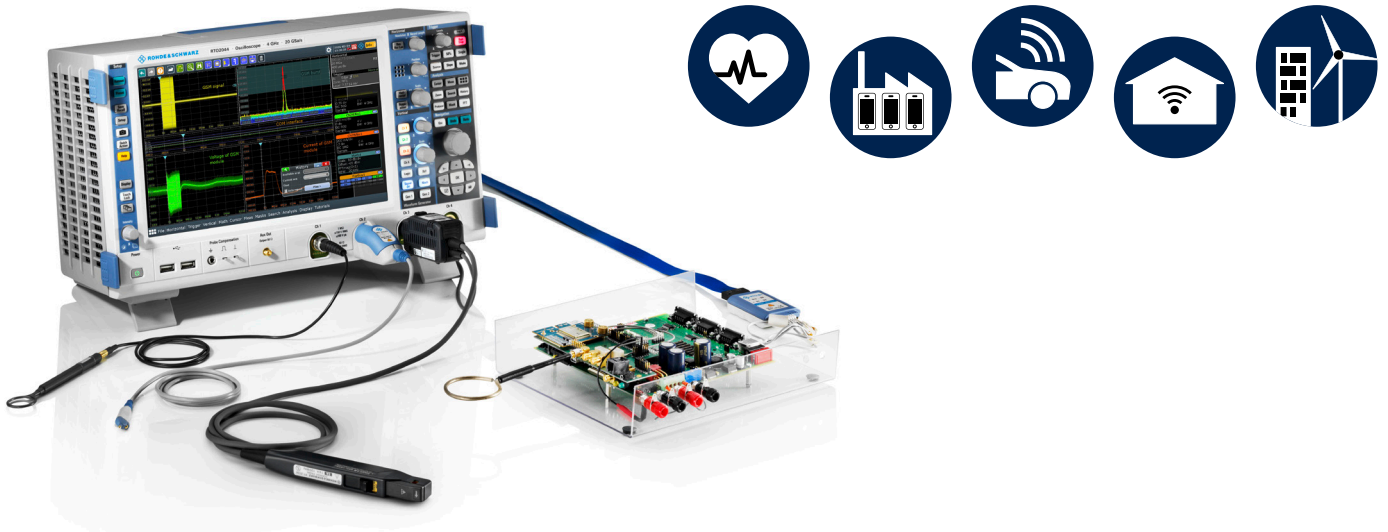


TESTING IOT DESIGNS WITH THE R&S® RTO

FOCUS EMI DEBUGGING

The need for internet of things (IoT) solutions can arise fast. In most cases, wireless communications modules are added to an embedded design. When designing and debugging IoT systems, many different measurements need to be performed. Since developers are very familiar with using an oscilloscope for voltage and time measurements, they also want to use it to for all other necessary measurements. And now they can – with the R&S® RTO oscilloscopes.



Typical measurement tasks during the development of wireless embedded IoT systems that can be accomplished with Rohde & Schwarz oscilloscope solutions

Task	Need	Product feature
Validation of power management	<ul style="list-style-type: none"> ▶ Measure small currents ▶ Verify power integrity 	<ul style="list-style-type: none"> ▶ Up to 16-bit resolution, 500 $\mu\text{V}/\text{div}$ vertical scale ▶ High acquisition rate of 1 million waveforms/s ▶ Fast FFT analysis, from DC ▶ High-sensitivity current probe, 1:1 passive probe
Chipset interconnection testing	<ul style="list-style-type: none"> ▶ Trigger and decode serial protocols ▶ Measure bus timing on parallel buses 	<ul style="list-style-type: none"> ▶ Serial triggering and decoding options for up to 17 protocols, including custom decoding (NRZ/Manchester protocols) ▶ MSO option with 5 Gsample/s, 16 channels and up to 200000 waveforms/s
Testing of wireless modules	<ul style="list-style-type: none"> ▶ Capture transmission bursts ▶ Check signal quality 	<ul style="list-style-type: none"> ▶ Full bandwidth down to 1 mV/div ▶ Fast FFT and mask test in frequency domain ▶ Zone trigger option ▶ Signal analysis with R&S®VSE vector signal explorer software
Validation of overall system	<ul style="list-style-type: none"> ▶ Trigger and decode serial protocols ▶ Correlate device activity at various interfaces and the power supply 	<ul style="list-style-type: none"> ▶ Time-correlated view of analog signals, decoded serial and parallel buses, signal spectrum ▶ Segmented memory and history mode
EMI debugging	<ul style="list-style-type: none"> ▶ Identify EMI sources on the PCB ▶ Precompliance testing against EMI standard 	<ul style="list-style-type: none"> ▶ Fast FFT with spectrogram option ▶ Log scale and mask for EMI precompliance measurements against EMI standards

Application Card | Version 03.00

ROHDE & SCHWARZ

Make ideas real



Measurement examples

Analysis of a wireless module's data capture, processing and communications timing

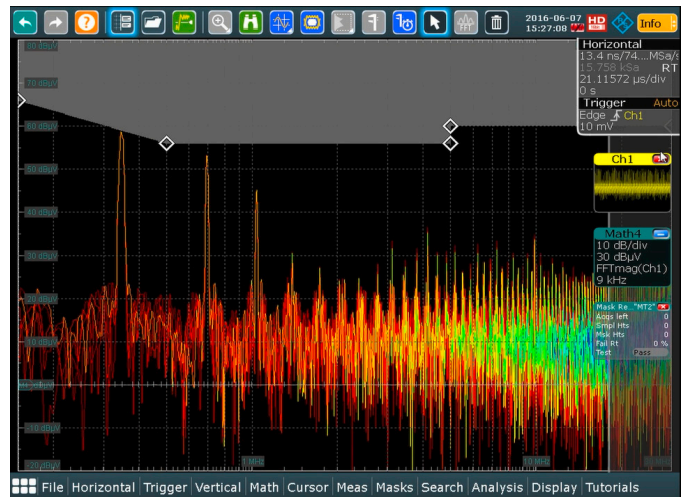
The screenshot displays an IoT module's GSM connection time-correlated to power consumption and data traffic on the modem interface. The RF and power supply voltage and current are measured on the analog channels. The digital channels acquire the module's modem interface communications via UART and decode the protocol. The spectrum of the GSM bursts is shown on the top right.



GSM connection of an IoT module.

EMC debugging of an power supply

The built-in fast FFT, the spectrum mask test and advanced spectrum features such as the log display allow relative measurements of EMC emissions. The example conducted emission on the right side shows the conducted emission test with a line impedance stabilization network (LISN). This makes it easy to determine EMI protection measures and prepare compliance measurements.



Conducted emission test with a mask defined in the spectrum.

Suggested configuration

The table shows a suggested configuration for IoT measurements. This configuration can be extended depending on your needs, e.g. by adding custom decoding for NRZ/Manchester protocols, I/Q acquisition and vector analysis software, even after the initial purchase. A broad portfolio of active and current probes is also available.

Designation	Type	Order No.
Oscilloscope series, Base unit, 200 Mpoints/800 Mpoints, 4 channels, bandwidth option required	R&S®RTO64	1802.0001.04
Bus analysis	R&S®RTO6-K500	1801.6864.02
Spectrum analysis	R&S®RTO6-K37	1801.6870.02
Mixed signal option 400 MHz, 16 digital channels	R&S®RTO6-B1	1801.6741.02
Probe set for E and H near-field measurements, two passive E and three passive H near-field probes, 30 MHz to 3 GHz	R&S®HZ-15	1147.2736.02