# Spirent **TestCenter WLAN**

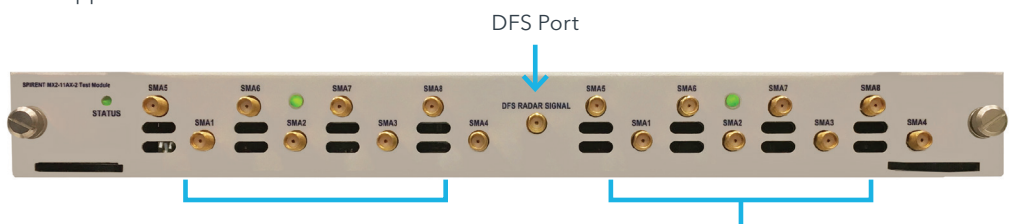## MX2 WLAN 802.11AX Test Module

### Applications:

- Conductive or OTA testing

- Multi-client WLAN network testing scenarios

- Functional, performance, and scalability testing

- Stability testing

- Security and authentica-tion type testing

- AP interwork AP interwork with legacy IEEE 802.11 mode clients

- Association processing and DHCP timing testing

- RFC2544 benchmark per-formance testing

- UDP stateless and TCP stateful traffic testing

- Application layer traffic testing

- 802.11ax feature testing

- Radar signal emulation for DFS testing

- Advanced features such as roaming, airtime fairness, band steering

- Easy rate vs range testing

Spirent TestCenter supports the highest performing and most realistic wireless local area network (WLAN) mul-ti-client emulation for direct functionality and performance testing of Access Points (APs) and end-to-end testing of WLAN ecosystems that include WLAN access controllers, and gateways. Spirent TestCenter WLAN 802.11ax MX2 test module integrates the latest 802.11ax support and radar signal emulation interface for Dynamic Frequency Selection (DFS) testing. It enables users to emulate a large number of realistic 802.11 a/b/g/n/ac/ax WLAN clients to connect with an AP via a cabled conductive or over-the-air (OTA) link for either WLAN functional or data traffic performance testing. Basic WLAN control plane and data plane features along with the advanced RFC style net-work traffic and throughput performance test cases are supported over the WALN network involving the emulat-ed clients and the APs under test. This test module also provides complete Dynamic Frequency Selection (DFS) testing coverage through the integration of a radar signal emulation tool.

The MX2 WLAN 802.11ax test module offers the highest performance and consists of multiple IEEE 802.11 radios. The newly designed 802.11ax radio interface supports those exciting features such as MU-MIMO, OFDMA, longer symbol duration, BSS color, etc. introduced in 802.11ax standard. It provides the maximum user configurability and flexibility to emulate various IEEE 802.11ax clients and other legacy 802.11 a/b/g/n/ac clients on either 2.4GHz or 5GHz band. A single WLAN radio supports 802.11ax clients with different spatial stream configurations up to 8 spatial streams for the best realistic client emulation scenarios in either conductive or OTA mode. Designed for testing WLAN network infrastructure devices, the intended DUTs include the latest 802.11ax carrier or enterprise thin APs with access controllers (AC), consumer grade 802.11ax APs, and integrated broadband WLAN gateway with 802.11ax support. Spirent TestCenter WLAN solutions offer the best in class traffic generation and analysis for testing functionality, performance, and scalability.

A dedicated radio interface is included to generate certain radar signals required by the regulators such as FCC, ETSI, Japan-MIC, Korea, and China Telecom, etc. on 5GHz DFS band that is unlicensed but shared with many applications including weather radars and WLAN. With this tester, users can easily validate the compliance of 802.11 APs to the latest regulatory mandated DFS requirements on 5GHz band. Both manual and automated test cases pro-vided cover the regulators requirements with multi-trial testing, detection probability testing, and detection bandwidth testing. The statistical results reported for those test cases include critical DFS timing characteristics that an AP under test can support.

DFS Port



- 802.11ax 8x8 on 5GHz 4x4 on 2.4GHz
- One 8x8 or two 4x4 on 5GHz
- One 4x4 on 2.4GHz

- 802.11ax 8x8 on 5GHz 4x4 on 2.4GHz
- One 8x8 or two 4x4 on 5GHz
- One 4x4 on 2.4GHz

*Spirent TestCenter MX2 WLAN 802.11AX DFS Test Module*

# Spirent **TestCenter WLAN**

## MX2 WLAN 802.11AX Test Module

## Features & Benefits

- Spirent TestCenter N12U and N4U chassis-based WLAN testing solutions with customizable hardware configurations

- Support either cabled conductive or OTA mode testing environment

- Utilize both in-chassis Ethernet test module and WLAN test modules for emulating a very large number of realistic 802.11 WLAN clients with traffic generation and analysis

- Support 802.11 b/g/n/ac/ax on 2.4GHz and 802.11 a/n/ac/ax on 5GHz frequency bands

- Support dual-band 2.4GHz and 5GHz concurrently

- Support up to 8x8 MIMO for 802.11 n/ac/ax on 5GHz and 4x4 MIMO for 802.11 n/ac/ax on 2.4GHz

- Support 20MHz and 40MHz channel bandwidths for clients on 2.4GHz band

- Support 20MHz, 40MHz, 80MHz, and 80+80Mhz, and 160MHz channel bandwidths for clients on 5GHz band

- Support 802.11ac/ax with 80 MHz channel bandwidth for MIMO up to 8x8 on 5GHz

- Support 802.11ac/ax with 80+80 MHz and 160MHz channel bandwidth for MIMO up to 4x4 on 5GHz

- 802.11ac/ax explicit transmit beamforming (TxBF) and legacy implicit TxBF for beamformee

- Switchable between SU-MIMO and MU-MIMO configurations

- Support various 802.11ac/ax client configurations for MU-MIMO grouping testing

- OFDMA RU management testing with multiple OFDMA capable clients

- Support different BSS color settings with a threshold of 0 to 64

- Support 802.11ax PHY features such as long training field; HE duration-based RTS; dual-carrier modulation

- Support various channel selection plan for different geographic regions globally

- Maximally interoperable with various chipset vendor's WLAN AP products

- Best in class realistic traffic generation and analysis over WLAN and Ethernet interfaces

- Capable of providing multiple traffic flows per client with each flow offering stateful traffic at layers 2 through 7

- Capable of generating realistic and stateful WLAN client traffic individually on per client basis

- Support individually controlled client behavior providing accurate control of 802.11, 802.3, and IP characteristics, including medium access control, authentication and encryption, frame size, and rate

- Emulate client association mode in either a designated sequential or more realistic random fashion

- Support various RFC2544 style test case for throughput benchmark performance testing

- Each emulated client supports the full MAC per 802.11 standard independently

- Upper layer protocols (e.g. DHCP and TCP) are fully supported using independent protocol tasks

- Test AP's data plane performance using flow packets of different sizes, protocol types, encryptions, and rates

- 802.3 Ethernet transmit capability: wire-speed hardware packet generation with timestamps, sequence numbers, data integrity signature, and flow group Identifier

- 802.3 Ethernet receive capability: wire-speed packet filtering, data integrity, and sequence checking, capture, real-time latency measurement on each flow

- Support different 802.3 Ethernet packet length control functionalities including fixed, increment, decrement by user-defined step or automatic, list, random and shuffle.

- Support a sniffer type IEEE 802.11 packet over-the-medium capture for a real-time Wireshark display or other precise post processing

- Simultaneously 802.3 packet capture and 802.11 packet capture up to 256mb per port, respectively

- Filter options with specific types of packets (SSIDs, BSSIDs, etc.) for reducing capture file size or for a longer capture

- Extensive 802.11 stats, counters, and statistics report in either real-time or periodically on per client or per port basis

- Support 802.3 and 802.11 real-time port statistics, per flow statistics, and port-level histogram

- Support per spatial stream statistics and counters

- Dedicated radio interface for certain radar signal emulation and DFS testing

- Switch to different channel on 5GHz band requested by the AP without interruption of traffic

- Support various regulatory required DFS specifications such as FCC, ETSI, Japan, Korea, and China

- Generate regulatory-specified radar signal pulses based on the region settings

- Various profile types of regulatory-specified radar pulses based on the region settings

- Configurable parameters such as signal strength, signal duration, center frequency, etc. for the radar signal generation

- Capture DFS statistics such as CSA number, time of the first CSA arrival, channel switch time, channel moving time, etc.

## WLAN NIC Technical Specifications

| | |
|---|---|
| 802.11 Protocols | IEEE 802.11 a/b/g/n/ac/ax on 2.4GHz and 5GHz frequency band |
| Maximum Number of Emulated Clients | Up to 480 clients per MX2 for 3 radio profile and 400 clients per MX2 for 2 radio profile:<br>• Up to 200 clients per radio<br>• Up to 400 clients on 2.4GHz band for 802.11 b/g/n/ac/ax per MX2<br>• Up to 480 clients on 5GHz band for 802.11 a/n/ac/ax per MX2 |
| MIMO (5GHz) | Support MIMO configurations 1x1, 2x2, 3x3, 4x4, and 8x8 on 5GHz<br>Support two 4x4 radios on 5GHz |
| MIMO (2.4GHz) | Support MIMO configurations 1x1, 2x2, 3x3, and 4x4 |
| DL MU-MIMO | Support DL MU-MIMO clients with 1x1, 2x2, 3x3, or 4x4 MIMO configurations |
| Beamforming Support | 802.11ac/ax explicit transmit beamforming (TxBF) and legacy implicit TxBF for beamformee |
| Coding Supported | Supports Spatial Multiplexing, Cyclic-Delay Diversity (CDD), Low-Density Parity Check (LDPC), Maximum Ratio combining (MRC), Space Time Block Code (STBC) |
| Frequency Band | 2.4GHz (802.11 b/g/n/ac/ax) and 5 GHz (802.11 a/n/ac/ax), single band or concurrent dual/tri-band support |
| Guard Interval | Guard interval selection - 800/400 ns for 802.11 n/ac, 800/1600/3200 ns for 802.11ax |
| DL OFDMA | Support DL OFDMA |
| UL OFDMA | Support UL OFDMA |
| Maximum PHY Rates | Maximum PHY rates<br>• 6.5 Mbps (802.11b) to 600 Mbps (802.11n, 40MHz, 4x4, MCS31);<br>• 433.6 Mbps (MCS9) and 541.5 Mbps (MCS11) (802.11ac, 80MHz, 1x1, GI =400ns)<br>• 867.1 Mbps (MCS9) and 1082.9 Mbps (MCS11) (802.11ac, 80MHz, 2x2, GI =400ns)<br>• 1300.7 Mbps (MCS9)1624.4 Mbps (MCS11) (802.11ac, 80MHz, 3x3, GI =400ns)<br>• 1734.2 Mbps (MCS9) and 2165.8 Mbps (MCS11) (802.11ac, 80MHz, 4x4, GI =400ns)<br>• 3468.4 Mbps (MCS9) and 4331.6 Mbps (MCS11) (802.11ac, 80MHz, 8x8, or 80MHz+80MHz/160MHz, 4x4, GI =400ns)<br>• 480.4 Mbps (MCS9) and 600 Mbps (MCS11) (802.11ax, 80MHz, 1x1, MCS11, GI =800ns)<br>• 960.7 Mbps (MCS9) and 1201 Mbps (MCS11) (802.11ax, 80MHz, 2x2, MCS11, GI =800ns)<br>• 1441.2 Mbps (MCS9) and 1801.5 Mbps (MCS11) (802.11ax, 80MHz, 3x3, GI =800ns)<br>• 1921.5 Mbps (MCS9) and 2401.9 Mbps (MCS11) (802.11ax, 80MHz, 4x4, GI =800ns)<br>• 3843.1 Mbps (MCS9) and 4803.9 Mbps (MCS11) (802.11ax, 80MHz, 8x8, or 80MHz+80MHz/160MHz, 4x4, GI =800ns) |
| MCS Type | Full MCS index support in 802.11 n/ac/ax<br>• all 0-31 MCS index for 802.11n<br>• all 0-11 MCS index for 802.11ac/ax |
| Rate Adaptation | Support full rate adaptation by default, and selectable MCS index |
| Coding Rates | FEC coding rates - 1/1, 2/3, 3/4, 5/6 |
| Channel Bandwidth | 20 MHz, 40 MHz, 80 MHz, 80 MHz+80 MHz, 160 MHz |
| Frame Aggregation | 802.11 n/ac/ax aggregation types: Both Tx and Rx A-MPDU, A-MSDU, and Block ACK |
| BSS Color Threshold | 0-64 |
| Maximum TX Power | Maximum TX power per chain:<br>• 16dBm/MCS0 (+-2dB tolerance) on 5GHz band, and 16.5dBm/MCS0 (+-2dB tolerance) on 2.4GHz band<br>• 9dBm/MCS11 (+-2dB tolerance) on 5GHz band, and 9.5dBm/MCS11 (+-2dB tolerance) on 2.4GHz band |
| Transmit Power Control | Transmit power control: 16dB range in 1 dB step |
| Channel Attenuation | Programmable RX/TX attenuation up to 63.5dB with 0.25dB resolution on each of 8 spatial streams on 5GHz and on each of 4 spatial streams on 2.4GHz |
| RX Sensitivity | Minimum receiver sensitivity level: -93 dBm (+-2dB tolerance) on 5GHz band<br>Minimum receiver sensitivity level: -95 dBm (+-2dB tolerance) on 2.4GHz band |
| TX EVM | -42.5 dB (+-2dB tolerance) for -9.5 dBm TX power with MCS11 on 2.4GHz<br>-40.5 dB (+-2dB tolerance) for -9.5dBm TX power with MCS11 on 5GHz |
| Channel and Frequency | Operation Channels:<br>• 2.412 to 2.484 GHz: 1 to 14<br>• 5.180 to 5.320 GHz: 36, 40, 44, 48, 52, 56, 60, 64<br>• 5.500 to 5.700 GHz: 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140<br>• 5.740 to 5.825 GHz: 149, 153, 157, 161, 165 |

# Spirent **TestCenter WLAN**

## MX2 WLAN 802.11AX Test Module

### About Spirent Communications

Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks.

We help bring clarity to increasingly complex technological and business challenges.

Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled.

For more information, visit: www.spirent.com

| WLAN NIC Technical Specifications (cont'd) | |
|---|---|
| Interface Connector | Antenna interface connectors: SMA female connector, standard thread, AC coupled, 50 Ohms |
| Authentication Support | 802.1x - PEAP/MSCHAPv2, TLS, LEAP/EAP-FAST, AKA, TTLS |
| Encryption Support | WEP-40 and WEP-104, TKIP (WPA), AES-CCMP (WPA2/WPA3) |
| DFS Support | Radar Signal Emulation with the following types supported: FCC, ETSI, Japan, Korea, and China |
| DFS Port TX Power | Maximum 10dBm (+-2dB tolerance) |
| DFS Port Attenuation | Up to 90 dB, with 1 dB step |
| Physical Specifications | 3U H x 16.53" W x 19.75" D, weight: 38 lbs. (17 kg) |
| Environmental Specifications | Operating temperature: 5 C/41 F–35 C/ 95 F, 10%–90% RH (non-condensing) |
| Power Supply | 115 V–230 V, 50/60 Hz–750 W |
| Safety Compliance and Certifications | • FCC Part 15 Class A<br>• CE Mark Class A EN 55032:2012; EN 55024:2010; EN 61000-3-3:2013; EN 61000-3-2:2014<br>• UL 60950-1:2007 R10.14<br>• CAN/CSA-C22.2 NO.60950-1-07+A1:2011+A2:2014<br>• IEC 60950-1:2005 (Second Edition) + Am 1:2009 + Am 2:2013 |

## Product Information

| Description | Part Number |
|---|---|
| MX2 Test Module, 802.11AX Wi-Fi, 2.4GHZ/5GHZ, DFS Radar Signal Emulation and Testing, and HW Timing | MX2-11AX-2-V2 |

*A full complement of Spirent protocol and test packages are available with perpetual and subscription licensing options.*
*Please contact your Spirent sales representative to select the right option for your test needs.*

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