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AFGROW.NET

Spectrum Manager Version 1.2

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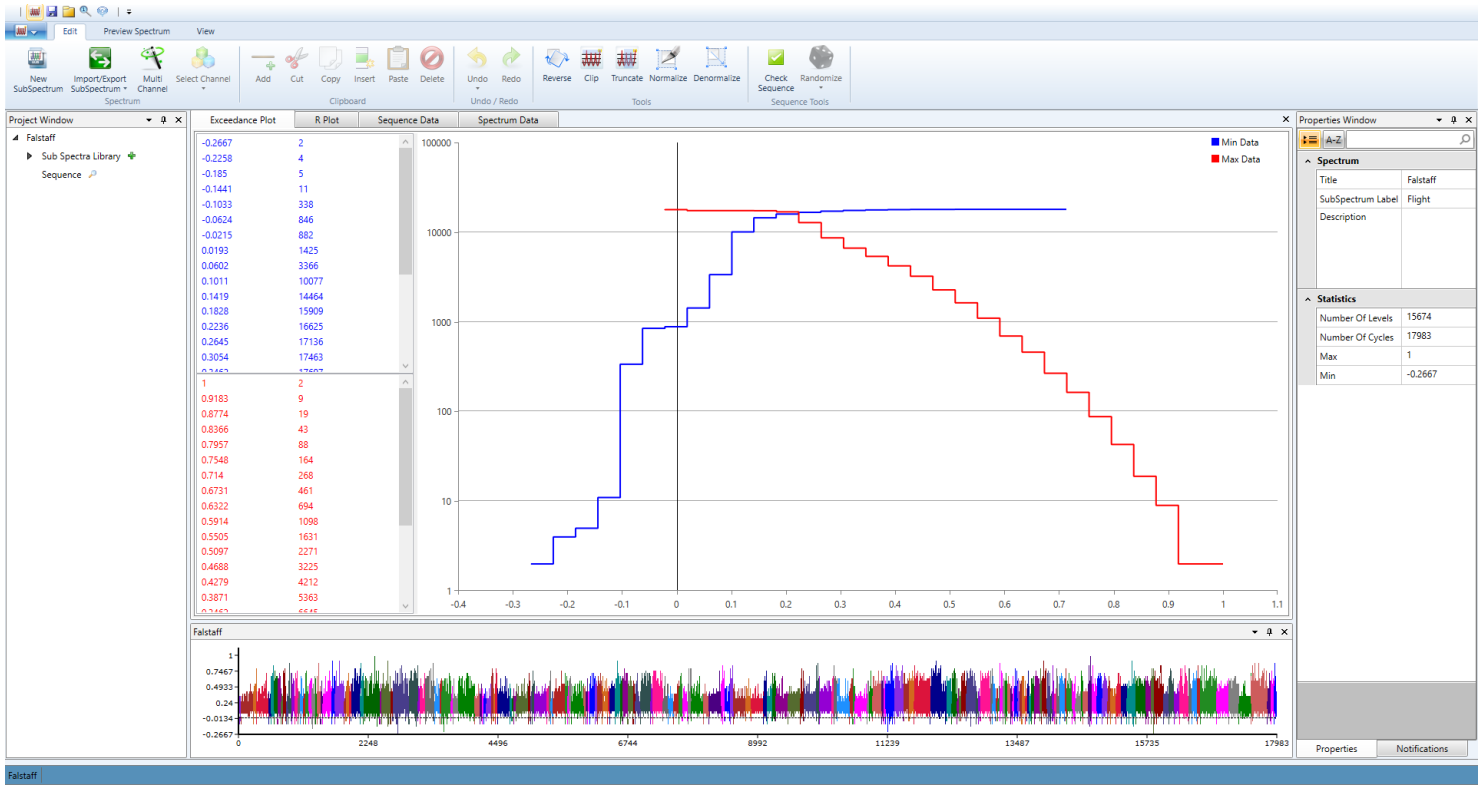
What is Spectrum Manager

AFGROW.NET

- Next evolution in AFGROW Spectrum generation using XML capabilities.
- Used to Generate Spectrum files for use in AFGROW.
- Create, Edit, and View Spectra Data through multiple detailed windows.
- Customizable window layout.



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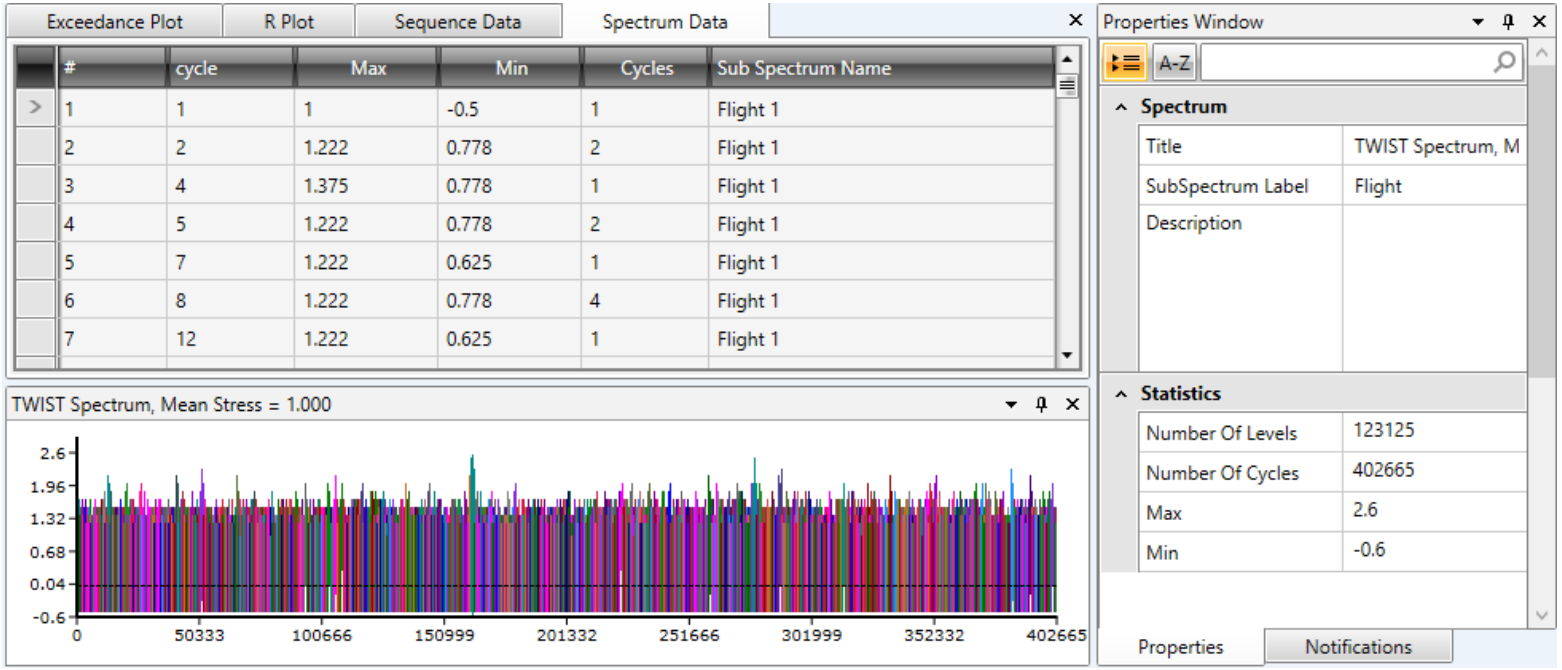
Basic Capabilities

AFGROW.NET

- Visual spectrum design
- Spectrum level reordering
- Sub-spectra organized in any user-defined sequence
- Sub-spectra may be placed in the sequence more than once
- Sub-spectra may be re-ordered in the sequence
- Spectrum statistics at a glance
- Exceedance curve plotting
- R-plots
- Sub-spectra tagging for future analysis
- Synchronized data views
- Spectrum level damage tagging
- Spectra normalization/de-normalization
- Clipping/Truncation capability
- Import data from “old” text sub files



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What is new in Version 1.2

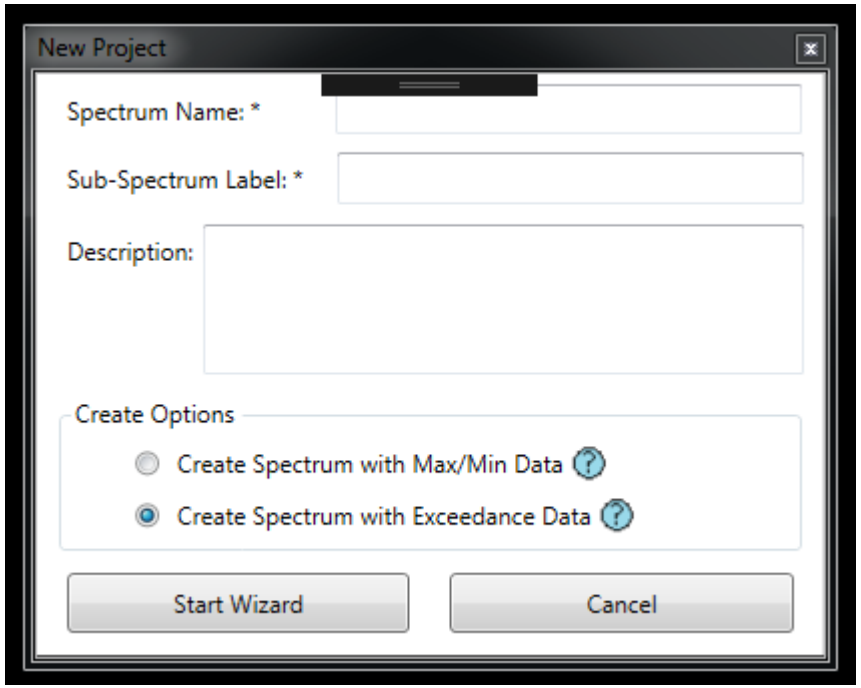
AFGROW.NET

- Spectrum Generation from Exceedance Curve Data
- New Delta Plot View
- Grid operation improvements (Copy, Cut, Insert, Paste)
- Compressive Truncation
- Randomize Sub Spectra, Randomize Sequence
- Import/Export individual sub spectra
- New Preview Selector design
- Additional Statistics in Properties Window
- Speed Enhancements
- Popups for error messages
- Alert Ribbon
- COM support

Spectrum Generation from Exceedance Curve

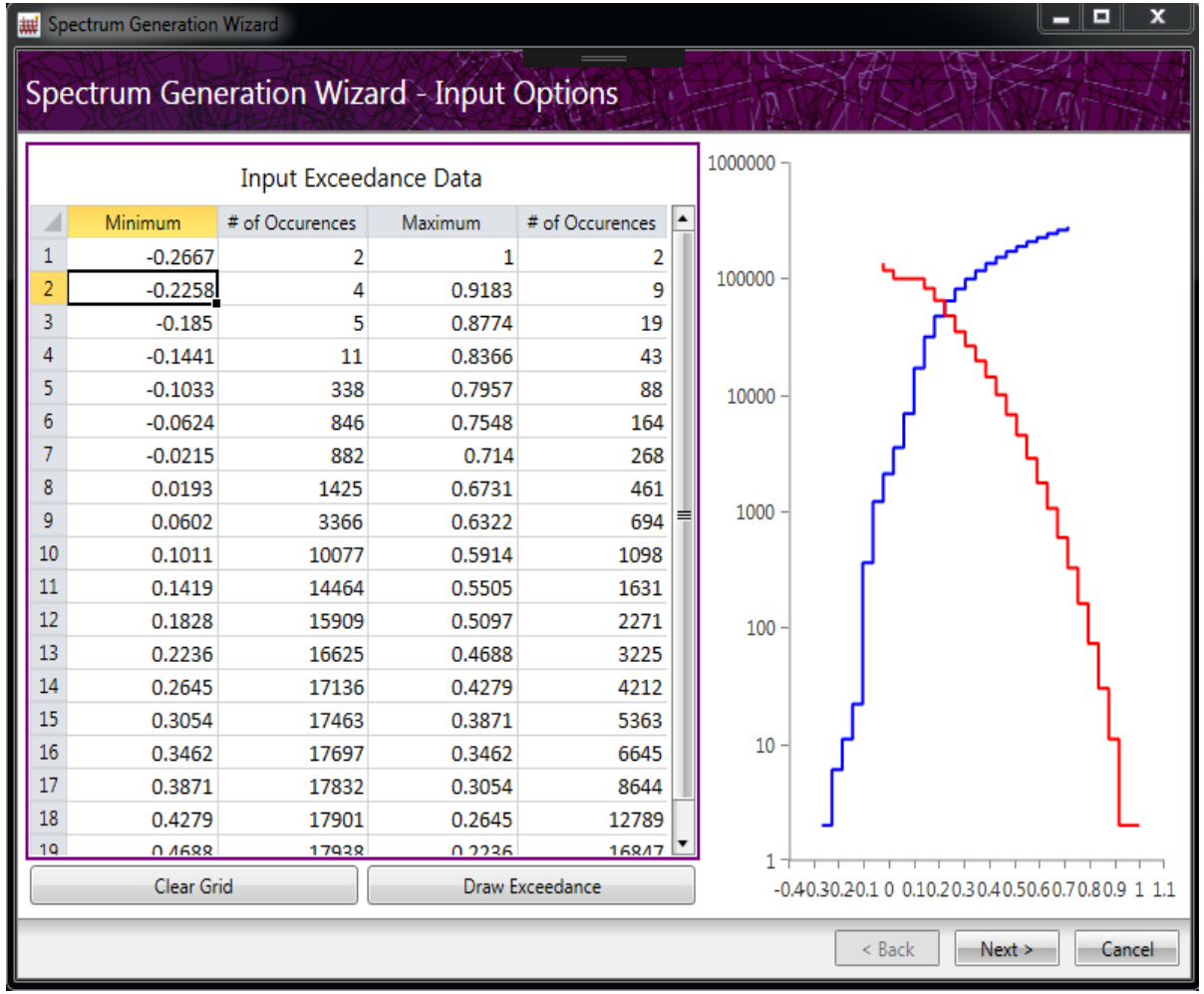
- New option to create a spectrum from exceedance curve data.

- Select the “Create Spectrum with Exceedance Data” option in the New project dialogue.



Spectrum Generation from Exceedance Curve

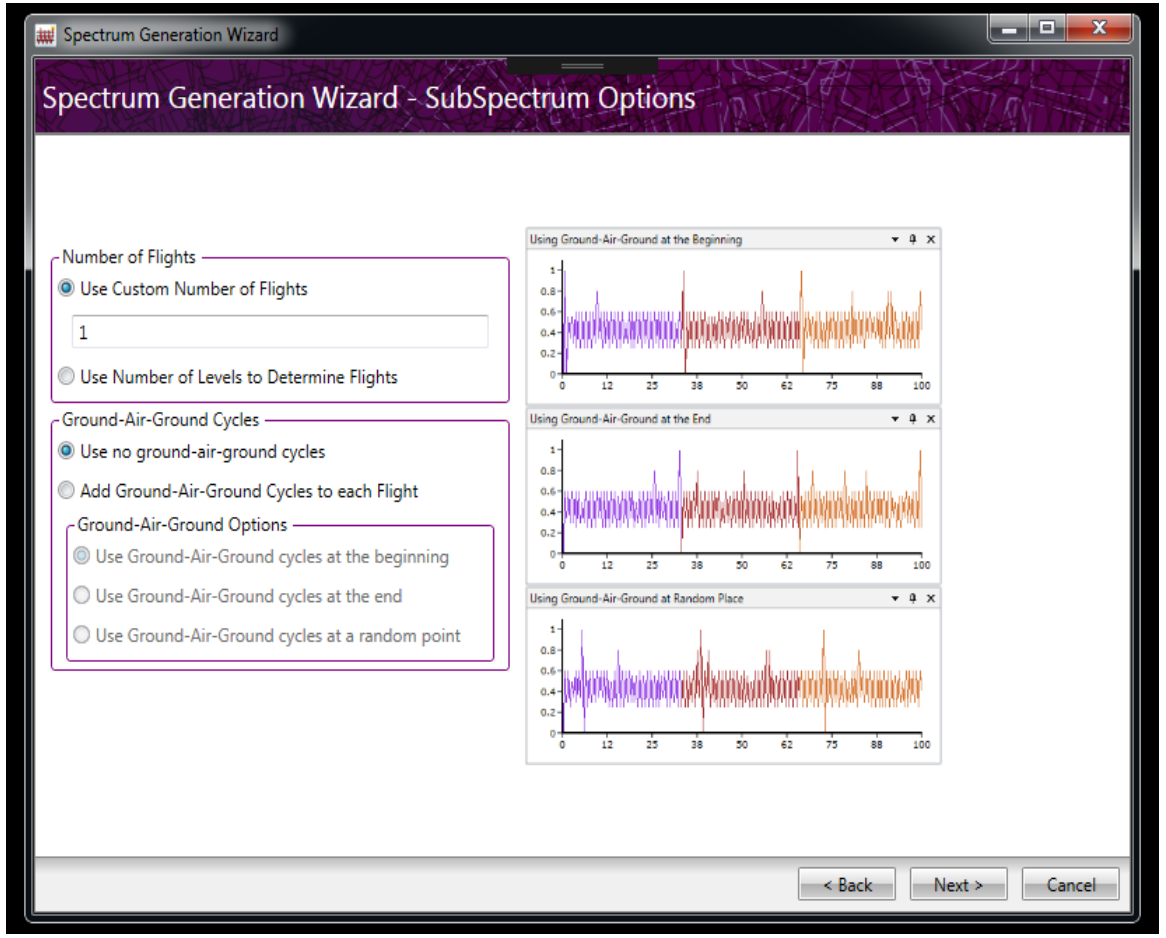
- Enter/Paste exceedance data into the grid (table).
- Clicking “Draw Exceedance” will create a chart visualizing the data.



Spectrum Generation from Exceedance Curve

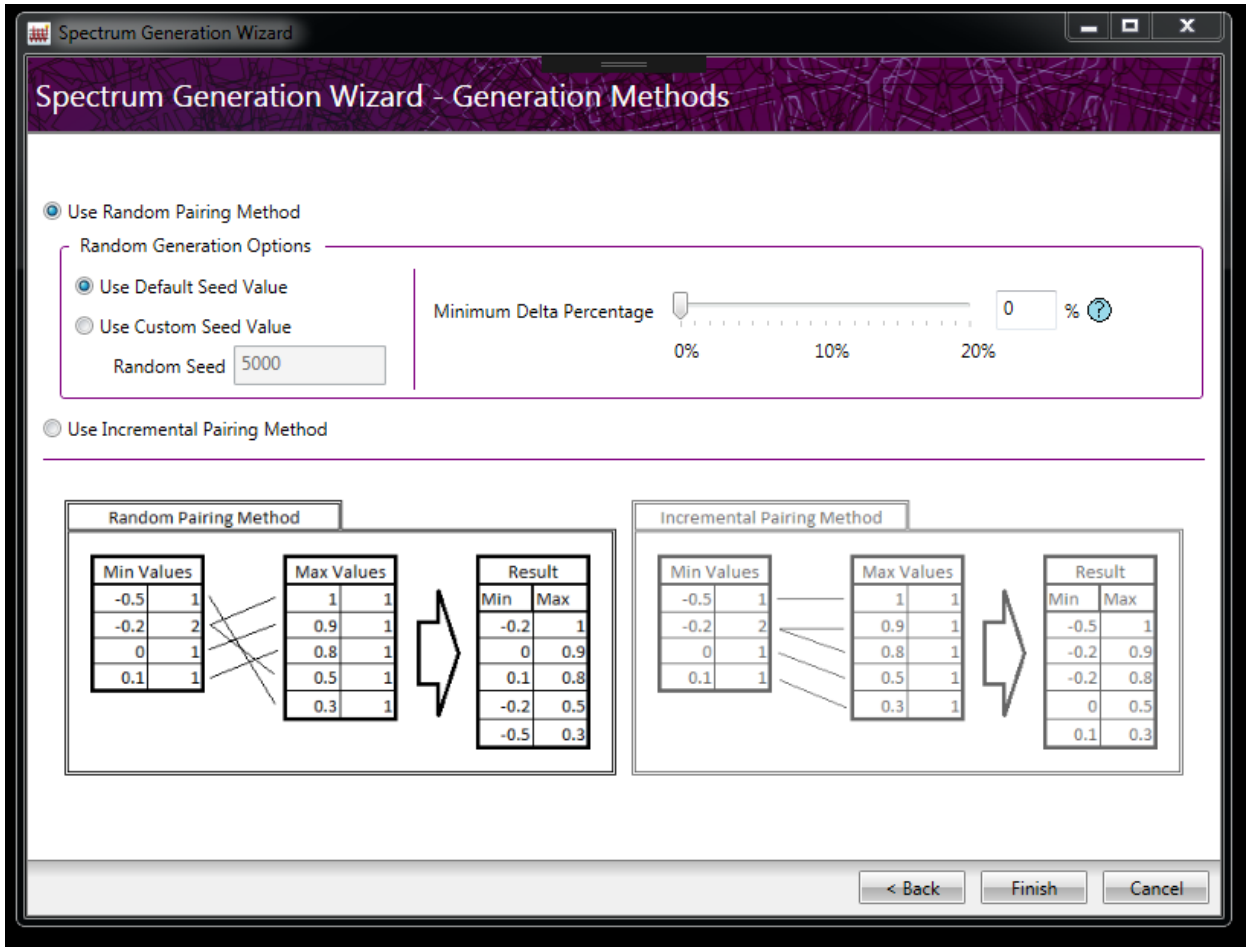
- Specify the number of flights (sub spectra) for the spectrum, or the number of levels per flight (sub spectra).

- Ground-Air-Ground cycles can be included and placed at the beginning, end, or a random point inside each sub spectrum.



Spectrum Generation from Exceedance Curve

- Random pairing will match the Max and Min values randomly.
- Incremental pairing sorts the max and min values, then sequentially pairs the greatest max value with the least min value.



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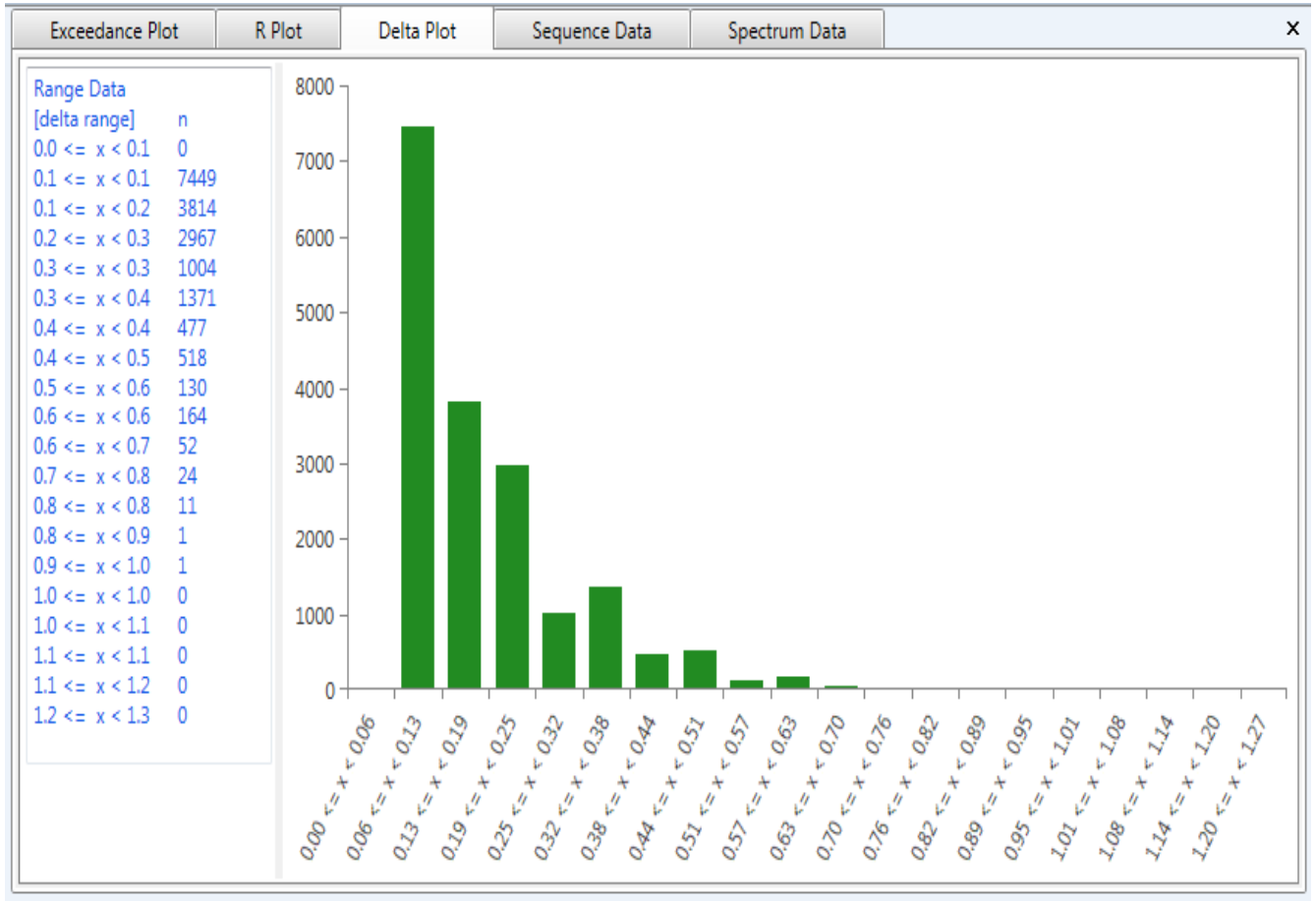
Delta Plot

AFGROW.NET

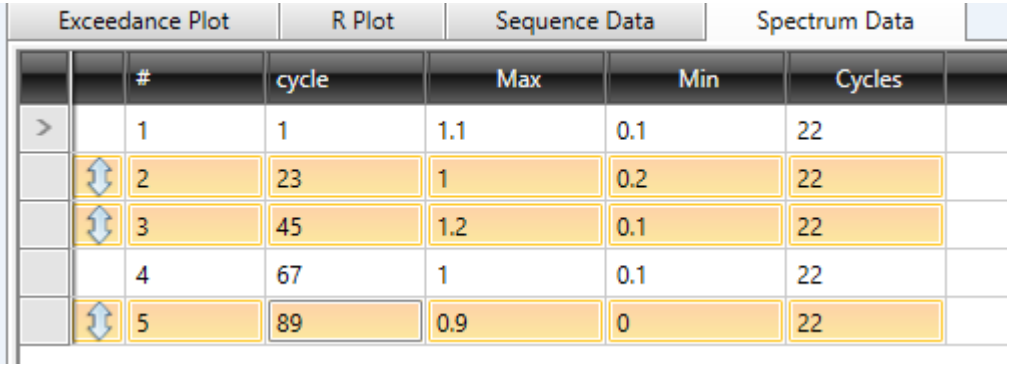
- This new view has been added to the default layout.
- Displays the occurrences of each level's delta value. (Max – Min)
- Displays delta values vs. number of occurrences.



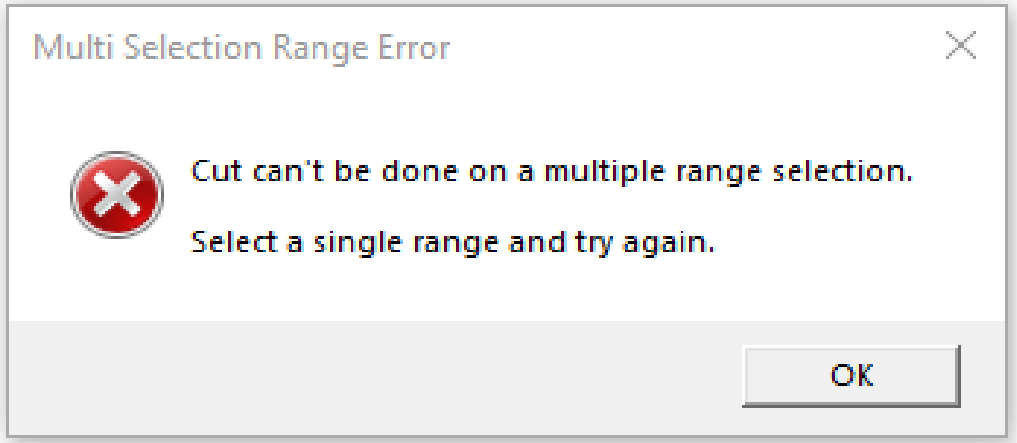
Grid Operation Improvements

Multi-Range Cut

Multi-Range selections (selections that include gaps between one or more selected items) are no longer allowed.



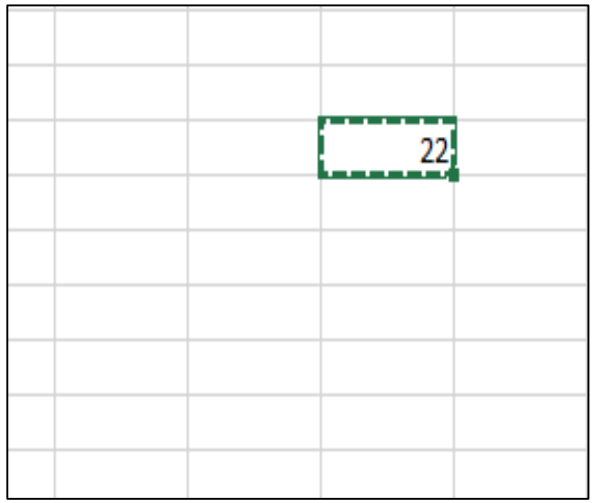
An error message will appear if a user attempts to cut a multi-range selection.

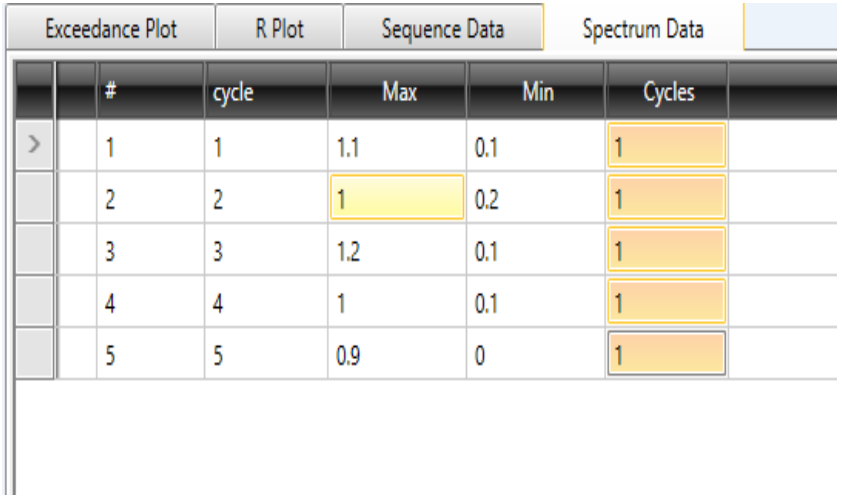


Grid Operation Improvements

Single value paste

Copying one value to the clipboard and pasting into multiple cells in the same column will fill all selected columns with the clipboard value.





	#	cycle	Max	Min	Cycles
>	1	1	1.1	0.1	1
	2	2	1	0.2	1
	3	3	1.2	0.1	1
	4	4	1	0.1	1
	5	5	0.9	0	1

	#	cycle	Max	Min	Cycles
>	1	1	1.1	0.1	22
	2	23	1	0.2	22
	3	45	1.2	0.1	22
	4	67	1	0.1	22
	5	89	0.9	0	22

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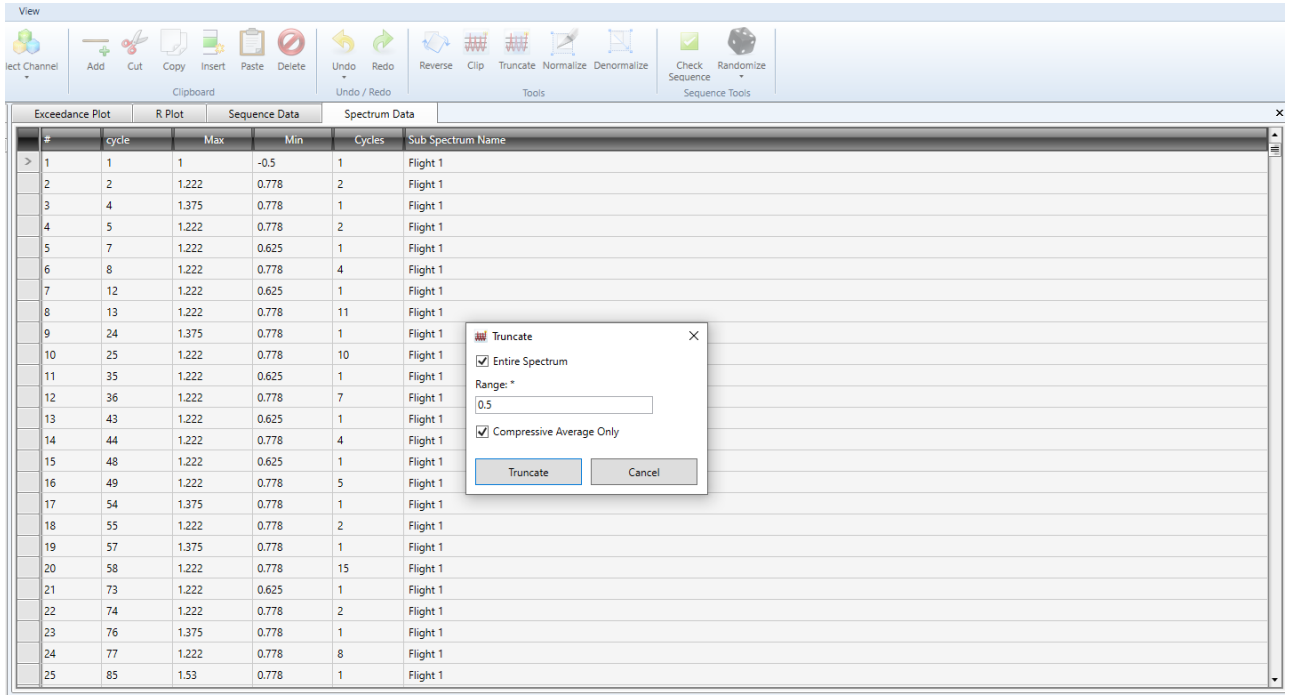
Compressive Truncation

AFGROW.NET

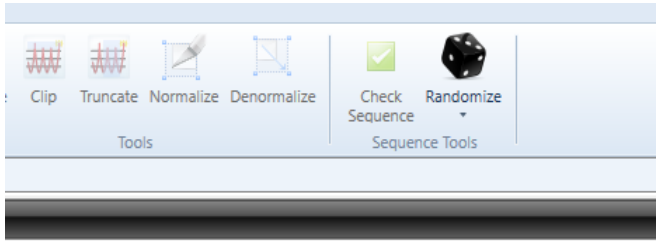
- New option to truncate by Compressive Average Only.
- Checking the Compressive Average box tells the truncation operation to only remove levels whose average value is negative.
- A prompt will appear to remove any resulting empty sub spectra.

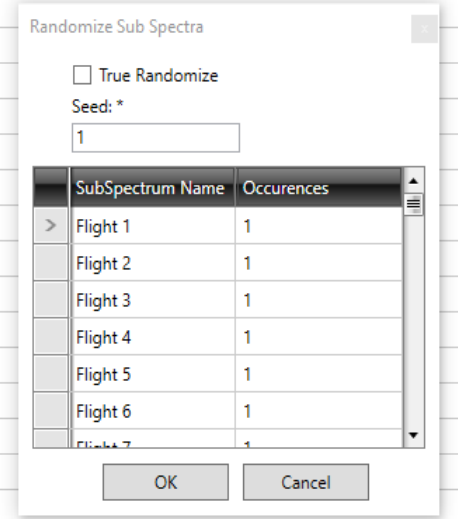


#	cycle	Max	Min	Cycles	Sub Spectrum Name
1	1	1	-0.5	1	Flight 1
2	2	1.222	0.778	2	Flight 1
3	4	1.375	0.778	1	Flight 1
4	5	1.222	0.778	2	Flight 1
5	7	1.222	0.625	1	Flight 1
6	8	1.222	0.778	4	Flight 1
7	12	1.222	0.625	1	Flight 1
8	13	1.222	0.778	11	Flight 1
9	24	1.375	0.778	1	Flight 1
10	25	1.222	0.778	10	Flight 1
11	35	1.222	0.625	1	Flight 1
12	36	1.222	0.778	7	Flight 1
13	43	1.222	0.625	1	Flight 1
14	44	1.222	0.778	4	Flight 1
15	48	1.222	0.625	1	Flight 1
16	49	1.222	0.778	5	Flight 1
17	54	1.375	0.778	1	Flight 1
18	55	1.222	0.778	2	Flight 1
19	57	1.375	0.778	1	Flight 1
20	58	1.222	0.778	15	Flight 1
21	73	1.222	0.625	1	Flight 1
22	74	1.222	0.778	2	Flight 1
23	76	1.375	0.778	1	Flight 1
24	77	1.222	0.778	8	Flight 1
25	85	1.53	0.778	1	Flight 1

Randomize Sub Spectra

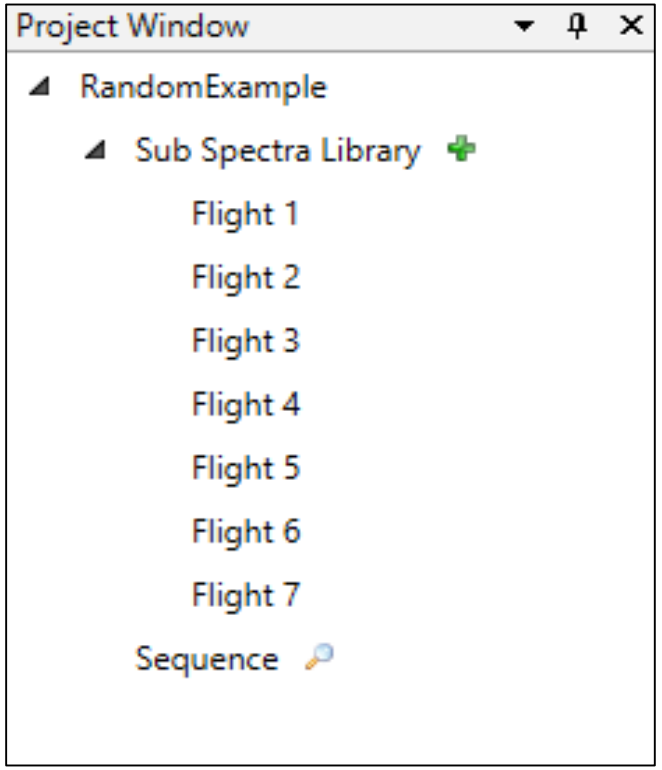
- Will arrange all sub spectra in the project into a sequence in random order.
- Only available if the Sequence Data window is visible.
- Each sub spectra will occur in the sequence a number of times equal to the Occurrences value next to the sub spectrum name.
- By default, the random order is determined by a seed, so that the same order can be repeated in different instances of spectrum manager, provided all other properties are the same.
- For a non-repeatable random sequence, check the “True Randomize” checkbox.
- This action will overwrite the existing sequence, if one exists.





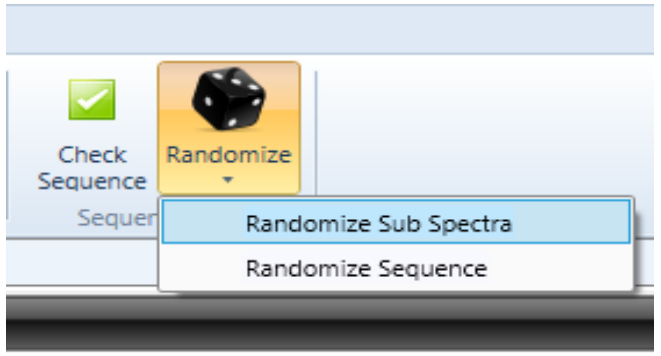
Randomize Sub Spectra

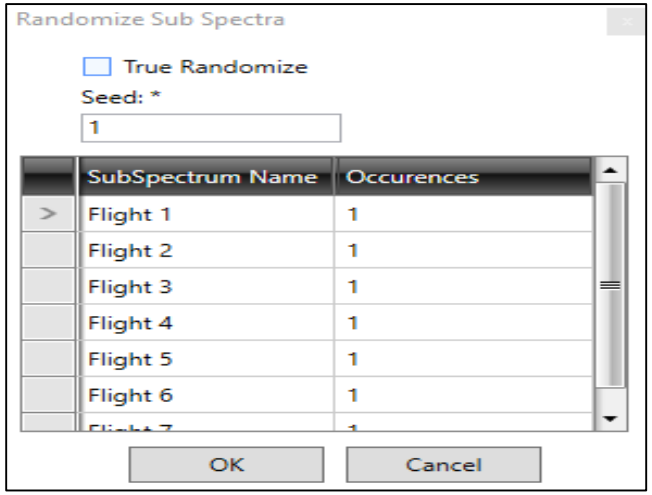
Example



Starting with a Spectrum with 7 sub spectra

Clicking Randomize and selecting Randomize Sub Spectra gives us the following



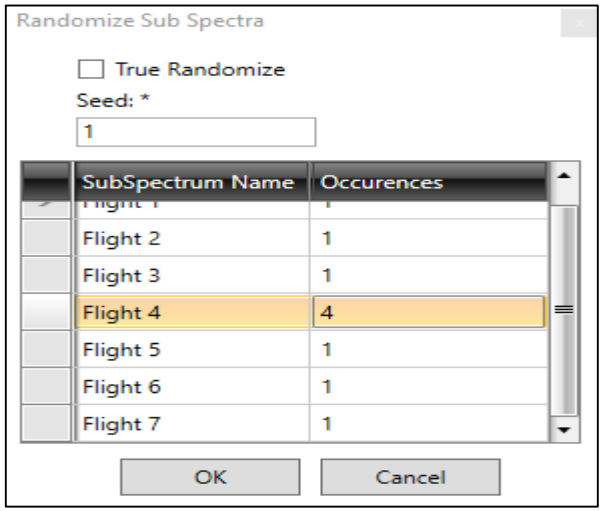


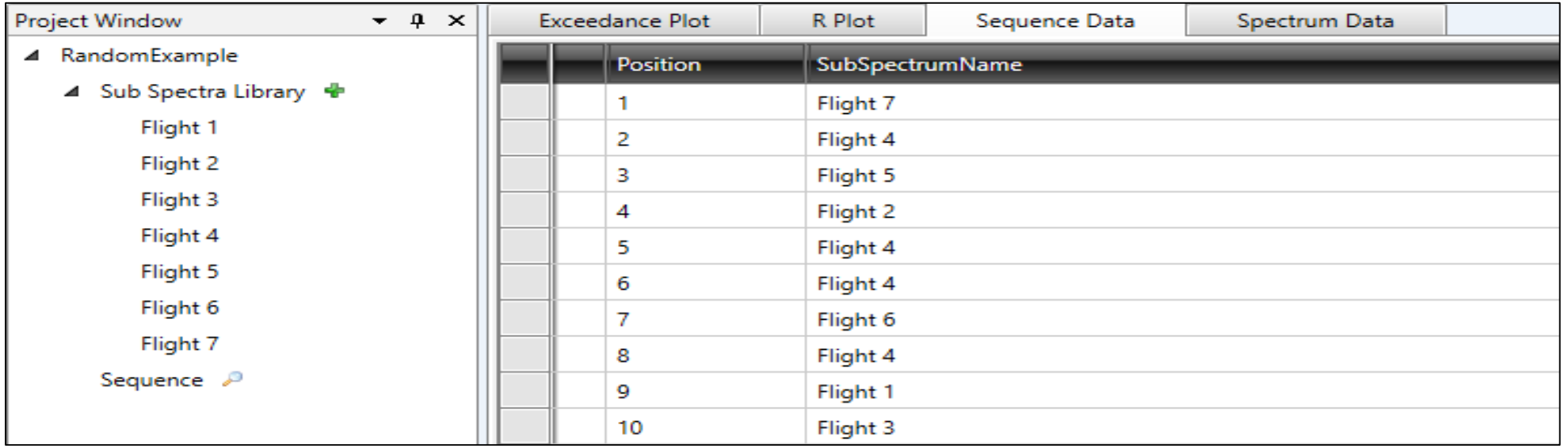
Notice that all sub spectra have an Occurrence of 1

Randomize Sub Spectra

Example Cont.

Changing the number of occurrences for Flight 4 to 4 and leaving the rest at 1 will result in a sequence that has four occurrences of Flight 4 and a single occurrence of all other flights.





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Randomize Sequence

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- Will arrange all sub spectra in the current sequence into a new sequence in random order.
- Only available if the Sequence Data window is visible and if there is an existing sequence.
- Each sub spectra will be appear in the sequence a number of times equal to the Occurrences value next to the sub spectrum name.
- The ordering works the same way as Randomize Sub Spectra, based on a seed value with the option to truly randomize.
- This action will replace the existing sequence, if one exists.

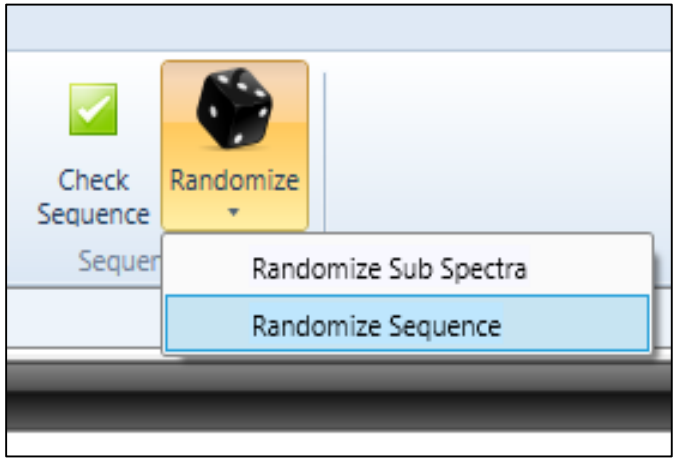
Randomize Sequence
Example

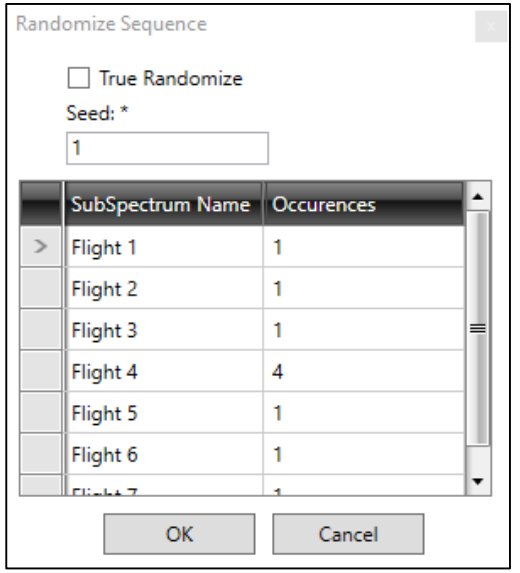
Exceedance Plot | R Plot | Sequence Data | Spectrum Data

	Position	SubSpectrumName
	1	Flight 1
	2	Flight 2
	3	Flight 3
	4	Flight 4
	5	Flight 4
	6	Flight 4
	7	Flight 4
	8	Flight 5
	9	Flight 6
	10	Flight 7

Starting with a sequence of 7 sub spectra, with Flight 4 being sequenced four times and the rest being sequenced only once.

Clicking Randomize and selecting Randomize Sequence gives us the following.





Randomize Sequence

Example Cont.

Exceedance Plot | R Plot | Sequence Data | Spectrum Data

	Position	SubSpectrumName
	1	Flight 7
	2	Flight 4
	3	Flight 5
	4	Flight 2
	5	Flight 4
	6	Flight 4
	7	Flight 6
	8	Flight 4
	9	Flight 1
	10	Flight 3

Note that the order matches the previous example exactly, this is because we used the same seed value and the same number of occurrences for each sub spectrum.

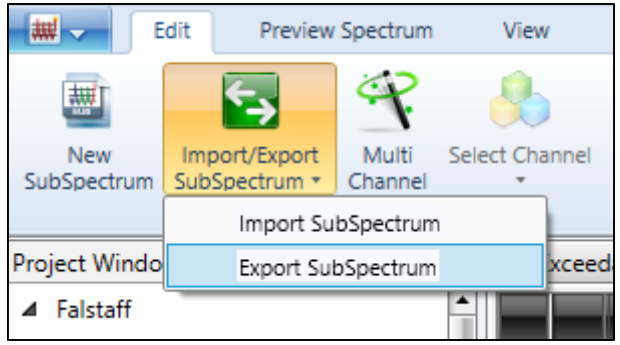
If we go back to Randomize Sequence and leave all values the same but change the seed to 2, we get the following sequence instead.

Exceedance Plot | R Plot | Sequence Data | Spectrum Data

	Position	SubSpectrumName
	1	Flight 3
	2	Flight 6
	3	Flight 5
	4	Flight 4
	5	Flight 4
	6	Flight 1
	7	Flight 7
	8	Flight 2
	9	Flight 4
	10	Flight 4

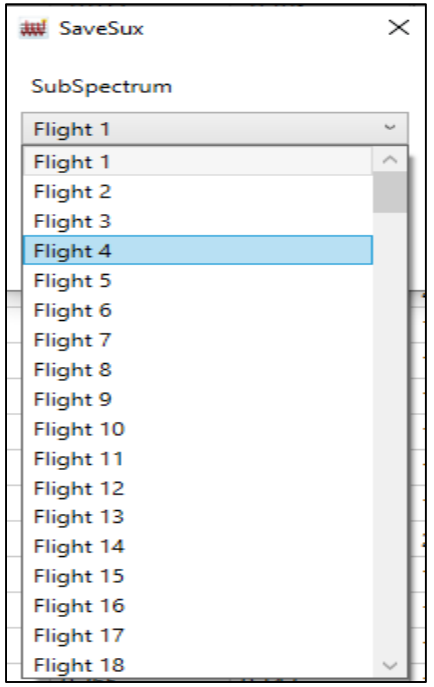
Export Sub-Spectrum

New ability to save a single sub spectrum to a .sux file.



Click on the Import/Export Sub spectrum button and select Export.

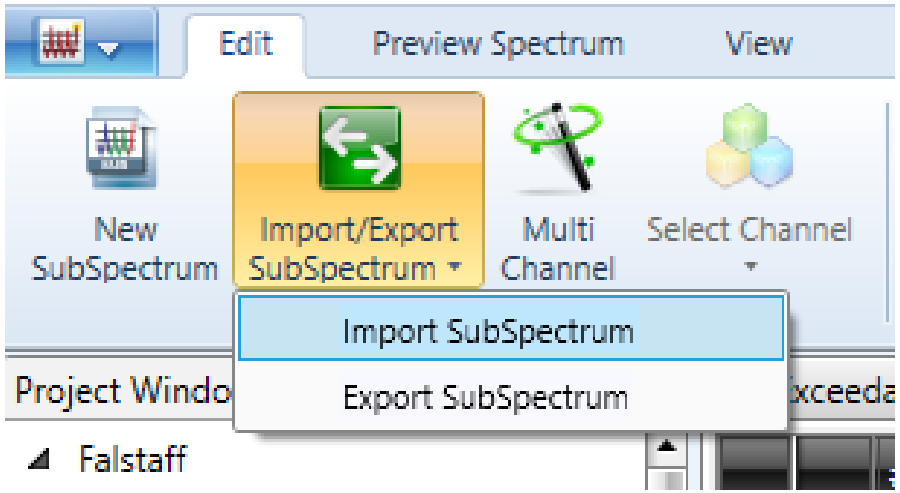
Select which sub spectrum to save from the dropdown and click OK. Navigate to a path to save the file to, and click Save.



Import Sub-Spectrum

Can import either .sub or .sux files

Importing a .sux file will present an option to either use the sub spectrum name included in the .sux file, or to autogenerate a name for the sub spectrum based off the project's sub spectrum label.



Note that an imported sub spectrum will not be automatically added to the sequence

Preview Selector

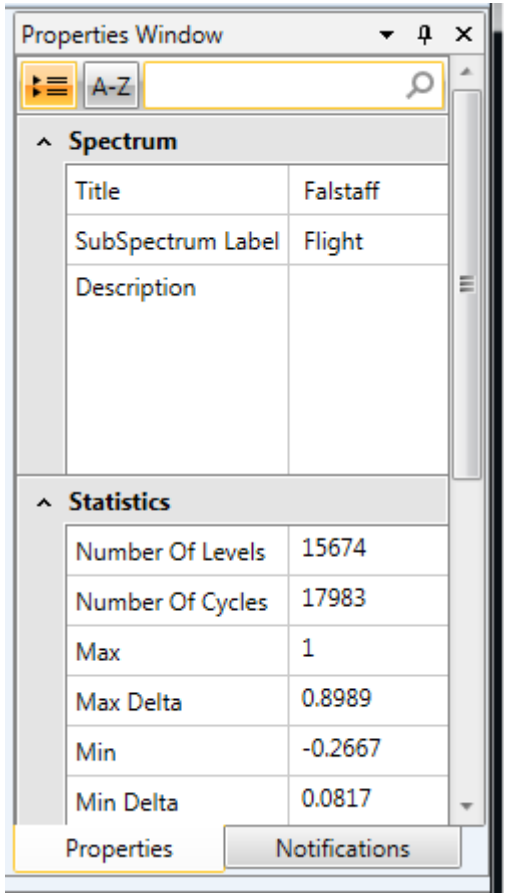
- The preview selector has gotten a visual upgrade.

- The new look has clearly defined edges, side handles, and a transparent background.
- Now able to continue tracking mouse movements outside of the preview box.
- In addition, a number of visual bugs with the old selector were fixed (moving one edge behind the other, moving outside of the selection box, etc.)

New Properties

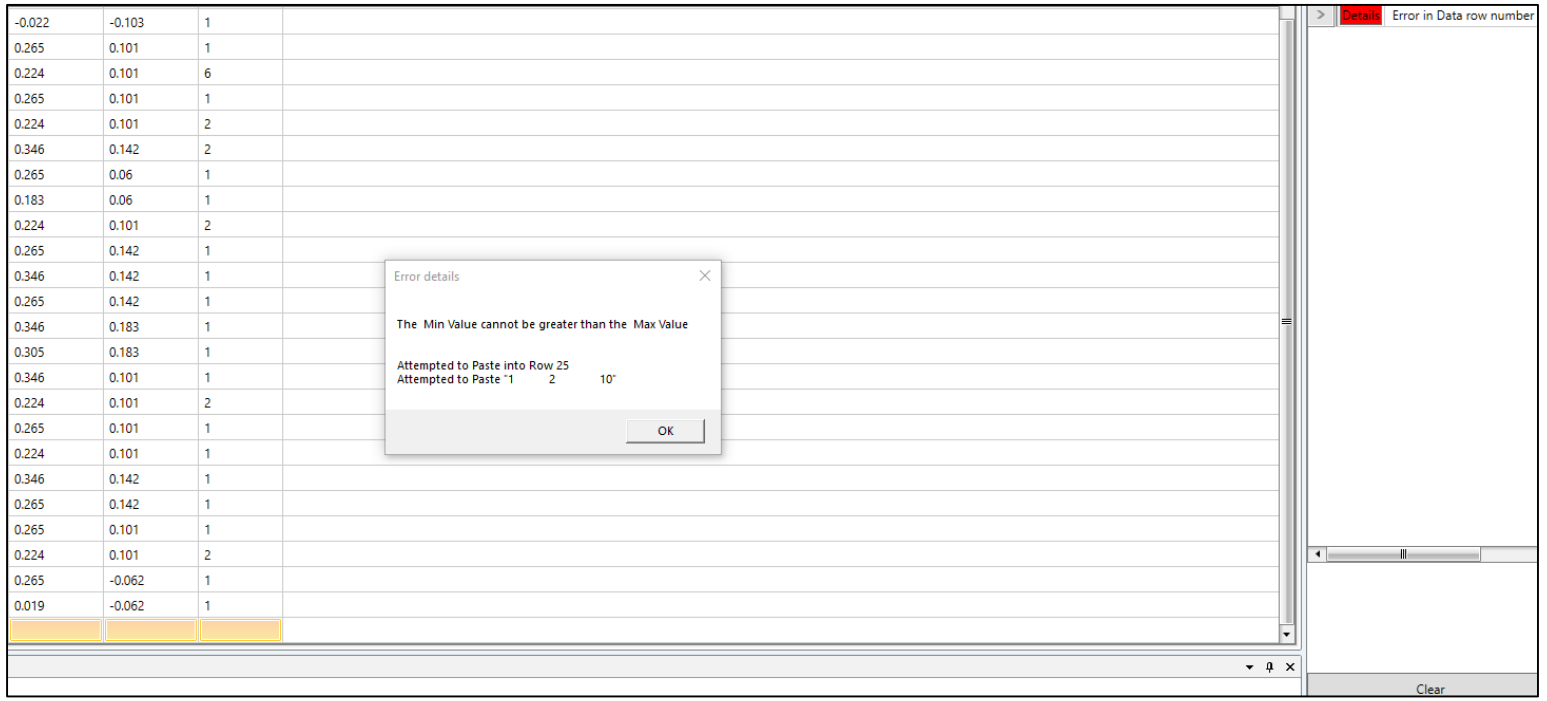
- The Properties Window now displays two additional properties: Max Delta and Min Delta.

- This display the max and min for either the spectrum or currently selected sub spectrum.



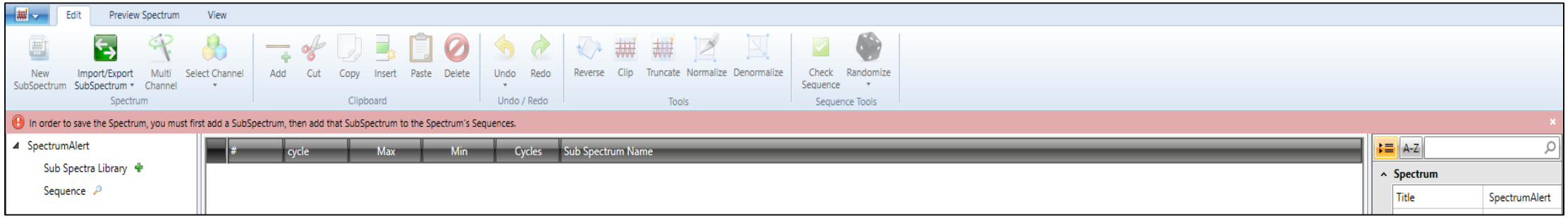
Popup Error Messages

- When an error is detected, a popup window appears with details about the error.
- View these details again by clicking the red “Details” button in the error window.



Alert Ribbon

- Displays when the spectrum can't be saved (e.g. if the sequence is empty/no sub spectra exist).



- Will disappear automatically when spectrum may be saved.
- Can be dismissed by clicking the white 'x' on far right of the alert.

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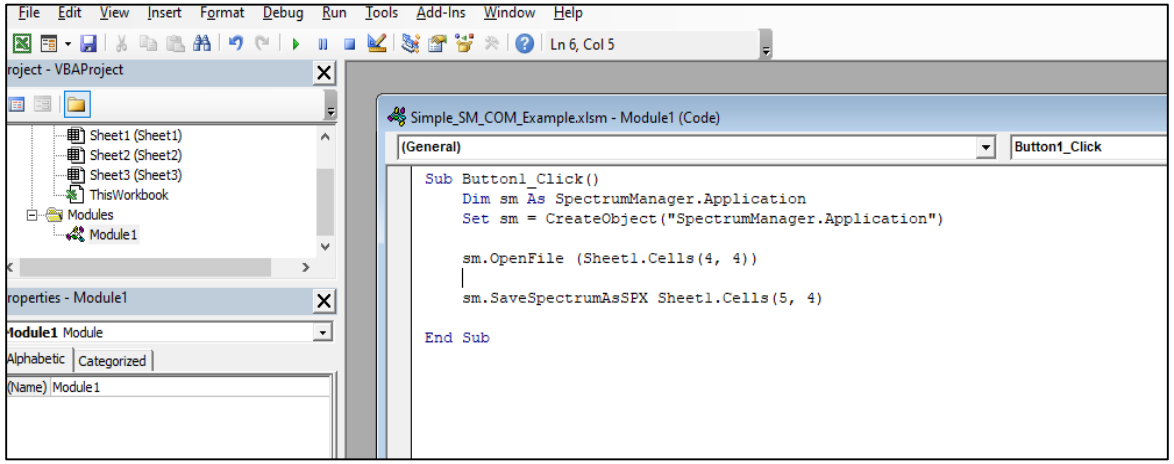
COM Support

AFGROW.NET

- Preform most Spectrum Manager actions through COM
- Create a new spectrum/Edit existing spectrum
- Get statistics of spectrum/single sub spectrum
- Reverse, Clip, Truncate spectrum/single sub spectrum



Bug Fixes in Version 1.2

- Multiple instances of spectrum manager can now run without overwriting each other.
- Re-arranging levels in the Spectrum Data grid now correctly updates cycle number and row number.
- Closing the truncate window by hitting the x in the top corner now cancels the entire truncate.
- Load Type column now appears immediately when the time dependent option is selected.
- Levels marked as erroneous are re-checked to verify error.

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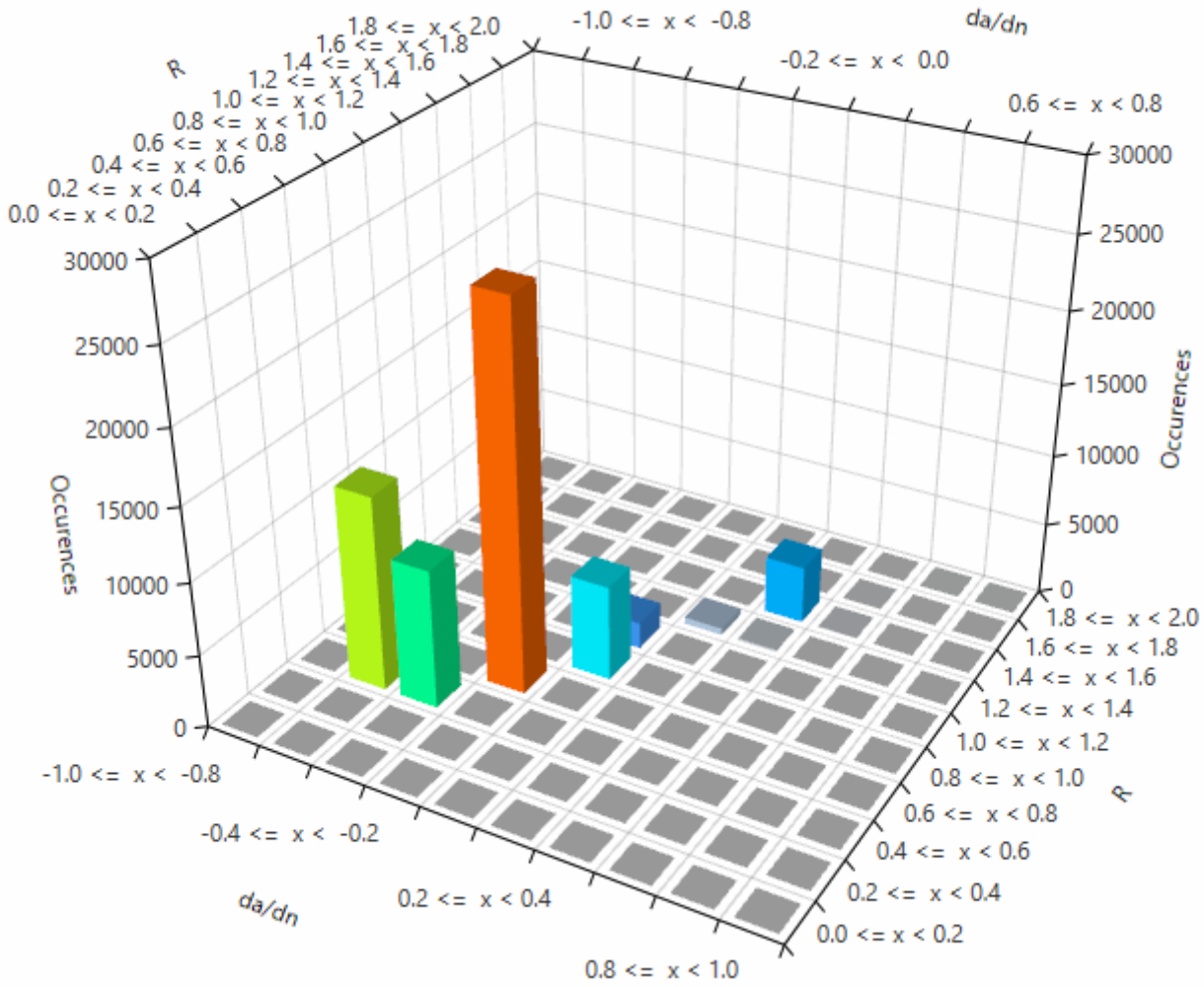
Short-Term Future Development Plans

AFGROW.NET

- Combined (R – Delta) plot view using a 3D chart
- Configuration Options (Colors, Max-Min plot values, Exceedance plot orientation, etc..)
- Spectrum Changelog



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Long Term Future Development Plans

AFGROW.NET

- Spectrum Cycle Counting
- Saving uncounted spectrum with count
- Improved Undo/Redo
- Spectrum Severity Comparison

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Conclusion

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- Spectrum Manager v 1.2 new features include: Spectrum Generation from Exceedance Curve data, improved application speed, ability to save individual sub spectra, a new preview selector, COM support, and several bug fixes.

- Upcoming new features include R - Delta plot view.

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Questions/Comments?