WLAN OTA MEASUREMENT SOLUTION

COVERED PRODUCTS

» **RTS25, RTS65, RTS95 Reverberation Test System**
» **TRU1 WLAN Reference Unit**
» **ISS11 Attenuator System**
» **Bluetest Flow software platform**

SOLUTION OVERVIEW

This application note describes Bluetest's complete WLAN Over-the-Air (OTA) test solution consisting of TRU1 WLAN reference radio, ISS11 Attenuator System and any of Bluetest's reverberation chambers from the RTS-family. Focus is on the use with the WLAN/Bluetooth dedicated RTS25 reverberation chamber but the solution is applicable also to the larger reverberation chambers RTS65 and RTS95.

RTS25 REVERBERATION TEST SYSTEM

The RTS25 has been introduced to address the increasing need for efficient test systems targeting WLAN and Bluetooth measurements. It supports the 2.4GHz and 5GHz ISM-bands hence covering all existing WLAN and Bluetooth applications. Up to 8 measurement antennas provide flexibility to the system and an expansion possibility to 8x8 MIMO when introduced. The chamber is, with its outer dimensions of 0.8m x 1.5m x 1.4m, quite compact and fits through most doorways. Bluetest Flow measurement and control software resides on the included RTSc controller unit where measurements can easily be initiated and supervised through the touch screen.

Further information can be found in the RTS25 data sheet, ref. 1.
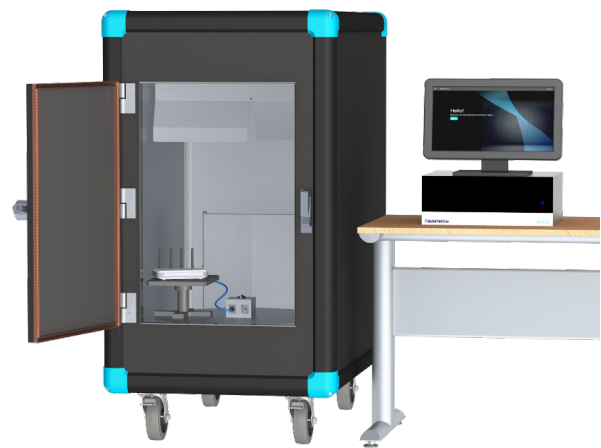
1. RTS25 Reverberation Test System including RTSc controller unit with touch screen

TRU1

The TRU1 is a dual band WLAN reference radio that can be set to both access point mode and WLAN client (station) mode. It enables data throughput measurements in both uplink and downlink direction. The WLAN radio supports 802.11ac Wave 2 with 4x4 MIMO as well as all the legacy WLAN standards (802.11a/b/g/n).

Settings include parameters such as WLAN standard, region, SSID, channel number, and fixed MCS index or adaptive MCS index.

2. TRU1 WLAN Reference Radio with 4x4 MIMO

The output power is calibrated, making it possible to conduct throughput measurements vs received power (rather than vs path loss), as well as comparing results between Bluetest test systems in different locations.

ISS11 ATTENUATOR SYSTEM

The ISS11 Attenuator System is used to control the path loss between the TRU1 WLAN reference radio and the Device Under Test (DUT) located inside the reverberation chamber. It contains four remotely controlled step attenuators with 95dB dynamic range in 1dB steps. Further information can be found in the ISS11 Attenuator System data sheet, ref. 2.

4. DUT access point with 4x4 MIMO

3. ISS11 Attenuator System

FLOW MEASUREMENT SOFTWARE

Flow is Bluetest's software platform that is used to configure, control, supervise and analyze measurements in the RTS. It consists of three main parts as shown below in Flow Platform Overview. Flow enables very advanced measurements, while at the same time allowing you to become productive with a very short introduction to the system. Flow is integrated in all Bluetest's hardware products and makes your system a complete, easy-to-use, and powerful test solution.

CONFIGURATION EXAMPLES

Measuring the performance of a WLAN client

The Flow server generates UDP or TCP IP traffic. The traffic is sent through the TRU1 WLAN reference radio OTA to the DUT. The DUT is in this case a WLAN client. A Bluetest throughput IP UE application is installed on the device and reports back the received amount of IP traffic. The UE app is available for most operating systems such as Android, Windows, iOS and Linux. The TRU1 is acting as the access point to which the client (DUT) is connected. The path loss is controlled with the ISS11 Attenuator System enabling the throughput performance to be measured vs received power in the DUT.

The TRU1 is also supporting data throughput measurements without the UE app loaded on the client. This is similar to a throughput measurement on the MAC layer and can be very useful for clients where it may be difficult to load external applications such as many IoT devices. We call these "app-less" throughput measurements.

FLOW PLATFORM OVERVIEW

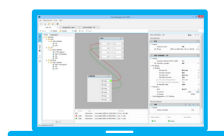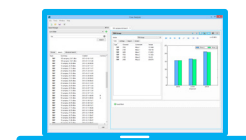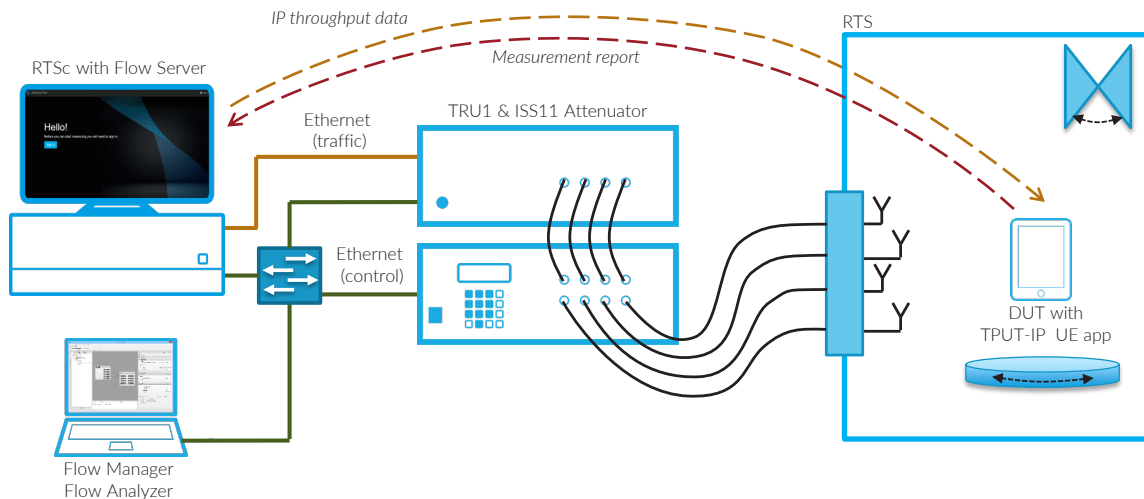| FLOW TOUCH	FLOW MANAGER	FLOW ANALYZER
Flow Touch is a touch interface that can be used on any device with a web browser. Flow Touch allows you to control and monitor your measurements remotely. Start, stop and pause the measurements are just a few examples of the possibilities. Flow touch comes with the touch screen included in your RTS chamber or RTSc.	Flow Manager is the desktop client in which you configure your measurements. You set up your measurements, create batches and add multi parameter sweeps. Define your measurements as you want whether you are a new or advanced user. You are guided in Flow Manager by the built-in user manual, to make your life easier.	Flow Analyzer is the result and data processing tool that gives you endless opportunities to plot your data as you want. Search for your results in the built-in database and compare your measurements. Create your own design for plots and graphs, put them in a report format and export your results.

5. System configuration for device tests

## Measuring the performance of an access point

The measurement of access point performance is quite similar to the client measurement but the TRU1 is now acting as the WLAN client. The throughput IP UE app can now either be loaded directly on the access point if possible or on an external device connected through Ethernet to the access point as shown in Figure 6.

It is also for this case possible to run throughput measurements without the TPUT-IP app, and go for the "app-less" throughput.
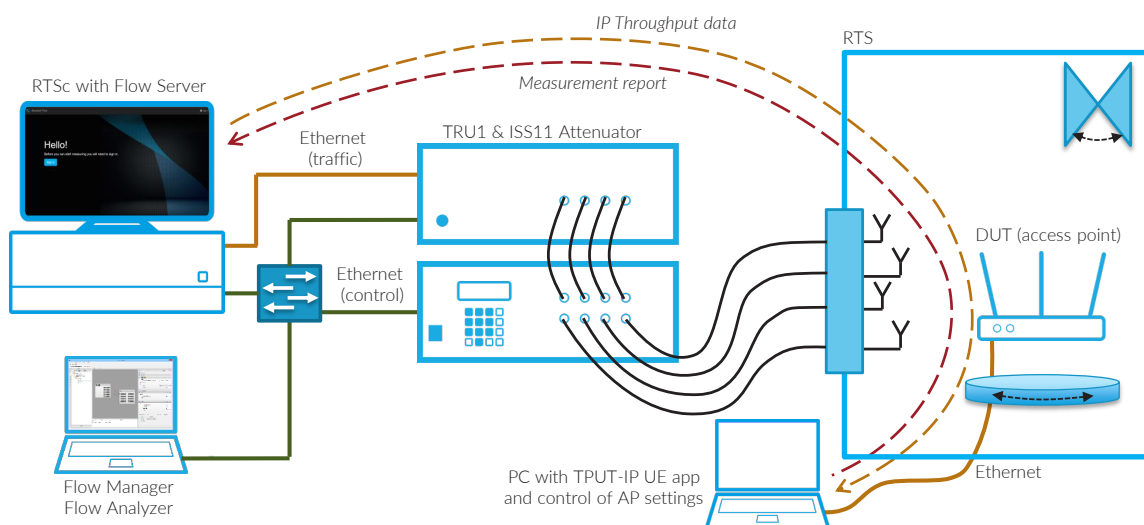
MEASUREMENT EXAMPLES

Figure 7 shows a UDP throughput measurement for a mobile phone in the 5GHz band using 802.11ac with 40MHz and 80MHz bandwidth and 802.11n with 40MHz bandwidth. Considering the small difference in throughput between 802.11ac and 802.11n on 40MHz bandwidth it can be assumed that 802.11ac is not using the highest modulation, 256-QAM. It is also possible to view the MCS index distribution for each power level hence providing valuable information for performance analysis and trouble shooting.
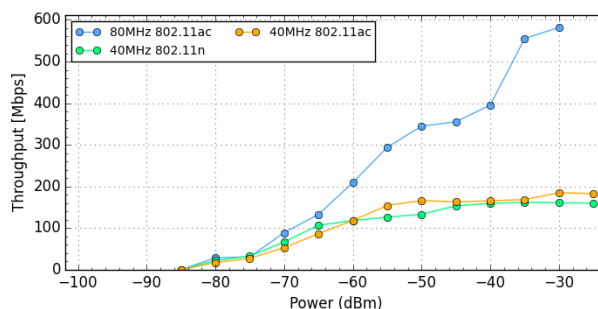
7. Throughput vs. power WLAN measurement results on 3 different standards

6. System configuration for access point tests

SOLUTION SPECIFICATION

Supported WLAN standards	802.11a/b/g/n/ac
Frequency coverage	2.4GHz channels 1-13 5GHz channels* 36-64 and 100-165 *actual channels depends on selected bandwidth
Bandwidths	Up to 160MHz (802.11ac)
MIMO	Up to 4x4 MIMO and MU-MIMO (802.11ac)
Modulation	Up to 256 QAM
Output power (TRU1)	Up to 20 dBm
Dynamic range	Up to 95 dB
Attenuation resolution	1 dB
Power accuracy	+/- 1 dB
Flow traffic generator capacity	Up to 2 Gbps
RF connectors	N-female

For RTS25 specific data, see reference 1).

REFERENCES

1) RTS25 Data Sheet, BTD-16-085

2) ISS11 Attenuator System Data Sheet, BTD-14-044

ABOUT BLUETEST

Bluetest is the world leader in over-the-air measurements of wireless devices. We provide reverberation chambers that are developed to help our engineering customers to optimize antenna performance and to accurately measure radio transmitters and receivers in devices, in a real world environment.

Thanks to our products, consumers can enjoy a better wireless experience and the industry benefit from more efficient wireless systems.

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