5470-5725MHz Formal Test Report for
IW9165E-B & IW9165E-ROW for 160MHz BW (5570MHz)

Supports

BLE/4.9GHz/ 5GHz 802.11 a/ac/ax/n Wi-Fi radio

FCC ID: LDKIW9165E

Against the following Specifications:

47 CFR 15.205

47 CFR 15.209

47 CFR 15.407

A2LA ACCREDITED
CERTIFICATE #1178.01

Cisco Systems, Inc.
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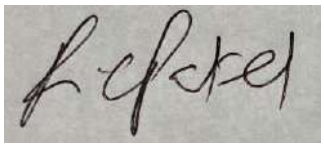	
Author: Ronak Patel **Tested By:** Ronak Patel	**Approved By:** Adam Walb **Title:** Compliance Manager **Revision:** 1.0

This report replaces any previously entered test report under **EDCS # 24696727.** This test report has been electronically authorized and archived using the CISCO Engineering Document Control system. Test Report Template EDCS# 11644120.

Section 1: Overview

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

Specifications:
CFR47 Part 15.407 LP0002:2020

Section 2: Assessment Information

2.1: General

This report contains an assessment of an apparatus against Electromagnetic Compatibility 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	860 mbar to 1060 mbar (25.4" to 31.3")
Humidity	10% to 75*%

e) All AC testing was performed at one or more of the following supply voltages:

110V 60 Hz (+/-20%)

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 – 40 GHz	± 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.

2.2: Date of testing

11/08/2023 – 11/10/2023

2.3: Report Issue Date

8/3/2023 – 1.0 VERSION
1/1/2024 – 1.1 VERSION

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.

2.4: Testing facilities

This assessment was performed by: NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties: NCC (National Communications Commission) APEC Tel MRA – Phase I.

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Registration Number

Cisco System Site	Address	Site Identifier
Building P, 10m Chamber	125 West Tasman Dr San Jose, CA 95134	Company #: 2461A

Test Engineer(s):

Ronak Patel

2.5: Equipment Assessed (EUT)

IW9165E-B

2.6: EUT Description

RF General Information			
Evaluation Mode	**Frequency Range (MHz)**	**Operating Frequency (MHz)**	**Modulation Type**
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5250 5250-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
4.9GHz WLAN	4940-4990	4945-4985	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Bluetooth	2400-2483.5	2402-2480	LE: GFSK

R1		-	V (AP: 20/40/80) (P2P/P2MP: 20/40/80)	V	-	-	-
R2		-	V (AP: 20/40/80/160) (P2P/P2MP: 20/40/80/160)	V	-	-	-
R3		-	-	-	-	V	-
R4		-	-	-	-	-	V

For Radio1 - 5GHz UNII 1~UNII 3 and 4.9GHz:
For IEEE 802.11a/n/ac/ax mode (1TX, 2TX/2RX):
1TX
Only Port 1 can be use as transmitting antenna.
2TX
Port 1, Port 2 can be use as transmitting antenna. Port 1, Port 2 could transmit simultaneously.

2RX
Port 1, Port 2, Port 3, Port 4 can be used as receiving antennas. Port 1 and Port 2 could receive simultaneously.

For Radio 2 - 5GHz UNII 1~UNII 3 and 4.9GHz:
For IEEE 802.11a/n/ac/ax mode (1TX, 2TX/2RX):

1TX
Only Port 1 can be use as transmitting antenna.
2TX
Port 1, Port 2 can be use as transmitting antenna. Port 1, Port 2 could transmit simultaneously.

2RX
Port 1, Port 2, Port 3, Port 4 can be used as receiving antennas. Port 1 and Port 2 could receive simultaneously.

For Radio 3 - BLE
Bluetooth(1TX):
Only Port 1 can be used as transmitting/receiving antenna.

For Radio 4 – GNSS (1Rx)
Only Port 1 can be used as receiving antenna.
The following antennas are supported by this product series. Please note, the antenna information has been provided by the customer (the Cisco business unit). The data included in this report represent the worst-case data for all antennas.

Note: As per KDB 353028 D01 Antennas Part 15 Transmitters v01r01 Clause III (A), When submitting test data for part 15 transmitters to be used with multiple antennas, FCC require testing for the highest gain of each type of antenna (e.g., highest gain for each patch, yagi, grid, dish, monopole, etc.). As per the below table IW9165E and IW9165D supports Dipole, Two-port panel antenna and four port panel antennas. Based on the KDB requirement Cisco will provide test data for 3dBi / 8dBi/ 15dBi.

Product ID	Family	Description	Supported by IW9165DHD?	Supported by IW9165E?	Peak Gain 2.4 GHz (dBi)	Peak Gain 4.9 GHz (dBi)	Peak Gain 5 GHz (dBi)	Gain > 30° Elevation UNII-1 (dBi)	Peak Gain 6 GHz (dBi)	Gain > 30° Elevation UNII-5 & 7	5 GHz Fixed Point-to-Point?	5 GHz Point-to-Multipoint?
IW-ANT-OMM-53-N=	Legacy	5 GHz 3 dBi Omnidirectional Antenna, Multi-polarized, N Female Connector	No	Yes	N/A	3	3	0	N/A	N/A	No	Yes
AIR-ANT5180V-N=	Legacy	5 GHz 8 dBi Omnidirectional Colinear Array Antenna, N Male Connector	Yes	Yes	N/A	8	8	-3	N/A	N/A	No	Yes
IW-ANT-PNL-59-N=	Legacy	5 GHz 9 dBi 2-Element Patch Array Antenna, Slant ±45 Polarized, N Female Connectors	Yes	Yes	N/A	N/A	10	7	N/A	N/A	Yes	Yes
AIR-ANT5114P2M-N=	Legacy	5 GHz 13 dBi 2-Element Patch Array	Yes	Yes	N/A	N/A	13	4	N/A	N/A	Yes	Yes
AIR-ANT5114P2M-NS=	SIA	Antenna, N Male Connectors	Yes	Yes	N/A	N/A	13	3	N/A	N/A	Yes	Yes
IW-ANT-SKD-513-Q=	Legacy	5 GHz 14 dBi 2-Element Shark Antenna, Slant ±45 Polarized, QMA Female Connectors	No	Yes	N/A	13	13	8	N/A	N/A	No	Yes
IW-ANT-SKS-514-Q=	Legacy	5 GHz 14 dBi 2-Element Shark Antenna, Slant ±45 Polarized, QMA Female Connectors	No	Yes	N/A	13	13	8	N/A	N/A	No	Yes
AIR-ANT2547V-N=	Legacy	2.4 GHz 4 dBi / 5 GHz 7 dBi Omnidirectional Colinear Array Antenna, N male connector	Yes	Yes	4	N/A	7	-3	N/A	N/A	No	Yes
AIR-ANT2547VG-N=	Legacy	2.4 GHz 4 dBi / 5 GHz 7 dBi	Yes	Yes	4	N/A	7	-3	N/A	N/A	No	Yes
AIR-ANT2547VG-NS=	SIA	Omnidirectional Colinear Array	Yes	Yes	4	N/A	7	-3	N/A	N/A	No	Yes
AIR-ANT2568VG-N=	Legacy	2.4 GHz 6 dBi / 5 GHz 8 dBi	Yes	Yes	6	N/A	8	3	N/A	N/A	No	Yes
AIR-ANT2568VG-NS=	SIA	Omnidirectional Antenna, N Male	Yes	Yes	6	N/A	8	3	N/A	N/A	No	Yes
AIR-ANT2588P4M-NS=	SIA	2.4 GHz 8 dBi / 5 GHz 8 dBi 4-Element Dual-Polarized Patch Antenna, N	No	Yes	8	N/A	8	-2	N/A	N/A	No	Yes
AIR-ANT2513P4M-N=	Legacy	2.4 GHz 13 dBi / 5 GHz 13 dBi	No	Yes	13	N/A	13	1	N/A	N/A	Yes	Yes
AIR-ANT2513P4M-NS=	SIA	Polarization Diverse Patch Array	No	Yes	13	N/A	13	1	N/A	N/A	Yes	Yes
IW-ANT-OMV-2567-N	SIA	Tri-band 2.4 GHz 4 dBi, 5/6 GHz 7 dBi Omnidirectional Colinear Array Antenna, Vertically Polarized, N Male Connector	Yes	Yes	4	7	7	-7	7	-6	No	Yes
IW-ANT-OMH-2567-N	SIA	Tri-band 2.4 GHz 4 dBi, 5/6 GHz 7 dBi Omnidirectional Colinear Array Antenna, Horizontally Polarized, N Male Connector	Yes	Yes	4	7	7	-6	7	-4	No	Yes
IW-ANT-PNL-515-N=	SIA	Tri-band 5 GHz 15dBi Panel Antenna	Yes	Yes			15	3			Yes	Yes

Section 3: Result Summary

3.1: Results Summary Table

Conducted test results summary.

Basic Standard	Technical Requirements / Details	Result
FCC 15.407 FCC 15.407 LP0002:2020 5.7.2.3 5.7.3.4 (2) (B)	**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.	Pass
FCC 15.407 LP0002:2020 Clause 5.7.3.2 (1)	**Output Power:** **15.407** (2) 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. In addition, 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.	Pass
15.407 LP0002:2020 Clause 5.7.3.2 (2)	**Power Spectral Density:** **15.407** (2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands…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.	Pass
15.407 LP0002:2020 Clause 5.7.4.1, 3.5 & 3.6	**Conducted Spurious Emissions / Band-Edge:** **15.407** (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz	Pass
FCC 15.407 FCC 15.209 FCC 15.205 LP0002:2020 Clause 5.7.4.1, 3.5 & 3.6	**Restricted band:** Unwanted emissions falling within the restricted bands, as defined in FCC 15.205 (a) must also comply with the radiated emission limits specified in FCC 15.209 (a).	Pass

Radiated Emissions (General requirements)

Basic Standard	Technical Requirements / Details	Result
FCC 15.407 FCC 15.205 FCC 15.209 LP0002 (2018-01-10) (3.6)	**TX Spurious Emissions:** Unwanted emissions must comply with the general field strength limits set forth in §15.209. (7) The provisions of §15.205 apply to intentional radiators operating under this section.	[EDCS # 24346978]
FCC 15.207 LP0002 (2020-07-01) (3.3)	**AC conducted Emissions:** Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table in these sections. The more stringent limit applies at the frequency range boundaries.	Pass

* MPE calculation is recorded in a separate report

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.

4.1: Sample Details

Sample No.	Equipment Details	Manufacturer	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	IW9165E-B	Cisco Systems	P2A	QC_IMAGE_VERSION_STRING=WLAN.HK.2.4-02142-QCAHKSWPL_SILICONZ-1	[sjc-ads-6561:/nobackup/haijia/ap_wlc_me/m22_mfg]	FOC2638BKX3
S02	IW-PWRADPT-MFIT4P	Cisco Systems	V00	-	-	LIN264450C6

4.2: System Details

System #	Description	Samples
1	IW9165E-B	S01
2	IW-PWRADPT-MFIT4P	S02

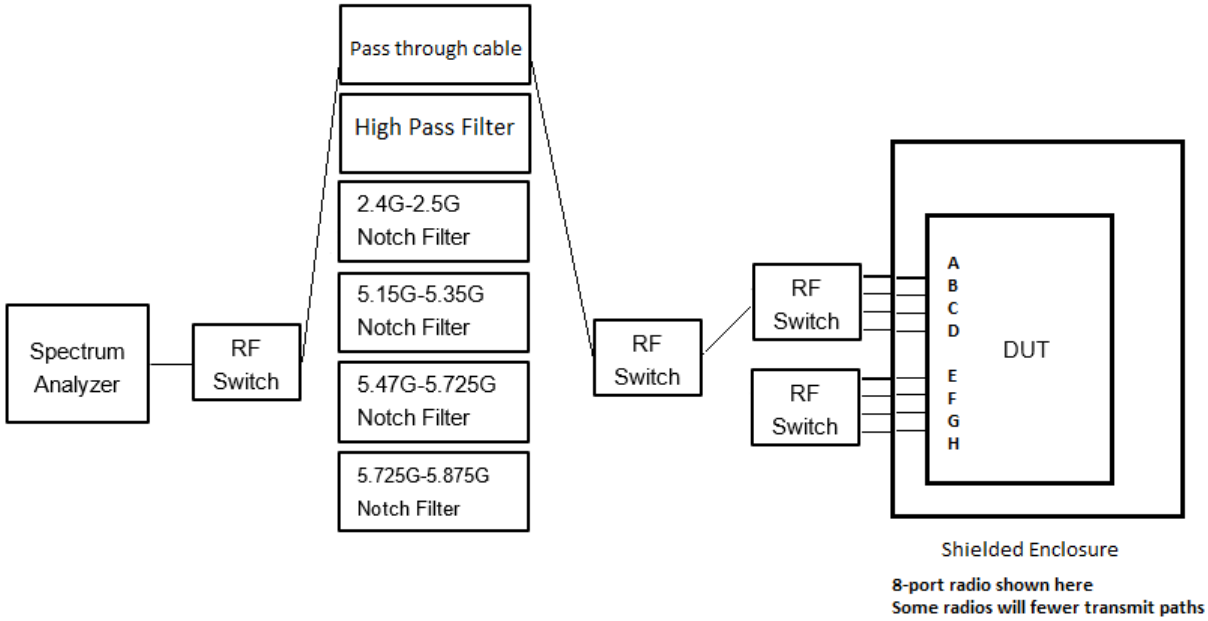
4.3: Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmitting	

Function	**Support Band**
AP	BLE,5GHz, 4.9GHz
P2P/P2MP	5GHz, 4.9GHz

Appendix A: Emission Test Results

Conducted Test Setup Diagram



Test Setup Description

The EUT was placed inside an RF shielded enclosure. RF cables connect to each antenna port on the EUT inside the enclosure. Those cables are routed to RF switch cards in a National Instruments chassis. There are different paths, some paths contain a notch filter or high pass filter as shown above. The signal is then routed to the spectrum analyzer where measurements are made.

Plots listed herein represent the measured worst-case per antenna, frequency, and modulation.

A.1: Duty Cycle

Duty Cycle Test Requirement

From KDB 789033 D02 General UNII Test Procedures New Rules v02r01

B. Duty Cycle (x), Transmission Duration (T), and Maximum Power Control Level

1. All measurements are to be performed with the EUT transmitting at 100 percent duty cycle at its maximum power control level; however, if 100 percent duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, *T*, are required for each tested mode of operation.

Duty Cycle Test Method

From KDB 789033 D02 General UNII Test Procedures New Rules v02r01:

B. Duty Cycle (x), Transmission Duration (T), and Maximum Power Control Level

The zero-span mode on a spectrum analyzer or EMI receiver, if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T, where T is defined in section II.B.1.a), and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

Duty Cycle Test Information

Tested By: Ronak Patel	**Date of testing:** 11/09/2023 – 11/10/2023 – version
Test Result: PASS	

Test Equipment

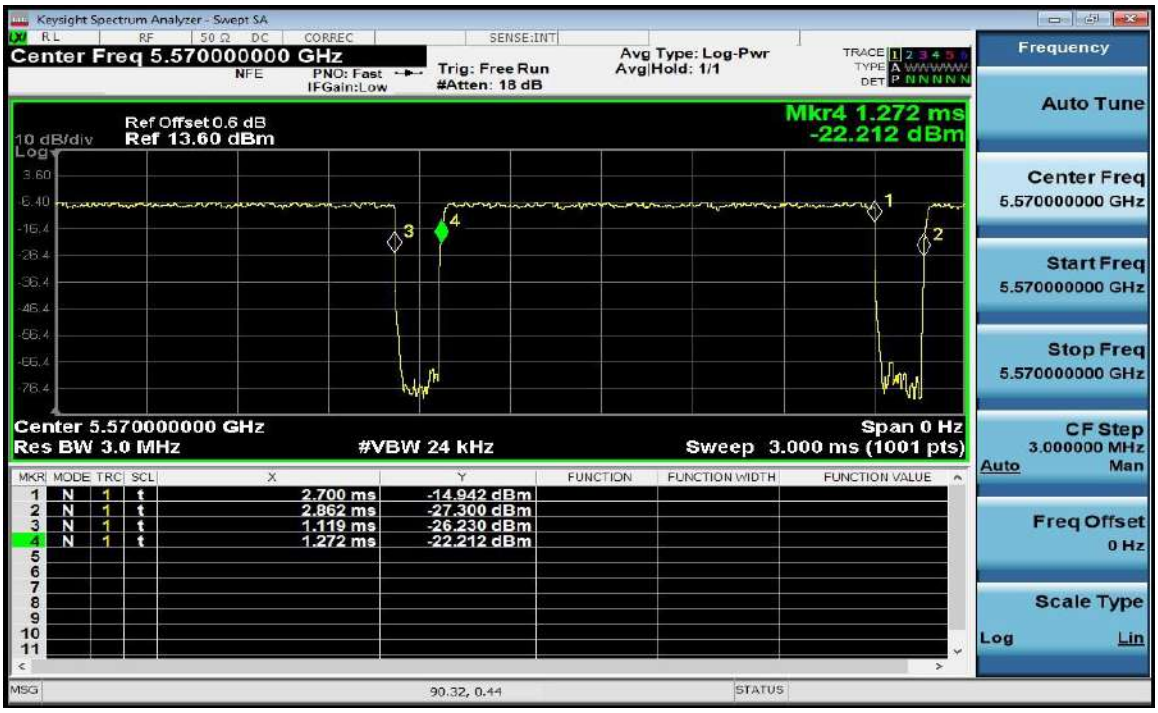
See Appendix C for list of test equipment.

Duty Cycle Data Table
Duty Cycle table and screen captures are shown below for Power/PSD modes.

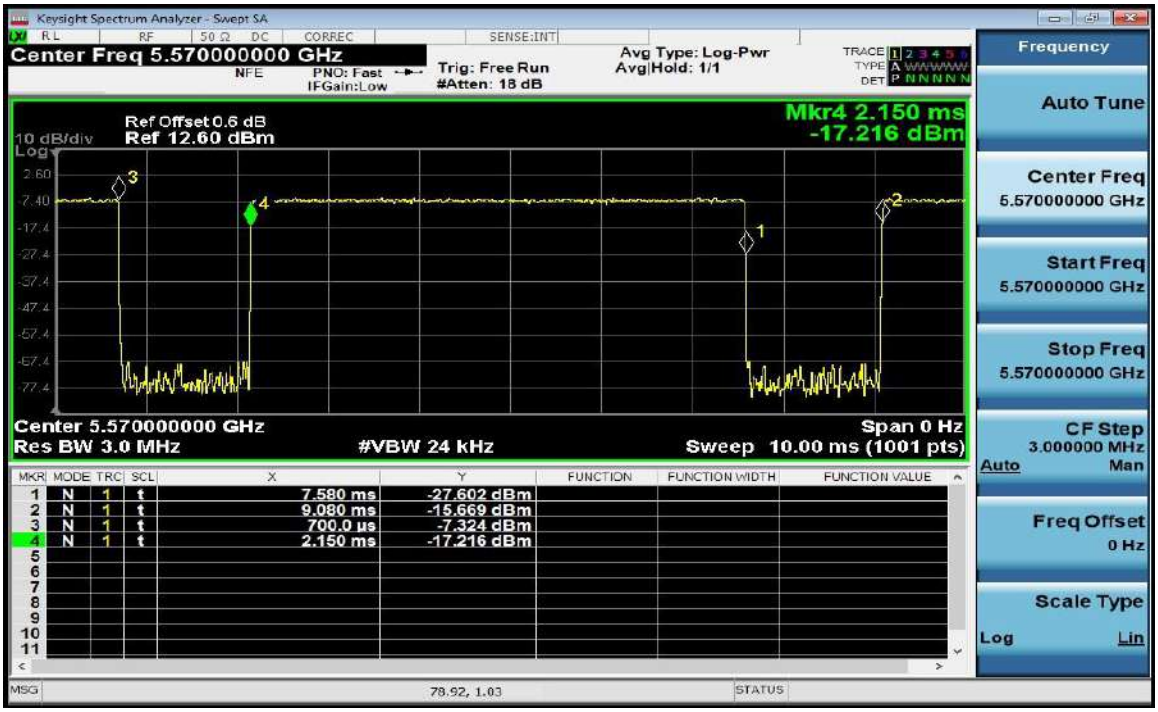
Frequency (MHz)	Mode	Data Rate (Mbps)	Duty Cycle (dB)
5570	Non HT160, 6 to 54 Mbps	6.0	0.44
	VHT160, M0 to M11 1ss	m0x1	1.03
	HE160, M0 to M11 1ss	m0h1	1.01

Data Screenshots

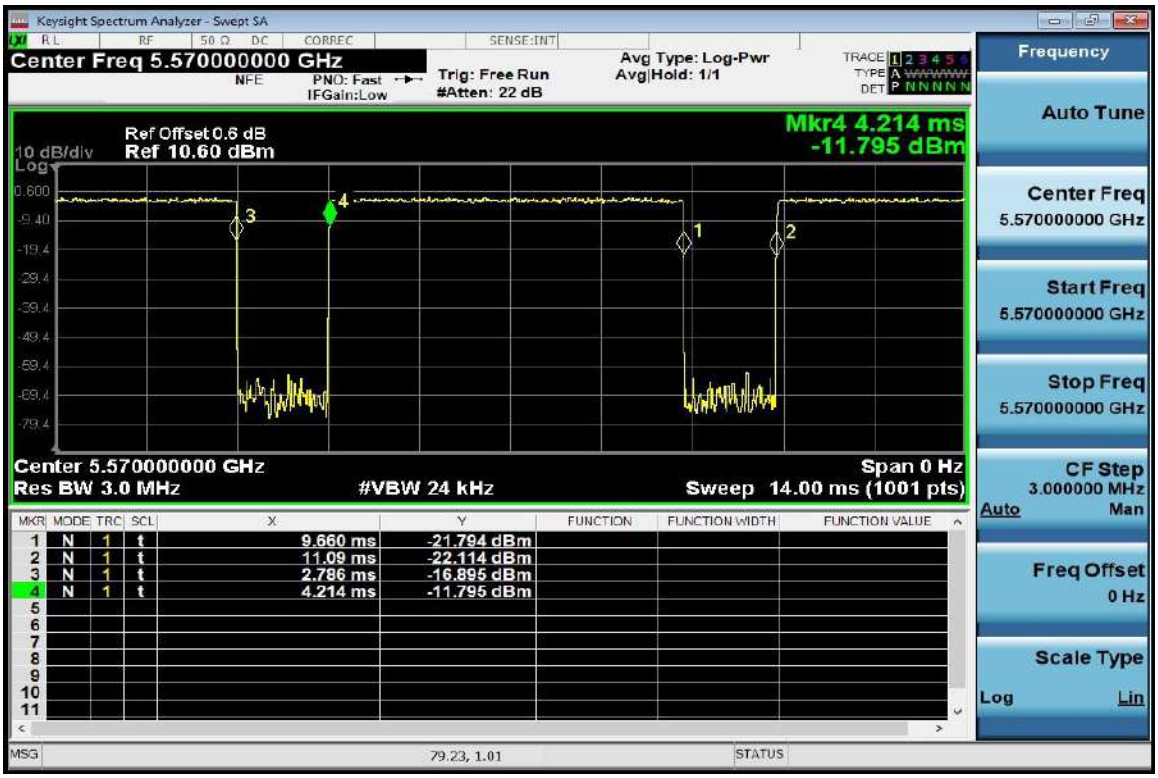
5570 MHz, Non HT160, 6 to 54 Mbps – Antenna A



5570 MHz, VHT160, M0 to M11 1ss – Antenna A



5570 MHz, HE160, M0 to M11 1ss – Antenna A



A.2: 99% and 26dB Bandwidth

99% and 26dB Bandwidth Test Requirement

There is no requirement for the value of bandwidth. However, the 26dB BW (EBW) is used to calculate the power limits in 15.407 (a) (2). Power measurements are made using the 99% Bandwidth as the integration bandwidth.

Band-crossing emissions:

For an emission that crosses the boundary between two adjacent U-NII bands, the boundary frequency between the bands serves as one edge for defining the portion of the EBW that falls within a particular U-NII band. However, the -26 dB points are measured relative to the highest point on the contiguous segment—regardless of which band contains that highest point (Figure4).

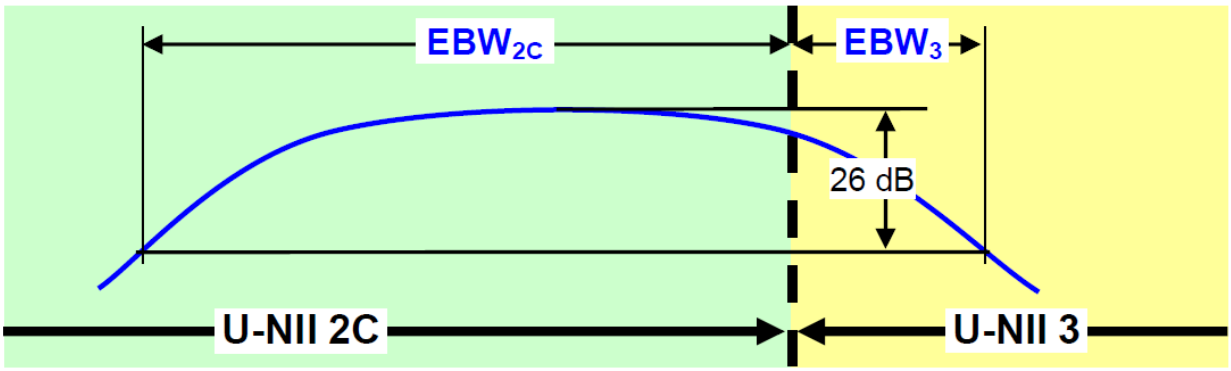


Figure 3. Emission Bandwidth (EBW) within a Band for Band-Crossing Signals

99% and 26dB Bandwidth Test Procedure

ANSI C63.10: 2013 Section 6.9.3

Ref. KDB 789033 Section D. 99 Percent Occupied Bandwidth
KDB 662911

99% BW Test Parameters
1. Set center frequency to the nominal EUT channel center frequency. 2. Set span = 1.5 times to 5.0 times the OBW. 3. Set RBW = 1 % to 5 % of the OBW 4. Set VBW ≥ 3 · RBW 5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used. 6. Use the 99 % power bandwidth function of the instrument (if available).

Ref KDB 789033 in Section C. Measurement Bandwidth, Section 1

26 BW Test parameters
X dB BW = -26dB (using the OBW function of the spectrum analyzer) Emission Bandwidth (EBW) a) Set RBW = approximately 1% of the emission bandwidth. b) Set the VBW > RBW. c) Detector = Peak. d) Trace mode = max hold. e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Tested By: Ronak Patel	**Date of testing:** 11/09/2023 – 11/10/2023 – version
Test Result: PASS	

Test Equipment

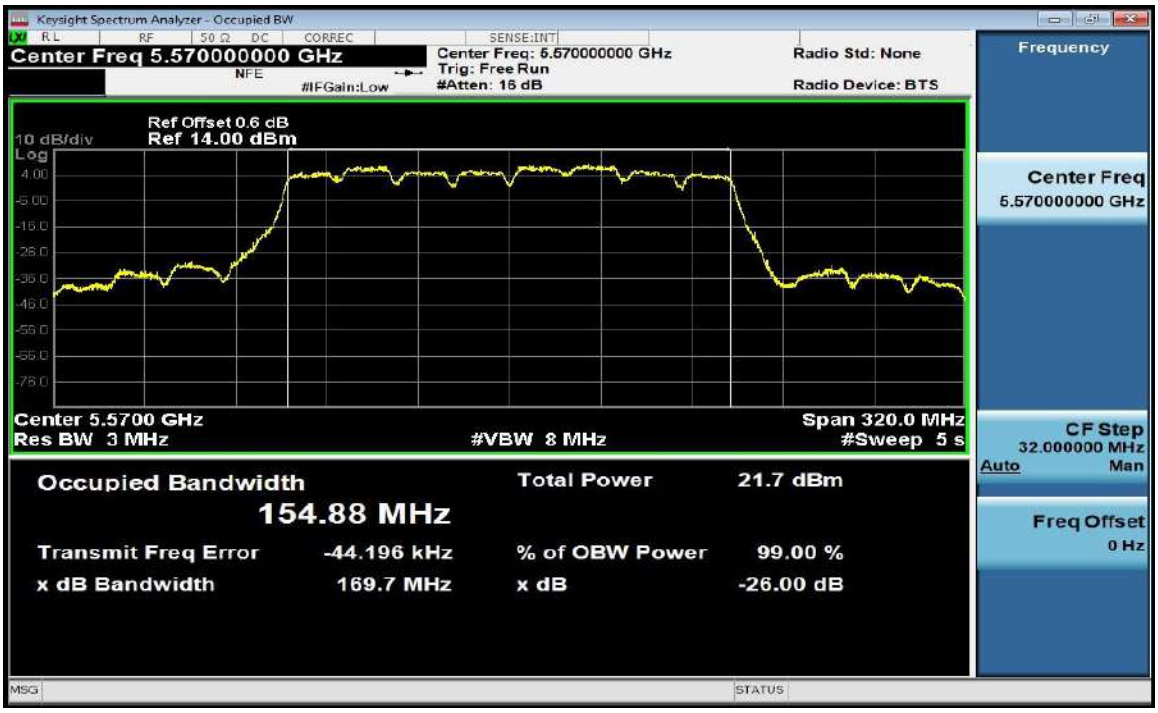
See Appendix C for list of test equipment.

99% and 26dB Bandwidth Table

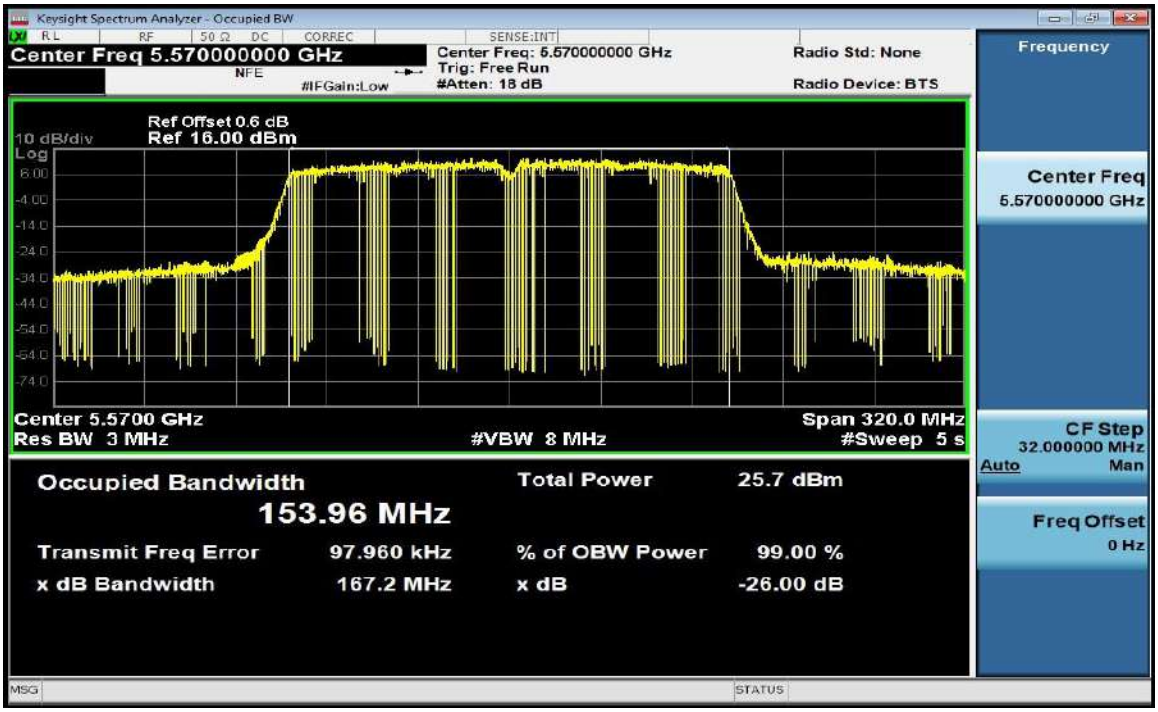
Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
5570	Non HT160, 6 to 54 Mbps	6.0	169.70	154.88
	VHT160, M0 to M11 1ss	m0x1	167.20	153.96
	HE160, M0 to M11 1ss	m0h1	167.00	155.60

Data Screenshots

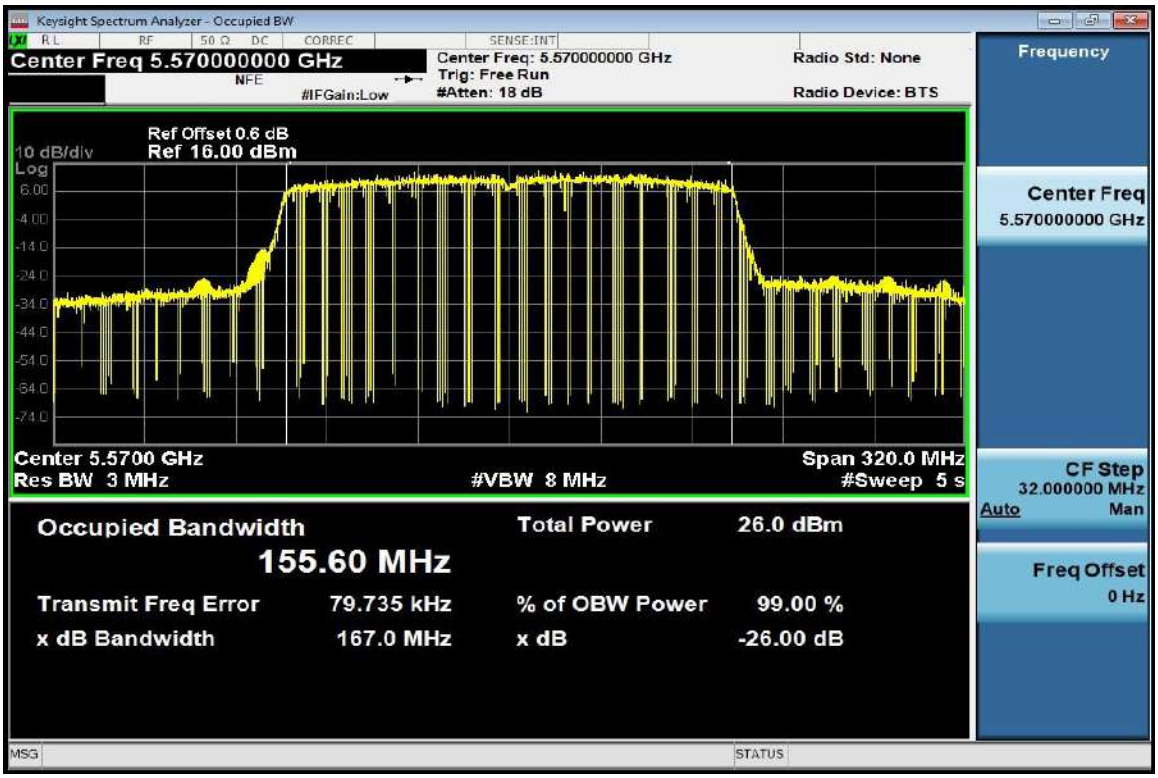
5570 MHz, Non HT160, 6 to 54 Mbps – Antenna A



5570 MHz, VHT160, M0 to M11 1ss – Antenna A



5570 MHz, HE160, M0 to M11 1ss – Antenna A



A.3: Maximum Conducted Output Power

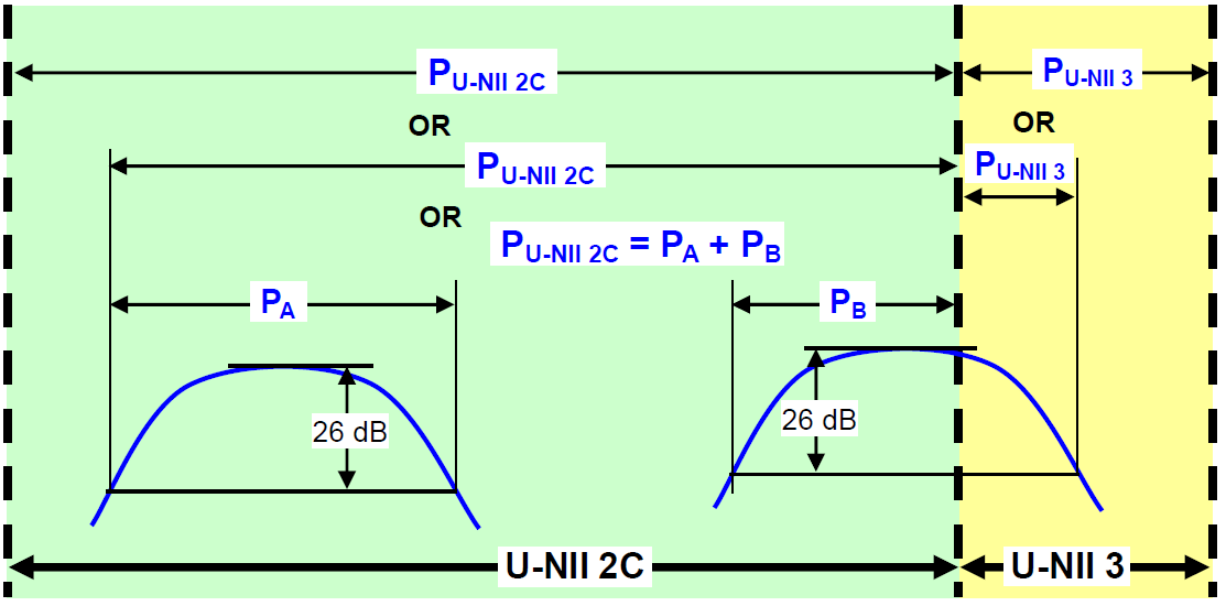
Maximum Conducted Output Power Test Requirement

15.407:

(2) 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.

Band-Crossing Signals:

When measuring the portion of the maximum conducted output power within a single U-NII band, the power shall be integrated across only the portion of the EBW that falls within that band. That is, if an EBW extends across the boundary between two adjacent bands, the boundary frequency between the bands serves as one edge of the frequency range to be integrated. Integration across an entire U-NII band without regard to 26 dB points is also acceptable for determining conducted output power within that band.



Conducted output power within a U-NII band: Integrate over the band or integrate over a span including the 26 dB EBWs of transmission segments within the band or integrate over 26 dB EBW of each transmission segment in the band and sum.

Figure 4. Conducted Output Power Measurement Examples

Maximum Conducted Output Power Test Procedure

ANSI C63.10: 2013

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Maximum Conducted Output Power Test Procedure
1. Set the radio in the continuous transmitting mode at full power 2. Compute power by integrating the spectrum across the EBW (or alternatively entire 99% OBW) of the signal using the instrument's band power measurement function. The integration shall be performed using the spectrum analyzer band-power measurement function with band limits set equal to the EBW or the OBW band edges. 3. Capture graphs and record pertinent measurement data.

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01

2. Measurement using a Spectrum Analyzer or EMI Receiver (SA), (d) Method SA-2

Maximum Conducted Output Power Test parameters
Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction). (i) Measure the duty cycle, x, of the transmitter output signal as described in section II.B. (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal. (iii) Set RBW = 1 MHz. (iv) Set VBW ≥ 3 MHz. (v) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.) (vi) Sweep time = auto. (vii) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode. (viii) Do not use sweep triggering. Allow the sweep to "free run". (ix) Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter. (x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth)

The "measure-and-sum technique" is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units. ANSI C63.10 section 14.3.2.2

Tested By: Ronak Patel	**Date of testing:** 11/09/2023 – 11/10/2023 – version
Test Result: PASS	

Test Equipment

See Appendix C for list of test equipment.

Maximum EIRP – Antenna gin 3dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Duty Cycle (dB)	Total EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	3.00	12.80		0.44	16.27	30.00	13.73
Non HT160, 6 to 54 Mbps	2	3.00	12.80	12.60	0.44	19.16	30.00	10.84
VHT160, M0 to M11 1ss	1	3.00	15.00		1.03	19.04	30.00	10.96
VHT160, M0 to M11 1ss	2	3.00	15.00	14.90	1.03	22.00	30.00	8.00
VHT160, M0 to M11 2ss	2	3.00	15.00	14.90	1.03	22.00	30.00	8.00
VHT160 Beam Forming, M0 to M11 1ss	2	6.00	12.80	12.70	1.03	22.79	30.00	7.21
VHT160 Beam Forming, M0 to M11 2ss	2	3.00	15.00	14.90	1.03	22.00	30.00	8.00
VHT160 STBC, M0 to M11 2ss	2	3.00	15.00	14.90	1.03	22.00	30.00	8.00
HE160, M0 to M11 1ss	1	3.00	15.40		1.01	19.45	30.00	10.55
HE160, M0 to M11 1ss	2	3.00	15.40	15.20	1.01	22.32	30.00	7.68
HE160, M0 to M11 2ss	2	3.00	15.40	15.20	1.01	22.32	30.00	7.68
HE160 Beam Forming, M0 to M11 1ss	**2**	**6.00**	**14.40**	**14.20**	**1.01**	**24.31**	**30.00**	**5.69**
HE160 Beam Forming, M0 to M11 2ss	2	3.00	15.40	15.20	1.01	22.32	30.00	7.68
HE160 STBC, M0 to M11 2ss	2	3.00	15.40	15.20	1.01	22.32	30.00	7.68

Maximum Conducted Output Power – Antenna gain 3dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Duty Cycle (dB)	Total EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	3.00	12.80		0.44	13.27	24.00	10.73
Non HT160, 6 to 54 Mbps	2	3.00	12.80	12.60	0.44	16.16	24.00	7.84
VHT160, M0 to M11 1ss	1	3.00	15.00		1.03	16.04	24.00	7.96
VHT160, M0 to M11 1ss	2	3.00	15.00	14.90	1.03	19.00	24.00	5.00
VHT160, M0 to M11 2ss	2	3.00	15.00	14.90	1.03	19.00	24.00	5.00
VHT160 Beam Forming, M0 to M11 1ss	2	6.00	12.80	12.70	1.03	16.79	24.00	7.21
VHT160 Beam Forming, M0 to M11 2ss	2	3.00	15.00	14.90	1.03	19.00	24.00	5.00
VHT160 STBC, M0 to M11 2ss	2	3.00	15.00	14.90	1.03	19.00	24.00	5.00
HE160, M0 to M11 1ss	1	3.00	15.40		1.01	16.45	24.00	7.55
HE160, M0 to M11 1ss	2	3.00	15.40	15.20	1.01	19.32	24.00	4.68
HE160, M0 to M11 2ss	2	3.00	15.40	15.20	1.01	19.32	24.00	4.68
HE160 Beam Forming, M0 to M11 1ss	2	6.00	14.40	14.20	1.01	18.31	24.00	5.69
HE160 Beam Forming, M0 to M11 2ss	**2**	**3.00**	**15.40**	**15.20**	**1.01**	**19.32**	**24.00**	**4.68**
HE160 STBC, M0 to M11 2ss	2	3.00	15.40	15.20	1.01	19.32	24.00	4.68

Maximum EIRP – Antenna gain 8dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Duty Cycle (dB)	Total EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	8.00	11.70		0.44	20.12	30.00	9.88
Non HT160, 6 to 54 Mbps	2	8.00	10.60	10.60	0.44	22.08	30.00	7.92
VHT160, M0 to M11 1ss	1	8.00	12.80		1.03	21.87	30.00	8.13
VHT160, M0 to M11 1ss	2	8.00	12.80	12.70	1.03	24.79	30.00	5.21
VHT160, M0 to M11 2ss	2	8.00	12.80	12.70	1.03	24.79	30.00	5.21
VHT160 Beam Forming, M0 to M11 1ss	2	11.00	12.80	12.70	1.03	27.79	30.00	2.21
VHT160 Beam Forming, M0 to M11 2ss	2	8.00	12.80	12.70	1.03	24.79	30.00	5.21
VHT160 STBC, M0 to M11 2ss	2	8.00	12.80	12.70	1.03	24.79	30.00	5.21
HE160, M0 to M11 1ss	1	8.00	14.40		1.01	23.40	30.00	6.60
HE160, M0 to M11 1ss	2	8.00	13.20	13.00	1.01	25.11	30.00	4.89
HE160, M0 to M11 2ss	**2**	**8.00**	**13.20**	**13.00**	**1.01**	**25.11**	**30.00**	**1.89**
HE160 Beam Forming, M0 to M11 1ss	2	11.00	13.20	13.00	1.01	28.11	30.00	4.89
HE160 Beam Forming, M0 to M11 2ss	2	8.00	13.20	13.00	1.01	25.11	30.00	4.89
HE160 STBC, M0 to M11 2ss	2	8.00	13.20	13.00	1.01	25.11	30.00	4.89

Maximum conducted Output Power – Antenna gain 8dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Duty Cycle (dB)	Total Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	8.00	11.70		0.44	12.12	22.00	9.88
Non HT160, 6 to 54 Mbps	2	8.00	10.60	10.60	0.44	14.08	22.00	7.92
VHT160, M0 to M11 1ss	1	8.00	12.80		1.03	13.87	22.00	8.13
VHT160, M0 to M11 1ss	2	8.00	12.80	12.70	1.03	16.79	22.00	5.21
VHT160, M0 to M11 2ss	2	8.00	12.80	12.70	1.03	16.79	22.00	5.21
VHT160 Beam Forming, M0 to M11 1ss	2	11.00	11.80	11.70	1.03	18.79	19.00	0.21
VHT160 Beam Forming, M0 to M11 2ss	2	8.00	12.80	12.70	1.03	16.79	22.00	5.21
VHT160 STBC, M0 to M11 2ss	2	8.00	12.80	12.70	1.03	16.79	22.00	5.21
HE160, M0 to M11 1ss	1	8.00	14.40		1.01	15.40	22.00	6.6
HE160, M0 to M11 1ss	**2**	**8.00**	**13.20**	**13.00**	**1.01**	**17.11**	**22.00**	**4.89**
HE160, M0 to M11 2ss	2	8.00	13.20	13.00	1.01	17.11	22.00	4.89
HE160 Beam Forming, M0 to M11 1ss	2	11.00	13.20	13.00	1.01	17.11	19.00	1.89
HE160 Beam Forming, M0 to M11 2ss	2	8.00	13.20	13.00	1.01	17.11	22.00	4.89
HE160 STBC, M0 to M11 2ss	2	8.00	13.20	13.00	1.01	17.11	22.00	4.89

Maximum EIRP – Antenna gain 15dBi.
Frequency 5570 MHz

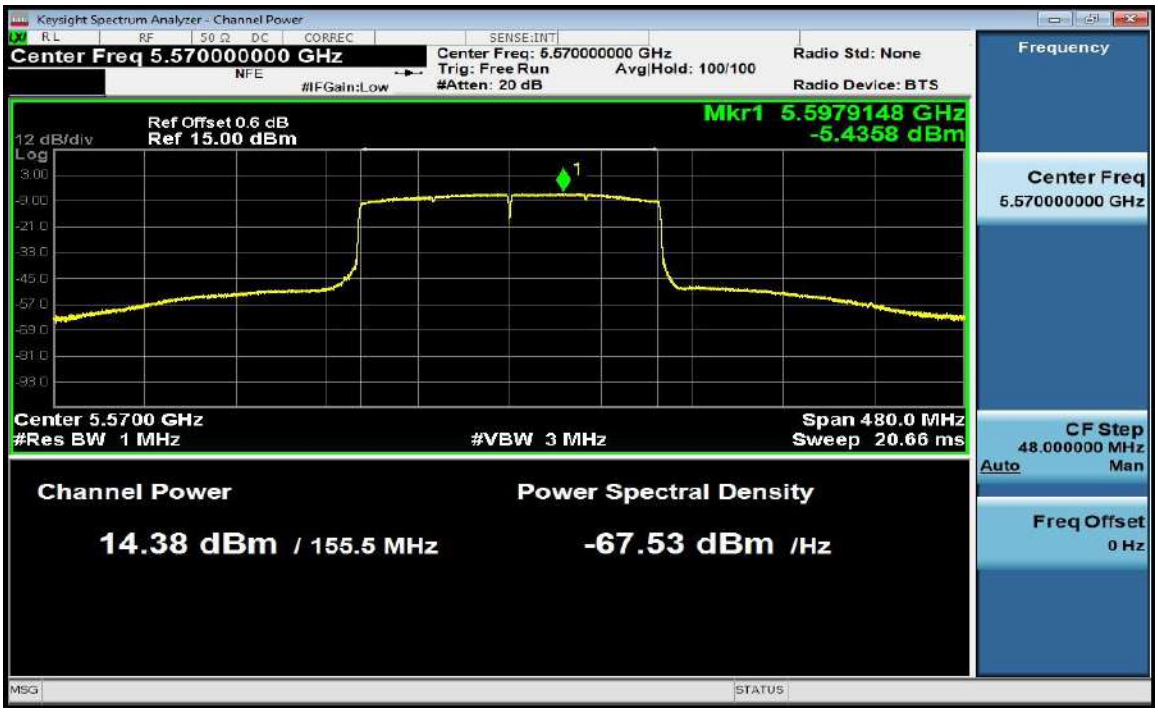
Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Duty Cycle (dB)	Total EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	15.00	8.80		0.44	24.23	30.00	5.77
Non HT160, 6 to 54 Mbps	2	15.00	8.80	8.60	0.44	27.16	30.00	2.84
VHT160, M0 to M11 1ss	1	15.00	10.70		1.03	26.78	30.00	3.22
VHT160, M0 to M11 1ss	2	15.00	9.80	9.60	1.03	28.73	30.00	1.27
VHT160, M0 to M11 2ss	2	15.00	9.80	9.60	1.03	28.73	30.00	1.27
VHT160 Beam Forming, M0 to M11 1ss	2	15.00	9.80	9.60	1.03	28.73	30.00	1.27
VHT160 Beam Forming, M0 to M11 2ss	2	15.00	9.80	9.60	1.03	28.73	30.00	1.27
VHT160 STBC, M0 to M11 2ss	2	15.00	9.80	9.60	1.03	28.73	30.00	1.27
HE160, M0 to M11 1ss	1	15.00	11.10		1.01	27.15	30.00	2.85
HE160, M0 to M11 1ss	**2**	**15.00**	**10.10**	**9.90**	**1.01**	**29.02**	**30.00**	**0.98**
HE160, M0 to M11 2ss	2	15.00	10.10	9.90	1.01	29.02	30.00	0.98
HE160 Beam Forming, M0 to M11 1ss	2	15.00	10.10	9.90	1.01	29.02	30.00	0.98
HE160 Beam Forming, M0 to M11 2ss	2	15.00	10.10	9.90	1.01	29.02	30.00	0.98
HE160 STBC, M0 to M11 2ss	2	15.00	10.10	9.90	1.01	29.02	30.00	0.98

Conducted Output Power – Antenna gain 15dBi.
Frequency 5570 MHz

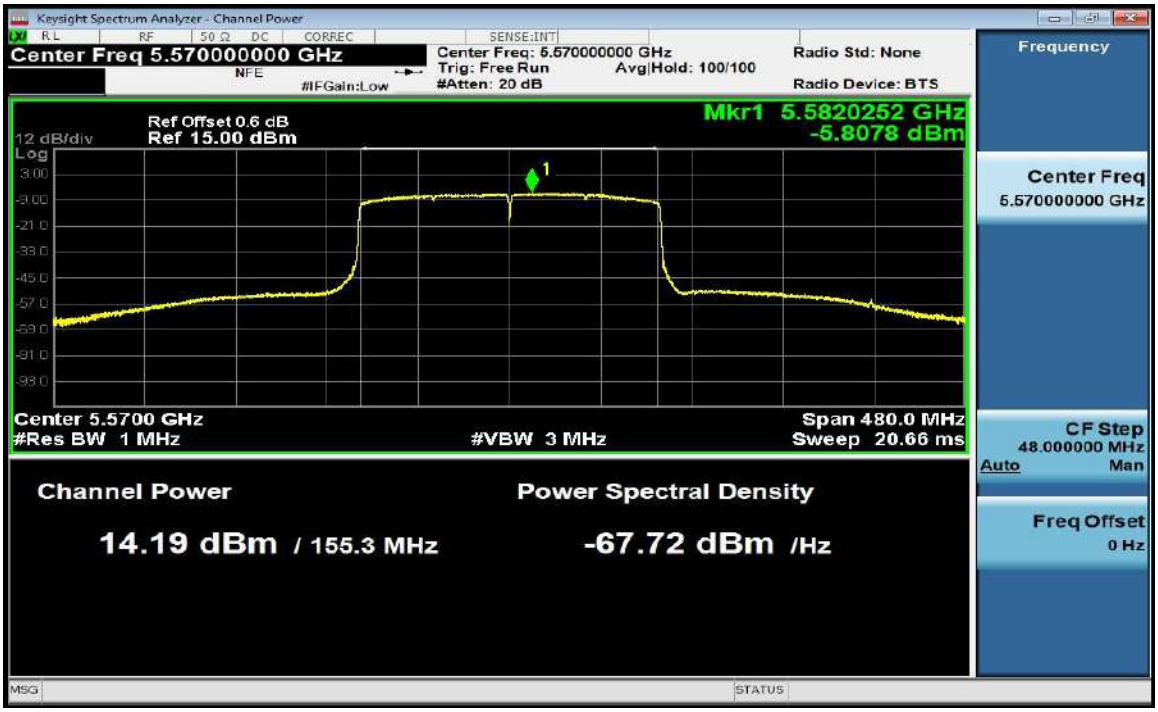
Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Duty Cycle (dB)	Total EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	15.00	8.80		0.44	9.23	15.00	5.77
Non HT160, 6 to 54 Mbps	2	15.00	8.80	8.60	0.44	12.16	15.00	2.84
VHT160, M0 to M11 1ss	1	15.00	10.70		1.03	11.78	15.00	3.22
VHT160, M0 to M11 1ss	2	15.00	9.80	9.60	1.03	13.73	15.00	1.27
VHT160, M0 to M11 2ss	2	15.00	9.80	9.60	1.03	13.73	15.00	1.27
VHT160 Beam Forming, M0 to M11 1ss	2	15.00	9.80	9.60	1.03	13.73	15.00	1.27
VHT160 Beam Forming, M0 to M11 2ss	2	15.00	9.80	9.60	1.03	13.73	15.00	1.27
VHT160 STBC, M0 to M11 2ss	2	15.00	9.80	9.60	1.03	13.73	15.00	1.27
HE160, M0 to M11 1ss	1	15.00	11.10		1.01	12.15	15.00	2.85
HE160, M0 to M11 1ss	2	15.00	10.10	9.90	1.01	14.02	15.00	**0.98**
HE160, M0 to M11 2ss	2	15.00	10.10	9.90	1.01	14.02	15.00	0.98
HE160 Beam Forming, M0 to M11 1ss	2	15.00	10.10	9.90	1.01	14.02	15.00	0.98
HE160 Beam Forming, M0 to M11 2ss	2	15.00	10.10	9.90	1.01	14.02	15.00	0.98
HE160 STBC, M0 to M11 2ss	2	15.00	10.10	9.90	1.01	14.02	15.00	0.98

Data Screenshots – Antenna gain 3dBi.

5250MHz HE160 Beam Forming, M0 to M11 1ss – Antenna A



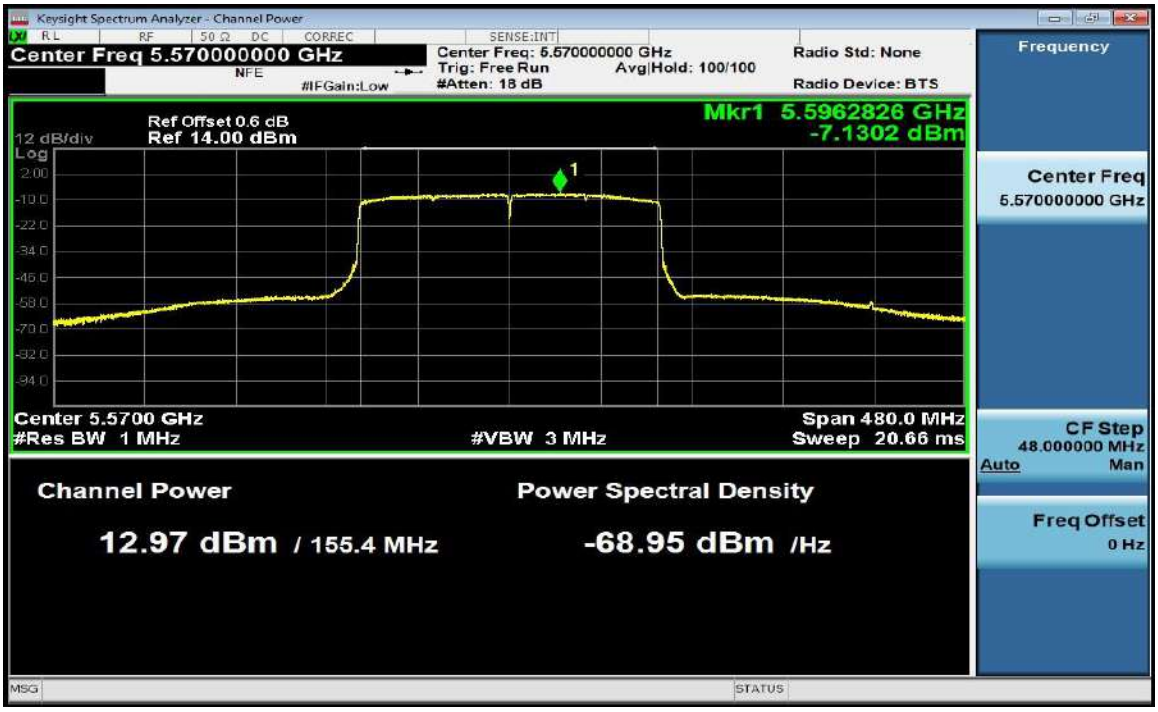
5250MHz HE160 Beam Forming, M0 to M11 1ss – Antenna B



Data Screenshots – Antenna gain 8dBi.

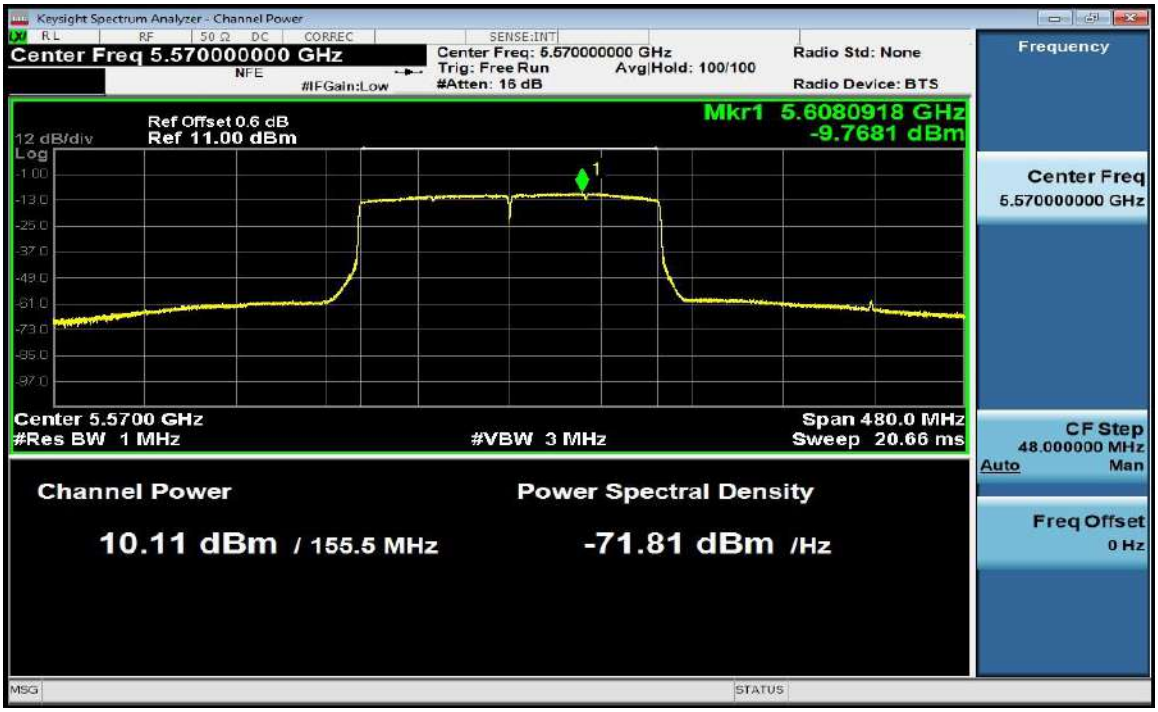
5250MHz HE160, M0 to M11 1ss – Antenna A

5250MHz HE160, M0 to M11 1ss – Antenna A

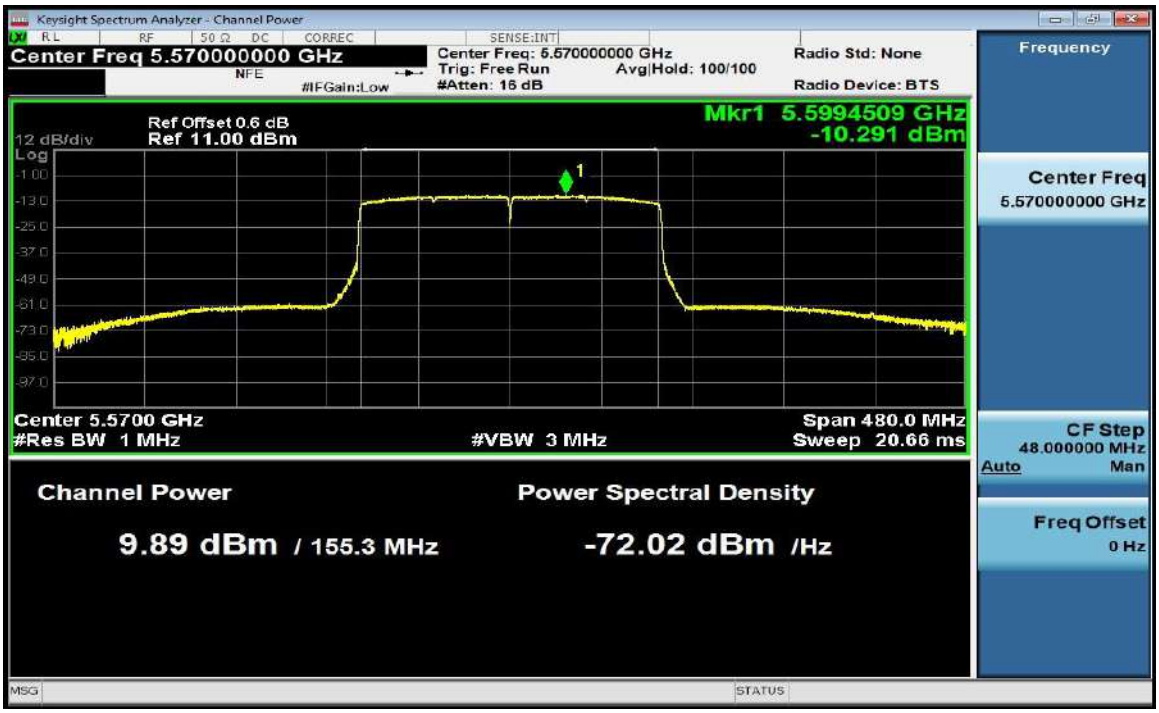


Data Screenshots – Antenna gain 15dBi.

5250MHz HE160, M0 to M11 1ss – Antenna A



5250MHz HE160, M0 to M11 1ss – Antenna B



A.4: Power Spectral Density

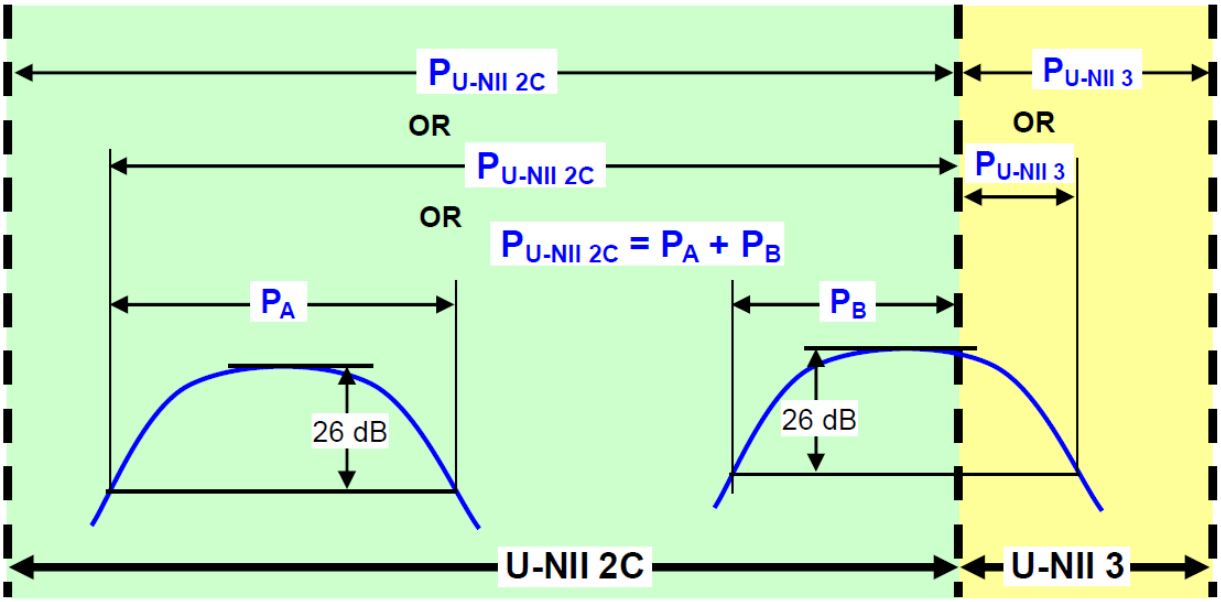
Power Spectral Density Test Requirement

15.407:

(2) 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. In addition, 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.

Band-Crossing Signals:

When measuring the portion of the maximum conducted output power within a single U-NII band, the power shall be integrated across only the portion of the EBW that falls within that band. That is, if an EBW extends across the boundary between two adjacent bands, the boundary frequency between the bands serves as one edge of the frequency range to be integrated. Integration across an entire U-NII band without regard to 26 dB points is also acceptable for determining conducted output power within that band.



Conducted output power within a U-NII band: Integrate over the band or integrate over a span including the 26 dB EBWs of transmission segments within the band or integrate over 26 dB EBW of each transmission segment in the band and sum.

Figure 4. Conducted Output Power Measurement Examples

Power Spectral Density Test Procedure

ANSI C63.10: 2013 Peak Power Spectral Density 12.5, 12.3.2.4 Method SA-2
Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01, F. Maximum Power Spectral Density

Power Spectral Density Test Procedure
The rules requires "maximum power spectral density" measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. 1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power…". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.) 2. Use the peak search function on the instrument to find the peak of the spectrum and record its value. 3. Make the following adjustments to the peak value of the spectrum, if applicable: a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum. b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging. 4. The result is the Maximum PSD over 1 MHz reference bandwidth.

ANSI C63.10: 2013 Peak Power Spectral Density 12.5, 12.3.2.4 Method SA-2
Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01, F. Maximum Power Spectral Density

Power Spectral Density Test parameters
Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction). (i) Measure the duty cycle, x, of the transmitter output signal as described in section II.B. (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal. (iii) Set RBW = 1 MHz. (iv) Set VBW ≥ 3 MHz. (v) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.) (vi) Sweep time = auto. (vii) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode. (viii) Do not use sweep triggering. Allow the sweep to "free run". (ix) Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter. (x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) **F. Maximum Power Spectral Density (PSD)** 2. Use the peak search function on the instrument to find the peak of the spectrum and record its value. 3. Make the following adjustments to the peak value of the spectrum, if applicable: a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.

The "measure-and-sum technique" is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units. ANSI C63.10 section 14.3.2.2.

Tested By: Ronak Patel	**Date of testing:** 11/09/2023 – 11/10/2023
Test Result: PASS	

Test Equipment
See Appendix C for list of test equipment.

Power Spectral Density EIRP – Antenna gain 3dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Duty Cycle (dB)	Total PSD (dBm/MHz)	EIRP Limit (dBm/MHz)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	3.00	-6.30		0.44	-2.85	17.00	19.85
Non HT160, 6 to 54 Mbps	2	6.00	-6.30	-6.50	0.44	3.07	17.00	13.93
VHT160, M0 to M11 1ss	1	3.00	-4.90		1.03	-0.87	17.00	17.87
VHT160, M0 to M11 1ss	2	6.00	-4.90	-5.30	1.03	4.95	17.00	12.05
VHT160, M0 to M11 2ss	2	3.00	-4.90	-5.30	1.03	1.95	17.00	15.05
VHT160 Beam Forming, M0 to M11 1ss	2	6.00	-7.30	-7.40	1.03	2.69	17.00	14.31
VHT160 Beam Forming, M0 to M11 2ss	2	3.00	-4.90	-5.30	1.03	1.95	17.00	15.05
VHT160 STBC, M0 to M11 2ss	2	3.00	-4.90	-5.30	1.03	1.95	17.00	15.05
HE160, M0 to M11 1ss	1	3.00	-4.30		1.01	-0.29	17.00	17.29
HE160, M0 to M11 1ss	**2**	**6.00**	**-4.30**	**-5.20**	**1.01**	**5.31**	**17.00**	**11.69**
HE160, M0 to M11 2ss	2	3.00	-4.30	-5.20	1.01	2.31	17.00	14.69
HE160 Beam Forming, M0 to M11 1ss	2	6.00	-5.40	-5.80	1.01	4.40	17.00	12.60
HE160 Beam Forming, M0 to M11 2ss	2	3.00	-4.30	-5.20	1.01	2.31	17.00	14.69
HE160 STBC, M0 to M11 2ss	2	3.00	-4.30	-5.20	1.01	2.31	17.00	14.69

Conducted Power Spectral Density – Antenna gain 3dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Duty Cycle (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	3.00	-6.30		0.44	-5.85	11.00	16.85
Non HT160, 6 to 54 Mbps	2	6.00	-6.30	-6.50	0.44	-2.93	11.00	13.93
VHT160, M0 to M11 1ss	1	3.00	-4.90		1.03	-3.87	11.00	14.87
VHT160, M0 to M11 1ss	2	6.00	-4.90	-5.30	1.03	-1.05	11.00	12.05
VHT160, M0 to M11 2ss	2	3.00	-4.90	-5.30	1.03	-1.05	11.00	12.05
VHT160 Beam Forming, M0 to M11 1ss	2	6.00	-7.30	-7.40	1.03	-3.31	11.00	14.31
VHT160 Beam Forming, M0 to M11 2ss	2	3.00	-4.90	-5.30	1.03	-1.05	11.00	12.05
VHT160 STBC, M0 to M11 2ss	2	3.00	-4.90	-5.30	1.03	-1.05	11.00	12.05
HE160, M0 to M11 1ss	1	3.00	-4.30		1.01	-3.29	11.00	14.29
HE160, M0 to M11 1ss	**2**	**6.00**	**-4.30**	**-5.20**	**1.01**	**-0.69**	**11.00**	**11.69**
HE160, M0 to M11 2ss	2	3.00	-4.30	-5.20	1.01	-0.69	11.00	11.69
HE160 Beam Forming, M0 to M11 1ss	2	6.00	-5.40	-5.80	1.01	-1.60	11.00	12.60
HE160 Beam Forming, M0 to M11 2ss	2	3.00	-4.30	-5.20	1.01	-0.69	11.00	11.69
HE160 STBC, M0 to M11 2ss	2	3.00	-4.30	-5.20	1.01	-0.69	11.00	11.69

Power Spectral Density EIRP – Antenna gain 8dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Duty Cycle (dB)	Total PSD (dBm/MHz)	EIRP Limit (dBm/MHz)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	8.00	-7.30		0.44	1.14	17.00	15.86
Non HT160, 6 to 54 Mbps	2	8.00	-8.50	-8.40	0.44	3.02	17.00	13.98
VHT160, M0 to M11 1ss	1	8.00	-7.30		1.03	1.74	17.00	15.26
VHT160, M0 to M11 1ss	2	8.00	-7.30	-7.40	1.03	4.69	17.00	12.31
VHT160, M0 to M11 2ss	2	8.00	-7.30	-7.40	1.03	4.69	17.00	12.31
VHT160 Beam Forming, M0 to M11 1ss	2	11.00	-7.30	-7.40	1.03	7.69	17.00	9.31
VHT160 Beam Forming, M0 to M11 2ss	2	8.00	-7.30	-7.40	1.03	4.69	17.00	12.31
VHT160 STBC, M0 to M11 2ss	2	8.00	-7.30	-7.40	1.03	4.69	17.00	12.31
HE160, M0 to M11 1ss	1	8.00	-5.40		1.01	3.58	17.00	13.42
HE160, M0 to M11 1ss	**2**	**8.00**	**-6.90**	**-7.10**	**1.01**	**5.02**	**17.00**	**11.98**
HE160, M0 to M11 2ss	2	8.00	-6.90	-7.10	1.01	5.02	17.00	11.98
HE160 Beam Forming, M0 to M11 1ss	2	11.00	-6.90	-7.10	1.01	8.02	17.00	8.98
HE160 Beam Forming, M0 to M11 2ss	2	8.00	-6.90	-7.10	1.01	5.02	17.00	11.98
HE160 STBC, M0 to M11 2ss	2	8.00	-6.90	-7.10	1.01	5.02	17.00	11.98

Conducted Power Spectral Density – Antenna gain 8dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Duty Cycle (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	8.00	-7.30		0.44	-6.86	9.00	15.86
Non HT160, 6 to 54 Mbps	2	8.00	-8.50	-8.40	0.44	-4.98	9.00	13.98
VHT160, M0 to M11 1ss	1	8.00	-7.30		1.03	-6.26	9.00	15.26
VHT160, M0 to M11 1ss	2	8.00	-7.30	-7.40	1.03	-3.31	9.00	12.31
VHT160, M0 to M11 2ss	2	8.00	-7.30	-7.40	1.03	-3.31	9.00	12.31
VHT160 Beam Forming, M0 to M11 1ss	2	11.00	-7.30	-7.40	1.03	-3.31	6.00	9.31
VHT160 Beam Forming, M0 to M11 2ss	2	8.00	-7.30	-7.40	1.03	-3.31	9.00	12.31
VHT160 STBC, M0 to M11 2ss	2	8.00	-7.30	-7.40	1.03	-3.31	9.00	12.31
HE160, M0 to M11 1ss	1	8.00	-5.40		1.01	-4.42	9.00	13.42
HE160, M0 to M11 1ss	**2**	**8.00**	**-6.90**	**-7.10**	**1.01**	**-2.98**	9.00	**11.98**
HE160, M0 to M11 2ss	2	8.00	-6.90	-7.10	1.01	-2.98	9.00	11.98
HE160 Beam Forming, M0 to M11 1ss	2	11.00	-6.90	-7.10	1.01	-2.98	6.00	9.98
HE160 Beam Forming, M0 to M11 2ss	2	8.00	-6.90	-7.10	1.01	-2.98	9.00	11.98
HE160 STBC, M0 to M11 2ss	2	8.00	-6.90	-7.10	1.01	-2.98	9.00	11.98

Power Spectral Density EIRP – Antenna gain 15dBi.
Frequency 5570 MHz

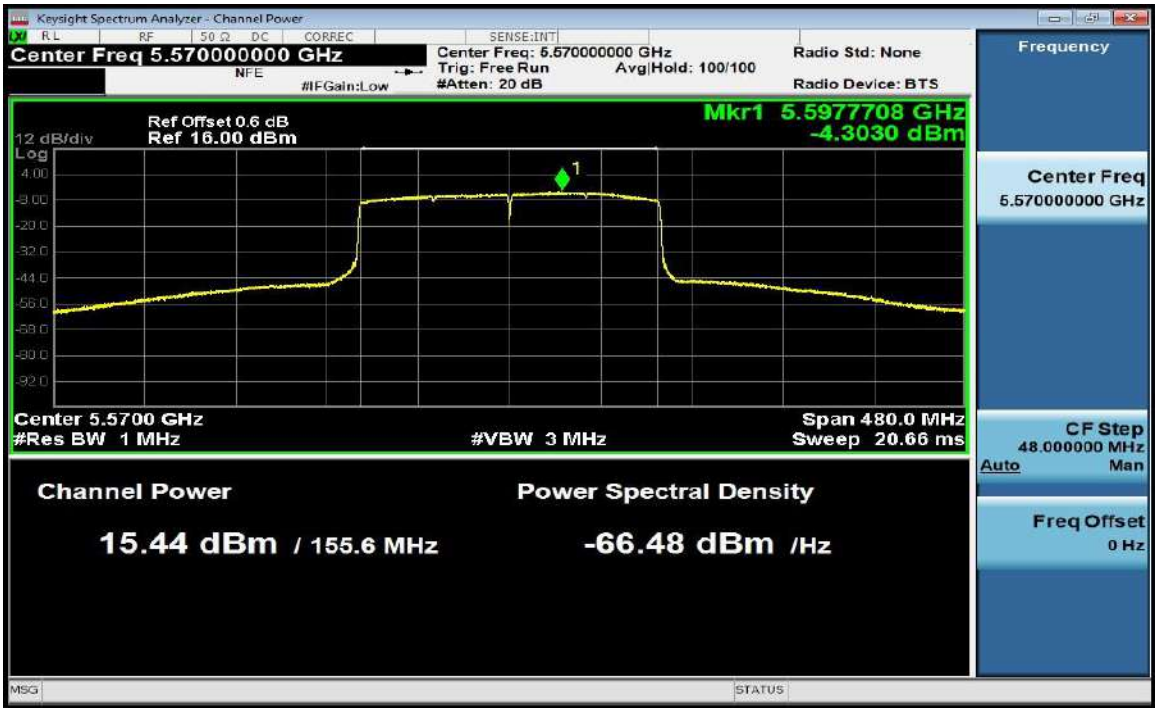
Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Duty Cycle (dB)	Total PSD (dBm/MHz)	EIRP Limit (dBm/MHz)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	15.00	-10.30		0.44	5.12	17.00	11.88
Non HT160, 6 to 54 Mbps	2	15.00	-10.30	-10.50	0.44	8.03	17.00	8.97
VHT160, M0 to M11 1ss	1	15.00	-9.40		1.03	6.61	17.00	10.39
VHT160, M0 to M11 1ss	2	15.00	-10.30	-10.70	1.03	8.51	17.00	8.49
VHT160, M0 to M11 2ss	2	15.00	-10.30	-10.70	1.03	8.51	17.00	8.49
VHT160 Beam Forming, M0 to M11 1ss	2	15.00	-10.30	-10.70	1.03	8.51	17.00	8.49
VHT160 Beam Forming, M0 to M11 2ss	2	15.00	-10.30	-10.70	1.03	8.51	17.00	8.49
VHT160 STBC, M0 to M11 2ss	2	15.00	-10.30	-10.70	1.03	8.51	17.00	8.49
HE160, M0 to M11 1ss	1	15.00	-8.80		1.01	7.21	17.00	9.79
HE160, M0 to M11 1ss	**2**	**15.00**	**-9.80**	**-10.30**	**1.01**	**9.00**	**17.00**	**8.00**
HE160, M0 to M11 2ss	2	15.00	-9.80	-10.30	1.01	9.00	17.00	8.00
HE160 Beam Forming, M0 to M11 1ss	2	15.00	-9.80	-10.30	1.01	9.00	17.00	8.00
HE160 Beam Forming, M0 to M11 2ss	2	15.00	-9.80	-10.30	1.01	9.00	17.00	8.00
HE160 STBC, M0 to M11 2ss	2	15.00	-9.80	-10.30	1.01	9.00	17.00	8.00

Conducted Power Spectral Density – Antenna gain 15dBi.
Frequency 5570 MHz

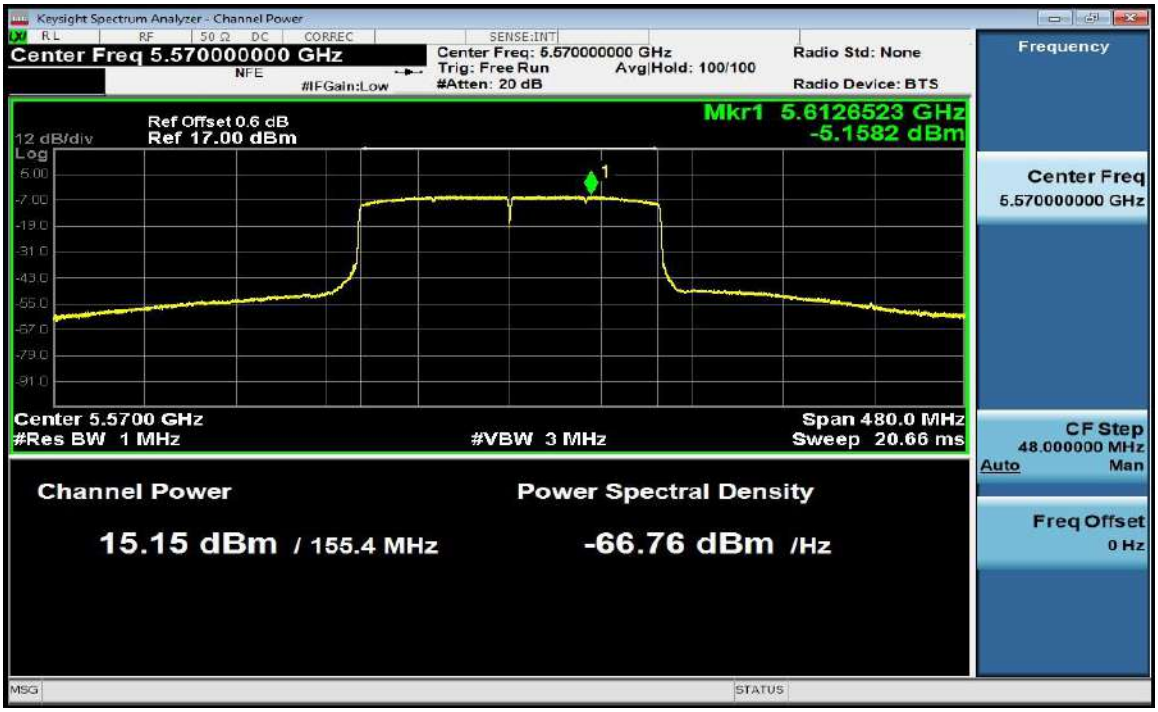
Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Duty Cycle (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	15.00	-10.30		0.44	-9.88	2.00	11.88
Non HT160, 6 to 54 Mbps	2	15.00	-10.30	-10.50	0.44	-6.97	2.00	8.97
VHT160, M0 to M11 1ss	1	15.00	-9.40		1.03	-8.39	2.00	10.39
VHT160, M0 to M11 1ss	2	15.00	-10.30	-10.70	1.03	-6.49	2.00	8.49
VHT160, M0 to M11 2ss	2	15.00	-10.30	-10.70	1.03	-6.49	2.00	8.49
VHT160 Beam Forming, M0 to M11 1ss	2	15.00	-10.30	-10.70	1.03	-6.49	2.00	8.49
VHT160 Beam Forming, M0 to M11 2ss	2	15.00	-10.30	-10.70	1.03	-6.49	2.00	8.49
VHT160 STBC, M0 to M11 2ss	2	15.00	-10.30	-10.70	1.03	-6.49	2.00	8.49
HE160, M0 to M11 1ss	1	15.00	-8.80		1.01	-7.79	2.00	9.79
HE160, M0 to M11 1ss	**2**	**15.00**	**-9.80**	**-10.30**	**1.01**	**-6.00**	2.00	**8.00**
HE160, M0 to M11 2ss	2	15.00	-9.80	-10.30	1.01	-6.00	2.00	8.00
HE160 Beam Forming, M0 to M11 1ss	2	15.00	-9.80	-10.30	1.01	-6.00	2.00	8.00
HE160 Beam Forming, M0 to M11 2ss	2	15.00	-9.80	-10.30	1.01	-6.00	2.00	8.00
HE160 STBC, M0 to M11 2ss	2	15.00	-9.80	-10.30	1.01	-6.00	2.00	8.00

Data Screenshots – Antenna gain 3dBi.

5250MHz HE160, M0 to M11 1ss – Antenna A

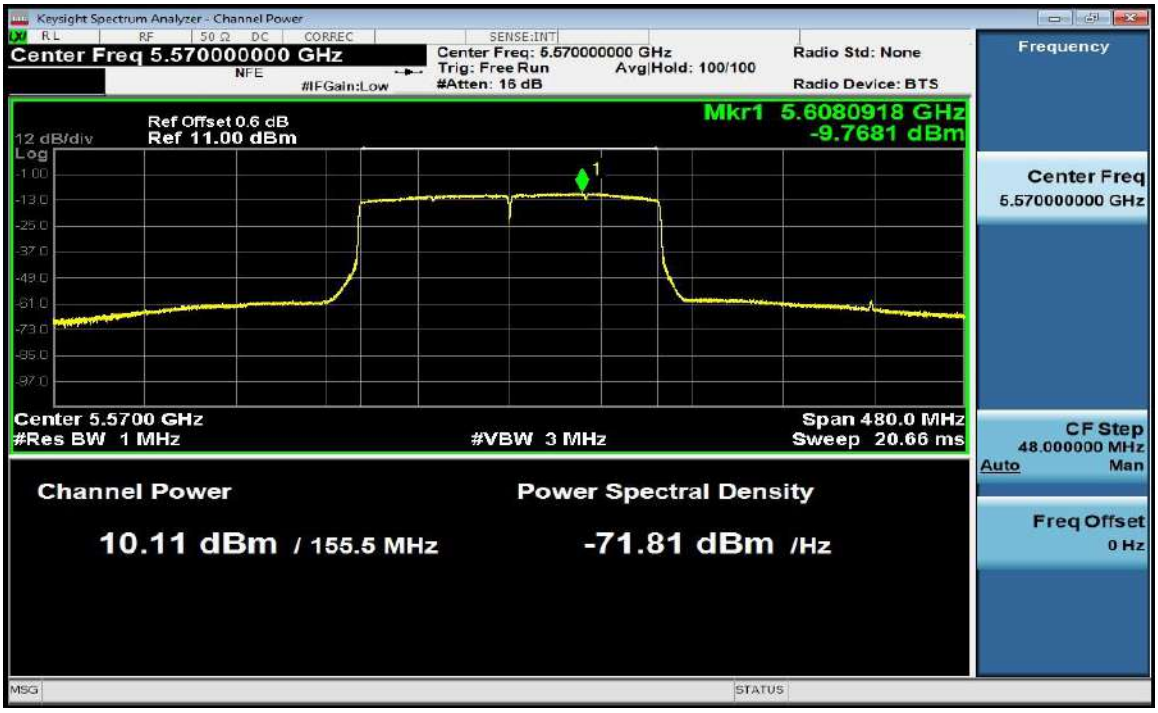


5250MHz HE160, M0 to M11 1ss – Antenna B



Data Screenshots – Antenna gain 15dBi.

5570MHz HE160, M0 to M11 1ss – Antenna A



5570MHz HE160, M0 to M11 1ss – Antenna B

A.5: Conducted Spurious Emissions

Conducted 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:

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

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

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits

15.205 | 15.209:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Use formula below to substitute conducted measurements in place of radiated measurements

E[dBμV/m] = EIRP[dBm] - 20 log(d[meters]) + 104.77, where E = field strength and d = 3 meter

1) Average Plot, Limit= -41.25 dBm eirp
2) Peak plot, Limit = -21.25 dBm eirp

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

2. Unwanted Emissions that fall Outside of the Restricted Bands

a) For all measurements, follow the requirements in II.G.3. *"General Requirements for Unwanted Emissions Measurements."*

b) At frequencies below 1000 MHz, use the procedure described in II.G.4. *"Procedure for Unwanted Emissions Measurements Below 1000 MHz."*

c) At frequencies above 1000 MHz, use the procedure for maximum emissions described in II.G.5., *"Procedure for Unwanted Emissions Measurements Above 1000 MHz."*

(i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.

Conducted Spurious Emissions Test Procedure

Ref. ANSI C63.10: 2013
KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Conducted Spurious Emissions Test Procedure
1. Connect the antenna port(s) to the spectrum analyzer input. 2. Place the radio in continuous transmit mode 3. Configure Spectrum analyzer as per test parameters below (be sure to enter all losses between the transmitter output and the spectrum analyzer). 4. Use the peak marker function to determine the maximum spurs amplitude level. 5. The "measure-and-sum technique" is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units. The worst-case output is recorded. (see ANSI C63.10:2013 section 14.3.2.2) 6. Capture graphs and record pertinent measurement data.

Ref. ANSI C63.10: 2013 section 12.7.6 (Peak) and 12.7.7.2 (Average)
KDB 789033 D02 General UNII Test Procedures New Rules v02r01, Sec. 5 (Peak), Sec. 6 (Average Method AD)

Conducted Spurious Emissions Test parameters	
Peak RBW = 1 MHz VBW ≥ 3 MHz Sweep = Auto Detector = Peak Trace = Max Hold.	**Average** RBW = 1 MHz VBW ≥ 3 MHz Sweep = Auto Detector = RMS Power Averaging

Add the max antenna gain + ground reflection factor (4.7 dB for frequencies between 30 MHz and 1000 MHz, and 0 dB for frequencies > 1000 MHz).

Tested By: Ronak Patel	**Date of testing:** 11/09/2023 – 11/10/2023
Test Result: PASS	

Test Equipment
See Appendix C for list of test equipment.

Note:
1. Although 100kHz RBW is required for emissions below 1GHz, 1MHz RBW was used in order to show compliance under worst-case setting
2. Emissions above 12GHz are only noise floor and that data can be additionally shown in radiated report

Conducted Spurious Average Table – Antenna gain 3dBi.

Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Duty Cycle (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	3.00	-65.70		0.44	-62.26	-41.25	21.01
Non HT160, 6 to 54 Mbps	2	3.00	-65.70	-65.20	0.44	-58.99	-41.25	17.74
VHT160, M0 to M11 1ss	1	3.00	-66.20		1.03	-62.17	-41.25	20.92
VHT160, M0 to M11 1ss	2	3.00	-66.20	-65.70	1.03	-58.90	-41.25	17.65
VHT160, M0 to M11 2ss	2	3.00	-66.20	-65.70	1.03	-58.90	-41.25	17.65
VHT160 Beam Forming, M0 to M11 1ss	2	6.00	-66.30	-65.90	1.03	-56.06	-41.25	14.81
VHT160 Beam Forming, M0 to M11 2ss	2	3.00	-66.20	-65.70	1.03	-58.90	-41.25	17.65
VHT160 STBC, M0 to M11 2ss	2	3.00	-66.20	-65.70	1.03	-58.90	-41.25	17.65
HE160, M0 to M11 1ss	1	3.00	-66.50		1.01	-62.49	-41.25	21.24
HE160, M0 to M11 1ss	2	3.00	-66.50	-65.70	1.01	-59.06	-41.25	17.81
HE160, M0 to M11 2ss	2	3.00	-66.50	-65.70	1.01	-59.06	-41.25	17.81
HE160 Beam Forming, M0 to M11 1ss	**2**	**6.00**	**-66.60**	**-66.10**	**1.01**	**-56.32**	**-41.25**	**15.07**
HE160 Beam Forming, M0 to M11 2ss	2	3.00	-66.50	-65.70	1.01	-59.06	-41.25	17.81
HE160 STBC, M0 to M11 2ss	2	3.00	-66.50	-65.70	1.01	-59.06	-41.25	17.81

Conducted Spurious Peak Table – Antenna gain 3dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Duty Cycle (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	3.00	-58.20		0.44	-54.76	-27.00	27.76
Non HT160, 6 to 54 Mbps	2	3.00	-58.20	-57.40	0.44	-51.33	-27.00	24.33
VHT160, M0 to M11 1ss	1	3.00	-57.60		1.03	-53.57	-27.00	26.57
VHT160, M0 to M11 1ss	2	3.00	-57.60	-55.90	1.03	-49.63	-27.00	22.63
VHT160, M0 to M11 2ss	2	3.00	-57.60	-55.90	1.03	-49.63	-27.00	22.63
VHT160 Beam Forming, M0 to M11 1ss	2	6.00	-57.40	-56.70	1.03	-47.00	-27.00	20.00
VHT160 Beam Forming, M0 to M11 2ss	2	3.00	-57.60	-55.90	1.03	-49.63	-27.00	22.63
VHT160 STBC, M0 to M11 2ss	2	3.00	-57.60	-55.90	1.03	-49.63	-27.00	22.63
HE160, M0 to M11 1ss	1	3.00	-57.20		1.01	-53.19	-27.00	26.19
HE160, M0 to M11 1ss	2	3.00	-57.20	-56.40	1.01	-49.76	-27.00	22.76
HE160, M0 to M11 2ss	2	3.00	-57.20	-56.40	1.01	-49.76	-27.00	22.76
HE160 Beam Forming, M0 to M11 1ss	**2**	**6.00**	**-57.40**	**-56.90**	**1.01**	**-47.12**	**-27.00**	**20.12**
HE160 Beam Forming, M0 to M11 2ss	2	3.00	-57.20	-56.40	1.01	-49.76	-27.00	22.76
HE160 STBC, M0 to M11 2ss	2	3.00	-57.20	-56.40	1.01	-49.76	-27.00	22.76

Conducted Spurious Average Table – Antenna gain 8dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Duty Cycle (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	8.00	-65.80		0.44	-57.36	-41.25	16.11
Non HT160, 6 to 54 Mbps	2	8.00	-65.70	-71.00	0.44	-56.13	-41.25	14.88
VHT160, M0 to M11 1ss	1	8.00	-66.30		1.03	-57.27	-41.25	16.02
VHT160, M0 to M11 1ss	**2**	**8.00**	**-66.30**	**-65.90**	**1.03**	**-54.06**	**-41.25**	**12.81**
VHT160, M0 to M11 2ss	2	8.00	-66.30	-65.90	1.03	-54.06	-41.25	12.81
VHT160 Beam Forming, M0 to M11 1ss	2	11.00	-66.30	-65.90	1.03	-51.06	-41.25	9.81
VHT160 Beam Forming, M0 to M11 2ss	2	8.00	-66.30	-65.90	1.03	-54.06	-41.25	12.81
VHT160 STBC, M0 to M11 2ss	2	8.00	-66.30	-65.90	1.03	-54.06	-41.25	12.81
HE160, M0 to M11 1ss	1	8.00	-66.60		1.01	-57.59	-41.25	16.34
HE160, M0 to M11 1ss	2	8.00	-67.00	-65.80	1.01	-54.34	-41.25	13.09
HE160, M0 to M11 2ss	2	8.00	-67.00	-65.80	1.01	-54.34	-41.25	13.09
HE160 Beam Forming, M0 to M11 1ss	2	11.00	-67.00	-65.80	1.01	-51.34	-41.25	10.09
HE160 Beam Forming, M0 to M11 2ss	2	8.00	-67.00	-65.80	1.01	-54.34	-41.25	13.09
HE160 STBC, M0 to M11 2ss	2	8.00	-67.00	-65.80	1.01	-54.34	-41.25	13.09

Conducted Spurious Peak Table – Antenna gain 8dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Duty Cycle (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	8.00	-58.00		0.44	-49.56	-27.00	22.56
Non HT160, 6 to 54 Mbps	2	8.00	-57.80	-61.10	0.44	-47.69	-27.00	20.69
VHT160, M0 to M11 1ss	1	8.00	-57.40		1.03	-48.37	-27.00	21.37
VHT160, M0 to M11 1ss	**2**	**8.00**	**-57.40**	**-56.70**	**1.03**	**-45.00**	**-27.00**	**18.00**
VHT160, M0 to M11 2ss	2	8.00	-57.40	-56.70	1.03	-45.00	-27.00	18.00
VHT160 Beam Forming, M0 to M11 1ss	2	11.00	-57.40	-56.70	1.03	-42.00	-27.00	15.00
VHT160 Beam Forming, M0 to M11 2ss	2	8.00	-57.40	-56.70	1.03	-45.00	-27.00	18.00
VHT160 STBC, M0 to M11 2ss	2	8.00	-57.40	-56.70	1.03	-45.00	-27.00	18.00
HE160, M0 to M11 1ss	1	8.00	-57.40		1.01	-48.39	-27.00	21.39
HE160, M0 to M11 1ss	2	8.00	-57.30	-57.40	1.01	-45.33	-27.00	18.33
HE160, M0 to M11 2ss	2	8.00	-57.30	-57.40	1.01	-45.33	-27.00	18.33
HE160 Beam Forming, M0 to M11 1ss	2	11.00	-57.30	-57.40	1.01	-42.33	-27.00	15.33
HE160 Beam Forming, M0 to M11 2ss	2	8.00	-57.30	-57.40	1.01	-45.33	-27.00	18.33
HE160 STBC, M0 to M11 2ss	2	8.00	-57.30	-57.40	1.01	-45.33	-27.00	18.33

Conducted Spurious Average Table – Antenna gain 15dBi.
Frequency 5570 MHz

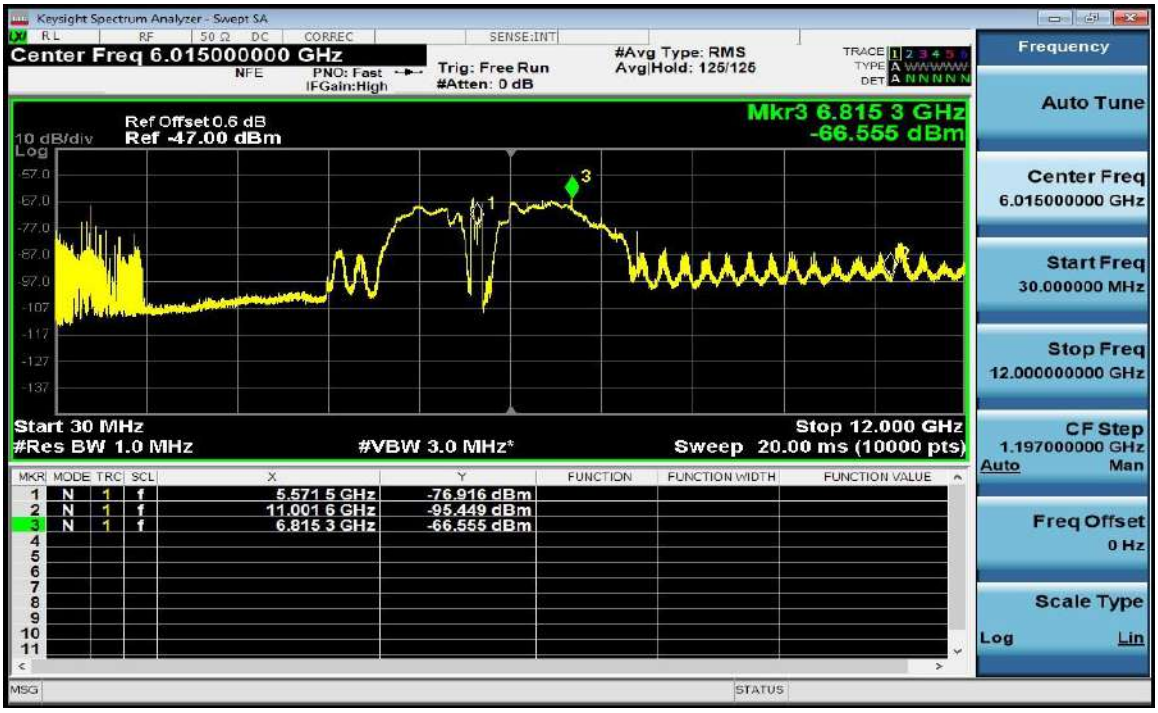
Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Duty Cycle (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	15.00	-66.00		0.44	-50.56	-41.25	9.31
Non HT160, 6 to 54 Mbps	2	15.00	-66.00	-71.20	0.44	-49.41	-41.25	8.16
VHT160, M0 to M11 1ss	1	15.00	-66.10		1.03	-50.07	-41.25	8.82
VHT160, M0 to M11 1ss	**2**	**15.00**	**-66.50**	**-71.70**	**1.03**	**-49.33**	**-41.25**	**8.08**
VHT160, M0 to M11 2ss	2	15.00	-66.50	-71.70	1.03	-49.33	-41.25	8.08
VHT160 Beam Forming, M0 to M11 1ss	2	15.00	-66.50	-71.70	1.03	-49.33	-41.25	8.08
VHT160 Beam Forming, M0 to M11 2ss	2	15.00	-66.50	-71.70	1.03	-49.33	-41.25	8.08
VHT160 STBC, M0 to M11 2ss	2	15.00	-66.50	-71.70	1.03	-49.33	-41.25	8.08
HE160, M0 to M11 1ss	1	15.00	-66.70		1.01	-50.69	-41.25	9.44
HE160, M0 to M11 1ss	2	15.00	-67.20	-71.70	1.01	-49.87	-41.25	8.62
HE160, M0 to M11 2ss	2	15.00	-67.20	-71.70	1.01	-49.87	-41.25	8.62
HE160 Beam Forming, M0 to M11 1ss	2	15.00	-67.20	-71.70	1.01	-49.87	-41.25	8.62
HE160 Beam Forming, M0 to M11 2ss	2	15.00	-67.20	-71.70	1.01	-49.87	-41.25	8.62
HE160 STBC, M0 to M11 2ss	2	15.00	-67.20	-71.70	1.01	-49.87	-41.25	8.62

Conducted Spurious Peak Table – Antenna gain 15dBi.
Frequency 5570 MHz

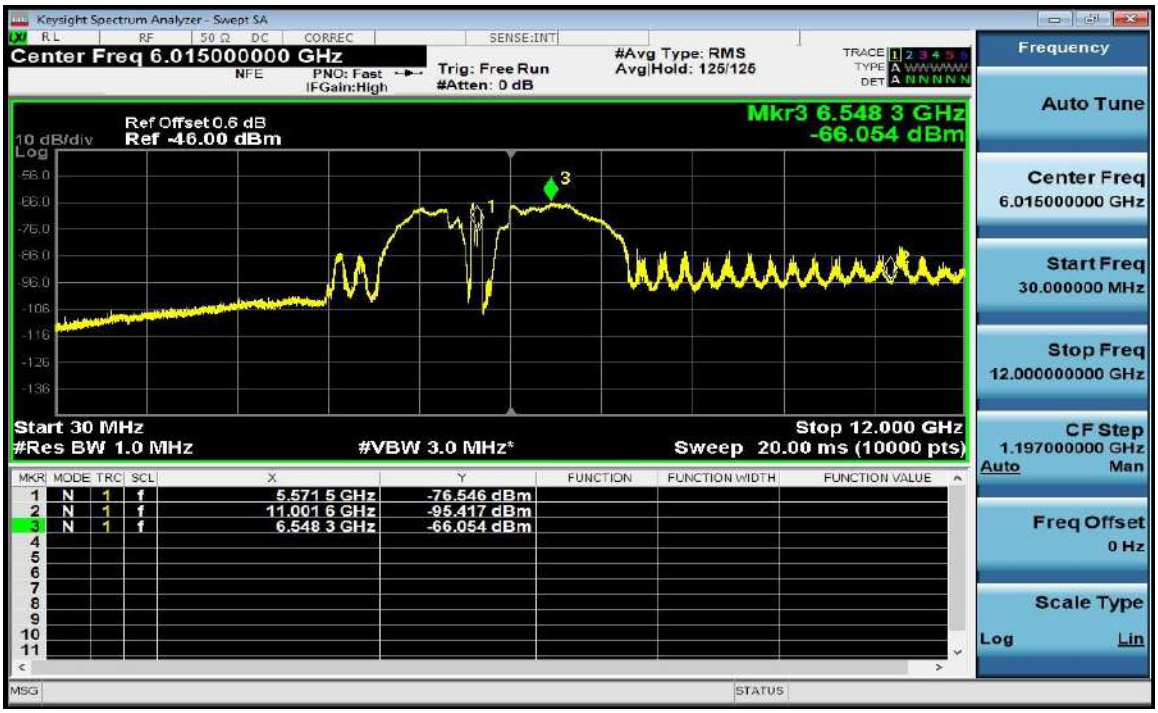
Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Duty Cycle (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	15.00	-58.10		0.44	-42.66	-27.00	15.66
Non HT160, 6 to 54 Mbps	2	15.00	-58.10	-62.30	0.44	-41.26	-27.00	14.26
VHT160, M0 to M11 1ss	1	15.00	-57.80		1.03	-41.77	-27.00	14.77
VHT160, M0 to M11 1ss	**2**	**15.00**	**-57.70**	**-61.70**	**1.03**	**-40.22**	**-27.00**	**13.22**
VHT160, M0 to M11 2ss	2	15.00	-57.70	-61.70	1.03	-40.22	-27.00	13.22
VHT160 Beam Forming, M0 to M11 1ss	2	15.00	-57.70	-61.70	1.03	-40.22	-27.00	13.22
VHT160 Beam Forming, M0 to M11 2ss	2	15.00	-57.70	-61.70	1.03	-40.22	-27.00	13.22
VHT160 STBC, M0 to M11 2ss	2	15.00	-57.70	-61.70	1.03	-40.22	-27.00	13.22
HE160, M0 to M11 1ss	1	15.00	-58.10		1.01	-42.09	-27.00	15.09
HE160, M0 to M11 1ss	2	15.00	-58.30	-61.90	1.01	-40.72	-27.00	13.72
HE160, M0 to M11 2ss	2	15.00	-58.30	-61.90	1.01	-40.72	-27.00	13.72
HE160 Beam Forming, M0 to M11 1ss	2	15.00	-58.30	-61.90	1.01	-40.72	-27.00	13.72
HE160 Beam Forming, M0 to M11 2ss	2	15.00	-58.30	-61.90	1.01	-40.72	-27.00	13.72
HE160 STBC, M0 to M11 2ss	2	15.00	-58.30	-61.90	1.01	-40.72	-27.00	13.72

Data Screenshots – Antenna gain 3dBi average.

5250MHz VHT160, M0 to M11 1ss – Antenna A

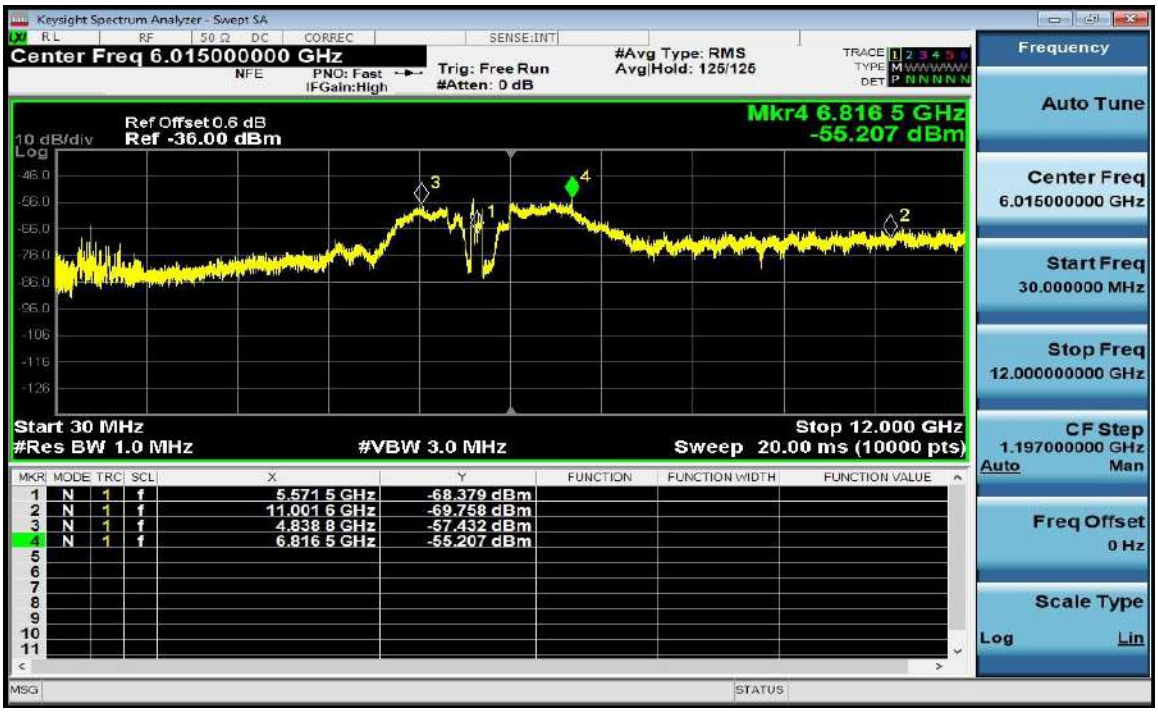


5250MHz VHT160, M0 to M11 1ss – Antenna B

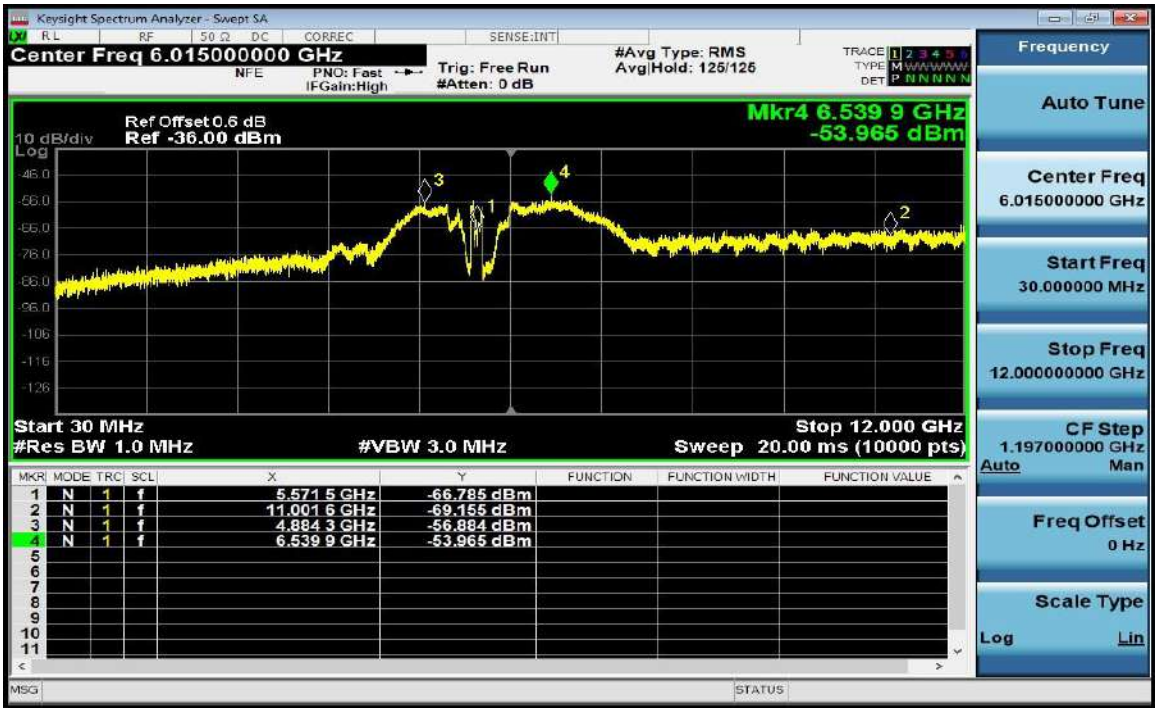


Data Screenshots – Antenna gain 3dBi peak.

5250MHz HE160 Beam Forming, M0 to M11 1ss – Antenna A

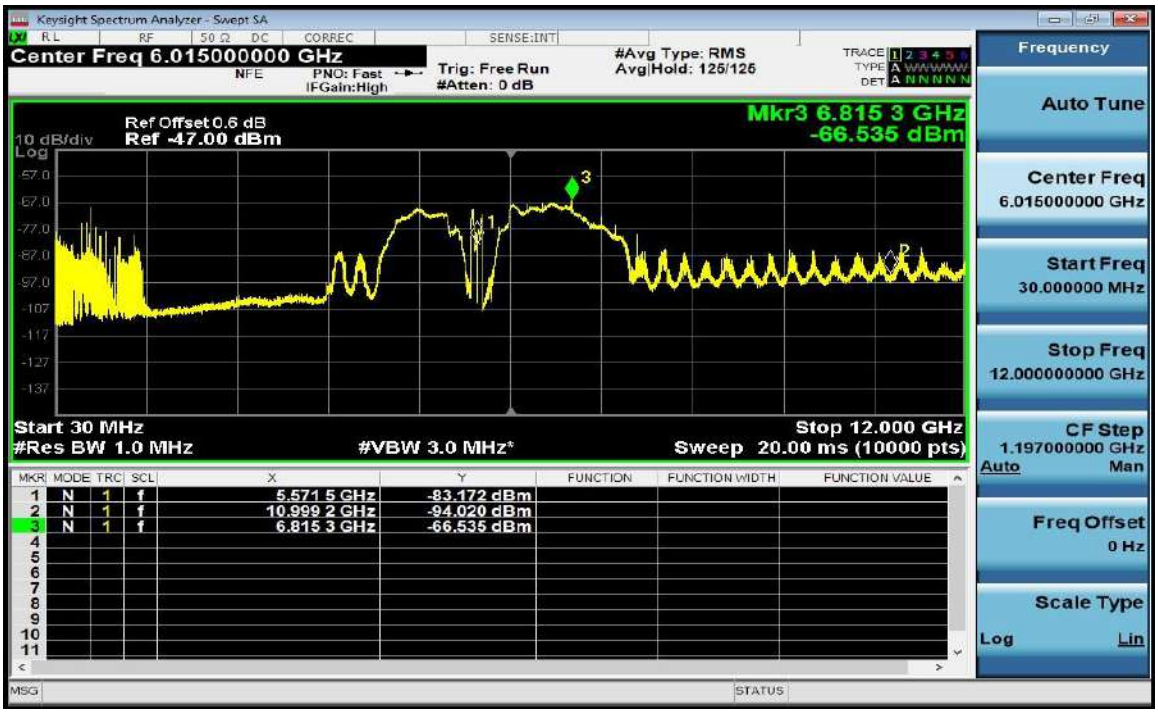


5250MHz HE160 Beam Forming, M0 to M11 1ss – Antenna B

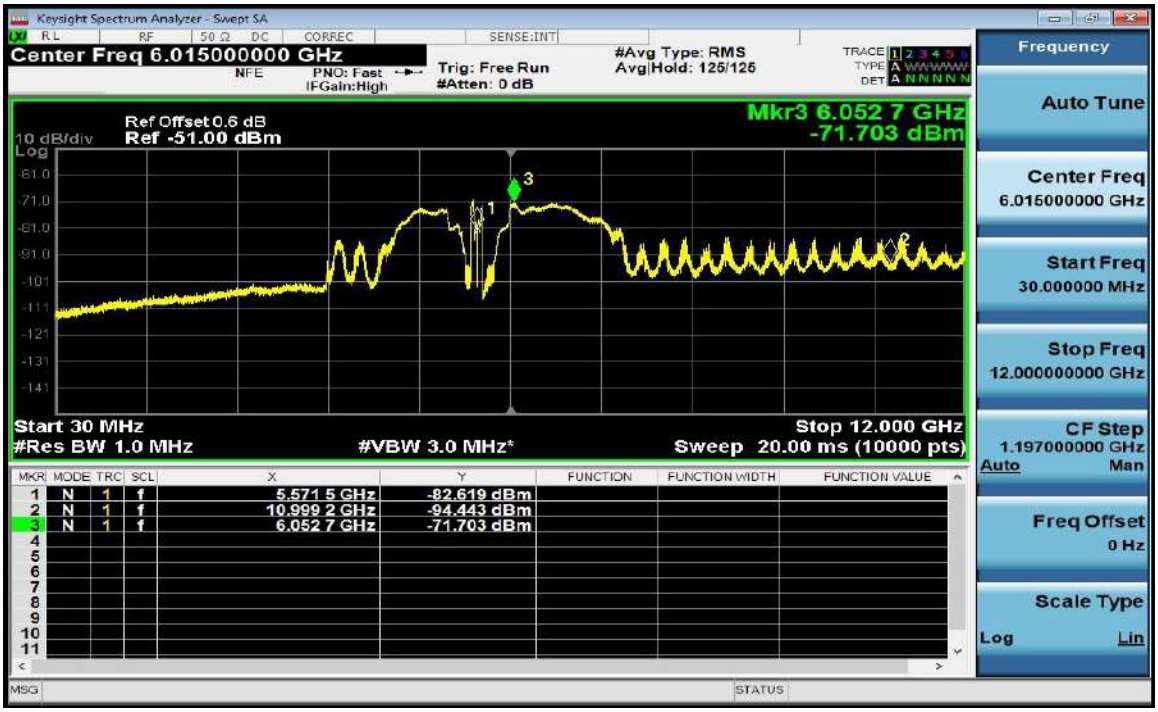


Data Screenshots – Antenna gain 15dBi average.

5250MHz VHT160, M0 to M11 1ss – Antenna A

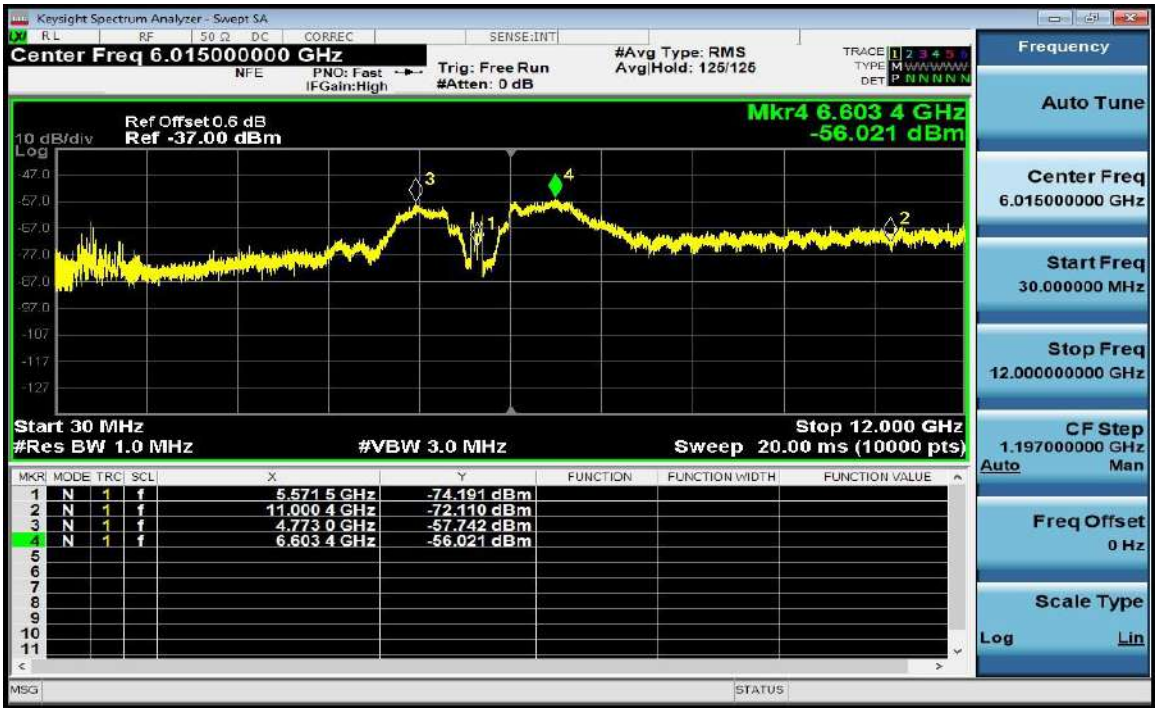


5250MHz VHT160, M0 to M11 1ss – Antenna B

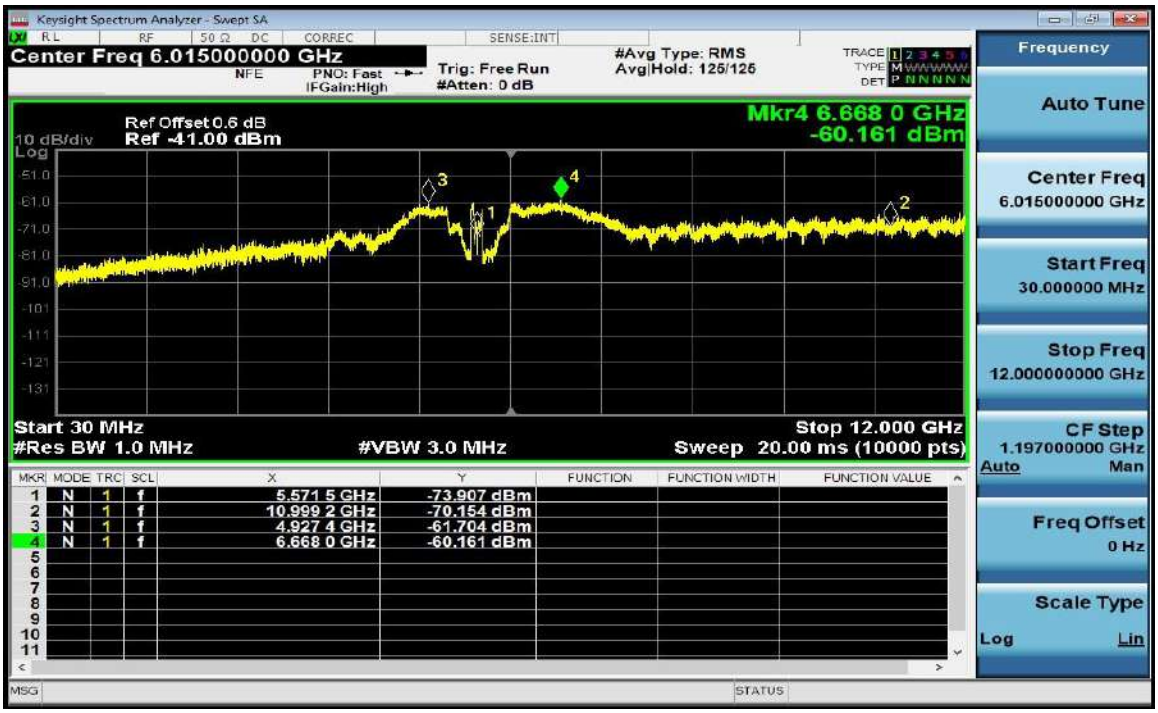


Data Screenshots – Antenna gain 15dBi peak.

5250MHz VHT160, M0 to M11 1ss – Antenna A



5250MHz VHT160, M0 to M11 1ss – Antenna B



A.6: Conducted Band Edge

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:

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

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

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits

15.205 | 15.209:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Use formula below to substitute conducted measurements in place of radiated measurements

E[dBµV/m] = EIRP[dBm] - 20 log(d[meters]) + 104.77, where E = field strength and d = 3 meter

1) Average Plot, Limit= -41.25 dBm eirp
2) Peak plot, Limit = -21.25 dBm eirp

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

2. Unwanted Emissions that fall Outside of the Restricted Bands

a) For all measurements, follow the requirements in II.G.3. *"General Requirements for Unwanted Emissions Measurements."*

b) At frequencies below 1000 MHz, use the procedure described in II.G.4. *"Procedure for Unwanted Emissions Measurements Below 1000 MHz."*

c) At frequencies above 1000 MHz, use the procedure for maximum emissions described in II.G.5., *"Procedure for Unwanted Emissions Measurements Above 1000 MHz."*

(i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.

Conducted Band Edge Test Procedure

Ref. ANSI C63.10: 2013

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Conducted Spurious Emissions Test Procedure
1. Connect the antenna port(s) to the spectrum analyzer input. 2. Place the radio in continuous transmit mode 3. Configure Spectrum analyzer as per test parameters below (be sure to enter all losses between the transmitter output and the spectrum analyzer). 4. Use the peak marker function to determine the maximum spurs amplitude level. 5. The "measure-and-sum technique" is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units. The worst-case output is recorded. (See ANSI C63.10:2013 section 14.3.2.2) 6. Capture graphs and record pertinent measurement data.

Ref. ANSI C63.10: 2013 section 12.7.6 (Peak) and 12.7.7.2 (Average)
KDB 789033 D02 General UNII Test Procedures New Rules v02r01, Sec. 5 (Peak), Sec. 6 (Average Method AD)

Conducted Spurious Emissions Test parameters	
Peak RBW = 1 MHz VBW ≥ 3 MHz Sweep = Auto Detector = Peak Trace = Max Hold.	**Average** RBW = 1 MHz VBW ≥ 3 MHz Sweep = Auto Detector = RMS Power Averaging

Tested By: Ronak Patel	**Date of testing:** 11/09/2023 – 11/10/2023
Test Result: PASS	

Test Equipment
See Appendix C for list of test equipment**.**

Conducted Band Edge Average Table – Antenna gain 3dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Band edge Level (dBm)	Tx 2 Band edge Level (dBm)	Duty Cycle (dB)	Total Tx Band Edge Level (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	3.00	-47.30		0.44	-43.86	-41.25	2.61
Non HT160, 6 to 54 Mbps	**2**	3.00	-47.30	-50.60	0.44	-42.19	-41.25	0.94
VHT160, M0 to M11 1ss	1	3.00	-48.60		1.03	-44.57	-41.25	3.32
VHT160, M0 to M11 1ss	2	3.00	-48.60	-52.20	1.03	-43.00	-41.25	1.75
VHT160, M0 to M11 2ss	2	3.00	-48.60	-52.20	1.03	-43.00	-41.25	1.75
VHT160 Beam Forming, M0 to M11 1ss	2	6.00	-52.90	-55.40	1.03	-43.93	-41.25	2.68
VHT160 Beam Forming, M0 to M11 2ss	2	3.00	-48.60	-52.20	1.03	-43.00	-41.25	1.75
VHT160 STBC, M0 to M11 2ss	2	3.00	-48.60	-52.20	1.03	-43.00	-41.25	1.75
HE160, M0 to M11 1ss	1	3.00	-48.20		1.01	-44.19	-41.25	2.94
HE160, M0 to M11 1ss	2	3.00	-48.20	-51.80	1.01	-42.62	-41.25	1.37
HE160, M0 to M11 2ss	2	3.00	-48.20	-51.80	1.01	-42.62	-41.25	1.37
HE160 Beam Forming, M0 to M11 1ss	**2**	**6.00**	**-51.10**	**-52.80**	**1.01**	**-41.85**	**-41.25**	**0.60**
HE160 Beam Forming, M0 to M11 2ss	2	3.00	-48.20	-51.80	1.01	-42.62	-41.25	1.37
HE160 STBC, M0 to M11 2ss	2	3.00	-48.20	-51.80	1.01	-42.62	-41.25	1.37

Conducted Band Edge Peak Table – Antenna gain 3dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Band edge Level (dBm)	Tx 2 Band edge Level (dBm)	Total Tx Band Edge Level (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	3.00	-38.00		-34.56	-27.00	7.56
Non HT160, 6 to 54 Mbps	2	3.00	-38.00	-41.80	-33.04	-27.00	6.04
VHT160, M0 to M11 1ss	1	3.00	-38.10		-34.07	-27.00	7.07
VHT160, M0 to M11 1ss	2	3.00	-38.10	-41.10	-32.31	-27.00	5.31
VHT160, M0 to M11 2ss	2	3.00	-38.10	-41.10	-32.31	-27.00	5.31
VHT160 Beam Forming, M0 to M11 1ss	2	6.00	-40.60	-42.60	-31.45	-27.00	4.45
VHT160 Beam Forming, M0 to M11 2ss	2	3.00	-38.10	-41.10	-32.31	-27.00	5.31
VHT160 STBC, M0 to M11 2ss	2	3.00	-38.10	-41.10	-32.31	-27.00	5.31
HE160, M0 to M11 1ss	1	3.00	-38.40		-34.39	-27.00	7.39
HE160, M0 to M11 1ss	2	3.00	-38.40	-39.10	-31.71	-27.00	4.71
HE160, M0 to M11 2ss	2	3.00	-38.40	-39.10	-31.71	-27.00	4.71
HE160 Beam Forming, M0 to M11 1ss	**2**	**6.00**	**-40.30**	**-39.30**	**-29.75**	**-27.00**	**2.75**
HE160 Beam Forming, M0 to M11 2ss	2	3.00	-38.40	-39.10	-31.71	-27.00	4.71
HE160 STBC, M0 to M11 2ss	2	3.00	-38.40	-39.10	-31.71	-27.00	4.71

Conducted Band Edge Average Table – Antenna gain 8dBi.

Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Band edge Level (dBm)	Tx 2 Band edge Level (dBm)	Duty Cycle (dB)	Total Tx Band edge Level (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	8.00	-49.90		0.44	-41.46	-41.25	0.21
Non HT160, 6 to 54 Mbps	**2**	**8.00**	**-52.00**	**-53.80**	**0.44**	**-41.35**	**-41.25**	**0.10**
VHT160, M0 to M11 1ss	1	8.00	-52.90		1.03	-43.87	-41.25	2.62
VHT160, M0 to M11 1ss	2	8.00	-52.90	-55.40	1.03	-41.93	-41.25	0.68
VHT160, M0 to M11 2ss	2	8.00	-52.90	-55.40	1.03	-41.93	-41.25	0.68
VHT160 Beam Forming, M0 to M11 1ss	2	11.00	-55.90	-58.40	1.03	-41.93	-41.25	0.68
VHT160 Beam Forming, M0 to M11 2ss	2	8.00	-52.90	-55.40	1.03	-41.93	-41.25	0.68
VHT160 STBC, M0 to M11 2ss	2	8.00	-52.90	-55.40	1.03	-41.93	-41.25	0.68
HE160, M0 to M11 1ss	1	8.00	-51.10		1.01	-42.09	-41.25	0.84
HE160, M0 to M11 1ss	2	8.00	-52.80	-56.00	1.01	-42.09	-41.25	0.84
HE160, M0 to M11 2ss	2	8.00	-52.80	-56.00	1.01	-42.09	-41.25	0.84
HE160 Beam Forming, M0 to M11 1ss	2	11.00	-55.80	-59.00	1.01	-42.09	-41.25	0.84
HE160 Beam Forming, M0 to M11 2ss	2	8.00	-52.80	-56.00	1.01	-42.09	-41.25	0.84
HE160 STBC, M0 to M11 2ss	2	8.00	-52.80	-56.00	1.01	-42.09	-41.25	0.84

Conducted Band Edge Peak Table – Antenna gain 8dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Band edge Level (dBm)	Tx 2 Band edge Level (dBm)	Total Tx Band Edge Level (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	8.00	-41.20		-32.76	-27.00	5.76
Non HT160, 6 to 54 Mbps	2	8.00	-43.00	-45.40	-32.58	-27.00	5.58
VHT160, M0 to M11 1ss	1	8.00	-40.60		-31.57	-27.00	4.57
VHT160, M0 to M11 1ss	2	8.00	-40.60	-42.60	-29.45	-27.00	2.45
VHT160, M0 to M11 2ss	2	8.00	-40.60	-42.60	-29.45	-27.00	2.45
VHT160 Beam Forming, M0 to M11 1ss	2	11.00	-43.60	-45.60	-29.45	-27.00	2.45
VHT160 Beam Forming, M0 to M11 2ss	2	8.00	-40.60	-42.60	-29.45	-27.00	2.45
VHT160 STBC, M0 to M11 2ss	2	8.00	-40.60	-42.60	-29.45	-27.00	2.45
HE160, M0 to M11 1ss	1	8.00	-40.30		-31.29	-27.00	4.29
HE160, M0 to M11 1ss	**2**	**8.00**	**-38.50**	**-41.40**	**-27.69**	**-27.00**	**0.69**
HE160, M0 to M11 2ss	2	8.00	-38.50	-41.40	-27.69	-27.00	0.69
HE160 Beam Forming, M0 to M11 1ss	2	11.00	-41.50	-44.40	-27.69	-27.00	0.69
HE160 Beam Forming, M0 to M11 2ss	2	8.00	-38.50	-41.40	-27.69	-27.00	0.69
HE160 STBC, M0 to M11 2ss	2	8.00	-38.50	-41.40	-27.69	-27.00	0.69

Conducted Band Edge Average Table – Antenna gain 15dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Band edge Level (dBm)	Tx 2 Band edge Level (dBm)	Duty Cycle (dB)	Total Tx Band Edge Level (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	15.00	-59.10		0.44	-43.66	-41.25	2.41
Non HT160, 6 to 54 Mbps	**2**	**15.00**	**-59.10**	**-61.70**	**0.44**	**-41.76**	**-41.25**	**0.51**
VHT160, M0 to M11 1ss	1	15.00	-59.00		1.03	-42.97	-41.25	1.72
VHT160, M0 to M11 1ss	2	15.00	-59.80	-62.30	1.03	-41.83	-41.25	0.58
VHT160, M0 to M11 2ss	2	15.00	-59.80	-62.30	1.03	-41.83	-41.25	0.58
VHT160 Beam Forming, M0 to M11 1ss	2	15.00	-59.80	-62.30	1.03	-41.83	-41.25	0.58
VHT160 Beam Forming, M0 to M11 2ss	2	15.00	-59.80	-62.30	1.03	-41.83	-41.25	0.58
VHT160 STBC, M0 to M11 2ss	2	15.00	-59.80	-62.30	1.03	-41.83	-41.25	0.58
HE160, M0 to M11 1ss	1	15.00	-58.70		1.01	-42.69	-41.25	1.44
HE160, M0 to M11 1ss	2	15.00	-61.20	-61.90	1.01	-42.51	-41.25	1.26
HE160, M0 to M11 2ss	2	15.00	-61.20	-61.90	1.01	-42.51	-41.25	1.26
HE160 Beam Forming, M0 to M11 1ss	2	15.00	-61.20	-61.90	1.01	-42.51	-41.25	1.26
HE160 Beam Forming, M0 to M11 2ss	2	15.00	-61.20	-61.90	1.01	-42.51	-41.25	1.26
HE160 STBC, M0 to M11 2ss	2	15.00	-61.20	-61.90	1.01	-42.51	-41.25	1.26

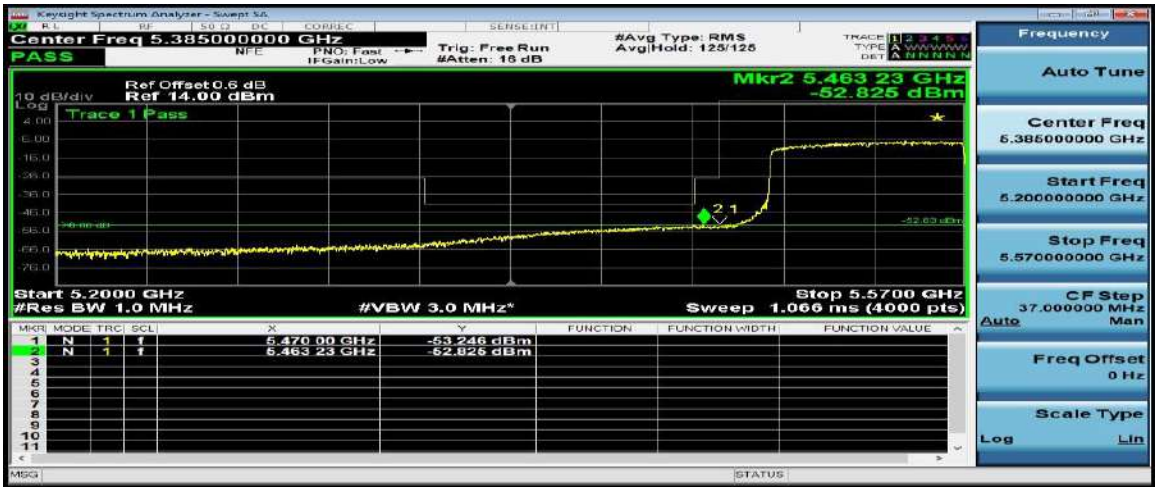
Conducted Band Edge Peak Table – Antenna gain 15dBi.
Frequency 5570 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Band edge Level (dBm)	Tx 2 Band edge Level (dBm)	Total Tx Band Edge Level (dBm)	Limit (dB)	Margin (dB)
Non HT160, 6 to 54 Mbps	1	15.00	-48.00		-32.56	-27.00	5.56
Non HT160, 6 to 54 Mbps	2	15.00	-48.00	-51.60	-30.98	-27.00	3.98
VHT160, M0 to M11 1ss	1	15.00	-45.40		-29.37	-27.00	2.37
VHT160, M0 to M11 1ss	**2**	**15.00**	**-45.10**	**-47.70**	**-27.17**	**-27.00**	**0.17**
VHT160, M0 to M11 2ss	2	15.00	-45.10	-47.70	-27.17	-27.00	0.17
VHT160 Beam Forming, M0 to M11 1ss	2	15.00	-45.10	-47.70	-27.17	-27.00	0.17
VHT160 Beam Forming, M0 to M11 2ss	2	15.00	-45.10	-47.70	-27.17	-27.00	0.17
VHT160 STBC, M0 to M11 2ss	2	15.00	-45.10	-47.70	-27.17	-27.00	0.17
HE160, M0 to M11 1ss	1	15.00	-45.50		-29.49	-27.00	2.49
HE160, M0 to M11 1ss	2	15.00	-50.00	-50.20	-31.08	-27.00	4.08
HE160, M0 to M11 2ss	2	15.00	-50.00	-50.20	-31.08	-27.00	4.08
HE160 Beam Forming, M0 to M11 1ss	2	15.00	-50.00	-50.20	-31.08	-27.00	4.08
HE160 Beam Forming, M0 to M11 2ss	2	15.00	-50.00	-50.20	-31.08	-27.00	4.08
HE160 STBC, M0 to M11 2ss	2	15.00	-50.00	-50.20	-31.08	-27.00	4.08

Data Screenshots – Antenna gain 3dBi average.

5570 MHz: HE160, M0 to M11 1ss – Antenna A

5570 MHz: HE160, M0 to M11 1ss – Antenna B



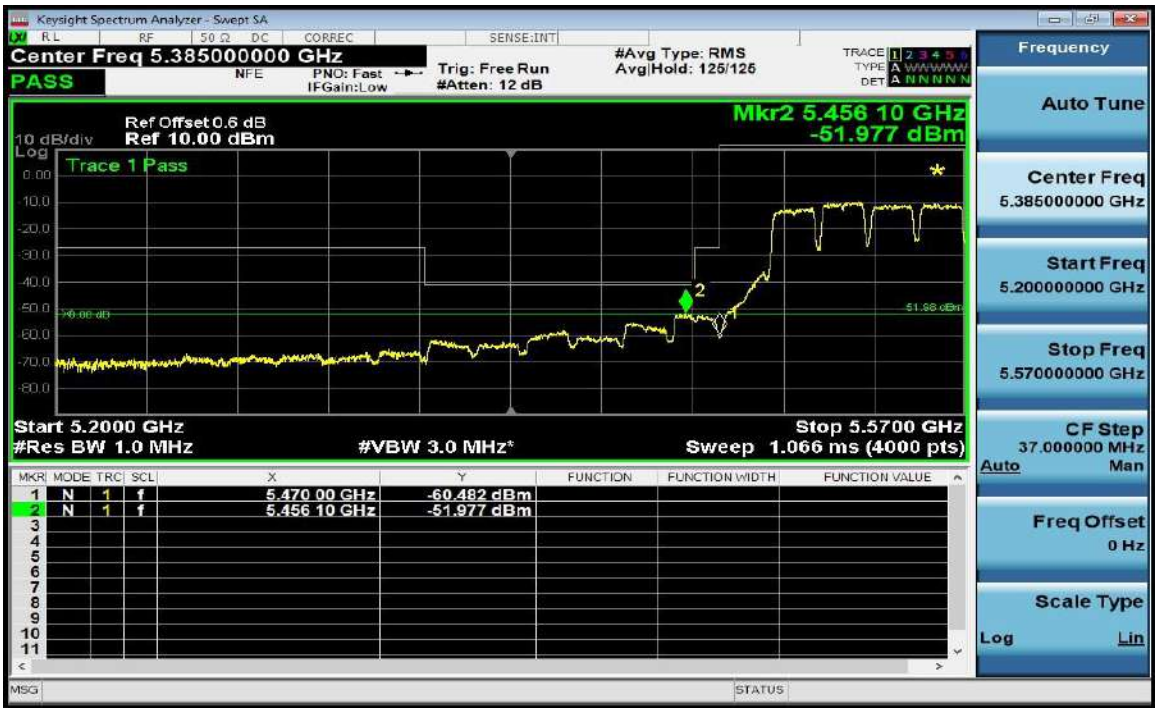
Data Screenshots – Antenna gain 3dBi peak.

5570 MHz: HE160 Beam Forming, M0 to M11 1ss – Antenna A

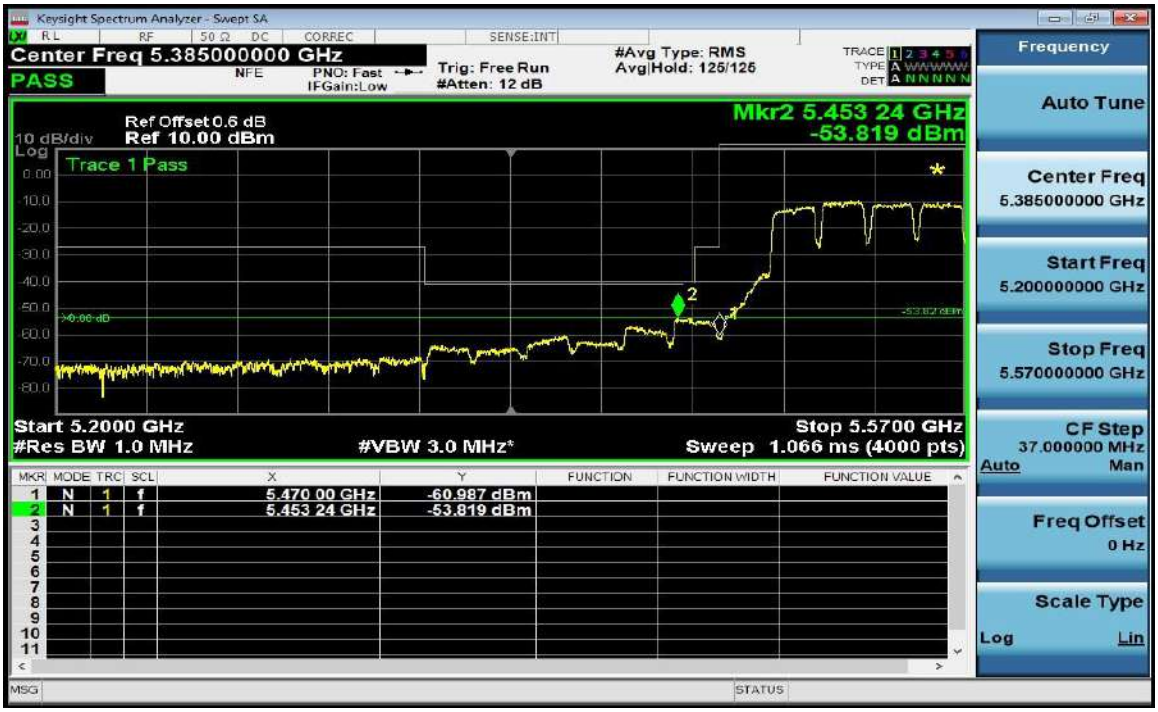
5570 MHz: HE160 Beam Forming, M0 to M11 1ss – Antenna B

Data Screenshots – Antenna gai 8dBi average.

5570MHz, Non HT160, 6 to 54 Mbps – Antenna A



5570MHz, Non HT160, 6 to 54 Mbps – Antenna B



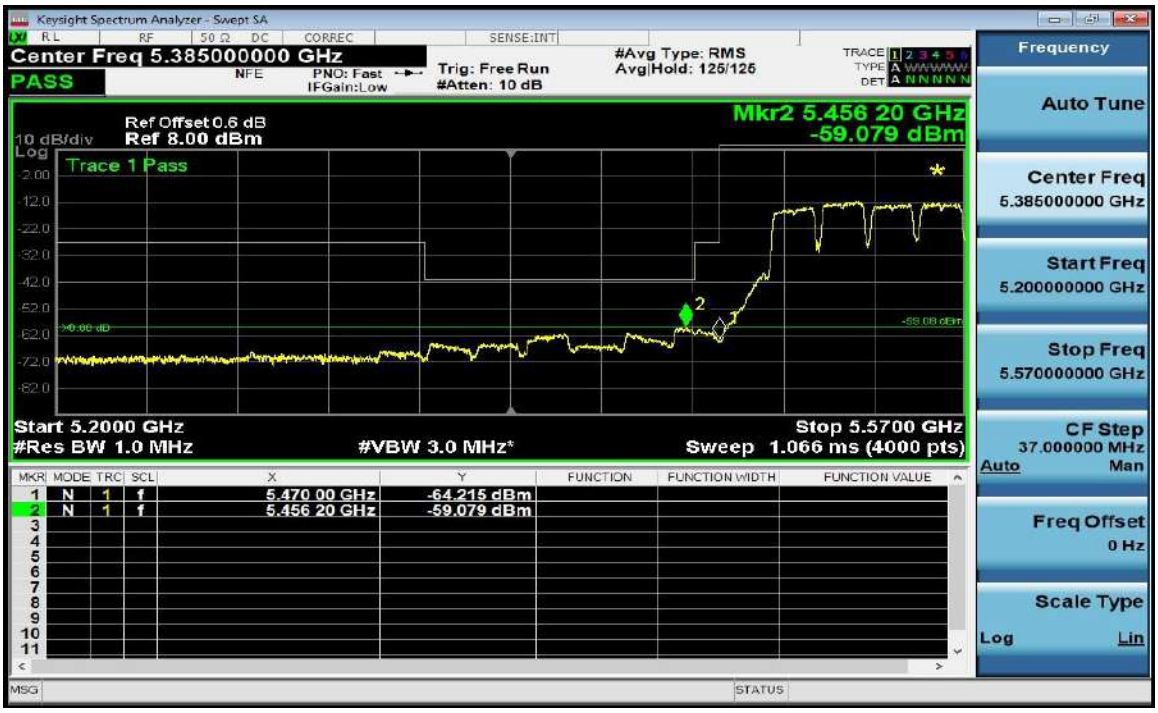
Data Screenshots – Antenna gain 8dBi peak.

5570MHz, HE160, M0 to M11 1ss – Antenna A

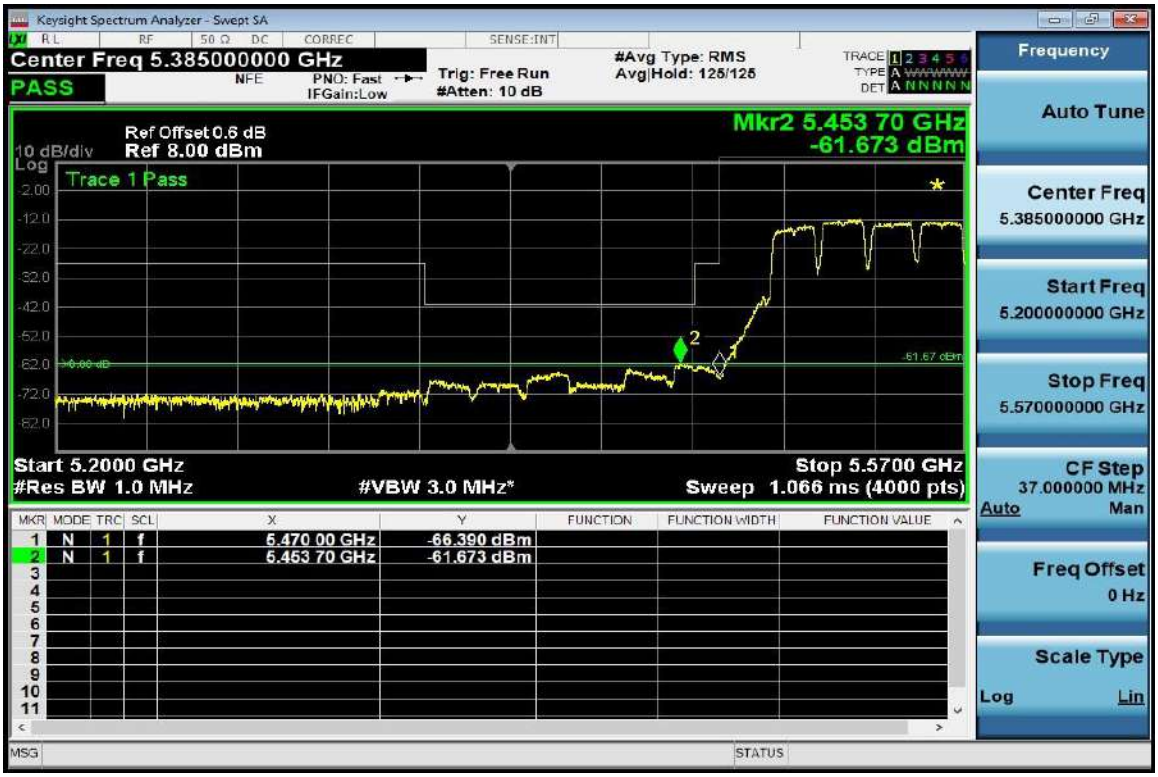
5570MHz, HE160, M0 to M11 1ss – Antenna B

Data Screenshots – Antenna gain 15dBi.

5570MHz, Non HT160, 6 to 54 Mbps – Antenna A



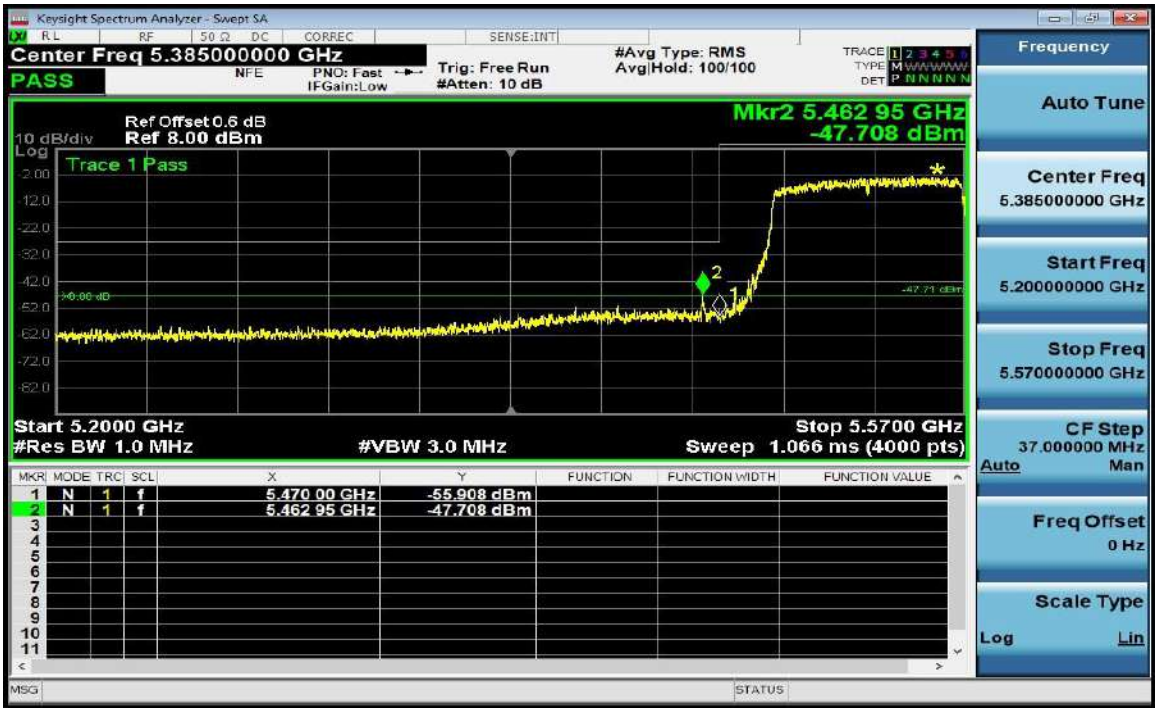
5570MHz, Non HT160, 6 to 54 Mbps – Antenna B



Data Screenshots – Antenna gain 15dBi peak.

5570MHz, VHT160, M0 to M11 1ss - Antenna A

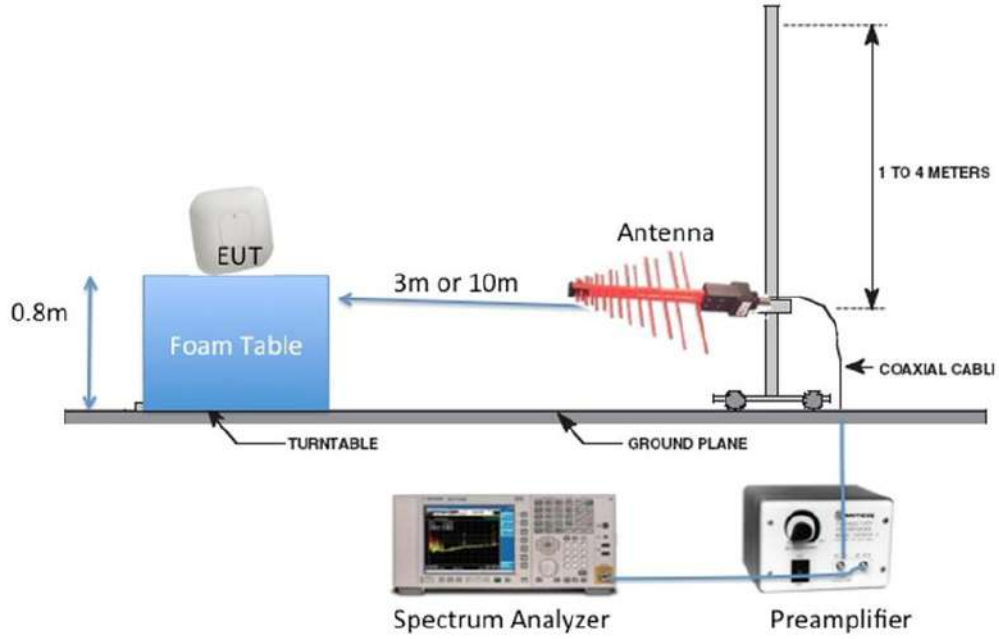
5570MHz, VHT160, M0 to M11 1ss - Antenna B



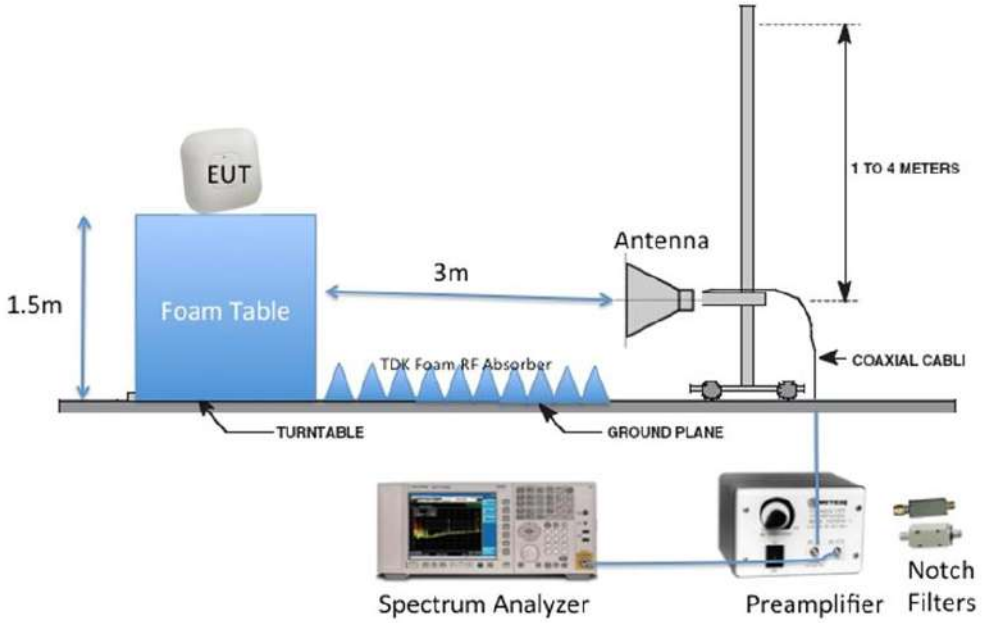
Appendix B: Emission Test Results

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

FCC 15.205 | 15.407 | LP0002 (2018-01-10) (3.6)

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Radiated emissions test results are covered in EDCS # 24346978.

B.2: Radiated Emissions 30MHz to 1GHz

FCC 15.209 | 15.205 | 15.407

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)) and RSS-Gen §8.9.

Ref. ANSI C63.10: 2013 section 6.5

Radiated emissions test results are covered in EDCS # 24346978.

B.3: AC Conducted Emissions

FCC 15.207 | LP0002 (2020-07-01) (3.3)

Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table in these sections. The more stringent limit applies at the frequency range boundaries.

Measurement Procedure
Accordance with ANSI C63.10:2013 section 6.2

Case Details

Test Case ID: 5088	**Test Type: Conducted Emissions**		
Product Standard	**Port Type**	**Test Details**	**Comments**
FCC CFR 15.207	DC (Indoor)	Start Freq: 0.15MHz - Stop Freq: 30MHz Power: DC Range: 150KHz to 30MHz. Class: N/A Measure: Voltage(dBuV) Detector(s): Quasi-Peak and Average 150kHz - 500kHz - 89dBuV (QP) 76(AV) 500kHz - 30MHz - 83dBuV (QP) 70(AV)	
Basic Standard	CISPR16 Series		
Overall Result	Pass		
Deviation	NA		

Subtest Details

Subtest Number: 5088-1 Subtest Date: 1/25/2023		
Engineer	Jose Huamani	
Lab Information	Bldg. P - Shield Room 1	
Subtest Results		
Subtest Title	5088-1	
Port Reference	[J] DC Input	
Measured Voltage	48VDC	
Transducer	LISN	
Subtest Result	Pass	
Comments on the above Test Results	Powered by 48VDC. DC Input port is under test.	
Environmental Conditions		
Temperature: (59 to 95) ^{oF}	72	
Humidity: (10 to 75) %	41	
Test Result File	**Start Freq [MHz]**	**Stop Freq [MHz]**
plce_150k-30m_lisn_m22e_48vdc [24-1-2023 15.53]	.15	30

Operation Mode

Mode#	Title	Description
1	Formal Test	EUT is set to auto-boot with Linux version 4.4.60 (root@137067b22dab) (gcc version 5.2.0 (OpenWrt GCC 5.2.0 c17576669+r49254)) #41 SMP PREEMPT Tue Oct 25 15:03:29 UTC 2022

Hardware Configuration

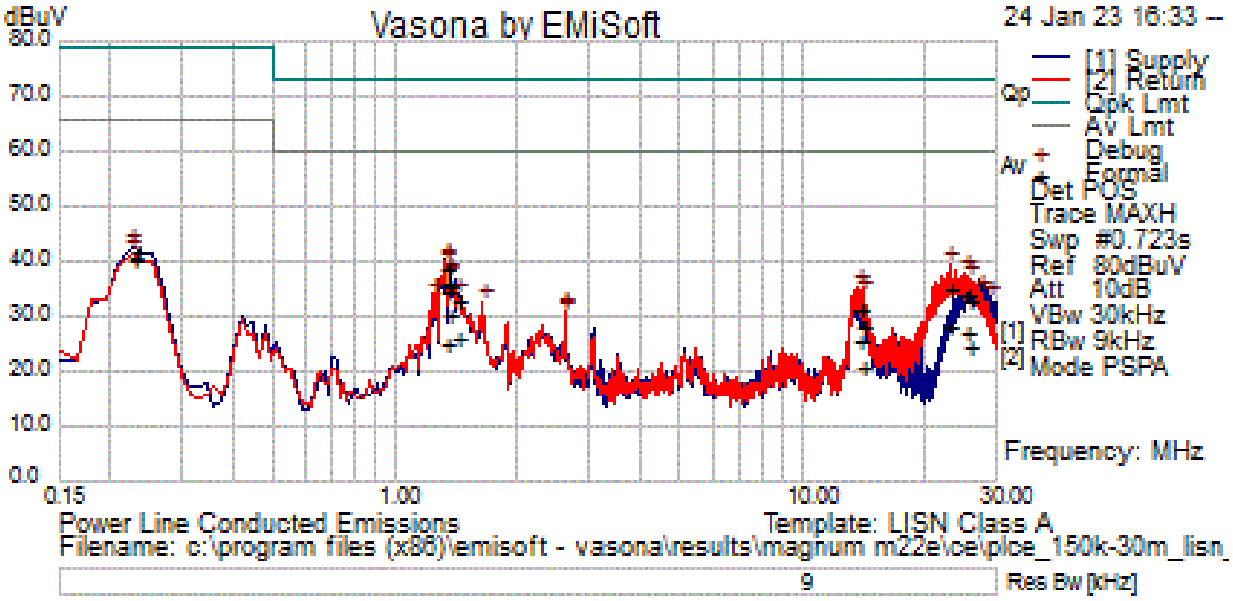
Config#	Title	Description
1	Mode-1 (DC Generator)	M22E powered up directly through a DC generator

Systems Details

System Number	Description	Samples	System under Test
5	IXIA Traffic Generator (Support)	1, 3, 2	No
3	Support - 2.4GHz & 5GHz Clients, Switch, and Laptop	4, 5, 8, 9	No

System Number	Description	Samples	System under Test
1	EUT - Config. 1: M22E powered up through DC Generator, without M12	1	Yes

Test Results Details



No	Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	1.333	16.1	19.9	.0	36.1	Average	Supply	60.0	-23.9	Pass	
2	1.333	16.1	19.9	.0	36.0	Average	Return	60.0	-24.0	Pass	
3	.231	21.7	20.1	.0	41.8	Average	Supply	66.0	-24.2	Pass	
4	.230	20.5	20.1	.0	40.6	Average	Return	66.0	-25.4	Pass	
5	1.365	10.6	19.9	.0	30.5	Average	Supply	60.0	-29.5	Pass	
6	23.014	7.5	20.5	.1	28.1	Average	Return	60.0	-31.9	Pass	
7	25.218	6.8	20.5	.2	27.4	Average	Return	60.0	-32.6	Pass	
8	1.416	6.4	19.9	.0	26.4	Average	Supply	60.0	-33.6	Pass	
9	1.333	18.9	19.9	.0	38.8	Quasi Peak	Supply	73.0	-34.2	Pass	
10	1.333	18.8	19.9	.0	38.8	Quasi Peak	Return	73.0	-34.2	Pass	
11	13.789	5.3	20.2	.1	25.7	Average	Return	60.0	-34.3	Pass	
12	1.341	5.0	19.9	.0	24.9	Average	Return	60.0	-35.1	Pass	
13	25.564	3.8	20.5	.2	24.5	Average	Supply	60.0	-35.5	Pass	
14	.231	22.0	20.1	.0	42.1	Quasi Peak	Supply	79.0	-36.9	Pass	
15	1.365	15.7	19.9	.0	35.7	Quasi Peak	Supply	73.0	-37.3	Pass	
16	23.014	14.6	20.5	.1	35.2	Quasi Peak	Return	73.0	-37.8	Pass	
17	.230	21.0	20.1	.0	41.1	Quasi Peak	Return	79.0	-37.9	Pass	
18	1.341	14.4	19.9	.0	34.4	Quasi Peak	Return	73.0	-38.6	Pass	
19	14.125	.7	20.2	.1	21.1	Average	Supply	60.0	-38.9	Pass	
20	25.218	13.3	20.5	.2	34.0	Quasi Peak	Return	73.0	-39.0	Pass	
21	1.416	13.1	19.9	.0	33.0	Quasi Peak	Supply	73.0	-40.0	Pass	
22	25.564	12.1	20.5	.2	32.8	Quasi Peak	Supply	73.0	-40.2	Pass	
23	13.789	10.9	20.2	.1	31.2	Quasi Peak	Return	73.0	-41.8	Pass	
24	14.125	7.7	20.2	.1	28.1	Quasi Peak	Supply	73.0	-44.9	Pass	

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

Rack 4: Test Equipment used for Conducted Tests – 160MHz bandwidth conducted testing						
Equip No.	**Serial No.**	**Manufacturer Model**	**Description**	**Last Cal**	**Next Due**	**Test Item**
49515	MY53050054	Keysight N5182B	MXG X-Series RF Vector Signal Generator	30-Jan-23	30-Jan-24	A.1-A.6
49516	MY52350825	Keysight N9030A	PXA Signal Analyzer (2 Hz - 50 GHz)	3-Jan-23	3-Jan-24	A.1-A.6
57478	N/A	Cisco Automation Test Insertion Loss	Rack 4	Verify Before Use	Verify Before Use	A.1-A.6
55096	308FE01	National Instruments PXI-1042	8 slot PXI chassis	Cal Not Required	Cal Not Required	A.1-A.6
57239	3099202	National Instruments PXI-8115	Embedded Controller	Cal Not Required	Cal Not Required	A.1-A.6
57250	01A1F212	National Instruments PXI-2796	40 GHz Dual 6x1 Multiplexer (SP6T)	Verify Before Use	Verify Before Use	A.1-A.6
57251	01AA139C	National Instruments PXI-2799	40 GHz Dual SPDT	Verify Before Use	Verify Before Use	A.1-A.6
56093	1C7CC78	National Instruments PXI-2796	40 GHz Dual 6x1 Multiplexer (SP6T)	Verify Before Use	Verify Before Use	A.1-A.6
54235	N/A	PASTERNACK PE5019-1	Torque Wrench	23-Mar-23	23-Mar-24	A.1-A.6

Test Equipment used for AC line Conducted emissions.

Cis-Id	Manufacturer	Model	Description	Calibrated Date	Calibration Due Date
008187	Fischer Custom Communications	FCC-450B-2.4-N	Instrumentation Limiter	2/12/2022	2/12/2023
008478	Bird	5-T-MB	5W,50 Ohm Terminator, Type BNC	6/23/2022	6/23/2023
018960	York	CNE V	Comparison Noise Emitter, 30 - 1000MHz	NA	NA
035242	Klein Tools	926-8ME	8 Meter Tape Measure	NA	NA
044022	Fischer Custom Communications	FCC-801-M2-32A	Power Line Coupling Decoupling Network	3/4/2022	3/4/2023
045982	Fischer Custom Communications	F-090527-1009-1	Line Impedance Stabilization Network	12/21/2022	12/21/2023
045983	Fischer Custom Communications	F-090527-1009-2	LISN Adapter	12/21/2022	12/21/2023
002125	FLUKE	79 II	MULTIMETER	11/18/2022	11/18/2023
058276	ROHDE & SCHWARZ	ESR3	EMI Receiver	7/29/2022	7/29/2023
058663	Vibration Research Corp	VR9500	Controller	7/18/2022	7/18/2023
062419	TTE	H785-150K-50-21378	150kHz Hi Pass Filter	2/12/2022	2/12/2023
063067	COMET	T7611-4	Temperature/Relative Humidity/Barometric Pressure Gauge/Transmitter	7/13/2022	7/13/2023

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

EUT Photos have been omitted from this test report. Photos can be found in the supplementary exhibit included in the submission and EDCS# 24671116 (5GHz and BLE Conducted test setup pictures) . All radiated test setup pictures are included in the Radiated emissions test report

Appendix F: Software Used to Perform Testing

Cisco Internal LabView Radio Test Automation Software:

RF Automation Main versions: 208, 218 & 310 (160MHz BW testing)
RF Domain Report Generation - version 3

Appendix G: Test Procedures

Measurements were made in accordance with:

- LP0002 (2020-07-01)
- KDB Publication No. 789033 - D02 General UNII Test Procedures New Rules v02r01
- KDB Publication No. 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 (Excel) EDCS# 24086914
Target Power Tables EDCS# 23409888

Appendix J: Worst Case Justification

N/A

End