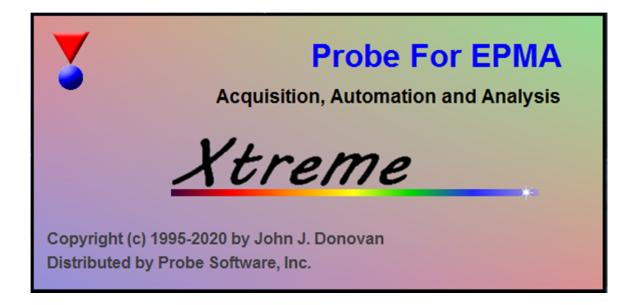
Probe for EPMA v. 12.8.0

User's Guide to Getting Started Xtreme Edition



By Daniel T. Kremser Edited by David T. Adams and Karsten Goemann for Probe Software, Inc. © Copyright 1994-2020

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Disclaimer

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Conventions Used in this Guide

The screenshots used in this guide are consistent with Probe For EPMA version 9.4.1, released April 2013. Some screenshots might display older version information, but the contents of these dialogs and windows have not been changed since then.

The following conventions are used in this document; **Menu Commands** and **Dialog Box** (**Windows**) **Names and buttons** are bold-faced whenever they occur in the text. *Dialog Box Options* are italicized and FILE NAMES are capitalized. Several tips for saving time/steps include:

Context sensitive HELP is available in any window by pressing the F1 key.

Pressing <Enter> (or <Return> < \leftarrow > on international keyboards) on the keyboard is identical to clicking the **OK** button.

Pressing the <Esc> key on the keyboard is identical to clicking the **Cancel** command. To select a range of items in *Multi-Select* list boxes, click on the first item, move to the last and hold the <Shift> key down while clicking on the last item.

To select individual items in *Multi-Select* list boxes, hold down the <Ctrl> key down while clicking on the item.

De-select items in *Multi-Select* list boxes by holding the <Ctrl> key down and clicking the item.

Creating the Default Standard Database File

PROBE FOR EPMA requires a database of microprobe standards for use in quantitative analysis. This standard database can store up to 32768 standards each with up to 72 elements per standard. All standard information is stored in a file designated STANDARD.MDB. MDB is an abbreviation for Microsoft DataBase and represents a Microsoft Access v. 3.5 database file. In addition to the default standard database, four other standard databases are supplied as ASCII files and as MDB files. These are:

DHZ.MDB	Deer, Howie and Zussman
ORE.MDB	Dana's Mineralogy (Sulfides)
SRM.MDB	NIST standard reference alloys and glasses
AMCSD.MDB	American Mineralogist Crystal Structures

The DHZ.MDB is a database of all of the analyses listed in the first edition of "Rock Forming Minerals" by Deer, Howie and Zussman.

The ORE.MDB is a database composed of sulfide minerals from Dana's Mineralogy entered in ideal formulas.

The SRM.MDB is a database of SRM (Standard Reference Materials) alloys and glasses from the NIST SRM catalog.

The AMCSD.MDB is the American Mineralogist Crystal Structure Database, which contains over 9500 compositions based on formula stoichiometries.

All of these database files can be used for reference and compositional matching purposes through the Standard menu.

The following procedure illustrates how to create a new default standard database and enter standard compositions into it.

Open the STANDARD application. If available, double click on the yellow Probe for EPMA software folder on the desktop. Then double click on the **Standard** icon:



Alternatively, select **Standard** from the Probe Software group in the Windows Start Menu, or locate and double click on the STANDARD application in the Probe for EPMA application directory, which is usually C:\Probe Software\Probe for EPMA under Windows Vista and Windows 7, or C:\Program Files\Probe Software\Probe for EPMA for older operating systems.

STANDARD can also be launched by selecting **Standard Database** in the **Standard** menu of Probe for EPMA:

👎 Probewir	(Probe for EPMA)	_ D _ X
File Edit	Standard Xray Analytical Window Run Output Help	
ŀ	Standard Database (load default standard compositional database)	
Welcom	Evaluate Standards	1
Copyri	Select Standard Database (specify a different standard composition database as the defau	lt)
This sof	Edit Standard Parameters (coating)	
Karsten Probe Sc	Add/Remove Standards To/From Run	Ctrl+S
item sim Initiali	e F1 key in any window for context sensitive help. To get help ply highlight with the mouse and hit the F1 key. zing Demonstration Interface ation Interface Initialized	on a menu
Click File	New or Open to create or open a probe database. Click File User Wizard! for Eancel	Pause //

This action launches the STANDARD (Compositional Database) program and opens the **Open Old Standard Database File** dialog box.

Standard (Compositional Database)				×		
File Edit Standard Options Xray	Analytical Output Help					
Sing Open Old Standard Database File	and the second			x		
🔾 🗢 🚺 🕨 Computer 🕨 Local D	isk (C:) Probe Software Probe for EPMA	👻 🍫 Search F	Probe for EPMA	٩		
Organize 🔻 New folder				2		
☆ Favorites	Name	Date modified	Туре	-		
🧫 Desktop	amcsd.mdb	04/02/2012 08:35	MDB File			
Downloads	boundary.mdb	18/11/2012 06:45	MDB File	=		
B Recent Places Dana.MDB 27/09/2002 08:43 MDB File						
	DHZ.MDB	04/02/2012 10:23	MDB File			
词 Libraries	jeolel.mdb	06/09/2009 08:24	MDB File			
jeolox.mdb 06/09/2009 08:24 MDB File						
🔞 Homegroup	MANvsOFF-1.MDB	16/06/2008 08:27	MDB File			
	matrix.mdb	18/04/2013 11:35	MDB File			
🖳 Computer	Ore.MDB	04/02/2012 10:23	MDB File			
🚢 Local Disk (C:)	POSITION.MDB	23/04/2013 09:58	MDB File	Ŧ		
emxmdata (\moselev) (M:) 🔻 🕻 👘 👘						
File name: standard.mdb						
		Open	Cance			
I						
2						
<u> </u>			Cancel Pause			

To create a new standard database, click on the **Cancel** button to close the **Open Old Standard Database File** dialog box.

Select File from the menu bar and then click on New from the menu.

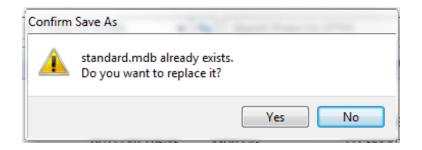
Calculated Oxygen Z - Bar	ASCII File SCII File (single row format) SCII File (single row format) SCII File (single row format) MCSD.MDB (American Mineralogist Database) Standards From Cameca PeakSight (Sx.mdb) Standards From JEOL Text File (created from Perl script) rmation Ctrl+F g Ctrl+P	tandard (Compositional Database)	-	
Save As Close Import ASCII File Export ASCII File Import ASCII File (single row format) Export ASCII File (single row format) Export ASCII File (single row format) Create AMCSD.MDB (American Mineralogist Database) Import Standards From Cameca PeakSight (Sx.mdb) Import Standards From JEOL Text File (created from Perl script) File Information Ctrl+F	ASCII File SCII File SCII File (single row format) SCII File (single row format) SCII File (single row format) MCSD.MDB (American Mineralogist Database) standards From Cameca PeakSight (Sx.mdb) standards From JEOL Text File (created from Perl script) rmation Ctrl+F g Ctrl+P	, , , , , ,	Information	
Import Standards From Cameca PeakSight (Sx.mdb) Import Standards From JEOL Text File (created from Perl script) File Information Ctrl+F	itandards From Cameca PeakSight (Sx.mdb) itandards From JEOL Text File (created from Perl script) rmation Ctrl+F g Ctrl+P	Save As Close Import ASCII File Export ASCII File Import ASCII File (single row format) Export ASCII File (single row format)	Calculated Oxyg	en Z-Bar
	g Ctrl+P	Import Standards From Cameca PeakSight (Sx.mdb) Import Standards From JEOL Text File (created from Perl script)		
Print Log Ctrl+P				
Print Setup		-	Ctrl+P	
Exit		Exit		

This opens the **Open New Standard Database File** dialog box.

Organize 🔻 New fold	er			8== -
퉬 Downloads 🔷	Name	Date modified	Туре	Size
🔚 Recent Places	amcsd.mdb	04/02/2012 08:35	MDB File	1,560 KB
=	boundary.mdb	18/11/2012 06:45	MDB File	111,564 KB
libraries	Dana.MDB	27/09/2002 08:43	MDB File	116 KB
a	DHZ.MDB	04/02/2012 10:23	MDB File	168 KB
👶 Homegroup	📄 jeolel.mdb	06/09/2009 08:24	MDB File	220 KB
	jeolox.mdb	06/09/2009 08:24	MDB File	232 KB
Computer	MANvsOFF-1.MDB	16/06/2008 08:27	MDB File	692 KB
Local Disk (C:)	matrix.mdb	18/04/2013 11:35 III	MDB File	21,996 KB
File name: stan	dard.mdb			
Save as type: *.MD	B (*.MDB)			

Click the Save button to open a new default standard database (STANDARD.MDB).

The Confirm Save As window appears. Click Yes.



The default standard database supplied with the installation is J. Donovan's standard listing. The user has a different set of standards typically, so the choice is to overwrite the supplied database. Click the **Yes** button to confirm overwriting the existing default database. Note: the supplied demonstration files JEOLEL.MDB and JEOLOX.MDB will no longer be usable after this operation.

The File Information window opens.

File Name	C:\Probe Software\Probe for EPMA\standard.mdb	
Version	9.41 Type STANDARD	OK
User	Standard	Cancel
Title	Default Standard Database	
Department		
Account #	Group	
Description	Standard Composition (Probe for EPMA)	
Date Created	23/04/2013 10:34:03 Date Modified 23/04/20	013 10:34:03

Enter the relevant information into the *User*, *Title*, and other *Description* text boxes shown in the **File Information** dialog box displayed below. Use the <tab> key to move between text boxes.

File Name	C:\Probe Software\Probe for EPMA\standard.mdb	
Version	9.41 Type STANDARD	ок
User	Karsten Goemann	Cancel
Title	Default Standard Database	
Department		
Account #	Group	
Description	Standard Composition (Probe for EPMA)	
Date Created	23/04/2013 10:34:03 Date Modified 23/04/201	3 10:34:03

When finished, click the **OK** button.

The user now has an empty database ready to accept standard composition data.

Standard [C:\Probe Software\Probe for EPMA\standard.mdb]	
File Edit Standard Options Xray Analytical Output Help	
Standards (double-click to see composition data) Standard Information Image: Standard Information Image: Standard Information Image:	Total Weight % Z ⋅ Bar Atomic Weight
	Cancel Pause 🕢

To enter standards into this database, select **Standard** from the menu bar and click on **New** from the menu.

Standard [C:	\Probe Software\Probe for EPMA\standard.mo	lb]	
	andard Options Xray Analytical Output	: Help	
Standarc	New	Ctrl+N	ormation
	Modify Duplicate	Ctrl+M	
	Delete Delete Selected		
	List All Standard Names List All Standard Names and Average Z List Elemental Standard Names List Oxide Standard Names		otal Oxygen Total Weight % alculated Oxygen Z - Bar xcess Oxygen Atomic Weight
	List Selected Standards List All Standards List Elemental Standards List Oxide Standards		
			Cancel Pause ,

This action opens the **Standard Composition** dialog box. Type the appropriate *Sample Number, Standard Name,* and *Standard Description* into the text boxes. The software automatically loads the next available number by default. Choose standard numbers that will allow grouping of standards into various functional sets. Standard numbers may range from 1 to 32768, however to avoid conflict with the supplied NIST SRM, DHZ, and Dana ORE sample databases select numbers below 2000.

ndard Com	position	-					
	umber, Name	and Descri	iption				OK
1						_	
Standard I	Description					^	Cancel
							Density (gm/cm3
							5.00000
						Ŧ	Calculate Density
Click Elem	ent Row to	Edit Elemen	t Compositio	n and/or Cat	ions (click er	npty row	to add) ————
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic _
ondinioi			Cutono	onygono	Lionorita	Childo	
	_						
	_						
•							
							P
Enter Com	position In-	Display	Composition	As	Cu Elemental		lumn Totals ide Atomic
		C 0	de Standard		.000	UX	ide Atomic
Oxide F	Percent	C Oxic					
Oxide F	Percent ital Percent		mental Stand	ard To		om Catio	
Oxide F			nental Stand	10	tal Oxygen F		ns
○ Oxide F • Elemen	tal Percent			To	tal Oxygen Fi tal Oxygen fr	om Halog	ns
○ Oxide F • Elemen				To Ha	tal Oxygen Fi tal Oxygen fr logen Correc	om Halog	en

Click the *Elemental Percent* and *Elemental Standard* buttons under *Enter Composition In* and *Display Composition As* respectively, as necessary. All standard compositions are saved in the standard database as elemental concentrations. If oxygen is present in the standard then the user must enter oxygen as an element and its concentration into the standard entry. See the silicate example in this manual for details.

The first example will illustrate the entry of an elemental metal standard. Click on any empty row in the spreadsheet. This opens the **Element Properties** dialog box. In the *Element* field either type in the first element in the standard or use the drop-down list box to select the element symbol. Continue by choosing the correct *X-Ray* line, *Cations*, and *Oxygens*. The *X-Ray* line is used for modeling purposes only. When entering properties and concentrations for elements in elemental mode, the program grays out the *Cations* and *Oxygens* text boxes, as no editing of these text boxes is necessary.

5.00000 Click Element Row to Edit Element Composition and/or Cations (click empty row to add) Channel Element Properties Enter Element Properties and Weight Percent For : OK Element ×-Ray (default) Cations Oxygens Co ion In Elemental Percent Crystal (default) Change Clear isplay Composition As Current Column Totals Elemental Oxide Percent Oxide Standard	Sample Nu	umber, Nam	ne and Description —			
Provided by JEOL Provided by JEOL Density (gm/c 5.00000 Calculate Density Click Element Row to Edit Element Composition and/or Cations (click empty row to add) Channel Element Properties and Weight Percent For : Element X-Ray (default) Cations Oxygens Element X-Ray (default) Cations Oxygens Cancel Composition In Elemental Percent Crystal (default) Charge Enter Composition As Elemental Oxide Atom .000 Composition As Elemental Percent Current Column Totals Elemental Percent Current Column Totals Elemental Oxide Atom .000 Total Oxygen From Cations Total Oxygen from Halogens Halogens Conversed Owners	529	Co	pper Metal			OK
Click Element Row to Edit Element Composition and/or Cations (click empty row to add) Channel Element Properties Channel Element Properties and Weight Percent For: Channel Element X-Ray (default) Cations Oxygens Channel Element X-Ray (default) Cations Oxygens Cancel Co Co Co Co Co Co Co Co Co C					~	Cancel
Click Element Row to Edit Element Composition and/or Cations (click empty row to add) Channel Element Properties Enter Element Properties and Weight Percent For : Element X-Ray (default) Cations Oxygens Cancel Ka v 2 v 1 v Cancel Co or or or on In Elemental or o	Toridea	by VLOL				Density (gm/cm)
Click Element Row to Edit Element Composition and/or Cations (click empty row to add) Channel Element Properties Enter Element Properties and Weight Percent For : Element X-Ray (default) Cations Oxygens Cancel Co on In Elemental Percent Crystal (default) Charge Clear Cu Zn ga Enter Comp as Elemental Oxide Standard Current Column Totals Elemental Percent Current Column Totals Elemental Oxide Atom .000 Total Oxygen From Cations Total Oxygen from Halogens Helegene Convected Owners						5.00000
Click Element Row to Edit Element Composition and/or Cations (click empty row to add) Channel Element Properties Element X-Ray (default) Cations Oxygens Cancel Ka Z Co on In Elemental Percent Crystal (default) Charge Clear Cl					-	
se Image: Se Image: Se Image: Se Image: Se Elemental Oxide Atom Image: Se Image: Oxide Standard Image: Se	·	CU CO ni CU ZN Ga Ge	▼ ka ▼	Crystal (defau	v 1 v It) Charge v 1	Clear
Elemental Percent Elemental Standard Total Oxygen From Cations Total Oxygen from Halogens Halegen Corrected Owneen		se	-			
Total Oxygen From Lations Total Oxygen from Halogens Halogen					.000	.000
Haleger Corrected Owner	. Liciler			lot		
Enter Atom Formula Composition Halogen Lorrected Uxygen						
				Ha	ogen Lorrected Ux	liden

Enter the elemental weight percent for copper into the *Enter Composition In Elemental Weight Percent* text box. Finish by clicking the **OK** button of the **Element Properties** dialog box.

Enter Element F	Properties and We	ight Percent For :		OK
Element	X-Ray (default) ka 👻	Cations	Oxygens	Cancel
	ion In Elemental Percent	Crystal (default)	Charge	Clear

The program returns to the **Standard Composition** dialog box.

ndard Com Sample Nu	umber, Name	and Descr	iption				_
529	Cop	per Metal					OK
Pure meta Provided	al standard by JEOL					*	Cancel
							Density (gm/cm3 5.00000
						Ŧ	Calculate Density
Click Elem Channel	Element	Edit Elemer X-Ray	nt Compositio	n and/or Cati	ions (click en Elemental	npty row Oxide	o add) Atomic
1	cu	ka	Culture	cijgene	100.000	Cinco	100.000
•							
Oxide I	position In – Percent Ital Percent	C Oxi	y Compositior de Standard mental Stand		Co Elemental 100.000 tal Oxygen Fi	0×	umn Totals ide Atomic 100.000 ns
				To	tal Oxygen fr	om Halog	ens
12000		ula Compos	ition	Ha	logen Correc	ted Oxyg	en

If there are more elements (compound standards) in the standard, click the next empty *Element* row and repeat the data entry process. When all elements are entered, click the **OK** button on the **Standard Composition** dialog box. This concludes the entry of a standard into the standard database and results in the following log window output.

	Standard Options Xray (double-click to see com					-
			.000 Total Oxygen .000 Calculated Oxygen .000 Excess Oxygen	29.000 Z	otal Weight % - Bar tomic Weight	
	Copper Metal					-
Pure meta Provided	40.0 KiloVolt = l standard by JEOL Composition					
Average T	otal Oxygen:	.000	Average Total Weight%:	100.000		
Average C	alculated Oxygen:	.000	Average Atomic Number:	29.000		=
Average E	xcess Oxygen:	.000	Average Atomic Weight:	63.546		1
LEM:	Cu					
RAY:	ka					
INT:	0.000					
	0000					
LWT: 10	.0000					
ELWT: 10 TFAC: 1	.0000					- 12
ELWT: 10 XFAC: 1 ZCOR: 1						
ELWT: 10 RFAC: 1 ZCOR: 1	.0000					

Many standards contain oxygen in their compositions. Since all standard compositions are saved to the standard database as elemental concentrations, it is necessary to enter the oxygen concentration if oxygen is present in the compound. This applies to all standards, even those that are entered and/or displayed as oxide concentrations. The following example illustrates a silicate (oxygen bearing) standard entry into the database.

From the main STANDARD log window, select **Standard** from the menu bar and click on **New** from the menu choices. This action opens the **Standard Composition** dialog box. Type the appropriate *Sample Number, Standard Name,* and *Standard Description* into the text boxes. Click the *Oxide Percent* and *Oxide Standard* buttons under the *Enter Composition In* and *Display Composition As* boxes.

Sample Nu	umber, Name	and Descri	iption				
1	Ame	elia Albite					OK
Natural sp	ecimen from	Amelia, VA	, USA			~	Cancel
							Density (gm/cm 5.00000
						*	Calculate Density
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic
	-						
	-						
٠ 🗌							÷.
	position In-	Display	Composition	As			umn Totals
Enter Com		G Ovia	de Standard		Elemental	xU 00.	ide Atomic 0 .000
	Percent				.000		
• Oxide F	Percent tal Percent		nental Standa	rd Tot	al Oxygen Fi	rom Catio	ns .000
• Oxide F			nental Standa	Tot			
• Oxide F • Elemen		⊂ Eler		Tot	al Oxygen Fi	om Halog	ens .000

Click on any empty row in the spreadsheet.

This opens the **Element Properties** dialog box. In the *Element* field either type in the first element in the standard or use the drop-down list box to select the element symbol. Continue by choosing the correct *X-Ray* line, *Cations*, and *Oxygens*. Finally, enter the weight percent for SiO_2 into the *Enter Composition In Oxide Weight Percent* text box.

Enter Element Pro	operties and We	eight Percen	t For :		OK
	K-Ray (default) ka	Cation:	s • 2	Oxygens •	Cancel
Enter Composit Weight P		Crystal (de	fault)	Charge	-
68.71		TAP	- 4	L I	Clear

Finish by clicking the **OK** button of the **Element Properties** dialog box. This results in the following **Standard Composition** dialog box.

Sample Nu	umber, Name	e and Descr	iption				ОК
-	ecimen from		A, USA			~	Cancel
							Density (gm/cm)
							5.00000
						~	Calculate Density
Channel 1	Element Si	X-Ray ka	Cations 1	Oxygens 2	Elemental 32.117	0xide 68.710	Atomic •
	-						
•							•
Enter Com	position In -		y Compositior	n As –	Cu Elemental	urrent Col Ox	umn Totals
Enter Com • Oxide F	Percent	© Oxi	de Standard				umn Totals ide Atomic
Enter Com • Oxide F		© Oxi			Elemental	0x	umn Totals ide Atomic 10 100.000
Enter Com • Oxide F	Percent	© Oxi	de Standard	ard To	Elemental 32.117	Ox 68.7 om Catio	umn Totals ide Atomic 10 100.000 ns <u>36.593</u>
Enter Com • Oxide F • Elemen	Percent	© Oxi C Elei	de Standard mental Stand	ard To To	Elemental 32.117 tal Oxygen Fi	Ox 68.7 om Catio om Halog	umn Totals ide Atomic 10 100.000 ns <u>36.593</u> ens .000

Note: to facilitate the data entry for the oxygen concentration of standard compositions which are entered as oxide concentrations, the program will display a running total in the text box designated *Total Oxygen From Cations*.

Sample Nu	umber, Name	and Descr	iption				OK	
1	Am	elia Albite					OK	
Natural sp	ecimen from	n Amelia, VA	A, USA			~	Cancel	
							Density (gm/	cm
							5.00000	
						~	Calculate Der	nsity
			nt Compositio					
Channel 1	Element Si	X-Ray ka	Cations 1	Oxygens 2	Elemental 32.117	0xide 68,710	Atomic 60.006	
2	AI	ka	2	3	10.320	19,500	20.071	
3	Na	ka	2	1	8.680	11.700	19.811	
4	К	ka	2	1	.083	.100	.111	
•							•	
		Diaplay	Composition			wast Cale) Imp Tatala	
Enter Com	position In -		y Compositior	n As –			imn Totals le Ator	nic
Enter Com			y Compositior de Standard	n As –	Ci Elemental 51.200		le Ator	
Enter Com • Oxide F		⊙ Oxi		ard	Elemental	0xid 100.01	de Aton 0 100.00	00
Enter Com • Oxide F	Percent	⊙ Oxi	de Standard	ard To	Elemental 51.200	Oxio 100.01 rom Cation	de Aton 0 100.00 s 48.81	0
Enter Com C Oxide F C Elemen	Percent	© Oxi ⊖ Elei	de Standard mental Stand	ard To To	Elemental 51.200 tal Oxygen F	Oxio 100.01 rom Cation om Haloge	de Atom 0 100.00 s 48.81 ens .000	00

Continue the data entry process for the remaining elements (as oxides).

To complete the standard entry into the standard database, enter oxygen as the last element in the standard. Click on any empty row in the spreadsheet. This opens the **Element Properties** dialog box. In the *Element* field type in the element symbol for oxygen. Check for the appropriate *X-Ray* line, *Cations*, and *Oxygens*. Finally, enter the running total from the *Total Oxygen From Cations* text box into the *Enter Composition in Oxide Weight Percent* text box.

1	Ame	elia Albite					OK
Natural sp	pecimen fron	n Amelia, Vi	A, USA			*	Cancel
							Density (gm/cr
							5.00000
						~	Calculate Densi
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic
	Si	ka	1	2	32.117	68.710	60.006
2	AI	ka	2	3	10.320	19.500	20.071
	Na Iement Prope	_	2		8 680		19.811
	lement Prope	erties Nent Propert		Jht Percent Fo Cations	r: Oxyge		OK Cancel
4 EI	Enter Element Element O Enter Co	erties nent Propert nt X-Ra	ties and Weig (default) I Nide	Jht Percent Fo Cations	r: Oxyge] 0	ns	OK Cancel
4 El	Enter Element Element O Enter Co	erties nent Propert nt X-Ra v ka poposition I	ties and Weig (default) v (default) v (def	pht Percent Fo Cations 1	r: Oxyge] 0	ns	ОК
4 El Content Co Content Co Content Co	Enter Element D Enter Co Enter Co	erties ment Propert at X-Ra v ka mposition I eight Perce	ties and Weig (default) v (default) v (def	Jht Percent Fo Cations 1	r: Oxyge] 0) Charg	ns v	OK Cancel
 Enter Co Oxido 	Enter Element Element D Enter Co W(48.81	erties ment Propert at X-Ra v ka mposition I eight Perce	ties and Weig (default) v (default) r Oxide nt C	pht Percent Fo Cations 1 ▼ Crystal (default NiCrBN ▼ iarg Tot	r : Oxyge] 0) Charg] -2	ns Je rom Cations	OK Cancel Clear 48.810

Click the **OK** button of the **Element Properties** dialog box.

The following **Standard Composition** dialog box illustrates the completed five-element silicate standard, Albite.

Sample Nu	umber, Name	and Descr	iption					
1	Am	elia Albite					OK	
Natural sp	oecimen from	n Amelia, VA	A, USA			~	Cancel	
							Density (gm/	сп
							5.00000	
						-	Calculate Der	nsitu
Channel 1	Element Si	X-Ray ka	Cations 1	Oxygens 2	Elemental 32.117	0xide 68.710	Atomic 23.072	-
	ient How to	Edit Elemer	nt Composition	n and/or Lati	ons (click en			
								-
2	AI	ka	2	3	10.320	19.500	7.717	
3	Na	ka	2	1	8.680	11.700	7.617	
4	ĸ	ka	2	1	.083	.100	.043	
5	0	ka	1	0	48.810	.000	61.550	
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•								
	position In -	Display	y Composition	n As –			ımn Totals	
Enter Com			y Composition de Standard	n As	Elemental	Oxio	ımn Totals Je Ator	nic
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The compositional data of any standard entered into the standard database may be reviewed by simply double-clicking on the standard of interest from the scrollable *Standards* list box. The following window contains two standards with the compositional data of Albite displayed in the log window in oxide form.

St 1 Amelia Albite FakeOff = 40.0 KiloVolt = 15.0 Density = 5.000 Natural specimen from Amelia, VA, USA Dxide and Elemental Composition Average Total Oxygen: 48.810 Average Total Weight*: 100.010 Average Calculated Oxygen: 48.810 Average Atomic Number: 10.712 Average Excess Oxygen: .000 Average Atomic Weight: 20.178 ELEM: Si02 Al203 Na20 K20 0 KRAY: ka ka ka ka DXWT: 68.710 19.500 11.700 .100 .000 ELWT: 32.117 10.320 8.680 .083 48.810 KFAC: .2532 .0790 .0499 .0007 .2550 ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142 AT*: 23.072 7.717 7.617 .043 61.550	1 Amelia Albite 529 Copper Metal 529 Copper Metal 1 Amelia Albite T0 = 40, KeV = 15 Natural specimen from Amelia, VA, USA 48.810 Total Daygen 100.010 Total Weight 3 2.1 Amelia Albite St 1 Amelia Albite St 1 Amelia Albite St 1 Amelia Albite TakeOff = 40.0 KiloVolt = 15.0 Density = 5.000 Natural specimen from Amelia, VA, USA Oxide and Elemental Composition Average Total Oxygen: 48.810 Average Total Oxygen: 48.810 Average Total Oxygen: 48.810 Average Atomic Number: 10.712 Average Excess Oxygen: .000 Average Atomic Weight: 20.178 ELEM: SiO2 Average KRAY: ka ka Ka ka ka XWT: 68.710 19.500 RACK: .2532 .0790 XWT: 30.59 1.7377 XHOR .0001 .0007				Xray Anal			d Information			
529 Copper Metal T0 = 40, KeV = 15 Natural specimen from Amelia, VA, USA 48.810 Total Daygen 100.010 Total Weight % 20.178 Atomic Weight 52 1 Amelia Albite TakeOff = 40.0 KiloVolt = 15.0 Density = 5.000 Natural specimen from Amelia, VA, USA Natural specimen from Amelia, VA, USA Oxide and Elemental Composition Average Total Oxygen: 48.810 Average Total Oxygen: 10.712 Average Total Oxygen: 48.810 Average Atomic Number: 10.712 Average Excess Oxygen: .000 Average Atomic Weight*: 100.010 Average Excess Oxygen: .000 Average Atomic Weight: 20.178 ELEM: SiO2 Al2O3 KEA: ka ka OXWT: 68.710 19.500 KEA: .2550 .2079 COR: 1.2685 1.3059 KEA: .2550 .2072 AVE .007 .2550 COR: 1.2685 1.3059	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Standa	ras (aouble	-CIICK to see	e composido	on dataj –	Standard	d Information			
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XRAY: ka ka ka ka ka OXWT: 68.710 19.500 11.700 .100 .000 ELWT: 32.117 10.320 8.680 .083 48.810 KFAC: .2532 .0790 .0499 .0007 .2550 ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142 AT%: 23.072 7.717 7.617 .043 61.550	XRAY: ka ka ka ka ka ka OXWT: 68.710 19.500 11.700 .100 .000 ELWT: 32.117 10.320 8.680 .083 48.810 KFAC: .2532 .0790 .0499 .0007 .2550 ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142	Natural Oxide a Average Average	E = 40.0 specime and Eleme Total C Calcula	KiloVol en from A ental Com Oxygen: ated Oxyg	melia, V position 48. gen: 48.	A, USA 810 810	- Average Average	Total Weight%: Atomic Number:	10.712		
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ELWT: 32.117 10.320 8.680 .083 48.810 KFAC: .2532 .0790 .0499 .0007 .2550 ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142 AT%: 23.072 7.717 7.617 .043 61.550	ELWT: 32.117 10.320 8.680 .083 48.810 KFAC: .2532 .0790 .0499 .0007 .2550 ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142	Natural Oxide a Average Average Average ELEM:	<pre>5 = 40.0 5 specime and Eleme a Total C c Calcula a Excess SiO2</pre>	KiloVol en from A ental Com Dxygen: ated Oxyg Oxygen: Al2O3	umelia, V uposition 48. gen: 48. Na2O	A, USA 810 810 000 K20	Average Average Average 0	Total Weight%: Atomic Number:	10.712		ſ
KFAC: .2532 .0790 .0499 .0007 .2550 ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142 AT%: 23.072 7.717 7.617 .043 61.550	KFAC: .2532 .0790 .0499 .0007 .2550 ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142	Natural Oxide a Average Average Average ELEM: XRAY:	F = 40.0 specime and Eleme Total C Calcula Excess SiO2 ka	KiloVol en from A ental Com Dxygen: ated Oxyg Oxygen: Al2O3 ka	umelia, V uposition 48. gen: 48. Na2O ka	A, USA 810 810 000 K20 ka	Average Average Average 0 ka	Total Weight%: Atomic Number:	10.712		
ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142 AT%: 23.072 7.717 7.617 .043 61.550	ZCOR: 1.2685 1.3059 1.7377 1.1563 1.9142	Natural Oxide a Average Average ELEM: XRAY: OXWT:	F = 40.0 specime and Eleme Total C Calcula Excess SiO2 ka 68.710	KiloVol en from A ental Com Dxygen: ated Oxyg Oxygen: Al2O3 ka 19.500	melia, V uposition 48. gen: 48. Na20 ka 11.700	A, USA 810 810 000 K20 ka .100	Average Average Average 0 ka .000	Total Weight%: Atomic Number:	10.712		
	ATT - 02 070 7 717 7 617 042 61 550	Natural Oxide a Average Average ELEM: XRAY: OXWT: ELWT:	F = 40.0 specime and Eleme Total C Calcula Excess SiO2 ka 68.710 32.117	KiloVol en from A ental Com Dxygen: ated Oxyg Oxygen: Al2O3 ka 19.500 10.320	melia, V uposition 48. gen: 48. Na20 ka 11.700 8.680	A, USA 810 810 000 K20 ka .100 .083	Average Average Average 0 ka .000 48.810	Total Weight%: Atomic Number:	10.712		
24 0: 8.996 3.009 2.970 .017 24.000	AIT : 23.072 7.717 7.017 .045 01.550	Natural Oxide a Average Average ELEM: XRAY: OXWT: ELWT: KFAC:	<pre>5 = 40.0 . specime . specime . Total C . Calcula . Excess . SiO2 . ka . 68.710 .32.1172532</pre>	KiloVol en from A ental Com Dxygen: ated Oxyg Oxygen: Al2O3 ka 19.500 10.320 .0790	melia, V uposition 48. gen: 48. Na20 ka 11.700 8.680 .0499	A, USA 810 810 000 K20 ka .100 .083 .0007	Average Average Average 0 ka .000 48.810 .2550	Total Weight%: Atomic Number:	10.712		
	24 0: 8.996 3.009 2.970 .017 24.000	Natural Oxide a Average Average ELEM: XRAY: OXWT: ELWT: KFAC: ZCOR:	<pre>F = 40.0 . specime . specime . Total C . Calcula . Excess . SiO2 . ka 68.710 .22.117 .2532 1.2685</pre>	KiloVol en from A ental Com Dxygen: ated Oxyg Oxygen: Al2O3 ka 19.500 10.320 .0790 1.3059	melia, V uposition 48. gen: 48. Na2O ka 11.700 8.680 .0499 1.7377	A, USA 810 810 000 K20 ka .100 .083 .0007 1.1563	Average Average Average 0 ka .000 48.810 .2550 1.9142	Total Weight%: Atomic Number:	10.712		

Some standards are simple end-member compounds or stoichiometric phases. These standards may be entered as a formula string.

Select **Standard** from the menu bar and click on **New** from the menu. This action opens the **Standard Composition** dialog box. Type the appropriate *Sample Number, Standard Name*, and *Standard Description* into the text boxes.

310	Nis	and Descri					OK
Synthetic						*	Cancel
							Density (gm/cn
							5.00000
						Ŧ	Calculate Densit
Plink Elem	ant Dam to I		. Composition	and an Cali	inne feliele en		
Channel	Element	X-Ray	t Composition	Oxygens	Elemental	Oxide	Atomic
Sugure	Liement		Cations	Oxygens	Liellientai	Uxide	Atomic
	_						
<							•
		- Display	Composition	As		urrent Col	
Enter Com	position In -		Composition	As	Cu Elemental		umn Totals
Enter Com Oxide F	Percent	C Oxio	le Standard				umn Totals
Enter Com Oxide F		C Oxio		avd	Elemental	Oxi	umn Totals ide Atomic .000
Enter Com Oxide F	Percent	C Oxio	le Standard	ard To	Elemental .000	Oxi	umn Totals ide Atomic .000

Click the **Enter Atom Formula Composition** button and enter the formula string into the text box.

In this example NiS for nickel sulfide was entered.

3oh'' or ''ca2mg5si8o22(oh)2''
Cancel
1.

Click the **OK** button. The stoichiometric phase NiS is entered into the **Standard Composition** window.

ndard Com			The Property lies	Rey Official			
Sample Nu 310	Imber, Name		iption				OK
Synthetic	- USGS					~	Cancel
							Density (gm/cm 5.00000
						_	5.00000
							Calculate Density
							1.0
			t Composition				
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic 4
1	Ni	ka			64.677		50.000
2	S	ka			35.323		50.000
	_						
	-						
	-						
•							F.
	100 A	D: 1	· · · ·	-			umn Totals
Enter Com	position In-	Display	Composition	AS	Elemental		
Oxide F	Percent	C Oxio	de Standard		100.000		100.000
0.51	tal Percent	@ Eler	nental Standa	- bre			
Element				To	tal Oxygen Fr	rom Catio	ns
Elemen						12121112	
• Elemen				To	tal Oxygen fr	om Halog	ens
						-	
	r Atom Form	ula Composi	ition		logen Correc	-	en

Click the **OK** button closing the **Standard Composition** window and returning to the main STANDARD log window.

Standar		Options Xray				
	ds (double	-click to see compo	osition dataj	Standard Information		
1 Amelia Albite 310 NiS 529 Copper Metal				St 310 NiS TO = 40, KeV = 15 Synthetic - USGS		
				.000 Total Oxygen .000 Calculated Oxygen .000 Excess Oxygen	23.761	Total Weight % Z - Bar Atomic Weight
A18 :	23.012	/./1/ /.0				
24 0:	8.996	3.009 2.9	70 .01	7 24.000		
TakeOff Synthet: Elementa	ic - USC		5.0 Dens	sity = 5.000		
Average	Total ()xvgen:	.000	Average Total Weight%:	100.000	
		ated Oxygen:	.000	Average Atomic Number:	23.761	
-	Excess	Oxygen:	.000	Average Atomic Weight:	45.387	
Average						
	Ni	S				
ELEM:	Ni ka	S ka				
ELEM: XRAY:	ka	-				
ELEM: XRAY: ELWT:	ka	ka 35.323				
ELEM: XRAY: ELWT: KFAC:	ka 64.677 .6158	ka 35.323				
Average ELEM: XRAY: ELWT: KFAC: ZCOR: AT% :	ka 64.677 .6158	ka 35.323 .3096 1.1407				

To modify a particular standard, select the standard in the *Standards* list box. Click **Standard** from the menu bar and select **Modify** from the menu. Edit the appropriate fields in the **Standard Composition** window as described previously.

After entering all of the standard compositions in your standard collection, copy this important file (STANDARD.MDB) to another directory on the hard disk and likewise to another storage media for archival purposes.

Note: the takeoff, kilovolt, x-ray, and cation ratio parameters displayed here are used only for nominal calculations of the k-factors and ZAF corrections within the program STANDARD. The PROBE FOR EPMA quantitative analysis will calculate the quantitative standard k-factors based on the actual conditions.

Creating Standard Position Files

The program STAGE is used to digitize your standard mounts to create pre-digitized standard coordinate files. These files are necessary for automated acquisition and standardization. The standard coordinates are digitized in three dimensions (X, Y, and Z) as well as the W stage position (JEOL multi-position specimen stages only) and are typically referenced to three physical fiducial marks on the standard mount surface. These coordinate files should be digitized with the standard mount located in the position where it is typically found.

The following procedure illustrates how to create a new standard position file. In this example, four carbonate standards will be digitized. These standards must already be entered into the standard database, using program STANDARD.

When creating digitized standard files for standard mounts containing more than 64 standards, a slightly different procedure than outlined below must be followed. Concise instructions on how to bypass the current 64 standard limit in the STAGE digitize feature are outlined in the reference documentation. To find these instructions, open the PROBEWIN.HLP program from the Probe for EPMA folder. Click the **Index** button and type in digitize in the text box. Highlight the topic entitled *Digitizing Standard Mounts with More than 64 Standards* and click the **Display** button.

Open the STAGE application (Stage Control and Automation), if available by double clicking on the **Stage** icon in the Probe for EPMA Software group.



Alternatively, select **Stage** from the Probe Software group in the Windows Start Menu, or locate and double click on the STAGE application in the Probe for EPMA application directory, which is usually C:\Probe Software\Probe for EPMA under Windows Vista and 7, or C:\Program Files\Probe Software\Probe for EPMA for older operating systems.

This starts the STAGE program and opens its main log window. If no POSITION.MDB is detected, the **PositionOpenNewFile** dialog opens.

Stage (Stage Control and Automation)	
File Edit Standard Window Output Help	
Welcome to Stage, Probe for EPMA (Xtreme Editio	n) v.
<u>9.4.1</u> Copyright (c) 1995-2013 John J. Donovan	
This se PositionOpenNewFile	×
Probe S	
Press t Creating a new Position database: C:\Probe Software\Probe for EPMA\POSITION.MDB	get help
on a me	key.
Initial	
Demonst OK	
Cancel	Pause //

Clicking the **OK** button creates a new Position database.

If the POSITION.MDB exists then STAGE opens the **Stage Map!** window and the **Automate!** dialog as seen below.

	* Automate! [Standard Position Samples From POSITION.MD	E] X
	Position List (multi-select) (double-click to see data) Standards Unknowns Wavescans All Samples	Digitize Move Fiducials Conditions Mosaic Sample Setups Plot File Setups
Stage (Stage Control and Automation) File Edit Standard Window Output Help SP1 SP2 SP3 SP4 52750.0 53100.0 53250.0 52950.0 5 Welcome to Stage, Probe for 11.0.6 Copyright (c) 1995-2015 Joh This software is registered to : Karsten Goemann Probe Software Press the F1 key in any win help. To get help on a menu the mouse and hit the F1 ke Initializing Demonstration Interfa Demonstration Interface Initialize	Select Stds Select All Go Auto Focus Update Delete All Delete Selected Samples Import from ASCII File Delete Selected Positions Export Selected Samples Import *LEP Import *.DCD	Plot File Setups Confine Stage Map! (double-click to move)

The following display illustrates the STAGE log window.

🎦 Stage (S	tage Control	and Automatio	n)					x
File Edit	Standard	Window Out	put Help					
SP1	SP2	SP3	SP4	SP5	х	Y	Z	
52549.3	41971.3	59907.8 20	5937.1 44	4980.6 -:	12449. 387	768.0 310	.518	
-	e to St	age, Pro	be for	EPMA	Xtreme	Edition) v.	
9.4.1 Copyri	ght (c)	1995-20	13 Joh	n J. Do	novan			
This sof Karsten Probe So	Goemann	registere	d to :					
		in any wi imply high				_	-	elp
	-	onstration terface In						
						Canad	Pausa	
						Cancel	Pause	11.

Select **Standard** from the menu bar and click on **Add/Remove Standards To/From Run** from the menu choices.

🎦 Stage (S	tage Control and Automation)			_ 0	x
File Edit	Standard Window Output Help				
SP1		x	Y		
52549.3	Add/Remove Standards To/From Run		8768.0 31		_
9.4.1	e to Stage, Probe for EPMA (X ght (c) 1995-2013 John J. Don		; Farcio	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
This sof Karsten Probe So					
	ne F1 key in any window for context s nu item simply highlight with the mou		_	_	help
	zing Demonstration Interface ration Interface Initialized				
<u></u>			Cancel	Pause	

This action opens the **Add Standards to Run** dialog box. Click on the name of each of the standards in the standard block to be digitized from the *Available Standards in Database* list box.

Add Standards to Run				
Available Standards in Databas	se (multi-select)	Curre	nt Standards in Run	I
113 Muscovite (U.C. #15463) 116 Biotite (GHC 305)				
135 Calcite (analyzed) 138 Calcite (Harvard #97189) 139 Magnesite (Harvard #10505	301			
140 Rhodocrosite (Harvard #89 141 Dolomite (Harvard #105064	794)			
143 Kutnahorite (Harvard #8567 145 Siderite (Harvard #96217)	70)			
147 Celestine (U.C. #4593) 160 NBS K-412 mineral glass 162 NBS K-411 mineral glass 177 Corning 1737 Glass 180 An00 feldspar glass	-			
	,	,	· · · · · · · · · · · · · · · · · · ·	
Enter Standard To Find:	Add Standard	To Run >>		OK
	<< Remove Stan	dard from Run		Cancel

Click the **Add Standard to Run** >> button to move these standards into the current run. Standards may be added one at a time or the user may multi-select standards by holding down the <Ctrl> button on the keyboard as standards are selected. Double clicking each entry will also send the standard to the other column in the dialog window.

Add Standards to Run			_
Available Standards in Databa	se (multi-select)	Current Standard	ls in Run
113 Muscovite (U.C. #15463) 116 Biotite (GHC 305) 135 Calcite (analyzed) 138 Calcite (Harvard #97189) 139 Magnesite (Harvard #10500) 140 Rhodocrosite (Harvard #10506) 141 Dolomite (Harvard #10506) 143 Kutnahorite (Harvard #856) 145 Siderite (Harvard #96217) 147 Celestine (U.C. #4593) 160 NBS K-412 mineral glass 162 NBS K-411 mineral glass 177 Corning 1737 Glass 180 An00 feldspar glass	794) I)	135 Calcite (analyzed) 140 Rhodocrosite (Harvard # 141 Dolomite (Harvard #105 145 Siderite (Harvard #9621	5064)
Enter Standard To Find:	Add Standard	d To Run >>	ОК
	<< Remove Sta	ndard from Run	Cancel

Click the OK button of the Add Standards to Run dialog box when finished.

The previously opened **Automate!** dialog box should be brought forward.

	double-click to see data)	Digitize	Move
Standards Unknowns		Fiducials	Conditions
C Wavescans		Mosaic	Sample Setups
C All Samples		Plot	File Setups
	Confirm Delay (sec) 10	
Select Stds Select All		Use Beam Defle	
Go F Auto Focus		Use ROM Auto New Sample C Every Point	Focus Digitized
Delete All		Confirm All Positi	⊮ ith Confirm
Delete Selected Samples	Import from ASCII File	Use Auto Brightne	
Delete Selected Positions	Export Selected Samples	Confirm Positions	
Import *.LEP	Import *.DCD		USICIONS
Row X	Y Z N	₩ Grain #	Focus

Click the **Fiducials** button.

This opens the **Select Fiducial Set** window.

Current Fiducial Sets In Position Database		OK
Sample fiducial data sets may be used to reference sample positions to physical fiducial marks on your sample mounts. These fiducial sets can be used later to re-locate your sample positions exactly even after being removed from the microprobe and reloaded at a later time.	Confirm	Cancel
The fiducial set selected below will be referenced for all subsequent position digitization and manual sample acquisitions. To reference sample positions to another fiducial set, select a different set or create a new one and select it.	View	Help
Fid O No Fiducial Set	Modify	Assign Fiducials To Position Samples
	New	Move
	Delete	

Click the **New** button. This opens the **Modify Fiducial Positions** window. The current stage coordinates are loaded by default.

Modify Fidu	cial Positions	Construction of the local division of the lo			-	
Enter Ap	proximate Fig	lucial Positions	For Fiducial S	Set 1		ОК
Fiducial Description		New Fiducial	Coordinate Se		Canad	
Point#	x	Y	Z	w		Cancel
1	-12448.71	38768.04	310.5177	0	Update	
2	-12448.71	38768.04	310.5177	0	Update	Move
3	-12448.71	38768.04	310.5177	0	Update	Stage

Type in a *Fiducial Description*. Enter the nominal coordinates or move to each of the three fiducial marks on the standard mount, determining their approximate coordinates, and enter those values into the appropriate fields. On JEOL 733 microprobes, the W stage position needs to be recorded as well. The following window will result.

Enter Ap	proximate Fid	ucial Positions	For Fiducial S	Set 1		OK
Fiducial	Description	Carbonate St	andards			Canad
Point#	х	Y	z	w		Cancel
1	-12448.71	38768.04	310.5177	0	Update	
2	-12448.71	38768.04	310.5177	0	Update	Move
3	-12448.71	38768.04	310.5177	0	Update	Stage

Click the **OK** button when done. This creates a new entry in the **Select Fiducial Set** list box as shown below.

Current Fiducial Sets In Position Database		OK
Sample fiducial data sets may be used to reference sample positions to physical fiducial marks on your sample mounts. These fiducial sets can be used later to re-locate your sample positions exactly even after being removed from the microprobe and reloaded at a later time.	Confirm	Cancel
The fiducial set selected below will be referenced for all subsequent position digitization and manual sample acquisitions. To reference sample positions to another fiducial set, select a different set or create a new one and select it.	View	Help
Fid O No Fiducial Set		Assign
Fid 1 Carbonate Standards	Modify	Fiducials To Position Samples
	New	Move
	Delete	

Select (highlight) the new fiducial set and click the **Confirm** button to initiate a precise centering of the three fiducial marks.

The **Modify Fiducial Positions** window opens displaying the originally entered fiducial coordinates. Click the **OK** button to initiate the centering process.

Enter Ap	proximate Fig	lucial Positions	s For Fiducial S	Set 1		OK
Fiducial	Description	Carbonate St	tandards			Cancel
Point#	x	Y	Z	w		Lancel
1	-12448.71	38768.04	310.5177	0	Update	
2	-12448.71	38768.04	310.5177	0	Update	Move
3	-12448.71	38768.04	310.5177	0	Update	Stage

The computer then drives the stage to each fiducial mark and displays the **FiducialVerifyFiducial** window. Adjust the stage position to center the fiducial mark and click the **OK** button.

FiducialVer	ifyFiducial	 	1.5	x
1	Please adjust the stage alignment mark. Click <esc> to quit.</esc>			
		ОК		Cancel

After centering the third fiducial mark and clicking the **OK** button, the **FiducialVerifyFiducials** window opens to display the specimen tilt in radians and degrees. A warning will be given if the sample is tilted at more than 0.5 degrees.

FiducialVer	ifyFiducials
Î	Specimen tilt in radians: ThetaX = 1.804077E-03 ThetaY= 2.85416E-04 Theta= 1.826514E-03 Specimen tilt in degrees: ThetaX = .103366 ThetaY= 1.635313E-02 Theta= .1046516
	ОК

Click this **OK** button.

Closing the FiducialVerifyFiducials window returns to the Select Fiducial Set dialog box.

urrent Fiducial Sets In Position Database		OK
Sample fiducial data sets may be used to reference sample positions to physical fiducial marks on your sample mounts. These fiducial sets can be used later to re-locate your sample positions exactly even after being removed from the microprobe and reloaded at a later time.	Confirm	Cancel
The fiducial set selected below will be referenced for all subsequent position digitization and manual sample acquisitions. To reference sample positions to another fiducial set, select a different set or create a new one and select it.	View	Help
rid O No Fiducial Set		Assign
id 1 Carbonate Standards	Modify	Fiducials To Position Samples
	New	Move
	Delete	

Finally, click the **OK** button on the **Select Fiducial Set** dialog box. This opens the **FiducialSaveSelect** window to confirm the currently selected fiducial set.

FiducialSav	eSelect
i	Subsequent manual and digitized sample positions will not be referenced to a fiducial set
	OK

Click the **OK** button of the **FiducialSaveSelect** window.

The fiducial coordinate positions are recorded to disk and the **Automate!** dialog box returns.

-Position List (multi-select)	(double-click to see data) -	Distri	Mauri			
• Standards		Digitize	Move			
C Unknowns		Fiducials	Conditions			
C Wavescans		Mosaic	Sample Setups			
C All Samples		Plot File Setup				
		Confirm Delay (s	ec) 10			
Select Stds		🗌 Use Beam De	Use Beam Deflection			
Select All		🔽 On Stds 🔲 On Unks 🗌 On Wavs				
Go			Use ROM Auto Focus New Sample C Digitized Every Point C Interval 5			
Auto Focus						
Update		_	1 -			
Delete All			Confirm All Positions			
Delete Selected Samples	Import from ASCII File	Use Auto Bright				
Delete Selected Positions		Send Scan Rotation For Each Image				
		es Confirm Positions				
Import *.LEP	Import *.DCD					
Row X	Y Z	W Grain	# Focus			

The position of each of the standards in this standard mount must now be digitized. Move to the first standard; either by turning the motor controls manually or, if possible with your instrument, by using the joystick via the JOYWIN (Joystick Control for Stage and Spectrometers) program, or by using the **Move** button in the **Automate!** window. Clicking the **Move** button opens the **Move Motors and Change Crystals** dialog box.

Type in the appropriate target coordinates in the *Stage Target Positions* boxes for the first standard. Use the <tab> key to move between entries.

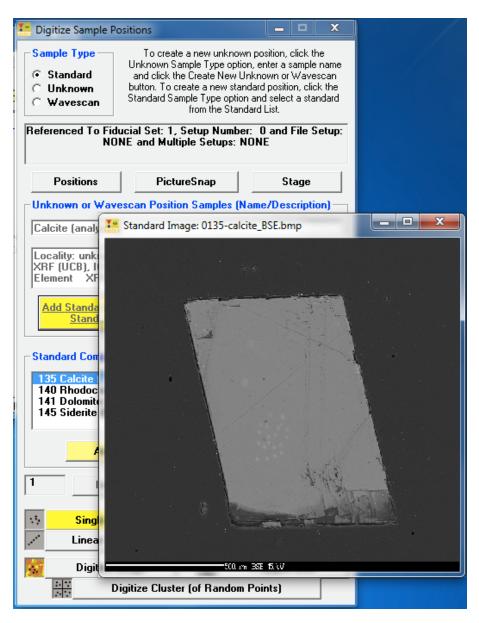
X	Positions		Remove F	2	Go Stage	Go Spectro:
300.000 Z	1125.00	Increment	Z Axis Adj	ust crement	Positions	Stage
310.500		100.		1.00	Auto	Focus
	Stage					ge Sample
🔲 Use Stage B	Backlash	Park Stage	Update P	ositions	Filamen	t Standby
EDS Ir		DS Retract	Free/C	lear	Cl	ose
SP1	Target Position SP2	s SP3	SP4	SP5		
		LIF2 -	TAP -	LLIF	-	-
52750.0	53100.0	53250.0	52950.0	53250.0		
1 0	2 0	3 0	4 0	5	0	6 0
		💓 🕅	1	1		2
🌌 🕰						

Click **Go All.** This will drive the stage to the target positions. Check the position and optical focus.

Click the **Digitize** button of the **Automate!** dialog box. This activates the **Digitize Sample Positions** dialog box. The *Standard Position Samples* list box contains the standards already added to the run.

				E Digitize Sample Pos	sitions	×
Automate! [Standard Position	Samples From POSITION.MDB]	1		Sample Type © Standard © Unknown	To create a new unknow Unknown Sample Type opti and click the Create New I button. To create a new sta	on, enter a sample name Jnknown or Wavescan ndard position, click the
Position List (multi-select) (dd Standards Unknowns Wavescans All Samples	puble-click to see data)	Digitize Fiducials Mosaic Plot	Move Conditions Sample Setups File Setups	○ Wavescan	Standard Sample Type optio from the Star	
		Confirm Delay (sec) 10	Positions	PictureSnap	Stage
Select Stds Select All Go C Auto Focus Update Delete All		Use Beam Defle On Stds On Use ROM Auto New Sample Every Point Confirm All Positi Acquire Inages V Use Auto Brightnes	Unks On Wavs Focus Digitized Interval 5 ons With Confirm	Unknown or Wave	scan Position Samples (I	Name/Description) —
Delete Selected Samples Delete Selected Positions	Import from ASCII File	Send Scan Rotatio	on For Each Image		1 1 1 D 1	Auto Increment
Import *.LEP	Export Selected Samples Import *.DCD	Confirm Po	ositions			Auto Digitize
Row X Y	<u>z</u> w	^r Grain #	Focus	135 Calcite (analy 140 Rhodocrosite 141 Dolomite (Har 145 Siderite (Har Add/R	i (Hárvard #89794) rvard #105064) vard #96217) Remove Standards To/Fr ent Grain Use Di int(s) Sh verse Standards Co/Fr	

Select (highlight) the first standard to digitize from the *Standard Position Samples* list box. The standard will be added automatically to the **Automate!** *Position List*. If a BMP electron image file exists for the standard, then it too will be displayed. This can be used to check whether you are on the correct standard. Further, the image could be annotated to suggest places or grains to avoid during the standard digitization or acquisition process.



To digitize a random point on this standard, click the **Single Point(s)** button of the **Digitize Sample Positions** dialog box to record the current coordinates (X, Y, Z, and W) for this grain. The coordinates of this standard in the **Automate!** dialog box are seen below.

	Samples From	m POSITION.M	DB]		
Position List (multi-select) (d	ouble-click t	o see data) —		Digitize	Move
Standards St 0135 Fid 1 O Unknowns	Calcite (analy	zed)		Fiducials	Conditions
C Wavescans				Mosaic	Sample Setups
C All Samples				Plot	File Setups
				Confirm Delay (sec)	10
Select Stds Select All				Use Beam Defle	Jnks 🔲 On Wavs
Go E				Use ROM Auto I O New Sample	
Auto Focus Update			_	C Every Point C	
Delete All			- [Confirm All Position	
Delete Selected Samples	Import fro	om ASCII File		Use Auto Brightnes	s/Contrast
Delete Selected Positions	Export Sel	ected Samples	-	Confirm Po	
Import *.LEP	Impo	Import *.DCD		Confirm Po	sicions
Row X Y	37653.02	Z 310.5000	W 0	Grain # 1	Focus
KeV = 15 Curr = 10 Size = 0 MagAnal = 2533 Mag			Spot	t Sample Setup	(row) Number = 0
MagAnal = 2533 Ma	glmag = 2533	ImgShift = -2, 3 File Setup = NON			(row) Number = 0 ates = 1

Note, that although only one position per standard need be digitized, if additional points are digitized, PROBE FOR EPMA will automatically utilize them. Otherwise, PROBE FOR EPMA will simply increment the stage X position for each additional acquisition required.

Move the stage to the next standard, select the standard from the list box in the **Digitize Sample Position** window and click the **Single Point(s)** button again. The standard position will be digitized. Continue until all of the remaining standards in the standard block are digitized. In this example the **Automate!** and **Digitize Sample Positions** dialog boxes would appear as follows.

Automate! [Standard Position Samples From POSITION.MDB Position List (multi-select) (double-click to see data) Standards Unknowns St 0135 Fid 1 Calcite (analyzed) St 0140 Fid 1 Rhodecrosite (Harvard #89794) All Samples St 0145 Fid 1 Sideme (Harvard #85217)	Digitize Move Fiducials Conditions Mosaic Sample Setups Plot File Setups Confirm Delay (sec) 10	Digitize Sample Positions
Select Stds Select All Go Auto Focus Update	Use Beam Deflection On Stds On Unks On Wavs Use ROM Auto Focus New Sample C Digitized Every Point C Interval 5 Confirm All Positions	Positions PictureSnap Stage Unknown or Wavescan Position Samples (Name/Description)
Delete All Import from ASCII File Delete Selected Samples Export Selected Samples Import *LEP Import *.DCD	Confirm Positions Confirm Con	Specimen from Harvard Mineralogical Museum (Carl Francis) Locality: St. Just, Cornwall, England Add Standards To Bun Then Select Standard from List Below
Row X Y Z W 1 11910.95 36553.13 310.5000 0 KeV = 15 Curr = 10 Size = 0 Mag = 2533 Mode = Analog S MagAnal = 2533 MagImag = 2533 ImgShift = -2, 3	1 0	Standard Compositions Added To Run (select to create new) 135 Calcite (analyzed) 140 Rhodocrosite (Harvard #89794) 141 Dolomite (Harvard #105064) 145 Siderite (Harvard #195217) Add/Remove Standards To/From Run 1 Increment Grain Use Digitized AutoFocus Number Size Single Point(s) Linear Traverse
File Setup = NONE Multiple Setups = NONE	Replicates = 1	Digitize Image W Polygon Grid Help Digitize Cluster (of Random Points)

Close the **Digitize Sample Positions** dialog box by clicking the **Close** button in the upper right corner.

Finally, store the new pre-digitized standard coordinates to disk as an ASCII position file (.POS). Select all of the standards using the **Select Stds** button of the **Automate!** dialog box.

🥌 Automate! [Standard F	Position Samples F	rom POSITION.M	DB]		
Position List (multi-sel	lect) (double-click	k to see data) —		Digitize	Move
Standards St 01 O Unknowns St 01 O	135 Fid 1 Calcite (an	alyzed)		Fiducials	Conditions
5(0)	140 Fid 1 Rhodocros 141 Fid 1 Dolomite (H	te (Harvard #8979	4)	Mosaic	Sample Setups
0.01	145 Fid 1 Siderite (Ha			Plot	File Setups
			Cor	nfirm Delay (sec)	10
Select Stds			Г	Use Beam Defle	ction
Select All			Ē		Jnks 🔲 On Wavs
Go			P	Use ROM Auto I	
Auto Focus				New Sample C Every Point C	
Update			-		1
Delete All				onfirm All Positio cquire Images W	
				Use Auto Brightnes	
Delete Selected Sam		from ASCII File		Send Scan Rotation	n For Each Image
Delete Selected Posi		elected Sample	<u> </u>	Confirm Po	sitions
Import *.LEP		nport *.DCD			
Row X 1 11910.5	Y 95 36553.13	Z 310.5000	W 0	Grain # 1	Focus
KeV = 15 Curr = 10 3 MagAnal = 25	Size = 0 Mag = 25 33 MagImag = 253	33 Mode = Analog 33 ImgShift = -2, 3	g Spot	Sample Setup	(row) Number = 0
		File Setup = NON	E		

Click the Export Selected Samples button.

This action opens the **Open File To Export Position Data To** window. The default *Save in:* location is specified by the StandardPOSFileDirectory keyword in the PROBEWIN.INI file.

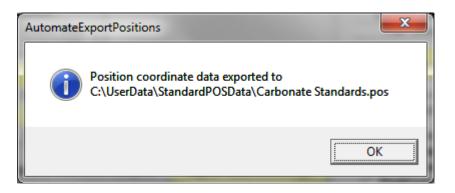
Copen File	To Export Position Data To			×
Save in: 🚺	StandardPOSData	•	(= 🖻 💣 🗉	
Name	*		Date modified	Туре
	No items ma	tch your se	arch.	
•				Þ
File name:	untitled.pos			Save
Save as type:	ASCII Position Files (*.POS)		•	Cancel

Type in an appropriate *File name*:

Y Open File	To Export Position Data To		×
Save in: 🔒	StandardPOSData	⇐ 🖻 💣 📰 ◄	
Name	^	Date modified	Туре
	No items match your se	arch.	
•	m		Þ
File name:	Carbonate Standards.pos	S	ave
Save as type:	ASCII Position Files (*.POS)	▼ Ca	ancel

Click the Save button of the **Open File To Export Position Data To** window.

After the positions are written to disk, the **AutomateExportPositions** window appears.



Click the **OK** button to confirm the exported position coordinate data to disk in the **AutomateExportPositions** window. Next, close the **Automate!** dialog box by clicking the **Close** button. Finally, close STAGE by clicking the **File** | **Exit** menu.

Stage (Stage Control and Automation)	
File Edit Standard Window Output Help	
Import Positions from Cameca PeakSight (Sx.mdb)	Y Z
Re-load PROBEWIN.INI File	37653.1 307.999
Print Log Ctrl+P	e Edition) v.
Print Setup	
Exit	
Probe Software Press the F1 key in any window for context ser on a menu item simply highlight with the mouse Initializing Demonstration Interface Demonstration Interface Initialized	
	Cancel Pause //

After digitizing all of the standards on the standard mounts and creating various *.POS files, copy these files to another directory and to a backup media.

Beam and Detector Stability

Testing beam (drift) stability is an important step prior to acquiring any quantitative data. The following step-by-step procedure illustrates how to monitor and plot beam current with time. On JEOL microprobes the FARADAY module may also be run for measurement of the beam (see the User's Guide and Reference documentation for further details).

From the Desktop, double click on the yellow Probe for EPMA Software folder, if available. Then, double click on the **Startwin** icon.



Alternatively, select **Startwin** in the Probe Software group of the Windows Start Menu, or locate and double click on STARTWIN in the Probe for EPMA application directory, which is usually C:\Probe Software\Probe for EPMA under Windows Vista and Windows 7, or C:\Program Files\Probe Software\Probe for EPMA for older operating systems.

This action launches the STARTWIN (Motion and Counter Control) program and opens three windows. The main STARTWIN log window, the **Count Acquisition** window and the first **Stage Map!** are displayed.

Startwin (Motion and	d Counter Control)			_ 🗆 X	👯 Stage Map! (double-click to move) 📃 💻 🗙
File Edit Modes Xi	ray Window Output H	lelp			- Holder Selection @
	artwin, Probe		me Edition) v.	9.4.1	
Copyright (c)	1995-2013 Joh	n J. Donovan			H06.wmf -2650.6 ×0.8
This software is	registered to :				40000.0 x1.2) (+)
Karsten Goemann	2				
Probe Software					Faraday
Press the F1 key	in any window for	context sensitiv	e help. To get hel	p on a menu item	Positions
simply highlight	with the mouse an	d hit the F1 key.			C No Samples
Initializing Dem	onstration Interfa	ce			C Unknown
	terface Initialize				C Wavescan
					C All Samples) (+)
					Light Mode
				Cancel Pause	Refl Tran On Off
	Count Acquisition				
					Spot Scan
	SP1 SP2	SP3 SP4	SP5 X 4980.6 -13511. 376	Y Z	B/C-1 B/C-2
V	1	2 3	4 5	Faraday	
		.00 .00	.00 .00	.00	
				.000000	
	РНА	Count Times	Start Wavescan	Start Count	
	Analytical Conditions	Peak/Scan Options	Start Peak Center	Traverse Move	Spot

This causes both the Count Acquisition window and the Stage Map! window to open.

From the STARTWIN log window, select **Modes** from the menu bar and click on **Cycle Counters** from the menu choices. The **Measure Faraday** menu should also be selected.

🚺 Startwin (Moti	ion and Counter Control)		
File Edit Moo	les Xray Window Output Help	-	
Welcom 🗸	Cycle Counters	reme Edition) v. 9	.4.1
Copyri	Do Not Set Analytical or Column Conditions	ı	
This sof Karsten Probe Sc	Perform Auto Focus Move To Off Peaks Measure Off Peaks		
Press th 🗸 simply h	Measure Faraday Measure Absorbed	tive help. To get help ey.	on a menu item
Initiali Demonstr	Use Stage Traverse Use Time Stamp		
			Cancel Pause 📈

Next, click the **Count Times** button in the **Count Acquisition** window.

	Count Acqui	sition							x
	SP1	SP2	SP3	SP4	SP5	x	Y	Z	
ſ	52548.6 4	1970.2	59910.5	26937.8	44980.9	-13511.	37653.1	307.999	
	1		2	3	4		5	Far	aday
	3.56	53	.56	3.56	3.36	3.5	56		.00
	30902.	2842	28. 9	9579.	6747.	32778	3.	.00	0000
	PHA	L	Cou	ınt Times	Sta	art Wavesc	an	Start Cou	nt
	Analytical Co	onditions	Peak/S	can Option	s 🛛 Sta	rt Peak Cer	nter Tr	averse	Move

This opens the **Count Times** dialog box. Choose an *On Peak* and *Cycle Time* count time. The *On Peak* time is the time the scalers will count and the *Cycle Time* is the interval of time between successive measurements. Thus, the sum of both numbers is the time between measurements of the beam. Finally, disable the beam drift correction; confirm that the *Use Beam Drift Correction* box is unchecked.

		ОК
On Peak	Off Peak	
10.00	5.00	Cancel
Max Count	Cycle Time	
10000000	10.00	
☐ Use DeadTim ✓ Normalize To	e Correction Counts Per Second	Parameters for Intensity Displa
Nominal Beam Cu Nominal beam		Averages

Click the **OK** button returning to the **Count Acquisition** window. Click the **Start Count** button to initiate a continuous cycle of beam current measurements. In this example, a ten second scaler count will be done, followed by a thirty-second countdown and then a Faraday current measurement. This process repeats until the user cancels the loop.

SP1	SP2	SP3	SP4	SP5	Х	Y	Z
52549.5 4	1972.9	59910.6	26936.3	44979.3	-13511.	37653.1	307.999
1-TAP	2-LI	LIF 3-	LPET	4-TAP	5-LLI	F	Absorbed
4.06	4	.06	4.27	4.06	4.0	6	.00
26343.	86	72.	5081.	4463.	32729		.000000
PHA		Cou	int Times	Sta	art Wavesca	in	Start Count

When the user has acquired a suitable number of beam current measurements, click the **Cancel** button in the **Automation Status** bar located at the bottom right side of the STARTWIN log window to stop the acquisition cycle. All log windows in any PROBE FOR EPMA program will have a **Cancel** and **Pause/Continue** buttons in the lower right portion of the window.

Probe Software Press the F1 key in any window for context sensitive help. To get help on a menu	•
Karsten Goemann Probe Software Press the F1 key in any window for context sensitive help. To get help on a menu	
Press the F1 key in any window for context sensitive help. To get help on a menu	
	Contraction of the second s
	item
simply highlight with the mouse and hit the F1 key.	
Initializing Demonstration Interface	
Demonstration Interface Initialized	
19.9989 6484.7 2134.8 1425.6 1098.7 8056.8 .000000	E
19.9809 8589.6 8596.9 2426.7 3640.5 9240.6 .000000	
20.0122 8861.7 2830.5 3021.1 559.5 3800.6 .000000	
19.9864 5488.6 4183.7 8140.8 8904.8 375.6 .000000	
20.0197 7264.9 7266.4 9145.2 8969.8 9446.3 .000000	

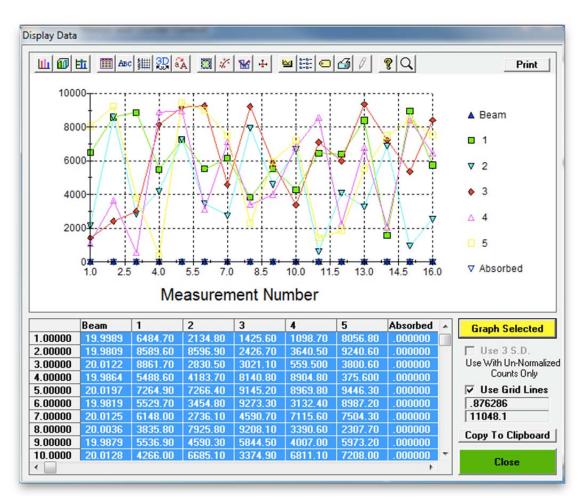
The STARTWIN log window will contain the beam current data acquired so far (in this example, reported in nanoamps). The other five columns represent counts in counts per second acquired by each spectrometer, which is in this case randomly generated by the demonstration mode of the software:

M Startwin (M	otion and Cou	unter Control)						_ 🗆 🗙
File Edit M	lodes Xray	Window O	utput Help					
Welcome to Startwin, Probe for EPMA (Xtreme Edition) v. 9.4.1								
Copyrigh	Copyright (c) 1995-2013 John J. Donovan							
This softw		gistered	to :					
Karsten Go Probe Soft								
Probe Solt	ware							
Press the	F1 key in	any wind	ow for co	ntext sen	sitive he	elp. To get	help on a	menu item
simply hig	-	_						
Initializi	-							
Demonstrat				1000 7				
19.9989		2134.8		1098.7	8056.8			
		8596.9		3640.5		.000000		
		2830.5		559.5		.000000		
19.9864		4183.7		8904.8	375.6			
20.0197	7264.9 5529.7	7266.4	9145.2 9273.3	8969.8 3132.4	9446.3	.000000		
20.0125	6148.0	2736.1	4590.7	7115.6	7504.3			
20.0036	3835.8	7925.8	9208.1	3390.6	2307.7			
19.9879	5536.9	4590.3	5844.5	4007.0	5973.2			
20.0128	4266.0	6685.1	3374.9	6811.1	7208.0			
20.0126	6454.5	620.3	7092.8	8563.0	1420.2			
20.0044	6384.1	4093.8	5986.6	2222.0	1858.1			
19.9918	8392.4	3265.4	9345.6	6772.1	5519.7			
19.9866	1577.7		7223.2	2074.2	7489.0			
19.9944	8945.0			8422.9	8397.4			
19.9830	5744.4	2542.6	8415.8	6445.5	7529.9	.000000		
19.9787	7989.6	3302.4	2872.2	4941.6	6334.0	.000000		
							Cancel	Pause //

Evaluating the trend between beam current and time may best be viewed in graphical format rather than looking at a long series of numbers. Use the mouse to select the data set to plot. Then, select **Output** from the menu bar and click **Plot Count Data (Selected in Log Window)** from the drop-down menu choices.

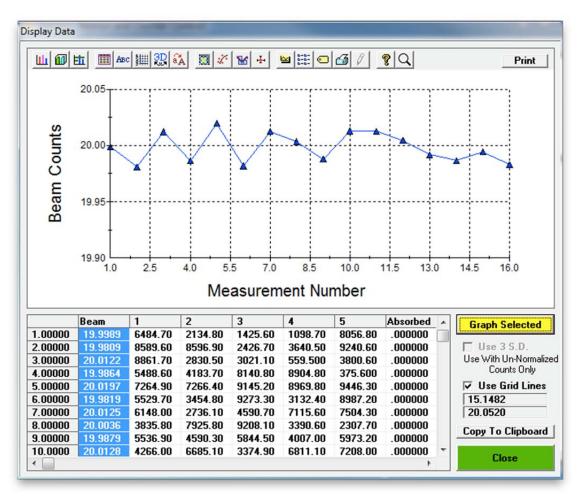
Startwin (Motion and Counter Control)				
File Edit Modes Xray Window	Output Help			
Welcome to Startwin,	Log Window Font	v. 9.4.1		
Copyright (c) 1995-20	Debug Mode			
This software is registere	✓ Extended Format			
Karsten Goemann	Verbose Mode			
Probe Software				
Drees the Et have in any wi	Save To Disk Log	help on a menn item		
Press the F1 key in any wi simply highlight with the	View Disk Log	help on a menu item		
	Plot Count Data (Selected in Log Window)			
Initializing Demonstration	List Spectrometer Setup			
Demonstration Interface In 19.9989 6484.7 2134.8				
19.9809 8589.6 8596.9	Open Link To Excel			
20.0122 8861.7 2830.5				
19.9864 5488.6 4183.7 20.0197 7264.9 7266.4				
19.9819 5529.7 3454				
20.0125 6148.0 2736.1	4590.7 7115.6 7504.3 .000000			
20.0036 3835.8 7925.8				
19.9879 5536.9 4590.3 20.0128 4266.0 6685.1				
20.0126 6454.5 620.3				
20.0044 6384.1 4093.8				
19.9918 8392.4 3265.4				
19.9866 1577.7 6867.6 19.9944 8945.0 936.4				
19.9830 5744.4 2542.0				
19.9787 7989.6 3302.4				
		Cancel Pause 🔏		

This opens the **Display Data** window.



While all data columns were selected by the mouse operation previously, the user may plot a single column of data by clicking the column label of the desired data and then clicking the **Graph Selected** button.

Below, *Beam Counts* versus *Measurement Number* (time) are graphed and the overall beam stability with time may be judged. Here, the beam measurements fluctuate slightly around a value of 20 nA.



The numeric value of any point on the graph may be read by placing the mouse cursor over the data point and viewing its value in the two windows directly above the **Close** button (bottom right).

Click the **Close** button to return to the STARTWIN log window.

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Quantitative Measurement Run

Introduction

This chapter illustrates step by step how to set up a new PROBE FOR EPMA quantitative run and how to analyze ten elements in an unknown pyroxene, which is a type of silicate mineral. This documentation was produced using a five spectrometer Cameca SX100 electron microprobe and on a computer running in demo mode. Your particular run may look very different depending on the specific configuration of your microprobe. This document should be used in conjunction with the User's Guide and Reference documentation, on-line help, Probe for EPMA Quick Start Guide and the PROBEUSERWIZARD program.

This run will demonstrate some of the basic and more advanced features of the PROBE FOR EPMA program. These include the use of manual and automated spectrometer peaking, manual and automated standard count and unknown sample acquisition, mean atomic number (MAN) background corrections, and automated spectral interference corrections. The use of predigitized standard positions, the unique wavescan option, off-peak adjustment capabilities and data output methods will be illustrated.

Opening Probe for EPMA

From the Desktop, double-click on the yellow Probe for EPMA Software folder, if available. Double click on the **Probe for EPMA** icon.



Alternatively, select Probe For EPMA from the Probe Software Group in the Windows Start Menu, or locate and double click on PROBEWIN in the Probe for EPMA application directory, which is usually C:\Probe Software\Probe for EPMA under Windows Vista and Windows 7, or C:\Program Files\Probe Software\Probe for EPMA for older operating systems. Upon launching PROBEWIN (Probe For EPMA), the main log window appears along with the **RealTimeInitInterface** window as illustrated below. To collect real time data click the **Yes** button. The program can also be run off-line without the microprobe interface to re-process previously acquired data or on another computer.

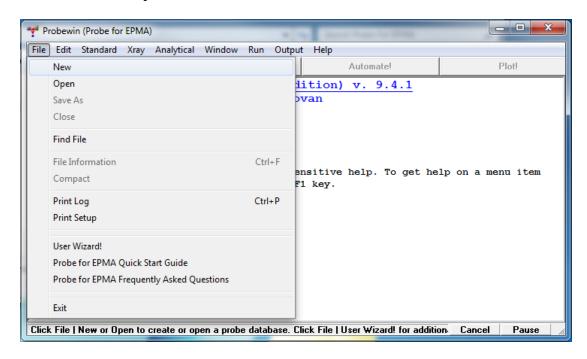
Probewin (Probe for EPMA)					
File Edit Standard Xray Ana	lytical Window Run Output Helj	p			
Acquire!	Analyze!	Automate!	Plot!		
Welcome to Probe fo	r EPMA (Xtreme Editio	on) v. 9.4.1			
Copyright (c) 1995-	2013 John J. Donovan				
This software is registered to : Karsten Goemann Probe Software Press the F1 key in any window for context sensitive help. To get help on a menu item simply highlight with the mouse and hit the F1 key.					
	RealTimeInitInterface	x			
	Do you want to interface t	o the microprobe hardware?			
		Yes No			
			Cancel Pause		

Note if this is the first time running PROBEWIN, several database files are created; SETUP.MDB, SETUP2.MDB, and SETUP3.MDB via the **SetupOpenNewFile** window. Click **Yes** to create these database files if prompted. The main PROBE FOR EPMA log window is now visible as seen below.

Probewin (Probe for EPMA)						
File Edit Standard Xray Analytical Window Run Output Help						
Acquire! Analyze! Automate!	Plot!					
item simply highlight with the mouse and hit the F1 key. Initializing Demonstration Interface Demonstration Interface Initialized	Welcome to Probe for EPMA (Xtreme Edition) v. 9.4.1 Copyright (c) 1995-2013 John J. Donovan This software is registered to : Karsten Goemann Probe Software Press the F1 key in any window for context sensitive help. To get help on a menu item simply highlight with the mouse and hit the F1 key. Initializing Demonstration Interface					
Click File New or Open to create or open a probe database. Click File User Wizard! for	ac Cancel Pause 🕢					

Creating a New Run

To create a new sample run, select **File** from the menu bar and click **New** from the menu.



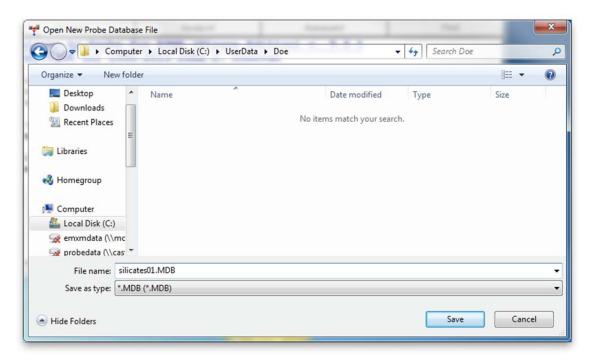
The Open New Probe Database File dialog box opens.

Organize 🔻 New fold	ler			-
Favorites	Name	Date modified	Туре	Size
E Desktop	3011	23/04/2013 08:53	File folder	
Downloads ≡	3012	22/04/2013 15:37	File folder	
🖳 Recent Places	Jan 2013	23/04/2013 08:53	File folder	
	퉬 CalcZAFDATData	22/04/2013 14:11	File folder	
🔰 Libraries	ColumnPCCData	29/07/2011 20:06	File folder	
	퉬 DemoImages	22/04/2013 14:11	File folder	
\delta Homegroup	퉬 Doe	22/04/2013 16:05	File folder	
	퉬 Penepma08	29/07/2011 19:55	File folder	
Somputer	퉬 Penepma12	25/10/2012 16:08	File folder	
🕌 Local Disk (C:) 👻	PFW Position Files	23/04/2013 12:03	File folder	
File name:				
	B (*.MDB)			

Change the directory if desired and type an appropriate run name into the File name: text box.

The initial *Save in:* location is specified by the UserDataDirectory keyword in the PROBEWIN.INI file.

In this example, a new file designated SILICATES01.MDB will be created in the Doe directory. Any existing old runs may be re-opened to acquire additional data or used as a "setup" file for starting a new run. This will be the first .MDB file in this folder.



Close the **Open New Probe Database File** window by clicking the **Save** button. First time users will see the creation of a new User database as shown below.

UserOpenN	lewFile
i	Creating a new User database: C:\Probe Software\Probe for EPMA\USER.MDB
	ОК

Clicking the OK button opens the File Information dialog box.

Enter the relevant information for the new run into the *User, Title*, and other *Description* text boxes. Use the <tab> key to move between text boxes. When finished, click the **OK** button.

File Name	C:\UserData\Doe\silicates01.MDB
Version	9.41 Type PROBE OK
User	Karsten Goemann Cancel
Title	Quantitative run demo
Department	Probe Software
Account #	Group
Description	Quantitative run demonstration
Date Created	23/04/2013 13:34:56 Date Modified 23/04/2013 13:34:55
Date created	

This returns the program to the main PROBE FOR EPMA log window. Now the four main Probe buttons **Acquire!**, **Analyze!**, **Automate!**, and **Plot!** become active.

Probe for EPMA [C:\UserData\I	Doe\silicates01.MDB]		
File Edit Standard Xray Ar	nalytical Window Run Output	: Help	
Acquire!	Analyze!	Automate!	Plot!
This software is regist Karsten Goemann Probe Software Press the F1 key in any simply highlight with t Initializing Demonstrat Demonstration Interface	-2013 John J. Donor tered to : y window for context set the mouse and hit the F tion Interface	van nsitive help. To get he	
New: Ready			Cancel Pause //

It is assumed that the user has previously chosen the elements to be analyzed, decided on initial standard assignments and has worked through the assignment of spectrometers for each element to be collected. Of course, additional elements and standards may be added or deleted at any time.

Parameter Initialization

Analytical Standard Selection

Select the analytical standards to be used in the new probe run. From the main PROBE FOR EPMA log window, click **Standard** from the menu bar and select **Add/Remove Standards To/From Run** from the menu.

👎 Probe for	EPMA [C:\UserData\Doe\silicates01.MDB]	_ D _ X			
File Edit	Standard Xray Analytical Window Run Output Help				
	Standard Database (load default standard compositional database)				
Welcom	Evaluate Standards				
Copyri	Select Standard Database (specify a different standard composition database as the default)				
This sof Karsten	Edit Standard Parameters (coating)				
Probe Sc	Add/Remove Standards To/From Run	Ctrl+S			
Prope SqAdd/denote Saman (1970) for the sensitive help. To get help on a menu item simply highlight with the mouse and hit the F1 key. Initializing Demonstration Interface Demonstration Interface Initialized					
New: Read	v Can	cel Pause 🛛 🖉			

This opens the Add Standards to Run dialog box.

Add Standards to Run			
Available Standards in Database	multi-select)	Current Stand	lards in Run
1 Schott Cover Slip Glass (D 263 2 Soda-Lime Glass 3 Soda Glass (Microscope slide) 4 Shultenite, HPbAs04 5 Rathite, (PbS)3 (As2S3)2 6 Baumhauerite, (PbS)4 (As2S3)3 7 Sartorite, PbS As2S3 8 Jordanite, (PbS)4 As2S3 9 NaCF3S03 10 BRI Polymer 11 Si0 12 MgO synthetic 13 Al2O3 synthetic 14 Si02 synthetic			
Enter Standard To Find:			OK
	Add Standard To R	un >>	
	<< Remove Standard (rom Run	Cancel

All previously entered standards in the default standard database are accessible. Scroll through the *Available Standards in Database* list box to find the standards to be used in this run. Select primary analytical standards, secondary standards for method validation, and the MAN background standards. The latter are used for background calculation and must not contain the element they are used for, so for example a few silicon free standards should be selected for Si background calculation. Standards may serve more than one purpose, e.g. pure silica could be used as Si primary standard and MAN standard for all other elements. Select each and click the **Add Standard To Run** >> button to add each to the *Current Standards in Run* list box.

Add Standards to Run		_	
Available Standards in Databas	e (multi-select)	Curre	ent Standards in Run
453 Augite, Kakanui USNM 122 455 Chromite USNM 117075 457 Diopside, NY USNM 11733 458 Fayalite Rockport, MA USI 460 Garnet USNM 87375 461 Garnet USNM 110752 462 Obsidian USNM 110752 463 Glass, basaltic USNM 11341 464 Obsidian USNM 113716 465 Obsidian USNM 72854 466 Glass, synthetic tektite USN 467 Hornblende (Kakanui) USNI 469 Hypersthene, johnstown US	NM 85276 VG-2 98 IM 2213 111356 4 143965		etic tic etic etic netic) iic eetic hematite c
Enter Standard To Find:	Add Standar	d To Run >>	ОК
,	<< Remove Sta	ndard from Run	Cancel

Click the **OK** button of the **Add Standards to Run** window when finished selecting standards. This returns the program to the main log window.

Creating a New Sample

Click the **Acquire!** button in the main PROBE FOR EPMA log window. This action opens the **Acquire!** dialog box. Note, not all buttons are active.

The first task is to create an initial sample as a template that can be populated with the elements the user wishes to analyze.

SP1 SP2	SP3	SP4	SP5	х	Y	Z	Spectro	Progress
52750.0 53100.0	53250.0	52950.0	53250.0	300.000 1125	.00 31	0.500		
1-TAP 2-L	LIF 3-1	LIF2	4-TAP	5-LLIF		Faraday		
.00	.00	.00	.00	.00		1		
						.000000		æ
				Start Standard	or Unkn	own Acquisition		
					or Unknot Waves		300.000 um .000000	1125.00
Ne w Sample	F	РНА	Acqu		Waves			1125.00 .000000 0 2533
New Sample Elements/Cations		PHA can Options	_	Star	Waves	can	um .000000 px 0 Magnification Beam Mode	.000000 0 2533 Analog Spo
	Peak/Sc		_	Star	Waves	aking Options	um .000000 px 0 Magnification	.000000 0 2533

Click the **New Sample** button of the **Acquire!** dialog box.

This opens the New Sample dialog box.

New Sample Type -	OK	Cancel
O Unknown	Load Elem	ent Setups
C Wavescan	Load Sam	nple Setup
	Load Fi	le Setup
Add/Remove Standards	Load Mul	tiple Setup
	-	ement setup.
Load Wavesca New Sample Name	in From Another Pro	
Load Wavesca New Sample Name unknown sample	an From Another Pro	obe Run
Load Wavesca New Sample Name unknown sample	an From Another Pro	
Load Wavesca New Sample Name unknown sample	an From Another Pro	obe Run
Load Wavesca New Sample Name unknown sample New Sample Descript	ion	Add <cr></cr>
Load Wavesca New Sample Name unknown sample New Sample Descript To add standards to the s then click the Standard //	ion	Add <cr></cr>

Select *Unknown* from the *New Sample Type* buttons. Type an appropriate sample name and description into the *New Sample Name* and *New Sample Description* text boxes. This first sample will be used as a "template", only to establish the analysis parameters.

New Sample Type -	OK	Cancel
Unknown	Load Elem	ent Setups
C Wavescan	Load Sam	ple Setup
	Load Fil	e Setup
Add/Remove Standards	Load Mult	iple Setup
make any necessary	From Another Pro	
New Sample Name		
•	elements	
template for pyroxene		Add <cr></cr>
template for pyroxene		Add <cr></cr>
template for pyroxene		Add <cr></cr>
template for pyroxene New Sample Description No add standards to the sta hen click the Standard Ad	o n andard list below, c	ancel this dialog
New Sample Name template for pyroxene New Sample Description To add standards to the stat then click the Standard Ad- the 12 MgO synthetic 13 Al2O3 synthetic 14 SiO2 synthetic 22 TiO2 synthetic	o n andard list below, c dd Standards to Ri	ancel this dialog

Click the **OK** button of the **New Sample** dialog box.

The program returns to the **Acquire!** window. Notice that the first sample designated $Un \ 1 \ * template for pyroxene elements is now listed in the$ *Current Sample*text box. The * symbol indicates that no data has been collected for this sample yet. Note, all of the buttons in**Acquire!**are now available.

SP1 SP	2 SP	3 SP4	SP5	х	Y	Z	Spectro	Progress
52750.0 53100.	0 53250.	0 52950.0	53250.0	300.000 112	5.00 3	10.500		
1-TAP 2-	LLIF 3	B-LIF2	4-TAP	5-LLIF		Faraday		
.00	.00	.00	.00	.00		1		
						.000000		a.
Current Sample: Un 1 Normal Acquisition U				Start Standard	or Unkr	own Acquisition		
Data Rows: O	Good D)ata Rows: O		Sta	rt Wave	scan	300.000 um .000000	1125.00 .000000
Ne w Sample		РНА	Acqu	uisition Options	Pe	aking Options	px 0 Magnification	0
Elements/Cations	Peak	/Scan Option	s Sp	ecial Options	S	itart Peaking	Beam Mode Kilovolts	Analog Spo 15
Analytical Condition	ns C	ount Times		Stage	1	Imaging	Beam Current	10
	Sector and the sector of the s			0.000.000			Beam Size	0

Setting Analytical Conditions

Click the **Analytical Conditions** button to open the **Analytical Conditions** dialog box. Enter the appropriate numbers into the *Kilovolts, Beam Current*, and *Beam Size* text boxes for the currently *Selected Sample*. The *Kilovolts, Beam Current*, and *Beam Size* will need to be manually adjusted if a column digital interface is not present. If a hardware interface is supported, the user may specify a column condition string to indicate the desired analytical conditions of the instrument. Clicking the **Read Conditions** button will cause PROBE FOR EPMA to check the current analytical conditions and reload them if the conditions have changed.

Selected Samples	OK Cancel
Un 1 * template for pyroxene elements	
	Select Beam Mode and Magnification Analog Spot Select the analytical conditions beam
· · · · · · · · · · · · · · · · · · ·	mode for sample acquisitions. Use "spot"
Enter Analytical Conditions For Un 1 * template for	C Analog Scan mode for a defocussed beam and "scan" mode for a scanning beam.
	C Digital Spot
Take Off Kilovolts (keV)	Magnification
Conditions	Read Beam/Mag
Beam Current	
	Magnification Magnification (analytical) (imaging) (imaging)
40 10 Force Size	2533 2 533
	V V
efault Aperture 1 JEOL only	150.0197 um 150.0197 um
	<u>60</u>
Nominal Beam (nA) 1.00000	Image Shift X _2 Image Shift Y 3
,	
Use Analytical Conditions (TKCS)	
Use Column Condition String	
	Calibrate Set Beam Current
Select Column Condition String For Un 1 * template f	or pyroxene elements
Force Column Condition Save Condition	Note: When using a column condition string for the analytical
Prowee Condition	setup, be sure that the analytical conditions (Kilovolts, Beam Current and Beam Size) are specified correctly. Note that
Column Condition	_ SX50/51 or Jeol 8900 Pre and Post Acquire Strings only apply
	to Analytical Conditions (not Column Conditions).
EOL 8900 Pre Acquire String (e.g., PB OFF)	JEOL 8900 Post Acquire String (e.g., PB ON)

Click the **OK** button when done. The **Analytical Conditions** dialog box closes, returning to the **Acquire!** window.

Nominal Beam Current Measurement

The nominal beam current is not the actual measured beam current but a close approximation that is used to calibrate the magnitude of the beam drift correction. If the nominal beam current is close to the actual measured beam current then the correction is close to 1.0. The beam drift corrected counts displayed in the main log window will be close in magnitude to the counts displayed on the screen scalers. The nominal beam can be adjusted in several ways. Click the **Count Times** button of the **Acquire!** dialog box.

SP1 SP2	SP3 SP4	SP5	х	Y	Z	Spectro	Progress
52750.0 53100.0	53250.0 52950.0	0 53250.0	300.000 1125	.00 31	0.500		
1-TAP 2-1	LIF 3-LIF2	4-TAP	5-LLIF		Faraday		
.00	.00 .00	.00	.00		1		
					.000000		Þ
Current Sample: Un 1 Normal Acquisition Un	* template for pyroxen known		Start Standard o			300.000	1125.00
Data Rows: O	Good Data Rows:	0	Start	Waves	can	J um .0000000	.000000
	DUA		isition Options	Par	aking Options		2533
Ne w Sample	PHA	Acqu	Isidon Opdons	rea	aking options	Magnification	2000
New Sample Elements/Cations	PHA Peak/Scan Optio		ecial Options	-	tart Peaking	Beam Mode	Analog Sp
	Peak/Scan Optio		-	-		-	

This opens the **Count Times** dialog box.

Click Element Row t										
Channel Element !	Spectro	Crystal	Un-Peak	Hi-Peak	Lo-Peak	MaxCo	un Factor	Wave	Peak	Quick
د eam Averages	0			1	2	3	4	5		,
Iominal Beam (nA) Change the Nominal Bea normalization constant u ntensity display. For exam for cps/nA intensi	sed for the tiple, enter ty display.	fy the x-ray								OK Cancel
eturn To On-Peak Ti rystal Flip Time et Column (TKCS) Ti		_	Calculated Spectrometer Motion and Acquisition Time							
										Help

Any value desired may be directly entered into the *Nominal Beam* text box (1 nA value is stored in the PROBEWIN.INI file) or the user may measure the present beam current by clicking the **Measure Nominal Beam** button. The **AcquireCheckNormal** dialog box appears, choose the **Yes** button to measure the present beam current for use in the beam drift correction.

AcquireChe	cckNominal
?	The nominal beam current is just a non-zero value used for the beam drift correction. A value of one will display the x-ray intensities in cps/nA. Choose Yes to measure the present beam current, No to skip or Cancel to just use the default beam current from the PROBEWIN.INI file.
	Yes No Cancel

The current value of the faraday beam is measured and reported to both the **Acquire!** window and the *Nominal Beam* text box in the **Count Times** window as seen below.

Click Elen	nent Row	to Edit Co	ount Time	s						_
Channel	Element	Spectro	Crystal	On-Peak	Hi-Peak	Lo-Peak	MaxCoun Factor	Wave	Peak	Quick
eam Avera	ages	1			1	2	3 4	5		Þ
ominal Be Change the normalization ntensity disp for cp	aam (nA) Nominal Be n constant u lay. For exar ps/nA intens Dn-Peak T	10.010 am to modi used for the mple, enter ity display.	ty the x-ray 1 (nA)	Calculated				5	_	OK Cancel
	(TKCS) T	ime		Motion and Acquisition Time						Help

Close the **Count Times** window by clicking the **OK** button.

Element, X-Ray Line and Spectrometer Parameters Selection

Next, the user specifies the elements to be analyzed. Click the **Elements/Cations** button of the **Acquire!** window.

SP1 SP2	SP3	SP4	SP5	х	Y	Z	Spectro	Progress
52750.0 53100.0	53250.0 529	950.0 53	3250.0	300.000 11	25.00 3	10.500		
1-TAP 2-I	LIF 3-LI	F2 4	-TAP	5-LLIF		Faraday		
.00	.00 .	00	.00	.00		1		
						.000000		æ
	Good Data R	ows: 0		S	tart Wave	scan	300.000 um .000000	1125.00
			Acqu	S isition Options	1	scan eaking Options		
Data Rows: 0	Good Data R	4			P		l um .0000000 px 0	.000000 0 2533 Analog Spo
	Good Data Ro PHA Peak/Scan	A Options		isition Options	P	aking Options	l um .000000 px 0 Magnification Beam Mode	.000000 0 2533

This action opens the **Acquired and Specified Elements** dialog box. Click on the first empty row under the element column to enter the first element to analyze. The user may enter the analyzed elements in any order; however, the analysis output will follow the order in which the elements were entered here.

Selected S	amples					ОК			Canc	el
Un 1 *1	template for p	yroxene								
				C.				nent S		
						LUa	u san	nple S	etup	
				F	lead	d curren	t setup	from M	IOVE v	vindo
					1	2	3	4	5	6
			Cations Parame			y row I	o add	ŋ		
Click Elem Channel	Element	dit Element/C X-Ray	Cations Parame	ters (click en Spectro			o add	ŋ	Peak	
						y row I	o add	ŋ		
						y row I	o add	ŋ		
						y row I	o add	ŋ		

This opens the **Element Properties** dialog box. In the *Element* field type in the first element to analyze. Certain default values listed in this window are based on parameters entered into the previously established configuration files.

nter Element Properties For:		Background Type (note that Background Type can differ for standards and unknowns)
Element X-Ray Line Bragg Order Cations / Oxygens	OK	Background Type Off-Peak Entry
i v ka v 1 v 1 v 2 v	Cancel	Off Peak Help C Multi-Point Help C Absolute Position
WDS Set x-ray line blank for unanalyzed elements (specified, by difference, etc.) Charge	Delete	C MAN Help © Relative Offset
4	Disable Acq	Conf Peak Correction Type
/DS Spectrometer Parameters		C Linear C Average C High Only C Low Only
Spectrometer Crystal On-Peak High Off-Peak	Low Off-Peak	C Exponential population Position Positio Positio Positio Positio Positio Positio Po
▼ .000000 .000000	.000000	
BaseLine Window Gain 🗔 Bias	Deadtime (us)	C Slope (Hi) 1.0000 C Polynomial Coeff1 Coeff2 Coeff3
00 .00 .00	.00	C Slope (Lo) 1.0000 0 0 000000 000000
Calculate Empirical PHA Slit Size Slit Position	Detector Mode	C Multi-Point Acquire Low Iterate Low Acquire High Iterate High
Use Differential PHA Mode	•	C Multi-Point Acquire Low Iterate Low Acquire High Iterate High
		Fit Type
pectral Interference Calculations (nominal only)		Linear Low Multi-Point Positions High Multi-Point Positions
Hi Off-Peak Interferences Low Off-Peak Interferences Check All Ir	nterfering Elements	
	*	
		Integrated Intensity Scan
		Use Integrated Intensities Initial Step Size Minimum Step Size Specified APF

Under the *Enter Element Properties For:* section (top of the **Element Properties** dialog box), choose the correct *X-Ray Line, Cations*, and *Oxygens* for the first element. Both alpha and beta lines are now supported as well as the ability to analyze the same element on all relevant spectrometers.

Continue by selecting the *Background Type*. Three background correction methods are available to the user; off-peak, MAN (mean atomic number), and the multi-point method (see the User's Guide and Reference documentation for a complete discussion of these three types).

Short Note on Background Types

The *off-peak* method entails measuring the background conventionally on each element in the sample of interest with the spectrometer adjusted to a position, typically on each side of the analytical peak. This method, while somewhat time-consuming, can accurately determine the background contribution for major, minor, and trace element concentrations. Sophisticated modeling routines are available for precisely fitting backgrounds around analytical peaks (see User's Guide and Reference documentation for details).

The *MAN* method relies on the fact that most of the background (continuum) production in the sample is directly proportional to the average atomic number of the sample. The MAN correction is an empirical calibration curve method involving the measurement of standards of known composition (hence average atomic number). If many samples are to be analyzed for their major and minor element concentrations then substantial time may be saved using the MAN method. However, if the user is required to measure high atomic number samples and/or trace concentrations, more accurate data may be obtained with off-peak background corrections.

Finally, a new third background method is now available for high accuracy trace element analysis, called the *multi-point* background method. PROBE FOR EPMA automatically acquires a number of off-peak intensities distributed on each side of the analytical peak (user specified) so that at least a few of the background measurements will not be affected by the unpredicted presence of various other elements in the sample.

In this exercise, we will use MAN for the major pyroxene elements Si, Fe, Mg, Ca, and off-peak for Ti, Al, Cr, V, Mn, Na, which might only be present at trace levels. Continue by selecting MAN for the Si *Background Type* in the *Parameters* section. This deactivates the *Off Peak Correction Type* buttons as well as the *High* and *Low Off-Peak* boxes.

Next, use the drop-down menu to select or click the text box under *Spectrometer* and enter the appropriate spectrometer number that will be used to analyze the first element. Choosing a spectrometer number loads various parameters from the configuration files. Each of these parameters in this window should be inspected and edited as needed (use the <tab> key to move between boxes).

The next screen shows the edited **Element Properties** dialog box for silicon.

nter Element Properties For:		Background Type	e (note that Backg	round Type c	an differ for star	idards and ur	nknowns)
Element X-Ray Line Bragg Order Cations / Oxygens	OK	OK Background Type				Off-Peak Entry	
ši v ka v 1 v 1 v 2 v	Cancel	Off Peak	Help	[°] Multi-Point	Help		ute Position
WDS Set x-ray line blank for unanalyzed elements (specified, by difference, etc.) Charge	Delete	C MAN	Help			Relative	ve Offset
4 4	Disable Acq						
		Off Peak Correct					
/DS Spectrometer Parameters	and the second	Linear	C Avera	je	C High Only	С	Low Only
Spectrometer Crystal On-Peak High Off-Peak		C Exponential	1.0000		Position1	Position2	Position3
▼ TAP ▼ 27738 1331.90	-1331.9	COMPANY STATES		Polynomial	000000	000000	000000
BaseLine Window Gain 🙀 Bias	Deadtime (us)	1000	1.0000		Coeff1	Coeff2	Coeff3
56 4.99 2759.00 🔷 1317.	3.00	Slope (LO)	11.0000	0	1.00000	000000	1.0000000
Calculate Empirical PHA Slit Size Slit Position	Detector Mode			100.00			
Use Differential PHA Mode	-	Multi-Point	Acquire Low	Iterate Lo	W Acc	quire High	Iterate High
		Fit Type	1 *	1	<u> </u>	-	
pectral Interference Calculations (nominal only)		Linear 👻		Point Positions		ligh Multi-Poi	
Hi Off-Peak Interferences Low Off-Peak Interferences	nterfering Elements		-2475.1	- <-2475.1	1 247	5.1 -	< 2475.1
		Set To Defaults					
			, בבכבנו				
		Integrated Intens	eitu Scan				

Click the **OK** button of the **Element Properties** dialog box to accept these element parameters for silicon.

The program returns to the **Acquired and Specified Elements** window with silicon now entered into the *Element/Cations Parameters* table.

Selected S	amples emplate for p				OK			Cance	el
UN I I	empiate for p	yroxene			Lo	ad Ele	ment S	etup	
				Ē.	Lo	ad Sa	nple S	etup	
				R	ead curre		o from №	10VE w	indo 6
					1 6	5			
Click Elemo	ent Row to E		Cations Parame		npty rov	to ad	d)	Peak	
		dit Element/C X-Ray ka	Cations Parame Acquired WDS	ters (click er Spectro 4		to ad	d) On-		
Channel	Element	X-Ray	Acquired	Spectro	npty rov Crys	to ad	d) On-	Peak	
Channel	Element	X-Ray	Acquired	Spectro	npty rov Crys	to ad	d) On-	Peak	
Channel	Element	X-Ray	Acquired	Spectro	npty rov Crys	to ad	d) On-	Peak	
Channel	Element	X-Ray	Acquired	Spectro	npty rov Crys	to ad	d) On-	Peak	

Enter titanium as the next element in the run by clicking on the next empty row of the **Acquired and Specified Elements** window. This opens the **Element Properties** dialog box again. Enter the appropriate *Element, Spectrometer, and Crystal* and adjust all other text boxes and buttons. Choose *Background Type* off-peak this time. The software calculates default high and low off-peak positions as shown below. Leave these as they are for the moment. They can be changed later if required.

inter Element Properties For:		Background Type (note that Back	ground Type can differ for st	andards and unknowns)
Element X-Ray Line Bragg Order Cations / Oxygens	OK	Background Type		Off-Peak Entry
fi v ka v 1 v 1 v 2 v	Cancel	Off Peak Help	C Multi-Point Help	C Absolute Position
WDS Set x-ray line blank for unanalyzed elements (specified, by difference, etc.) Charge	Delete	C MAN Help		Relative Offset
	Disable Acq			
	🔲 Disable Quant	Off Peak Correction Type		22210 10.00
VDS Spectrometer Parameters		Linear Avera	ige C High Only	C Low Only
Spectrometer Crystal On-Peak High Off-Peak	Low Off-Peak	C Exponential 1.0000	Position1	Position2 Position3
• LPET • 31430.0 930.199	-930.10		000000 0 00000 C Polynomial	000000 000000
BaseLine Window Gain - Bias	Deadtime (us)		Coerri	Coeff2 Coeff3
56 4.99 873.00 🔷 1845.	3.00	C Slope (Lo) 1.0000	0 000000	0000000 .0000000
Calculate Empirical PHA Slit Size Slit Position	Detector Mode	C Multi-Point Acquire Low	Iterate Low A	cquire High Iterate High
Use Differential PHA Mode	•	Acquire Low		4 2 v
		Fit Type		· —
pectral Interference Calculations (nominal only)		Linear	Point Positions	High Multi-Point Positions
Hi Off-Peak Interferences Low Off-Peak Interferences	nterfering Elements	1 -1728.5	✓ -1728.5	728.602 🚽 < 1728.602
HI OIT-Feak Intelletences	Remaining Elements	Set To Defaults		
	~		- FFFFFF FF	
		Integrated Intensity Scan		
		and the second	Initial Step Size Minimum Step	Size Specified APF
		Use Integrated Intensities —	37.2063 9.30156	1.00000

Click the **OK** button of the **Element Properties** to enter titanium into the *Element/Cations Parameters* table of the **Acquired and Specified Elements** window.

Continue adding the remaining elements in the desired order, choosing *Background Type* **MAN** or **off-peak** as indicated above. The remaining eight element entries are not shown here to save space. Finally, oxygen is added to the element list as a not analyzed element for subsequent formula calculations. This is done by entering O (for oxygen) in the *Element* text box and leaving the *X-Ray Line* text box empty (see User's Guide and Reference documentation for more details).

Selected S	amples				OK			Cance	el
Un 1 * 1	template for p	yroxene							
					Loa	d Elen	nent S	etup	
					Loa	d San	nple S	etup	
					ead curren	t setup 3	from M	10VE w	vindov 6
					_				
Click Elem Channel	ent Row to Ed	dit Element/(X-Ray	Cations Parame	ters (click em	pty row			Peak	
	Element Si		The second s	and the second second second			On-	Peak 738.0	_ ^
Channel	Element	X-Ray	Acquired	Spectro	Crysta	al I	0n- 277	And the owner of the owner owner.	_
Channel 1	Element Si	X-Ray ka	Acquired WDS	Spectro 4	Crysta TAP	al I	0n- 277 314	738.0	^
Channel 1 2	Element Si Ti	X-Ray ka ka	Acquired WDS WDS	Spectro 4 3	Crysta TAP LPET	al I	0n- 277 314 324	738.0 430.0	^
Channel 1 2 3	Element Si Ti Al	X-Ray ka ka ka	Acquired WDS WDS WDS	Spectro 4 3 4	Crysta TAP LPET TAP	al I	0n- 277 314 324 622	738.0 430.0 465.9	-
Channel 1 2 3 4	Element Si Ti Al V	X-Ray ka ka ka ka	Acquired WDS WDS WDS WDS WDS	Spectro 4 3 4 2	Crysta TAP LPET TAP LLIF	al I	0n- 277 314 324 622 568	738.0 430.0 465.9 209.1	^
Channel 1 2 3 4 5 6 7	Element Si Ti Al V Cr	X-Ray ka ka ka ka ka ka	Acquired WDS WDS WDS WDS WDS WDS WDS WDS WDS	Spectro 4 3 4 2 2	Crysta TAP LPET TAP LLIF LLIF LLIF LLIF	al I	0n- 277 314 324 622 560 487 522	738.0 430.0 465.9 209.1 898.5 115.4 232.9	-
Channel 1 2 3 4 5 6 7 8	Element Si Ti Al V Cr Fe Mn Mg	X-Ray ka ka ka ka ka ka ka	Acquired WDS WDS WDS WDS WDS WDS WDS WDS WDS WDS	Spectro 4 3 4 2 2 5 5 5 1	Crysta TAP LPET TAP LLIF LLIF LLIF LLIF TAP	al I	0n- 277 314 324 622 566 487 522 384	738.0 430.0 465.9 209.1 898.5 115.4 232.9 499.2	
Channel 1 2 3 4 5 6 7 8 9	Element Si Ti Al V Cr Fe Mn Mg Ca	X-Ray ka ka ka ka ka ka ka ka	Acquired WDS WDS WDS WDS WDS WDS WDS WDS WDS WDS	Spectro 4 3 4 2 5 5 1 3	Crysta TAP LPET TAP LLIF LLIF LLIF LLIF TAP LPET	al I	0n- 277 314 324 622 566 487 522 384 383	738.0 430.0 465.9 209.1 898.5 115.4 232.9 499.2 399.6	
Channel 1 2 3 4 5 6 7 8	Element Si Ti Al V Cr Fe Mn Mg	X-Ray ka ka ka ka ka ka ka ka ka	Acquired WDS WDS WDS WDS WDS WDS WDS WDS WDS WDS	Spectro 4 3 4 2 2 5 5 5 1	Crysta TAP LPET TAP LLIF LLIF LLIF LLIF TAP	al I	0n- 277 314 324 622 566 487 522 384 383	738.0 430.0 465.9 209.1 898.5 115.4 232.9 499.2	

Click the **OK** button of the **Acquired and Specified Elements** window when done entering elements in the run.

The **GetElmLoadDefaultStds** window opens to inform the user that standard assignments have been made based on elemental concentrations. The user will edit these choices shortly.

GetElmLoa	idDefaultStds	3
1	Default standard assignments were loaded for the sample(s) based on the highest concentration of the element in the standards. It may be necessary to modify these default standard assignments for best results.	
Ē	ОК	

Click **OK** to return to the main **Acquire!** window.

Editing Acquisition Options

The user may change the element acquisition order of the spectrometers by clicking the **Acquisition Options** button in the **Acquire!** dialog box.

🚰 Acquire!							
SP1 SP2	SP3 SP4	SP5	x	Y	Z	Spectro	Progress
52750.0 53100.0				25.00	310.500		
1-TAP 2-LL	IF 3-LIF2	4-TAP	5-LLIF		Faraday		
.00 .	00.00	.00	.00		1		
					.000000		\$
Current Sample: Un 1 *		-			known Acquisition		1105.00
Data Rows: 0	Good Data Rows: 0		St	art ₩av	escan		1125.00 .000000
New Sample	РНА	Acqu	uisition Options	۶ (eaking Options	px 0 Magnification	0
Elements/Cations	Peak/Scan Option	s Sp	ecial Options		Start Peaking	Beam Mode Kilovolts	Analog Spot 15
Analytical Conditions	Count Times		Stage		Imaging	Beam Current Beam Size	10
Combined Conditions	Standard Assignments	\$	Locate		Move	Dogin oleo	

This opens the Acquisition Options dialog box.

Click Eleme	nt Row to Edit /	cquisition Optio	ns							1	2	3	4	5
hannel	Element	Spectro	Crystal	Order	Std Bgd	Unk Bgd	Peaking	Nth Point	Nth Interv +					• •••••••••••••••••••••••••••••••••••
	Si ka	4	TAP	1	Off Peak	Off Peak	No	No	10	Na	Cr	Ca	AL	Mo
<u> </u>	Ti ka	3	LPET	1	Off Peak	Off Peak	No	No	10					
	Al ka	4	TAP	2	Off Peak	Off Peak	No	No	10					
	V ka	2	LLIF	1	Off Peak	Off Peak	No	No	10					
	Crka Feka	2	LLIF	2	Off Peak Off Peak	Off Peak Off Peak	No No	No	10					
	Min ka	5	LLIF		Off Peak	Off Peak	No	No	10					
	Minka	1	TAP	1	Off Peak	Off Peak	No	No	10					
	mg ka	-	101	-	or p	or o								
And														
quisition	Order		EDS	Acquisition [Bi	uker Quantax]		Miscellaneous	Options		Mg	v	n	Si	Fe
Channel	Number		@ A	cquire No EDS	Spectra	Help	Return to 0	In Peaks After A	cquisition					
Ascendir	ng Angstroms		CA	cquire EDS Sp	ectrum Intensities		T Do Not Set	Conditions Duri	ng Acquisition					
Descend	ling Angstroms						🔽 Blank Beam	n After Move an	d Acquisitions					
User Def	ined Order Num	ber					Measure At	osorbed Current	On Samples					
			EDS	Unknown Count	Factor 1			am On Sample						
pectromete	er Motion		Mar	imum Energy (ke\			Measure Be	eam Current On '	Wavescans					
Asynchro	onous				Get Set		Nth Point Be	am Measurement	1					
Synchron	nous		Puls	e Throughput (kc	ps)	Ψ.								
		1.1.1	- C	Use Preset Time (in EDS application)			uring Spectrom		Automa	tic Analy	sis and C	Jutput M	odes
uick Stand	lard Acquisition	Modes		Use Specified Co	unt Time 40		Use Alterna	ating On And Off	Peak Acquire	=				Acquisition
Only Assig	ned Elements							lard Data From F	ile Cetur					•
* Assigned o	or Major Elements >	10 %	CLA	cquisition				play Standard In				ht Percent		
							1 001101010	picy orandara m	lager			K-Ratios T		
Ith Point U	ff-Peak Backgro	und Uptions		cquire No CL S			🗆 Use Last U	nknown As Way	rescan Setup			ts/Sec To		
		n For Off-Peaks	1.000		trum Intensities		🗆 Use Unkno	wn Count Time	For Interf. Std	(E)	port Haw	Counts (i"t)	I TO EXCEL	Link
Use Nth	Point Monitor E	lement Intensity	CLI	Count Time	40									
Element I	ntensity To Monito		1 au	Jnknown Count F	actor 1			tamination/Incu		Automa	ted Imag	e Acquis	ition	
Personal (Change Intensity	-		Spectra Count T	ine Freetien		Decontam	ination/Incubation I	Delay 0	T Acq	ire Auto	mated Im	ages on	Standard
reicent	inange mensity	5	Dan	c opectra Count 1	ime Fraction 0.1		Auto-Focus Th	reshold (JEOL o	nly] 33	C Acq	ire Auto	mated Im	ages on	Unknown
On Peak	Time Fraction	1.00000			-10.000		Guio i deus Th	icanoid (aror o	1.33	C Acq	uire Auto	mated Im	ages on	Wavesca
			Stag	e/Spec BackL	ash (only with aut	omation)				CB	efore	 After 	C	Both
utomation	Error Reporting		□ B	ackLash Correctio	n on Standards			igitized Standar		E 11	. Comela	Markall	(ited Imaging
E-mail No	otification of Sta	atus and Errors	∏ B.	ackLash Correctio	n on Unknowns		Use Curren	t Instrument Cor	iditions Always	1 0	se sample	magikevi	IOI AUtoma	ked imaging
Mail Address	to Report Automa	tion Status and Erro	B.	ackLash Correctio	n on Wavescans			ated PHA Contro	J					

To change the order that the spectrometer measures an element, select the *User Defined Order Number* button under *Acquisition Order* and click the row of the element to edit.

This opens the **Acquisition Properties** dialog box, seen below. Here, the user will re-define sodium (Na) to be counted on the first spectrometer pass due to its susceptibility to being volatilized by long exposure to the electron beam. In samples containing volatile elements the user may wish to consider running the time dependent intensity calibration routine (see User's Guide and Reference documentation and/or Advanced Topics manual).

Enter Acquisition Options For: Na	a ka OK
Acquisition Order Number 1	Cancel
To change the acquisition order first se order to User Defined in the previous di then in this dialog enter the desired acqu order for all elements on that spectrom Note that the acquisition order of "comb samples are automatically sorted by t analytical conditions.	t the alog, uisition eter. ined''
Background Type for Standards	·
Off Peak	
C MAN (mean atomic number)	
C Multi-Point Off-Peak	
Background Type for Unknown: Off Peak MAN (mean atomic number) Multi-Point Off-Peak	
Peaking on Acquisition	
Peaking on Acquisition Peak Element Before Acquisition	
	ptions –
Peak Element Before Acquisition	ptions –

Edit the *Spectrometer Order Number* for all elements to change the acquisition order, e.g. change Na to 1 and Mg, which is measured on the same spectrometer, to 2. Further, to use the same background correction method for both standards and unknowns edit the *Background Type for Standards* to *MAN* for Si, Fe, Mg, and Ca. Click the **OK** button returning to the **Acquisition Options** window.

Click the **OK** button of the **Acquisition Options** window to return to the **Acquire!** window.

Modifying Standard Assignments

The standard assignments chosen by PROBE FOR EPMA may be inspected and edited by clicking the **Standard Assignments** button in the **Acquire!** window:

SP1 SH	2 SP3	SP4	SP5	X	Y	Z	Spectro	Progress
52750.0 53100	0 53250.0	52950.0	53250.0	300.000 1125	5.00 31	0.500		
1-TAP 2-	LLIF 3	-LIF2	4-TAP	5-LLIF		Faraday		
.00	.00	.00	.00	.00		1		
						.000000		a
Normal Acquisition L		Start Standard or Unknown Acquisition				1105.00		
Data Rows: 0	Good D	ata Rows: O		Sta	rt Waves	can	300.000	1125.00 .000000
Data Ro w s: O Ne w Sample	Good D	ata Rows: 0 PHA	Acqu	Sta uisition Options	1	aking Options		
ſ					Pea		Magnification Beam Mode	.000000 0 2533 Analog Spe
Ne w Sample	Peak/	РНА		uisition Options	Pea	aking Options	um .000000 px 0 Magnification	.000000 0 2533

The Standard and Interference Assignments dialog box opens.

Selected S	-				ОК	Cancel
Un 1 *t	emplate for py	roxene eleme	ents		Save Elemer	nt Setun
					Save Sample	
					Add/Remove S	Standards
				Re	load Standard	Assignments
					Remove TDI (Correction
				1	2 3	4 5 6
	Element	it Standard/Ir X-Ray	nterference/Tim Analyzed	e Dependent Standard	Intensity (TDI)	Assignments
Channel 1	Element Si	X-Ray ka	Analyzed Yes	Standard 14		Interf-Std 0,0,0,0,0
Channel 1 2	Element Si Ti	X-Ray	Analyzed Yes Yes	Standard 14 22	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0
Channel 1 2 3	Element Si Ti Al	X-Ray ka	Analyzed Yes Yes Yes	Standard 14 22 13	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0
Channel 1 2 3 4	Element Si Ti Al V	X-Ray ka ka	Analyzed Yes Yes Yes Yes	Standard 14 22 13 23	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel 1 2 3 4 5	Element Si Ti Al V Cr	X-Ray ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes	Standard 14 22 13 23 24	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel 1 2 3 4 5 6	Element Si Ti Al V Cr Fe	X-Ray ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes	Standard 14 22 13 23 24 26	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel 1 2 3 4 5 6 7	Element Si Ti Al V Cr	X-Ray ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	Standard 14 22 13 23 24 26 25	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel 1 2 3 4 5 6 7 8	Element Si Ti Al V Cr Fe	X-Ray ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes	Standard 14 22 13 23 24 26 25 12	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel 1 2 3 4 5 6 7 8 9	Element Si Ti Al V Cr Fe Mn Mg Ca	X-Ray ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Standard 14 22 13 23 24 26 25 12 2401	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel 1 2 3 4 5 6 7 8 9 10	Element Si Ti Al V Cr Fe Mn Mg Ca Na	X-Ray ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Standard 14 22 13 23 24 26 25 12 2401 303	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Eleme Channel 1 2 3 4 5 5 6 7 8 9 9 10 11	Element Si Ti Al V Cr Fe Mn Mg Ca	X-Ray ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Standard 14 22 13 23 24 26 25 12 2401	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,

Click the row of an element to change the respective standard assignment, e.g. Si.

This opens the **Assignment Properties** dialog box. The default standard assignments are based on the highest concentration of the element in the standards currently in the run. In addition to standard assignments, the user may assign spectral interference corrections and time dependent intensity element calibrations from this window.

Elem	Standard As: ent X-R	- and a second second	or: Si ka Assigned (Primary) Standard	0K.	Time Dependent Intensity (TDI) Calibration Assignment (se	elect unknown sample for assigned TDI calibration] Both "assigned" and "sell" calibration Time Dependent Intensit
	ka ILL STO2 synthetic Juse Virtual Standard For Standard Intensity Calculation (see Analytical menu) Intensee Standard Assignments for Interfered Element: Si ka		Cancel	No TDI Calibration Correction Use TDI "Self" Calibration Correction Use TDI "Assigned" Calibration Correction	(TDI) element samples can be acquired. See the Special Option dialog in the Acquire window. Both "assigned" and "self" Time Dependent Intensity (TDI) element calibrations can be assigned or unassigned here. Assigned Time Dependent Intensity (TDI) correctons are assigned to samples acquired with the "assigned" flag in	
	Intf Elem		Interference Standard	Help		Special Options. "Sell" Time Dependent Intensity (TDI) corrections are assigned to themselves. Time Dependent
st [•	•	•	Remove		Intensity (TDI) element "self" calibrations are automatically assigned to themselves at the time of acquisition.
nd [•	-	•	Remove		assigned to crementes at the time of acquisitoir.
d [-	-	•	Remove		Display TDI Fit Fror Bars
h [-	-	•	Remove	C Use Log-Linear (exponential) Fit	
th [•	•		Remove	C Use Log-Quadratic (hyper-exponential) Fit C Use Log-Log (double-exponential) Fit	
	neck All Interfer <mark>culate Interf</mark> e		Maximum Order Minimum Overlap Intensity 1 Testandard used for the interference element and none of the interference other interfering eleme	of the interfering element, nor any	Blank Correction Sample Assignment	Assign a sample to be used for a "blank" trace element
				*		correction. The blank sample should be a similar matrix to the unknown sample and should have a zero or known trace of the element present.
						Blank Level .000000 Remove Blank Hel

Click the *Assigned Standard* menu box. A scrollable list of all standards added to the current run is displayed. Select a new standard for element Si.

nter Standard Assignments for: Si ka Element X-Ray Assigned (Primary) Standard	OK	Time Dependent Intensity (TDI) Calibration Assignment (TDI Correction Type (Self or Assigned)	Both "assigned" and "self" calibration Time Dependent Intensity
i v ka v 453 Augite, Kakanui USNM 122142 v 20 Ver Virtual Standarf For 24 C 2023 synthetic 25 Fe203 synthetic 26 Fe203 synthetic hematite 26 Fe203 synthetic hematite 27 Standard As 26 Fe203 synthetic hematite	Cancel	No TDI Calibration Correction Help Use TDI "Sell" Calibration Correction Use TDI "Assigned" Calibration Correction	(TDI) element samples can be acquired. See the Special Options dialog in the Acquire window. Both "assigned" and "self" Time Dependent Intensity (TDI) element cabitrations can be assigned or unassigned here. Assigned Time Dependent Intensity (TDI) corrections are assigned to sambles acquired with the "assigned" than in the sambles acquired with the "assigned" than in the sambles acquired with the "assigned" than the sambles acquired with the "assigned" than the same that the same the same that the same the same that the same that the same that the same
Intf Elem Intf 0r 463 August Askanui USNM 122142 T 463 Hypersthere, johnstown USNM #746 Z401 Wollastonic Willsborg, NY) T	Help		Special Options: "Self" Time Dependent Intensity (TDI) corrections are assigned to themselves. Time Dependent Intensity (TDI) element "self" calibrations are automatically
	Remove		assigned to themselves at the time of acquisition.
d v v	Remove		Display TDI Fit Error Bars
h 🔻 👻	Remove	C Use Log-Linear (exponential) Fit	
h v v	Remove	C Use Log-Quadratic (hyper-exponential) Fit C Use Log-Log (double-exponential) Fit	
Check All Interfering Elements Maximum Order Intensity Calculate Interferences V Maximum Order Intensity The standard used for the interference contrain of none of the interference other interfering element other interfering element	the interfering lement, nor any	Blank Correction Sample Assignment	Assian a sample to be used for a "blank" trace element
	 * 		correction. The blank sample should be a similar matrix to the unknown sample and should have a zero or known trace of the element present.
			Blank Level [wt. 2] .000000 Remove Blank Assignment Help

Click the **OK** button returning to the **Standard and Interference Assignments** dialog box. Repeat these editing steps until all necessary element standard assignments have been modified. In this example, the standard assignments for Si and Mg are edited, resulting in the following window.

	amples				OK	Cancel
Un 1 ×t	emplate for py	vroxene eleme	ents		C	L D a base
					Save Elemen	
					Save Sample	e Setup
					Add/Remove S	itandards
				Rel	oad Standard /	Assignments
					Remove TDI C	Correction
				1	2 3 4	1 5 6
Channel 1	Element Si	X-Ray ka	Analyzed Yes	Standard 453	Interf-Ele	Interf-Std 0,0,0,0,0
2	Ti	ka	Yes	22		0,0,0,0,0
3	AI	ka	Yes	13		0,0,0,0,0
4	v	ka	Yes	23		0,0,0,0,0
5	Cr	ka	Yes	24		0,0,0,0,0
6	Fe	ka	Yes	26		0,0,0,0,0
7	Mn	ka	Yes	25		0,0,0,0,0
8	Mg	ka	Yes	473		0,0,0,0,0
9	Ca	ka	Yes	2401		0,0,0,0,0
10	Na	ka	Yes	303		0,0,0,0,0
	0		No	0		0,0,0,0,0
11						

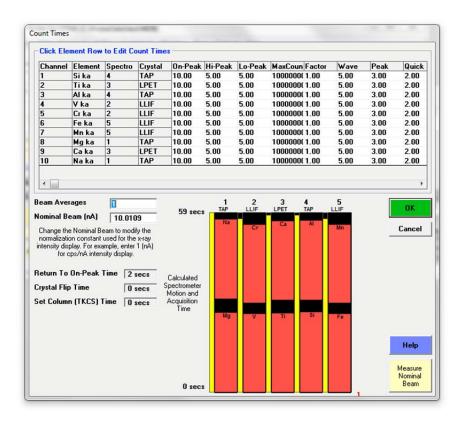
Click the **OK** button of the **Standard and Interference Assignments** dialog box returning to the **Analyze!** window.

Setting Count Times

Click the **Count Times** button of the **Acquire!** window.

SP1 SF	2 S	P3 SP4	SP5	x	Y	Z	Spectro	Progress
52750.0 53100	0 53250	.0 52950.0	53250.0	300.000 1125	.00 31	0.500		
1-TAP 2-	LLIF	3-LIF2	4-TAP	5-LLIF		Faraday		
.00	.00	.00	.00	.00		1		
						.000000		a
				Start Standard	OI OIIKIN	own Acquisition		
•		Data Rows: 0			t Waves	•	300.000 um .000000	1125.00
Normal Acquisition U Data Rows: 0 Ne w Sample		I Data Rows: 0 PHA	1		t Waves	•		
Data Rows: 0	Good		Acqu	Sta	t Waves Pea	can	Jum .000000 px 0 Magnification Beam Mode	.000000 0 2533 Analog Spo
Data Rows: 0 New Sample	Good	РНА	Acqu	Sta	t Waves Pea	can aking Options	um .000000 px 0 Magnification	.000000 0 2533

This opens the **Count Times** dialog box. Here various parameters relating to counting times can be adjusted. Initially *On-Peak* count time is set for 10 seconds and both *Hi-Peak* and *Lo-Peak* times are set for 5 seconds based on the configuration file defaults. For elements measured with Background Type MAN only the *On-Peak* setting is relevant. Note: Real time spectrometer motion and acquisition time is graphically displayed.



To edit the count times for any element click that row in the spreadsheet. This opens the **Count Time Properties** dialog box.

Enter Count Time Pr	operties For: Si ka—		OK
On-Peak Time	Hi Off Peak Time	Lo Off Peak Time	
10.00	5.00	5.00	Cancel
Wave Scan Time	Peaking Time	Quick Scan Time	Note that the
5.00	8.00	2.00	Peaking Time divided by 4 fo
for quick wavescan MultiPoint bac	scan time for wavescan sa s and peaking time for spa kground count times are l Hi and Lo Off Peak Times	ectrometer peaking. based on the	Off-Peak Statistics
Unknown Maximum	Count : 1	0000000	
Use the Unknown Ma	Count : 1 ximum Count to specify a total counts acquired ex acquisition will be cons	ceeds the Unknown Max	
Use the Unknown Ma fixed count time. If the Background counting tir	ximum Count to specify a e total counts acquired ex	desired statistical significa ceeds the Unknown Max idered complete. Ilculated based on the ra bunting time and the actu	tio of the specified
Use the Unknown Ma fixed count time. If the Background counting tir off-peak counting time to	ximum Count to specify a e total counts acquired ex acquisition will be cons me will be automatically ca o the specified on-peak co	desired statistical significa ceeds the Unknown Max idered complete. alculated based on the ra aunting time and the actu time.	timum Count the tio of the specified lal elapsed on-peal
Use the Unknown Ma fixed count time. If the Background counting tir off-peak counting time to	ximum Count to specify a d e total counts acquired ex acquisition will be cons ne will be automatically ca o the specified on-peak co counting i	desired statistical significa ceeds the Unknown Max idered complete. alculated based on the ra aunting time and the actu time.	timum Count the tio of the specified lal elapsed on-peal
Use the Unknown Mar fixed count time. If the Background counting tim off-peak counting time to Unknown/Standard Unknown Count Tim Use the Unknown Count lo count times for unknown 10 and the Unknown Count	ximum Count to specify a d e total counts acquired ex acquisition will be cons ne will be automatically ca o the specified on-peak co counting i	desired statistical significa ceeds the Unknown Max idered complete. alculated based on the ra- ounting time and the actu- time. d Alternating On/Off .00 cally change the counting andards. For example, if t standards will count 10	timum Count the tio of the specified al elapsed on-peal Peaks g time for on, hi and he on-peak time is

Edit the *Count Time* text boxes with new times. To adjust the count times on unknowns, change the *Unknown Count Time Factor*. This is the multiplicity factor for acquiring unknown sample elements relative to the count times specified for the standards.

The *Unknown Maximum Count* text box is used to specify a statistics based count time. This is most useful if the user wishes to count for 30 seconds or 40000 counts, whichever comes first. For samples with high count rate elements, the actual analysis time would be shorter.

Click the **OK** button of the **Count Time Properties** window. Finally, click the **OK** button of the **Count Times** dialog box to accept any modified count times and return to the **Acquire!** window.

Loading Standard Position Files

Running standards using automation requires PROBE FOR EPMA to know the physical location of all the standards for this run. Click the **Automate!** button from the main PROBE FOR EPMA log window.

File Edit	Standard	Xray Ana	lytical Wir	ndow Run	Output	Help	-				
	Acquire!			Analyze!		A	utomate!			Plot!	
WINDOW	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	-
MODE :	0	0	0	0	0	0	0	0	0	0	
GAIN:	2759.	873.	2759.	393.	393.	375.	375.	2874.	873.	2874.	
BIAS:	1317.	1845.	1317.	1838.	1838.	1824.	1824.	1328.	1845.	1328.	
		On and O		Count Tim	nes:						
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
BGD:	MAN	OFF	OFF	OFF	OFF	MAN	OFF	MAN	MAN	OFF	
BGDS:	MAN	LIN	LIN	LIN	LIN	MAN	LIN	MAN	MAN	LIN	
SPEC:	4	3	4	2	2	5	5	1	3	1	
CRYST:	TAP	LPET	TAP	LLIF	LLIF	LLIF	LLIF	TAP	LPET	TAP	
ORDER:	1	2	2	2	1	1	2	2	1	1	
ONTIM:	10.00	10.00	10.00	10.00	10.00	20.00	20.00	10.00	10.00	10.00	
HITIM:		5.00	5.00	5.00	5.00		5.00			5.00	
LOTIM:		5.00	5.00	5.00	5.00		5.00			5.00	
Miscella	neous S	ample Ac	quisition	n/Calcula	ation Par	rameters					
KILO:	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	
ENERGY	1.740	4.509	1.487	4.950	5.412	6.400	5.895	1.254	3.691	1.041	
EDGE :	1.839	4.967	1.560	5.466	5.990	7.112	6.539	1.305	4.039	1.073	ų
Eo/Ec:	8.16	3.02	9.62	2.74	2.50	2.11	2.29	11.49	3.71	13.98	
STDS:	453	22	13	23	24	26	25	473	2401	303	***
Acquire: R	eady								Cancel	Pause	

This opens the **Automate!** dialog box shown below.

Standa	ards St	ulti-select) (double-click to see data) - St 135 Fid 1 Calcite (analyzed)		alyzed)	Move Stage		Automation Actions
C Unknowns C Wavescans C All Samples		St 140 Fid 1 Rhodocrosite (Harvard #8979 St 141 Fid 1 Dolomite (Harvard #105064) St 145 Fid 1 Siderite (Harvard #96217)		64) Dia	itize	Confirm Unknown Positions	
						lot	Peak Spectrometers Peaking Acquire Standard Samples
Select S					Fidu	icials	Acquire Unknown Samples Acquire Wavescan Samples
Select					Repl	icates	C Acquire Standard Samples (again)
Go Auto Fo					Cond	litions	- Automation Options
Upda	te				Sample	Setups	Peak on Assigned Standards Use "Quick" Standards
Delete					File S	Setups	Use Filament Standby Afterwards
Re-Lo	ad				Multiple	e Setups	Use Confirm During Acquisition
low 1	X -13511.	Y 38 37653	z	W		Focus 0	Confirm All Positions In Sample Combine Multiple Sample Setups Use ROM Auto Focus C New Sample C Every Point Digitized C Interval 5
							Standard Points To Acquire 1 Automate Confirm Delay (sec) 1 Standard X Increment (um) 4 Re-Standard Y Increment (um) 6 Re-Standard Interval (hrs) 6
			g = 400 Mod a = 400 ImgSł File Setup =		Sample Setup (ro = 0	w) Number	 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
					Replicate		

The last set of digitized standards used is visible in the *Position List* list box of the **Automate!** window. Currently, the carbonate standards digitized previously are listed. These will be deleted and replaced by the appropriate standard position file(s).

Click the **Delete All** button. This opens the **AutomateDeleteAll** window. Click the **Yes** button of the **AutomateDeleteAll** window to clear the *Position List* list box of all displayed position samples.

👎 Automate!		
Position List (multi-select) (double-click to see data) Standards St 135 Fid 1 Calcite (analyzed) St 140 Fid 1 Rhodocrosite (Harvard #8979)	Move Stage	Automation Actions
C Wavescans C All Samples	Digitize	Confirm Wavescan Positions
	Plot	Peak Spectrometers Peaking Acquire Standard Samples
Select Stds	Fiducials	Acquire Unknown Samples Acquire Wavescan Samples
Go	Replicates	Acquire Standard Samples (again)
Auto Focus Update	Conditions Sample Setups	✓ Peak on Assigned Standards
Delete All AutomateDeleteAll	The Longer	y Afterwards
Delete Selected Sam Delete Selected Posit Row X Y 1 =13511.38 376	Ye	Every Point Standard Points To Acquire Automate Confirm Delay (sec) Standard X Increment (um) 4 Re-Standard Y Increment (um) 6 Re-Standard Interval (hrs) 6
MagAnal = 2533 MagImag = 400 ImgShift = -2, 3 File Setup = NONE	ele Setup (row) Number = 0 Replicates = 1	C Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
Multiple Setups - North	ricplicates - 1	Run Selected Samples

The **FiducialDeleteUnreferenced** window opens. Click the **Yes** button to clear the fiducial coordinate set from the position database.

FiducialDel	eteUnreferenced	-		×
?	Fiducial set 1 is not ref database. Do you want			he position
		Yes	No	Cancel

Click the **Import from ASCII File (*.POS File)** button of the **Automate!** dialog box to import position samples from a previously saved ASCII file.

🚏 Automate!		
Position List (multi-select) (double-click to see data)-		Automation Actions
© Standards	Move Stage	Confirm Standard Positions
C Unknowns C Wavescans	Digitize	Confirm Unknown Positions
C All Samples		Peak Spectrometers Peaking
	Plot	Acquire Standard Samples
Select Stds	Fiducials	Acquire Unknown Samples Acquire Wavescan Samples
Select All	Replicates	C Acquire Standard Samples (again)
Go Auto Focus	Conditions	Automation Options
Update	Sample Setups	Peak on Assigned Standards Use "Quick" Standards
Delete All	File Setups	Use Filament Standby Afterwards
Re-Load	Multiple Setups	Use Confirm During Acquisition
Delete Selected Positions Export Se	Grain # Focus	Confirm All Positions In Sample Combine Multiple Sample Setups Use ROM Auto Focus New Sample Digitized Conterval Standard Points To Acquire Automate Confirm Delay (sec) Standard X Increment (um) Re-Standard Y Increment (um) Re-Standard Interval (hrs) Conterval Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups Use Digitized Multiple Setups
		Run Selected Samples

This action opens the **Open File To Import Position Data From** window. The user previously digitized all standard blocks and created a variety of *.POS files. Two *.POS files will be loaded for the pyroxene run documented here: SynthStds_pos1.pos, which contains a range of synthetic simple oxides and silicates, and Smithsonian_pos2.pos, which contains a selection of Smithsonian microbeam standards.

The default location for *.POS files is at C:\Probe Software\Probe for EPMA\PFW Position Files, but this can be changed in the PROBEWIN.INI file.

Select the file in the list and click the **Open** button.

Look in:	PFW Position Files	<u> </u>	🖻 📸 🎫
Smithson	nian_pos2.pos		
SynthSto	s_pos1.pos		
	Si	ype: POS File ze: 764 bytes ate modified: 23/04/2013	17:19
File name:	SynthStds_pos1.	DOS	Open

This action opens the **FiducialLoad** window. Click the **Yes** button to do a fiducial transformation on this pre-digitized standard block to obtain an accurate set of standard positions.

FiducialLoa	ad		- 1.40	×
?	Do you want to transfo for position matrix tran	orm the sample nsformation?	positions using sa	mple fiducials
		Yes	No	Cancel

The **Modify Fiducial Positions** window opens. Normally the user would simply accept the defaults or edit the position text boxes for each point, including the appropriate stage location number (JEOL 733 use appropriate W stage position). When done, click the **OK** button.

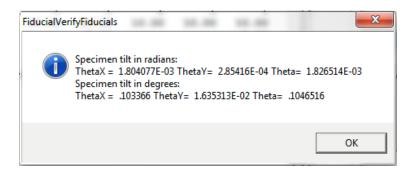
odify Fidu	cial Positions				100.000	1.0.8
Enter Ap	proximate Fig	lucial Positio	ns For Fiducial	Set 1		OK
Fiducial	Description	:\UserData	PFW Position	Files\SynthStd	ls_pos1.pos	Cancel
Point#	х	Y	Z	w		Cancer
1	-7060	7219	77	0	Update	
2	-20970	540	50	0	Update	Move
3	-11085	-9390	65	0	Update	Stage

This action causes the stage motors to drive to the first fiducial coordinate in its lookup table.

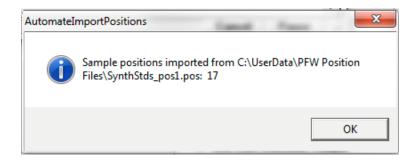
The **FiducialVerifyFiducial** window appears. Adjust the stage motors to center the first fiducial mark, click the **OK** button.

FiducialVer	ifyFiducial
i	Please adjust the stage position for fiducial #1 to the exact center of the alignment mark. Click OK or <enter> when ready or click Cancel or <esc> to quit.</esc></enter>
	OK Cancel

The computer will drive to each of the three fiducial marks for centering. Clicking the **OK** button after the third fiducial mark opens the **FiducialsVerifyFiducials** window. Click this **OK** button.



The program then imports and updates the position coordinates of all of the standards in the predigitized standard position file. The **AutomateImportPositions** window opens.



Click the **OK** button returning to the **Automate!** window.

The **Automate!** window would appear as below. The currently transformed standard position file is listed in the *Position List* list box.

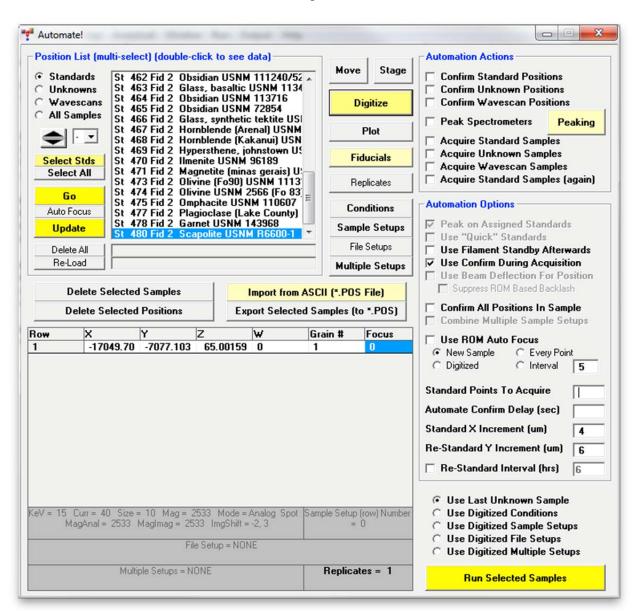
Automate!	or inspired these is	- frank frage		
Position List	t (multi-select) (double-click t	o see data)		Automation Actions
 G Standard C Unknown 	ns St 14 Fid 1 SiO2 synt		Move Stage	Confirm Standard Positions
C Wavesca C All Samp	ans St 16 Fid 1 ThSi04 ('horite)	Digitize	Confirm Wavescan Positions Peak Spectrometers Peaking
	St 19 Fid 1 HfSiO4 (H St 20 Fid 1 ThSiO4 (H			C Acquire Standard Samples
Select Std	ls St 21 Fid 1 USiO4 (Č	offinite) 🗉	Fiducials	Acquire Unknown Samples
	St 23 Fid 1 V203 syn	thetic	Replicates	C Acquire Standard Samples (again)
Go Auto Focu:	St 25 Fid 1 MnO synt	hetic	Conditions	Automation Options
Update	St 27 Fid 1 CoO synth St 28 Fid 1 ZnO synth	netic	Sample Setups	✓ Peak on Assigned Standards ✓ Use "Quick" Standards
Delete All	and the second se		File Setups	Use Filament Standards
Re-Load			Multiple Setups	Use Beam Deflection For Position
Row 1	e Selected Positions 7 Z W -3532.066 65.00127 0	Export Selected Sa Grain # Fo 1 0	amples (to *.POS)	Confirm All Positions In Sample Combine Multiple Sample Setups Use ROM Auto Focus New Sample C Every Point Digitized C Interval 5 Standard Points To Acquire
				Automate Confirm Delay (sec)
				Standard X Increment (um) 4 Re-Standard Y Increment (um) 6
				Re-Standard Interval (hrs) 6
	= 40 Size = 10 Mag = 2533 h nal = 2533 Magimag = 2533 Im File Setuj	gShift = -2, 3	ple Setup (row) Number = 0	 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
	Multiple Setups = NONE		Replicates = 1	Run Selected Samples

Repeat the same loading procedure for the other standard position files required for use in the automation. After clicking the **Import from ASCII File** button, the **AutomateImportFile** window opens.

Automatel	mportFile	122		X
?	The Automate list alr delete all positions in			Do you want to
		Yes	No	Cancel

Typically, when using more than one standard mount, the user would not delete all positions in the *Position List*, instead appending the additional position files to the first file. Select **No** and import additional standards.

All of the standards loaded are listed in the *Position List* list box of the **Automate!** window. These may now be accessed by the program during any automation action. For instance, it is now possible to drive to any standard located on the imported blocks by double clicking on the standard in the list first and then double clicking on the coordinate row.

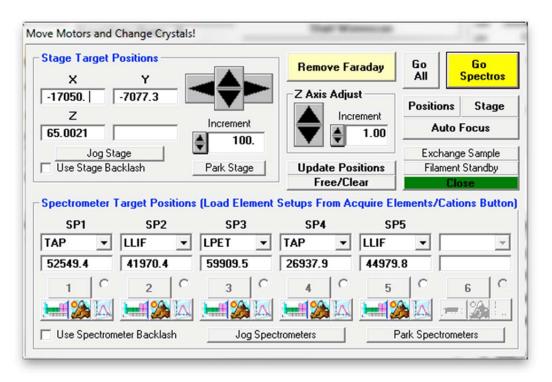


This concludes the initial parameter setup portion of PROBE FOR EPMA.

Manual Peaking and PHA using the Acquire! Window

The user may now manually determine the peak positions from the Acquire! window.

Move to the silicon standard either by double clicking in the **Automate!** window as described on the previous page, or by clicking the **Move** button found in many windows. This opens the **Move Motors and Change Crystals!** dialog box. Enter the coordinates of the standard into the *Stage Target Positions* text boxes. Click the **Go All** button.

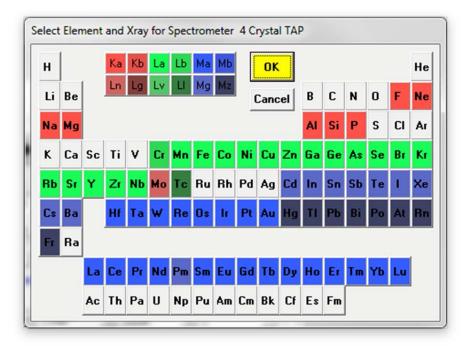


The stage motors will move the stage to the expected position of the standard. Inspect the final X, Y location, adjust if necessary and check the focus.

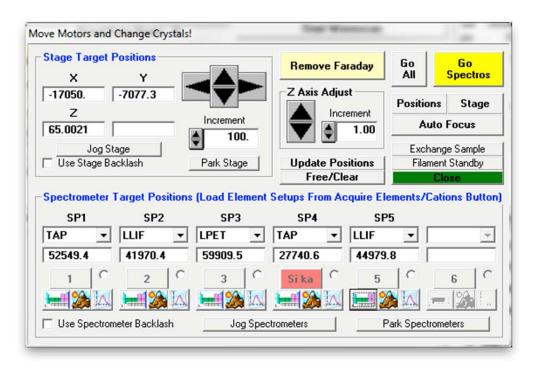
Inspect the spectrometer crystal type and position text boxes, edit if required. The user may also select the element and x-ray line from the Periodic Table function. Click on the **Periodic Table** () button for spectrometer 4, where silicon is measured in this method.

Stage Target X	Positions Y		Remove Fa		Go All	Go Spectros
-17050.	-7077.3		Z Axis Adjus		Positions	Stage
Z 65.0021		Increment		1.00	Auto	Focus
Jog S		100.			Exchang	je Sample
Use Stage B	acklash	Park Stage	Update Pos	itions	Filamen	t Standby
-		ons (Load Elemen	Free/Cle	ar	CI	ose
			Free/Cle	ar	CI	ose
Spectrometer SP1	Target Positio	ons (Load Elemen	Free/Cle Setups From Ac	ar quire Elem	CI	ose
Spectrometer SP1	Target Positio	ons (Load Elemen SP3	Free/Cle Setups From Ac SP4	ar quire Elem SP5	CI	ose
Spectrometer SP1 TAP 🗨	Target Positio SP2 LLIF 41970.4	ons (Load Elemen SP3 LPET v	Free/Cle Setups From Ac SP4 TAP	ar quire Elem SP5 LLIF	CI	ose ions Butte
Spectrometer SP1 TAP v 52549.4	Target Position SP2 LLIF 41970.4	SP3 ILPET ▼ 59909.5	Free/Cle Setups From Ac SP4 TAP V 26937.9	ar quire Elem SP5 LLIF 44979.8	CI	ose ions Butto

The **Select Element and Xray for Spectrometer** window opens, click on Si in the periodic table.



Click the **OK** button to return to the **Move Motors and Change Crystals!** window.



The Move Motors and Change Crystals! window appears as below.

Send the spectrometer directly to the theoretical position by clicking the Go Spectros button.

The user could peak spectrometers as well as adjust the PHA parameters (baseline, window, gain, and bias) from the **Move Motors and Change Crystals!** window by clicking on the respective Peaking (22) and PHA (22) buttons next to the Periodic Table buttons, but in this exercise the peaking functionality of the **Acquire!** window will be used for this purpose.

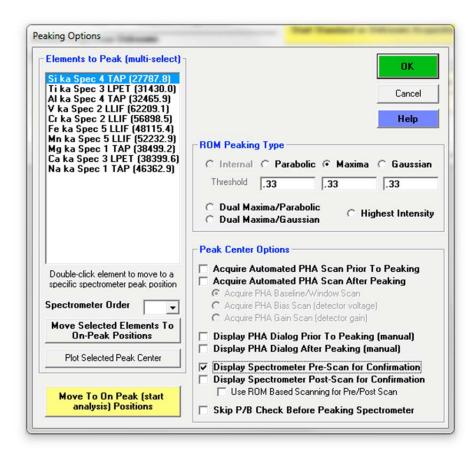
Click the **Peaking Options** button of the **Acquire!** window.

SP1 SP	2 SP	3 SP4	SP5	x	Y	Z	Spectro	Progress
52750.0 53100.	0 53250.	0 52950.0	53250.0	300.000 112	5.00 31	.0.500		
1-TAP 2-	LLIF 3	B-LIF2	4-TAP	5-LLIF		Faraday		
.00	.00	.00	.00	.00		1		
						.000000		a .
Normal Acquisition U								
Data Rows: 0)ata Rows: O		Sta	nt Waves	can		1125.00 .000000
-)ata Rows: 0 PHA	Acqu	Sta		can aking Options		
Data Rows: 0	Good D				Pea		um .0000000 px 0	.000000 0 2533 Analog Spe
Data Rows: O New Sample	Good D	РНА		uisition Options	Pea	aking Options	Jum .0000000 px 0 Magnification Beam Mode	000000.

This opens the **Peaking Options** dialog box. Different *ROM Peaking Types* are available (see User's Guide and Reference documentation for discussion of various Peak Center methods).

Elements to Peak (multi-select) - Si ka Spec 4 TAP (27787.8) Ti ka Spec 3 LPET (31430.0) Al ka Spec 4 TAP (32465.9) V ka Spec 2 LLIF (52209.1) Cr ka Spec 2 LLIF (55698.5) Fe ka Spec 5 LLIF (52232.9) Mg ka Spec 1 TAP (88499.2) Ca ka Spec 3 LPET (38399.6) Na ka Spec 1 TAP (46362.9)	OK Cancel Help C Internal C Parabolic · Maxima C Gaussian Threshold .33 C Dual Maxima/Parabolic O Highest Intensity
Double-click element to move to a specific spectrometer peak position Spectrometer Order	Peak Center Options Acquire Automated PHA Scan Prior To Peaking Acquire Automated PHA Scan After Peaking Acquire PHA Baseline/Window Scan C Acquire PHA Bias Scan (detector voltage)
Move Selected Elements To On-Peak Positions	C Acquire PHA Gain Scan (detector gain) Display PHA Dialog Prior To Peaking (manual) Display PHA Dialog After Peaking (manual)
Plot Selected Peak Center	 Display Spectrometer Pre-Scan for Confirmation Display Spectrometer Post-Scan for Confirmation Use ROM Based Scanning for Pre/Post Scan

Click Display Spectrometer Pre-Scan for Confirmation from the Peak Center Options choices. Finally, select the Si k α Spec 4 TAP selection under the Elements to Peak list box. The **Peak Center** window should appear as follows.

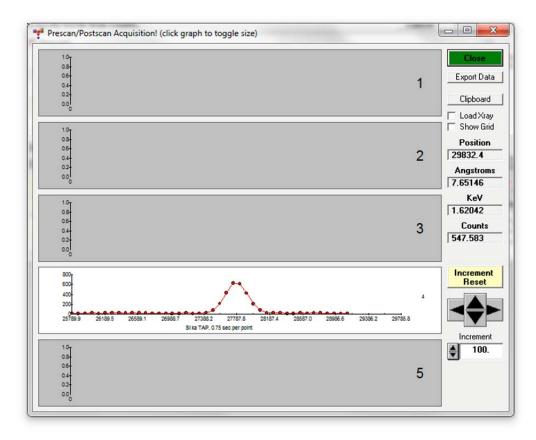


Click the **OK** button to close the **Peaking Options** dialog box.

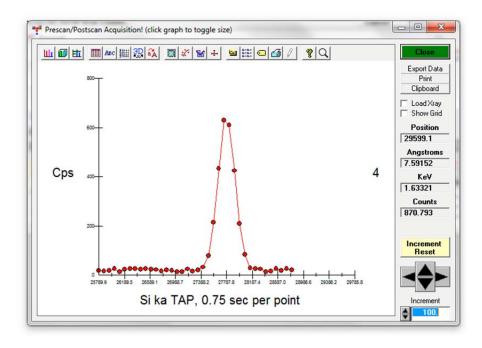
Click the **Start Peaking** button in the **Acquire!** window.

SP1 SH	2 SP3	SP4	SP5	х	Y	Z	Spectro	Progress
52750.0 53100	0 53250.0	52950.0	53250.0	300.000 1125	.00 31	10.500		
1-TAP 2-	LLIF 3	-LIF2	4-TAP	5-LLIF		Faraday		
.00	.00	.00	.00	.00		1		
						.000000		8
Normal Acquisition L		ata Rows: 0		Star	t Wave:	scan	300.000 um .000000	1125.00
Data Hows: U	Jacou D	ata mono. o						
Data Rows: O New Sample		PHA	Acqu	uisition Options	Pe	aking Options	px 0 Magnification	0
r				uisition Options ecial Options	-	aking Options tart Peaking	px 0	Analog Spo
Ne w Sample	Peak/	РНА		•	-		px 0 Magnification Beam Mode	

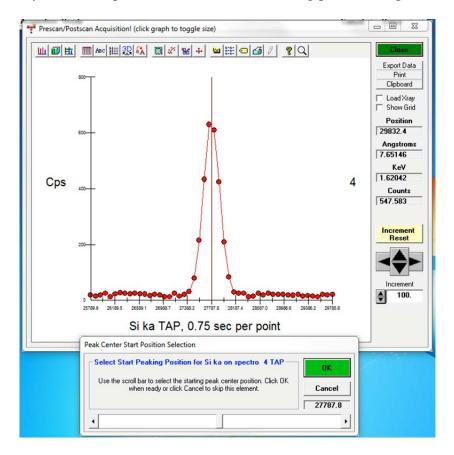
This action opens the **Prescan/Postscan Acquisition** window. The software then performs a peak pre-scan (40 step, user defined parameter) on spectrometer 4 in the Si K α region.



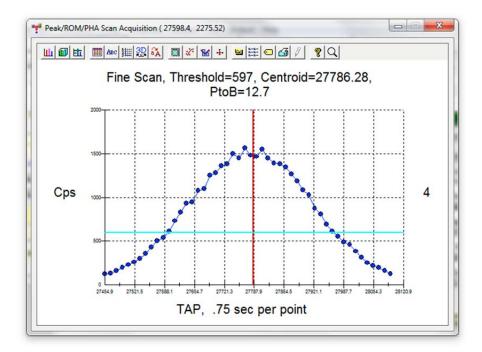
Click on a graph to toggle the display between graphs for all spectrometers and a single spectrometer.



Upon completion of the spectrometer pre-scan the **Peak Center Start Position Selection** window opens. Slide the scroll bar to move the vertical (maroon) peak line to match the actual x-ray maximum position. This selects a starting peak center position for the peaking routine.



Click the **OK** button when manually centered. This initiates a peak center routine to locate the precise peak center. The **Peak/ROM/PHA Scan Acquisition** window opens and real time peaking can be viewed.

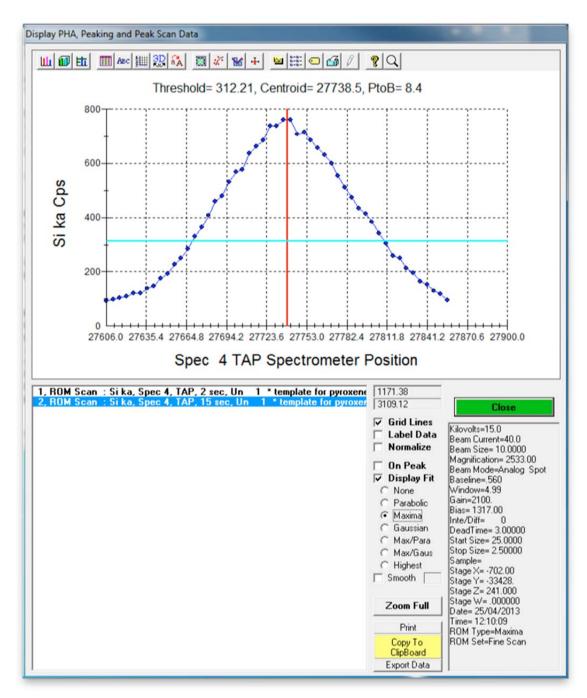


The results appear in the main log window, displayed below.

	Standard >	(ray Analy	rtical Win	dow Run	Output	Help					
	Acquire!			Analyze!		1	Automate!			Plot!	
KILO:	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	
ENERGY	1.740	4.509	1.487	4.950	5.412	6.400	5.895	1.254	3.691	1.041	
EDGE :	1.839	4.967	1.560	5.466	5.990	7.112	6.539	1.305	4.039	1.073	
Eo/Ec:	8.16	3.02	9.62	2.74	2.50	2.11	2.29	11.49	3.71	13.98	
STDS:	453	22	13	23	24	26	25	473	2401	303	
Starting	spectron	eter pe	aking pr	ocedure	for Si	ka on sp	ectro 4				
_	ectro 4,	-				873.9					
Interval	Peak Cen	ter Res	ults:								
Element	Spectr	Peaked	Start	Pk S	topPk C	ffset	StartI	Stop	C I		
Si ka	4 TAP	Yes	2773	38.0 2	7738.7	1.83	911.4	873.	.9		
Ti ka	3 LPET	No	.000	. 0000	000000	.016	.0		.0		
Al ka	4 TAP	No	.000	. 0000	000000	.025	.0		.0		
V ka	2 LLIF	No	.000	. 0000	000000	.031	.0		.0		
Cr ka	2 LLIF	No	.000	. 0000	000000	.016	.0		.0		
Fe ka	5 LLIF	No	.000	. 0000	000000	30.4	.0		.0		
Mn ka	5 LLIF	No	.000	. 0000	000000	30.9	.0		.0		
Mg ka	1 TAP	No	.000	. 0000	000000	05	.0		.0		
Ca ka	3 LPET	No	.000	. 0000	000000	12.6	.0		.0		
	1 TAP	No	.000	. 0000	000000	05	.0		.0		
Na ka											- 1
Na ka											

All spectrometer peaking and PHA scans are automatically saved to the probe run. These can be reviewed by selecting the **Run** | **Display, Fit and Export Spectrometer Peaking and PHA Scans** menu in the main Probe for EPMA log window.

🚏 Probe for EPMA [C:\UserData\Doe\silicates01.MDB		X
File Edit Standard Xray Analytical Window	Run Output Help	
Acquire! A	List Run Summary Ctrl+R	
Miscellaneous Sample Acquisition/Cal KILO: 15.00 15.00 15.00 15 ENERGY 1.740 4.509 1.487 4.5 EDGE: 1.839 4.967 1.560 5.4 Eo/Ec: 8.16 3.02 9.62 2. STDS: 453 22 13 Starting spectrometer peaking proceed Si ka Spectro 4, StopPk: 27738.7,	List Sample Rows, Names, Conditions Ctrl+ N List Anomalous Intensity Data for Standards or Unknowns Ctrl+ O List Sample Calculation Options Ctrl+ O List Standard Counts (Intensities) Ctrl+ I List Standard Compositions List Fiducial Coordinate Sets List Current MACs List Current MACs	-
Interval Peak Center Results: Element Spectr Peaked StartPk Si ka 4 TAP Yes 27738.0	List Current APFs List Current Alpha Factors	
Ti ka 3 LPET No .000000 Al ka 4 TAP No .000000 V ka 2 LLIF No .000000	Display, Fit and Export Spectrometer Peaking and PHA Scans Display, Annotate and Export Analog Signal Images	
Cr ka 2 LLIF No .000000 Fe ka 5 LLIF No .000000 Mn ka 5 LLIF No .000000 Mg ka 1 TAP No .000000 Ca ka 3 LPET No .000000 Na ka 1 TAP No .000000	Display Time Dependent (TDI) and Alternating (on/off) Intensities Display Integrated Intensities Display Calibration Curve Intensities (multi-standard) Display MultiPoint Background Intensities	Ш
Motion: Ready	Display PictureSnap	



The Display PHA, Peaking and Peak Scan Data window opens.

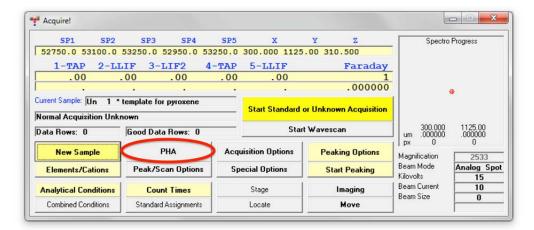
The user has the option to check the fitting (change radio buttons in list) and view the threshold values (set in the PROBEWIN.INI file as well as edited in the **Peaking Options** window). As well as Export capabilities.

Click the **Close** button to exit this dialog.

Next, the PHA properties for each element need to be checked. Each spectrometer has a single channel analyzer that selects pulses of interest (the amplitude of the pulse from the detector is proportional to the energy of the incident x-ray photon) and then outputs this pulse to the counting electronics. PROBE FOR EPMA allows adjustment of the baseline, window, whether the SCA is run in integral or differential mode, and the gain and/or bias voltage of the counter.

Most microprobe automation systems have gain and bias hardware interfaces. However, JEOL instruments typically run a fixed gain setting and allow bias scans on a per element basis. The object is to place the pulse height peak near 4 volts by adjusting the bias. Each element may have a slightly different bias value. On Cameca instruments both bias and gain scans can be performed and the gain value can be adjusted to change the position of the pulse height maximum, typically to a value around 2-2.5 volts.

Click the **PHA** button in the **Acquire!** window.



The Pulse Height Analysis (PHA) window opens.

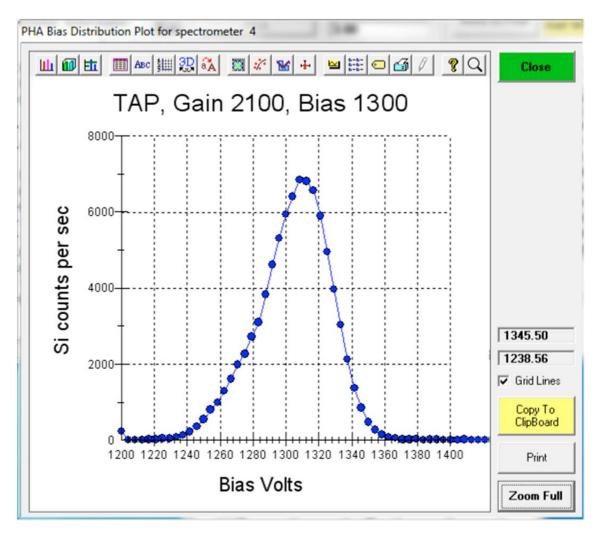
Channel	Element	Spectro	Crystal	Baseline	Window	Inte/Diff	Gain	Bias	Deadtime	Slit Size	Slit Pos.	Det.
1	Si ka	4	TAP	.56	4.99	INTE	2100.00	1300.	3.00			
2	Tika	3	LPET	.56	4.99	INTE	873.00	1845.	3.00			
3	Al ka	4	TAP	.56	4.99	INTE	2759.00	1317.	3.00			
4	¥ ka	2	LLIF	.56	4.99	INTE	393.00	1837.	3.00			
5	Cr ka	2	LLIF	.56	4.99	INTE	393.00	1838.	3.00			
6	Fe ka	5	LLIF	.56	4.99	INTE	375.00	1824.	3.00			
7	Mn ka	5	LLIF	.56	4.99	INTE	375.00	1824.	3.00			
8	Mg ka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			
9	Ca ka	3	LPET	.56	4.99	INTE	873.00	1845.	3.00			
10	Na ka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			
<	nd Export	Scans								OK		Cance

To select the first element to evaluate (Si), click its element row.

The **PHA Properties** window appears. Run a Bias scan for Si by clicking on the **Acquire and Graph Bias Scan Distribution** button.

Enter PHA Prope		CONTRACTOR OF T	OK
Baseline .56	4.99	ndow 🛓	Cancel
Gain	B	ias 🖂	Set PHA
2100.00	♦ 1300.		Get PHA
Calculate Empiri PHA	ical Deadtim	e (soft w are)	Move On Peal
🔲 Use Diffe	rential PHA Mo	ode	Adjust PHA
Bias and Gain So Bias Low	vindow of the ght analyzer. Jain scan to bias or gain for ias setting. Window Scan Wind 80	Dist Scan Bias o Count Time 1 Acquire ar	e Intervals 30 Ind Graph PHA ribution
A	Gain High 3200.	Scan D	e Intervals 30 nd Graph Gain Distribution
Slit Size	Slit Pos		etector Mode
×			
_			

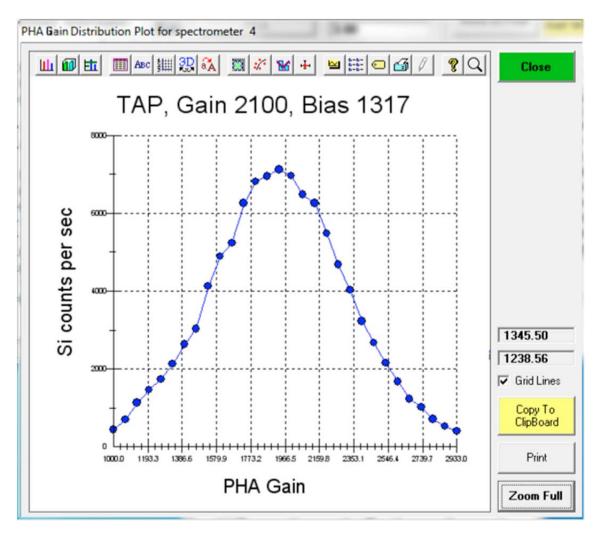
At the completion of the bias scan the **PHA Bias Distribution Plot for spectrometer 4** window will be visible. Read the bias value for the maximum Si count rate from the plot and click the **Close** button.



Edit the *Bias* text field in the **PHA Properties** window with the appropriate value, here 1317. On Cameca instruments only, run a gain scan by clicking on the **Acquire and Graph Bias Scan Distribution** button.

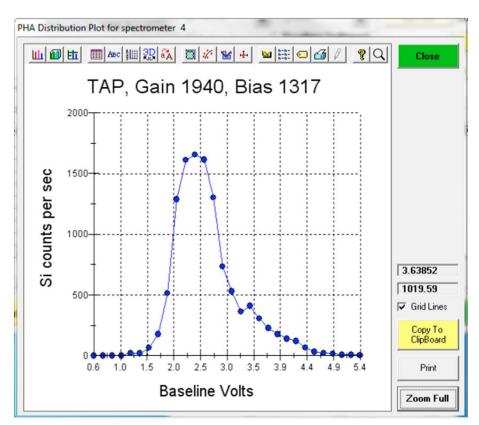
	perties For Spec		OK
Baseline	-▲ Win 4.99	ndow 🛓	Cancel
Gain	B	ias	Set PHA
2100.00	1317.		Get PHA
Calculate Em PHA	pirical Deadtin 3.00	e (software)	Move On Peal
🔲 Use Di	fferential PHA M	ode	Adjust PHA
Perform a PHA so proper baseline o detector pulse h Perform a bias o letermine the prop a given gain o	r window of the eight analyzer. or gain scan to er bias or gain for	Scan PHA Di Count Time 2 Acquire and	istribution Intervals 30
Bias/Gain Sca	n Window		bution
Scan BaseL	Scan Wind	Scan Bias or	Gain
Bias and Gain Bias Low 1200 Gain Low	Bias High 1450	Count Time 2 Acquire and	30 Graph Bias stribution Intervals 30 I Graph Gain stribution
Enter Detecto Slit Size	Parameters For Slit Pos		tector Mode

At the completion of the gain scan the **PHA Gain Distribution Plot for spectrometer 4** window will be visible. Read the gain value for the maximum Si count rate from the plot and click the **Close** button.



Edit the Gain text field in the PHA Properties window with the appropriate value, here 1940.

Next, run a PHA scan to evaluate the appropriate baseline and window (if in differential mode operation) settings as well as gain and bias settings for the element of interest. Click the **Acquire and Graph PHA Distribution** button in the **PHA Properties** window.



The **PHA Distribution Plot** window will display at the completion of the scan.

Click the **Close** button to return to the **PHA Properties** window. Click the **OK** button to close the **PHA Properties** window. Note the new *Bias* and *Gain* values for Si in the **Pulse Height Analysis (PHA)** window.

Channel	Element	Spectro	Crystal	Baseline	Window	Inte/Diff	Gain	Bias	Deadtime	Slit Size	Slit Pos.	Det.
1	Si ka	4	TAP	.56	4.99	INTE	1940.00	1317.	3.00			
2	Ti ka	3	LPET	.56	4.99	INTE	873.00	1845.	3.00			
3	Al ka	4	TAP	.56	4.99	INTE	2759.00	1317.	3.00			
4	V ka	2	LLIF	.56	4.99	INTE	393.00	1837.	3.00			
5	Cr ka	2	LLIF	.56	4.99	INTE	393.00	1838.	3.00			
6	Fe ka	5	LLIF	.56	4.99	INTE	375.00	1824.	3.00			
7	Mn ka	5	LLIF	.56	4.99	INTE	375.00	1824.	3.00			
3	Mg ka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			
9	Ca ka	3	LPET	.56	4.99	INTE	873.00	1845.	3.00			
10	Naka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			
•	Na ka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			

Click the **OK** button to close the **Pulse Height Analysis (PHA)** window returning to the **Acquire!** window.

Manual Count Acquisition using the Acquire! Window

To acquire a single point of x-ray count data for a standard proceed as follows. From the **Acquire!** dialog box click the **New Sample** button.

SP1 SP2	SP3 SP4	4 SP5	х	Y Z	1	Spectro	Progress
52750.0 53100.0	53250.0 52950.	0 53250.0	300.000 1125	.00 310.500			
1-TAP 2-L	LIF 3-LIF2	4-TAP	5-LLIF	Fa	raday		
.00	.00 .00	.00	.00		1		
				.0	00000		b
Current Sample: Un 1 Normal Acquisition Un Data Rows: 0			Start Standard of Start	r Unknown Ac Wavescan	quisition	300.000 um .000000	1125.00 .000000
		1 A A				px 0	0
New Sample	РНА	Acqu	uisition Options	Peaking 0	ptions	Magnification	2533
New Sample Elements/Cations	PHA Peak/Scan Optic		uisition Options ecial Options	Peaking O Start Pea	king	Magnification Beam Mode	Analog Spo
	Peak/Scan Optio		-	-	king	Magnification	2533 Analog Spo 15 10 0

This opens the **New Sample** window. Click on *Standard* from the *New Sample Type* buttons. This allows the user to specify a standard from the list now active at the bottom of the *New Sample* dialog box. Click *12 MgO synthetic*, its name now appears under *New Sample Name*. Click the **OK** button when done.

New Sample Type	OK	Canc	el
C Unknown	Load Ele	ment Setup	s
○ Wavescan	Load Sa	mple Setup	,
	Load F	ile Setup	
Add/Remove Standards	Load Mu	ultiple Setup	
buttons above or first crea make anv necessarv			
Load Wavesca	n From Another P		
Load Wavescar New Sample Name			
Load Wavesca New Sample Name MgO synthetic	n From Another P		
Load Wavesca New Sample Name MgO synthetic New Sample Descripti 1. UCB # M3567, 99. 0.2%	n From Another P on 8%, EPMA (UC	robe Run Add < CB]: Ca ~	
Load Wavesca New Sample Name Mg0 synthetic New Sample Descripti 1. UCB # M3567, 99. 0.2% 2. C. M. Taylor, 99.98 To add standards to the st hen click the Standard JA	ion 8%, EPMA (UC 3%, EPMA (UC	robe Run Add < (B): Ca ~ B) Ca ~ , cancel this o	cr>
Load Wavesca New Sample Name Mg0 synthetic New Sample Descripti 1. UCB # M3567, 99. 0.2% 2. C. M. Taylor, 99.98 To add standards to the st then click the Standard JA	n From Another P on 8%, EPMA (UC 3%, EPMA (UC andard list below dd Standards to	robe Run Add < (B): Ca ~ B) Ca ~ , cancel this o	cr>

Check the optical focus on the standard and click the **Start Standard or Unknown Acquisition** button of the **Acquire!** window to initiate the data acquisition.

SP1 SP2	SP3 SP4	SP5	х	Y	Z	Spectro	Progress
38499.1 62209.0	31430.0 27786.4	48115.3 3	300.000 1125	0.00 31	0.500		
1-TAP 2-L	LIF 3-LPET	4-TAP	5-LLIF		Faraday		
.00	.00 .00	3.00	.00		1		
		1868.			9.98466		
Normal Acquisition Sta				or Unkno	own Acquisition	300.000	1125.00
Normal Acquisition Sta						300.000 um .000000	.000000
	ndard	1		t Waves		300.000	
Normal Acquisition Sta Data Rows: 0	ndard Good Data Rows: 0	Acqui	Star	t Waves Pea	can	300.000 um .0000000 px 0	.000000 0 2533 Analog Spo
Normal Acquisition Sta Data Rows: O New Sample	ndard Good Data Rows: 0 PHA	Acqui	Star isition Options	t Waves Pea	can aking Options	300.000 um .000000 px 0 Magnification Beam Mode	.000000 0 2533

The progress of all data acquisition may be viewed in the **Acquire!** window. The current sample is displayed in the **Acquire!** window and the spectrometers move to their respective peak positions for the first elements and count on peak and off peak for times specified earlier in the **Count Times** window. Off peak measurements are not performed for Si, Fe, Mg, and Ca as the MAN background type was selected earlier. The Faraday cup is also measured.

		and the second se		Contraction of the local division of the loc							
SP1 S	P2	SP3 S	P4 SI	25 X	Y		Z		Spectro	Progres	\$
46362.8 56898	8.6 3839	9.7 32465	.9 52232	9 300.000	1125.00	310.50	00		Na Cr		
Na-TAP Cr	-LLIF	Ca-LPET	Al-TA	P Mn-LLI	F	Ab	sorbed		In Cr	Ca /	" Min
5.68	6.55	5.93	6.3	6.9	7		1				
79.	164.	271.	83	. 154			000000		Mg V		Si Fe
Normal Acquisition	Standard			Start Star		IKIIOTIII 7	cquisition				
Normal Acquisition Data Rows: 0		d Data Rows	: 0		Start Wa		cquisition		300.000	1125	
		od Data Rows PHA	1	cquisition Optio	Start ₩a		1944 - 1924	Jum. px	.000000 0	.000	000)
)ata Rows: 0	Goo		A		Start Wa	vescan	Options	um . px Magnific Beam M	000000 0 cation fode	.000 (2 Analo	000) 533 9 9 Sp
Data Rows: 0 New Sample	s Pe	PHA	tions	cquisition Optio	Start Wa	vescan Peaking	Options eaking	um . px Magnific	000000 0 cation fode s Current	.000 (Analo	000) 533

After completion of acquisition, the results are written to the log window.

142			Doe\silicates	and the second se	n Output	Help					
rile call	Acquire!			Analyze!			Automate		1	Plot	
	Acquire						Automate			Fille	
st	12 Set	t 11	MgO sy	ntheti	C						
		Mg0 syn	t = 15.0	Boom	mmont .	- 40 0 1	loom Cin	= 10			
			ical) =			Beam Mode					
-	ication					tion (ima					
	Shift (X)			2000, 14	agini i ca	cion (ime		2333)			
rmage .	mire (n	-/-					2.00	, 5.00			
I. UCB	# M3567	99.88.	EPMA (UC	(B) : Ca	0.28						
			, EPMA								
		.,	.,								
On and	Off Peak	Positio	ons:								
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
ONPEAK	27738.0	31430.0	32465.9	62209.1	56898.5	48085.0	52202.0	38499.2	38387.0	46362.9	
OFFSET	2.56641	.015625	.025391	.031250	.015625	30.3867	30.9023	04688	12.5859	05078	
HIPEAK		32367.7	33699.8	62723.7	57436.6		52763.6			47402.1	
LOPEAK		30492.3	31232.0	61694.5	56360.4		51640.4			45323.6	
HI-OFF		937.699	1233.90	514.598	538.102		561.602			1039.20	
LO-OFF		-937.70	-1233.9	-514.60	-538.10		-561.60			-1039.3	
PHA Par	ameters										
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
DEAD:	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
BASE:	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	
WINDOW	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	
MODE :	0	0	0	0	0	0	0	0	0	0	
GAIN:	2759.	873.	2759.	393.	393.	375.	375.	2874.	873.	2874.	
BIAS:	1317.	1845.	1317.	1838.	1838.	1824.	1824.	1328.	1845.	1328.	
			Off Peak								
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
BGD:	MAN	OFF	OFF	OFF	OFF	MAN	OFF	MAN	MAN	OFF	
BGDS:	MAN	LIN	LIN	LIN	LIN	MAN	LIN	MAN	MAN	LIN	
SPEC:	4	3	4	2	2	5	5	1	3	1	
CRYST:	TAP	LPET	TAP	LLIF	LLIF	LLIF	LLIF	TAP	LPET	TAP	
ORDER :	1	2	2	2	1	1	2	2	1	1	
ONTIM:	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
HITIM:		5.00	5.00	5.00	5.00		5.00			5.00	
LOTIM:		5.00	5.00	5.00	5.00		5.00			5.00	
Miscell	aneone	ample A	cquisitio	n/Calon	lation P	arameter					
KILO:	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	
ENERGY	1.740	4.509	1.487	4.950	5.412	6.400	5.895	1.254	3.691	1.041	
EDGE :	1.839	4.967	1.560	5.466	5.990	7.112	6.539	1.305	4.039	1.041	
Eo/Ec:	8.16	3.02	9.62	2.74	2.50	2.11	2.29	11.49	3.71	13.98	
STDS:	453	22	13	2.74	2.50	2.11	2.29	473	2401	303	
	400	22	10	20	24	20	25	475	2401	505	
Off-Pea	k Correc	ted or 1	MAN On-Pe	ak X-ray	Counts	(cms/39	99426n4				
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	

Repeated clicking of the **Start Standard or Unknown Acquisition** button acquires additional intensity data. The following log window illustrates the acquisition of three data points on the MgO standard.

BGDS: MAN LIN LIN LIN LIN MAN LIN Case MAN LIN Case MAN LIN Case MAN LIN MAN LIN		Standard	Aldy Al	alytical Wir	ndow Kun	Output	нер						
BLEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BGD: MAN OFF OFF OFF OFF OFF MAN OFF MAN OFF BGDS: MAN LIN LIN LIN LIN MAN OFF MAN MAN MAN OFF BGDS: MAN LIN LIN LIN LIN MAN LIN MAN MAN MAN MAN OFF BGDS: MAN LIN LIN LIN MAN LIN LIN LIN MAN MAN MAN MAN MAN MAN MAN MAN LIN LIN MAN MAN MAN MAN MAN MAN MAN LIN MAN		Acquire	ł		Analyz	zel		Auto	mate!			Plot!	
ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BGD: MAN OFF OFF OFF OFF OFF MAN OFF MAN MAN OFF BGDS: MAN LIN LIN LIN LIN MAN LIN MAN MAN MAN OFF BGDS: MAN LIN LIN LIN MIN MAN MAN MAN MAN OFF BGDS: MAN LIN LIN LIN MAN LIN MAN MAN MAN MAN MAN MAN DFF BGDS: MAN LIP LLIF LLIF LLIF LLIF TAP LPET TAP DRDER: 1 2 2 1 1 2 2 1 1 ORDER: 1 0.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00													
BGD: MAN OFF OFF OFF OFF MAN OFF MAN MAN LIN MAN MAN MAN MAN MAN MAN LIN SEPEC: 4 3 4 2 2 5 5 1 3 1 SEPEC: 4 3 4 2 2 5 5 1 3 1 SEPEC: 4 3 4 2 2 5 5 1 3 1 SEPEC: 4 3 4 2 2 5 5 1 3 1 CRYST: TAP LPET TAP LLIF LLIF LLIF LLIF LLT TAP LPET TAP ONTIM: 5.00 5.00 5.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th>De les</th><th>10. 1.</th><th>Mar ha</th><th>0- 1-</th><th>N</th><th></th><th></th></td<>							De les	10. 1.	Mar ha	0- 1-	N		
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HITIM: 5.00 5.00 5.00 5.00 5.00 5.00 5.00 LOTIM: 5.00 5.00 5.00 5.00 5.00 5.00 Miscellaneous Sample Acquisition/Calculation Parameters: KILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426AA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 16 13.1 -3.2 .21 -1.9 22.9 .6 4756.2 45.94 40.010 26 13.0 2.57 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 36 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.58 39.976 AVER: 13.1 -2.32 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 151G: 1.1 1.8 1.1 1.6 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5													
LOTIM: 5.00 5.00 5.00 5.00 5.00 5.00 Miscellaneous Sample Acquisition/Calculation Parameters: KILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .21 -1.9 22.9 .6 4756.2 45.94 40.010 2G 13.0 2.57 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.58 39.976 AVER: 13.1 -2.32 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5									10.00	10.00			
Miscellaneous Sample Acquisition/Calculation Parameters: KILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .21 -1.9 22.9 .6 4756.2 45.94 40.010 2G 13.0 2.57 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.58 39.976 AVER: 13.1 -2.32 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5													
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ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): E E ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 <td></td> <td>neous</td> <td></td> <td>equisition</td> <td>n/Calcula</td> <td>ation Pa</td> <td>rameters</td> <td>:</td> <td></td> <td></td> <td></td> <td></td> <td></td>		neous		equisition	n/Calcula	ation Pa	rameters	:					
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Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): E E ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5	ENERGY				4.950		6.400	5.895			1.041		
STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): E ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1		1.839	4.967	1.560	5.466	5.990	7.112	6.539		4.039	1.073		
Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 </td <td>Eo/Ec:</td> <td>8.16</td> <td>3.02</td> <td>9.62</td> <td>2.74</td> <td>2.50</td> <td></td> <td>2.29</td> <td>11.49</td> <td>3.71</td> <td>13.98</td> <td></td> <td></td>	Eo/Ec:	8.16	3.02	9.62	2.74	2.50		2.29	11.49	3.71	13.98		
ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5	STDS:	453	22	13	23	24	26	25	473	2401	303		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Off-Peak	Correc	ted or M	AN On-Pea	ak X-ray	Counts	(cps/39.	99426nA)	:				
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3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5	1G	13.1	-3.2	.2	1	-1.9	22.9	. 6	4756.2	45.9	4	40.010	
AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5	2G	13.0	2.5	7	2.1	-2.3	25.2	.3	4725.7	47.1	-1.9	39.983	
SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5	3G	13.0	-6.2	.1	3.0	-2.3	24.6	2.6	4731.2	46.5	8	39.976	
SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5	AVER:	13.1	-2.3	2	1.7	-2.2	24.2	1.2	4737.7	46.5	-1.0	39.990	
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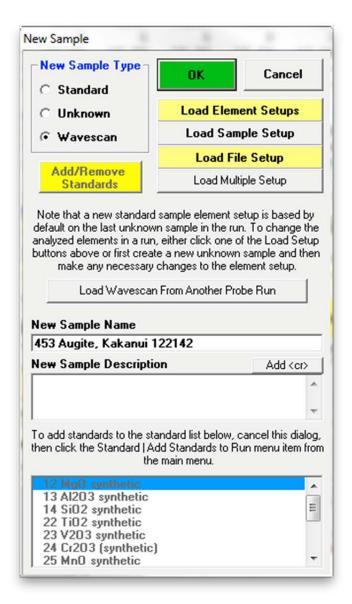
Similarly, x-ray counts can be acquired on the other standards. Move to the next standard position via the **Move** button and inspect the location and focus. Click the **New Sample** button, select the next standard from the standard list, and click the **OK** button when done.

Wavescan Acquisitions and Off-Peak Adjustments

Wavescans can be performed for example to check for spectral interferences, presence of minor elements, or to check and adjust off-peak positions.

Move to standard 453 (Augite, Kakanui USNM 122142), which is a pyroxene expected to be similar in composition to the unknowns, using the **Move Motors and Change Crystals!** or the **Automate!** window as explained before.

Click the **New Sample** button. Select *Wavescan* under *New Sample Type*, edit the *New Sample Name* and *New Sample Description* text boxes, as desired.



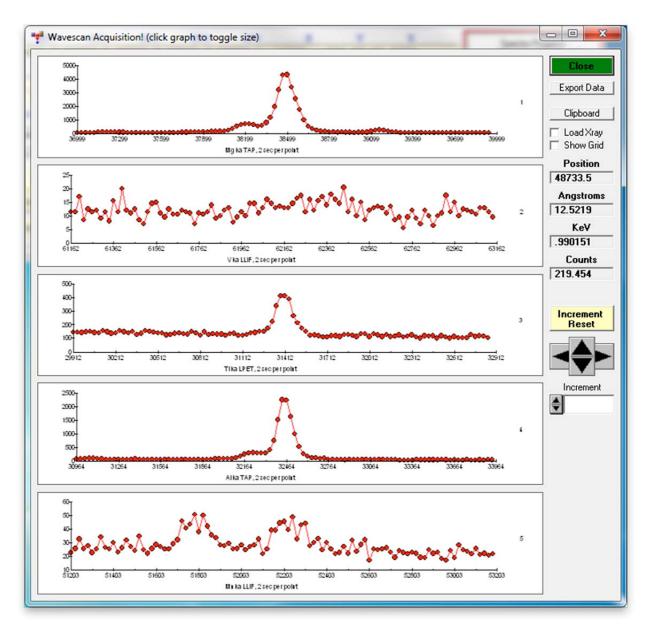
Click **OK** when done.

Click the **Start Wavescan** button of the **Acquire!** window.

SP1 SP2	SP3	SP4	SP5	х	Y	Z	Spectro	Progress
38499.4 62209.1	31430.0	27786.4	48115.5	300.000 1125	.00 310	.500		
1-TAP 2-I	LIF 3-	LPET	4-TAP	5-LLIF		Faraday		
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74. 1	.36.	147.	65.	105.		9.98601		a
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Data Rows: O New Sample	Good Da	nta Rows: 0 PHA		Star	t Wavesc Peal Sta	an king Options	um .000000 px 0 Magnification Beam Mode	.000000 0 2533

This action opens the **Wavescan Acquisition** window and automatically initiates a 100 step (user defined) wavelength scan for all of the elements entered into the current sample.

Graphical output of the completed scan via the **Wavescan Acquisition** window can be seen below for the second set of elements on the respective spectrometers, Mg, V, Ti, Al, and Mn. The Augite Kakanui standards contains Mg and Al as major elements, Ti and Mn as minor elements, and may contain a trace amount of V. Additional peaks are present which will be discussed later.



The wavescan labels appear in the main PROBE FOR EPMA log window.

File Edit S	tandard Xray Anal	ytical Window Run Out	tput Help			
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The wavescan positions and counts may be displayed in the main log window by clicking the **Analyze!** button opening the **Analyze!** window.

Select the *Wavescans* radio button, highlight the *Wa 1 453 Augite, Kakanui 122142* sample and finally click the **Raw Data** button to write the data to the main log window.

	ct) (double-click to see inte 1 453 Augite, Kakanui 122142	ensity data)	Analyze List Standard Intensities	Raw Data KRaws >>Excel Calculation Options	Combine Selected Samples Combine Analysis Lines From Selected Samples Combine Data Lines From
An Samples Select All Add To Setups Save Setups		ſ	Pause Betwe	Corrections	Selected Samples Sort Stat and Data Grids By Geological/Atomic Number Do Not Output To Log
tandard Assignments	Specified Concentrations	Total Oxy	ugen d Oxygen	Count Times Count Times Elements/Cations Total Weight % Z - Bar Atomic Weight	Combine the Selected Sample: into a New Sample Search For "Shared" Bgds "Shared" Bgd Boundary Corrections Create Material File
py					
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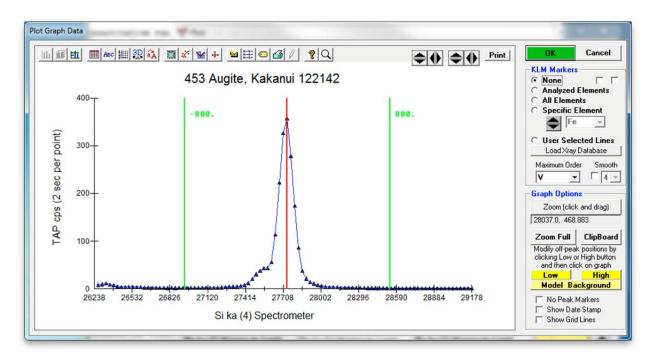
The output of the first lines of the wavescan data is shown below. Graphical display of these wavescans may be accomplished using the **Plot!** window, where they can also be used to check and adjust off-peak background positions. Click the **Plot!** button

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Acquire		Analyze!	Auton	nate!		Plot!	>
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SLEM: Angstro SPEC:					BEAM		
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CRIZD: CRYK :	.002180	000144	25.7450	4.0267			1
ORDER:	1	2	2	.000058			
WVTIM:	5.00	5.00	5.00	5.00			
ONPEAK	27738.0	31430.0	32465.9	62209.1			
WAVHI:	30218.6	33305.4	34779.5	63238.3			
WAVLO:	25212.6	29554.6	30152.3	61179.9			
HI-OFF	2480.55	1875.44	2313.57	1029.22			
LO-OFF	-2525.4	-1875.4	-2313.6	-1029.2			
WAVEPT	100	100	100	100			
Calibrated Ang	stroms and Co	unts:					
4G 6.47761					39.979		
5G 6.49020					39.979		
6G 6.50331					39.979		
7G 6.51633					39.979		
8G 6.52920					39.979		
9G 6.54258 10G 6.55532					39.979		
10G 6.55532 11G 6.56816					39.979 39.979		
12G 6.58114					39.979		
13G 6.59458					39.979		
14G 6.60759					39.979		
15G 6.62033					39.979		
16G 6.63341					39.979		
170 6 64657					30 070		
Open: Ready					Cance	Pause	1

The **Plot!** window opens. Click to highlight the *Wa 1 453 Augite, Kakanui 122142* wavescan sample.

Click on *Si ka* (4) *Spectrometer* from the *X*-Axis list and *Si ka* (4) *Wavescan Counts* from the *Y*-Axis list selections. The number following the element label (4, in this case) designates which spectrometer collected the data. The same element may be run on multiple spectrometers (see User's Guide and Reference documentation for additional details). Choose a *Graph Type*, click the *Line* button and an *Output Target* of *Send Data to Plot Window*. Finally, click the **Output** button to view the graph.

Wavescan Sample List (multi-select)	Use Manual Selection	Output Target	t) File (X, Y, (Z))
		Include Deleted Points Data Point Labels ASCII File Column Labels Force Black and White Print Normalize Samples	Run Information Sample Names Off Peak Labels
Si ka (4) Spectrometer Ti ka (2) Spectrometer Ti ka (2) Spectrometer Cr ka (2) Spectrometer Fe ka (3) Spectrometer Mn ka (5) Spectrometer Mn ka (5) Spectrometer Ca ka (3) Spectrometer Na ka (1) Spectrometer Si ka (4) Angstroms Ti ka (3) Angstroms Al ka (4) Angstroms Cr ka (2) Angstroms Mn ka (5) Angstroms Mn ka (5) Angstroms Mn ka (5) Angstroms Mn ka (5) Angstroms Mn ka (3) Angstroms Si ka (4) Kilovolts Si ka (4) Kilovolts Si ka (4) Kilovolts Al ka (4) Kilovolts V ka (2) Kilovolts V ka (2) Kilovolts	 Mn ka (5) Sp Mg ka (1) Sp Ca ka (3) Sp Na ka (1) Sp Si ka (4) Ang Ti ka (3) Ang Cr ka (2) Ang Cr ka (2) Ang Fe ka (5) An Mn ka (5) Ar Mg ka (1) Ar Ca ka (3) An Na ka (1) An Si ka (4) Kilo Ti ka (3) Kilo Al ka (4) Kilo Ci ka (2) Kilo Ci ka (2) Kilo Fe ka (5) Kilo Mn ka (5) Kilo Mn ka (5) Kilo Mg ka (1) Kilo Ca ka (3) Kilo Mn ka (3) Kilo Na ka (3) Kilo Mn ka (3) Kilo	ectrometer ectrometer sectrometer sectormeter stroms stroms stroms gstroms gstroms gstroms gstroms gstroms yvolts vvolts vvolts ovolts ovolts ovolts ovolts ovolts ovolts	Graph Type Scatter Line Linear-Log Intensity Error Bars Plot Error Bars n Sigma 1 n Spacing 1 Close

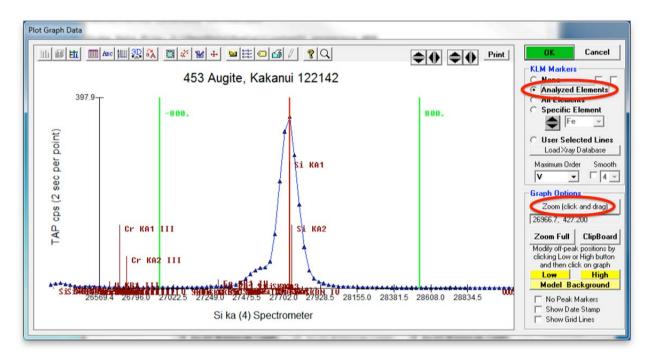


The program then loads the selected data into the **Plot Graph Data** window.

The **Plot Graph Data** module allows a more robust treatment of the wavescan data. The graph of *Si ka (4) Spectrometer* position versus *Si (4) Wavescan Counts* (labeled as *TAP cps*) is plotted as well as the locations of the on-peak (red vertical line) and both off-peaks (green vertical lines).

Various options are available for evaluation of the data. Besides click and drag *Zoom* capabilities, a large selection of *KLM Markers* options may be enabled to plot theoretical x-ray line positions. Further, a model background option is available (see User's Guide and Reference documentation for a complete discussion of this feature).

With the **Zoom** button active, click and drag the mouse over the region the user wishes to magnify. The *Analyzed Elements* button of the *KLM Markers* may be selected, plotting the various x-ray line positions for all analyzed elements in the current spectrum region.

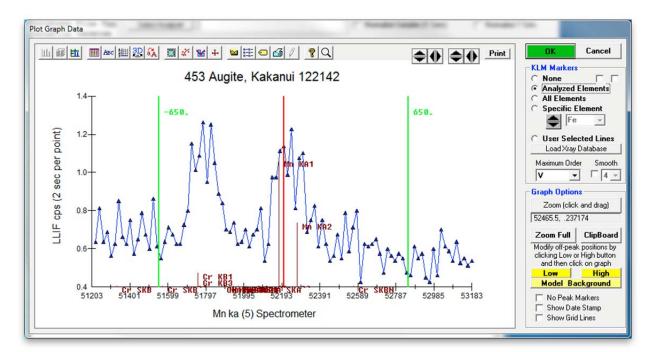


The default choices for both silicon background positions (green vertical lines) appear sound as no analyzed element lies nearby and the background counts near these peaks are low. Click the **OK** button of the **Plot Graph Data** window to return to the **Plot!** dialog box.

Next, the user evaluates the same data set for manganese. From the **Plot!** dialog box, select Mn ka (5) Spectrometer from the X-Axis list and Mn ka (5) Wavescan Counts from the Y-Axis list selections. Click the **Output** button.

Plot Wavescans!		
Wavescan Sample List (multi-select) U: Wa 1 453 Augite, Kakanui 122142	se Manual Selection Plot Data In Graph Win C Output Data to ASCII (t C Send Data To Printer (s	ext) File (X, Y, (Z))
	Include Deleted Points Data Point Labels ASCII File Column Labels Force Black and White Print Normalize Samples	Run Information Sample Names Off Peak Labels
X-Axis	Y Axis	Graph Type
Si ka (4) Spectrometer Ti ka (3) Spectrometer Al ka (4) Spectrometer V ka (2) Spectrometer Cr ka (2) Spectrometer Fe ka (5) Spectrometer Mg ka (1) Spectrometer Mg ka (1) Spectrometer Na ka (1) Spectrometer Si ka (4) Angstroms Ti ka (3) Angstroms Al ka (4) Angstroms Cr ka (2) Angstroms Fe ka (5) Angstroms Fe ka (5) Angstroms Mn ka (5) Angstroms Mn ka (1) Angstroms Cr ka (2) Angstroms Mag ka (1) Angstroms Ca ka (3) Angstroms Si ka (4) Kilovolts Si ka (4) Kilovolts Al ka (4) Kilovolts V ka (2) Kilovolts V ka (2) Kilovolts	 Ti ka (3) Kilovolts Al ka (4) Kilovolts V ka (2) Kilovolts Cr ka (2) Kilovolts Fe ka (5) Kilovolts Mg ka (1) Kilovolts Mg ka (1) Kilovolts Ca ka (3) Kilovolts Na ka (1) Kilovolts Si ka (4) Wavescan Counts Ti ka (3) Wavescan Counts Al ka (4) Wavescan Counts V ka (2) Wavescan Counts Fe ka (5) Wavescan Counts Fe ka (5) Wavescan Counts Fe ka (5) Wavescan Counts Mg ka (1) Wavescan Counts Mg ka (1) Wavescan Counts Mg ka (1) Wavescan Counts Na ka (3) Wavescan Counts Na ka (1) Wavescan Counts Si ka (4) Raw Wavescan Counts Si ka (4) Raw Wavescan Counts Ti ka (3) Raw Wavescan Counts Al ka (4) Raw Wavescan Counts Y ka (2) Raw Wavescan Counts 	 Scatter Line Linear-Log Intensity Error Bars Plot Error Bars n Sigma 1 - n Spacing 1 - Output

The **Plot Graph Data** window for the manganese data set is shown below. Two peaks are visible and the user observes that the low background position lies close to the second unknown peak, which is identified as Cr $K\beta_{1,2}$.



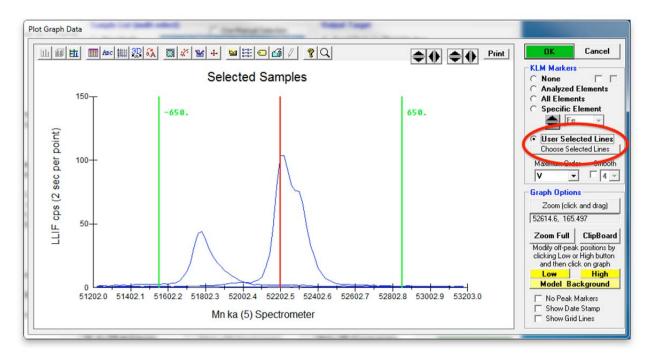
As both Mn and Cr are only present as minor elements in the Augite Kakanui standards, the count rates are low. To better assess the situation, additional wavescans need to be collected in the same way on standards high in chromium and manganese, respectively.

Click **OK** to return to the **Plot!** window.

Additional wavescans are collected using the same procedure, which is not shown again to save space. The Plot! window is now shown below with additional wavescans acquired on standards, including Bustamite for Mn and Chromite for Cr. Hold the $\langle ctrl \rangle$ key and click on the Augite, Bustamite, and Chromite standards to multi-select all three. Again, select *Mn ka* (5) *Spectrometer* from the *X*-Axis list and *Mn ka* (5) *Wavescan Counts* from the *Y*-Axis list selections. Click the **Output** button.

Wa 1 453 Augite, Kakanui 122142 Wa 2 22 TiO2 synthetic Wa 3 26 Fe2O3 synthetic hematite Wa 4 509 Bustamite	e Manual Selection	Output Target Plot Data In Graph Windo C Dutput Data to ASCII (tex C Send Data To Printer (sep	t) File (X, Y, (Z))
Wa 5 455 Chromite 177075		Include Deleted Points Data Point Labels ASCII File Column Labels Force Black and White Print Normalize Samples	Run Information Sample Names Off Peak Labels
X-Axis		Y Axis	Graph Type
Si ka (4) Spectrometer Ti ka (3) Spectrometer Al ka (4) Spectrometer V ka (2) Spectrometer Cr ka (2) Spectrometer Fe ka (5) Spectrometer Mn ka (5) Spectrometer Mg ka (1) Spectrometer Ca ka (3) Spectrometer Si ka (4) Angstroms Si ka (3) Angstroms	Ti ka (3) Wav	volts volts volts volts vvolts vvolts volts	C Scatter Eine C Linear-Log
Al ka (4) Angstroms	🚽 🛛 V 🛛 ka (2) Wav	rescan Counts	- Intensity Error Bars -
√ ka (2) Angstroms Cr ka (2) Angstroms		vescan Counts vescan Counts	Plot Error Bars
Fe ka (5) Angstroms Mn ka (5) Angstroms Mg ka (1) Angstroms Ca ka (3) Angstroms Na ka (1) Angstroms Si ka (4) Kilovolts Ti ka (3) Kilovolts Al ka (4) Kilovolts V ka (2) Kilovolts Cr ka (2) Kilovolts	Mg ka (1) Wa Ca ka (3) Wa Na ka (1) Wa Si ka (4) Raw Ti ka (3) Raw Al ka (4) Raw V ka (2) Raw Cr ka (2) Raw	vescan Counts vescan Counts vescan Counts Wavescan Counts Wavescan Counts Wavescan Counts Wavescan Counts Wavescan Counts Wavescan Counts	n Sigma 1 • n Spacing 1 • Output •

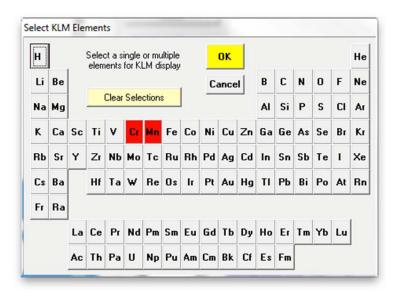
The **Plot Graph Data** window for the manganese data set is shown below. Due to the better counting statistics, the Mn and Cr peak shapes can now be much better assessed for off-peak positioning. To make a more detailed selection for the KLM Markers to be displayed, click the *User Selected Lines* radio button. Then click the **Choose Selected Lines** button below.



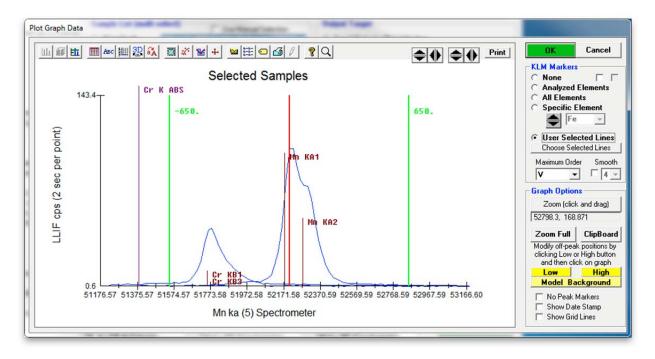
The **Xray Database** window opens containing the NIST x-ray line catalog. The user may select or multi-select any x-ray line to plot in the **Plot Graph Data** window simply by highlighting (a) line(s) and clicking the **Graph Selected** button. To select all lines for certain elements, click the **Periodic Table** button.

NIST Xra	y Lines	(multi-select)					Graph Selected
Xray Li	ne	Angstroms	Energy	Intensity Referen	ce		
Hg LB3	Ш			5.17500	JD	~	Close
Cr K				.000000 ABS	ES		
Ba LI		2.07039	5.98850	.000000 ABS	ES		
TI LB4	11	2.07872	11.9290	4.33500	JD		- Highlight Element
Pr LIII		2.07890	5.96400	.000000 ABS	ES		
Br KA1	11	2.07994	11.9220	80.0000	JD		-
Pm LB1		2.08026	5.96010	43.0800	ES		
Hg LB2		2.08029	11.9200	17.7680	JD		Periodic
Au LB5	11		11.9140		JD		Table
Pm LB4			5.95490		ES		Table
Fr LA2	Ш		11.8930		JD		\sim
Cr KB1			5.94600		ES		- Specify Range -
Cr KB3			5.94600		ES	=	specily nange
Ho LI	22			4.75900	ES	=	
Br KA2	11		11.8760		JD		
Np Ll	11		11.8680		JD		
Pu MI				.000000 ABS	ES		Bragg Order
Hg LB1	11		11.8210		JD		_
Mn KA1				100.000	ES		
La LII				.000000 ABS	ES		
Mn KA2			5.88700	The second second of the second se	ES		Load New Range
Rn LA1				80.0000	JD		
As KB1			11.7240		JD		Absorption Edg
As KB3	п		11.7180		JD		Apsorption Lug
Pr LB2				19.5190	ES		Maximum Order
Eu LA1			5.84510		ES		
Re LG1			11.6830		JD		
W LG3	Ш		11.6720		JD		
Nd LB3				12.8690	ES		Minimum Intensity
Eu LA2			5.81610		ES	-	2
ULI	11	2.134/4	11.6160	5.52000	JD		1 -
							Start Angstroms
				with Bragg reflection (er	2.062835
				corrected for refracti			
				d in the Graph Data v		plot	Stop Angstroms
	dialog ar	re corrected usir	ng the equa	tion A' = A * (1 - (K /)	N^2]]		2.143405
	c	Clipboard	1	Copy Selected to (1	KeV

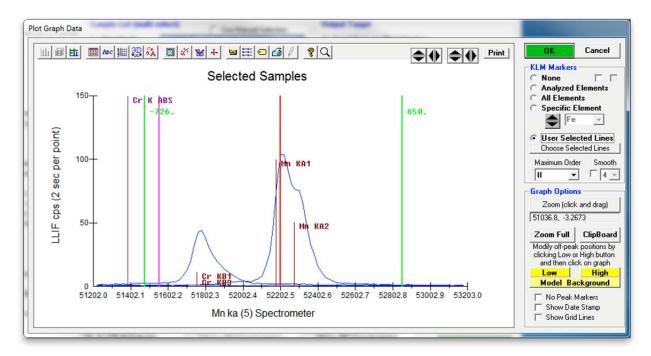
This opens the Select KLM Elements window. Click to highlight Cr and Mn.



Click **OK** to return to the **Xray Database** window when finished. Click the **Graph Selected button** again in the **Xray Database** window to plot the new selection, then click the **Close** button to return to the **Plot Graph Data** window.



The low off-peak position for Mn appears to be slightly on the slope of the Cr K β peak. To adjust the low off-peak position further away from this peak, click the **Low** button, creating a crosshair on the graph window. Move the crosshair to a new low background position and click the mouse. The color of the initial off-peak position changes to pink and a new vertical green line appears, indicating the new off-peak position.



If high Cr samples are analyzed, the user should not move the off-peak position close or past the Cr K edge depicted by the purple *Cr K ABS* marker. It might become necessary to measure the Mn background using a high off-peak only with a slope factor (see User's Guide and Reference manual for details). The Cr K β peak also interferes slightly with the Mn K α on-peak position, potentially requiring an interference correction, which will be discussed further below.

Click the **OK** button to update this background position in the run and close the **Graph Data** window. The **GetPeakSave** window appears and the user is notified that new parameters (off-peak position) will take effect on the next new sample.



Click this **OK** button, returning to the **Plot!** window. Finally, click the **Close** button to exit the **Plot!** window returning to the main PROBE FOR EPMA log window.

Automation Actions

Confirm Standard Positions

All of the basic position confirmation, peak centering and x-ray count acquisition procedures may be automated. This is accomplished via the **Automate!** window.

Click the **Select Stds** button of the **Automate!** dialog box. All standards that have been added to the current run will be highlighted in the *Position List* list box.

👎 Automate!	To be Spectrum 1	
Position List (multi-select) (double-click to see data) • Standards St 12 Fid 1 Mg0 synthetic	Move Stage	Automation Actions
C Unknowns C Wavescans C All Samples C All Samples St 13 Fid 1 Al2O3 synthetic St 14 Fid 1 SiO2 synthetic St 15 Fid 1 UO2 St 15 Fid 1 UO2 St 16 Fid 1 LO2	≣ Digitize	Confirm Unknown Positions Confirm Wavescan Positions
← · · · · · · · · · · · · · · · · · · ·	Plot	Peak Spectrometers Peaking Acquire Standard Samples
St 19 Fid 1 HfSiO4 (Hafnon) Select Stds St 20 Fid 1 ThSiO4 (Huttonite) St 21 Fid 1 USiO4 (Coffinite)	Fiducials	Acquire Unknown Samples Acquire Wavescan Samples
Go St 22 Fid 1 TiO2 synthetic St 23 Fid 1 V2O3 synthetic St 24 Fid 1 Cr2O3 (synthetic)	Conditions	Acquire Standard Samples (again)
Auto Focus Update St 25 Fid 1 Mn0 synthetic St 26 Fid 1 Fe2O3 synthetic hematite St 27 Fid 1 Co0 synthetic		✓ Peak on Assigned Standards ✓ Use "Quick" Standards
Delete All St 12 MgD synthetic Re-Load Current Row = 1	File Setups Multiple Setups	Use Filament Standby Afterwards
	om ASCII (*.POS File) cted Samples (to *.POS)	Use Beam Deflection For Position Suppress ROM Based Backlash Confirm All Positions In Sample Combine Multiple Sample Setups
Row X Y Z W 1 -17049.70 -7077.103 65.00159 0 KeV = 15 Curr = 40 Size = 10 Mag = 2533 Mode = Analog Sp MagAnal = 2533 MagImag = 2533 ImgShift = -2, 3 File Setup = NONE	Grain # Focus 1 0 iot Sample Setup (row) Number = 0	Use ROM Auto Focus New Sample Cevery Point Digitized Conterval S Standard Points To Acquire Automate Confirm Delay (sec) 10 Standard X Increment (um) 4 Re-Standard Y Increment (um) 6 Re-Standard Interval (hrs) 6 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups Use Digitized Multiple Setups
Multiple Setups = NONE	Replicates = 1	Run Selected Samples

The user might start by checking the location and focus of each standard selected for the automated analysis. Click the box for *Confirm Standard Positions* under *Automation Actions*.

👎 Automate!	AND Description of	to the Spectrum of	to the Opposition of the	
Position List (me Standards	ulti-select) (double-click St 12 Fid 1 MaD sy		Move Stage	Automation Actions
C Unknowns C Wavescans	St 13 Fid 1 Al203 s St 14 Fid 1 Si02 sy St 15 Fid 1 U02	ynthetic 👘	Digitize	Confirm Unknown Positions
← All Samples	St 16 Fid 1 ThSiO4 St 17 Fid 1 PbCO3 St 18 Fid 1 ThO2	(Thorite)	Plot	Peak Spectrometers Peaking Acquire Standard Samples
Select Stds Select All	St 19 Fid 1 HfSiO4 St 20 Fid 1 ThSiO4 St 21 Fid 1 USiO4	(Huttonite) Coffinite)	Fiducials	Acquire Unknown Samples Acquire Wavescan Samples Acquire Mayescan Samples
Go	St 22 Fid 1 TiO2 sy St 23 Fid 1 V2O3 s St 24 Fid 1 Cr2O3 (Inthetic	Replicates	Acquire Standard Samples (again)
Auto Focus Update	St 25 Fid 1 Mn0 sy St 26 Fid 1 Fe203	nthetic synthetic hematite	Conditions Sample Setups	Automation Options
Delete All	St 27 Fid 1 CoD syn	nthetic * O synthetic	File Setups	Use "Quick" Standards Use Filament Standby Afterwards
Re-Load	Current	Ro w = 1	Multiple Setups	Use Confirm During Acquisition Use Beam Deflection For Position
	elected Samples elected Positions		CII (*.POS File) Samples (to *.POS)	Suppress ROM Based Backlash Confirm All Positions In Sample Combine Multiple Sample Setups
KeV = 15 Curr = 4	0 Size = 10 Mag = 2533 2533 MagImag = 2533	5.00159 0	irain # Focus 1 0 mple Setup (row) Number = 0	Use ROM Auto Focus New Sample Digitized C Interval Standard Points To Acquire Automate Confirm Delay (sec) Standard X Increment (um) Re-Standard Y Increment (um) Re-Standard Interval (hrs) C Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups C Use Digitized Multiple Setups
	Multiple Setups = NONE		Replicates = 1	Run Selected Samples

Click the **Run Selected Samples** button in the bottom right corner of the window.

The **AutomateConfirmSelected** window opens informing the user how many standards were chosen and asks if the user wants to run these automated samples. Click **Yes**.

AutomateC	ConfirmSelected: Using Last Unknown Sample
?	Number of Standard Position Samples: 12 Number of Unknown Position Samples: 0 Number of Wavescan Position Samples: 0
	Are you sure you want to run these automated position samples?
	Yes No

The program then sends the stage motors to the fiducial transformed coordinates for the first selected standard and opens the **Confirm Positions** window. Clicking the two-way **Pause/Continue** button suspends the 10 second countdown (user defined in the PROBEWIN.INI file). Adjust the stage motors (X, Y, and Z) to a new, clean analysis position. Click the **OK** button of the **Confirm Positions** window when done, sending the stage to the next standard to confirm its position. Again, the **Confirm Positions** window opens, allowing the user to pause the countdown and adjust the sample position.

If more than one position is digitized, the software moves to the first position and updates all positions for that sample by the same X, Y, and Z offset.

Confirm Positions		1000	-	and Property lies	
St 12 MgO	synthetic				
Please adjust the click OK when rea click th			-		Time remaining 3.70
Refl Tran On Off	Remove Faraday	Jog Cancel	Auto Focus	Pause	OK

After the final standard is confirmed, the **AcquireStop** window appears. Click this **OK** button to return to the **Automate!** dialog box.

AcquireStop	P. Park on Assessed Transients
•	Automation Completed
	ОК

Calibrate Peak Positions

X-ray peaking may be automated from the **Automate!** window as follows. Under *Automation Actions* click only the *Peak Spectrometers* box. Under *Automation Options* click the *Peak on Assigned Standards* box. This option causes the program to attempt a peak center on a standard position sample if the standard is assigned as the primary standard for that element. If the element has no assigned standard, then the program will attempt to assign one automatically based on the highest concentration of the elements present among the standards in the run.

-53 Automate! Position List (multi-select) (double-click to see data) **Automation Actions** Stage Move 12 Fid 1 MgO synthetic 13 Fid 1 Al2O3 synthetic 14 Fid 1 SiO2 synthetic G Standards **Confirm Standard Positions** . Unknowns **Confirm Unknown Positions** Wavescans Digitize **Confirm Wayescan Positions** 15 Fid 1 UO2 16 Fid 1 ThSiO4 (Thorite) St Ε C All Samples St Peak Spectrometers Peaking 17 Fid 1 PbCO3 18 Fid 1 ThO2 St Plot • 🔻 Acquire Standard Samples St 19 Fid 1 HfSiO4 (Hafnon) 20 Fid 1 ThSiO4 (Huttonite) St Acquire Unknown Samples Fiducials Select Stds St Acquire Wavescan Samples 21 Fid 1 USiO4 (Coffinite) Select All St Acquire Standard Samples (again) Replicates 1102 synthetic V203 synthetic 23 Fid 1 Go Cr2O3 (synthetic) Fid 1 **Automation Options** Conditions Auto Focus 25 Fid 1 MnO synthetic synthetic Peak on Assigned Standards Sample Setups Update 27 Fid 1 CoO synthetic St File Setups Delete All St 2401 Wollastonite (Willsboro, NY) Use Filament Standby Afterwards Re-Load Use Confirm During Acquisition Current Row = 1 of 1 **Multiple Setups Use Beam Deflection For Position** Suppress ROM Based Backlash Delete Selected Samples Import from ASCII (*.POS File) **Confirm All Positions In Sample Delete Selected Positions** Export Selected Samples (to *.POS) **Combine Multiple Sample Setups** Bow X Y Z w Grain # Focus **Use ROM Auto Focus** 13644.14 -1092.094 1 65.00002 0 0 New Sample C Every Point Digitized C Interval 5 Standard Points To Acquire Automate Confirm Delay (sec) 10 Standard X Increment (um) 4 Re-Standard Y Increment (um) 6 Re-Standard Interval (hrs) 6 Use Last Unknown Sample KeV = 15 Curr = 40 Size = 0 Mag = 2533 Mode = Analog Spot Sample Setup (row) Number **Use Digitized Conditions** MagAnal = 2533 MagImag = 2533 ImgShift = -2, 3 = 0 Use Digitized Sample Setups C **Use Digitized File Setups** File Setup = NONE **Use Digitized Multiple Setups** Multiple Setups = NONE Replicates = 1 **Run Selected Samples**

Next, click the **Peaking** button to open the **Peaking Options** dialog box.

In the **Peaking Options** dialog box, highlight (select) all of the elements in the *Elements to Peak* list box, and click on a *Peak Center Method*. A spectrometer pre-scan is useful if that element has not been run recently or if maintenance has occurred on the spectrometer.

Elements to Peak (multi-select) Si ka Spec 4 TAP (27786.3) Ti ka Spec 3 LPET (31430.0) Al ka Spec 4 TAP (32465.9) V ka Spec 2 LLIF (62209.1) Cr ka Spec 2 LLIF (56898.5) Fe ka Spec 5 LLIF (55898.5) Fe ka Spec 5 LLIF (48115.4) Mn ka Spec 5 LLIF (52232.9) Mg ka Spec 1 TAP (38499.2) Ca ka Spec 1 TAP (46362.9)	OK Cancel Help C Internal C Parabolic © Maxima C Gaussian Threshold [.33 [.33 [.33].33 C Dual Maxima/Parabolic © Highest Intensity
Double-click element to move to a specific spectrometer peak position	Peak Center Options Acquire Automated PHA Scan Prior To Peaking Acquire Automated PHA Scan After Peaking Acquire PHA Baseline/Window Scan Acquire PHA Bias Scan (detector voltage)
Move Selected Elements To On-Peak Positions Plot Selected Peak Center	C Acquire PHA Gain Scan (detector gain) Display PHA Dialog Prior To Peaking (manual) Display PHA Dialog After Peaking (manual) Display Spectrometer Pre-Scan for Confirmation
Move To On Peak (start analysis) Positions	Display Spectrometer Pre-Scan for Confirmation Display Spectrometer Post-Scan for Confirmation Use ROM Based Scanning for Pre/Post Scan Skip P/B Check Before Peaking Spectrometer

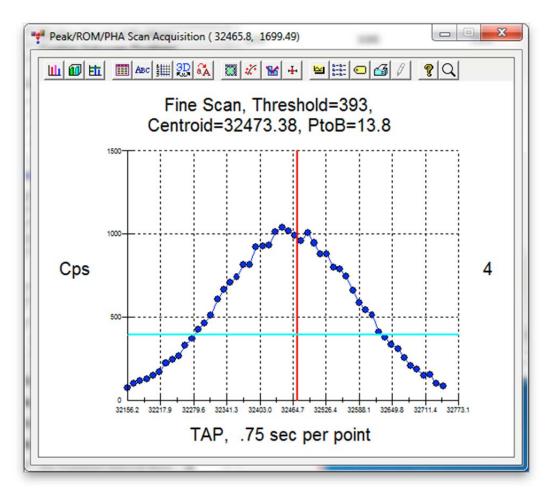
Click the **OK** button of the **Peaking Options** window. Click the **Run Selected Samples** button from the **Automate!** window. This opens the **AutomateConfirmSelected** window. To run these automated samples, click **Yes**.

Automate	ConfirmSelected: Using Last Unknown Sample
?	Number of Standard Position Samples: 12 Number of Unknown Position Samples: 0 Number of Wavescan Position Samples: 0 Are you sure you want to run these automated position samples?
	Yes No

The steps of the automated procedure are similar to the manual peaking procedure described in the section "Manual Peaking and PHA using the Acquire! Window".

The stage motors move to the position coordinates of the first standard in the *Position List* list box. If the *Use Confirm During Acquisition* box under *Automation Options* is checked then the computer automation will pause at each standard (**Confirm Positions** window will open) for some user defined amount of time (usually 10 seconds) to allow the operator to adjust the stage position and focus. The **Peak/ROM/PHA Scan Acquisition** window opens and the spectrometers go through the peaking routine to peak center the spectrometer position to the intensity maximum for all the elements assigned to that standard. After finding a new peak position and reporting the results to the graph window and the main log window, the stage motors move on to the coordinates of the next standard highlighted in the *Position List* list box. Once situated on this standard, the spectrometers peak center those elements assigned to it. This procedure continues until all standards are done. When all automation action is complete, the **AcquireStop** window appears and requests the user to click the **OK** button.

An example for the graph displayed in the **Peak/ROM/PHA Scan Acquisition** window for Al Ka on TAP for Al2O3, using the ROM based peak center method and maxima fitting, is given below.



The following summary of the peak automation for two standards is found in the main log window.

	Acquire!		4	nalyze!		A	utomate!		Plot!	
starting	spectrome	eter peal	ing proced	are for Ma	ka on	spectro 1	(TAP)			
-	-	-	tro 1 with	_		-	(
	ctro 1, S	-	38408.0,		109.					
ig na opo		o opration		o o o p z .						
ROM Brent	's Maxima	a Peak Ce	enter Resul	ts:						
Element	Spectr	Peaked	StartPk	StopPk	Std	Offset	StartI	StopI		
Si ka	4 TAP	Yes	27738.0	27550.2	453	190.	708.7	723.4		
Ti ka	3 LPET	Yes	31430.0	31268.3	22	162.	409.6	427.1		
Al ka	4 TAP	Yes	32465.9	32472.4	13	-6.5	1175.5	1195.3		
V ka	2 LLIF	Yes	62209.1	62319.8	23	-111.	514.1	509.1		
Cr ka	2 LLIF	Yes	56898.5	56742.6	24	156.	1276.5	1299.6		
Fe ka	5 LLIF	Yes	48085.0	48261.8	26	-146.	1400.6	1351.0		
Mn ka	5 LLIF	Yes	52202.0	52244.0	25	-11.	59.3	48.8		
Mg ka	1 TAP	Yes	38499.2	38408.0	473	91.2	118.5	109.2		
Ca ka	3 LPET	Yes	38387.0	38419.4	2401	-20.	370.5	352.8		
Na ka	1 TAP	Yes	46362.9	46153.9	303	209.	385.3	368.4		
na ka	1 1.61	103	40502.5	40133.5	505	205.	505.5	500.4		
Calibrate	Peak Pos	sitions A	Automation .	Action is (Complet	ed				

Acquire Standard Samples

The next step is to automate the acquisition of x-ray counts on all primary and MAN background standards as calibration for the unknown samples. Again, click the **Select Stds** button in the **Automate!** dialog box to select all current standards in the run, highlighting them in the *Position List* list box. Next, under *Automation Actions*, click only on the *Acquire Standard Samples* box. From the *Automation Options* choices select the number of *Standard Points To Acquire* and whether to *Use Confirm During Acquisition*.

In this example, only one XYZ(W) position was digitized for each standard, but four standard points are chosen along with a *Standard X Increment* of 15 μ m. This means that the first measurement will be performed in the digitized position, and for each consecutive measurement the X position will be shifted by +15 μ m. This value should be sufficiently larger than the beam diameter (here 10 μ m) to prevent overlapping measurements. The user has to ensure that sufficient space is available in the X direction on the standard grains for this operation. Alternatively, additional measurement positions could be digitized for each standard.

Star		lti-select) (double-click St 12 Fid 1 MgO syr St 13 Fid 1 Al2O3 s	thetic 🔺	Move Stage	Automation Actions Confirm Standard Positions Confirm Unknown Positions
	escans	St 14 Fid 1 SiO2 syn	nthetic	Digitize	Confirm Wavescan Positions
C All S	amples	St 15 Fid 1 U02 St 16 Fid 1 ThSi04	(Thorite)		Peak Spectrometers Peaking
	. •	St 17 Fid 1 PbC03 St 18 Fid 1 Th02		Plot	Acquire Standard Samples
	t Stds ct All	St 19 Fid 1 HfSiO4 St 20 Fid 1 ThSiO4 St 21 Fid 1 USiO4 ((Huttonite)	Fiducials	Acquire Unknown Comples
		St 22 Fid 1 TiO2 syn	nthetic	Replicates	Acquire Standard Samples (again)
	io Focus	St 23 Fid 1 V203 sy St 24 Fid 1 Cr203 (s St 25 Fid 1 Mn0 syr	synthetic) Ithetic	Conditions	Automation Options
Upo	date	St 26 Fid 1 Fe2O3 s St 27 Fid 1 CoD sym		Sample Setups	Peak on Assigned Standards Use "Quick" Standards
Dele	te All	St 473 Olivine (Fo90		File Setups	Use Filament Standards
Re-l	Load	Current Ro	w = 1 of 1	Multiple Setups	Use Confirm During Acquisition
		elected Samples elected Positions	Import from ASC Export Selected Sa		Suppress ROM Based Backlash Confirm All Positions In Sample Confirm All Positions In Sample
0₩	x	Y Z		ain # Focus	Combine Multiple Sample Setups
1			.99579 0 1	0	Use ROM Auto Focus New Sample Cevery Point Digitized Cinterval 5
					Standard Points To Acquire
					Automate Confirm Delay (sec) 10
				1	Standard X Increment (um) 15
					Re-Standard Y Increment (um) 6
					☐ Re-Standard Interval (hrs) 6
			Mode = Analog Spot Sam	nple Setup (row) Number	 Use Last Unknown Sample Use Digitized Conditions
	lagAnal =	2533 MagImag = 2533 I	mgShift = -2, 3	= 0	○ Use Digitized Sample Setups
			UR - NONE		Use Digitized File Setups
		File Set	up = NUNE		C Use Digitized Multiple Setups

Finally, click the **Run Selected Samples** button. The **AutomateConfirmSelected** window opens again, stating how many standards are chosen and how long the run is expected to take and asking if these automated position samples should be run. Click **Yes**.

Automate	ConfirmSelected: Using Last Unknown Sample
2	Number of Standard Position Samples: 14 Number of Unknown Position Samples: 0 Number of Wavescan Position Samples: 0 Elapsed Time for Last Standard Acquisition: 49 seconds Projected Time for All Standard Acquisitions: 1.1 hours Total Projected Time for All Acquisitions: 1.1 hours Are you sure you want to run these automated position samples?
	Yes No

The stage moves to the coordinates of the first standard in the *Position List* list box. If *Use Confirm During Acquisition* was chosen, the **Confirm Positions** window opens, allowing a readjustment of the stage position and optical focus. X-rays are counted on peak and off peak positions for all elements as specified earlier. Progress can be monitored in the **Acquire!** window.

SP1 SP2	SP3	SP4	SP5	х	Y	Z		SDE	orto	Progre	ess	
38499.0 62209.1	31430.1 2778	86.3 48	8115.6	300.000 112	5.00 31	0.500		Na	Cr	Ca	AI	Mn
Mg-TAP V-L	LIF TI-LPE	T Si	-TAP	Fe-LLIF		Absorbed			Cr	~		MIT
	.49 4.4		4.49	4.48		1						
68. 2	15. 245	5.	107.	143.		.000000		Mg	V	Ti	Si	Fe
	iet 1 * Cr2O3 (sy ndard	Inthetic		Start Standard	l or Unkn	own Acquisition						
Normal Acquisition Sta					<mark>l or Unkno</mark> art Waves		um	300.0 .0000		11 .00	25.00	0
Normal Acquisition Sta	ndard		Acqu		art Waves		um px		000	11	25.00 00000 0 253	0
Normal Acquisition Sta Data Rows: 0	ndard Good Data Rov	ws: O		St	art Waves	can	um px Magn	.0000 0 ificatior Mode	000	.00	00000 0 253 alog	0 3 Spo
Normal Acquisition Sta Data Rows: O New Sample	ndard Good Data Roy PHA	ws: 0 Options		Station Options	art Waves	can aking Options	Magn Kilovo	.0000 0 lificatior Mode lts Curren	100 n	.00	00000 0 253	0 3 5 1

Finally, the Faraday cup is measured. The stage moves 15 μ m in the X direction and the procedure is repeated for the remaining three points as specified in the *Automation Options* section of the **Automate!** dialog box. After completing data collection on the first standard, the stage travels to the next standard in the list and acquires four complete analyses on that standard. After finishing the automation schedule the familiar **AcquireStop** window opens and requires the user to click the **OK** button, thereby returning to the **Automate!** window.

The log window result for the x-ray count acquisition for the Augite Kakanui standard is seen below.

File Edit	Standard	Xray An	alytical V	Vindow Run	Output	Help						
	Acquir	1.1.1.	1		Analyze!		1	Autom	ate!	1		Plot!
DLDP1;	U											
BLWT:	.000											
On-Peak	(off-pe	ak corre	cted) o	r MAN On-	Peak X-	ray Counts	(cps/3	99426n	A) (and	Faraday	Current)	:
ELEM:	Si ka	Ti ka	Al ka		Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	BEAM	
BGD:	MAN	OFF	OFF	OFF	OFF	MAN	OFF	MAN	MAN	OFF		
SPEC:	4	3	4	2	2	5	5	1	3	1		
CRYST:	TAP	LPET	TAP	LLIF	LLIF	LLIF	LLIF	TAP	LPET	TAP		
ORDER:	1	2	2	2	1	1	2	2	1	1		
162G	1865.4	43.3	317.0	1.2	7.7	432.4	10.0	686.5	1083.1	53.9	39.984	
163G	1852.0	41.8	326.5	1.5	8.1	445.0	8.1	699.2	1088.0	54.3	40.000	
164G	1871.3	48.6	315.2	-3.3	7.2	446.0	12.0	701.6	1078.1	52.8	40.025	
165G	1865.1	41.7	321.8	9	6.8	442.8	10.9	699.8	1087.2	50.6	39.971	
COLUMN CO.												
AVER:	1863.4	43.8	320.1		7.5	441.6	10.2	696.8	1084.1	52.9	39.995	
SDEV:	8.1	3.2	5.1		.5	6.2	1.7	6.9	4.5	1.7	.023	
1SIG:	13.6	2.8	5.8		2.0	6.6	1.8	8.3	10.4	2.5		
SIGR:	. 60	1.15	. 88		.27	.94	. 90	.83	.44	. 66		
SERR:	4.1	1.6	2.6		.3	3.1	.8	3.5	2.3	.8		
&RSD:	.44	7.41	1.59	-618.45	7.15	1.41	16.16	1.00	. 42	3.15		
Off-Peak	(calcu	lated) X	-ray Co	unts (cps	/39.994	26nA):						
ELEM:	Si ka	Ti ka	Al ka		Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka		
TYPE:	NONE	LINEAR	LINEAR		LINEAR	NONE	LINEAR	NONE	NONE	LINEAR		
162G	NONE	36.1	18.3		30.6	NONE	24.7	NONE	NONE	11.1		
163G		37.1	18.3		30.3		23.5			12.5		
164G		33.9	17.9		32.5		23.6			10.8		
1640 165G		37.0	19.7		30.0		22.3			11.9		
1000		00		00.5	00.0							
AVER:		36.0	18.5	30.8	30.9		23.5			11.6		
SDEV:		1.5	. 8	1.0	1.1		1.0			.8		
		-		39.99426n								
ELEM:	Si ka	Ti ka	Al ka		Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka		
162G		34.2	16.6		32.2		25.3			10.9		
163G		40.0	16.7		29.8		24.3			10.8		
164G		34.3	15.6		33.5		24.7			10.7		
165G		39.8	19.2	28.0	30.4		22.7			11.4		
AVER:		37.1	17.0	30.2	31.5		24.2			11.0		
AVER: SDEV:		37.1	17.0		31.5		1.1			.3		
1SIG: SIGR:		2.7	1.8		2.5		2.2			1.5		
STOK!		1.10	.04	. 73	.00		.50			.21		
Raw Lo-H	eak X-r	ay Count	s (cps/	39.99426n	A):							
ELEM:	Si ka	Ti ka	Al ka		Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka		
162G		37.9	20.0		29.1		24.2			11.3		
163G		34.2	19.9	27.0	30.9		22.7			14.3		
164G		33.5	20.1		31.6		22.5			11.0		
165G		34.3	20.2		29.7		21.9			12.3		
		35.0	20.0		30.3		22.8			12.2		
		2.0	.1	3.1	1.2		1.0			1.5		
SDEV:			1 - 1 - 1 - 1									
AVER: SDEV: 1SIG: SIGR:		2.6	2.0		2.5		2.1			1.6		

Off-peak counts were not collected for Si, Fe, Mg, and Ca, where MAN background correction was specified. In addition to the four individual lines of count data, the *AVER*, *SDEV*, *1SIG*, *SERR*, and %*RSD* are calculated. *AVER* is the average intensity reading of each element column. *SDEV* is the standard deviation of these results, *1SIG* (one sigma) is the predicted standard deviation, and *SERR* (standard error) is essentially the precision of the average. %*RSD* (percent relative standard deviation) is the *SDEV* divided by the *AVER* times 100. See the User's Guide and Reference documentation for exact equations. The output of the raw data counts for the remaining standards is not shown here to save space.

Evaluate Standard Count Data

After standard data is acquired it is useful to check the data for agreement among standards and for possible interferences. Click the **Analyze!** button in the main PROBE FOR EPMA log window.

AVER: SDEV: Raw Hi-Pe ELEM: 162G 163G	Acquire!	Ti ka		Analyze 30.8 1.0	30.9 1.1		Automa 23.5	ite!		Plot!	
SDEV: Raw Hi-Pe ELEM: 162G 163G	ak X-ra Si ka	1.5 ny Counts Ti ka	.8 (cps/39	1.0			23.5			11 6	
Raw Hi-Pe ELEM: 162G 163G	ak X-ra Si ka	y Counts Ti ka	(cps/39		1.1					11.0	-
ELEM: 162G 163G	Si ka	Ti ka		004060			1.0			.8	
162G 163G				. 994201	A):						
163G			Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
		34.2	16.6	29.8	32.2		25.3			10.9	
		40.0	16.7	32.3	29.8		24.3			10.8	
164G		34.3	15.6	30.8	33.5		24.7			10.7	
165G		39.8	19.2	28.0	30.4		22.7			11.4	
AVER:		37.1	17.0	30.2	31.5		24.2			11.0	
SDEV:		3.2	1.5	1.8	1.7		1.1			.3	
1SIG:		2.7	1.8	2.5	2.5		2.2			1.5	
SIGR:		1.18	.84	.73	.66		.50			.21	
Raw Lo-Pe	ak X-ra	y Counts	(cps/39	.99426n	A):						
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
162G		37.9	20.0	31.1	29.1		24.2			11.3	
163G		34.2	19.9	27.0	30.9		22.7			14.3	
164G		33.5	20.1	33.4	31.6		22.5			11.0	
165G		34.3	20.2	33.7	29.7		21.9			12.3	
AVER:		35.0	20.0	31.3	30.3		22.8			12.2	
SDEV:		2.0	.1	3.1	1.2		1.0			1.5	
1SIG:		2.6	2.0	2.5	2.5		2.1			1.6	
SIGR:		.76	.05	1.24	.47		.46			. 95	
Open: Read										Cancel	Pause

This opens the **Analyze!** dialog box. The *Sample List* list box contains the list of the standards that on which data has been acquired. To examine the raw count data acquired on any standard run under automation, first select the standard of interest and click the **Data** button.

Analyze!	No PERMIT	Sandhardan (-				
Sample List (mul Standards Unknowns Wavescans All Samples Select All Add To Setups Save Setups	St 24 Set 21 St 25 Set 21 St 26 Set 21 St 28 Set 21 St 2401 Set 2 St 303 Set 2 St 453 Set 2 St 459 Set 2 St 459 Set 2 St 459 Set 2 St 473 Set 2	Wollastonite (Wills	matite sboro, NY) stown USN # 111312		ed Sample(s) Match	Combine Select Combine Analysi Selected S Combine Data Selected S Sort Stat and D Geological/Ator Do Not Output Combine the Sele	s Lines From amples Lines From amples ata Grids By nic Number To Log cted Samples
Standard Assignm	nents Specifie	d Concentrations	Calcul	Condition Dxygen ated 0xygen s 0xygen	IS Elements/Cations Total Weight % Z - Bar Atomic Weight	Search For "Shared" Bgds Boundary Co Create Mate	Remove Shared''Bgds rrections
		1		1		1	
Disable Sele	cted Line(s)	Enable Se	lected Line(s)	Ana	lyze Selected Line(s)		
						Cancel	•

The raw count data for the four automated measurements of the Augite Kakanui standard are shown below. Each individual line (162 G to 165 G) is illustrated along with the *Average*, *Std Dev, OneSigma, Std Err, %Rel SD*, and *Minimum* and *Maximum* of the acquired points. This count data is also printed to the log window.

				tensity data) –	— A	nalyze	Raw Data		Combine Select	ed Samples		
G Standa	St	25 Set 2 M	203 (syntheti n0 synthetic		^	Standard		100 Land 100	Combine Analysi Selected S			
C Waves	scans St	28 Set 2 Ni		c hematite ∀illsboro, NY)	Int	ensities	Calculation (Combine Data Selected S	Lines From		
Select.	All St 3	303 Set 2 A	lbite, Amelia ugite, Kakanu	ii USNM 1221		Pause Betwe Use All Matrix	Corrections		Sort Stat and Da Geological/Ator	ata Grids By		
Save Se	os St	73 Set 20		ohnstown USN USNM 111312 e elements		sable Selected nable Selected		Match 🗖	Do Not Output	To Log		
L	Assignments	Specified	Concentratio	ne Name/D	Cor escription	mbined Conditions	ns Cour	1	ombine the Sele into a New			
St 12 Set	1 MgO synthet	ic		.000 T	otal Oxygen	.00	0 Total Wei		Bearch For hared" Bgds	and a second state of the		
	ev = 15, Beam (cps/10.0109r	1 = 10, Size = 0 14)	Ŧ	1 .000	alculated Oxyg xcess Oxygen		the second se	eight	Boundary Co Create Mate	the second second		
Сору	Si ka Off	Ti ka Off	Al ka Off	¥ ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Mg ka Off	Ca ka Off	Na ka Off	Beam	
Average:	1863.4	43.8	320.1	4	7.5	441.6	10.2	696.8	1084.1	52.9	39.995	
Std Dev:	8.1	3.2	5.1	2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	
			5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
)neSigma:	13.6	2.8				0.0						
)neSigma:	4.1	1.6	2.6	1.1	.3	3.1	.8	3.5	2.3	.8		
DneSigma: Std Err: &Rel SD:		1.6 7.41	2.6 1.59	1.1 -618.45	.3 7.15	3.1 1.41	.8 16.16	3.5 1.00	2.3	.8 3.15		
DneSigma: Std Err: &Rel SD:	4.1	1.6 7.41 41.7	2.6 1.59 315.2	1.1 -618.45 -3.3	.3 7.15 6.8	3.1	.8	3.5	2.3	.8 3.15 50.6	39.971	
DneSigma: Std Err: &Rel SD: Minimum: Maximum:	4.1 .44	1.6 7.41	2.6 1.59	1.1 -618.45	.3 7.15	3.1 1.41	.8 16.16	3.5 1.00	2.3	.8 3.15	39.971 40.025	
DneSigma: Std Err: &Rel SD: Minimum: Maximum:	4.1 .44 1852.0	1.6 7.41 41.7 48.6	2.6 1.59 315.2 326.5	1.1 -618.45 -3.3	.3 7.15 6.8 8.1	3.1 1.41 432.4 446.0	.8 16.16 8.1	3.5 1.00 686.5 701.6	2.3 .42 1078.1	.8 3.15 50.6		
DneSigma: Std Err: &Rel SD: Ainimum: Aaximum:	4.1 .44 1852.0 1871.3	1.6 7.41 41.7 48.6	2.6 1.59 315.2 326.5	1.1 -618.45 -3.3 1.5	.3 7.15 6.8 8.1	3.1 1.41 432.4 446.0	.8 16.16 8.1 12.0	3.5 1.00 686.5 701.6	2.3 .42 1078.1	.8 3.15 50.6		
DneSigma: Std Err: KRel SD: Ainimum: Aaximum: Disab	4.1 .44 1852.0 1871.3	1.6 7.41 41.7 48.6 Line(s)	2.6 1.59 315.2 326.5 Enable	1.1 -618.45 -3.3 1.5 e Selected Lin	.3 7.15 6.8 8.1 e(s)	3.1 1.41 432.4 446.0 Analyz	.8 16.16 8.1 12.0	3.5 1.00 686.5 701.6	2.3 .42 1078.1 1088.0	.8 3.15 50.6 54.3	40.025	
DneSigma: Std Err: &Rel SD: Ainimum: Aaximum: Disab	4.1 .44 1852.0 1871.3 Die Selected Si ka Off	1.6 7.41 41.7 48.6 Line(s)	2.6 1.59 315.2 326.5 Enable	1.1 -618.45 -3.3 1.5 e Selected Lin	.3 7.15 6.8 8.1 e(s) Cr ka Off	3.1 1.41 432.4 446.0 Analyz	.8 16.16 8.1 12.0 e Selected Line	3.5 1.00 686.5 701.6 s)	2.3 .42 1078.1 1088.0	.8 3.15 50.6 54.3 Na ka Off	40.025 Beam	
IneSigma: Std Err: Stel SD: Animum: Aaximum: Disab Copy 162 G	4.1 .44 1852.0 1871.3 ele Selected Si ka Off 1865.4	1.6 7.41 41.7 48.6 Line(s) Ti ka Off 43.3	2.6 1.59 315.2 326.5 Enable Al ka Off 317.0	1.1 -618.45 -3.3 1.5 e Selected Lin V ka Off 1.2	.3 7.15 6.8 8.1 e(s) Cr ka Off 7.7	3.1 1.41 432.4 446.0 Analyz Fe ka Off 432.4	.8 16.16 8.1 12.0 e Selected Line Mn ka Off 10.0	3.5 1.00 686.5 701.6 s) Mg ka Off 686.5	2.3 .42 1078.1 1088.0 Ca ka Off 1083.1	.8 3.15 50.6 54.3 Na ka Off 53.9	40.025 Beam 39.984	

Examine the raw count data for each standard. If more than one sample/standard is selected for assessment, select the *Pause Between Samples* check box.

Standards Unknowns Wavescan: All Samples Select All Add To Setups Save Setups Standard Assig St 12 Set 1 Mgg St 12 Set 1 Mgg	St 24 S St 25 S St 26 S St 28 S St 24 S St 26 S St 28 S St 303 S St 453 S St 453 S St 453 S St 473 S	et 2 Cr2 et 2 Mn et 2 Fe2 et 2 NiC Set 2 W set 2 All set 2 Au set 2 Au	03 synthetic 03 (synthetic 03 synthetic 203 synthetic 201astonite (V ollastonite (V bite, Amelia 1gite, Kakanu 1gersthene, jo ivine (Fo90) (c) c hematite #'illsboro, N' ii USNM 122 ohnstown US		Analyze Standard ensities Pause Betwee Ose All House isable Selected S nable Selected S	Calculation O en Samples Conections Sample(s)	Report	Combine Analysi: Selected Sa Combine Data Selected S Sort Stat and Da Geological/Aton	amples Lines From amples ata Grids By		
C All Samples Select All Add To Setups Save Setups Standard Assig St 12 Set 1 Mg(s St 26 S St 28 S St 2401 S St 303 S St 453 S St 453 S St 453 S St 453 S St 453 S St 473 S	et 2 Fe2 et 2 NiC Set 2 W set 2 All set 2 All set 2 All set 2 Di set 2 Di	203 synthetic) synthetic follastonite (V bite, Amelia Igite, Kakanu ipersthene, jo ivine (Fo90) (Willsboro, N ii USNM 122 ohnstown US		Pause Betwee Ose All Marin isable Selected 1	en Samples Conections Sample(s)	Report	Selected S Sort Stat and Da	amples ata Grids By		
Add To Setups Save Setups Standard Assig St 12 Set 1 Mg(St 303 S St 453 S St 453 S St 469 S St 473 S nments Splant	et 2 All et 2 Au et 2 Hy et 2 Di	bite, Amelia Igite, Kakanu Ipersthene, jo Ivine (Fo90) (ii USNM 122 ohnstown US		Use All Makin isable Selected !	Conections Sample(s)					
Save Setups Standard Assig	St 469 9 St 473 9	et 2 Hy et 2 Oli	persthene, jo ivine (Fo90) (ohnstown US	SN E					nic Number		
Standard Assig		ecified C				nable Selected s	Sample(s)	Match [Do Not Output	To Log		
St 12 Set 1 Mg		ecinea L		A Named	Co	mbined Condition	ns Coun	1	iombine the Sele into a New			
TO = 40 KeV = 1) synthetic		oncentration	.000	Total Oxygen	.00	1		Search For Shared'' Bgds ''	Remove Shared''Bgds		
X-ray Counts (cps/	15, Beam = 10, 10.0109nA)	Size = 0		.000	Calculated Oxyg Excess Oxygen		-	eight	Boundary Co Create Mate	the second s		
	and the second	a Off	Al ka Off	V ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Mg ka Off	Ca ka Off	Na ka Off	Beam	Τ
verage: 18	63.4 4	3.8	320.1	4	7.5	441.6	10.2	696.8	1084.1	52.9	39.995	
td Dev:	8.1	3.2	5.1	2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	
IneSigma: 1		2.8	5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
td Err:	4.1	1.6	2.6	1.1	.3	3.1	.8	3.5	2.3	.8		
Rel SD:	.44 7	7.41	1.59	-618.45	7.15	1.41	16.16	1.00	.42	3.15		
linimum: 18	52.0	1.7	315.2	-3.3	6.8	432.4	8.1	686.5	1078.1	50.6	39.971	
laximum: 18	71.3	8.6	326.5	1.5	8.1	446.0	12.0	701.6	1088.0	54.3	40.025	
•												
Disable Se	elected Line(•)	Enable	Selected Li	ine(s)	Analyze	e Selected Line(s)				
Copy Si k	a Off Tik	a Off	Al ka Off	V ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Mg ka Off	Ca ka Off	Na ka Off	Beam	Т
162 G 18	65.4	3.3	317.0	1.2	7.7	432.4	10.0	686.5	1083.1	53.9	39.984	1
163 G 18	52.0	1.8	326.5	1.5	8.1	445.0	8.1	699.2	1088.0	54.3	40.000	
64 G 18		8.6	315.2	-3.3	7.2	446.0	12.0	701.6	1078.1	52.8	40.025	
		1.7	321.8	9	6.8	442.8	10.9	699.8	1087.2	50.6	39.971	

When this box is checked, the program will automatically pause after displaying each analysis until the user clicks the **Cancel** or **Next (red flashing)** buttons on that are located at the bottom of the log window.

Sample L	ist (multi-sel	ect) (double-	click to see in	tensity data)			D	KRaws	Combine Select	ted Samples		
Stand			203 synthetic		^ ⁶	Analyze	Ra w Data	>>Excel	Combine Analysi	s Lines From		
C Unkno	SI		r203 (synthel n0 synthetic	icJ		Standard	Calculation	Options	Selected S			
C Wave	50 50	26 Set 2 F 28 Set 2 N	e203 synthet	ic hematite		tensities			Combine Data Selected S			
Select	All St	2401 Set 21	₩ollastonite Note, Amelia	Willsboro, N		Pause Between Use All Matrix		Report	Sort Stat and D	ata Grids By		
Add T Setup	o St ps St	453 Set 2 # 469 Set 2 #	lugite, Kakan Typersthene,	johnstown US	EN E	isable Selected		Match -	Geological/Ato			
Save Se	etups St	473 Set 20	livine (Fo90)	USNM 1113		mbined Conditi	ons Cou	nt Times				
Standard	Assignments	Specified	Concentratio	ns Name/I	Description	Conditions			Combine the Sele into a New			
St 12 Set	1 MgO synthei	tic		.000	Total Oxygen	.0	00 Total We		Search For "Shared" Bgds			
	eV = 15, Beam (cps/10.0109r	n = 10, Size = (nA)	-	1	Calculated Oxy Excess Oxyger		00 Z · Bar 00 Atomic W	/eight	Boundary Co Create Mat			
Сору	Si ka Off	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Mg ka Ol		Na ka Off	Beam	
Average:	1863.4	43.8	320.1	4	7.5	441.6	10.2	696.8	1084.1	52.9	39.995	
itd Dev:	8.1	3.2	5.1	2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	2
)neSigma:	13.6	2.8	5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
itd Err:	4.1	1.6	2.6	1.1	.3	3.1	.8	3.5	2.3	.8		
Rel SD:	.44	7.41	1.59	-618.45	7.15	1.41	16.16	1.00	.42	3.15		
finimum:	1852.0	41.7	315.2	-3.3	6.8	432.4	8.1	686.5	1078.1	50.6	39.971	
laximum:	1871.3	48.6	326.5	1.5	8.1	446.0	12.0	701.6	1088.0	54.3	40.025	
Disat	le Selected	Line(s)	Enabl	e Selected Li	ine(s)	Analy	ze Selected Line	(s)				
Сору	Si ka Off	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Mg ka Ol	f Ca ka Off	Na ka Off	Beam	
162 G	1865.4	43.3	317.0	1.2	7.7	432.4	10.0	686.5	1083.1	53.9	39.984	
163 G	1852.0	41.8	326.5	1.5	8.1	445.0	8.1	699.2	1088.0	54.3	40.000	
164 G	1871.3	48.6	315.2	-3.3	7.2	446.0	12.0	701.6	1078.1	52.8	40.025	
165 G	1865.1	41.7	321.8	9	6.8	442.8	10.9	699.8	1087.2	50.6	39.971	

If there are any bad data points, use the **Delete Selected Line(s)** button to flag a line of data as bad. In the Augite Kakanui standard, seen below, line 163 G (good) shows the lowest Si and highest Al counts which could indicate contribution of a small inclusion to the analysis. To delete, click on the line number in the first column, highlighting the line. Next click the **Delete Selected Line(s)** button.

		ect) (double- 23 Set 2 V				nalyze	Raw Data		Combine Select	and the second second		
G Stand C Unkne	owns St	24 Set 2 C	203 (synthet		▲	Standard	ton the strength of		Combine Analysi Selected S			
	scans St	25 Set 2 M 26 Set 2 F 28 Set 2 N	e203 syntheti	c hematite	Int	ensities	Calculation (Iptions	Combine Data Selected S	Lines From		
Select	tAll St	2401 Set 21 303 Set 24	∀ollastonite (Ibite, Amelia			Pause Betwe Use All Matrix	Corrections		Sort Stat and D Geological/Ator	ata Grids By		
Save Si	ps St	453 Set 2 A 469 Set 2 H 473 Set 2 C		ohnstown U	SN Er	sable Selected nable Selected		Matoh	Do Not Output			
		1		1	Cor	mbined Conditio		1	ombine the Sele into a New			
St 12 Set TO = 40, K		tic 1 = 10, Size = 0	Concentratio	Name/ .000 .000	Description Total Oxygen Calculated Oxyg Excess Oxygen		0 Z · Bar	ght %	Search For Shared'' Bgds '' Boundary Co Create Mate	rrections		
X-ray Counts Copy	s (cps/10.0109 Si ka Off	nA) TikaOff	Al ka Off	V ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Mg ka Off	Ca ka Off	Na ka Off	Beam	_
verage:	1863.4	43.8	320.1	4	7.5	441.6	10.2	696.8	1084.1	52.9	39,995	-
td Dev:	8.1	3.2	5.1	2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	•
neSigma:	13.6	2.8	5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
td Err:	4.1	1.6	2.6	1.1	.3	3.1	.8	3.5	2.3	.8		
	.44	7.41	1.59	-618.45	7.15	1.41	16.16	1.00	.42	3.15		
				2.2	6.8	432.4	8.1	686.5	1078.1	50.6	39,971	
Rel SD:		41.7	315.2	-3.3								
KRel SD: Ainimum: Aaximum:	1852.0 1871.3	41.7 48.6	315.2 326.5	-3.3 1.5	8.1	446.0	12.0	701.6	1088.0	54.3	40.025	
SRel SD: Ainimum: Aaximum: A	1852.0	48.6	326.5		8.1	446.0		1	1088.0	54.3	40.025	
Rel SD: linimum: laximum:	1852.0 1871.3	48.6	326.5	1.5	8.1	446.0	12.0	1	1088.0	54.3 Na ka Off	40.025 Beam	
Rel SD: linimum: laximum: Disal	1852.0 1871.3 ble Selected	48.6	326.5 Enable	1.5 • Selected L	8.1	446.0 Analyz	12.0 e Selected Line	s)				
Rel SD: linimum: laximum: Disal	1852.0 1871.3 ble Selected Si ka Off	48.6 Line(s) Ti ka Off	326.5 Enable Al ka Off	1.5 Selected L V ka Off	8.1 ine(s)	446.0 Analyz Fe ka Off	12.0 e Selected Line Mn ka Off	s) Mg ka Off	Ca ka Off	Na ka Off	Beam	
Rel SD: linimum: laximum: Disal	1852.0 1871.3 ble Selected Si ka Off 1865.4	48.6 Line(s) Ti ka Off 43.3	326.5 Enable Al ka Off 317.0	1.5 • Selected L V ka Off 1.2	8.1 ine(s) Cr ka Off 7.7	446.0 Analyz Fe ka Off 432.4	12.0 e Selected Line Mn ka Off 10.0	s) Mg ka Off 686.5	Ca ka Off 1083.1	Na ka Off 53.9	Beam 39.984	

This opens the **SampleDeleteLines** window.

SampleDel	eteLines	-	X
?	Delete line(s) 163, in sample St 453 122142?	Set 2 Augite, H	Kakanui USNM
		Yes	No

Click the **Yes** button.

The computer will flag this line with a B (bad) and ignore this data for any subsequent calculations, but the raw point data is still kept in the SILICATES01.MDB data file. Note that data lines can always be undeleted later with the **Undelete Selected Line(s)** button.

			click to see in 203 synthetic		A	nalyze	Raw Data	KRaws	Combine Select	execute week control		
Stand Unkne	St St	24 Set 2 C	r203 (syntheti		A Liet	Standard			Combine Analysi Selected S			
C Wave C All Sa	scans St	26 Set 2 F	nO synthetic e2O3 syntheti	c hematite		ensities	Calculation (Options	Combine Data Selected S			
Select	t All	303 Set 2 A	Wollastonite (Ibite, Amelia			Pause Betwe Use All Matrix		Report	Sort Stat and Da Geological/Ator	ata Grids By		
Add T Setu	ps St St	469 Set 2 F	lypersthene, j	ohnstown US	E E	isable Selected nable Selected		Match	Do Not Output			
Save Se	etups	473 Set 21	llivine (Fo90)	USNM TIT3		mbined Conditio	ons Cour	nt Times C	ombine the Sele into a New			
St 12 Set TO = 40, K		tic n = 10, Size = 0	Concentration	.000	Description Total Oxygen Calculated Oxyg Excess Oxygen		0 Z · Bar	ight %	Search For Shared'' Bgds '' Boundary Co Create Mate	Remove Shared" Bgds rrections		
X-ray Counts Copy	s (cps/10.0109) Si ka Off	nA) TikaOff	Al ka Off	V ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Mg ka Off	Ca ka Off	Na ka Off	Beam	Т
verage:	1863.4	43.8	320.1	4	7.5	441.6	10.2	696.8	1084.1	52.9	39,995	-
itd Dev:	8.1	3.2	5.1	2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	
neSigma:	13.6	2.8	5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
	4.1	1.6	2.6	1.1	.3	3.1	.8	3.5	2.3	.8		
ta En:	.44	7.41	1.59	-618.45	7.15	1.41	16.16	1.00	.42	3.15		
			045.0	0.0	6.8	432.4	8.1	686.5	1078.1	50.6	39.971	
Rel SD:	1852.0	41.7	315.2	-3.3								
Std Err: &Rel SD: dinimum: daximum:		41.7 48.6	315.2 326.5	-3.3	8.1	446.0	12.0	701.6	1088.0	54.3	40.025	
&Rel SD: Ainimum: Aaximum: A	1852.0 1871.3	48.6	326.5	1.5	8.1	446.0	12.0	701.6	1088.0	54.3	40.025	
KRel SD: Ainimum: Aaximum:	1852.0 1871.3 ble Selected	48.6	326.5 Enable	1.5 • Selected Li	8.1	446.0 Analyz	12.0 e Selected Line	701.6				
GRel SD: Ainimum: Aaximum: Disat	1852.0 1871.3 ble Selected Si ka Off	48.6 Line(s) Ti ka Off	326.5 Enable Al ka Off	1.5 Selected Li V ka Off	8.1 ine(s)	446.0 Analyz	12.0 e Selected Line	701.6 (s) Mg ka Off	Ca ka Off	Na ka Off	Beam	L
Arel SD: dinimum: daximum: Disat Copy 102 3	1852.0 1871.3 ble Selected Si ka Off 1865.4	48.6 Line(s) Ti ka Off 43.3	326.5 Enable Al ka Off 317.0	1.5 Selected Li V ka Off 1.2	8.1 ine(s) Cr ka Off 7.7	446.0 Analyz Fe ka Off 432.4	12.0 e Selected Line Mn ka Off 10.0	701.6 (s) Mg ka Off 686.5	Ca ka Off 1083.1	Na ka Off 53.9	Beam 39.984	
Rel SD: linimum: laximum: Disat	1852.0 1871.3 ble Selected Si ka Off 1865.4 1852.0	48.6 Line(s) Ti ka Off 43.3 41.8	326.5 Enable Al ka Off 317.0 326.5	1.5 Selected Li V ka Off 1.2 1.5	8.1 ine(s) Cr ka Off 7.7 8.1	446.0 Analyz Fe ka Off 432.4 445.0	12.0 e Selected Line Mn ka Off 10.0 8.1	701.6 (s) Mg ka Off 686.5 699.2	Ca ka Off 1083.1 1088.0	Na ka Off 53.9 54.3	Beam 39.984 40.000	
KRel SD: Ainimum: Aaximum: Disat	1852.0 1871.3 ble Selected Si ka Off 1865.4	48.6 Line(s) Ti ka Off 43.3	326.5 Enable Al ka Off 317.0	1.5 Selected Li V ka Off 1.2	8.1 ine(s) Cr ka Off 7.7	446.0 Analyz Fe ka Off 432.4	12.0 e Selected Line Mn ka Off 10.0	701.6 (s) Mg ka Off 686.5	Ca ka Off 1083.1	Na ka Off 53.9	Beam 39.984	

At this point, the user has collected all standardization data and is ready to make MAN background assignments for the elements Si, Fe, Mg, and Ca.

Assign MAN Background Calibrations

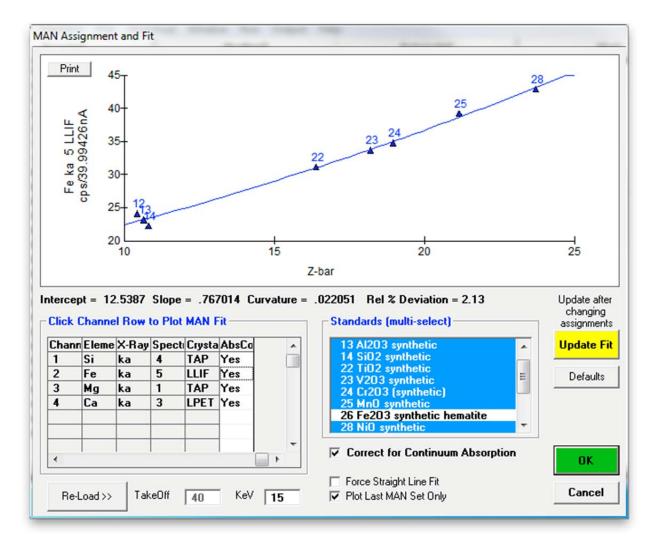
From the main PROBE FOR EPMA log window, select **Analytical** from the menu bar and click **Assign MAN Fits** from the menu choices.

File Edit	Standard	Xray Ana	alytical Win	dow Run	Output H	lelp						
	Acquire!		Analysis Op	tions								
AVER:		36	Assign MAI	l Fits								
SDEV:		1	Clear All M	AN Assignm	ents (use de	fault)						
Raw Hi-H	eak X-ra	y Co		-			k intensities	from eleme	nts acquired	using off-n	eak backgrounds)	
SLEM:	Si ka	Ti										
162G		34	Use MAN C	orrection Fo	r Off Peak El	ements (Cal	culate MAN	background	is for eleme	nts acquired	using off-peak bac	kgrounds)
163G		40	Empirical N	ACs								
164G		34	Empirical A									
165G		39	EmpiricarA	rrs -								
AVER:		37	ZAF, Phi-Rh	o-Z, Alpha I	actor and C	alibration C	urve Selectio	ins				
SDEV:		3	C	10 1 1								
1SIG:		2	Create Virtu									
SIGR:		1.	Update Dea	d Time Con	stants							
Raw Lo-F	eak X-ra	V Co	Student's "t	" Table								
ELEM:	Si ka	Ti	CalcZAF Ca	lculations								
162G		37	2010	J1.1	22.1		4714			11.5		
163G		34.2	19.9	27.0	30.9		22.7			14.3		
164G		33.5	20.1	33.4	31.6		22.5			11.0		
165G		34.3	20.2	33.7	29.7		21.9			12.3		
AVER:		35.0	20.0	31.3	30.3		22.8			12.2		
SDEV:		2.0	.1	3.1	1.2		1.0			1.5		
LSIG:		2.6	2.0	2.5	2.5		2.1			1.6		
SIGR:		.76	.05	1.24	. 47		.46			.95		

This opens the **MANLoadNewElements** window. Default standards have now been assigned for the background correction of each element based on the standard database.

	Acquire!		1	Analyze			Automa			Ple	- 14
	Acquire			Analyze	"		Automa				DU
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
162G		37.9	20.0	31.1	29.1		24.2			11.3	
163G		34.2	19.9	27.0	30.9		22.7			14.3	
164G		33.5	20.1	33.4	31.6		22.5			11.0	
165G		34.3	20.2	33.7	29.7		21.9			12.3	N
				ANLoadNev	vElements					<u> </u>	٢
AVER:		35.0	20.0								
SDEV:		2.00	.1	_							
1SIG:		2.6	2.0			background					
SIGR:						I fit and mod					
	ting All					king the mo					
Standard	1 12 Mg) synthet	ic	St	tandards list	king the mo . Click the Up					
Standard Standard	1 12 Mg(1 13 Al:	0 synthet 203 synth	ic etic	St							
Standard Standard Standard	1 12 Mg 1 13 Al 1 14 Si) synthet 203 synth 203 synth	ic etic tic	St	tandards list						
Standaro Standaro Standaro Standaro	1 12 Mg(1 13 Al: 1 14 Si(1 22 Ti() synthet 203 synth 22 synthe 22 synthe	tic etic etic etic	St	tandards list					I	
Standaro Standaro Standaro Standaro Standaro	1 12 Mg(1 13 Al 1 14 Si(1 22 Ti(1 23 V2() synthet 203 synth 22 synthe 22 synthe 23 synthe	tic etic etic etic etic	St	tandards list						
Standaro Standaro Standaro Standaro Standaro Standaro	1 12 Mg(1 13 A12 1 14 Si(1 22 Ti(1 23 V2(1 24 Cr2	0 synthet 203 synth 22 synthe 22 synthe 23 synthe 203 (synt	tic etic etic etic etic etic chetic)	St	tandards list					I	
Standard Standard Standard Standard Standard Standard Standard	1 12 Mg(1 13 A12 1 14 Si(1 14 Si(1 22 Ti(1 23 V2(1 24 Cr2 1 25 Mn(0 synthet 203 synth 22 synthe 22 synthe 23 synthe 203 (synthet 23 synthet	tic etic etic etic etic etic chetic) cic	S1 st	tandards list					I	
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Standard Standard Standard Standard Standard Standard Standard Standard Standard	i 12 Mg(i 13 A12 i 14 Si(i 22 Ti(i 23 V2(i 24 Cr2 i 25 Mn(i 26 Fe2 i 28 Ni(0 synthet 203 synthe 202 synthe 203 synthe 203 (synthet 203 (synthet 203 synthet 203 synthet 203 synthet	tic etic etic etic etic chetic) cic etic her cic	Si st natite	tandards list					I]
Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	1 12 Mg(1 13 A12 1 14 Si(1 22 Ti(1 23 V2(1 24 Cr2 1 24 Cr2 1 25 Mn(1 26 Fe2 1 28 Ni(1 2401 V) synthet 203 synthe 203 synthe 203 synthe 203 (synthet 203 synthet 203 synthet 203 synthet 203 synthet 203 synthet	tic tic tic tic tic tic tic tic tic tic	Si st natite	tandards list					I	
Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	1 12 Mgd 1 13 Al2 1 14 Sid 1 14 Sid 1 22 Tid 1 23 V2d 1 24 Cr2 1 25 Mmd 1 26 Fe2 1 28 Nid 1 2401 Nid) synthet 203 synthe 203 synthe 203 synthe 203 (synthet 203 synthet 203 synthe	tic tic tic tic tic tic tic tic tic tic	Si st natite Llsboro,	NY)					I	
Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	1 12 Mg(1 3 A12 1 14 Si(1 22 Ti(1 23 V2(1 24 Cr2 1 25 Mm(1 26 Fe2 1 26 Ni(1 28 Ni(1 2401 V 3 303 A1 4 453 An	0 synthet 203 synthe 202 synthe 203 synthe 203 synthe 203 synthet 203 synthet 203 synthet 30 synthe	tic tic tic tic tic tic tic tic	Si st latite Llsboro, SNM 12214	NY)					I	
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Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	1 12 MgG 1 13 A12 1 14 Si(1 14 Si(1 14 Si(1 24 Si(1 24 Cr2 1 24 Cr2 1 25 Mn(1 26 Fe2 1 26 Fe2 1 26 Fe2 1 2401 V 1 303 A1 4 469 Hy 4 473 O1	0 synthet 203 synthe 202 synthe 203 synthe 203 synthe 203 synthet 203 synthet 203 synthet 30 synthe	tic tic tic tic tic tic tic tic	Si st Lisboro, SNM 12214 stown US1	NY) 42 MM #746					I	

Click the **OK** button.

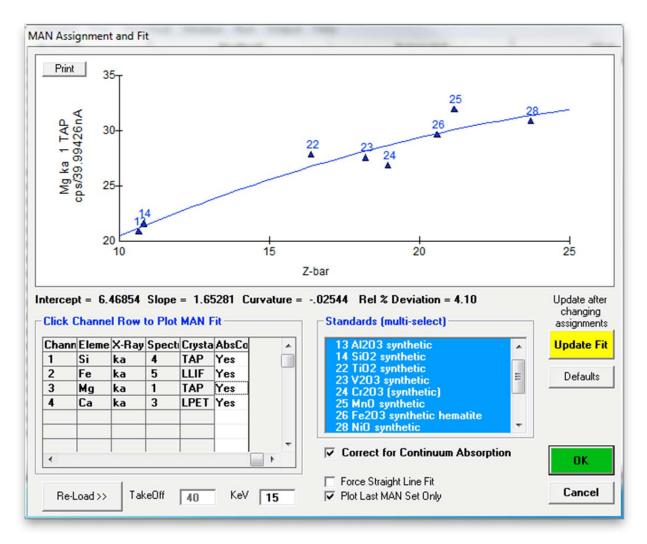


This opens the **MAN** Assignment and Fit dialog box. The second element in the list, iron (Fe), is shown below.

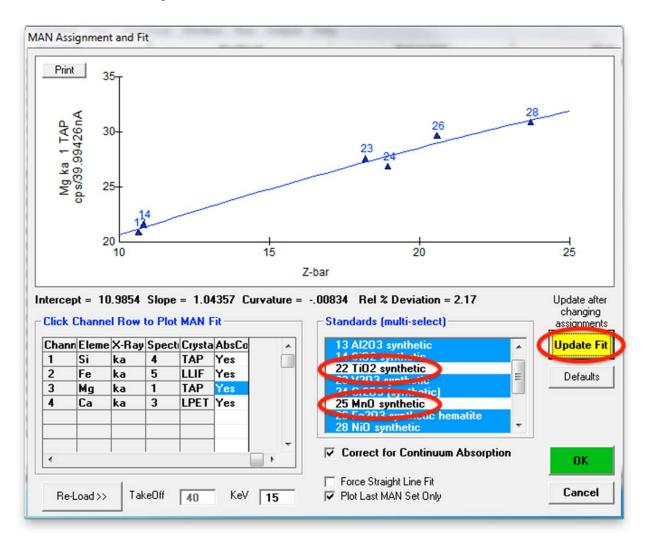
From this dialog box, the user may display and modify the MAN background assignments and fits used for the background correction of all elements in the current run. The advantage of this method is that it requires only a simple calibration of the analyzing channel over a range of atomic number. Substantial time may be saved when many samples are to be analyzed. However, if measuring high atomic number samples and/or trace concentrations, the off-peak background correction technique is usually superior.

To review the MAN assignments, select the row for each element in the *Click Channel Row to Plot MAN Fit* section. The measured background counts are plotted as a function of the mean atomic number (MAN or Z-bar). Select standards from the *Standards* list box that do not contain the element itself. Use the shift key and the control key together with the left mouse button to select a range or additional individual standards, respectively. Choose at least five standards per element and click the **Update Fit** button to update the graph. Choose between a second-order polynomial or force a straight line fit. For further details and suggestions, see the User's Guide and Reference documentation.

Standards 22 (TiO2 synthetic) and 25 (MnO synthetic) plot slightly above the fit curve for magnesium. This could indicate a spectral interference or, more likely in this case, a minor amount of Mg in these standards which was so far not documented in the standards database.



Use <ctrl>-click to deselect these two standards in the *Standards* list and click the **Update Fit** button to update the graph. This change only applies to the MAN assignments for the current element, in this case Mg.



When done adjusting individual elements, click the **OK** button to store the updated MAN background corrections.

Analyze Standard Samples

The user will now analyze all of the raw standard data to calculate quantitative compositions. The results of the standards provide a valuable check on the quality of the analysis.

Click the **Analyze** button in the main PROBE FOR EPMA log window to re-open or bring forward the **Analyze!** window. Under *Sample List* select the *Standards* button. Click the **Select All** button to highlight all standards. Click the **Calculation Options** button.

	click to see intensity data) FiO2 synthetic /203 synthetic		Raw Data KRaws	Combine Selected Samples Combine Analysis Lines From
Wavescans St 24 Set 20 St 25 Set 21	Cr2O3 (synthetic) AnO synthetic	List Standard Intensities	Calculation Options	Selected Samples Combine Data Lines From
Select All St 28 Set 21 St 2401 Set 2	Wollastonite (Willsboro, NY)	🔲 🗖 Use All Ma	ween Samples Report	Selected Samples Sort Stat and Data Grids By Geological/Atomic Number
Setups St 303 Set 2	Albite, Amelia Augite, Kakanui USNM 1221 Hypersthene, johnstown USN	Disable Select Enable Select		Do Not Output To Log
		Combined Cond		Combine the Selected Samples
tandard Assignments Specified	Cal	cription Condition	Total Weight %	Search For Remove "Shared" Bgds "Shared" Bgds Boundary Corrections Create Material File
	C			
Disable Selected Line(s)	Enable Selected Line	s] Ana	alyze Selected Line(s)	
Disable Selected Line(s)	Enable Selected Line	s) Ana	alyze Selected Line(\$)	

This action opens the **Calculation Options** dialog box. As all standards and unknowns are oxide compounds and oxygen is not measured in this method, click the tick box *Display Results As Oxides* and the radio button *Calculate with Stoichiometric Oxygen* under *Calculations Options*. Elemental results are always calculated and written to the log window.

St 12 Set 1 MgO synthetic St 12 Set 2 MgO synthetic St 13 Set 1 Al2O3 synthetic St 14 Set 1 SiO2 synthetic St 22 Set 1 TiO2 synthetic St 20 Set 1 TiO2 synthetic	OK Cancel
St 23 Set 1 V203 synthetic St 24 Set 1 Cr203 (synthetic) St 25 Set 1 Mn0 synthetic St 26 Set 1 Fe203 synthetic hematite St 28 Set 1 Ni0 synthetic St 2401 Set 1 Wollastonite (Willsboro, NY) St 303 Set 1 Albite, Amelia St 453 Set 1 Augite, Kakanui USNM 122142 St 469 Set 1 Hypersthene, johnstown USNM # •	EDS Calculation Data Do Not Use EDS Element Data Use EDS Spectrum Element Data Assign EDS Spectral Elements Integrated Intensity Data Options Do Not Use Integrated Intensities Use Integrated Intensities
c 🛛 2.1 200 🕅 U	
Calculations Options ▼ Display Results As Oxides Calculate Atomic Percents	Calculate with Stoichiometric Oxygen
Calculations Options Display Results As Oxides Coloulate Atomic Porcents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges	
Calculations Options Display Results As Oxides Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) :	Use Particle/Film Calculations
Calculations Options Display Results As Oxides Calculate Atomic Percents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen:	Laicuido de Classadal

Click the **OK** button to output data in oxide form.

Analyzing all of the data on the standards will create a large amount of output, possibly overflowing the log window buffer, depending on the value specified in the LogWindowBufferSize parameter in the PROBEWIN.INI file. The size of the log window buffer is limited only by the amount of memory available. Setting this parameter to 512000 bytes is roughly equivalent to 300 pages of average density text. In some cases saving all log window output to a user specified text file for viewing with a text editor or printing to a printer may be best.

Select **Output** from the menu bar in the main log window and click **Save to Disk Log**.

		tical Window Run	1 Out	put Help
	Acquire!	Analyze	_	Log Window Font (Change log window font)
Chan dan d	24 Cr203 (synt)			Debug Mode (Debug output to log window)
	25 MnO synthet:			
	26 Fe203 synthe		⊡	Extended Format (Output all elements on a single line to log window)
	28 NiO synthet			Kiosk Display Mode
	2401 Wollaston			Verbose Mode (Verbose output to log window)
	303 Albite, Ame			Time Stamp Mode (Time stamp output to log window)
	453 Augite, Kal 469 Hypersthem			
	473 Olivine (Fe			Driver Logging Mode (Driver logging output to .log file)
	K-factors Calcu			Save To Disk Log (Save all output to log window to disk file)
	ing All Standard			View Disk Log (Open log file in text editor)
	12 MgO synthet:			
	13 Al203 synthe			Open File Viewer (Open text editor with empty file)
	14 SiO2 synthe 22 TiO2 synthe			Load Custom Position Format #1 (C.G.S.), (Import .LEP stage coordinate files)
	23 V203 synthe			
Standard	24 Cr2O3 (synth	hetic)		Save Custom Analysis Format #1 (C.G.S.), (Fixed length fields, Output based on file setups)
	25 MnO synthet:			Save Custom Analysis Format #2 (H.T.), (Calculated and raw data, Output based on sample names)
	26 Fe203 synthe			Save Custom Analysis Format #3 (J.H.), (Calculated, raw and statistical results. Output to single file)
	28 NiO synthet: 2401 Wollaston:			Save Custom Analysis Format #4 (J.J.D.), (Averages, standard deviations, statistics. Output to single file)
	303 Albite, Ame			Save Custom Analysis Format #5 (J.J.D2), (Calculated, raw and statistical results, Output based on sample names)
	453 Augite, Kal			
Standard	469 Hypersthene	e, johnstown USN	4	Save Custom Analysis Format #6 (H.W.), (Calculated and statistical results with sample description fields. Output to single file)
	473 Olivine (Fo		2	Save Custom Analysis Format #7 (NIST), (Raw uncorrected and unnormalized data. Output to single file)
Standard	K-factors Calcu	lated		Save Custom Analysis Format #8 (MAN), (Average atomic numbers and on-peak intensities of standards. Output to single file)
				Save Custom Analysis Format #9 (P.C.), (Calculated and statistical results with formulas and mineral end-members. Output to single file)
Open: Rea	dy		1	Save Custom Analysis Format #10 (Wavescan samples), (Output based on sample names)
	1			
		and the second second		Save Custom Analysis Format #11 (Wavescan centroids), (Output based on sample names)
				Save Custom Analysis Format #12 (Time Dependent Intensities- TDI), (Output based on sample names)
				Save Custom Analysis Format #13 (Hanchar-Montel Geochron), (Output to single file)
				Save Custom Analysis Format #14 (Trace Element Average Statistics), (Output to single file)
				Save Custom Analysis Format #15 (U, Th, Pb Age Calculations), (Output to single file)
				Save Custom Analysis Format #16 (Homogeneity Calculations), (Output to single file)
				Save Images to BMP Files (Output all images via clipboard to save current drawing objects)
				Save User Specified Format Output (Output only the data types specified by the user)
				Save Multi-Point Position and Intensity Data (Output multi-point background intensity data and related parameters)
				Save All EDS Spectra To EMSA (Output all EDS spectra to EMSA format files)
				Output Wavescan Spectrum Image (Output a wavescan spectrum image in Lispix format from multiple wavescan samples)
				Cours Col-7AE Example (Output the dead of under some land Discours under Col-7AE and)
				Save CalcZAF Format (Output standard or unknown samples. Process using CalcZAF.exe)
				Save CalcZAF "Standard" Format (Output standard samples. Process using CalcZAF.exe)
				Save StrataGem Format (Output k-ratios and thin film models. Process using StrataGem)
				Save Cluster Classification Format (for CalcImage)
				Open Link To Excel (Allow data and results to go to Excel)

This opens the **Open File To Output Probe Data To** dialog box. The *Save in:* location will be the directory specified for the original file name (SILICATES01.MDB). All subsequent files created by the user will use this location. Edit the *File name* if desired. The default output file has the extension .OUT. Note that the raw data is always saved in the .MDB run file for future re-calculation and/or output. Click **Save** when finished.

Save in:	Doe	- + 6	• 🖬 🎦	
Name	^	Date	modified	Т
٠ [m			Þ
∢ File name:	III silicates01.out		Save	•

Select the **Analyze!** button in the main PROBE FOR EPMA log window to bring forward the **Analyze!** dialog box. Click the **Select All** button highlighting all standards again. Then click the **Analyze** button. This will analyze all selected standard data into the specified text file. If the *Pause Between Samples* tick box is selected, the program will pause after each standard to allow the user to view the results directly in the **Analyze!** window.

	ct) (double-click to see inten	sity data)	Analyze	Raw Data	KRaws	Combine Selected Samples
C Unknowned St 2	22 Set 2 TiO2 synthetic 23 Set 2 V2O3 synthetic 24 Set 2 Cr2O3 (synthetic)	^	List Standard		>>Excel	Combine Analysis Lines From Selected Samples
Wavescans St 2	24 Set 2 LT203 (synthetic) 25 Set 2 MnO synthetic 26 Set 2 Fe2O3 synthetic hi	omatika	Intensities	Calculation		Combine Data Lines From Selected Samples
Select All St 2	28 Set 2 NiO synthetic 101 Set 2 Wollastonite (Will		Use All Ma		Report	Sort Stat and Data Grids By Geological/Atomic Number
Setups St 4	03 Set 2 Albite, Amelia 53 Set 2 Augite, Kakanui U 69 Set 2 Hypersthene, john	SNM 1221	Disable Select Enable Select		Match	Do Not Output To Log
save setups	os sec iz riyperstrictic, join	stown o'sh	Combined Conc	fitions Co	unt Times	Combine the Selected Sample into a New Sample
tandard Assignments	Specified Concentrations	Name/Descript	ion Condition	Element	s/Cations	Search For Remove
	^ _	Total Oxy			/eight %	"Shared" Bgds "Shared" Bgd
	*	Excess 0	ed Oxygen	Z - Bar Atomic	Weight	Boundary Corrections Create Material File
py						
	ine(s) Enable Se	elected Line(s)	Ana	lvze Selected Lir	e(s)	
Disable Selected Li	ine(s) Enable St	elected Line(s)	Ana	lyze Selected Lin	ie(s)	
Disable Selected Li	ine(s) Enable St	elected Line(s)	Ana	lyze Selected Lir	ie(s)	
Disable Selected Li	ine(s) Enable Se	elected Line(s)	Ana	lyze Selected Lir	e(s)	
Disable Selected Li	ine(s) Enable Se	elected Line(s)	Ana	lyze Selected Lin	e(s)	
Disable Selected Li	ine(s) Enable Se	elected Line(s)	Ana	lyze Selected Lir	ie(\$)	
Disable Selected Li	ine(s) Enable St	elected Line(s)	Ana	lyze Selected Lir	ie(s)	
Disable Selected Li	ine(s) Enable Se	elected Line(s)	Ana	lyze Selected Lin	ve(s)	
Disable Selected Li	ine(s) Enable So	elected Line(s)	Ana	lyze Selected Lin	re(s)	Cancel Next

To view this data in full, return to the main PROBE FOR EPMA log window and select **Output** from the menu bar again and click **View Disk Log** from the menu.

Probe for	EPMA [C:\F	probeData\f	test.MDB]		
File Edit	Standard	X-Ray Ar	nalytical W	indow Rur	Output Help
	Acqui	el			Output Standard and Unknown Plots
SDEV:	.0	.0	.0	.0	Output Automatic Traverse Plots
1SIG:	1.2	1.9	1.1	1.7	Output Automatic Ternary Plots
SIGR: SERR:	.00.	.00	.00	.00	
SERR: SERR:	.00	.00	.00	.0 .00	Save User Specified Format Output (Output only the data types specified by the user)
					Save Custom Analysis Output
Off-Peak	(calcul	ated) X-	-ray Cou	nts (cps,	Save Wavescan Output
ELEM:	Si ka	Ti ka	Al ka	V ka	
TYPE: 1 1G	.INEAR 15.7	LINEAR 33.1	LINEAR 12.2	LINEAR 23.7	Save Images to BMP Files (Output all images via clipboard to save current drawing objects)
10	15.7	33.1	12.2	23.1	Save Multi-Point Position and Intensity Data (Output multi-point background intensity data and related parameters)
Raw Hi-Pe	eak X-ra	y Counts	s (cps/1	0.0109nA)	
ELEM:	Si ka	Ti ka	Al ka	V ka	Save Time Dependent Intensities (TDI), (Output based on sample names)
1G	16.3	31.1	11.5	22.9	Save All EDS Spectra To EMSA (Output all EDS spectra to EMSA format files)
Raw Lo-Pe	ak V-ra	w Connte	e (me/1)	010004	Save All CL Spectra To EMSA (Output all CL spectra to EMSA format files)
ELEM:	Si ka	Ti ka	Al ka	V ka	
1G	15.1	35.2	12.9	24.5	Save Trace Element Average Statistics, (Output to single file)
					Save Homogeneity Calculations, (Output to single file)
					Save U, Th, Pb Age Calculations, (Output to single file)
Open: Read	y .				Save Hanchar-Montel Geochron Calculations, (Output to single file)
Analyze!					
					Save CalcZAF Format (Output standard or unknown samples. Process using CalcZAF.exe)
-Sample Li	st (multi-se	elect) (dout	ble-click to	see intensit	Save CalcZAF "Standard" Format (Output standard samples. Process using CalcZAF.exe)
			2 TiO2 syn		Save StrataGem Format (Output k-ratios and thin film models. Process using StrataGem)
C Unkno			2 V203 syl 2 Cr203 (s		Save Cluster Classification Format (for CalcImage)
C All San	noles St	25 Set	2 MnO syn	thetic	
Select			2 Fe2O3 s 2 NiO synt	inthetic he	 Extended Format (Output all elements on a single line to log window)
Add T				onite (Wills	Debug Mode (Debug output to log window)
Setup			2 Albite, A		
Save Sel				Kakanui US nene, johns	
					Time stamp wode (Time stamp output to log window)
Standard A	ssignment	s Speci	fied Concer	trations	Driver Logging Mode (Driver logging output to .log file)
0. 10.0.1.1					Log Window Font (Change log window font)
St 12 Set 1 TO = 40, Ke			e = 0		
X-ray Counts					
Copy	Si ka Off	Tika 0	lff Al ka	Off V ka	New black boy topen log me in text cultury
Average:	7	2.4			Open File Viewer (Open text editor with empty file)
Std Dev:	.0	.0			
OneSigma:	1.2	1.9			Open Link To Excel (Allow Analyze! >>Excel button to export results to Excel)
Std Err:	.0 .00	0. 00.)	Close Link To Excel
%Rel SD:					

This opens the file editor. This example utilizes the editor **Notepad++**, seen below. A number of text file viewers may be used. To utilize a specific editor such as Notepad, Textpad or Word, edit the FileViewer keyword in the PROBEWIN.INI file.

2 *C:\U	serData\Doe	silicates01.	out - Notepa	ad++	_		_	_		-			- 🗆 <mark>- X</mark>
File Ed	lit Search	View End	oding Lan	quage Set	tings Mac	ro Run Ple	ugins Win	dow ?					x
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1002		of Data		4		umber of		Data Lin	es: 3				
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1005		- Forcin											
1006													
1007	Average	Total O	xygen:	44.	240	Average T	otal We:	ight%:	100.805				
1008	Average	Calcula	ted Oxyg	en: 44.	542	Average A	tomic Nu	umber:	12.419				
1009	Average	Excess	Oxygen:		302	Average A	tomic We	eight:	21.772				
1010	Average	ZAF Ite	ration:	3	.00	Average Q	uant Ite	erate:	3.00				
1011													
1012	Oxygen	Calculat	ed by Ca	tion Sto	ichiomet	ry and In	cluded :	in the M	atrix Co	rrection			
1013			•							-			
1014	St 453	Set 2	Augite,	Kakanui	USNM 12	2142, Res	ults in	Element	al Weigh	t Percent	ts		
1015	SPEC:	0											
1010	TYPE:	CALC											
1018		01120											
1019	AVER:	44.240											
1020	SDEV:	.151											
1021													
1022	ELEM:	Si	Ti	Al	v	Cr	Fe	Mn	Mg	Ca	Na		
1023	BGDS:	MAN	LIN	LIN	LIN	LIN	MAN	LIN	MAN	MAN	LIN		
1024	TIME:	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00		
1025	BEAM:	39.99	39.99	39.99	39.99	39.99	39.99	39.99	39.99	39.99	39.99		
1026							-						
1027	ELEM:	Si	Ti	Al	V	Cr	Fe	Mn	Mg	Ca	Na 1 051	SUM	
1028	162	23.685 23.772	.516	4.550 4.532	.014	.090	4.838 4.998	.122	10.051	11.382 11.325		100.369 101.109	
1029		23.698	.578	4.624	.000	.085	4.998	.145		11.325		100.936	
1030	105	20.050	. 190	1.021	.000	.000	1.500	.132	10.245	11.120	. 500	100.530	
1031	AVER:	23.719	.530	4.569	.005	.085	4.932	.133	10.192	11.377	1.022	100.805	
1032	SDEV:	.047	.043	.049	.008	.005	.084	.012	.124	.051	.033	.387	
1034	SERR:	.027	.025	.028	.005	.003	.048	.007	.072	.029	.019		
1035	%RSD:	.20	8.06		173.20	5.96	1.70	8.84	1.22	.45	3.22		-
, Normal te	evt file			58832 lines	. 1243	In • 992	Col:2 S	el · O		Dos\Windov		NSI	INS
	exerne		rengen	00002 11163	. 1245	LIT. 332	01.2 3			003(111100)	73 AI	-54	145

The user may now scroll through the analyzed standards using the text editor or may direct the file data to a printer by selecting **File** from the **Notepad**++ menu bar and clicking on **Print** in the drop-down menu.

Since all elements were acquired on all standards, examination of the results will serve as quality control for the calibration. Several of the standard compositions will be displayed in the **Analyze!** window. The first example is the Augite Kakanui standard displayed below, which is currently assigned as primary standard for silicon. To be able to directly compare the results with the published values, the tick box *Display Results As Oxides* in the **Calculation Options** window is deselected and elemental wt% are displayed. An excellent agreement between measured and published values is observed. No composition is calculated for line 163 B, which was disabled before by the user.

© Standa			click to see inte 203 synthetic		- Ana	lyze F	ław Data 📃	KRaws >>Excel	Combine Selecter			
C Unkno	St 2	4 Set 2 Cr	203 (synthetic)		List Sta	andard ,	and the second		Combine Analysis Selected Sar			
C Waves	scans St 2	6 Set 2 Fe	nO synthetic 203 synthetic I	hematite	Inten		Calculation O	ptions	Combine Data Li Selected Sar			
Select Add T	All St 24	01 Set 2 W 03 Set 2 Al	0 synthetic Vollastonite (Wi Ibite, Amelia		ΓU	ause Betwee se All Matrix (Corrections -	Report	Sort Stat and Dat Geological/Atomi	a Grids By		
Save Se	os St 4 St 4	59 Set 2 H	ugite, Kakanui ypersthene, joh livine (Fo90) US	nstown USN-	Enab	ble Selected S ble Selected S		Match	Do Not Output T	o Log		
St 453 Set	Assignments 2 Augite, Kak. eV = 15, Beam	anui USNM 12		44.240 T 44.542 C			Elements/0 805 Total We 419 Z · Bar	eight %	Combine the Select into a New S Search For "Shared" Bgds "S Boundary Corr Create Mater	ample Remove hared''Bgds ections		
Results in Ele	emental Weight	Percent	AI			21. Fe	772 Atomic V	Mg	Ca	Na	0	Total
verage:	23.719	.530	4.569	.005	.085	4.932	.133	10.1		1.022	44.240	100.805
itd Dev:	.047	.043	.049	.003	.005	.084	.012	.12		.033	.151	.387
ublished:	23.714	.492	4.620	n.a.	.089	4.928	.108	10.1		.994	44,198	100.660
td Err:	.027	.025	.028	.005	.003	.048	.007	.07		.019	.087	.223
Rel SD:	.20	8.06	1.06	173.20	5.96	1.70	8.84	1.2		3.22	.34	.38
finimum:	23.685	.496	4.532	.000	.080	4.838	.122	10.0		.986	44.071	100.369
Aaximum:	23.772	.578	4.624	.014	.090	4.998	.145	10.2		1.051	44.362	101.109
< <u></u>			Hadalah	e Selected Li	ne(s)	Analyz	e Selected Line	e(s)				
	e Selected I	ine(s)	Undelete	, o o o o o o o o							1.27	
	e Selected I Si	Ti	AI		Cr	Fe	Mn	Mg	Ca	Na	0	Total
Delet					Cr .090	Fe 4.838	Mn .122	Mg 10.0		Na 1.051	0 44.071	Total 100.369
Delet Copy 162 G	Si	Ti	AI	v								
Delet	Si	Ti	AI	v					51 11.382			

The analysis of the TiO_2 standard reveals apart from titanium 0.5 wt% iron which is a known contamination, and 0.6 wt% vanadium. This sample has no vanadium; here the user sees the notorious Ti-V spectral interference. This will be corrected for (shortly) using the automatic interference correction routine.

- Sample L			lick to see in		- Ana	alyze	Raw Data	KRaws	Combine Sele	cted Samples		
Stand	0. 0	l01 Set 1 ₩ 03 Set 1 All		Willsboro, NY)	^	- Jaco		>>Excel		sis Lines From		
C Unkno	St 4	53 Set 1 Au	gite, Kakanu	i USNM 1221		andard nsities	Calculation (ptions		Samples ta Lines From		
C All Sa	mples St 4	73 Set 1 Oli	vine (Fo90) I	ohnstown USN USNM 111312		Pause Betwee	en Samples	Report		a Lines From Samples		
Select Add 1		2 Set 3 Mg 3 Set 2 Al2				Use All Matrix	Corrections	Treport	Sort Stat and Geological/A	Data Grids By tomic Number		
Setu	ns St 1	4 Set 2 Si0	2 synthetic			ble Selected		Match	Do Not Outp			
Save Se		23 Set 2 V2			-	pined Condition		nt Times		- 1		
		1		1			1			elected Samples w Sample		
Standard	Assignments	Specified	Concentration	ns Name/De	scription	Conditions	Elements/	Cations	Search For	Bemove		
	2 TiO2 synthet		-	10.001	otal Oxygen	100.		eight %		"Shared" Bgds		
TO = 40, Ke	eV = 15, Beam	= 40, Size = 1	• •	10.000	alculated Oxyge cess Oxygen	en 16.3 26.0		Vaiabt		Corrections		
Design of the second	emental Weight	Percent			ACESS Oxygen	26.0	531 Atomic	weight	Lreate M	aterial File		
		and the second second							-			
	Si	Ti	AI		Cr	Fe	Mn	Mg	Ca	Na	0	Total
Copy verage:	Si .001	Ti 59.946	.016	.604	.000	.007	.014	.02	21 .01	.001	40.091	100.120
Copy verage: td Dev:	Si	Ti 59.946 .141	.016 .032						21 .01	.001	40.091	100.120 .264
Copy verage: td Dev:	Si .001	Ti 59.946	.016	.604	.000	.007	.014	.02	21 .010 16 .012	.001	40.091	100.120
Copy verage: td Dev: ublished:	Si .001 .002	Ti 59.946 .141	.016 .032	.604 .028	.000	.007	.014 .016	.02	21 .010 16 .012 a. n.a.	.001 .003 n.a.	40.091	100.120 .264
Copy verage: td Dev: ublished: td Err:	Si .001 .002 n.a.	Ti 59.946 .141 59.939	.016 .032 .011	.604 .028 n.a.	.000 .000 n.a.	.007 .011 n.a.	.014 .016 n.a.	.02 .01 n.a	21 .010 16 .012 a. n.a. 08 .000	.001 2.003 n.a. 3.001	40.091 .104 40.050	100.120 .264 100.000
Copy verage: td Dev: ublished: td Err: :Rel SD:	Si .001 .002 n.a. .001	Ti 59.946 .141 59.939 .071	.016 .032 .011 .016	.604 .028 n.a. .014	.000 .000 n.a. .000	.007 .011 n.a. .005	.014 .016 n.a. .008	.02 .01 n.a	21 .011 16 .012 a. n.a. 08 .000 46 122.0	.001 .003 n.a. .001 5 200.00	40.091 .104 40.050 .052	100.120 .264 100.000 .132
Copy verage: td Dev: ublished: td Err: (Rel SD: linimum:	Si .001 .002 n.a. .001 200.00	Ti 59.946 .141 59.939 .071 .24	.016 .032 .011 .016 200.00	.604 .028 n.a. 014 4.58	.000 .000 n.a. .000 .01	.007 .011 n.a. .005 161.92	.014 .016 n.a. .008 117.67	.02 .01 n.a .00 73.	21 .010 16 .017 a. n.a. 08 .000 46 122.0 00 .000	0 .001 2 .003 n.a. 5 .001 15 200.00 0 .000	40.091 .104 40.050 .052 .26	100.120 .264 100.000 .132 .26
Copy Average: Atd Dev: Published: Atd Err: Arel SD: Ainimum:	Si .001 .002 n.a. .001 200.00 .000	Ti 59.946 .141 59.939 .071 .24 59.745	.016 .032 .011 .016 200.00 .000	.604 .028 n.a. .014 4.58 .579	.000 .000 n.a. .000 .01 .000	.007 .011 n.a. .005 161.92 .000	.014 .016 n.a. .008 117.67 .000	.02 .01 n.a .00 73. .00	21 .010 16 .017 a. n.a. 08 .000 46 122.0 00 .000	0 .001 2 .003 n.a. 5 .001 15 200.00 0 .000	40.091 .104 40.050 .052 .26 39.935	100.120 .264 100.000 .132 .26 99.726
Copy Everage: Std Dev: Published: Std Err: Std Err: Std Err: Aaximum: Aaximum:	Si .001 .002 n.a. .001 200.00 .000	Ti 59.946 .141 59.939 .071 .24 59.745 60.046	.016 .032 .011 .016 200.00 .000 .064	.604 .028 n.a. .014 4.58 .579	.000 .000 n.a. .000 .01 .000 .000	.007 .011 n.a. .005 161.92 .000 .023	.014 .016 n.a. .008 117.67 .000	.02 .01 n.a .00 73. .00	21 .010 16 .017 a. n.a. 08 .000 46 122.0 00 .000	0 .001 2 .003 n.a. 5 .001 15 200.00 0 .000	40.091 .104 40.050 .052 .26 39.935	100.120 .264 100.000 .132 .26 99.726
Copy verage: td Dev: vublished: td Err: Rel SD: linimum: laximum: Dele	Si .001 .002 n.a. .001 200.00 .000 .003	Ti 59.946 .141 59.939 .071 .24 59.745 60.046	.016 .032 .011 .016 200.00 .000 .064	.604 .028 n.a. 4.58 .579 .636	.000 .000 n.a. .000 .01 .000 .000	.007 .011 n.a. .005 161.92 .000 .023 Analy	.014 .016 n.a. .008 117.67 .000 .031	.02 .01 n.a .00 73. .00 .03	21 .011 16 .013 a. n.a. 18 .000 46 122.0 10 .000 37 .022	0 .001 2 .003 n.a. 6 .001 5 200.00 0 .000 6 .006	40.091 .104 40.050 .052 .26 39.935 40.148	100.120 .264 100.000 .132 .26 99.726 100.286
Copy verage: td Dev: ublished: td Err: Rel SD: linimum: laximum: Dele: Copy	Si .001 .002 n.a. .001 200.00 .000 .000 .003 te Selected	Ti 59.946 .141 59.939 .071 .24 59.745 60.046 Line(s)	.016 .032 .011 .016 200.00 .000 .064 Undele	.604 .028 n.a. 034 4.58 .579 .636 ete Selected Li	.000 .000 n.a. .000 .01 .000 .000 me(s)	.007 .011 n.a. .005 161.92 .000 .023 Analy	.014 .016 n.a. .008 117.67 .000 .031 ze Selected Lin	.02 .01 n.a .00 73. .00 .03 .03	21 .011 16 .013 a. n.a. 18 .000 46 122.0 100 .000 37 .029 Ca	0 .001 2 .003 n.a. 5 .001 15 200.00 0 .000 5 .006	40.091 .104 40.050 .052 .26 39.935 40.148	100.120 .264 100.000 .132 .26 99.726 100.286
Copy verage: td Dev: ublished: td Err: Rel SD: inimum: aximum: Dele Copy 30 G	Si .001 .002 n.a. .001 200.00 .000 .003 te Selected	Ti 59.946 .141 59.939 .071 .24 59.745 60.046 Line(s) Ti 59.745	.016 .032 .011 .016 200.00 .000 .064 Undele	.604 .028 n.a. 0.4 4.58 .579 .636	.000 .000 n.a. .000 .01 .000 .000 me(s)	.007 .011 n.a. .005 161.92 .000 .023 Analy Fe .004	.014 .016 n.a. .008 117.67 .000 .031	.02 .01 n.a .00 73. .00 .03 e(s) Mg .02	21 .011 16 .011 a. n.a. 18 .001 46 122.(10 .001 37 .029 Ca 21 .001	0 .001 2 .003 n.a. 6 .001 5 200.00 0 .000 5 .006 Na 0 .000	40.091 .104 40.050 .052 .26 39.935 40.148 0 39.935	100.120 .264 100.000 .132 .26 99.726 100.286 Total 99.726
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Copy iverage: itd Dev: 'ublished: itd Err: GRel SD: finimum: faximum:	Si .001 .002 n.a. .001 200.00 .000 .003 te Selected Si .000 .000	Ti 59.946 .141 59.939 .071 .24 59.745 60.046 Line(s) Ti 59.745 60.043	.016 .032 .011 .016 200.00 .000 .064 Undele Al .000 .000	.604 .028 n.a. 034 4.58 .579 .636 .636 .636 .618	.000 .000 n.a. .000 .01 .000 .000 re{s}	.007 .011 n.a. .005 161.92 .000 .023 Analy Fe .004 .004	.014 .016 n.a. .008 117.67 .000 .031 ze Selected Lin Mn .000 .000	e(s)	21 .011 16 .013 a. n.a. 18 .000 46 122.0 00 .000 37 .029 Ca 21 .000 26 .011 37 .029	.001 .003 n.a. 6.000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000	40.091 .104 40.050 .052 .26 39.935 40.148 0 39.935 40.133	100.120 .264 100.000 .132 .26 99.726 100.286 Total 99.726 100.218

All of the data lines gathered on the standards are examined in the same way and appear close to their standard database values. To save space they will not be reproduced here.

Spectral Interference Assignments

PROBE FOR EPMA allows the user to select a fully quantitative correction for spectral interferences. The program can only correct for interferences if both the interfered and interfering elements are measured. Further, data for an interference calibration standard must be acquired that contains a major concentration of the interfering element and none of the interfered element or any other elements that interfere with the interfered element.

The review of the analysis results for the standards in the previous section has identified interferences between various transition metals which require correction. Many transition metal K α x-ray lines are interfered by the element to the left in the periodic table of elements, e.g. Ti interferes with V, V with Cr, and so forth.

Select the *Standards* button in the *Sample List* and click the **Select All** button in the **Analyze!** window. Next, click the **Standard Assignments** button.

Unitable Addition Deprivation Controller Addition Deprivation Set 24 Set 2 Addite, Advantu USNM 1221 Stat 53 Set 2 Addition Deprivation Condition Addition Deprivation Setups Stat 473 Set 2 Addition Deprivation Setups Stat 33 Set 2 Addition Deprivation Setups Setup: Setup: Setup: Setup: Setup: Setup: Setup: Setup: <th< th=""><th>Sit 24 Set 2 Cr203 (synthetic) total List Standard Intensities Calculation Options Collisities Collis Collisities Colis</th><th>Sample I</th><th></th><th></th><th>click to see in 103 synthetic</th><th>tensity data) –</th><th>- An</th><th>alyze</th><th>Raw Data</th><th></th><th>Combine Selecter</th><th></th><th></th><th></th><th></th></th<>	Sit 24 Set 2 Cr203 (synthetic) total List Standard Intensities Calculation Options Collisities Collis Collisities Colis	Sample I			click to see in 103 synthetic	tensity data) –	- An	alyze	Raw Data		Combine Selecter								
Internation Internation MI Samples St 25 Set 2 NiO synthetic bematile Select All 51 2401 Sot 2 Wollastonite (Willsboro, NY) Internation Report Combine Data Lines From Selected Samples Sot Stat and Data Grids By Geodogical/Atomic Number Select All Soft 2 All Samples Stat 2 NiO set 2 Nio set Machine Sot Stat and Data Grids By Geodogical/Atomic Number Save Setups Stat 23 Set 2 Nighte, Kakanui USNM 1221 at 20 livine (Fo90) USNM 11312 at 20 livine (Fo90) USNM 122142 at 20 livine (Fo90) USNM 20 livine (Fo90) USNM 20 livine (Fo9	Averscare Internatives Internative Internatives Internatives Combine Data Lines From Belected Samples Internatives 22401 Set 22 Noll-synthetic (1303 Set 2 Abulte, Amelia Bit 433 Set 2 Univine (FoSU) USNM 1221 St 453 Set 2 Univine (FoSU) USNM 111312 Image: Use All Matix Corrections Enable Selected Samples Combine Data Lines From Belected Samples ard Assignments Specified Concentrations Name/Description Conditions Count Times Internatives Combine Data Lines From Use All Matix Corrections Combine Data Lines From Belected Samples Soit Stat and Data Gids By Belected Samples ard Assignments Specified Concentrations Name/Description Conditions Count Times in Elemental Weight Percent 44.542 Colladed Oxygen 21.772 Total Oxygen 21.772 Disable Selected Samples Boundary Corrections Create Material File si Ti All V Cr Fe Mn Mg Ca Na O Total si 23.7719 .530 4.563 .005 .085 4.932 .133 10.192 11.377 1.022 44.240 100.805 c .047 .043	Terrent and the second	St St	24 Set 2 Cr	203 (syntheti	c)	List S	tandard											
SelectAl It 200 Set 2 Albite, Amelia (V) Itsboro, NY Pause Between Samples Report Setups St. 403 Set 2 Albite, Amelia USNM 1221 Itse All Matrix Corrections Match Do Not Dutput To Log Save Setups St. 473 Set 2 Olivine (Fo90) USNM 11312 Combined Conditions Count Times Combine the Selected Sample(s) Match St. 433 Set 2 Augite, Kakami USNM 122142 44.240 Total Oxygen 100.805 Total Weight % Combine the Selected Sample St. 433 Set 2 Augite, Kakami USNM 122142 44.240 Total Oxygen 100.805 Total Weight % Second Seco	electAl in 2401 Set 2 Wollastonic (Willsboro, NY) Sit 433 Set 2 Alugite, Akanul USNM 1221 Use Al Matrix Corrections Match Sort Stat and Data Gnids By Sit 433 Set 2 Augite, Kakanul USNM 1221 Enable Selected Samples Match Do Not Output To Log Combined Conditions Count Times Combined Conditions Count Times Combined Weight % ard Assignments Specified Concentrations Name/Description Conditions Elements/Cations Set 2 Augite, Kakanui USNM 122142 44.240 Total Oxygen 100.805 Total Weight % Set 2 Augite, Kakanui USNM 122142 44.240 Total Oxygen 100.805 Total Weight % Sit 2 Augite, Kakanui USNM 122142 44.240 Total Oxygen 12.419 Z.433 10.192 11.377 1.022 44.240 100.805 10, KeV = 15, Beam = 40, Size = 10 44.240 Total Oxygen 12.419 Z.4133 10.192 11.377 1.022 44.240 100.805 10, KeV = 15, Beam = 40, Size = 10 44.240 0.085 .084 .012 .124 .051 .033 .151 .387 12.3714		escans St	26 Set 2 Fe	203 synthetic	: hematite				ptions									
Setups St. 453 Set. 2 Augute, Kakanu USNM 1221 Disade Selected Sample(s) Match Do Not Output To Log Save Setups St. 473 Set. 2 Divine (FoS0) USNM 111312 Combined Conditions Count Times Combined Conditions Count Times Standard Assignments Specified Concentrations Name/Description Conditions Elements/Cations Search For Remove Stad3 Set. 2 Augite, Kakanu USNM 122142 44.542 Total Dxygen 100.805 Total Weight Search For Remove Stad3 Set. 2 Augite, Kakanu USNM 122142 44.542 Total Dxygen 12.419 Z - Bar Boundary Corrections Calculated Dxygen 21.772 Atomic Weight Do 1.022 44.240 100 Presults in Elemental Weight Percent 302 Excess Dxygen 11.33 10.192 11.377 1.022 44.240 100 td Dev: .047 .043 .049 .005 .084 .012 .124 .051 .033 .151 .003 .151 .003 .151 .029 .013 .051 .033 .151 .005 .084 .0012 .124 .051 .033	Setups St 43 St 2 Augule, Kakanu USNM 1221 Diadue Selected Samples Match Do Not Dutput To Log re Setups St 473 Set 2 Divine (F390) USNM 111131 Combined Conditions Count Times Combined the Selected Samples) Search For	Selec	tAll 12	101 Set 2 V 103 Set 2 A	/ollastonite (\ bite, Amelia			Use All Matrix	Corrections		Sort Stat and Dat	a Grids By							
Standard Assignments Specified Concentrations Name/Description Conditions Elements/Cations Combine the Selected Samples into a New Sample St 453 Set 2 Augite, Kakanui USNM 122142 44.240 Total Oxygen 100.805 Total Weight % Search For Remove "Shared' Bgds "Shared' Bgds "Shared' Bgds Bounday Corrections Bounday	Si Ti AI V Cr Fe Mn Mg Cast Name/Description Conditions Elements/Cations Conditions	Setu	ips St St	69 Set 2 H	persthene, jo	ohnstown USN	Ena			Match									
Copy Si Ti Al V Cr Fe Mn Mg Ca Na O Tot verage: 23.719 .530 4.569 .005 .085 4.932 .133 10.192 11.377 1.022 44.240 10 td Dev: .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 . ublished: 23.714 .422 4.620 n.a. .089 4.928 .108 10.125 11.332 .994 44.198 10 td Err: .027 .025 .028 .005 .003 .048 .007 .072 .029 .019 .087 . rRel SD: .20 8.06 1.06 173.20 5.96 1.70 8.84 1.22 .45 3.22 .34 timinum: 23.685 .496 4.532 .000 .080 4.838 .122 10.051 11.3	Si Ti Al V Cr Fe Mn Mg Ca Na O Total 23.719 .530 4.569 .005 .085 4.932 .133 10.192 11.377 1.022 44.240 100.805 c. .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 .387 ad: 23.714 .492 4.620 n.a. .089 4.928 .108 10.125 11.332 .994 44.198 100.605 .027 .025 .028 .005 .003 .048 .007 .072 .029 .019 .087 .223 .02 .20 8.06 1.06 173.20 5.96 1.70 8.84 1.22 .45 3.22 .34 .38 n: 23.685 .496 4.532 .000 .080 4.838 .122 10.051 11.325 .986 44.071	St 453 Set TO = 40, K	2 Augite, Kak KeV = 15, Bean	anuiUSNM 12 n = 40, Size =	2142	44.240	escription Total Oxygen Calculated Oxy	Conditions	Elements/0 0.805 Total W 2.419 Z · Bar	Cations eight % "S	into a New S. earch For hared' Bgds ''SI Boundary Com	ample Remove hared'' Bgds ections							
International Dev: 0.047 0.043 0.049 0.008 0.005 0.084 0.012 1.24 0.051 0.033 1.51 0.033 1.51 0.033 1.51 0.033 1.51 0.033 1.51 0.033 1.51 0.033 1.51 0.005 0.006 0.080 4.928 1.08 10.125 11.392 9.94 44.198 100 ind Err: 0.027 0.025 0.028 0.005 0.003 0.048 0.007 0.72 0.029 0.19 0.807 0.807 0.772 0.293 0.19 0.807 0.807 0.702 0.029 0.19 0.807 0.807 0.808 1.828 1.22 10.051 11.325 .986 44.071 100 taximum: 23.685 .496 4.532 0.000 0.800 4.838 .122 10.051 11.325 .986 44.071 100 taximum: 23.772 .578 4.624 .014 .090 4.998 .145 10.282 11.426 1.051 44.362 10 Copy	r: .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 .387 23.714 .492 4.620 n.a. .089 4.928 .108 10.125 11.392 .994 44.198 100.660 .027 .025 .028 .005 .003 .048 .007 .072 .029 .019 .087 .223 .02 .8.06 1.06 173.20 5.96 1.70 8.84 .122 .453 .322 .34 .38 n: 23.685 .496 4.522 .000 .080 4.838 .122 10.051 11.325 .986 44.071 100.369 n: 23.772 .578 4.624 .014 .090 4.938 .145 10.282 11.426 1.051 44.362 101.109 Vendet Eselected Line(s) Vendet Eselected Line(s) Undelete Selected Line(s) Analyze Selected Line(s) Si Ti Als3 .122 1.051 11.382																		
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Copy Si Ti Al V Cr Fe Mn Mg Ca Na O Tot 162.6 23.685 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100	Si Ti Al V Cr Fe Mn Mg Ca Na O Total 23.695 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 101.109	verage: td Dev: ublished: td Err: :Rel SD: linimum:	Si 23.719 .047 23.714 .027 .20 23.685	Ti .530 .043 .492 .025 8.06 .496	4.569 .049 4.620 .028 1.06 4.532	.005 .008 n.a. .005 173.20 .000	.085 .005 .089 .003 5.96 .080	4.932 .084 4.928 .048 1.70 4.838	.133 .012 .108 .007 8.84 .122	10.192 .124 10.125 .072 1.22 10.051	11.377 .051 11.392 .029 .45 11.325	1.022 .033 .994 .019 3.22 .986	44.240 .151 44.198 .087 .34 44.071	100.805 .387 100.660 .223 .38 100.369					
162 G 23.685 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 10	23.685 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 101.109	verage: td Dev: ublished: td Err: :Rel SD: linimum:	Si 23.719 .047 23.714 .027 .20 23.685	Ti .530 .043 .492 .025 8.06 .496	4.569 .049 4.620 .028 1.06 4.532	.005 .008 n.a. .005 173.20 .000	.085 .005 .089 .003 5.96 .080	4.932 .084 4.928 .048 1.70 4.838	.133 .012 .108 .007 8.84 .122	10.192 .124 10.125 .072 1.22 10.051	11.377 .051 11.392 .029 .45 11.325	1.022 .033 .994 .019 3.22 .986	44.240 .151 44.198 .087 .34 44.071	100.805 .387 100.660 .223 .38 100.369					
162 G 23.685 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 10	23.685 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 101.109	verage: td Dev: ublished: td Err: (Rel SD: tinimum: taximum:	Si 23.719 .047 23.714 .027 .20 23.685 23.772	Ti .530 .043 .492 .025 8.06 .496 .578	4.569 .049 4.620 .028 1.06 4.532 4.624	.005 .008 n.a. .005 173.20 .000 .014	.085 .005 .089 .003 5.96 .080 .090	4.932 .084 4.928 .048 1.70 4.838 4.998	.133 .012 .108 .007 8.84 .122 .145	10.192 .124 10.125 .072 1.22 10.051 10.282	11.377 .051 11.392 .029 .45 11.325	1.022 .033 .994 .019 3.22 .986	44.240 .151 44.198 .087 .34 44.071	100.805 .387 100.660 .223 .38 100.369					
G2 B		verage: td Dev: ublished: td Err: Rel SD: inimum: aximum: Dele	Si 23.719 .047 23.714 .027 .20 23.685 23.772 ete Selected	Ti .530 .043 .492 .025 8.06 .496 .578 Line(s)	4.569 .049 4.620 .028 1.06 4.532 4.624	.005 .008 n.a. .005 173.20 .000 .014	.085 .005 .089 .003 5.96 .080 .090	4.932 .084 4.928 .048 1.70 4.838 4.998 Anal	.133 .012 .108 .007 8.84 .122 .145	10.192 .124 10.125 .072 1.22 10.051 10.282	11.377 .051 11.392 .029 .45 11.325 11.426	1.022 .033 .994 .019 3.22 .986 1.051	44.240 .151 44.198 .087 .34 44.071 44.362	100.805 .387 100.660 .223 .38 100.369 101.109					
05.0		verage: td Dev: ublished: td Err: Rel SD: inimum: aximum: Dele	Si 23.719 .047 23.714 .027 .20 23.685 23.772 ete Selected Si	Ti .530 .043 .492 .025 8.06 .496 .578 Line(s)	4.569 .049 4.620 .028 1.06 4.532 4.624 Undele	.005 .008 n.a. .005 173.20 .000 .014	.085 .005 .089 .003 5.96 .080 .090 inne(s)	4.932 .084 4.928 .048 1.70 4.838 4.998 Anal	.133 .012 .108 .007 8.84 .122 .145 yze Selected Line	10.192 .124 10.125 .072 1.22 10.051 10.282	11.377 .051 11.392 .029 .45 11.325 11.325 11.426	1.022 .033 .994 .019 3.22 .986 1.051	44.240 .151 44.198 .087 .34 44.071 44.362	100.805 .387 100.660 .223 .38 100.369 101.109					
64 G 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 10	23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936	verage: td Dev: ublished: td Err: Rel SD: inimum: aximum: Dele Copy 62 G	Si 23.719 .047 23.714 .027 .20 23.685 23.772 ete Selected Si	Ti .530 .043 .492 .025 8.06 .496 .578 Line(s)	4.569 .049 4.620 .028 1.06 4.532 4.624 Undele	.005 .008 n.a. .005 173.20 .000 .014	.085 .005 .089 .003 5.96 .080 .090 inne(s)	4.932 .084 4.928 .048 1.70 4.838 4.998 Anal	.133 .012 .108 .007 8.84 .122 .145 yze Selected Line	10.192 .124 10.125 .072 1.22 10.051 10.282	11.377 .051 11.392 .029 .45 11.325 11.325 11.426	1.022 .033 .994 .019 3.22 .986 1.051	44.240 .151 44.198 .087 .34 44.071 44.362	100.805 .387 100.660 .223 .38 100.369 101.109					
<u>65 6</u> 23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 10		verage: td Dev: ublished: td Err: Rel SD: inimum: aximum: Dele	Si 23,719 .047 23,714 .027 .20 23,685 23,772 ete Selected Si Si 23,685	Ti .530 .043 .492 .025 8.06 .496 .578 Line(s) Ti .516	4.569 .049 4.620 .028 1.06 4.532 4.624 Undele Al 4.550	.005 .008 n.a. .005 173.20 .000 .014	.085 .005 .089 .003 5.96 .080 .090 .090	4.932 .084 4.928 .048 1.70 4.838 4.998 Anal Fe 4.838	. 133 .012 .108 .007 8.84 .122 .145 yze Selected Lind	10.192 .124 10.125 .072 1.22 10.051 10.282 e(s) Mg 10.051	11.377 .051 11.392 .029 .45 11.325 11.426 Ca 11.382	1.022 .033 .994 .019 3.22 .986 1.051	44.240 .151 44.198 .087 .34 44.071 44.362	100.805 .387 100.660 .223 .38 100.369 101.109 Total 100.369					

Clicking this button opens the **Standard and Interference Assignments** dialog box.

Ciccica J	amples				ОК	Cancel
St 12 Set				A		
	2 MgO synt 1 Al2O3 syn				Save Elemer	nt Setup
	1 SiO2 synl			=	Save Sample	o Colum
St 22 Set	1 TiO2 synt	thetic			Save Sample	e setup
	1 V203 syn				Add/Remove S	Chandrada
	1 Cr2O3 (sy 1 MnO synt				Add/hemove;	standards
	1 Fe2O3 sy		tite	Rel	load Standard	Assignments
St 28 Set	1 NiO synth	netic		[Remove TDI (Correction
	et 1 Wollasto		ro, NY)	L	nemove i Di u	Junection
	t 1 Albite, A		1 1 2 2 1 4 2	-		
	Element		nterference/Tim	e Dependent Standard		Interf-Std
lick Eleme	ent Row to Ed	it Standard/Ir	nterference/Tim	e Dependent	Intensity (TDI)	Assignments
Click Eleme Channel	ent Row to Ed	it Standard/Ir X-Ray	nterference/Tim Analyzed	e Dependent Standard	Intensity (TDI)	Assignments
Click Eleme Channel 2 3	Element Si Ti Al	it Standard/Iı X-Ray ka	nterference/Tim Analyzed Yes	e Dependent Standard 453	Intensity (TDI) Interf-Ele	Assignments Interf-Std 0,0,0,0,0
Click Eleme Channel 2 3 4	Element Si Ti Al V	it Standard/Ir X-Ray ka ka	nterference/Tim Analyzed Yes Yes	e Dependent Standard 453 22	Intensity (TDI)	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0
Click Eleme Channel 2 3 4 5	Element Si Ti Al	it Standard/Iı X-Ray ka ka ka	Analyzed Yes Yes Yes	e Dependent Standard 453 22 13	Intensity (TDI)	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0
Click Eleme Channel 2 3 4 5 5	Element Si Ti Al V	it Standard/Iı X-Ray ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23	Intensity (TDI)	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Eleme Channel 2 3 4 5 5 7	ent Row to Ed Element Si Ti Al V Cr	it Standard/Ir X-Ray ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24	Intensity (TDI) Interf-Ele	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Eleme Channel 2 3 4 5 5 7 3	ent Row to Ed Element Si Ti Al V Cr Fe	it Standard/Ir X-Ray ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 23 24 26	Intensity (TDI)	Assignments 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Eleme Channel 2 3 4 5 5 7 3 3 3	ent Row to Ed Element Si Ti Al V Cr Fe Mn	it Standard/Iı X-Ray ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 23 24 26 25	Intensity (TDI) Interf-Ele	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Eleme Channel 2 3 4 5 5 7 3	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg	it Standard/Iı X-Ray ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25 473	Intensity (TDI)	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Eleme Channel 2 3 4 5 5 7 3 3 3	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca	it Standard/Iı X-Ray ka ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25 473 2401	Intensity (TDI) Interf-Ele	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Eleme Channel 2 3 4 5 5 7 3	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg	it Standard/Iı X-Ray ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25 473	Intensity (TDI)	Assignmen 0,0,0,0,0, 0,0,0,0,0, 0,0,0,0,0, 0,

Click on the element row for vanadium to edit the Interference Assignments.

The **Assignment Properties** dialog box for vanadium opens. Select the first *interference element* for this element and the corresponding *standard* from the respective drop down menus. Select a standard that contains a known amount of the interfering element but none of the interfered element.

Linco	Standard A	ssignments	for: V ka	OK	Time Dependent Intensity (TDI) Calibration Assignment (select unknown sample for assigned TDI calibration)
Elen V			Assigned (Primary) Standard 23 V203 synthetic v Indard Intensity Calculation (see Analytical menu)	Cancel	TDI Correction Type (Self or Assigned)	Both "assigned" and "sell" calibration Time Dependent Intensity (TDI) element samples can be acquired. See the Special Option datag in the Acquire window. Both "assigned" and "sell" Time Dependent Intensity (TDI) element calibrations can be assigned or unassigned here. Assigned Time Dependent Intensity (TDI corrections are
nterf	erence Star	ndard Assig	nments for Interfered Element: V ka			assigned to samples acquired with the "assigned" flag in Special Options: "Self" Time Dependent Intensity (TDI)
st	Intf Elem		Interference Standard	Help		corrections are assigned to themselves. Time Dependent Intensity (TDI) element "sell" calibrations are automatically
st	Ti 👻	· ·	22 TiO2 synthetic	Remove		assigned to themselves at the time of acquisition.
ind.	-		-	Remove		Display TDI Fit
2			· · · · · · · · · · · · · · · · · · ·	Remove		Display TDI Fit Error Bars
lth 5th	•		-	Remove	C Use Log-Linear (exponential) Fit	
an		· ·	· ·	Remove	C Use Log-Quadratic (hyper-exponential) Fit C Use Log-Log (double-exponential) Fit	
	Theck All Inter		ts Maximum Order Minimum Overlap Intensity I 1.1 The standard used for the interfere contain a known concentration element and none of the interfere other interfere other interfere	of the interfering d element, nor any	Blank Correction Sample Assignment	Assign a sample to be used for a "blank" trace element
				*		correction. The blank sample should be a similar matrix to the unknown sample and should have a zero or known trace of th element present.

Click the **OK** button when finished.

The Standard and Interference Assignments window will appear as below.

elected Samples			OK			Canc	el
St 12 Set 1 MgD synthetic	*						
St 12 Set 2 MgO synthetic			Sav	e Elen	ent S	etun	
St 13 Set 1 Al2O3 synthetic			541	C LICH	icite o	ctup	
St 14 Set 1 SiO2 synthetic	=		Say	e San	ple S	etup	
St 22 Set 1 TiO2 synthetic							
St 23 Set 1 V203 synthetic							
St 24 Set 1 Cr2O3 (synthetic)			Add/F	emov	e Sta	ndard	s
St 25 Set 1 MnO synthetic		Pal	oad S	tanda	rd Aa	ianm	anto
St 26 Set 1 Fe2O3 synthetic hematite		ne	uau s	tanua	IU AS	sigrimit	snes
St 28 Set 1 NiO synthetic		(Remo			ection	
St 2401 Set 1 Wollastonite (Willsboro, NY)		L	TTCIIIO	10 10	1 000	ccuo	
St 303 Set 1 Albite, Amelia			1				
St 453 Set 1 Augite, Kakanui USNM 122142	-	1	2	3	4	5	6

Channel	Element	X-Ray	Analyzed	Standard	Interf-Ele	Interf-Std
1	Si	ka	Yes	453		0,0,0,0,0
2	Ti	ka	Yes	22		0,0,0,0,0
3	AI	ka	Yes	13		0,0,0,0,0
4	v	ka	Yes	23	Ti	22,0,0,0,0
5	Cr	ka	Yes	24		0,0,0,0,0
6	Fe	ka	Yes	26		0,0,0,0,0
7	Mn	ka	Yes	25		0,0,0,0,0
8	Mg	ka	Yes	473		0,0,0,0,0
9	Ca	ka	Yes	2401		0,0,0,0,0
10	Na	ka	Yes	303		0,0,0,0,0
11	0		No	0		0,0,0,0,0

Repeat these editing steps for all of the other element interferences, resulting in the following **Standard and Interference Assignments** window.

beleeted o	amples				OK	Cancel
St 12 Sel						
St 12 Sel St 13 Sel	2 MgO synt 1 Al2O3 syn				Save Elemer	nt Setup
	1 SiO2 syn			=	C C I	- C - I
St 22 Sel	1 TiO2 syn	thetic		_	Save Sample	e Setup
St 23 Sel	1 V203 syr	thetic				
St 24 Sel	1 Cr2O3 (sy	nthetic)			Add/Remove S	Standards
	1 MnO synt 1 Fe2O3 sy		lite	Re	load Standard	Assignments
	1 NiO synth		ute			_
	et 1 Wollasto		ro, NY)	L	Remove TDI (Correction
St 303 Se	t 1 Albite, A	melia			1 1 1	1
SF 453 So	E 1 Augito K	akanui USNN	1 1 2 2 1 4 2	T	2 3	4 5 6
Click Eleme Channel	ent Row to Ed	lit Standard/Iı X-Ray	nterference/Tim Analyzed	Standard	Intensity (TDI)	Assignments
Click Eleme Channel 1	ent Row to Ed Element Si	lit Standard/Iı X-Ray ka	nterference/Tim Analyzed Yes	e Dependent Standard 453	Intensity (TDI)	Assignments Interf-Std 0,0,0,0,0
Click Eleme Channel 1 2	ent Row to Ed Element Si Ti	lit Standard/Iı X-Ray ka ka	nterference/Tim Analyzed Yes Yes	e Dependent Standard 453 22	Intensity (TDI)	Assignments Interf-Std 0,0,0,0,0 0,0,0,0
Click Elema Channel 1 2 3	Element Si Ti Al	lit Standard/Iı X-Ray ka ka ka ka	nterference/Tim Analyzed Yes Yes Yes	e Dependent Standard 453 22 13	Intensity (TDI)	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0
Click Eleme Channel 1 2 3 4	Element Si Ti Al V	lit Standard/Iu X-Ray ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23	Intensity (TDI) Interf-Ele Ti	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
Click Eleme Channel 1 2 3 4 5	Element Si Ti Al V Cr	lit Standard/Iı X-Ray ka ka ka ka ka ka	nterference/Tim Analyzed Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24	Intensity (TDI) Interf-Ele Ti V	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
Click Eleme Channel 1 2 3 3 4 5 6	Element Si Ti Al V Cr Fe	lit Standard/Iı X-Ray ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26	Intensity (TDI) Interf-Ele Ti, V Mn,	Assignments Interf-Std 0,0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 23,0,0,0,0 25,0,0,0,0
Click Eleme Channel 1 2 2 3 4 5 5 6 7	Element Si Ti Al V Cr Fe Mn	lit Standard/Iı X-Ray ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25	Intensity (TDI) Interf-Ele Ti V	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
Click Eleme Channel 1 2 3 4 5 5 6 7 8	Element Si Ti Al V Cr Fe Mn Mg	lit Standard/Iı X-Ray ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25 473	Intensity (TDI) Interf-Ele Ti, V Mn,	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
Click Eleme Channel 1 2 3 3 4 5 5 6 7 8 9	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca	lit Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25 473 2401	Intensity (TDI) Interf-Ele Ti V Mn Cr	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
Click Eleme Channel 1 2 3 4 5 5 6 5 6 7 8 9 9 10	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca Na	lit Standard/Iı X-Ray ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25 473 2401 303	Intensity (TDI) Interf-Ele Ti V Mn Cr	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
Click Eleme Channel 1 2 3 3 4 5 5 6 7 8 9	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca	lit Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25 473 2401	Intensity (TDI) Interf-Ele Ti V Mn Cr	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
Click Eleme Channel 1 2 3 4 5 5 6 5 6 7 8 9 9	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca Na	lit Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23 24 26 25 473 2401 303	Intensity (TDI) Interf-Ele Ti V Mn Cr	Assignment 0,0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0, 23,0,0,0, 25,0,0,0, 24,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,

Click the **OK** button when finished returning to the **Analyze!** window.

Next, check the analysis options that are currently assigned. From the main PROBE FOR EPMA log window, select **Analytical** from the menu bar and click **Analysis Options** from the menu choices.

File Edit	Standard	Xray An	alytical V	Indow	Run Outpu	ıt Help							
	Acquire	1	Analysis	Options									
BEAM:	39.99	39.	Assign N										
ELEM:	Si		Clear All	MAN Ass	ignments (u	e default)							
	23.685	.5	Use Off I	Peak Elem	ents For MAI	N Fit (Use on-p	eak intensiti	es from elem	ents acquire	d using off-	peak backgro	ounds)	
	23.772 23.698	.5	Use MAI	V Correcti	on For Off Pe	ak Elements (Calculate MA	N backgroui	nds for elem	ents acquire	d using off-p	eak backgi	rounds)
100	23.090	. 4											
AVER:	23.719	. 5	Empirica	IMACs									
SDEV:	.047	. 0	Empirica	I APFs									
SERR:	.027	. 0	745 013			- I Callback	Come Calant						
&RSD:	.20	8.	ZAF, Phi	-Kno-Z, A	ipna Factor a	nd Calibration	Curve Select	lions					
PUBL:	23.714	. 4	Create V	irtual Stan	dard Intensit	у							
VAR:	(.02)	7.	Update [Dead Time	Constants								
DIFF:	(.00)	. 0											
STDS:	453		Student	s "t" Table	1								
			CalcZAF	Calculatio	ons								
STRF:	.1843	.55	. 4000			0 .0010		.2000	10211	10100		_	
STCT:	1846.9	5540.9	4352.2	6323	9 6406.	8 6549.1	7331.1	2074.5	3208.4	485.2			
UNKF :	.1843	.0045	.0318	.000	00.000	7 .0415	.0011	.0684	.1048	.0053			
UNCT :	1847.1	44.5	318.0	-1	0 7.	3 415.1	11.0	680.7	1046.2	52.5			
UNBG:	20.1	35.7	18.6	31	1 31.	1 25.4	23.5	15.2	36.6	11.3			
	1.2870	1.1902	1.4364					1.4891	1.0856	1.9389			
	1.0001 92.78	.0080	.0731 18.10		02 .001 07 1.2			.3281 45.70	.3261 29.55	.1081			
PKBG:													

This opens the **Analysis Calculation Options** window. Check that the tick boxes for *Use Assigned Interference Corrections on Standards* and *Unknowns and Force Negative Interference Intensities To Zero in Corrections* are marked.

Quantitative Acquisition Options	OK Cancel
✓ Use Deadtime Correction	
 Use Normal Deadtime Correction (single term factorial) 	
C Use Precision Deadtime Correction (two term factorial for > 50K cps)	Calculation Options
✓ Use Beam Drift Correction	Use Aggregate Intensities for Duplicate Quantitative Elements
✓ Use Beam Drift Correction	Use Blank Calibration Sample Trace Element Accuracy Corrections
Ose Automatic Dirit Conection on Standard Intensities	Force Negative K-Ratios To Zero in ZAF Calculations
	Calculate Electron and Xray Ranges for Sample Compositions
Quantitative Analysis Ontions	Use Oxygen From Halogens (F, Cl, Br and I) Correction
V Use Assigned Interference Corrections on Standards and Unknowns	Use Nth Point Calculation For Off-Peak Intensities (for testing only
Concerning of the standards and offendering Concerning of Standards and Offendering	Use Count Overwrite Intensity Table for Data Calculations
Do Not Use Full Quant Interference Corrections (use traditional Gilfrich, et. al.)	Force Negative Interference Intensities To Zero in Corrections
Use Assigned or Self Time Dependent Intensity (TDI) Corrections on Unknowns	Use Chemicar Age Calculation (U, Tir, Fb)
Use Linear Fit (slope coefficient only) for TDI Extrapolation	
C Use Quadratic Fit (two coefficient) for TDI Extrapolation	
Use Time Weighted Data for TDI Fit (weight intensities based on elasped time)	Use Secondary Boundary Fluorescence Correction
Time Weighted Data Weight Factor 2	
	Formatting Options
Use Absorption Corrected MAN Continuum Intensities	Use Automatic Format For Quantitative Results
Use Particle or Thin Film Correction Parameters	Ose Automatic Format For Quantitative Results Ose Display the Maximum Number of Numerical Digits
Check For Same Peak Positions in Unknown and Standard	 Display the Maximum Number of Numerical Digits C Display Only Statistically Significant Number of Numerical Digits
Check For Same PHA Settings in Unknown and Standard	
-	Use Detailed Printout For Data and Analytical Results
Use Zero Point For Calibration Curve (off-peak elements only)	Print Analyzed And Specified On Same Line
Use Conductive Coating Correction For Beam Energy Loss	Display Count Intensities Unnormalized To Time (in Analyze!)
Use Conductive Coating Correction For X-ray Absorption	Finit Additional MAN Fit and Correction Parameters To Log Window
Do Not Use Fast Quantitative Analysis Feature	
so not over an quantative mayor routero	Output Options
MAC (mass absorption coefficient) and APF (area peak factor) Options	Display Charge Balance Calculation
Use Empirical MAC Values	Elemental Output Sort Order For JJD-2 and HW Custom Output:
Use Empirical APF Values	Use Traditional Geological Sort Order (SiD2, TiD2, etc.)
 Use Empirical APF Factors (calculated from elemental composition) 	C Use Low To High Atomic Number Sort Order
C Use Specified APF Factors (based on a fixed composition)	C Use High To Low Atomic Number Sort Order

A range of other options can be switched on an off in this window which affect the calculation and output of the quantitative data. See the PROBE FOR EPMA User's Guide and Reference manual for details.

Click the **OK** button returning to the main log window.

The user then reanalyzes the standards (**Analyze** button in the **Analyze!** window), utilizing the spectral interference correction routine. The results for the TiO_2 standard are dramatic; the apparent 0.6 wt% vanadium concentration has been replaced with an average 0.01 wt% content (which is below the detection limit).

• Stand	ist (multi-sele			villsboro, NY)	- Ana	<mark>alyze F</mark>	lawData 📃	KRaws >>Excel	Combine Selecter			
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C Wave	scans St 4	59 Set 1 Hy	persthene, jo	i USNM 1221 hnstown USN	Inten	anuaru (Calculation O	ptions	Combine Data Li			
C All Sa Select	All St 1	73 Set 1 Oli 2 Set 3 Mg	vine (Fo90) l O synthetic	JSNM 111312		^p ause Betweer Jse All Matrix (Report	Selected Sa Sort Stat and Dat	a Grids By		
Add T Setu	St 1	3 Set 2 Al2 4 Set 2 Si0	2 synthetic		Disat	ble Selected S ble Selected S	Sample(s)	Match	Geological/Atomi			
Save Se		2 Set 2 Ti0 3 Set 2 V20			-				Do Not Dutput 1	o Log		
		1		1		ined Condition	is Coun	t Times	Combine the Select into a New S			
Standard	Assignments	Specified	Concentration	ns Name/De	scription C	Conditions	Elements/	Cations		Remove		
	2 TiO2 synthet		~	1	otal Oxygen	100.1		eight %	"Shared" Bgds "S			
TO - 40 V.	V = 15 Ream	= 40. Size = 11	0	40.093 C	alculated Oxyge	en 16.3			Boundary Corr	ections		
10 = 40, KE	- 10, beam		•	000 5		00.0	Atomin's	(failed at		1 mm 1		
	mental Weight	and the second second	•	.003 E	cess Oxygen	26.6			Create Materi			
Results in Ele	mental Weight	Ti	AI	v	Cr	Fe	Mn	Mg	Ca	Na	0	Total
 Results in Ele Copy Average:	mental Weight Si .001	Ti 59.946	.016	V .014	Cr .000	Fe .007	Mn .014	Mg .02	Ca 1 .010	Na .001	40.091	100.120
Results in Ele Copy Average: Std Dev:	mental Weight	Ti 59.946 .141	.016 .032	v	Cr	Fe	Mn	Mg	Ca 1 .010	Na	40.091	100.120 .264
Results in Ele <u>Copy</u> Average: Std Dev: Published:	mental Weight Si .001 .002 n.a.	Ti 59.946 .141 59.939	.016 .032 .011	V .014 .017 n.a.	Cr .000 .000 n.a.	Fe .007 .011 n.a.	Mn .014 .016 n.a.	Mg .02 .01 n.a	Ca 1 .010 6 .012 5 n.a.	Na .001 .003 n.a.	40.091 .104 40.050	100.120 .264 100.000
Results in Ele <u>Copy</u> Average: Std Dev: Published:	mental Weight Si .001 .002	Ti 59.946 .141	.016 .032	V .014 .017	Cr .000 .000	Fe .007 .011	Mn .014 .016	Mg .02 .01	Ca 1 .010 6 .012 5 n.a.	Na .001 .003	40.091	100.120 .264
Results in Ele Copy Average: Std Dev: Published: Std Err:	mental Weight Si .001 .002 n.a.	Ti 59.946 .141 59.939	.016 .032 .011	V .014 .017 n.a.	Cr .000 .000 n.a.	Fe .007 .011 n.a.	Mn .014 .016 n.a.	Mg .02 .01 n.a	Ca 1 .010 6 .012 1. n.a. 18 .006	Na .001 .003 n.a.	40.091 .104 40.050	100.120 .264 100.000
Results in Ele Copy Average: Std Dev: Published: Std Err: &Rel SD:	mental Weight Si .001 .002 n.a001	Ti 59.946 .141 59.939 .071	.016 .032 .011 .016	V .014 .017 n.a.	Cr .000 .000 n.a. .000	Fe .007 .011 n.a. .005	Mn .014 .016 n.a. .008	Mg .02 .01 n.a .00	Ca 1 .010 6 .012 . n.a. 18 .006 122.05	Na .001 .003 n.a. .001	40.091 .104 40.050 .052	100.120 .264 100.000 .132
Results in Ele	mental Weight Si .001 .002 n.a. .001 200.00	Ti 59.946 .141 59.939 .071 .24	.016 .032 .011 .016 200.00	V .014 .017 n.a. .090 122.70	Cr .000 .000 n.a. .000 .01	Fe .007 .011 n.a. .005 161.92	Mn .014 .016 n.a. .008 117.67	Mg .02 .01 n.a .00 73.4	Ca 1 .010 6 .012 . n.a. 18 .006 16 122.05 10 .000	Na .001 .003 n.a. .001 200.00	40.091 .104 40.050 .052 .26	100.120 .264 100.000 .132 .26
Results in Ele Copy Average: Std Dev: Published: Std Err: &Rel SD: Minimum:	mental Weight Si .001 .002 n.a. .001 200.00 .000	Ti 59.946 .141 59.939 .071 .24 59.745	.016 .032 .011 .016 200.00 .000	V .014 .017 n.a. .000 122.70 .000	Cr .000 .000 n.a. .000 .01 .000	Fe .007 .011 n.a. .005 161.92 .000	Mn .014 .016 n.a. .008 117.67 .000	Mg .02 .01 n.a .00 73.4 .00	Ca 1 .010 6 .012 . n.a. 18 .006 16 122.05 10 .000	Na .001 .003 n.a. .001 200.00 .000	40.091 .104 40.050 .052 .26 39.935	100.120 .264 100.000 .132 .26 99.726
Results in Ele Copy Average: Std Dev: Published: Std Err: %Rel SD: Minimum: Maximum:	mental Weight Si .001 .002 n.a. .001 200.00 .000	Ti 59.946 .141 59.939 .071 .24 59.745 60.046	.016 .032 .011 .016 200.00 .000 .064	V .014 .017 n.a. .000 122.70 .000	Cr .000 .000 n.a. .000 .01 .000 .000	Fe .007 .011 n.a. .005 161.92 .000 .023	Mn .014 .016 n.a. .008 117.67 .000	Mg .02 .01 n.a .00 73.4 .00 .03	Ca 1 .010 6 .012 . n.a. 18 .006 16 122.05 10 .000	Na .001 .003 n.a. .001 200.00 .000	40.091 .104 40.050 .052 .26 39.935	100.120 .264 100.000 .132 .26 99.726
Copy Copy Average: Std Dev: Published: Std Err: &Rel SD: Minimum: Maximum: Deleu	mental Weight Si .001 .002 n.a. .001 200.00 .000 .003	Ti 59.946 .141 59.939 .071 .24 59.745 60.046	.016 .032 .011 .016 200.00 .000 .064	V .014 .017 n.a. .095 122.70 .000 .034	Cr .000 n.a. .000 .01 .000 .000 .000	Fe .007 .011 n.a. .005 161.92 .000 .023	Mn .014 .016 n.a. .008 117.67 .000 .031	Mg .02 .01 n.a .00 73.4 .00 .03	Ca 1 .010 6 .012 . n.a. 18 .006 16 122.05 10 .000	Na .001 .003 n.a. .001 200.00 .000	40.091 .104 40.050 .052 .26 39.935	100.120 .264 100.000 .132 .26 99.726 100.286
Results in Ele Copy Average: Std Dev: Published: Std Err: &Rel SD: dinimum: dasimum: Delel Copy	Si .001 .002 n.a. .001 200.00 .000 .003	Ti 59.946 .141 59.939 .071 .24 59.745 60.046	.016 .032 .011 .016 200.00 .000 .064	V .014 .017 n.a. .966 122.70 .000 .034 te Selected Li	Cr .000 n.a. .000 .01 .000 .000 .000	Fe .007 .011 n.a. .005 161.92 .000 .023 Analyz	Mn .014 .016 n.a. .008 117.67 .000 .031 ze Selected Lin	Mg .02 .01 n.a .00 73.4 .00 .03 e(s)	Ca 1 .010 6 .012 . n.a. 18 .006 46 122.05 10 .000 17 .025	Na .001 .003 n.a. .001 200.00 .000 .000	40.091 .104 40.050 .052 .26 39.935 40.148	100.120 .264 100.000 .132 .26 99.726
Copy Copy Copy Copy Copy Copy Copy Copy	mental Weight Si .001 .002 n.a. .001 200,00 .000 .000 .003 te Selected I Si .000	Ti 59.946 .141 59.939 .071 .24 59.745 60.046 inne(s) Ti	.016 .032 .011 .016 200.00 .006 .064 Undele	V .014 .017 n.a. 000 122.70 .000 .034 te Selected Lii V .020	Cr .000 .000 n.a. .000 .000 .000 .000 Cr .000	Fe .007 .011 n.a. .005 161.92 .000 .023 Analyz Fe .004	Mn .014 .016 n.a. .008 117.67 .000 .031 ze Selected Lin Mn .000	Mg .02 .01 n.a .00 73.4 .00 .03 e(s) Mg .02	Ca 11 .010 6 .012 b. n.a. 18 .006 146 122.05 10 .000 17 .025 Ca .000 11 .000	Na .001 .003 n.a. .001 200.00 .000 .000 .006	40.091 .104 40.050 .052 .26 39.935 40.148	100.120 .264 100.000 .132 .26 99.726 100.286
Results in Ele Copy Std Dev: Published: Std Err: &Rel SD: #aximum: Copy Dele Copy 130 G 131 G	mental Weight Si .001 .002 n.a. .001 200.00 .000 .003 te Selected I Si .000 .000	Ti 59.946 .141 59.939 .071 .24 59.745 60.046 .ine(s) Ti 59.745 60.043	.016 .032 .011 .016 200.00 .000 .064 Undele Al .000 .000	V .014 .017 n.a. 020 .034 te Selected Lii V .020 .000	Cr .000 n.a. .000 .01 .000 .000 re(s) Cr .000 .000	Fe .007 .011 n.a. .005 161.92 .000 .023 Analyz Fe .004 .000	Mn .014 .016 n.a. .008 117.67 .000 .031 ze Selected Lin Mn .000 .000	Mg .02 .01 n.a .00 73.4 .00 .03 e(s) Mg .02 .02	Ca 1 .010 6 .012 n.a. 88 .006 46 122.05 10 .000 17 .025 Ca	Na .001 .003 n.a. .001 200.00 .000 .000 .000 .000 .000	40.091 .104 40.050 .052 .26 39.935 40.148 0 39.935 40.133	100.120 .264 100.000 .132 .26 99.726 100.286 Total 99.726 100.218
Results in Ele Copy Average: Std Dev: Published: Std Err: %Rel SD: Minimum: Maximum:	mental Weight Si .001 .002 n.a. .001 200,00 .000 .000 .003 te Selected I Si .000	Ti 59.946 .141 59.939 .071 .24 59.745 60.046 	.016 .032 .011 .016 200.00 .006 .064 Undele	V .014 .017 n.a. 000 122.70 .000 .034 te Selected Lii V .020	Cr .000 .000 n.a. .000 .000 .000 .000 Cr .000	Fe .007 .011 n.a. .005 161.92 .000 .023 Analyz Fe .004	Mn .014 .016 n.a. .008 117.67 .000 .031 ze Selected Lin Mn .000	Mg .02 .01 n.a .00 73.4 .00 .03 e(s) Mg .02	Ca 1 .010 6 .012 n.a. 18 .006 46 122.05 00 .000	Na .001 .003 n.a. .001 200.00 .000 .000 .006	40.091 .104 40.050 .052 .26 39.935 40.148 0 39.935	100.120 .264 100.000 .132 .26 99.726 100.286 Total 99.726

The user is ready to move on to unknown samples.

Manual Unknown Sample Data Collection and Analysis

To collect x-ray data on an unknown sample, bring forward the **Acquire!** dialog box and click the **Move** button. Enter the stage coordinates of the first unknown sample and click **Go All**, or use the cursor buttons in the *Stage Target Positions* section, or use the joystick to drive the stage, if available. Adjust the Z focus.

Stage Target X	Positions Y [Remove Fa	araday	Go All	Go Spectros
-13600.	-1074.1		Z Axis Adju		Positions	Stage
Z 64.9978		Increment		1.00	Auto	Focus
Jog S	tage	100.			Exchan	ge Sample
Use Stage B.	acklash	Park Stage	Update Po:	eitione	Filamer	nt Standby
			Free/Cl	ear	C	lose
		ns (Load Element	Free/Cl	ear	ements/Cal	lose
Spectrometer	Target Positior	ns (Load Element	Free/Cli Setups From Ac	ear cquire El	ements/Cal	lose
Spectrometer SP1	Target Positior SP2	ns (Load Element	Free/Cli Setups From Ac SP4	ear cquire El SF	ements/Cal	lose
Spectrometer SP1 TAP –	Target Position SP2	s (Load Element SP3 LPET V 38417.8	Free/Cli Setups From Ad SP4 TAP	ear cquire El SF LLIF	ements/Cal	lose
Spectrometer SP1 TAP –	Target Position SP2 LLIF – 56743.3	s (Load Element SP3 LPET V 38417.8	Free/Cli Setups From Ac SP4 TAP 27550.7	ear cquire El SF LLIF 48262	ements/Cal	lose tions Butto

Click the New Sample button in the Acquire! window to activate the New Sample dialog box.

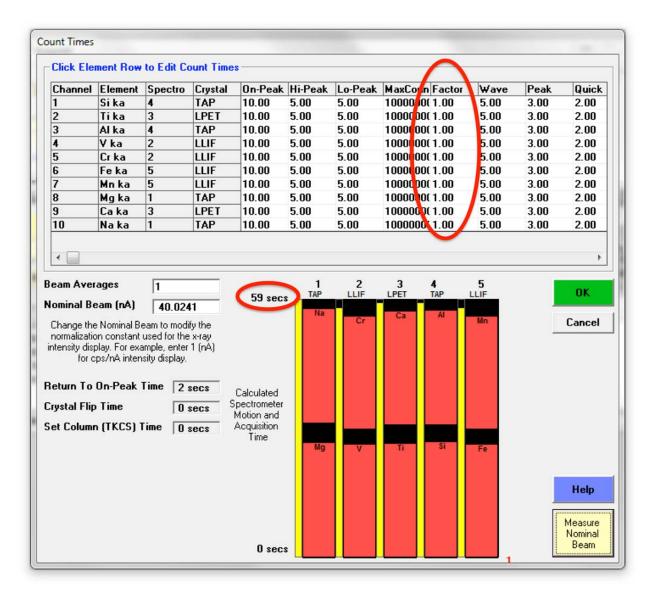
Check the *Unknown* button under *New Sample Type*. Enter an appropriate sample name and description into the *New Sample Name* and *New Sample Description* text boxes.

New Sample Type	OK	Cancel
 Unknown 	Load Elem	ent Setups
C Wavescan	Load Sam	ple Setup
	Load Fil	e Setup
Add/Remove Standards	Load Mult	iple Setup
make any necessary Load Wavescar	changes to the ele From Another Pro	1
Load Wavescar	-	ement setup.
Load Wavescar New Sample Name pyroxene 1	n From Another Pro	ement setup.
	n From Another Pro	ement setup. Ibe Run
Load Wavescar New Sample Name pyroxene 1 New Sample Description	n From Another Pro on	ement setup. be Run Add <cr></cr>

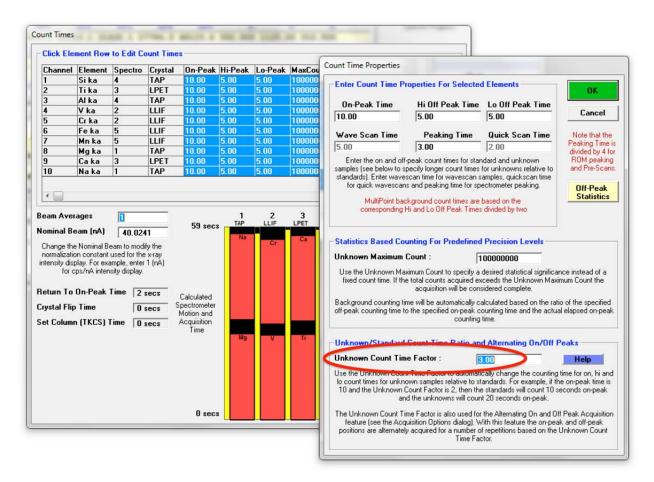
Click the **OK** button.

By default, all settings from the last measurement before will be loaded, in this case the standards acquisition using the pyroxene setup. Before starting the acquisition, any measurement conditions which don't require the acquisition of new standards can be changed, such as beam current and size in the **Analytical Conditions** window or count times, which can be increased to improve precision and detection limits for minor and trace elements.

Click on the **Count Times** button in the **Acquire!** window to launch the **Count Times** window. In this example, the *Unknown Count Time Factor (Factor)* in the **Count Times** window will be modified. This factor is a simple multiplication of the default count times (peak and backgrounds) on the standards. Currently this value, which is shown in the Factor column, is set to 1, leading to an estimated acquisition time of 59 seconds per point.



Left-click and drag the mouse across the rows in the table to select all elements. This opens the **Count Time Properties** window. In there, change the *Unknown Count Time Factor* from 1 to 3.



Click OK to return to the Count Times window.

The **Count Times** window now shows a new estimate of 142 seconds for a measurement of unknown.

1 Si ka 4 TAP 10.00 5.00 5.00 100000 (13.00 5.00 3.00 2.00 2 Ti ka 3 LPET 10.00 5.00 5.00 100000 (013.00 1.00 3.00 2.00 3 Al ka 4 TAP 10.00 5.00 5.00 10000 (013.00 1.00 3.00 2.00 3 Al ka 4 TAP 10.00 5.00 5.00 10000 (013.00 1.00 3.00 2.00 3 Cr ka 2 LLIF 10.00 5.00 5.00 10000 (013.00 1.00 3.00 2.00 5 Cr ka 2 LLIF 10.00 5.00 5.00 10000 (013.00 1.00 3.00 2.00 6 Fe ka 5 LLIF 10.00 5.00 5.00 10000 (013.00 1.00 3.00 2.00 7 Mn ka 1 TAP 10.00 5.00 5.00 100000 (013.00 5.00 3.00 2.00 10 Na ka 1 TAP	Channel	Element	Spectro	Crystal	On-Peak	Hi-Peak		MaxCou	Factor	Wave	Peak	Quick
3 Al ka 4 TAP 10.00 5.00 5.00 10000 00 3.00 2.00 4 V ka 2 LLIF 10.00 5.00 5.00 100000 1000000 1000000 100000 10	1	Si ka	-	TAP	10.00	Contract of the second second	-		and a second	5.00	and the second second	and the second
4 V ka 2 LLIF 10.00 5.00 5.00 10000 100 3.00 2.00 5 Cr ka 2 LLIF 10.00 5.00 5.00 10000 100 3.00 2.00 6 Fe ka 5 LLIF 10.00 5.00 5.00 10000 100 3.00 2.00 7 Mn ka 5 LLIF 10.00 5.00 5.00 10000 100 3.00 2.00 8 Mg ka 1 TAP 10.00 5.00 5.00 100000.01 3.00 3.00 2.00 9 Ca ka 3 LPET 10.00 5.00 5.00 100000.01 3.00 3.00 2.00 10 Na ka 1 TAP 10.00 5.00 5.00 100000.01 3.00 2.00 eam Averages 1 TAP 1.00 5.00 5.00 100000.01 3.00 2.00 Change the Nominal Beam to modify the normalization constant used for the x-ray tensity display. Calculated Spectrometer Motion and Acquisition						Contraction of the second					and the second	and the second second
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9 Ca ka 3 LPET 10.00 5.00 5.00 1000000 (3.00) 5.00 3.00 2.00 10 Na ka 1 TAP 10.00 5.00 5.00 1000000 (3.00) 5.00 3.00 2.00 eam Averages Image: the Nominal Beam (nA) 10.0109 1 2 3 4 5 0K Change the Nominal Beam to modify the normalization constant used for the x-ray intensity display. For example, enter 1 (nA) for cps/nA intensity display. Calculated Spectrometer Motion and Acquisition Calculated Spectrometer Motion and Acquisition Calculated Spectrometer Motion and Acquisition Image: Calculated Spectrometer Motion Im	-		-						and the second			
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eam Averages ominal Beam (nA) 10.0109 Change the Nominal Beam to modify the normalization constant used for the x-ray intensity display. For example, enter 1 (nA) for cps/nA intensity display. eturn To On-Peak Time 2 secs rystal Flip Time 0 secs Calculated Spectrometer Motion and Acquisition	1077 C. 1	and the second										and the product of the second
et Column (TKCS) Time O secs Acquisition	eam Ave ominal B Change th normalizati	eam (nA) e Nominal Bi on constant	10.010 eam to modif used for the	fy the x-ray	and the second se	TAP	LLIF	LPET	4 TAP	5 LLIF		,
Time Time	eam Ave ominal B Change th normalizati ntensity dis for o eturn To	eam (nA) e Nominal Bi on constant play. For exa ps/nA inten On-Peak	10.010 eam to modil used for the ample, enter sity display. Time 2 s	fy the x-ray 1 (nA) secs	2 mir Calculated	TAP	LLIF	LPET	4 TAP	5 LLIF		OK
	eam Ave ominal B Change th normalizati ntensity dis for o eturn To rystal Flip	eam (nA) e Nominal Bi on constant play. For exa ps/nA inten On-Peak	10.010 eam to modil used for the ample, enter sity display. Time 2 s 0 s	iythe x-ray 1 (nA) secs S	2 mir Calculated pectrometer Motion and	TAP	LLIF	LPET	4 TAP	5 LLIF		OK
Нер	eam Ave ominal B Change th normalizati ntensity dis for o eturn To rystal Flip	eam (nA) e Nominal Bi on constant play. For exa ps/nA inten On-Peak	10.010 eam to modil used for the ample, enter sity display. Time 2 s 0 s	iythe x-ray 1 (nA) secs S	2 mir Calculated pectrometer Motion and Acquisition	Na	Cr	Ca Ca	4 AI	5 LLIF Mn		OK

Further, the graphical spectrometer motion bars next to the time estimate indicate how efficient the usage of the spectrometers is. Spectrometer 2 needs more time compared to the other four spectrometers as off-peak backgrounds are acquired for both Cr and V. It would therefore be more efficient to either reduce counting times for Cr and/or V, or, as both are expected to be present only at minor to trace level in the unknown samples, extend counting times on the other spectrometers.

Adjust all count times as desired and click **OK** to return to the **Acquire!** window.

Click the **Start Standard or Unknown Acquisition** button in the **Acquire!** window to start the acquisition of the unknown.

SP1 SP2	SP3	SP4	SP5	х	Y	Z	Spectro	Progress
38499.0 62209.1	31430.1 27	7786.3 4	8115.6	300.000 112	5.00 31	0.500		
1-TAP 2-I	LIF 3-LI	PET 4	I-TAP	5-LLIF		Faraday		
9.16 9	9.14 9	.14	9.14	9.13		1		
138. 4	138. 4	99.	218.	291.		10.0132		æ
•		Dowe: 0			rt Waves	own Acquisition	300.000	1125.00
•	known Good Data F	Rows: O					um .000000	.000000
•					rt Waves			
Normal Acquisition Un Data Rows: 0 New Sample Elements/Cations	Good Data F	IA	- · · ·	Sta	rt Waves	can	_ um .000000 px 0	.000000 0 2533 Analog Spo
Data Rows: O New Sample	Good Data F PH Peak/Scar	IA n Options	- · · ·	Sta isition Options	rt Waves	can king Options	um .000000 px 0 Magnification Beam Mode	.000000 0 2533

Again, progress can be monitored in the **Acquire!** window. After completion of the measurement, move the stage to a different position and click the **Start Standard or Unknown Acquisition** button again to start another measurement. Repeat this procedure a third time so that three random spots are acquired on the same pyroxene sample.

Next, reopen or bring forward the **Analyze!** window. Click the *Unknowns* button under the *Sample List* buttons and highlight (select) *Un 2 pyroxene 1*.

Standards Un		ene elements	Analyze	Ra w Data	KRaws >>Excel	Combine Selec	is Lines From	
Unknowns Un	2 pyroxene 1		List Standard Intensities	Calculation	Options	Selected S Combine Data	Lines From	
C All Samples Select All		Pause Between S		atrix Corrections	Report	Selected Samples Sort Stat and Data Grids By Geological/Atomic Number		
Add To Setups Save Setups			Disable Select Enable Select		Match	Do Not Output		
	1		Combined Cond		unt Times	Combine the Sel into a New		
tandard Assignment	s Specified Concentra	Tota Calc	cription Condition	Total W Z - Bar Atomic V	5	Search For "Shared" Bgds Boundary C Create Mai	Remove "Shared" Bgd orrections	
Disable Selected	Line(s) Ena	ble Selected Line(s) Ana	lyze Selected Lin	e(s)			
py								
	-							

Click the **Analyze** button to calculate the results for these three points. The values are viewed below.

C Stand	and the second		lick to see inte		Ana	lyze I	Raw Data 📃	KRaws >Excel	Combine Selected				
· Unkno	UNITED STATES	1 * template 2 pyroxene	e for pyroxene	elements	List St	andard			Combine Analysis L Selected Sam				
○ Wave	scans					sities	Calculation O	otions	Combine Data Lin Selected Sam				
C All Sa Select	All					Pause Betwee Jse All Matrix		Report	Sort Stat and Data Geological/Atomic	Grids By			
Add T Setup Save Se	s					ble Selected S ble Selected S		Match F	Do Not Output To				
	Assignments	Specified	Concentrations		escription	ined Condition	Elements/0	Cations	Combine the Selecte into a New Sa Search For F				
1000 Contractor	ene 1 ∛ = 15, Beam ⊧ mental Weight I			43.583 C	otal Oxygen alculated Oxygen xcess Oxygen	99.56 12.49 21.87	3 Z·Bar		"Shared" Bgds "Sh Boundary Corre Create Materia	ctions			
Сору	Si	Ti	AI	٧	Cr	Fe	Mn	Mg	Ca	Na	0	Total	
verage:	23.829	.322	2.810	.025	.474	3.107	.066	9.62		.707	43.583	99.567	
td Dev:	.104	.002	.040	.011	.019	.025	.011	.013		.077	.104	.150	
AF Corr:	1.2648	1.1995	1.4264	1.2136	1.1844	1.1921	1.2131	1.485		1.9415			
td Err:	.060	.001	.023	.007	.011	.014	.007	.00		.045	.060	.087	
Rel SD:	.44	.73	1.43	45.36	4.10	.80	17.05	.14		10.95	.24	.15	
inimum:	23.725	.320	2.782	.018	.453	3.080	.057	9.61		.636	43.468	99.401	
laximum:	23.933	.324	2.857	.038	.492	3.129	.079	9.64	3 15.062	.789	43.673	99.693	
Dele	te Selected L	.ine(s)	Undelet	e Selected I	ine(s)	Analy	ze Selected Line	e(s)					
Сору	Si	Ti	AI	v	Cr	Fe	Mn	Ma	Ca	Na	0	Total	-
	23.933	.320	2.792	.038	.478	3.080	.057	9.62	3 15.062	.636	43.673	99.693	
882 G	23,830	.320	2.857	.019	.492	3.129	.063	9.61	8 14.977	.694	43.608	99.607	
882 G 883 G	23.030						.079	9.64	3 15.007	.789	43.468	99,401	

To set the software up to perform additional calculations, click the **Calculation Options** button.

This opens the **Calculation Options** dialog box. Make the following changes: under *Calculations Options* check the *Display Results as Oxides* and *Calculate Detection Limits and Sensitivity* boxes. Under *Formula and Mineral Calculations* check the *Calculate Formula Based On* box. Select *Pyroxene*, enter *6 Atoms of* in the text box, and select O (oxygen) from the drop down menu.

Un 2 pyroxene 1	OK Cancel
	EDS Calculation Data
	Do Not Use EDS Element Data O Use EDS Spectrum Element Data
	Assign EDS Spectral Elements
	☐ Integrated Intensity Data Options —
	C Do Not Use Integrated Intensities
	C Use Integrated Intensities
Display Results As Oxides	Calculate with Stoichiometric Oxygen Calculate as Elemental
Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges	
Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits	Calculate as Elemental
Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges	Calculate as Elemental
Display Results As Oxides Calculate Atomic 1 creents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) :	Calculate as Elemental
Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) :	Calculate as Elemental Use Particle/Film Calculations

Click the **OK** button to return to the **Analyze!** window. Click the **Analyze** button again.

The table in the Analyze! window now shows the formula units for the pyroxene formula calculation as below.

Constraints	and the group		lick to see inte	104270 12420 R	Ana	<mark>lyze</mark> F	law Data 📃	KRaws	_	nbine Selected S			
C Stand	Un	1 * template 2 pyroxene	e for pyroxene	elements	List Sta	ndard		>>Excel	Com	bine Analysis Lir Selected Samp			
Lana and a second	escans	2 pyroxene			Inten		Calculation O	ptions	Co	mbine Data Line	s From		
C All Sa Selec	amples				ГГР	ause Betweer	n Samples	Report		Selected Samp			
Add						se All Matrix C				t Stat and Data (plogical/Atomic)			
Setu	ips					le Selected S le Selected S		Match	□ Do	Not Output To I			
Save S	etups				Combi	ned Condition	s Count	Times	Comb	ine the Selected	d Samples		
Standard	Assignments	Specified	Concentrations	Name/De:	scription C	onditions	Elements/0	Cations		into a New San			
	.eV = 15, Beam =			43.583 Ca	tal Oxygen culated Oxygen cess Oxygen	99.56 12.49 21.87	3 Z·Bar		"Shar	rch For ed" Bgds "Sha Boundary Correc Create Material	tions		
Copy	lemental Weight I	Ti	AI	v	Cr	Fe	Mn	Ma		Са	Na	0	Total
verage:	1.869	.015	.229	.001	.020	.123	.003		373	.825	.068	6.000	10.025
td Dev:	.004	.000	.003	.000	.001	.001	.000		003	.002	.008	.000	.008
AF Corr:	1.2648	1,1995	1.4264	1.2136	1.1844	1.1921	1,2131	1.4	855	1.0854	1.9415		
td Err:	.002	.000	.002	.000	.000	.001	.000		002	.001	.004	.000	.005
Rel SD:	.21	.96	1.37	45.15	3.92	.93	17.30		37	.28	11.19	.00	.08
linimum:	1.866	.015	.227	.001	.019	.121	.002	3.	370	.823	.061	6.000	10.018
laximum:	1.873	.015	.233	.002	.021	.123	.003		376	.827	.076	6.000	10.034
(
Dele	ete Selected L	.ine(s)	Undelet	e Selected L	ine(s)	Analy	ze Selected Lin	ie(s)					
Сору	Si	Ti	AI	V	Cr	Fe	Mn	Mg		Ca	Na	0	Total
382 G	1.873	.015	.227	.002	.020	.121	.002		370	.826	.061	6.000	10.018
883 G	1.868	.015	.233	.001	.021	.123	.003	.8	371	.823	.066	6.000	10.023
884 G	1.866	.015	.228	.001	.019	.123	.003	.8	876	.827	.076	6.000	10.034
. —													
•												-	•

Additional data is written to the log window, which can be stored to a text file and viewed as described before, or simply be highlighted with the mouse and copied to the system clipboard with the key combination <Crtl>+C. The contents of the log window are shown on the following pages.

The user may obtain a large amount of information besides elemental and oxide weight percent data. These expanded capabilities include formula and mineral end member calculations, an extended set of detection limit and statistics including homogeneity and analytical sensitivity. See the User's Guide and Reference documentation for calculation details.

TakeOff (Magnif (Magnif Image S Number	ication ication hift (X, of Data	KiloVol (analyti (default Y): Lines:	cal) = .) = 3	2533), 2533, Ma N	B gnificat umber of	40.0 B Beam Mode ion (ima 'Good' 04/25/2	= Analo ging) = 50 Data Lin	g Spot 2533) , .00 es: 3			
Average Average	Excess		en: 43.	583 000	Average Average	Total We Atomic N Atomic W Quant It	umber: eight:	99.567 12.493 21.877 3.00			
Oxygen	Calculat	ed by Ca	tion Sto	ichiomet	ry and I	ncluded	in the M	atrix Co	rrection		
Un 2	pyroxen	le 1, Res	ults in	Elementa	l Weight	Percent	S				
SPEC: TYPE:	0 CALC										
AVER: SDEV:	43.583 .104										
ELEM: BGDS: TIME: BEAM:	Si MAN 30.00 40.11	Ti LIN 30.00 40.11	Al LIN 30.00 40.11	V LIN 30.00 40.11	Cr LIN 30.00 40.11	Fe MAN 30.00 40.11	Mn LIN 30.00 40.11	Mg MAN 30.00 40.11	Ca MAN 30.00 40.11	Na LIN 30.00 40.11	
ELEM: 382 383 384	Si 23.933 23.830 23.725	Ti .320 .320 .324	Al 2.792 2.857 2.782	V .038 .019 .018	Cr .478 .492 .453	Fe 3.080 3.129 3.112	Mn .057 .063 .079	Mg 9.623 9.618 9.643	Ca 15.062 14.977 15.007	Na .636 .694 .789	
AVER: SDEV: SERR: %RSD: STDS:	23.829 .104 .060 .44 602	.322 .002 .001 .73 539	2.810 .040 .023 1.43 609	.025 .011 .007 45.36 584	.474 .019 .011 4.10 631	3.107 .025 .014 .80 524	.066 .011 .007 17.05 509	9.628 .013 .008 .14 607	15.015 .043 .025 .29 602	.707 .077 .045 10.95 651	99.567 .150
STKF: STCT:	.1884 387.65	.5489 1658.01	.1277 272.03		.3856 169.81	.6539 460.67	.1612 107.33	.2085 336.16	.1386 336.12	.0392 43.93	
UNKF: UNCT: UNBG:	.1884 387.70 1.92	.0027 8.10 3.15	.0197 41.98 1.08	.0002 .07 .30	.0040 1.76 .42	.0261 18.36 .86	.0005 .36 .64	.0648 104.50 1.12	.1383 335.38 2.39	.0036 4.08 .47	
ZCOR: KRAW: PKBG: INT%:	1.2648 1.0001 202.96	.0049	1.4264 .1543 39.87 	.0002	.0104	1.1921 .0399 22.36 	1.2131 .0034 1.57 -1.31	1.4855 .3108 94.93 	1.0854 .9978 141.17 	.0928	
Un 2	pyroxen	le 1, Res	ults in	Oxide We	ight Per	cents					
SPEC: TYPE:	0 CALC										
AVER: SDEV:	.000										
ELEM: 382 383 384	SiO2 51.201 50.980 50.756	TiO2 .534 .534 .541	Al2O3 5.276 5.398 5.257	V2O3 .056 .028 .026	Cr2O3 .699 .719 .663	FeO 3.963 4.026 4.003	MnO .073 .081 .102	MgO 15.958 15.949 15.992	CaO 21.075 20.956 20.998	Na2O .857 .936 1.064	SUM 99.693 99.607 99.401
AVER: SDEV: SERR: %RSD: STDS:	50.979 .222 .128 .44 602	.536 .004 .002 .73 539	5.310 .076 .044 1.43 609	.037 .017 .010 45.36 584	.693 .028 .016 4.10 631	3.997 .032 .018 .80 524	.085 .015 .008 17.05 509	15.966 .022 .013 .14 607	21.009 .060 .035 .29 602	.953 .104 .060 10.95 651	99.567 .150

Un 2 pyroxene 1, Results Based on 6 Atoms of 0

SPEC: TYPE:	0 CALC										
AVER: SDEV:	6.000										
ELEM: 382 383 384	Si 1.873 1.868 1.866	Ti .015 .015 .015	Al .227 .233 .228	V .002 .001 .001	Cr .020 .021 .019	Fe .121 .123 .123	Mn .002 .003 .003	Mg .870 .871 .876	Ca .826 .823 .827	Na .061 .066 .076	SUM 10.018 10.023 10.034
AVER: SDEV: SERR: %RSD:	1.869 .004 .002 .21	.015 .000 .000 .96	.229 .003 .002 1.37	.001 .000 .000 45.15	.020 .001 .000 3.92	.123 .001 .001 .93	.003 .000 .000 17.30	.873 .003 .002 .37	.825 .002 .001 .28	.068 .008 .004 11.19	10.025 .008
Pyroxene	e Mineral	. End-Mem	ber Calo	culations							
382 383 384	Wo 45.4 45.3 45.3	En 47.9 47.9 48.0	Fs 6.7 6.8 6.7								
AVER: SDEV:	45.3 .1	47.9 .1	6.7 .1								
Detectio	on limit	at 99 %	Confider	nce in El	emental	Weight I	Percent (Single L	ine):		
ELEM: 382 383 384	Si .009 .009 .009	Ti .008 .007 .007	Al .007 .008 .007	V .019 .021 .019	Cr .018 .019 .018	Fe .017 .017 .017	Mn .016 .015 .015	Mg .010 .010 .011	Ca .007 .007 .007	Na .013 .012 .013	
AVER: SDEV: SERR:	.009 .000 .000	.007 .000 .000	.007 .000 .000	.020 .001 .001	.018 .000 .000	.017 .000 .000	.015 .000 .000	.010 .000 .000	.007 .000 .000	.013 .001 .000	
Percent	Analytic	al Relat	ive Erro	or (One S	igma, Si	ngle Lir	ne):				
ELEM: 382 383 384	Si .2 .2 .2	Ti 1.7 1.7 1.6	Al .6 .6	V 25.9 53.1 52.6	Cr 3.2 3.2 3.3	Fe .9 .9 .9	Mn 14.6 12.9 10.7	Mg .3 .3 .3	Ca .2 .2 .2	Na 2.1 1.9 1.8	
AVER: SDEV: SERR:	. 2 . 0 . 0	1.7 .0 .0	.6 .0 .0	43.9 15.6 9.0	3.2 .1 .0	.9 .0 .0	12.7 2.0 1.1	.3 .0 .0	.2 .0 .0	1.9 .1 .1	
Detectio	on Limit	(t-test)	in Eler	mental We	ight Per	cent (Av	verage of	Sample)	:		
ELEM: 60ci 80ci 90ci 95ci 99ci	Si 	Ti .001 .002 .004 .005 .012	Al 	V .008 .014 .022 .033 .076	Cr .016 .028 .044 .065 .149	Fe 	Mn .009 .015 .024 .035 .080	Mg 	Ca 	Na .062 .111 .171 .252 .582	
Analytic	cal Sensi	tivity (t-test)	in Eleme	ntal Wei	ght Pero	cent (Ave	rage of	Sample)	:	
ELEM: 60ci 80ci 90ci 95ci 99ci	Si .099 .177 .274 .403 .931	Ti .001 .002 .003 .004 .010	Al .037 .065 .101 .149 .343	V .002 .003 .005 .008 .018	Cr .014 .025 .039 .058 .133	Fe .022 .038 .059 .088 .202	Mn .003 .006 .009 .013 .030	Mg .010 .018 .028 .042 .096	Ca .038 .068 .105 .155 .357	Na .061 .109 .169 .249 .575	

Digitized Sample Data Collection and Analysis

Acquisition of data on unknown samples can also be automated. As an example the user will perform a digitized traverse across an unknown pyroxene grain. The user can digitize standards, unknowns or wavescan positions based on random points, linear traverse or rectangular or polygon gridded areas. Check that the *Unknowns* button is clicked in the **Automate!** window.

👎 Automate!				
Position List (multi-select) (double-click C Standards	Move Stage	Automation Actions		
Unknowns Wavescans All Samples	Digitize	Confirm Unknown Positions		
	Plot	Peak Spectrometers Peaking Acquire Standard Samples Acquire Unknown Samples		
Select Stds Select All	ect All Replicates			
Go	Conditions	Acquire Standard Samples (again)		
Auto Focus Update	Sample Setups	Peak on Assigned Standards □ Use "Quick" Standards		
Delete All Re-Load				
Delete Selected Samples Delete Selected Positions	Import from ASCII (*.POS File) Export Selected Samples (to *.POS)	Use Beam Deflection For Position Suppress ROM Based Backlash Confirm All Positions In Sample		
Row X Y Z	W Grain # Focus	Combine Multiple Sample Setups Use ROM Auto Focus New Sample C Every Point Digitized Interval 5 Standard Points To Acquire 3 Automate Confirm Delay (sec) 10 Standard X Increment (um) 0 Re-Standard Y Increment (um) 0 Re-Standard Interval (hrs) 6 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups Use Digitized Multiple Setups Use Digitized Multiple Setups		
		Run Selected Samples		

Click the **Digitize** button in the **Automate!** window.

This opens the **Digitize Sample Positions** dialog box.

To create an unknown digitized sample, click *Unknown* under *Sample Type* and enter a sample name in the *Unknown or Wavescan Position Samples* text box. Next, click the **Create New Unknown or Wavescan** button. The unknown sample will now appear in the *Position List* list box of the **Automate!** window. Finally, click the **Linear Traverse** button to create a traverse of digitized points.

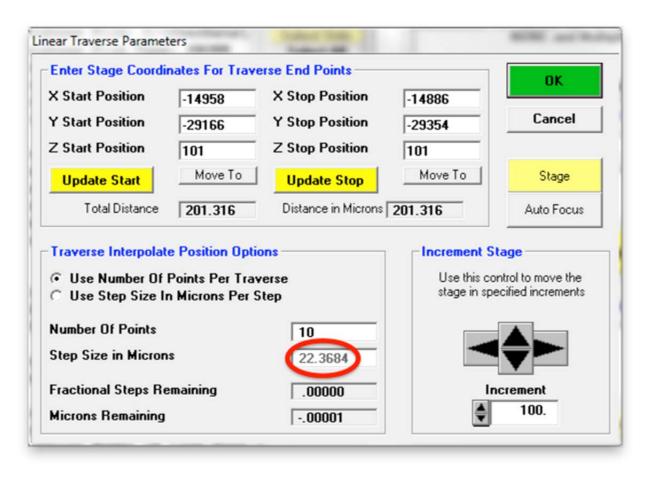
Digitize Sample P	ositions	
Sample Type Clandard Unknown Wavescan	To create a new unknow Unknown Sample Type opti and click the Create New U button. To create a new sta Standard Sample Type optic from the Star	on, enter a sample name Jnknown or Wavescan ndard position, click the on and select a standard ndard List.
Referenced To Fic NC	ducial Set: O, Setup Numb INE and Multiple Setups:	er: 0 and File Setup: NONE
Positions	PictureSnap	Stage
Unknown or Way	vescan Position Samples (I	Name/Description) —
pyroxene travers	e	
pyroactic durets		
		~
		*
Add New Unkr	nown To Position List	- Auto Increment
Add New Unkr	nown To Position List	Auto Increment Auto Digitize
Add New Unkr	nown To Position List	
	ſ	Auto Digitize 1
	nown To Position List	Auto Digitize 1
- Standard Compos	sitions Added To Run (sele	Auto Digitize 1
Standard Compose 12 MgO synthe 13 Al2O3 synthe	sitions Added To Run (sele tic tetic	Auto Digitize 1
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe	sitions Added To Run (sele tic tetic etic	Auto Digitize 1
Standard Compose 12 MgO synthe 13 Al2O3 synth 14 SiO2 synthe 22 TiO2 synthe	sitions Added To Run (sele tic tetic tic tic	Auto Digitize 1
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe	sitions Added To Run (sele tic tetic tic tic	Auto Digitize 1
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe 22 TiO2 synthe 23 V2O3 synthe	sitions Added To Run (sele tic tetic etic etic etic etic	Auto Digitize 1
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe 22 TiO2 synthe 23 V2O3 synthe	sitions Added To Run (sele tic tetic tic tic	Auto Digitize 1
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe 22 TiO2 synthe 23 V2O3 synthe Add	sitions Added To Run (sele tic tetic tic tic etic etic etic	Auto Digitize 1 ect to create new)
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe 22 TiO2 synthe 23 V2O3 synthe Add	sitions Added To Run (sele tic tetic tic tic etic etic /Remove Standards To/Fr	Auto Digitize 1
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe 22 TiO2 synthe 23 V2O3 synthe Add	sitions Added To Run (sele tic tetic tic tic etic etic etic	Auto Digitize 1 ect to create new)
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe 22 TiO2 synthe 23 V2O3 synthe Add. 1 Incre	sitions Added To Run (sele tic tic tic tic etic /Remove Standards To/Fr ement Grain	Auto Digitize 1 ect to create new) om Run gitized AutoFocus Number Size
Standard Compose 12 MgO synthe 13 Al2O3 synthe 22 TiO2 synthe 23 V2O3 synthe Add. 1 Increase Single P	sitions Added To Run (sele tic tetic etic etic etic etic etic eti	Auto Digitize 1 ect to create new) om Run gitized AutoFocus Number Size otgun 12 40
Standard Compose 12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe 22 TiO2 synthe 23 V2O3 synthe Add. 1 Incre	sitions Added To Run (sele tic tetic etic etic etic etic etic eti	Auto Digitize 1 ect to create new) om Run gitized AutoFocus Number Size
Standard Compose 12 MgO synthe 13 Al2O3 synthe 22 TiO2 synthe 23 V2O3 synthe Add. 1 Incree Single P Linear Tr	sitions Added To Run (sele tic tic tic etic	Auto Digitize 1 ect to create new) om Run gitized AutoFocus Number Size otgun 12 40 Rectangular Grid
Standard Compose 12 MgO synthe 13 Al2O3 synthe 22 TiO2 synthe 23 V2O3 synthe Add. 1 Increase Single P	sitions Added To Run (sele tic tic tic etic	Auto Digitize 1 ect to create new) om Run gitized AutoFocus Number Size otgun 12 40
Standard Compose 12 MgO synthe 13 Al2O3 synthe 22 TiO2 synthe 23 V2O3 synthe Add. 1 Increase Single P Linear Tr Digitize	sitions Added To Run (sele tic tic tic etic	Auto Digitize 1 ect to create new) ect to cr

Note: Other available digitization options include rectangular and polygon grids as well as clusters of random points. The user can also digitize positions from an image acquired on the microprobe, or load a previously scanned image file for stage position calibration and then digitize samples on that image via the **PictureSnap!** menu.

The **Linear Traverse Parameters** dialog box opens. Move to the start position of the linear traverse, and click the **Update Start** button. Move to the stop position and click the **Update Stop** button. The *Total Distance* is displayed.

ear Traverse Paramet		erse End Points		MORE and the
X Start Position Y Start Position Z Start Position	-14958 -29166 101	X Stop Position Y Stop Position Z Stop Position	-14886 -29354 101	OK Cancel
Update Start Total Distance	Move To	Update Stop Distance in Microns	Move To 201.316	Stage Auto Focus
• Use Number Of • Use Step Size In	Points Per Tra	verse		tage ntrol to move the ecified increments
Number Of Points Step Size in Micron	s	10 22.3684		
Fractional Steps Re Microns Remaining	emaining	.00000	lr I	ncrement 100.

Select *Use Number of Points Per Traverse* or and type 10 into the *Number of Points* text box. The *Step Size in Microns* is calculated.



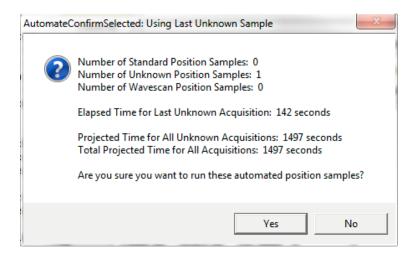
Click the **OK** button to add the 10-point traverse to the position list and return to the **Automate!** window.

Now all of the calculated analysis positions have been digitized and listed. Under Automation Actions click the Acquire Unknown Samples button.

Automation Actions Confirm Standard Positions Confirm Unknown Positions Confirm Wavescan Positions Plot Confirm Wavescan Positions Peak Spectrometers Peaking Acquire Standard Samples Acquire Unknown Samples Acquire Standard Samples Confirm Wavescan Samples Confirm Wavesc
Confirm Standard Positions Confirm Unknown Positions Confirm Wayescan Positions Plot ducials eplicates Acquire Standard Samples Acquire Unknown Samples Acquire Standard Samples
Inigitize Confirm Wavescan Positions Plot Peak Spectrometers Peaking ducials Acquire Standard Samples eplicates Acquire Standard Samples (again) nditions Automation Options
Plot Plot Acquire Standard Samples Acquire Unknown Samples Acquire Standard Samples Acquire Standard Samples Acquire Standard Samples (again) nditions
Plot Acquire Standard Samples Acquire Unknown Samples Acquire Wersseam Samples Acquire Standard Samples Acquire Standard Samples (again) Automation Options
ducials Acquire Unknown Samples Acquire Wetterson Samples Plicates Acquire Standard Samples (again) Advice Standard Samples (again)
Acquire Standard Samples (again)
nditions Automation Options
ole Setups 🛛 🔽 Peak on Assigned Standards
e Setups Use "Quick" Standards
Dele Setups Vise Confirm During Acquisition
Use Beam Deflection For Position
File) Suppress ROM Based Backlash
• *.POS) Confirm All Positions In Sample
Focus
0 Use ROM Auto Focus 0 • New Sample C Every Point
0
0 C Digitized C Interval 5
0 Standard Points To Acquire
0 Standard Points To Acquire 4
0 Automate Confirm Delay (sec) 10
0 Standard X Increment (um) 15
0
0 Re-Standard Y Increment (um) 6
0

Click **Run Selected Samples** button to initiate the traverse.

The AutomateConfirmSelected window opens. Click Yes.



When the traverse is completed the familiar **AcquireStop** window appears.

AcquireStop	Easter from -	
•	Automation Completed	
	ОК	

Click the **OK** button returning the user to the **Automate!** dialog box.

To analyze the data obtained from the traverse, again open the **Analyze!** window, select the *Un 3 pyroxene traverse* sample in the *Sample List*, and process the data in a similar way as before.

-Sample I	List (multi-sel	ect) (double-o	click to see inte	nsity data)	_			KBaws	Combine Sele	ated Country		
C Stand			e for pyroxene		An	alyze	Raw Data	>>Excel	Combine Sele			
🕫 Unkn	owns Un	2 pyroxene	1	cicilicittà		andard	Calculation	and the second	Selected	Samples		
	amples	5 pyroxerie	udfelse.			nsities			Combine Dat Selected			
Selec Add							een Samples ix Corrections d Sample(a)	Report	Sort Stat and Geological/At			
Setu Save S						ible Selecte		Match	🗖 Do Not Outpu	ut To Log		
	,	1		1		bined Condit		int Times	Combine the Se into a Ner			
	Assignments	Specified	Concentrations		otal Oxygen	Conditions	Elements		Search For "Shared" Bods	Remove "Shared" Rada		
	keV = 15, Bean	= 40, Size = 1	10		alculated Oxyge		489 Z · Bar	cigin /e	Boundary (and the second se		
Results in E	lemental Weigh	t Percent	•		xcess Oxygen		.872 Atomic \	√eight	Create Ma			
Сору	Si	Ti	AI	v	Cr	Fe	Mn	Mg	Ca	Na	0	Total
verage:	23.898	.324	2.816	.029	.454	3.093	.063	9.567	7 15.001	.687	43.603	99.535
td Dev:	.041	.005	.023	.010	.015	.022	.011	.036	.033	.044	.084	.212
AF Corr:	1.2642	1.1996	1.4253	1.2137	1.1846	1.1922	1.2132	1.485	0 1.0855	1.9413		
td Err:	.013	.002	.007	.003	.005	.007	.003	.011	.010	.014	.026	.067
Rel SD:	.17	1.52	.82	34.84	3.33	.70	17.14	.37	.22	6.33	.19	.21
linimum:	23.837	.318	2.774	.012	.437	3.040	.048	9,500	3 14.947	.635	43.476	99,169
aximum:	23.966	.336	2.842	.044	.481	3.115	.079	9.63	15.050	.766	43.708	99.792
Dele	ete Selected	Line(s)	Undelete	Selected Li	ne(s)	Anal	ze Selected Line	e(s)				
Сору	Si	Ti	AI	v	Cr	Fe	Mn	Mg	Ca	Na	0	Total
388 G	23.890	.320	2.785	.024	.457	3.073	.051	9.50	3 14.947	.638	43.476	99.169
389 G	23.869	.322	2.774	.042	.441	3.098	.057	9.526		.746	43.509	99.347
390 G	23.966	.324	2.797	.012	.481	3.115	.062	9.593	3 15.037	.697	43.708	99.792
391 G	23.886	.336	2.825	.021	.446	3.105	.054	9.574	15.050	.635	43.605	99.538
392 G	23.915	.322	2.815	.024	.457	3.104	.079	9.567	7 15.020	.674	43.630	99.609
393 G	23.886	.318	2.834	.027	.437	3.106	.074	9.63	15.010	.766	43.672	99.761
555 G	23.857	.326	2.832	.024	.437	3.093	.061	9.53	9 14.994	.654	43.528	99.345
	23.837	.327	2.842	.034	.449	3.096	.048	9.565	5 14.977	.676	43.541	99.393
394 G	23.923	.321	2.834	.038	.476	3.104	.075	9.596	5 14.991	.676	43.677	99.711
394 G 395 G		.323	2.821	.044	.456	3.040	.070	9.56	3 15.019	.713	43.683	99.691
394 G 395 G 396 G	23.955	.525										
394 G 395 G 396 G 397 G	23.955	.525										•

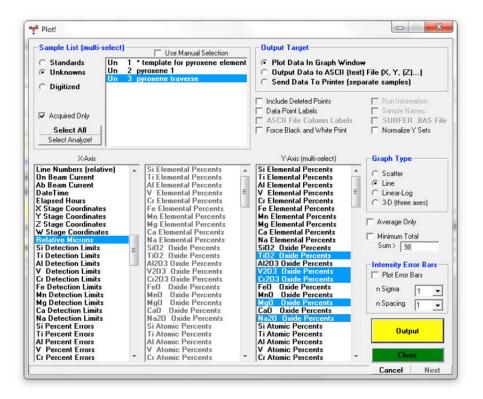
The next two sections will illustrate more powerful options to plot and export analysis data.

Plotting Analysis Data

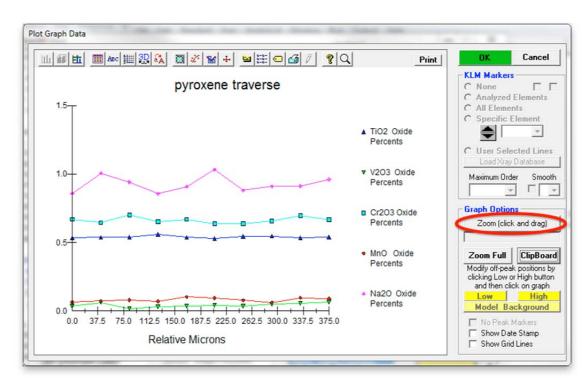
The user may wish to examine the traverse data in a graphical presentation. Return to the main PROBE FOR EPMA log window and select **Output** from the menu bar again and select **Output Standard and Unknown Plots** from the menu:

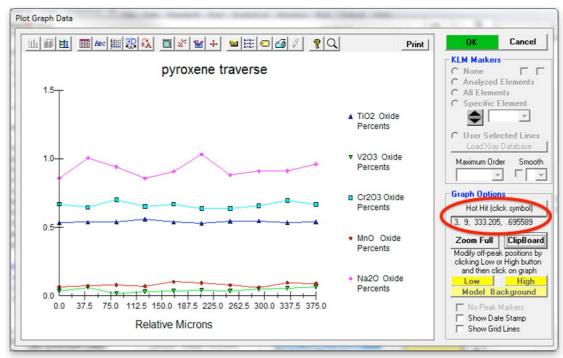
File Edit	Standard	X-Ray Ar	nalytical W	Vindow Run O	utput Help	
	Acqui	rel		<	Output Standard and Unknown Plots	
BGDS:	LIN	LIN	LIN	LIN	Output Automatic Traverse Plots	
SPEC: CRYST:	4 TAP	3 LPET	4 TAP	2 LLIF	Output Automatic Ternary Plots	
ORDER:	1	1	2	1	Save User Specified Format Output (Output only the data types specified by the user)	
ONTIM: HITIM:	10.00	10.00	10.00	10.00 5.00	Save Custom Analysis Output	
LOTIM: UNFAC:	5.00	5.00	5.00	5.00	Save Wavescan Output	
ONTIME	30.00	30.00	30.00	30.00	Save Images to BMP Files (Output all images via clipboard to save current drawing objects)	
LOTIME	15.00	15.00	15.00	15.00	Save Multi-Point Position and Intensity Data (Output multi-point background intensity data and related parameters)	
Miscella	aneous Sa	ample Aco	quisitio	n/Calculat	Save Time Dependent Intensities (TDI), (Output based on sample names)	
RILO:	15.00	15.00	15.00	15.00	Save All EDS Spectra To EMSA (Output all EDS spectra to EMSA format files)	
ENERGY EDGE :	1.740	4.509	1.487	4.950 5.466	Save All CL Spectra To EMSA (Output all CL spectra to EMSA format files)	
Eo/Ec: STDS:	8.16	3.02	9.62	2.74 23	Save Trace Element Average Statistics, (Output to single file)	
					Save Homogeneity Calculations, (Output to single file)	
Column: R	aadu				Save U, Th, Pb Age Calculations, (Output to single file)	
coluinn: h	eauy				Save Hanchar-Montel Geochron Calculations, (Output to single file)	

First, choose the pyroxene traverse from the *Sample List* list box. Select *Relative Microns* for the *X-Axis*. To plot for example the data for all minor elements in the pyroxene sample, ctrl-click to multi-select *TiO2*, *V2O3*, *Cr2O3*, *MnO*, and *Na2O* oxide percents in the *Y-Axis* list. Select a *Graph Type* and the button *Send Data to Plot Window*. Finally, click the **Output** button.



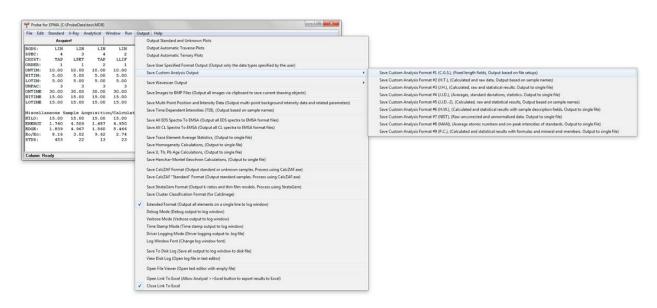
This opens the **Plot Graph Data** window with the graph of the selected data. Clicking the **Zoom** button toggles its function with the **Hot Hit** mode, in which the weight percent concentration may be read directly by clicking on a point and reading the corresponding values in the box below the **Hot Hit** button. Any graph may be directly output using the **Print** button.





Output of Analyzed Data

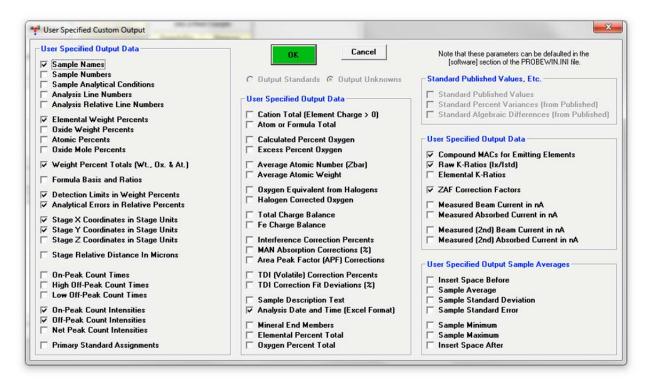
In addition to saving and viewing the log window output, which has already been discussed, a wide variety of other output options are available to the user and can be accessed through the **Output** menu of the main window of PROBE FOR EPMA. These include customized analysis output, saving to an ASCII file and sending data to Excel directly. Note that all raw data is always automatically saved in the .MDB run file for future re-calculation and /or output.



The most flexible output procedure is the *User Specified Format Output*, which is also accessible directly in the **Analyze!** window. Select the range of samples from the *Sample List* of the **Analyze!** window to be output to file. Then right click in the *Sample List* and choose *Export Selected Samples To User Specified Format Output*.

Standards Un 1 * tem	ele-click to see intensity data)	Analyze	Raw Data	KRaws >>Excel	Combine Selected Samples	
Unknowns Un 2 pyrox Un 3 pyrox	kene 1	List Standard	Calculation		Combine Analysis Lines From Selected Samples	
C All Samples Select All Add To Setups Save Setups	Export Selected Samples To Cust Export Selected Samples To Cust Export Selected Samples To User Output Automatic Traverse Plots Output Automatic Ternary Plots Export Selected Samples To Cust	om Analysis Format # Specified Format Out	9 (P.C.) (Calcul put (Output onl	ated and sta y the data ty	tistical results with formulas ar	
	Export Selected Samples To Calc	ZAF Analysis Format (1	for CalcZAF imp	oort)	we water in a state of the second	
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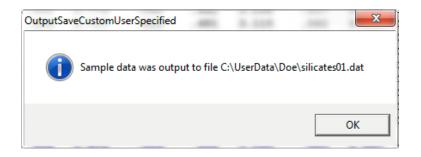
This opens the User Specified Custom Output window. Select the data types to export.



Click **OK**. This opens the **Open File To Save ASCII Data To** dialog box. Choose a file name and click **Save**.

Save in:	Doe	-	+ 🗈 💣 🛛	· #
Name	A :		Date modified	т в
	Ho Kellis Ha	tch your search		
•	m			•
< File name:	m silicates01.dat			Save

The software will then reanalyze the selected samples and write the results to the specified file. On completion, the following message box is displayed.



Click **OK**. Next, the following dialog box is displayed, asking the user if the data should be sent directly to Excel.

OutputSaveCustom	2SendToExcel		×
🕐 Do you	want to send the cust	om output data fi	les to Excel?
	Yes	No	Cancel

If Excel is installed, click **Yes**. The data will then directly be opened in a new Excel spreadsheet for saving and/ or further processing.

Closing the Current Run and Probe for EPMA

To end the analysis session from the main PROBE FOR EPMA log window, select **File** from the menu bar and click **Close** from the menu selections.

🌱 Pi	obe for EPMA [C:\UserData\Doe\silicates01.MDB]						x
File	Edit Standard Xray Analytical Window Run	Output	Help			-	
	New			Automa	ite!	Plot!	
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	Probe for EPMA Quick Start Guide						
	Probe for EPMA Frequently Asked Questions						
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This opens the ProbFormCloseFile window. Click Yes to close this file.

ProbFormC	CloseFile	1.0 40.0	-	X
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L		Yes	5	No

)	Edit Standard Xray Analytical Window R	un Output	Help	
	New		Automate!	Plot!
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	Print Log	Ctrl+P		
	Print Setup			
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	Probe for EPMA Frequently Asked Questions			
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	C:\UserData\Doe\silicates01.MDB			
	C:\UserData\Doe\silicates01_wavescans+Px.MDB			
	C:\UserData\Doe\silicates01_wavescans.MDB			
	C:\UserData\Doe\silicates01_rutile_meas.MDB			

Finally, close PROBE for EPMA by selecting **File** from the menu bar and clicking **Exit**.