RADIO TEST REPORT
FCC 47 CFR PART 15 SUBPART C

Test Standard	**FCC Part 15.247**
Product name	**Harvey Surgical Assistant Navigation Unit**
Brand Name	OrthAlign precision · technology · simplified
Model No.	**405061**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

Approved by:

Kevin Tsai
Deputy Manager

Revision History

Rev.	Issue Date	Revisions	Page	Revised By
00	February 04, 2020	Initial Issue	ALL	May Lin
01	February 13, 2020	See the following Note Rev. (01)	P.24-25	May Lin

Rev (01):
1. Revised the test result and test data.

Table of contents

1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	OrthAlign Inc. 120 Columbia, Suite 500 Aliso Viejo, CA 92656 USA
Manufacturer	OrthAlign Inc. 120 Columbia, Suite 500 Aliso Viejo, CA 92656 USA
Equipment	Harvey Surgical Assistant Navigation Unit
Model No.	405061
Model Discrepancy	N/A
Trade Name	OrthAlign precision · technology · simplified
Received Date	December 18, 2019
Date of Test	January 02 ~ 10, 2020
Output Power (W)	GFSK : 0.0134 8DPSK : 0.0077
Power Supply	Power from Rechargeable Li-polymer Battery–alternate Brand name: Energizer Model name: Ultimate Lithium Rating: 4.5V/ 9000mAh

1.2 INFORMATION ABOUT THE FHSS CHARACTERISTICS

1.2.1 Pseudorandom Frequency Hopping Sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1 600 hops/s.

1.2.2 Equal Hopping Frequency Use

The channels of this system will be used equally over the long-term distribution of the hopsets.

1.2.3 Example of a 79 hopping sequence in data mode:

02, 05, 31, 24, 20, 10, 43, 36, 30, 23, 40, 06, 21, 50, 44, 09, 71, 78, 01, 13, 73, 07, 70, 72, 35, 62, 42, 11, 41, 08, 29, 60, 15, 34, 61, 58, 04, 67, 12, 22, 53, 57, 18, 27, 76, 39, 32, 17, 77, 52, 33, 56, 46, 37, 47, 64, 49, 45, 38, 69, 14, 51, 26, 79, 19, 28, 65, 75, 54, 48, 03, 25, 66, 16, 68, 74, 59, 63, 55

1.2.4 System Receiver Input Bandwidth

Each channel bandwidth is 1MHz.
The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

1.2.5 Equipment Description

15.247(a)(1) that the Rx input bandwidths shift frequencies in synchronization with the transmitted signals.
15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
15.247(h): In accordance with the Bluetooth Industry Standard, the system does not coordinate it channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

1.3 EUT CHANNEL INFORMATION

Frequency Range	2402MHz-2480MHz
Modulation Type	1. GFSK for BDR-1Mbps 2. π/4-DQPSK for EDR-2Mbps 3. 8DPSK for EDR-3Mbps
Number of channel	79 Channels

Remark:
Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 test channels

Number of frequencies to be tested		
Frequency range in which device operates	**Number of frequencies**	**Location in frequency range of operation**
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.4 ANTENNA INFORMATION

Antenna Type	☒ FPC ☐ PCB ☐ Dipole ☐ Coils
Antenna Gain	Gain: 4 dBi
Antenna connector	MHF4

1.5 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87

***Remark**:*
1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.6 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at
No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	N/A	Not applicable, because EUT not connect to AC Main Source direct.
Radiation	Jerry Chang	-
RF Conducted	Dally Hong	-

***Remark:** The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.*

1.7 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Coaxial Cable	Woken	WC12	CC001	06/28/2019	06/27/2020
Coaxial Cable	Woken	WC12	CC003	06/28/2019	06/27/2020
Power Meter	Anritsu	ML2495A	1149001	02/12/2019	02/11/2020
Power Seneor	Anritsu	MA2491A	030982	02/12/2019	02/11/2020
EXA Signal Analyzer	KEYSIGHT	N9010B	MY55460167	07/31/2019	07/30/2020
Software	N/A				

3M 966 Chamber Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Band Reject Filters	MICRO TRONICS	BRM 50702	120	02/26/2019	02/25/2020
Bilog Antenna	Sunol Sciences	JB3	A030105	07/26/2019	07/25/2020
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/26/2019	02/25/2020
Coaxial Cable	EMCI	EMC105	190914+25111	09/20/2019	09/19/2020
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/30/2019	01/29/2020
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	10/04/2019	10/03/2020
Loop Ant	COM-POWER	AL-130	121051	03/22/2019	03/21/2020
Pre-Amplifier	EMEC	EM330	060609	02/26/2019	02/25/2020
Pre-Amplifier	HP	8449B	3008A00965	02/26/2019	02/25/2020
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/29/2019	05/28/2020
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 6.11-20180413				

AC Conducted Emissions Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
N/A					

Remark: *Each piece of equipment is scheduled for calibration once a year.*

1.8 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

Support Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

1.9 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247.

2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	5.1	AC Conducted Emission	N/A
15.247(a)(1)	5.2	20 dB Bandwidth	-
-	5.2	Occupied Bandwidth (99%)	-
15.247(b)(1)	5.3	Output Power Measurement	Pass
15.247(a)(1)	5.4	Frequency Separation	Pass
15.247(a)(1)(iii)	5.5	Number of Hopping	Pass
15.247(d)	5.6	Conducted Band Edge	Pass
15.247(d)	5.6	Conducted Emission	Pass
15.247(a)(1)(iii)	5.7	Time of Occupancy	Pass
15.247(d)	5.8	Radiation Band Edge	Pass
15.247(d)	5.8	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	GFSK for BDR-1Mbps (DH5) 8DPSK for EDR-3Mbps (3DH5)
Test Channel Frequencies	**GFSK for BDR-1Mbps:** 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz **8DPSK for EDR-3Mbps:** 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz

3.2 THE WORST MODE OF MEASUREMENT

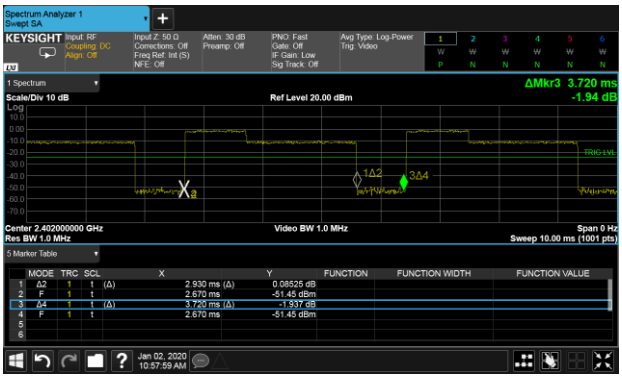
Radiated Emission Measurement Above 1G	
Test Condition	**Band edge, Emission for Unwanted and Fundamental**
Power supply Mode	**Mode 1: EUT power by Adapter.**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**
Worst Position	☐ **Placed in fixed position.** ☒ **Placed in fixed position at X-Plane (E2-Plane)** ☐ **Placed in fixed position at Y-Plane (E1-Plane)** ☐ **Placed in fixed position at Z-Plane (H-Plane)**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Adapter.**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis, X, Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report.

4. EUT DUTY CYCLE

Duty Cycle				
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)	Duty Factor(dB)
BDR-1Mbps	2.95	3.76	78.46%	1.05
EDR-3Mbps	2.93	3.72	78.76%	1.04

BDR-1Mbps	EDR-3Mbps
	

5. TEST RESULT

5.1 AC POWER LINE CONDUCTED EMISSION

5.1.1 Test Limit

According to §15.207(a),

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

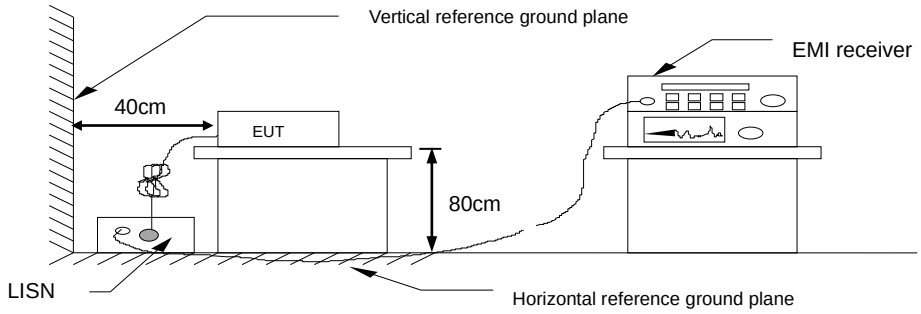
* Decreases with the logarithm of the frequency.

5.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

5.1.3 Test Setup



5.1.4 Test Result

Not applicable, because EUT not connect to AC Main Source direct.

5.2 20dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

5.2.1 Test Limit

According to §15.247(a) (1),

20 dB Bandwidth ：For reporting purposes only.

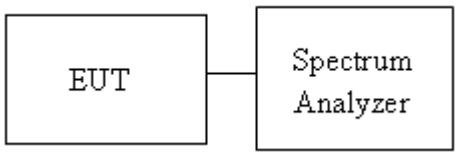
Occupied Bandwidth(99%) ：For reporting purposes only.

5.2.2 Test Procedure

Test method Refer as Section 8.1 and ANSI C63.10: 2013 clause 7.8.7,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW =30kHz, VBW = 100kHz and Detector = Peak, to measurement 20dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth.
5. Measure and record the result of 20 dB Bandwidth and 99% Bandwidth. in the test report.

5.2.3 Test Setup



5.2.4 Test Result

Test mode: GFSK_BDR-1Mbps mode / 2402-2480 MHz			
Channel	**Frequency (MHz)**	**OBW(99%) (MHz)**	**20dB BW (MHz)**
Low	2402	0.89833	0.9231
Mid	2441	0.89953	0.9229
High	2480	0.90078	0.9224

Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz			
Channel	**Frequency (MHz)**	**OBW(99%) (MHz)**	**20dB BW (MHz)**
Low	2402	1.1853	1.26
Mid	2441	1.1836	1.262
High	2480	1.1801	1.26

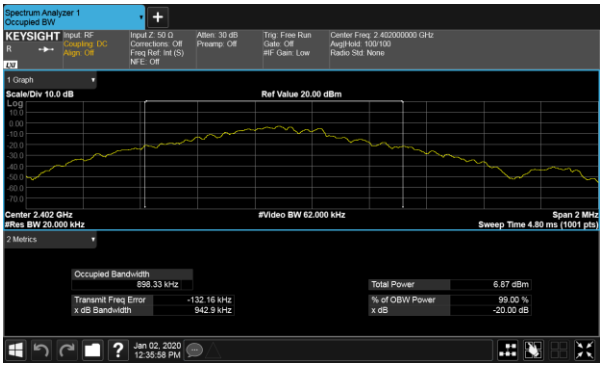
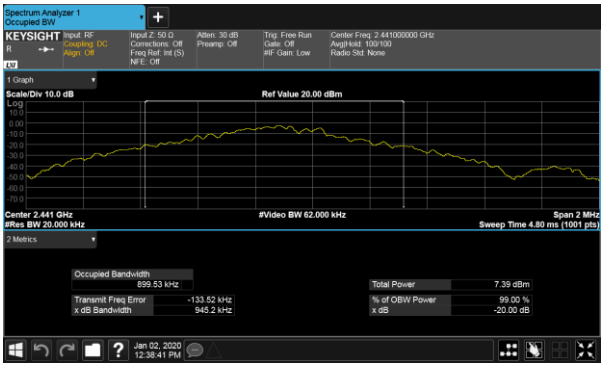
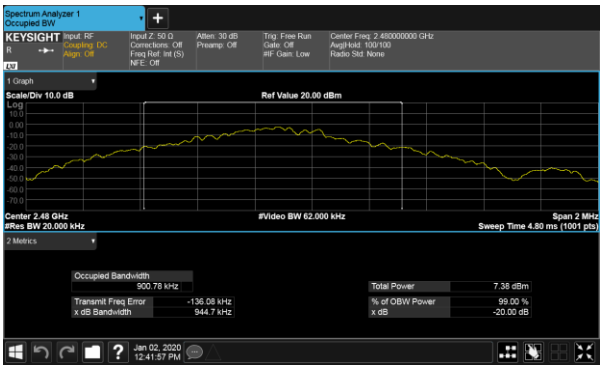
Test Data

20 dB Bandwidth

GFSK_BDR-1Mbps mode	
Low CH	**Mid CH**
	
High CH	
	

8DPSK_EDR-3Mbps mode	
Low CH	**Mid CH**
	
High CH	
	

99% Bandwidth

GFSK_BR-1Mbps mode	
Low CH	**Mid CH**
	
High CH	
	

8DPSK_EDR-3Mbps mode	
Low CH	**Mid CH**
	
High CH	
	

5.3 OUTPUT POWER MEASUREMENT

5.3.1 Test Limit

According to §15.247(b)(1).

Peak output power：

FCC

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies 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.

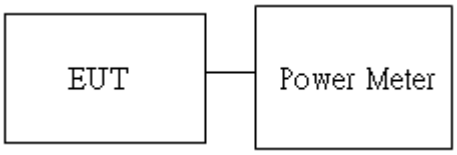
Limit	☒ Antenna not exceed 6 dBi：21dBm ☐ Antenna with DG greater than 6 dBi：21dBm [Limit = 30 – (DG – 6)]

Average output power：For reporting purposes only.

5.3.2 Test Procedure

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

5.3.3 Test Setup



5.3.4 Test Result

Peak output power：

BT					
Config.	CH	Freq. (MHz)	PK Power (dBm)	PK Power (W)	Limit (dBm)
GFSK BR-1Mbps (DH5)	0	2402	10.9	0.0123	21
	39	2441	11.28	0.0134	
	78	2480	11.27	0.0134	
8DPSK EDR-3Mbps (DH5)	0	2402	8.48	0.0070	
	39	2441	8.88	0.0077	
	78	2480	8.82	0.0076	

Average output power：

BT			
Config.	CH	Freq. (MHz)	AV Power (dBm)
GFSK BR-1Mbps (DH5)	0	2402	10.69
	39	2441	11.08
	78	2480	11.08
8DPSK EDR-3Mbps (DH5)	0	2402	8.24
	39	2441	8.62
	78	2480	8.57

5.4 FREQUENCY SEPARATION

5.4.1 Test Limit

According to §15.247(a)(1),

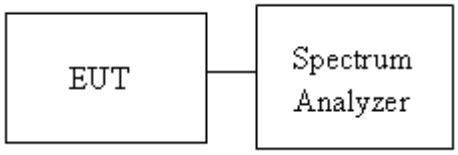
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Limit	> two-thirds of the 20 dB bandwidth

5.4.2 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. EUT RF output port connected to the SA by RF cable.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = 300kHz, Sweep = auto. Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency

5.4.3 Test Setup



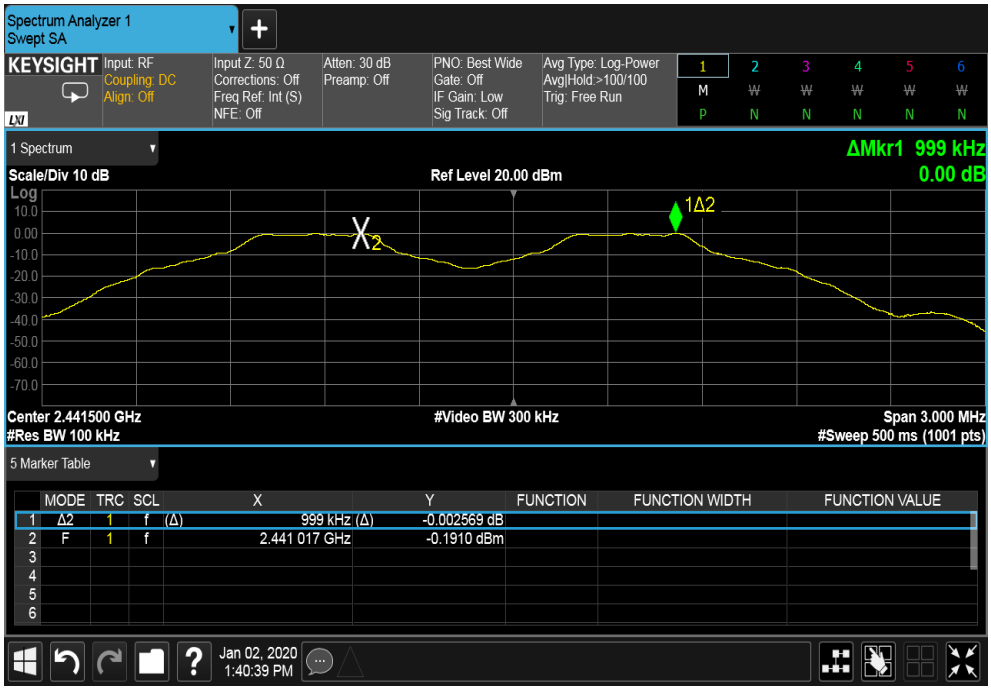
5.4.4 Test Result

Test mode: GFSK_BDR-1Mbps mode / 2402-2480 MHz				
Channel	**Frequency (MHz)**	**Channel Separation (MHz)**	**Channel Separation Limits (MHz)**	**Result**
Low	2402	0.9990	0.789	PASS
Mid	2441	0.9990	0.787	PASS
High	2480	0.9990	0.784	PASS

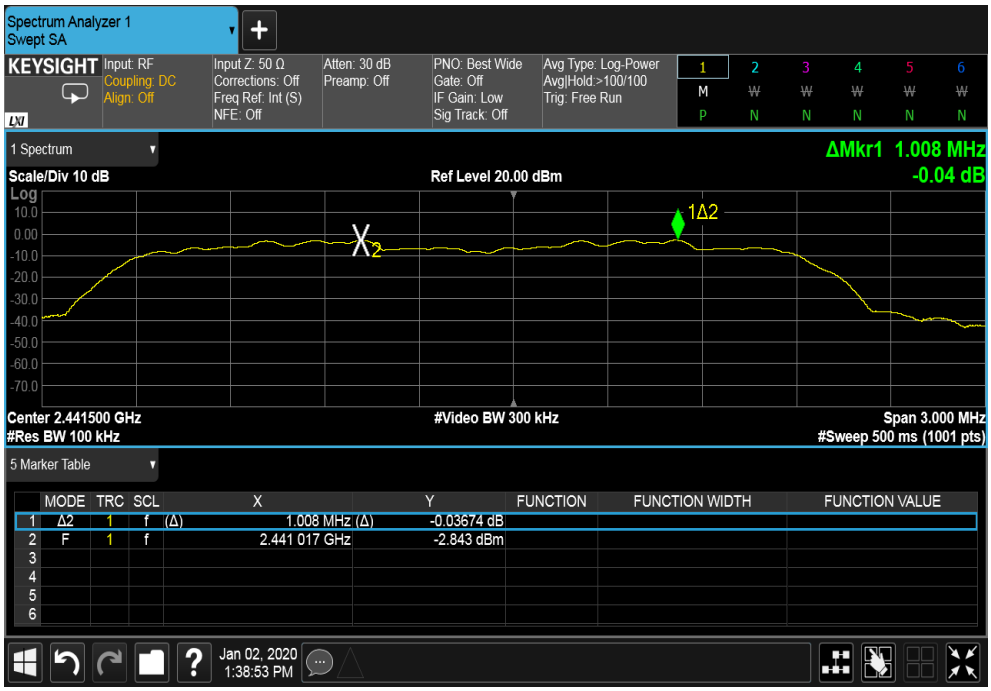
Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	**Frequency (MHz)**	**Channel Separation (MHz)**	**Channel Separation Limits (MHz)**	**Result**
Low	2402	1.0080	0.596	PASS
Mid	2441	1.0080	0.598	PASS
High	2480	1.0080	0.596	PASS

Test Data

GFSK_BDR-1Mbps mode



8DPSK_EDR-3Mbps mode



5.5 NUMBER OF HOPPING

5.5.1 Test Limit

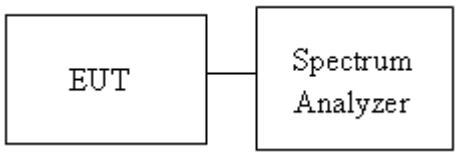
According to §15.247(a)(1)(iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

5.5.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 7.8.3
1. Place the EUT on the table and set it in transmitting mode.
2. EUT RF output port connected to the SA by RF cable.
3. Set spectrum analyzer Start Freq. = 2400 MHz, Stop Freq. = 2483.5 MHz, RBW =100KHz, VBW = 300KHz.
4. Max hold, view and count how many channel in the band.

5.5.3 Test Setup



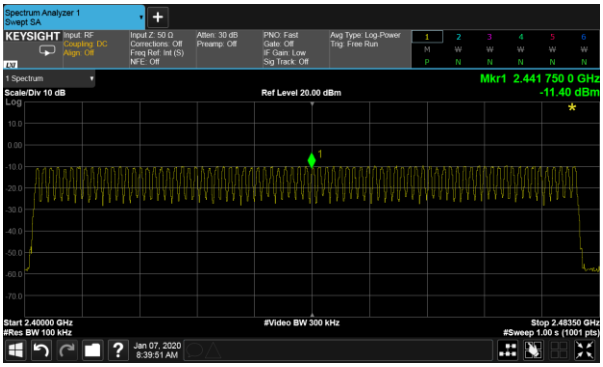
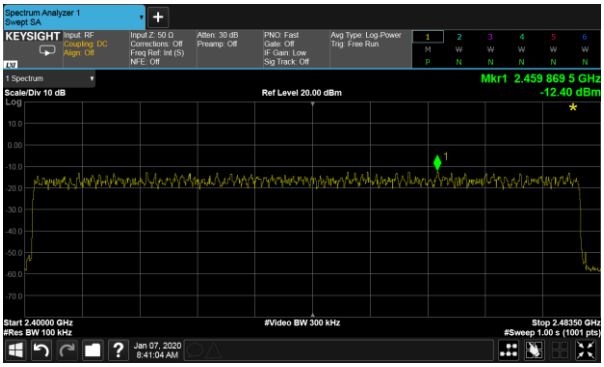
5.5.4 Test Result

Number of Hopping				
Mode	**Frequency (MHz)**	**Hopping Channel Number**	**Hopping Channel Number Limits**	**Result**
BDR-1Mbps	2402-2480	79	15	Pass
EDR-3Mbps	2402-2480	79	15	

REMARK:

The frequency spectrum was broken up in to two sub-range to clearly show all of the hopping frequencies. In the AFH mode, this device operation was using 20 channels, so the requirement for minimum number of hopping channels is satisfied

Test Data

Number of Hopping	
GFSK_BDR-1Mbps mode	**8DPSK_EDR-3Mbps mode**
	

5.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

5.6.1 Test Limit

According to §15.247(d),

Limit	-20 dBc

.

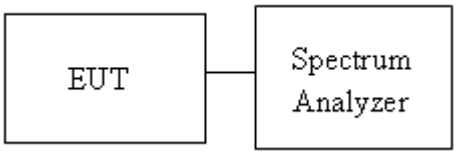
5.6.2 Test Procedure

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

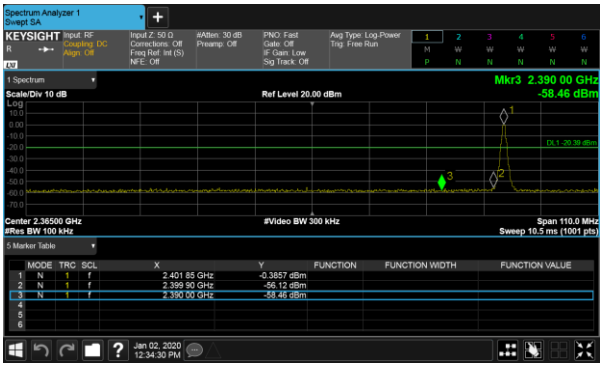
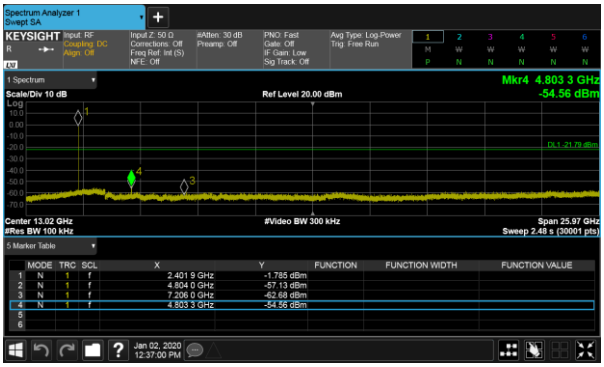
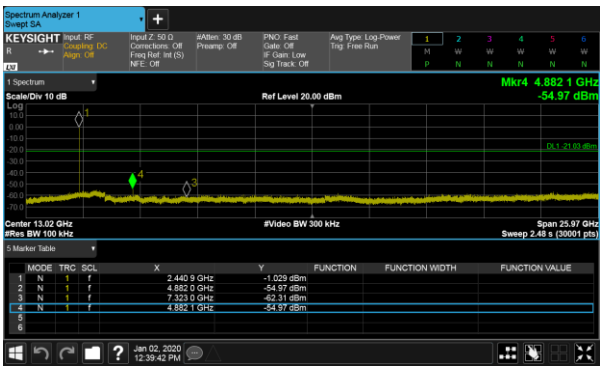
3. The Band Edge at 2.4GHz and 2.4835GHz are investigated with normal hopping mode.

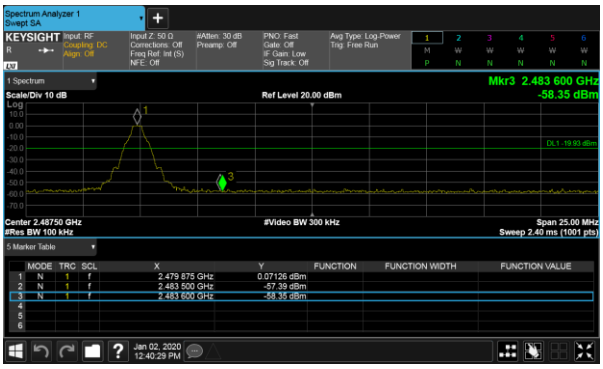
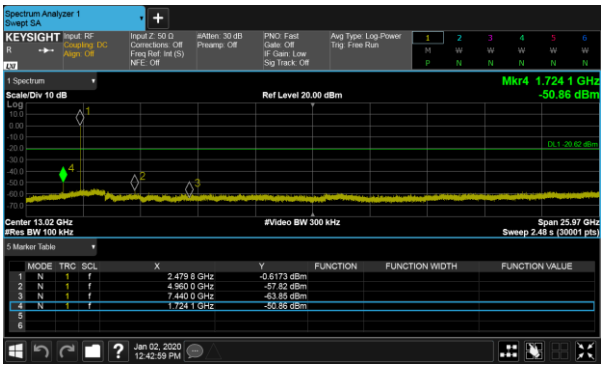
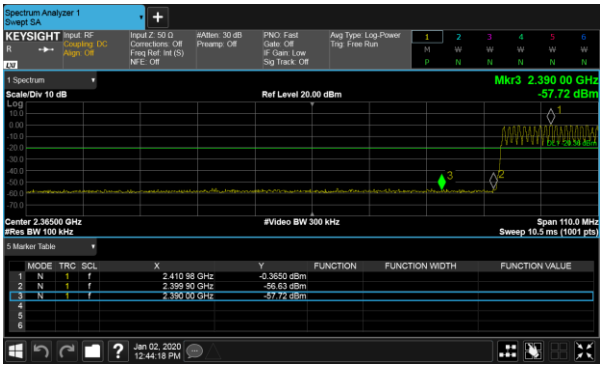
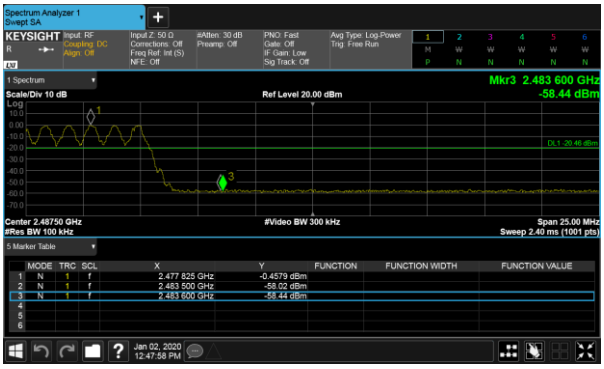
5.6.3 Test Setup

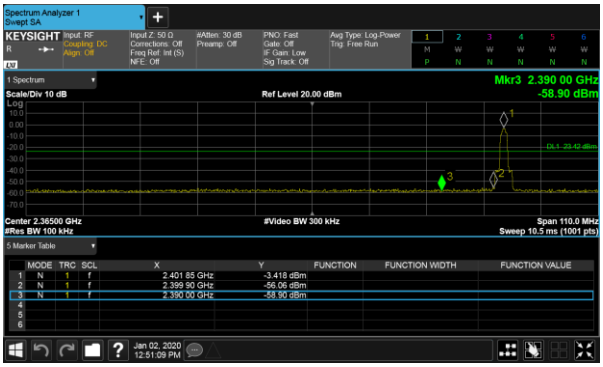
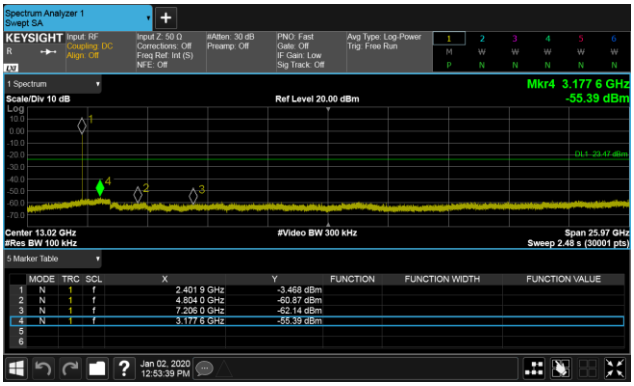


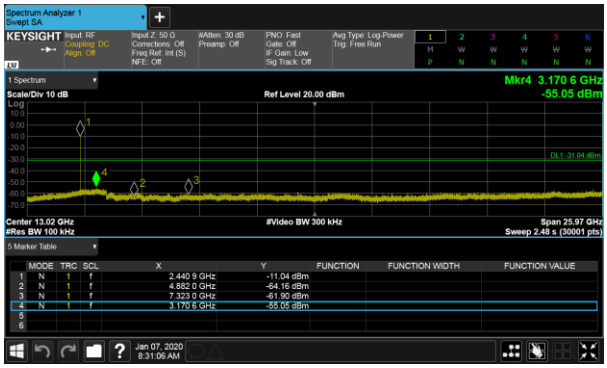
5.6.4 Test Result

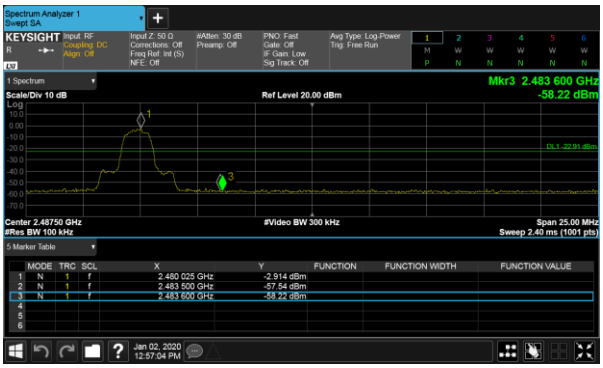
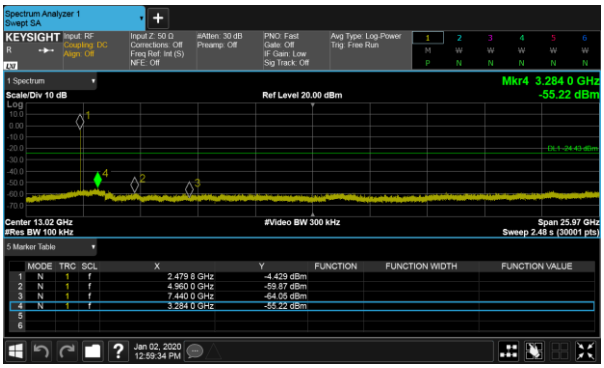
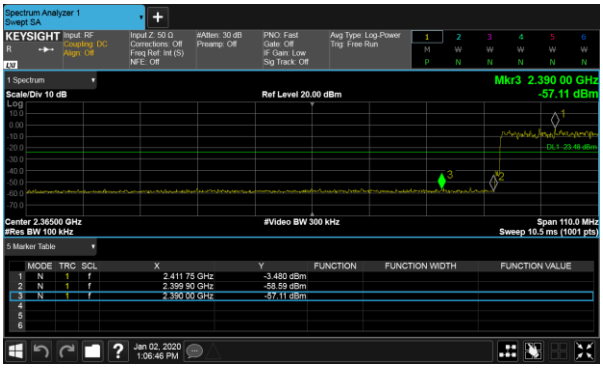
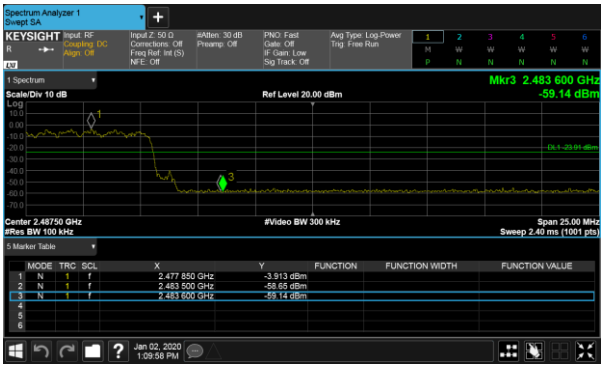
Test Data

GFSK_BDR-1Mbps mode Low CH	
Band Edge	**Spurious Emission 30MHz-25GHz**
	
GFSK_BDR-1Mbps mode Mid CH	
Spurious Emission 30MHz-25GHz	
	

GFSK_BDR-1Mbps mode High CH	
Band Edge	**Spurious Emission 30MHz-25GHz**
	
GFSK_BDR-1Mbps Hopping mode	
Low Band Edge	**High Band Edge**
	

8DPSK_EDR-3Mbps mode Low CH	
Band Edge	**Spurious Emission 30MHz-25GHz**
	

8DPSK_EDR-3Mbps mode Mid CH
Spurious Emission 30MHz-25GHz


8DPSK_EDR-3Mbps mode High CH	
Band Edge	**Spurious Emission 30MHz-25GHz**
	
8DPSK_EDR-3Mbps Hopping mode	
Low Band Edge	**High Band Edge**
	

5.7 TIME OF OCCUPANCY (DWELL TIME)

5.7.1 Test Limit

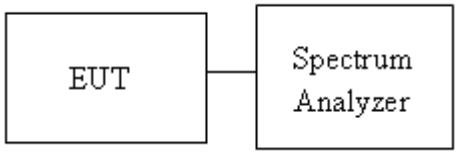
According to §15.247(a)(1)(iii),

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

5.7.2 Test Procedure

1. EUT RF output port connected to the SA by RF cable.
2. Set center frequency of spectrum analyzer = operating frequency.
3. Set the spectrum analyzer as RBW, VBW=1MHz, Sweep = 1 ms

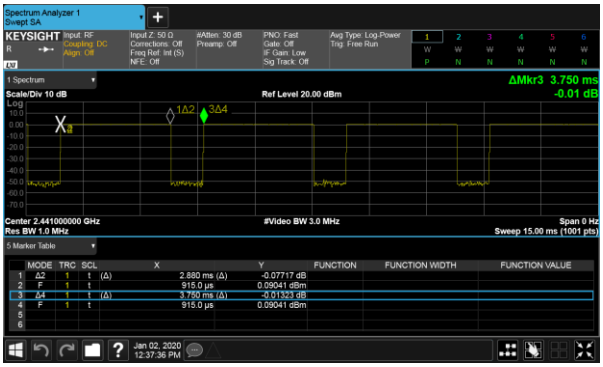
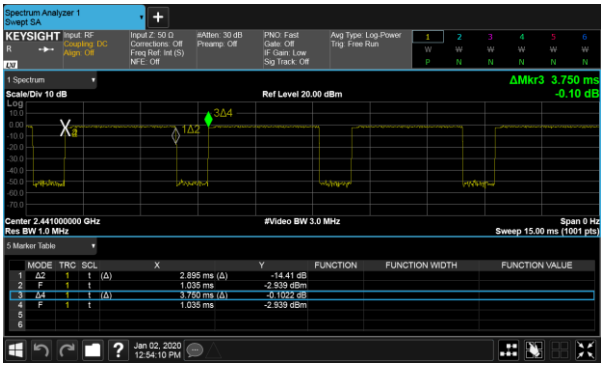
5.7.3 Test Setup



5.7.4 Test Result

Time of Occupancy (Dwell Time)							
Mode	Frequency (MHz)	Pulse Time Per Hopping (ms)	Minimum Number of Hopping Freq.	Number of pulse in (0.4 * N sec)	Dwell Time IN (0.4 * N sec)	Dwell Time Limits (s)	Result
BDR-1Mbps	2441	2.9565	79	106.67	0.3138	0.4	Pass
EDR-3Mbps	2441	2.9565	79	106.67	0.3147	0.4	
Non-AFH: DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 3.37 * 0.4 *79 = 106.6							

Test Data

Time of Occupancy (Dwell Time)	
GFSK_BDR-1Mbps mode	8DPSK_EDR-3Mbps mode
	

5.8 RADIATION BANDEDGE AND SPURIOUS EMISSION

5.8.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Remark:
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

5.8.2 Test Procedure

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10: 2013, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9kHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

4. For harmonic, the worst case of output power was BDR-1Mbps. Therefore only BDR-1Mbps record in the report.

5. The SA setting following：

(1) Below 1G：RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G：

(2.1) For Peak measurement：RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2.2) For Average measurement：RBW = 1MHz, VBW

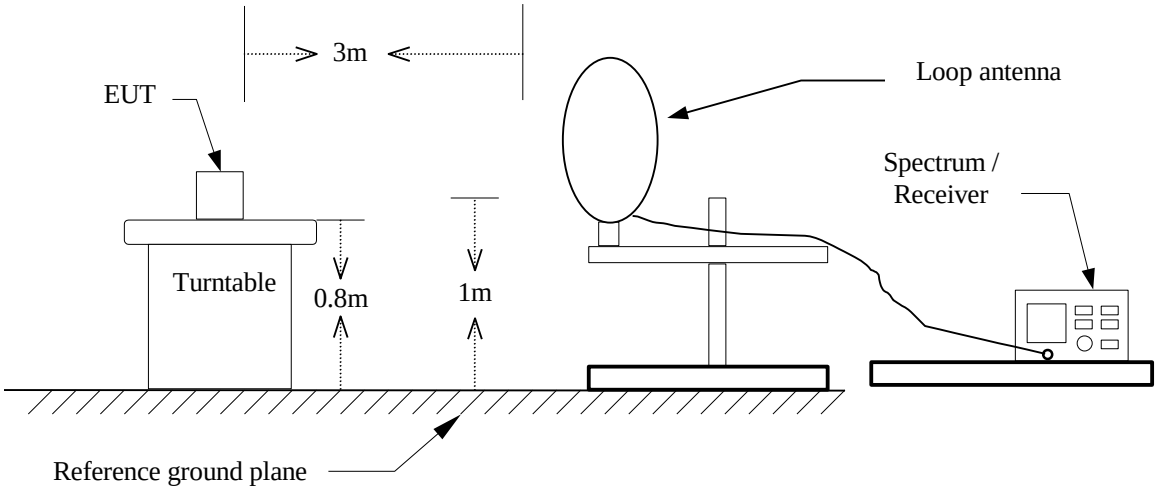
- If Duty Cycle ≥ 98%, VBW=10Hz.
- If Duty Cycle < 98%, VBW≥1/T.

Remark:

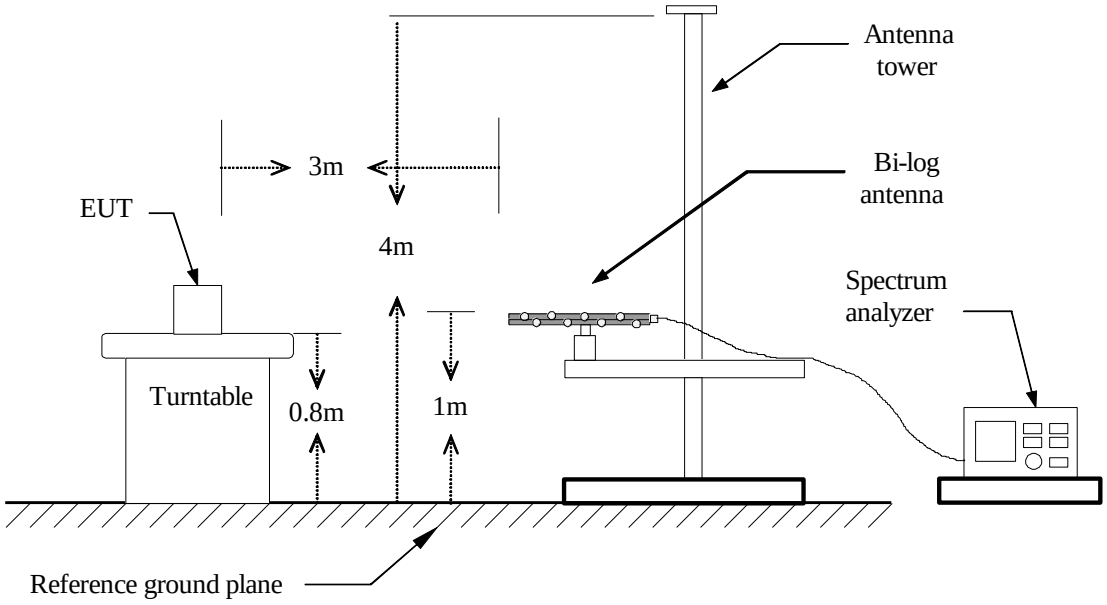
1. *Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.*
2. *No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).*

5.8.3 Test Setup

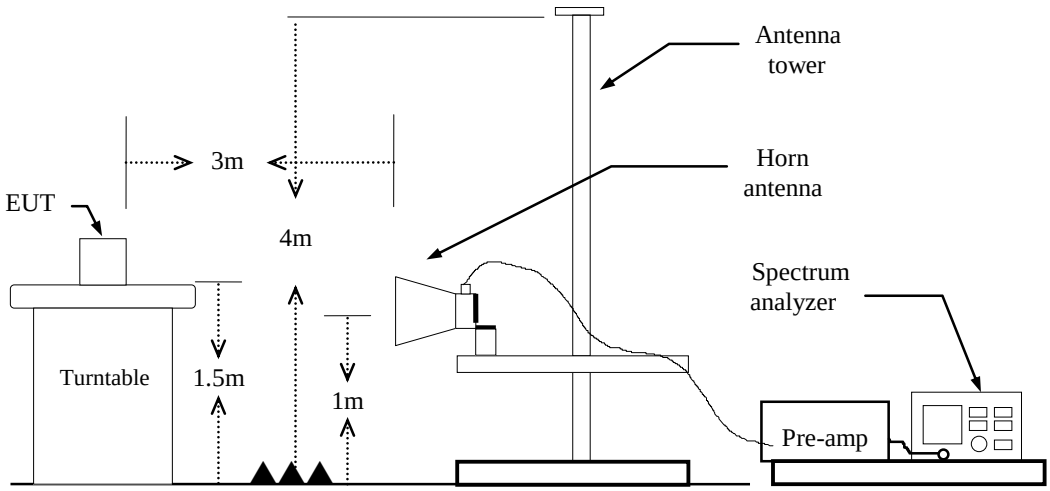
9kHz ~ 30MHz



30MHz ~ 1GHz



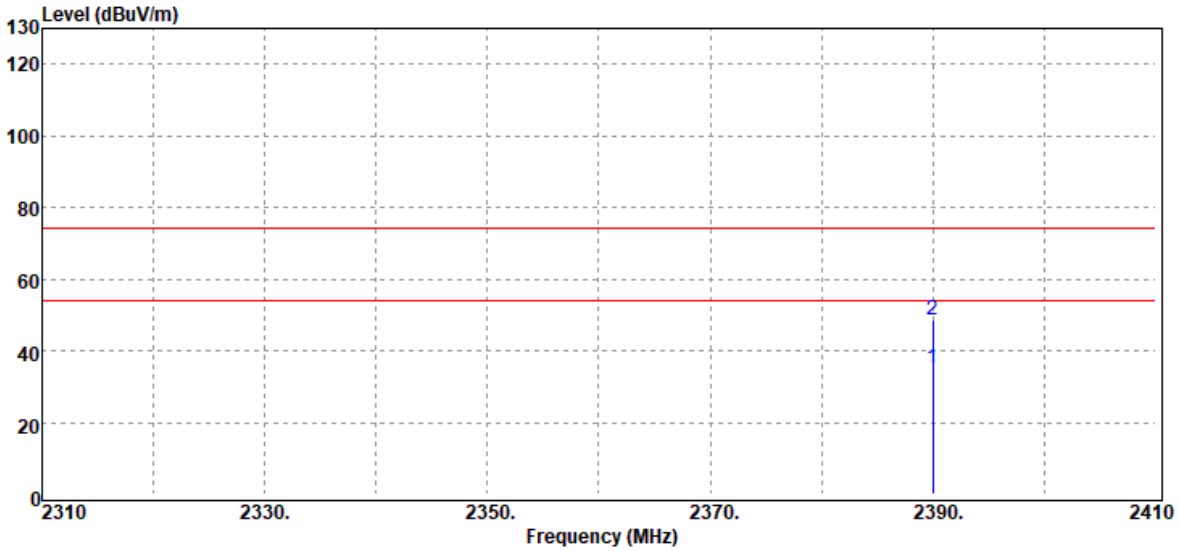
Above 1 GHz



5.8.4 Test Result

Band Edge Test Data

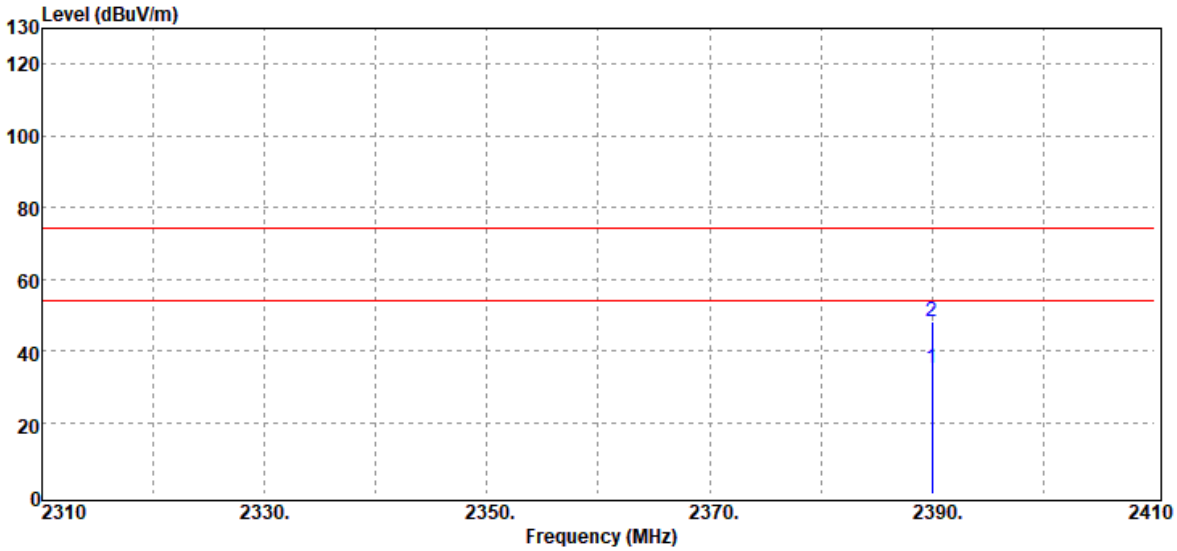
Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Band Edge	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak / Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.00	37.96	-2.82	35.14	54.00	-18.86	Average
2390.00	51.51	-2.82	48.69	74.00	-25.31	Peak

Report No.: T191218D03-RP1

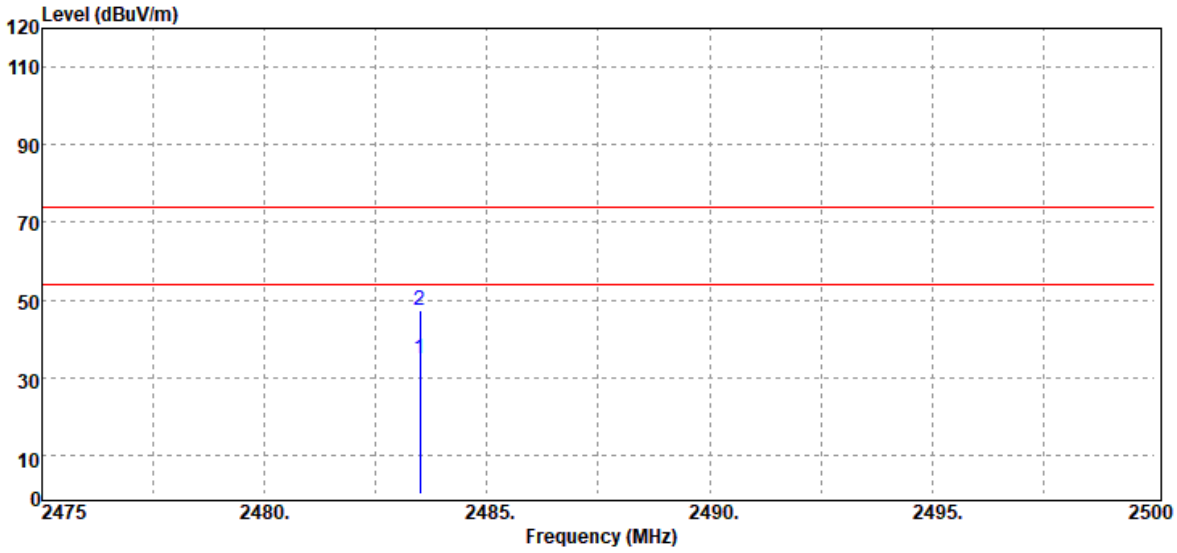
Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Band Edge	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak / Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.00	38.02	-2.82	35.20	54.00	-18.80	Average
2390.00	51.15	-2.82	48.33	74.00	-25.67	Peak

Report No.: T191218D03-RP1

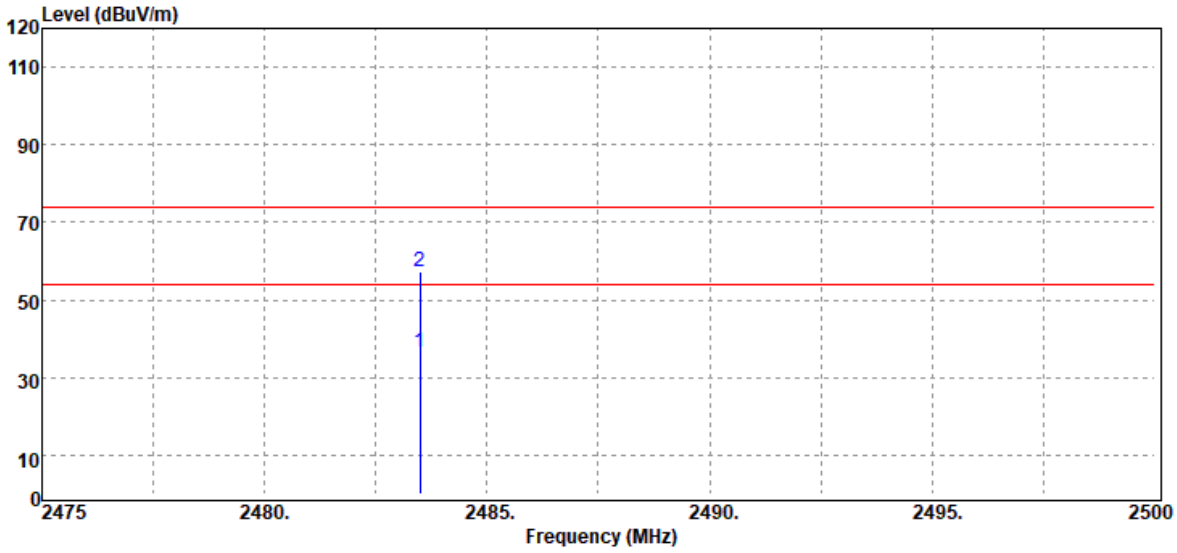
Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Band Edge	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak / Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.50	37.16	-2.30	34.86	54.00	-19.14	Average
2483.50	49.57	-2.30	47.27	74.00	-26.73	Peak

Report No.: T191218D03-RP1

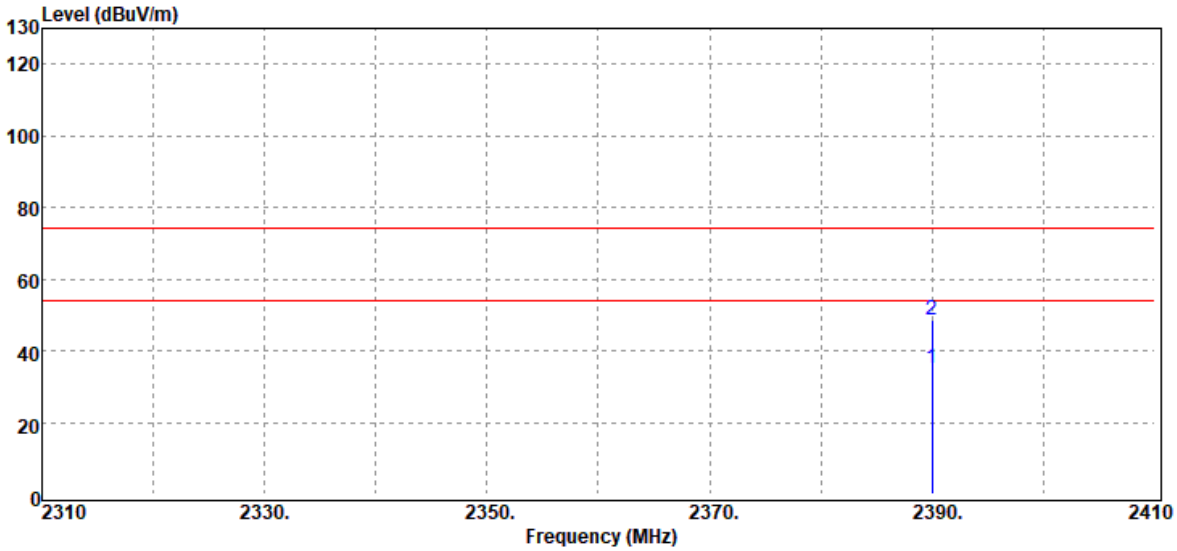
Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Band Edge	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak / Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.50	38.96	-2.30	36.66	54.00	-17.34	Average
2483.50	59.56	-2.30	57.26	74.00	-16.74	Peak

Report No.: T191218D03-RP1

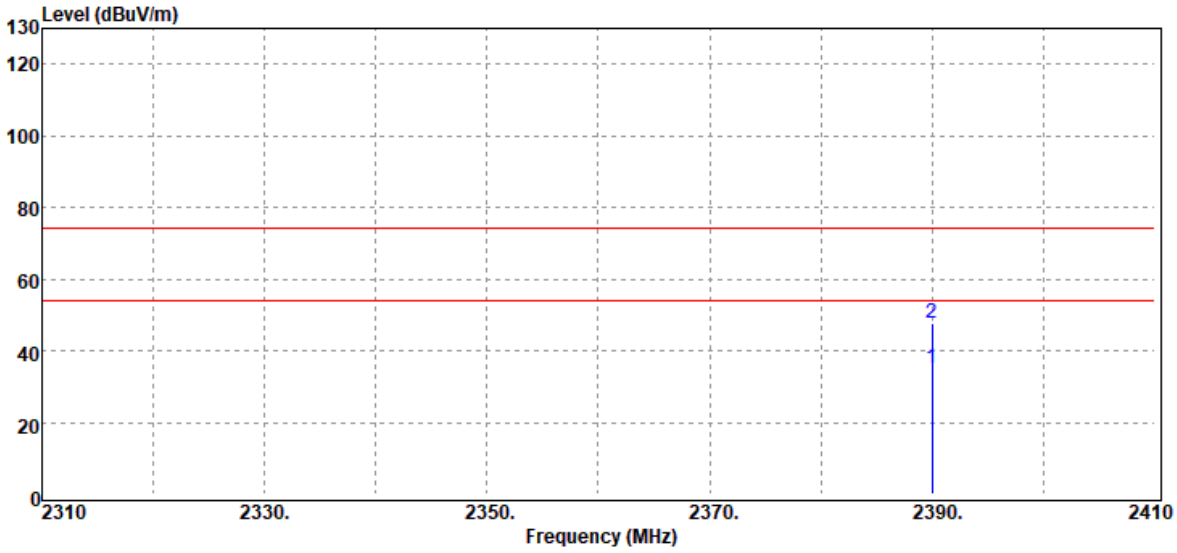
Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Band Edge	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak / Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.00	37.82	-2.82	35.00	54.00	-19.00	Average
2390.00	51.24	-2.82	48.42	74.00	-25.58	Peak

Report No.: T191218D03-RP1

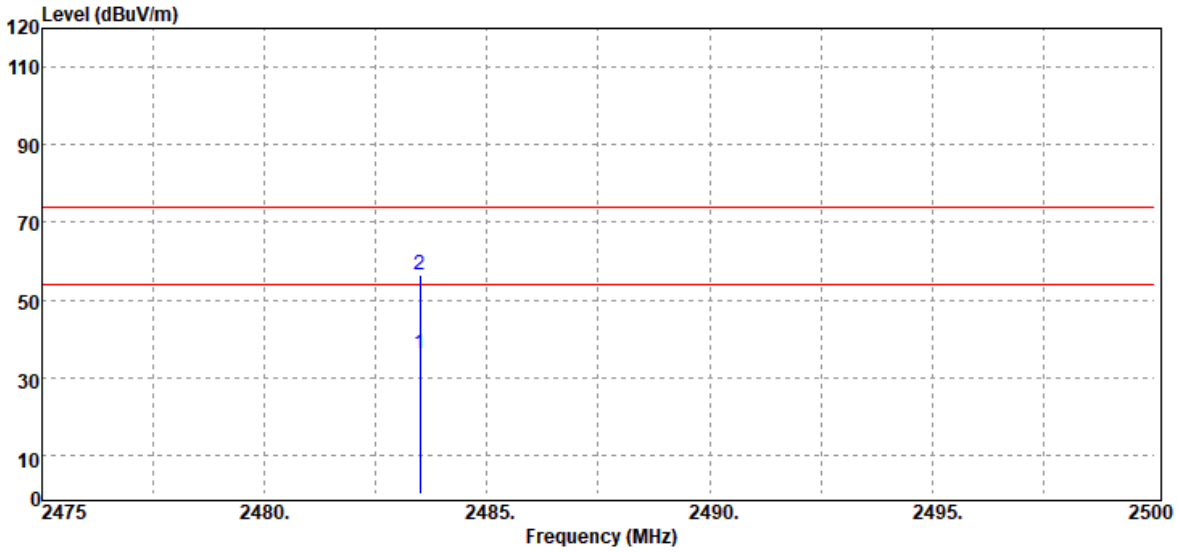
Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Band Edge	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak / Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.00	38.06	-2.82	35.24	54.00	-18.76	Average
2390.00	50.67	-2.82	47.85	74.00	-26.15	Peak

Report No.: T191218D03-RP1

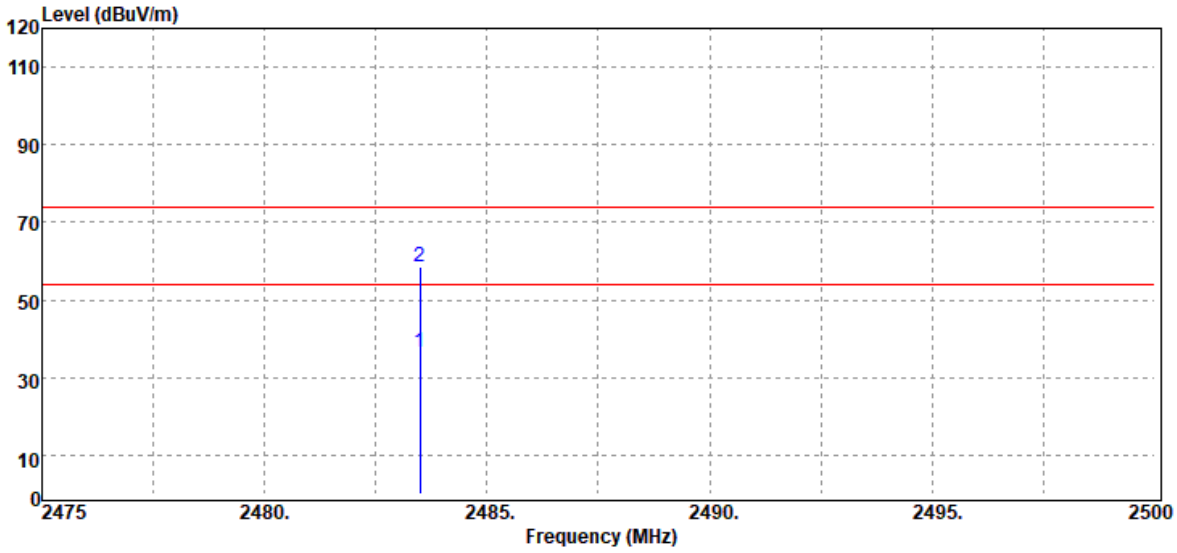
Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Band Edge	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak / Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.50	38.27	-2.30	35.97	54.00	-18.03	Average
2483.50	58.70	-2.30	56.40	74.00	-17.60	Peak

Report No.: T191218D03-RP1

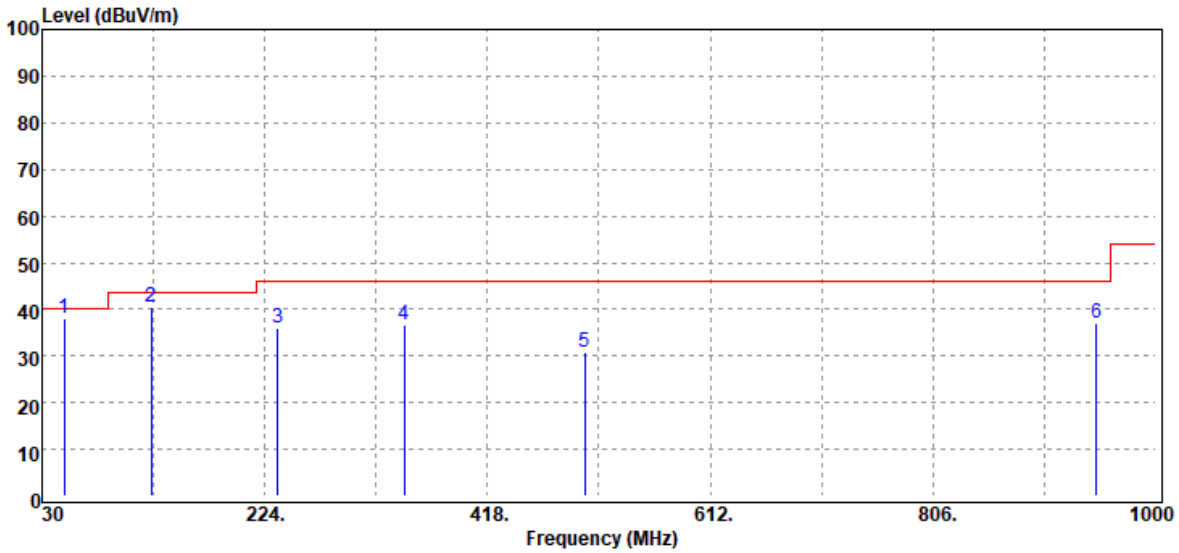
Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Band Edge	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak / Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.50	38.72	-2.30	36.42	54.00	-17.58	Average
2483.50	60.74	-2.30	58.44	74.00	-15.56	Peak

Below 1G Test Data

Test Mode:	BT Mode	Temp/Hum	21.3(℃)/ 51%RH
Test Item	30MHz-1GHz	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		

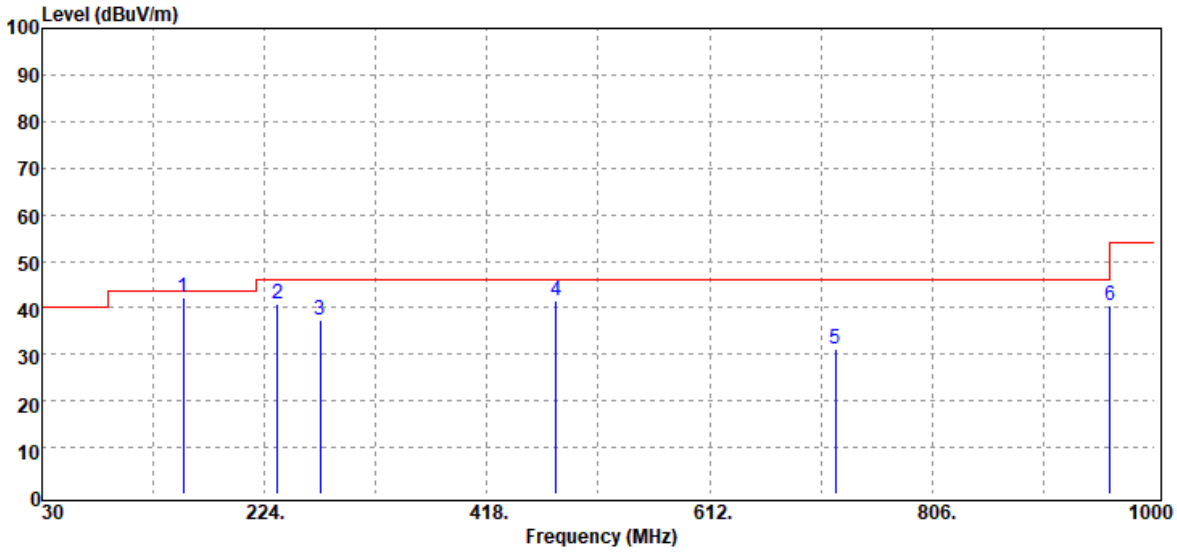


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
49.40	53.17	-14.98	38.19	40.00	-1.81	Peak
125.06	49.44	-8.80	40.64	43.50	-2.86	Peak
235.64	46.50	-10.56	35.94	46.00	-10.06	Peak
345.25	43.64	-7.12	36.52	46.00	-9.48	Peak
502.39	33.71	-2.96	30.75	46.00	-15.25	Peak
948.59	33.02	3.97	36.99	46.00	-9.01	Peak

Note: *No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)*

Report No.: T191218D03-RP1

Test Mode:	BT Mode	Temp/Hum	21.3(℃)/ 51%RH
Test Item	30MHz-1GHz	Test Date	January 10, 2020
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		

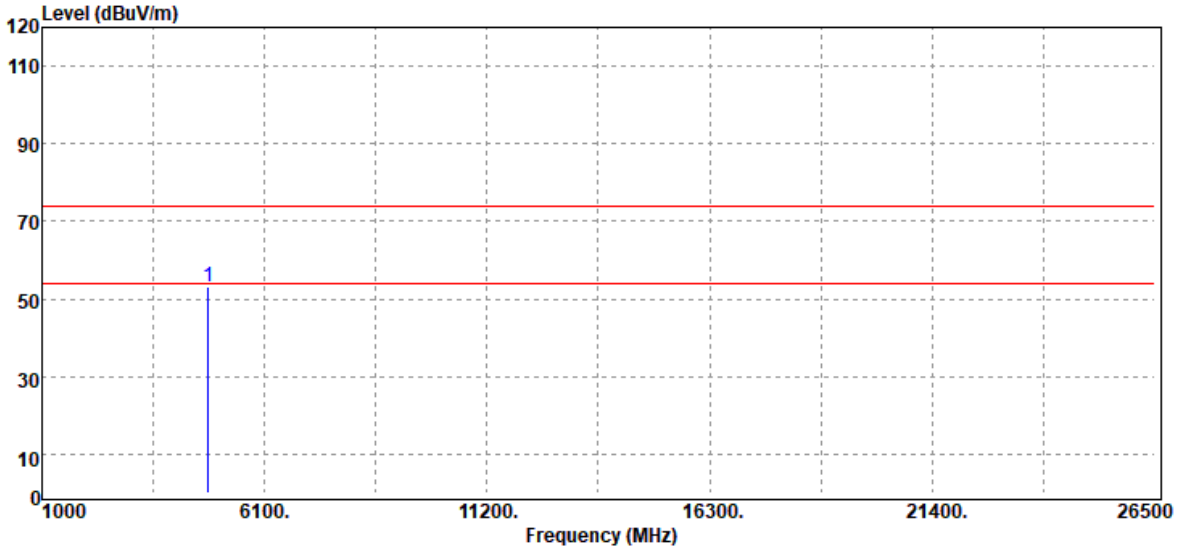


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
153.19	52.21	-10.09	42.12	43.50	-1.38	Peak
235.64	51.26	-10.56	40.70	46.00	-5.30	Peak
272.50	45.85	-8.49	37.36	46.00	-8.64	Peak
478.14	44.40	-2.97	41.43	46.00	-4.57	Peak
721.61	30.48	0.74	31.22	46.00	-14.78	Peak
961.20	35.98	4.51	40.49	54.00	-13.51	Peak

Note: *No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)*

Above 1G Test Data

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		

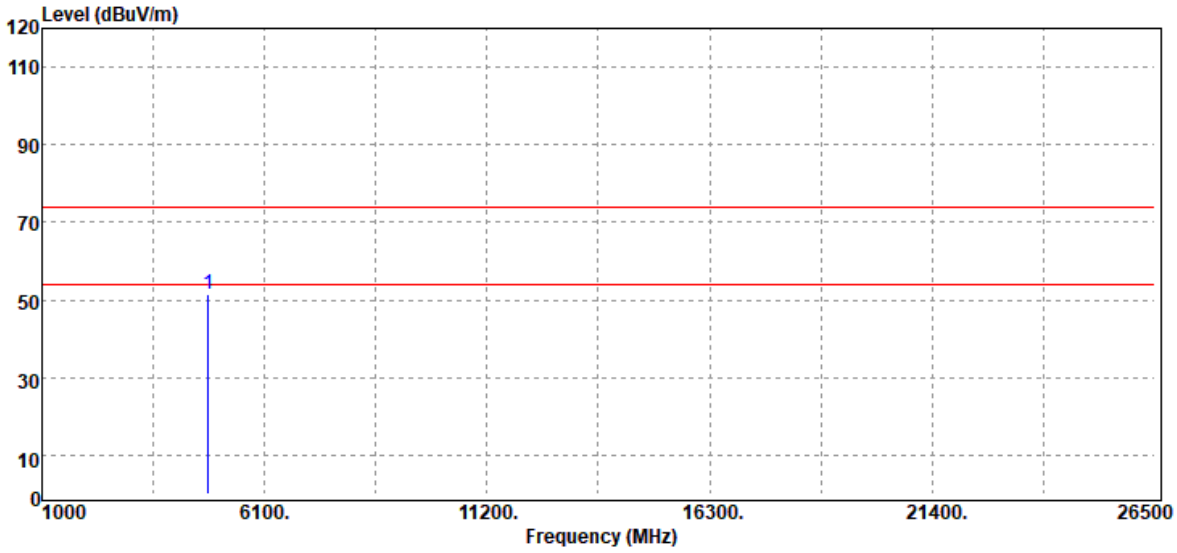


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.00	49.65	3.56	53.21	74.00	-20.79	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		

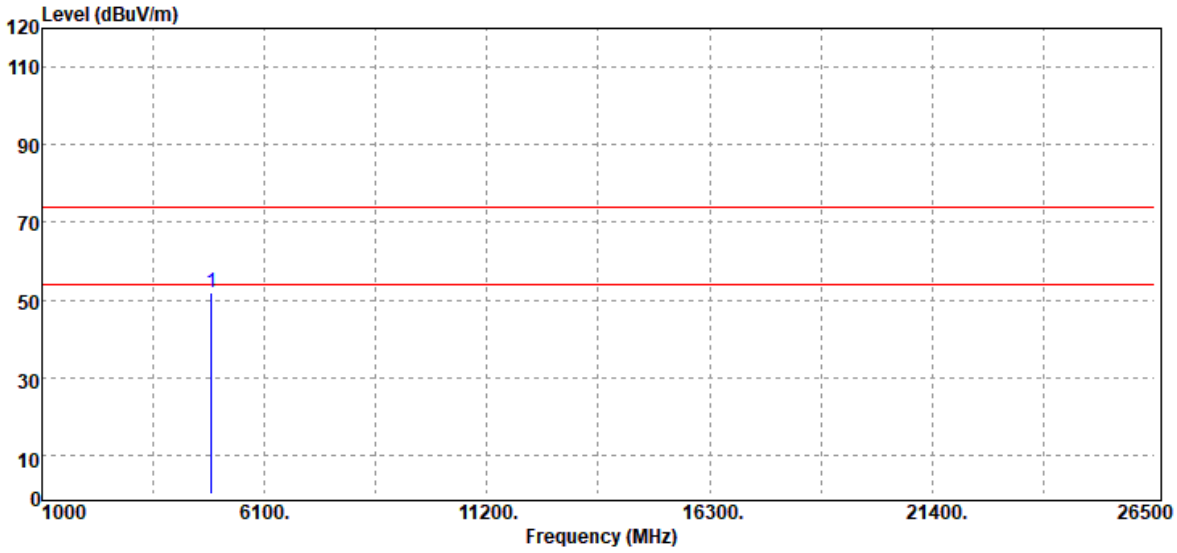


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.00	47.84	3.56	51.40	74.00	-22.60	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode:	GFSK_BR-1Mbps Mid CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		

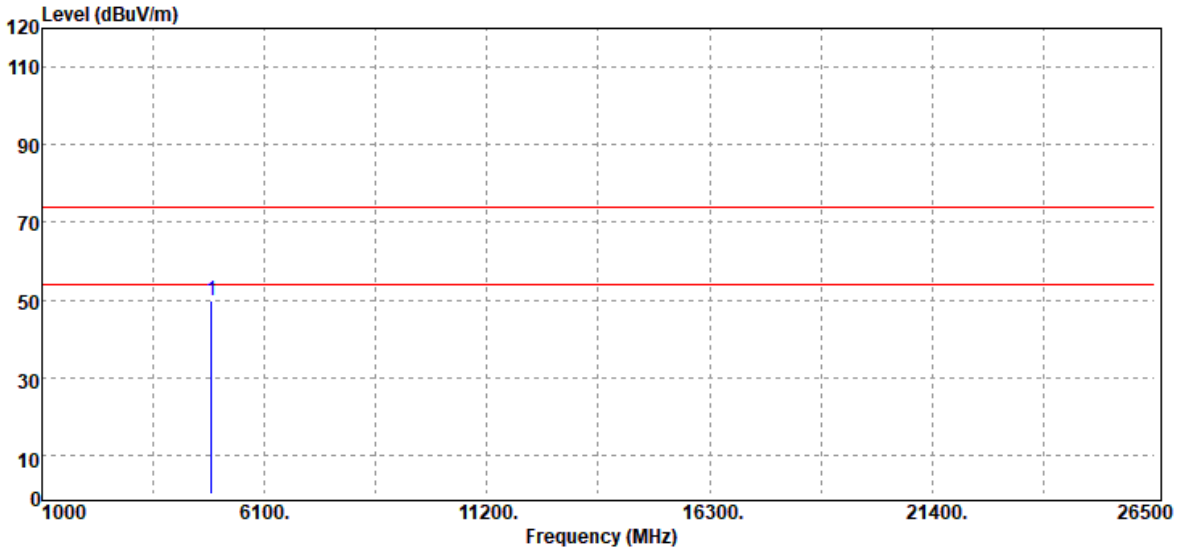


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.00	48.02	3.78	51.80	74.00	-22.20	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode:	GFSK_BR-1Mbps Mid CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



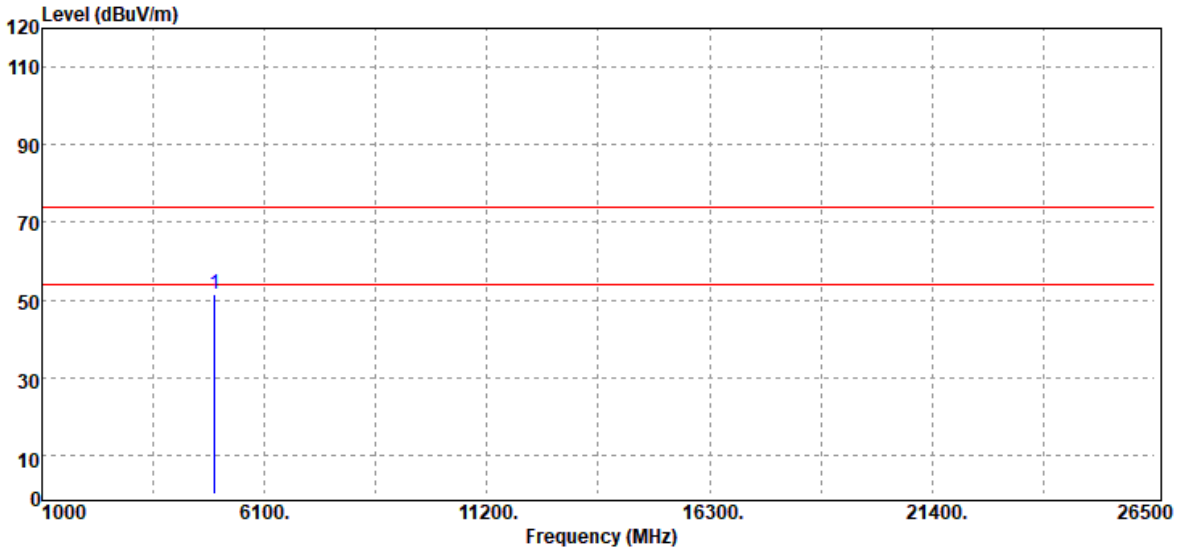
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.00	45.85	3.78	49.63	74.00	-24.37	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Report No.: T191218D03-RP1

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		

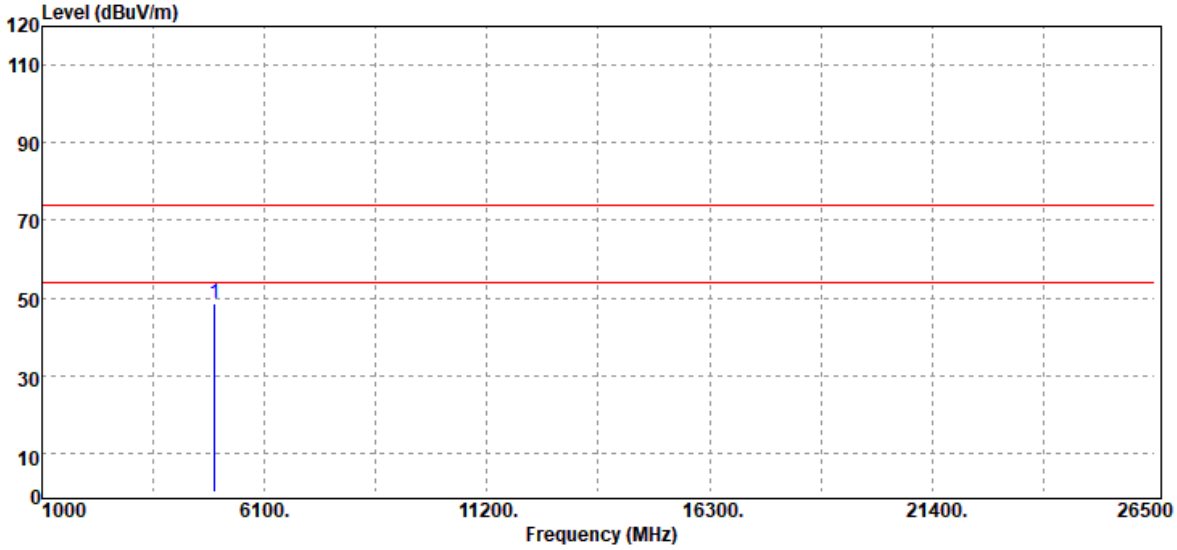


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.00	47.10	4.56	51.66	74.00	-22.34	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



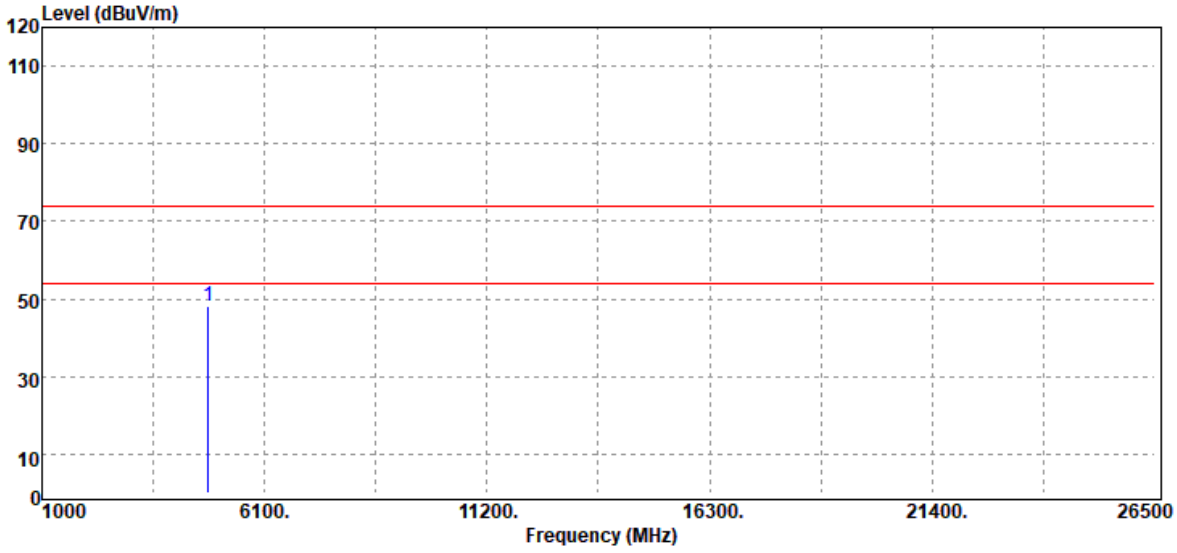
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.00	43.82	4.56	48.38	74.00	-25.62	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Report No.: T191218D03-RP1

Test Mode	8DPSK_EDR-3Mbps Low CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



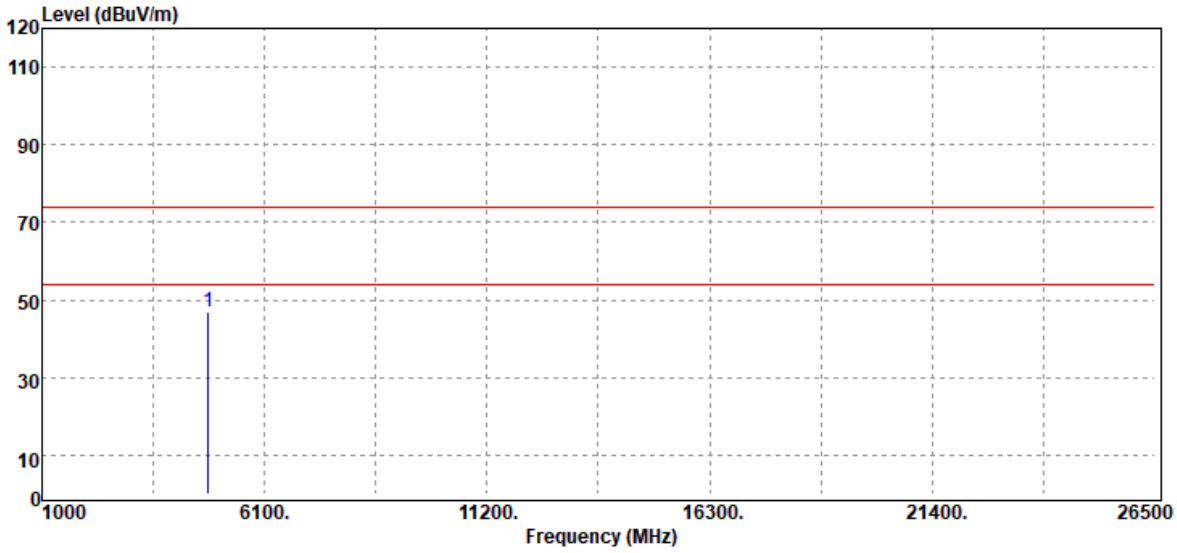
Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (BuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.00	44.79	3.56	48.35	74.00	-25.65	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Report No.: T191218D03-RP1

Test Mode	8DPSK_EDR-3Mbps Low CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



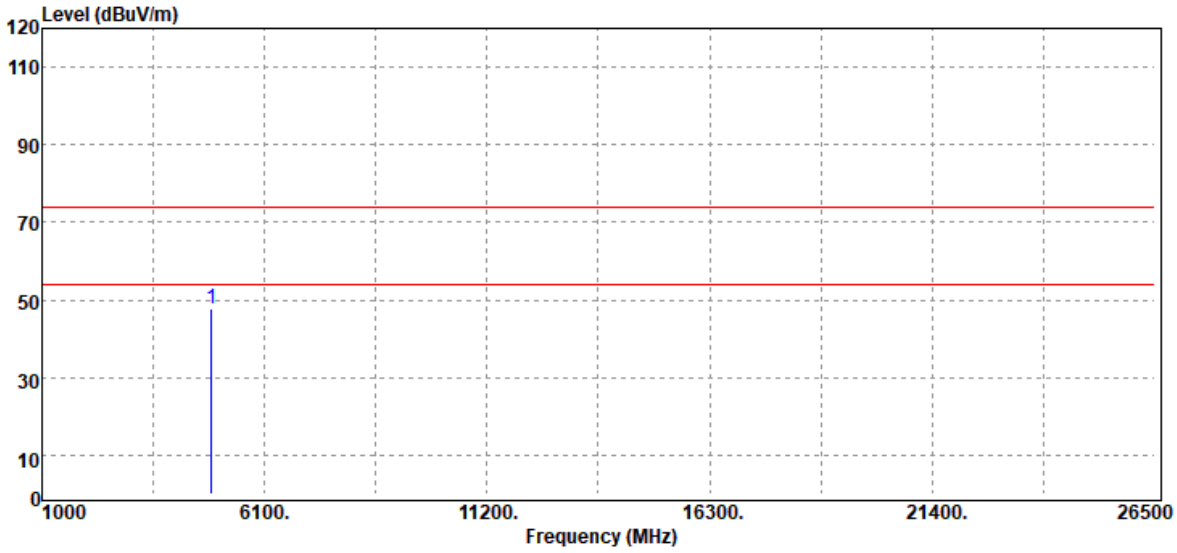
Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.00	43.42	3.56	46.98	74.00	-27.02	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Report No.: T191218D03-RP1

Test Mode	8DPSK_EDR-3Mbps Mid CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



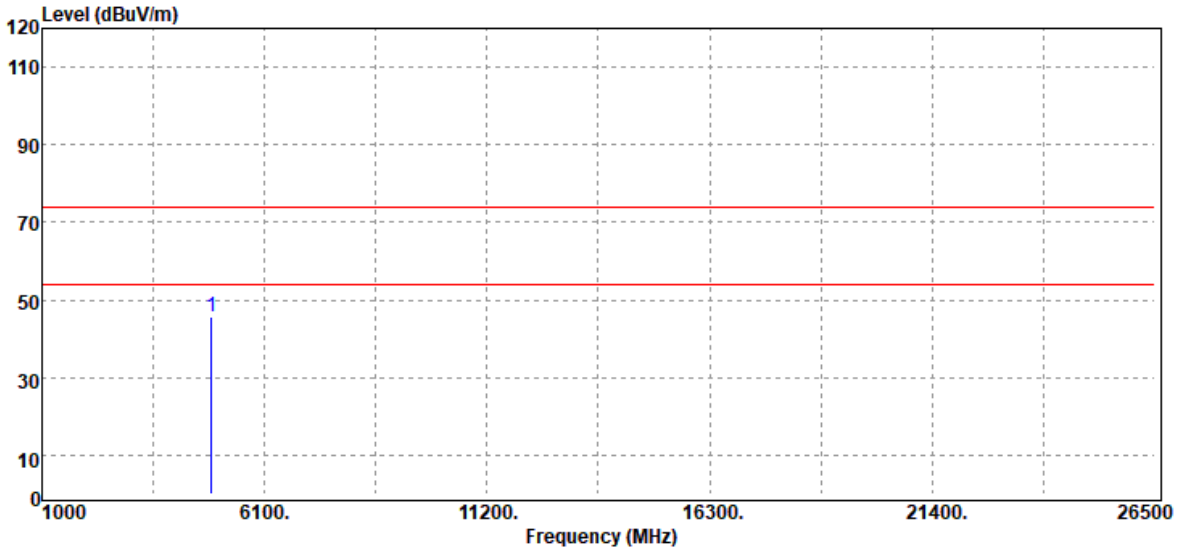
Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.00	43.97	3.78	47.75	74.00	-26.25	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Report No.: T191218D03-RP1

Test Mode	8DPSK_EDR-3Mbps Mid CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		

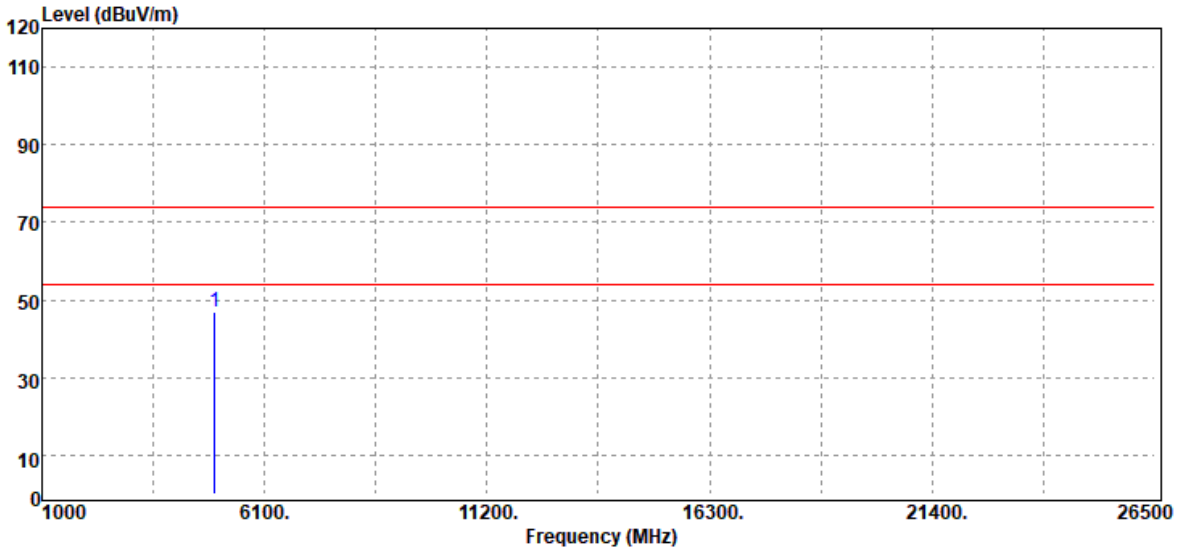


Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.00	41.84	3.78	45.62	74.00	-28.38	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	8DPSK_EDR-3Mbps High CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



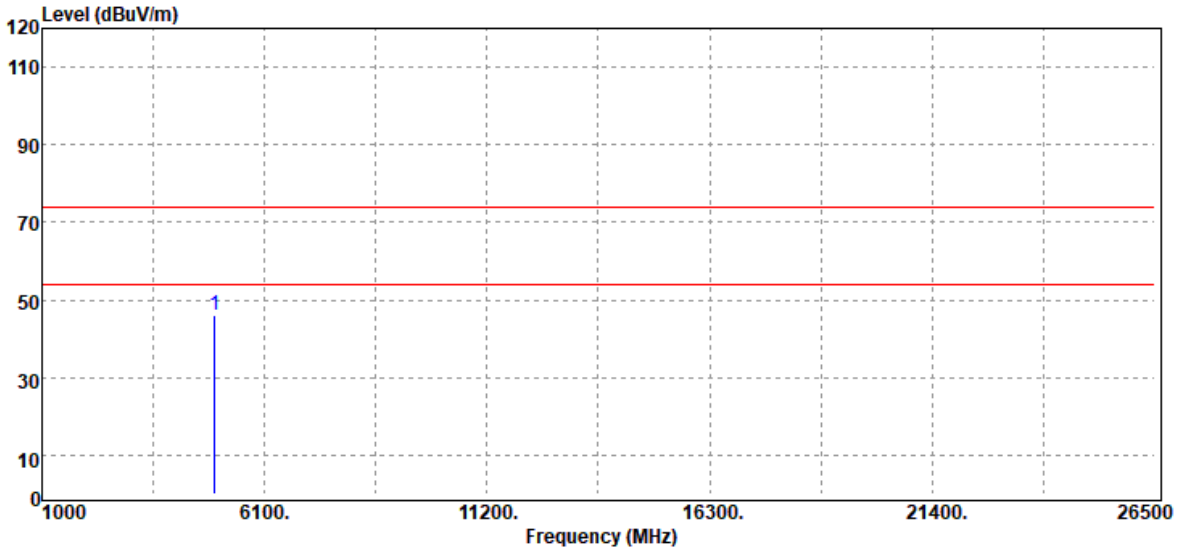
Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.00	42.40	4.56	46.96	74.00	-27.04	Peak
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Report No.: T191218D03-RP1

Test Mode	8DPSK_EDR-3Mbps High CH	Temp/Hum	21.3(℃)/ 51%RH
Test Item	Harmonic	Test Date	January 10, 2020
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.00	41.40	4.56	45.96	74.00	-28.04	Peak
N/A						

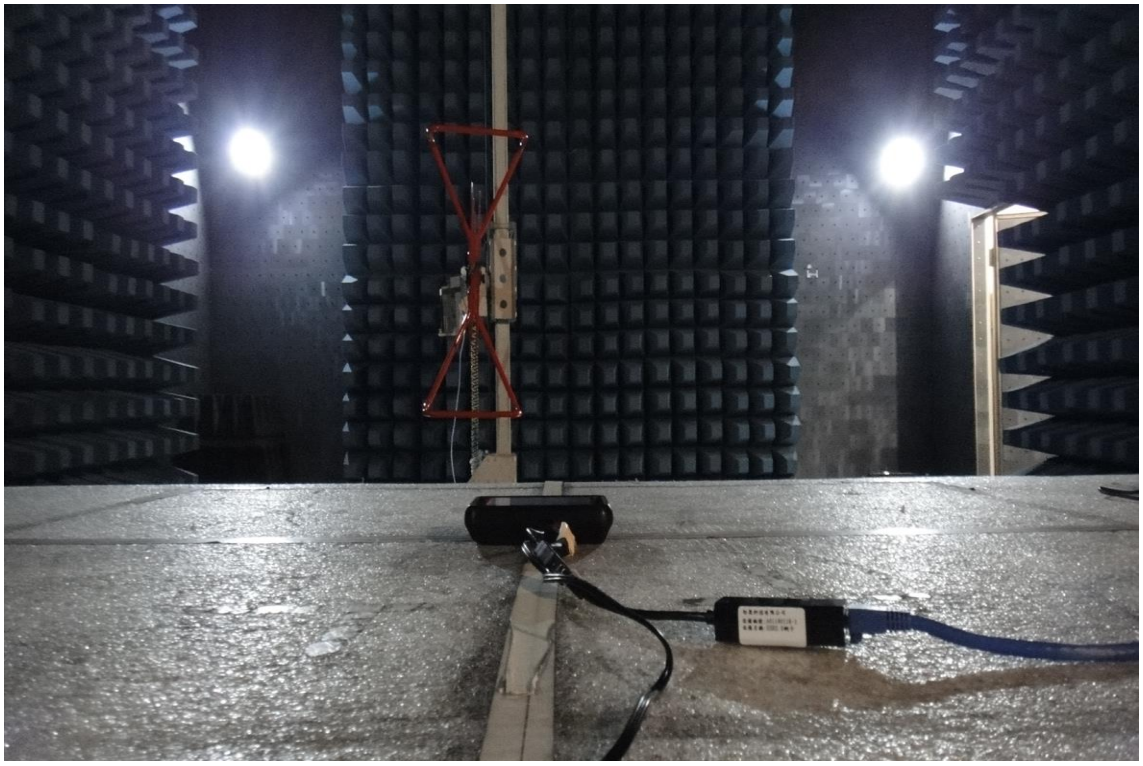
Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

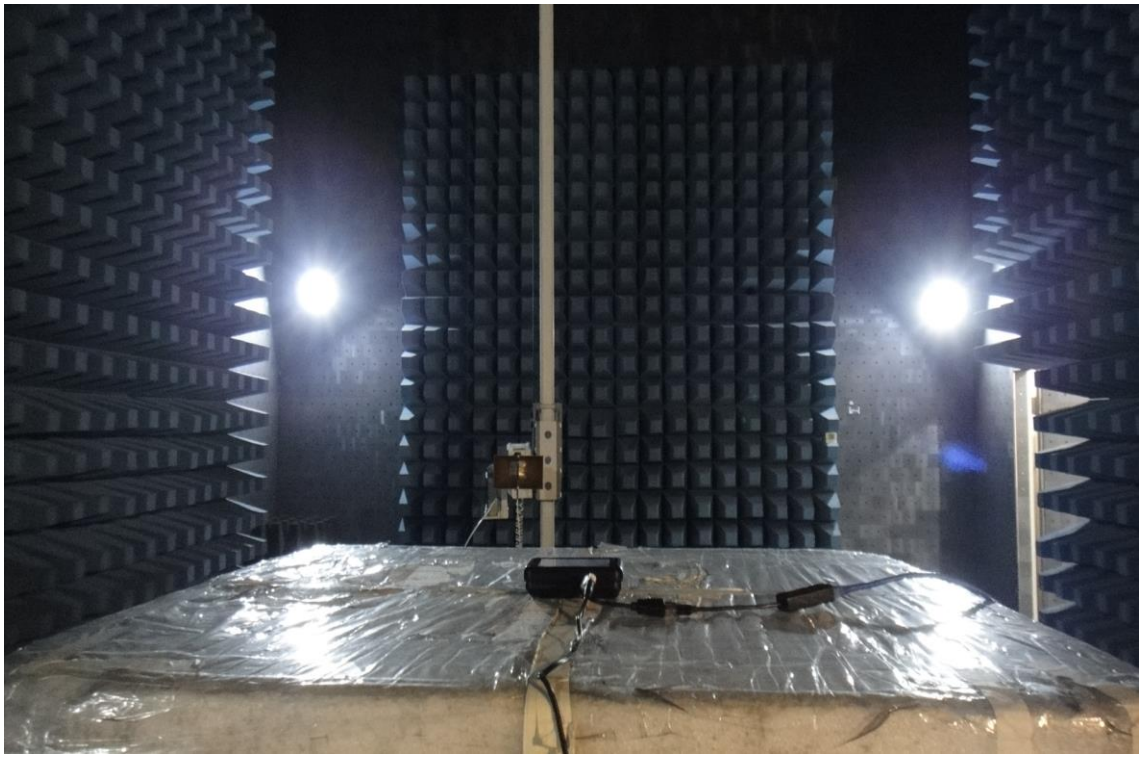
--End of Test Report--

APPENDIX-A TEST PHOTO

Radiation (Below 1GHz)



Radiation (Above 1GHz)



Conducted Emission Set Up Photo