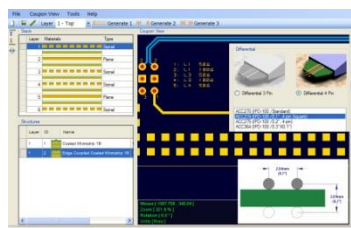
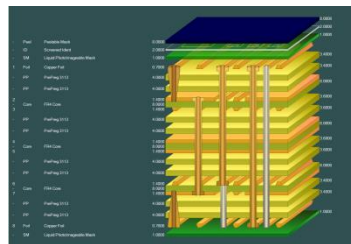
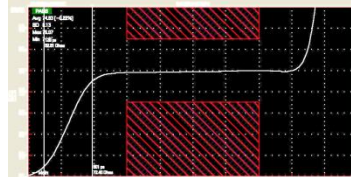
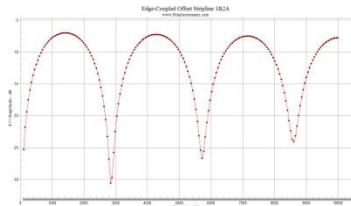
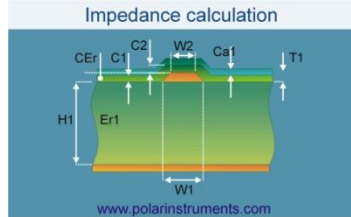




# Speedstack 2021 - 2024 Updates

Richard Attrill – January 2024 (Rev 13)



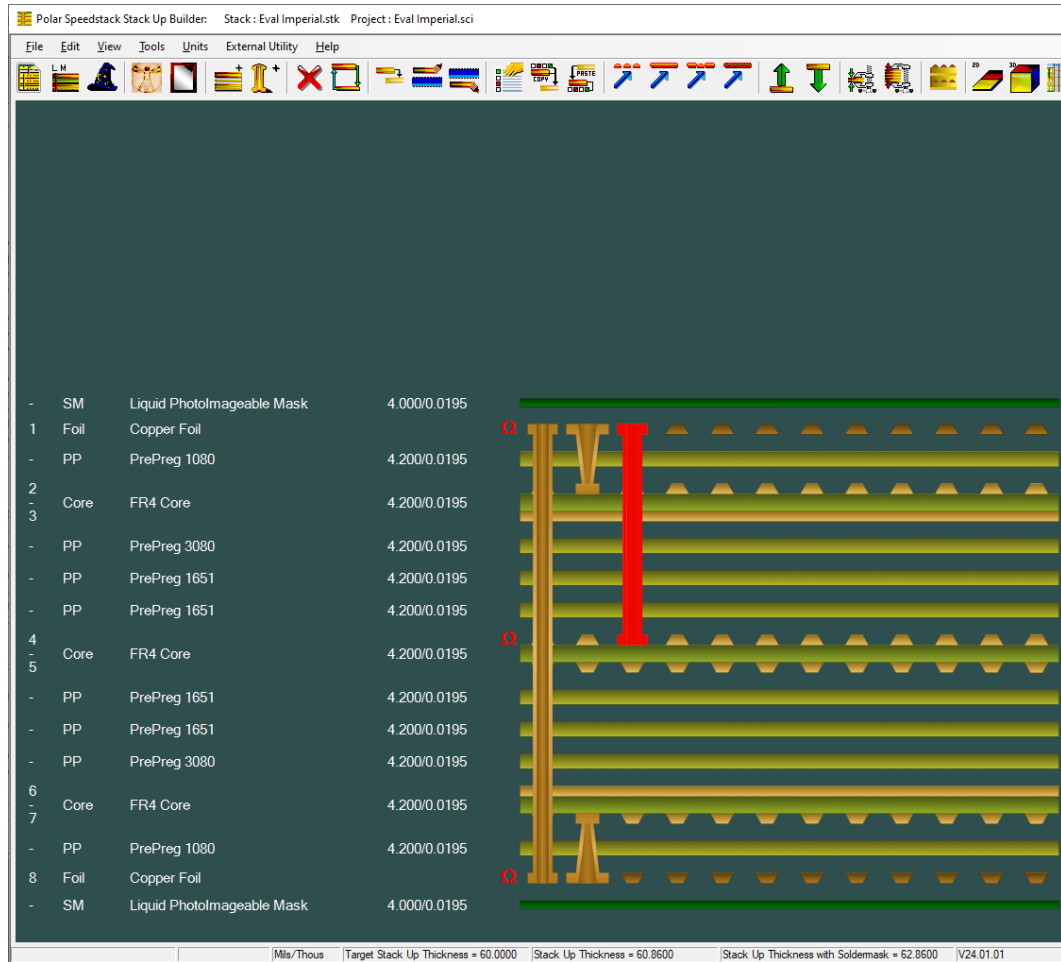
# Speedstack v24.01.01 (Jan 2024)

## Enhancements

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

# Speedstack v23.09.01 (Sept 2023)

# Design Rule Check (DRC) Enhancements



Stack Up Editor | DRC : 1 | Controlled Impedance | CI Results

DRC Test Selection

- Design Logic
- Symmetry
- Copper Balance
- Board Thickness
- Manufacturing Tests (Tools | Manufacturing Constraints)
  - Active Constraint : Polar Microns
  - Min. Trace Width
  - Min. Gap Width
  - Aspect Ratios
    - Mechanical Drill
    - Buried Laser Microvia
    - Blind Laser Microvia
    - Trace
    - Resin Starvation

Maximum Drill Aspect Ratio Exceeded **L1 - L4, Col3**

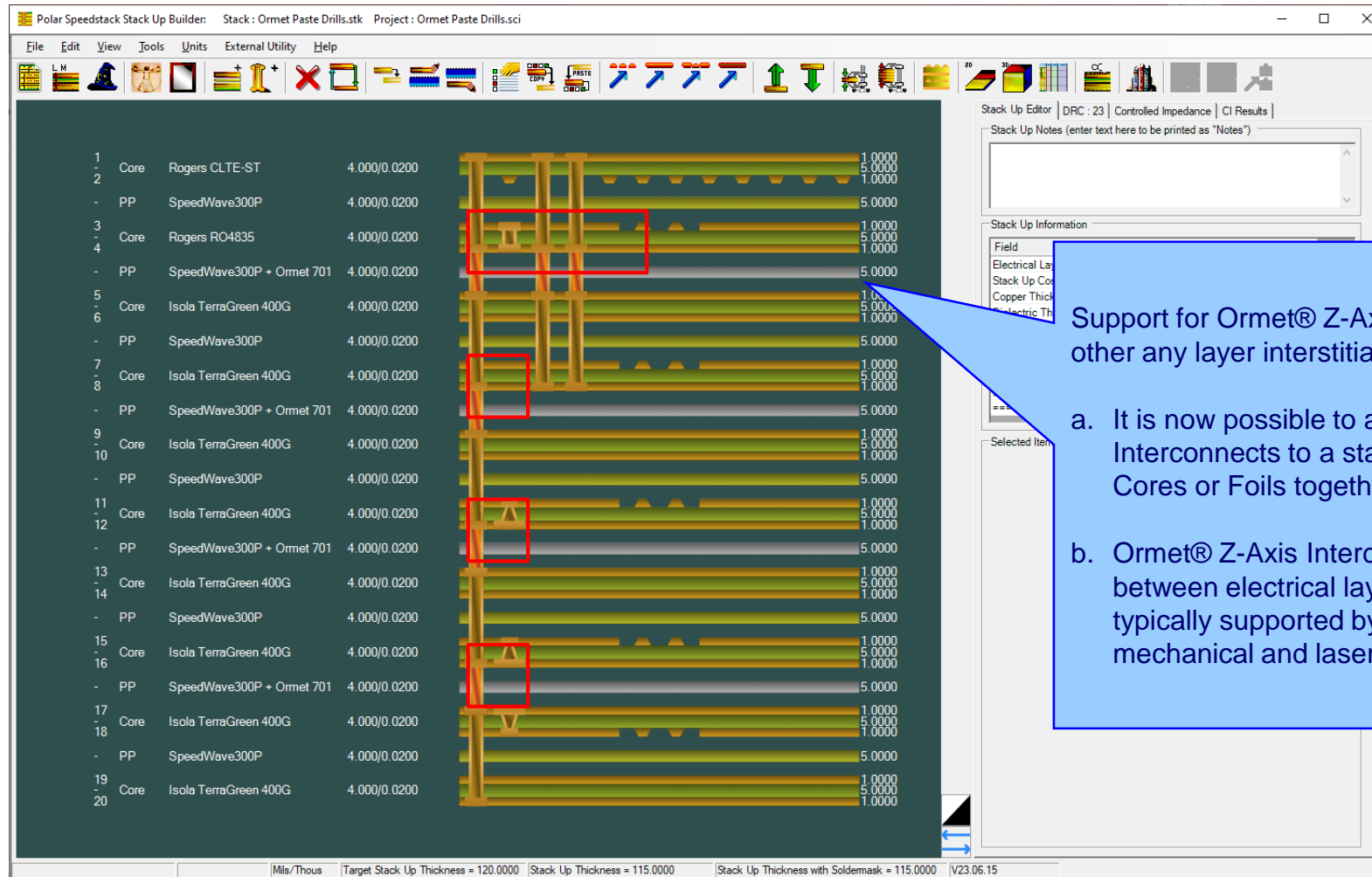
Design Rule Check information for Drills has been enhanced to provide more information, including start / end electrical layers and the column where the errant drill is located

## Other enhancements

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

# Speedstack v23.06.15 (June 2023)

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



The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up configuration with 20 layers. The layers are listed in a table on the left, and a 3D visualization of the stack up is shown in the center. Red boxes highlight the Ormet Z-axis interconnects placed between layers 2-3, 7-8, 11-12, and 15-16. The right-hand side of the interface shows the Stack Up Editor panel with fields for Stack Up Notes, Stack Up Information, and Selected Item.

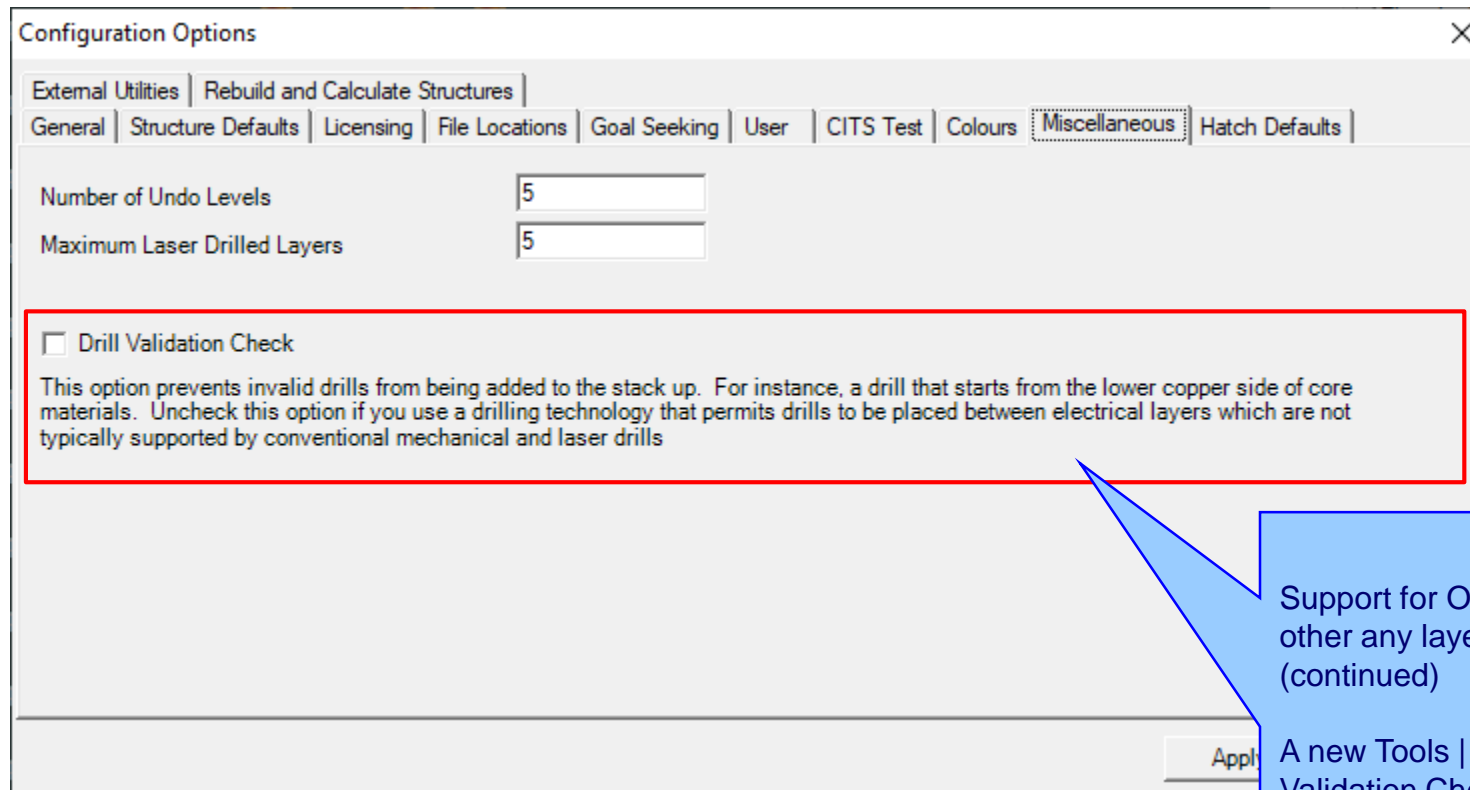
Layer	Material	Thickness	Properties
1	Core Rogers CLTE-ST	4.000/0.0200	1.0000
2	PP SpeedWave300P	4.000/0.0200	5.0000
3	Core Rogers RO4835	4.000/0.0200	1.0000
4	PP SpeedWave300P + Ormet 701	4.000/0.0200	5.0000
5	Core Isola TerraGreen 400G	4.000/0.0200	1.0000
6	PP SpeedWave300P	4.000/0.0200	5.0000
7	Core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

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

- It is now possible to add Ormet® Z-Axis Interconnects to a stack up to connect two Cores or Foils together
- Ormet® Z-Axis Interconnects can be placed between electrical layers which are not typically supported by conventional mechanical and laser drills



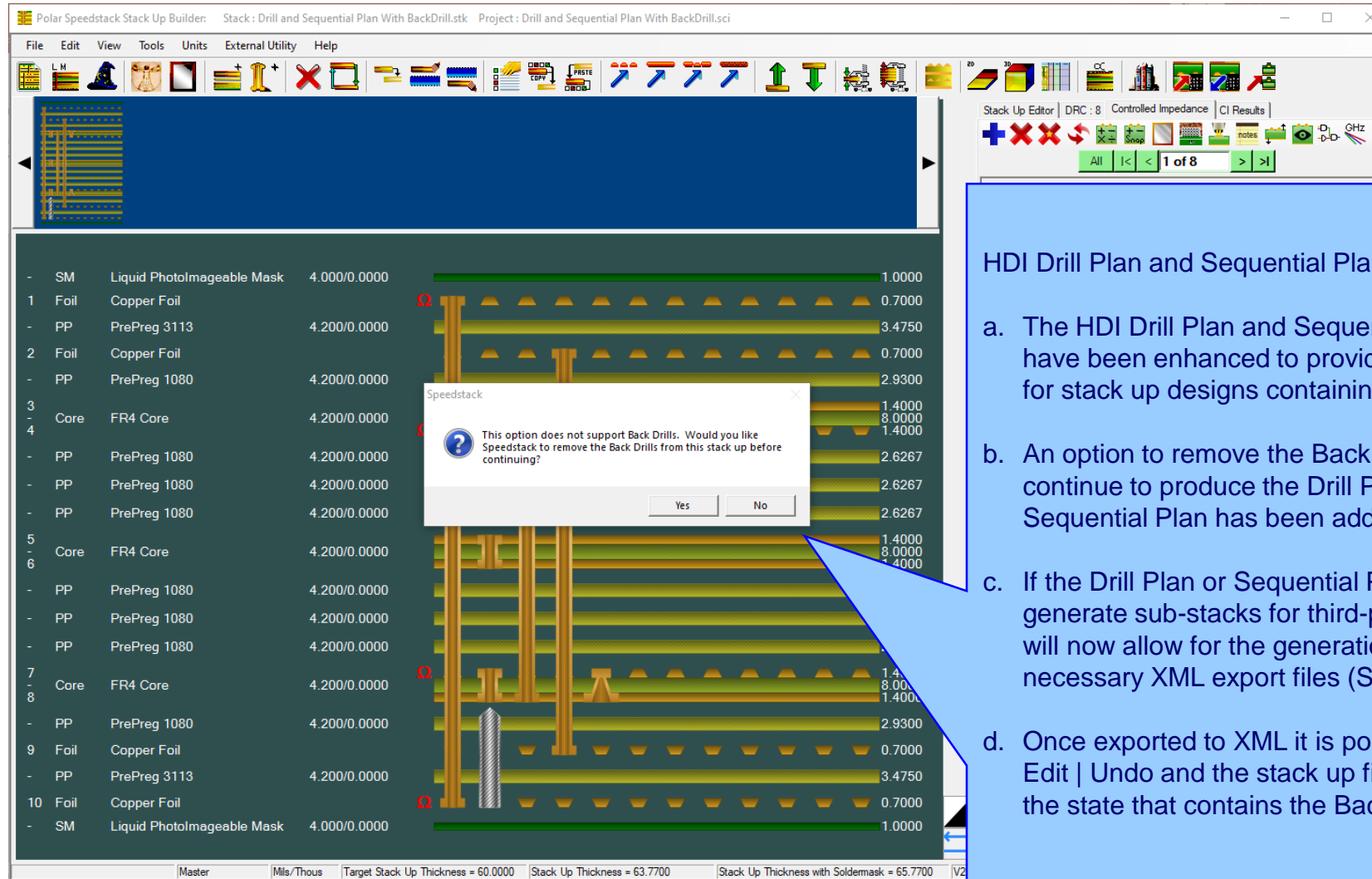
## Enhancements including support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology



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

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

## HDI Drill Plan and Sequential Plan Enhancements



### HDI Drill Plan and Sequential Plan Enhancements

- The HDI Drill Plan and Sequential Plan options have been enhanced to provide better support for stack up designs containing Back Drills
- An option to remove the Back Drills and continue to produce the Drill Plan or Sequential Plan has been added
- If the Drill Plan or Sequential Plan is used to generate sub-stacks for third-party tools, this will now allow for the generation of the necessary XML export files (SSX)
- Once exported to XML it is possible to select Edit | Undo and the stack up file will return to the state that contains the Back Drills

## HDI Drill Plan and Sequential Plan Enhancements

Layer	Material	Thickness	Position
-	SM	Liquid Photolimageable Mask	4.000/0.0000
1	Foil	Copper Foil	0.7000
-	PP	PrePreg 3113	4.200/0.0000
2	Foil	Copper Foil	0.7000
-	PP	PrePreg 1080	4.200/0.0000
3	Core	FR4 Core	1.4000
4			8.0000
			1.4000
-	PP	PrePreg 1080	4.200/0.0000
-	PP	PrePreg 1080	4.200/0.0000
-	PP	PrePreg 1080	4.200/0.0000
5	Core	FR4 Core	1.4000
6			8.0000
			1.4000
-	PP	PrePreg 1080	4.200/0.0000
-	PP	PrePreg 1080	4.200/0.0000
-	PP	PrePreg 1080	4.200/0.0000
7	Core	FR4 Core	1.4000
8			8.0000
			1.4000
-	PP	PrePreg 1080	4.200/0.0000
9	Foil	Copper Foil	0.7000
-	PP	PrePreg 3113	4.200/0.0000
10	Foil	Copper Foil	0.7000
-	SM	Liquid Photolimageable Mask	4.000/0.0000

HDI Drill Plan and Sequential Plan Enhancements (continued)

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

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

# Speedstack v23.05.01 (May 2023)

## New Check Copper Coverage Percentage option

The screenshot shows the Polar Speedstack Stack Up Builder interface. The 'Tools' menu is open, and the 'Check Copper Coverage Percentage' option is highlighted with a red box. Below the menu, a dialog box titled 'Speedstack' displays an information icon and the message: 'The Copper Coverage percentage has not been entered for the following layers: 6, 7,' with an 'OK' button.

Layer	Material	Thickness (Mils/Thous)	Property
-	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 1.4000
3	-		-
-	PP		PrePreg 3080 4.200/0.0195
-	PP		PrePreg 1080 4.200/0.0195
-	PP		PrePreg 1080 4.200/0.0195
4	Core		FR4 Core 1.4000
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 1.4000
7	-		-
-	PP		PrePreg 1080 4.200/0.0195
8	Foil		Copper Foil 1.4000
-	SM		Liquid PhotoImageable Mask 4.000/0.0195

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

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

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

## Virtual Material Wizard Improvements

Stack Up Wizard (Virtual Material Mode)

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

Symmetrical

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

Nominal Dielectric Constant: 4.2000  
Nominal Loss Tangent: 0.0195

Solder Mask Top  Solder Mask Bottom

Solder Mask Dielectric Constant: 4.0000  
Solder Mask Loss Tangent: 0.0195  
Solder Mask Thickness: 0.0000

Preferred Core Thickness:  
Copper Thickness:

Build Type:  Foil  Core

<Previous Next >

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

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

## Resonac materials added to the Online Library

Online Library

Filter by Supplier

- 
- RESONAC**  
Chemistry for Change
- 
- 

File Type

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

Library Files Available : Resonac

- Resonac\_GEA\_679\_1GHz\_1901.mlbx
- Resonac\_GEA\_67BE\_1GHz\_1901.mlbx
- Resonac\_GEA\_67N\_1GHz\_1901.mlbx
- Resonac\_GEA\_705G(L)\_1GHz\_2201.mlbx
- Resonac\_GEA\_705G\_1GHz\_2201.mlbx
- Resonac\_GFA\_2\_1GHz\_1901.mlbx
- Resonac\_GHA\_679G(S)\_1GHz\_1901.mlbx
- Resonac\_GHA\_679G\_1GHz\_1901.mlbx
- Resonac\_GWA\_900G\_1GHz\_1901.mlbx
- Resonac\_GWA\_910G\_1GHz\_1901.mlbx

Append

Close

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

Filter by Frequency

- All
- 1 GHz  20 GHz
- 5 GHz  50 GHz
- 10 GHz  75 GHz

Library Files Selected during this session

File Access Mode

- Online Polar Library ( ftp://polarinstruments.com )
- On-Premise Mode [Application Note](#)

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

Browse... Download...

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

# Speedstack v23.04.02 (April 2023)



## Manufacturing Constraints / Design Rule Check Enhancements

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up design with layers and their thicknesses. A red vertical bar highlights a specific layer. A dialog box titled 'Stack Up Editor: DRC:1 | Controlled Impedance | CI Results' is open, showing the 'DRC Test Selection' section. This section includes checkboxes for 'Design Logic', 'Board Thickness', 'Symmetry', 'Copper Balance', and 'Manufacturing Tests (Tools | Manufacturing Constraints)'. Under 'Manufacturing Tests', there is a sub-section for 'Active Constraint: Fabricator 'A'' with checkboxes for 'Min. Trace Width', 'Min. Gap Width', 'Aspect Ratios', 'Mechanical Drill', 'Blind Laser Microvia', 'Buried Laser Microvia', 'Trace', and 'Resin Starvation'. A message box below the dialog states 'Maximum Drill Aspect Ratio Exceeded'.

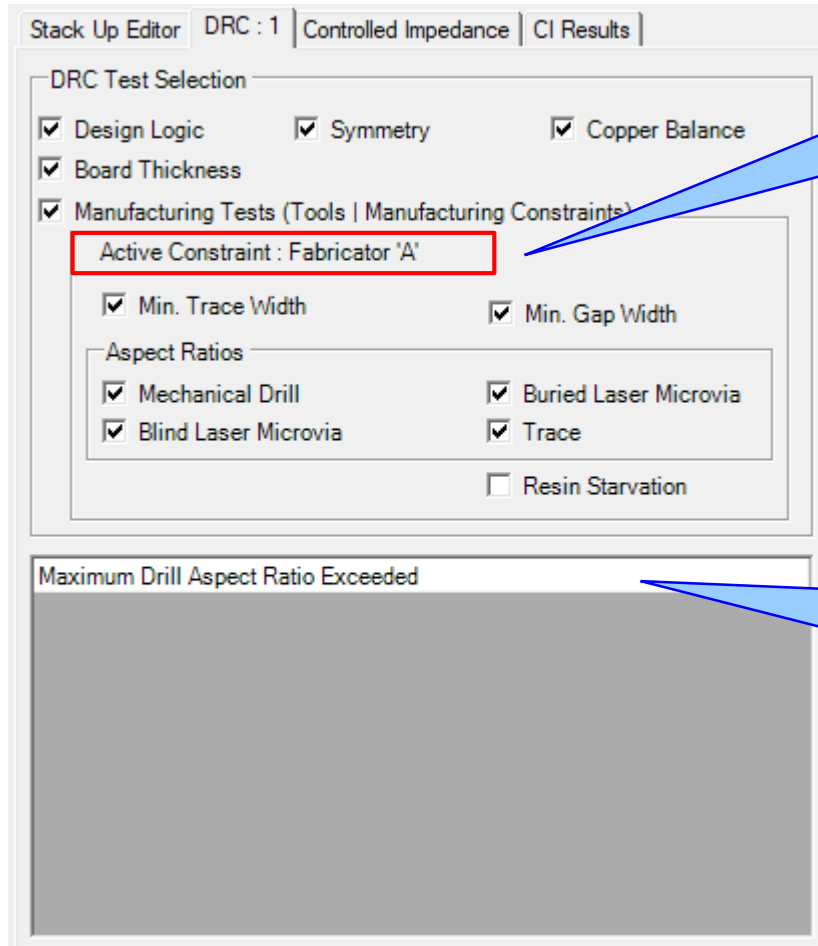
Layer	Material	Thickness (Mils/Thous)	Order
-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.4000
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	4.200/0.0195
-	PP	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
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195

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

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

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

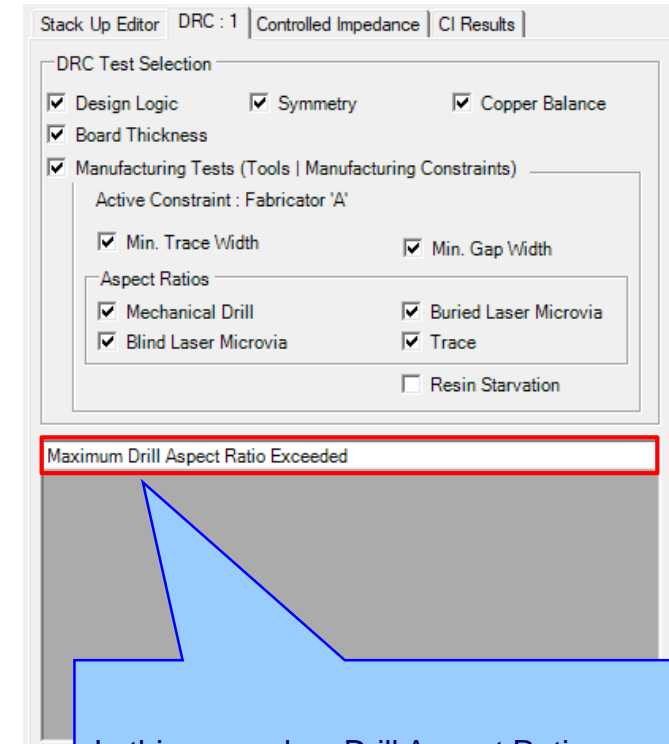
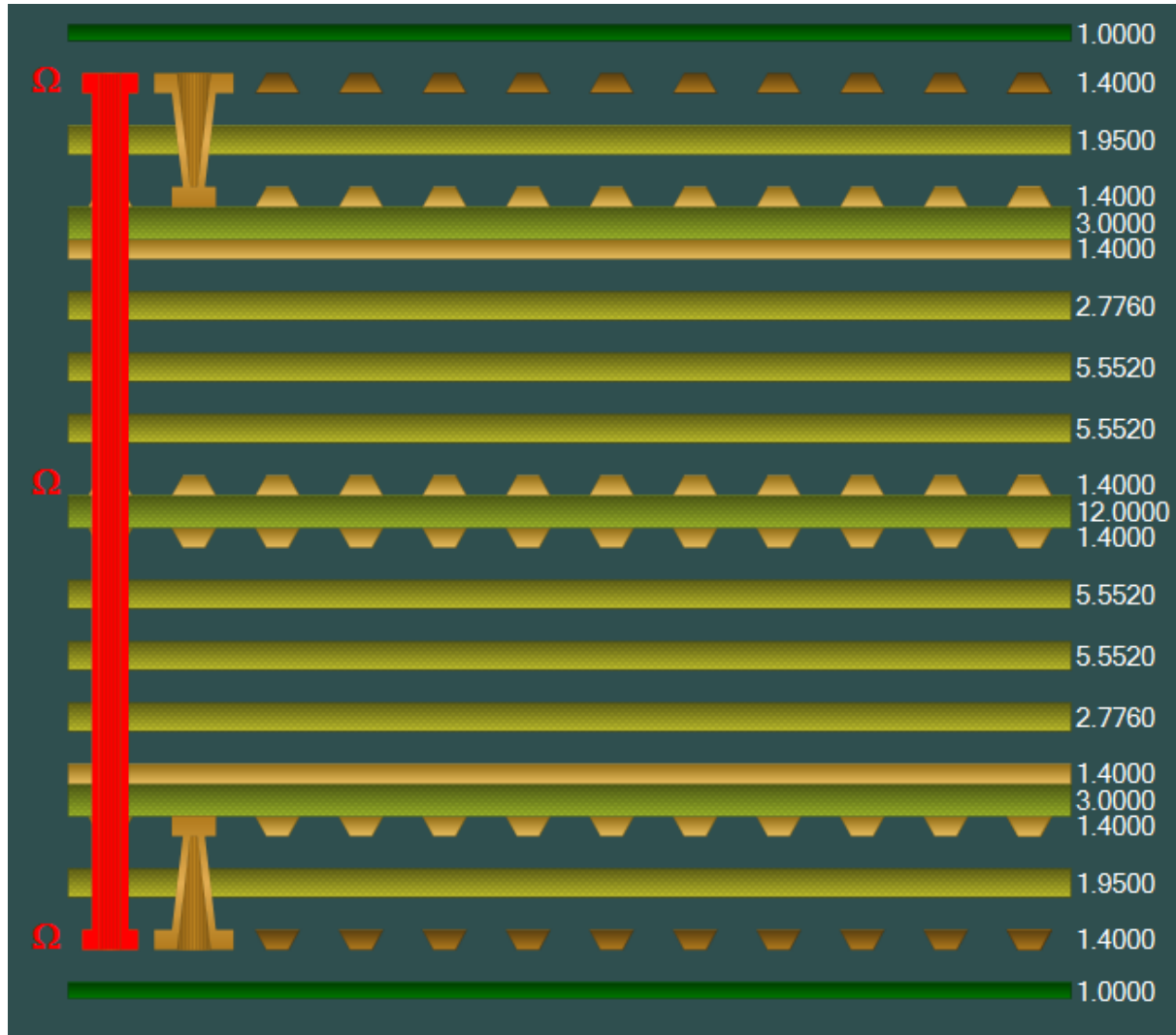
## Manufacturing Constraints / Design Rule Check Enhancements



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

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

## Manufacturing Constraints / Design Rule Check Enhancements



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

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

## Manufacturing Constraints / Design Rule Check Enhancements

Manufacturing Constraints

Active Constraint : Fabricator 'A'

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

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

Highlight and Set Active Constraint

Highlight Set

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

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

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

## Manufacturing Constraints / Design Rule Check Enhancements

Manufacturing Constraints

Active Constraint : Fabricator 'A'

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

Highlight    Set

Edit Constraints

Units

Mils                       Microns  
 Inches                         Millimetres

Option Name: Fabricator 'A'

Minimum Gap: 3

Minimum Trace Width: 3

Mechanical Drill A.R.: 6

Blind Via A.R.: 0.5

Buried Via A.R.: 0.5

Trace A.R.: 1

<< < 5 of 5 > >>

Add    Delete    Done    Cancel

Instructions  
Add: Press Add, which will add a new blank constraint. Notice the 'n of n' record number will increase. Now key in the constraint details and select Done.  
Delete: Press Delete to remove the existing constraint. Notice the 'n of n' record number will reduce. Then select Done to close the dialog.  
Edit: Edit the existing constraint and select Done to close the dialog.

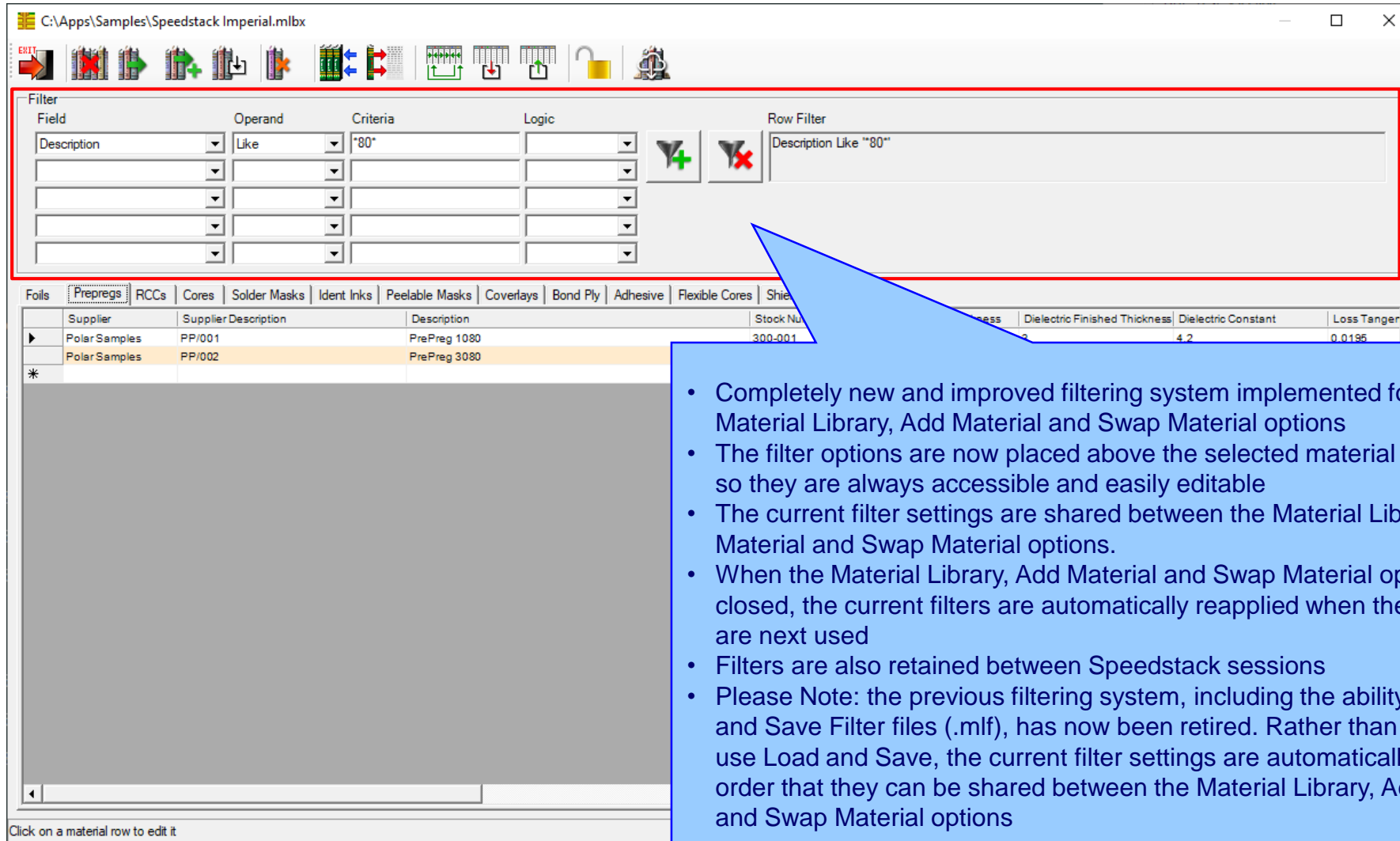
Width	Trace A. R.	Units
	1	Microns
	1	Mils
	1	Millimetres
	1	Inches
	1	Mils

Close

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

# Speedstack v23.03.01 (March 2023)

## Material Library Filter / Search Enhancements



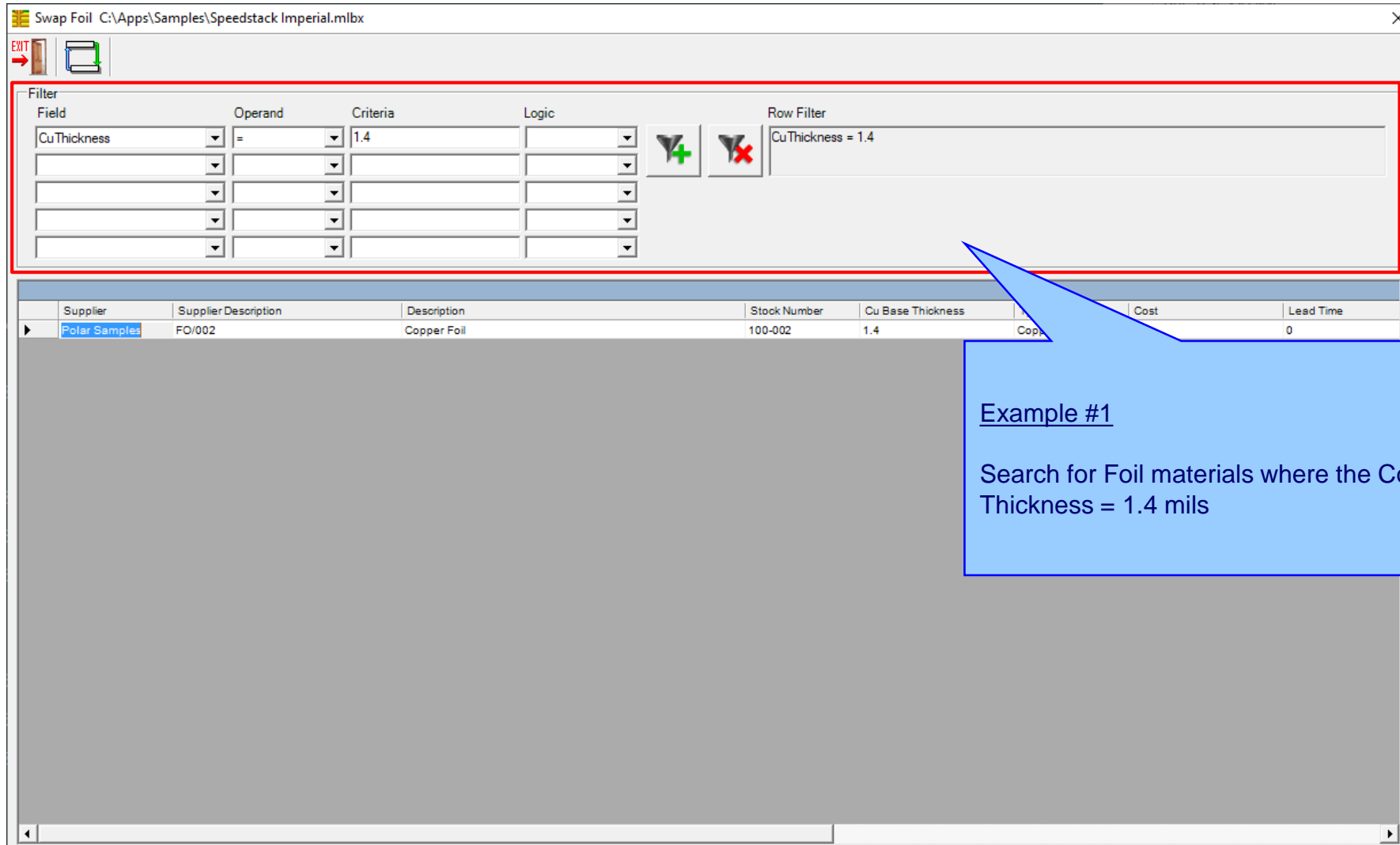
Field	Operand	Criteria	Logic	Row Filter
Description	Like	*80*		Description Like *80*

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

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

## Material Library Filter / Search Enhancements



The screenshot shows a software window titled "Swap Foil C:\Apps\Samples\Speedstack Imperial.mlbx". The window contains a filter configuration section and a data table. The filter section is highlighted with a red border and includes a table with columns: Field, Operand, Criteria, Logic, and Row Filter. The first row is populated with "CuThickness", "=", "1.4", and a plus sign icon. The Row Filter text box shows "CuThickness = 1.4". Below the filter section is a table with columns: Supplier, Supplier Description, Description, Stock Number, Cu Base Thickness, Cost, and Lead Time. The first row of data is: Polar Samples, FO/002, Copper Foil, 100-002, 1.4, Cop, 0.

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

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

Example #1  
Search for Foil materials where the Copper Thickness = 1.4 mils



## Material Library Filter / Search Enhancements

The screenshot shows a software window titled "Swap Core C:\Apps\Samples\Speedstack Imperial.mlbx". The "Filter" section is highlighted with a red border and contains the following configuration:

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

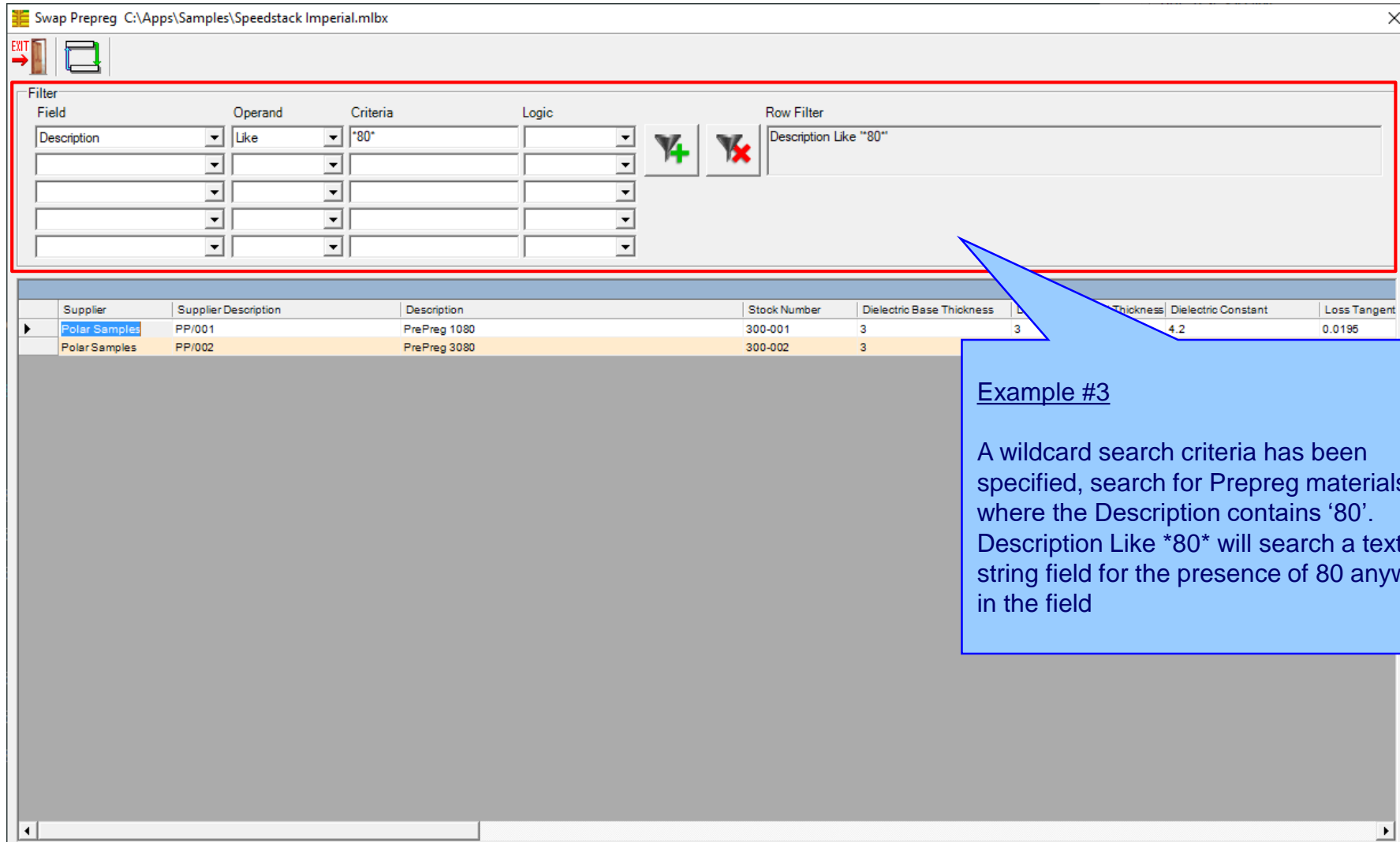
The "Row Filter" text box displays the resulting filter expression: "Base Thickness >= 5 AND Base Thickness <= 10".

Below the filter configuration is a table of material samples:

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

**Example #2**  
Two search criteria are specified, for Core materials where the Base Thickness >= 5 mils and Base Thickness <= 10 mils

## Material Library Filter / Search Enhancements



The screenshot shows a software window titled "Swap Prepreg C:\Apps\Samples\Speedstack Imperial.mlbx". Inside, there is a "Filter" section with a table for defining search criteria. The first row is highlighted with a red border and contains the following data:

Field	Operand	Criteria	Logic
Description	Like	*80*	

To the right of the table is a "Row Filter" field containing the text "Description Like \*80\*". Below the filter section is a data table with the following columns: Supplier, Supplier Description, Description, Stock Number, Dielectric Base Thickness, Thickness, Dielectric Constant, and Loss Tangent.

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

Example #3

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

## Online Library – Now supports three modes

The screenshot shows the 'Online Library' window with the following sections:

- Filter by Supplier:** A list of suppliers including 'All Suppliers', 'Polar', 'AGC', and 'ARLON MATERIALS FOR ELECTRONICS'.
- File Type:** A list of file types such as 'Foils', 'RCCs', 'PrePregs', 'Cores', 'SolderMasks', 'Idents', 'Peelables', 'Coverlays', 'BondPly', 'Adhesives', 'FlexCores', and 'Shields'. 'Foils' is currently selected.
- Library Files Available : All:** A list of available files including 'CircuitFoil\_BF-ANP\_1901.mlbx', 'CircuitFoil\_BF-TZA\_1901.mlbx', 'CircuitFoil\_TWS\_1901.mlbx', 'CircuitFoil\_TZA-B\_1901.mlbx', 'CircuitFoil\_TZA\_1901.mlbx', 'Mitsui\_3EC-M3S-HTE\_1901.mlbx', 'Mitsui\_HS-VSP\_1901.mlbx', 'Mitsui\_MLS-G\_1901.mlbx', 'Mitsui\_TQ-M4-VSP\_1901.mlbx', 'Mitsui\_TQ-M7-VSP\_1901.mlbx', 'Polar\_Foils\_1901.mlbx', 'Rogers\_CU4000\_2105.mlbx', and 'Rogers\_CU4000\_LoPro\_2105.mlbx'.
- Filter by Frequency:** Radio buttons for 'All', '1 GHz', '20 GHz', '5 GHz', '50 GHz', '10 GHz', and '75 GHz'. 'All' is selected.
- Library Files Selected during this session:** An empty list.
- File Access Mode:** Radio buttons for 'Online Polar Library ( ftp://polarinstruments.com )' (selected) and 'On-Premise Mode [Application Note](#)'. Below this is a text field containing 'C:\Users\vicha\AppData\Roaming\Polar\Speedstack\MaterialLibrary' and 'Browse...' and 'Download...' buttons.

**Mode #1 Online Polar Library**

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

## Online Library – Now supports three modes

The screenshot shows the 'Online Library' application window. It features several panels: 'Filter by Supplier' with logos for All Suppliers, Polar, AGC, and ARLO; 'File Type' with a list of file categories like Foils, RCCs, and PrePregs; 'Filter by Frequency' with radio buttons for All, 1 GHz, 5 GHz, 10 GHz, 20 GHz, 50 GHz, and 75 GHz; 'Library Files Available : All' listing various .mlbx files; and 'Library Files Selected during this session' which is currently empty. At the bottom, the 'File Access Mode' section has 'On-Premise Mode' selected and highlighted with a red box. Below it, a file path is shown in a text box, with 'Browse...' and 'Download...' buttons, the latter also highlighted with a red box. A blue callout box points to the 'On-Premise Mode' option.

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

This option downloads the complete set of On-Premise material libraries so that they are stored locally.

It is then possible to append selected library files to the existing Speedstack library. This requires an internet connection but overcomes the problem where FTP access is not permitted as it uses the HTTPS protocol for downloading the complete set of material library files.

## Online Library – Now supports three modes

The screenshot shows the 'Online Library' application window. On the left, there is a 'Filter by Supplier' section with logos for 'All Suppliers', 'Polar', 'AGC', and 'ARLON MATERIALS FOR ELECTRONICS'. In the center, the 'File Type' list includes Foils, RCCs, PrePregs, Cores, SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, FlexCores, and Shields. Below that, the 'Filter by Frequency' section has radio buttons for 'All', '1 GHz', '20 GHz', '5 GHz', '50 GHz', '10 GHz', and '75 GHz'. The 'Library Files Available : All' list contains various .mlbx files from suppliers like CircuitFoil, Mitsui, and Rogers. At the bottom, the 'File Access Mode' section has two options: 'Online Polar Library (ftp://polarinstruments.com)' and 'On-Premise Mode [Application Note](#)', with the latter selected and highlighted by a red box. Below this is a file path input field containing 'S:\Software\Speedstack\MaterialLibrary' and a 'Browse...' button, also highlighted by a red box. A 'Download...' button is to its right. A blue callout box points to the 'On-Premise Mode' option.

**Mode #3 On-Premise Mode with Browse option**

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

# Speedstack v22.11.01 (November 2022)

## Introducing Structure View

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 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 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	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

Edge Coupled Coated Microstrip 1B

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
<b>Differential Impedance</b>	<b>Zd</b>	<b>99.94</b>
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

The screenshot shows the 'Stack Up Editor' interface. At the top, there are tabs for 'Stack Up Editor', 'DRC : 0', 'Controlled Impedance', and 'CI Results'. Below the tabs is a toolbar with various icons. A navigation bar shows 'All | < < 1 of 8 > > |'. The main area is split into two panes. The left pane displays a table of 8 structures with columns for Zo, W1/W2, Zdiff, W1/W2, S1, and W1/W2. The right pane shows a cross-sectional diagram of a 'Coated Microstrip 1B' with parameters like H1, Er1, W1, W2, C1, C2, and CEr. Below the diagram is a table of parameters and their values.

Structure	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						
4	49.83	14.7500 / 15.7500	99.55	9.0000 / 10.0000	12.0000	9.0000 / 10.0000
5	49.83	15.7500 / 14.7500	99.55	10.0000 / 9.0000	12.0000	10.0000 / 9.0000
6						
7						
8	49.54	10.9500 / 9.9500	99.94	8.0000 / 7.0000	8.8200	8.0000 / 7.0000

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

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

# Introducing Structure View

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

Filtering structures by layer is useful when focusing on critical layers of the stack up.  
In this example layer 4 has been selected

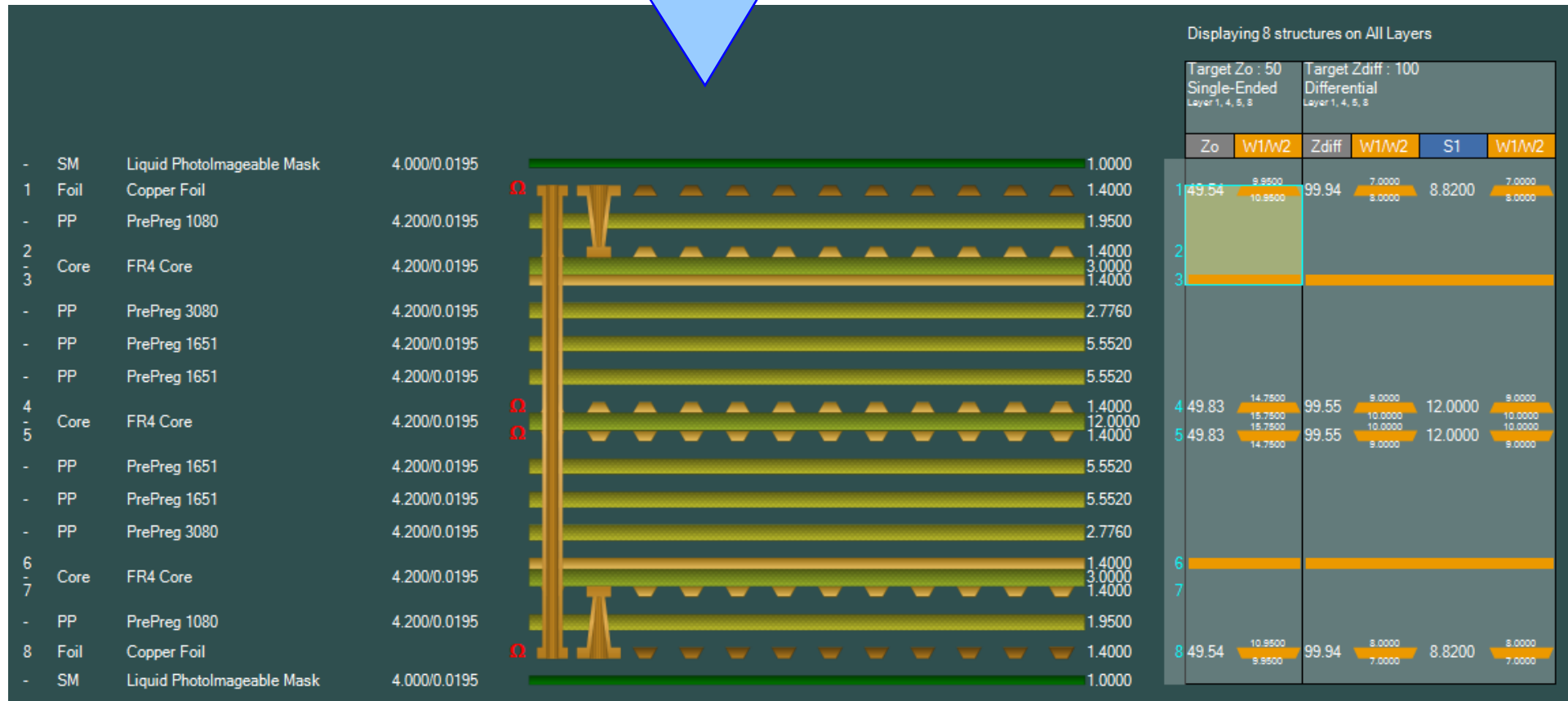
The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up of 8 layers. Layer 4 is highlighted in orange, and its structures are shown in a detailed view on the right. The detailed view shows a microstrip structure on a substrate with parameters: Substrate 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, and Trace Thickness (T1) 1.4000. The impedance target is 50.00 with a 10.00% tolerance.

Layer	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1						
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						

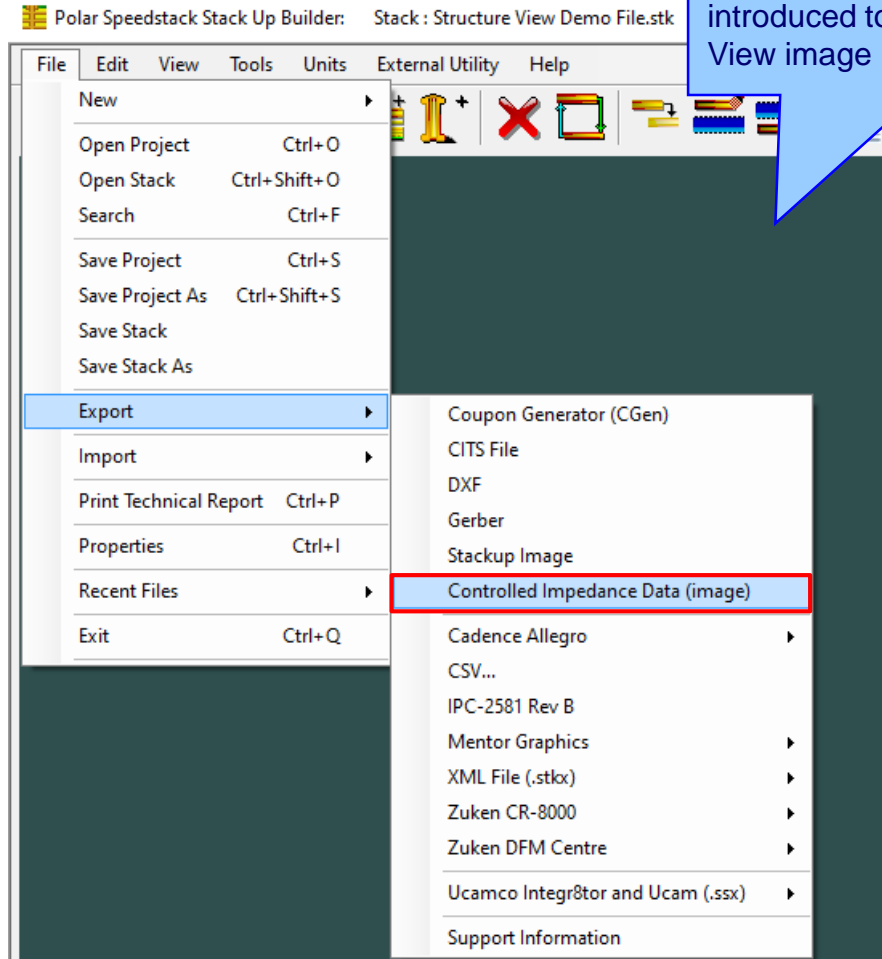
## Introducing Structure View

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

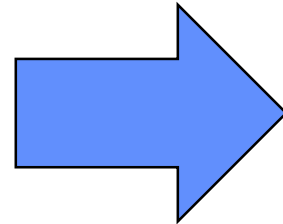
All data is now visible in one view



## 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 with the following sections:

- Filter by Supplier:** A scrollable list of suppliers including Nan Ya Plastics, Nelco, OAK-MITSUI TECHNOLOGIES (highlighted with a red box), and Panasonic.
- File Type:** A list of file types including Foils, RCCs, PrePregs, Cores (highlighted), SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, FlexCores, and Shields.
- Filter by Frequency:** Radio buttons for All, 1 GHz, 20 GHz, and 50 GHz.
- Library Files Available : OakMitsui:** A list of files such as OakMitsui\_FaradFlex\_MC12M\_1GHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC12M\_1MHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC12TM\_1GHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC12TM\_1MHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC24M\_1GHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC24M\_1MHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC24P\_1MHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC8M\_1GHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC8M\_1MHz\_2201.mlbx, OakMitsui\_FaradFlex\_MC8TM\_1GHz\_2201.mlbx, and OakMitsui\_FaradFlex\_MC8TM\_1MHz\_2201.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 for Download and Close are present.
- Library Files Downloaded during this session:** An empty box.
- File Access Mode:** Radio buttons for Online Polar Library (ftp://polarinstruments.com) (selected) and On-Premise Mode (Application Note). A text field contains 'C:\Users\vicha\Desktop\Material\_Library\_2021' with a Browse... button.

A blue callout box points to the OAK-MITSUI TECHNOLOGIES supplier entry with the text: "Regular updates of materials and suppliers".

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

# Speedstack v22.07.20 (July 2022)

## Introducing Grid View

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

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

**Stack Up Builder** Stack: Eval Imperial.stk Project: Eval Imperial.sci

Layer	Material	Thickness	Order	Thickness
-	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			3.0000	
-	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			12.0000	
-	PP	PrePreg 1651	4.200/0.0195	1.4000
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 3080	4.200/0.0195	2.7760
6	Core	FR4 Core	4.200/0.0195	1.4000
7			3.0000	
-	PP	PrePreg 1080	4.200/0.0195	1.4000
-	PP	PrePreg 1080	4.200/0.0195	1.9500
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

Parameter	Value
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
<b>Differential Impedance</b>	<b>Zd 100.29</b>
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 FR4 Core). The 'Layer Name' is highlighted in red, indicating a change to 'Power'. The 'Processed Thickness' is also highlighted in red, indicating adjustments.

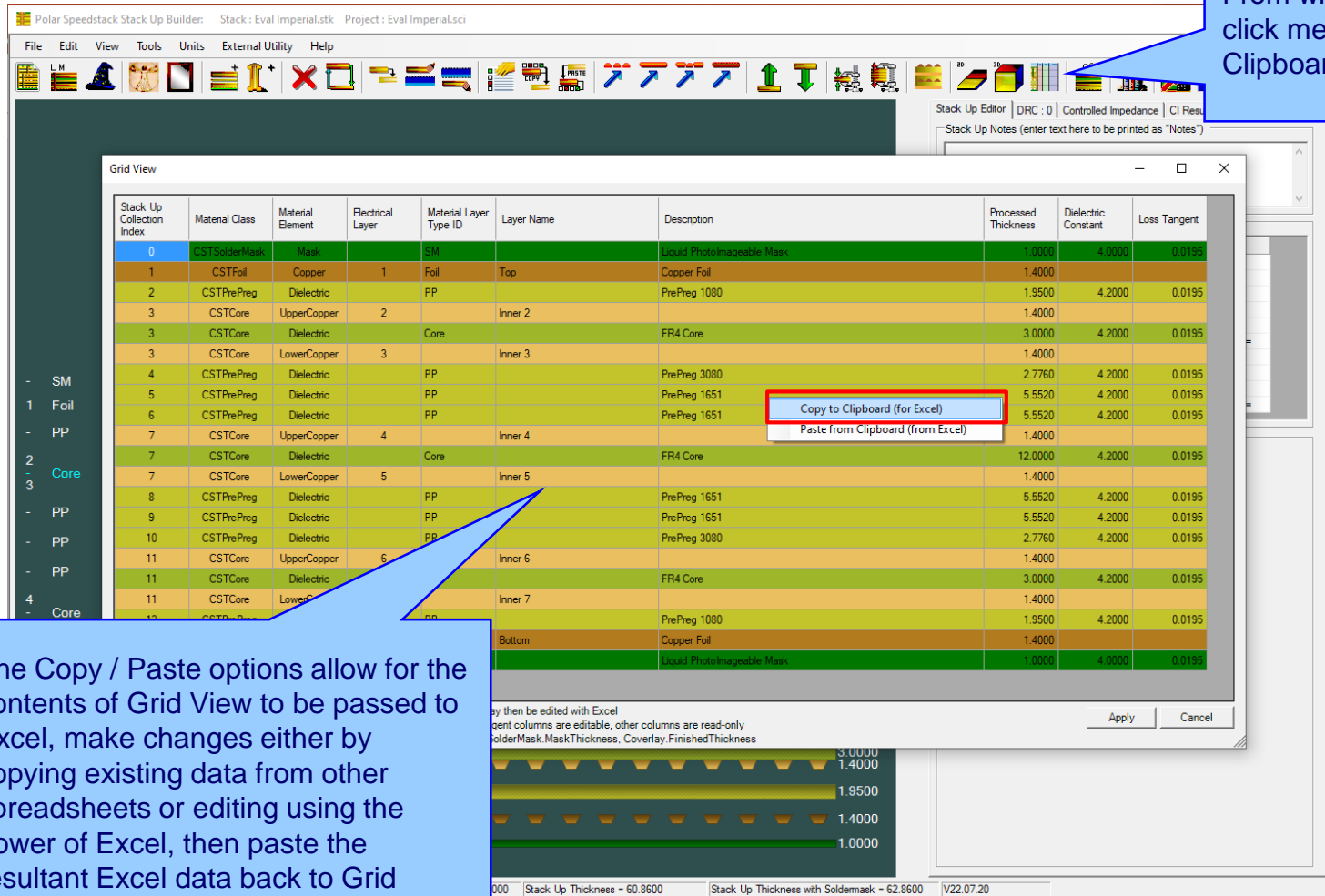
Step #3  
Changes made under Grid View are now applied back to the stack up editor.

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 window contains a table with the following columns: Stack Up Collection Index, Material Class, Material Element, Electrical Layer, Material Layer Type ID, Layer Name, Description, Processed Thickness, Dielectric Constant, and Loss Tangent. A context menu is open over the row with index 6, showing options for 'Copy to Clipboard (for Excel)' and 'Paste from Clipboard (from Excel)'. The 'Copy to Clipboard (for Excel)' option is highlighted with a red box.

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

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

Layer	Material	Thickness	Start	End
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil	4.200/0.0195	1.5000
-	PP	PrePreg 1080	4.200/0.0195	2.1000
2	Core	FR4 Core	4.200/0.0195	1.4000
3			3.0000	
-	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			10.0000	
-	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			3.0000	
-	PP	PrePreg 1080	4.200/0.0195	2.1000
8	Foil	Copper Foil	4.200/0.0195	1.5000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

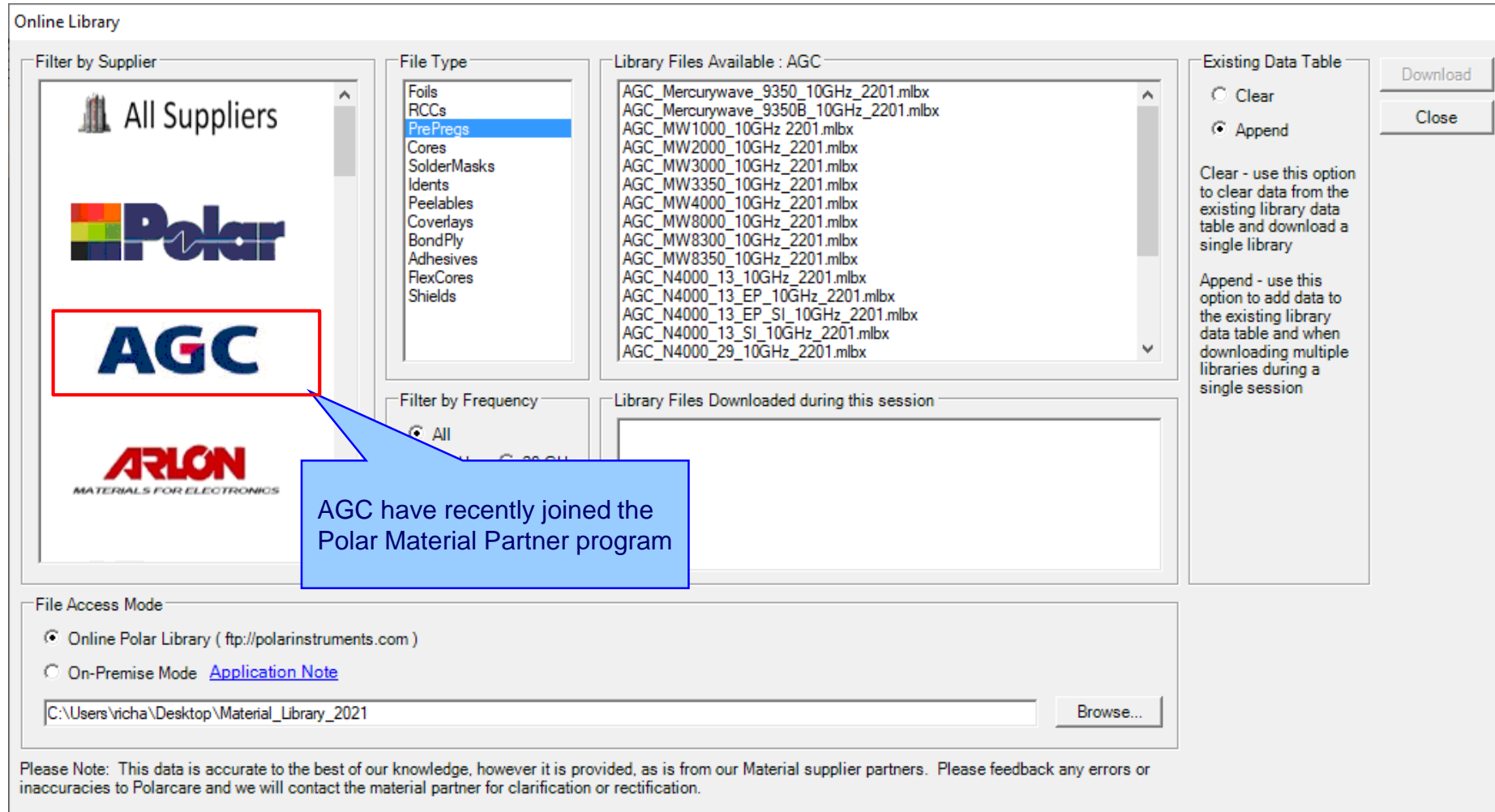
Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.4000
Dielectric Thickness	47.9600
Solder Mask Thickness	2.0000
=====	
Target Stack Up Thickness	60.0000
Stack Up Thickness	59.3600
Stack Up Thickness with Soldermask	61.3600
=====	

## 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 window. On the left, under 'Filter by Supplier', the 'AGC' logo is highlighted with a red box. A blue callout bubble points to it 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 )' and a local path is entered in the text box.

Online Library

Filter by Supplier

All Suppliers

Polar

**AGC**

ARLON  
MATERIALS FOR ELECTRONICS

File Type

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

Filter by Frequency

- All

Library Files Available : AGC

- AGC\_Mercurywave\_9350\_10GHz\_2201.mlbx
- AGC\_Mercurywave\_9350B\_10GHz\_2201.mlbx
- AGC\_MW1000\_10GHz\_2201.mlbx
- AGC\_MW2000\_10GHz\_2201.mlbx
- AGC\_MW3000\_10GHz\_2201.mlbx
- AGC\_MW3350\_10GHz\_2201.mlbx
- AGC\_MW4000\_10GHz\_2201.mlbx
- AGC\_MW8000\_10GHz\_2201.mlbx
- AGC\_MW8300\_10GHz\_2201.mlbx
- AGC\_MW8350\_10GHz\_2201.mlbx
- AGC\_N4000\_13\_10GHz\_2201.mlbx
- AGC\_N4000\_13\_EP\_10GHz\_2201.mlbx
- AGC\_N4000\_13\_EP\_SI\_10GHz\_2201.mlbx
- AGC\_N4000\_13\_SI\_10GHz\_2201.mlbx
- AGC\_N4000\_29\_10GHz\_2201.mlbx

Existing Data Table

Clear

Append

Download

Close

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

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

File Access Mode

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

On-Premise Mode [Application Note](#)

C:\Users\vicha\Desktop\Material\_Library\_2021

Browse...

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
<b>Impedance</b>	<b>Zo 49.88</b>
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 Supplier, Description, Type, Processed Thickness, 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, and various impedance parameters. A dialog box titled "Confidential Stamp Options" is open, allowing the user to select the location where the "CONFIDENTIAL" stamp should appear. The dialog includes a preview of the stamp 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	er	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			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			
		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)



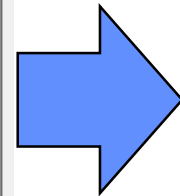
## Snap Parameters and Calculate Structure

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

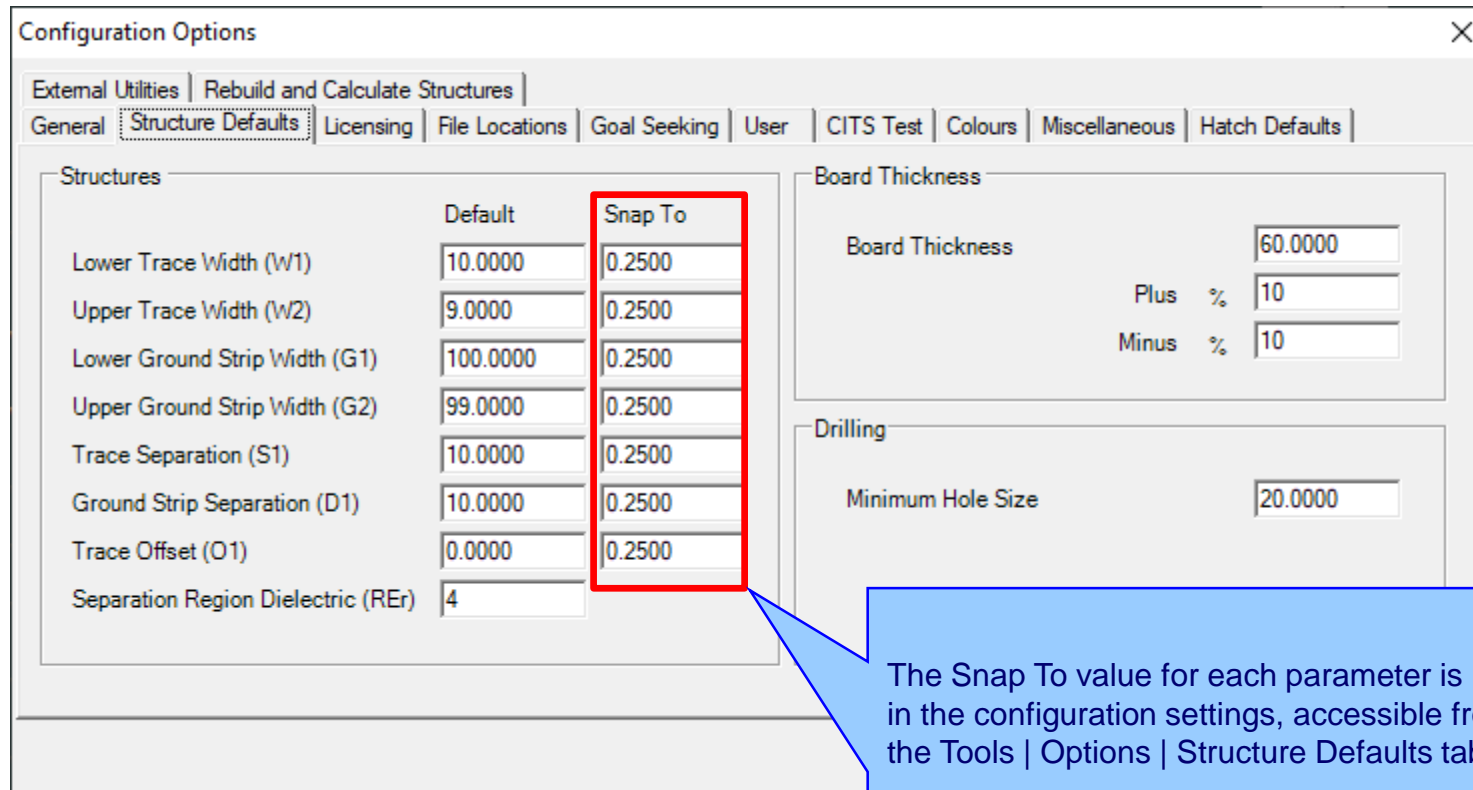
Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.7500
Upper Trace Width	W2	6.7500
Trace Separation	S1	8.0000
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000
Differential 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 software interface with a material library table. A red box highlights the 'Tolerance' column, and a blue callout box provides details about 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%.

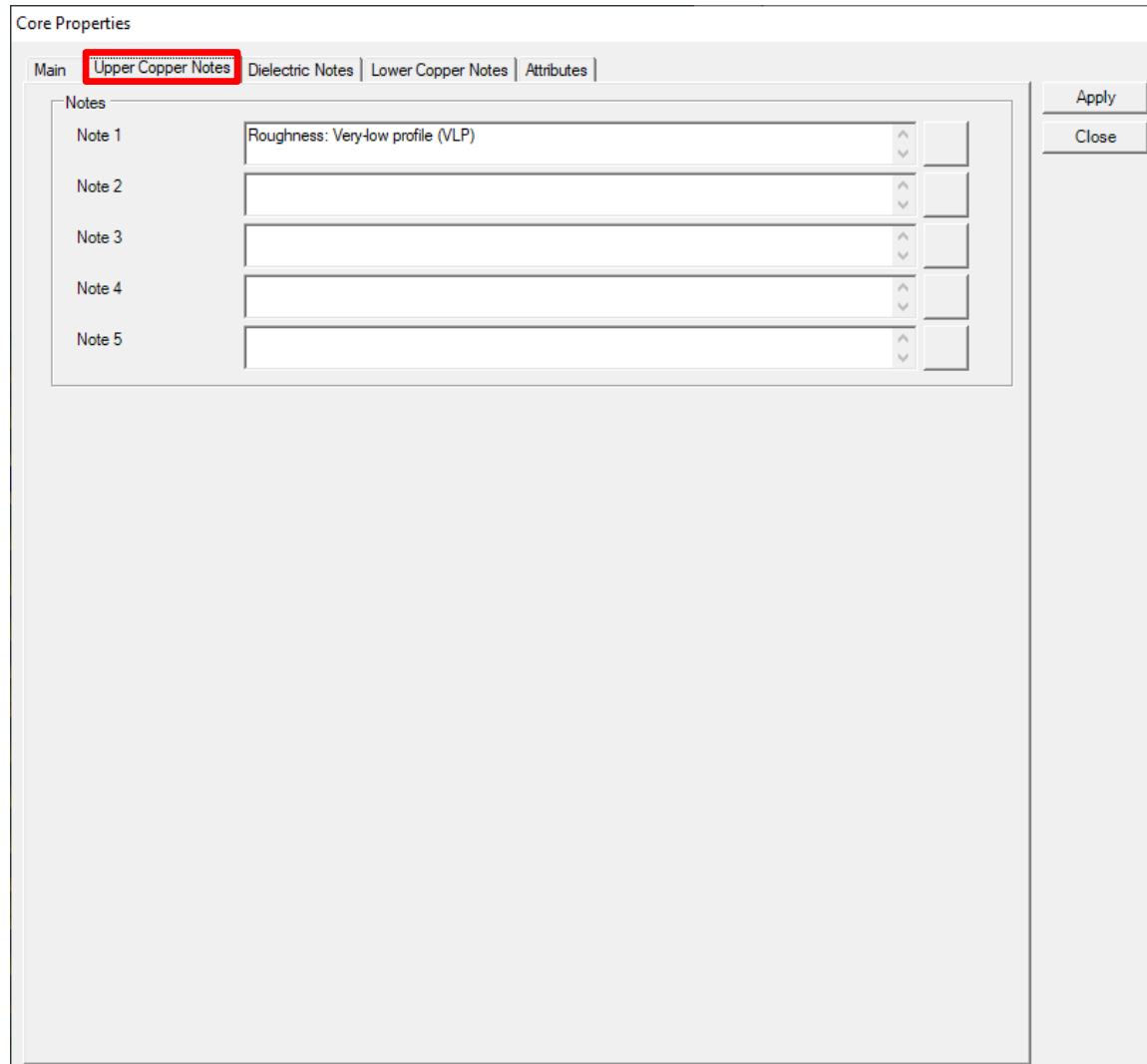
Previous versions of Speedstack would prompt the user to enter a value greater than 0%

# 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

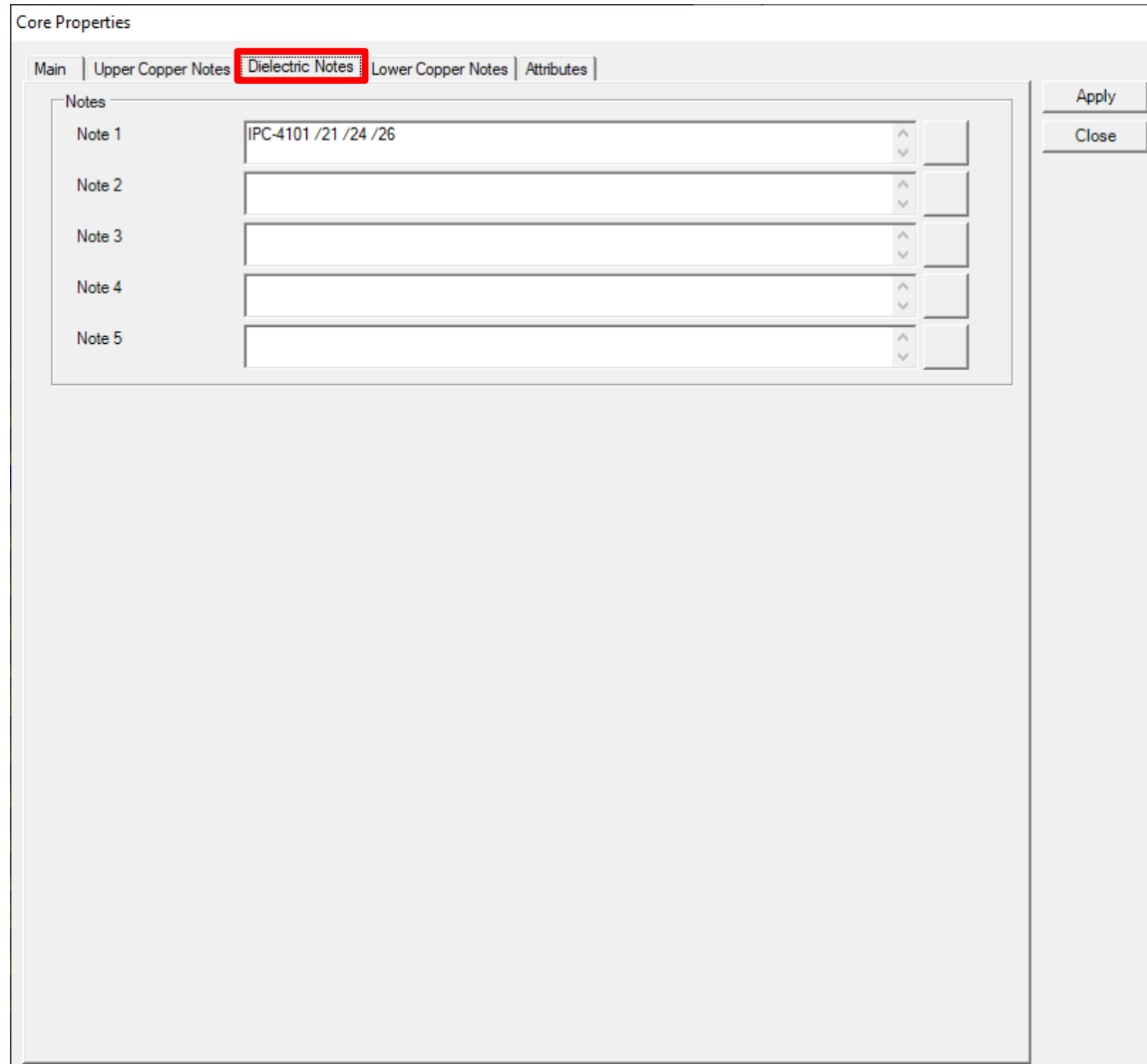
Apply

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



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'. The first field, 'Note 1', contains the text 'IPC-4101 /21 /24 /26'. To the right of the input fields are 'Apply' and 'Close' buttons.

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
<b>Upper Copper Notes</b>	
Note 1	Roughness: Very-low profile
Note 2	
Note 3	
Note 4	
Note 5	
<b>Dielectric Notes</b>	
Note 1	IPC-4101 /21 /24 /26
Note 2	
Note 3	
Note 4	
Note 5	
<b>Lower Copper Notes</b>	
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"/>

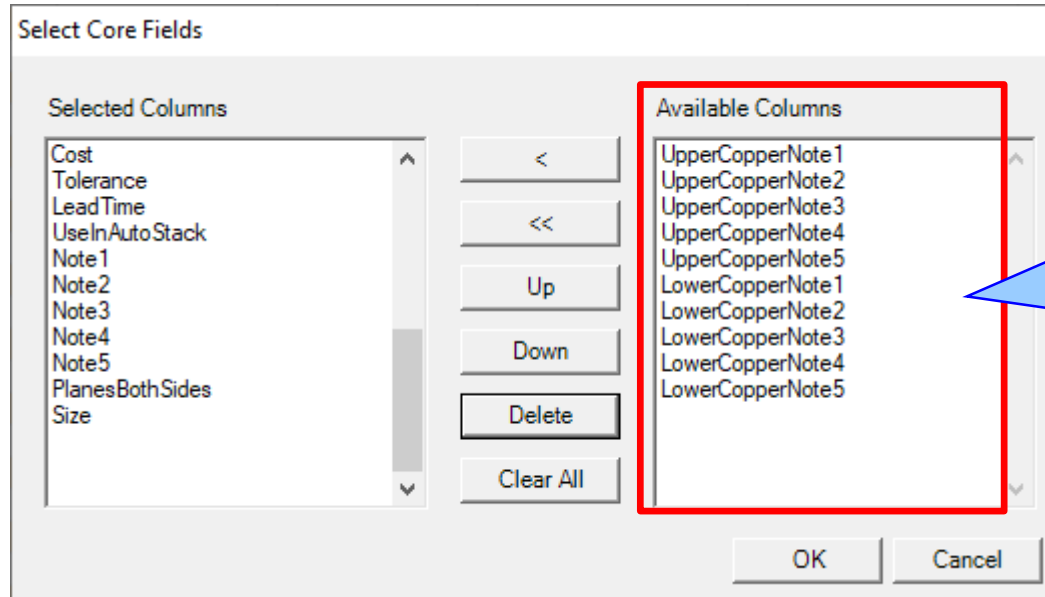
Upper Copper Notes		Dielectric Notes		Lower Copper Notes	
Note 1	Roughness: Very-low profile (VLP)	Note 1	IPC-4101 /21 /24 /26	Note 1	Roughness: Very-low profile (VLP)
Note 2		Note 2		Note 2	
Note 3		Note 3		Note 3	
Note 4		Note 4		Note 4	
Note 5		Note 5		Note 5	

<< < 5 of 27 > >>

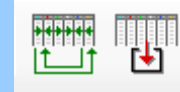
The Speedstack material library has been enhanced to support the extra notes fields.

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

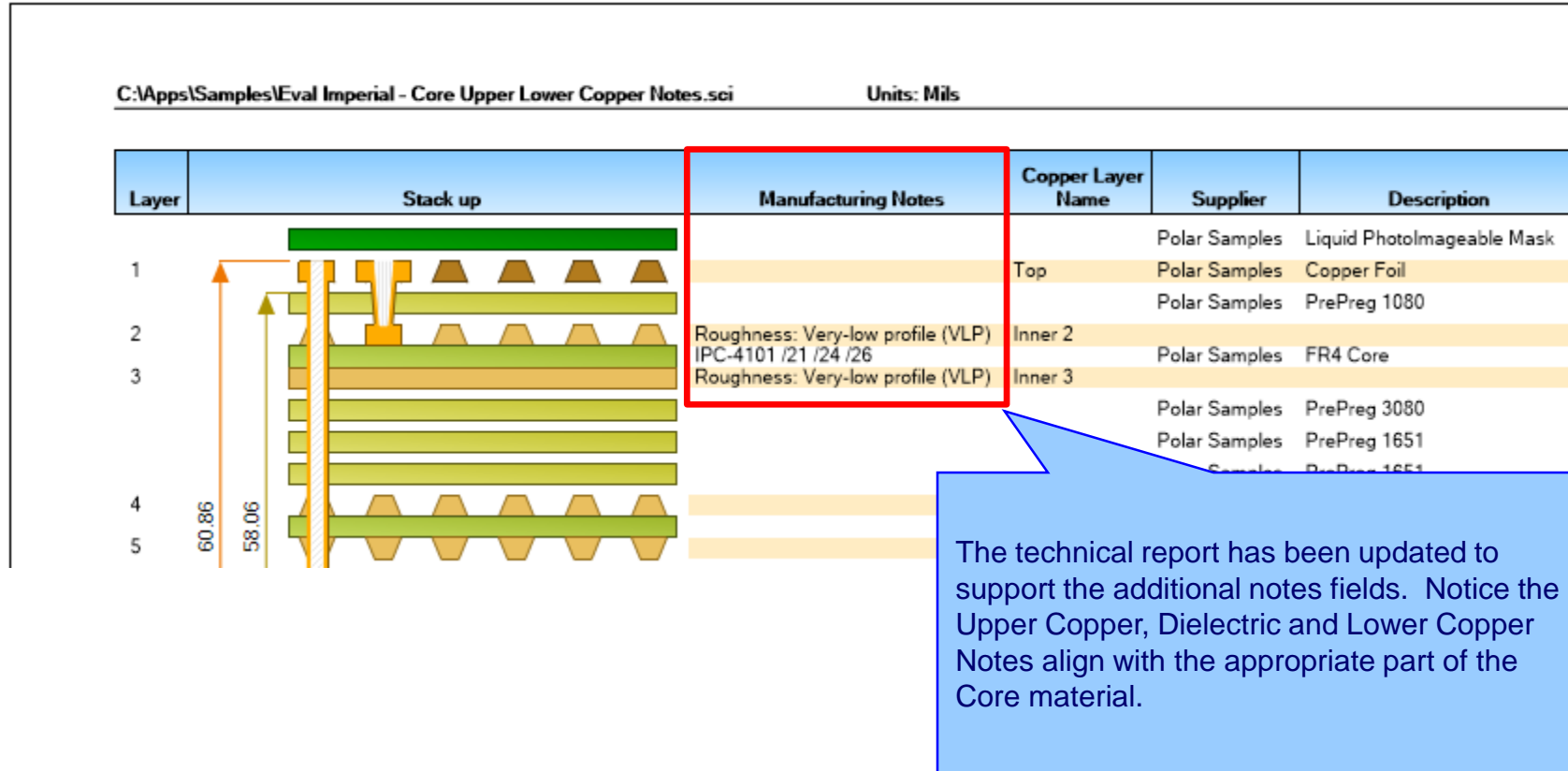


### Material Library Import / Export

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

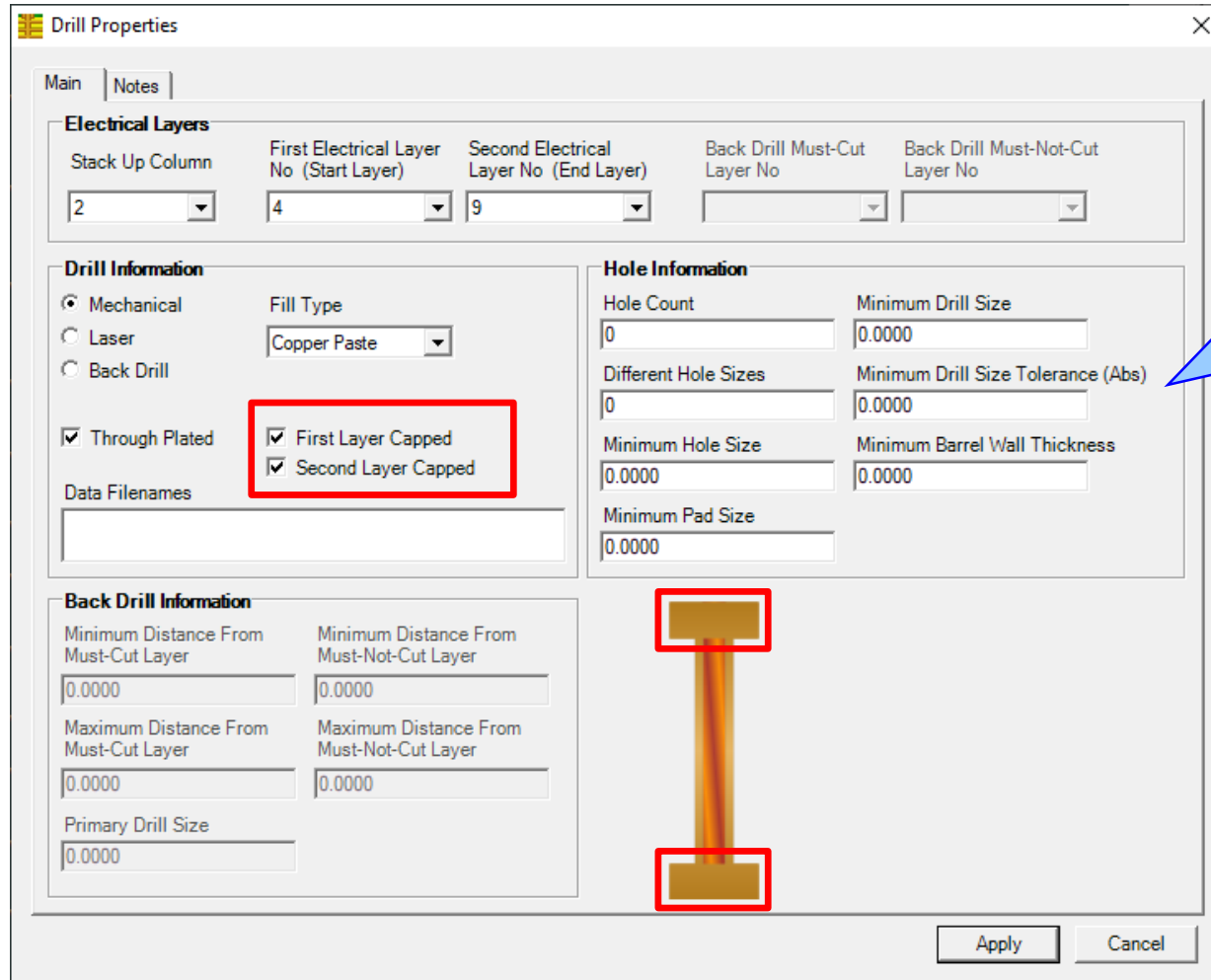
The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up configuration with 13 layers. A red box highlights a specific layer configuration for a drill cap. The right-hand panel shows a cross-sectional diagram of a 'Coated Microstrip 18' with various parameters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



The screenshot shows the 'Drill Properties' dialog box with the following settings:

- Electrical Layers:** Stack Up Column: 2, First Electrical Layer No (Start Layer): 4, Second Electrical Layer No (End Layer): 9.
- Drill Information:** Mechanical (selected), Fill Type: Copper Paste, Through Plated (checked), First Layer Capped (checked), Second Layer Capped (checked).
- Hole Information:** Hole Count: 0, Minimum Drill Size: 0.0000, Different Hole Sizes: 0, Minimum Drill Size Tolerance (Abs): 0.0000, Minimum Hole Size: 0.0000, Minimum Barrel Wall Thickness: 0.0000, Minimum Pad Size: 0.0000.
- Back Drill Information:** Minimum Distance From Must-Cut Layer: 0.0000, Minimum Distance From Must-Not-Cut Layer: 0.0000, Maximum Distance From Must-Cut Layer: 0.0000, Maximum Distance From Must-Not-Cut Layer: 0.0000, Primary Drill Size: 0.0000.

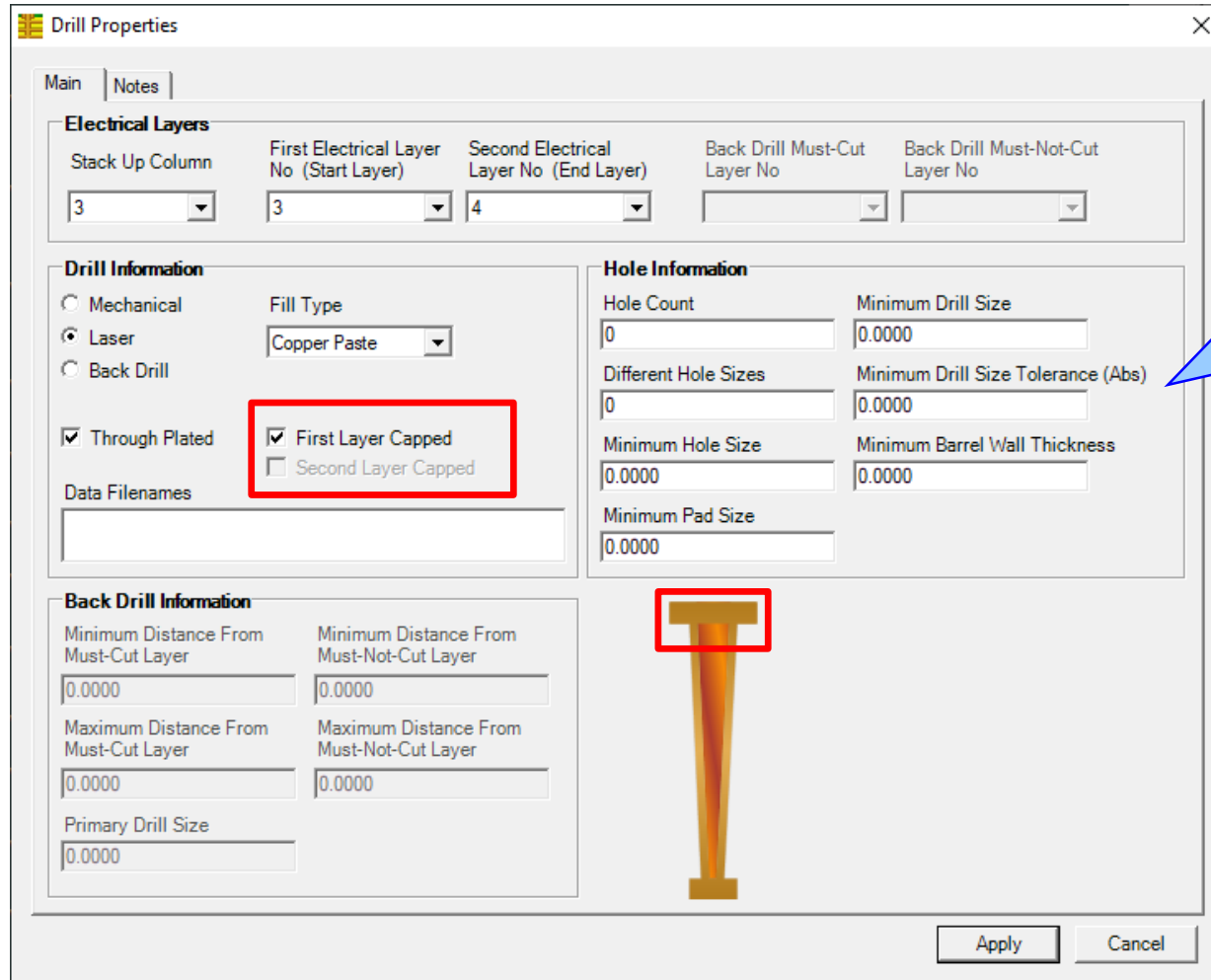
A red box highlights the 'First Layer Capped' and 'Second Layer Capped' checkboxes. A blue callout box points to the 'Through Plated' section.

### 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: [ ]

**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	

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	

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

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

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

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

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

## 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	FR4 Core	FR4	1.400			
11		Inner 11	Polar Samples	PrePreg 1080	Dielectric	2.178	4.200	0.0195	3, 4
12		Bottom	Polar Samples	PrePreg 1080	Dielectric	2.178	4.200	0.0195	5, 6
			Polar Samples	PrePreg 1080	Dielectric	2.178	4.200	0.0195	
			Polar Samples	FR4 Core	FR4	1.400			
			Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
			Polar Samples	FR4 Core	FR4	2.100			
			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

The screenshot shows the Polar Speedstack Stack Up Builder interface. On the left, a table lists the stack layers:

Order	Material	Thickness
-	SM Liquid Photolmageable 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 Photolmageable Mask	4.000/0.0195

The 3D model shows layers labeled Top, Inner 2, Inner 3, Inner 4, Inner 5, Inner 6, Inner 7, and Bottom. A red box highlights the 'Inner 5' label. To the right, a cross-section diagram titled 'Edge Coupled Coated Microstrip IB' shows parameters: H1 (Substrate 1 Height), Er1 (Substrate 1 Dielectric), W1 (Lower Trace Width), W2 (Upper Trace Width), S1 (Trace Separation), T1 (Trace Thickness), and C1 (Coating Above Substrate). A table below the diagram lists these values.

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

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

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
=====	

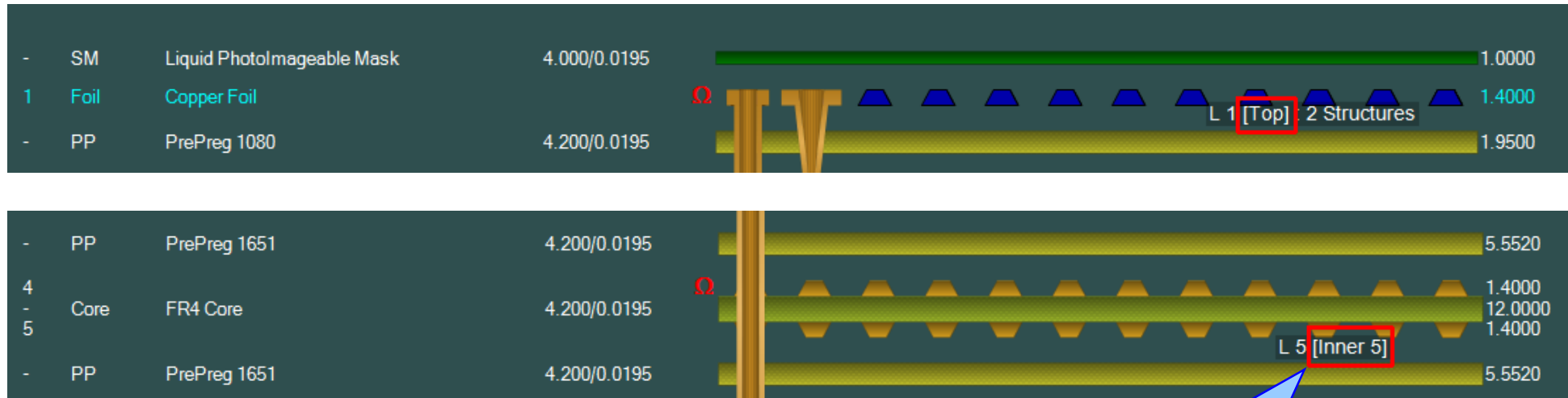
  

Field	Value
Supplier	Polar Samples
Supplier Description	FO.001
Description	Copper Foil
Stock Number	100-001
Type	Copper
-----	
Cu Base Thickness	0.7000
Cu Finished Thickness	1.4000
Copper Coverage	0
<b>Layer Name</b>	<b>Top</b>
Data Filenames	
Minimum Trace Width	2.9528
Note 1	
Note 2	
Note 3	
Note 4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

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



## 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

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

Order	Type	Material	Thickness
-	SM	Liquid PhotoImageable 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	FR4	FR4	

Configuration Options

External Utilities | Rebuild and Calculate Structures |

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

Default Stack Up View

2D

3D

Units

Mils/Thous  Microns  Millimetres  Inches

Open last used file on application start up

Display File Properties Dialog for New Stackups and Projects

Display Data

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

Display Field 3: Description

Display Field 4: Dielectric Constant/Loss Tangent

Display Field 5: Layer Name

Layer Name

Tg

Colour

Data Filenames

Processed Thickness

Mask Thickness

Dielectric Constant/Loss Tangent

Loss Tangent

Layer Name

Apply Cancel

Top

Inner 2

Inner 3

Inner 4

Inner 5

Inner 6

Inner 7

Bottom

## New Layer Name property for electrical / copper layers

Speedstack Report Printer

File Options

C:\Mps\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	
			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

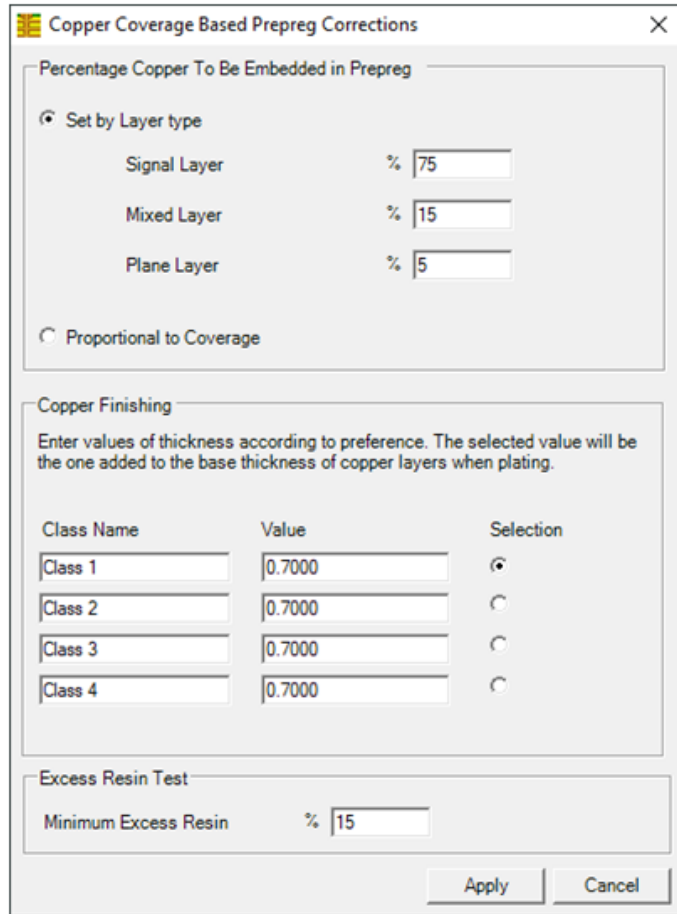
Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	100.000	100.290
2		Coated 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	Version:	Revision:	Modification:	Date of Revision:	Editor	Page 1/X
Date:	Associated Documents:					
Author:						
Department:						
Site:						

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The technical report has also been updated to support layer names

## Copper Finishing classes increased



**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.

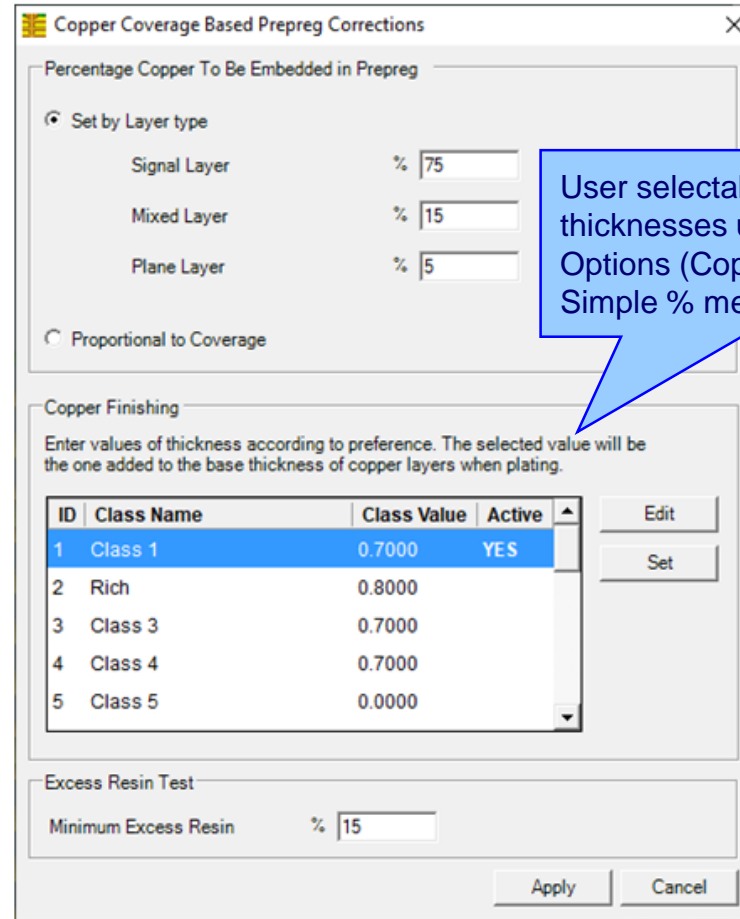
Class Name	Value	Selection
Class 1	0.7000	<input checked="" type="radio"/>
Class 2	0.7000	<input type="radio"/>
Class 3	0.7000	<input type="radio"/>
Class 4	0.7000	<input type="radio"/>

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

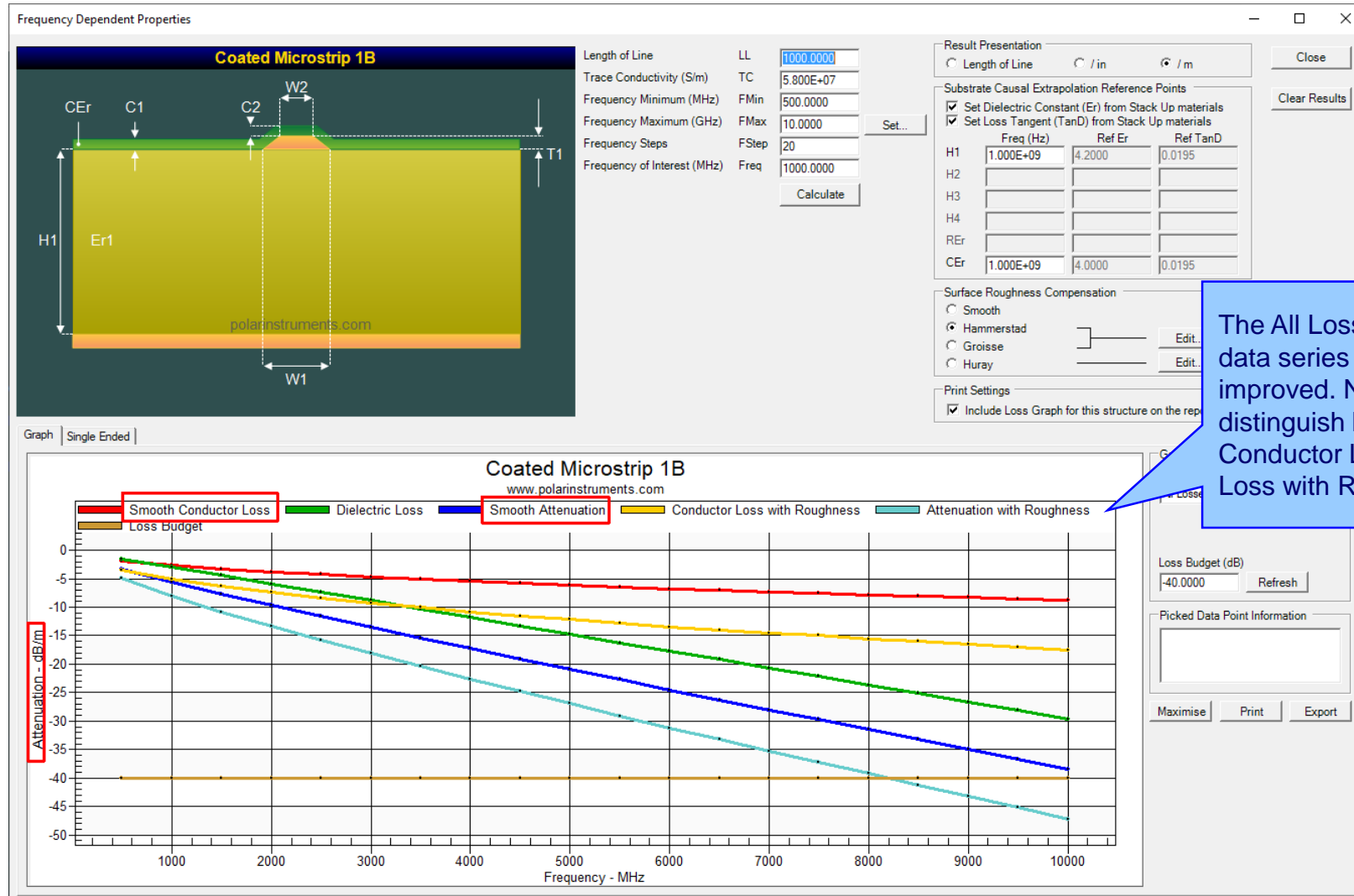
## Import / Export enhancements

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



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 stack of layers with a red circle) 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 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
=====	

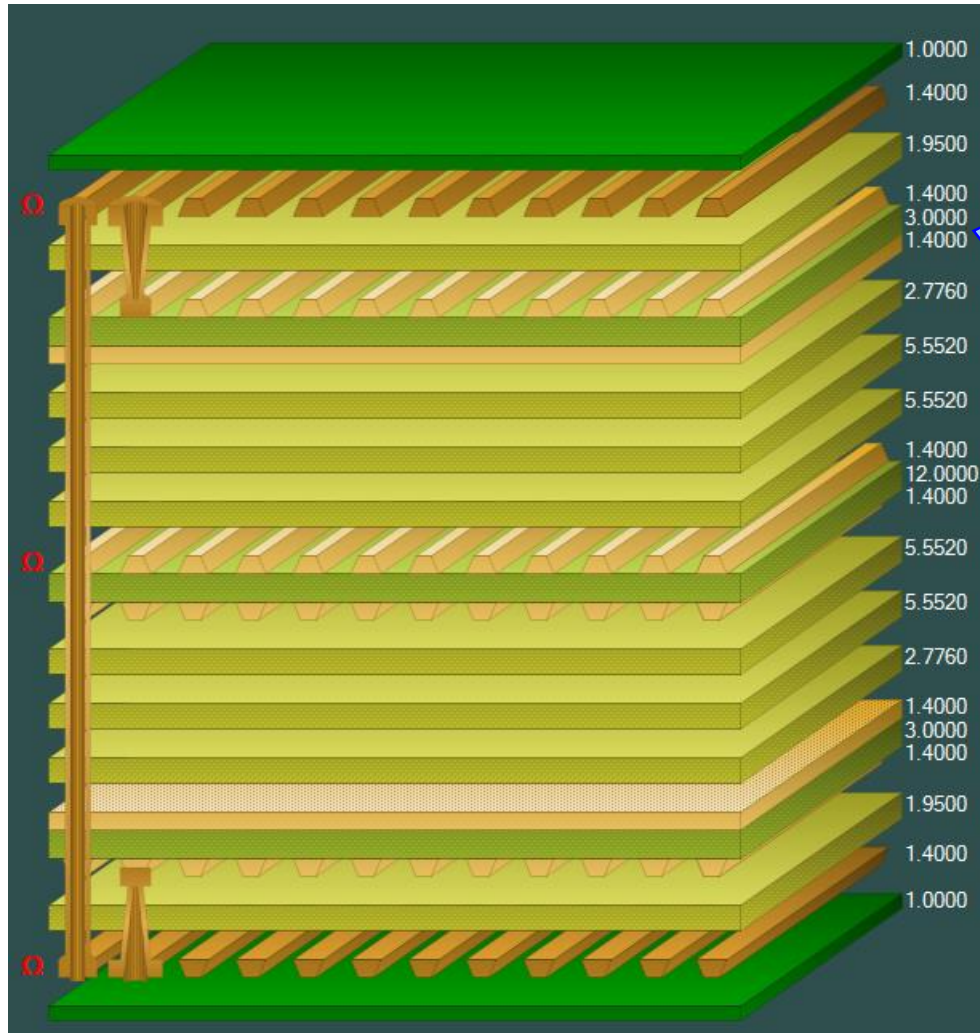
Below this table is a 'Selected Item Information' section which is currently empty.

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.

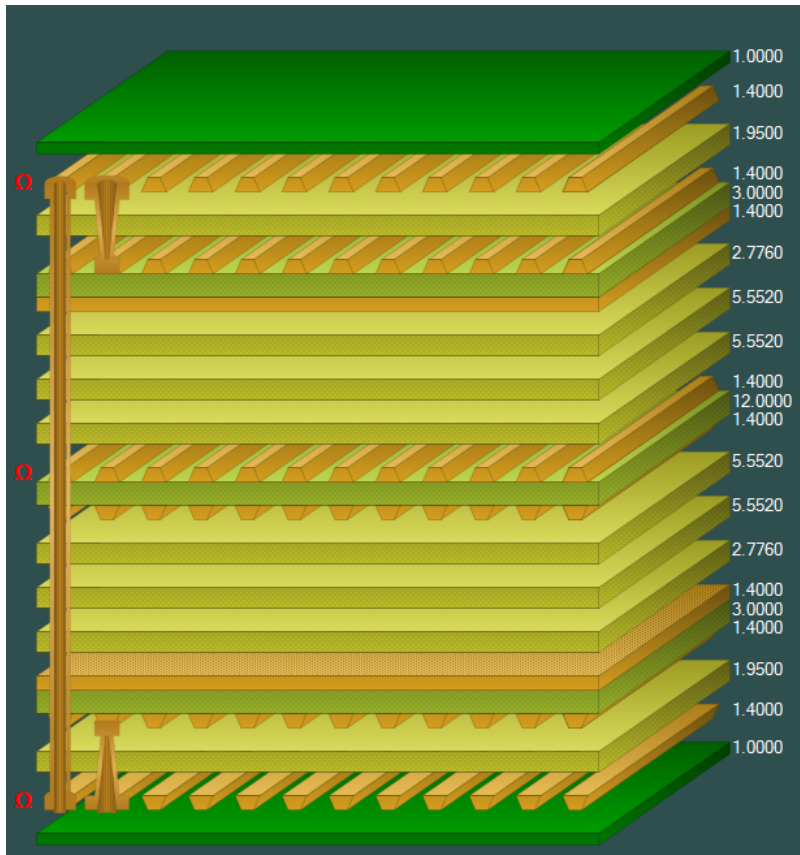
It is important to account for this additional plated copper thickness when calculating the overall stack up thickness and controlled impedance / insertion loss structures.

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

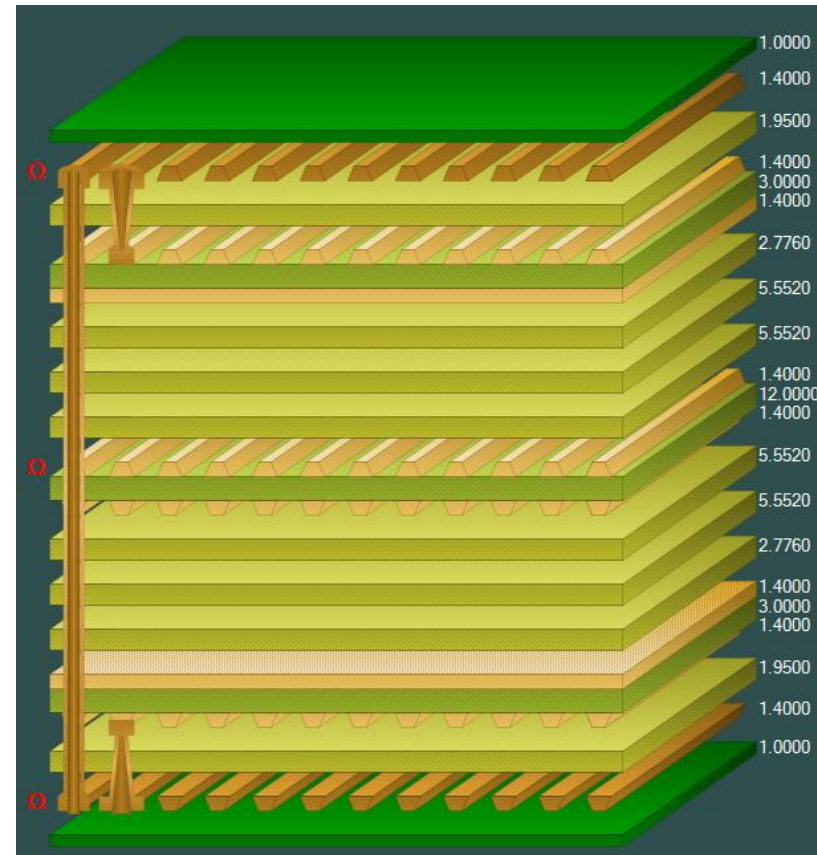
New Apply Plating Colours toolbar option



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			3
		Polar Samples	FR4 Core	FR4	12.000	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	
		Polar Samples	PreProg 3080	Dielectric	2.776	4.200	0.0195	
6		Polar Samples	FR4 Core	FR4	1.400			
		Polar Samples	FR4 Core	FR4	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

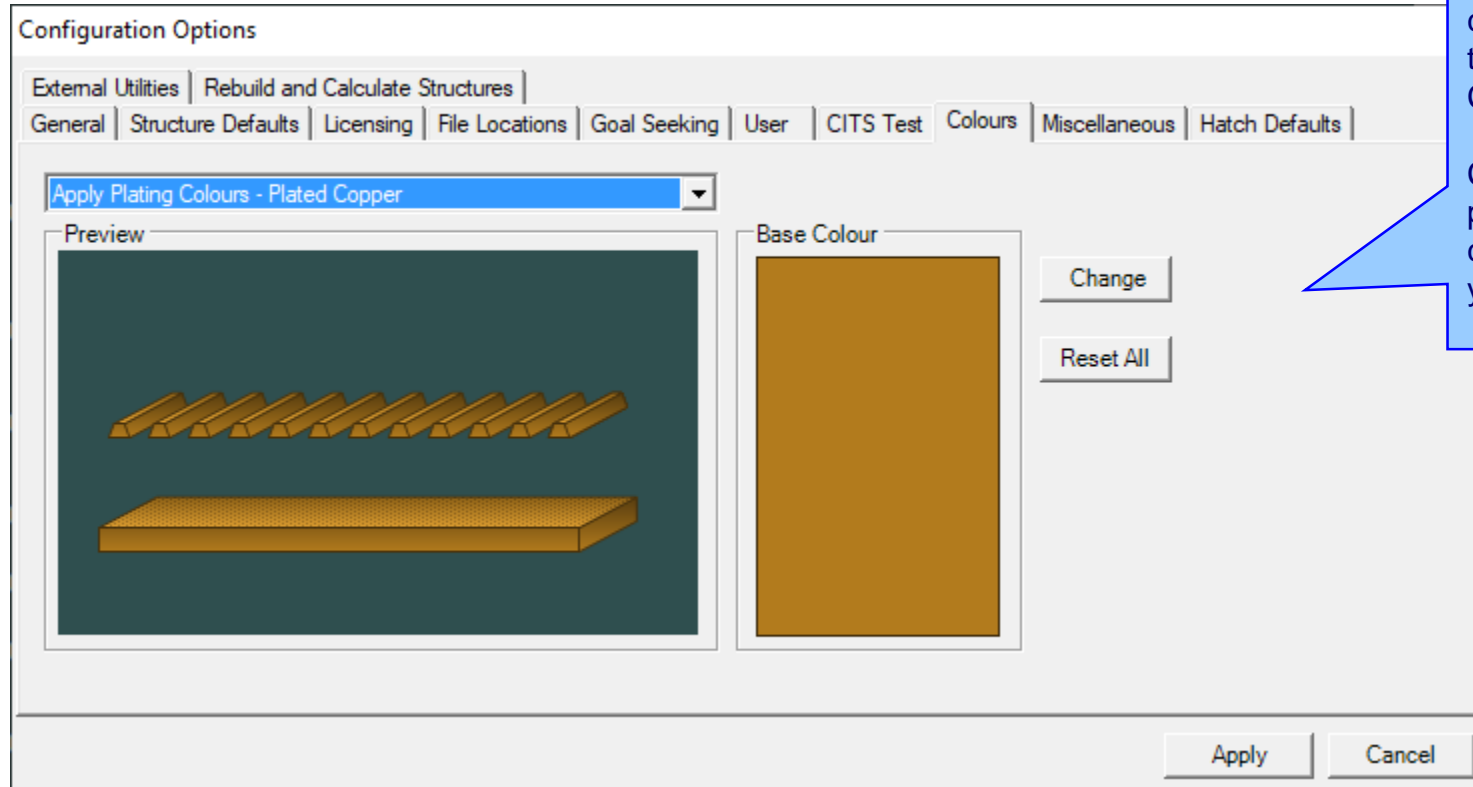
Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	100.000	10.000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

- Filter by Supplier:** Callouts highlight the logos for **SHOWA DENKO** and **TATSUTA**, with the text: "Showa Denko and Tatsuta have recently joined the Polar Material Partner program".
- File Type:** A list of file types is shown, 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:** "Clear - use this option to clear data from the existing library data table and download a single library".
  - Append:** "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' radio button and the file path input field (C:\Users\vicha\Desktop\Material\_Library\_2021) with the text: "Improvements to On-Premise Mode to help users where, for security reasons, no Internet connection is available".

At the bottom of the window, there is a 'Please Note' section: "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 various layers. A red box highlights the top and bottom shield layers. Below the model is a table listing the layers:

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, there is a status bar with the following information: [Mils/Thous] | Target Stack Up Thickness = 30.0000 | Stack Up Thickness = 29.6000 | Stack Up Thickness with Soldermask = 29.6000 | Beta V21.02.01

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

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

## New Shield material

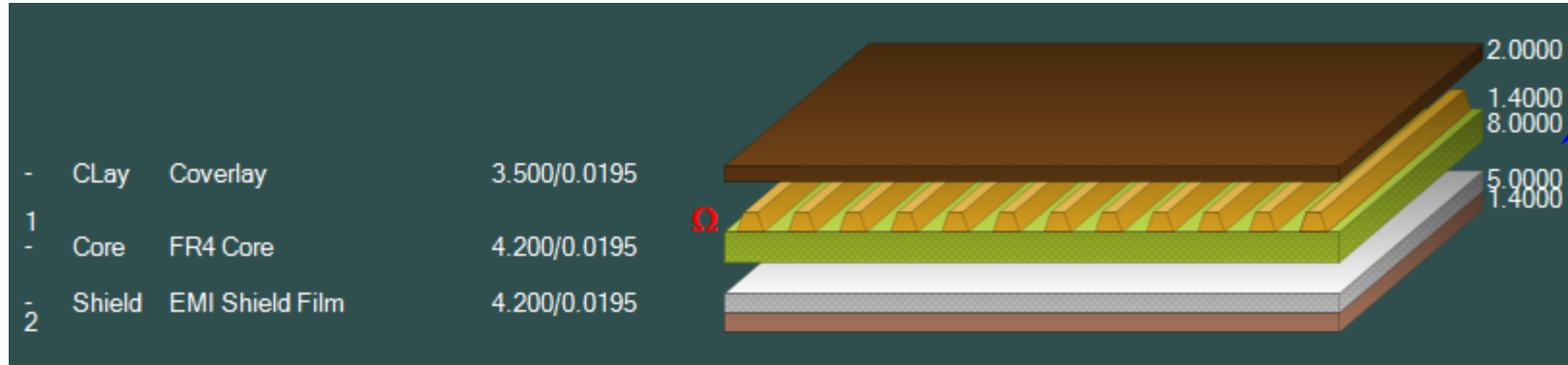
Shields are typically applied to the outer layer(s) of the stack up

1	Shield	EMI Shield Film	4.200/0.0195	1.4000	5.0000
-	PP	PrePreg 1080	4.200/0.0195	3.0000	
2	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				1.4000	

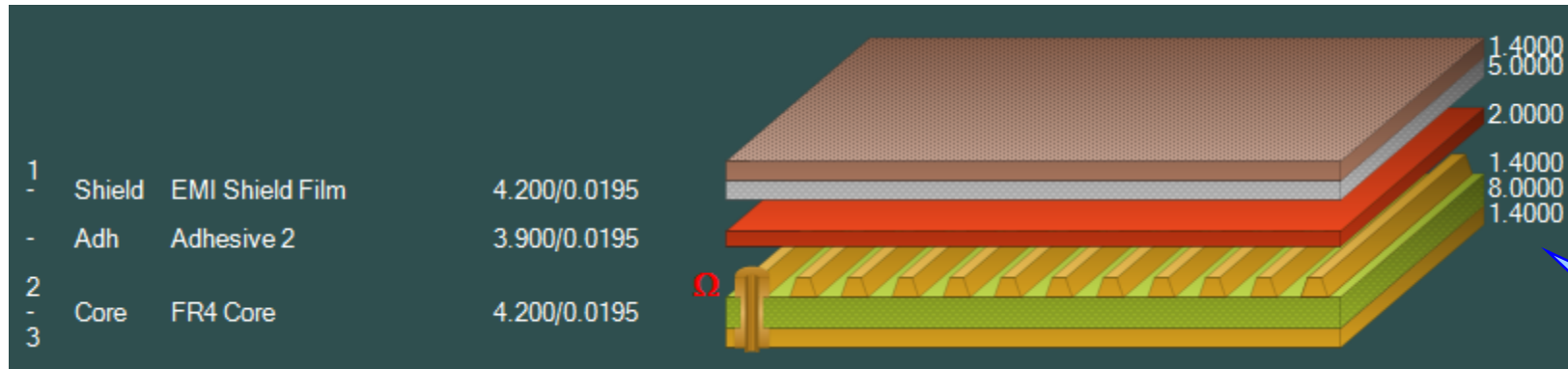


They consist of a shield layer (brown) and dielectric adhesive (silver)

## Shield material examples

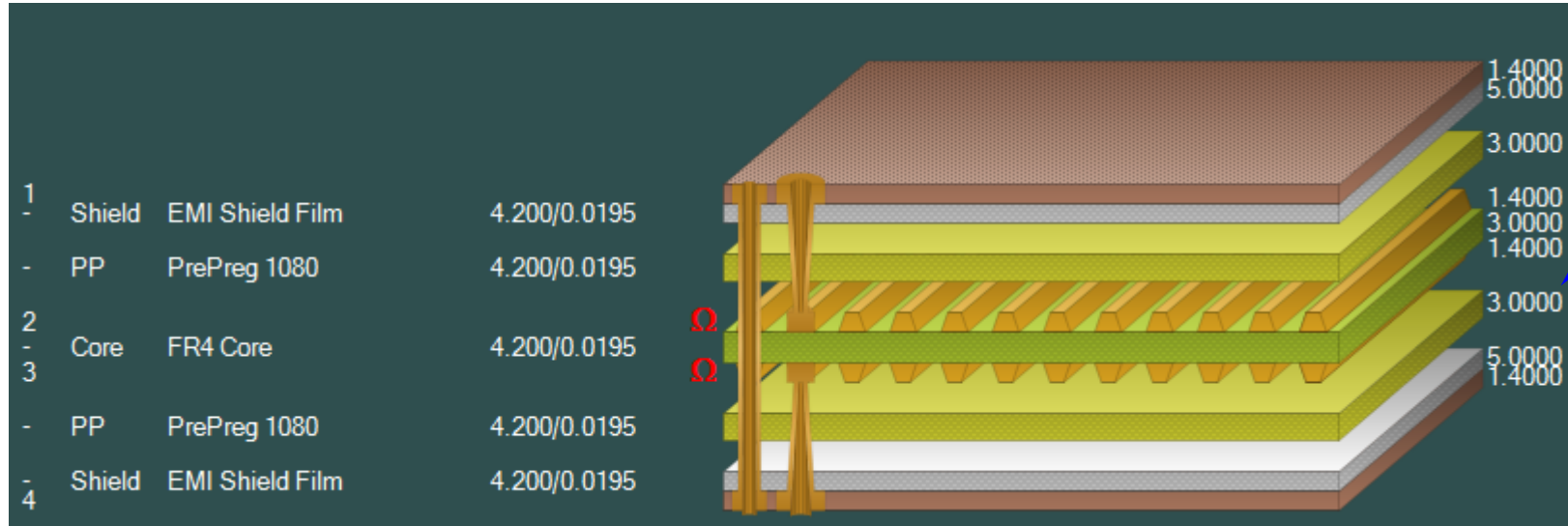


Example #1  
Single-sided core,  
coverlay above trace,  
shield below

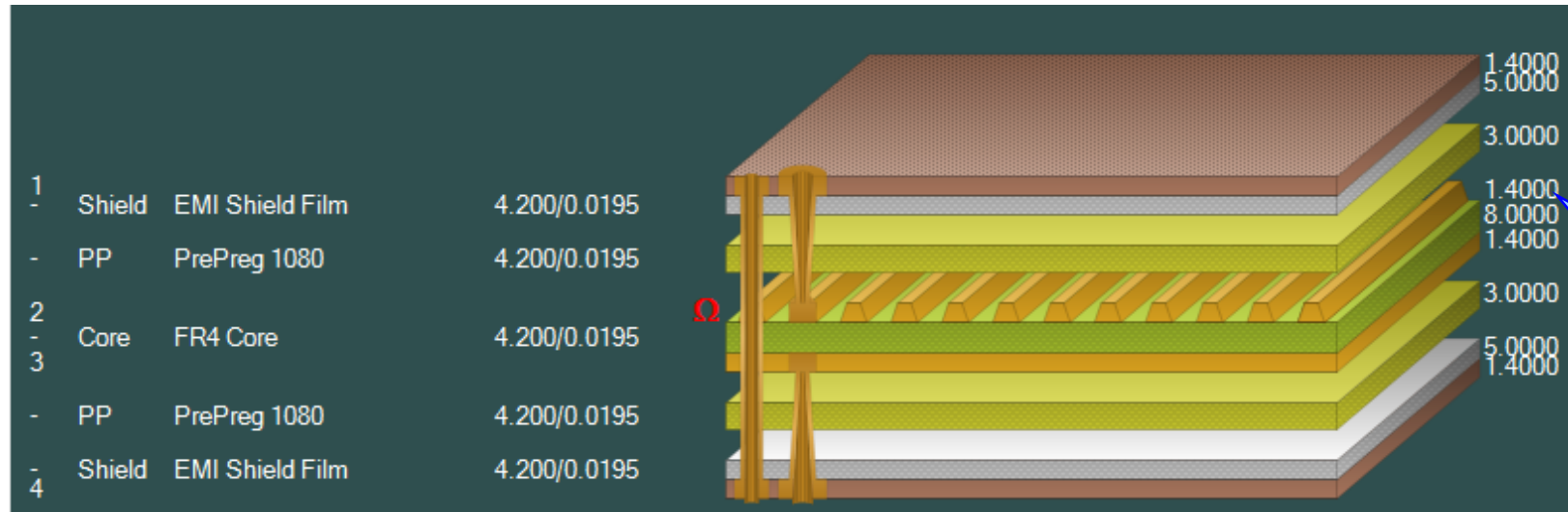


Example #2  
Double-sided core,  
adhesive and shield  
above

## 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

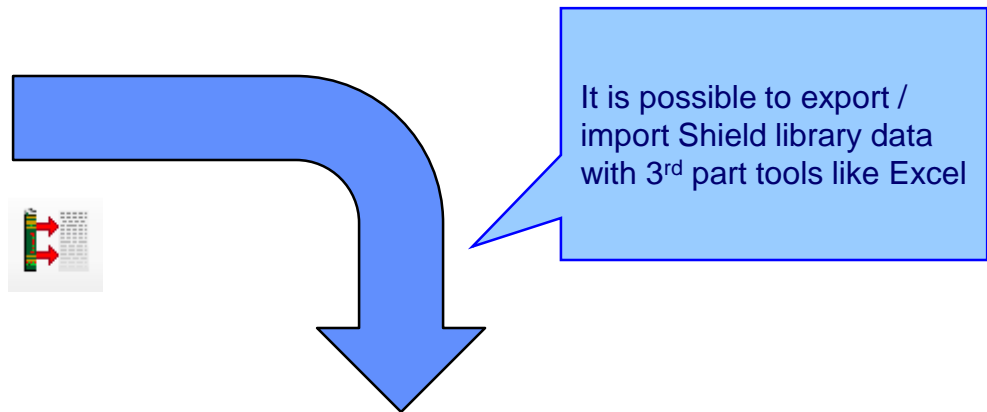
The screenshot shows the 'Online Library' interface with the following components:

- Filter by Supplier:** A list of suppliers including Polar, ARLON, CIRCUIT FOIL, and DOOSAN.
- 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 callout box points to this list 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', '1 GHz', and '10 GHz'.
- Existing Data Table:** Radio buttons for 'Clear' and 'Append'. 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'.
- Library Files Downloaded during this session:** A list containing 'Polar\_Shield\_21\_02.mlbx'.
- File Access Mode:** Radio buttons for 'Online Polar Library ( ftp://polarinstruments.com )' and 'On-Premise Mode'. Below is a text input field with the path 'S:\Software\Speedstack\MaterialLibrary\_v20\_11' and a 'Browse...' button.

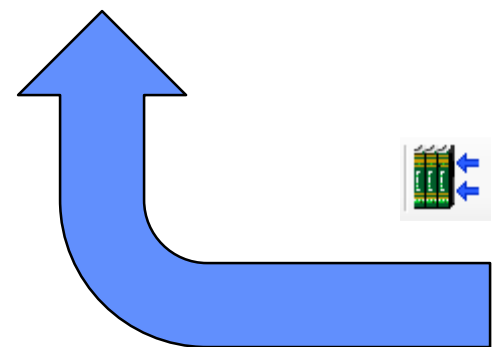
Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

## 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



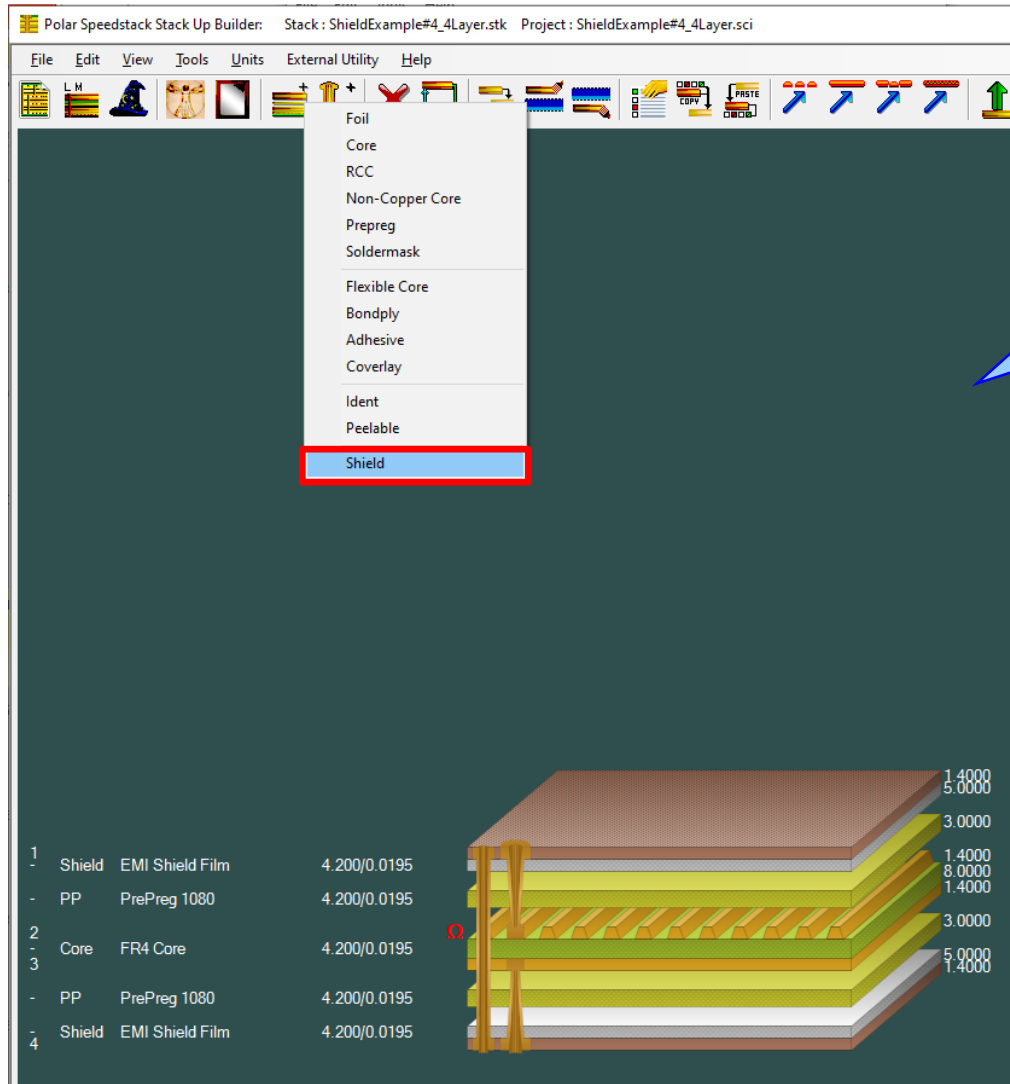
It is possible to export / import Shield library data with 3<sup>rd</sup> part tools like Excel



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

Layer	Material	Properties	Thickness (Mils)
1	Shield EMI Shield Film	4.200/0.0195	1.4000
-	PP PrePreg 1080	4.200/0.0195	3.0000
2	Core FR4 Core	4.200/0.0195	8.0000
3	PP PrePreg 1080	4.200/0.0195	1.4000
-	PP PrePreg 1080	4.200/0.0195	3.0000
4	Shield EMI Shield Film	4.200/0.0195	5.0000

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

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

## Controlled impedance and insertion loss calculations

Stack Up Editor | DRC : 3 | Controlled Impedance | CI Results | 1 of 2

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
<b>Impedance</b>		
Target Impedance	Zo	50.46
Target Tolerance %		10.00

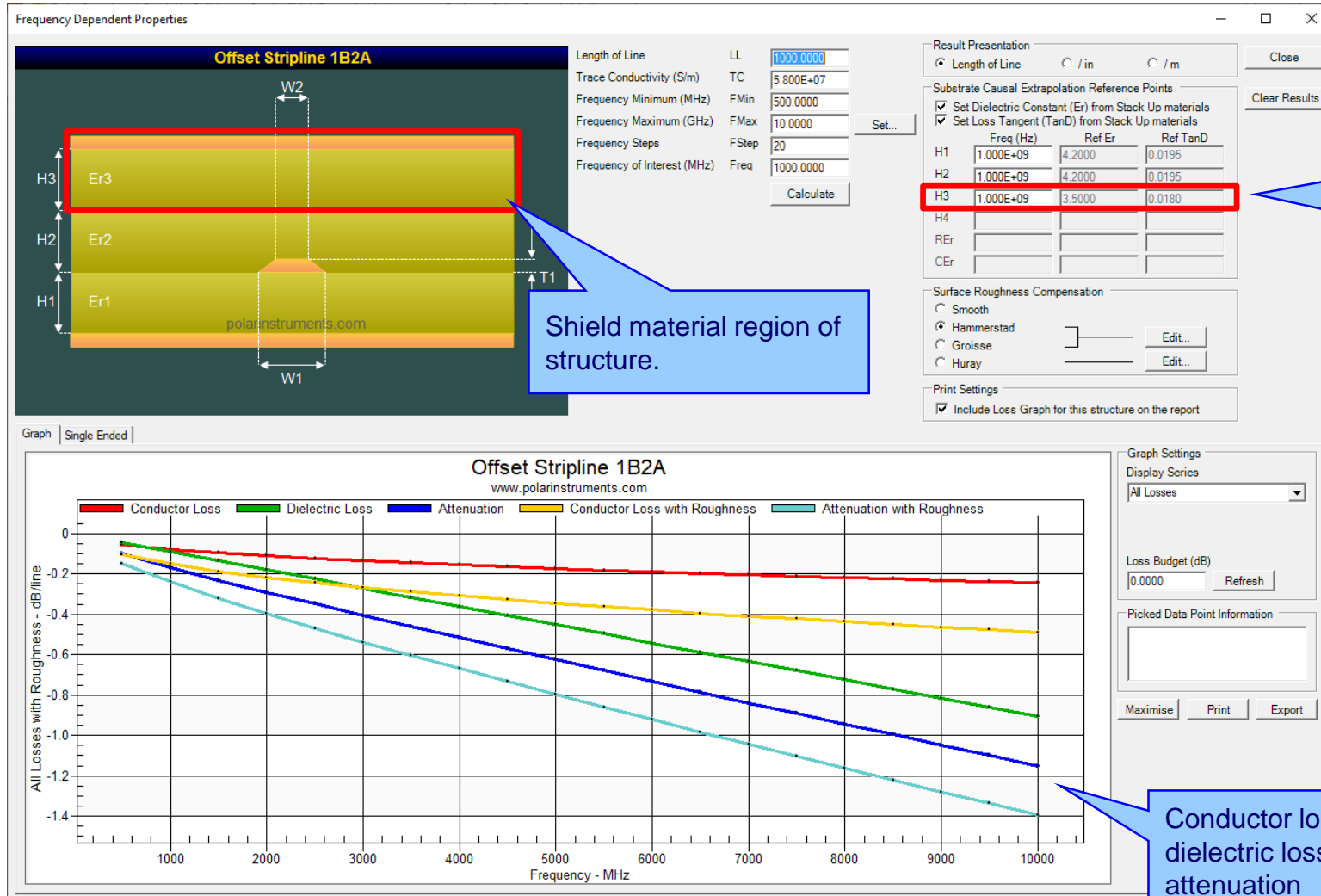
Impedance and insertion calculations support the new Shield material type.

Shield material region of structure.

Shield material in stack up

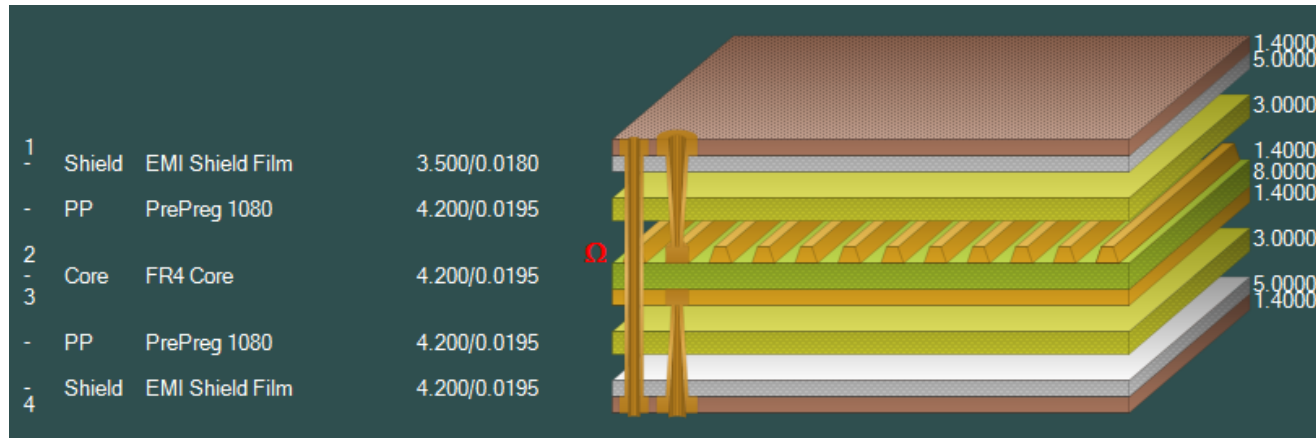
Shield adhesive height / thickness dimension and dielectric constant.

## Controlled impedance and insertion loss calculations



## 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	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
		Polar Samples	EMI Shield Film	Shield	1.400			
4		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
		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

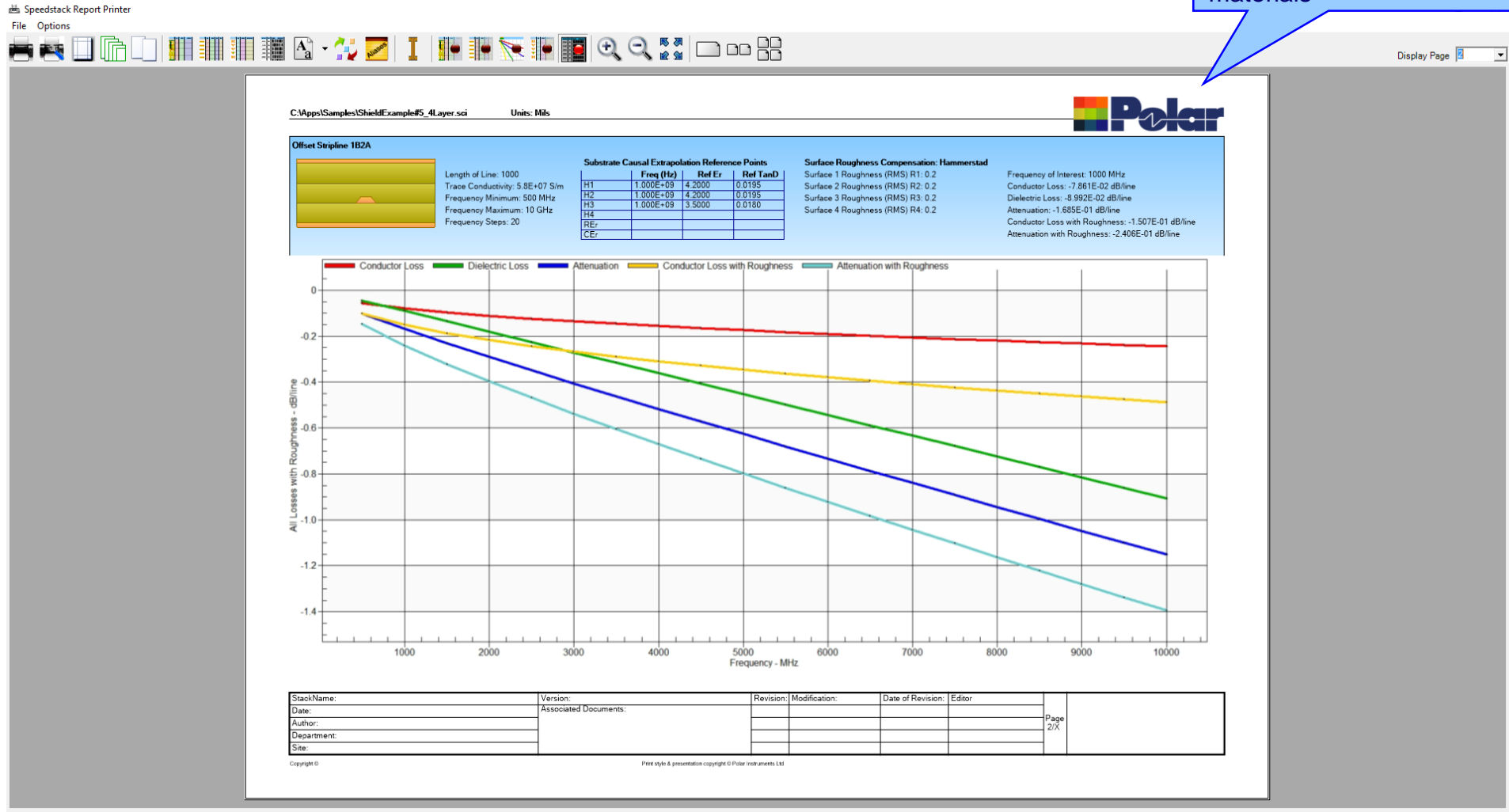
Drill Image	1st Layer	2nd Layer	Column Position	Drill Type
	1	2	2	Laser PTH
	1	4	1	Mechanical PTH
	4	3	2	Laser PTH

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

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# Technical report enhancements

Insertion loss report supporting shield materials

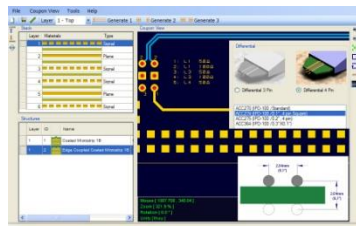
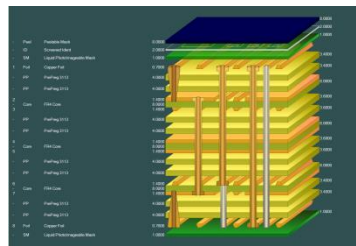
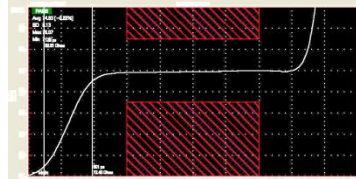
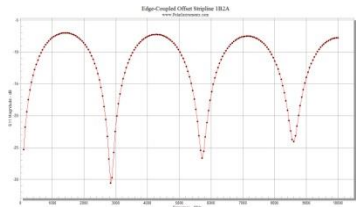
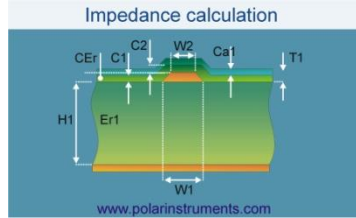
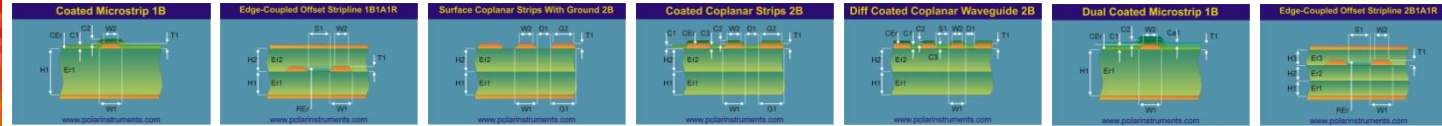


## Import / Export enhancements

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

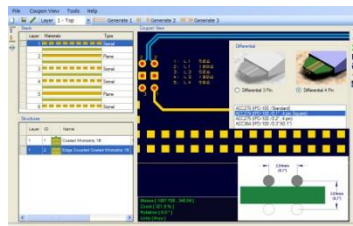
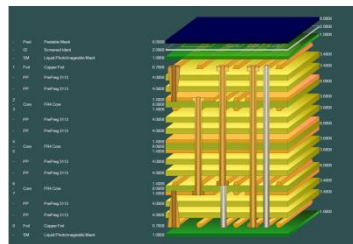
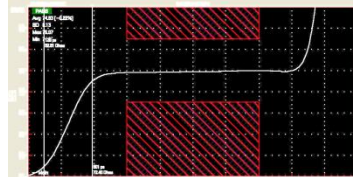
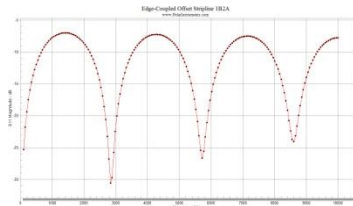
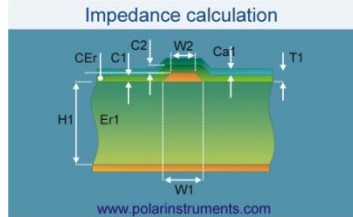




Thank you for viewing this Speedstack 2021 - 2023 preview.  
If you have questions we would be delighted to help you.  
Your local contact information is contained on the following slide



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