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# FCC Test Report

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Report No.: AGC02291161001FE03

**FCC ID** : 2ACB3T-REX  
**APPLICATION PURPOSE** : Original Equipment  
**PRODUCT DESIGNATION** : Helmet Bluetooth Intercom Headset  
**BRAND NAME** : FreedConn  
**MODEL NAME** : T-Rex  
**CLIENT** : ShenZhen FreedConn(FDC) Electronics Co., Ltd.  
**DATE OF ISSUE** : Dec. 02, 2016  
**STANDARD(S)** : FCC Part 15 Rules  
**REPORT VERSION** : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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**Report Revise Record**

<b>Report Version</b>	<b>Revise Time</b>	<b>Issued Date</b>	<b>Valid Version</b>	<b>Notes</b>
V1.0	/	Dec. 02, 2016	Valid	Original Report

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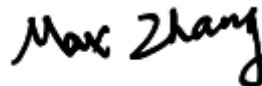
## 1. VERIFICATION OF CONFORMITY

<b>Applicant</b>	ShenZhen FreedConn(FDC) Electronics Co., Ltd.
<b>Address</b>	6th Floor,Wanlihua Industrial Park,Gushu 2nd Road, Gushu Community, Xixiang Street, BaoAn District,Shenzhen,China
<b>Manufacturer</b>	ShenZhen FreedConn(FDC) Electronics Co., Ltd.
<b>Address</b>	East Area of 4th floor, E building, Hua Chuang Da Industry Park, No.176 HangCheng Road, Gushu Community, Xixiang street, Baoan District, ShenZhen China 518126
<b>Product Designation</b>	Helmet Bluetooth Intercom Headset
<b>Brand Name</b>	FreedConn
<b>Test Model</b>	T-Rex
<b>Date of test</b>	Nov. 15, 2016 to Nov. 25, 2016
<b>Deviation</b>	None
<b>Condition of Test Sample</b>	Normal
<b>Test Result</b>	Pass
<b>Report Template</b>	AGCRT-US-BR/RF (2013-03-01)

We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Tested by



Max Zhang(Zhang Yi) Dec. 02, 2016

Reviewed by



Bart Xie(Xie Xiaobin)) Dec. 02, 2016

Approved by



Solger Zhang(Zhang Hongyi)  
Authorized Officer Dec. 02, 2016

## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION

The EUT is “Helmet Bluetooth Intercom Headset” designed as a “Communication Device”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following

<b>Operation Frequency</b>	2.402 GHz to 2.480GHz
<b>RF Output Power</b>	15.149dBm(Max)
<b>Bluetooth Version</b>	Only BR/EDR for BT 3.0
<b>Modulation</b>	GFSK, $\pi/4$ -DQPSK, 8DPSK
<b>Number of channels</b>	79
<b>Hardware Version</b>	V1.02
<b>Software Version</b>	V1.0
<b>Antenna Designation</b>	Integrated Antenna
<b>Antenna Gain</b>	2dBi
<b>Power Supply</b>	DC 3.7V by adapter or DC 5V by Micro USB port

Note: The USB port is only for charging.

### 2.2. TABLE OF CARRIER FREQUENCIES

Frequency Band	Channel Number	Frequency
2402~2480MHZ	0	2402MHZ
	1	2403MHZ
	:	:
	38	2440 MHZ
	39	2441 MHZ
	40	2442 MHZ
	:	:
	77	2479 MHZ
	78	2480 MHZ

### 2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHz. In every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single or multislotted packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be sent on the same frequency, it is sent on the next frequency of the hopping sequence.

### 2.4. EXAMPLE OF A HOPPING SEQUENCE IN DATA MODE

Example of a 79 hopping sequence in data mode:

40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67  
56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59  
72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75  
09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06  
01, 51, 03, 55, 05, 04

### 2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:

1. LAP/UAP of the master of the connection.
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD\_ADDRESS. The BD\_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD\_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronization with other units only offsets are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5µs. The clock has a cycle of about one day (23h30). In most cases it is implemented as a 28-bit counter. For the deriving of the hopping sequence the entire LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With these input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended.

The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmissions is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5µs). The hopping sequence will always differ from the first one.

## **2.6. RELATED SUBMITTAL(S) / GRANT (S)**

This submittal(s) (test report) is intended for **FCC ID: 2ACB3T-REX** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## **2.7. TEST METHODOLOGY**

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

## **2.8. SPECIAL ACCESSORIES**

Refer to section 5.2.

## **2.9. EQUIPMENT MODIFICATIONS**

Not available for this EUT intended for grant.



**3. MEASUREMENT UNCERTAINTY**

Conducted measurement: +/- 3.18dB

Radiated measurement: +/- 3.91dB

**4. DESCRIPTION OF TEST MODES**

NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX
4	Normal Operating (BT)

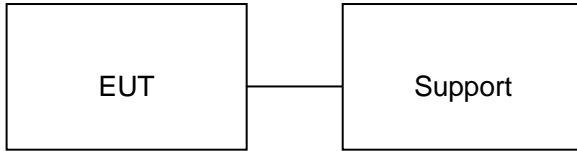
Note:

- 1. Only the result of the worst case was recorded in the report, if no other cases.
- 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

## 5. SYSTEM TEST CONFIGURATION

### 5.1. CONFIGURATION OF EUT SYSTEM

Configure 1: Only for AC Power line Conducted



Configure 2:



### 5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	Helmet Bluetooth Intercom Headset	T-REX	XRQT-REX	EUT
2	Adapter	A22W050200US	AC100-240V 50/60Hz DC 5V/2A	Support

### 5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Peak Output Power	Compliant
§15.247	20 dB Bandwidth	Compliant
§15.247	Spurious Emission	Compliant
§15.209	Radiated Emission	Compliant
§15.207	Conduction Emission	Compliant
§15.247	Number of Hopping Frequency	Compliant
§15.247	Time of Occupancy	Compliant
§15.247	Frequency Separation	Compliant

## 6. TEST FACILITY

Site	Dongguan Precise Testing Service Co., Ltd.
Location	Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China.
FCC Registration No.	371540
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2014.

### ALL TEST EQUIPMENT LIST

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017
Trilog Broadband Antenna (25M-1GHz)	SCHWARZBECK	VULB9160	9160-3355	July 3, 2016	July 2, 2017
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 3, 2016	July 2, 2017
RF Cable	SCHWARZBECK	AK9515E	96221	July 3, 2016	July 2, 2017
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 3, 2016	June 2, 2017
MULTI-DEVICE Positioning Controller	Max-Full	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	Schwarzbeck	FMZB1519	1519-038	June 3, 2016	June 2, 2017
Spectrum analyzer	Agilent	E4407B	MY46185649	June 3, 2016	June 2, 2017
Power Sensor	Agilent	U2021XA	MY55050474	June 3, 2016	June 2, 2017
Horn Antenna (1G-18GHz)	SCHWARZBECK	BBHA9120D	9120D-1246	June 3, 2016	June 2, 2017
Horn Ant (18G-40GHz)	Schwarzbeck	BBHA 9170	9170-181	June 3, 2016	June 2, 2017

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017
Artificial Mains Network	Narda	L2-16B	000WX31025	July 3, 2016	July 2, 2017
Artificial Mains Network (AUX)	Narda	L2-16B	000WX31026	July 3, 2016	July 2, 2017
RF Cable	SCHWARZBECK	AK9515E	96222	July 3, 2016	July 2, 2017
Shielded Room	CHENGYU	843	PTS-002	June 3, 2016	June 2, 2017

## 7. PEAK OUTPUT POWER

### 7.1. MEASUREMENT PROCEDURE

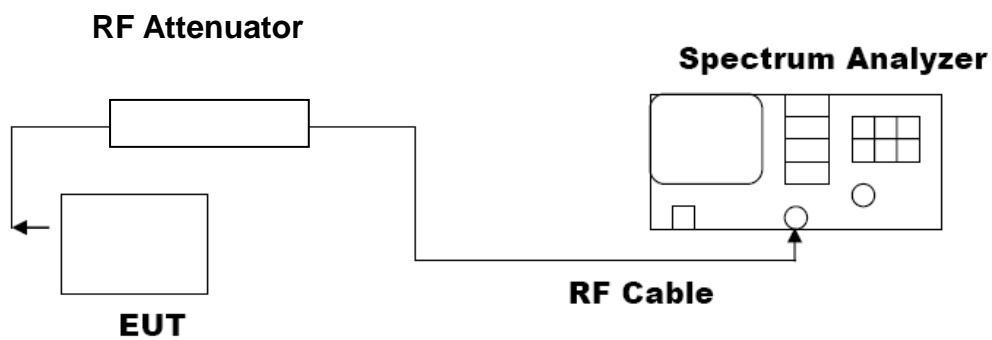
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
3. RBW > 20 dB bandwidth of the emission being measured.
4. VBW  $\geq$  RBW.
5. Sweep: Auto.
6. Detector function: Peak.
7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

### 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

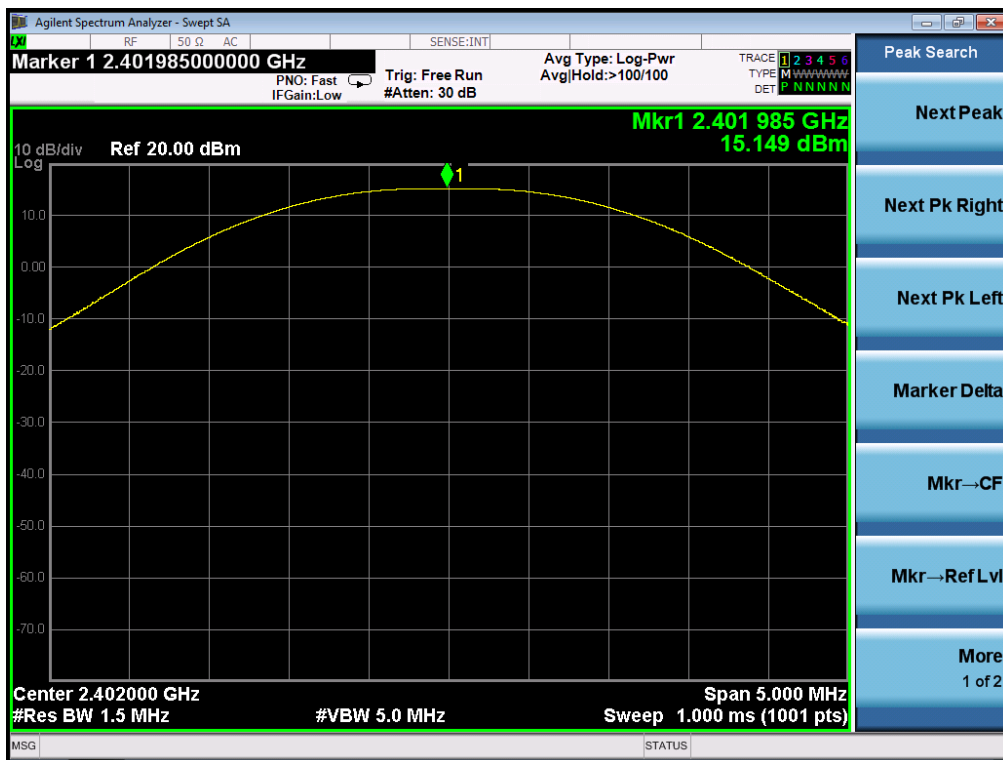
#### PEAK POWER TEST SETUP



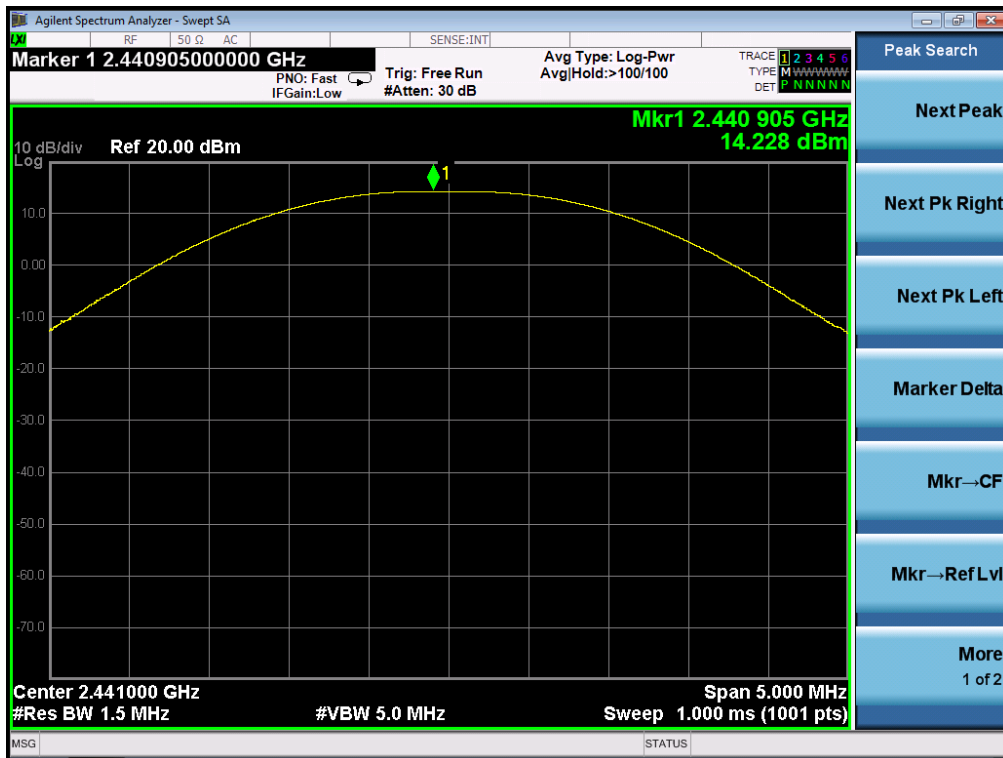
7.3. LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	15.149	30	Pass
2.441	14.228	30	Pass
2.480	13.293	30	Pass

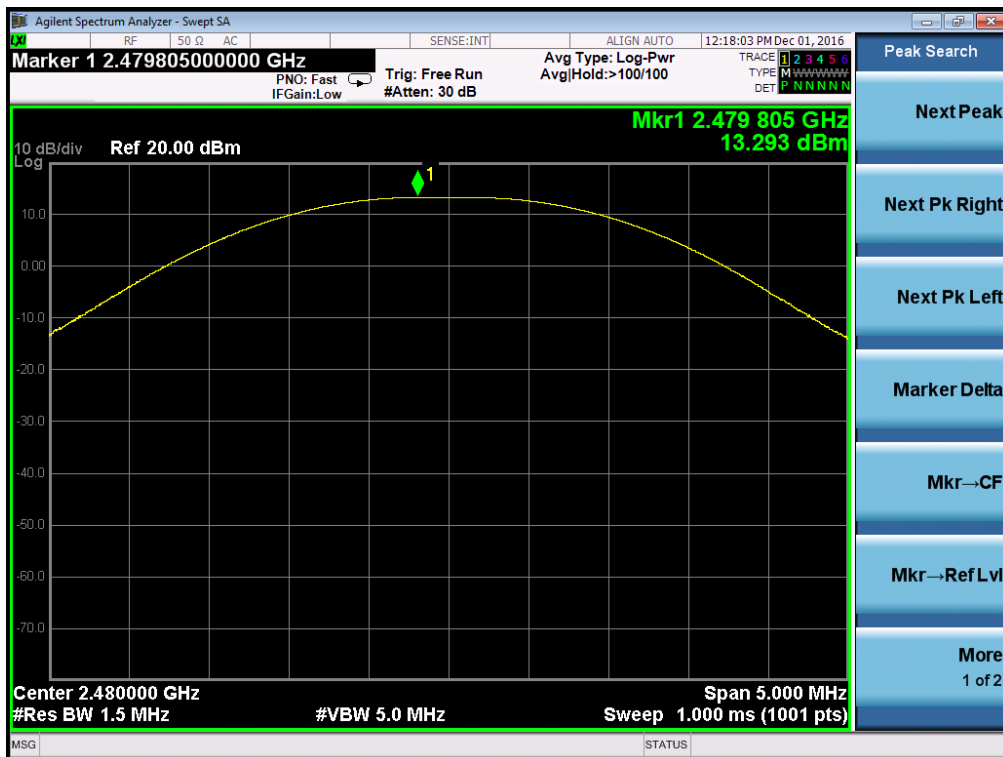
CH0



CH39

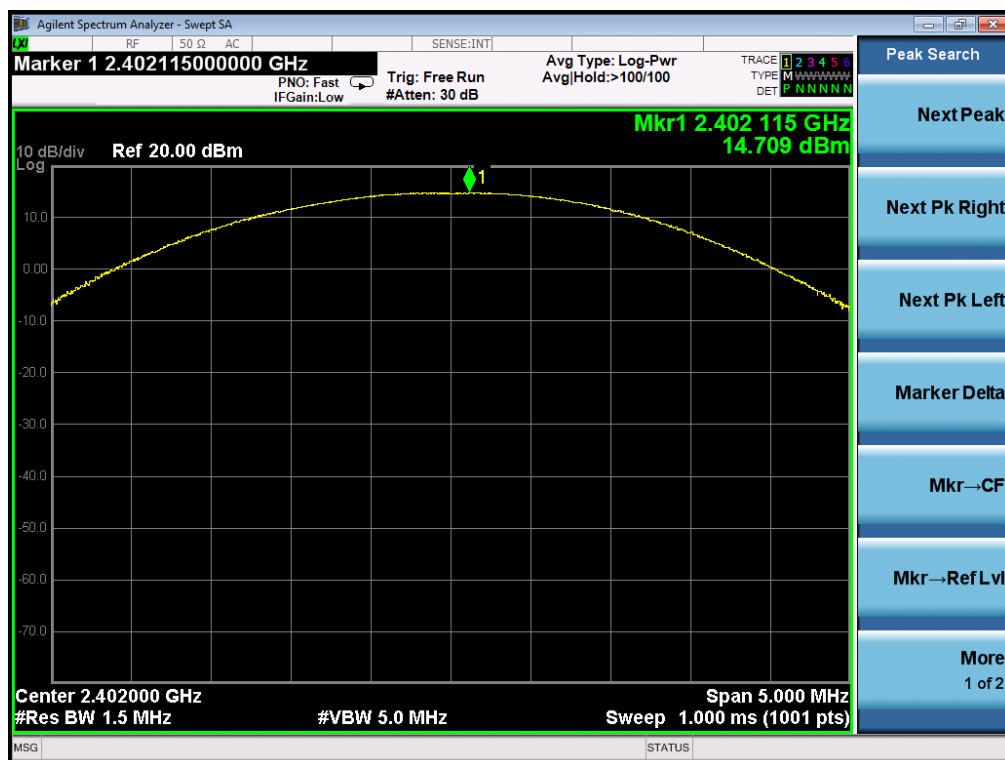


CH78

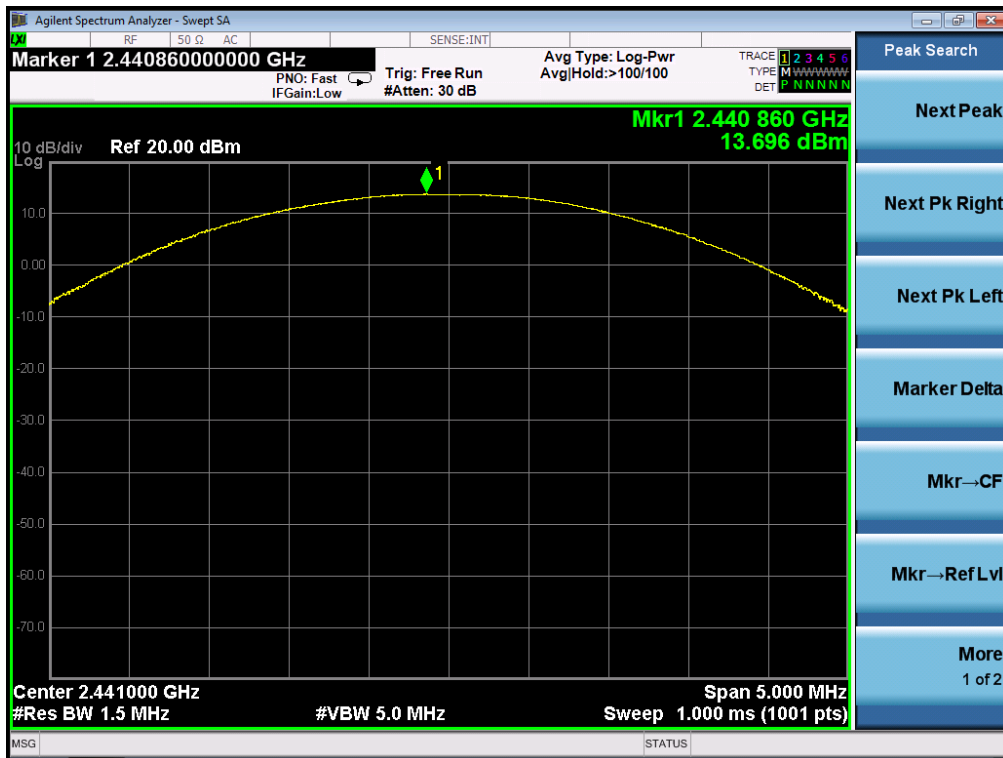


PEAK OUTPUT POWER MEASUREMENT RESULT FOR $\Pi$ /4-DQPSK MODULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	14.709	30	Pass
2.441	13.696	30	Pass
2.480	12.760	30	Pass

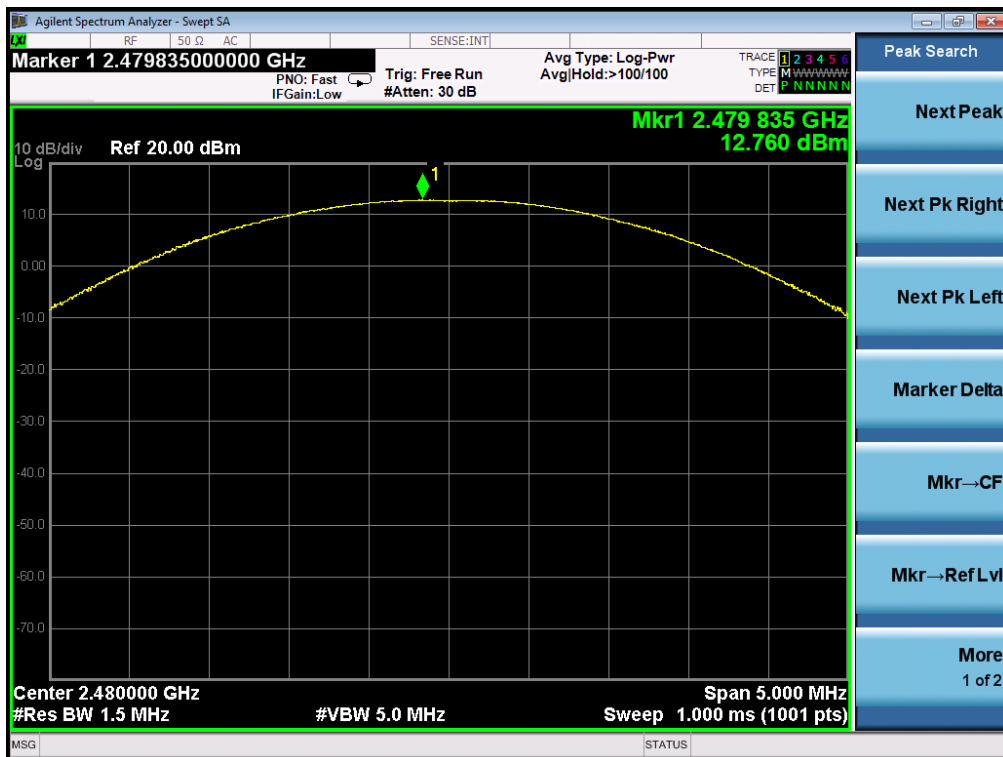
CH0



CH39



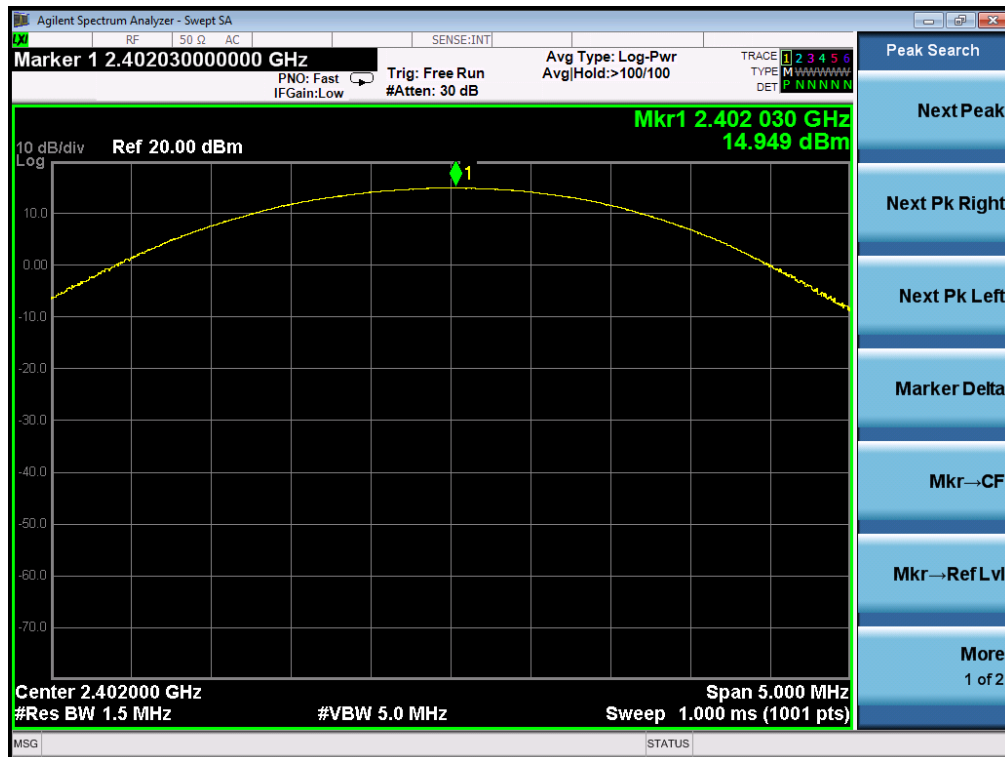
CH78



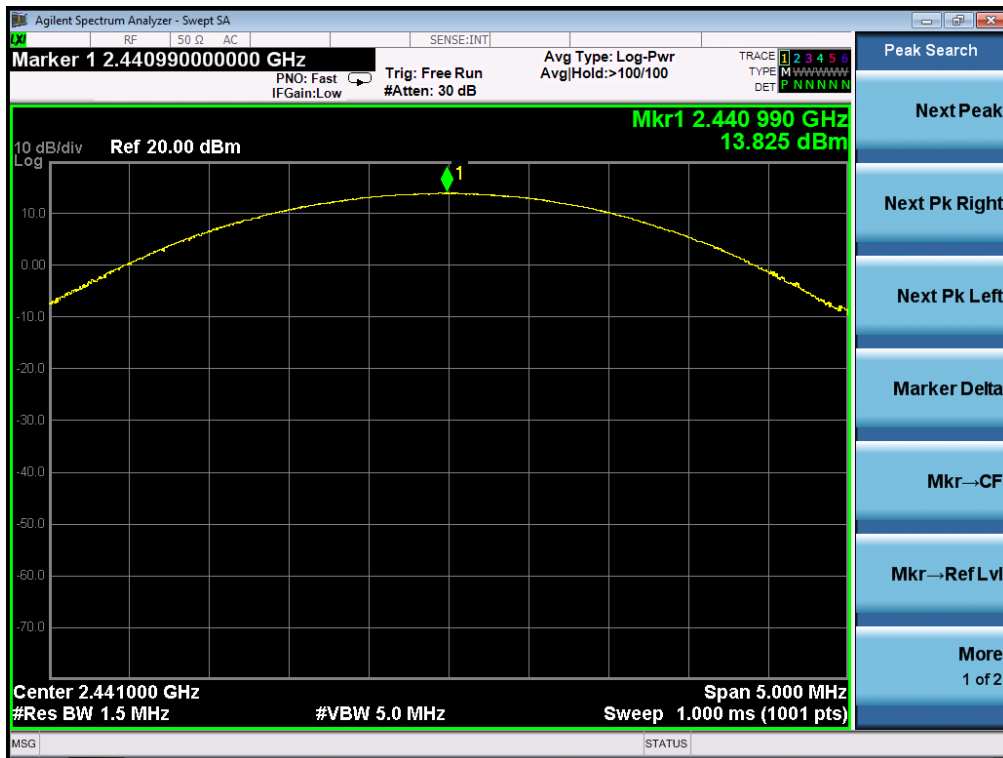


PEAK OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MODULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	14.949	30	Pass
2.441	13.825	30	Pass
2.480	13.000	30	Pass

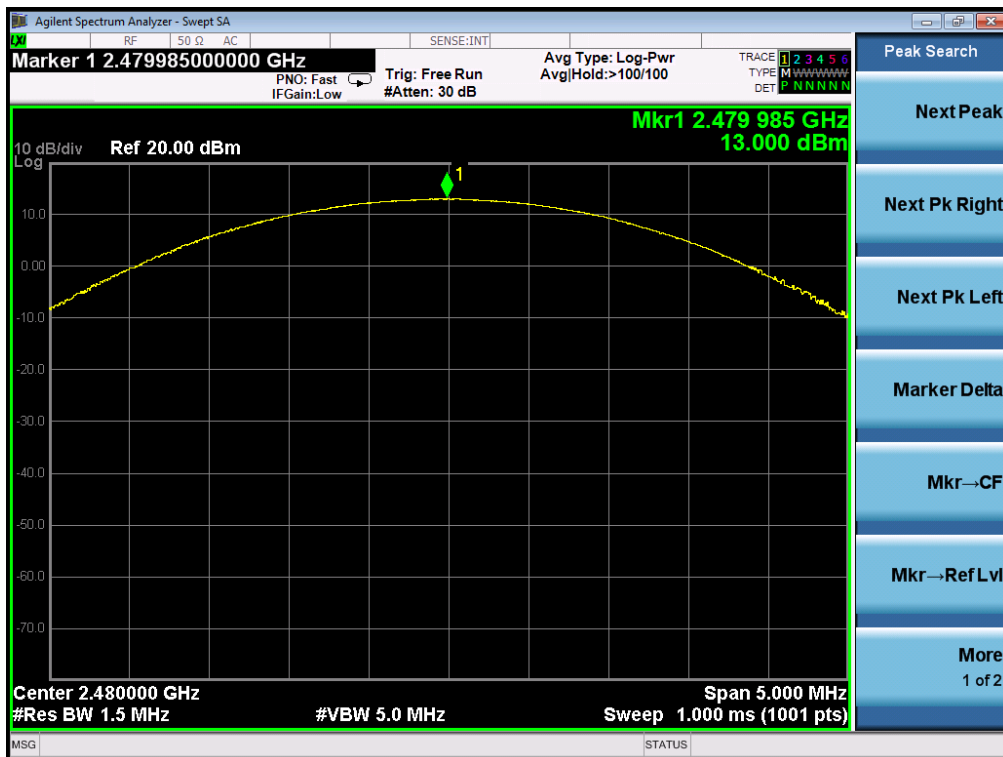
CH0



CH39



CH78



## 8. 20DB BANDWIDTH

### 8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel  
The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

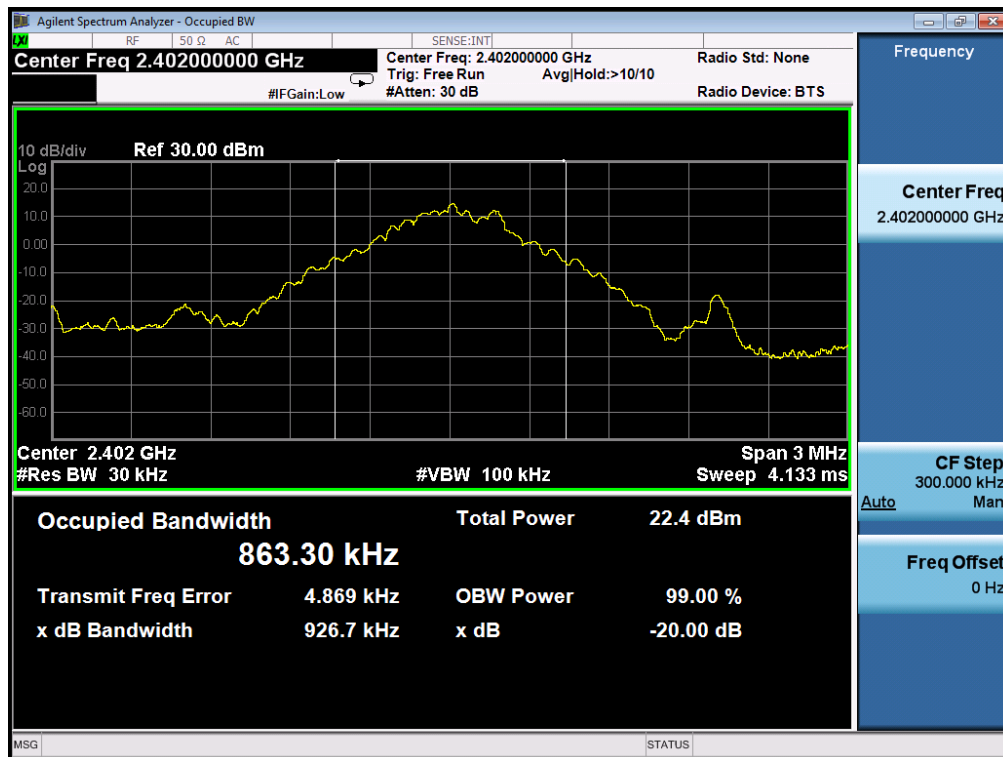
### 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

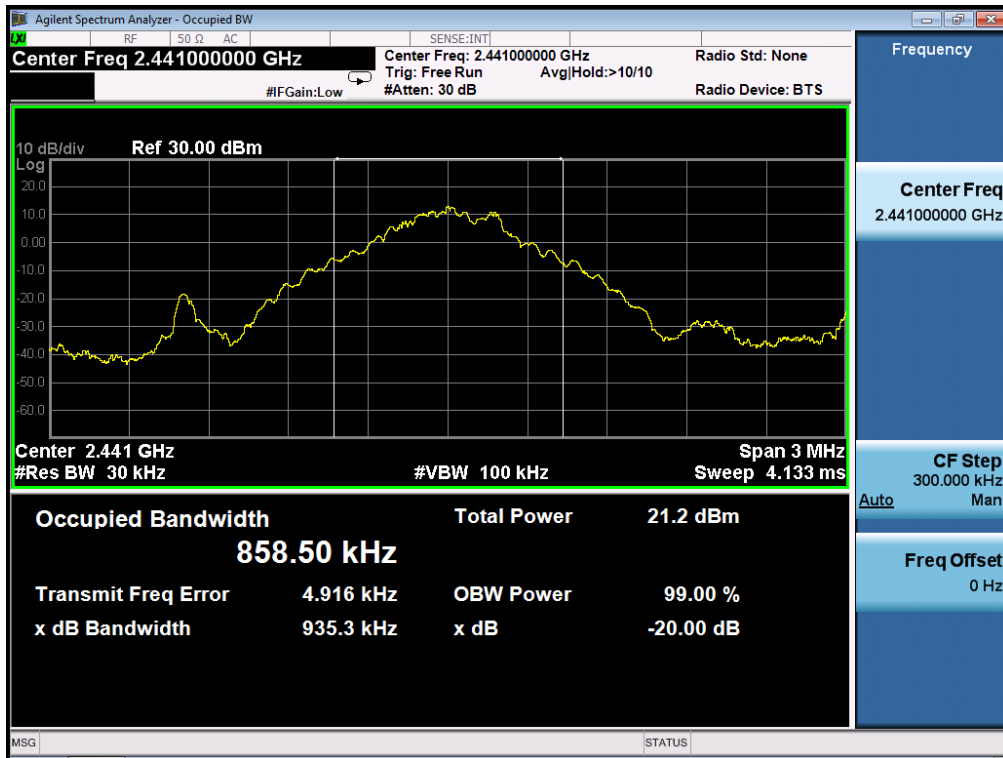
### 8.3. LIMITS AND MEASUREMENT RESULTS

MEASUREMENT RESULT FOR GFSK MOUDULATION			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
N/A	Low Channel	0.9267	PASS
	Middle Channel	0.9353	PASS
	High Channel	0.9255	PASS

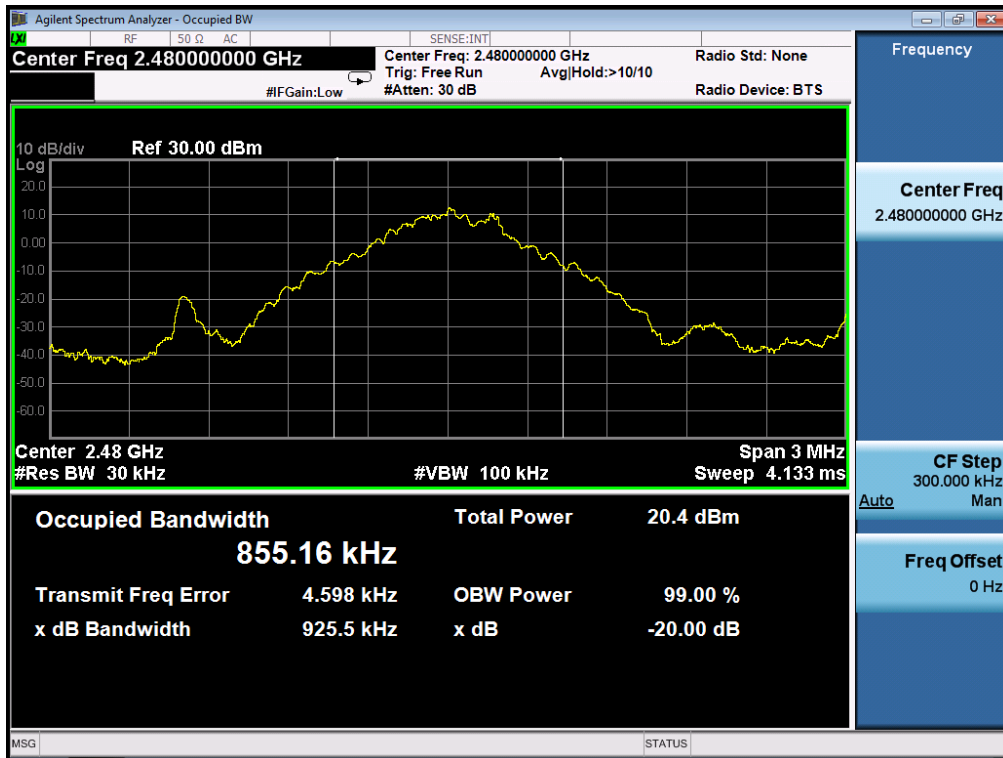
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

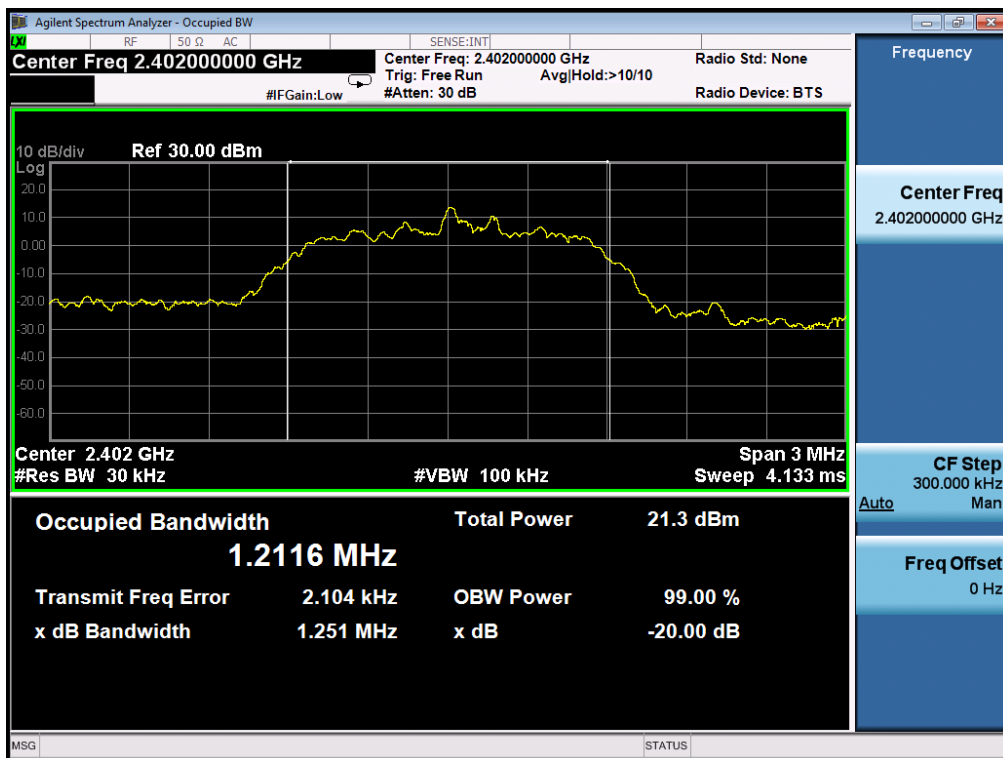


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

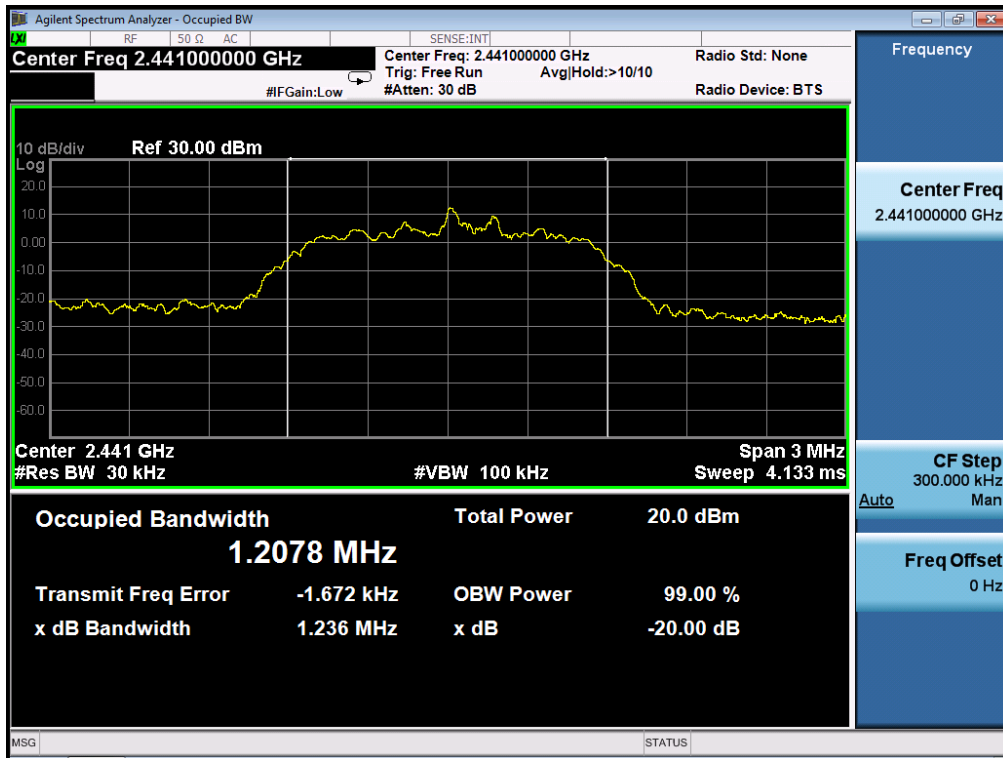


MEASUREMENT RESULT FOR II /4-DQPSK MODULATION			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
N/A	Low Channel	1.251	PASS
	Middle Channel	1.236	PASS
	High Channel	1.250	PASS

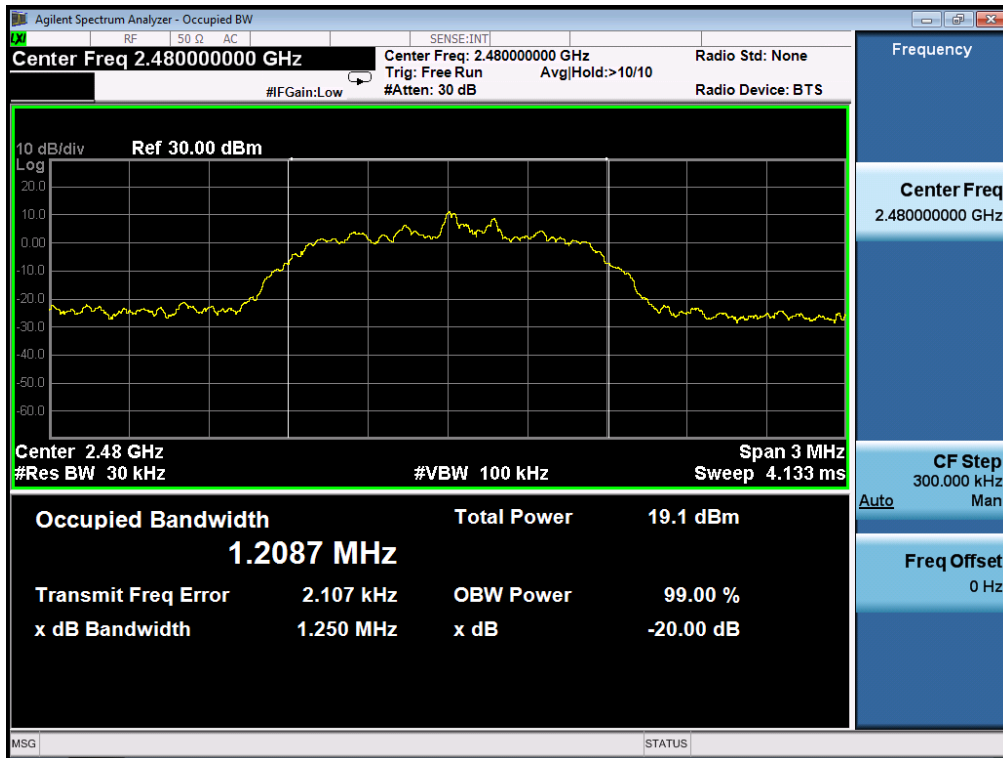
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

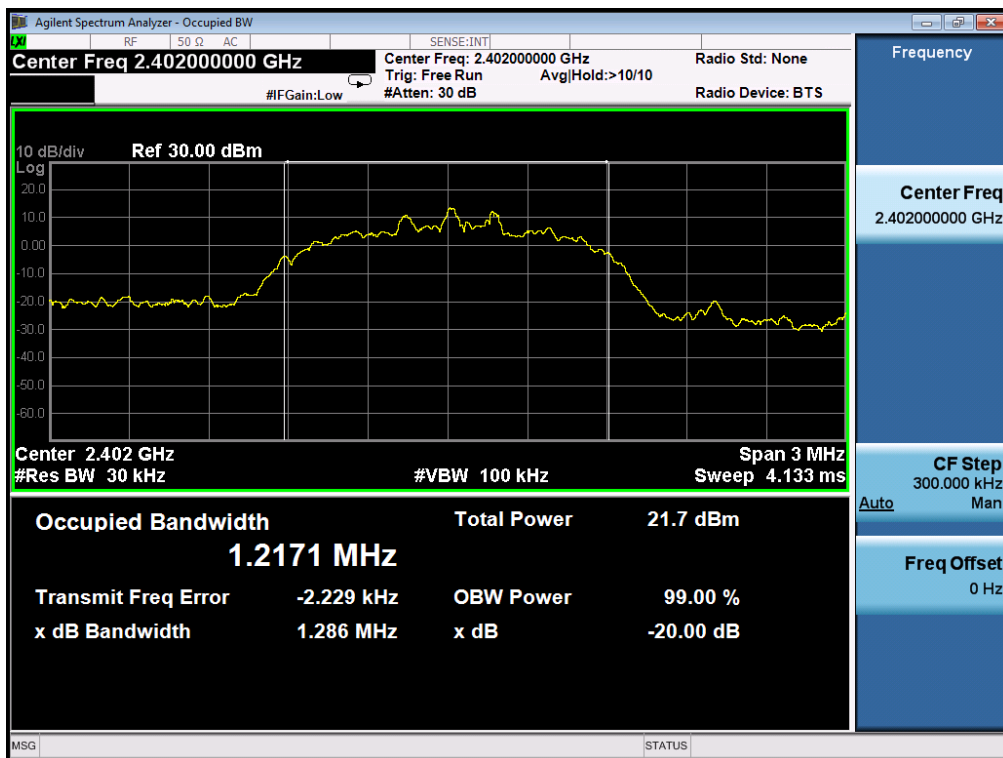


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

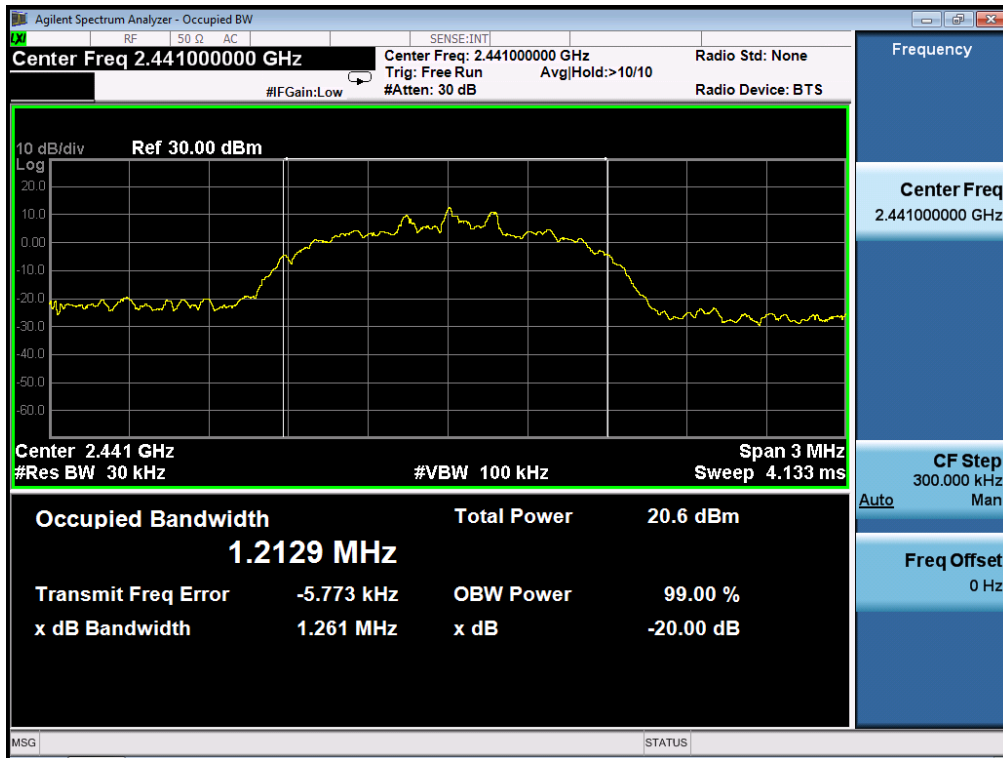


MEASUREMENT RESULT FOR 8-DPSK MODULATION			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
N/A	Low Channel	1.286	PASS
	Middle Channel	1.261	PASS
	High Channel	1.262	PASS

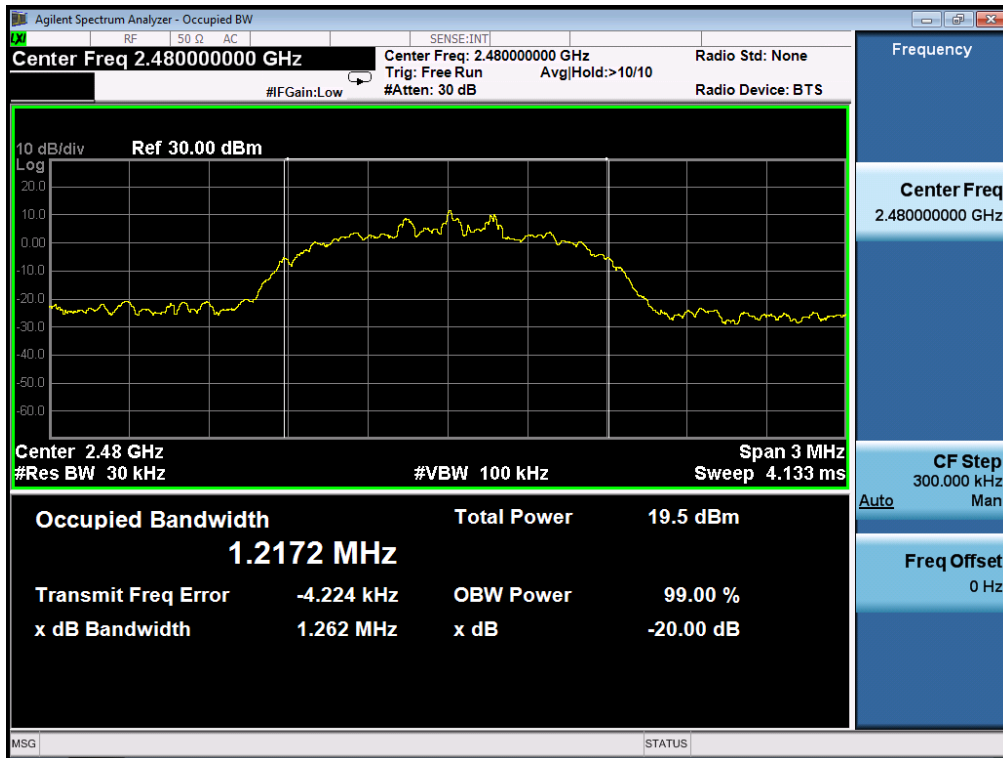
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL





## 9. CONDUCTED SPURIOUS EMISSION

### 9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.  
RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

### 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2

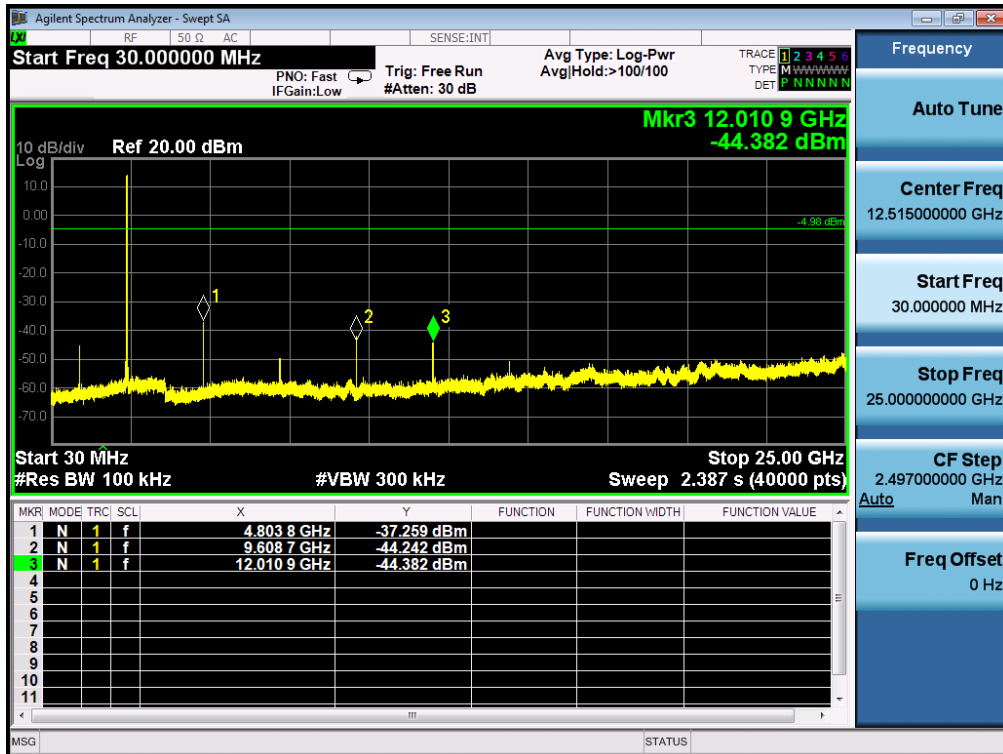
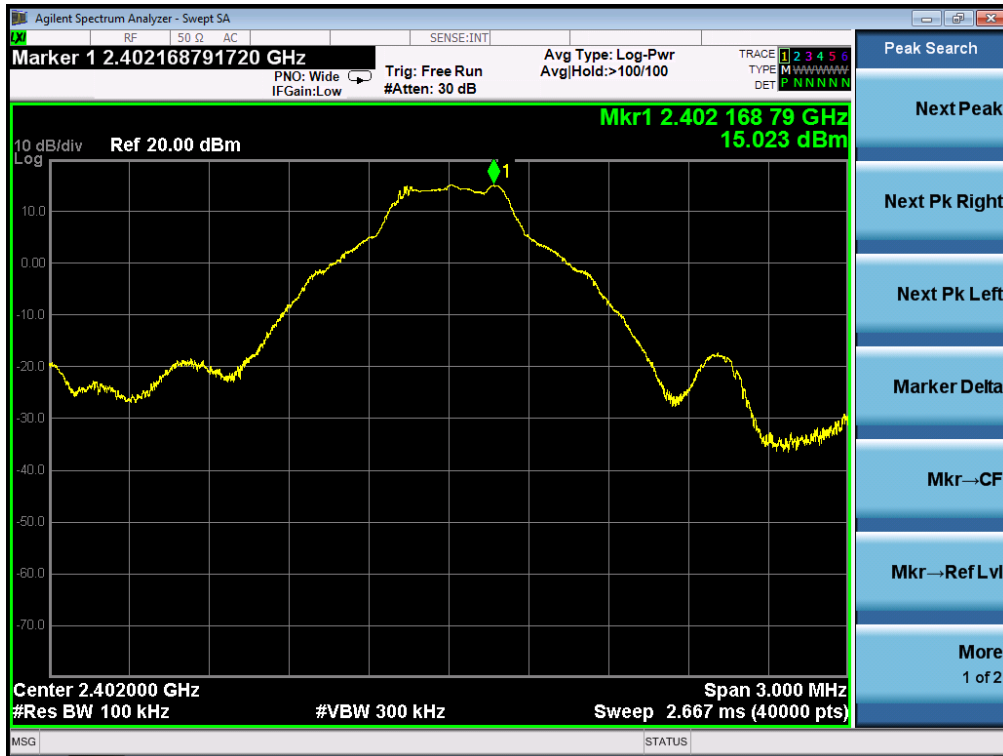
### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

### 9.4. LIMITS AND MEASUREMENT RESULT

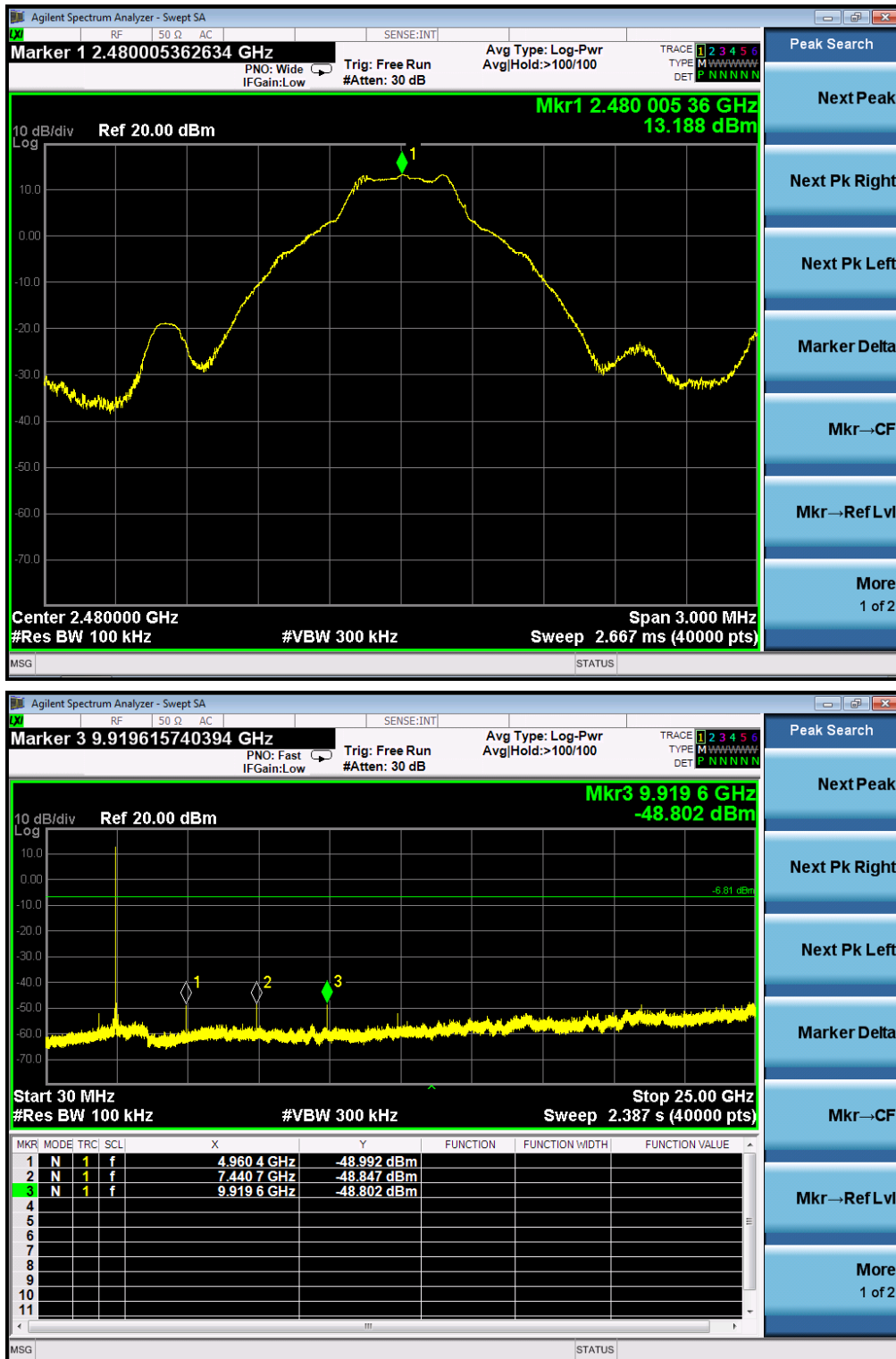
LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation 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)	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
	At least -20dBc than the limit Specified on the TOP Channel	PASS

**TEST RESULT FOR ENTIRE FREQUENCY RANGE**  
**TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE**  
**OF GFSK MODULATION IN LOW CHANNEL**





TEST PLOT OF OUT OF BAND EMISSIONS  
OF GFSK MODULATION IN HIGH CHANNEL



Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit. The GFSK modulation is the worst case and only those data recorded in the report.

### TEST RESULT FOR BAND EDGE GFSK MODULATION IN LOW CHANNEL

Hopping off



Hopping on



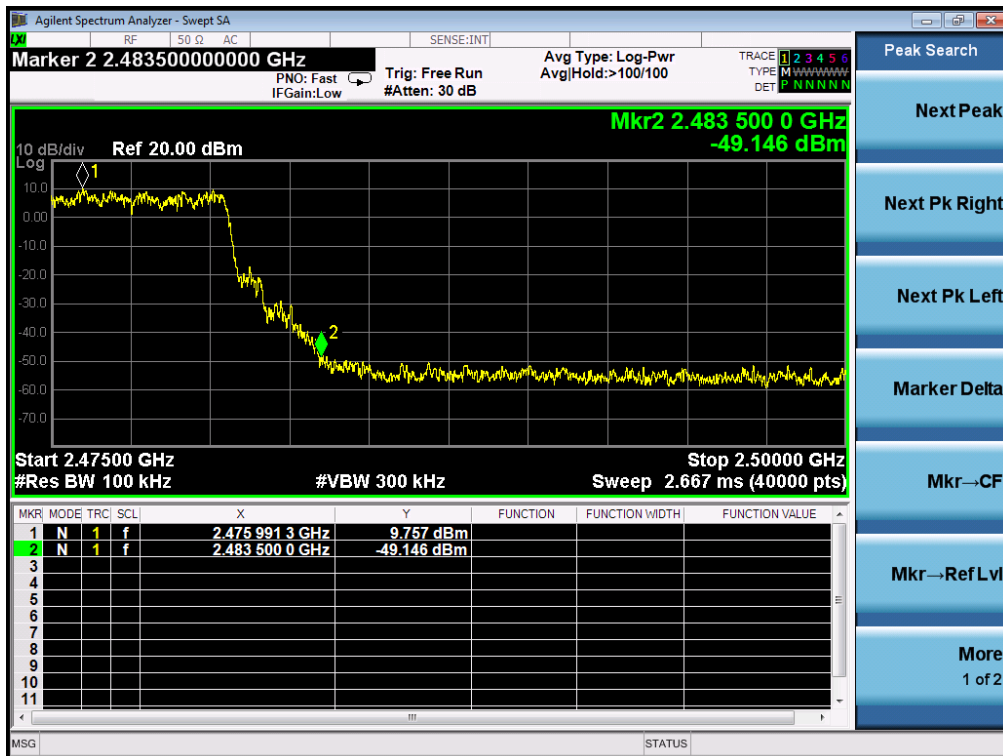




$\pi$  /4-DQPSK MODULATION IN HIGH CHANNEL  
 Hopping off

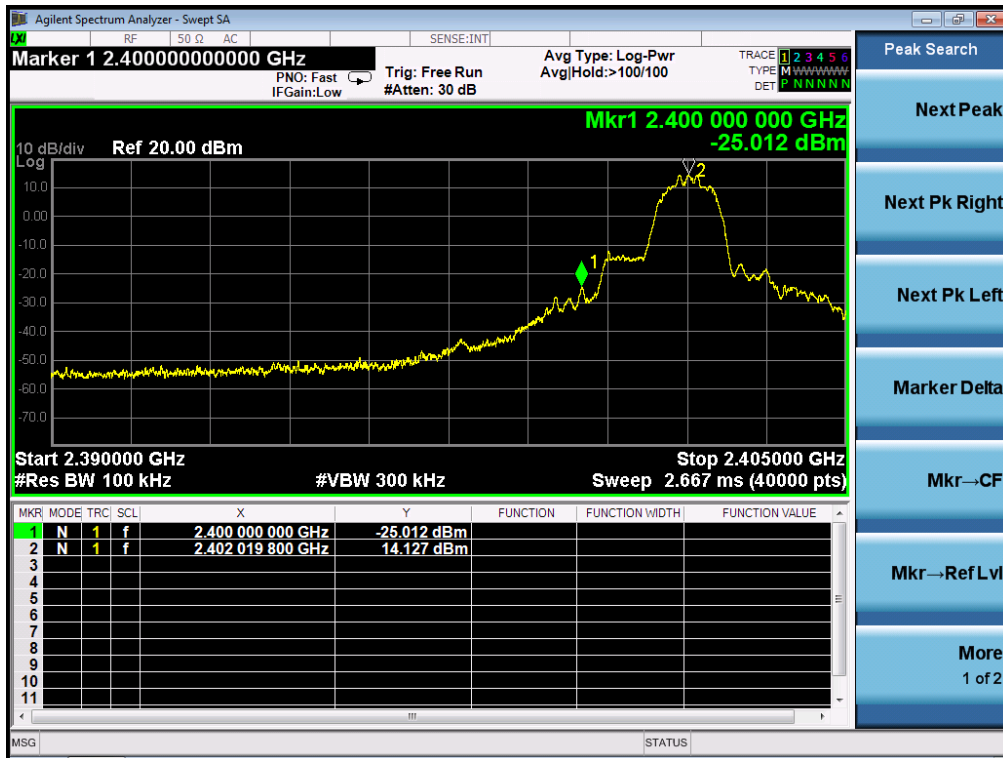


Hopping on





### 8-DPSK MODULATION IN LOW CHANNEL Hopping off



### Hopping on





## 10. RADIATED EMISSION

### 10.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

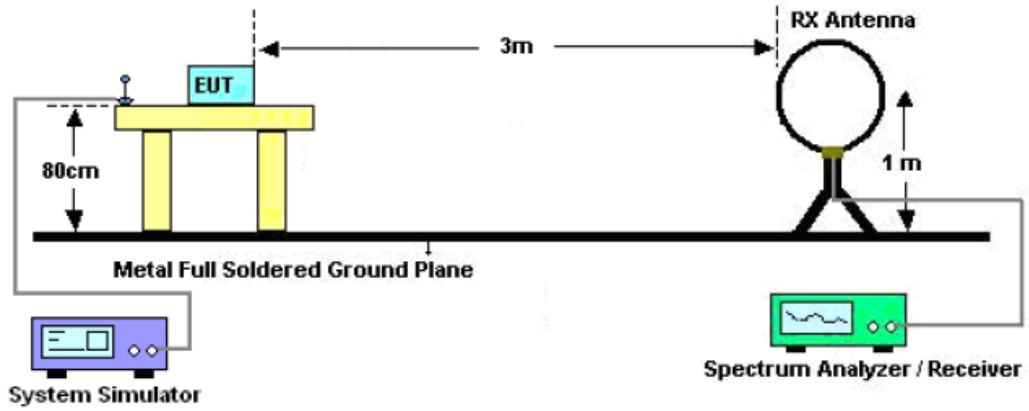
The following table is the setting of spectrum analyzer and receiver.

<b>Spectrum Parameter</b>	<b>Setting</b>
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/1MHz for Peak, 1MHz/10Hz for Average

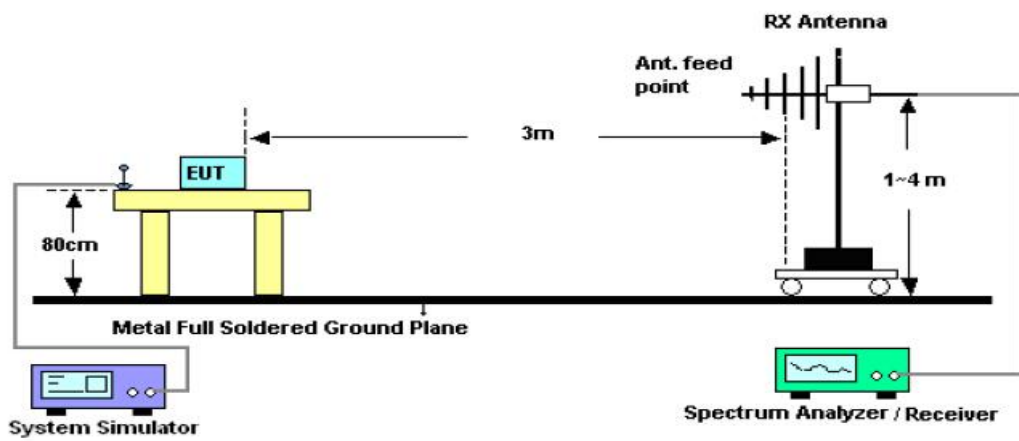
<b>Receiver Parameter</b>	<b>Setting</b>
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

## 10.2. TEST SETUP

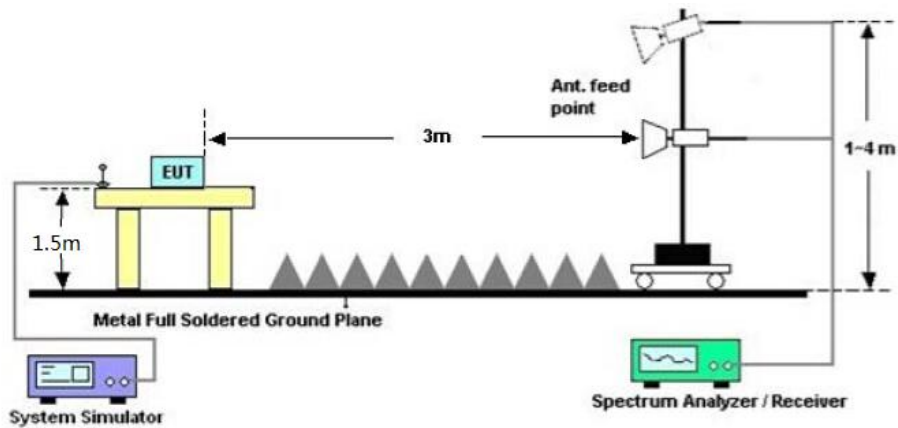
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



### 10.3. LIMITS AND MEASUREMENT RESULT

15.209(a) Limit in the below table has to be followed

<b>Frequencies (MHz)</b>	<b>Field Strength (micorvolts/meter)</b>	<b>Measurement Distance (meters)</b>
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested For restricted band radiated emission,  
the test records reported below are the worst result compared to other modes.

### 10.4. TEST RESULT

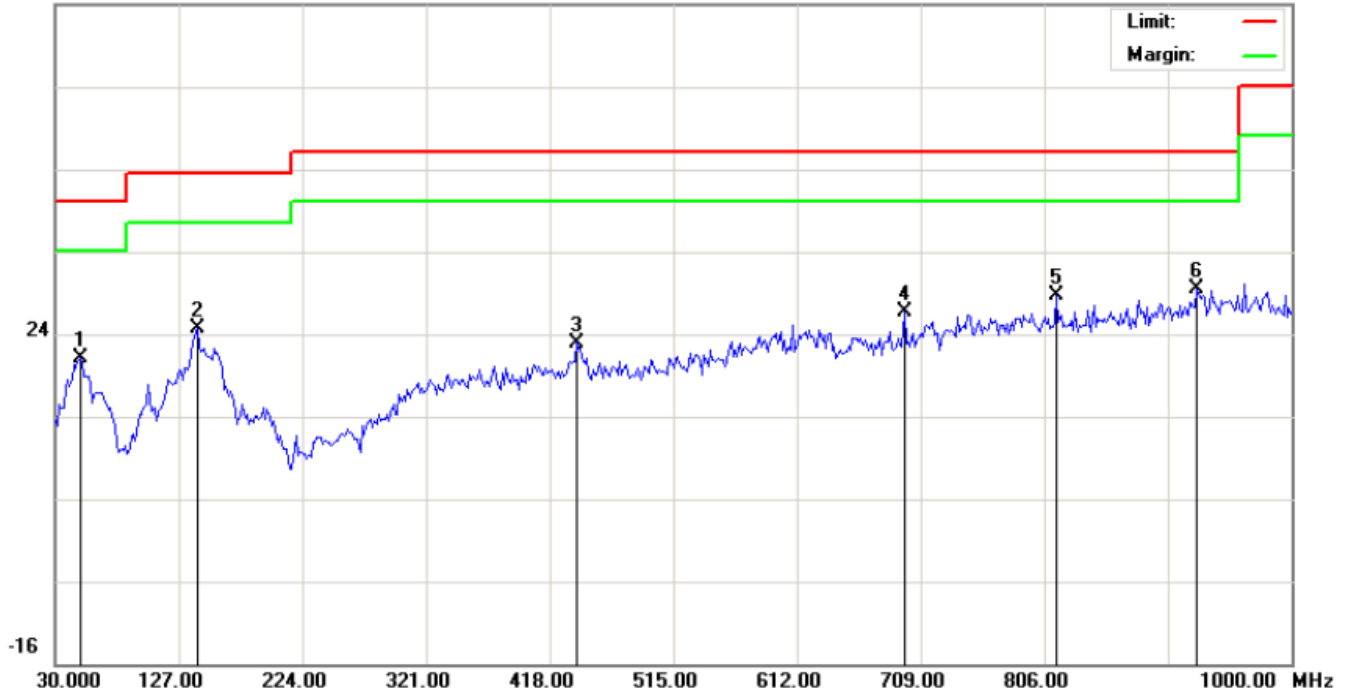
#### **RADIATED EMISSION BELOW 30MHZ**

No emission found between lowest internal used/generated frequencies to 30MHz.

**RADIATED EMISSION BELOW 1GHZ**

<b>EUT</b>	Helmet Bluetooth Intercom Headset	<b>Model Name</b>	T-REX
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 4	<b>Antenna</b>	Horizontal

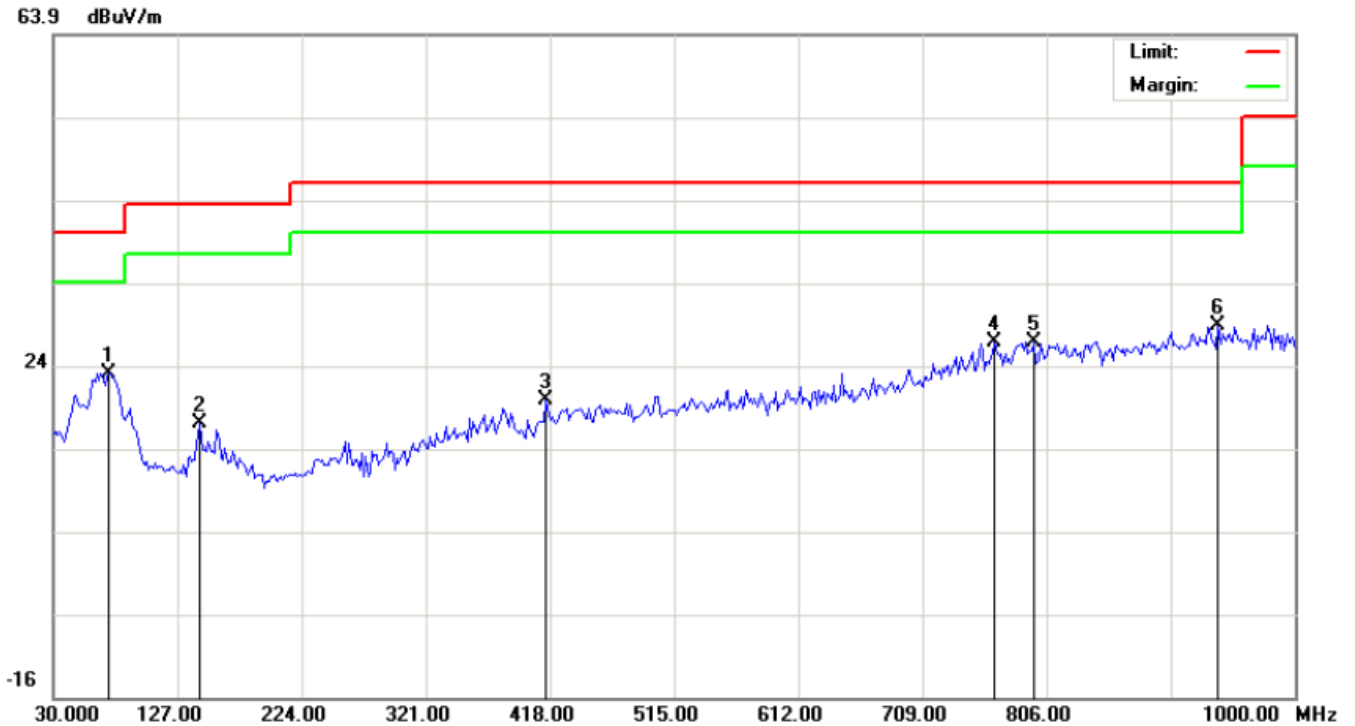
63.9 dBuV/m



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		49.4000	9.81	11.28	21.09	40.00	-18.91	peak			
2		141.5500	9.80	14.82	24.62	43.50	-18.88	peak			
3		439.0167	2.64	20.26	22.90	46.00	-23.10	peak			
4		696.0667	1.57	25.08	26.65	46.00	-19.35	peak			
5		815.7000	1.32	27.32	28.64	46.00	-17.36	peak			
6	*	925.6333	0.11	29.32	29.43	46.00	-16.57	peak			

**RESULT: PASS**

<b>EUT</b>	Helmet Bluetooth Intercom Headset	<b>Model Name</b>	T-REX
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 4	<b>Antenna</b>	Vertical



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	73.6500	19.73	3.36	23.09	40.00	-16.91	peak			
2		144.7833	1.75	15.23	16.98	43.50	-26.52	peak			
3		414.7667	0.25	19.52	19.77	46.00	-26.23	peak			
4		765.5833	-0.07	26.84	26.77	46.00	-19.23	peak			
5		796.3000	-0.39	27.27	26.88	46.00	-19.12	peak			
6		940.1833	-0.91	29.73	28.82	46.00	-17.18	peak			

**RESULT: PASS**

**Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The "Factor" value can be calculated automatically by software of measurement system.

3. All test modes had been pre-tested. The mode 4 is the worst case and recorded in the report.



**RADIATED EMISSION ABOVE 1GHZ**

<b>EUT</b>	Helmet Bluetooth Intercom Headset	<b>Model Name</b>	T-REX
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Value Type
4804.026	50.12	3.74	53.86	74	-20.14	peak
4804.026	46.87	3.74	50.61	54	-3.39	AVG
7206.026	44.37	8.14	52.51	74	-21.49	peak
7206.026	40.74	8.14	48.88	54	-5.12	AVG

Remark:  
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

<b>EUT</b>	Helmet Bluetooth Intercom Headset	<b>Model Name</b>	T-REX
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Value Type
4804.026	49.74	3.74	53.48	74	-20.52	peak
4804.026	46.12	3.74	49.86	54	-4.14	AVG
7206.026	42.54	8.14	50.68	74	-23.32	peak
7206.026	38.65	8.14	46.79	54	-7.21	AVG

Remark:  
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

<b>EUT</b>	Helmet Bluetooth Intercom Headset	<b>Model Name</b>	T-REX
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 2	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Value Type
4882.026	49.85	3.76	53.61	74	-20.39	peak
4882.026	46.27	3.76	50.03	54	-3.97	AVG
7323.039	44.74	8.17	52.91	74	-21.09	peak
7323.039	41.22	8.17	49.39	54	-4.61	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

<b>EUT</b>	Helmet Bluetooth Intercom Headset	<b>Model Name</b>	T-REX
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 2	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Value Type
4882.026	48.74	3.76	52.5	74	-21.5	peak
4882.026	45.33	3.76	49.09	54	-4.91	AVG
7323.039	44.57	8.17	52.74	74	-21.26	peak
7323.039	40.86	8.17	49.03	54	-4.97	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

<b>EUT</b>	Helmet Bluetooth Intercom Headset	<b>Model Name</b>	T-REX
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 3	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Value Type
4960.026	47.75	3.83	51.58	74	-22.42	peak
4960.026	45.12	3.83	48.95	54	-5.05	AVG
7440.039	43.25	8.21	51.46	74	-22.54	peak
7440.039	39.87	8.21	48.08	54	-5.92	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

<b>EUT</b>	Helmet Bluetooth Intercom Headset	<b>Model Name</b>	T-REX
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 3	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Value Type
4960.026	46.85	3.83	50.68	74	-23.32	peak
4960.026	44.21	3.83	48.04	54	-5.96	AVG
7440.039	41.85	8.21	50.06	74	-23.94	peak
7440.039	38.26	8.21	46.47	54	-7.53	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

**RESULT: PASS**

**Note:**

Other emissions from 1G to 25 GHz are considered as ambient noise. No recording in the test report.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

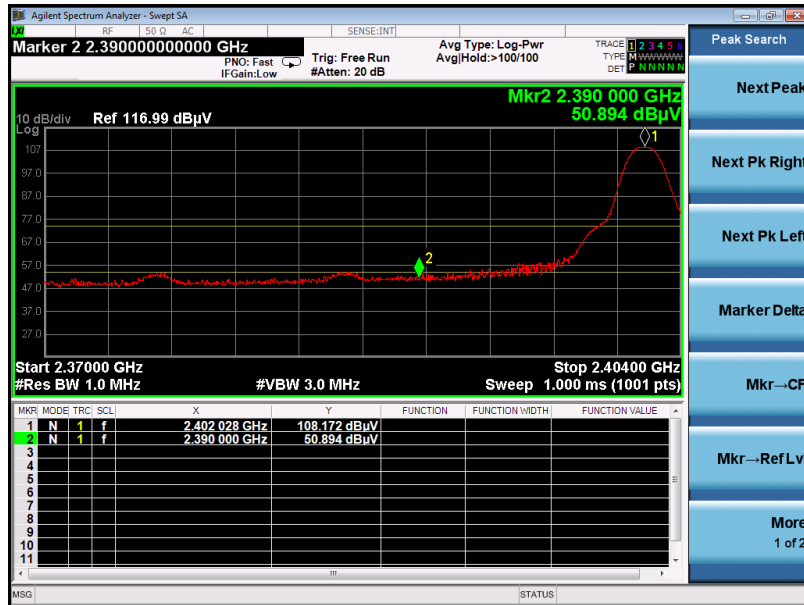
The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been pre-tested. The GFSK modulation is the worst case and recorded in the report.



EUT	Helmet Bluetooth Intercom Headset	Model Name	T-REX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

PK

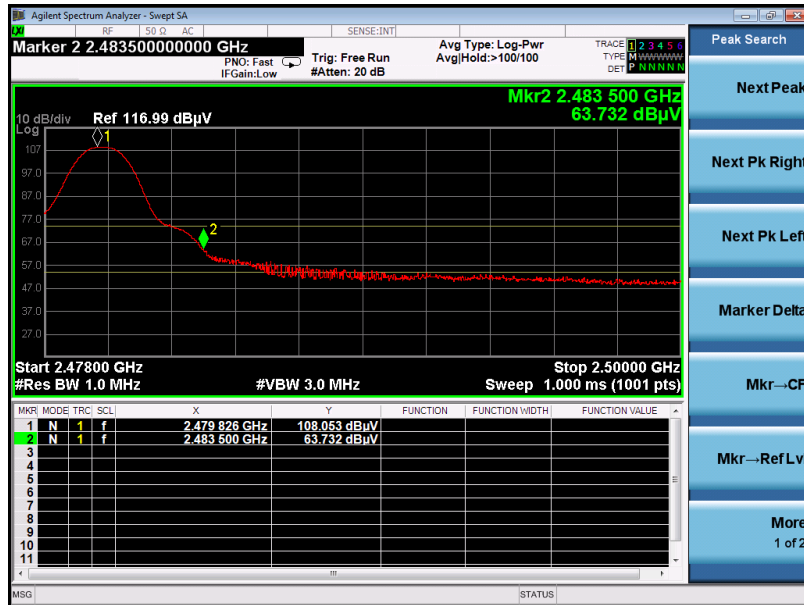


AV



EUT	Helmet Bluetooth Intercom Headset	Model Name	T-REX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

PK

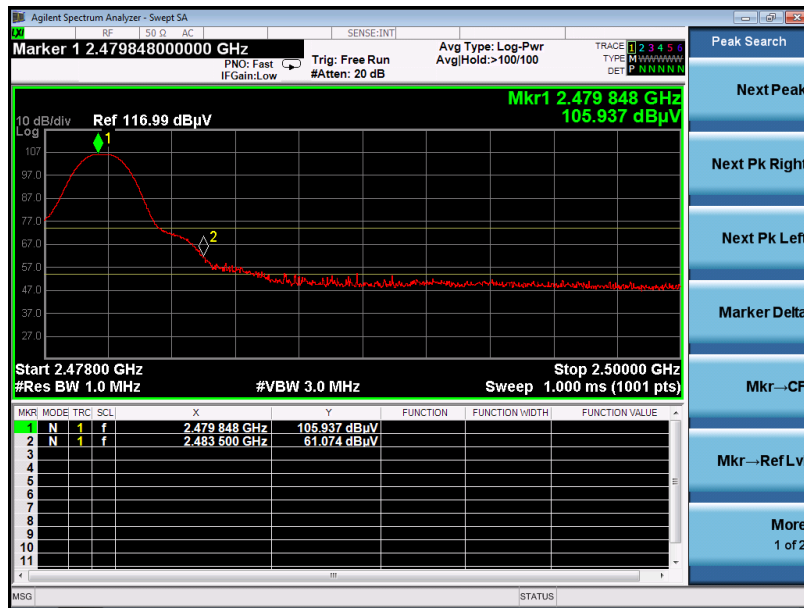


AV



EUT	Helmet Bluetooth Intercom Headset	Model Name	T-REX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

PK



AV



**Note:** The factor had been edited in the "Input Correction" of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(μV) to represent the Amplitude. Use the F dB(μV/m) to represent the Field Strength. So A=F. All test modes had been pre-tested. The GFSK modulation is the worst case and recorded in the report.

## 11. NUMBER OF HOPPING FREQUENCY

### 11.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW  $\geq$  RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.
4. Allow the trace to stabilize.

### 11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

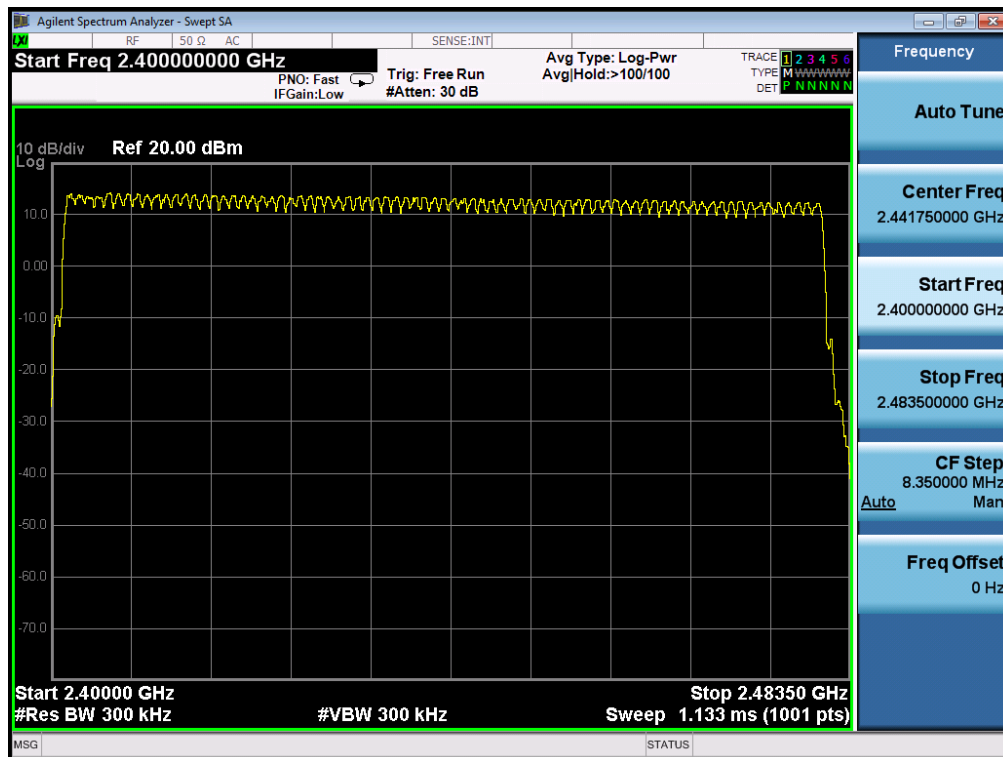
### 11.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

### 11.4. LIMITS AND MEASUREMENT RESULT

TOTAL NO. OF HOPPING CHANNEL	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT
	$\geq 15$	79	PASS

TEST PLOT FOR NO. OF TOTAL CHANNELS



Note: The 8-DPSK modulation is the worst case and recorded in the report.



## 12. TIME OF OCCUPANCY (DWELL TIME)

### 12.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Zero span, centered on a hopping channel.
2. RBW shall be  $\leq$  channel spacing and where possible RBW should be set  $\gg 1 / T$ , where T is the expected dwell time per channel.
3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
4. Detector function: Peak. Trace: Max hold.
5. Use the marker-delta function to determine the transmit time per hop.
6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:  
(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer)  $\times$  (period specified in the requirements / analyzer sweep time)
7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

### 12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

### 12.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

### 12.4. LIMITS AND MEASUREMENT RESULT

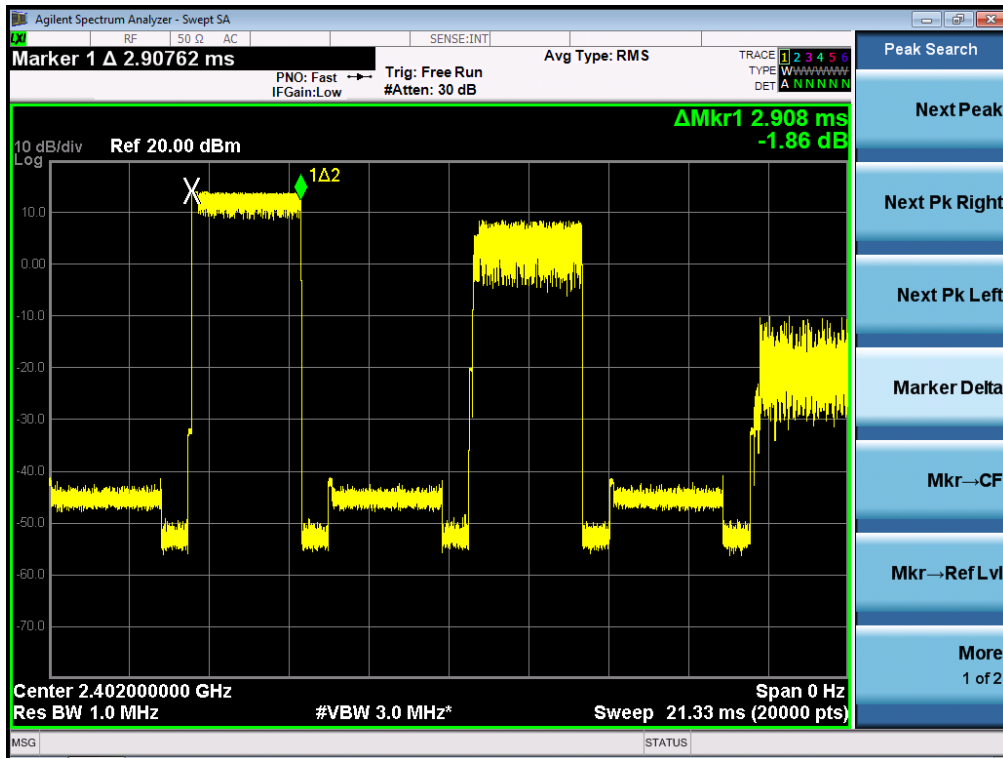
Channel	Time of Pulse for DH5 (ms)	Number of hops in the period specified in the requirements	Sweep Time (ms)	Limit (ms)
Low	2.908	27*4	314.064	400
Middle	2.908	27*4	314.064	400
High	2.908	27*4	314.064	400

Note: The 8-DPSK modulation is the worst case and recorded in the report.

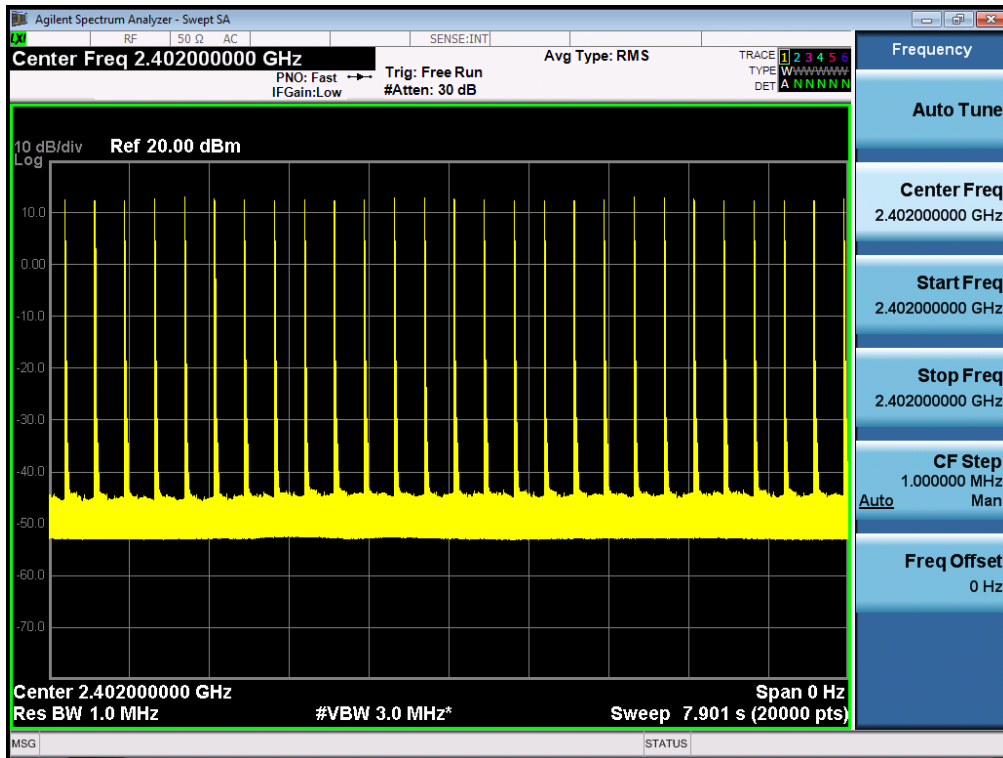
$$(\text{period specified in the requirements} / \text{analyzer sweep time}) = (79 \times 0.4) / 7.9 = 4$$

$$(\text{Number of hops in the period specified in the requirements}) = 4 \times \text{number of hops on spectrum analyzer}$$

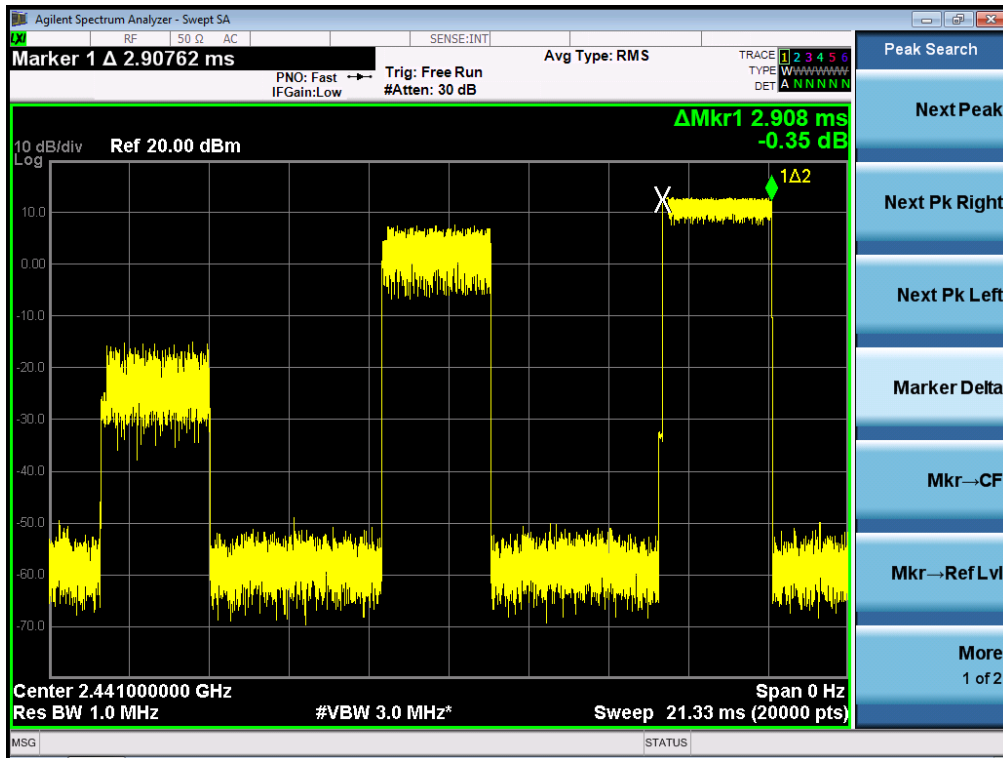
### TEST PLOT OF LOW CHANNEL



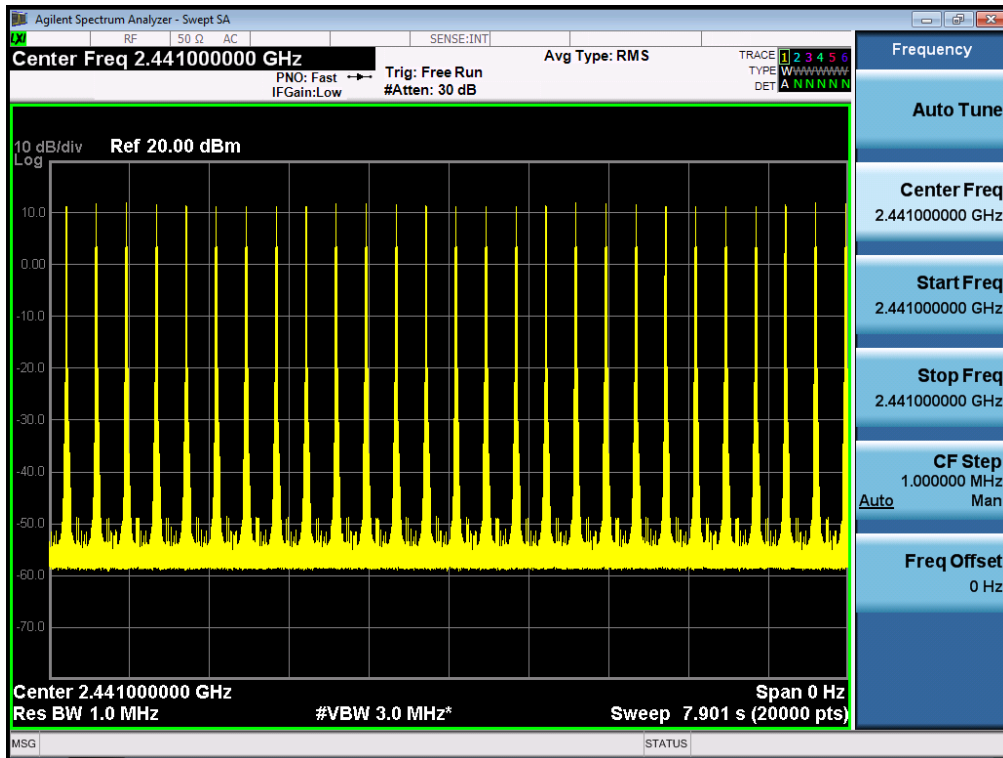
### NUMBER OF HOPS ON SPECTRUM ANALYZER



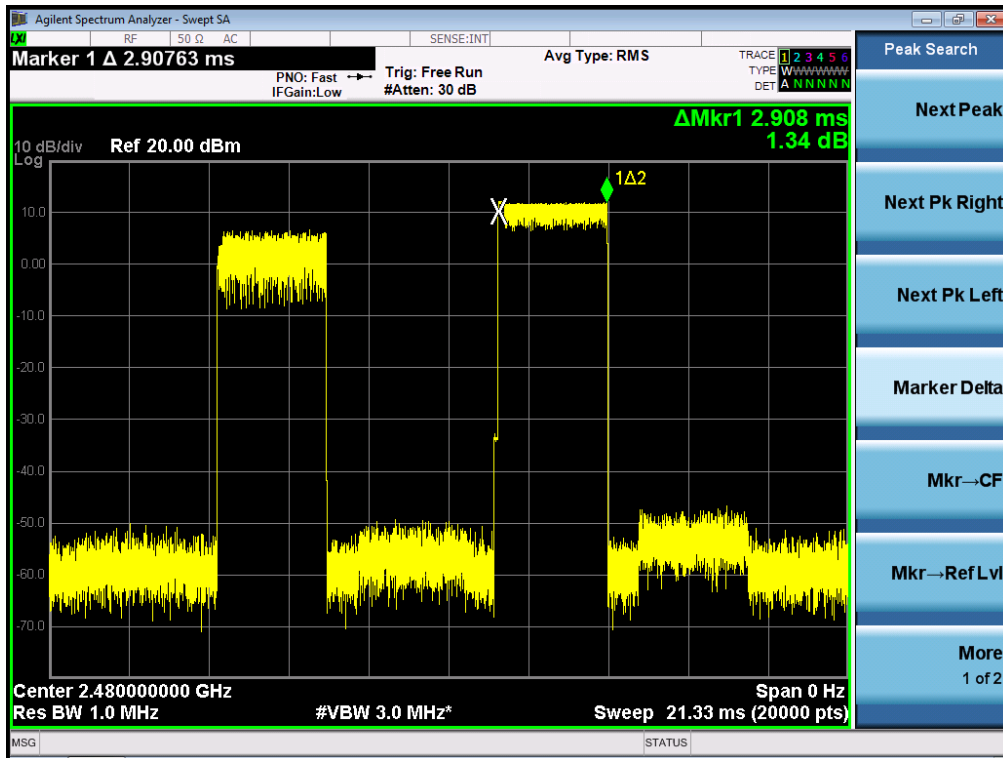
### TEST PLOT OF MIDDLE CHANNEL



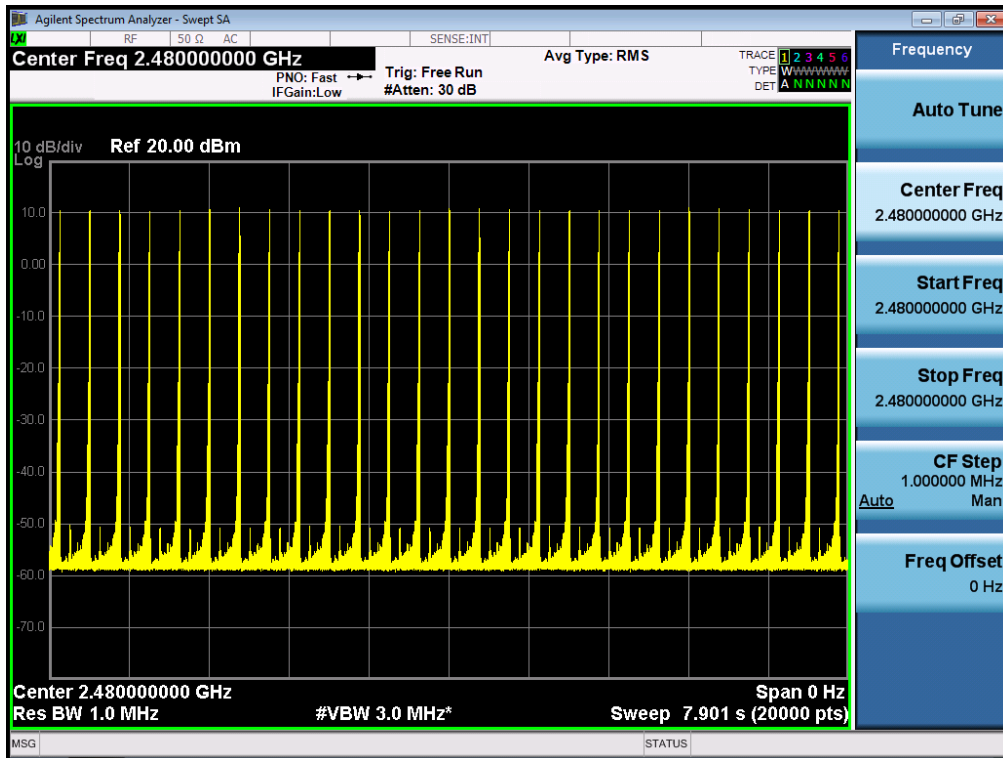
### NUMBER OF HOPS ON SPECTRUM ANALYZER



### TEST PLOT OF HIGH CHANNEL



### NUMBER OF HOPS ON SPECTRUM ANALYZER



### 13. FREQUENCY SEPARATION

#### 13.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.
  2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
  3. Video (or average) bandwidth (VBW)  $\geq$  RBW.
  4. Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize.
- Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

#### 13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

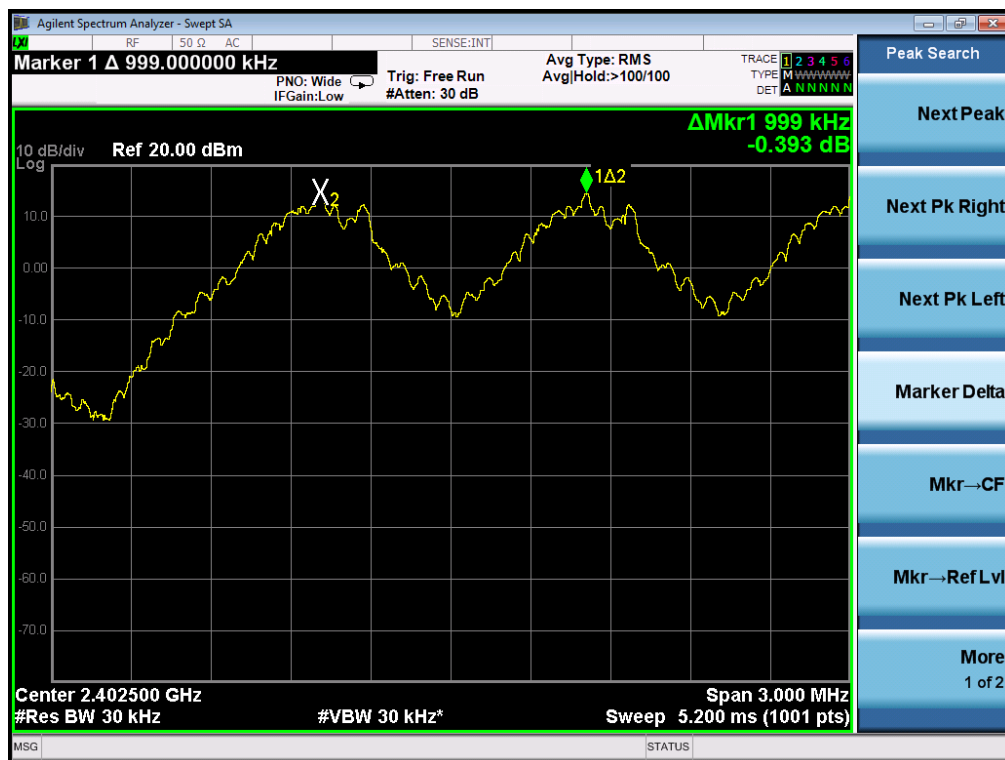
#### 13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

#### 13.4. LIMITS AND MEASUREMENT RESULT

CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	
CH01-CH02	999	$\geq 25$ KHz or 2/3 20 dB BW	Pass

TEST PLOT FOR FREQUENCY SEPARATION



Note: The GFSK modulation is the worst case and recorded in the report.

## 14. FCC LINE CONDUCTED EMISSION TEST

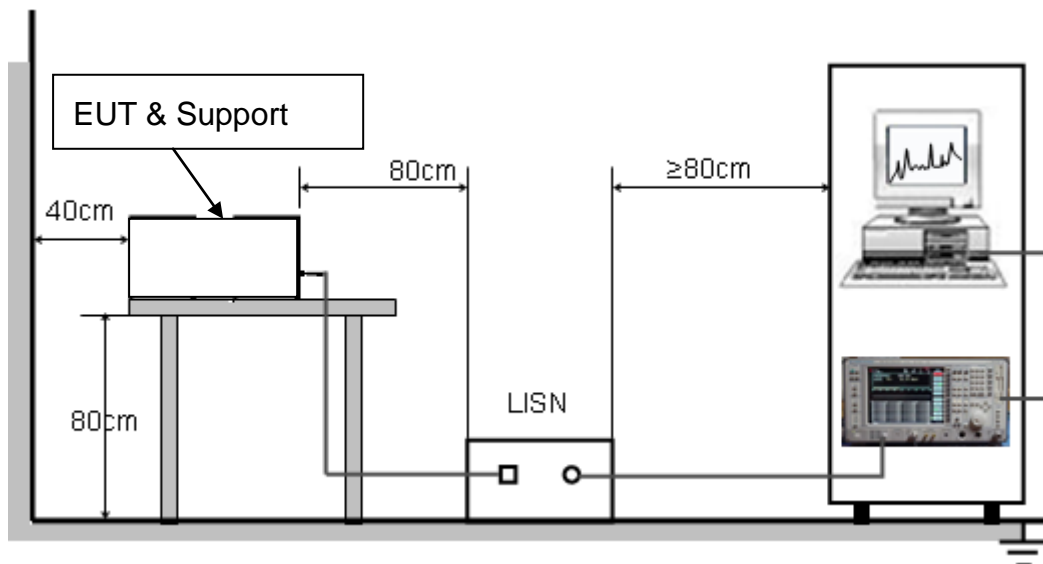
### 14.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.( dBuV)	Average( dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 14.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



#### **14.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST**

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC charging voltage by adapter which received 120V/60Hz power by a LISN..
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

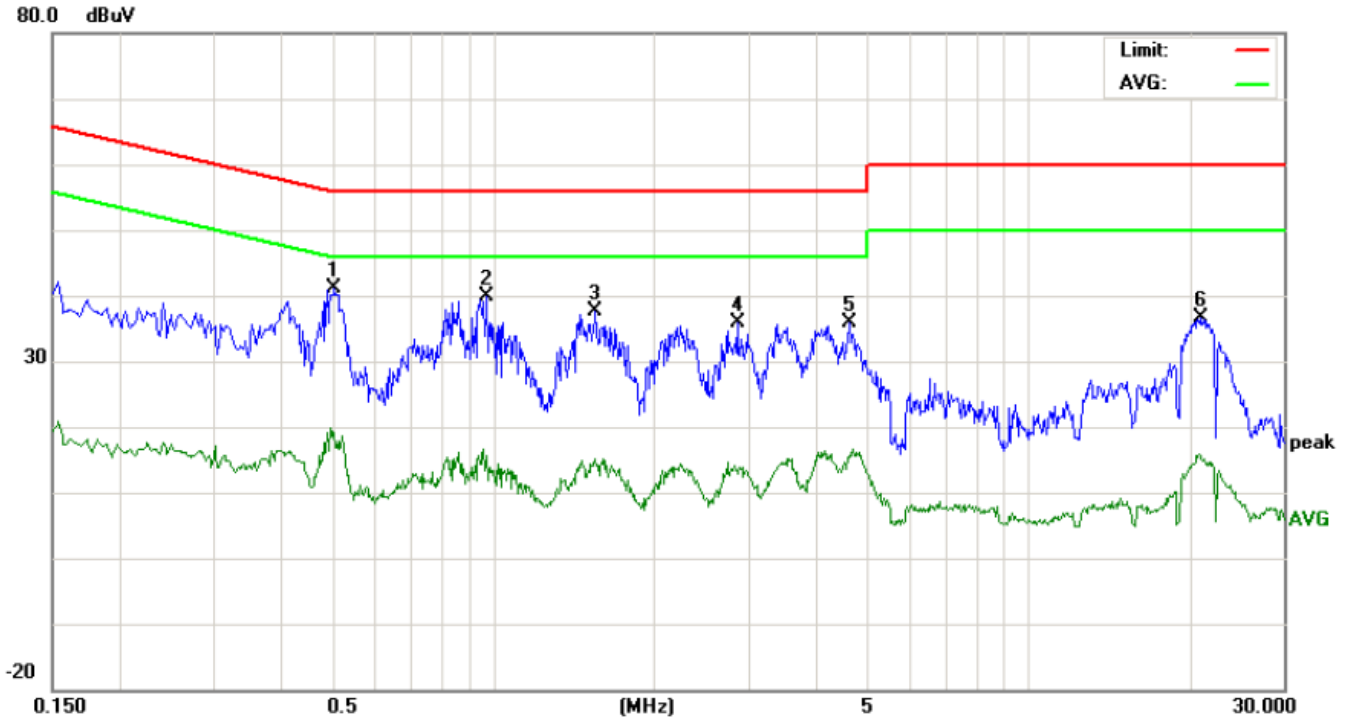
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

#### **14.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST**

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

### 14.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

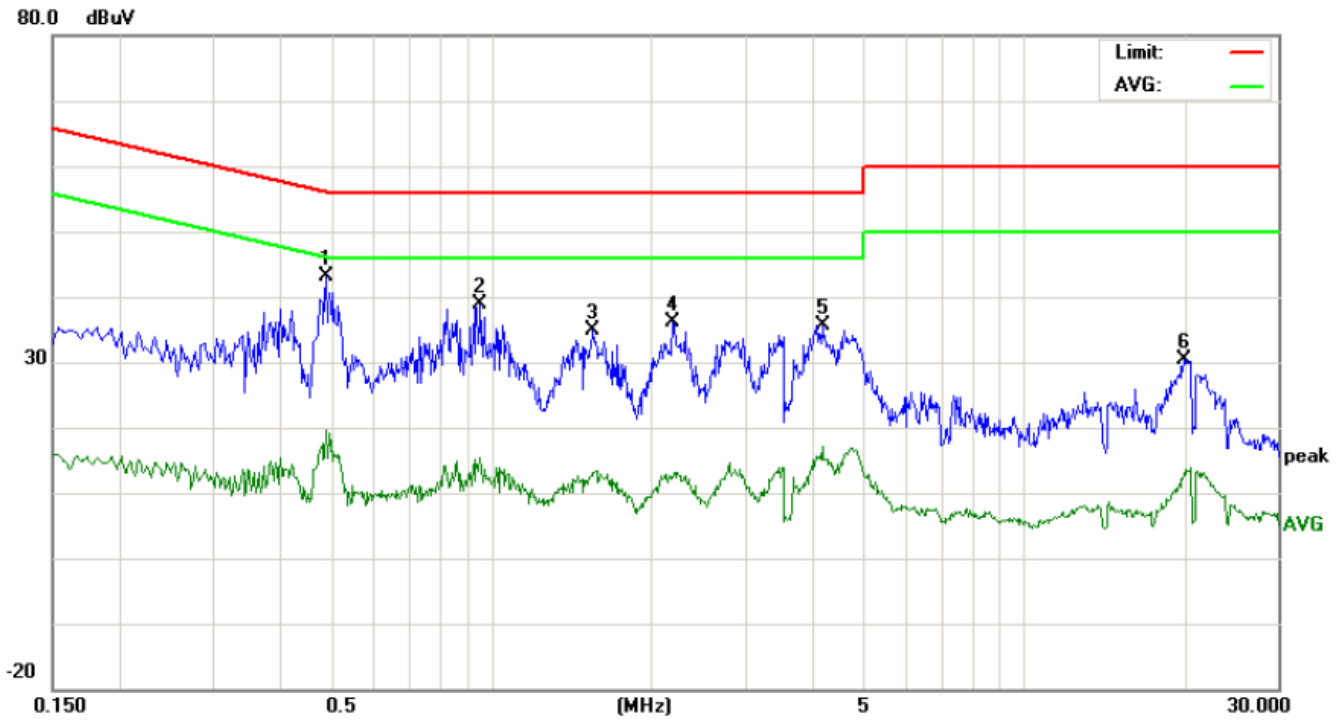
Line Conducted Emission Test Line 1-L



No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor (dB)	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.5060	30.66		8.63	10.39	41.05	19.02	56.00	46.00	-14.95	-26.98	P		
2	0.9780	29.59		5.26	10.38	39.97	15.64	56.00	46.00	-16.03	-30.36	P		
3	1.5580	27.17		4.51	10.36	37.53	14.87	56.00	46.00	-18.47	-31.13	P		
4	2.8660	25.45		2.85	10.52	35.97	13.37	56.00	46.00	-20.03	-32.63	P		
5	4.6299	25.61		5.28	10.22	35.83	15.50	56.00	46.00	-20.17	-30.50	P		
6	21.0260	26.60		5.60	10.13	36.73	15.73	60.00	50.00	-23.27	-34.27	P		



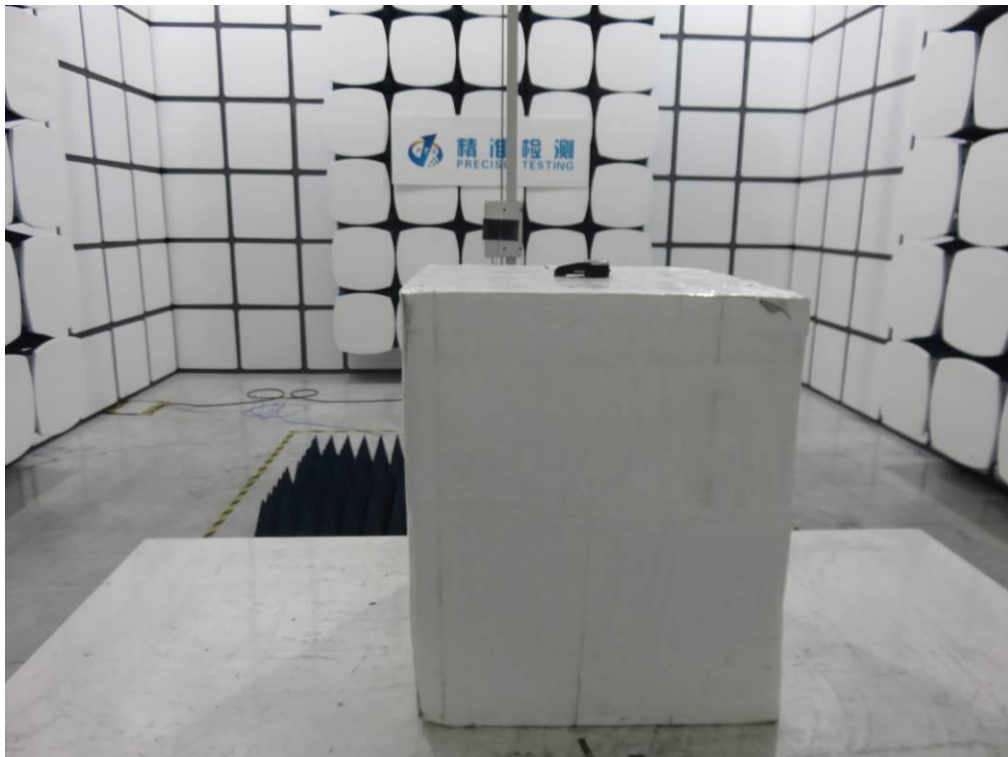
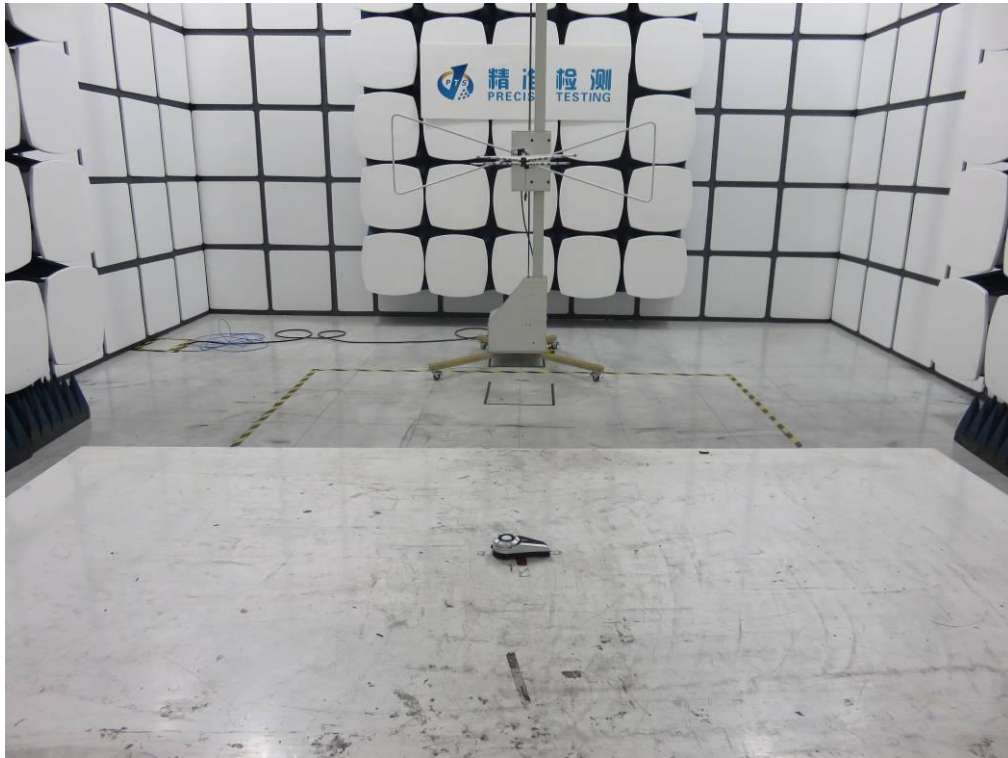
Line Conducted Emission Test Line 2-N



No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor (dB)	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.4900	32.73		9.34	10.39	43.12		19.73	56.17	46.17	-13.05	-26.44	P	
2	0.9540	28.39		4.78	10.39	38.78		15.17	56.00	46.00	-17.22	-30.83	P	
3	1.5580	24.43		2.76	10.36	34.79		13.12	56.00	46.00	-21.21	-32.88	P	
4	2.1940	25.78		2.14	10.30	36.08		12.44	56.00	46.00	-19.92	-33.56	P	
5	4.1898	25.39		6.70	10.35	35.74		17.05	56.00	46.00	-20.26	-28.95	P	
6	19.9980	20.25		2.67	10.11	30.36		12.78	60.00	50.00	-29.64	-37.22	P	

## APPENDIX A: PHOTOGRAPHS OF TEST SETUP

### FCC RADIATED EMISSION TEST SETUP



FCC LINE CONDUCTED EMISSION TEST SETUP

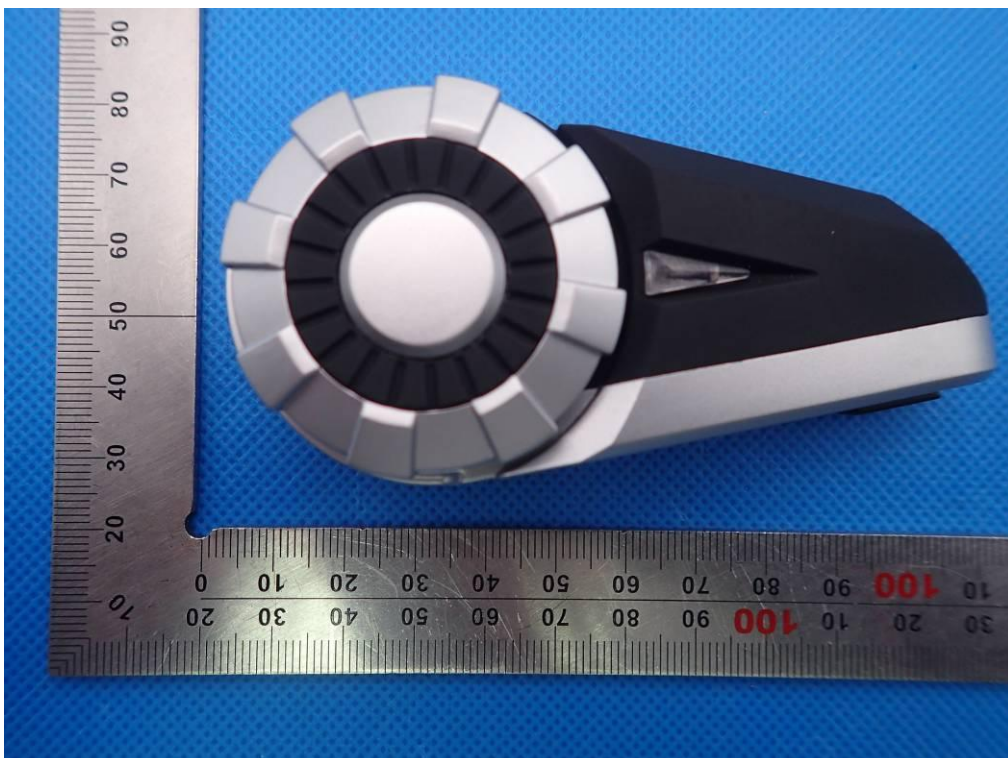


## APPENDIX B: PHOTOGRAPHS OF EUT

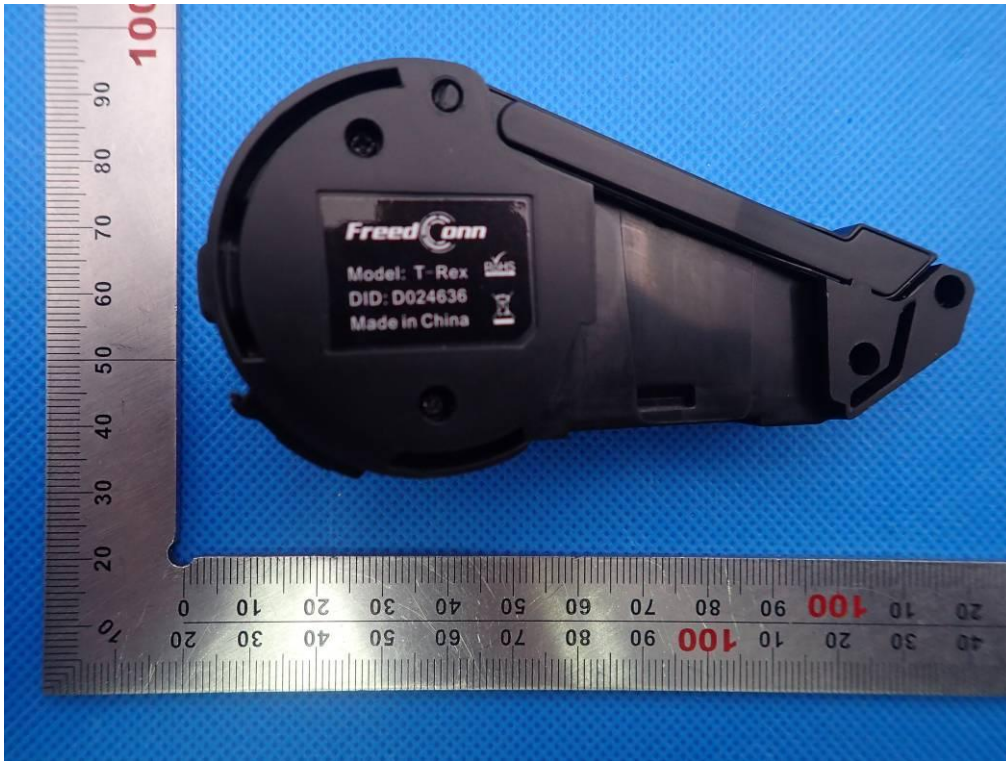
All VIEW OF EUT



TOP VIEW OF EUT



BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



BACK VIEW OF EUT



LEFT VIEW OF EUT



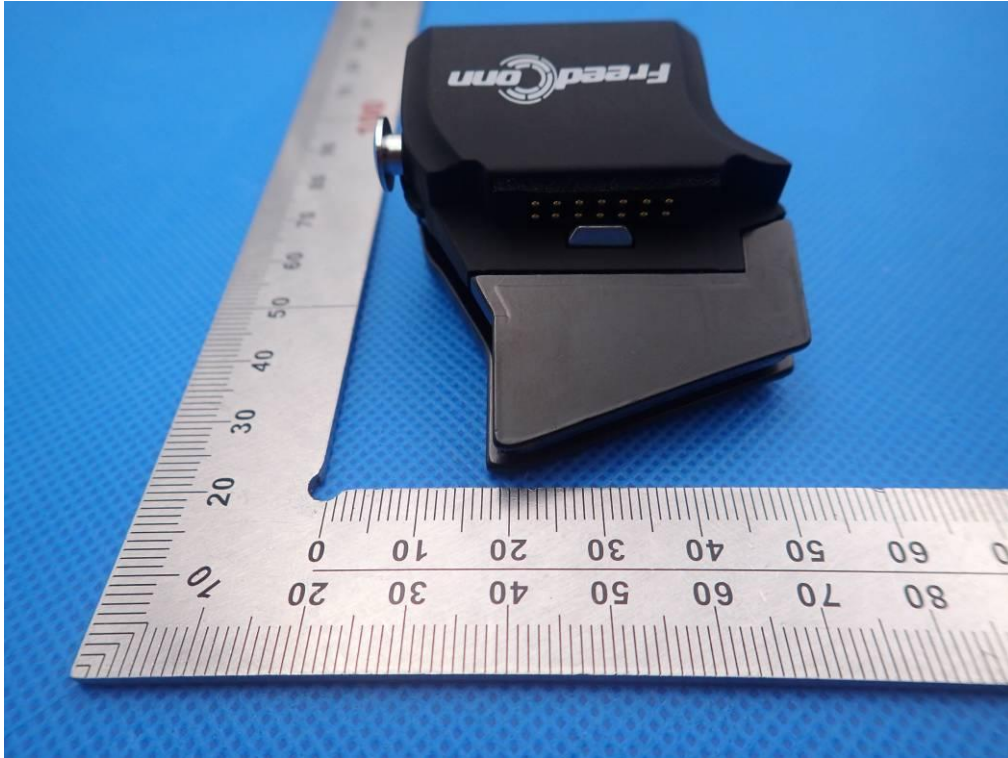
RIGHT VIEW OF EUT



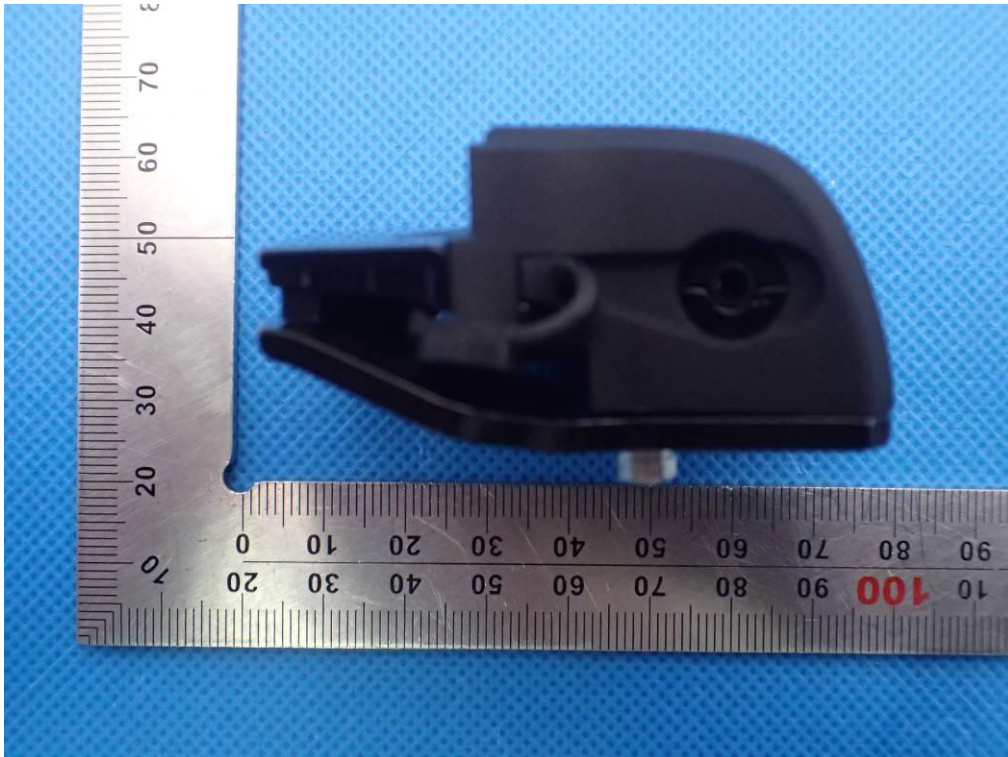
CONNECTOR VIEW OF EUT 1



CONNECTOR VIEW OF EUT 2



CONNECTOR VIEW OF EUT 3

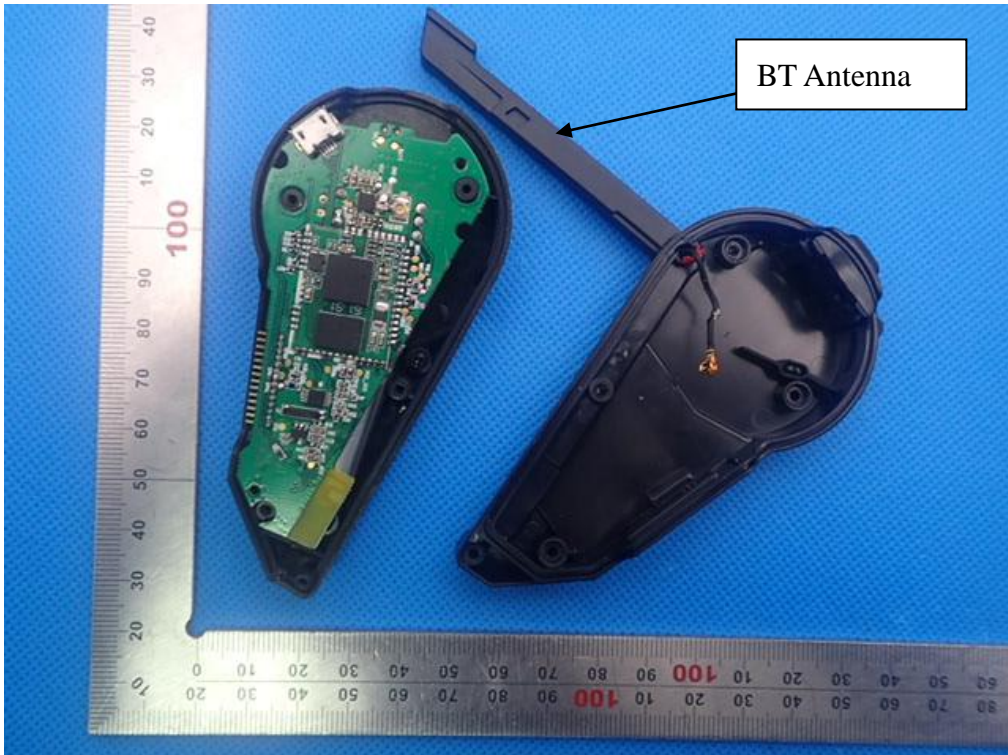




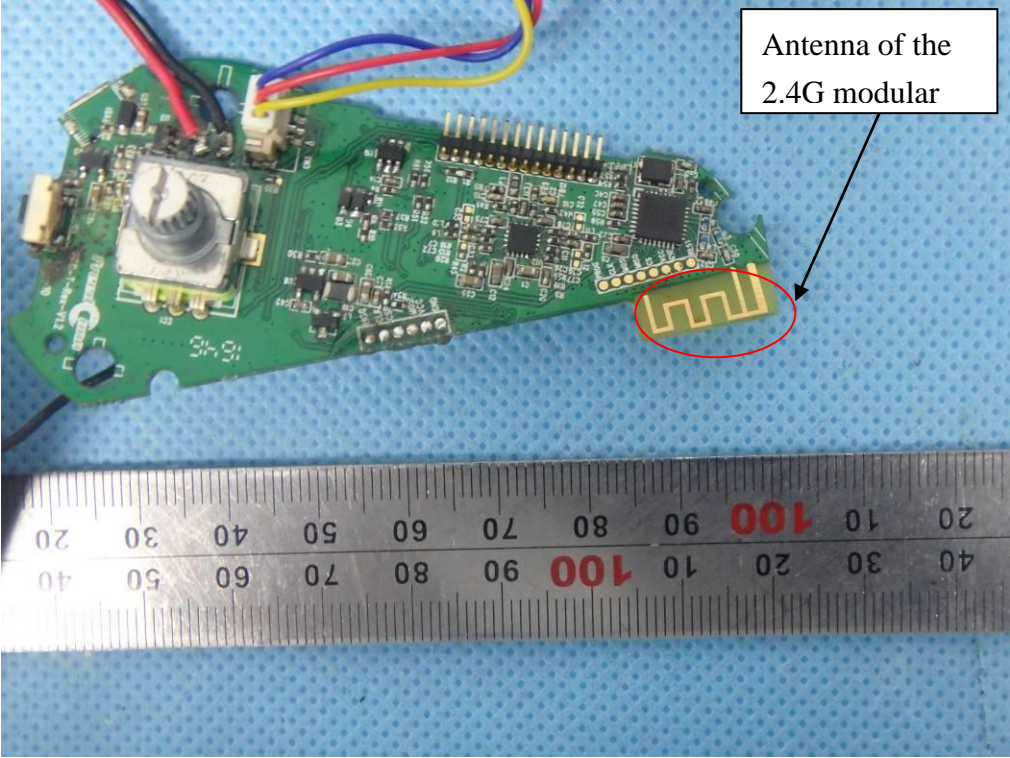
CONNECTOR VIEW OF EUT 4



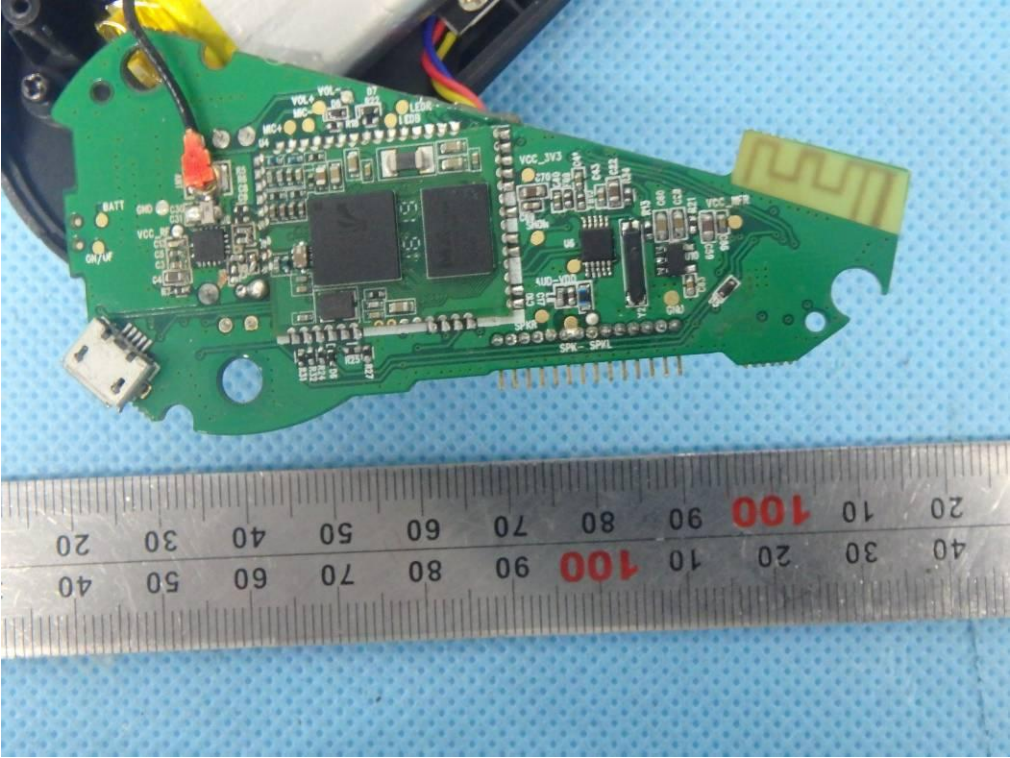
OPEN VIEW OF EUT



INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



----END OF REPORT----