



IOT0047A Regulatory Test Solution

ETSI and FCC regulatory tests for wireless devices operating in 2.4 GHz, 5 GHz, and 6 GHz unlicensed bands

Deliver the Win-Win in IoT

The race to launch IoT chipsets, modules and devices is pushing test labs to the limit. That is why Keysight created the IOT0047A regulatory test solution as to accelerate the certification of unlicensed wireless devices in a flexible and efficient way.

Before, during and after compliance testing—full or partial—the IOT0047A gives you multiple ways to cover more tests for more standards in less time. With faster throughput for you and quicker time-to-market for your clients, Keysight helps you deliver the win-win in IoT.

Flexible and Scalable Platform For 2.4 GHz, 5 GHz, and 6 GHz Regulatory Testing

Regulatory test is complex, time consuming and costly. It directly impacts project schedule and time to market for new products. Hence, regulatory testing needs to be carefully planned into the project schedule.

The Keysight IOT0047A wireless IoT device regulatory test solution makes 2.4 GHz, 5 GHz, and 6 GHz unlicensed bands wireless device testing easy and efficient. Be confident with Keysight's laboratory grade RF instruments. The solution:

- Covers the latest test cases of ETSI EN 300 328, EN 301 893, EN 303 687 (Draft), FCC Part 15.247, and FCC 15.407 (consists of KDB987594 for Wi-Fi 6E) and DFS with dedicated test software.
- Scalable test system to cover wide arrays of IoT Devices Types: Frequency Hopping, Adaptivity, MIMO up to eight Channels and supports common radio formats (WLAN, Bluetooth®, ZigBee® etc.).

- Simplifies test automation and improves speed with signaling test method using companion device.
- Expand your test system - purchase what you need now and add more capabilities later for better capital planning with its flexible platform.
- Reduces test complexity with readily available software which automates the regulatory testing and report generation (Figures 1-5).



Figure 1. Spurious Emission



Figure 2. In-Service Monitor

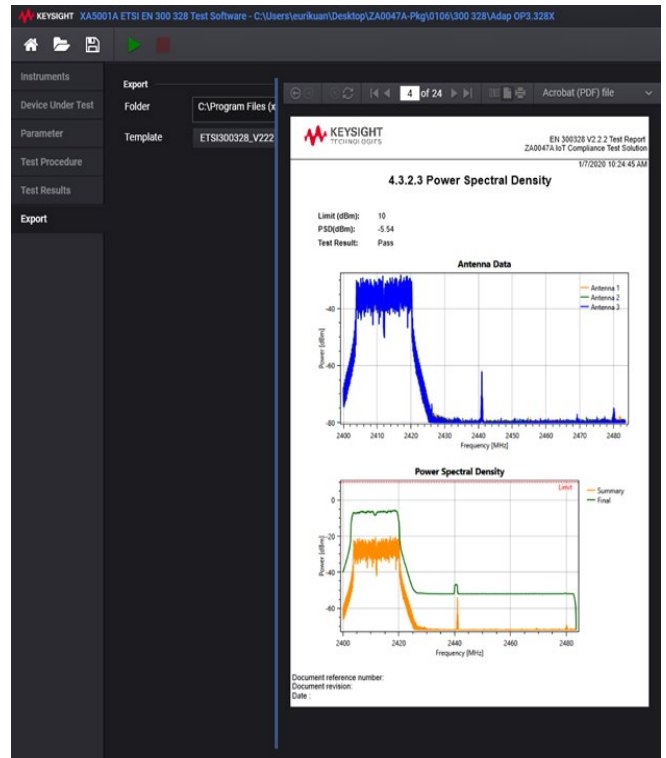


Figure 3. Test Report Generation

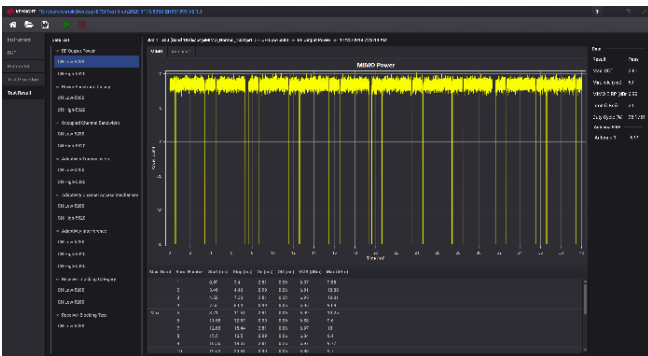


Figure 4. MIMO Power Measurement



Figure 5. Adaptivity Waveform Analysis

Test Cases: Keysight XA5001A ETSI Regulatory Test Software

This version of the system software addresses the latest versions of the ETSI EN 300 328, EN 301 893 and EN 303 687 (Draft 0.0.13) test cases:

XA5001A test software supports ETSI EN 300 328 V2.2.2, EN 301 893 V2.1.1 and EN 303 687 (Draft 0.0.13)

The table summarizes the test items covered for each set of test cases.

	Test items	ETSI EN 300 328	ETSI EN 301 893	ETSI EN 303 687 (Draft 0.0.13)
1	RF output power	✓		✓
2	Duty cycle, transmitter sequence, transmitter gap	✓		
3	Medium utilization	✓		
4	Power spectral density (PSD)	✓		✓
5	RF output power, transmit control power (TCP) and power density		✓	
6	Occupied channel bandwidth	✓	✓	✓
7	Transmitter: unwanted emission in the out-of-band domain	✓	✓	✓
8	Transmitter: unwanted emission in the spurious domain	✓	✓	✓
9	Transmitter: unwanted emission in within the 5 GHz RLAN bands		✓	✓
10	Accumulated transmit time, frequency occupation and hopping sequence	✓		
11	Hopping frequency separation	✓		
12	Carrier frequencies	✓	✓	✓
13	Receiver: spurious emissions	✓	✓	✓
14	Adaptivity	✓	✓	✓
15	Receiver blocking	✓	✓	✓
16	Adjacent Channel Selectivity			✓
17	Dynamic frequency selection (DFS)		✓ (XA5003A)	

Test Cases: Keysight XA5002A FCC Regulatory Test Software

This version of the test software addresses the most recent versions of the FCC Part 15.247 and Part 15.407 test cases. The table summarizes the test items covered for each set of test cases.

	Test items	FCC part 15.247 / RSS247		FCC part 15.407 U-NII
		DSS/FHSS (1)	DTS (2)	
1	Peak output power	✓	✓	
2	Maximum conducted output power		✓	✓
3	Power spectral density (PSD)		✓	
4	Emission bandwidth (6 dB)		✓	✓
5	Emission bandwidth (20 dB)	✓		
6	Emission bandwidth (26 dB)		✓	✓
7	99% occupied bandwidth	✓		✓
8	Channel separation	✓		
9	Channel number	✓		
10	Dwell time	✓		
11	Band edge	✓	✓	✓
12	Spurious emission		✓	✓
13	Dynamic frequency selection (DFS)	✓		✓ (XA5003A)
14	Frequency stability			✓
15	Contention-based Protocol (CBP)			✓ (3)

1. Digital spread spectrum (DSS) and frequency-hopping spread-spectrum (FHSS) systems
2. Digital transmission system (DTS)
3. According to FCC KDB987594 D02 test requirement

Test Cases: Keysight XA5003A DFS Test Software

The dedicated Dynamic Frequency Selection (DFS) test software supports test cases for ETSI EN301 893 V2.1.1 and EN302 502 V1.2.1, FCC-06-96 and FCC-13-22, Japan MIC 2019-07, Korea, and China. It significantly reduces test time by simplifying and automating DFS testing, data collection and calculation, and allows easy report generation.

Test Cases: Keysight XA5004A ETSI Regulatory Test Software for Non-signaling Tests

XA5004A test software addresses the test requirements of most recent versions of the ETSI EN 300 328 (V2.2.2), EN 301 893 (V2.1.1), and EN 303 687 (draft 0.0.13). This test software is a subset of XA5001A test software and covers test requirements such as RF output power, occupied channel bandwidth, power spectral density, spurious emissions, and hopping frequency separation.

Test Cases: Keysight XA5005A ETSI Regulatory Test Software for Signaling Tests

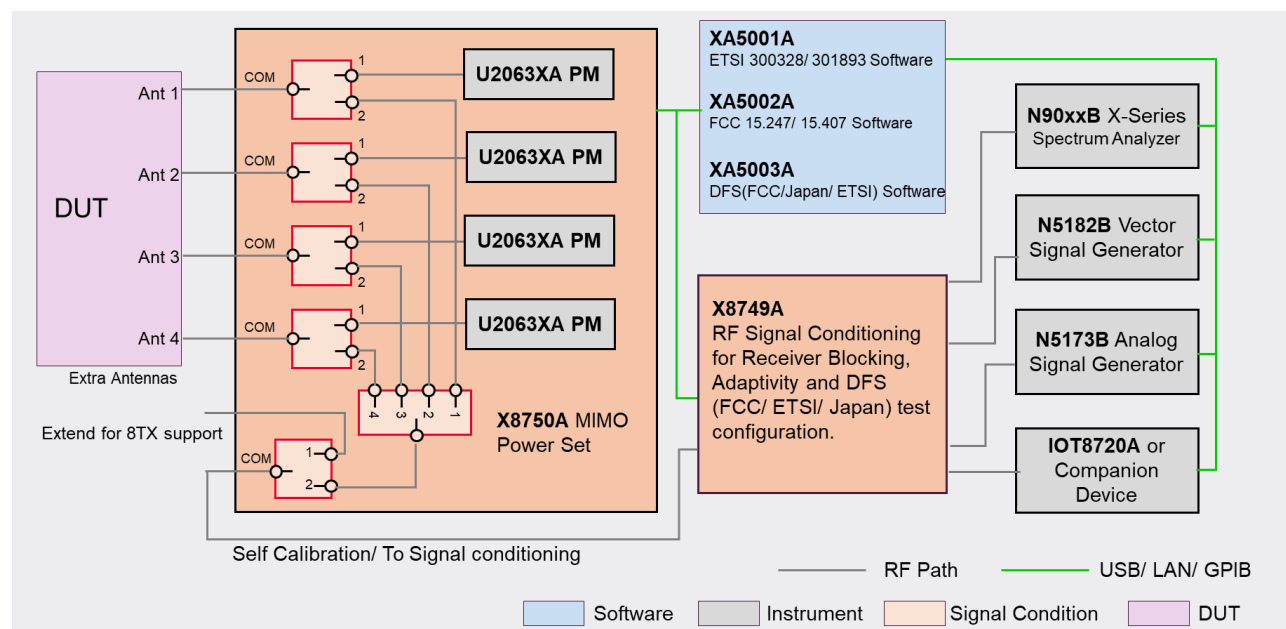
XA5005A test software addresses the test requirements of most recent versions of the ETSI EN 300 328 (V2.2.2), EN 301 893 (V2.1.1), and EN 303 687 (draft 0.0.13). This test software is a subset of XA5001A test software and covers test requirements such as adaptivity and receiver blocking.

System Configuration

ETSI EN300 328, EN 301 893, EN 303 687 (Draft 0.0.13) and FCC 15.247, and 15.407 requires multiple instruments to work together and complex calculation to complete the tests.

- Keysight N90xxB X-Series Signal Analyzer
- Keysight N518xB Vector Signal Generator
- Keysight N517xB Analog Signal Generator
- Keysight N5182BX07 Frequency Extender for EXG/MXG, 9 kHz to 7.2 GHz (For Wi-Fi 6E test)
- Keysight X8749A* Signal Conditioning Test Set
- Keysight X8750A* 4-Channels MIMO Power Test Set, which are built upon U2063XA Power Sensor.
- Keysight XA5001A* ETSI Regulatory Test Software
- Keysight XA5002A* FCC Regulatory Test Software
- Keysight XA5003A* DFS Test Software
- Keysight IOT8720A IoT Wireless Test Set (Support WLAN, Bluetooth® and ZigBee® signal profiles)

*Orderable under IOT0047A



Keysight IOT0047A Regulatory Test System Block Diagram

Keysight X8749A Signal Conditioning Test Set Characteristics

The X8749A set has a built-in data package counter and provides level control and signal conditioning capabilities. It enables PER measurement for Receiver Blocking test using a WLAN companion device, as well as Adaptivity, Channel Access Mechanism and DFS tests.

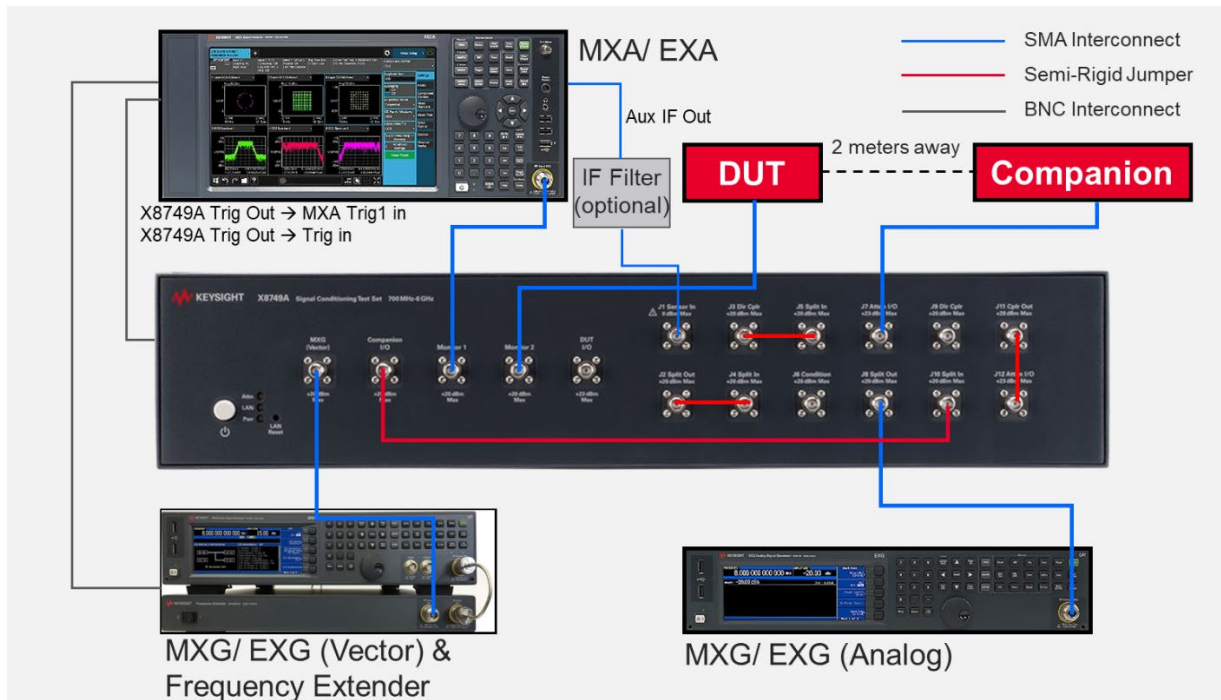
Parameters	Characteristics
RF frequency range	700 MHz to 7.2 GHz
RF attenuation range	0 to 60 dB with 1 dB steps
Max. power input	+20 dBm typical
Input Power	-40 to +20 dBm power acquisition range Sampling rate up to 1MSa/sec
Connector Type	SMA Female
Input Voltage and Frequency	100 to 240V, 50 to 60 Hz,
Input Power Consumption	50 W max
Operating temperature	0 to 40 °C

Keysight X8750A 4-Channels MIMO Power Test Set Characteristics

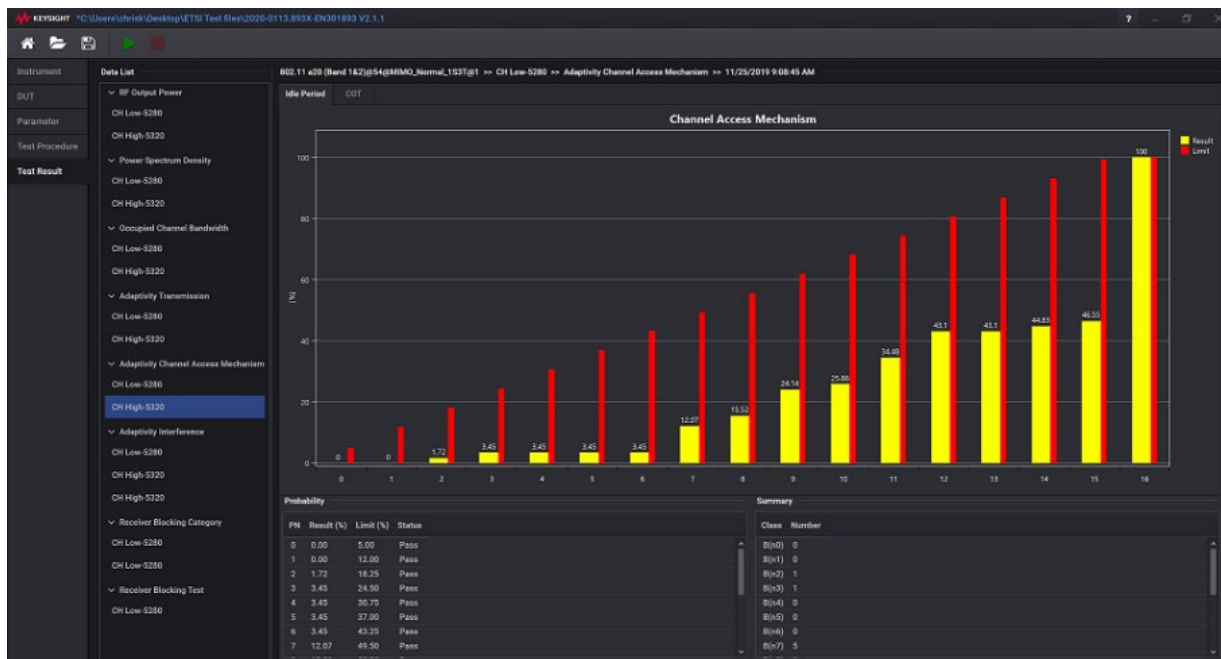
X8750A consists of U2063XA USB Wide Dynamic Range Average & Peak Power Sensors to enable simultaneous 4-Channels MIMO power measurements. It supports variable sampling rate of over 1MSa/sec to meet or exceed regulatory requirements. On high speed wireless radio format such as IEEE 802.11ax with 160MHz bandwidth, the X8750A's broadband average power measurement capabilities enable accurate RMS power measurement and calculation.

Parameters	Characteristics
RF Frequency	10 MHz to 26 GHz simultaneous power measurement
Power Measurement	Wideband dynamic range: • -40 to +26 dBm (Peak RMS mode) • -70 to +26 dBm (Average mode)
Sampling Rate	Variable, 1 MSa/sec to 20 MSa/sec
Connector Type	2.92mm (K-Type), Female
Input Voltage and Frequency	100 to 240V, 50 to 60 Hz,
Input Power Consumption	50 W max
Operating Temperature	0 to 40 °C
Average Power Accuracy	10MHz to 8GHz, ± 0.5 dB

Example ETSI EN 300 328, EN 301 893 and EN 303 687(Draft) Adaptivity Test (Supports Wi-Fi 6E Test Configuration)



Keysight IOT0047A Adaptivity Test Connection Diagram



XA5001A ETSI EN301 893 Adaptivity screen capture

Ordering Information for IOT0047A

Example Configuration: ETSI EN 300 328, EN 301 893 and EN 303 687
(Draft 0.0.13), FCC Part 15.247 and Part 15.407 and DFS for 2.4, 5, and 6 GHz
Wireless Devices

I. Hardware

Model/Option number	Description
N9020B with options 544, B1X, CR3, AMG	MXA Signal Analyzer, 10Hz to 44GHz, 160MHz analysis bandwidth, wideband IF output connector, calibration + uncertainties + Guard-banding (accredited)
N5172B with options 506, 653, 655, 657, AMG, N7607EMBC	EXG RF Vector Signal Generator, 9kHz to 6GHz, with 160MHz RF bandwidth, calibration + uncertainties + Guard-banding (accredited), Signal Studio for DFS Radar Profiles
N5173B with options 540, AMG	EXG RF Analog Signal Generator, 9kHz to 40GHz, calibration + uncertainties + Guard-banding (accredited)
N5182BX07	Frequency Extender for EXG/MXG, 9 kHz – 7.2 GHz
IOT0047A-150	X8749A Signal Conditioning Test Set
IOT0047A-171	X8750A 4-Channels MIMO Power Test Set

II. Software

Model/Option number	Description
XA5001A	ETSI Regulatory Test Software
XA5001A-1TL	Subscription, 12 months Transportable license
R-X4Q-004-L	12 months, transportable, support subscription
XA5002A	FCC Regulatory Test Software
XA5002A-1TL	Subscription, 12 months Transportable license
R-X4Q-004-L	12 months, transportable, support subscription
XA5003A	DFS Test Software
XA5003A-1TL	Subscription, 12 months Transportable license
R-X4Q-004-L	12 months, transportable, support subscription

Keysight and our partners provide system integration, startup assistant and training services. To place an order or for more information, please contact your local Keysight representative.

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