


Report No.: SEWM2306000198RG02

Rev.: 01

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# TEST REPORT

**Application No.:** SEWM2306000198RG  
**Applicant:** Beijing InHand Networks Technology Co., Ltd.  
**Address of Applicant:** Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing  
**Manufacturer:** Beijing InHand Networks Technology Co., Ltd.  
**Address of Manufacturer:** Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing  
**EUT Description:** Edge Computer  
**Test Model No.:** EC900-NRQ3  
**Series Model No.:** EC9x2-NRQ3, EC9x4-NRQ3  
**Trade Mark:**   
**FCC ID:** 2AANY-EC9005G  
**Standards:** FCC 47 CFR Part 2, Subpart J  
FCC 47 CFR Part 15, Subpart E  
**Date of Receipt:** 2023/06/13  
**Date of Test:** 2023/06/19 to 2023/07/05  
**Date of Issue:** 2023/08/23

<b>Test Result :</b>	<b>PASS *</b>
----------------------	---------------

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

*Well Wei*

Well Wei  
Wireless Laboratory Manager



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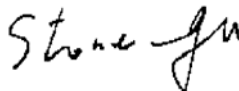
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## 1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023/08/23		Original

Prepared By	
	(Ives Cheng) / Test Engineer
Checked By	
	(Stone Gu) / Reviewer



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## 2 Test Summary

Test Item	Band <sup>[1]</sup>	FCC rules No.	Test Requirements	Test Result	Result
Antenna Requirement	--	15.203/15.407(a)	--	Clause 4.1	PASS
26dB Emission Bandwidth	Band I	15.407(a)(1)	No limit.	Clause 4.5	For Report Purpose
6dB Emission Bandwidth	Band III	15.407(e)	≥ 500 kHz.	Clause 4.6	PASS
99% Occupied Bandwidth	Band I	KDB 789033 D02§ D	No limit.	Clause 4.7	For Report Purpose
	Band III				
Duty Cycle	Band I Band III	--	No limit.	Clause 4.3	For Report Purpose
Maximum Conducted Output Power	Band I	15.407(a)(ii)	<1W	Clause 4.4	PASS
	Band III	15.407(a)(3)	< 1W		
Maximum Power Spectral Density	Band I	15.407(a)(ii)	< 17dBm/MHz	Clause 4.8	PASS
	Band III	15.407(a)(3)	<30dBm/500KHz		
Radiated Spurious Emissions	Band I	15.407(b) 15.205/15.209	F<1GHz: §15.209 limit (QP). F≥1GHz & out-restricted: <-27dBm/MHz PK e.i.r.p. (exl. 5.15-5.35 GHz). F≥1GHz & in-restricted: §15.209 limit (AV&PK).	Clause 4.9	PASS
	Band III	15.407(b) 15.205/15.209	F<1GHz: §15.209 limit (QP) F≥1GHz & out-restricted:(PK) 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. F≥1GHz & in-restricted: §15.209 limit (AV&PK).		PASS



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Restricted bands around fundamental frequency	Band I Band III	15.407(b) 15.205/15.209	---	Clause 4.10	PASS
AC Power Line Conducted Emissions	Band I Band III	15.207	---	Clause 4.2	PASS
Frequency Stability	Band I Band III	15.407(g)	Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual	N/A	N/A
Note 1: Band I: 5150-5250MHz Band III: 5725-5850MHz					



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### 3 General Information

#### 3.1 Details of Client

Applicant:	Beijing InHand Networks Technology Co., Ltd.
Address of Applicant:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing
Manufacturer:	Beijing InHand Networks Technology Co., Ltd.
Address of Manufacturer:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing

#### 3.2 Test Location

Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test engineer:	Ives Cheng, King-p Li

#### 3.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 6336.01)**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

• **FCC –Designation Number: CN1312**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.

Designation Number: CN1312.

Test Firm Registration Number: 717327



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### 3.4 General Description of EUT

EUT Description:	Edge Computer		
Test Model No.:	EC900-NRQ3		
Series Model No.:	EC9x2-NRQ3, EC9x4-NRQ3		
Trade Mark:			
Hardware Version:	NA		
Software Version:	NA		
Power Supply:	DC 12V		
SN:	RF Conducted	CF9422310000161	
	RSE & AC power line	CF9422310000176	
WLAN Mode Supported:	802.11a:	20 MHz channel bandwidth	
	802.11n:	20 MHz / 40 MHz channel bandwidth	
	802.11ac:	20 MHz / 40 MHz / 80 MHz channel bandwidth	
Operation Frequency:	5150MHz to 5250MHz 5725MHz to 5850MHz		
Modulation Type:	802.11a:	OFDM (BPSK, QPSK, 16QAM, 64QAM)	
	802.11n:	OFDM (BPSK, QPSK, 16QAM, 64QAM)	
	802.11ac:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)	
Channel Spacing:	20MHz:	802.11a/n(HT20)/ac(VHT20)	
	40MHz:	802.11n(HT40)/ac(VHT40)	
	80MHz:	802.11ac(VHT80)	
Antenna Type:	External Antenna		
Antenna Gain:	5150MHz to 5250MHz: -0.01dBi(Ant0); -0.01dBi(Ant1); 5725MHz to 5850MHz: -0.14dBi(Ant0); -0.14dBi(Ant1);		
	Note: The antenna gain are derived from the gain information report provided by the manufacturer.		
Smart System:	<input type="checkbox"/> SISO	802.11a/n/ac	
	<input checked="" type="checkbox"/> MIMO	802.11n/ac: 2Tx & 2Rx	
	<input checked="" type="checkbox"/> Diversity	802.11a: 2Tx & 2Rx	
Use Conditions:	Indoor		
RF Cable:	2.0dB		
Remark: As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.			



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## Remark:

In FCC 15.31, for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table, and the selected channel to perform the test as below:

Frequency range over which device operates	Number of Measurement Frequencies Required	Location of Measurement Frequency in Band of Operation
1 MHz or less	1	centre
1 MHz to 10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near centre

## For UNII Band I:

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5180
	The Middle channel	5200
	The Highest channel	5240
IEEE 802.11n/ac 40MHz	The Lowest channel	5190
	The Highest channel	5230
IEEE 802.11ac 80MHz	The Middle channel	5210

## For UNII Band III:

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5745
	The Middle channel	5785
	The Highest channel	5825
IEEE 802.11n/ac 40MHz	The Lowest channel	5755
	The Highest channel	5795
IEEE 802.11ac 80MHz	The Middle channel	5775



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### 3.5 Test Environment and Mode

Environment Parameter	101.0kPa Selected Values During Tests	
Relative Humidity	44-46 % RH Ambient	
Value	Temperature(°C)	Voltage(Vdc)
NTNV	22~23	12
Remark: NV: Normal Voltage NT: Normal Temperature		

### 3.6 Description of Support Units

The EUT has been tested as an independent unit.

### 3.7 Worst-case configuration and mode

Low data rate was used to test on antenna port conducted tests and radiated spurious emissions since it has the highest maximum power. Following are the worst-case data rates set for test:

Modulation Type	SISO - Data Rate	CDD/MIMO - Data Rate
802.11a	/	12 Mbps
802.11n (HT 20)	/	MCS0 (13 Mbps)
802.11n (HT 40)	/	MCS0 (27 Mbps)
802.11ac (VHT 20)	/	MCS0 (13 Mbps)
802.11ac (VHT 40)	/	MCS0 (27 Mbps)
802.11ac (VHT 80)	/	MCS0 (58.5 Mbps)



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## 4 Test results and Measurement Data

### 4.1 Antenna Requirement

<b>Standard requirement:</b>	47 CFR Part 15 Section 15.203
<p>The antenna is External Antenna and no consideration of replacement.</p> <p>The best case gain of the antenna is</p> <p>5150MHz to 5250MHz: -0.01dBi(Ant0); -0.01dBi(Ant1);*</p> <p>5725MHz to 5850MHz: -0.14dBi(Ant0); -0.14dBi(Ant1);*</p> <p><i>*Note:</i></p> <p><i>The antenna gain are derived from the gain information report provided by the manufacturer.</i></p> <p><i>Remark:</i></p> <p><i>As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.</i></p>	



**Cyclic Delay Diversity (CDD) System:**

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

If all antennas have the same gain,  $G_{ANT}$ , Directional gain =  $G_{ANT}$  + Array Gain, where Array Gain is as follows.

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

$$\text{Array Gain} = 10 \log(N_{ANT}/N_{SS}=1) \text{ dB.}$$

- For power measurements on IEEE 802.11 devices:

$$\text{Array Gain} = 0 \text{ dB (i.e., no array gain) for } N_{ANT} \leq 4;$$

Directional gain may be calculated by using the formulas applicable to equal gain antennas with  $G_{ANT}$  set equal to the gain of the antenna having the highest gain.**The Power and PSD limit should be modified if the directional gain of eut is over 6dbi.**

The EUT supports CDD System.

All antennas have the same gain:

Operation Frequency	ANT Gain0 (dBi)	ANT Gain1 (dBi)	Directional gain For Power (dBi)	Directional gain For PSD (dBi)	Power Limit Reduction (dBm)	PSD Limit Reduction (dBm)
5150MHz to 5250MHz	-0.01	-0.01	-0.01	3.00	0	0
5725MHz to 5850MHz	-0.14	-0.14	-0.14	2.87	0	0

5150MHz to 5250MHz:

Power Limit Reduction = Directional gain – 6dBi, (Directional gain &lt; 6dBi) =0

PSD Limit Reduction = Directional gain – 6dBi, (Directional gain &lt; 6dBi) =0

5725MHz to 5850MHz:

Power Limit Reduction = Directional gain – 6dBi, (Directional gain &lt; 6dBi) =0

PSD Limit Reduction = Directional gain – 6dBi, (Directional gain &lt; 6dBi) =0



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## 4.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15 Section 15.207		
Test Method:	ANSI C63.10-2020 Section 6.2		
Test Frequency Range:	150kHz to 30MHz		
Receiver Setup:	RBW = 9kHz, VBW = 30kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	<ol style="list-style-type: none"> <li>1) The mains terminal disturbance voltage test was conducted in a shielded room.</li> <li>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.</li> <li>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,</li> <li>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.</li> <li>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10-2020 on conducted measurement.</li> </ol>		



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Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. DC Supply + transmitting mode.
Final Test Mode:	Refer to section 3.7 for details. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass



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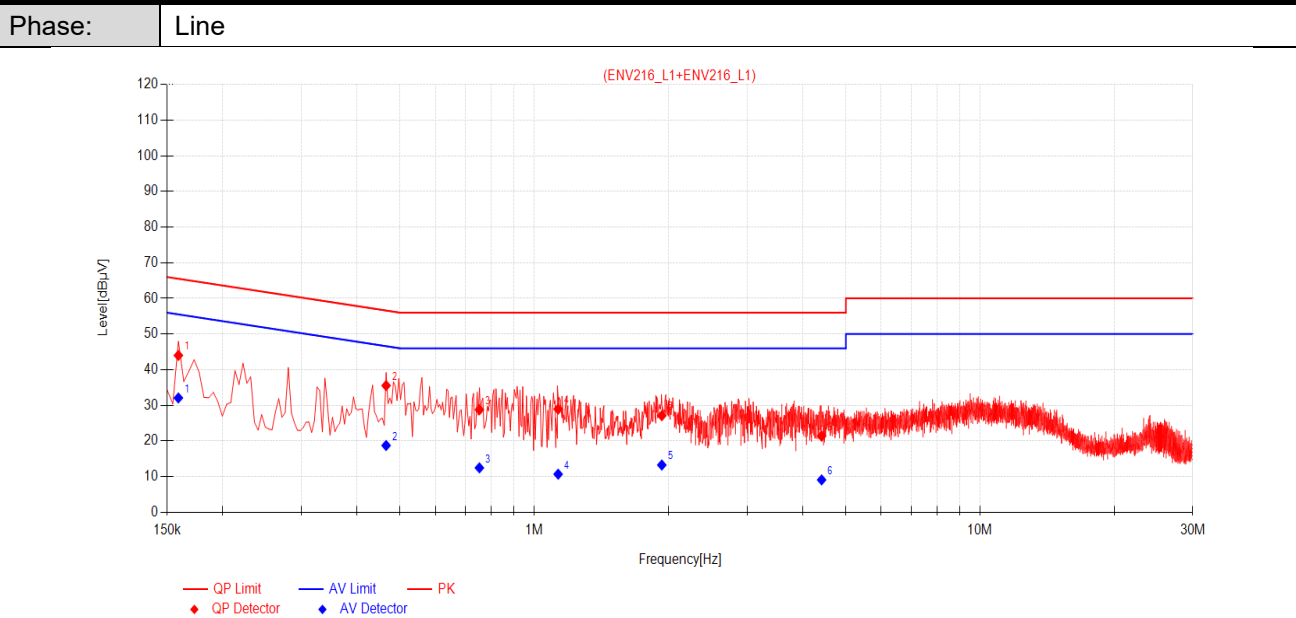
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## Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.  
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.



## Data List

NO.	Frequency [MHz]	Factor [dB]	QP Reading [dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.1590	10.67	33.34	44.01	65.52	21.51	21.41	32.08	55.52	23.44	PASS
2	0.4650	10.57	24.97	35.54	56.60	21.06	8.18	18.75	46.60	27.85	PASS
3	0.7530	10.54	18.24	28.78	56.00	27.22	1.93	12.47	46.00	33.53	PASS
4	1.1310	10.68	18.27	28.95	56.00	27.05	0.01	10.69	46.00	35.31	PASS
5	1.9320	10.70	16.41	27.11	56.00	28.89	2.57	13.27	46.00	32.73	PASS
6	4.4115	10.69	10.69	21.38	56.00	34.62	-1.59	9.10	46.00	36.90	PASS

## Remark:

- The following Quasi-Peak and Average measurements were performed on the EUT:
- Value = Reading [dBμV] + Factor (Lisn factor [dB] + cable loss [dB]).
- Margin = Limit [dBμV] – Value [dBμV]

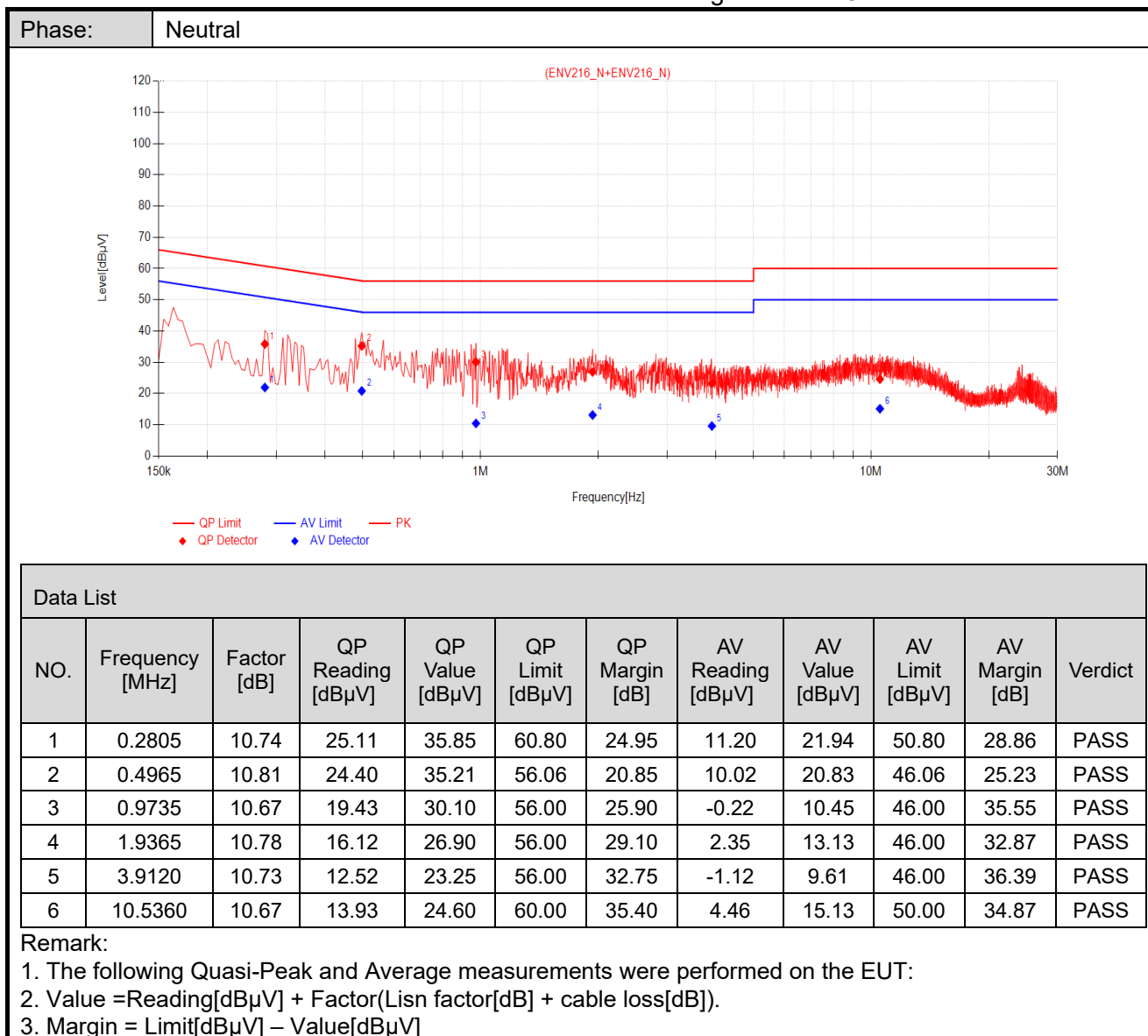


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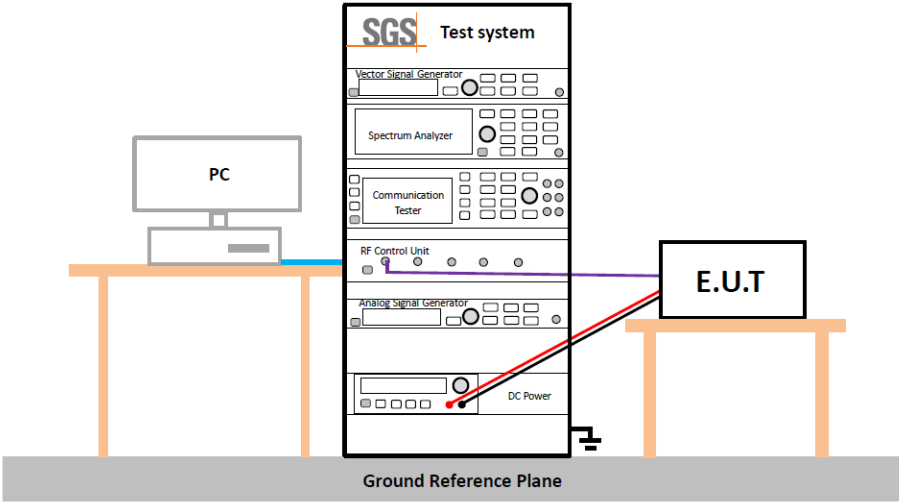
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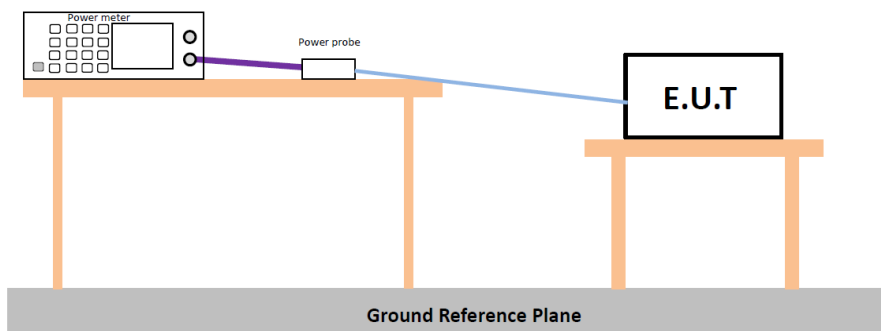
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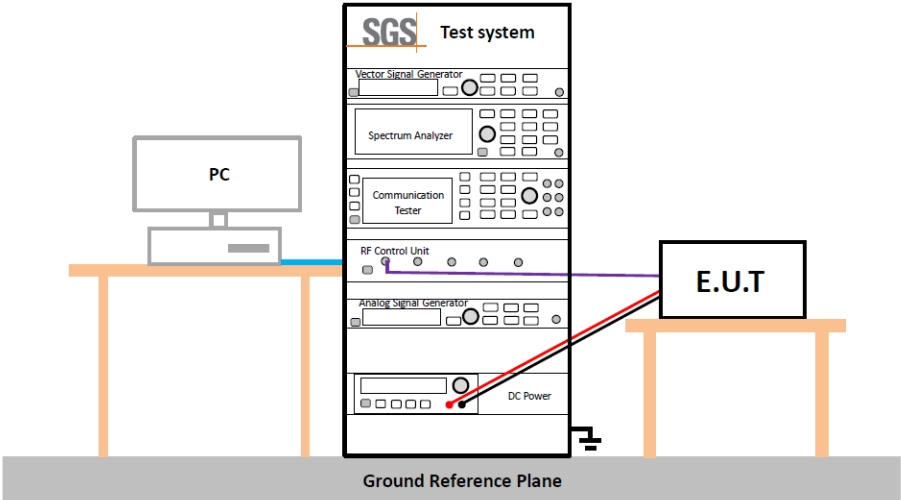
### 4.3 Duty Cycle

Test Requirement:	ANSI C63.10-2020 Section 12.2
Test Method:	ANSI C63.10-2020 Section 12.2
Test Setup:	
Instruments Used:	Refer to section 6 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	No restriction limits
Test Results:	For report purpose
The detailed test data see: <b>Appendix</b>	

## 4.4 Conducted Output Power

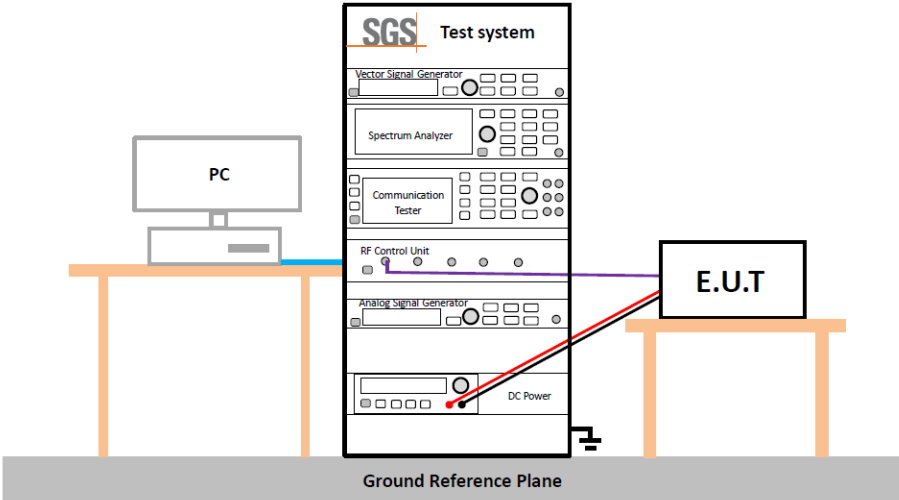
Test Requirement:	47 CFR Part 15 Section 15.407(a)	
Test Method:	ANSI C63.10-2020 Section 12.4.3.2	
Test Setup:	<div></div> <p>* Test with power meter (Detector function: Average) Method PM-G is measurement using a gated RF average power meter. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.</p>	
Test Instruments:	Refer to section 6 for details.	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates	
Final Test Mode:	Refer to section 3.7 for details.	
Limit:	Frequency Band	Limit
	5150-5250MHz	Not exceed 1W(30dBm)
	5725-5850MHz	Not exceed 1W(30dBm)
Test Results:	Pass	
The detailed test data see: <b>Appendix</b>		

## 4.5 26dB Emission Bandwidth

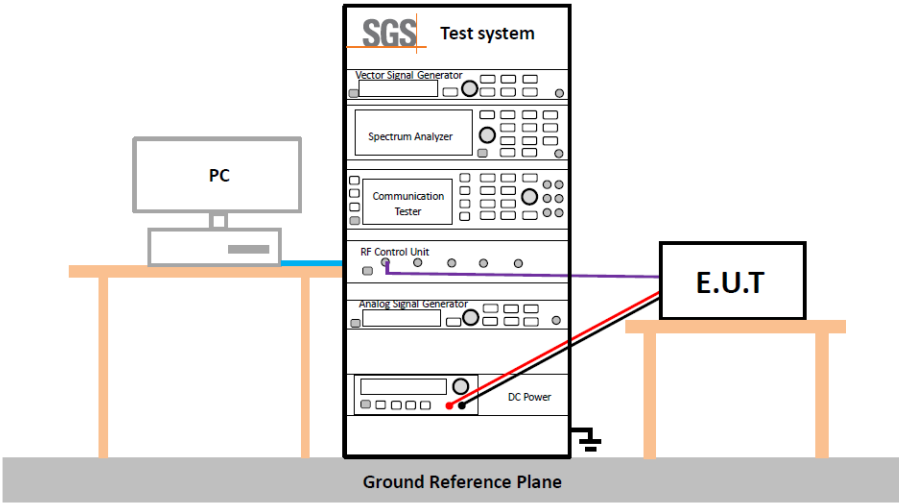
Test Requirement:	47 CFR Part 15 Section 15.407(a), KDB 789033 D02& C
Test Method:	ANSI C63.10-2020 Section 12.5.2
Test Setup:	
Instruments Used:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	No restriction limits
Test Results:	For Report Purpose
The detailed test data see: <b>Appendix</b>	



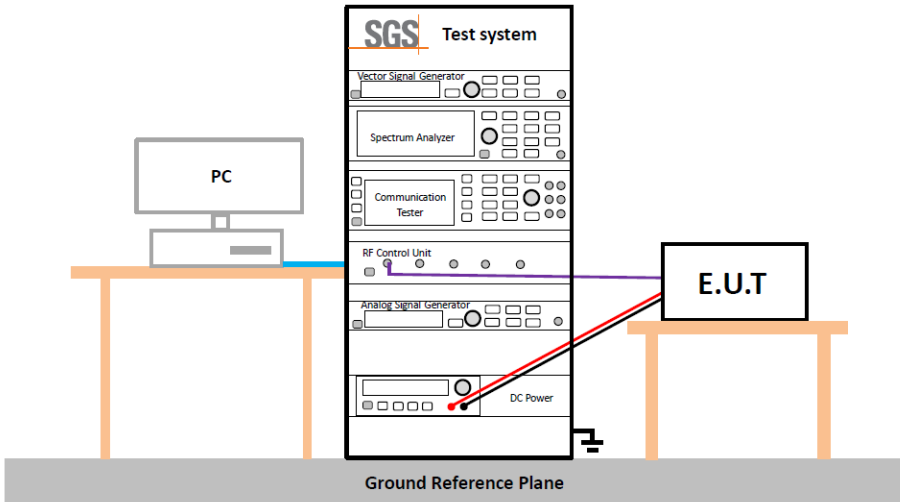
## 4.6 6dB Emission Bandwidth

Test Requirement:	47 CFR Part 15 Section 15.407(e)	
Test Method:	ANSI C63.10-2020 Section 12.5.1	
Test Setup:		
Test Instruments:	Refer to section 6 for details.	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates	
Final Test Mode:	Refer to section 3.7 for details.	
Limit:	Frequency Band	Limit
	5725-5850MHz	At lease 500kHz
Test Results:	Pass	
The detailed test data see: <b>Appendix</b>		

## 4.7 99% Occupied Bandwidth

Test Requirement:	KDB 789033 D02§ D
Test Method:	ANSI C63.10-2020 Section 12.5.3
Test Setup:	
Instruments Used:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	No restriction limits
Test Results:	For Report Purpose
The detailed test data see: <b>Appendix</b>	

## 4.8 Power Spectral Density

Test Requirement:	47 CFR Part 15 Section 15.407(a)	
Test Method:	ANSI C63.10-2020 Section 12.6 KDB 789033 D02 v02r01, Section F.	
Test Setup:		
Instruments Used:	Refer to section 6 for details.	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates	
Final Test Mode:	Refer to section 3.7 for details.	
Limit:	Frequency Band	Limit
	5150-5250MHz	The power spectral density less than 17dBm/1MHz
	5725-5850MHz	The power spectral density less than <30dBm/500KHz
Test Results:	Pass	
The detailed test data see: <b>Appendix</b>		

### 4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15 Section 15.205/15.209/15.407(b)
Test Method:	ANSI C63.10-2020 Section 6.4 / 6.5 / 6.6
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)
Test frequency:	9kHz ~ 40GHz(or 10 Harmonic)

#### Test Setup:

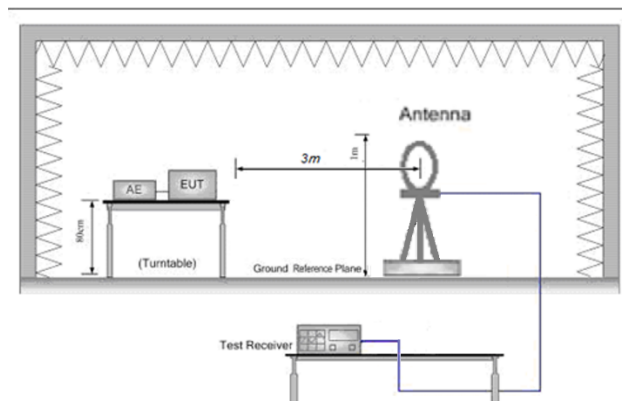


Figure 1. 9kHz to 30MHz

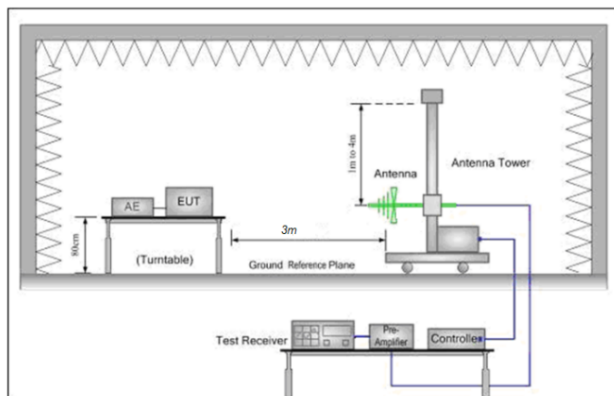


Figure 1. 30MHz to 1GHz

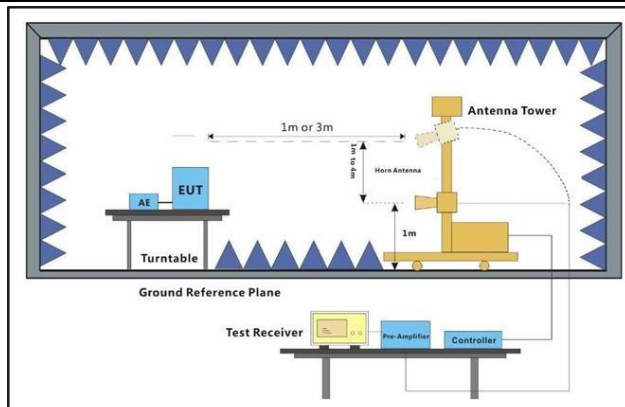


Figure 2. Above 1 GHz

#### Test Procedure:

- For below 1GHz test, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz test, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. (Distance from antenna to EUT is 1m for measurements >18GHz).
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

	<p>e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>g. Test the EUT in the outermost channels.</p> <p>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Y axis positioning which it is worse case.</p> <p>i. Repeat above procedures until all frequencies measured was complete.</p> <p>j. 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</p> <p>k. The disturbance above 18GHz was very low, and the harmonics were the highest point could be found when testing, so only the harmonics had been displayed.</p> <p>l. At a measurement distance of 1 meter the limit line was increased by <math>20 \cdot \text{LOG}(3/1) = 9.54 \text{ dB}</math>.</p>
Test Configuration:	<p>Measurements below 30MHz</p> <ul style="list-style-type: none"> <li>• RBW = 10 kHz</li> <li>• VBW = 30 kHz</li> <li>• Detector = Peak &amp; Average &amp; Quasi-peak</li> <li>• Trace mode = max hold</li> </ul> <p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> <li>• RBW = 120 kHz</li> <li>• VBW = 300 kHz</li> <li>• Detector = Quasi-peak</li> <li>• Trace mode = max hold</li> </ul> <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none"> <li>• RBW = 1 MHz</li> <li>• VBW <math>\geq 3 \text{ MHz}</math></li> <li>• Detector = Peak</li> <li>• Sweep time = auto</li> <li>• Trace mode = max hold</li> </ul> <p>Average Measurements Above 1000MHz</p> <ul style="list-style-type: none"> <li>• RBW = 1 MHz</li> <li>• VBW = 10Hz, when duty cycle is no less than 98 percent.</li> <li>• VBW <math>\geq 1/T</math>, 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.</li> </ul>
Exploratory Test Mode:	<p>Transmitting with all kind of modulations, data rates.</p> <p>DC Supply + transmitting mode.</p>
Final Test Mode:	<p>Refer to section 3.7 for details.</p> <p>For below 1GHz part, through pre-scan all channels, but only the worst case is recorded in the report.</p>
Instruments Used:	<p>Refer to section 6 for details.</p>







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Test Results:	Pass
The detailed test data see: <b>Appendix</b>	



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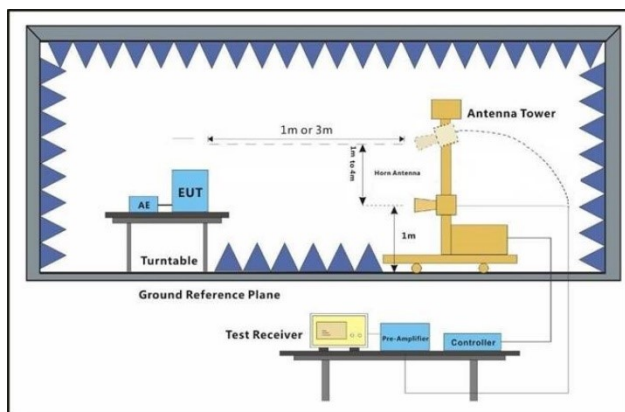
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### 4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15 Section 15.205/15.209/15.407(b)		
Test Method:	ANSI C63.10-2020 Section 12.7		
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m)	Remark
	30MHz-88MHz	40.0	Quasi-peak
	88MHz-216MHz	43.5	Quasi-peak
	216MHz-960MHz	46.0	Quasi-peak
	960MHz-1GHz	54.0	Quasi-peak
	Above 1GHz	54.0	Average Value
		74.0	Peak Value

#### Test Setup:



#### Test Procedure:

- The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel
- Test the EUT in the outermost channels.
- The radiation measurements are performed in X, Y, Z axis positioning for

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	Transmitting mode, And found the Y axis positioning which it is worse case. i. Repeat above procedures until all frequencies measured was complete.
Test Configuration:	<p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> <li>• RBW = 120 kHz</li> <li>• VBW = 300 kHz</li> <li>• Detector = Quasi-peak</li> <li>• Trace mode = max hold</li> </ul> <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none"> <li>• RBW = 1 MHz</li> <li>• VBW <math>\geq</math> 3 MHz</li> <li>• Detector = Peak</li> <li>• Sweep time = auto</li> <li>• Trace mode = max hold</li> </ul> <p>Average Measurements Above 1000MHz</p> <ul style="list-style-type: none"> <li>• RBW = 1 MHz</li> <li>• VBW = 10Hz, when duty cycle is no less than 98 percent.</li> <li>• VBW <math>\geq</math> 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.</li> </ul>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. DC Supply + transmitting mode.
Final Test Mode:	Refer to section 3.7 for details.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass
The detailed test data see: <b>Appendix</b>	



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## 5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	$\pm 0.54\text{dB}$
2	RF power density, conducted	$\pm 1.03\text{dB}$
3	Spurious emissions, conducted	$\pm 0.54\text{dB}$
4	Radio Frequency	$\pm 1.0\%$
5	Duty Cycle	$\pm 0.37\%$
6	Occupied Bandwidth	$\pm 1.0\%$
7	Conduction Emission	$\pm 2.90\text{dB}$ (150kHz to 30MHz)
8	Radiated Emission	$\pm 3.13\text{dB}$ (9k to 30MHz)
		$\pm 4.8\text{dB}$ (30M to 1GHz)
		$\pm 4.8\text{dB}$ (1GHz to 18GHz)
		$\pm 4.8\text{dB}$ (Above 18GHz)

**Remark:**

The  $U_{\text{lab}}$  (lab Uncertainty) is less than  $U_{\text{CISPR/ETSI}}$  (CISPR/ETSI Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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## 6 Equipment List

RF Test Equipment					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)
Shielding Room	Brilliant-emc	N/A	SUWI-04-01-06	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2023/02/06	2024/02/05
Measurement Software	Tonscend	JS1120-3 Test System V 3.3.20	SUWI-02-09-09	NCR	NCR
Signal Analyzer	ROHDE& SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10
Wideband Radio Communication Tester	ROHDE& SCHWARZ	CMW500	SUWI-01-16-05	2023/02/06	2024/02/05
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2023/02/06	2024/02/05
Power meter	Anritsu	ML2495A	SUWI-01-31-01	2022/11/23	2023/11/22
Pulse power sensor	Anritsu	MA2411B	SUWI-01-32-01	2022/11/23	2023/11/22
Temperature Chamber	ESPEC	SU-242	SUWI-01-13-01	2023/02/06	2024/02/05

Conduction Test Equipment					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-06	2023/02/07	2024/02/06
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-03	2023/02/08	2024/02/07
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-04	2023/02/08	2024/02/07
Measurement Software	Tonscend	JS32-CE V4.0.0.2	SUWI-02-09-05	NCR	NCR



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RSE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date (yyyy/mm/dd)	Cal Due Date (yyyy/mm/dd)
Semi-Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-01	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2023/02/07	2024/02/06
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-05	2022/11/23	2023/11/22
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	VULB 9163	SUWI-01-11-01	2023/05/13	2024/05/12
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	2023/05/13	2024/05/12
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9170	SUWI-01-11-03	2023/05/12	2024/05/11
Active Loop Antenna	SCHWRZBECK MESS- ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	2023/05/13	2024/05/12
Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	2023/02/06	2024/02/05
Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	2023/02/06	2024/02/05
Amplifier	Tonscend	TAP18040048	SUWI-01-14-03	2023/02/08	2024/02/07
Measurement Software	Tonscend	JS32-RE 4.0.0.0	SUWI-02-09-04	NCR	NCR



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## 7 Photographs - Setup Photos

Refer to Appendix A.2 WLAN Setup Photos.



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# Appendix



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## Emission Bandwidth

## Test Result

TestMode	Antenna	Frequency[MHz]	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Verdict
11a-CDD	Ant0	5180	22.72	5170.64	5193.36	For Report Purpose
11a-CDD	Ant1	5180	18.84	5170.68	5189.52	
11a-CDD	Ant0	5220	18.52	5210.72	5229.24	
11a-CDD	Ant1	5220	18.64	5210.64	5229.28	
11a-CDD	Ant0	5240	21.64	5230.80	5252.44	
11a-CDD	Ant1	5240	21.68	5230.64	5252.32	
11a-CDD	Ant0	5745	21.84	5735.60	5757.44	
11a-CDD	Ant1	5745	22.24	5735.16	5757.40	
11a-CDD	Ant0	5785	18.72	5775.64	5794.36	
11a-CDD	Ant1	5785	18.64	5775.64	5794.28	
11a-CDD	Ant0	5825	18.64	5815.64	5834.28	
11a-CDD	Ant1	5825	18.68	5815.60	5834.28	
11ac20MIMO	Ant0	5180	19.48	5170.28	5189.76	
11ac20MIMO	Ant1	5180	19.60	5170.20	5189.80	
11ac20MIMO	Ant0	5220	19.52	5210.24	5229.76	
11ac20MIMO	Ant1	5220	19.68	5210.20	5229.88	
11ac20MIMO	Ant0	5240	19.68	5230.16	5249.84	
11ac20MIMO	Ant1	5240	19.56	5230.20	5249.76	
11ac20MIMO	Ant0	5745	19.56	5735.28	5754.84	
11ac20MIMO	Ant1	5745	19.52	5735.24	5754.76	
11ac20MIMO	Ant0	5785	19.68	5775.20	5794.88	
11ac20MIMO	Ant1	5785	19.56	5775.20	5794.76	
11ac20MIMO	Ant0	5825	19.32	5815.32	5834.64	
11ac20MIMO	Ant1	5825	19.60	5815.24	5834.84	
11ac40MIMO	Ant0	5190	41.76	5169.12	5210.88	
11ac40MIMO	Ant1	5190	41.28	5169.12	5210.40	
11ac40MIMO	Ant0	5230	41.60	5209.12	5250.72	
11ac40MIMO	Ant1	5230	41.04	5209.36	5250.40	
11ac40MIMO	Ant0	5755	43.52	5733.56	5777.08	
11ac40MIMO	Ant1	5755	41.28	5734.36	5775.64	
11ac40MIMO	Ant0	5795	40.96	5774.28	5815.24	
11ac40MIMO	Ant1	5795	41.12	5774.44	5815.56	
11ac80MIMO	Ant0	5210	81.44	5169.20	5250.64	
11ac80MIMO	Ant1	5210	81.44	5169.20	5250.64	
11ac80MIMO	Ant0	5775	81.92	5734.04	5815.96	
11ac80MIMO	Ant1	5775	81.76	5734.04	5815.80	

Remark:

For 802.11n HT20/ac VHT20 and 802.11n HT40/ac VHT40 mode, the whole testing have assessed only, 802.11ac VHT20/40 by referring to their higher output power.



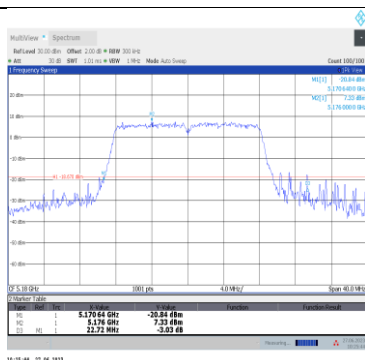
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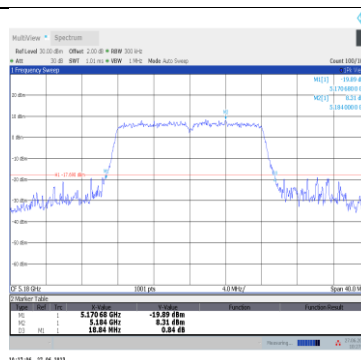
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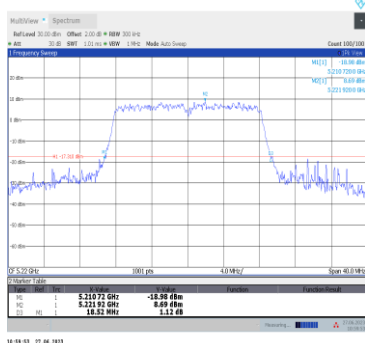
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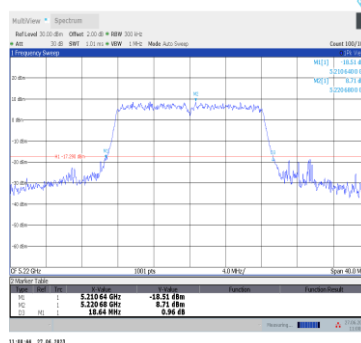
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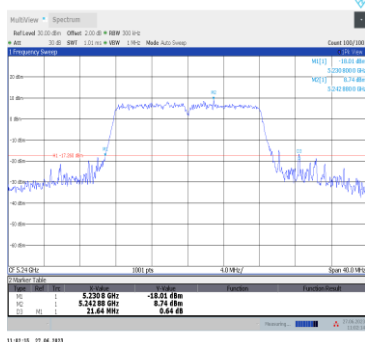
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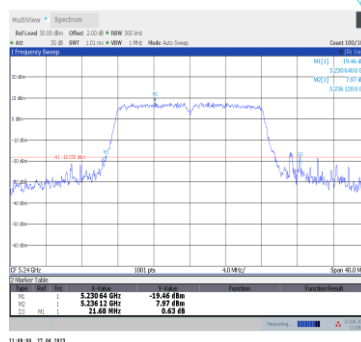
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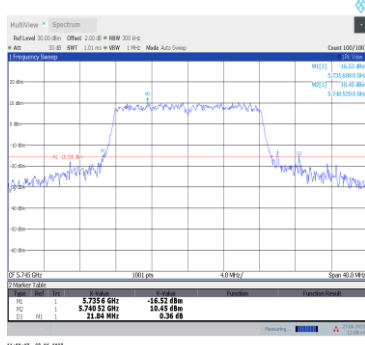
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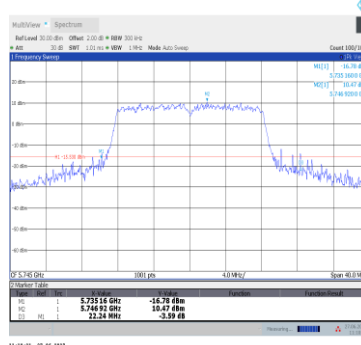
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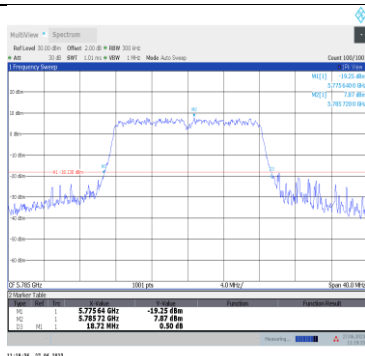
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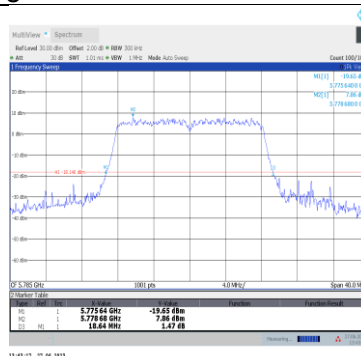
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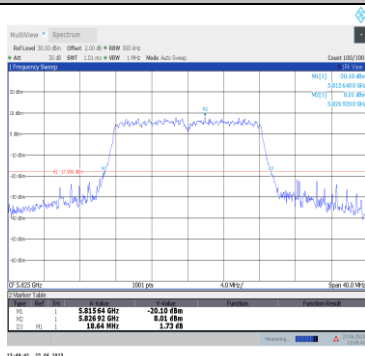
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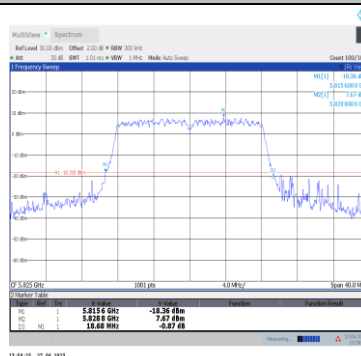
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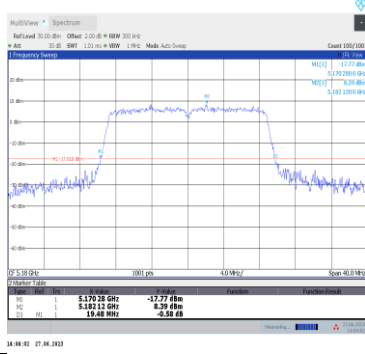
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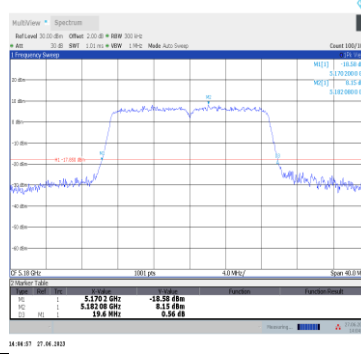
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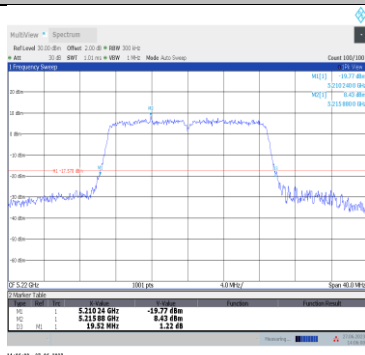
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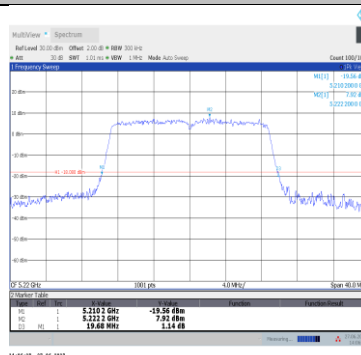
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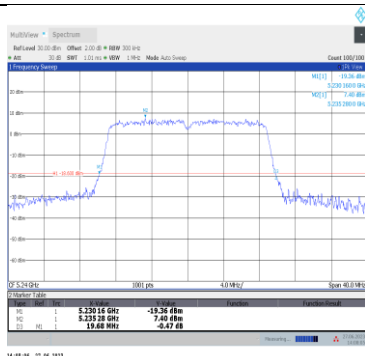
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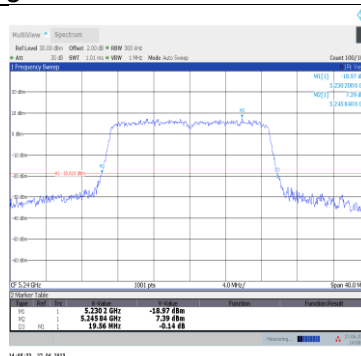
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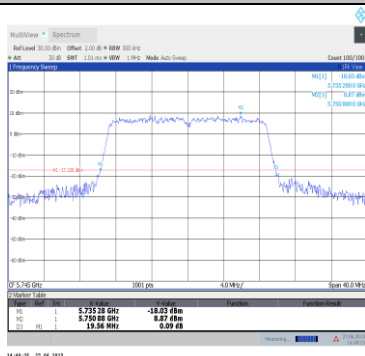
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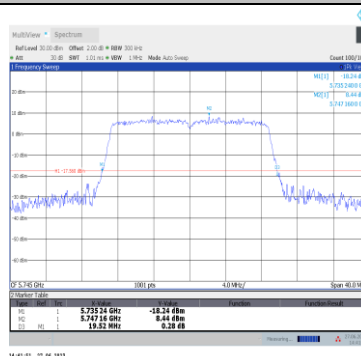
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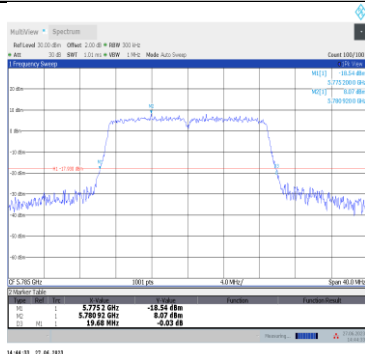
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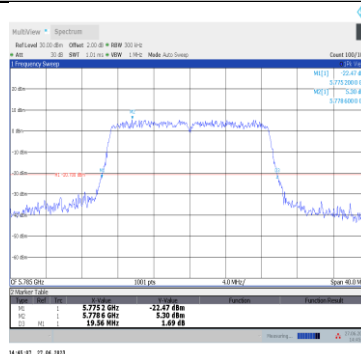
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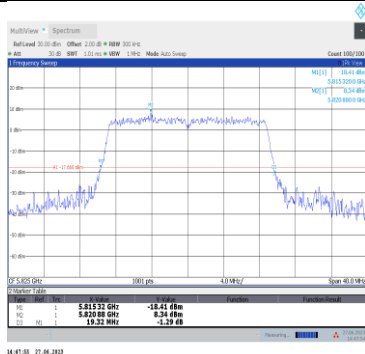
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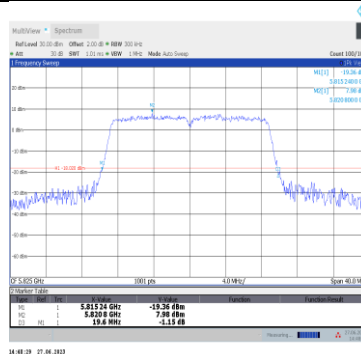
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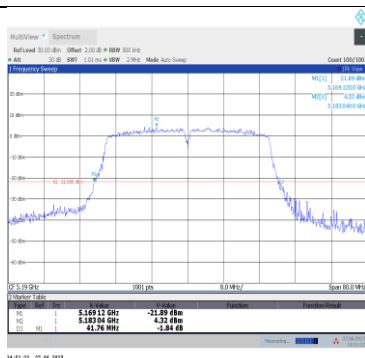
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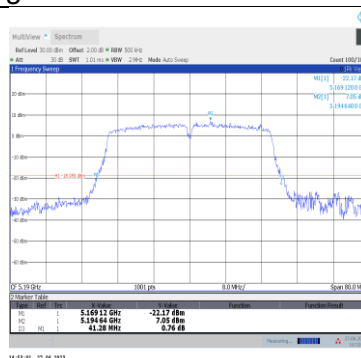
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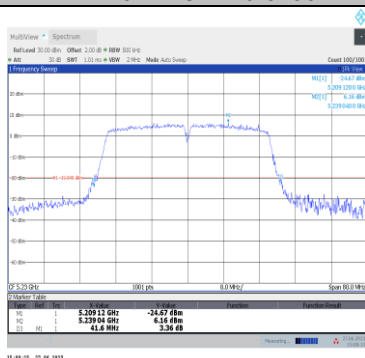
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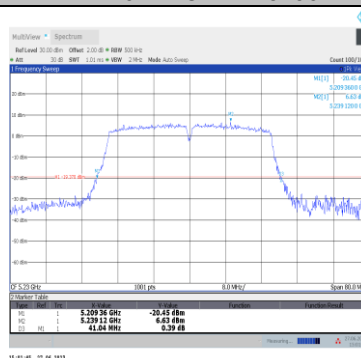
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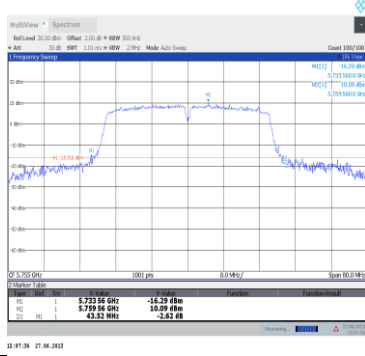
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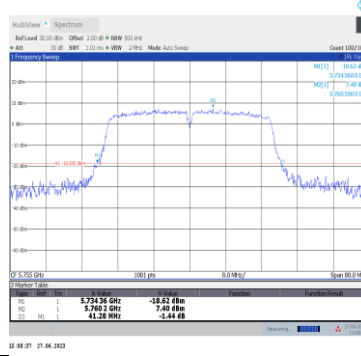
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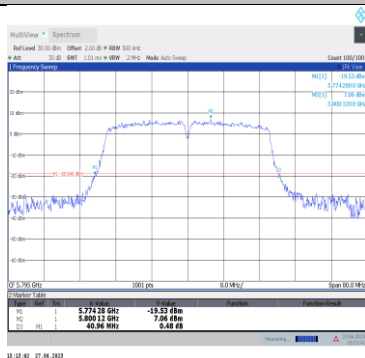
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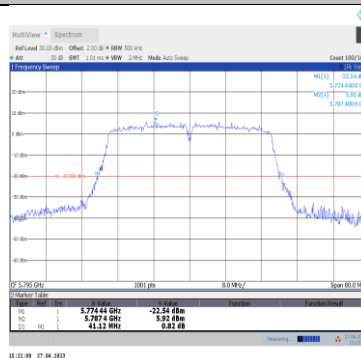
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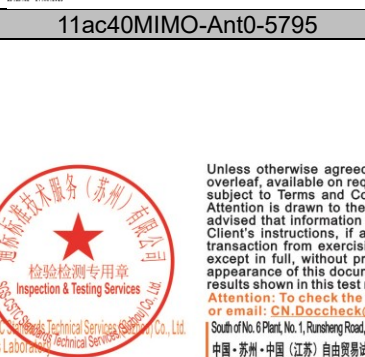
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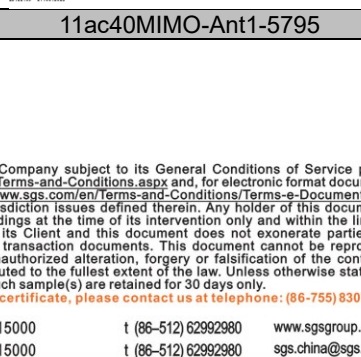
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11ac40MIMO-Ant1-5755



11ac40MIMO-Ant0-5795



11ac40MIMO-Ant1-5795



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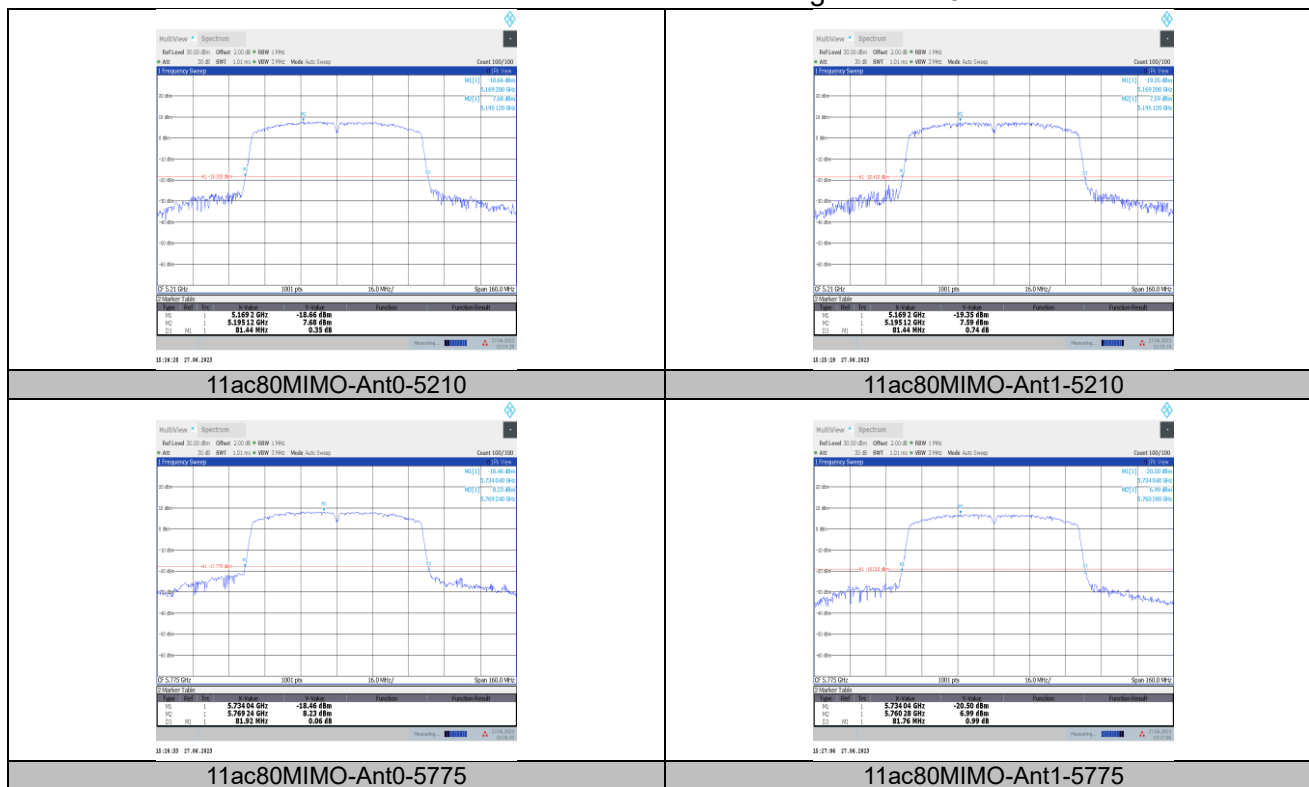
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## Occupied channel bandwidth

## Test Result

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
11a-CDD	Ant0	5180	16.589	5171.7542	5188.3427	For Report Purpose
11a-CDD	Ant1	5180	16.584	5171.7503	5188.3340	
11a-CDD	Ant0	5220	16.543	5211.7434	5228.2863	
11a-CDD	Ant1	5220	16.559	5211.7382	5228.2976	
11a-CDD	Ant0	5240	16.582	5231.7430	5248.3250	
11a-CDD	Ant1	5240	16.574	5231.7258	5248.2993	
11a-CDD	Ant0	5745	16.596	5736.7211	5753.3174	
11a-CDD	Ant1	5745	16.576	5736.7456	5753.3214	
11a-CDD	Ant0	5785	16.545	5776.7421	5793.2875	
11a-CDD	Ant1	5785	16.526	5776.7531	5793.2791	
11a-CDD	Ant0	5825	16.553	5816.7409	5833.2940	
11a-CDD	Ant1	5825	16.501	5816.7694	5833.2707	
11ac20MIMO	Ant0	5180	17.714	5171.1517	5188.8652	
11ac20MIMO	Ant1	5180	17.705	5171.1706	5188.8755	
11ac20MIMO	Ant0	5220	17.689	5211.1533	5228.8427	
11ac20MIMO	Ant1	5220	17.681	5211.1823	5228.8635	
11ac20MIMO	Ant0	5240	17.712	5231.1548	5248.8667	
11ac20MIMO	Ant1	5240	17.685	5231.1598	5248.8450	
11ac20MIMO	Ant0	5745	17.733	5736.1459	5753.8791	
11ac20MIMO	Ant1	5745	17.718	5736.1471	5753.8650	
11ac20MIMO	Ant0	5785	17.715	5776.1494	5793.8641	
11ac20MIMO	Ant1	5785	17.707	5776.1654	5793.8724	
11ac20MIMO	Ant0	5825	17.678	5816.1755	5833.8533	
11ac20MIMO	Ant1	5825	17.698	5816.1715	5833.8693	
11ac40MIMO	Ant0	5190	36.291	5171.9618	5208.2529	
11ac40MIMO	Ant1	5190	36.304	5171.9449	5208.2488	
11ac40MIMO	Ant0	5230	36.297	5211.9005	5248.1976	
11ac40MIMO	Ant1	5230	36.343	5211.8870	5248.2300	
11ac40MIMO	Ant0	5755	36.605	5736.7848	5773.3900	
11ac40MIMO	Ant1	5755	36.318	5736.8797	5773.1982	
11ac40MIMO	Ant0	5795	36.322	5776.8954	5813.2177	
11ac40MIMO	Ant1	5795	36.323	5776.9071	5813.2305	
11ac80MIMO	Ant0	5210	74.88	5172.6026	5247.4827	
11ac80MIMO	Ant1	5210	75.006	5172.5581	5247.5636	
11ac80MIMO	Ant0	5775	75.158	5737.4249	5812.5830	
11ac80MIMO	Ant1	5775	74.988	5737.5305	5812.5189	

## Remark:

For 802.11n HT20/ac VHT20 and 802.11n HT40/ac VHT40 mode, the whole testing have assessed only, 802.11ac VHT20/40 by referring to their higher output power.



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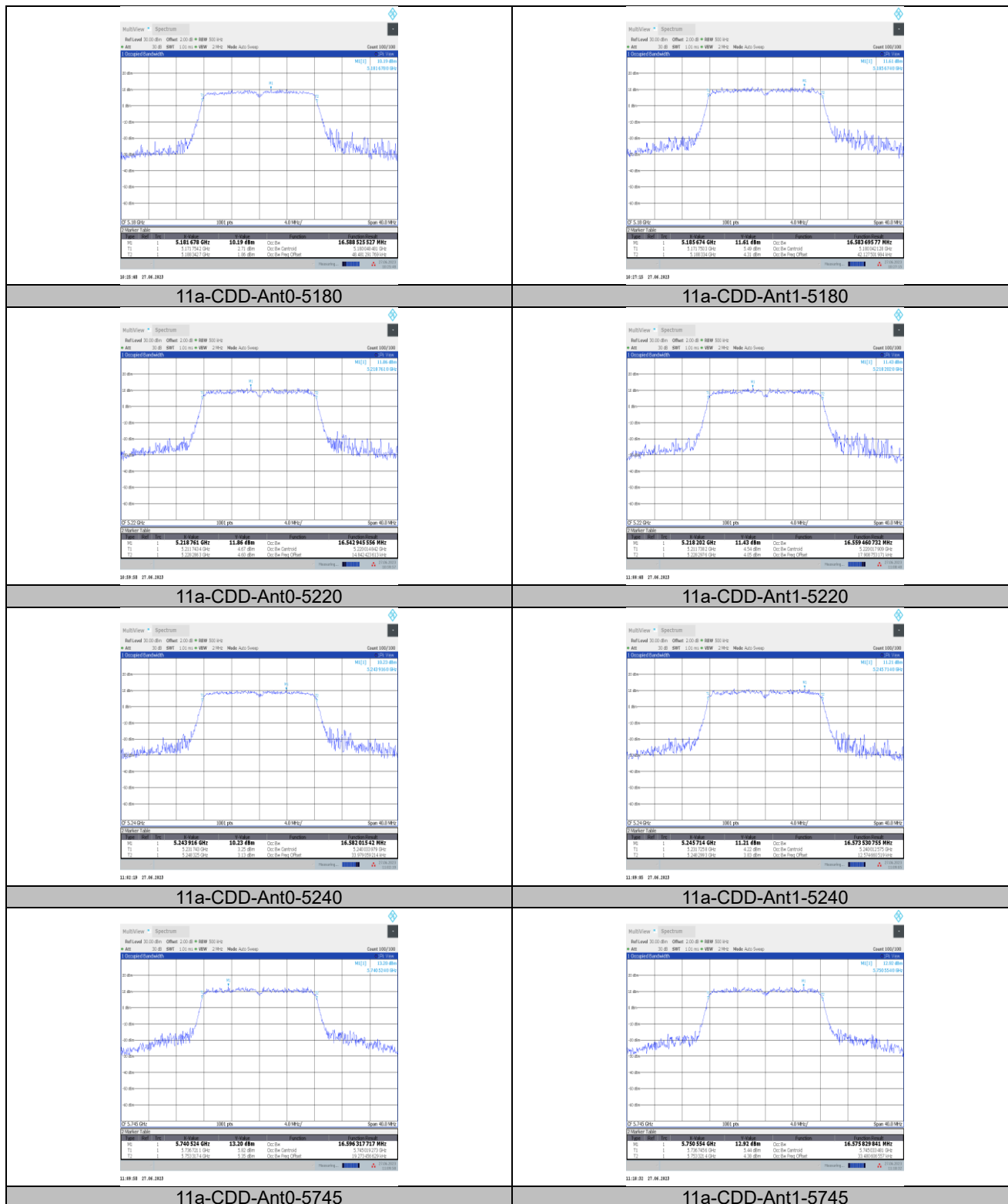
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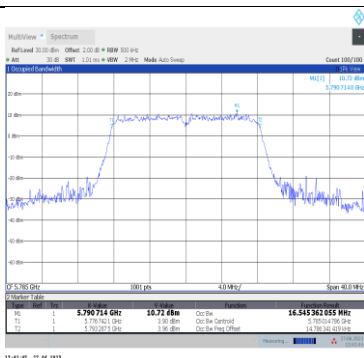
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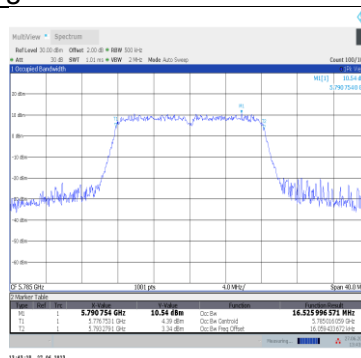


### Test Graphs

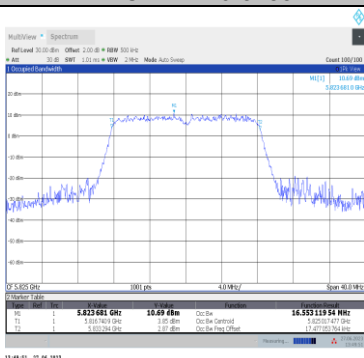




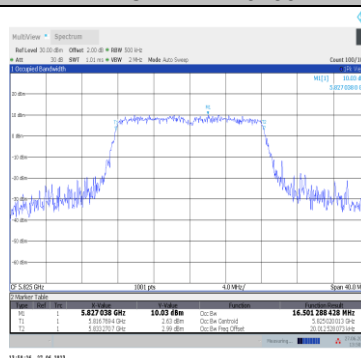
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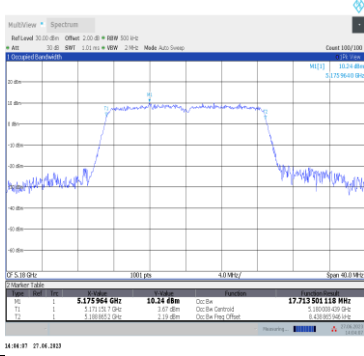
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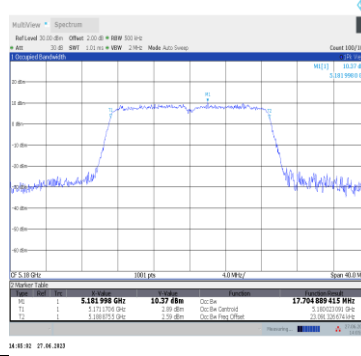
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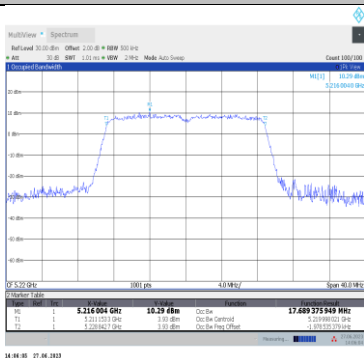
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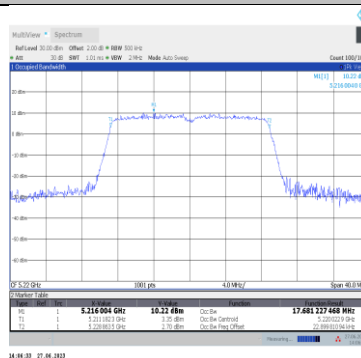
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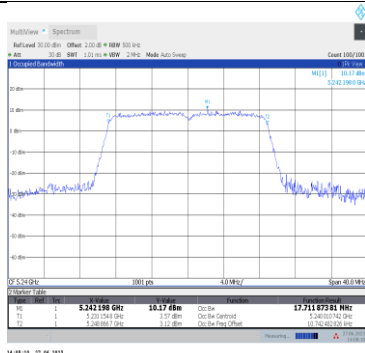


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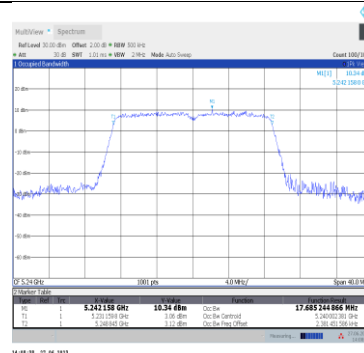
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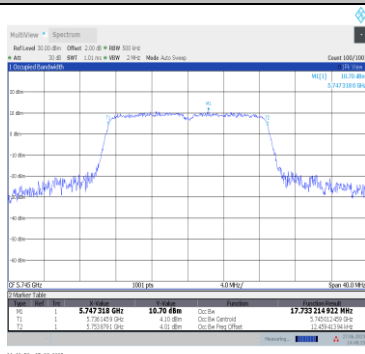
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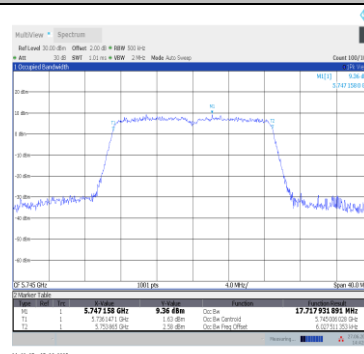
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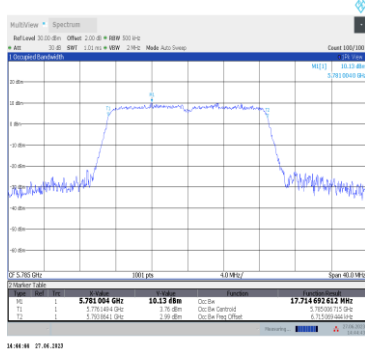
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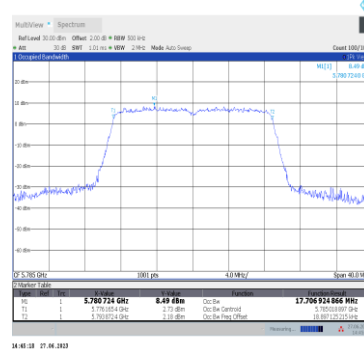
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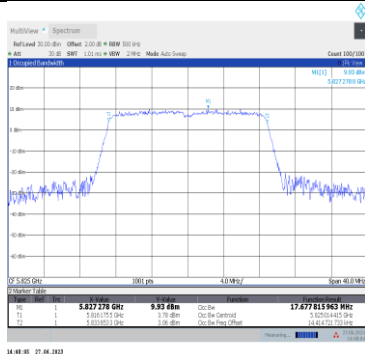
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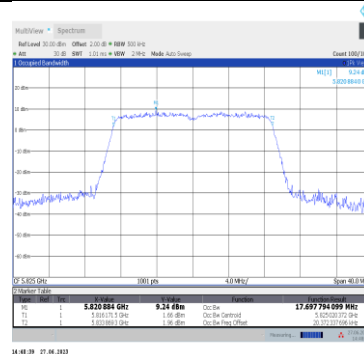
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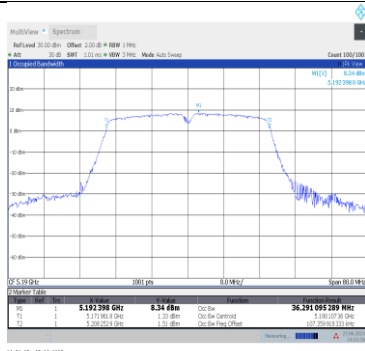
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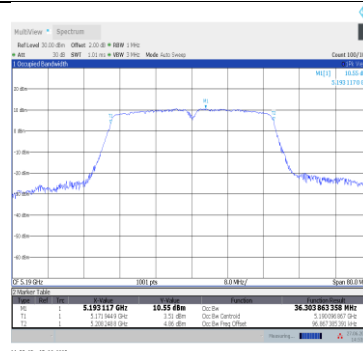
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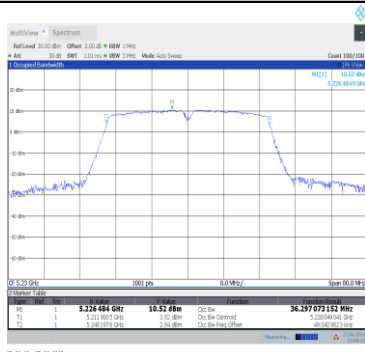
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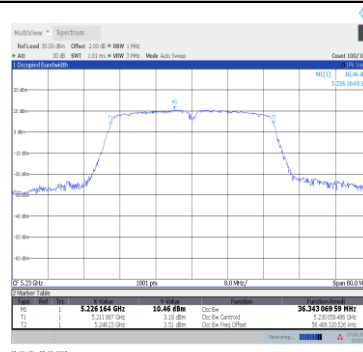
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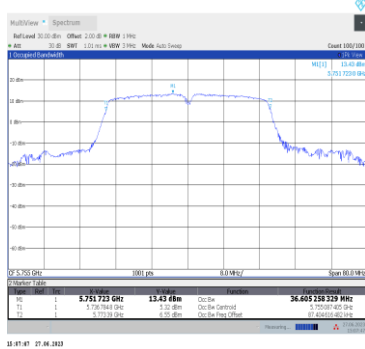
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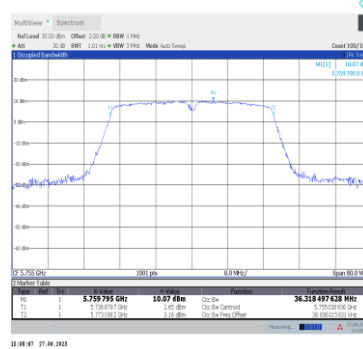
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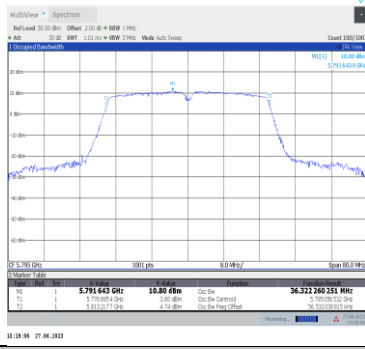
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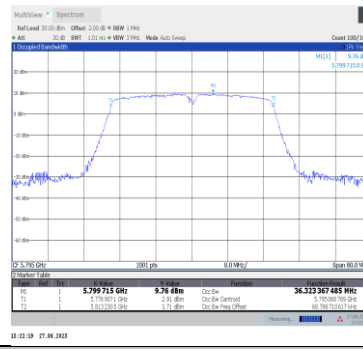
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11ac40MIMO-Ant1-5250



11ac40MIMO-Ant0-5755



11ac40MIMO-Ant1-5755



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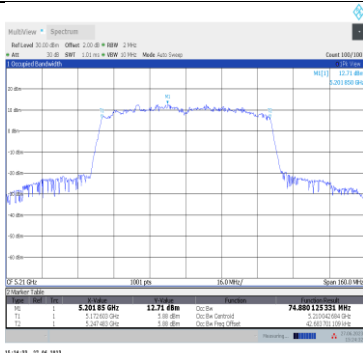
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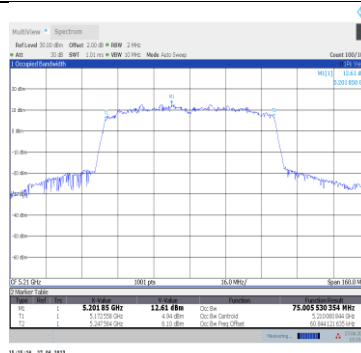
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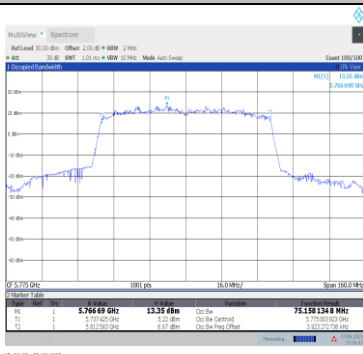
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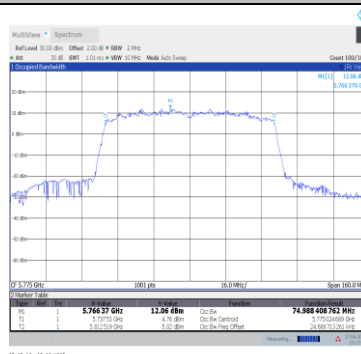
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11ac80MIMO-Ant1-5210



11ac80MIMO-Ant0-5775



11ac80MIMO-Ant1-5775



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**6dB emission bandwidth****Test Result B4**

TestMode	Antenna	Frequency[MHz]	6dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11a-CDD	Ant0	5745	16.40	5736.80	5753.20	≥0.5	PASS
11a-CDD	Ant1	5745	16.40	5736.80	5753.20	≥0.5	PASS
11a-CDD	Ant0	5785	16.40	5776.80	5793.20	≥0.5	PASS
11a-CDD	Ant1	5785	16.40	5776.80	5793.20	≥0.5	PASS
11a-CDD	Ant0	5825	16.40	5816.80	5833.20	≥0.5	PASS
11a-CDD	Ant1	5825	16.40	5816.80	5833.20	≥0.5	PASS
11ac20MIMO	Ant0	5745	17.24	5736.20	5753.44	≥0.5	PASS
11ac20MIMO	Ant1	5745	17.60	5736.20	5753.80	≥0.5	PASS
11ac20MIMO	Ant0	5785	17.60	5776.20	5793.80	≥0.5	PASS
11ac20MIMO	Ant1	5785	17.36	5776.44	5793.80	≥0.5	PASS
11ac20MIMO	Ant0	5825	17.60	5816.20	5833.80	≥0.5	PASS
11ac20MIMO	Ant1	5825	17.60	5816.20	5833.80	≥0.5	PASS
11ac40MIMO	Ant0	5755	32.08	5738.04	5770.12	≥0.5	PASS
11ac40MIMO	Ant1	5755	35.20	5737.40	5772.60	≥0.5	PASS
11ac40MIMO	Ant0	5795	35.28	5777.32	5812.60	≥0.5	PASS
11ac40MIMO	Ant1	5795	35.28	5777.32	5812.60	≥0.5	PASS
11ac80MIMO	Ant0	5775	75.52	5737.24	5812.76	≥0.5	PASS
11ac80MIMO	Ant1	5775	74.24	5738.52	5812.76	≥0.5	PASS

Remark:

For 802.11n HT20/ac VHT20 and 802.11n HT40/ac VHT40 mode, the whole testing have assessed only, 802.11ac VHT20/40 by referring to their higher output power.



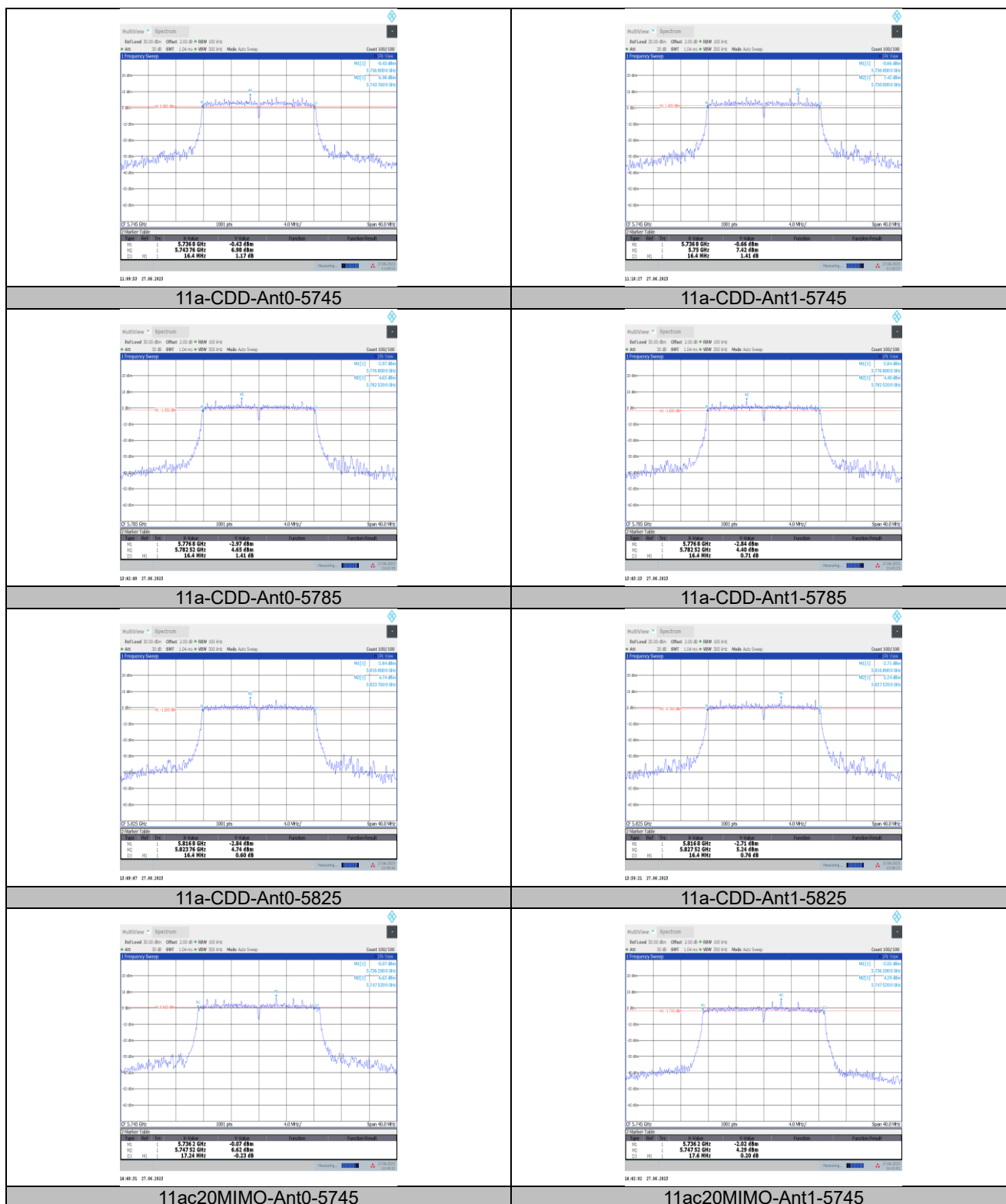
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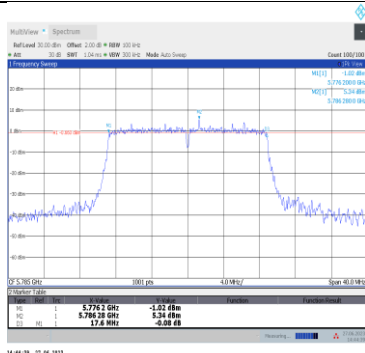
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### Test Graphs B4

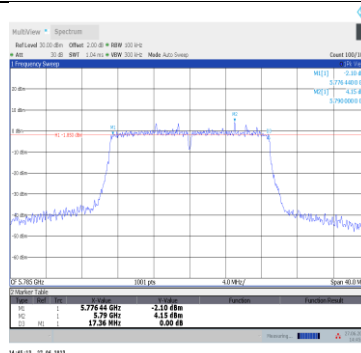


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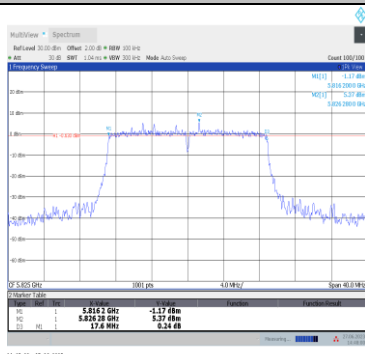
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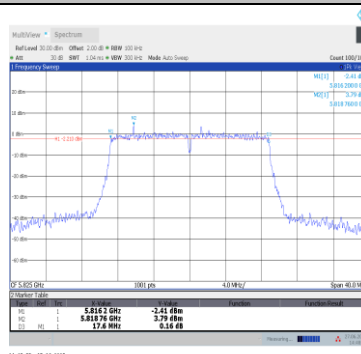
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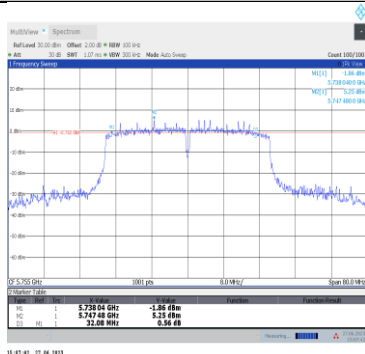
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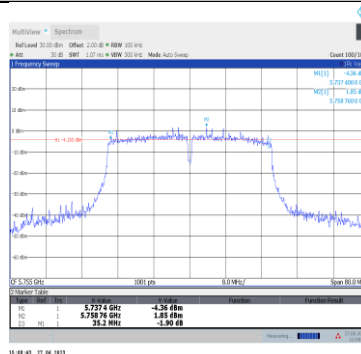
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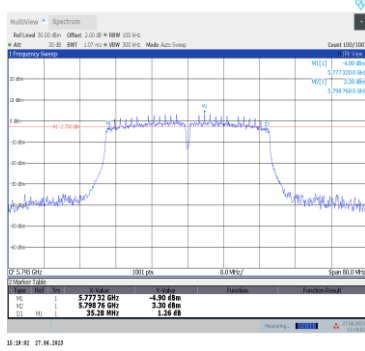
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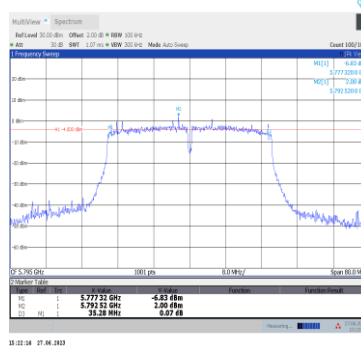
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11ac20MIMO-Ant1-5825



11ac40MIMO-Ant0-5755



11ac40MIMO-Ant1-5755

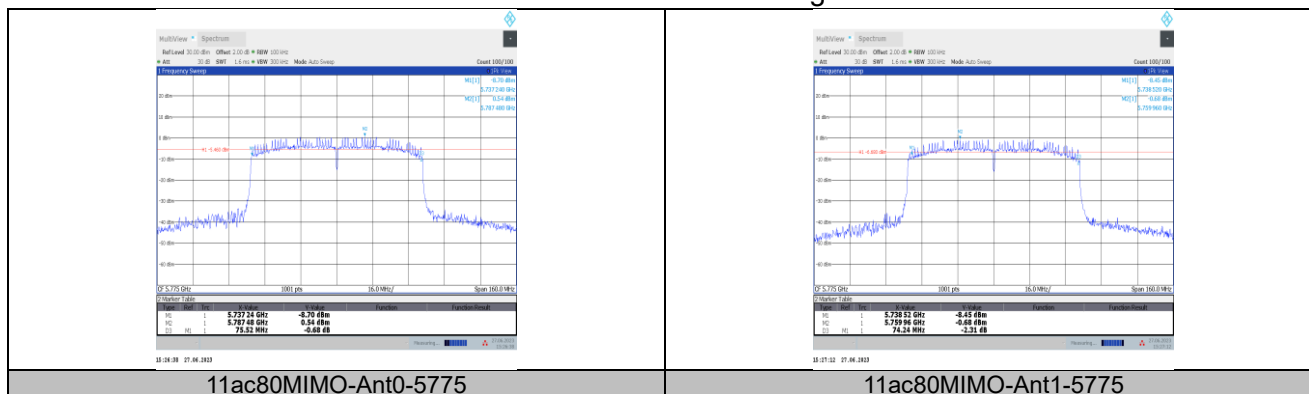
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11ac40MIMO-Ant1-5795

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## Duty Cycle

## Test Result

TestMode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11a-CDD	Ant0	5180	2.06	2.23	92.38
11a-CDD	Ant1	5180	2.07	2.21	93.67
11n20MIMO	Ant0	5180	1.93	2.14	90.19
11n20MIMO	Ant1	5180	1.92	2.13	90.14
11n40MIMO	Ant0	5190	0.94	1.18	79.66
11n40MIMO	Ant1	5190	0.94	1.17	80.34
11ac20MIMO	Ant0	5180	1.93	2.17	88.94
11ac20MIMO	Ant1	5180	1.93	2.17	88.94
11ac40MIMO	Ant0	5190	0.95	1.20	79.17
11ac40MIMO	Ant1	5190	0.95	1.19	79.83
11ac80MIMO	Ant0	5210	0.46	0.71	64.79
11ac80MIMO	Ant1	5210	0.46	0.70	65.71

Note:

Radiated Emission Average VBW = 1 / T

TestMode	T[ms]	Period[ms]	Duty Cycle[%]	1/T[kHz]	VBW Setting
11a-CDD	2.07	2.21	93.67	0.48309	0.51KHz
11ac20MIMO	1.93	2.17	88.94	0.51813	0.56KHz
11ac40MIMO	0.95	1.19	79.83	1.05263	1.1KHz
11ac80MIMO	0.46	0.70	65.71	2.17391	2.22KHz



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