Shenzhen Huatongwei International Inspection Co., Ltd.
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TEST REPORT

Report Reference No.....:	**TRE1706002302**	R/C…….: 70896
FCC ID.....:	**Q5EDP99001**	
Applicant's name.....:	**Kirisun Communications Co., Ltd**	
Address .....:	3-6 Flrs, ROBETA Building, No.1, QiMin Road, Song Ping Shan Area, Science & Industry Park, Nanshan District, Shenzhen, 518057 P.R.China	
Manufacturer.....:	Kirisun Communications Co., Ltd	
Address.....:	3-6 Flrs, ROBETA Building, No.1, QiMin Road, Song Ping Shan Area, Science & Industry Park, Nanshan District, Shenzhen, 518057 P.R.China	
Test item description .....:	**DMR Two Way Radio**	
Trade Mark .....:	KIRISUN	
Model/Type reference .....:	DP990	
Listed Model(s).....:	DP995	
Standard .....:	**FCC CFR Title 47 Part 15 Subpart C Section 15.247**	
Date of receipt of test sample…….:	June 05, 2017	
Date of testing……..:	June 06, 2017 – July 05, 2017	
Date of issue……..……..:	July 05, 2017	
Result..... ……..:	**PASS**	

Compiled by (position+printedname+signature) ..:	File administrators Shayne Zhu	Shayne Zhu
Supervised by (position+printedname+signature) ...:	Project Engineer Jerry Wang	Jerry Wang
Approved by (position+printedname+signature) ...:	RF Manager Hans Hu	Hans Hu

Testing Laboratory Name .....:	**Shenzhen Huatongwei International Inspection Co., Ltd.**
Address .....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Contents

1. TEST STANDARDS ANDTEST DESCRIPTION

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10-2013:AmericanNationalStandardforTestingUnlicensedWirelessDevicese

FCC PUBLIC NOTICE DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

1.2. Report version

Version No.	Date of issue	Description
00	July 05, 2017	Original

2. TEST DESCRIPTION

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)	Pass
Restricted band	15.247(d)/15.205	Pass
Radiated Emission	15.247(d)/15.209	Pass

Note: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	Kirisun Communications Co., Ltd
Address:	3-6 Flrs, ROBETA Building, No.1, QiMin Road, Song Ping Shan Area, Science & Industry Park, Nanshan District, Shenzhen, 518057 P.R.China
Manufacturer:	Kirisun Communications Co., Ltd
Address:	3-6 Flrs, ROBETA Building, No.1, QiMin Road, Song Ping Shan Area, Science & Industry Park, Nanshan District, Shenzhen, 518057 P.R.China

3.2. Product Description

Name of EUT:	DMR Two Way Radio
Trade mark:	KIRISUN
Model/Type reference:	DP990
Listed mode(s):	DP995
Power supply:	DC 7.4V
Battery information:	Model: KB-990 DC 7.4V, 2000mAh
Charger information:	Model:KBC-77Q Input: 12Vd.c.,1000mA Output: 8.4Vd.c.,800mA
Adapter information:	Model:ZAU-A120100A-04 Input:100-240Va.c.,50/60Hz,0.4A Output: 12Vd.c., 1000mA
Hardware Version:	0
Software Version:	R0.22.007
Bluetooth	
Version:	Supported BT3.0+EDR
Modulation:	GFSK, π/4DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	Internal Antenna
Antenna gain:	0 dBi

3.3. Operation state

➢ **Test frequency list**

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

Channel	Frequency (MHz)
0	2402
1	2403
⋮	⋮
39	2441
⋮	⋮
77	2479
78	2480

➢ **Test mode**

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
the EUT was set to connect with the Bluetooth under large package sizes transmission.
For RF test axis
EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report.

3.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

		Manufacturer :	/
		Model No. :	/
		Manufacturer :	/
		Model No. :	/

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. Test Environment

4.1. Address of the test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

4.2. Test Facility

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

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection 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.

FCC-Registration No.: 317478

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 317478.

IC-Registration No.: 5377B

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4.3. Environmental conditions

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

Temperature:	15~35°C
lative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.4. 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 TR-100028-01"Electromagnetic compatibilityand Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 1"and TR-100028-02 "Electromagnetic compatibilityand Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 2 " and is documented in the Shenzhen Huatongwei International Inspection 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 Shenzhen Huatongweilaboratory is reported:

Test Items	MeasurementUncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-40 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	35 Hz	(1)
Conducted output power	0.57 dB	(1)
Power spectral density	1.80 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.5. Equipments Used during the Test

Line Conducted Emission (AC Main)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	R&S	ESCI	101247	2016/11/13
2	Artificial Mains	Shwarzbeck	NNLK 8121	573	2016/11/13
3	Pulse Limiter	R&S	ESH3-Z2	101488	2016/11/13
4	Test Software	R&S	ES-K1	N/A	N/A
5	Test cable	ENVIROFLEX	3651	1101902	2016/11/13

Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal
1	Signal and spectrum analyzer	Rohde&Schwarz	FSV40	100048	2016/11/13
2	Power Meter	Anritsu	ML2480B	100798	2016/11/13
3	Power Sensor	Anritsu	MA2411B	100258	2016/11/13
4	Test cable	FARPU	MCX-J	N/A	2016/11/13
5	Temporary antenna connector	D-LENP	NJ-SMAK	N/A	2016/11/13

NOTE:The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	2016/11/13
2	RF Test Panel	Rohde&Schwarz	TS / RSP	335015/0017	N/A
3	EMI Test Software	Rohde&Schwarz	ESK1	N/A	N/A
4	Loop Antenna	Rohde&Schwarz	HZ-9	838622\013	2016/11/13
5	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2016/11/13
6	Horn Antenna	ShwarzBeck	9120D	1011	2016/11/13
7	Broadband Horn Antenna	Shwarzbeck	BBHA9170	BBHA9170472	2016/11/13
8	Preamplifier	Shwarzbeck	BBV9742	9742-196	2016/11/13
9	Broadband Preamplifer	Shwarzbeck	BBV 9721	9721-102	2016/11/13
10	Broadband Preamplifer	Shwarzbeck	BBV 9718	9718-247	2016/11/13
11	Turn Table	MATURO	TT2.0	/	N/A
12	Antenna Mast	MATURO	TAM-4.0-P	/	N/A
13	EMI Test Software	Audix	E3	N/A	N/A
14	Test Software	R&S	ES-K1	N/A	N/A
15	Test cable	Siva Cables Italy	RG 58A/U	W14.02	2016/11/13

The Cal.Interval was one year.

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C 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. The use of a permanently attached antenna or of anantenna 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.

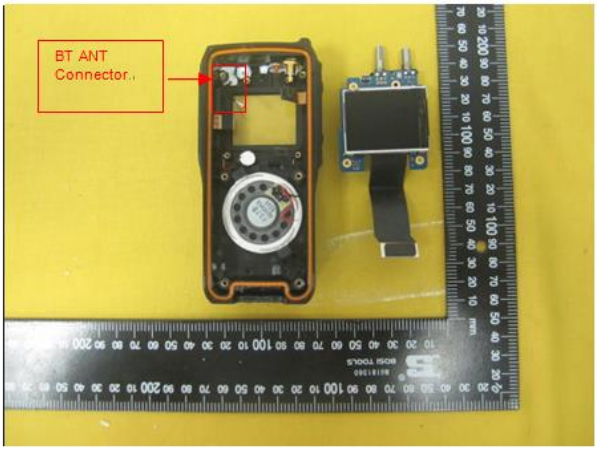
FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

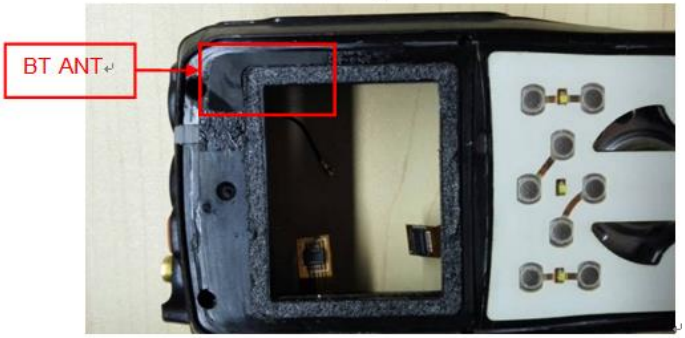
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

The antenna is internal antenna, the best case gain of the antenna is 0dBi, please refer to the below antenna photo.





5.2. Conducted Emission (AC Main)

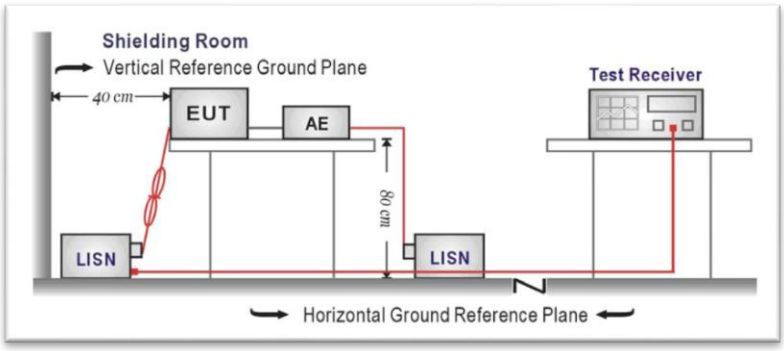
LIMIT

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

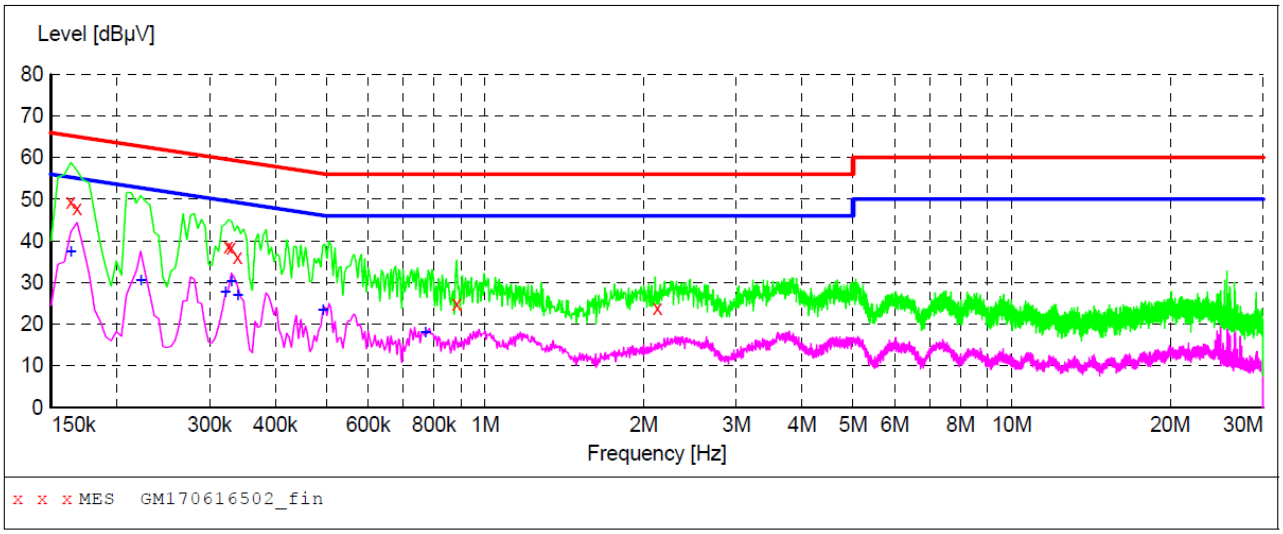
1. The EUT was setup according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above theconducting ground plane. The vertical conducting plane was located 40 cm to the rear of theEUT. All other surfaces of EUT were at least 80 cm from any other grounded conductingsurface.
3. The EUT and simulators are connected to the main power through a line impedancestabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for themeasuring equipment.
4. The peripheral devices are also connected to the main power through aLISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor,was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were foldedback and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHzusing a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE:

Please refer to the clause 3.3

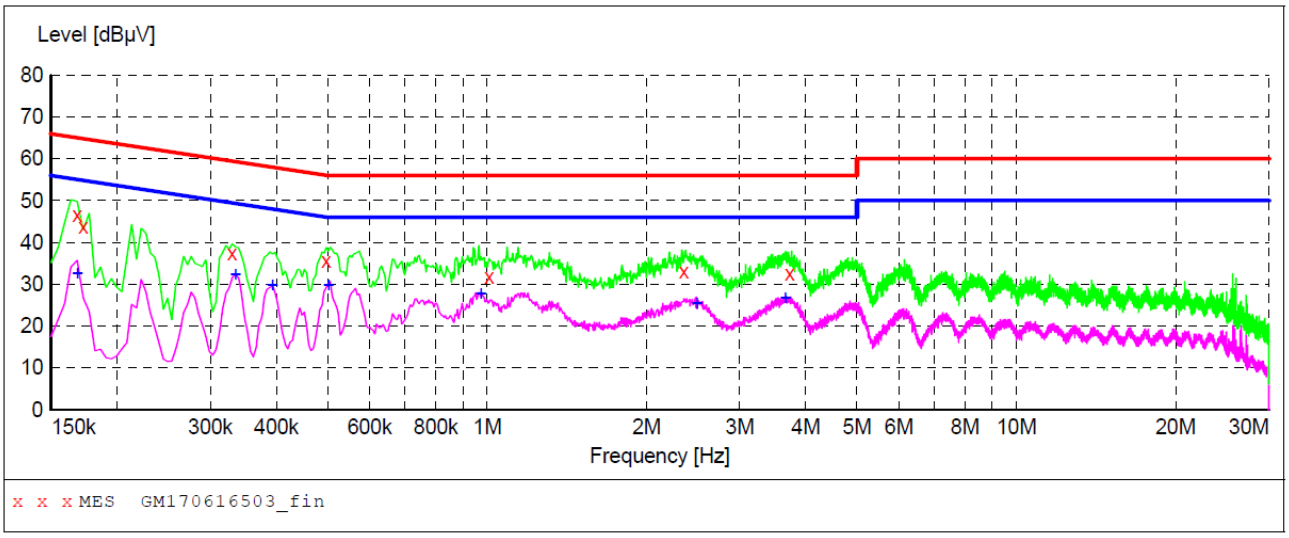
TEST RESULTS

☒ **Passed** ☐ **Not Applicable**



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.163500	49.30	10.4	65	16.0	QP	L1	GND
0.168000	47.80	10.4	65	17.3	QP	L1	GND
0.325500	38.70	10.2	60	20.9	QP	L1	GND
0.330000	38.40	10.2	60	21.1	QP	L1	GND
0.339000	36.10	10.2	59	23.1	QP	L1	GND
0.883500	25.00	10.1	56	31.0	QP	L1	GND
2.125500	23.80	10.2	56	32.2	QP	L1	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.163500	37.30	10.4	55	18.0	AV	L1	GND
0.222000	30.40	10.3	53	22.3	AV	L1	GND
0.321000	27.70	10.2	50	22.0	AV	L1	GND
0.330000	30.30	10.2	50	19.2	AV	L1	GND
0.339000	26.90	10.2	49	22.3	AV	L1	GND
0.492000	23.30	10.2	46	22.8	AV	L1	GND
0.771000	18.10	10.2	46	27.9	AV	L1	GND



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.168000	46.60	10.4	65	18.5	QP	N	GND
0.172500	43.90	10.4	65	20.9	QP	N	GND
0.330000	37.40	10.2	60	22.1	QP	N	GND
0.496500	35.60	10.2	56	20.5	QP	N	GND
1.009500	31.90	10.2	56	24.1	QP	N	GND
2.355000	33.10	10.2	56	22.9	QP	N	GND
3.732000	32.50	10.3	56	23.5	QP	N	GND

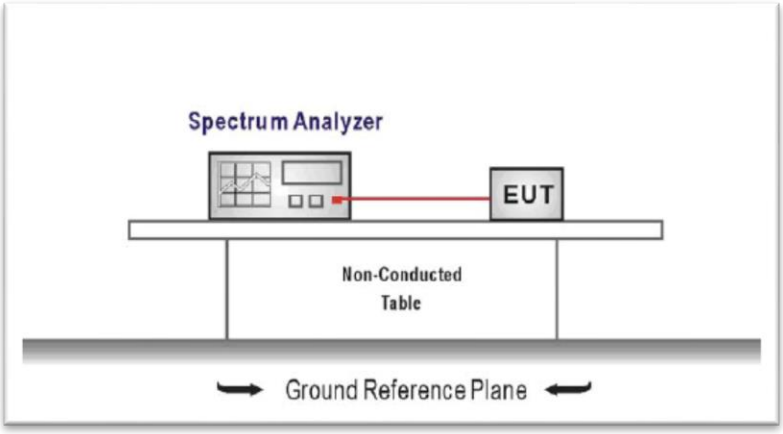
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.168000	32.50	10.4	55	22.6	AV	N	GND
0.334500	32.20	10.2	49	17.1	AV	N	GND
0.393000	29.70	10.2	48	18.3	AV	N	GND
0.501000	29.80	10.2	46	16.2	AV	N	GND
0.973500	27.60	10.2	46	18.4	AV	N	GND
2.490000	25.50	10.2	46	20.5	AV	N	GND
3.655500	26.60	10.3	46	19.4	AV	N	GND

5.3. Conducted Peak Output Power

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): **30dBm**

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
   RBW≥ the 20 dB bandwidth of the emission being measured, VBW≥RBW
   Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

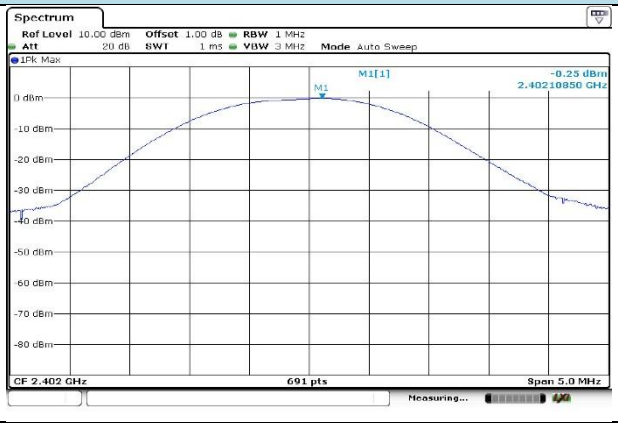
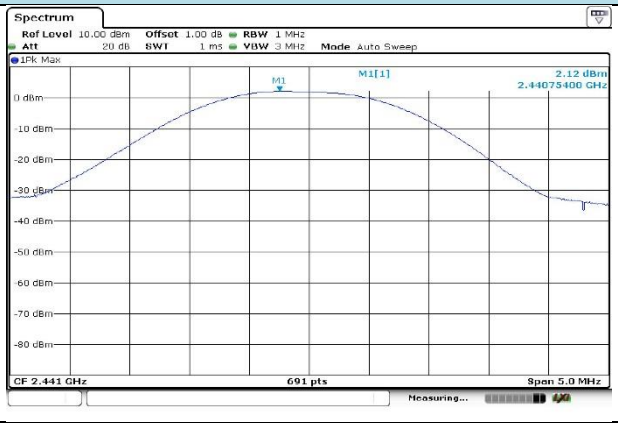
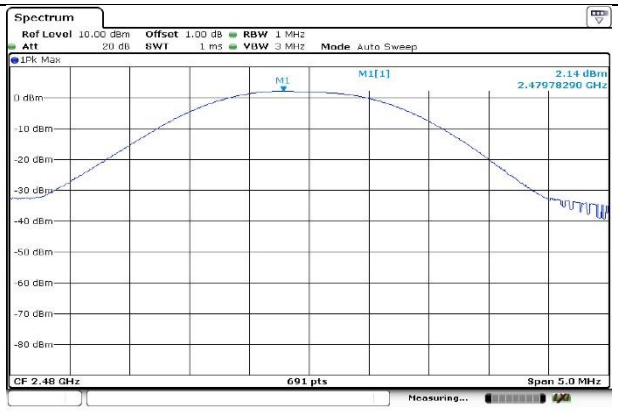
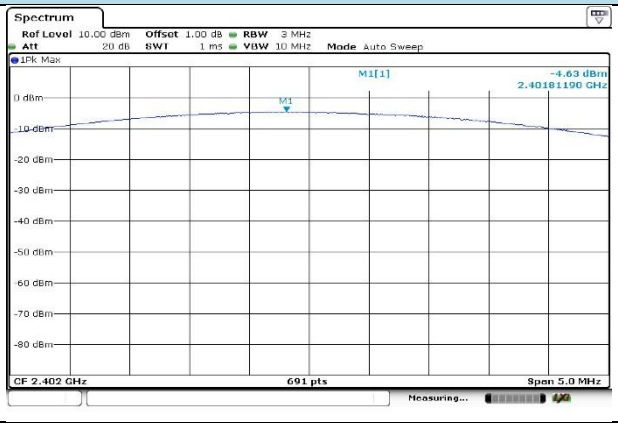
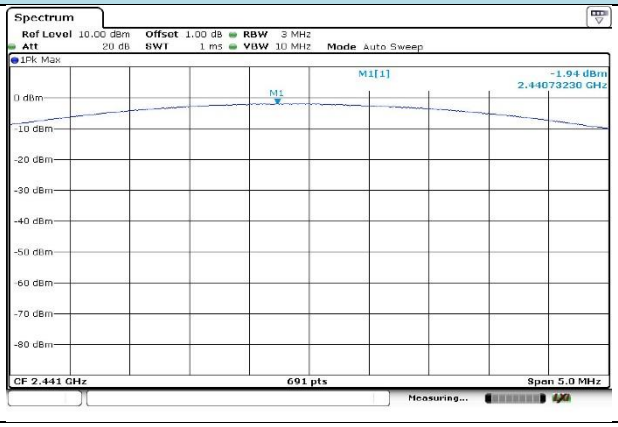
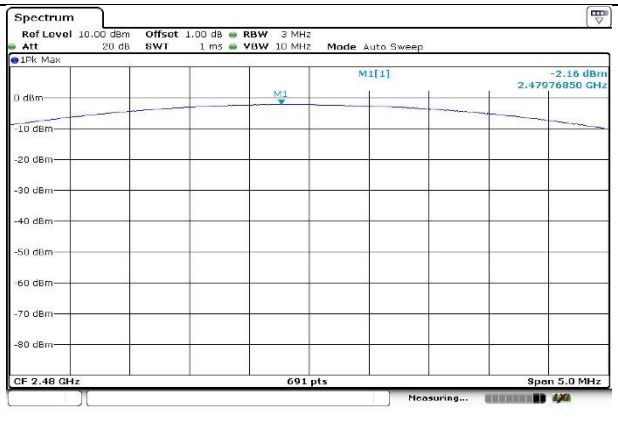
TEST MODE:

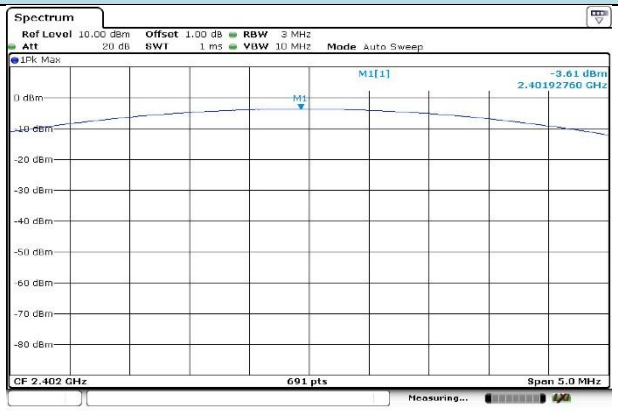
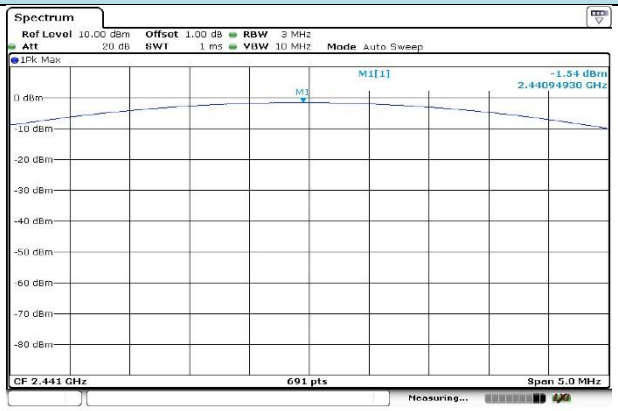
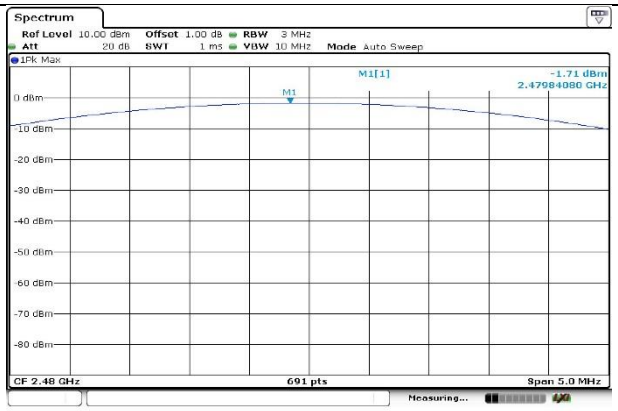
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Modulation type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	00	-0.25	30.00	Pass
	39	2.12		
	78	2.14		
π/4DQPSK	00	-4.63	30.00	Pass
	39	-1.94		
	78	-2.16		
8DPSK	00	-3.61	30.00	Pass
	39	-1.54		
	78	-1.71		

GFSK	
	
CH00	CH39
	No Plot
CH78	-
π/4DQPSK	
	
CH00	CH39
	No Plot
CH78	-

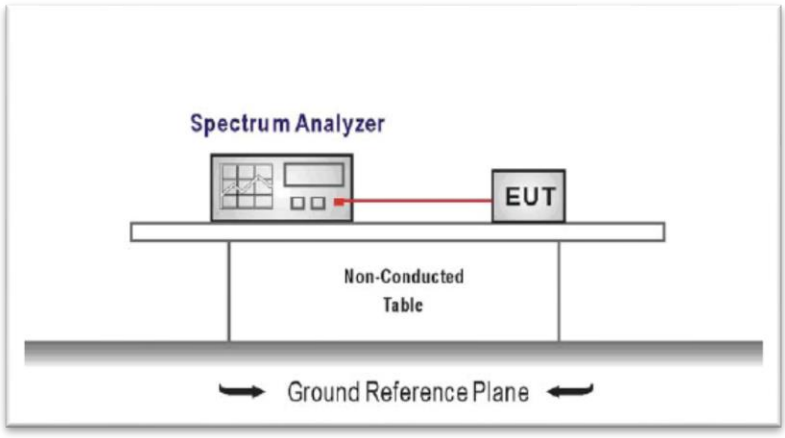
8DPSK	
	
CH00	CH39
	No Plot
CH78	-

5.4. 20dB Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   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.

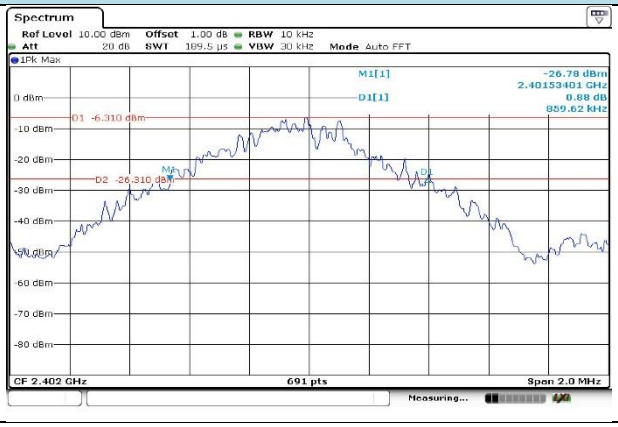
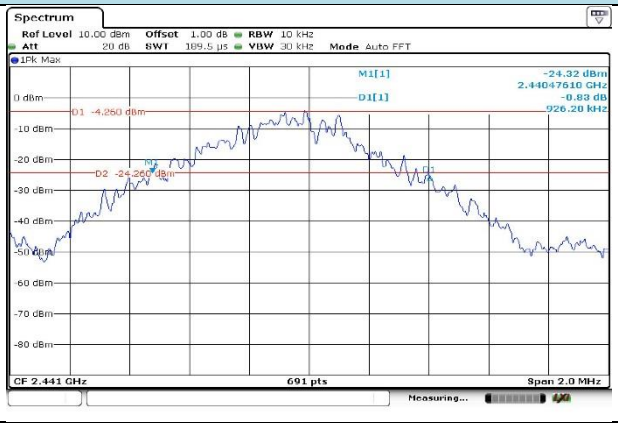
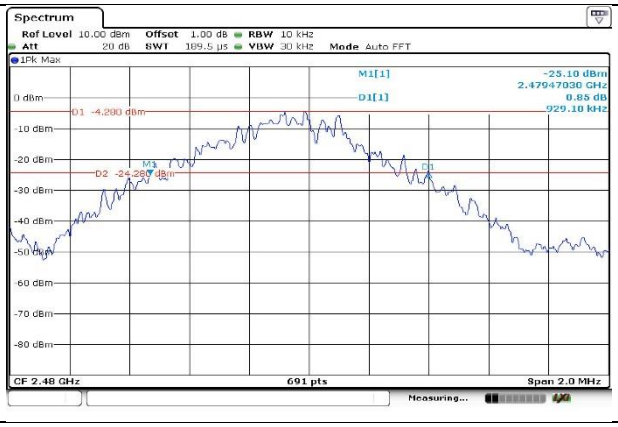
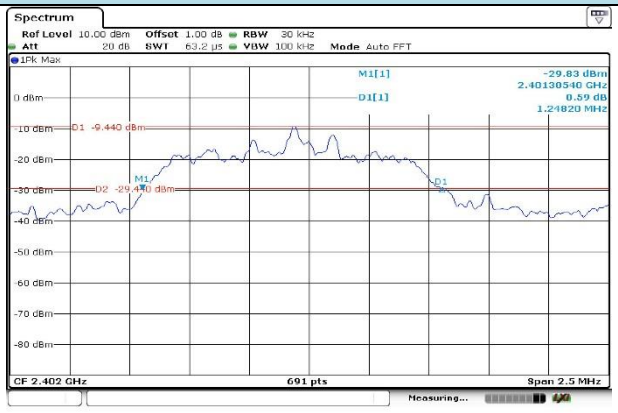
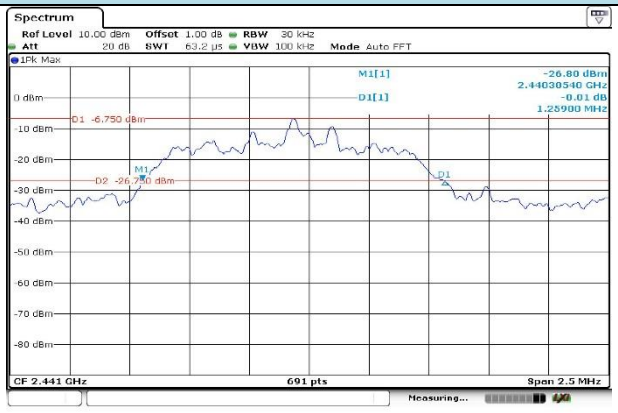
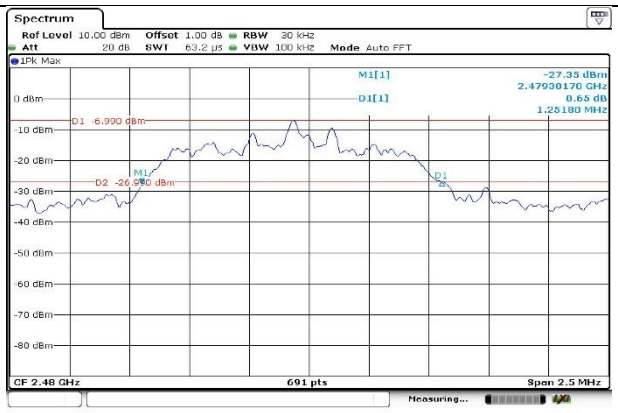
TEST MODE:

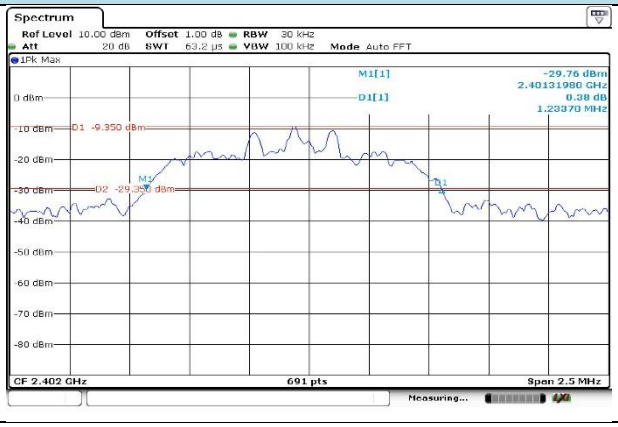
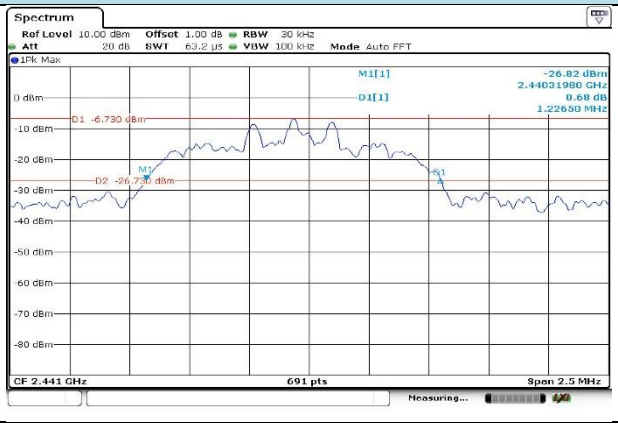
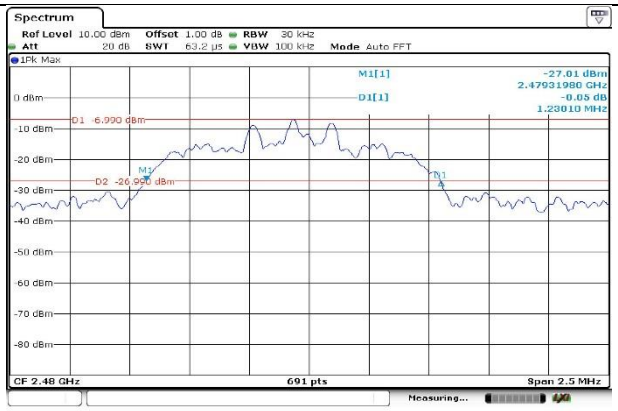
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Modulation type	Channel	20dB Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.860	-	Pass
	39	0.926		
	78	0.929		
π/4DQPSK	00	1.248	-	Pass
	39	1.259		
	78	1.252		
8DPSK	00	1.234	-	Pass
	39	1.227		
	78	1.230		

GFSK	
	
CH00	CH39
	No Plot
CH78	-
π/4DQPSK	
	
CH00	CH39
	No Plot
CH78	-

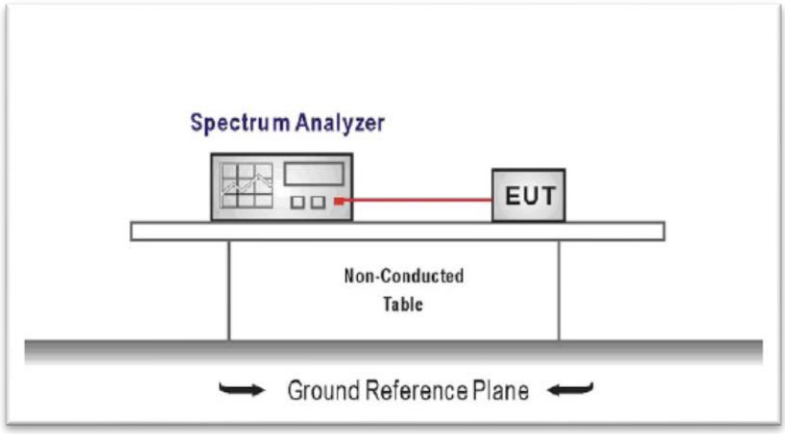
8DPSK	
	
CH00	CH39
	No Plot
CH78	-

5.5. Carrier Frequencies Separation

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):
frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels
   RBW≥1% of the span, VBW≥RBW
   Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

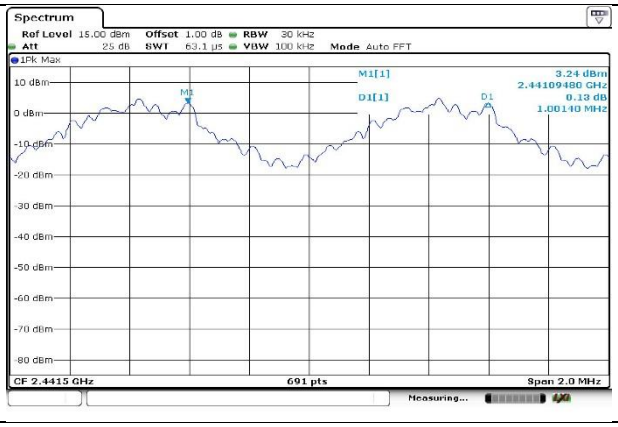
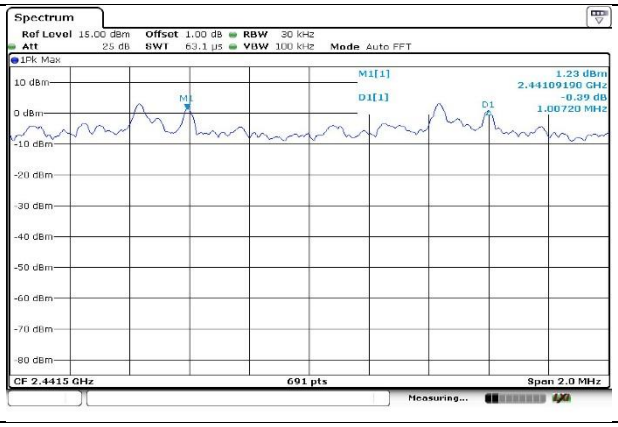
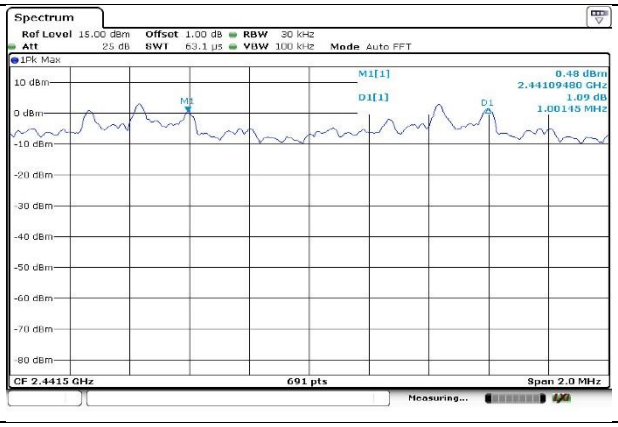
TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
GFSK	39	1.001	0.617	Pass
π/4DQPSK	39	1.007	0.839	Pass
8DPSK	39	1.001	0.822	Pass

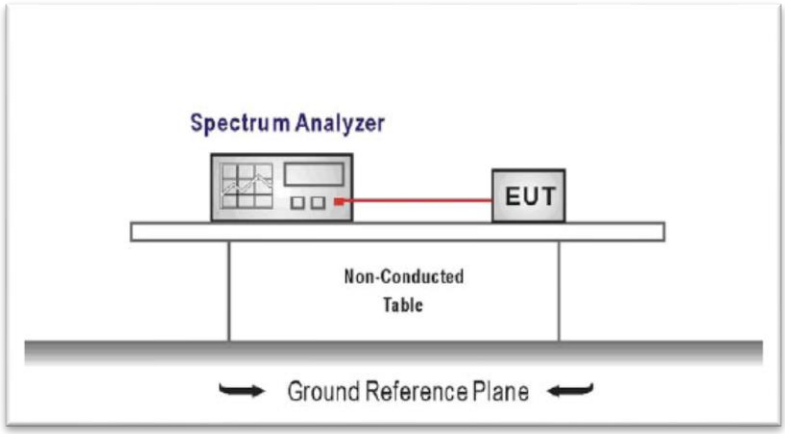
	
GFSK	π/4DQPSK
	No Plot
8DPSK	-

5.6. Hopping Channel Number

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least **15** channels.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   Span = the frequency band of operation
   RBW≥1% of the span, VBW≥RBW
   Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

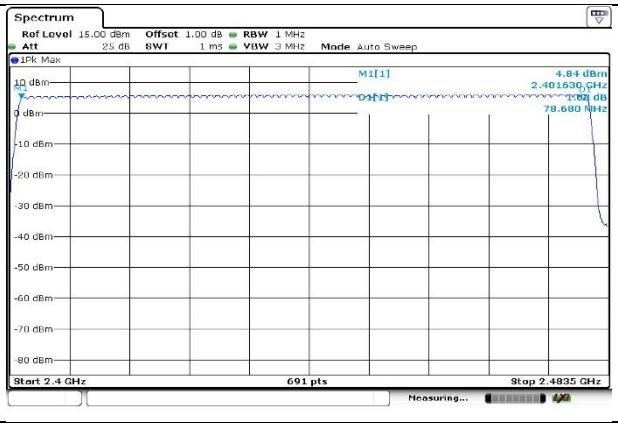
TEST MODE:

Please refer to the clause 3.3

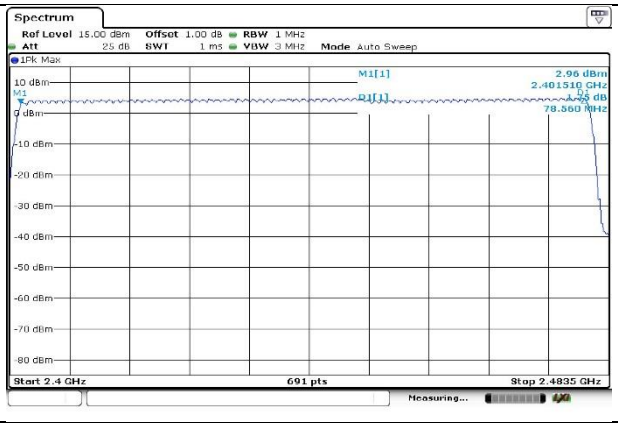
TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

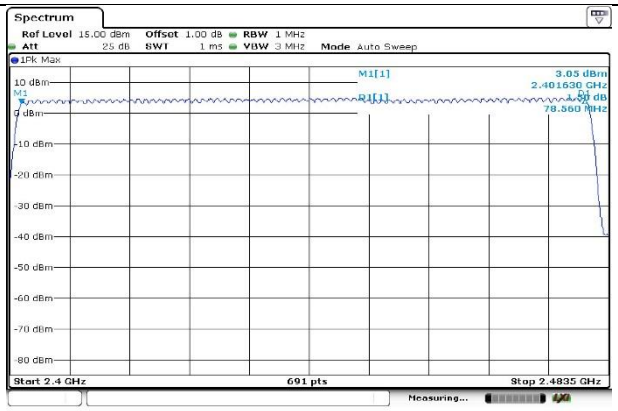
Modulation type	Channel number	Limit	Result
GFSK	79	15.00	Pass
π/4DQPSK	79		
8DPSK	79		



GFSK



π/4DQPSK



8DPSK

No Plot

-

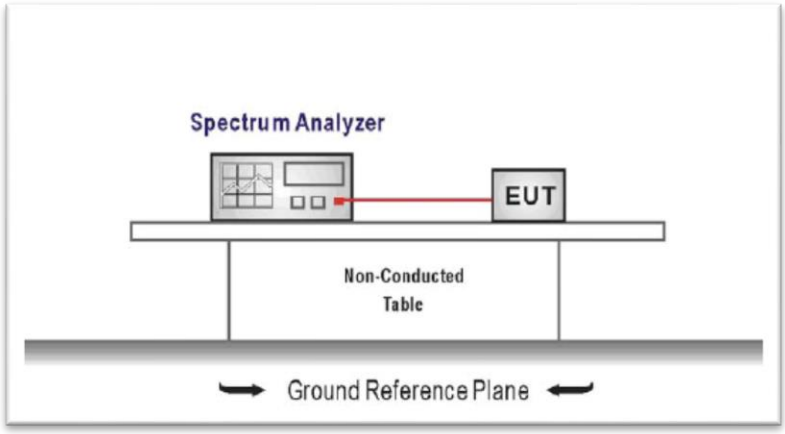
5.7. Dwell Time

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   Span = zero span, centered on a hopping channel, RBW= 1 MHz, VBW≥RBW
   Sweep = as necessary to capture the entire dwell time per hopping channel,
   Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

TEST MODE:

Please refer to the clause 3.3

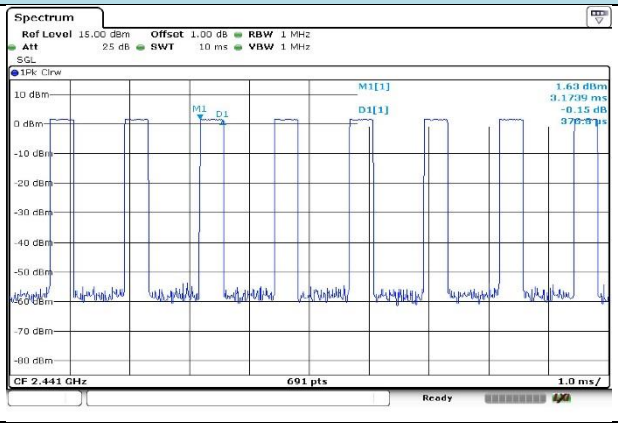
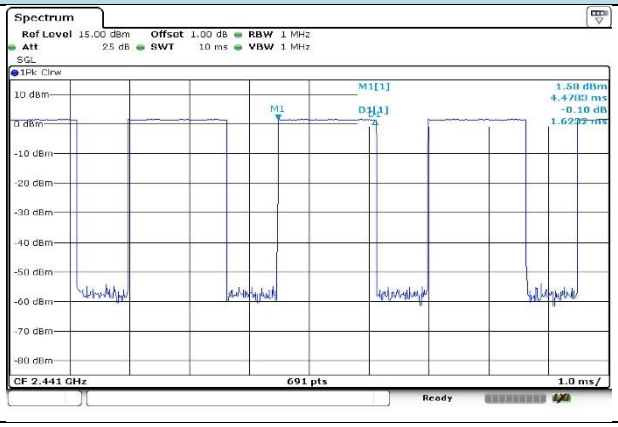
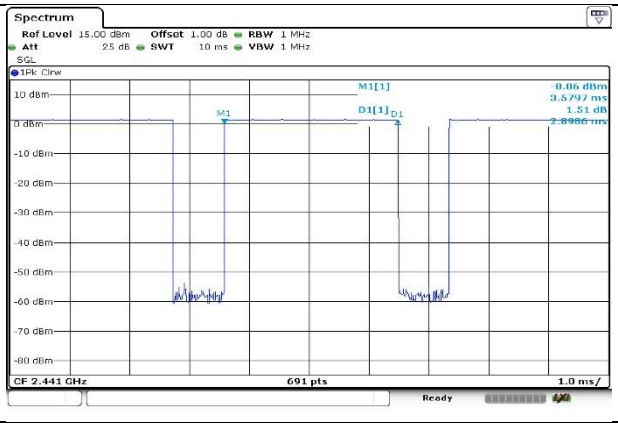
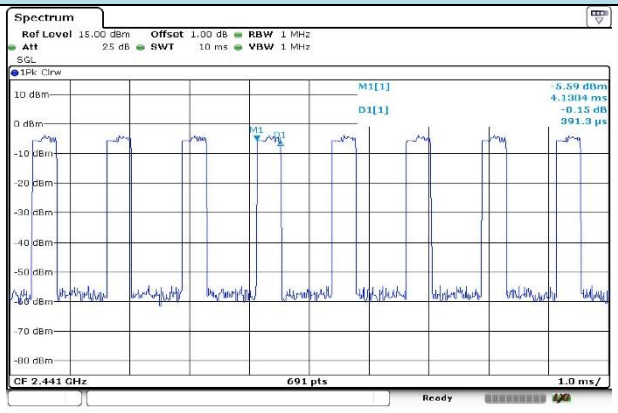
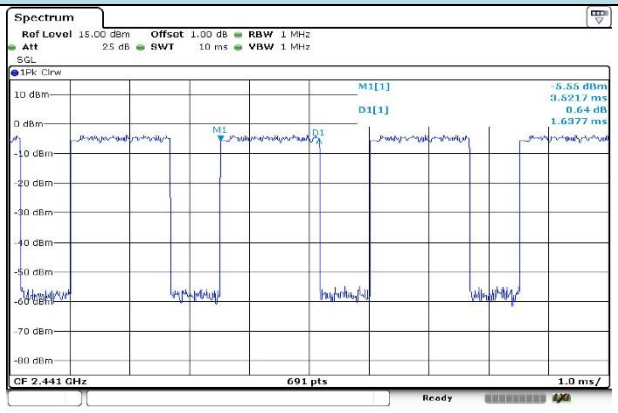
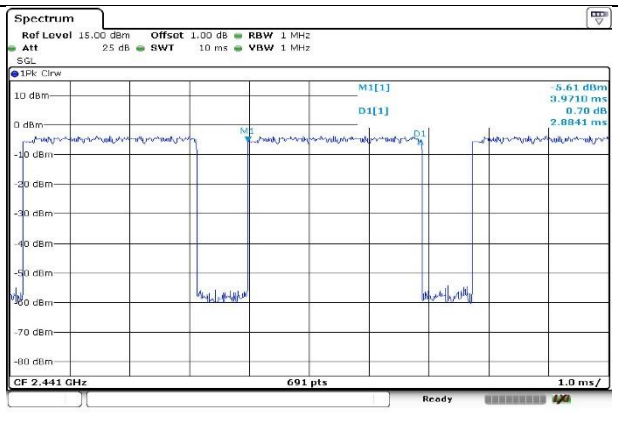
TEST RESULTS

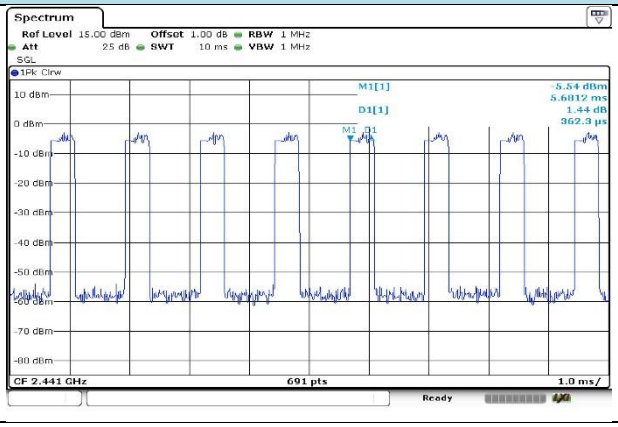
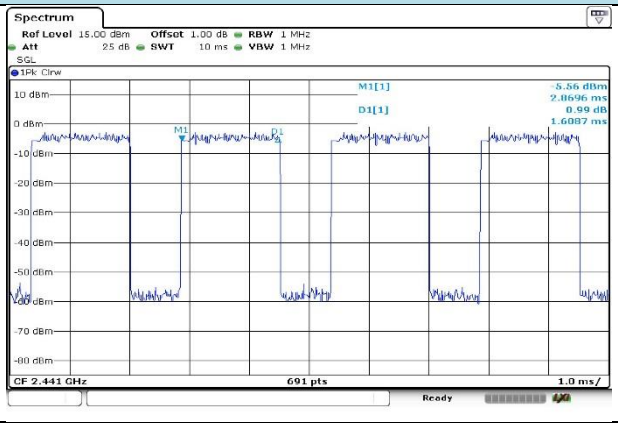
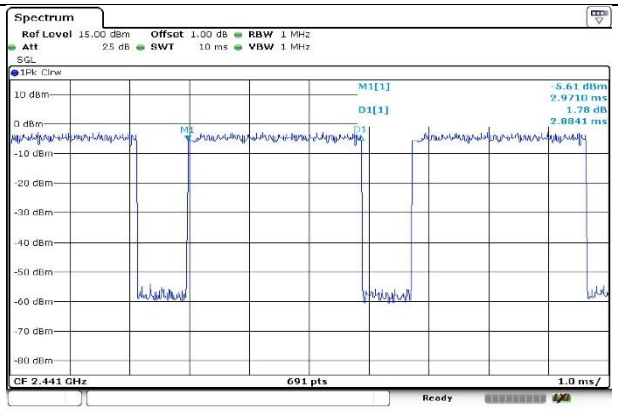
☒ **Passed** ☐ **Not Applicable**

Modulation type	Channel	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.121	0.40	Pass
	DH3	0.260		
	DH5	0.309		
π/4DQPSK	2-DH1	0.125	0.40	Pass
	2-DH3	0.262		
	2-DH5	0.308		
8DPSK	3-DH1	0.116	0.40	Pass
	3-DH3	0.257		
	3-DH5	0.308		

Note:

1. We have tested all mode at high,middle and low channel,and recoreded worst case at middle channel.
2. Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2-DH1, 3-DH1
   Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second for DH3, 2-DH3, 3-DH3
   Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second for DH5, 2-DH5, 3-DH5

GFSK	
	
DH1	DH3
	No Plot
DH5	-
π/4DQPSK	
	
2-DH1	2-DH3
	No Plot
2-DH5	-

8DPSK	
	
3-DH1	3-DH3
	No Plot
3-DH5	-

5.8. Pseudorandom Frequency Hopping Sequence

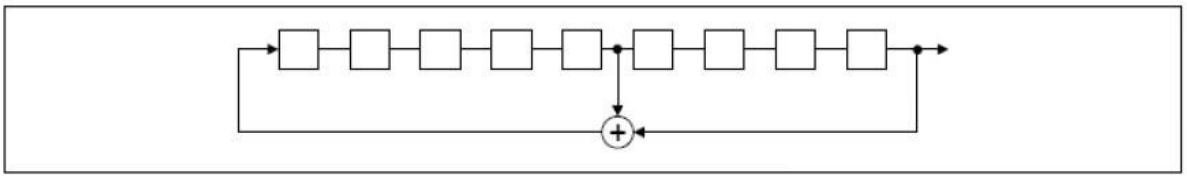
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):
Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

TEST RESULTS

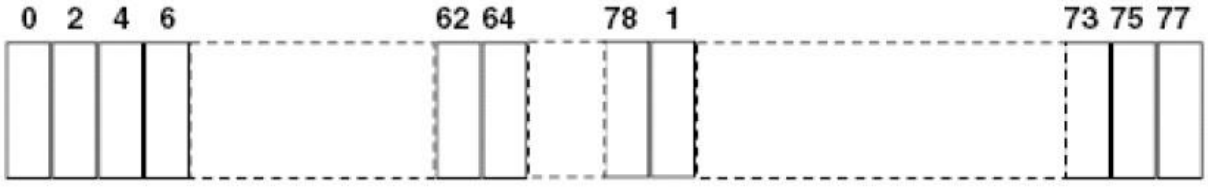
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the friststage.The sequence begins with the frist one of 9 consecutive ones,forexample:the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:



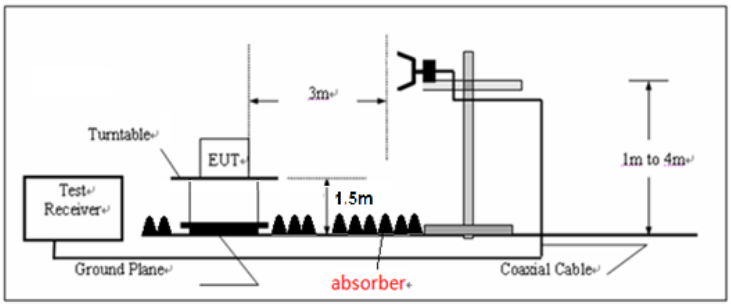
Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

5.9. Restricted band (radiated)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, 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) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated360 degrees to determine the position of the maximum emission level.
3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna. In order to find themaximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
   RBW=1MHz, VBW=3MHzPeak detetor for Peak value
   RBW=1MHz, VBW=10HzPeak detetor for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note:
1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor
2) Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report.

CH00									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2310.00	35.37	28.05	6.62	37.65	32.39	74.00	-41.61	Vertical	Peak
2390.03	35.95	27.65	6.75	37.87	32.48	74.00	-41.52	Vertical	
2310.00	35.33	28.05	6.62	37.65	32.35	74.00	-41.65	Horizontal	
2390.03	35.98	27.65	6.75	37.87	32.51	74.00	-41.49	Horizontal	
2310.00	21.91	28.05	6.62	37.65	18.93	54.00	-35.07	Vertical	Average
2390.03	21.68	27.65	6.75	37.87	18.21	54.00	-35.79	Vertical	
2310.00	22.10	28.05	6.62	37.65	19.12	54.00	-34.88	Horizontal	
2390.03	21.58	27.65	6.75	37.87	18.11	54.00	-35.89	Horizontal	

CH78									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2483.50	39.60	27.26	6.83	37.87	35.82	74.00	-38.18	Vertical	Peak
2500.00	37.88	27.20	6.84	37.87	34.05	74.00	-39.95	Vertical	
2483.50	40.70	27.26	6.83	37.87	36.92	74.00	-37.08	Horizontal	
2500.00	37.63	27.20	6.84	37.87	33.80	74.00	-40.20	Horizontal	
2483.50	24.47	27.26	6.83	37.87	20.69	54.00	-33.31	Vertical	Average
2500.00	24.32	27.20	6.84	37.87	20.49	54.00	-33.51	Vertical	
2483.50	26.95	27.26	6.83	37.87	23.17	54.00	-30.83	Horizontal	
2500.00	24.34	27.20	6.84	37.87	20.51	54.00	-33.49	Horizontal	

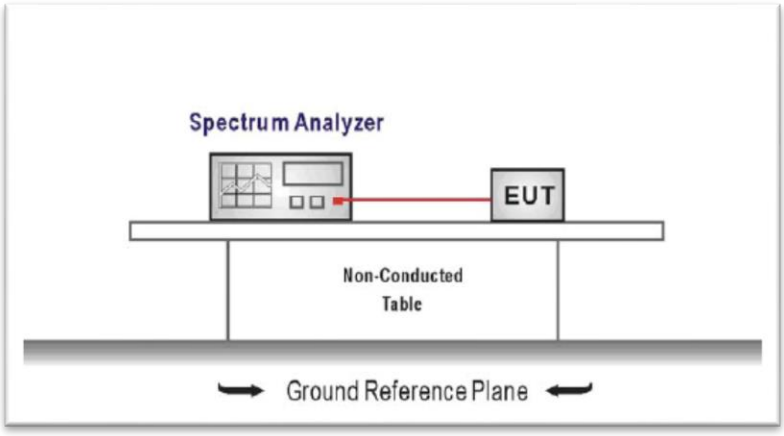
5.10. Bandedge and Spurious Emission (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

TEST CONFIGURATION



TEST PROCEDURE

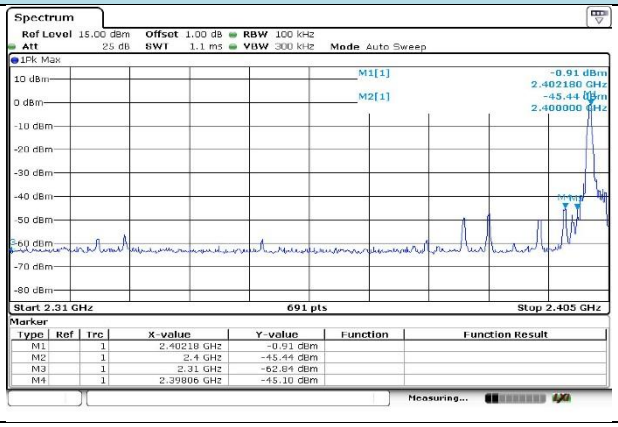
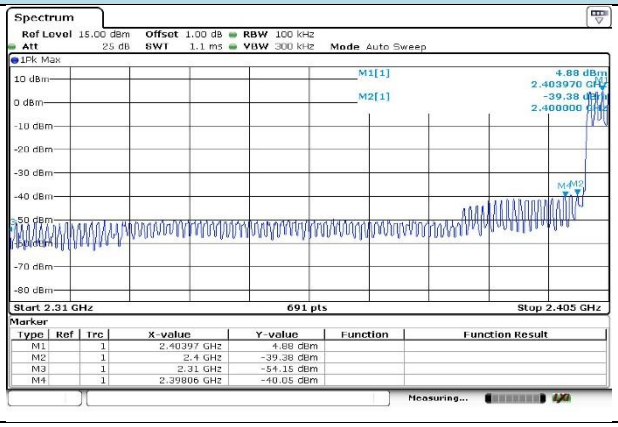
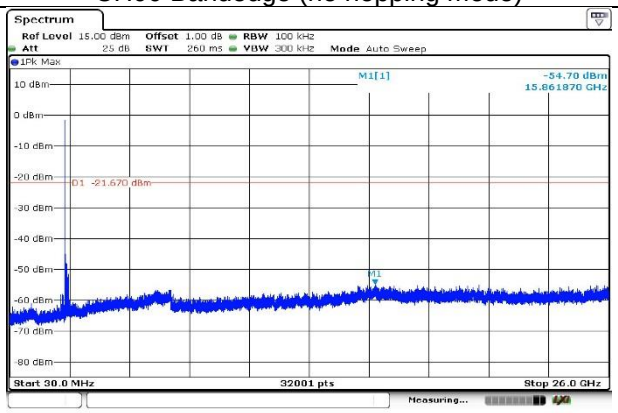
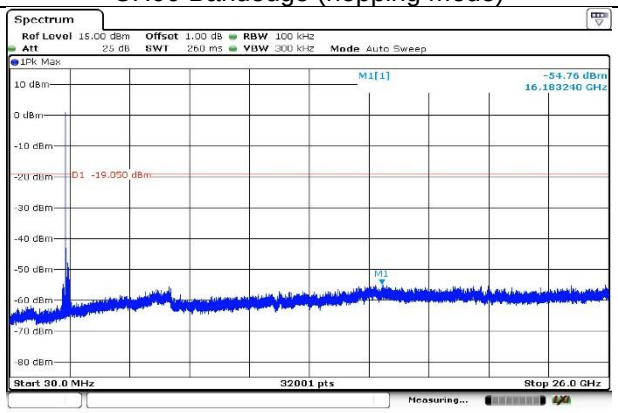
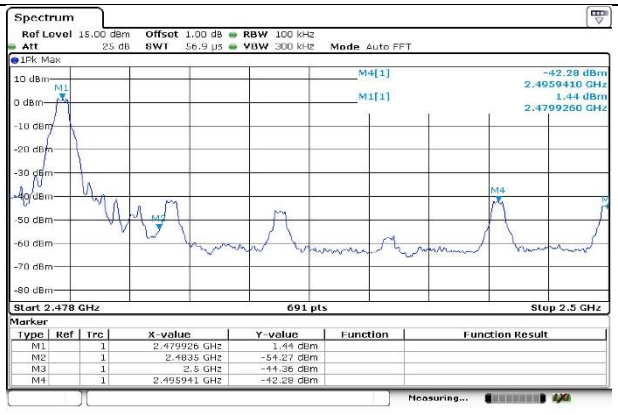
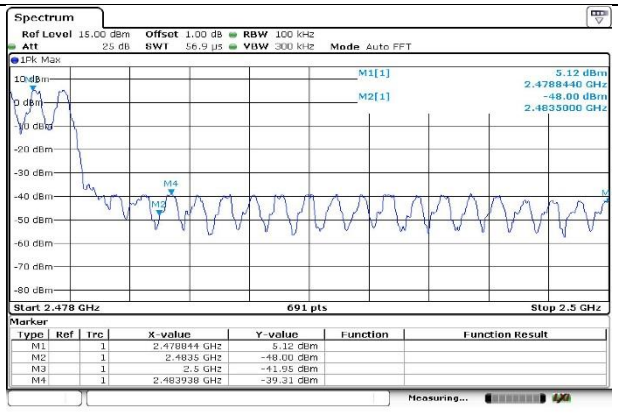
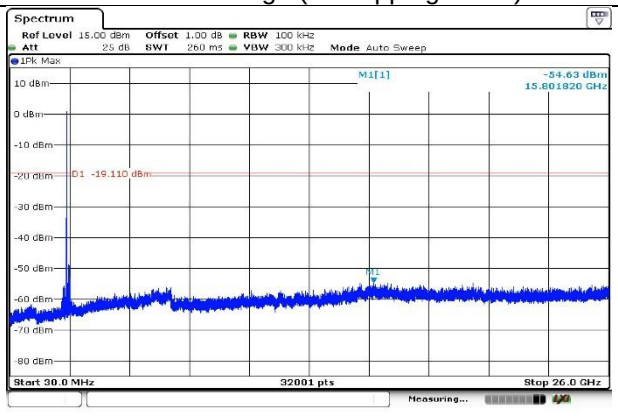
1. The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   RBW= 100 KHz, VBW≥RBW
   Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

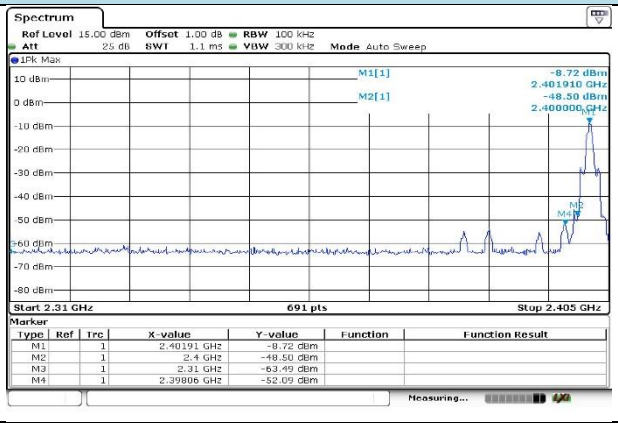
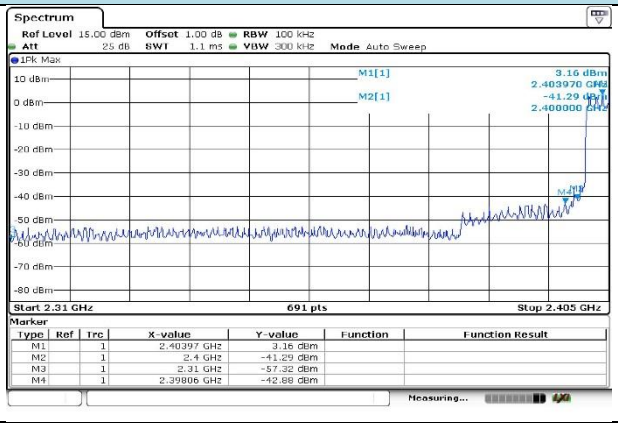
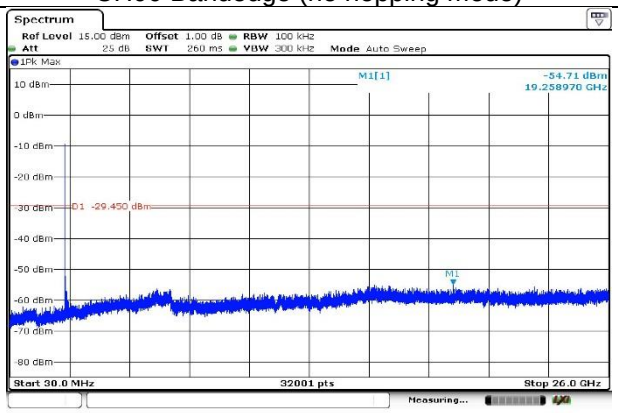
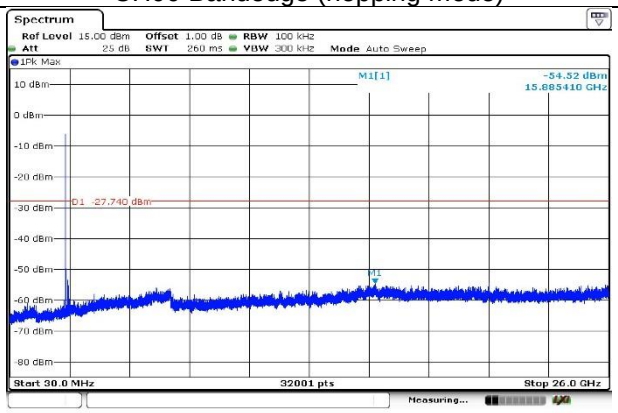
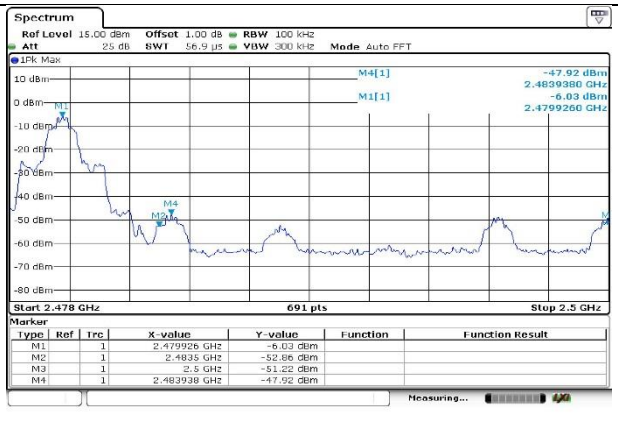
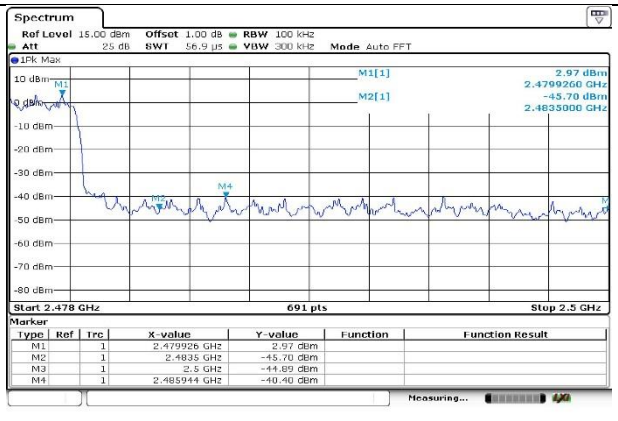
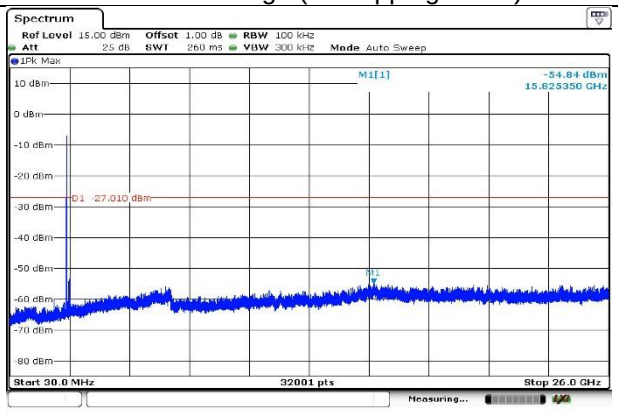
TEST MODE:

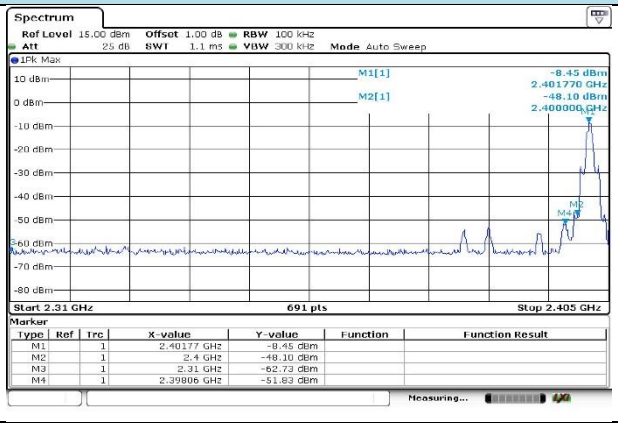
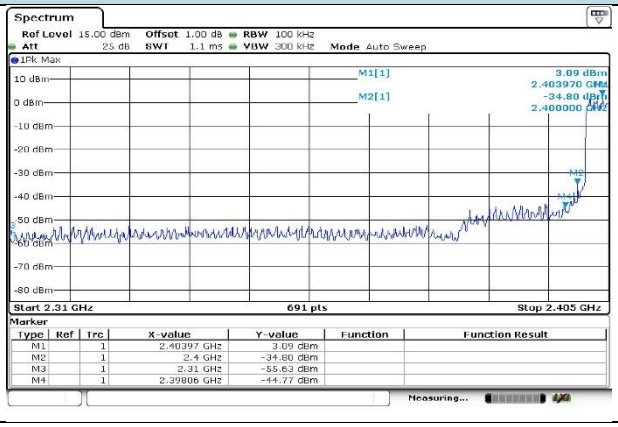
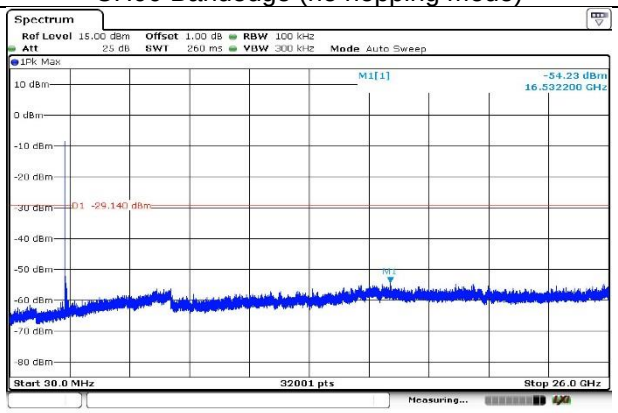
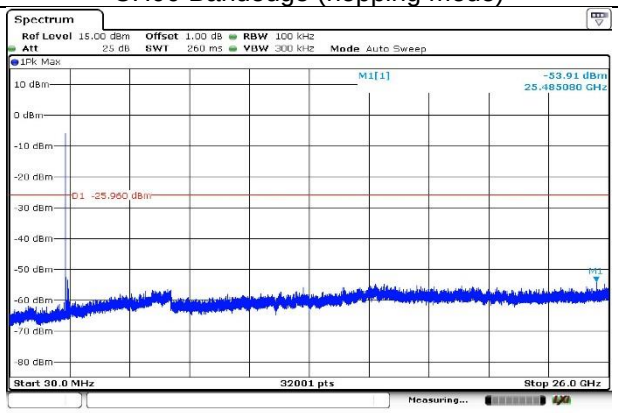
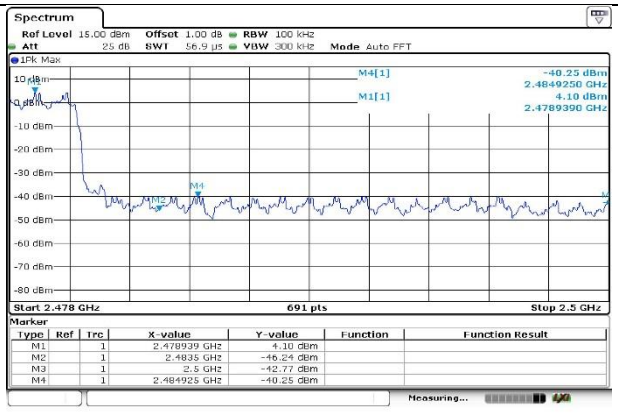
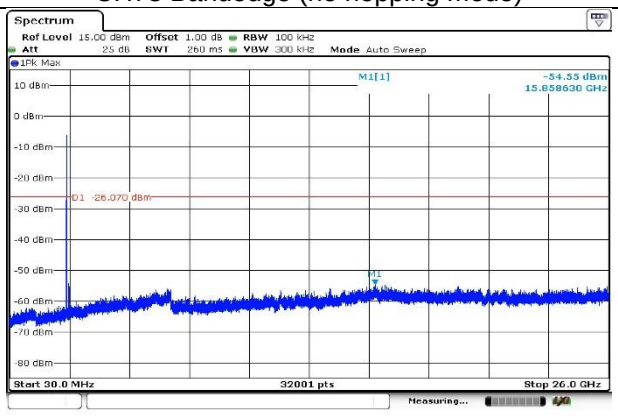
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

GFSK	
	
CH00 Bandedge (no hopping mode)	CH00 Bandedge (hopping mode)
	
CH00 SE	CH39 SE
	
CH78 Bandedge (no hopping mode)	CH78 Bandedge (hopping mode)
	No Plot
CH78 SE	-

π/4DQPSK	
	
CH00 Bandedge (no hopping mode)	CH00 Bandedge (hopping mode)
	
CH00 SE	CH39 SE
	
CH78 Bandedge (no hopping mode)	CH78 Bandedge (hopping mode)
	No Plot
CH78 SE	-

8DPSK	
	
CH00 Bandedge (no hopping mode)	CH00 Bandedge (hopping mode)
	
CH00 SE	CH39 SE
	
CH78 Bandedge (no hopping mode)	CH78 Bandedge (hopping mode)
	No Plot
CH78 SE	-

5.11. Spurious Emission (radiated)

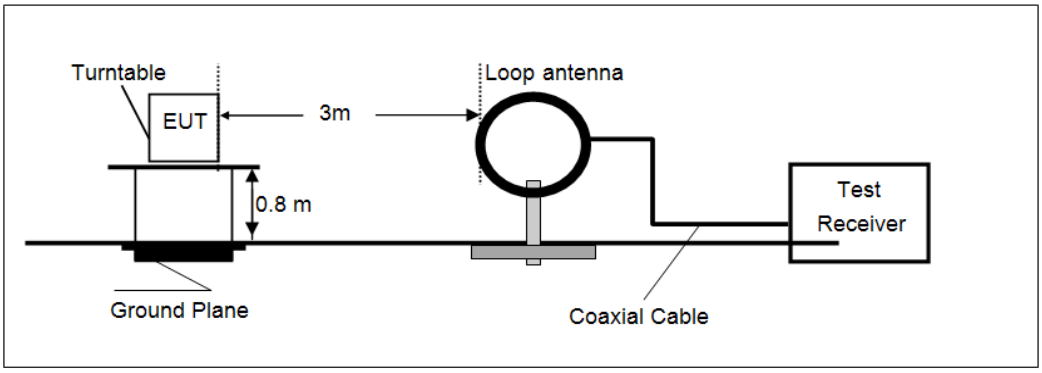
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

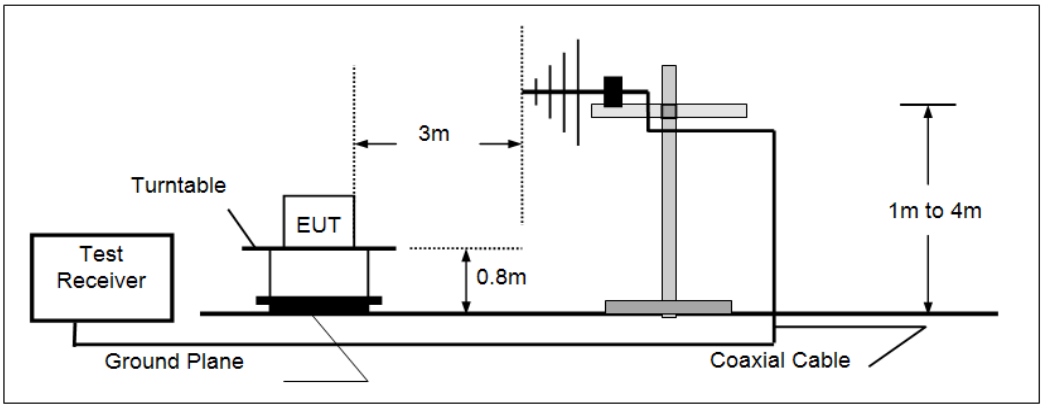
Frequency	Limit (dBuV/m @3m)	Value
0.009 MHz-0.09MHz	88.52-68.52	Average
0.09MHz–0.11MHz	68.52-66.78	Quasi-peak
0.11MHz–0.49 MHz	66.78-53.80	Average
0.49 MHz -1.705 MHz	53.80-42.97	Quasi-peak
1.705 MHz -30 MHz	49.54	Quasi-peak
30MHz-88MHz	40.00	Quasi-peak
88MHz-216MHz	43.50	Quasi-peak
216MHz-960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

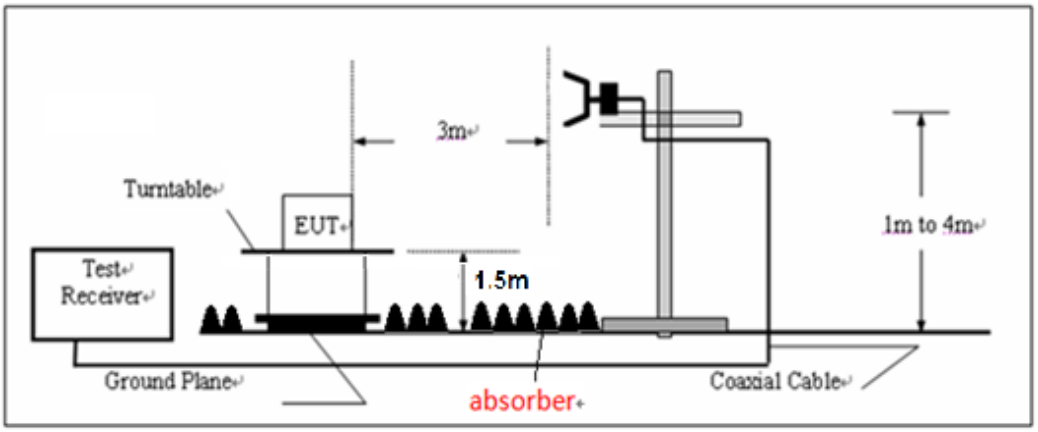
- 9KHz ~30MHz



- 30MHz ~ 1GHz



➢ Above 1GHz



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated360 degrees to determine the position of the maximum emission level.
3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna.
5. Use the following spectrum analyzer settings
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Below 1GHz, RBW=120KHz, VBW=300KHz, Sweep=auto, Detector function=peak, Trace=max hold; If the emission level of the EUT measured by the peak detectoris 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, theemission measurement will be repeated using the quasi-peak detector and reported.
   (3) Above 1GHz, RBW=1MHz, VBW=3MHz Peak detetorfor Peak value
   RBW=1MHz, VBW=10Hz Peak detetorfor Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note:

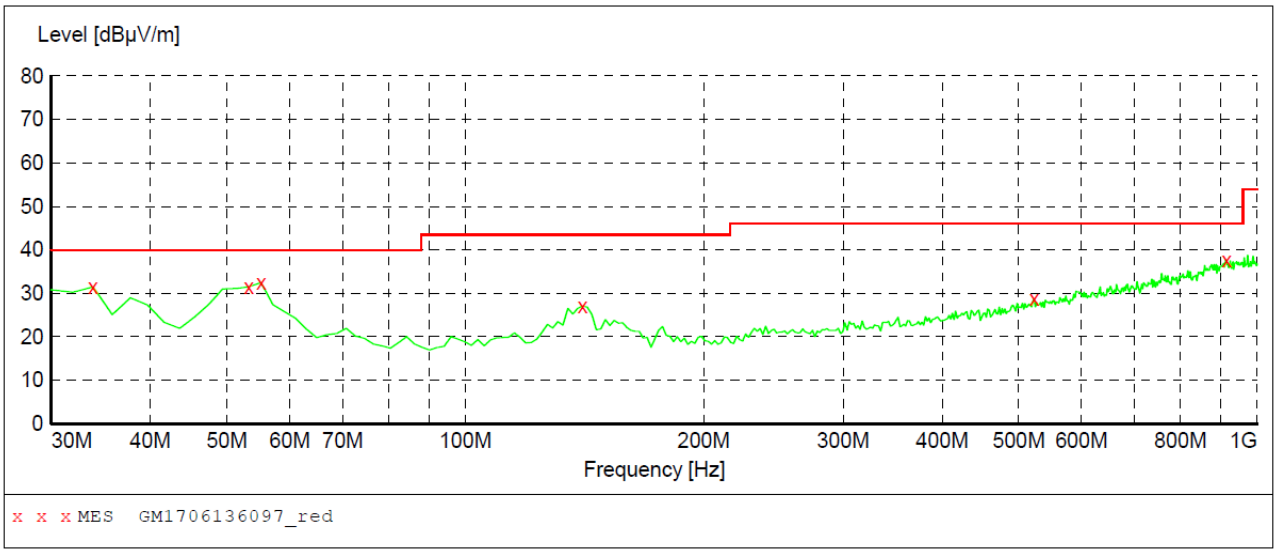
1) Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2) "*", means this data is the too weak instrument of signal is unable to test.
3) The emission levels of other frequencies are very lower than the limit and not show in test report.
4) Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report.

➢ **9kHz ~ 30MHz**

The EUT was pre-scanned the frequency band (9KHz~30MHz), found the radiated level lower than the limit, so don't show on the report.

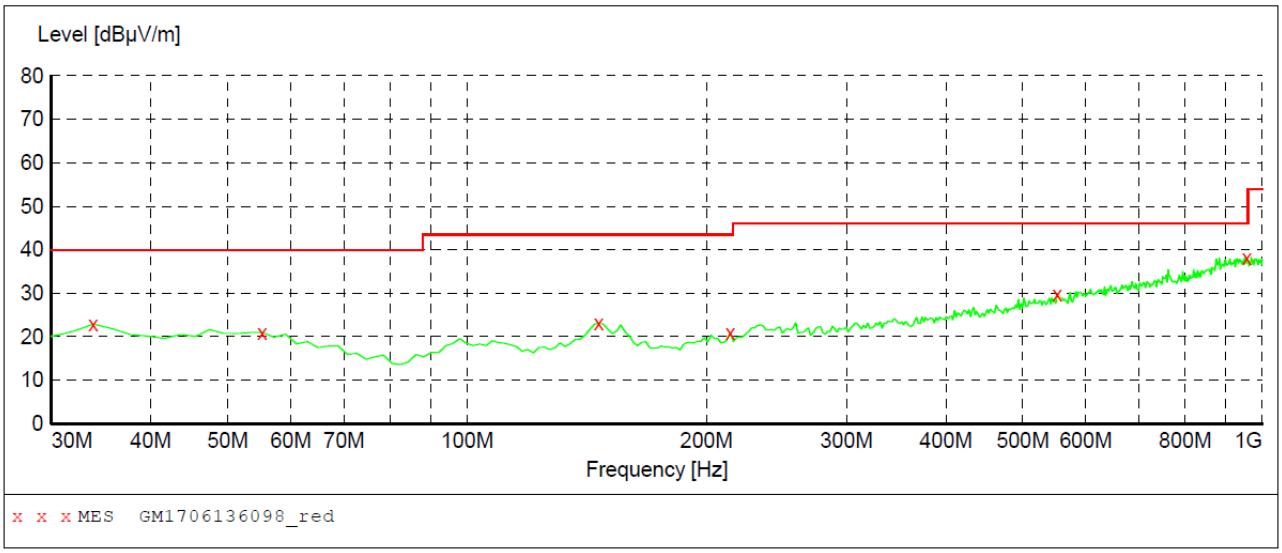
➢ **30MHz ~ 1GHz**

Polarization:	Vertical



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
33.880000	31.50	-12.6	40.0	8.5	QP	100.0	321.00	VERTICAL
53.280000	31.50	-9.0	40.0	8.5	QP	100.0	160.00	VERTICAL
55.220000	32.50	-9.2	40.0	7.5	QP	100.0	133.00	VERTICAL
140.580000	27.10	-13.8	43.5	16.4	QP	100.0	241.00	VERTICAL
522.760000	28.80	-1.3	46.0	17.2	QP	100.0	41.00	VERTICAL
914.640000	37.70	6.9	46.0	8.3	QP	100.0	3.00	VERTICAL

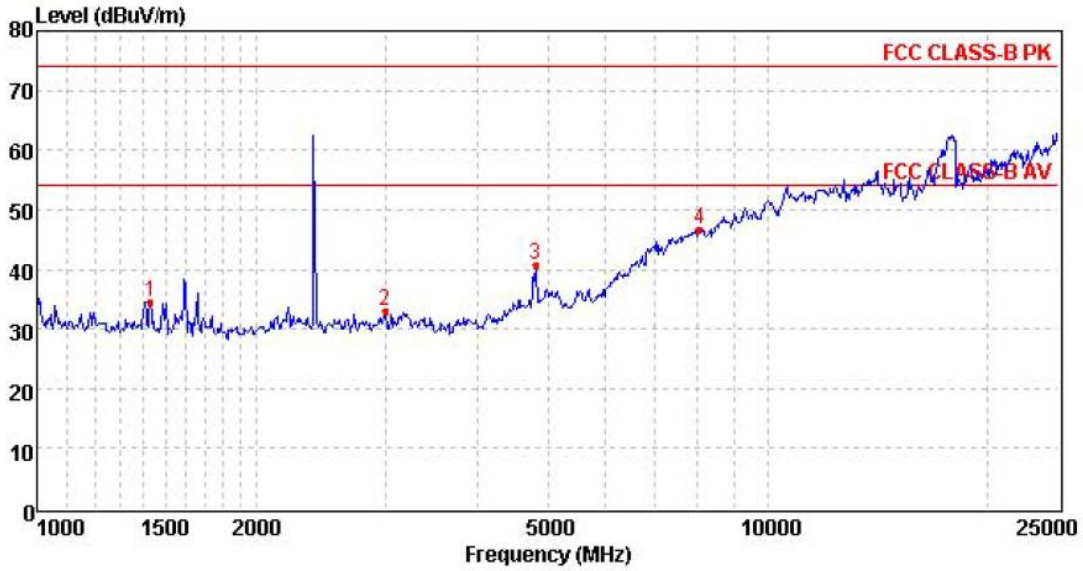
Polarization:	Horizontal



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
33.880000	22.90	-12.6	40.0	17.1	QP	300.0	337.00	HORIZONTAL
55.220000	21.00	-9.2	40.0	19.0	QP	300.0	213.00	HORIZONTAL
146.400000	23.20	-13.9	43.5	20.3	QP	300.0	189.00	HORIZONTAL
214.300000	20.90	-10.3	43.5	22.6	QP	300.0	229.00	HORIZONTAL
551.860000	29.80	-0.7	46.0	16.2	QP	100.0	202.00	HORIZONTAL
955.380000	38.20	7.3	46.0	7.8	QP	300.0	284.00	HORIZONTAL

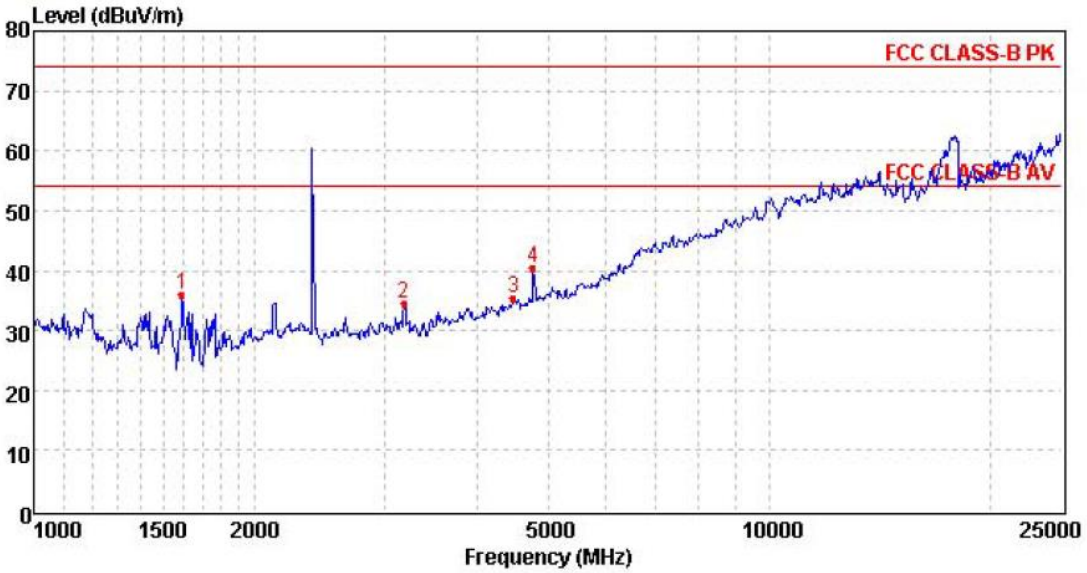
➢ **1GHz ~ 25GHz**

CH00	Vertical



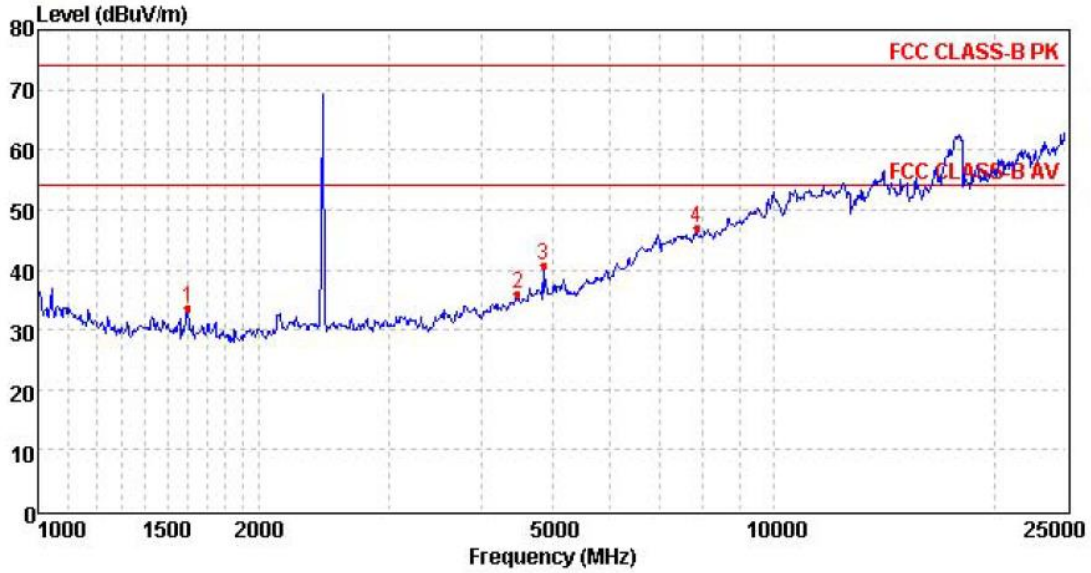
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1429.46	40.07	25.87	5.08	36.50	34.52	74.00	-39.48	Peak
2	2997.07	35.03	28.60	7.48	38.23	32.88	74.00	-41.12	Peak
3	4810.55	36.50	31.58	9.55	36.93	40.70	74.00	-33.30	Peak
4	8077.24	31.80	37.02	12.48	34.54	46.76	74.00	-27.24	Peak

CH00	Horizontal



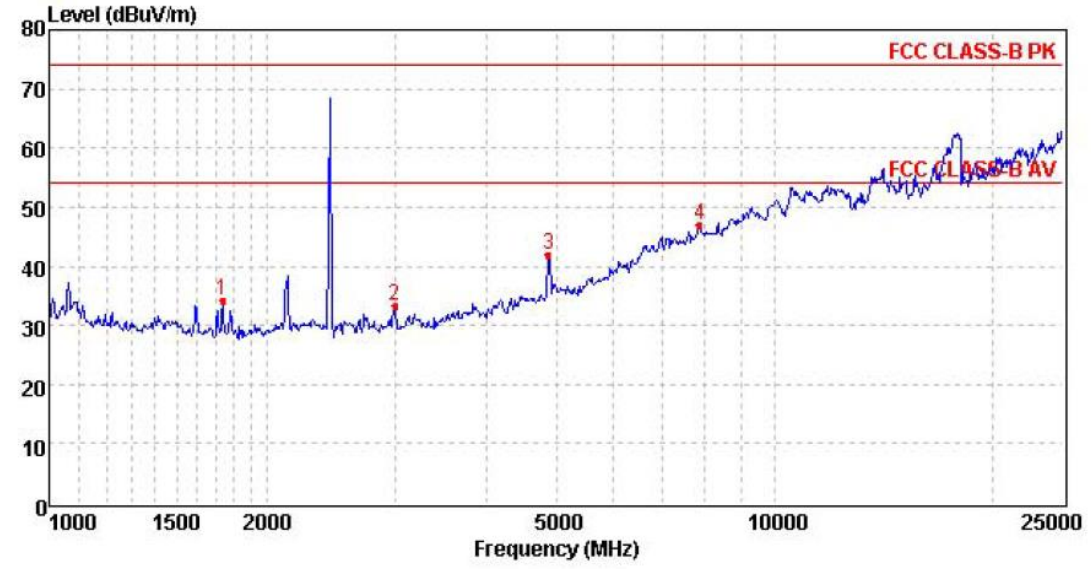
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1589.66	42.07	24.99	5.54	36.71	35.89	74.00	-38.11	Peak
2	3186.09	36.28	28.80	7.70	38.20	34.58	74.00	-39.42	Peak
3	4496.12	32.95	30.69	9.29	37.40	35.53	74.00	-38.47	Peak
4	4779.68	36.51	31.52	9.53	36.99	40.57	74.00	-33.43	Peak

CH39	Vertical



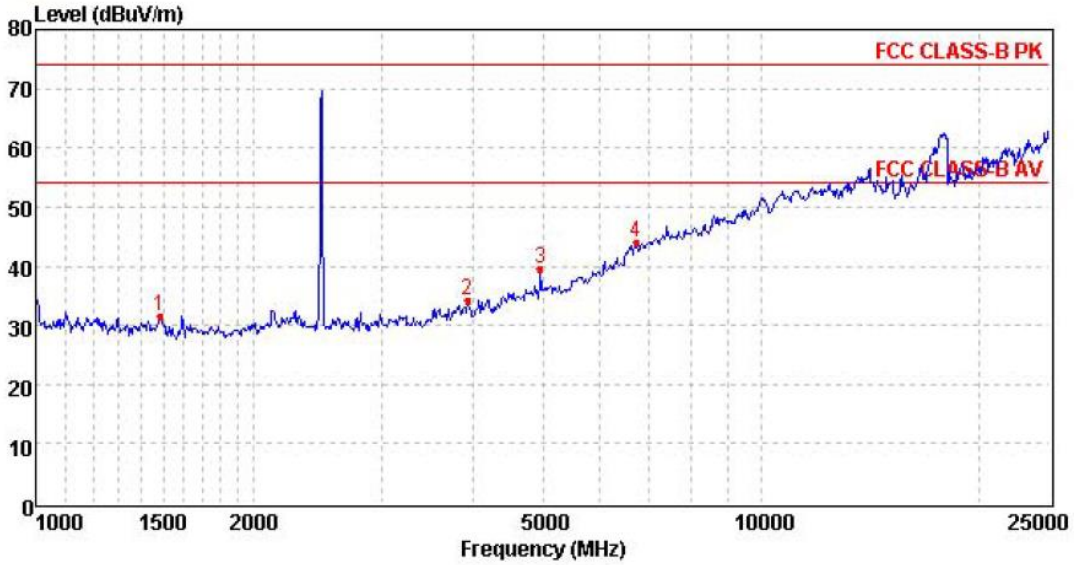
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1599.92	39.96	24.90	5.57	36.72	33.71	74.00	-40.29	Peak
2	4496.12	33.35	30.69	9.29	37.40	35.93	74.00	-38.07	Peak
3	4872.89	36.48	31.45	9.59	36.76	40.76	74.00	-33.24	Peak
4	7871.90	32.30	36.53	12.91	34.88	46.86	74.00	-27.14	Peak

CH39	Horizontal



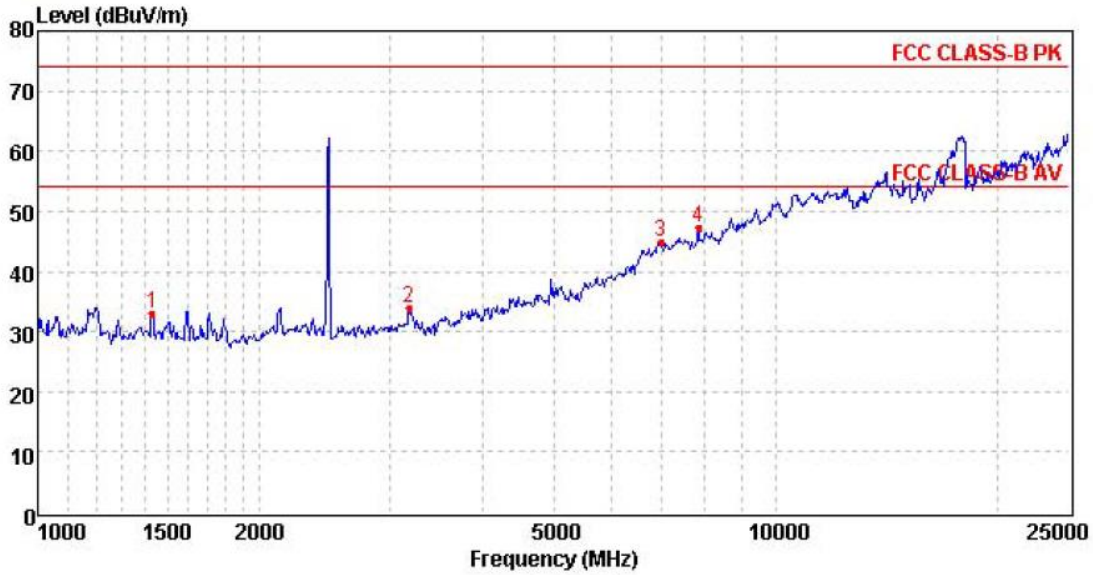
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1734.00	40.18	25.27	5.83	37.00	34.28	74.00	-39.72	Peak
2	2997.07	35.54	28.60	7.48	38.23	33.39	74.00	-40.61	Peak
3	4888.60	37.77	31.42	9.60	36.71	42.08	74.00	-31.92	Peak
4	7897.28	32.19	36.68	12.79	34.81	46.85	74.00	-27.15	Peak

CH78	Vertical



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1485.75	37.17	25.81	5.24	36.57	31.65	74.00	-42.35	Peak
2	3940.24	34.09	29.70	8.70	38.15	34.34	74.00	-39.66	Peak
3	4967.92	34.90	31.47	9.65	36.49	39.53	74.00	-34.47	Peak
4	6723.27	33.47	34.15	11.51	35.13	44.00	74.00	-30.00	Peak

CH78	Horizontal



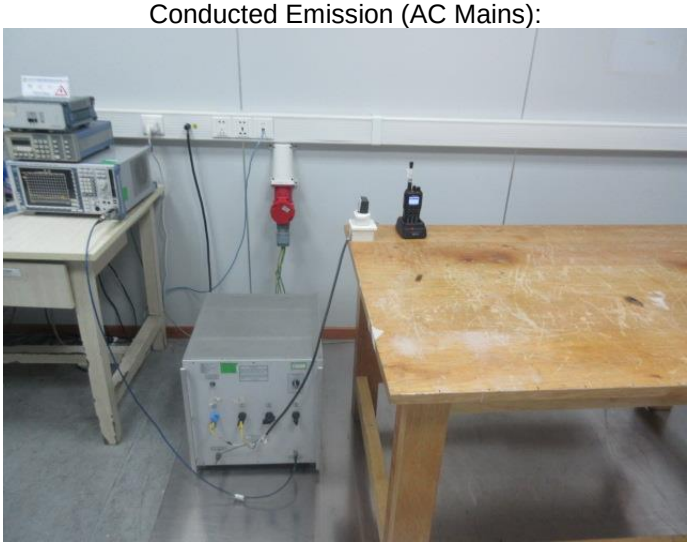
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1429.46	38.47	25.87	5.08	36.50	32.92	74.00	-41.08	Peak
2	3186.09	35.52	28.80	7.70	38.20	33.82	74.00	-40.18	Peak
3	6988.05	32.67	35.23	11.84	34.80	44.94	74.00	-29.06	Peak
4	7871.90	32.62	36.53	12.91	34.88	47.18	74.00	-26.82	Peak

Remark:

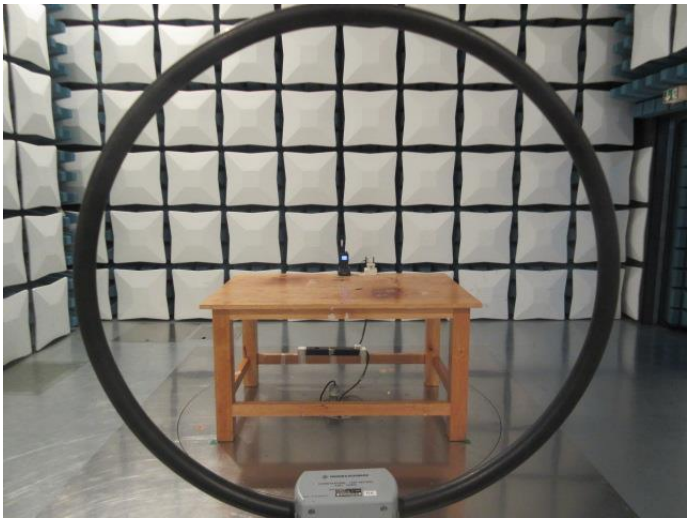
1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The peak level is lower than average limit(54dBuV/m), this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

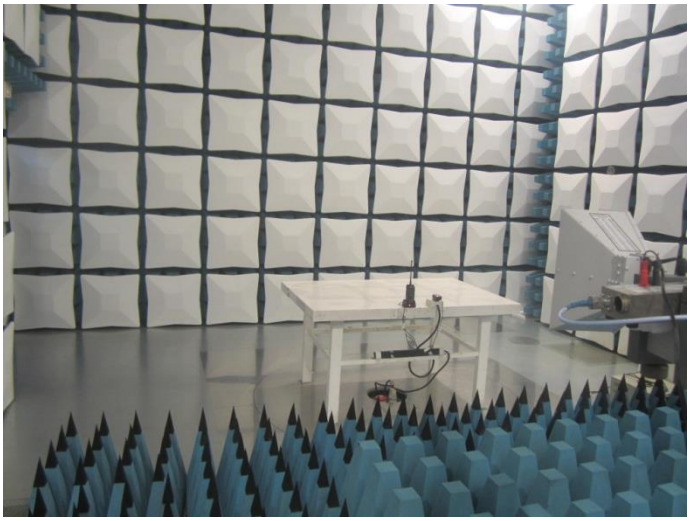
6. Test Setup Photos of the EUT

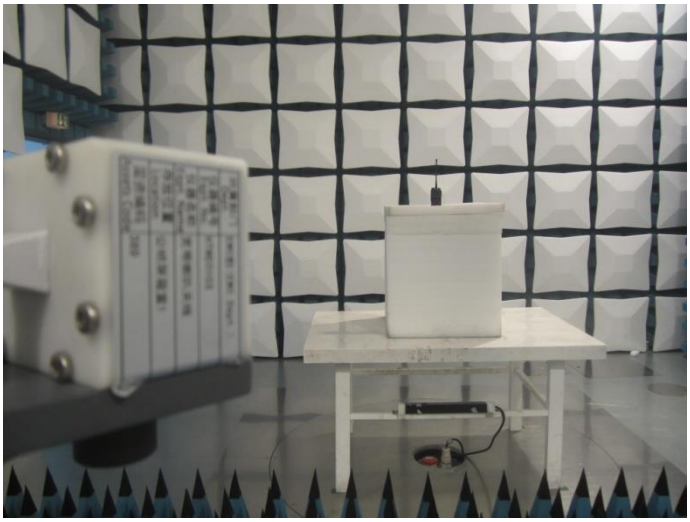
Conducted Emission (AC Mains):



Radiated Emission:







Conducted Emission

7. External and Internal Photos of the EUT

Reference to the test report No.: TRE1706002301.

----------End of Report----------