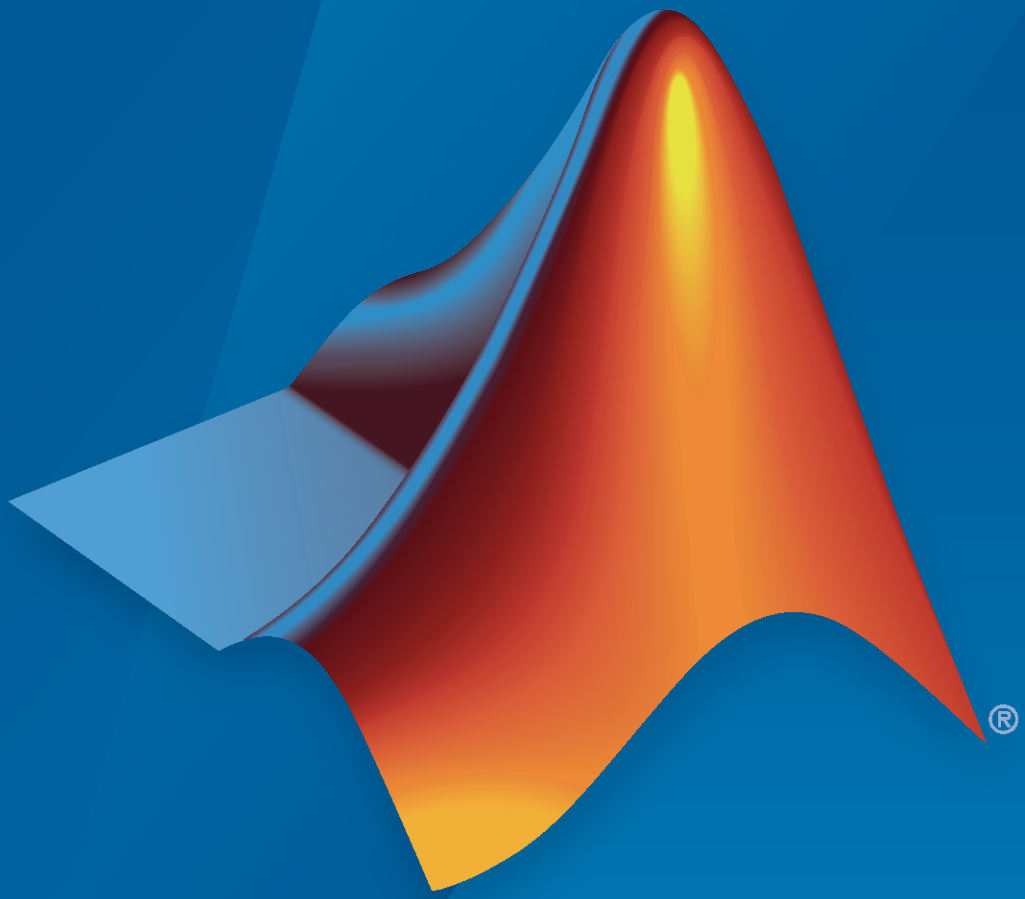
RF PCB Toolbox™ Release Notes



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RF PCB Toolbox™ Release Notes

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Contents

R2022b

Custom Transmission Lines, Resonators, Directionals Couplers, Baluns, and more: Design, visualize, and analyze nine new PCB components using parameterized geometry **1-2**

Behavioral Analysis: Perform behavioral analysis on five PCB components **1-2**

2-D Method of Moments Solver: New solver to analyze transmission line cross-section **1-3**

Even- and Odd-Mode Impedances, RLGC parameters, and Propagation Delay: Analysis functions for transmission lines **1-3**

gerberRead Update: Support for New Shapes **1-3**

mesh Update: Additional support for MinEdgeLength and GrowthRate control for meshing all PCB elements **1-3**

current Update: Visualize direction of current flow and complex current on metal surface **1-4**

R2022a

Wideband Wilkinson Power Divider or Combiner, Corporate Power Divider, and Coupled Line Balun: Design, visualize, and analyze three new PCB components using parameterized geometry **2-2**

Tapered Trace Shapes: Create tapered trace shapes to use as an RF PCB interconnect **2-2**

MirrorX and MirrorY Functions: Create symmetrical structures for resonators, couplers, and filters **2-2**

Coupling, Directivity, and Isolation: Understand and compare the behaviors of couplers **2-2**

New RF PCB Toolbox **3-2**

Transmission lines, Couplers, Splitters, Filters, and More: PCB component library for rapid design and visualization of PCBs using parameterized geometry **3-2**

Bends, Traces, Rings and More: Create and visualize 17 PCB shapes used in custom PCB geometry **3-3**

PCB Design Function: Design PCB components with appropriate parameters around specified frequency **3-3**

Custom PCB Component: Design custom PCB components with arbitrary metal and dielectric layers, solid feed or via models, and advanced meshing control **3-3**

PCB Component Subsystem: Cascade PCB components to create RF subsystems **3-3**

PCB Component Circuit Element: Convert PCB components to circuit elements **3-4**

PCB Component Analysis: Perform various EM analyses of PCB components and visualize the results **3-4**

Behavioral Analysis: Perform behavioral analysis of noncritical components on a PCB Board **3-4**

Gerber File Generation: Prototype and implement antennas using customizable library of RF connectors and PCB manufacturing services **3-4**

Dielectric Catalog and Visualization: Choose, customize, and visualize metal using DielectricCatalog function **3-4**

Metal Catalog and Visualization: Choose, customize, and visualize metal using MetalCatalog function **3-5**

Application-Based Examples **3-5**

R2022b

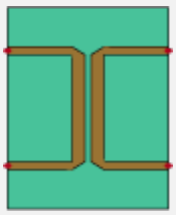
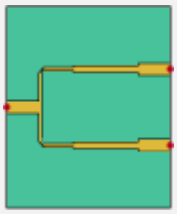
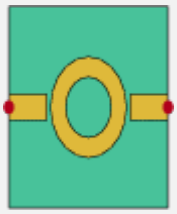
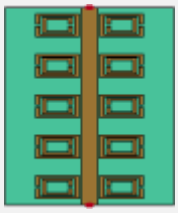
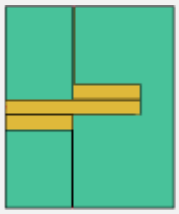
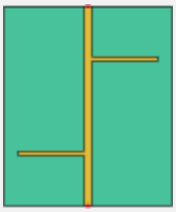
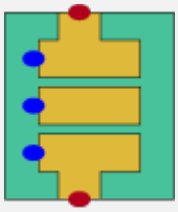
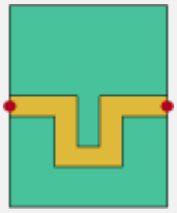
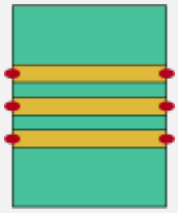
Version: 1.2

New Features

Bug Fixes

Custom Transmission Lines, Resonators, Directionals Couplers, Baluns, and more: Design, visualize, and analyze nine new PCB components using parameterized geometry

Create and analyze the structure of nine PCB components using objects in the `PCB Components Catalog`. Use the `show` function to view the structure of the PCB components.

`couplerDirectional`  Create a single or multisection directional coupler in the microstrip form.	`splitterTee`  Create a T-junction power divider or splitter.	`resonatorRing`  Create a gap-coupled ring resonator.	`resonatorSplitRingSquare`  Create a microstrip loaded square split-ring resonator.	`balunMarchand`  Create a Marchund balun in the microstrip form with an unbalanced input and a balanced output.
`filterStub`  Create a stub filter in the microstrip form.	`filterCombline`  Create a combline filter in the microstrip form	`phaseShifter`  Create a phase shifter on the X-Y plane	`microstripLineCustom`  Create a coupled form of microstrip transmission line.	

Behavioral Analysis: Perform behavioral analysis on five PCB components

Use the `sparameters` function and the `pcbElement` object to perform behavioral analysis on the `couplerBranchline`, `couplerRatrace`, `splitterTee`, `wilkinsonSplitter`, and `wilkinsonSplitterUnequal` objects. For more information on behavioral analysis, see Behavioral Models.

2-D Method of Moments Solver: New solver to analyze transmission line cross-section

RF PCB Toolbox™ now has a new 2-D Method of Moments (MoM) solver that you can use to analyze characteristic impedance and propagation delays of transmission lines. For more information, see “2-D Field Solver”.

Even- and Odd-Mode Impedances, RLGC parameters, and Propagation Delay: Analysis functions for transmission lines

- `rlgc` function : Calculate the RLGC parameters of a transmission line object.
- `propagationDelay` function : Calculate the propagation delay of a transmission line.
- `getZEven` and `getZOdd` functions: Calculate the even- and odd-mode impedance of differential transmission line objects.

gerberRead Update: Support for New Shapes

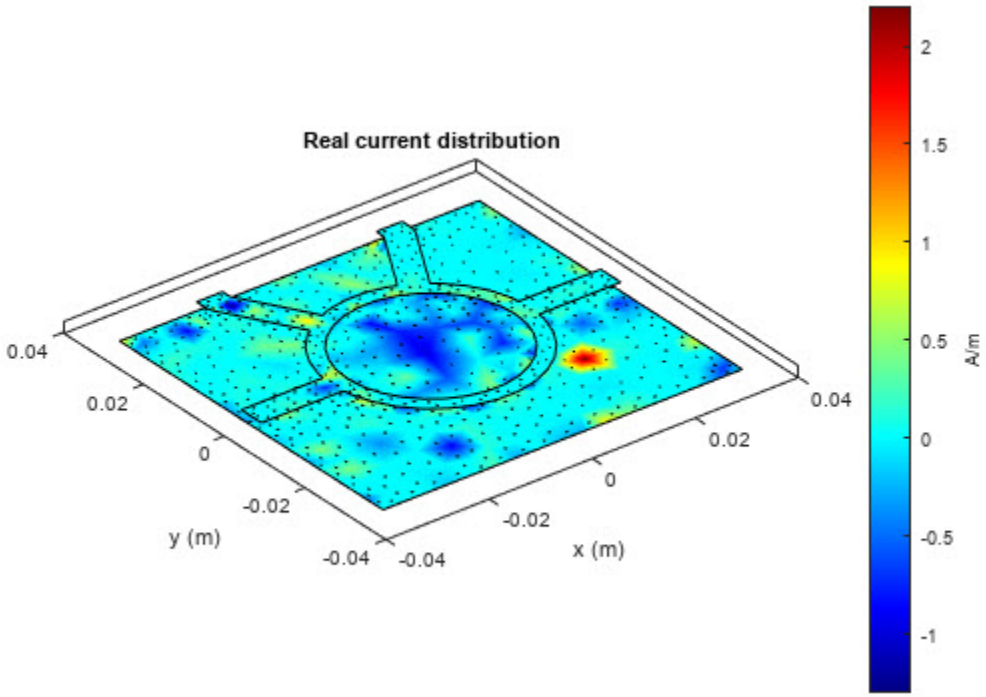
The `gerberRead` function now supports three new shapes: clockwise and anticlockwise circular arc, curved regions, and obround aperture.

mesh Update: Additional support for MinEdgeLength and GrowthRate control for meshing all PCB elements

You can now specify two new name-value arguments for the `mesh` function:

- Use `MinEdgeLength` to generate a mesh using the smallest edge length of your feature.
- Use `GrowthRate` to control the growth rate of the mesh. This argument defines the gradation in the size of the triangles in the mesh.

current Update: Visualize direction of current flow and complex current on metal surface



The `current` function now takes two new name-value pairs `'Type'` and `'Direction'`.

- Use `Type` to choose between the absolute, real, or imaginary values of the current vector to plot the current distribution.
- Use `Direction` to plot the direction of the current flow overlayed on the distribution plot.

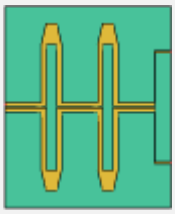
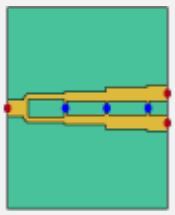
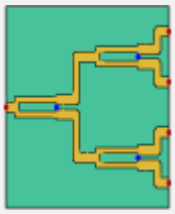
R2022a

Version: 1.1

New Features

Wideband Wilkinson Power Divider or Combiner, Corporate Power Divider, and Coupled Line Balun: Design, visualize, and analyze three new PCB components using parameterized geometry

Create and analyze the structure of 3 PCB components using the objects in PCB Components Catalog. Use the `show` function to view the structure of the PCB components.

`balunCoupledLine`	`wilkinsonSplitterWideband`	`powerDividerCorporate`
		
Create a multisection coupled-line balun on the X-Y plane.	Create a wideband Wilkinson power divider.	Create a corporate power divider.

Tapered Trace Shapes: Create tapered trace shapes to use as an RF PCB interconnect

Use the `traceStep` and `traceTapered` objects to create tapered trace shapes used in RF PCB interconnect. This trace creates different PCB components in tapered form to create the required electrical connection.

MirrorX and MirrorY Functions: Create symmetrical structures for resonators, couplers, and filters

Use the `mirrorX` and `mirrorY` functions to create symmetrical structures like resonators, couplers, and filters. The `mirrorX` and `mirrorY` functions mirror an RF PCB shape along the X and Y axis, respectively.

Coupling, Directivity, and Isolation: Understand and compare the behaviors of couplers

- Use the `coupling` function to calculate and plot the coupling factor of a coupler.
- Use the `directivity` function to calculate and plot the directivity of a coupler over a specified frequency.
- Use the `isolation` function to calculate and plot the isolation of a coupler over a specified frequency.

R2021b

Version: 1.0

New Features

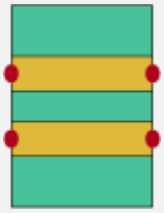
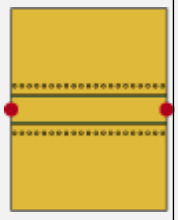
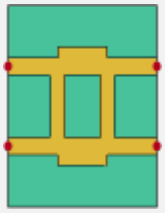
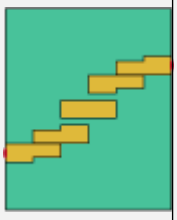
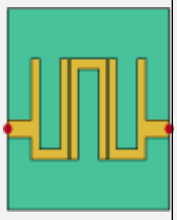
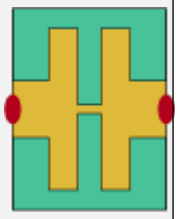
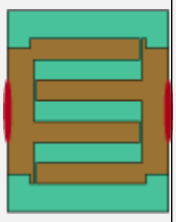
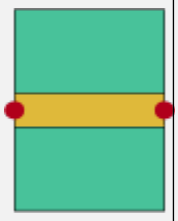
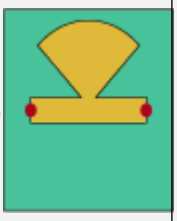
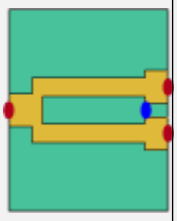
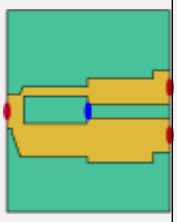
New RF PCB Toolbox

The new RF PCB Toolbox features a comprehensive set of objects, functions, and solvers for designing, analyzing, and prototyping printed circuit boards (PCBs) operating at high frequencies.

Transmission lines, Couplers, Splitters, Filters, and More: PCB component library for rapid design and visualization of PCBs using parameterized geometry

Create and analyze the structure of 13 PCB components using the objects in PCB Components Catalog. Use the `show` function to view the structure of the PCB components.

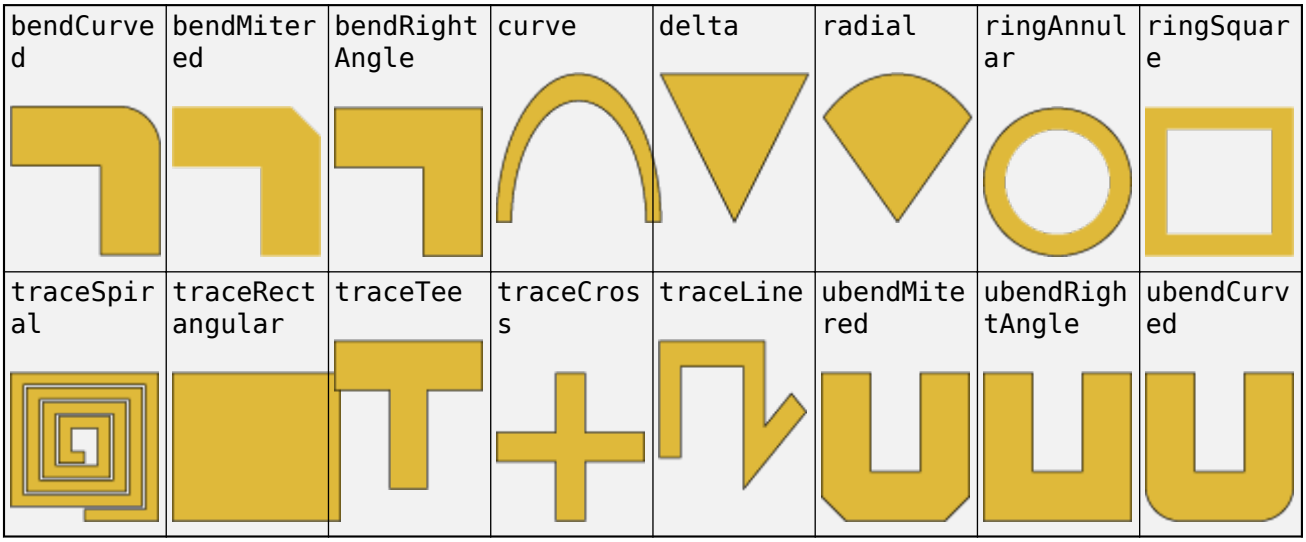
The following PCB components are available in this release:

`coupledMicrostripLine`  Creates coupled transmission line in the microstrip form.	`coplanarWaveguide`  Creates a coplanar waveguide transmission line.	`couplerBranchline`  Creates an equal branchline coupler or a quadrature hybrid.	`couplerRatrace` Creates an equal-split rat-race coupler or a 180-degree ring hybrid.	`filterCoupledLine`  Creates a coupled line filter in the microstrip form.	`filterHairpin`  Creates a hairpin filter in the microstrip form.	`filterStepImpedanceLowPass`  Creates a stepped-impedance lowpass filter in the microstrip form.
`interdigitalCapacitor`  Creates a basic interdigital capacitor.	`microstripLine`  Creates a microstrip transmission line.	`spiralInductor` Creates a spiral inductor in four different shapes.	`stubRadialShunt`  Creates a single and double radial shunt.	`wilkinsonSplitter`  Creates a Wilkinson splitter in the microstrip form.	`wilkinsonSplitterUnequal`  Creates an unequal Wilkinson splitter.	

Bends, Traces, Rings and More: Create and visualize 17 PCB shapes used in custom PCB geometry

Create different layouts by using interconnects such as traces, bends, curves, and mitered edges from Custom Geometry and PCB Fabrication. Combine parameterized shapes using Boolean operations to create new planar geometry for PCB design. Use the `show` function to view the shapes.

The following shape objects are available in this release:



PCB Design Function: Design PCB components with appropriate parameters around specified frequency

Use the `design` function on the objects in PCB Components Catalog to create PCB components that operate around a specified frequency.

Custom PCB Component: Design custom PCB components with arbitrary metal and dielectric layers, solid feed or via models, and advanced meshing control

Use the `pcbComponent` object to build custom multilayer metal-dielectric PCB components.

PCB Component Subsystem: Cascade PCB components to create RF subsystems

Use the `pcbcascade` function cascade one or two of PCB components or a PCB component object and an Antenna Toolbox™ `pcbStack` object across edge-based ports.

PCB Component Circuit Element: Convert PCB components to circuit elements

Use the `pcbElement` function to convert a PCB component into circuit elements. You can use these circuit elements in the `circuit` object from RF Toolbox™.

PCB Component Analysis: Perform various EM analyses of PCB components and visualize the results

Use the functions in Analysis and Verification to analyze:

- All the components in PCB Components Catalog
- PCB components designed using the `design` function
- Custom PCB components created using functions and objects in Custom Geometry and PCB Fabrication

Behavioral Analysis: Perform behavioral analysis of noncritical components on a PCB Board

Use the following objects and functions to compute the behavioral model for PCB components to:

- Calculate the S-parameters of the component using the `Behavioral` property in the `sparameters` function
- Convert the PCB component into a PCB element object using the `pcbElement` object with the object `Behavioral` property to 1.

For more information on behavioral analysis, see Behavioral Models.

Gerber File Generation: Prototype and implement antennas using customizable library of RF connectors and PCB manufacturing services

Use the `PCBWriter` object or the `gerberWrite` function with the `pcbComponent` object to generate Gerber files. You can share these files with manufacturers for PCB fabrication. Optionally, you can choose the RF connectors for the PCB board using `PCBConnectors` or manufacturing services using `PCBServices`.

Dielectric Catalog and Visualization: Choose, customize, and visualize metal using DielectricCatalog function

Use the `DielectricCatalog` function to:

- Select dielectric substrates for PCB components from the dielectric catalog
- Use a custom dielectric and add it to the dielectric catalog
- Visualize PCB components created using substrates from the dielectric catalog

Metal Catalog and Visualization: Choose, customize, and visualize metal using MetalCatalog function

Use the `MetalCatalog` function to:

- Select metal for PCB components from the metal catalog
- Use a custom metal and add it to the metal catalog
- Visualize PCB components created using different metals from the metal catalog

Application-Based Examples

RF Filter Modeling

- Bandstop and Bandpass Filters with Open Microstrip Line Stubs using Behavioral and EM Simulation
- Stepped Impedance Maximally Flat Low-Pass Filter for Microwave Applications
- Design and Analysis of Hairpin Micro-Strip Line Bandpass Filter
- Design and Analyze Compact UWB Low Pass Filter Using pcbComponent
- Design and Analyze Band Stop Filter using `pcbComponent`
- Design and Analyze High Pass Filter using pcbComponent

RF Matching

- Design Two-Stage Low Noise Amplifier Using Microstrip Transmission Line Matching Network
- Design of Quarter-Wave Transformer for Impedance Matching Applications

Signal Integrity

- Analyzing High Frequency Currents and Techniques for Routing PCB Traces
- Analyzing Crosstalk Between PCB Traces
- Create and Analyze PCB Interconnects using Custom Traces

Antenna and RFIC

- Design of Dual-Fed Square Microstrip Patch Antenna for Bluetooth Low Energy Applications
- Characterization and Modeling of On-Chip Square Spiral Inductor for Si RFIC Application