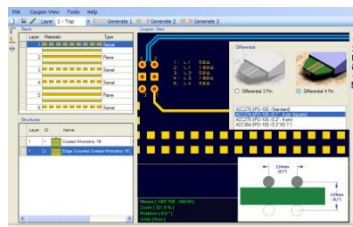


Richard Attrill / John Lee – May 2019 (Rev 2)



Introducing Speedstack 2019

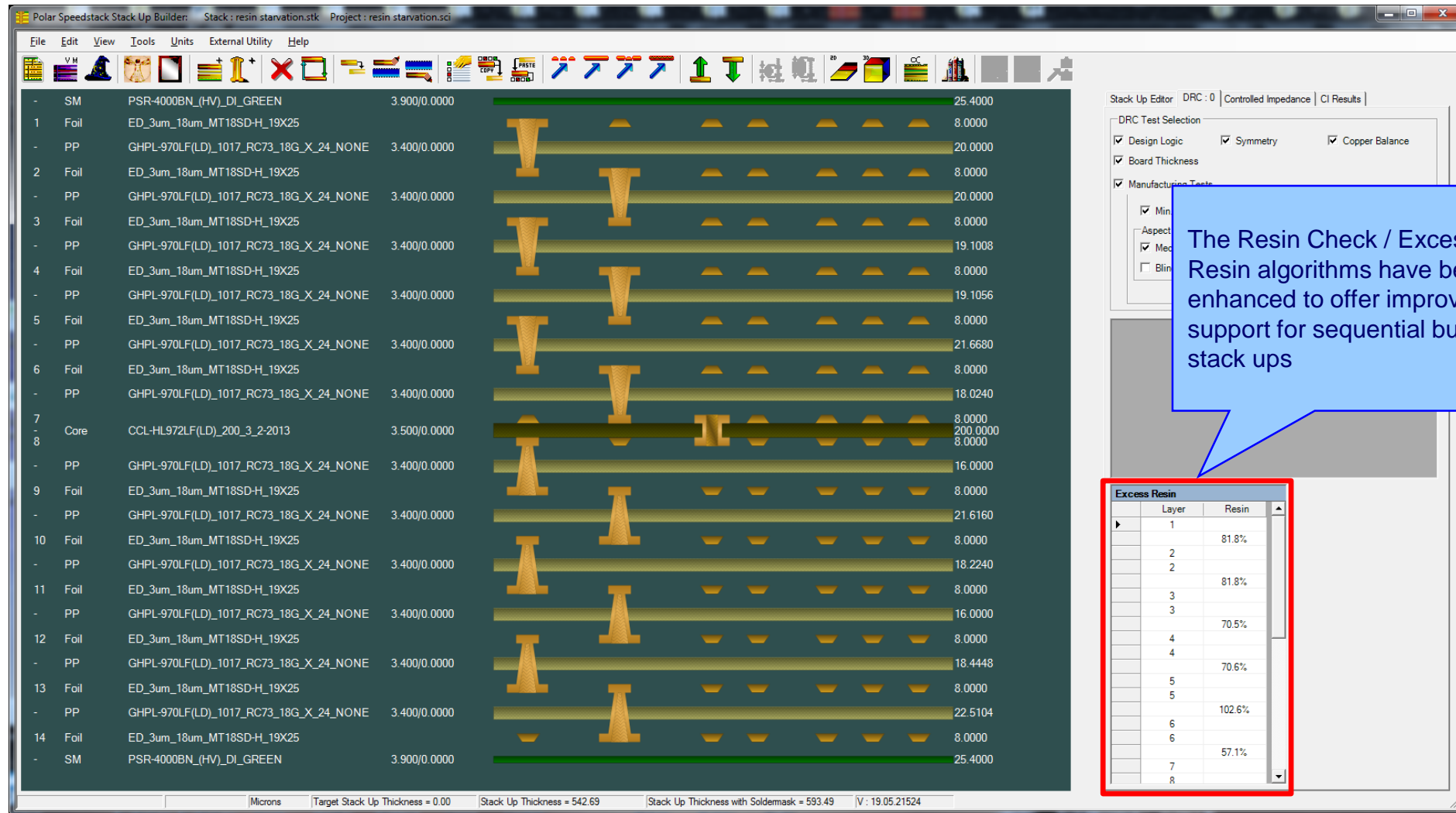
Welcome to a preview of Speedstack 2019.

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

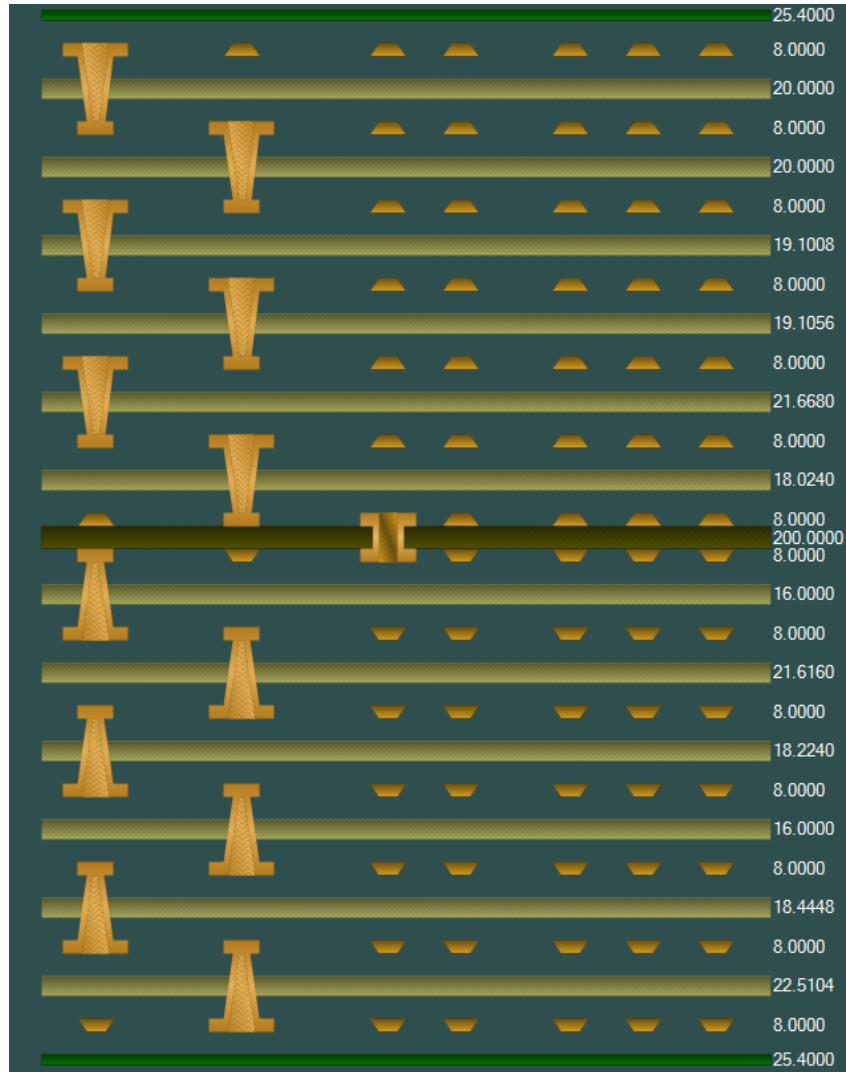
If you would like to have a web-based demonstration please contact your local Polar office – details are shown on the last slide of this presentation.

Speedstack v19.05 (May 2019)

DRC Resin Check / Excess Resin enhancements



DRC Resin Check / Excess Resin enhancements

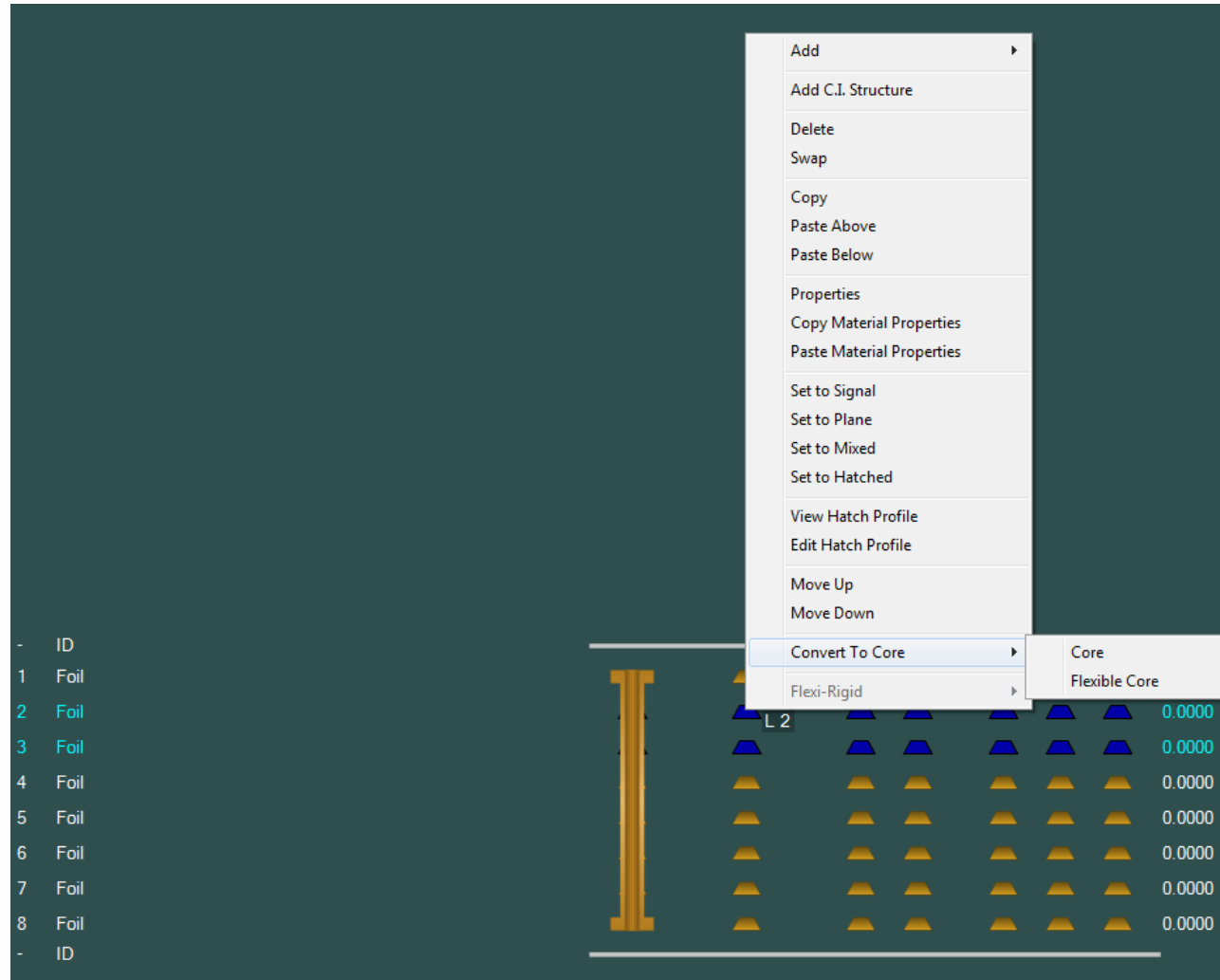


Excess Resin		
	Layer	Resin
▶	1	
		81.8%
	2	
	2	81.8%
	3	
	3	70.5%
	4	
	4	70.6%
	5	
	5	102.6%
	6	
	6	57.1%
	7	
	8	

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

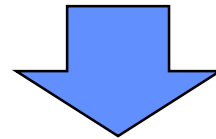


When importing stack up data from some CAD / CAM systems only the electrical layers are defined. In this example an eight layer design has been imported.

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

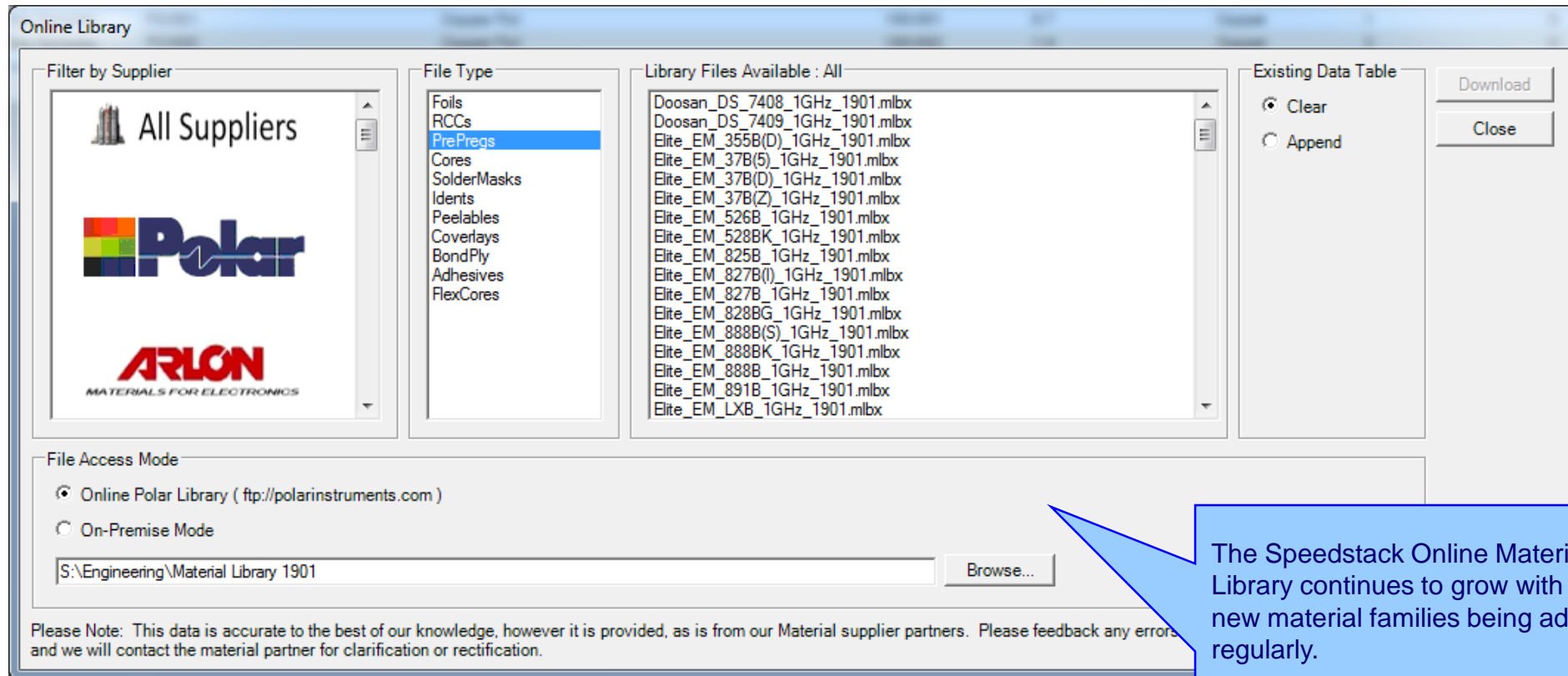
-	ID									
1	Foil									0.0000
2	Foil									0.0000
3	Foil									0.0000
4	Foil									0.0000
5	Foil									0.0000
6	Foil									0.0000
7	Foil									0.0000
8	Foil									0.0000
-	ID									



-	ID									
1	Foil	Copper Foil								1.4000
-	PP	PrePreg 1080	4.200/0.0195							3.0000
2	Core	FR4 Core	4.200/0.0195							1.4000
3										8.0000
-	PP	PrePreg 1080	4.200/0.0195							1.4000
4										3.0000
-	FC	Flex Core	4.200/0.0195							0.7000
5										4.0000
-	PP	PrePreg 1080	4.200/0.0195							0.7000
6										3.0000
-	Core	FR4 Core	4.200/0.0195							1.4000
7										8.0000
-	PP	PrePreg 1080	4.200/0.0195							1.4000
8	Foil	Copper Foil								3.0000
-	ID									

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

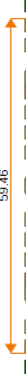
New option to sort structures by type has been included with v19.05:

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.scl Units: Mils



Layer	Stack up	Supplier	Type	Description	Base Thickness	Processed Thickness	Resin Content	εr	Loss Tangent	Impedance ID
1		Polar Samples	SolderMask	Liquid Photolimageable Mask		1.000		4.000	0.0195	
		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
5				12.000	12.000	46.000	4.200	0.0195		
				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					
7				3.000	3.000	60.000	4.200	0.0195		
				1.400	1.400					
	Polar Samples	Dielectric	PrePreg 1080	3.000	1.950	60.000	4.200	0.0195		
8				0.700	0.700				6	
	Polar Samples	SolderMask	Liquid Photolimageable 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	Page 1/X
Date:	Associated Documents:					
Author:						
Department:						
Site:						


www.polarinstruments.com

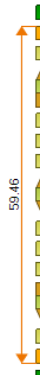
The Footer section is now an optional item and can be hidden

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
1		Polar Samples	SolderMask	Liquid Photolimageable Mask		1.000		4.000	0.0195	
		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				0.700	0.700				6	
	Polar Samples	SolderMask	Liquid Photolimageable 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

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

Override the labels shown in the footer of the printout

Version
[Drawing No]

Date

Author

Department

Site

Clear Okay

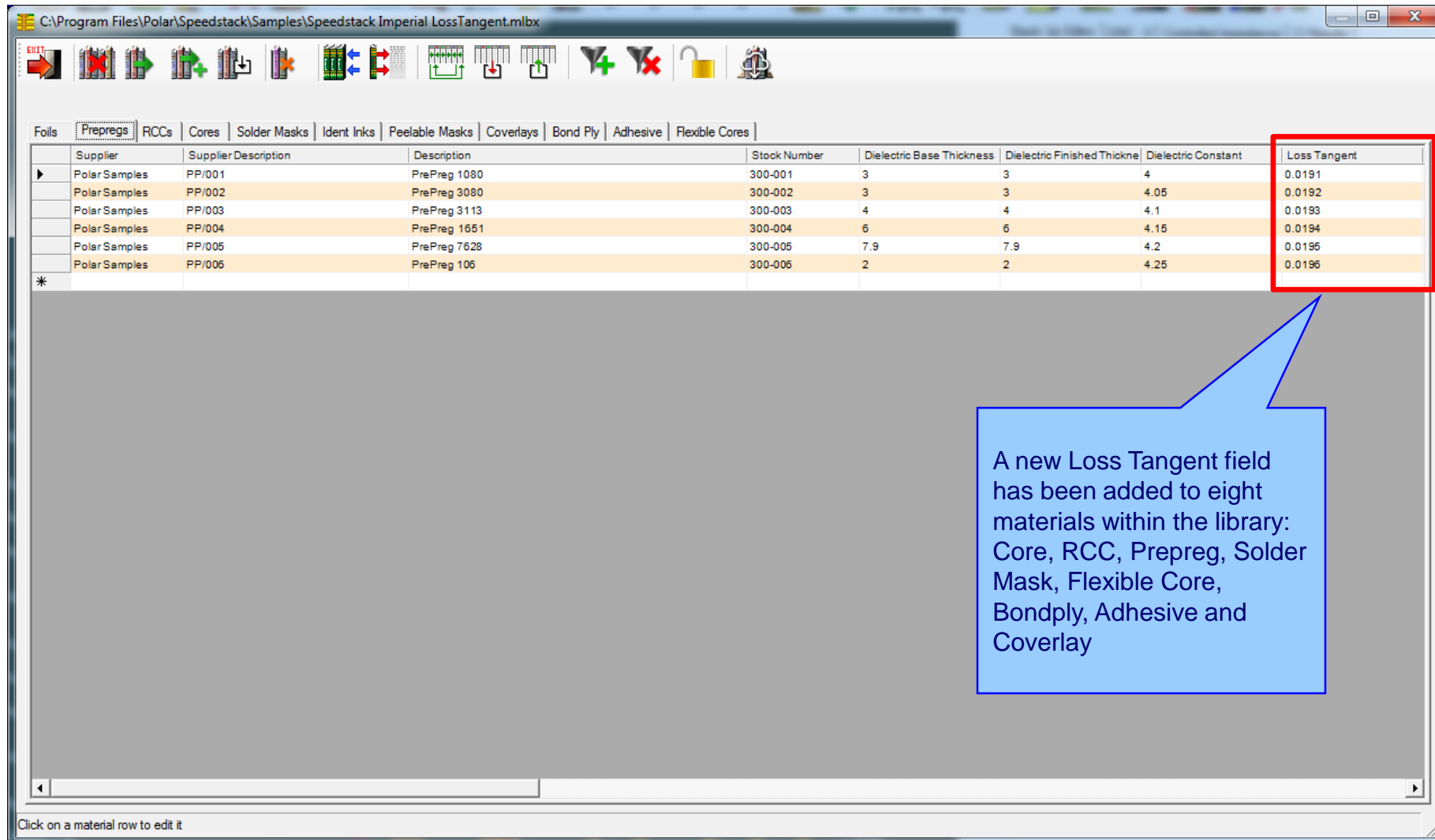
Override footer labels using your own company naming conventions.

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



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 Thickness	Dielectric Constant	Loss Tangent		
	Polar Samples	PP/001	PrePreg 1080	300-001	3	3	4	0.0191		
	Polar Samples	PP/002	PrePreg 3080	300-002	3	3	4.05	0.0192		
	Polar Samples	PP/003	PrePreg 3113	300-003	4	4	4.1	0.0193		
	Polar Samples	PP/004	PrePreg 1651	300-004	6	6	4.15	0.0194		
	Polar Samples	PP/005	PrePreg 7628	300-005	7.9	7.9	4.2	0.0195		
	Polar Samples	PP/006	PrePreg 106	300-006	2	2	4.25	0.0196		

Click on a material row to edit it

Loss Tangent field now available in the Material Library

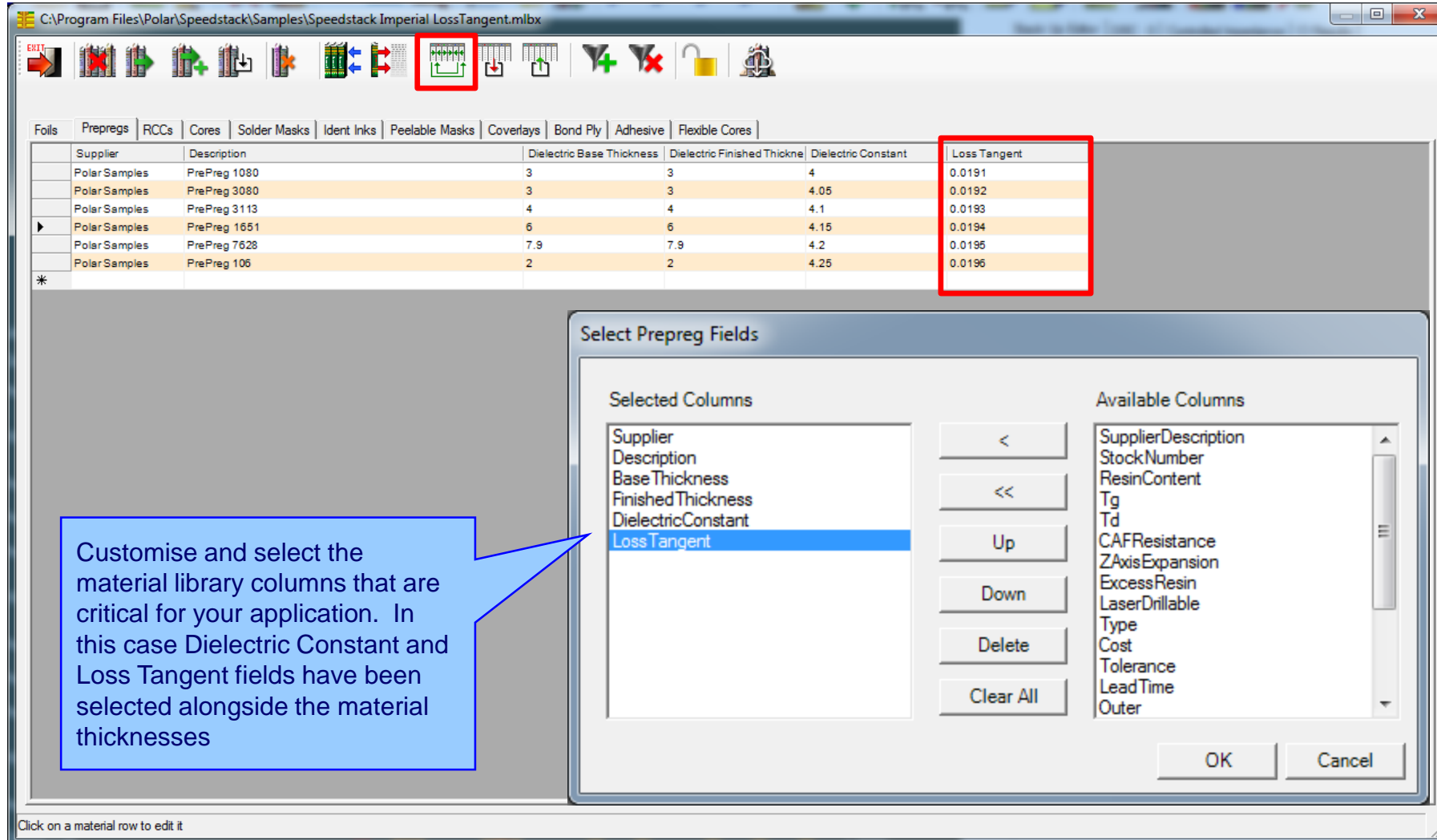
Review/Edit Prepregs

Supplier	Polar Samples	Size	*
Supplier Description	PP/004	Note 1	
Description	PrePreg 1651	Note 2	
Stock Number	300-004	Note 3	
Type	Dielectric		
Base Thickness	6.0000		
Finished Thickness	6.0000		
Dielectric Constant	4.15		
Loss Tangent	0.0194		
Resin Content	47		
Tg	180		
Td	0		
CAF Resistance	0		
Z Axis Expansion	0		
Excess Resin	0.0000		
Tolerance +/-	10		
Cost	4		
Lead Time	0		
Laser Drillable	<input type="checkbox"/>		
Use in Auto Stack	<input checked="" type="checkbox"/>		
Next To Foils	<input checked="" type="checkbox"/>		

[Add](#) [Delete](#) << < 4 of 6 > >> [OK](#)

The Loss Tangent field is an important dielectric material property that is used when calculating frequency dependent insertion loss

Loss Tangent field now available in the Material Library



The screenshot shows the Speedstack Imperial LossTangent.mlbx window. The Material Library table is displayed with the following columns: Supplier, Description, Dielectric Base Thickness, Dielectric Finished Thickness, Dielectric Constant, and Loss Tangent. The Loss Tangent column is highlighted with a red box. The Select Prepreg Fields dialog box is open, showing the Selected Columns list with Supplier, Description, Base Thickness, Finished Thickness, Dielectric Constant, and Loss Tangent. The Available Columns list includes SupplierDescription, StockNumber, ResinContent, Tg, Td, CAFResistance, ZAxisExpansion, ExcessResin, LaserDrillable, Type, Cost, Tolerance, LeadTime, and Outer. A blue callout box points to the dialog box with the text: "Customise and select the material library columns that are critical for your application. In this case Dielectric Constant and Loss Tangent fields have been selected alongside the material thicknesses".

Supplier	Description	Dielectric Base Thickness	Dielectric Finished Thickness	Dielectric Constant	Loss Tangent
PolarSamples	PrePreg 1080	3	3	4	0.0191
PolarSamples	PrePreg 3080	3	3	4.05	0.0192
PolarSamples	PrePreg 3113	4	4	4.1	0.0193
PolarSamples	PrePreg 1651	6	6	4.15	0.0194
PolarSamples	PrePreg 7628	7.9	7.9	4.2	0.0195
PolarSamples	PrePreg 106	2	2	4.25	0.0196

Customise and select the material library columns that are critical for your application. In this case Dielectric Constant and Loss Tangent fields have been selected alongside the material thicknesses

Select Prepreg Fields

Selected Columns

- Supplier
- Description
- Base Thickness
- Finished Thickness
- Dielectric Constant
- Loss Tangent

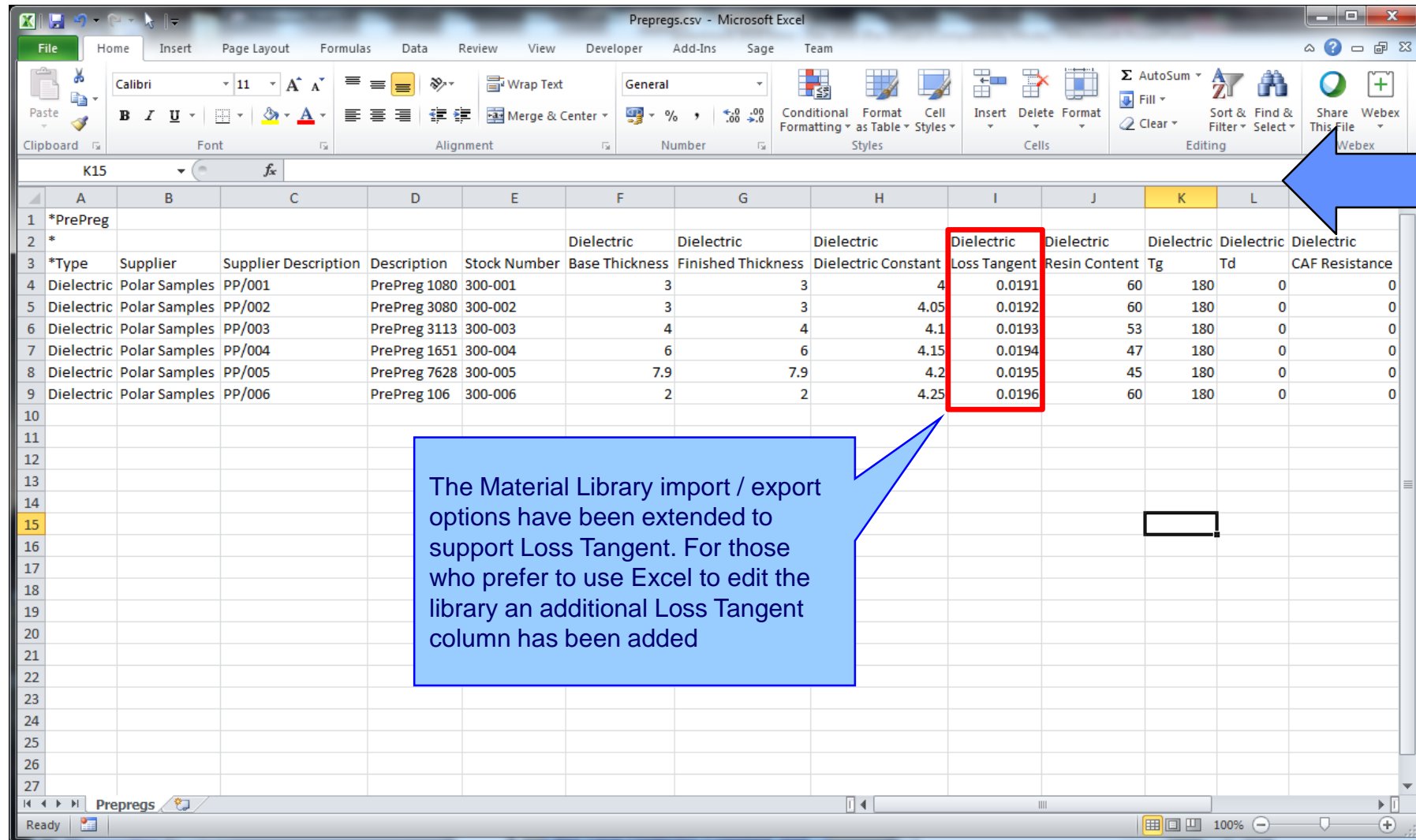
Available Columns

- SupplierDescription
- StockNumber
- ResinContent
- Tg
- Td
- CAFResistance
- ZAxisExpansion
- ExcessResin
- LaserDrillable
- Type
- Cost
- Tolerance
- LeadTime
- Outer

OK Cancel

Click on a material row to edit it

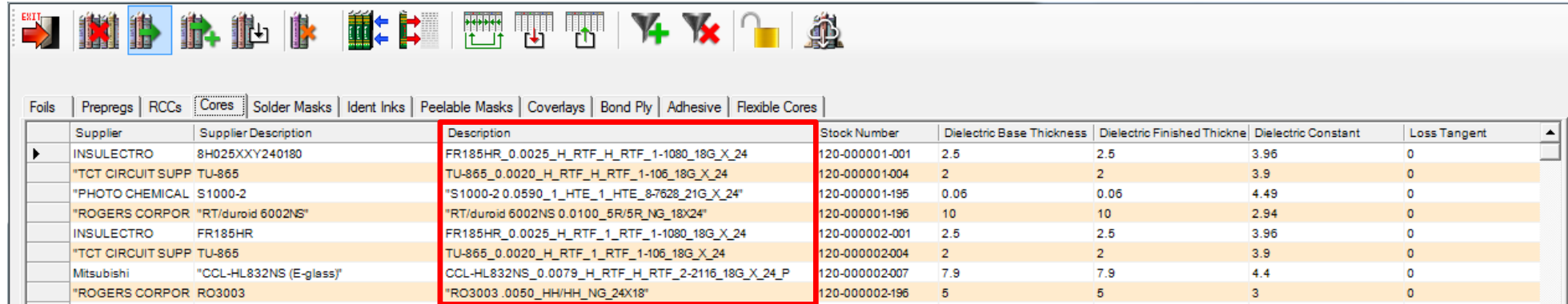
Loss Tangent field now available in the Material Library



The Material Library import / export options have been extended to support Loss Tangent. For those who prefer to use Excel to edit the library an additional Loss Tangent column has been added

*PrePreg						Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric
*Type	Supplier	Supplier Description	Description	Stock Number	Base Thickness	Finished Thickness	Dielectric Constant	Loss Tangent	Resin Content	Tg	Td	CAF Resistance
Dielectric	Polar Samples	PP/001	PrePreg 1080	300-001	3	3	4	0.0191	60	180	0	0
Dielectric	Polar Samples	PP/002	PrePreg 3080	300-002	3	3	4.05	0.0192	60	180	0	0
Dielectric	Polar Samples	PP/003	PrePreg 3113	300-003	4	4	4.1	0.0193	53	180	0	0
Dielectric	Polar Samples	PP/004	PrePreg 1651	300-004	6	6	4.15	0.0194	47	180	0	0
Dielectric	Polar Samples	PP/005	PrePreg 7628	300-005	7.9	7.9	4.2	0.0195	45	180	0	0
Dielectric	Polar Samples	PP/006	PrePreg 106	300-006	2	2	4.25	0.0196	60	180	0	0

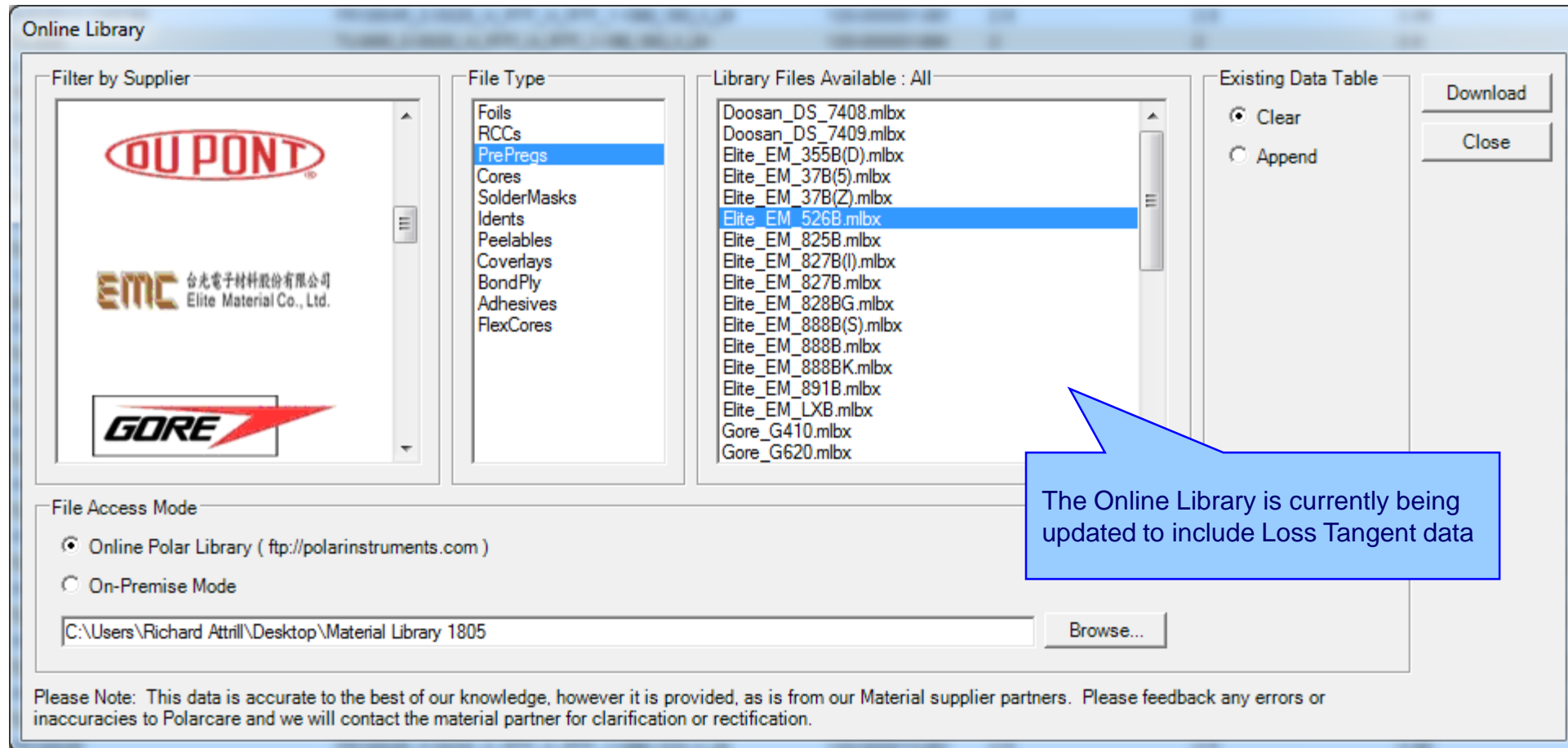
Description column width has been increased



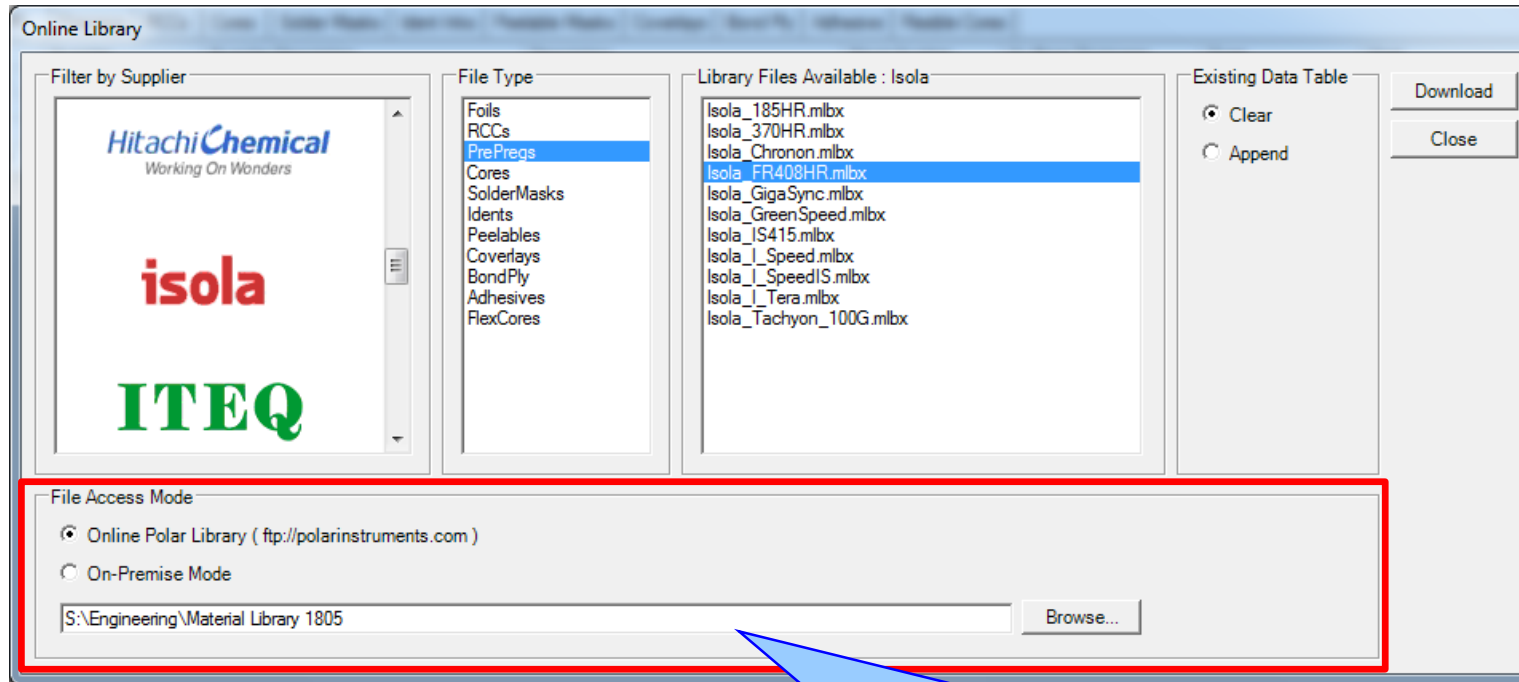
Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickne	Dielectric Constant	Loss Tangent
INSULECTRO	8H025XXY240180	FR185HR_0.0025_H_RTF_H_RTF_1-1080_18G_X_24	120-000001-001	2.5	2.5	3.96	0
"TCT CIRCUIT SUPP	TU-865	TU-865_0.0020_H_RTF_H_RTF_1-106_18G_X_24	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

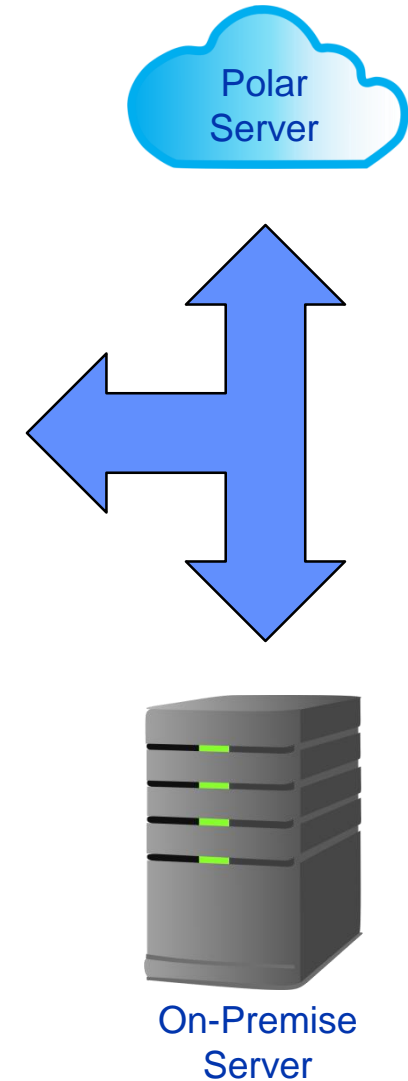
Online Library – Now supports libraries containing Loss Tangent data



Online Library – On-Premise Mode has been enhanced

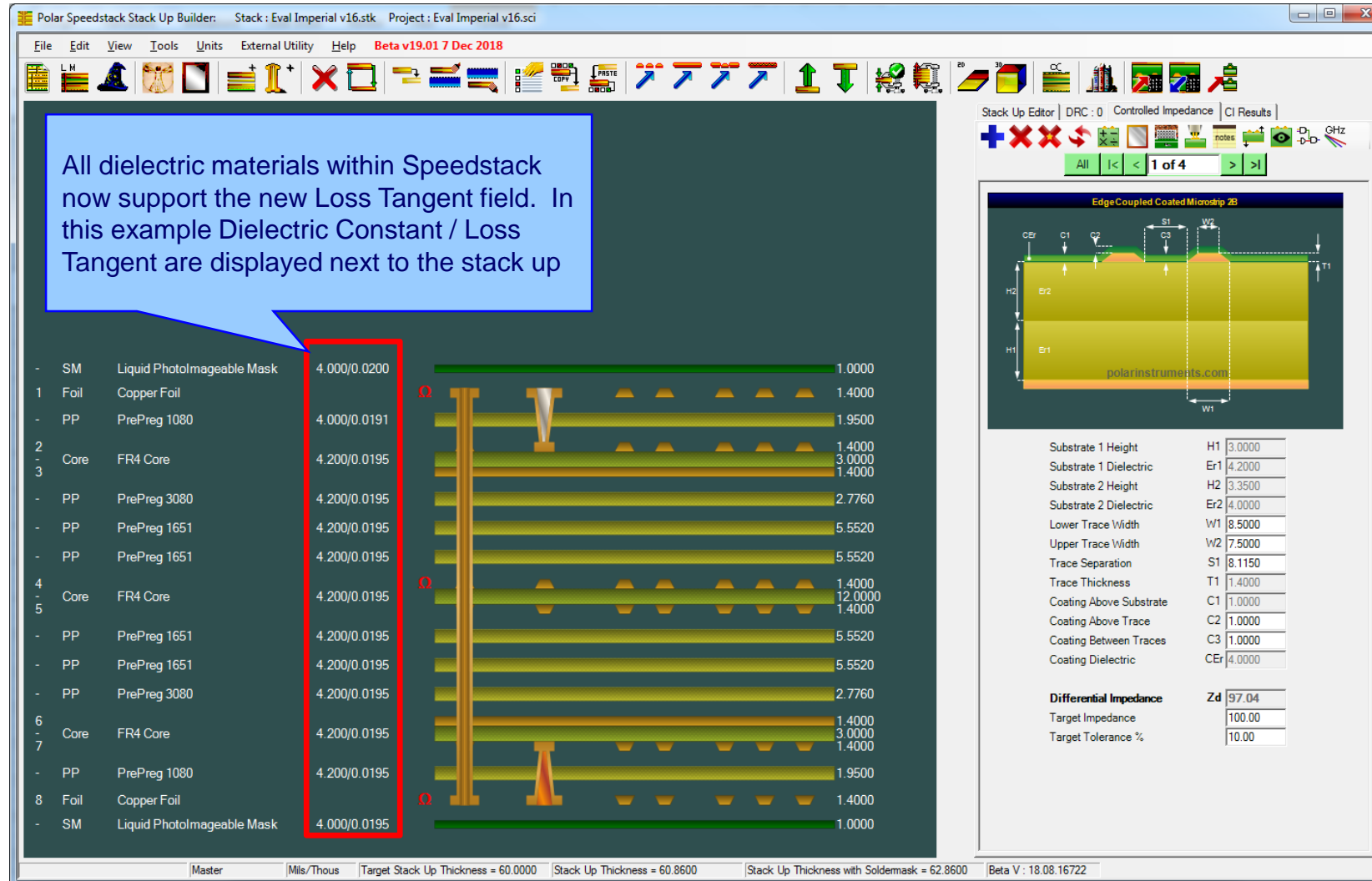


The Online Library can access the latest material library data from either the Polar FTP Server or an On-Premise Server. The On-Premise Mode is ideal for those users where internal security policies prevent access to external FTP servers. Further enhancements have been made when no access to the Polar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



Stack Up Editor Enhancements – Support for Loss Tangent

All dielectric materials within Speedstack now support the new Loss Tangent field. In this example Dielectric Constant / Loss Tangent are displayed next to the stack up



Layer	Material	Dielectric Constant / Loss Tangent	Thickness (in)
SM	Liquid Photolimageable Mask	4.000/0.0200	1.0000
1	Foil	Copper Foil	1.4000
PP	PrePreg 1080	4.000/0.0191	1.9500
2	Core	FR4 Core	1.4000
3	Core	FR4 Core	3.0000
PP	PrePreg 3080	4.200/0.0195	1.4000
PP	PrePreg 1651	4.200/0.0195	2.7760
PP	PrePreg 1651	4.200/0.0195	5.5520
PP	PrePreg 1651	4.200/0.0195	5.5520
4	Core	FR4 Core	1.4000
5	Core	FR4 Core	12.0000
PP	PrePreg 1651	4.200/0.0195	1.4000
PP	PrePreg 1651	4.200/0.0195	5.5520
PP	PrePreg 1651	4.200/0.0195	5.5520
PP	PrePreg 3080	4.200/0.0195	2.7760
6	Core	FR4 Core	1.4000
7	Core	FR4 Core	3.0000
PP	PrePreg 1080	4.200/0.0195	1.4000
8	Foil	Copper Foil	1.9500
SM	Liquid Photolimageable Mask	4.000/0.0195	1.4000
			1.0000

Stack Up Editor | DRC: 0 | Controlled Impedance | CI Results

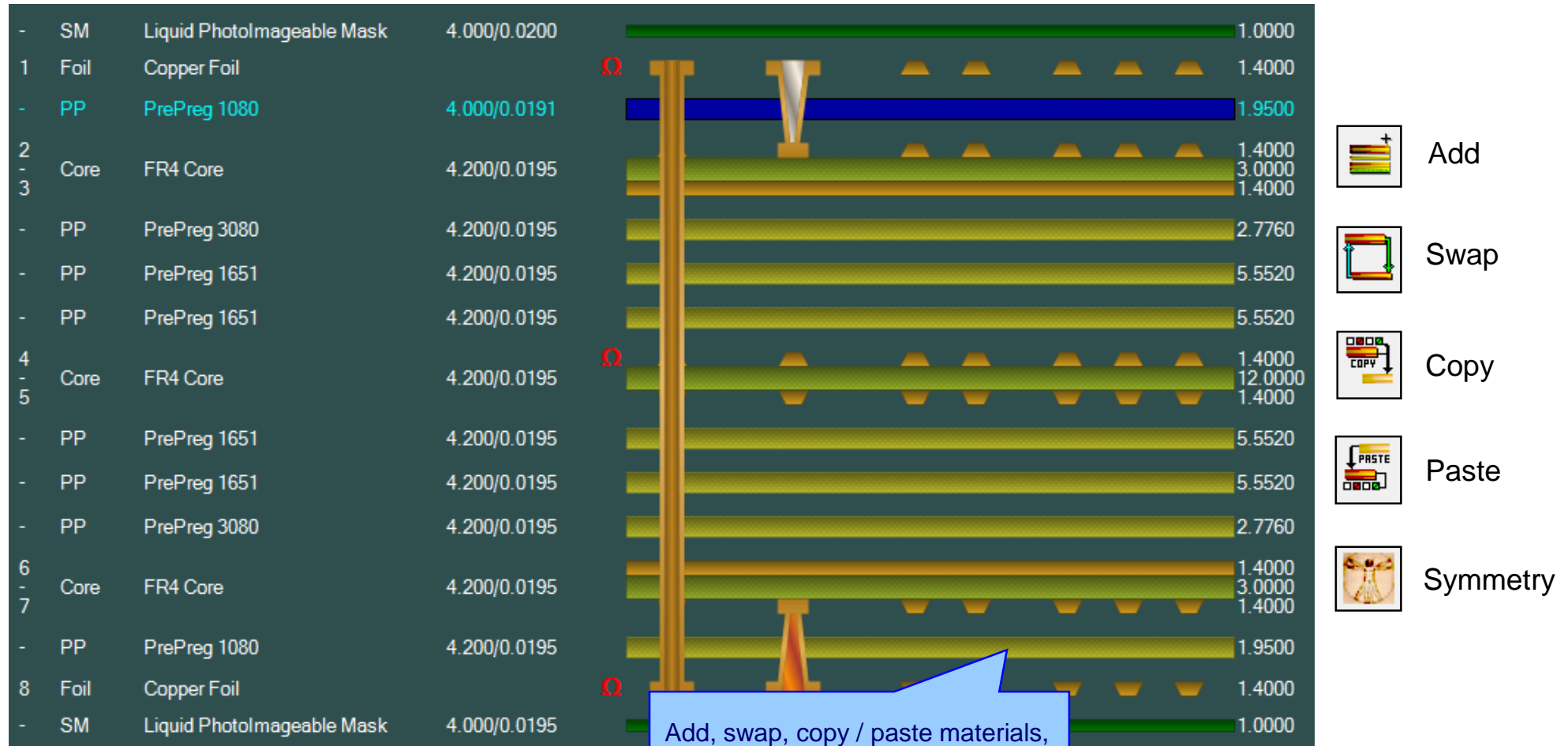
Edge Coupled Coated Microstrip 2D

Substrate 1 Height H1 3.0000
Substrate 1 Dielectric Er1 4.2000
Substrate 2 Height H2 3.3500
Substrate 2 Dielectric Er2 4.0000
Lower Trace Width W1 8.5000
Upper Trace Width W2 7.5000
Trace Separation S1 8.1150
Trace Thickness T1 1.4000
Coating Above Substrate C1 1.0000
Coating Above Trace C2 1.0000
Coating Between Traces C3 1.0000
Coating Dielectric CEr 4.0000

Differential Impedance Zd 97.04
Target Impedance 100.00
Target Tolerance % 10.00

Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 62.8600 | Stack Up Thickness with Soldermask = 62.8600 | Beta V: 18.08.16722

Stack Up Editor Enhancements – Support for Loss Tangent



Stack Up Editor Enhancements – Support for Loss Tangent

-	SM	Liquid PhotImageable Mask	4.000/0.0200	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.000/0.0191	1.9500
2	Core	FR4 Core	4.200/0.0195	3.0000
3				1.4000



Properties

Prepreg Properties

Main | Notes | Attributes

General Information

Supplier: Polar Samples

Supplier Description: PP/001

Description: PrePreg 1080

Stock Number: 300-001

Type: Dielectric

Cost: 1.00

Tolerance: 10.00

Lead Time: 0.00

Apply

Close

Dielectric

Base Thickness: 3.0000

Finished Thickness: 3.0000

Dielectric Constant: 4.0000

Loss Tangent: 0.0191

Resin Content %: 60.00

Tg: 180.0


Td: 0.0

CAF Resistance: 0.0

Z Axis Expansion: 0.0

Excess Resin: 0.0000

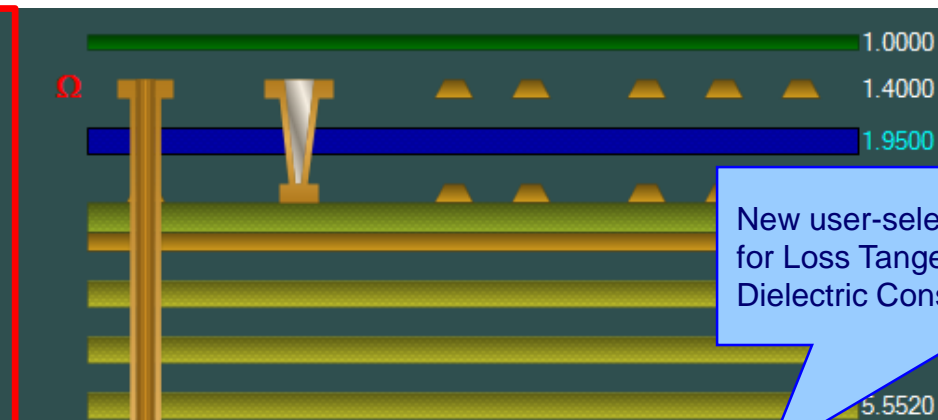
Isolation Distance: 1.9500

Graphical Colour: 

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 Photolmageable 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 Photolmageable Mask	4.000/0.0195



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

Configuration Options

External Utilities | Rebuild and Calculate Structures |

General | Structure Defaults | Licensing | File Locations | Goal Seeking | User | CITS Test | Colours | Miscellaneous | Hatch Defaults |

Default Stack Up View

☒ 2D ☐ 3D

Display Data

Display Fields 1 and 2 are reserved for Layer Numbers and Layer Types

Display Field 3: Description

Display Field 4: Dielectric Constant/Loss Tangent

Display Field 5: Processed Thickness

Units

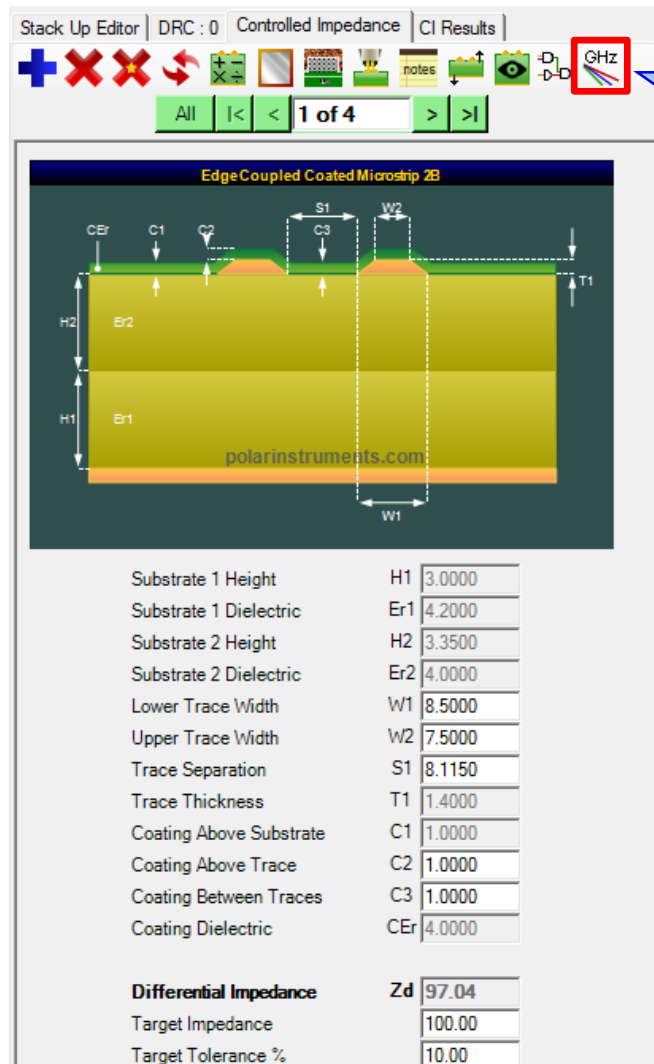
☒ Mils/Thous ☐ Microns ☐ Millimetres

☒ Open last used file on application start up

☒ Display File Properties Dialog for New Stackups and Projects

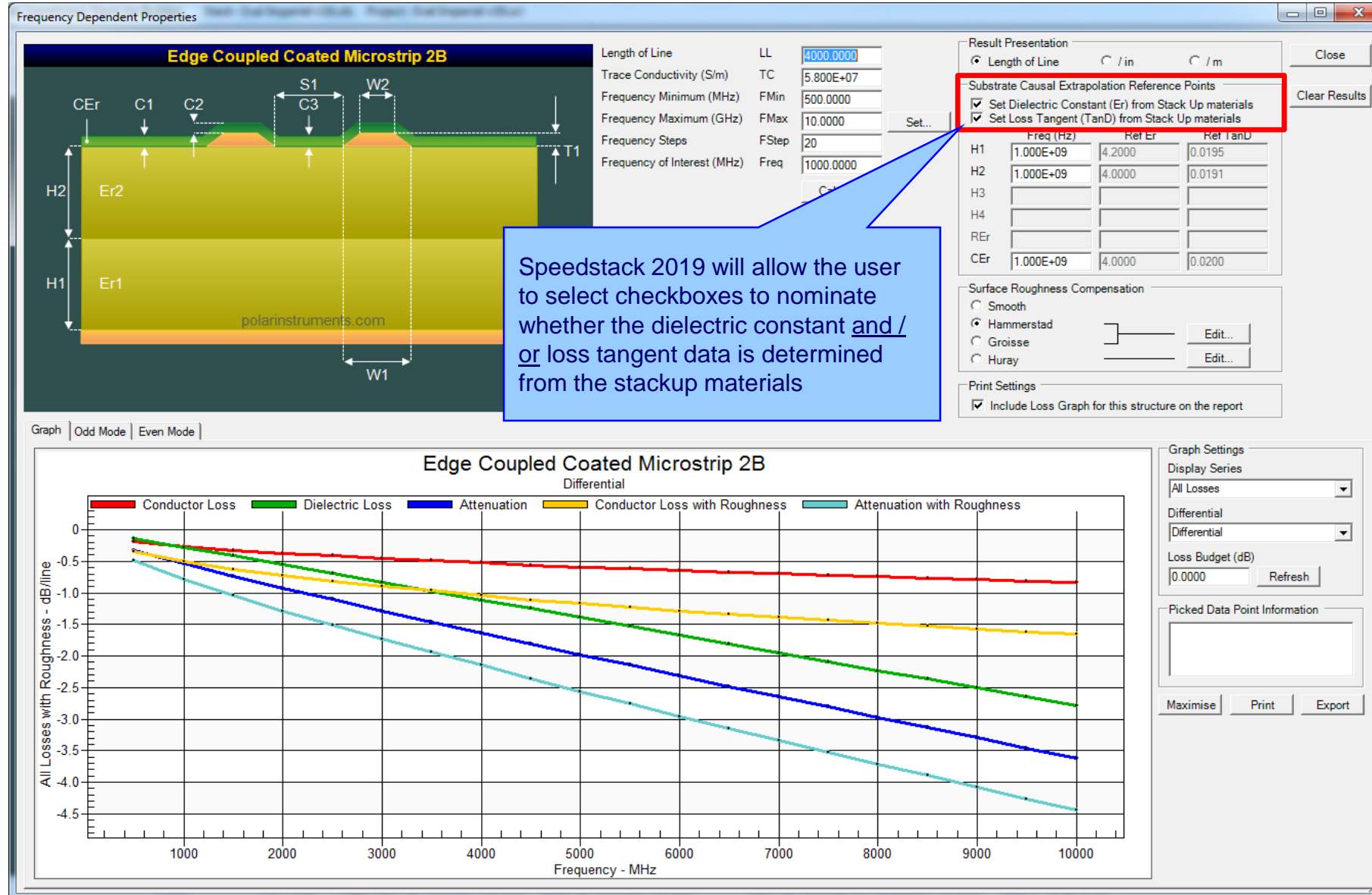
Apply Cancel

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

Substrate Causal Extrapolation Reference Points

☒ Set Dielectric Constant (Er) from Stack Up materials
☒ Set Loss Tangent (TanD) from Stack Up materials

	Freq (Hz)	Ref Er	Ref TanD
H1	1.000E+09	4.2000	0.0195
H2	1.000E+09	4.0000	0.0191
H3			
H4			
REr			
CEr	1.000E+09	4.0000	0.0200

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

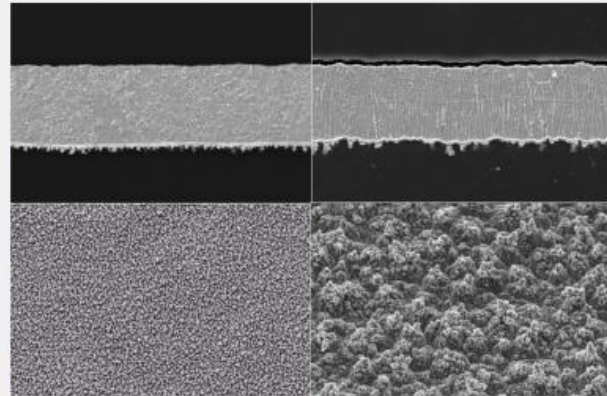
These substrate properties including dielectric constant (Er) and loss tangent (TanD) are specified here for each structure substrate region.

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.

Surface Roughness Compensation

☐ Smooth
☐ Hammerstad
☐ Grosse
☒ Huray

Surface Roughness Compensation - Huray - BETA



Ratio of Areas: 1.0000
Effective Ball Radius (µm): 0.7500
Area of Ball Count (sq µm): 32.0000
Number of Balls in Area: 32

Images by courtesy of Circuit Foil Luxembourg

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

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

Virtual Material Mode enhancements

Stack Up Wizard (Virtual Material Mode)

Number of Layers	8	Nominal Dielectric Constant	4.2000
Target Stack Up Thickness	60.0000	Nominal Loss Tangent	0.0195
Positive Tolerance %	10	Solder Mask Top <input checked="" type="checkbox"/> Solder Mask Bottom <input checked="" type="checkbox"/>	
Negative Tolerance %	10	Solder Mask Dielectric Constant	4.0000
Symmetrical <input checked="" type="checkbox"/>		Solder Mask Loss Tangent	0.0210
Plane Layers	Mixed Layers	Solder Mask Thickness	1.0000
1	1	Preferred Core Thickness	6.0000
2	2	Copper Thickness	1.0000
3	3		
4	4		
5	5		
6	6		
7	7		
8	8		

Build Type

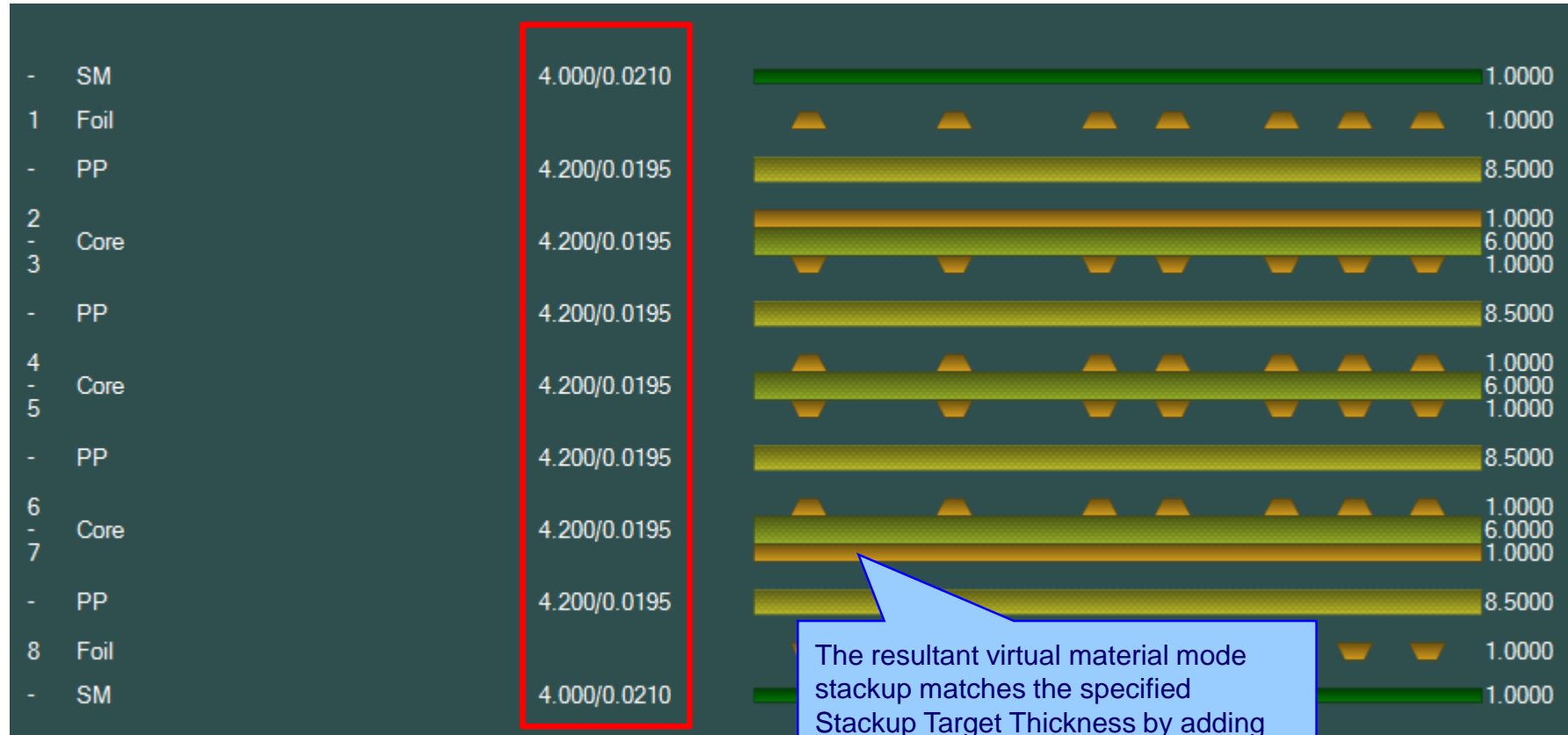
☒ Foil ☐ Core ☐ Sequential/HDI

<Previous Next >

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



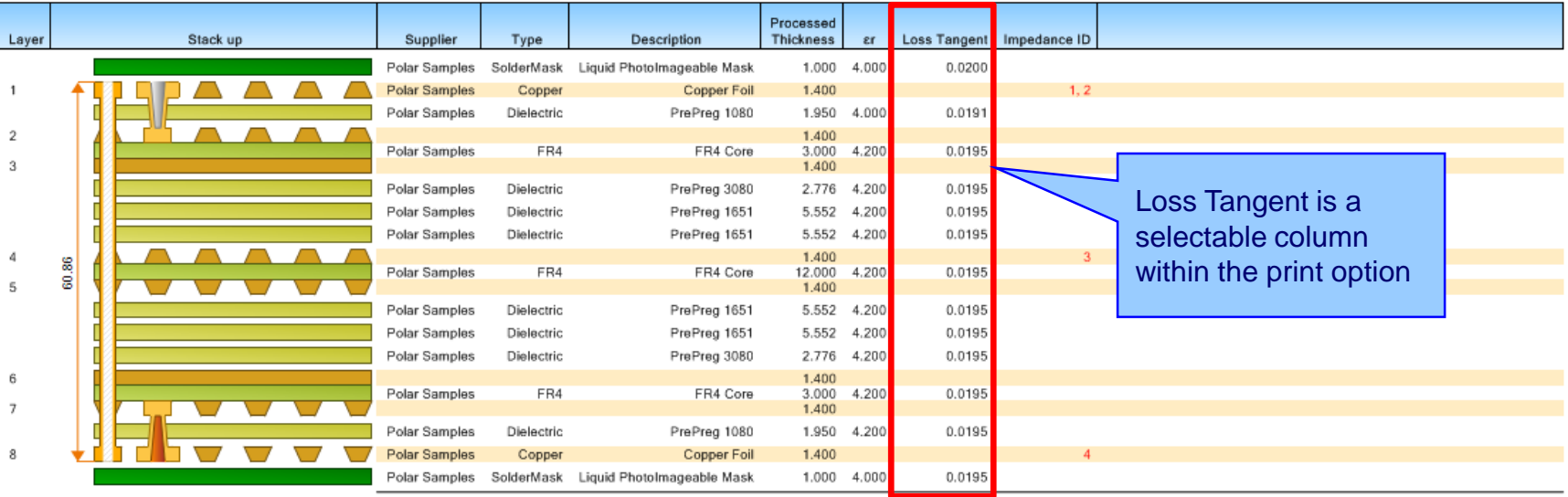
Printing Enhancements – Support for Loss Tangent

Speedstack Report Printer

File Options

C:\Program Files\Polar\Speedstack\Samples\Eval Imperial v16.sci Units: Mills

Display Page 1

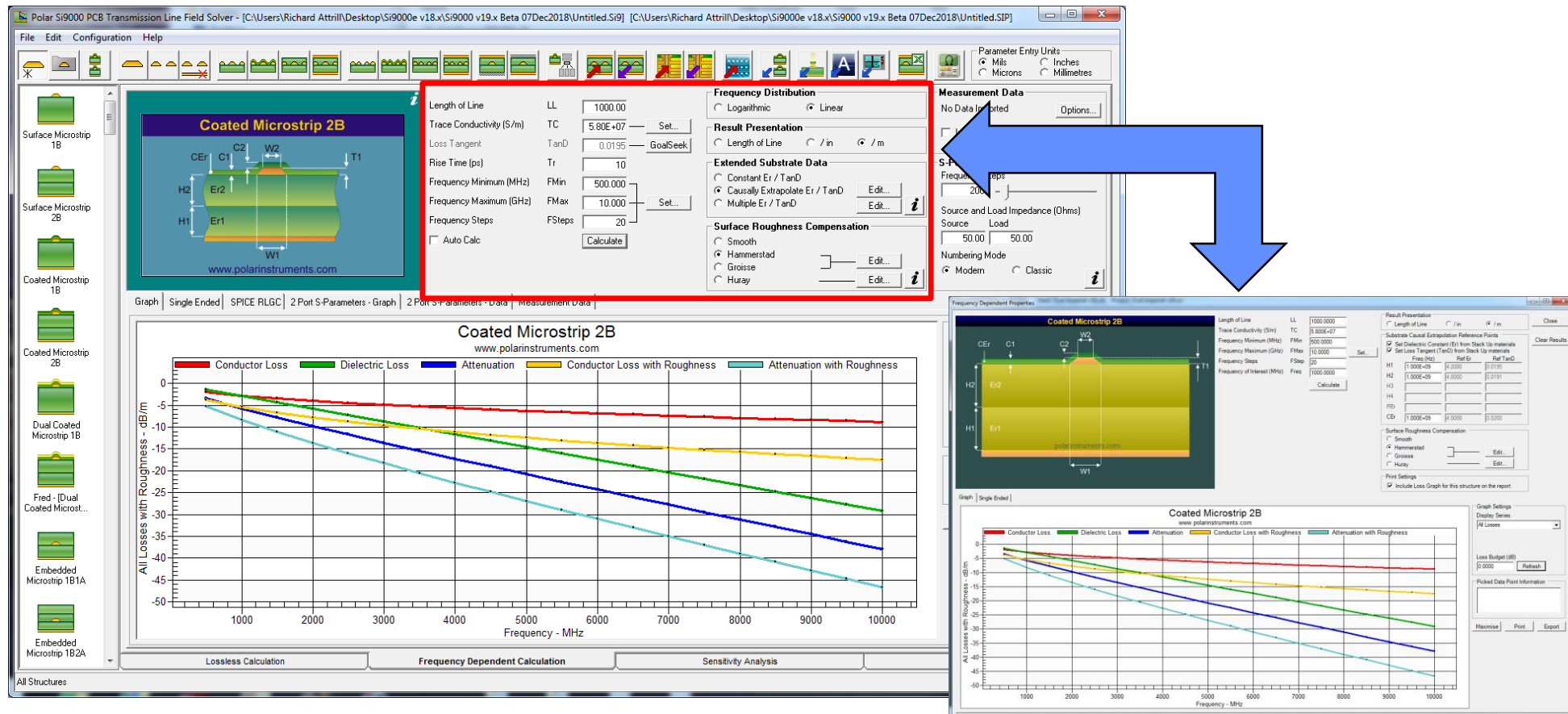


Layer	Stack up	Supplier	Type	Description	Processed Thickness	εr	Loss Tangent	Impedance ID
		Polar Samples	SolderMask	Liquid Photoimageable Mask	1.000	4.000	0.0200	
1		Polar Samples	Copper	Copper Foil	1.400			1, 2
2		Polar Samples	Dielectric	PrePreg 1080	1.950	4.000	0.0191	
3		Polar Samples	FR4	FR4 Core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

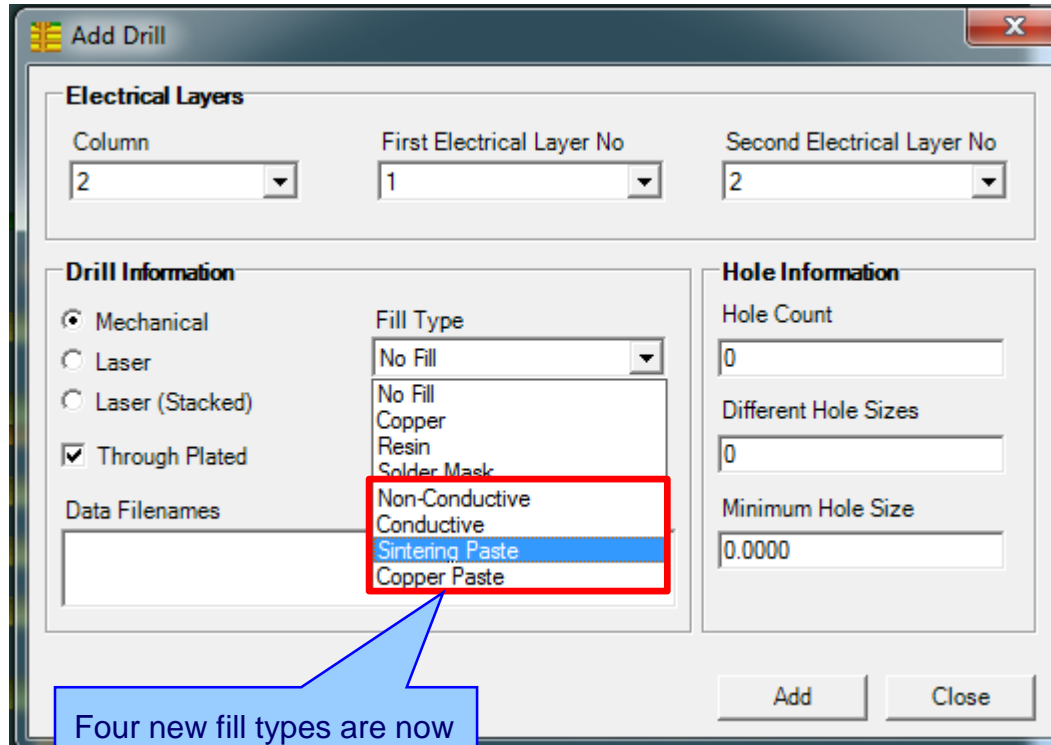
Copper Thickness = 11.200 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 60.860 | Stack Up Thickness with Soldermask = 62.860

Loss Tangent is a selectable column within the print option

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.



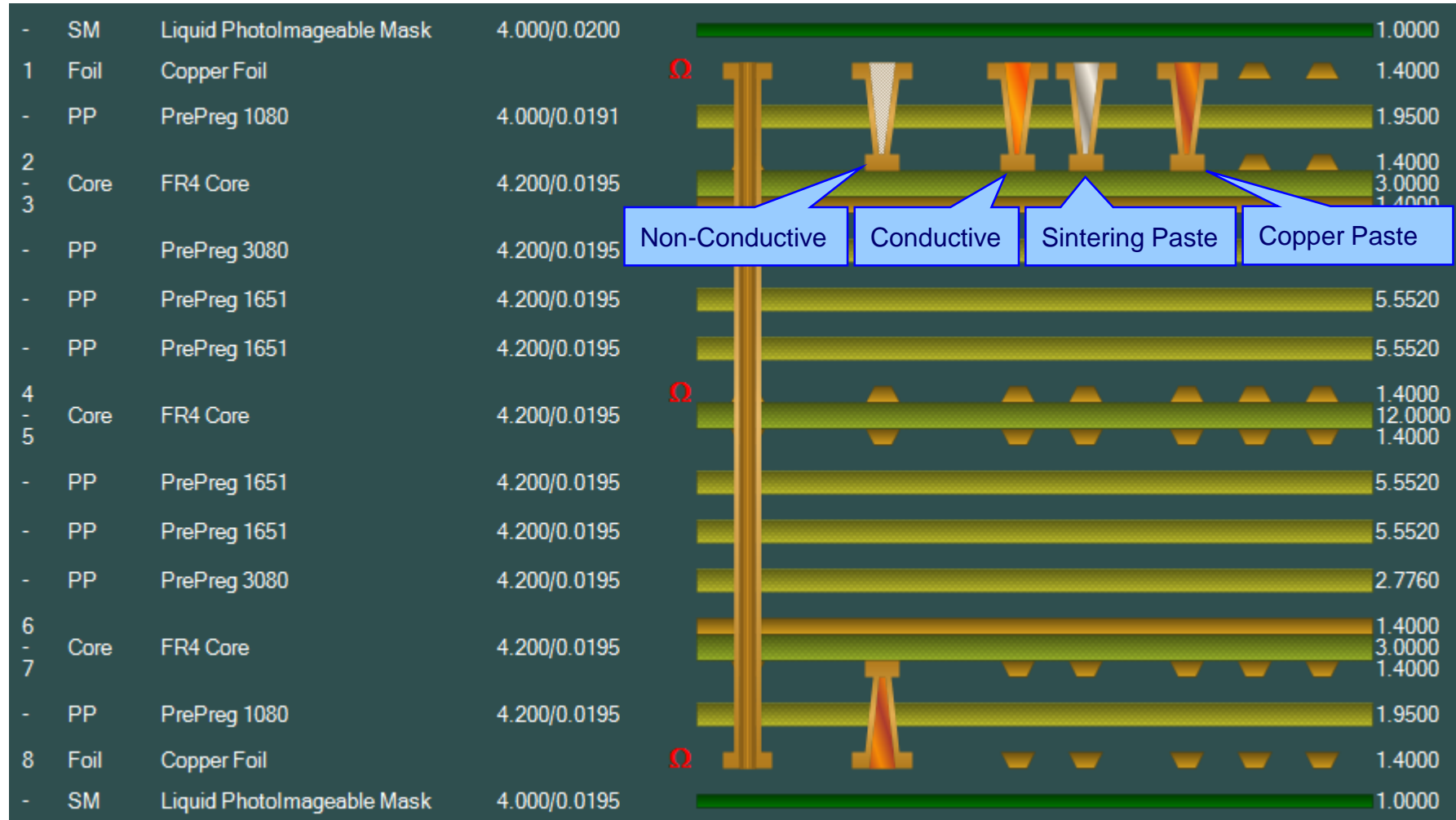
Drill / Via Fill Types – Four new types added



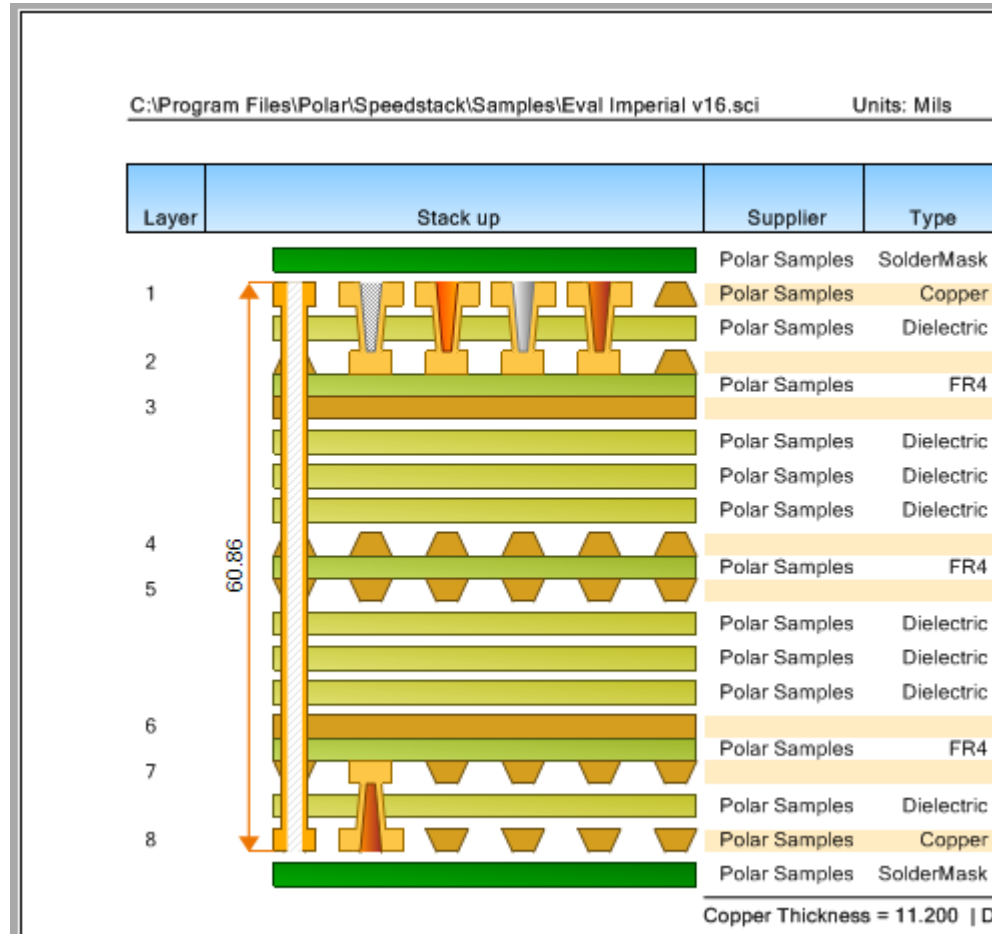
Four new fill types are now supported:

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



C:\Program Files\Polar\Speedstack\Samples\Eval Imperial v16.sci Units: Mils

Drill Image	1st Layer	2nd Layer	Column Position	Drill Type	Fill Type
	1	2	4	Laser PTH	Sintering Paste
	1	2	3	Laser PTH	Conductive
	1	2	5	Laser PTH	Copper Paste
	1	2	2	Laser PTH	Non-Conductive
	1	8	1	Mechanical PTH	None
	8	7	2	Laser PTH	Copper Paste

Fill Types

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

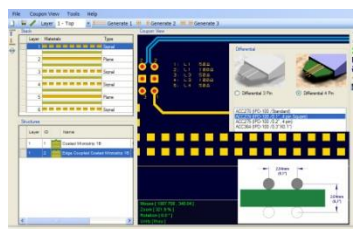
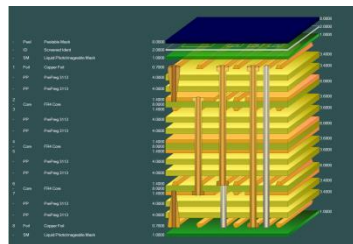
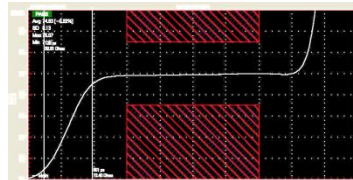
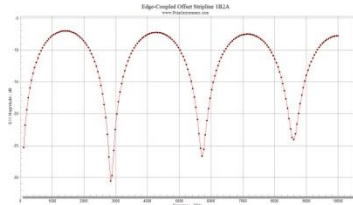
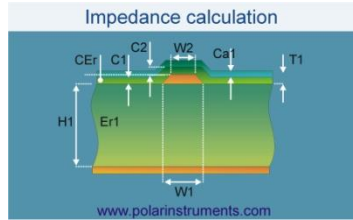
- XML STKX v16.00 and SSX v6.00 import / export options
- IPC-2581 Rev B import / export options
- CSV export option
- Gerber export option
- DXF export option

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

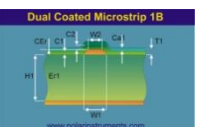
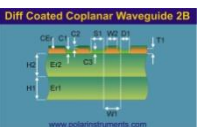
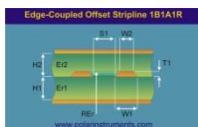
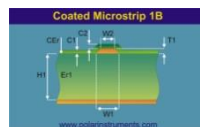
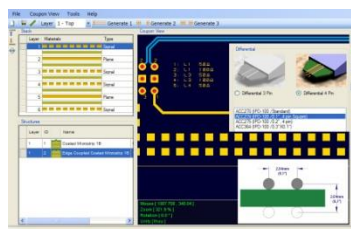
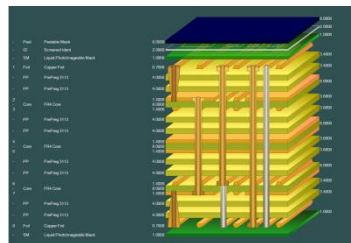
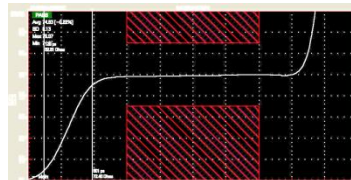
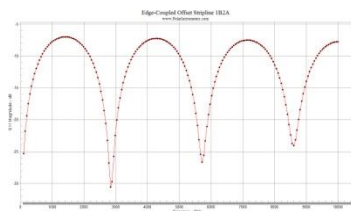
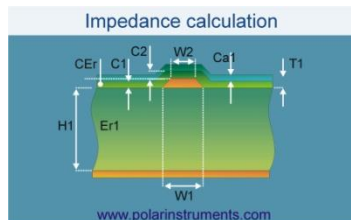


Thank you



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