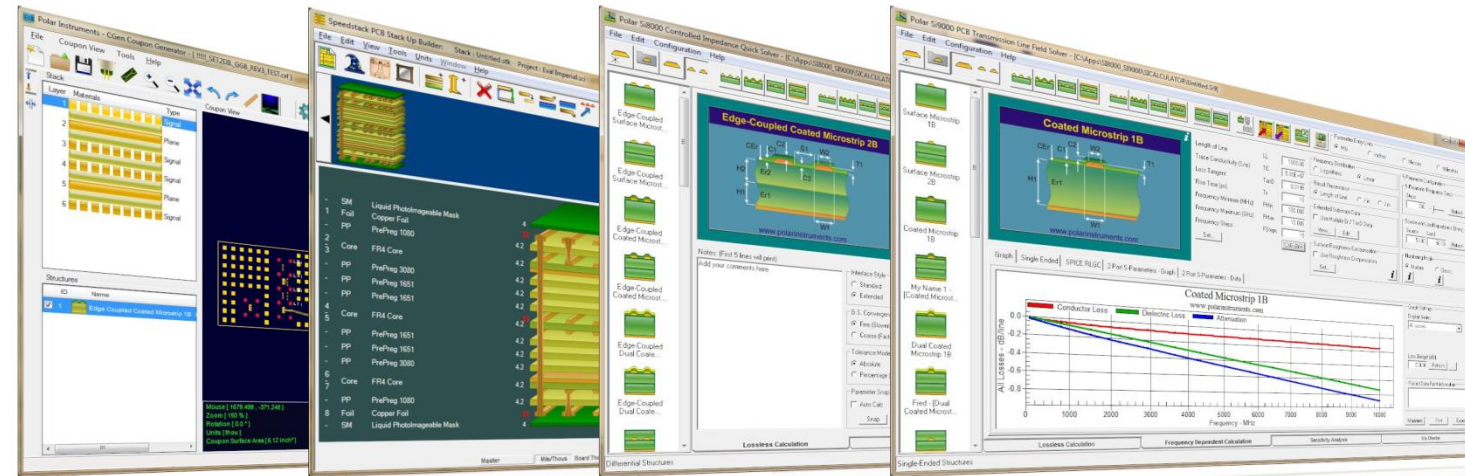
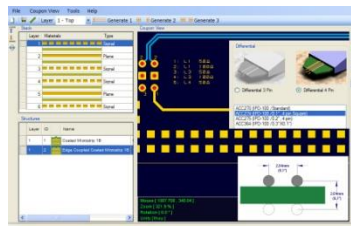
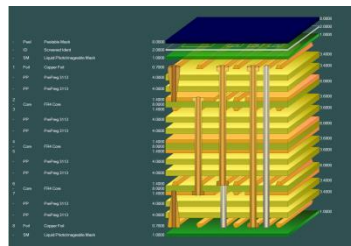
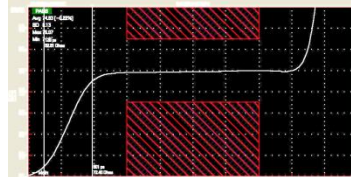
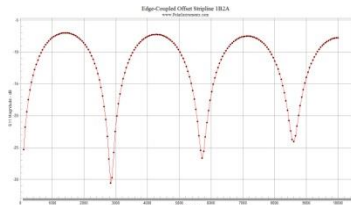
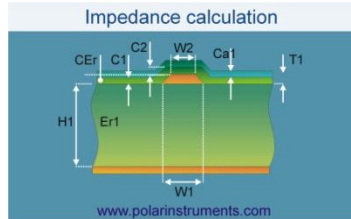




Speedstack updates – now with *Structure View*

Richard Attrill – November 2022 (Rev 10)



Speedstack v22.11.01 (November 2022)

Introducing Structure View

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

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

Coated Microstrip IB

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

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

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

All | < | << | 1 of 8 | >> | >

Coated Microstrip 1B

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
 Target Impedance Zo 49.54
 Target Tolerance % 10.00

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

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

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up of 8 layers. Layer 4 is highlighted in orange, indicating it is the selected layer for filtering. A table below the stack up shows the properties for the selected layer.

Layer	Target Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	50		100			
2						
3						
4	49.83	14.7500 / 15.7500	99.55	9.0000 / 10.0000	12.0000	9.0000 / 10.0000
5						
6						
7						
8						

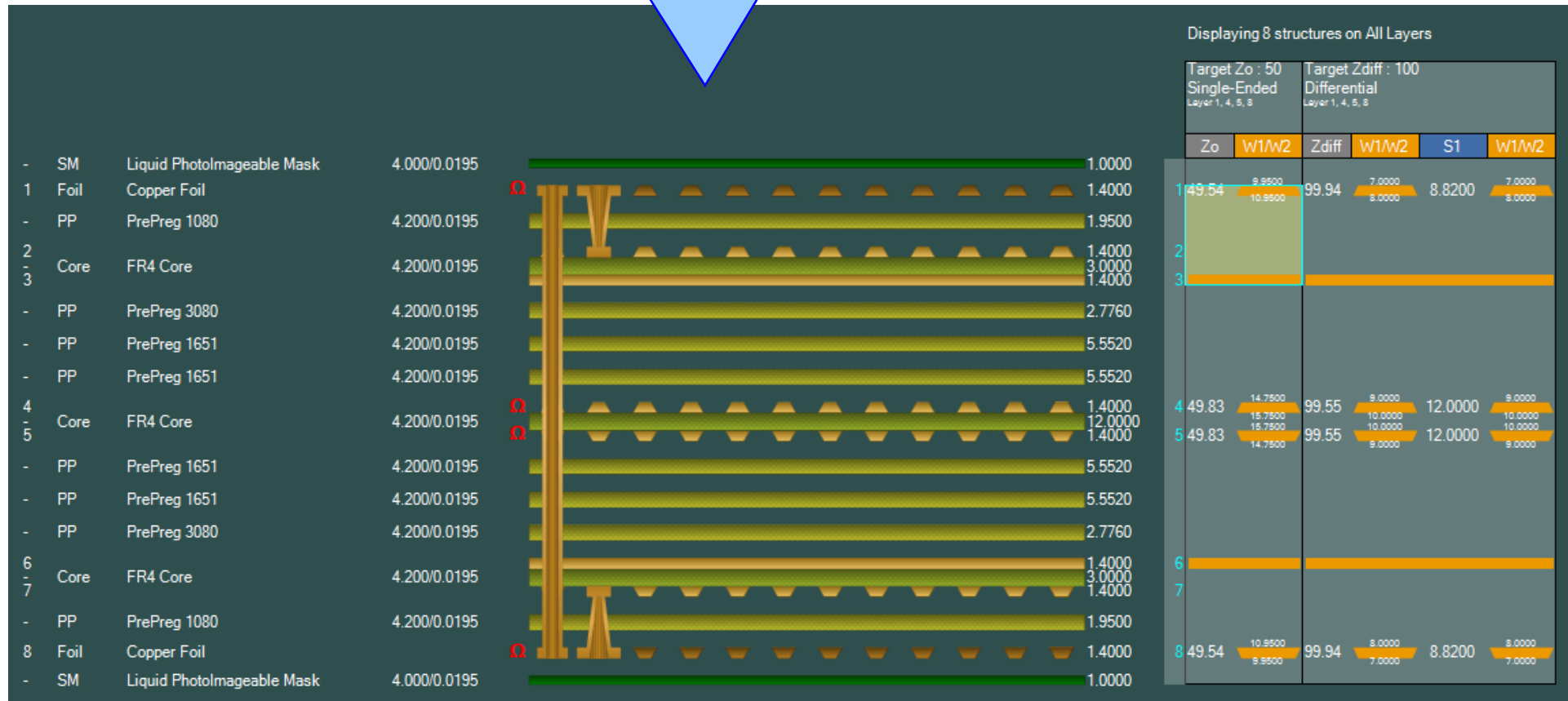
The detailed view on the right shows a cross-section of a microstrip structure on layer 4. The structure is a differential pair with a central gap. The parameters for the structure are listed below:

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

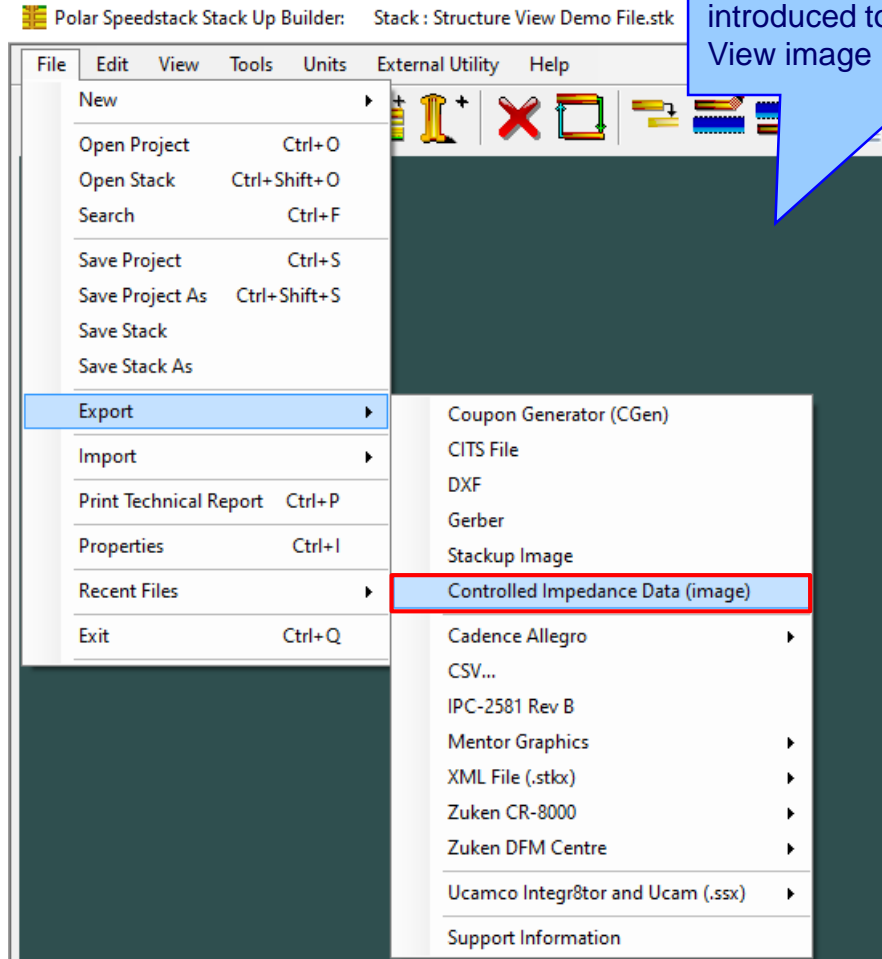
Introducing Structure View

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

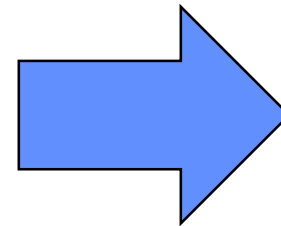
All data is now visible in one view



Introducing Structure View



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

The screenshot shows the 'Online Library' interface. On the left, under 'Filter by Supplier', 'OAK-MITSUI TECHNOLOGIES' is highlighted with a red box. A blue callout box points to it with the text: 'Oak-Mitsui have recently joined the Polar Material Partner program'. Other suppliers listed include Nan Ya Plastics and Nelco. The 'File Type' section lists various file formats like Foils, RCCs, Cores, etc. The 'Library Files Available : OakMitsui' section lists several .mlbx files. The 'Existing Data Table' section has 'Append' selected. At the bottom, 'File Access Mode' is set to 'Online Polar Library'. A 'Please Note' section at the bottom provides a disclaimer.

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	UpperCopper			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

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

Grid View
— □ ×

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Type	Layer Name	Description	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

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

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	Layer Name	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM				
1	CSTFoil	Copper	1	Foil	Top		4.0000	0.0195
2	CSTPrePreg	Dielectric		PP			4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner			
3	CSTCore	Dielectric		Core			4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner			
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
7	CSTCore	LowerCopper	5		Inner 5	1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000
11	CSTCore	UpperCopper	6		Inner 6	1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000
11	CSTCore	LowerCopper	7		Inner 7	1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4000	
14	CSTSolderMask	Mask		SM		Liquid Photoimageable Mask	1.0000	4.0000

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

Apply Cancel

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

The screenshot shows the Polar Speedstack Stack Up Builder interface. On the left, a table lists the stack up layers. In the center, a 3D grid view shows the layers. On the right, a detailed cross-section diagram of the stack up is shown, with various parameters labeled. Below the diagram, a table lists the parameters and their values.

Layer	Material	Thickness	Position
-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.4000
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
3			3.0000
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	4.200/0.0195
5			12.0000
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6	Core	FR4 Core	4.200/0.0195
7			3.0000
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	1.4000
-	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
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

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	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		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 only
 Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Apply Cancel

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

Grid View – Walkthrough Step #3

The screenshot displays the Polar Speedstack Stack Up Builder interface. The main window shows a grid view of the PCB stack-up layers. The layers are listed in a table on the left, and a 3D visualization of the stack-up is shown in the center. The right-hand panel displays the 'Stack Up Information' and 'Selected Item Information' for the selected layer.

Layer	Material	Thickness	Processed Thickness
- SM	Liquid Photoimageable Mask	4.000/0.0195	1.0000
1	Foil Copper Foil		1.4000
- PP	PreReg 1080	4.200/0.0195	1.9500
2	Core FR4 Core	4.200/0.0195	1.4000
- 3	Core FR4 Core	4.200/0.0195	3.0000
			1.4000
- PP	PreReg 3080	4.200/0.0195	2.5000
- PP	PreReg 1651	4.200/0.0195	2.5000
- PP	PreReg 1651	4.200/0.0195	6.0000
4	Core FR4 Core	4.200/0.0195	1.4000
- 5	Core FR4 Core	4.200/0.0195	12.0000
			1.4000
- PP	PreReg 1651	4.200/0.0195	6.0000
- PP	PreReg 1651	4.200/0.0195	6.0000
- PP	PreReg 3080	4.200/0.0195	2.5000
6	Core FR4 Core	4.200/0.0195	1.4000
- 7	Core FR4 Core	4.200/0.0195	3.0000
			1.4000
- PP	PreReg 1080	4.200/0.0195	1.9500
8	Foil Copper Foil		1.4000
- SM	Liquid Photoimageable Mask	4.000/0.0195	1.0000

The right-hand panel shows the 'Stack Up Information' and 'Selected Item Information' for the selected layer (Core). The 'Layer Name' is highlighted in red, indicating a change to 'Power'.

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 1	
Note 2	
Note 3	
Note 4	
Note 5	
Lower Copper Notes	
Note 1	
Note 2	

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

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

The screenshot shows the 'Grid View' window in the Polar Speedstack Stack Up Builder. The table contains the following data:

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		PP		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper			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

A context menu is open over the row with index 6, showing options: 'Copy to Clipboard (for Excel)' and 'Paste from Clipboard (from Excel)'. The 'Copy to Clipboard (for Excel)' option is highlighted with a red box.

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

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

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

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

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

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	1.5000		
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		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	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

Apply Cancel

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

The screenshot displays the Polar Speedstack Stack Up Builder interface. The main window shows a grid view of a PCB stack up with various layers and their thicknesses. The layers are listed on the left, and their thicknesses are shown on the right. The stack up is visualized as a series of horizontal bars of different colors and patterns, representing different materials and their thicknesses. The total stack up thickness is shown as 59.3600. The target stack up thickness is 60.0000. The stack up thickness with soldermask is 61.3600.

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

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

The screenshot shows the 'Online Library' application interface. On the left, under 'Filter by Supplier', the 'AGC' logo is highlighted with a red box. A blue callout bubble points to this box with the text: 'AGC have recently joined the Polar Material Partner program'. The 'File Type' list includes 'PrePregs' which is selected. The 'Library Files Available : AGC' list contains various .mlbx files such as 'AGC_Mercurywave_9350_10GHz_2201.mlbx'. On the right, the 'Existing Data Table' section has 'Append' selected. At the bottom, the 'File Access Mode' is set to 'Online Polar Library (ftp://polarinstruments.com)'. A text box shows the path 'C:\Users\vicha\Desktop\Material_Library_2021' with a 'Browse...' button next to it. A disclaimer at the bottom reads: '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

Layer	Material	Thickness (Mils/Thous)	Height
-	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	Core FR4 Core	4.200/0.0195	1.4000
3	Core FR4 Core	4.200/0.0195	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	Core FR4 Core	4.200/0.0195	1.4000
5	Core FR4 Core	4.200/0.0195	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	Core FR4 Core	4.200/0.0195	1.4000
7	Core FR4 Core	4.200/0.0195	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

Parameter	Value
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

New Confidential Stamp options added to the technical report

The screenshot shows the Speedstack Report Printer interface. The main window displays a technical report for a PCB stackup. At the top, the word "CONFIDENTIAL" is printed in large red letters. Below this is a table of the stackup layers, including details like Layer, Stack up, Supplier, Description, Type, Processed Thickness, ϵ_r , Loss Tangent, and Impedance ID. A diagram on the left shows the physical stackup with dimensions. Below the stackup table is a table of impedance structures with columns for 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, and Calculated Impedance. A dialog box titled "Confidential Stamp Options" is open, allowing the user to select the location where the stamp should appear. The dialog includes a preview of the stamp with the word "CONFIDENTIAL" and a red "1" next to it. The dialog also has an "Alternative word" field and checkboxes for "Location 1", "Location 2", "Location 3", and "Location 4". A blue callout box points to the dialog with the text: "The confidential stamps are customisable in terms of the text used and location. This new functionality is available from the technical report Options menu".

Layer	Stack up	Supplier	Description	Type	Processed Thickness	ϵ_r	Loss Tangent	Impedance ID
1		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	
		Polar Samples	Copper Foil	Copper	1.400			1, 2
		Polar Samples	PrePreg 1050	Dielectric	1.950	4.200	0.0195	
2		Polar Samples	FR4 Core	FR4	1.400			
		Polar Samples	PrePreg 3080	Dielectric	2.775	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	
3		Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	3
		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	2.775	4.200	0.0195	
4		Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
		Polar Samples	PrePreg 1050	Dielectric	1.950	4.200	0.0195	
		Polar Samples	Copper Foil	Copper	1.400			4
		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	

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									

Speedstack v22.01.01 (January 2022)

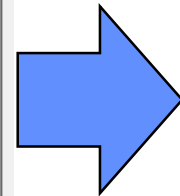
Snap Parameters and Calculate Structure

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

Edge Coupled Coated Microstrip 1B

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



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

Edge Coupled Coated Microstrip 1B

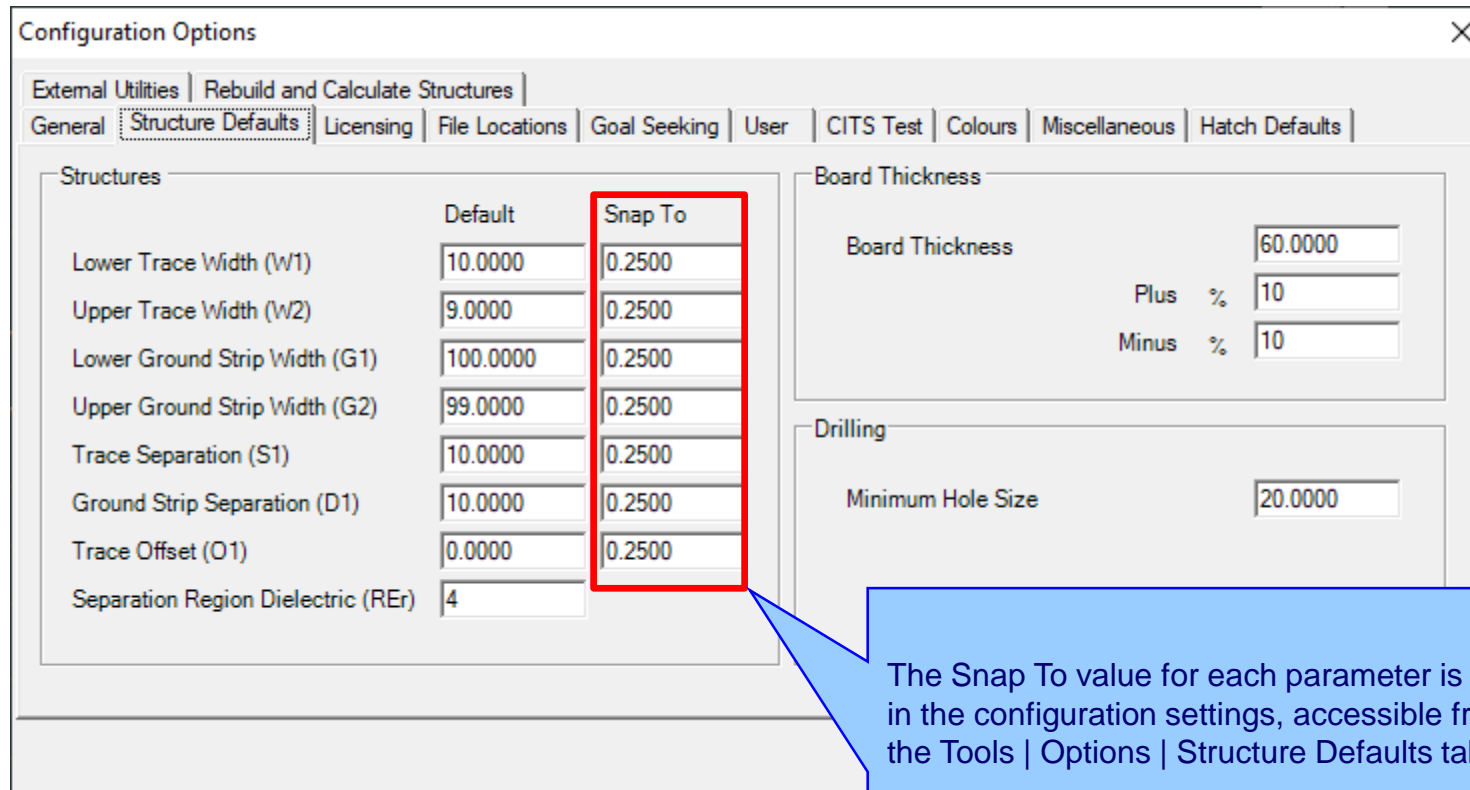
Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.7500
Upper Trace Width	W2	6.7500
Trace Separation	S1	8.0000
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000
Differential Impedance	Zd	99.49
Target Impedance		100.00
Target Tolerance %		10.00

Snapped/rounded parameter values

New option

- 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

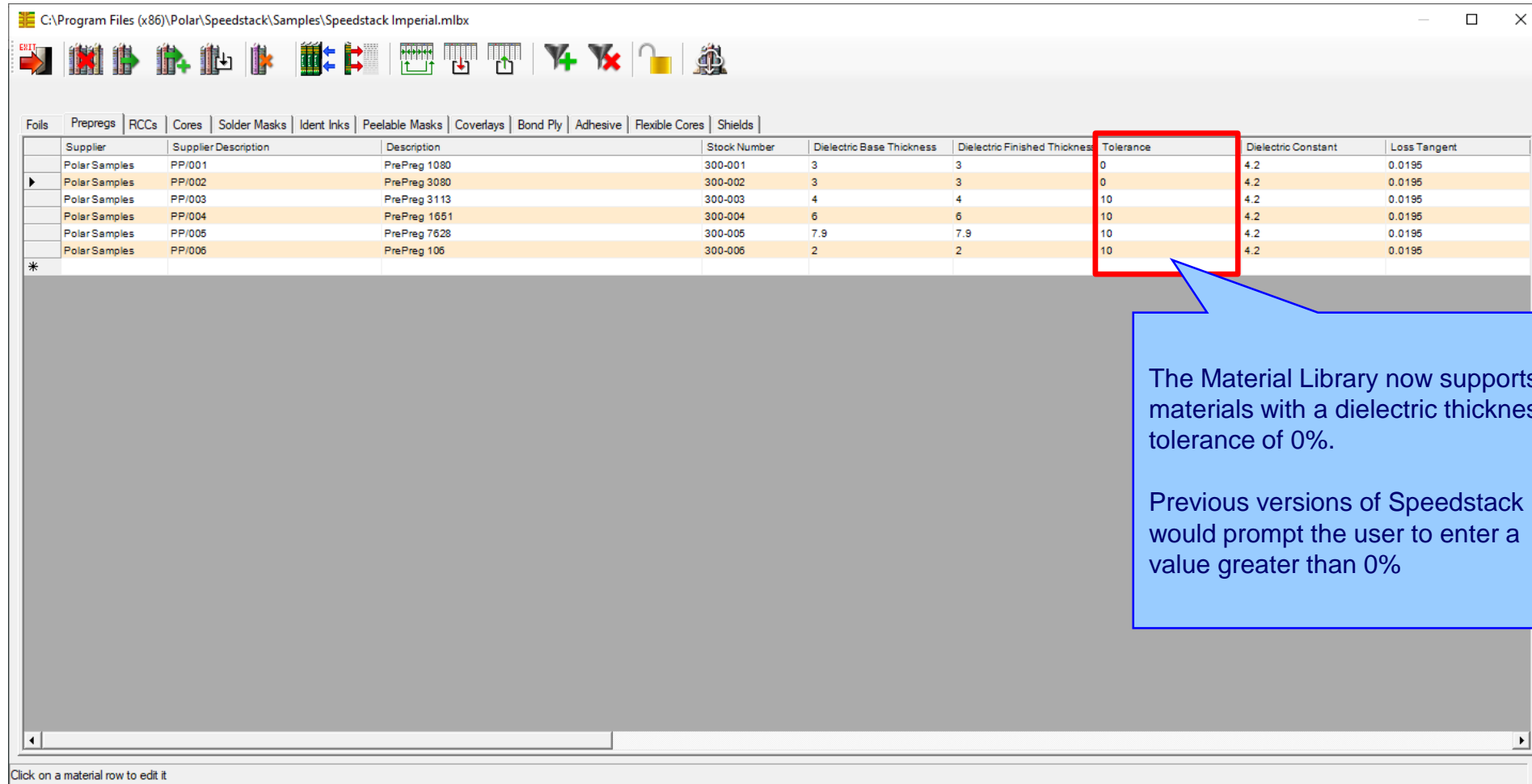
Drilling

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



The screenshot shows the Speedstack Material Library interface. The 'Prepregs' tab is selected, displaying a table of materials. A red box highlights the 'Tolerance' column, which now includes a value of 0% for the first two materials. A blue callout box explains this enhancement.

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickness	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

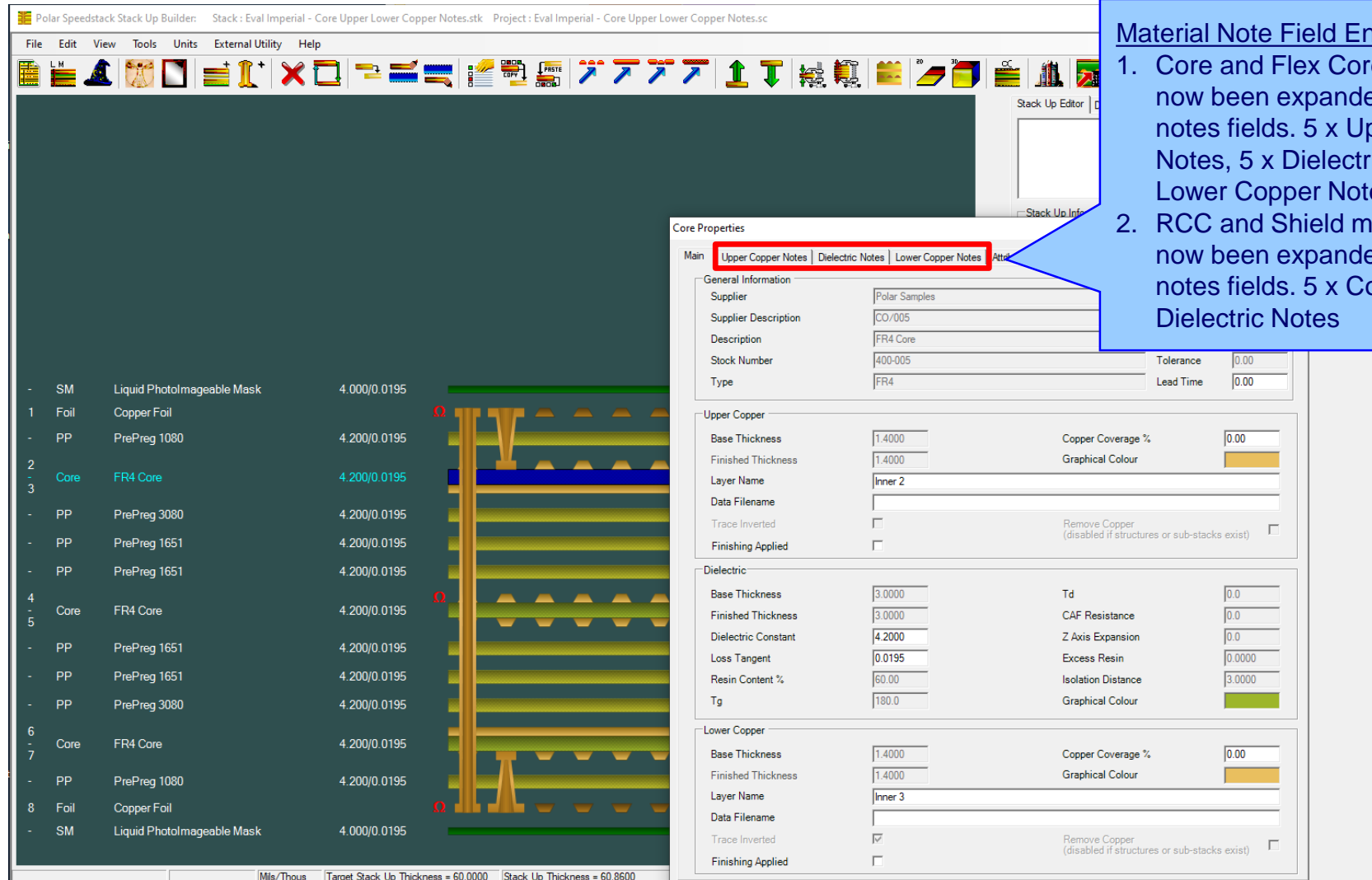
*
Click on a material row to edit it

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)

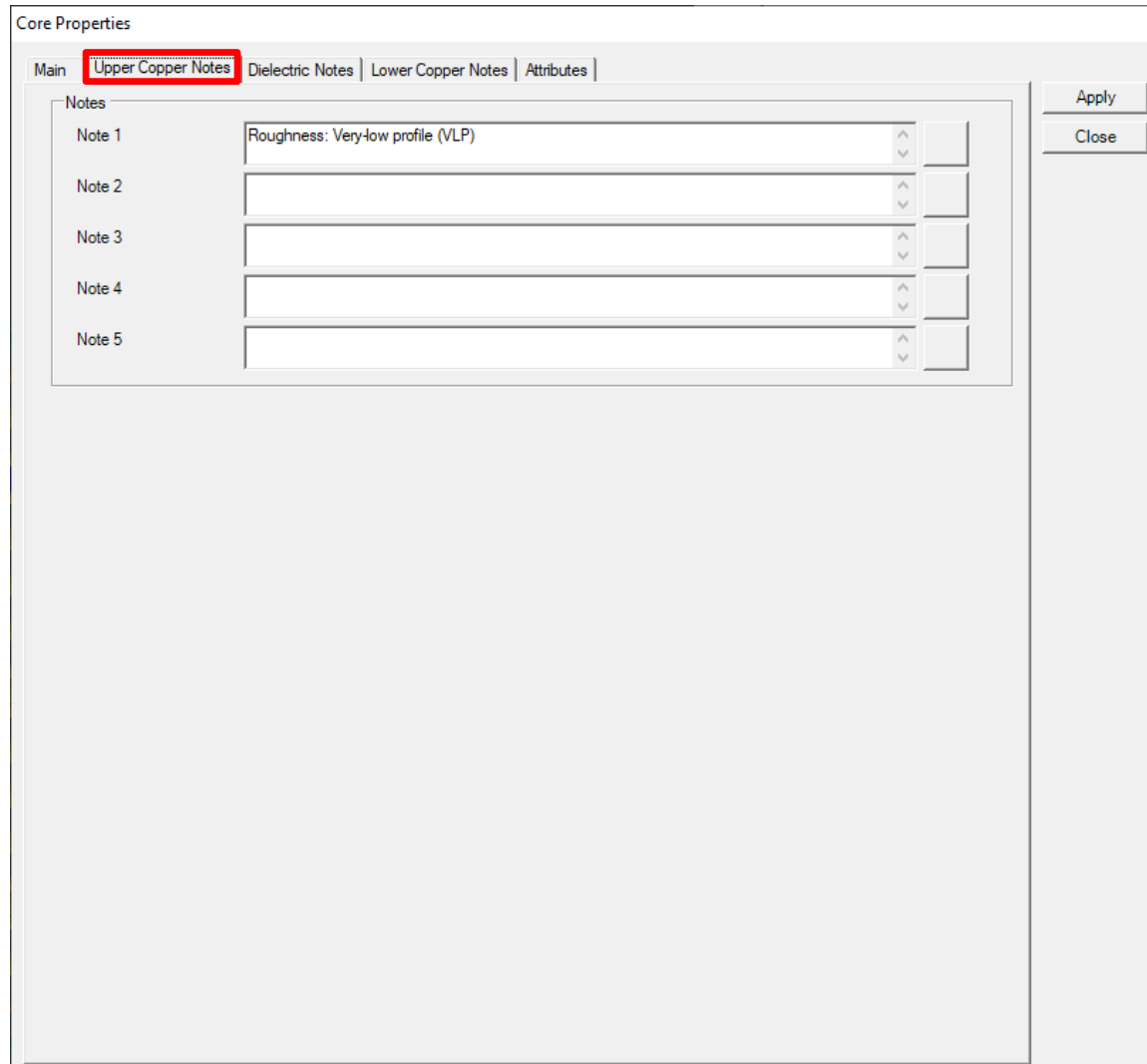
Material Note Field Enhancements – improvements to stack up documentation



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

Notes

Note 1	Roughness: Very-low profile (VLP)	^	v
Note 2		^	v
Note 3		^	v
Note 4		^	v
Note 5		^	v

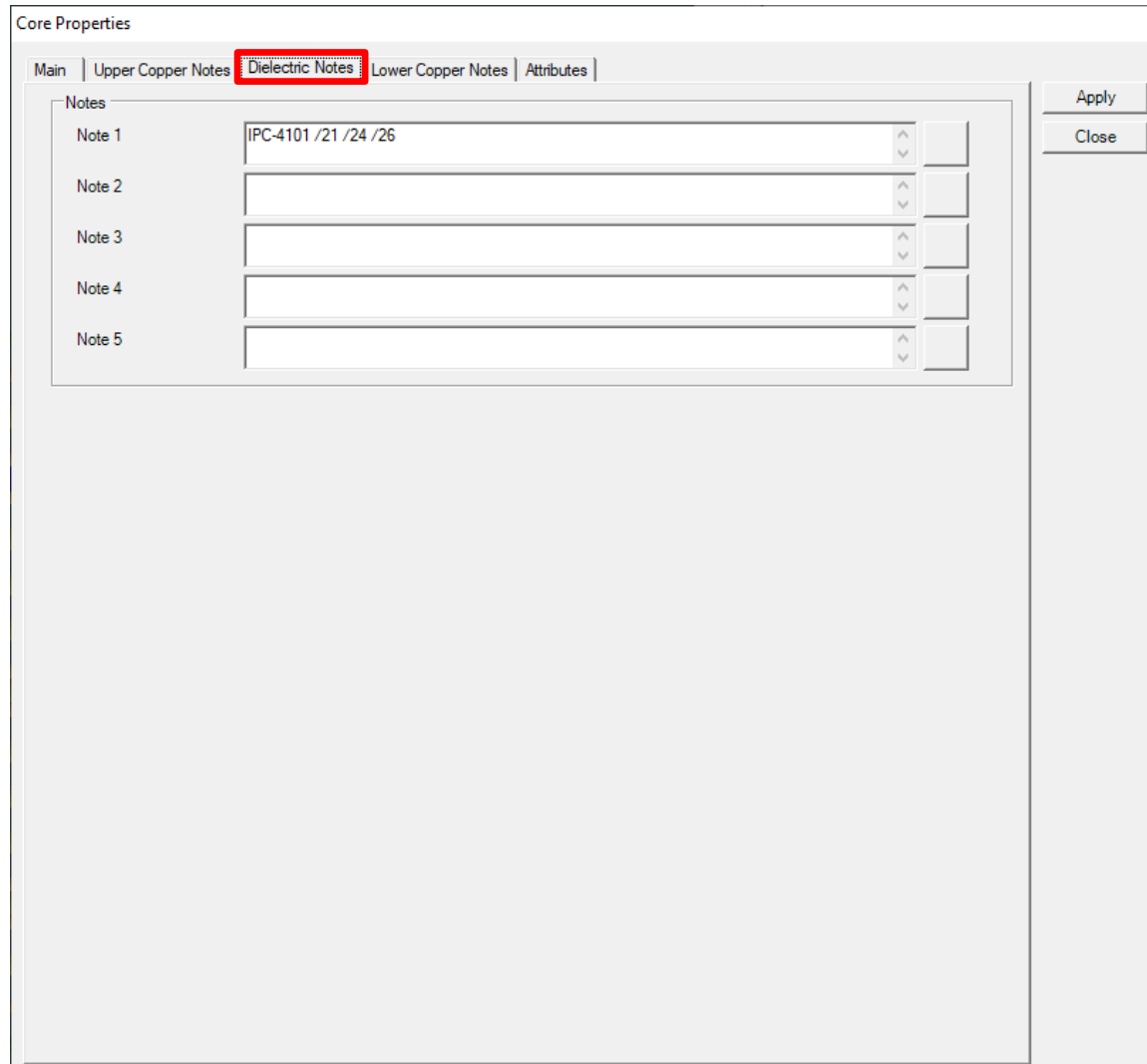
Apply

Close

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

Notes

Note 1	IPC-4101 /21 /24 /26	^	v
Note 2		^	v
Note 3		^	v
Note 4		^	v
Note 5		^	v

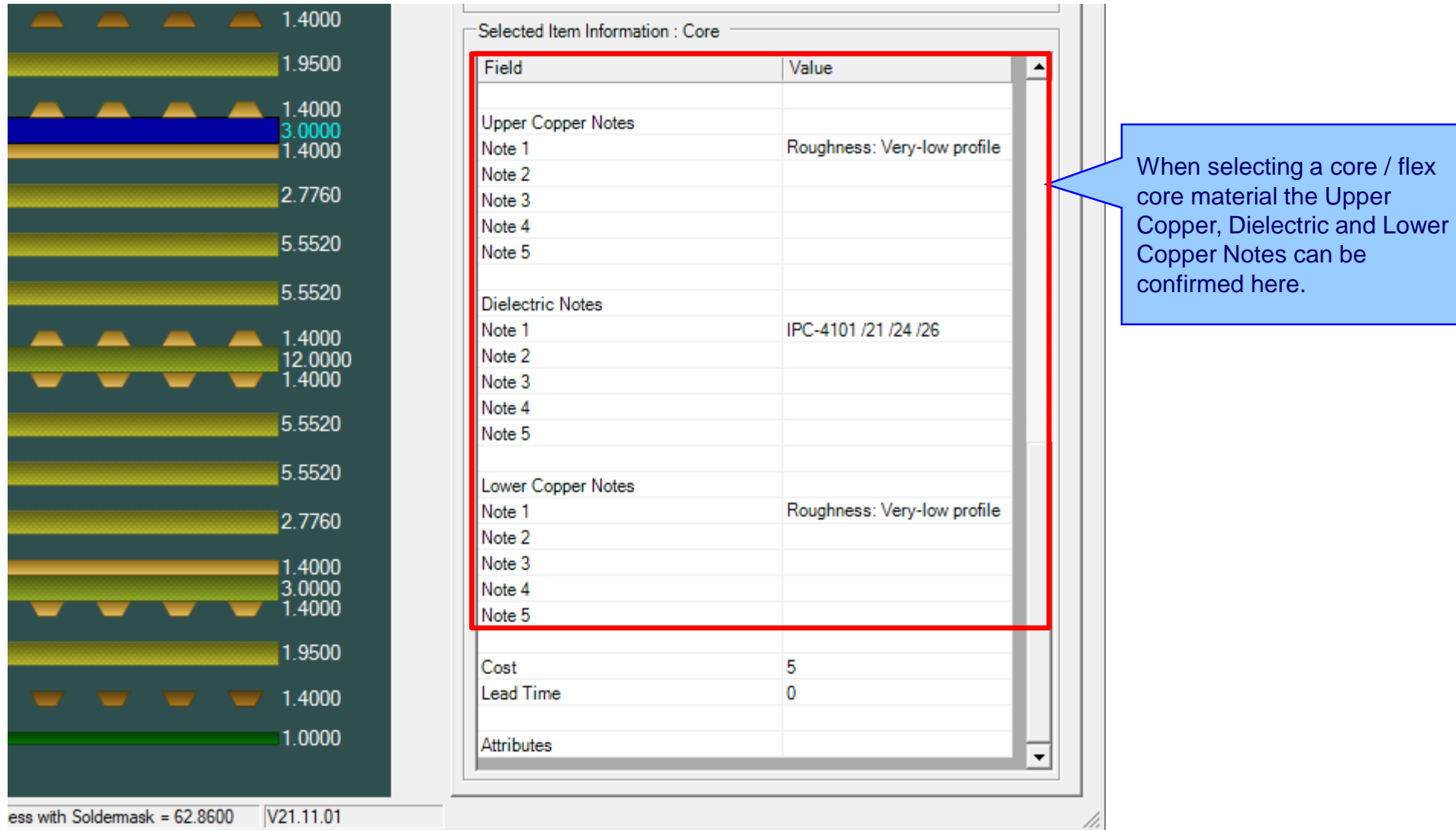
Apply

Close

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



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	

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	<input checked="" type="checkbox"/>
Planes Both Sides	<input type="checkbox"/>
Laser Drillable	<input checked="" type="checkbox"/>

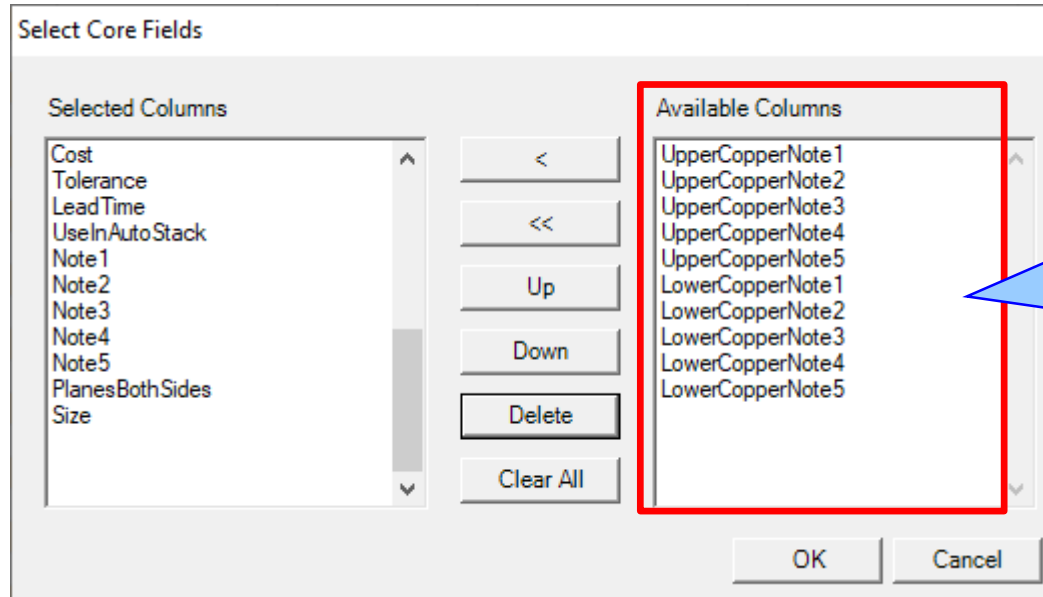
Upper Copper Notes	Dielectric Notes	Lower Copper Notes
Note 1 Roughness: Very-low profile (VLP)	Note 1 IPC-4101 /21 /24 /26	Note 1 Roughness: Very-low profile (VLP)
Note 2	Note 2	Note 2
Note 3	Note 3	Note 3
Note 4	Note 4	Note 4
Note 5	Note 5	Note 5

<< < 5 of 27 > >>

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



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

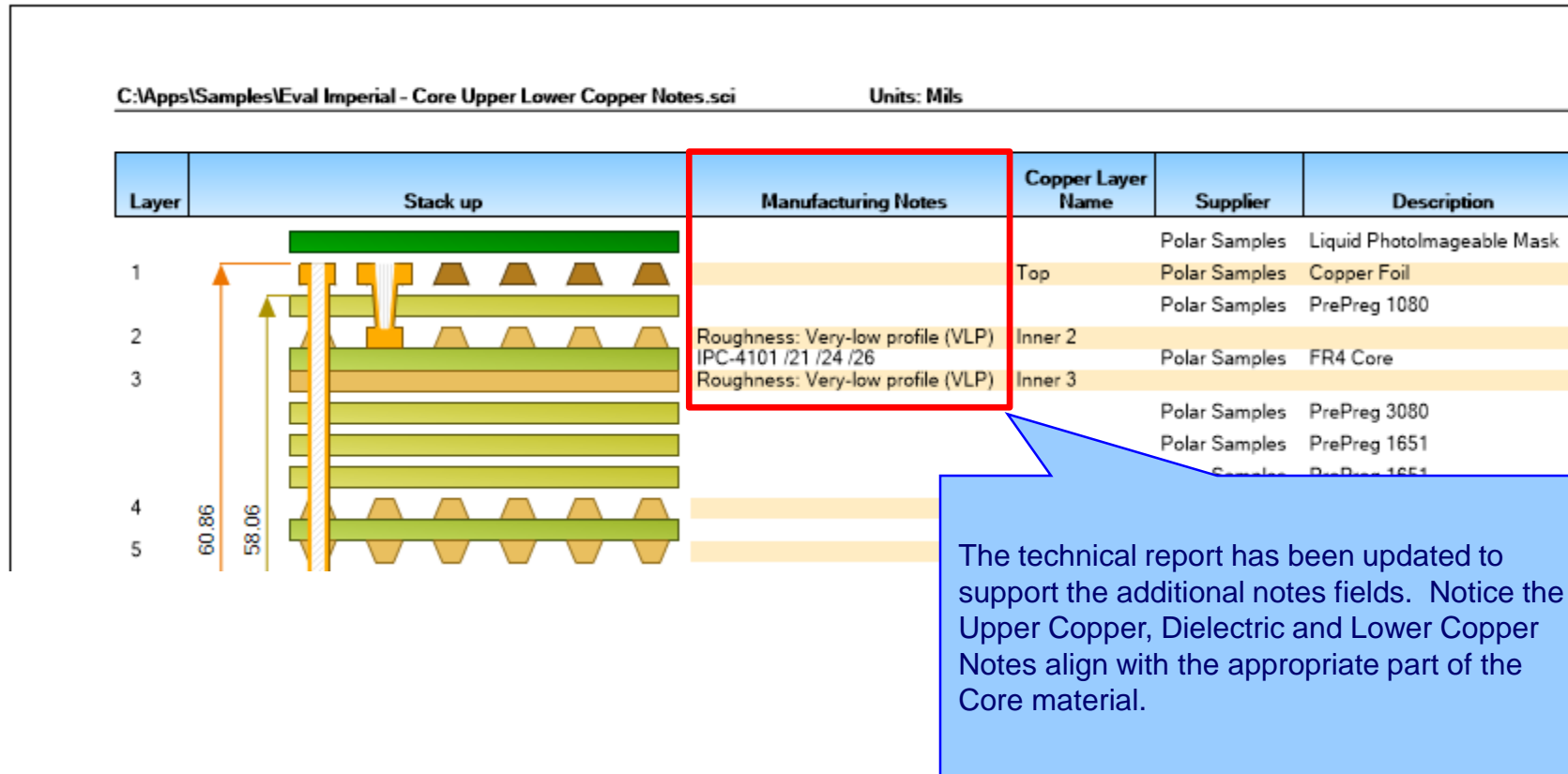


Material Library Import / Export

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



Material Note Field Enhancements – technical report enhancements



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

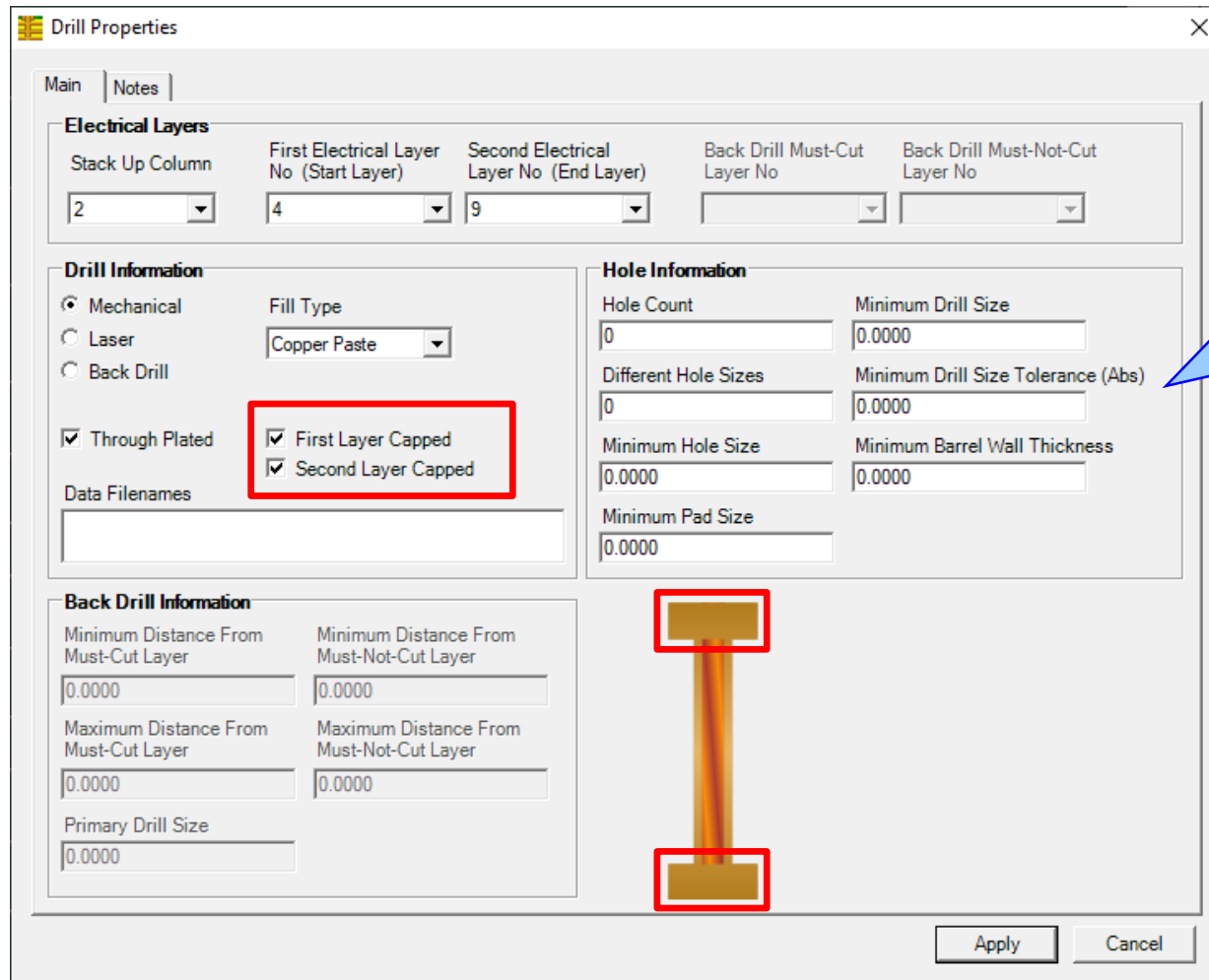
The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up configuration with 13 layers. A red box highlights a specific layer configuration for a drill cap. The right-hand panel shows a cross-sectional diagram of a 'Coated Microstrip 18' with various parameters defined in a table below it.

Parameter	Value
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

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

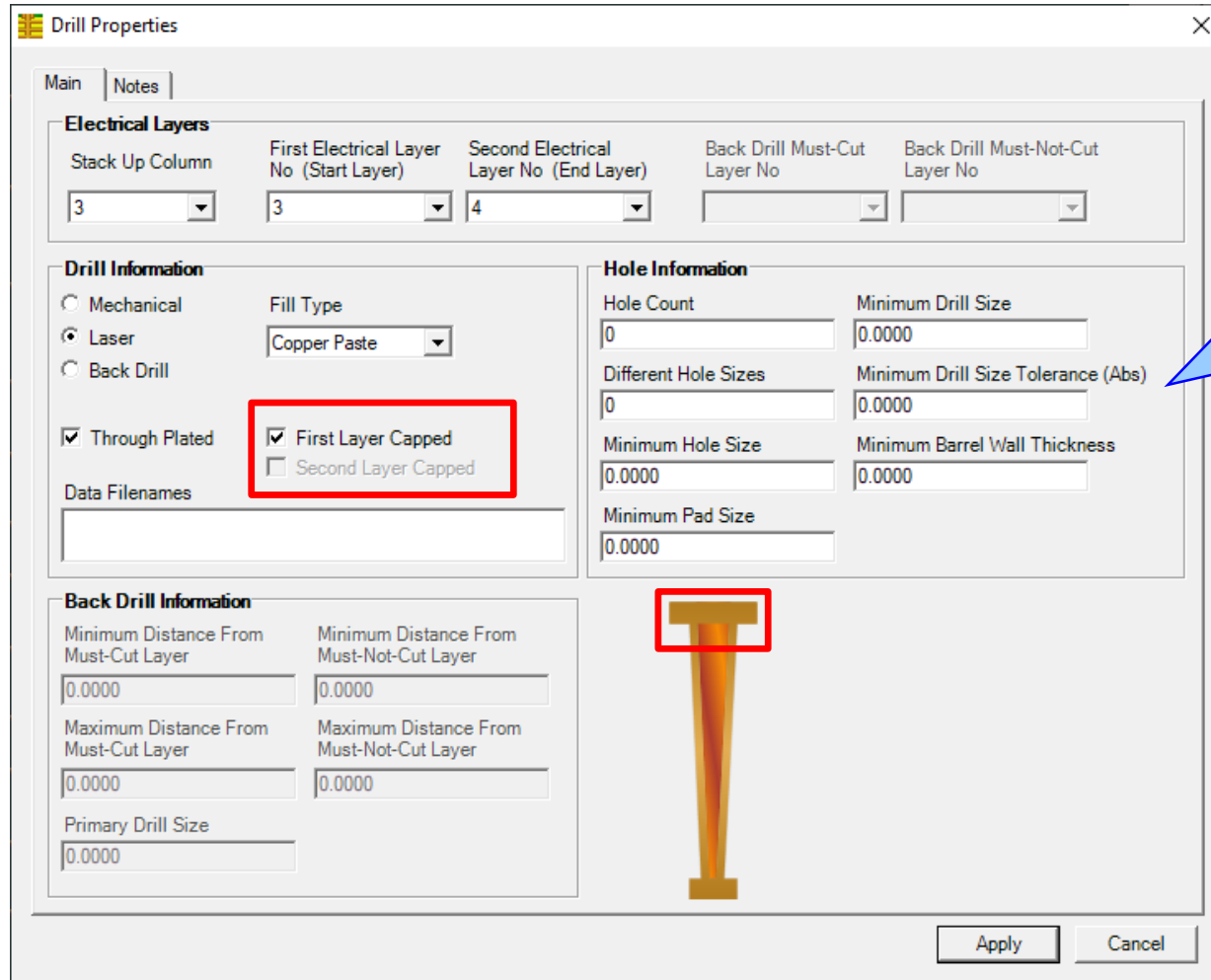


Mechanical

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



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

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stackup of layers with a drill cap feature highlighted in blue. The 'Selected Item Information' panel on the right shows the following data:

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 Size	
Minimum Pad Size	
Minimum Drill Size	
Minimum Drill Size Tolerance	
Minimum Barrel Wall Thickness	
Note 1	
Note 2	
Note 3	
Note 4	
Note 5	

The 'First Layer Capped' and 'Second Layer Capped' fields are highlighted in red, indicating the new feature. A blue callout box points to these fields with the text: "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

Speedstack Report Printer

File Options

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
1		Top	Polar Samples	Liquid PhotImageable Mask	SolderMask	1.000	4.000	0.0195	
2		Inner 2	Polar Samples	Copper Foil	Copper	1.400			1, 2
3		Inner 3	Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
4		Inner 4	Polar Samples	Copper Foil	Copper	1.400			
5		Inner 5	Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
6		Inner 6	Polar Samples	Copper Foil	Copper	1.400			
7		Inner 7	Polar Samples	PrePreg 1080	Dielectric	1.425	4.200	0.0195	
8		Inner 8	Polar Samples	FR4 Core	FR4	2.100			
9		Inner 9	Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
10		Inner 10	Polar Samples	Copper Foil	Copper	1.400			
11		Inner 11	Polar Samples	PrePreg 1080	Dielectric	2.178	4.200	0.0195	
12		Bottom	Polar Samples	Copper Foil	Copper	2.178	4.200	0.0195	3, 4
			Polar Samples	FR4 Core	FR4	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	
			Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	
			Polar Samples	PrePreg 1080	Dielectric	2.100			
			Polar Samples	Copper Foil	Copper	1.400			
			Polar Samples	PrePreg 1080	Dielectric	1.425	4.200	0.0195	
			Polar Samples	Copper Foil	Copper	1.400			
			Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
			Polar Samples	Copper Foil	Copper	1.400			
			Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
			Polar Samples	Copper Foil	Copper	1.400			7, 8
			Polar Samples	PrePreg 1080	Dielectric	1.000	4.000	0.0195	

56.96
54.16

The technical report has also been updated to support capped drills

Imageable 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

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

Order	Material	Thickness	Layer Name
-	SM	4.000/0.0195	Top
1	Foil	Copper Foil	Inner 2
-	PP	PrePreg 1080	Inner 3
2	Core	FR4 Core	Inner 4
3			
-	PP	PrePreg 3080	Inner 5
-	PP	PrePreg 1651	Inner 6
-	PP	PrePreg 1651	Inner 7
4	Core	FR4 Core	Bottom
5			
-	PP	PrePreg 1651	
-	PP	PrePreg 1651	
-	PP	PrePreg 3080	
6	Core	FR4 Core	
7			
-	PP	PrePreg 1080	
8	Foil	Copper Foil	
-	SM	Liquid Photoimageable Mask	
		4.000/0.0195	

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

Edge Coupled Coated Microstrip IB

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

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

Copper

Base Thickness	0.7000	Copper Coverage %	0.00
Finished Thickness	1.4000	Graphical Colour	
Layer Name	Top		
Data Filename			
Trace Inverted	<input type="checkbox"/>	Remove Copper (disabled if structures or sub-stacks exist)	<input type="checkbox"/>
Finishing Applied	<input type="checkbox"/>		

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

Main | Notes | Attributes


General Information

Supplier	Polar Samples	Exchange Copper	<input type="checkbox"/>
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	<input type="checkbox"/>	Remove Copper (disabled if structures or sub-stacks exist)	<input type="checkbox"/>
Finishing Applied	<input type="checkbox"/>		

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	<input checked="" type="checkbox"/>	Remove Copper (disabled if structures or sub-stacks exist)	<input type="checkbox"/>
Finishing Applied	<input type="checkbox"/>		

Apply

Close

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

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack of materials with their properties. The 'Foil' layer is selected, and its properties are shown in the 'Selected Item Information' panel on the right. A red box highlights the 'Layer Name' field, which is set to 'Top'. A blue callout box points to this field with the text: 'The Selected Item Information auto updates as you click each material, the Layer Name can be confirmed here'.

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
=====	

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	

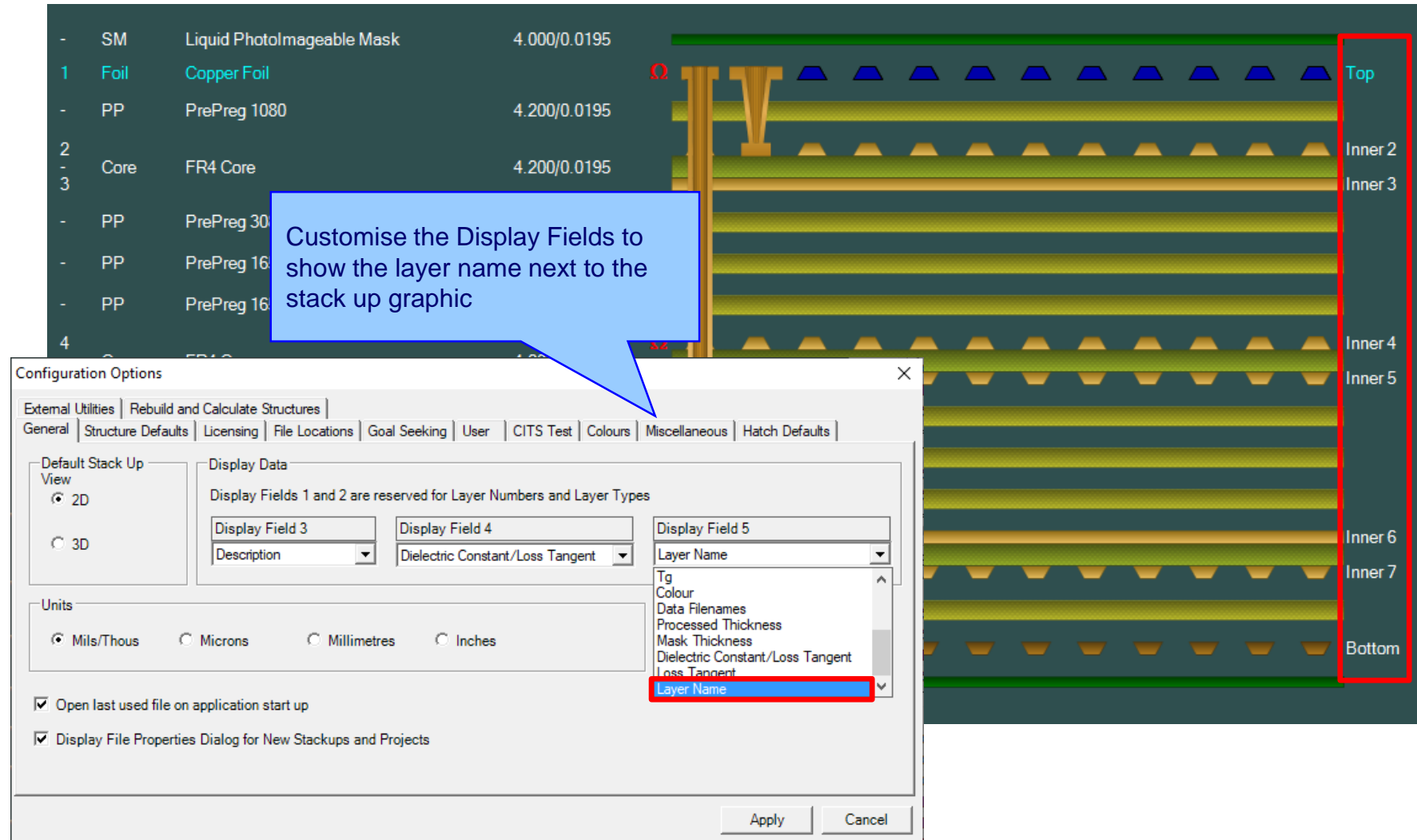
Attributes	

New Layer Name property for electrical / copper layers



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



The screenshot displays a PCB stackup configuration interface. On the left, a table lists the layers:

Order	Type	Material	Thickness
-	SM	Liquid Photolimageable Mask	4.000/0.0195
1	Foil	Copper Foil	
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
3	PP	PrePreg 30	
-	PP	PrePreg 16	
-	PP	PrePreg 16	
4	PP	PrePreg 16	

On the right, a 3D stackup graphic shows the layers with labels: Top, Inner 2, Inner 3, Inner 4, Inner 5, Inner 6, Inner 7, and Bottom. A red box highlights these labels.

A blue callout box points to the stackup graphic with the text: "Customise the Display Fields to show the layer name next to the stack up graphic".

The "Configuration Options" dialog box is open, showing the "Display Data" tab. The "Display Fields 1 and 2 are reserved for Layer Numbers and Layer Types" section is visible. The "Display Field 5" dropdown menu is open, showing a list of properties, with "Layer Name" selected and highlighted by a red box.

New Layer Name property for electrical / copper layers

Speedstack Report Printer

File Options

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

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

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
Date: _____
Author: _____
Department: _____
Site: _____

Version: _____
Associated Documents: _____

Revision: _____
Modification: _____
Date of Revision: _____
Editor: _____

Page 1/X

Copyright © Polar Instruments Ltd

The technical report has also been updated to support layer names

Copper Finishing classes increased

Copper Coverage Based Prepreg Corrections

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	<input checked="" type="radio"/>
Class 2	0.7000	<input type="radio"/>
Class 3	0.7000	<input type="radio"/>
Class 4	0.7000	<input type="radio"/>

Excess Resin Test

Minimum Excess Resin % 15

Apply Cancel

Speedstack v21.04 and earlier supported 4 classes



Copper Coverage Based Prepreg Corrections

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

Apply Cancel

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

Speedstack v21.05 now supports 20 classes

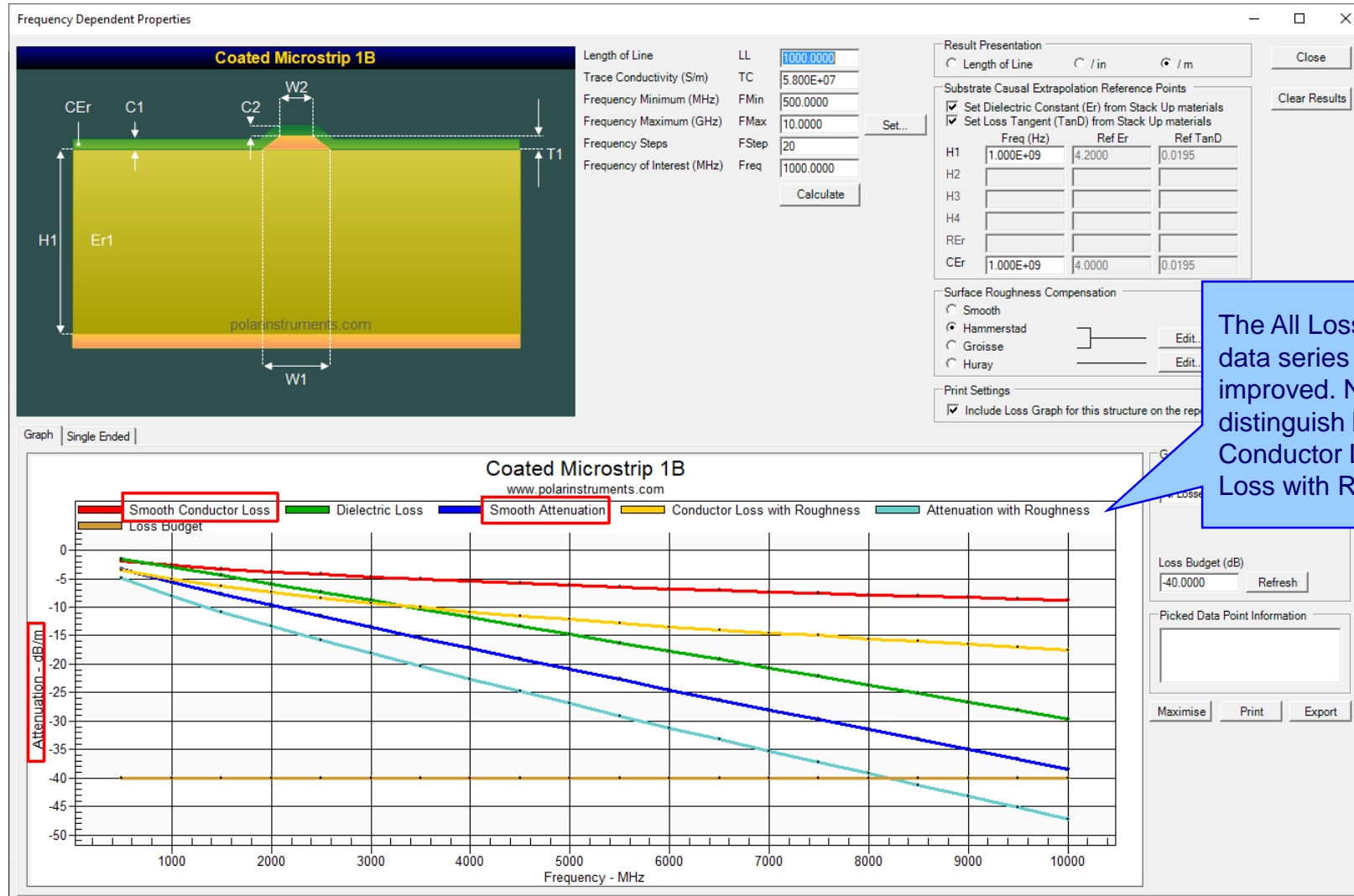
Import / Export enhancements

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



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

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a 3D cross-section of a PCB stack-up with various layers. A toolbar at the top contains several icons, with the 'Apply Plating Colours' icon (a stack of layers with a red circle) highlighted by a red box. A blue callout box points to this icon, stating: "New Apply Plating Colours toolbar option. Toggle between standard and enhanced colours".

On the right side of the interface, there is a 'Stack Up Information' panel with a table of values:

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
=====	

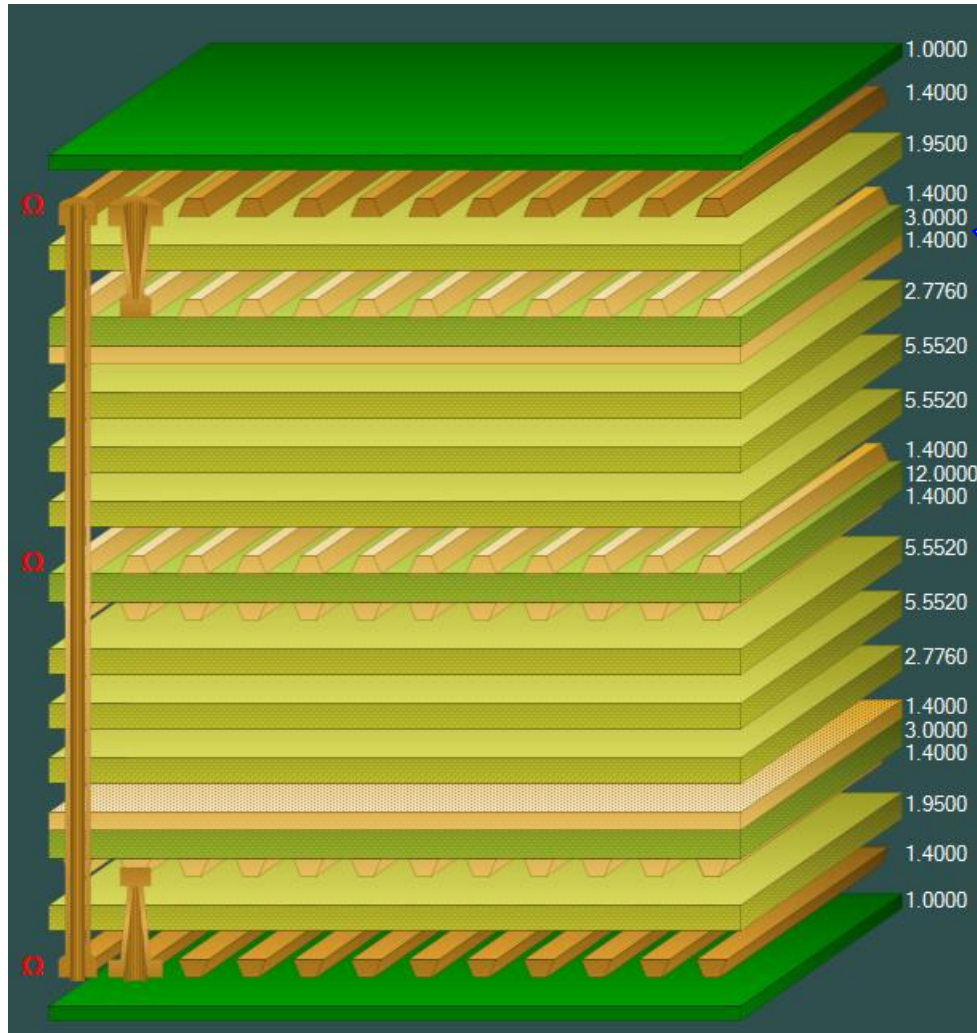
Below this table is a 'Selected Item Information' section which is currently empty.

At the bottom of the interface, a status bar displays the following information: |Mils/Thous |Target Stack Up Thickness = 60.0000 |Stack Up Thickness = 60.8600 |Stack Up Thickness with Soldermask = 62.8600 |V21.03.09

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



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.

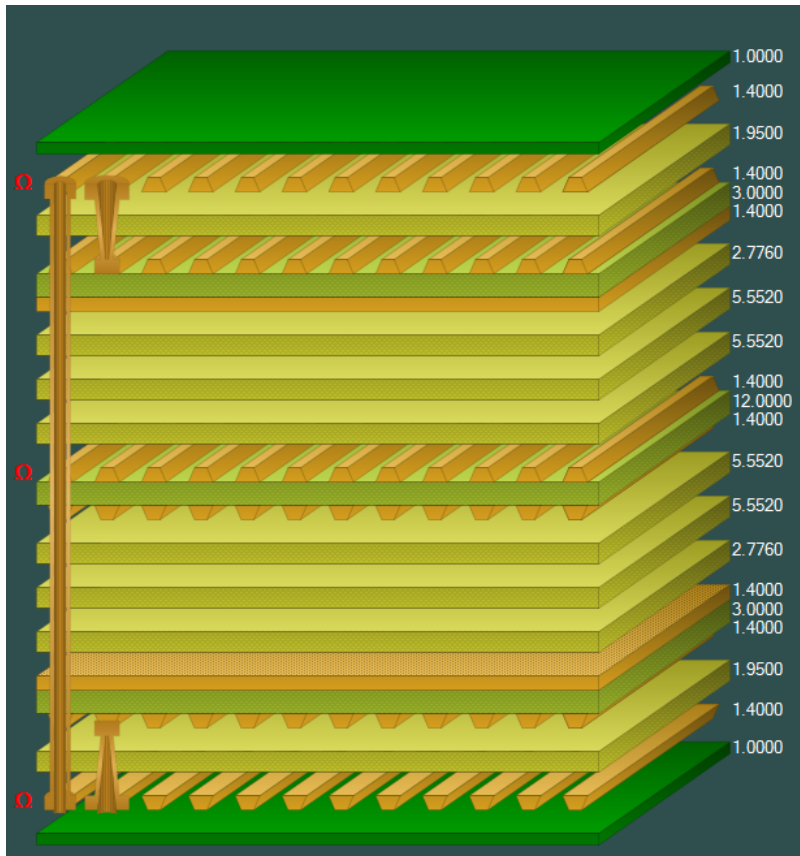
It is important to account for this additional plated copper thickness when calculating the overall stack up thickness and controlled impedance / insertion loss structures.

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 unplated layers

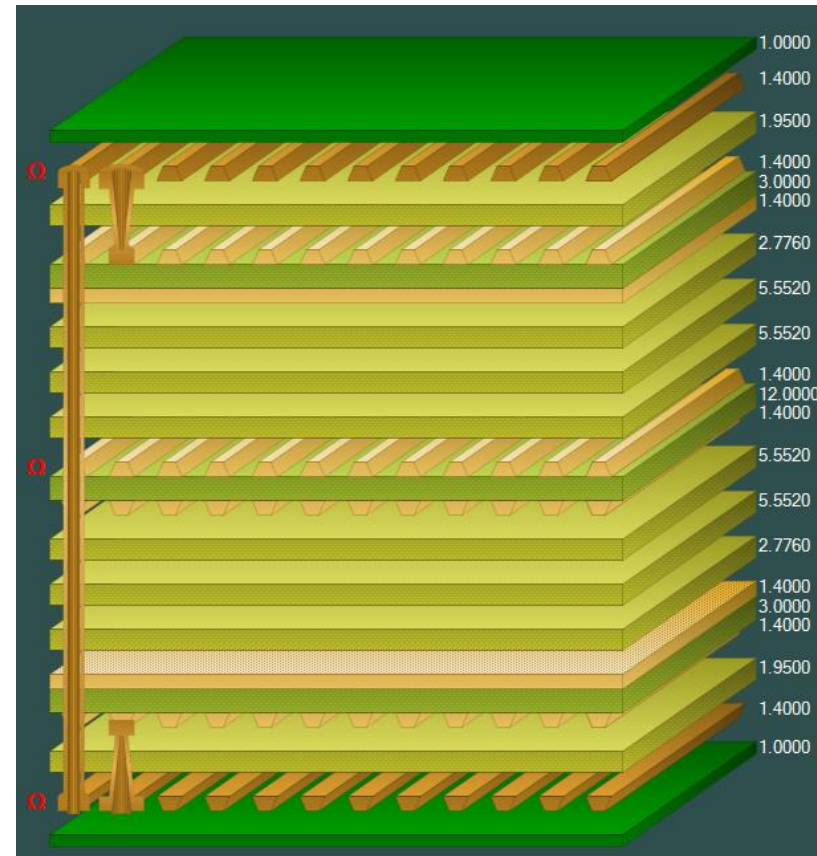
New Apply Plating Colours toolbar option



Standard Colours



Apply Plating Colours



New Apply Plating Colours toolbar option

Speedstack Report Printer

File Options

C:\Appst\Samples\Eval Imperial.sci Units: MILs

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

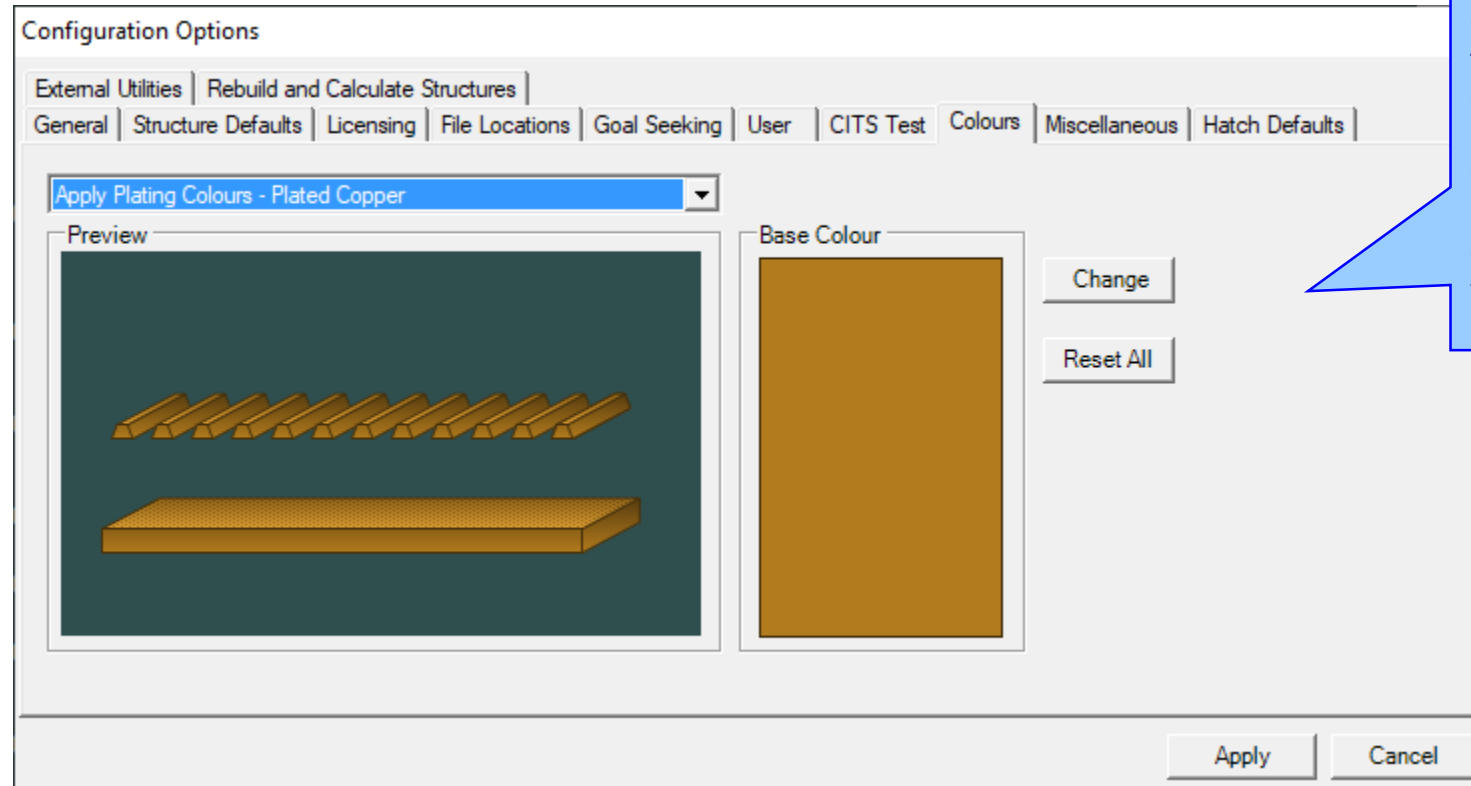
Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	100.000	10.000	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 1/1
Date:	Associated Documents:					
Author:						
Department:						
Site:						

Copyright © Polar Instruments 2022 / 23

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

New Apply Plating Colours toolbar option



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

The screenshot shows the 'Online Library' window with several callouts:

- Filter by Supplier:** Callouts highlight the logos for **SHOWA DENKO** and **TATSUTA**, with a note: "Showa Denko and Tatsuta have recently joined the Polar Material Partner program".
- File Type:** A list of file types including Foils, RCCs, PrePregs, Cores, SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, FlexCores, and Shields.
- Filter by Frequency:** A callout points to the frequency filter options (All, 1 GHz, 5 GHz, 10 GHz, 20 GHz, 50 GHz, 75 GHz) with the text: "Filter downloadable libraries by frequency. The frequency of the dielectric constant (Er) / loss tangent (TanD) material properties".
- Existing Data Table:** Callouts explain the 'Clear' and 'Append' options: "Clear - use this option to clear data from the existing library data table and download a single library" and "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:** A callout points to the 'On-Premise Mode' section, which includes a text box with the path "C:\Users\vicha\Desktop\Material_Library_2021" and a 'Browse...' button. The note says: "Improvements to On-Premise Mode to help users where, for security reasons, no Internet connection is available".

At the bottom, a 'Please Note' message states: "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 v21.02.01 (February 2021)

New Shield material

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a 3D stack-up model and a table of layers. A red box highlights the top layer, which is an EMI Shield Film. The table below shows the following configuration:

Layer	Type	Material	Thickness
1	Shield	EMI Shield Film	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
4	Shield	EMI Shield Film	4.200/0.0195

At the bottom of the interface, the status bar shows: 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

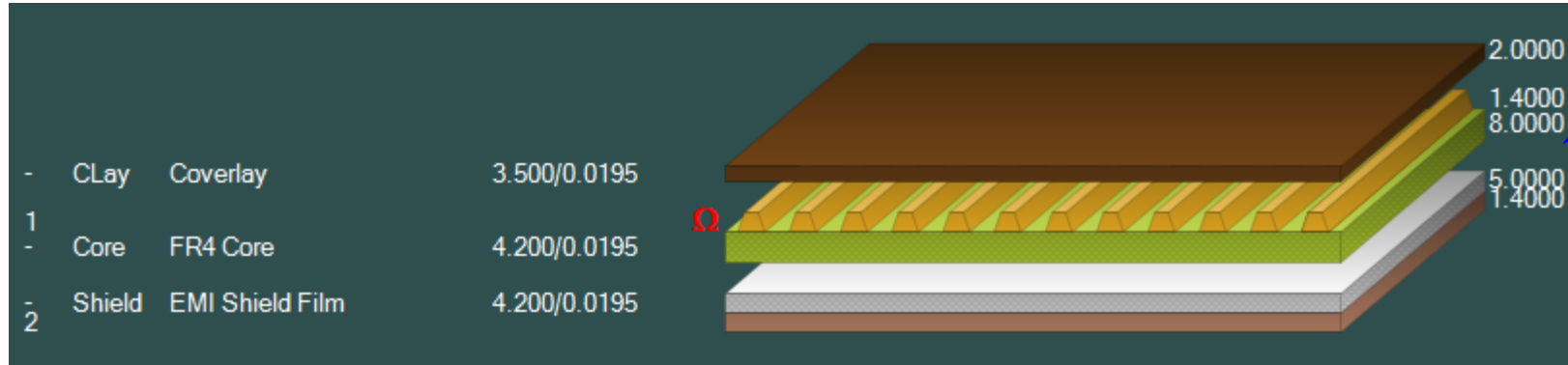
Shields are typically applied to the outer layer(s) of the stack up

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

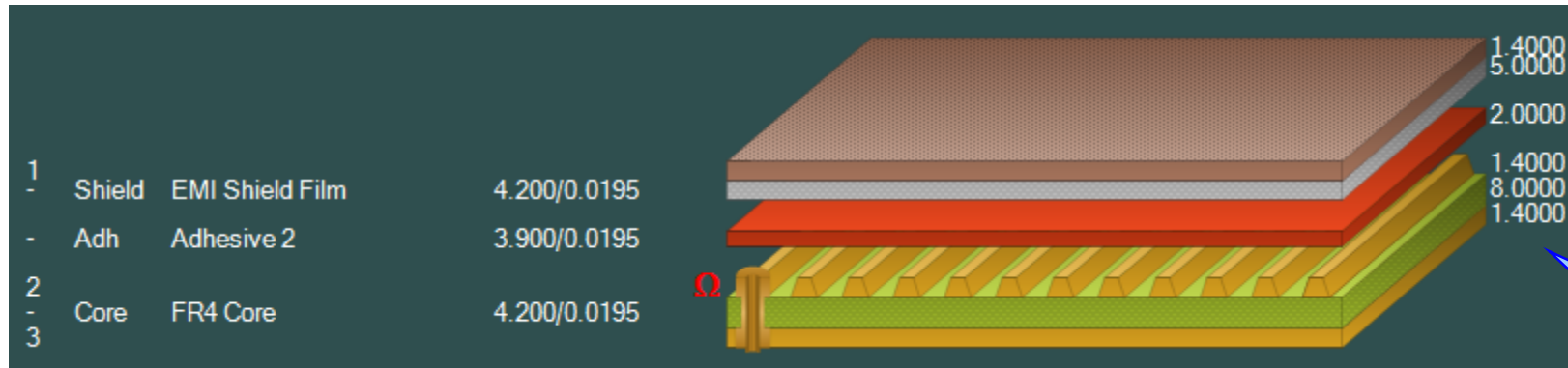


They consist of a shield layer (brown) and dielectric adhesive (silver)

Shield material examples

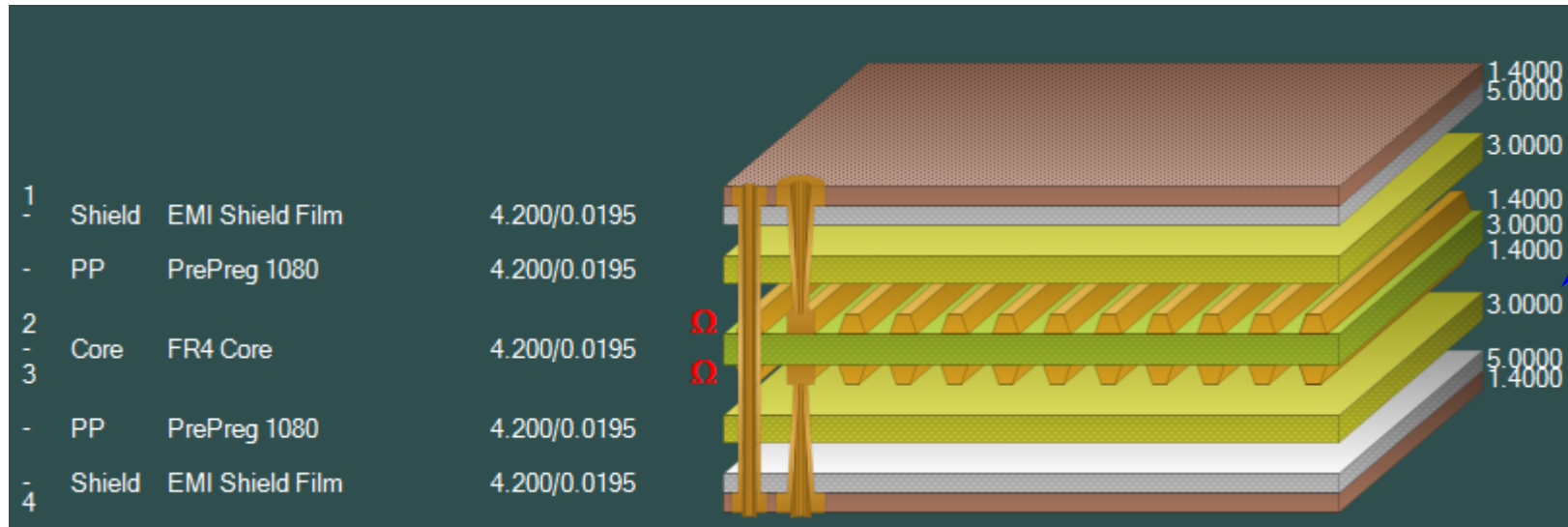


Example #1
Single-sided core,
coverlay above trace,
shield below

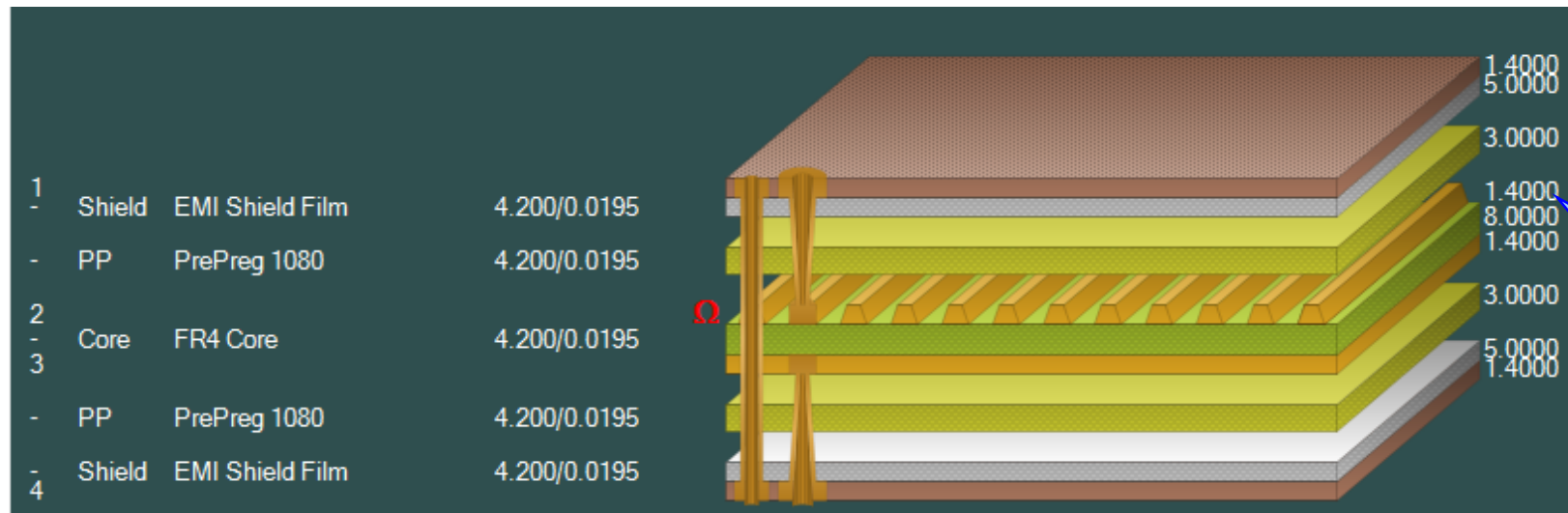


Example #2
Double-sided core,
adhesive and shield
above

Shield material examples

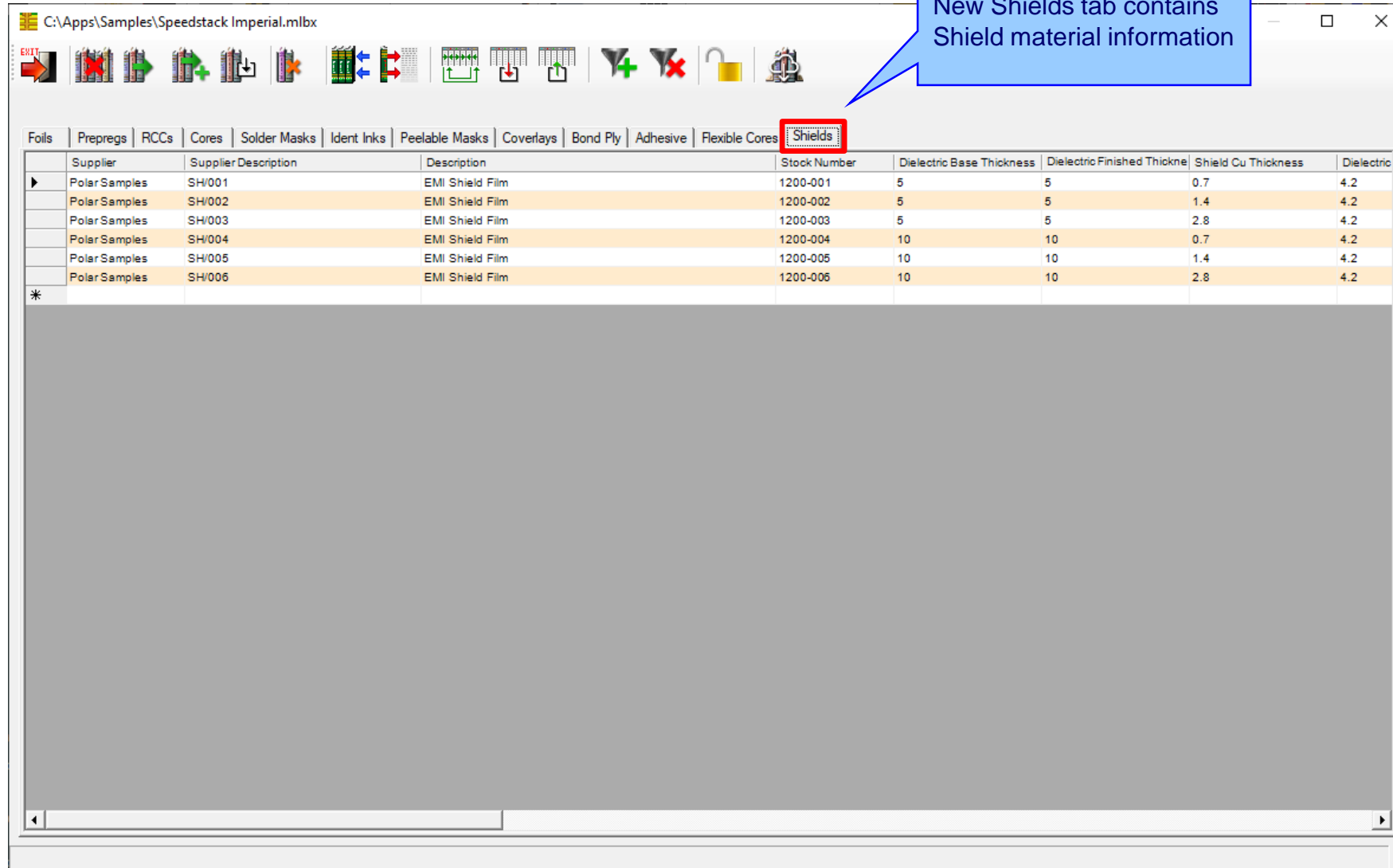


Example #3
Double-sided core with two signal trace layers with shield above and below trace layers



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

Material library enhancements



The screenshot shows the Speedstack software interface with the 'Shields' tab selected in the material library. The 'Shields' tab is highlighted with a red box. A blue callout box points to the 'Shields' tab with the text 'New Shields tab contains Shield material information'.

	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
*								

Material library enhancements

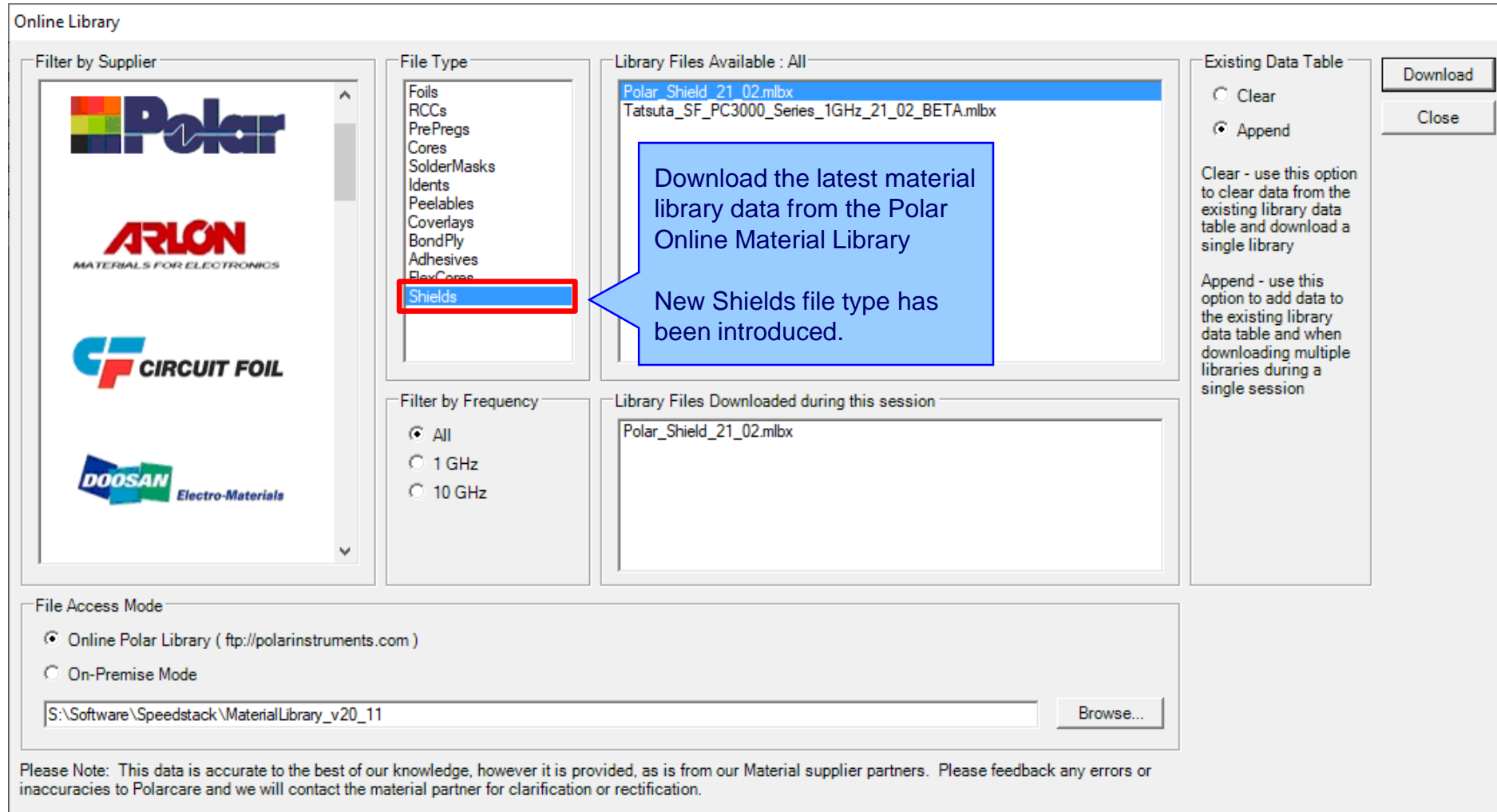
Review/Edit Shield

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

1 of 6

Material library Edit Shield dialog

Online Library enhanced to support Shield materials

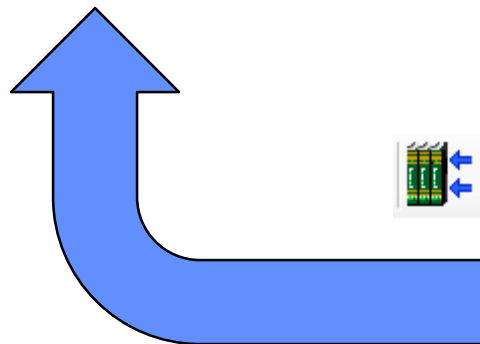
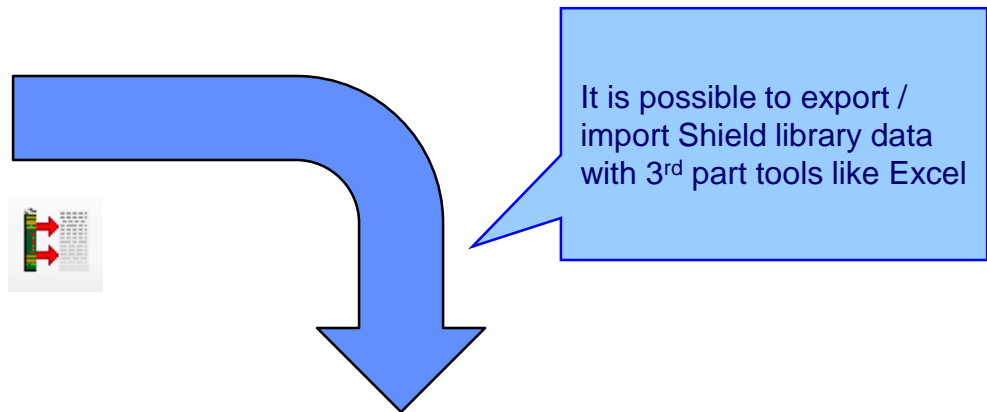


The screenshot displays the 'Online Library' interface with the following components:

- Filter by Supplier:** A list of suppliers including Polar, ARLON (MATERIALS FOR ELECTRONICS), CIRCUIT FOIL, and DOOSAN Electro-Materials.
- File Type:** A list of material types including Foils, RCCs, PrePregs, Cores, SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, FlexCores, and **Shields** (highlighted with a red box).
- Library Files Available:** A list of files including 'Polar_Shield_21_02.mlbx' and 'Tatsuta_SF_PC3000_Series_1GHz_21_02_BETA.mlbx'. A blue callout box points to this section with the text: 'Download the latest material library data from the Polar Online Material Library' and 'New Shields file type has been introduced.'
- Filter by Frequency:** Radio buttons for 'All' (selected), '1 GHz', and '10 GHz'.
- Library Files Downloaded during this session:** A list containing 'Polar_Shield_21_02.mlbx'.
- Existing Data Table:** Radio buttons for 'Clear' and 'Append' (selected). Below are instructions: 'Clear - use this option to clear data from the existing library data table and download a single library' and 'Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session'.
- Buttons:** 'Download' and 'Close' buttons are located at the top right.
- File Access Mode:** Radio buttons for 'Online Polar Library (ftp://polarinstruments.com)' (selected) and 'On-Premise Mode'. Below is a text input field containing 'S:\Software\Speedstack\MaterialLibrary_v20_11' and a 'Browse...' button.
- Disclaimer:** A note at the bottom states: '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.'

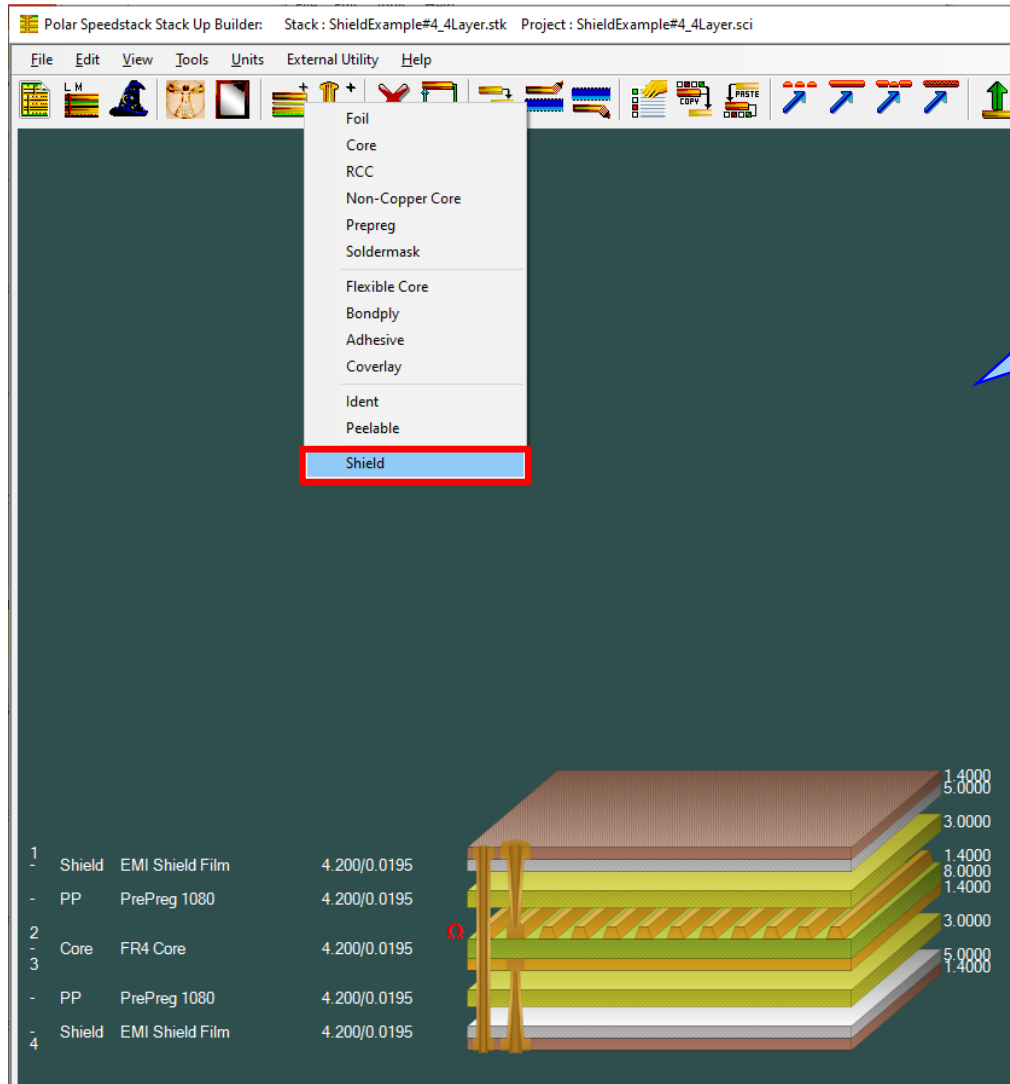
Export / Import Shield library to Excel

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickness	Shield Cu Thickness	Dielectric
Polar Samples	SH001	EMI Shield Film	1200-001	5	5	0.7	4.2
Polar Samples	SH002	EMI Shield Film	1200-002	5	5	1.4	4.2
Polar Samples	SH003	EMI Shield Film	1200-003	5	5	2.8	4.2
Polar Samples	SH004	EMI Shield Film	1200-004	10	10	0.7	4.2
Polar Samples	SH005	EMI Shield Film	1200-005	10	10	1.4	4.2
Polar Samples	SH006	EMI Shield Film	1200-006	10	10	2.8	4.2



Type	Supplier	Supplier Description	Description	Stock Number	Shield Cu Thickness	Dielectric Base Thickness	Dielectric Finished Thickness	Dielectric Constant	Dielectric Loss Tangent	Dielectric Resin Content	Tg	Td	CAF Resistance	ZAxisExpansion	ExcessResin	Tolerance	LaserDrillable	
Shield	Polar Samples	SH/001	EMI Shield Film	1200-001	0.7	5	5	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/002	EMI Shield Film	1200-002	1.4	5	5	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/003	EMI Shield Film	1200-003	2.8	5	5	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/004	EMI Shield Film	1200-004	0.7	10	10	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/005	EMI Shield Film	1200-005	1.4	10	10	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/006	EMI Shield Film	1200-006	2.8	10	10	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE

Stack up editor enhancements



Stack Up editor enhancements:
Shield material options to add, delete, swap, move up, move down, symmetry and set properties

Shield properties

Shield Properties

Main | Notes | Attributes

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

Shield Dielectric

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

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

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

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

Controlled impedance and insertion loss calculations

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a 3D stack up model with a red box highlighting the top layer, labeled 'Shield material in stack up'. Below the model is a table listing the layers:

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

On the right side, the 'Controlled Impedance' results are shown:

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

Impedance and insertion calculations support the new Shield material type.

Shield material region of structure.

Shield material in stack up

Shield adhesive height / thickness dimension and dielectric constant.

Controlled impedance and insertion loss calculations

Shield material region of structure.

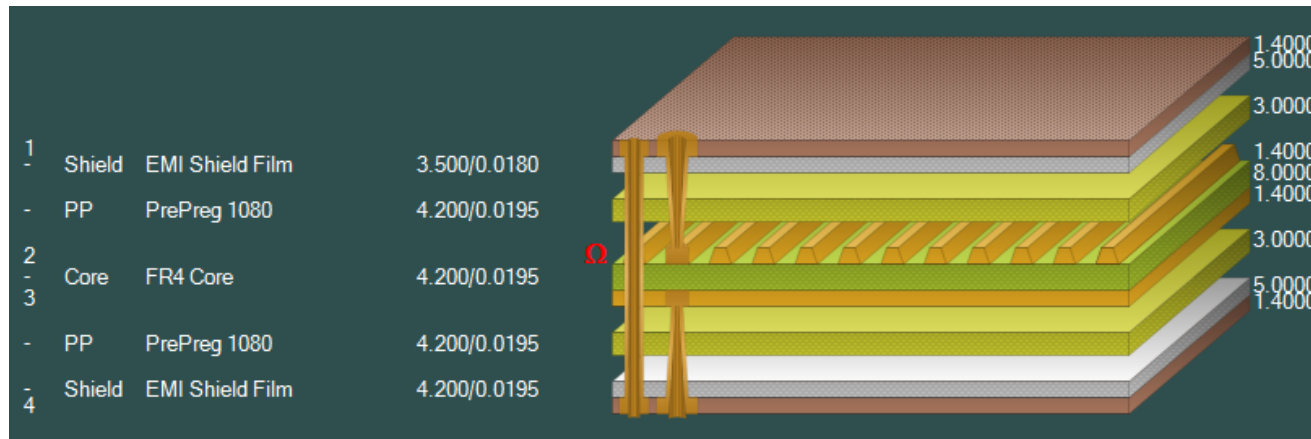
Substrate Causal Extrapolation Reference Points			
	Freq (Hz)	Ref Er	Ref TanD
H1	1.000E+09	4.2000	0.0195
H2	1.000E+09	4.2000	0.0195
H3	1.000E+09	3.5000	0.0180
H4			
REr			
CEr			

Shield adhesive dielectric constant / loss tangent.

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’.



Technical report enhancements

Technical report showing shield materials

Speedstack Report Printer
File Options

C:\Apps\Samples\ShieldExample\F5_4layer.sci Units: Mils

Layer	Stack up	Supplier	Description	Type	Processed Thickness	ϵ_r	Loss Tangent	Impedance ID
1		Polar Samples	EMI Shield Film	Shield	1.400			
		Polar Samples	PrePreg 1080	Dielectric	3.000	3.500	0.0180	
		Polar Samples	FR4 Core	FR4	1.400	4.200	0.0195	1, 2
		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
2		Polar Samples	EMI Shield Film	Shield	1.400			
		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
3		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
		Polar Samples	EMI Shield Film	Shield	1.400	4.200	0.0195	
4		Polar Samples	EMI Shield Film	Shield	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	8.800	100.000	10.000	100.010

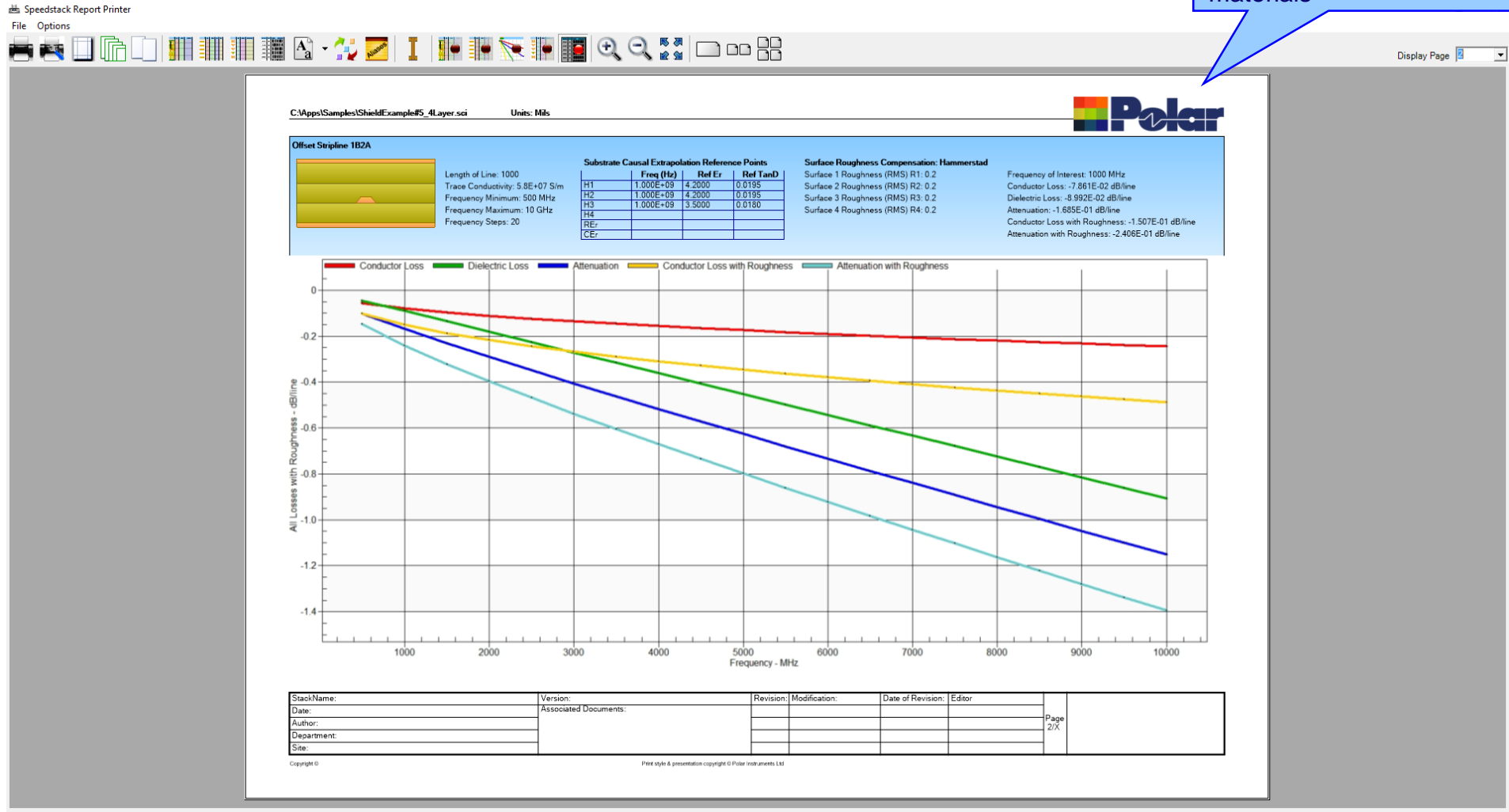
Drill Image	1st Layer	2nd Layer	Column Position	Drill Type
	1	2	2	Laser PTH
	1	4	1	Mechanical PTH
	4	3	2	Laser PTH

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

Copyright © Polar Instruments Ltd

Technical report enhancements

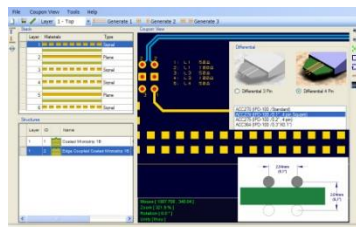
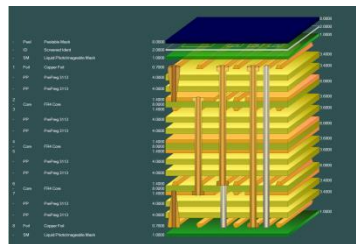
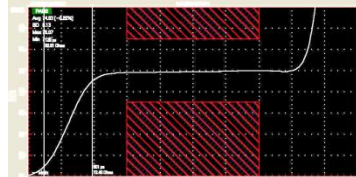
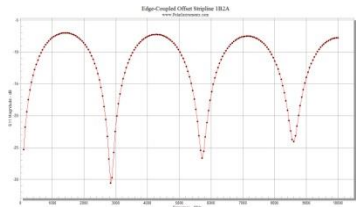
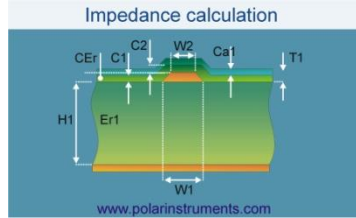
Insertion loss report supporting shield materials



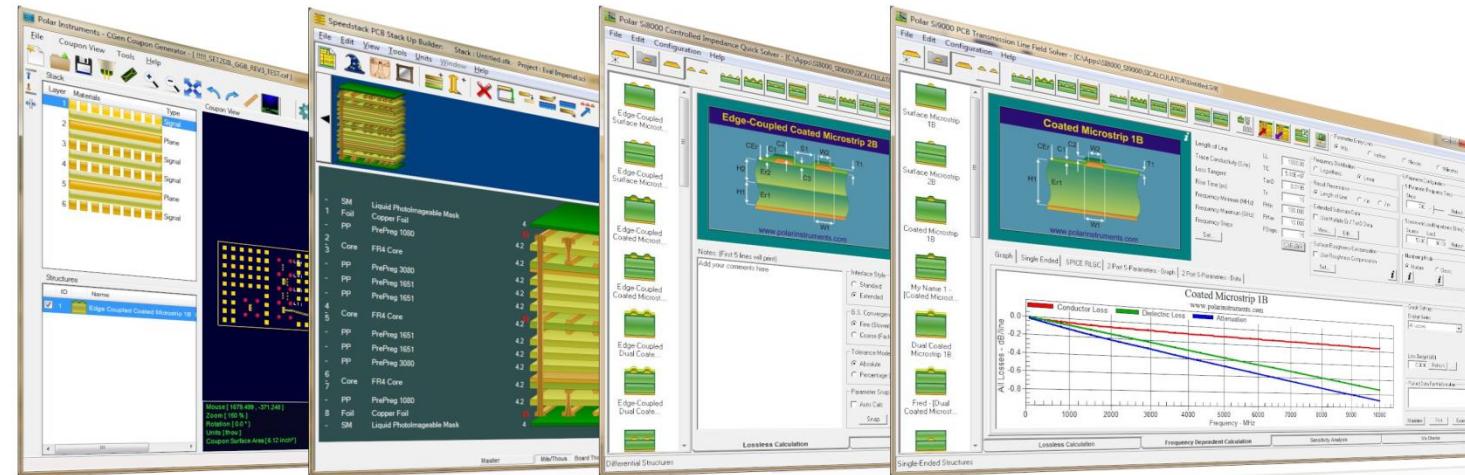
Import / Export enhancements

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

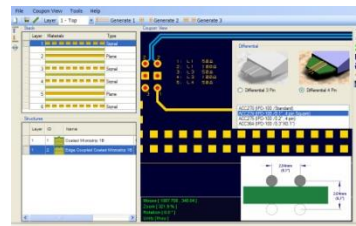
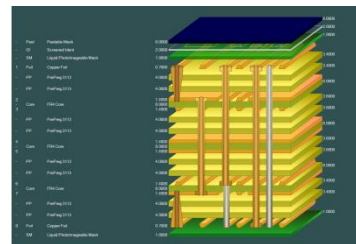
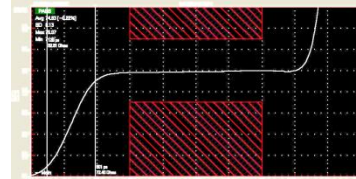
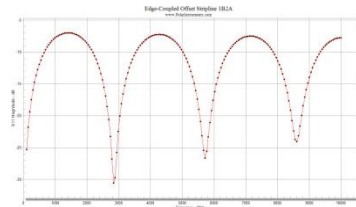
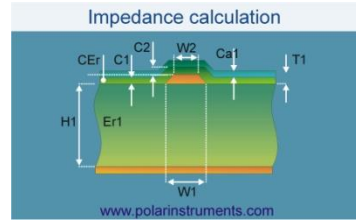
- XML STKX v20.00 and SSX v10.00 import / export options
- CSV export option
- Gerber / DXF export option



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



Polar Logo & graphic devices are registered trade marks of Polar Instruments Ltd.
Copyright Polar Instruments Ltd (c) 2022 / 23



For more information:
Contact Polar:

Phone

USA / Canada / Mexico
[Erik Bateham](#)

(503) 356 5270

Asia / Pacific
[Terence Chew](#)

+65 6873 7470

UK / Europe
[Neil Chamberlain](#)

+44 23 9226 9113

Germany / Austria / Switzerland
[Hermann Reischer](#)

+43 7666 20041-0

Polar Logo & graphic devices are registered trade marks of Polar Instruments Ltd.
Copyright Polar Instruments Ltd (c) 2022 / 23

polarinstruments.com