# Spirent **TestCenter™**

## WLAN Wi-Fi 6 AP Emulation for Device Testing

### Applications:

- Wi-Fi 6 (IEEE 802.11ax) Multi-AP emulation for device testing
- Reference AP for device functional and performance testing
- Wi-Fi 6 features such as 1024QAM, OFDMA. Mu-MIMO, BSS color, TWT, etc. testing
- WPA/WPA2/WPA3 and Enhanced Open device personal and enterprise security type testing
- Device stability testing
- Device interwork testing with legacy mode APs
- Association processing and timing testing under various authentication selections
- DHCP performance testing
- Benchmark or baseline testing for UDP and TCP traffic throughput
- RFC2544 testing to examine throughput performance vs different packet size
- DFS testing mode support
- Rate vs range (RSSI, pathloss) testing

Spirent TestCenter supports the highest performing and most realistic wireless local area network (WLAN) interface emulation for direct functionality and performance testing of WLAN devices with a focus on functional and data traffic throughput.

Spirent TestCenter WLAN Wi-Fi 6 hardware platforms offer multiple Wi-Fi 6 (IEEE 802.11ax) access points (APs) emulation with realistic 802.11 a/b/g/n/ac/ax WLAN interfaces, supporting the latest IEEE 802.11ax standard as well as legacy IEEE 802.11 a/b/g/n/ac.

The solution enables users to easily build up a testbed involving the emulated reference APs with a validated golden performance and the devices under test (DUT), a task that was previously one of the most challenging ones in wireless interface testing. The DUTs can be a wide range of portable WLAN devices such as smartphones, tablets, laptops, Internet of Thing (IoT) devices, etc.

It offers comprehensive, scalable capabilities for lab performance testing or certification testing, for a wide range of Wi-Fi device products. The feasible connections between the emulated APs and DUTs can be either directly RF cabled conductive connection or an Over The Air (OTA) link with antennas mounted for both WLAN functional and data traffic experiment. The solutions cover basic WLAN connectivity, control message, and data throughput testing including advanced Wi-Fi 6 features such as 1024QAM, OFDMA, MU-MIMO, BSS color, TWT, as well as UDP, TCP traffic, and throughput performance test methodologies for convenient manual trials or fully automated testing.

Spirent TestCenter WLAN Wi-Fi 6 test platforms consist of multiple IEEE 802.11ax radios, providing the maximum user configurability and flexibility to emulate various configured IEEE 802.11ax APs with user selected parameters and capabilities. They deliver best in class functional and traffic generation capabilities for testing functionality, performance, and scalability. They are equipped with both Spirent TestCenter signature traffic and embedded iPerf 2.0 and 3.0 traffic generation, as well as analytical tools for UDP and TCP throughput performance in unidirectional or bi-directional testing.

Performance metrics such as CPU and battery utilization, and impact with the maximum possible throughput can also be examined along with functional, benchmark or baseline performance testing. The platforms are enabled with support for both multi-client or AP emulation on Wi-Fi 6, allowing users to perform back-to-back testing with emulated AP and clients for various Wi-Fi devices.

- 802.11ax 8x8 on 5GHz 4x4 on 2.4GHz
- Per NIC: one 8x8 or two 4x4 on 5GHz
- Per C50: two 8x8 or four 4x4 on 5GHz
- Per NIC: one 4x4 on 2.4GHz
- Per C50: two 4x4 on 2.4GHz
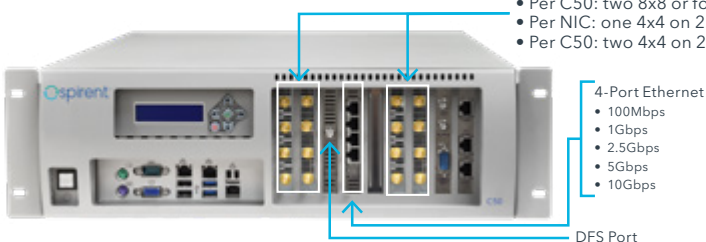


4-Port Ethernet
- 100Mbps
- 1Gbps
- 2.5Gbps
- 5Gbps
- 10Gbps

DFS Port

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 C50 WLAN 802.11AX DFS Appliance*

*Spirent TestCenter MX2 WLAN 802.11AX DFS Test Module*

# Features & Benefits

- Common platform for either multi-client or AP emulation
- Support multiple SSIDs (up to 16 on the same radio)
- 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 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 on 2.4GHz
- Support 20MHz, 40MHz, 80MHz, and 80+80Mhz, and 160MHz channel bandwidths on 5GHz
- 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
- Internal channel attenuation up to 63.5dB for both TX and RX with 0.25dB resolution for each individual spatial stream
- Each internal attenuation can be adjusted easily and independently
- Support full dynamic data rate adaptation with user selectable MCS index for different protocol rates in 802.11 a/b/g/n/ac/ax
- Support advanced 802.11ax features such as downlink and uplink OFDMA, MU-MIMO, BSS color, and TWT
- 802.11ac/ax explicit transmit beamforming (TxBF) and legacy implicit TxBF for beamformee
- Switchable between SU-MIMO and MU-MIMO configurations
- OFDMA RU management for various RU configurations defined in IEEE 802.11ax standard
- Support different BSS color settings with a threshold of 0 to 63
- Support 802.11ax PHY features such as long training field; HE duration-based RTS; dual-carrier modulation

- Support WPA/WPA2/WPA3 and Enhanced Open authentication for personal and enterprise authentication
- Support various EAP-TLS, TTLS, PEAP, FAST, AKA, AKA', SIM enterprise types
- Support various channel selection plan for different geographic regions globally
- Maximally interoperable with various chipset vendor's WLAN client products
- Best in class realistic traffic generation and analysis over WLAN interface
- Capable of providing multiple traffic flows per client with each flow offering stateless UDP or stateful TCP traffic
- Capable of generating realistic and stateful WLAN client traffic individually on per client basis
- Upper layer protocols (e.g., DHCP and TCP) are fully supported using independent protocol tasks
- Test client data plane performance using flow packets of different sizes, protocol types, encryptions, and rates
- 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 (e.g. 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
- Support various regulatory required DFS specifications such as FCC, ETSI, Japan, Korea, and China

Spirent
Promise. Assured.

| 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 SSIDs per radio | 16 per radio and 96 per C50 or MX2 |
| 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-band support |
| MIMO (5GHz) | • Support MIMO configurations 1x1, 2x2, 3x3, 4x4, and 8x8 on 5GHz<br>• Support two 4x4 radios on 5GHz<br>• Support single 8x8 radio on 5GHz |
| MIMO (2.4GHz) | Support MIMO configurations 1x1, 2x2, 3x3, and 4x4 |
| MU-MIMO | Support downlink and uplink MU-MIMO |
| Beamforming Support | 802.11ac/ax explicit transmit beamforming (TxBF) and legacy implicit TxBF |
| Guard Interval | Guard interval selection—800/400 ns for 802.11 n/ac, 800/1600/3200 ns for 802.11ax |
| Coding Supported | Supports Spatial Multiplexing, Cyclic-Delay Diversity (CDD), Low-Density Parity Check (LDPC), Maximum Ratio combining (MRC), Space Time Block Code (STBC) |
| Maximum PHY Rates | • 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 | 0-63 |
| 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 | 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<br>Minimum receiver sensitivity level: -95 dBm (+-2dB tolerance) on 2.4GHz |
| 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 | • 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 |
| Interface Connector | Antenna interface connectors:<br>SMA female connector, standard thread, AC coupled, 50 Ohms |
| Authentication Support | 802.1x - PEAP/MSCHAPv2, TLS, LEAP/EAP-FAST, AKA, AKA', SIM, TTLS |
| Encryption Support | WEP-40 and WEP-104, TKIP (WPA), AES-CCMP (WPA2/WPA3), Enhanced Open |
| 802.11w PMF | Enable/Disable |
| DFS Support | Radar Signal Emulation with the following types supported: FCC, ETSI, Japan, Korea, and China |
| 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 |

## Spirent **TestCenter™**

**WLAN Wi-Fi 6 AP Emulation for Device Testing**

### 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

AMERICAS 1-800-SPIRENT

+1-800-774-7368

sales@spirent.com

EUROPE AND THE MIDDLE EAST

+44 (0) 1293 767979

emeainfo@spirent.com

ASIA AND THE PACIFIC

+86-10-8518-2539

salesasia@spirent.com

## Product Information

| Description | Part Number |
|---|---|
| C50 4-Port 10G/5G/2.5G/1G/100M Copper, 802.11AX Wi-Fi NICs, 2.4GHZ/5GHZ, DFS Radar | C50-KIT-11AX-1-V2 |
| C50 4-Port 10G/5G/2.5G/1G/100M Copper, One 802.11AX Wi-Fi NIC, 2.4GHZ/5GHZ, and HW Timing | C50-KIT-11AX-3 |
| MX2 Test Module, 802.11AX Wi-Fi, 2.4GHZ/5GHZ, DFS Radar Signal Emulation and Testing, and HW Timing | MX2-11AX-2-V2 |
| Wi-Fi AP Emulation Package for Spirent Test Center | BPK-5001 |
| Wi-Fi AP Emulation Package for Spirent Test Center C50 | C50-BPK-5001 |