

TEST REPORT

FCC ID: 2AKSAMOBULAA-NOTE

Product: Mobile Phone

Model No.: NOTE1

Additional Model No.: NOTE2, NOTE3, NOTE4, NOTE5, NOTE6, NOTE7, NOTE8, NOTE9, NOTE10, NOTE11, NOTE12, NOTE13, NOTE14, NOTE15, NOTE16, NOTE17, NOTE18, NOTE19, NOTE20, NOTE21, NOTE22, NOTE23, NOTE24, NOTE25, NOTE26, NOTE27, NOTE28, NOTE29, NOTE30

Trade Mark: MOBULAA

Report No.: TCT200831E047

Issued Date: Sep. 24, 2020

Issued for:

Shenzhen YLWD Technology Co., Ltd

RM1002.A.Haisong BLD.RD Tairan.FuTian District, Shenzhen, China

Issued By:

Shenzhen Tongce Testing Lab.

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TABLE OF CONTENTS

1. Test Certification	3
2. Test Result Summary	4
3. EUT Description.....	5
4. General Information.....	6
4.1. Test environment and mode.....	6
4.2. Description of Support Units.....	6
5. Facilities and Accreditations	7
5.1. Facilities	7
5.2. Location	7
5.3. Measurement Uncertainty.....	7
6. Test Results and Measurement Data	8
6.1. Antenna requirement	8
6.2. Conducted Emission.....	9
6.3. Conducted Output Power	13
6.4. Emission Bandwidth	14
6.5. Power Spectral Density.....	15
6.6. Conducted Band Edge and Spurious Emission Measurement	16
6.7. Radiated Spurious Emission Measurement	18

Appendix A: Test Result of Conducted Test**Appendix B: Photographs of Test Setup****Appendix C: Photographs of EUT**

1. Test Certification

Product:	Mobile Phone
Model No.:	NOTE1
Additional Model No.:	NOTE2, NOTE3, NOTE4, NOTE5, NOTE6, NOTE7, NOTE8, NOTE9, NOTE10, NOTE11, NOTE12, NOTE13, NOTE14, NOTE15, NOTE16, NOTE17, NOTE18, NOTE19, NOTE20, NOTE21, NOTE22, NOTE23, NOTE24, NOTE25, NOTE26, NOTE27, NOTE28, NOTE29, NOTE30
Trade Mark:	MOBULAA
Applicant:	Shenzhen YLWD Technology Co., Ltd
Address:	RM1002.A.Haisong BLD.RD Tairan.FuTian District, Shenzhen, China
Manufacturer:	Shenzhen YLWD Technology Co., Ltd
Address:	RM1002.A.Haisong BLD.RD Tairan.FuTian District, Shenzhen, China
Date of Test:	Sep. 01, 2020 – Sep. 23, 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:

Brews Xu

Date: Sep. 23, 2020

Brews Xu

Reviewed By:

Beryl Zhao

Date: Sep. 24, 2020

Beryl Zhao

Approved By:

Tomsin

Date: Sep. 24, 2020

Tomsin

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.
5. After pre-testing the two earphones, the two earphones are left and right ears respectively; we found that the left earphone is the worst case, so the results are recorded in this report.

3. EUT Description

Product:	Mobile Phone
Model No.:	NOTE1
Additional Model No.:	NOTE2, NOTE3, NOTE4, NOTE5, NOTE6, NOTE7, NOTE8, NOTE9, NOTE10, NOTE11, NOTE12, NOTE13, NOTE14, NOTE15, NOTE16, NOTE17, NOTE18, NOTE19, NOTE20, NOTE21, NOTE22, NOTE23, NOTE24, NOTE25, NOTE26, NOTE27, NOTE28, NOTE29, NOTE30
Trade Mark:	MOBULAA
Bluetooth Version:	V4.2 (This report is for BLE)
Operation Frequency:	2402MHz~2480MHz
Channel Separation:	2MHz
Data Rate:	1M PHY
Number of Channel:	40
Modulation Type:	GFSK
Antenna Type:	Internal Antenna
Antenna Gain:	-1.82dBi
Power Supply:	Rechargeable Li-ion Battery DC 3.8V
AC adapter:	Adapter Information: Model: MF-05002100SM1 Input: AC 100-240V, 50/60Hz, 0.4A Output: DC 5V, 2.1A
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.

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
...
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz

Remark: Channel 0, 19 & 39 have been tested.

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	
<p>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.</p>		

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.

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 $y \pm U$, 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	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p>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.</p> <p>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.</p>	
<p>E.U.T Antenna:</p> <p>The Bluetooth antenna is internal antenna which permanently attached, and the best case gain of the antenna is -1.82dBi.</p>	



6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <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> </tbody> </table>	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
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													
Test Setup:	<p>Reference Plane</p> <p><i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
Test Mode:	Charging + Transmitting Mode														
Test Procedure:	<ol style="list-style-type: none"> 1. The E.U.T is connected to an adapter 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. 														
Test Result:	PASS														

6.2.2. Test Instruments

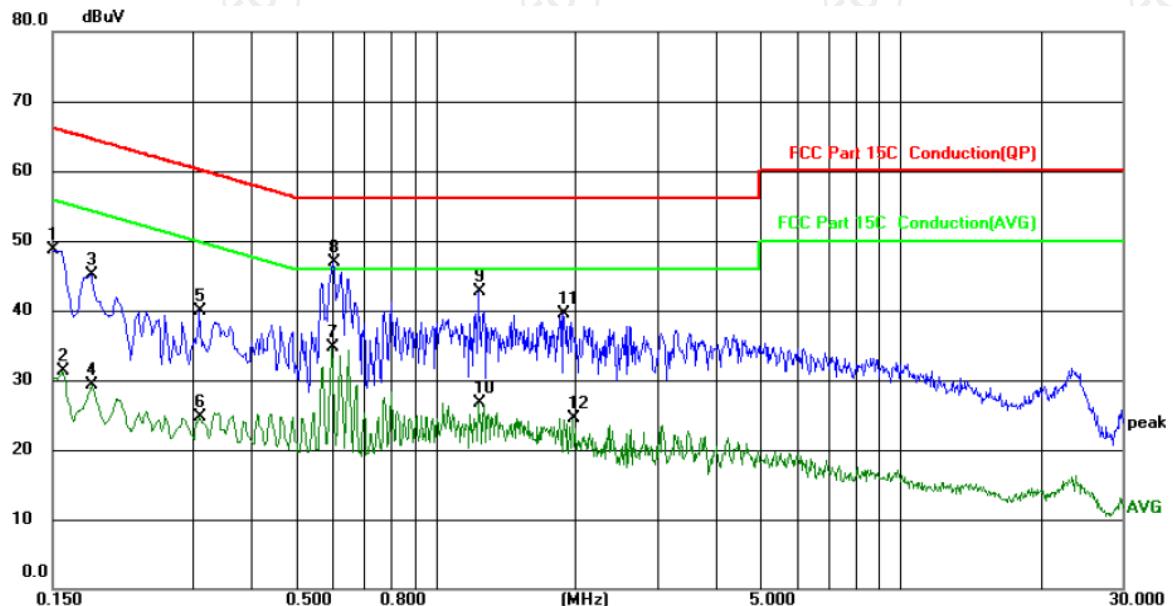
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESCI3	100898	Jul. 27, 2021
LISN-2	Schwarzbeck	NSLK 8126	8126453	Sep. 11, 2021
Line-5	TCT	CE-05	N/A	Sep. 02, 2021
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

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				Phase:	L1		Temperature:	25 (C)
Limit: FCC Part 15C Conduction(QP)				Power:	AC 120V/60Hz		Humidity:	55 %RH
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dB	Detector	Comment
1		0.1500	38.51	10.12	48.63	66.00	-17.37	peak
2		0.1580	21.22	10.12	31.34	55.57	-24.23	AVG
3		0.1819	34.99	10.12	45.11	64.40	-19.29	peak
4		0.1819	19.25	10.12	29.37	54.40	-25.03	AVG
5		0.3100	29.70	10.13	39.83	59.97	-20.14	peak
6		0.3100	14.60	10.13	24.73	49.97	-25.24	AVG
7		0.5980	24.57	10.13	34.70	46.00	-11.30	AVG
8 *		0.6020	36.82	10.13	46.95	56.00	-9.05	peak
9		1.2420	32.55	10.12	42.67	56.00	-13.33	peak
10		1.2420	16.52	10.12	26.64	46.00	-19.36	AVG
11		1.8780	29.32	10.12	39.44	56.00	-16.56	peak
12		1.9700	14.46	10.12	24.58	46.00	-21.42	AVG

Note:

Freq. = Emission frequency in MHz

Reading level (dB μ V) = Receiver reading

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

Measurement (dB μ V) = Reading level (dB μ V) + Corr. Factor (dB)

Limit (dB μ V) = Limit stated in standard

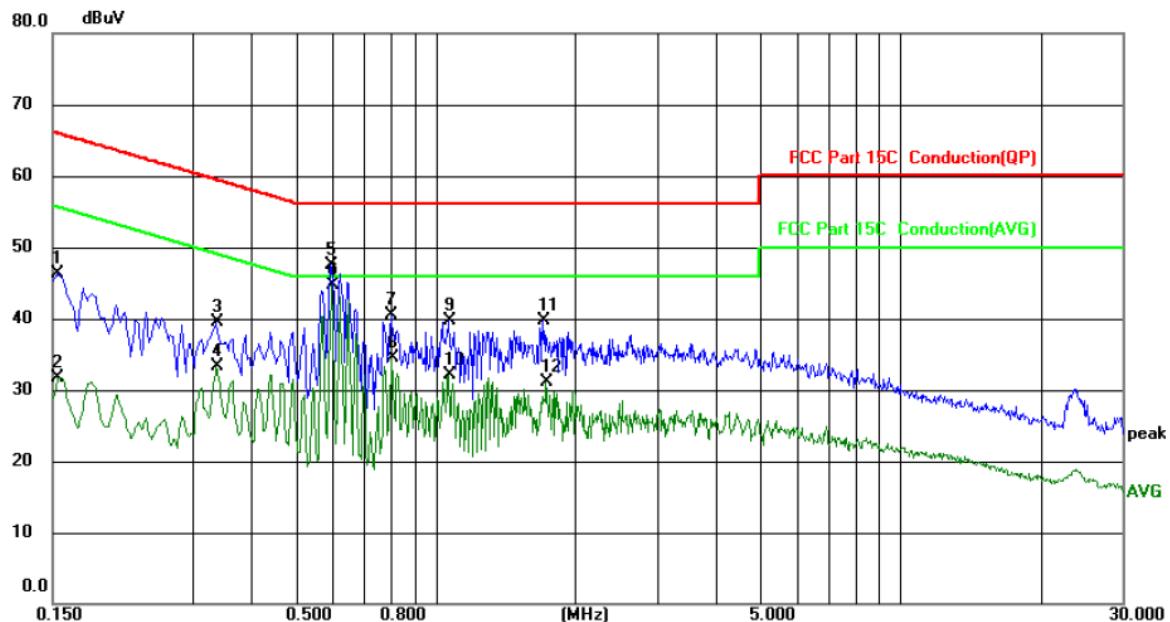
Margin (dB) = Measurement (dB μ V) - Limits (dB μ V)

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: <i>N</i>	Temperature: 25 (C)		
Limit: FCC Part 15C Conduction(QP)				Power: AC 120V/60Hz	Humidity: 55 %RH		
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over
		MHz	dBuV	dB	dBuV	dB	Detector
1		0.1539	36.13	10.12	46.25	65.79	-19.54
2		0.1539	21.59	10.12	31.71	55.79	-24.08
3		0.3379	29.36	10.13	39.49	59.25	-19.76
4		0.3379	23.13	10.13	33.26	49.25	-15.99
5		0.5940	37.42	10.13	47.55	56.00	-8.45
6	*	0.5980	34.60	10.13	44.73	46.00	-1.27
7		0.8020	30.35	10.12	40.47	56.00	-15.53
8		0.8059	24.42	10.12	34.54	46.00	-11.46
9		1.0660	29.53	10.12	39.65	56.00	-16.35
10		1.0660	21.91	10.12	32.03	46.00	-13.97
11		1.7060	29.54	10.12	39.66	56.00	-16.34
12		1.7340	20.96	10.12	31.08	46.00	-14.92

Note1:

Freq. = Emission frequency in MHz

Reading level (dB μ V) = Receiver reading

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

Measurement (dB μ V) = Reading level (dB μ V) + Corr. Factor (dB)

Limit (dB μ V) = Limit stated in standard

Margin (dB) = Measurement (dB μ V) – Limits (dB μ V)

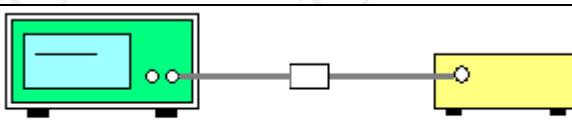
Q.P. =Quasi-Peak

AVG =average

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

6.3. Conducted 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:	 <p>Spectrum Analyzer EUT</p>
Test Mode:	Refer to item 4.1
Test Procedure:	<p>Set spectrum analyzer as following:</p> <ol style="list-style-type: none"> Set the $RBW \geq DTS$ bandwidth. Set $VBW \geq 3 \times RBW$. Set span $\geq 3 \times RBW$ Sweep time = auto couple. Detector = peak. Trace mode = max hold. Allow trace to fully stabilize. Use peak marker function to determine the peak amplitude level.
Test Result:	PASS

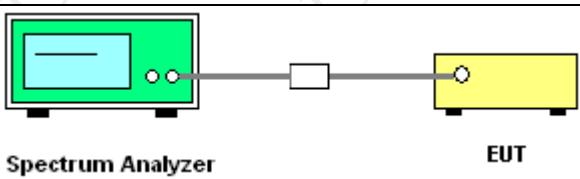
6.3.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2021
4 Ch. Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	N/A	Sep. 02, 2021
Combiner Box	Ascentest	AT890-RFB	N/A	Sep. 02, 2021

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:	Refer to item 4.1
Test Procedure:	<ol style="list-style-type: none"> 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

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2021
4 Ch. Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	N/A	Sep. 02, 2021
Combiner Box	Ascentest	AT890-RFB	N/A	Sep. 02, 2021

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

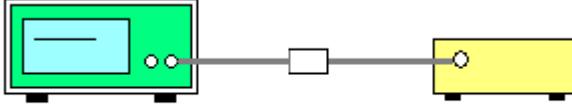
6.5.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2021
4 Ch. Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	N/A	Sep. 02, 2021
Combiner Box	Ascentest	AT890-RFB	N/A	Sep. 02, 2021

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:	KDB 558074 D01 v05r02
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:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Refer to item 4.1
Test Procedure:	<ol style="list-style-type: none"> 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

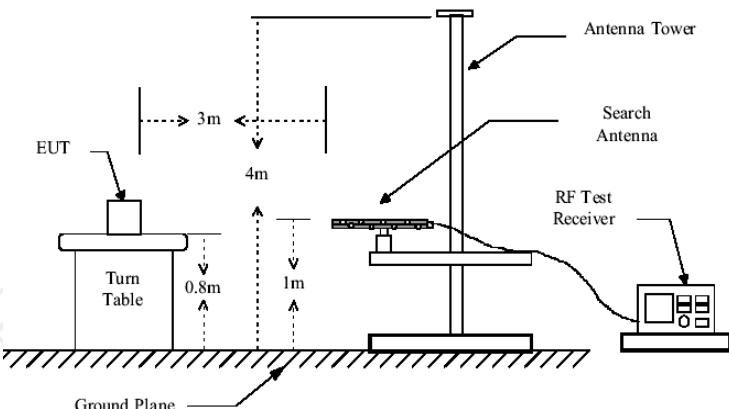
Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2021
4 Ch. Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	N/A	Sep. 02, 2021
Combiner Box	Ascentest	AT890-RFB	N/A	Sep. 02, 2021

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

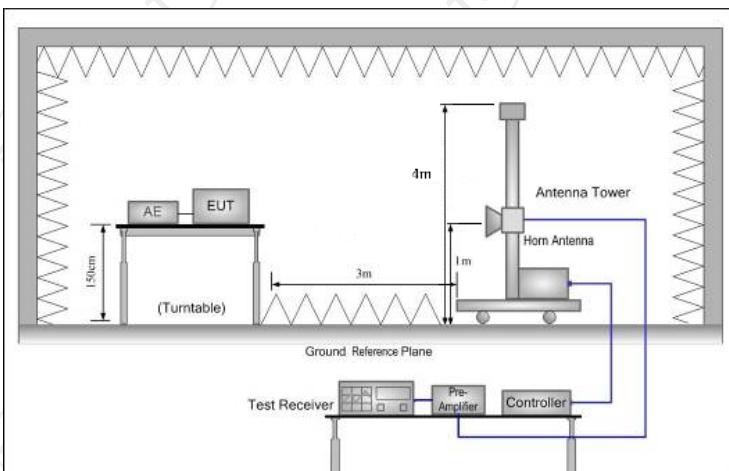
6.7. Radiated Spurious Emission Measurement

6.7.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209																																															
Test Method:	ANSI C63.10: 2013																																															
Frequency Range:	9 kHz to 25 GHz																																															
Measurement Distance:	3 m																																															
Antenna Polarization:	Horizontal & Vertical																																															
Operation mode:	Refer to item 4.1																																															
Receiver Setup:	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Detector</th> <th>RBW</th> <th>VBW</th> <th>Remark</th> </tr> </thead> <tbody> <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> </tbody> </table>					Frequency	Detector	RBW	VBW	Remark	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value	Above 1GHz	Peak	1MHz	3MHz	Peak Value	Peak	1MHz	10Hz	Average Value														
Frequency	Detector	RBW	VBW	Remark																																												
9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value																																												
150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value																																												
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value																																												
Above 1GHz	Peak	1MHz	3MHz	Peak Value																																												
	Peak	1MHz	10Hz	Average Value																																												
Limit:	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Field Strength (microvolts/meter)</th> <th>Measurement Distance (meters)</th> <th></th> </tr> </thead> <tbody> <tr> <td>0.009-0.490</td> <td>2400/F(KHz)</td> <td>300</td> <td></td> </tr> <tr> <td>0.490-1.705</td> <td>24000/F(KHz)</td> <td>30</td> <td></td> </tr> <tr> <td>1.705-30</td> <td>30</td> <td>30</td> <td></td> </tr> <tr> <td>30-88</td> <td>100</td> <td>3</td> <td></td> </tr> <tr> <td>88-216</td> <td>150</td> <td>3</td> <td></td> </tr> <tr> <td>216-960</td> <td>200</td> <td>3</td> <td></td> </tr> <tr> <td>Above 960</td> <td>500</td> <td>3</td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Field Strength (microvolts/meter)</th> <th>Measurement Distance (meters)</th> <th>Detector</th> </tr> </thead> <tbody> <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> </tbody> </table>					Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)		0.009-0.490	2400/F(KHz)	300		0.490-1.705	24000/F(KHz)	30		1.705-30	30	30		30-88	100	3		88-216	150	3		216-960	200	3		Above 960	500	3		Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector	Above 1GHz	500	3	Average	5000	3	Peak
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30-88	100	3																																														
88-216	150	3																																														
216-960	200	3																																														
Above 960	500	3																																														
Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector																																													
Above 1GHz	500	3	Average																																													
	5000	3	Peak																																													
Test setup:	<p>For radiated emissions below 30MHz</p> <p>Distance = 3m</p> <p>0.8m</p> <p>Turn table</p> <p>1m</p> <p>Ground Plane</p> <p>30MHz to 1GHz</p>																																															



Above 1GHz



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

Test Procedure:

	<p>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.</p> <p>2. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</p> <p>3. 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.</p> <p>4. Use the following spectrum analyzer settings:</p> <ol style="list-style-type: none"> (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=120 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for $f > 1$ GHz for peak measurement. <p>For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW \geq 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.</p>
Test mode:	Refer to section 4.1 for details
Test results:	PASS

6.7.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHW ARZ	ESIB7	100197	Jul. 27, 2021
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ40	200061	Sep. 11, 2021
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 02, 2021
Pre-amplifier	HP	8447D	2727A05017	Sep. 02, 2021
Loop antenna	ZHINAN	ZN30900A	12024	Oct. 27, 2020
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 04, 2022
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 04, 2022
Horn Antenna	A-INFO	LB-180400-KF	J211020657	Sep. 04, 2022
Antenna Mast	Keleto	RE-AM	N/A	N/A
Line-4	TCT	RE-high-04	N/A	Sep. 02, 2021
Line-8	TCT	RE-01	N/A	Jul. 27, 2021
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

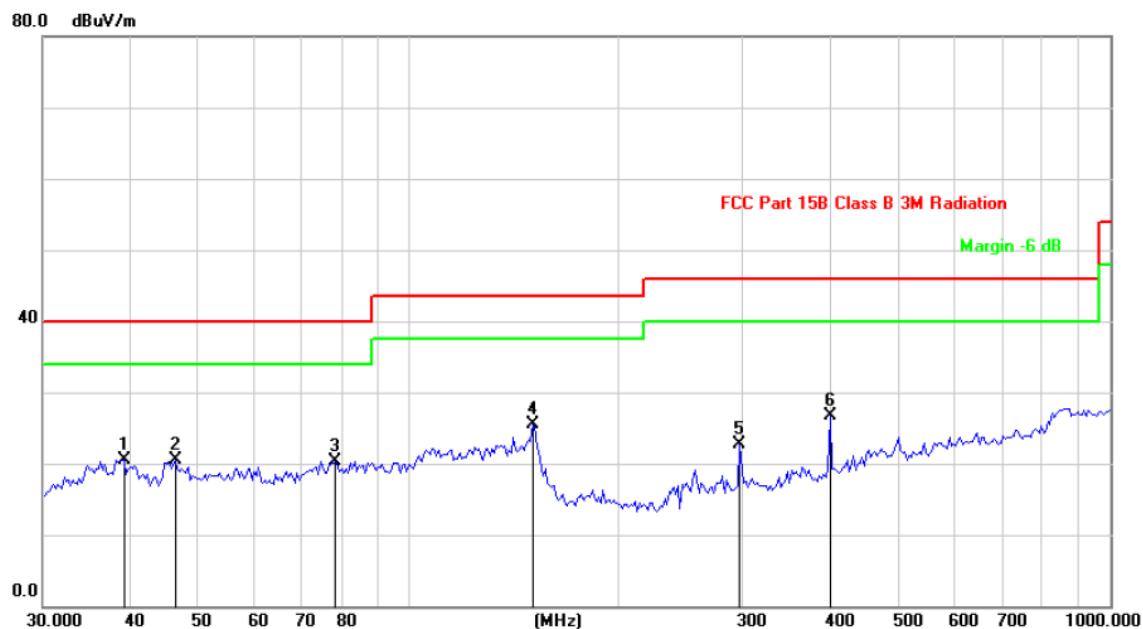
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.7.3. Test Data

Please refer to following diagram for individual

Below 1GHz

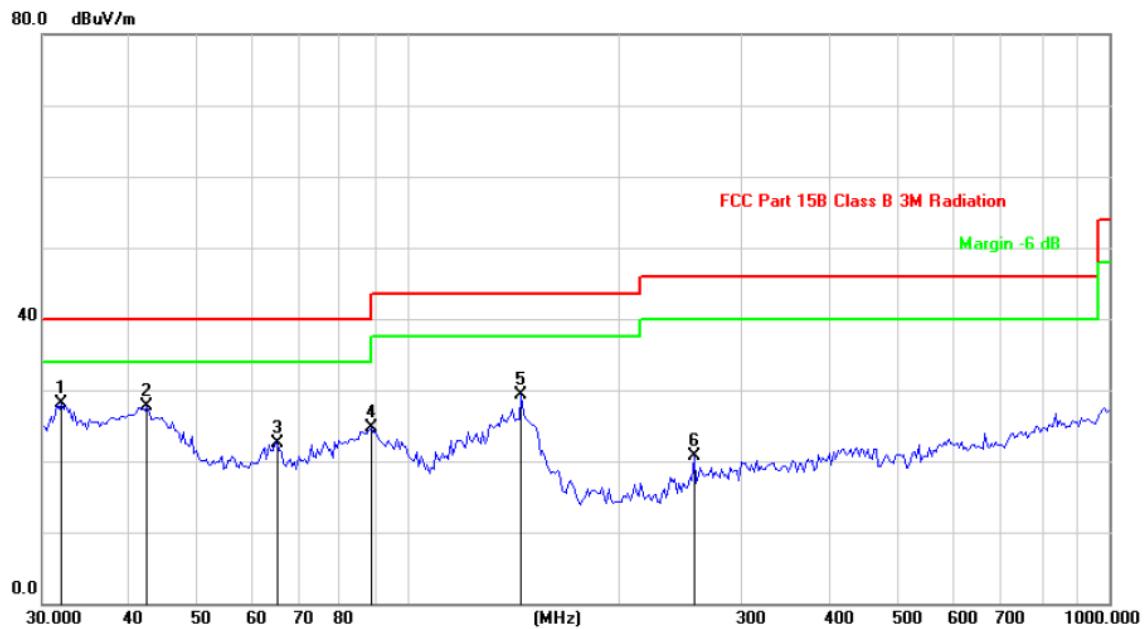
Horizontal:



Site: Polarization: **Horizontal** Temperature: 25
 Limit: FCC Part 15B Class B 3M Radiation Power: AC 120V/60Hz Humidity: 55 %

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
			Level	Factor	ment				
			MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		39.1824	31.77	-11.18	20.59	40.00	-19.41	peak	
2		46.3806	31.01	-10.51	20.50	40.00	-19.50	peak	
3		78.5644	37.21	-16.86	20.35	40.00	-19.65	peak	
4	*	149.9676	42.03	-16.62	25.41	43.50	-18.09	peak	
5		296.5022	33.88	-11.15	22.73	46.00	-23.27	peak	
6		398.2961	35.65	-8.93	26.72	46.00	-19.28	peak	

Vertical:



Site	Polarization: Vertical	Temperature: 25
Limit: FCC Part 15B Class B 3M Radiation		Power: AC 120V/60Hz
Humidity: 55 %		

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	31.9586	39.34	-11.15	28.19	40.00	-11.81	peak
2		42.3314	38.62	-10.94	27.68	40.00	-12.32	peak
3		64.9869	36.75	-14.23	22.52	40.00	-17.48	peak
4		88.5336	36.47	-11.70	24.77	43.50	-18.73	peak
5		144.7898	45.90	-16.54	29.36	43.50	-14.14	peak
6		255.8223	33.30	-12.56	20.74	46.00	-25.26	peak

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 the worst case Mode (Highest channel) was submitted only.

3. Freq. = Emission frequency in MHz

Measurement (dB μ V/m) = Reading level (dB μ V) + Corr. Factor (dB)

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

Limit (dB μ V/m) = Limit stated in standard

Margin (dB) = Measurement (dB μ V/m) – Limits (dB μ V/m)

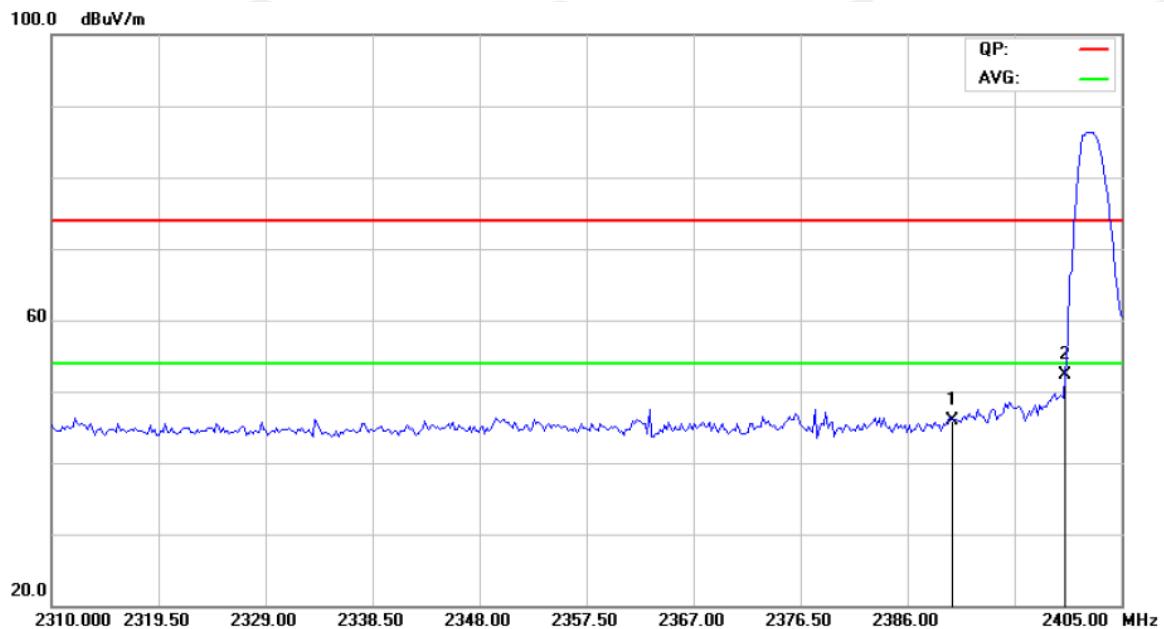
Any value more than 10dB below limit have not been specifically reported

* is meaning the worst frequency has been tested in the test frequency range

Test Result of Radiated Spurious at Band edges

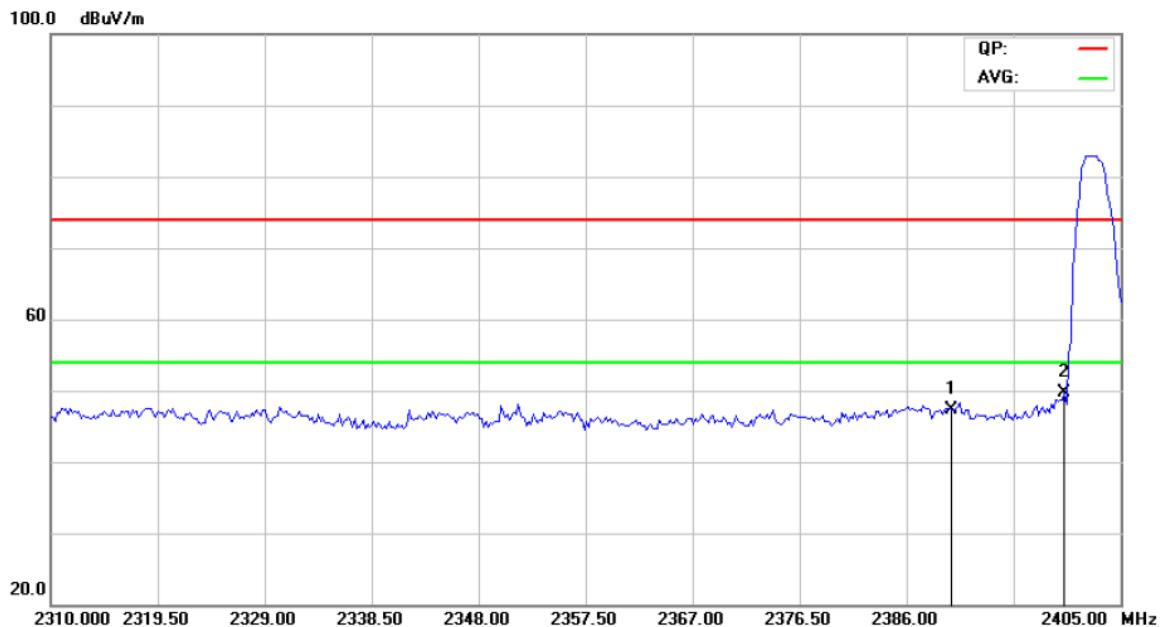
Lowest channel 2402:

Horizontal:



Site	Polarization: <i>Horizontal</i>			Temperature: 25 (C)
Limit: FCC part 15 (PK)			Power:	Humidity: 55 %
<hr/>				
No.	Mk.	Reading Level	Correct Factor	Measure-ment Limit
	MHz	dBuV	dB	dBuV/m
1	2390.000	59.05	-13.15	45.90
2 *	2400.000	65.41	-13.12	52.29
<hr/>				
Over Detector				
1	2390.000	59.05	-13.15	45.90
2 *	2400.000	65.41	-13.12	52.29

Vertical:

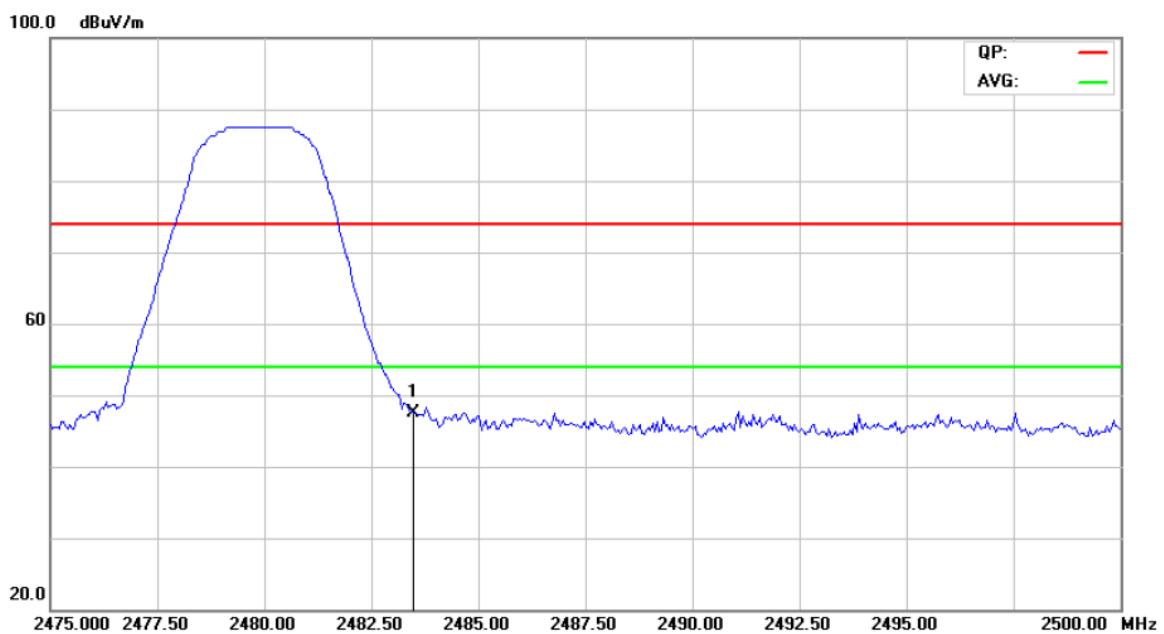


Site: Polarization: **Vertical** Temperature: 25 (C)
Limit: FCC part 15 (PK) Power: Humidity: 55 %

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over
			Level	Factor	ment		
		MHz	dBuV	dB	dBuV/m	dB	Detector
1		2390.000	60.44	-13.15	47.29	74.00	-26.71 peak
2 *		2400.000	62.88	-13.12	49.76	74.00	-24.24 peak

Highest channel 2480:

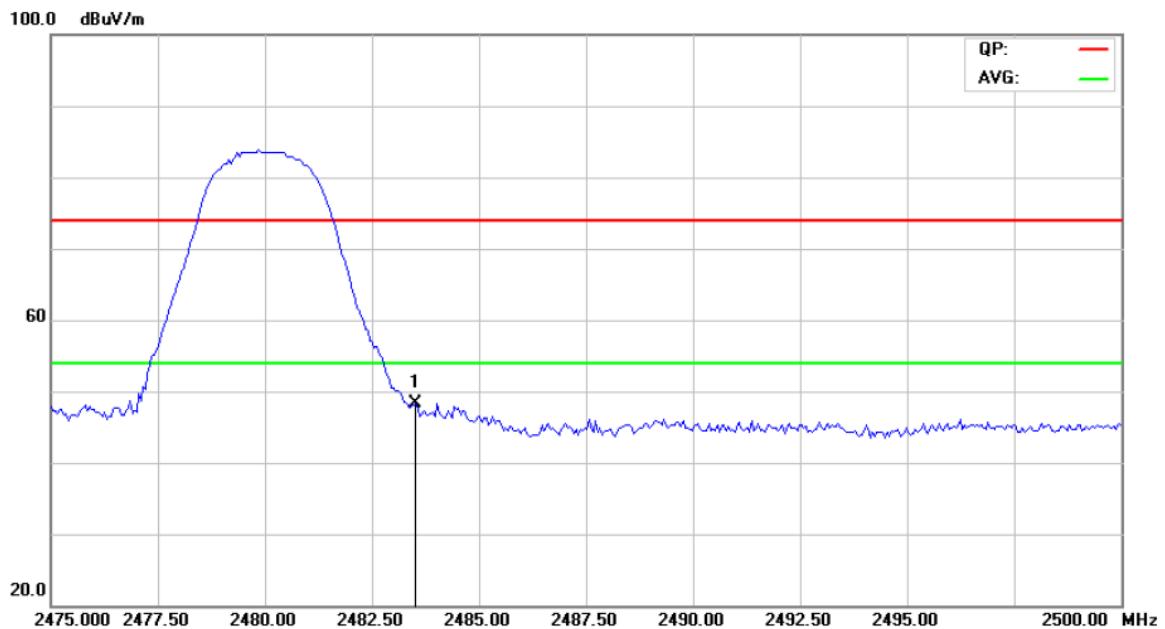
Horizontal:



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

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB Detector
1	*	2483.500	60.15	-12.74	47.41	74.00	-26.59 peak

Vertical:



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

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB Detector
1	*	2483.500	61.01	-12.74	48.27	74.00	-25.73 peak

Above 1GHz

Low channel: 2402 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
4804	H	45.38	---	0.66	46.04	---	74	54	-7.96
7206	H	34.21	---	9.50	43.71	---	74	54	-10.29
---	H	---	---	---	---	---	---	---	---
4804	V	46.04	---	0.66	46.70	---	74	54	-7.30
7206	V	34.99	---	9.50	44.49	---	74	54	-9.51
---	V	---	---	---	---	---	---	---	---

Middle channel: 2440 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
4880	H	43.56	---	0.99	44.55	---	74	54	-9.45
7320	H	33.28	---	9.87	43.15	---	74	54	-10.85
---	H	---	---	---	---	---	---	---	---
4880	V	44.56	---	0.99	45.55	---	74	54	-8.45
7320	V	34.79	---	9.87	44.66	---	74	54	-9.34
---	V	---	---	---	---	---	---	---	---

High channel: 2480 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
4960	H	45.04	---	1.33	46.37	---	74	54	-7.63
7440	H	35.95	---	10.22	46.17	---	74	54	-7.83
---	H	---	---	---	---	---	---	---	---
4960	V	46.17	---	1.33	47.50	---	74	54	-6.50
7440	V	36.20	---	10.22	46.42	---	74	54	-7.58
---	V	---	---	---	---	---	---	---	---

Note:

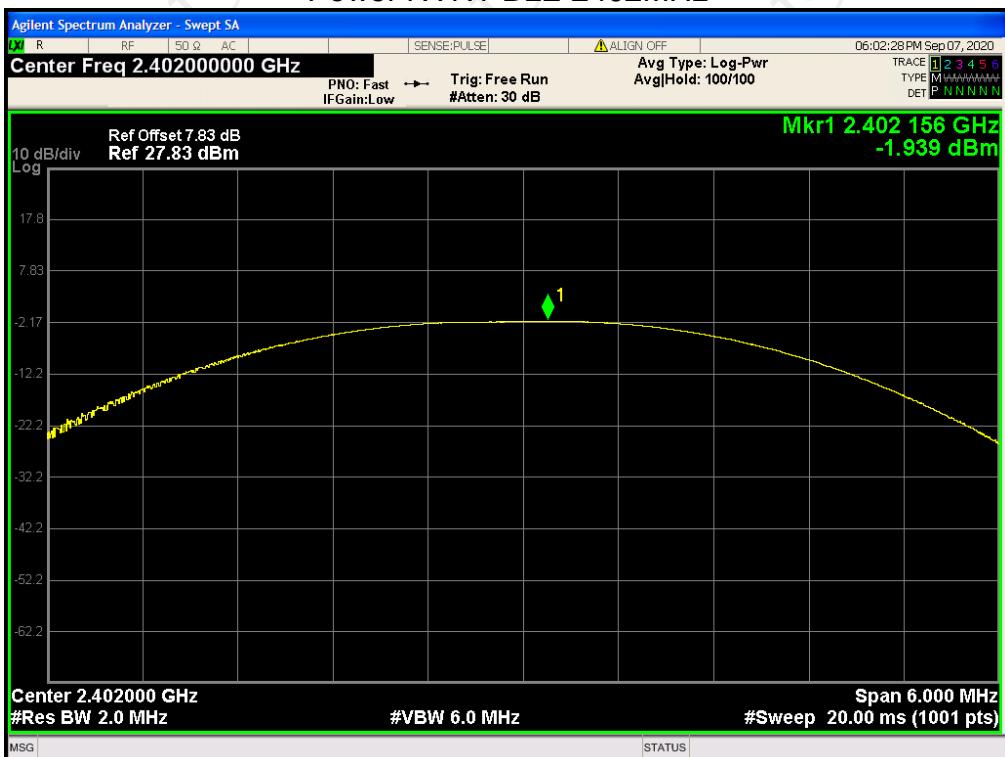
1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dB μ V/m)-Average limit (dB μ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
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

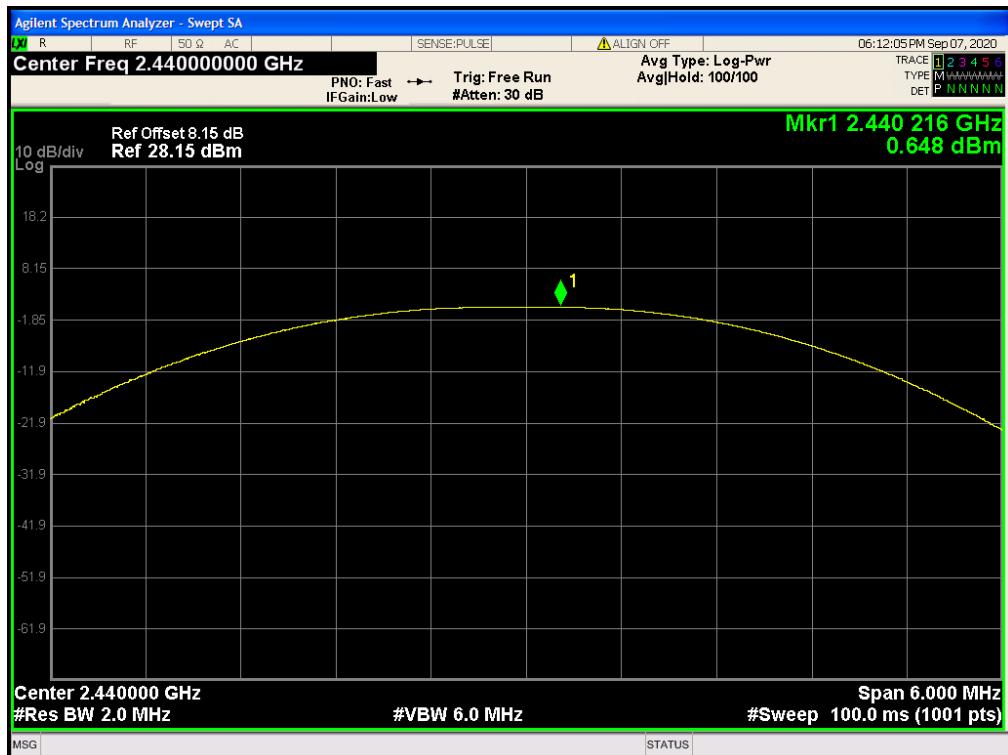
Maximum Conducted Output Power

Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
BLE	2402	-1.939	30	Pass
BLE	2440	0.648	30	Pass
BLE	2480	1.026	30	Pass

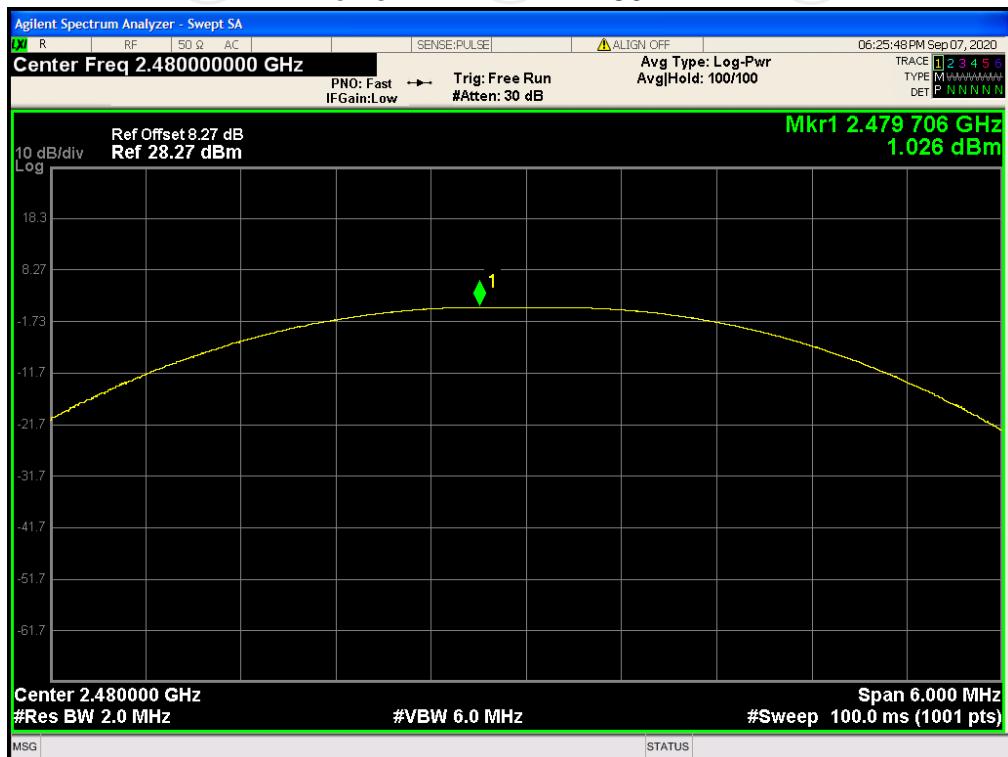
Power NVNT BLE 2402MHz



Power NVNT BLE 2440MHz



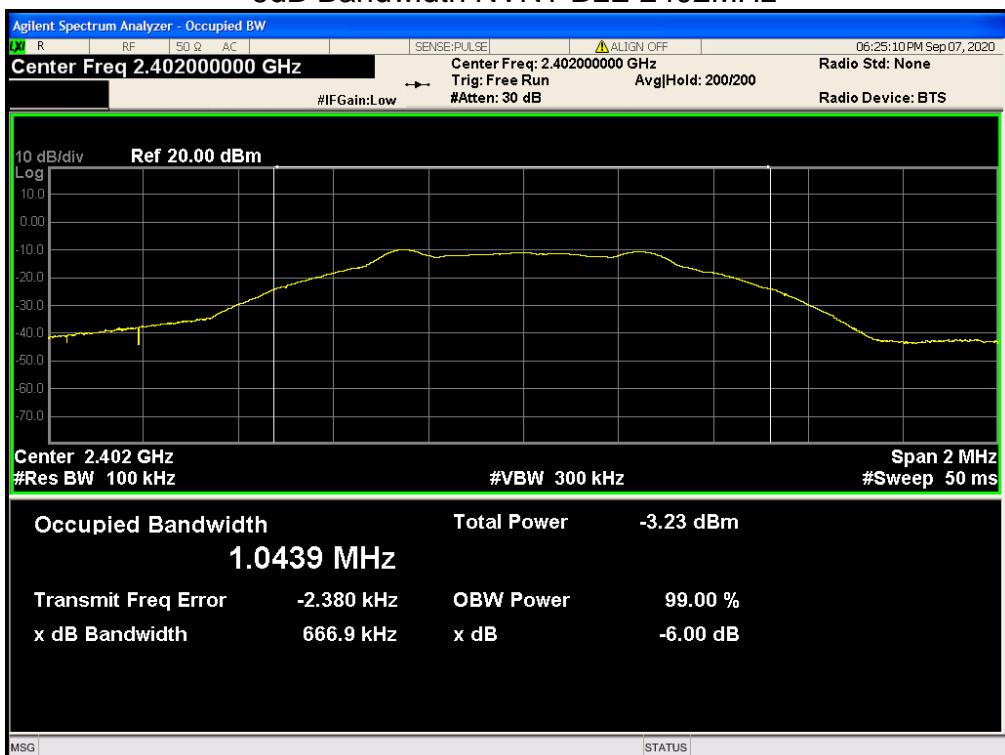
Power NVNT BLE 2480MHz



-6dB Bandwidth

Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
BLE	2402	0.6669	0.5	Pass
BLE	2440	0.6667	0.5	Pass
BLE	2480	0.665	0.5	Pass

-6dB Bandwidth NVNT BLE 2402MHz



-6dB Bandwidth NVNT BLE 2440MHz



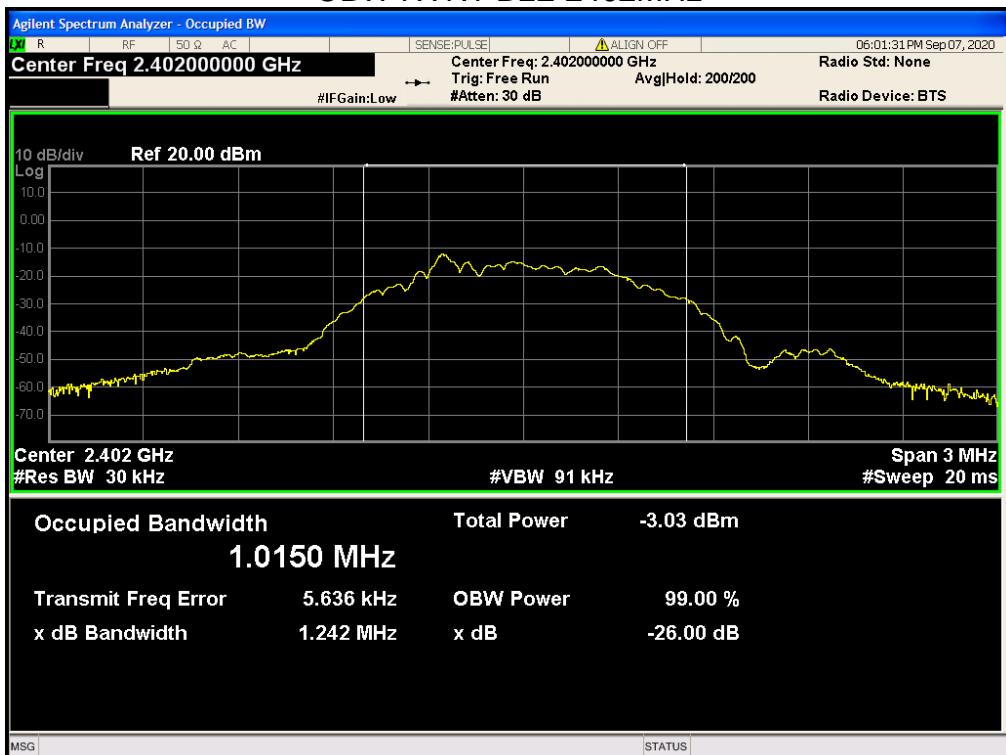
-6dB Bandwidth NVNT BLE 2480MHz



Occupied Channel Bandwidth

Mode	Frequency (MHz)	99% OBW (MHz)	-26 dB Bandwidth (MHz)	Limit -26 dB Bandwidth (MHz)	Verdict
BLE	2402	1.015	1.2416	0.5	Pass
BLE	2440	1.016	1.2428	0.5	Pass
BLE	2480	1.0164	1.2441	0.5	Pass

OBW NVNT BLE 2402MHz



OBW NVNT BLE 2440MHz



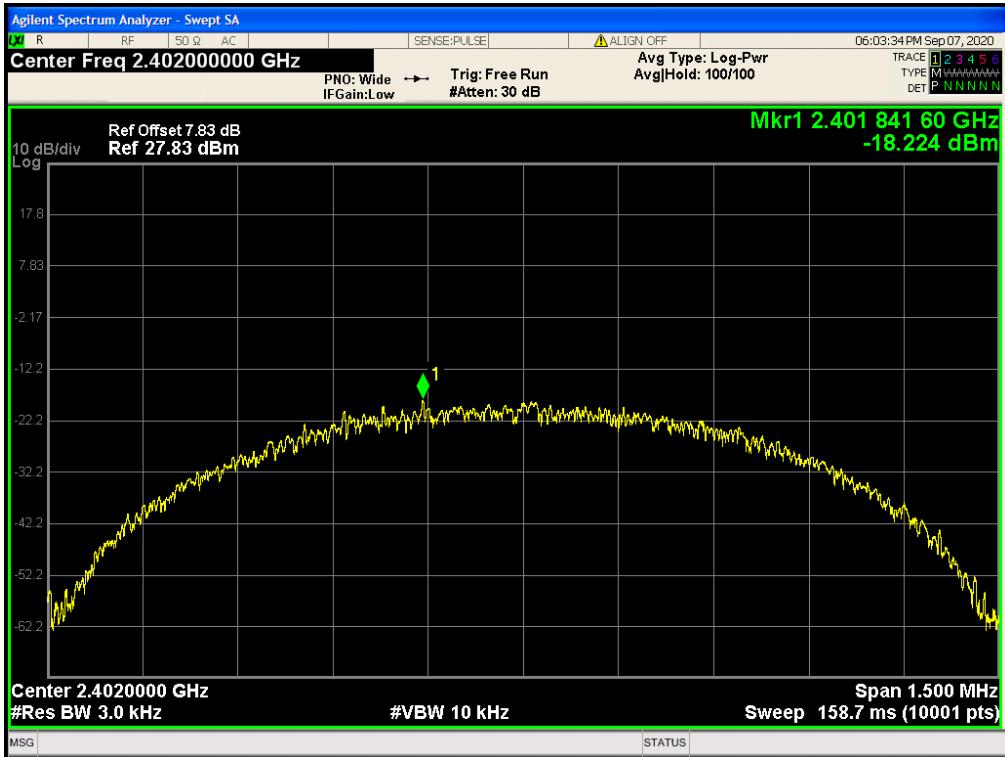
OBW NVNT BLE 2480MHz



Maximum Power Spectral Density Level

Mode	Frequency (MHz)	Max PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
BLE	2402	-18.224	8	Pass
BLE	2440	-15.612	8	Pass
BLE	2480	-15.264	8	Pass

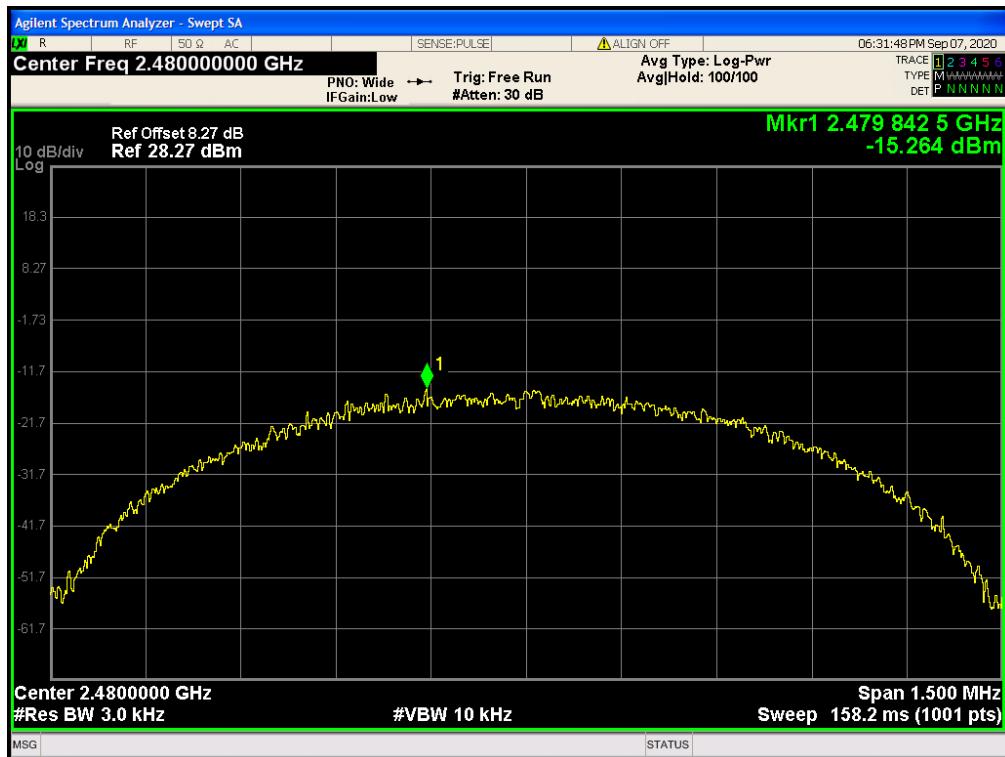
PSD NVNT BLE 2402MHz



PSD NVNT BLE 2440MHz



PSD NVNT BLE 2480MHz



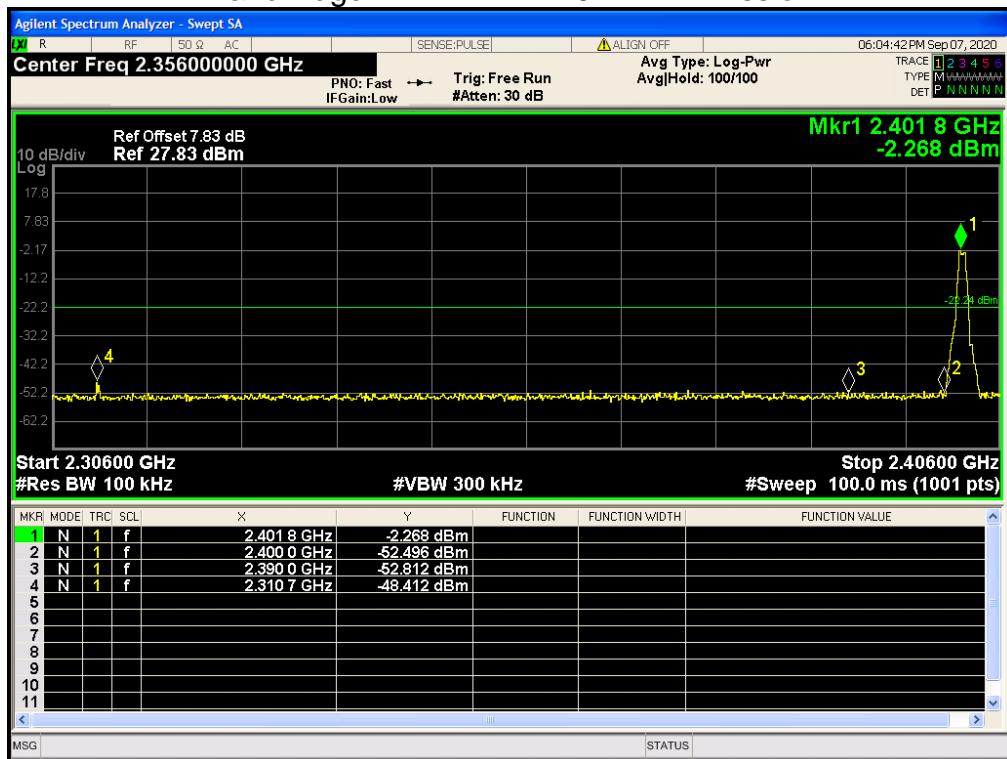
Band Edge

Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
BLE	2402	-46.17	-20	Pass
BLE	2480	-51.81	-20	Pass

Band Edge NVNT BLE 2402MHz Ref



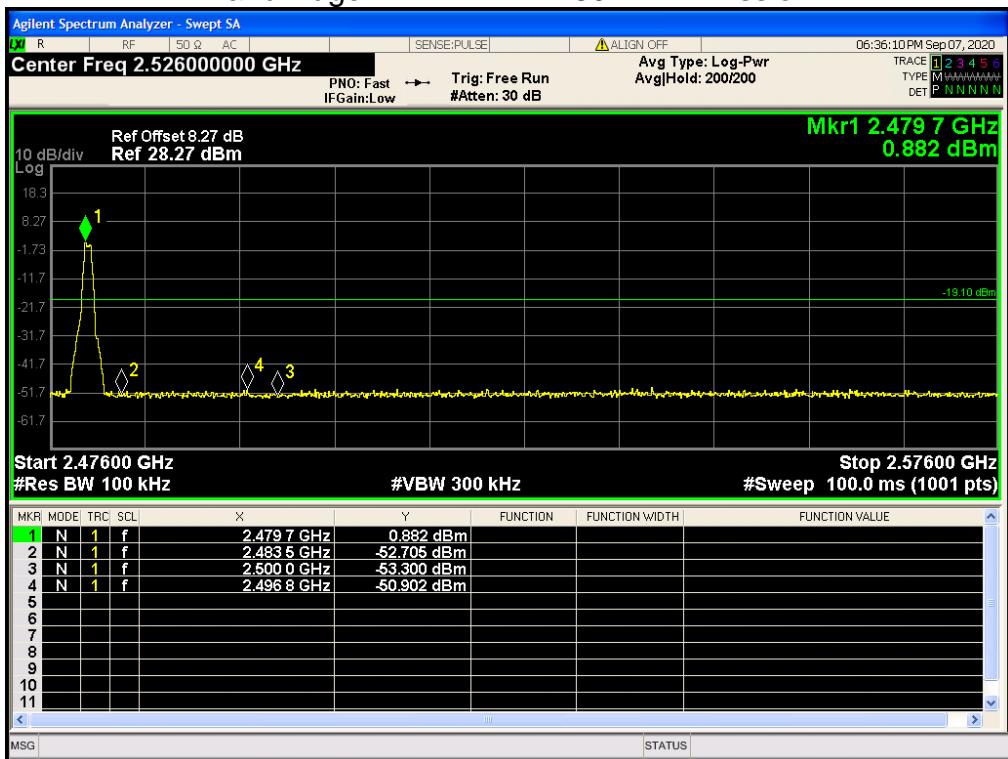
Band Edge NVNT BLE 2402MHz Emission



Band Edge NVNT BLE 2480MHz Ref



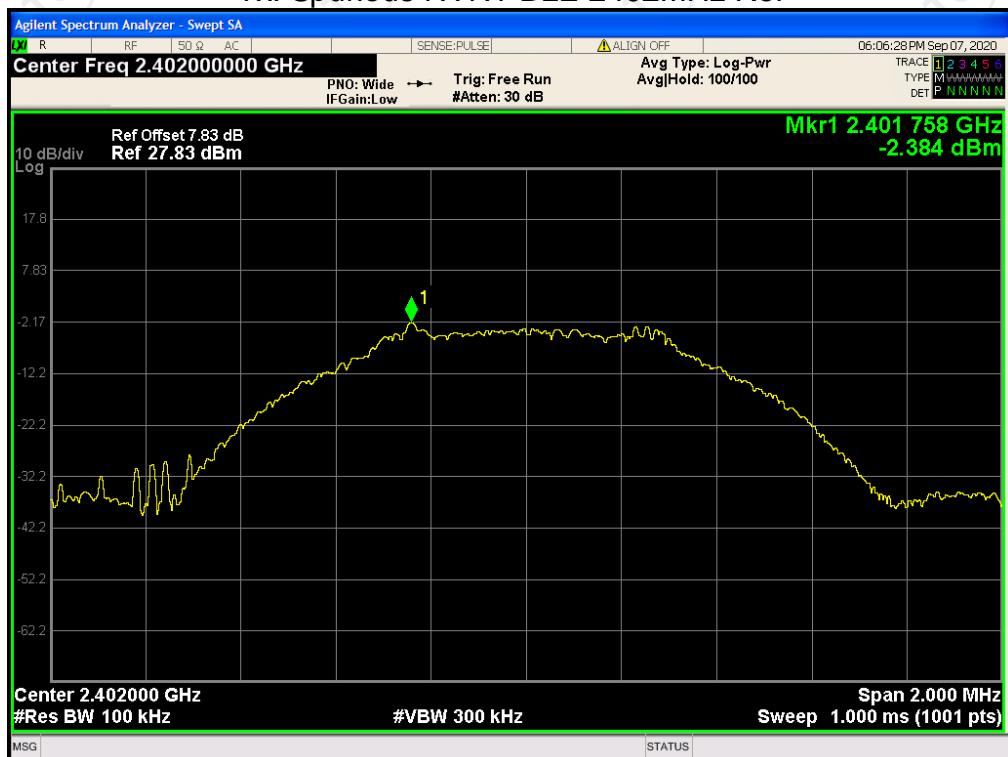
Band Edge NVNT BLE 2480MHz Emission



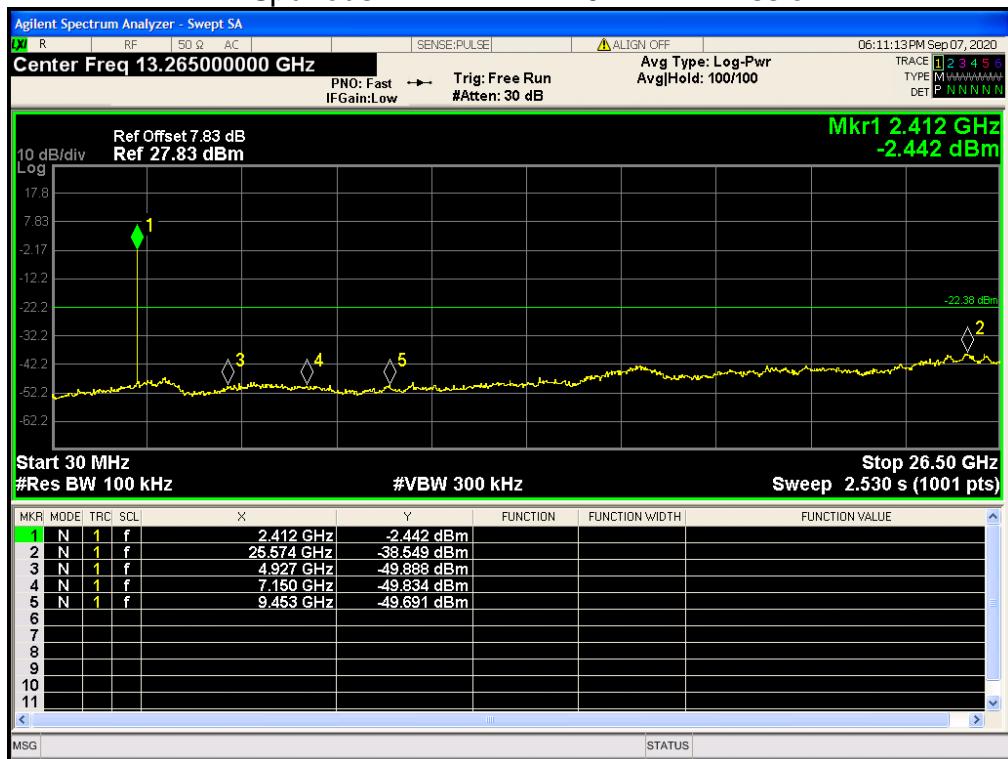
Conducted RF Spurious Emission

Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
BLE	2402	-36.16	-20	Pass
BLE	2440	-38.48	-20	Pass
BLE	2480	-38.38	-20	Pass

Tx. Spurious NVNT BLE 2402MHz Ref



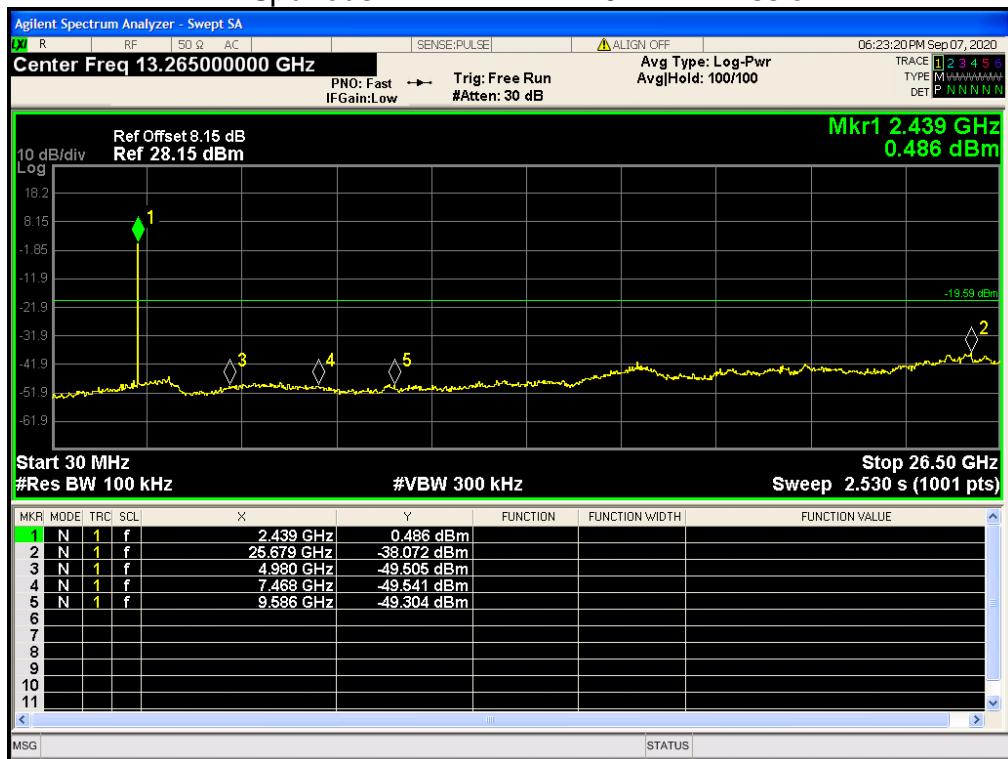
Tx. Spurious NVNT BLE 2402MHz Emission



Tx. Spurious NVNT BLE 2440MHz Ref



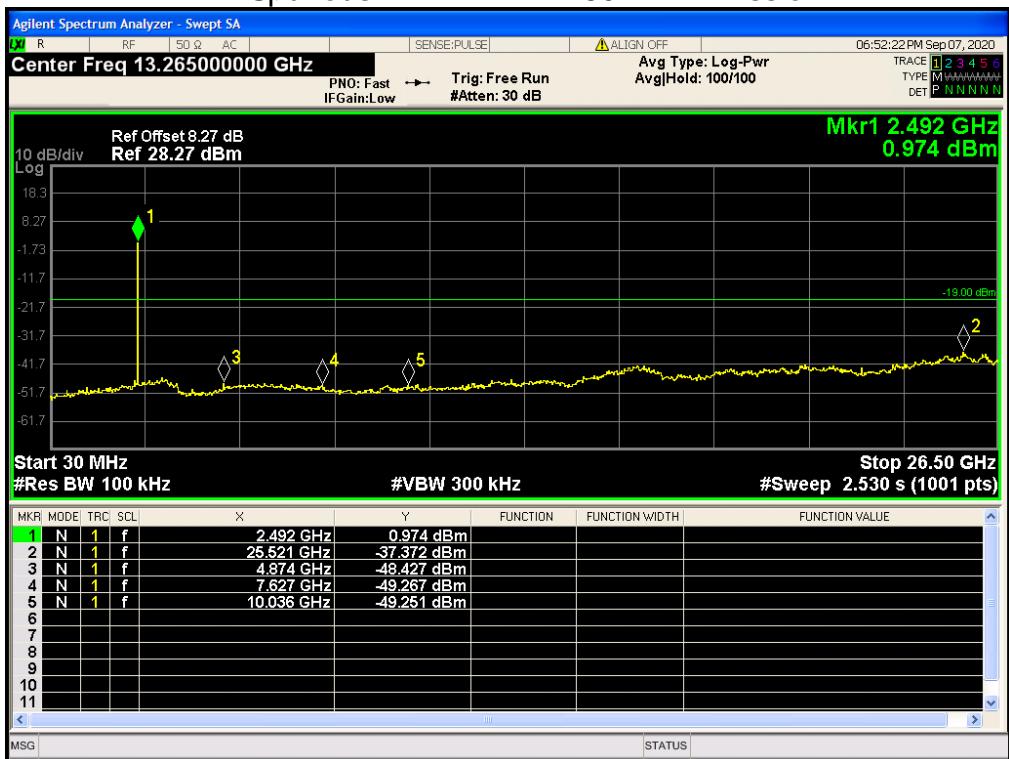
Tx. Spurious NVNT BLE 2440MHz Emission



Tx. Spurious NVNT BLE 2480MHz Ref



Tx. Spurious NVNT BLE 2480MHz Emission



Appendix B: Photographs of Test Setup

Refer to the test report No. TCT200831E010

Appendix C: Photographs of EUT

Refer to the test report No. TCT200831E010

*******END OF REPORT*******