RF Toolbox™ Release Notes

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RF Toolbox™ Release Notes

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Summary by Version

This table provides quick access to what's new in each version. For clarification, see "Using Release Notes" on page 2.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Latest Version V2.9 (R2011b)	Yes Details	Yes Summary	Bug Reports Includes fixes
V2.8.1 (R2011a)	No	No	Bug Reports Includes fixes
V2.8 (R2010b)	Yes Details	Yes Summary	Bug Reports
V2.7 (R2010a)	Yes Details	No	Bug Reports
V2.6 (R2009b)	Yes Details	No	Bug Reports Includes fixes
V2.5 (R2009a)	Yes Details	Yes Summary	Bug Reports Includes fixes
V2.4 (R2008b)	Yes Details	No	Bug Reports Includes fixes
V2.3 (R2008a)	Yes Details	No	Bug Reports Includes fixes
V2.2 (R2007b)	Yes Details	No	Bug Reports
V2.1 (R2007a)	Yes Details	No	Bug Reports
V2.0 (R2006b)	Yes Details	No	Bug Reports
V1.3 (R2006a)	Yes Details	No	Bug Reports at Web site
V1.2 (R14SP3)	Yes Details	No	Bug Reports at Web site

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
V1.1 (R14SP2)	Yes Details	No	Bug Reports at Web site
V1.0.1 (R14+)	No	No	Fixed bugs
V1.0 (R14)	Yes Details	No	No bug fixes

Using Release Notes

Use release notes when upgrading to a newer version to learn about:

- New features
- Changes
- Potential impact on your existing files and practices

Review the release notes for other MathWorks® products required for this product (for example, MATLAB® or Simulink®). Determine if enhancements, bugs, or compatibility considerations in other products impact you.

If you are upgrading from a software version other than the most recent one, review the current release notes and all interim versions. For example, when you upgrade from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

What Is in the Release Notes

New Features and Changes

- New functionality
- Changes to existing functionality

Version Compatibility Considerations

When a new feature or change introduces a reported incompatibility between versions, the **Compatibility Considerations** subsection explains the impact.

Compatibility issues reported after the product release appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so review the fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. Bug Reports include provisions for any known workarounds or file replacements. Information is available for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

Documentation on the MathWorks Web Site

Related documentation is available on `mathworks.com` for the latest release and for previous releases:

- Latest product documentation
- Archived documentation

Version 2.9 (R2011b) RF Toolbox Software

This table summarizes what's new in V2.9 (R2011b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports Includes fixes

New features and changes introduced in this version are:

- "New Intermediate Frequency (IF) Planning Object" on page 4
- "New Functions for Calculating Transmission Line RLGC Parameters" on page 4
- "Enhanced Rational Fitting" on page 4
- "Conversion of Error and Warning Message Identifiers" on page 5

New Intermediate Frequency (IF) Planning Object

The `openIF` object supports a new partial workflow for multiband transmitter or receiver design. Use these objects to analyze intermediate frequencies (IFs) that do not produce interference (spurs) in operating bands.

New Functions for Calculating Transmission Line RLGC Parameters

The `rlgc2s` and `s2rlgc` functions allow you to calculate the per-unit-length RLGC parameters of a transmission line from transmission-line S-parameters.

Enhanced Rational Fitting

The `rationalfit` function has improved robustness, speed, and accuracy in this version.

Compatibility Considerations

Some default values of `rationalfit` have changed. For more information, see the function reference page.

Conversion of Error and Warning Message Identifiers

For R2011b, error and warning messages identifiers have changed in RF Toolbox™ software.

Compatibility Considerations

If you have scripts or functions that use message identifiers that changed, you must update the code to use the new identifiers. Typically, message identifiers are used to turn off specific warning messages, or in code that uses a try/catch statement and performs an action based on a specific error identifier.

For example, the `rf:rfckt:seriesrlc:setpositive:NotAPositive` identifier has changed to `rf:rfbase:rfbase:setpositive:NotAPositive`. If your code checks for `rf:rfckt:seriesrlc:setpositive:NotAPositive`, you must update it to check for `rf:rfbase:rfbase:setpositive:NotAPositive` instead.

To determine the identifier for a warning, run the following command just after you see the warning:

```
[MSG,MSGID] = lastwarn;
```

This command saves the message identifier to the variable `MSGID`.

To determine the identifier for an error, run the following command just after you see the error:

```
exception = MException.last;
MSGID = exception.identifier;
```

Note Warning messages indicate a potential issue with your code. While you can turn off a warning, a suggested alternative is to change your code so it runs warning-free.

Version 2.8.1 (R2011a) RF Toolbox Software

This table summarizes what's new in V2.8.1 (R2011a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	Bug Reports Includes fixes

Version 2.8 (R2010b) RF Toolbox Software

This table summarizes what's new in V2.8 (R2010b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports

New features and changes introduced in this version are:

- "Enhanced Rational Function Modeling" on page 7
- "Extended Methods and Parameters for RF Object Visualization" on page 8

Enhanced Rational Function Modeling

An improved algorithm for the `rationalfit` function fits an accurate rational model to passive S-parameter data in less time than in previous versions. In addition, a new parameter specifies the number of iterations `rationalfit` attempts at each value for the number of poles.

Compatibility Considerations

Default behavior for some parameters have changed:

- The number-of-poles argument `npoles` defaults to a minimum value of `0` in version 2.8, instead of `4`, as in previous versions.
- `rationalfit` does not display a wait bar by default in this version. A new `showwaitbar` parameter allows you to specify whether `rationalfit` displays a wait bar.

For more information on using this function, see the `rationalfit` reference page.

Extended Methods and Parameters for RF Object Visualization

RF Toolbox version 2.8 extends the Plots and Charts methods to include:

- Support for third-order intercept point and transducer power gain parameters, `IIP3` and `Gt`.
- A new method, `table`, for visualizing network data in the Variable Editor.

Version 2.7 (R2010a) RF Toolbox Software

This table summarizes what's new in V2.7 (R2010a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are:

- "Function Added" on page 9
- "Methods Added" on page 9
- "Demo Added" on page 9

Function Added

The `makepassive` function creates passive S-Parameters from any S-parameter array. Use this function to enforce strict numerical passivity on an array of S-parameters that represents a passive device.

Methods Added

Two new methods for `rfmodel.rational` objects are available:

- The `ispassive` method tests global passivity of an `rfmodel.rational` object.
- The `stepresp` method calculates the response of an `rfmodel.rational` object to a step signal. You can use this function to perform time-domain reflectometry (TDR) and time-domain transmission (TDT) analysis.

Demo Added

The Modeling a High-Speed Backplane (Part 3: 4-Port S-Parameters to Differential TDR and TDT) demo shows how to perform time-domain reflectometry (TDR) and time-domain transmission (TDT) analysis on network data.

Version 2.6 (R2009b) RF Toolbox Software

This table summarizes what's new in V2.6 (R2009b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

New features and changes introduced in this version are:

- "New Function for Testing Passivity of S-Parameters" on page 10
- "Expanded Port-Ordering Schemes for S-Parameter Conversion Functions" on page 10
- "Support for Calculation of Power-Wave Gain for Transfer Functions" on page 10

New Function for Testing Passivity of S-Parameters

The `ispassive` function checks the passivity of N-port S-parameter matrices.

Expanded Port-Ordering Schemes for S-Parameter Conversion Functions

The functions `s2scc`, `s2scd`, `s2sdc`, `s2sdd`, `s2smm`, `smm2s` now support a third commonly-used port-ordering. For more information on using this feature, see the corresponding function reference page.

Support for Calculation of Power-Wave Gain for Transfer Functions

The `s2tf` function can now calculate the power-wave gain of 2-port S-parameters. Calculation in terms of voltage is still the default option.

Version 2.5 (R2009a) RF Toolbox Software

This table summarizes what's new in V2.5 (R2009a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports Includes Fixes

New features and changes introduced in this version are:

- "New Functions for Converting 4N-Port S-Parameter Matrices" on page 11
- "Enhanced Dielectric Loss Model in Three Transmission Line Objects" on page 11
- "Demos Added" on page 12

New Functions for Converting 4N-Port S-Parameter Matrices

There are two new functions for converting between 4N-port single-ended S-parameter matrices and 2N-port mixed-mode S-parameter matrices:

- The `s2smm` function lets you convert 4N-port single-ended S-parameters to 2N-port mixed-mode S-parameters. You can view the 2N-port output data to see interactions, such as crosstalk, that are not apparent in the single-ended data. This lets you easily select the ports of interest for further analysis.
- The `smm2s` function lets you convert 2N-port mixed-mode S-parameters to 4N-port single-ended S-parameters.

Enhanced Dielectric Loss Model in Three Transmission Line Objects

The following objects now provide a more realistic model for dielectric loss:

- `rfckt.coaxial`

- `rfckt.twowire`
- `rfckt.parallelplate`

To specify dielectric loss, you use a new property, `LossTangent`. This property replaces the `SigmaDiel` parameter.

Compatibility Considerations

Your existing objects with a nonzero value for the `SigmaDiel` parameter no longer model dielectric loss. Instead, the objects issue a warning message and use the default value of zero for the `LossTangent` property when you use the `analyze` method.

Demos Added

Two new demos show how to design broadband impedance matching networks for RF components:

- Designing Broadband Matching Networks (Part 1: Antenna) shows how to design a matching network for an antenna.
- Designing Broadband Matching Networks (Part 2: Amplifier) shows how to design a matching network for an amplifier.

Version 2.4 (R2008b) RF Toolbox Software

This table summarizes what's new in V2.4 (R2008b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes	No	Bug Reports Includes Fixes

New features and changes introduced in this version are:

- "cascadesparams Function now supports N-port S-parameters" on page 13
- "Improvements to the plotyy Method" on page 13

cascadesparams Function now supports N-port S-parameters

You can now use the `cascadesparams` function to cascade the S-parameters of an arbitrary number of N-port devices to form a network. The function lets you specify how to connect the ports of each N-port device to the ports of the subsequent N-port device in the cascade. For more information about the function, see the `cascadesparams` reference page.

Improvements to the plotyy Method

The `plotyy` method now uses a more intuitive approach when determining how to plot the specified parameters if you do not specify the plot format. For more information about the function, see the `plotyy` reference page.

Version 2.3 (R2008a) RF Toolbox Software

This table summarizes what's new in V2.3 (R2008a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are:

- "Calculation and Plotting Metrics Added" on page 14
- "Network Parameter Conversion Functions Enhanced" on page 14
- "gammams and gammaml Functions Added" on page 14
- "z2gamma Function Added" on page 14
- "Demos Added and Updated" on page 15
- "Command-Line Help Updated" on page 15

Calculation and Plotting Metrics Added

You can now compute and visualize group delay, voltage gain, and stability factor using the `calculate` and `plot` methods.

Network Parameter Conversion Functions Enhanced

You can now use the `s2sdd`, `s2sdc`, `s2scd`, and `s2scc` functions to perform conversions on network parameters with alternate port arrangements.

gammams and gammaml Functions Added

Use the new `gammams` and `gammaml` functions to compute source and load reflection coefficients required for simultaneous conjugate match.

z2gamma Function Added

Use the new `z2gamma` function to convert impedance values to reflection coefficients.

Demos Added and Updated

A new demo, Writing a Touchstone® File, shows how to write `rfckt` object data to an industry-standard Touchstone data file.

Modeling a High-Speed Backplane (Part 2: 4-Port S-Parameters to a Rational Function Model) now uses the new Communications Toolbox™ eye diagram scope, `commscope.eyediagram`, to plot the eye diagram.

Command-Line Help Updated

The `help` function returns additional information for objects and packages. The function now includes descriptions of all properties and links to all relevant methods.

Version 2.2 (R2007b) RF Toolbox Software

This table summarizes what's new in V2.2 (R2007b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are:

- "snp2smp Function Added" on page 16
- "circle Method Added" on page 16
- "powergain Function Added" on page 16
- "Smith Chart Enhanced" on page 16
- "Demos Added and Updated" on page 17

snp2smp Function Added

Use the new `snp2smp` function to convert N-port S-parameter data and termination impedances to M-port S-parameters.

circle Method Added

Use the new `circle` method to place circles on a Smith® Chart to depict stability regions and display constant gain, noise figure, reflection, and immitance circles.

powergain Function Added

Use the new `powergain` function to compute various power gains of a 2-port network.

Smith Chart Enhanced

The `smith` method now lets you plot the network parameters of devices with more than two ports on a Smith Chart.

Demos Added and Updated

Modeling a High-Speed Backplane (Part 1: Measured 16-Port S-Parameters to 4-Port S-Parameters) is the new first part of a four-part demo on "Modeling a High-Speed Backplane." The new demo shows how to extract 4-port S-parameter data from 16-port S-parameter data. The original three parts of the demo are now parts 2, 3, and 4.

The following demos replace the "Designing Impedance Matching Networks" and "Placing Circles on a Smith Chart" demos, respectively, and show how to use the new `circle` method:

- Designing Matching Networks (Part 1: Networks with an LNA and Lumped Elements) uses the available gain design technique to design a low-noise amplifier for a wireless communication system.
- Designing Matching Networks (Part 2: Single Stub Transmission Lines) shows how to design input and output matching networks for an amplifier.

Version 2.1 (R2007a) RF Toolbox Software

This table summarizes what's new in V2.1 (R2007a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are

- "Agilent P2D and S2D System-Level Verification Model Support Added" on page 18
- "Mixer Spur Analysis Added" on page 19
- "timeresp Method Added" on page 19
- "Plotting Methods Added" on page 19
- "gamma2z Function Added" on page 20
- "Tab Completion Added" on page 20
- "Data Tips Added" on page 20
- "Demos Added and Updated" on page 20

Agilent P2D and S2D System-Level Verification Model Support Added

The `rfckt.amplifier` and `rfckt.mixer` objects now let you import system-level verification models of amplifiers and mixers, respectively, using data from Agilent® P2D and S2D files.

Use P2D files to specify the following data for multiple operating conditions, such as temperature and bias values:

- Small-signal network parameters
- Power-dependent network parameters
- Noise data

- Intermodulation tables

Use S2D files to specify the following data for multiple operating conditions:

- Small-signal network parameters
- Gain compression (1 dB)
- Third-order intercept point (IP3)
- Power-dependent S_{21} parameters
- Noise data
- Intermodulation tables

Use the following methods to work with operating condition data after you import a P2D or S2D file into an RF object:

- `setop` — Use this method to set operating condition values or to list all available values.
- `getop` — Use this method to display the selected operating condition values.

Mixer Spur Analysis Added

You can import an intermodulation table into an `rfckt.mixer` object. The object's `plot` method has a new option for plotting mixer spur data.

timeresp Method Added

Use the new `timeresp` method of the `rfmodel.rational` object to compute the time response of an `rfmodel` object to a specified input signal. Use this method rather than computing impulse response with the `impulse` method and then convolving that response with the input signal because the `timeresp` method generally gives a more accurate output signal for a given input signal.

Plotting Methods Added

Four new plotting methods provide additional plotting options:

- Use the `plotyy` method of the `rfckt` class to create a plot that contains RF circuit object data on both the left and right Y-axes.

- Use the `loglog` method of the `rfckt` class to plot RF circuit object data on a log-log scale.
- Use the `semilogx` method of the `rfckt` class to plot RF circuit object data using a logarithmic scale for the X-axis.
- Use the `semilogy` method of the `rfckt` class to plot RF circuit object data using a logarithmic scale for the Y-axis.

gamma2z Function Added

Use the new `gamma2z` function to compute input impedance from a reflection coefficient.

Tab Completion Added

Tab completion is now available in the MATLAB command window for all functions and methods. For more information on tab completion, see in the MATLAB documentation.

Data Tips Added

Data tips are now available for any RF plot. For more information on data tips, see “Data Cursor — Displaying Data Values Interactively” in the MATLAB documentation.

Demos Added and Updated

Visualizing Mixer Spurs shows how to use the toolbox to perform mixer spur analysis using data from an intermodulation table and then plot the output power spectrum of the desired signal and the undesired spurs.

Modeling a High-Speed Backplane (Part 1: Measured 4-Port S-Parameters to a Rational Function Model) now uses the `timeresp` method to compute the time-domain response of a system characterized by measured data.

Modeling a High-Speed Backplane (Part 2: Rational Function Model to Simulink Model) now includes code that you can use to generate a Simulink model for any `rfmodel.rational` object.

Version 2.0 (R2006b) RF Toolbox Software

This table summarizes what's new in V2.0 (R2006b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

Version 2.0 (R2006b) lets you create a rational function model from measured network parameters. This type of model is useful to signal integrity engineers, whose goal is to reliably connect high-speed semiconductor devices with, for example, multi-Gbit/s serial data streams across backplanes and printed circuit boards. New features and changes introduced in this version are described in this section.

S-Parameter Conversion Function Added

Use the `s2tf` function to convert 2-port scattering parameters into a transfer function that represents the normalized voltage gain of a 2-port network.

rfmodel Class Added

Use objects from the `rfmodel` class to represent components and networks with mathematical equations. The `rfmodel.rational` object stores a rational function model of a component or network.

rationalfit Function Added

Use the `rationalfit` function to fit a rational function to passive data that represents an RF component or network and then store the result in an `rfmodel.rational` object.

freqresp and impulse Functions Added

Use the `freqresp` method of the `rfmodel` class to compute the frequency response of an `rfmodel` object.

Use the `impulse` method of the `rfmodel` class to compute the impulse response of an `rfmodel` object.

Support for Exporting Verilog-A Models Added

Use the `writeva` method of the `rfmodel` class to export a description of an RF component or network for use in a time-domain circuit simulator.

Demos Added

"Modeling a High-Speed Backplane (Part 1: Measured 4-Port S-Parameters to a Rational Function Model)" shows how to use the toolbox to model a differential high-speed backplane using rational functions.

"Modeling a High-Speed Backplane (Part 2: Rational Function Model to a Verilog-A Module)" shows how to use toolbox functions to generate a Verilog-A module that models the high-level behavior of a high-speed backplane.

"Modeling a Differential High-Speed Backplane in Simulink" shows how to use Simulink to simulate a differential high-speed backplane.

Version 1.3 (R2006a) RF Toolbox Software

This table summarizes what's new in V1.3 (R2006a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports at Web site

New features and changes introduced in this version are

S-Parameter Conversion Functions Added

Use the `s2scc` function to convert 4-port, single-ended S-parameters to 2-port, common mode S-parameters.

Use the `s2scd` function to convert 4-port, single-ended S-parameters to 2-port, cross mode S-parameters.

Use the `s2sdc` function to convert 4-port, single-ended S-parameters to 2-port, cross mode S-parameters.

Use the `s2sdd` function to convert 4-port, single-ended S-parameters to 2-port, differential mode S-parameters.

Version 1.2 (R14SP3) RF Toolbox Software

This table summarizes what's new in V1.2 (R14SP3):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports at Web site

New features and changes introduced in this version are

extract Function Added

Use the `extract` function to extract specified network parameters from a circuit or data object and return the result in an array.

Circuit Object Added

Use `rfckt.rlcgline` to construct an RLCG transmission line object.

Transmission Line Object Improved

The new `Freq` property of the circuit object, `rfckt.txline`, is a vector of positive frequencies at which the parameter values are known.

The `Loss`, `PV`, and `Z0` properties of the circuit object, `rfckt.txline`, can now be vectors of line loss, phase velocity, and characteristic impedance values that correspond to the frequencies specified in the `Freq` property.

The new `IntpType` property of the circuit object, `rfckt.txline`, is the interpolation method used to calculate the parameter values between the known frequencies.

Touchstone Data File Support Improved

You can now read data from Touchstone data files that contain comments and spaces between sections of data.

Demos Improved

The demos have new documentation and can be accessed using an improved interface.

Command Window Help for Functions That Act on Circuit Objects Added

You can access help for functions that act on circuit objects by using the syntax `help` *`functionname`* at the MATLAB command prompt.

Version 1.1 (R14SP2) RF Toolbox Software

This table summarizes what's new in V1.1 (R14SP2):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports at Web site

New features and changes introduced in this version are

- "Plot Figures Integrated into the RF Tool GUI" on page 26
- "Five Objects Added" on page 26
- "Three Circuit Objects Added" on page 26
- "Methods Added" on page 27
- "Method Enhanced" on page 27
- "Functions Added" on page 27
- "General Enhancements" on page 27

Plot Figures Integrated into the RF Tool GUI

In earlier versions, a plot figure would appear in a separate window after clicking the **Plot** button. In this version, plot figures are integrated into the GUI itself.

Five Objects Added

These objects can be used to store rfdata such as network parameters, noise figure, power, IP3, and spot noise.

Three Circuit Objects Added

Use `rfckt.delay` to model delay lines, `rfckt.hybridg` to model hybrid G connected networks, and `rfckt.passive` to model RF passive networks.

Methods Added

The new `write` method allows saving of RF network data into files for all `rfckt` objects.

The new methods, `read` and `restore`, read and restore data for `rfckt.datafile`, `rfckt.amplifier`, and `rfckt.mixer`.

Method Enhanced

The `analyze` method now takes three additional optional inputs for the load, source, and reference impedances.

Functions Added

The functions `stabilitymu` and `stabilityk` calculate the stability factors μ and k.

The functions `h2g` and `g2h` convert between hybrid G and hybrid H parameters.

General Enhancements

It is now possible to create the objects `rfckt.amplifier` and `rfckt.mixer` from a MATLAB variable.

The frequency-dependent NF and IP3 data types were added to the AMP format.

Version 1.0.1 (R14+) RF Toolbox Software

This table summarizes what's new in V1.0.1 (R14+):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	Fixed bugs

Version 1.0 (R14) RF Toolbox Software

This table summarizes what's new in V1.0 (R14):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No bug fixes

New features and changes introduced in this version are

- "Introduction to RF Toolbox Software" on page 29
- "RF Circuits" on page 29
- "Data Visualization" on page 30
- "Data Format Support" on page 30
- "RF Analysis GUI" on page 30

Introduction to RF Toolbox Software

RF Toolbox software lets you create and combine RF circuits for simulation in the frequency domain with support for both nonlinear and noise data. You can read, write, analyze, combine, and visualize RF network parameters. The toolbox enables you to

- Work directly with network parameter data.
- Model RF networks.
- Analyze circuits interactively.

RF Circuits

The toolbox provides classes that let you model these circuit objects and networks.

- Passive networks
- Amplifiers and mixers

- Transmission lines: coaxial, coplanar waveguide, general transmission, microstrip, parallel-plate, and two-wire
- SeriesRLC and shuntRLC circuits
- LC ladder filters: LC bandpass pi, LC bandpass tee, LC bandstop pi, LC bandstop tee, LC highpass pi, LC highpass tee, LC lowpass pi, and LC lowpass tee
- Networks: cascade, hybrid, parallel, and series

You can also model general circuit elements from data files.

Data Visualization

The toolbox lets you plot the network parameters of the circuits you create.

You can generate an X-Y plane plot, polar plane plot, or Smith Chart of one or more selected network parameters directly from your data. You can also generate these plots from circuit objects you create using the toolbox. See “RF Circuit Objects” and “RF Data Objects” for information.

Data Format Support

The toolbox supports the Touchstone SnP, YnP, ZnP, and HnP data file formats. It also introduces the MathWorks AMP format for amplifier data. For more information about this format, see “AMP File Format”.

RF Analysis GUI

RF Tool is an RF analysis GUI that provides a visual interface for creating and analyzing RF (radio frequency) components and networks. You can create RF circuits quickly with the GUI. You can also import and export circuits from the MATLAB workspace and RF data files.

RF Tool also provides the ability to set circuit parameters, analyze circuits, view their resulting S-parameter data, and visualize the data using X-Y plane plots, polar plane plots, and Smith Charts.

Compatibility Summary for RF Toolbox Software

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided in the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version V2.9 (R2011b)	See the **Compatibility Considerations** subheading for these new features or changes: • "Conversion of Error and Warning Message Identifiers" on page 5 • "Enhanced Rational Fitting" on page 4
V2.8.1 (R2011a)	None
V2.8 (R2010b)	See the **Compatibility Considerations** subheading for this new feature or change: • "Enhanced Rational Function Modeling" on page 7
V2.7 (R2010a)	None
V2.6 (R2009b)	None
V2.5 (R2009a)	See the **Compatibility Considerations** subheading for this new feature or change: • "Enhanced Dielectric Loss Model in Three Transmission Line Objects" on page 11
V2.4 (R2008b)	None
V2.3 (R2008a)	None

Version (Release)	New Features and Changes with Version Compatibility Impact
V2.2 (R2007b)	None
V2.1 (R2007a)	None
V2.0 (R2006b)	None
V1.3 (R2006a)	None
V1.2 (R14SP3)	None
V1.1 (R14SP2)	None
V1.0.1 (R14+)	None
V1.0 (R14)	None