# Spirent TestCenter WLAN

C50 WLAN 802.11AX Tri-Band 6GHz Wi-Fi 6/6E Appliance

IEEE 802.11ax on 6GHz spectrum or Wi-Fi 6E comes alongside the latest 802.11ax standard and means devices can now operate on 6GHz band in addition to the existing 2.4GHz and 5GHz. Spirent TestCenter Wi-Fi 6E appliance 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 C50 Wi-Fi 6E Appliance in a compact 3U appliance form factor combines Spirent's industry- leading IEEE 802.11ax WLAN tri-band 2.4GHz/5GHz/6GHz interface cards with Spirent IEEE 802.3bz BASE-T 100Mbps/1Gbps/2.5Gbps/5Gbps/10Gbps Ethernet card on a copper interface. Users can 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. 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 C50 Appliance also provides complete Dynamic Frequency Selection (DFS) testing coverage through the integration of a radar signal emulation tool.

The Wi-Fi 6E interfaces installed in the highly integrated C50 Appliance consist of multiple IEEE 802.11ax tri-band radios, providing maximum user configurability and flexibility to emulate various IEEE 802.11ax clients on 2.4GHz, 5GHz, and 6GHz band and other legacy 802.11 a/b/g/n/ac clients on either 2.4GHz or 5GHz band. The newly designed 802.11ax Wi-Fi 6E radio interface supports the latest 802.11ax standard. A single WLAN radio supports 802.11ax clients with different spatial stream configurations up to 4 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 controllers, 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 provided, covering 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.
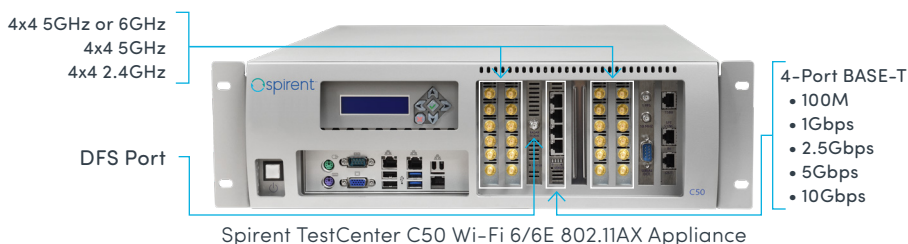
Applications

- Conductive or OTA testing
- Support tri-band 2.4GHz, 5GHz, and 7GHz concurrently
- Multi-client WLAN network testing scenarios
- Functional, performance, and scalability testing
- Stability testing
- Security and authentication type testing
- AP interwork with legacy IEEE 802.11 mode clients
- Association processing and DHCP timing testing
- RFC 2544 benchmark performance 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

4x4 5GHz or 6GHz
4x4 5GHz
4x4 2.4GHz

DFS Port

4-Port BASE-T
- 100M
- 1Gbps
- 2.5Gbps
- 5Gbps
- 10Gbps

Spirent TestCenter C50 Wi-Fi 6/6E 802.11AX Appliance

Features & Benefits

- Utilize both the Ethernet and multiple WLAN cards installed in the appliance 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, 802.11 a/n/ac/ax on 5GHz, and 802.11ax on 6GHz frequency bands

- Support tri-band 2.4GHz, 5GHz, and 6GHz concurrently

- Support up to 4x4 MIMO for 802.11ax on 6GHz, 802.11 n/ac/ax on 5GHz and 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 160MHz channel bandwidths for clients on 5GHz and 6GHz bands

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

- Support 802.11ax with 80 MHz channel bandwidth for MIMO up to 4x4 on 6GHz

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

- Support 802.11ax 160MHz channel bandwidth for MIMO up to 4x4 on 5GHz or 6GHz

- Internal channel attenuation up to 63.5dB for both TX and RX with 0.25dB resolution for each of individual spatial stream completely independently

- 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 plans 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 (e.g. SSIDs, BSSIDs, etc.) for reducing capture file size or for a longer capture

- Extensive 802.11 statistics, 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 per card reservation for WLAN cards and per port reservation for the Ethernet ports

- 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.

- Support TestCenter IQ for smart data storage, data process, and results display and report

WLAN and DFS NIC Technical Specifications

802.11 Protocols	IEEE 802.11 a/b/g/n/ac/ax on 2.4GHz and 5GHz frequency band IEEE 802.11ax on 6GHz frequency band
Per NIC Radio Profile	Configurable for either tri-band 2.4GHz/5GHz/6GHz with each radio on each band or dual-band 2.4GHz/5GHz with one radio on 2.4GHz and two radios on 5GHz
Maximum Number of Emulated Clients	Up to total 608 clients per C50 appliance • Up to 128 clients per C50 on 6GHz with two 6GHz radios for 802.11ax • Up to 528 clients per C50 on 5GHz with four radios for 802.11 b/g/n/ac/ax • Up to 400 clients on 2.4GHz band with two radios for 802.11 a/n/ac/ax
MIMO (5GHz)	Support MIMO configurations 1x1, 2x2, 3x3, and 4x4 on 2.4GHz/5GHz/6GHz
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), 5GHz (802.11 a/n/ac/ax), 6GHz (802.11ax) 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
Maximum PHY Rates	Maximum PHY rates • 6.5 Mbps (802.11b) to 600 Mbps (802.11n, 40MHz, 4x4, MCS31) • 433.6 Mbps (MCS9) and 541.5 Mbps (MCS11) (802.11ac, 80MHz, 1x1, GI =400ns) • 867.1 Mbps (MCS9) and 1082.9 Mbps (MCS11) (802.11ac, 80MHz, 2x2, GI =400ns) • 1300.7 Mbps (MCS9)1624.4 Mbps (MCS11) (802.11ac, 80MHz, 3x3, GI =400ns) • 1734.2 Mbps (MCS9) and 2165.8 Mbps (MCS11) (802.11ac, 80MHz, 4x4, GI =400ns) • 3468.4 Mbps (MCS9) and 4331.6 Mbps (MCS11) (802.11ac, 80MHz, 8x8, or 80MHz+80MHz/160MHz, 4x4, GI =400ns) • 480.4 Mbps (MCS9) and 600 Mbps (MCS11) (802.11ax, 80MHz, 1x1, MCS11, GI =800ns) • 960.7 Mbps (MCS9) and 1201 Mbps (MCS11) (802.11ax, 80MHz, 2x2, MCS11, GI =800ns) • 1441.2 Mbps (MCS9) and 1801.5 Mbps (MCS11) (802.11ax, 80MHz, 3x3, GI =800ns) • 1921.5 Mbps (MCS9) and 2401.9 Mbps (MCS11) (802.11ax, 80MHz, 4x4, GI =800ns) • 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 • all 0-31 MCS index for 802.11n • all 0-11 MCS index for 802.11ac/ax • 12-13 MCS index for 802.11ax on 5/6GHz (optional)
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	20MHz and 40MHz for 2.4GHz band; 20MHz, 40MHz, 80Mhz, and 160MHz for 5GHz and 6GHz bands
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: • 15.5dBM/MCS0(+-2dB tolerance) on 6GHz, 16dBm/MCS0 (+-2dB tolerance) on 5GHz band, and 16.5dBm/MCS0 (+-2dB tolerance) on 2.4GHz band • 8.5dBm/MCS11 (+-2dB) on 6GHz, 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 4 spatial streams on 2.4GHz, 5GHz, and 6GHz band
RX Sensitivity	Minimum receiver sensitivity level: -93 dBm (+-2dB tolerance) on 5GHz band Minimum receiver sensitivity level: -95 dBm (+-2dB tolerance) on 2.4GHz band Minimum receiver sensitivity level: -91 dBm (+-2dB tolerance) on 6GHz band
TX EVM	-42.5 dB (+-2dB tolerance) for -9.5 dBm TX power with MCS11 on 2.4GHz -40.5 dB (+-2dB tolerance) for -9.5dBm TX power with MCS11 on 5GHz -40 dB (+-2dB tolerance) for -9.5dBm TX power with MCS11 on 6GHz

WLAN and DFS NIC Technical Specifications

Channel and Frequency	**2.4GHz band** • 2.412 to 2.484 GHz: 1 to 14 **5GHz band** • 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 **6GHz band** **Total 59x 20MHz Channels** UNI5: 5925–6425 (24 x 20MHz): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93 UNI6: 6425–6525 (5 x 20MHz): 97,101,105,109,113 UNI7: 6525–6875 (18 x 20MHz): 117,121,125,129,133,137,141,145,149,153,157,161,165,169,173,177,181,185 UNI8: 6875–7125 (12 x 20MHz): 189,193,197,201,205,209,213,217,221,225, 229,233 **Total 29x 40MHz Channels** UNI5: 5925–6425 (12 x 40MHz): 3,11,19,27,35,43,51,59,67,75,83,91 UNI6: 6425–6525 (3 x 40MHz): 99,107,115 UNI7: 6525–6875 (9 x 40MHz): 123,131,139,147,155,163,171,179,187 UNI8: 6875–7125 (5 x 20MHz): 195,203,211,219,227 **Total 14x 80MHz Channels** UNI5: 5925–6425 (6 x 80MHz): 7,23,39,55,71,87 UNI6: 6425–6525 (2 x 80MHz): 103,119 UNI7: 6525–6875 (4 x 80MHz): 135,151,167,183 UNI8: 6875–7125 (2 x 80MHz): 199,215 **Total 7x 160MHz Channels** UNI5: 5925–6425 (3 x 160MHz): 15,47,79 UNI6: 6425–6525 (1 x 160MHz): 111 UNI7: 6525–6875 (2 x 160MHz): 143,175 UNI8: 6875–7125 (1 x 160MHz): 207
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, AKA', SIM, 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 • CE Mark Class A EN 55032:2012; EN 55024:2010; EN 61000-3-3:2013; EN 61000-3-2:2014 • UL 60950-1:2007 R10.14 • CAN/CSA-C22.2 NO.60950-1-07+A1:2011+A2:2014 • IEC 60950-1:2005 (Second Edition) + Am 1:2009 + Am 2:2013

Product Information

Description	Part Number
C50 4-Port 10G/5G/2.5G/1G/100M Copper, 802.11AX Wi-Fi 6E Tri-Band Wi-Fi NICs, 2.4GHZ/5GHZ/6GHz, DFS Radar Signal Emulation and Testing, and HW Timing	C50-KIT-11AX-8

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**

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