FCC RF Test Report

APPLICANT	:	Aerohive networks Inc
EQUIPMENT	:	wireless access point
BRAND NAME	:	Aerohive
MODEL NAME	:	AP650X
FCC ID	:	WBV-AP650X
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure

The product was received on Feb. 15, 2019 and testing was completed on Jul. 10, 2019. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

James Huang

Approved by: James Huang / Manager

ACCREDITED
Cert #5145.02

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR921502C	Rev. 01	Initial issue of report	Aug. 12, 2019

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Not Required	-
3.1	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
-	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Not Required	-
3.2	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 3.70 dB at 55.220 MHz
-	15.207	AC Conducted Emission	15.207(a)	Not Required	-
3.3	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.4	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-
Remark: Not required means after assessing, test items are not necessary to carry out.					

1 General Description

1.1 Applicant

Aerohive networks Inc
1011 McCarthy Boulevard,Milpitas, CA 95035,United States

1.2 Product Feature of Equipment Under Test

Product Feature	
Equipment	wireless access point
Brand Name	Aerohive
Model Name	AP650X
FCC ID	WBV-AP650X
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n (HT20) WLAN 2.4GHz 802.11ac (VHT20) WLAN 2.4GHz 802.11ax (HE20) WLAN 5GHz 802.11a/n(HT20/HT40) WLAN 5GHz 802.11ac (VHT20/VHT40/VHT80) WLAN 5GHz 802.11ax (HE20/HE40/HE80/HE160) Bluetooth v4.0 LE
HW Version	1
SW Version	10.0
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This is a C2PC report for AP650X For model change note, please refer the product equality declaration exhibit submitted separately. Based on the similarity between current and previous project, only the power, conducted band-edge and RSE from original test report (Report Number 1842039R-RF-US-P09V01, FCC ID WBV-AP650X) was verified for the differences.

1.3 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5725 MHz ~ 5850 MHz
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac/ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)
Antenna Type / Gain	<Ant. 1> : Internal bent metal Antenna with gain 5.00 dBi <Ant. 2> : Internal bent metal Antenna with gain 5.00 dBi <Ant. 3> : Internal bent metal Antenna with gain 5.00 dBi <Ant. 4> : Internal bent metal Antenna with gain 5.00 dBi **Additional Beamforming Gain : 8.01 dB**
Antenna Function Description	

	Ant. 1	Ant. 2	Ant. 3	Ant. 4
802.11 a/n/ac/ax SISO	V	V	V	V
802.11 a/n/ac/ax SISO	V	V	V	V

Remark:

1. Support cross-polarization Antenna.
2. ETH6 module support WLAN 5G B1-4，ETH7 module support WLAN 2.4G and 5G B1-2.

1.4 Modification of EUT

No modifications are made to the EUT during all test items.

1.5 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	TH01-KS 03CH06-KS	CN1257	314309

1.6 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155#	5775	165	5825

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "#" were 802.11ac VHT80.

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

Single Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT80	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0

MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT80	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0

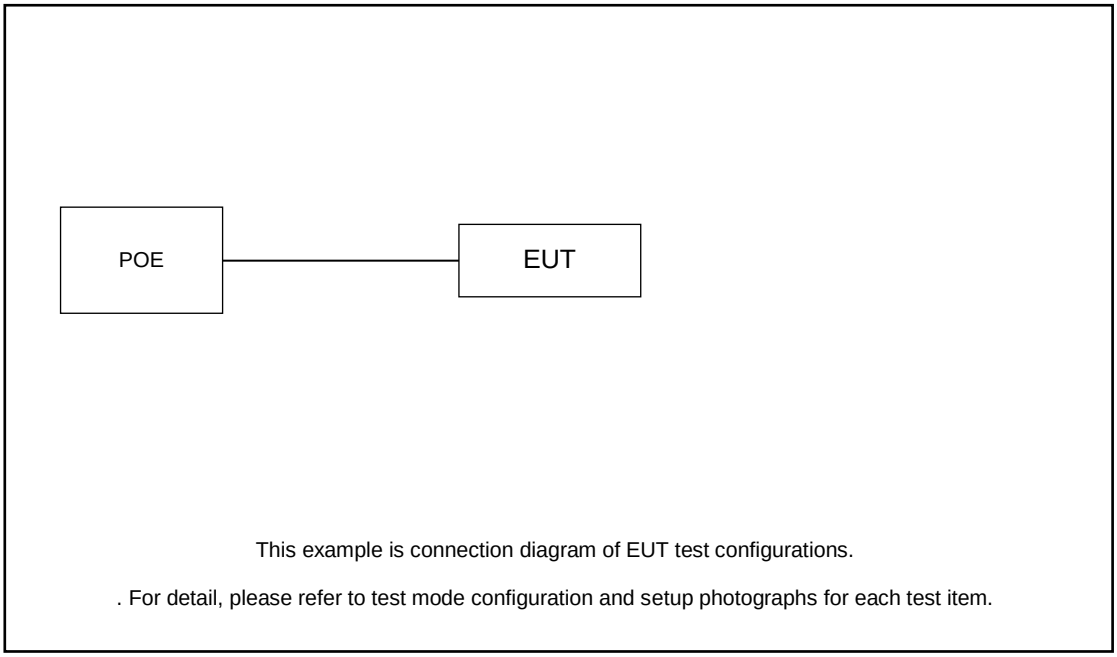
TXBF Mode

Modulation	Data Rate
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT80	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0

Ch. #		Band IV：5725-5850 MHz			
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

Ch. #		Band IV：5725-5850 MHz		
		802.11ax HE20	802.11ax HE40	802.11ax HE80
L	Low	149	151	-
M	Middle	157	-	155
H	High	165	159	-

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	POE	N/A	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously transmit/receive.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 6.2 dB.

Offset(dB) = RF cable loss(dB).

= 6.2 (dB)

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

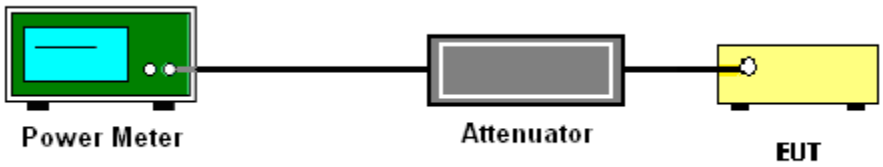
<TXBF Modes>

The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 for TXBF modes.

Method PM-G (Measurement using a gated RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.2 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.2.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5.725-5.85 GHz band:

15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.2

Note: The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

(3) ANSI C63.10-2013 clause 12.7.3 note 97

As specified by regulatory requirements, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit. However, an out-of-band emission that complies with both the average and peak general regulatory limits is not required to satisfy the peak emission limit.

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.

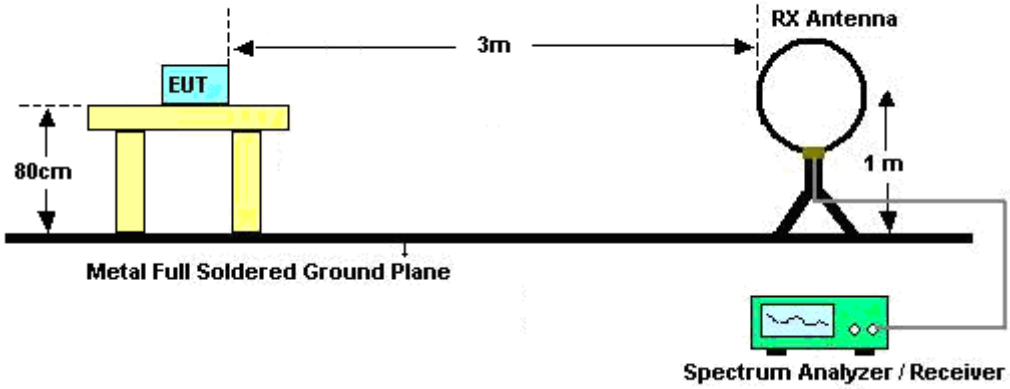
   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

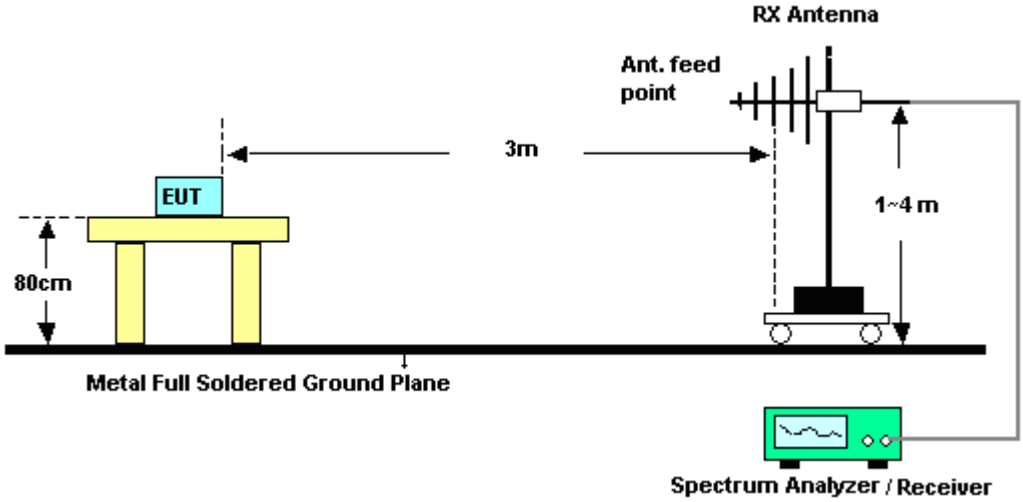
3.2.4 Test Setup

For radiated emissions below 30MHz

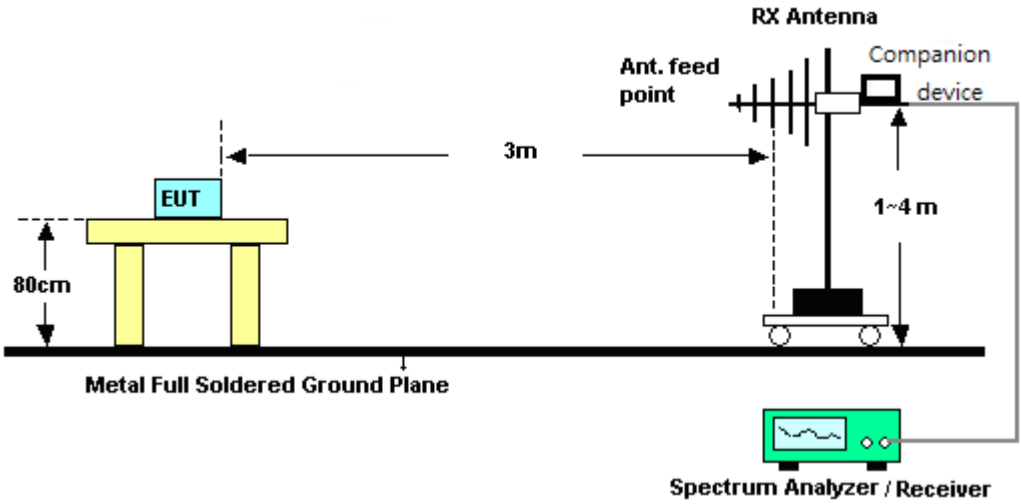


For radiated emissions from 30MHz to 1GHz

<CDD Mode>

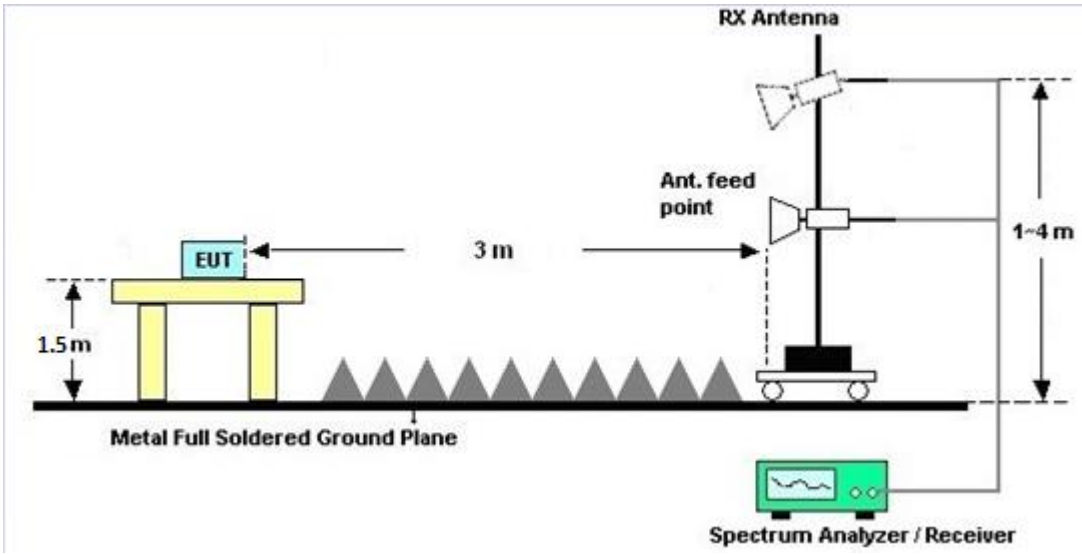


<TXBF Modes>

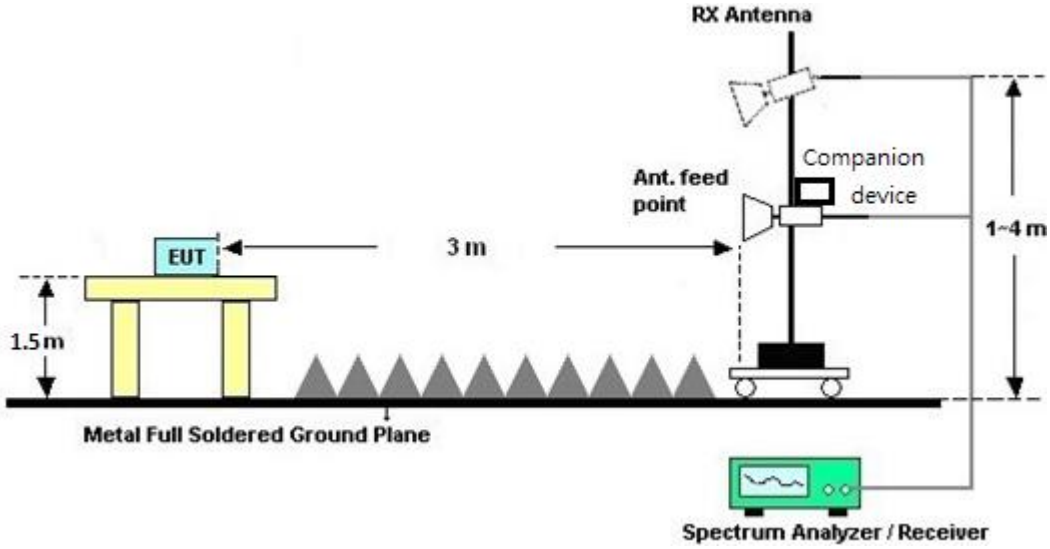


For radiated emissions above 1GHz

<CDD Mode>



<TXBF Modes>



3.2.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.2.6 Test Result of Conducted Spurious at Band Edges

Please refer to Appendix B.

3.2.7 Duty Cycle

Please refer to Appendix D.

3.2.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C.

3.3 Automatically Discontinue Transmission

3.3.1 Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

3.4 Antenna Requirements

3.4.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = GANT + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = 10 log(NANT/NSS=1) dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with GANT set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G_{ANT} is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain “DG” is calculated as following table.

5.8G Band Antenna	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
1	5.00	5.00	0.00	0.00
2	5.00	5.00	0.00	0.00
3	5.00	5.00	0.00	0.00
4	5.00	5.00	0.00	0.00
1+2+3+4	5.00	11.02	0.00	5.02

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)

TXBF modes

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

The EUT supports beamforming for 802.11ac modes.

The directional gain calculation is following F)2)e)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

5.8G Band Antenna	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
1	5.00	5.00	0.00	0.00
2	5.00	5.00	0.00	0.00
3	5.00	5.00	0.00	0.00
4	5.00	5.00	0.00	0.00
1+2+3+4	8.01	8.01	2.01	2.01

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 14, 2019	Jun. 28, 2019~ Jul. 10, 2019	Jan. 13, 2020	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 14, 2019	Jun. 28, 2019~ Jul. 10, 2019	Jan. 13, 2020	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400023	3Hz~8.5GHz;Max 30dBm	Oct. 12, 2018	Jul. 01, 2019	Oct. 11, 2019	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz-44GHz	Apr. 16, 2019	Jul. 01, 2019	Apt.18, 2020	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 19, 2018	Jul. 01, 2019	Oct. 18, 2019	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Dec. 28, 2018	Jul. 01, 2019	Dec. 27, 2019	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 20, 2018	Jul. 01, 2019	Oct. 19, 2019	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2019	Jul. 01, 2019	Jan. 04, 2020	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	187289	9KHz ~1GHZ	Aug. 06, 2018	Jul. 01, 2019	Aug. 05, 2019	Radiation (03CH06-KS)
Amplifier	MITEQ	TTA1840-35-HG	2014749	18~40GHz	Jan. 14, 2019	Jul. 01, 2019	Jan.13, 2020	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Apr. 17, 2019	Jul. 01, 2019	Apr. 16, 2020	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270203	500MHz~26.5GHz	Apr. 15, 2019	Jul. 01, 2019	Apr. 14, 2020	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 01, 2019	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 01, 2019	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 01, 2019	NCR	Radiation (03CH06-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Appendix A. Conducted Test Results

Report Number : FR921502C

Test Engineer:	Aly Cao	Temperature:	21~25	°C
Test Date:	2019/6/28~2019/7/10	Relative Humidity:	51~54	%

Report Number : FR921502C

CDD Mode

TEST RESULTS DATA
Average Power Table

Band IV															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor (dBm)					FCC Conducted Power Limit (dBm)	DG (dBi)				Pass/ Fail
					Ant 1	Ant 2	Ant 3	Ant 4	SUM		Ant 1	Ant 2	Ant 3	Ant 4	
11a	6Mbps	1	149	5745	20.50				-	30.00	5.00	5.00	5.00	5.00	Pass
11a	6Mbps	1	157	5785	20.41				-	30.00	5.00	5.00	5.00	5.00	Pass
11a	6Mbps	1	165	5825	20.12				-	30.00	5.00	5.00	5.00	5.00	Pass
HT20	MCS0	1	149	5745	20.25				-	30.00	5.00	5.00	5.00	5.00	Pass
HT20	MCS0	1	157	5785	20.54				-	30.00	5.00	5.00	5.00	5.00	Pass
HT20	MCS0	1	165	5825	20.10				-	30.00	5.00	5.00	5.00	5.00	Pass
HT40	MCS0	1	151	5755	18.37				-	30.00	5.00	5.00	5.00	5.00	Pass
HT40	MCS0	1	159	5795	18.35				-	30.00	5.00	5.00	5.00	5.00	Pass
VHT20	MCS0	1	149	5745	20.44				-	30.00	5.00	5.00	5.00	5.00	Pass
VHT20	MCS0	1	157	5785	20.38				-	30.00	5.00	5.00	5.00	5.00	Pass
VHT20	MCS0	1	165	5825	20.33				-	30.00	5.00	5.00	5.00	5.00	Pass
VHT40	MCS0	1	151	5755	15.88				-	30.00	5.00	5.00	5.00	5.00	Pass
VHT40	MCS0	1	159	5795	15.80				-	30.00	5.00	5.00	5.00	5.00	Pass
VHT80	MCS0	1	155	5775	19.53				-	30.00	5.00	5.00	5.00	5.00	Pass
AX20	MCS0	1	149	5745	20.51				-	30.00	5.00	5.00	5.00	5.00	Pass
AX20	MCS0	1	157	5785	20.91				-	30.00	5.00	5.00	5.00	5.00	Pass
AX20	MCS0	1	165	5825	20.71				-	30.00	5.00	5.00	5.00	5.00	Pass
AX40	MCS0	1	151	5755	20.33				-	30.00	5.00	5.00	5.00	5.00	Pass
AX40	MCS0	1	159	5795	20.68				-	30.00	5.00	5.00	5.00	5.00	Pass
AX80	MCS0	1	155	5775	18.94				-	30.00	5.00	5.00	5.00	5.00	Pass
11a	6Mbps	4	149	5745	18.15	18.03	18.81	18.84	24.49	30.00	5.00				Pass
11a	6Mbps	4	157	5785	18.64	18.50	18.9	18.92	24.76	30.00	5.00				Pass
11a	6Mbps	4	165	5825	18.58	18.42	18.6	18.50	24.55	30.00	5.00				Pass
HT20	MCS0	4	149	5745	17.68	18.16	18.19	18.51	24.17	30.00	5.00				Pass
HT20	MCS0	4	157	5785	17.93	18.07	18.58	18.30	24.25	30.00	5.00				Pass
HT20	MCS0	4	165	5825	17.72	18.10	18.02	17.91	23.96	30.00	5.00				Pass
HT40	MCS0	4	151	5755	18.34	18.54	18.72	18.91	24.65	30.00	5.00				Pass
HT40	MCS0	4	159	5795	19.98	19.15	19.94	19.93	25.78	30.00	5.00				Pass
VHT20	MCS0	4	149	5745	17.85	17.42	18.27	18.32	24.00	30.00	5.00				Pass
VHT20	MCS0	4	157	5785	17.94	17.65	18.22	18.14	24.01	30.00	5.00				Pass
VHT20	MCS0	4	165	5825	17.93	17.86	18.35	18.22	24.12	30.00	5.00				Pass
VHT40	MCS0	4	151	5755	18.43	18.51	19.59	19.06	24.94	30.00	5.00				Pass
VHT40	MCS0	4	159	5795	18.84	18.71	19.9	19.45	25.27	30.00	5.00				Pass
VHT80	MCS0	4	155	5775	14.29	14.51	15.26	15.17	20.85	30.00	5.00				Pass
AX20	MCS0	4	149	5745	17.87	17.96	18.49	18.71	24.29	30.00	5.00				Pass
AX20	MCS0	4	157	5785	17.75	17.58	17.72	17.79	23.73	30.00	5.00				Pass
AX20	MCS0	4	165	5825	17.64	17.60	17.09	17.15	23.40	30.00	5.00				Pass
AX40	MCS0	4	151	5755	18.34	18.38	18.81	17.90	24.39	30.00	5.00				Pass
AX40	MCS0	4	159	5795	19.18	19.17	19.72	19.63	25.45	30.00	5.00				Pass
AX80	MCS0	4	155	5775	14.26	13.92	15.29	15.27	20.75	30.00	5.00				Pass

Report Number : FR921502C

Beamforming Mode

TEST RESULTS DATA
Average Power Table

Band IV															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor (dBm)					FCC Conducted Power Limit (dBm)	DG (dBi)				Pass/ Fail
					Ant 1	Ant 2	Ant 3	Ant 4	SUM		Ant 1	Ant 2	Ant 3	Ant 4	
HT20	MCS0	4	149	5745	16.76	16.51	16.66	17.19	22.81	27.99	8.01				Pass
HT20	MCS0	4	157	5785	16.29	15.96	16.35	16.80	22.38	27.99	8.01				Pass
HT20	MCS0	4	165	5825	15.79	15.83	15.97	16.53	22.06	27.99	8.01				Pass
HT40	MCS0	4	151	5755	16.75	16.43	16.85	17.12	22.82	27.99	8.01				Pass
HT40	MCS0	4	159	5795	16.46	16.22	16.95	16.89	22.66	27.99	8.01				Pass
VHT20	MCS0	4	149	5745	16.52	16.99	16.82	17.18	22.90	27.99	8.01				Pass
VHT20	MCS0	4	157	5785	16.41	16.10	16.35	16.23	22.29	27.99	8.01				Pass
VHT20	MCS0	4	165	5825	15.89	15.54	15.96	16.37	21.97	27.99	8.01				Pass
VHT40	MCS0	4	151	5755	15.99	16.26	16.17	16.22	22.18	27.99	8.01				Pass
VHT40	MCS0	4	159	5795	15.84	15.36	15.96	15.70	21.74	27.99	8.01				Pass
VHT80	MCS0	4	155	5775	13.53	13.10	14.08	13.26	19.53	27.99	8.01				Pass
AX20	MCS0	4	149	5745	17.21	17.19	17.15	18.10	23.45	27.99	8.01				Pass
AX20	MCS0	4	157	5785	17.33	16.98	17.39	17.78	23.40	27.99	8.01				Pass
AX20	MCS0	4	165	5825	16.35	16.16	16.99	17.28	22.74	27.99	8.01				Pass
AX40	MCS0	4	151	5755	16.97	16.88	17	17.05	23.00	27.99	8.01				Pass
AX40	MCS0	4	159	5795	16.67	16.32	16.77	16.96	22.71	27.99	8.01				Pass
AX80	MCS0	4	155	5775	13.53	13.13	13.92	14.29	19.76	27.99	8.01				Pass

Appendix B. Conducted Spurious Emission Plots

Note symbol

-L	**Low channel location**
-R	**High channel location**

Procedure for conducted measurements in restricted bands:

a) Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency

b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP (see 11.12.2.6 for guidance on determining the applicable antenna gain)

c) Add the appropriate maximum ground reflection factor to the EIRP (6 dB for frequencies ≤30 MHz; 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive; and 0 dB for frequencies > 1000 MHz).

d) For MIMO devices, measure the power of each chain and sum the EIRP of all chains in linear terms

e) Convert the resultant EIRP to an equivalent electric field strength using the following relationship:

E= EIRP −20 log d+ 104.8

where

E is the electric field strength in dBμV/m

EIRP is the equivalent isotropically radiated power in dBm

d is the specified measurement distance in m

f) Compare the resultant electric field strength level with the applicable regulatory limit.

Thus, the conducted limits for restricted bands can be converted:

For SISO mode (limit at restricted bands):

Conducted Peak limit=74dBuV/m - 95.2 - Antenna Gain (5dBi) - setup loss (3.01 dB) = -29.21dBm

Conducted Average limit=54dBuV/m - 95.2 - Antenna Gain (5dBi) - setup loss (3.01 dB) = -49.21dBm

For SISO mode (limit at non-restricted bands):

Conducted Peak limit=68.3dBuV/m - 95.2 - Antenna Gain (5dBi) - setup loss (3.01 dB) = -34.91dBm

For CDD (TX Ant=4) MIMO mode (limit at restricted bands):

Conducted Peak limit=74dBuV/m - 95.2- Directional Gain (8.01dBi) – 10 log(N_{ANT})dB (6.02 dB) - setup loss (1dB) = -36.23dBm

Conducted Average limit=54dBuV/m - 95.2 - Directional Gain (8.01dBi) – 10 log(N_{ANT})dB (6.02 dB) - setup loss (1dB) = -56.23dBm

For CDD (TX Ant=4) MIMO mode (limit at non-restricted bands):

Conducted Peak limit=68.3dBuV/m - 95.2- Directional Gain (8.01dBi) – 10 log(N_{ANT})dB (6.02 dB) - setup loss (0dB) = -40.93dBm

For UNII-3C limit:

SISO mode:

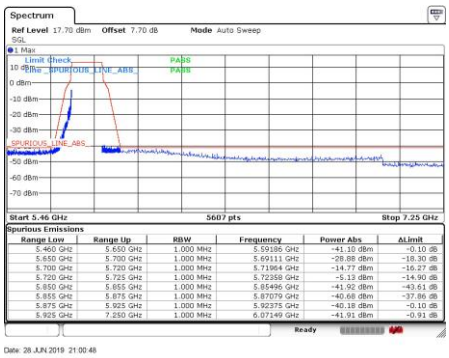
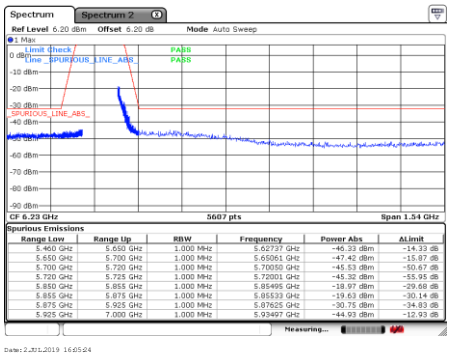
(All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge) - Antenna Gain (5dBi)

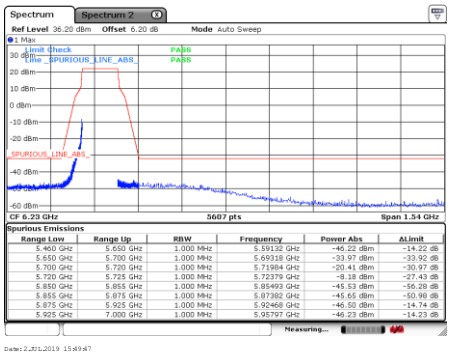
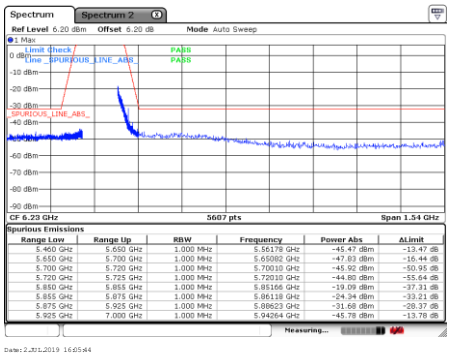
MIMO mode:

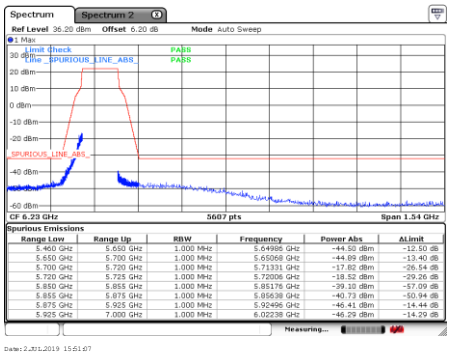
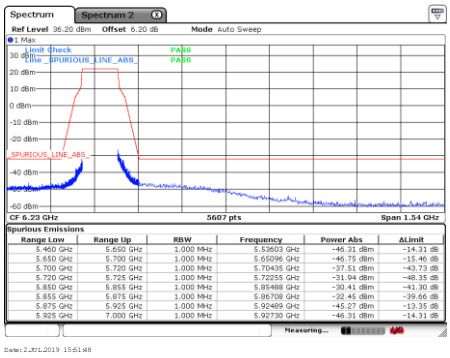
(All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge) - Directional Gain For CDD(8.01dBi) - 10 log(NANT) dB(6.02dB)

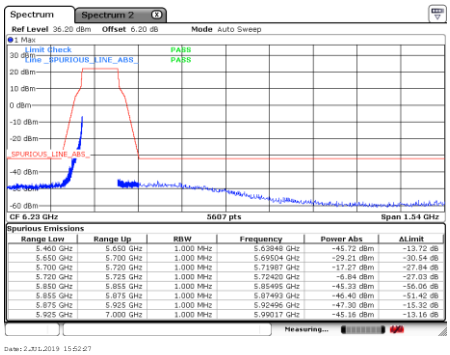
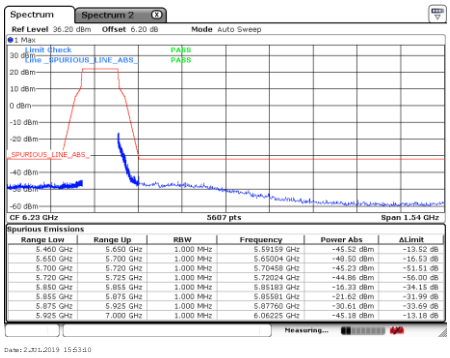
For ETH6 SISO mode:

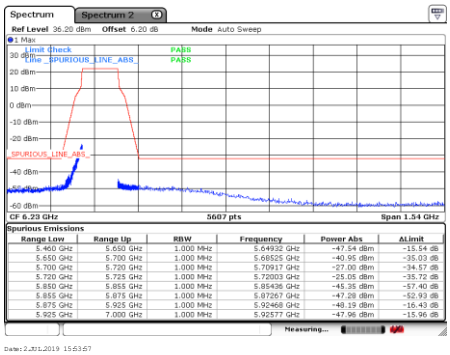
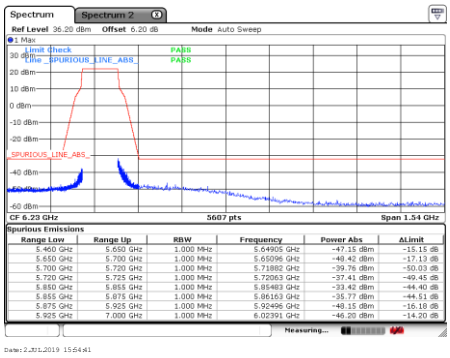
Band 4 - 5725~5850MHz

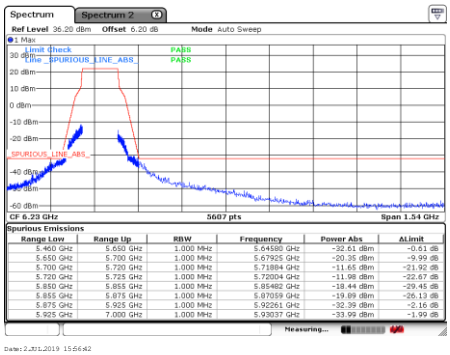
WIFI	802.11a	
Ant1	Peak	Average
CH149		Left Blank
CH165		Left Blank

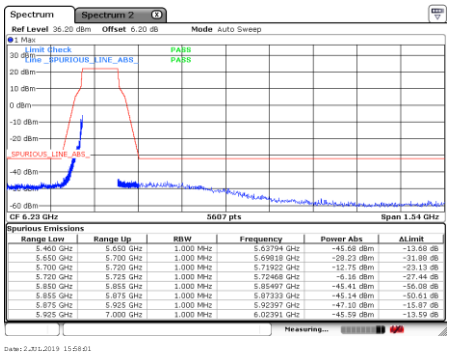
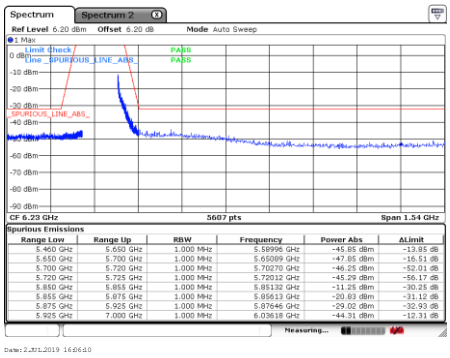
WIFI	802.11n HT20	
Ant1	Peak	Average
CH149		Left Blank
CH165		Left Blank

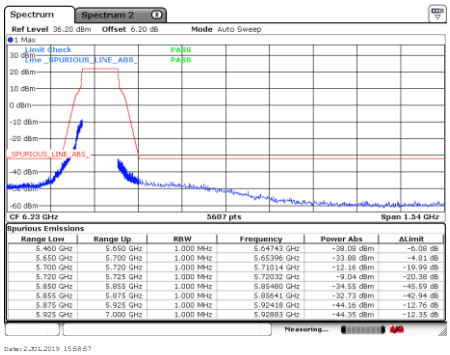
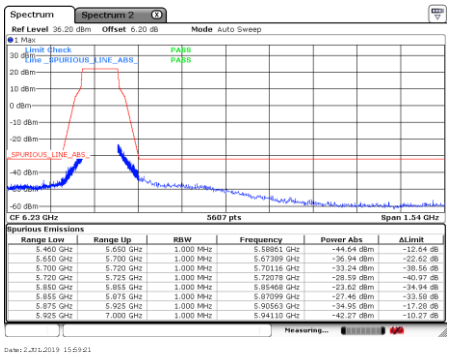
WIFI	802.11n HT40	
Ant1	Peak	Average
CH151		Left Blank
CH159		Left Blank

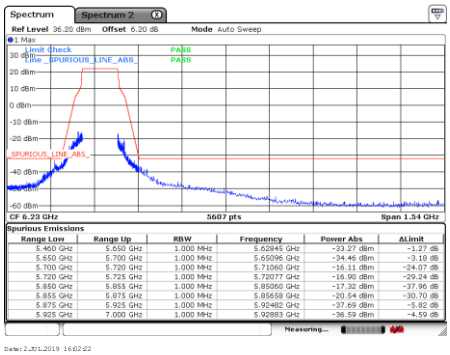
WIFI	802.11ac VHT20	
Ant1	Peak	Average
CH149		Left Blank
CH165		Left Blank

WIFI	802.11ac VHT40	
Ant1	Peak	Average
CH151		Left Blank
CH159		Left Blank

WIFI	802.11ac VHT80	
Ant1	Peak	Average
CH155		Left Blank

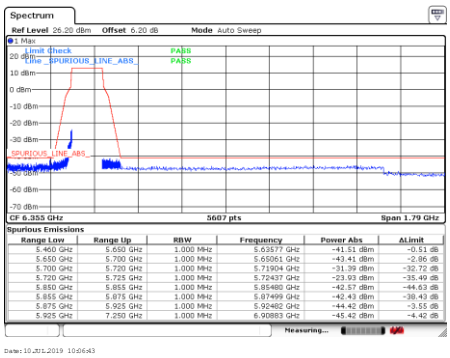
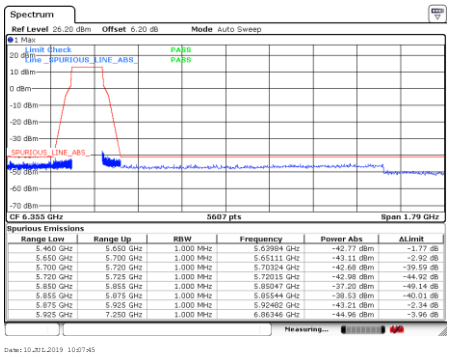
WIFI	802.11ax HE20	
Ant1	Peak	Average
CH149		Left Blank
CH165		Left Blank

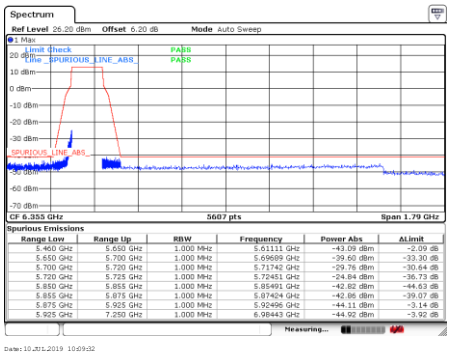
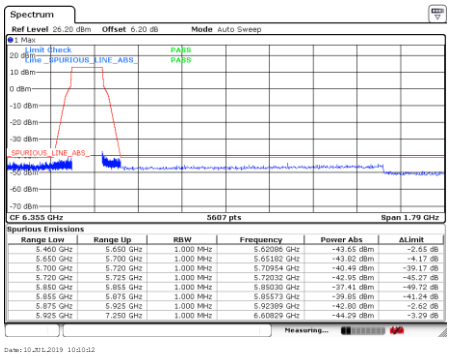
WIFI	802.11ax HE40	
Ant1	Peak	Average
CH151		Left Blank
CH159		Left Blank

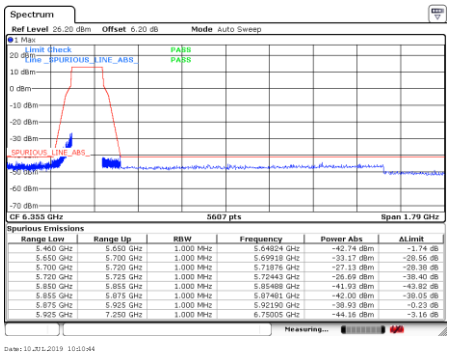
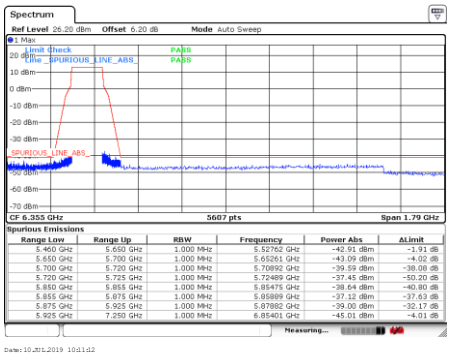
WIFI	802.11ax HE80	
Ant1	Peak	Average
CH155		Left Blank

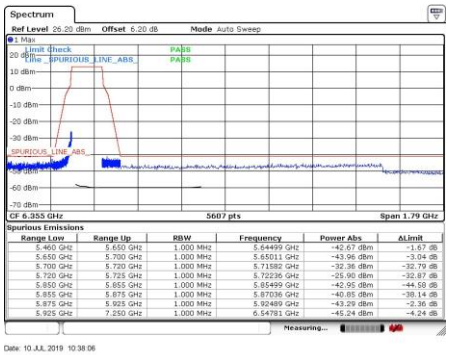
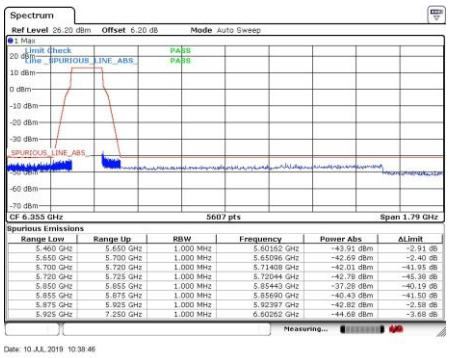
For ETH6 MIMO mode:

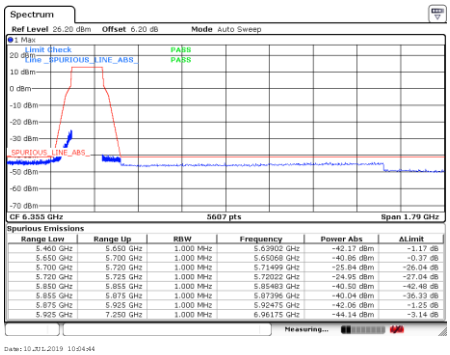
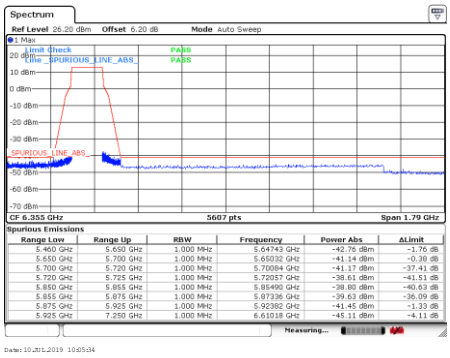
Band 4 - 5725~5850MHz

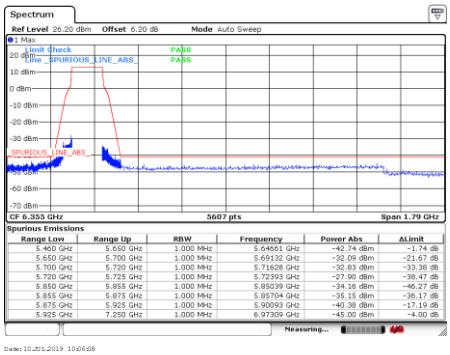
WIFI	802.11a	
Ant1	Peak	Average
CH149		Left Blank
CH165		Left Blank

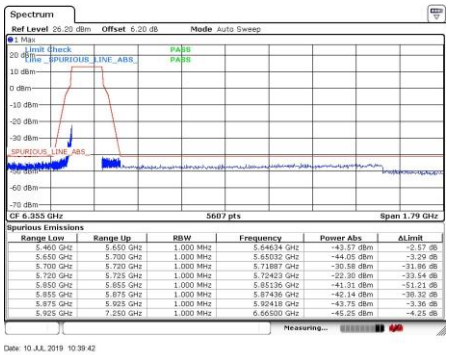
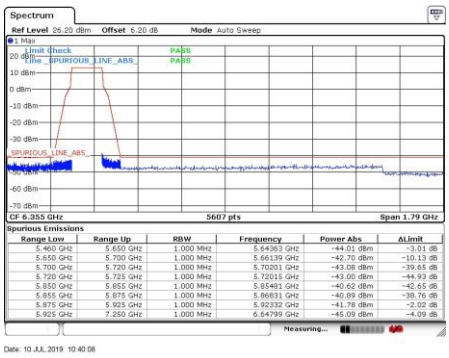
WIFI	802.11n HT20	
Ant1	Peak	Average
CH149		Left Blank
CH165		Left Blank

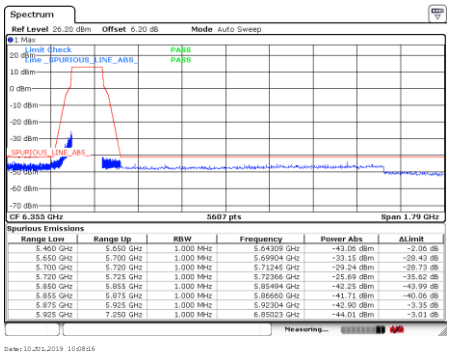
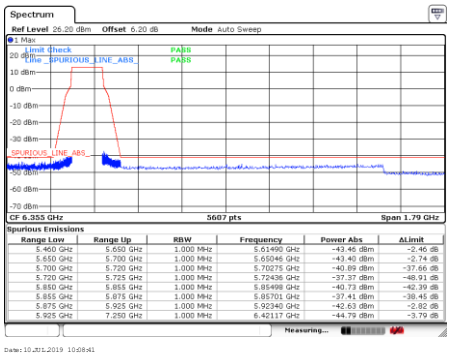
WIFI	802.11n HT40	
Ant1	Peak	Average
CH151		Left Blank
CH159		Left Blank

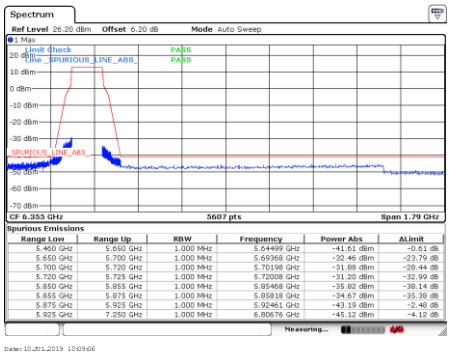
WIFI	802.11ac VHT20	
Ant1	Peak	Average
CH149		Left Blank
CH165		Left Blank

WIFI	802.11ac VHT40	
Ant1	Peak	Average
CH151		Left Blank
CH159		Left Blank

WIFI	802.11ac VHT80	
Ant1	Peak	Average
CH155		Left Blank

WIFI	802.11ax HE20	
Ant1	Peak	Average
CH149		Left Blank
CH165		Left Blank

WIFI	802.11ax HE40	
Ant1	Peak	Average
CH151		Left Blank
CH159		Left Blank

WIFI	802.11ax HE80	
Ant1	Peak	Average
CH155		Left Blank

Appendix C. Radiated Spurious Emission

For ETH6 SISO mode:

Band 4 5725~5850MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 149 5745MHz		11490	42.64	-31.36	74	55.01	39.68	13.36	65.41	150	0	P	H
		17232	46.91	-21.39	68.3	50.83	42.68	16.03	62.63	150	360	P	H
		11490	42.46	-31.54	74	54.83	39.68	13.36	65.41	150	360	P	V
		17232	48.74	-19.56	68.3	52.66	42.68	16.03	62.63	150	0	P	V
802.11a CH 157 5785MHz		11570	42.36	-31.64	74	54.82	39.49	13.44	65.39	150	0	P	H
		17352	48.7	-19.6	68.3	51.99	43.32	16.09	62.7	150	360	P	H
		11570	44.19	-29.81	74	56.65	39.49	13.44	65.39	150	360	P	V
		17352	47.68	-20.62	68.3	50.97	43.32	16.09	62.7	150	0	P	V
802.11a CH 165 5825MHz		11650	42.38	-31.62	74	54.95	39.29	13.5	65.36	150	0	P	H
		17472	48.07	-20.23	68.3	50.72	43.96	16.16	62.77	150	360	P	H
		11650	42.68	-31.32	74	55.25	39.29	13.5	65.36	150	360	P	V
		17472	48.64	-19.66	68.3	51.29	43.96	16.16	62.77	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		11490	43.38	-30.62	74	55.75	39.68	13.36	65.41	150	0	P	H
HT20		17232	46.45	-21.85	68.3	50.37	42.68	16.03	62.63	150	360	P	H
CH 149		11490	42.88	-31.12	74	55.25	39.68	13.36	65.41	150	360	P	V
5745MHz		17232	48.51	-19.79	68.3	52.43	42.68	16.03	62.63	150	0	P	V
802.11n		11570	42.33	-31.67	74	54.79	39.49	13.44	65.39	150	0	P	H
HT20		17352	46.62	-21.68	68.3	49.91	43.32	16.09	62.7	150	360	P	H
CH 157		11570	42.17	-31.83	74	54.63	39.49	13.44	65.39	150	360	P	V
5785MHz		17352	47.9	-20.4	68.3	51.19	43.32	16.09	62.7	150	0	P	V
802.11n		11650	42.3	-31.7	74	54.87	39.29	13.5	65.36	150	0	P	H
HT20		17472	48.06	-20.24	68.3	50.71	43.96	16.16	62.77	150	360	P	H
CH 165		11650	42.26	-31.74	74	54.83	39.29	13.5	65.36	150	360	P	V
5825MHz		17472	48.62	-19.68	68.3	51.27	43.96	16.16	62.77	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		11510	42.4	-31.6	74	54.75	39.7	13.37	65.42	150	0	P	H
HT40		17268	45.86	-22.44	68.3	49.61	42.86	16.04	62.65	150	360	P	H
CH 151		11510	43.37	-30.63	74	55.72	39.7	13.37	65.42	150	360	P	V
5755MHz		17268	46.2	-22.1	68.3	49.95	42.86	16.04	62.65	150	0	P	V
802.11n		11590	42.49	-31.51	74	54.98	39.44	13.45	65.38	150	0	P	H
HT40		17388	46.61	-21.69	68.3	49.71	43.51	16.11	62.72	150	360	P	H
CH 159		11590	42.63	-31.37	74	55.12	39.44	13.45	65.38	150	360	P	V
5795MHz		17388	46.34	-21.96	68.3	49.44	43.51	16.11	62.72	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac		11550	43.29	-30.71	74	55.73	39.54	13.42	65.4	150	0	P	H
VHT80		17328	46.09	-22.21	68.3	49.56	43.14	16.07	62.68	150	360	P	H
CH 155		11550	43.01	-30.99	74	55.45	39.54	13.42	65.4	150	360	P	V
5775MHz		17328	46.17	-22.13	68.3	49.64	43.14	16.07	62.68	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ax HE 20(Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax		11490	43.02	-30.98	74	55.39	39.68	13.36	65.41	150	0	P	H
HE 20		17232	47.41	-20.89	68.3	51.33	42.68	16.03	62.63	150	360	P	H
CH 149		11490	42.98	-31.02	74	55.35	39.68	13.36	65.41	150	360	P	V
5745MHz		17232	47.83	-20.47	68.3	51.75	42.68	16.03	62.63	150	0	P	V
802.11ax		11570	43.3	-30.7	74	55.76	39.49	13.44	65.39	150	0	P	H
HE 20		17352	48.27	-20.03	68.3	51.56	43.32	16.09	62.7	150	360	P	H
CH 157		11570	43.31	-30.69	74	55.77	39.49	13.44	65.39	150	360	P	V
5785MHz		17352	50.15	-18.15	68.3	53.44	43.32	16.09	62.7	150	0	P	V
802.11ax		11650	43.06	-30.94	74	55.63	39.29	13.5	65.36	150	0	P	H
HE 20		17472	48.38	-19.92	68.3	51.03	43.96	16.16	62.77	150	360	P	H
CH 165		11650	42.87	-31.13	74	55.44	39.29	13.5	65.36	150	360	P	V
5825MHz		17472	50.2	-18.1	68.3	52.85	43.96	16.16	62.77	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ax HE 40 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax		11510	42.7	-31.3	74	55.05	39.7	13.37	65.42	150	0	P	H
HE 40		17268	45.74	-22.56	68.3	49.49	42.86	16.04	62.65	150	360	P	H
CH 151		11510	43.61	-30.39	74	55.96	39.7	13.37	65.42	150	360	P	V
5755MHz		17268	47.16	-21.14	68.3	50.91	42.86	16.04	62.65	150	0	P	V
802.11ax		11590	42.43	-31.57	74	54.92	39.44	13.45	65.38	150	0	P	H
HE 40		17388	46.65	-21.65	68.3	49.75	43.51	16.11	62.72	150	360	P	H
CH 159		11590	42.61	-31.39	74	55.1	39.44	13.45	65.38	150	360	P	V
5795MHz		17388	46.51	-21.79	68.3	49.61	43.51	16.11	62.72	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ax HE 80 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax		11550	42.79	-31.21	74	55.23	39.54	13.42	65.4	150	0	P	H
HE 80		17328	46.39	-21.91	68.3	49.86	43.14	16.07	62.68	150	360	P	H
CH 155		11550	42.86	-31.14	74	55.3	39.54	13.42	65.4	150	360	P	V
5775MHz		17328	46.57	-21.73	68.3	50.04	43.14	16.07	62.68	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

For ETH6 MIMO mode:

CDD Mode

Band 4 5725~5850MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 149 5745MHz		11490	43.06	-30.94	74	55.43	39.68	13.36	65.41	100	204	P	H
		17232	49.61	-18.09	68.3	53.05	42.68	16.03	62.63	300	0	P	H
		11490	44.12	-29.88	74	56.49	39.68	13.36	65.41	150	360	P	V
		17232	55.99	-12.31	68.3	59.91	42.68	16.03	62.63	300	360	P	V
802.11a CH 157 5785MHz		11570	43.13	-30.87	74	55.59	39.49	13.44	65.39	100	245	P	H
		17352	49.67	-18.63	68.3	52.96	43.32	16.09	62.7	300	0	P	H
		11570	44.51	-29.49	74	56.97	39.49	13.44	65.39	300	5	P	V
		17352	56.18	-12.12	68.3	59.47	43.32	16.09	62.71	200	160	P	V
802.11a CH 165 5825MHz		11650	42.7	-31.3	74	55.27	39.29	13.5	65.36	258	360	P	H
		17472	50.46	-17.84	68.3	53.11	43.96	16.16	62.77	200	177	P	H
		11650	43.95	-30.05	74	56.52	39.29	13.5	65.36	200	360	P	V
		17472	53.51	-14.79	68.3	56.16	43.96	16.16	62.77	300	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		11490	43.42	-30.58	74	55.79	39.68	13.36	65.41	150	0	P	H
HT20		17232	-48.52	-19.78	68.3	52.44	42.68	16.03	62.63	150	360	P	H
CH 149		11490	44.53	-29.47	74	56.9	39.68	13.36	65.41	150	360	P	V
5745MHz		17232	50.19	-18.11	68.3	54.11	42.68	16.03	62.63	150	0	P	V
802.11n		11570	43.12	-30.88	74	55.58	39.49	13.44	65.39	150	0	P	H
HT20		17352	47.34	-20.96	68.3	50.63	43.32	16.09	62.7	150	360	P	H
CH 157		11570	42.13	-31.87	74	54.59	39.49	13.44	65.39	150	360	P	V
5785MHz		17352	49.08	-19.22	68.3	52.37	43.32	16.09	62.7	150	0	P	V
802.11 n		11650	42.11	-31.89	74	54.68	39.29	13.5	65.36	150	0	P	H
HT20		17472	48.16	-20.14	68.3	50.81	43.96	16.16	62.77	150	360	P	H
CH 165		11650	43.64	-30.36	74	56.21	39.29	13.5	65.36	150	360	P	V
5825MHz		17472	49.22	-19.08	68.3	51.87	43.96	16.16	62.77	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		11510	42.1	-31.9	74	54.45	39.7	13.37	65.42	150	0	P	H
HT40		17268	47.11	-21.19	68.3	50.86	42.86	16.04	62.65	150	360	P	H
CH 151		11510	42.69	-31.31	74	55.04	39.7	13.37	65.42	150	360	P	V
5755MHz		17268	49.13	-19.17	68.3	52.88	42.86	16.04	62.65	150	0	P	V
802.11n		11590	42.27	-31.73	74	54.76	39.44	13.45	65.38	150	0	P	H
HT40		17388	47.22	-21.08	68.3	50.32	43.51	16.11	62.72	150	360	P	H
CH 159		11590	43.14	-30.86	74	55.63	39.44	13.45	65.38	150	360	P	V
5795MHz		17388	49.48	-18.82	68.3	52.58	43.51	16.11	62.72	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac		11550	41.91	-32.09	74	54.35	39.54	13.42	65.4	150	0	P	H
VHT80		17328	47.79	-20.51	68.3	51.26	43.14	16.07	62.68	150	360	P	H
CH 155		11550	42.23	-31.77	74	54.67	39.54	13.42	65.4	150	360	P	V
5775MHz		17328	47.33	-20.97	68.3	50.8	43.14	16.07	62.68	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ax HE 20(Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax		11490	43.04	-30.96	74	55.41	39.68	13.36	65.41	150	0	P	H
HE 20		17232	50.25	-18.05	68.3	54.17	42.68	16.03	62.63	150	360	P	H
CH 149		11490	43.22	-30.78	74	55.59	39.68	13.36	65.41	150	360	P	V
5745MHz		17232	54.08	-14.22	68.3	58	42.68	16.03	62.63	150	0	P	V
802.11ax		11570	42.77	-31.23	74	55.23	39.49	13.44	65.39	150	0	P	H
HE 20		17352	46.98	-21.32	68.3	50.27	43.32	16.09	62.7	150	360	P	H
CH 157		11570	42.55	-31.45	74	55.01	39.49	13.44	65.39	150	360	P	V
5785MHz		17352	49.27	-19.03	68.3	52.56	43.32	16.09	62.7	150	0	P	V
802.11ax		11650	42.05	-31.95	74	54.62	39.29	13.5	65.36	150	0	P	H
HE 20		17472	47.49	-20.81	68.3	50.14	43.96	16.16	62.77	150	360	P	H
CH 165		11650	42.67	-31.33	74	55.24	39.29	13.5	65.36	150	360	P	V
5825MHz		17472	48.78	-19.52	68.3	51.43	43.96	16.16	62.77	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ax HE 40 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax		11510	42.67	-31.33	74	55.02	39.7	13.37	65.42	150	0	P	H
HE 40		17268	46.68	-21.62	68.3	50.43	42.86	16.04	62.65	150	360	P	H
CH151		11510	43.32	-30.68	74	55.67	39.7	13.37	65.42	150	360	P	V
5755MHz		17268	48.07	-20.23	68.3	51.82	42.86	16.04	62.65	150	0	P	V
802.11ax		11590	42.6	-31.4	74	55.09	39.44	13.45	65.38	150	0	P	H
HE 40		17388	47.49	-20.81	68.3	50.59	43.51	16.11	62.72	150	360	P	H
CH159		11590	42.28	-31.72	74	54.77	39.44	13.45	65.38	150	360	P	V
5795MHz		17388	47.01	-21.29	68.3	50.11	43.51	16.11	62.72	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ax HE 80 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax		11550	42.2	-31.8	74	54.64	39.54	13.42	65.4	150	0	P	H
HE 80		17328	47.85	-20.45	68.3	51.32	43.14	16.07	62.68	150	360	P	H
CH155		11550	42.04	-31.96	74	54.48	39.54	13.42	65.4	150	360	P	V
5775MHz		17328	46.62	-21.68	68.3	50.09	43.14	16.07	62.68	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

For ETH6 MIMO mode:

Beamforming Mode

Band 4 5725~5850MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 151 5755MHz		11510	41.42	-32.58	74	53.77	39.7	13.37	65.42	100	360	P	H
		11510	41.83	-32.17	74	54.18	39.7	13.37	65.42	100	0	P	V
802.11n HT40 CH 159 5795MHz		11590	41.86	-32.14	74	54.35	39.44	13.45	65.38	100	360	P	H
		11590	42.81	-31.19	74	55.3	39.44	13.45	65.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ac VHT20 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT20 CH 149 5745MHz		11490	45.4	-28.6	74	57.77	39.68	13.36	65.41	100	360	P	H
		11490	43.97	-30.03	74	56.34	39.68	13.36	65.41	100	0	P	V
802.11ac VHT20 CH 157 5785MHz		11570	44.22	-29.78	74	56.68	39.49	13.44	65.39	100	360	P	H
		11570	43.43	-30.57	74	55.89	39.49	13.44	65.39	100	0	P	V
802.11ac VHT20 CH 165 5825MHz		11650	42.97	-31.03	74	55.54	39.29	13.5	65.36	100	360	P	H
		11650	42.09	-31.91	74	54.66	39.29	13.5	65.36	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 155 5775MHz		11550	42.77	-31.23	74	55.21	39.54	13.42	65.4	100	360	P	H
		11550	42.67	-31.33	74	55.11	39.54	13.42	65.4	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11ax HE 20 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE 20 CH 149 5745MHz		11490	43.18	-30.82	74	55.55	39.68	13.36	65.41	100	360	P	H
		11490	44.06	-29.94	74	56.43	39.68	13.36	65.41	100	0	P	V
802.11 ax HE 20 CH 157 5785MHz		11570	42.24	-31.76	74	54.7	39.49	13.44	65.39	100	360	P	H
		11570	41.7	-32.3	74	54.16	39.49	13.44	65.39	100	0	P	V
802.11 ax HE 20 CH 165 5825MHz		11650	42.83	-31.17	74	55.4	39.29	13.5	65.36	100	360	P	H
		11650	43.56	-30.44	74	56.13	39.29	13.5	65.36	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11 ax HE 40 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11 ax HE 40 CH 151 5755MHz		11510	42.16	-31.84	74	54.51	39.7	13.37	65.42	100	360	P	H
		11510	42.91	-31.09	74	55.26	39.7	13.37	65.42	100	0	P	V
802.11 ax HE 40 CH 159 5795MHz		11590	43.47	-30.53	74	55.96	39.44	13.45	65.38	100	0	P	H
		11590	42.42	-31.58	74	54.91	39.44	13.45	65.38	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11 ax HE 80 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11 ax HE 80 CH 155 5775MHz		11550	42.96	-31.04	74	55.4	39.54	13.42	65.4	100	0	P	H
		11550	42.48	-31.52	74	54.92	39.54	13.42	65.4	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15E Emission below 1GHz

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
LF		39.7	23.28	-16.72	40	34.84	19.7	0.7	31.96	-	-	P	H
		79.47	26.99	-13.01	40	44.24	13.62	1.06	31.93	-	-	P	H
		100.81	33.11	-10.39	43.5	47.66	16.22	1.16	31.93	100	0	P	H
		113.42	30.82	-12.68	43.5	45.05	16.47	1.23	31.93	-	-	P	H
		189.08	32.05	-11.45	43.5	46.83	15.55	1.58	31.91	-	-	P	H
		884.57	25.04	-20.96	46	23.95	29.23	3.42	31.56	-	-	P	H
		55.22	36.3	-3.7	40	54.4	13	0.85	31.95	100	0	P	V
		74.62	31.71	-8.29	40	49.4	13.2	1.01	31.9	-	-	P	V
		127	33.1	-10.4	43.5	47.02	16.74	1.28	31.94	-	-	P	V
		176.47	27.86	-15.64	43.5	42.16	16.09	1.53	31.92	-	-	P	V
		751.68	23.83	-22.17	46	24.44	28.49	3.15	32.25	-	-	P	V
		930.16	25.47	-20.53	46	22.91	30.23	3.51	31.18	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".

Appendix D. Duty Cycle Plots

CDD Mode

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1	802.11a for ETH6	95.39	2.070	0.483	1kHz
1	802.11n HT20 for ETH6	95.07	1.930	0.518	1kHz
1	802.11n HT40 for ETH6	33.33	0.350	2.857	3kHz
1	802.11ac VHT20 for ETH6	98.48	-	-	10Hz
1	802.11ac VHT40 for ETH6	96.97	0.960	1.042	3kHz
1	802.11ac VHT80 for ETH6	94.69	0.464	2.155	3kHz
1	802.11ax HE20 for ETH6	98.29	-	-	10Hz
1	802.11ax HE40 for ETH6	96.29	0.778	1.285	3kHz
1	802.11ax HE80 for ETH6	92.20	0.402	2.488	3kHz
1	802.11ax HE160 for ETH6	87.00	0.252	3.966	10kHz
1+2+3+4	802.11a for ETH6	94.52	2.070	0.483	1kHz
1+2+3+4	802.11n HT20 for ETH6	95.07	1.930	0.518	1kHz
1+2+3+4	802.11n HT40 for ETH6	90.48	0.950	1.052	3kHz
1+2+3+4	802.11ac VHT20 for ETH6	98.47	-	-	10Hz
1+2+3+4	802.11ac VHT40 for ETH6	96.97	0.960	1.042	3kHz
1+2+3+4	802.11ac VHT80 for ETH6	94.69	0.464	2.155	3kHz
1+2+3+4	802.11ax HE20 for ETH6	98.29	-	-	10Hz
1+2+3+4	802.11ax HE40 for ETH6	96.07	0.782	1.279	3kHz
1+2+3+4	802.11ax HE80 for ETH6	92.69	0.406	2.463	3kHz
1+2+3+4	802.11ax HE160 for ETH6	86.14	0.252	3.966	10kHz

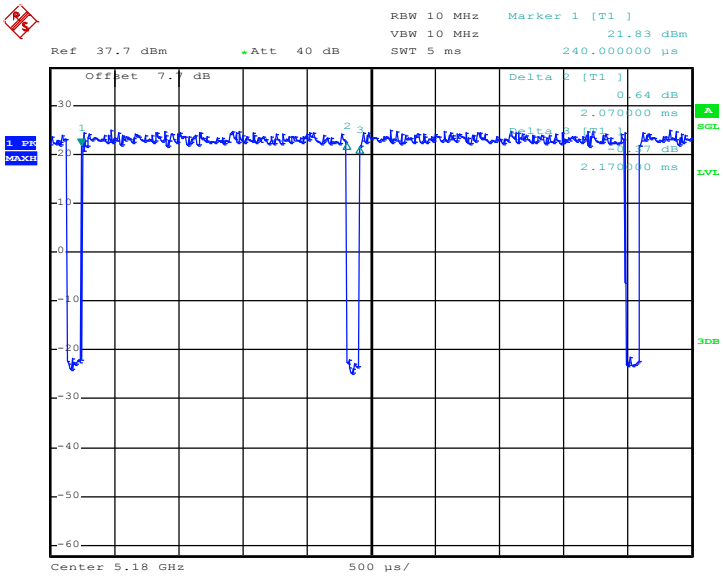
Beamforming Mode

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2+3+4	802.11n HT20 for ETH6	95.88	5.391	0.185	300Hz
1+2+3+4	802.11n HT40 for ETH6	95.38	5.391	0.185	300Hz
1+2+3+4	802.11ac VHT20 for ETH6	95.36	5.362	0.186	300Hz
1+2+3+4	802.11ac VHT40 for ETH6	94.45	5.420	0.184	300Hz
1+2+3+4	802.11ac VHT80 for ETH6	94.92	5.420	0.184	300Hz
1+2+3+4	802.11ax HE20 for ETH6	94.71	5.188	0.193	300Hz
1+2+3+4	802.11ax HE40 for ETH6	93.91	5.362	0.186	300Hz
1+2+3+4	802.11ax HE80 for ETH6	94.42	5.391	0.185	300Hz

<ETH6>

<Ant. 1>

802.11a



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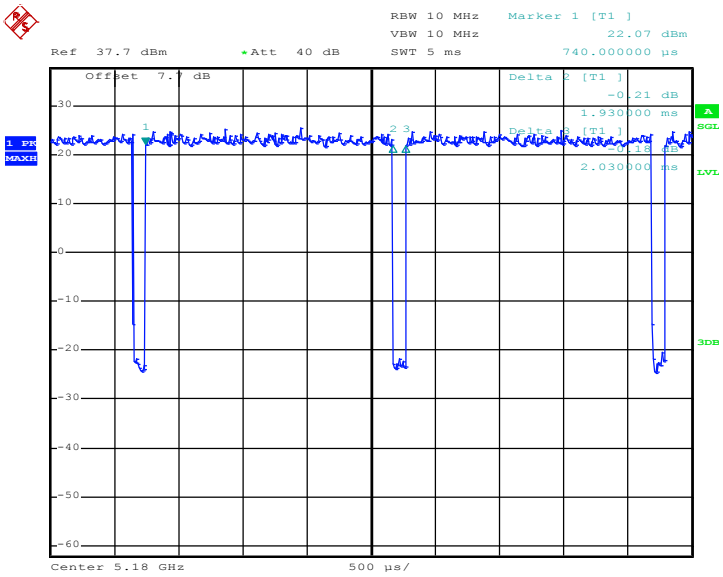

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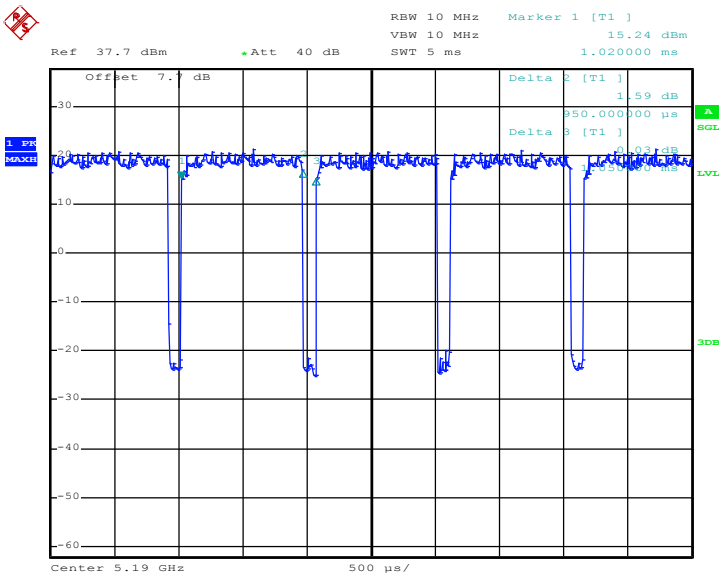

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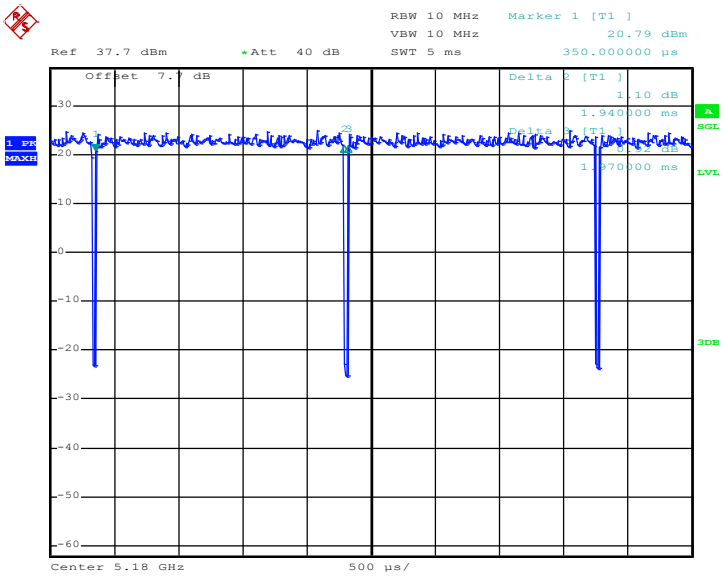

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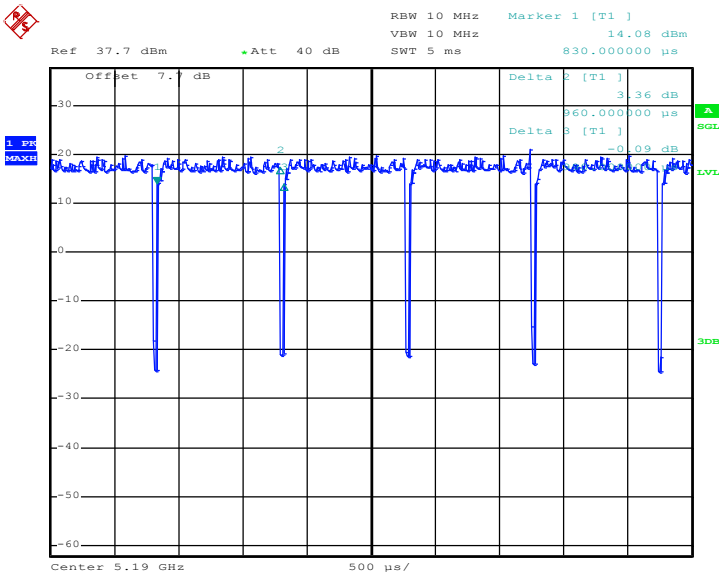

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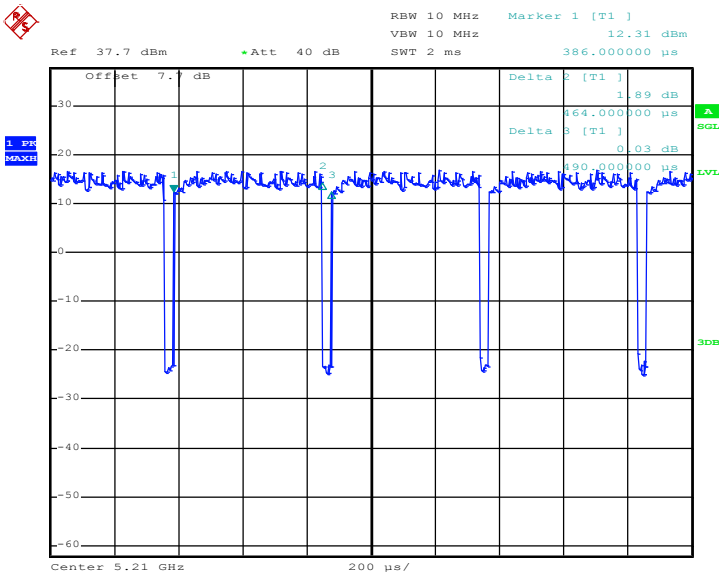

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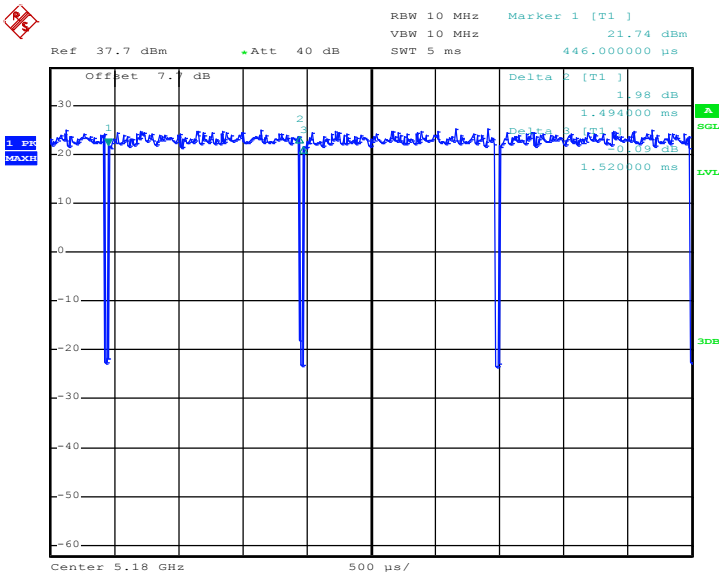

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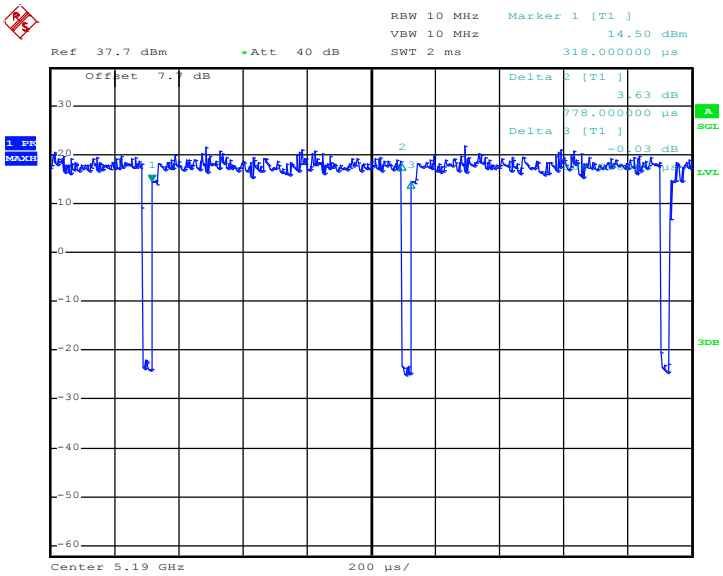

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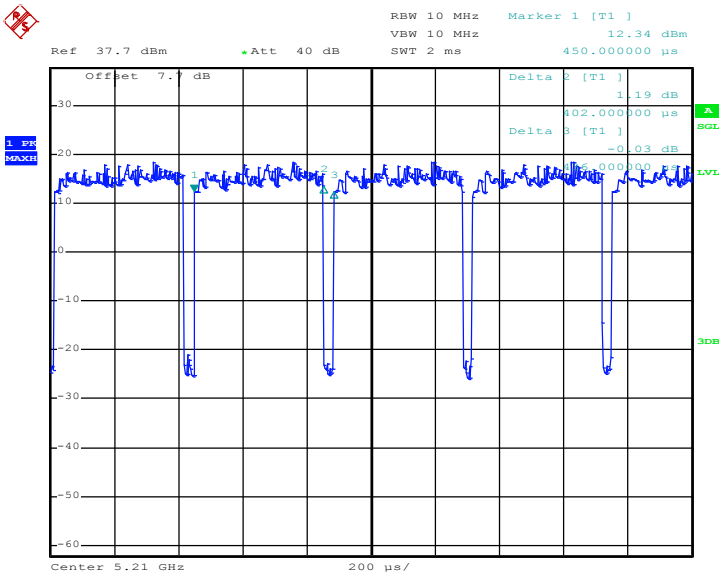

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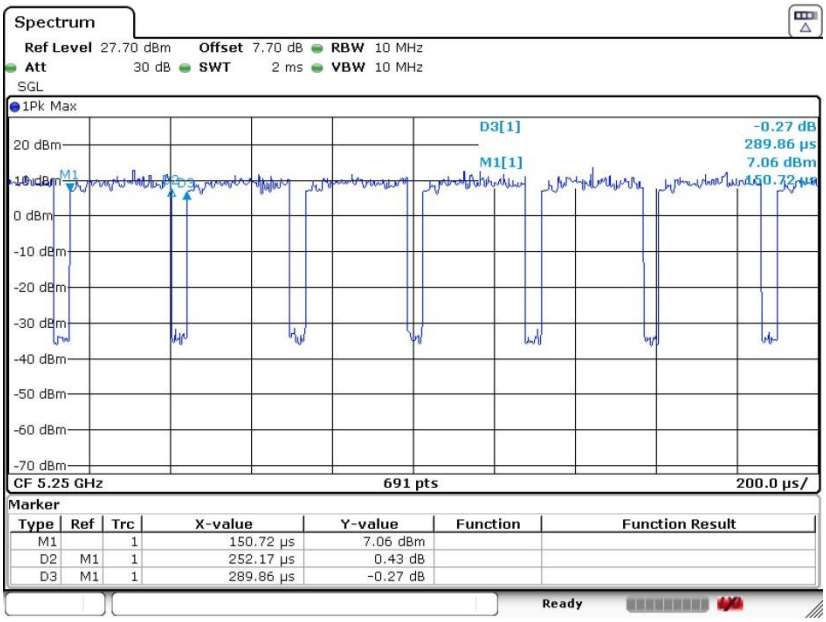

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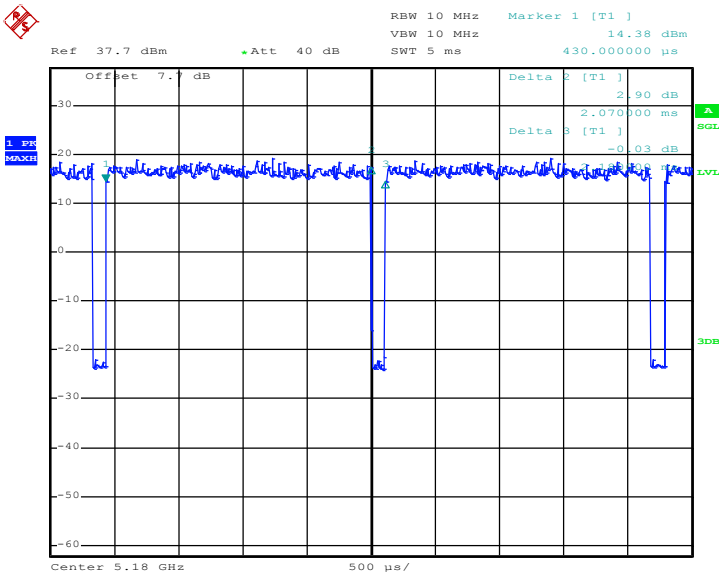
CDD Mode

MIMO <Ant. 1+2+3+4>

802.11a



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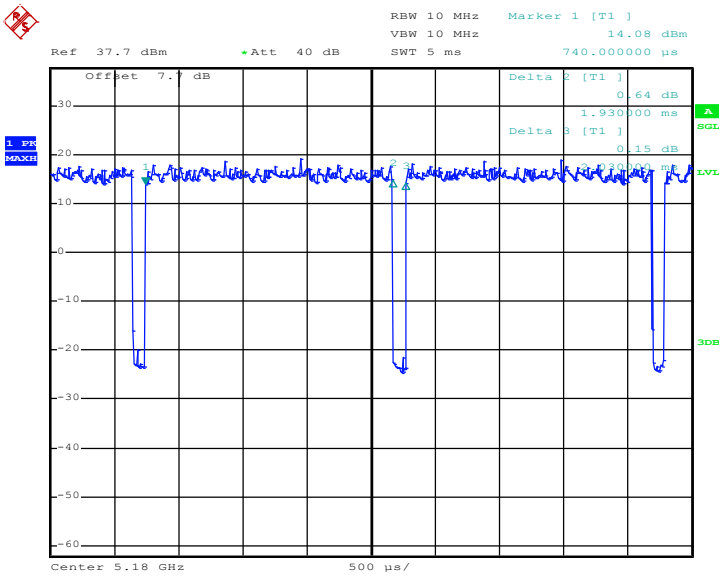

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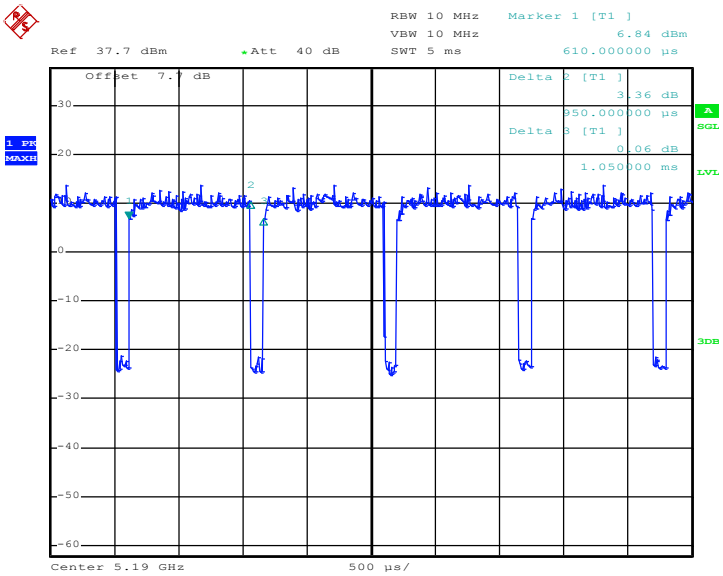
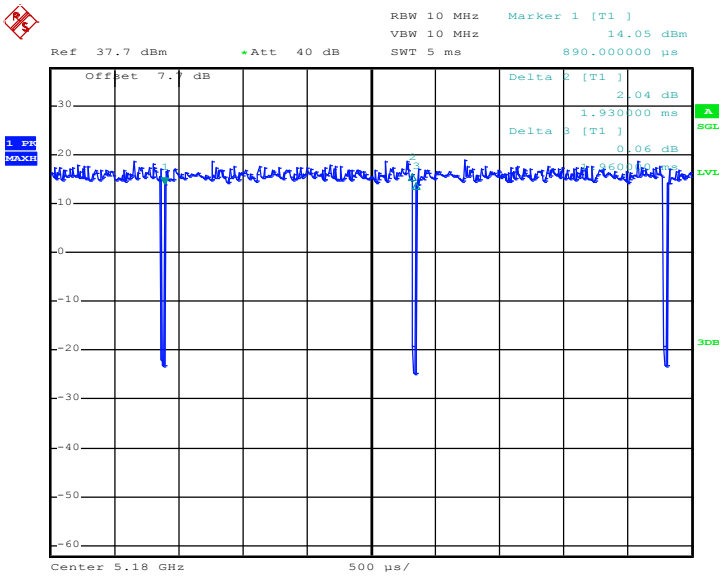


802.11ac VHT20



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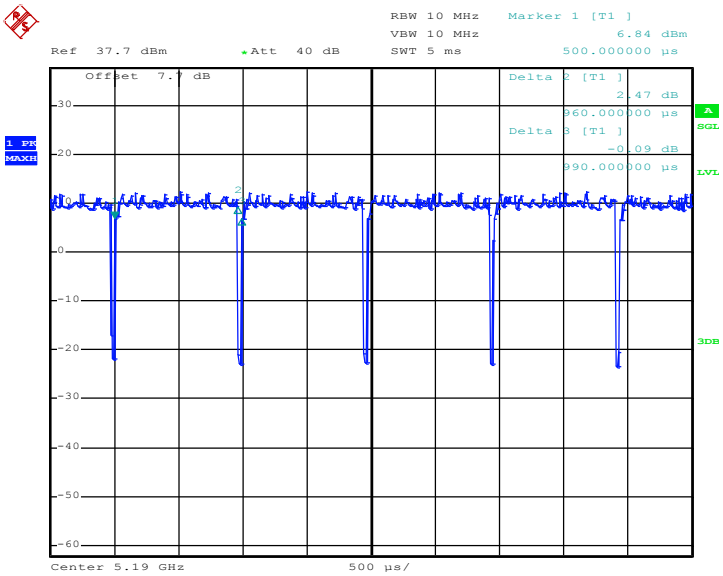

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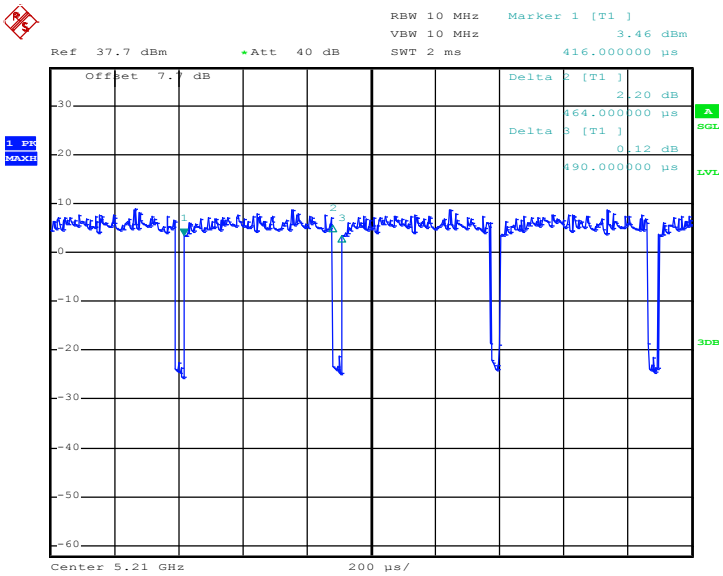

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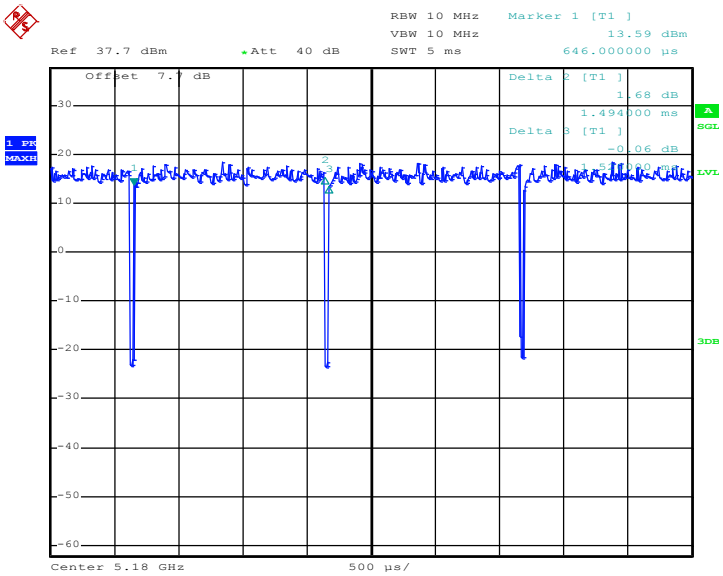

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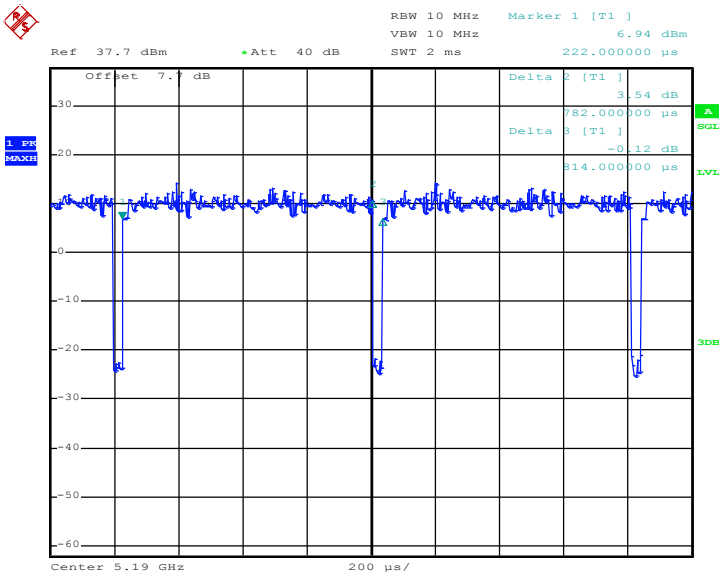

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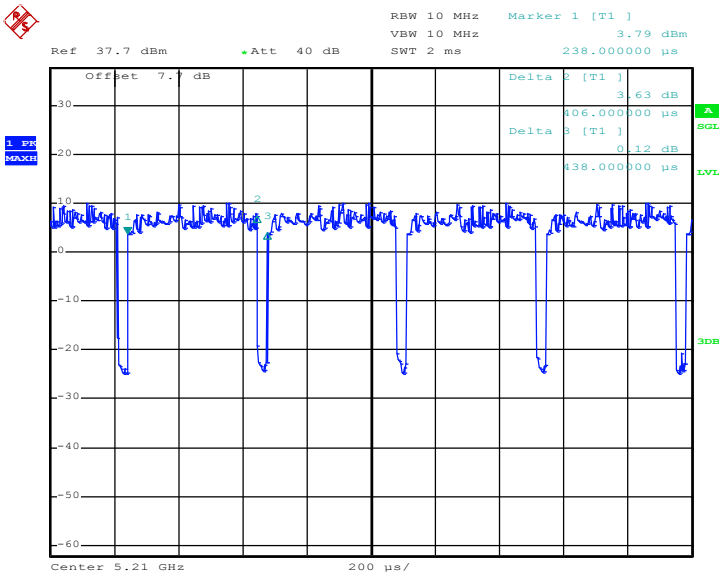

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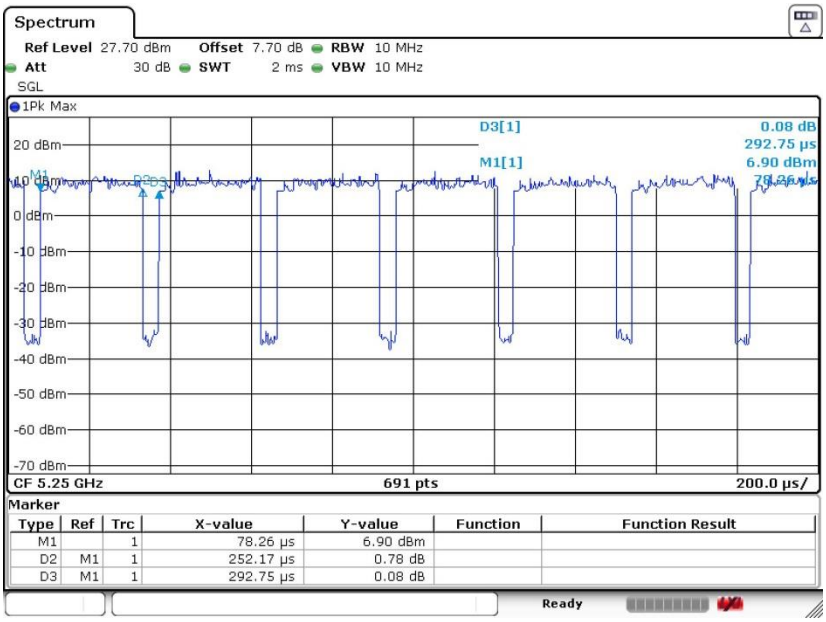

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Beamforming Mode

<ETH6>

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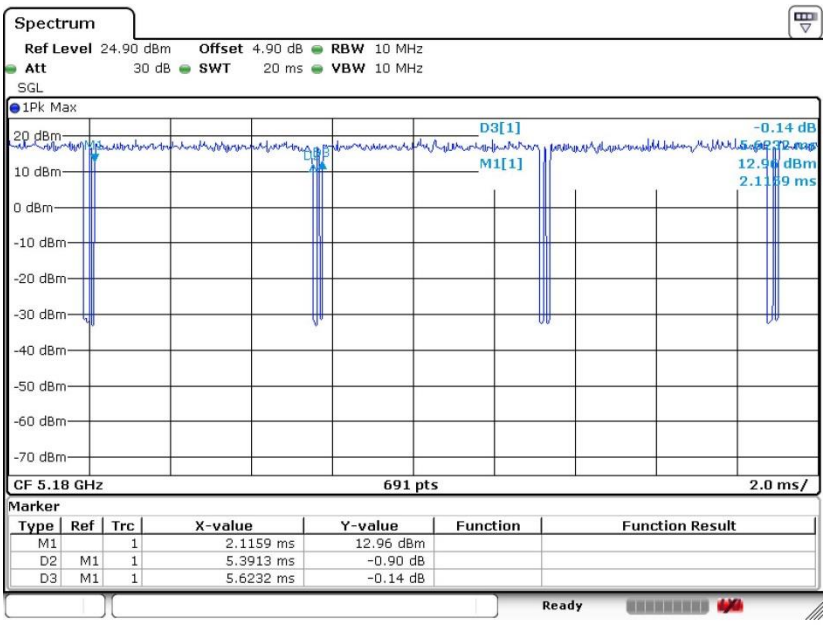
802.11n HT20



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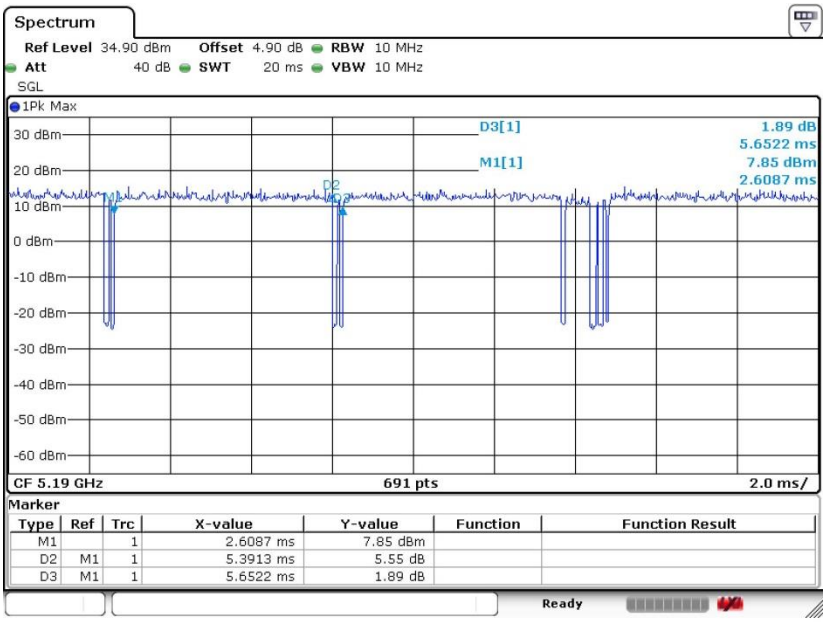
802.11n HT40



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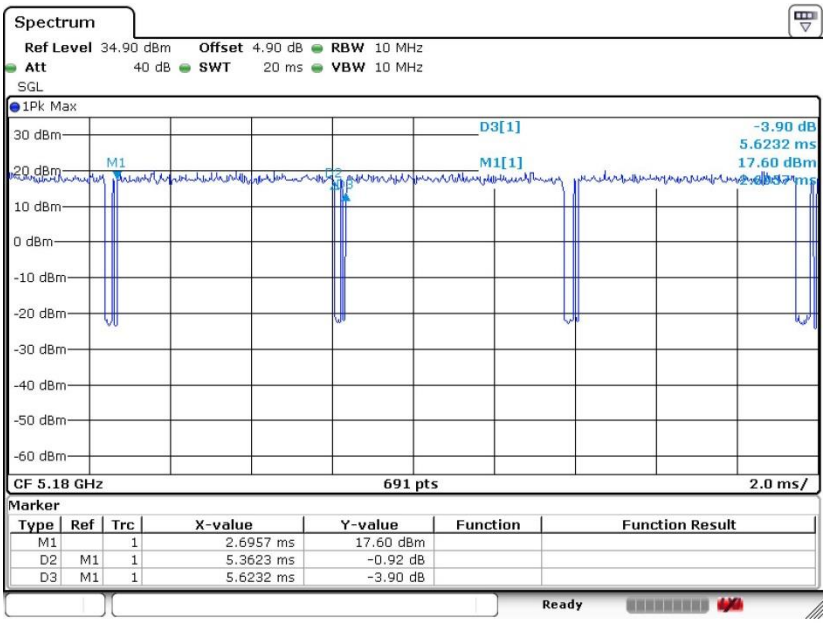

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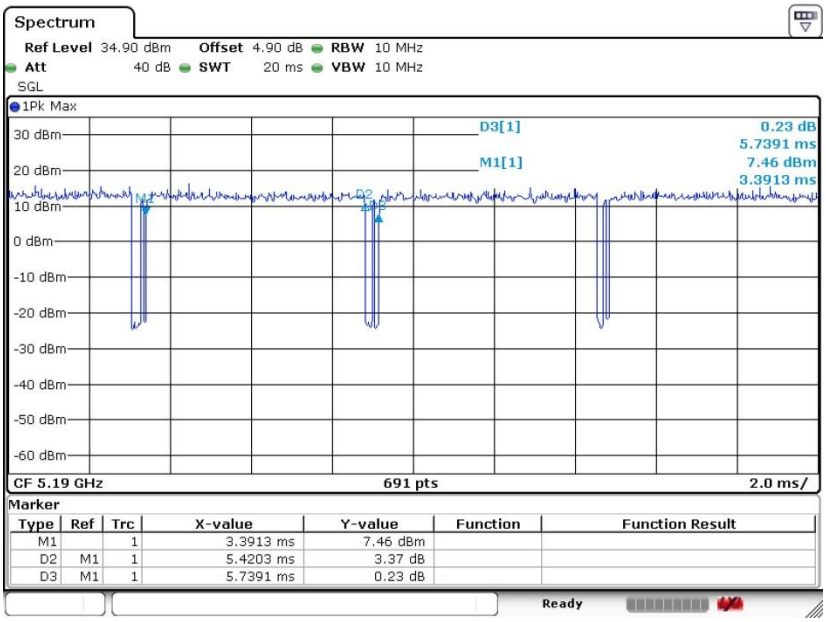

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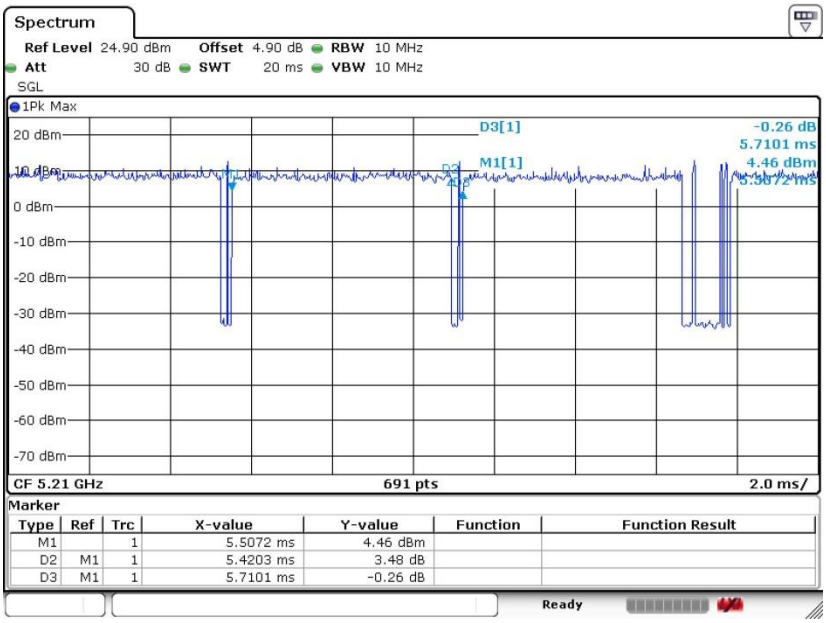

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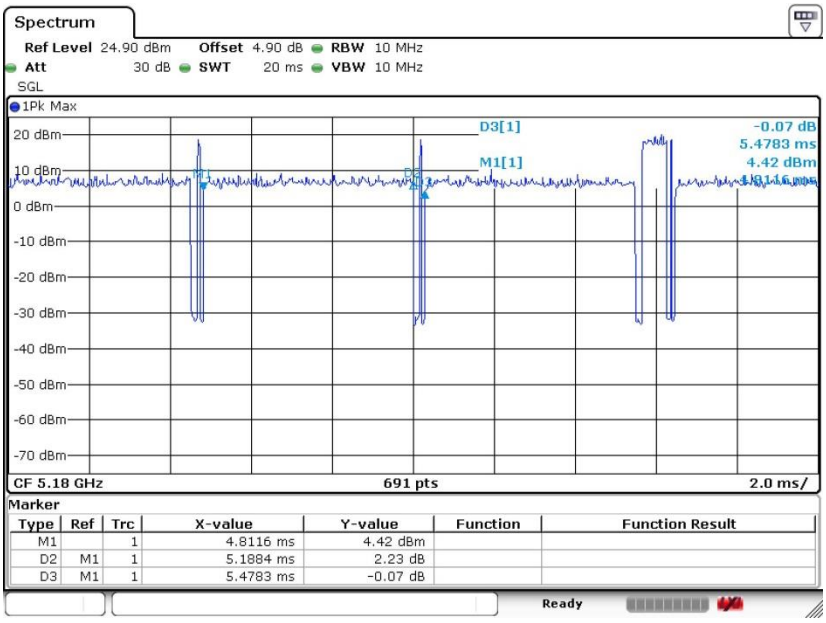

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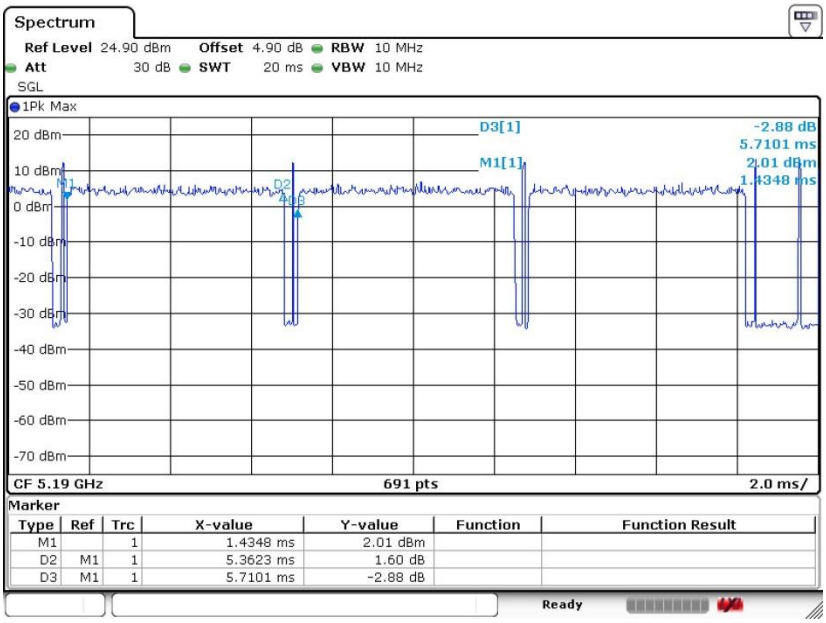

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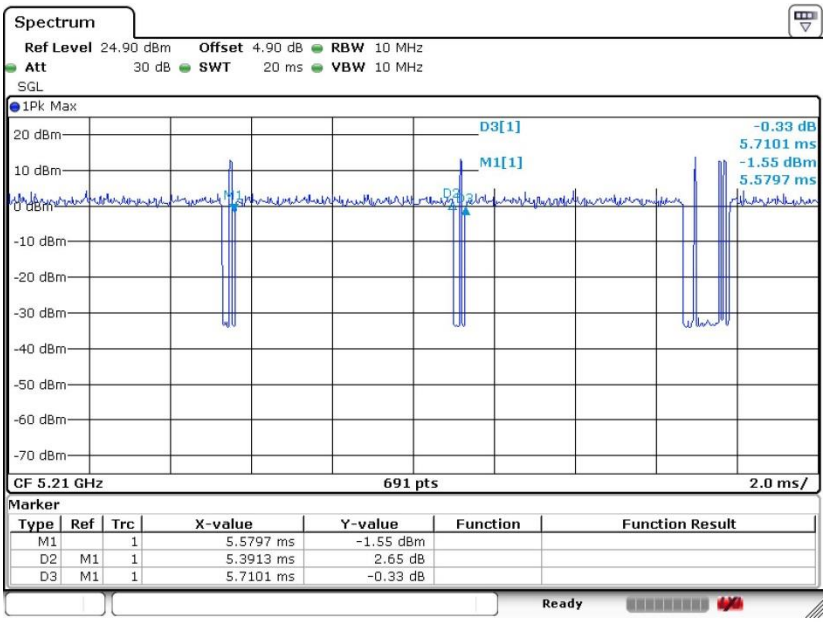

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