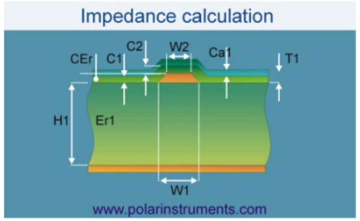
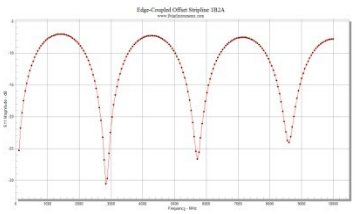
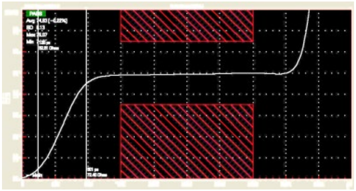
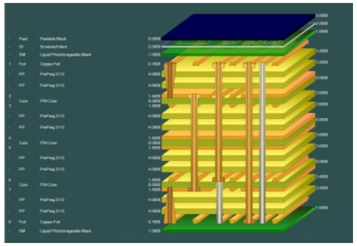
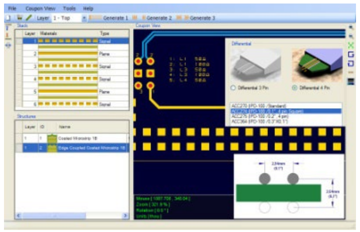








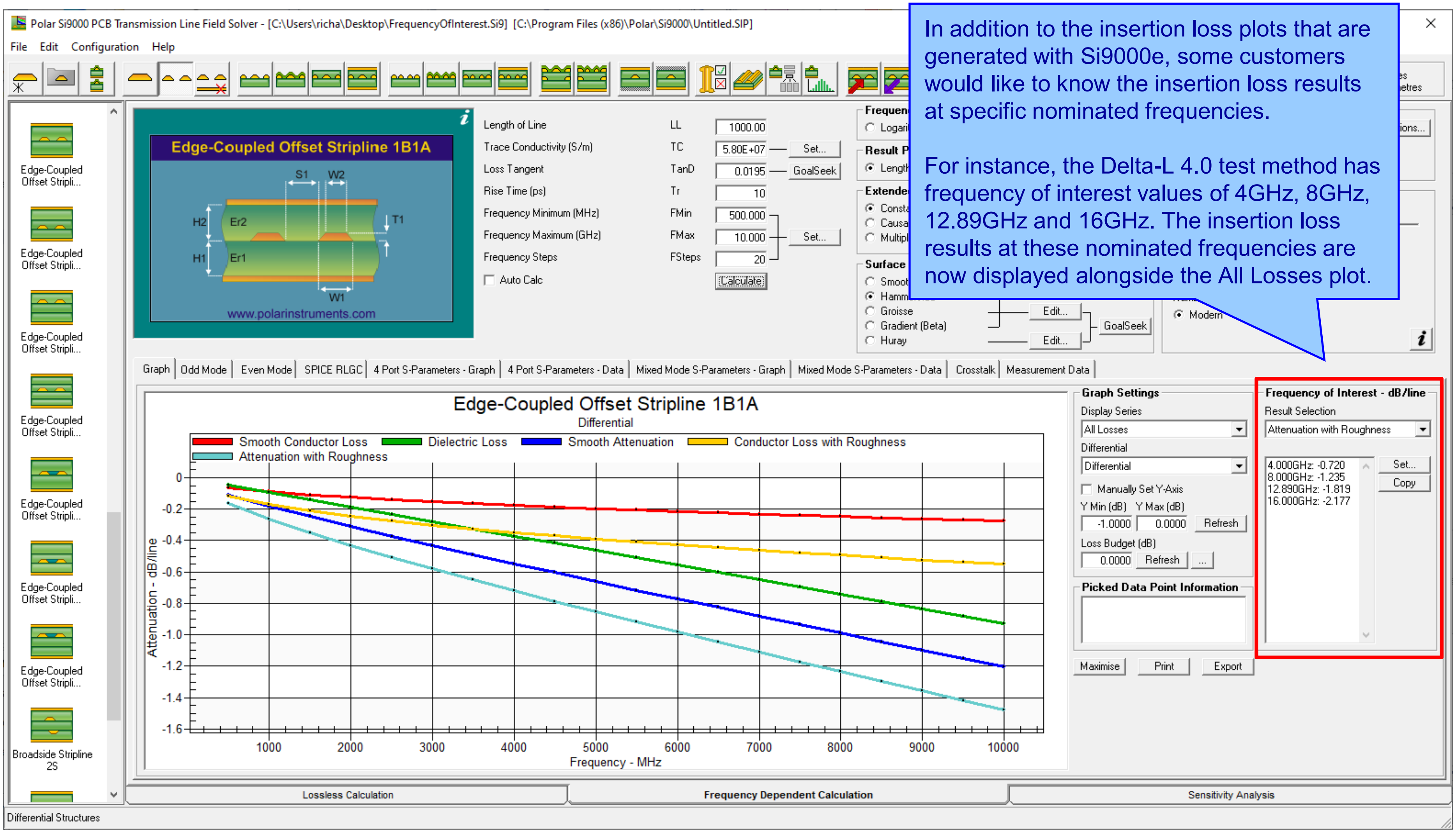


Si9000e 2021 – 2023 Preview

Richard Attrill – September 2023 (Rev 5)

Si9000e v23.09.21 (September 2023)

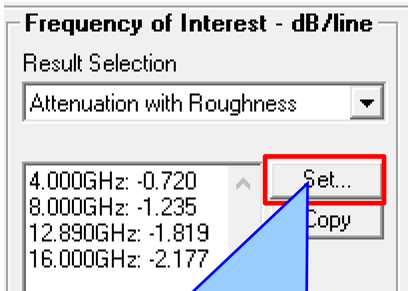
New Frequency of Interest option added



In addition to the insertion loss plots that are generated with Si9000e, some customers would like to know the insertion loss results at specific nominated frequencies.

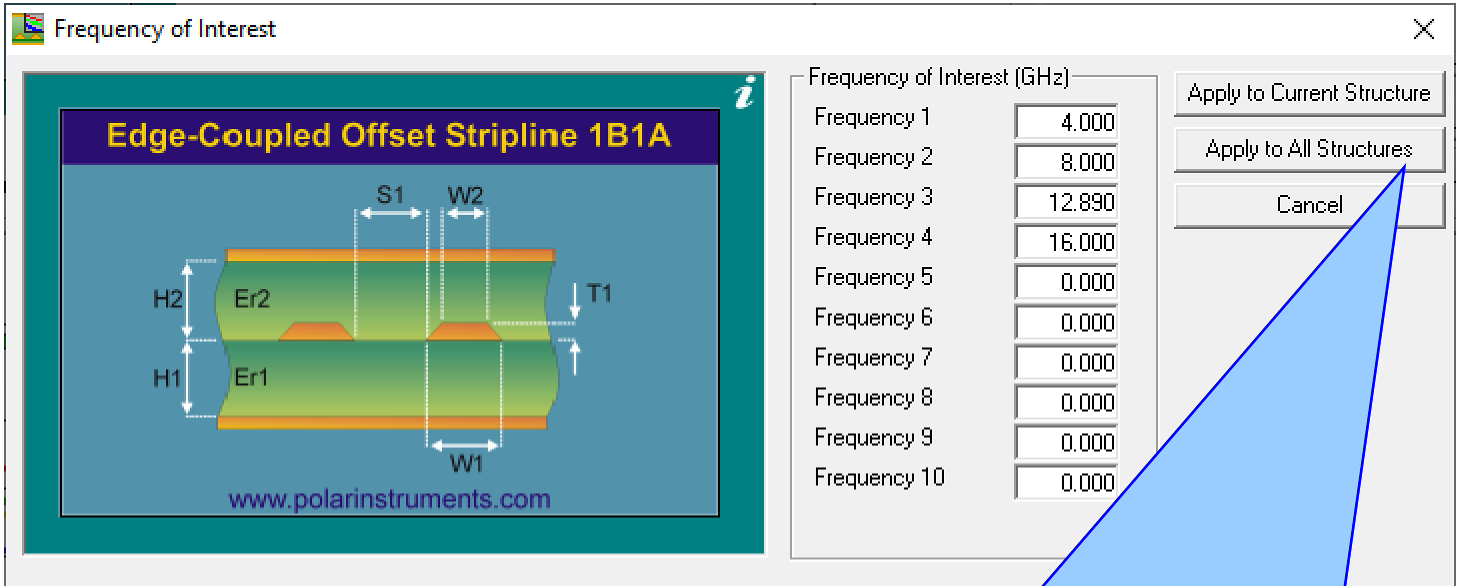
For instance, the Delta-L 4.0 test method has frequency of interest values of 4GHz, 8GHz, 12.89GHz and 16GHz. The insertion loss results at these nominated frequencies are now displayed alongside the All Losses plot.

New Frequency of Interest option added



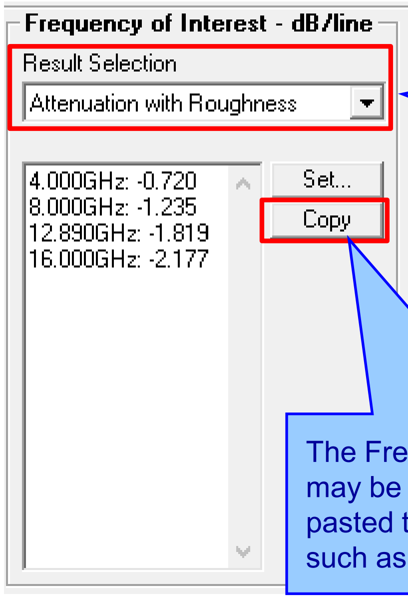
Select the Set… button to load the Frequency of Interest dialog

This dialog allows the user to nominate 10 frequency values per structure, so each structure inside Si9000e can have 10 unique frequency values.



- Selecting Apply to Current Structure will place those frequency values with the current selected structure so the next time the structure is calculated the results for each specified frequency will be placed on the main dialog, giving immediate feedback of the results at those frequency values.
- Selecting Apply to All Structures will place those same nominated frequency values on all structures in the Si9000e, including those structures that exist in a Project.
- In this example we have keyed in the four Delta-L 4.0 frequencies of 4GHz, 8GHz, 12.89GHz and 16GHz

New Frequency of Interest option added



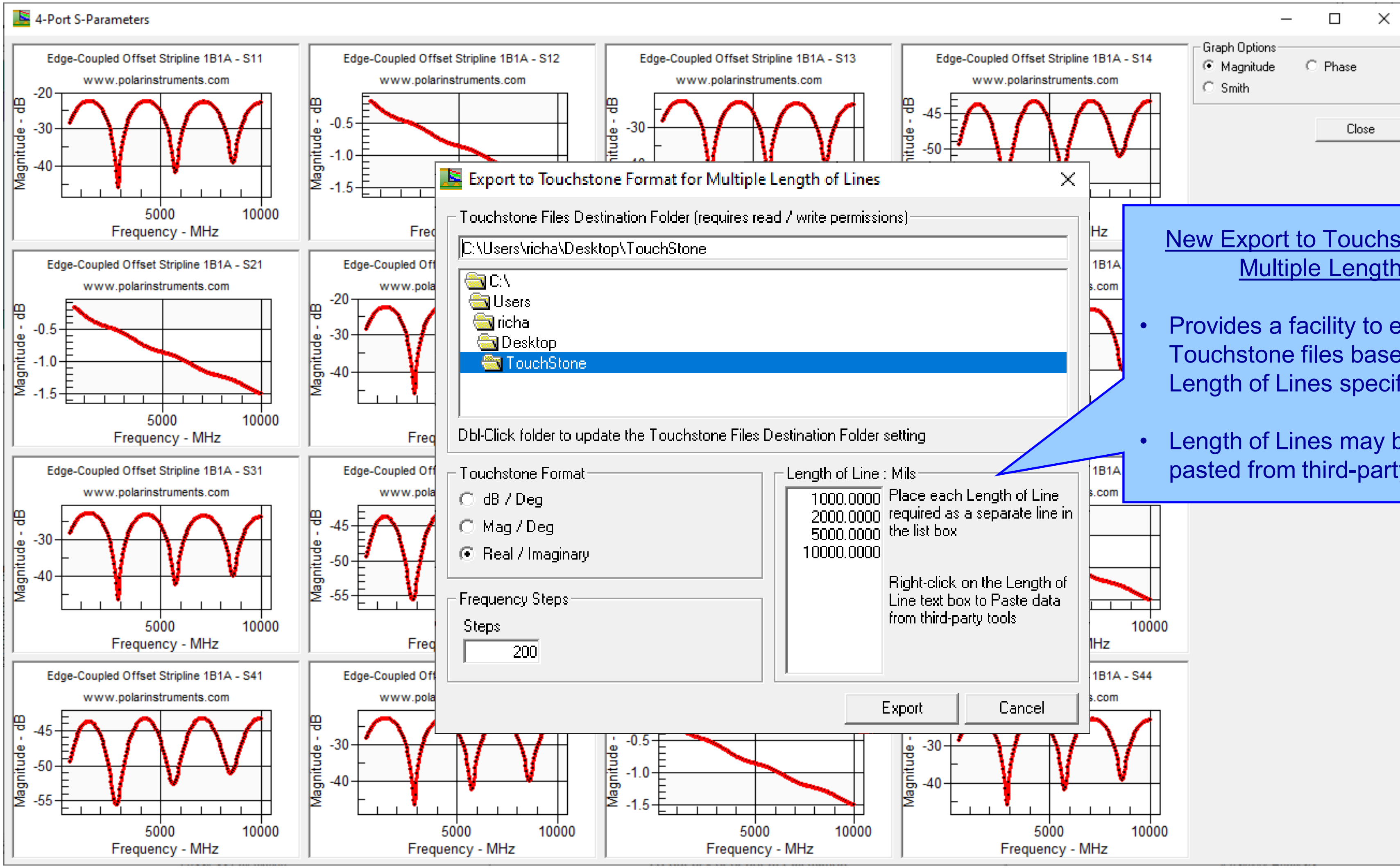
Use the Result Selection dropdown to choose which loss result is displayed. The options available are Attenuation with Roughness, Smooth Conductor Loss, Dielectric Loss, Smooth Attenuation and Conductor Loss with Roughness.

Like the All Losses plots, the formatting of the dB results will match that as specified by Result Presentation, so the dB results will be by /Length or /inch or /metre

The Frequency of Interest results may be copied to the clipboard, then pasted to third-party applications such as Excel

Si9000e v23.08.02 (August 2023)

New Export to Touchstone Format for Multiple Length of Lines

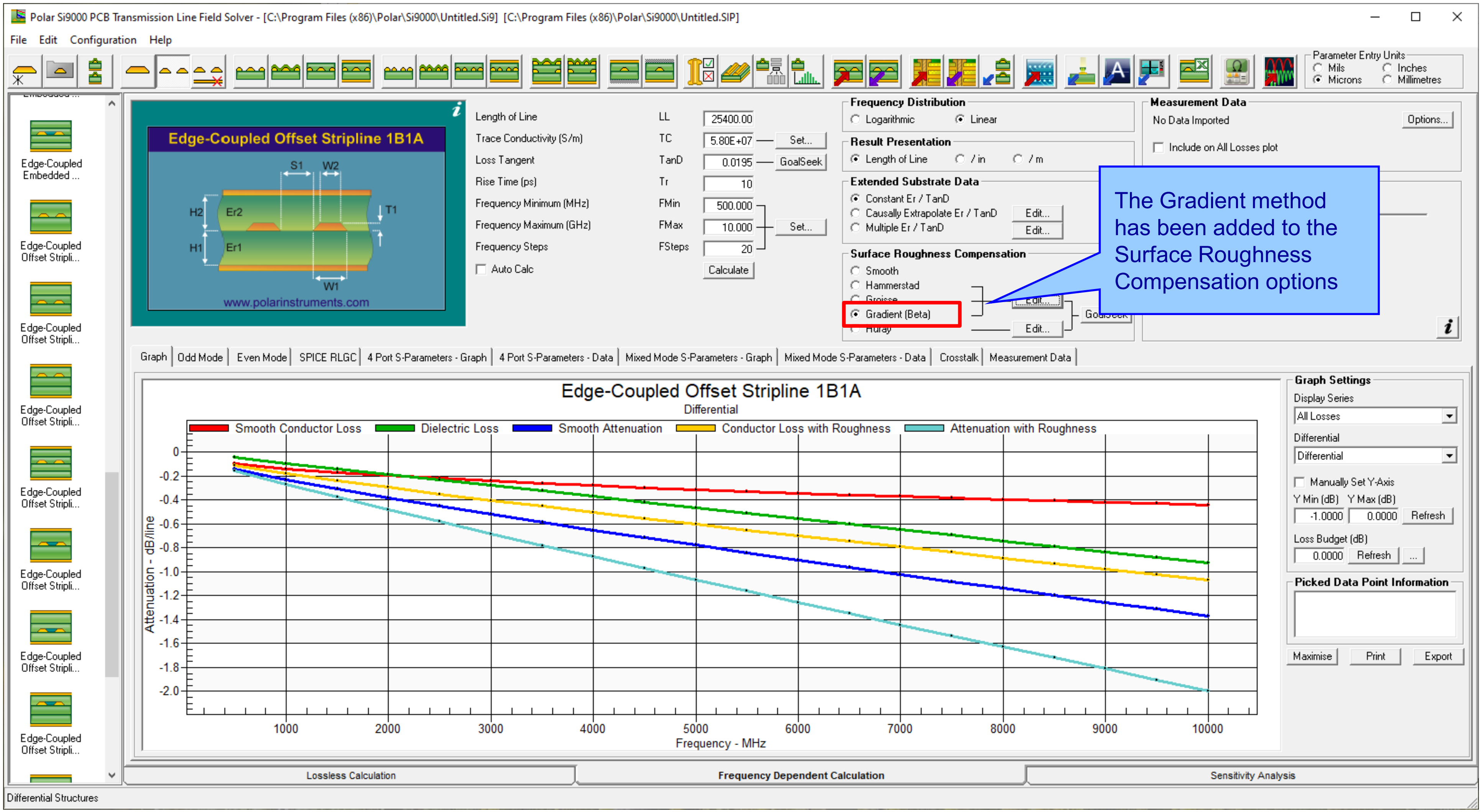


New Export to Touchstone Format for Multiple Length of Lines

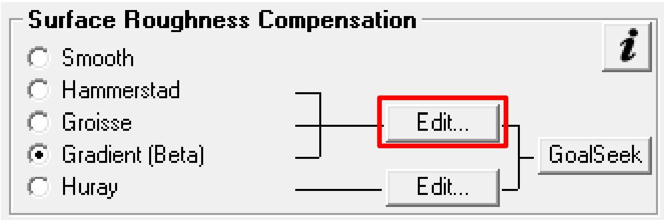
- Provides a facility to export multiple Touchstone files based upon the Length of Lines specified
- Length of Lines may be keyed in or pasted from third-party applications

Si9000e v23.06.01 (June 2023)

New Gradient Surface Roughness Compensation Method added

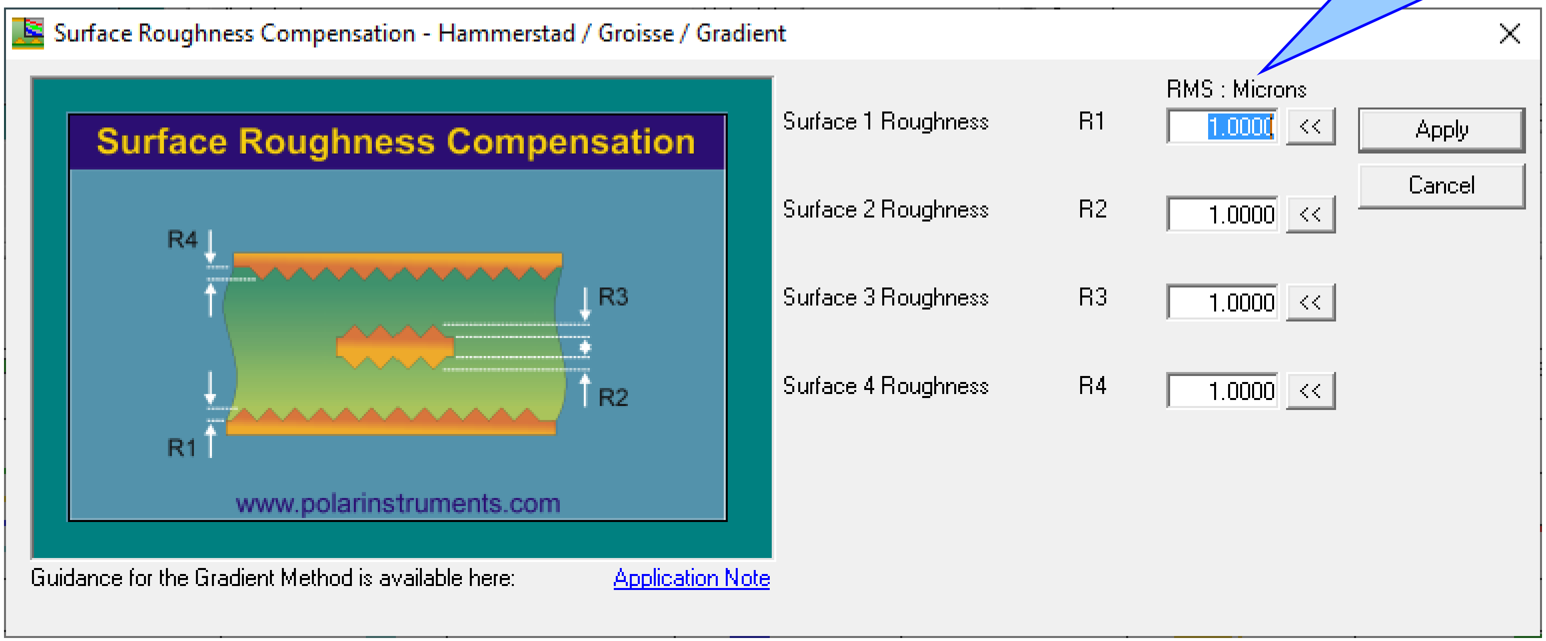


New Gradient Surface Roughness Compensation Method added

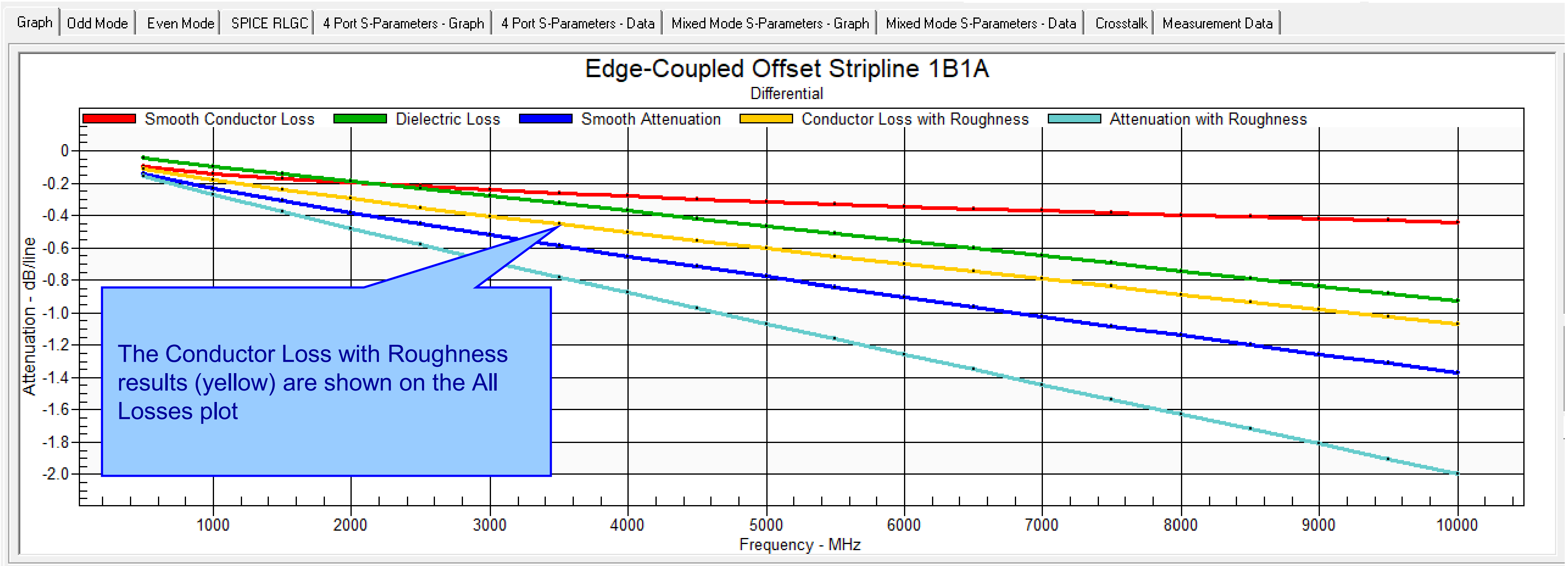


Selecting the Edit button will allow the RMS roughness values to be entered.

In this example 1µm roughness for all significant surfaces



New Gradient Surface Roughness Compensation Method added



New Gradient Surface Roughness Compensation Method added

Graph | Odd Mode | Even Mode | SPICE RLGC | 4 Port S-Parameters - Graph | 4 Port S-Parameters - Data | Mixed Mode S-Parameters - Graph | Mixed Mode S-Parameters - Data | Crosstalk | Measurement Data

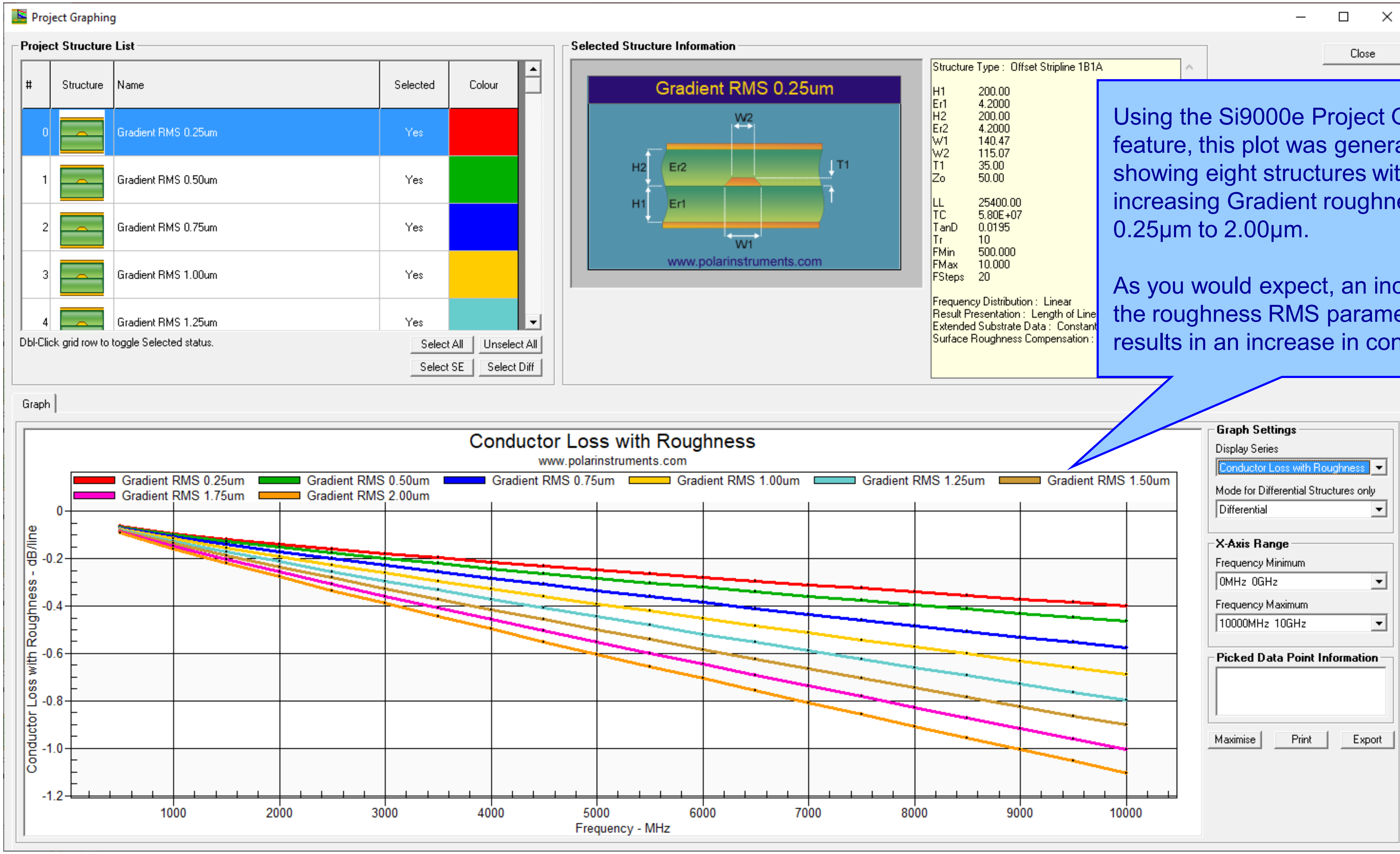
Frequency Hz	Impedance Real Ohms	Impedance Imaginary Ohms	Impedance Magnitude Ohms	Inductance H/line	Resistance Ohms/line	Capacitance F/line	Conductance S/line	Skin Depth m	Smooth Conductor Loss dB/line	Dielectric Loss dB/line	Smooth Attenuation dB/line	Conductor Loss with Roughness dB/line	Attenuation with Roughness dB/line	Modal Phase Velocity m/s	Alpha Np/line	Alpha dB/line	Beta rad/line
5.000E+08	3.161E+01	-3.664E-01	3.161E+01	5.955E-09	7.989E-01	5.964E-12	3.653E-04	2.955E-06	-9.873E-02	-4.717E-02	-1.459E-01	-1.128E-01	-1.599E-01	1.348E+08	1.841E-02	-1.599E-01	5.921E-01
1.000E+09	3.138E+01	-2.268E-01	3.138E+01	5.869E-09	1.253E+00	5.964E-12	7.307E-04	2.090E-06	-1.399E-01	-9.376E-02	-2.337E-01	-1.792E-01	-2.730E-01	1.358E+08	3.142E-02	-2.730E-01	1.176E+00
1.500E+09	3.126E+01	-1.675E-01	3.126E+01	5.827E-09	1.660E+00	5.964E-12	1.096E-03	1.706E-06	-1.715E-01	-1.403E-01	-3.118E-01	-2.391E-01	-3.794E-01	1.363E+08	4.368E-02	-3.794E-01	1.757E+00
2.000E+09	3.119E+01	-1.330E-01	3.119E+01	5.799E-09	2.043E+00	5.964E-12	1.461E-03	1.478E-06	-1.982E-01	-1.867E-01	-3.849E-01	-2.957E-01	-4.824E-01	1.366E+08	5.554E-02	-4.824E-01	2.337E+00
2.500E+09	3.113E+01	-1.097E-01	3.113E+01	5.779E-09	2.410E+00	5.964E-12	1.827E-03	1.322E-06	-2.217E-01	-2.331E-01	-4.548E-01	-3.501E-01	-5.832E-01	1.368E+08	6.714E-02	-5.832E-01	2.916E+00
3.000E+09	3.109E+01	-9.260E-02	3.109E+01	5.763E-09	2.766E+00	5.964E-12	2.192E-03	1.207E-06	-2.429E-01	-2.795E-01	-5.224E-01	-4.028E-01	-6.823E-01	1.370E+08	7.856E-02	-6.823E-01	3.495E+00
3.500E+09	3.105E+01	-7.937E-02	3.105E+01	5.750E-09	3.112E+00	5.964E-12	2.557E-03	1.117E-06	-2.624E-01	-3.259E-01	-5.883E-01	-4.543E-01	-7.802E-01	1.372E+08	8.982E-02	-7.802E-01	4.072E+00
4.000E+09	3.102E+01	-6.871E-02	3.102E+01	5.739E-09	3.452E+00	5.964E-12	2.923E-03	1.045E-06	-2.806E-01	-3.723E-01	-6.529E-01	-5.047E-01	-8.770E-01	1.373E+08	1.010E-01	-8.770E-01	4.650E+00
4.500E+09	3.100E+01	-5.988E-02	3.100E+01	5.730E-09	3.785E+00	5.964E-12	3.288E-03	9.851E-07	-2.976E-01	-4.187E-01	-7.163E-01	-5.543E-01	-9.730E-01	1.374E+08	1.120E-01	-9.730E-01	5.227E+00
5.000E+09	3.097E+01	-5.241E-02	3.097E+01	5.721E-09	4.114E+00	5.964E-12	3.653E-03	9.346E-07	-3.138E-01	-4.650E-01	-7.788E-01	-6.032E-01	-1.068E+00	1.375E+08	1.230E-01	-1.068E+00	5.803E+00
5.500E+09	3.095E+01	-4.597E-02	3.095E+01	5.714E-09	4.437E+00	5.964E-12	4.019E-03	8.911E-07	-3.291E-01	-5.114E-01	-8.405E-01	-6.515E-01	-1.163E+00	1.376E+08	1.339E-01	-1.163E+00	6.379E+00
6.000E+09	3.094E+01	-4.034E-02	3.094E+01	5.707E-09	4.757E+00	5.964E-12	4.384E-03	8.532E-07	-3.438E-01	-5.577E-01	-9.015E-01	-6.992E-01	-1.257E+00	1.377E+08	1.447E-01	-1.257E+00	6.955E+00
6.500E+09	3.092E+01	-3.536E-02	3.092E+01	5.702E-09	5.073E+00	5.964E-12	4.750E-03	8.197E-07	-3.579E-01	-6.040E-01	-9.619E-01	-7.464E-01	-1.350E+00	1.377E+08	1.555E-01	-1.350E+00	7.531E+00
7.000E+09	3.091E+01	-3.091E-02	3.091E+01	5.696E-09	5.387E+00	5.964E-12	5.115E-03	7.899E-07	-3.714E-01	-6.503E-01	-1.022E+00	-7.931E-01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.500E+09	3.089E+01	-2.691E-02	3.089E+01	5.691E-09	5.697E+00	5.964E-12	5.480E-03	7.631E-07	-3.845E-01	-6.967E-01	-1.081E+00	-8.395E-01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.000E+09	3.088E+01	-2.327E-02	3.088E+01	5.686E-09	6.005E+00	5.964E-12	5.846E-03	7.389E-07	-3.971E-01	-7.430E-01	-1.140E+00	-8.855E-01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.500E+09	3.087E+01	-1.995E-02	3.087E+01	5.682E-09	6.310E+00	5.964E-12	6.211E-03	7.168E-07	-4.093E-01	-7.893E-01	-1.199E+00	-9.311E-01	-1.720E+00	1.380E+08	1.981E-01	-1.720E+00	9.831E+00
9.000E+09	3.086E+01	-1.690E-02	3.086E+01	5.678E-09	6.613E+00	5.964E-12	6.576E-03	6.966E-07	-4.212E-01	-8.356E-01	-1.257E+00	-9.764E-01	-1.812E+00	1.380E+08	2.086E-01	-1.812E+00	1.041E+01
9.500E+09	3.085E+01	-1.409E-02	3.085E+01	5.674E-09	6.914E+00	5.964E-12	6.942E-03	6.780E-07	-4.328E-01	-8.819E-01	[illegible]	-1.021E+00	-1.903E+00	1.381E+08	2.191E-01	-1.903E+00	1.098E+01
1.000E+10	3.084E+01	-1.148E-02	3.084E+01	5.671E-09	7.213E+00	5.964E-12	7.307E-03	6.609E-07	-4.441E-01	-9.282E-01	[illegible]	-1.066E+00	-1.994E+00	1.381E+08	2.296E-01	-1.994E+00	1.155E+01

Copy Results to Clipboard (for Excel)

The Conductor Loss with Roughness results data is also shown alongside the other field solver results.

The complete set of results can be exported to third-party tools like Excel using the right-click menu | Copy Results to Clipboard

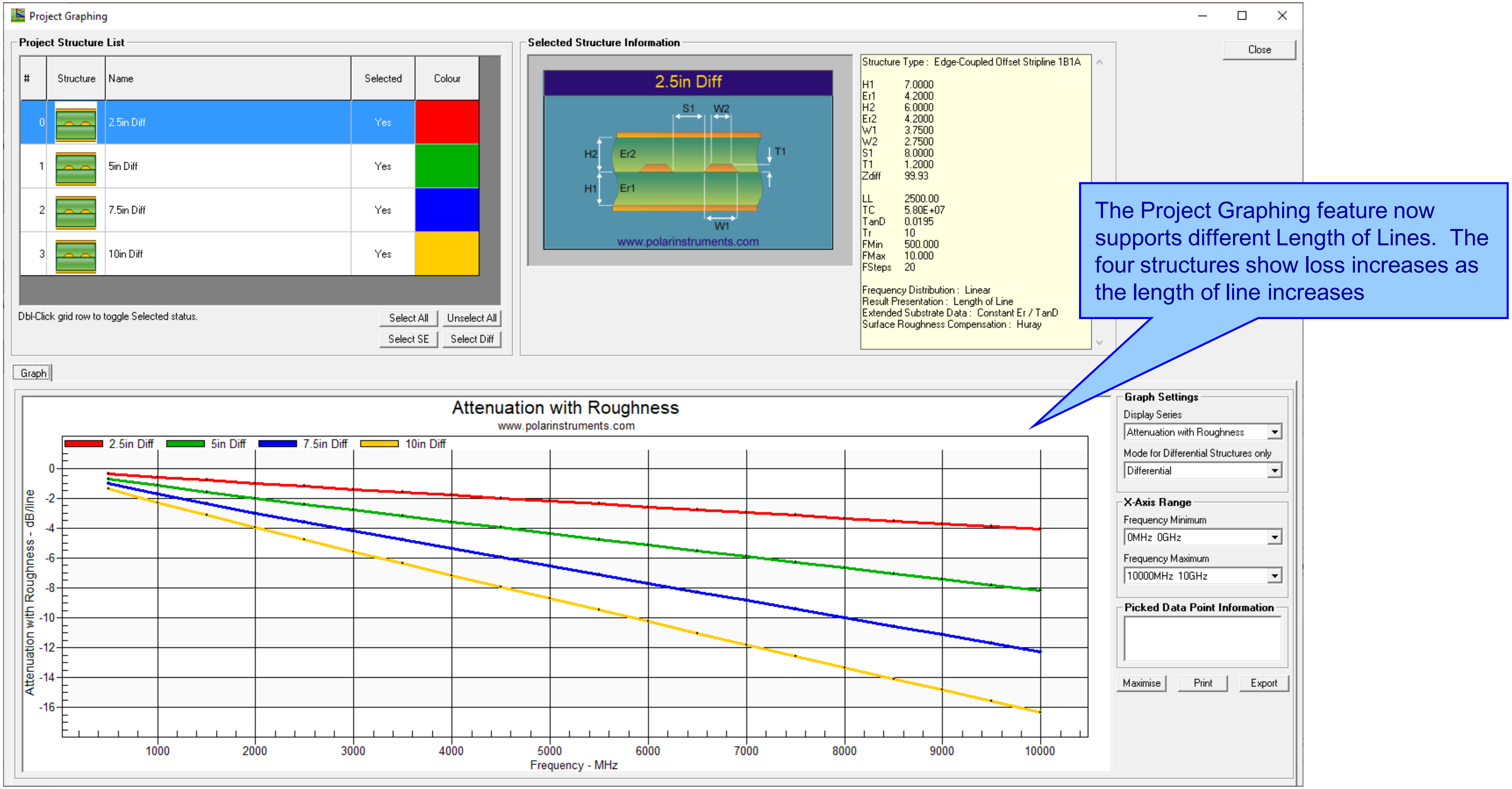
New Gradient Surface Roughness Compensation Method added



Using the Si9000e Project Graphing feature, this plot was generated showing eight structures with an ever increasing Gradient roughness from 0.25µm to 2.00µm.

As you would expect, an increase in the roughness RMS parameter value results in an increase in conductor loss

Project Graphing Enhancements – now supports structures within the Project with varying Length of Line

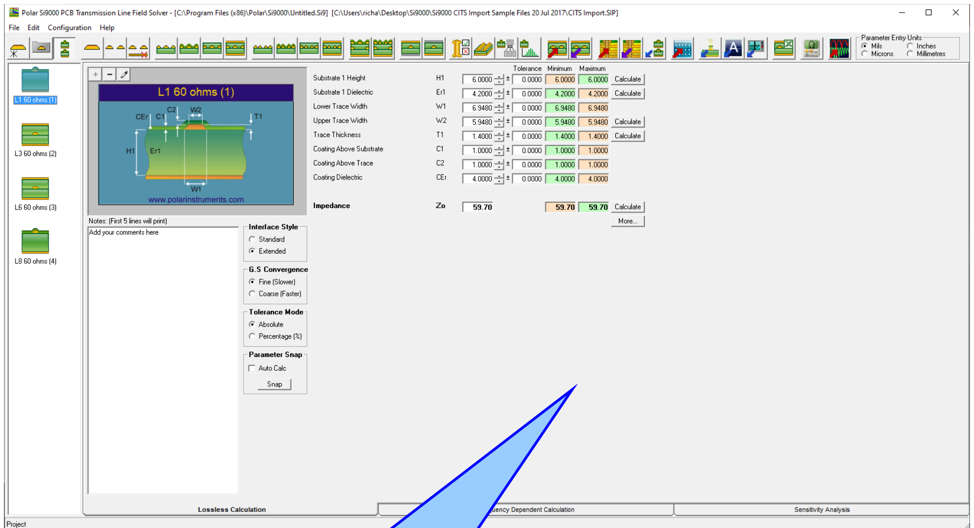


Other enhancements

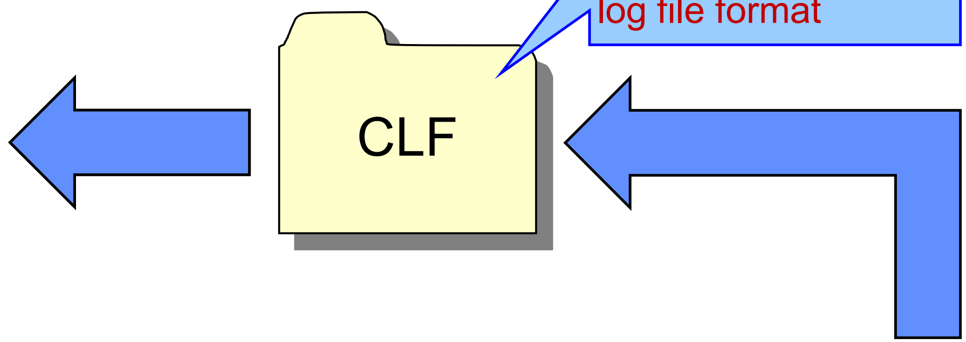
- FlexNet Publisher / FLEXlm v11.19.0.0 supported

Si9000e v22.09.01 (September 2022)

Enhancements to the Import Polar CITS Datalog File option

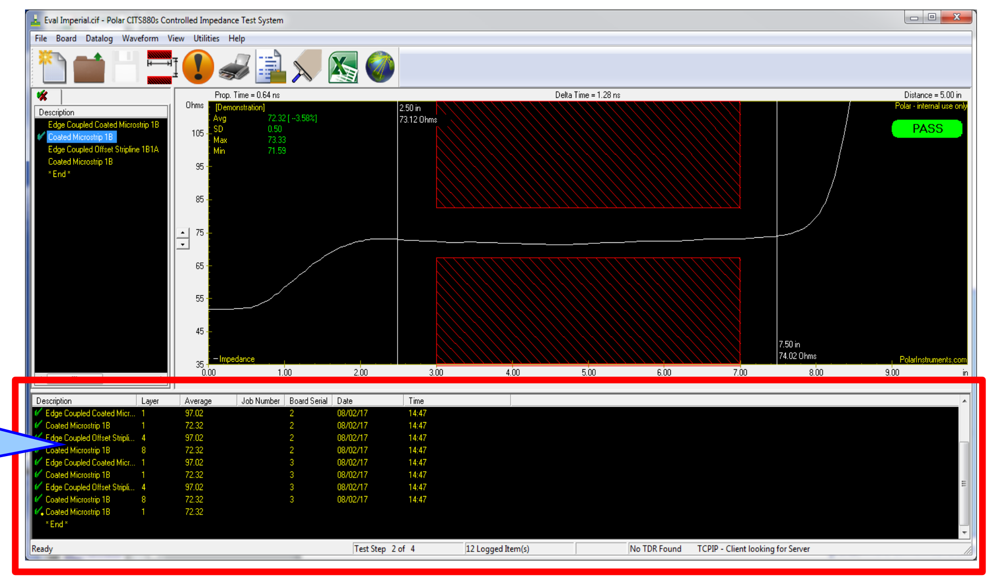


New for v22.09.01
Now supports the latest CITS880s data log file format



Overview
The Polar Si8000m / Si9000e field solver products have the capability to read a Polar CITS Data Log File (.CLF). This file contains comprehensive impedance measurement data and, along with existing modelled structure information, offers graphing capabilities and statistical analysis where the modelled and measured data can be presented together.

The Data Log of the CITS software is stored in a CLF file



Import CITS Datalog File option – feature recap

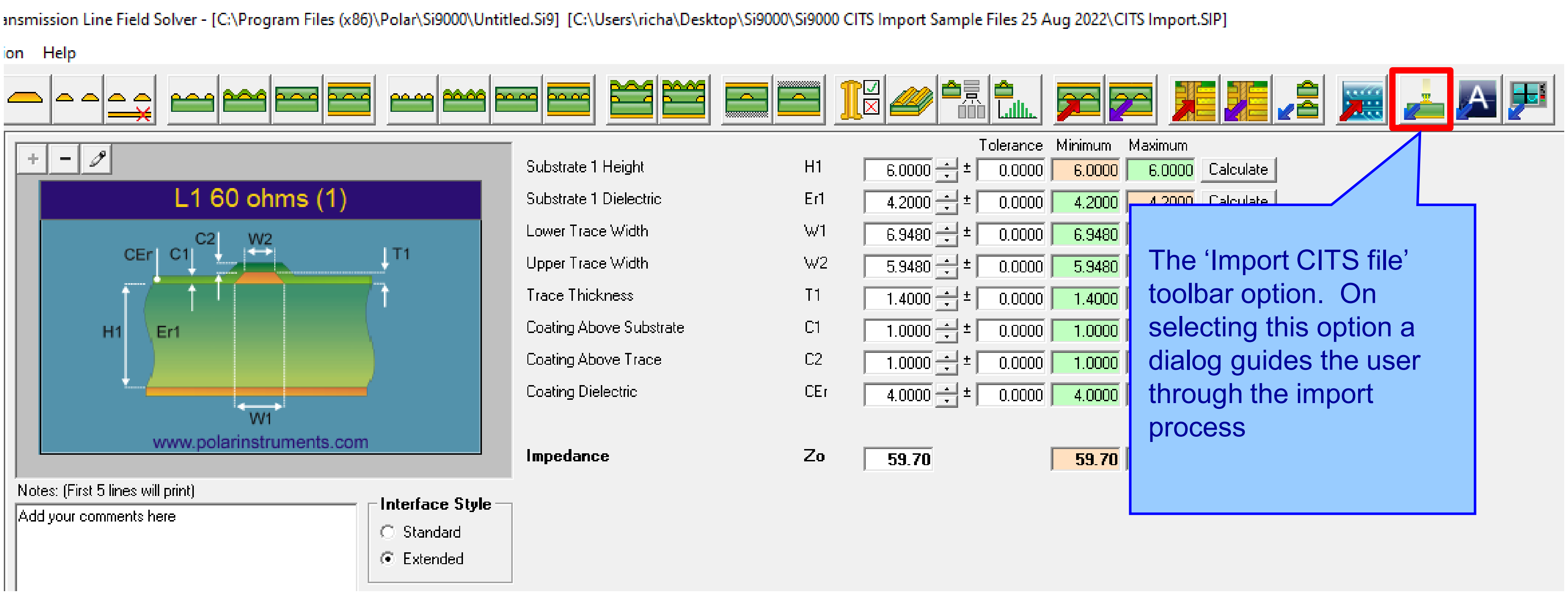
Whilst working with controlled impedance designs it is often desirable to compare the reality of the measurement data against the modelled structure.

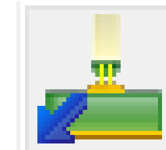
'Closing the loop' between the predicted and actual measured results has a number of benefits for both the design and fabrication environments. It allows for fine tuning of the structure parameters in future manufacturing batches, statistical analysis and improved overall process control.

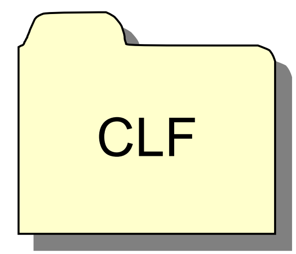
This capability within the Polar's Si8000m / Si9000e field solver products allows the user to quickly import measurement data directly from the industry-standard Polar Controlled Impedance Test System (CITS).

If you are a design customer using the Si8000m / Si9000e and would like to use this feature, please request the Polar CITS Datalog File from your fabricator.

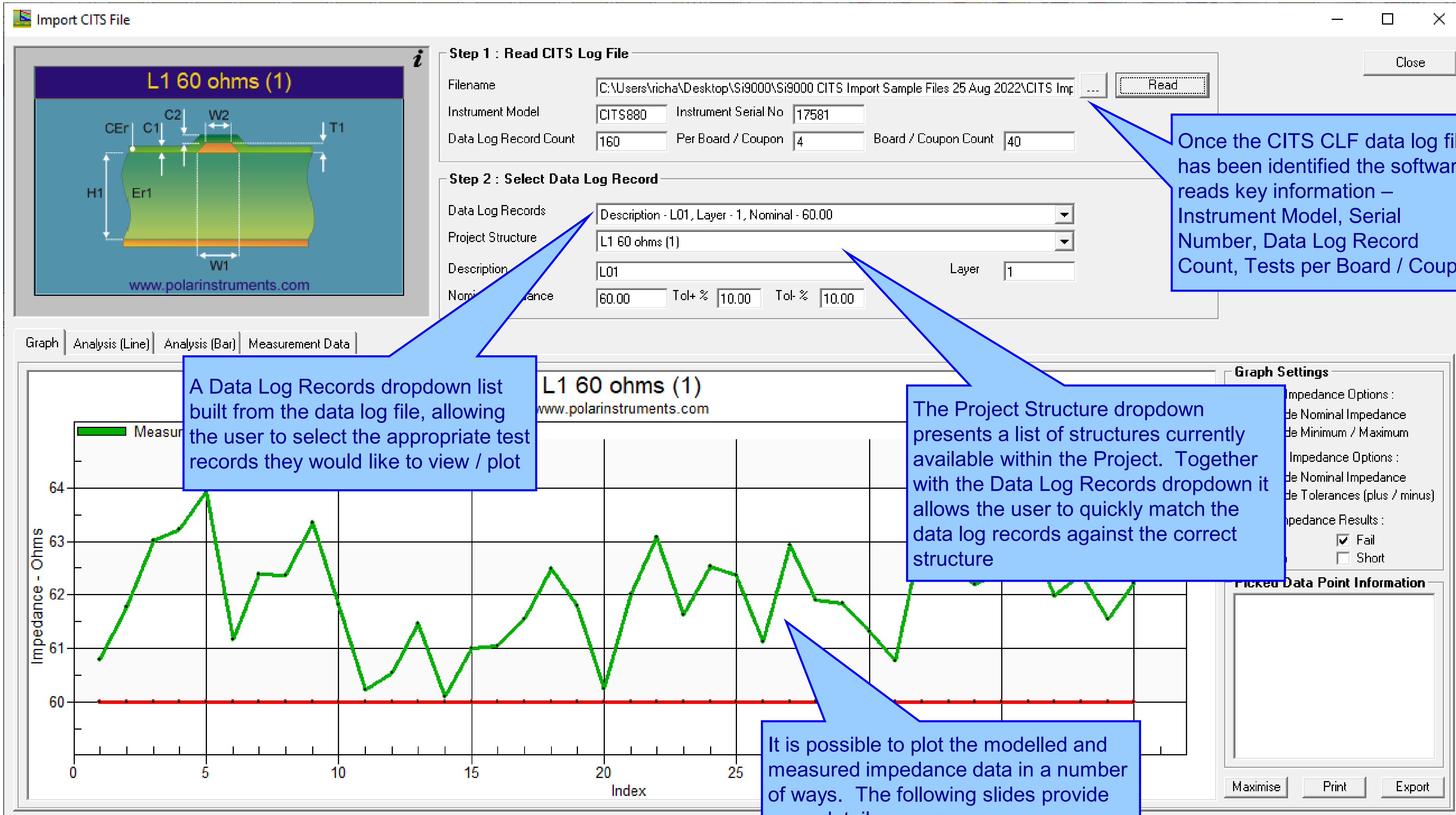
Import CITS Datalog File option – feature recap







Import CITS Datalog File option – feature recap



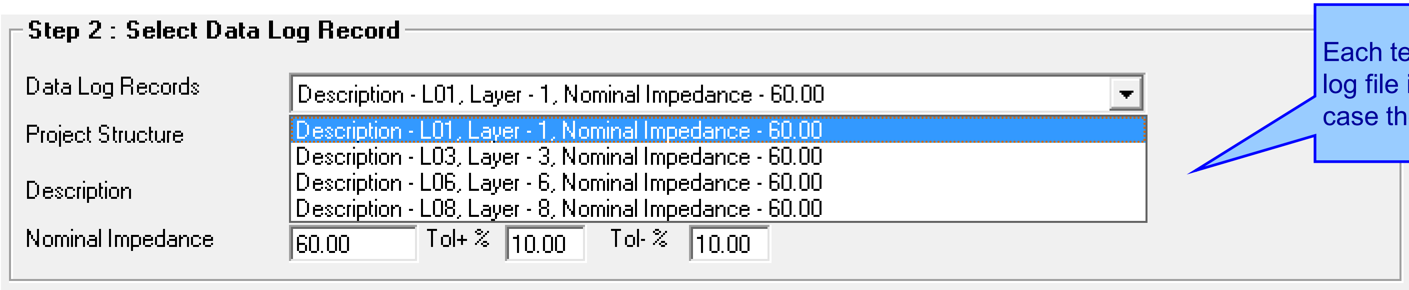
Once the CITS CLF data log file has been identified the software reads key information – Instrument Model, Serial Number, Data Log Record Count, Tests per Board / Coupon

A Data Log Records dropdown list built from the data log file, allowing the user to select the appropriate test records they would like to view / plot

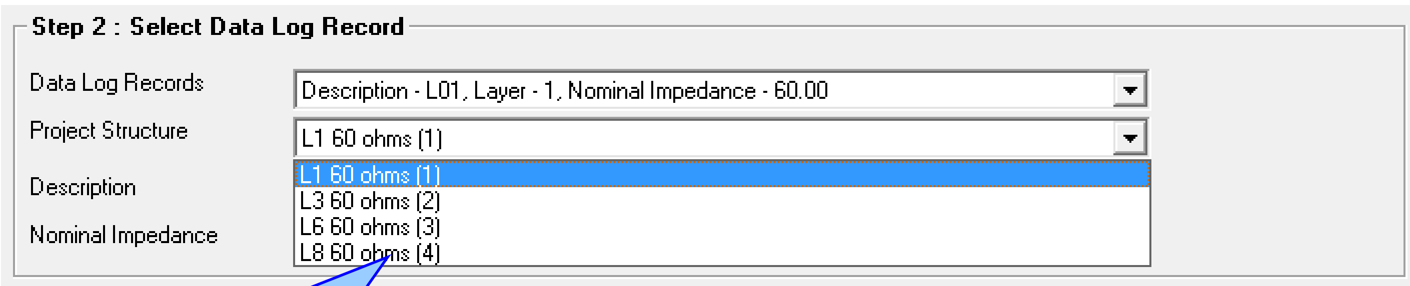
The Project Structure dropdown presents a list of structures currently available within the Project. Together with the Data Log Records dropdown it allows the user to quickly match the data log records against the correct structure

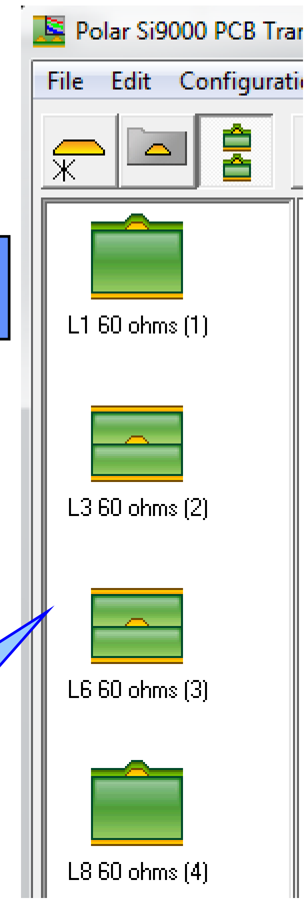
It is possible to plot the modelled and measured impedance data in a number of ways. The following slides provide more details

Import CITS Datalog File option – feature recap



Each test record type found in the data log file is listed in the drop down. In this case there are four tests.





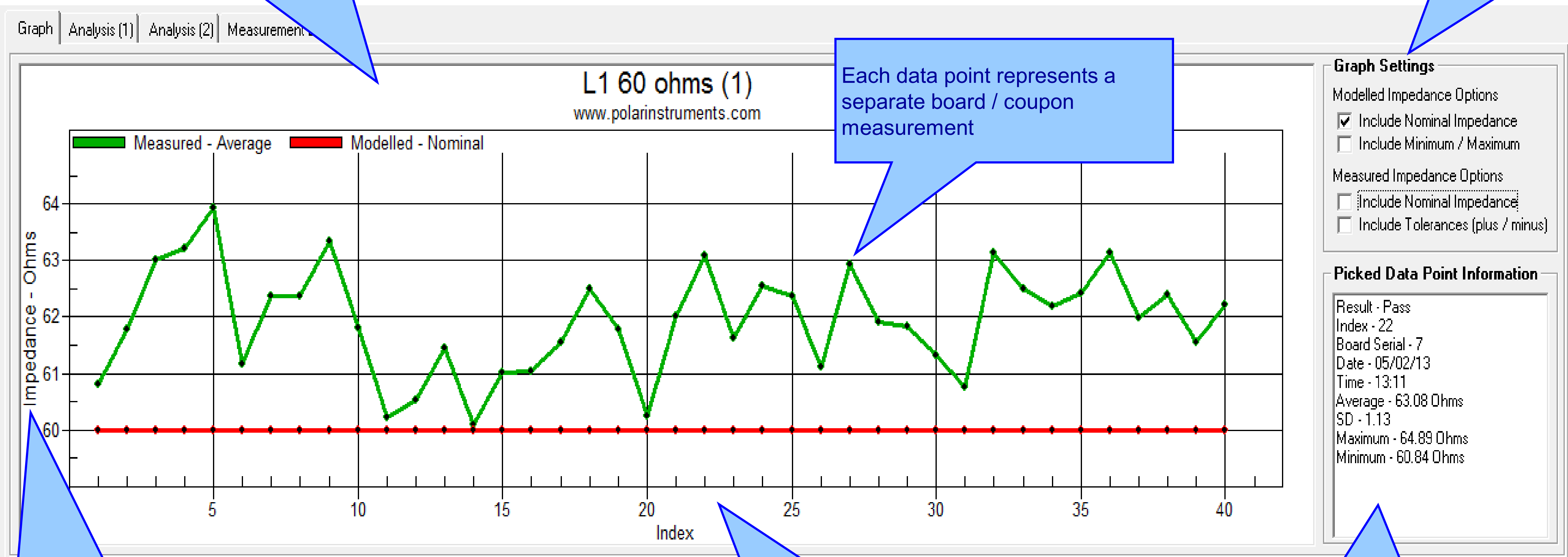
To match one of the four modelled structures from the Project group against a data log test record simply select the structure from the Project Structure dropdown

Four structures loaded into the Project group

Import CITS Datalog File option – feature recap

The Graph tab provides a number of plot options. In this case the measured data is shown in Green, the modelled data in Red

Graph Settings allow the selection of modelled / measured data to be plotted



Each data point represents a separate board / coupon measurement

The y-axis is the measured impedance for each board / coupon

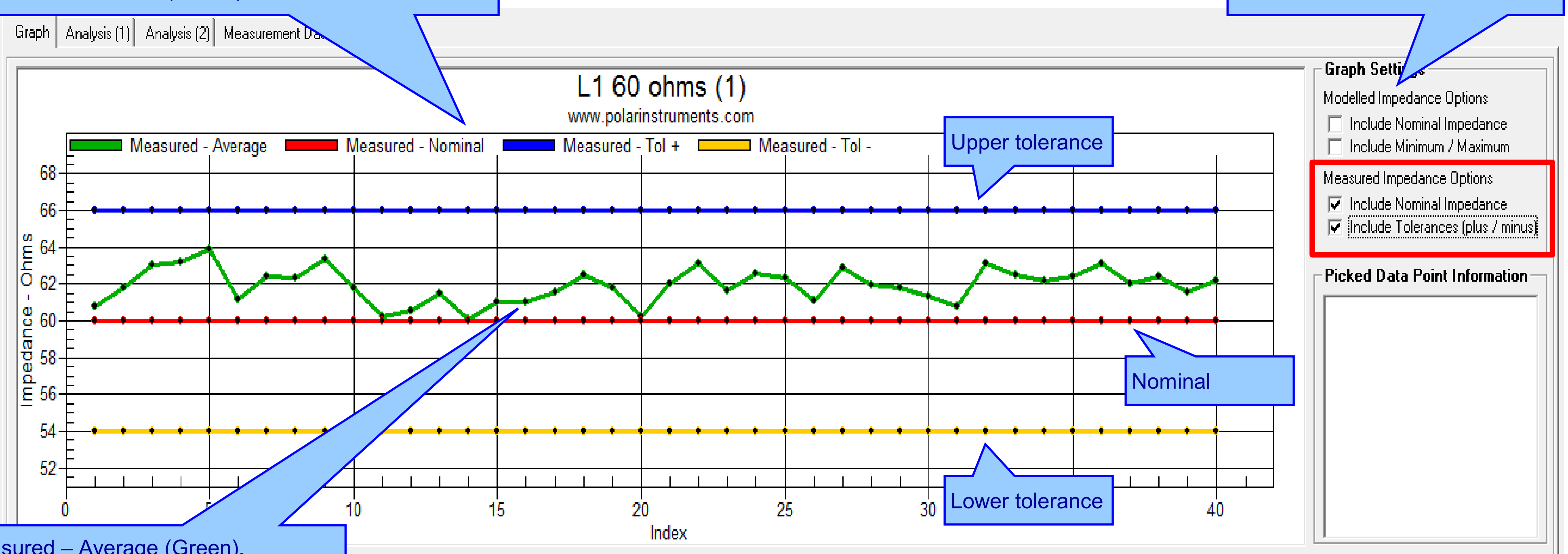
The x-axis is the identifying Index of the board / coupon read from the data log file

It is possible to pick a measured data point, key information is displayed here

Import CITS Datalog File option – feature recap

In this case the Graph contains:
Measured – Average (Green)
Nominal (Red)
Upper Tolerance (Blue)
Lower Tolerance (Yellow)

Graph Settings allow the selection of modelled / measured data to be plotted

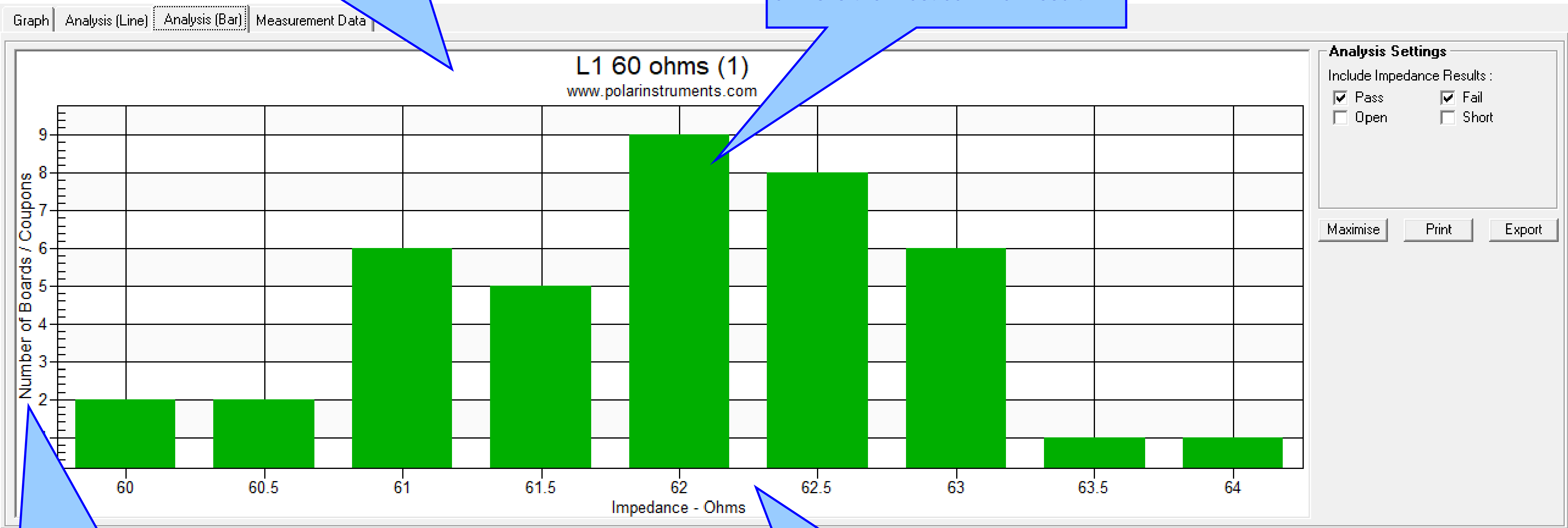


Measured – Average (Green).
Whilst reading slightly higher than the Nominal (60 ohms) all measured data points are within the upper and lower tolerance bands

Import CITS Datalog File option – feature recap

Analysis options:
This bar chart shows the distribution of measurement results over an impedance range

From this batch of 40 board / coupon measurements, 62 +/- 0.25 ohms is the most common result



The y-axis is the number of boards / coupons that fall within a given impedance as detailed on the x-axis

The x-axis is the measured impedance in 0.5 ohm increments

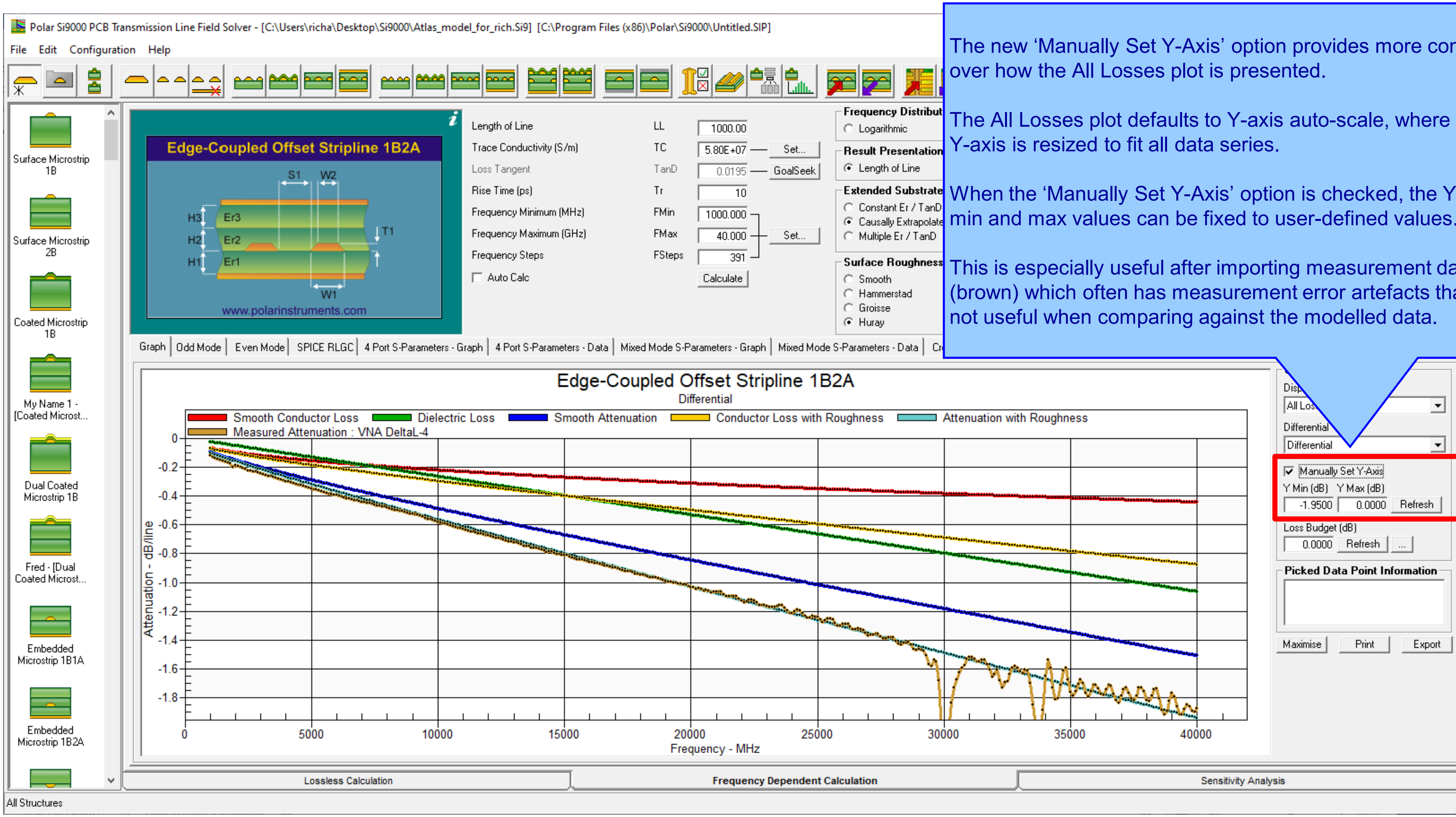
Import CITS Datalog File option – feature recap

Measurement Data:
The CITS Data Log data may also be viewed in a data grid layout. This is especially useful for viewing the Result data (Pass / Fail)

Graph | Analysis (Line) | Analysis (Bar) | Measurement Data

Result	Index	Board Serial	Date	Time	Average	SD	Maximum	Minimum	Station	Description	Layer	Nominal	Tol+ %	Tol- %	Instrument	Serial No
Passed	1	24	05/02/13	12:48	60.8	0.8	61.9	59.56	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	2	29	05/02/13	12:50	61.77	0.95	63.21	59.93	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	3	17	05/02/13	12:51	63.01	0.94	64.48	61.68	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	4	39	05/02/13	12:52	63.22	1.07	64.62	61.29	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	5	8	05/02/13	12:59	63.93	0.95	65.32	62.2	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	6	10	05/02/13	13:00	61.17	0.89	62.69	59.63	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	7	32	05/02/13	13:01	62.38	0.88	63.58	60.72	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	8	21	05/02/13	13:01	62.37	0.82	63.88	60.98	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	9	4	05/02/13	13:02	63.35	0.68	64.41	61.75	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	10	33	05/02/13	13:03	61.81	0.78	62.95	60.09	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	11	18	05/02/13	13:03	60.22	0.62	61.48	59.09	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	12	3	05/02/13	13:04	60.54	0.75	62.1	59.19	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	13	15	05/02/13	13:05	61.46	0.73	62.83	60.12	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	14	2	05/02/13	13:05	60.09	0.67	61.24	58.57	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	15	23	05/02/13	13:06	61.01	0.78	62.4	59.69	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	16	5	05/02/13	13:07	61.05	0.63	62.14	59.49	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	17	6	05/02/13	13:07	61.54	0.8	62.98	60.11	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	18	76	05/02/13	13:08	62.49	0.92	63.44	60.32	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	19	11	05/02/13	13:09	61.79	0.83	63.08	60.37	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	20	31	05/02/13	13:09	60.25	0.65	61.37	58.85	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	21	12	05/02/13	13:10	62.01	0.69	63.24	60.65	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	22	7	05/02/13	13:11	63.08	1.13	64.89	60.84	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581
Passed	23	19	05/02/13	13:11	61.63	0.72	62.81	60.19	_TEST STATION 1_	L01	1	60	10	10	CITS880	17581

New Manually Set Y-Axis option for the All Losses plot



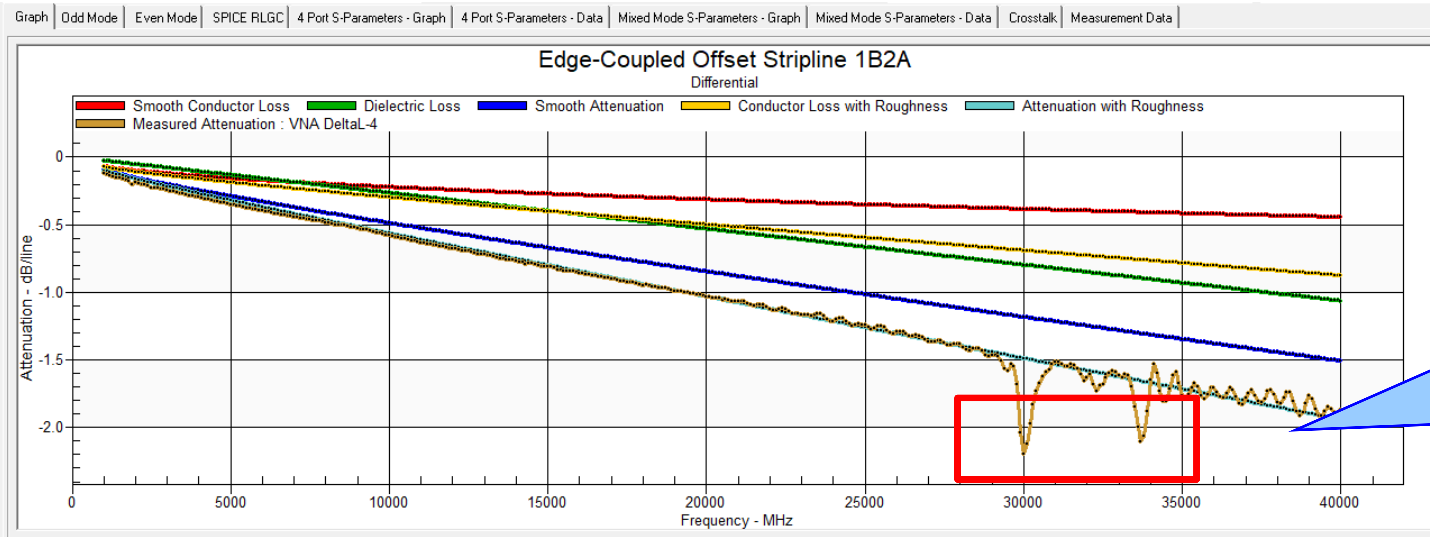
The new 'Manually Set Y-Axis' option provides more control over how the All Losses plot is presented.

The All Losses plot defaults to Y-axis auto-scale, where the Y-axis is resized to fit all data series.

When the 'Manually Set Y-Axis' option is checked, the Y-axis min and max values can be fixed to user-defined values.

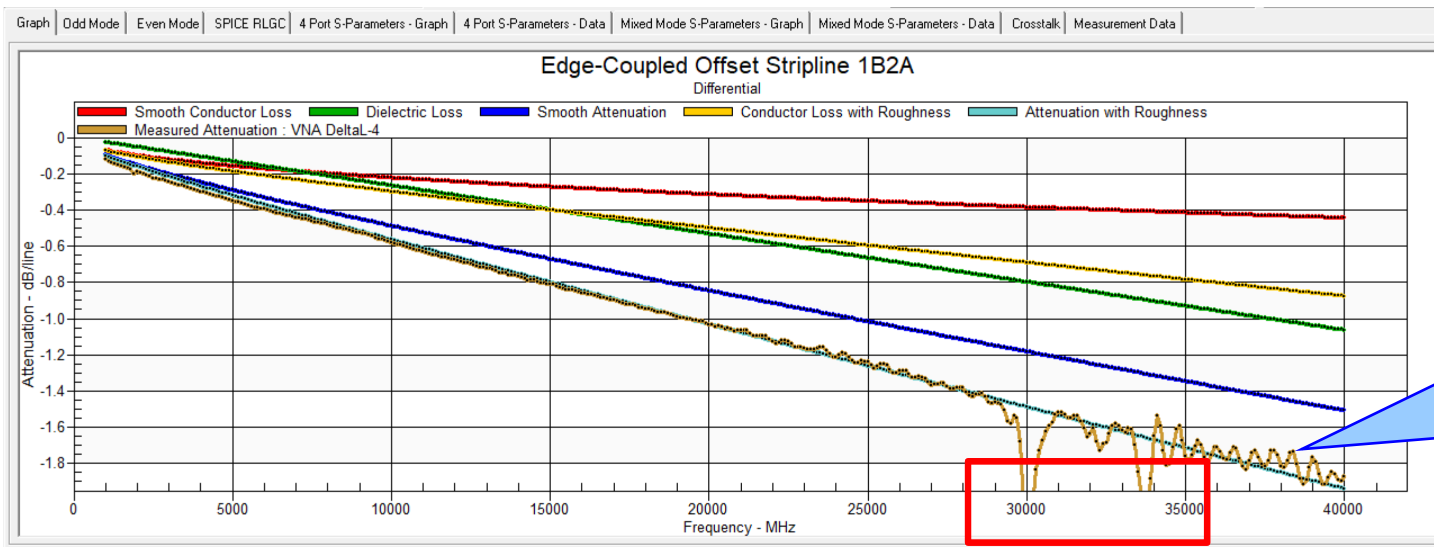
This is especially useful after importing measurement data (brown) which often has measurement error artefacts that are not useful when comparing against the modelled data.

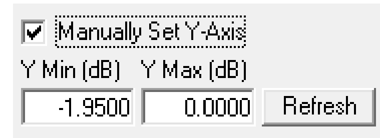
New Manually Set Y-Axis option for the All Losses plot



'Manually Set Y-Axis' unchecked, the Y-axis will auto-scale.

Notice the plot will scale the Y-axis to include all the measurement data including the measurement error artefacts





'Manually Set Y-Axis' is checked, the Y Min is set to -1.95 dB

Notice the plot will fix the Y-axis min / max to the values specified, the measurement error artefacts will be ignored.

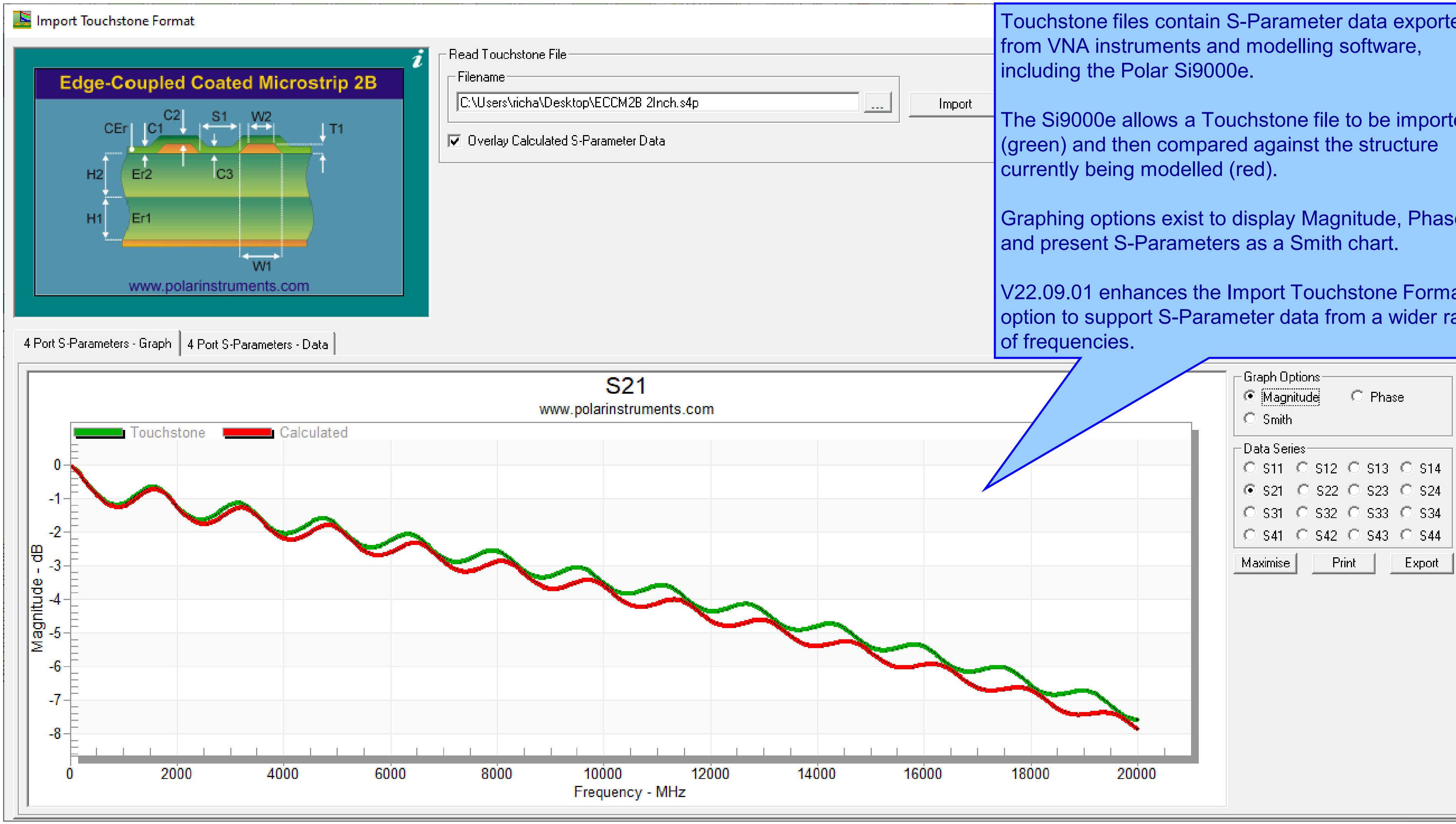
Enhancements to the Import Touchstone Format option

Touchstone files contain S-Parameter data exported from VNA instruments and modelling software, including the Polar Si9000e.

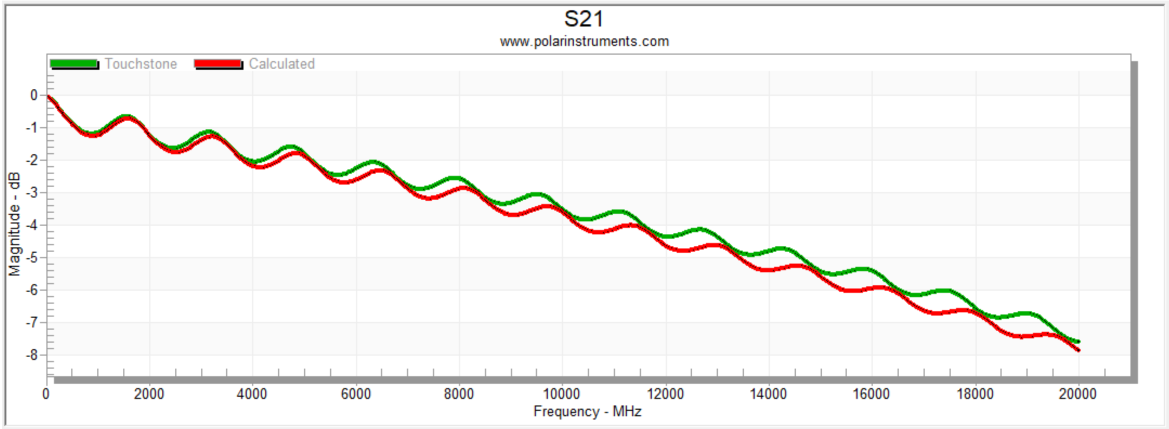
The Si9000e allows a Touchstone file to be imported (green) and then compared against the structure currently being modelled (red).

Graphing options exist to display Magnitude, Phase and present S-Parameters as a Smith chart.

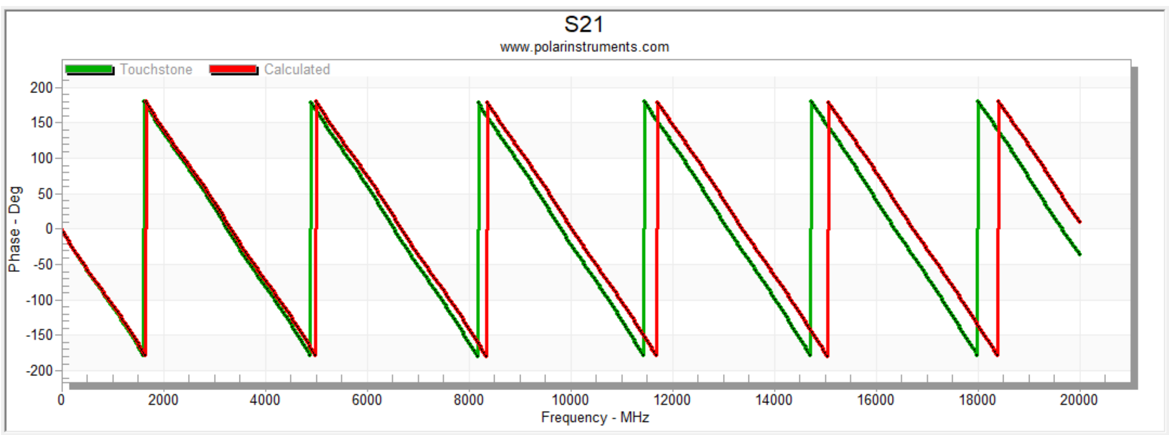
V22.09.01 enhances the Import Touchstone Format option to support S-Parameter data from a wider range of frequencies.

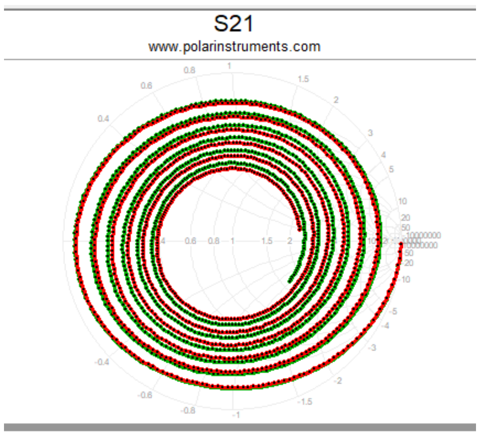


Enhancements to the Import Touchstone Format option



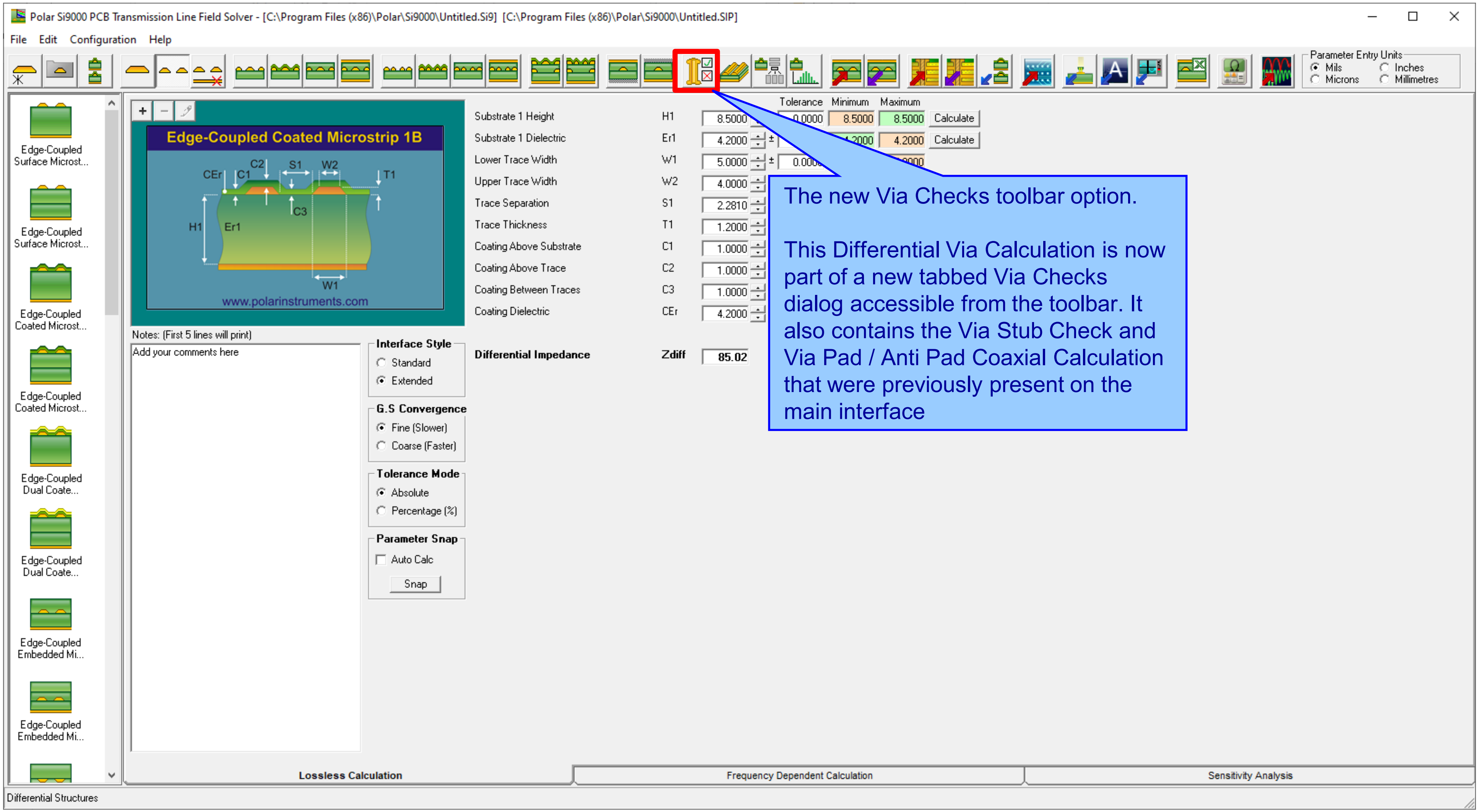
In this example a Touchstone 4-port file (.S4P) has been imported into the Si9000e. Magnitude, Phase and Smith Chart are shown for S21





Si9000e v22.04 (April 2022)

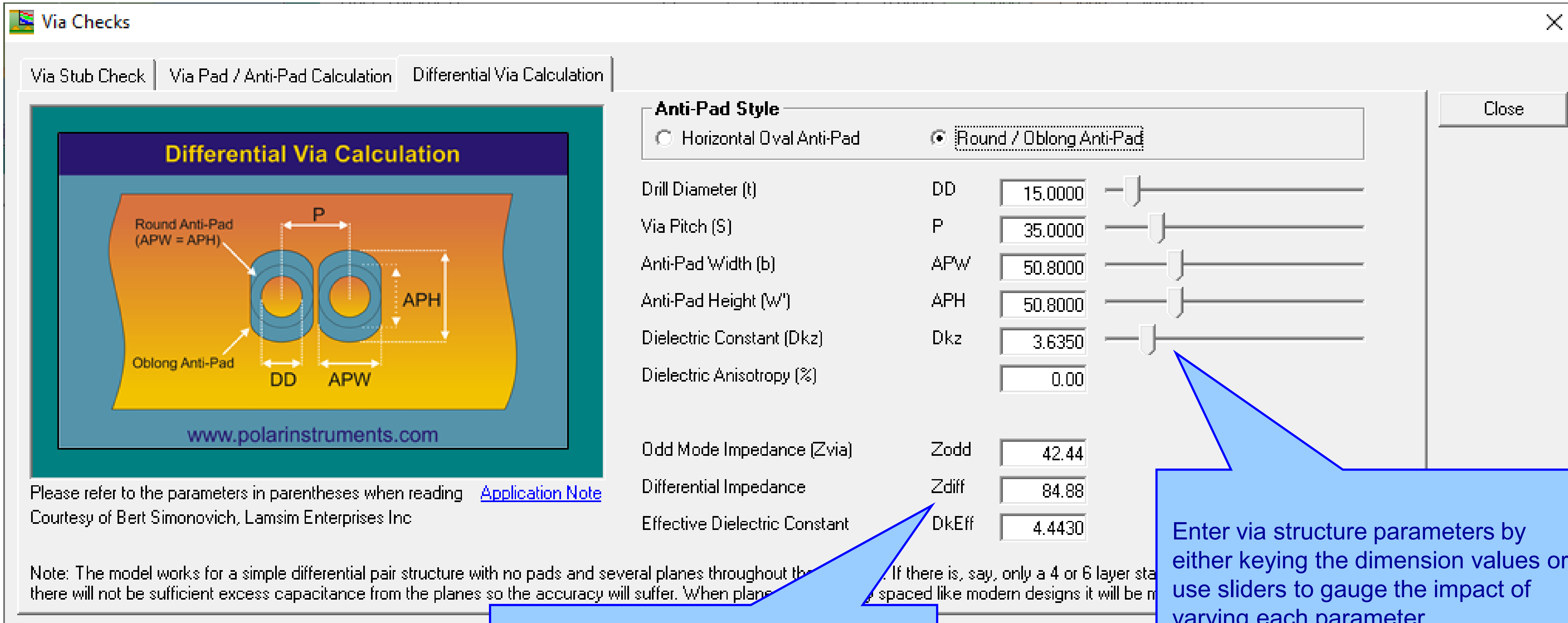
New Differential Via Calculation capability



The new Via Checks toolbar option.

This Differential Via Calculation is now part of a new tabbed Via Checks dialog accessible from the toolbar. It also contains the Via Stub Check and Via Pad / Anti Pad Coaxial Calculation that were previously present on the main interface

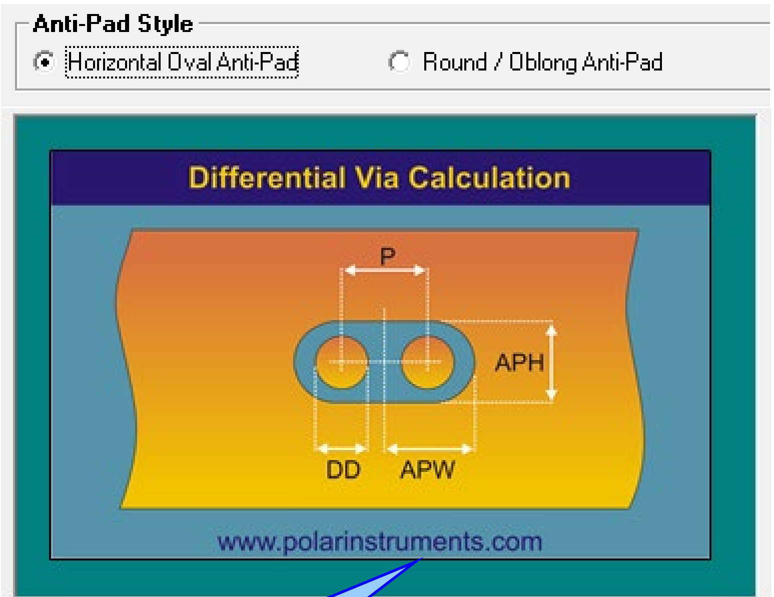
New Differential Via Calculation

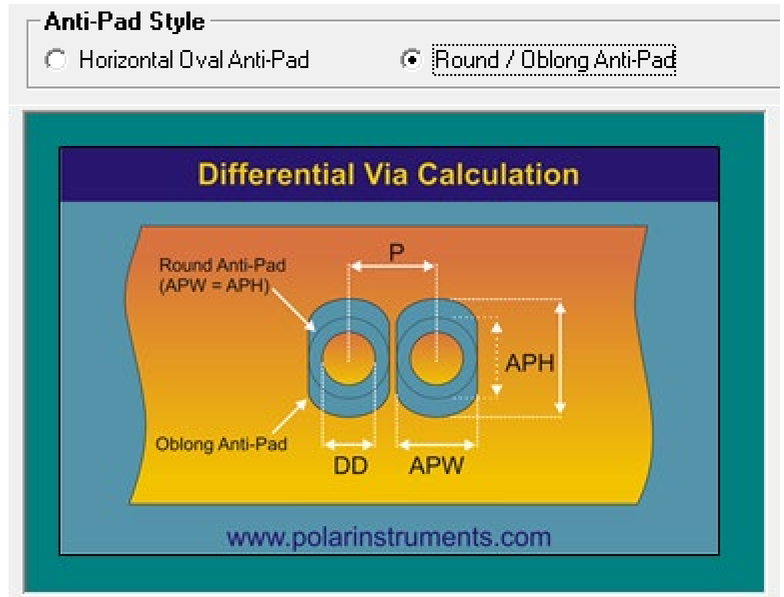


Enter via structure parameters by either keying the dimension values or use sliders to gauge the impact of varying each parameter

Calculation results are presented here

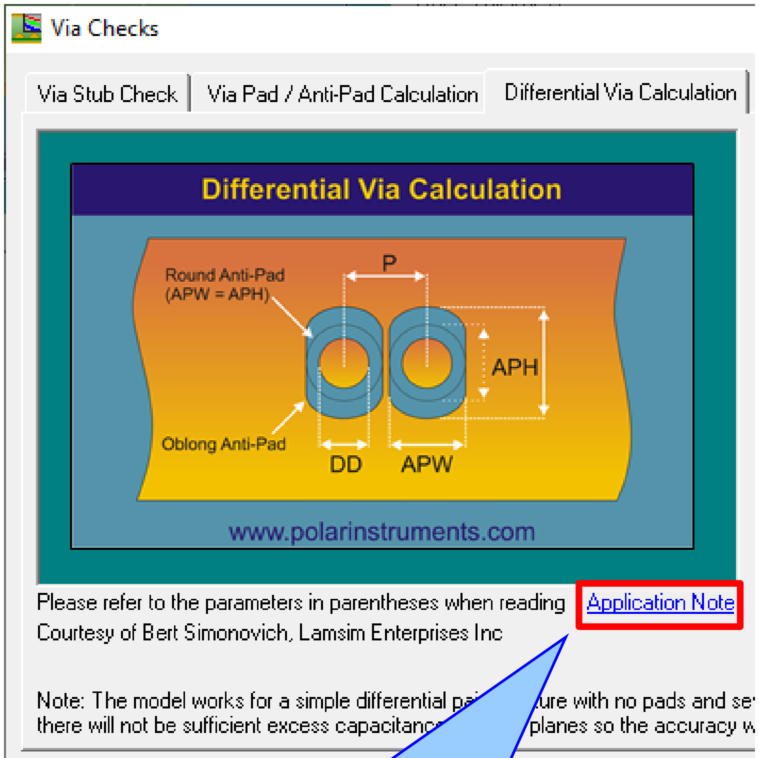
New Differential Via Calculation



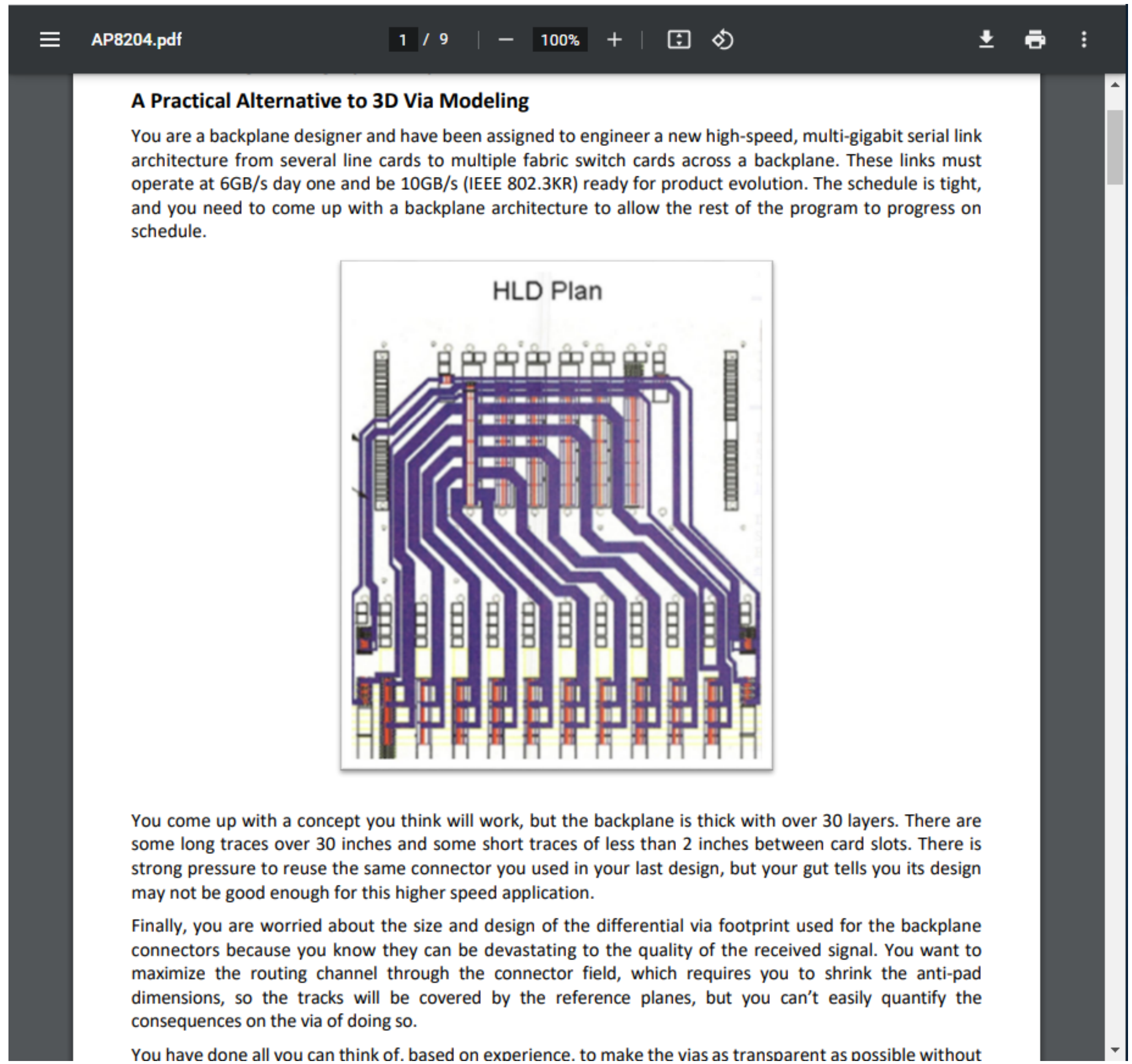


Two different selectable Anti-Pad Styles available

New Differential Via Calculation



The Application Note link provides further details of how the model works


AP8204.pdf 1 / 9 100%

A Practical Alternative to 3D Via Modeling

You are a backplane designer and have been assigned to engineer a new high-speed, multi-gigabit serial link architecture from several line cards to multiple fabric switch cards across a backplane. These links must operate at 6GB/s day one and be 10GB/s (IEEE 802.3KR) ready for product evolution. The schedule is tight, and you need to come up with a backplane architecture to allow the rest of the program to progress on schedule.

HLD Plan

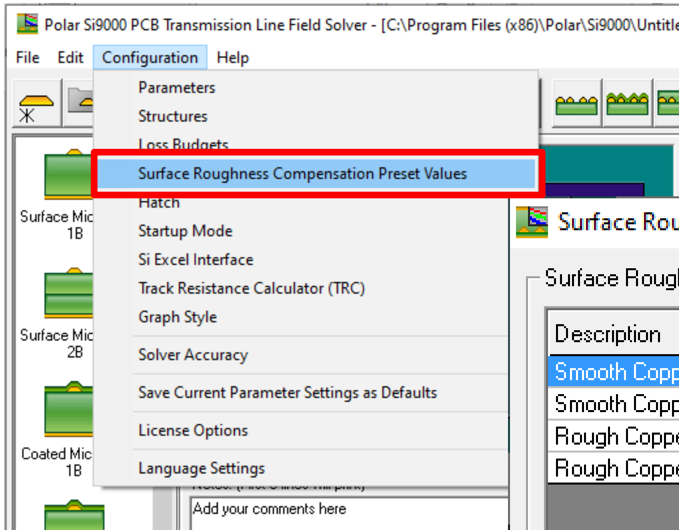
You come up with a concept you think will work, but the backplane is thick with over 30 layers. There are some long traces over 30 inches and some short traces of less than 2 inches between card slots. There is strong pressure to reuse the same connector you used in your last design, but your gut tells you its design may not be good enough for this higher speed application.

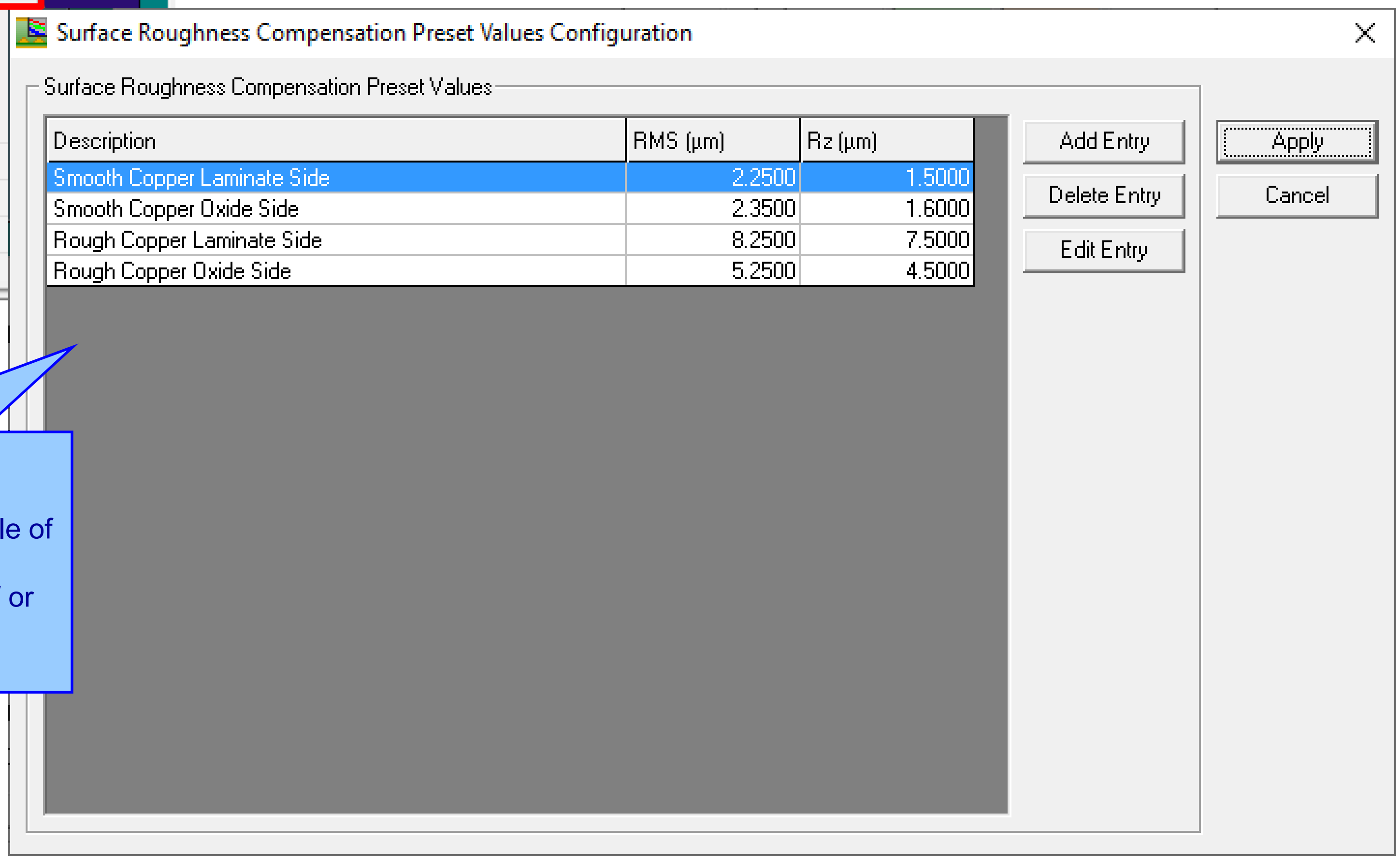
Finally, you are worried about the size and design of the differential via footprint used for the backplane connectors because you know they can be devastating to the quality of the received signal. You want to maximize the routing channel through the connector field, which requires you to shrink the anti-pad dimensions, so the tracks will be covered by the reference planes, but you can't easily quantify the consequences on the via of doing so.

You have done all you can think of, based on experience, to make the vias as transparent as possible without

Si9000e v22.03 (March 2022)

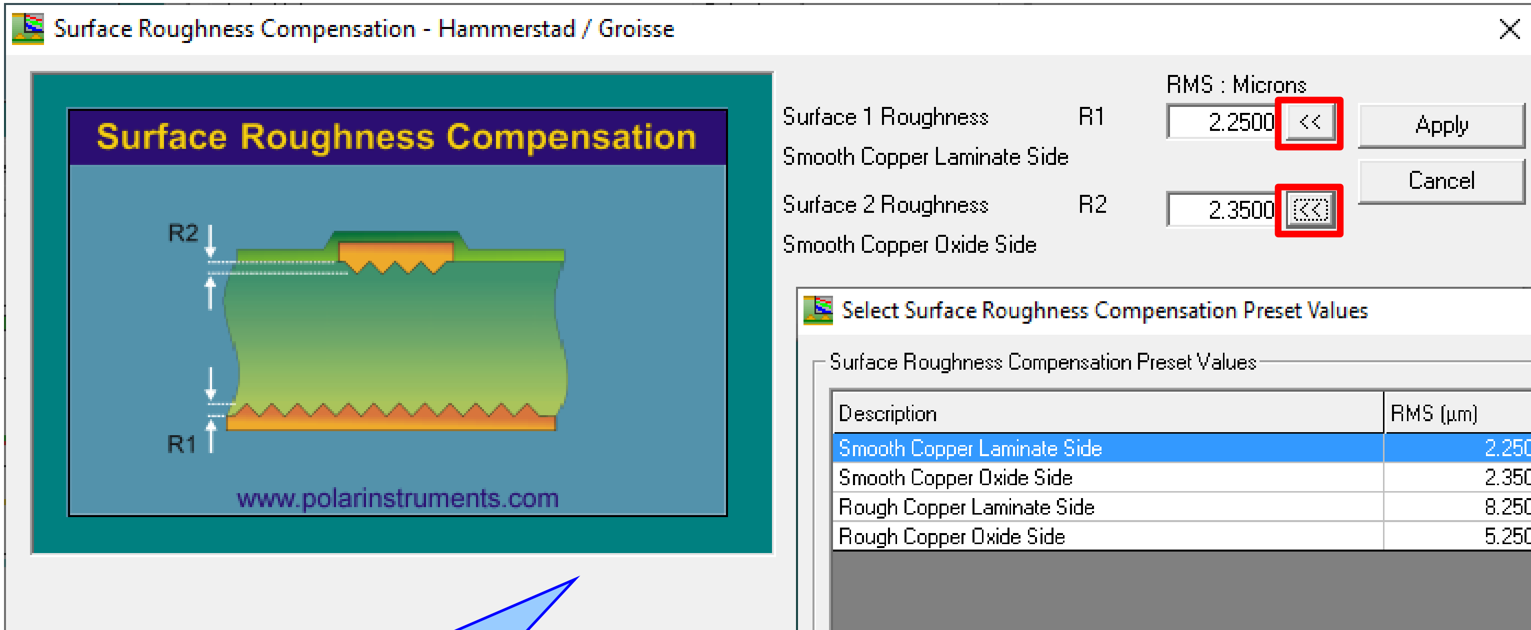
New Surface Roughness Compensation Preset Values option

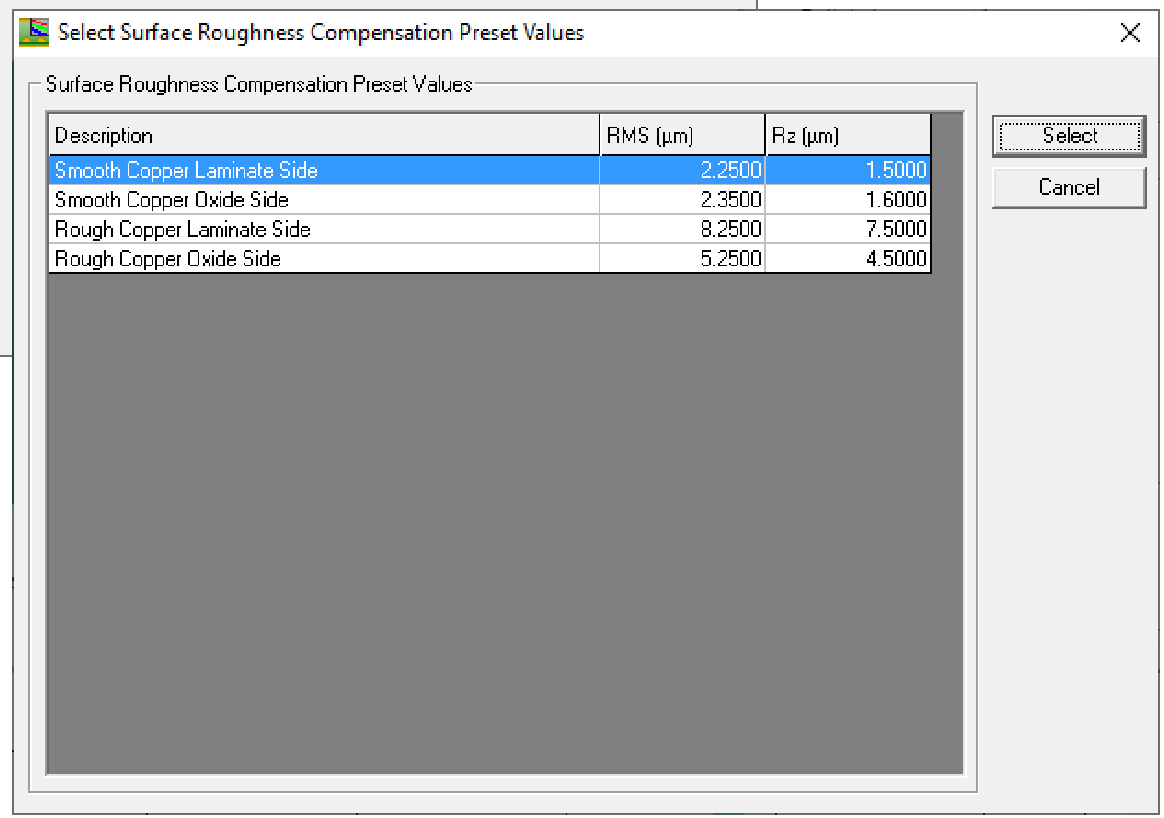




A new entry has been added to the Configuration menu to manage a table of Surface Roughness Preset Values composed of Description, RMS and / or Rz values

New Surface Roughness Compensation Preset Values option

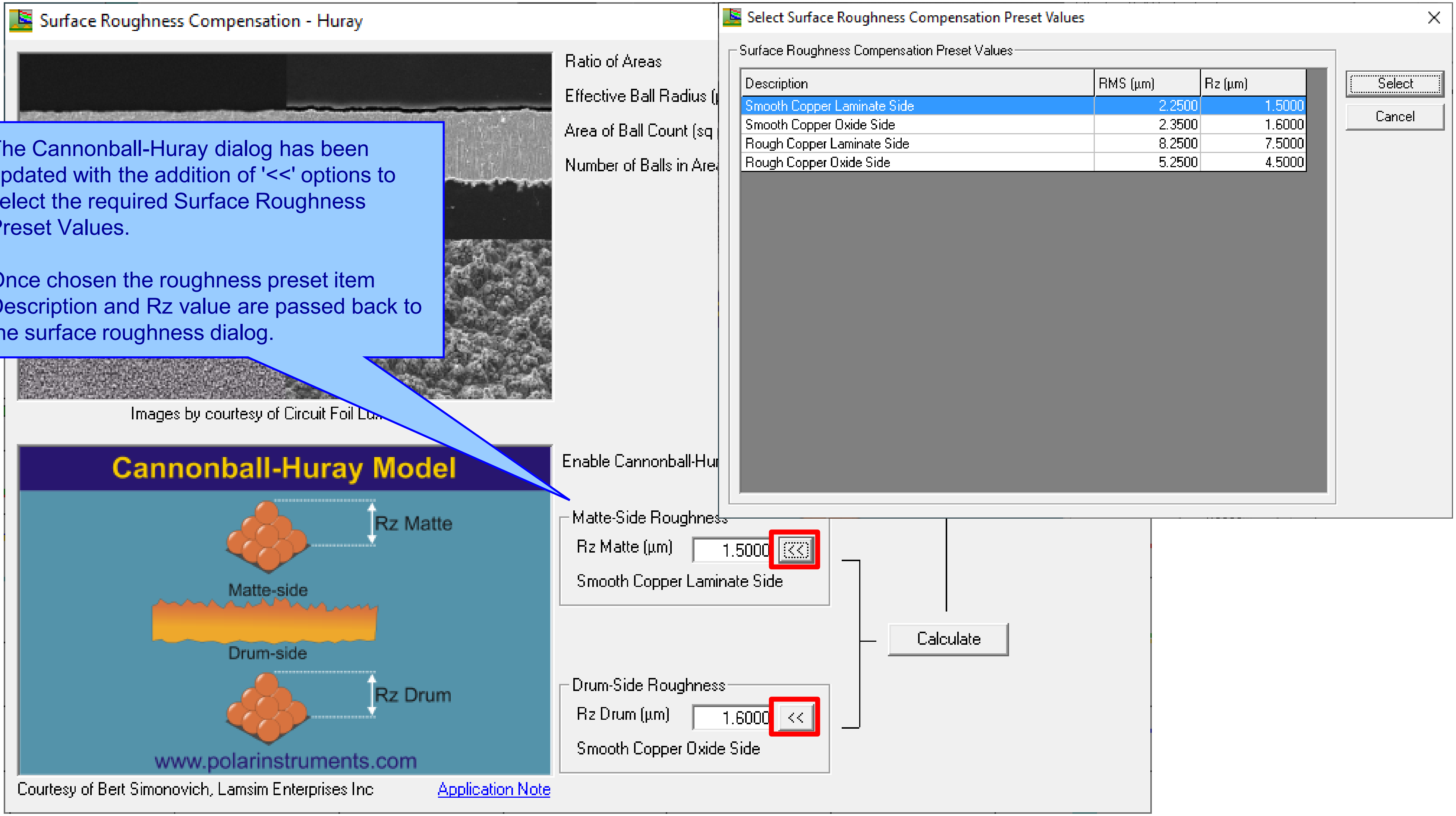




The Hammerstad / Groisse dialog has been updated with the addition of '<<' options to select the required Surface Roughness Preset Values.

Once chosen the roughness preset item Description and RMS value are passed back to the surface roughness dialog.

New Surface Roughness Compensation Preset Values option

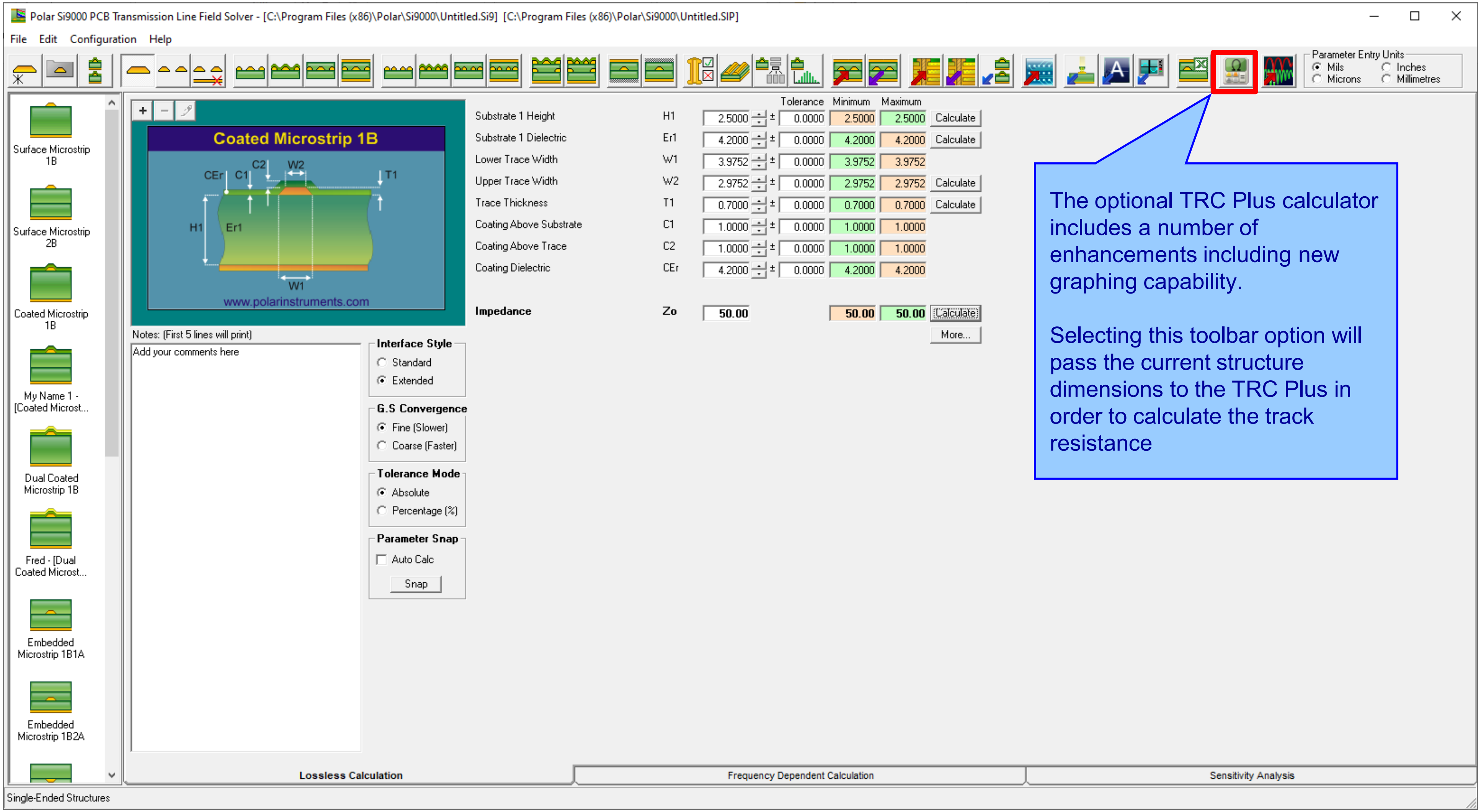


The Cannonball-Huray dialog has been updated with the addition of '<<' options to select the required Surface Roughness Preset Values.

Once chosen the roughness preset item Description and Rz value are passed back to the surface roughness dialog.

Si9000e v22.02 (February 2022)

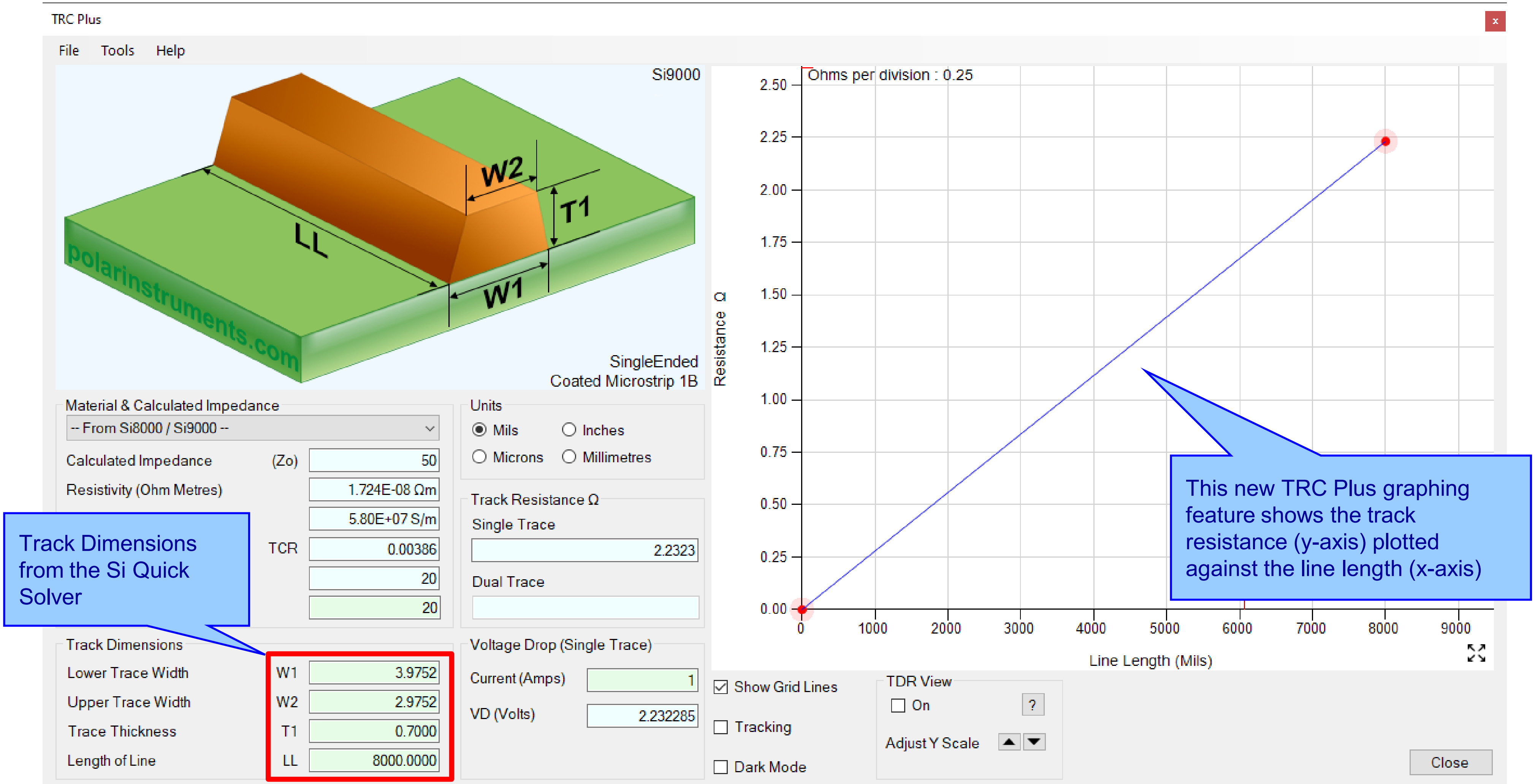
Track Resistance Calculator (TRC Plus) enhancements



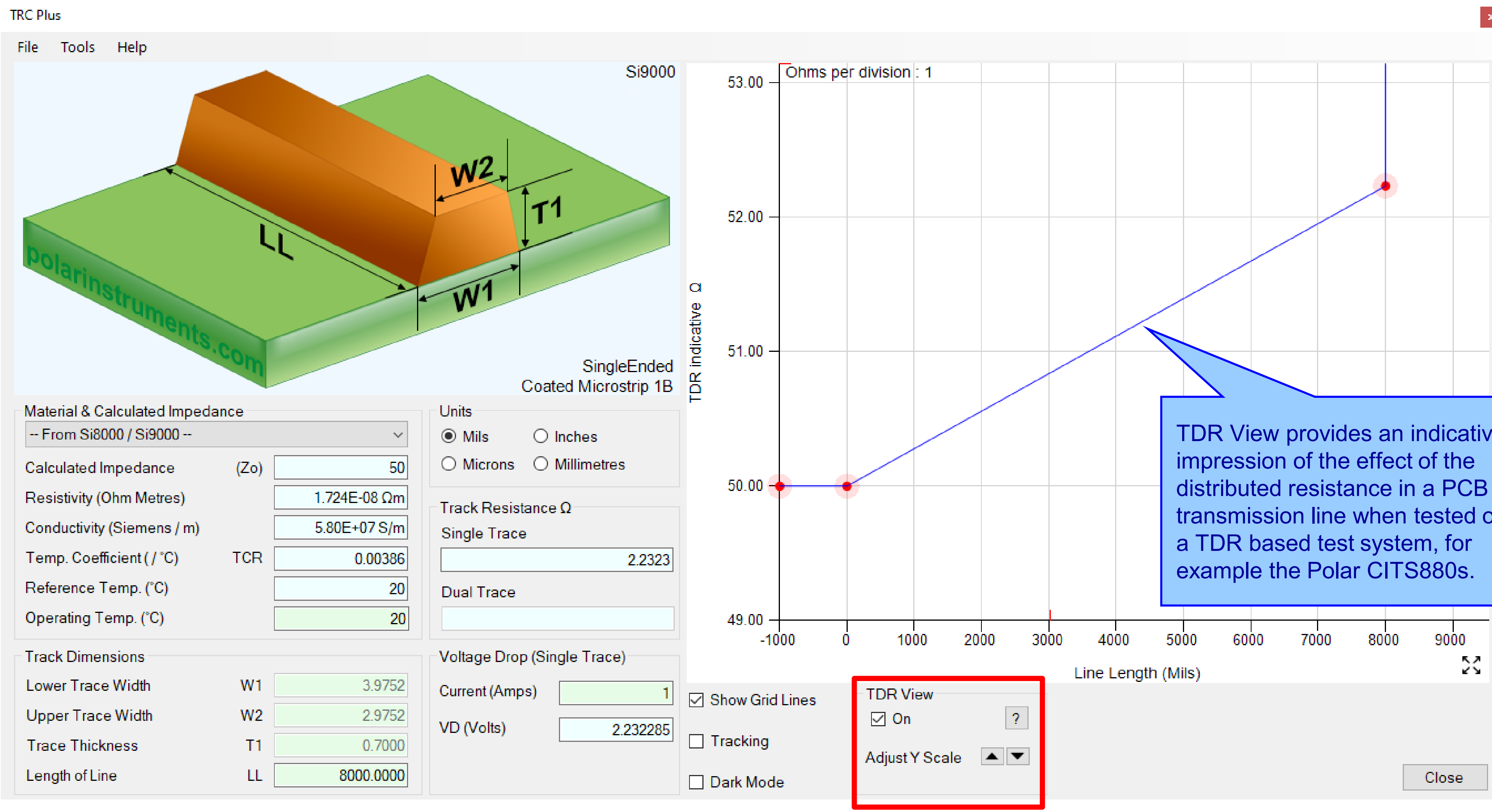
The optional TRC Plus calculator includes a number of enhancements including new graphing capability.

Selecting this toolbar option will pass the current structure dimensions to the TRC Plus in order to calculate the track resistance

Track Resistance Calculator (TRC Plus) enhancements



Track Resistance Calculator (TRC Plus) enhancements



TDR View provides an indicative impression of the effect of the distributed resistance in a PCB transmission line when tested on a TDR based test system, for example the Polar CITS880s.

Si9000e v21.09 (Sept 2021)

Project Graphing – Introduction *(requires the Si Projects feature)*

It is often useful to compare the results from similar structures, especially with frequency dependent calculations where changing just one or two parameters can have significant impact.

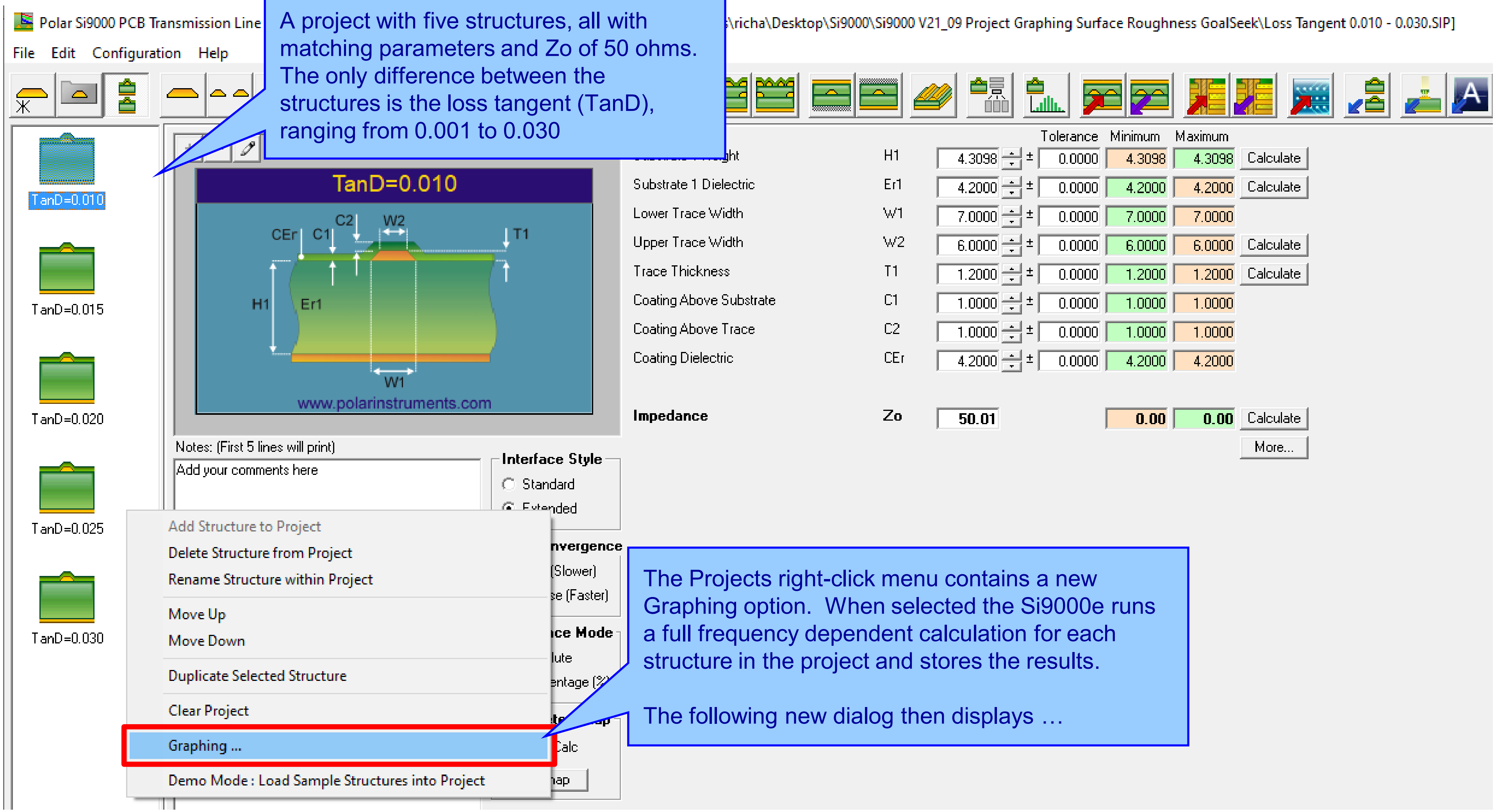
Until now the Si9000e Quick Solver graphing has focused on a single structure, for instance the All Losses graph will display a single plot that includes multiple data series for the same structure.

The new Project Graphing option calculates all the results for a group of structures contained in the Project and then plots the selected data series (total attenuation, conductor loss or dielectric loss etc) on the same graph.

A single graph that combines results from multiple structures is useful in a number of ways. Comparing the impact of different dielectric materials, different roughness, sensitivity analysis for lossy calculations and many more uses.

Project Graphing

A project with five structures, all with matching parameters and Zo of 50 ohms. The only difference between the structures is the loss tangent (TanD), ranging from 0.001 to 0.030



The Projects right-click menu contains a new Graphing option. When selected the Si9000e runs a full frequency dependent calculation for each structure in the project and stores the results.

The following new dialog then displays …

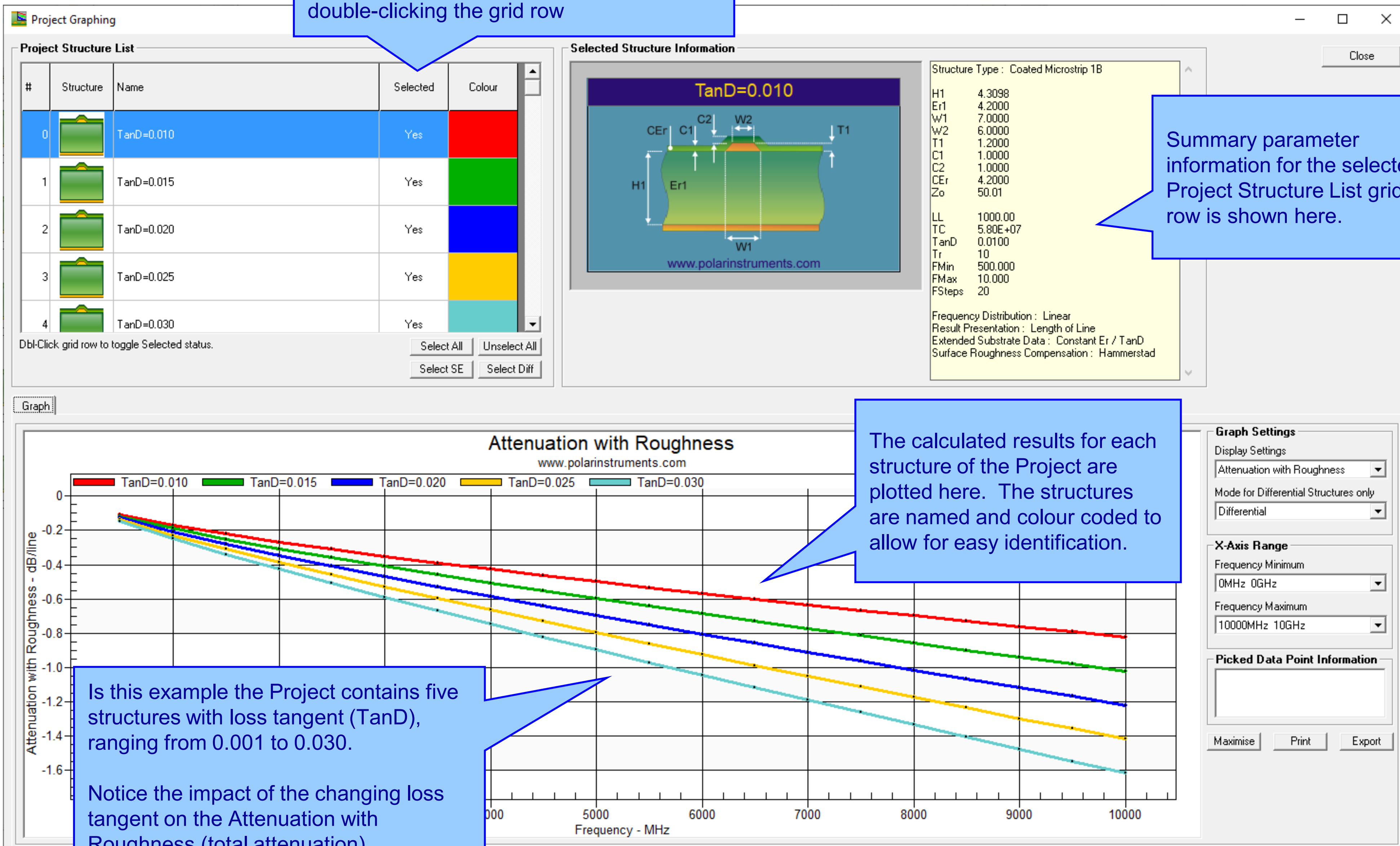
The Project Structure List provides options to choose which structures from the Project are plotted. Individual structures can toggled between selected / deselected by double-clicking the grid row

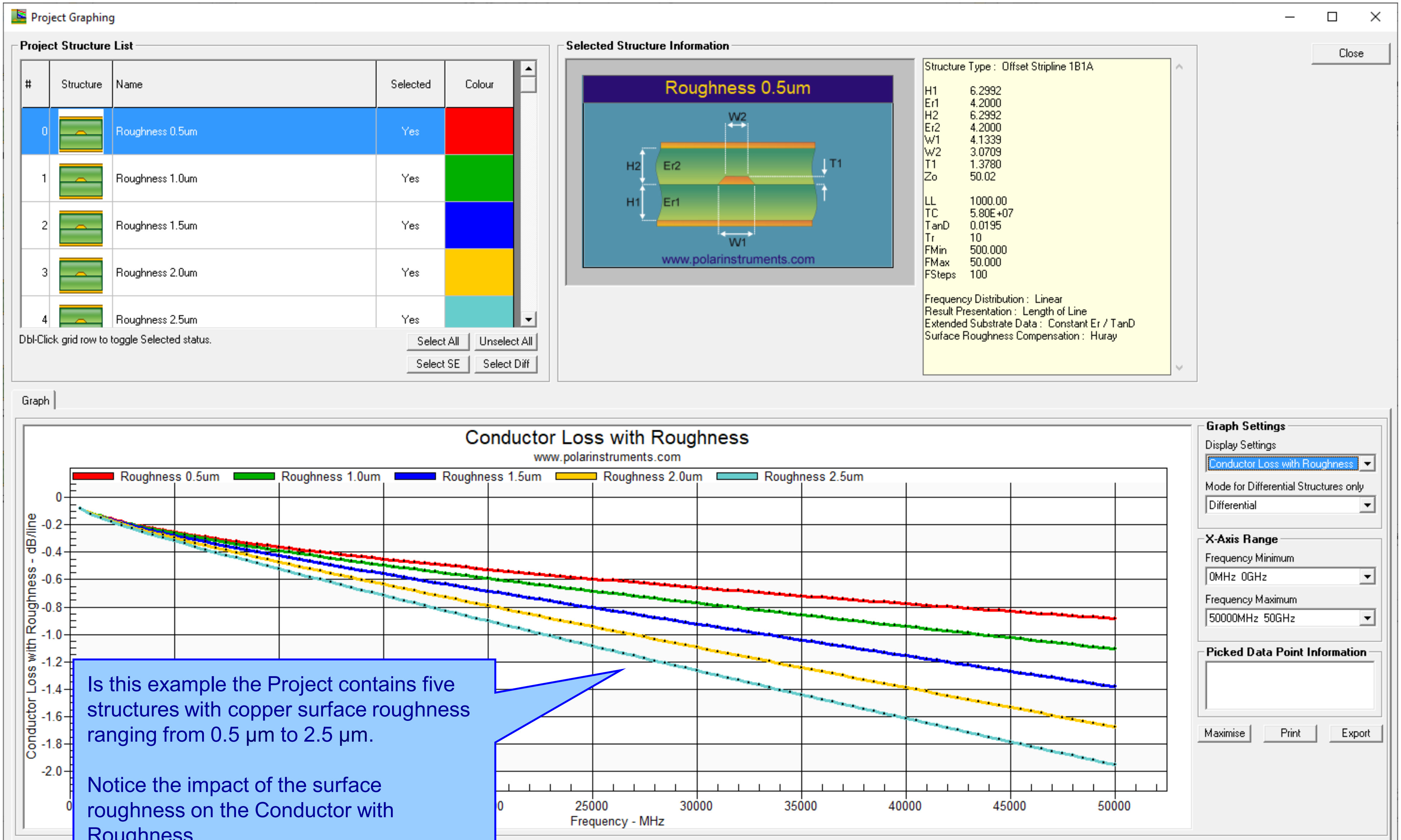
Summary parameter information for the selected Project Structure List grid row is shown here.

The calculated results for each structure of the Project are plotted here. The structures are named and colour coded to allow for easy identification.

Is this example the Project contains five structures with loss tangent (TanD), ranging from 0.001 to 0.030.

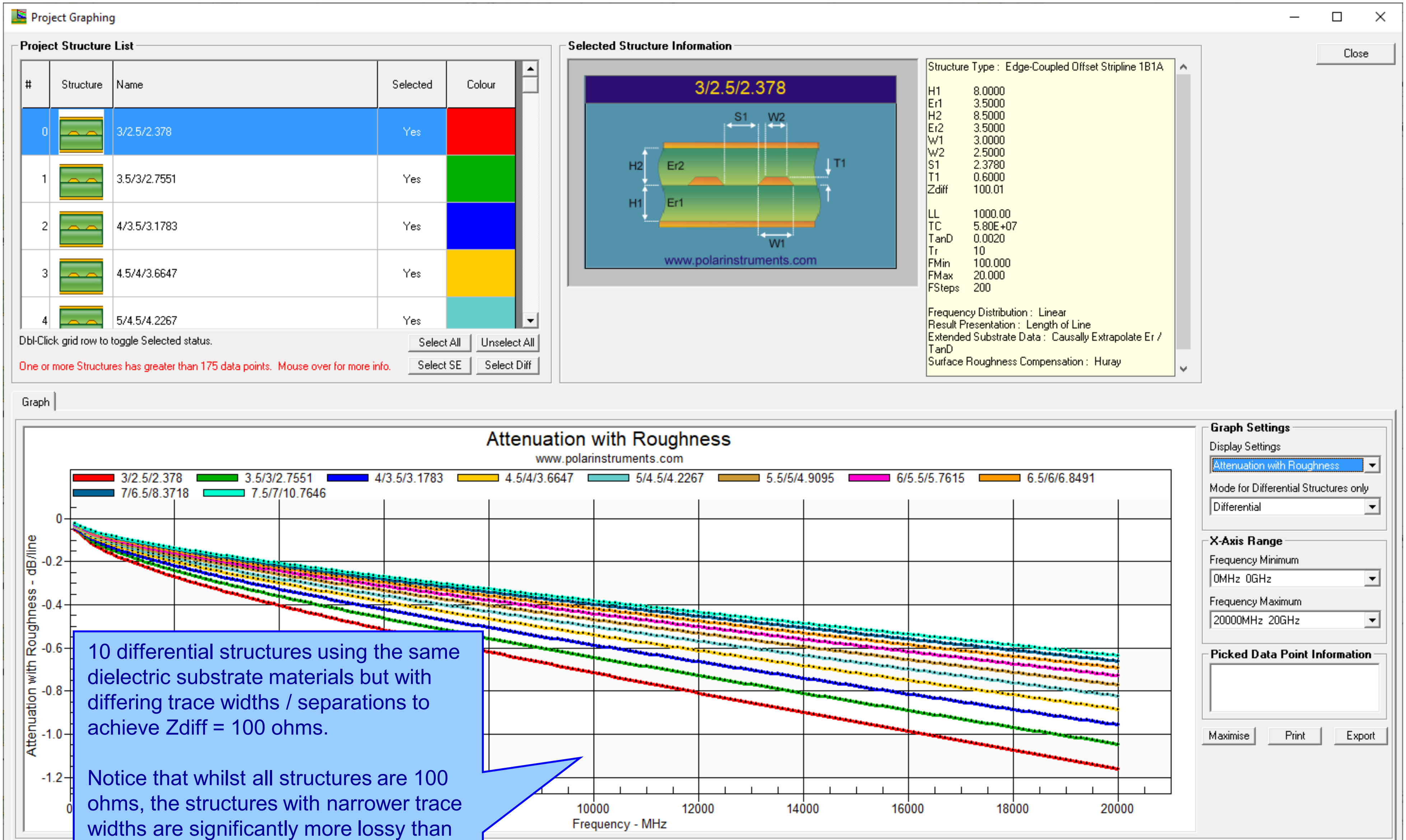
Notice the impact of the changing loss tangent on the Attenuation with Roughness (total attenuation)





Is this example the Project contains five structures with copper surface roughness ranging from 0.5 µm to 2.5 µm.

Notice the impact of the surface roughness on the Conductor with Roughness



10 differential structures using the same dielectric substrate materials but with differing trace widths / separations to achieve Zdiff = 100 ohms.

Notice that whilst all structures are 100 ohms, the structures with narrower trace widths are significantly more lossy than those with wider trace widths.

Project Graphing – Summary

- The new Graphing option for Si Projects provides useful plots that contain data from multiple structures
- There are numerous uses for this type of option - comparing the impact of different dielectric materials, different roughness, sensitivity analysis for lossy calculations and more
- 'What if' scenarios where one structure in the project would use the current design parameters and the second structure would contain a modified set based on a newer material. The plots comparing the original versus the new material will instantly show the impact
- Useful to both fabricators and design companies

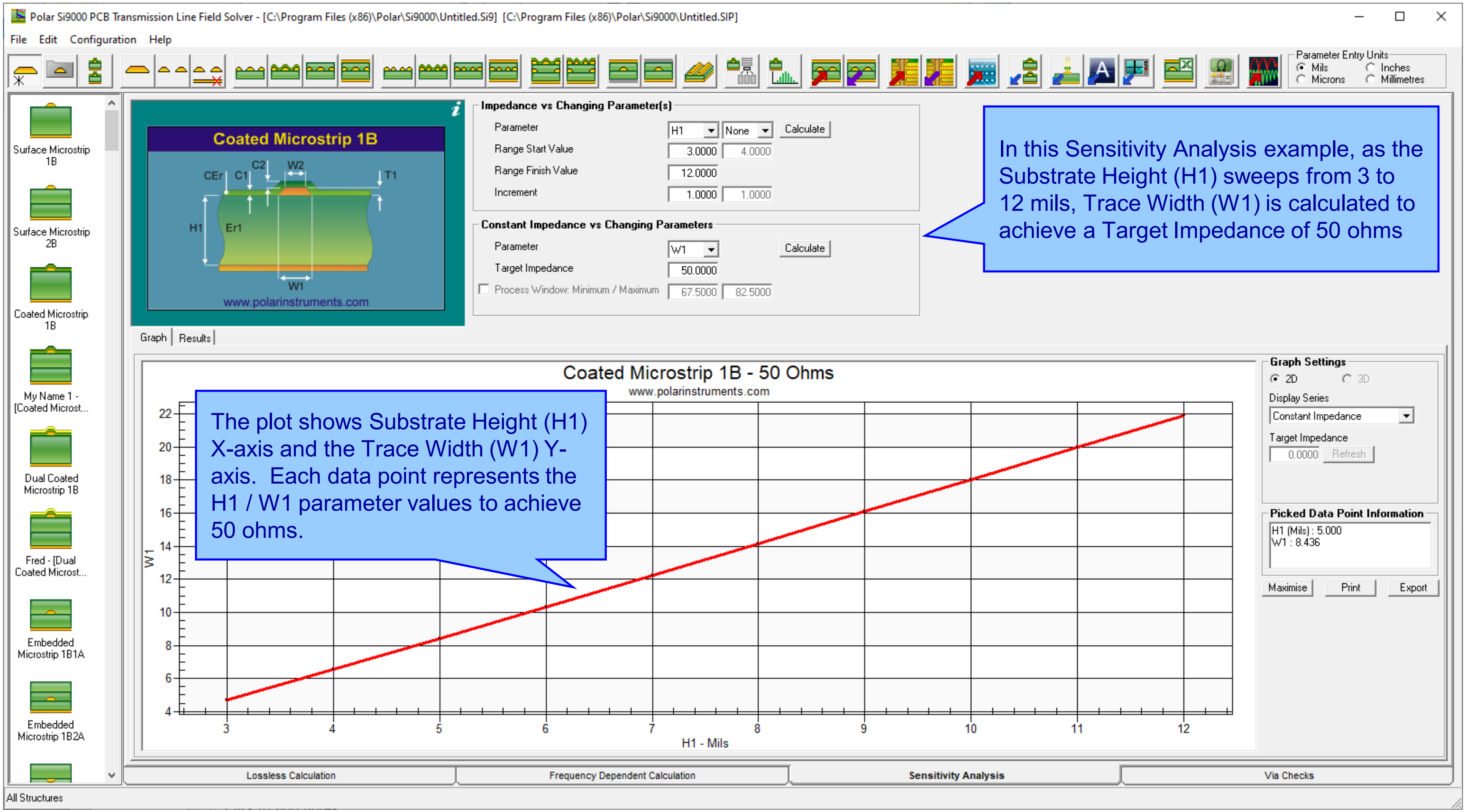
Populate a Project from Sensitivity Analysis Results

(requires the Si Projects feature)

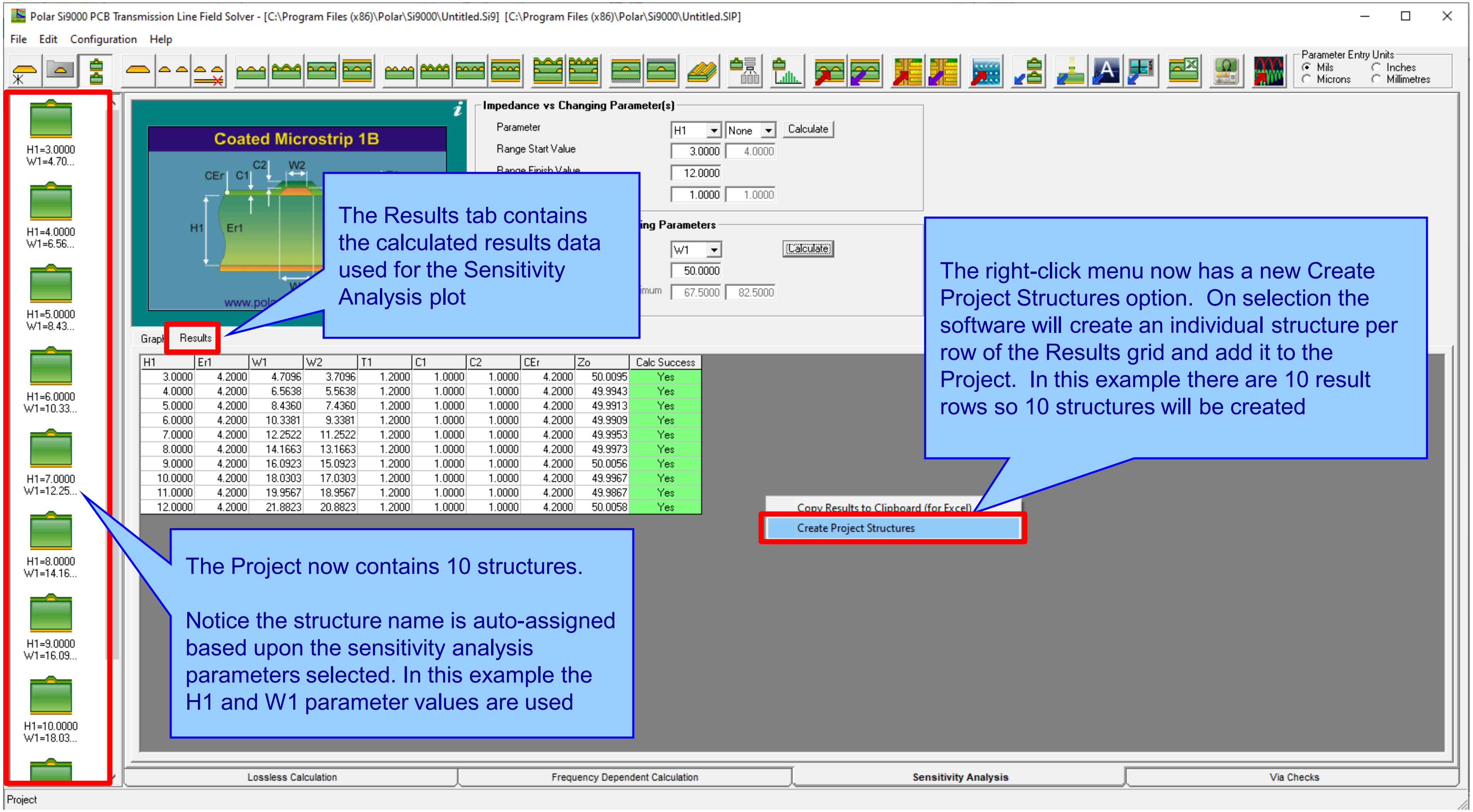
When using the Sensitivity Analysis option it is often useful to examine the calculated results in more details. It is now possible to auto-create a Project containing structures based upon the Sensitivity Analysis results data.

The following slides provide further details:

Populate a Project from Sensitivity Analysis Results

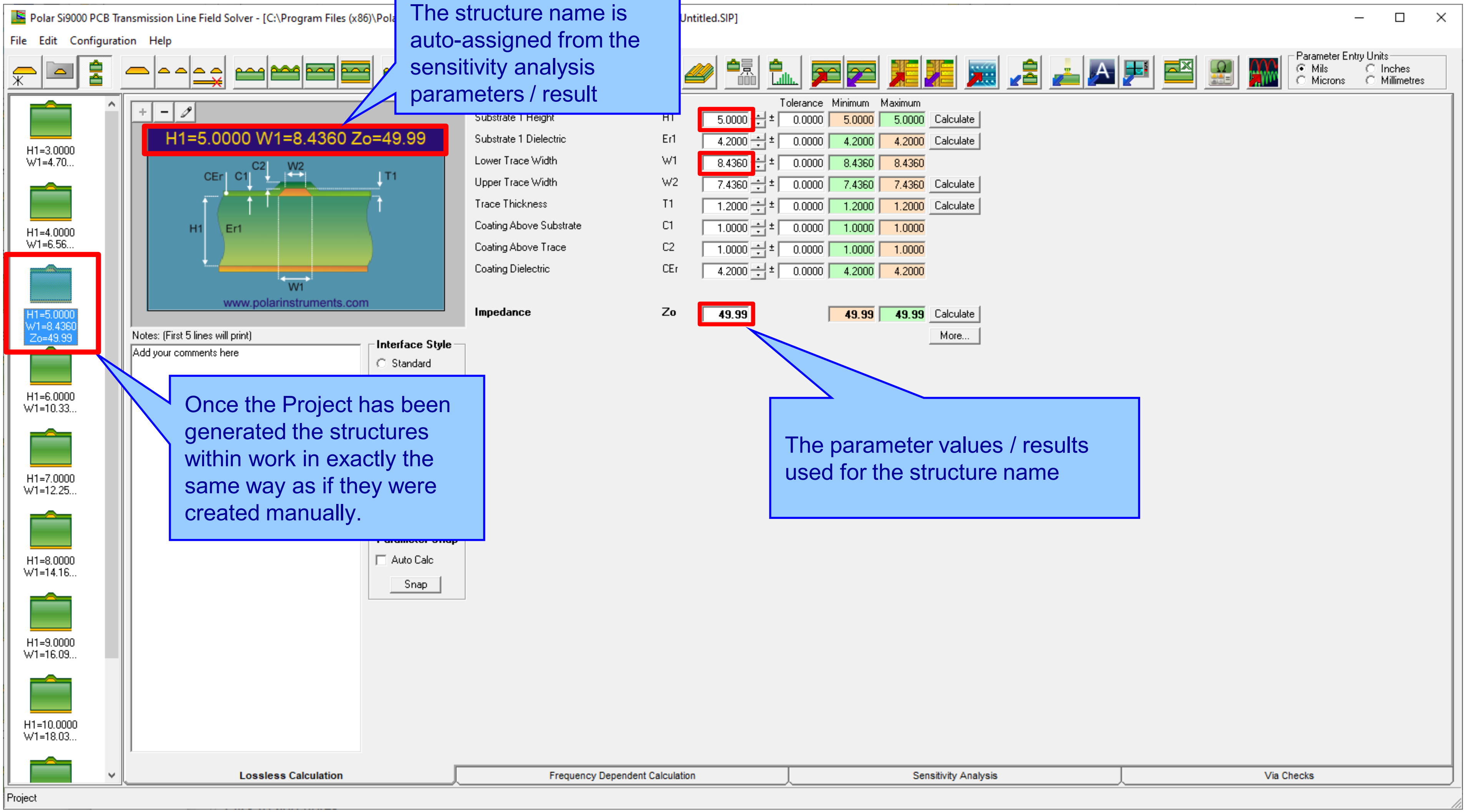


Populate a Project from Sensitivity Analysis Results



H1	Er1	W1	W2	T1	C1	C2	CEr	Zo	Calc Success
3.0000	4.2000	4.7096	3.7096	1.2000	1.0000	1.0000	4.2000	50.0095	Yes
4.0000	4.2000	6.5638	5.5638	1.2000	1.0000	1.0000	4.2000	49.9943	Yes
5.0000	4.2000	8.4360	7.4360	1.2000	1.0000	1.0000	4.2000	49.9913	Yes
6.0000	4.2000	10.3381	9.3381	1.2000	1.0000	1.0000	4.2000	49.9909	Yes
7.0000	4.2000	12.2522	11.2522	1.2000	1.0000	1.0000	4.2000	49.9953	Yes
8.0000	4.2000	14.1663	13.1663	1.2000	1.0000	1.0000	4.2000	49.9973	Yes
9.0000	4.2000	16.0923	15.0923	1.2000	1.0000	1.0000	4.2000	50.0056	Yes
10.0000	4.2000	18.0303	17.0303	1.2000	1.0000	1.0000	4.2000	49.9967	Yes
11.0000	4.2000	19.9567	18.9567	1.2000	1.0000	1.0000	4.2000	49.9867	Yes
12.0000	4.2000	21.8823	20.8823	1.2000	1.0000	1.0000	4.2000	50.0058	Yes

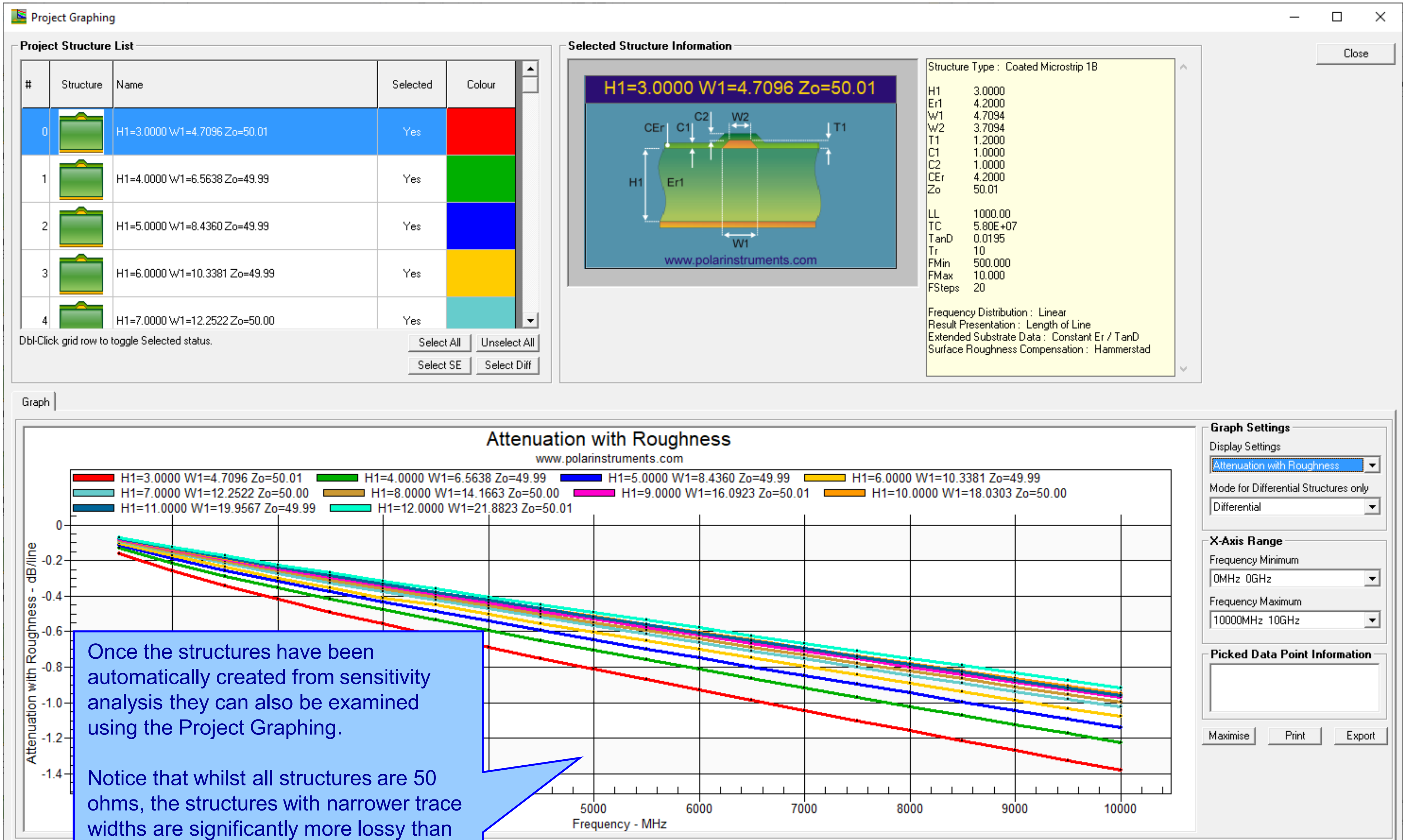
Populate a Project from Sensitivity Analysis Results



The structure name is auto-assigned from the sensitivity analysis parameters / result

Once the Project has been generated the structures within work in exactly the same way as if they were created manually.

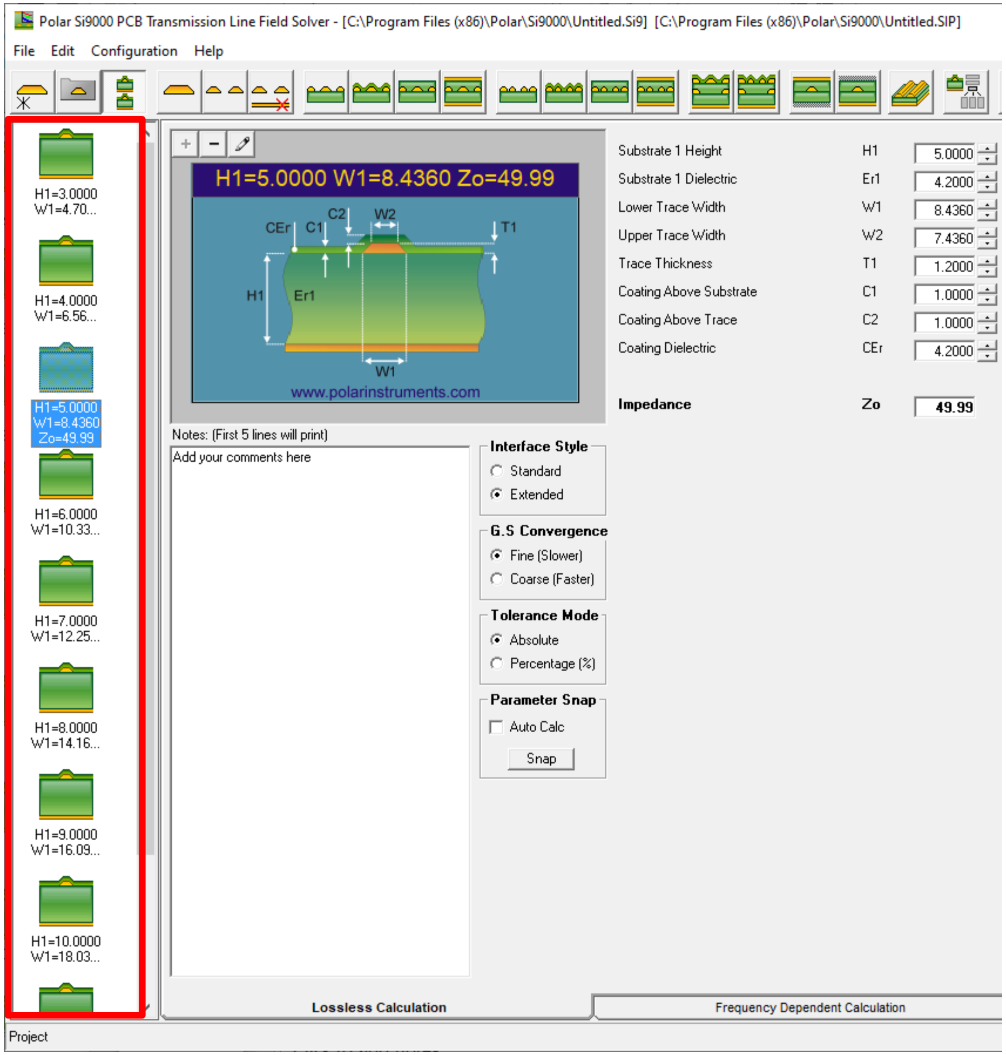
The parameter values / results used for the structure name

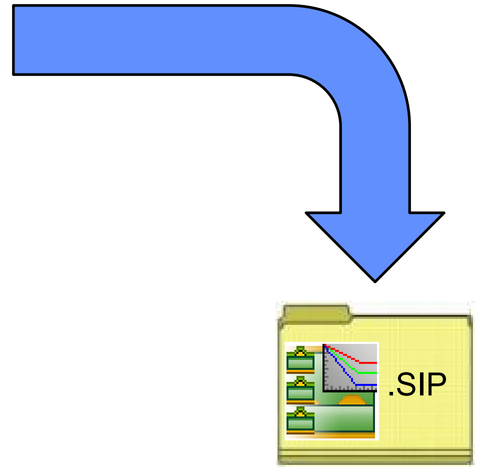


Once the structures have been automatically created from sensitivity analysis they can also be examined using the Project Graphing.

Notice that whilst all structures are 50 ohms, the structures with narrower trace widths are significantly more lossy than those with wider trace widths.

Populate a Project from Sensitivity Analysis Results





Save the newly created project to the Si Project file format (.SIP) so that it can be recalled at a later date.

Populate a Project from Sensitivity Analysis Results - Summary

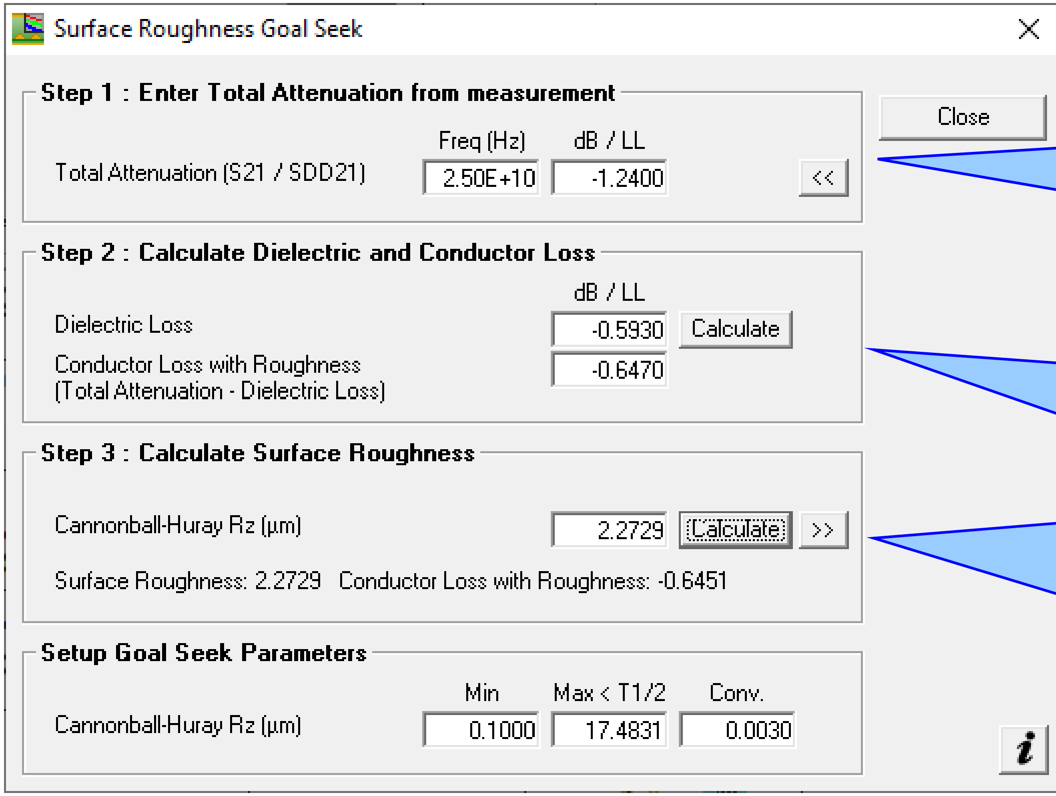
- As separate structure in a Project it is now possible to examine the results in a lot more detail than when in sensitivity analysis
- Lossy calculations can be performed and compared
- As a Project the structure data can be stored as a .SIP file and recalled later
- Useful to both fabricators and design companies

Surface Roughness Goal Seek option

New option to back calculate the surface roughness value for a structure from the insertion loss measurement data. The measurements can be generated using the Polar Atlas system or others that are capable of measuring insertion loss.

Cyan = Modelled Attenuation with Roughness (insertion loss)
Brown = Insertion Loss measurement data from Polar Atlas

Surface Roughness Goal Seek option

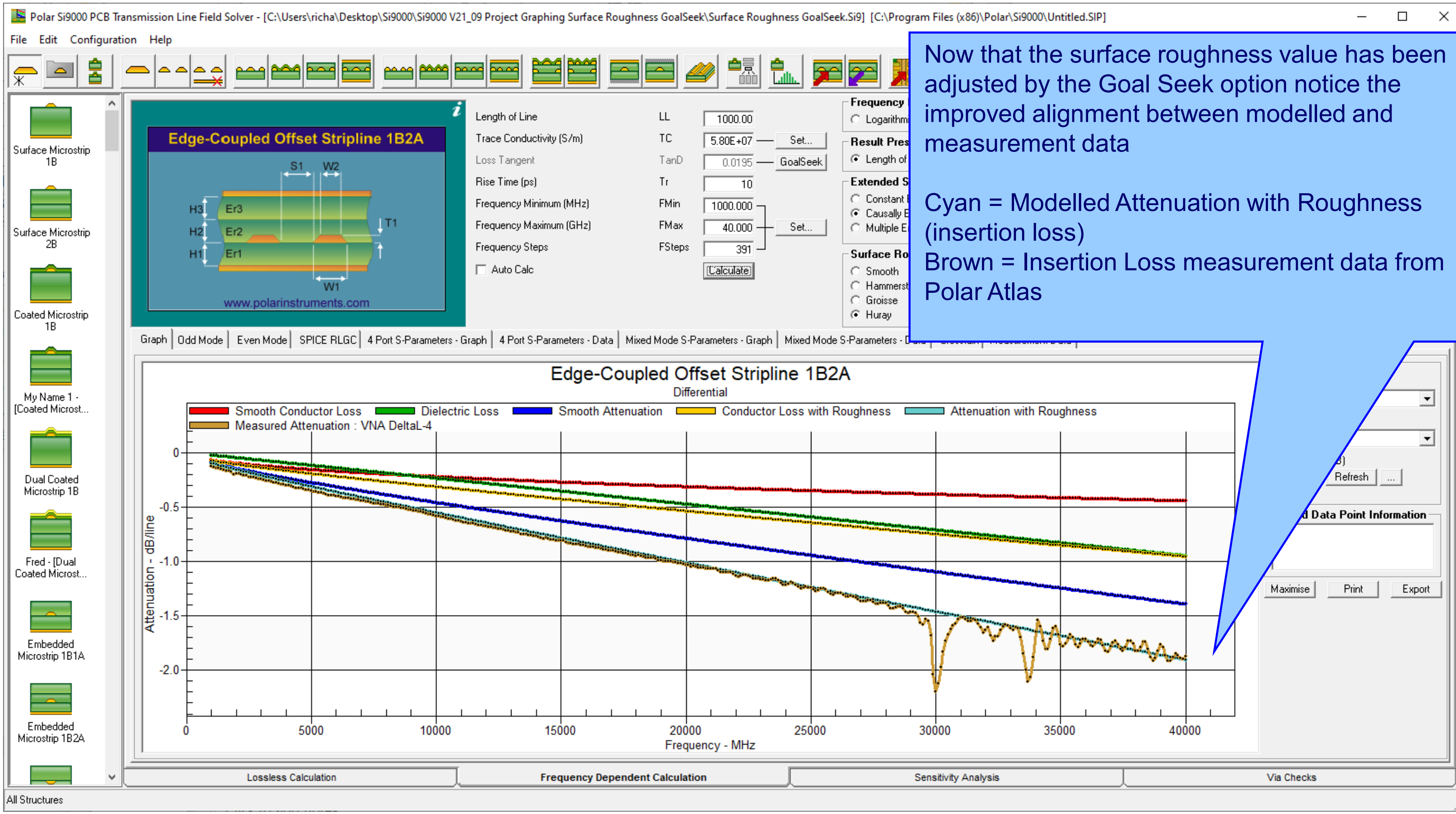


<u>Step 1</u>
Key in or pick the total attenuation (S21 / SDD21) at a given frequency from the insertion loss measurement data

<u>Step 2</u>
Calculate the dielectric loss for the frequency entered from the current structure parameters. Subtracting this calculated dielectric loss from the total attenuation will leave the target conductor loss

<u>Step 3</u>
Use the Si9000 Goal Seek algorithm to vary the surface roughness until it matches the required value to achieve the conductor loss as calculated in Step 2.
In this example a Surface Roughness of 2.2729 µm is required

Surface Roughness Goal Seek option



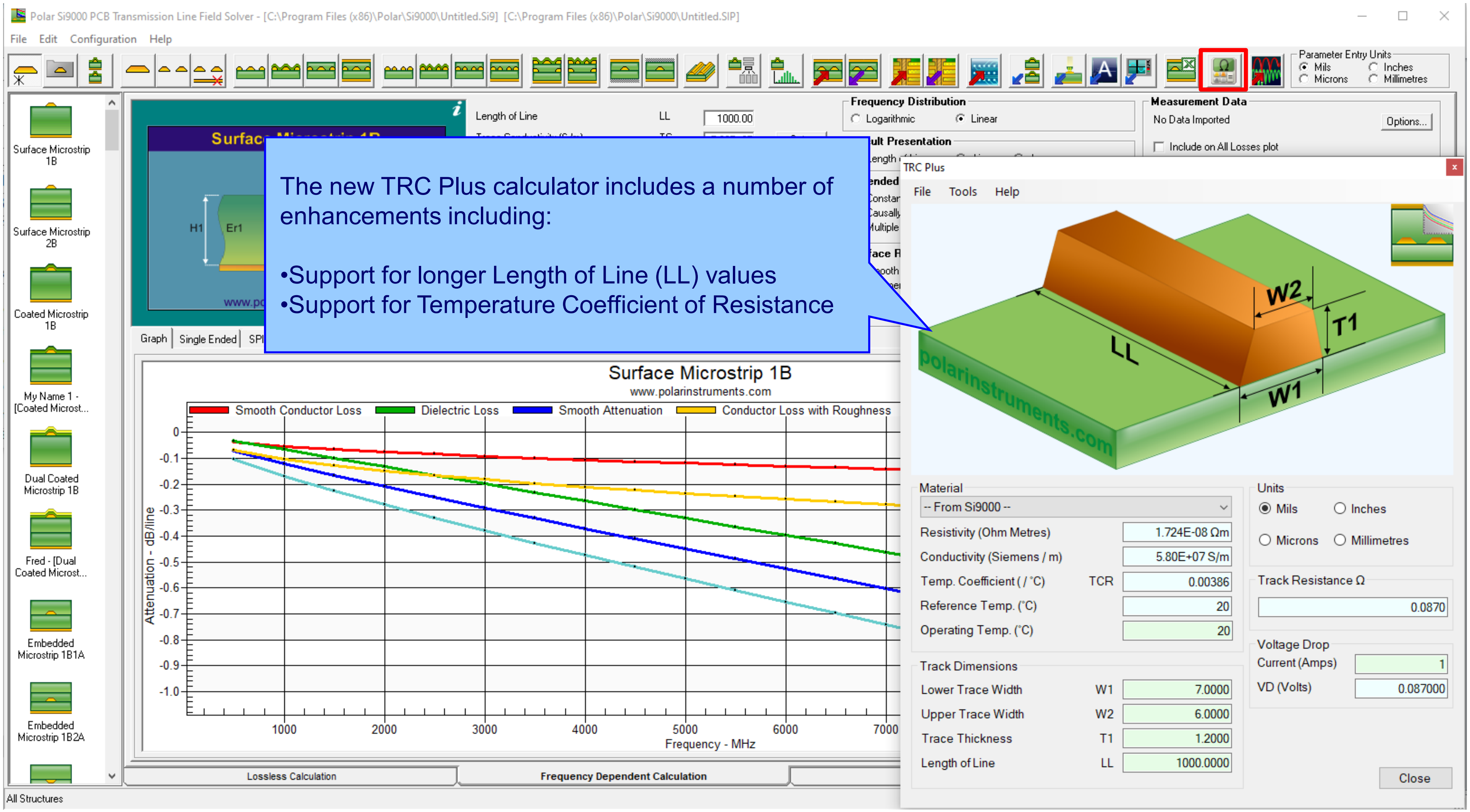
Now that the surface roughness value has been adjusted by the Goal Seek option notice the improved alignment between modelled and measurement data

Cyan = Modelled Attenuation with Roughness (insertion loss)
Brown = Insertion Loss measurement data from Polar Atlas

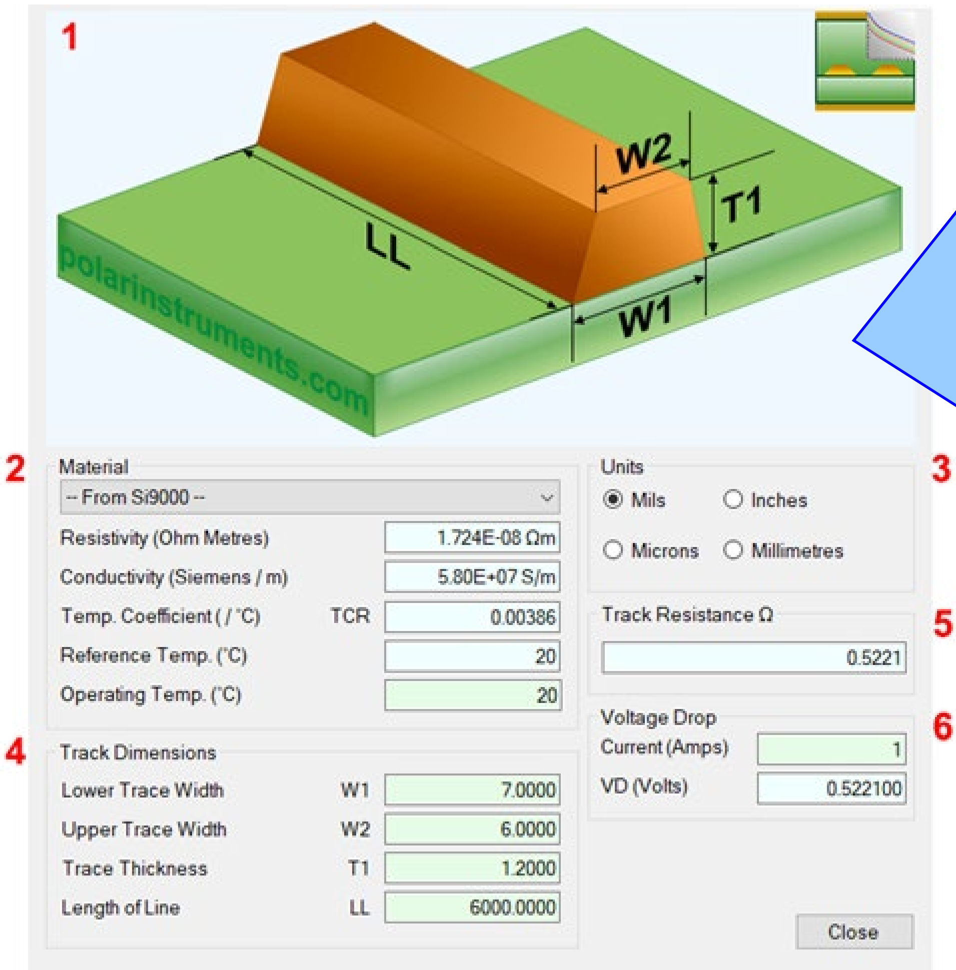
Track Resistance Calculator (TRC Plus)

The new TRC Plus calculator includes a number of enhancements including:

- Support for longer Length of Line (LL) values
- Support for Temperature Coefficient of Resistance



Track Resistance Calculator (TRC Plus)



1. Interactive track material image.
Clicking on a track parameter label will highlight the associated Track Dimension field (text box). Enter data into the active field.

Double-clicking anywhere on the image will bring up the Materials Editor.

2. Material selection and properties
Select the material via the drop-down list.

Fields coloured in light-blue are not directly editable but the field values can be in the Materials Editor.

Fields coloured in light-green are editable by the user. For example, Operating Temperature will determine a material's resistivity at that temperature, which in turn will be applied in calculating the track resistance.

3. Units
Switch to your preferred units by clicking the associated option button – imperial units include Mils (Thou) and Inches; for metric units choose Microns (Micrometres) or Millimetres.

4. Track or trace dimensions
Enter or change track dimensions in the Track Dimensions in the chosen units.

5. Resistance result
Calculation of the track resistance. The result should update immediately upon any changes to the editable (light-green) fields.

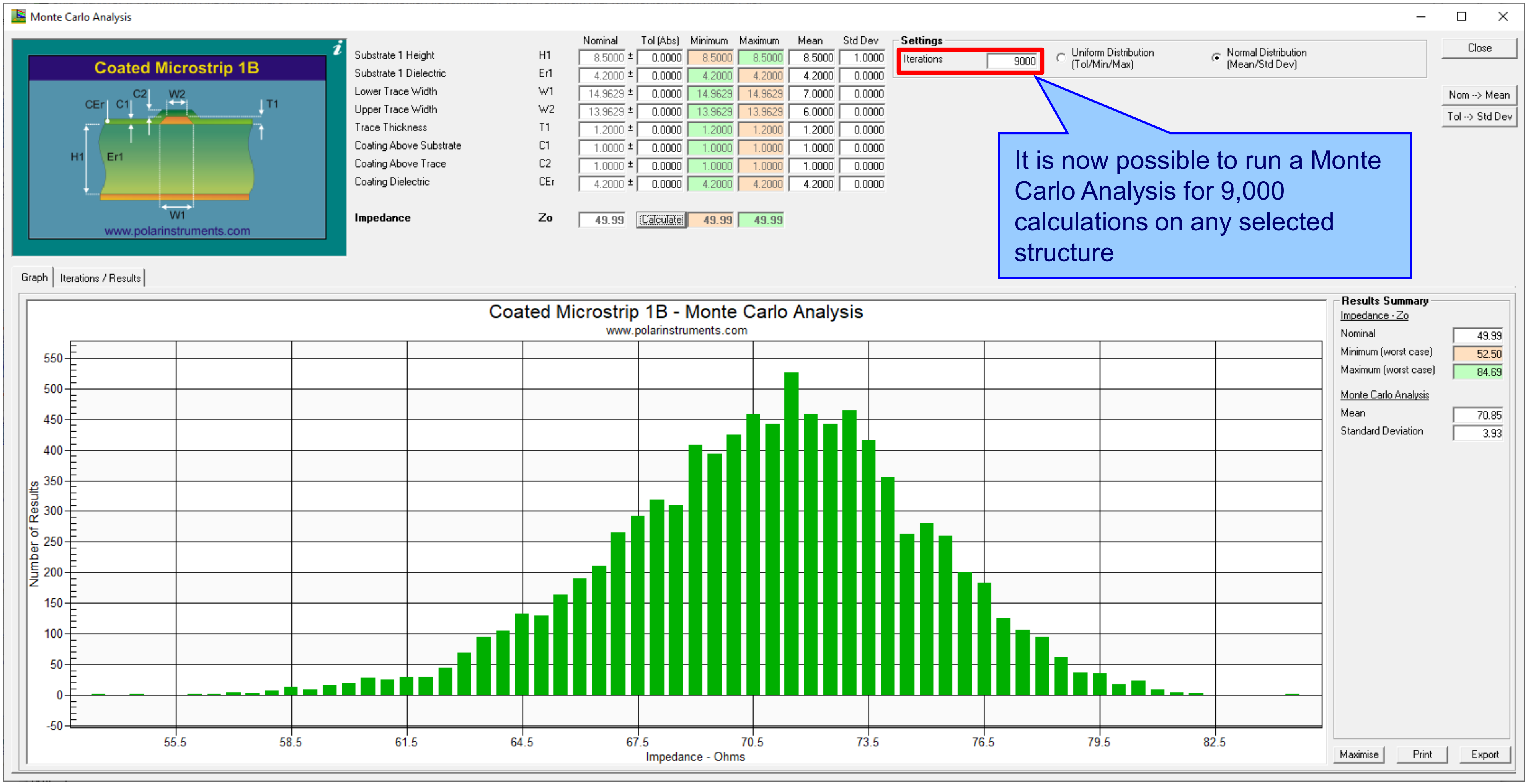
6. Voltage Drop calculation result
The calculated Voltage Drop is displayed in the VD (Volts) text box

Other enhancements

- Monte Carlo Analysis. New option added to export the Iterations / Results to Clipboard (for Excel), accessible from the right-click menu
- Causally Extrapolated Substrate Data. New option added to export the Results to Clipboard (for Excel), accessible from the right-click menu

Si9000e v21.04 (April 2021)

Monte Carlo Analysis maximum iteration increased to 9000



It is now possible to run a Monte Carlo Analysis for 9,000 calculations on any selected structure

Import from Atlas enhanced to support measurement data to 50GHz

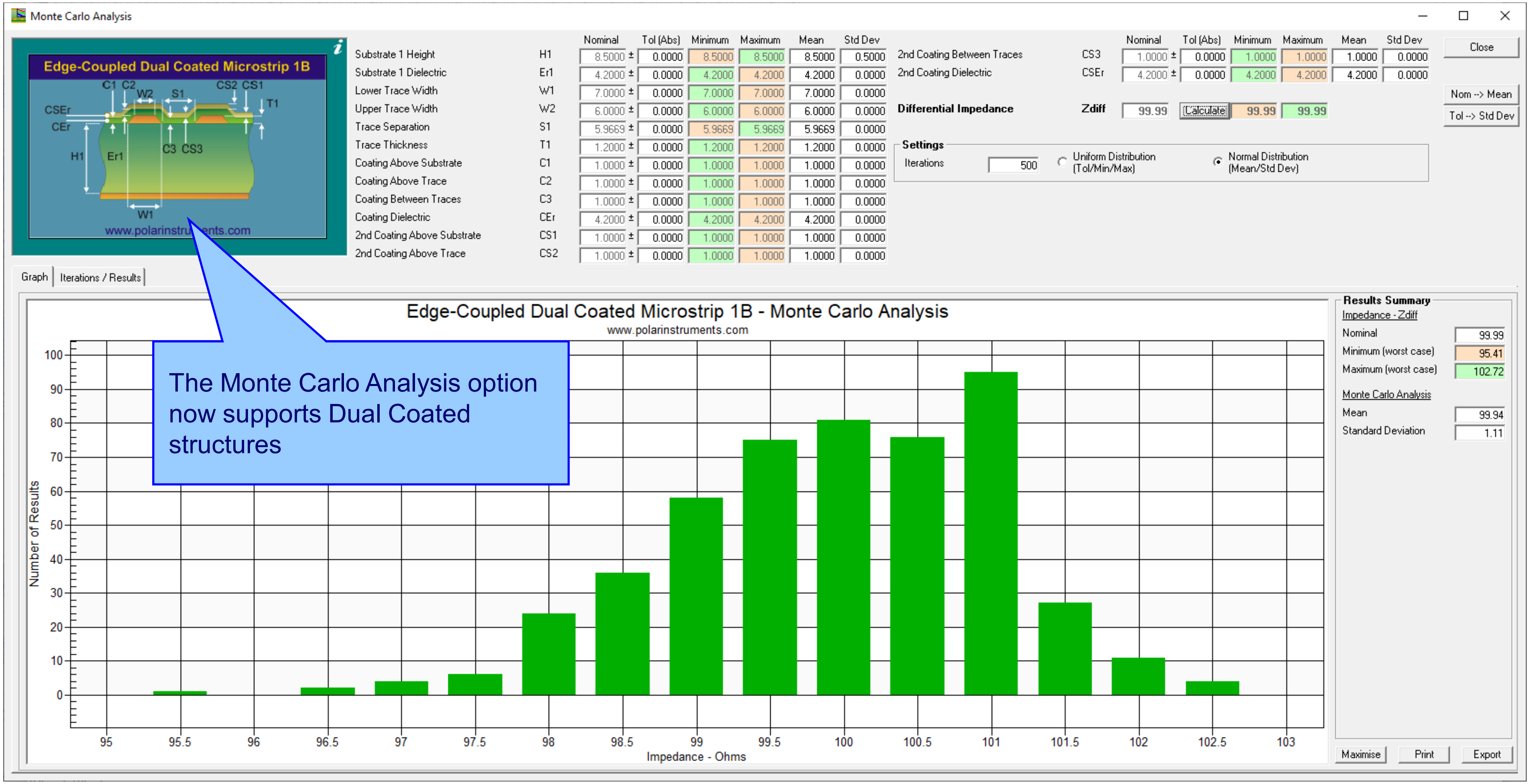
The Polar Atlas VNA Delta-L insertion loss test system now exports measurement data up to 50 Ghz.

The Si9000e Import from Atlas option allows the insertion loss measurement data (brown data series) to be overlaid on the All Losses plot.

In this example the Anritsu ShockLine™ instrument was used, Delta-L maximum frequency set to 40GHz

Si9000e v21.01 (January 2021)

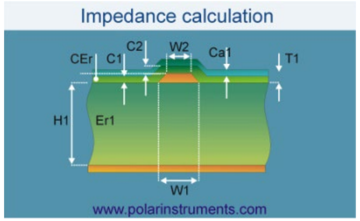
Monte Carlo support added for Dual Coated structures

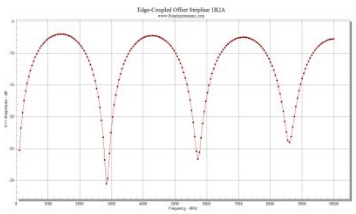


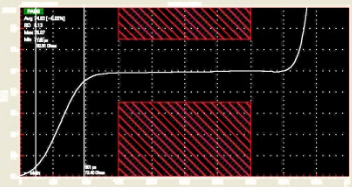
The Monte Carlo Analysis option now supports Dual Coated structures

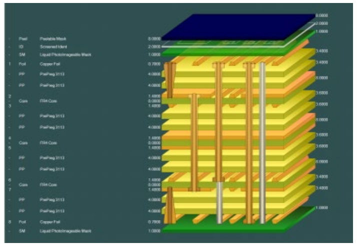
Other enhancements

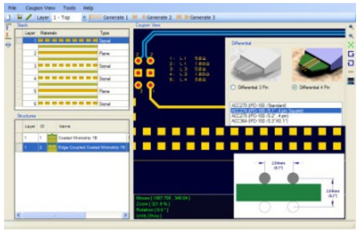
- FlexNet Publisher / FLEXlm v11.17.2.0 supported











Thank you for viewing this Si9000e 2021 – 2023 preview. If you have questions we would be delighted to help you. Your local contact information is contained on the following slide

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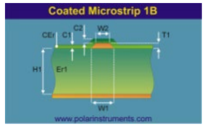

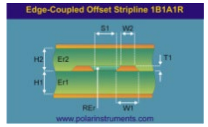

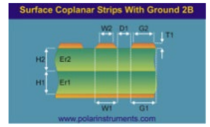

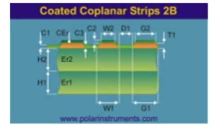

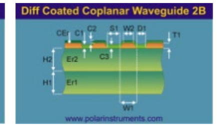

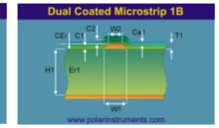

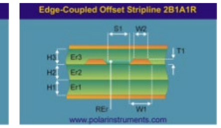

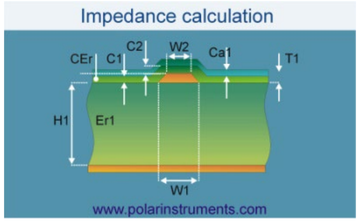

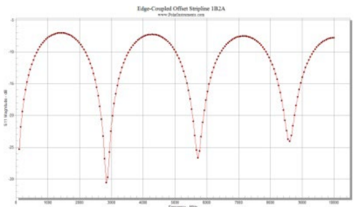
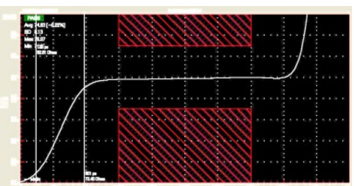
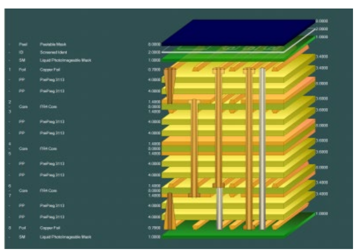
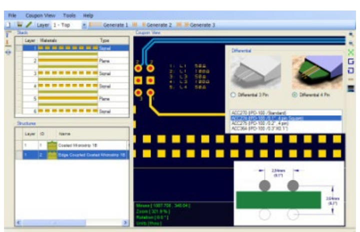

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