

Unknowingly Transmitting Abnormal Output?

-Tx Power Mode Usage Examples-

Wireless Connectivity Test Set MT8862A



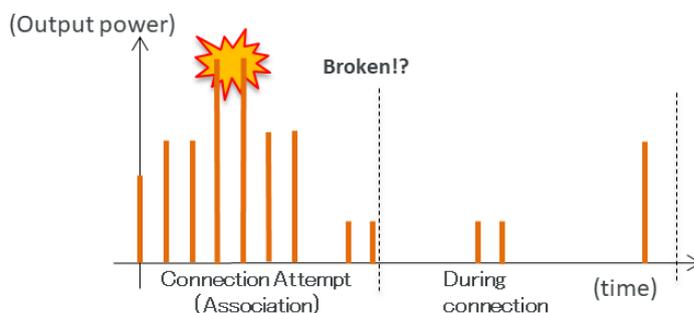
1 Abnormal WLAN Device Output Not Detected at Legal Compliance Tests?

Many devices are connecting to the Internet due to the recent growth of IoT applications. Most of these connections use a wireless LAN (WLAN) module to make the connection. However, the RF performance (WLAN signal quality) of each WLAN device is different even when based on the same WLAN module due to how the relationship with other electronic parts is implemented. Moreover, it is risky to put too much reliance on the guaranteed WLAN signal quality of purchased separate modules.

Legal radio-wave compliance tests to measure the output of the radio terminal under specific conditions, known as the Test Mode, it differs from the actual usage conditions of WLAN device or module. As a result, there are increasing numbers of cases where even commercially released devices that have passed the legal compliance tests still have power-output related problems.

2 Trouble Case

Company-A shipped a product incorporating a WLAN module but received warranty claims that the product was not transmitting a WLAN signal. On investigating the cause, it was discovered that the output had been abnormal during connection attempt (Association) with an Access Point (AP); the failure was due to a damaged amplifier in the output section. Although the affected WLAN module had passed the legal compliance test, **why was the abnormal output during connection attempt (Association) not detected at the legal compliance test?**



Column W-LAN Product Signal Quality Evaluation Method: What are Direct and Network Modes?

(DUT: Device Under Test)

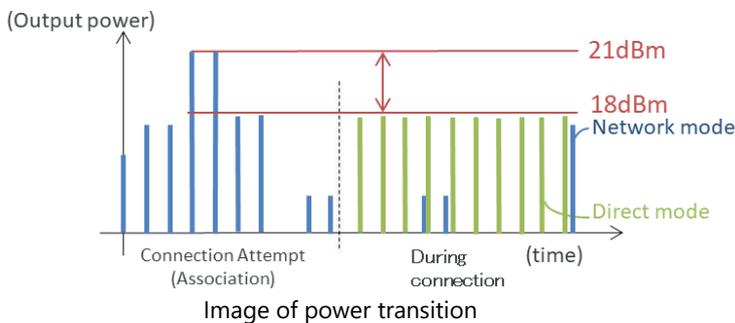
Direct Mode

This mode sets the DUT to the signal receive or send status using the DUT test mode (test mode for examining only RF basic performance). The test mode method and commands are different for each DUT and sometimes the test mode cannot be used, depending on the shipped firmware.

Network Mode

This mode uses standard WLAN protocol messaging to establish a connection with the WLAN product and measure the RF TRx characteristics under actual operating conditions.

In other words, when using the Direct Mode, the WLAN signal quality is evaluated without performing a connection association between devices. However, the Direct Mode is suitable for evaluating the signal quality of many DUTs quickly if there are automation tools for controlling the DUT. On the other hand, in the Network Mode, a connection association is performed between devices using protocol messages to establish the connection between the AP and WLAN module in the same process (or method) as the actual usage environment. Additionally, some internal devices built-in the WLAN product might be performing for the first time when the WLAN product operates on actual usage environment. The effects of noise and signal outputs from these devices RF performance can also be measured in the Network Mode. For power-related measurements, as mentioned previously, there are many cases where legal compliance measurements are performed using the Direct Mode, but in these cases, the signal is output under specific conditions irrespective of whether there is a connection target(signals of Direct mode are green bars in following figure). On the other hand, at communications in the Network Mode, power is measured for all phases of the communications connections procedure (signals of Network mode are blue bars in following figure). The following table shows the measurement results for an actual WLAN device with problems and clarifies the large separation between maximum measured powers.



MT8862A measurement screen

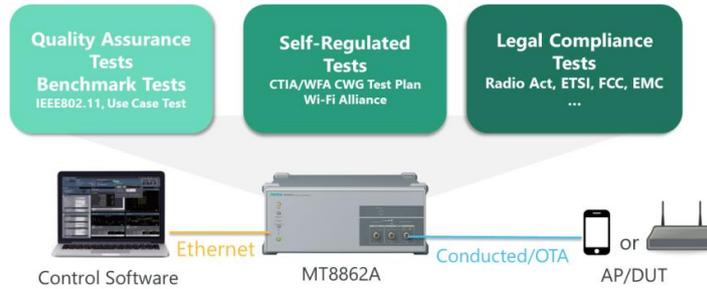
Standard	Connecting	Connection Complete
11b	21 dBm	18 dBm
11a	19.9 dBm	17 dBm

*Maximum output may vary with national laws and frequency but uses 50 mW (17 dBm)/250 mW (24 dB) as guidelines.

In this case, since the legal compliance evaluation is performed only in the Direct Mode, it is impossible to detect abnormalities in the WLAN signal output when performing a connection attempt (Association) between the AP and DUT. As a consequence, it is important to use the Network Mode to confirm the presence/absence of any abnormal power output as well as the signal quality during the entire connection procedure.

3 Measuring DUT Output Power in Network Mode

The MT8862A is a WLAN tester for STA (DUT)/AP evaluations. Since it can measure RF TRx characteristics, such as Tx power, modulation accuracy (EVM), Rx sensitivity, etc., of various products with built-in WLAN, it has wide-ranging applications from legal compliance testing to quality assurance (QA) testing. Normally, the MT8862A can be used for measurements at any timing after establishing the call connection. Since the MT8862A can be switching to the Tx Power mode for measuring power during the entire connection procedure, customer can pre-test to reduce troubles as this case.



Outline of MT8862A Performance

Connection	RF	Tools
IEEE 802.11a/b/g/n/ac/(ax)	Freq. 2.4G/5G	Built-in Web server - eliminates need for dedicated software install.
Network Mode connections	BW 20/40/80 MHz	Support for logging Frame Capture signaling messages.
STA/AP Measurements	Power Output:-120 to 0 dBm	
2x2MIMO (dual-unit setup)	Input:-65 to +25 dBm	