TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: 2ACJAHNDPF1002

Product: Social Photo Frame

Model No.: HN-DPF1002

Additional Model No.: DigiFrame 10X, HN-DPF10XX

Trade Mark: N/A

Report No.: TCT200622E046

Issued Date: Jun. 30, 2020

Issued for:

Shenzhen Harmony Technology Co., Ltd
Block 2, Jiayuan Industrial Zone, Heping Community, high-tech park, No 2 Fuyuan Road, Fuyong, Bao'an, Shenzhen, China

Issued By:

Shenzhen Tongce Testing Lab.
1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China
TEL: +86-755-27673339
FAX: +86-755-27673332

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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. Test Certification

Product:	Social Photo Frame
Model No.:	HN-DPF1002
Additional Model:	DigiFrame 10X, HN-DPF10XX
Trade Mark:	**N/A**
Applicant:	Shenzhen Harmony Technology Co., Ltd
Address:	Block 2, Jiayuan Industrial Zone, Heping Community, high-tech park, No 2 Fuyuan Road, Fuyong, Bao'an, Shenzhen, China
Manufacturer:	Shenzhen Harmony Technology Co., Ltd
Address:	Block 2, Jiayuan Industrial Zone, Heping Community, high-tech park, No 2 Fuyuan Road, Fuyong, Bao'an, Shenzhen, China
Date of Test:	Jun. 23, 2020 – Jun. 29, 2020
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:	Brave Zeng	***Date:***	***Jun. 29, 2020***
Reviewed By:	Beryl Zhao	***Date:***	***Jun. 30, 2020***
Approved By:	Tomsin	***Date:***	***Jun. 30, 2020***

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2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(3)	PASS
6dB Emission Bandwidth	§15.247 (a)(2)	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	§15.247(d)	PASS
Spurious Emission	§15.205/§15.209	PASS

Note:

1. PASS: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

3. N/A: Test case does not apply to the test object.

4. The test result judgment is decided by the limit of test standard.

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3. EUT Description

Product:	Social Photo Frame
Model No.:	HN-DPF1002
Additional Model:	DigiFrame 10X, HN-DPF10XX
Trade Mark:	**N/A**
Operation Frequency:	2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20))
Channel Separation:	5MHz
Number of Channel:	11 for 802.11b/802.11g/802.11n(HT20)
Modulation Technology: (IEEE 802.11b)	Direct Sequence Spread Spectrum (DSSS)
Modulation Technology: (IEEE 802.11g/802.11n)	Orthogonal Frequency Division Multiplexing(OFDM)
Data speed (IEEE 802.11b):	1Mbps, 2Mbps, 5.5Mbps, 11Mbps
Data speed (IEEE 802.11g):	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps
Data speed (IEEE 802.11n):	Up to 150Mbps
Antenna Type:	FPC Antenna
Antenna Gain:	0dBi
Power Supply:	AC 120V/60Hz
AC adapter:	Adapter Information: MODEL: RSF-DY056-0502000 INPUT: AC 100-240V, 50/60Hz, 0.4A OUTPUT: 5V, 2.0A
Remark:	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

Note: *The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.*

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Operation Frequency each of channel For 802.11b/g/n(HT20)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz	--	--

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

802.11b/802.11g/802.11n (HT20)

Channel	Frequency
The lowest channel	2412MHz
The middle channel	2437MHz
The Highest channel	2462MHz

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4. General Information

4.1. Test environment and mode

Operating Environment:		
Condition	Conducted Emission	Radiated Emission
Temperature:	25.0 °C	25.0 °C
Humidity:	55 % RH	55 % RH
Atmospheric Pressure:	1010 mbar	1010 mbar
Test Mode:		
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations with Fully-charged battery	
The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case(Z axis) are shown in Test Results of the following pages.		

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11b	1Mbps
802.11g	6Mbps
802.11n(H20)	6.5Mbps
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation

1. For WIFI function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

2. According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup” 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n(H20). Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.

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4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

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5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

  Shenzhen Tongce Testing Lab

  The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

  The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

5.3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	±2.56dB
2	RF power, conducted	±0.12dB
3	Spurious emissions, conducted	±0.11dB
4	All emissions, radiated(<1G)	±3.92dB
5	All emissions, radiated(>1G)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%

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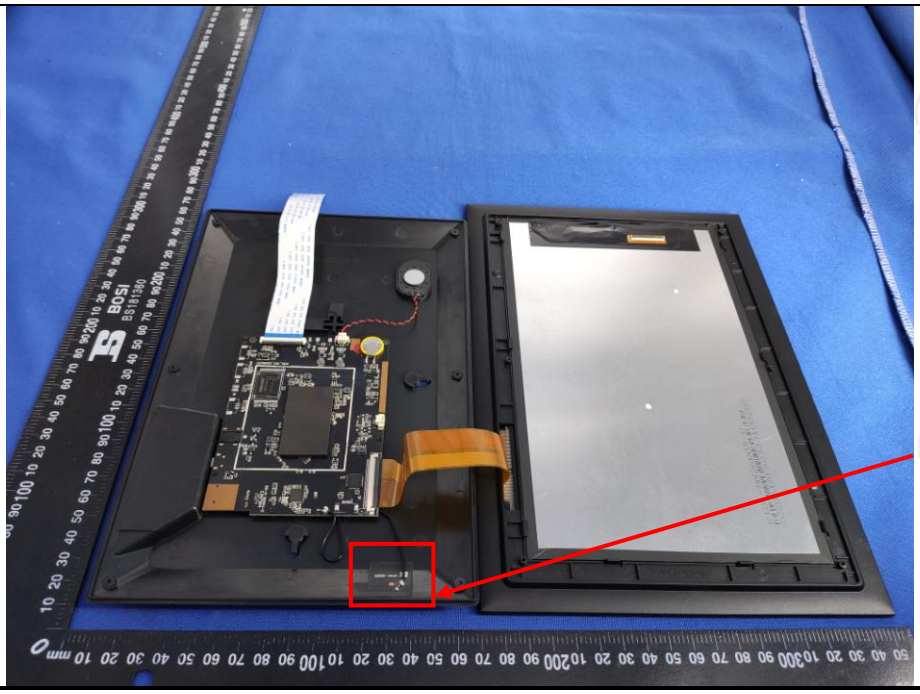
6. Test Results and Measurement Data

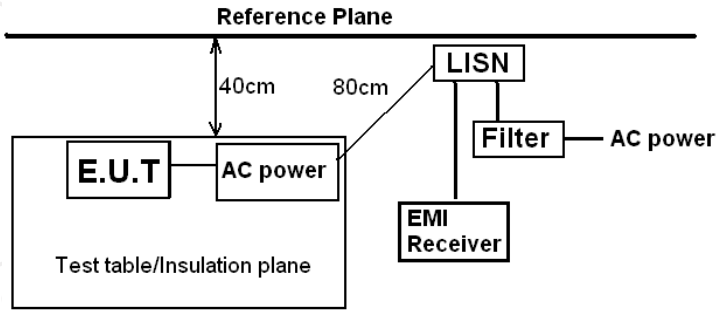
6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The WIFI antenna is fpc antenna which permanently attached, and the best case gain of the antenna is 0dBi.	



6.2. Conducted Emission

6.2.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
</td></tr>
<tr><td>Test Setup:</td><td> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Mode:</td><td>Charging + transmitting with modulation</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T is connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. 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: 2013 on conducted measurement.</td></tr>
<tr><td>Test Result:</td><td>PASS</td></tr>
</table>

6.2.2. Test Instruments

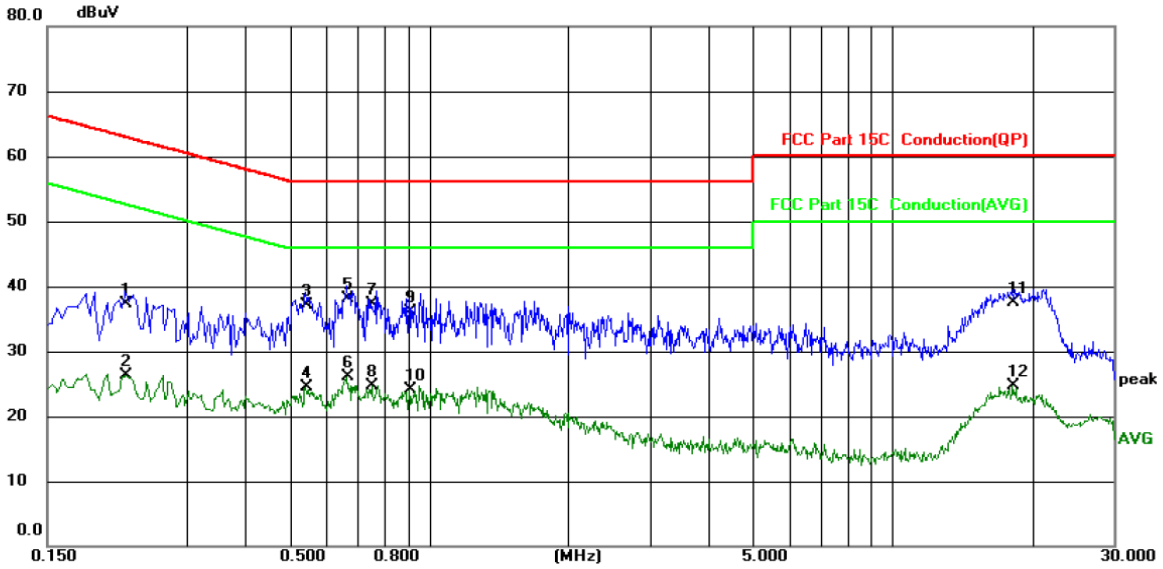
Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	R&S	ESPI	101402	Jul. 29, 2020
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 11, 2020
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 08, 2020
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site

Limit: FCC Part 15C Conduction(QP)

Phase: *L1*

Power: AC 120/60Hz

Temperature: 25 (C)

Humidity: 55 %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2220	27.04	10.23	37.27	62.74	-25.47	QP	
2		0.2220	16.05	10.23	26.28	52.74	-26.46	AVG	
3		0.5420	26.84	10.22	37.06	56.00	-18.94	QP	
4		0.5420	14.21	10.22	24.43	46.00	-21.57	AVG	
5	*	0.6660	27.88	10.23	38.11	56.00	-17.89	QP	
6		0.6660	15.87	10.23	26.10	46.00	-19.90	AVG	
7		0.7539	27.03	10.25	37.28	56.00	-18.72	QP	
8		0.7539	14.55	10.25	24.80	46.00	-21.20	AVG	
9		0.9060	25.73	10.32	36.05	56.00	-19.95	QP	
10		0.9060	13.86	10.32	24.18	46.00	-21.82	AVG	
11		18.1540	26.52	10.97	37.49	60.00	-22.51	QP	
12		18.1540	13.71	10.97	24.68	50.00	-25.32	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBµV) = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dBµV) = Reading level (dBµV) + Corr. Factor (dB)

Limit (dBµV) = Limit stated in standard

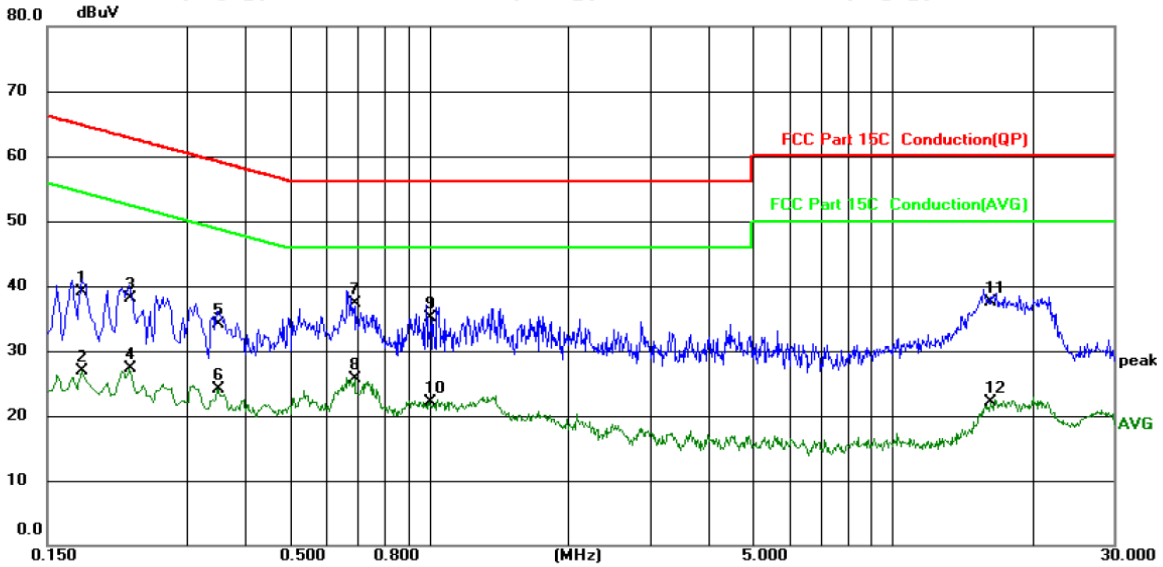
Margin (dB) = Measurement (dBµV) – Limits (dBµV)

Q.P. =Quasi-Peak

AVG =average

** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site | Phase: N | Temperature: 25 (C)

Limit: FCC Part 15C Conduction(QP) | Power: AC 120/60Hz | Humidity: 55 %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1780	28.85	10.22	39.07	64.58	-25.51	QP	
2		0.1780	16.75	10.22	26.97	54.58	-27.61	AVG	
3		0.2260	27.97	10.23	38.20	62.60	-24.40	QP	
4		0.2260	17.07	10.23	27.30	52.60	-25.30	AVG	
5		0.3502	23.95	10.22	34.17	58.96	-24.79	QP	
6		0.3502	13.81	10.22	24.03	48.96	-24.93	AVG	
7	*	0.6900	27.10	10.23	37.33	56.00	-18.67	QP	
8		0.6900	15.55	10.23	25.78	46.00	-20.22	AVG	
9		1.0020	24.74	10.36	35.10	56.00	-20.90	QP	
10		1.0020	11.67	10.36	22.03	46.00	-23.97	AVG	
11		16.2380	26.56	10.86	37.42	60.00	-22.58	QP	
12		16.2380	11.20	10.86	22.06	50.00	-27.94	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

Margin (dB) = Measurement (dBμV) – Limits (dBμV)

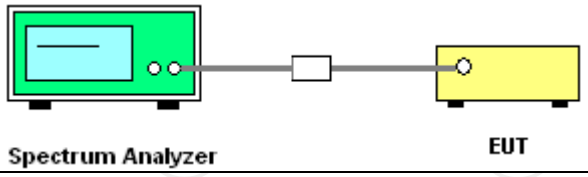
Q.P. =Quasi-Peak

AVG =average

** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

6.3. Maximum Conducted (Average) Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074 D01 v05r02
Limit:	30dBm
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Measure the conducted output power and record the results in the test report.
Test Result:	PASS

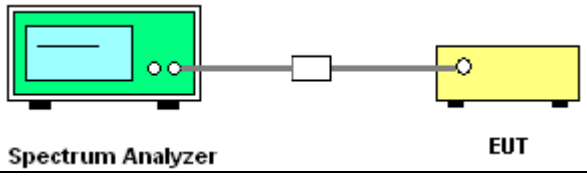
6.3.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2020
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.4. Emission Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074 D01 v05r02
Limit:	>500kHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. Set to the maximum power setting and enable the EUT transmit continuously. 2. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 3. Measure and record the results in the test report.
Test Result:	PASS

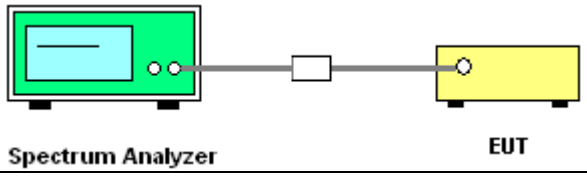
6.4.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2020
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.5. Power Spectral Density

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074
Limit:	The average power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW): 3 kHz ≤ RBW ≤ 100 kHz. Video bandwidth VBW ≥ 3 x RBW. Set the span to at least 1.5 times the OBW. 4. Detector = RMS, Sweep time = auto couple. 5. Employ trace averaging (RMS) mode over a minimum of 100 traces. Use the peak marker function to determine the maximum power level. 6. Measure and record the results in the test report.
Test Result:	PASS

6.5.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2020
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.6. Conducted Band Edge and Spurious Emission Measurement

6.6.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB558074
Limit:	In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d). 4. Measure and record the results in the test report. 5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

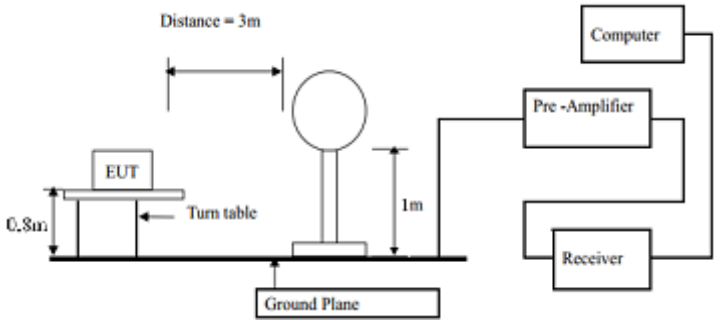
6.6.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2020
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

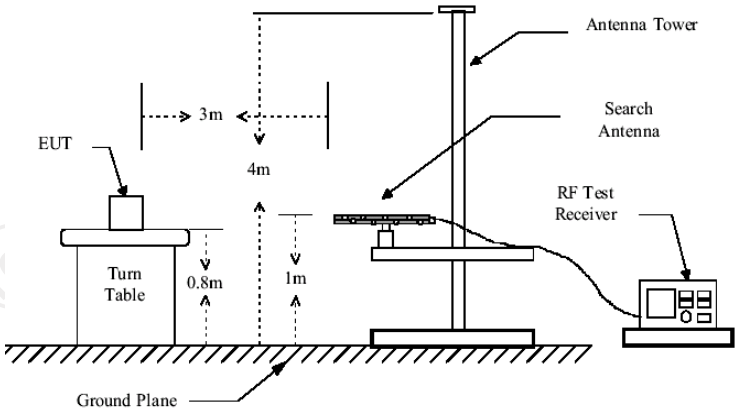
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.7. Radiated Spurious Emission Measurement

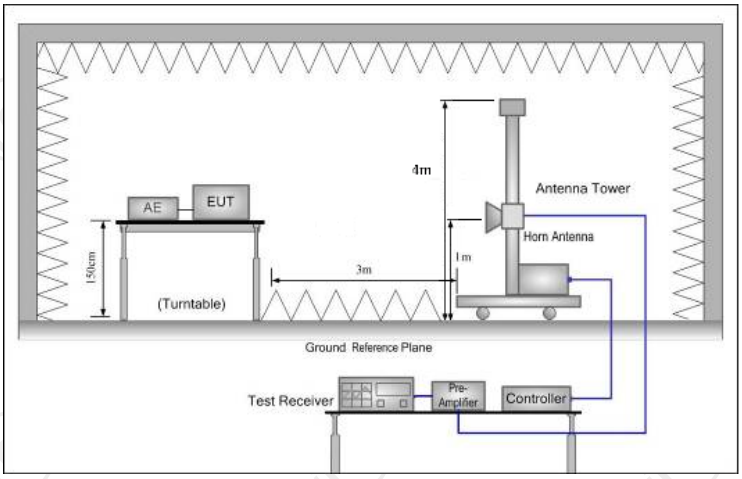
6.7.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 25 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Operation mode:</td><td>Transmitting mode with modulation</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>30</td></tr>
<tr><td>1.705-30</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td><td>Detector</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>3</td><td>Average</td></tr>
<tr><td>5000</td><td>3</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions below 30MHz
 

30MHz to 1GHz</td></tr>
</table>



Above 1GHz



Test Procedure:

1. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.
For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which

	maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 4. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported. 5. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=120 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for f >1 GHz for peak measurement. For average measurement: 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.
Test results:	PASS

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6.7.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	ROHDE&SCHWARZ	ESIB7	100197	Jul. 29, 2020
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ40	200061	Sep. 11, 2020
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 08, 2020
Pre-amplifier	HP	8447D	2727A05017	Sep. 08, 2020
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 11, 2020
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 06, 2020
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 06, 2020
Horn Antenna	A-INFO	LB-180400-KF	J211020657	Sep. 06, 2020
Antenna Mast	Keleto	RE-AM	N/A	N/A
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 08, 2020
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 08, 2020
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

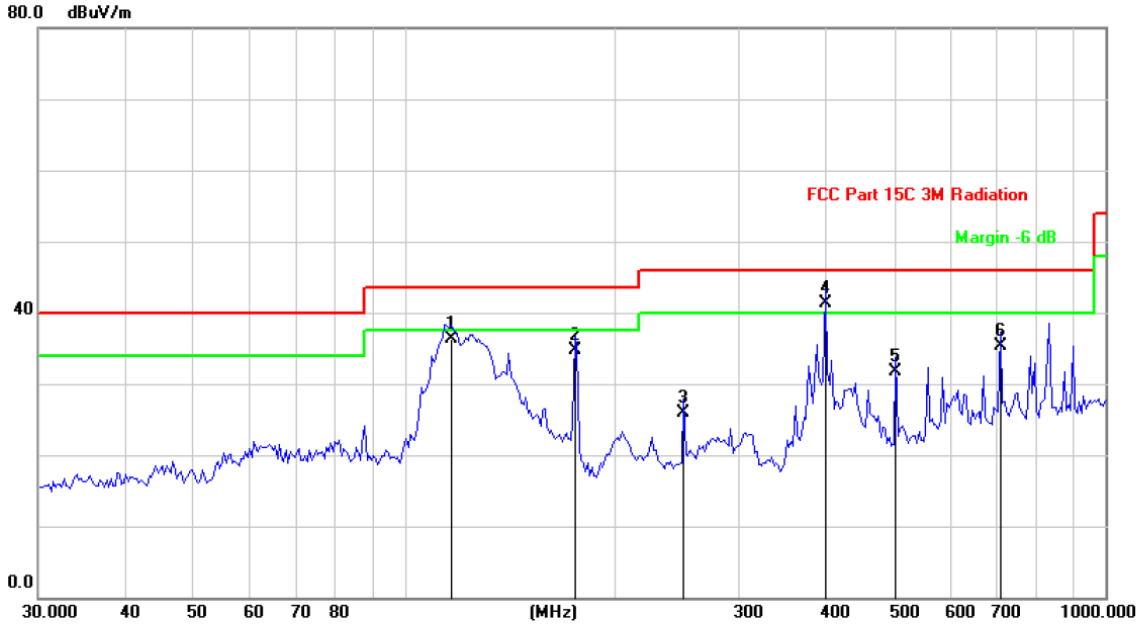
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.7.3. Test Data

Please refer to following diagram for individual

Below 1GHz

Horizontal:



Site

Limit: FCC Part 15C 3M Radiation

Polarization: *Horizontal*

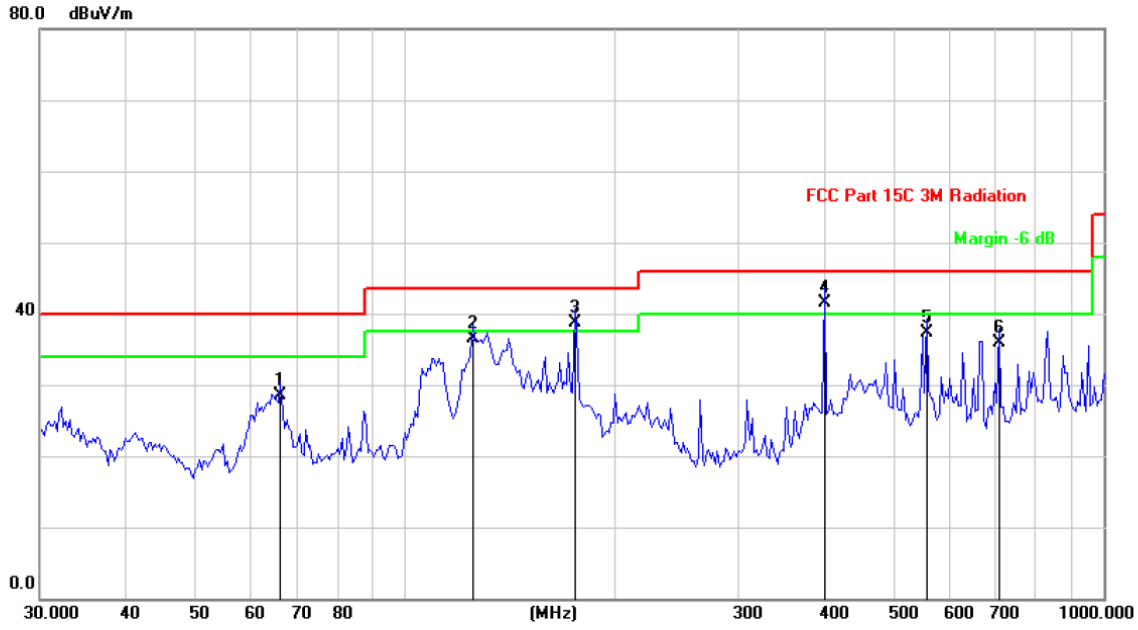
Power: AC 120V/60Hz

Temperature: 25

Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		116.4475	47.37	-11.02	36.35	43.50	-7.15	QP
2		175.0404	50.07	-15.44	34.63	43.50	-8.87	QP
3		250.4858	38.62	-12.74	25.88	46.00	-20.12	QP
4	*	398.2961	50.25	-8.93	41.32	46.00	-4.68	QP
5		502.2472	38.79	-7.17	31.62	46.00	-14.38	QP
6		708.6941	40.02	-4.79	35.23	46.00	-10.77	QP

Vertical:



Site | Polarization: *Vertical* | Temperature: 25

Limit: FCC Part 15C 3M Radiation | Power: AC 120V/60Hz | Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		66.3713	43.22	-14.68	28.54	40.00	-11.46	QP
2		124.9248	50.32	-13.86	36.46	43.50	-7.04	QP
3	!	175.0404	54.16	-15.44	38.72	43.50	-4.78	QP
4	*	398.2961	50.40	-8.93	41.47	46.00	-4.53	QP
5		558.0788	43.77	-6.51	37.26	46.00	-8.74	QP
6		708.6941	40.60	-4.79	35.81	46.00	-10.19	QP

Note: *1.The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported*

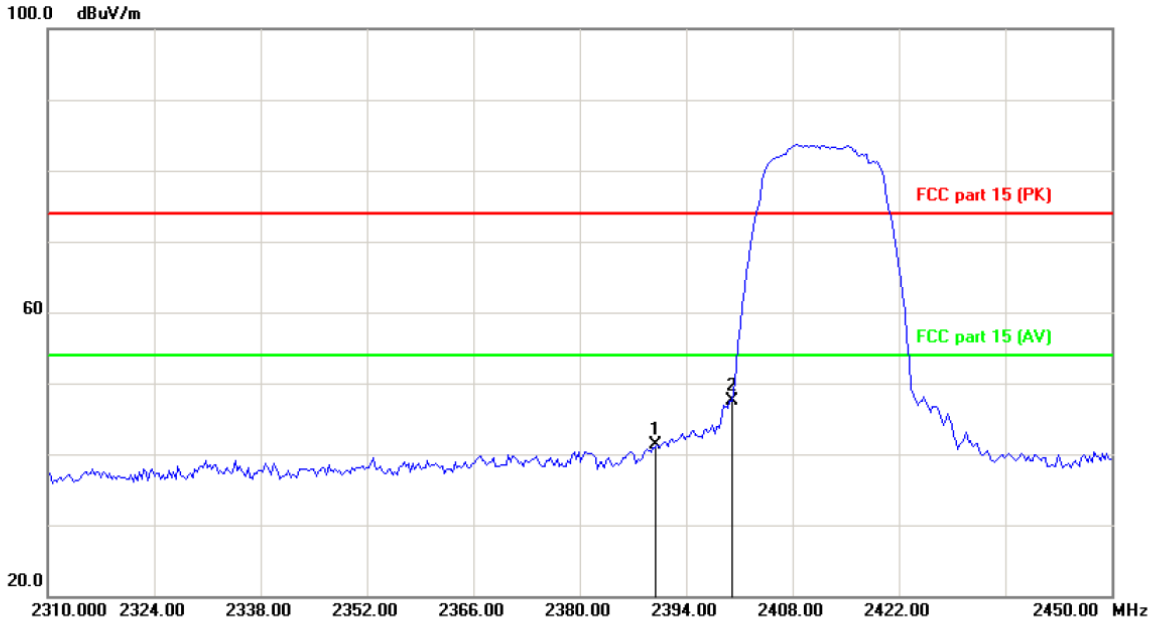
2. Measurements were conducted in all three channels (high, middle, low) and all modulation(802.11b, 802.11g, 802.11n(HT20)), and the worst case Mode (Highest channel and 802.11b) was submitted only.

3. Freq. = Emission frequency in MHz
Measurement (dBμV/m) = Reading level (dBμV) + Corr. Factor (dB)
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
Limit (dBμV/m) = Limit stated in standard
Margin (dB) = Measurement (dBμV/m) – Limits (dBμV/m)
Any value more than 10dB below limit have not been specifically reported.
** is meaning the worst frequency has been tested in the test frequency range*

Test Result of Radiated Spurious at Band edges

Lowest channel 2412:

Horizontal:



Site

Limit: FCC part 15 (PK)

Polarization: *Horizontal*

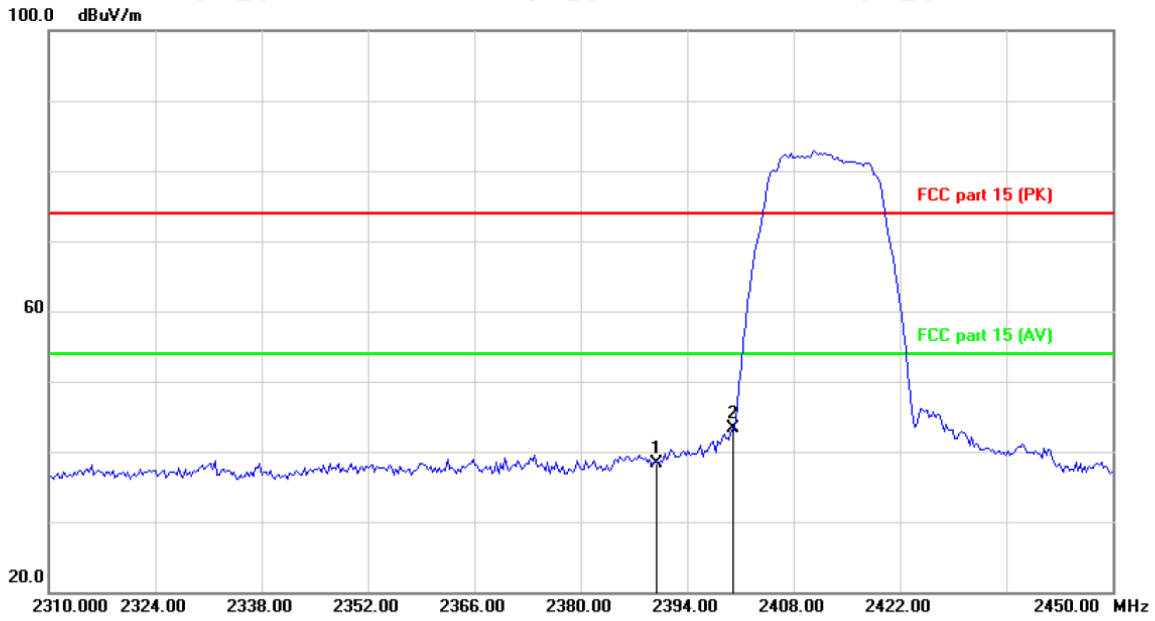
Power:

Temperature: 25

Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		2390.000	54.54	-13.15	41.39	74.00	-32.61	peak
2	*	2400.000	60.72	-13.12	47.60	74.00	-26.40	peak

Vertical:



Site

Limit: FCC part 15 (PK)

Polarization: *Vertical*

Power:

Temperature: 25

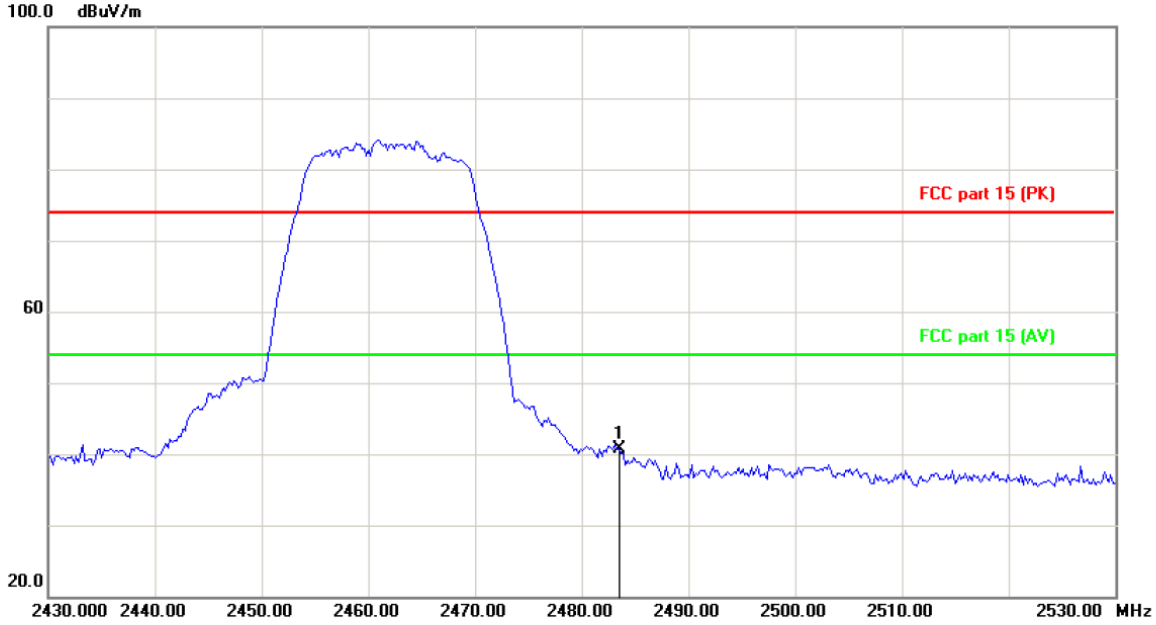
Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		2390.000	51.53	-13.15	38.38	74.00	-35.62	peak
2	*	2400.000	56.46	-13.12	43.34	74.00	-30.66	peak

Note: *Measurements were conducted in all two channels (high, low) and all modulation (802.11b, 802.11g, 802.11n(HT20)), and the worst case Mode (802.11b)*

Highest channel 2462:

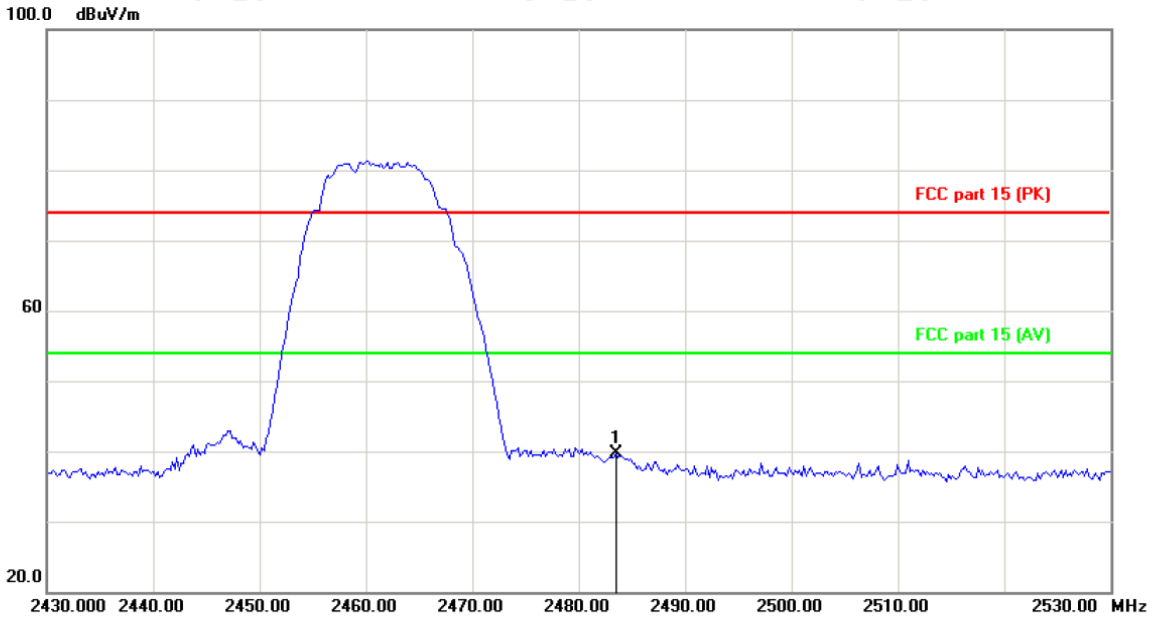
Horizontal:



Site	Polarization: *Horizontal*	Temperature: 25
Limit: FCC part 15 (PK)	Power:	Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	2483.500	53.44	-12.74	40.70	74.00	-33.30	peak

Vertical:



Site	Polarization: *Vertical*	Temperature: 25
Limit: FCC part 15 (PK)	Power:	Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	2483.500	52.37	-12.74	39.63	74.00	-34.37	peak

Note:

1. *Peak Final Emission Level=Peak Reading + Correction Factor;*
2. *Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
3. *Measurements were conducted in all modulation(802.11b, 802.11g, 802.11n(HT20)), and the worst case Mode 802.11b was submitted only.*

Above 1GHz

Modulation Type: 802.11b

Low channel: 2412 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4824	H	48.56	---	0.75	49.31	---	74	54	-4.69
7236	H	40.39	---	9.87	50.26	---	74	54	-3.74
---	H	---	---	---	---	---	---	---	---
4824	V	47.38	---	0.75	48.13	---	74	54	-5.87
7236	V	40.51	---	9.87	50.38	---	74	54	-3.62
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4874	H	48.24	---	0.97	49.21	---	74	54	-4.79
7311	H	41.49	---	9.83	51.32	---	74	54	-2.68
---	H	---	---	---	---	---	---	---	---
4874	V	49.75	---	0.97	50.72	---	74	54	-3.28
7311	V	41.59	---	9.83	51.42	---	74	54	-2.58
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4924	H	49.57	---	1.18	50.75	---	74	54	-3.25
7386	H	38.66	---	10.07	48.73	---	74	54	-5.27
---	H	---	---	---	---	---	---	---	---
4924	V	48.97	---	1.18	50.15	---	74	54	-3.85
7386	V	40.88	---	10.07	50.95	---	74	54	-3.05
---	V	---	---	---	---	---	---	---	---

Note:

1. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
2. *Margin (dB) = Emission Level (Peak) (dBµV/m)-Average limit (dBµV/m)*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.*
5. *Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.*
6. *All the restriction bands are compliance with the limit of 15.209.*

Modulation Type: 802.11g

Low channel: 2412 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	49.27	---	0.75	50.02	---	74	54	-3.98
7236	H	40.39	---	9.87	50.26	---	74	54	-3.74
---	H	---	---	---	---	---	---	---	---
4824	V	47.98	---	0.75	48.73	---	74	54	-5.27
7236	V	40.56	---	9.87	50.43	---	74	54	-3.57
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874	H	47.55	---	0.97	48.52	---	74	54	-5.48
7311	H	40.99	---	9.83	50.82	---	74	54	-3.18
---	H	---	---	---	---	---	---	---	---
4874	V	47.71	---	0.97	48.68	---	74	54	-5.32
7311	V	40.52	---	9.83	50.35	---	74	54	-3.65
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4924	H	47.95	---	1.18	49.13	---	74	54	-4.87
7386	H	39.44	---	10.07	49.51	---	74	54	-4.49
---	H	---	---	---	---	---	---	---	---
4924	V	47.86	---	1.18	49.04	---	74	54	-4.96
7386	V	39.94	---	10.07	50.01	---	74	54	-3.99
---	V	---	---	---	---	---	---	---	---

Note:

1. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
2. *Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.*
5. *Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.*
6. *All the restriction bands are compliance with the limit of 15.209.*

Modulation Type: 802.11n (HT20)

Low channel: 2412 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	49.33	---	0.75	50.08	---	74	54	-3.92
7236	H	40.52	---	9.87	50.39	---	74	54	-3.61
---	H	---	---	---	---	---	---	---	---
4824	V	47.77	---	0.75	48.52	---	74	54	-5.48
7236	V	41.07	---	9.87	50.94	---	74	54	-3.06
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874	H	48.49	---	0.97	49.46	---	74	54	-4.54
7311	H	40.85	---	9.83	50.68	---	74	54	-3.32
---	H	---	---	---	---	---	---	---	---
4874	V	47.66	---	0.97	48.63	---	74	54	-5.37
7311	V	40.94	---	9.83	50.77	---	74	54	-3.23
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4924	H	48.62	---	1.18	49.8	---	74	54	-4.20
7386	H	41.38	---	10.07	51.45	---	74	54	-2.55
---	H	---	---	---	---	---	---	---	---
4924	V	47.49	---	1.18	48.67	---	74	54	-5.33
7386	V	40.56	---	10.07	50.63	---	74	54	-3.37
---	V	---	---	---	---	---	---	---	---

Note:

1. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
2. *Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.*
5. *Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.*
6. *All the restriction bands are compliance with the limit of 15.209.*

Appendix A: Test Result of Conducted Test

Appendix A: DTS Bandwidth

Test Result

TestMode	Antenna	Channel	DTS BW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
11B	Ant1	2412	8.600	2408.440	2417.040	0.5	PASS
		2437	8.160	2432.440	2440.600	0.5	PASS
		2462	7.080	2458.440	2465.520	0.5	PASS
11G	Ant1	2412	15.040	2405.920	2420.960	0.5	PASS
		2437	17.560	2428.040	2445.600	0.5	PASS
		2462	14.560	2454.800	2469.360	0.5	PASS
11N20SISO	Ant1	2412	14.480	2406.480	2420.960	0.5	PASS
		2437	17.720	2428.080	2445.800	0.5	PASS
		2462	15.320	2454.480	2469.800	0.5	PASS

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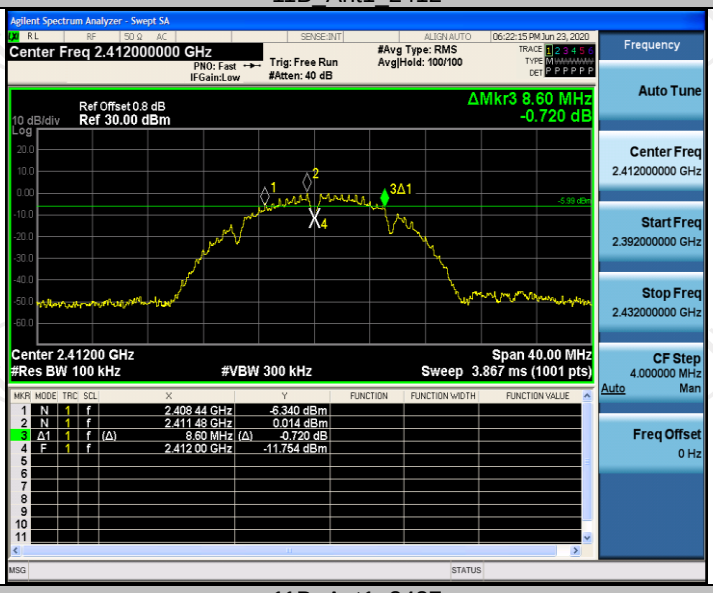
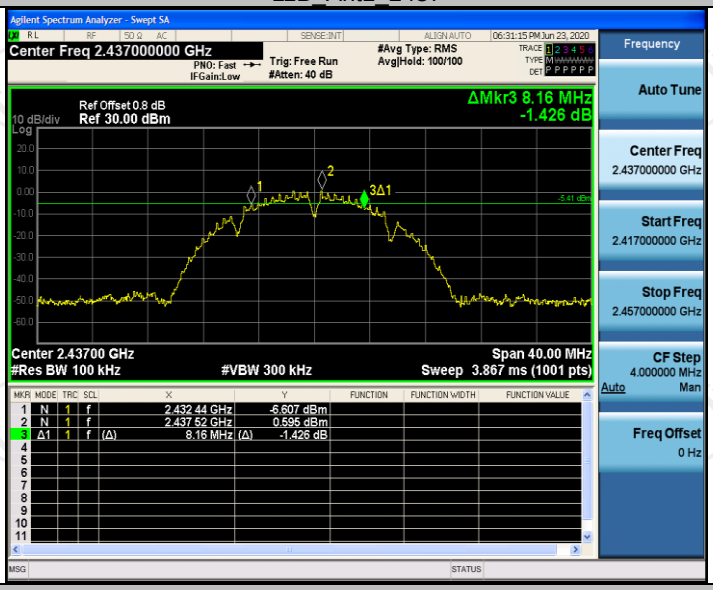
Test Graphs

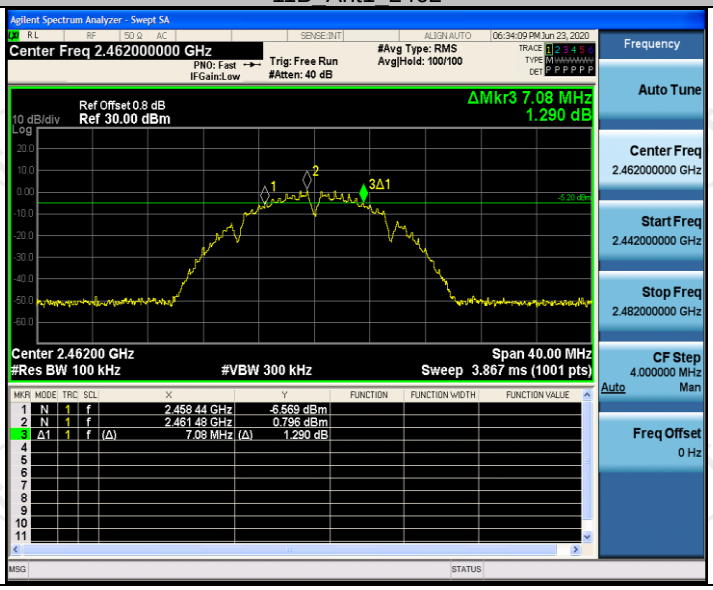
11B_Ant1_2412



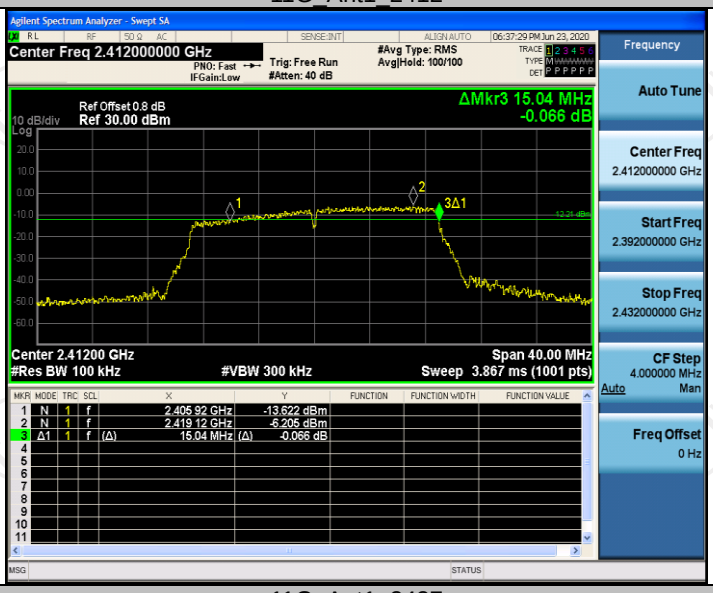
11B_Ant1_2437



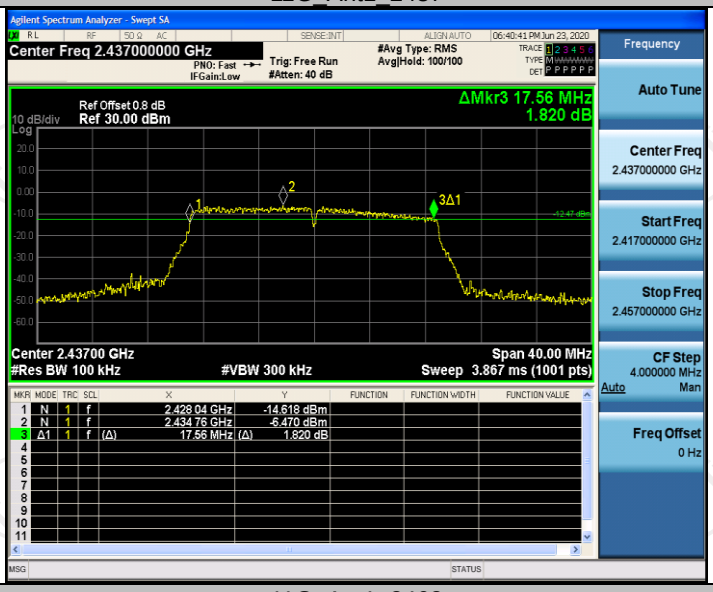
11B_Ant1_2462



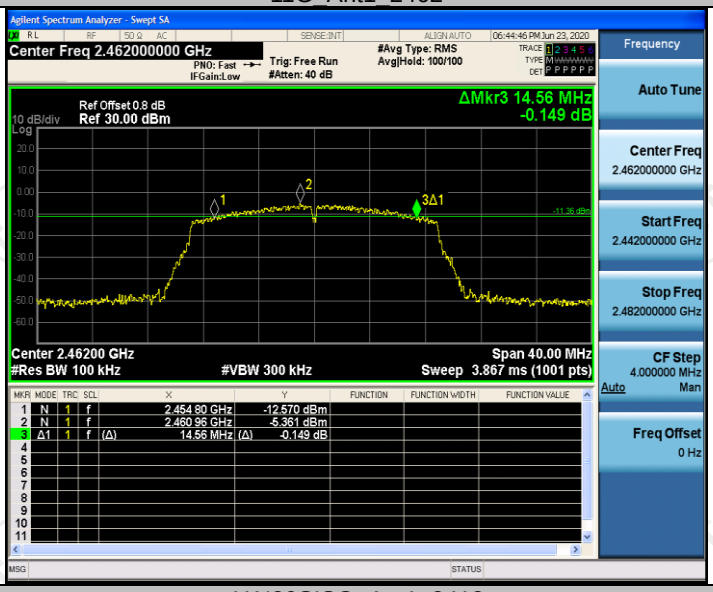
11G_Ant1_2412



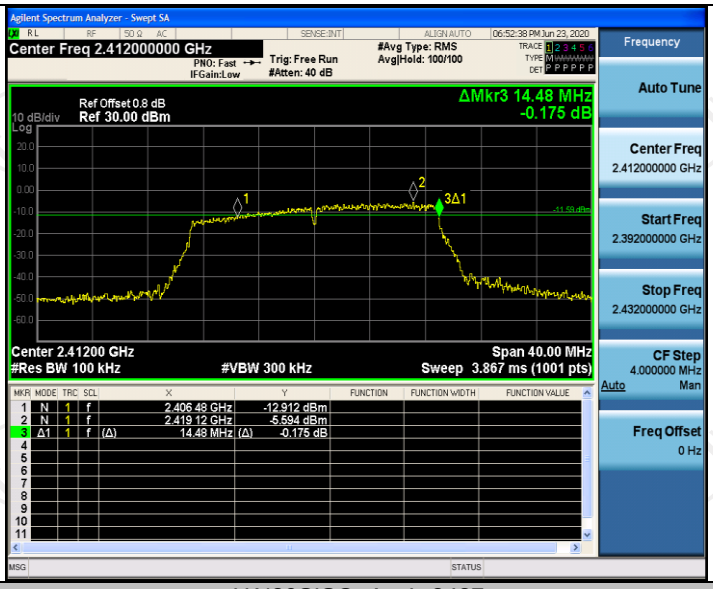
11G_Ant1_2437



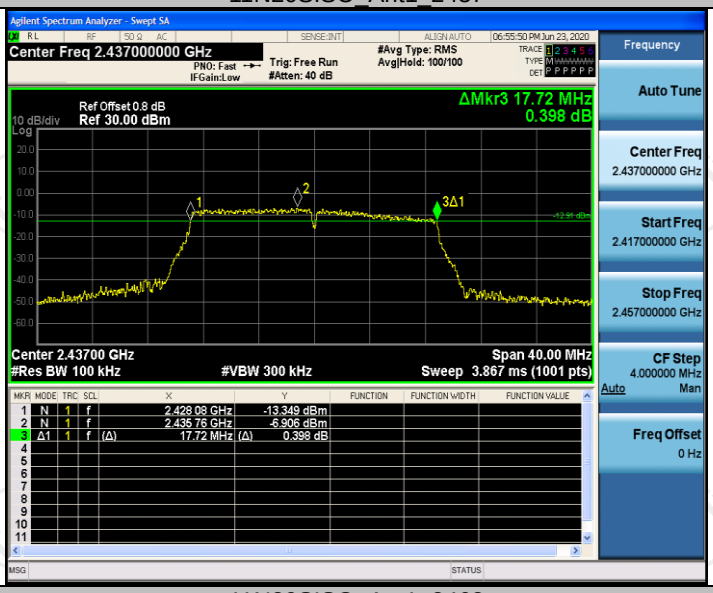
11G_Ant1_2462



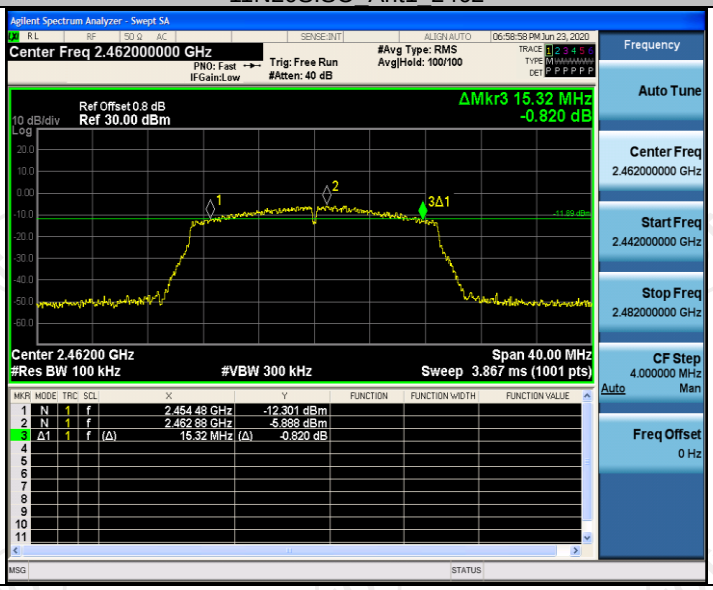
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462



Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Channel	OCB [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
11B	Ant1	2412	12.997	2406.022	2419.019	---	PASS
		2437	13.000	2430.226	2443.226	---	PASS
		2462	12.180	2455.957	2468.137	---	PASS
11G	Ant1	2412	17.885	2403.372	2421.257	---	PASS
		2437	17.984	2427.822	2445.806	---	PASS
		2462	17.417	2453.300	2470.717	---	PASS
11N20SISO	Ant1	2412	17.854	2403.383	2421.237	---	PASS
		2437	17.911	2427.901	2445.812	---	PASS
		2462	17.498	2453.224	2470.722	---	PASS

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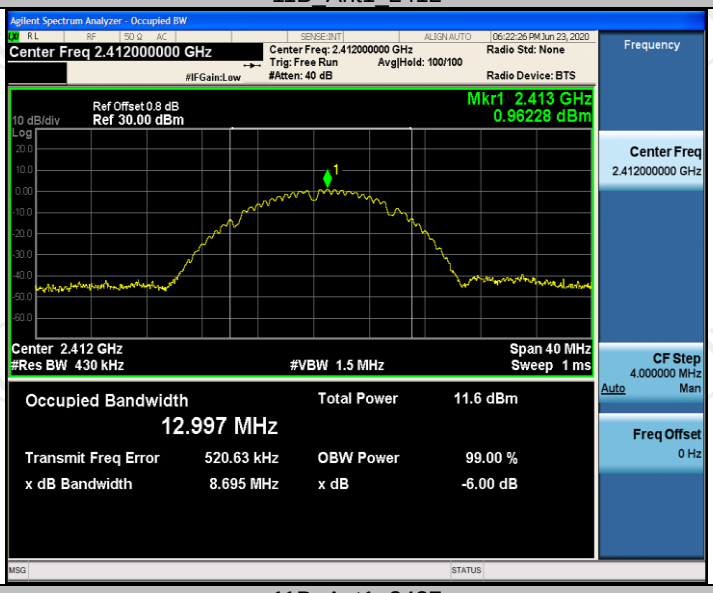
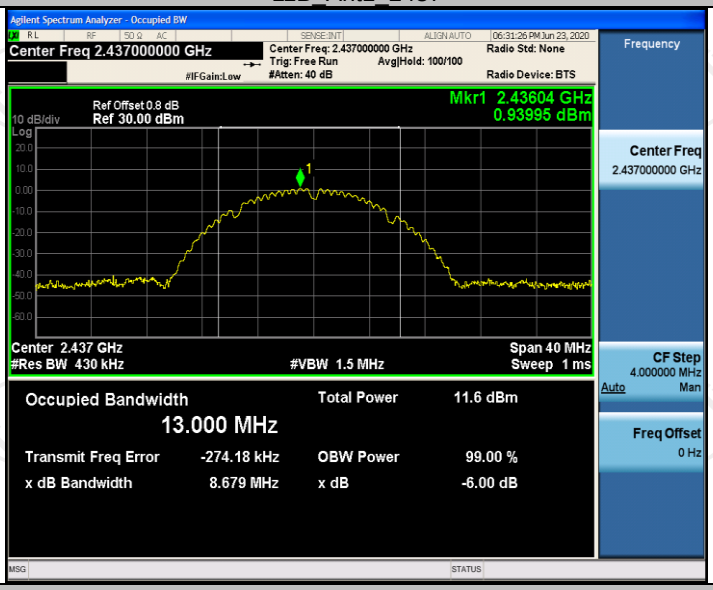
Test Graphs

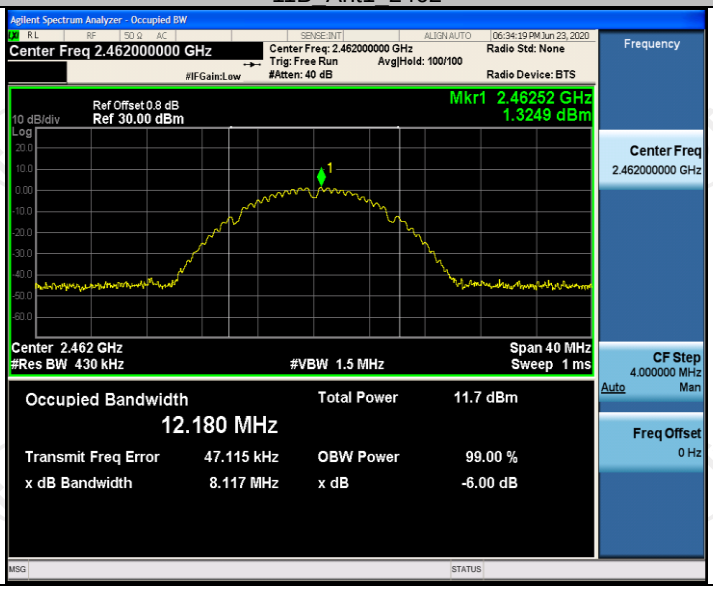
11B_Ant1_2412



11B_Ant1_2437

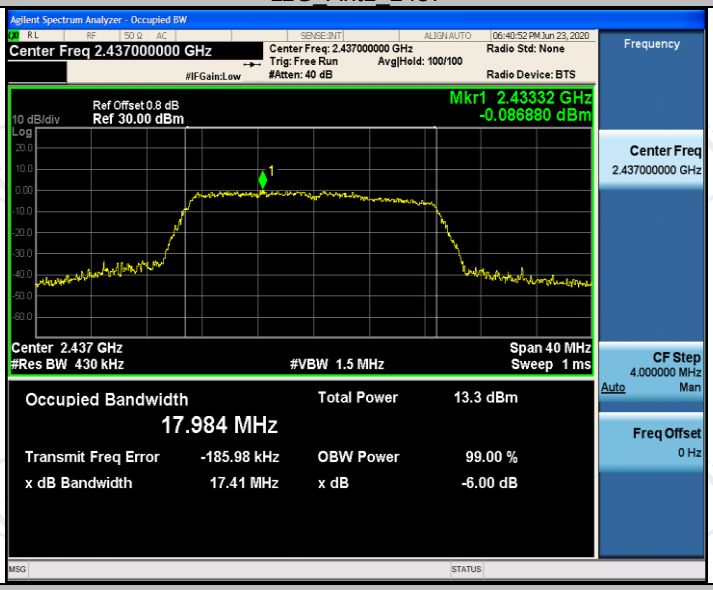


11B_Ant1_2462

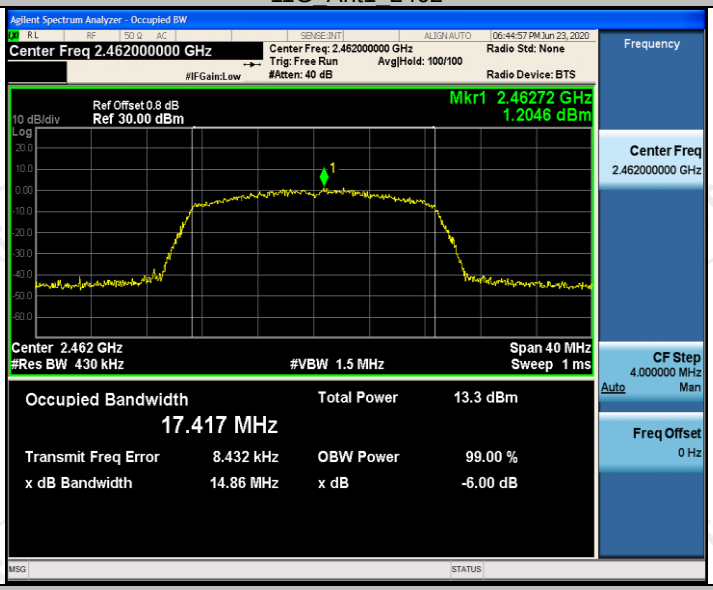


11G_Ant1_2412

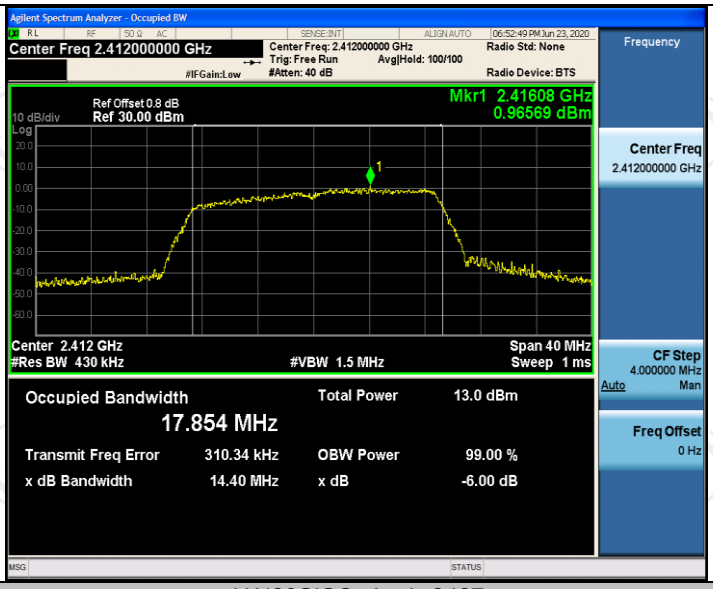
11G_Ant1_2437



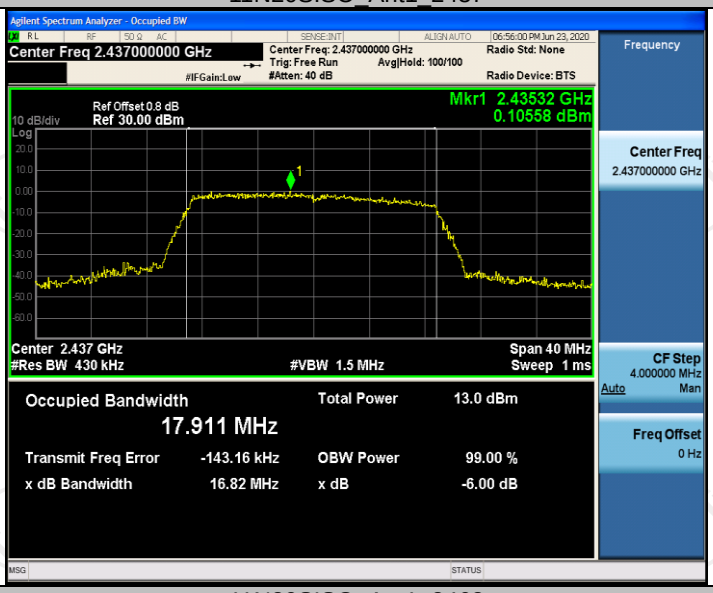
11G_Ant1_2462



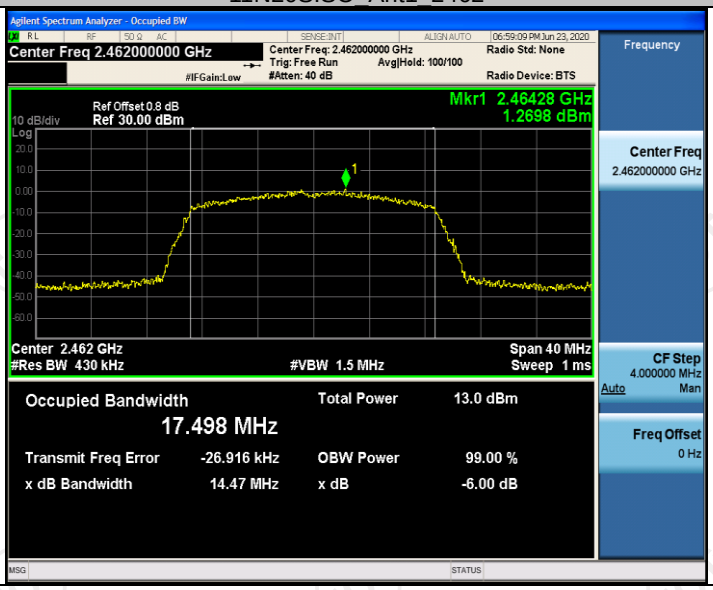
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462



Maximum conducted output power

Test Result

TestMode	Antenna	Channel	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	8.69	<=30	PASS
		2437	8.67	<=30	PASS
		2462	8.78	<=30	PASS
11G	Ant1	2412	7.18	<=30	PASS
		2437	7.18	<=30	PASS
		2462	7.15	<=30	PASS
11N20SISO	Ant1	2412	6.98	<=30	PASS
		2437	6.88	<=30	PASS
		2462	6.88	<=30	PASS

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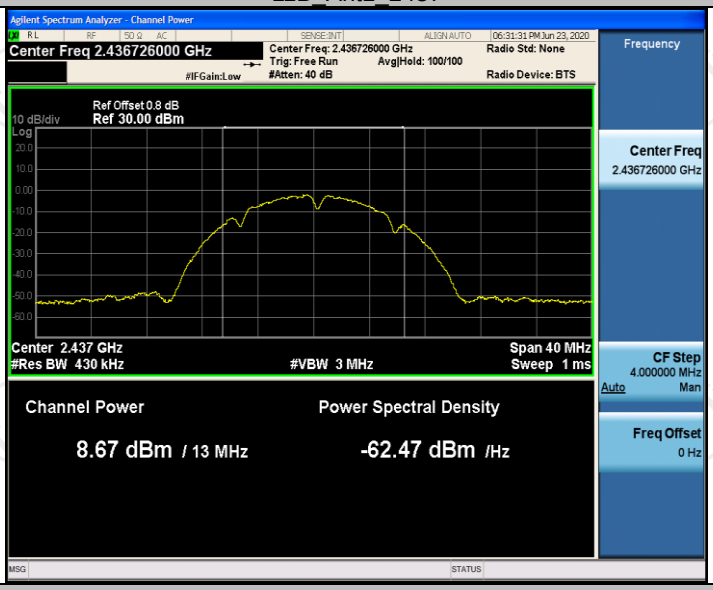
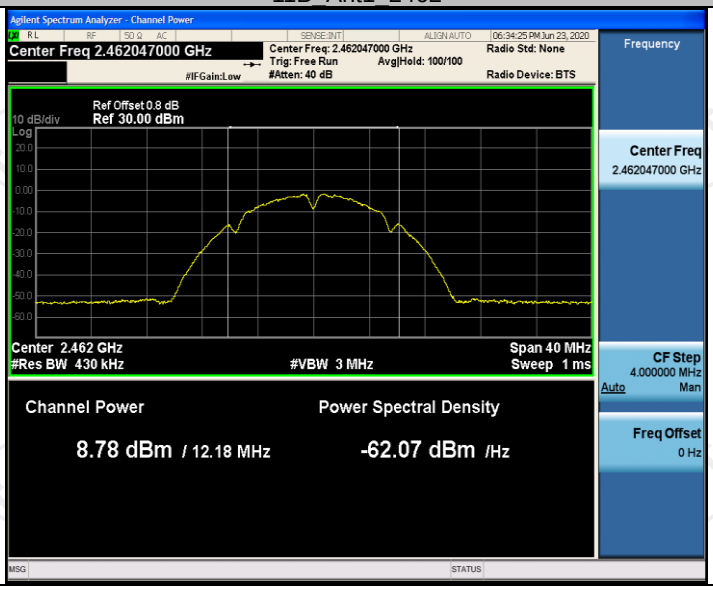
Test Graphs

11B_Ant1_2412

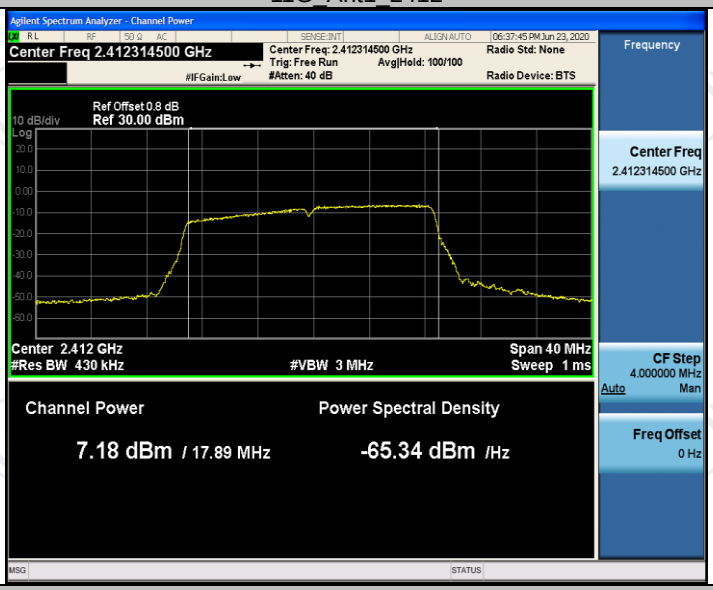
11B_Ant1_2437



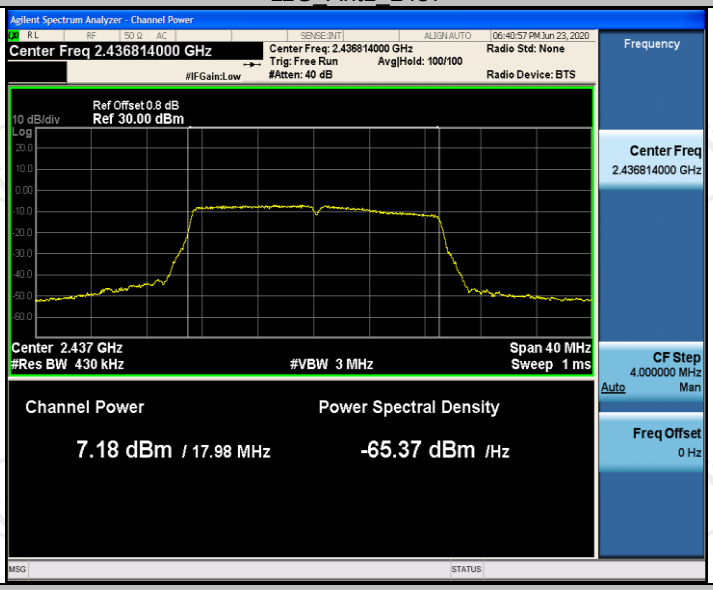
11B_Ant1_2462



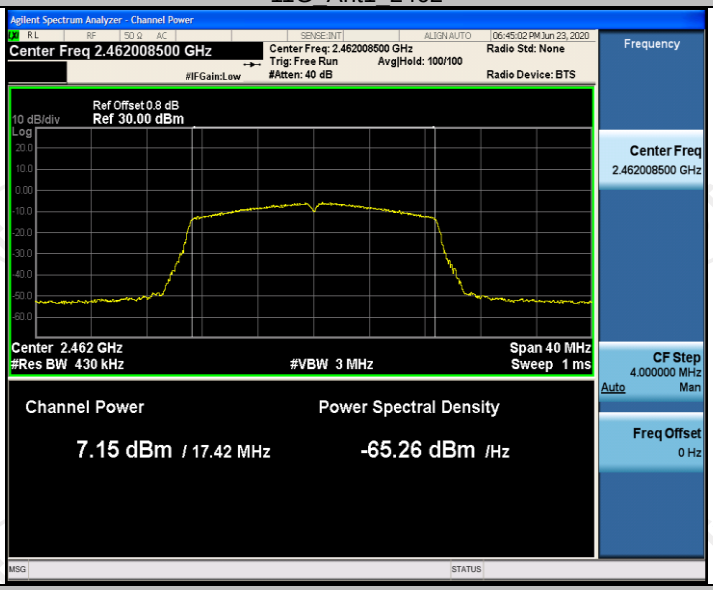
11G_Ant1_2412



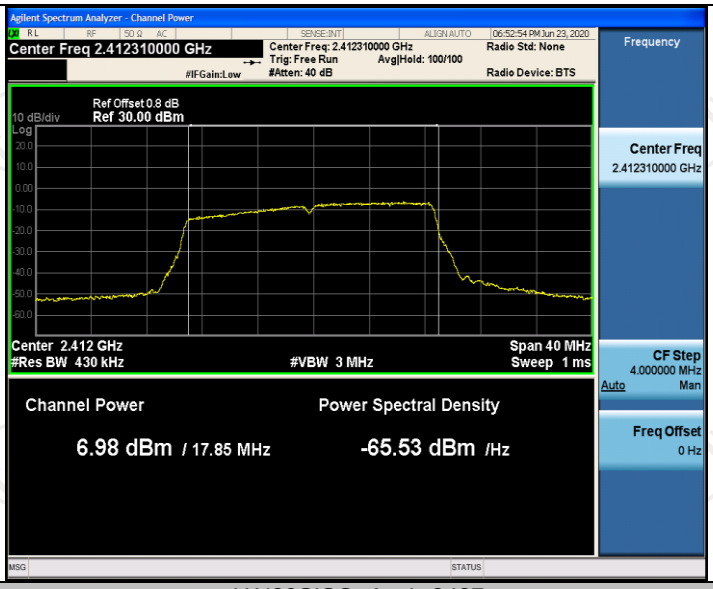
11G_Ant1_2437



11G_Ant1_2462

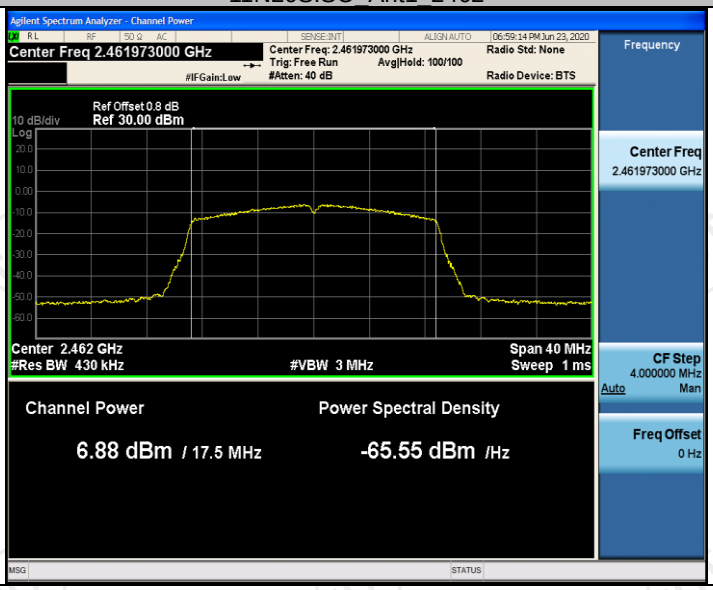


11N20SISO_Ant1_2412



11N20SISO_Ant1_2437

11N20SISO_Ant1_2462



Maximum power spectral density

Test Result

Mode	Channel	Meas.Level [dBm/30KHz]	Meas.Level [dBm/3KHz]	Verdict
11B	LCH	-12.57	-22.57	PASS
11B	MCH	-12.68	-22.68	PASS
11B	HCH	-12.22	-22.22	PASS
11G	LCH	-16.02	-26.02	PASS
11G	MCH	-16.75	-26.75	PASS
11G	HCH	-15.71	-25.71	PASS
11N20SISO	LCH	-15.94	-25.94	PASS
11N20SISO	MCH	-16.84	-26.84	PASS
11N20SISO	HCH	-15.83	-25.83	PASS

Note: *Compensate 10dB is for Exchange rate of RBW*

*Exchange rate of RBW = 10*log10(Reference bandwidth/RBW at measurement) = -10[dB]*

where Reference bandwidth = 3 KHz

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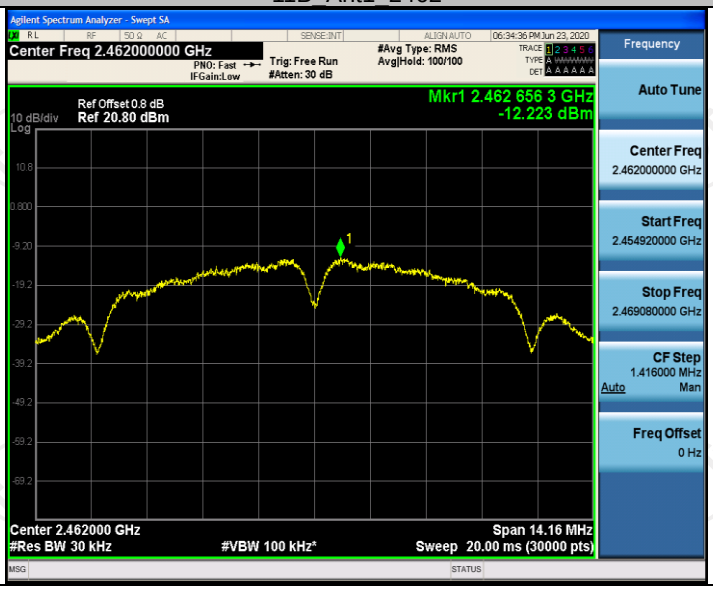
Test Graphs

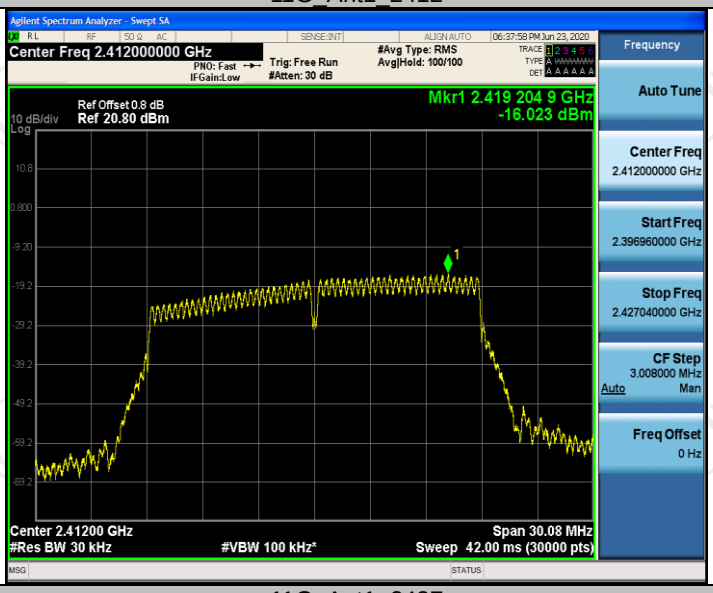
11B_Ant1_2412

11B_Ant1_2437

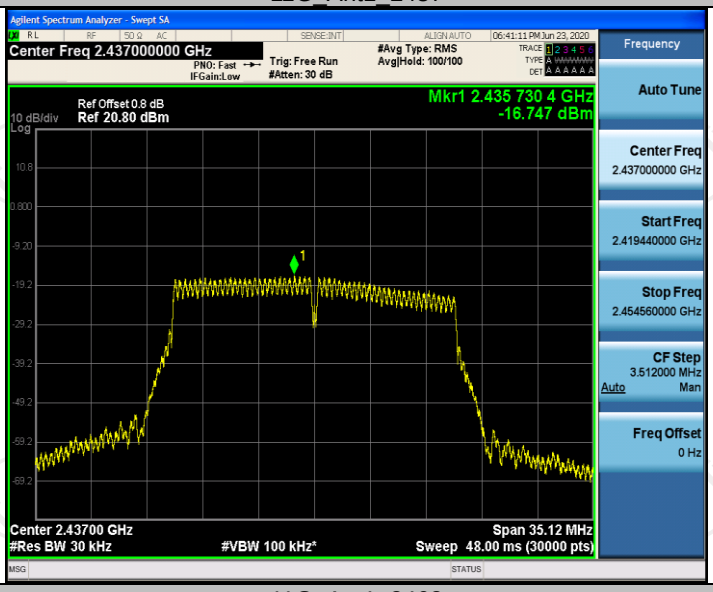
11B_Ant1_2462



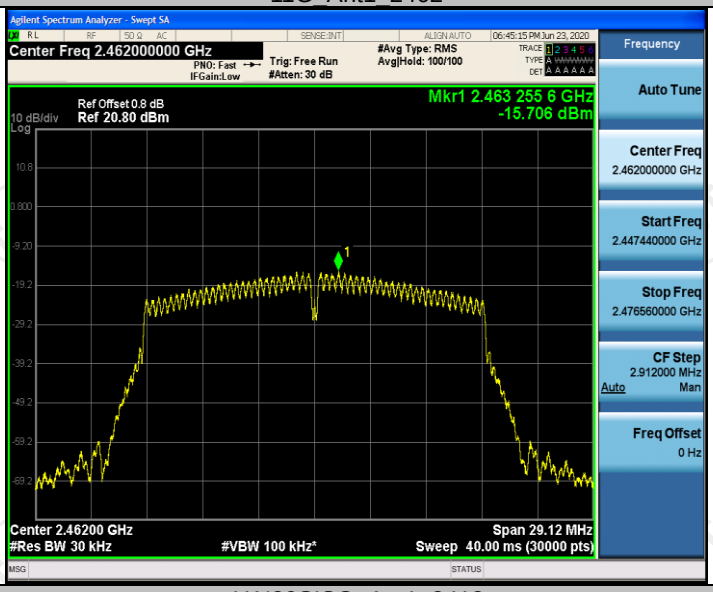
11G_Ant1_2412



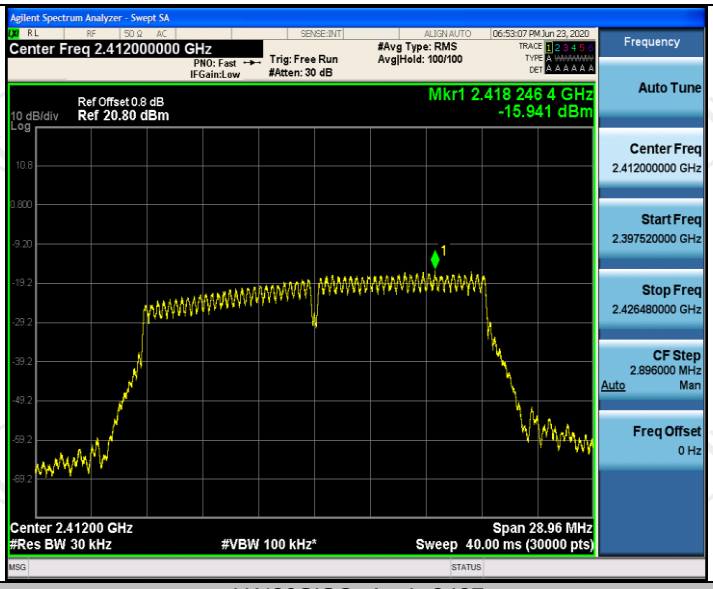
11G_Ant1_2437



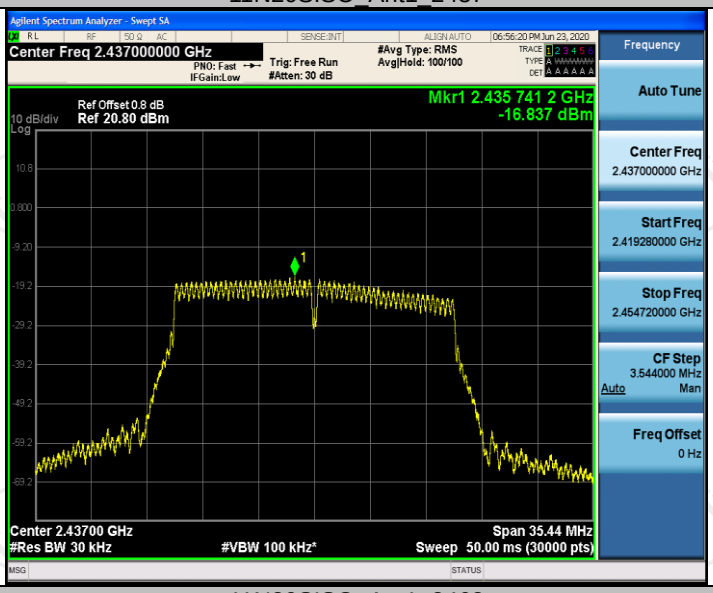
11G_Ant1_2462



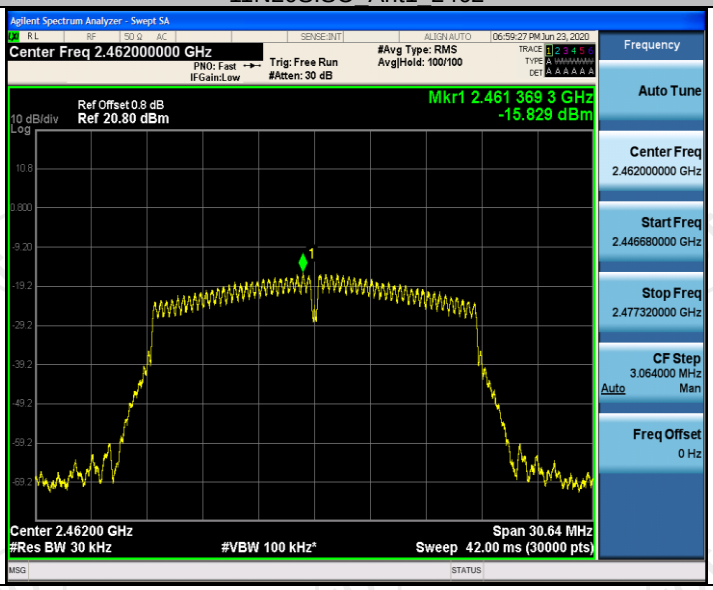
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462



Band edge measurements

Test Result

TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	Low	2412	0.44	-52.65	<=-29.56	PASS
		High	2462	1.09	-57.02	<=-28.91	PASS
11G	Ant1	Low	2412	-5.64	-45.17	<=-35.64	PASS
		High	2462	-5.25	-55.85	<=-35.25	PASS
11N20SISO	Ant1	Low	2412	-5.80	-46.94	<=-35.8	PASS
		High	2462	-5.59	-56.25	<=-35.59	PASS

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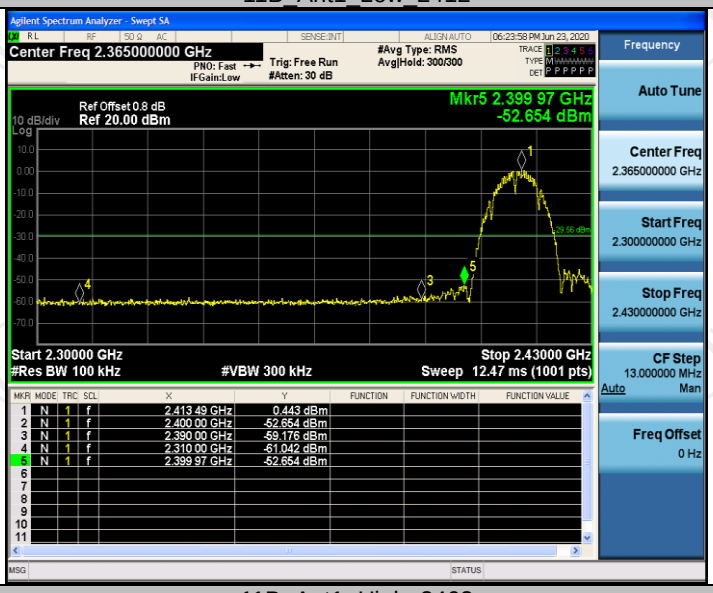
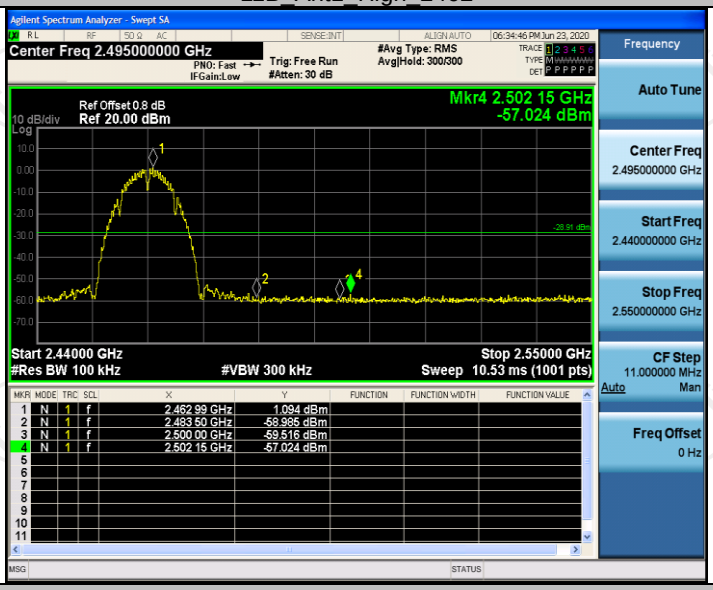
Test Graphs

11B_Ant1_Low_2412



11B_Ant1_High_2462



11G_Ant1_Low_2412