Power Amplifier Design Flow

This page is intended to be a collection of features and resources targeted towards power amplifier designers. These are features, capabilities, examples, and other utilities that PA designers are likely to find useful. Explore the page on your own or click on the links below to learn more about specific topics.

In addition to the aforementioned resources, each of these topics can also be explored in the context of an example design. Click the **Show in Example** button in each section to download and open an amplifier design project highlighting how the topics in each section were utilized in the design.

Load-Pull Analysis

Load Pull

Simulate or import measured load-pull data and use the built-in measurements to understand the performance impacts of load or source impedances on your device.

Show in E

Simulated Load-Pull

Want an overview of the load-pull capabilities in the AWR Design Environment? Watch this video..

Looking to learn how to load-pull your device? Watch this video ...

- Analyze Effects of Harmonic Terminations
- Analyze Effects of Source Impedance

Load-Pull Measurements and Visualizations

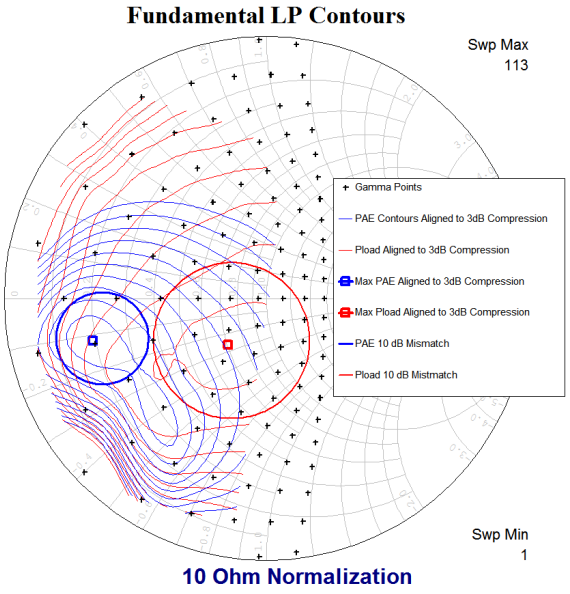
You've load-pulled your device and now want to understand the impact of loads on its performance. Watch this video...

System Load-Pull

We have a great example that analyzes the effects of load on your adjacent channel power ratio (ACPR)

Use Measured Load-Pull Data

The AWR Design Environment can read various measured load-pull files. Learn how to import measured load-pull files to use with the great measurement and visualization capabilities of the AWR Design Environment.



Electromagnetic Analysis

Electromagnetic Analysis

Understand the electrical characteristics of the metalization of your power amplifier. Analyze 3D planar metal structures with AWR's AXIEM or use AWR's Analyst to simulate fully arbitrary 3D structures.

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AXIEM

Fast, accurate 3D planar EM analysis. Using the method of moments (MOM) technique, AXIEM is great tool for performing EM analysis on single layer or multi-layer boards.

AXIEM pairs even better with harmonic balance simulations when AFS band limiting is used.

With EM Extraction, spend less time creating EM structures and hooking up s-parameters in a schematic and more time designing.

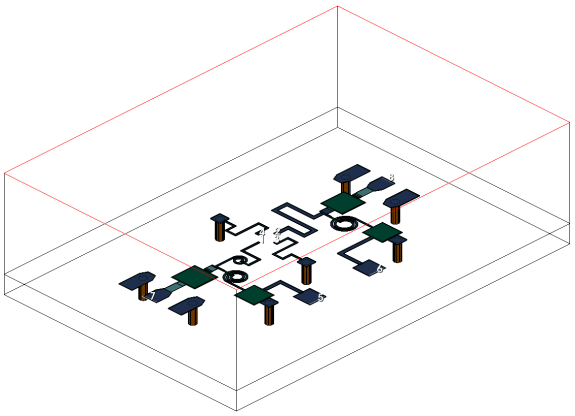
Analyst

EM analysis for fully arbitrary 3D EM structures. Using the finite element method (FEM) technique, Analyst can simulate any type of structure, including connectors and their transitions, structures with finite dielectrics, or devices in a package.

General

Even faster results can be obtained by using shape pre-processing, which can reduce the complexity of the structure being simulated while maintaining the original electrical characteristics.

Power at the push of a button - send your EM simulations to more powerful machines, run simulations in parallel, and get your results back faster using Remote simulation



Simulation

Simulation

Linear, Non-linear, Envelope, Optimization, Yield - You design it. We simulate it.

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Non-linear

Set your operating condition with IV-Curve and dynamic load line measurements.

Look at the steady-state non-linear behavior of your amplifier with Harmonic Balance. Measure gain, output power, efficiency, or other performance metrics or dig in deep and look at voltages and currents in your circuit.

Understand how your amplifier behaves when driven with a modulated input signal using a circuit envelope simulator.

Follow the simulation progress - cancel anytime.

Vendor uses X-parameters? We can simulate that.

Run simulations at a constant output power or a constant compression.

System

Simulate the latest modulated signals through your design.

Verify system level performance metrics, such as ACPR.

Easily track down spurious tones with the RF Inspector.

Analyze the effects of input signal dependent bias.

General

Easily change the value of a sweep a trace is plotting by tying it to a marker. This video shows how to utilize this powerful feature.

Design is close? Make it perfect with easy-to-set-up optimization.

Look at the sensitivity of your circuit's performance due to manufacturing variations or component tolerances with easy-to-set-up yield analysis.

Keep working while simulations are running - we simulate asynchronously.

Results stay around with Data sets. Tag results that look good so can easily compare iterations of a design

Models

The AWR Design Environment has support for models from all of the major component vendors and MMIC foundries.

See this list of foundry partners.

Test Benches

Speed up your device analysis by using pre-configured test benches and measurement templates.

Single Tone Analysis

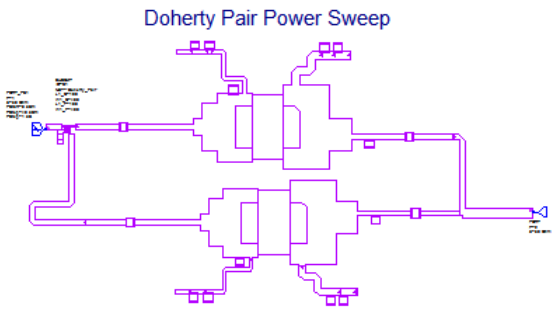
- One Tone Frequency Sweep
- One Tone Frequency Sweep Constant Pout
- One Tone Frequency Sweep 1dB Compressed
- One Tone Power Sweep

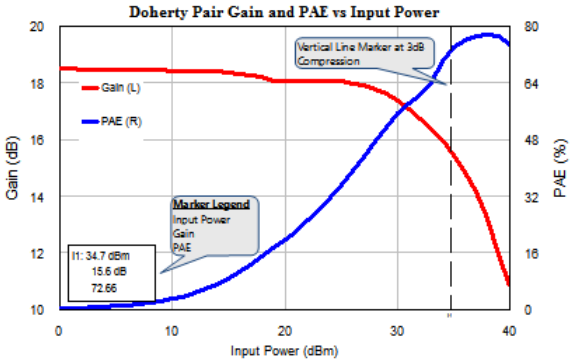
Two Tone Analysis

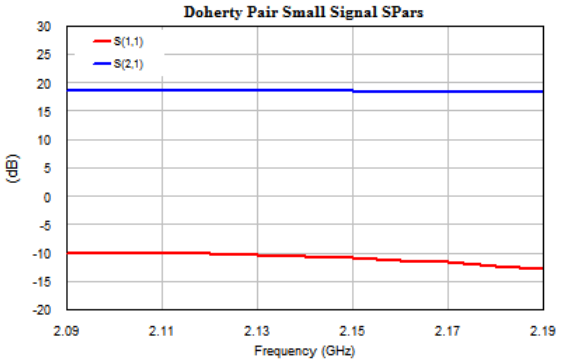
- Two Tone Frequency Sweep
- Two Tone Frequency Sweep - Swept Spacing
- Two Tone Frequency Sweep Constant Pout
- Two Tone Frequency Sweep 1dB Compressed
- Two Tone Power Sweep

Miscellaneous

- Power Supply Rejection Ratio
- ACPR and EVM in VSS
- Dynamic Load Line







Stability Analysis

Stability Analysis

Don't unintentionally build an oscillator...

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Linear Stability

In addition to the well known linear stability analysis methods (K, Mu, B1) check out these other methods/tools:

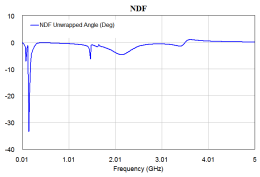
- Normalized Determinant Function (NDF)
- Stability envelope (see the AWRDE documentation)
- Gamma Probe (see the AWRDE documentation)

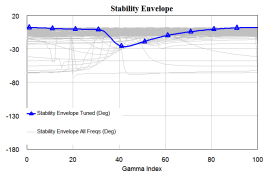
Nonlinear Stability

Use the STAN wizard (see the AWRDE documentation) in AWR to perform nonlinear stability analysis using the pole zero method.

General

Learn about all of the Stability Analysis (see the AWRDE documentation) methods at your disposal.





Redesign

Re-Design Flow

Taking over a design, or re-working an older design for new specs? Here are some tools that might help you.

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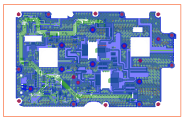
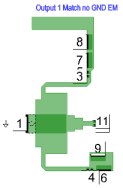
Artwork Only?

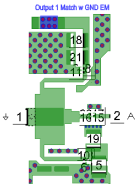
Create a custom, parameterized, layout for EM simulation from artwork using shape modifiers.

Coming from a PCB tool?

Have a PCB file? Effortlessly import it into AWR for analysis using the PCB Import Wizard. Once the PCB is in AWR - save time by simulating only the RF portion of interest using EM clip regions (see the AWRDE documentation)







Statistical Analysis

Statistical Analysis

Make sure your design still meets spec. over the component variations and manufacturing tolerances of your chips and process.

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Monte Carlo

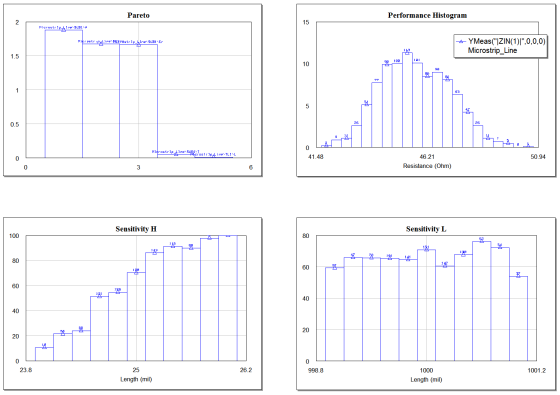
Monte Carlo analysis is an efficient way to predict circuit performance where there are a large number of independent variables. Watch this video to learn how to perform Monte Carlo analysis in the AWR Design Environment.

Corners Analysis/Design of Experiments

Understand the circuit performance at the edges of your component or manufacturing variations or create a design of experiments to test your circuit against.

Yield Optimization

Maximize your yield by using an optimizer to center your design for you.



Examples

Examples

A list of examples that PA designers might find useful.

- Introduction to Amplifier Design Flow
- MMIC High Power Amplifier
- Power Dissipation for FET
- PAE Measurements
- 5G PA Analysis
- 7GHz Amplifier
- Nonlinear Amplifier
- UHF/VHF Amplifier
- Distributed Amplifier
- Class E Amplifier
- High Power BJT Amplifier

For Feedback on this page:

Please contact the AWR Product Marketing team.