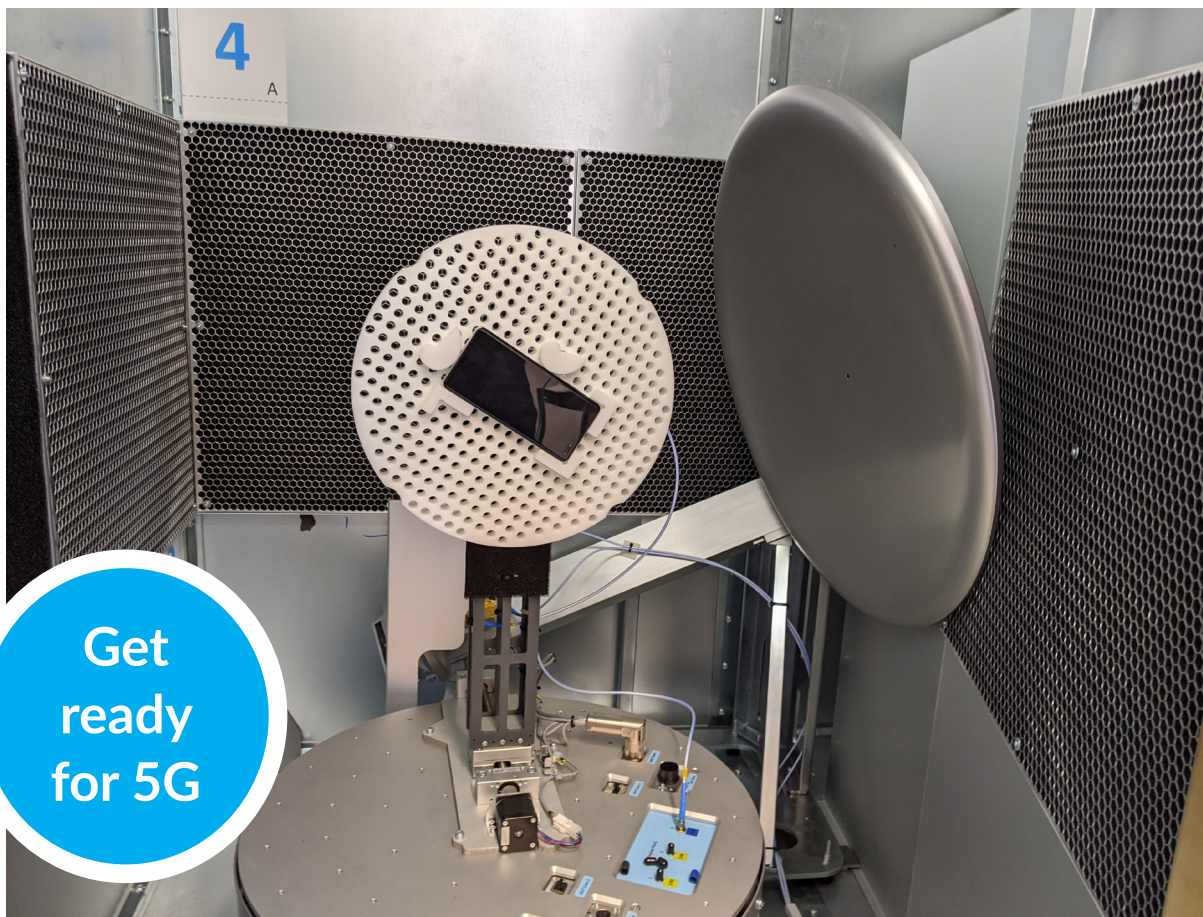


5G OTA

DEVICE TESTING IN THE RTS65



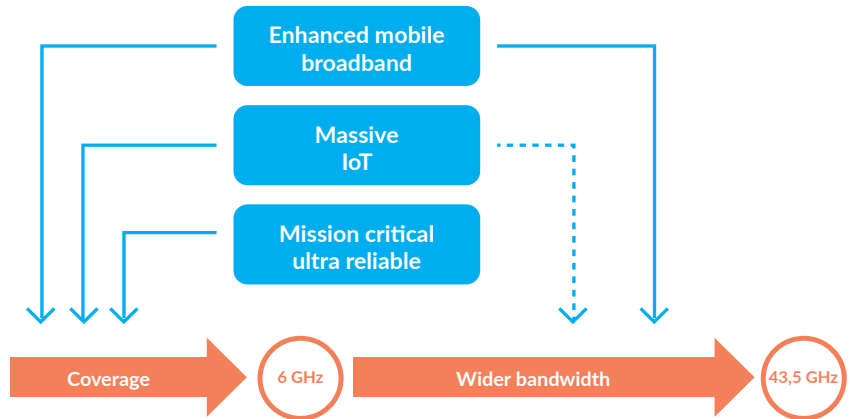
Get
ready
for 5G

EXPLORE THE FULL POTENTIAL OF YOUR 5G USER EQUIPMENT

The wireless industry is once again, with the introduction of 5G, taking a leap forward. Bluetest is assisting this development by introducing new options for the RTS65 reverberation chamber OTA test system. These 5G solutions enable measurements of even more carriers and parallel MIMO streams in the FR1 frequency range (primarily sub 6 GHz), extend the range of our established OTA measurements on wireless equipment all the way up to 43.5 GHz (FR2) and then, add even more test capability than you ever thought possible in a reverberation chamber.

MULTI-STREAM FLEXIBILITY

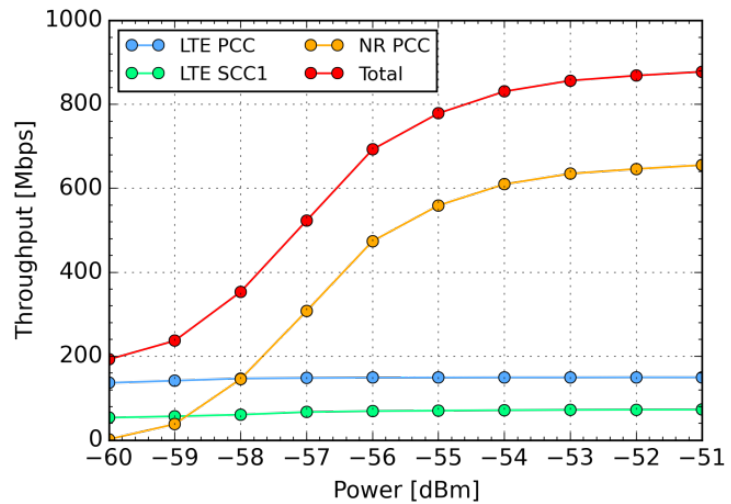
One of the strengths with the Bluetest Reverberation Test System (RTS) is the ability to support many carriers in multiple frequency bands at the same time. This becomes even more important when introducing 5G and dual connectivity. EN-DC combines the control plane on LTE or 5G in the FR1 frequencies for reliability and user plane on 5G in FR2 frequencies for bandwidth and higher data rates. With the 5G extension, up to 16 separate FR1 MIMO streams can be supported together with two FR2 MIMO streams. Even more streams can be supported by combining carriers in the communication tester and sharing antennas.



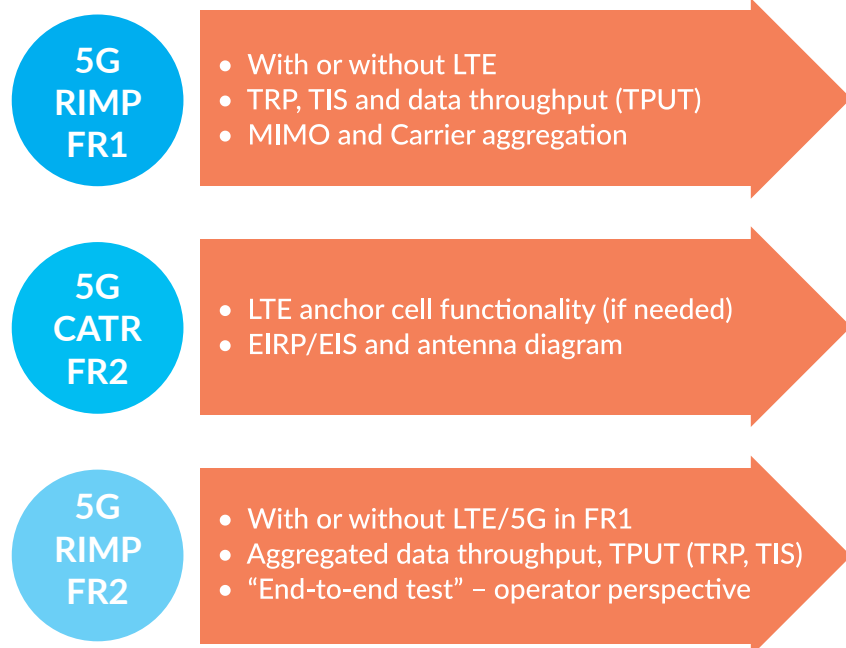
5G applications vs frequency bands

TEST TRACKS

The foundation for the 5G measurements is still the well proven Rich Isotropic Multipath (RIMP) environment inherent in the reverberation chamber. For 5G devices operating in the FR2 (mmWave) frequency bands, measurements of radiation patterns with antenna gain performance become desirable. This is typically not possible to do in a reverberation chamber. Instead a Compact Antenna Test Range (CATR) is preferred. Bluetest has now merged these two test methods into one system creating a unique test solution for a complete evaluation of the device radio performance, hence creating an indispensable tool for the R&D of 5G devices.



Data throughput vs receiver power level for 2 x LTE + 1 x 5G NR carriers



RTS65 5G test tracks overview

FR1 RIMP

Since the introduction of LTE, Bluetest has been in the forefront of supporting radio performance measurements on multiple MIMO-streams and carriers in different frequency bands. With the introduction of 5G NR these measurements are extended to also include 5G NR carriers regardless of it is in combination with LTE in a Non-Standalone (NSA) mode or Standalone (SA) mode. Measurement metrics for FR1 5G devices include the well-known Total Radiated Power (TRP), Total Isotropic Receiver Sensitivity (TIS), and data throughput (TPUT). The metrics can be presented on a per carrier basis or as a total aggregated value. With up to 16 measurement ports the Bluetest RTS chambers make it easy to implement anything from a simple SISO setup to a complex, multi-stream solution with stacked communication testers.

FR2 CATR

The Bluetest CATR option creates a single plane wave with uniform amplitude and phase inside the quiet zone. This enables EIRP and EIS measurements according to 3GPP NR test specifications.

A Gregorian dual reflector system with numerically shaped surfaces makes it possible to achieve a very compact CATR installation with precision management of the RF radiation minimizing RF spillover to the surrounding reverberation chamber environment. This is one of the key components of the “CATR inside reverberation chamber” solution. The other essential component is Bluetest’s unique and patented solution for frequency selective absorbers allowing us to maintain a low absorption isotropic multipath environment in FR1 while providing sufficient attenuation of reflections in FR2 to allow accurate EIRP and EIS measurement with the CATR option.



Patented frequency selective absorber

The CATR is dual polarized and has an integrated 2x2 transfer switch simplifying the calibration process with a 2-port Vector Network Analyzer (VNA). Measurements are configured and executed in Bluetest Flow software, providing a well known and comprehensive environment for measurements as well as result analysis.

5G SOLUTION HIGHLIGHTS

- 5G NR NSA and SA configurations
- Isotropic and directive measurements in one test system
- FR1 & FR2 support
- Handles multiple carriers and 2x2/4x4 MIMO

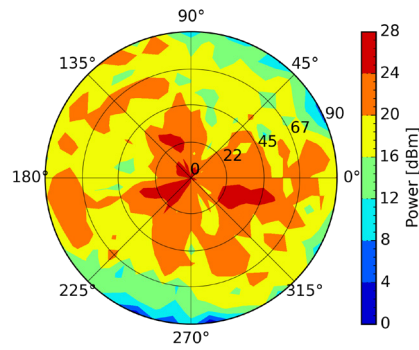
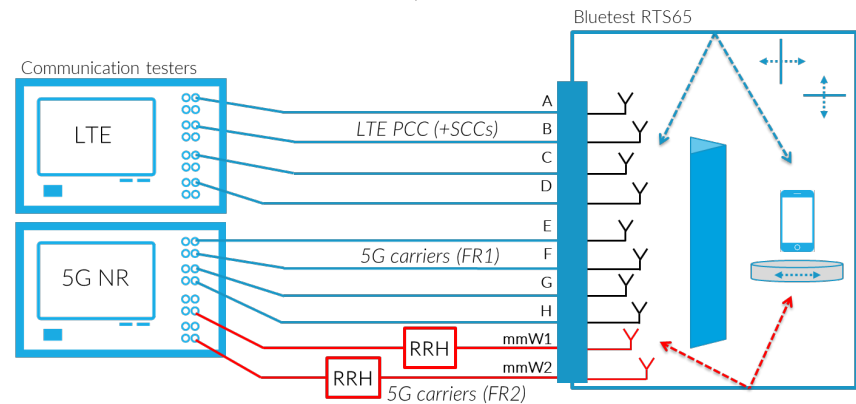


Figure 4. EIRP measurement example

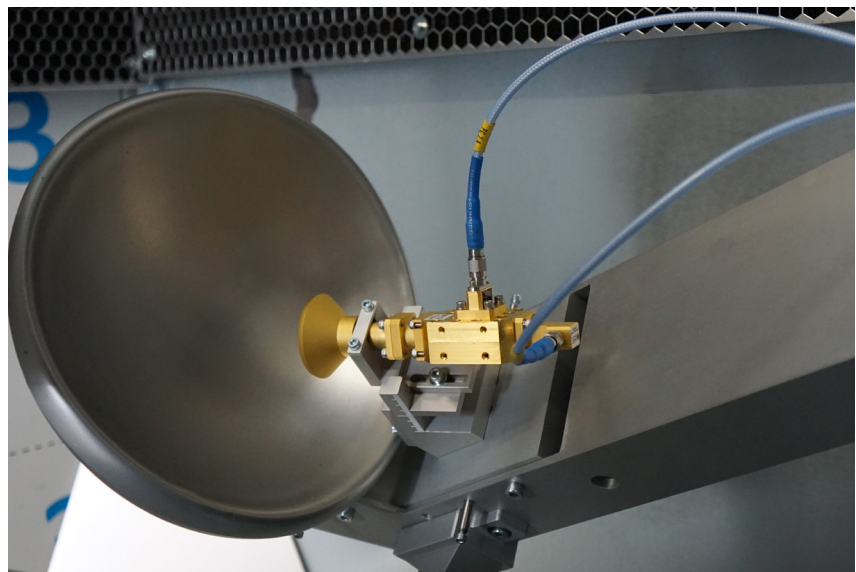
FR2 RIMP

The CATR absorbers are easily removed to create a multipath fading environment in the FR2 range, similar to the FR1 environment. Separate measurement antennas support these non-line-of-sight isotropic measurements. Metrics are the same as for FR1 RIMP,

i.e. TRP, TIS and TPUT. The FR2 RIMP test track allows for more rapid TRP and TIS measurements without having to integrate the device performance over multiple pointing directions as required when using the CATR track. Instead samples are taken over multiple mode stirring positions returning the isotropic value with good accuracy. The RIMP environment can also be used to evaluate device performance in more challenging conditions, complementing the directive CATR measurements. The beamlock function is used for 3GPP compliant TRP while beam tracking will offer a more dynamic UE test condition for all metrics. The mode stirring can either be done continuously or stepped allowing more time for the device to adapt to changing conditions.



Setup for 5G NSA measurements over multiple frequency bands



CATR antenna and subreflector

ADDITIONAL MEASUREMENTS

In addition to the communication tests it is also possible to measure unwanted emissions from the device. These spurious emission measurements are typically TRP based and measured with a signal analyzer. Evaluation of FR2 antennas such as radiation pattern or efficiency, including power added efficiency of active antennas (antenna + amplifier), can be done using a VNA.

All the regular advantages with RTS65 and the Bluetest Flow measurement software are of course still available. Other standards such as WLAN, Bluetooth and legacy 2G/3G standards can be tested in the same system as LTE and 5G.

SUMMARY AND AVAILABILITY

The 5G upgrades for RTS65 create a unique and versatile tool for the evaluation of the 5G UE performance. These options offer simultaneous support for both FR1 and FR2 measurements on LTE and 5G NR. They can handle several MIMO carriers and offer complex test scenarios with efficient and time saving, batch measurements. Target use is the design of 5G devices and 5G RF components. Other use cases include operator evaluation and comparison of device performance to optimize network performance and end-customer satisfaction. The 5G options are available for new RTS65 systems or as an upgrade to existing RTS65 systems.

TECHNICAL SPECIFICATIONS

General

Measurement Antennas	650 MHz-6 GHz (FR1) 6 GHz-43.5 GHz (FR2)	Up to 16 (SMA - female) 2 (2.4 mm - female)
Reference Antenna Port	650 MHz-43.5 GHz	1 (2.4 mm - female)
Passive Antenna Ports	650 MHz-43.5 GHz	Up to 3 (2.4 mm - female)
Shielding	650 MHz-6 GHz 6 GHz-43.5 GHz	100 dB 80 dB
Typical Link Loss (unloaded chamber)	28 GHz 39 GHz	
Supported Communication Testers		Contact Bluetest for latest status


CATR option specification


Frequency Range	24.25 GHz-42 GHz
Quiet Zone Diameter	30 cm
Amplitude Ripple (STD)	0.6 dB
Phase Ripple (STD)	4°
Link Loss (typ.)	28 GHz 49 dB 39 GHz 55 dB
Dynamic Range	>20 dB
Max DUT Size (Holder Dependent)	<1 kg, 240 mm longest side, <10 mm thickness
Supported Communication Testers	Contact Bluetest for latest status


ABBREVIATIONS


TRP Total Radiated Power	EIS Effective Isotropic Sensitivity
TIS Total Isotropic Sensitivity	RIMP Rich Isotropic Multipath
EIRP Effective Isotropic Radiated Power	CATR Compact Antenna Test Range

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