TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: YZHMDLNRF24L0102

Product: Module

Model No.: MDL NRF24L01+ 02

Additional Model No.: N/A

Trade Mark: N/A

Report No.: TCT200730E014

Issued Date: Sep. 07, 2020

Issued for:

Raffel Systems, LLC

N112 W14600 Mequon Road, Germantown, Wisconsin 53022, United States

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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1. Test Certification

Product:	Module
Model No.:	MDL NRF24L01+ 02
Additional Model No.:	N/A
Trade Mark:	**N/A**
Applicant:	Raffel Systems, LLC
Address:	N112 W14600 Mequon Road, Germantown, Wisconsin 53022, United States
Manufacturer:	Xiamen Wellness Technology Co., Ltd.
Address:	No.3 Houbin Road, Xiang'an District, Xiamen, China
Date of Test:	Jul. 31, 2020 – Sep. 07, 2020
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249 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:***	***Sep. 07, 2020***
Reviewed By:	Beryl Zhao	***Date:***	***Sep. 07, 2020***
Approved By:	Tomsin	***Date:***	***Sep. 07, 2020***

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2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Field Strength of Fundamental	§15.249 (a)	PASS
Spurious Emissions	§15.249 (a) (d)/ §15.209	PASS
Band Edge	§15.249 (d)/ §15.205	PASS
20dB Occupied Bandwidth	§15.215 (c)	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:	Module
Model No.:	MDL NRF24L01+ 02
Additional Model No.:	N/A
Trade Mark:	**N/A**
Hardware Version:	REV A
Software Version:	V1.0
Operation Frequency:	2404.6MHz - 2479.6MHz
Number of Channel:	76
Modulation Technology:	GFSK
Antenna Type:	30mm Quarter Wave Monopole Wire Antenna
Antenna Gain:	5.19dBi
Power Supply:	DC 5V

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

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2404.6MHz	19	2423.6MHz	38	2442.6MHz	57	2461.6MHz
1	2405.6MHz	20	2424.6MHz	39	2443.6MHz	58	2462.6MHz
…	…	…	…	…	…	…	…
8	2412.6MHz	27	2431.6MHz	46	2450.6MHz	65	2469.6MHz
9	2413.6MHz	28	2432.6MHz	47	2451.6MHz	66	2470.6MHz
…	…	…	…	…	…	…	…
17	2421.6MHz	36	2440.6MHz	55	2459.6MHz	74	2478.6MHz
18	2422.6MHz	37	2441.6MHz	56	2460.6MHz	75	2479.6MHz

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:

Channel	Frequency
The Lowest channel	2404.6MHz
The Middle channel	2439.6MHz
The Highest channel	2479.6MHz

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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.		

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.

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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

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5.3. Measurement Uncertainty

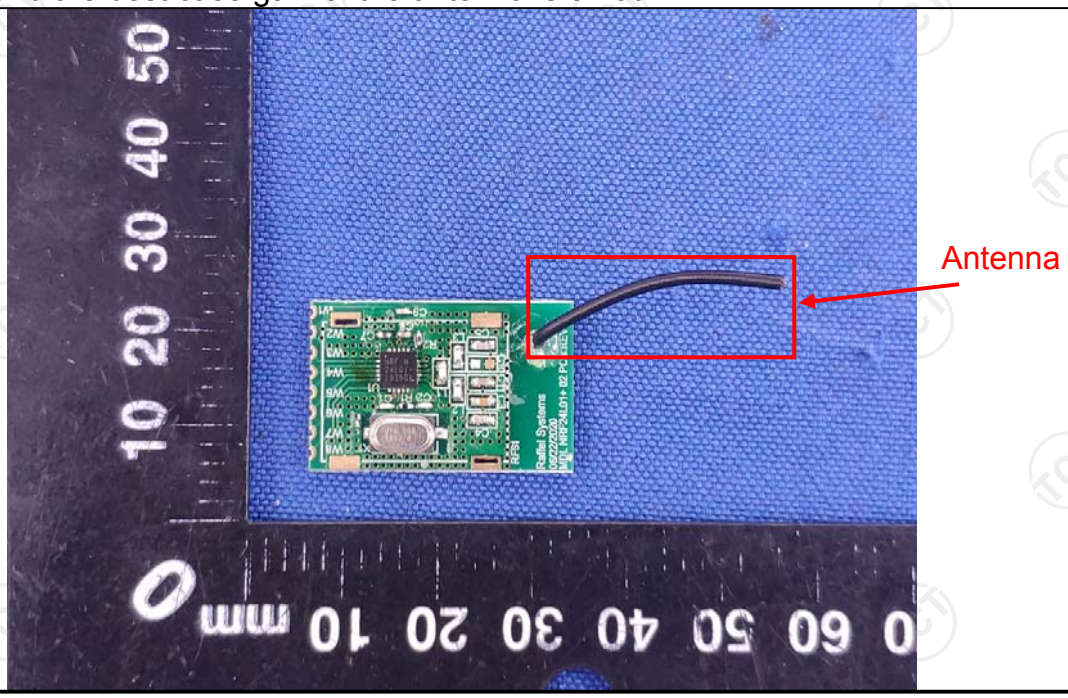
The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

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

6. Test Results and Measurement Data

6.1. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203
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.	
E.U.T Antenna:	
The EUT antenna is 30mm quarter wave monopole wire antenna which permanently attached, and the best case gain of the antenna is 5.19dBi.	



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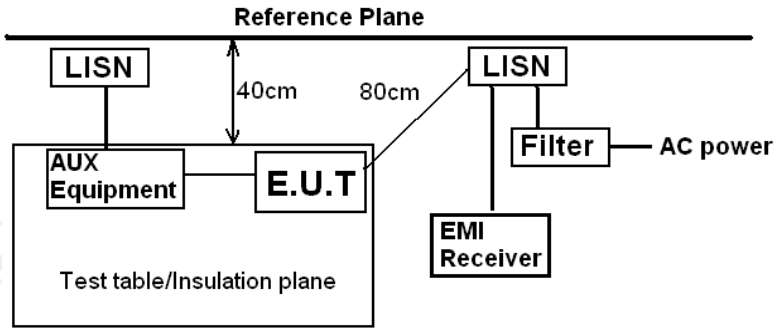
6.2. Conducted Emission

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>Transmitting mode with modulation</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T and simulators are 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. 27, 2021
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).*

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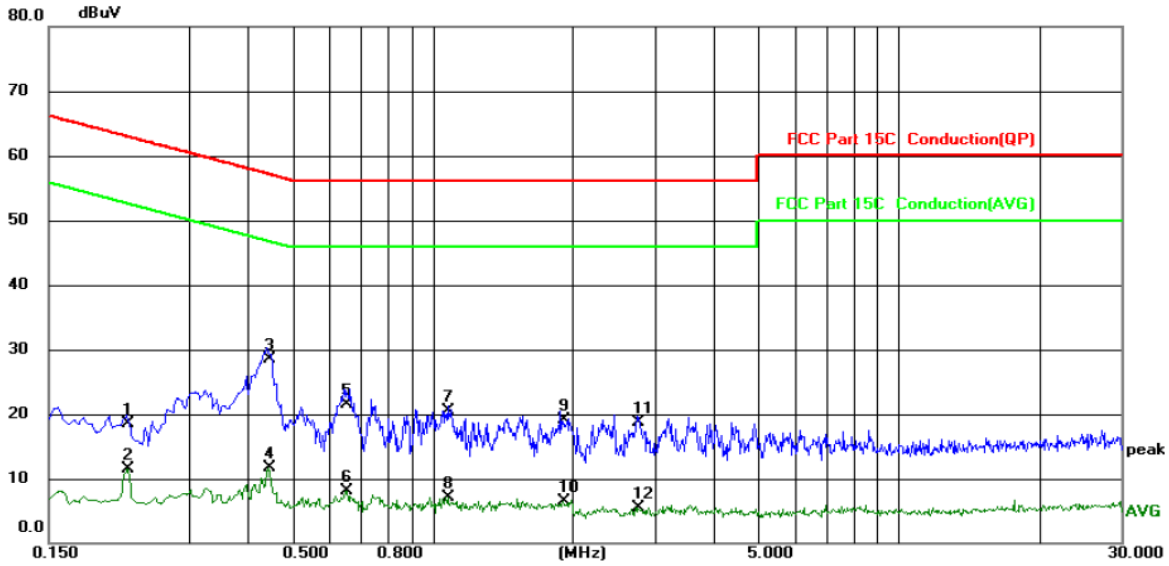
6.2.3. Test data

Please refer to following diagram for individual

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



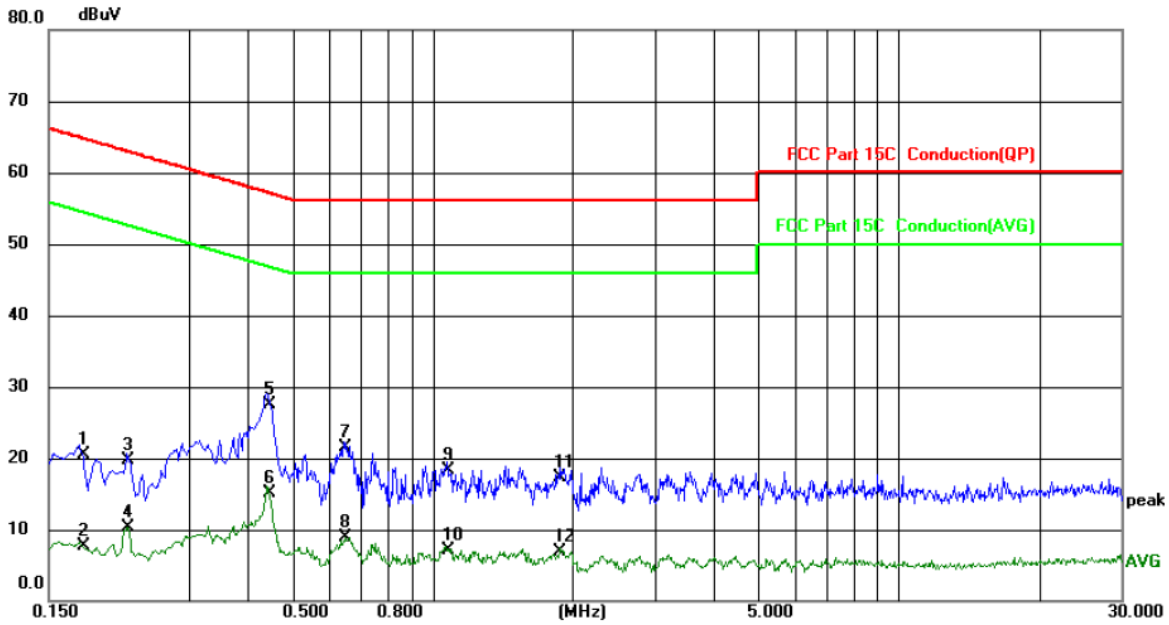
Site	Phase: *L1*	Temperature: 25 (C)
Limit: FCC Part 15C Conduction(QP)	Power:	Humidity: 55 %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2220	8.36	10.13	18.49	62.74	-44.25	QP	
2		0.2220	1.31	10.13	11.44	52.74	-41.30	AVG	
3	*	0.4460	18.29	10.13	28.42	56.95	-28.53	QP	
4		0.4460	1.66	10.13	11.79	46.95	-35.16	AVG	
5		0.6540	11.36	10.12	21.48	56.00	-34.52	QP	
6		0.6540	-1.99	10.12	8.13	46.00	-37.87	AVG	
7		1.0820	10.45	10.12	20.57	56.00	-35.43	QP	
8		1.0820	-2.95	10.12	7.17	46.00	-38.83	AVG	
9		1.9060	9.02	10.12	19.14	56.00	-36.86	QP	
10		1.9060	-3.65	10.12	6.47	46.00	-39.53	AVG	
11		2.7580	8.67	10.12	18.79	56.00	-37.21	QP	
12		2.7580	-4.58	10.12	5.54	46.00	-40.46	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: | Humidity: 55 %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1768	10.36	10.12	20.48	64.63	-44.15	QP	
2		0.1768	-2.38	10.12	7.74	54.63	-46.89	AVG	
3		0.2220	9.56	10.13	19.69	62.74	-43.05	QP	
4		0.2220	0.26	10.13	10.39	52.74	-42.35	AVG	
5	*	0.4460	17.36	10.13	27.49	56.95	-29.46	QP	
6		0.4460	5.03	10.13	15.16	46.95	-31.79	AVG	
7		0.6500	11.34	10.12	21.46	56.00	-34.54	QP	
8		0.6500	-1.24	10.12	8.88	46.00	-37.12	AVG	
9		1.0740	8.26	10.12	18.38	56.00	-37.62	QP	
10		1.0740	-3.09	10.12	7.03	46.00	-38.97	AVG	
11		1.8740	7.13	10.12	17.25	56.00	-38.75	QP	
12		1.8740	-3.26	10.12	6.86	46.00	-39.14	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.Radiated Emission Measurement

6.3.1. 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>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(Field strength of the fundamental signal):</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td rowspan="2">2400MHz-2483.5MHz</td><td>94.00</td><td>Average Value</td></tr>
<tr><td>114.00</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit(Spurious Emissions):</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>Quasi-peak Value</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>Quasi-peak Value</td></tr>
<tr><td>1.705-30</td><td>30</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit (band edge) :</td><td>Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.</td></tr>
<tr><td>Test Procedure:</td><td>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.</td></tr>
</table>

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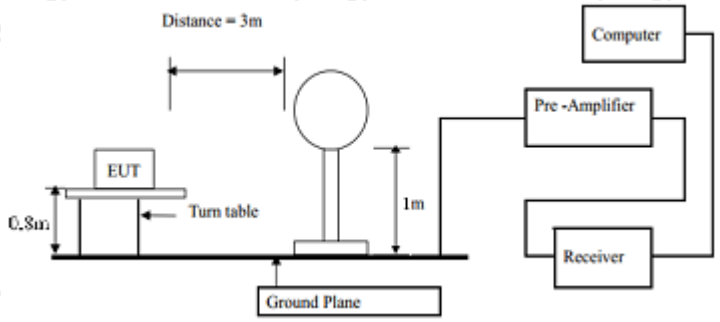
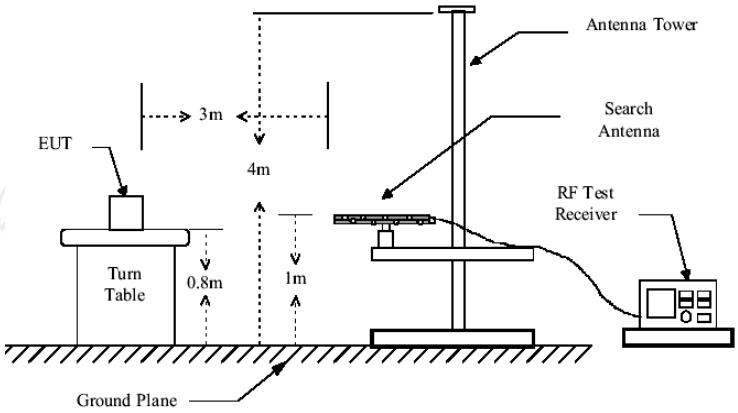
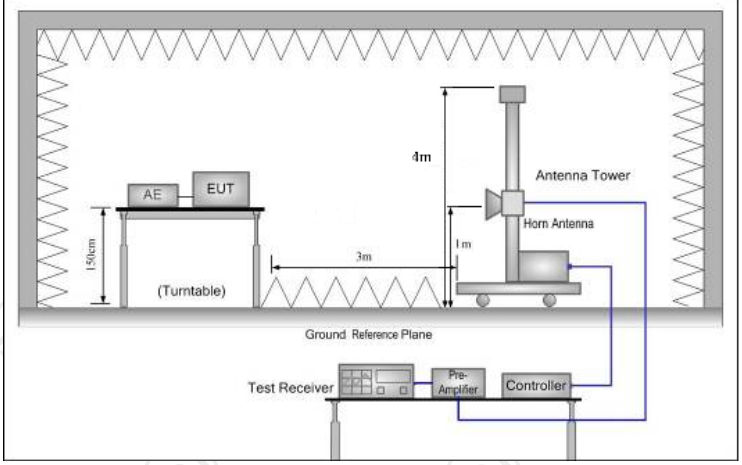
	4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test setup:	For radiated emissions below 30MHz  30MHz to 1GHz  Above 1GHz (The diagram below shows the test setup that is utilized to make the measurements for emission from 1GHz to the tenth harmonic of the highest fundamental frequency or to 40GHz emissions, whichever is lower.)

	
Test results:	PASS

6.3.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	ROHDE&SCHWARZ	ESIB7	100197	Jul. 27, 2021
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. 11, 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).*

6.3.3. Test Data

Field Strength of Fundamental

Frequency (MHz)	Emission PK (dBuV/m)	Horizontal /Vertical	Limits PK (dBuV/m)	Margin (dB)
2404.6	77.25	H	114	-36.75
2404.6	75.61	V	114	-38.39
2439.6	79.73	H	114	-34.27
2439.6	76.26	V	114	-37.74
2479.6	78.48	H	114	-35.52
2479.6	75.39	V	114	-38.61

Frequency (MHz)	Emission AV (dBuV/m)	Horizontal /Vertical	Limits AV (dBuV/m)	Margin (dB)
2404.6	66.78	H	94	-27.22
2404.6	64.52	V	94	-29.48
2439.6	65.17	H	94	-28.83
2439.6	64.36	V	94	-29.64
2479.6	66.92	H	94	-27.08
2479.6	64.68	V	94	-29.32

Spurious Emissions

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: *1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor.*

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

3. For fundamental frequency, RBW >20dB BW , VBW>=RBW, PK detector is for PK value, RMS detector is for AV value.

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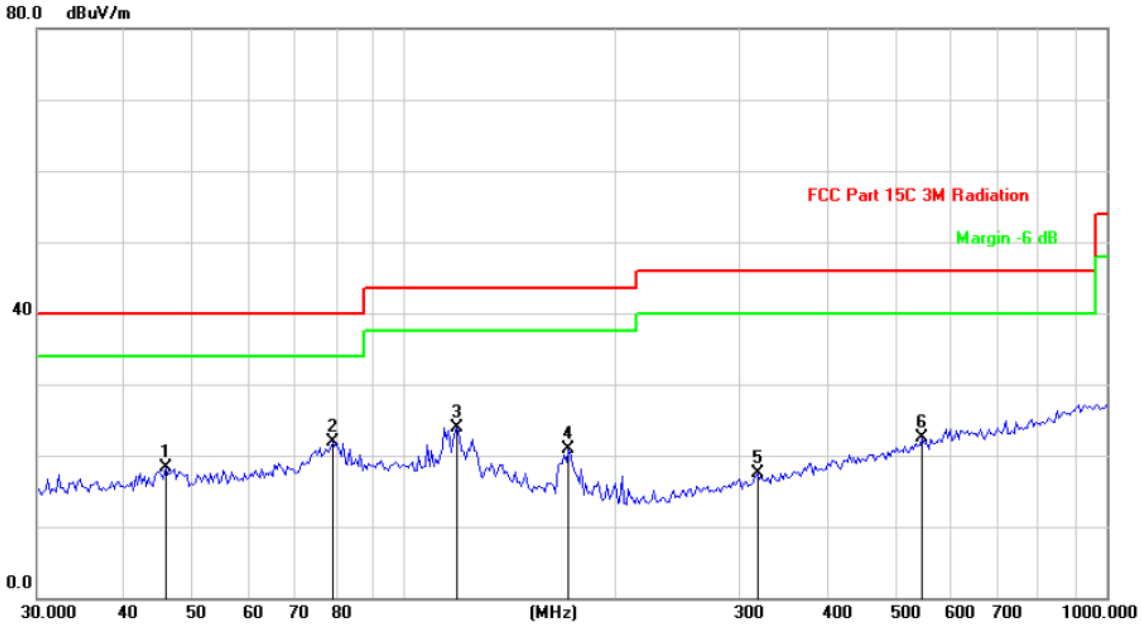
Frequency Range (30MHz-1GHz)

Horizontal:

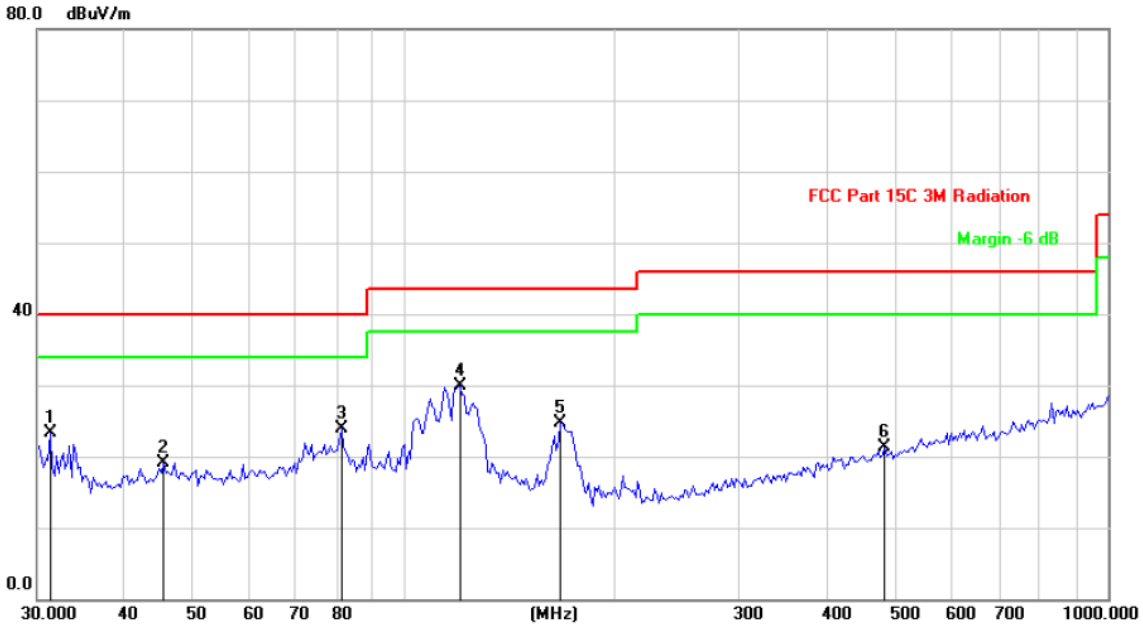


Site | Polarization: *Horizontal* | Temperature: 25

Limit: FCC Part 15C 3M Radiation | Power: DC 5V | Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		45.7333	28.79	-10.58	18.21	40.00	-21.79	peak
2	*	79.1185	38.90	-16.92	21.98	40.00	-18.02	peak
3		118.9285	35.66	-11.68	23.98	43.50	-19.52	peak
4		171.3890	36.54	-15.61	20.93	43.50	-22.57	peak
5		318.0875	28.16	-10.56	17.60	46.00	-28.40	peak
6		546.4368	29.16	-6.75	22.41	46.00	-23.59	peak

Vertical:



Site | Polarization: *Vertical* | Temperature: 25

Limit: FCC Part 15C 3M Radiation | Power: DC 5V | Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		31.2919	34.40	-11.14	23.26	40.00	-16.74	peak
2		45.4130	29.70	-10.62	19.08	40.00	-20.92	peak
3		81.3740	40.11	-16.17	23.94	40.00	-16.06	peak
4	*	119.7672	41.86	-11.90	29.96	43.50	-13.54	peak
5		166.6385	40.60	-15.83	24.77	43.50	-18.73	peak
6		481.5112	28.79	-7.56	21.23	46.00	-24.77	peak

Note: *1. Measurements were conducted in all channels (high, middle, low), and the worst case (high channel) was submitted only.*
2. Any value more than 10dB below limit have not been specifically reported.

Above 1GHz

Low channel: 2404.6MHz									
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)			
4809.20	H	52.04	---	-3.94	48.10	---	74	54	-5.90
7213.80	H	46.27	---	0.52	46.79	---	74	54	-7.21
---	---	---	---	---	---	---	---	---	---
4809.20	V	49.79	---	-3.94	45.85	---	74	54	-8.15
7213.80	V	43.23	---	0.52	43.75	---	74	54	-10.25
---	---	---	---	---	---	---	---	---	---

Middle channel: 2439.6MHz									
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)			
4879.20	H	51.26	---	-3.98	47.28	---	74	54	-6.72
7318.80	H	46.05	---	0.57	46.62	---	74	54	-7.38
---	---	---	---	---	---	---	---	---	---
4879.20	V	51.38	---	-3.98	47.40	---	74	54	-6.60
7318.80	V	45.24	---	0.57	45.81	---	74	54	-8.19
---	---	---	---	---	---	----	---	---	---

High channel: 2479.6MHz									
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)			
4959.20	H	52.81	---	-3.98	48.83	---	74	54	-5.17
7438.80	H	47.95	---	0.57	48.52	---	74	54	-5.48
---	---	---	---	---	---	---	---	---	---
4959.20	V	51.53	---	-3.98	47.55	---	74	54	-6.45
7438.80	V	45.77	---	0.57	46.34	---	74	54	-7.66
---	---	---	---	---	---	---	---	---	---

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.*
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.*

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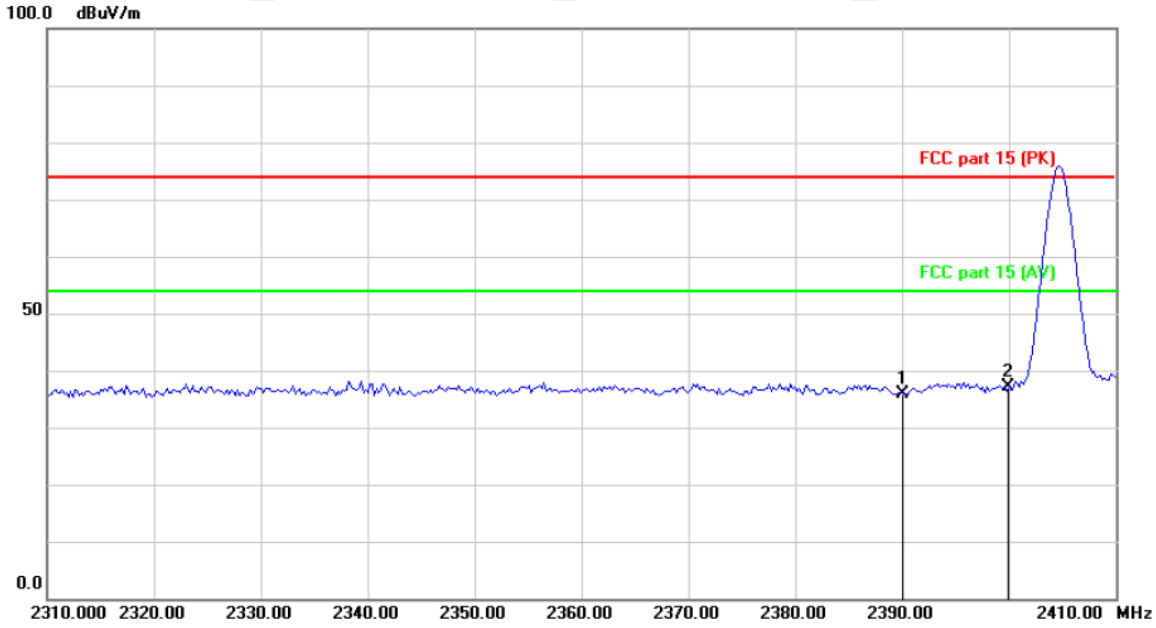
Band Edge Requirement

Lowest channel 2404.6:

Horizontal:



Site

Limit: FCC part 15 (PK)

Polarization: *Horizontal*

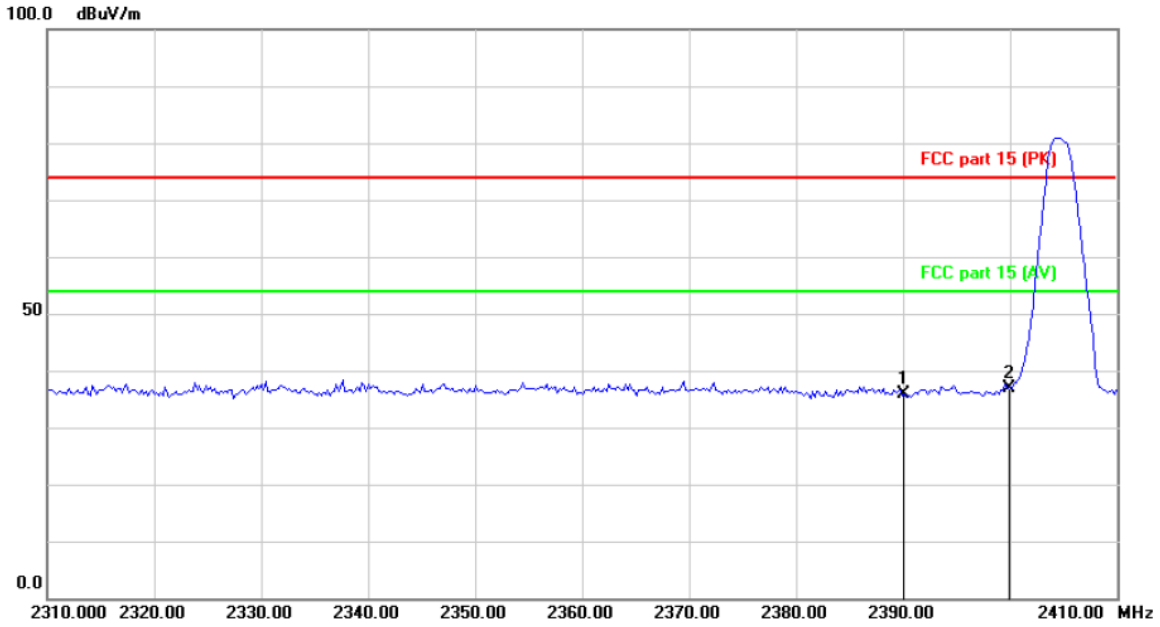
Power:

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	49.07	-13.15	35.92	74.00	-38.08	peak
2	*	2400.000	50.36	-13.12	37.24	74.00	-36.76	peak

Vertical:

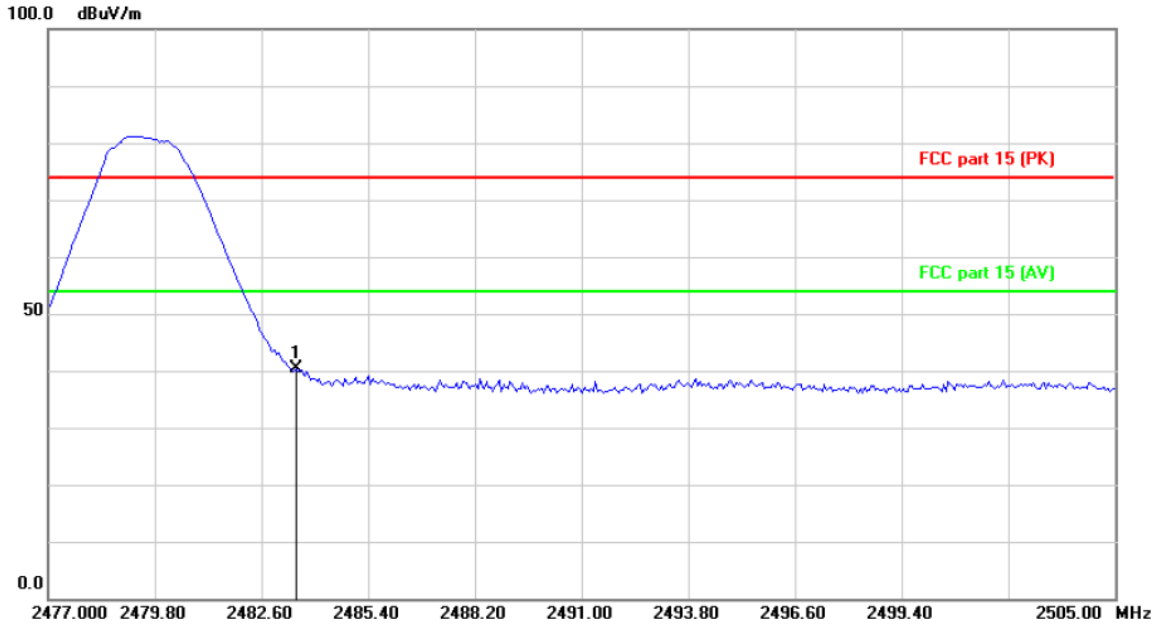


Site
Limit: FCC part 15 (PK)
Polarization: *Vertical*
Power:
Temperature: 25
Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		2390.000	48.99	-13.15	35.84	74.00	-38.16	peak
2	*	2400.000	50.08	-13.12	36.96	74.00	-37.04	peak

Highest channel 2479.6:

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	*	2483.500	53.29	-12.84	40.45	74.00	-33.55	peak

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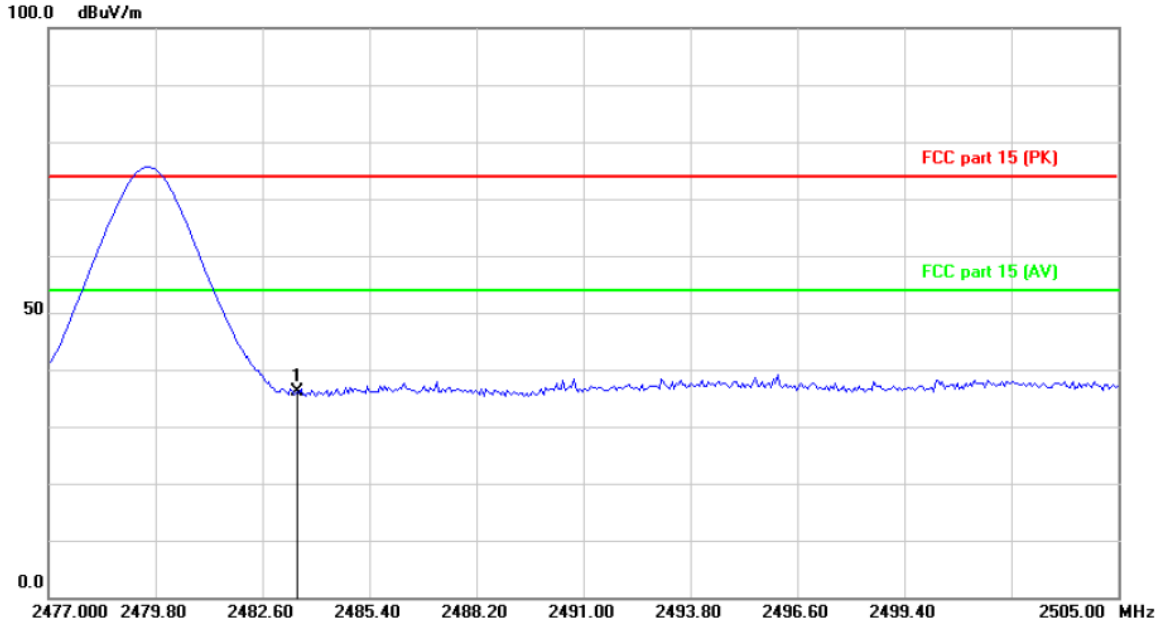
Vertical:



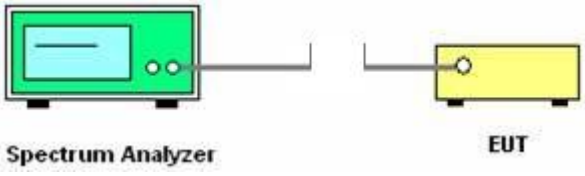
Site
Limit: FCC part 15 (PK)
Polarization: *Vertical*
Power:
Temperature: 25
Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	2483.500	49.04	-12.84	36.20	74.00	-37.80	peak

Note: *Measurements were conducted in all channels (high, middle, low), and the worst case (high channel) was submitted only.*

6.4. 20dB Occupied Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.215(c)
Test Method:	ANSI C63.10: 2013
Limit:	N/A
	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW≥1% of the 20 dB bandwidth; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold. 4. Measure and record the results in the test report.
Test setup:	
Test Mode:	Transmitting mode with modulation
Test results:	PASS

6.4.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	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).*

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6.4.3. Test data

Test Channel	20dB Occupy Bandwidth (kHz)	Limit	Conclusion
Lowest	573.72	---	PASS
Middle	548.08	---	PASS
Highest	557.69	---	PASS

Test plots as follows:

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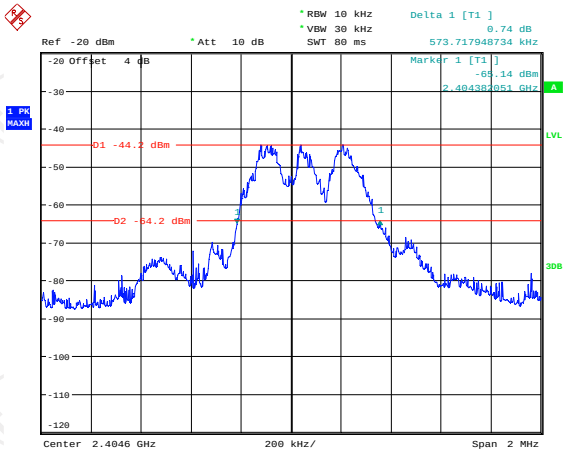
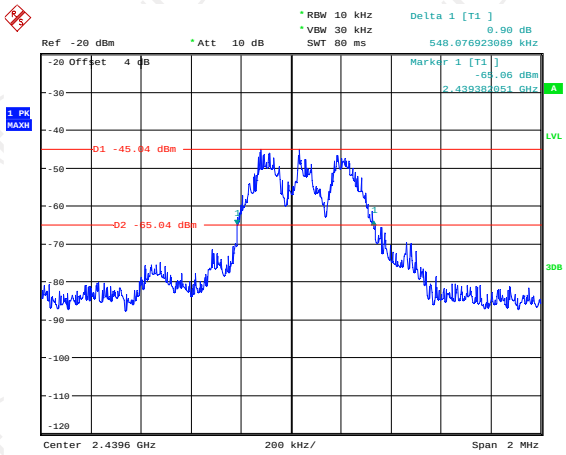
Lowest channel



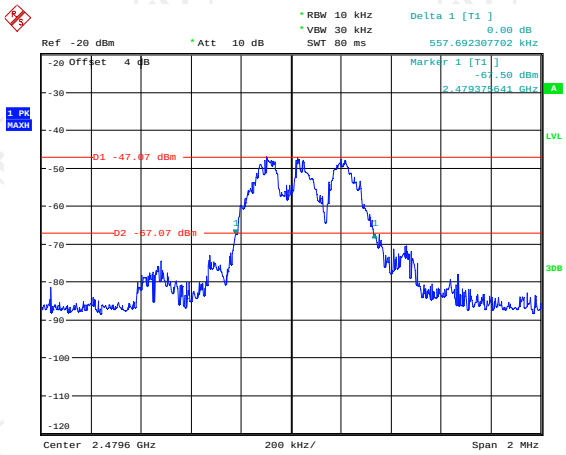
Date: 7.SEP.2020 11:39:56

Middle channel



Date: 7.SEP.2020 11:42:56

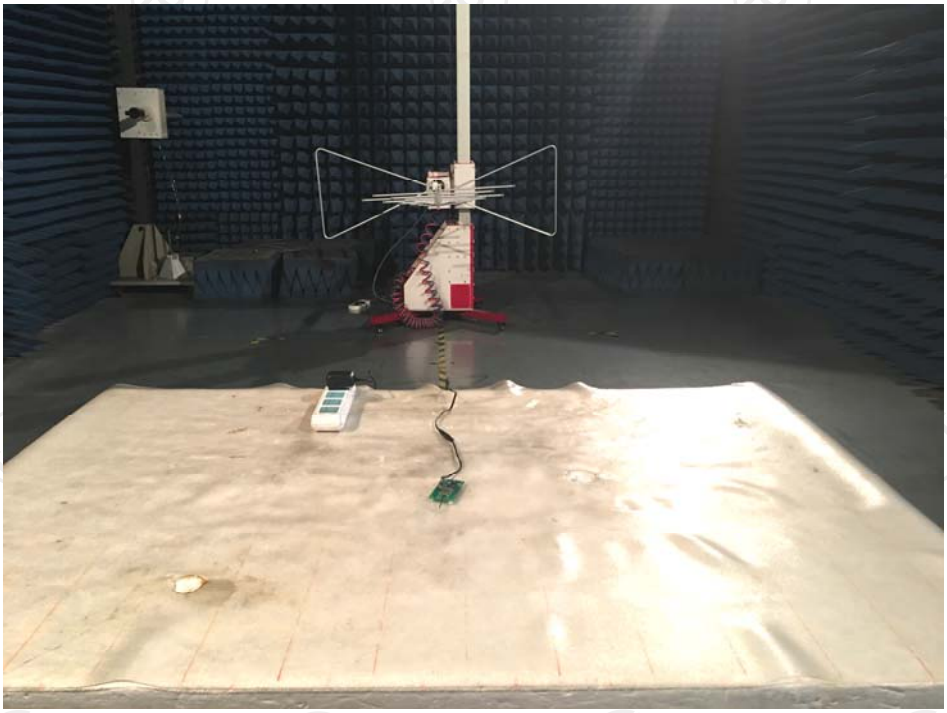
Highest channel

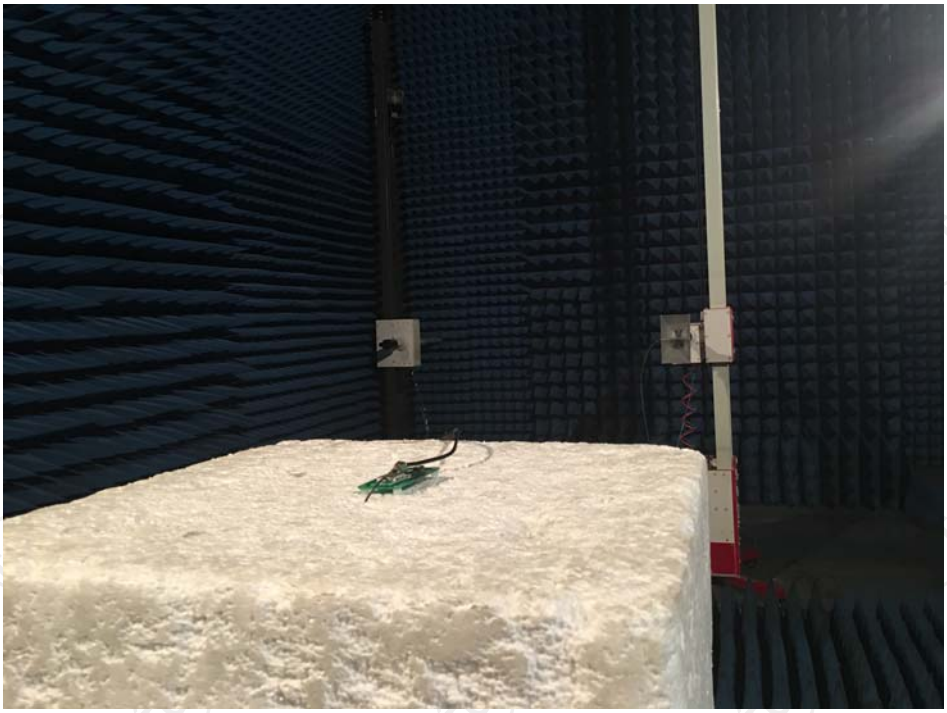


Date: 7.SEP.2020 11:44:19

Appendix A: Photographs of Test Setup

Product: Module
Model: MDL NRF24L01+ 02
Radiated Emission





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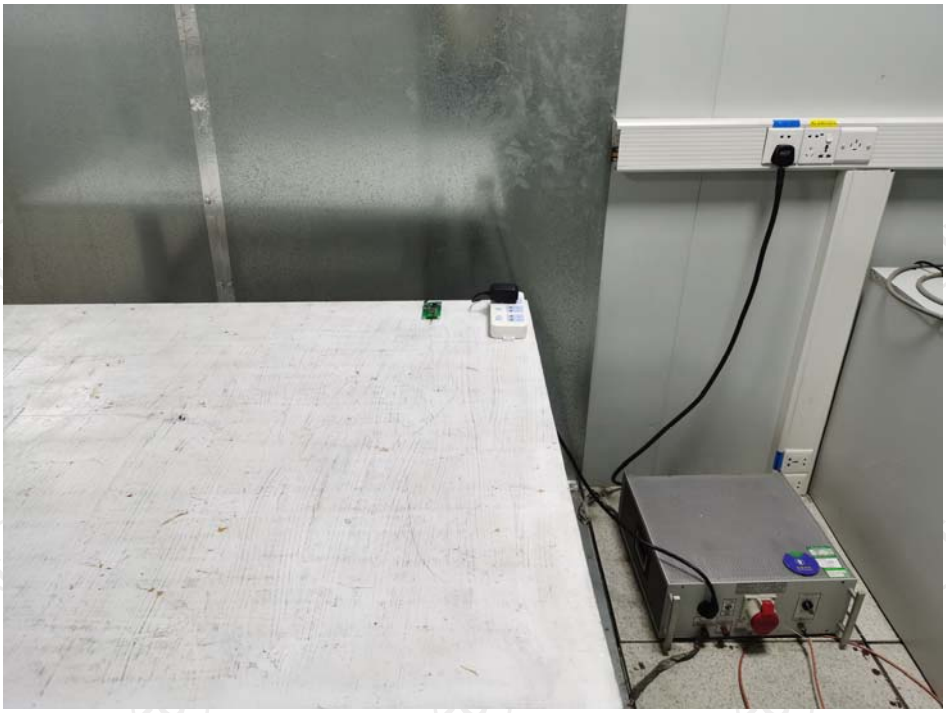
CE

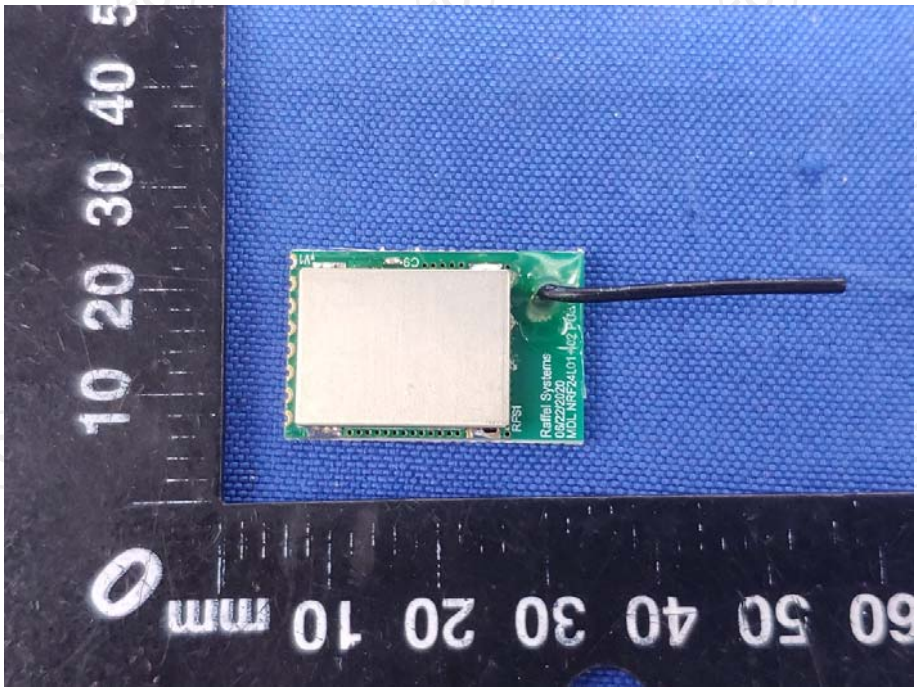


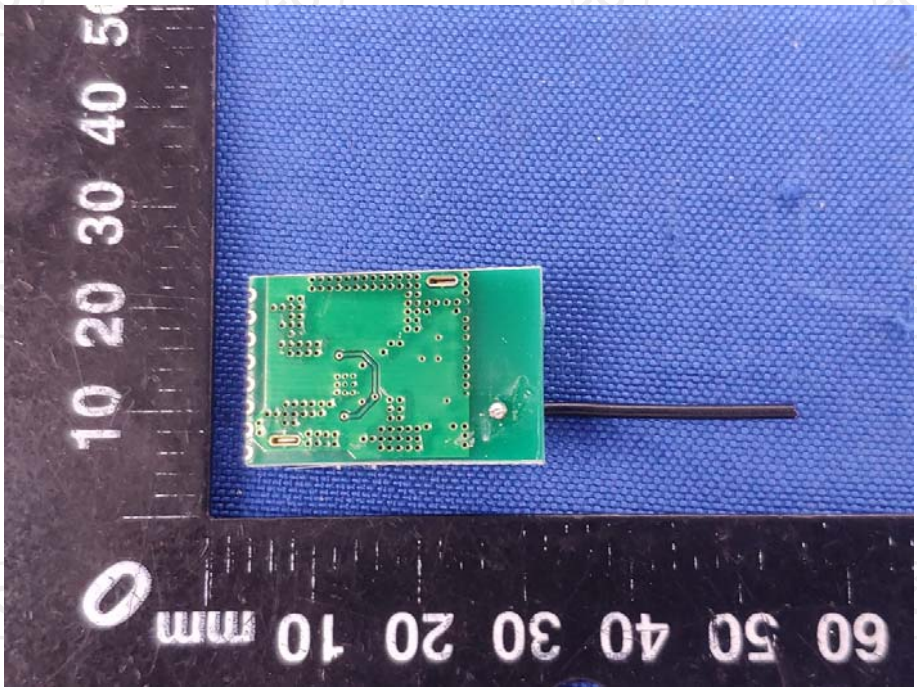
Appendix B: Photographs of EUT

Product: Module

Model: MDL NRF24L01+ 02

External Photos





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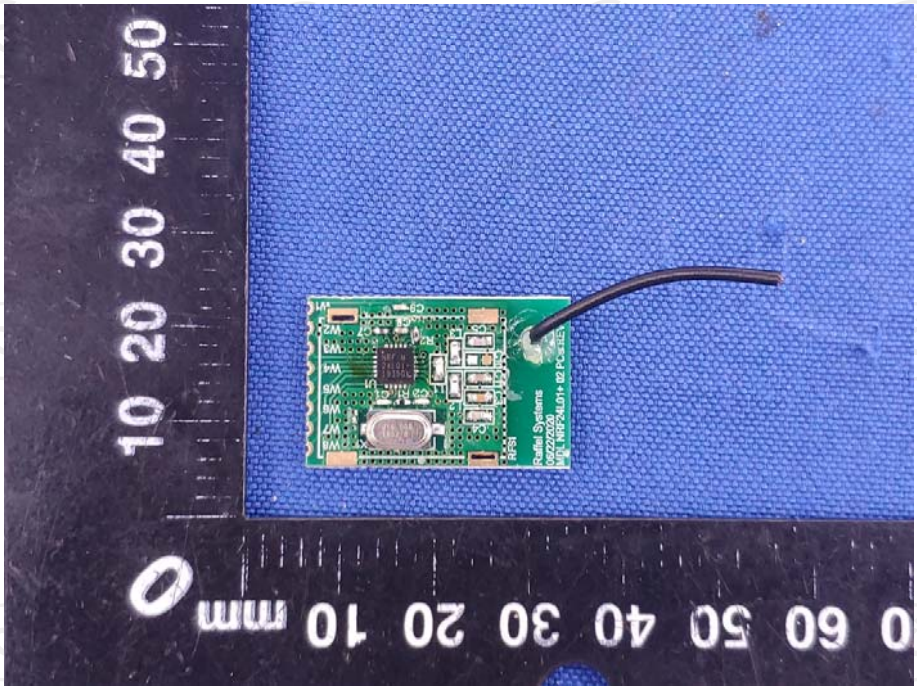
Product: Module
Model: MDL NRF24L01+ 02
Internal Photos



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

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