

# Spirent TestCenter™

## WLAN Wave-2 FX2 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
- 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. By adding a Wave-2 FX2 test module to the N4U/N11U chassis, users can emulate a large number of realistic 802.11 a/n/ac clients on 5GHz frequency band to connect with an access point via a cabled conductive or over-the-air (OTA) link. 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 WLAN network involving the emulated clients and the APs under test.

The WLAN test module offered consists of multiple IEEE 802.11 radios and provide the maximum user configurability and flexibility to emulate various 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.



802.11ac Wave-2 FX2 test module for Spirent TestCenter chassis

### Features & Benefits

- Spirent chassis based WLAN Testing solutions with customizable hardware configurations
- 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
- 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 31dB for both TX and RX with 0.25dB resolution
- Switch for configuring either SU-MIMO or MU-MIMO
- Support various 802.11ac Wave-2 clients configurations for MU-MIMO grouping testing
- Support various channel selection plan for different geographic regions globally

## Features & Benefits (continued)

- Maximally interoperable with various different chipset vendors based WLAN AP products
- Best-in-class realistic traffic generation and analysis between WLAN and Ethernet clients or just amongst WLAN clients with WLAN APs involved
- 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
- 802.3 Ethernet transmit capability: Wire-speed hardware packet generation with timestamps, sequence numbers, data integrity signature, and flow group Identifiers
- 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
- 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, SSID, BSSID, etc. 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



Combined FX2 Wave-2 WLAN test module and the new 2.5G/5G Ethernet test module for Spirent TestCenter chassis

Technical Specifications	
WLAN NIC Technical Specifications	
802.11 Protocols	IEEE 802.11 a/n/ac capable on 5GHz frequency band
Maximum Number of Emulated Clients	64 per radio and 256 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
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	5GHz (802.11 a/n/ac)
Guard Interval	Guard interval selection - 800/400 ns for 802.11 n/ac
PHY Rates	PHY rates - 600 Mbps (802.11n, 40MHz, 4x4, MCS31) 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: <ul style="list-style-type: none"> <li>all 0-31 MCS index for 802.11n</li> <li>all 0-9 MCS index for 802.11ac</li> </ul>
Rate Adaptation	Support full rate adaptation by default
Coding Rates	FEC coding rates - 1/1, 2/3, 3/4, 5/6
Channel Bandwidth	20MHz, 40MHz, 80MHz, 80MHz+80MHz, 160MHz
Frame Aggregation	802.11 n/ac Aggregation types: Both Tx and Rx A-MPDU, A-MSDU, and Block ACK
DFS Support	Supports Dynamic Frequency Selection (DFS)
Maximum TX Power (5GHz)	Maximum default TX power per chain: 5dBm (+-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 31dB with 0.25dB resolution
RX Sensitivity (5GHz)	Minimum receiver sensitivity level: -75 dBm (+-2dB tolerance) on 5GHz band
Channel and Frequency	Operation Channels: <ul style="list-style-type: none"> <li>5.180 to 5.320GHz: 36, 40, 44, 48, 52, 56, 60, 64</li> <li>5.500 to 5.720GHz: 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144</li> <li>5.740 to 5.825GHz: 149, 153, 157, 161, 165</li> </ul>
Interface Connector	Antenna interface connectors: <ul style="list-style-type: none"> <li>SMA female connector, standard thread, AC coupled, 50 Ohms</li> </ul>
Authentication Support	802.1x - PEAP/MSCHAPv2, TLS, LEAP/EAP-FAST, TTLS
Encryption Support	WEP-40 and WEP-104, TKIP (WPA), AES-CCMP (WPA2)

### 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](http://www.spirent.com)

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### Product Information

Description	Part Number
FX2 802.11 AC WAVE-2 2-PORTS 5GHZ For SPT-N4U and SPT-N11U chassis with 2 ports, support 256 802.11 a/n/ac clients, 4x4 MIMO, 80 MHz, 80 MHz +80 MHz, 160 MHz channel bandwidth, 5 GHz band	FX2-11AC-WAVE2-2

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.