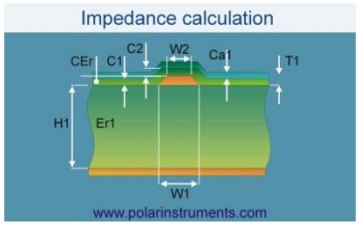
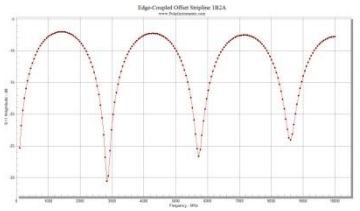
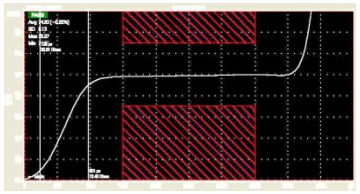
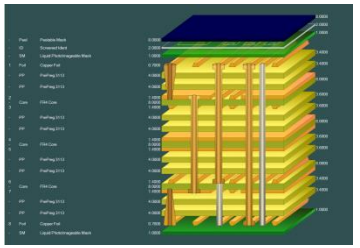
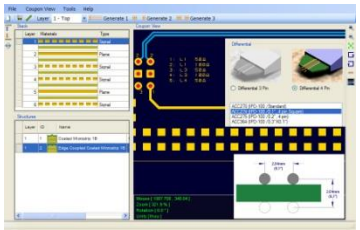










Speedstack 2018 Introduction

Richard Attrill / John Lee – Aug 2018 (Rev 6)

A brief note regarding the major enhancements in Speedstack 2018.

The application and licensing changes for Speedstack 2018 are significant. If you are an existing customer currently running Speedstack 2017 or earlier, please note that all Speedstack Si and Speedstack PCB users in an organisation will need to simultaneously upgrade in order to use the 2018 license.

Importantly, as Speedstack allows comprehensive bidirectional copy and paste into Si8000m / Si9000e and CGen it is important that all products are updated to the 2018 editions at the same time.

During 2018 there have been four releases of Speedstack.

V18.08 (August)

- Import and export for industry-standard IPC-2581 Rev B files
- Eight new coplanar structures added, requested specifically for flex and rigid-flex designs
- Online Library - new On-Premise Mode

V18.05 (May)

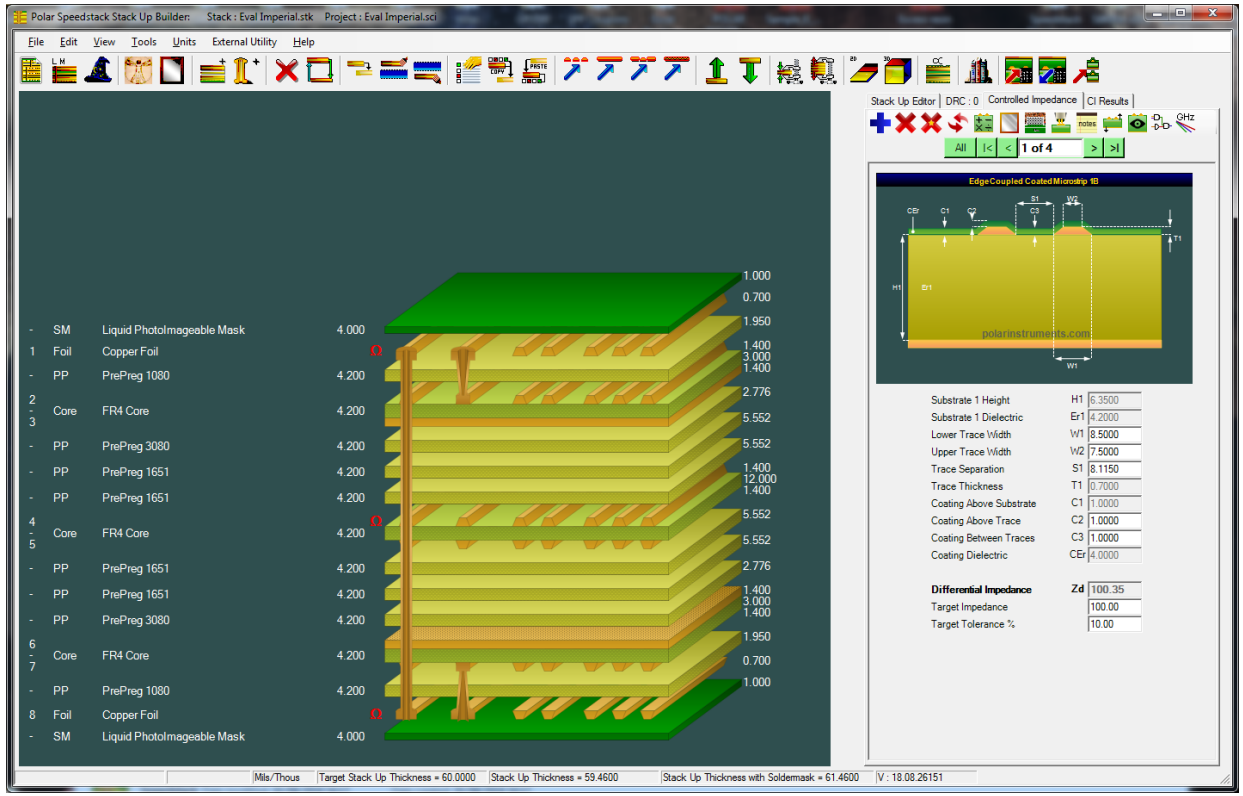
- New Cannonball-Huray method added to Surface Roughness Compensation options

V18.03 (March) / V18.01 (January)

- Full insertion loss data per structure including roughness modelling methodology
- Insertion loss graphs and data in reports
- Rich copy / paste insertion loss data to / from Si9000e
- Export insertion loss projects to Si9000e

Speedstack v18.08 (August 2018)

Import / Export industry-standard IPC-2581 Rev B files

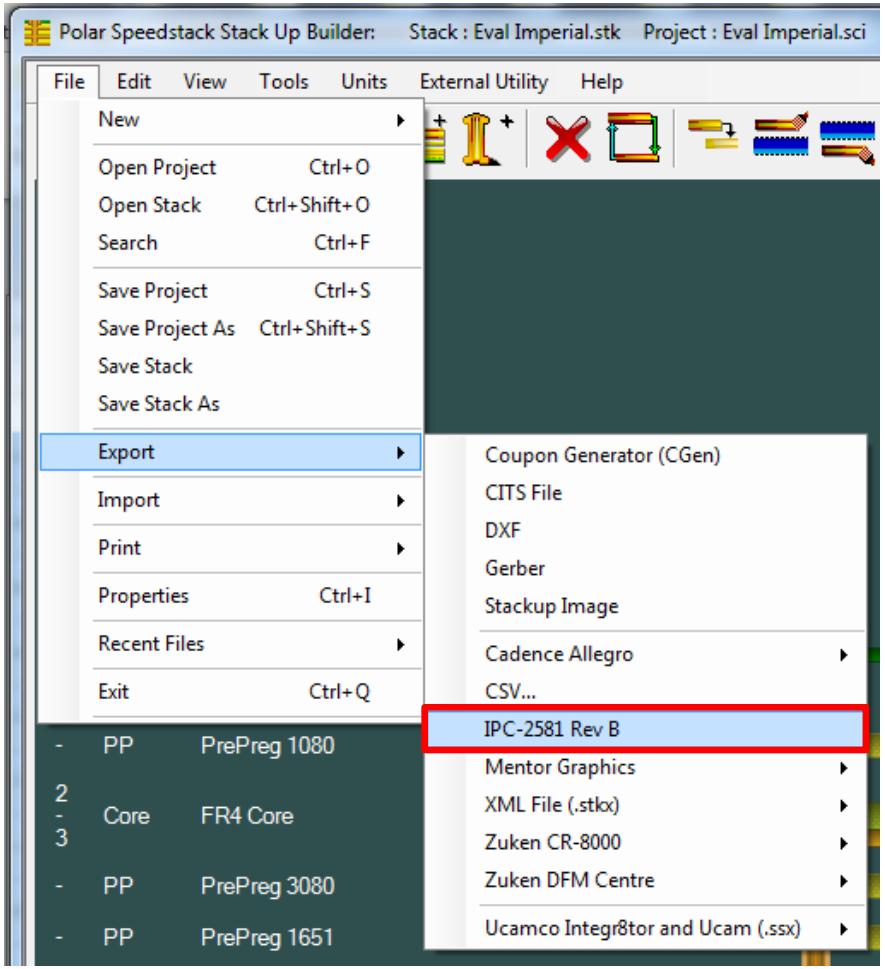


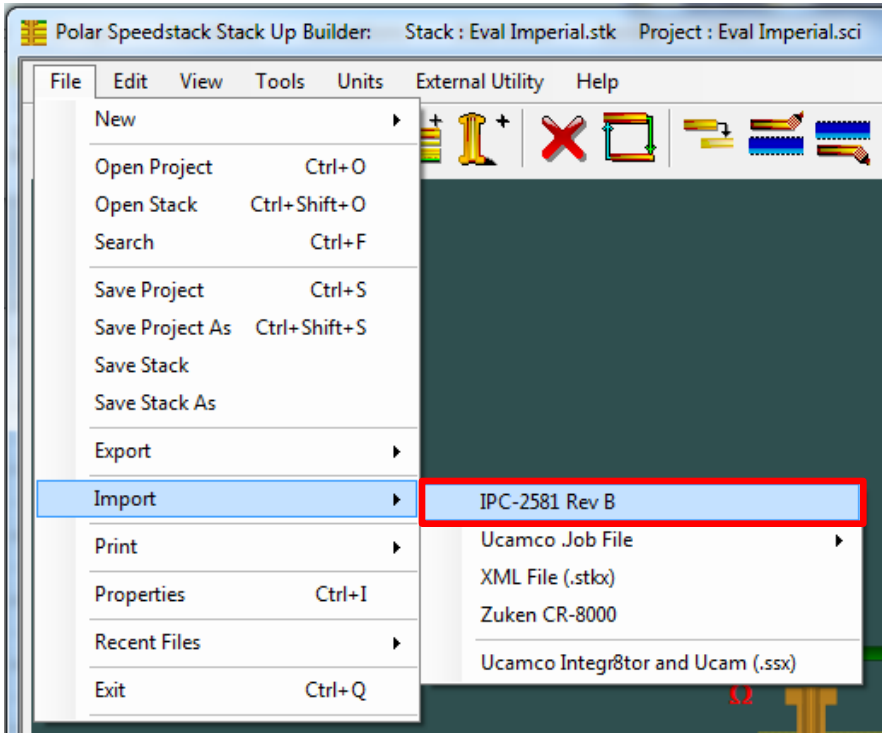
Speedstack v18.08 can export and import stack up and impedance structure data using the IPC-2581 Rev B XML file format

IPC-2581 CONSORTIUM

Other popular EDA tools can export and import IPC-2581 files, allowing easy exchange of stack up data with Speedstack

Import / Export industry-standard IPC-2581 Rev B files



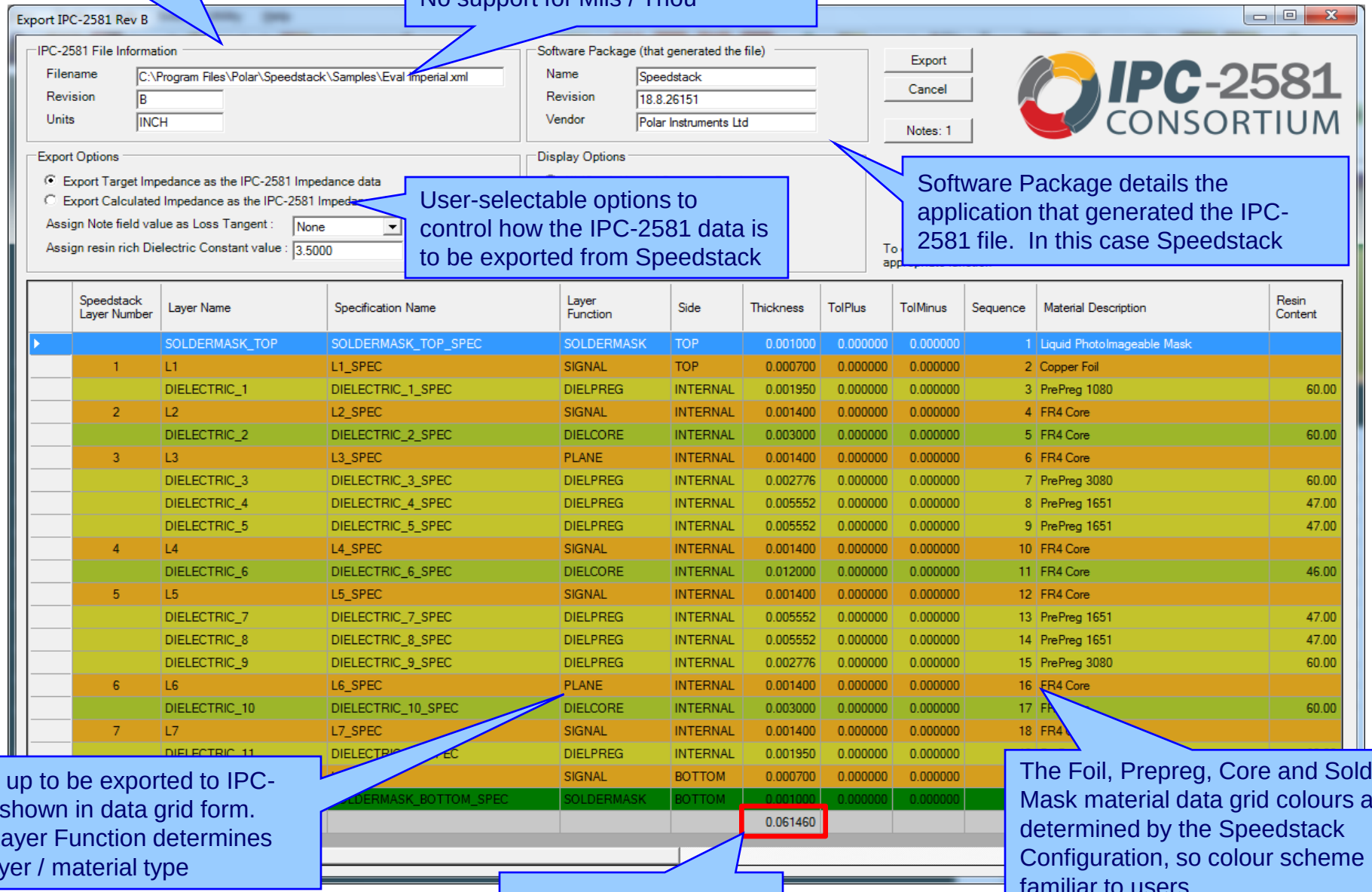


New Export and Import IPC-2581 Rev B options introduced to the File menu

Export to IPC-2581 Rev B

A new dialog guides the user through the **Export** process.

Useful file info including Revision and Units (IPC-2581 support Inches, Millimetres and Microns) No support for Mils / Thou



Speedstack Layer Number	Layer Name	Specification Name	Layer Function	Side	Thickness	TolPlus	TolMinus	Sequence	Material Description	Resin Content
	SOLDERMASK_TOP	SOLDERMASK_TOP_SPEC	SOLDERMASK	TOP	0.001000	0.000000	0.000000	1	Liquid PhotoImageable Mask	
1	L1	L1_SPEC	SIGNAL	TOP	0.000700	0.000000	0.000000	2	Copper Foil	
	DIELECTRIC_1	DIELECTRIC_1_SPEC	DIELPREG	INTERNAL	0.001950	0.000000	0.000000	3	PrePreg 1080	60.00
2	L2	L2_SPEC	SIGNAL	INTERNAL	0.001400	0.000000	0.000000	4	FR4 Core	
	DIELECTRIC_2	DIELECTRIC_2_SPEC	DIELCORE	INTERNAL	0.003000	0.000000	0.000000	5	FR4 Core	60.00
3	L3	L3_SPEC	PLANE	INTERNAL	0.001400	0.000000	0.000000	6	FR4 Core	
	DIELECTRIC_3	DIELECTRIC_3_SPEC	DIELPREG	INTERNAL	0.002776	0.000000	0.000000	7	PrePreg 3080	60.00
	DIELECTRIC_4	DIELECTRIC_4_SPEC	DIELPREG	INTERNAL	0.005552	0.000000	0.000000	8	PrePreg 1651	47.00
	DIELECTRIC_5	DIELECTRIC_5_SPEC	DIELPREG	INTERNAL	0.005552	0.000000	0.000000	9	PrePreg 1651	47.00
4	L4	L4_SPEC	SIGNAL	INTERNAL	0.001400	0.000000	0.000000	10	FR4 Core	
	DIELECTRIC_6	DIELECTRIC_6_SPEC	DIELCORE	INTERNAL	0.012000	0.000000	0.000000	11	FR4 Core	46.00
5	L5	L5_SPEC	SIGNAL	INTERNAL	0.001400	0.000000	0.000000	12	FR4 Core	
	DIELECTRIC_7	DIELECTRIC_7_SPEC	DIELPREG	INTERNAL	0.005552	0.000000	0.000000	13	PrePreg 1651	47.00
	DIELECTRIC_8	DIELECTRIC_8_SPEC	DIELPREG	INTERNAL	0.005552	0.000000	0.000000	14	PrePreg 1651	47.00
	DIELECTRIC_9	DIELECTRIC_9_SPEC	DIELPREG	INTERNAL	0.002776	0.000000	0.000000	15	PrePreg 3080	60.00
6	L6	L6_SPEC	PLANE	INTERNAL	0.001400	0.000000	0.000000	16	FR4 Core	
	DIELECTRIC_10	DIELECTRIC_10_SPEC	DIELCORE	INTERNAL	0.003000	0.000000	0.000000	17	FR	60.00
7	L7	L7_SPEC	SIGNAL	INTERNAL	0.001400	0.000000	0.000000	18	FR4	
	DIELECTRIC_11	DIELECTRIC_11_SPEC	DIELPREG	INTERNAL	0.001950	0.000000	0.000000			
			SIGNAL	BOTTOM	0.000700	0.000000	0.000000			
		LDERMASK_BOTTOM_SPEC	SOLDERMASK	BOTTOM	0.001000	0.000000	0.000000			
					0.061460					

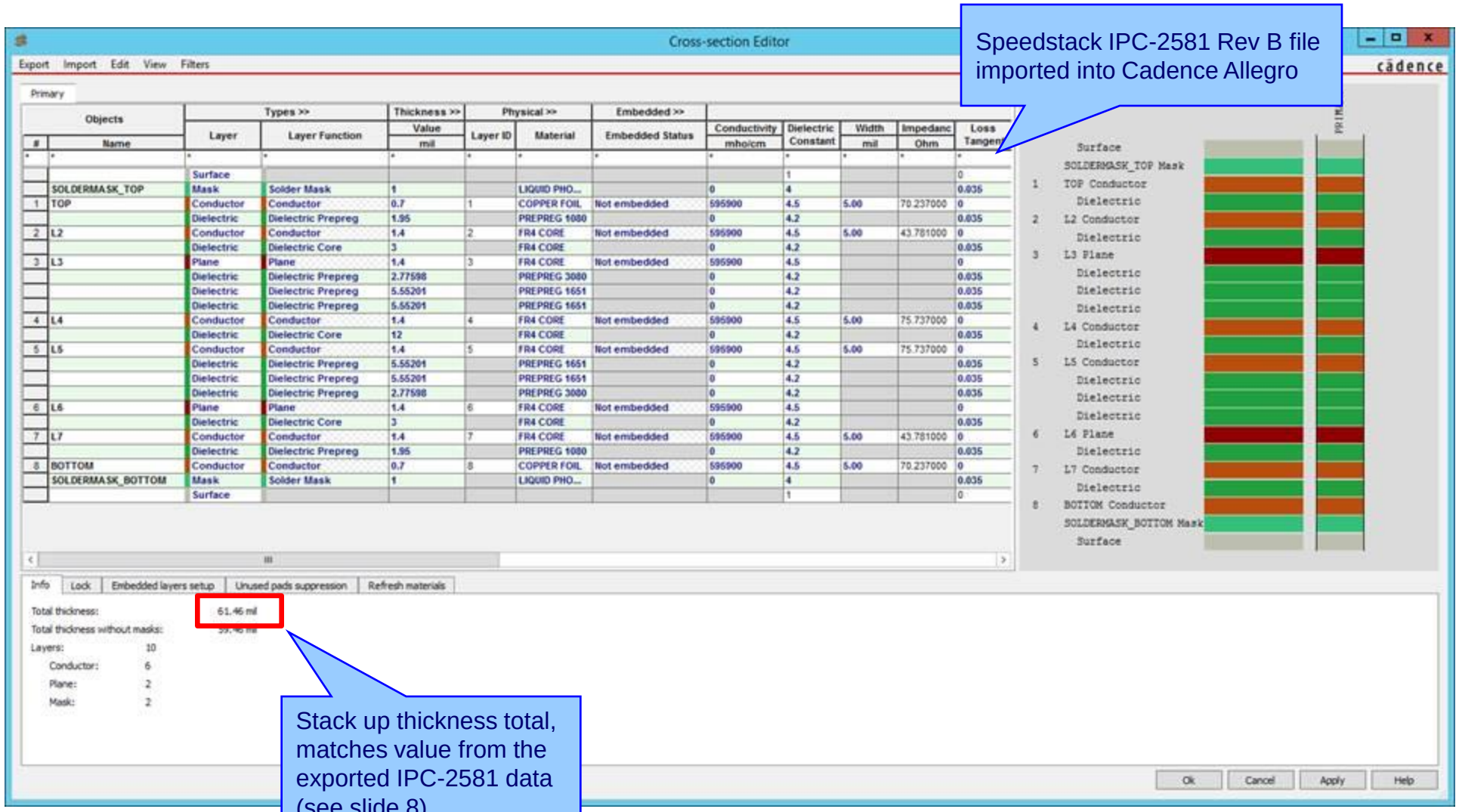
User-selectable options to control how the IPC-2581 data is to be exported from Speedstack

Software Package details the application that generated the IPC-2581 file. In this case Speedstack

Stack up to be exported to IPC-2581 shown in data grid form. The Layer Function determines the layer / material type

Stack up thickness total

The Foil, Prepreg, Core and Solder Mask material data grid colours are determined by the Speedstack Configuration, so colour scheme familiar to users



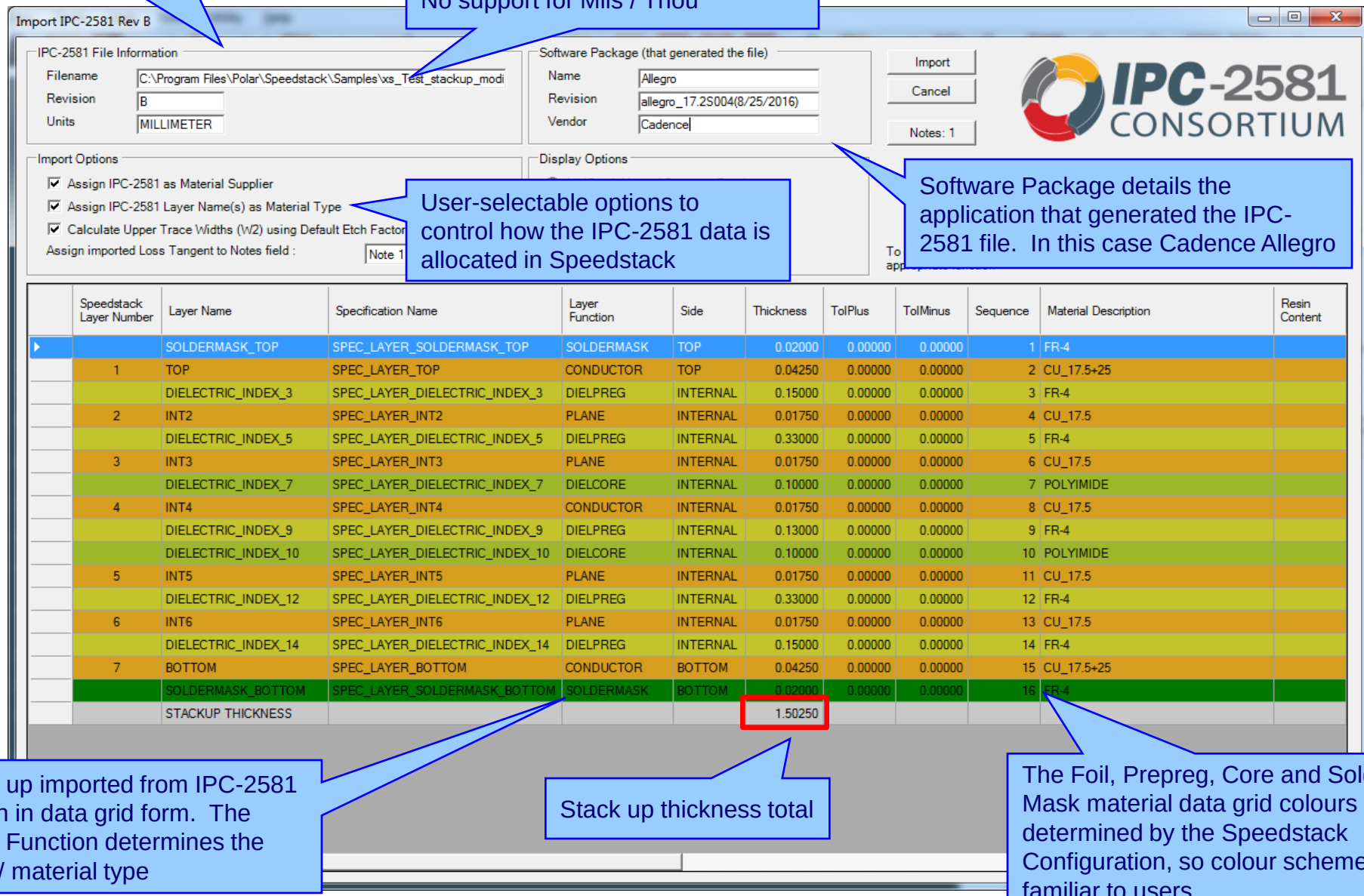
Speedstack IPC-2581 Rev B file imported into Cadence Allegro

Stack up thickness total, matches value from the exported IPC-2581 data (see slide 8)

Import from IPC-2581 Rev B

A new dialog guides the user through the **Import** process.

Useful file info including Revision and Units (IPC-2581 support Inches, Millimetres and Microns) No support for Mils / Thou



User-selectable options to control how the IPC-2581 data is allocated in Speedstack

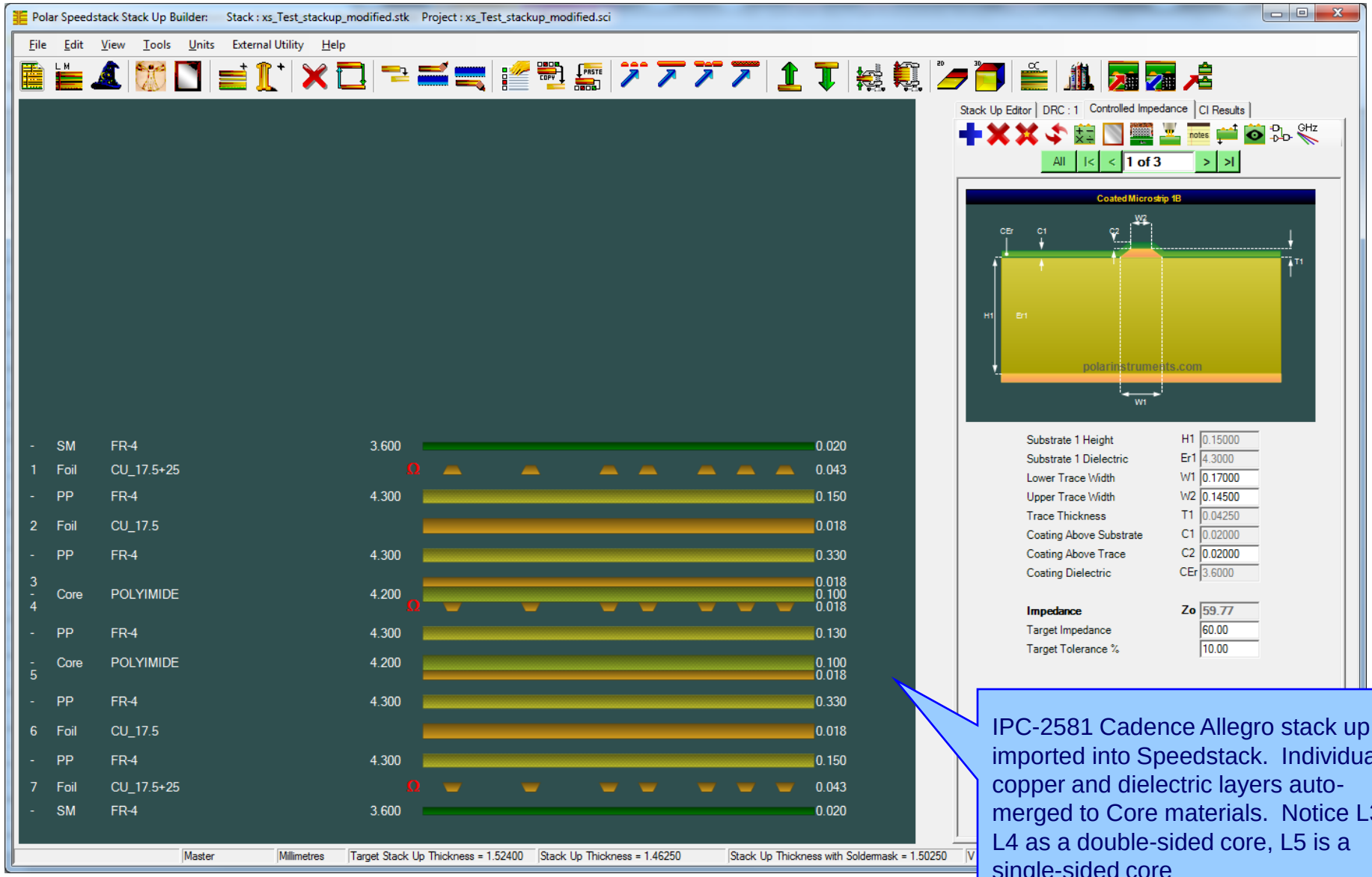
Software Package details the application that generated the IPC-2581 file. In this case Cadence Allegro

	Speedstack Layer Number	Layer Name	Specification Name	Layer Function	Side	Thickness	TolPlus	TolMinus	Sequence	Material Description	Resin Content
▶		SOLDERMASK_TOP	SPEC_LAYER_SOLDERMASK_TOP	SOLDERMASK	TOP	0.02000	0.00000	0.00000	1	FR-4	
	1	TOP	SPEC_LAYER_TOP	CONDUCTOR	TOP	0.04250	0.00000	0.00000	2	CU_17.5+25	
		DIELECTRIC_INDEX_3	SPEC_LAYER_DIELECTRIC_INDEX_3	DIELPREG	INTERNAL	0.15000	0.00000	0.00000	3	FR-4	
	2	INT2	SPEC_LAYER_INT2	PLANE	INTERNAL	0.01750	0.00000	0.00000	4	CU_17.5	
		DIELECTRIC_INDEX_5	SPEC_LAYER_DIELECTRIC_INDEX_5	DIELPREG	INTERNAL	0.33000	0.00000	0.00000	5	FR-4	
	3	INT3	SPEC_LAYER_INT3	PLANE	INTERNAL	0.01750	0.00000	0.00000	6	CU_17.5	
		DIELECTRIC_INDEX_7	SPEC_LAYER_DIELECTRIC_INDEX_7	DIELCORE	INTERNAL	0.10000	0.00000	0.00000	7	POLYIMIDE	
	4	INT4	SPEC_LAYER_INT4	CONDUCTOR	INTERNAL	0.01750	0.00000	0.00000	8	CU_17.5	
		DIELECTRIC_INDEX_9	SPEC_LAYER_DIELECTRIC_INDEX_9	DIELPREG	INTERNAL	0.13000	0.00000	0.00000	9	FR-4	
		DIELECTRIC_INDEX_10	SPEC_LAYER_DIELECTRIC_INDEX_10	DIELCORE	INTERNAL	0.10000	0.00000	0.00000	10	POLYIMIDE	
	5	INT5	SPEC_LAYER_INT5	PLANE	INTERNAL	0.01750	0.00000	0.00000	11	CU_17.5	
		DIELECTRIC_INDEX_12	SPEC_LAYER_DIELECTRIC_INDEX_12	DIELPREG	INTERNAL	0.33000	0.00000	0.00000	12	FR-4	
	6	INT6	SPEC_LAYER_INT6	PLANE	INTERNAL	0.01750	0.00000	0.00000	13	CU_17.5	
		DIELECTRIC_INDEX_14	SPEC_LAYER_DIELECTRIC_INDEX_14	DIELPREG	INTERNAL	0.15000	0.00000	0.00000	14	FR-4	
	7	BOTTOM	SPEC_LAYER_BOTTOM	CONDUCTOR	BOTTOM	0.04250	0.00000	0.00000	15	CU_17.5+25	
		SOLDERMASK_BOTTOM	SPEC_LAYER_SOLDERMASK_BOTTOM	SOLDERMASK	BOTTOM	0.02000	0.00000	0.00000	16	FR-4	
		STACKUP THICKNESS				1.50250					

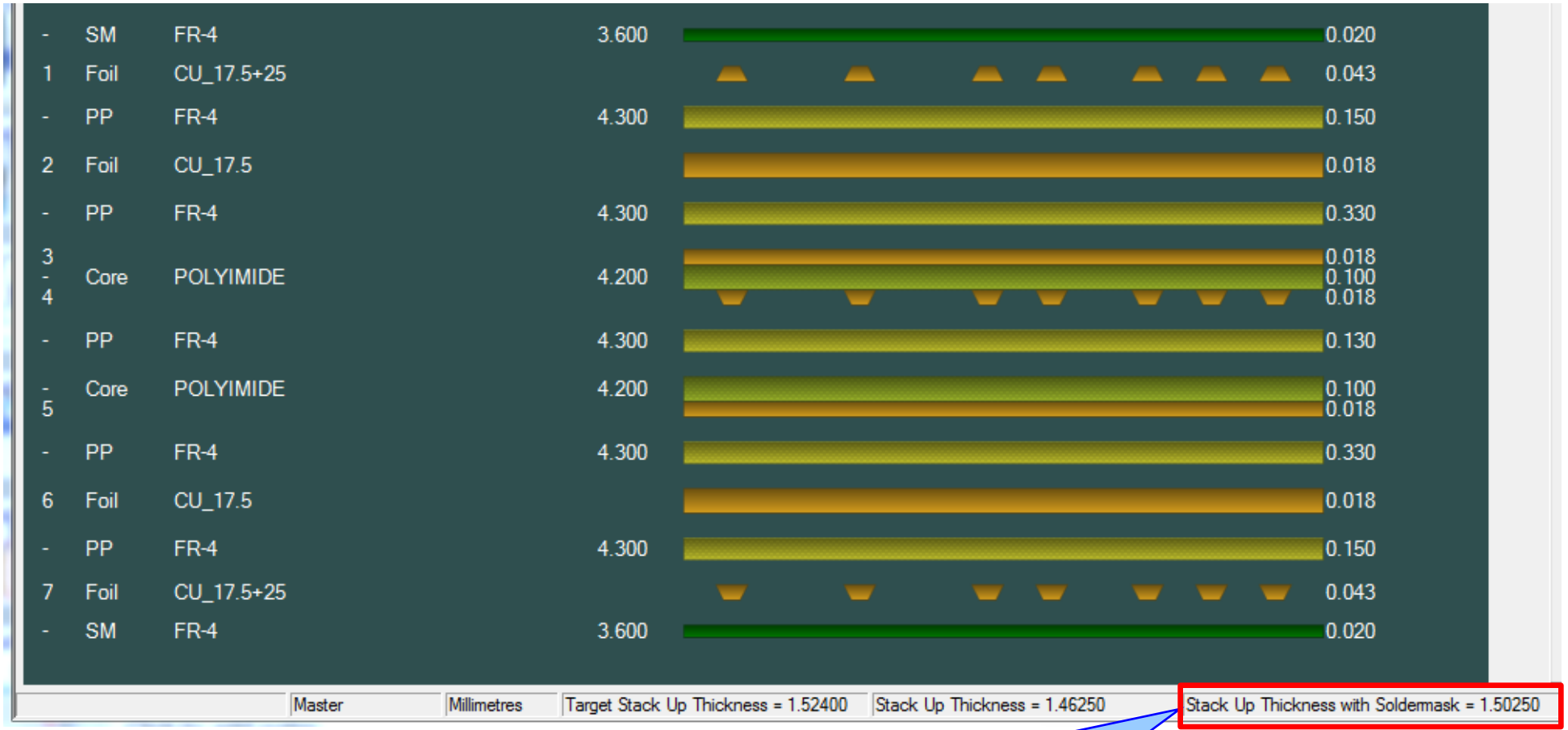
Stack up imported from IPC-2581 shown in data grid form. The Layer Function determines the layer / material type

Stack up thickness total

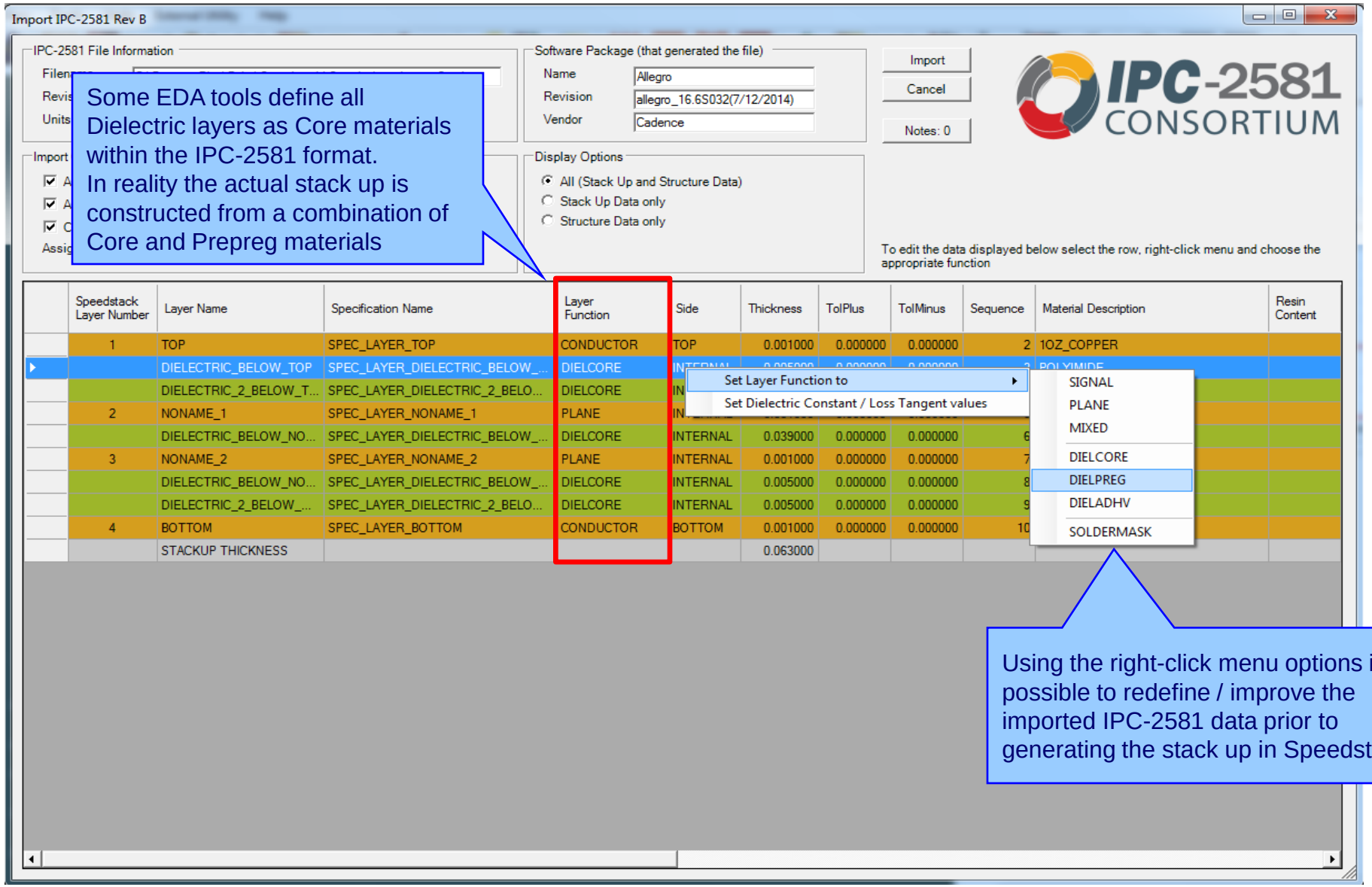
The Foil, Prepreg, Core and Solder Mask material data grid colours are determined by the Speedstack Configuration, so colour scheme familiar to users

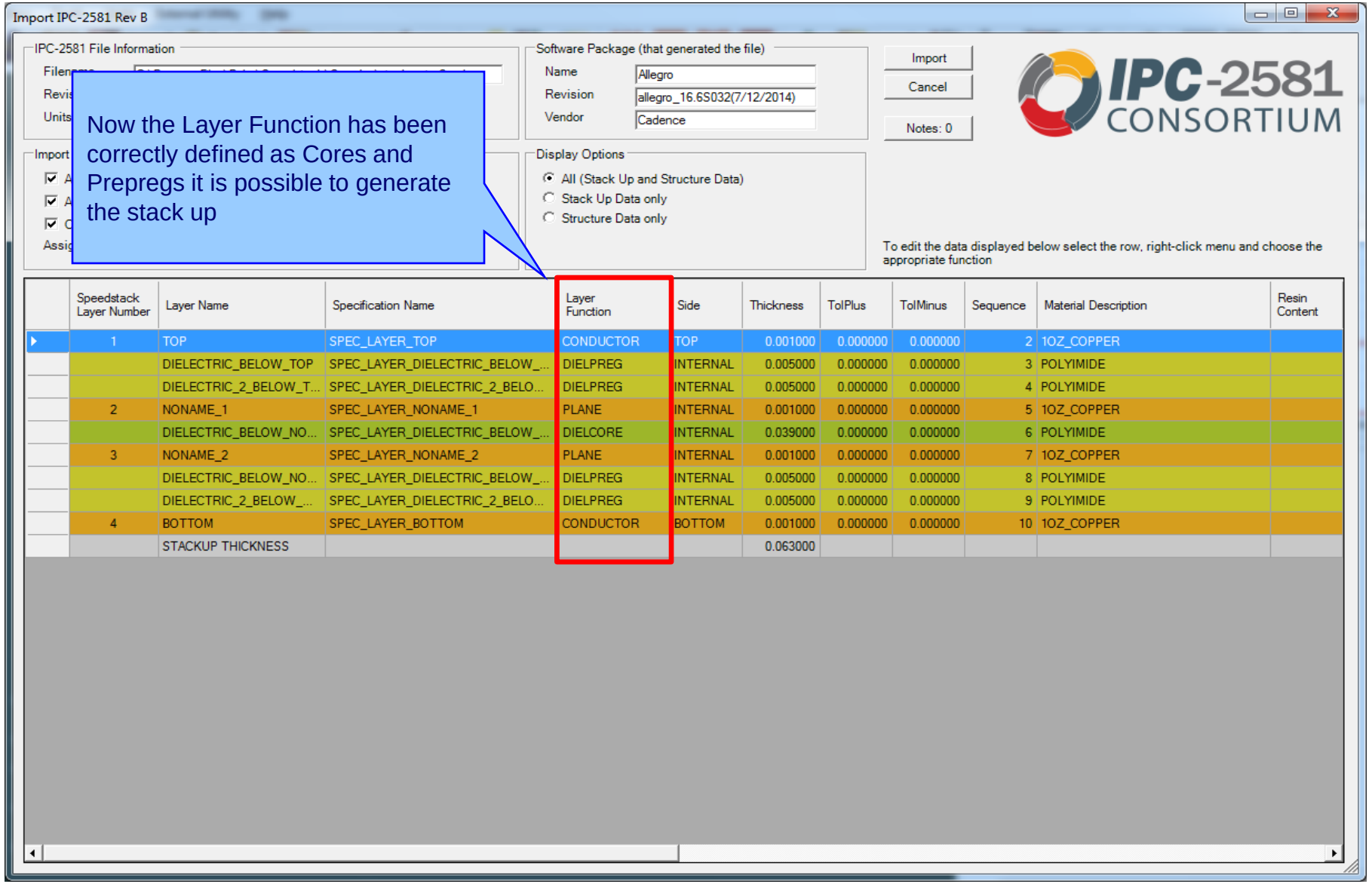


IPC-2581 Cadence Allegro stack up imported into Speedstack. Individual copper and dielectric layers auto-merged to Core materials. Notice L3 / L4 as a double-sided core, L5 is a single-sided core

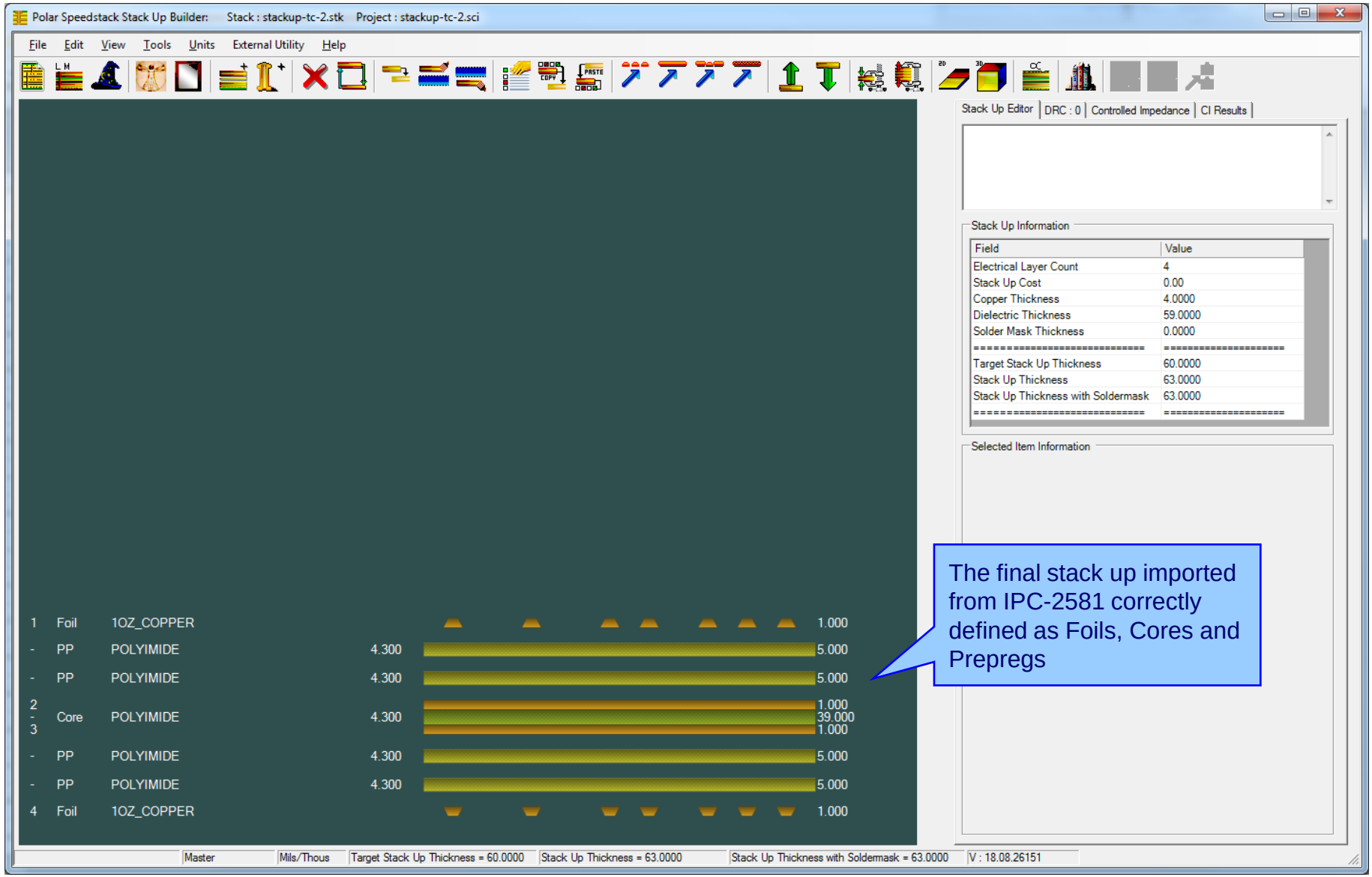


Stack Up Thickness with Solder Mask value of 1.5025mm matches value from the imported IPC-2581 data (see slide 11)

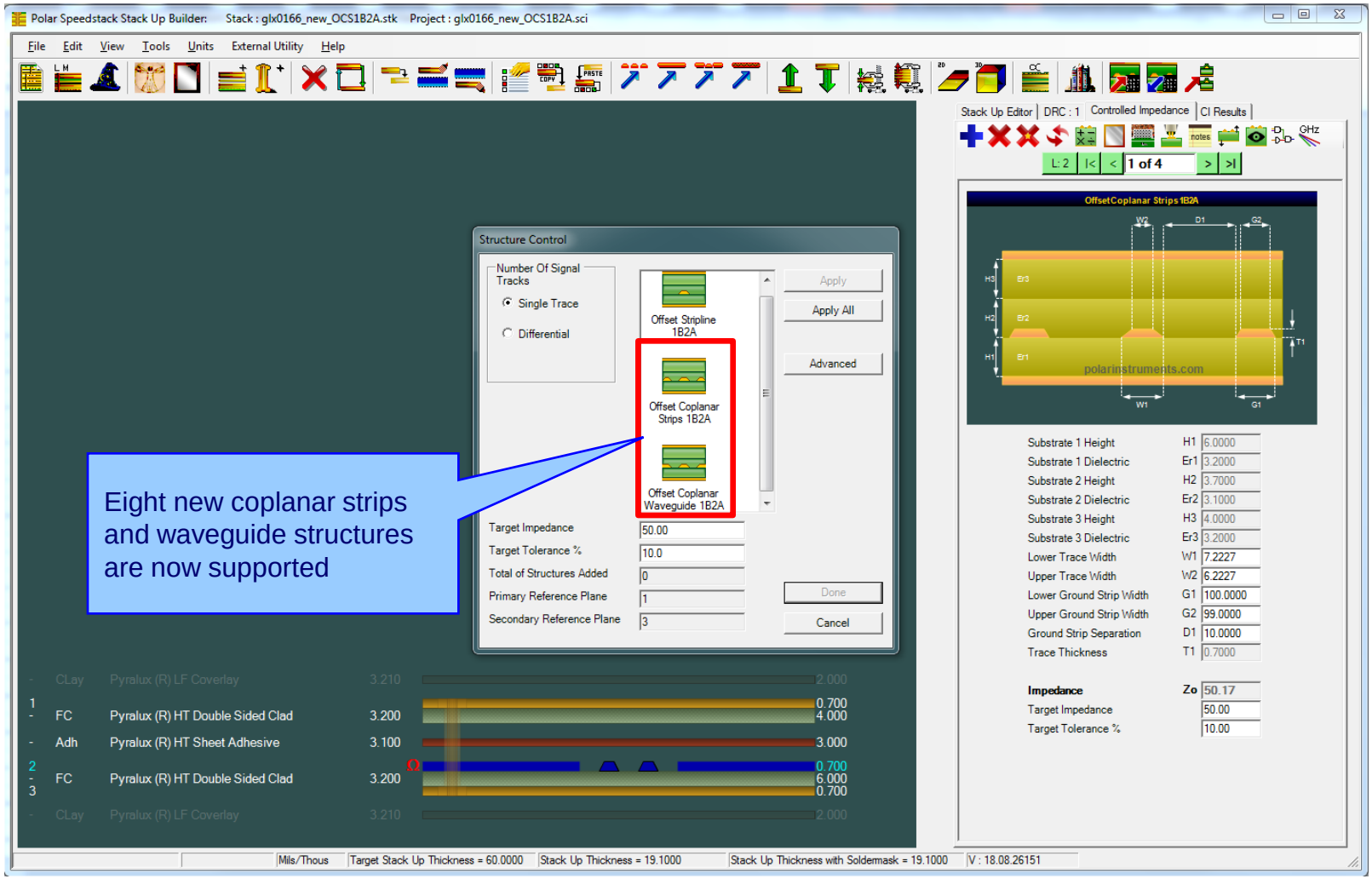




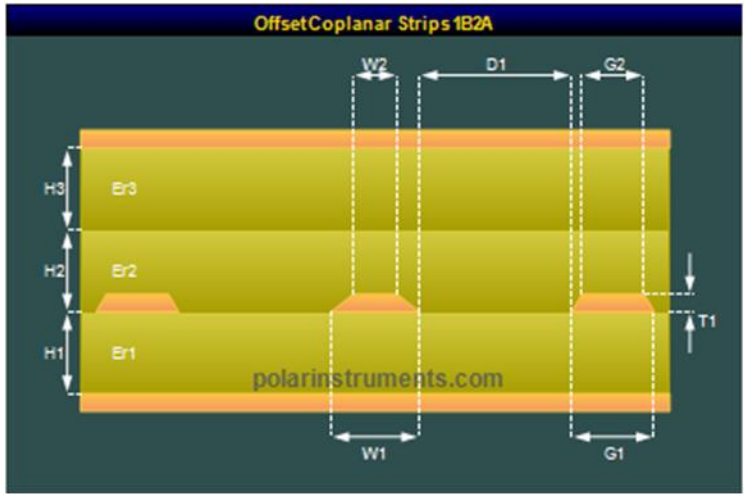
	Speedstack Layer Number	Layer Name	Specification Name	Layer Function	Side	Thickness	TolPlus	TolMinus	Sequence	Material Description	Resin Content
▶	1	TOP	SPEC_LAYER_TOP	CONDUCTOR	TOP	0.001000	0.000000	0.000000	2	1OZ_COPPER	
		DIELECTRIC_BELOW_TOP	SPEC_LAYER_DIELECTRIC_BELOW_...	DIELPREG	INTERNAL	0.005000	0.000000	0.000000	3	POLYIMIDE	
		DIELECTRIC_2_BELOW_T...	SPEC_LAYER_DIELECTRIC_2_BELO...	DIELPREG	INTERNAL	0.005000	0.000000	0.000000	4	POLYIMIDE	
	2	NONAME_1	SPEC_LAYER_NONAME_1	PLANE	INTERNAL	0.001000	0.000000	0.000000	5	1OZ_COPPER	
		DIELECTRIC_BELOW_NO...	SPEC_LAYER_DIELECTRIC_BELOW_...	DIELCORE	INTERNAL	0.039000	0.000000	0.000000	6	POLYIMIDE	
	3	NONAME_2	SPEC_LAYER_NONAME_2	PLANE	INTERNAL	0.001000	0.000000	0.000000	7	1OZ_COPPER	
		DIELECTRIC_BELOW_NO...	SPEC_LAYER_DIELECTRIC_BELOW_...	DIELPREG	INTERNAL	0.005000	0.000000	0.000000	8	POLYIMIDE	
		DIELECTRIC_2_BELOW_...	SPEC_LAYER_DIELECTRIC_2_BELO...	DIELPREG	INTERNAL	0.005000	0.000000	0.000000	9	POLYIMIDE	
	4	BOTTOM	SPEC_LAYER_BOTTOM	CONDUCTOR	BOTTOM	0.001000	0.000000	0.000000	10	1OZ_COPPER	
		STACKUP THICKNESS				0.063000					

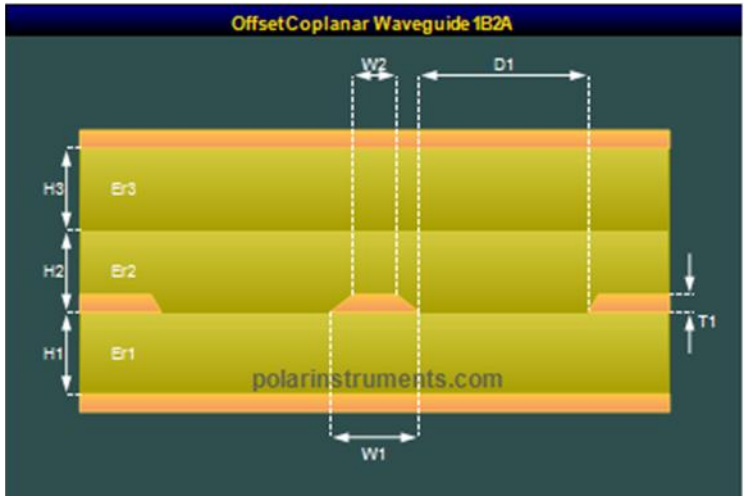


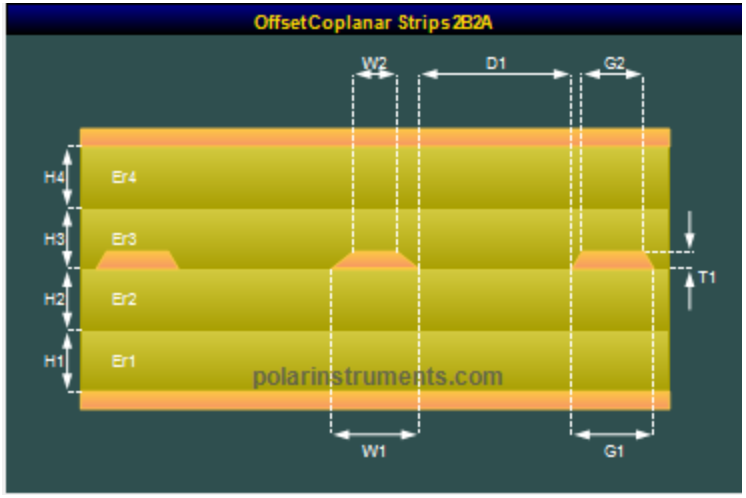
New coplanar structures supported, specifically for flex and rigid-flex designs

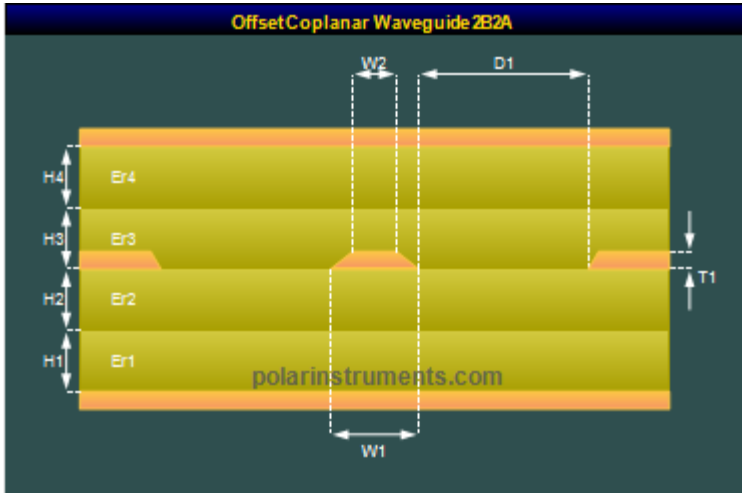


New coplanar structures supported: four new single-ended structures

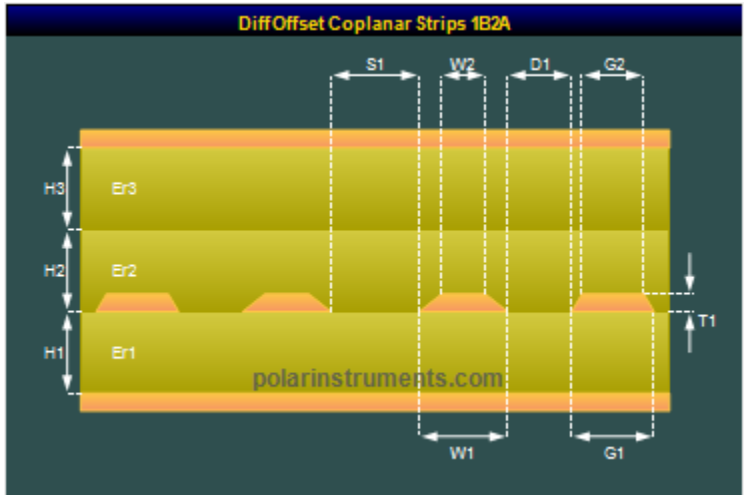


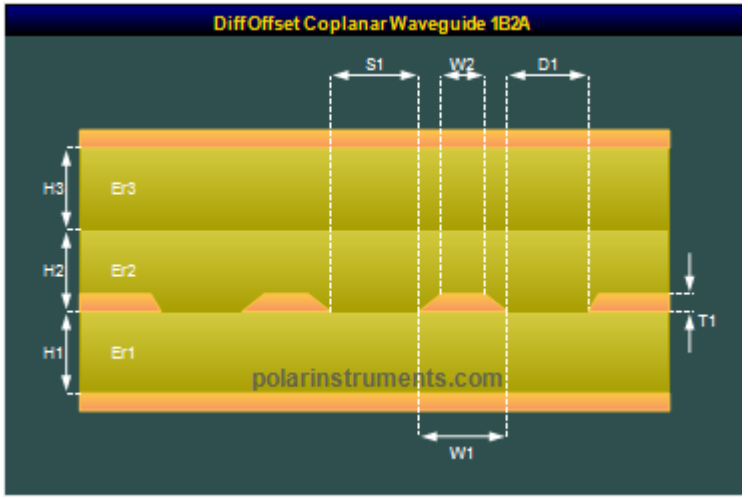


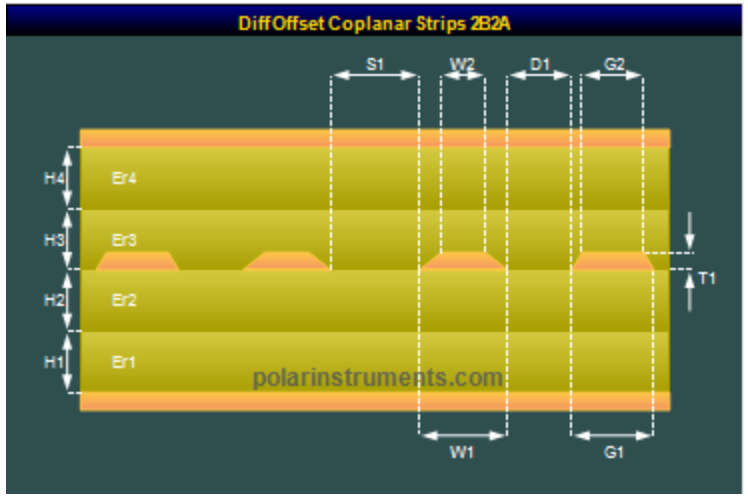


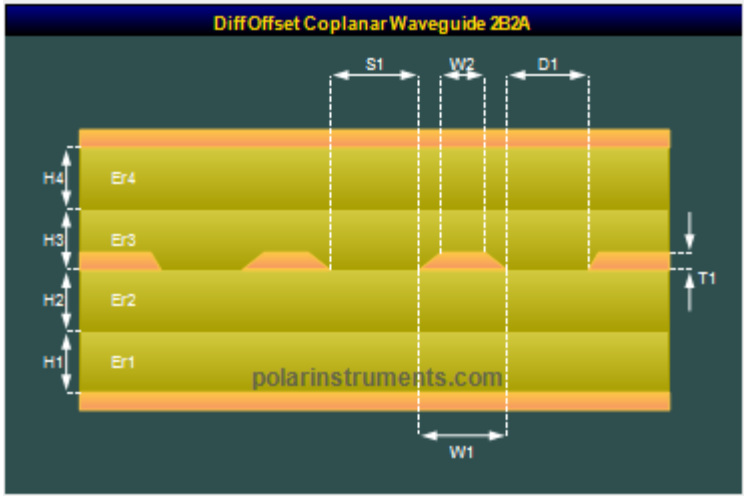


New coplanar structures supported: four new differential structures

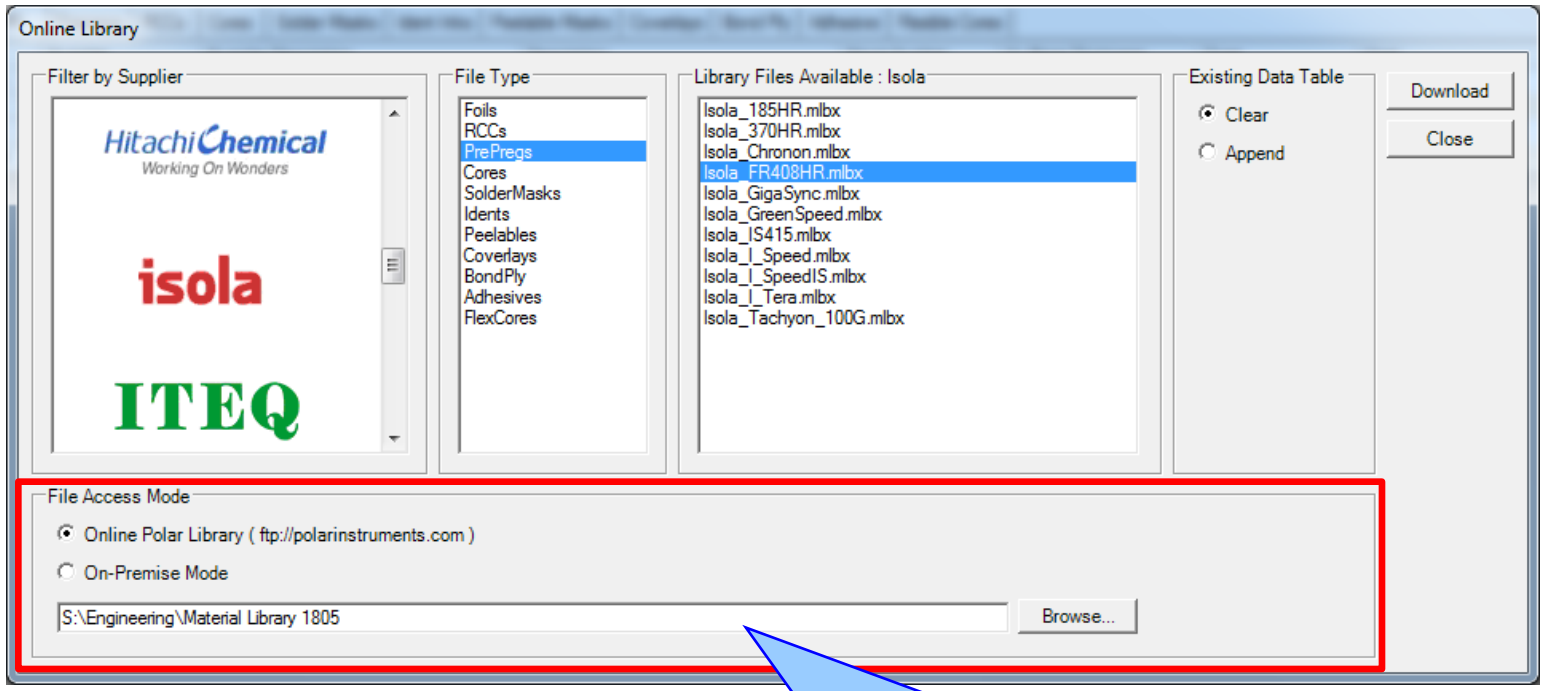


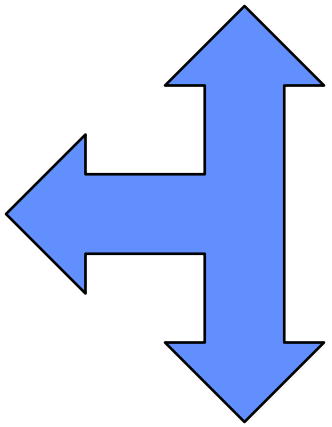






Online Library – New On-Premise Mode



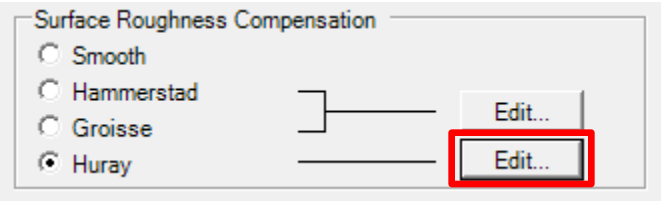


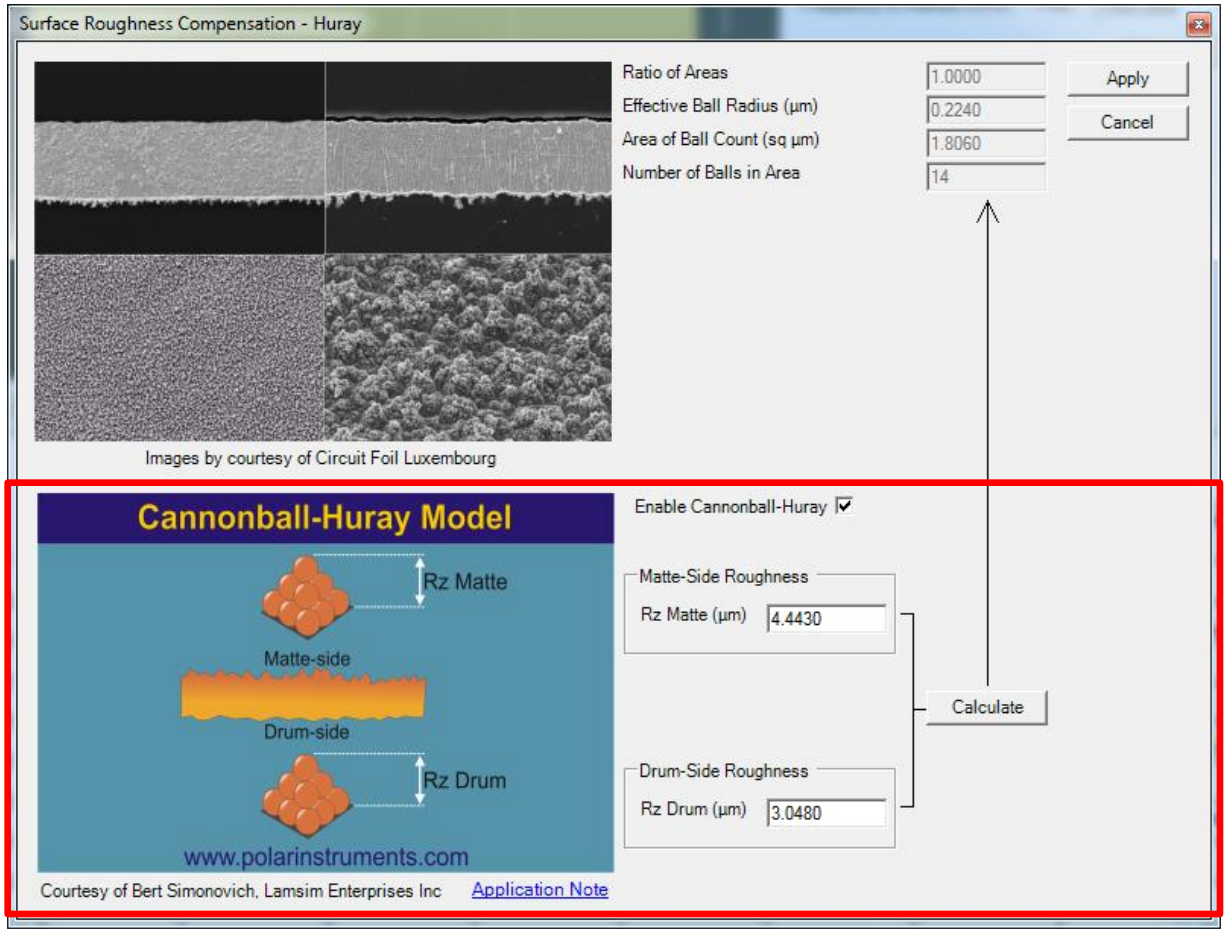
On-Premise Server

The Online Library can now access the latest material library data from either the Polar FTP Server or an On-Premise Server.
The On-Premise Mode is ideal for those users where internal security policies prevent access to external FTP servers. Please contact your local Polar office for more information

Speedstack v18.05 (May 2018)

Cannonball-Huray Surface Roughness Method

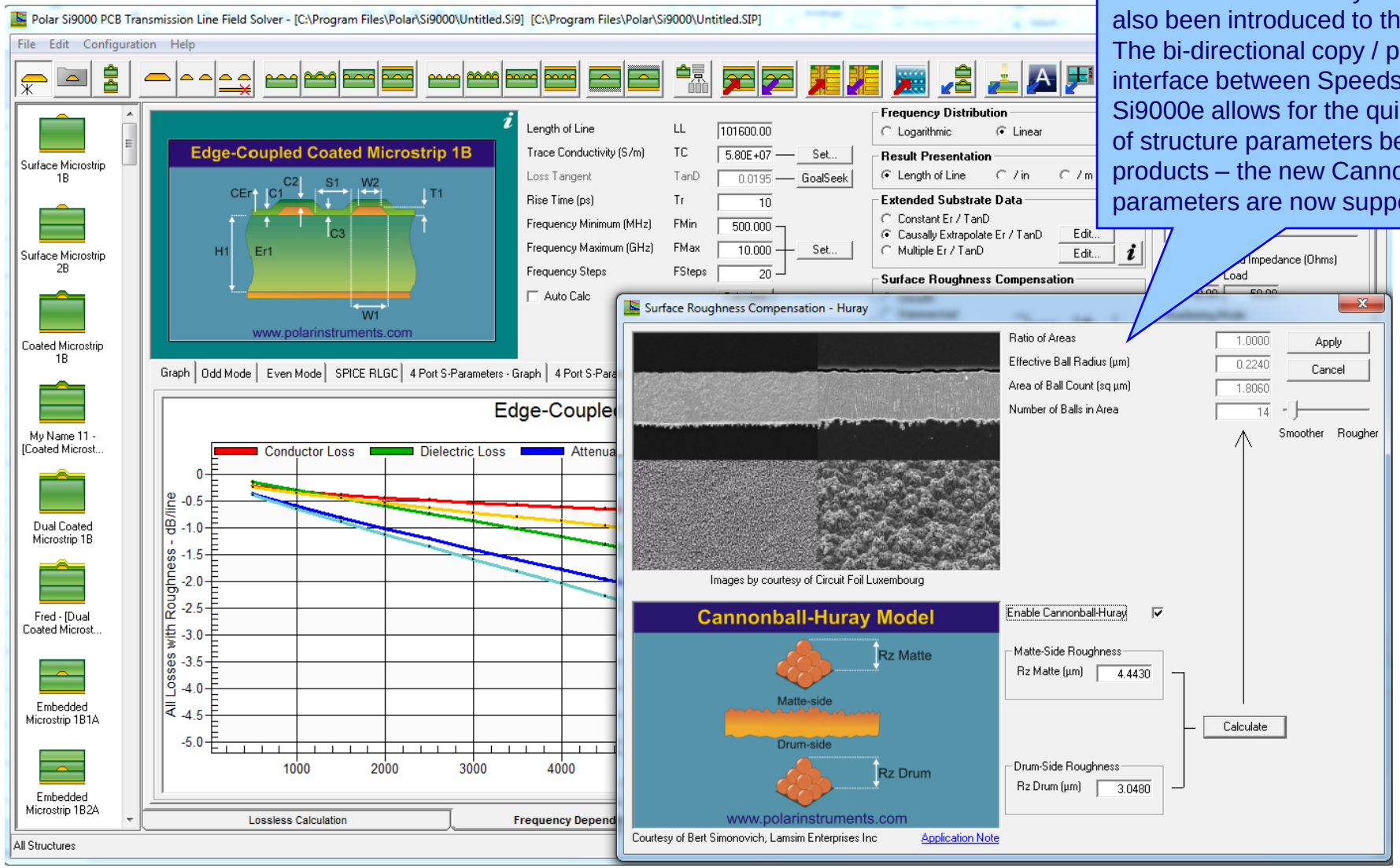




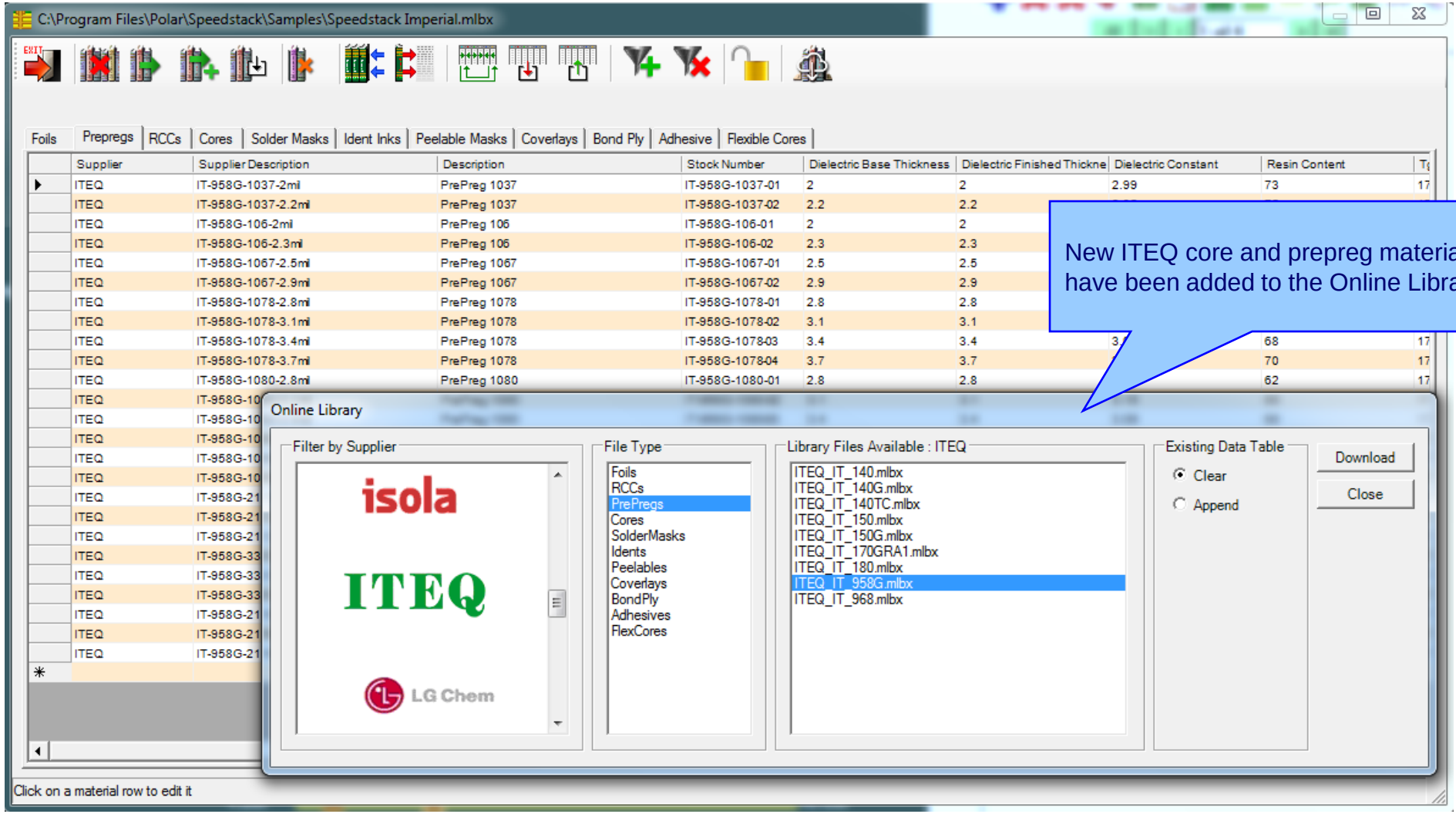
The Cannonball-Huray method has been added to Surface Roughness Compensation options. This requires the entry of Matte and Drum side Rz values

Cannonball-Huray Surface Roughness Method

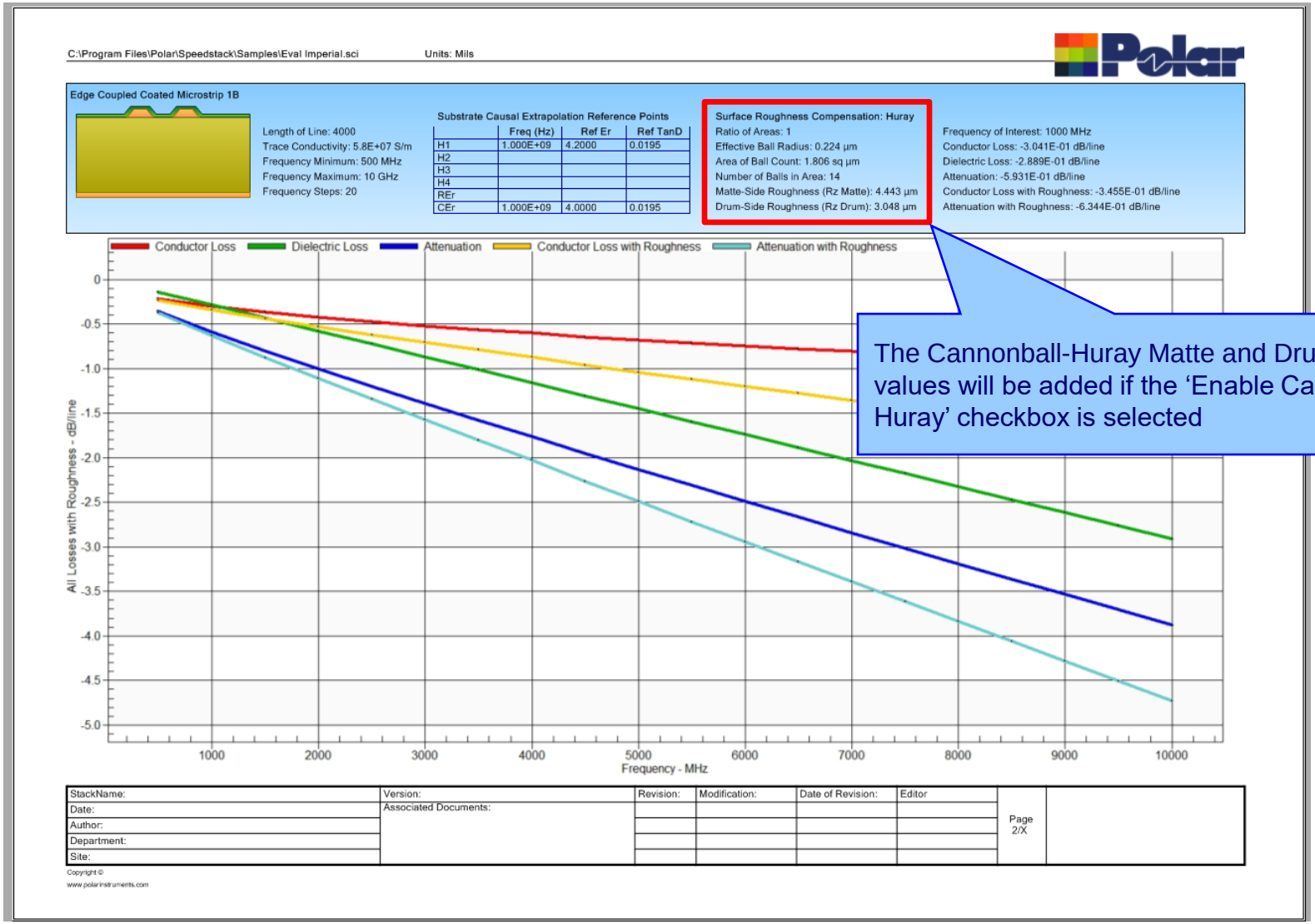
The Cannonball-Huray method has also been introduced to the Si9000e. The bi-directional copy / paste interface between Speedstack and Si9000e allows for the quick transfer of structure parameters between products – the new Cannonball-Huray parameters are now supported



Online Material Library Enhancements

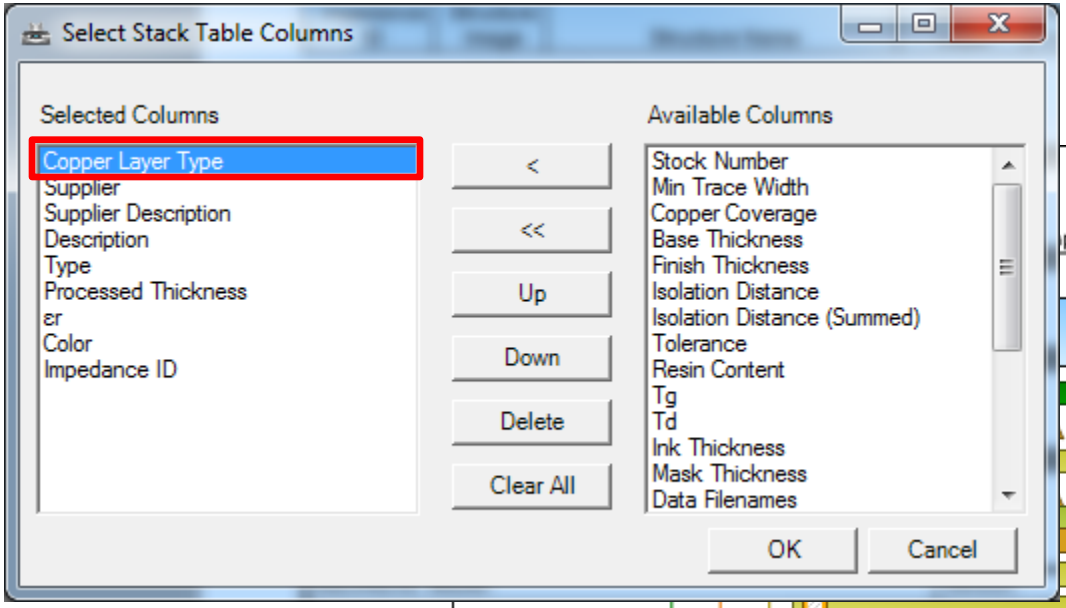


Speedstack – Technical Report enhancements



The Cannonball-Huray Matte and Drum side Rz values will be added if the 'Enable Cannonball-Huray' checkbox is selected

Speedstack – Technical Report enhancements



In addition to the graphical stack up image, copper layer types can been determined by a new selectable column

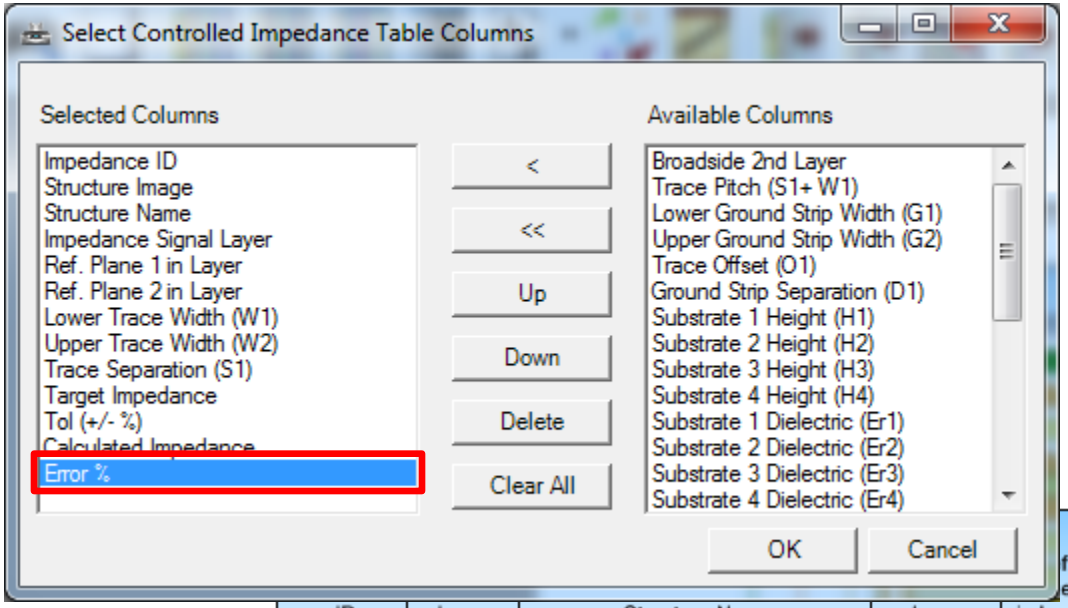
perial.sci Units: Mils

Copper Layer Type	Supplier	Supplier Description	Description
	Polar Samples	SM/001	Liquid PhotoImageable Mask
Signal	Polar Samples	FO/001	Copper Foil
	Polar Samples	PP/001	PrePreg 1080
Signal			
	Polar Samples	CO/005	FR4 Core
Plane			
	Polar Samples	PP/002	PrePreg 3080
	Polar Samples	PP/004	PrePreg 1651
	Polar Samples	PP/004	PrePreg 1651
Signal			
	Polar Samples	CO/020	FR4 Core
Signal			
	Polar Samples	PP/004	PrePreg 1651
	Polar Samples	PP/004	PrePreg 1651
	Polar Samples	PP/002	PrePreg 3080
Plane			
	Polar Samples	CO/005	FR4 Core
Signal			
	Polar Samples	PP/001	PrePreg 1080
Signal	Polar Samples	FO/001	Copper Foil
	Polar Samples	SM/001	Liquid PhotoImageable Mask

4 5 6 7 8 61.46 59.46 58.06

Copper Thickness = 9.800 | Dielectric Thickness = 49.660 | Solder Mask Thickr

Speedstack – Technical Report enhancements

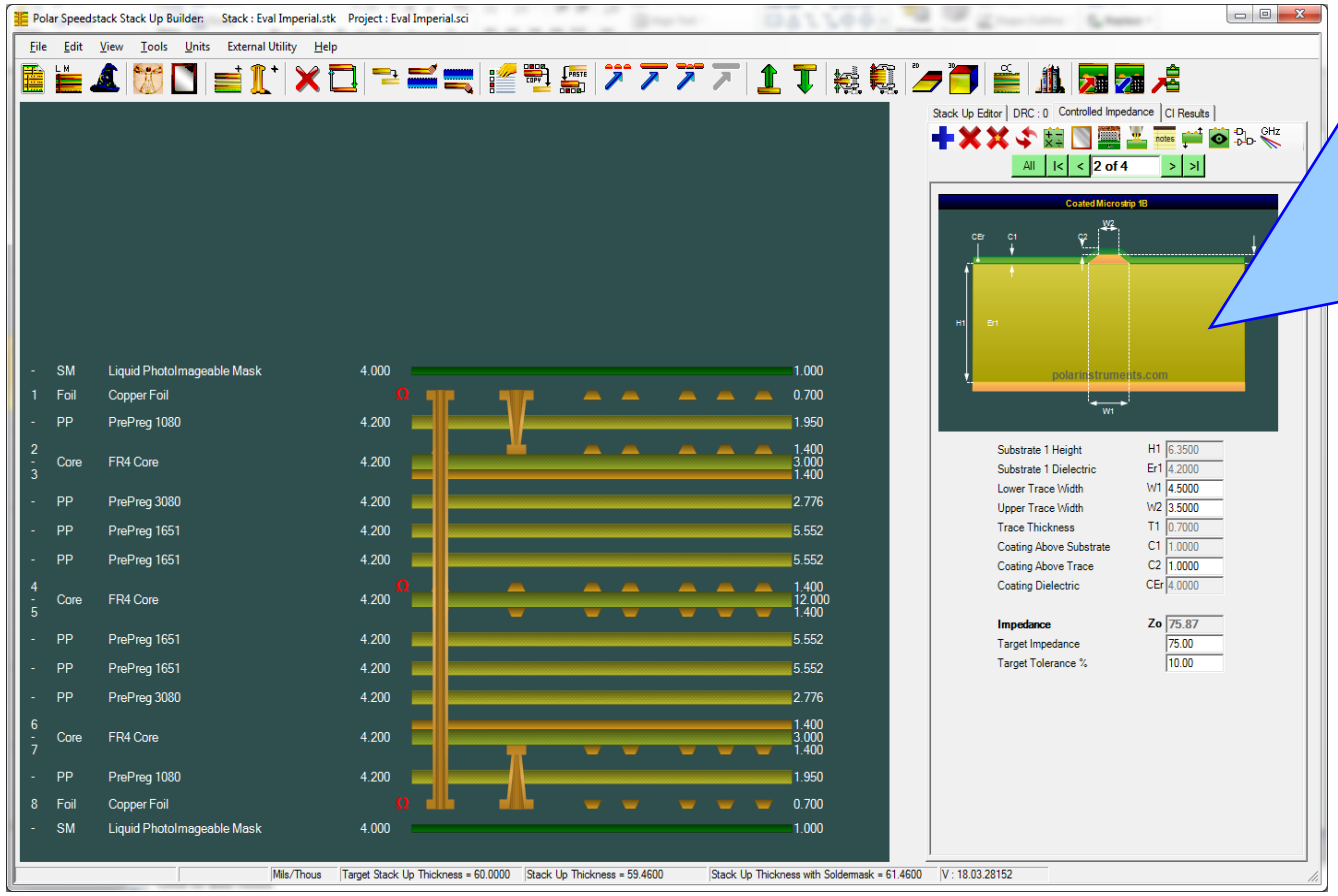


New selectable impedance table 'Error %' field. Print the Error % between the Target and Calculated Impedance

ID	Image	Structure Name	Layer	f. e 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance	Error %
1		Edge Coupled Coated Microstrip 1B	1	3	0	8.500	7.500	8.115	100.000	10.000	100.350	0.3
2		Coated Microstrip 1B	1	3	0	4.500	3.500	0.000	75.000	10.000	75.870	1.2
3		Edge Coupled Offset Stripline 1B1A	4	3	6	7.250	6.250	8.500	100.000	10.000	101.280	1.3
4		Coated Microstrip 1B	8	6	0	4.500	3.500	0.000	75.000	10.000	75.870	1.2

Speedstack v18.03 (March 2018)

Speedstack – Frequency Dependent Loss Calculations

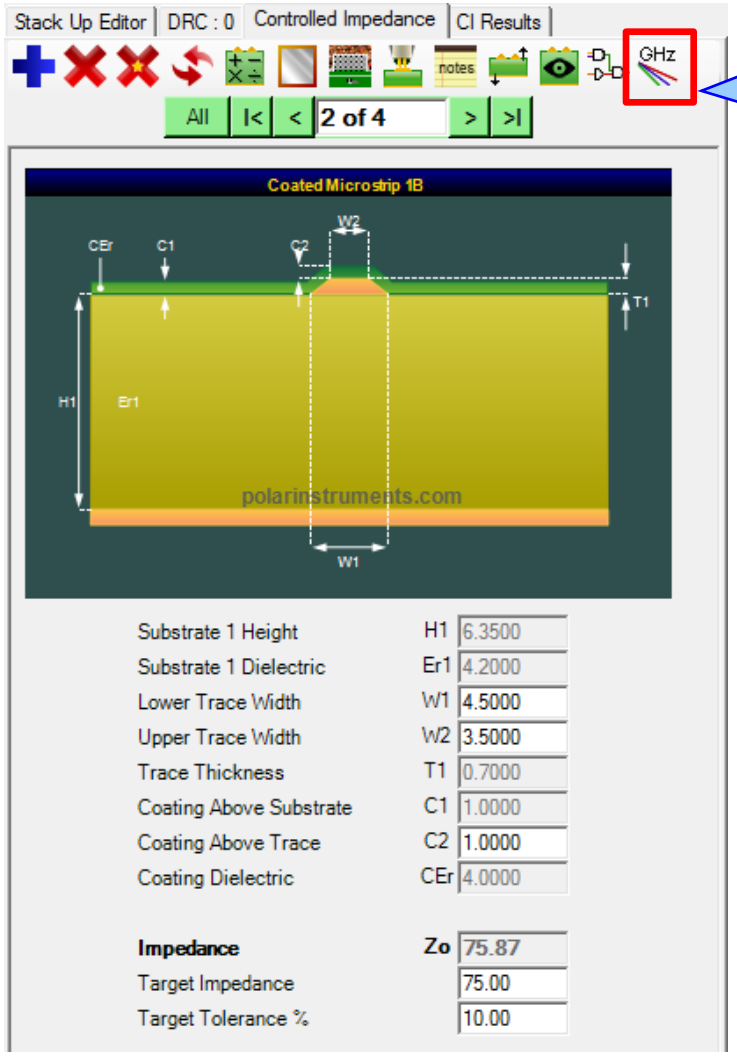


In order to calculate frequency dependent loss it is necessary to know the following critical information regarding the transmission line structure:

a.Material properties including dielectric constant and loss tangent
b.Conductor properties such as trace conductivity and surface roughness
c.Frequency range that the transmission line structure will operate

Once this information has been gathered it is possible to run a detailed analysis of the transmission line structure for both controlled impedance and insertion loss

Speedstack – Frequency Dependent Loss Calculations



Each structure that has been added to the stack up now has a set of Frequency Dependent Properties that are accessible using this new icon.

Selecting this icon will load the following dialog.

Result presentation, show plot and table of results in preferred units.

Structure image of the current selected structure

User-specifiable frequency range.

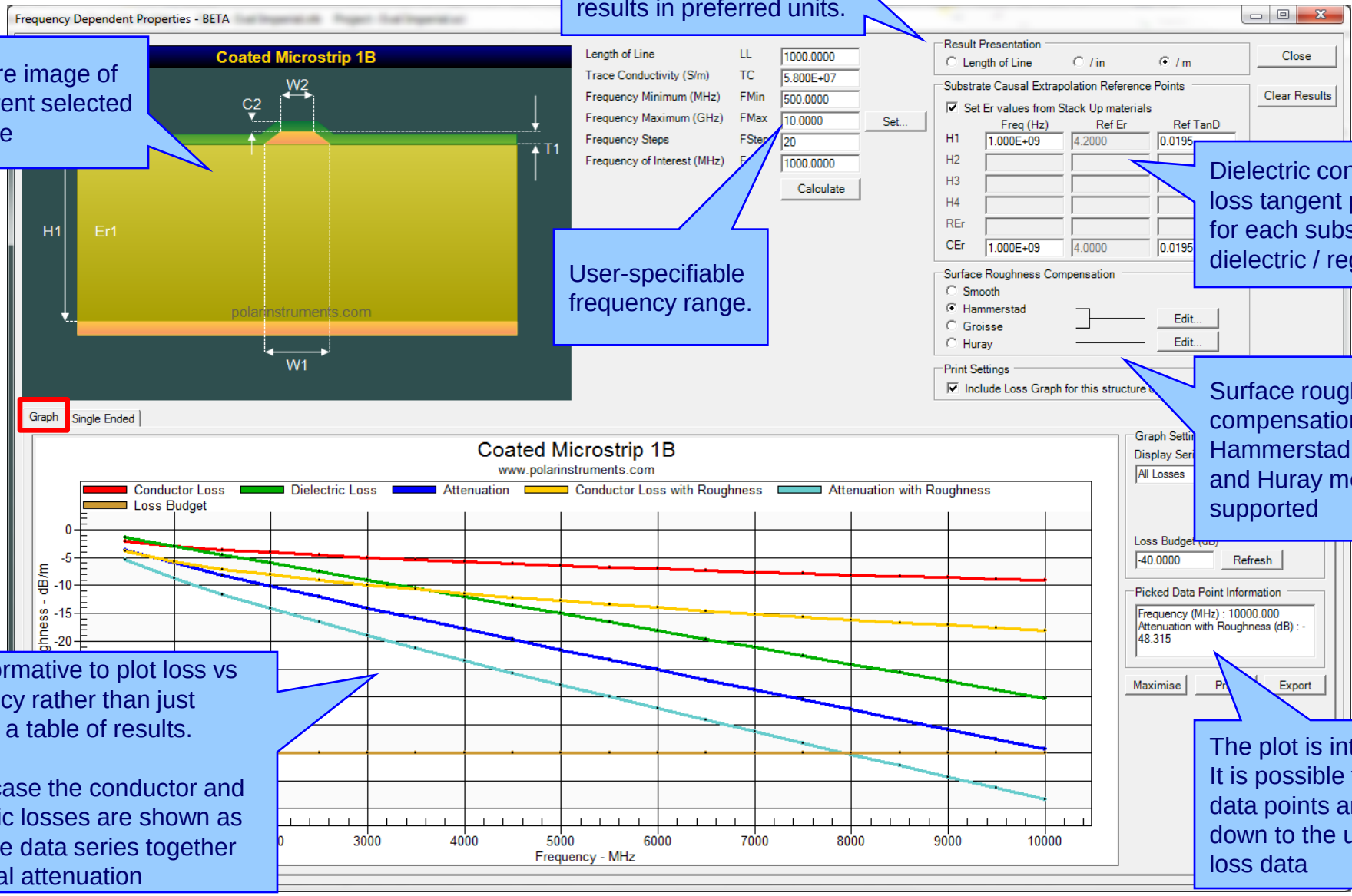
Dielectric constant and loss tangent properties for each substrate dielectric / region

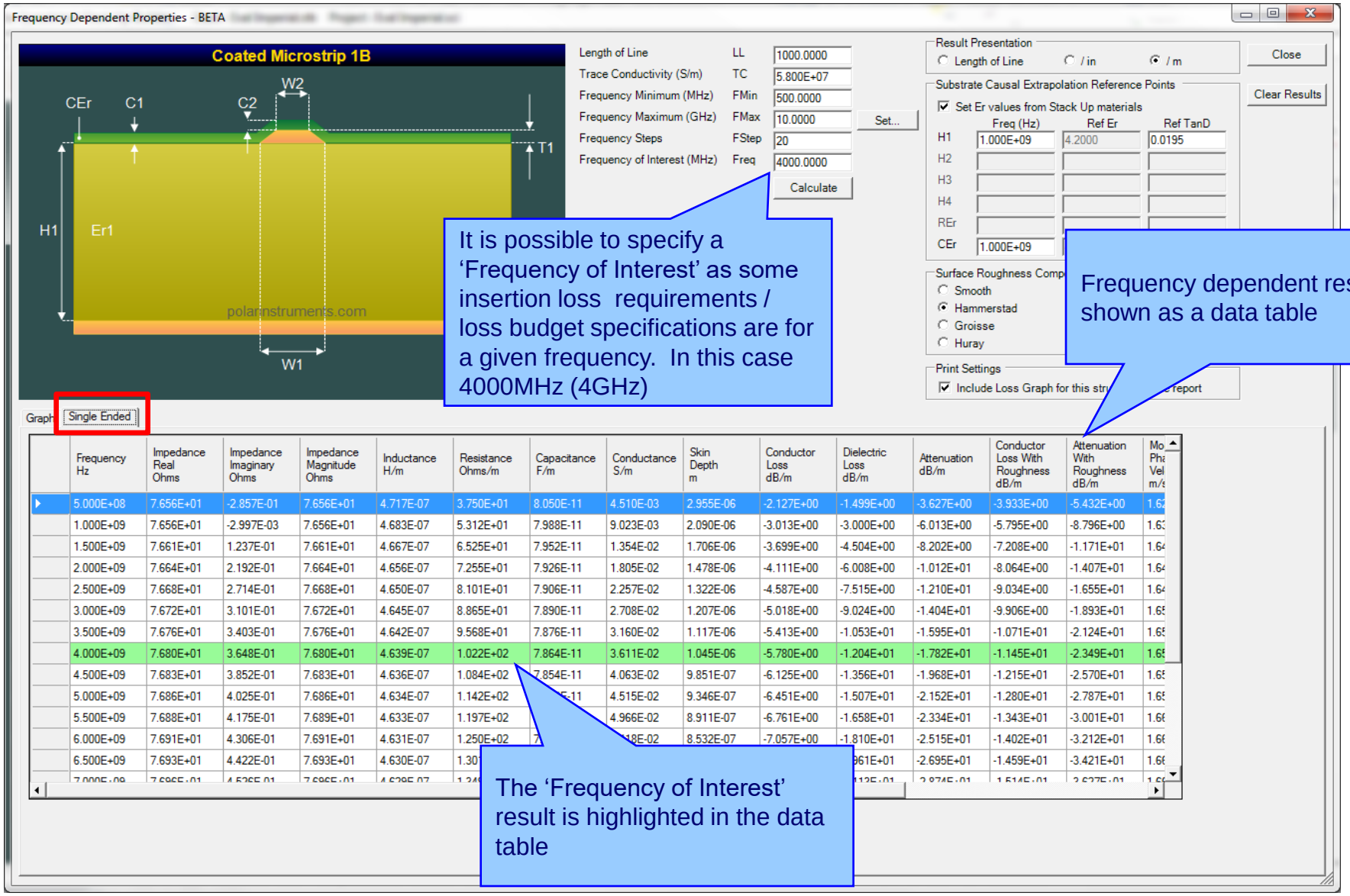
Surface roughness compensation model. Hammerstad, Groisse and Huray methods supported

It is informative to plot loss vs frequency rather than just present a table of results.

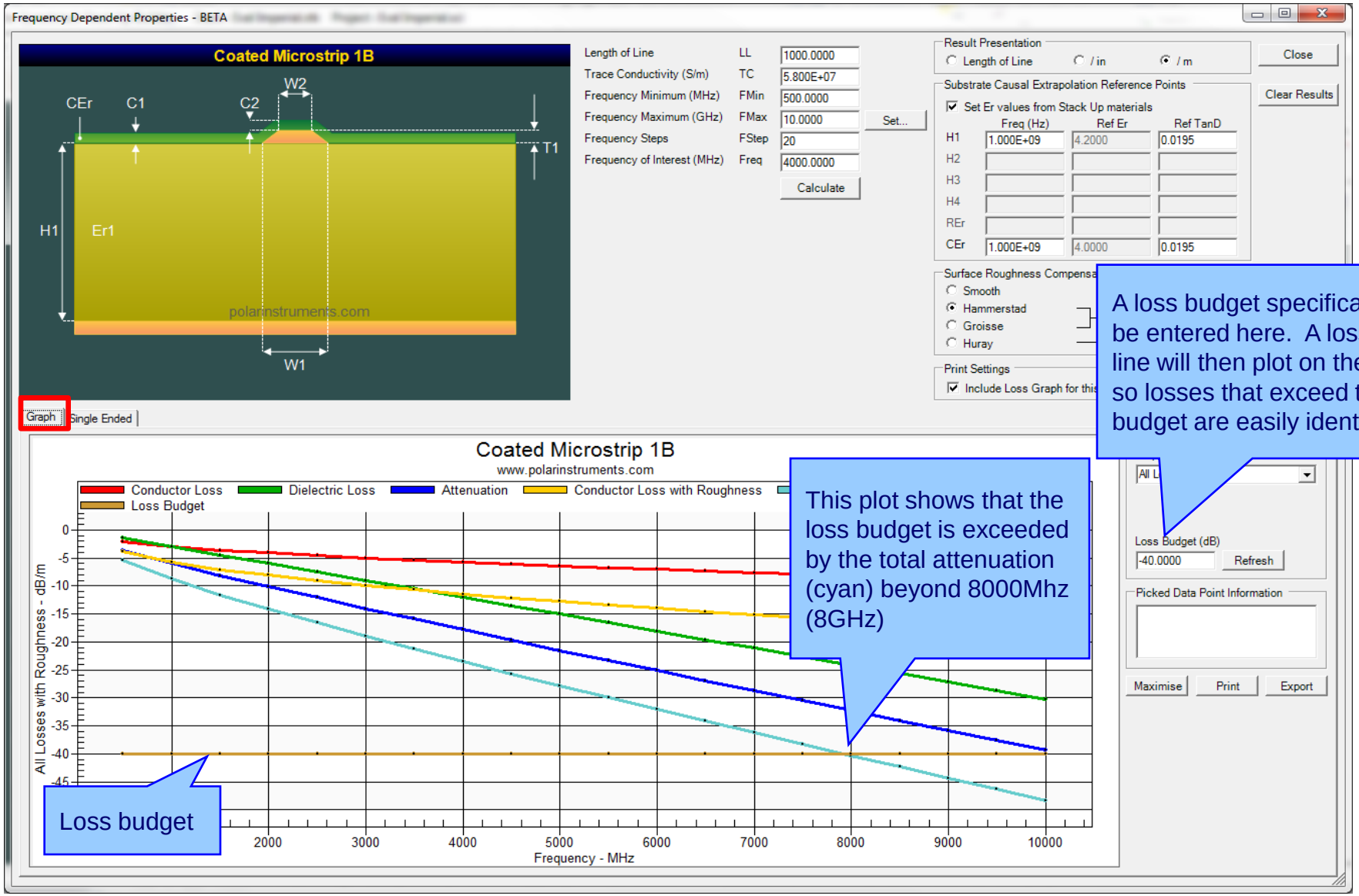
In this case the conductor and dielectric losses are shown as separate data series together with total attenuation

The plot is interactive. It is possible to select data points and drill down to the underlying loss data

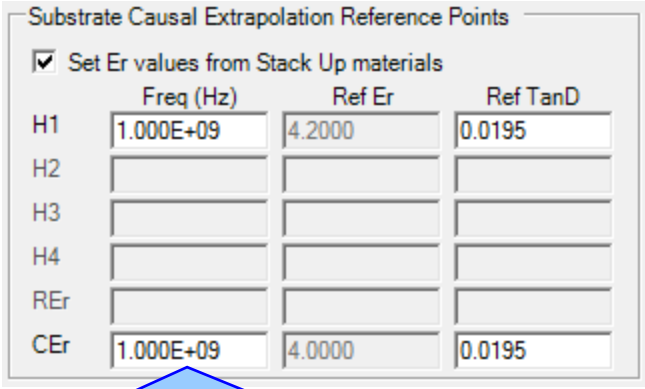




Frequency Hz	Impedance Real Ohms	Impedance Imaginary Ohms	Impedance Magnitude Ohms	Inductance H/m	Resistance Ohms/m	Capacitance F/m	Conductance S/m	Skin Depth m	Conductor Loss dB/m	Dielectric Loss dB/m	Attenuation dB/m	Conductor Loss With Roughness dB/m	Attenuation With Roughness dB/m	Mo Pha Vel m/s
5.000E+08	7.656E+01	-2.857E-01	7.656E+01	4.717E-07	3.750E+01	8.050E-11	4.510E-03	2.955E-06	-2.127E+00	-1.499E+00	-3.627E+00	-3.933E+00	-5.432E+00	1.62
1.000E+09	7.656E+01	-2.997E-03	7.656E+01	4.683E-07	5.312E+01	7.988E-11	9.023E-03	2.090E-06	-3.013E+00	-3.000E+00	-6.013E+00	-5.795E+00	-8.796E+00	1.63
1.500E+09	7.661E+01	1.237E-01	7.661E+01	4.667E-07	6.525E+01	7.952E-11	1.354E-02	1.706E-06	-3.699E+00	-4.504E+00	-8.202E+00	-7.208E+00	-1.171E+01	1.64
2.000E+09	7.664E+01	2.192E-01	7.664E+01	4.656E-07	7.255E+01	7.926E-11	1.805E-02	1.478E-06	-4.111E+00	-6.008E+00	-1.012E+01	-8.064E+00	-1.407E+01	1.64
2.500E+09	7.668E+01	2.714E-01	7.668E+01	4.650E-07	8.101E+01	7.906E-11	2.257E-02	1.322E-06	-4.587E+00	-7.515E+00	-1.210E+01	-9.034E+00	-1.655E+01	1.64
3.000E+09	7.672E+01	3.101E-01	7.672E+01	4.645E-07	8.865E+01	7.890E-11	2.708E-02	1.207E-06	-5.018E+00	-9.024E+00	-1.404E+01	-9.906E+00	-1.893E+01	1.65
3.500E+09	7.676E+01	3.403E-01	7.676E+01	4.642E-07	9.568E+01	7.876E-11	3.160E-02	1.117E-06	-5.413E+00	-1.053E+01	-1.595E+01	-1.071E+01	-2.124E+01	1.65
4.000E+09	7.680E+01	3.648E-01	7.680E+01	4.639E-07	1.022E+02	7.864E-11	3.611E-02	1.045E-06	-5.780E+00	-1.204E+01	-1.782E+01	-1.145E+01	-2.349E+01	1.65
4.500E+09	7.683E+01	3.852E-01	7.683E+01	4.636E-07	1.084E+02	7.854E-11	4.063E-02	9.851E-07	-6.125E+00	-1.356E+01	-1.968E+01	-1.215E+01	-2.570E+01	1.65
5.000E+09	7.686E+01	4.025E-01	7.686E+01	4.634E-07	1.142E+02	[illegible]	4.515E-02	9.346E-07	-6.451E+00	-1.507E+01	-2.152E+01	-1.280E+01	-2.787E+01	1.65
5.500E+09	7.688E+01	4.175E-01	7.689E+01	4.633E-07	1.197E+02	[illegible]	4.966E-02	8.911E-07	-6.761E+00	-1.658E+01	-2.334E+01	-1.343E+01	-3.001E+01	1.66
6.000E+09	7.691E+01	4.306E-01	7.691E+01	4.631E-07	1.250E+02	[illegible]	[illegible]	8.532E-07	-7.057E+00	-1.810E+01	-2.515E+01	-1.402E+01	-3.212E+01	1.66
6.500E+09	7.693E+01	4.422E-01	7.693E+01	4.630E-07	1.30[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]961E+01	-2.695E+01	-1.459E+01	-3.421E+01	1.66



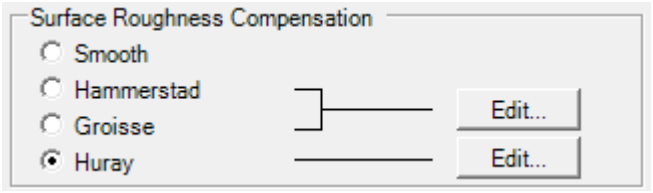
Speedstack – Material and Surface Roughness properties

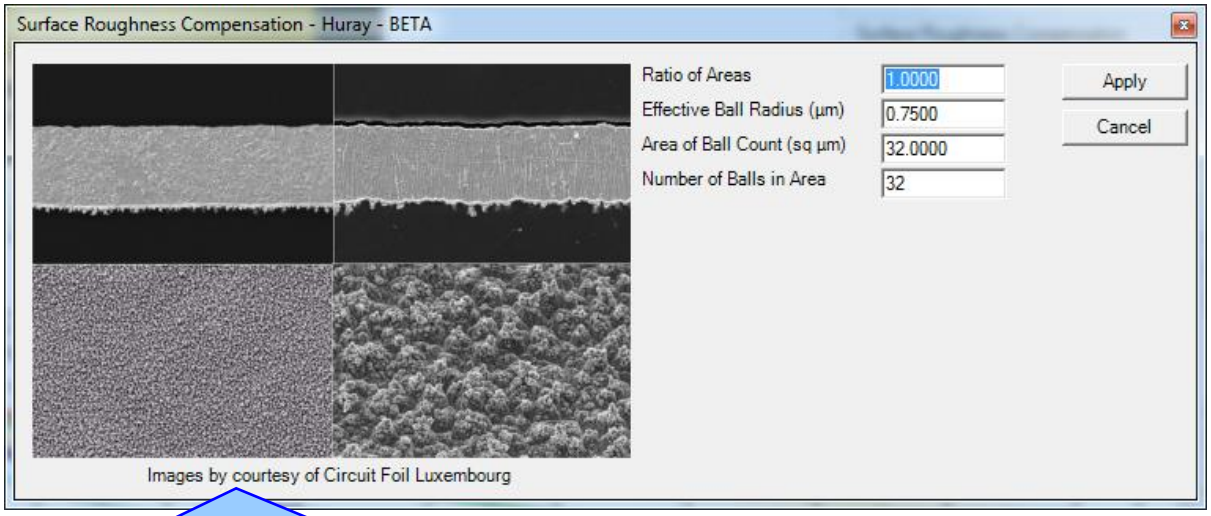


In order to accurately calculate Dielectric Loss it is important to understand the material / substrate properties.

These substrate properties including dielectric constant (Er) and loss tangent (TanD) are specified here for each structure substrate region.

Speedstack causally extrapolates Er and TanD over the specified frequency range using the Svensson-Djordjevic method, hence the ability to specify the extrapolation reference points for each substrate region. The reference point data is usually available from the material supplier data sheet.



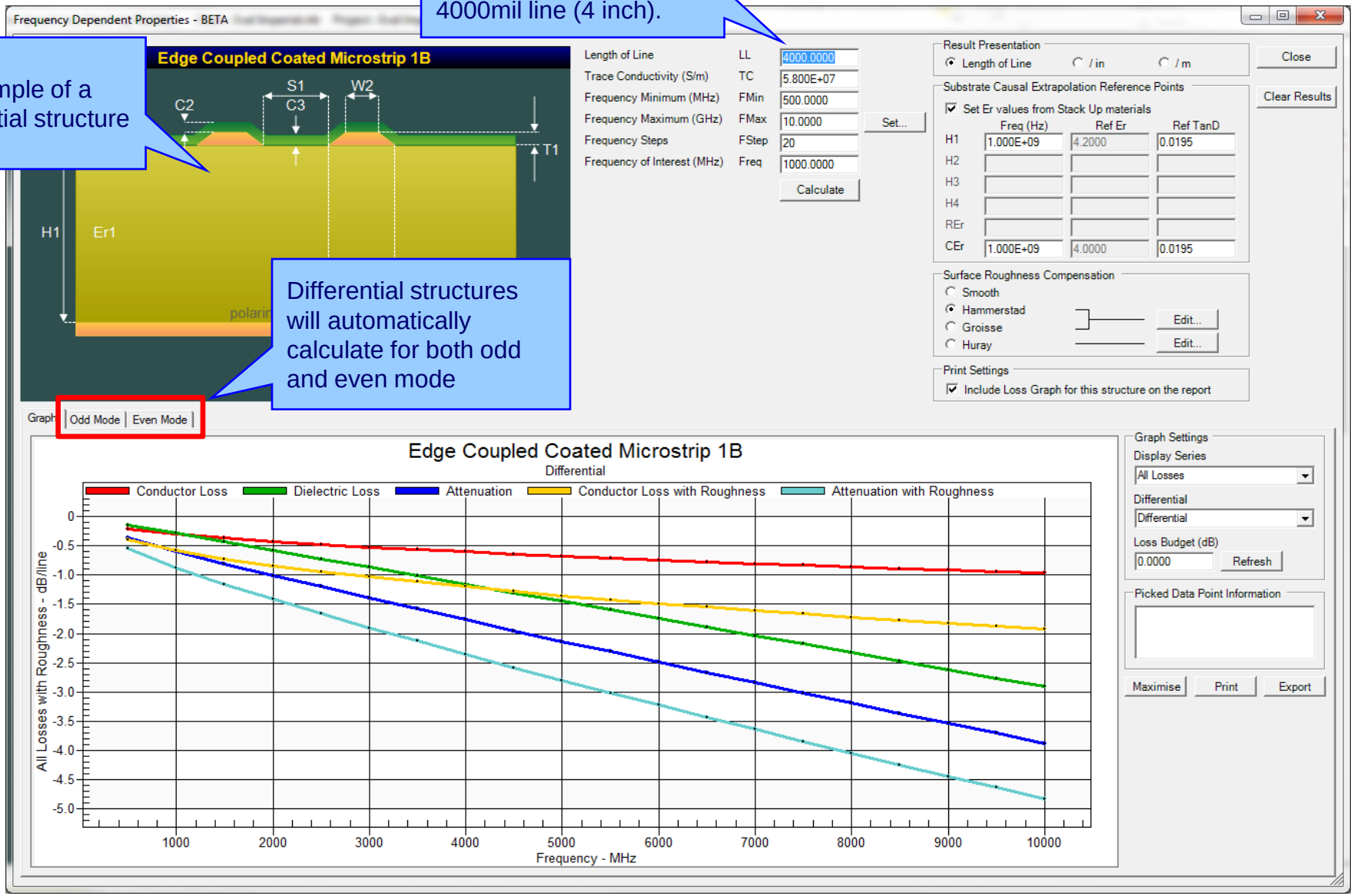


In order to accurately calculate Conductor Loss it is necessary to specify the surface roughness parameters.

Speedstack supports three different roughness models: Hammerstad, Groisse and Huray. In this example the Huray method is used, the dialog prompts for the required roughness parameters.

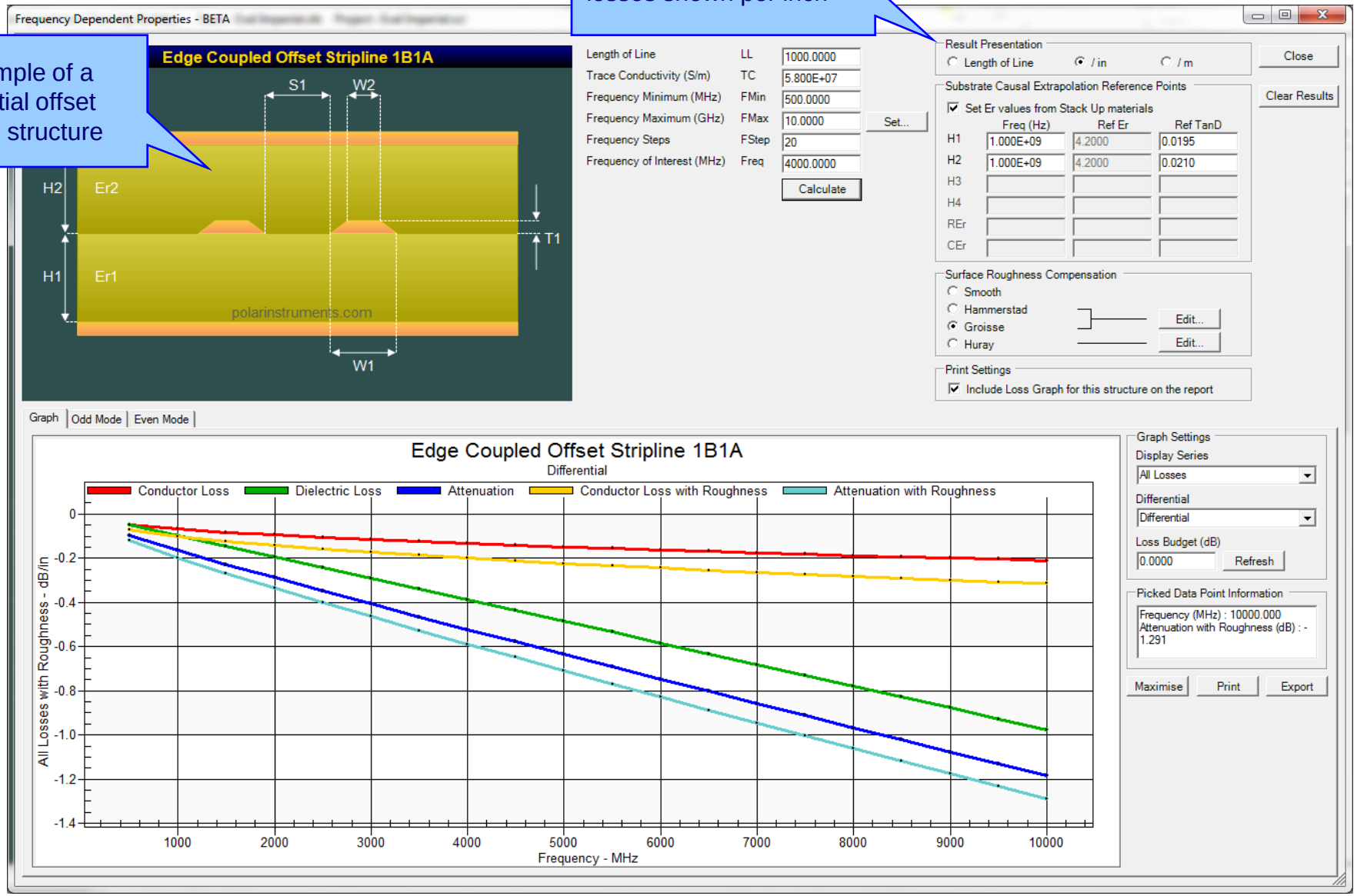
Result presentation, losses shown for a 4000mil line (4 inch).

An example of a differential structure

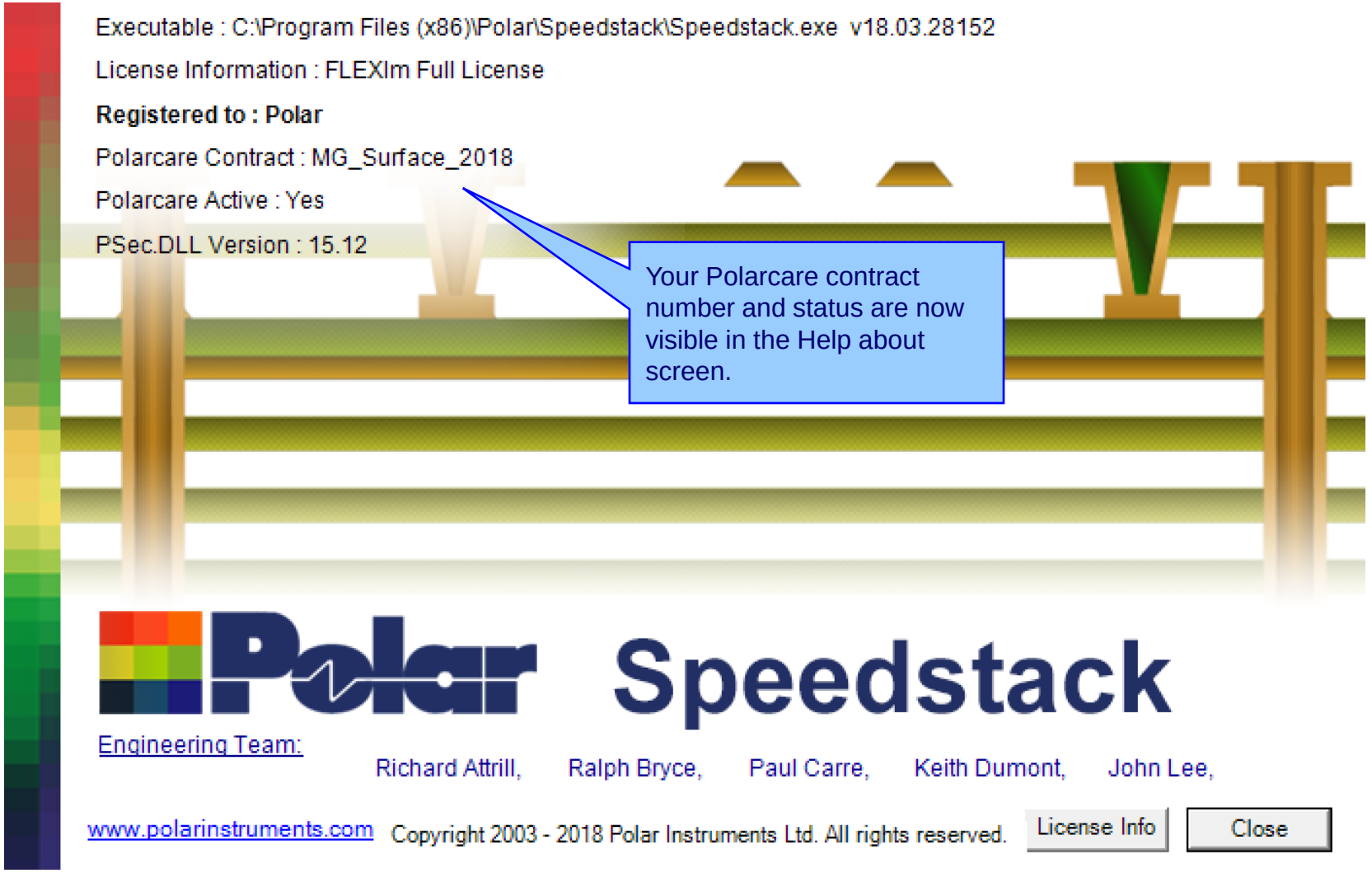


An example of a differential offset stripline structure

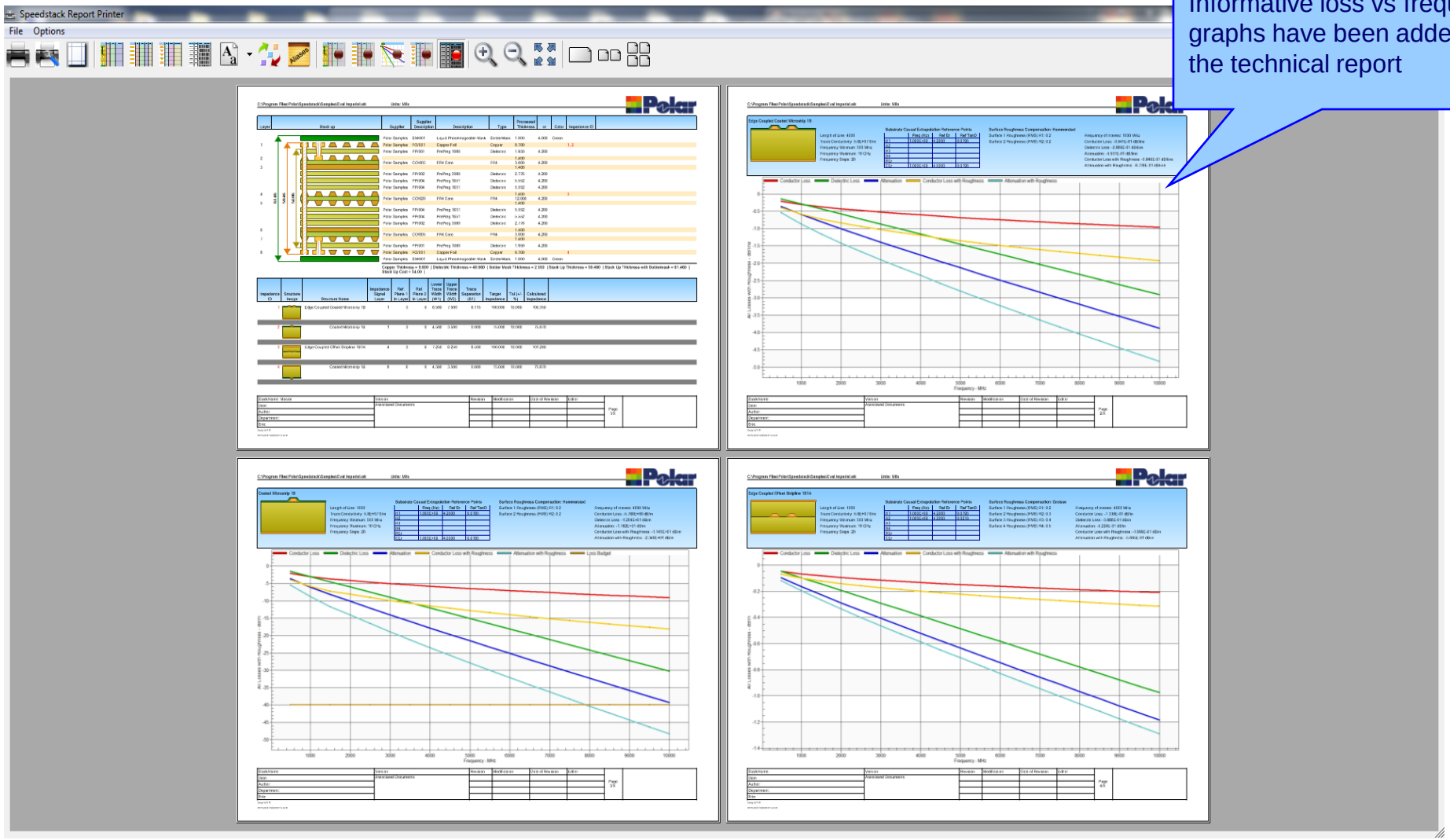
Result presentation, losses shown per inch



Speedstack – Contacting Polar for support

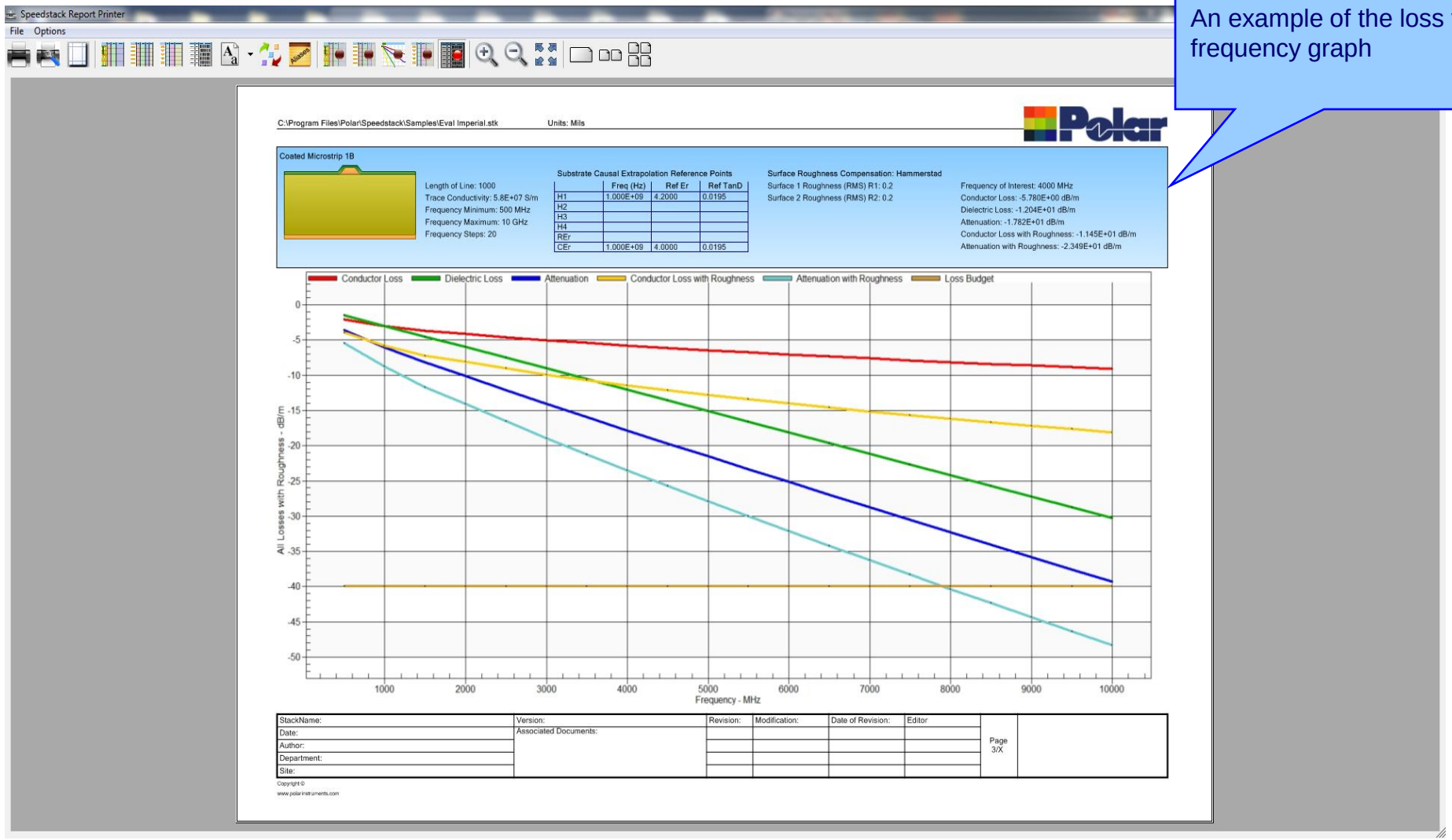


Speedstack – Technical Report enhancements



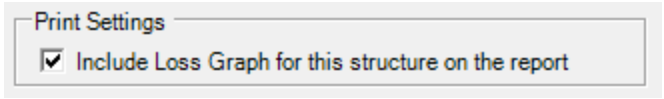
Informative loss vs frequency graphs have been added to the technical report

Speedstack – Technical Report enhancements

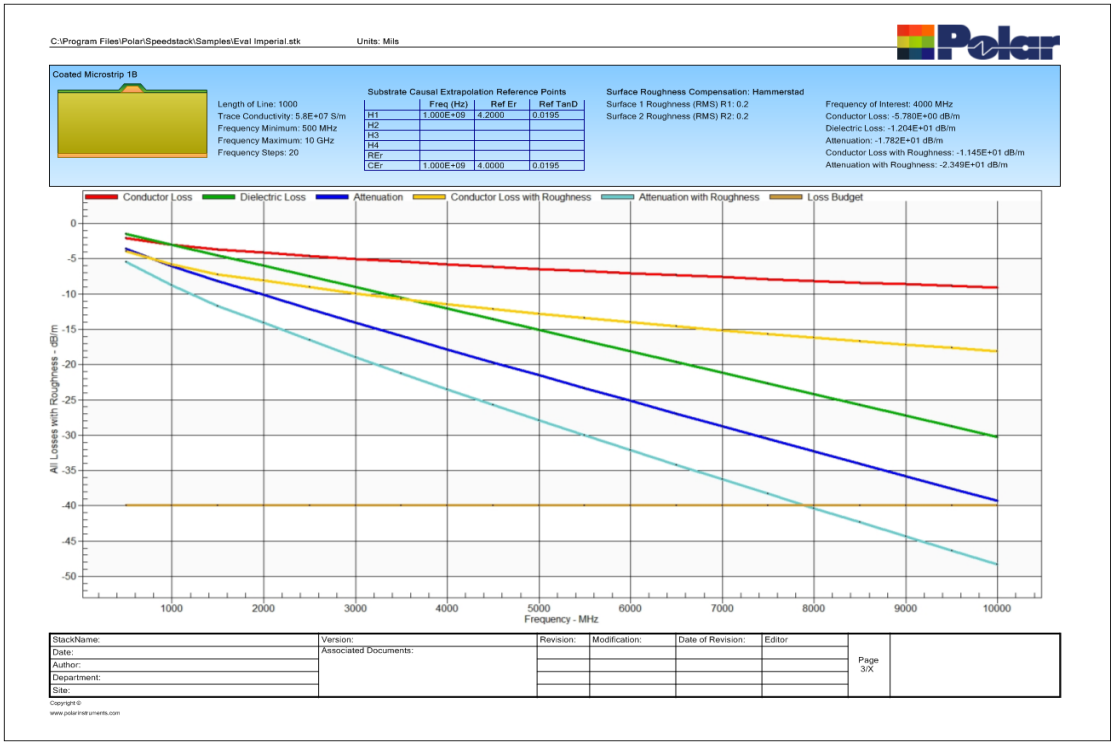


An example of the loss vs frequency graph

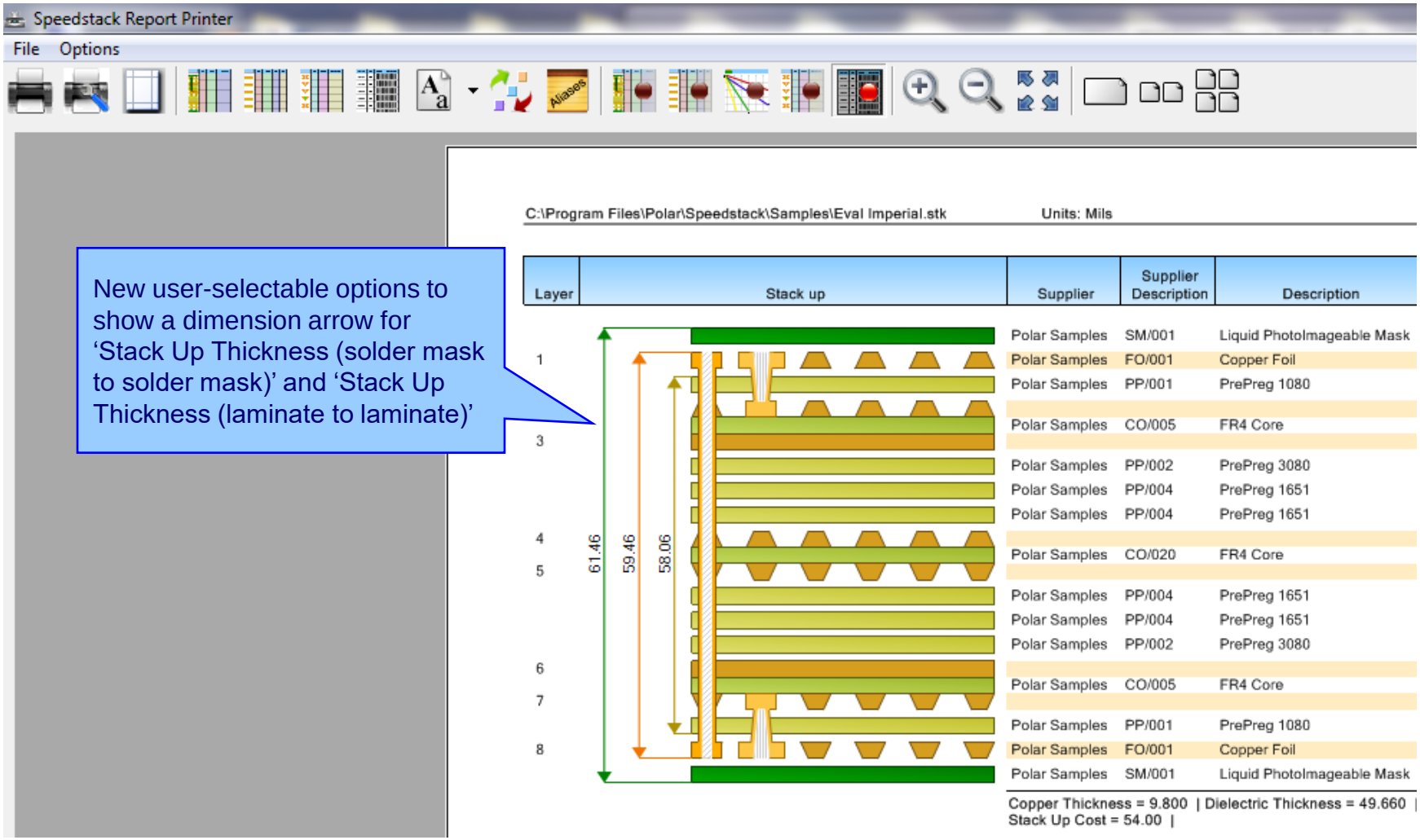
Speedstack – Technical Report enhancements



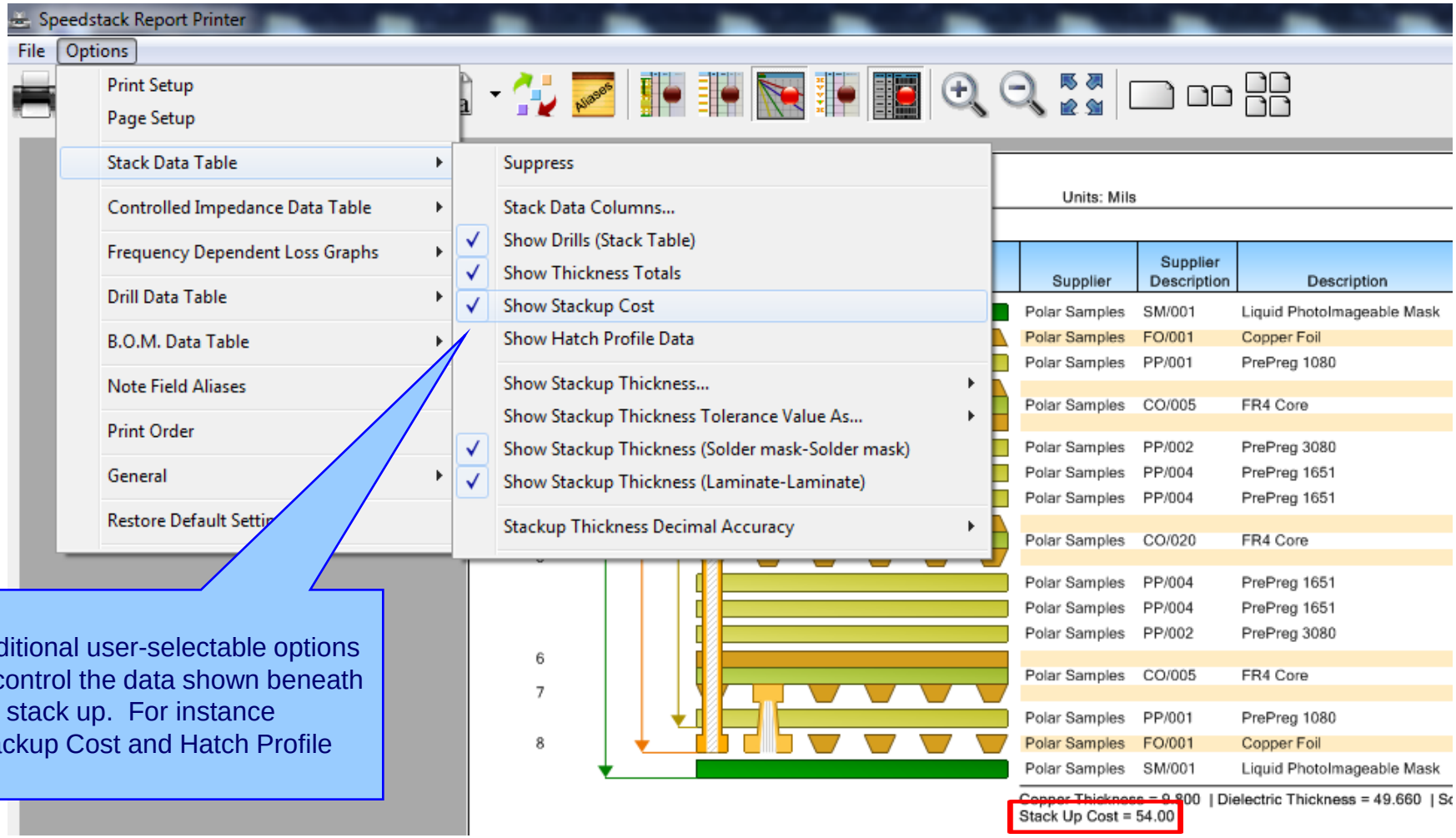
'Include Loss Graph for this structure on the report' checkbox allows the user to nominate which structures will contain a separate loss graph page



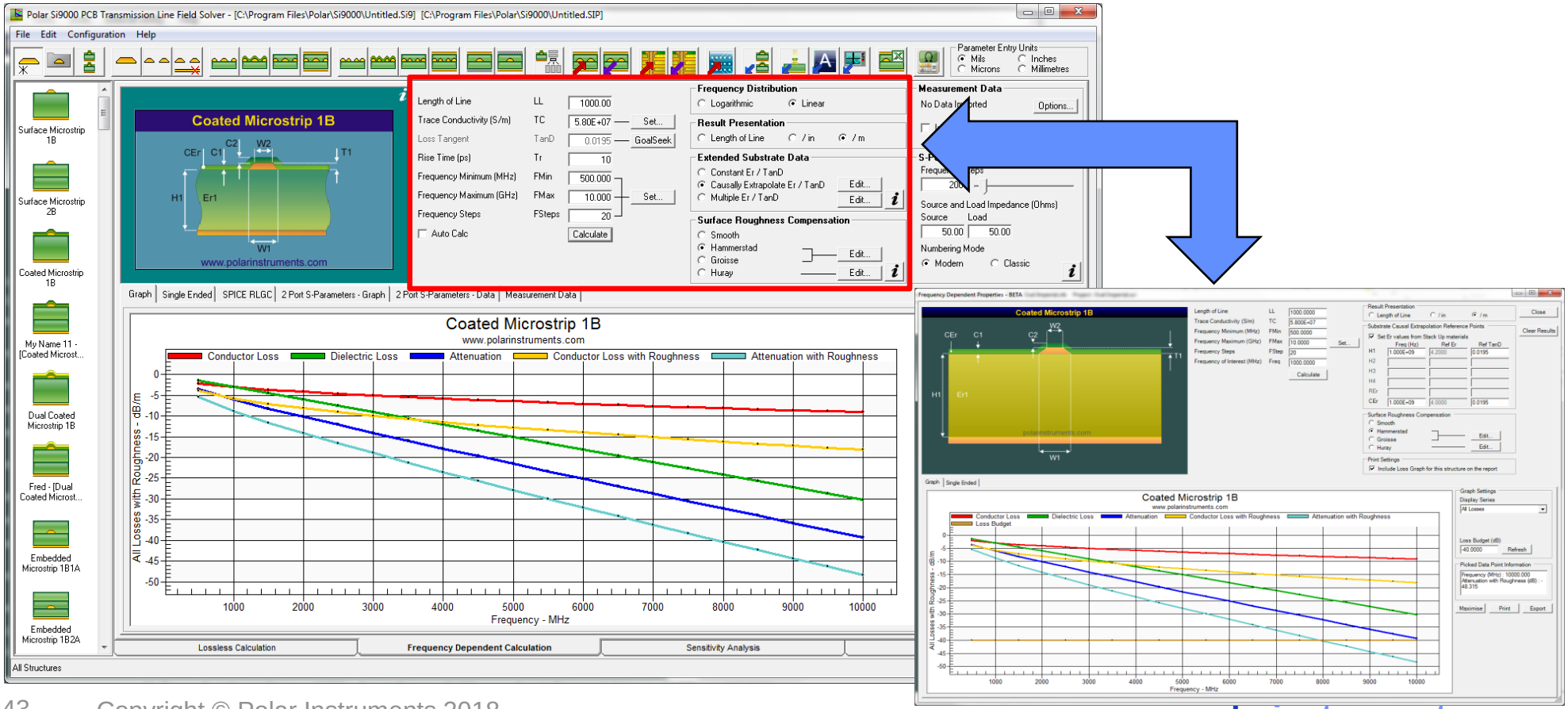
Speedstack – Technical Report enhancements



Speedstack – Technical Report enhancements



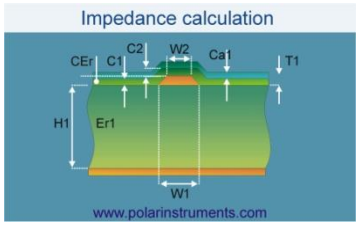
Importantly Speedstack 2018 allows comprehensive bidirectional copy and paste from Speedstack into Si9000e including all the relevant loss tangent, roughness and roughness method along with frequencies of interest.

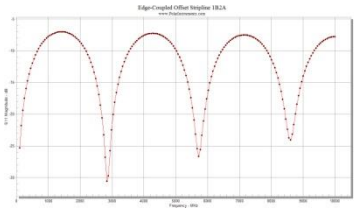


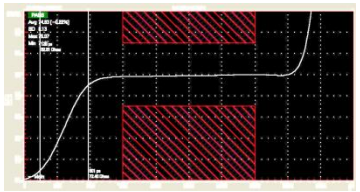
- IMPORTANT NOTE:

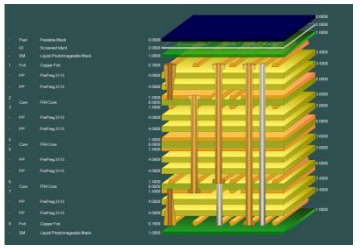
- Please contact your local Polar office for information regarding evaluation and upgrading.

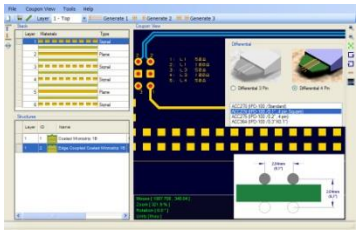
- As noted earlier – there are significant changes “under the hood” in both Speedstack, its associated Si8000m / Si9000e field solvers and FlexNet license management – it is important you discuss these especially if you are running a network or WAN license.



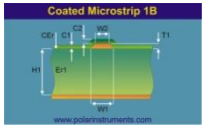


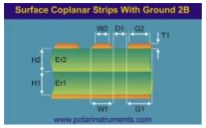


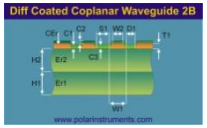


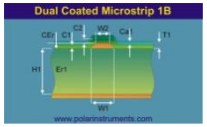


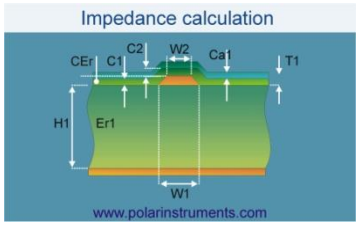
Thank you

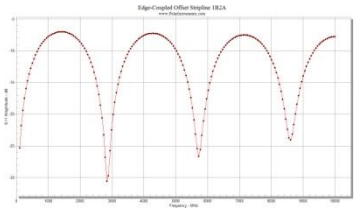


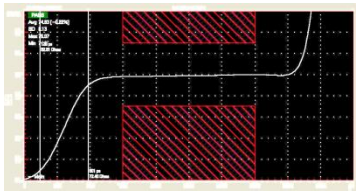


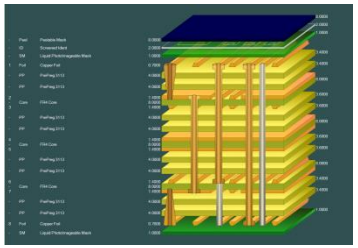


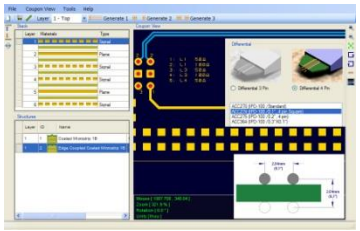












For more information:

Contact Polar now:	**Phone**
USA / Canada / Mexico	
Geoffrey Hazelett	**(503) 356 5270**
Asia / Pacific	
Terence Chew	**+65 6873 7470**
UK / Europe	
Neil Chamberlain	**+44 23 9226 9113**
Germany / Austria / Switzerland	
Hermann Reischer	**+43 7666 20041-0**

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