DVTEST™
Best Isolation. Better Results.

OTA Performance Testing

With Near Field to Far Field Transformation

DVTEST in partnership with ETS Lindgren are proud to announce that the EMQuest Antenna Measurement Software (including the Near Field to Far Field measurement suite) is now fully compatible with select DVTEST enclosures and positioners. Continue reading to find out more about Near Field to Far Field transformation and how it reduces your costs and test time!

Today's wireless devices are often equipped with multiple antenna elements to reduce power consumption and improve signal rates. Proper antenna characterization is crucial and can be performed by a combination of different measurement techniques, which can provide antenna radiation patterns for single or multi-element antennas in 2D or 3D formats.

There are three widely accepted techniques that can be used for the evaluation of an antenna's performance in an Over-the-Air (OTA) environment:

Direct Far Field (DFF) – requires a test chamber in which the measurement distance is sufficiently large such that the Antenna Under Test (AUT) can be tested in a far field condition.

In-Direct Far Field or Compact Antenna Test Range (CATR) - in which a parabolic reflector is used to create plane waves where the AUT is placed within a specific quiet zone.

Near Field to Far Field (NF-FF) - where a sphere enclosing the AUT in its center is scanned in the near field (NF) region, and the data is transformed into far field (FF) results using a mathematical transformation algorithm.

The NF-FF method allows measurement to be done in the very NF - which in turn allows for use of a smaller and a more compact enclosure as opposed to other costly methods which require larger or walk-in spaces.

MEASUREMENT SETUP

A NF- FF OTA testing system is comprised of several key components:

The **RF Anechoic Enclosure** provides the quiet, isolated environment in which measurements can be taken. The enclosure must be equipped with a **Dual Axis Positioner** which adjusts the orientation of the AUT. A dedicated **Probe Antenna** is installed a specified distance away to sample the radiated field of the AUT via the attached **Vector Network Analyzer** (VNA).

The **Antenna Measurement Software** (EMQuest) controls this entire process and creates a spherical scan around the AUT by coordinating the measuring equipment with the positioner. The acquired NF data is then processed through the NF-FF transformation algorithm and FF results are provided in tabular and graphical formats

EXAMPLE MEASUREMENT

In this example measurement, we will be characterizing a 24-40GHz, 20dBi horn antenna at a test frequency of 25GHz. The horn will be measured in the NF and then the data will be converted into the FF results.

KEY COMPONENTS

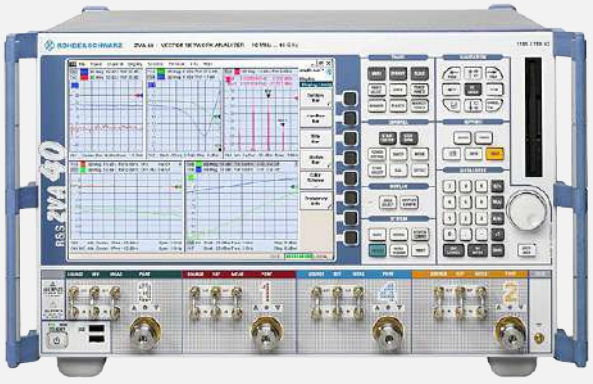
We will be using a dbSAFE ARMOR 3270 test enclosure equipped with a 24-48GHz, 15dBi horn antenna as the antenna probe.

The AUT will be affixed to a 2-axis azimuth over elevation positioner and EMQuest 100 will be used as our test software and transformation. The system will be using a Rohde & Schwarz ZVA67 VNA for the measurements.

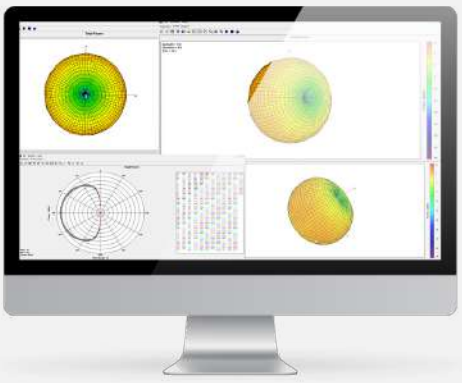
AUT: 24-40 GHz 20dBi Horn

PROBE: 24-48 GHz 15dBi Horn

POSITIONER: Dual Axis

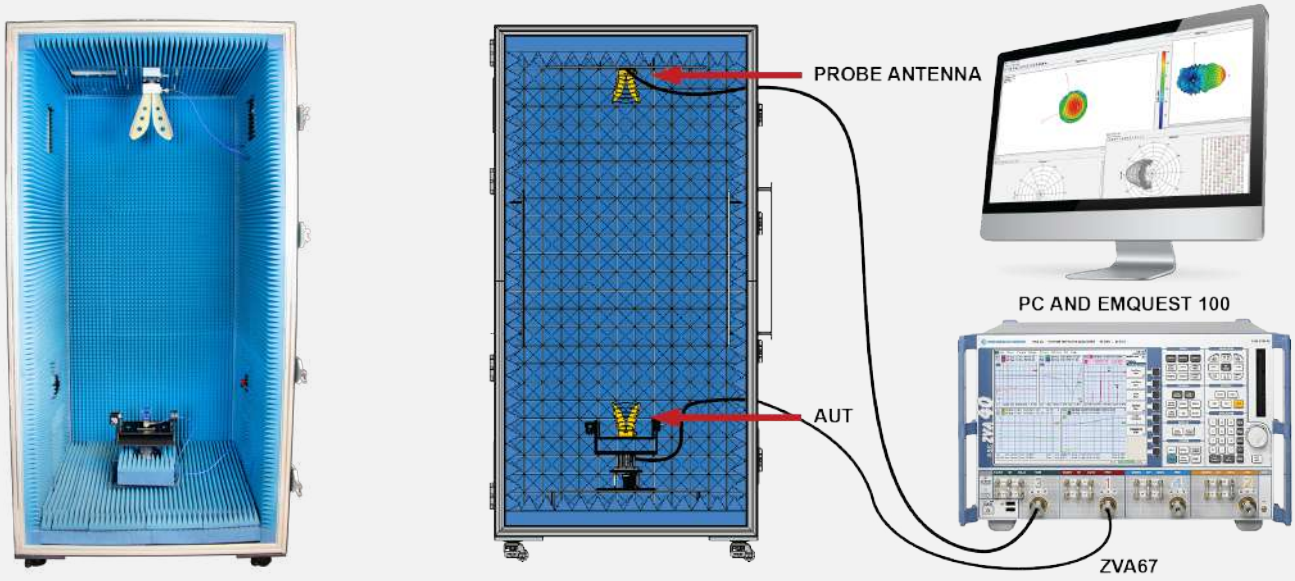


Rohde & Schwarz ZVA67



EMQUEST 100

SYSTEM SETUP



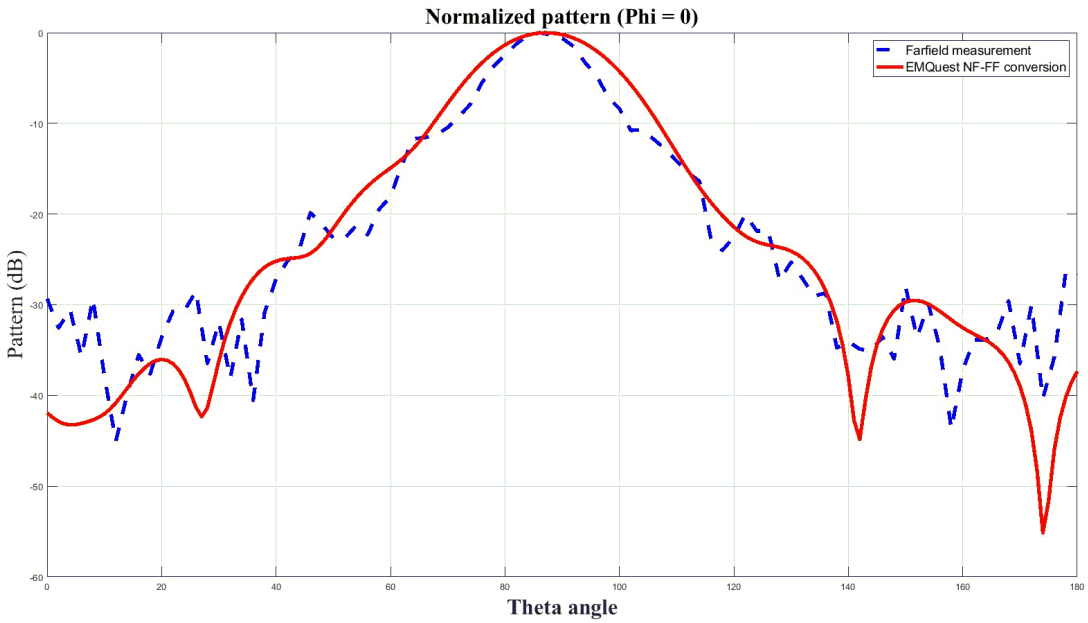
**Typical set up is shown above*

TEST RESULTS

The NF data was collected and transformed into FF results as indicated by the **red line** in the graph below.

For comparison, the **blue dotted line** represents results as performed in a large walk-in chamber (DFF). As a result of existing misalignment between the AUT and the probe, and the reflections from the walk-in chambers interior surfaces, some ripples appear below 40°.

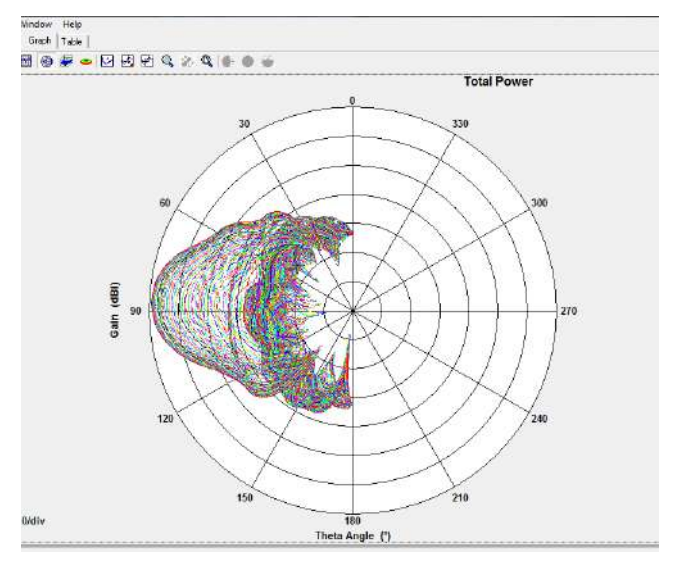
The NF data measured within a portable anechoic enclosure “dbSAFE ARMOR” does not display this ripple as they are inherently designed for NF measurements.



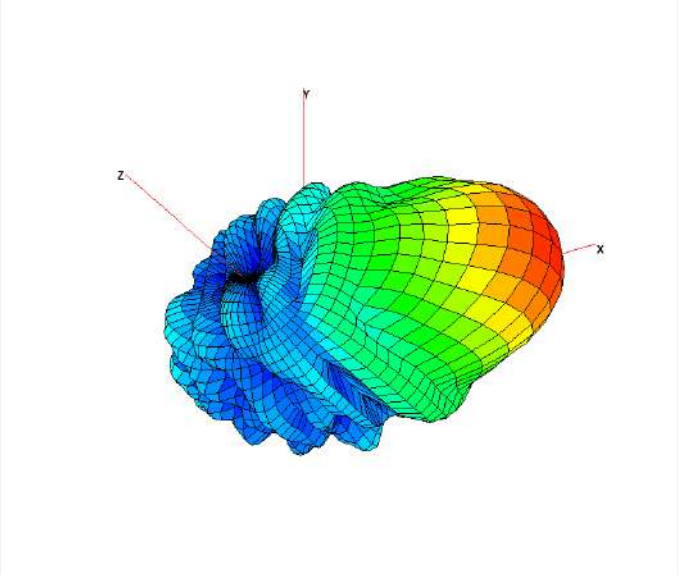
Comparison for NF-FF transformation (red) and walk-in chamber (DFF)

TEST RESULTS

Below are the resultant FF radiation patterns of the scanned angles in both 2D and 3D graphical format.



Radiation pattern for scanned angles



3D view

CONCLUSION

NF-FF OTA testing is a viable solution for performing antenna characterization.

For NF measurements, the ability to place the probe in the NF distance of the AUT results in minimization of reflections and allows for a much easier alignment at this close distance.

More importantly, the NF-FF algorithm calculated potential misalignments and reflections and filtered out the ripples while producing accurate results. The above features along with cost and space saving advantages are fundamental factors for companies who have limited budget and still want to produce reliable and accurate data.

Want to find out more about OTA performance testing? Contact DVTEST today. Our application engineers are available for online demos and consultations.

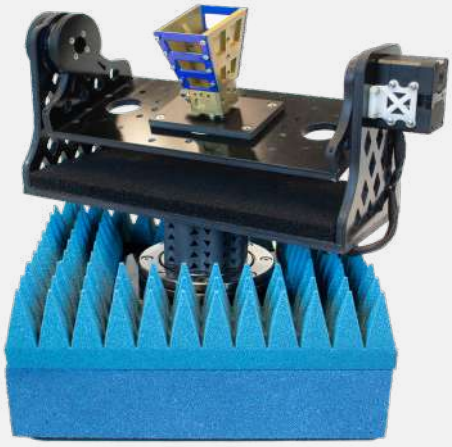
SYSTEM COMPONENTS

Don’t need a full system? No problem! All system components are available individually, Contact DVTEST to request a quote.

Let the DVTEST Engineering team customize a solution for you. OTA test enclosures are fully customizable in their size and internal features aiming to meet test criteria for wireless/5G devices.

OTA enclosures manufactured by DVTEST can be used in a wide range from Sub-6GHz to mmWave frequencies for device testing and validation. The select model numbers shown below are widely used in OTA testing.

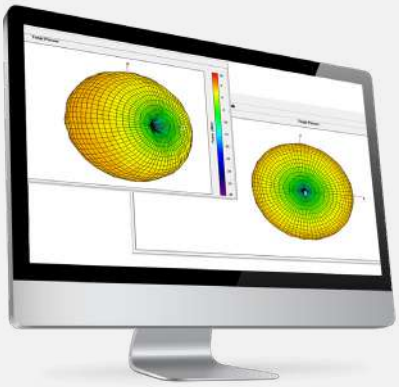
The compact nature of these enclosures allows them to be used in spaces and are easily movable, saving the need for dedicated permanent infrastructures. In addition to space-saving, the NF-FF system costs a fraction of what is typically spent on a CATR or DFF system.



DVTEST positioners are two-axis azimuth over elevation positioners for precise angular positioning with full spherical coverage.

Designed for antenna and RF device characterization. They are built out of low-permittivity materials, with additional RF absorbing material for minimal multipath and improved measurement accuracy.

Options available for RF rotary joints, slip rings for data communications, pass-through bores, and custom sizing.



ETS-Lindgren’s EMQuest EMQ-100 and EMQUEST LITE Antenna Measurement Software offers a wide range of fully parameterized test methods for measuring basic antenna performance metrics, as well as testing both radiated and conducted performance of various wireless devices.

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