

Radio Test Report

For

C9115AXI-B, C9115AXI-A, C9115AXI-T

FCC ID: LDKSLTSP1905

IC: 2461N-SLTSP1905

2412-2462 MHz

Against the following Specifications:

CFR47 Part 15.247

RSS-247

RSS-Gen Issue 5

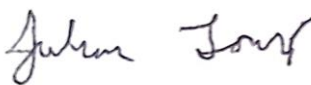
LP0002 (2018-01-10)



Applicant : Cisco Systems, Inc.

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SECTION 1: OVERVIEW.....	5
1.1 TEST SUMMARY	5
SECTION 2: ASSESSMENT INFORMATION.....	6
2.1 GENERAL.....	6
2.2 UNITS OF MEASUREMENT	6
2.3 DATE OF TESTING (INITIAL SAMPLE RECEIPT DATE TO LAST DATE OF TESTING)	8
2.4 REPORT ISSUE DATE.....	8
2.5 TESTING FACILITIES.....	8
2.6 EQUIPMENT ASSESSED (EUT)	9
2.7 EUT DESCRIPTION.....	9
SECTION 3: RESULT SUMMARY	10
3.1 RESULTS SUMMARY TABLE.....	10
3.1.1 Radio Port Results.....	10
3.1.2 Radiated Emissions (General requirements)	12
SECTION 4: SAMPLE DETAILS.....	13
4.1 SAMPLE DETAILS	13
4.2 SYSTEM DETAILS	13
4.3 MODE OF OPERATION DETAILS	13
SECTION 5: RADIO PORT RESULTS	14
5.1 DUTY CYCLE.....	14
5.1.1 Duty Cycle Test Requirement.....	14
5.1.2 Duty Cycle Test Method	15
5.1.3 Duty Cycle Test Information	16
5.1.4 Duty Cycle Data Table.....	17
5.1.5 Duty Cycle Data Screenshots.....	18
5.2 6dB BANDWIDTH.....	20
5.2.1 6dB Bandwidth Test Requirement	20
5.2.2 6dB Bandwidth Test Procedure	21
5.2.3 6dB Bandwidth Test Information.....	22
5.2.4 6dB Bandwidth Data Table	23
5.2.5 6dB Bandwidth Screenshots.....	24
5.3 OCCUPIED BANDWIDTH	26
5.3.1 Occupied Bandwidth Test Requirement	26
5.3.2 Occupied Bandwidth Test Method	27
5.3.3 Occupied Bandwidth Test Information	28
5.3.4 Occupied Bandwidth Data Table	29
5.3.5 Occupied Bandwidth Screenshots.....	30
5.4 MAXIMUM CONDUCTED OUTPUT POWER	32
5.4.1 Maximum Conducted Output Power Test Requirement.....	32
5.4.2 Maximum Conducted Output Power Test Method	33
5.4.3 Maximum Conducted Output Power Test Information	34
5.4.4 Maximum Conducted Output Power Data Table	35
5.4.5 Maximum Conducted Output Power Screenshots	40

5.5	POWER SPECTRAL DENSITY	44
5.5.1	Power Spectral Density Test Requirement	44
5.5.2	Power Spectral Density Test Method.....	45
5.5.3	Power Spectral Density Test Information.....	46
5.5.4	Power Spectral Density Data Table	47
5.5.5	Power Spectral Density Screenshots.....	51
5.6	CONDUCTED SPURIOUS EMISSIONS	55
5.6.1	Conducted Spurious Emissions Test Requirement	55
5.6.2	Conducted Spurious Emissions Test Method	56
5.6.3	Conducted Spurious Emissions Test Information	57
5.6.4	Conducted Spurious Emissions Data Table - Average	58
5.6.5	Conducted Spurious Average Screenshots 1GHz-12GHz.....	63
5.6.6	Conducted Spurious Average Screenshots 12GHz-26GHz.....	67
5.6.7	Conducted Spurious Emissions Data Table – Peak	68
5.6.8	Conducted Spurious Peak Screenshots 1GHz – 12GHz.....	73
5.6.9	Conducted Spurious Peak Screenshots 12GHz-26GHz.....	77
5.7	CONDUCTED BAND EDGE	78
5.7.1	Conducted Band Edge Test Requirement	78
5.7.2	Conducted Band Edge Test Method.....	79
5.7.3	Conducted Band Edge Test Information.....	80
5.7.4	Conducted Band Edge (Restricted Band) Data Table Average	81
5.7.5	Conducted Band Edge (Restricted Band) Screenshots Average.....	84
5.7.6	Conducted Band Edge (Restricted Band) Data Table Peak	85
5.7.7	Conducted Band Edge Screenshots Peak.....	88
5.8	CONDUCTED BAND EDGE (NON-RESTRICTED BAND)	89
5.8.1	Emissions in non-restricted frequency bands - Test Requirement.....	89
5.8.2	Emissions in non-restricted frequency bands - Test Method	90
5.8.3	Emissions in non-restricted frequency bands – Test Information	91
5.8.4	Emissions in non-restricted frequency bands – Data Tables	92
5.8.5	Emissions in non-restricted frequency bands – Screenshots	95
SECTION 6: SYSTEM TEST RESULTS.....		96
6.1	RADIATED SPURIOUS EMISSIONS.....	96
6.1.1	Radiated Transmitter Spurious Emissions – Test Requirement	96
6.1.2	Radiated Transmitter Spurious Emissions - Test Method.....	97
6.1.3	Radiated Transmitter Spurious Emissions – Test Information	98
6.1.4	Radiated Transmitter Spurious Emissions 30MHz-1GHz	99
6.1.5	Radiated Transmitter Spurious Emissions – 1-10GHz.....	102
6.1.6	Radiated Transmitter Spurious Emissions – 10-18GHz.....	108
6.1.7	Radiated Transmitter Spurious Emissions – 18-26GHz.....	114
6.2	RECEIVER SPURIOUS EMISSIONS.....	116
6.2.1	Receiver Spurious Emissions – Test Requirement.....	116
6.2.2	Receiver Spurious Emissions - Test Method	117
6.2.3	Receiver Spurious Emissions – Test Information	119
6.2.4	Receiver Spurious Emissions – 30MHz-1GHz	120
6.2.5	Receiver Spurious Emissions – 1GHz-10GHz.....	121
6.2.6	Receiver Spurious Emissions – 10GHz-18GHz.....	123

6.2.7 Receiver Spurious Emissions – 18GHz-26GHz.....	125
6.3 AC CONDUCTED EMISSIONS.....	127
APPENDIX A: LIST OF TEST EQUIPMENT USED TO PERFORM THE TEST	128
APPENDIX B: ABBREVIATION KEY AND DEFINITIONS.....	130
APPENDIX C: SOFTWARE USED TO PERFORM TESTING	131
APPENDIX D: TEST PROCEDURES.....	132
APPENDIX E: SCOPE OF ACCREDITATION (A2LA CERTIFICATE NUMBER 1178-01)	133
APPENDIX F: TEST ASSESSMENT PLAN	134

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 Part 15.247 RSS-247 Issue 2: Feb 2017 RSS-Gen Issue 5: Apr 2018 LP0002 (2018-01-10)

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*%

1. All AC testing was performed at one or more of the following supply voltages:

110V 60 Hz (+/-20%)

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	$\pm 2.4 \cdot 10^{-7}$
temperature measurements	$\pm 0.54^\circ$.
humidity measurements	$\pm 2.3\%$
DC and low frequency measurements	$\pm 2.5\%$.

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
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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.

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

November 5, 2018 – January 29, 2019

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: Chris Blair

A 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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Building 7, 5m Chamber	425 E. Tasman Drive San Jose, California 95134 United States	Company #: 2461N-3

Test Engineers

Julian Land

2.6 Equipment Assessed (EUT)

C9115AXI-B(For USA), C9115AXI-A(For Canada), C9115AXI-T(For Taiwan)

These 3 models are using same hardware specificaiton include antennas excetp for the software.

2.7 EUT Description

The C9115AXI is a next generation access point. The dual band 2.4GHz and 5GHz WIFI radio supports the next generation WIFI protocol of 802.11ax and is backwards compatible with 802.11a, b, g, n, ac. The access point features 4 internal antennas and operates in a 4x4 configuration in both the 2.4GHz and 5GHz bands.

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)
2.4GHz / 5GHz	(A antenna port)	Internal Antenna	2.3 / 4.1
2.4GHz / 5GHz	(B antenna port)	Internal Antenna	2.6 / 4.1
2.4GHz / 5GHz	(C antenna port)	Internal Antenna	2.2 / 4.1
2.4GHz / 5GHz	(D antenna port)	Internal Antenna	2.4 / 4.1

Section 3: Result Summary

3.1 Results Summary Table

3.1.1 Radio Port Results

Worst-case results from the tables are in bold, and are represented in plots that follow the tables.

Basic Standard	Technical Requirements / Details	Result
FCC 15.247 RSS-247 LP0002 (2018-01-10) (3.10.1.6) (2)(A)	6dB Bandwidth Systems using digital modulation techniques may operate in the 2400-2483.5MHz band. The minimum 6dB bandwidth shall be at least 500 kHz	Pass
FCC 15.247 RSS-247	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 15.247 RSS-247 LP0002 (2018-01-10) (3.10.1.2) (1) (C)	Output Power: 15.247 The maximum conducted output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. RSS-247 For DTSSs employing digital modulation techniques operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(e), the e.i.r.p. shall not exceed 4 W.	Pass
FCC 15.247 RSS-247 LP0002 (2018-01-10) (3.10.1.6) (2) (B)	Power Spectral Density For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.	Pass
FCC 15.247 RSS-247 LP0002 (2018-01-10) (3.10.1.5) 2.8	Conducted Spurious Emissions / Band-Edge: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated	Pass

	measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.	
FCC 15.247 RSS-247 FCC 15.205 RSS-Gen	Restricted band: Unwanted emissions falling within the restricted bands, as defined in FCC 15.205 (a) and RSS-Gen 8.10 must also comply with the radiated emission limits specified in FCC 15.209 (a) and RSS-Gen 8.9	Pass

3.1.2 Radiated Emissions (General requirements)

Basic Standard	Technical Requirements / Details	Result
FCC 15.209 RSS-Gen LP0002 (2018-01-10) (3.10.1.5) 2.8	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 filed strength limits table in this section. Unwanted emissions falling within the restricted bands, as defined in FCC 15.205 (a) and RSS-Gen 8.10 must also comply with the radiated emission limits specified in FCC 15.209 (a) and RSS-Gen 8.9	Pass
RSS-Gen LP0002 (2018-01-10) (3.10.1.5) 2.8	RX Spurious Emissions: RSS-Gen 7.3 Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna ports. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least five times the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz. Spurious emissions from receivers shall not exceed the radiated emissions limits shown in table 3	Pass
FCC 15.207 RSS-Gen LP0002 (2018-01-10) 2.3	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.	N/A (Unit only powered by DC power i.e. POE)

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	C9115AXI	Cisco Systems, Inc.	07 (P2C)		8.9.1.73	FOC22204U51
S02	Catalyst 3850 48 PoE+	Cisco Systems, Inc.	M0	1.2 (cat3k_caa-universalk9)	03.03.03SE	FOC18218BFL
S03	C9115AXI	Cisco Systems, Inc.	07 (P2C)	17.10 RC25.11	AP Image: 8.8.1.10 (Compiled Sep 25 09:42:55 PDT 2018)	FOC22204U4T
S04	AIR-PWRINJ6	Cisco Systems, Inc.	V01	N/A	N/A	C15456663000000625

4.2 System Details

System #	Description	Samples
1	EUT and Power Supply (Conducted Tests)	S01, S02
2	EUT and Power Supply (Radiated Tests)	S03, S04

4.3 Mode of Operation Details

Mode#	Description	Comments
1	802.11b, CCK	Receive and Transmit (1, 2, 3, or 4 chains)
2	802.11g, OFDM	Receive and Transmit (1, 2, 3, or 4 chains)
3	802.11n20, OFDM	Receive and Transmit (1, 2, 3, or 4 chains)
4	802.11ax20, OFDMA	Receive and Transmit (1, 2, 3, or 4 chains)

Section 5: Radio Port Results

5.1 Duty Cycle

5.1.1 Duty Cycle Test Requirement

From KDB 558074, Section 6

6.0 Duty cycle, transmission duration and maximum power control level

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (*i.e.*, with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized to ensure that measurements are made only during transmissions at the maximum power control level. ... When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternate procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle. Within this guidance document, the duty cycle refers to the fraction of time over which the transmitter is on and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ± 2 percent, otherwise the duty cycle is considered to be non-constant.

5.1.2 Duty Cycle Test Method

From KDB 558074, Section 6:

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 $RBW \geq OBW$ if possible; otherwise, set RBW to the largest available value. Set $VBW \geq RBW$. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ 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 $T \leq 16.7$ microseconds.)

5.1.3 Duty Cycle Test Information

Samples, Systems, and Modes

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

Tested By: Julian Land	Date of testing: November 5, 2018 – November 8, 2018
Test Result: Pass	

Test Equipment

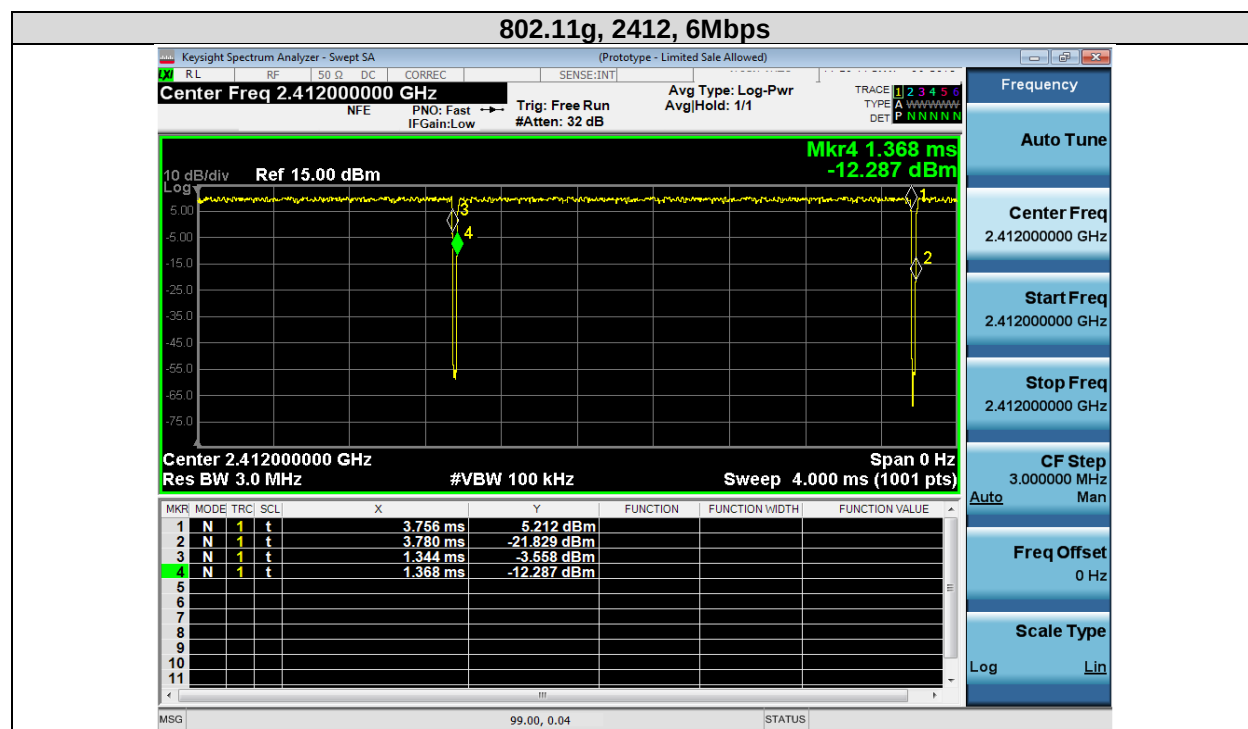
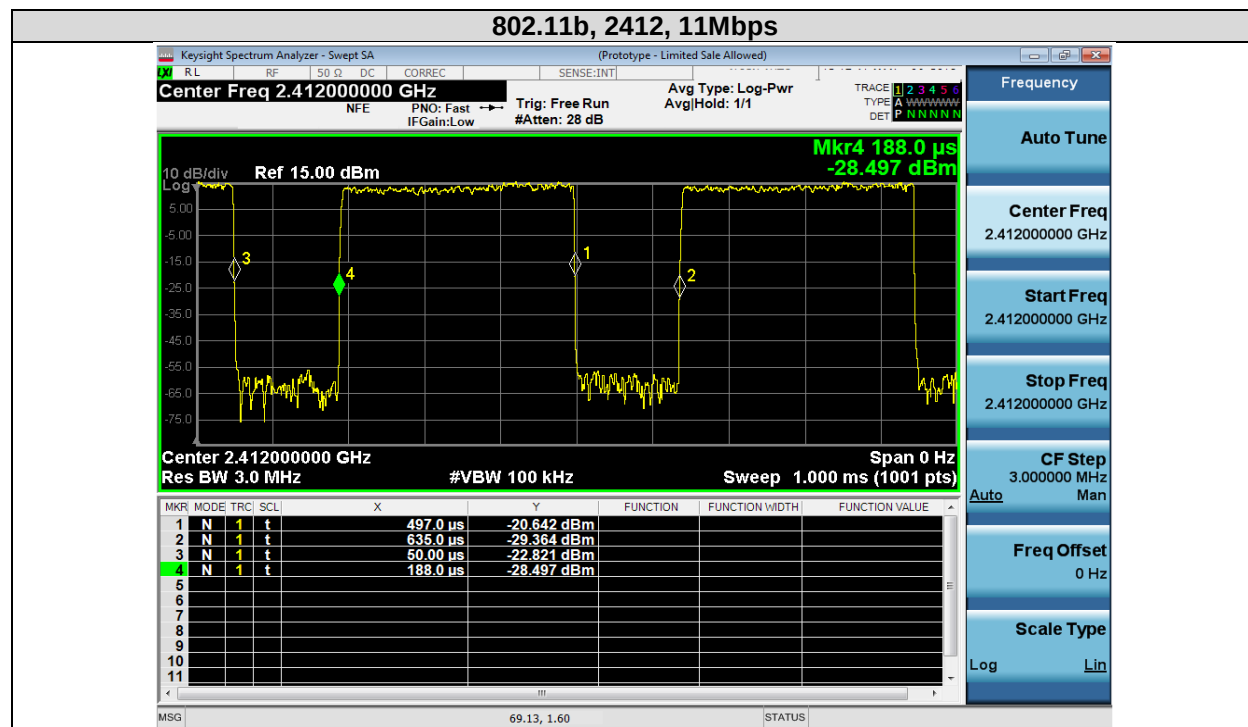
See Appendix A for list of test equipment

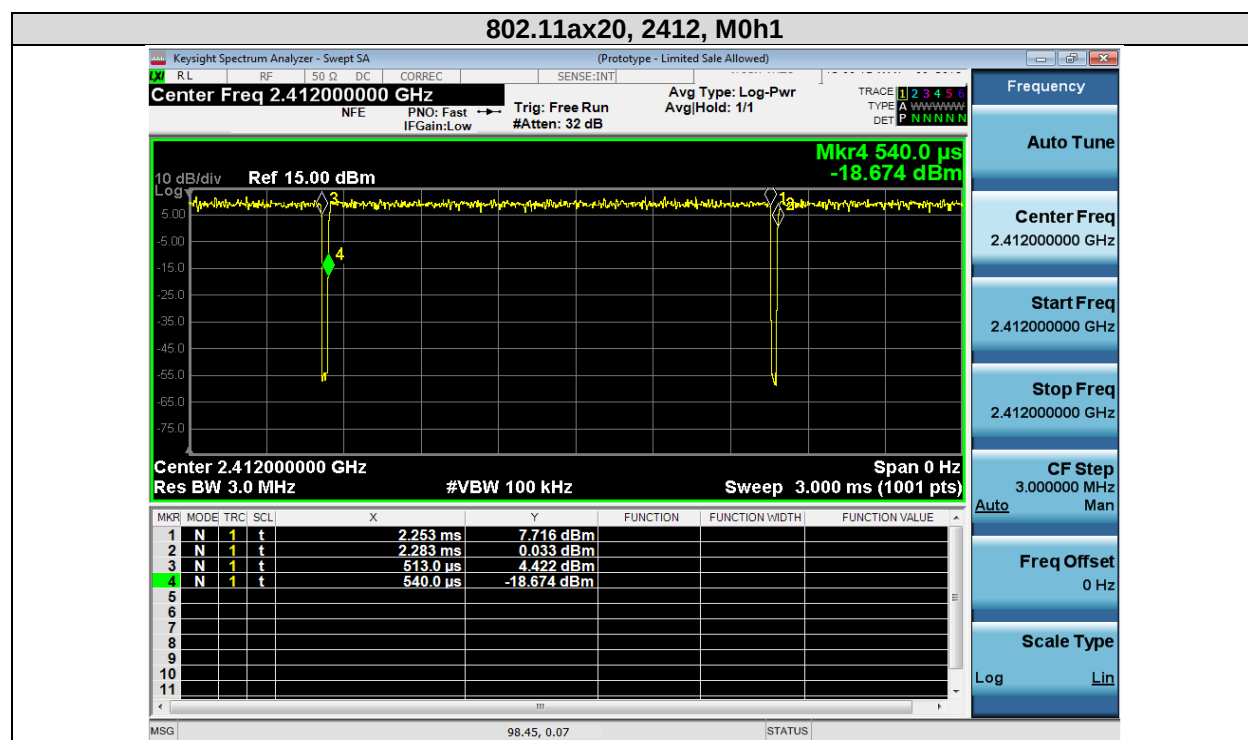
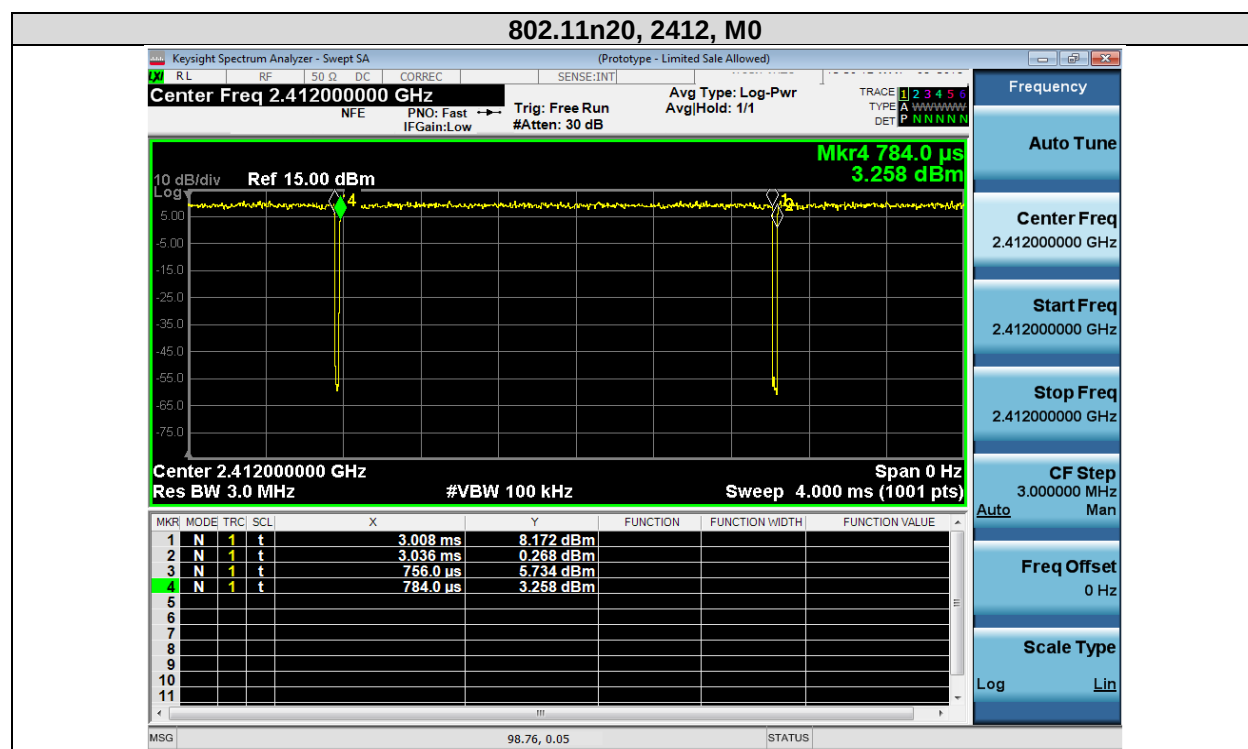
5.1.4 Duty Cycle Data Table

Duty Cycle table and screen captures are shown below for power/psd modes.

Mode	Data Rate	On-time (ms)	Total Time (ms)	Duty Cycle (%)	Correction Factor (dB)
CCK	11Mbps	0.309	0.447	69.128	1.603
NonHT20	6Mbps	2.388	2.412	99.005	0.043
HT20	MCS0	2.224	2.252	98.757	0.054
HE20	MCS0	1.713	1.743	98.279	0.075

5.1.5 Duty Cycle Data Screenshots





5.2 6dB Bandwidth

5.2.1 6dB Bandwidth Test Requirement

For the FCC / LP0002 (2018-01-10) (3.10.1.6) (2) (A):
15.247 (2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

For Industry Canada:
RSS-247 5.2 (a)

5.2 Digital transmission systems

DTSS include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to the bands 902-928 MHz and 2400-2483.5 MHz:

a) The minimum 6 dB bandwidth shall be 500 kHz.

5.2.2 6dB Bandwidth Test Procedure

Ref. KDB 558074 D01 DTS Meas. Guidance v04, 8.2 Option 2
ANSI C63.10: 2013

6dB BW Test Procedure
1. Set the radio in the continuous transmitting mode. 2. Allow the trace to stabilize. 3. Setting the x-dB bandwidth mode to -6dB within the measurement set up function. 4. Select the automatic OBW measurement function of an instrument to perform bandwidth measurement. 5. Capture graphs and record pertinent measurement data.

Ref. KDB 558074 D01 DTS Meas. Guidance v04, 8.2 Option 2
ANSI C63.10: 2013 section 11.8.2 Option 2

6dB BW Test parameters
8.0 DTS bandwidth One of the following procedures may be used to determine the modulated <i>DTS bandwidth</i>. 8.1 Option 1 a) Set RBW = 100 kHz. b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW. c) Detector = Peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) Measure the maximum 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 6 dB relative to the maximum level measured in the fundamental emission. 8.2 Option 2 The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (<i>i.e.</i>, RBW = 100 kHz, VBW $\geq 3 \times$ RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

5.2.3 6dB Bandwidth Test Information

Samples, Systems, and Modes

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

Tested By: Julian Land	Date of testing: January 17, 2019
Test Result: PASS	

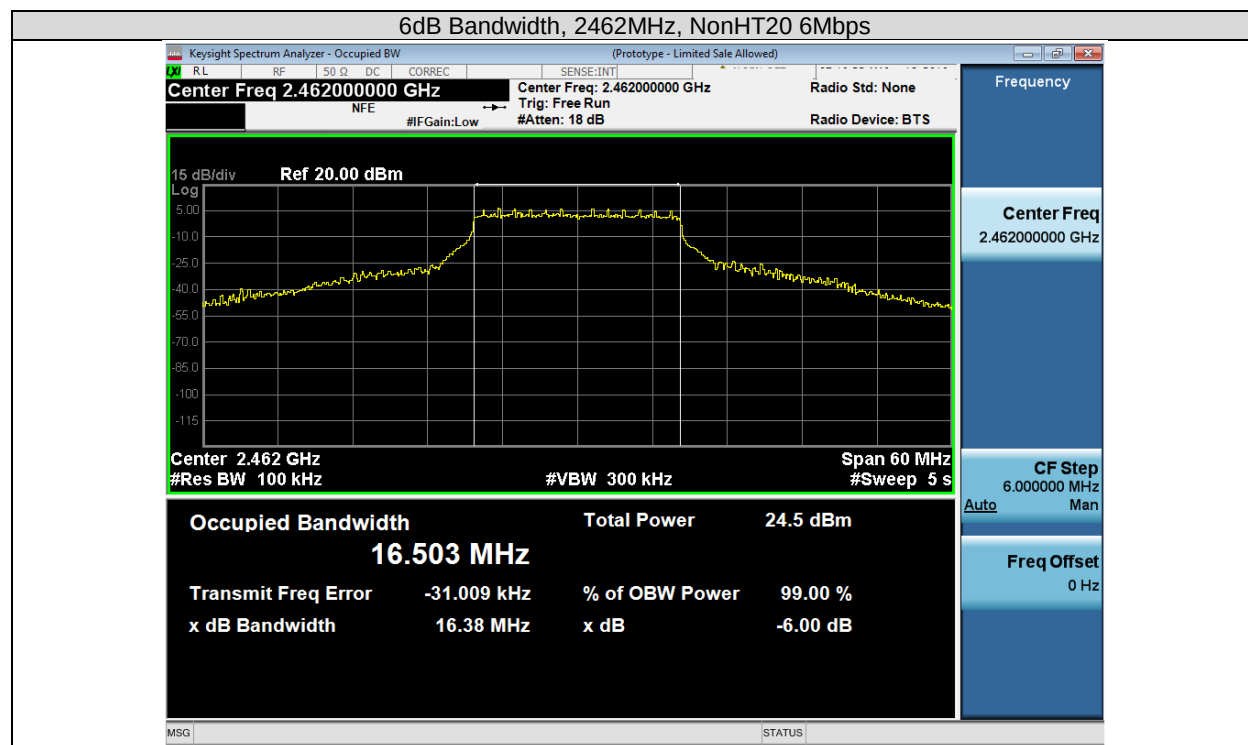
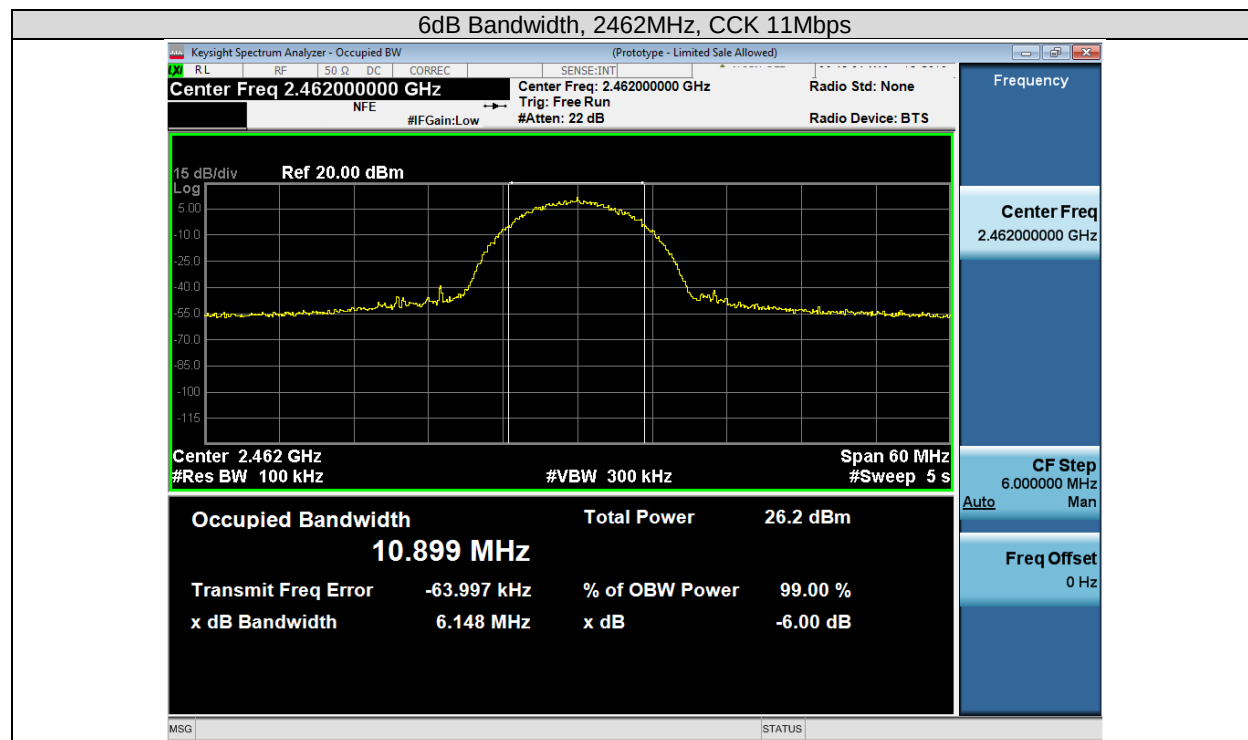
Test Equipment

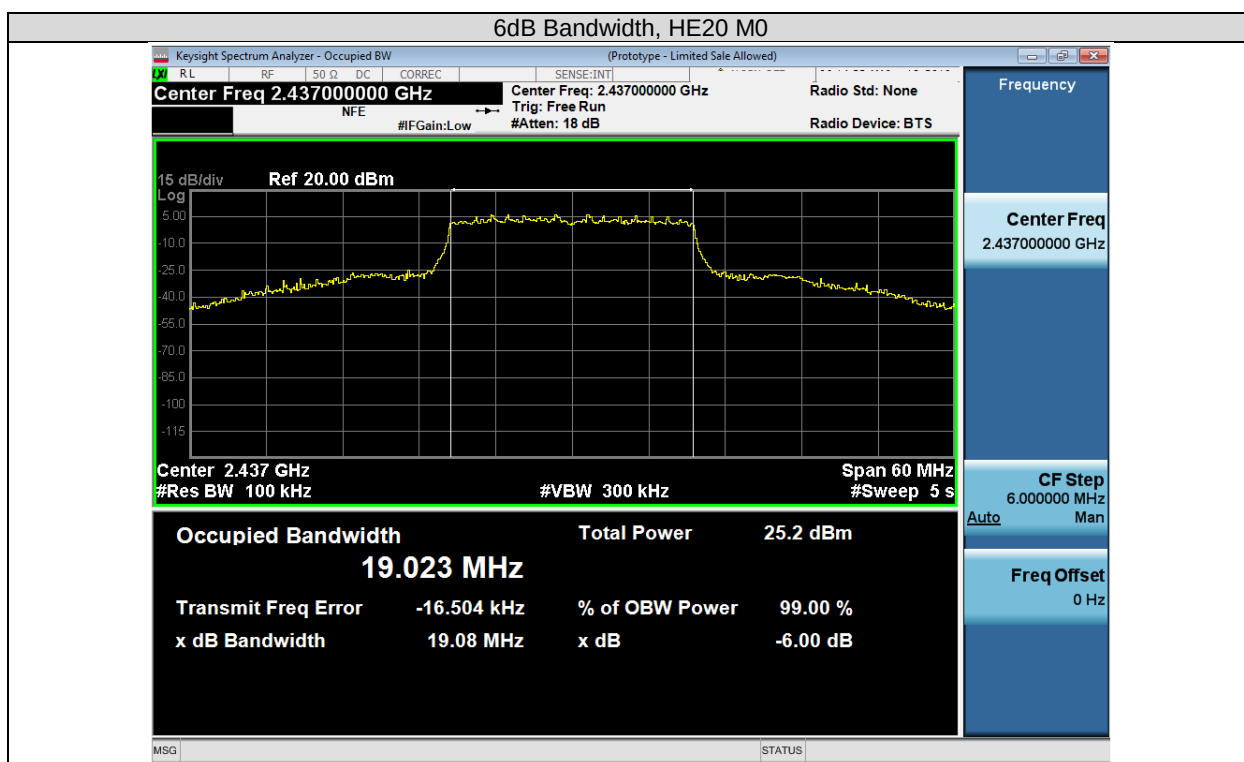
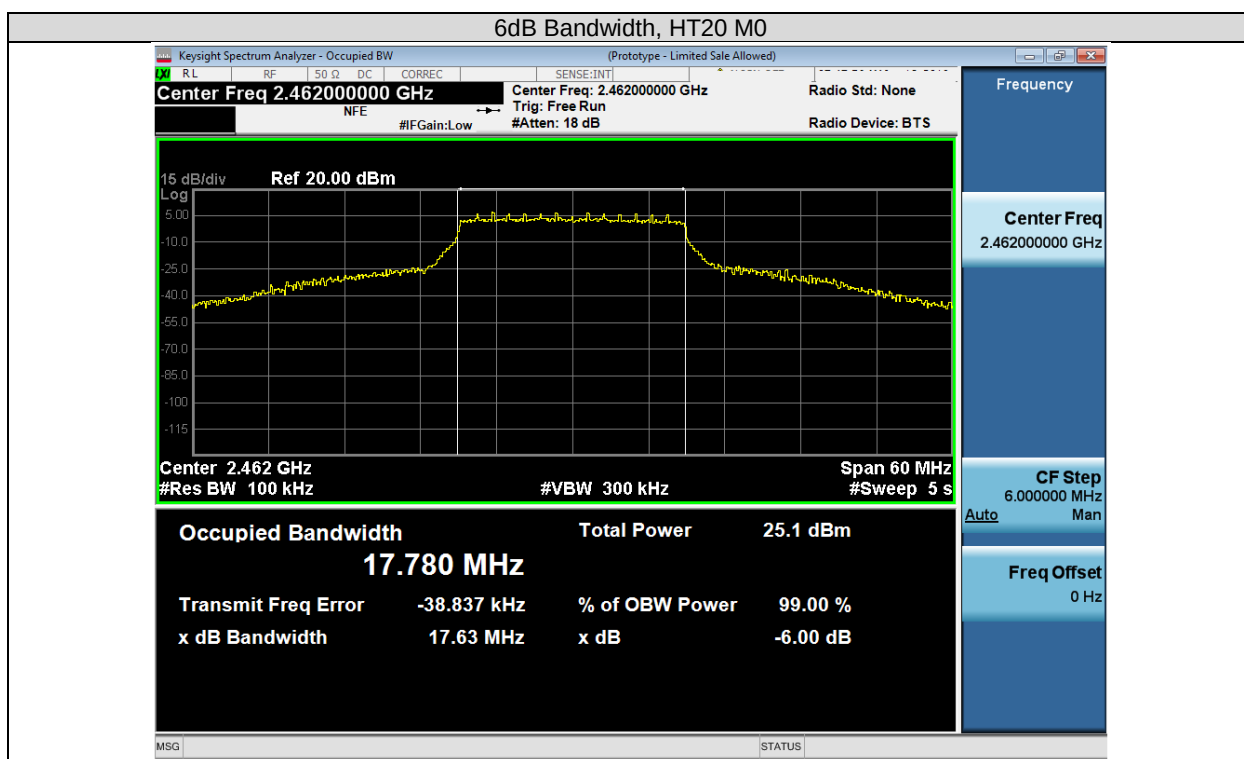
See Appendix A for list of test equipment

5.2.4 6dB Bandwidth Data Table

Frequency (MHz)	Mode	Data Rate (Mbps)	6dB BW (MHz)	Limit (kHz)	Margin (MHz)
2412	CCK, 1 to 11 Mbps	11	6.4	> 500	5.9
	Non HT20, 6 to 54 Mbps	6	16.4	> 500	15.9
	HT20, M0 to M7	m0	17.6	> 500	17.1
	HE20 M0 to M11	moh1	19.2	>500	18.7
2437	CCK, 1 to 11 Mbps	11	6.4	> 500	5.9
	Non HT20, 6 to 54 Mbps	6	16.4	> 500	15.9
	HT20, M0 to M7	m0	17.7	> 500	17.2
	HE20 M0 to M11	m0h1	19.1	>500	18.6
2462	CCK, 1 to 11 Mbps	11	6.1	> 500	5.6
	Non HT20, 6 to 54 Mbps	6	16.4	> 500	15.9
	HT20, M0 to M7	m0	17.6	> 500	17.1
	HE20 M0 to M11	m0h1	19.1	>500	18.6

5.2.5 6dB Bandwidth Screenshots





5.3 Occupied Bandwidth

5.3.1 Occupied Bandwidth Test Requirement

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 26dB 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.

5.3.2 Occupied Bandwidth Test Method

Ref. ANSI C63.10: 2013

26 BW & 99% BW

Test Procedure

1. Set the radio in the continuous transmitting mode.
2. Allow the trace to stabilize.
3. Setting the x-dB bandwidth mode to -26dB & OBW to 99% within the measurement set up function.
4. Select the automatic OBW measurement function of an instrument to perform bandwidth measurement.
5. Capture graphs and record pertinent measurement data.

Ref. ANSI C63.10: 2013 section 6.9.3

26 BW & 99% BW

Test parameters

6.9.3 Occupied bandwidth—power bandwidth (99%) measurement procedure

The 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. The following procedure shall be used for measuring 99% power bandwidth:

- a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (OBW/RBW)]$ below the reference level. Specific guidance is given in 4.1.5.2.
- d) Step a) through step c) might require iteration to adjust within the specified range.
- e) 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.
- f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
- g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
- h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

5.3.3 Occupied Bandwidth Test Information

Samples, Systems, and Modes

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

Tested By: Julian Land	Date of testing: 11/5/2018 – 11/8/2018
Test Result: PASS	

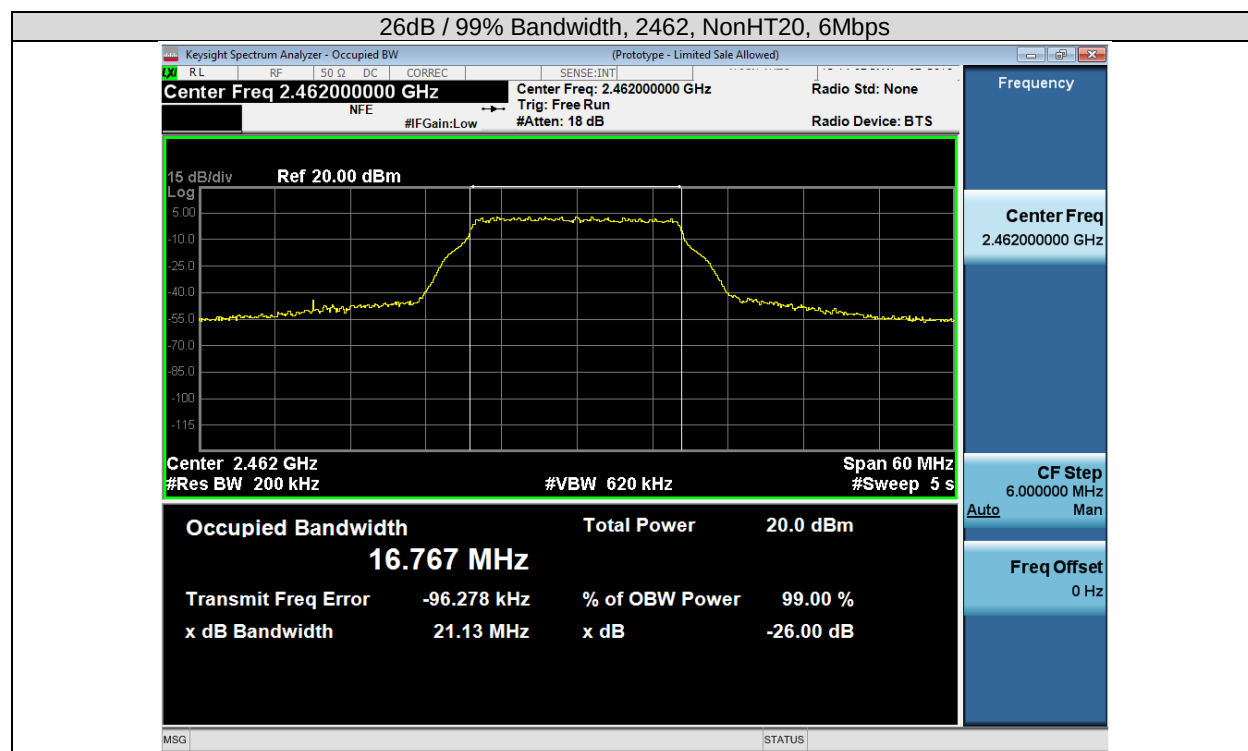
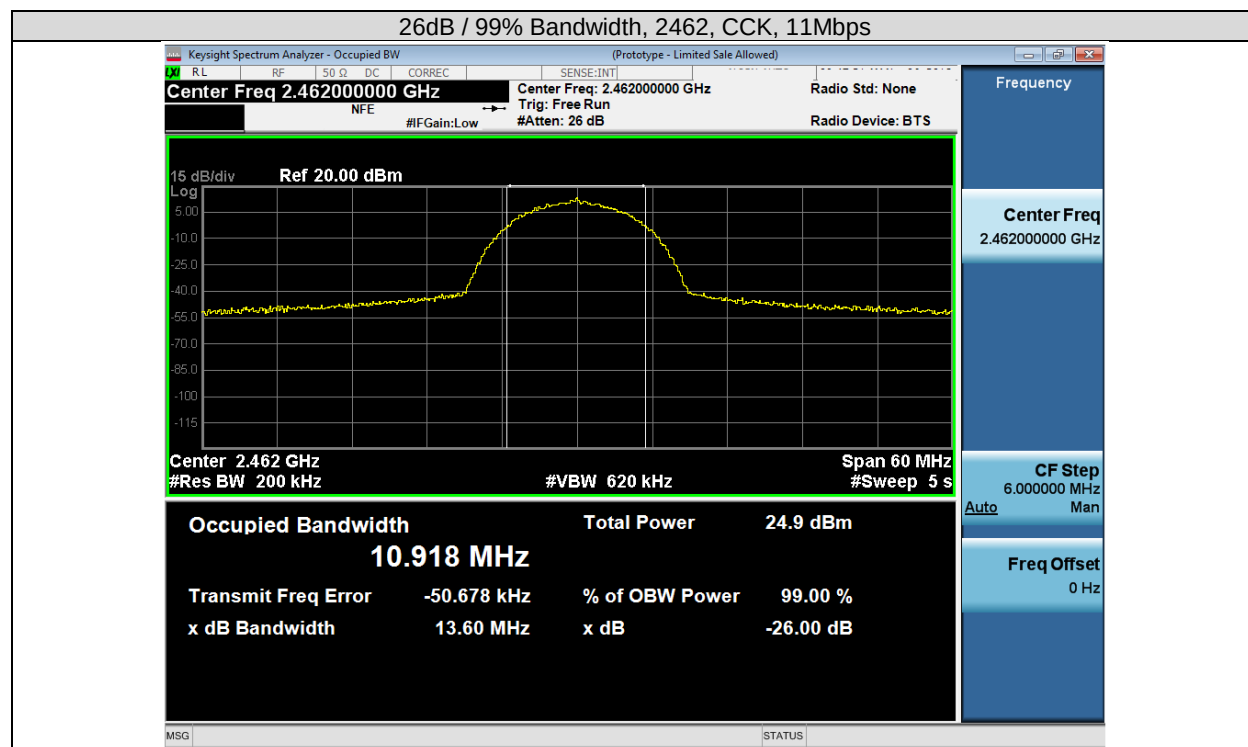
Test Equipment

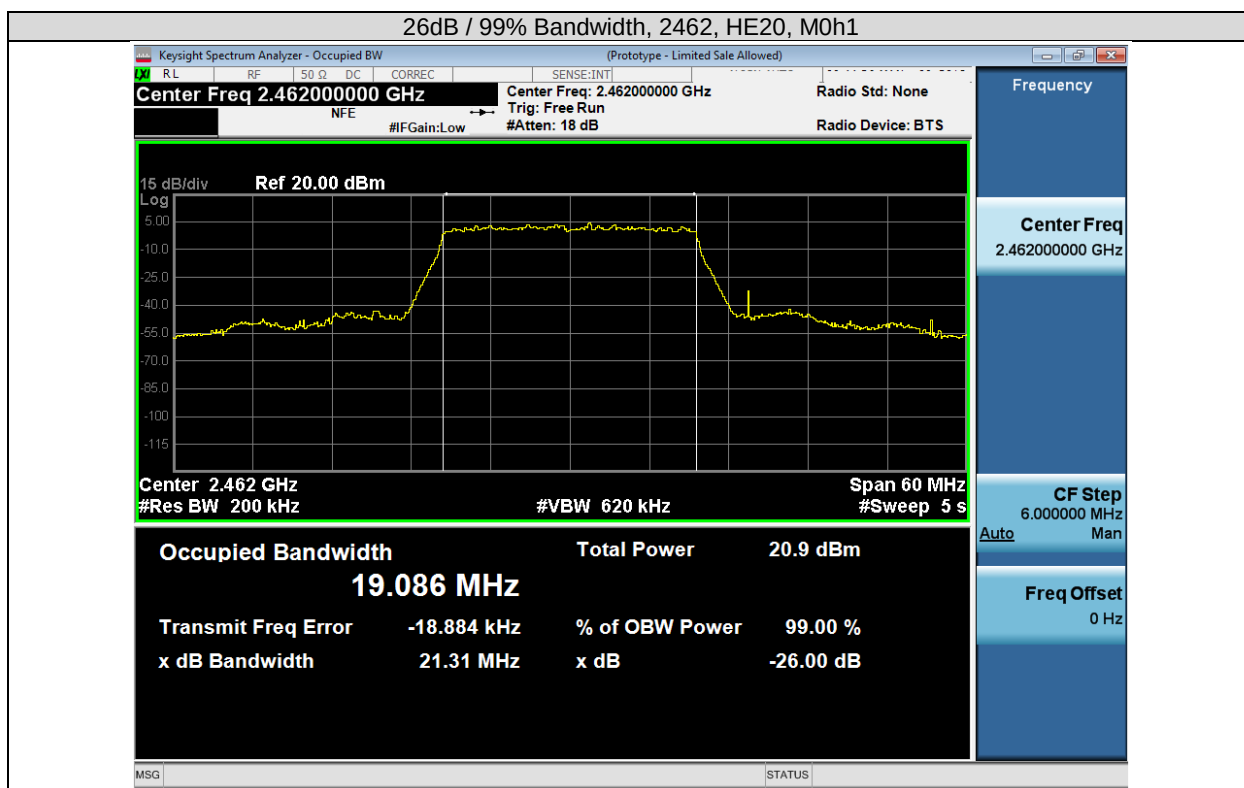
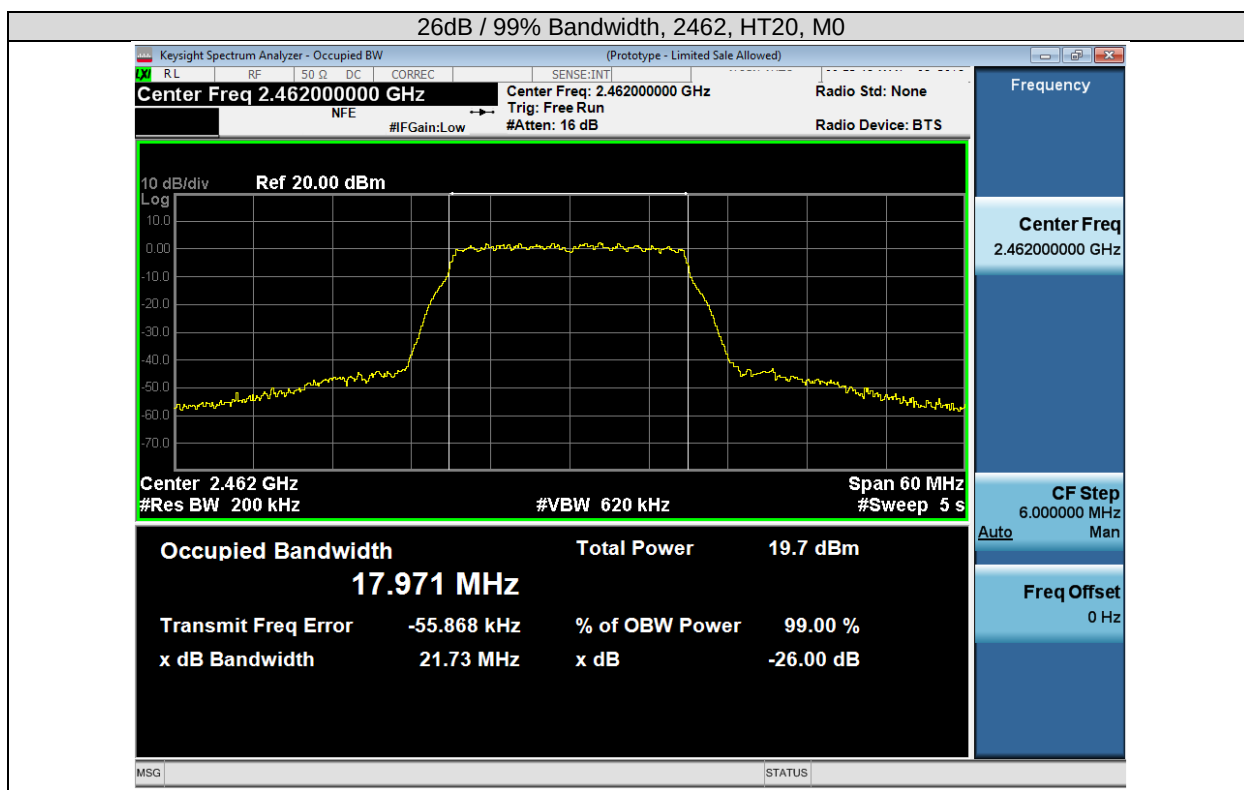
See Appendix A for list of test equipment

5.3.4 Occupied Bandwidth Data Table

Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
2412	CCK, 1 to 11 Mbps	11	14.01	10.933
	Non HT20, 6 to 54 Mbps	6	21.14	16.775
	HT20, M0 to M15	m0	21.71	17.994
	HE20, M0 to M11	m0h1	21.43	19.111
2437	CCK, 1 to 11 Mbps	11	13.99	10.960
	Non HT20, 6 to 54 Mbps	6	21.17	16.785
	HT20, M0 to M15	m0	21.70	18.042
	HE20, M0 to M11	m0h1	21.43	19.130
2462	CCK, 1 to 11 Mbps	11	13.60	10.918
	Non HT20, 6 to 54 Mbps	6	21.13	16.767
	HT20, M0 to M15	m0	21.73	17.971
	HE20, M0 to M11	m0h1	21.31	19.086

5.3.5 Occupied Bandwidth Screenshots





5.4 Maximum Conducted Output Power

5.4.1 Maximum Conducted Output Power Test Requirement

FCC, 15.247 / LP0002 (2018-01-10) (3.10.1.2) (1) (C):

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (3) For systems using digital modulation in the 902-928 MHz, **2400-2483.5 MHz**, and 5725-5850 MHz bands: **1 Watt**. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Industry Canada, RSS-247:

5.4 Transmitter output power and equivalent isotropically radiated power (e.i.r.p.) requirements

d) For DTSSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

5.4.2 Maximum Conducted Output Power Test Method

Ref. KDB 558074 D01 DTS Meas. Guidance v04

ANSI C63.10: 2013

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. 558074 D01 DTS Meas. Guidance v04, section 9.2.2.4 Method **AVGSA-2**

ANSI C63.10: 2013, section 11.9.2.2.4 **Method AVGSA-2**

Maximum Conducted Output power

Test parameters

9.2.2.4 Method AVGSA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction)

- a) Measure the duty cycle, x , of the transmitter output signal as described in 6.0.
- b) Set span to at least 1.5 times the OBW.
- c) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- d) Set VBW $\geq 3 \times$ RBW.
- e) Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. (This gives bin-to-bin spacing $\leq \text{RBW}/2$, so that narrowband signals are not lost between frequency bins.)
- f) Sweep time = auto.
- g) Detector = RMS (*i.e.*, power averaging), if available. Otherwise, use sample detector mode.
- h) Do not use sweep triggering. Allow the sweep to "free run".
- i) 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 such that the average accurately represents the true average over the on and off periods of the transmitter.
- j) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- k) Add $10 \log (1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add $10 \log (1/0.25) = 6$ dB if the duty cycle is 25 %.

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. (See ANSI C63.10 section 14.3 for Guidance)

5.4.3 Maximum Conducted Output Power Test Information

Samples, Systems, and Modes

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

Tested By: Julian Land	Date of testing: 11/5/2018 – 11/8/2018
Test Result: PASS	

Test Equipment

See Appendix A for list of test equipment

5.4.4 Maximum Conducted Output Power Data Table

Frequency (MHz)	Mode	Tx Paths	Index Power Per Chain (dBm)	Correlated Antenna Gain (dBi)	Duty Cycle	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Tx 3 Max Power (dBm)	Tx 4 Max Power (dBm)	Total TX Power – with duty cycle correction factor (dBm)	Limit (dBm)	Margin (dB)
2412	CCK, 1 – 11 Mbps	1	17	3	69.13	15.8				17.4	30	12.6
	CCK, 1 – 11 Mbps	2	17	3	69.13	15.8	16.0			20.51	30	9.49
	CCK, 1 – 11 Mbps	3	17	3	69.13	15.8	16.0	16.3		22.41	30	7.59
	CCK, 1 – 11 Mbps	4	17	3	69.13	15.8	16.0	16.3	16.7	23.84	30	6.16
	Non HT20, 6 – 54 Mbps	1	15	3	99.01	15.2				15.24	30	14.76
	Non HT20, 6 – 54 Mbps	2	15	3	99.01	15.2	15.0			18.15	30	11.85
	Non HT20, 6 – 54 Mbps	3	14	3	99.01	14.1	14.1	14.2		18.95	30	11.05
	Non HT20, 6 – 54 Mbps	4	14	3	99.01	14.1	14.1	14.2	14.4	20.27	30	9.73
	Non HT20 Beam Forming, 6 – 54 Mbps	2	14	6	99.01	14.1	14.1			17.15	30	12.85
	Non HT20 Beam Forming, 6 – 54 Mbps	3	13	8	99.01	13.4	13.0	13.2		18.02	28	9.98
	Non HT20 Beam Forming, 6 – 54 Mbps	4	11	9	99.01	11.5	11.3	11.4	11.6	17.52	27	9.48
	HT20, M0 - M7	1	16	3	98.76	16.4				16.45	30	13.55
	HT20, M0 - M7	2	15	3	98.76	15.3	14.9			18.17	30	11.83
	HT20, M8 - M15	2	15	3	98.76	15.3	14.9			18.17	30	11.83
	HT20, M0 - M7	3	15	3	98.76	15.3	14.9	15.2		19.96	30	10.04
	HT20, M8 - M15	3	15	3	98.76	15.3	14.9	15.2		19.96	30	10.04
	HT20, M16 - M23	3	15	3	98.76	15.3	14.9	15.2		19.96	30	10.04
	HT20, M0 - M7	4	14	3	98.76	14.2	14.0	14.3	14.6	20.36	30	9.64
	HT20, M8 - M15	4	14	3	98.76	14.2	14.0	14.3	14.6	20.36	30	9.64
	HT20, M16 - M23	4	14	3	98.76	14.2	14.0	14.3	14.6	20.36	30	9.64
	HT20, M24 - M31	4	14	3	98.76	14.2	14.0	14.3	14.6	20.36	30	9.64
	HT20 Beam Forming, M0 - M7	2	14	6	98.76	14.2	14.0			17.17	30	12.83
	HT20 Beam Forming, M8 - M15	2	15	3	98.76	15.3	14.9			19.86	30	10.14
	HT20 Beam Forming, M0 - M7	3	13	8	98.76	13.3	13.0	13.4		19.25	28	8.75
	HT20 Beam Forming, M8 - M15	3	14	5	98.76	14.2	14.0	14.3		20.2	30	9.8
	HT20 Beam Forming, M16 - M23	3	15	3	98.76	15.3	14.9	15.2		21.15	30	8.85
	HT20 Beam Forming, M0 - M7	4	11	9	98.76	11.4	11.2	11.4	11.6	17.38	27	9.62
	HT20 Beam Forming, M8 to M15	4	13	6	98.76	13.3	13.0	13.4	13.6	18.17	30	11.83
	HT20 Beam Forming, M16 to M23	4	14	4	98.76	14.2	14.0	14.3	14.6	19.13	30	10.87
	HT20 Beam Forming, M24 to M31	4	14	3	98.76	14.2	14.0	14.3	14.6	20.36	30	9.64