

Evaluation of RF Characteristics using Optimized OTA Measurement by MT8862A

- CTIA/WFA CWG V. 2.1 Test Plan Conformance -

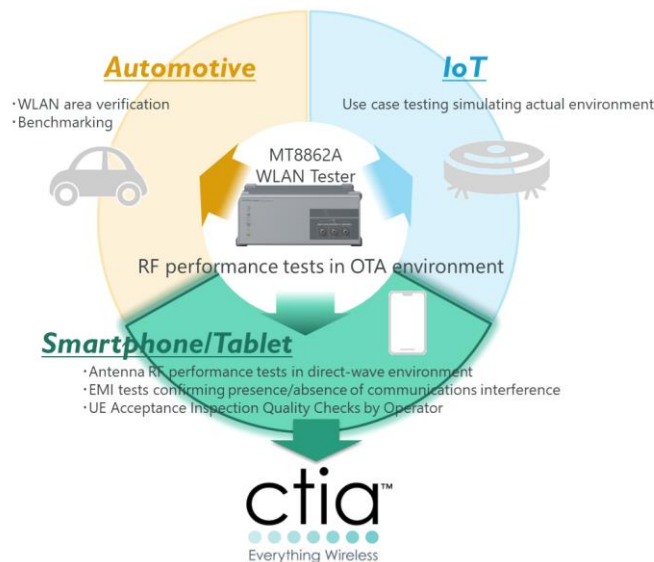
Wireless Connectivity Test Set MT8862A

- Data Rate Control
- Wide Dynamic Range
- OTA MIMO Measurements



1. WLAN Market Trends

Wireless LAN (WLAN) communications functions have only been built into a limited range of products, such as personal computers and mobile phones, until recently when WLAN has started being included in various other products, such as digital cameras, household goods, sensors, industrial products, etc. As the variety of usage applications increases, faults with WLAN products, such as poor and broken connections, are a major source of customer dissatisfaction and product warranty claims. **Consequently, there is increasing demand from vendors of WLAN products, such as communications operators, smartphone manufacturers, and the automobile and household goods markets, for evaluation of WLAN RF characteristics in a realistic over-the-air (OTA) test environment.**



De facto RF Performance Standard for OTA Tests

A typical OTA method for evaluating RF characteristics uses the **CTIA/WFA CWG Test Plan V. 2.1** (Test Plan for RF Performance Evaluation of Wi-Fi Mobile Converged Devices) released in April 2019. As a result, it is attracting attention as document has been covered IEEE802.11ac for the increasingly popular high-speed WLAN standard. Since this standard specifies details of the method for evaluating WLAN characteristics using

OTA testing, it is being referenced both in North America and other regions worldwide. As a result, CTIA/WFA CWG Test Plan Ver. 2.1 is expected to become the **de facto standard for OTA testing including IEEE802.11ac**. In addition, test efficiency is improved greatly when evaluating RF characteristics in an OTA environment using the **MT8862A, which is the only measurement instrument supporting to control all data rate at IEEE801.11ac**.

*CTIA is a business organization representing the N. American wireless communications world and is composed of communications carriers, equipment manufacturers, mobile application developers, content creators, etc.
 *WFA Wi-Fi Alliance: The WFA is a business organization tasked with promoting the spread of WLAN products. It determines connection compatibility test methods and certifies product compliance, etc.

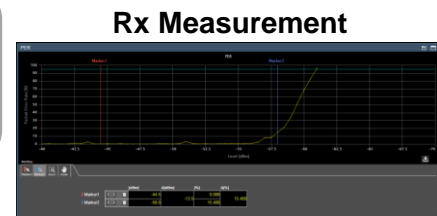
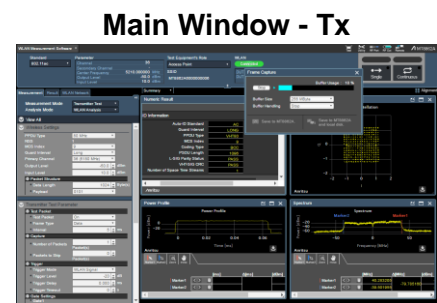
2. MT8862A Advantages of OTA test

2.1. Summary

The Wireless Connectivity Test Set MT8862A is a tester for evaluating the RF characteristics of WLAN products under near-to-real usage conditions. Measurement is easy with no installation of control software by a simple connection of the MT8862A, PC controller and EUT.

MT8862A Specifications

- Signaling Mode
- TRx RF Characteristics Measurement
- IEEE802.11 a/b/g/n/ac (80MHz BW, SISO/MIMO) [AP/STA] Support
- Security (WEP, WPA/WPA2-Personal) [AP/STA] Support



2.2. Advantages of OTA Measurements

Data Rate Control Function

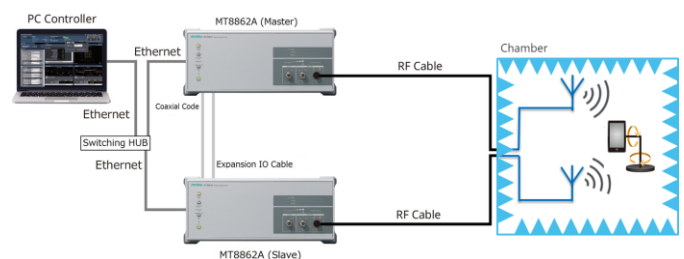
The MT8862A can **control the EUT at the specified data rates for all IEEE802.11a/b/g/n/ac communications methods** to evaluate RF characteristics by combination with the Signal Detect mode. This function plays a key role in measurement at data rates specified by the CTIA/WFA CWG Test Plan. In particular, this industry-leading Anritsu technology (patent pending) overcomes the extreme difficulty of controlling the EUT at IEEE802.11ac data rates.

Wide Dynamic Range

Since OTA transmissions have comparatively larger path losses than cable connections, the measuring instrument must have a wide dynamic range. With a wider dynamic range than its competitors, the MT8862A supports stable OTA measurements even at high-order modulation methods (256QAM/512QAM). Anritsu offers a stable OTA measurement environment based on its long experience in development of radio measuring instruments.

MIMO Measurements

Only the MT8862A supports OTA tests of MIMO characteristics. The CTIA/WFA CWG Test Plan does not currently specify this measurement, but it is the one of candidates for the future test items.



Partnering with Chamber Suppliers

As a result of our partnership with several leading chamber suppliers, customers already using chambers from these leading makers can perform **OTA tests in combination with the MT8862A without needing to purchase a new chamber**. It can be used with cellular testers and MT8862A.

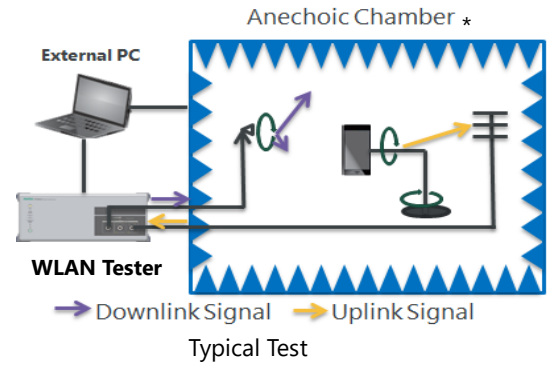
*A cellular tester, such as the Anritsu Radio Communication Analyzer MT8821C, is for evaluating RF TRx characteristics of LTE, UMTS, GSM, etc., cellular signals.

3. CTIA/WFA CWG Test Plan (as de facto standard for OTA Test)

3.1. Testing Outline

The CTIA/WFA CWG Test Plan was established jointly by the CTIA and WFA for evaluating the RF performance of products with built-in Wi-Fi and cellular communications functions by conducted and radiated measurement.

The test contents are split broadly into two: a test of the antenna TRx performance, and a Desense test for checking the presence or absence of interference waveforms. The data rate is a key point in this test plan, requiring the equipment under test (EUT) to respond precisely at the target data rate.



*Anechoic Chamber

This chamber is constructed of materials blocking and absorbing radio waves to assure measurement only of radio waves passing directly between the EUT and WLAN measuring instrument, so the EUT antenna characteristics can be evaluated with no impact from external radio waves and internal radio-wave reflections.

3.2. Test Items

The CTIA/WFA CWG Test Plan V. 2.1 test items in an OTA environment are listed below.

■ Wi-Fi Total Radiated Measurements

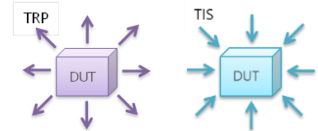
- ◇ TRP (Total Radiated Power)

This measures the total power radiated in all directions from the EUT.

- ◇ TIS (Total Isotropic Sensitivity)

This measures the power of the radio waves received from all directions at the EUT.

At this measurement, **multiple data rates must be set for each frequency sub-band**.

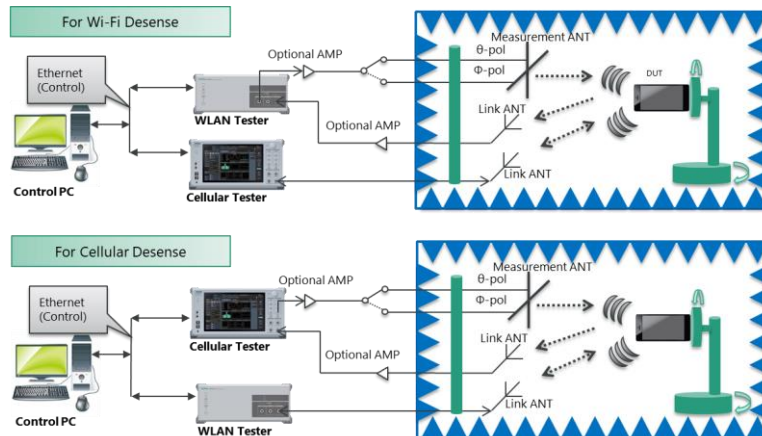


■ Wi-Fi Desense Measurements with Cellular Transmitter on

With the EUT communicating via cellular, this measures and confirms the presence or absence of interference in the Wi-Fi frequency bands.

■ Cellular Desense Measurements with Wi-Fi Transmitter on

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4. Other Key OTA Tests

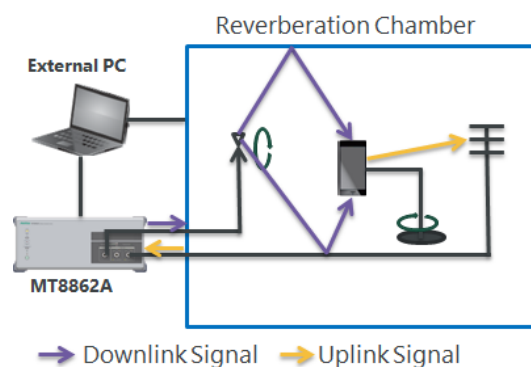
The CTIA/WFA CWG Test Plan as the typical RF performance tests in an OTA environment for smartphones and tablets. MT8862A supports for OTA tests not only of the CTIA/WFA CWG Test Plan but also in other fields, such as the IoT and automobile markets, as well as in regulatory testing, the MT8862A is an effective all-round OTA test solution. Some examples of other OTA tests using the MT8862A are described below.

OTA Tests for IoT

To improve communications quality, operators and module vendors commonly use their own independently created use case tests. To test in near-to-real usage environments, the RF characteristics are evaluated at each data rate and MIMO measurement is performed using a reverberation chamber* rather than an anechoic chamber. In addition to the MT8862A supporting these application tests, Anritsu also provides solutions for **both types of chamber**.

*Reverberation Chamber

To prevent absorption of radio waves as much as possible, this chamber is constructed of an agitator and materials that reflect radio waves. It is used to evaluate the EUT (DUT) antenna characteristics with many reflected radio waves by measuring signals reflected around inside the chamber.



OTA Tests for Automobile Market

Testing the WLAN RF characteristics of a completed vehicle requires a **connection method under actual usage conditions using WLAN protocol messaging (Network mode)** rather than connecting in a test mode.

■ WLAN Area Verification

The typical OTA test in the automobile market is a WLAN area verification test to check the WLAN unit layout. This test measures the change in output power at fixed distances from the antenna and performs distance conversion to verify the relative signal outreach. Additionally, the WLAN signal outreach area can be estimated in three dimensions by measuring while changing the antenna angle and vehicle position.

■ Benchmarking Test

Since the WLAN unit layout varies with automobile type, model, and grade, each area and RF performance must be verified. And it is also important to check electronic interference while the engine is running by benchmark.

Regulatory Tests

Regulatory tests confirm radio-wave compliance with national legislation, such as the Radio Law in Japan, the FCC* in N. America, and ETSI* in Europe, regulating frequency and radiated power. The tests specify measurement conditions, such as the "Worst Case" and "The combination of the smallest channel bandwidth and the lowest data rate", requiring control of the EUT and access point (AP) signals. In particular, the ETSI Blocking Test requires PER measurement in the Signaling Mode. With functions for **configuring a Network mode test environment and controlling the data rate and bandwidth**, the MT8862A meets these test requirements and is the focus of market attention. Additionally, since the EMC test finds out the Worst Case, the MT8862A is ideal for these tests as well.

*FCC Federal Communications Commission: Organization certifying that communications equipment for use in USA meets required standards

*ETSI European Telecommunications Standards Institute: Standards organization regulating all European telecommunication