NI AWR Design Environment™ V11 Release Overview
V11 Release Overview

• A more complete design platform for MMIC, RFIC, RF PCB, MCMs and other high-frequency systems & circuits
  – Electromagnetic analysis: 3D planar & arbitrary 3D FEM EM for components like SMA connectors
  – Ease-of-use enhancements that improve designer productivity

Emphasis on enabling customers to spend more time focused on their design challenge and less time on driving the design software
V11 Major Feature: Analyst

• What is Analyst (Quick Peek Video)
  – Powerful 3D Finite Element Method (FEM) electromagnetic (EM) simulation and analysis software that is seamlessly integrated within the AWR Design Environment
  – Analyst lets you move from circuit concept to full 3D EM verification with a single mouse click
  – With 3D EM and circuit design in one integrated workflow, you're time is well spent designing and optimizing for performance
Analyst: New Feature Highlights

Key New Features

• 3D EM Editor
• Antenna Analysis for 3D EM
• User Defined 3D Cells
• Visualization Improvements
  • Connectivity Mesh View
AXIEM: New Feature Highlights

Key New Features

• **Automatic Ports** –
• AFS Band Limiting
• Simulation Enhancements
  • Higher Accuracy Loss Model for Thin Conductors
  • Surface Roughness Supported
  • Frequency Dependent Dielectrics
• Mesh Improvements
Visual System Simulator: New Feature Highlights

Key New Features

• Datasets for VSS
• 64-bit Support and Multi-threading
• New Model Features
  • **Phased Array Block**
  • WLAN 802.11ac Library
  • **Radar Library Enhancements**
  • Proportional-Integral-Derivative Controller
  • RF Block Temperature Dependence
• XML Script for Custom Library Creation
• System Diagrams – Connections by Name
Key New Features

• Solver Technology
  • 64-bit Microwave Office
  • New Gamma Probe Model
  • Tuning Parameter Groups
  • APLAC as Default Simulator
• Layout
  • Connect Net Shapes
  • Improved SPP
• User Environment
  • Project Archiving
  • Improved Variable
• Schematics
  • User Attribute
  • Easier Sweep Setup
  • Add Measurements Directly from Schematic
  • User Defined Attributes for Model Bocks
• Graphing/Measurements
  • Stepped Colors
  • Output Equation Markers
What’s New – Details
NI AWR Design Environment

NI AWR Design Environment (AWRDE) now compiled to run 64-bit.

- Can now use much more RAM than before.
- Many operations will run faster due in 64-bit mode.
NI AWR Design Environment

Variable Browser Improvements ([Video](#))

![Variable Browser screenshot](image)

Demo – LPF_Lumped.emp

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Tuner Improvements

Tags solve problem of too many tune variables.

Demo – LPF_Lumped.emp
NI AWR Design Environment

Add Measurements From Documents (Video)
Save favorite measurements.

Right click to activate.

Demo – LPF_Lumped.emp
User Attributes (Video)

User settable values on each model.
Annotated on schematic.
Accessible in API to build reports.
Set in vendor libraries.

Demo – LPF_Lumped.emp
Optimization Rounding

New command can now round to user defined precision.

Parameter values can have many decimal places after rounding.

Demo – LPF_Lumped.emp
Easier Sweep Setup (Video)

Right click command on parameter value to setup sweeps.

Demo – LPF_Lumped.emp
Graph Improvements (Video)

From a graph, can get to more places, help move around complex designs.
Output Equations and Markers

Demo – OEqn_Marker_clickIV2selectSparam.emp
Swept Color Traces (Video)
Each trace of a sweep has a different color.
Library Structure Improvements

EM structures can now be part of a vendor library part.
New folder path to add vendor library xml (no need to edit files to add).
New folder paths to add custom models, layout cells, and symbols.
3D Parts / Enhanced Editor (Video)
Expanded library of 3D parts.
Ability to create/edit 3D parts in 3D editor.

Demo – 3DEditorIntegration_Final.emp
Connected Mesh View

Demo – 3DEditorIntegration_Final.emp
Antenna Patterns

Demo – dual input patch.emp
Auto Ports (Video)

Automatically determine port settings for:
- Ground connection
- Reference plane extension
- Mutual grouping

Demo – auto_ports_Distributed_Amplifier.emp
General Improvements

More robust meshing.
Speed improvements in the solvers.
Improved loss models including surface roughness.
AFS band limiting.
Frequency dependent materials.
Circuit Envelope Simulation

N-port Microwave Office circuit can be co-simulated with Visual System Simulator.

Visual System Simulator controls input signals and other signals (such as bias) to the Microwave Office circuit simulation.
APLAC Datasets

Simulation data stored in datasets.

Enables:

- Simulation data will persist from project save and open
- Can compare various runs against one another
- Enables remote simulation in the future
Improved Gamma Probe

Uses APLAC and datasets to enable more efficient stability analysis.
Microwave Office

iNet Enhancements (Video)
Automatically change iNets when they are shorted. Combine separate routes into one.

Demo - inet_cleanup.emp
Connect Net Shapes (Video)
Uses the connectivity checker to associate layout shapes with the appropriate schematic net.

Demo - connect_nets_shapes_wn.emp
Datasets

Datasets can store results from a number of simulations. User can then easily switch between different datasets and display the results of these simulations.
VSS/LabVIEW 802.11ac IP-sharing

Transmitter

Transmit Spectrum Mask
Spectral Flatness
Center Frequency Tolerance
Packet Alignment
Symbol Clock Frequency Tolerance
ModAcc
  Center frequency leakage
  Constellation EVM

Receiver Tests

Minimum input level sensitivity
Adjacent channel rejection
Nonadjacent channel rejection
Receiver maximum input level
Clear Channel Assessment (CCA) sensitivity

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VSS/LabVIEW 802.11ac Signal Generator and Receiver Integration

Simulated 802.11ac receiver

LabVIEW 802.11ac Generation

LabVIEW 802.11ac Generation
VSS/LabVIEW
Example 802.11ac Measurement

80 MHz Bandwidth
Up to 256-QAM

Key Measurement, RMS EVM

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Temperature Dependent RF Models

- Amplifiers\Linamp
- Amplifiers\Lvga
- Antennas\Rx\_Antenna
- Antennas\Tx\_Antenna
- Blocks\Couplers\Scoupling
- Combiners/Splitters\Combiner
- Combiners/Splitters\Qhyb\_12
- Combiners/Splitters\Qhyb\_21
- Combiners/Splitters\Qhyb\_22
- Combiners/Splitters\Splitter
- Couplers\Dcoupler\_3
- Couplers\Dcoupler\_4
- Freq. Multipliers\Fmult\_B2
- Impedance Mismatch\Load
- Impedance Mismatch\Rf\_End
- Impedance Mismatch\Rf\_Start
- Network Blocks\S2p\_Blk
- Network Blocks\Sblk\_2State
- Network Blocks\Y2p\_Blk
- Network Blocks\Z2p\_Blk
- Passive\Attenuators\DSattenu\_Var
- Passive\Attenuators\RFattenu
- Passive\Attenuators\Vva
- Passive\Circ\_12
- Passive\Circ\_21
- Passive\Isolator
- Passive\Phase\Apshft\_Var
- Passive\Phase\Dphshft
- Passive\Phase\Dphshft\_Var
- Passive\Rf\_Delay
- Passive\Rf\_Delay\_Var
- Pre\_Release\Amplifiers\Amp\_B2
- Pre\_Release\Mixers\Mixer\_B2
- Pre\_Release\Rf\ Sources\Tone
- Switches\Rfdpdt\_24St
- Switches\Rfdpdt\_42St
- Switches\RF\ Sw\_1nDyn
- Switches\RF\ Sw\_1nSt
- Switches\RF\ Sw\_n1Dyn
- Switches\RF\ Sw\_n1St

40 models in all
Unique to VSS!
Visual System Simulator

Phased Array Model (Video)

Capable of simulating very large phased arrays. Easy to configure (manually or via data files). Standard or custom array architectures. Implement standard or user-defined tapers. Support for various signal distribution schemes. Allow implementation of array imperfections. Characterize individual elements. Frequency dependent configuration.
Phased Arrays Implemented Using Discrete Blocks

Define gain & phase offset for each element.
Specify common or unique RF link for each element.
Implement customer specific beam-forming algorithms.
Good for relatively small phased arrays, not practical for more than a few hundred elements.
Phased Array Geometry

Standard array geometry configurations.
- Lattice (rectangular, triangular)
- Circular (multiple concentric circles)

Custom configurations.
Configured via X/Y locations
Array Configuration

Gain Tapers

Standard
  Dolph-Chebyshev, Taylor, Uniform
User-defined (gain/phase vectors for each element)

Array Imperfections

Geometry imperfections (offsets from nominal X/Y)
Gain and phase errors (quantization effects)
Element failure
  Random (% of total number of elements)
  Deterministic (specific array elements)
Visual System Simulator

Phased Array Testbench

Phased array characterization.

Antenna pattern, array response, HPBW, etc.

RF analysis and planning.

System level simulations with modulated signals.
Visual System Simulator

Typical Analyses

Evaluate array performance for over a range or power levels and/or frequencies.

Perform various budget analysis (video) measurements such as cascade NF, P1dB, G/T, etc.

Evaluate sensitivity to imperfections and HW impairments via yield analysis.

Perform end-to-end system simulations using a complete model of the phased array.
RADAR Library Improvements (Video)

MTD and CFAR blocks have been improved to provide direct estimates of the target distance, velocity and Doppler offset, avoiding the need for external circuitry to perform these estimates.

The parameters used by most elements in the library have been reworked to make configuration of new RADAR systems easier and less prone to mistakes.

The RADAR example has been updated to implement a dynamic target, with its parameters defined internally or through third-party tools and stored in a data file.
Visual System Simulator

Solver Technology Enhancements

64-bit
Multi-threading

10x faster in some instances
Typically 30% faster for most designs
Learn More

• Visit www.awrcorp.com/whatsnew
• Contact your local AWR representative