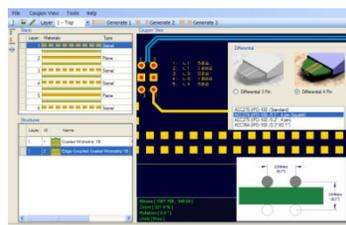
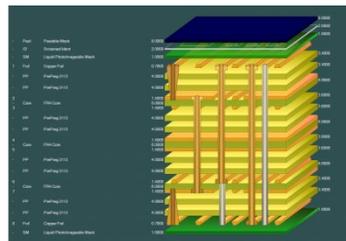
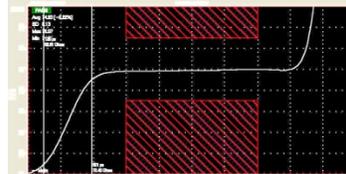
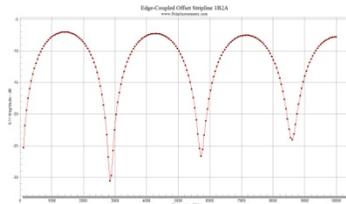
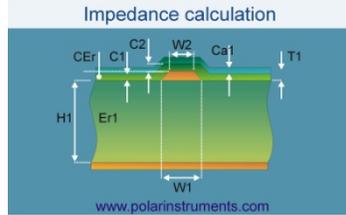




Speedstack 2021 Preview

Richard Attrill – November 2021 (Rev 5)



Introducing Speedstack 2021

Welcome to a preview of Speedstack 2021.

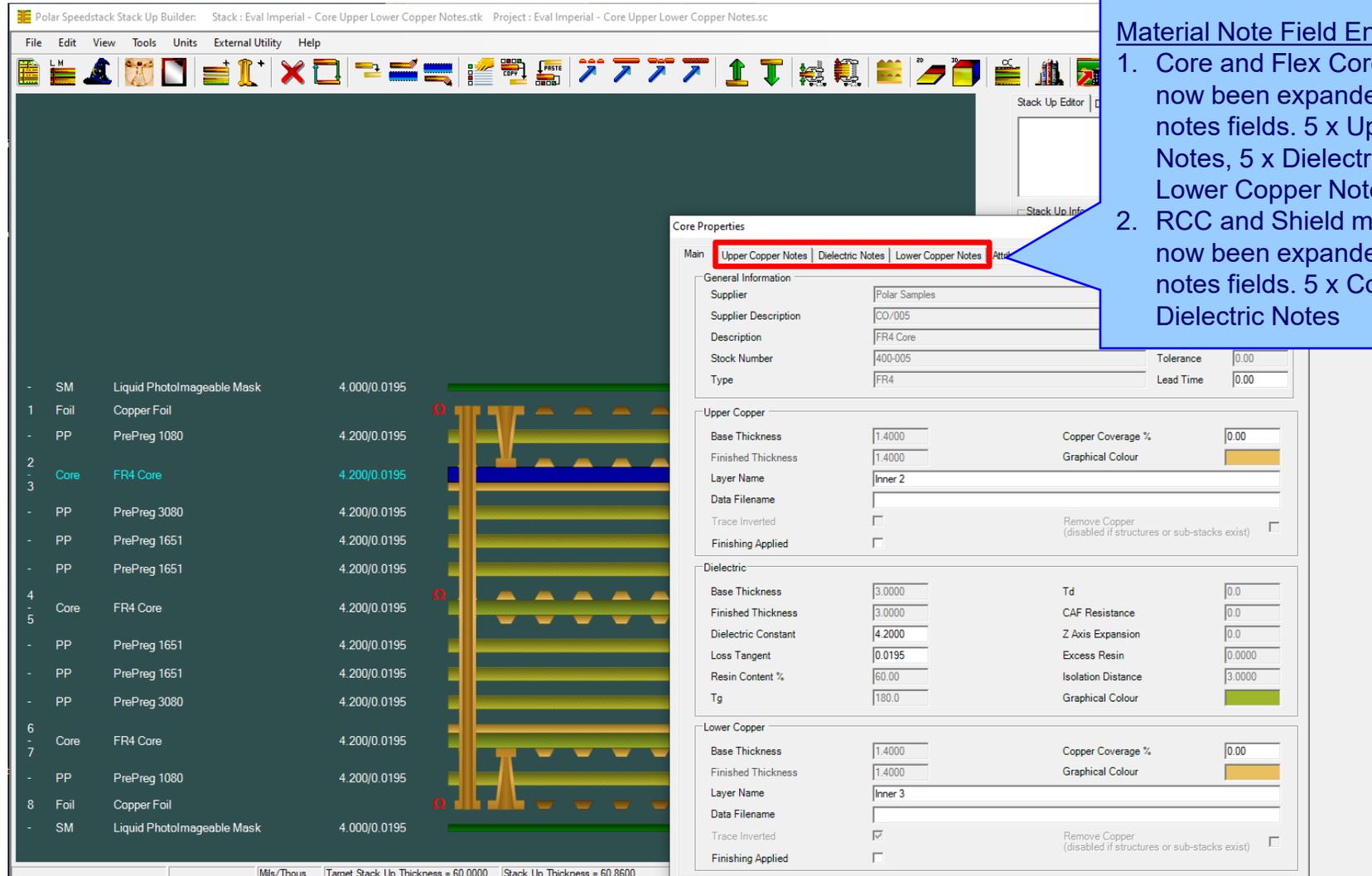
We have introduced a number of new features that have been requested through our Polarcare software maintenance service.

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

Please note: the Speedstack units have been set to Mils in the following screen grabs

Speedstack v21.11.01 (November 2021)

Material Note Field Enhancements – improvements to stack up documentation



The screenshot shows the Polar Speedstack Stack Up Builder interface. On the left, a list of materials is displayed with their thicknesses and a corresponding 3D cross-section of the stack up. The materials include Liquid Photolmageable Mask, Copper Foil, PrePreg 1080, FR4 Core, PrePreg 3080, PrePreg 1651, and another FR4 Core layer. The 3D view shows alternating layers of copper (yellow) and prepreg/core (green and blue).

The 'Core Properties' dialog box is open, showing tabs for 'Main', 'Upper Copper Notes', 'Dielectric Notes', and 'Lower Copper Notes'. The 'Upper Copper Notes' tab is selected and highlighted with a red box. The dialog contains the following information:

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

Upper Copper	
Base Thickness	1.4000
Finished Thickness	1.4000
Copper Coverage %	0.00
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"/>

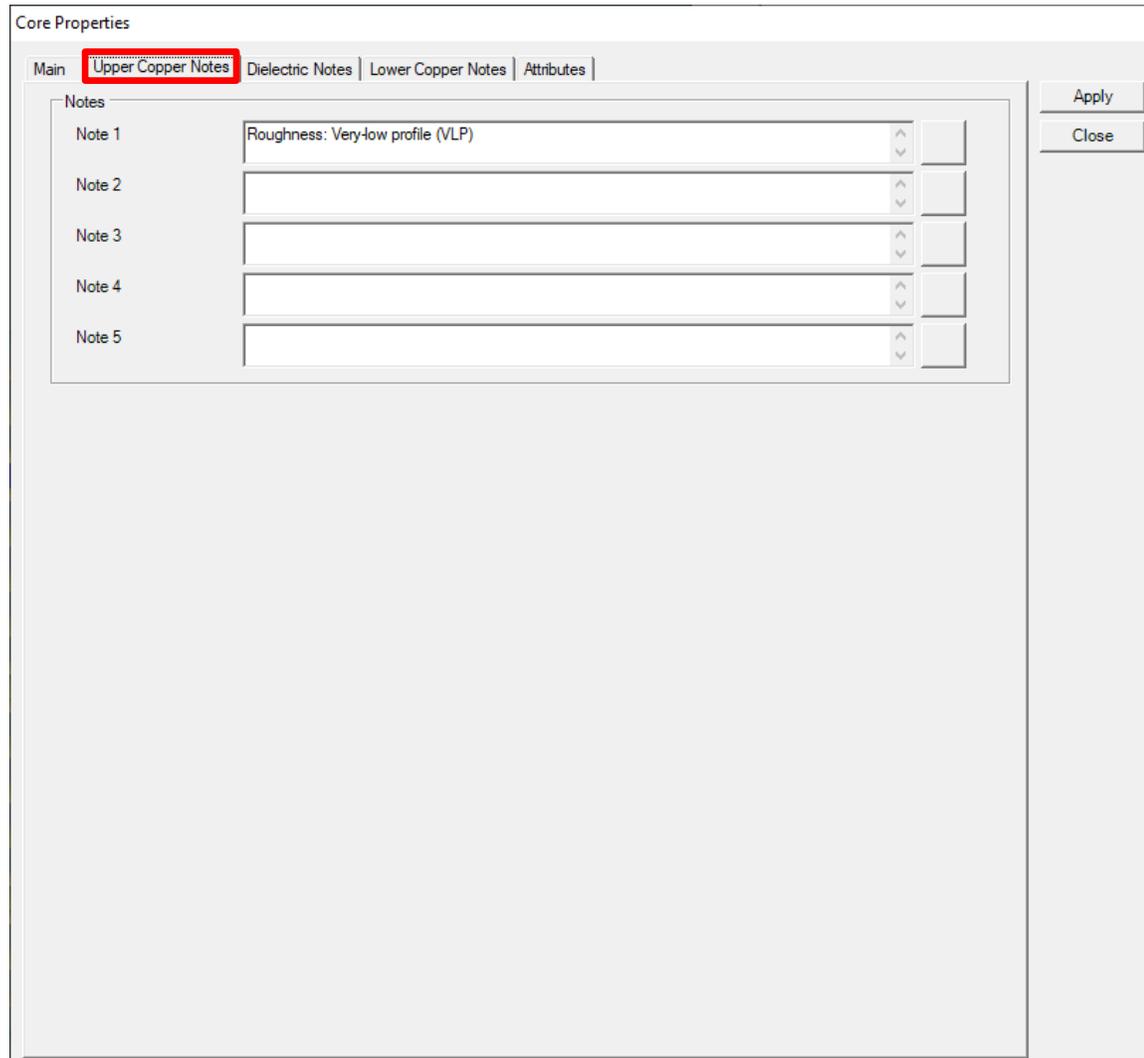
Dielectric	
Base Thickness	3.0000
Finished Thickness	3.0000
Td	0.0
Dielectric Constant	4.2000
CAF Resistance	0.0
Loss Tangent	0.0195
Z Axis Expansion	0.0
Resin Content %	60.00
Excess Resin	0.0000
Tg	180.0
Isolation Distance	3.0000
Graphical Colour	

Lower Copper	
Base Thickness	1.4000
Finished Thickness	1.4000
Copper Coverage %	0.00
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"/>

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

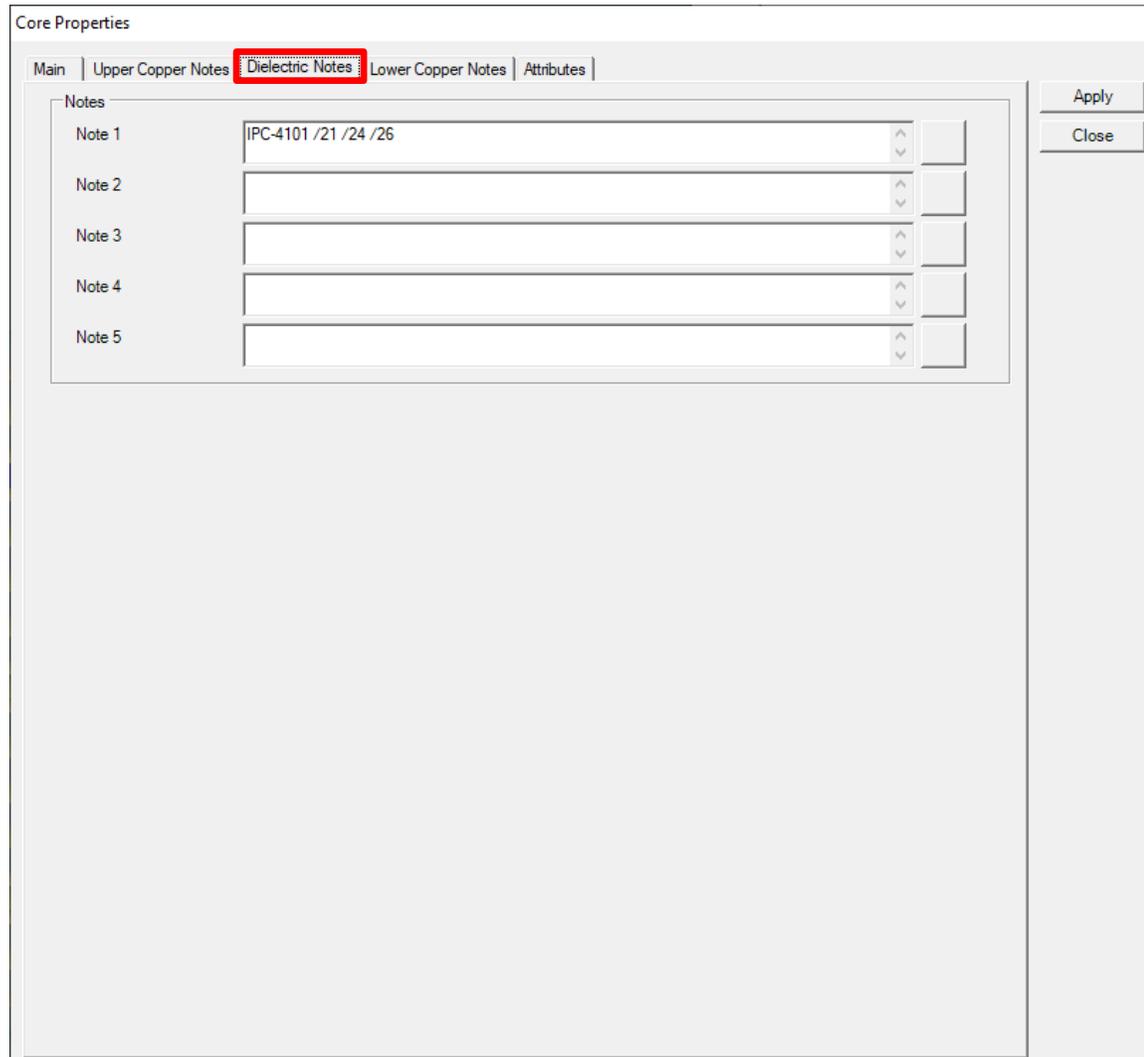
Apply

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



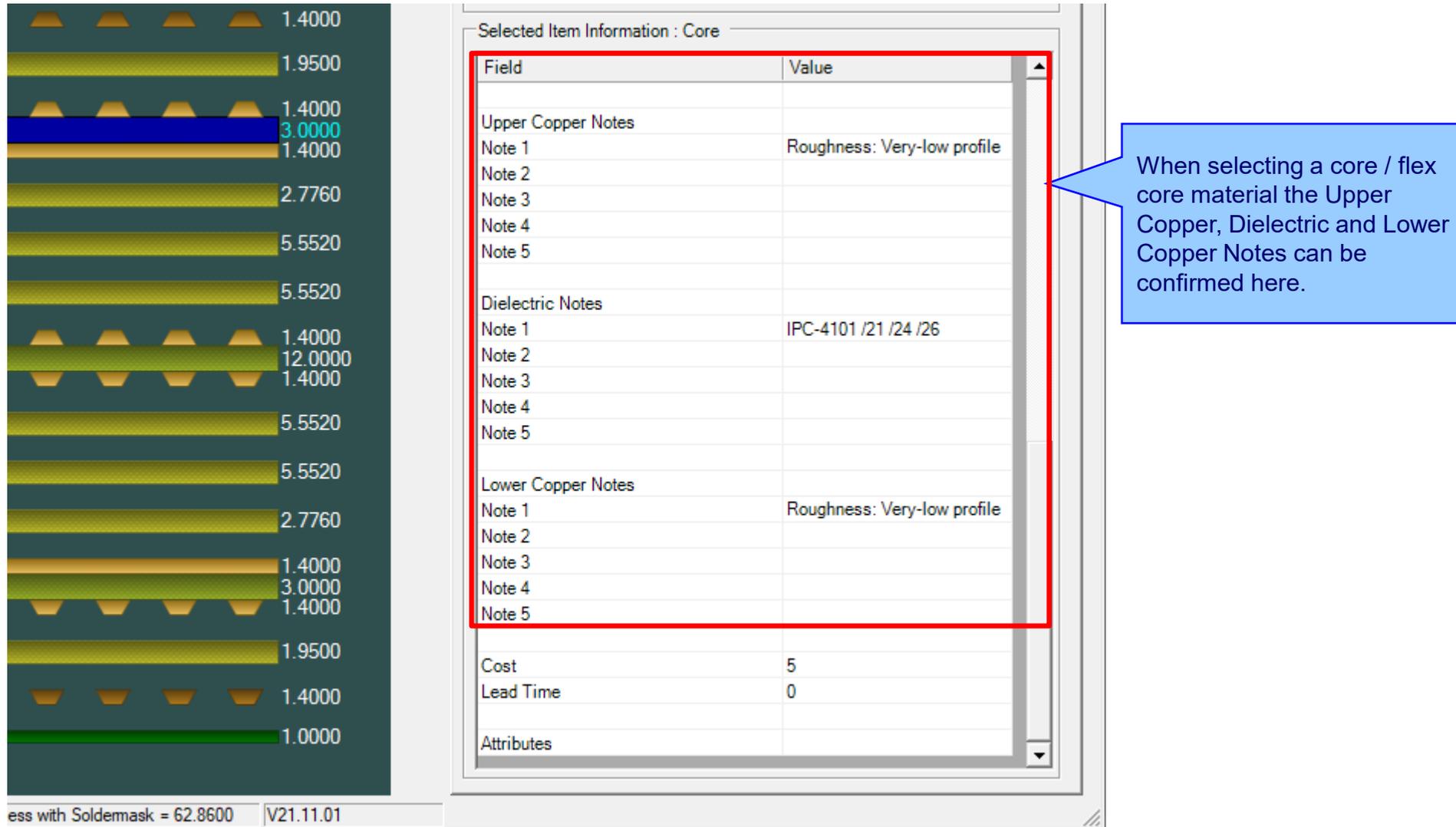
The screenshot shows the 'Core Properties' dialog box with the 'Dielectric Notes' tab selected. The 'Notes' section contains five text input fields labeled 'Note 1' through 'Note 5'. 'Note 1' contains the text 'IPC-4101 /21 /24 /26'. To the right of the input fields are two buttons: 'Apply' and 'Close'.

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

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	

ess with Soldermask = 62.8600 | V21.11.01

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"/>

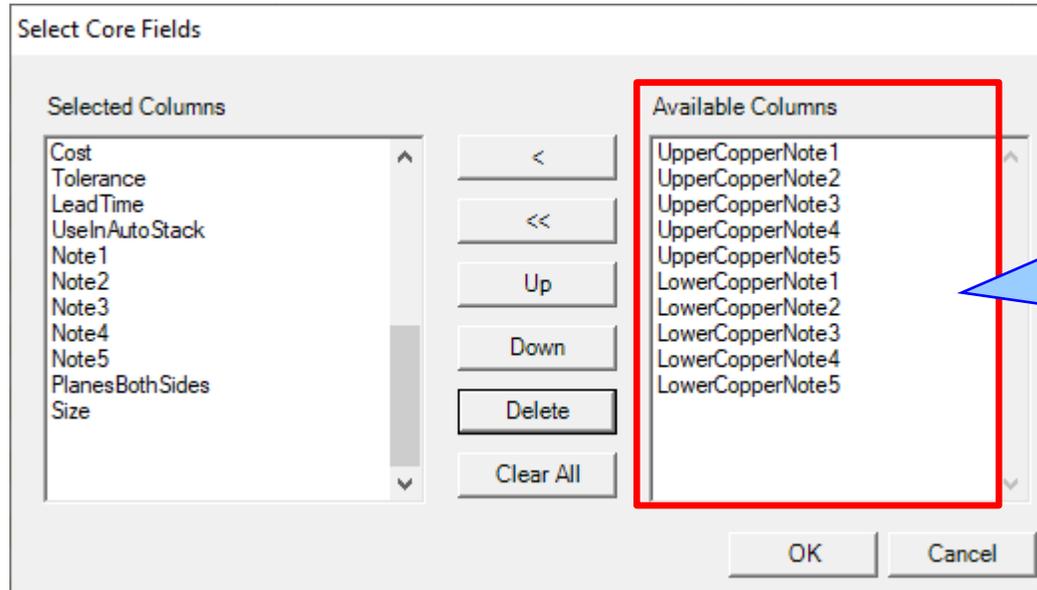
Upper Copper Notes		Dielectric Notes		Lower Copper Notes	
Note 1	Roughness: Very-low profile (VLP)	Note 1	IPC-4101 /21 /24 /26	Note 1	Roughness: Very-low profile (VLP)
Note 2		Note 2		Note 2	
Note 3		Note 3		Note 3	
Note 4		Note 4		Note 4	
Note 5		Note 5		Note 5	

<< < 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

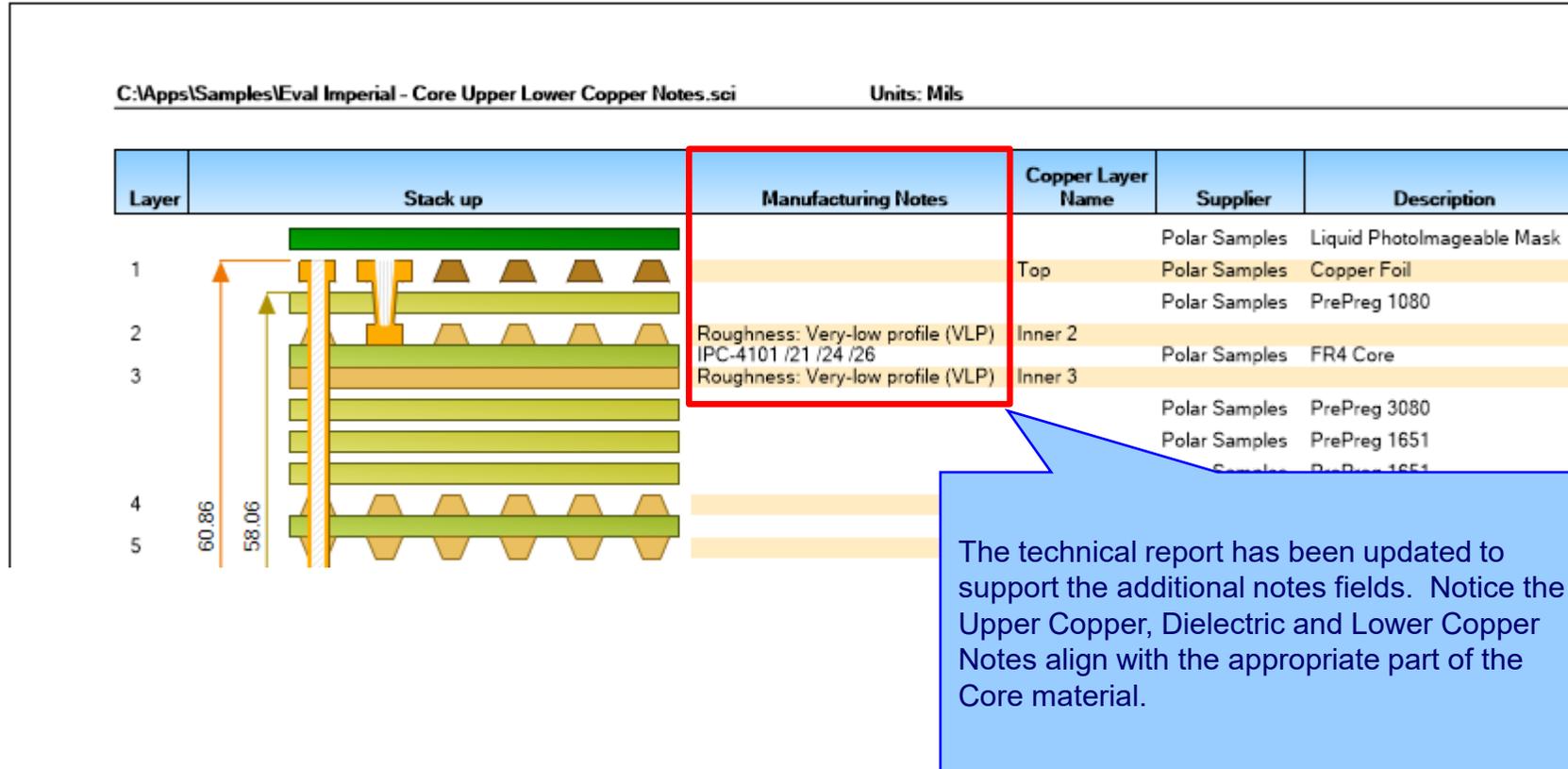


Material Library Import / Export

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 list on the left and a 3D cross-section view on the right. A red box highlights a specific feature in the stack up, which is a drill cap. The stack up list includes layers such as SM (Liquid Photolmageable Mask), Foil (Copper Foil), PP (PrePreg 1080), and Core (FR4 Core). The 3D view shows a cross-section of the stack up with a drill cap structure highlighted in red. The drill cap is a conductive lid added to the via hole during fabrication.

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

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

Coiled Microstrip 18

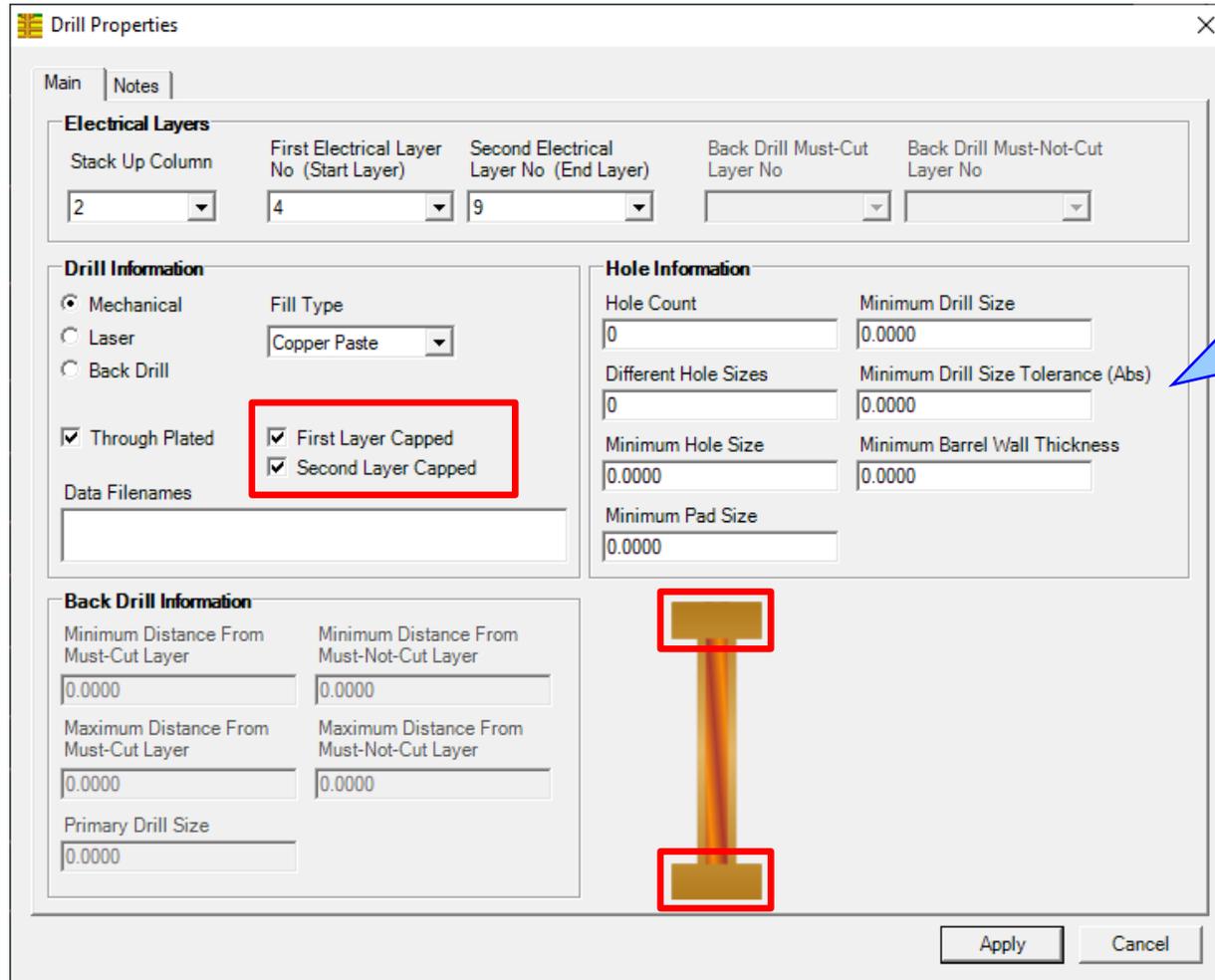
Substrate 1 Height H1 13.2250
 Substrate 1 Dielectric Er1 4.2000
 Lower Trace Width W1 10.1563
 Upper Trace Width W2 9.1563
 Trace Thickness T1 1.4000
 Coating Above Substrate C1 1.0000
 Coating Above Trace C2 1.0000

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

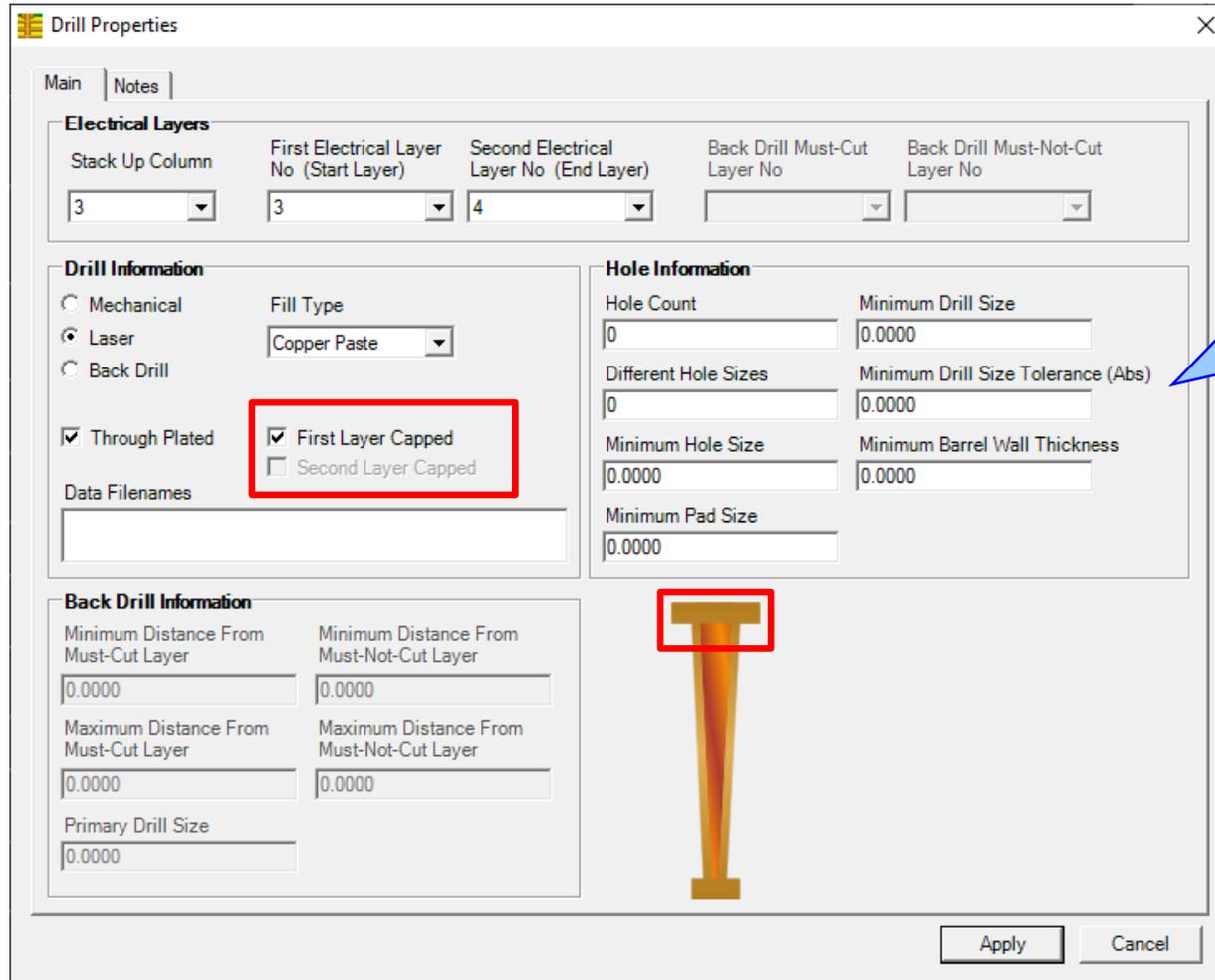


Mechanical

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

Main | Notes

Electrical Layers

Stack Up Column	First Electrical Layer No (Start Layer)	Second Electrical Layer No (End Layer)	Back Drill Must-Cut Layer No	Back Drill Must-Not-Cut Layer No
3	3	4		

Drill Information

Mechanical Laser Back Drill

Fill Type: Copper Paste

Through Plated

First Layer Capped Second Layer Capped

Data Filenames: []

Hole Information

Hole Count	Minimum Drill Size
0	0.0000
Different Hole Sizes	Minimum Drill Size Tolerance (Abs)
0	0.0000
Minimum Hole Size	Minimum Barrel Wall Thickness
0.0000	0.0000
Minimum Pad Size	
0.0000	

Back Drill Information

Minimum Distance From Must-Cut Layer	Minimum Distance From Must-Not-Cut Layer
0.0000	0.0000
Maximum Distance From Must-Cut Layer	Maximum Distance From Must-Not-Cut Layer
0.0000	0.0000
Primary Drill Size	
0.0000	

Apply Cancel

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 stack-up of materials and a 3D model of a drill. 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	

A blue callout box points to the 'First Layer Capped' and 'Second Layer Capped' fields, containing 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
			Polar Samples	Liquid PhotImageable Mask	SolderMask	1.000	4.000	0.0195	
1		Top	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	Copper Foil	Copper	1.400			
4		Inner 4	Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
5		Inner 5	Polar Samples	FR4 Core	FR4	2.100	3.000	4.200	0.0195
6		Inner 6	Polar Samples	PrePreg 1080	Dielectric	1.400	2.178	4.200	0.0195
7		Inner 7	Polar Samples	FR4 Core	FR4	2.178	4.200	0.0195	3, 4
8		Inner 8	Polar Samples	PrePreg 1080	Dielectric	12.000	4.200	0.0195	5, 6
9		Inner 9	Polar Samples	PrePreg 1080	Dielectric	2.100	2.178	4.200	0.0195
10		Inner 10	Polar Samples	FR4 Core	FR4	1.400	3.000	4.200	0.0195
11		Inner 11	Polar Samples	PrePreg 1080	Dielectric	2.100	1.425	4.200	0.0195
12		Bottom	Polar Samples	Copper Foil	Copper	1.400	1.400	4.200	0.0195
			Polar Samples	Liquid PhotImageable Mask	SolderMask	1.000	4.000	0.0195	7, 8

56.96
54.16

The technical report has also been updated to support capped drills

Imageable Mask | 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

The screenshot shows the Polar Speedstack Stack Up Builder interface. On the left, a table lists the layers of a PCB stack-up. The layers are numbered 1 through 8, with 'Top' and 'Bottom' labels. The table columns are Layer Name, Material, and Thickness. The layers are:

Layer	Material	Thickness
SM	Liquid Photoimageable Mask	4.000/0.0195
1	Foil Copper Foil	4.200/0.0195
PP	PrePreg 1080	4.200/0.0195
2	Core FR4 Core	4.200/0.0195
3		
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		
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		
PP	PrePreg 1080	4.200/0.0195
8	Foil Copper Foil	4.200/0.0195
SM	Liquid Photoimageable Mask	4.000/0.0195

The 3D model on the right shows the physical stack of these layers, with labels for Top, Inner 2, Inner 3, Inner 4, Inner 5, Inner 6, Inner 7, and Bottom. A red box highlights the 'Inner 5' layer in the 3D model, which corresponds to the 'PrePreg 1651' layer in the table.

On the right side of the interface, there is a 'Stack Up Editor' panel with a 'Controlled Impedance' section. It shows a cross-section diagram of an 'Edge Coupled Coated Microstrip IB' with parameters: Substrate 1 Height (H1), Substrate 1 Dielectric (Er1), Lower Trace Width (W1), Upper Trace Width (W2), Trace Separation (S1), Trace Thickness (T1), and Coating Above Substrate (C1). Below the diagram is a table of these parameters:

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

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 up editor with a table of materials and a 3D visualization of the stack. The table lists materials such as Liquid Photolmageable Mask, Copper Foil, PrePreg 1080, FR4 Core, and PrePreg 3080. The right-hand panel shows 'Stack Up Information' and 'Selected Item Information'. The 'Selected Item Information' panel is highlighted with a red box, and a callout box points to the 'Layer Name' field, which is set to 'Top'.

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
=====	

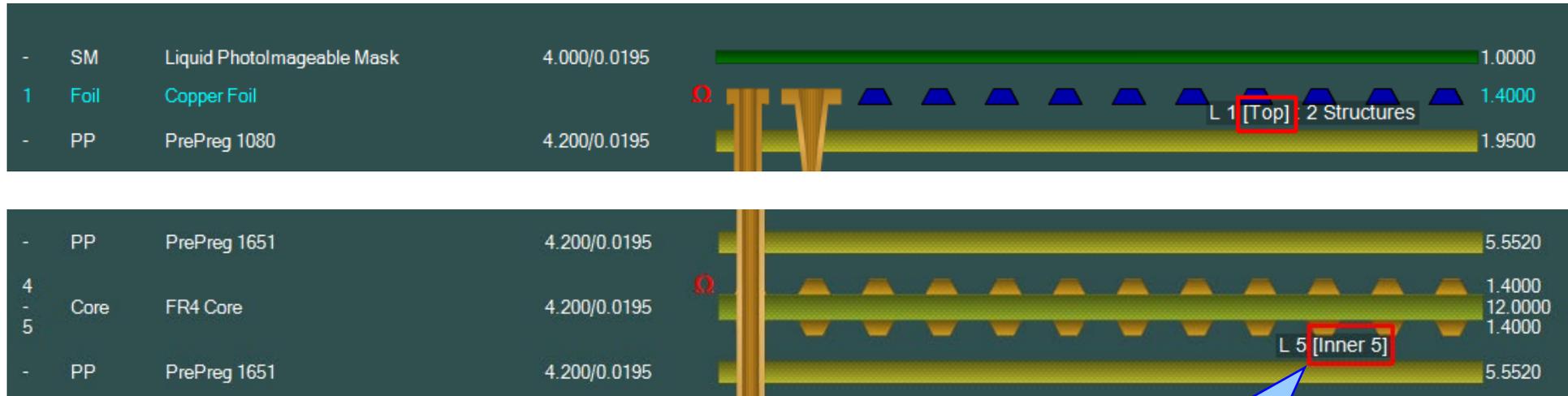
Field	Value
Supplier	Polar Samples
Supplier Description	FO.001
Description	Copper Foil
Stock Number	100-001
Type	Copper

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	

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



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 the Speedstack software interface. On the left, a table lists the stack up layers:

-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Fail	Copper Fail	
-	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			

In the center, a 3D stack up graphic shows various layers with a red box highlighting the labels: Top, Inner 2, Inner 3, Inner 4, Inner 5, Inner 6, Inner 7, and Bottom. A blue callout box points to the configuration options dialog 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. It contains the following settings:

- Default Stack Up View: 2D, 3D
- Units: Mils/Thous, Microns, Millimetres, Inches
- Open last used file on application start up:
- Display File Properties Dialog for New Stackups and Projects:
- 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 (highlighted with 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	2.776	4.200	0.0195	
			Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
4	Inner 4		Polar Samples	FR4 Core	FR4	1.400			3
			Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	
			Polar Samples	PrePreg 1651	Dielectric	1.400			
			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		Polar Samples	FR4 Core	FR4	1.400			
			Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
7	Inner 7		Polar Samples	PrePreg 1080	Dielectric	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: _____

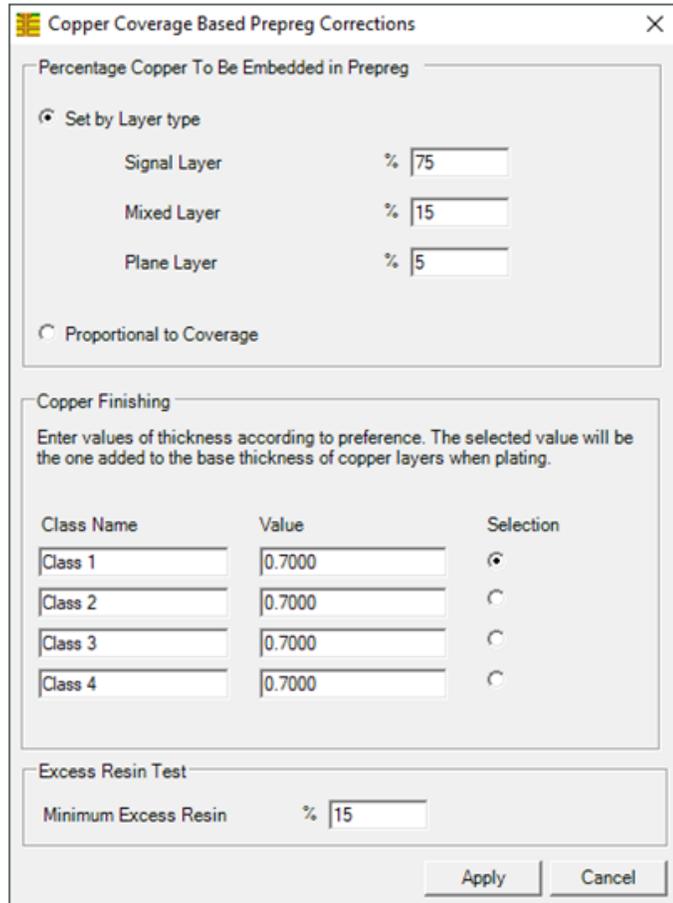
Revision: _____
Modification: _____
Date of Revision: _____
Editor: _____

Page 1/X

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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.

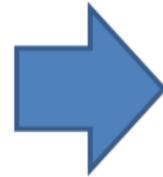
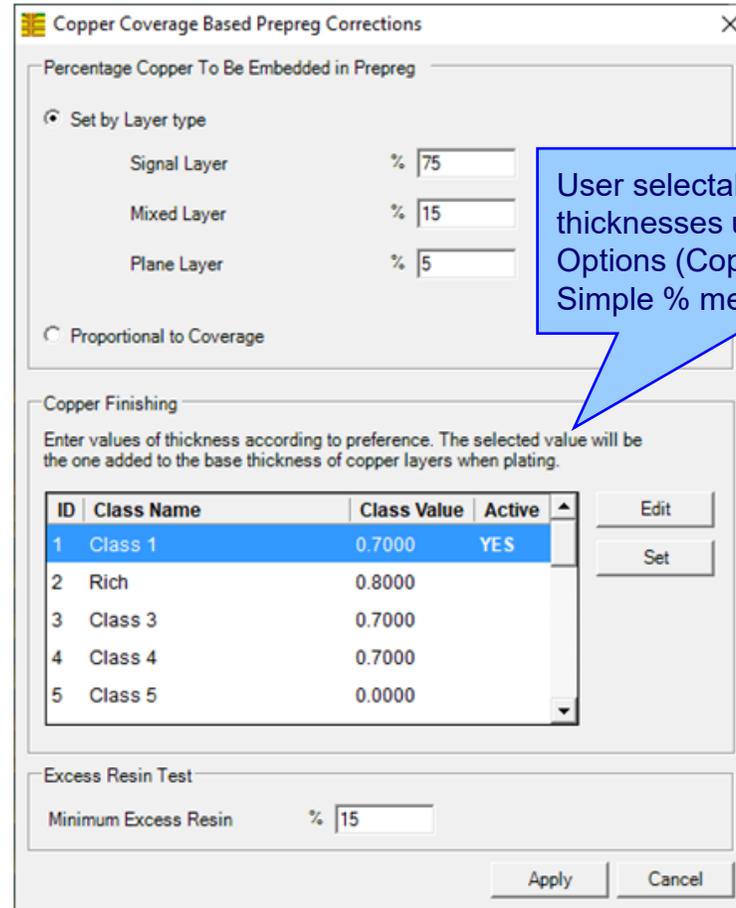
Class Name	Value	Selection
Class 1	0.7000	<input checked="" type="radio"/>
Class 2	0.7000	<input type="radio"/>
Class 3	0.7000	<input type="radio"/>
Class 4	0.7000	<input type="radio"/>

Excess Resin Test

Minimum Excess Resin % 15

Apply Cancel

Speedstack v21.04 and earlier supported 4 classes

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

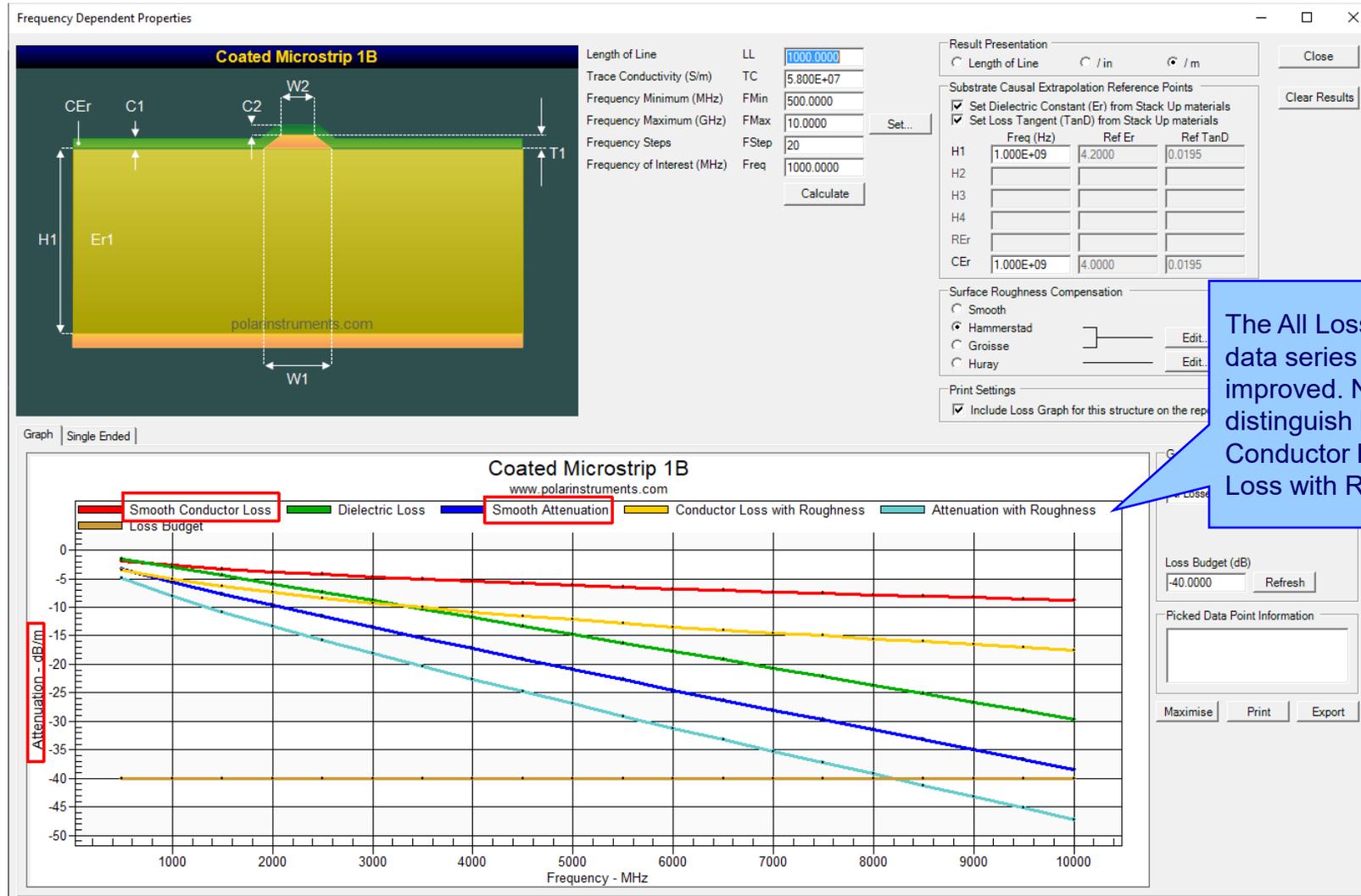
Import / Export enhancements

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



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

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 one icon (a green and yellow square) highlighted by a red box. A blue callout bubble points to this icon, stating: "New Apply Plating Colours toolbar option. Toggle between standard and enhanced colours".

On the right side, 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
=====	

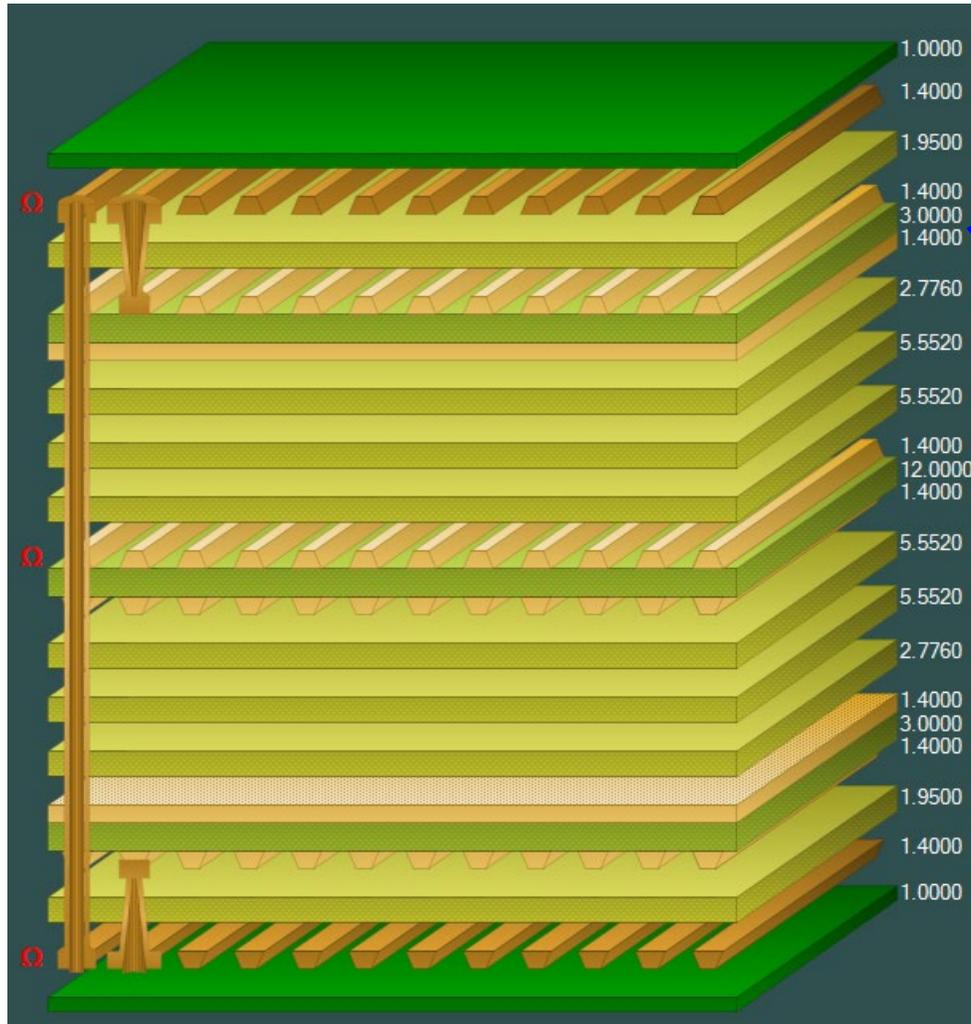
Below this is a "Selected Item Information" panel which is currently empty.

At the bottom of the main window, there is a status bar with the following text: "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.

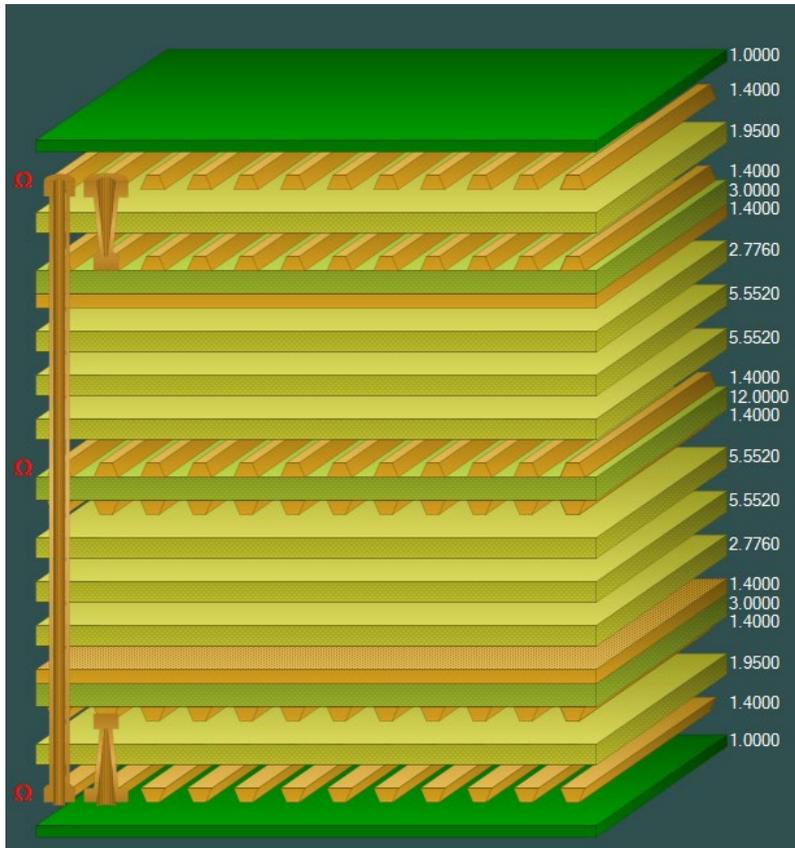
It is important to account for this additional plated copper thickness when calculating the overall stack up thickness and controlled impedance / insertion loss structures.

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

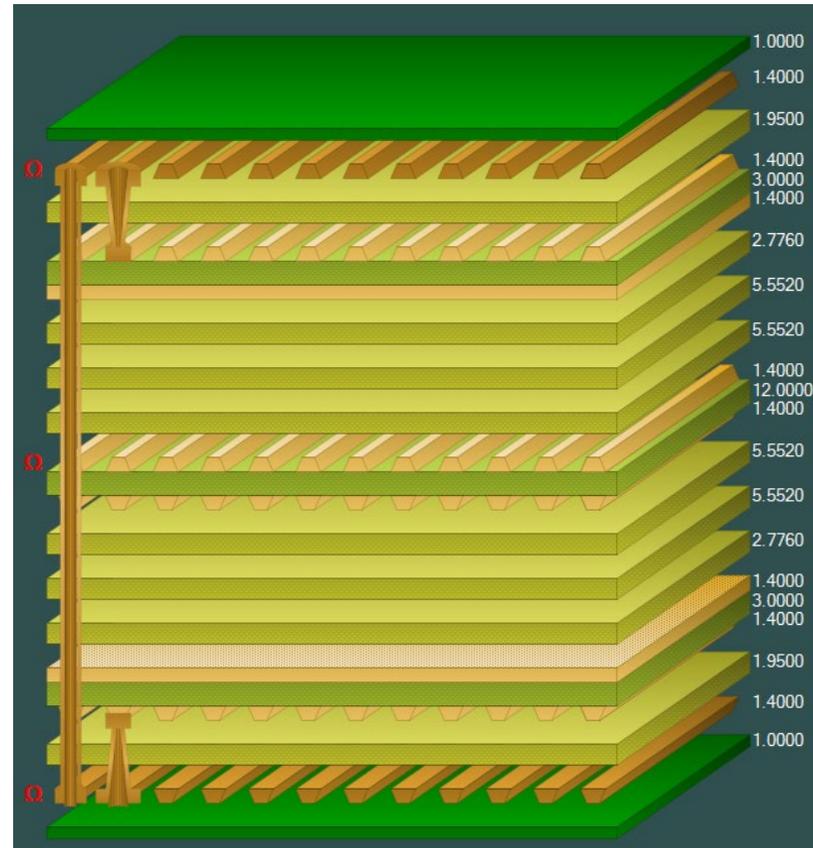
New Apply Plating Colours toolbar option



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

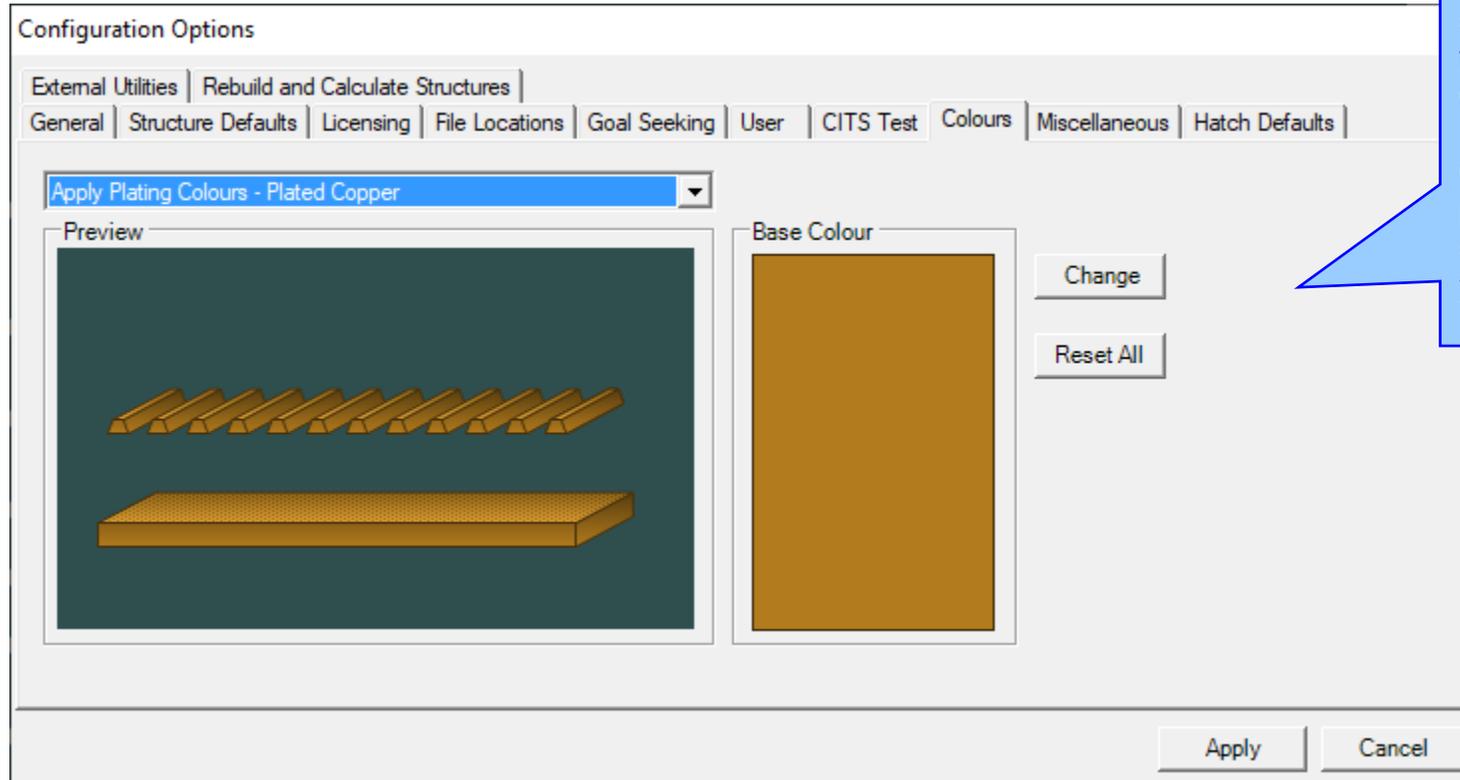
Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	100.000	10.000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

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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' application window. It features several sections: 'Filter by Supplier' with logos for Showa Denko, Taconic, and Tatsuta; 'File Type' with a list of material types; 'Filter by Frequency' with radio buttons for various frequency ranges; 'Library Files Available' listing various material files; and 'Existing Data Table' with 'Clear' and 'Append' options. A 'File Access Mode' section at the bottom allows switching between 'Online Polar Library' and 'On-Premise Mode' with a file path input field.

Callout 1: Showa Denko and Tatsuta have recently joined the Polar Material Partner program

Callout 2: Filter downloadable libraries by frequency. The frequency of the dielectric constant (Er) / loss tangent (TanD) material properties

Callout 3: Improvements to On-Premise Mode to help users where, for security reasons, no Internet connection is available

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 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 of a PCB with a red box highlighting the top and bottom shield layers. Below the model is a table listing the layers:

Layer	Type	Material	Thickness (Mils/Thous)
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

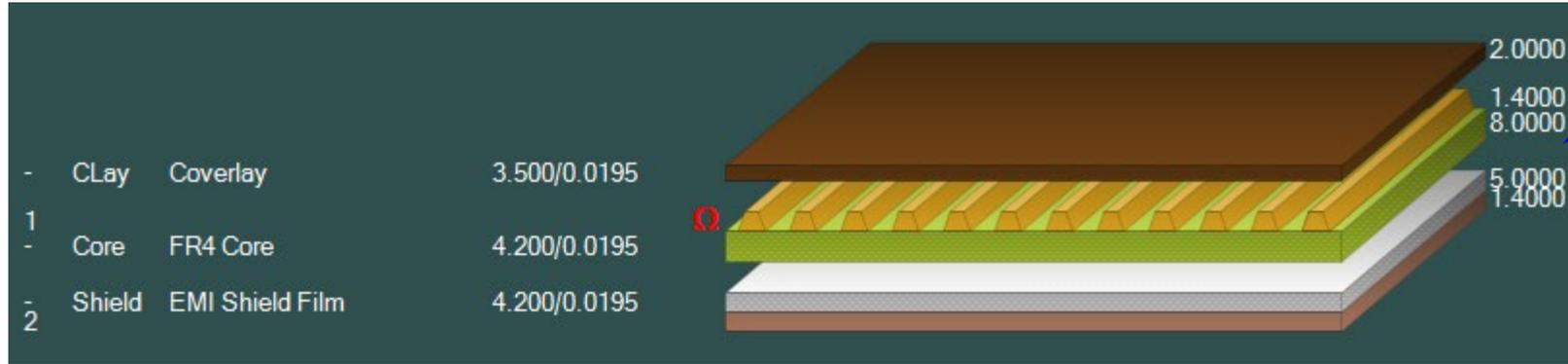
Shields are typically applied to the outer layer(s) of the stack up

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

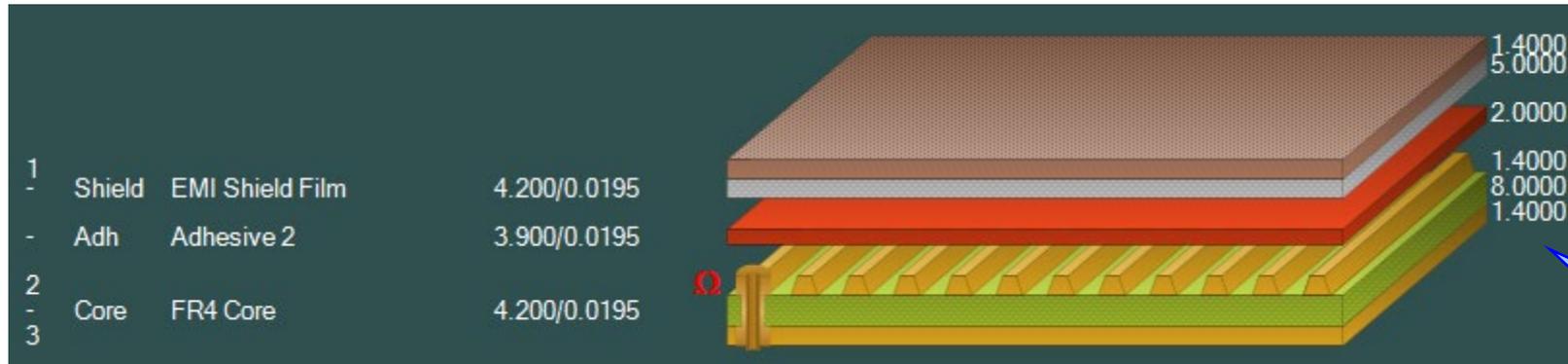


They consist of a shield layer (brown) and dielectric adhesive (silver)

Shield material examples

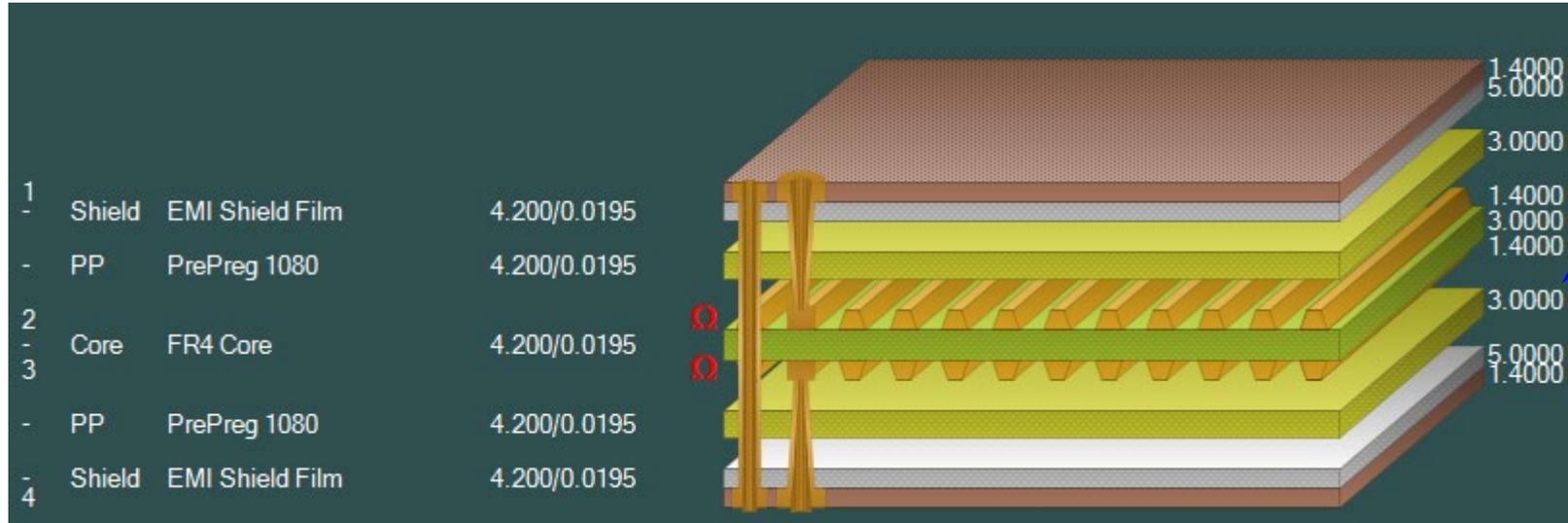


Example #1
Single-sided core,
coverlay above trace,
shield below

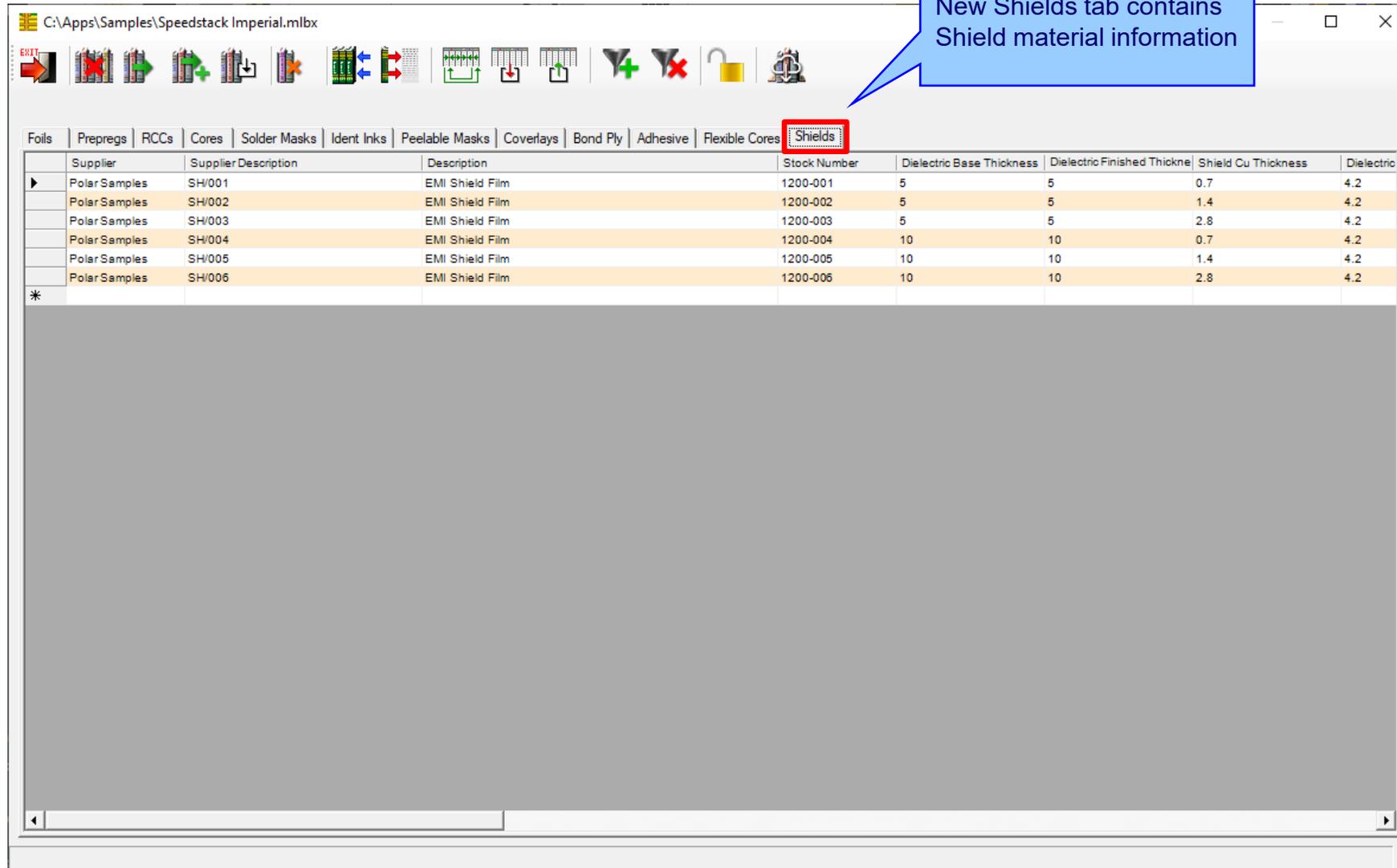


Example #2
Double-sided core,
adhesive and shield
above

Shield material examples



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

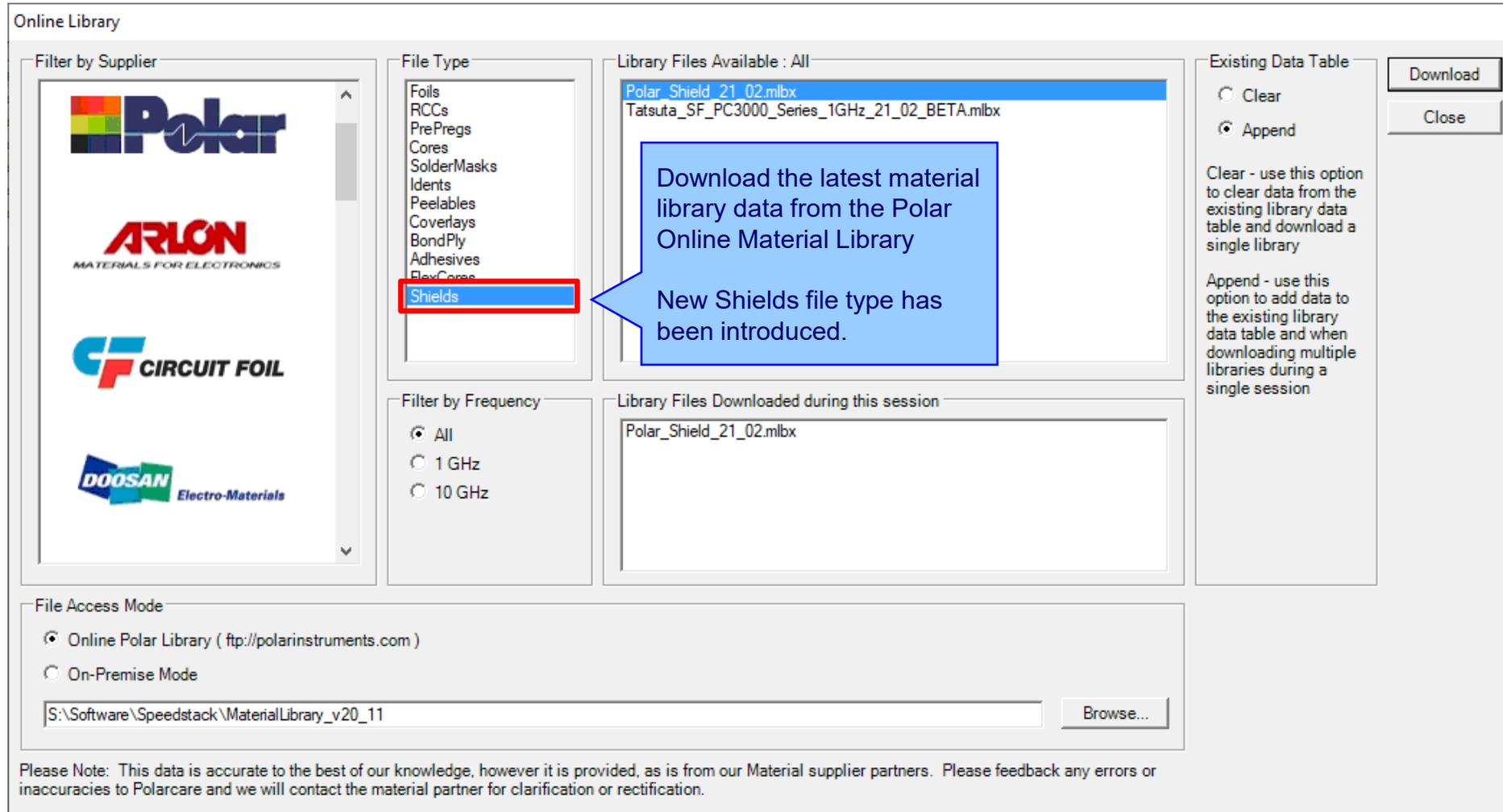
Review/Edit Shield

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



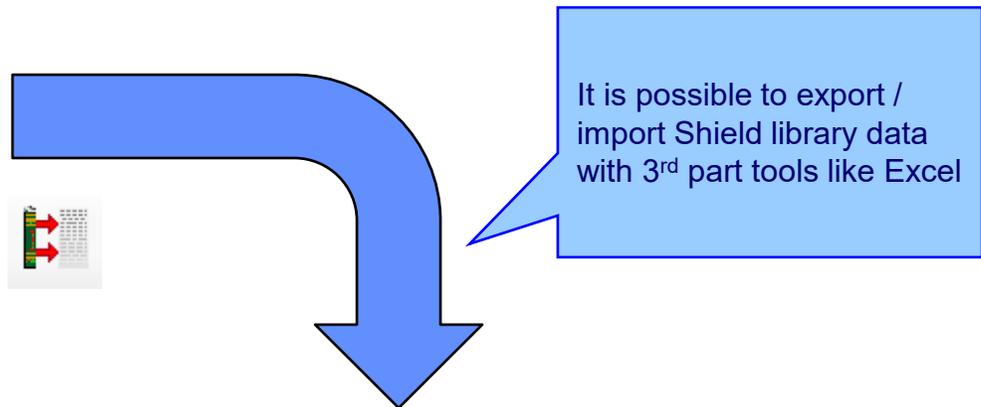
The screenshot displays the 'Online Library' interface with several sections:

- 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 : All:** 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 them 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'.
- File Access Mode:** Radio buttons for 'Online Polar Library (ftp://polarinstruments.com)' (selected) and 'On-Premise Mode'. Below is a text input field with the path 'S:\Software\Speedstack\MaterialLibrary_v20_11' and a 'Browse...' button.
- Buttons:** 'Download' and 'Close' buttons are located at the top right.

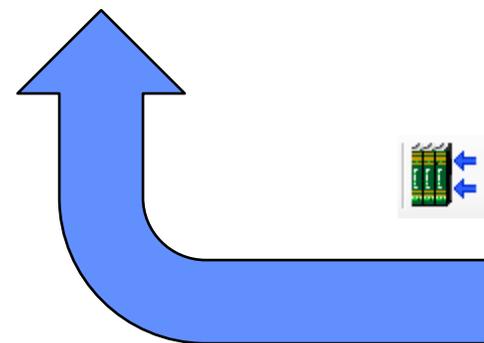
Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

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

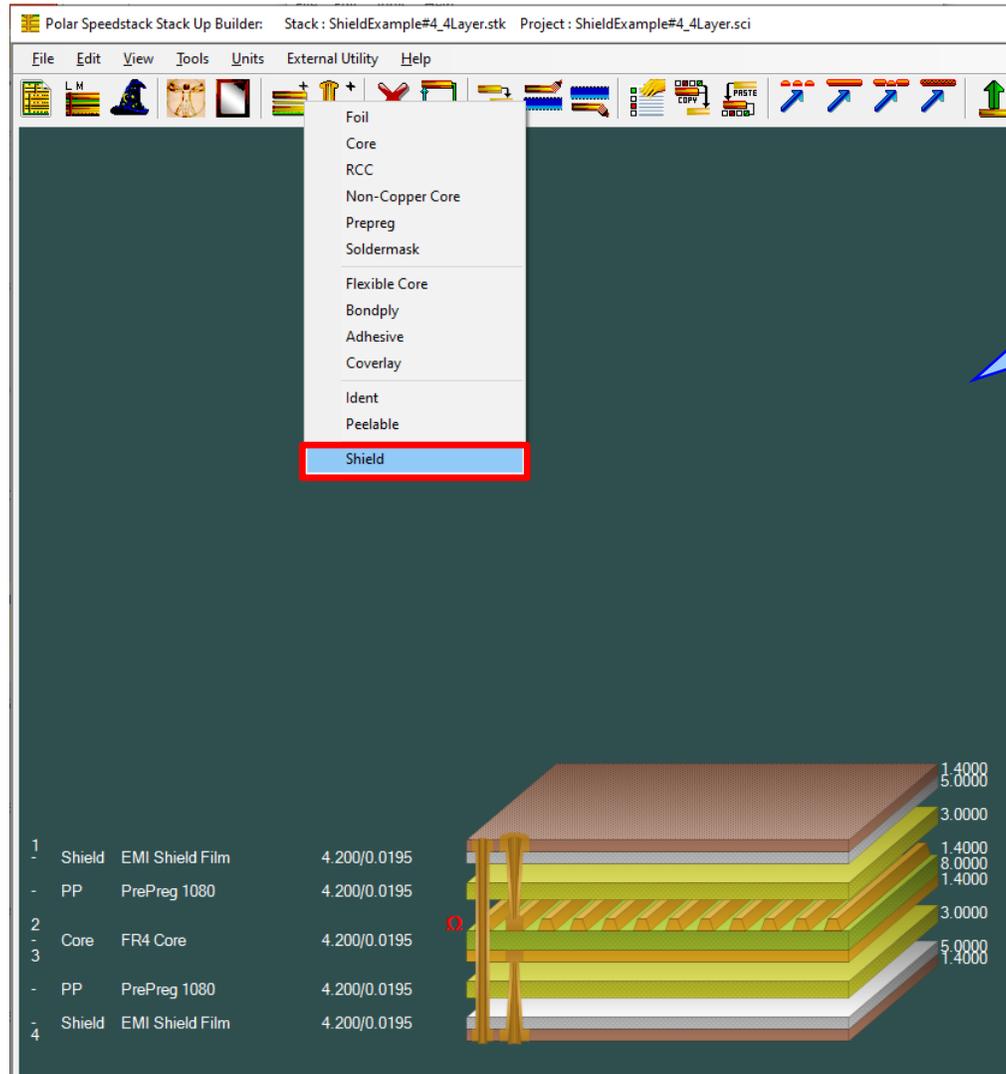


It is possible to export / import Shield library data with 3rd part tools like Excel



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	Dielectric CAF Resistance	Dielectric ZAxisExpansion	Dielectric ExcessResin	Dielectric Tolerance	Dielectric 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:

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

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

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 model of a stack up structure with a shield material region highlighted in red. The shield material is labeled 'EMI Shield Film' in the layer list. The interface includes a menu bar, a toolbar, and a 'Stack Up Editor' panel on the right. The 'Stack Up Editor' panel shows a table of material properties and a 'CI Results' section.

Property	Value
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

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:

	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 material region of structure.

Shield adhesive dielectric constant / loss tangent.

Graph: Single Ended

Offset Stripline 1B2A

www.polarinstruments.com

All Losses with Roughness - dB/line

Frequency - MHz

Legend: Conductor Loss (red), Dielectric Loss (green), Attenuation (blue), Conductor Loss with Roughness (yellow), Attenuation with Roughness (cyan)

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

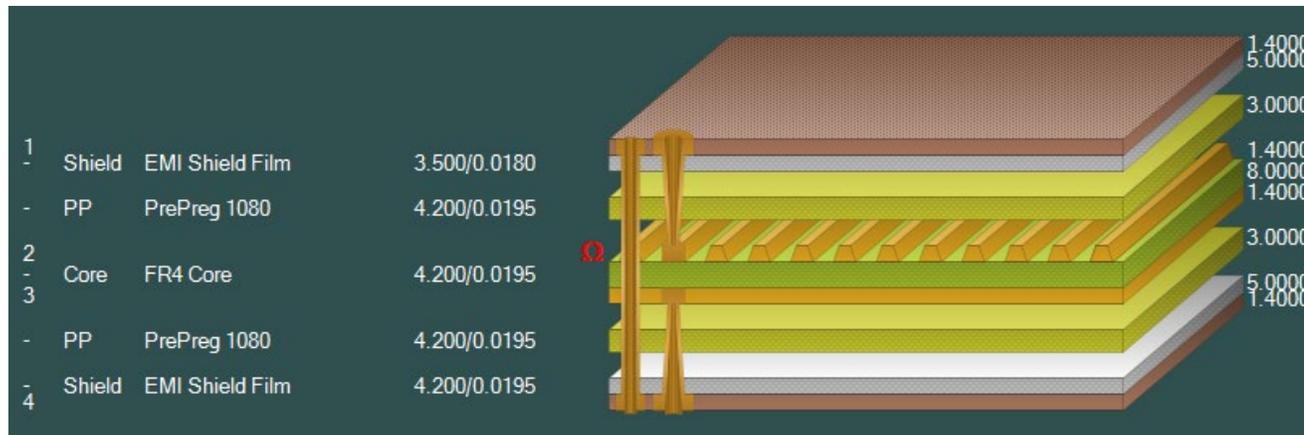
Picked Data Point Information

Maximise, Print, Export

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	εr	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
2		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
		Polar Samples	EMI Shield Film	Shield	5.000	4.200	0.0195	
3		Polar Samples	FR4 Core	FR4	1.400			
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

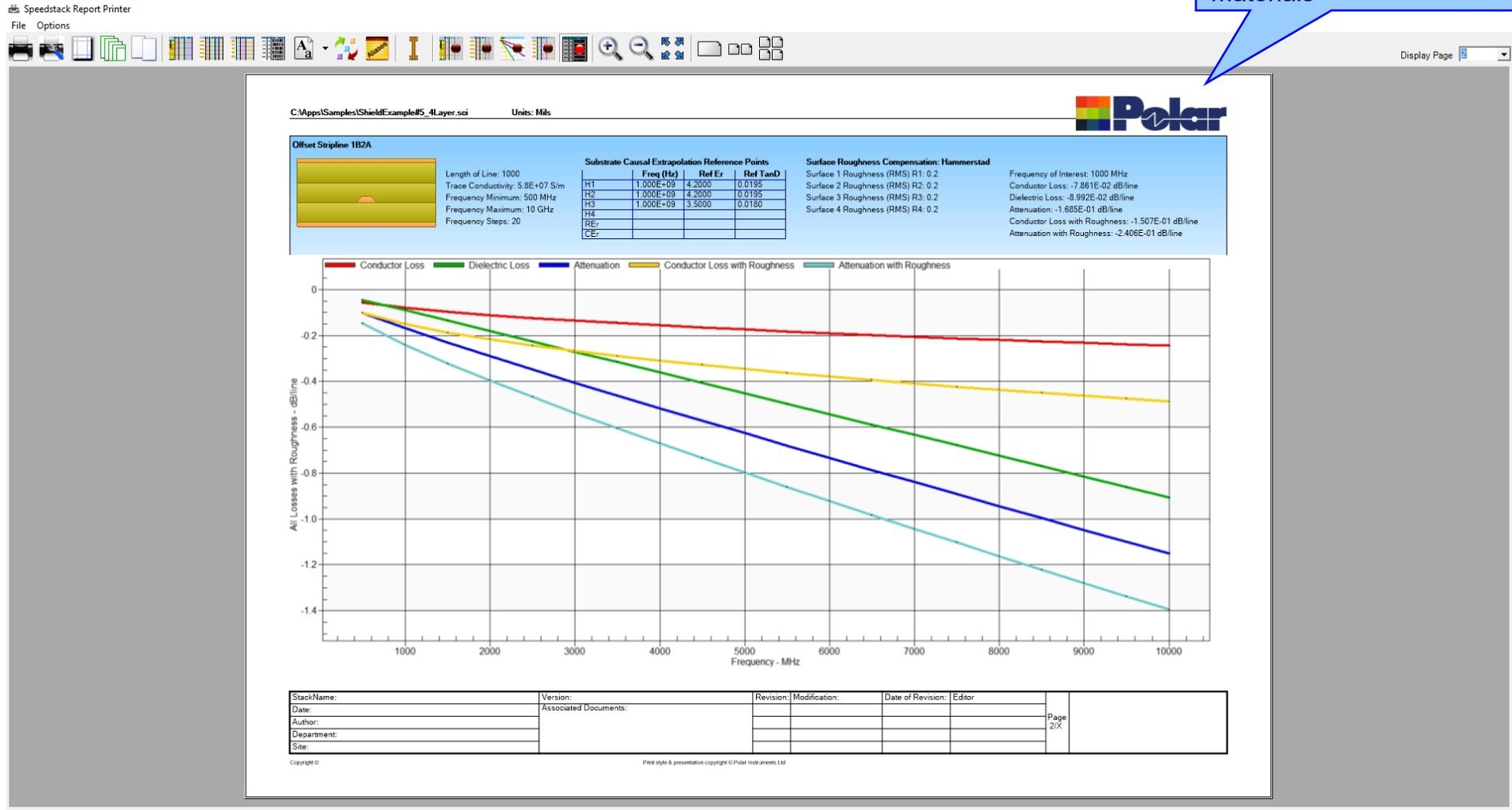
Drill Image	1st Layer	2nd Layer	Column Position	Drill Type
	1	2	2	Laser PTH
	1	4	1	Mechanical PTH
	4	3	2	Laser PTH

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

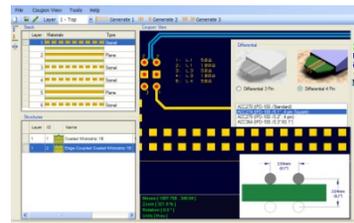
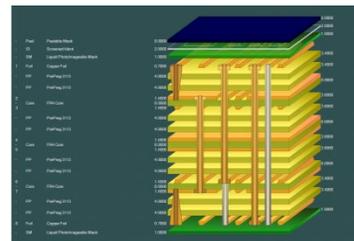
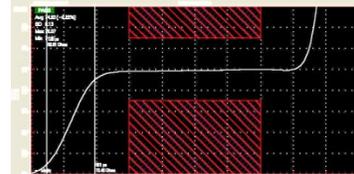
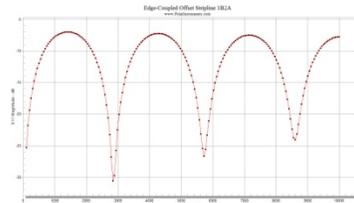
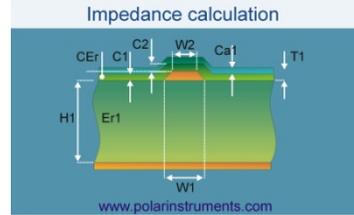
Insertion loss report supporting shield materials



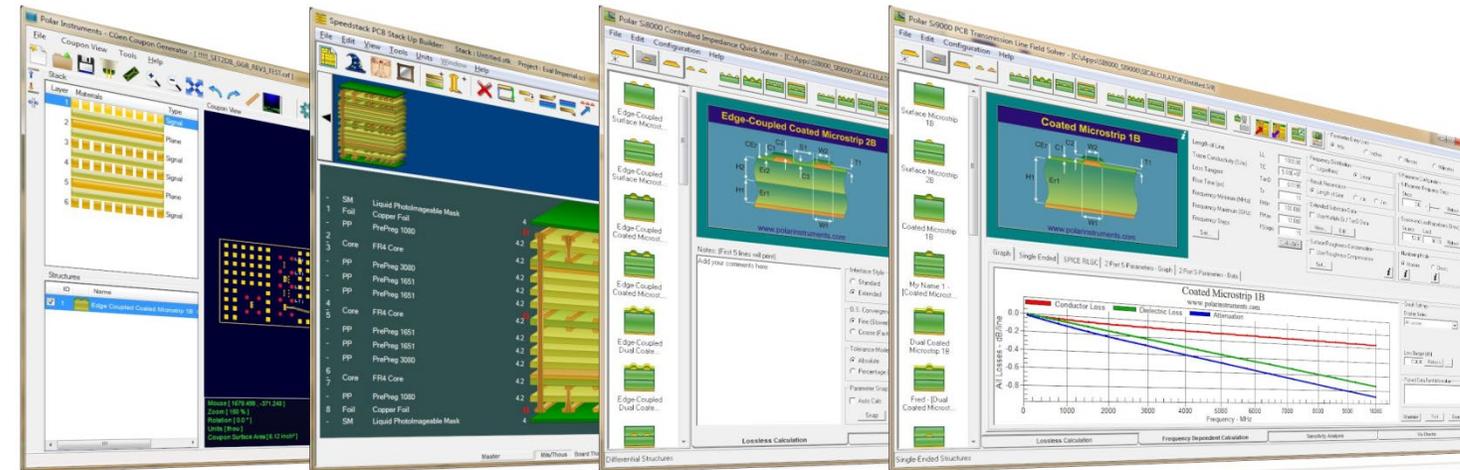
Import / Export enhancements

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

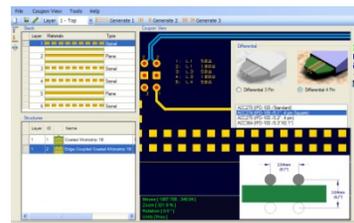
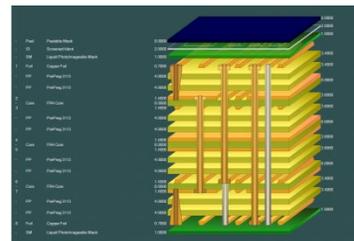
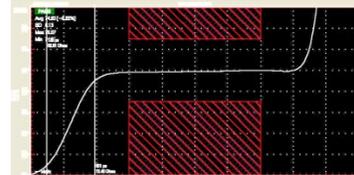
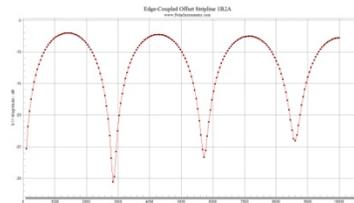
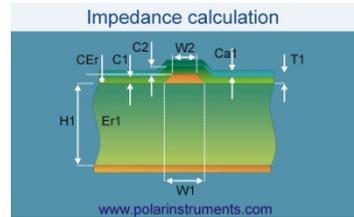
- XML STKX v20.00 and SSX v10.00 import / export options
- CSV export option
- Gerber / DXF export option



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



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