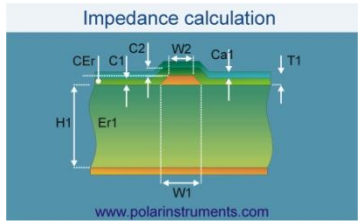
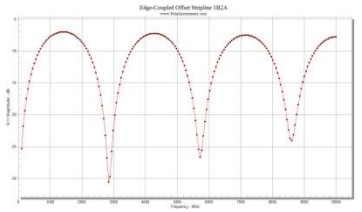
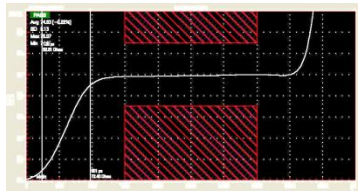
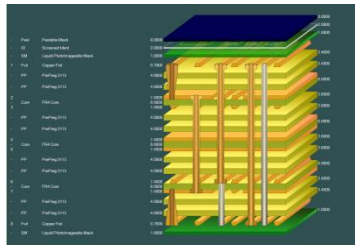
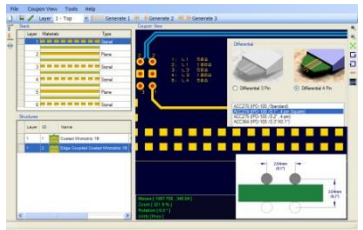










Speedstack 2019 Introduction

Richard Attrill / John Lee – May 2019 (Rev 2)

Introducing Speedstack 2019

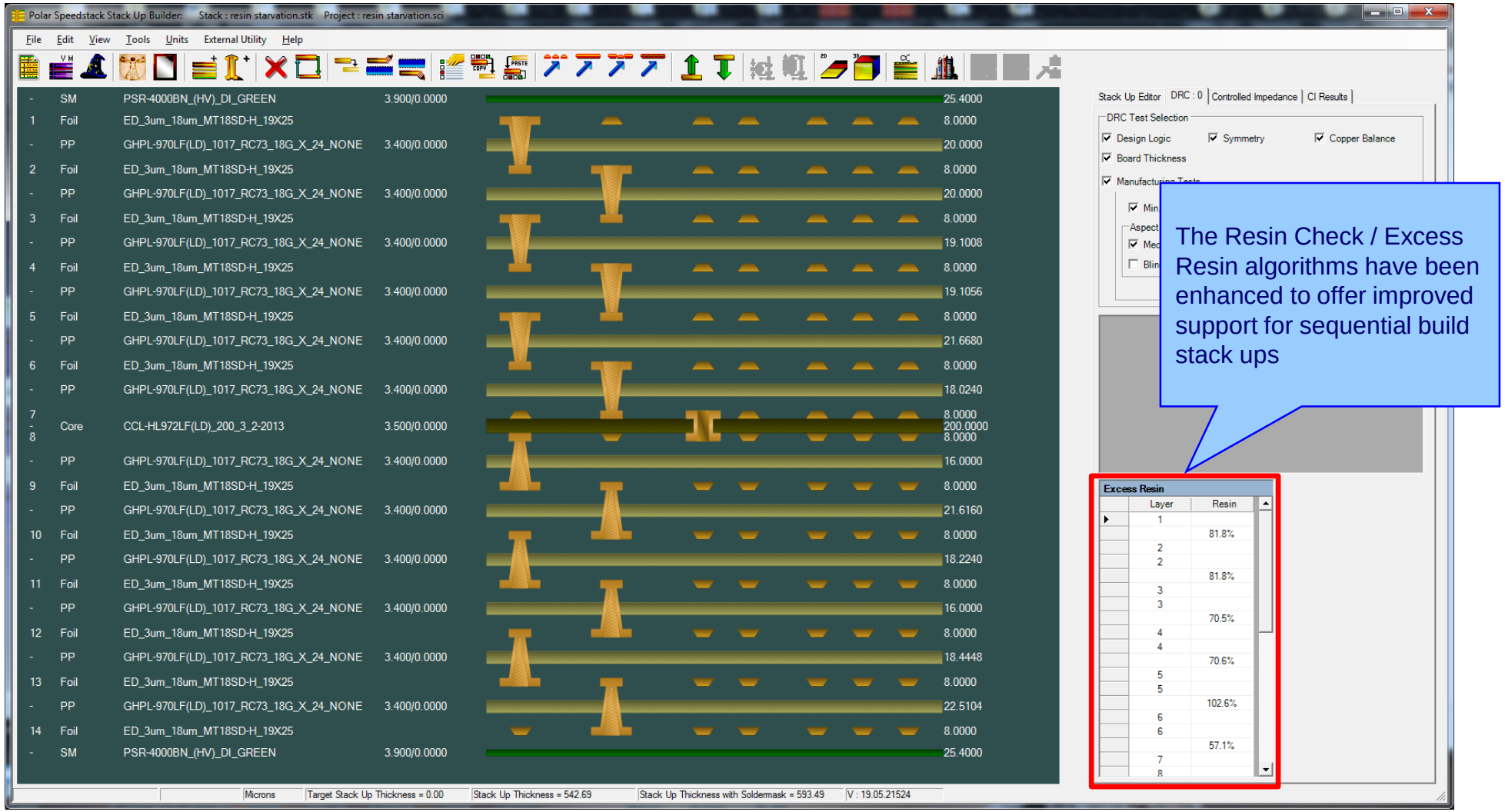
Welcome to a preview of Speedstack 2019.

We have introduced a number of new features that have been requested through our Polarcare software maintenance service.

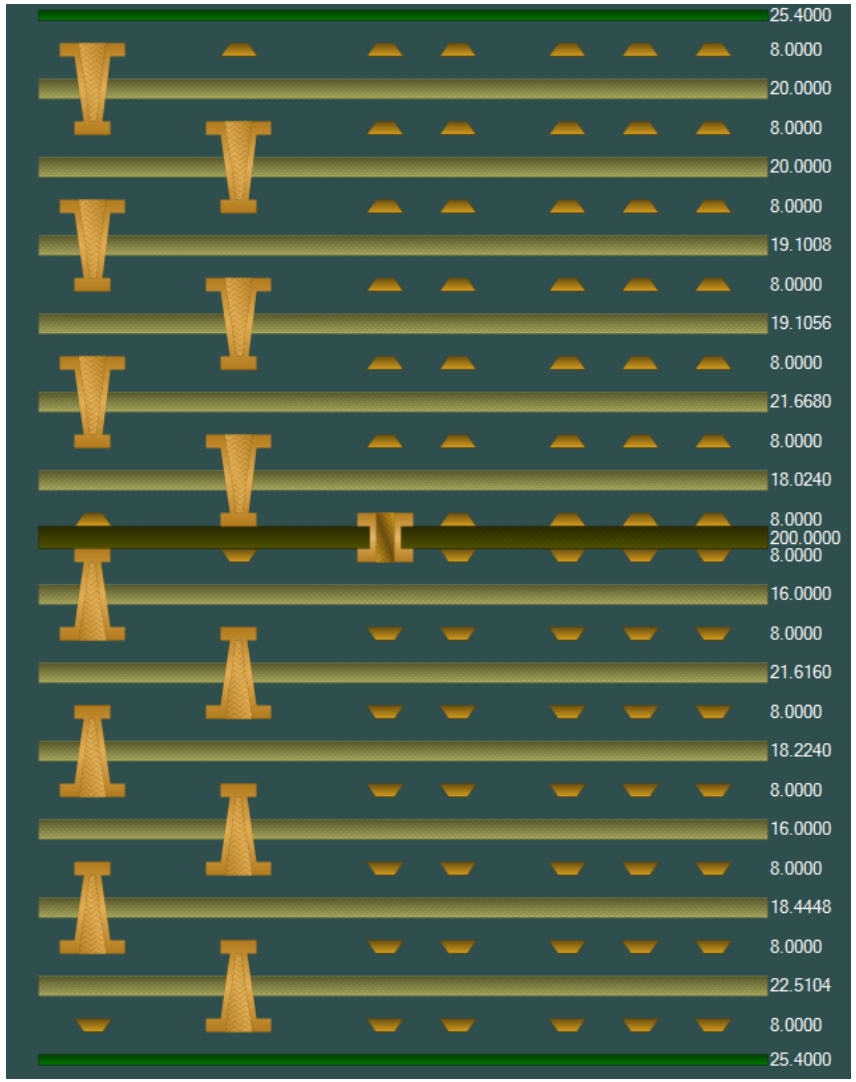
If you would like to have a web-based demonstration please contact your local Polar office – details are shown on the last slide of this presentation.

Speedstack v19.05 (May 2019)

DRC Resin Check / Excess Resin enhancements



DRC Resin Check / Excess Resin enhancements



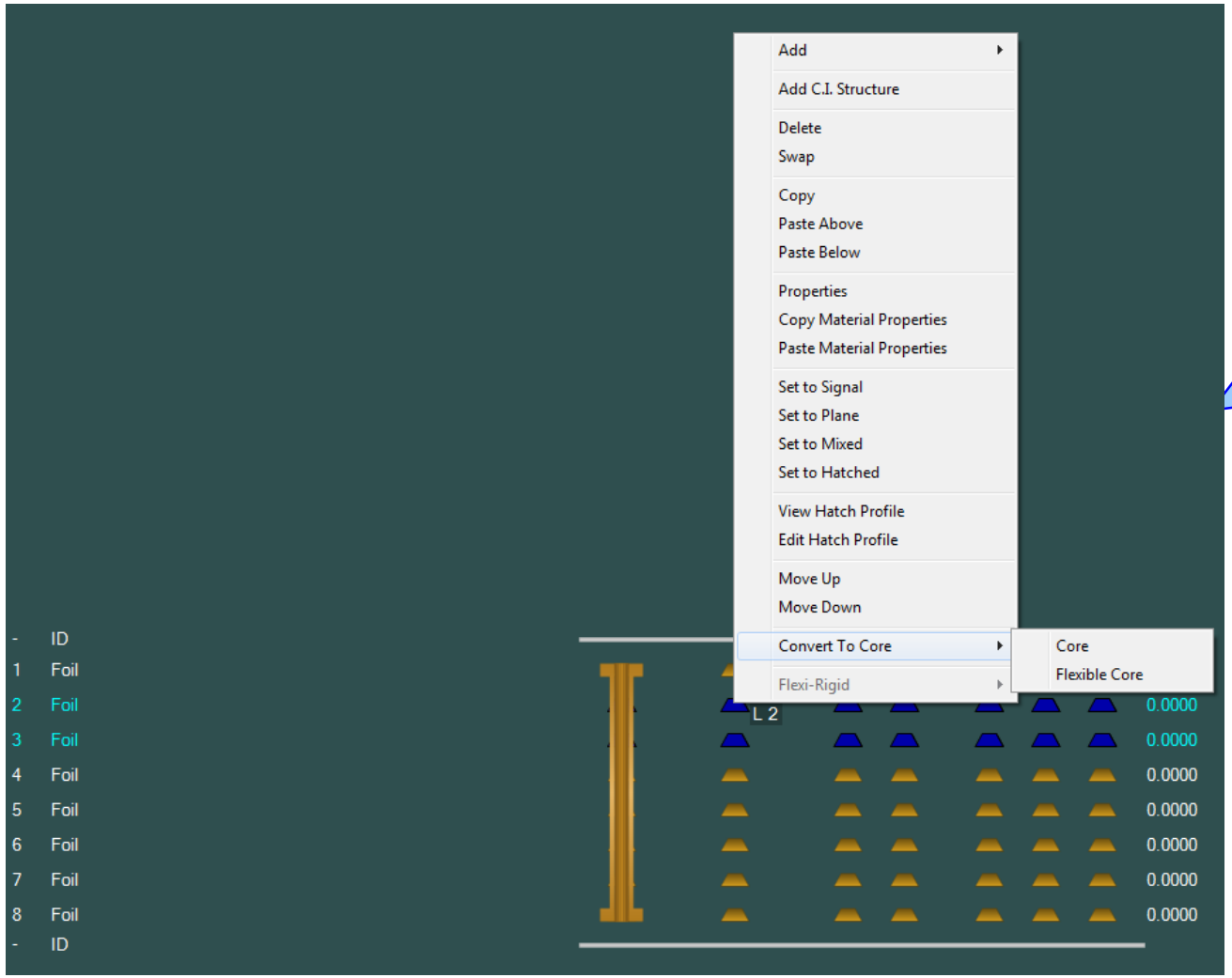
Excess Resin

	Layer	Resin
▶	1	
		81.8%
	2	
	2	
		81.8%
	3	
	3	
		70.5%
	4	
	4	
		70.6%
	5	
	5	
		102.6%
	6	
	6	
		57.1%
	7	
	8	

Sequential builds require multiple press cycles to achieve the final stack up.

The new Resin Check / Excess Resin algorithms determine the order in which the materials are pressed together and return useful resin percentage information that can be used to determine potential de-lamination problems.

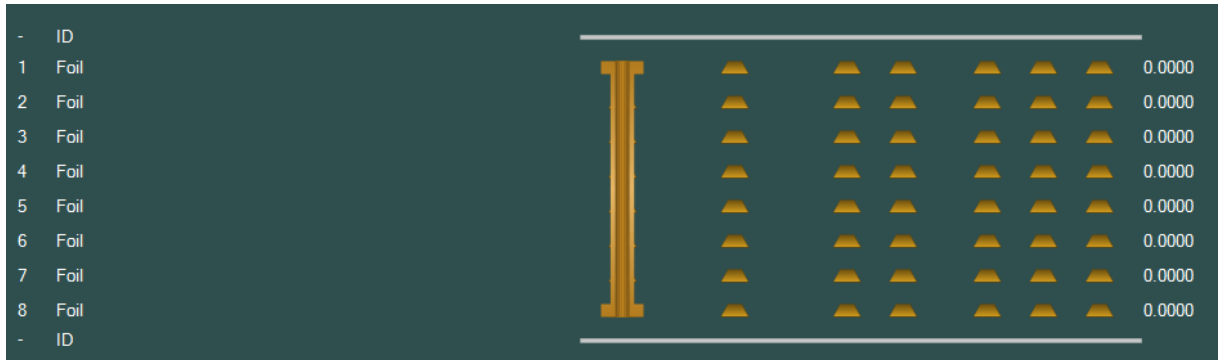
Convert to Core enhancements

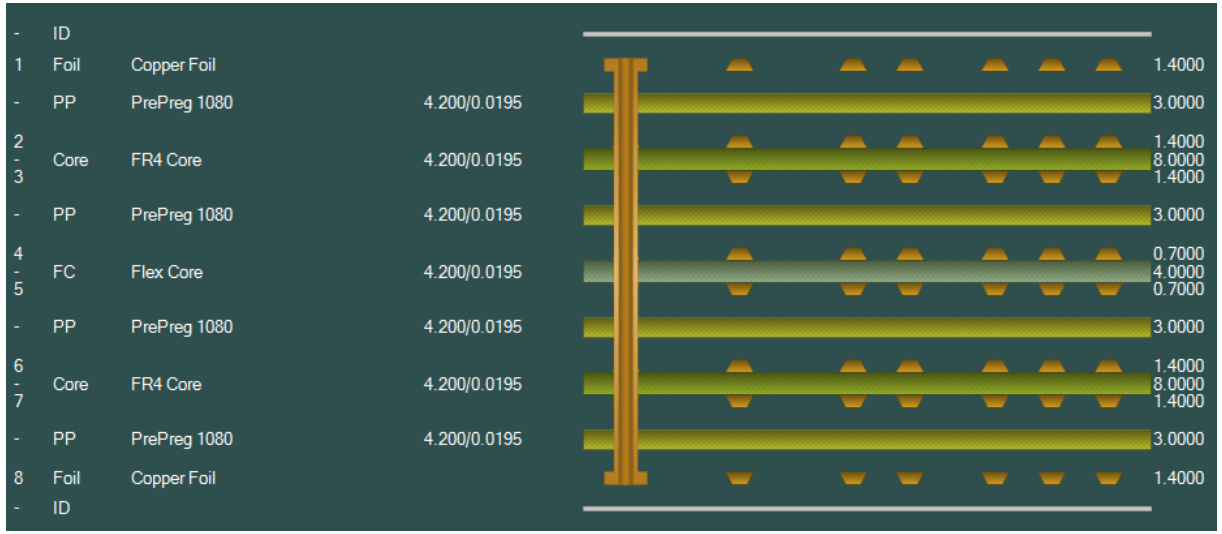


When importing stack up data from some CAD / CAM systems only the electrical layers are defined. In this example an eight layer design has been imported.

Speedstack allows the user to quickly convert two adjacent electrical layers into Core or Flexible Core materials using the 'Convert to Core' function.

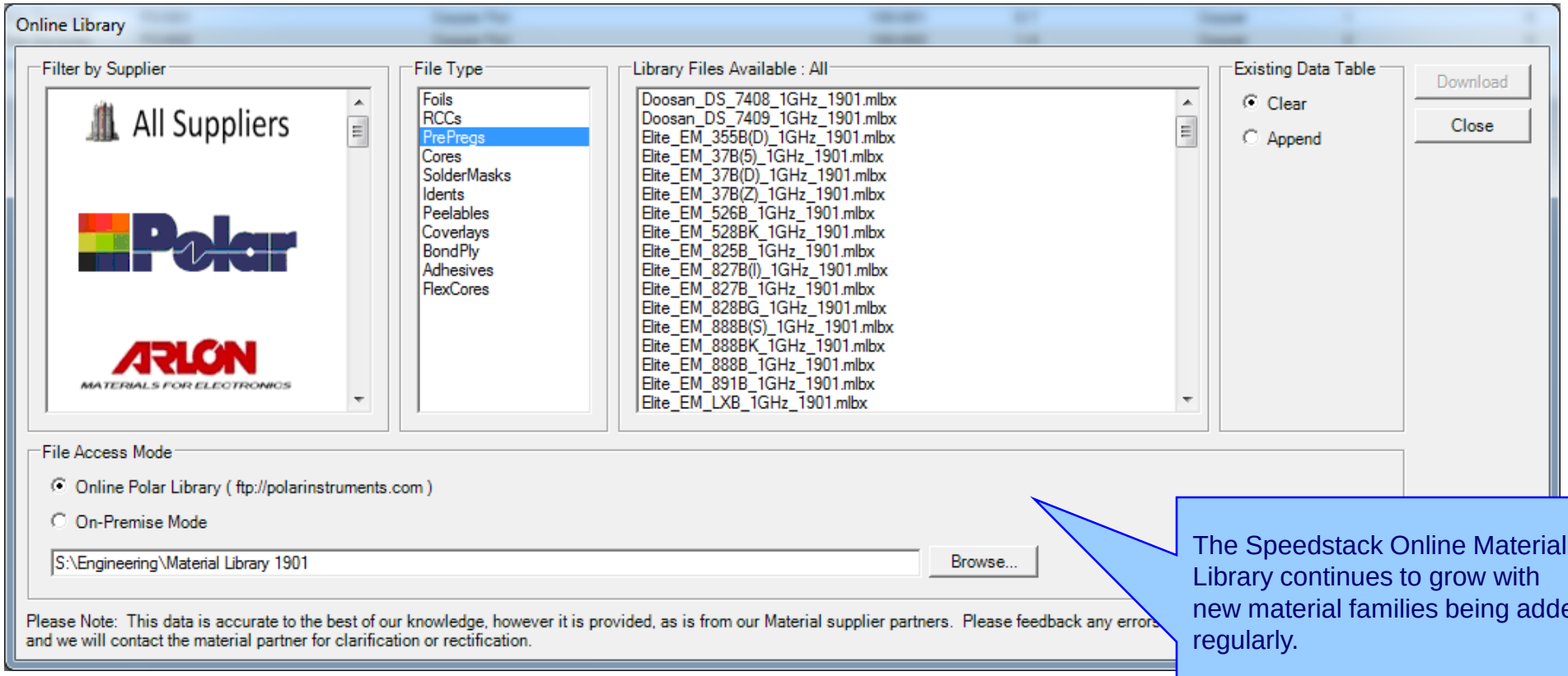
Convert to Core enhancements





Using ‘Convert to Core’ alongside other Speedstack editing functions, a simple electrical layer only stackup can be quickly converted into a useful fully defined stack up containing full definitions of foils, prepreg and core materials .

Online Material Library



The Speedstack Online Material Library continues to grow with new material families being added regularly.

The latest material information is instantly available to all Speedstack users with an active Polarcare contract.

Printing: Sort impedance structures per layer by type

Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	8.500	7.500	8.115	100.000	10.000	100.350
2		Coated Microstrip 1B	1	3	0	4.500	3.500	0.000	75.000	10.000	75.870
3		Coated Microstrip 1B	1	3	0	11.476	10.476	0.000	50.000	10.000	49.520
4		Edge Coupled Coated Microstrip 1B	1	3	0	12.542	11.542	10.000	85.000	10.000	85.220

The order that the structures are added to the stack up is the default print order:

1. Differential – 100 ohms
2. Single-Ended – 75 ohms
3. Single-Ended – 50 ohms
4. Differential – 85 ohms

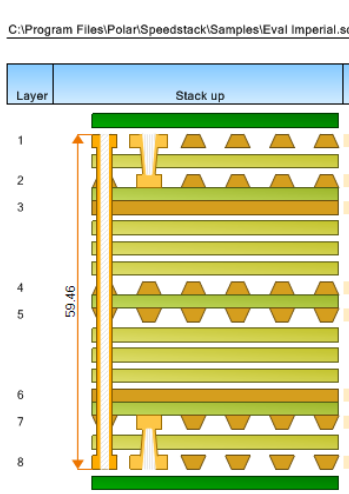
Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
2		Coated Microstrip 1B	1	3	0	4.500	3.500	0.000	75.000	10.000	75.870
3		Coated Microstrip 1B	1	3	0	11.476	10.476	0.000	50.000	10.000	49.520
1		Edge Coupled Coated Microstrip 1B	1	3	0	8.500	7.500	8.115	100.000	10.000	100.350
4		Edge Coupled Coated Microstrip 1B	1	3	0	12.542	11.542	10.000	85.000	10.000	85.220

New option to sort structures by type has been included with v19.05:

1. Single-Ended – 75 ohms
2. Single-Ended – 50 ohms
3. Differential –100 ohms
4. Differential – 85 ohms

Printing: Option to hide the footer section

C:\Program Files\Polar\Speedstack\Samples\Eval Imperial.sci Units: Mils



Layer	Stack up	Supplier	Type	Description	Base Thickness	Processed Thickness	Resin Content	εr	Loss Tangent	Impedance ID
		Polar Samples	SolderMask	Liquid PhotoImageable Mask		1.000		4.000	0.0195	
1		Polar Samples	Copper	Copper Foil	0.700	0.700				1, 2, 3, 4
		Polar Samples	Dielectric	PrePreg 1080	3.000	1.950	60.000	4.200	0.0195	
2					1.400	1.400				
		Polar Samples	FR4	FR4 Core	3.000	3.000	60.000	4.200	0.0195	
3					1.400	1.400				
		Polar Samples	Dielectric	PrePreg 3080	3.000	2.776	60.000	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	6.000	5.552	47.000	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	6.000	5.552	47.000	4.200	0.0195	
4					1.400	1.400				5
		Polar Samples	FR4	FR4 Core	12.000	12.000	46.000	4.200	0.0195	
5					1.400	1.400				
		Polar Samples	Dielectric	PrePreg 1651	6.000	5.552	47.000	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	6.000	5.552	47.000	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 3080	3.000	2.776	60.000	4.200	0.0195	
6					1.400	1.400				
		Polar Samples	FR4	FR4 Core	3.000	3.000	60.000	4.200	0.0195	
7					1.400	1.400				
		Polar Samples	Dielectric	PrePreg 1080	3.000	1.950	60.000	4.200	0.0195	
8		Polar Samples	Copper	Copper Foil	0.700	0.700				6
		Polar Samples	SolderMask	Liquid PhotoImageable Mask		1.000		4.000	0.0195	

Copper Thickness = 9.800 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 59.460 | Stack Up Thickness with Soldermask = 61.460

Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
2		Coated Microstrip 1B	1	3	0	4.500	3.500	0.000	75.000	10.000	75.870
3		Coated Microstrip 1B	1	3	0	11.476	10.476	0.000	50.000	10.000	49.520
1		Edge Coupled Coated Microstrip 1B	1	3	0	8.500	7.500	8.115	100.000	10.000	100.350
4		Edge Coupled Coated Microstrip 1B	1	3	0	12.542	11.542	10.000	85.000	10.000	85.220

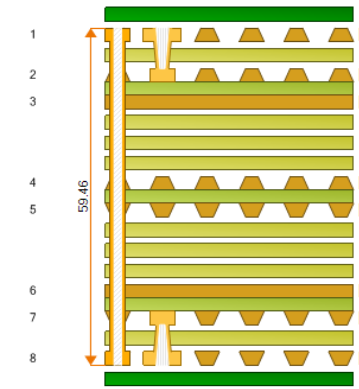
StackName: Master	Version:	Revision:	Modification:	Date of Revision:	Editor		
Date:	Associated Documents:					Page 1/X	
Author:							
Department:							
Site:							

www.polarinstruments.com

The Footer section is now an optional item and can be hidden

Printing: Option to hide the footer section

C:\Program Files\Polar\Speedstack\Samples\Eval Imperial.sci Units: Mils



Layer	Stack up	Supplier	Type	Description	Base Thickness	Processed Thickness	Resin Content	εr	Loss Tangent	Impedance ID
		Polar Samples	SolderMask	Liquid PhotoImageable Mask		1.000		4.000	0.0195	
1		Polar Samples	Copper	Copper Foil	0.700	0.700				1, 2, 3, 4
		Polar Samples	Dielectric	PrePreg 1080	3.000	1.950	60.000	4.200	0.0195	
2					1.400	1.400				
		Polar Samples	FR4	FR4 Core	3.000	3.000	60.000	4.200	0.0195	
3					1.400	1.400				
		Polar Samples	Dielectric	PrePreg 3080	3.000	2.776	60.000	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	6.000	5.552	47.000	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	6.000	5.552	47.000	4.200	0.0195	
4					1.400	1.400				5
		Polar Samples	FR4	FR4 Core	12.000	12.000	46.000	4.200	0.0195	
5					1.400	1.400				
		Polar Samples	Dielectric	PrePreg 1651	6.000	5.552	47.000	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	6.000	5.552	47.000	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 3080	3.000	2.776	60.000	4.200	0.0195	
6					1.400	1.400				
		Polar Samples	FR4	FR4 Core	3.000	3.000	60.000	4.200	0.0195	
7					1.400	1.400				
		Polar Samples	Dielectric	PrePreg 1080	3.000	1.950	60.000	4.200	0.0195	
8		Polar Samples	Copper	Copper Foil	0.700	0.700				6
		Polar Samples	SolderMask	Liquid PhotoImageable Mask		1.000		4.000	0.0195	

Copper Thickness = 9.800 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 59.460 | Stack Up Thickness with Soldermask = 61.460

Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
2		Coated Microstrip 1B	1	3	0	4.500	3.500	0.000	75.000	10.000	75.870
3		Coated Microstrip 1B	1	3	0	11.476	10.476	0.000	50.000	10.000	49.520
1		Edge Coupled Coated Microstrip 1B	1	3	0	8.500	7.500	8.115	100.000	10.000	100.350
4		Edge Coupled Coated Microstrip 1B	1	3	0	12.542	11.542	10.000	85.000	10.000	85.220
5		Edge Coupled Offset Stripline 1B1A	4	3	6	7.250	6.250	8.500	100.000	10.000	101.280
6		Coated Microstrip 1B	8	6	0	4.500	3.500	0.000	75.000	10.000	75.870

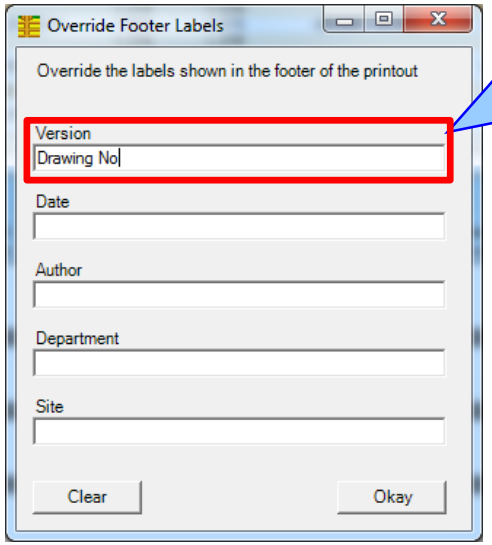
Page 1/X

When the Footer section is hidden the space is used for other data, often reducing the number of pages required for the technical report

Printing: Customisable footer section

Support for longer stack up names

StackName: POLAR SET2DIL MWPD1636					
Version: A	Associated Documents:	Revision:	Modification:	Date of Revision:	Editor
Date: 22/01/2014		A	L2/L3 Core Changed	23/10/2016	R Attrill
Author: R Attrill (Polar)		B	Solder Mask Mod	20/05/2019	J Lee
Department: Engineering					
Site: Waterlooville					



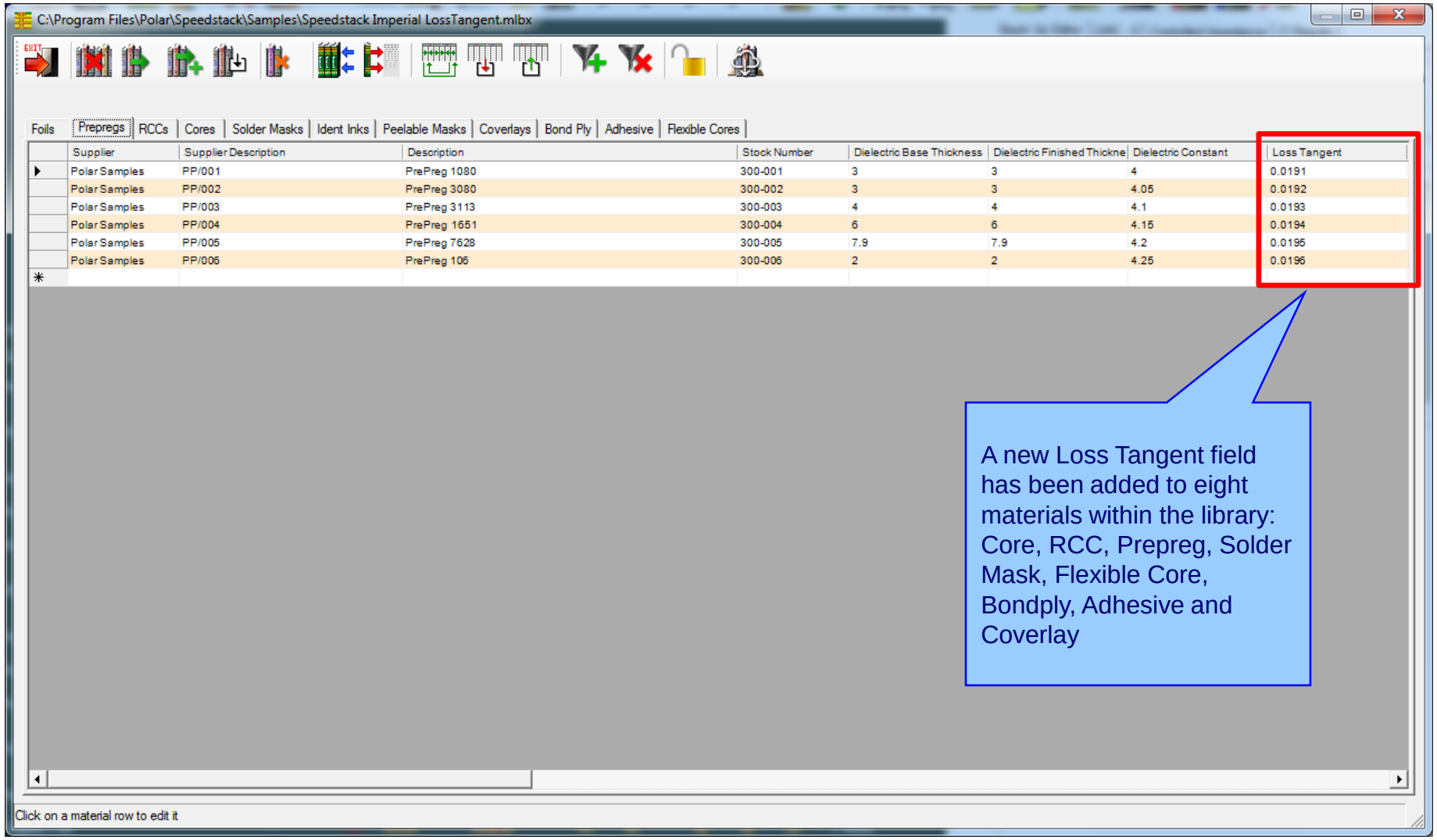
Override footer labels using your own company naming conventions.

In this example Version has been replaced with Drawing No.

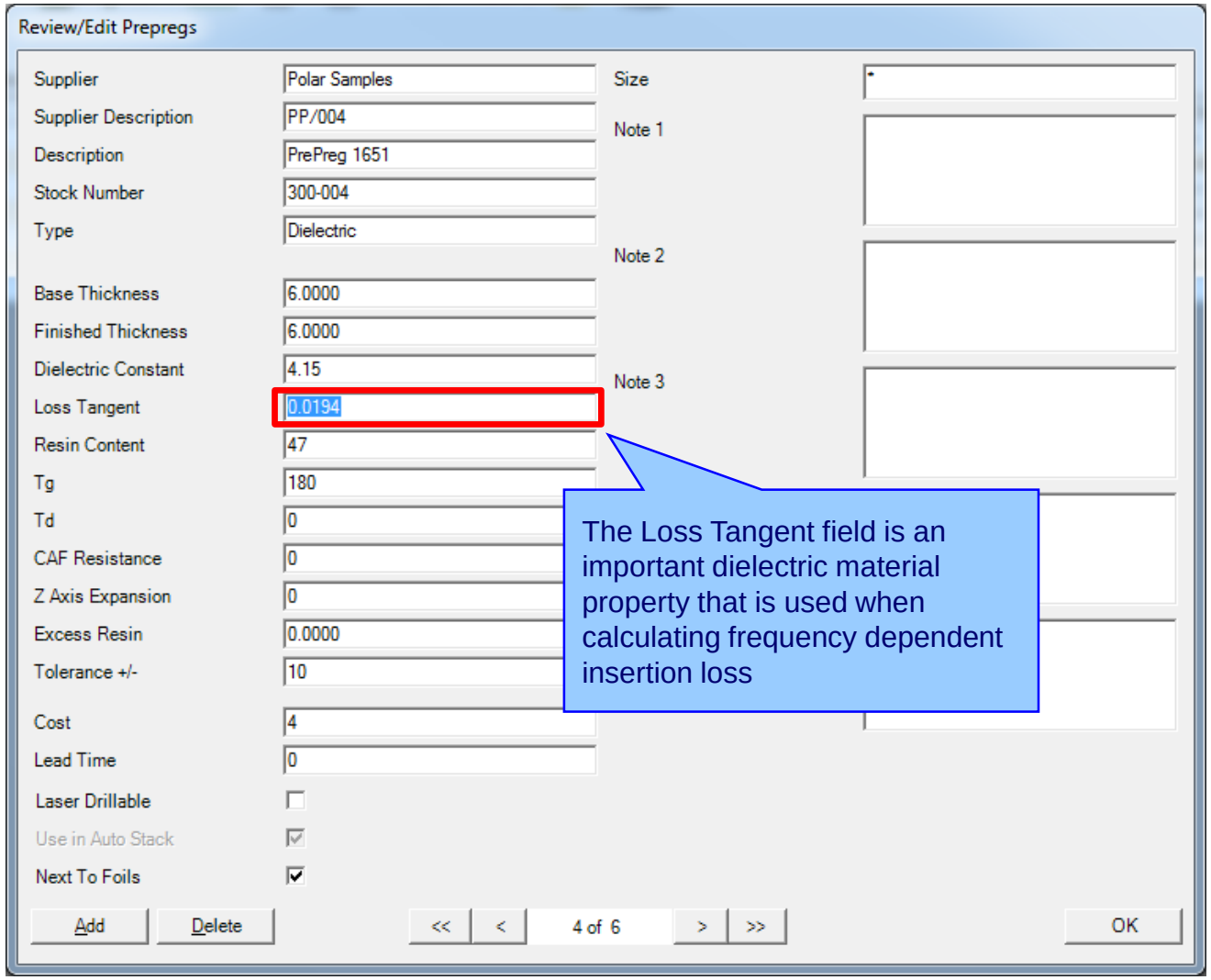
StackName: POLAR SET2DIL MWPD1636					
Drawing No: A	Associated Documents:	Revision:	Modification:	Date of Revision:	Editor
Date: 22/01/2014		A	L2/L3 Core Changed	23/10/2016	R Attrill
Author: R Attrill (Polar)		B	Solder Mask Mod	20/05/2019	J Lee
Department: Engineering					
Site: Waterlooville					

Speedstack v19.01 (January 2019)

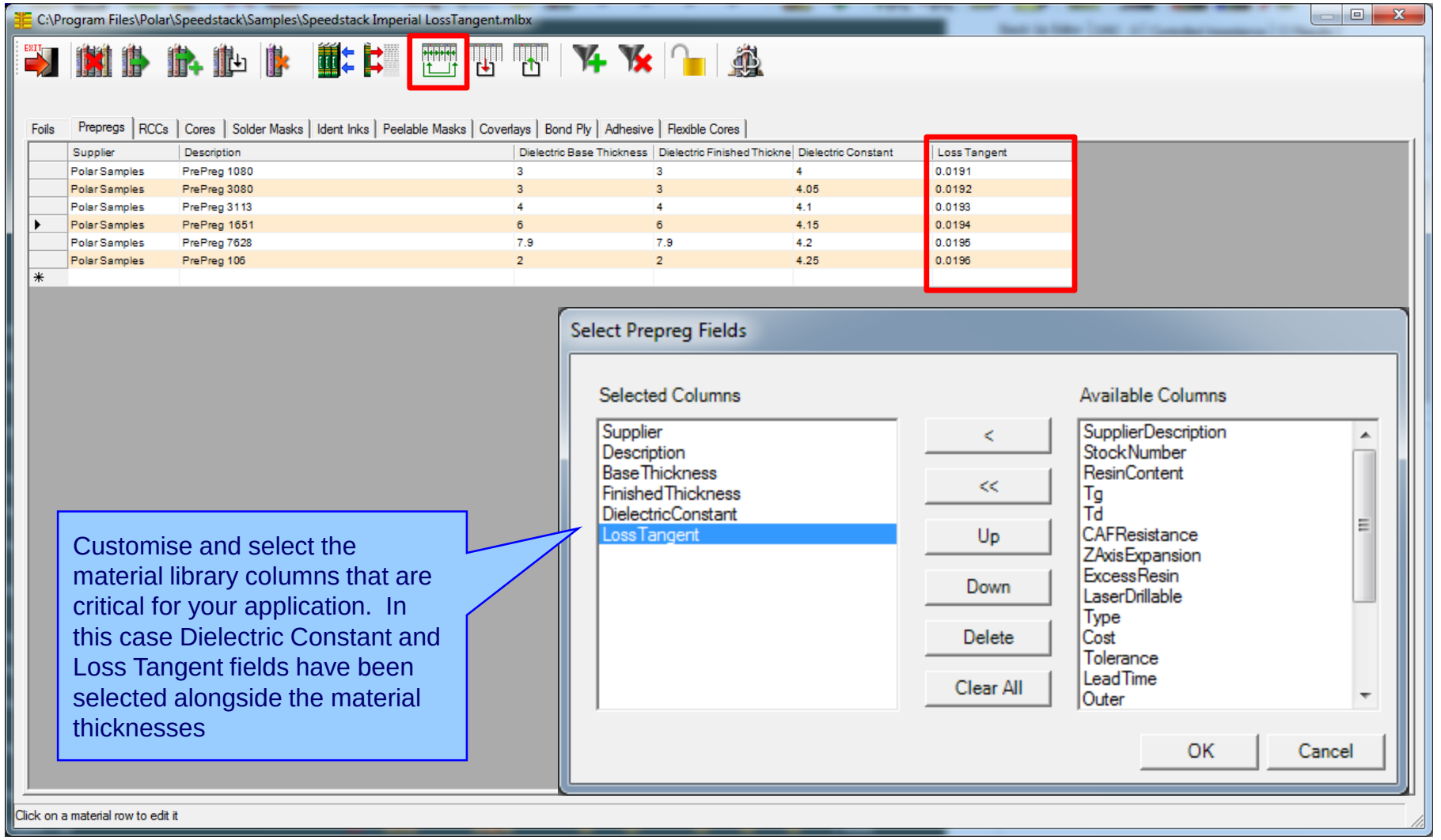
Loss Tangent field now available in the Material Library



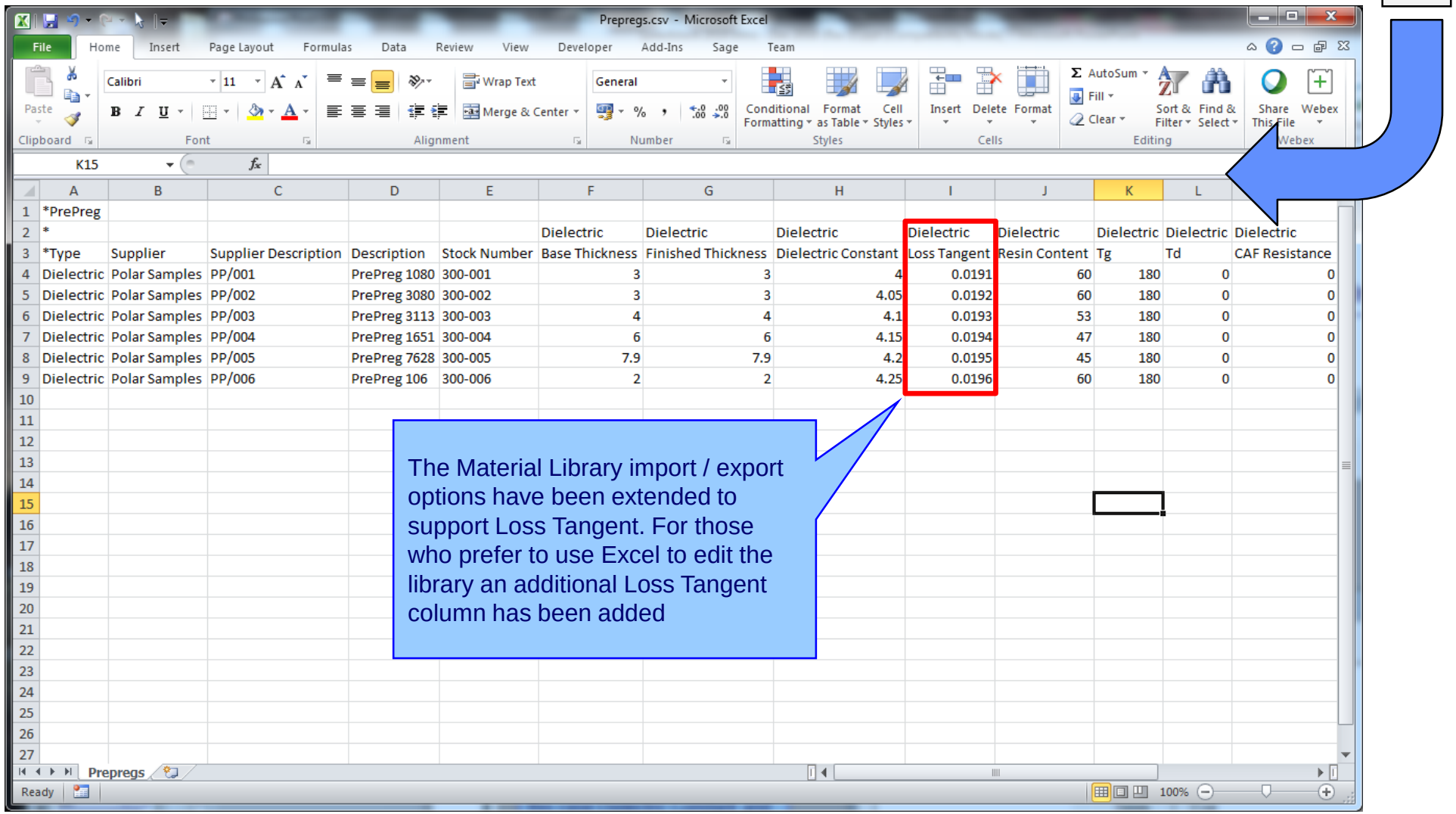
Loss Tangent field now available in the Material Library



Loss Tangent field now available in the Material Library

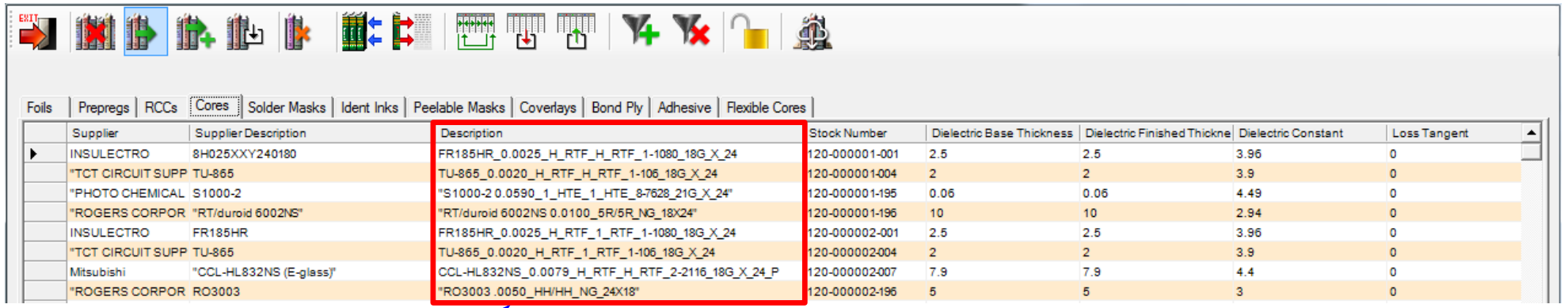


Loss Tangent field now available in the Material Library



	A	B	C	D	E	F	G	H	I	J	K	L	
1	*PrePreg												
2	*					Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric
3	*Type	Supplier	Supplier Description	Description	Stock Number	Base Thickness	Finished Thickness	Dielectric Constant	Loss Tangent	Resin Content	Tg	Td	CAF Resistance
4	Dielectric	Polar Samples	PP/001	PrePreg 1080	300-001	3	3	4	0.0191	60	180	0	0
5	Dielectric	Polar Samples	PP/002	PrePreg 3080	300-002	3	3	4.05	0.0192	60	180	0	0
6	Dielectric	Polar Samples	PP/003	PrePreg 3113	300-003	4	4	4.1	0.0193	53	180	0	0
7	Dielectric	Polar Samples	PP/004	PrePreg 1651	300-004	6	6	4.15	0.0194	47	180	0	0
8	Dielectric	Polar Samples	PP/005	PrePreg 7628	300-005	7.9	7.9	4.2	0.0195	45	180	0	0
9	Dielectric	Polar Samples	PP/006	PrePreg 106	300-006	2	2	4.25	0.0196	60	180	0	0

Description column width has been increased

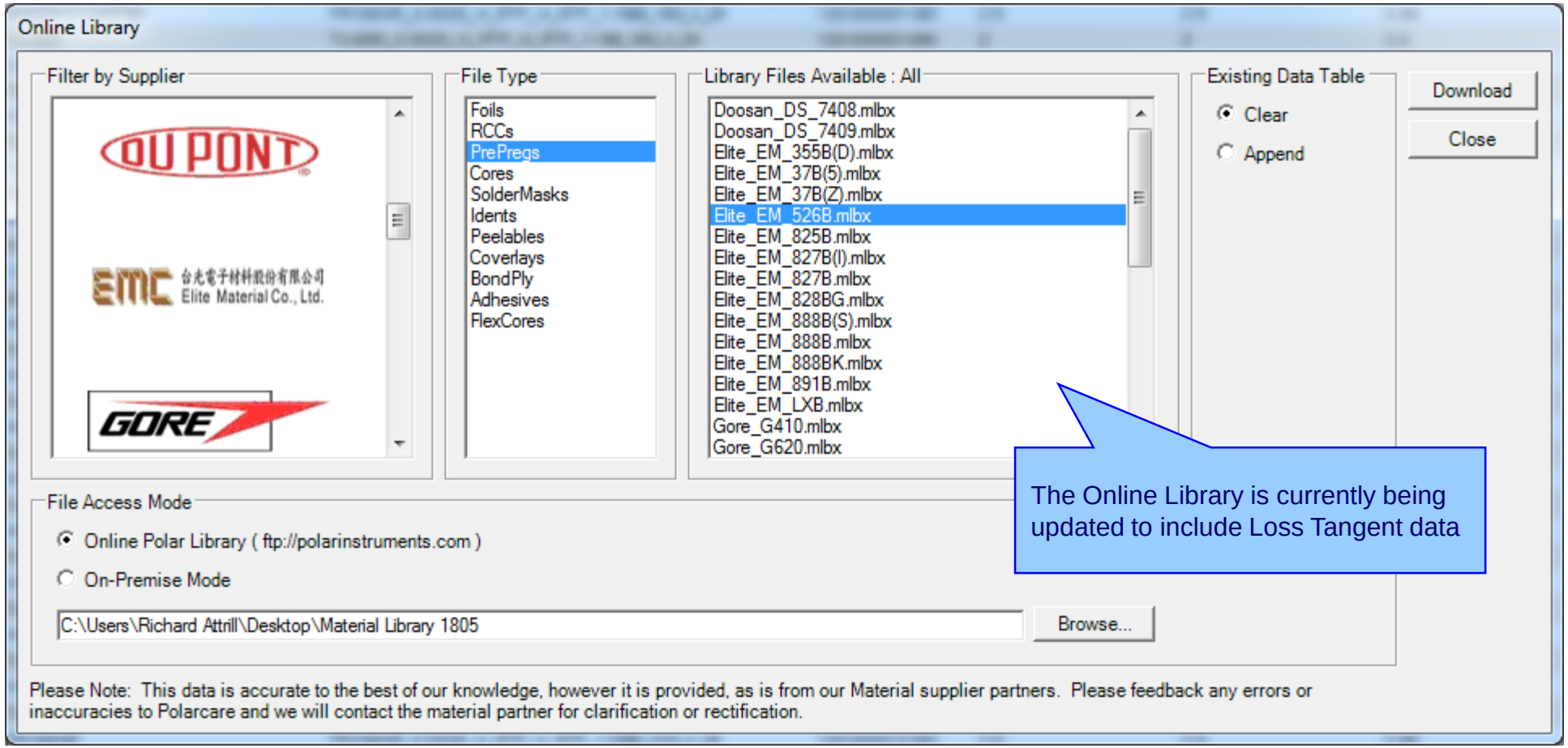


Foils | Prepregs | RCCs | Cores | Solder Masks | Ident Inks | Peelable Masks | Coverlays | Bond Ply | Adhesive | Flexible Cores

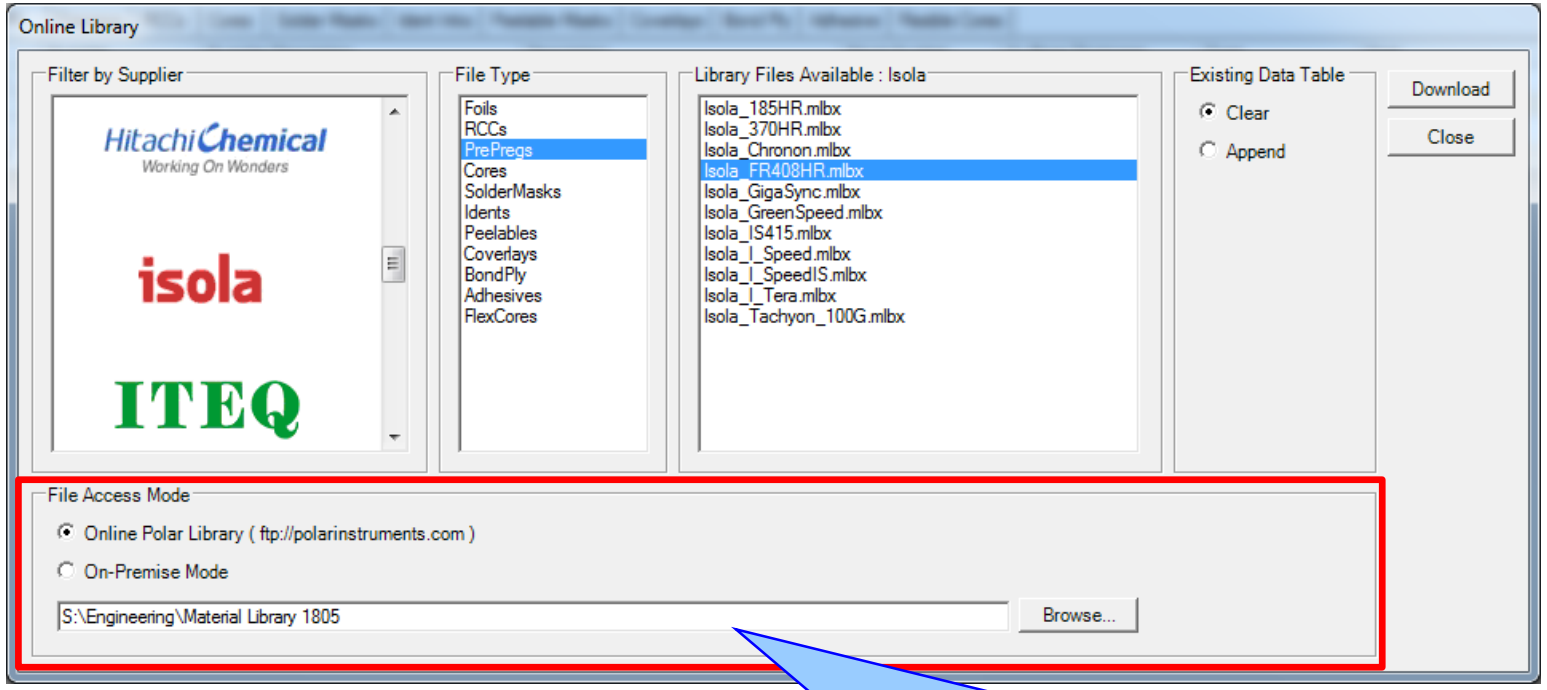
Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickne	Dielectric Constant	Loss Tangent
INSULECTRO	8H025XXY240180	FR185HR_0.0025_H_RTF_H_RTF_1-1080_18G_X_24	120-000001-001	2.5	2.5	3.96	0
"TCT CIRCUIT SUPP	TU-865	TU-865_0.0020_H_RTF_H_RTF_1-106_18G_X_24	120-000001-004	2	2	3.9	0
"PHOTO CHEMICAL	S1000-2	"S1000-2 0.0590_1_HTE_1_HTE_8-7628_21G_X_24"	120-000001-195	0.06	0.06	4.49	0
"ROGERS CORPOR	"RT/duroid 6002NS"	"RT/duroid 6002NS 0.0100_5R/5R_NG_18X24"	120-000001-196	10	10	2.94	0
INSULECTRO	FR185HR	FR185HR_0.0025_H_RTF_1_RTF_1-1080_18G_X_24	120-000002-001	2.5	2.5	3.96	0
"TCT CIRCUIT SUPP	TU-865	TU-865_0.0020_H_RTF_1_RTF_1-106_18G_X_24	120-000002-004	2	2	3.9	0
Mitsubishi	"CCL-HL832NS (E-glass)"	CCL-HL832NS_0.0079_H_RTF_H_RTF_2-2116_18G_X_24_P	120-000002-007	7.9	7.9	4.4	0
"ROGERS CORPOR	RO3003	"RO3003 .0050_HH/HH_NG_24X18"	120-000002-196	5	5	3	0

More detailed material descriptions can now be viewed without needing to adjust the column widths

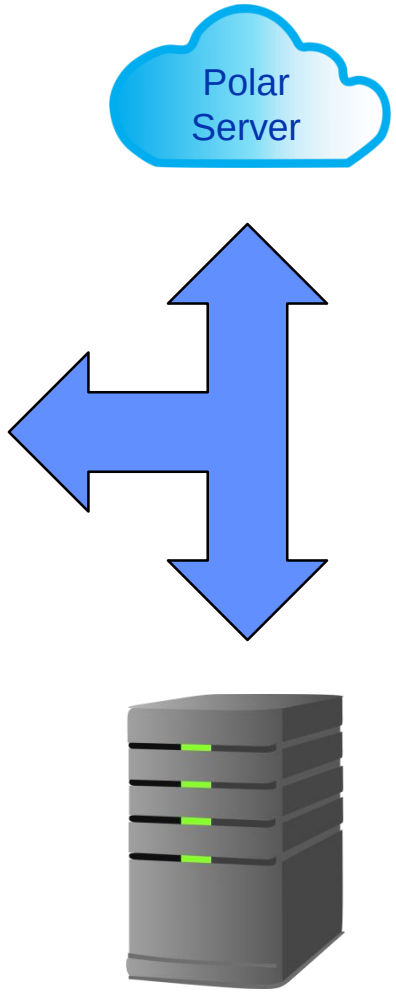
Online Library – Now supports libraries containing Loss Tangent data



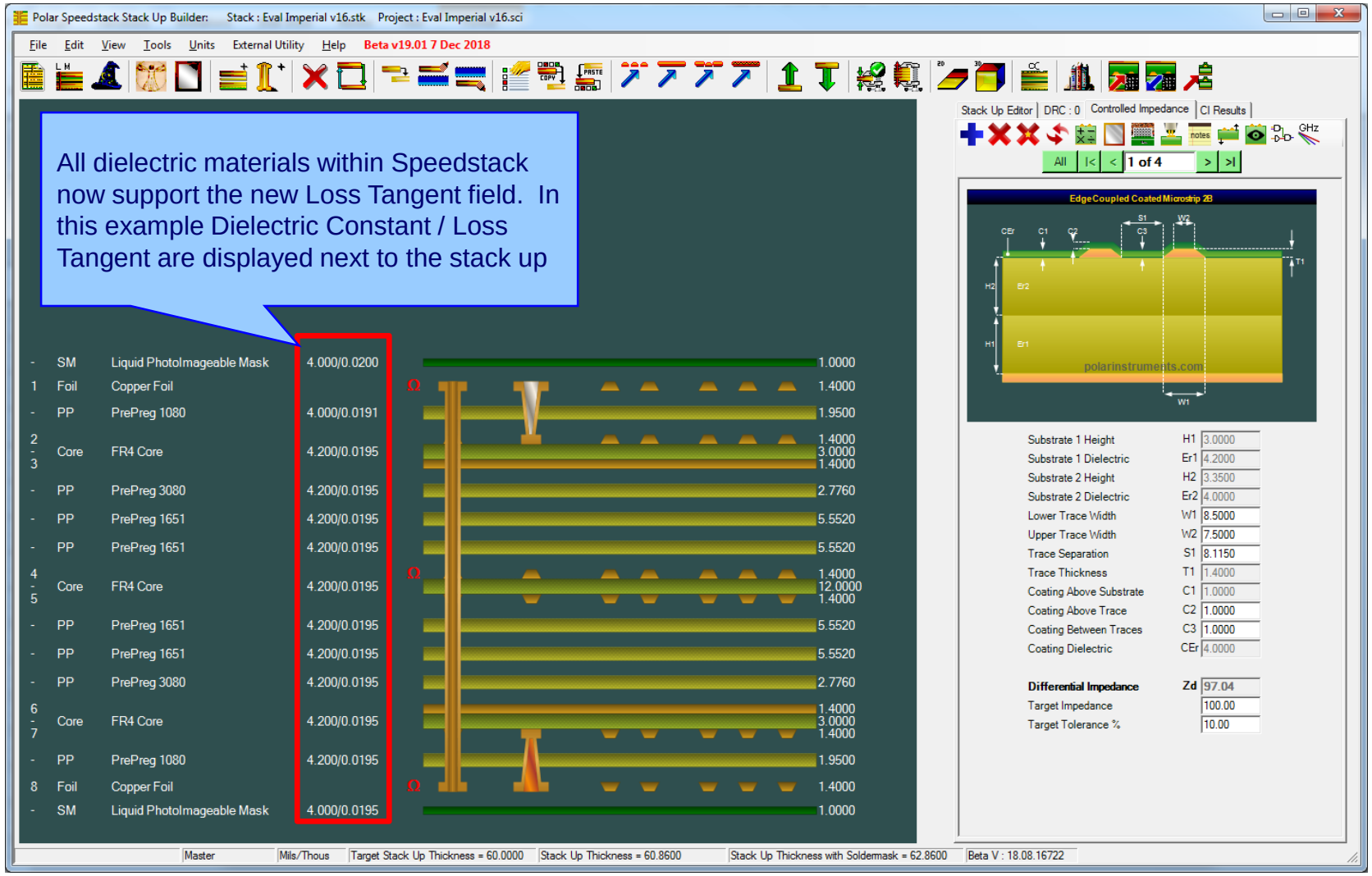
Online Library – On-Premise Mode has been enhanced



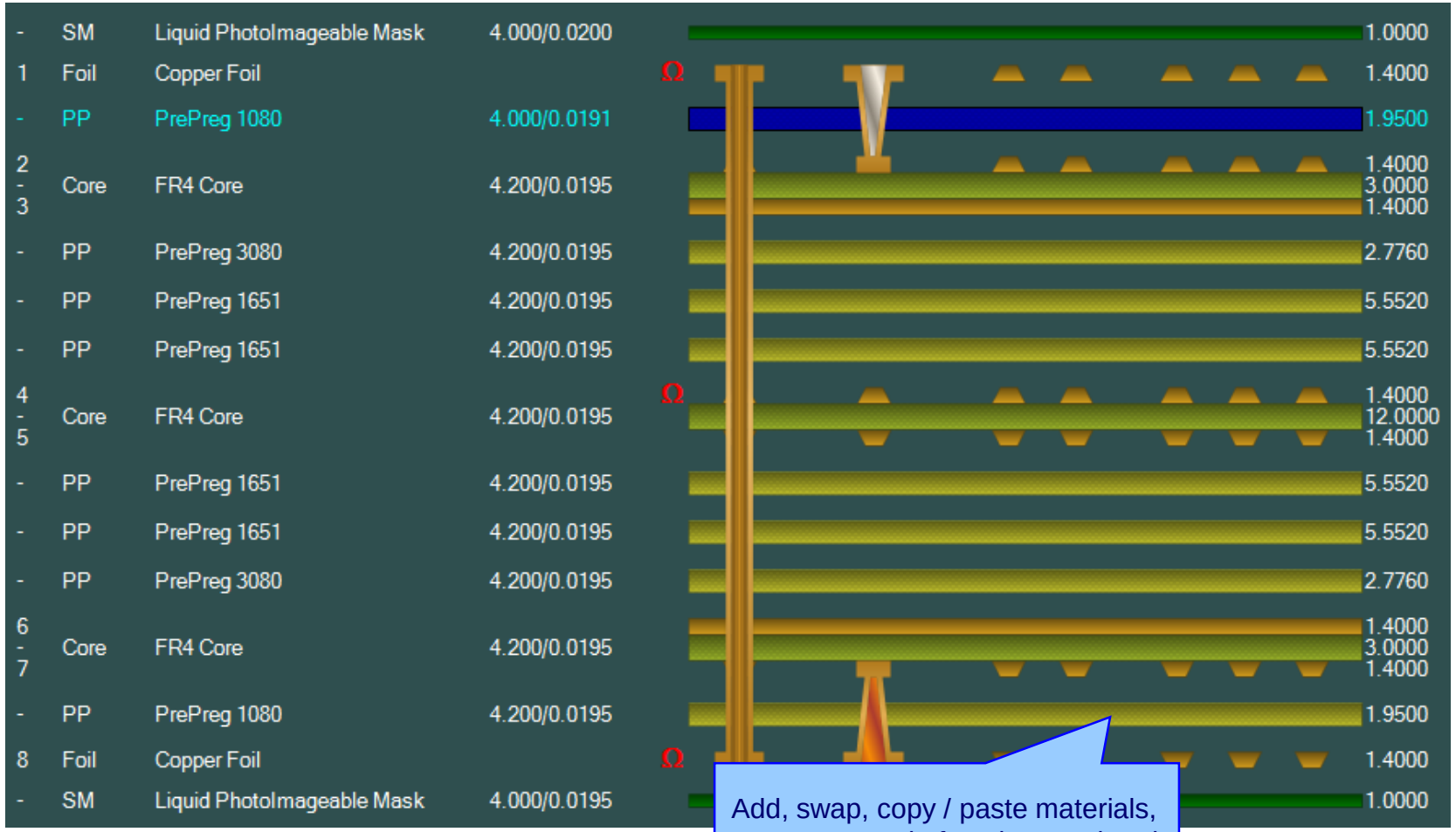
The Online Library can access the latest material library data from either the Polar FTP Server or an On-Premise Server.
The On-Premise Mode is ideal for those users where internal security policies prevent access to external FTP servers. Further enhancements have been made when no access to the Polar FTP Server is allowed



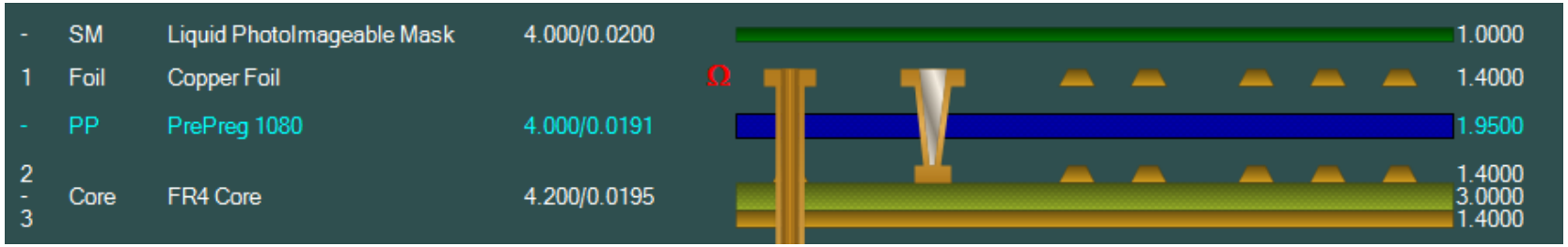
Stack Up Editor Enhancements – Support for Loss Tangent



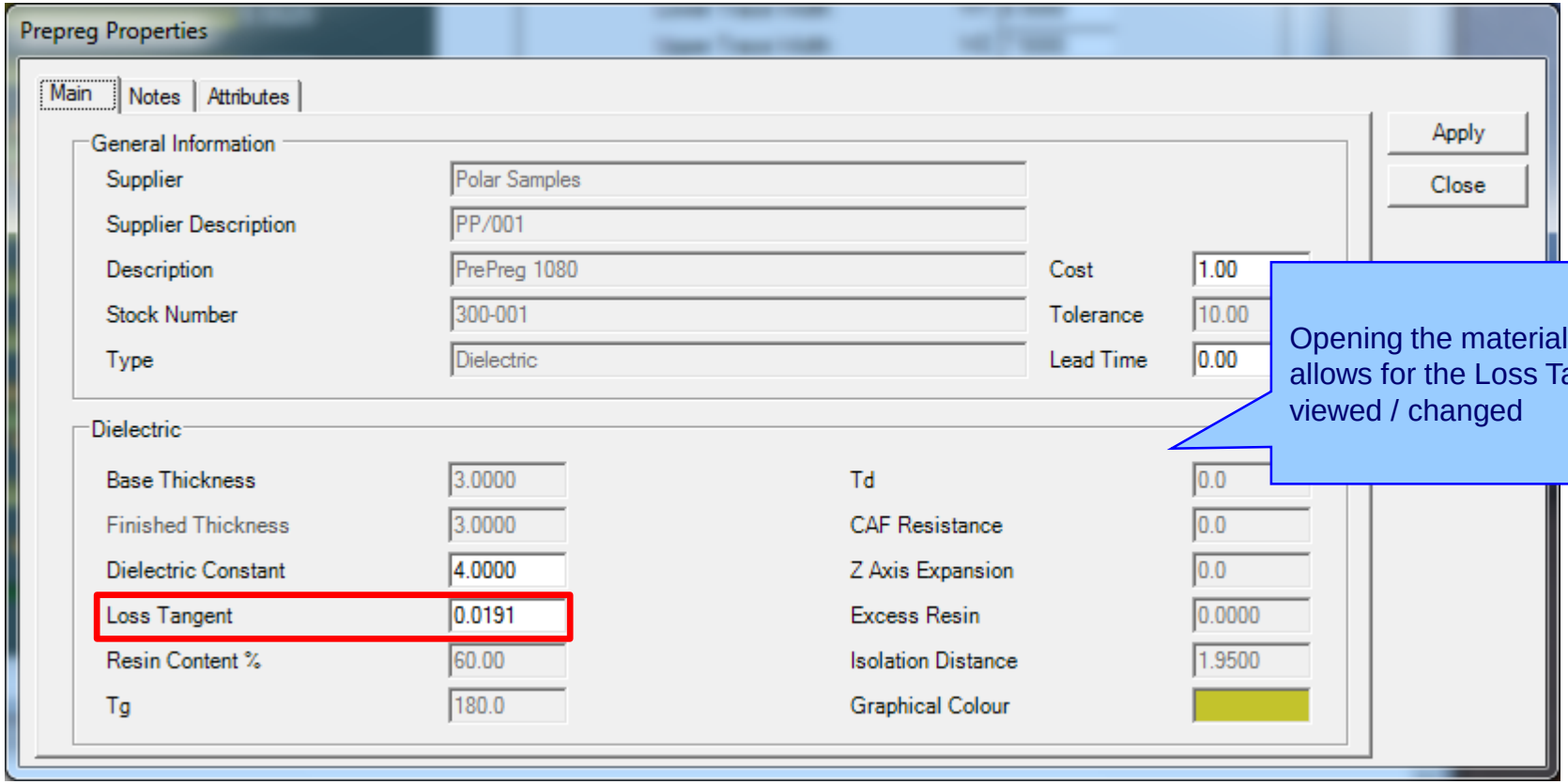
Stack Up Editor Enhancements – Support for Loss Tangent



Stack Up Editor Enhancements – Support for Loss Tangent



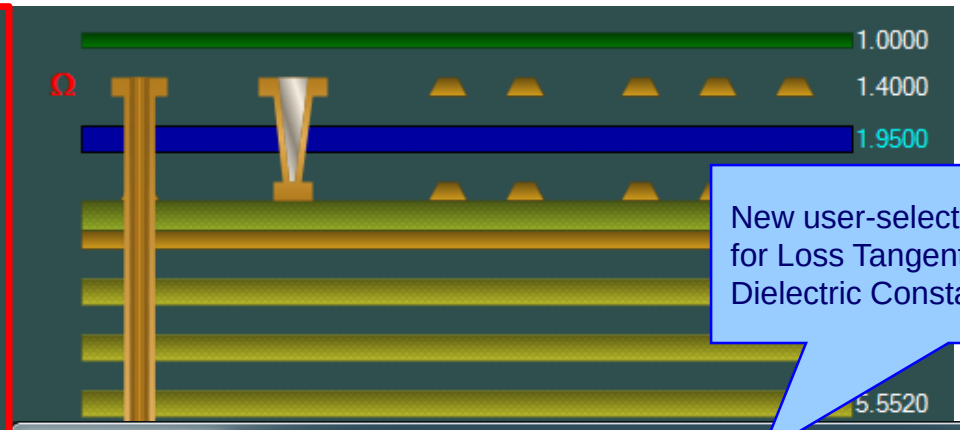
Properties



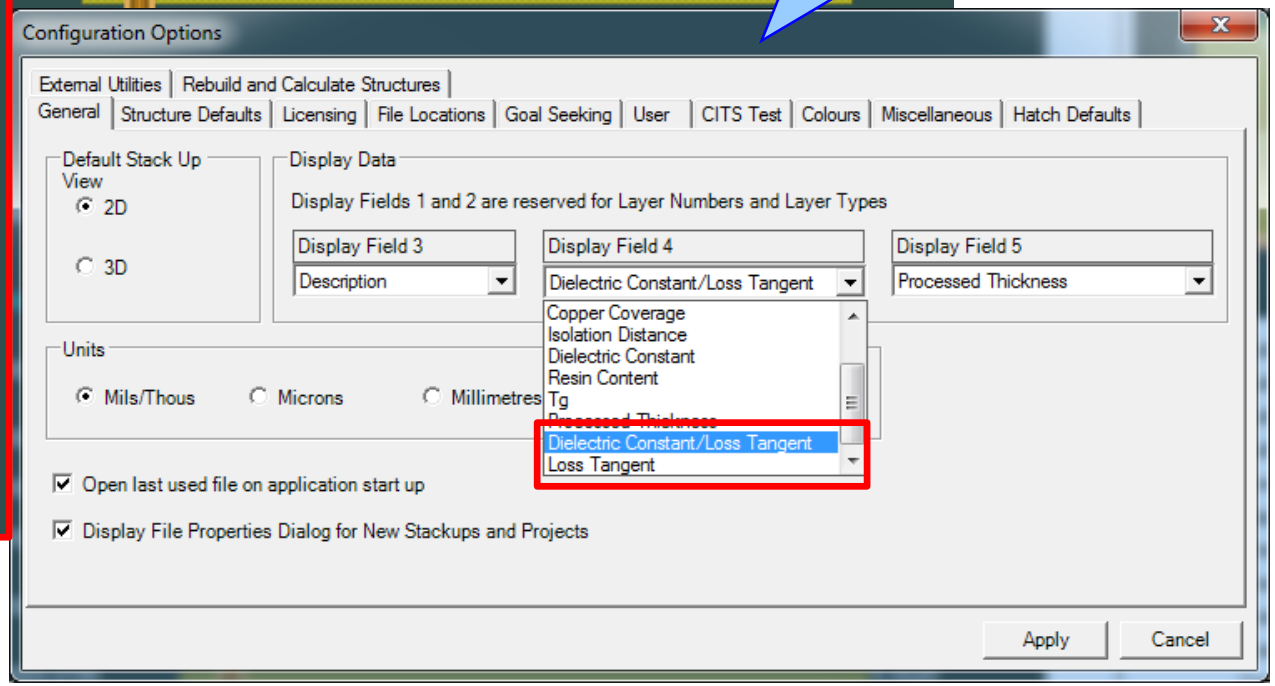
Opening the material Properties dialog allows for the Loss Tangent value to be viewed / changed

Stack Up Editor Enhancements – Support for Loss Tangent

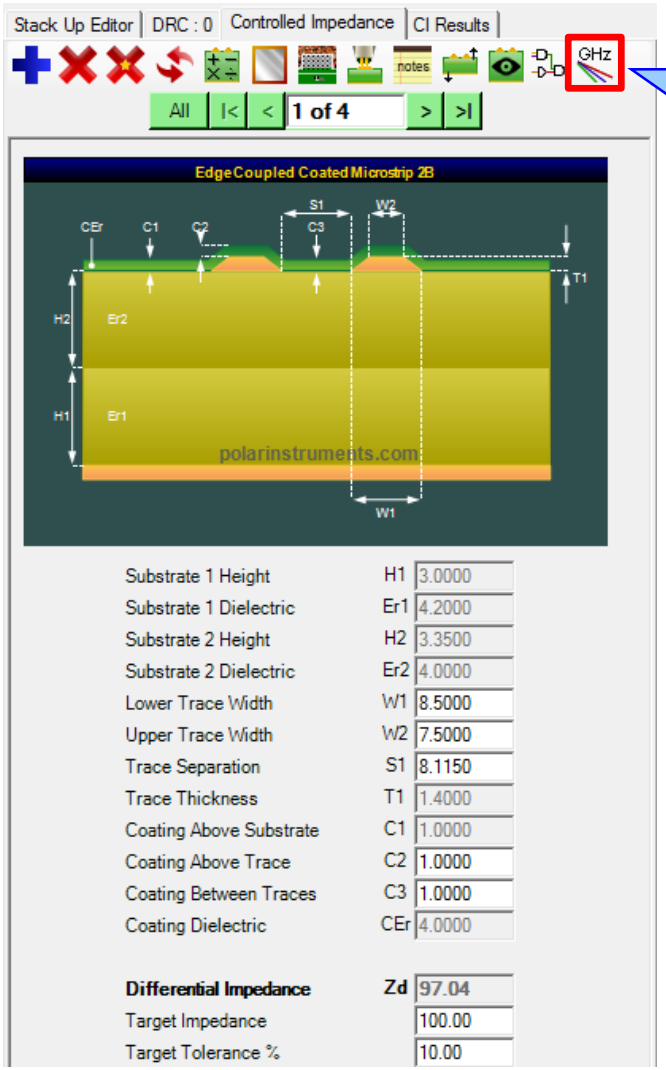
-	SM	Liquid PhotoImageable Mask	4.000/0.0200
1	Foil	Copper Foil	
-	PP	PrePreg 1080	4.000/0.0191
2 - 3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4 - 5	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6 - 7	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	
-	SM	Liquid PhotoImageable Mask	4.000/0.0195



New user-selectable display columns for Loss Tangent and a combined Dielectric Constant / Loss Tangent

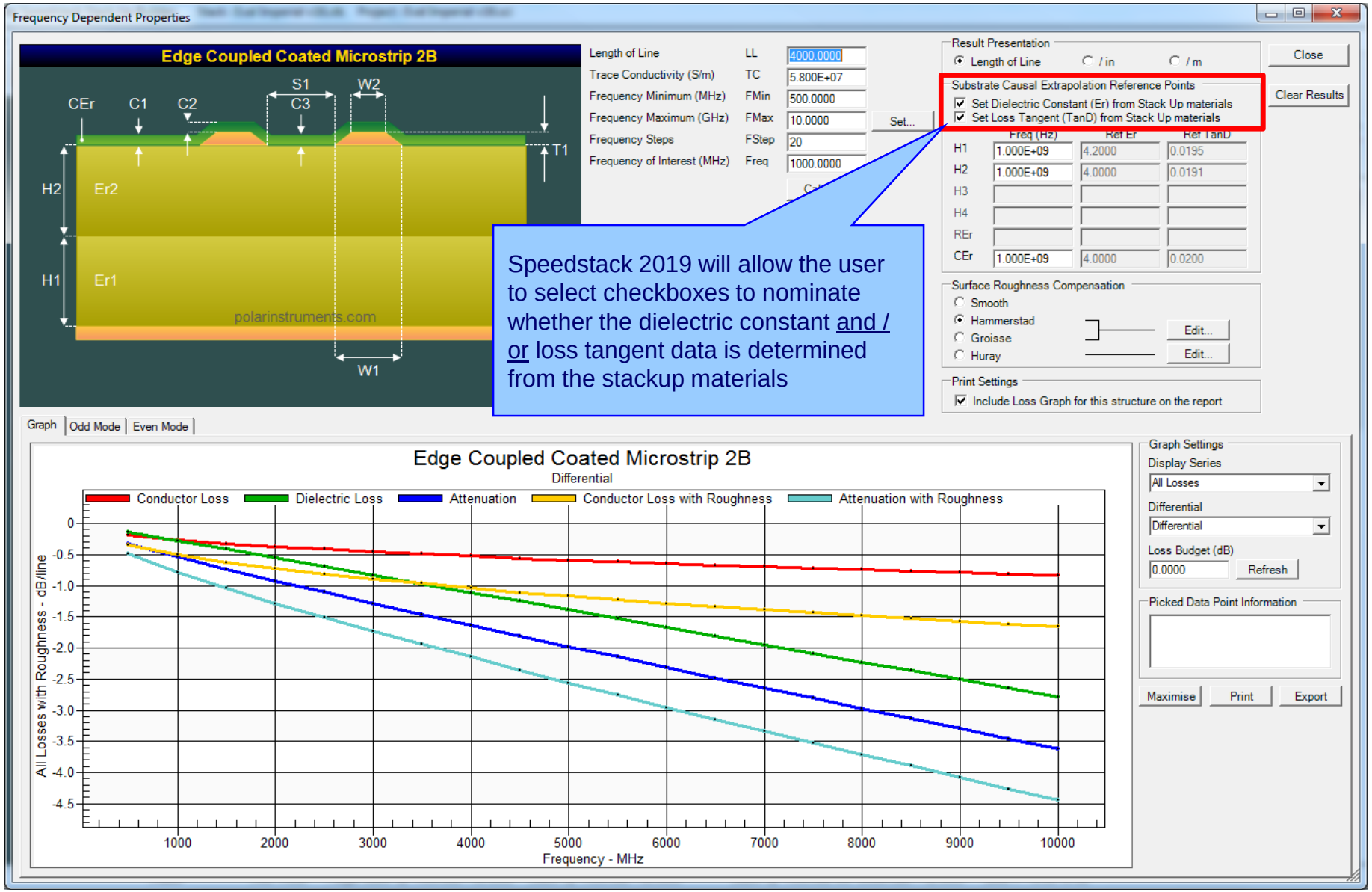


Frequency Dependent Calculation Enhancements (Speedstack Si)

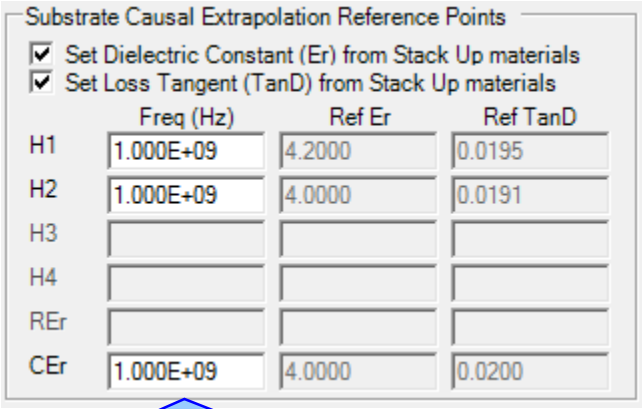


In order to accurately calculate frequency dependent loss it is necessary to know the critical information regarding the transmission line structure.

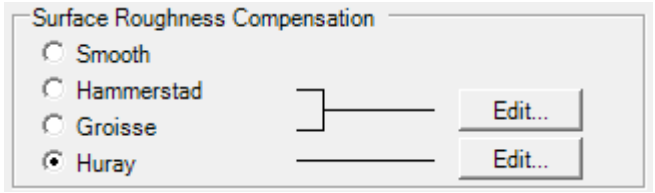
Speedstack 2019 will use the dielectric constant and loss tangent data from the stackup

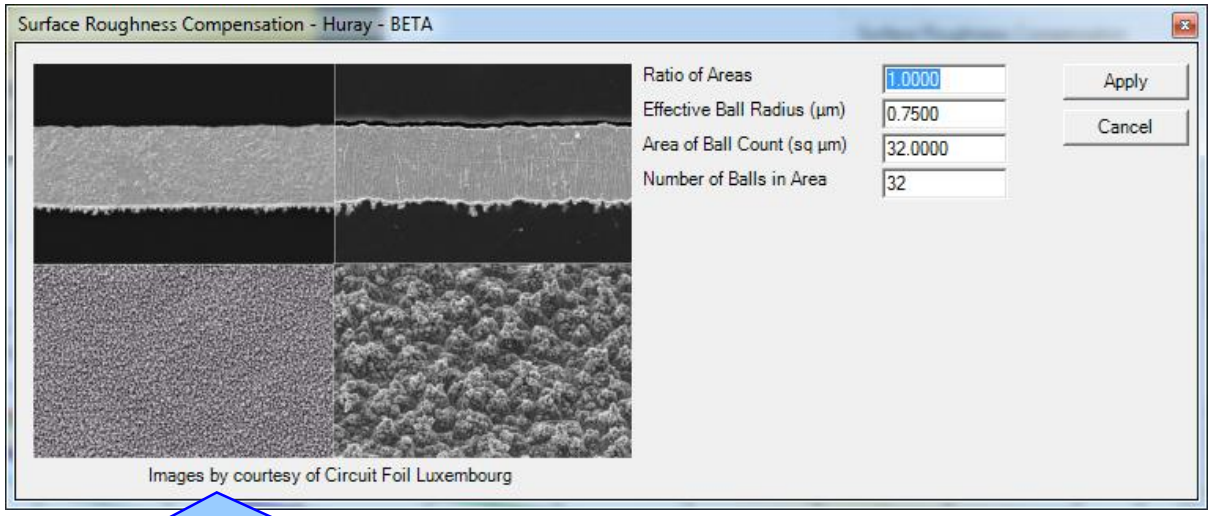


Speedstack – Material and Surface Roughness properties



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 and can be added to the Speedstack material library.
The checkbox options will automatically populate these fields from the stackup materials.

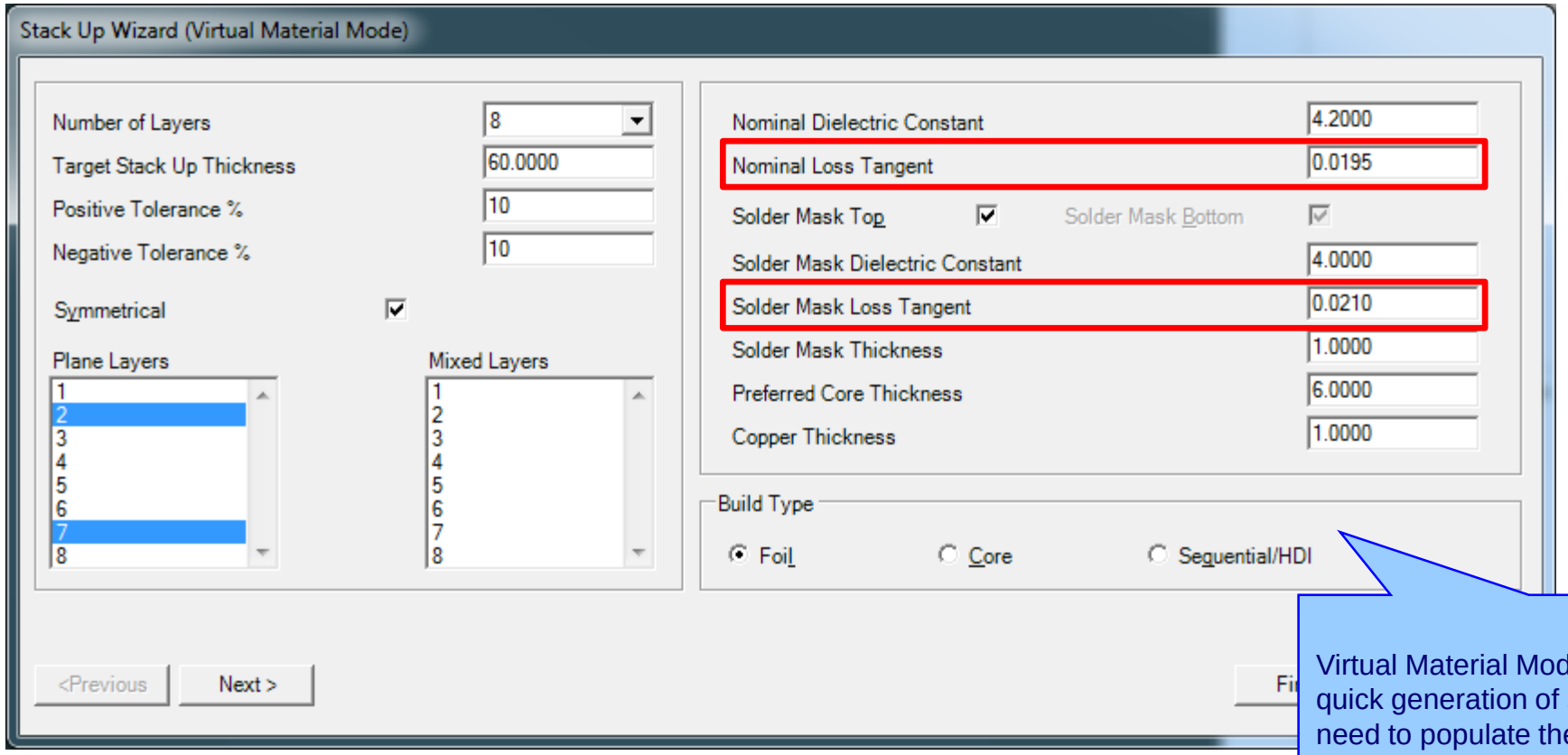




To accurately calculate Conductor Loss it is necessary to specify the surface roughness parameters.

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

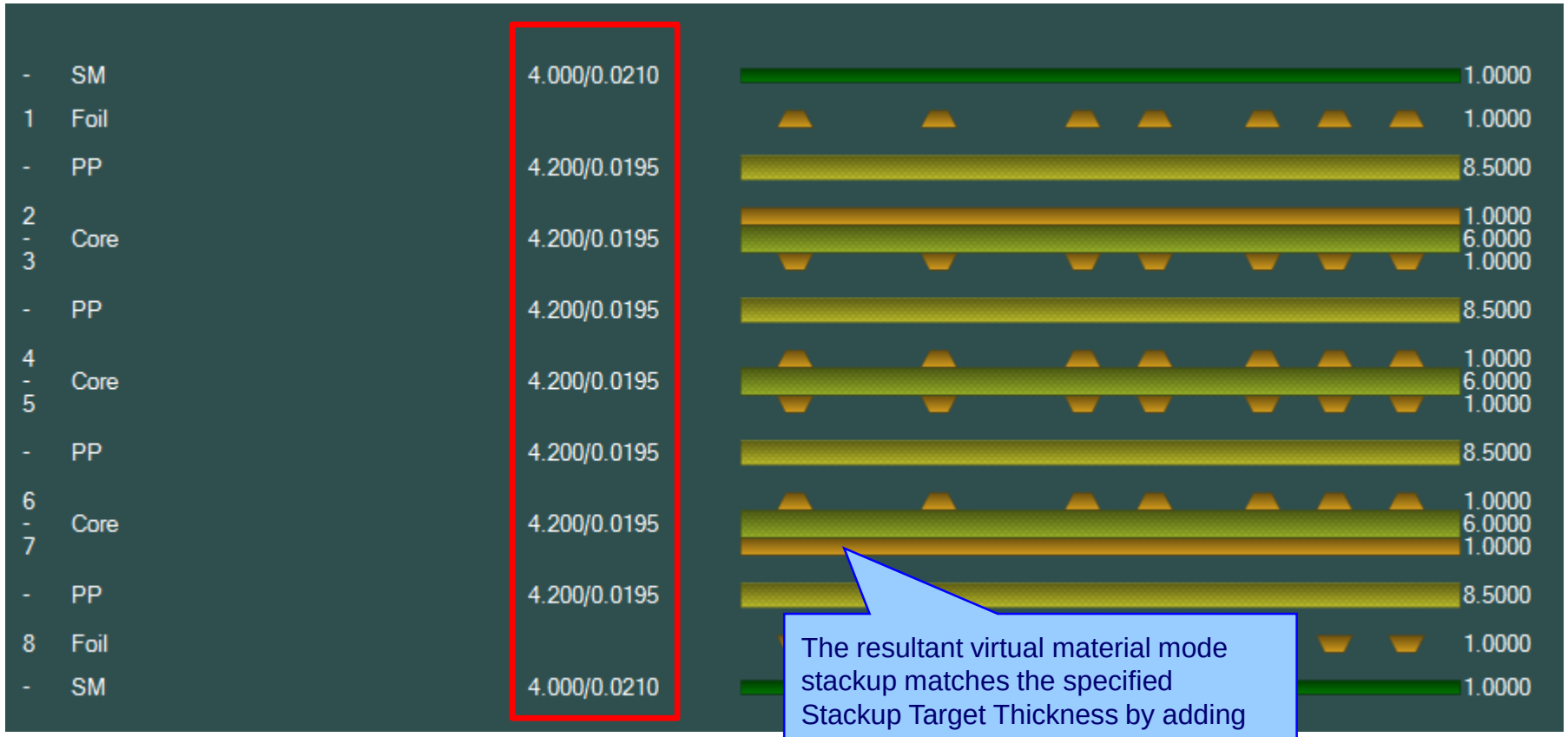
Virtual Material Mode enhancements



Virtual Material Mode allows for very quick generation of stackups without the need to populate the material library – great for 'what if' scenarios.

Speedstack 2019 introduces material and solder mask loss tangent parameter entries to the wizard.

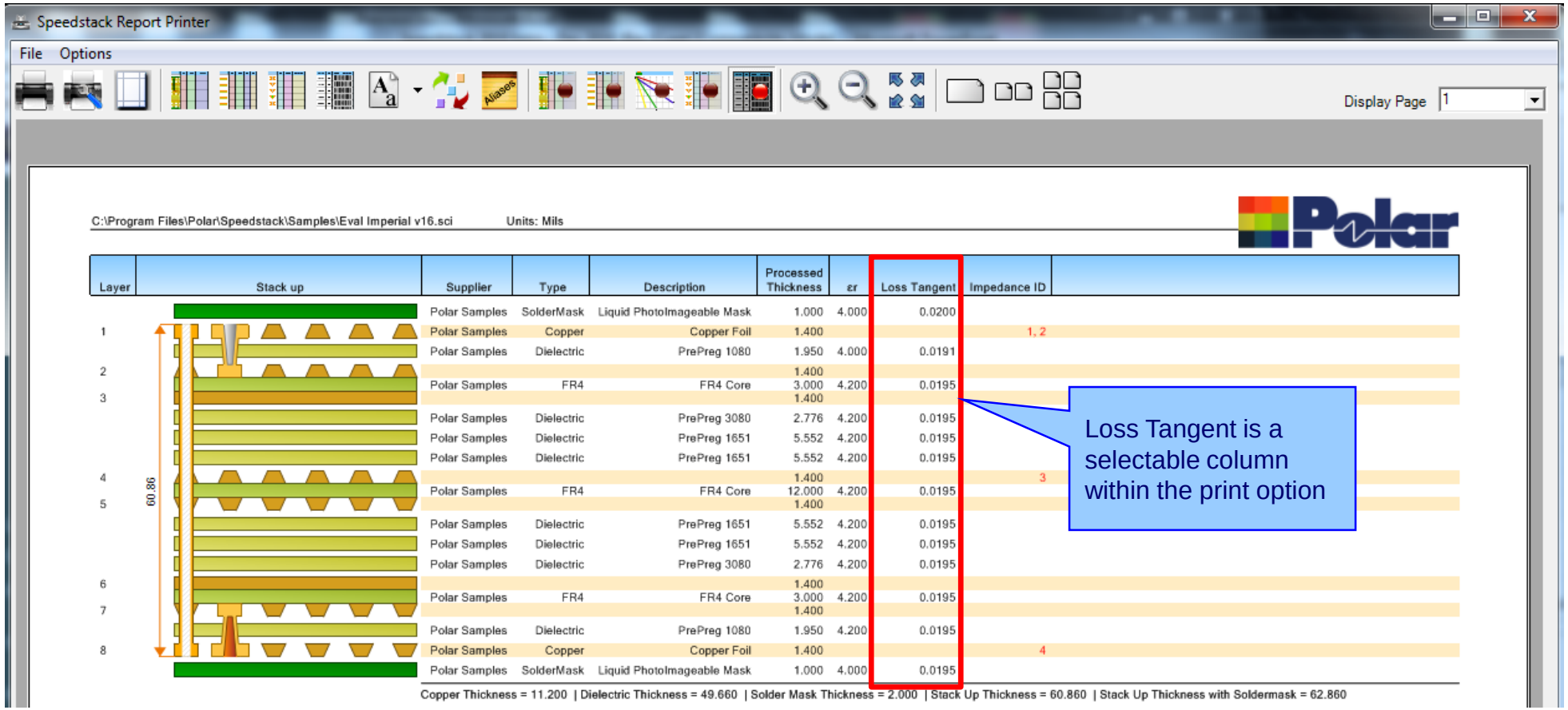
Virtual Material Mode enhancements



The resultant virtual material mode stackup matches the specified Stackup Target Thickness by adding suitable Prepreg thicknesses between each nominated Foil and Core materials.

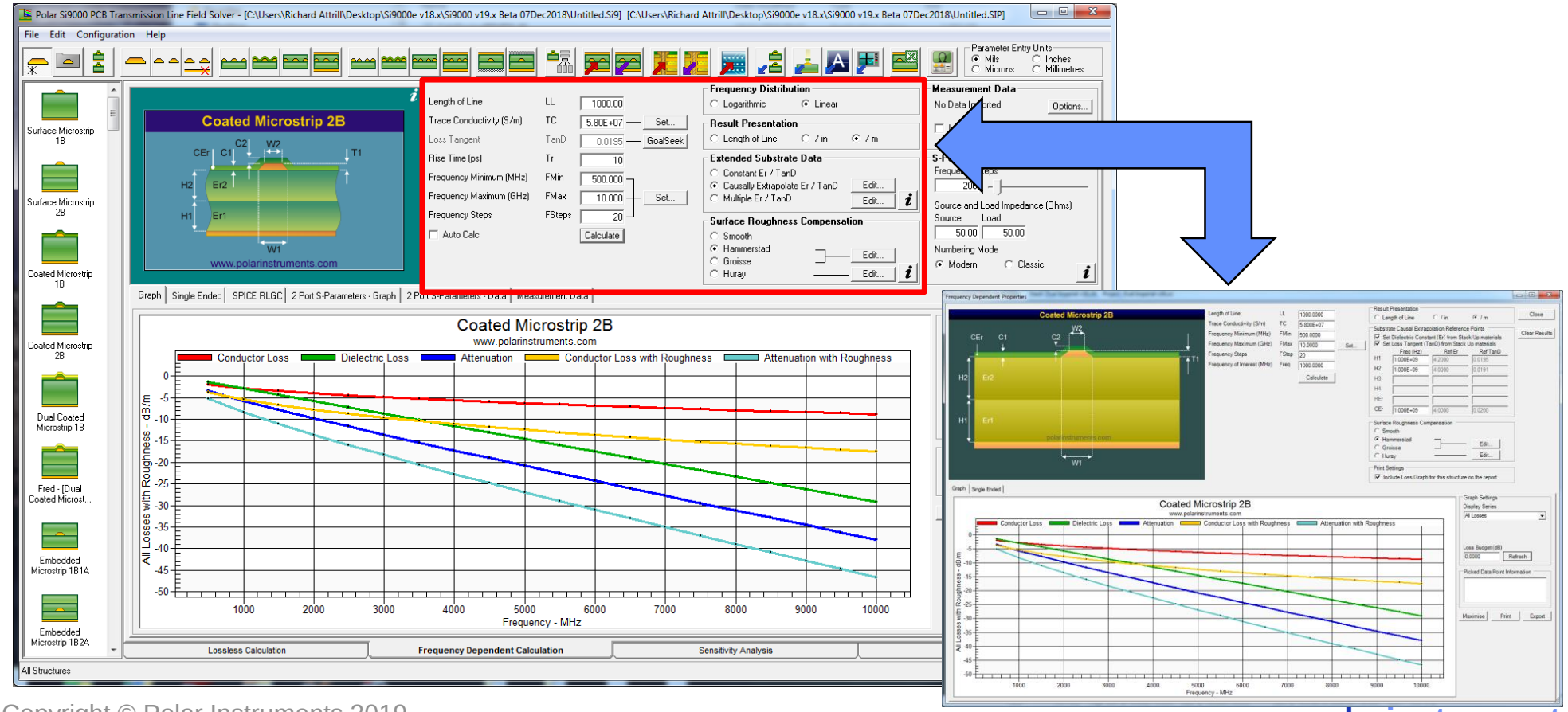
Speedstack 2019 introduces core / prepreg and solder mask loss tangent parameters.

Printing Enhancements – Support for Loss Tangent

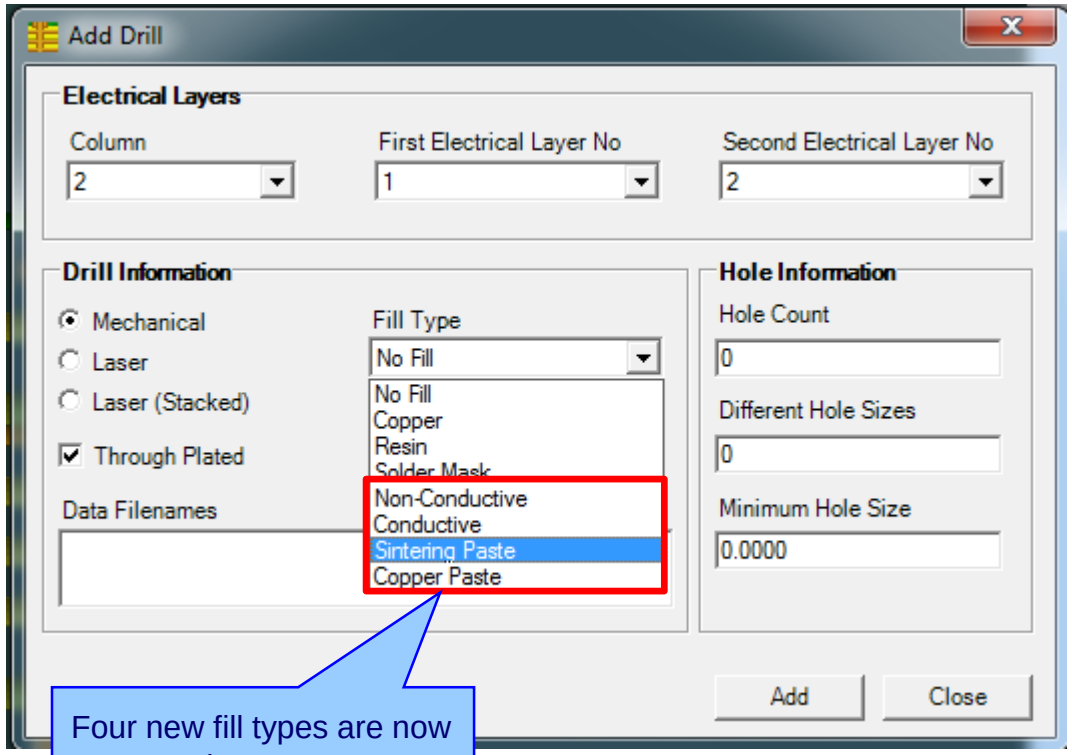


Layer	Stack up	Supplier	Type	Description	Processed Thickness	εr	Loss Tangent	Impedance ID
		Polar Samples	SolderMask	Liquid PhotoImageable Mask	1.000	4.000	0.0200	
1		Polar Samples	Copper	Copper Foil	1.400			1, 2
		Polar Samples	Dielectric	PrePreg 1080	1.950	4.000	0.0191	
2					1.400			
		Polar Samples	FR4	FR4 Core	3.000	4.200	0.0195	
3					1.400			
		Polar Samples	Dielectric	PrePreg 3080	2.776	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	5.552	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	5.552	4.200	0.0195	
4					1.400			3
		Polar Samples	FR4	FR4 Core	12.000	4.200	0.0195	
5					1.400			
		Polar Samples	Dielectric	PrePreg 1651	5.552	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 1651	5.552	4.200	0.0195	
		Polar Samples	Dielectric	PrePreg 3080	2.776	4.200	0.0195	
6					1.400			
		Polar Samples	FR4	FR4 Core	3.000	4.200	0.0195	
7					1.400			
		Polar Samples	Dielectric	PrePreg 1080	1.950	4.200	0.0195	
8		Polar Samples	Copper	Copper Foil	1.400			4
		Polar Samples	SolderMask	Liquid PhotoImageable Mask	1.000	4.000	0.0195	

Speedstack 2019 allows comprehensive bidirectional copy and paste from Speedstack into Si9000e including all relevant loss tangent, roughness and roughness method parameters along with frequencies of interest.



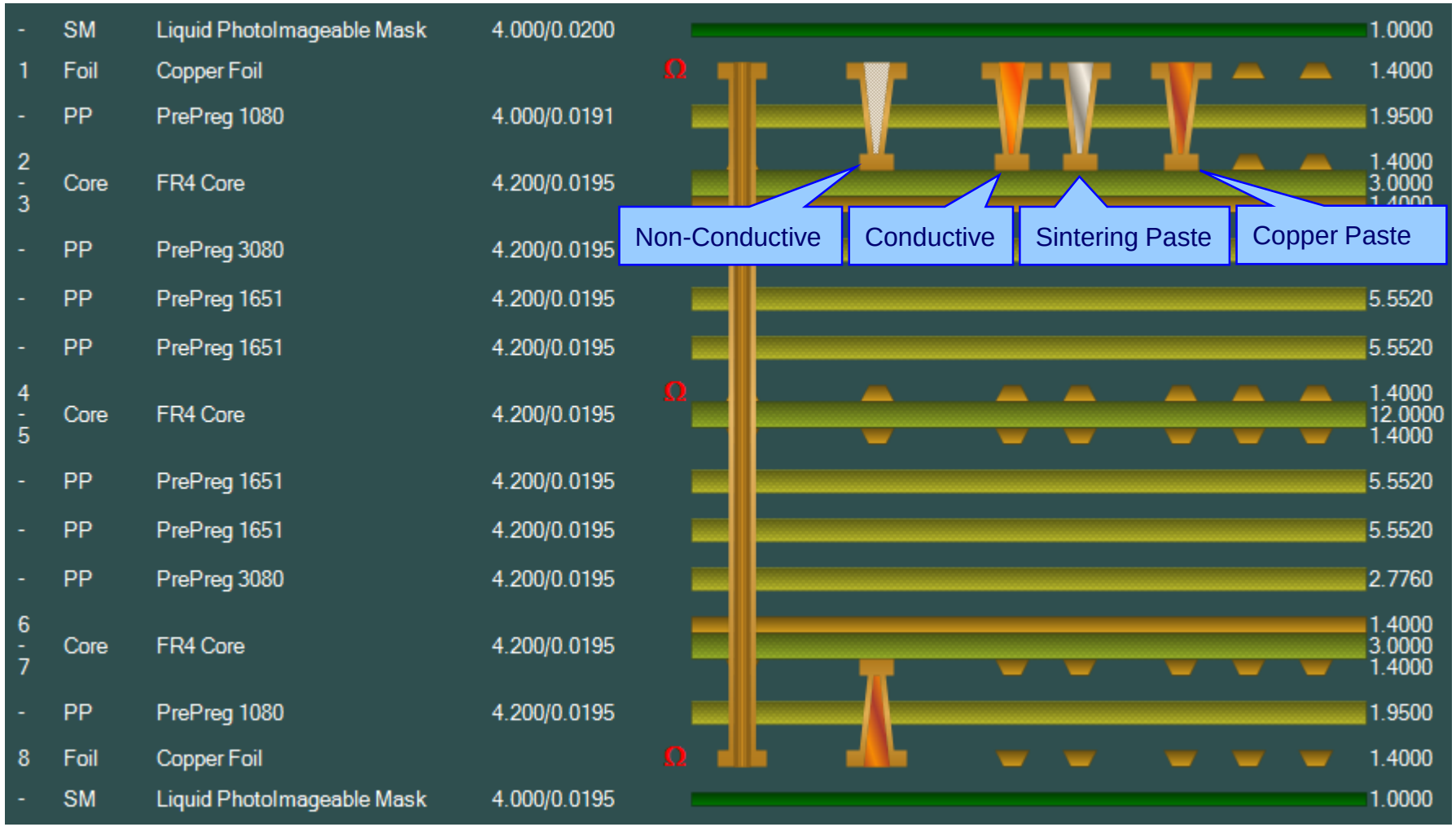
Drill / Via Fill Types – Four new types added



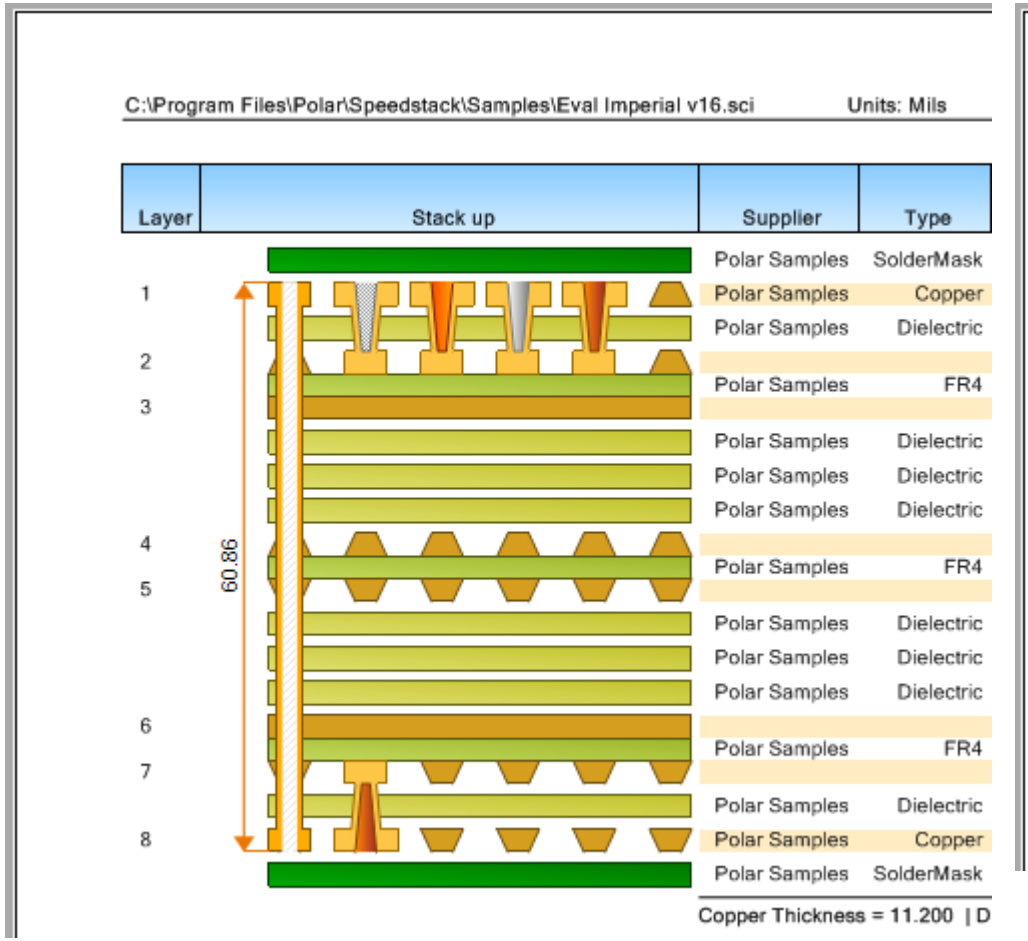
Four new fill types are now supported:

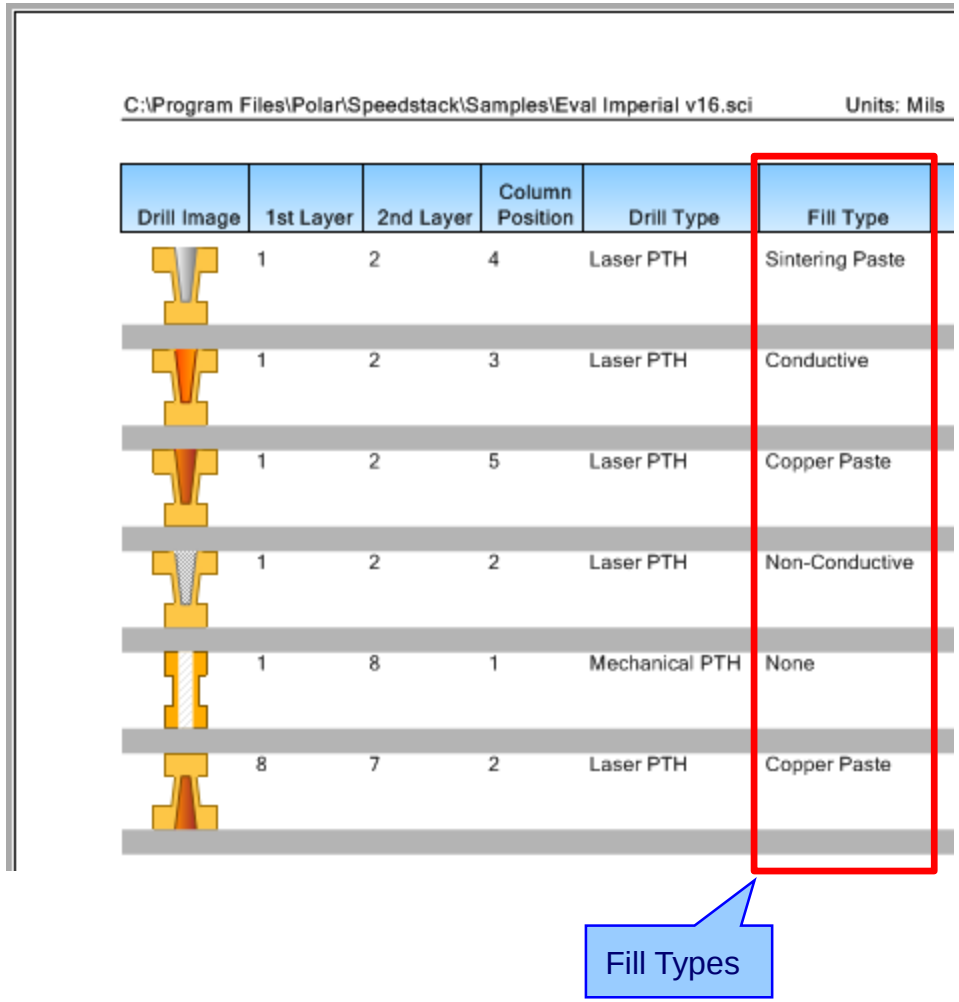
1. Non-Conductive
2. Conductive
3. Sintering Paste
4. Copper Paste

Drill / Via Fill Types – Four new types added



Drill / Via Fill Types – Four new types added





The following Import / Export options have been updated to support new fields introduced with Speedstack 2019:

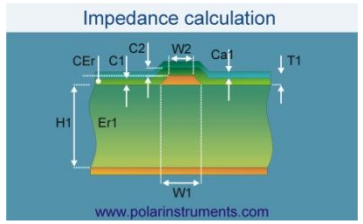
- XML STKX v16.00 and SSX v6.00 import / export options
- IPC-2581 Rev B import / export options
- CSV export option
- Gerber export option
- DXF export option

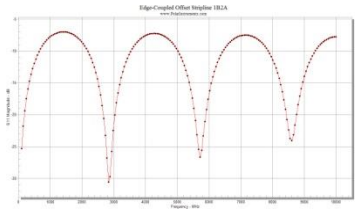
Impedance and Insertion Loss Calculations:

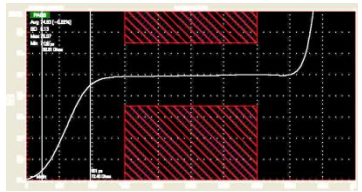
- New amalgamation algorithm – now amalgamates multiple substrates to a single substrate for both dielectric constant and loss tangent
- Modifications implemented to support causal surface roughness

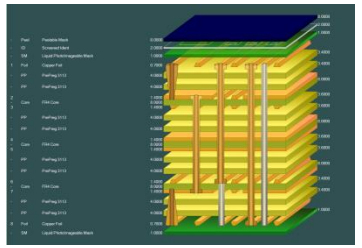
Rigid-Flex Improvements: When introducing air gaps into a sub-stack that previously had contiguous materials it is now possible to reassign this sub-stack to one that contains mini-stacks by using the 'Reset Mini-Stack Settings' option from the Navigator menu. This is especially useful when designing 'book-binder' or 'doublet' rigid-flex constructions

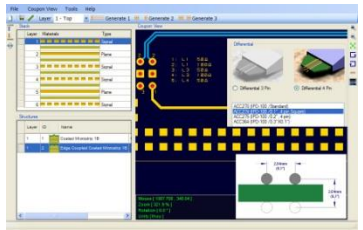
Ucamco Interface: The File menu 'Save and Continue' and 'Save and Quit' options now support the SSX v6.00 file format



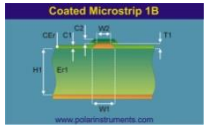


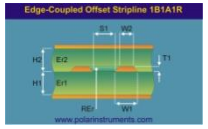


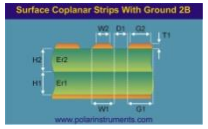


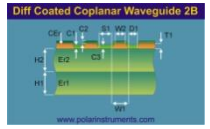


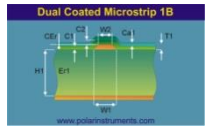
Thank you

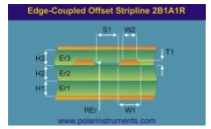


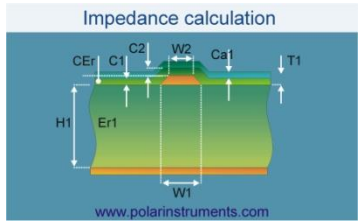


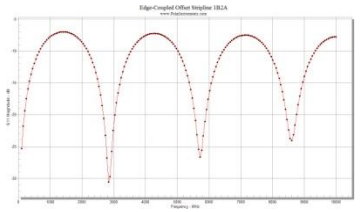


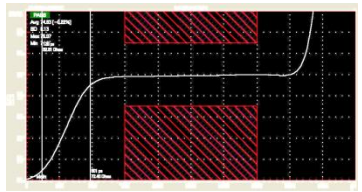


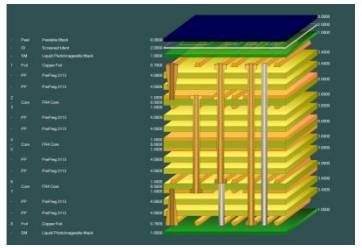


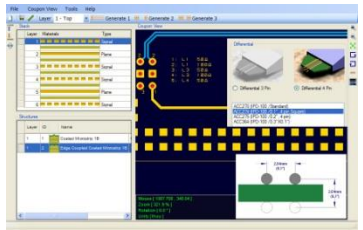












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