SPECIAL TOPIC

Easy Testing and Quality Assurance of Wi-Fi 6/6E Communications Devices using Anritsu Test Equipment

More Wi-Fi 6/6E products are coming to market while device developers face many unexpected challenges in achieving high-speed and low-latency 6 GHz communications. The key to shorten time to market is to quickly confirm and improve device performance and quality. Anritsu's MT8862A solves this challenge.

PCs, smartphones, automobiles, air conditioners, and even most home appliances, such as refrigerators and vacuum cleaners, use Wi-Fi (WLAN) in this network-connected era.

The first Wi-Fi standard officially launched 20 years ago and has since evolved into Wi-Fi 6 (IEEE 802.11ax) released in 2021 with many new functions. For example, as well as switching from 256QAM to the faster 1024QAM data modulation method, Wi-Fi 6 uses OFDMA technology which allows multi-user access by subdividing channels. Additionally, adopting MU-MIMO supports multi-user access by using different spatial streams for both downlink and uplink. Tomoko Arita, Assistant Manager of IoT Test Solutions Div., Anritsu Corporation explains that these advances, "Facilitate efficient, large-capacity communications."

IoT Test Solutions Div., Anritsu Corporation
Manager **Keita Masuhara**
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6 GHz Devices Already on North American and European Markets

Wi-Fi 6E, the enhanced version of Wi-Fi 6, is available now. The most significant feature of Wi-Fi 6E is its support for the new 6 GHz frequency band in addition to the existing 2.4 GHz and 5 GHz bands. Authorities in the U.S., Europe, South Korea and Japan have already opened the 6 GHz band so, and compatible devices are now available in each country.

The key advantage of Wi-Fi 6E is that it makes a 1.2 GHz band of previously unused frequencies available from 5.925 to 7.125 GHz.

A wider bandwidth facilitates using 160 MHz wide channels. Although the Wi-Fi 6 standard does support 160 MHz channels, the congested 2.4 and 5 GHz bands cause interference, resulting in problems such as slower speeds. As Arita comments, "Widening the usable frequencies by adding the 6 GHz band solves these problems to offer an easy-to-use environment with faster wide band connections using previously unavailable 160 MHz channels".

How to Avoid Sacrificing Performance and Why Regulatory Tests are Insufficient

While further growth and evolution of WLAN are expected, compatible devices must pass the Regulatory tests stipulated by each country. In addition, Evolution of WLAN technology requires some new quality indexes. For example, in 2022, the European EMC Directive added a mandatory test to the Immunity test item for receiver sensitivity when exposed to interference. Since WLAN evolution requires further quality assurance of devices and products, receiver sensitivity tests demand an efficient test environment because test procedures are complex using conventional instruments.

Moreover, in the development of access points and devices, Arita reveals that in fact, "There are more cases where required performance cannot be achieved due to unexpected factors."

There are three main reasons.

1. Interference: From other nearby equipment, such as microwave ovens
2. Product internal reflections: From own internal circuits, such as inverter, CPU, LCD
3. Mismatch with adjacent circuits: Due to poor connections with WLAN module, antenna, antenna coaxial cable

Naturally, WLAN compatible devices must pass legally defined regulatory tests before they are released to the public so they can be used safely. However, as Keita Masuhara, the manager of IoT Test Solutions Div., explains, "There are some cases where performance is inadequate because Wi-Fi 6/6E components are still immature having just started appearing on the market." Therefore, Anritsu recommends that, "In addition to the legally regulatory test items, we recommend conducting non-regulatory test items if possible." says Arita.

As typical non-regulatory wireless performance but recommended tests there are US CTIA (Cellular Telecommunications and Internet Association) over-the-air (OTA) tests and IEEE wireless performance tests.

While many developers may think, "I know it would be better to conduct non-regulatory tests, but that is time-consuming, costly, and difficult." This is especially true for 6 GHz devices, because the bandwidth is so wide that tests take more time and costs. Anritsu's Wireless Connectivity Test Set MT8862A solves these device performance and quality assurance challenges.

As well as supporting non-regulatory tests, the MT8862A also supports the new receiver sensitivity test added to the regulatory tests described above. With built-in required protocol functions for wireless performance tests, the MT8862A facilitates tests under usual device operating conditions.

General tests of WLAN device characteristics use a non-signaling method to evaluate the DUT (device under test) controlled in the Test Mode. Since this non-signaling method does not require high-level protocol functions for communications with the DUT, it supports evaluation of device characteristics from the first development stages. It also has the advantage of enabling faster testing with the minimum necessary connections and settings for mass production.

However, device testing in the Test Mode has disadvantages because it does not mimic users' actual operating environments, causing unexpected problems after commercial release.

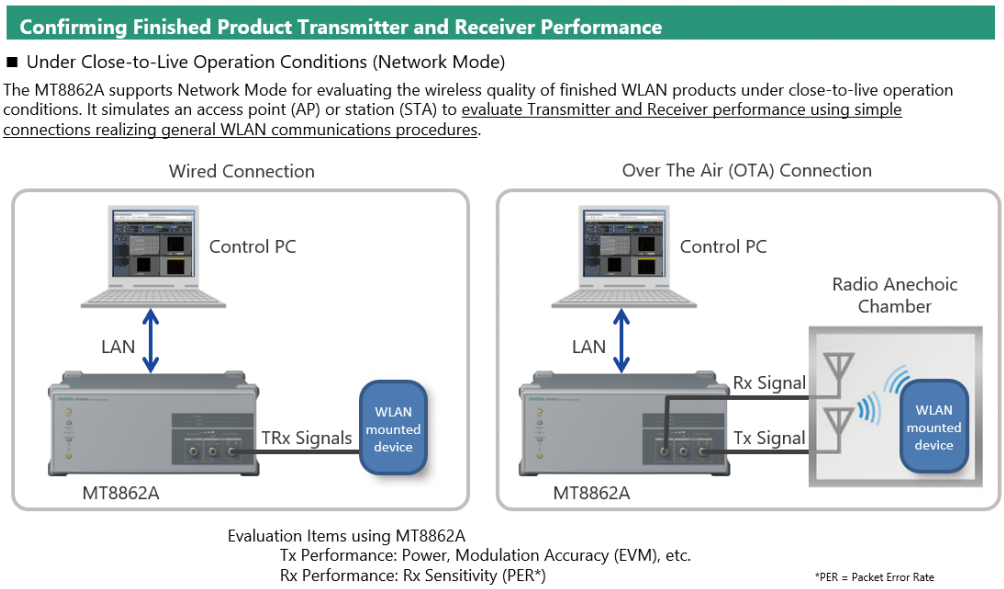
Another disadvantage is the high-level technology requirements for managing the special Test Mode operating conditions. As Masuhara explains, "The MT8862A meets customers' requirements for testing products under actual usage conditions, as well as for easy WLAN quality assurance tests by anyone."

Arita adds that a key feature of the MT8862A is, "Easy WLAN quality assurance by anyone without needing high-level technical skills." In other words, the MT8862A supports easy development of WLAN products even without experienced on-staff WLAN engineers.

Another merit of the MT8862A Signaling Mode is evaluation of signal quality during WLAN communications to detect and solve issues that cannot be resolved with the device in the Test Mode.

In addition, the Signaling Mode cuts evaluation times because it uses a simple test environment without cable connections to control DUT, unlike the Test Mode. It also simplifies re-evaluation of final products after firmware updates. Arita says, “The MT8862A is the only all-in-one test solution with both signaling and non-signaling plus support for Wi-Fi 6/6E devices.”

Alongside the Signaling Mode, the MT8862A supports the device Test Mode for assuring wireless communications quality for small-scale production line, prototype runs and final products before commercial release, while the MT8870A is more suitable for efficient mass-production line testing. Arita comments, “I think the MT8862A Signaling Mode is ideal for evaluating final product operation in the actual usage environment without requiring an experienced wireless communications engineer, whereas the MT8870A with non-signaling is targeted at improving the quality of wireless modules on large-volume mass-production lines.”



MT8862A Test Image

While the all-in-one MT8862A solutions supports both signaling and non-signaling on all standards as described previously, other WLAN testers in the market implement WLAN signaling methods by connecting multiple test units with other external equipment. As Masuhara clearly explains, “Since the start of the COVID pandemic, test instruments are being controlled increasingly by remote access to the office test environment. All-in-one testers such as Anritsu’s MT8862A simplify in-office portability while saving space too. Best of all, early development of built-in functions for implementing the Signaling Mode offer a stable and efficient test environment.”

* Anritsu’s web portal on IEEE 802.11 WLAN trends and the company’s latest test solutions covers various WLAN-related information, including Wi-Fi 6E/7 Advantages & Consideration; Trends in WLAN Regulatory Test; A Beginner’s Guide to WLAN Product Development; Testing IoT Devices, etc. Please use it to learn more about wireless technology, especially Wi-Fi 6/6E/7.
  https://www.anritsu.com/test-measurement/technologies/wlan/wlan6gfeatures

* These materials are translations from Business Network Anritsu interviews and the original is in Japanese.
  https://businessnetwork.jp/article/9112/