Radio Test Report

Model: C9120AXI-x
Cisco Catalyst C9120AX Series 802.11ax Access Point
5GHz Dedicated Radio

FCC ID: LDKVCVER1937

5250-5350 MHz

Against the following Specifications:

CFR47 Part 15.407

ACCREDITED

Cisco Systems
170 West Tasman Drive
San Jose, CA 95134

Authors: Chris Blair, Allan Beecroft **Tested By: Chris Blair, Allan Beecroft**	**Approved By:** Gez Thorpe **Title:** Radio Compliance Manager **Revision:** 2.0

This report replaces any previously entered test report under EDCS – **19196611.** This test report has been electronically authorized and archived using the CISCO Engineering Document Control system. Test Report Template EDCS# 1526149.

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Section 1: Overview

1.1 Test Summary

The samples were assessed against the tests detailed in section 3 under the requirements of the following specifications:

Specifications
CFR47 15.407

Section 2: Assessment Information

2.1 General

This report contains an assessment of an apparatus against Radio Standards based upon tests carried out on the samples submitted. The testing was performed by and for the use of Cisco systems Inc:

With regard to this assessment, the following points should be noted:

a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results due to production and measurement tolerances.

b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.

c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).

d) All testing was performed under the following environmental conditions:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%

2.2 Units of Measurement

The units of measurements defined in the appendices are reported in specific terms, which are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in units of [dBuV]

As an example, the basic calculation for all measurements is as follows:

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + Other correction factors [dB]

The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss and Filter Insertion Loss..

Note: to convert the results from dBuV/m to uV/m use the following formula:-

Level in uV/m = Common Antilogarithm [(X dBuV/m)/20] = Y uV/m

Measurement Uncertainty Values

voltage and power measurements	± 2 dB
conducted EIRP measurements	± 1.4 dB
radiated measurements	± 3.2 dB
frequency measurements	± 2.4 10-7
temperature measurements	± 0.54º.
humidity measurements	± 2.3%
DC and low frequency measurements	± 2.5%.

Where relevant measurement uncertainty levels have been estimated for tests performed on the apparatus. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Radiated emissions (expanded uncertainty, confidence interval 95%)

30 MHz - 300 MHz	+/- 3.8 dB
300 MHz - 1000 MHz	+/- 4.3 dB
1 GHz - 10 GHz	+/- 4.0 dB
10 GHz - 18GHz	+/- 8.2 dB
18GHz - 26.5GHz	+/- 4.1 dB
26.5GHz - 40GHz	+/- 3.9 dB

Conducted emissions (expanded uncertainty, confidence interval 95%)

30 MHz – 40GHz	+/- 0.38 dB

A product is considered to comply with a requirement if the nominal measured value is below the limit line. The product is considered to not be in compliance in case the nominal measured value is above the limit line.

2.3 Date of testing (initial sample receipt date to last date of testing)

22-JAN-2020 to 20-FEB-2020

2.4 Report Issue Date

Cisco uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.5 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.
125 West Tasman Drive (Building P)
San Jose, CA 95134
USA

Headquarters

Cisco Systems, Inc.,
170 West Tasman Drive
San Jose, CA 95134,
USA

Registration Numbers for Industry Canada

Cisco System Site	Address	Site Identifier
Building P, 10m Chamber	125 West Tasman Dr San Jose, CA 95134	Company #: 2461N-2
Building P, 5m Chamber	125 West Tasman Dr San Jose, CA 95134	Company #: 2461N-1
Building I, 5m Chamber	285 W. Tasman Drive San Jose, California 95134	Company #: 2461M-1
Building 7, 5m Chamber	425 E. Tasman Drive San Jose, California 95134	Company #: 2461N-3

Test Engineers

Chris Blair, Allan Beecroft

2.6 Equipment Assessed (EUT)

Model: C9120AXI-x, VE

2.7 EUT Description

802.11ax Access Point with Dual 4x4 MIMO with 4 Spatial Streams

The EUT 5GHz dedicated radio supports the following modes of operation. The modes are further defined in the radio Theory of Operation. The modes included in this report represent the worst case data for all modes. Data is recorded at the lowest supported data rate for each mode.

802.11a - Non HT20, One Antenna, 6 to 54 Mbps, 1ss
802.11a - Non HT20, Two Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT20, Three Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT20, Four Antennas, 6 to 54 Mbps, 1ss

802.11a - Non HT20 Beam Forming, Two Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT20 Beam Forming, Three Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT20 Beam Forming, Four Antennas, 6 to 54 Mbps, 1ss

802.11n/ac - HT/VHT20, One Antenna, M0 to M7, 1ss
802.11n/ac - HT/VHT20, Two Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT20, Two Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT20, Three Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT20, Three Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT20, Three Antennas, M16 to M23, 3ss
802.11n/ac - HT/VHT20, Four Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT20, Four Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT20, Four Antennas, M16 to M23, 3ss
802.11n/ac - HT/VHT20, Four Antennas, M24 to M31, 4ss

802.11n/ac - HT/VHT20 Beam Forming, Two Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT20 Beam Forming, Two Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT20 Beam Forming, Three Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT20 Beam Forming, Three Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT20 Beam Forming, Three Antennas, M16 to M23, 3ss
802.11n/ac - HT/VHT20 Beam Forming, Four Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT20 Beam Forming, Four Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT20 Beam Forming, Four Antennas, M16 to M23, 3ss
802.11n/ac - HT/VHT20 Beam Forming, Four Antennas, M24 to M31, 4ss

802.11n/ac - HT/VHT20 STBC, Two Antennas, M0 to M7, 2ss
802.11n/ac - HT/VHT20 STBC, Three Antennas, M0 to M7, 2ss
802.11n/ac - HT/VHT20 STBC, Four Antennas, M0 to M7, 2ss

802.11ax - HE20, One Antenna, M0 to M9 1ss

802.11ax - HE20, Two Antennas, M0 to M9 1ss
802.11ax - HE20, Two Antennas, M0 to M9 2ss
802.11ax - HE20, Three Antennas, M0 to M9 1ss
802.11ax - HE20, Three Antennas, M0 to M9 2ss
802.11ax - HE20, Three Antennas, M0 to M9 3ss
802.11ax - HE20, Four Antennas, M0 to M9 1ss
802.11ax - HE20, Four Antennas, M0 to M9 2ss
802.11ax - HE20, Four Antennas, M0 to M9 3ss
802.11ax - HE20, Four Antennas, M0 to M9 4ss

802.11ax - HE20 Beam Forming, Two Antennas, M0 to M9 1ss
802.11ax - HE20 Beam Forming, Two Antennas, M0 to M9 2ss
802.11ax - HE20 Beam Forming, Three Antennas, M0 to M9 1ss
802.11ax - HE20 Beam Forming, Three Antennas, M0 to M9 2ss
802.11ax - HE20 Beam Forming, Three Antennas, M0 to M9 3ss
802.11ax - HE20 Beam Forming, Four Antennas, M0 to M9 1ss
802.11ax - HE20 Beam Forming, Four Antennas, M0 to M9 2ss
802.11ax - HE20 Beam Forming, Four Antennas, M0 to M9 3ss
802.11ax - HE20 Beam Forming, Four Antennas, M0 to M9 4ss

802.11ax - HE20 STBC, Two Antennas, M0 to M9 2ss
802.11ax - HE20 STBC, Three Antennas, M0 to M9 2ss
802.11ax - HE20 STBC, Four Antennas, M0 to M9 2ss

802.11a - Non HT40, One Antenna, 6 to 54 Mbps, 1ss
802.11a - Non HT40, Two Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT40, Three Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT40, Four Antennas, 6 to 54 Mbps, 1ss

802.11n/ac - HT/VHT40, One Antenna, M0 to M7, 1ss
802.11n/ac - HT/VHT40, Two Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT40, Two Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT40, Three Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT40, Three Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT40, Three Antennas, M16 to M23, 3ss
802.11n/ac - HT/VHT40, Four Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT40, Four Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT40, Four Antennas, M16 to M23, 3ss
802.11n/ac - HT/VHT40, Four Antennas, M24 to M31, 4ss

802.11n/ac - HT/VHT40 Beam Forming, Two Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT40 Beam Forming, Two Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT40 Beam Forming, Three Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT40 Beam Forming, Three Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT40 Beam Forming, Three Antennas, M16 to M23, 3ss
802.11n/ac - HT/VHT40 Beam Forming, Four Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT40 Beam Forming, Four Antennas, M8 to M15, 2ss

802.11n/ac - HT/VHT40 Beam Forming, Four Antennas, M16 to M23, 3ss
802.11n/ac - HT/VHT40 Beam Forming, Four Antennas, M24 to M31, 4ss

802.11n/ac - HT/VHT40 STBC, Two Antennas, M0 to M7, 2ss
802.11n/ac - HT/VHT40 STBC, Three Antennas, M0 to M7, 2ss
802.11n/ac - HT/VHT40 STBC, Four Antennas, M0 to M7, 2ss

802.11ax - HE40, One Antenna, M0 to M9 1ss
802.11ax - HE40, Two Antennas, M0 to M9 1ss
802.11ax - HE40, Two Antennas, M0 to M9 2ss
802.11ax - HE40, Three Antennas, M0 to M9 1ss
802.11ax - HE40, Three Antennas, M0 to M9 2ss
802.11ax - HE40, Three Antennas, M0 to M9 3ss
802.11ax - HE40, Four Antennas, M0 to M9 1ss
802.11ax - HE40, Four Antennas, M0 to M9 2ss
802.11ax - HE40, Four Antennas, M0 to M9 3ss
802.11ax - HE40, Four Antennas, M0 to M9 4ss

802.11ax - HE40 Beam Forming, Two Antennas, M0 to M9 1ss
802.11ax - HE40 Beam Forming, Two Antennas, M0 to M9 2ss
802.11ax - HE40 Beam Forming, Three Antennas, M0 to M9 1ss
802.11ax - HE40 Beam Forming, Three Antennas, M0 to M9 2ss
802.11ax - HE40 Beam Forming, Three Antennas, M0 to M9 3ss
802.11ax - HE40 Beam Forming, Four Antennas, M0 to M9 1ss
802.11ax - HE40 Beam Forming, Four Antennas, M0 to M9 2ss
802.11ax - HE40 Beam Forming, Four Antennas, M0 to M9 3ss
802.11ax - HE40 Beam Forming, Four Antennas, M0 to M9 4ss

802.11ax - HE40 STBC, Two Antennas, M0 to M9 2ss
802.11ax - HE40 STBC, Three Antennas, M0 to M9 2ss
802.11ax - HE40 STBC, Four Antennas, M0 to M9 2ss

802.11a - Non HT80, One Antenna, 6 to 54 Mbps, 1ss
802.11a - Non HT80, Two Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT80, Three Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT80, Four Antennas, 6 to 54 Mbps, 1ss

802.11ac - VHT80, One Antenna, M0 to M9 1ss
802.11ac - VHT80, Two Antennas, M0 to M9 1ss
802.11ac - VHT80, Two Antennas, M0 to M9 2ss
802.11ac - VHT80, Three Antennas, M0 to M9 1ss
802.11ac - VHT80, Three Antennas, M0 to M9 2ss
802.11ac - VHT80, Three Antennas, M0 to M9 3ss
802.11ac - VHT80, Four Antennas, M0 to M9 1ss
802.11ac - VHT80, Four Antennas, M0 to M9 2ss
802.11ac - VHT80, Four Antennas, M0 to M9 3ss

802.11ac - VHT80, Four Antennas, M0 to M9 4ss

802.11ac - VHT80 Beam Forming, Two Antennas, M0 to M9 1ss
802.11ac - VHT80 Beam Forming, Two Antennas, M0 to M9 2ss
802.11ac - VHT80 Beam Forming, Three Antennas, M0 to M9 1ss
802.11ac - VHT80 Beam Forming, Three Antennas, M0 to M9 2ss
802.11ac - VHT80 Beam Forming, Three Antennas, M0 to M9 3ss
802.11ac - VHT80 Beam Forming, Four Antennas, M0 to M9 1ss
802.11ac - VHT80 Beam Forming, Four Antennas, M0 to M9 2ss
802.11ac - VHT80 Beam Forming, Four Antennas, M0 to M9 3ss
802.11ac - VHT80 Beam Forming, Four Antennas, M0 to M9 4ss

802.11ac - VHT80 STBC, Two Antennas, M0 to M9 2ss
802.11ac - VHT80 STBC, Three Antennas, M0 to M9 2ss
802.11ac - VHT80 STBC, Four Antennas, M0 to M9 2ss

802.11ax - HE80, One Antenna, M0 to M9 1ss
802.11ax - HE80, Two Antennas, M0 to M9 1ss
802.11ax - HE80, Two Antennas, M0 to M9 2ss
802.11ax - HE80, Three Antennas, M0 to M9 1ss
802.11ax - HE80, Three Antennas, M0 to M9 2ss
802.11ax - HE80, Three Antennas, M0 to M9 3ss
802.11ax - HE80, Four Antennas, M0 to M9 1ss
802.11ax - HE80, Four Antennas, M0 to M9 2ss
802.11ax - HE80, Four Antennas, M0 to M9 3ss
802.11ax - HE80, Four Antennas, M0 to M9 4ss

802.11ax - HE80 Beam Forming, Two Antennas, M0 to M9 1ss
802.11ax - HE80 Beam Forming, Two Antennas, M0 to M9 2ss
802.11ax - HE80 Beam Forming, Three Antennas, M0 to M9 1ss
802.11ax - HE80 Beam Forming, Three Antennas, M0 to M9 2ss
802.11ax - HE80 Beam Forming, Three Antennas, M0 to M9 3ss
802.11ax - HE80 Beam Forming, Four Antennas, M0 to M9 1ss
802.11ax - HE80 Beam Forming, Four Antennas, M0 to M9 2ss
802.11ax - HE80 Beam Forming, Four Antennas, M0 to M9 3ss
802.11ax - HE80 Beam Forming, Four Antennas, M0 to M9 4ss

802.11ax - HE80 STBC, Two Antennas, M0 to M9 2ss
802.11ax - HE80 STBC, Three Antennas, M0 to M9 2ss
802.11ax - HE80 STBC, Four Antennas, M0 to M9 2ss

802.11a - Non HT160, One Antenna, 6 to 54 Mbps, 1ss
802.11a - Non HT160, Two Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT160, Three Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT160, Four Antennas, 6 to 54 Mbps, 1ss

802.11ac - VHT160, One Antenna, M0 to M9 1ss

802.11ac - VHT160, Two Antennas, M0 to M9 1ss
802.11ac - VHT160, Two Antennas, M0 to M9 2ss
802.11ac - VHT160, Three Antennas, M0 to M9 1ss
802.11ac - VHT160, Three Antennas, M0 to M9 2ss
802.11ac - VHT160, Three Antennas, M0 to M9 3ss
802.11ac - VHT160, Four Antennas, M0 to M9 1ss
802.11ac - VHT160, Four Antennas, M0 to M9 2ss
802.11ac - VHT160, Four Antennas, M0 to M9 3ss
802.11ac - VHT160, Four Antennas, M0 to M9 4ss

802.11ac - VHT160 Beam Forming, Two Antennas, M0 to M9 1ss
802.11ac - VHT160 Beam Forming, Two Antennas, M0 to M9 2ss
802.11ac - VHT160 Beam Forming, Three Antennas, M0 to M9 1ss
802.11ac - VHT160 Beam Forming, Three Antennas, M0 to M9 2ss
802.11ac - VHT160 Beam Forming, Three Antennas, M0 to M9 3ss
802.11ac - VHT160 Beam Forming, Four Antennas, M0 to M9 1ss
802.11ac - VHT160 Beam Forming, Four Antennas, M0 to M9 2ss
802.11ac - VHT160 Beam Forming, Four Antennas, M0 to M9 3ss
802.11ac - VHT160 Beam Forming, Four Antennas, M0 to M9 4ss

802.11ac - VHT160 STBC, Two Antennas, M0 to M9 2ss
802.11ac - VHT160 STBC, Three Antennas, M0 to M9 2ss
802.11ac - VHT160 STBC, Four Antennas, M0 to M9 2ss

802.11ax - HE160, One Antenna, M0 to M9 1ss
802.11ax - HE160, Two Antennas, M0 to M9 1ss
802.11ax - HE160, Two Antennas, M0 to M9 2ss
802.11ax - HE160, Three Antennas, M0 to M9 1ss
802.11ax - HE160, Three Antennas, M0 to M9 2ss
802.11ax - HE160, Three Antennas, M0 to M9 3ss
802.11ax - HE160, Four Antennas, M0 to M9 1ss
802.11ax - HE160, Four Antennas, M0 to M9 2ss
802.11ax - HE160, Four Antennas, M0 to M9 3ss
802.11ax - HE160, Four Antennas, M0 to M9 4ss

802.11ax - HE160 Beam Forming, Two Antennas, M0 to M9 1ss
802.11ax - HE160 Beam Forming, Two Antennas, M0 to M9 2ss
802.11ax - HE160 Beam Forming, Three Antennas, M0 to M9 1ss
802.11ax - HE160 Beam Forming, Three Antennas, M0 to M9 2ss
802.11ax - HE160 Beam Forming, Three Antennas, M0 to M9 3ss
802.11ax - HE160 Beam Forming, Four Antennas, M0 to M9 1ss
802.11ax - HE160 Beam Forming, Four Antennas, M0 to M9 2ss
802.11ax - HE160 Beam Forming, Four Antennas, M0 to M9 3ss
802.11ax - HE160 Beam Forming, Four Antennas, M0 to M9 4ss

802.11ax - HE160 STBC, Two Antennas, M0 to M9 2ss
802.11ax - HE160 STBC, Three Antennas, M0 to M9 2ss

802.11ax - HE160 STBC, Four Antennas, M0 to M9 2ss

The following antennas are supported by this product series.
The data included in this report represent the worst case data for all antennas.

Frequency	Part Number	Antenna Type	Antenna Gain (dBi)
5GHz	-	Internal, Dual-band, VPOL, Omni-directional	5

Section 3: Result Summary

3.1 Results Summary Table

Conducted emissions

Basic Standard	Technical Requirements / Details	Result
15.407	**99% & 26 dB Bandwidth**: The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. There is no limit for 99% OBW. The 26 dB emission is the width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.	Not Tested
15.407	**Output Power**: For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	Not Tested
15.407	**Power Spectral Density** The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	Not Tested
15.407	**Conducted Spurious Emissions / Band-Edge**: 2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.	Not Tested
15.407 15.205 15.209	**Restricted band**: Unwanted emissions must comply with the general field strength limits set forth in §15.209.	Not Tested

Radiated Emissions (General requirements)

Basic Standard	Technical Requirements / Details	Result
15.407 15.205 15.209	**TX Spurious Emissions:** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the field strength limits table in this section.	Pass
15.207	**AC conducted Emissions:** U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.	Not Tested

Section 4: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing. Please also refer to the "Justification for worst Case test Configuration" section of this report for further details on the selection of EUT samples.

4.1 Sample Details

Sample No.	Equipment Details	Maker	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	C9120AXI-B	Foxconn (for Cisco)	800-106693-01	Radio FW ver. : 14948.14801. r39245 39245	Cisco AP Software, (ap1g7), [cheetah-build6:/san2/BUILD/ workspace/Nightly-Cheetah-axel-bcm-mfg-c8_10_throttle] Compiled Mon Jan 27 08:40:01 PST 2020	FOC23447WF2
S02	AIR-PWRINJ6	Microsemi (for Cisco)	V01	NA	NA	C1617666300000860

4.2 System Details

System #	Description	Samples
1	EUT+power source for RSE test	S01+S02

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmitting	

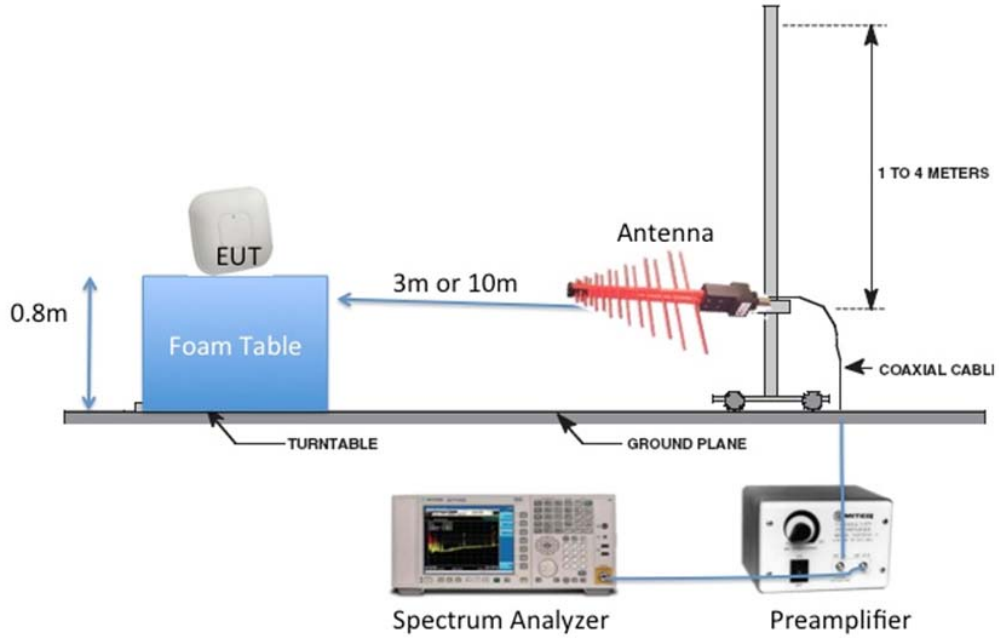
Appendix A: RF Conducted Test Results

RF conducted tests are not covered by this report.

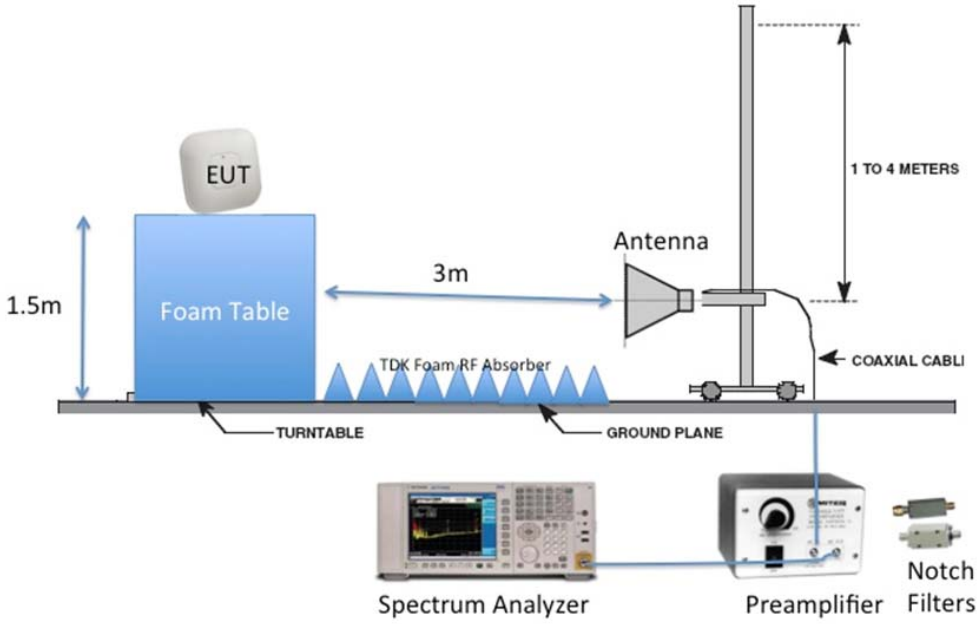
Appendix B: Emission Test Results

Testing Laboratory: Cisco Systems, Inc., 125 West Tasman Drive, San Jose, CA 95134, USA

Radiated Emission Setup Diagram-Below 1G



Radiated Emission Setup Diagram-Above 1G



B.1 Radiated Spurious Emissions

Radiated Spurious Emissions Test Requirement

15.407 (b) *Undesirable emission limits.* Except as shown in paragraph (b) (7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

15.205 / 15.209

(7) The provisions of 15.205 apply to intentional radiators operating under this section.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209.

Test Procedure

Ref. ANSI C63.10: 2013 section 12.7.6 (peak) & 12.7.7.3 (average)

Radiated Spurious Emissions Test parameters	
Peak	**Average**
Span = 1-18GHz /18GHz-26.5GHz/26.5GHz-40GHz RBW = 1 MHz VBW ≥ 3 MHz Sweep = Auto couple Detector = Peak Trace = Max Hold.	Span = 1-18GHz /18GHz-26.5GHz/26.5GHz-40GHz RBW = 1 MHz VBW ≥ 3 MHz Sweep = Auto couple Detector = RMS Power Averaging

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Terminate the access Point RF ports with 50 ohm loads.
Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

Save 2 plots: 1) Average plot (Vertical and Horizontal), Limit= 54dBuV/m @3m
2) Peak plot (Vertical and Horizontal), Limit = 74dBuV/m @3m

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance.
Also measure any emissions in the restricted bands.

This report represents the worst case data for all supported operating modes and antennas.

Samples, Systems, and Modes

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☑	☐
	Support	S02	☐	☑

Tested By : Chris Blair & Allan Beecroft	**Date of testing: February 2-20, 2020**
Test Result : PASS	

See Appendix C for list of test equipment

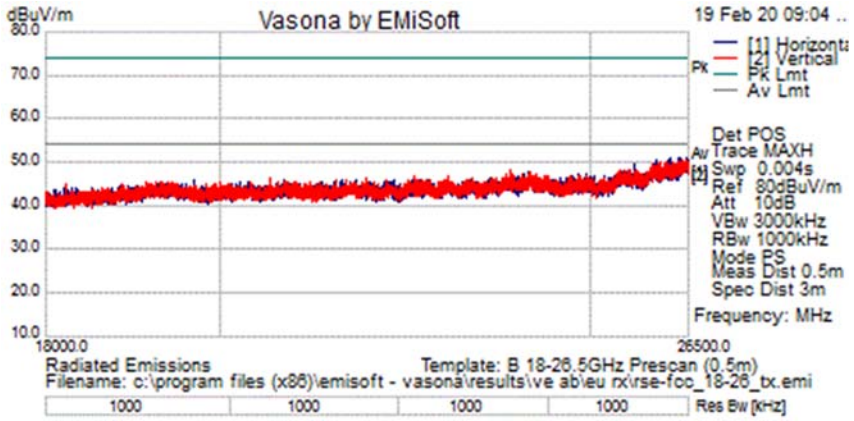
Transmitter Radiated Spurious Emissions
B.1.A Transmitter Radiated Spurious Emissions-Average

Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5260	NonHT20	6	48.70	**<54**	5.30
	HE20	m0h1	47.15	**<54**	6.85
5300	**NonHT20**	**6**	**51.94**	**<54**	**2.06**
	HE20	m0h1	49.35	**<54**	4.65
5320	NonHT20	6	50.29	**<54**	3.71
	HE20	m0h1	47.46	**<54**	6.54
5270	NonHT40	6	49.02	**<54**	4.98
	HE40	m0h1	47.91	**<54**	6.09
5310	NonHT40	6	50.12	**<54**	3.88
	HE40	m0h1	49.24	**<54**	4.76
5290	NonHT80	6	49.02	**<54**	4.98
	HE80	m0h1	47.73	**<54**	6.27
5250	NonHT160	6	49.06	**<54**	4.94
	HE160	m0h1	45.58	**<54**	8.42

Note: Formal average measurements not required for 1-10GHz, because peak emissions were under the average limit. See section B.1.P.

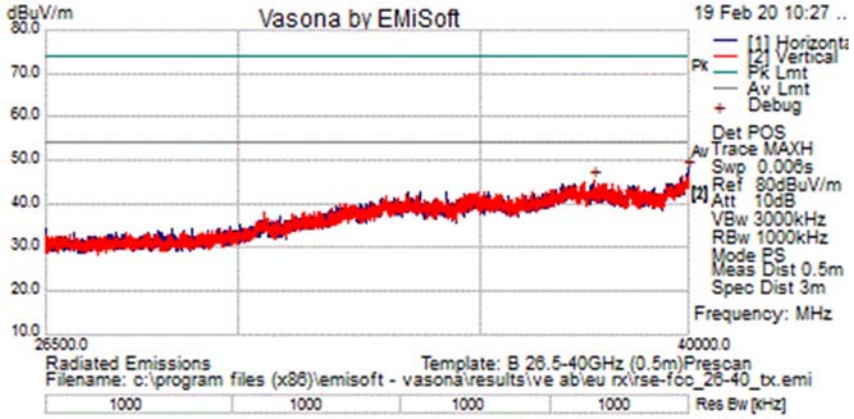
B.1.A.1 Radiated Transmitter Spurs, *5300 MHz, HT20* , Average (10-18GHz)

B.1.A.2 Radiated Transmitter Spurs, Peak and Average (18-26.5GHz)



All emissions were below the average limit when measured using a peak detector. There were no emissions within 20dB of the peak limit.

B.1.A.3 Radiated Transmitter Spurs, All rate, All modes, Peak (26.5-40GHz)



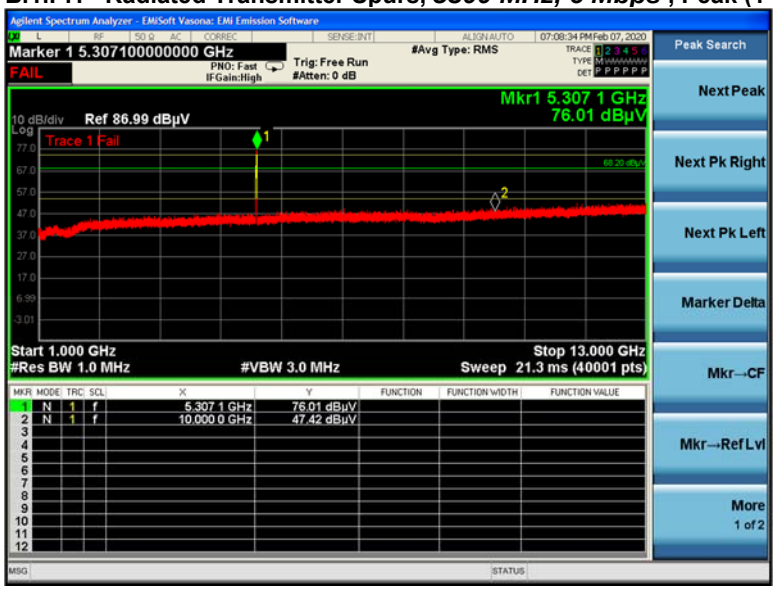
All emissions were below the average limit when measured using a peak detector. There were no emissions within 20dB of the peak limit.

B.1.P Transmitter Radiated Spurious Emissions-Peak

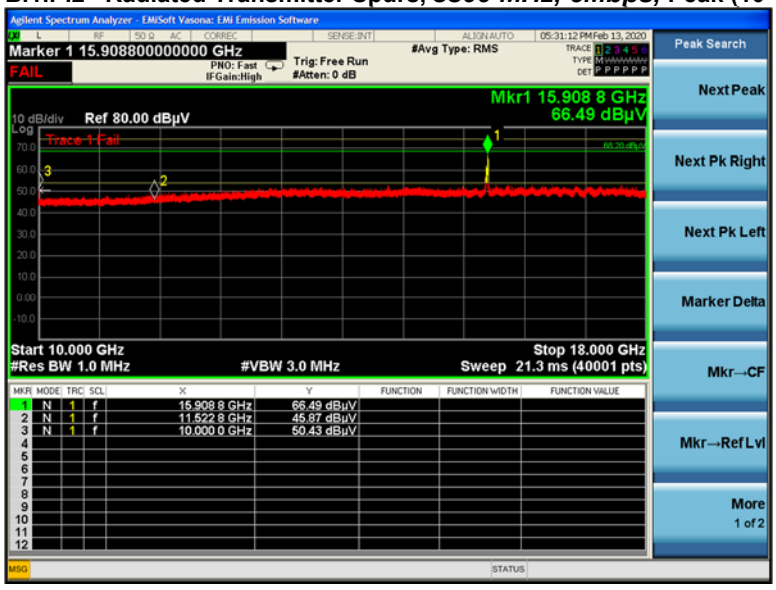
Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)*	Margin (dB)
5260	NonHT20	6	65.04	**<68.2**	3.16
	HE20	m0h1	59.59	**<68.2**	8.61
5300	**NonHT20**	**6**	**66.49**	**<68.2**	**1.71**
	HE20	m0h1	61.77	**<68.2**	6.43
5320	NonHT20	6	63.66	**<68.2**	4.54
	HE20	m0h1	61.36	**<68.2**	6.84
5270	NonHT40	6	62.07	**<68.2**	6.13
	HE40	m0h1	58.65	**<68.2**	9.55
5310	NonHT40	6	63.74	**<68.2**	4.46
	HE40	m0h1	61.93	**<68.2**	6.27
5290	NonHT80	6	63.09	**<68.2**	5.11
	HE80	m0h1	59.78	**<68.2**	8.42
5250	NonHT160	6	60.74	**<68.2**	7.46
	HE160	m0h1	58.72	**<68.2**	9.48

***The peak limit for emissions in the Restricted Band = 74dBuV/m, with additional average limit = 54dBuV/m.**
The peak limit for emissions in the Non-Restricted Band = 68.2dBuV/m, with no additional average limit.
The limit in this column reflects the worst-case peak limit, to cover all emission frequencies.

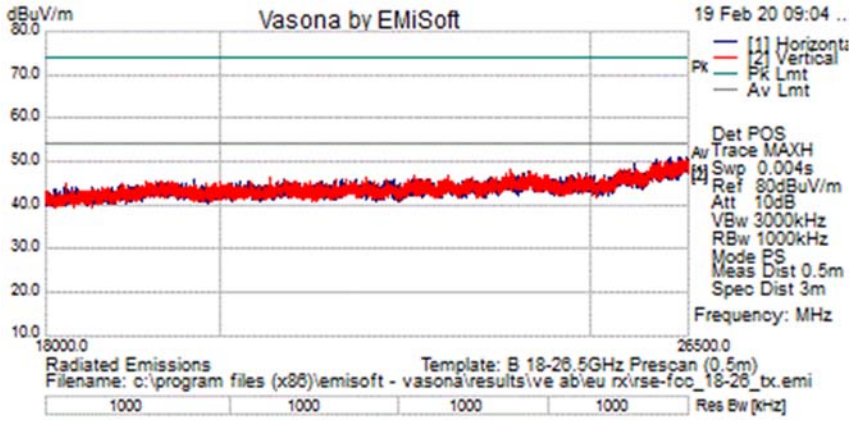
B.1.P.1 Radiated Transmitter Spurs, *5300 MHz, 6 Mbps* , Peak (1-10GHz)



B.1.P.2 Radiated Transmitter Spurs, *5300 MHz, 6Mbps*, Peak (10-18GHz)

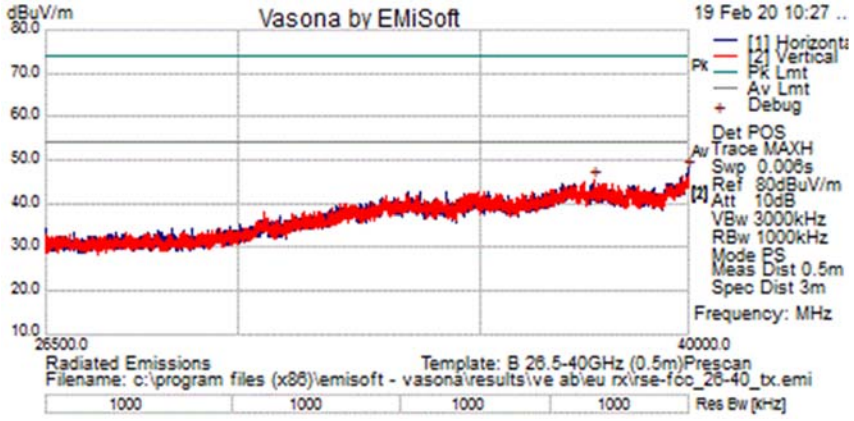


B.1.P.3 Radiated Transmitter Spurs, Peak and Average (18-26.5GHz)



All emissions were below the average limit when measured using a peak detector. There were no emissions within 20dB of the peak limit.

B.1.P.4 Radiated Transmitter Spurs, All rate, All modes, Peak (26.5-40GHz)



All emissions were below the average limit when measured using a peak detector. There were no emissions within 20dB of the peak limit.

B.2 Radiated Emissions 30MHz to 1GHz

15.205 / 15.209

(**7)** The provisions of §15.205 apply to intentional radiators operating under this section.
(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

Ref. ANSI C63.10: 2013 section 6.5

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	30MHz – 1GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	100kHz
Video Bandwidth:	300kHz
Detector:	Peak for Pre-scan, Quasi-Peak
.	Compliance shall be determined using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

Terminate the access Point RF ports with 50 ohm loads.

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

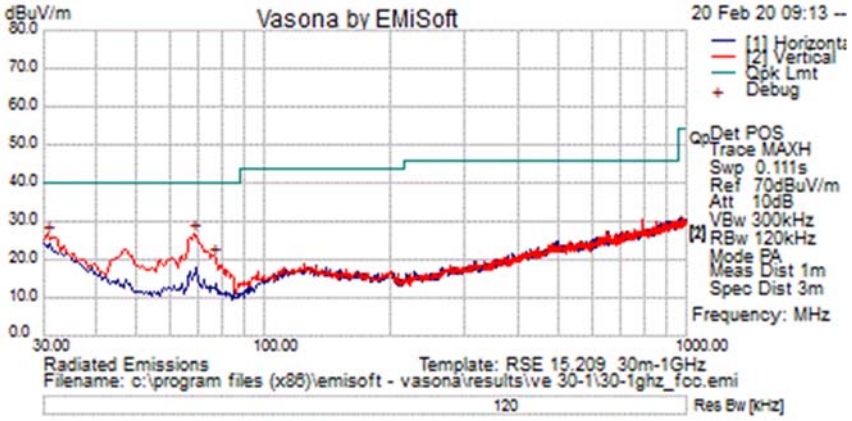
This report represents the worst case data for all supported operating modes and antennas.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☑	☐
	Support	S02	☐	☑

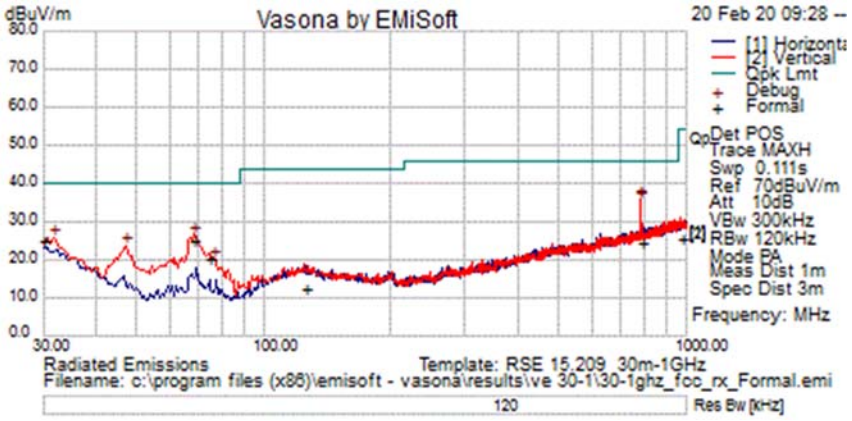
Tested By :	Date of testing:
Allan Beecroft	20-FEB-2020
Test Result : PASS	

See Appendix C for list of test equipment

Transmitter Radiated Emission



Receiver Radiated Emission



Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail	Comments
1	30.000	12.8	.5	11.7	25.0	Quasi Peak	V	99	-3	40.0	-15.0	Pass	
2	68.372	25.7	.8	-1.4	25.1	Quasi Peak	V	261	363	40.0	-14.9	Pass	
3	787.111	10.1	2.8	11.9	24.7	Quasi Peak	H	99	363	46.0	-21.3	Pass	Cell frequency
4	74.441	20.9	.8	-1.6	20.1	Quasi Peak	V	153	-3	40.0	-19.9	Pass	
5	977.875	9.2	3.1	13.6	25.8	Quasi Peak	H	361	-3	54.0	-28.2	Pass	
6	124.999	7.0	1.1	4.5	12.6	Quasi Peak	H	99	-3	43.5	-30.9	Pass	

B.3 AC Conducted Emissions

AC conducted tests are not covered by this report.

Appendix C: List of Test Equipment Used to perform the test

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due	Test Item
Test Equipment used for Radiated Emissions, 1-18GHz					
41201	ETS/Lindgren 3117	Double Ridged Horn Antenna	27 Aug 2019	27 Aug 2020	B.1
45096	Cisco TH0118	Mast Mount Preamplifier Array, 1-18GHz	29 Oct 2019	29 Oct 2020	B.1
38375	Cisco TH0118-PS	Power Supply for TH0118 1-18GHz Preamplifier	NA	NA	B.1
37237	JFW 50CB-015	GPIB control box	NA	NA	B.1
41202	ETS/Lindgren 3117	Double Ridged Horn Antenna	15 Feb 2019	15 Feb 2020	B.1
56066	Miteq TTA1800-30-HG-S	18GHz SMA Pre-Amplifier	20 May 2019	20 May 2020	B.1
56060	Miteq TTA1800-30-HG	SMA 18GHz Pre Amplifier	08 Apr 2019	08 Apr 2020	B.
47286	H+S Sucoflex 102E	40GHz Cable K Connector	05 Sep 2019	05 Sep 2020	B.1
35040	Micro-Tronics HPM50112-02	Notch Filter	27 Jun 2019	27 Jun 2020	B.1
51802	H+S Sucoflex 102PE	40 GHz Cable, K-Type	23 Dec 2019	23 Dec 2020	B.1
49563	H+S Sucoflex 106A	Coaxial Cable, 8m	12 Aug 2019	12 Aug 2020	B.1, B.2
21117	Micro-coax UFB311A-0-2484-520520	Coaxial Cable-18Ghz	12 Aug 2019	12 Aug 2020	B.1, B.2
56155	H+S Sucoflex 104PEA	Sucoflex N Type blue 7ft cable	13 Jan 2020	13 Jan 2021	B.1, B.2
47300	Keysight N9038A	EMI Receiver	29 May 2019	29 May 2020	B.1, B.2
34075	Schaffner RSG 2000	Reference Spectrum Generator, 1-18GHz	NA	NA	B.1
4883	EMCO 3115	Horn antenna	NA	NA	B.1
8171	Keysight 8491B Opt 010	Attenuator	23 Apr 2019	23 Apr 2020	B.1
35242	Klein tools 926-8ME	8m measurement tape	NA	NA	B.1, B.2
40597	Cisco Above 1GHz Site Cal	1GHz Cispr Site Verification	27 Sep 2019	27 Sep 2020	B.1
8448	Cisco NSA Cal	NSA/chamber	26 Sep 2019	26 Sep 2020	B.1, B.2

58225	Comet T7611-4	WEB SENSOR FOR REMOTE THERMOMETER HYGROMETER	20 Aug 2019	20 Aug 2020	B.1, B.2
56328	Pasternack PE5019-1	Torque wrench	25 Feb 2020	25 Feb 2021	B.1
56330	Pasternack PE5019-1	Torque wrench	02 Mar 2020	02 Mar 2021	B.1
33040	Fluke 175	True RMS Multimeter	04 Sep 2019	04 Sep 2020	B.1, B.2

Test Equipment used for Radiated Emissions, 18-40GHz					
CIS040597	CISCO Above 1GHz Site Cal	1GHz Cispr Site Verification	27 Sep 2019	27 Sep 2020	B.1.A.2, B.1.A.3, B.1.P.3, B.1.P.4, B.2.3, B.2.4
CIS45166	STANLEY 33-428	26' Tape Measure	Cal Not Required	Cal Not Required	B.1.A.2, B.1.A.3, B.1.P.3, B.1.P.4, B.2.3, B.2.4
CIS54235	PASTERNACK PE5011-1	PRESET TORQUE WRENCH, 8 IN/LBS	28 Feb 2019	28 Feb 2020	B.1.A.2, B.1.A.3, B.1.P.3, B.1.P.4, B.2.3, B.2.4
CIS41979	CISCO 1840	18-40GHz EMI Test Head/Verification Fixture	09 Apr 2019	09 Apr 2020	B.1.A.2, B.1.A.3, B.1.P.3, B.1.P.4, B.2.3, B.2.4
58225	Comet T7611-4	WEB SENSOR FOR REMOTE THERMOMETER HYGROMETER	20 Aug 2019	20 Aug 2020	B.1.A.2, B.1.A.3, B.1.P.3, B.1.P.4, B.2.3, B.2.4
CIS5972	Keysight (Agilent/HP) 83712B	SYNTHESIZED CW GENERATOR	Cal Not Required	Cal Not Required	B.1.A.2, B.1.A.3, B.1.P.3, B.1.P.4, B.2.3, B.2.4
CIS44940	ROHDE & SCHWARZ ESU40	EMI RECEIVER, 40GHZ	18 Dec 2019	18 Dec 2020	B.1.A.2, B.1.A.3, B.1.P.3, B.1.P.4, B.2.3, B.2.4

CIS37236	JFW 50CB-015	Control Box, GPIB	Cal Not Required	Cal Not Required	B.1.A.2, B.1.A.3, B.1.P.3, B.1.P.4, B.2.3, B.2.4
30MHz to 1GHz					
CIS008448	NSA 5m Chamber Cisco	NSA 5m Chamber	26-SEP-19	26-SEP-20	B3
CIS047300	Keysight N9038A	MXE EMI Receiver	29-MAY-2019	29-MAY-2020	B3
CIS030654	JB1 Sunol Sciences	Combination Antenna, 30MHz-2GHz	05 Jun 2019	05 Jun 2020	B3
CIS021117	MICRO-COAX UFB311A-0-2484-520520	Coaxial Cable-18Ghz	12 Aug 2019	12 Aug 2020	B3
CIS 56157	HUBER + SUHNER Sucoflex 104PEA	Sucoflex N Type blue 7ft cable	13 Jan 2020	13 Jan 2021	B3
58225	Comet T7611-4	WEB SENSOR FOR REMOTE THERMOMETER HYGROMETER	20 Aug 2019	20 Aug 2020	B3
CIS49563	HUBER + SUHNER Sucoflex 106A	Coaxial Cable, 8m	12 Aug 2019	12 Aug 2020	B3
CIS45166	STANLEY 33-428	26' Tape Measure	Cal Not Required	Cal Not Required	B3
CIS27233	YORK VNE V	Comparison Noise Emitter	Cal Not Required	Cal Not Required	B3
CIS54235	PASTERNACK PE5011-1	PRESET TORQUE WRENCH, 8 IN/LBS	28 Feb 2019	28 Feb 2020	B3

Appendix D: Abbreviation Key and Definitions

The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz ($1x10^3$)
EN	European Norm	MHz	MegaHertz ($1x10^6$)
IEC	International Electro technical Commission	GHz	Gigahertz ($1x10^9$)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt ($1x10^3$)
L1	Line 1	µV	Microvolt ($1x10^{-6}$)
L2	Line2	A	Amp
L3	Line 3	µA	Micro Amp ($1x10^{-6}$)
DC	Direct Current	mS	Milli Second ($1x10^{-3}$)
RAW	Uncorrected measurement value, as indicated by the measuring device	µS	Micro Second ($1x10^{-6}$)
RF	Radio Frequency	µS	Micro Second ($1x10^{-6}$)
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
P	Power Line	L	Live Line
N	Neutral Line	R	Return
S	Supply	AC	Alternating Current

Appendix E: Photographs of Test Setups

Please refer to the attachment

Appendix F: Software Used to Perform Testing

EMIsoft Vasona, version 6.047 & 6.071

Appendix G:Test Procedures

Measurements were made in accordance with

- KDB 789033 - D02 General UNII Test Procedures New Rules v02r01
- KDB 662911 - MIMO
- ANSI C63.4 2014 Unintentional Radiators
- ANSI C63.10 2013 Intentional Radiators

Test procedures are summarized below:

FCC 5GHz Test Procedures	EDCS # 1445048
FCC 5GHz RSE Test Procedures	EDCS # 1511600

Appendix H: Scope of Accreditation (A2LA certificate number 1178-01)

The scope of accreditation of Cisco Systems, Inc. can be found on the A2LA web page at:

http://www.a2la.org/scopepdf/1178-01.pdf

Appendix I: Test Assessment Plan

Compliance Test Plan: EDCS:16915207

Target Power Tables EDCS# 16415414

END