Spirent **TestCenter**™

WLAN Wave-2 MX2 DFS Test Module

Applications

- Multi-client WLAN network testing scenarios

- AP Personal and Enterprise security type testing

- AP interwork testing with various mixes of different IEEE 802.11 mode clients

- Association processing and timing testing under various authentication selections

- Benchmark or baseline testing for traffic throughput, TCP goodput, forwarding rate, and latency performance

- RFC-style testing originating from a large number of clients across APs through the WLAN RF interface

- Maximum client support, medium capacity testing, throughput vs. packet size, throughput vs. associated client numbers, etc.

- Roaming, drop and re-association process, admission control and load balancing

- Regulator required DFS testing

- Band steering testing

- Rate vs. range testing

Spirent TestCenter supports the highest performing and most realistic wireless local area network (WLAN) multi-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 MX2 test module has an integration of the latest 802.11ac Wave-2 support and radar signal emulation interface for Dynamic Frequency Selection (DFS) testing. With this test module installed into a Spirent TestCenter chassis in conjunction with other test modules, users can emulate a large number of realistic 802.11 a/b/g/n/ac WLAN clients to connect with an access point 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 network traffic and throughput performance test cases are supported over the WALN network involving the emulated clients and the APs under test.

The MX2 WLAN DFS test module offers the highest performance and consists of multiple IEEE 802.11 radios. It provides the maximum user configurability and flexibility to emulate various IEEE 802.11 a/b/g/n/ac clients on 2.4GHz and 5GHz and IEEE 802.11ac Wave-2 MU-MIMO clients on 5GHz band. A single WLAN radio supports 802.11ac Wave-2 clients with different spatial streams for the best realistic client emulation scenarios in either SU-MIMO or MU-MIMO. Designed for testing WLAN network infrastructure devices, including carrier or enterprise thin APs with controllers, consumer APs, and integrated broadband WLAN gateway, Spirent TestCenter WLAN solutions offer the best in class traffic generation and analysis for testing functionality, performance, and scalability.

Figure 1: MX2 test module for 802.11 a/b/g/n/ac WLAN Wave-2 and DFS radar signal emulation.

WLAN Wave-2 MX2 DFS Test Module

A dedicated radio interface is included to generate weather radar signals required by the regulators such as FCC, ETSI, etc., on 5GHz band that is un-licensed but shared with many applications including weather radars and WLAN. This new testing tool makes it easy to validate the compliance of 802.11 APs to the latest regulatory mandated DFS requirements on 5GHz band. Both manual and automated test cases cover the regulators requirements with multi-trial testing, detection probability testing, and detection bandwidth testing. The statistical results reported for those test cases include but are not limited to the following critical items:

• Number of Channel Switch Announcement (CSA)

• Arrival of first CSA

• Channel Move Time
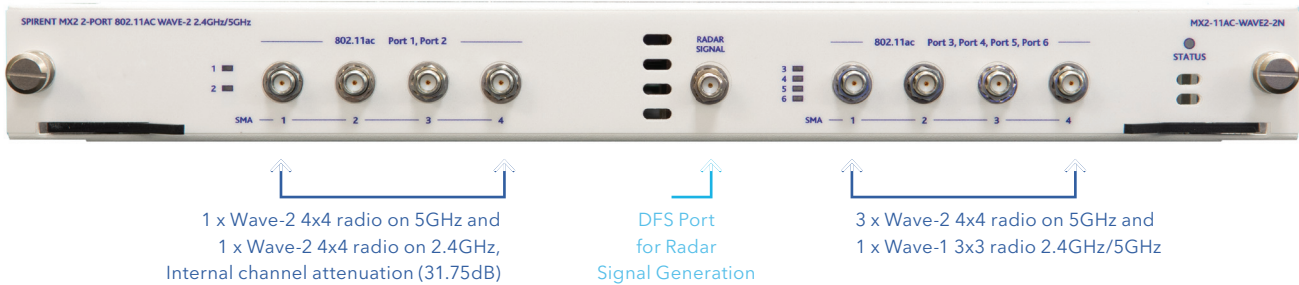
• Channel Closing Transaction Time

Figure 2: MX2 Wave-2 DFS test module with multi-radio ports and radar signal generation port.

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 modules and WLAN test modules for emulating a very large number of realistic WLAN clients with traffic generation and analysis

- Support 80MHz channel bandwidth for MIMO up to 4x4 on 5GHz band

- Support 40MHz channel bandwidth for MIMO up to 4x4 on 2.4GHz

- Support 80+80MHz and 160MHz channel bandwidth for MIMO up to 2x2

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

- Internal channel attenuation up to 31.75dB for both TX and RX with 0.25dB resolution for one of the two test ports

- Fully integrated and dedicated software defined radio (SDR) for the DFS radar signal emulation and other noise source generation purpose

- Support various MU-MIMO client configurations for MU-MIMO grouping testing

- Support of full dynamic data rate adaptation

- Support user selectable MCS index for various different protocol rates

- Support different MAC frame-aggregation configurations for A-MPDU and A-MSDU

- Support various channel selection plan for different geographic regions globally

- Maximally interoperable with various different chipset vendors based WLAN AP products

- Best in class realistic traffic generation and analysis between WLAN clients and Ethernet clients servers or WLAN clients

- 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 RFC style test cases (RFC2544 and RFC2889) for throughput, routing, forwarding performance testing

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

- 802.1x supplicant supports full EAP stack per client

- 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

- Transmit capability - Wire-speed hardware packet generation with timestamps, sequence numbers, data integrity signature, and flow group Identifiers

- Receive capability - Wire-speed packet filtering, data integrity, and sequence checking, capture, real-time latency measurement on each flow

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

- Per port statistics and rate counters - Link State, User programmable Line Speed, Packets Sent, Signature Valid Packets Received, Bytes Sent/Received, Fragments Received, Undersize, Oversize, VLAN Tagged Frames, FCS errors, Bad Sequence Errors, Bad Payload Checksum, ARP, DHCP and Ping requests and replies, IP/ICMP/UDP/TCP checksum errors, IP Multicast packets, Sent/Received IP Packets

- 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 for reducing the 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

- Dedicated SDR (Software Defined Radio) based NIC and Integrated SW for radar signal emulation and DFS testing

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

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

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

- User configurable parameters such as channel number or frequency, signal strength, signal duration, etc. for the radar signal generation

- Support FCC: 905462 D02 UNII DFS Compliance Procedures New Rules v02, 2016

- Support ETSI: ETSI EN 301 893 V2.0.7, 2016

Spirent **TestCenter**™

WLAN Wave-2 MX2 DFS Test Module

Technical Specifications	
WLAN NIC Technical Specifications	
802.11 Protocols	IEEE 802.11 a/b/g/n/ac on 2.4GHz and 5GHz frequency band
Maximum Number of Emulated Clients	64 per radio and 384 per test module
MIMO Supported	Support various MIMO configurations 1x1, 2x2, 3x3, and 4x4
MU-MIMO Supported	Support MU-MIMO clients with 1x1, 2x2, or 3x3 MIMO configurations for 802.11ac Wave-2 on 5GHz
Beamforming Support	802.11ac 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) and 5 GHz (802.11 a/n/ac)
Guard Interval	Guard interval selection - 800/400 ns for 802.11 n/ac
PHY Rates	PHY rates - 6.5 Mbps (802.11b) to 800 Mbps (802.11n, 40MHz, 4x4, MCS31, 802.11ac 40MHz, MCS9) and 1734.2 Mbps (802.11ac, 80MHz, 4x4, MCS9, or 80MHz+80MHz/160MHz, 2x2, MCS9)
MCS Type	Full MCS index support in 802.11 n/ac: • all 0-31 MCS index for 802.11n • all 0-9 MCS index for 802.11ac
Rate Adaptation	Support full rate adaptation by default
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 Aggregation types: Both Tx and Rx A-MPDU, A-MSDU, and Block ACK
DFS Support	Radar Signal Emulation with the following types supported: • FCC: 905462 D02 UNII DFS Compliance Procedures New Rules v02, 2016 • ETSI: ETSI EN 301 893 V2.0.7, 2016
Maximum TX Power (5GHz)	Maximum default TX power per chain: 5dBm (+-2dB tolerance) on 2.4GHz and 0dBm (+-2dB tolerance) on 5GHz band
Transmit Power Control	Transmit power control: 16dB range in 1 dB step
Channel Attenuation	Programmable RX/TX attenuation up to 31.75dB with 0.25dB resolution for one of two test ports
RX Sensitivity	< -90 dBm
Channel and Frequency	Operation Channels: • 2.412 to 2.484 GHz: 1 to 14 • 5.180 to 5.320 GHz: 36, 40, 44, 48, 52, 56, 60, 64 • 5.500 to 5.700 GHz: 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140 • 5.740 to 5.825 GHz: 149, 153, 157, 161, 165
Interface Connector	Antenna interface connectors: • SMA female connector, standard thread, AC coupled, 50 Ohms
Enterprise Authentication Support	802.1x – EAP/TLS, TTLS, PEAP, and AKA
Encryption Support	WEP-40 and WEP-104, TKIP (WPA), AES-CCMP (WPA2)

Product Information	
Description	**Part Number**
MX2 802.11 AC WAVE-2 2-PORTS 2.4GHz and 5GHZ, DFS Radar Signal Emulation and Testing, and Hardware Timing: For SPT-N4U and SPT-N12U chassis with 2 ports, support 802.11 b/g/n/ac clients on 2.4GHz, 20MHz and 40MHz channel bandwidth, 4x4 MIMO, and 802.11 a/n/ac clients on 5GHz, 20MHz, 40MHz, and 80 MHz channel bandwidth with 4x4 MIMO, 80 MHz +80 MHz or 160 MHz channel bandwidth with 2x2 MIMO	MX2-11AC-WAVE2-2N

A full suite 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.

Contact Us

For more information, call your Spirent sales representative or visit us on the web at www.spirent.com/ContactSpirent.

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