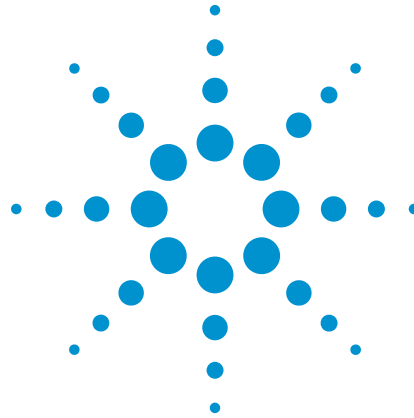# Momentum for Advanced Design System Users

Course Overview

Course numbers: Agilent Training Center: N3208A • Onsite Training Center: N3208B

Learn through a combination of lecture and hands-on exercises

Course overview

Agilent Technologies offers this medium-paced, detailed review of the 3D planar electromagnetic simulator Momentum. A number of designs are used to illustrate how the various simulation techniques may be effectively employed in a real-world situation.

What you will learn

- Momentum overview and user interface
- Momentum RF versus Momentum MW
- Defining multilayer structures
- Visualizing currents
- Patch antennas and radiation patterns
- Co-planar waveguide circuits and ground references
- Creating layout components for schematics
- Layout component parameterization methods
- Co-simulation and co-optimization
- Finite metal thickness modeling
- Interpreting inductor simulations
- Perturbational optimization
- Differential structures and ground at infinity
- Advanced Model Composer for analytical model generation
- Optimizing layouts directly to achieve performance goals

Specifications

Course type
User/Application Training

Audience
Technical staff who work in an RF, microwave or mm-wave design environment and want an in-depth understanding of designing circuits with Advanced Design System and the Momentum electromagnetic simulator.

Prerequisites
ADS Fundamentals class (N3211A/B/W) or at least 6 months experience using ADS. Familiarity with basic RF and microwave concepts. Windows and PC experience.
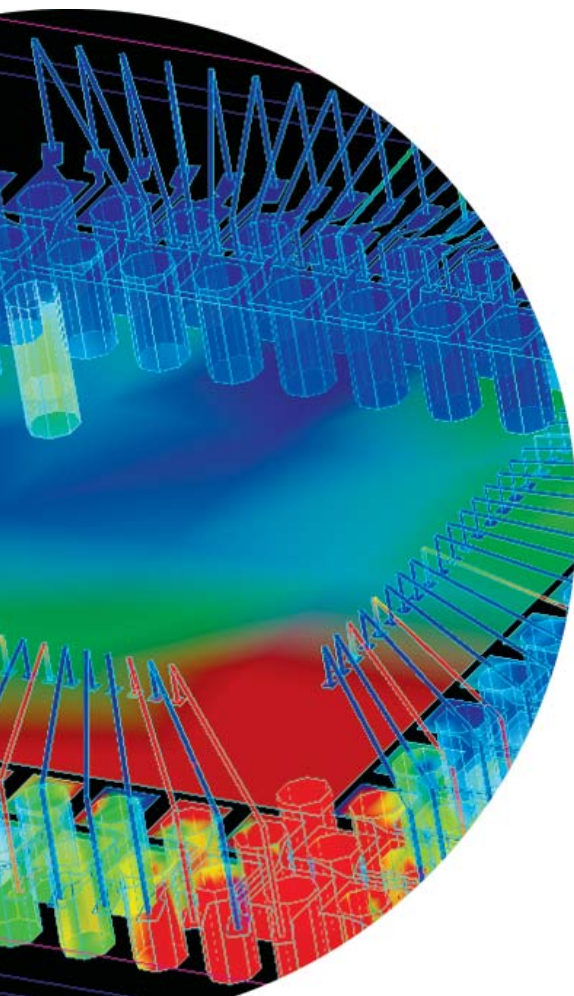
Course length
2 days

Course format
Lecture and Lab

Delivery method
Scheduled (at Agilent training locations), or

Dedicated (at a customer site)

To save you time and travel, many Agilent courses can be delivered at your site. Agilent can provide the required equipment.

Agilent Technologies

Detailed Course Agenda

Lab 1: Momentum Basics
A detailed review of Momentum, including the graphical user interface, the ADS layout tool, substrate editor, mesh controls, port editor, adaptive frequency sampling, and post processing capabilities.

Lab 2: Momentum RF Mode
Momentum RF has a dramatic impact on simulation speed and memory requirements, not only for RF, but also for classical microwave and mm-wave circuits. Using Momentum RF as the context, perturbational optimization techniques are discussed. An RFIC launch is used to contrast S-parameter accuracy depending on relative signal levels.

Lab 3: Antenna Design with Momentum
Using a patch antenna, learn how to define multilayer substrates and via model types. Understand when to reuse AFS data for far-field radiation patterns and other antenna characteristics.

Lab 4: Momentum Techniques
A Wilkinson 3-dB splitter design is employed to compare single and internal port types and to understand arc recognition settings for efficiently simulating curved structures. Layout components are introduced to demonstrate embedding of Momentum structures in schematics.

Lab 5: Layout Component Parameter Sweeps and Cooptimization
Layout component parameterization is introduced and the subnetwork method demonstrated using a high-Q MMIC resonator circuit. Multi-dimensional parameter sweeps are used to load the LC database for efficient co-optimizations. Limits on LC interpolation are discussed, as well as the important concept of power loss analysis.

**Lab 6: Coplanar Waveguides —
Slot versus Strip Models**
Using a simple coplanar waveguide and a CPW filter with airbridges and vias, the concept of slot layers is explained and contrasted to finite ground plane models. Ground References are introduced for use as signal return paths for structures with no infinite ground planes.

Lab 7: Finite Metal Thickness Modeling
Using a multilayer LTCC spiral, different approaches for modeling metallization thickness and loss are discussed and validated. Inductor parameters are extracted and compared for the different models. The spiral is parameterized using the Nominal/Perturbed method and a simple inductor synthesis approach is shown.

Lab 8: Simulating Differential Structures
Momentum Differential Ports are only one method to model differential circuits. More general methods are explained and using the mixed-mode templates, differential and common mode S-parameters are computed. Limits of Differential Ports are discussed using a differential antenna example requiring differential matching circuits. Ground references and LC Reference nodes are explained in detail as is the concept of ground at infinity.

Lab 9: Advanced Model Composer
The Advanced Model Composer is a generator for analytical models for any HF process where either no built-in circuit models exist or the accuracy is limited. AMC builds on LC technology to automatically construct Design Kits containing user-defined elements. The Design Kits can be shared with designers who do not have Momentum for traditional, puzzle-piece microwave modeling.

Lab 10: Momentum Optimizer
The Momentum Optimizer is directly available from the layout and can be used for simple tasks that do not require cosimulation with passive or active circuit elements. In the lab, a basic notch filter is used to demonstrate the impact of parasitics as the geometry is folded to make it more compact. Momentum is required for greatest accuracy and the optimizer is used to recenter the nominal circuit design.

For the latest information on class schedules and locations, visit:
www.agilent.com/find/eesof-class

Agilent Technologies