FRIB

SpecTk Documentation

Daniel Kaloyanov

Research Assistant
kaloyano@frib.msu.edu

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MICHIGAN STATE UNIVERSITY

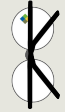U.S. DEPARTMENT OF ENERGY | Office of Science

Directory

Versions

Version 1.8.8 can be found Here or Locally at lisedev\Projects\SpecTk_Versions

- 1.3.2
  - Fixed 3 bugs
- 1.3.3
  - Page Reordering
- 1.4.0
  - Improvements to Page Reordering
  - Added a disable option
- 1.4.1
  - Added the Unstick tool
  - Spectrums no longer disappear when changes are made in SpecTcl
- 1.4.2
  - Added an Append option
  - Improvements to Performance
- 1.4.3
  - Added Remove Appended
  - Added the Disconnect and Reconnect option to refresh SpecTcl connection
  - Added ROI Print

- 1.5.0
  - Added "Safe Mode"
  - Added Purge
- 1.5.1
  - Grid Button added
  - Refresh Tool added
  - Added the SpecTk logo
  - Fixed the Clear selected/page options
- 1.6.0
  - Addressed a graphing bug in SpecTk
- 1.6.1 - 1.6.2
  - Fixed another graph display bug
  - Fixed a bug with changed directories
- 1.6.3
  - Added Xamine Import and Export options
- 1.6.4
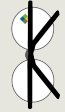 - Added a help tool page
  - 30% improvement to config load times

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Directory 2

Versions

- **1.6.5-1.6.9**
  - 3 Bug fixes
  - Added the auto update dialog
- **1.7.0**
  - SpecTk can create pages with Upper-Case names
- **1.7.1**
  - Added Reset and Restart Options
- **1.7.2 & 1.7.3**
  - Added auto Gating
- **1.7.4**
  - Added Covariance and Angle Statistics
  - Added an ellipse auto Gate option
- **1.7.5**
  - Improved auto gating speeds
- **1.7.6**
  - Bug Fixes
- **1.7.7**
  - Tweaks to Statistics Display

- **1.7.8**
  - Added the advanced calc option
  - Added a limit to the time auto gating could take
- **1.7.9**
  - Fixed an Xamine import issue
  - Allow autogating an ROI
- **1.7.10 & 1.7.11**
  - Added slope to the advanced calculations display
  - More tweaks to the Stat display
- **1.8.0, 1.8.1, 1.8.2 & 1.8.3**
  - Tweaks to the statistics display
  - General Fixes
- **1.8.4**
  - Added 2D fitting (Gaussian & Polynomial)
- **1.8.5**
  - Added the marker tool
- 1.8.6
  - Corrected the python issue seen in Linux
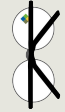- 1.8.7
  - Added 2D ellipse fit
  - General improvements

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Versions

Version 1.8.8 can be found Here or Locally at lisedev\Projects\SpecTk_Versions

- 1.8.8
  - Added an undo button for superimposition
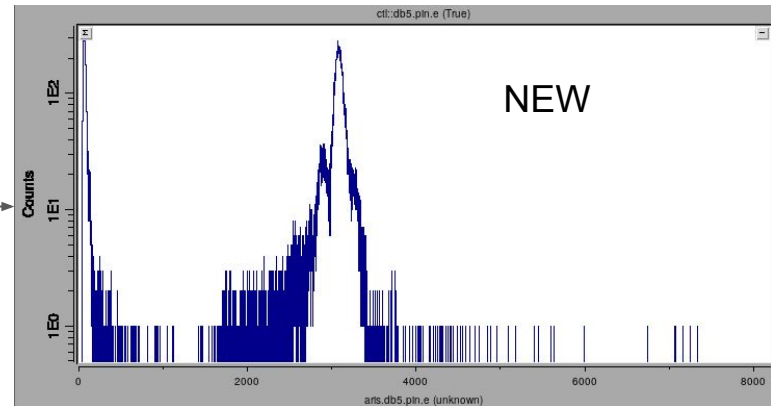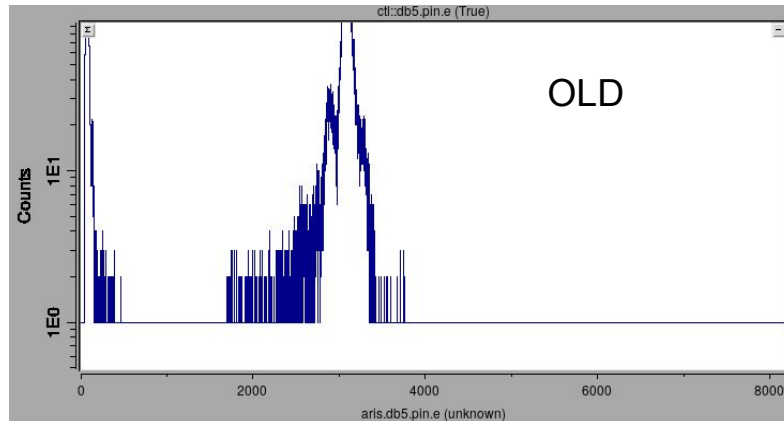 - Created the superimpose function here

SpecTk 1.3.2

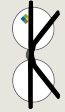## Bugs

- When Working with a 2D spectra the pressing the minus button would throw and error
- 1D log display wouldn't display properly
- 1D ROI fit

## Fixes

- All spectrums were renamed to no longer contain two sets of colons
- A slight offset of 1e-9 was added to all 1D channels

OLD

NEW

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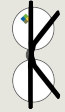Michigan State University

Page Reordering

- Reorder
  - Opens a window that lets the user select the order they want the page tabs to appear in
  - Configs are backward and forward compatible
- Alphabetical
  - Aligns the page tabs in alphabetical order
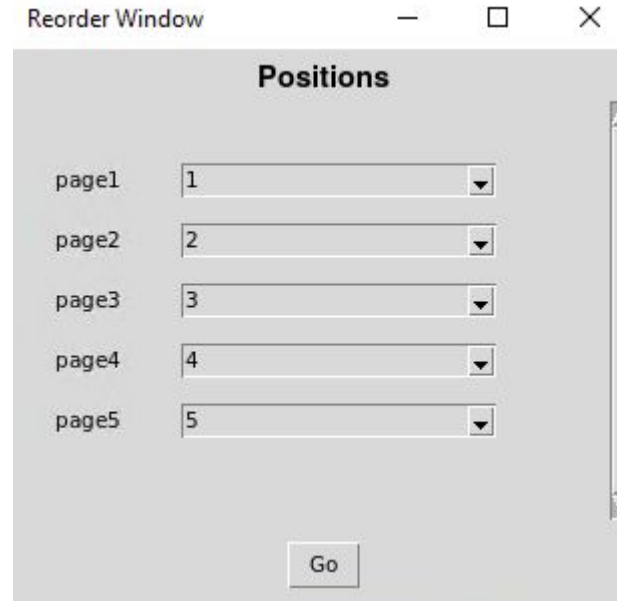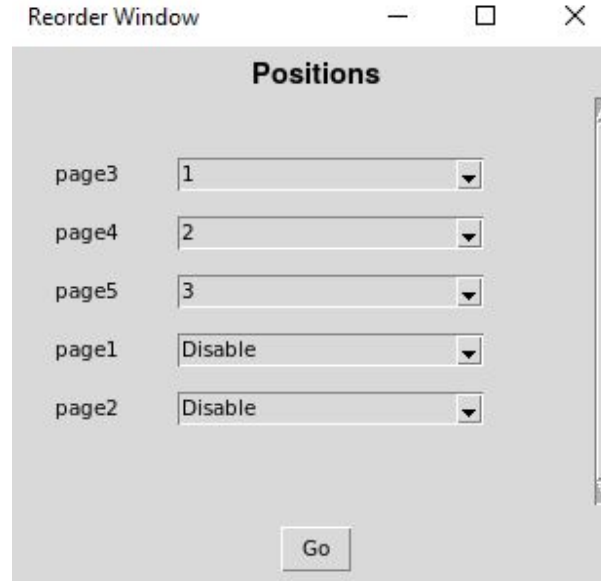
SpecTk 1.4.0/1.4.1

Improvements

- Updates to the UI
- Added an event check to make sure no pages could have the same position
- Fixed a bug with the client code now when a change is made in SpecTcl spectrums won't disappear
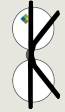
Disable

- It is important to make a backup of your config before using any new features
- You can Disable as many tabs as you would like
- Enabling is as easy as going into the Reorder window and just giving them a number

Unstick

- Updates the Spectrum buttons when they get stuck

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SpecTk 1.4.2/1.4.3

Append

- Before appending files there are two things too check:
    - Make sure the configs don't have matching page names
    - Makes sure they don't have matching spectrums
- Appending involves going into the file menu and selecting append then selecting the file
- If a save occurs while the file is still appended the appended file will merge with the original
- You can remove the appended file with the removed appended option under the tools menu
- If a new page was added during the merge it will stay
- Append works with as many configs as desired

Additions

- Remove appended option under remove tools
- Disconnect and Reconnect option (refreshes SpecTcl connection)
- ROI Print option
   - Outputs all ROIs present to a csv file
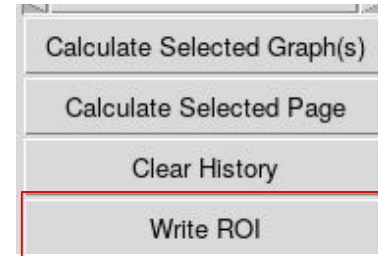
SpecTk 1.5.0

Safe Mode

- Checks to see if there is an empty ROI in the config file and removes it
- adds very little load time
- Is on if the Safe Mode box is checked

Purge

- Located under Tools->Remove Tools
- Currently (v1.4.4 and earlier) waves are permanent
- Causes longer load time and increased memory use
- Purge will remove all waves not currently displayed, and their ROIs
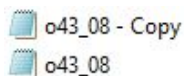
o43_08 - Copy	2/14/2024 2:19 PM	SPK File	412 KB Ln 10786, Col 1
o43_08	2/14/2024 2:17 PM	SPK File	723 KB Ln 15588, Col 1

- 30% reduction in lines of code (config files are code)
- 45% reduction in file size

SpecTk 1.5.1

Grid Button

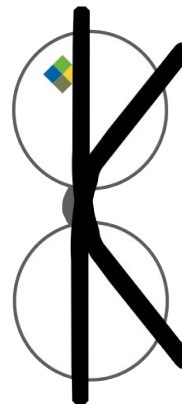- Added a button that lets grids be applied to all selected displays
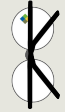
Refresh Displays

- Displays often get stuck and don't allow the user to click on displays and change them
- Added a new tool that lets the user refresh all displays on a page
- When pressed it will quickly parse through all displays refreshing them

Quality of Life

- Fixed the clear selected and clear page buttons
  - They no longer throw errors and will remove the data of selected displays/pages
- Added a dialog for ROI Write
  - Allows the user to choose file name and directory
- Created and implemented a icon for SpecTk
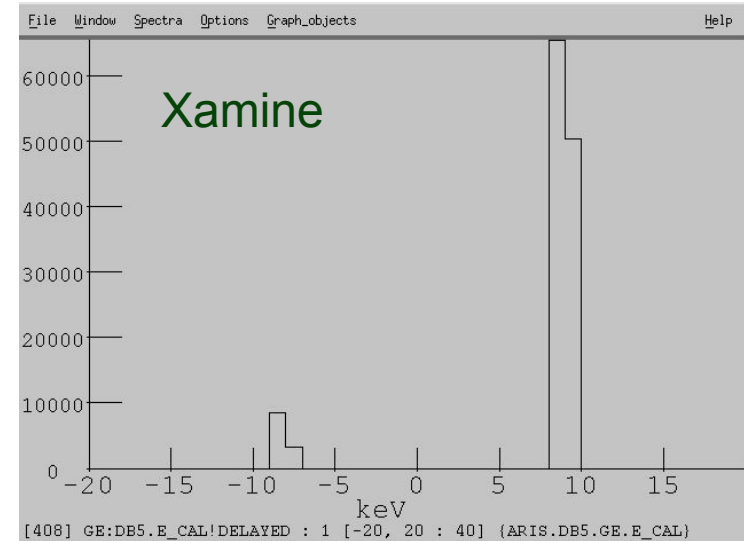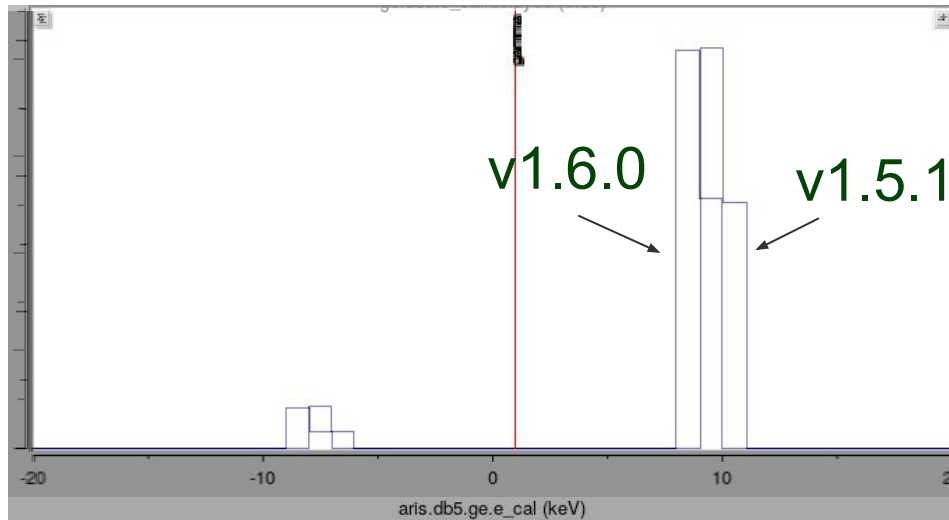 - Allows the user to better recognize SpecTk in the taskbar

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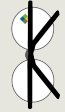U.S. Department of Energy Office of Science
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Bug

- SpecTk has been offsetting all channels by +1 in previous versions
- This was due to how the SpecTcl data in SpecTk was being processed
- It has now been corrected for both 1D and 2D spectras

Bug Fixes

- Directory bug has been addressed
  - Occured when the directory a file pointed to changed ie. SpecTk/1.6.2 →SpecTk_Versions/1.6.2
- Graphing bugs
  - -1 index bug
  - Tail bug (The last data point of all spectra in previous versions was getting cut off because of the right shifting)

Application Error

Error: couldn't open "/projects/lisedev/Projects/S...
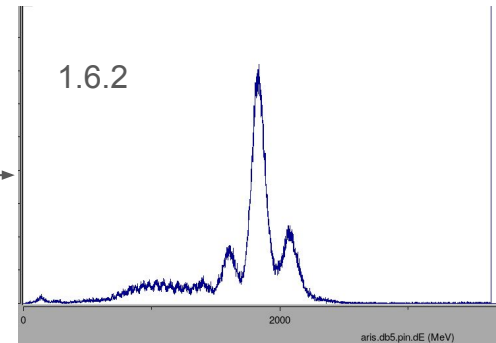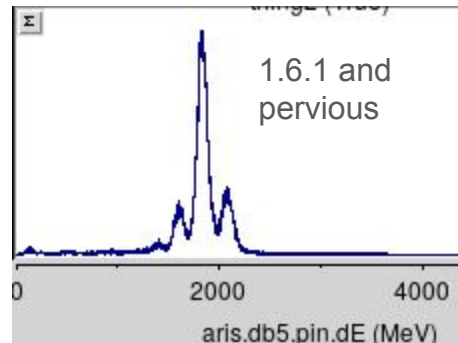
couldn't open "/projects/lisedev/Projects/SpecTk/SpecTk_DAK/test/dirTest.spk": no such file or directory
couldn't open "/projects/lisedev/Projects/SpecTk/SpecTk_DAK/test/dirTest.spk": no such file or directory

Application Error

Error: index "-1" is out of range

index "-1" is out of range
index "-1" is out of range

1.6.1 and pervious

aris.db5.pin.dE (MeV)

1.6.2

aris.db5.pin.dE (MeV)

[334] CTL:DB5.PIN.DE : 1 [0, 6000 : 6000] {ARIS.DB5.PIN.DE}

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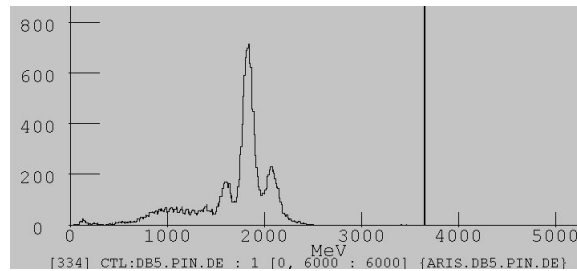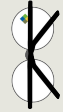
New Functions

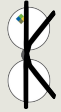- Xamine options added under file in SpecTk
  - To use exported saves go to Xamine->File->Restore
- Xamine Export
  - Selects the current page and exports as chosen name to the chosen directory
- Xamine Export All
  - Exports all pages to the current SpecTk directory with the name of each page as the file name
- Xamine Import
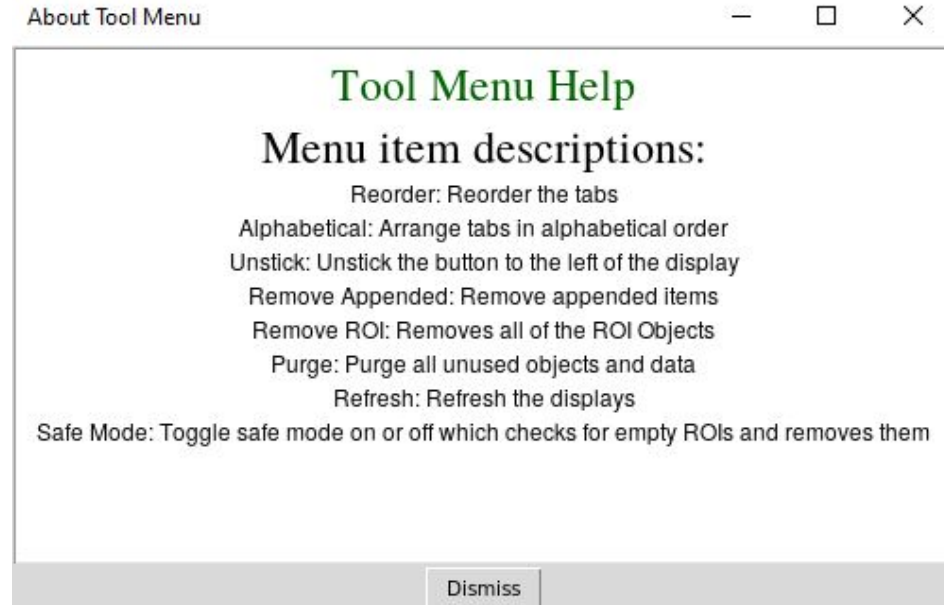 - Chosen Xamine save is imported with the file name as the page name

SpecTk 1.6.4
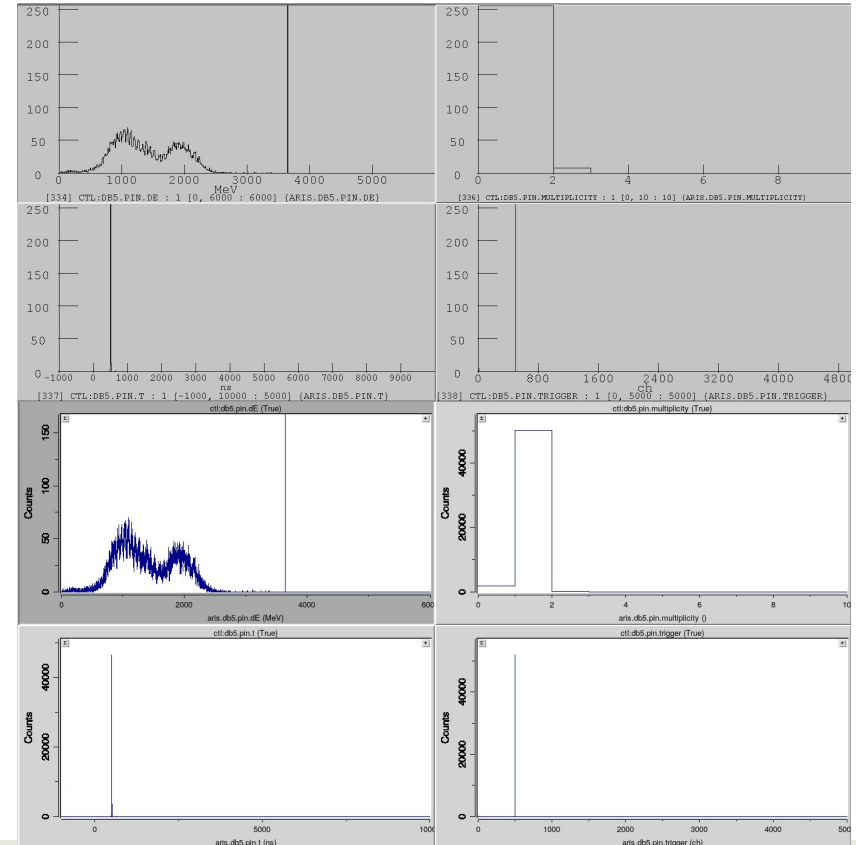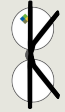
Config Load Times

- Configs can take very long to load ie. o48_01 in version 1.6.3 takes about 104 seconds to load
- In version 1.6.4 that has been cut by about 30 seconds
- Further improvements are being worked on

Tool Help

- Added a Help option under tools
- The help window describes the functionality of all the tools in the Tool menu

About Tool Menu

Tool Menu Help

Menu item descriptions:

Reorder: Reorder the tabs
Alphabetical: Arrange tabs in alphabetical order
Unstick: Unstick the button to the left of the display
Remove Appended: Remove appended items
Remove ROI: Removes all of the ROI Objects
Purge: Purge all unused objects and data
Refresh: Refresh the displays
Safe Mode: Toggle safe mode on or off which checks for empty ROIs and removes them

Dismiss

SpecTk 1.6.5-1.6.9

Bug Fixes

- Graph's gate displaying improperly
  - Added a line that was deleted in 1.6.4

    corr:Am3Z,:.db5x (False)
- Graph control buttons freezing
  - Commented out code that would cause the buttons to lock
- Auto Update bug output
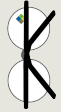 - Add a catch to stop auto Update from outputting multiple error pages

Auto Update

- New widget added that allows auto updating
- There are currently three options Select, Page, and All that each correspond to their respective update type. (Page is the default update type)
- The time text box allows for the selection of the delay between each update finishing and then beginning
- When enabled manual updating becomes restricted
- Switching between times, and types of updates is seamless
- There are two known bugs:
  - Shifting of data after an update. If it occurs just let another update cycle occur.(Currently unaddressed as the cause is unknown)
  - Occasional error while updating will open many windows(Addressed in 1.6.9, but may still occur)
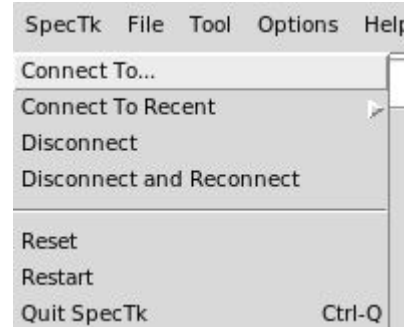
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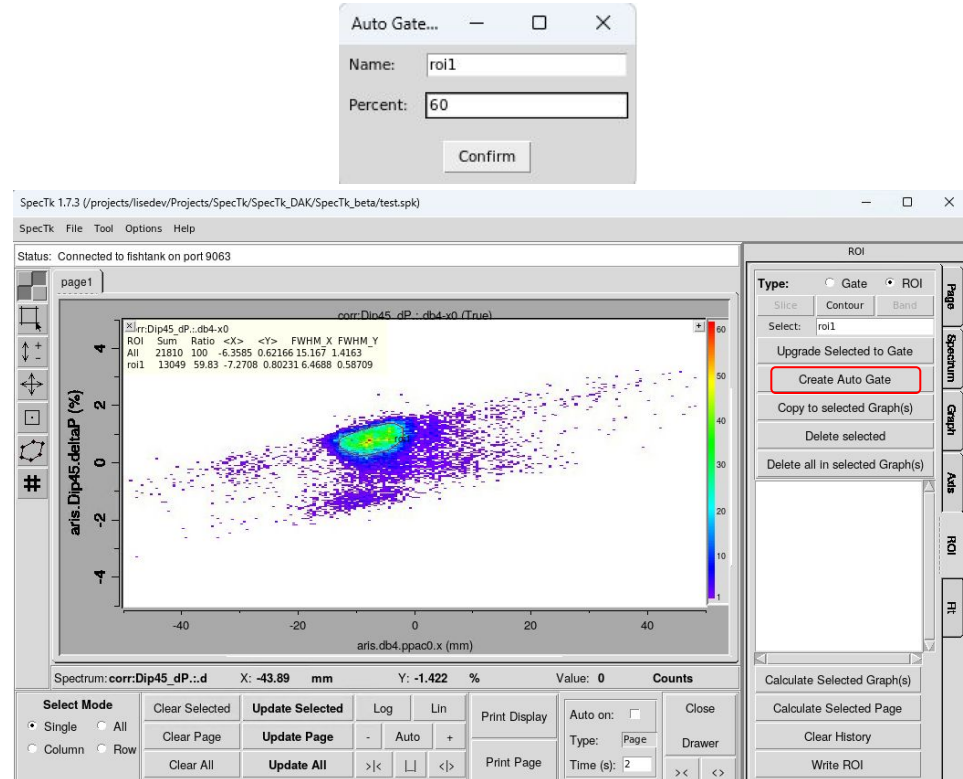Michigan State University

Updates

- Pages are now able to be named with capital letters
- Added Restart under SpecTk
  - This will automatically close, open, and then reconnect SpecTk to the server it was connected to prior to the Restart
  - Writes current server info into the temp.txt and then reads it on restart to reconnect
- Reset
  - Deletes all Pages, Waves, Displays, ROIs, and Spectra
  - Disconnects and Reconnects to the server

SpecTk	File	Tool	Options	Help

Connect To...
Connect To Recent   ▶
Disconnect
Disconnect and Reconnect

Reset
Restart
Quit SpecTk   Ctrl-Q

Auto Gating

- New Option added under ROI
- Requires:
  - Python 2.7 or later
  - Numpy and Scipy libraries
- When Create Auto Gate is pressed a dialog will open asking for:
  - The desired name of the ROI
  - The desired percent of the counts in the region
- It will then use a Gaussian Kernel Density Estimate to select the desired region, and create a contour around it.

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1.7.4

- Added Covariance and Angle Statistics
- Added the Generate Ellipse option in the auto gate dialogue
  - Fits an ellipse to the region instead of a convex hull
  - Slightly reduced accuracy

1.7.5

- Major speed improvements made to autogating
  - 120k points went from 9.3 mins to .6 seconds
- Dynamically culls counts to reduced the number of calculations required
- Slight drop in accuracy (1%)

1.7.6

- Fixed an issue with Covariance and Angle calculations where dividing by zero counts was possible
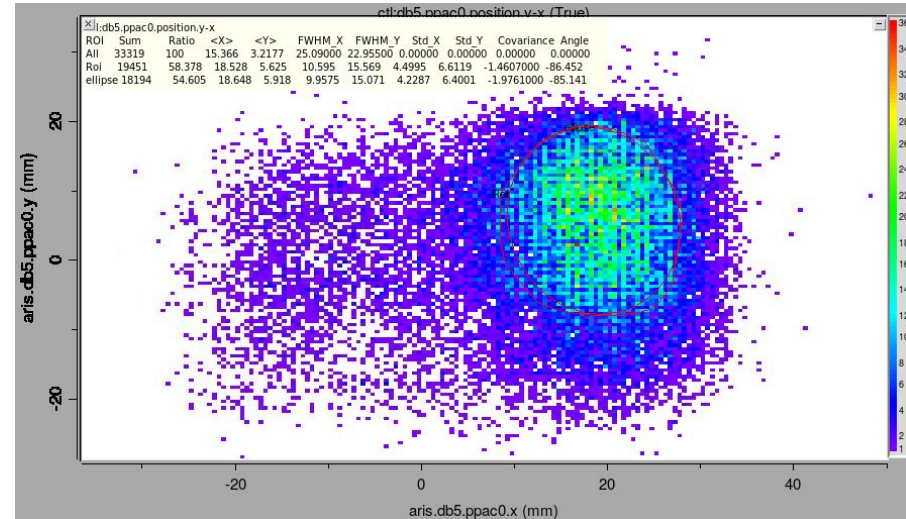
1.7.7

- Standard Deviation was removed from the statistics display

1.7.8

- Added the Advanced calculation option
- Auto gating can now only take 5 seconds at most

1.7.9

- Added and ROI option for Auto Gating
  - This will only use the counts inside the ROI
- Fixed an Issue with Xamine Importing where the rows and columns would be flipped

1.7.10 & 1.7.11

- Added slope to the Statistics
- Reformatted the statistics display for improved readability

ROI	Sum	Ratio	\<X\>	\<Y\>	FWHM_X	FWHM_Y	Covariance	Slope
All	33319	100.00000	15.36600	3.21820	25.08900	22.95600	0.00000	0.00000
roi1	29343	88.06700	18.47300	3.61120	14.80400	22.73600	-0.98168	-0.02484
roi2	33253	99.80200	15.37100	3.19160	25.07100	22.81000	9.16250	0.08083
roi3	5777	17.33800	17.75500	2.05680	4.96070	9.66970	-1.24090	-0.27962

ROI	Sum	Ratio	\<X\>	\<Y\>	FWHM_X	FWHM_Y
All	33319	100.00000	15.36600	3.21820	25.08900	22.95600
roi1	29343	88.06700	18.47300	3.61120	14.80400	22.73600
roi2	33253	99.80200	15.37100	3.19160	25.07100	22.81000
roi3	5777	17.33800	17.75500	2.05680	4.96070	9.66970

Auto Gate I...

Name:

Percent:

Region: roi1

roi1
roi2
roi3

☐ Generate Ellipse

Confirm

Updates

ROI	Sum	Ratio	<X>	<Y>	σ(X)	σ(Y)	Cov	Slope	Area
All	33319	100.00	15.366	3.2168	0.0000	0.0000	0.0000	0.0000	0.0000
gate1	28276	84.864	18.908	3.8310	5.9082	9.4597	-3.7460	-0.1073	1537.8

ROI	Sum	Ratio	<X>	<Y>	σ(X)	σ(Y)
All	33319	100.00	15.366	3.2168	0.0000	0.0000
gate1	28276	84.864	18.908	3.8310	5.9082	9.4597

- Statistics Display:
  - Finalized the Formatting
  - Limited all values to have 5 digits
  - Limited ROI names to be up to 15 characters
  - Standardized Spacing
  - Font option graph result can be used to resize and change fonts used
- Fixes
  - Changed clear selected and clear page to no longer clear all data
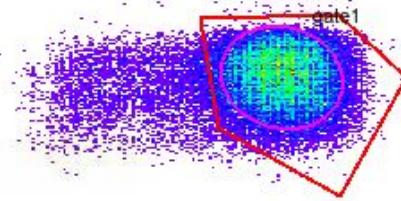 - This would cause the wave to forget the spectra it was attached to and errors would be thrown
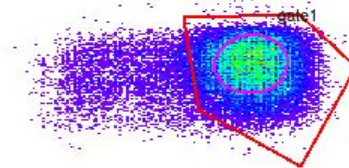
2D Fitting

- Requires:
  - Python 2.7 or later
  - Numpy and Scipy libraries
- Fitting for 2D waves is now an Option
- Two fits are currently implemented Gaussian and Polynomial
- Percent option which selects the amplitude of the cross section that will be displayed
- 2D Polynomial
  - The cross section is in magenta
  - Remove the cross section by clicking Remove Fit
- 2D Gaussian
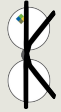 - The cross section is in magenta
  - Remove the cross section by clicking Remove Fit

Polynomial

Gaussian

Data: ctl:db5.ppac0.p...
ROI: gate1
Fit: 2D Polynomial
Maximum iterations: 100
Fit precision: 1e-5
Points in display: 200
☑ Auto Guess   ☑ Results on Graph

$Ax^2 + Bxy + Cy^2 + Dx + Ey + F$

A:	☐	-0.056113
B:	☐	-0.006818
C:	☐	-0.019229
D:	☐	2.151217
E:	☐	0.294471
F:	☐	-8.301090
Percent:		50

2D Polynomial initialization complete
Normalized Chi2 = 15.25
Area   = 609.02
a   = -0.056113
b   = -0.006818
c   = -0.019229
d   = 2.1512
e   = 0.29447
f   = -8.3011

Data: ctl:db5.ppac0.p...
ROI: gate1
Fit: 2D Gaussian
Maximum iterations: 100
Fit precision: 1e-5
Points in display: 200
☑ Auto Guess   ☑ Results on Graph

$A exp(-[\frac{(x')^2}{2\sigma_x^2} + \frac{(y')^2}{2\sigma_y^2}]) + Z$

A:	☐	16.371840
x0:	☐	18.712062
y0:	☐	5.625751
σ_x:	☐	-6.489228
σ_y:	☐	10.457771
θ:	☐	0.046064
Z:	☐	0.841594
Percent:		50

2D Gaussian initialization complete
Normalized Chi2 = 12.042
Area   = 295.36
A   = 16.372
x0   = 18.712
y0   = 5.6258
sigx   = -6.4892
sigy   = 10.458
theta   = 0.046064
Z   = 0.84159

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F$$

$$A exp(-[\frac{(x')^2}{2\sigma_x^2} + \frac{(y')^2}{2\sigma_y^2}]) + Z$$
$$x' = (x - x0)cos\theta + (y - y0)sin\theta$$
$$y' = -(x - x0)sin\theta + (y - y0)cos\theta$$

Marker Tool

- Work with both 1D and 2D graphs
- Delete all will delete all marking on the selected graph
- Double click to stop drawing
- Saves and loads with config

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SpecTk 1.8.7
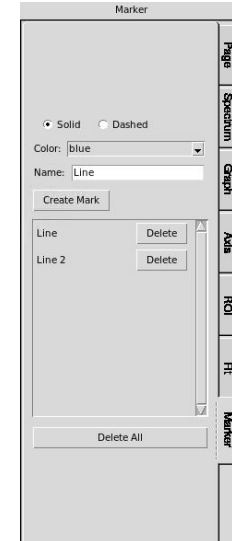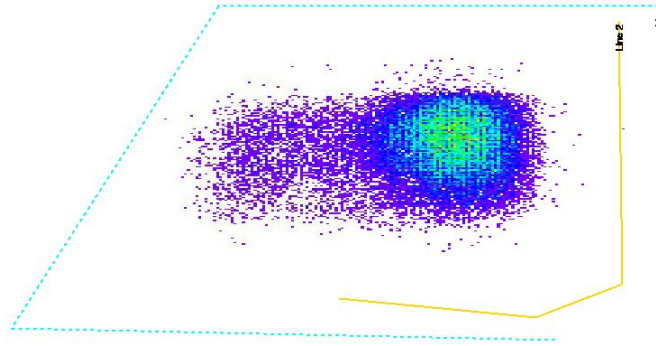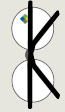
Improvements

- Fixed an Issue where graphs would change sizes rapidly causing a shift
- Added limits and made slight improvements to the fitting code improving the fit
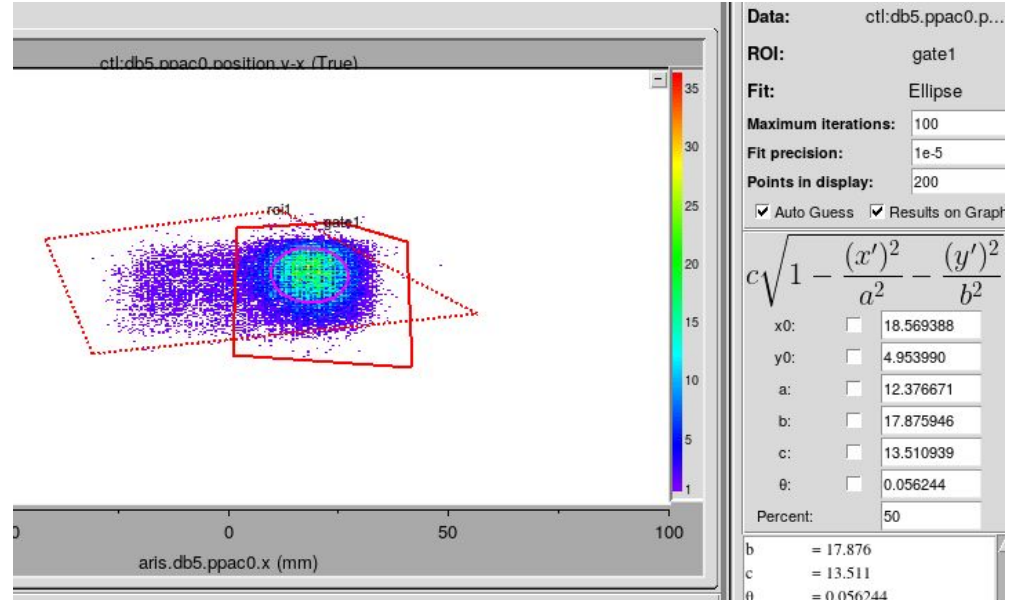- Changed percent to be percent of counts instead of percent of amplitude

2D Ellipse Fit

- Added a new option Ellipse to 2D fitting
- The equations used can be seen below

$$c\sqrt{1 - \frac{(x')^2}{a^2} - \frac{(y')^2}{b^2}}$$

$$y' = -(x - x_0)sin(\theta) + (y - y_0)cos(\theta)$$
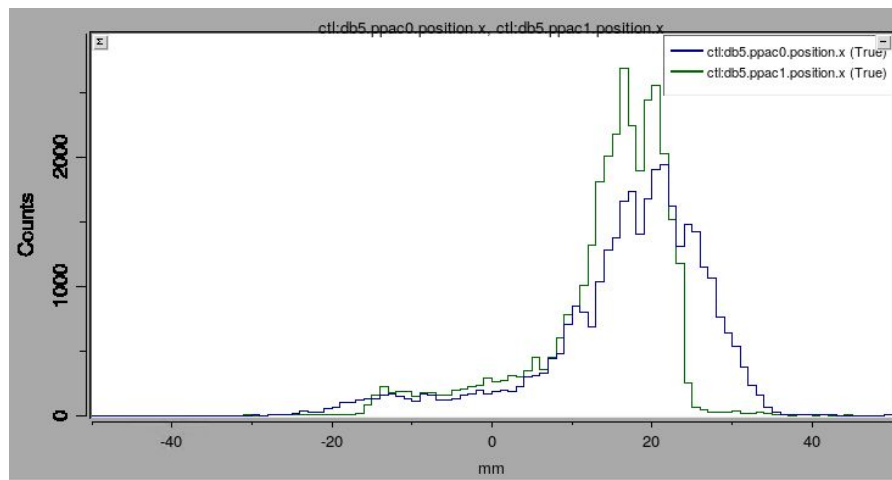
$$x' = (x - x_0)cos(\theta) + (y - y_0)sin(\theta)$$

Superimpose

- Added the undo button