Test solutions for 5G to enable your success

Massive MIMO test challenge

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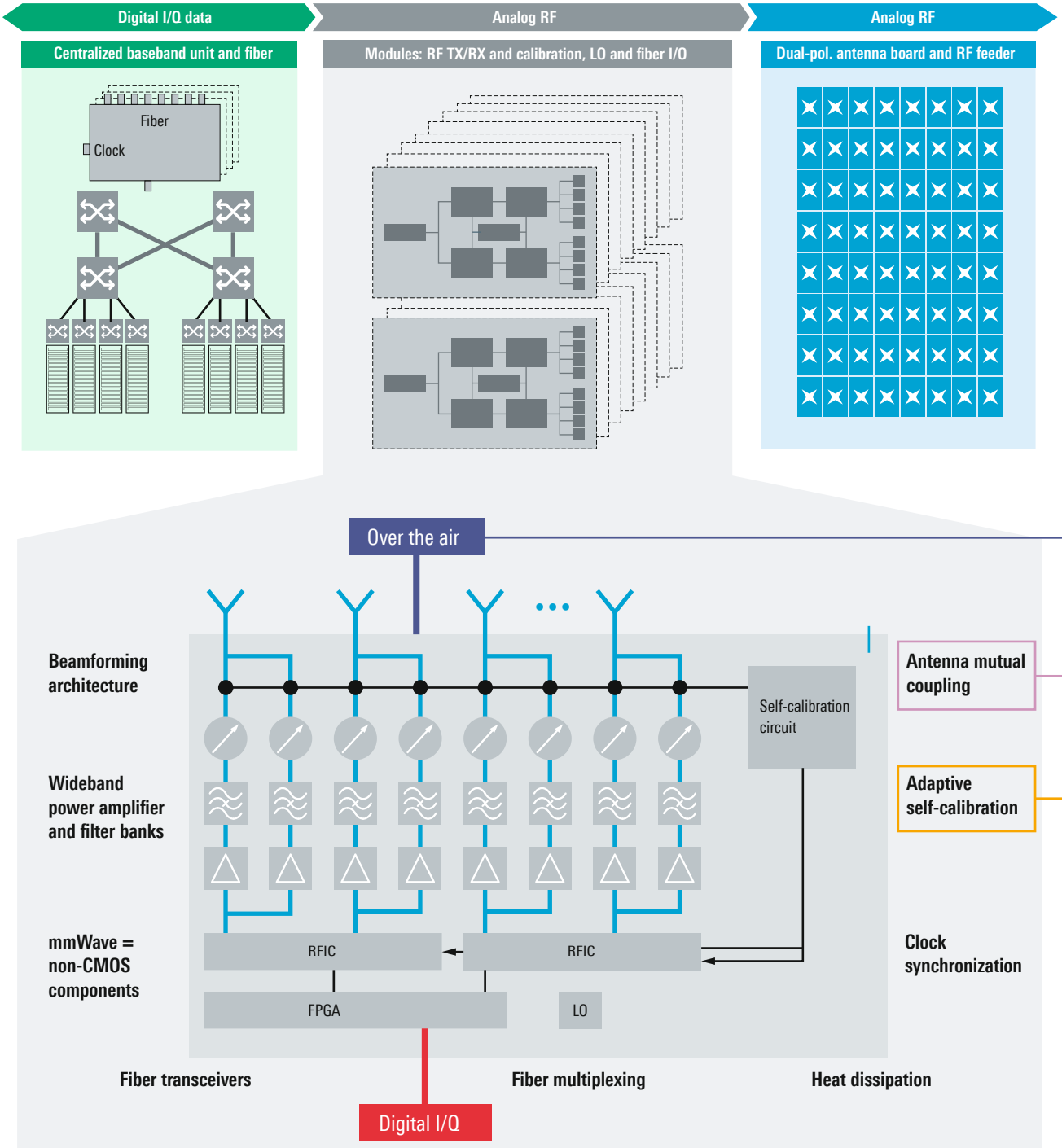
ROHDE&SCHWARZ

5G test challenge:
Measuring new 5G massive MIMO systems with limited interfaces

5G base station architecture

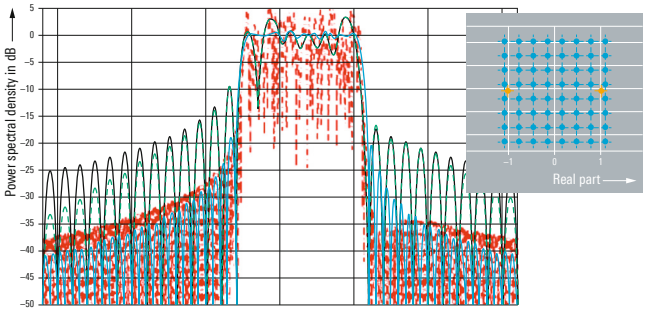


Only two external measurement interfaces, digital I/Q with proprietary signaling or over the air (OTA)

At Rohde&Schwarz, your test and measurement challenges are our motivation to provide solutions for your success: from wideband signals to massive MIMO and other enabling technologies for 5G development and deployment.

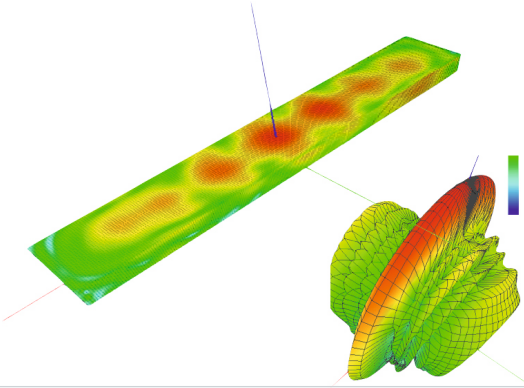
Transceiver calibration and performance

Current conformance testing and transceiver measurements use a conductive interface to measure EVM, spectral emission mask, PIM, ACLR and sensitivity, for example. Future 5G massive MIMO systems will no longer have a test port per transceiver, requiring sensitive, phase-coherent and wideband OTA measurements for research and production phases of the product.



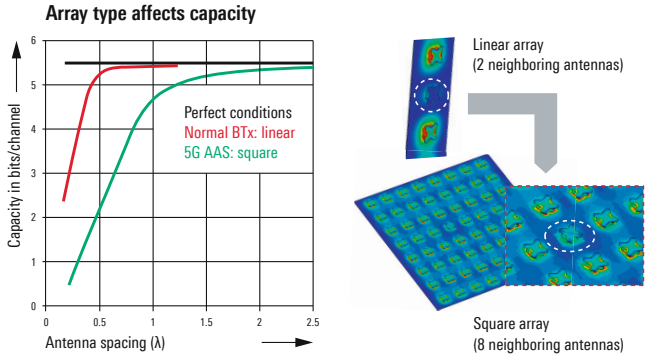
Active antenna measurements

Active antenna systems will no longer have RF test ports, necessitating OTA measurements to benchmark antennas and RF components (power amplifier). In addition, mmWave antenna systems cannot be measured with cables, making high-bandwidth OTA testing necessary. OTA in production verification is critical to massive MIMO base stations and UEs with multiple subsystems.



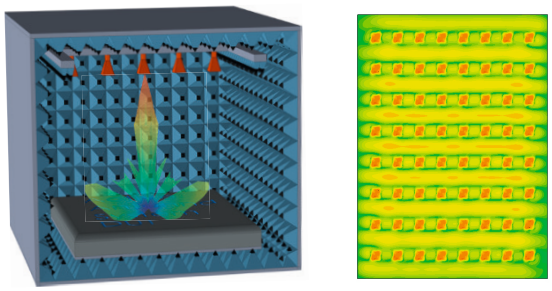
Antenna mutual coupling

The mutual coupling (S_{21} parameter) between antenna elements reduces the system capacity. The traditional linear arrays have much lower coupling than the new square arrays required by massive MIMO. As a result, the antenna mutual coupling must be characterized to determine minimum spacing. Mutual coupling not only affects network capacity, it also raises challenges for OTA transceiver conformance testing.



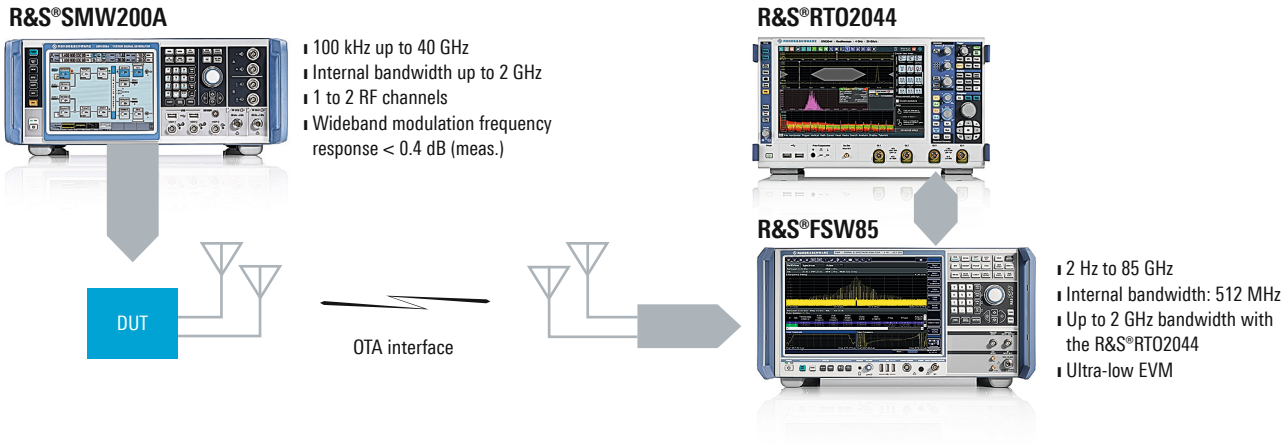
Massive MIMO and antenna calibration

Massive MIMO is an active antenna system with a large number of elements where the radio is combined with the antenna, enabling multi-user MIMO (MU-MIMO) for a significant increase in network capacity or reduction in operator OPEX (increased energy efficiency with targeted beams). Antenna calibration is required to ensure beamforming accuracy, the critical component for massive MIMO systems.



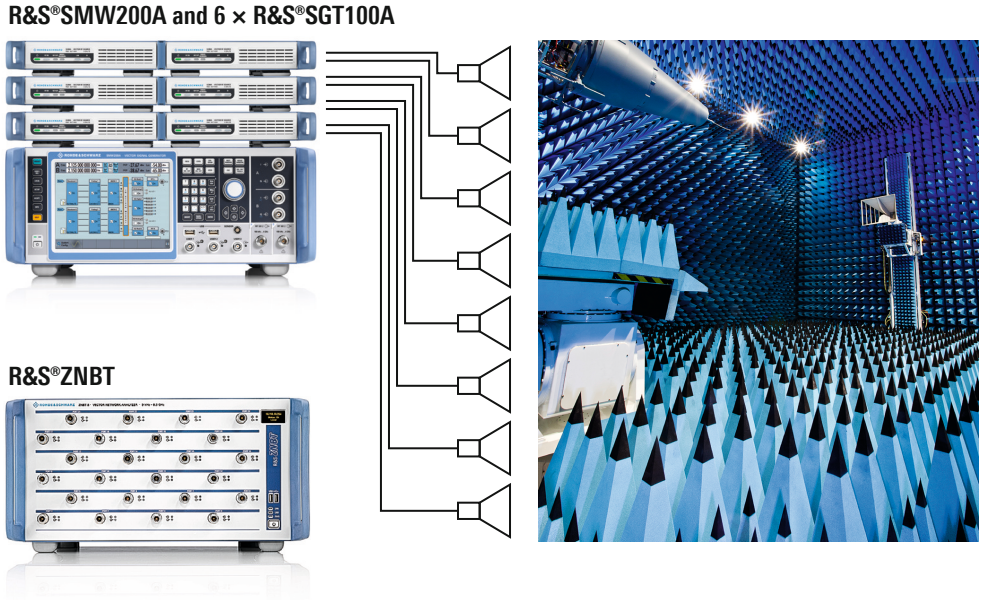
Transceiver calibration and performance

In addition to traditional OTA measurements of antenna radiation patterns, Rohde&Schwarz can measure the performance of individual or multiple transceivers inside the 3D-MIMO (horizontal and vertical beamforming) array. For example, the R&S®FSW signal and spectrum analyzer can be used to measure the error vector magnitude (EVM) of a transceiver or a DUT. The R&S®SMW200A vector signal generator also allows the generation of an RF signal based on customized waveforms, eliminating the need for difficult conductance measurements inside a 3D-MIMO array. The variety of available signal sources, such as LTE/LTE-A and 5G waveform candidates, and up to 2 GHz bandwidth support ensures comprehensive verification capabilities for 3D-MIMO systems in sub-6 GHz and mmWave frequency bands.



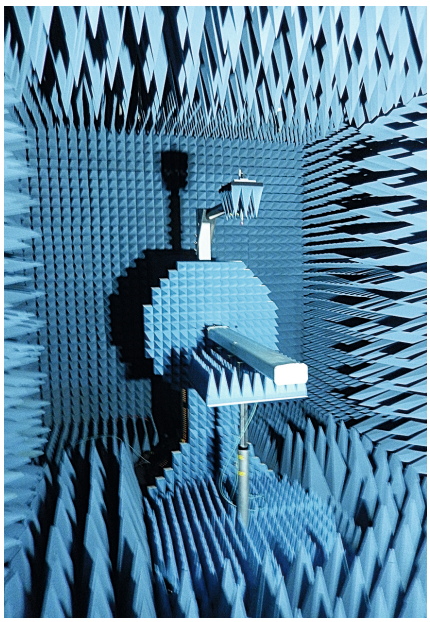
Massive MIMO and antenna calibration

Rohde&Schwarz is extending existing techniques to enable CPRI-free 3D-MIMO radiation measurements where direct access to the DUT digital I/Q data is not required. Extending the frequency further up to the V band, Rohde&Schwarz performs dynamic beamtracking measurements for the 3D-MIMO array and provides OTA test solutions including signal generators and analyzers, vector network analyzers and shielding chambers.



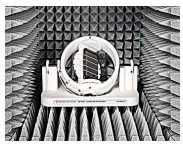
Active antenna measurements (active and passive)

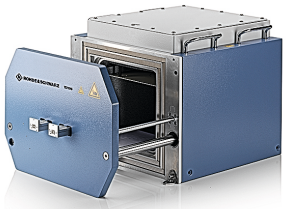
Rohde&Schwarz has developed a flexible near-field measurement technique that allows continuous sampling on arbitrary grids. This considerably decreases the measurement time in the near field compared to stepped measurements (40 times faster at 6 GHz). In addition, Rohde&Schwarz offers benchtop and production far-field measurement systems for 28 GHz to 90 GHz devices in new mmWave cellular systems.



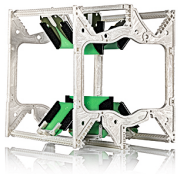
R&S®TS8991

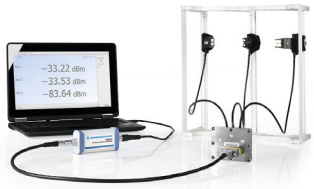
R&S®DST200





R&S®TS7124

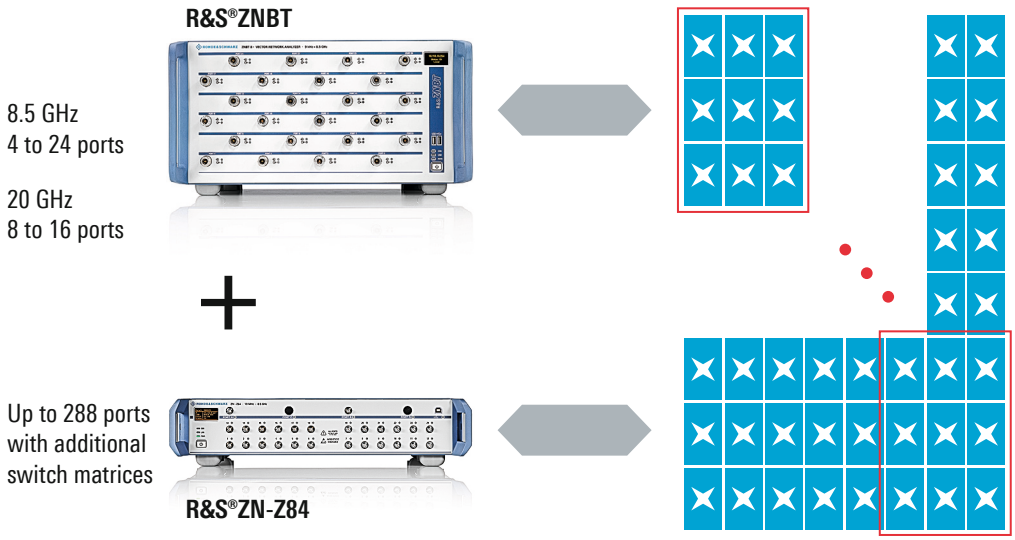




R&S®NRPM

Antenna mutual coupling

Due to the mutual coupling that occurs between neighboring antenna elements, a vector network analyzer that can simultaneously measure all antennas in a 3x3 grid is critical to antenna array optimization for 3D-MIMO. The true multiport R&S®ZNBT vector network analyzer can measure up to 24 ports simultaneously and be further extended to 288 ports using R&S®ZN-Z84 switch matrices. This allows significantly faster measurements of 3D-MIMO antenna arrays compared to a more traditional 4-port vector network analyzer (90% faster).



Service that adds value

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

About Rohde&Schwarz

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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