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TEST REPORT

FOR FCC PART 15 SUBPART C 15.249

Report Reference No.....: **CTL2108253012-WF02**

Compiled by: (position+printed name+signature)	Happy Guo (File administrators)	Happy Guo
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Approved by: (position+printed name+signature)	Ivan Xie (Manager)	Ivan Xie

Product Name..... :	HandHeld 2D Barcode Wireless Scann
Model/Type reference.....:	NT1642PW
List Model(s).....:	See the next page
Trade Mark..... :	NEWTOLOGIC
FCC ID..... :	2A3EL-NT1642PW
Applicant's name..... :	**Newtologic Optoelectronics CO., LTD**
Address of applicant.....:	58 Dongfu Road, Suzhou, China
Test Firm.....:	**Shenzhen CTL Testing Technology Co., Ltd.**
Address of Test Firm.....:	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
Test specification.....:	
Standard..... :	**FCC Part 15.249:**Operation within the bands 920-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0 - 24.25 GHz.
TRF Originator.....:	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF..... :	Dated 2011-01
Date of receipt of test item..... :	Sept. 13, 2021
Date of Test Date.....:	Sept. 13, 2021-Oct. 29, 2021
Data of Issue.....:	Nov. 01, 2021
Result..... :	**Pass**

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TEST REPORT

Test Report No. :	CTL2108253012-WF02	Nov. 01, 2021 Date of issue

Equipment under Test	:	HandHeld 2D Barcode Wireless Scann
Sample No.	:	CTL210825301-1-S002
Model /Type	:	NT1642PW
Listed Models	:	NT1610SW, NT1610PW, NT1620SW, NT1620PW, NT1630SW, NT1630PW, NT1640SW, NT1640PW, NT1640HW, NT1640HDW, NT1650SW, NT1650PW, NT1660SW, NT1660PW, NT1670SW, NT1670PW, NT1680SW, NT1680PW, NT1690SW, NT1690PW, NT1920SW, NT1920PW, NT1642SW, NT1642HW, NT1642HDW, VS430SW, VS401, VS402
Applicant	:	**Newtologic Optoelectronics CO., LTD**
Address	:	58 Dongfu Road, Suzhou, China
Manufacturer	:	**Newtologic Optoelectronics CO., LTD**
Address	:	58 Dongfu Road, Suzhou, China

Test result	**Pass ***

∗ In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

** Modified History **

Revision	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2021-11-01	CTL2108253012-WF02	Tracy Qi

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.249: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

ANSI C63.10:2020 : American National Standard for Testing Unlicensed Wireless Devices

1.2. Test Description

FCC PART 15.249		
FCC Part 15.249(a)	Field Strength of Fundamental	PASS
FCC Part 15.209	Spurious Emission	PASS
FCC Part 15.209	Band edge	PASS
FCC Part 15.215(c)	20dB bandwidth	PASS
FCC Part 15.207	Conducted Emission	PASS
FCC Part 15.203	Antenna Requirement	PASS

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

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

CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: 9618B

CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B on Jan. 22, 2019.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	Above 1GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	HandHeld 2D Barcode Wireless Scann
Model/Type reference:	NT1642PW
Power supply:	DC 3.7V from battery
Hardware version:	N/A
Software version:	25AA0500006
Bluetooth LE	
Supported type:	Bluetooth Low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	PCB Antenna
Antenna gain:	0.55dBi
2.4G	
Modulation:	GFSK
Operation frequency:	2410MHz~2470MHz
Channel number:	61
Channel separation:	1MHz
Antenna type:	Spring Antenna
Antenna gain:	0.53dBi

Note 1: For more details, refer to the user's manual of the EUT.
Note 2: Antenna gain provided by the applicant.
Note 3: This report is for 2.4G only.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 133 channels provided to the EUT and Channel 01/69/133 were selected for testing.

Operation Frequency List：

Channel	Frequency (MHz)
01	**2410**
02	2411
03	2412
⋮	⋮
31	**2440**
⋮	⋮
59	2468
60	2469
61	**2470**

Note: The line display in grey is the channel selected to perform test.

2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ESH2-Z5	860014/010	2021/05/13	2022/05/12
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2021/04/06	2022/04/05
EMI Test Receiver	R&S	ESCI	1166.5950.03	2021/05/16	2022/05/15
Spectrum Analyzer	Agilent	E4407B	MY41440676	2021/05/12	2022/05/11
Spectrum Analyzer	Agilent	N9020A	US46220290	2021/05/12	2022/05/11
Spectrum Analyzer	Keysight	N9020A	MY53420874	2021/05/12	2022/05/11
Controller	EM Electronics	EM 1000	060859	2021/05/18	2022/05/17
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2021/05/18	2022/05/17
Active Loop Antenna	Da Ze	ZN30900A	/	2021/05/18	2022/05/17
Amplifier	Agilent	8449B	3008A02306	2021/05/13	2022/05/12
Amplifier	Agilent	8447D	2944A10176	2021/05/13	2022/05/12
Temperature/Humidity Meter	Gangxing	CTH-608	02	2021/05/14	2022/05/13
Power Sensor	Agilent	U2021XA	MY55130004	2021/05/12	2022/05/11
Power Sensor	Agilent	U2021XA	MY55130006	2021/05/12	2022/05/11
Spectrum Analyzer	RS	FSP	1164.4391.38	2021/05/13	2022/05/12

Test Software

Name of Software	Version
TST-PASS	1.0.5
EZ_EMC(Below 1GHz)	V1.1.4.2
e3(Above 1GHz)	6.111221a

The calibration interval was one year

2.5. Related Submittal(s) / Grant(s)

This submittal(s) (test report) is intended to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

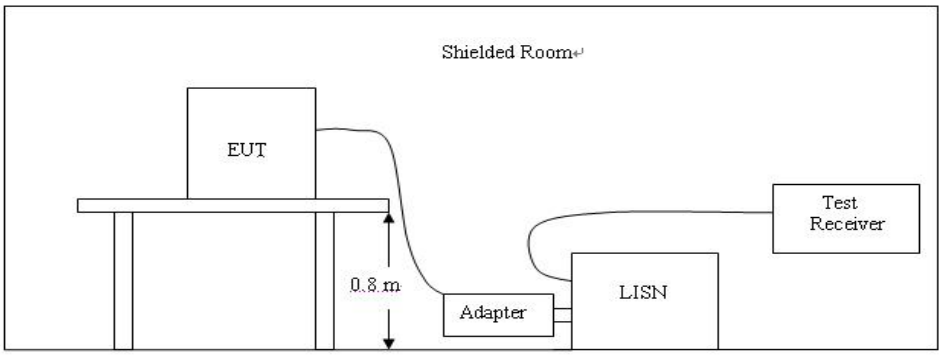
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION

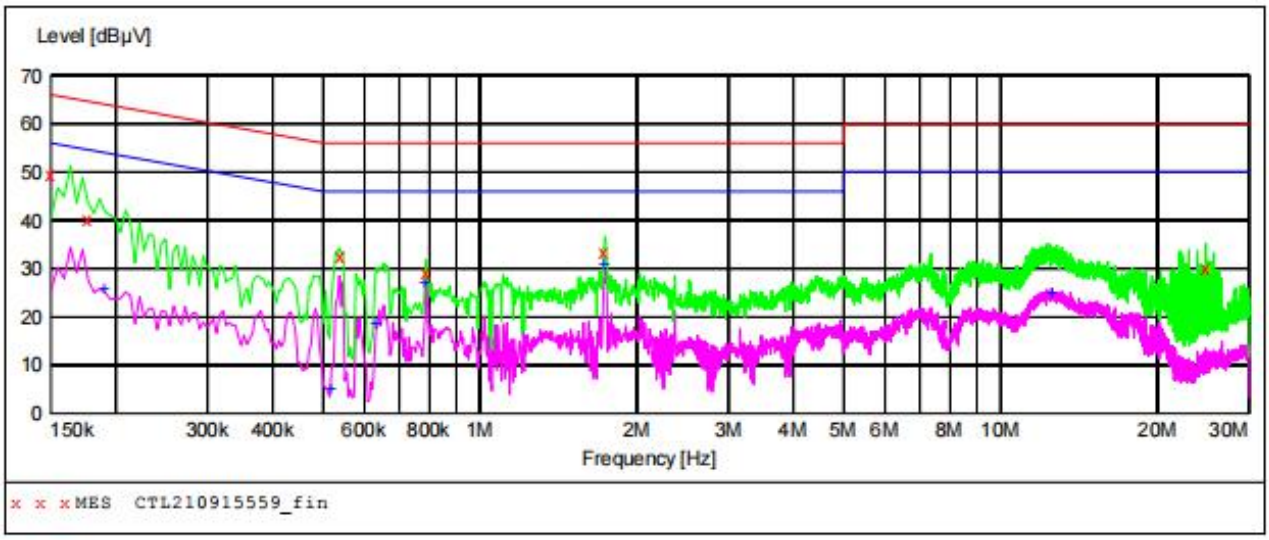


TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2020.
2. Support equipment, if needed, was placed as per ANSI C63.10:2020.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2020.
4. If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL210915559_fin"

9/15/2021 5:46PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	49.70	10.0	66	16.3	QP	L1	GND
0.177000	40.30	10.0	65	24.3	QP	L1	GND
0.541500	32.80	10.1	56	23.2	QP	L1	GND
0.789000	29.30	10.1	56	26.7	QP	L1	GND
1.738500	33.40	10.2	56	22.6	QP	L1	GND
24.792000	30.00	11.5	60	30.0	QP	L1	GND

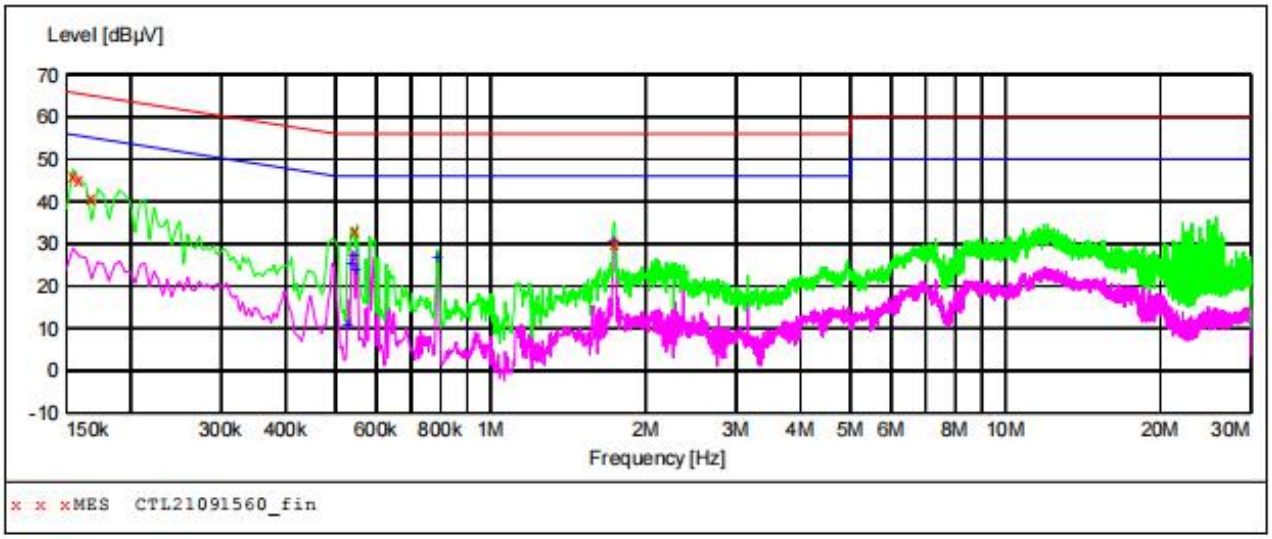
MEASUREMENT RESULT: "CTL210915559_fin2"

9/15/2021 5:46PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190500	26.00	10.0	54	28.0	AV	L1	GND
0.519000	5.30	10.1	46	40.7	AV	L1	GND
0.631500	18.50	10.1	46	27.5	AV	L1	GND
0.789000	27.20	10.1	46	18.8	AV	L1	GND
1.738500	30.80	10.2	46	15.2	AV	L1	GND
12.579000	25.00	10.9	50	25.0	AV	L1	GND

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL21091560_fin"

9/15/2021 5:50PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	46.30	10.0	66	19.5	QP	N	GND
0.159000	45.40	10.0	66	20.1	QP	N	GND
0.168000	40.70	10.0	65	24.4	QP	N	GND
0.546000	33.00	10.1	56	23.0	QP	N	GND
1.743000	30.40	10.2	56	25.6	QP	N	GND

MEASUREMENT RESULT: "CTL21091560_fin2"

9/15/2021 5:50PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.528000	10.70	10.1	46	35.3	AV	N	GND
0.537000	25.60	10.1	46	20.4	AV	N	GND
0.546000	27.10	10.1	46	18.9	AV	N	GND
0.550500	23.80	10.1	46	22.2	AV	N	GND
0.789000	26.80	10.1	46	19.2	AV	N	GND
1.738500	30.80	10.2	46	15.2	AV	N	GND

3.2. Radiated Emissions and Band Edge

Limit

According 15.249, the field strength of emissions from intentional radiators operated within 2400MHz-2483.5 MHz shall not exceed 94dBμV/m (50mV/m):

FCC PART 15.249(d) 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 §15.209, whichever is the lesser attenuation.
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

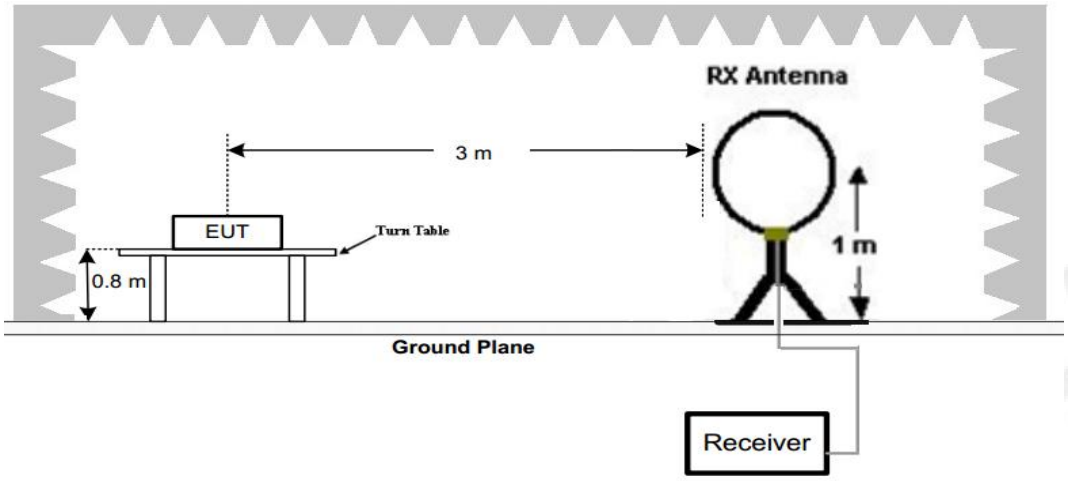
According to §15.249 (a): Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

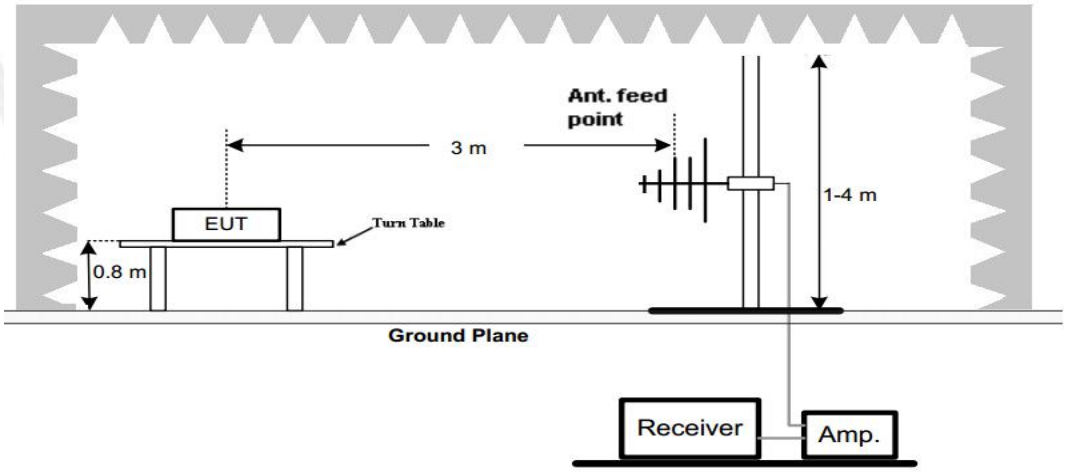
* Field strength limits are specified at a distance of 3 meters.
* As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.
* 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 §15.209, whichever is the lesser attenuation.

TEST CONFIGURATION

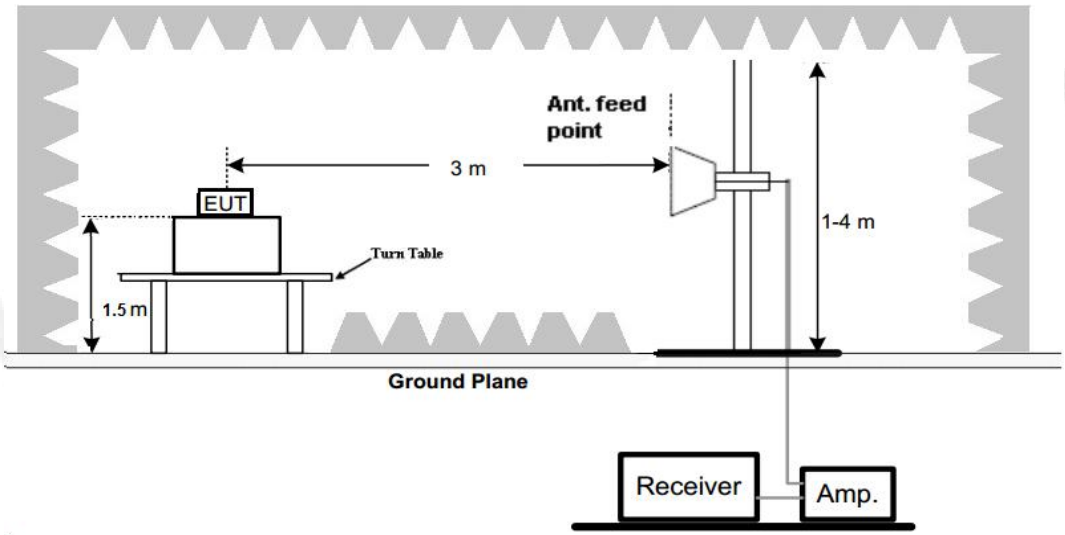
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

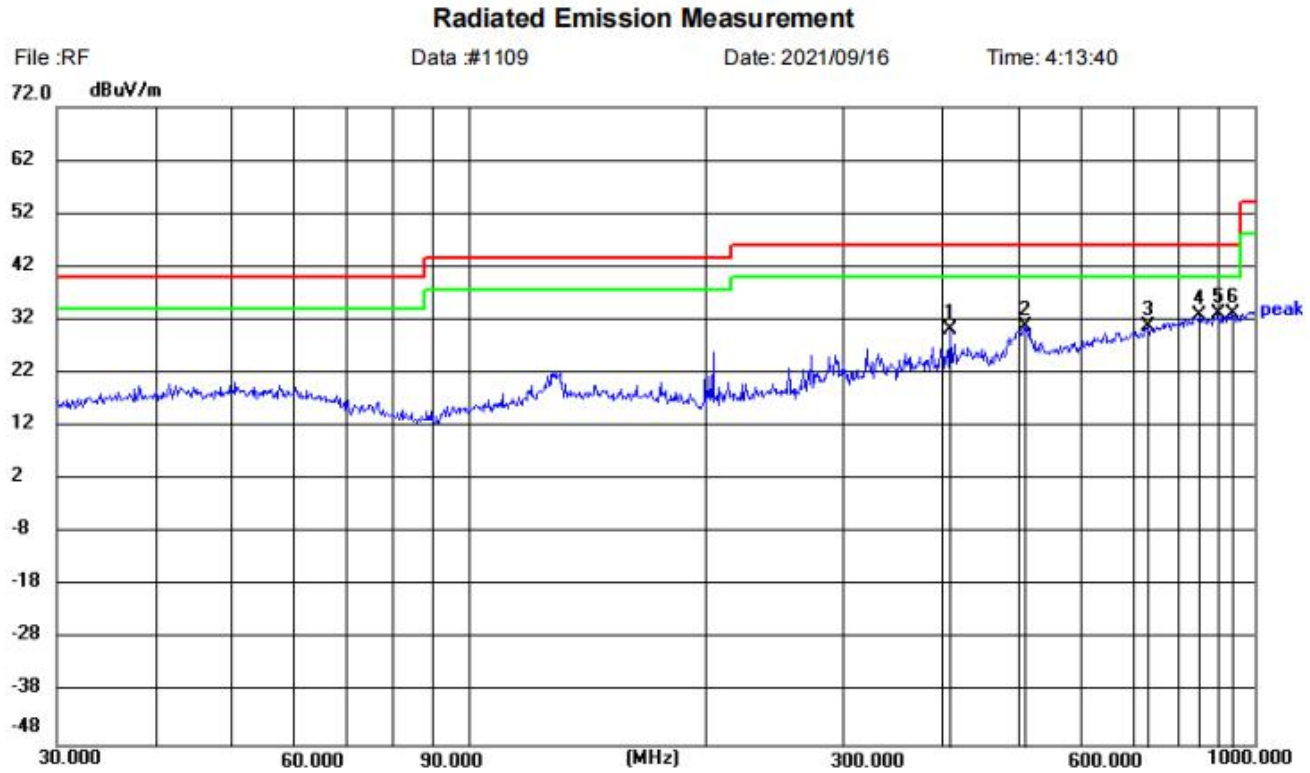
Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

TEST RESULTS

Remark:
1. We measured Radiated Emission at GFSK mode from 9 KHz to 25GHz and recorded worst case.
2. For below 1GHz testing recorded worst at GFSK low channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

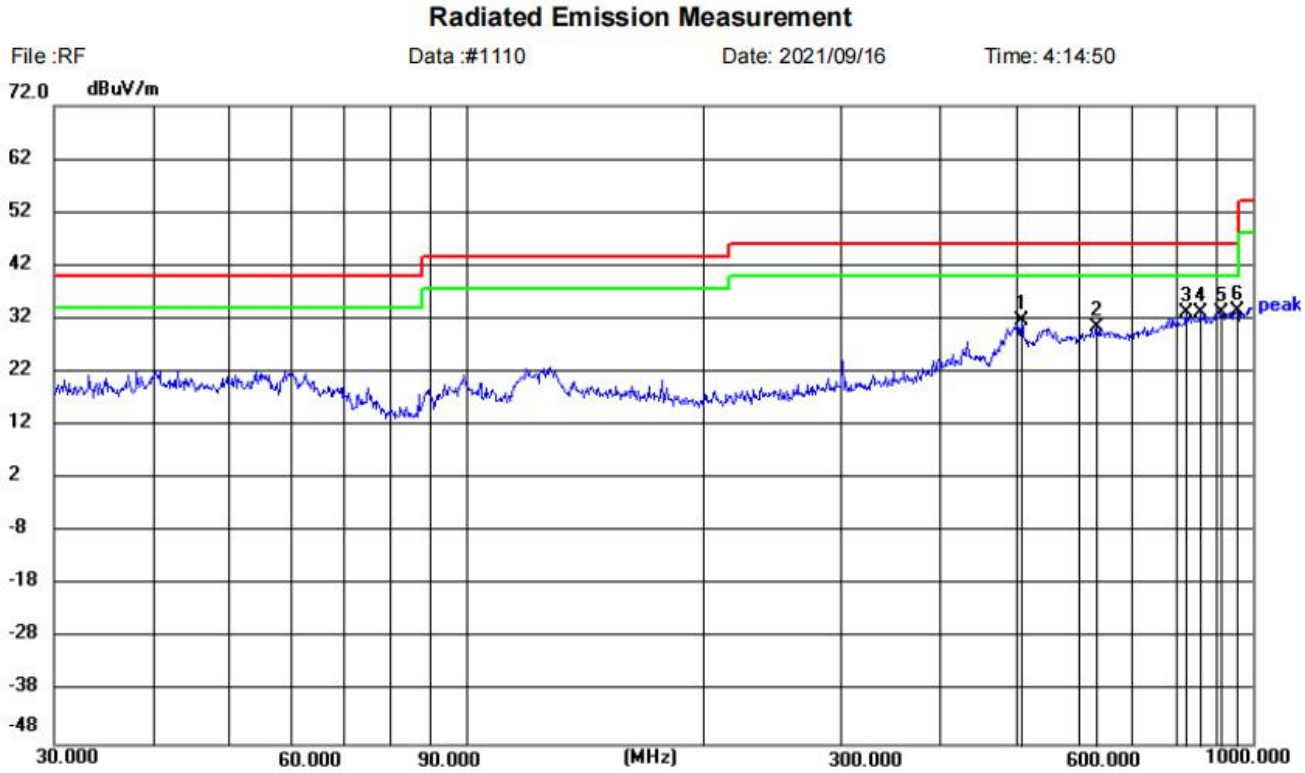
For 30MHz-1GHz

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1	410.3824	11.81	18.21	30.02	46.00	15.98	peak	100	105	P
2	508.2582	11.40	19.48	30.88	46.00	15.12	peak	100	240	P
3	731.9202	6.95	23.84	30.79	46.00	15.21	peak	100	36	P
4	851.0353	6.48	26.24	32.72	46.00	13.28	peak	100	266	P
5	896.9965	6.79	26.48	33.27	46.00	12.73	peak	100	354	P
6	935.5463	6.11	27.01	33.12	46.00	12.88	peak	100	317	P

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1	508.2582	12.20	19.48	31.68	46.00	14.32	peak	100	314	P
2	633.9073	7.80	22.56	30.36	46.00	15.64	peak	100	221	P
3	821.7103	7.09	26.00	33.09	46.00	12.91	peak	100	195	P
4	857.0247	6.88	26.33	33.21	46.00	12.79	peak	100	232	P
5	909.6667	6.55	26.64	33.19	46.00	12.81	peak	100	84	P
6	955.4381	6.17	27.18	33.35	46.00	12.65	peak	100	33	P

For 1GHz to 25GHz:

. GFSK Mode (above 1GHz)

Frequency(MHz):				2410		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2410.00	104.92	PK	114.00	9.08	71.48	28.82	4.62	0.00	33.44
1	2410.00	94.36	AV	94.00	-0.36	60.92	28.82	4.62	0.00	33.44
2	2390.00	46.45	PK	74.00	27.55	13.13	28.72	4.60	0.00	33.32
2	2390.00	--	AV	54.00	--	--	--	--	--	--
3	2400.00	50.17	PK	74.00	23.83	16.75	28.81	4.61	0.00	33.42
3	2400.00	--	AV	54.00	--	--	--	--	--	--
4	4812.00	60.82	PK	74.00	13.18	56.29	33.50	6.92	35.89	4.53
4	4812.00	52.36	AV	54.00	1.64	47.83	33.50	6.92	35.89	4.53
5	5022.00	49.21	PK	74.00	24.79	42.36	34.04	7.04	34.23	6.85
5	5022.00	--	AV	54.00	--	--	--	--	--	--
6	7218.00	52.87	PK	74.00	21.13	41.74	36.96	9.19	35.02	11.13
6	7218.00	--	AV	54.00	--	--	--	--	--	--

Frequency(MHz):				2410		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2410.00	102.08	PK	114.00	11.92	68.64	28.82	4.62	0.00	33.44
1	2410.00	90.15	AV	94.00	3.85	56.71	28.82	4.62	0.00	33.44
2	2390.00	46.59	PK	74.00	27.41	13.27	28.72	4.60	0.00	33.32
2	2390.00	--	AV	54.00	--	--	--	--	--	--
3	2400.00	50.61	PK	74.00	23.39	17.19	28.81	4.61	0.00	33.42
3	2400.00	--	AV	54.00	--	--	--	--	--	--
4	4812.00	57.39	PK	74.00	16.61	52.86	33.50	6.92	35.89	4.53
4	4812.00	49.86	AV	54.00	4.14	45.33	33.50	6.92	35.89	4.53
5	5022.00	42.04	PK	74.00	31.96	35.19	34.04	7.04	34.23	6.85
5	5022.00	--	AV	54.00	--	--	--	--	--	--
6	7218.00	49.37	PK	74.00	24.63	38.24	36.96	9.19	35.02	11.13
6	7218.00	--	AV	54.00	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value ; RMS detector is for AV value.

Frequency(MHz):				2440		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2440.00	101.89	PK	114.00	12.11	68.37	28.86	4.66	0.00	33.52
1	2440.00	93.00	AV	94.00	1.00	59.48	28.86	4.66	0.00	33.52
2	3422.00	45.93	PK	74.00	28.07	44.15	31.62	5.74	35.58	1.78
2	3422.00	--	AV	54.00	--	--	--	--	--	--
3	4880.00	56.50	PK	74.00	17.50	50.11	33.62	6.96	34.19	6.39
3	4880.00	48.87	AV	54.00	5.13	42.48	33.62	6.96	34.19	6.39
4	5084.00	45.34	PK	74.00	28.66	38.26	34.26	7.08	34.26	7.08
4	5084.00	--	AV	54.00	--	--	--	--	--	--
5	7320.00	51.51	PK	74.00	22.49	39.78	37.49	9.23	34.99	11.73
5	7320.00	--	AV	54.00	--	--	--	--	--	--

Frequency(MHz):				2440		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2440.00	101.15	PK	114.00	12.85	67.63	28.86	4.66	0.00	33.52
1	2440.00	91.78	AV	94.00	2.22	58.26	28.86	4.66	0.00	33.52
2	3422.00	45.03	PK	74.00	28.97	43.25	31.62	5.74	35.58	1.78
2	3422.00	--	AV	54.00	--	--	--	--	--	--
3	4880.00	54.03	PK	74.00	19.97	47.64	33.62	6.96	34.19	6.39
3	4880.00	45.10	AV	54.00	8.90	38.71	33.62	6.96	34.19	6.39
4	5084.00	46.60	PK	74.00	27.40	39.52	34.26	7.08	34.26	7.08
4	5084.00	--	AV	54.00	--	--	--	--	--	--
5	7320.00	49.06	PK	74.00	24.94	37.33	37.49	9.23	34.99	11.73
5	7320.00	--	AV	54.00	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value; RMS detector is for AV value.

Frequency(MHz):				2470		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2470.00	102.24	PK	114.00	11.76	68.63	28.92	4.69	0.00	33.61
1	2470.00	94.91	AV	94.00	-0.91	61.30	28.92	4.69	0.00	33.61
2	2483.50	49.56	PK	74.00	24.44	15.93	28.93	4.70	0.00	33.63
2	2483.50	--	AV	54.00	--	--	--	--	--	--
3	2500.00	45.27	PK	74.00	28.73	11.59	28.96	4.72	0.00	33.68
3	2500.00	--	AV	54.00	--	--	--	--	--	--
4	4944.00	58.17	PK	74.00	15.83	51.62	33.81	7.00	34.26	6.55
4	4944.00	49.32	AV	54.00	4.68	42.77	33.81	7.00	34.26	6.55
5	6365.00	47.71	PK	74.00	26.29	39.15	35.18	8.15	34.77	8.56
5	6365.00	--	AV	54.00	--	--	--	--	--	--
6	7416.00	48.68	PK	74.00	25.32	36.74	37.64	9.27	34.97	11.94
6	7416.00	--	AV	54.00	--	--	--	--	--	--

Frequency(MHz):				2470		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2470.00	101.03	PK	114.00	12.97	67.42	28.92	4.69	0.00	33.61
1	2470.00	88.79	AV	94.00	5.21	55.18	28.92	4.69	0.00	33.61
2	2483.50	47.24	PK	74.00	26.76	13.61	28.93	4.70	0.00	33.63
2	2483.50	--	AV	54.00	--	--	--	--	--	--
3	2500.00	42.20	PK	74.00	31.80	8.52	28.96	4.72	0.00	33.68
3	2500.00	--	AV	54.00	--	--	--	--	--	--
4	4944.00	54.67	PK	74.00	19.33	48.12	33.81	7.00	34.26	6.55
4	4944.00	43.82	AV	54.00	10.18	37.27	33.81	7.00	34.26	6.55
5	6365.00	51.86	PK	74.00	22.14	43.30	35.18	8.15	34.77	8.56
5	6365.00	--	AV	54.00	--	--	--	--	--	--
6	7416.00	49.23	PK	74.00	24.77	37.29	37.64	9.27	34.97	11.94
6	7416.00	--	AV	54.00	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value; RMS detector is for AV value.

3.3. Occupied Bandwidth Measurement

Limit

N/A

Test Configuration

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

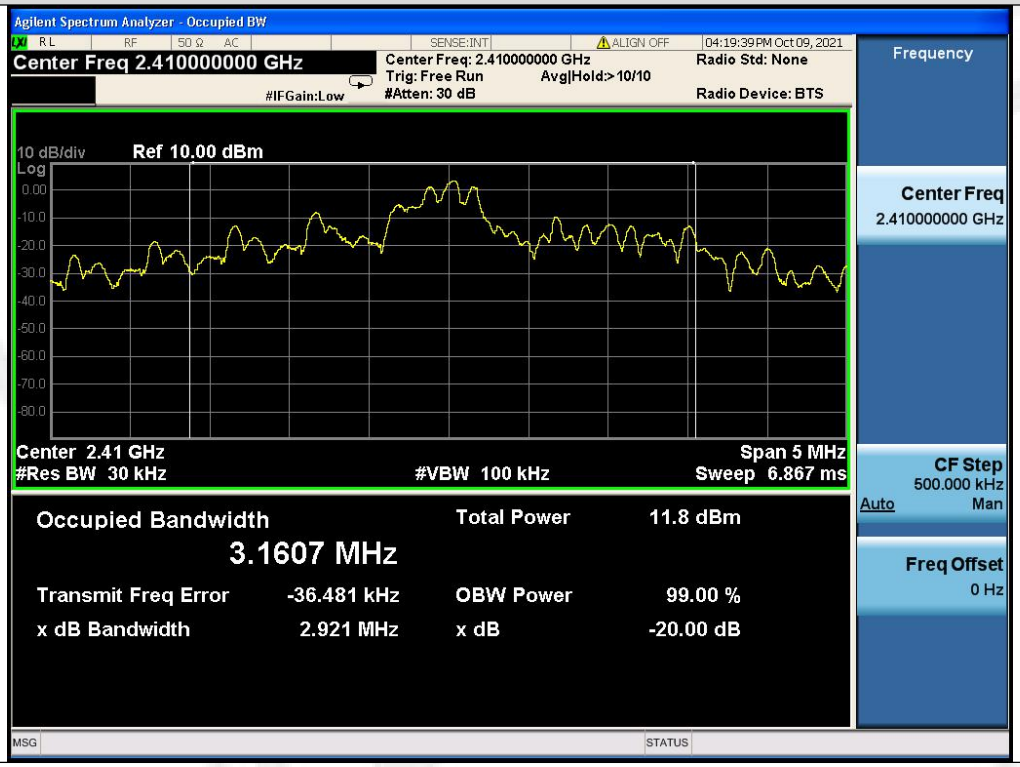
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Test Results

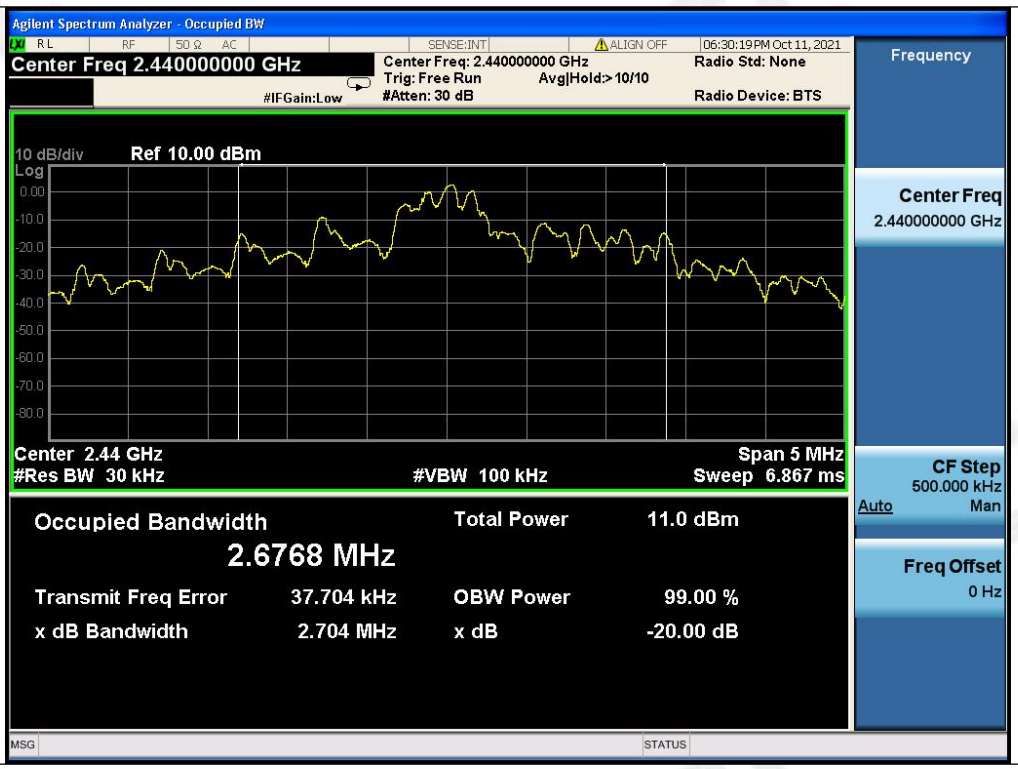
Modulation	Channel	99% OBW (MHz)	20dB bandwidth (MHz)	Result
GFSK	CH01	3.1607	2.921	Pass
	CH31	2.6768	2.756	
	CH61	1.2828	1.156	

Test plot as follows:

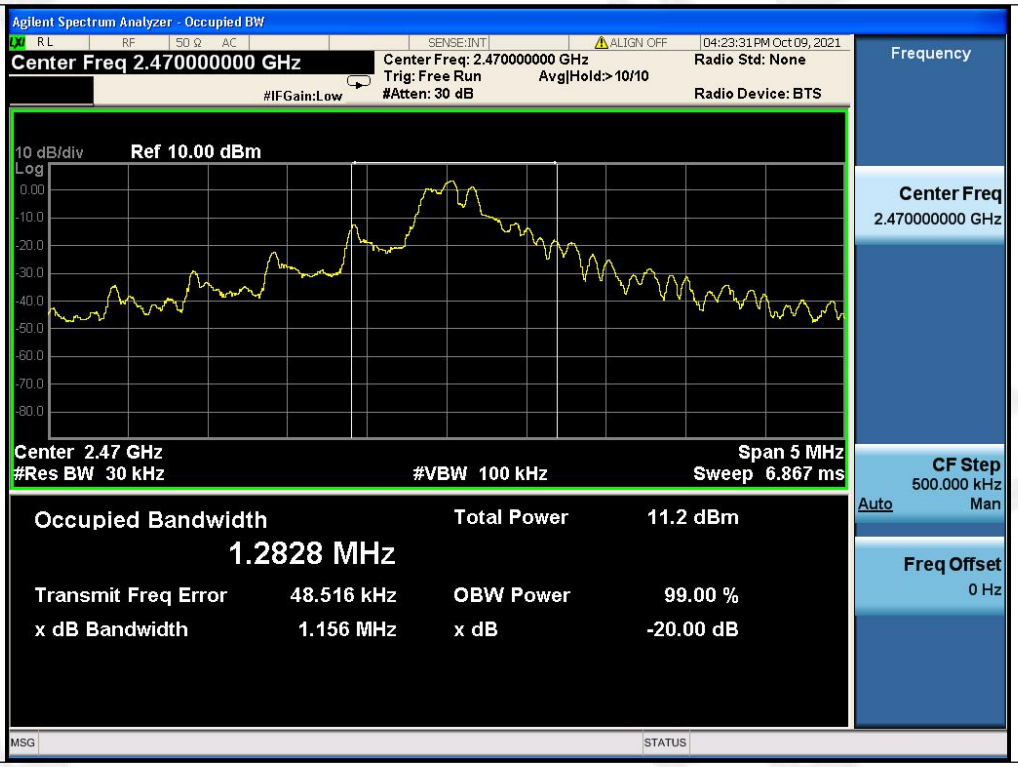
GFSK Modulation



CH01


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.440000000 GHz
Center Freq: 2.440000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
06:30:19 PM Oct 11, 2021
Frequency
10 dB/div
Ref 10.00 dBm
Center 2.44 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 5 MHz
Sweep 6.867 ms
Occupied Bandwidth
2.6768 MHz
Total Power 11.0 dBm
Transmit Freq Error 37.704 kHz
OBW Power 99.00 %
x dB Bandwidth 2.704 MHz
x dB -20.00 dB
Center Freq
2.440000000 GHz
CF Step
500.000 kHz
Auto Man
Freq Offset
0 Hz

CH31


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.470000000 GHz
Center Freq: 2.470000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
04:23:31 PM Oct 09, 2021
Frequency
10 dB/div
Ref 10.00 dBm
Center 2.47 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 5 MHz
Sweep 6.867 ms
Occupied Bandwidth
1.2828 MHz
Total Power 11.2 dBm
Transmit Freq Error 48.516 kHz
OBW Power 99.00 %
x dB Bandwidth 1.156 MHz
x dB -20.00 dB
Center Freq
2.470000000 GHz
CF Step
500.000 kHz
Auto Man
Freq Offset
0 Hz

CH61

3.4. Antenna Requirement

Standard Applicable

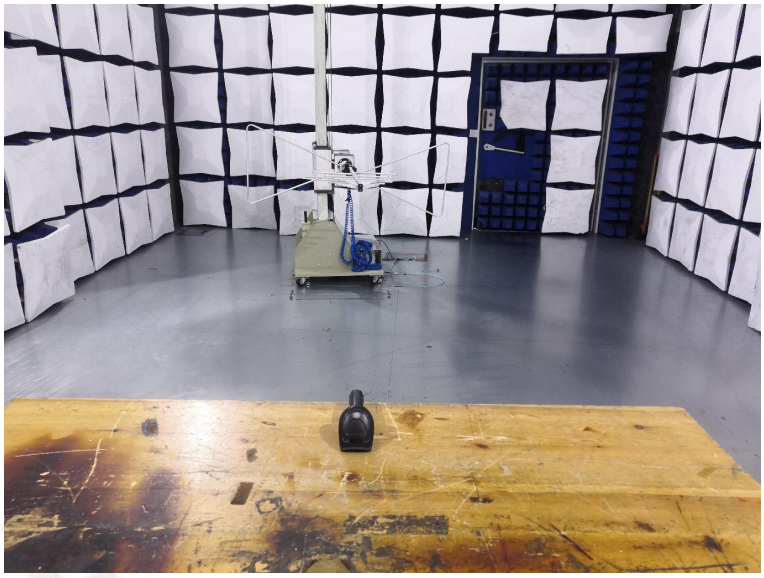
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Refer to statement below for compliance.
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a Spring Antenna, The directional gains of antenna used for transmitting is 0.53dBi.

4. Test Setup Photos of the EUT



5. External and Internal Photos of the EUT

Reference to the test report No. CTL2108253012-WF01

********** **End of Report** **********