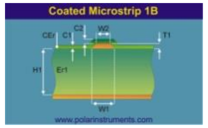
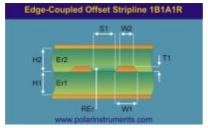
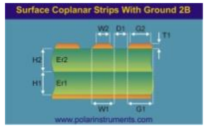
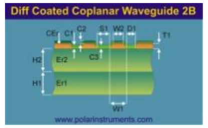
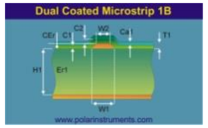
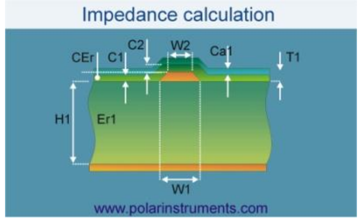
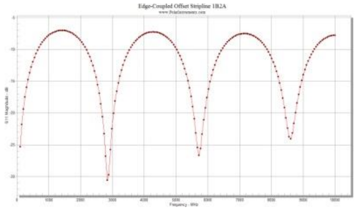
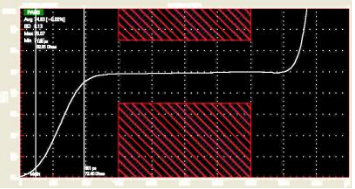

Coated Microstrip 1B
www.polarinstruments.com

Edge-Coupled Offset Stripline 1B1A1R
www.polarinstruments.com

Surface Coplanar Strips With Ground 2B
www.polarinstruments.com

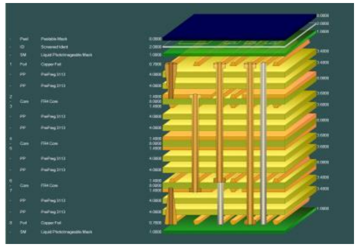
Coated Coplanar Strips 2B
www.polarinstruments.com

Diff Coated Coplanar Waveguide 2B
www.polarinstruments.com

Dual Coated Microstrip 1B
www.polarinstruments.com

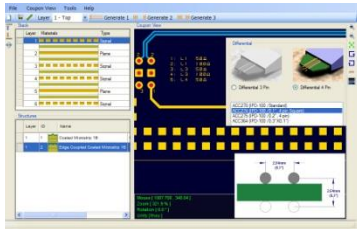
Edge-Coupled Offset Stripline 2B1A1R
www.polarinstruments.com


Impedance calculation
CEr
C1
C2
W2
Ca1
T1
H1
Er1
W1
www.polarinstruments.com









Speedstack 2021 - 2024 Updates

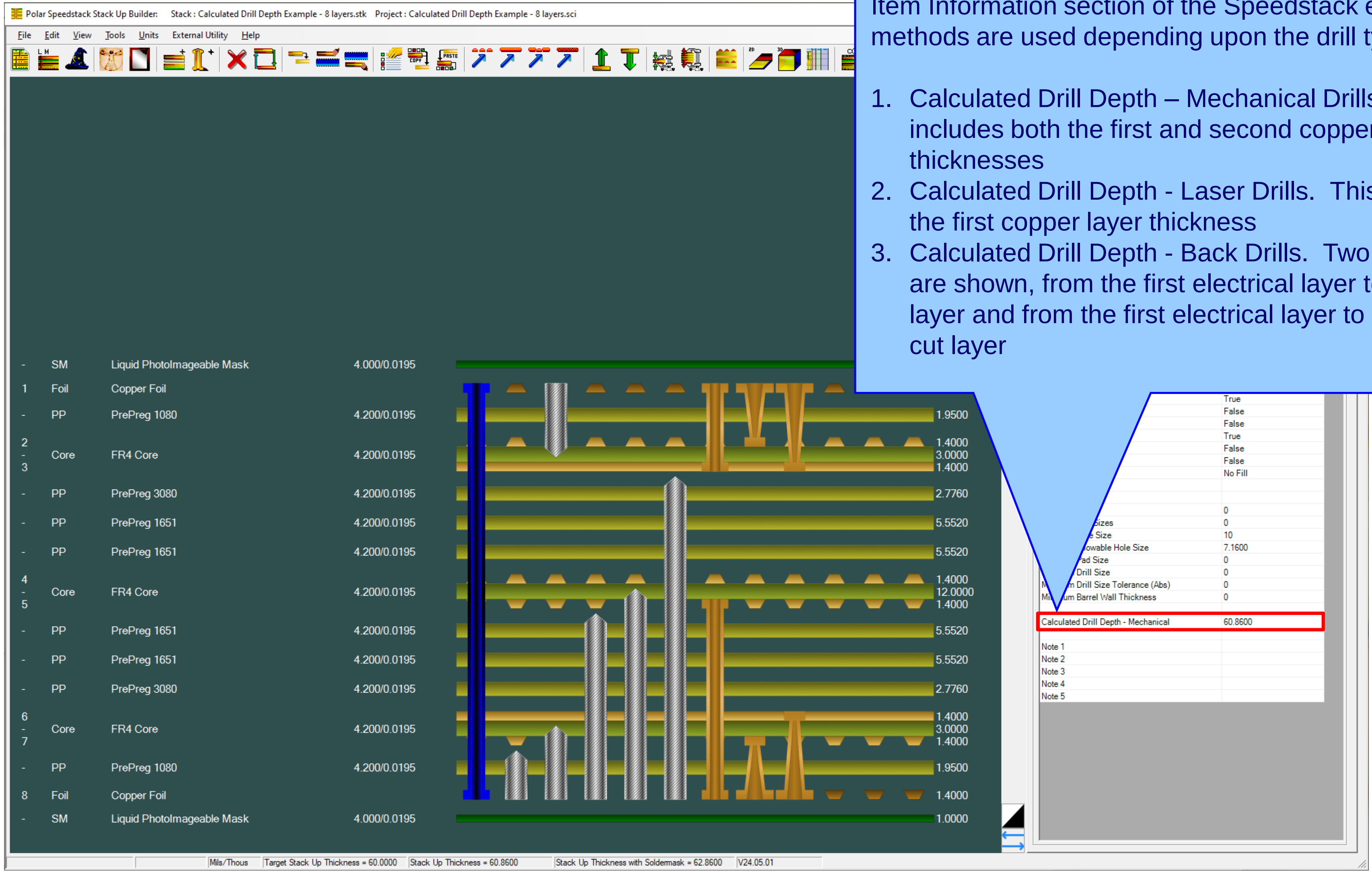
Richard Attrill – May 2024 (Rev 15)

Polar Instruments - CGen Coupon Generator
Speedstack PCB Stack Up Builder
Polar Si8000 Controlled Impedance Quick Solver
Polar Si9000 PCB Transmission Line Field Solver
Edge-Coupled Coated Microstrip 2B
Coated Microstrip 1B
Conductor Loss
Dielectric Loss
Attenuation
Frequency - MHz
Lossless Calculation
Frequency Dependent Calculation

polarinstruments.com

Speedstack v24.05.01 (May 2024)

New Calculated Drill Depth enhancements



Polar Speedstack Stack Up Builder: Stack : Calculated Drill Depth Example - 8 layers.stk Project : Calculated Drill Depth Example - 8 layers.sci

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	
1	Foil	Copper Foil		
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 3080	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 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 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 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

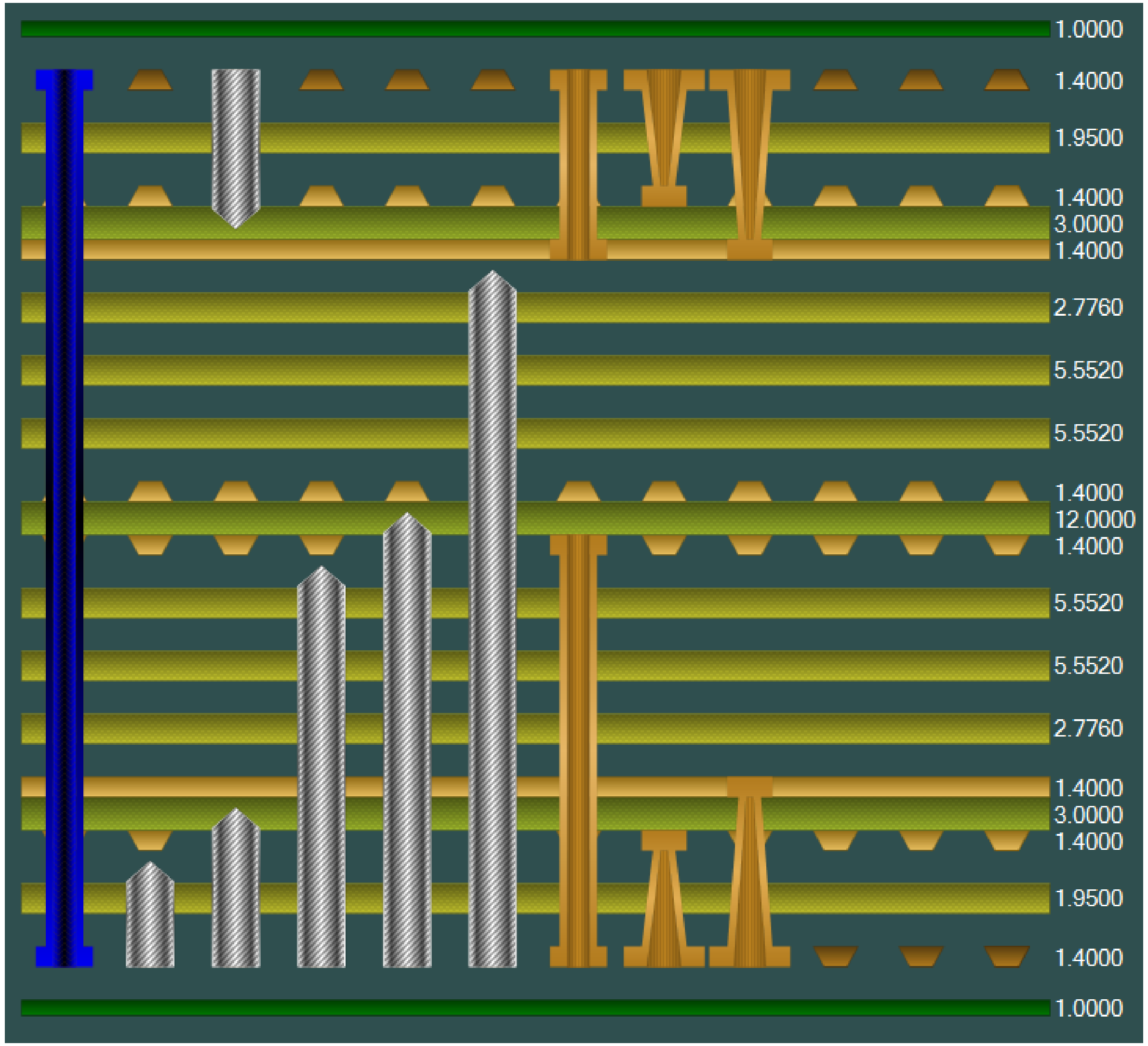
	True
	False
	False
	True
	False
	False
	No Fill
	0
Sizes	0
e Size	10
lowable Hole Size	7.1600
ad Size	0
Drill Size	0
M m Drill Size Tolerance (Abs)	0
Mi um Barrel Wall Thickness	0
Calculated Drill Depth - Mechanical	60.8600
Note 1	
Note 2	
Note 3	
Note 4	
Note 5	

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V24.05.01

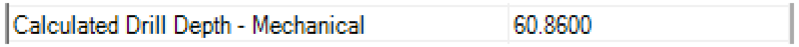
Calculate and display the Drill Depth under the Selected Item Information section of the Speedstack editor. Three methods are used depending upon the drill type:

1. Calculated Drill Depth – Mechanical Drills. This includes both the first and second copper layer thicknesses
2. Calculated Drill Depth - Laser Drills. This includes just the first copper layer thickness
3. Calculated Drill Depth - Back Drills. Two Drill Depths are shown, from the first electrical layer to the must-cut layer and from the first electrical layer to the must-not-cut layer

New Calculated Drill Depth – Mechanical Drills

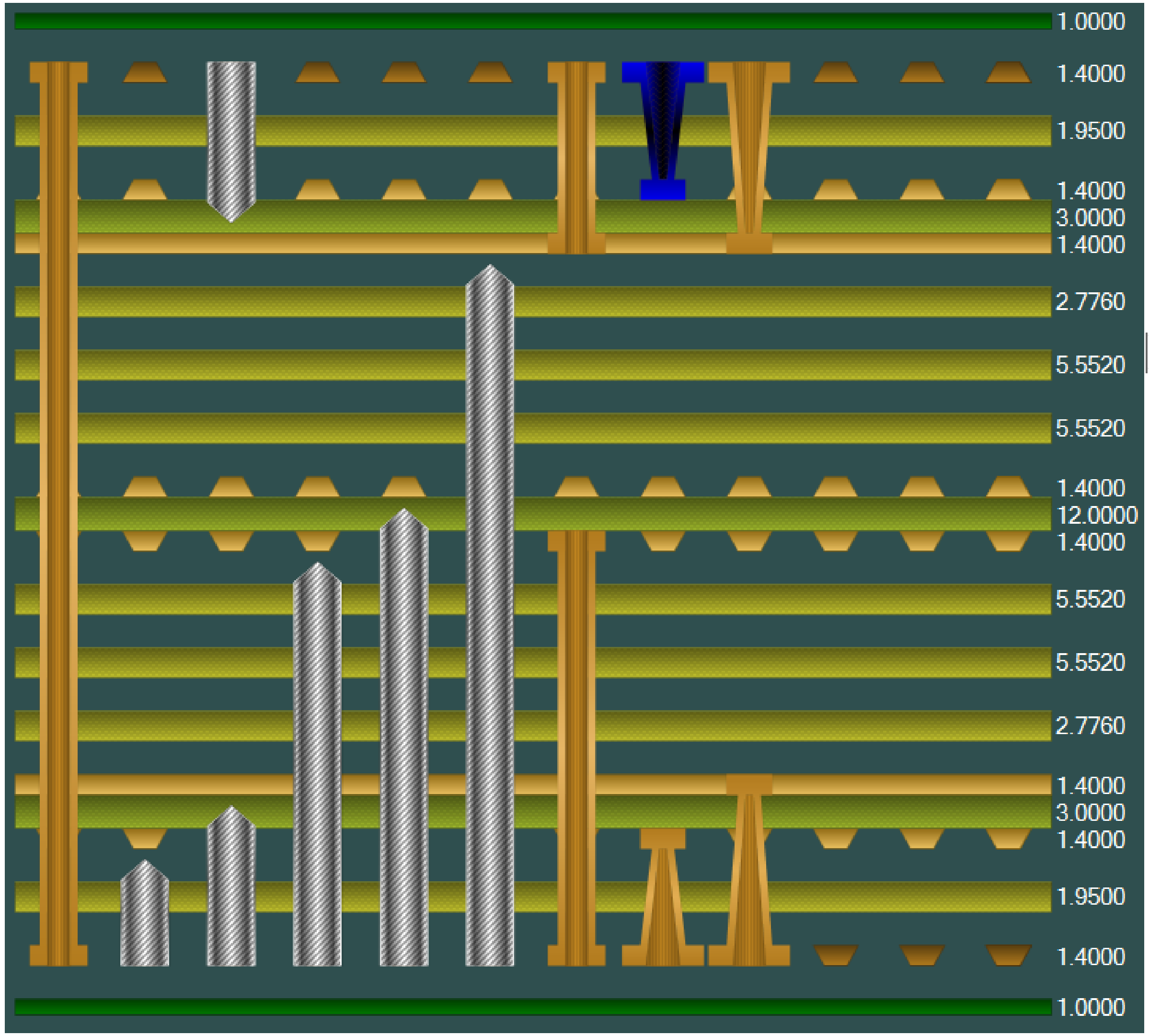

1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000

Calculated Drill Depth – Mechanical Drills. This includes both the first and second copper layer thicknesses

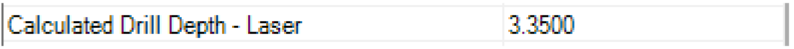


Calculated Drill Depth - Mechanical 60.8600

New Calculated Drill Depth – Laser Drills

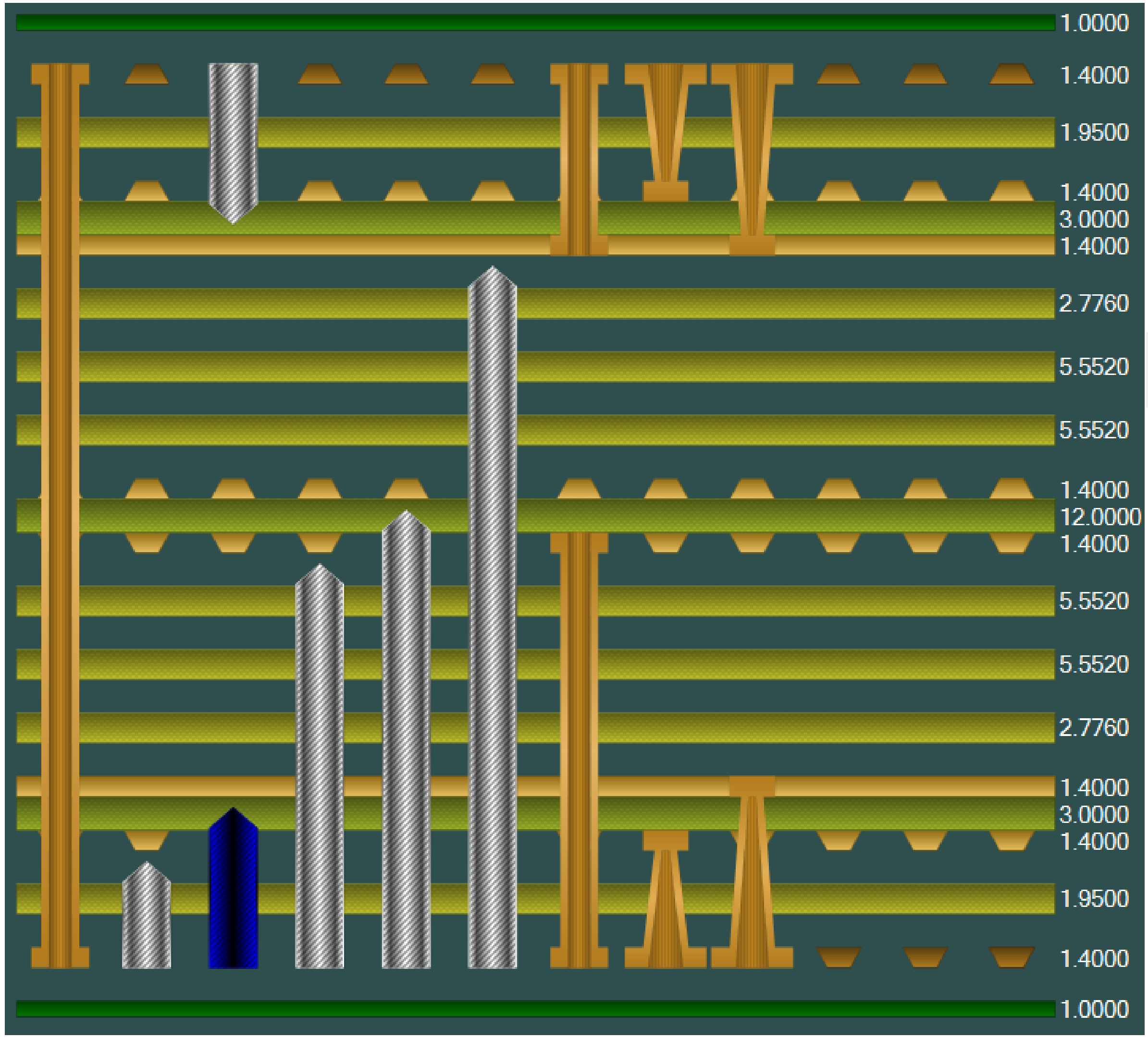

1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000

Calculated Drill Depth - Laser Drills. This includes just the first copper layer thickness

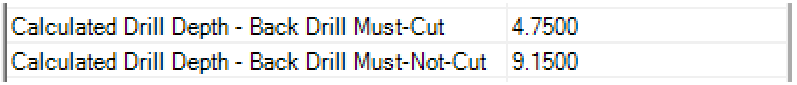


Calculated Drill Depth - Laser	3.3500

New Calculated Drill Depth – Back Drills

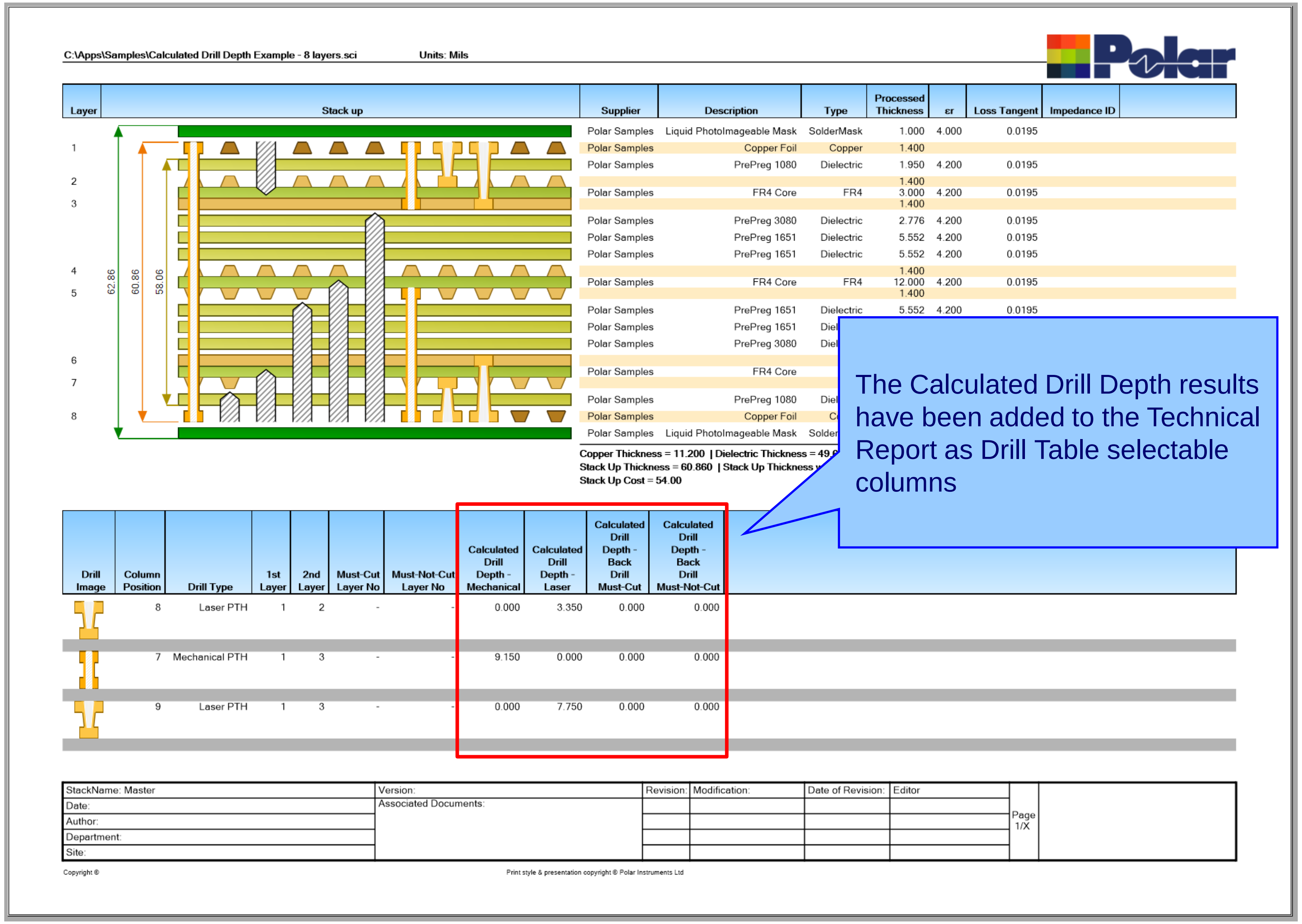

1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000

Calculated Drill Depth - Back Drills. Two Drill Depths are shown, from the first electrical layer to the must-cut layer and from the first electrical layer to the must-not-cut layer



Calculated Drill Depth - Back Drill Must-Cut	4.7500
Calculated Drill Depth - Back Drill Must-Not-Cut	9.1500

New Calculated Drill Depth enhancements



C:\Apps\Samples\Calculated Drill Depth Example - 8 layers.sci Units: Mils

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

Copper Thickness = 11.200 | Dielectric Thickness = 49.6
Stack Up Thickness = 60.860 | Stack Up Thickness w
Stack Up Cost = 54.00

Drill Image	Column Position	Drill Type	1st Layer	2nd Layer	Must-Cut Layer No	Must-Not-Cut Layer No	Calculated Drill Depth - Mechanical	Calculated Drill Depth - Laser	Calculated Drill Depth - Back Drill Must-Cut	Calculated Drill Depth - Back Drill Must-Not-Cut
	8	Laser PTH	1	2	-	-	0.000	3.350	0.000	0.000
	7	Mechanical PTH	1	3	-	-	9.150	0.000	0.000	0.000
	9	Laser PTH	1	3	-	-	0.000	7.750	0.000	0.000

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

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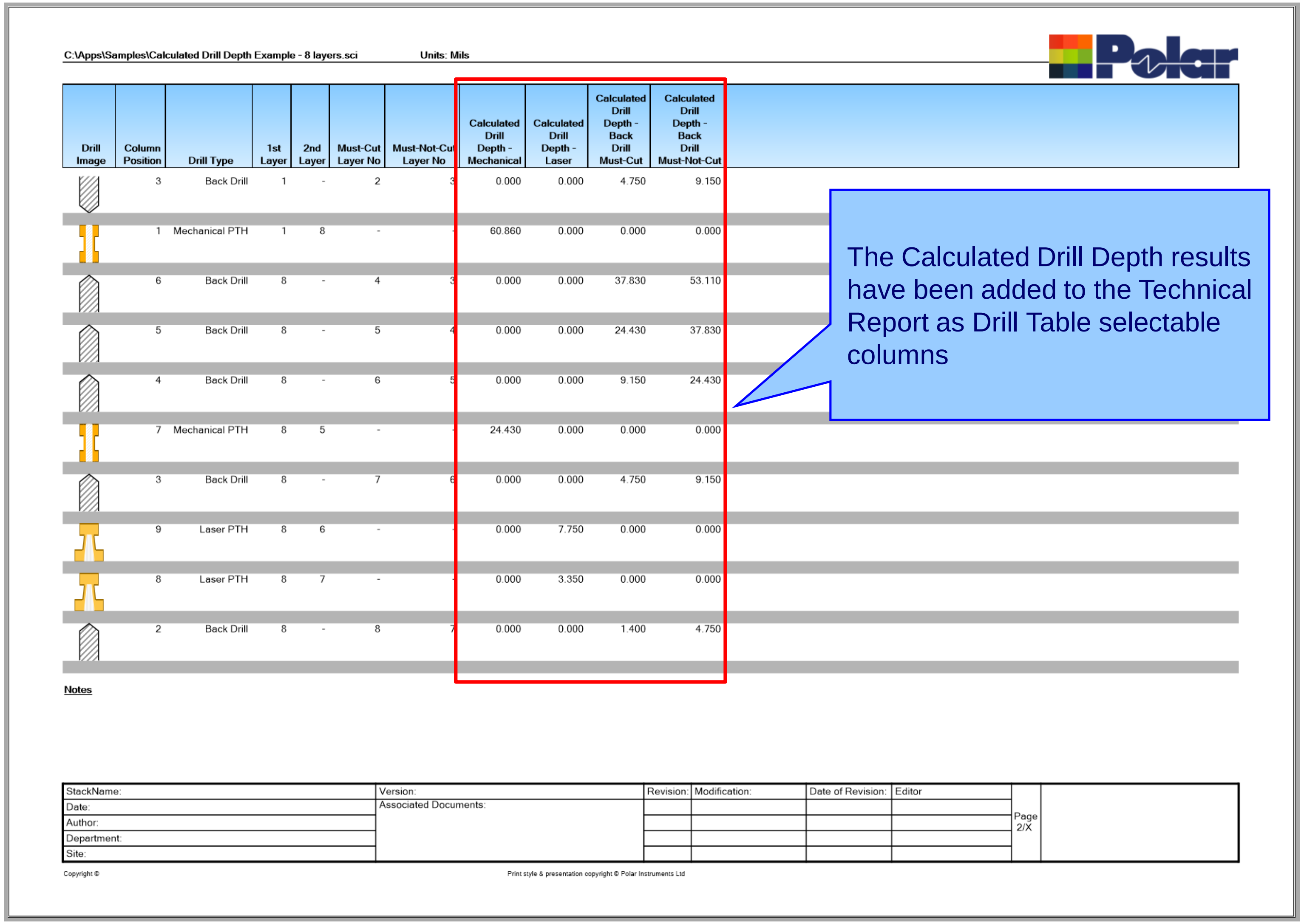
The Calculated Drill Depth results have been added to the Technical Report as Drill Table selectable columns

New Calculated Drill Depth enhancements



C:\Apps\Samples\Calculated Drill Depth Example - 8 layers.sci Units: Mils

Drill Image	Column Position	Drill Type	1st Layer	2nd Layer	Must-Cut Layer No	Must-Not-Cut Layer No	Calculated Drill Depth - Mechanical	Calculated Drill Depth - Laser	Calculated Drill Depth - Back Drill Must-Cut	Calculated Drill Depth - Back Drill Must-Not-Cut
	3	Back Drill	1	-	2	3	0.000	0.000	4.750	9.150
	1	Mechanical PTH	1	8	-	-	60.860	0.000	0.000	0.000
	6	Back Drill	8	-	4	3	0.000	0.000	37.830	53.110
	5	Back Drill	8	-	5	4	0.000	0.000	24.430	37.830
	4	Back Drill	8	-	6	5	0.000	0.000	9.150	24.430
	7	Mechanical PTH	8	5	-	-	24.430	0.000	0.000	0.000
	3	Back Drill	8	-	7	6	0.000	0.000	4.750	9.150
	9	Laser PTH	8	6	-	-	0.000	7.750	0.000	0.000
	8	Laser PTH	8	7	-	-	0.000	3.350	0.000	0.000
	2	Back Drill	8	-	8	7	0.000	0.000	1.400	4.750

Notes

StackName:	Version:	Revision:	Modification:	Date of Revision:	Editor	Page 2/X
Date:	Associated Documents:					
Author:						
Department:						
Site:						

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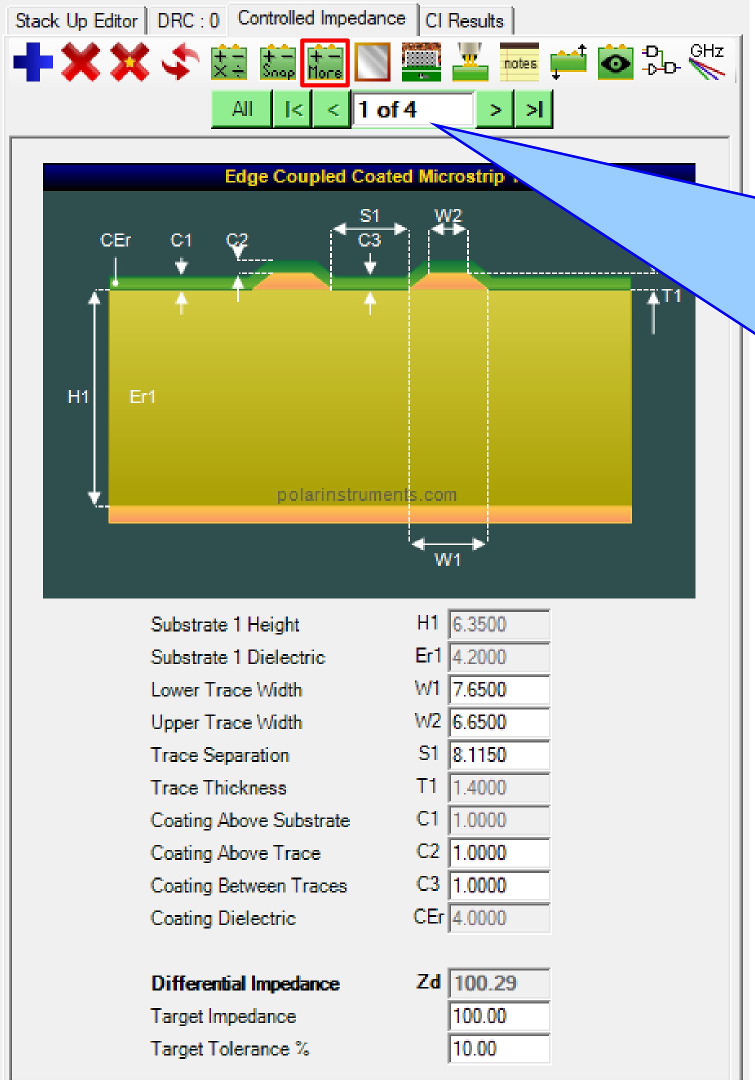
The Calculated Drill Depth results have been added to the Technical Report as Drill Table selectable columns

Speedstack v24.04.08 (April 2024)

New Structure More Calculations option


Stack Up Editor
DRC : 0
Controlled Impedance
CI Results
Snap
More
notes
GHz
All
|<
<
1 of 4
>
>|
Edge Coupled Coated Microstrip
CEr
C1
C2
S1
C3
W2
T1
H1
Er1
polarinstruments.com
W1

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.6500
Upper Trace Width	W2	6.6500
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**	**100.29**
Target Impedance		100.00
Target Tolerance %		10.00

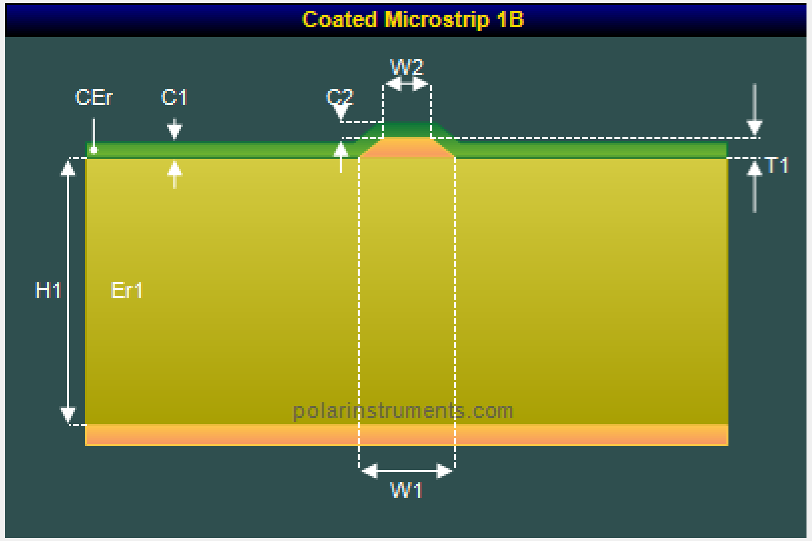
On the structure toolbar there is a new More Calculations button. On selecting this option the following field solver results will be calculated:

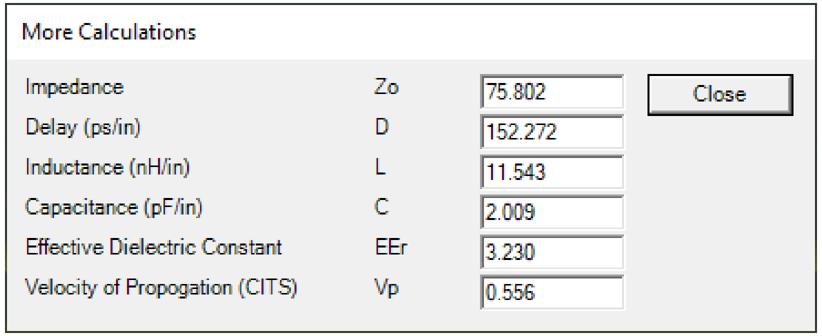
Singled-Ended Structures: Impedance (Zo), Delay, Inductance, Capacitance, Effective Dielectric Constant, Velocity of Propagation

Differential Structures: Differential Impedance (Zdiff), Delay (Odd Mode), Odd Mode Impedance (Zodd), Even Mode Impedance (Zeven), Common Mode Impedance (Zcommon), Effective Dielectric Constant, Velocity of Propagation, Near-End Crosstalk (NEXT), Coupling Percentage

New Structure More Calculations option

Single-ended structure results

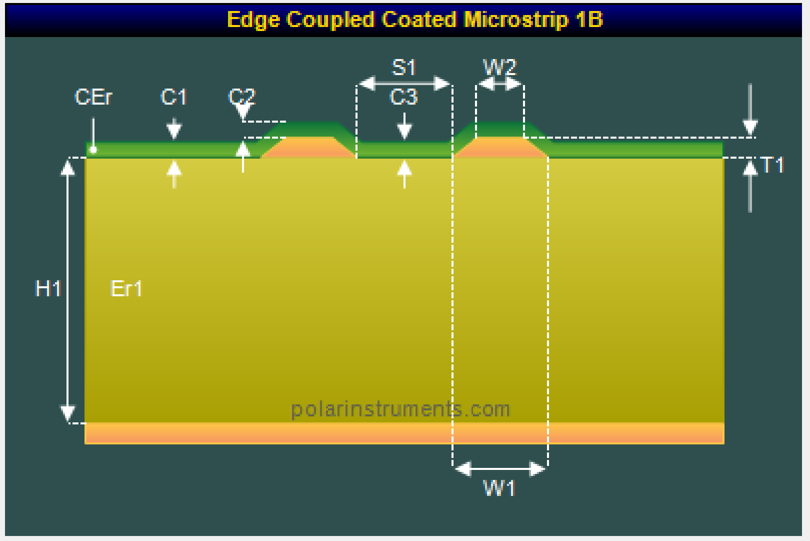

Coated Microstrip 1B
W2
CEr
C1
C2
T1
H1
Er1
polarinstruments.com
W1

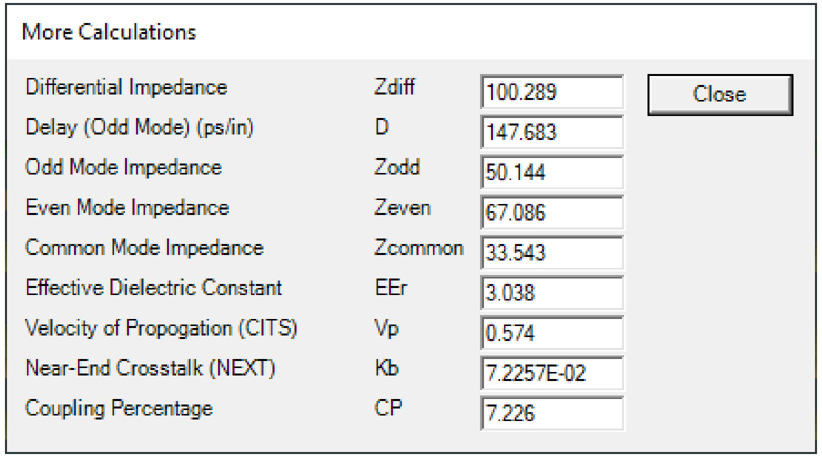


More Calculations

Impedance	Zo	75.802
Delay (ps/in)	D	152.272
Inductance (nH/in)	L	11.543
Capacitance (pF/in)	C	2.009
Effective Dielectric Constant	EEr	3.230
Velocity of Propogation (CITS)	Vp	0.556

Differential structure results

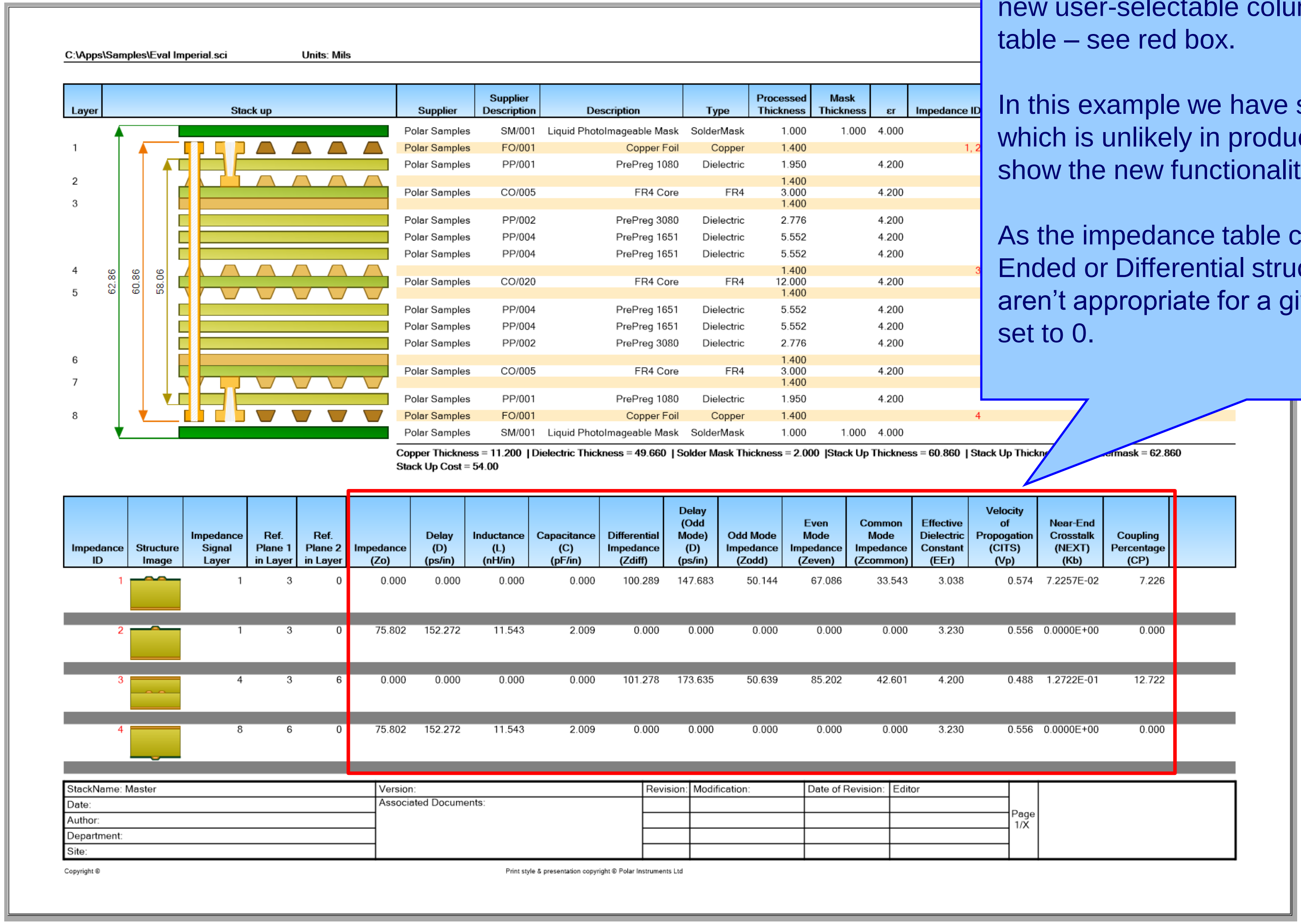

Edge Coupled Coated Microstrip 1B
S1
W2
C3
CEr
C1
C2
T1
H1
Er1
polarinstruments.com
W1



More Calculations

Differential Impedance	Zdiff	100.289
Delay (Odd Mode) (ps/in)	D	147.683
Odd Mode Impedance	Zodd	50.144
Even Mode Impedance	Zeven	67.086
Common Mode Impedance	Zcommon	33.543
Effective Dielectric Constant	EEr	3.038
Velocity of Propogation (CITS)	Vp	0.574
Near-End Crosstalk (NEXT)	Kb	7.2257E-02
Coupling Percentage	CP	7.226

New Structure More Calculations option



C:\Apps\Samples\Eval Imperial.sci Units: Mils

Layer	Stack up	Supplier	Supplier Description	Description	Type	Processed Thickness	Mask Thickness	εr	Impedance ID
		Polar Samples	SM/001	Liquid PhotoImageable Mask	SolderMask	1.000	1.000	4.000	
1		Polar Samples	FO/001	Copper Foil	Copper	1.400			1, 2
		Polar Samples	PP/001	PrePreg 1080	Dielectric	1.950		4.200	
2						1.400			
		Polar Samples	CO/005	FR4 Core	FR4	3.000		4.200	
3						1.400			
		Polar Samples	PP/002	PrePreg 3080	Dielectric	2.776		4.200	
		Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
		Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
4						1.400			3
		Polar Samples	CO/020	FR4 Core	FR4	12.000		4.200	
5						1.400			
		Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
		Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
		Polar Samples	PP/002	PrePreg 3080	Dielectric	2.776		4.200	
6						1.400			
		Polar Samples	CO/005	FR4 Core	FR4	3.000		4.200	
7						1.400			
		Polar Samples	PP/001	PrePreg 1080	Dielectric	1.950		4.200	
8		Polar Samples	FO/001	Copper Foil	Copper	1.400			4
		Polar Samples	SM/001	Liquid PhotoImageable Mask	SolderMask	1.000	1.000	4.000	

Copper Thickness = 11.200 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 |Stack Up Thickness = 60.860 | Stack Up Thickn ermask = 62.860
Stack Up Cost = 54.00

Impedance ID	Structure Image	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Impedance (Zo)	Delay (D) (ps/in)	Inductance (L) (nH/in)	Capacitance (C) (pF/in)	Differential Impedance (Zdiff)	Delay (Odd Mode) (D) (ps/in)	Odd Mode Impedance (Zodd)	Even Mode Impedance (Zeven)	Common Mode Impedance (Zcommon)	Effective Dielectric Constant (EEr)	Velocity of Propogation (CITS) (Vp)	Near-End Crosstalk (NEXT) (Kb)	Coupling Percentage (CP)
1		1	3	0	0.000	0.000	0.000	0.000	100.289	147.683	50.144	67.086	33.543	3.038	0.574	7.2257E-02	7.226
2		1	3	0	75.802	152.272	11.543	2.009	0.000	0.000	0.000	0.000	0.000	3.230	0.556	0.0000E+00	0.000
3		4	3	6	0.000	0.000	0.000	0.000	101.278	173.635	50.639	85.202	42.601	4.200	0.488	1.2722E-01	12.722
4		8	6	0	75.802	152.272	11.543	2.009	0.000	0.000	0.000	0.000	0.000	3.230	0.556	0.0000E+00	0.000

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

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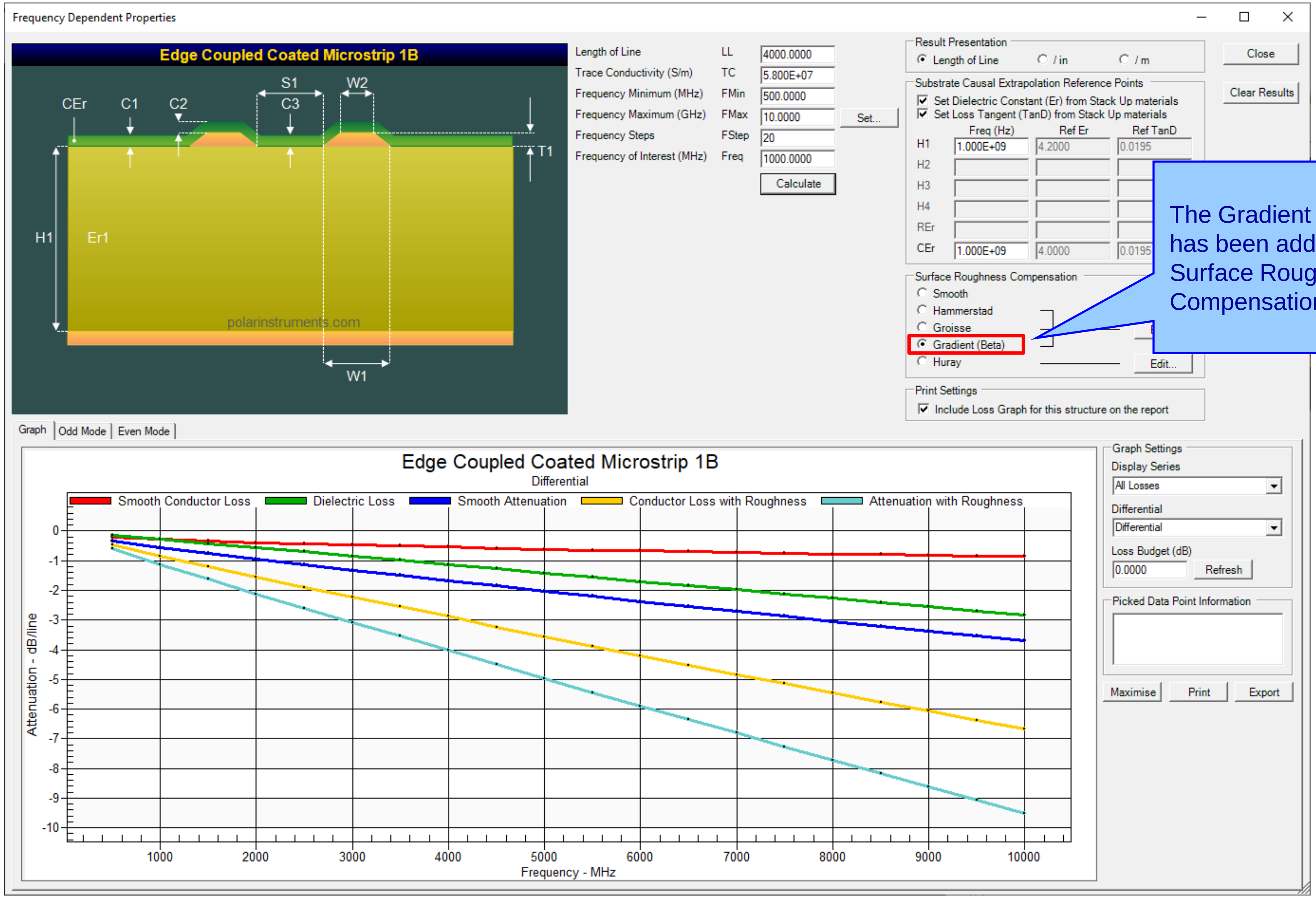
The technical report has been enhanced with 13 new user-selectable columns on the impedance table – see red box.

In this example we have selected all 13 columns, which is unlikely in production use, but is good to show the new functionality.

As the impedance table contains both Single-Ended or Differential structures the columns that aren’t appropriate for a given structure type are set to 0.

Gradient Roughness Method


Frequency Dependent Properties
Edge Coupled Coated Microstrip 1B
S1
W2
CEr
C1
C2
C3
T1
H1
Er1
polarinstruments.com
W1
Graph
Odd Mode
Even Mode
Edge Coupled Coated Microstrip 1B
Differential
Smooth Conductor Loss
Dielectric Loss
Smooth Attenuation
Conductor Loss with Roughness
Attenuation with Roughness
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
Attenuation - dB/line
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency - MHz
Close
Clear Results
Set...
Calculate
Edit...
Refresh
Maximise
Print
Export

Length of Line LL 4000.0000

Trace Conductivity (S/m) TC 5.800E+07

Frequency Minimum (MHz) FMin 500.0000

Frequency Maximum (GHz) FMax 10.0000

Frequency Steps FStep 20

Frequency of Interest (MHz) Freq 1000.0000

Result Presentation

● Length of Line ○ / in ○ / m

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			
H3			
H4			
REr			
CEr	1.000E+09	4.0000	0.0195

Surface Roughness Compensation

○ Smooth

○ Hammerstad

○ Groisse

● Gradient (Beta)

○ Huray

Print Settings

☑ Include Loss Graph for this structure on the report

Graph Settings

Display Series: All Losses

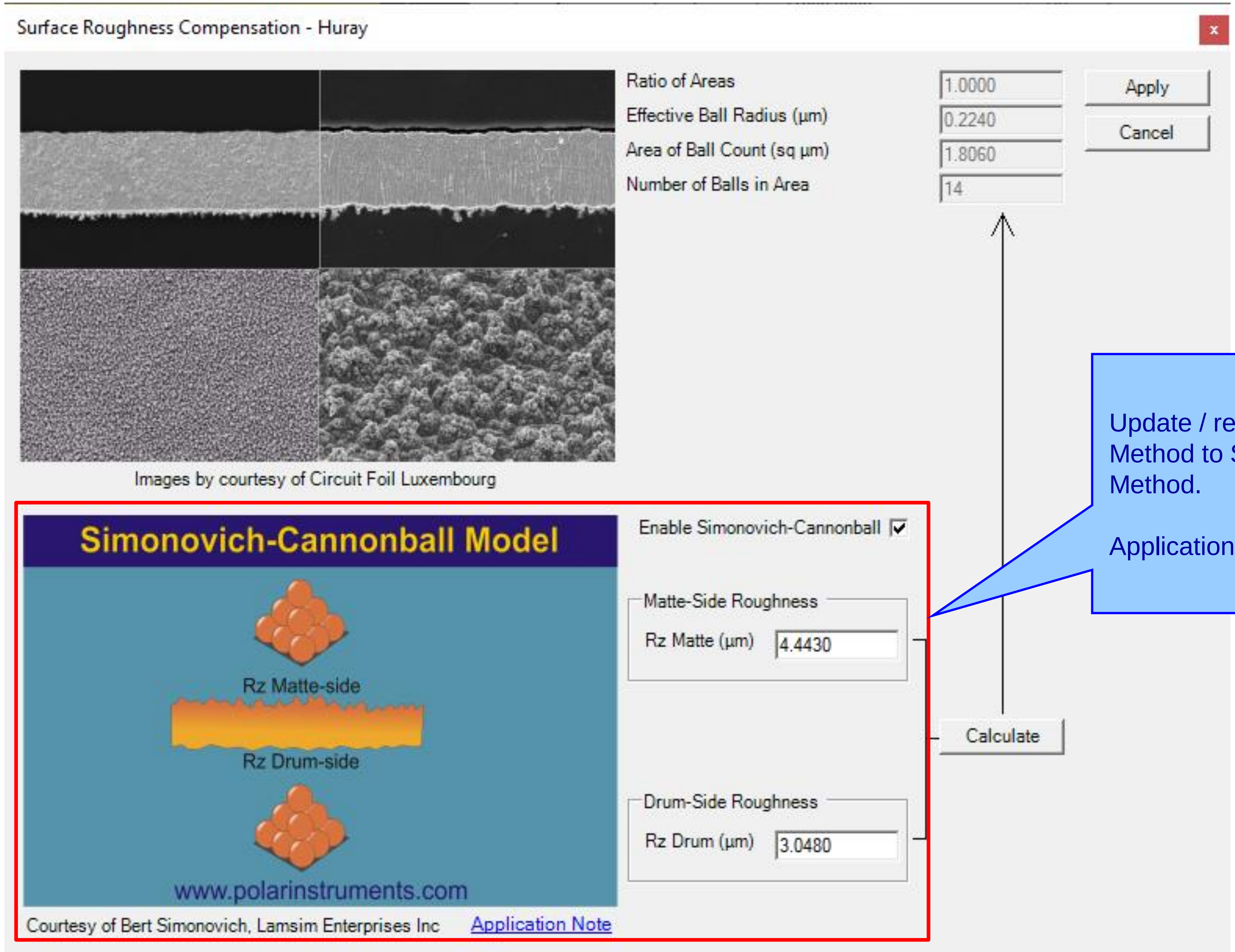
Differential: Differential

Loss Budget (dB): 0.0000

Picked Data Point Information

The Gradient method has been added to the Surface Roughness Compensation options

Update Cannonball-Huray Method to Simonovich-Cannonball Method



Surface Roughness Compensation - Huray

Ratio of Areas: 1.0000

Effective Ball Radius (µm): 0.2240

Area of Ball Count (sq µm): 1.8060

Number of Balls in Area: 14

Apply
Cancel
Simonovich-Cannonball Model
Rz Matte-side
Rz Drum-side
www.polarinstruments.com
Calculate
Application Note

Images by courtesy of Circuit Foil Luxembourg

Enable Simonovich-Cannonball ☑

Matte-Side Roughness

Rz Matte (µm): 4.4430

Drum-Side Roughness

Rz Drum (µm): 3.0480

Courtesy of Bert Simonovich, Lamsim Enterprises Inc

Update / rebrand of the Cannonball-Huray Method to Simonovich-Cannonball Method.

Application Note now links to two papers

Other enhancements

- New import / export XML STKX v24.00 and SSX v14.00 file formats to support the new Gradient Surface Roughness Compensation Method
- Updated to support latest BEM Calculation Engine
- FlexNet Publisher / FLEXlm v11.19.0.0 supported
- Printing: Fixed problem where the Laminate to Laminate dimension was not calculated corrected when materials spanned multiple print pages

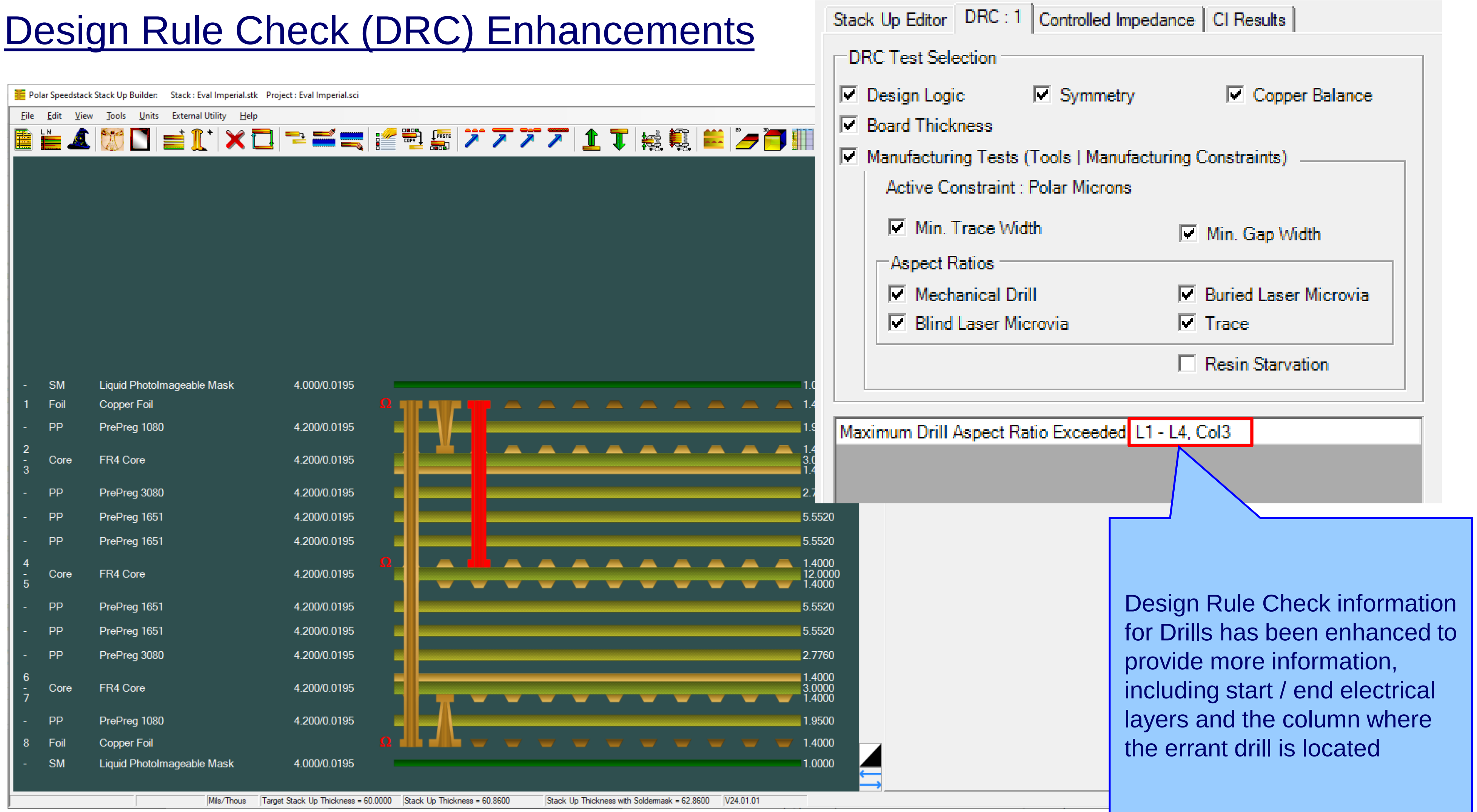
Speedstack v24.01.01 (Jan 2024)

Enhancements

- From 2024 Speedstack will be running on the Microsoft .Net Framework 4.8. It has migrated as a result of customer IT policy requests and we are working on new functionality for releases later in Q1 based on this new platform

Speedstack v23.09.01 (Sept 2023)

Design Rule Check (DRC) Enhancements



Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk Project : Eval Imperial.sci
File Edit View Tools Units External Utility Help

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0
1	Foil	Copper Foil		1.4
-	PP	PrePreg 1080	4.200/0.0195	1.9
2 - 3	Core	FR4 Core	4.200/0.0195	1.4 3.0 1.4
-	PP	PrePreg 3080	4.200/0.0195	2.7
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 1651	4.200/0.0195	5.5520
4 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 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 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V24.01.01

Stack Up Editor
DRC : 1
Controlled Impedance
CI Results

DRC Test Selection

☑ Design Logic ☑ Symmetry ☑ Copper Balance

☑ Board Thickness

☑ Manufacturing Tests (Tools | Manufacturing Constraints)

Active Constraint : Polar Microns

☑ Min. Trace Width ☑ Min. Gap Width

Aspect Ratios

☑ Mechanical Drill ☑ Buried Laser Microvia

☑ Blind Laser Microvia ☑ Trace

☐ Resin Starvation

Maximum Drill Aspect Ratio Exceeded L1 - L4, Col3

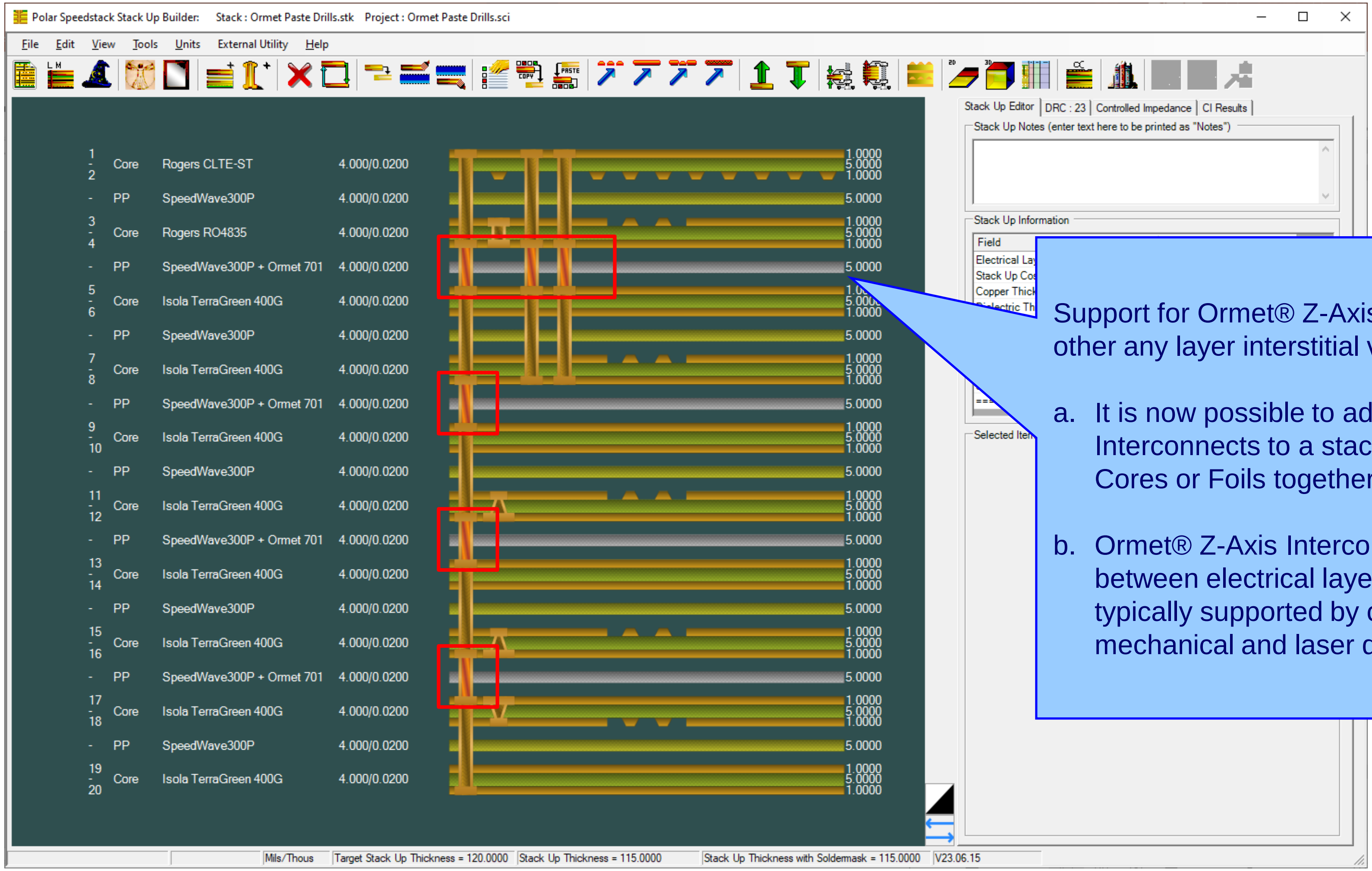
Design Rule Check information for Drills has been enhanced to provide more information, including start / end electrical layers and the column where the errant drill is located

Other enhancements

- Printing: Improvements to the Solder Mask to Solder Mask thickness line, particularly when an ident / coverlay / peelable material is above or below the Solder Mask
- Printing: Bill of Materials (BOM) table enhancements including options to enable / disable Number of Panels, Circuits Per Panel, Cost Per Circuit that appear under BOM table
- Editor: Multi-selected materials will now stay selected when right-mouse menu is used to bring up context menu

Speedstack v23.06.15 (June 2023)

Drill Enhancements including support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology


Polar Speedstack Stack Up Builder: Stack : Ormet Paste Drills.stk Project : Ormet Paste Drills.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 23
Controlled Impedance
CI Results
Stack Up Notes (enter text here to be printed as "Notes")
Stack Up Information
Field
Electrical La
Stack Up Co
Copper Thick
Selected Item

Layers	Type	Material		Thickness
1-2	Core	Rogers CLTE-ST	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P	4.000/0.0200	5.0000
3-4	Core	Rogers RO4835	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P + Ormet 701	4.000/0.0200	5.0000
5-6	Core	Isola TerraGreen 400G	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P	4.000/0.0200	5.0000
7-8	Core	Isola TerraGreen 400G	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P + Ormet 701	4.000/0.0200	5.0000
9-10	Core	Isola TerraGreen 400G	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P	4.000/0.0200	5.0000
11-12	Core	Isola TerraGreen 400G	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P + Ormet 701	4.000/0.0200	5.0000
13-14	Core	Isola TerraGreen 400G	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P	4.000/0.0200	5.0000
15-16	Core	Isola TerraGreen 400G	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P + Ormet 701	4.000/0.0200	5.0000
17-18	Core	Isola TerraGreen 400G	4.000/0.0200	1.0000 5.0000 1.0000
-	PP	SpeedWave300P	4.000/0.0200	5.0000
19-20	Core	Isola TerraGreen 400G	4.000/0.0200	1.0000 5.0000 1.0000

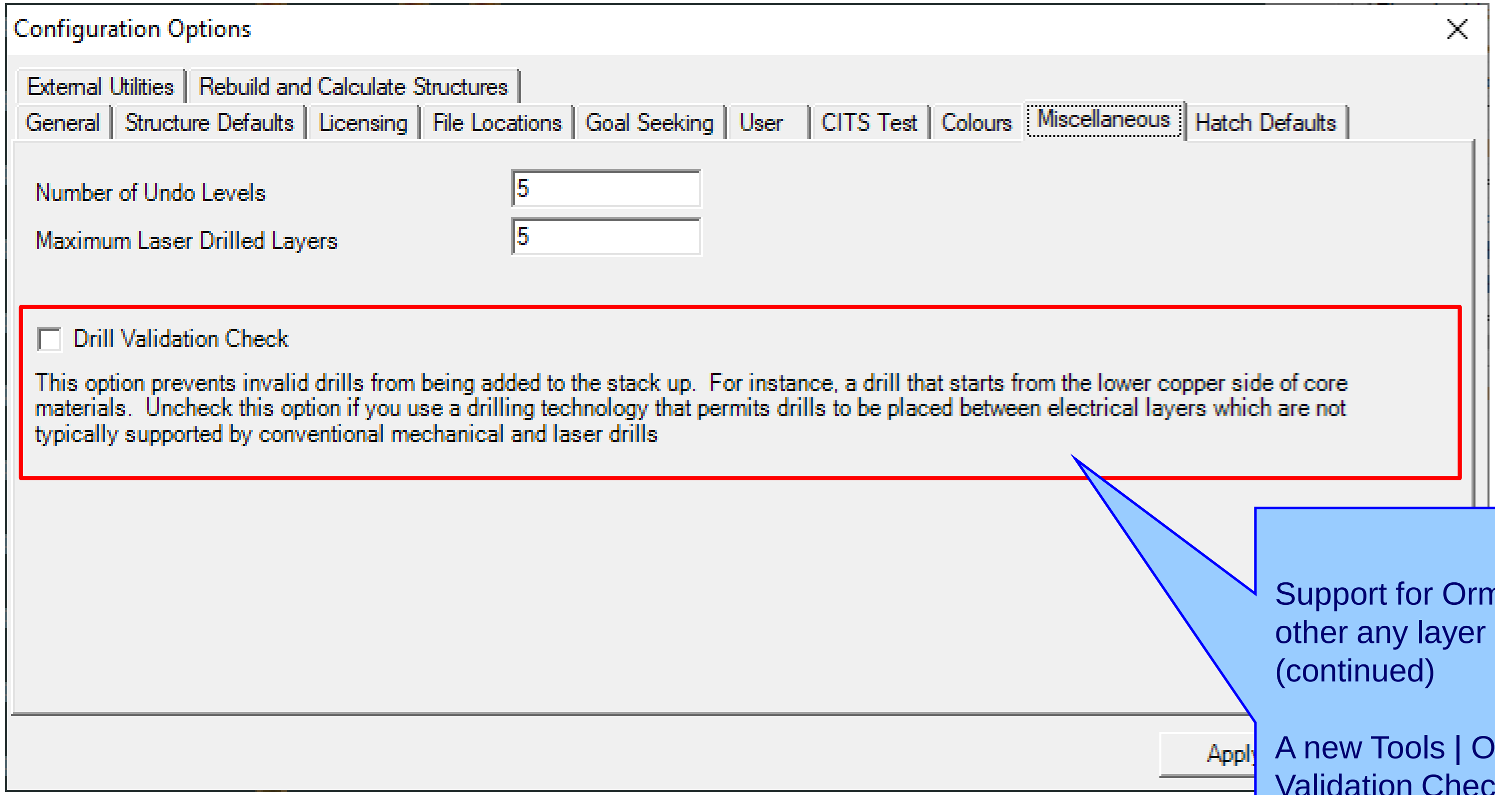
Mils/Thous
Target Stack Up Thickness = 120.0000
Stack Up Thickness = 115.0000
Stack Up Thickness with Soldermask = 115.0000
V23.06.15

Support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology

a. It is now possible to add Ormet® Z-Axis Interconnects to a stack up to connect two Cores or Foils together

b. Ormet® Z-Axis Interconnects can be placed between electrical layers which are not typically supported by conventional mechanical and laser drills

Enhancements including support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology


Configuration Options
External Utilities
Rebuild and Calculate Structures
General
Structure Defaults
Licensing
File Locations
Goal Seeking
User
CITS Test
Colours
Miscellaneous
Hatch Defaults
Apply

Number of Undo Levels 5

Maximum Laser Drilled Layers 5

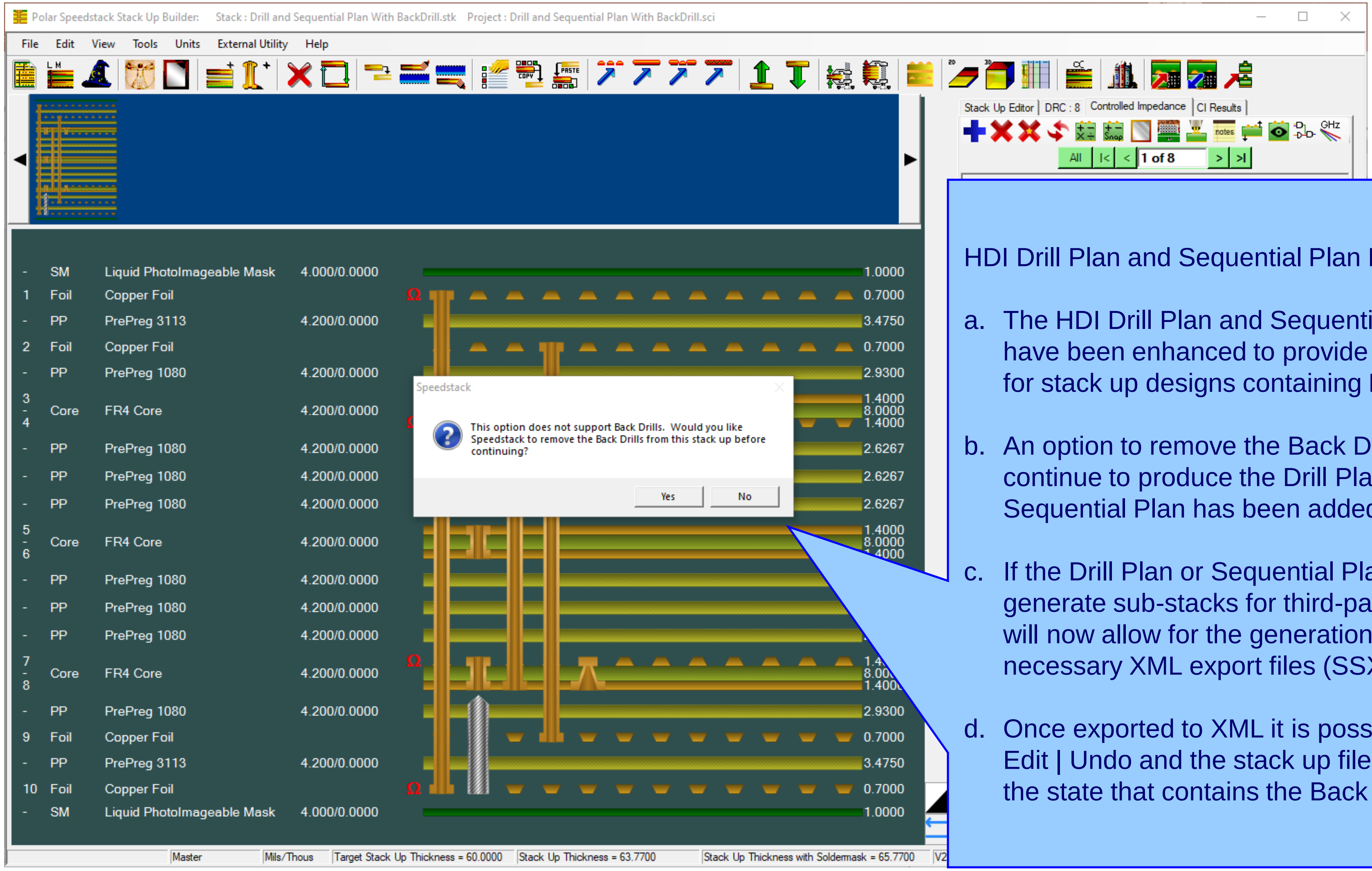
☐ Drill Validation Check

This option prevents invalid drills from being added to the stack up. For instance, a drill that starts from the lower copper side of core materials. Uncheck this option if you use a drilling technology that permits drills to be placed between electrical layers which are not typically supported by conventional mechanical and laser drills

Support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology (continued)

A new Tools | Options | Miscellaneous tab Drill Validation Check option has been introduced. Unchecking this option will disable the Speedstack invalid drills check in order to support the Ormet® Z-Axis Interconnects technology

HDI Drill Plan and Sequential Plan Enhancements



Polar Speedstack Stack Up Builder: Stack : Drill and Sequential Plan With BackDrill.stk Project : Drill and Sequential Plan With BackDrill.sci

-	SM	Liquid PhotoImageable Mask	4.000/0.0000	1.0000
1	Foil	Copper Foil		0.7000
-	PP	PrePreg 3113	4.200/0.0000	3.4750
2	Foil	Copper Foil		0.7000
-	PP	PrePreg 1080	4.200/0.0000	2.9300
3 - 4	Core	FR4 Core	4.200/0.0000	1.4000 8.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0000	2.6267
-	PP	PrePreg 1080	4.200/0.0000	2.6267
-	PP	PrePreg 1080	4.200/0.0000	2.6267
5 - 6	Core	FR4 Core	4.200/0.0000	1.4000 8.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0000	
-	PP	PrePreg 1080	4.200/0.0000	
-	PP	PrePreg 1080	4.200/0.0000	
7 - 8	Core	FR4 Core	4.200/0.0000	1.4 8.00 1.400
-	PP	PrePreg 1080	4.200/0.0000	2.9300
9	Foil	Copper Foil		0.7000
-	PP	PrePreg 3113	4.200/0.0000	3.4750
10	Foil	Copper Foil		0.7000
-	SM	Liquid PhotoImageable Mask	4.000/0.0000	1.0000

Speedstack

This option does not support Back Drills. Would you like Speedstack to remove the Back Drills from this stack up before continuing?

Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 63.7700 | Stack Up Thickness with Soldermask = 65.7700 | V2

HDI Drill Plan and Sequential Plan Enhancements

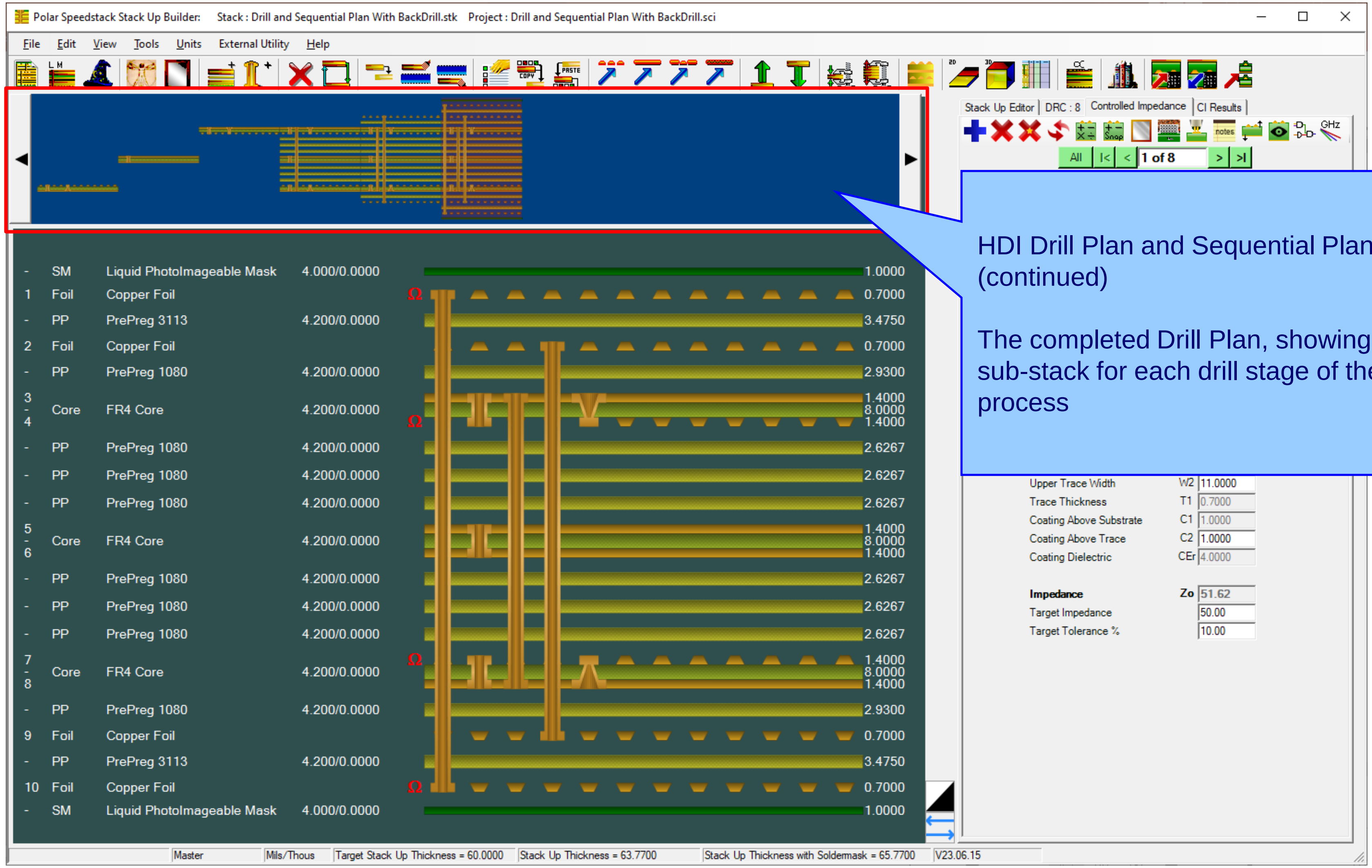
a. The HDI Drill Plan and Sequential Plan options have been enhanced to provide better support for stack up designs containing Back Drills

b. An option to remove the Back Drills and continue to produce the Drill Plan or Sequential Plan has been added

c. If the Drill Plan or Sequential Plan is used to generate sub-stacks for third-party tools, this will now allow for the generation of the necessary XML export files (SSX)

d. Once exported to XML it is possible to select Edit | Undo and the stack up file will return to the state that contains the Back Drills

HDI Drill Plan and Sequential Plan Enhancements



Polar Speedstack Stack Up Builder: Stack : Drill and Sequential Plan With BackDrill.stk Project : Drill and Sequential Plan With BackDrill.sci

-	SM	Liquid PhotoImageable Mask	4.000/0.0000	1.0000
1	Foil	Copper Foil		0.7000
-	PP	PrePreg 3113	4.200/0.0000	3.4750
2	Foil	Copper Foil		0.7000
-	PP	PrePreg 1080	4.200/0.0000	2.9300
3 - 4	Core	FR4 Core	4.200/0.0000	1.4000 8.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0000	2.6267
-	PP	PrePreg 1080	4.200/0.0000	2.6267
-	PP	PrePreg 1080	4.200/0.0000	2.6267
5 - 6	Core	FR4 Core	4.200/0.0000	1.4000 8.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0000	2.6267
-	PP	PrePreg 1080	4.200/0.0000	2.6267
-	PP	PrePreg 1080	4.200/0.0000	2.6267
7 - 8	Core	FR4 Core	4.200/0.0000	1.4000 8.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0000	2.9300
9	Foil	Copper Foil		0.7000
-	PP	PrePreg 3113	4.200/0.0000	3.4750
10	Foil	Copper Foil		0.7000
-	SM	Liquid PhotoImageable Mask	4.000/0.0000	1.0000

Upper Trace Width	W2	11.0000
Trace Thickness	T1	0.7000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Dielectric	CEr	4.0000
Impedance	**Zo**	51.62
Target Impedance		50.00
Target Tolerance %		10.00

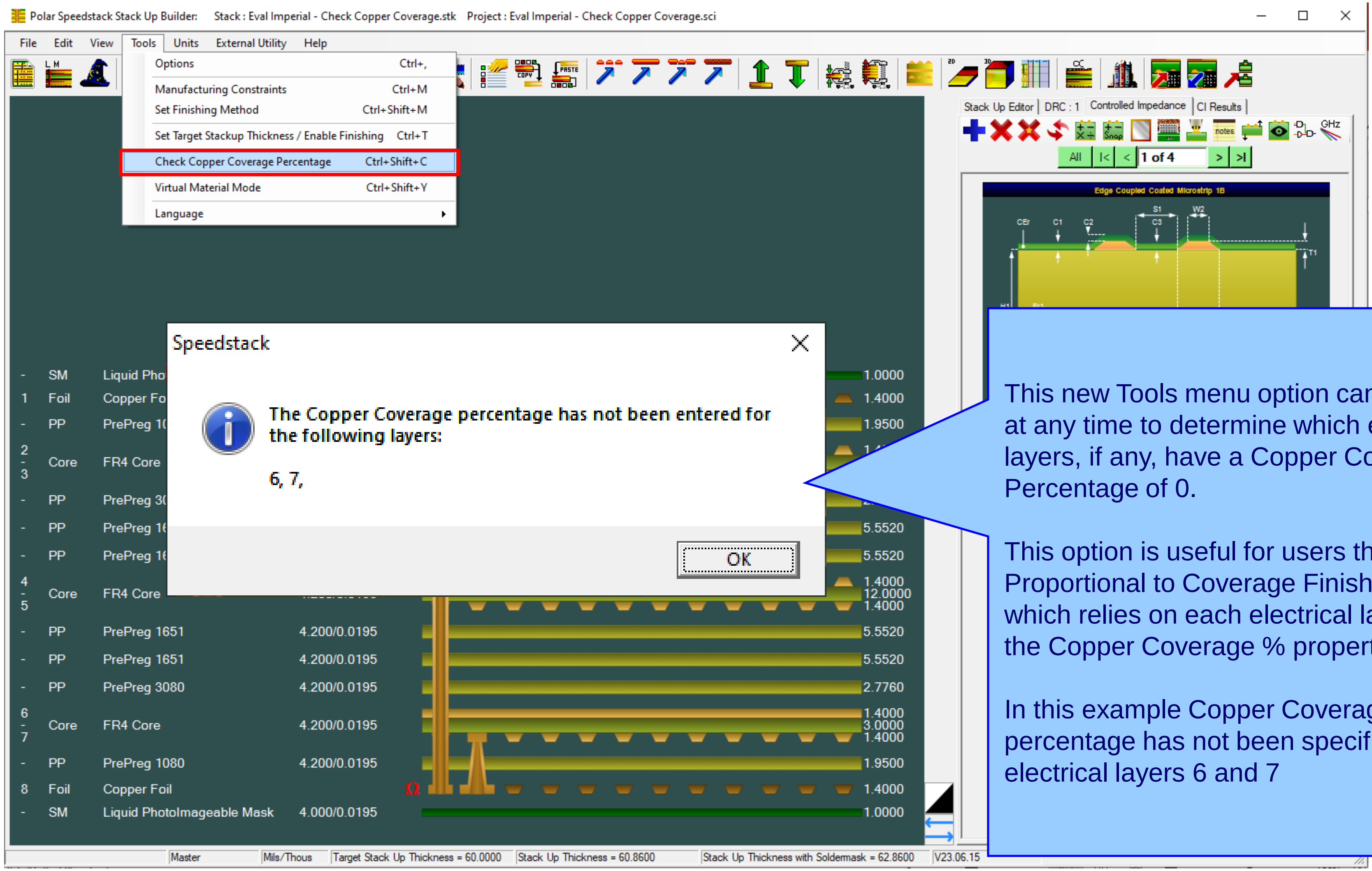
Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 63.7700 | Stack Up Thickness with Soldermask = 65.7700 | V23.06.15

HDI Drill Plan and Sequential Plan Enhancements (continued)

The completed Drill Plan, showing a separate sub-stack for each drill stage of the fabrication process

Speedstack v23.05.01 (May 2023)

New Check Copper Coverage Percentage option


Polar Speedstack Stack Up Builder: Stack : Eval Imperial - Check Copper Coverage.stk Project : Eval Imperial - Check Copper Coverage.sci
File Edit View Tools Units External Utility Help
Options Ctrl+,
Manufacturing Constraints Ctrl+M
Set Finishing Method Ctrl+Shift+M
Set Target Stackup Thickness / Enable Finishing Ctrl+T
Check Copper Coverage Percentage Ctrl+Shift+C
Virtual Material Mode Ctrl+Shift+Y
Language
Stack Up Editor | DRC : 1 | Controlled Impedance | CI Results
All |< < 1 of 4 > >|
Edge Coupled Coated Microstrip 1B
OK
Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V23.06.15

Speedstack

The Copper Coverage percentage has not been entered for the following layers:

6, 7,

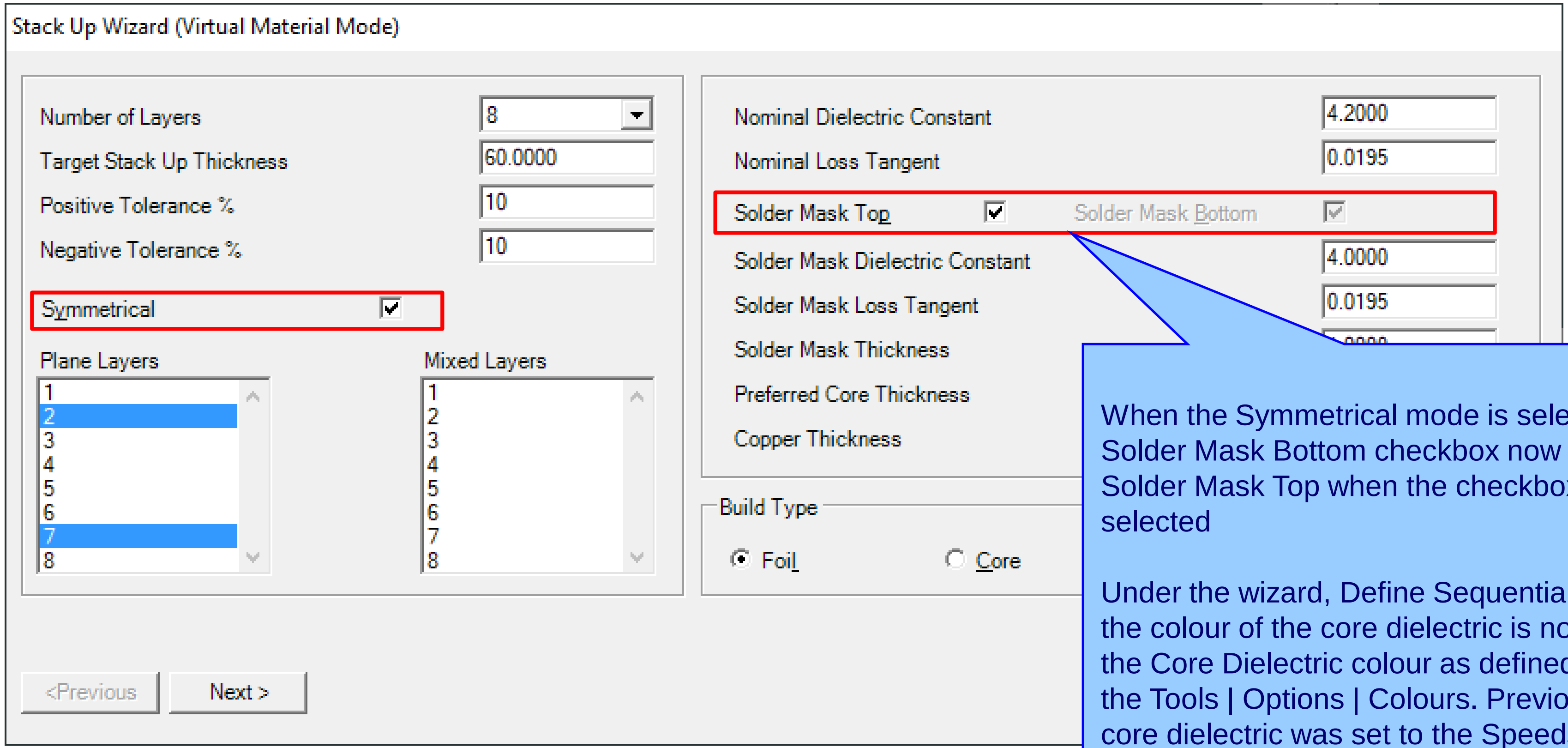
-	SM	Liquid Pho		1.0000
1	Foil	Copper Fo		1.4000
-	PP	PrePreg 10		1.9500
2 - 3	Core	FR4 Core		
-	PP	PrePreg 30		
-	PP	PrePreg 16		5.5520
-	PP	PrePreg 16		5.5520
4 - 5	Core	FR4 Core		1.4000 12.0000 1.4000
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 3080	4.200/0.0195	2.7760
6 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

This new Tools menu option can be selected at any time to determine which electrical layers, if any, have a Copper Coverage Percentage of 0.

This option is useful for users that select the Proportional to Coverage Finishing method, which relies on each electrical layer having the Copper Coverage % property populated

In this example Copper Coverage percentage has not been specified for electrical layers 6 and 7

Virtual Material Wizard Improvements



Stack Up Wizard (Virtual Material Mode)

Number of Layers: 8
Target Stack Up Thickness: 60.0000
Positive Tolerance %: 10
Negative Tolerance %: 10
Symmetrical ☑

Plane Layers: 1, 2, 3, 4, 5, 6, 7, 8
Mixed Layers: 1, 2, 3, 4, 5, 6, 7, 8

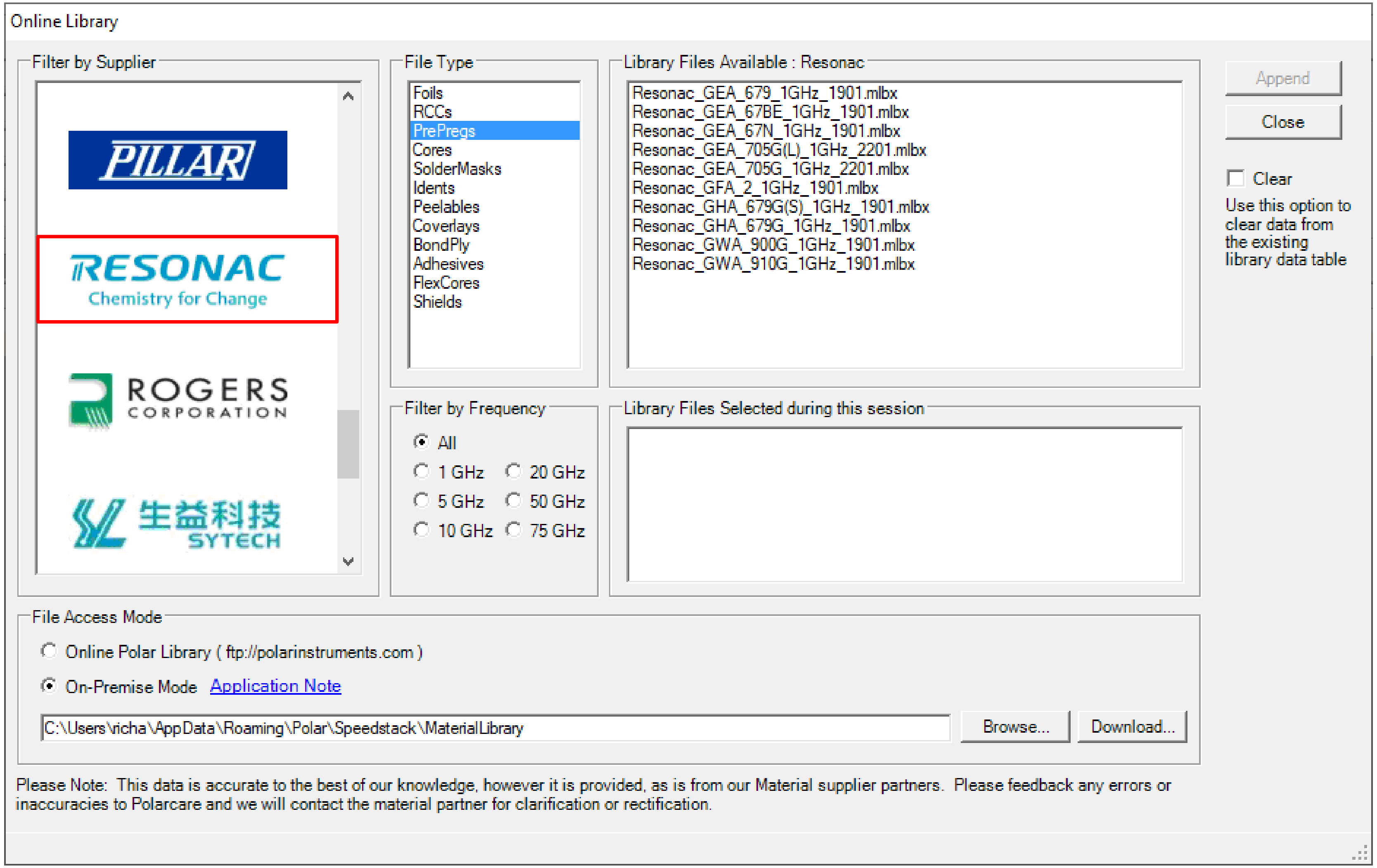
Nominal Dielectric Constant: 4.2000
Nominal Loss Tangent: 0.0195
Solder Mask Top ☑ Solder Mask Bottom ☑
Solder Mask Dielectric Constant: 4.0000
Solder Mask Loss Tangent: 0.0195
Solder Mask Thickness
Preferred Core Thickness
Copper Thickness

Build Type
● Foil ○ Core

When the Symmetrical mode is selected, the Solder Mask Bottom checkbox now matches Solder Mask Top when the checkbox is selected

Under the wizard, Define Sequential Build, the colour of the core dielectric is now set to the Core Dielectric colour as defined under the Tools | Options | Colours. Previously, the core dielectric was set to the Speedstack default colour

Resonac materials added to the Online Library



Online Library
Filter by Supplier
PILLAR
RESONAC Chemistry for Change
ROGERS CORPORATION
生益科技 SYTECH
File Type
Foils
RCCs
PrePregs
Cores
SolderMasks
Idents
Peelables
Coverlays
BondPly
Adhesives
FlexCores
Shields
Filter by Frequency
All
1 GHz
20 GHz
5 GHz
50 GHz
10 GHz
75 GHz
Library Files Selected during this session
Append
Close
Clear
File Access Mode
Browse...
Download...

Library Files Available : Resonac

- Resonac_GEA_679_1GHz_1901.mlbx
- Resonac_GEA_67BE_1GHz_1901.mlbx
- Resonac_GEA_67N_1GHz_1901.mlbx
- Resonac_GEA_705G(L)_1GHz_2201.mlbx
- Resonac_GEA_705G_1GHz_2201.mlbx
- Resonac_GFA_2_1GHz_1901.mlbx
- Resonac_GHA_679G(S)_1GHz_1901.mlbx
- Resonac_GHA_679G_1GHz_1901.mlbx
- Resonac_GWA_900G_1GHz_1901.mlbx
- Resonac_GWA_910G_1GHz_1901.mlbx

File Type: PrePregs

Filter by Frequency: ● All

☐ Clear

Use this option to clear data from the existing library data table

○ Online Polar Library (ftp://polarinstruments.com)

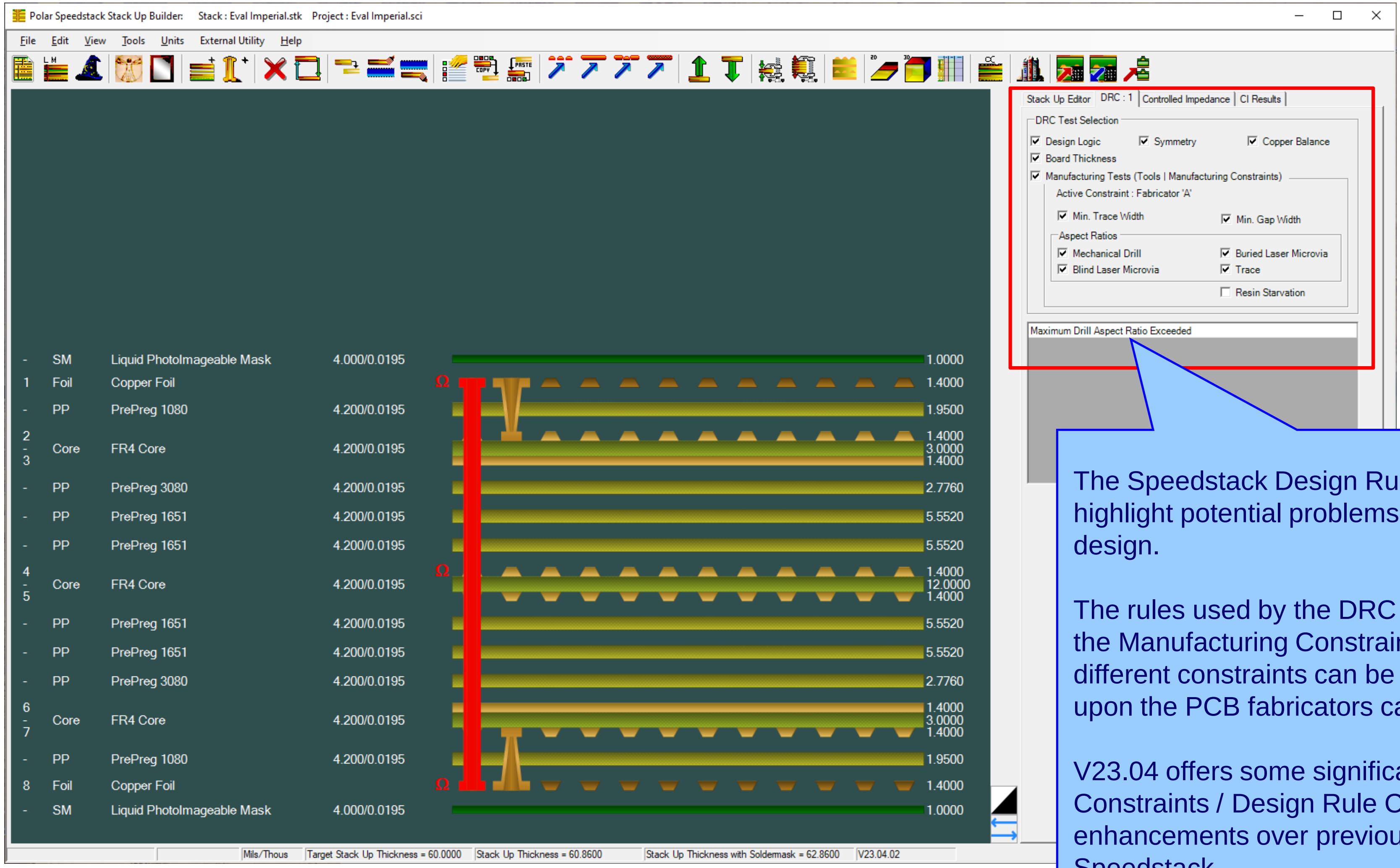
● On-Premise Mode Application Note

C:\Users\richa\AppData\Roaming\Polar\Speedstack\MaterialLibrary

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Speedstack v23.04.02 (April 2023)

Manufacturing Constraints / Design Rule Check Enhancements



Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk Project : Eval Imperial.sci

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 3080	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 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 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 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Mils/Thous
Target Stack Up Thickness = 60.0000
Stack Up Thickness = 60.8600
Stack Up Thickness with Soldermask = 62.8600
V23.04.02

DRC Test Selection

☑ Design Logic ☑ Symmetry ☑ Copper Balance
☑ Board Thickness
☑ Manufacturing Tests (Tools | Manufacturing Constraints)

Active Constraint : Fabricator 'A'

☑ Min. Trace Width ☑ Min. Gap Width

Aspect Ratios
☑ Mechanical Drill ☑ Buried Laser Microvia
☑ Blind Laser Microvia ☑ Trace
☐ Resin Starvation

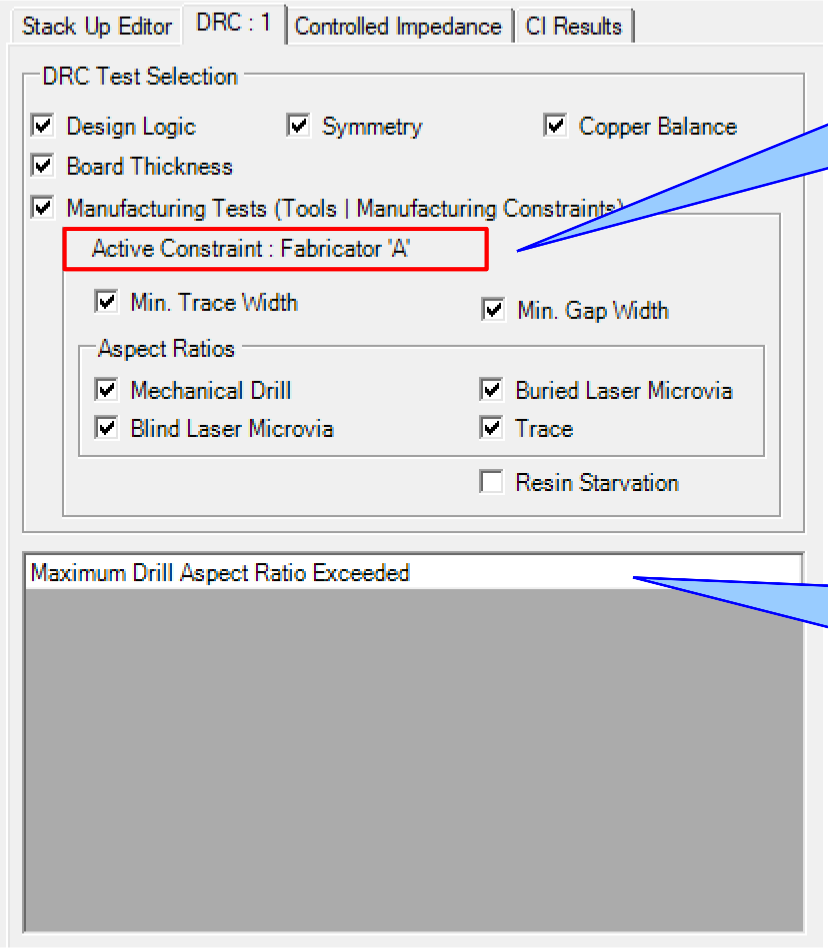
Maximum Drill Aspect Ratio Exceeded

The Speedstack Design Rule Checks (DRC) highlight potential problems with the stack up design.

The rules used by the DRC are held within the Manufacturing Constraints, where different constraints can be configured based upon the PCB fabricators capabilities.

V23.04 offers some significant Manufacturing Constraints / Design Rule Check enhancements over previous versions of Speedstack.

Manufacturing Constraints / Design Rule Check Enhancements



DRC Test Selection

☑ Design Logic ☑ Symmetry ☑ Copper Balance
☑ Board Thickness
☑ Manufacturing Tests (Tools | Manufacturing Constraints)

Active Constraint : Fabricator 'A'

☑ Min. Trace Width ☑ Min. Gap Width

Aspect Ratios

☑ Mechanical Drill ☑ Buried Laser Microvia
☑ Blind Laser Microvia ☑ Trace

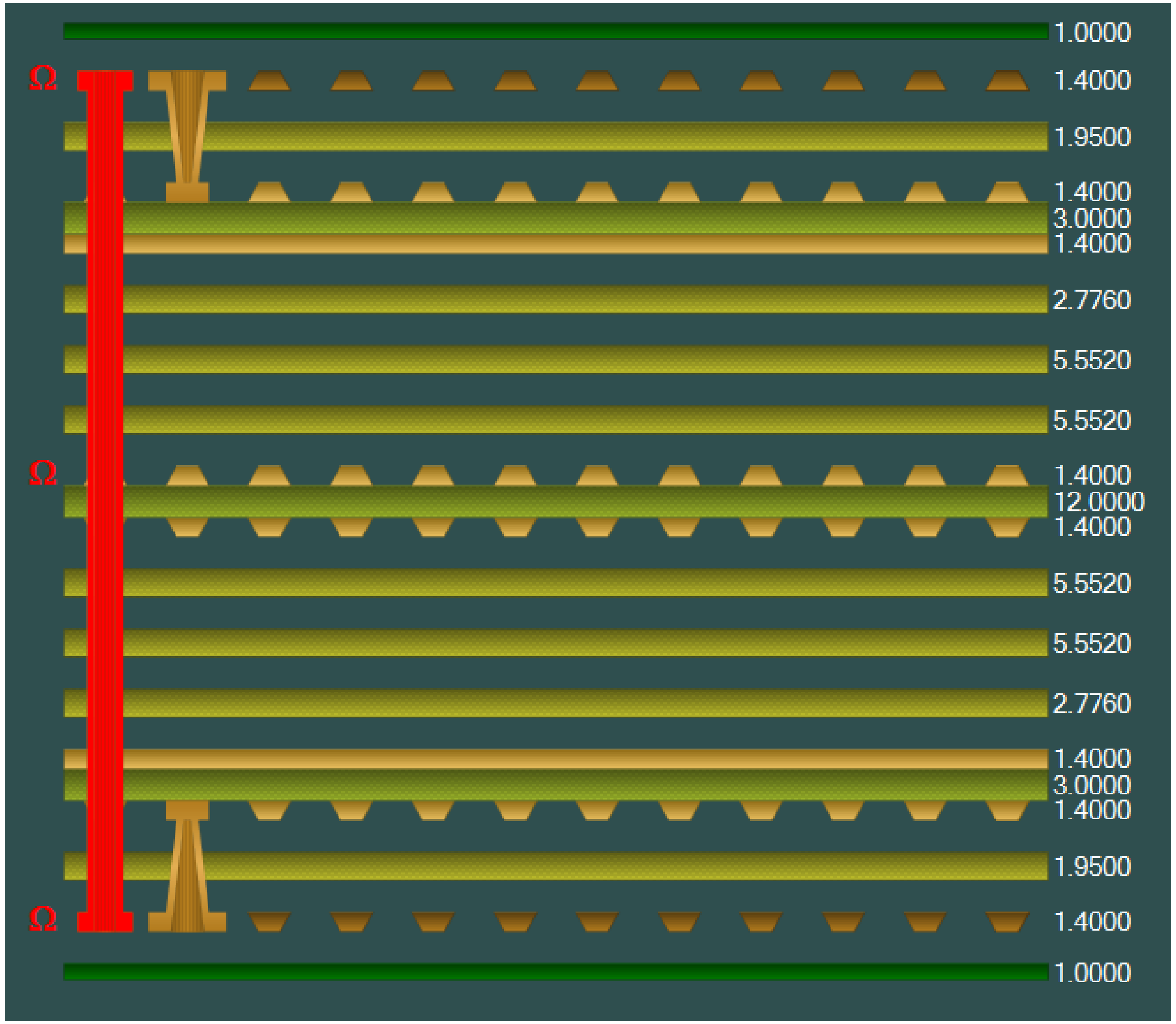
☐ Resin Starvation

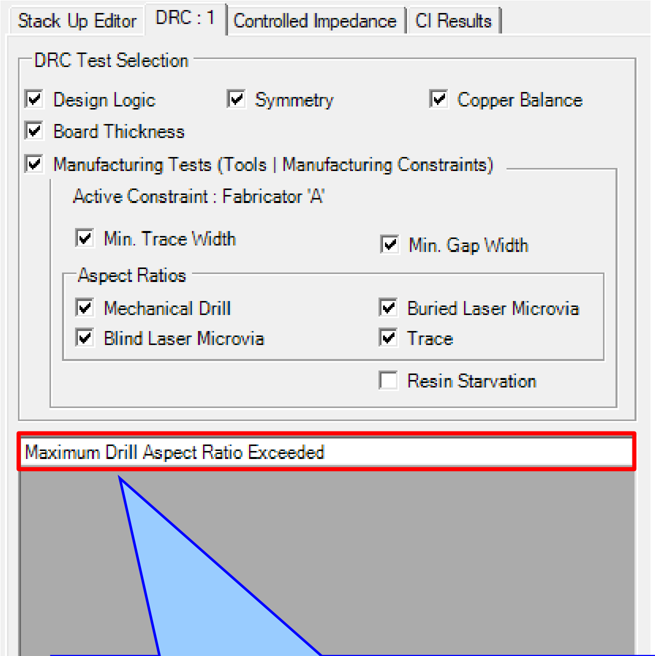
Maximum Drill Aspect Ratio Exceeded

The Active Constraint name is now displayed here so the current selected set of Manufacturing Constraints is easily identifiable

DRC errors are listed here. Clicking the error will graphically highlight the problem on the stack up

Manufacturing Constraints / Design Rule Check Enhancements


Ω
Ω
Ω
1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000


Stack Up Editor
DRC : 1
Controlled Impedance
CI Results

DRC Test Selection

☑ Design Logic ☑ Symmetry ☑ Copper Balance
☑ Board Thickness
☑ Manufacturing Tests (Tools | Manufacturing Constraints)

Active Constraint : Fabricator 'A'

☑ Min. Trace Width ☑ Min. Gap Width

Aspect Ratios

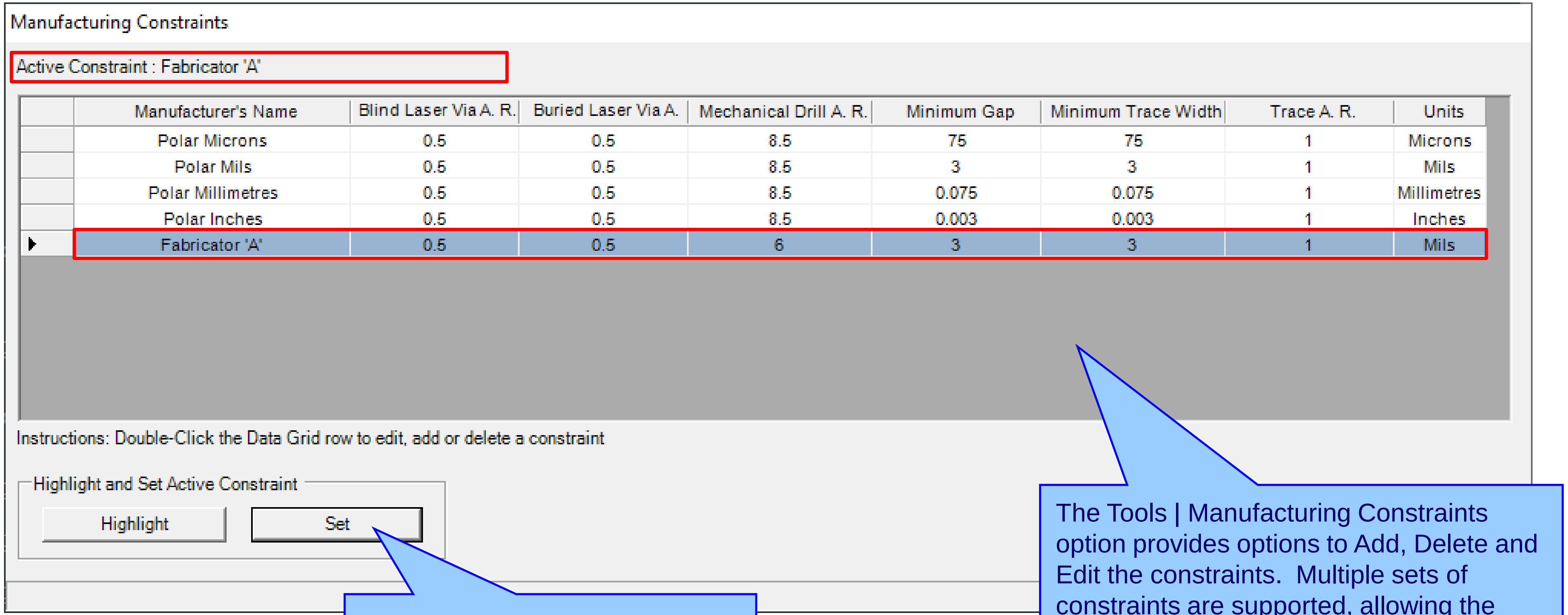
☑ Mechanical Drill ☑ Buried Laser Microvia
☑ Blind Laser Microvia ☑ Trace
☐ Resin Starvation

Maximum Drill Aspect Ratio Exceeded

In this example a Drill Aspect Ratio error has been identified, clicking on the error will highlight the offending drill in red.

Drill Aspect Ratio checks the length of the drill against the diameter to determine whether plating problems might occur

Manufacturing Constraints / Design Rule Check Enhancements



Manufacturing Constraints

Active Constraint : Fabricator 'A'

Manufacturer's Name	Blind Laser Via A. R.	Buried Laser Via A.	Mechanical Drill A. R.	Minimum Gap	Minimum Trace Width	Trace A. R.	Units
Polar Microns	0.5	0.5	8.5	75	75	1	Microns
Polar Mils	0.5	0.5	8.5	3	3	1	Mils
Polar Millimetres	0.5	0.5	8.5	0.075	0.075	1	Millimetres
Polar Inches	0.5	0.5	8.5	0.003	0.003	1	Inches
Fabricator 'A'	0.5	0.5	6	3	3	1	Mils

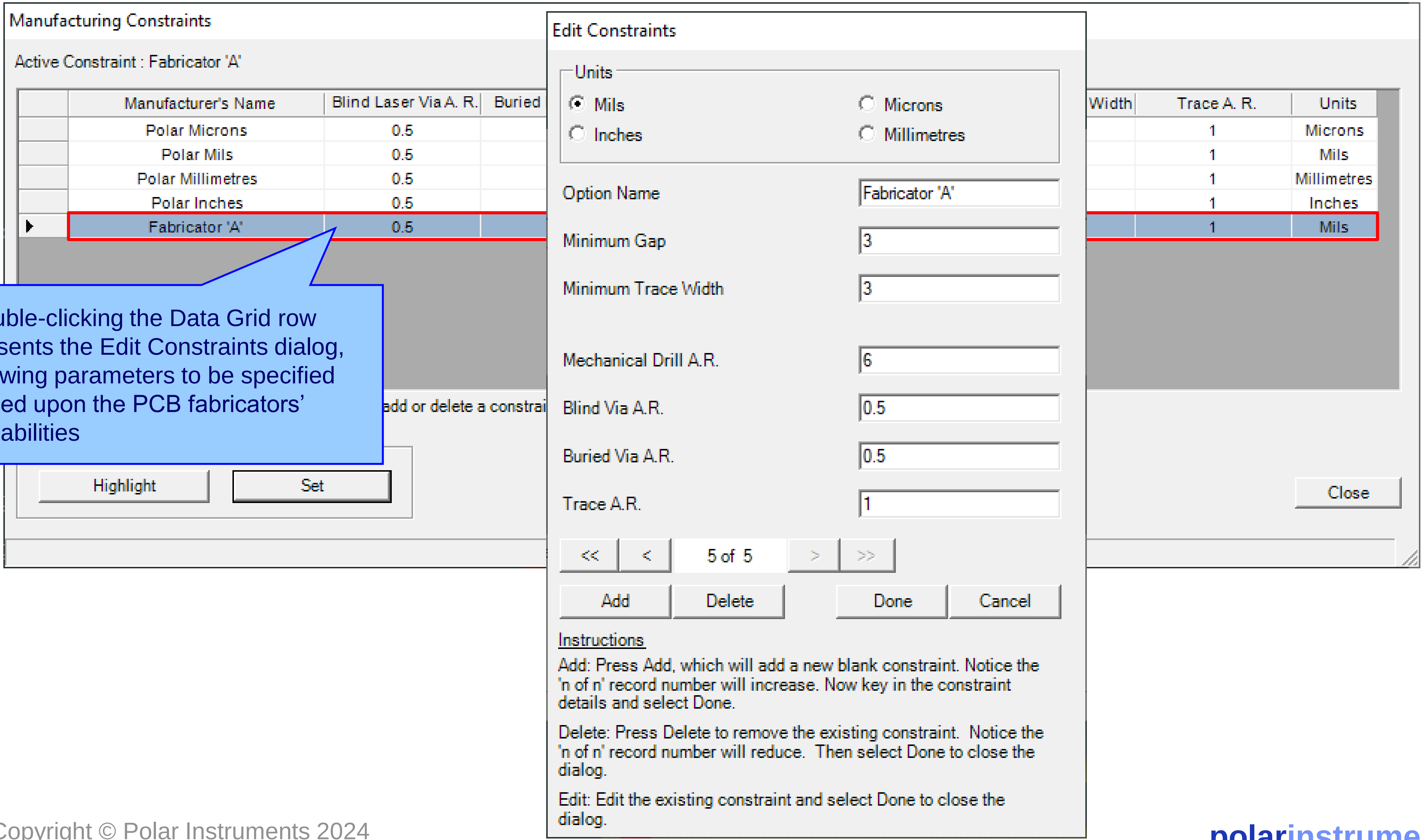
Instructions: Double-Click the Data Grid row to edit, add or delete a constraint

Switching the active constraint is achieved by selecting the required Data Grid row and clicking Set

The Tools | Manufacturing Constraints option provides options to Add, Delete and Edit the constraints. Multiple sets of constraints are supported, allowing the stack up design to be checked against different fabricators capabilities.

The current active constraint used by the DRC tab, Fabricator ‘A’, is displayed above the Data Grid

Manufacturing Constraints / Design Rule Check Enhancements



Active Constraint : Fabricator 'A'

	Manufacturer's Name	Blind Laser Via A. R.	Buried	Width	Trace A. R.	Units
	Polar Microns	0.5			1	Microns
	Polar Mils	0.5			1	Mils
	Polar Millimetres	0.5			1	Millimetres
	Polar Inches	0.5			1	Inches
▶	Fabricator 'A'	0.5			1	Mils

add or delete a constrai

Units
● Mils ○ Microns
○ Inches ○ Millimetres

Option Name: Fabricator 'A'
Minimum Gap: 3
Minimum Trace Width: 3
Mechanical Drill A.R.: 6
Blind Via A.R.: 0.5
Buried Via A.R.: 0.5
Trace A.R.: 1

5 of 5

Instructions

Add: Press Add, which will add a new blank constraint. Notice the 'n of n' record number will increase. Now key in the constraint details and select Done.

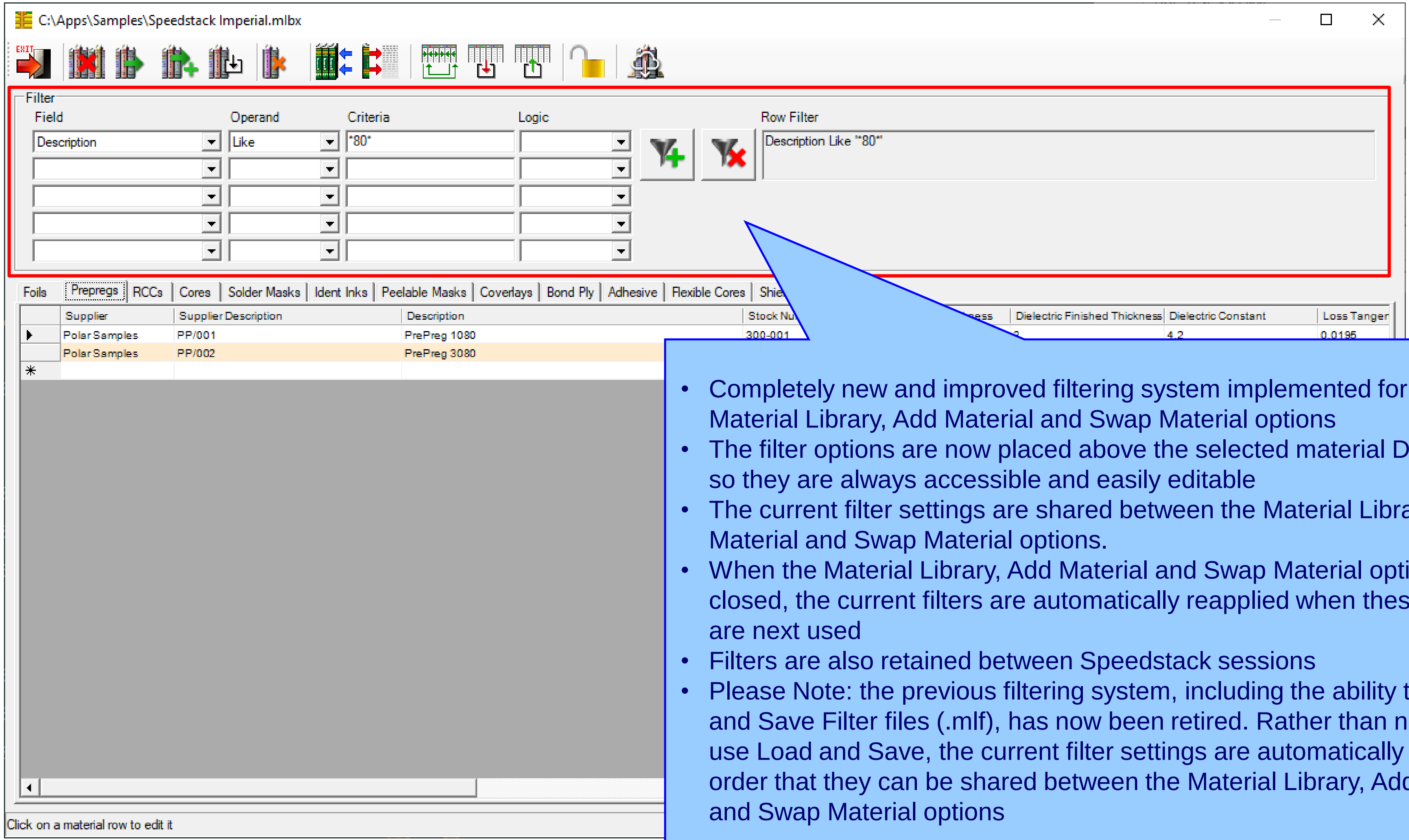
Delete: Press Delete to remove the existing constraint. Notice the 'n of n' record number will reduce. Then select Done to close the dialog.

Edit: Edit the existing constraint and select Done to close the dialog.

Double-clicking the Data Grid row presents the Edit Constraints dialog, allowing parameters to be specified based upon the PCB fabricators' capabilities

Speedstack v23.03.01 (March 2023)

Material Library Filter / Search Enhancements



C:\Apps\Samples\Speedstack Imperial.mlbx

Filter

Field	Operand	Criteria	Logic
Description	Like	*80*	

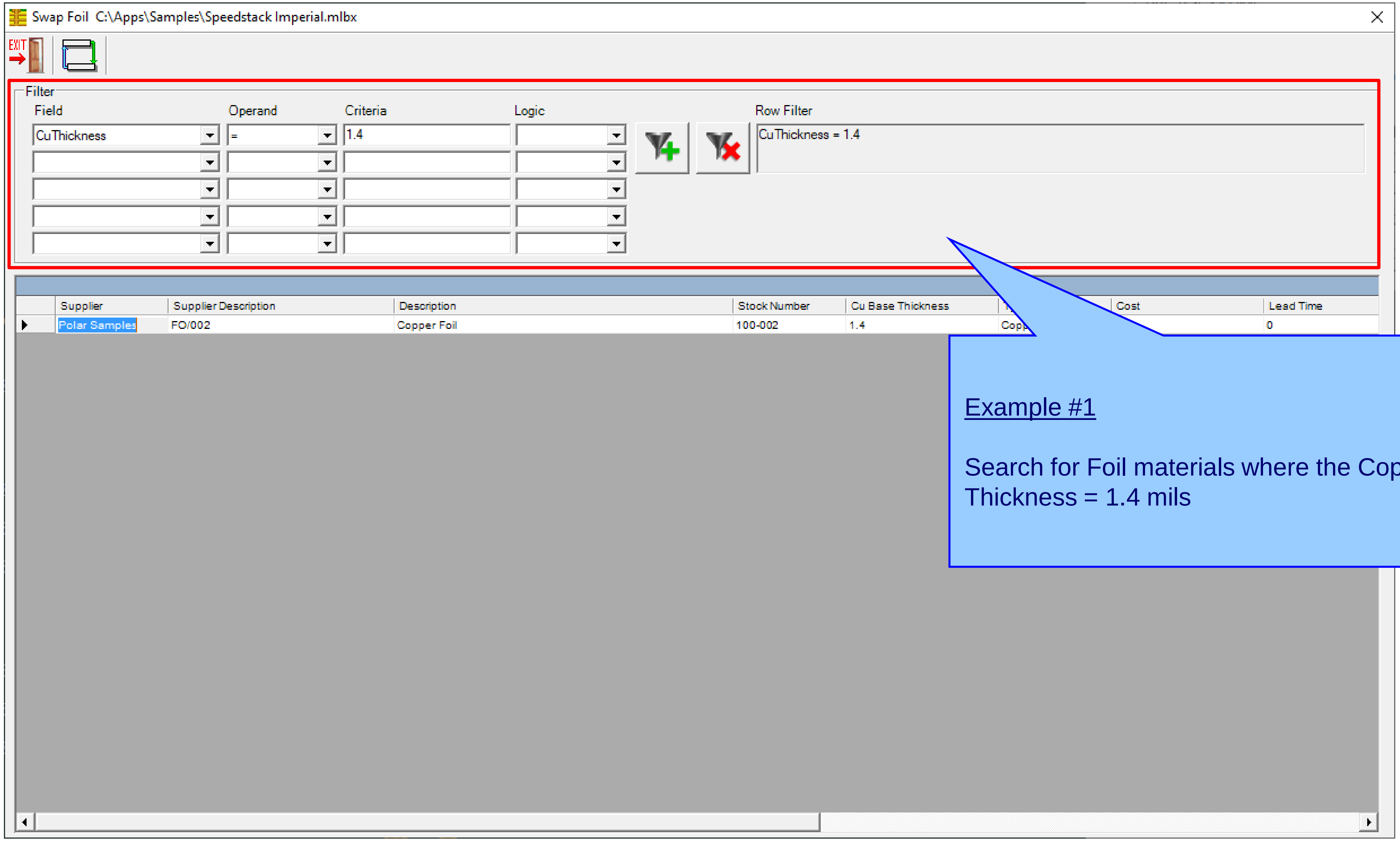
Row Filter: Description Like '*80*'

Supplier	Supplier Description	Description	Stock Nu	ess	Dielectric Finished Thickness	Dielectric Constant	Loss Tanger
Polar Samples	PP/001	PrePreg 1080	300-001		3	4.2	0.0195
Polar Samples	PP/002	PrePreg 3080					

Click on a material row to edit it

- Completely new and improved filtering system implemented for the Material Library, Add Material and Swap Material options
- The filter options are now placed above the selected material Data Grid, so they are always accessible and easily editable
- The current filter settings are shared between the Material Library, Add Material and Swap Material options.
- When the Material Library, Add Material and Swap Material options are closed, the current filters are automatically reapplied when these options are next used
- Filters are also retained between Speedstack sessions
- Please Note: the previous filtering system, including the ability to Load and Save Filter files (.mlf), has now been retired. Rather than needing to use Load and Save, the current filter settings are automatically saved in order that they can be shared between the Material Library, Add Material and Swap Material options

Material Library Filter / Search Enhancements



Swap Foil C:\Apps\Samples\Speedstack Imperial.mlbx

Filter

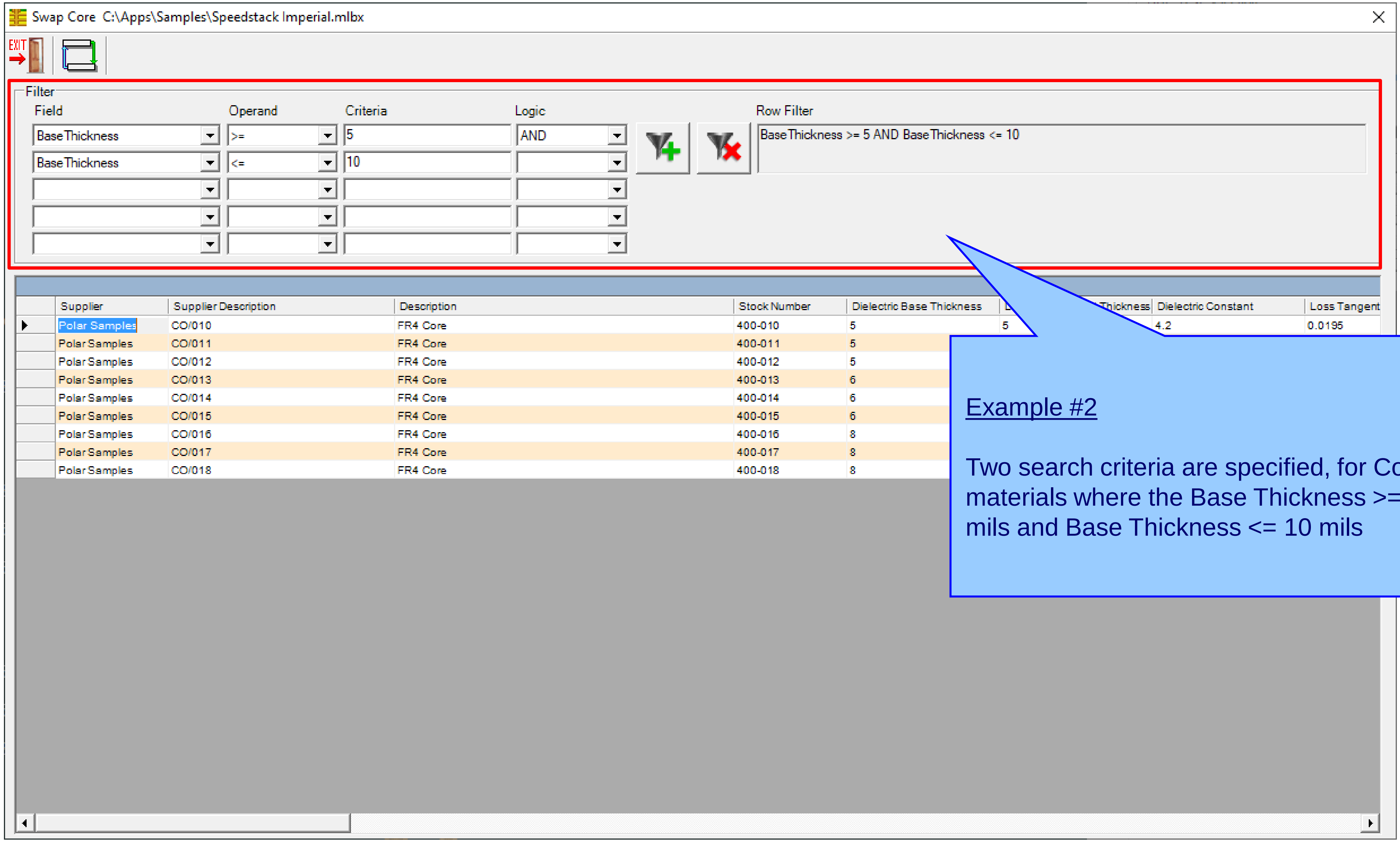
Field: CuThickness
Operand: =
Criteria: 1.4
Logic:
Row Filter: CuThickness = 1.4

	Supplier	Supplier Description	Description	Stock Number	Cu Base Thickness		Cost	Lead Time
▶	Polar Samples	FO/002	Copper Foil	100-002	1.4	Cop		0

Example #1

Search for Foil materials where the Copper Thickness = 1.4 mils

Material Library Filter / Search Enhancements



Field	Operand	Criteria	Logic
Base Thickness	>=	5	AND
Base Thickness	<=	10	

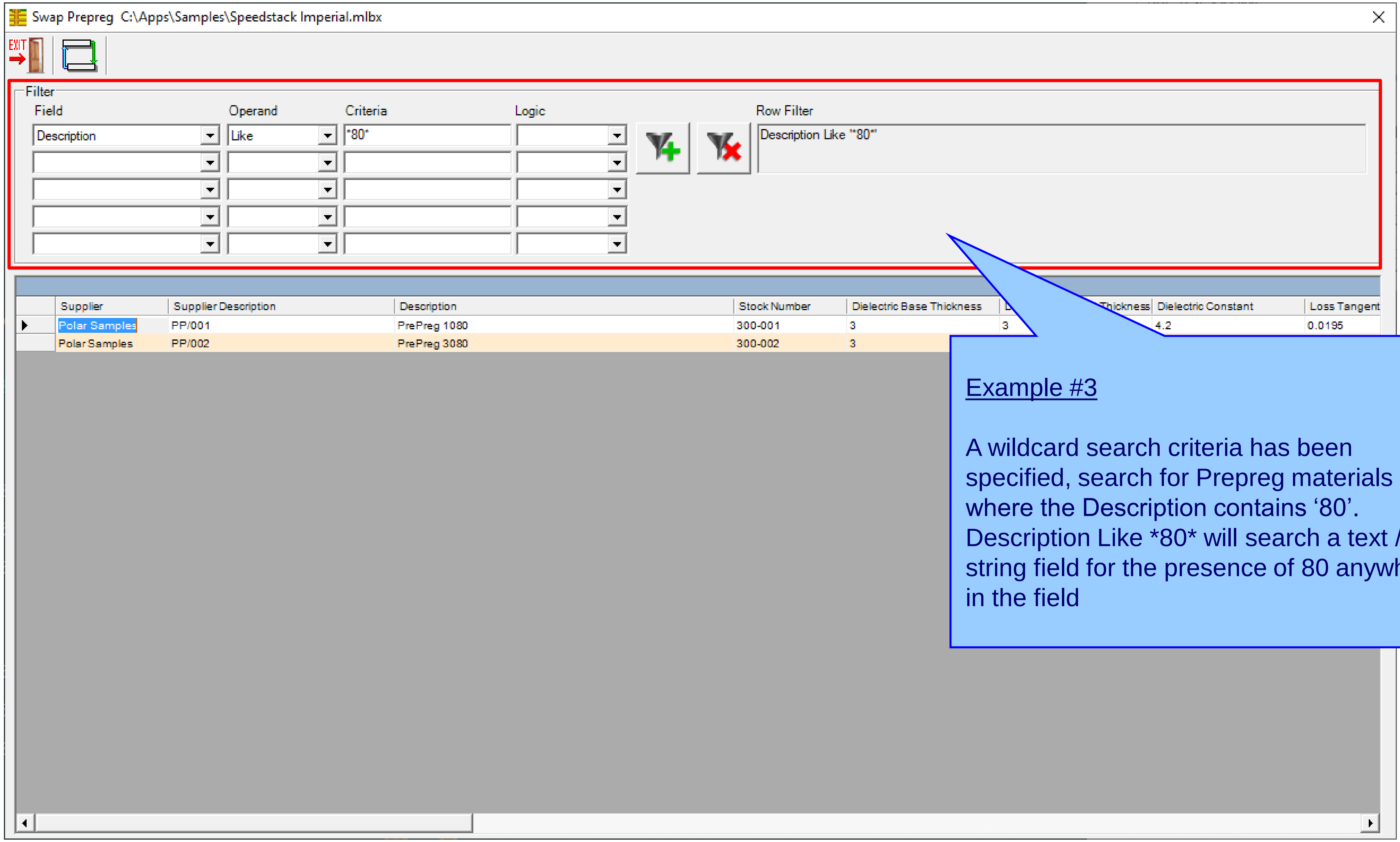
Row Filter: Base Thickness >= 5 AND Base Thickness <= 10

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Thickness	Dielectric Constant	Loss Tangent
Polar Samples	CO/010	FR4 Core	400-010	5	5	4.2	0.0195
Polar Samples	CO/011	FR4 Core	400-011	5			
Polar Samples	CO/012	FR4 Core	400-012	5			
Polar Samples	CO/013	FR4 Core	400-013	6			
Polar Samples	CO/014	FR4 Core	400-014	6			
Polar Samples	CO/015	FR4 Core	400-015	6			
Polar Samples	CO/016	FR4 Core	400-016	8			
Polar Samples	CO/017	FR4 Core	400-017	8			
Polar Samples	CO/018	FR4 Core	400-018	8			

Example #2

Two search criteria are specified, for Core materials where the Base Thickness >= 5 mils and Base Thickness <= 10 mils

Material Library Filter / Search Enhancements


Swap Prepreg C:\Apps\Samples\Speedstack Imperial.mlbx
EXIT
Filter
Field
Operand
Criteria
Logic
Row Filter

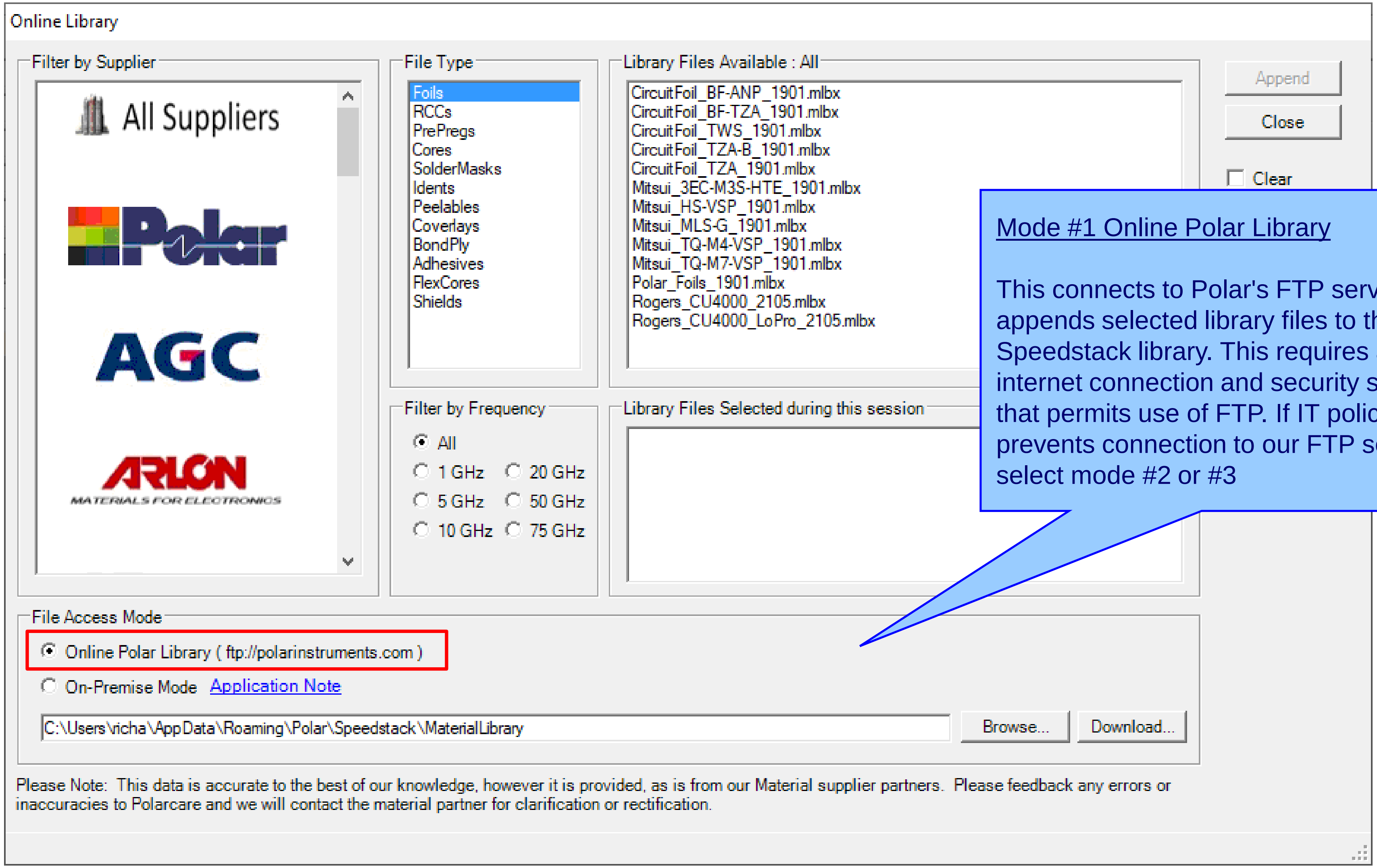
Field: Description
Operand: Like
Criteria: *80*
Row Filter: Description Like '*80*'

	Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	D	Thickness	Dielectric Constant	Loss Tangent
▶	Polar Samples	PP/001	PrePreg 1080	300-001	3	3		4.2	0.0195
	Polar Samples	PP/002	PrePreg 3080	300-002	3				

Example #3

A wildcard search criteria has been specified, search for Prepreg materials where the Description contains ‘80’. Description Like *80* will search a text / string field for the presence of 80 anywhere in the field

Online Library – Now supports three modes


Online Library
Filter by Supplier
All Suppliers
Polar
AGC
ARLON
MATERIALS FOR ELECTRONICS
File Type
Library Files Available : All
Append
Close
Clear
Filter by Frequency
Library Files Selected during this session
File Access Mode
Application Note
Browse...
Download...

File Type:
- Foils
- RCCs
- PrePregs
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields

Library Files Available : All
- CircuitFoil_BF-ANP_1901.mlbx
- CircuitFoil_BF-TZA_1901.mlbx
- CircuitFoil_TWS_1901.mlbx
- CircuitFoil_TZA-B_1901.mlbx
- CircuitFoil_TZA_1901.mlbx
- Mitsui_3EC-M3S-HTE_1901.mlbx
- Mitsui_HS-VSP_1901.mlbx
- Mitsui_MLS-G_1901.mlbx
- Mitsui_TQ-M4-VSP_1901.mlbx
- Mitsui_TQ-M7-VSP_1901.mlbx
- Polar_Foils_1901.mlbx
- Rogers_CU4000_2105.mlbx
- Rogers_CU4000_LoPro_2105.mlbx

☐ Clear

Filter by Frequency:
● All
○ 1 GHz ○ 20 GHz
○ 5 GHz ○ 50 GHz
○ 10 GHz ○ 75 GHz

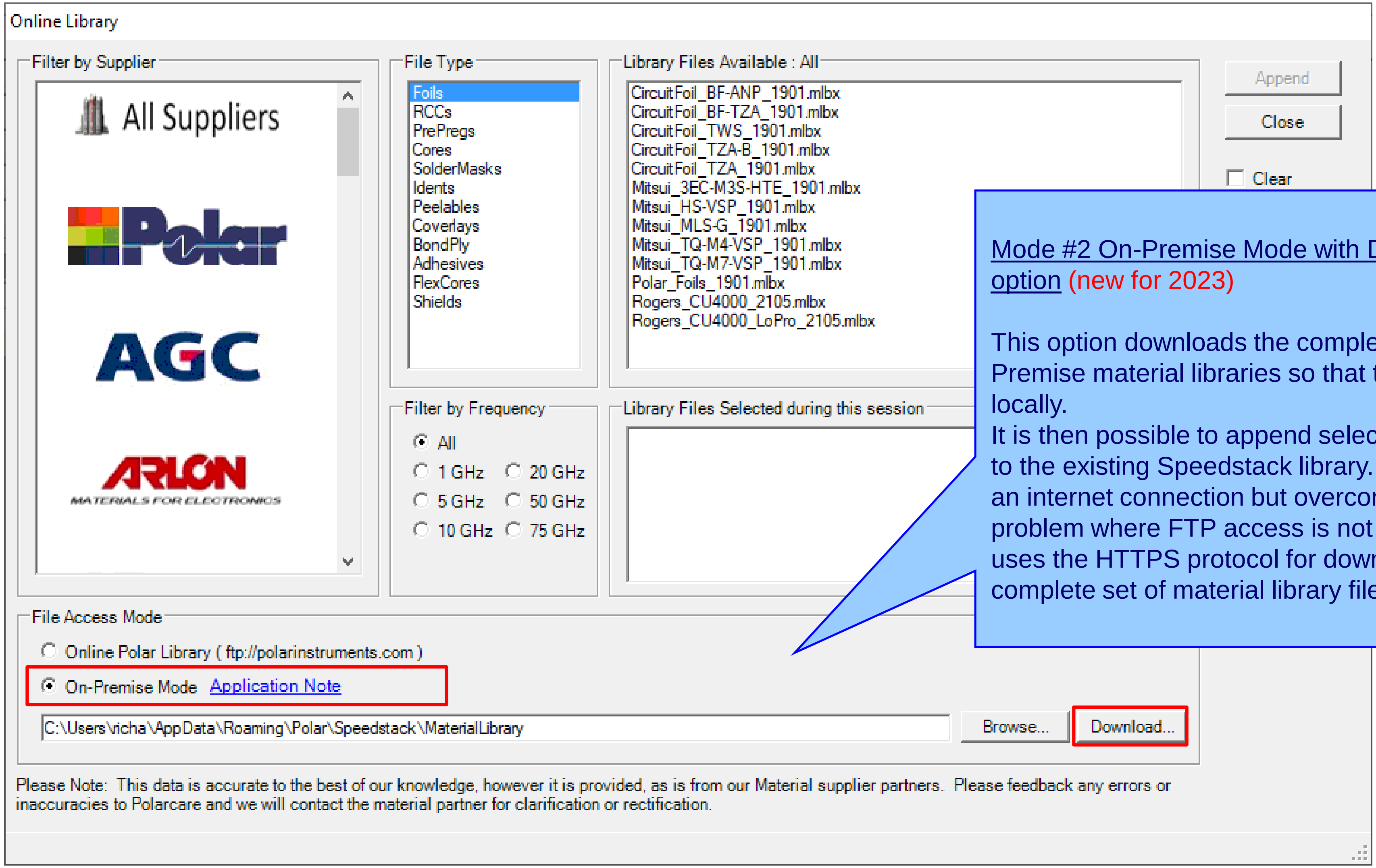
File Access Mode:
● Online Polar Library (ftp://polarinstruments.com)
○ On-Premise Mode Application Note
C:\Users\richa\AppData\Roaming\Polar\Speedstack\MaterialLibrary

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Mode #1 Online Polar Library

This connects to Polar's FTP server and appends selected library files to the existing Speedstack library. This requires an internet connection and security settings that permits use of FTP. If IT policies prevents connection to our FTP server, select mode #2 or #3

Online Library – Now supports three modes


Online Library
Filter by Supplier
All Suppliers
Polar
AGC
ARLON
MATERIALS FOR ELECTRONICS
File Type
Foils
RCCs
PrePregs
Cores
SolderMasks
Idents
Peelables
Coverlays
BondPly
Adhesives
FlexCores
Shields
Library Files Available : All
Append
Close
Clear
Filter by Frequency
All
1 GHz
20 GHz
5 GHz
50 GHz
10 GHz
75 GHz
Library Files Selected during this session
File Access Mode
Application Note
Browse...
Download...

Library Files Available : All
CircuitFoil_BF-ANP_1901.mlbx
CircuitFoil_BF-TZA_1901.mlbx
CircuitFoil_TWS_1901.mlbx
CircuitFoil_TZA-B_1901.mlbx
CircuitFoil_TZA_1901.mlbx
Mitsui_3EC-M3S-HTE_1901.mlbx
Mitsui_HS-VSP_1901.mlbx
Mitsui_MLS-G_1901.mlbx
Mitsui_TQ-M4-VSP_1901.mlbx
Mitsui_TQ-M7-VSP_1901.mlbx
Polar_Foils_1901.mlbx
Rogers_CU4000_2105.mlbx
Rogers_CU4000_LoPro_2105.mlbx

File Type: Foils

Filter by Frequency: ● All

File Access Mode
○ Online Polar Library (ftp://polarinstruments.com)
● On-Premise Mode Application Note

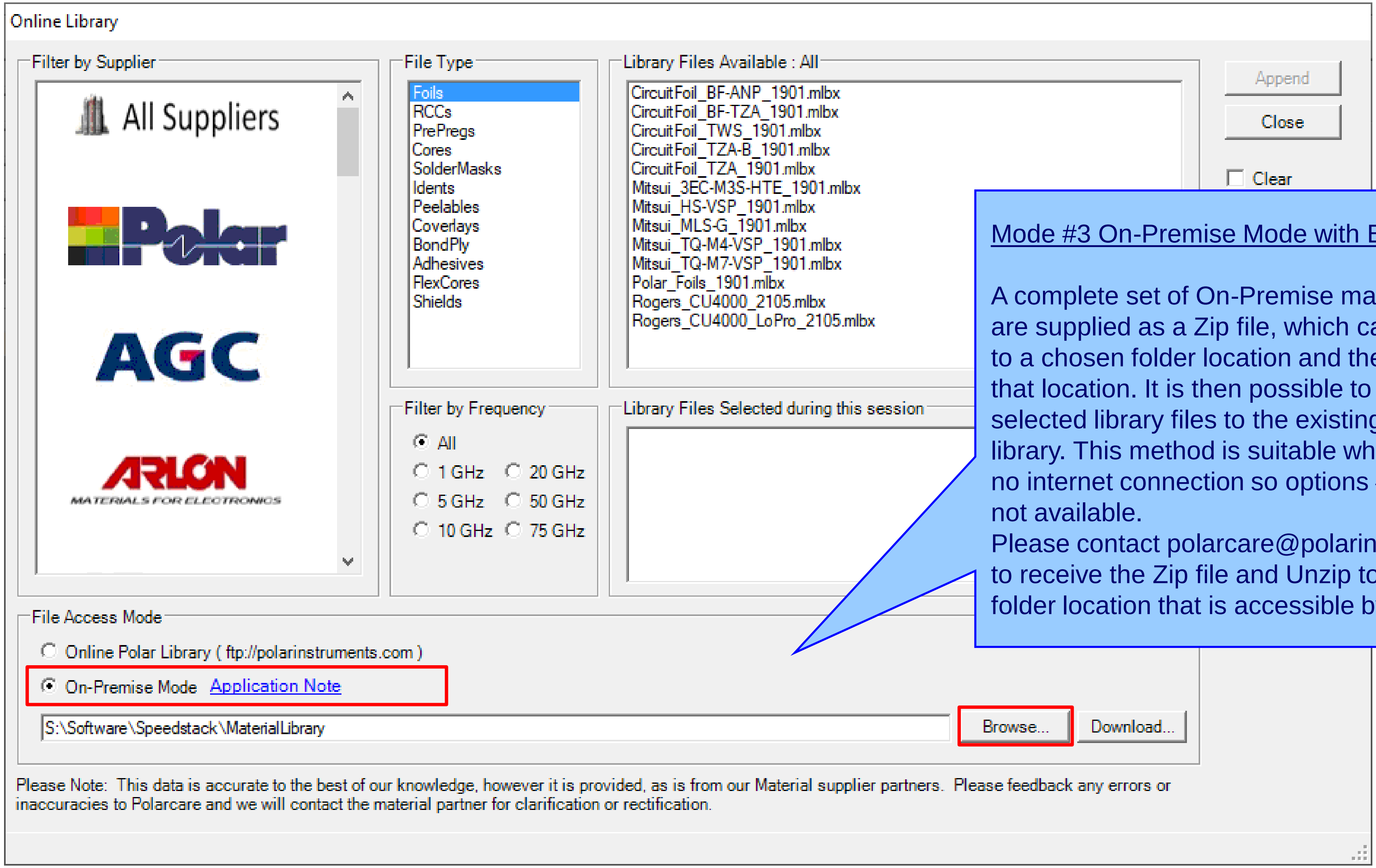
C:\Users\richa\AppData\Roaming\Polar\Speedstack\MaterialLibrary

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Mode #2 On-Premise Mode with Download option (new for 2023)

This option downloads the complete set of On-Premise material libraries so that they are stored locally.
It is then possible to append selected library files to the existing Speedstack library. This requires an internet connection but overcomes the problem where FTP access is not permitted as it uses the HTTPS protocol for downloading the complete set of material library files.

Online Library – Now supports three modes


Online Library
Filter by Supplier
All Suppliers
Polar
AGC
ARLON
MATERIALS FOR ELECTRONICS
File Type
Library Files Available : All
Append
Close
Clear
Filter by Frequency
Library Files Selected during this session
File Access Mode
Browse...
Download...

File Type:

- Foils
- RCCs
- PrePregs
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields

Library Files Available : All

- CircuitFoil_BF-ANP_1901.mlbx
- CircuitFoil_BF-TZA_1901.mlbx
- CircuitFoil_TWS_1901.mlbx
- CircuitFoil_TZA-B_1901.mlbx
- CircuitFoil_TZA_1901.mlbx
- Mitsui_3EC-M3S-HTE_1901.mlbx
- Mitsui_HS-VSP_1901.mlbx
- Mitsui_MLS-G_1901.mlbx
- Mitsui_TQ-M4-VSP_1901.mlbx
- Mitsui_TQ-M7-VSP_1901.mlbx
- Polar_Foils_1901.mlbx
- Rogers_CU4000_2105.mlbx
- Rogers_CU4000_LoPro_2105.mlbx

Filter by Frequency:

● All
○ 1 GHz ○ 20 GHz
○ 5 GHz ○ 50 GHz
○ 10 GHz ○ 75 GHz

File Access Mode:

○ Online Polar Library (ftp://polarinstruments.com)
● On-Premise Mode Application Note

S:\Software\Speedstack\MaterialLibrary

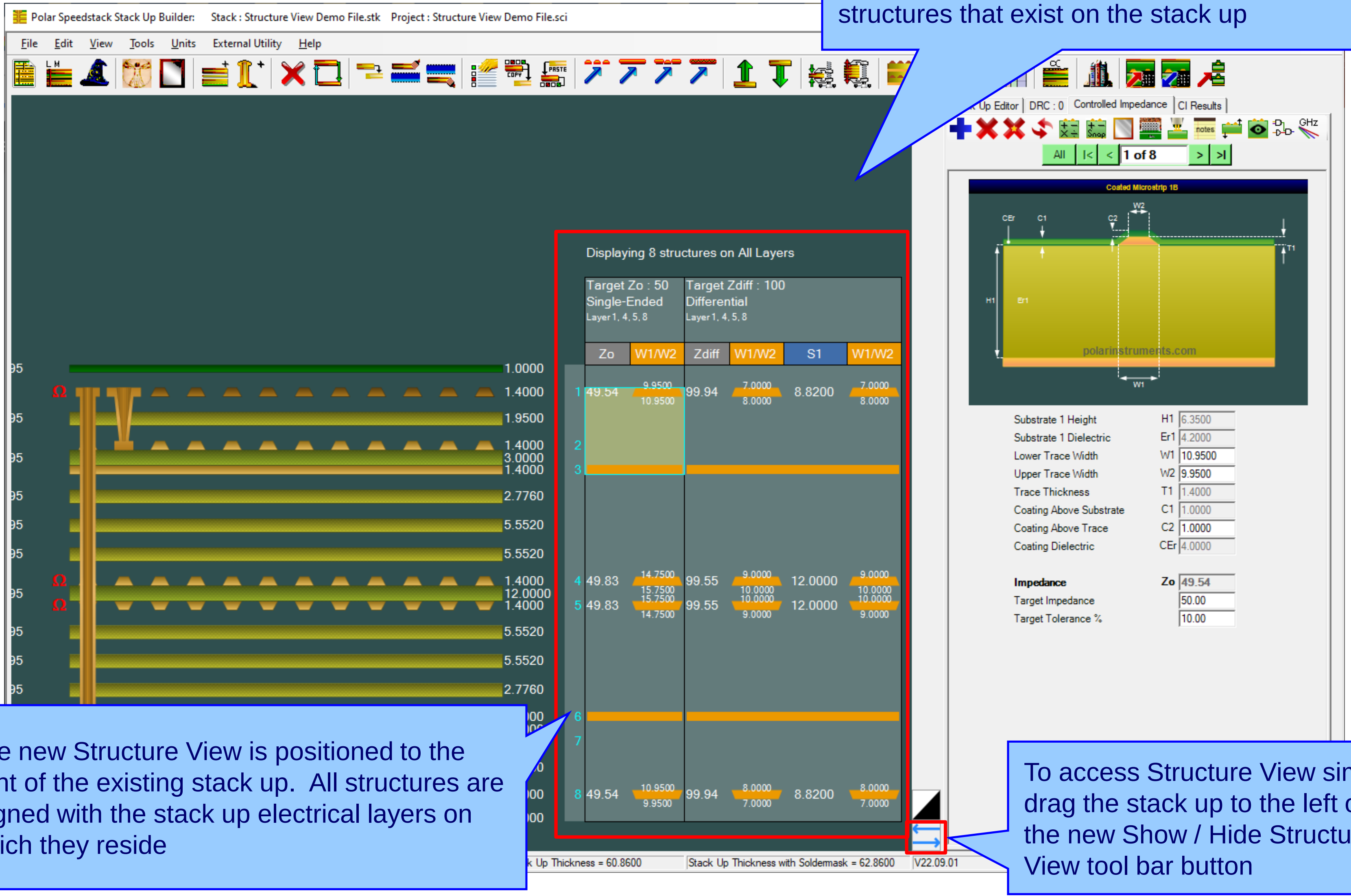
Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Mode #3 On-Premise Mode with Browse option

A complete set of On-Premise material libraries are supplied as a Zip file, which can be Unzipped to a chosen folder location and then Browse to that location. It is then possible to append selected library files to the existing Speedstack library. This method is suitable where users have no internet connection so options #1 and #2 are not available.
Please contact polarcare@polarinstruments.com to receive the Zip file and Unzip to a suitable folder location that is accessible by Speedstack

Speedstack v22.11.01 (November 2022)

Introducing Structure View


Polar Speedstack Stack Up Builder:
Stack : Structure View Demo File.stk
Project : Structure View Demo File.sci
File
Edit
View
Tools
Units
External Utility
Help
k Up Editor
DRC : 0
Controlled Impedance
CI Results
All
|<
<
1 of 8
>
>|
Coated Microstrip 1B
CEr
C1
C2
W2
T1
H1
Er1
W1
polarinstruments.com
1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760

Displaying 8 structures on All Layers

	Target Zo : 50 Single-Ended Layer 1, 4, 5, 8		Target Zdiff : 100 Differential Layer 1, 4, 5, 8			
	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	49.54	9.9500 10.9500	99.94	7.0000 8.0000	8.8200	7.0000 8.0000
2						
3						
4	49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000
5	49.83	15.7500 14.7500	99.55	10.0000 9.0000	12.0000	10.0000 9.0000
6						
7						
8	49.54	10.9500 9.9500	99.94	8.0000 7.0000	8.8200	8.0000 7.0000

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	10.9500
Upper Trace Width	W2	9.9500
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Dielectric	CEr	4.0000
Impedance	**Zo**	49.54
Target Impedance		50.00
Target Tolerance %		10.00

k Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V22.09.01

Structure View presents a useful overview of the controlled impedance / insertion loss structures that exist on the stack up

The new Structure View is positioned to the right of the existing stack up. All structures are aligned with the stack up electrical layers on which they reside

To access Structure View simply drag the stack up to the left or use the new Show / Hide Structure View tool bar button

Introducing Structure View

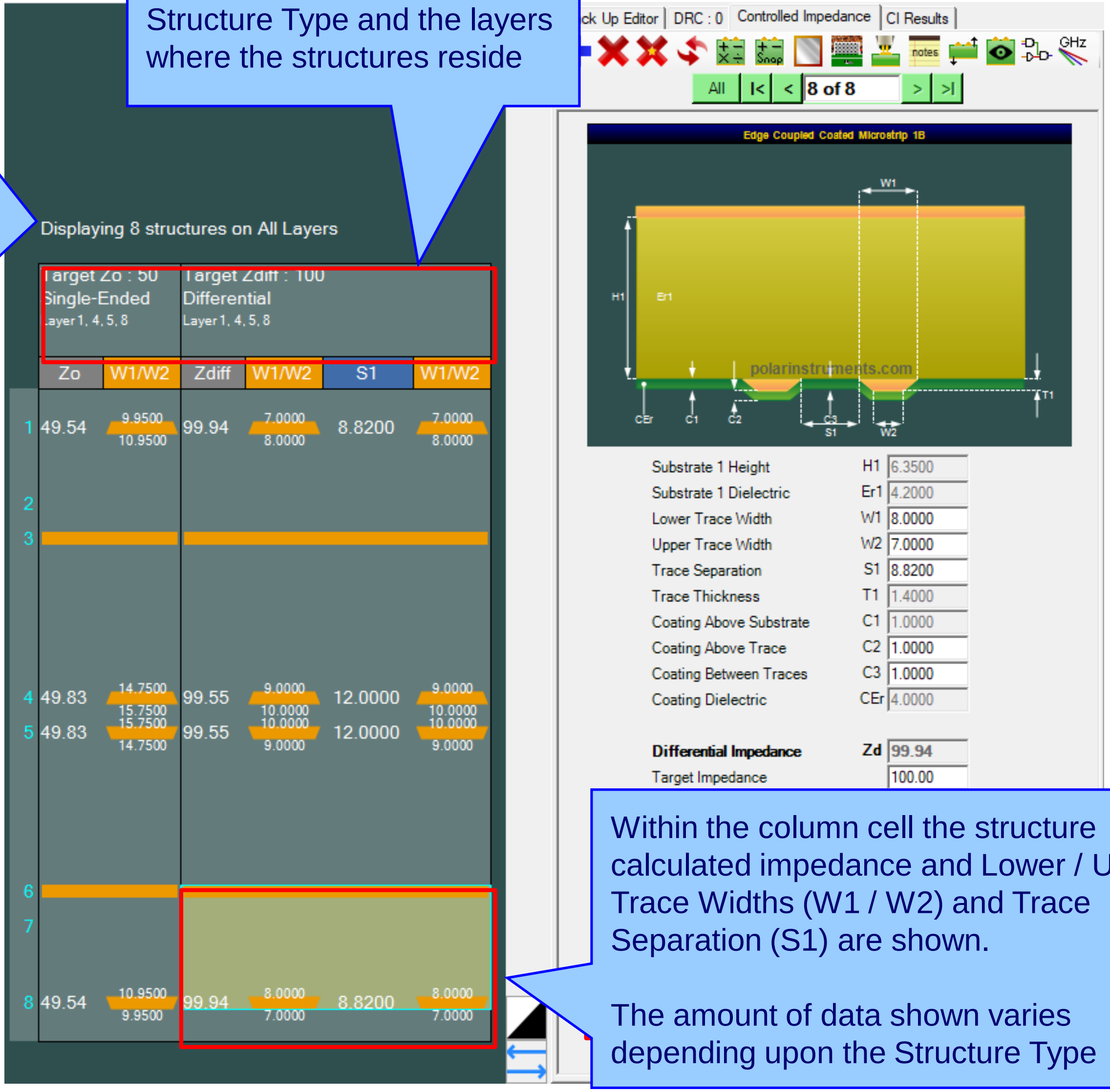
Structures are arranged by Target Impedance, low to high, then by Structure Type.

All structures of the same Target Impedance and Structure Type will be positioned in the same column

In this example there are 8 structures in total:

4 x 50 ohm singled-ended (column 1)
4 x 100 ohm differential (column 2)

The column header contains the Target Impedance, Structure Type and the layers where the structures reside



Displaying 8 structures on All Layers

	Target Zo : 50 Single-Ended ayer 1, 4, 5, 8		Target Zdiff : 100 Differential Layer 1, 4, 5, 8			
	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	49.54	9.9500 10.9500	99.94	7.0000 8.0000	8.8200	7.0000 8.0000
2						
3						
4	49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000
5	49.83	15.7500 14.7500	99.55	10.0000 9.0000	12.0000	10.0000 9.0000
6						
7						
8	49.54	10.9500 9.9500	99.94	8.0000 7.0000	8.8200	8.0000 7.0000

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	8.0000
Upper Trace Width	W2	7.0000
Trace Separation	S1	8.8200
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**	99.94
Target Impedance		100.00

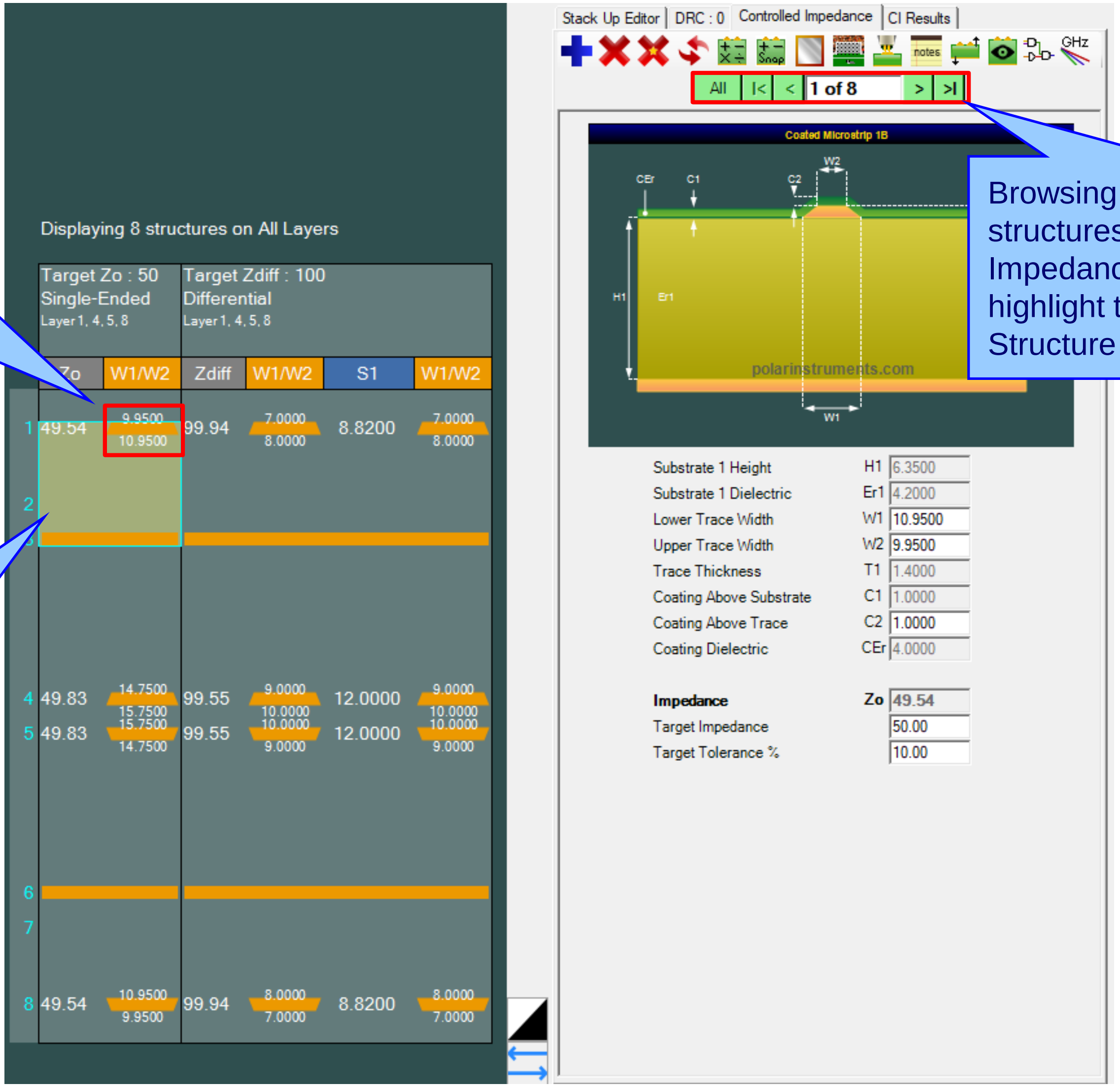
Within the column cell the structure calculated impedance and Lower / Upper Trace Widths (W1 / W2) and Trace Separation (S1) are shown.

The amount of data shown varies depending upon the Structure Type

Introducing Structure View

Structure View is interactive. Clicking on the golden trace will auto-switch to that structure on the Controlled Impedance tab

The transparent blue highlight reflects the current structure selected on the Controlled Impedance tab


Stack Up Editor
DRC : 0
Controlled Impedance
CI Results
Snap
notes
GHz
All
|<
<
1 of 8
>
>|
Coated Microstrip 1B
W2
CEr
C1
C2
H1
Er1
polarinstruments.com
W1

Displaying 8 structures on All Layers

	Target Zo : 50 Single-Ended Layer 1, 4, 5, 8		Target Zdiff : 100 Differential Layer 1, 4, 5, 8			
	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	49.54	9.9500 10.9500	99.94	7.0000 8.0000	8.8200	7.0000 8.0000
2						
3						
4	49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000
5	49.83	15.7500 14.7500	99.55	10.0000 9.0000	12.0000	10.0000 9.0000
6						
7						
8	49.54	10.9500 9.9500	99.94	8.0000 7.0000	8.8200	8.0000 7.0000

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	10.9500
Upper Trace Width	W2	9.9500
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Dielectric	CEr	4.0000
Impedance	**Zo**	49.54
Target Impedance		50.00
Target Tolerance %		10.00

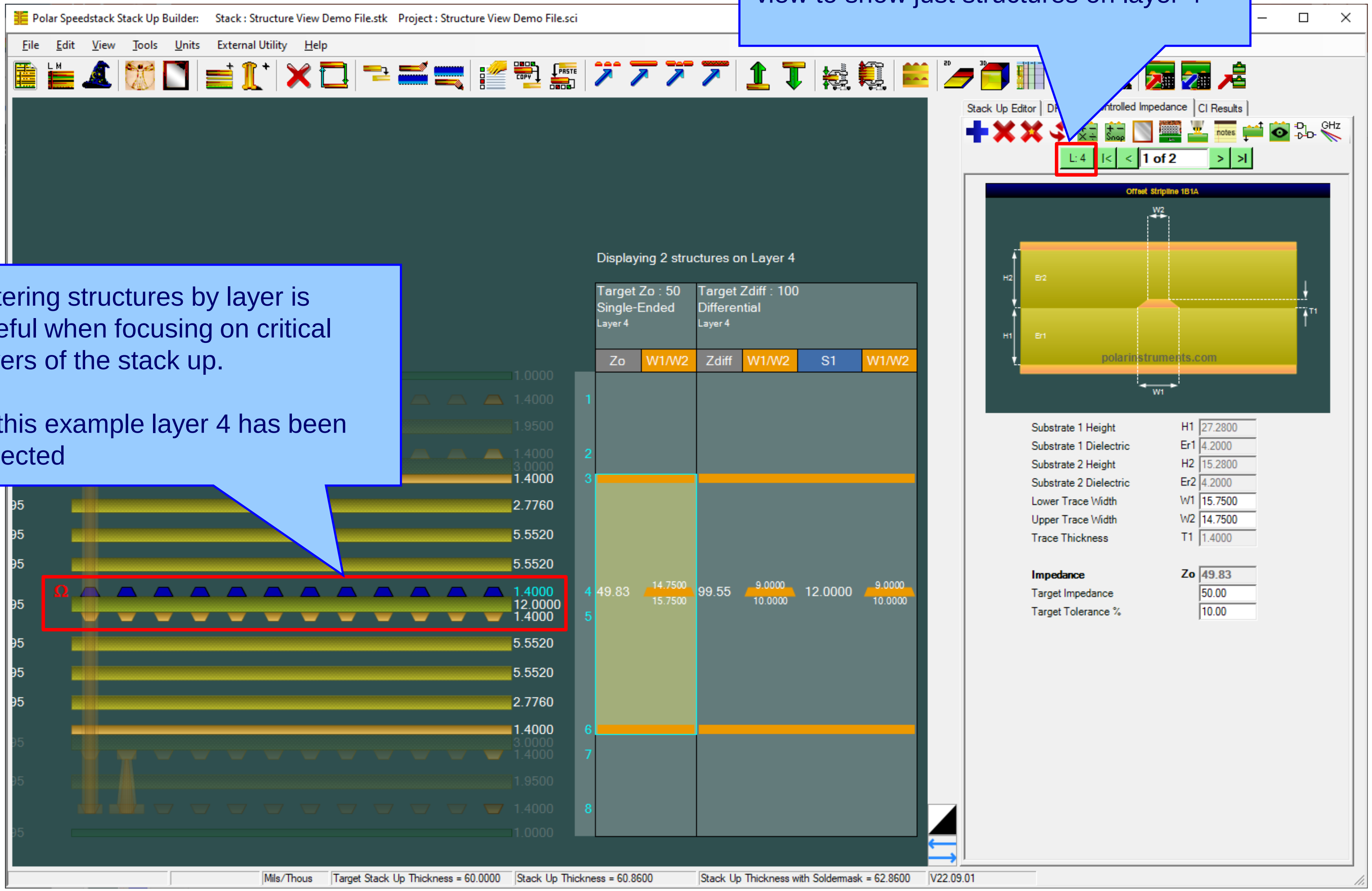
Browsing through the structures on the Controlled Impedance tab will auto highlight the structure on Structure View

Introducing Structure View

Clicking the ‘Filter by Layer’ updates the view to show just structures on layer 4

Filtering structures by layer is useful when focusing on critical layers of the stack up.

In this example layer 4 has been selected


Polar Speedstack Stack Up Builder:
Stack : Structure View Demo File.stk
Project : Structure View Demo File.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
Controlled Impedance
CI Results
notes
GHz
L: 4
|<
<
1 of 2
>
>|
Offset Stripline 1B1A
W2
H2
Er2
T1
H1
Er1
W1
polarinstruments.com

Displaying 2 structures on Layer 4

Target Zo : 50 Single-Ended Layer 4		Target Zdiff : 100 Differential Layer 4			
Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000

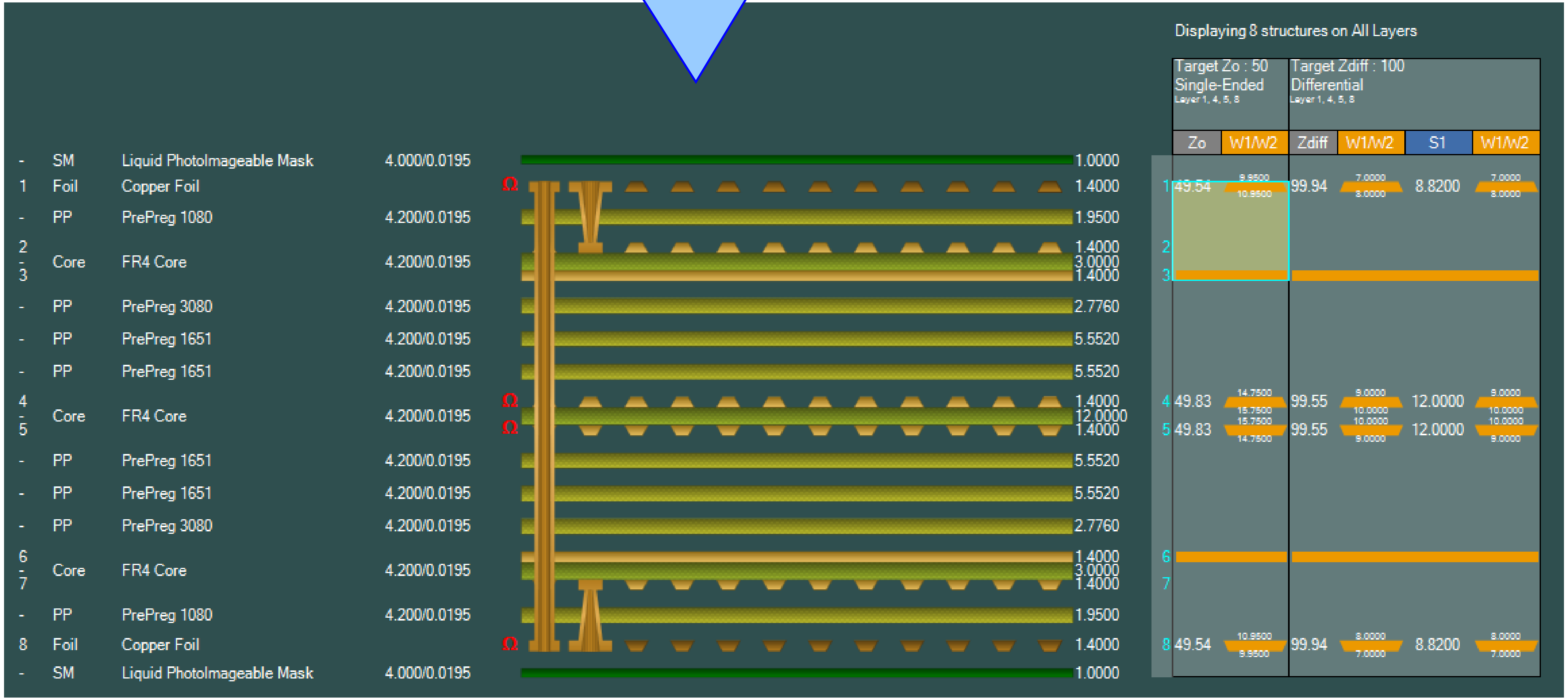
Substrate 1 Height	H1	27.2800
Substrate 1 Dielectric	Er1	4.2000
Substrate 2 Height	H2	15.2800
Substrate 2 Dielectric	Er2	4.2000
Lower Trace Width	W1	15.7500
Upper Trace Width	W2	14.7500
Trace Thickness	T1	1.4000
Impedance	Zo	49.83
Target Impedance		50.00
Target Tolerance %		10.00

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V22.09.01

Introducing Structure View

Use the mouse wheel to zoom out and show the complete stack up together with the structures.

All data is now visible in one view

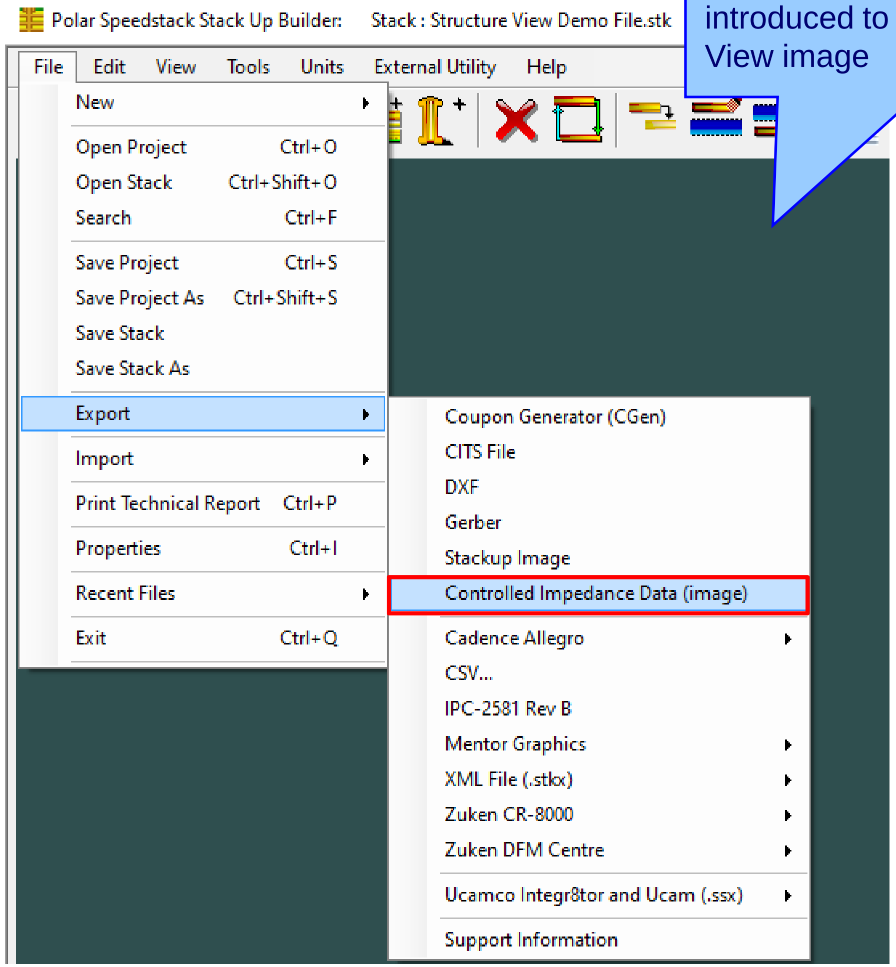


-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 3080	4.200/0.0195	2.7760
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 1651	4.200/0.0195	5.5520
4 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 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 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

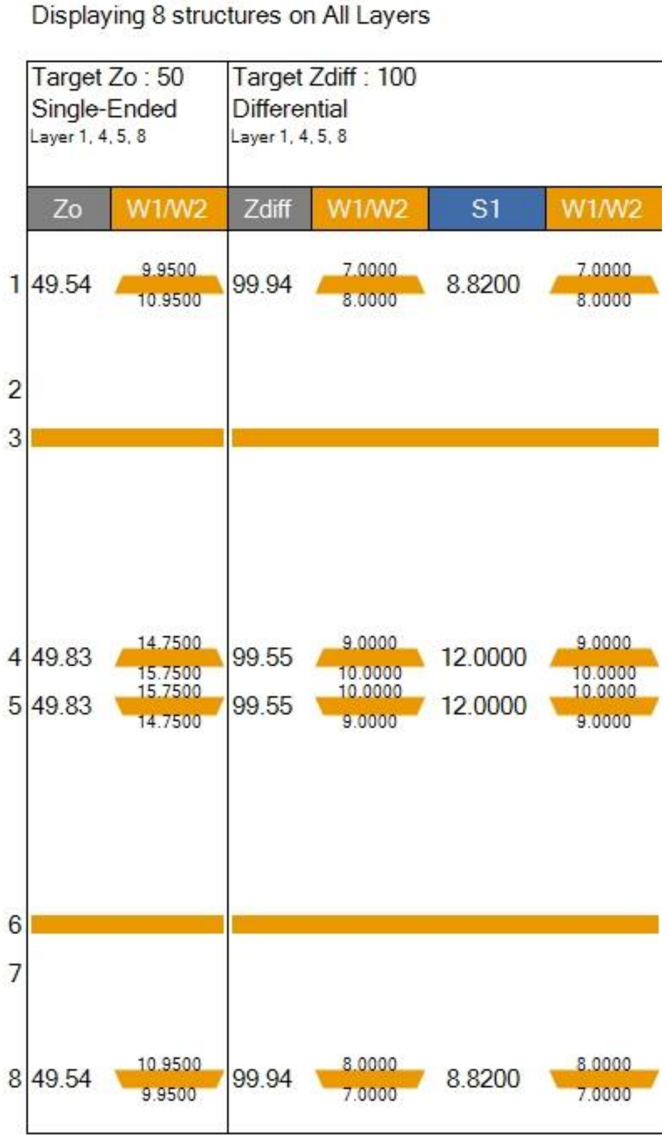
Displaying 8 structures on All Layers

	Target Zo : 50 Single-Ended Layer 1, 4, 5, 8		Target Zdiff : 100 Differential Layer 1, 4, 5, 8			
	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	49.54	9.9500 10.9500	99.94	7.0000 8.0000	8.8200	7.0000 8.0000
2						
3						
4	49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000
5	49.83	15.7500 14.7500	99.55	10.0000 9.0000	12.0000	10.0000 9.0000
6						
7						
8	49.54	10.9500 9.9500	99.94	8.0000 7.0000	8.8200	8.0000 7.0000

Introducing Structure View


Polar Speedstack Stack Up Builder: Stack : Structure View Demo File.stk
File
Edit
View
Tools
Units
External Utility
Help
New
Open Project Ctrl+O
Open Stack Ctrl+Shift+O
Search Ctrl+F
Save Project Ctrl+S
Save Project As Ctrl+Shift+S
Save Stack
Save Stack As
Export
Import
Print Technical Report Ctrl+P
Properties Ctrl+I
Recent Files
Exit Ctrl+Q
Coupon Generator (CGen)
CITS File
DXF
Gerber
Stackup Image
Controlled Impedance Data (image)
Cadence Allegro
CSV...
IPC-2581 Rev B
Mentor Graphics
XML File (.stkx)
Zuken CR-8000
Zuken DFM Centre
Ucamco Integr8tor and Ucam (.ssx)
Support Information

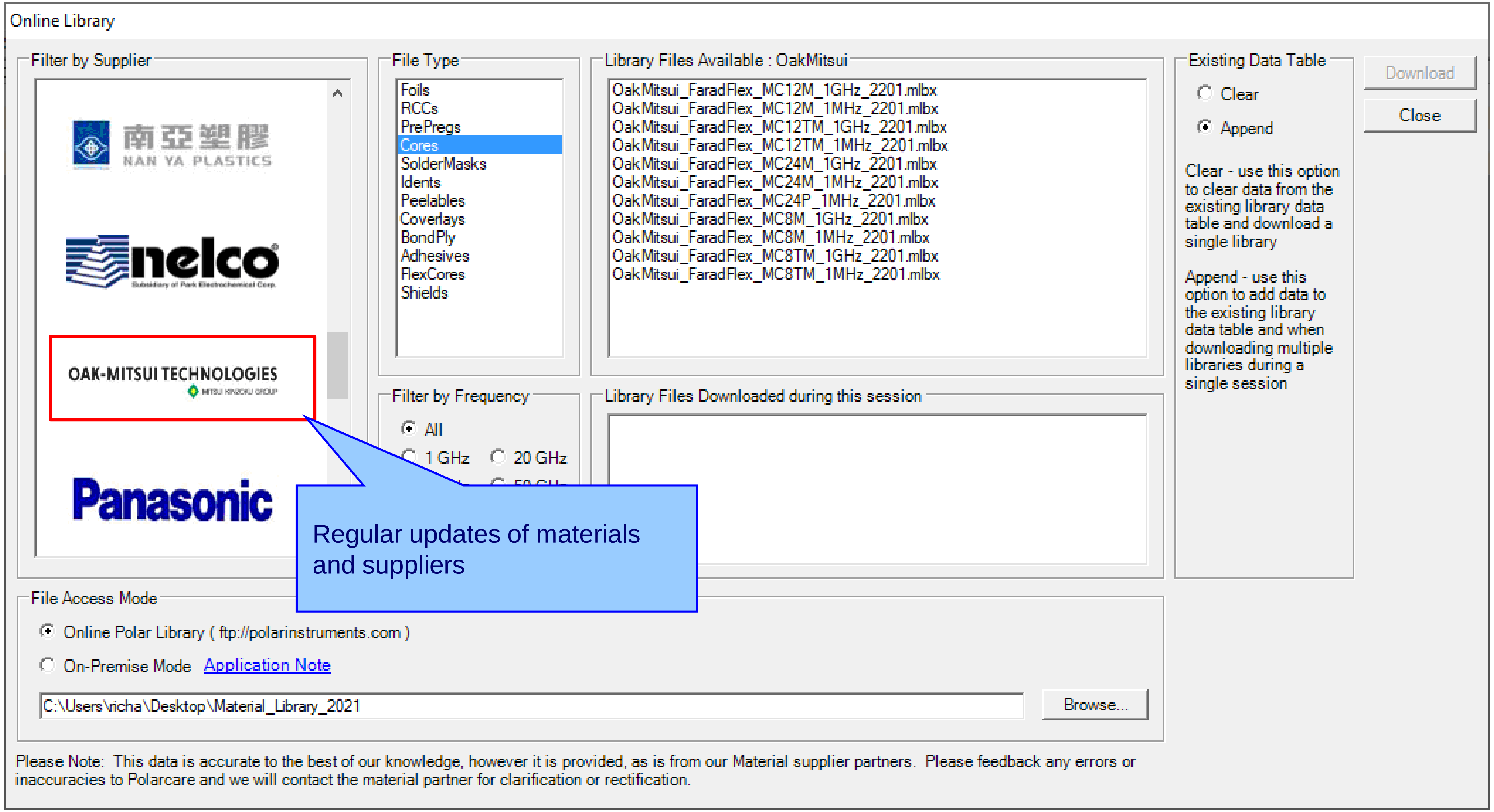
A new File | Export | Controlled Impedance Data option has been introduced to export the Structure View image



Displaying 8 structures on All Layers

	Target Zo : 50 Single-Ended Layer 1, 4, 5, 8		Target Zdiff : 100 Differential Layer 1, 4, 5, 8			
	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	49.54	9.9500 10.9500	99.94	7.0000 8.0000	8.8200	7.0000 8.0000
2						
3						
4	49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000
5	49.83	15.7500 14.7500	99.55	10.0000 9.0000	12.0000	10.0000 9.0000
6						
7						
8	49.54	10.9500 9.9500	99.94	8.0000 7.0000	8.8200	8.0000 7.0000

Online Library enhancements



Online Library

Filter by Supplier
南亞塑膠 NAN YA PLASTICS
nelco Subsidiary of Park Electrochemical Corp.
OAK-MITSUI TECHNOLOGIES MITSUI KINZOKU GROUP
Panasonic

File Type
- Foils
- RCCs
- PrePregs
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields

Library Files Available : OakMitsui
- OakMitsui_FaradFlex_MC12M_1GHz_2201.mlbx
- OakMitsui_FaradFlex_MC12M_1MHz_2201.mlbx
- OakMitsui_FaradFlex_MC12TM_1GHz_2201.mlbx
- OakMitsui_FaradFlex_MC12TM_1MHz_2201.mlbx
- OakMitsui_FaradFlex_MC24M_1GHz_2201.mlbx
- OakMitsui_FaradFlex_MC24M_1MHz_2201.mlbx
- OakMitsui_FaradFlex_MC24P_1MHz_2201.mlbx
- OakMitsui_FaradFlex_MC8M_1GHz_2201.mlbx
- OakMitsui_FaradFlex_MC8M_1MHz_2201.mlbx
- OakMitsui_FaradFlex_MC8TM_1GHz_2201.mlbx
- OakMitsui_FaradFlex_MC8TM_1MHz_2201.mlbx

Existing Data Table
- ○ Clear
- ● Append

Clear - use this option to clear data from the existing library data table and download a single library

Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session

Filter by Frequency
- ● All
- ○ 1 GHz ○ 20 GHz

Library Files Downloaded during this session

Regular updates of materials and suppliers

File Access Mode
- ● Online Polar Library (ftp://polarinstruments.com)
- ○ On-Premise Mode Application Note

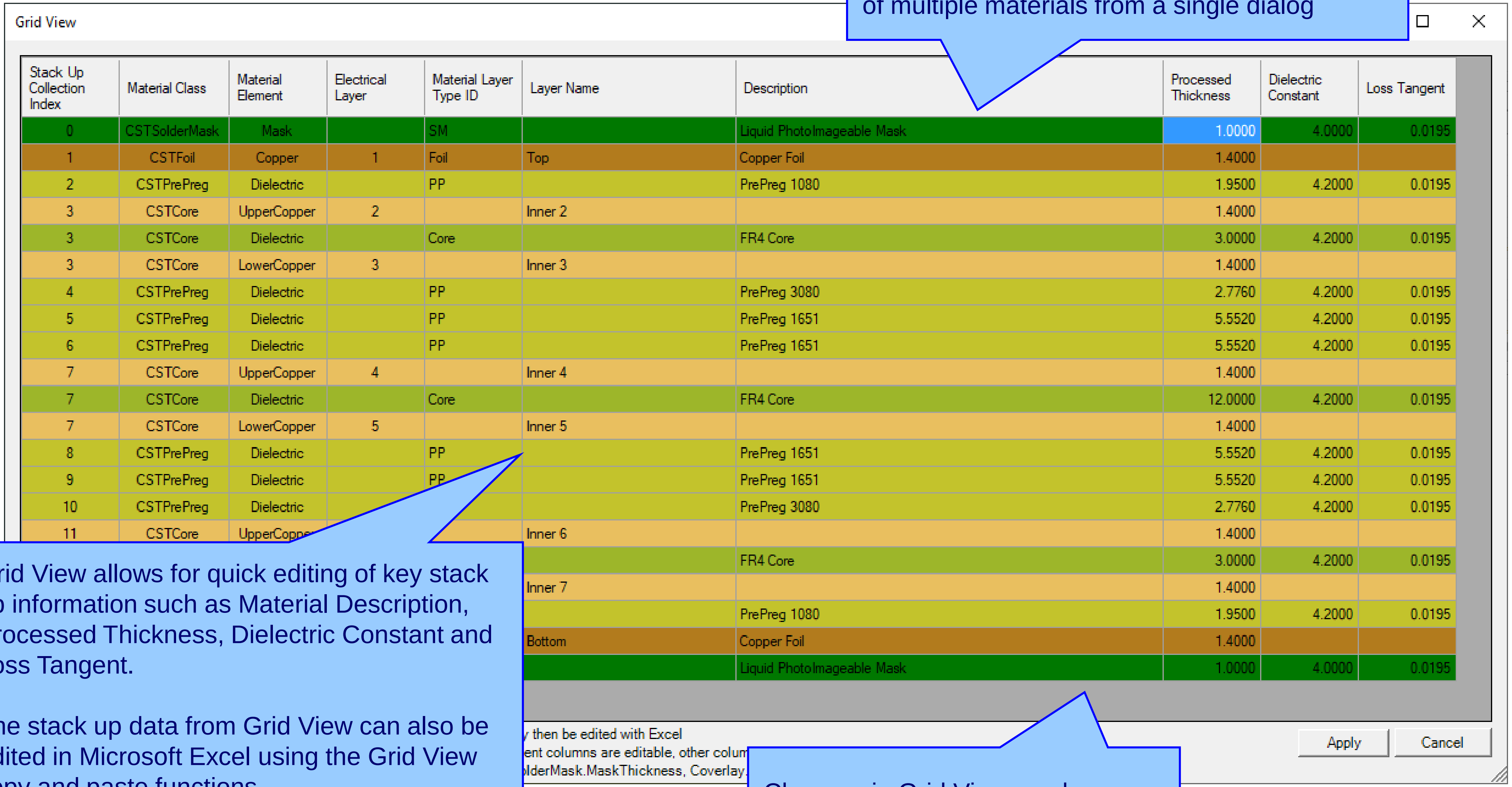
C:\Users\richa\Desktop\Material_Library_2021

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Speedstack v22.07.20 (July 2022)

Introducing Grid View

Grid View presents the current stack up in an editable data grid form to allow for easy editing of multiple materials from a single dialog



Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4000		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric				PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopp			Inner 6		1.4000		
						FR4 Core	3.0000	4.2000	0.0195
					Inner 7		1.4000		
						PrePreg 1080	1.9500	4.2000	0.0195
					Bottom	Copper Foil	1.4000		
						Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

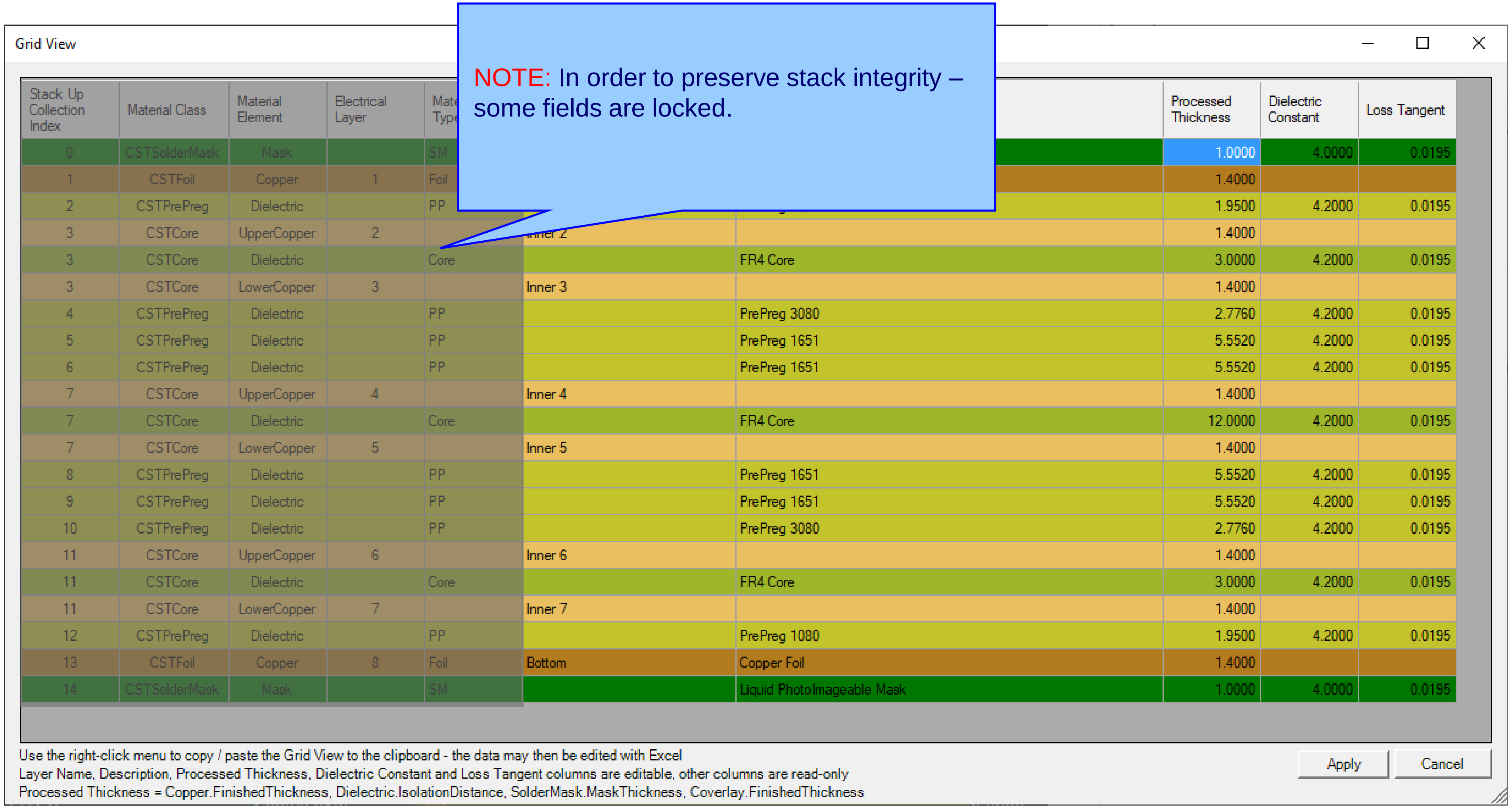
y then be edited with Excel
ent columns are editable, other colum
olderMask.MaskThickness, Coverlay.

Grid View allows for quick editing of key stack up information such as Material Description, Processed Thickness, Dielectric Constant and Loss Tangent.

The stack up data from Grid View can also be edited in Microsoft Excel using the Grid View copy and paste functions

Changes in Grid View can be saved back to the original stack up design

Introducing Grid View



NOTE: In order to preserve stack integrity – some fields are locked.

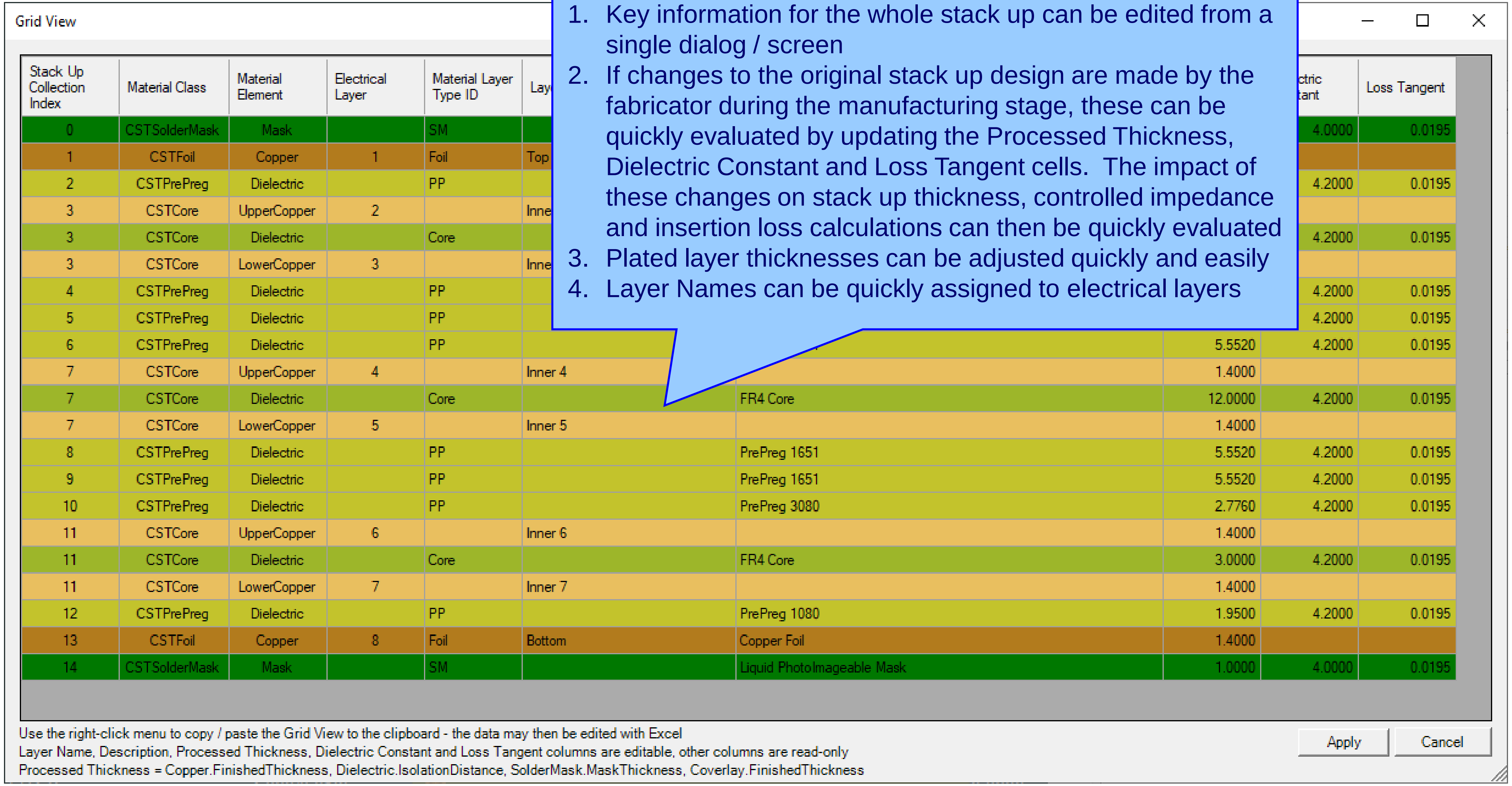
Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Mate Type			Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM			1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil			1.4000		
2	CSTPrePreg	Dielectric		PP			1.9500	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4000		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Excel
Layer Name, Description, Processed Thickness, Dielectric Constant and Loss Tangent columns are editable, other columns are read-only
Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Introducing Grid View

Grid View has many uses, some are highlighted here:

1. Key information for the whole stack up can be edited from a single dialog / screen
2. If changes to the original stack up design are made by the fabricator during the manufacturing stage, these can be quickly evaluated by updating the Processed Thickness, Dielectric Constant and Loss Tangent cells. The impact of these changes on stack up thickness, controlled impedance and insertion loss calculations can then be quickly evaluated
3. Plated layer thicknesses can be adjusted quickly and easily
4. Layer Names can be quickly assigned to electrical layers

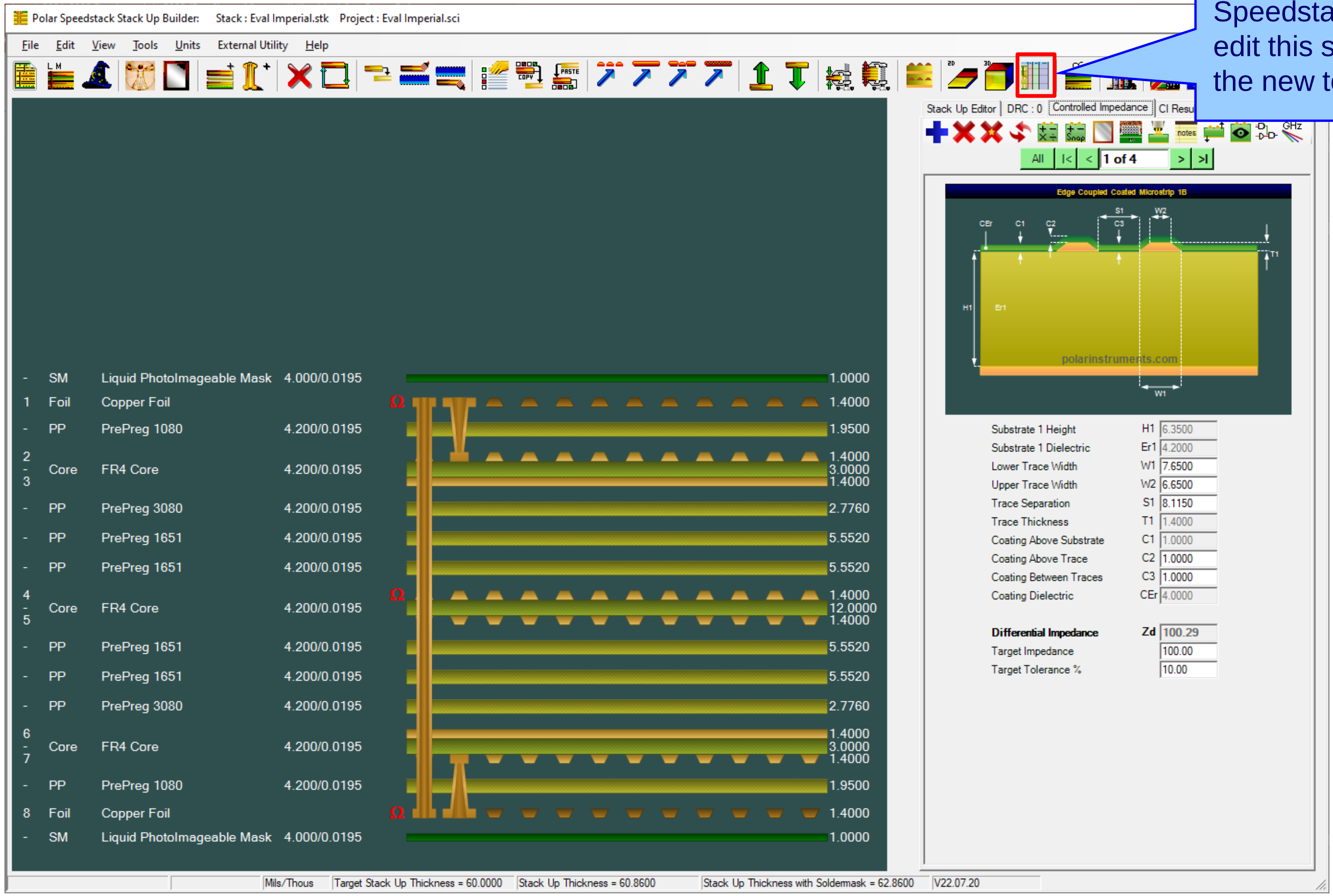


Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Lay			ctric tant	Loss Tangent
0	CSTSolderMask	Mask		SM				4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top				
2	CSTPrePreg	Dielectric		PP				4.2000	0.0195
3	CSTCore	UpperCopper	2		Inne				
3	CSTCore	Dielectric		Core				4.2000	0.0195
3	CSTCore	LowerCopper	3		Inne				
4	CSTPrePreg	Dielectric		PP				4.2000	0.0195
5	CSTPrePreg	Dielectric		PP				4.2000	0.0195
6	CSTPrePreg	Dielectric		PP			5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4000		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Excel
Layer Name, Description, Processed Thickness, Dielectric Constant and Loss Tangent columns are editable, other columns are read-only
Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Grid View – Walkthrough Step #1

Step #1
An 8 layer stack up is loaded into the Speedstack editor. To examine and edit this stack up in Grid View select the new toolbar button


File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 0
Controlled Impedance
CI Resu
All
|<
<
1 of 4
>
>|
Edge Coupled Coated Microstrip 1B
CEr
C1
C2
S1
C3
W2
T1
H1
Er1
W1
polarinstruments.com

Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk Project : Eval Imperial.sci

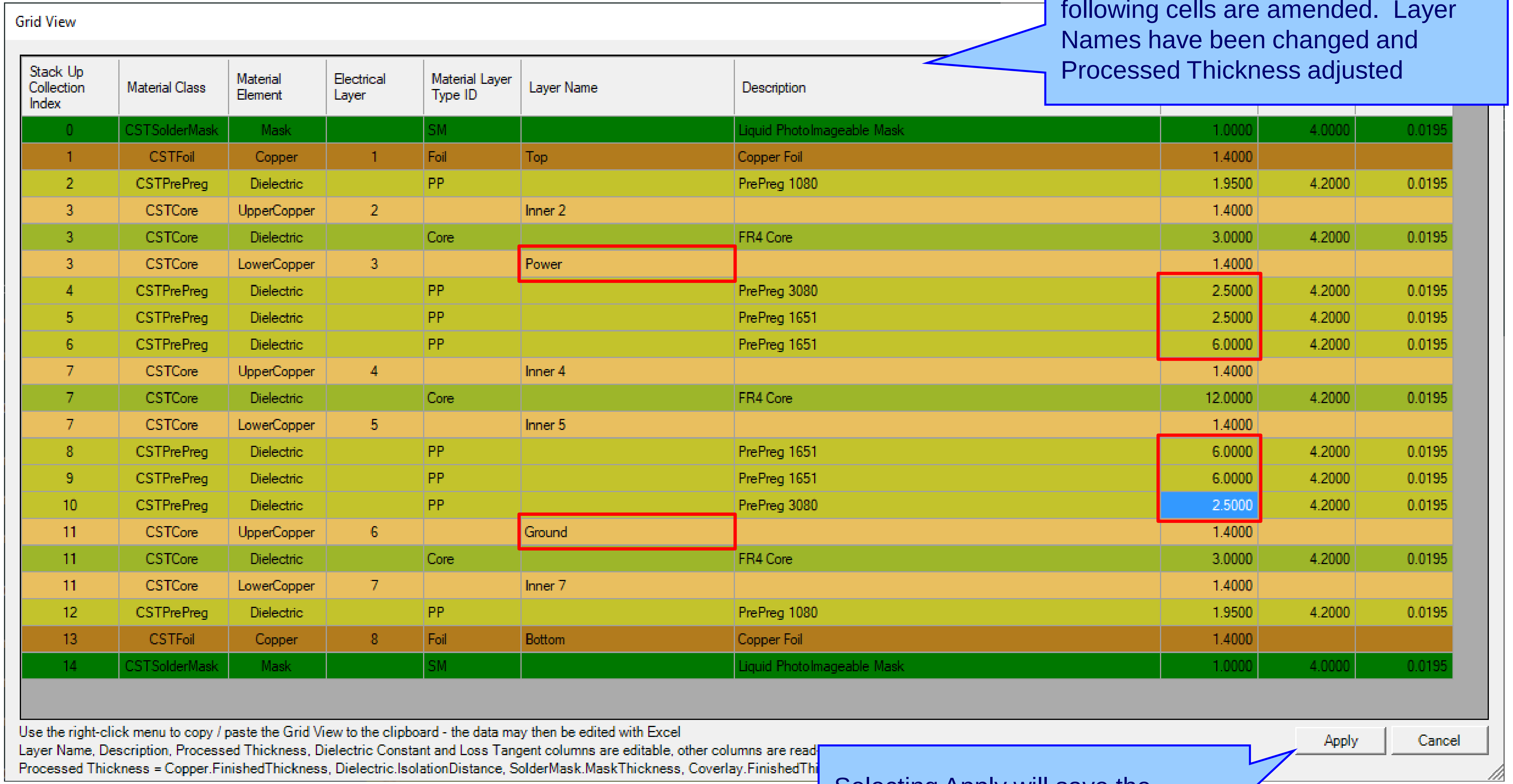
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 3080	4.200/0.0195	2.7760
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 1651	4.200/0.0195	5.5520
4 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 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 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.6500
Upper Trace Width	W2	6.6500
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**	100.29
Target Impedance		100.00
Target Tolerance %		10.00

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V22.07.20

Grid View – Walkthrough Step #2

Step #2
Using the Grid View editor the following cells are amended. Layer Names have been changed and Processed Thickness adjusted



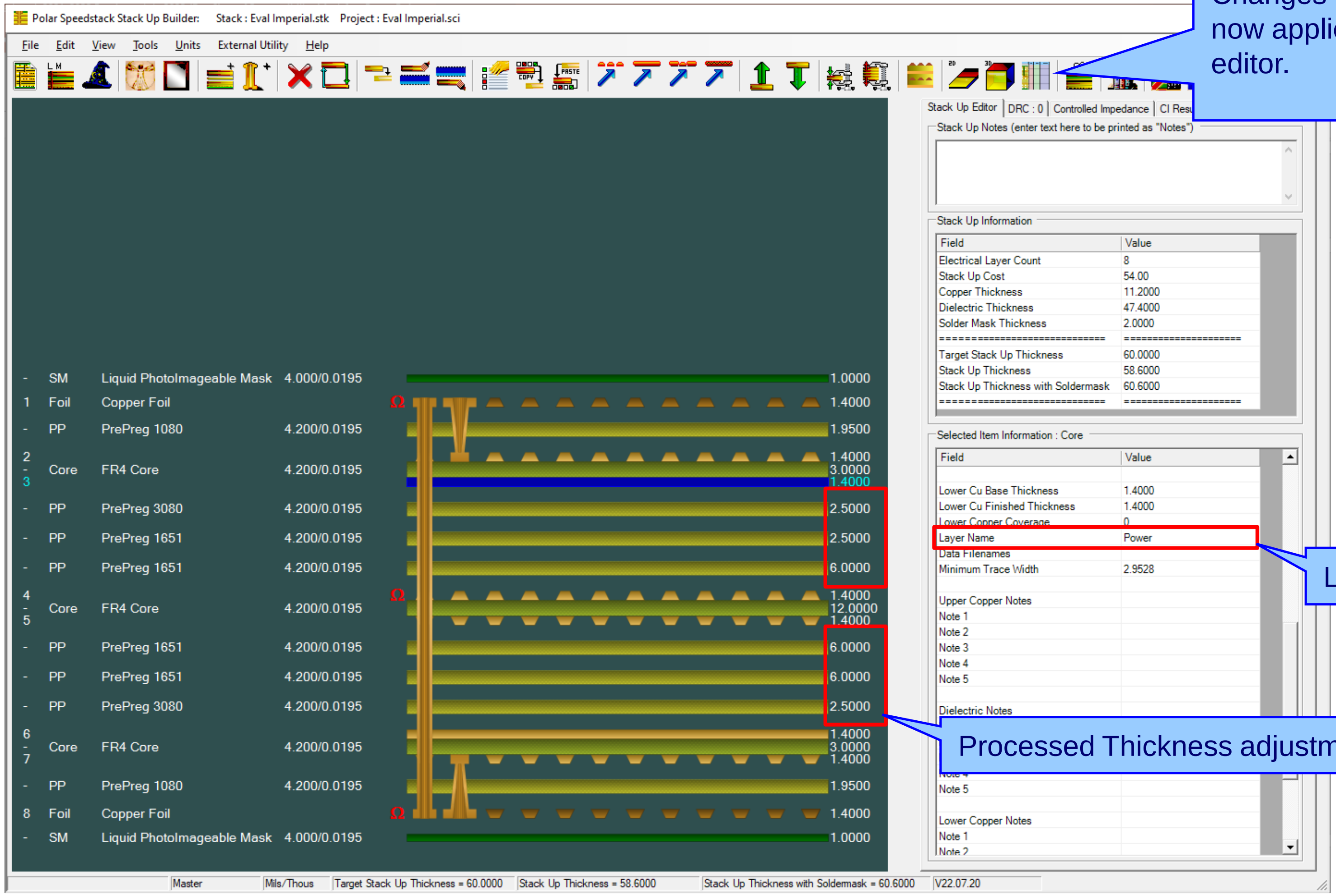
Grid View

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description			
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4000		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Power		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.5000	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	2.5000	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	6.0000	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	6.0000	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	6.0000	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.5000	4.2000	0.0195
11	CSTCore	UpperCopper	6		Ground		1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4000		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Excel
Layer Name, Description, Processed Thickness, Dielectric Constant and Loss Tangent columns are editable, other columns are read
Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThi

Selecting Apply will save the changes back to the stack up editor

Grid View – Walkthrough Step #3


Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk   Project : Eval Imperial.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 0
Controlled Impedance
CI Resu

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 3080	4.200/0.0195	2.5000
-	PP	PrePreg 1651	4.200/0.0195	2.5000
-	PP	PrePreg 1651	4.200/0.0195	6.0000
4 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 1.4000
-	PP	PrePreg 1651	4.200/0.0195	6.0000
-	PP	PrePreg 1651	4.200/0.0195	6.0000
-	PP	PrePreg 3080	4.200/0.0195	2.5000
6 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Stack Up Notes (enter text here to be printed as "Notes")

Stack Up Information

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.2000
Dielectric Thickness	47.4000
Solder Mask Thickness	2.0000
============================	=====================
Target Stack Up Thickness	60.0000
Stack Up Thickness	58.6000
Stack Up Thickness with Soldermask	60.6000
============================	=====================

Selected Item Information : Core

Field	Value
Lower Cu Base Thickness	1.4000
Lower Cu Finished Thickness	1.4000
Lower Copper Coverage	0
Layer Name	Power
Data Filenames	
Minimum Trace Width	2.9528
Upper Copper Notes	
Note 1	
Note 2	
Note 3	
Note 4	
Note 5	
Dielectric Notes	
Note 5	
Lower Copper Notes	
Note 1	
Note 2	

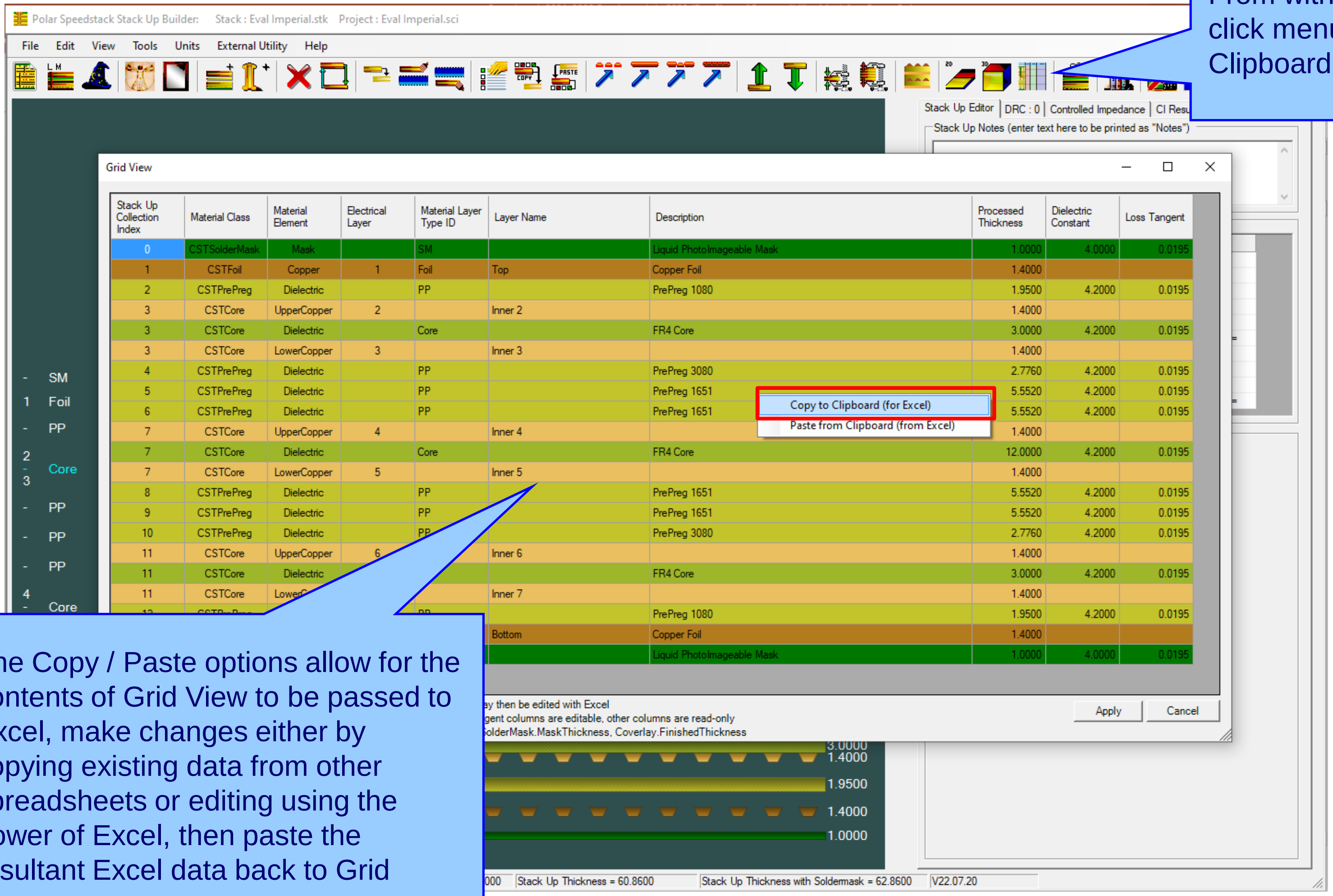
Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 58.6000 | Stack Up Thickness with Soldermask = 60.6000 | V22.07.20

Step #3
Changes made under Grid View are now applied back to the stack up editor.

Layer Name change

Processed Thickness adjustments

Using Grid View with Microsoft Excel – Step #1


Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk   Project : Eval Imperial.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 0
Controlled Impedance
CI Resu
Grid View
Copy to Clipboard (for Excel)
Paste from Clipboard (from Excel)
Apply
Cancel
SM
Foil
PP
Core
PP
PP
PP
Core
3.0000
1.4000
1.9500
1.4000
1.0000

Stack Up Notes (enter text here to be printed as "Notes")

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4000		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4000		
11	CSTCore	Dielectric				FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	Lowe			Inner 7		1.4000		
				PP		PrePreg 1080	1.9500	4.2000	0.0195
					Bottom	Copper Foil	1.4000		
						Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

ay then be edited with Excel
gent columns are editable, other columns are read-only
olderMask.MaskThickness, Coverlay.FinishedThickness

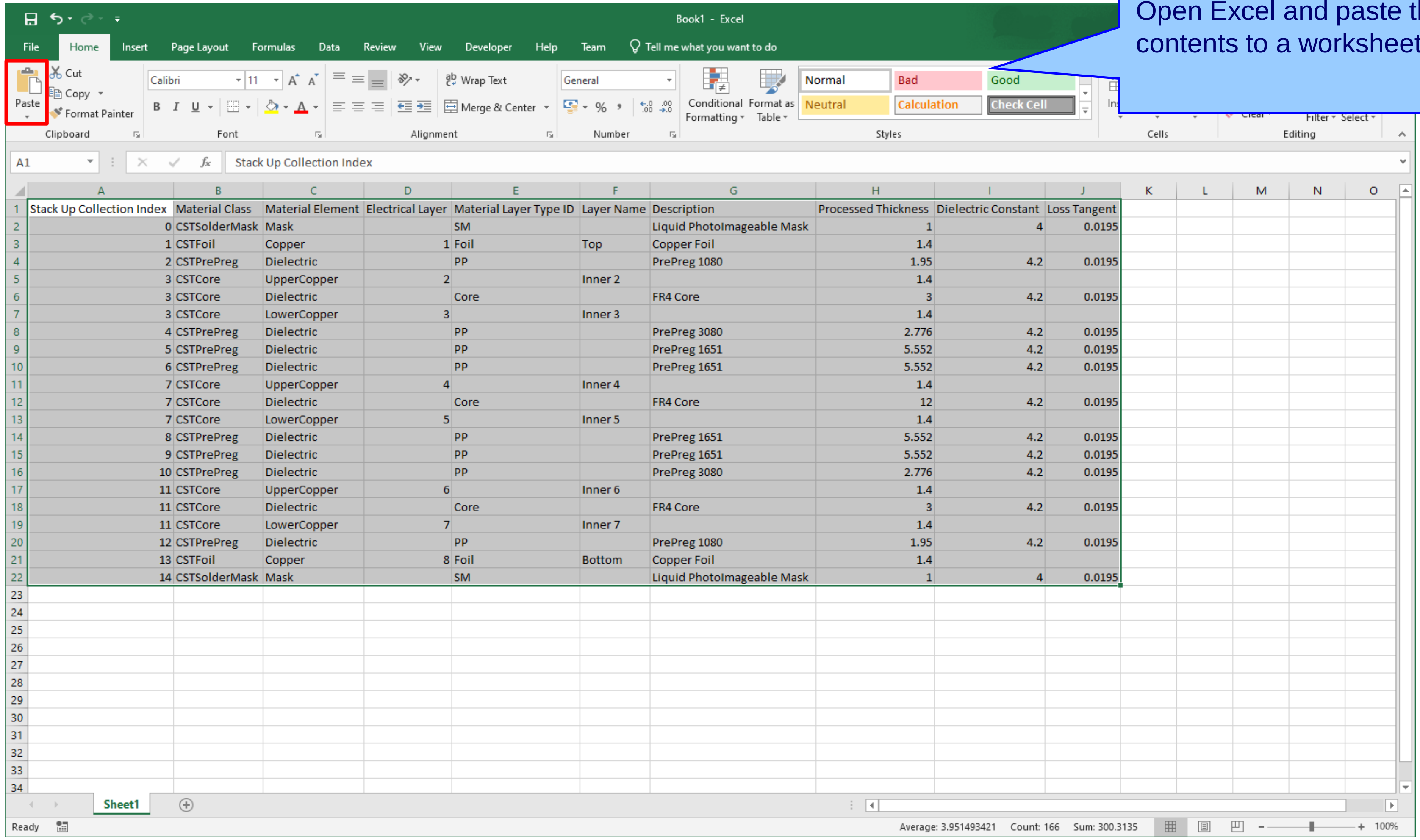
000 Stack Up Thickness = 60.8600 Stack Up Thickness with Soldermask = 62.8600 V22.07.20

Step #1
From within Grid View use the right-click menu and select the Copy to Clipboard option.

The Copy / Paste options allow for the contents of Grid View to be passed to Excel, make changes either by copying existing data from other spreadsheets or editing using the power of Excel, then paste the resultant Excel data back to Grid View.

Using Grid View with Microsoft Excel – Step #2

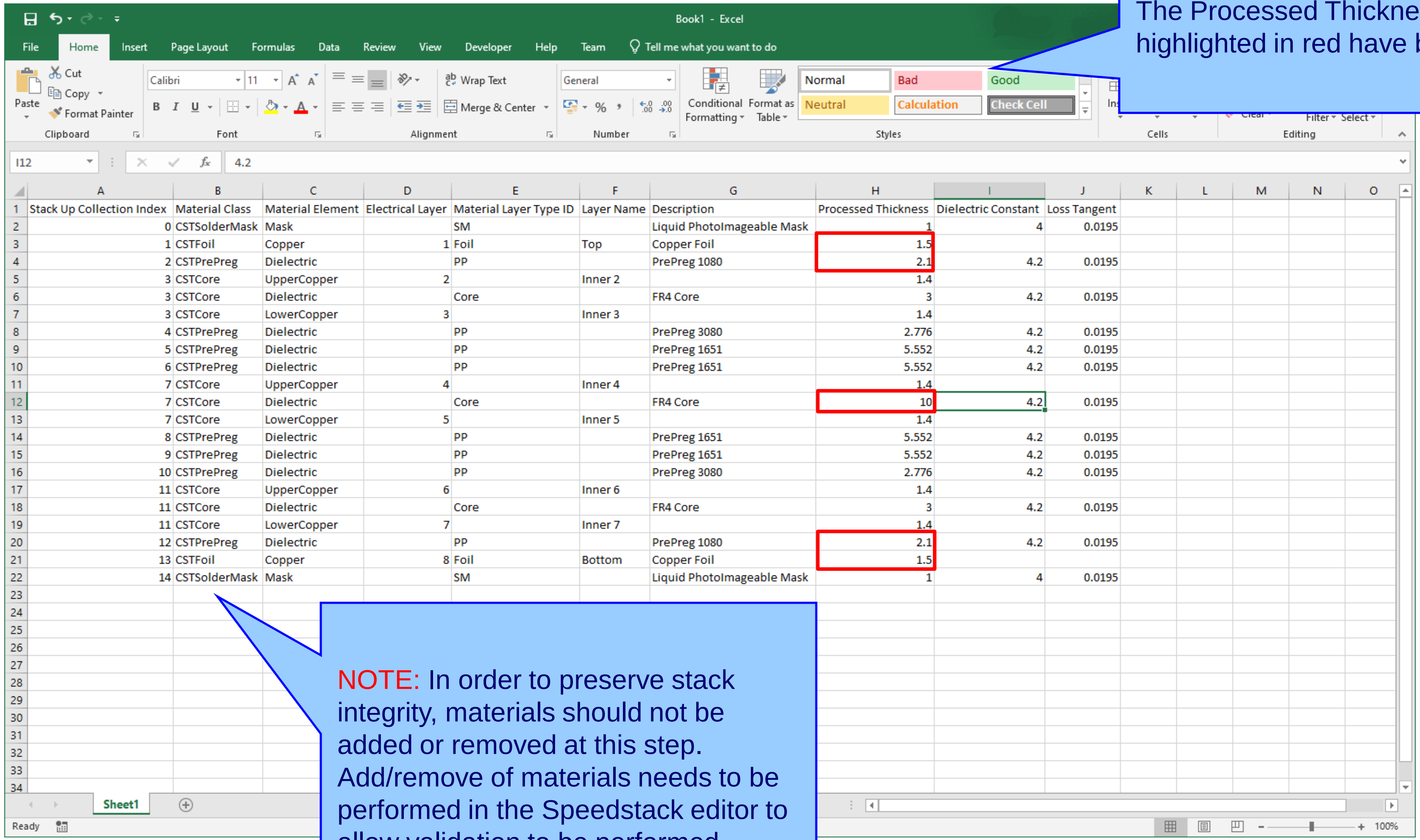
Step #2
Open Excel and paste the clipboard contents to a worksheet


Book1 - Excel
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Developer
Help
Team
Tell me what you want to do
Paste
Cut
Copy
Format Painter
Clipboard
Calibri
11
Font
Wrap Text
Merge & Center
Alignment
General
Number
Conditional Formatting
Format as Table
Normal
Bad
Good
Neutral
Calculation
Check Cell
Styles
Cells
Filter
Select
Editing
A1
Stack Up Collection Index
Sheet1
Ready
Average: 3.951493421
Count: 166
Sum: 300.3135
100%

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.95	4.2	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4		
3	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4		
7	CSTCore	Dielectric		Core		FR4 Core	12	4.2	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4		
11	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.95	4.2	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195

Using Grid View with Microsoft Excel – Step #3

Step #3
The Processed Thickness cells highlighted in red have been changed

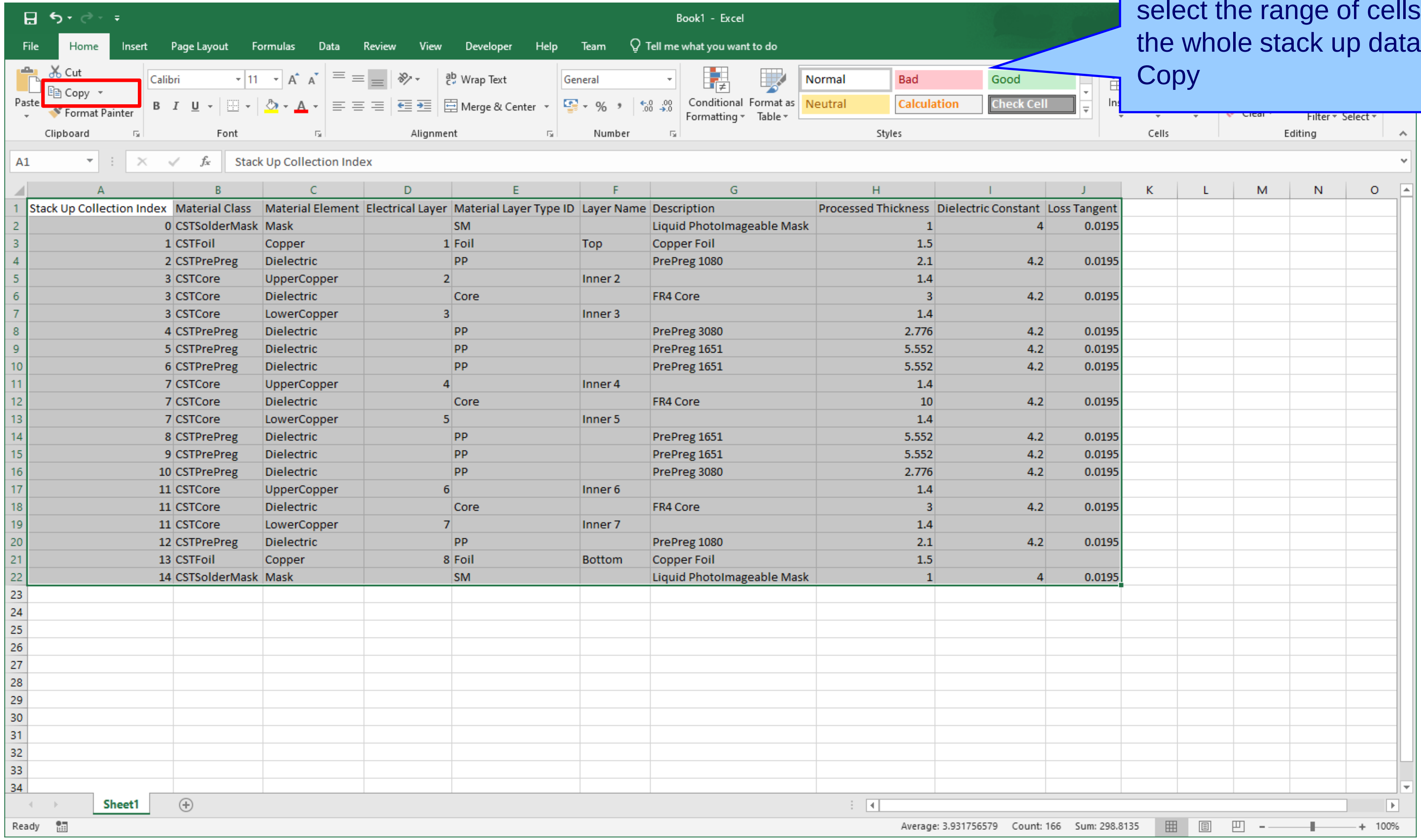

Book1 - Excel
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Developer
Help
Team
Tell me what you want to do
Cut
Copy
Format Painter
Paste
Clipboard
Calibri
11
Font
Wrap Text
Merge & Center
Alignment
General
Number
Conditional Formatting
Format as Table
Normal
Bad
Good
Neutral
Calculation
Check Cell
Styles
Cells
Filter
Select
Editing
I12
4.2
Sheet1
Ready
100%

	A	B	C	D	E	F	G	H	I	J
1	Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
2	0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195
3	1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.5		
4	2	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1	4.2	0.0195
5	3	CSTCore	UpperCopper	2		Inner 2		1.4		
6	3	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
7	3	CSTCore	LowerCopper	3		Inner 3		1.4		
8	4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
9	5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
10	6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
11	7	CSTCore	UpperCopper	4		Inner 4		1.4		
12	7	CSTCore	Dielectric		Core		FR4 Core	10	4.2	0.0195
13	7	CSTCore	LowerCopper	5		Inner 5		1.4		
14	8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
15	9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
16	10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
17	11	CSTCore	UpperCopper	6		Inner 6		1.4		
18	11	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
19	11	CSTCore	LowerCopper	7		Inner 7		1.4		
20	12	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1	4.2	0.0195
21	13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.5		
22	14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195

NOTE: In order to preserve stack integrity, materials should not be added or removed at this step. Add/remove of materials needs to be performed in the Speedstack editor to allow validation to be performed.

Using Grid View with Microsoft Excel – Step #4

Step #4
Once the Excel changes are complete select the range of cells representing the whole stack up data and select Copy

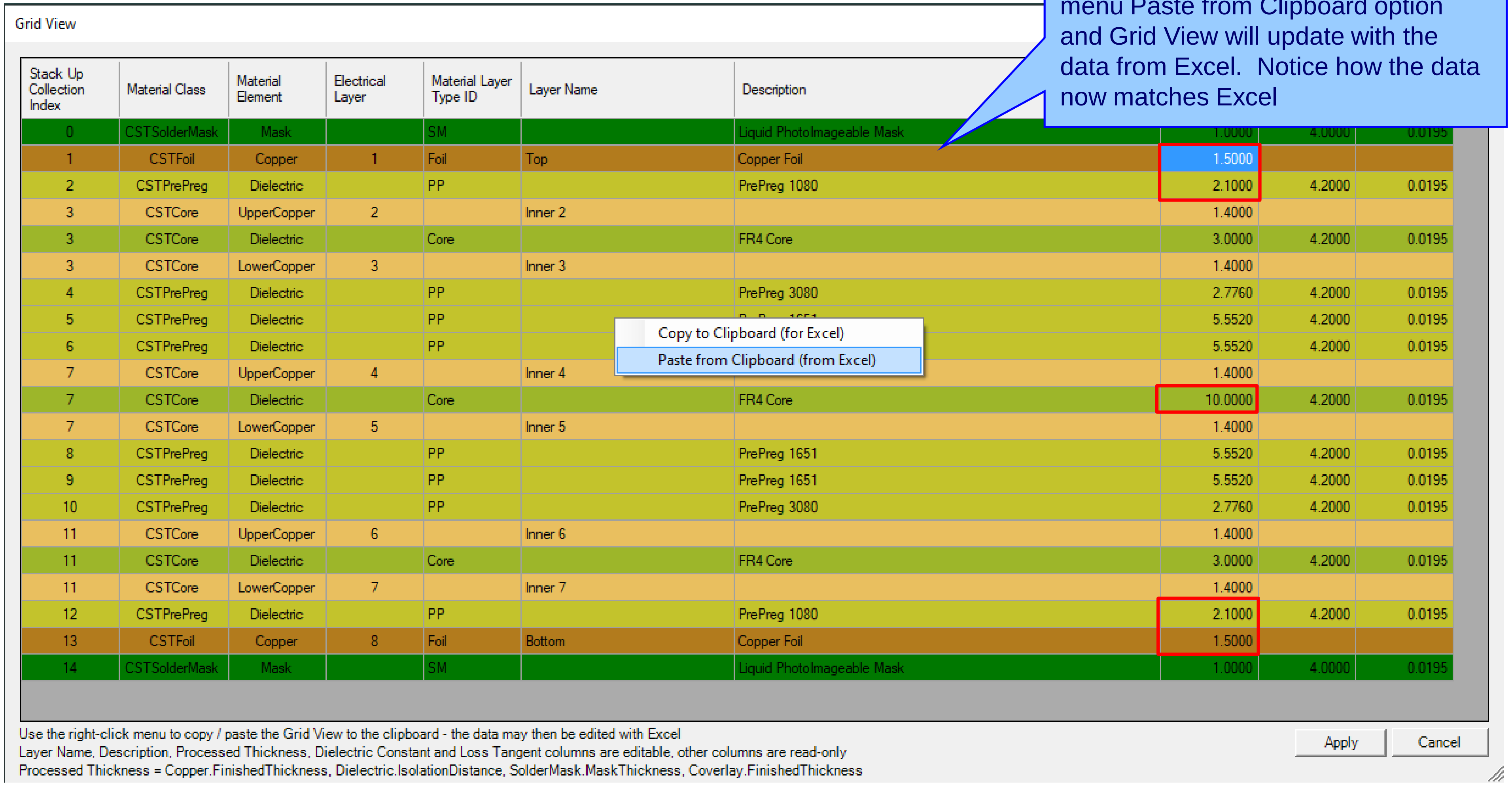

Book1 - Excel
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Developer
Help
Team
Tell me what you want to do
Cut
Copy
Format Painter
Paste
Clipboard
Calibri
11
Font
Wrap Text
Merge & Center
Alignment
General
Number
Conditional Formatting
Format as Table
Normal
Bad
Good
Neutral
Calculation
Check Cell
Styles
Cells
Editing
A1
Sheet1
Ready
Average: 3.931756579
Count: 166
Sum: 298.8135
100%

Stack Up Collection Index

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.5		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1	4.2	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4		
3	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4		
7	CSTCore	Dielectric		Core		FR4 Core	10	4.2	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4		
11	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1	4.2	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.5		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195

Using Grid View with Microsoft Excel – Step #5

Step #5
Back in Grid View select the right-click menu Paste from Clipboard option and Grid View will update with the data from Excel. Notice how the data now matches Excel

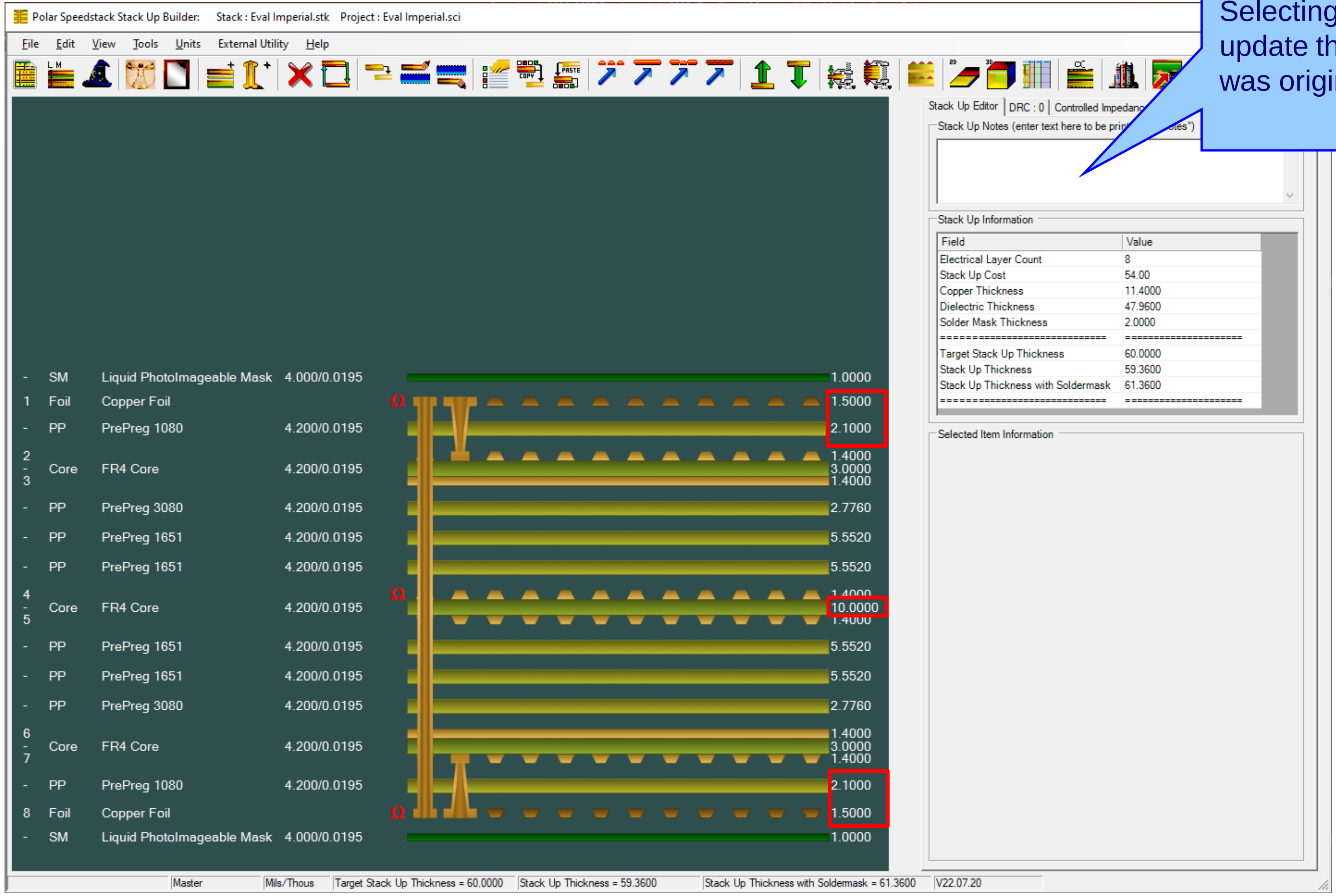

Grid View
Copy to Clipboard (for Excel)
Paste from Clipboard (from Excel)
Apply
Cancel

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description			
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.5000		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1000	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP			5.5520	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP			5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	10.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1000	4.2000	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.5000		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Excel
Layer Name, Description, Processed Thickness, Dielectric Constant and Loss Tangent columns are editable, other columns are read-only
Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Using Grid View with Microsoft Excel – Step #6

Step #6
Selecting Apply in Grid View will update the stack up with the data that was originally changed in Excel


Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk Project : Eval Imperial.sci
File Edit View Tools Units External Utility Help
Stack Up Editor
DRC : 0
Controlled Impedanc
Stack Up Notes (enter text here to be prin… …tes")
Selected Item Information

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.5000
-	PP	PrePreg 1080	4.200/0.0195	2.1000
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 3080	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 - 5	Core	FR4 Core	4.200/0.0195	1.4000 10.0000 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 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	2.1000
8	Foil	Copper Foil		1.5000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Stack Up Information

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.4000
Dielectric Thickness	47.9600
Solder Mask Thickness	2.0000
============================	=====================
Target Stack Up Thickness	60.0000
Stack Up Thickness	59.3600
Stack Up Thickness with Soldermask	61.3600
============================	=====================

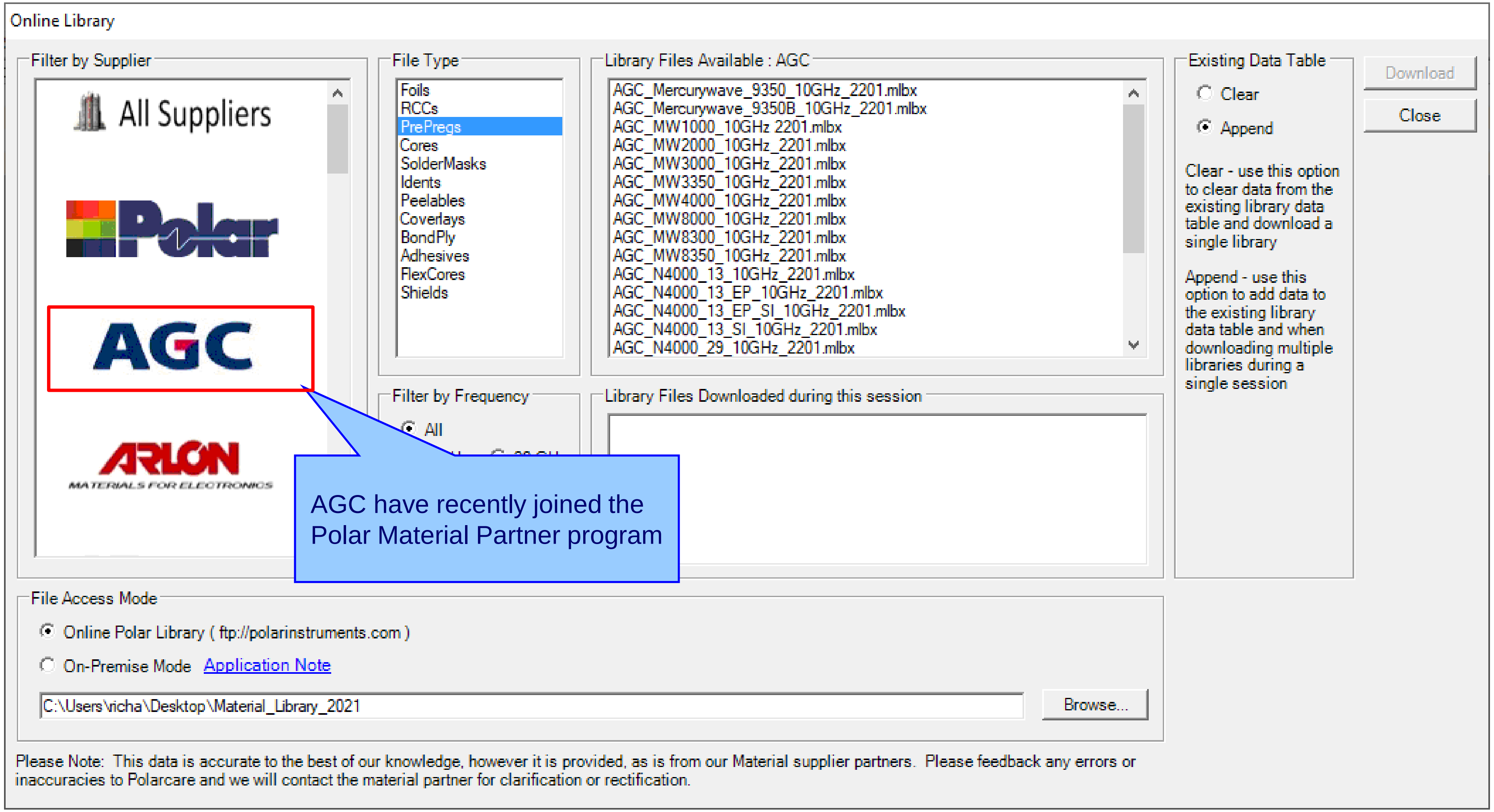
Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 59.3600 | Stack Up Thickness with Soldermask = 61.3600 | V22.07.20

Other enhancements

- Stack Up Notes user interface improvements
- The Tools | Options | Structure Defaults | Separation Region Dielectric (REr) now supports double data types. Previously, it only supported integers

Speedstack v22.05.06 (May 2022)

Online Library enhancements



File Type

- Foils
- RCCs
- PrePregs
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields

Library Files Available : AGC

- AGC_Mercurywave_9350_10GHz_2201.mlbx
- AGC_Mercurywave_9350B_10GHz_2201.mlbx
- AGC_MW1000_10GHz 2201.mlbx
- AGC_MW2000_10GHz_2201.mlbx
- AGC_MW3000_10GHz_2201.mlbx
- AGC_MW3350_10GHz_2201.mlbx
- AGC_MW4000_10GHz_2201.mlbx
- AGC_MW8000_10GHz_2201.mlbx
- AGC_MW8300_10GHz_2201.mlbx
- AGC_MW8350_10GHz_2201.mlbx
- AGC_N4000_13_10GHz_2201.mlbx
- AGC_N4000_13_EP_10GHz_2201.mlbx
- AGC_N4000_13_EP_SI_10GHz_2201.mlbx
- AGC_N4000_13_SI_10GHz_2201.mlbx
- AGC_N4000_29_10GHz_2201.mlbx

Existing Data Table

○ Clear
● Append

Clear - use this option to clear data from the existing library data table and download a single library

Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session

Filter by Frequency

● All

Library Files Downloaded during this session

AGC have recently joined the Polar Material Partner program

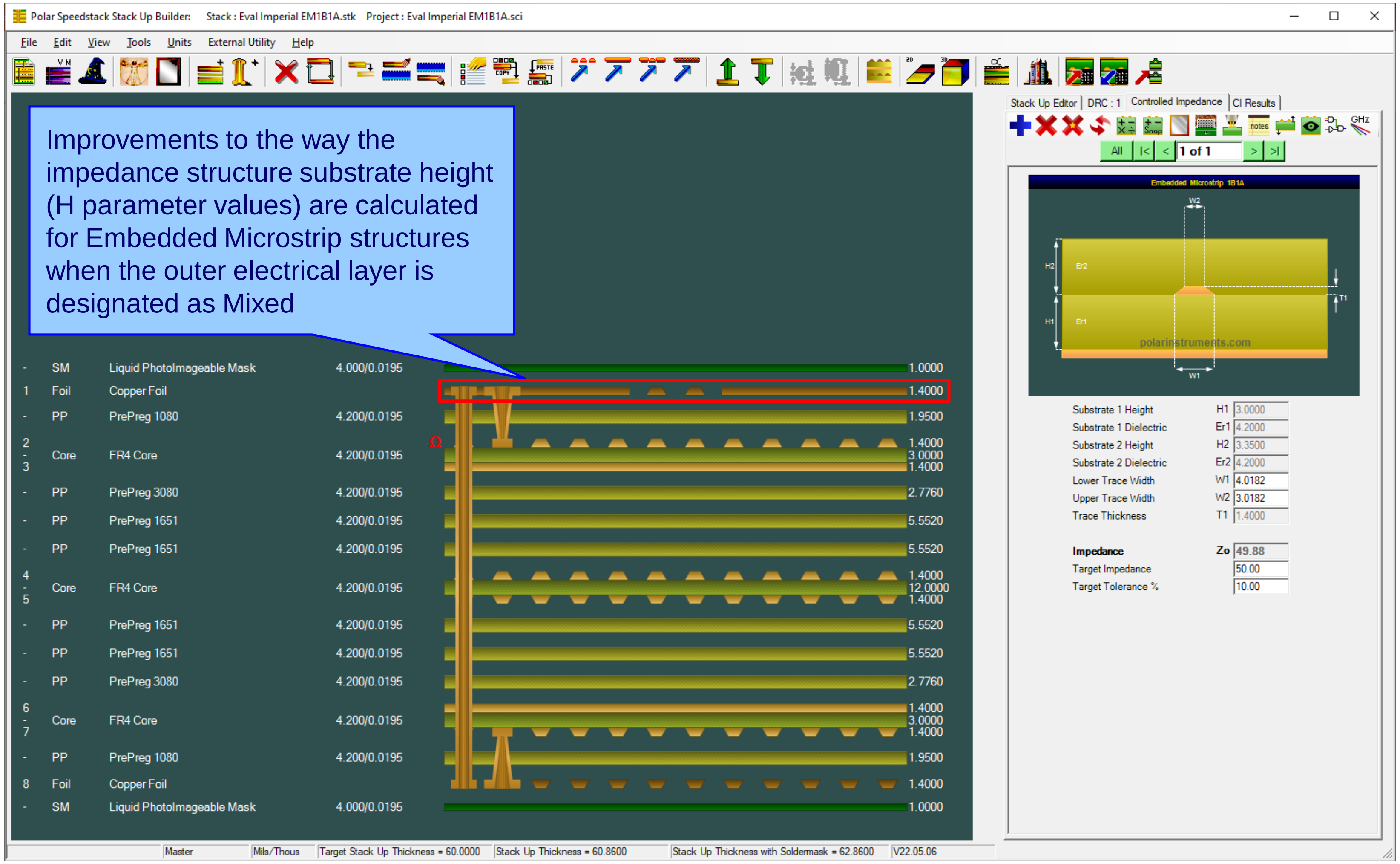
File Access Mode

● Online Polar Library (ftp://polarinstruments.com)
○ On-Premise Mode Application Note

C:\Users\richa\Desktop\Material_Library_2021

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Embedded Microstrip structure enhancements



Improvements to the way the impedance structure substrate height (H parameter values) are calculated for Embedded Microstrip structures when the outer electrical layer is designated as Mixed

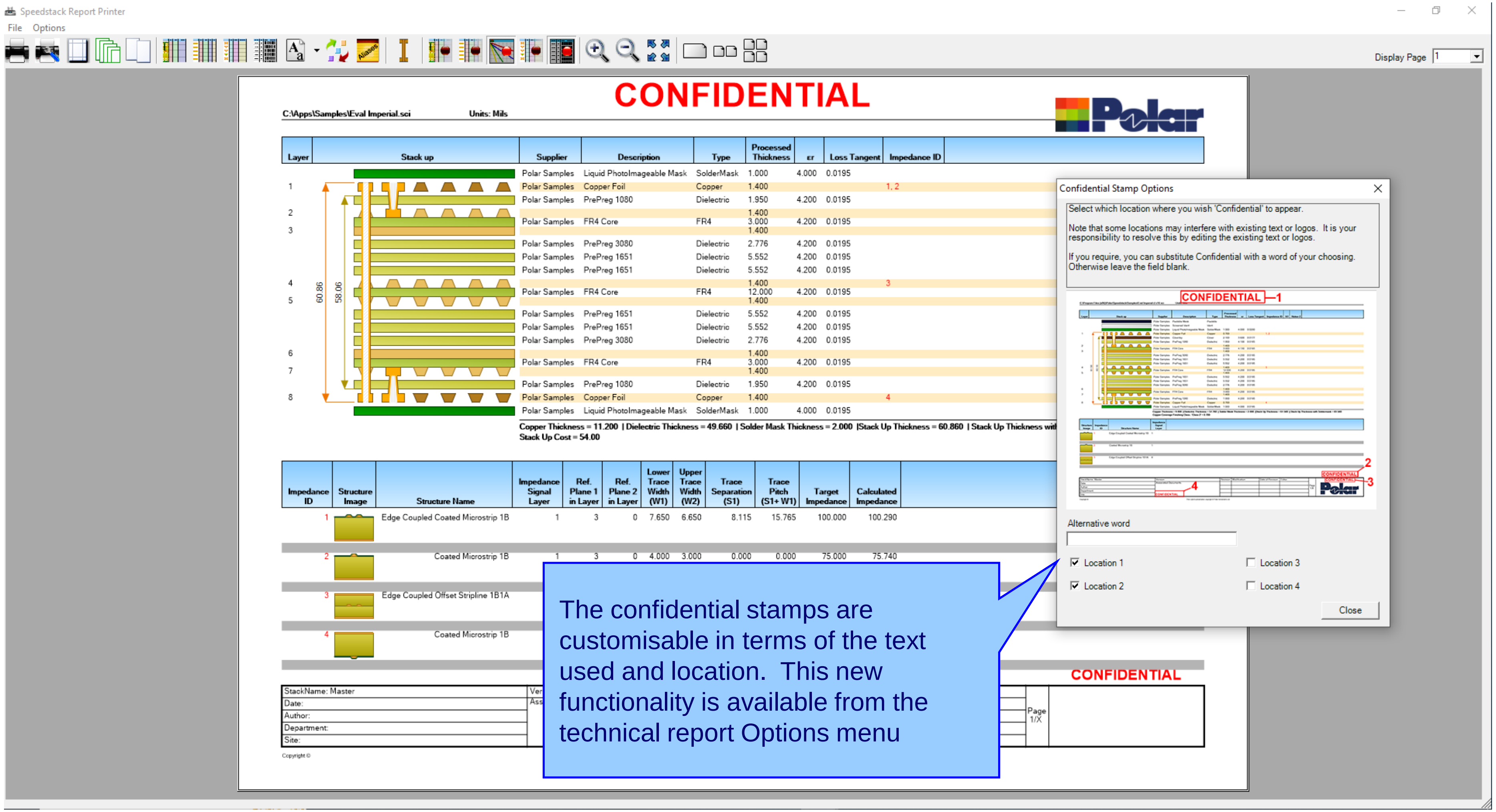
Polar Speedstack Stack Up Builder: Stack : Eval Imperial EM1B1A.stk Project : Eval Imperial EM1B1A.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 1
Controlled Impedance
CI Results
All
|<
<
1 of 1
>
>|
Embedded Microstrip 1B1A
W2
H2
Er2
T1
H1
Er1
polarinstruments.com
W1
Ω

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 3080	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 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 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 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Substrate 1 Height	H1	3.0000
Substrate 1 Dielectric	Er1	4.2000
Substrate 2 Height	H2	3.3500
Substrate 2 Dielectric	Er2	4.2000
Lower Trace Width	W1	4.0182
Upper Trace Width	W2	3.0182
Trace Thickness	T1	1.4000
Impedance	**Zo**	49.88
Target Impedance		50.00
Target Tolerance %		10.00

Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V22.05.06

New Confidential Stamp options added to the technical report



CONFIDENTIAL

C:\Apps\Samples\Eval Imperial.sci Units: Mils

Layer	Stack up	Supplier	Description	Type	Processed Thickness	εr	Loss Tangent	Impedance ID
		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	
1		Polar Samples	Copper Foil	Copper	1.400			1, 2
		Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
2					1.400			
		Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
3					1.400			
		Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
4					1.400			3
		Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	
5					1.400			
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
6					1.400			
		Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
7					1.400			
		Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
8		Polar Samples	Copper Foil	Copper	1.400			4
		Polar Samples	Liquid PhotoImageable Mask	SolderMask	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 wit
Stack Up Cost = 54.00

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)	Trace Pitch (S1+ W1)	Target Impedance	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	15.765	100.000	100.290
2		Coated Microstrip 1B	1	3	0	4.000	3.000	0.000	0.000	75.000	75.740
3		Edge Coupled Offset Stripline 1B1A									
4		Coated Microstrip 1B									

CONFIDENTIAL

StackName: Master
Date:
Author:
Department:
Site:
Ver
Ass
Page 1/X
Copyright ©

Confidential Stamp Options

Select which location where you wish 'Confidential' to appear.

Note that some locations may interfere with existing text or logos. It is your responsibility to resolve this by editing the existing text or logos.

If you require, you can substitute Confidential with a word of your choosing. Otherwise leave the field blank.

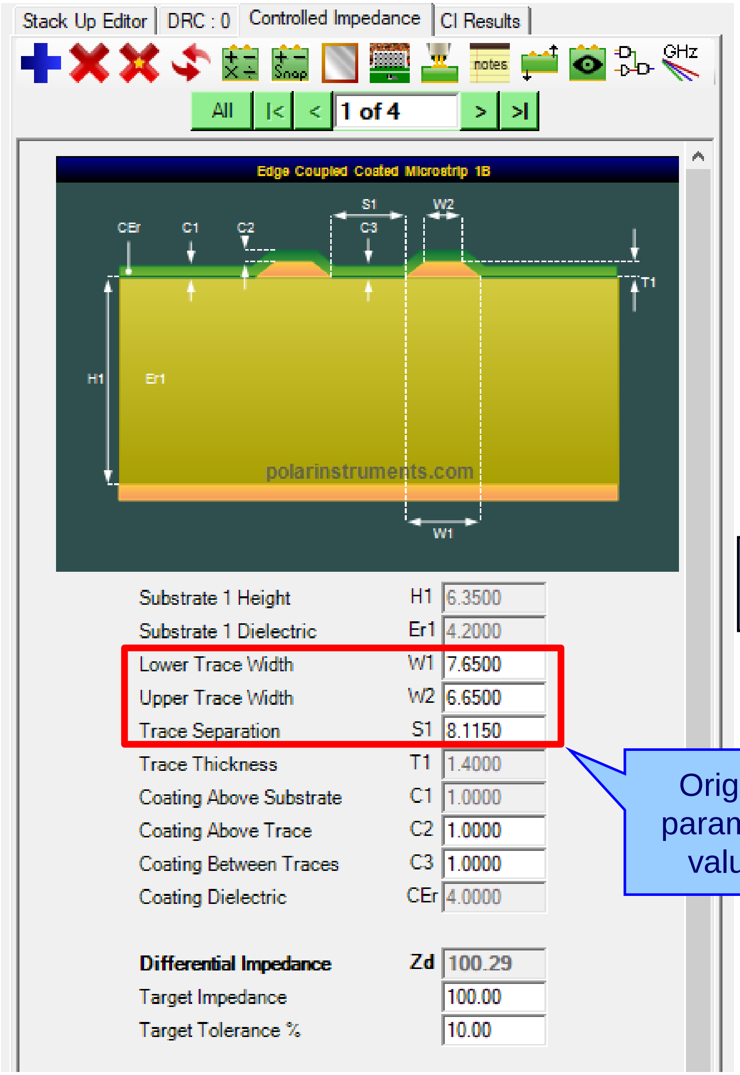
Alternative word

☑ Location 1
☑ Location 2
☐ Location 3
☐ Location 4

The confidential stamps are customisable in terms of the text used and location. This new functionality is available from the technical report Options menu

Speedstack v22.01.01 (January 2022)

Snap Parameters and Calculate Structure


Stack Up Editor
DRC : 0
Controlled Impedance
CI Results
notes
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All
|<
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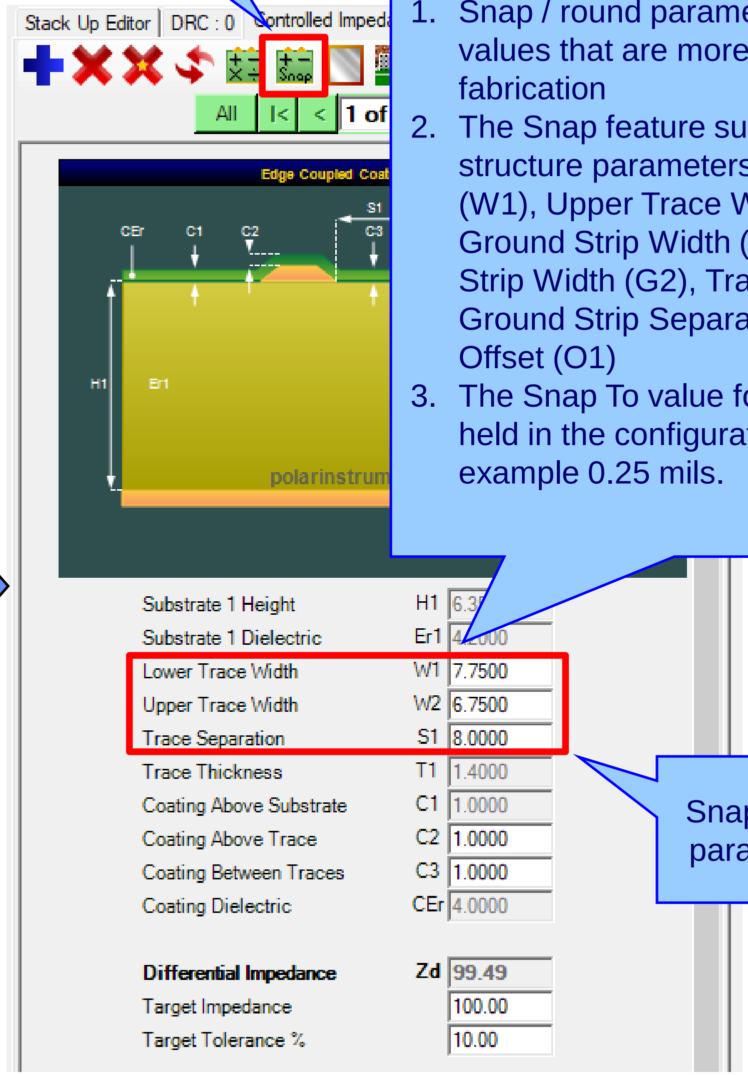
1 of 4
>
>|
Edge Coupled Coated Microstrip 1B
S1
W2
CEr
C1
C2
C3
T1
H1
Er1
polarinstruments.com
W1

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.6500
Upper Trace Width	W2	6.6500
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**	100.29
Target Impedance		100.00
Target Tolerance %		10.00

Original parameter values

New option


Stack Up Editor
DRC : 0
Controlled Impeda
Snap
All
|<
<
1 of
Edge Coupled Coat
S1
CEr
C1
C2
C3
H1
Er1
polarinstrum

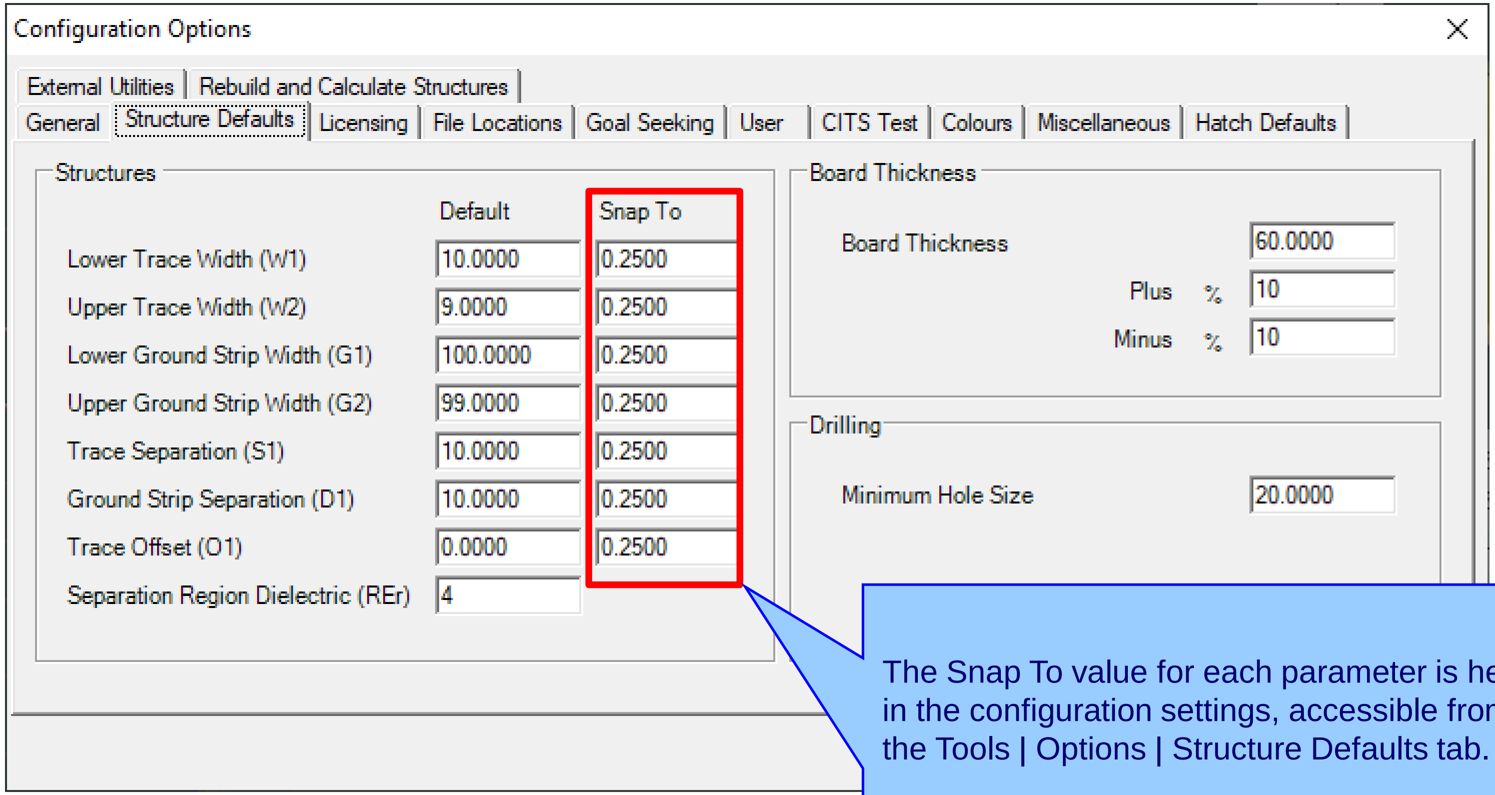
Substrate 1 Height	H1	6.3
Substrate 1 Dielectric	Er1	[illegible]
Lower Trace Width	W1	7.7500
Upper Trace Width	W2	6.7500
Trace Separation	S1	8.0000
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000
Differential Impedance	**Zd**	99.49
Target Impedance		100.00
Target Tolerance %		10.00

Snapped/rounded parameter values

Snap Parameters and Calculate Structure

1. Snap / round parameters to practical values that are more appropriate for fabrication
2. The Snap feature supports the following structure parameters : Lower Trace Width (W1), Upper Trace Width (W2), Lower Ground Strip Width (G1), Upper Ground Strip Width (G2), Trace Separation (S1), Ground Strip Separation (D1), Trace Offset (O1)
3. The Snap To value for each parameter is held in the configuration settings, in this example 0.25 mils.

Snap Parameters and Calculate Structure


Configuration Options
External Utilities
Rebuild and Calculate Structures
General
Structure Defaults
Licensing
File Locations
Goal Seeking
User
CITS Test
Colours
Miscellaneous
Hatch Defaults

Structures

	Default	Snap To
Lower Trace Width (W1)	10.0000	0.2500
Upper Trace Width (W2)	9.0000	0.2500
Lower Ground Strip Width (G1)	100.0000	0.2500
Upper Ground Strip Width (G2)	99.0000	0.2500
Trace Separation (S1)	10.0000	0.2500
Ground Strip Separation (D1)	10.0000	0.2500
Trace Offset (O1)	0.0000	0.2500
Separation Region Dielectric (REr)	4	

Board Thickness

Board Thickness 60.0000

Plus % 10

Minus % 10

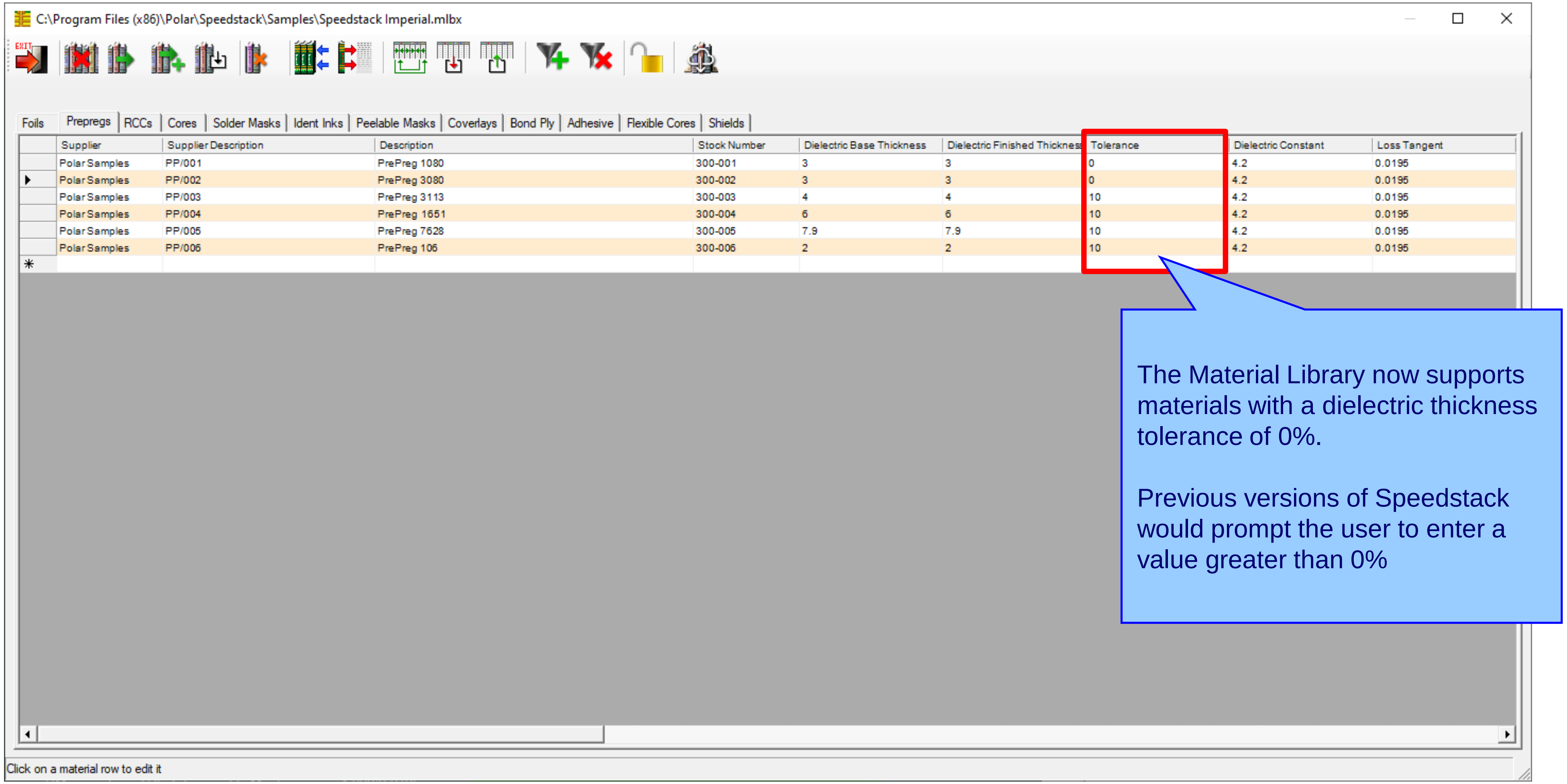
Drilling

Minimum Hole Size 20.0000

The Snap To value for each parameter is held in the configuration settings, accessible from the Tools | Options | Structure Defaults tab.

Although all Snap To values shown here are set to 0.25 mils, each parameter can support a different value

Material Library Enhancements



C:\Program Files (x86)\Polar\Speedstack\Samples\Speedstack Imperial.mlbx

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

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thicknes	Tolerance	Dielectric Constant	Loss Tangent
Polar Samples	PP/001	PrePreg 1080	300-001	3	3	0	4.2	0.0195
Polar Samples	PP/002	PrePreg 3080	300-002	3	3	0	4.2	0.0195
Polar Samples	PP/003	PrePreg 3113	300-003	4	4	10	4.2	0.0195
Polar Samples	PP/004	PrePreg 1651	300-004	6	6	10	4.2	0.0195
Polar Samples	PP/005	PrePreg 7628	300-005	7.9	7.9	10	4.2	0.0195
Polar Samples	PP/006	PrePreg 106	300-006	2	2	10	4.2	0.0195

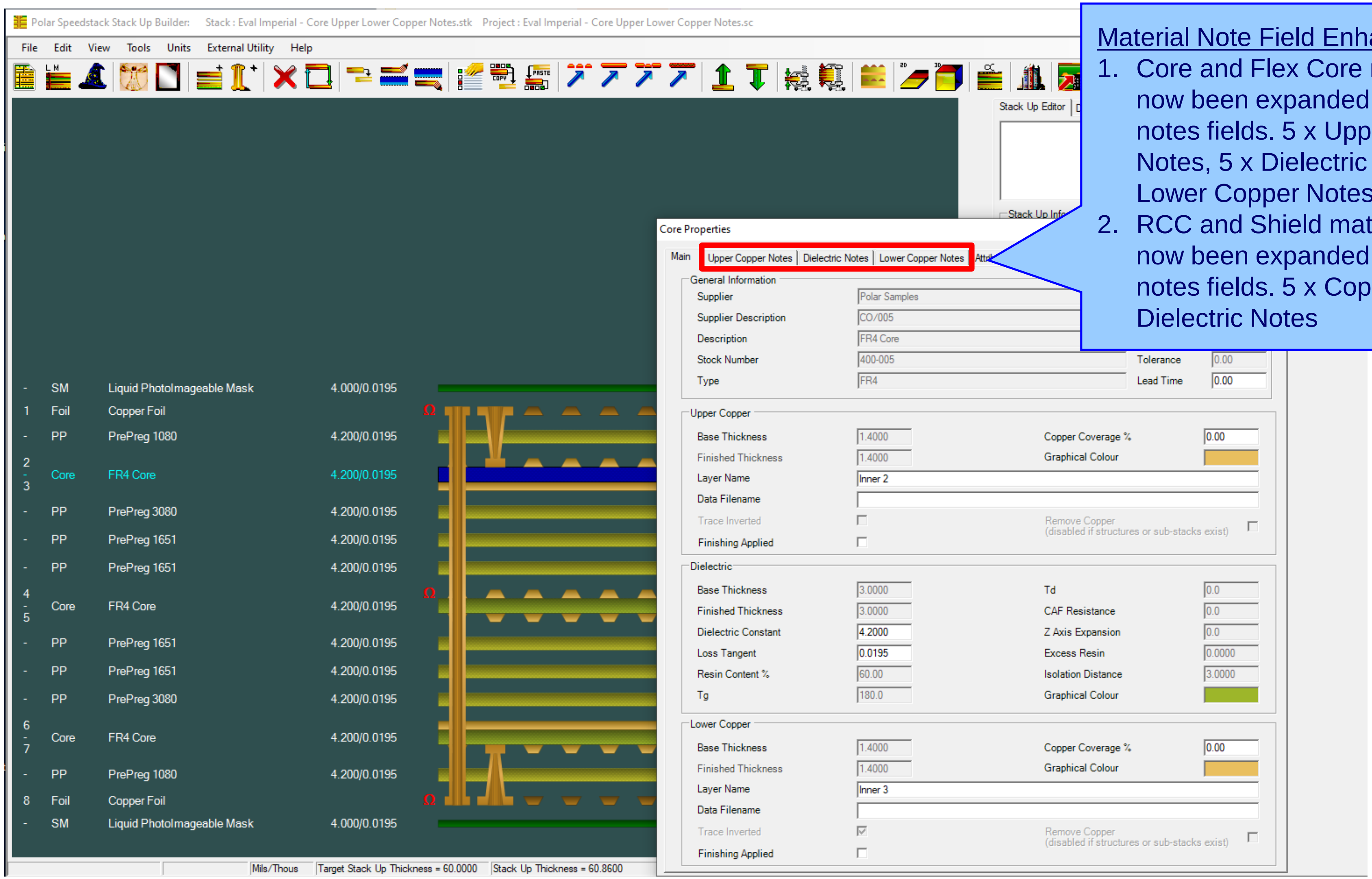
Click on a material row to edit it

The Material Library now supports materials with a dielectric thickness tolerance of 0%.

Previous versions of Speedstack would prompt the user to enter a value greater than 0%

Speedstack v21.11.01 (November 2021)

Material Note Field Enhancements – improvements to stack up documentation


Polar Speedstack Stack Up Builder: Stack : Eval Imperial - Core Upper Lower Copper Notes.stk Project : Eval Imperial - Core Upper Lower Copper Notes.sc
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
Stack Up Info

-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	
-	PP	PrePreg 1080	4.200/0.0195
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

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600

Core Properties

Main
Upper Copper Notes
Dielectric Notes
Lower Copper Notes
Attri

General Information

Supplier: Polar Samples
Supplier Description: CO/005
Description: FR4 Core
Stock Number: 400-005
Tolerance: 0.00
Type: FR4
Lead Time: 0.00

Upper Copper

Base Thickness: 1.4000
Copper Coverage %: 0.00
Finished Thickness: 1.4000
Graphical Colour
Layer Name: Inner 2
Data Filename:
Trace Inverted ☐
Remove Copper (disabled if structures or sub-stacks exist) ☐
Finishing Applied ☐

Dielectric

Base Thickness: 3.0000
Td: 0.0
Finished Thickness: 3.0000
CAF Resistance: 0.0
Dielectric Constant: 4.2000
Z Axis Expansion: 0.0
Loss Tangent: 0.0195
Excess Resin: 0.0000
Resin Content %: 60.00
Isolation Distance: 3.0000
Tg: 180.0
Graphical Colour

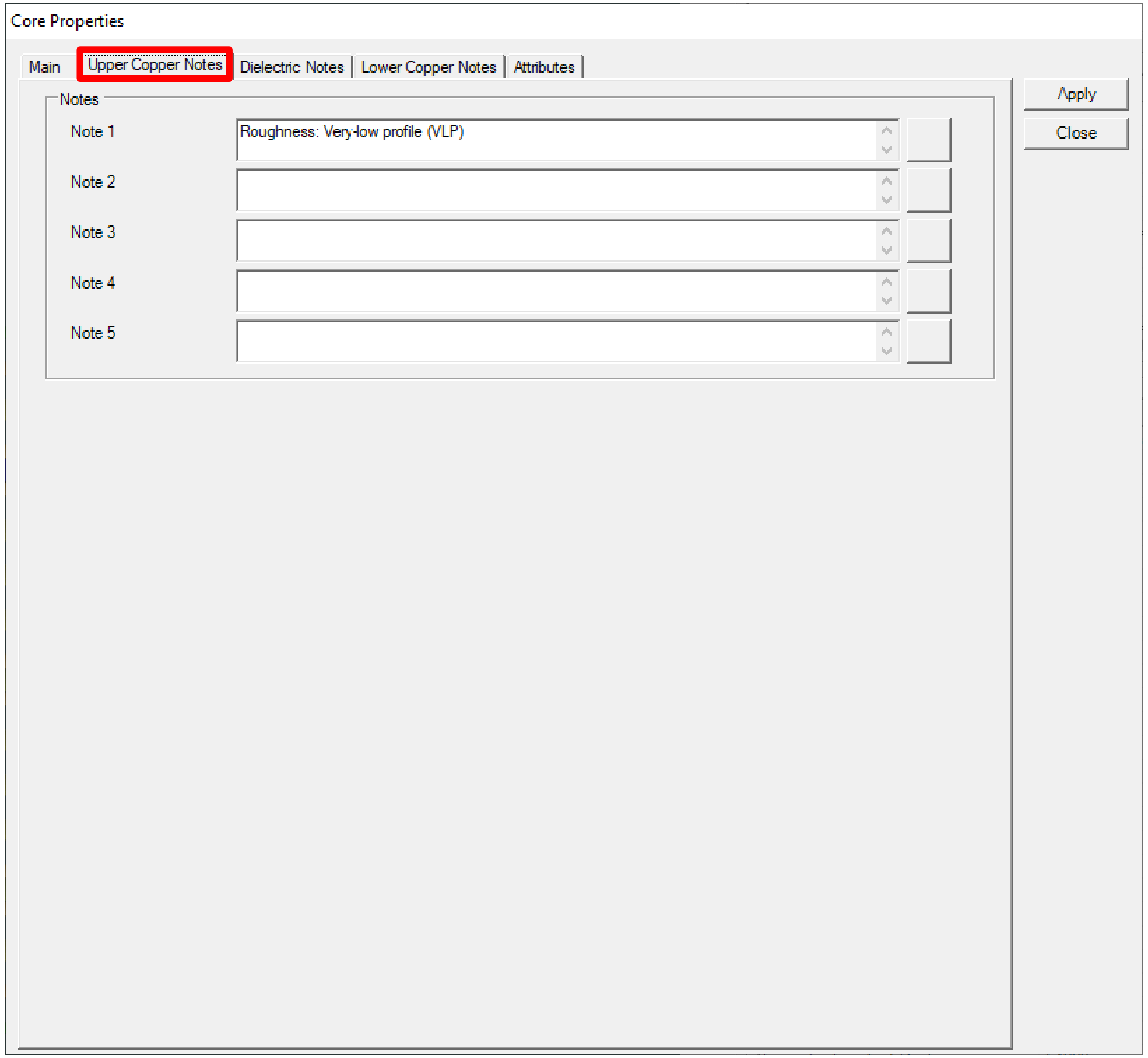
Lower Copper

Base Thickness: 1.4000
Copper Coverage %: 0.00
Finished Thickness: 1.4000
Graphical Colour
Layer Name: Inner 3
Data Filename:
Trace Inverted ☑
Remove Copper (disabled if structures or sub-stacks exist) ☐
Finishing Applied ☐

Material Note Field Enhancements

1. Core and Flex Core materials have now been expanded to support 15 notes fields. 5 x Upper Copper Notes, 5 x Dielectric Notes, 5 x Lower Copper Notes
2. RCC and Shield materials have now been expanded to support 10 notes fields. 5 x Copper Notes, 5 x Dielectric Notes

Material Note Field Enhancements – improvements to stack up documentation



Core Properties

Main
Upper Copper Notes
Dielectric Notes
Lower Copper Notes
Attributes
Apply
Close

Notes

Note 1: Roughness: Very-low profile (VLP)

Note 2:

Note 3:

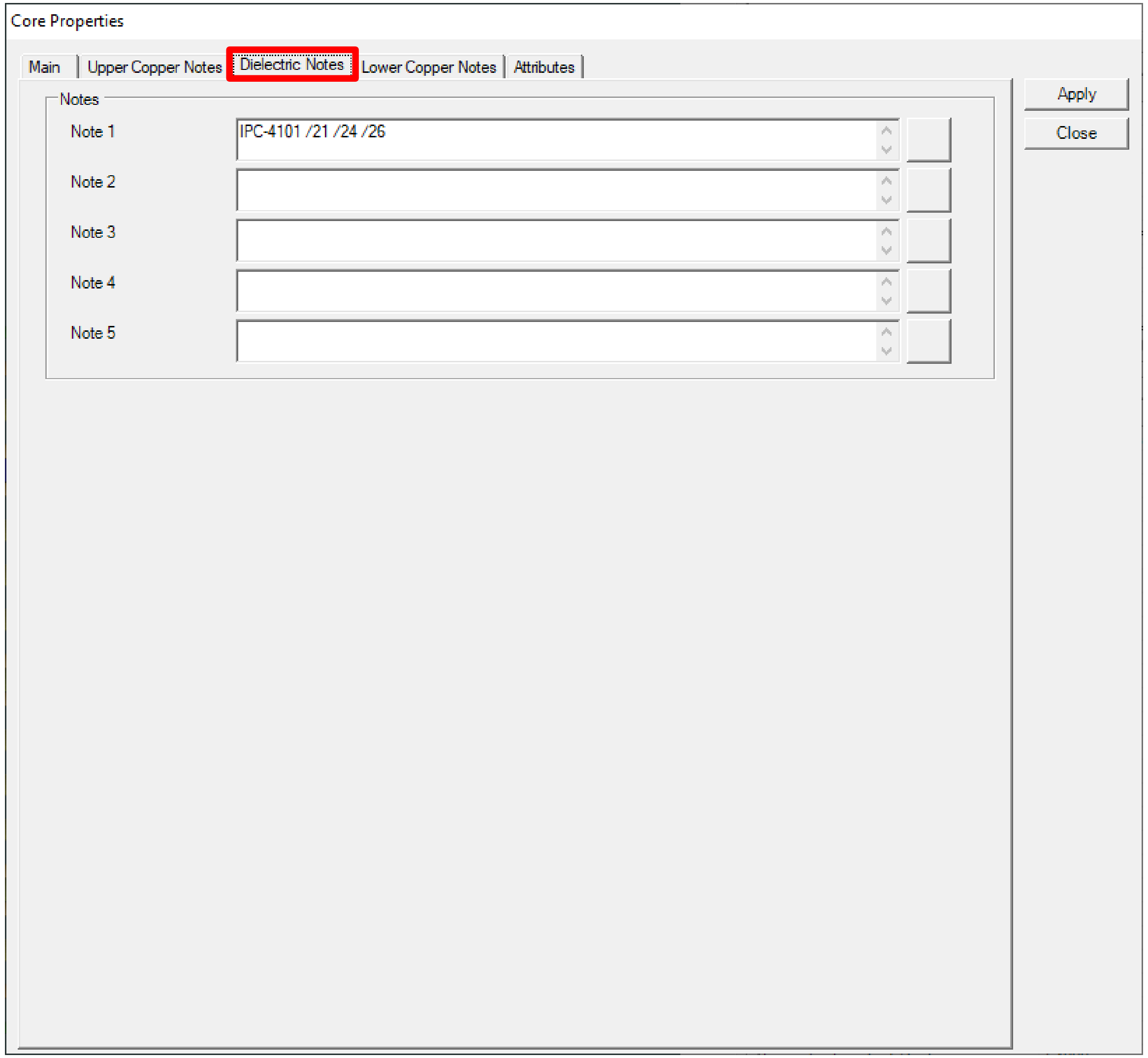
Note 4:

Note 5:

The new Upper and Lower Copper Notes allow the user to specify important information about the copper surfaces for a Core and Flex Core material.

For instance, copper roughness and plating fabrication information can be specified

Material Note Field Enhancements – improvements to stack up documentation

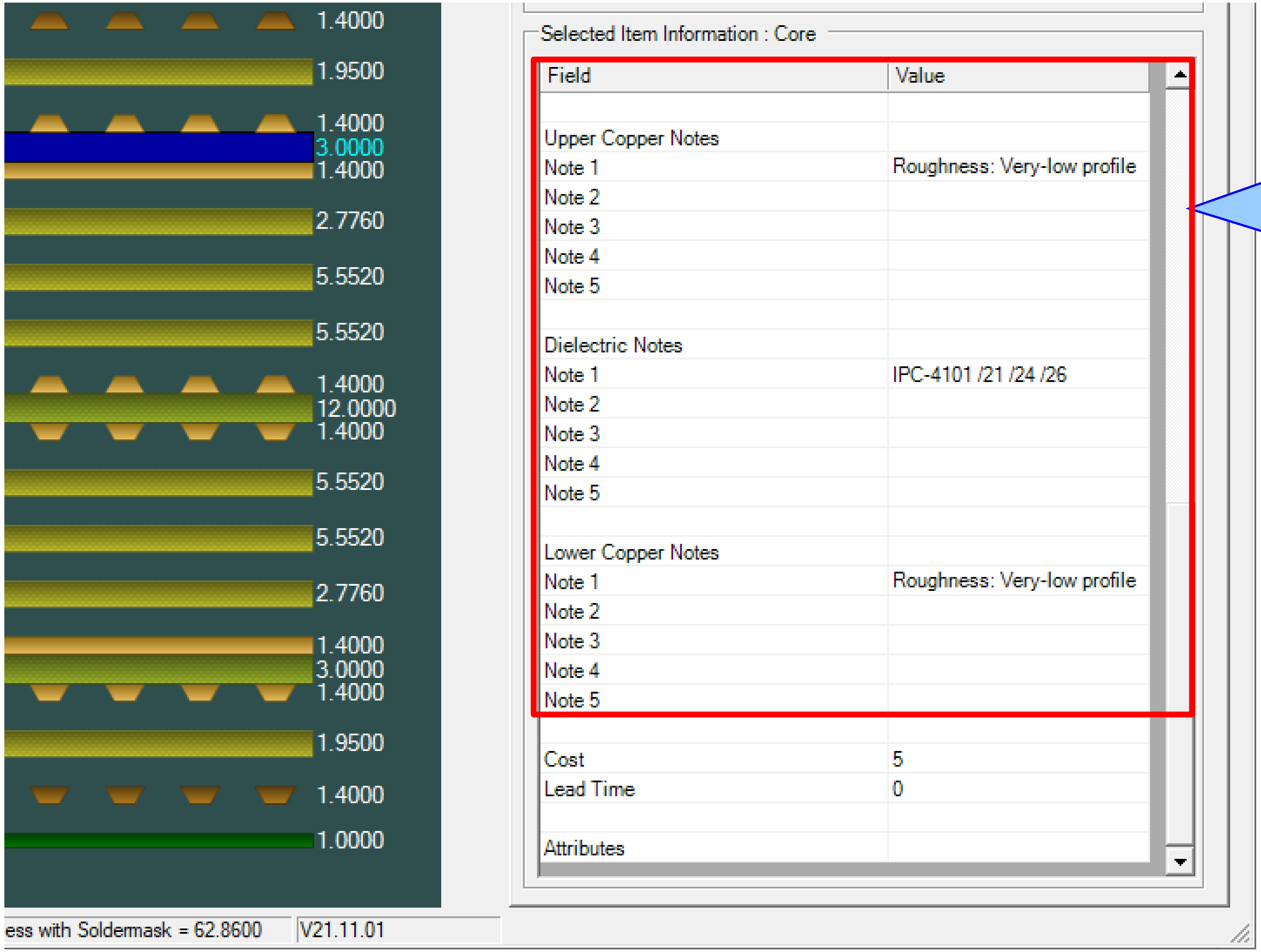

Core Properties
Main
Upper Copper Notes
Dielectric Notes
Lower Copper Notes
Attributes
Apply
Close
Notes
Note 1
Note 2
Note 3
Note 4
Note 5

Note 1: IPC-4101 /21 /24 /26

Dielectric Notes are useful for specifying IPC-4101 slash sheet categories, glass weave information (spread glass) and other important information regarding the dielectric region of the core.

The existing five Notes fields from previous versions of Speedstack will be allocated as Dielectric Notes.

Material Note Field Enhancements – improvements to stack up documentation


1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000

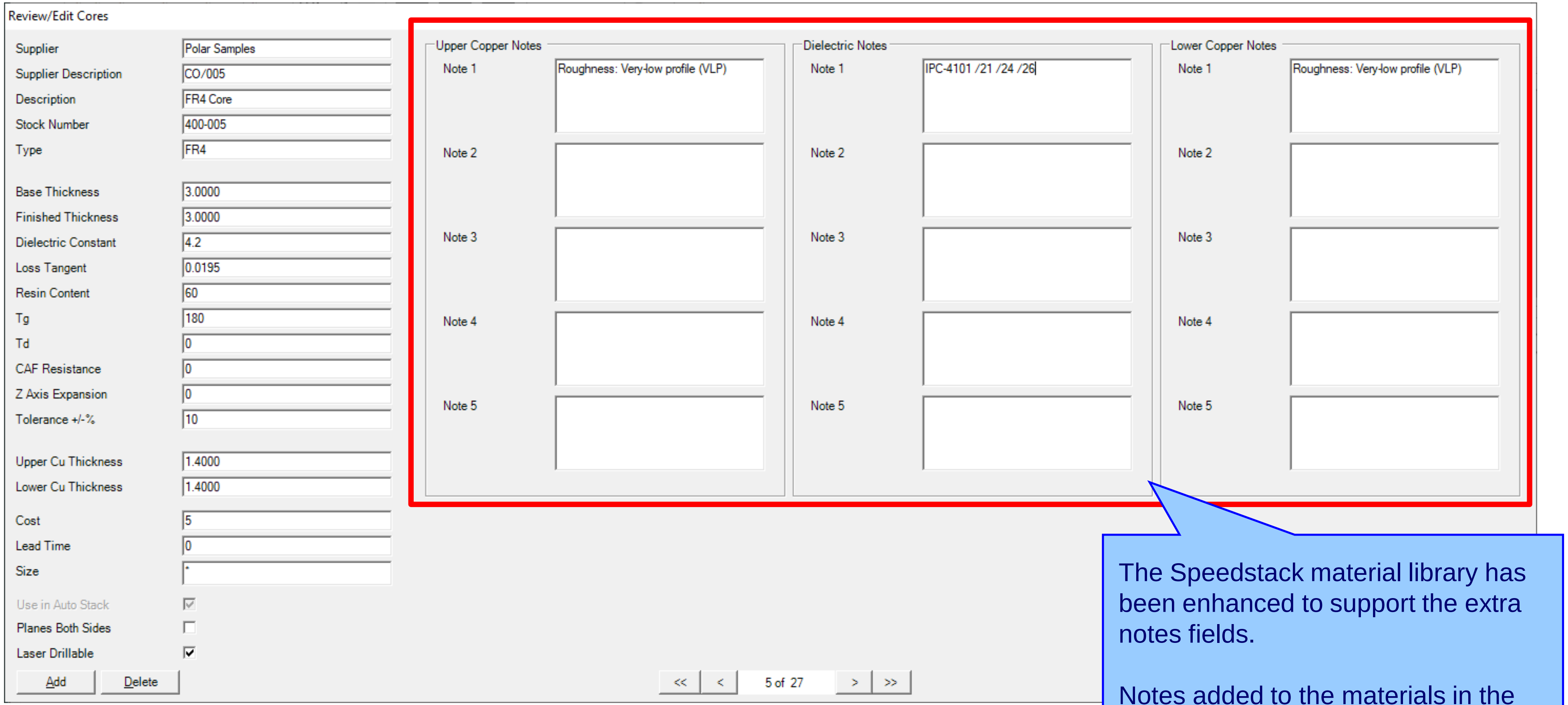
Selected Item Information : Core

Field	Value
Upper Copper Notes	
Note 1	Roughness: Very-low profile
Note 2	
Note 3	
Note 4	
Note 5	
Dielectric Notes	
Note 1	IPC-4101 /21 /24 /26
Note 2	
Note 3	
Note 4	
Note 5	
Lower Copper Notes	
Note 1	Roughness: Very-low profile
Note 2	
Note 3	
Note 4	
Note 5	
Cost	5
Lead Time	0
Attributes	

ess with Soldermask = 62.8600 | V21.11.01

When selecting a core / flex core material the Upper Copper, Dielectric and Lower Copper Notes can be confirmed here.

Material Note Field Enhancements – library enhancements



Review/Edit Cores

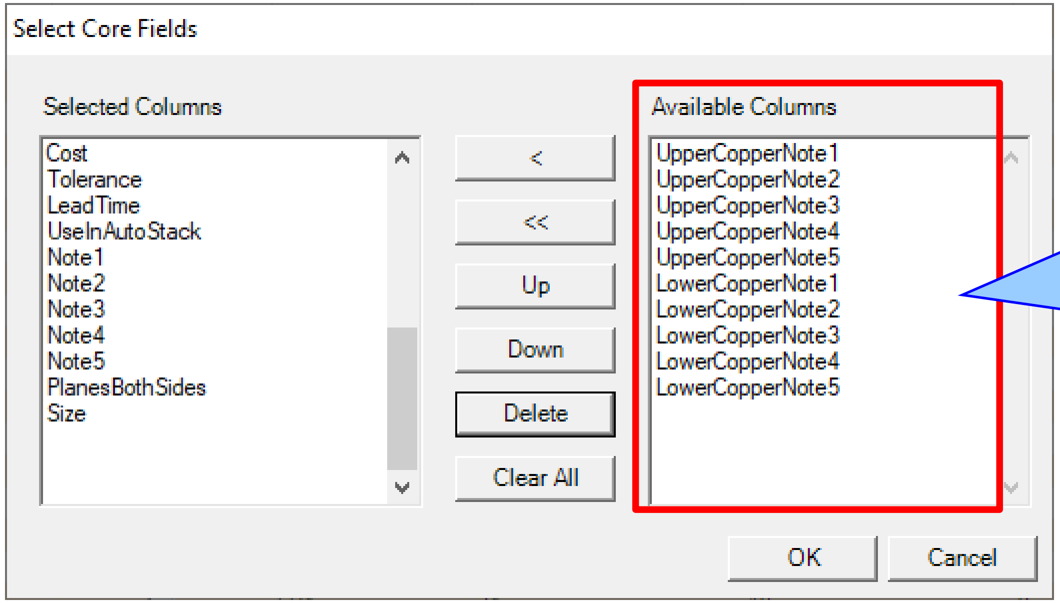
Supplier	Polar Samples
Supplier Description	CO/005
Description	FR4 Core
Stock Number	400-005
Type	FR4
Base Thickness	3.0000
Finished Thickness	3.0000
Dielectric Constant	4.2
Loss Tangent	0.0195
Resin Content	60
Tg	180
Td	0
CAF Resistance	0
Z Axis Expansion	0
Tolerance +/-%	10
Upper Cu Thickness	1.4000
Lower Cu Thickness	1.4000
Cost	5
Lead Time	0
Size	*
Use in Auto Stack	☑
Planes Both Sides	☐
Laser Drillable	☑

	Upper Copper Notes	Dielectric Notes	Lower Copper Notes
Note 1	Roughness: Very-low profile (VLP)	IPC-4101 /21 /24 /26	Roughness: Very-low profile (VLP)
Note 2			
Note 3			
Note 4			
Note 5			

The Speedstack material library has been enhanced to support the extra notes fields.

Notes added to the materials in the library will automatically be transferred to the stack up.

Material Note Field Enhancements – library enhancements



Select Core Fields

Selected Columns

- Cost
- Tolerance
- LeadTime
- UseInAutoStack
- Note1
- Note2
- Note3
- Note4
- Note5
- PlanesBothSides
- Size

Available Columns

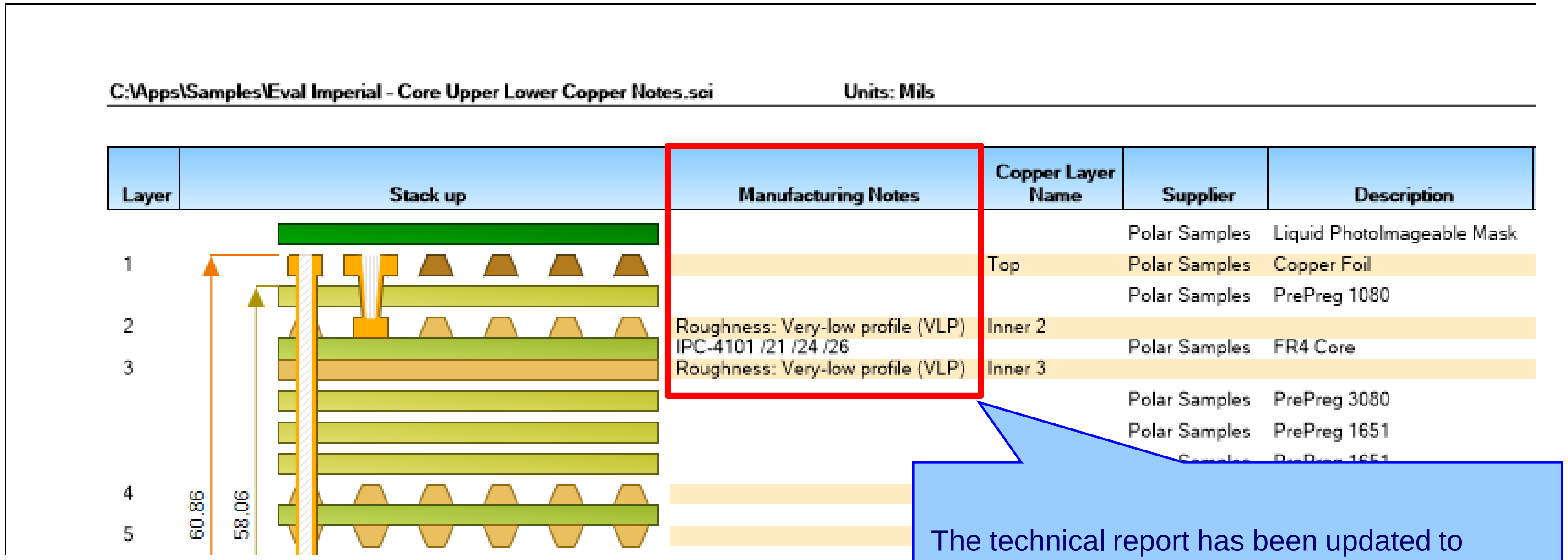
- UpperCopperNote1
- UpperCopperNote2
- UpperCopperNote3
- UpperCopperNote4
- UpperCopperNote5
- LowerCopperNote1
- LowerCopperNote2
- LowerCopperNote3
- LowerCopperNote4
- LowerCopperNote5

For existing Speedstack users upgrading to v21.11, use the Select and Arrange Columns and Save Column Order toolbar options to add these new material library columns to the Data Grid view

Material Library Import / Export

The import / export options have been enhanced to support the additional material library notes columns.

Material Note Field Enhancements – technical report enhancements



C:\Apps\Samples\Eval Imperial - Core Upper Lower Copper Notes.sci Units: Mils

Layer	Stack up	Manufacturing Notes	Copper Layer Name	Supplier	Description
				Polar Samples	Liquid PhotoImageable Mask
1			Top	Polar Samples	Copper Foil
				Polar Samples	PrePreg 1080
2		Roughness: Very-low profile (VLP)	Inner 2		
		IPC-4101 /21 /24 /26		Polar Samples	FR4 Core
3		Roughness: Very-low profile (VLP)	Inner 3		
				Polar Samples	PrePreg 3080
				Polar Samples	PrePreg 1651
4					
5					

The technical report has been updated to support the additional notes fields. Notice the Upper Copper, Dielectric and Lower Copper Notes align with the appropriate part of the Core material.

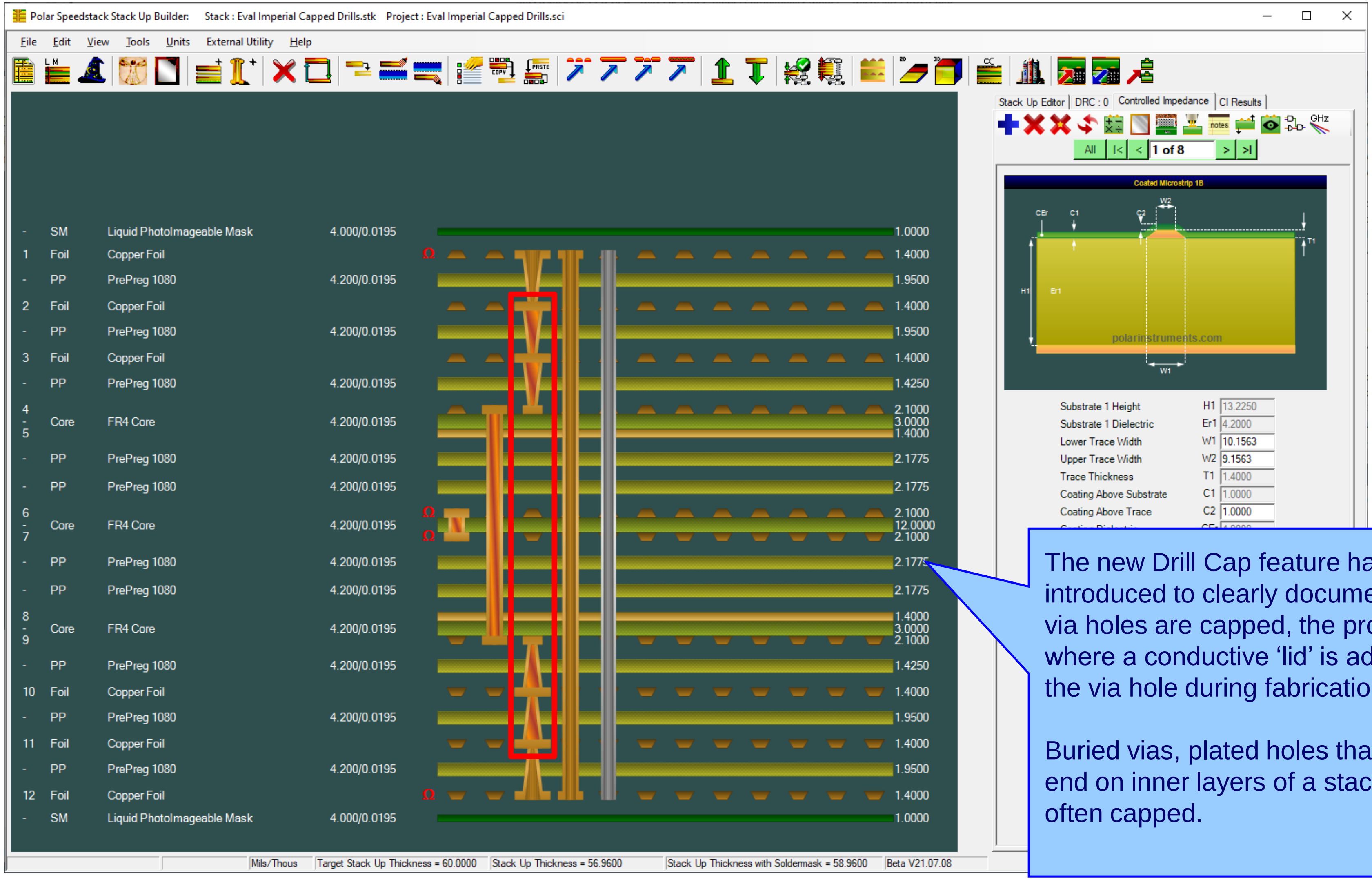
Import / Export enhancements

The following Import / Export options have been updated to support the additional material notes properties introduced with Speedstack v21.11.01:

- XML STKX v23.00 and SSX v13.00 import / export options
- CSV export option

Speedstack v21.07.08 (July 2021)

New Drill Cap feature


Polar Speedstack Stack Up Builder: Stack : Eval Imperial Capped Drills.stk Project : Eval Imperial Capped Drills.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 0
Controlled Impedance
CI Results
notes
GHz
All
|<
<
1 of 8
>
>|
Coated Microstrip 1B
CEr
C1
C2
W2
T1
H1
Er1
W1
polarinstruments.com

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
3	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.4250
4 - 5	Core	FR4 Core	4.200/0.0195	2.1000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	2.1775
-	PP	PrePreg 1080	4.200/0.0195	2.1775
6 - 7	Core	FR4 Core	4.200/0.0195	2.1000 12.0000 2.1000
-	PP	PrePreg 1080	4.200/0.0195	2.1775
-	PP	PrePreg 1080	4.200/0.0195	2.1775
8 - 9	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 2.1000
-	PP	PrePreg 1080	4.200/0.0195	1.4250
10	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
11	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
12	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

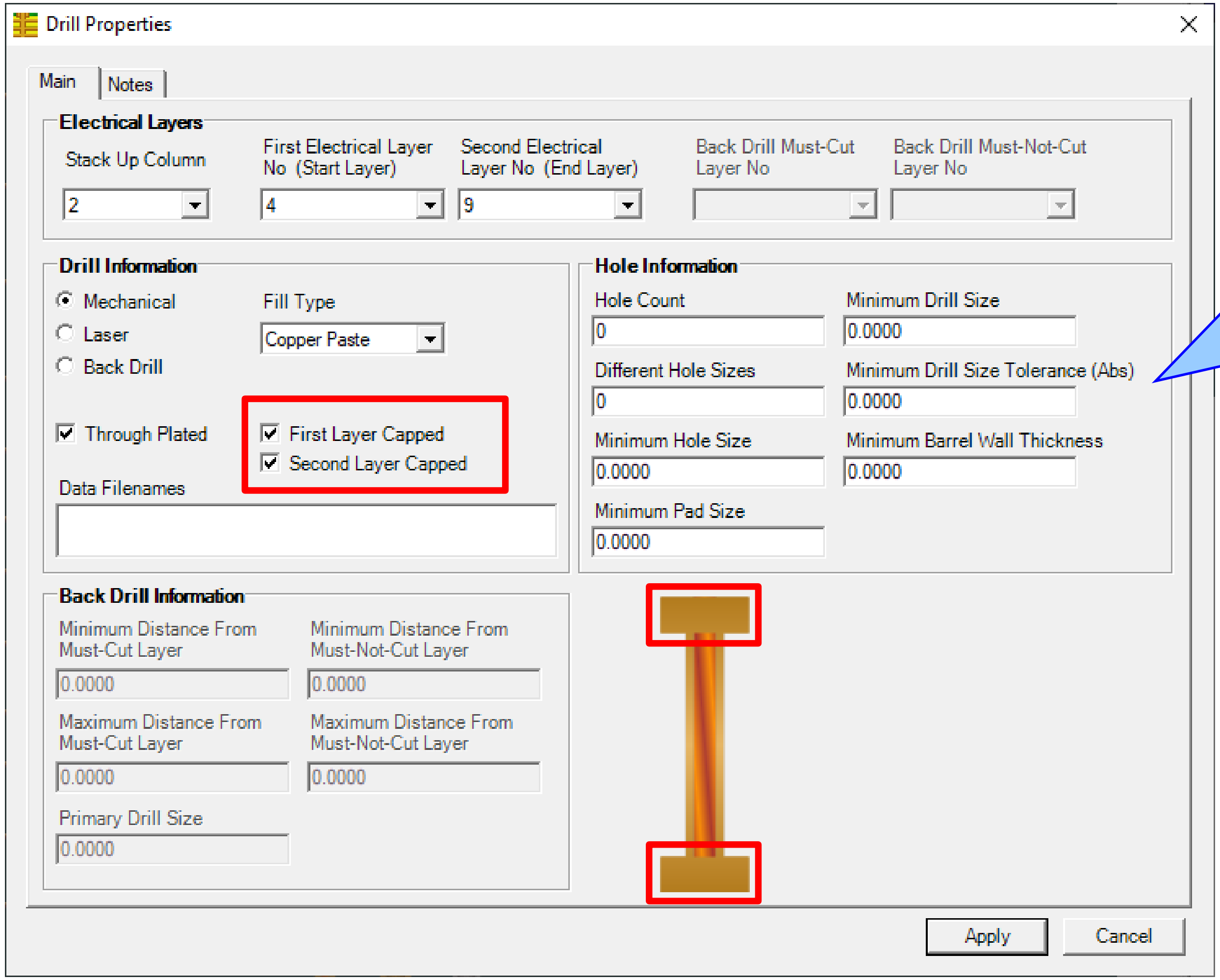
Substrate 1 Height	H1	13.2250
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	10.1563
Upper Trace Width	W2	9.1563
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 56.9600 | Stack Up Thickness with Soldermask = 58.9600 | Beta V21.07.08

The new Drill Cap feature has been introduced to clearly document when via holes are capped, the process where a conductive ‘lid’ is added to the via hole during fabrication.

Buried vias, plated holes that start and end on inner layers of a stack up, are often capped.

Drill Cap option – mechanical through plated drills



Electrical Layers

Stack Up Column: 2

First Electrical Layer No (Start Layer): 4

Second Electrical Layer No (End Layer): 9

Back Drill Must-Cut Layer No:

Back Drill Must-Not-Cut Layer No:

Drill Information

● Mechanical
○ Laser
○ Back Drill

Fill Type: Copper Paste

☑ Through Plated

☑ First Layer Capped
☑ Second Layer Capped

Data Filenames:

Hole Information

Hole Count: 0

Minimum Drill Size: 0.0000

Different Hole Sizes: 0

Minimum Drill Size Tolerance (Abs): 0.0000

Minimum Hole Size: 0.0000

Minimum Barrel Wall Thickness: 0.0000

Minimum Pad Size: 0.0000

Back Drill Information

Minimum Distance From Must-Cut Layer: 0.0000

Minimum Distance From Must-Not-Cut Layer: 0.0000

Maximum Distance From Must-Cut Layer: 0.0000

Maximum Distance From Must-Not-Cut Layer: 0.0000

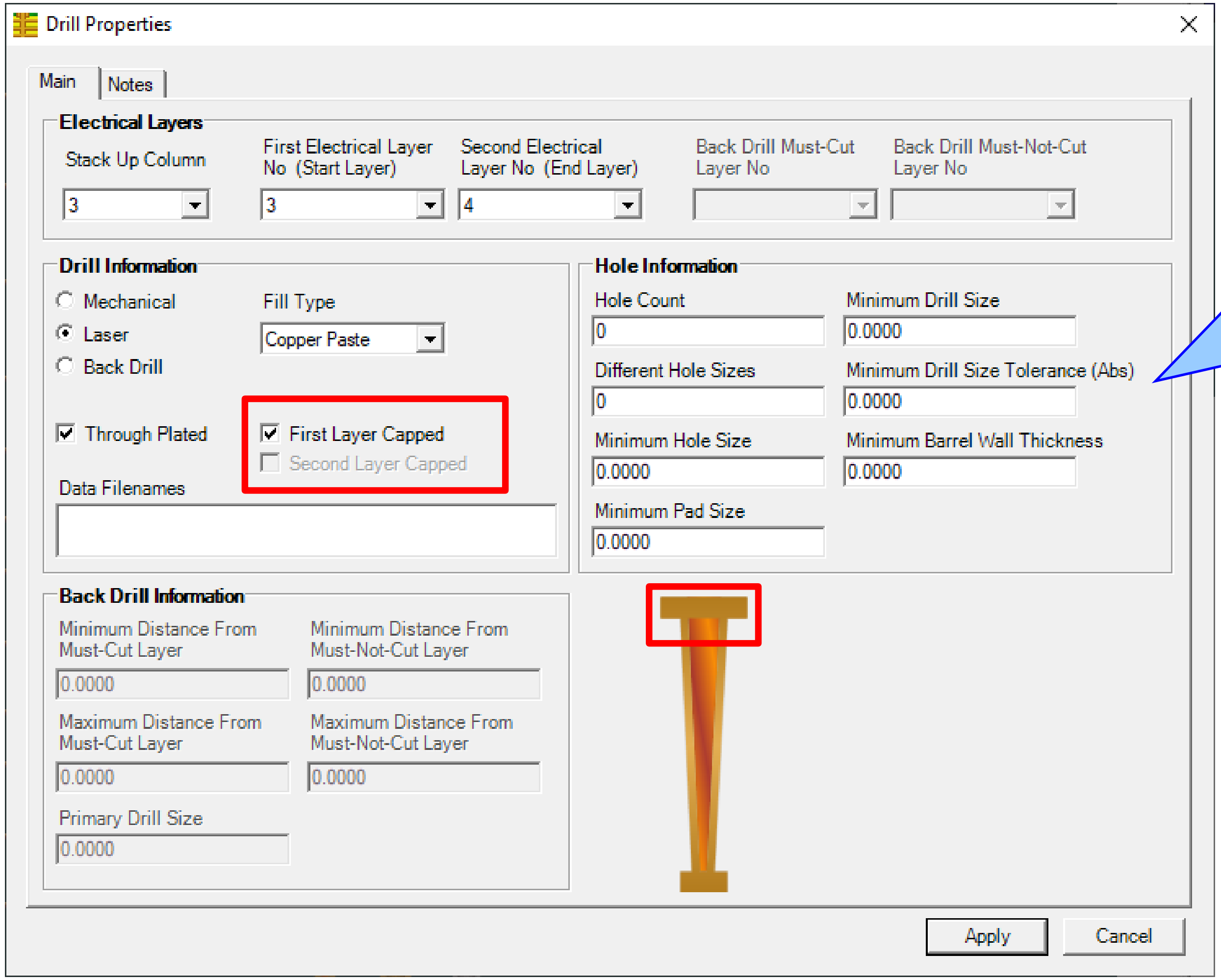
Primary Drill Size: 0.0000

Mechanical

For mechanical drills it is possible to have four states:

1. Neither first or second layer capped (default when adding a drill)
2. First layer capped
3. Second layer capped
4. Both layers capped

Drill Cap option – laser drills



Drill Properties

Electrical Layers

Stack Up Column: 3

First Electrical Layer No (Start Layer): 3

Second Electrical Layer No (End Layer): 4

Back Drill Must-Cut Layer No:

Back Drill Must-Not-Cut Layer No:

Drill Information

○ Mechanical
● Laser
○ Back Drill

Fill Type: Copper Paste

☑ Through Plated

☑ First Layer Capped
☐ Second Layer Capped

Data Filenames:

Hole Information

Hole Count: 0

Minimum Drill Size: 0.0000

Different Hole Sizes: 0

Minimum Drill Size Tolerance (Abs): 0.0000

Minimum Hole Size: 0.0000

Minimum Barrel Wall Thickness: 0.0000

Minimum Pad Size: 0.0000

Back Drill Information

Minimum Distance From Must-Cut Layer: 0.0000

Minimum Distance From Must-Not-Cut Layer: 0.0000

Maximum Distance From Must-Cut Layer: 0.0000

Maximum Distance From Must-Not-Cut Layer: 0.0000

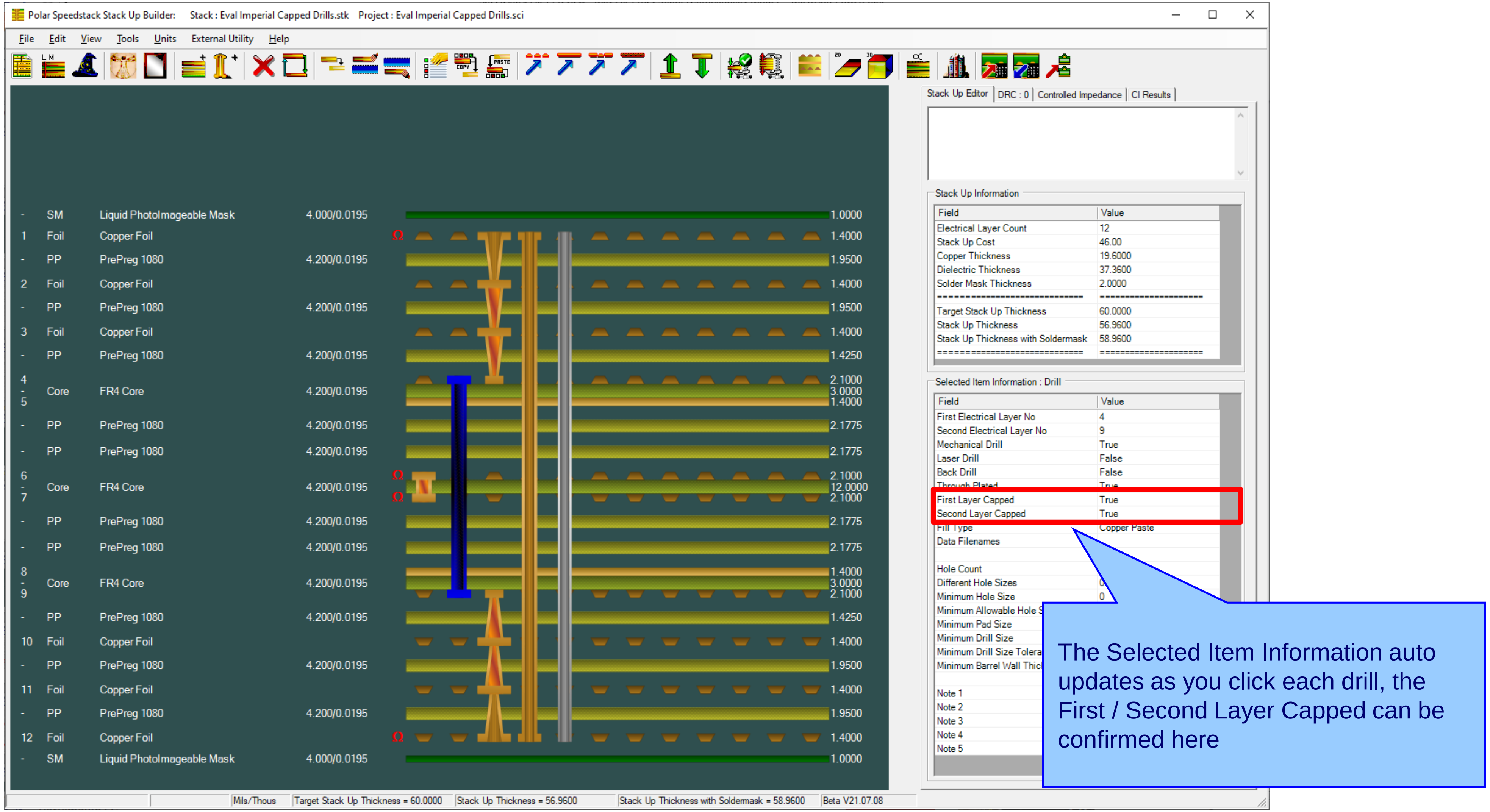
Primary Drill Size: 0.0000

Laser

For laser drills it is possible to have two states as the Second Layer Capped checkbox is disabled:

1. Not capped (default when adding a drill)
2. First layer capped

New Drill Cap feature


Polar Speedstack Stack Up Builder: Stack : Eval Imperial Capped Drills.stk Project : Eval Imperial Capped Drills.sci
File Edit View Tools Units External Utility Help
Stack Up Editor | DRC : 0 | Controlled Impedance | CI Results

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
3	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.4250
4 - 5	Core	FR4 Core	4.200/0.0195	2.1000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	2.1775
-	PP	PrePreg 1080	4.200/0.0195	2.1775
6 - 7	Core	FR4 Core	4.200/0.0195	2.1000 12.0000 2.1000
-	PP	PrePreg 1080	4.200/0.0195	2.1775
-	PP	PrePreg 1080	4.200/0.0195	2.1775
8 - 9	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 2.1000
-	PP	PrePreg 1080	4.200/0.0195	1.4250
10	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
11	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
12	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Stack Up Information

Field	Value
Electrical Layer Count	12
Stack Up Cost	46.00
Copper Thickness	19.6000
Dielectric Thickness	37.3600
Solder Mask Thickness	2.0000
============================	=====================
Target Stack Up Thickness	60.0000
Stack Up Thickness	56.9600
Stack Up Thickness with Soldermask	58.9600
============================	=====================

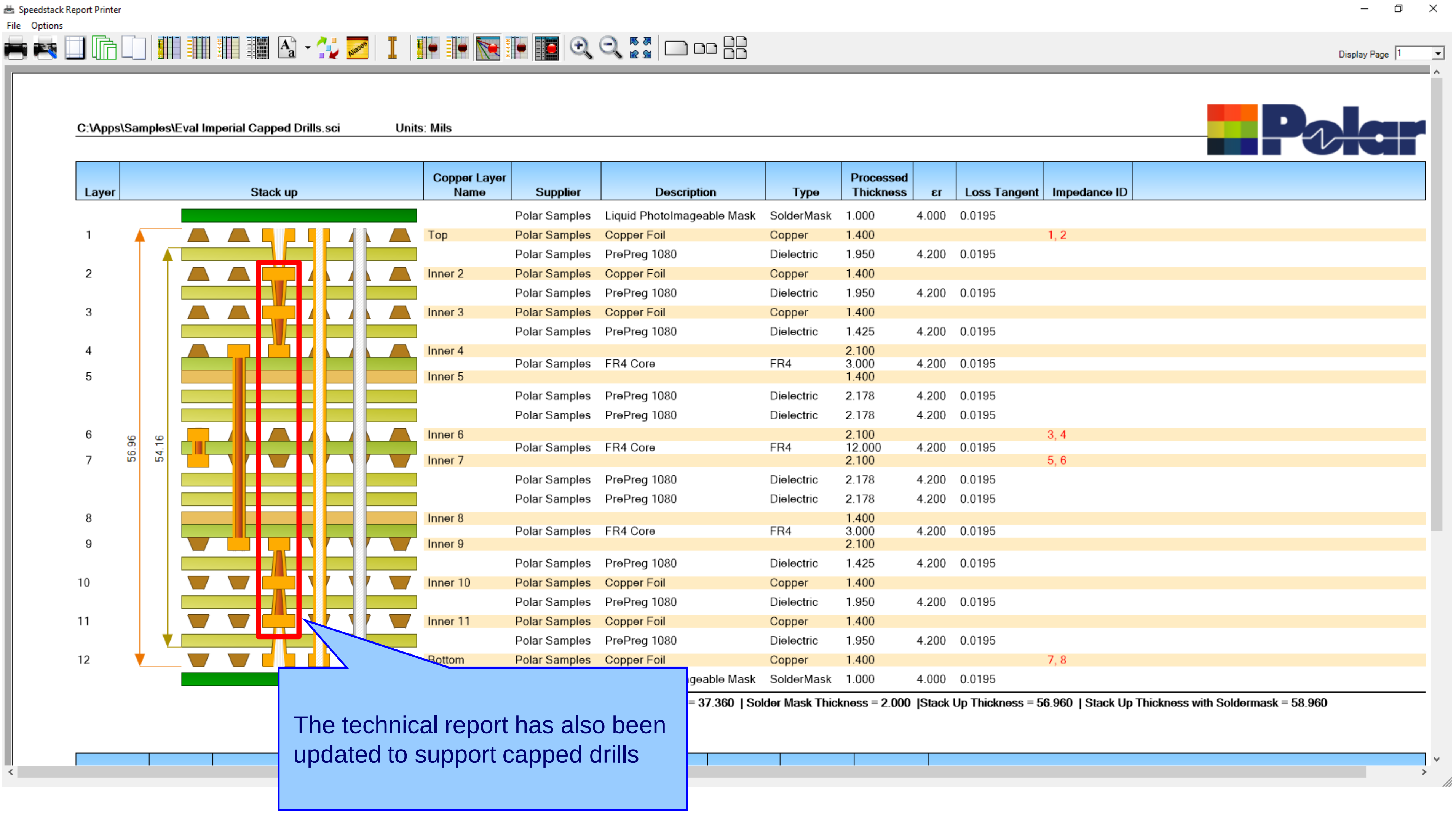
Selected Item Information : Drill

Field	Value
First Electrical Layer No	4
Second Electrical Layer No	9
Mechanical Drill	True
Laser Drill	False
Back Drill	False
Through Plated	True
First Layer Capped	True
Second Layer Capped	True
Fill Type	Copper Paste
Data Filenames	
Hole Count	
Different Hole Sizes	0
Minimum Hole Size	0
Minimum Allowable Hole S	
Minimum Pad Size	
Minimum Drill Size	
Minimum Drill Size Tolera	
Minimum Barrel Wall Thic	
Note 1	
Note 2	
Note 3	
Note 4	
Note 5	

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 56.9600 | Stack Up Thickness with Soldermask = 58.9600 | Beta V21.07.08

The Selected Item Information auto updates as you click each drill, the First / Second Layer Capped can be confirmed here

New Drill Cap feature – technical report enhancements



C:\Apps\Samples\Eval Imperial Capped Drills.sci Units: Mils

Layer	Stack up	Copper Layer Name	Supplier	Description	Type	Processed Thickness	εr	Loss Tangent	Impedance ID
			Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	
1		Top	Polar Samples	Copper Foil	Copper	1.400			1, 2
			Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
2		Inner 2	Polar Samples	Copper Foil	Copper	1.400			
			Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
3		Inner 3	Polar Samples	Copper Foil	Copper	1.400			
			Polar Samples	PrePreg 1080	Dielectric	1.425	4.200	0.0195	
4		Inner 4				2.100			
			Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
5		Inner 5				1.400			
			Polar Samples	PrePreg 1080	Dielectric	2.178	4.200	0.0195	
			Polar Samples	PrePreg 1080	Dielectric	2.178	4.200	0.0195	
6		Inner 6				2.100			3, 4
			Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	
7		Inner 7				2.100			5, 6
			Polar Samples	PrePreg 1080	Dielectric	2.178	4.200	0.0195	
			Polar Samples	PrePreg 1080	Dielectric	2.178	4.200	0.0195	
8		Inner 8				1.400			
			Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
9		Inner 9				2.100			
			Polar Samples	PrePreg 1080	Dielectric	1.425	4.200	0.0195	
10		Inner 10	Polar Samples	Copper Foil	Copper	1.400			
			Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
11		Inner 11	Polar Samples	Copper Foil	Copper	1.400			
			Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
12		Bottom	Polar Samples	Copper Foil	Copper	1.400			7, 8
				geable Mask	SolderMask	1.000	4.000	0.0195	

= 37.360 | Solder Mask Thickness = 2.000 |Stack Up Thickness = 56.960 | Stack Up Thickness with Soldermask = 58.960

The technical report has also been updated to support capped drills

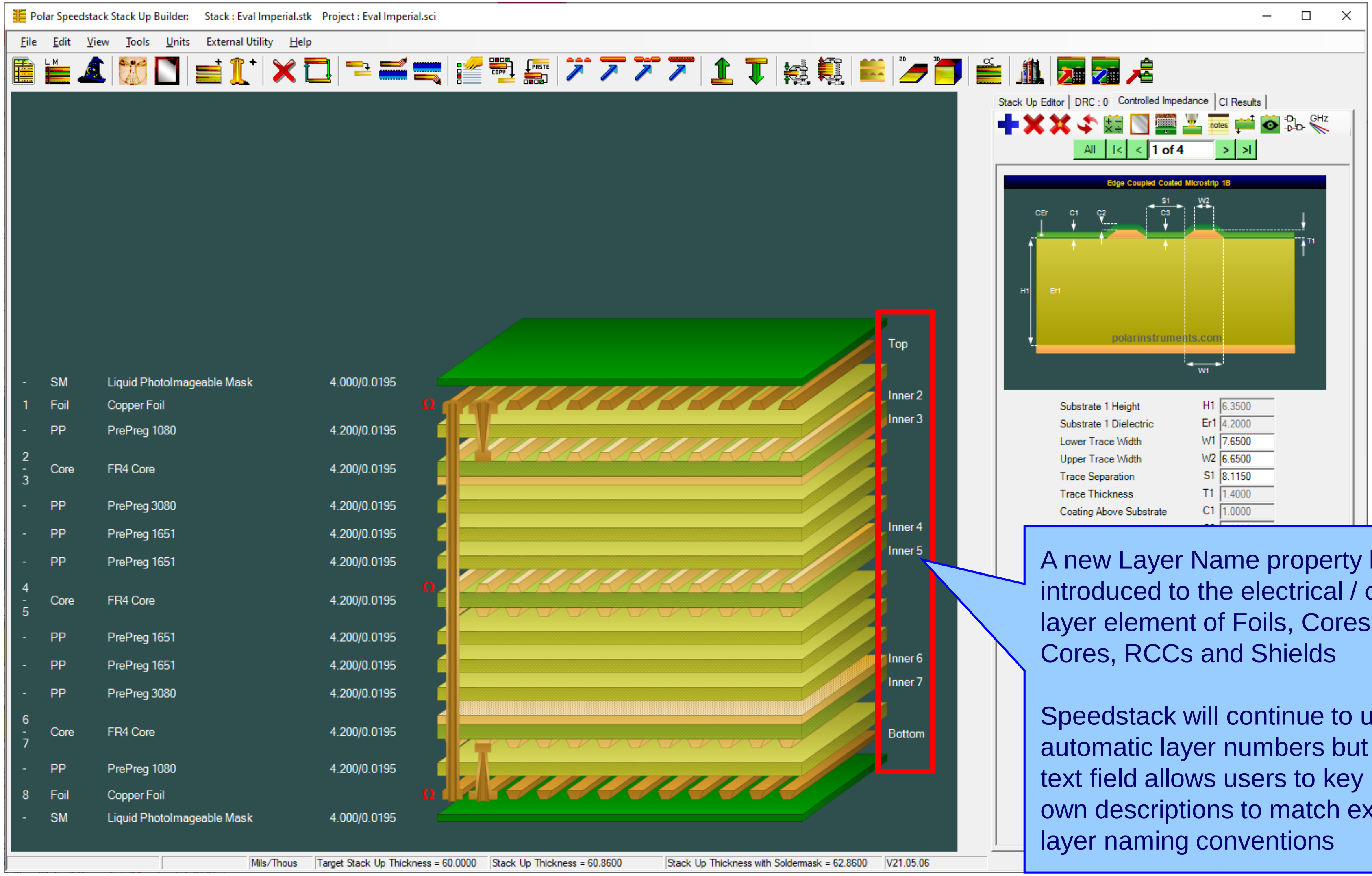
Import / Export enhancements

The following Import / Export options have been updated to support the drill cap properties introduced with Speedstack v21.07.08:

- XML STKX v22.00 and SSX v12.00 import / export options
- CSV export option

Speedstack v21.05.06 (May 2021)

New Layer Name property for electrical / copper layers


Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk Project : Eval Imperial.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 0
Controlled Impedance
CI Results
notes
GHz
All
|<
<
1 of 4
>
>|
Edge Coupled Coated Microstrip 1B
CEr
C1
C2
C3
S1
W2
T1
H1
Er1
W1
polarinstruments.com
Top
Inner 2
Inner 3
Inner 4
Inner 5
Inner 6
Inner 7
Bottom
Ω
Ω
Ω

-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	
-	PP	PrePreg 1080	4.200/0.0195
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

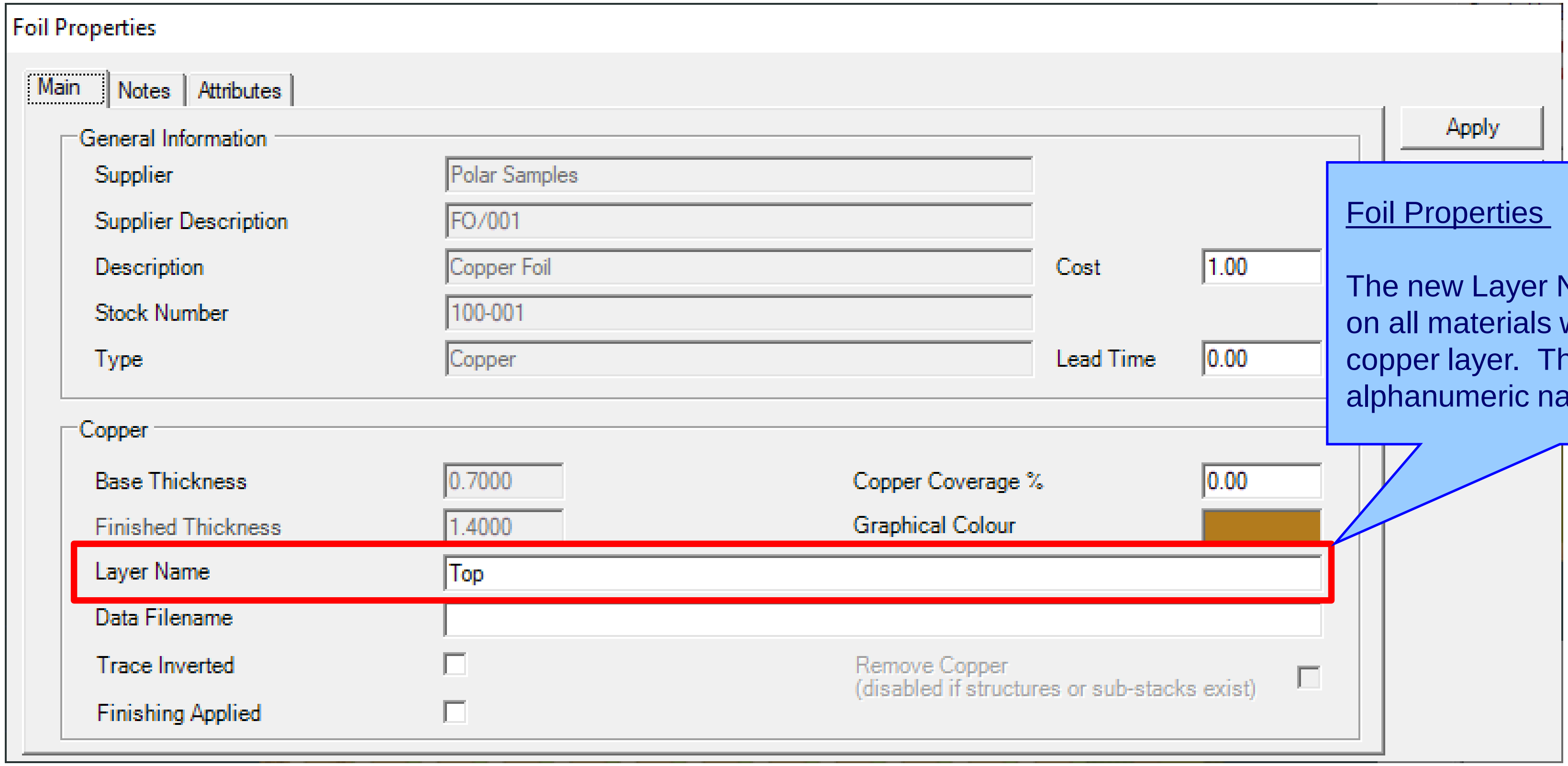
Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.6500
Upper Trace Width	W2	6.6500
Trace Separation	S1	8.1150
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V21.05.06

A new Layer Name property has been introduced to the electrical / copper layer element of Foils, Cores, Flex Cores, RCCs and Shields

Speedstack will continue to use the automatic layer numbers but this new text field allows users to key in their own descriptions to match existing layer naming conventions

New Layer Name property for electrical / copper layers


Foil Properties
Main
Notes
Attributes
Apply
General Information
Copper

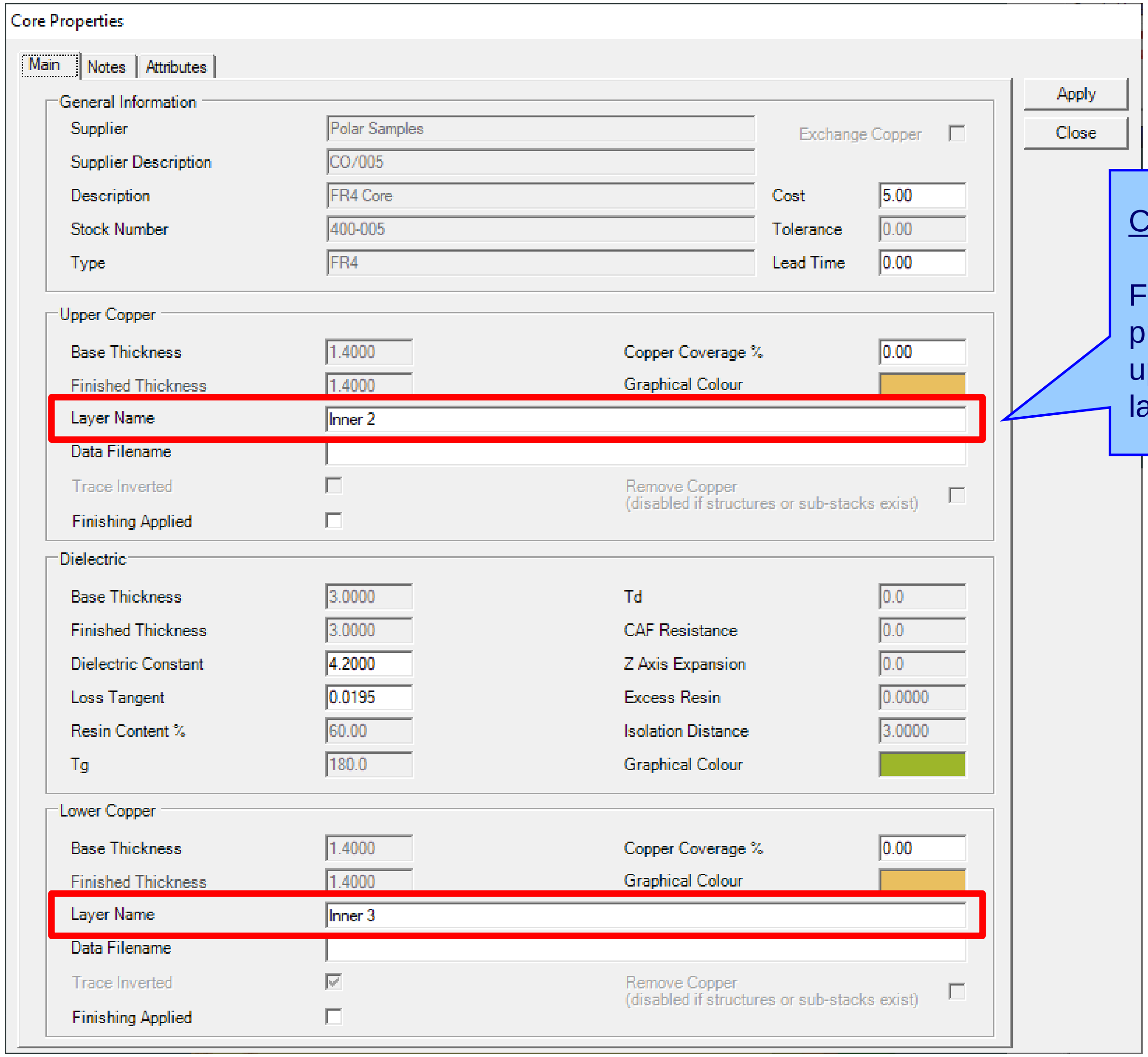
Supplier	Polar Samples		
Supplier Description	FO/001		
Description	Copper Foil	Cost	1.00
Stock Number	100-001		
Type	Copper	Lead Time	0.00

Base Thickness	0.7000	Copper Coverage %	0.00
Finished Thickness	1.4000	Graphical Colour	
Layer Name	Top		
Data Filename			
Trace Inverted	☐	Remove Copper (disabled if structures or sub-stacks exist)	☐
Finishing Applied	☐		

Foil Properties

The new Layer Name property exists on all materials with an electrical / copper layer. The user can key in any alphanumeric name

New Layer Name property for electrical / copper layers



Core Properties

General Information

Supplier	Polar Samples	Exchange Copper	☐
Supplier Description	CO/005		
Description	FR4 Core	Cost	5.00
Stock Number	400-005	Tolerance	0.00
Type	FR4	Lead Time	0.00

Upper Copper

Base Thickness	1.4000	Copper Coverage %	0.00
Finished Thickness	1.4000	Graphical Colour	🟨
Layer Name	Inner 2		
Data Filename			
Trace Inverted	☐	Remove Copper (disabled if structures or sub-stacks exist)	☐
Finishing Applied	☐		

Dielectric

Base Thickness	3.0000	Td	0.0
Finished Thickness	3.0000	CAF Resistance	0.0
Dielectric Constant	4.2000	Z Axis Expansion	0.0
Loss Tangent	0.0195	Excess Resin	0.0000
Resin Content %	60.00	Isolation Distance	3.0000
Tg	180.0	Graphical Colour	🟩

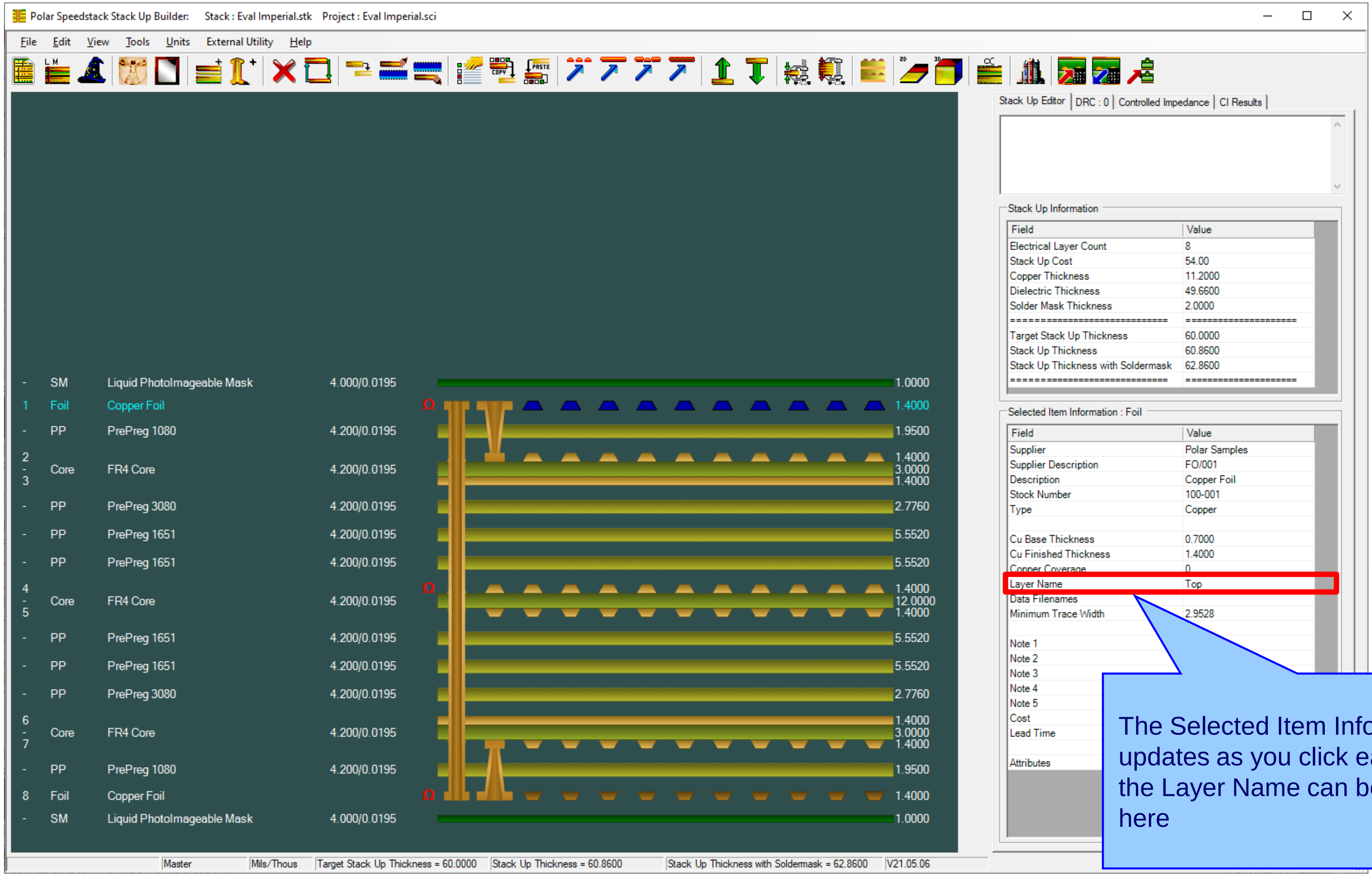
Lower Copper

Base Thickness	1.4000	Copper Coverage %	0.00
Finished Thickness	1.4000	Graphical Colour	🟨
Layer Name	Inner 3		
Data Filename			
Trace Inverted	☑	Remove Copper (disabled if structures or sub-stacks exist)	☐
Finishing Applied	☐		

Core Properties

For core materials, a new Layer Name property has been added for both upper and lower electrical / copper layers

New Layer Name property for electrical / copper layers


Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk Project : Eval Imperial.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 0
Controlled Impedance
CI Results

-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 3080	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 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 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 - 7	Core	FR4 Core	4.200/0.0195	1.4000 3.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil	Copper Foil		1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Stack Up Information

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.2000
Dielectric Thickness	49.6600
Solder Mask Thickness	2.0000
============================	=====================
Target Stack Up Thickness	60.0000
Stack Up Thickness	60.8600
Stack Up Thickness with Soldermask	62.8600
============================	=====================

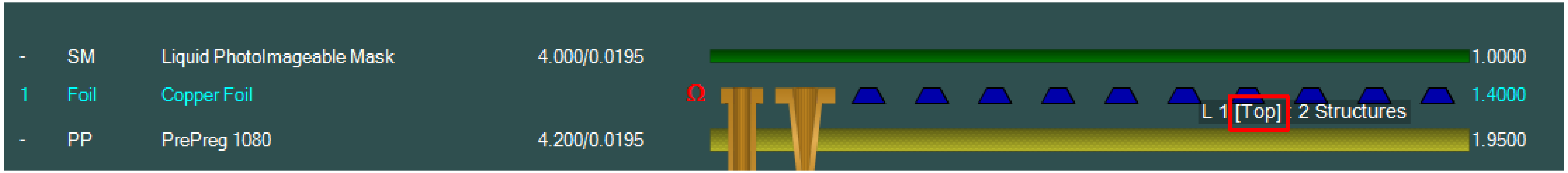
Selected Item Information : Foil

Field	Value
Supplier	Polar Samples
Supplier Description	FO/001
Description	Copper Foil
Stock Number	100-001
Type	Copper
Cu Base Thickness	0.7000
Cu Finished Thickness	1.4000
Copper Coverage	0
Layer Name	Top
Data Filenames	
Minimum Trace Width	2.9528
Note 1	
Note 2	
Note 3	
Note 4	
Note 5	
Cost	
Lead Time	
Attributes	

Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V21.05.06

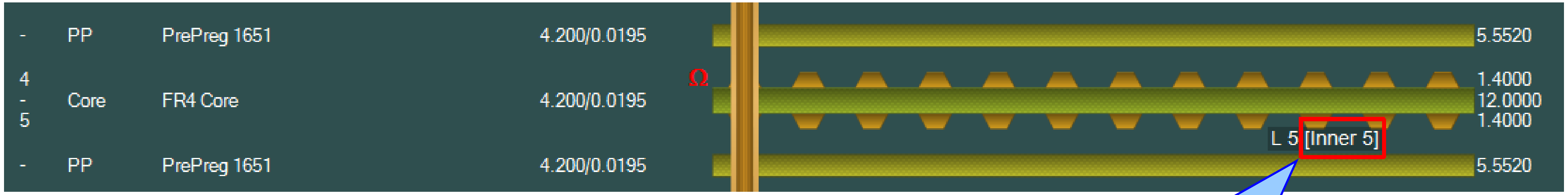
The Selected Item Information auto updates as you click each material, the Layer Name can be confirmed here

New Layer Name property for electrical / copper layers



-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil		1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500

L 1 [Top] : 2 Structures

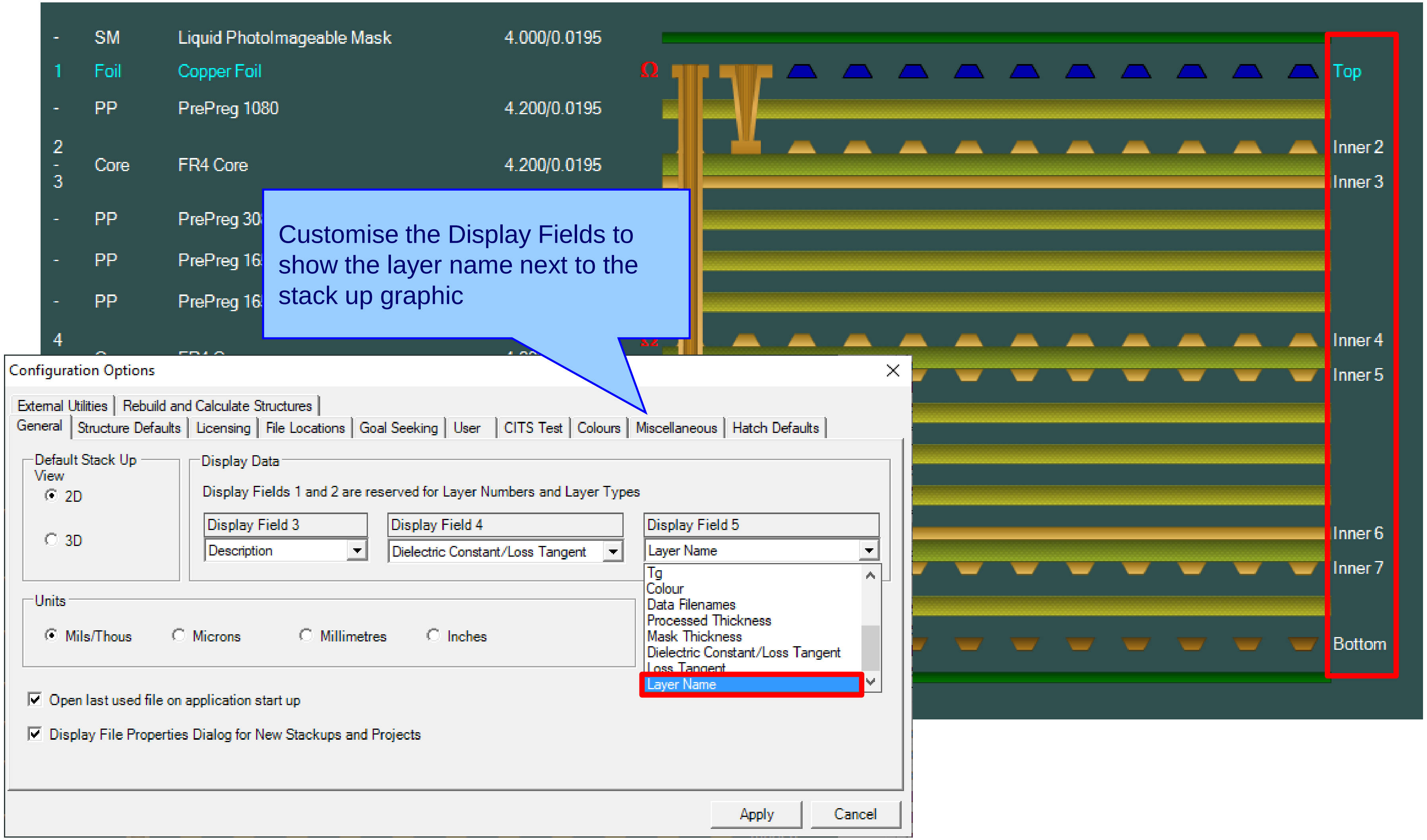


-	PP	PrePreg 1651	4.200/0.0195	5.5520
4 - 5	Core	FR4 Core	4.200/0.0195	1.4000 12.0000 1.4000
-	PP	PrePreg 1651	4.200/0.0195	5.5520

L 5 [Inner 5]

Mouse over the electrical layer and the Layer Name will display alongside the layer number and the amount of structures. Very quickly confirm the Layer Name without needing to open the Properties dialog

New Layer Name property for electrical / copper layers



-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	
-	PP	PrePreg 1080	4.200/0.0195
2 - 3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 30	
-	PP	PrePreg 16	
-	PP	PrePreg 16	
4			

Customise the Display Fields to show the layer name next to the stack up graphic

Configuration Options

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: Layer Name

Tg
Colour
Data Filenames
Processed Thickness
Mask Thickness
Dielectric Constant/Loss Tangent
Loss Tangent
Layer Name

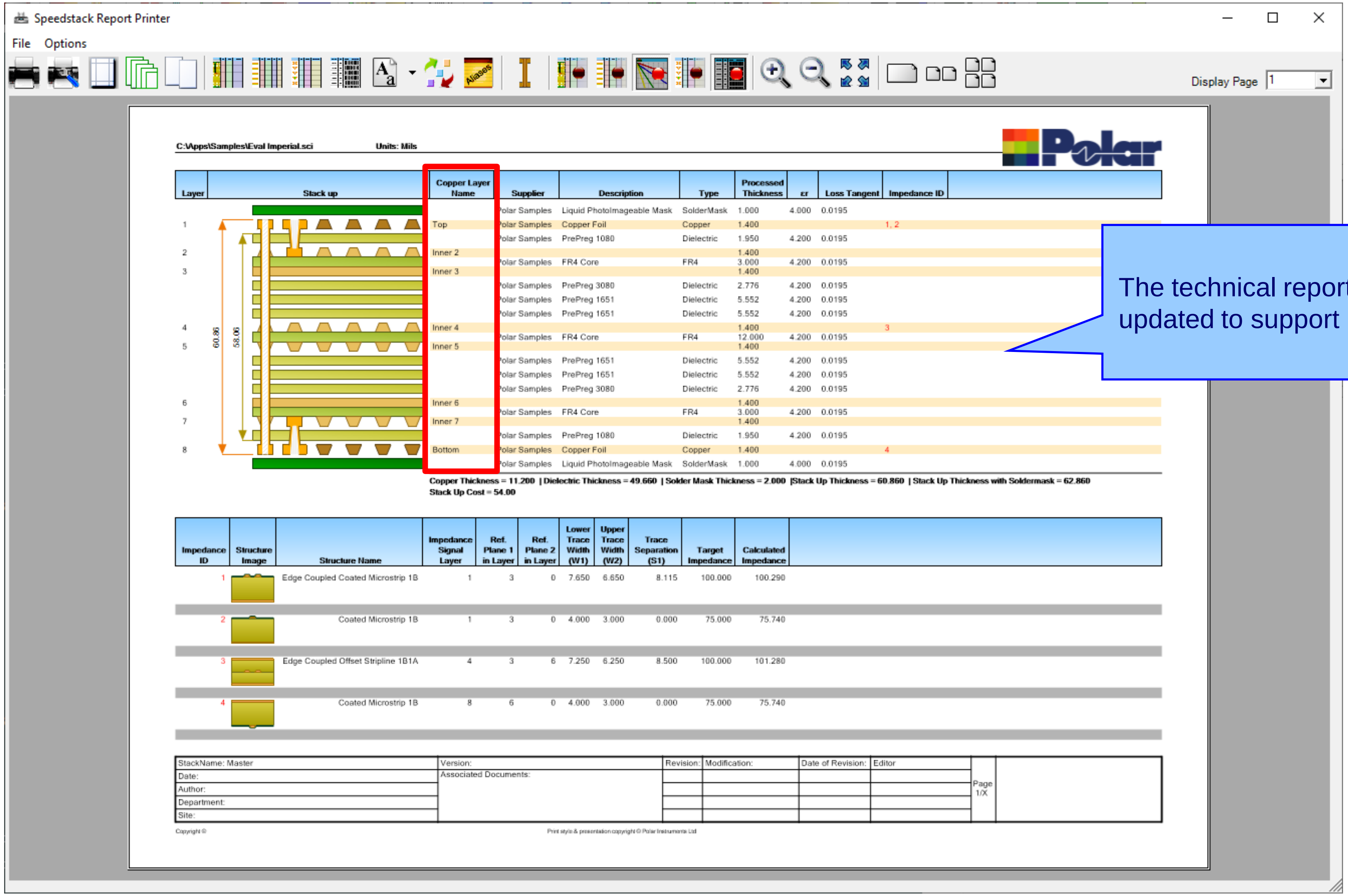
Units
● Mils/Thous ○ Microns ○ Millimetres ○ Inches

☑ Open last used file on application start up

☑ Display File Properties Dialog for New Stackups and Projects

Top
Inner 2
Inner 3
Inner 4
Inner 5
Inner 6
Inner 7
Bottom
Ω
External Utilities
Rebuild and Calculate Structures
General
Structure Defaults
Licensing
File Locations
Goal Seeking
User
CITS Test
Colours
Miscellaneous
Hatch Defaults
Apply
Cancel

New Layer Name property for electrical / copper layers



C:\Apps\Samples\Eval Imperial.sci   Units: Mils

Layer	Stack up	Copper Layer Name	Supplier	Description	Type	Processed Thickness	εr	Loss Tangent	Impedance ID
			olar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	
1		Top	olar Samples	Copper Foil	Copper	1.400			1, 2
			olar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
2		Inner 2				1.400			
			olar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
3		Inner 3				1.400			
			olar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
			olar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
			olar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
4	60.86	Inner 4				1.400			3
	58.06		olar Samples	FR4 Core	FR4	12.000	4.200	0.0195	
5		Inner 5				1.400			
			olar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
			olar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
			olar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
6		Inner 6				1.400			
			olar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
7		Inner 7				1.400			
			olar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
8		Bottom	olar Samples	Copper Foil	Copper	1.400			4
			olar Samples	Liquid PhotoImageable Mask	SolderMask	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
Stack Up Cost = 54.00

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	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	100.000	100.290
2		Coated Microstrip 1B	1	3	0	4.000	3.000	0.000	75.000	75.740
3		Edge Coupled Offset Stripline 1B1A	4	3	6	7.250	6.250	8.500	100.000	101.280
4		Coated Microstrip 1B	8	6	0	4.000	3.000	0.000	75.000	75.740

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

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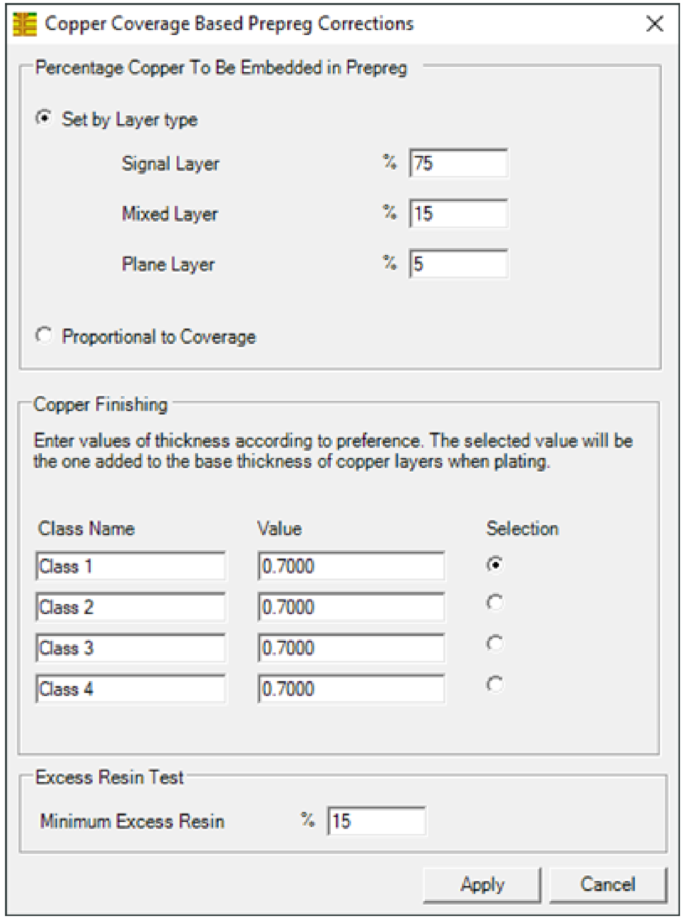
The technical report has also been updated to support layer names

Copper Finishing classes increased



Percentage Copper To Be Embedded in Prepreg

● Set by Layer type

Signal Layer % 75

Mixed Layer % 15

Plane Layer % 5

○ Proportional to Coverage

Copper Finishing

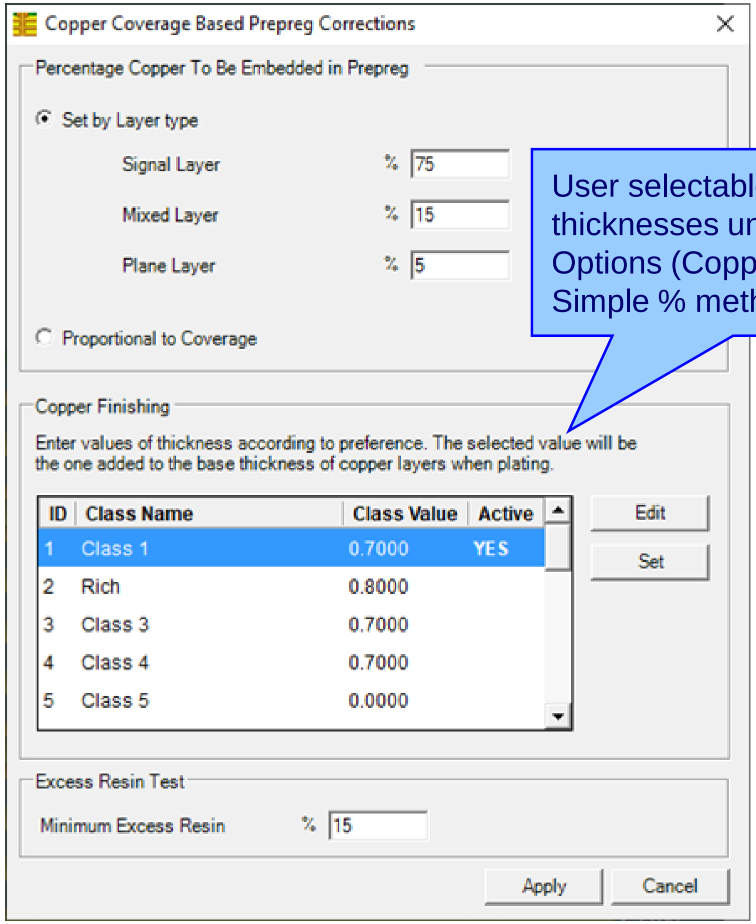
Enter values of thickness according to preference. The selected value will be the one added to the base thickness of copper layers when plating.

Class Name	Value	Selection
Class 1	0.7000	●
Class 2	0.7000	○
Class 3	0.7000	○
Class 4	0.7000	○

Excess Resin Test

Minimum Excess Resin % 15

Speedstack v21.04 and earlier supported 4 classes



Percentage Copper To Be Embedded in Prepreg

● Set by Layer type

Signal Layer % 75

Mixed Layer % 15

Plane Layer % 5

○ Proportional to Coverage

Copper Finishing

Enter values of thickness according to preference. The selected value will be the one added to the base thickness of copper layers when plating.

ID	Class Name	Class Value	Active
1	Class 1	0.7000	YES
2	Rich	0.8000	
3	Class 3	0.7000	
4	Class 4	0.7000	
5	Class 5	0.0000	

Excess Resin Test

Minimum Excess Resin % 15

User selectable plating thicknesses under Finishing Options (Copper Coverage & Simple % methods)

Speedstack v21.05 now supports 20 classes

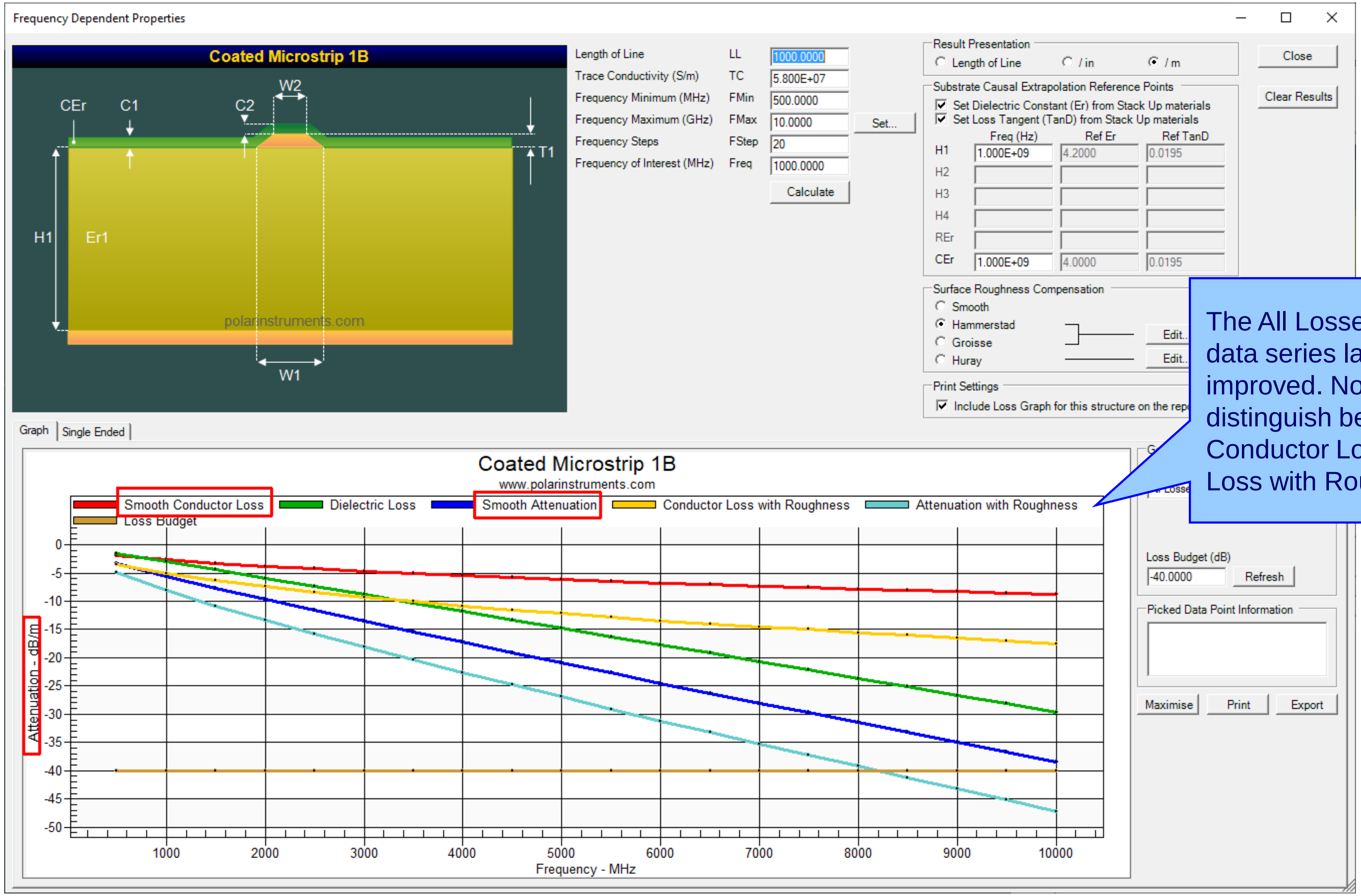
Import / Export enhancements

The following Import / Export options have been updated to support the layer name property introduced with Speedstack v21.05.06:

- XML STKX v21.00 and SSX v11.00 import / export options
- CSV export option
- Gerber / DXF export option

Speedstack v21.04.00 (April 2021)

All Losses plot - clearer labelling


Frequency Dependent Properties

Length of Line LL 1000.0000
Trace Conductivity (S/m) TC 5.800E+07
Frequency Minimum (MHz) FMin 500.0000
Frequency Maximum (GHz) FMax 10.0000
Frequency Steps FStep 20
Frequency of Interest (MHz) Freq 1000.0000

Result Presentation
○ Length of Line ○ / in ● / m

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			
H3			
H4			
REr			
CEr	1.000E+09	4.0000	0.0195

Surface Roughness Compensation
○ Smooth
● Hammerstad
○ Groisse
○ Huray

Print Settings
☑ Include Loss Graph for this structure on the rep

Loss Budget (dB) -40.0000

Picked Data Point Information

Set...
Calculate
Close
Clear Results
Edit...
Edit...
Refresh
Maximise
Print
Export
Graph
Single Ended
Coated Microstrip 1B
CEr
C1
C2
W2
T1
H1
Er1
polarinstruments.com
W1
Coated Microstrip 1B
www.polarinstruments.com
Smooth Conductor Loss
Dielectric Loss
Smooth Attenuation
Conductor Loss with Roughness
Attenuation with Roughness
Loss Budget
Attenuation - dB/m
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency - MHz

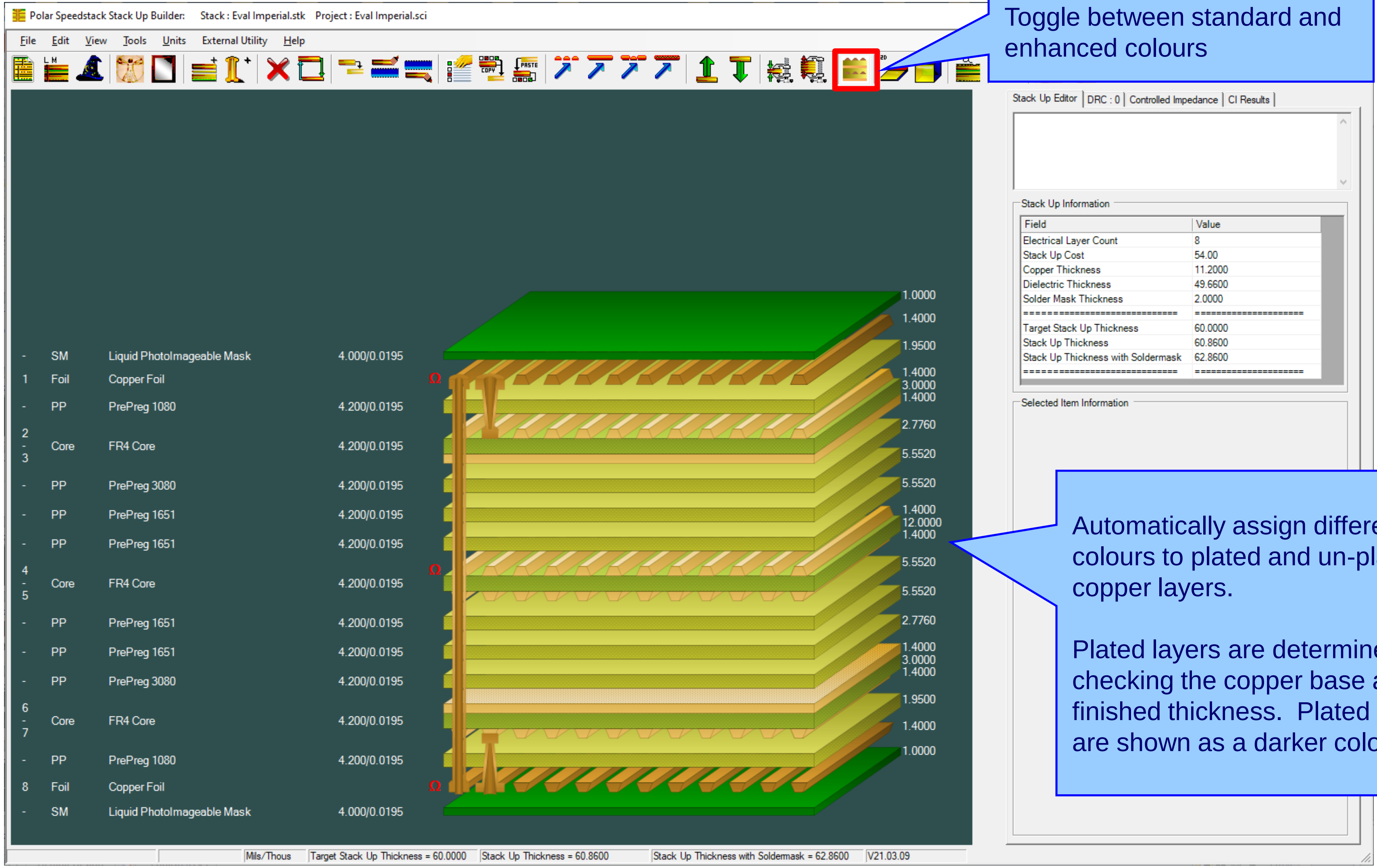
The All Losses plot y-axis and data series labelling has been improved. Now easier to distinguish between Smooth Conductor Loss and Conductor Loss with Roughness

Other enhancements

- The controlled impedance and insertion loss Calculation Engine updated to the latest edition
- Frequency Dependent Calculations graphing library enhancements

Speedstack v21.03.09 (March 2021)

New Apply Plating Colours toolbar option


Polar Speedstack Stack Up Builder: Stack : Eval Imperial.stk Project : Eval Imperial.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 0
Controlled Impedance
CI Results
1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000

-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	
-	PP	PrePreg 1080	4.200/0.0195
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

Stack Up Information

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.2000
Dielectric Thickness	49.6600
Solder Mask Thickness	2.0000
============================	=====================
Target Stack Up Thickness	60.0000
Stack Up Thickness	60.8600
Stack Up Thickness with Soldermask	62.8600
============================	=====================

Selected Item Information

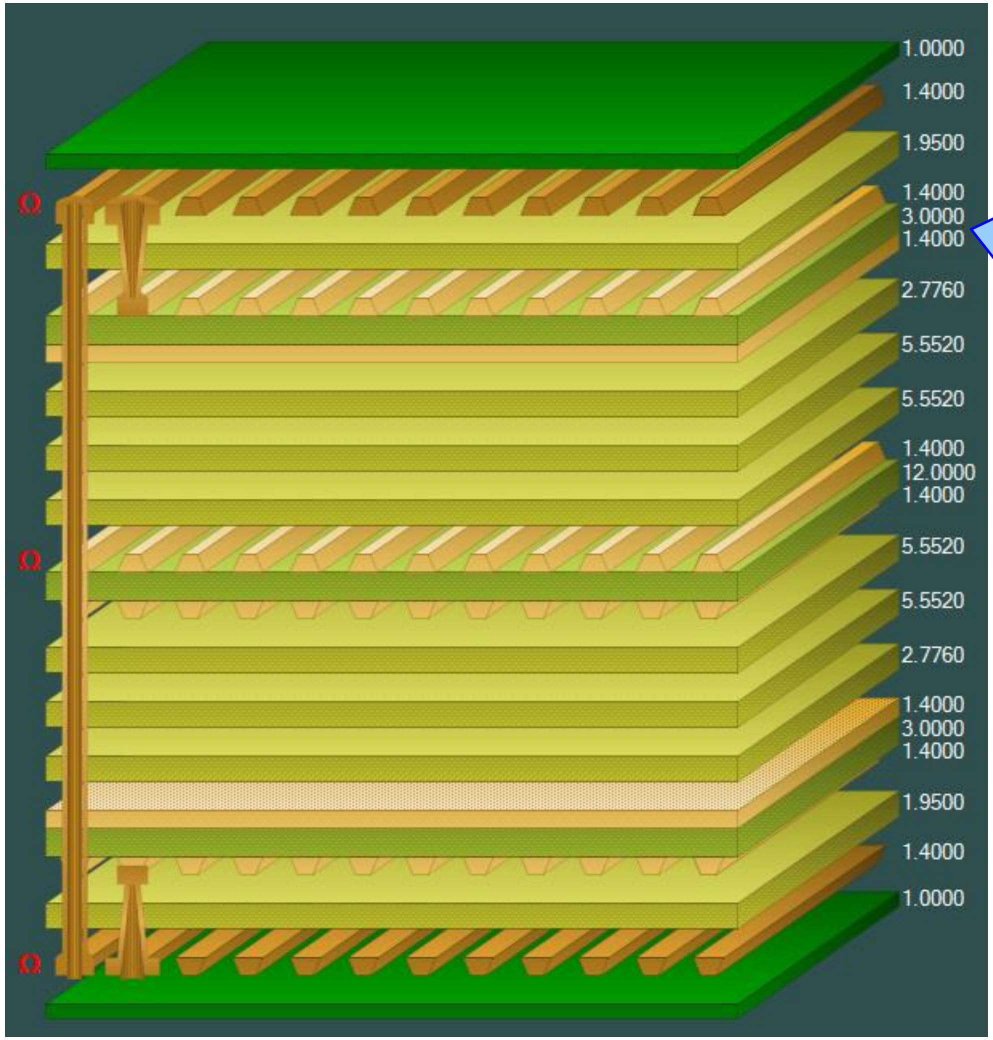
Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V21.03.09

New Apply Plating Colours toolbar option.
Toggle between standard and enhanced colours

Automatically assign different colours to plated and un-plated copper layers.

Plated layers are determined by checking the copper base and finished thickness. Plated layers are shown as a darker colour

New Apply Plating Colours toolbar option


1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000
Ω
Ω
Ω

Plated Copper Layers

During PCB fabrication drill holes commonly have copper applied to the barrel wall by an electroplating process. This provides an interconnect between copper layers in the stack up.

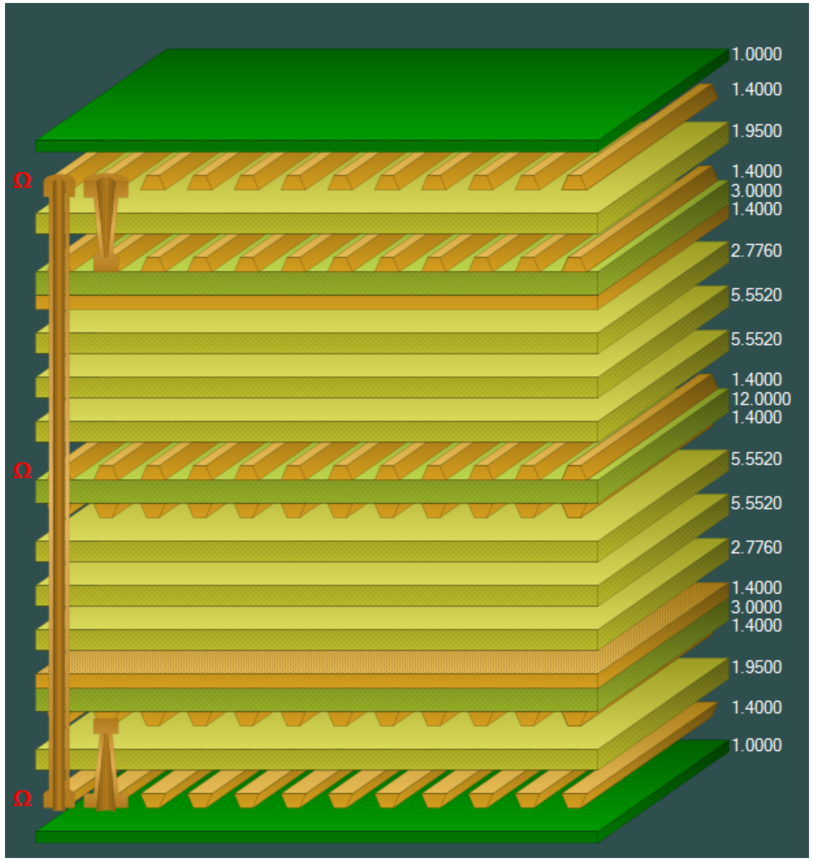
This electroplating process often results in additional copper also being applied to the exposed copper layers where the mechanical drill starts / ends.

It is important to account for this additional plated copper thickness when calculating the overall stack up thickness and controlled impedance / insertion loss structures.

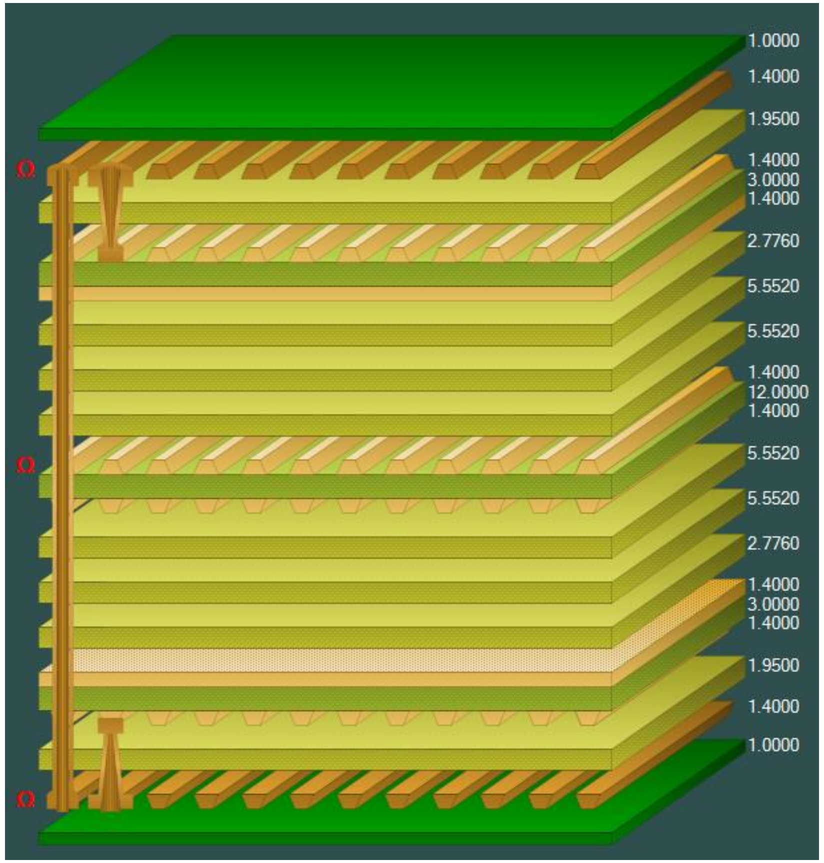
Speedstack has always allowed this additional plating thickness to be applied to the relevant copper layers. With v21.03 this has been enhanced further with automatic colour assignments to the plated and un-plated layers

New Apply Plating Colours toolbar option

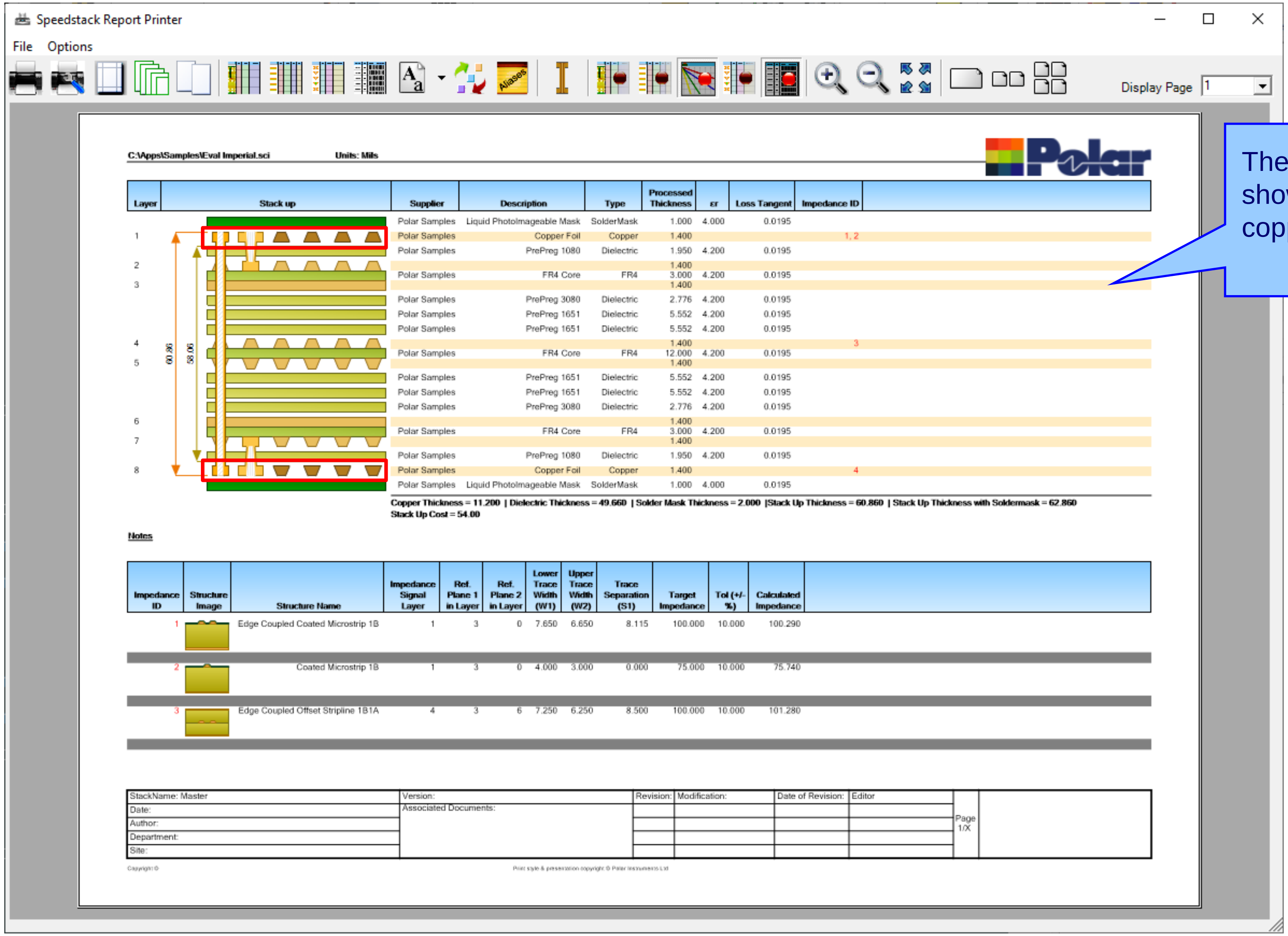
Standard Colours


1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000
Ω
Ω
Ω

Apply Plating Colours


1.0000
1.4000
1.9500
1.4000
3.0000
1.4000
2.7760
5.5520
5.5520
1.4000
12.0000
1.4000
5.5520
5.5520
2.7760
1.4000
3.0000
1.4000
1.9500
1.4000
1.0000
Ω
Ω
Ω

New Apply Plating Colours toolbar option



C:\Apps\Samples\Eval Imperial.sci Units: Mils

Layer	Stack up	Supplier	Description	Type	Processed Thickness	εr	Loss Tangent	Impedance ID
		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	
1		Polar Samples	Copper Foil	Copper	1.400			1, 2
		Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
2					1.400			
		Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
3					1.400			
		Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
4					1.400			3
		Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	
5					1.400			
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
6					1.400			
		Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
7					1.400			
		Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
8		Polar Samples	Copper Foil	Copper	1.400			4
		Polar Samples	Liquid PhotoImageable Mask	SolderMask	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
Stack Up Cost = 54.00

Notes

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	7.650	6.650	8.115	100.000	10.000	100.290
2		Coated Microstrip 1B	1	3	0	4.000	3.000	0.000	75.000	10.000	75.740
3		Edge Coupled Offset Stripline 1B1A	4	3	6	7.250	6.250	8.500	100.000	10.000	101.280

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

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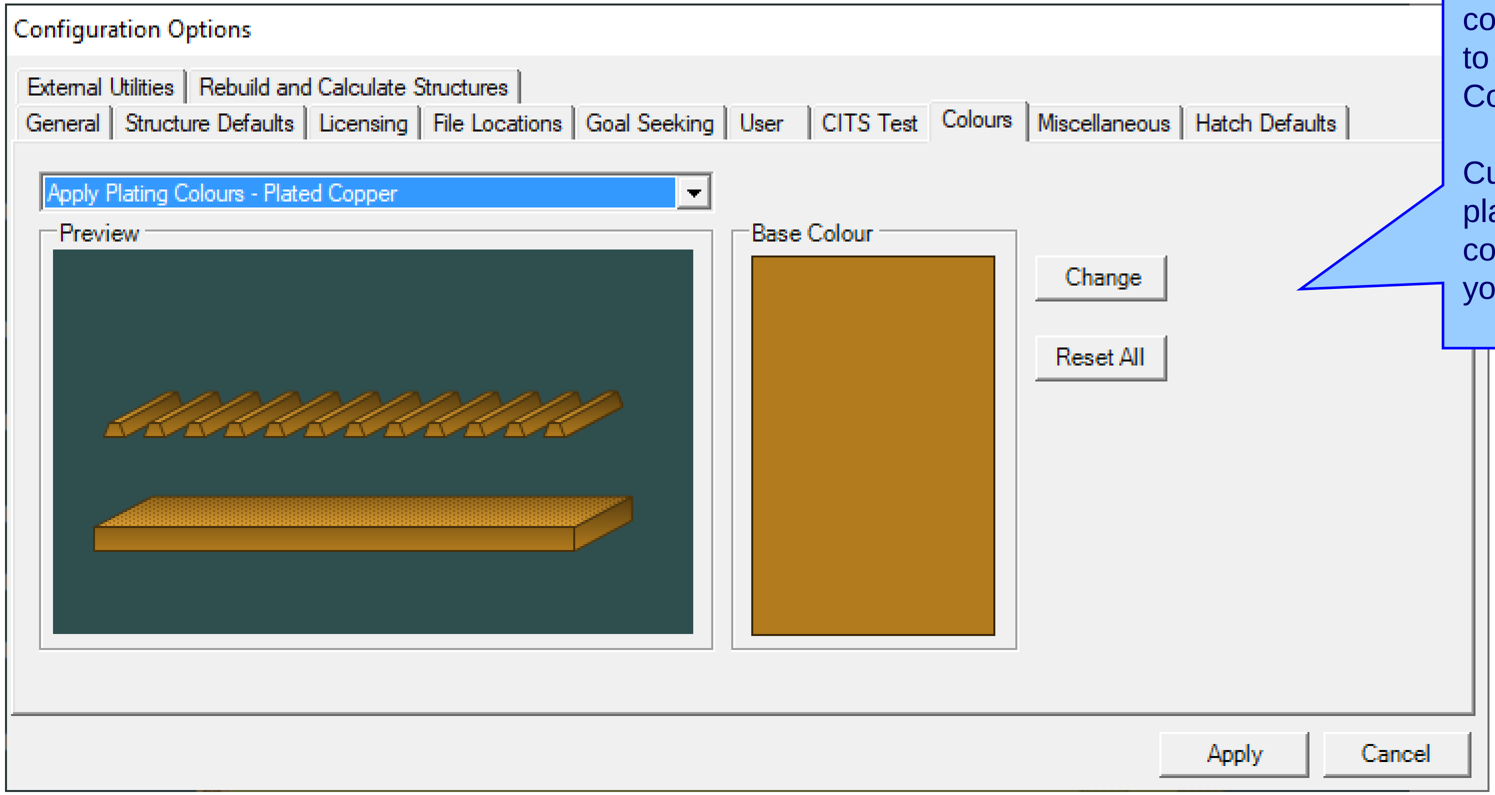
The technical report will also show the plated and un-plated copper layers.

New Apply Plating Colours toolbar option

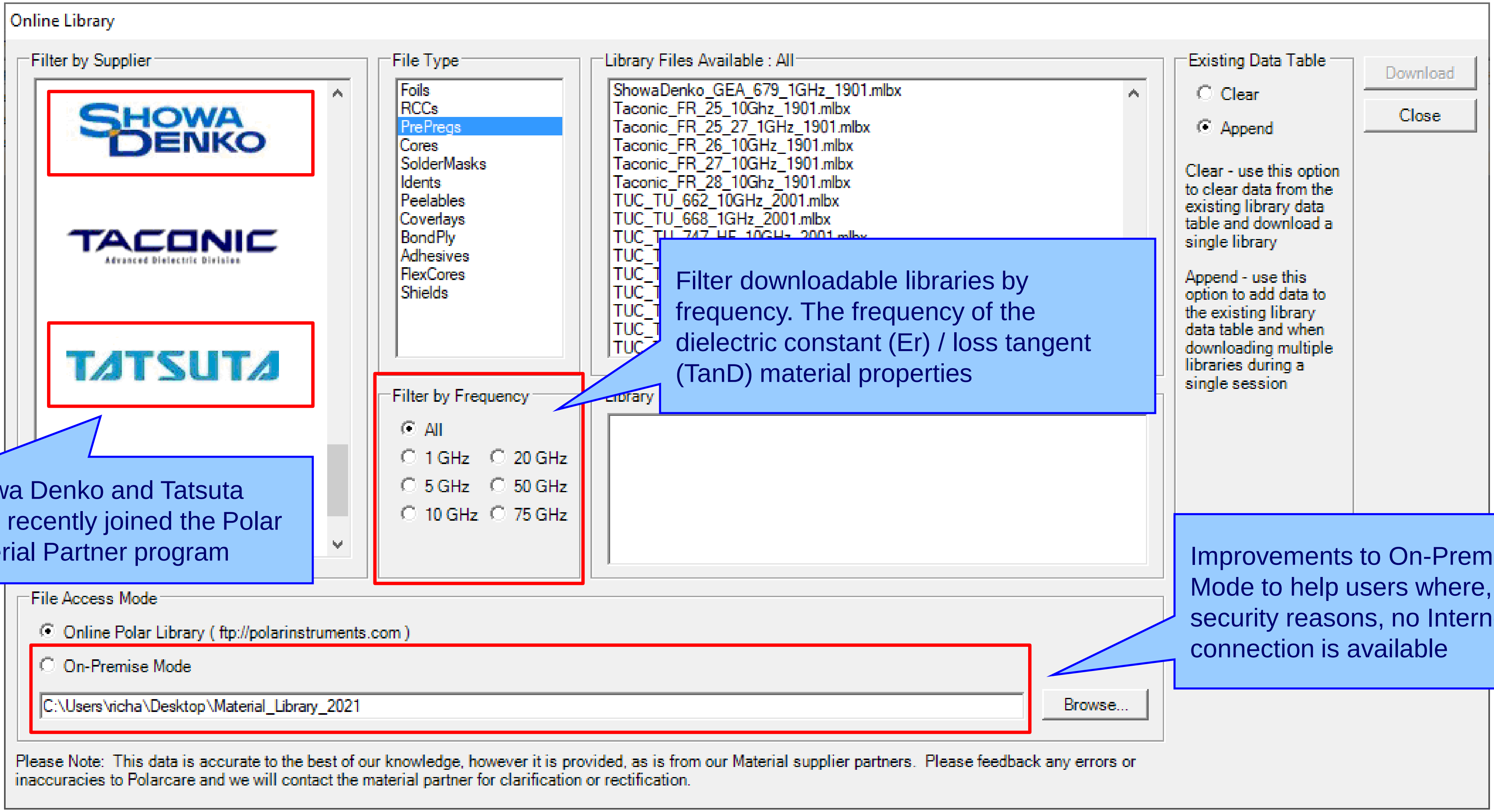

Configuration Options
External Utilities
Rebuild and Calculate Structures
General
Structure Defaults
Licensing
File Locations
Goal Seeking
User
CITS Test
Colours
Miscellaneous
Hatch Defaults
Preview
Base Colour
Change
Reset All
Apply
Cancel

Apply Plating Colours - Plated Copper

Two new user-definable colours have been introduced to the Speedstack Configuration Options.

Customise the Plated and Un-plated colours to suit existing colour schemes adopted by your organisation

Online Library enhancements



Online Library

Filter by Supplier

File Type

- Foils
- RCCs
- PrePregs
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields

Filter by Frequency

● All
○ 1 GHz ○ 20 GHz
○ 5 GHz ○ 50 GHz
○ 10 GHz ○ 75 GHz

Library Files Available : All

ShowaDenko_GEA_679_1GHz_1901.mlbx
Taconic_FR_25_10Ghz_1901.mlbx
Taconic_FR_25_27_1GHz_1901.mlbx
Taconic_FR_26_10GHz_1901.mlbx
Taconic_FR_27_10GHz_1901.mlbx
Taconic_FR_28_10Ghz_1901.mlbx
TUC_TU_662_10GHz_2001.mlbx
TUC_TU_668_1GHz_2001.mlbx
TUC_TU_747_HF_10GHz_2001.mlbx
TUC_T
TUC_T
TUC_T
TUC_T
TUC_T
TUC_

Library

Existing Data Table

○ Clear
● Append

Clear - use this option to clear data from the existing library data table and download a single library

Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session

File Access Mode

● Online Polar Library (ftp://polarinstruments.com)
○ On-Premise Mode

C:\Users\richa\Desktop\Material_Library_2021

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

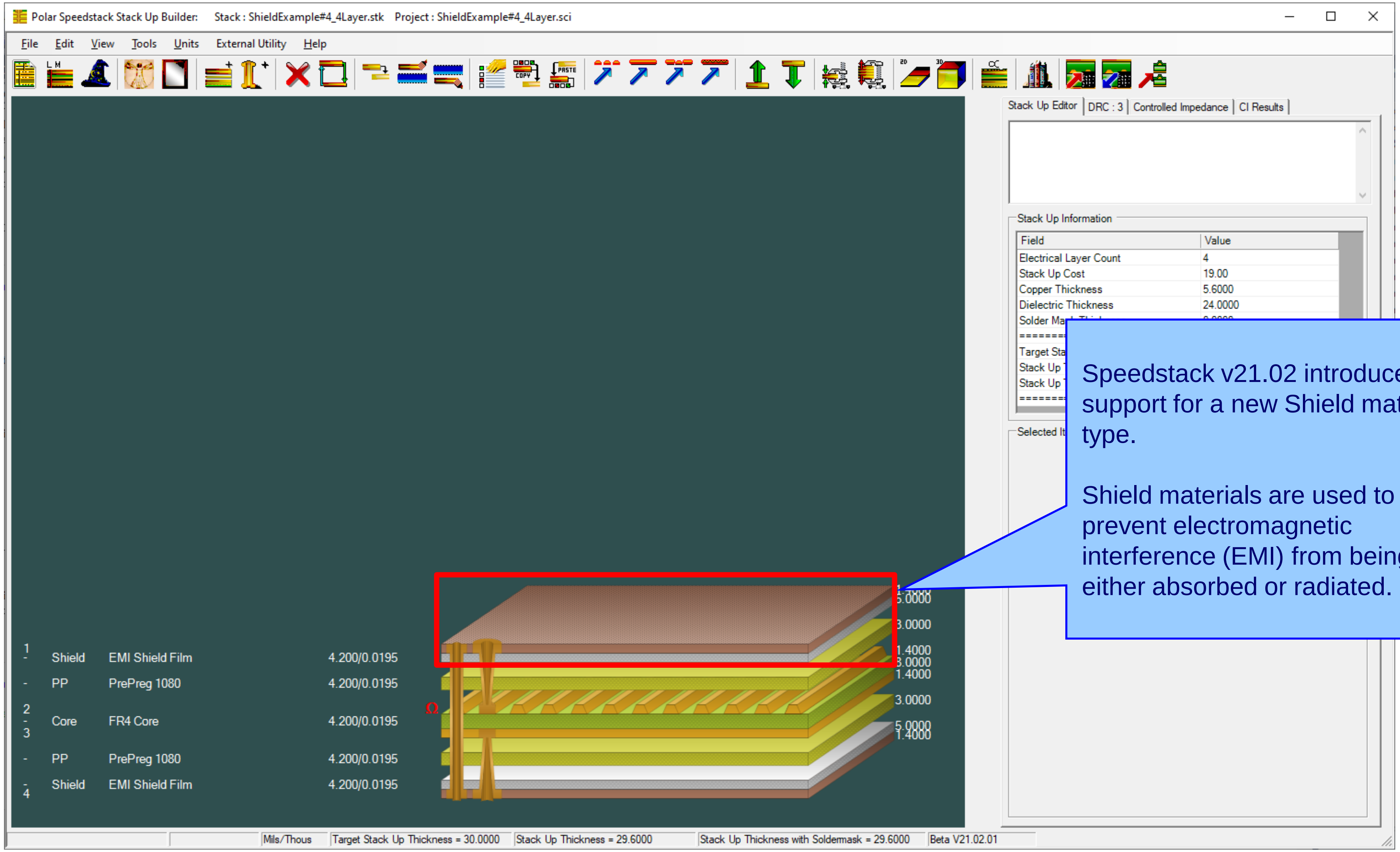
Filter downloadable libraries by frequency. The frequency of the dielectric constant (Er) / loss tangent (TanD) material properties

Showa Denko and Tatsuta have recently joined the Polar Material Partner program

Improvements to On-Premise Mode to help users where, for security reasons, no Internet connection is available

Speedstack v21.02.01 (February 2021)

New Shield material



Polar Speedstack Stack Up Builder: Stack : ShieldExample#4_4Layer.stk Project : ShieldExample#4_4Layer.sci

File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 3
Controlled Impedance
CI Results
Stack Up Information
Selected It

Field	Value
Electrical Layer Count	4
Stack Up Cost	19.00
Copper Thickness	5.6000
Dielectric Thickness	24.0000
Solder Ma	
=======	
Target Sta	
Stack Up	
Stack Up	
=======	

1 -	Shield	EMI Shield Film	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
2 - 3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
- 4	Shield	EMI Shield Film	4.200/0.0195

Ω
5.0000
3.0000
1.4000
3.0000
1.4000
3.0000
5.0000
1.4000

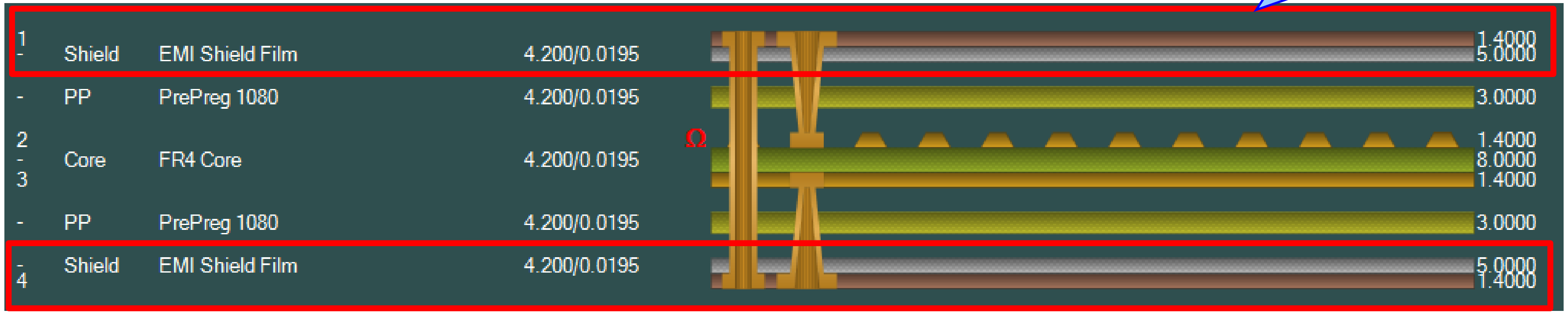
Mils/Thous | Target Stack Up Thickness = 30.0000 | Stack Up Thickness = 29.6000 | Stack Up Thickness with Soldermask = 29.6000 | Beta V21.02.01

Speedstack v21.02 introduces support for a new Shield material type.

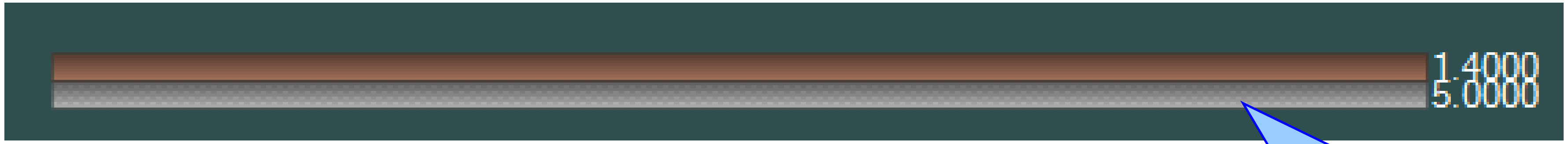
Shield materials are used to prevent electromagnetic interference (EMI) from being either absorbed or radiated.

New Shield material

Shields are typically applied to the outer layer(s) of the stack up

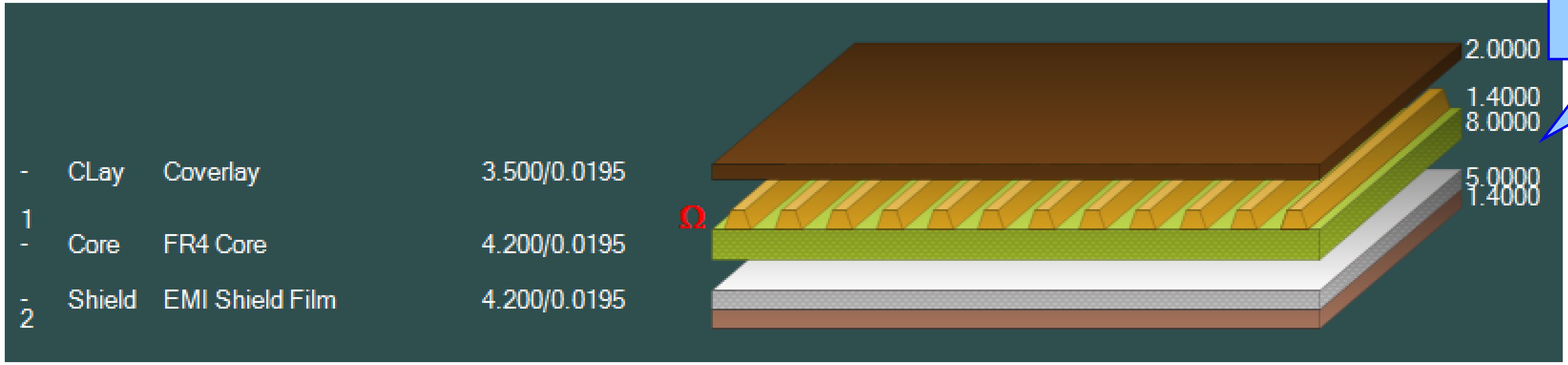


1 -	Shield	EMI Shield Film	4.200/0.0195	1.4000 5.0000
-	PP	PrePreg 1080	4.200/0.0195	3.0000
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 8.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	3.0000
- 4	Shield	EMI Shield Film	4.200/0.0195	5.0000 1.4000



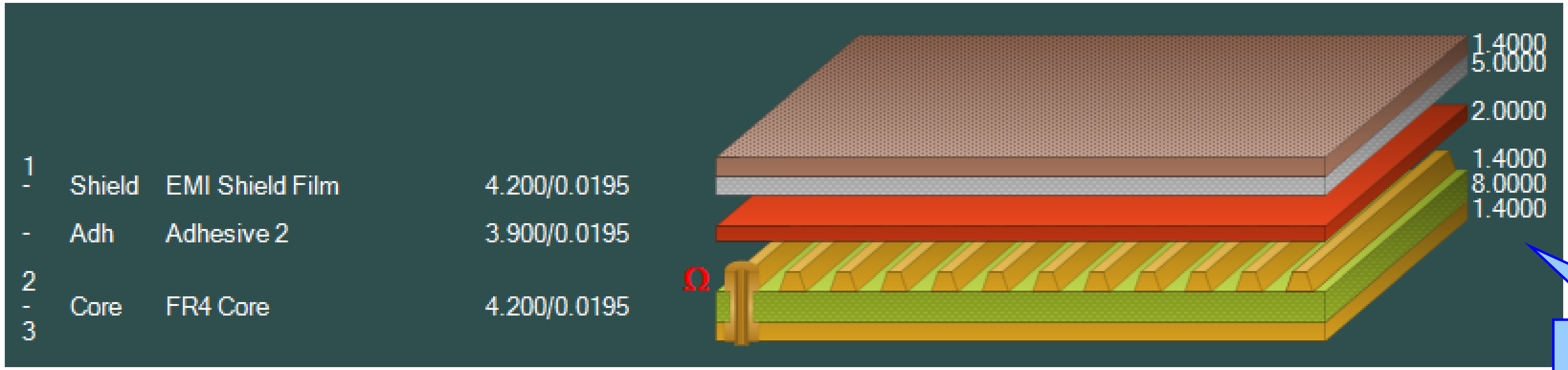
They consist of a shield layer (brown) and dielectric adhesive (silver)

Shield material examples


Ω
2.0000
1.4000
8.0000
5.0000
1.4000

-	CLay	Coverlay	3.500/0.0195
1			
-	Core	FR4 Core	4.200/0.0195
-	Shield	EMI Shield Film	4.200/0.0195
2			

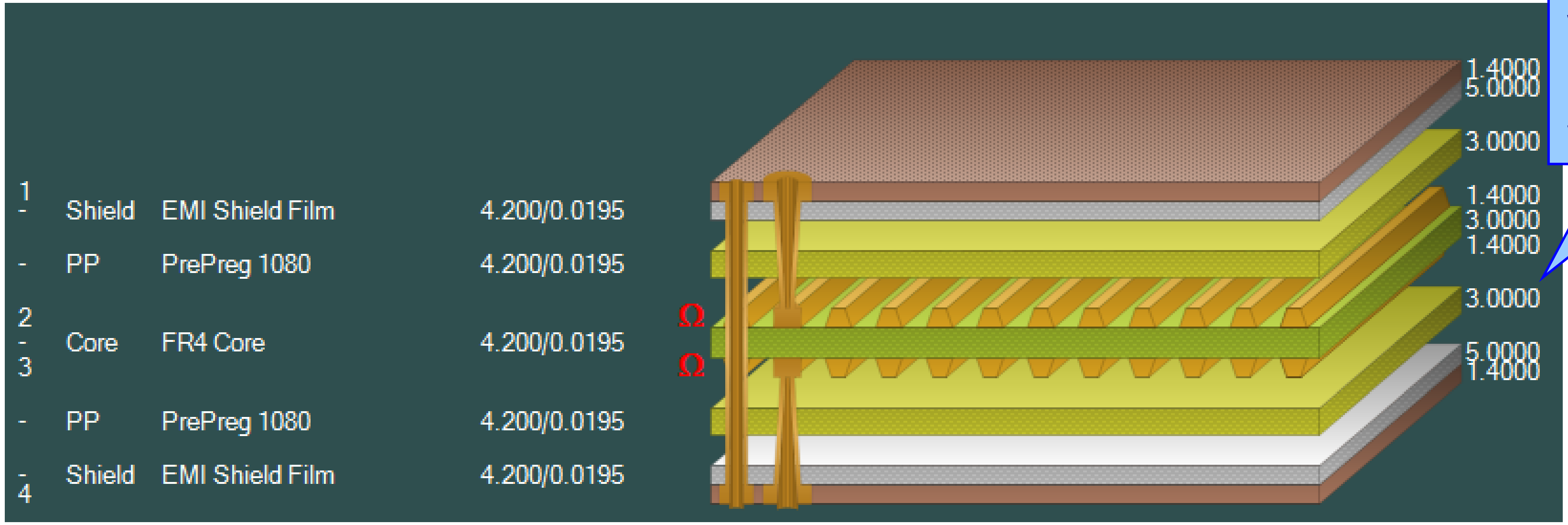
Example #1
Single-sided core, coverlay above trace, shield below


Ω
1.4000
5.0000
2.0000
1.4000
8.0000
1.4000

1			
-	Shield	EMI Shield Film	4.200/0.0195
-	Adh	Adhesive 2	3.900/0.0195
2			
-	Core	FR4 Core	4.200/0.0195
3			

Example #2
Double-sided core, adhesive and shield above

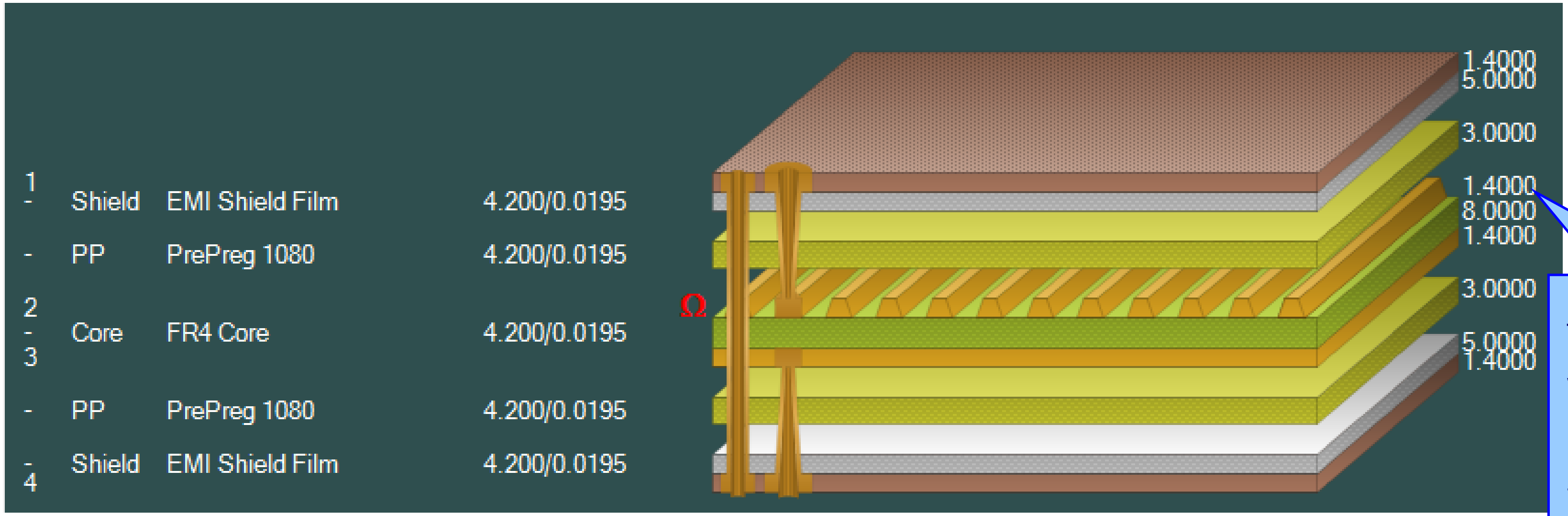
Shield material examples



1 -	Shield	EMI Shield Film	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
2 - 3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
- 4	Shield	EMI Shield Film	4.200/0.0195

Ω
Ω
1.4000
5.0000
3.0000
1.4000
3.0000
1.4000
3.0000
5.0000
1.4000

Example #3
Double-sided core with two signal trace layers with shield above and below trace layers

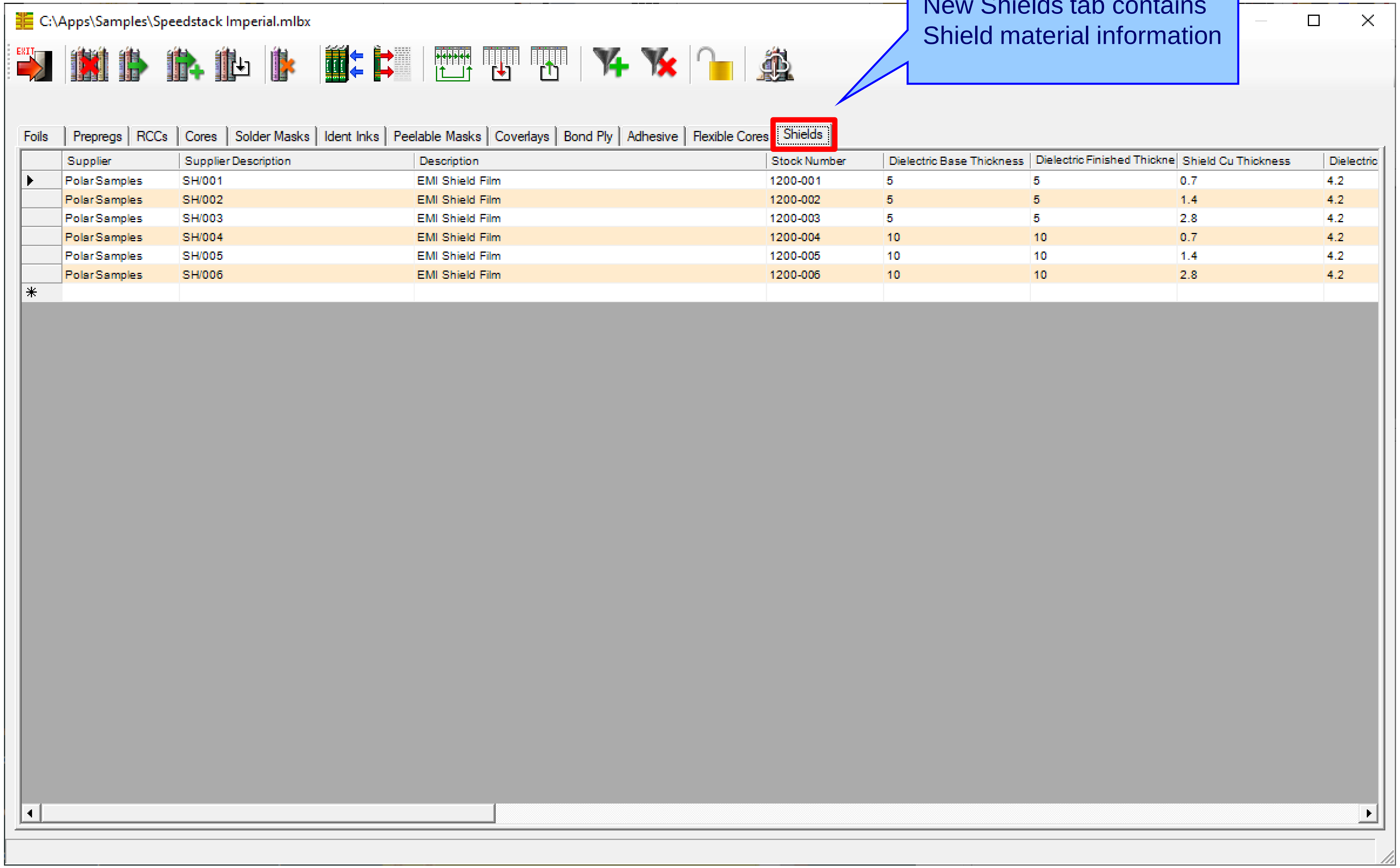


1 -	Shield	EMI Shield Film	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
2 - 3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
- 4	Shield	EMI Shield Film	4.200/0.0195

Ω
1.4000
5.0000
3.0000
1.4000
8.0000
1.4000
3.0000
5.0000
1.4000

Example #4
Double-sided core with one signal trace layer with shield above and below trace layers

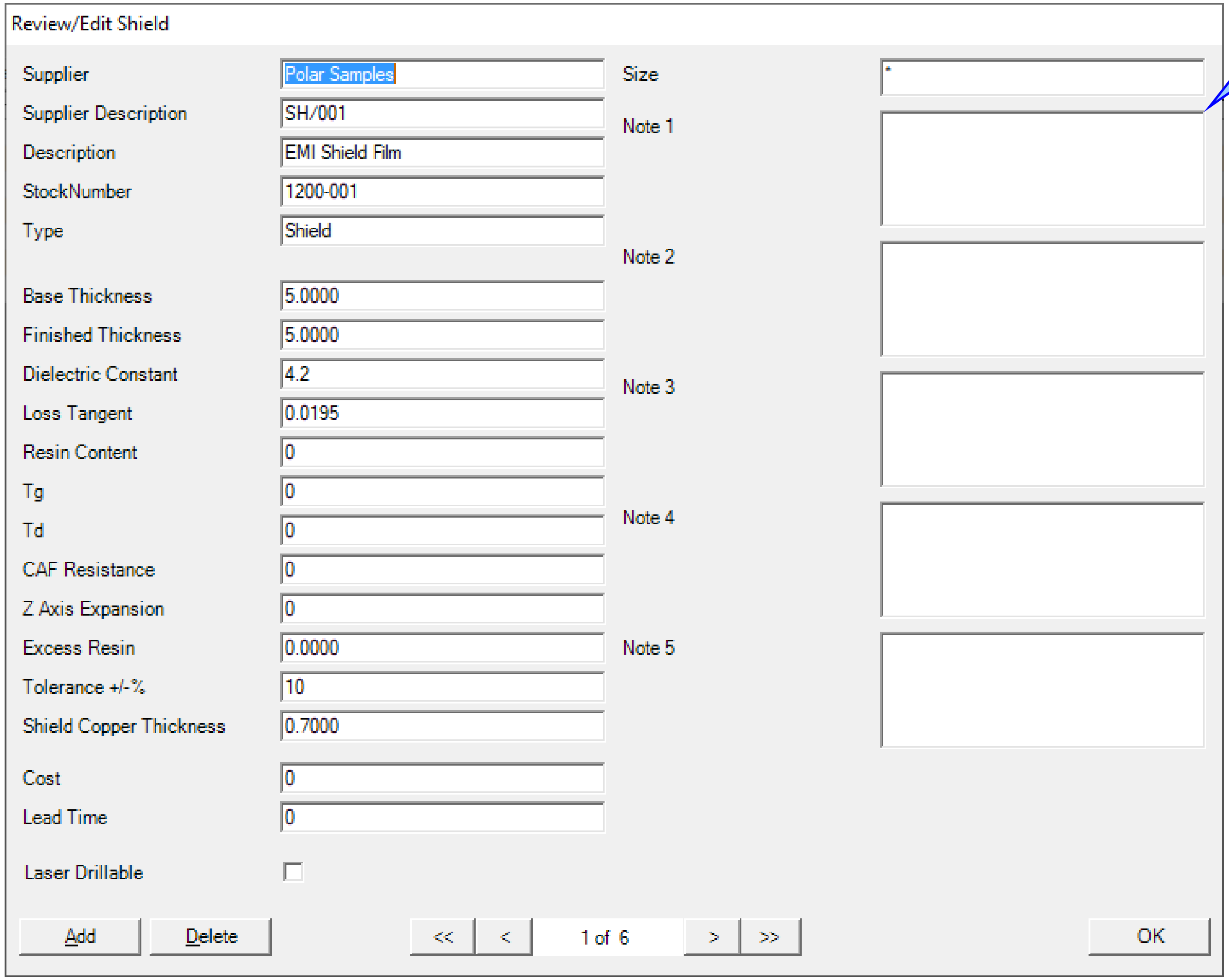
Material library enhancements


C:\Apps\Samples\Speedstack Imperial.mlbx
EXIT
Foils
Prepregs
RCCs
Cores
Solder Masks
Ident Inks
Peelable Masks
Coverlays
Bond Ply
Adhesive
Flexible Cores
Shields

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickne	Shield Cu Thickness	Dielectric
Polar Samples	SH/001	EMI Shield Film	1200-001	5	5	0.7	4.2
Polar Samples	SH/002	EMI Shield Film	1200-002	5	5	1.4	4.2
Polar Samples	SH/003	EMI Shield Film	1200-003	5	5	2.8	4.2
Polar Samples	SH/004	EMI Shield Film	1200-004	10	10	0.7	4.2
Polar Samples	SH/005	EMI Shield Film	1200-005	10	10	1.4	4.2
Polar Samples	SH/006	EMI Shield Film	1200-006	10	10	2.8	4.2

New Shields tab contains Shield material information

Material library enhancements

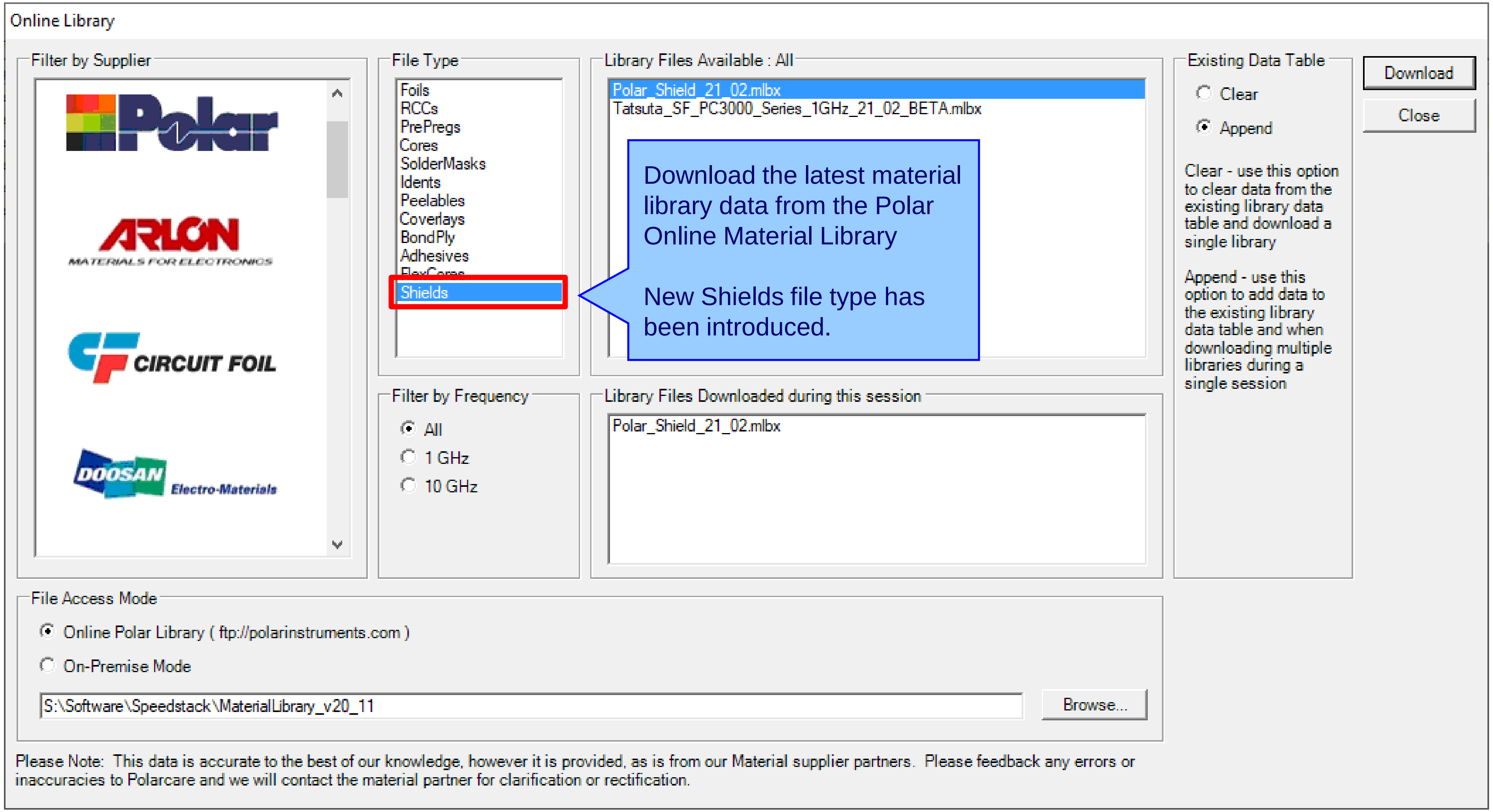


Review/Edit Shield

Supplier	Polar Samples
Supplier Description	SH/001
Description	EMI Shield Film
StockNumber	1200-001
Type	Shield
Base Thickness	5.0000
Finished Thickness	5.0000
Dielectric Constant	4.2
Loss Tangent	0.0195
Resin Content	0
Tg	0
Td	0
CAF Resistance	0
Z Axis Expansion	0
Excess Resin	0.0000
Tolerance +/-%	10
Shield Copper Thickness	0.7000
Cost	0
Lead Time	0
Laser Drillable	☐
Size	*
Note 1	
Note 2	
Note 3	
Note 4	
Note 5	

Material library Edit Shield dialog

Online Library enhanced to support Shield materials



Online Library

Filter by Supplier

File Type: Foils, RCCs, PrePregs, Cores, SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, Shields

Library Files Available : All
- Polar_Shield_21_02.mlbx
- Tatsuta_SF_PC3000_Series_1GHz_21_02_BETA.mlbx

Existing Data Table: ○ Clear ● Append

Clear - use this option to clear data from the existing library data table and download a single library

Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session

Filter by Frequency: ● All ○ 1 GHz ○ 10 GHz

Library Files Downloaded during this session
- Polar_Shield_21_02.mlbx

File Access Mode
- ● Online Polar Library (ftp://polarinstruments.com)
- ○ On-Premise Mode

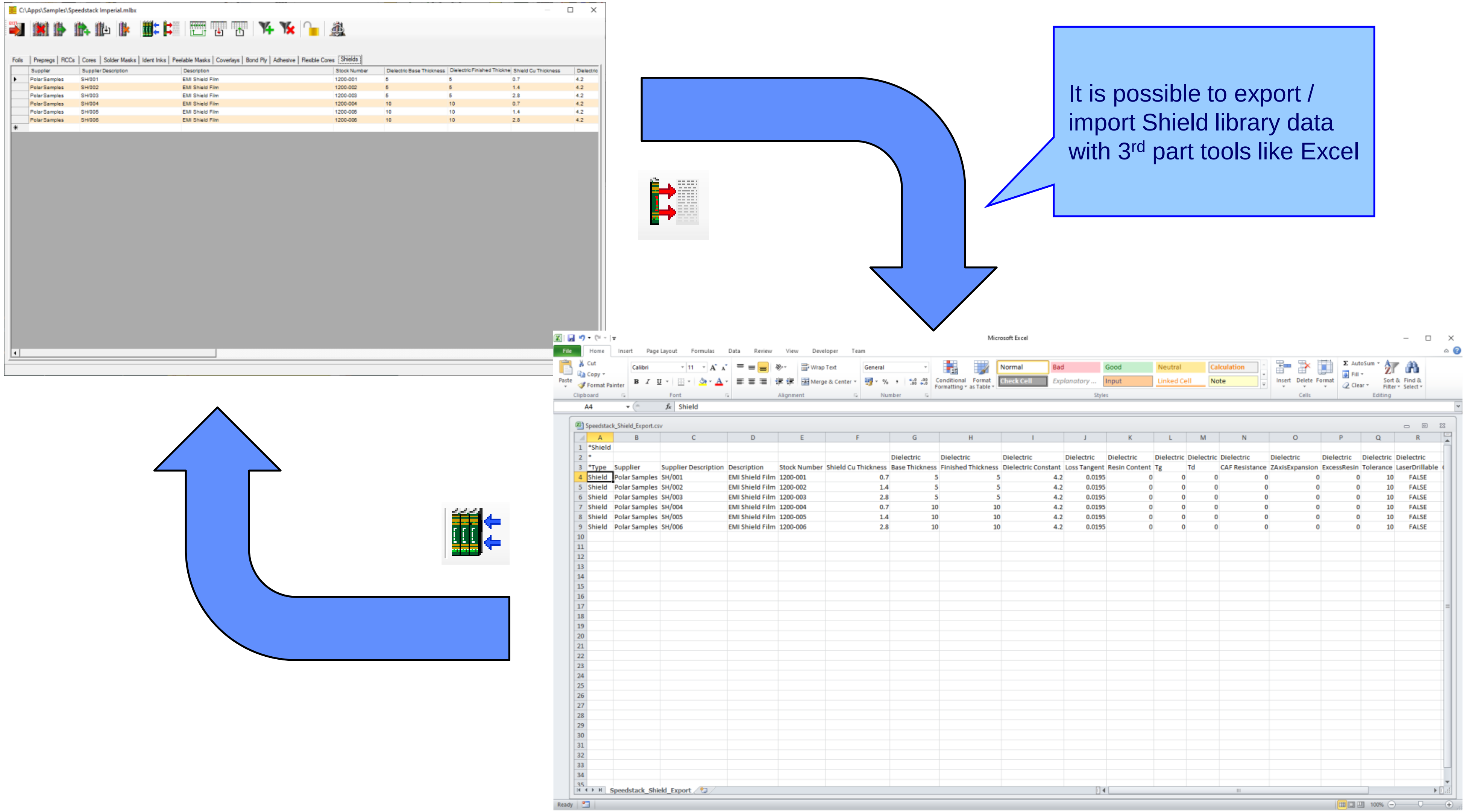
S:\Software\Speedstack\MaterialLibrary_v20_11

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Download the latest material library data from the Polar Online Material Library

New Shields file type has been introduced.

Export / Import Shield library to Excel



C:\Apps\Samples\Speedstack Imperial.mlbx

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

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickne	Shield Cu Thickness	Dielectric
Polar Samples	SH/001	EMI Shield Film	1200-001	5	5	0.7	4.2
Polar Samples	SH/002	EMI Shield Film	1200-002	5	5	1.4	4.2
Polar Samples	SH/003	EMI Shield Film	1200-003	5	5	2.8	4.2
Polar Samples	SH/004	EMI Shield Film	1200-004	10	10	0.7	4.2
Polar Samples	SH/005	EMI Shield Film	1200-005	10	10	1.4	4.2
Polar Samples	SH/006	EMI Shield Film	1200-006	10	10	2.8	4.2

Microsoft Excel

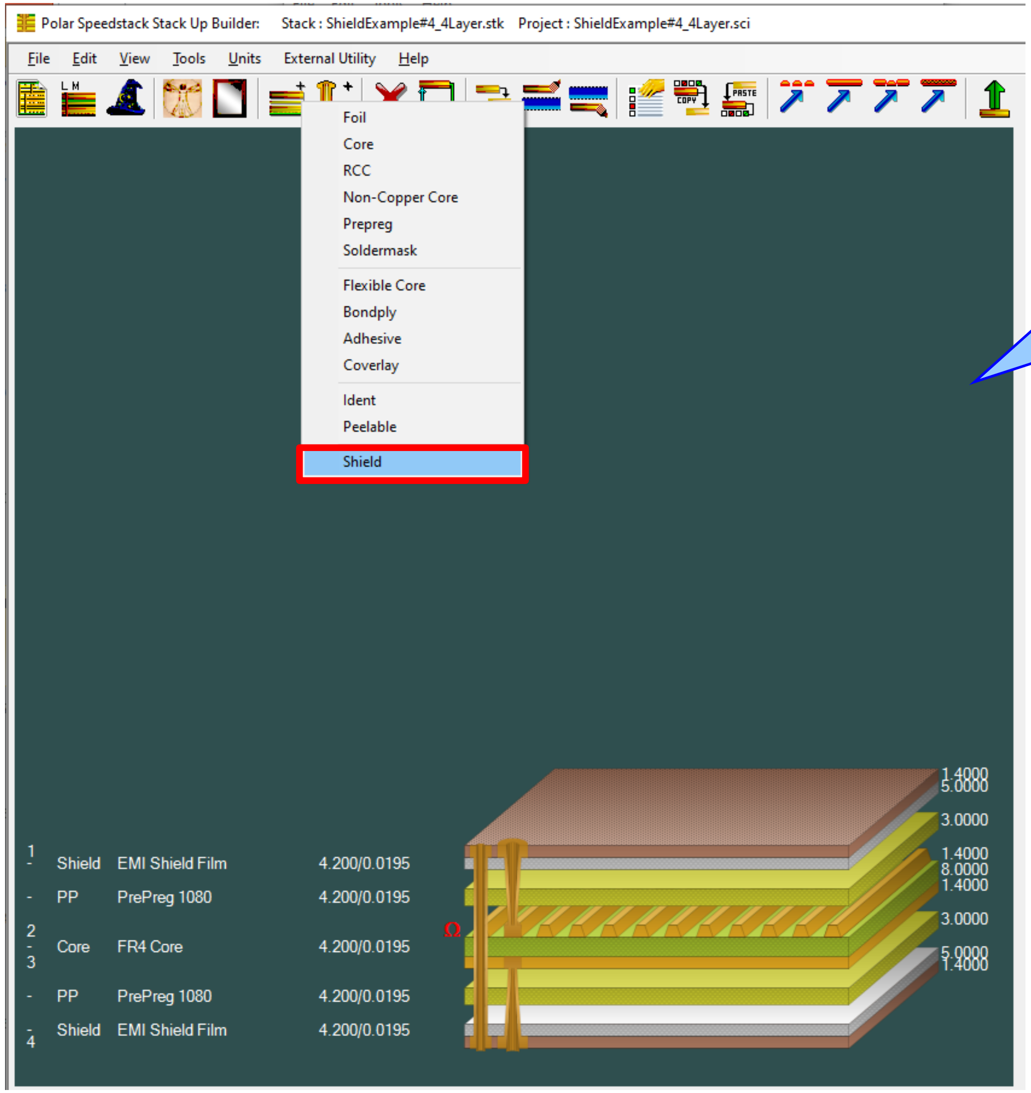
A4 Shield

Speedstack_Shield_Export.csv

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	*Shield																	
2	*						Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric	Dielectric
3	*Type	Supplier	Supplier Description	Description	Stock Number	Shield Cu Thickness	Base Thickness	Finished Thickness	Dielectric Constant	Loss Tangent	Resin Content	Tg	Td	CAF Resistance	ZAxisExpansion	ExcessResin	Tolerance	LaserDrillable
4	Shield	Polar Samples	SH/001	EMI Shield Film	1200-001	0.7	5	5	4.2	0.0195	0	0	0	0	0	0	10	FALSE
5	Shield	Polar Samples	SH/002	EMI Shield Film	1200-002	1.4	5	5	4.2	0.0195	0	0	0	0	0	0	10	FALSE
6	Shield	Polar Samples	SH/003	EMI Shield Film	1200-003	2.8	5	5	4.2	0.0195	0	0	0	0	0	0	10	FALSE
7	Shield	Polar Samples	SH/004	EMI Shield Film	1200-004	0.7	10	10	4.2	0.0195	0	0	0	0	0	0	10	FALSE
8	Shield	Polar Samples	SH/005	EMI Shield Film	1200-005	1.4	10	10	4.2	0.0195	0	0	0	0	0	0	10	FALSE
9	Shield	Polar Samples	SH/006	EMI Shield Film	1200-006	2.8	10	10	4.2	0.0195	0	0	0	0	0	0	10	FALSE

It is possible to export / import Shield library data with 3rd part tools like Excel

Stack up editor enhancements


Polar Speedstack Stack Up Builder: Stack : ShieldExample#4_4Layer.stk Project : ShieldExample#4_4Layer.sci

File
Edit
View
Tools
Units
External Utility
Help
Foil
Core
RCC
Non-Copper Core
Prepreg
Soldermask
Flexible Core
Bondply
Adhesive
Coverlay
Ident
Peelable
Shield
1.4000
5.0000
3.0000
1.4000
8.0000
1.4000
3.0000
5.0000
1.4000

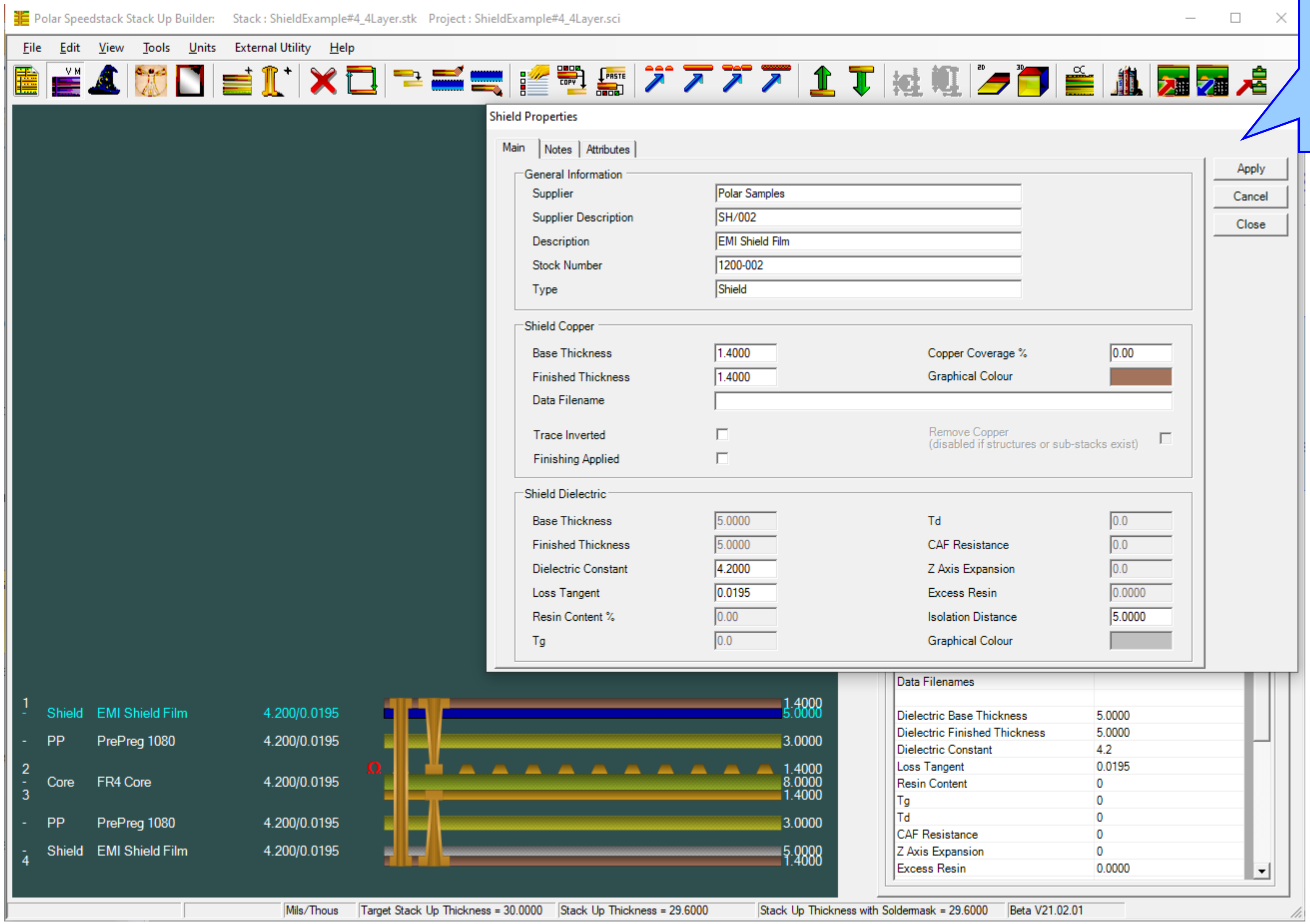
1 -	Shield	EMI Shield Film	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
2 - 3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
- 4	Shield	EMI Shield Film	4.200/0.0195

Stack Up editor enhancements:

Shield material options to add, delete, swap, move up, move down, symmetry and set properties

Shield properties

View and customise the Shield properties. Useful in ‘what-if’ scenarios


Polar Speedstack Stack Up Builder: Stack : ShieldExample#4_4Layer.stk Project : ShieldExample#4_4Layer.sci
File
Edit
View
Tools
Units
External Utility
Help
Shield Properties
Main
Notes
Attributes
Apply
Cancel
Close

General Information

Supplier	Polar Samples
Supplier Description	SH/002
Description	EMI Shield Film
Stock Number	1200-002
Type	Shield

Shield Copper

Base Thickness	1.4000	Copper Coverage %	0.00
Finished Thickness	1.4000	Graphical Colour	🟫
Data Filename			
Trace Inverted	☐	Remove Copper (disabled if structures or sub-stacks exist)	☐
Finishing Applied	☐		

Shield Dielectric

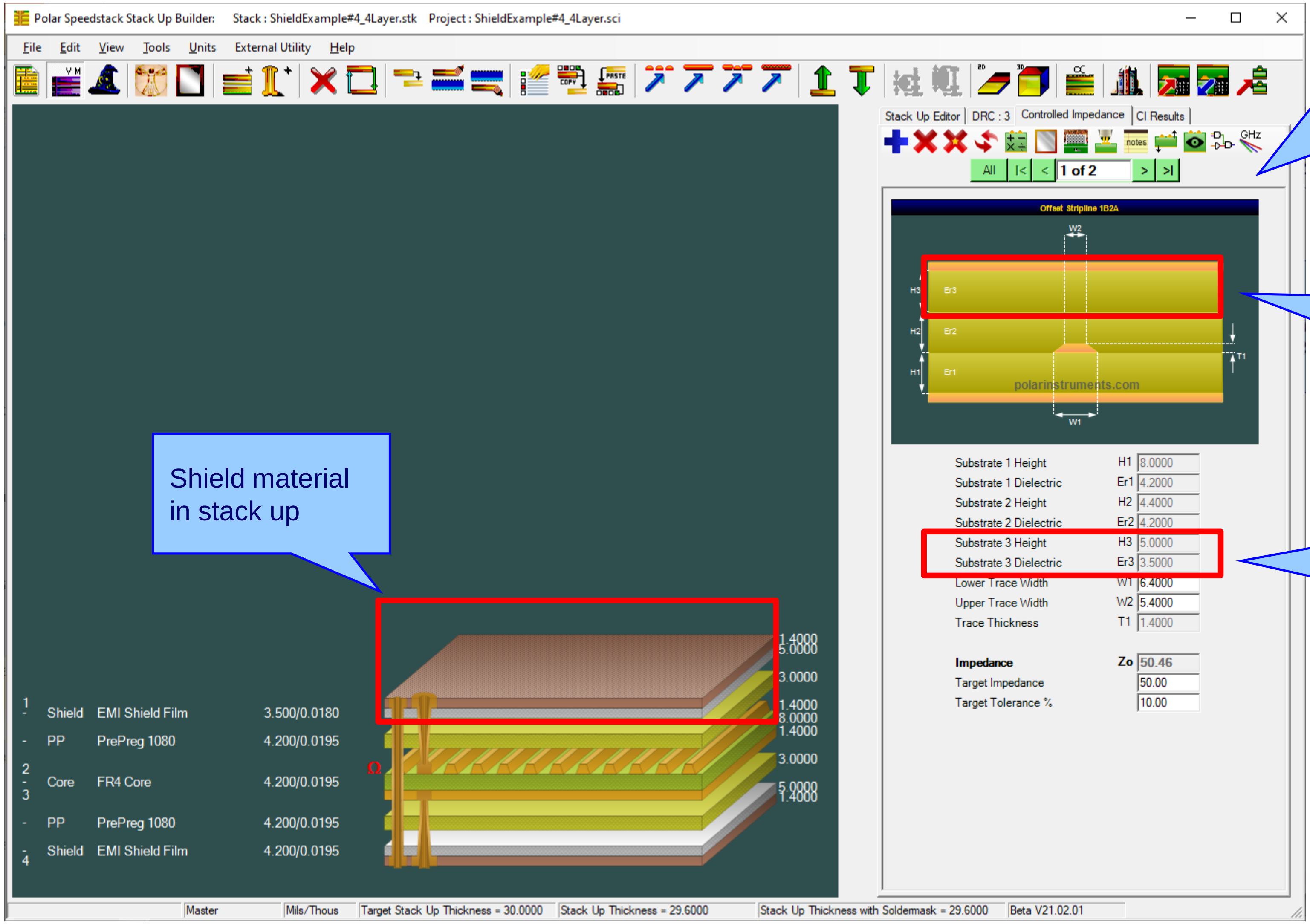
Base Thickness	5.0000	Td	0.0
Finished Thickness	5.0000	CAF Resistance	0.0
Dielectric Constant	4.2000	Z Axis Expansion	0.0
Loss Tangent	0.0195	Excess Resin	0.0000
Resin Content %	0.00	Isolation Distance	5.0000
Tg	0.0	Graphical Colour	▨

1 -	Shield	EMI Shield Film	4.200/0.0195	1.4000 5.0000
-	PP	PrePreg 1080	4.200/0.0195	3.0000
2 - 3	Core	FR4 Core	4.200/0.0195	1.4000 8.0000 1.4000
-	PP	PrePreg 1080	4.200/0.0195	3.0000
- 4	Shield	EMI Shield Film	4.200/0.0195	5.0000 1.4000

Data Filenames	
Dielectric Base Thickness	5.0000
Dielectric Finished Thickness	5.0000
Dielectric Constant	4.2
Loss Tangent	0.0195
Resin Content	0
Tg	0
Td	0
CAF Resistance	0
Z Axis Expansion	0
Excess Resin	0.0000

Mils/Thous | Target Stack Up Thickness = 30.0000 | Stack Up Thickness = 29.6000 | Stack Up Thickness with Soldermask = 29.6000 | Beta V21.02.01

Controlled impedance and insertion loss calculations


Polar Speedstack Stack Up Builder: Stack : ShieldExample#4_4Layer.stk Project : ShieldExample#4_4Layer.sci
File
Edit
View
Tools
Units
External Utility
Help
Stack Up Editor
DRC : 3
Controlled Impedance
CI Results
All
|<
<
1 of 2
>
>|
Offset Stripline 1B2A
W2
H3
Er3
H2
Er2
H1
Er1
T1
W1
polarinstruments.com
1.4000
5.0000
3.0000
1.4000
8.0000
1.4000
3.0000
5.0000
1.4000
Ω

1 -	Shield	EMI Shield Film	3.500/0.0180
-	PP	PrePreg 1080	4.200/0.0195
2 - 3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
- 4	Shield	EMI Shield Film	4.200/0.0195

Substrate 1 Height H1 8.0000
Substrate 1 Dielectric Er1 4.2000
Substrate 2 Height H2 4.4000
Substrate 2 Dielectric Er2 4.2000
Substrate 3 Height H3 5.0000
Substrate 3 Dielectric Er3 3.5000
Lower Trace Width W1 6.4000
Upper Trace Width W2 5.4000
Trace Thickness T1 1.4000

Impedance **Zo** 50.46
Target Impedance 50.00
Target Tolerance % 10.00

Master | Mils/Thous | Target Stack Up Thickness = 30.0000 | Stack Up Thickness = 29.6000 | Stack Up Thickness with Soldermask = 29.6000 | Beta V21.02.01

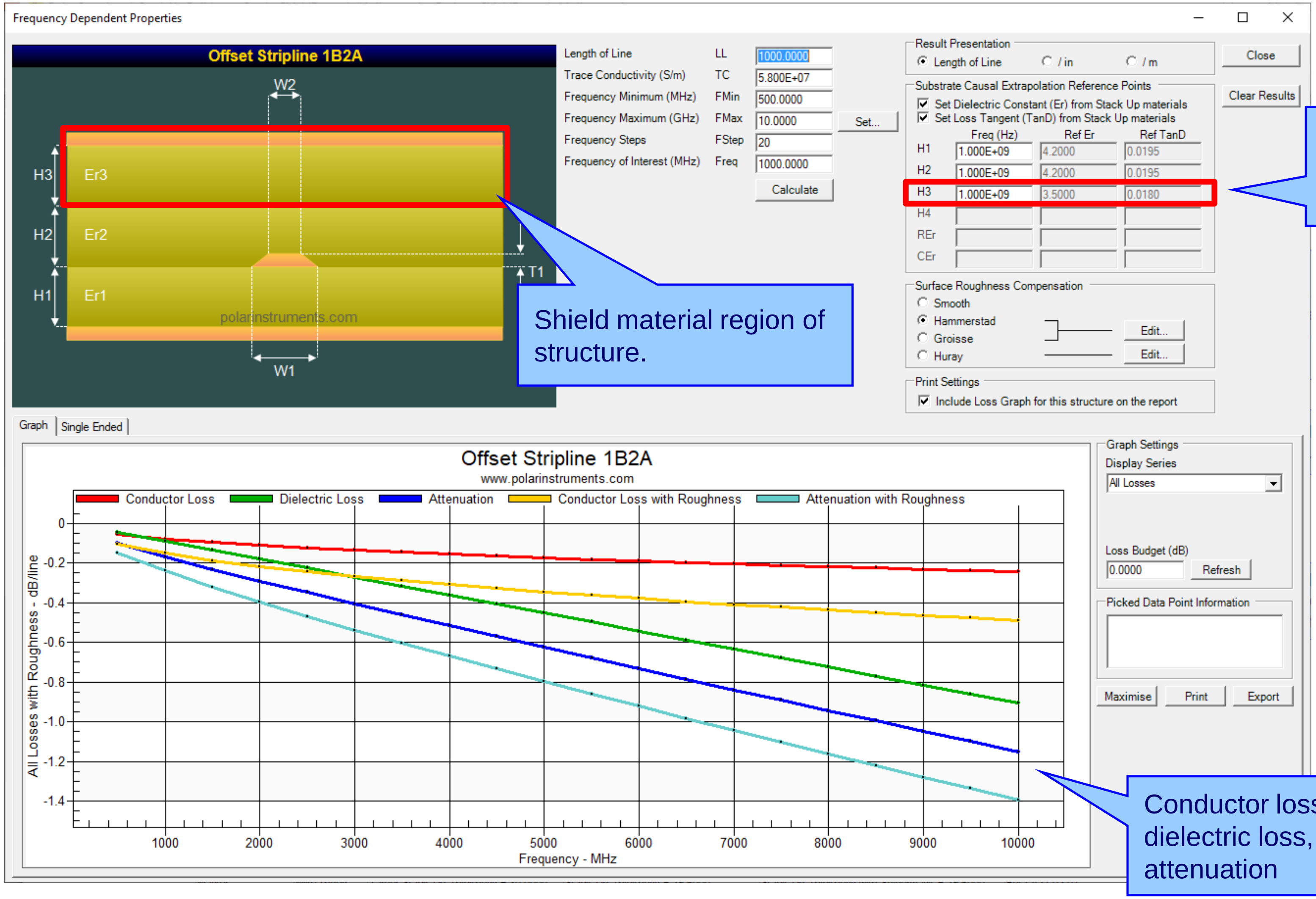
Shield material in stack up

Impedance and insertion calculations support the new Shield material type.

Shield material region of structure.

Shield adhesive height / thickness dimension and dielectric constant.

Controlled impedance and insertion loss calculations



Frequency Dependent Properties

Offset Stripline 1B2A

Length of Line LL 1000.0000
Trace Conductivity (S/m) TC 5.800E+07
Frequency Minimum (MHz) FMin 500.0000
Frequency Maximum (GHz) FMax 10.0000
Frequency Steps FStep 20
Frequency of Interest (MHz) Freq 1000.0000

Result Presentation: ● Length of Line ○ / in ○ / m

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	4.2000	0.0195
H3	1.000E+09	3.5000	0.0180
H4			
REr			
CEr			

Surface Roughness Compensation: ○ Smooth ● Hammerstad ○ Groisse ○ Huray

Print Settings: ☑ Include Loss Graph for this structure on the report

Graph Settings
Display Series: All Losses
Loss Budget (dB) 0.0000

Picked Data Point Information

W2
H3
H2
H1
Er3
Er2
Er1
T1
W1
polarinstruments.com
Set...
Calculate
Close
Clear Results
Edit...
Edit...
Graph
Single Ended
Refresh
Maximise
Print
Export
Offset Stripline 1B2A
www.polarinstruments.com
Conductor Loss
Dielectric Loss
Attenuation
Conductor Loss with Roughness
Attenuation with Roughness
All Losses with Roughness - dB/line
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency - MHz

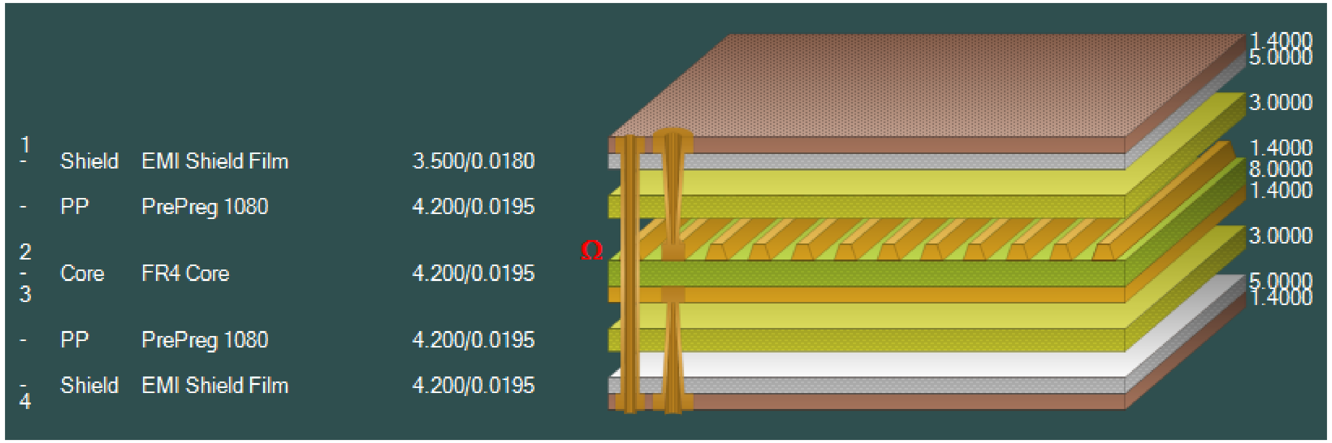
Shield adhesive dielectric constant / loss tangent.

Shield material region of structure.

Conductor loss, dielectric loss, total attenuation

Controlled impedance and insertion loss calculations

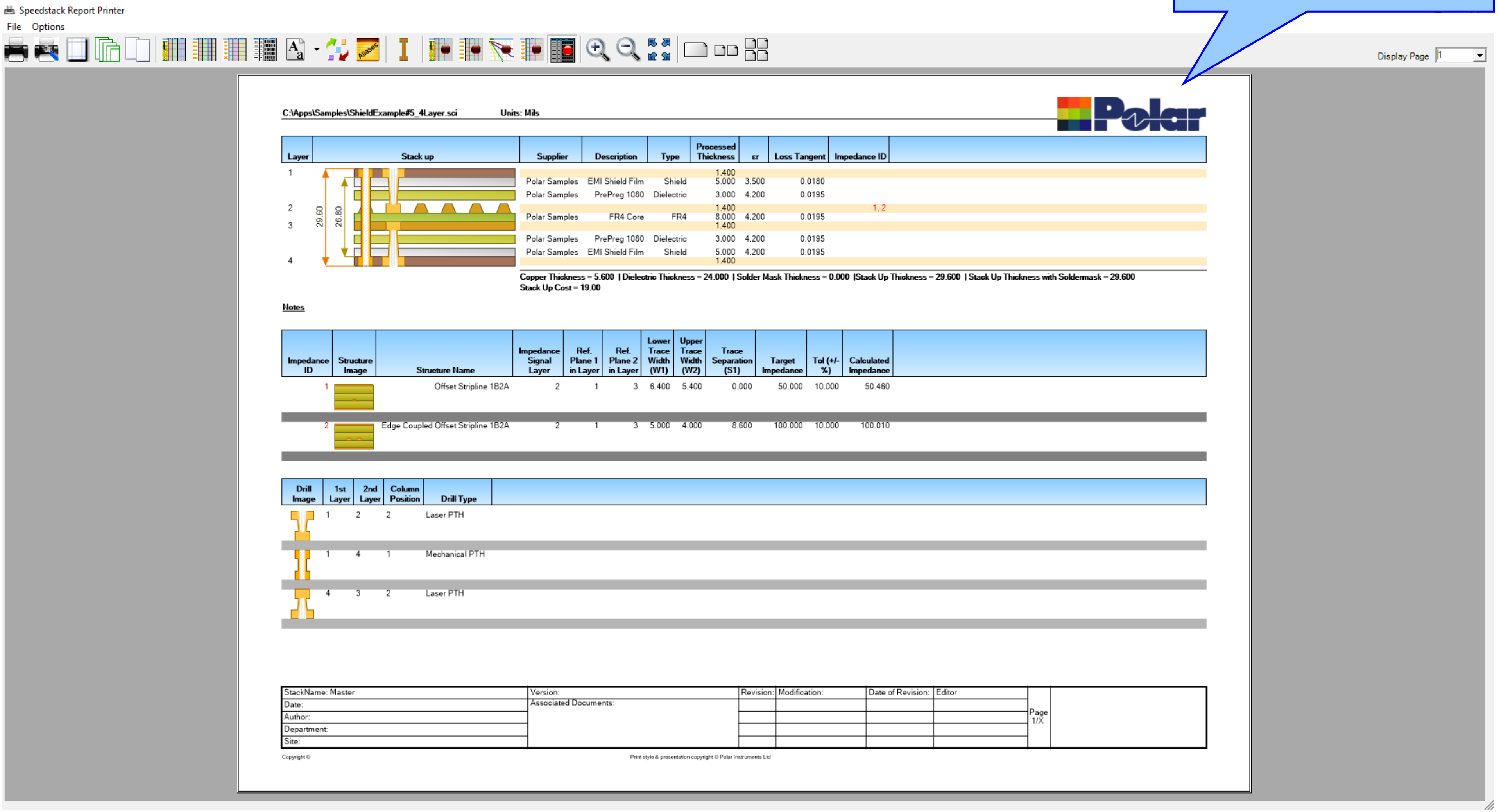
Please note: Speedstack is capable of supporting many shield types for stack up design and documentation. However, it is important to use the correct type of shield material for controlled impedance and insertion loss applications. They are often designated by the shield vendor as 'for high speed signal transmission applications'.



1 -	Shield	EMI Shield Film	3.500/0.0180
-	PP	PrePreg 1080	4.200/0.0195
2 - 3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
- 4	Shield	EMI Shield Film	4.200/0.0195

Technical report enhancements

Technical report showing shield materials



C:\Apps\Samples\ShieldExample#5_4Layer.sci Units: Mils

Layer	Stack up	Supplier	Description	Type	Processed Thickness	εr	Loss Tangent	Impedance ID
1					1.400			
		Polar Samples	EMI Shield Film	Shield	5.000	3.500	0.0180	
		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
2					1.400			1, 2
		Polar Samples	FR4 Core	FR4	8.000	4.200	0.0195	
3					1.400			
		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
		Polar Samples	EMI Shield Film	Shield	5.000	4.200	0.0195	
4					1.400			

Copper Thickness = 5.600 | Dielectric Thickness = 24.000 | Solder Mask Thickness = 0.000 |Stack Up Thickness = 29.600 | Stack Up Thickness with Soldermask = 29.600
Stack Up Cost = 19.00

Notes

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		Offset Stripline 1B2A	2	1	3	6.400	5.400	0.000	50.000	10.000	50.460
2		Edge Coupled Offset Stripline 1B2A	2	1	3	5.000	4.000	8.600	100.000	10.000	100.010

Drill Image	1st Layer	2nd Layer	Column Position	Drill Type
	1	2	2	Laser PTH
	1	4	1	Mechanical PTH
	4	3	2	Laser PTH

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

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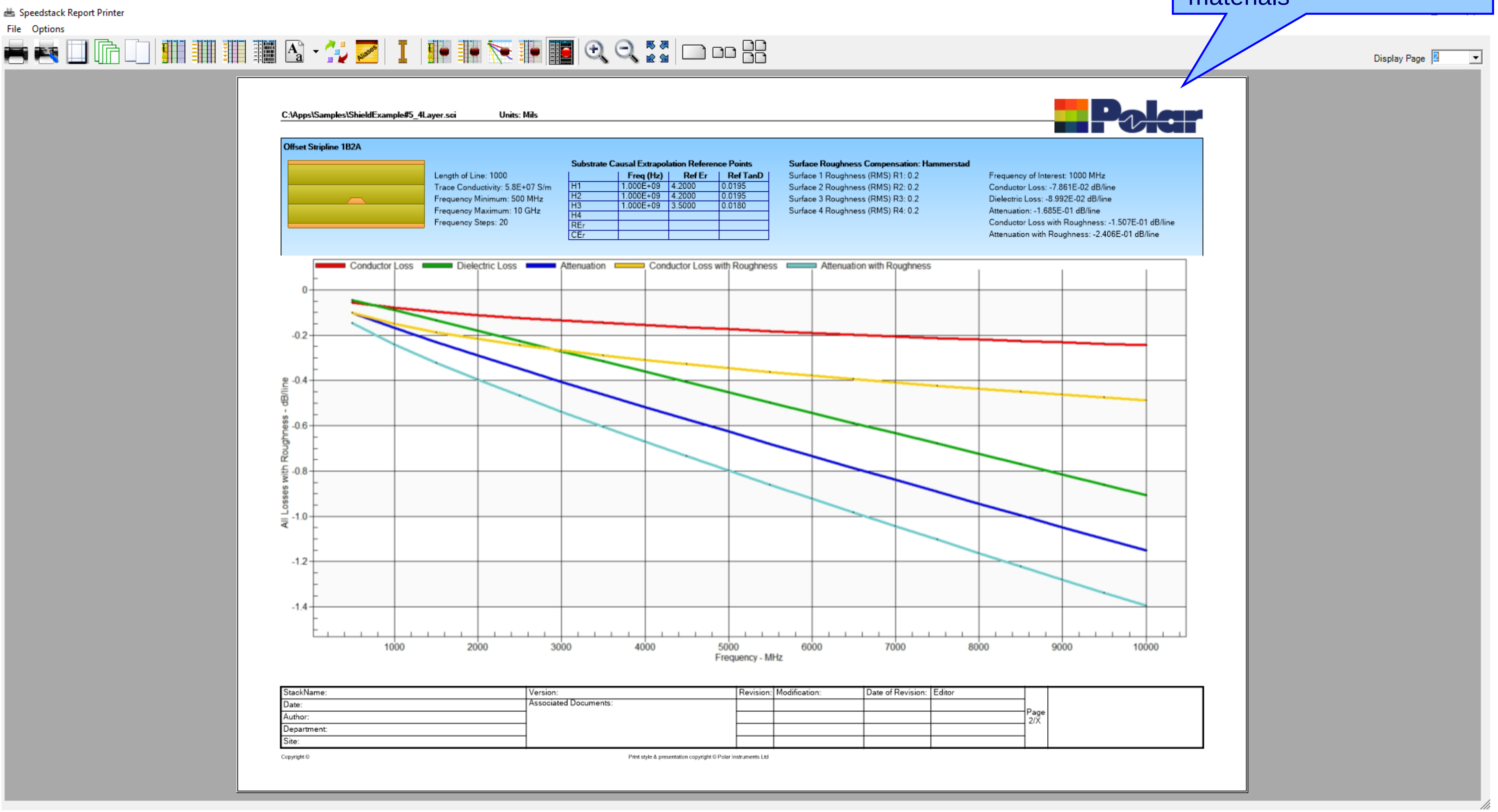
Technical report enhancements

Insertion loss report supporting shield materials


Speedstack Report Printer
File
Options
Display Page
2
Conductor Loss
Dielectric Loss
Attenuation
Conductor Loss with Roughness
Attenuation with Roughness
All Losses with Roughness - dB/line
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency - MHz

C:\Apps\Samples\ShieldExample#5_4Layer.sci   Units: Mils

Offset Stripline 1B2A

Length of Line: 1000
Trace Conductivity: 5.8E+07 S/m
Frequency Minimum: 500 MHz
Frequency Maximum: 10 GHz
Frequency Steps: 20

Substrate Causal Extrapolation Reference Points

	Freq (Hz)	Ref Er	Ref TanD
H1	1.000E+09	4.2000	0.0195
H2	1.000E+09	4.2000	0.0195
H3	1.000E+09	3.5000	0.0180
H4			
REr			
CEr			

Surface Roughness Compensation: Hammerstad

Surface 1 Roughness (RMS) R1: 0.2
Surface 2 Roughness (RMS) R2: 0.2
Surface 3 Roughness (RMS) R3: 0.2
Surface 4 Roughness (RMS) R4: 0.2

Frequency of Interest: 1000 MHz
Conductor Loss: -7.861E-02 dB/line
Dielectric Loss: -8.992E-02 dB/line
Attenuation: -1.685E-01 dB/line
Conductor Loss with Roughness: -1.507E-01 dB/line
Attenuation with Roughness: -2.406E-01 dB/line

StackName:	Version:	Revision:	Modification:	Date of Revision:	Editor	
Date:	Associated Documents:					Page 2/X
Author:						
Department:						
Site:						

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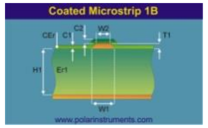
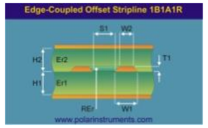
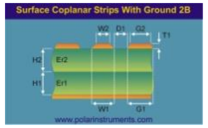
Import / Export enhancements

The following Import / Export options have been updated to support the new shield material introduced with Speedstack 2021:

- XML STKX v20.00 and SSX v10.00 import / export options
- CSV export option
- Gerber / DXF export option


Coated Microstrip 1B
www.polarinstruments.com


Edge-Coupled Offset Stripline 1B1A1R
www.polarinstruments.com


Surface Coplanar Strips With Ground 2B
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Coated Coplanar Strips 2B
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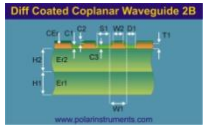
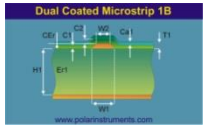

Diff Coated Coplanar Waveguide 2B
www.polarinstruments.com


Dual Coated Microstrip 1B
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Edge-Coupled Offset Stripline 2B1A1R
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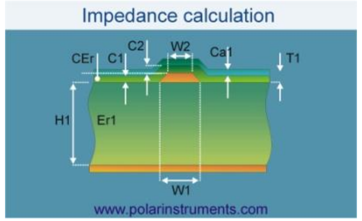
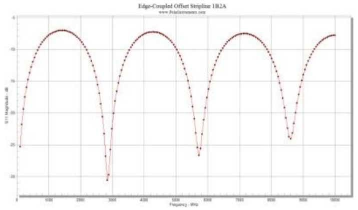
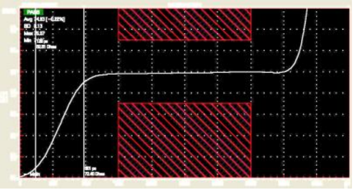
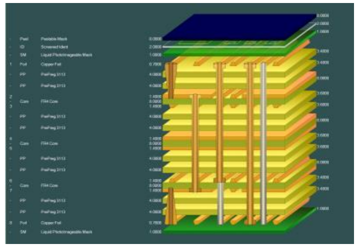
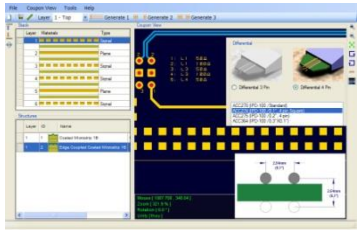

Impedance calculation
CEr
C1
C2
W2
Ca1
T1
H1
Er1
W1
www.polarinstruments.com









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

Speedstack PCB Stack Up Builder
Edge-Coupled Coated Microstrip 2B
Coated Microstrip 1B

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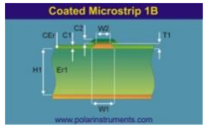
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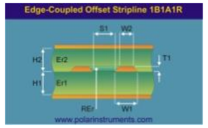
Edge-Coupled Offset Stripline 1B1A1R
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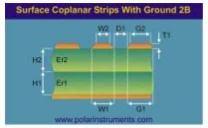
Surface Coplanar Strips With Ground 2B
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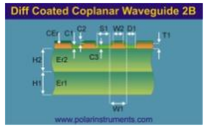
Diff Coated Coplanar Waveguide 2B
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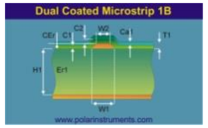
Dual Coated Microstrip 1B
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Edge-Coupled Offset Stripline 2B1A1R
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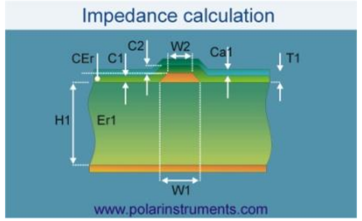
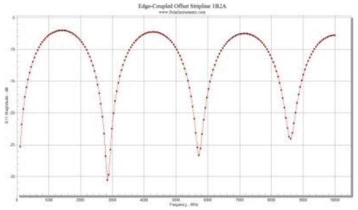
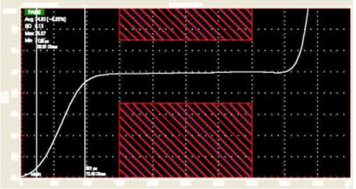
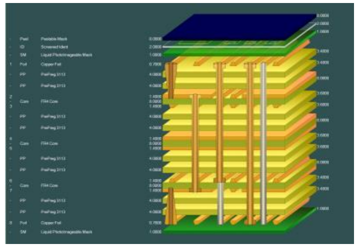
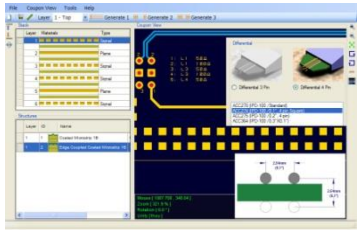

Impedance calculation
CEr
C1
C2
W2
Ca1
T1
H1
Er1
W1
www.polarinstruments.com









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