

APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
BODYFRIEND CO., LTD.

Massage Chair

Model No.: HUGCHAIR-2000US, OGI-2210A-BF

FCC ID: 2ALS5-HUGCHAIR

Prepared for : BODYFRIEND CO., LTD.
Address : 163 Yangjaecheon-ro, Gangnam-gu, Seoul, South Korea.

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Report No. : ATE20190291
Date of Test : Mar. 19, 2019-Apr. 06, 2019
Date of Report : Apr. 08, 2019

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Test Report Certification

Applicant : BODYFRIEND CO., LTD.
Address : 163 Yangjaecheon-ro, Gangnam-gu, Seoul, South Korea.
Manufacturer 1 : XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.
Address : (5/F) NO.168, QIANPU ROAD SIMING DISTRICT, XIAMEN, CHINA
Manufacturer 2 : Xiamen Healthcare Electronic Co., Ltd.
Address : No.62-63, Siming Industry Zone, Tongan District, Xiamen City, 361100, China.
Product : Massage Chair
Model No. : HUGCHAIR-2000US, OGI-2210A-BF
Trade name : n.a

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013

The EUT was tested according to DTS test procedure of Aug. 24, 2018 KDB558074 D01 DTS Meas Guidance v05 for compliance to FCC 47CFR 15.247 requirements

The device described above is tested by SHENZHEN ACCURATE TECHNOLOGY CO., LTD. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and SHENZHEN ACCURATE TECHNOLOGY CO., LTD. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of SHENZHEN ACCURATE TECHNOLOGY CO., LTD.

Date of Test : _____ Mar. 19, 2019-Apr. 06, 2019
Date of Report: _____ Apr. 08, 2019

Prepared by : _____



Approved & Authorized Signer : _____
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Massage Chair

Model Number : HUGCHAIR-2000US, OGI-2210A-BF

Bluetooth version : BT V4.0

Frequency Range : 2402MHz-2480MHz

Number of Channels : 79

Antenna Gain : 0dBi

Antenna type : PCB Antenna

Power Supply : AC 110-120V/60Hz

Modulation mode : GFSK, $\pi/4$ DQPSK, 8DPSK

Applicant : BODYFRIEND CO., LTD.

Address : 163 Yangjaecheon-ro, Gangnam-gu, Seoul, South Korea.

Manufacturer 1 : XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.

Address : (5/F) NO.168, QIANPU ROAD SIMING DISTRICT, XIAMEN, CHINA

Manufacturer 2 : Xiamen Healthcare Electronic Co., Ltd.

Address : No.62-63, Siming Industry Zone, Tongan District, Xiamen City, 361100, China.

Date of sample received : Mar. 18, 2019

Date of Test : Mar. 19, 2019-Apr. 06, 2019

1.2. Model difference declaration

HUGCHAIR-2000US, OGI-2210A-BF are identical in interior structure, electrical circuits and components, and just model number is different for the marketing requirement.

1.3.Special Accessory and Auxiliary Equipment

PC

Manufacturer: LENOVO
M/N: 4290-RT8
S/N: R9-FW93G 11/08

1.4.Description of Test Facility

EMC Lab

: Recognition of accreditation by Federal Communications Commission (FCC)
The Designation Number is CN1189
The Registration Number is 708358

Listed by Innovation, Science and Economic Development Canada (ISED)
The Registration Number is 5077A-2

Accredited by China National Accreditation Service for Conformity Assessment (CNAS)
The Registration Number is CNAS L3193

Accredited by American Association for Laboratory Accreditation (A2LA)
The Certificate Number is 4297.01

Name of Firm

: Shenzhen Accurate Technology Co., Ltd.

Site Location

: 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.5.Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty = 3.08dB, k=2
(9kHz-30MHz)

Radiated emission expanded uncertainty = 4.42dB, k=2
(30MHz-1000MHz)

Radiated emission expanded uncertainty = 4.06dB, k=2
(Above 1GHz)

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan.05, 2019	1 Year
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan.05, 2019	1 Year
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan.05, 2019	1 Year
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan.05, 2019	1 Year
Pre-Amplifier	Rohde&Schwarz	CBLU118354 0-01	3791	Jan.05, 2019	1 Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan.05, 2019	1 Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan.05, 2019	1 Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan.05, 2019	1 Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan.05, 2019	1 Year
Open Switch and Control Unit	Rohde&Schwarz	OSP120 + OSP-B157	101244 + 100866	Jan.05, 2019	1 Year
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan.05, 2019	1 Year
LISN	Schwarzbeck	NSLK8126	8126431	Jan.05, 2019	1 Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18 G-10SS	N/A	Jan.05, 2019	1 Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2 485-2375/2510 -60/11SS	N/A	Jan.05, 2019	1 Year
RF Coaxial Cable (Conducted Emission)	SUHNER	N-2m	No.2	Jan.05, 2019	1 Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-5m	NO.3	Jan.05, 2019	1 Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-5m	NO.4	Jan.05, 2019	1 Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-1m	NO.5	Jan.05, 2019	1 Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-1m	NO.6	Jan.05, 2019	1 Year
Conducted Emission Measurement Software: ES-K1 V1.71					
Radiated Emission Measurement Software: EZ EMC V1.1.4.2					

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: Transmitting mode

Low Channel: 2402MHz

Middle Channel: 2441MHz

High Channel: 2480MHz

Hopping

3.2.Configuration and peripherals

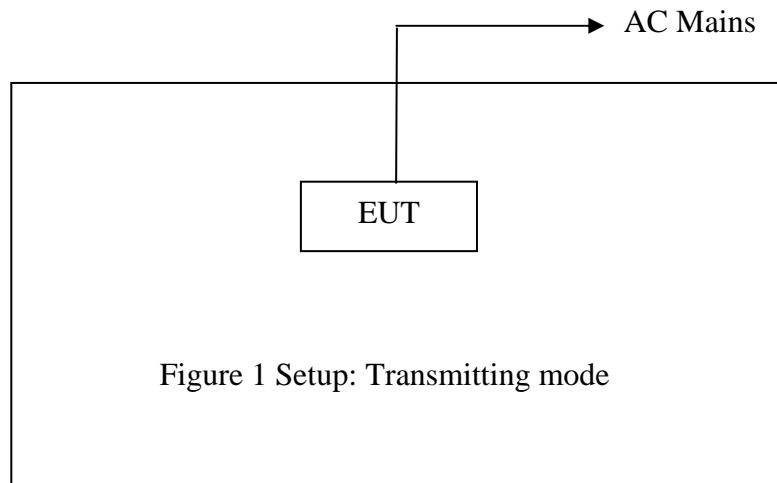


Figure 1 Setup: Transmitting mode

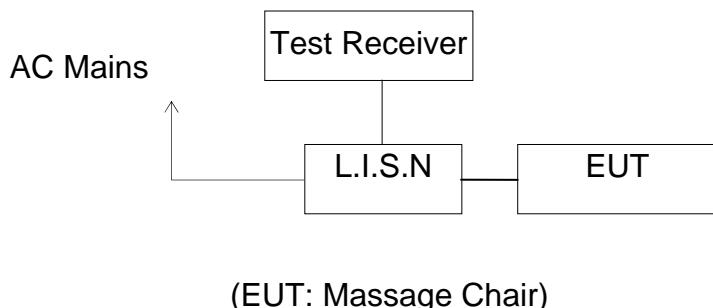
Note: The power was switched from 85% to 115%, and the worse case data was recorded.

4. TEST PROCEDURES AND RESULTS

FCC&IC Rules	Description of Test	Result
Section 15.207	AC Power Line Conducted Emission Test	Compliant
Section 15.247(a)(1)	20dB Bandwidth Test	Compliant
Section 15.247(a)(1)	Carrier Frequency Separation Test	Compliant
Section 15.247(a)(1)(iii)	Number Of Hopping Frequency Test	Compliant
Section 15.247(a)(1)(iii)	Dwell Time Test	Compliant
Section 15.247(b)(1)	Maximum Peak Output Power Test	Compliant
Section 15.247(d) Section 15.209	Radiated Emission Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.247(d)	Conducted Spurious Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

5. POWER LINE CONDUCTED MEASUREMENT

5.1. Block Diagram of Test Setup



5.2. Power Line Conducted Emission Measurement Limits

Frequency (MHz)	Limit dB(μ V)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0

NOTE1: The lower limit shall apply at the transition frequencies.
NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

5.3. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

5.4. Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in test mode and measure it.

5.5.Test Procedure

The EUT is put on the plane 0.1 m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

5.6.DATA SAMPLE

Frequency (MHz)	Quasi Peak Level (dB μ V)	Average Level (dB μ V)	Transducer value (dB)	QuasiPeak Result (dB μ V)	Average Result (dB μ V)	Quasi Peak Limit (dB μ V)	Average Limit (dB μ V)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XX	29.4	18.3	11.1	40.5	29.4	56.0	56.0	15.5	16.6	Pass

Transducer value = Insertion loss of LISN + Cable Loss

Result = Quasi-peak Level/Average Level + Transducer value

Limit = Limit stated in standard

Calculation Formula:

Margin = Limit – Reading level value – Transducer value

5.7.Power Line Conducted Emission Measurement Results

PASS.

The frequency range from 150kHz to 30MHz is checked.

Test mode : BT Operation(worse case)							
Test Voltage: 120V/60Hz							
MEASUREMENT RESULT: "F-0290-4_fin"							
2019-3-25 17:31							
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.168000	54.00	10.8	65	11.1	QP	N	GND
0.510000	42.40	11.0	56	13.6	QP	N	GND
1.000500	28.30	11.1	56	27.7	QP	N	GND
4.749000	31.50	11.4	56	24.5	QP	N	GND
5.725500	32.10	11.5	60	27.9	QP	N	GND
14.298000	33.00	11.6	60	27.0	QP	N	GND
MEASUREMENT RESULT: "F-0290-4_fin2"							
2019-3-25 17:31							
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.163500	35.50	10.8	55	19.8	AV	N	GND
0.510000	32.90	11.0	46	13.1	AV	N	GND
1.014000	20.90	11.1	46	25.1	AV	N	GND
4.839000	25.60	11.4	46	20.4	AV	N	GND
5.725500	26.30	11.5	50	23.7	AV	N	GND
14.361000	26.90	11.6	50	23.1	AV	N	GND
MEASUREMENT RESULT: "F-0290-3_fin"							
2019-3-25 17:25							
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.159000	56.60	10.8	66	8.9	QP	L1	GND
0.492000	42.70	11.0	56	13.4	QP	L1	GND
1.315500	30.30	11.2	56	25.7	QP	L1	GND
3.489000	31.10	11.4	56	24.9	QP	L1	GND
8.583000	36.70	11.5	60	23.3	QP	L1	GND
14.032500	36.00	11.6	60	24.0	QP	L1	GND
MEASUREMENT RESULT: "F-0290-3_fin2"							
2019-3-25 17:25							
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	41.60	10.8	56	14.4	AV	L1	GND
0.496500	36.60	11.0	46	9.5	AV	L1	GND
1.378500	22.60	11.2	46	23.4	AV	L1	GND
3.475500	24.60	11.4	46	21.4	AV	L1	GND
8.790000	31.70	11.5	50	18.3	AV	L1	GND
14.352000	30.50	11.6	50	19.5	AV	L1	GND

Emissions attenuated more than 20 dB below the permissible value are not reported.

The spectral diagrams are attached as below.

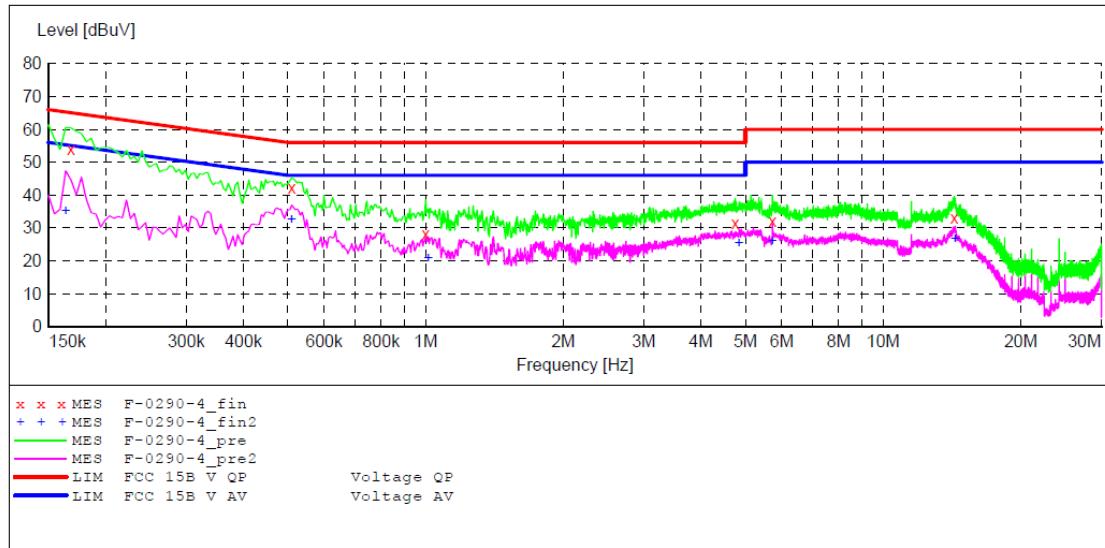
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 15B

EUT: Massage Chair M/N:HUGCHAIR-2000US
 Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD
 Operating Condition: BT OPERATION
 Test Site: 1#Shielding Room
 Operator: Frank
 Test Specification: N 120V/60Hz
 Comment: Report NO.:ATE20190292
 Start of Test: 2019-3-25 / 17:28:19

SCAN TABLE: "V 150K-30MHz fin"

Short Description:		SUB STD VTERM2 1.70				
Start Frequency	Stop Frequency	Step Width	Detector	Meas.	IF Time	Transducer
150.0 kHz	30.0 MHz	4.5 kHz	QuasiPeak	1.0 s	9 kHz	NSLK8126 2008
Average						

**MEASUREMENT RESULT: "F-0290-4_fin"**

2019-3-25 17:31

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.168000	54.00	10.8	65	11.1	QP	N	GND
0.510000	42.40	11.0	56	13.6	QP	N	GND
1.000500	28.30	11.1	56	27.7	QP	N	GND
4.749000	31.50	11.4	56	24.5	QP	N	GND
5.725500	32.10	11.5	60	27.9	QP	N	GND
14.298000	33.00	11.6	60	27.0	QP	N	GND

MEASUREMENT RESULT: "F-0290-4_fin2"

2019-3-25 17:31

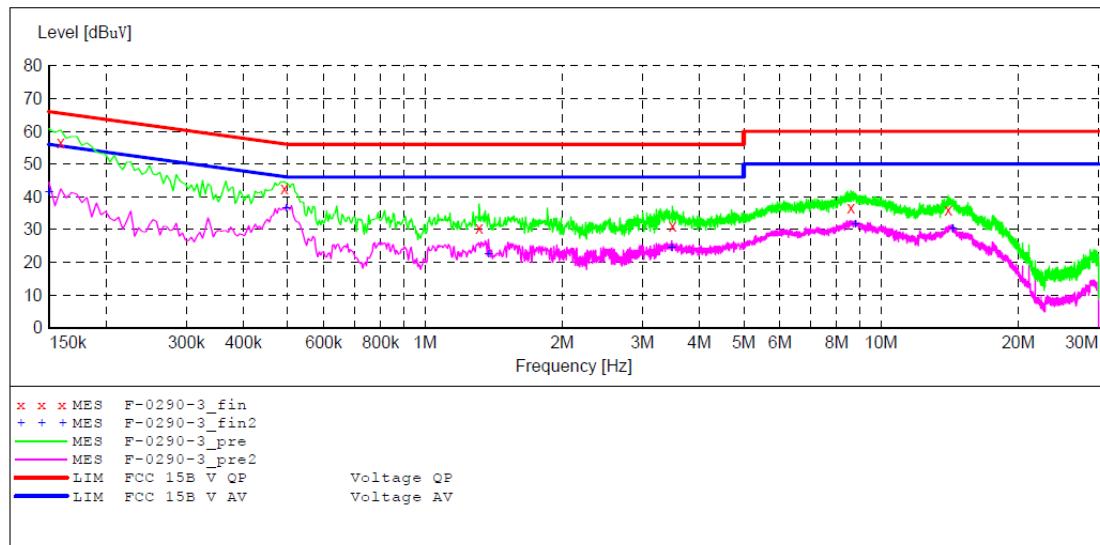
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.163500	35.50	10.8	55	19.8	AV	N	GND
0.510000	32.90	11.0	46	13.1	AV	N	GND
1.014000	20.90	11.1	46	25.1	AV	N	GND
4.839000	25.60	11.4	46	20.4	AV	N	GND
5.725500	26.30	11.5	50	23.7	AV	N	GND
14.361000	26.90	11.6	50	23.1	AV	N	GND

ACCURATE TECHNOLOGY CO., LTD**CONDUCTED EMISSION STANDARD FCC PART 15B**

EUT: Massage Chair M/N:HUGCHAIR-2000US
 Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO.,LTD
 Operating Condition: BT OPERATION
 Test Site: 1#Shielding Room
 Operator: Frank
 Test Specification: L 120V/60Hz
 Comment: Report NO.:ATE20190292
 Start of Test: 2019-3-25 / 17:23:43

SCAN TABLE: "V 150K-30MHz fin"

Short Description: SUB STD VTERM2 1.70
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 150.0 kHz 30.0 MHz 4.5 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008
 Average

**MEASUREMENT RESULT: "F-0290-3_fin"**

2019-3-25 17:25

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.159000	56.60	10.8	66	8.9	QP	L1	GND
0.492000	42.70	11.0	56	13.4	QP	L1	GND
1.315500	30.30	11.2	56	25.7	QP	L1	GND
3.489000	31.10	11.4	56	24.9	QP	L1	GND
8.583000	36.70	11.5	60	23.3	QP	L1	GND
14.032500	36.00	11.6	60	24.0	QP	L1	GND

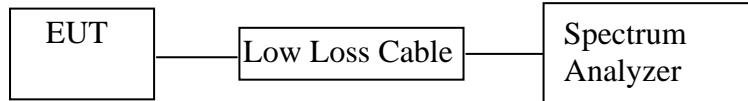
MEASUREMENT RESULT: "F-0290-3_fin2"

2019-3-25 17:25

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	41.60	10.8	56	14.4	AV	L1	GND
0.496500	36.60	11.0	46	9.5	AV	L1	GND
1.378500	22.60	11.2	46	23.4	AV	L1	GND
3.475500	24.60	11.4	46	21.4	AV	L1	GND
8.790000	31.70	11.5	50	18.3	AV	L1	GND
14.352000	30.50	11.6	50	19.5	AV	L1	GND

6. 20DB BANDWIDTH TEST

6.1. Block Diagram of Test Setup



(EUT: Massage Chair)

6.2. The Requirement For Section 15.247(a)(1)

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

6.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. Operating Condition of EUT

6.4.1. Setup the EUT and simulator as shown as Section 6.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

6.5. Test Procedure

6.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

6.5.2. The RBW should be 1%~5% of OBW.

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

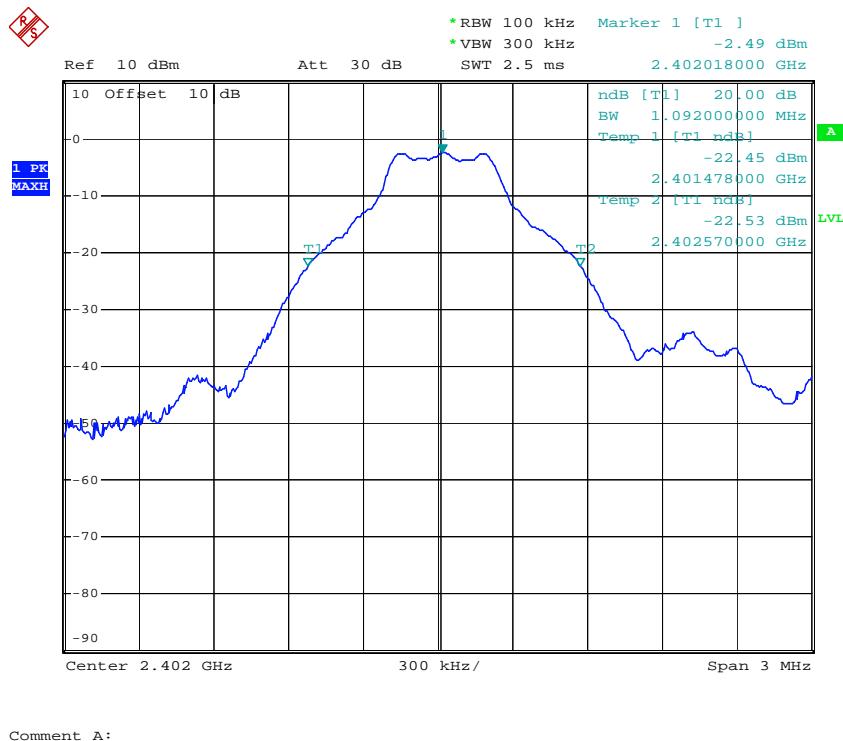
6.6. Test Result

Channel	Frequency (MHz)	GFSK mode 20dB Bandwidth (MHz)	$\pi/4$ DQPSK mode 20dB Bandwidth (MHz)	8DPSK mode 20dB Bandwidth (MHz)	Result
Low	2402	1.092	1.350	1.332	Pass
Middle	2441	1.098	1.356	1.344	Pass
High	2480	1.092	1.356	1.344	Pass

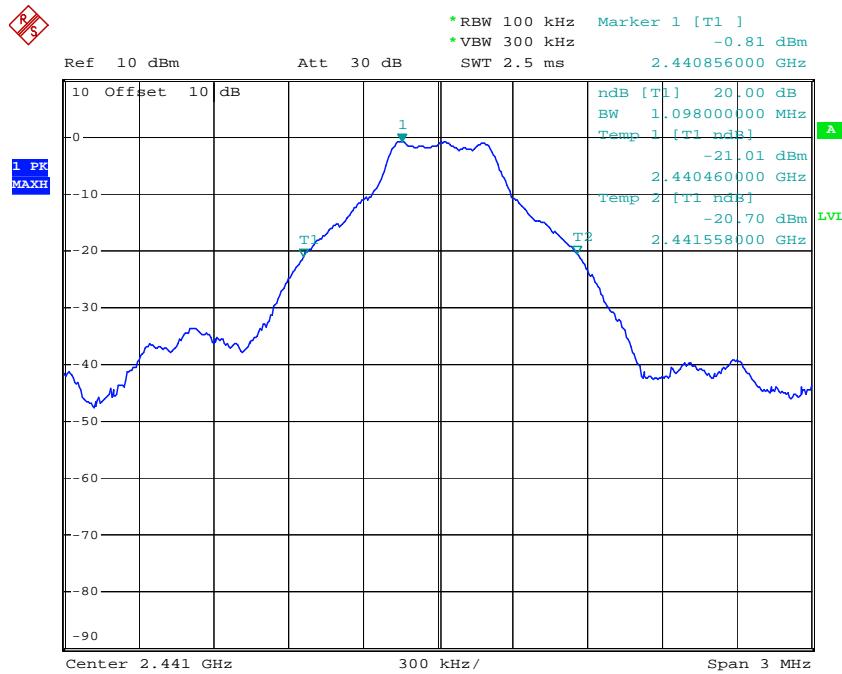
The spectrum analyzer plots are attached as below.

GFSK Mode

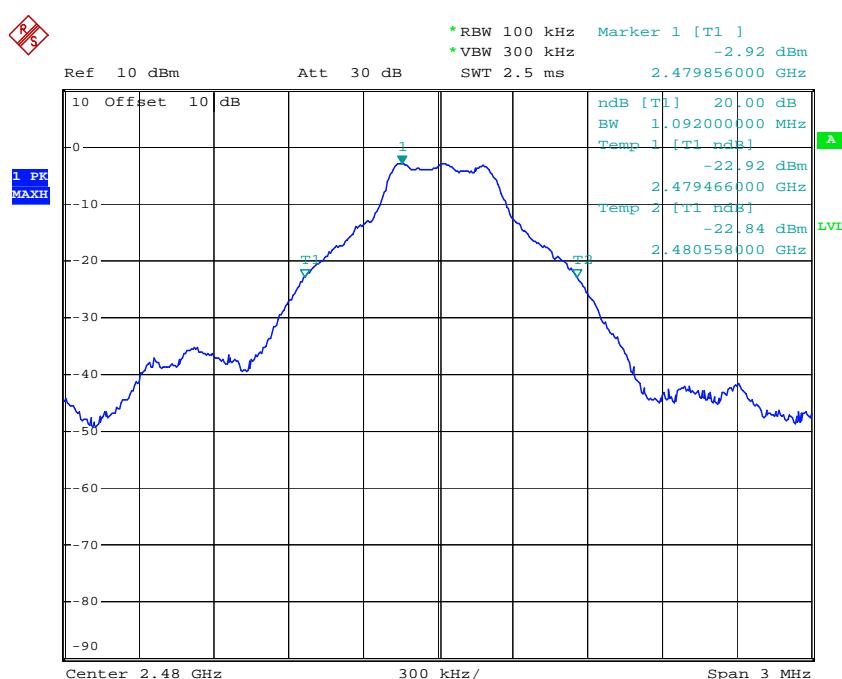
Low channel



Middle channel

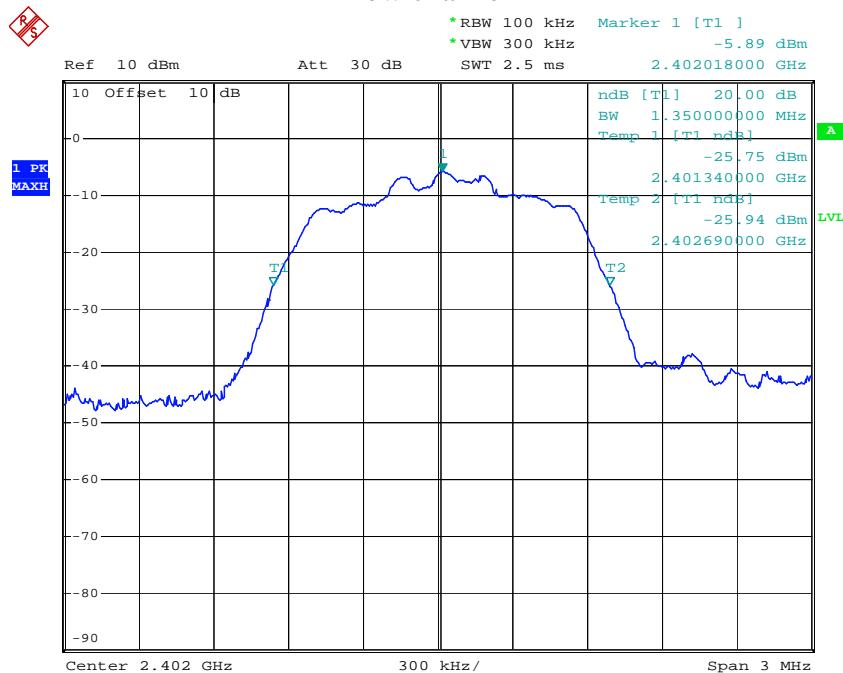


High channel



$\pi/4$ DQPSK Mode

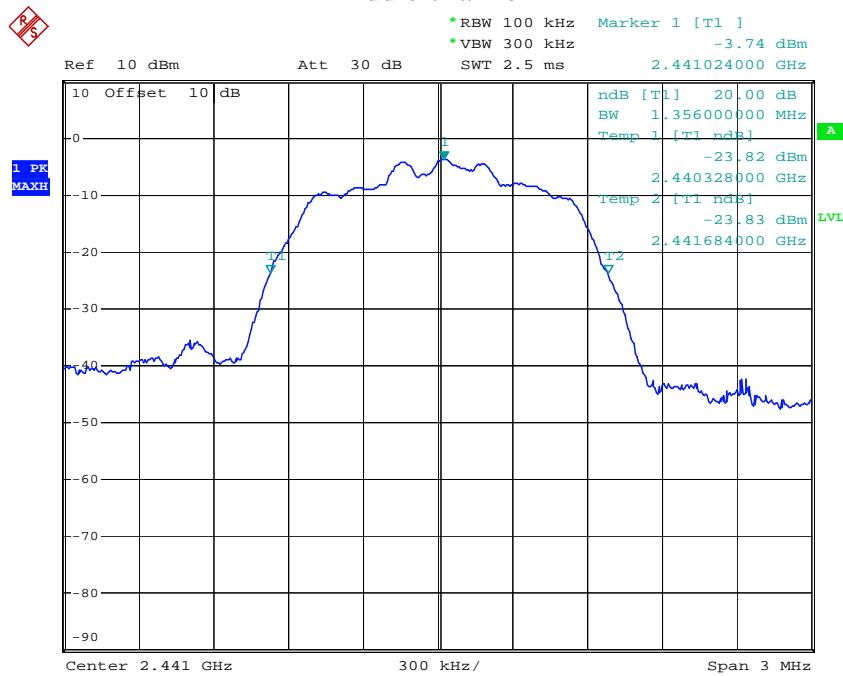
Low channel



Comment A:

Date: 27.MAR.2019 10:24:28

Middle channel



Comment A:

Date: 27.MAR.2019 10:23:22

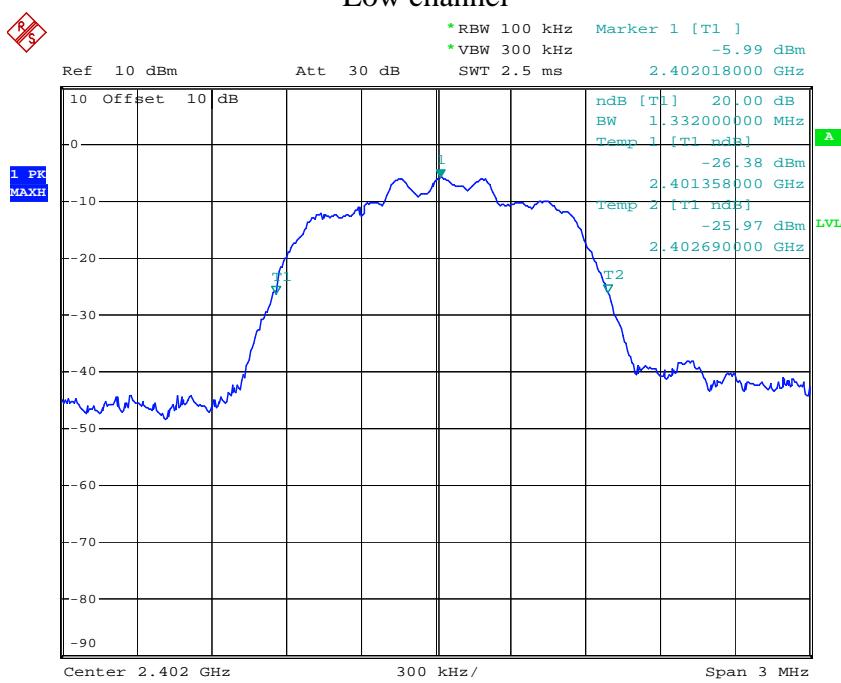
High channel



Comment A:
 Date: 27.MAR.2019 10:22:14

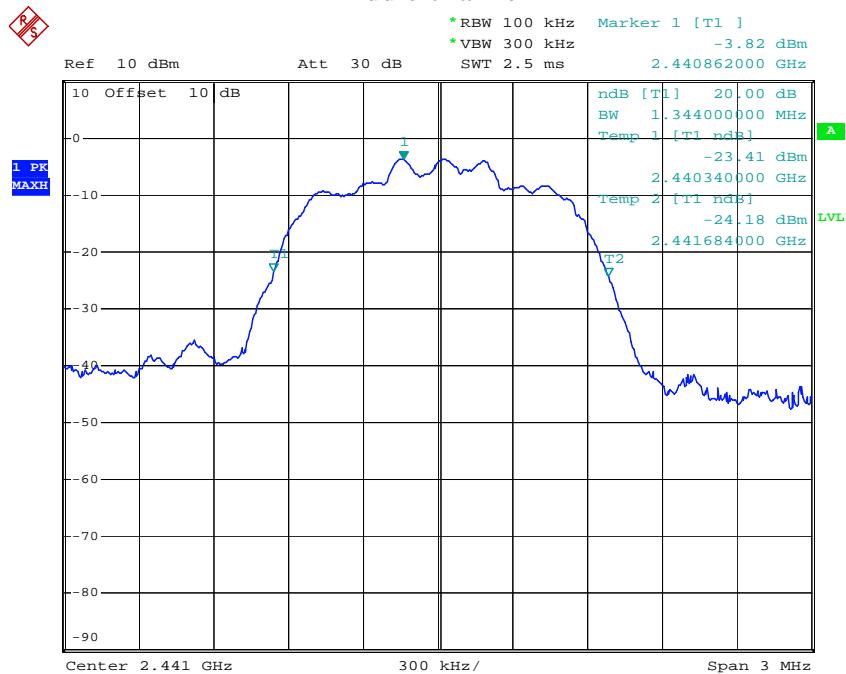
8DPSK Mode

Low channel



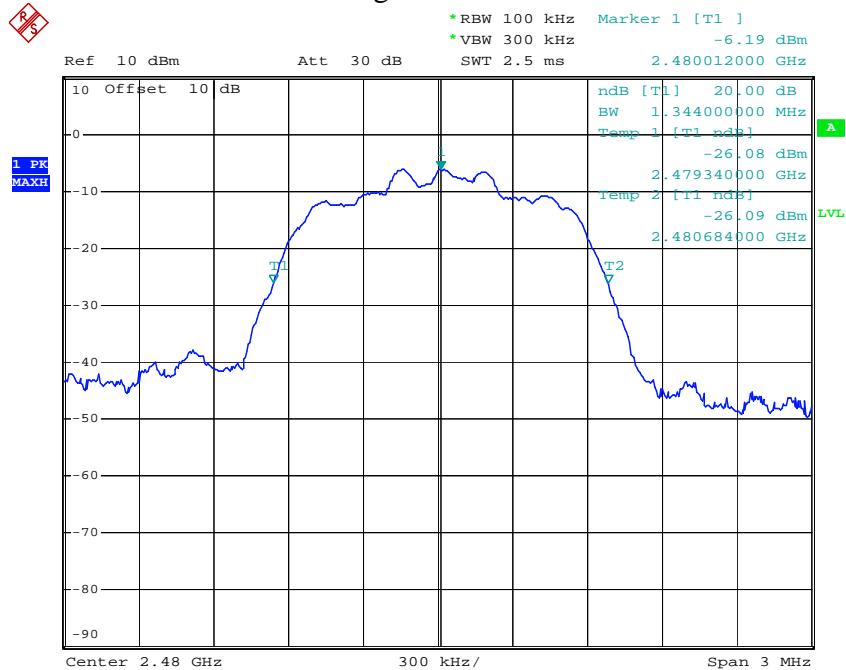
Comment A:
 Date: 27.MAR.2019 10:26:03

Middle channel



Comment A:
 Date: 27.MAR.2019 10:27:02

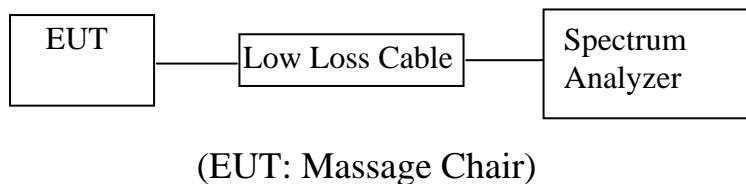
High channel



Comment A:
 Date: 27.MAR.2019 10:28:11

7. CARRIER FREQUENCY SEPARATION TEST

7.1. Block Diagram of Test Setup



7.2. The Requirement For Section 15.247(a)(1)

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

7.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

7.4.1. Setup the EUT and simulator as shown as Section 7.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

7.5. Test Procedure

- 7.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.
- 7.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz. Adjust Span to 3MHz.
- 7.5.3. Set the adjacent channel of the EUT Maxhold another trace.
- 7.5.4. Measurement the channel separation

7.6. Test Result

GFSK mode

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit	Result
Low	2402	1.002	25KHz or 0.784 MHz	PASS
	2403			
Middle	2440	0.996	25KHz or 0.772 MHz	PASS
	2441			
High	2479	1.002	25KHz or 0.788 MHz	PASS
	2480			

$\pi/4$ DQPSK mode

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit	Result
Low	2402	1.008	25KHz or 0.892 MHz	PASS
	2403			
Middle	2440	1.002	25KHz or 0.904 MHz	PASS
	2441			
High	2479	1.002	25KHz or 0.884 MHz	PASS
	2480			

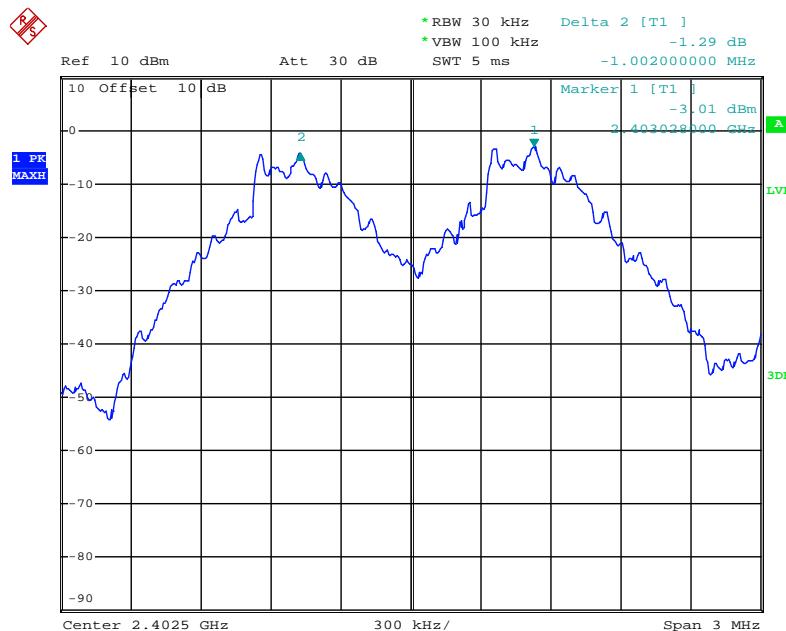
8DPSK mode

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit	Result
Low	2402	1.008	25KHz or 0.928 MHz	PASS
	2403			
Middle	2440	1.002	25KHz or 0.920 MHz	PASS
	2441			
High	2479	0.996	25KHz or 0.936 MHz	PASS
	2480			

The spectrum analyzer plots are attached as below.

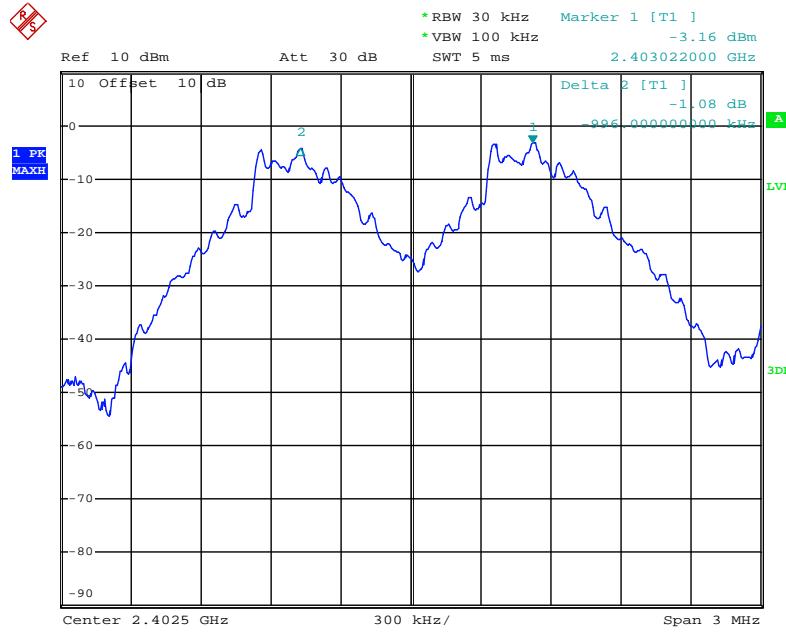
GFSK Mode

Low channel



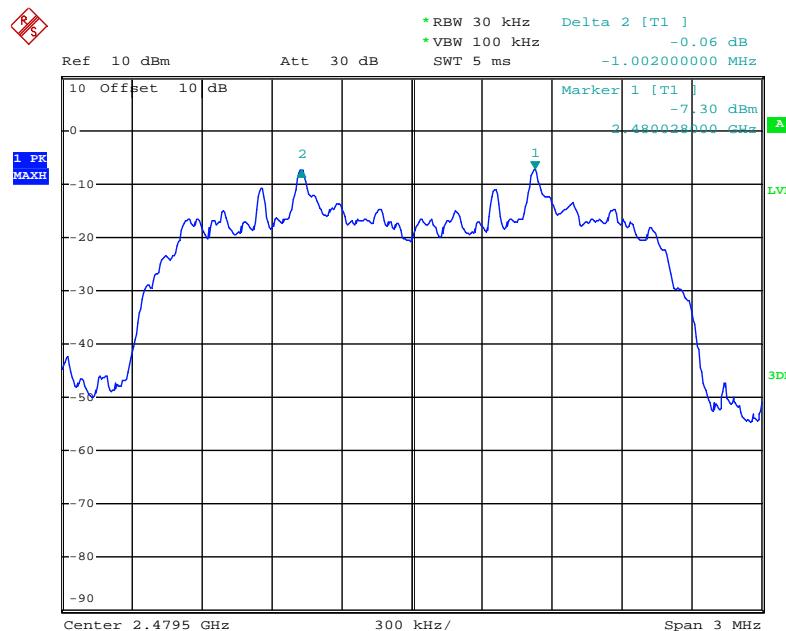
Date: 28.MAR.2019 09:13:56

Middle channel



Date: 28.MAR.2019 09:13:18

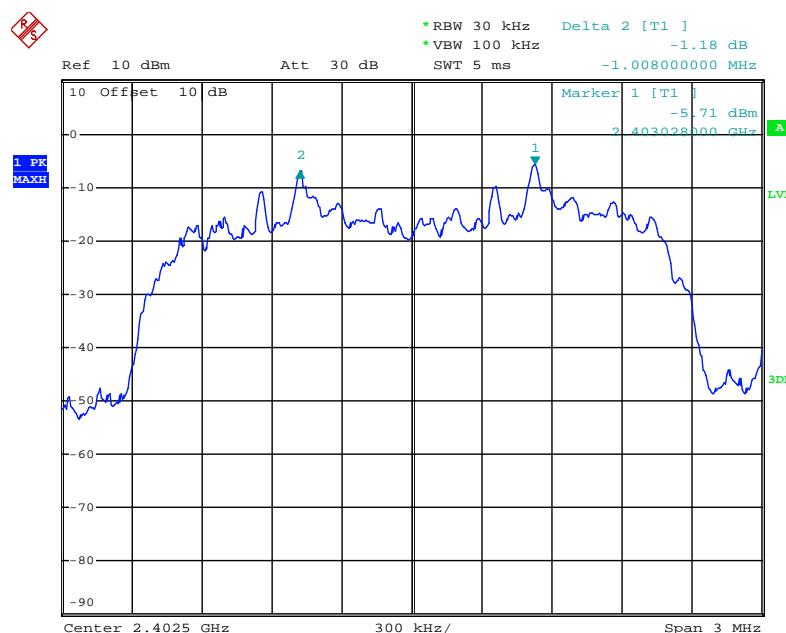
High channel



Date: 28.MAR.2019 09:16:38

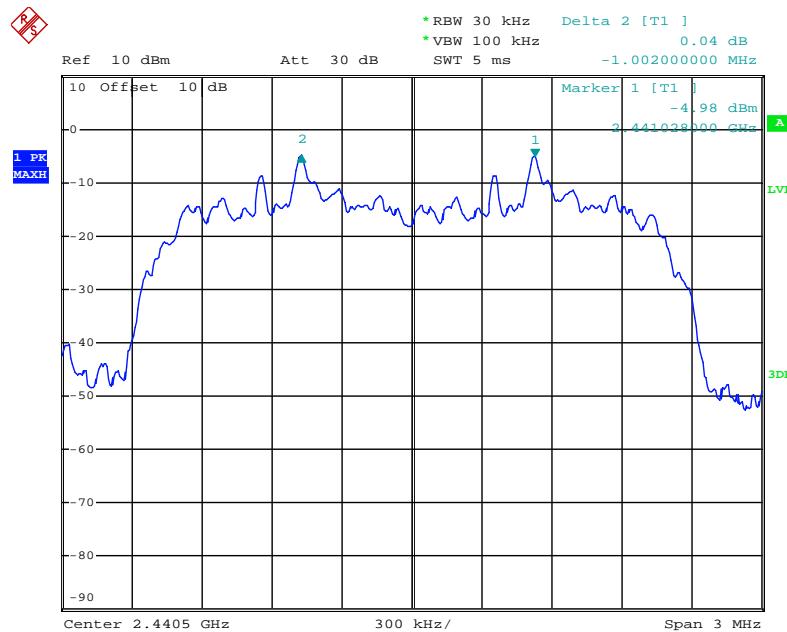
 $\pi/4$ DQPSK Mode

Low channel



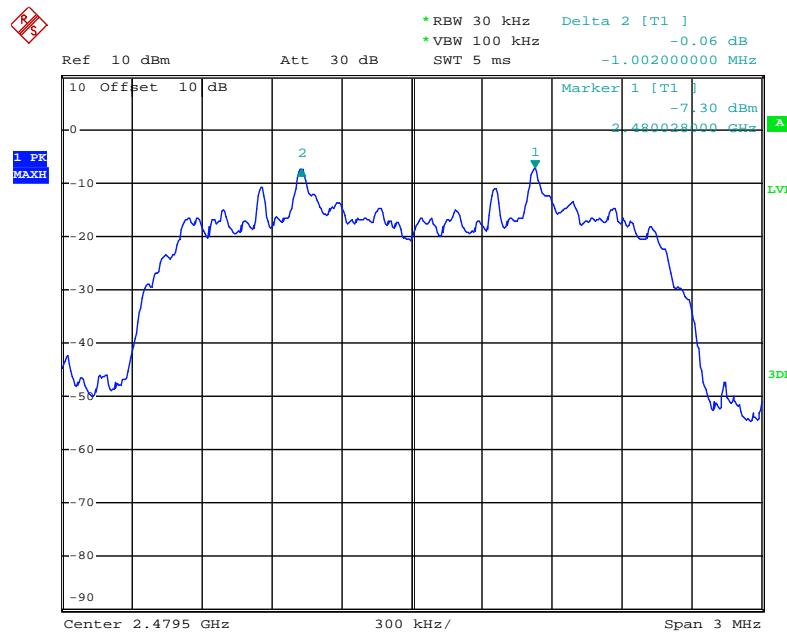
Date: 28.MAR.2019 09:18:34

Middle channel



Date: 28.MAR.2019 09:17:42

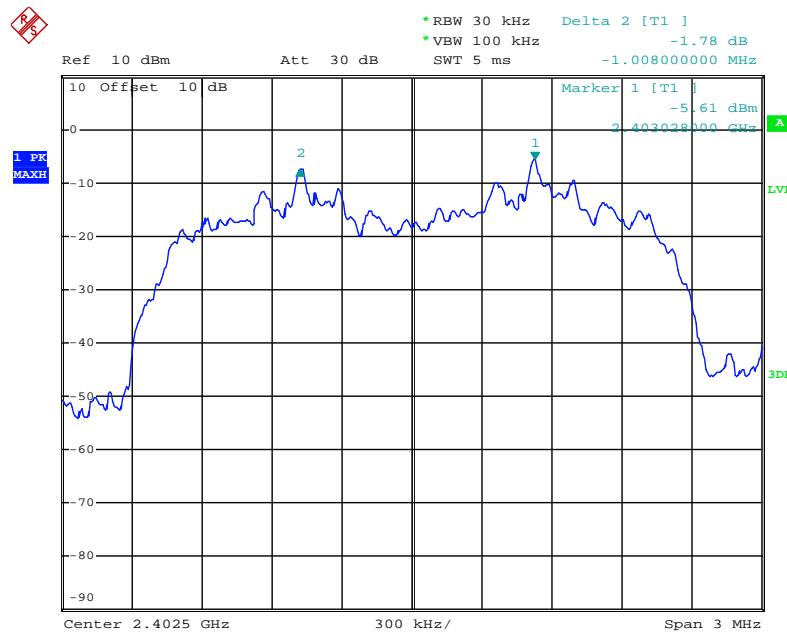
High channel



Date: 28.MAR.2019 09:16:38

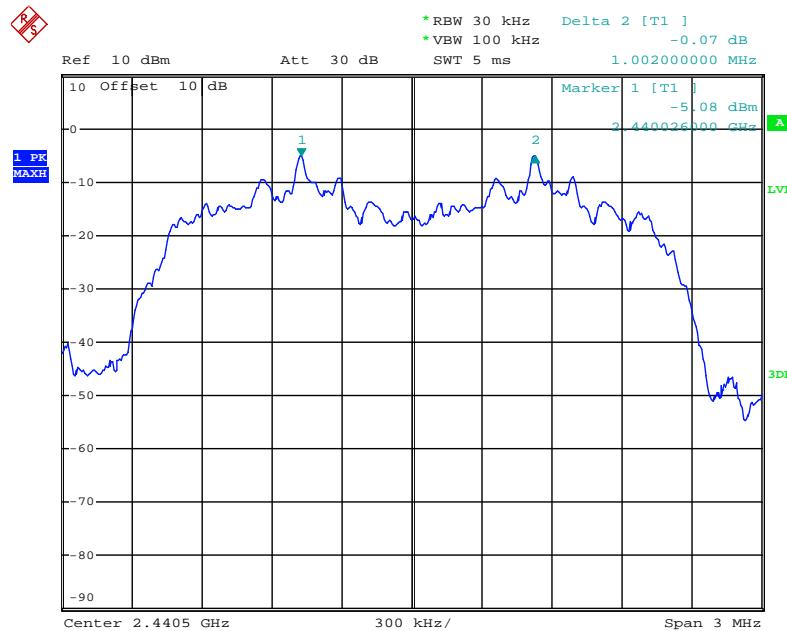
8DPSK Mode

Low channel



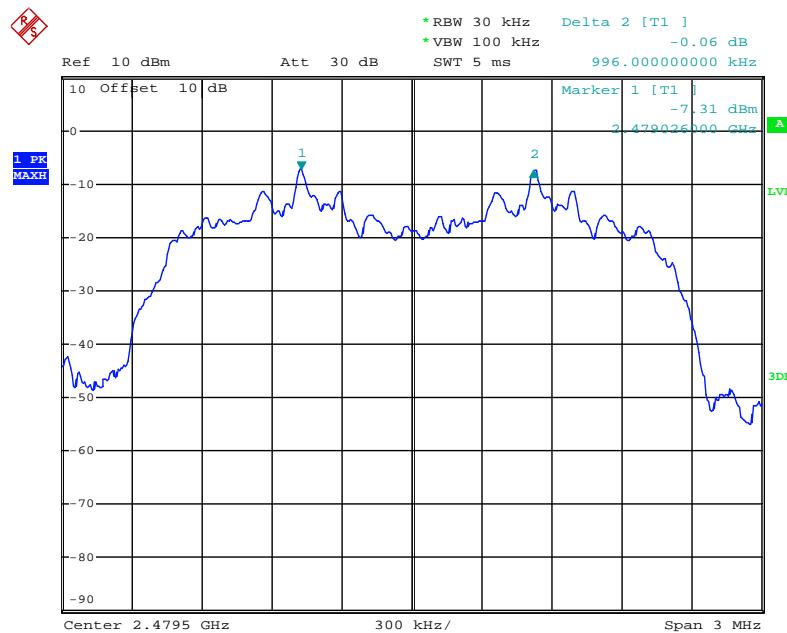
Date: 28.MAR.2019 09:20:19

Middle channel



Date: 28.MAR.2019 09:21:17

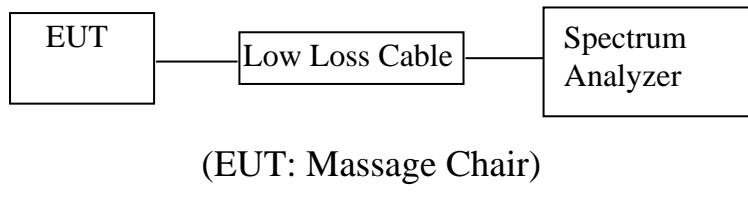
High channel



Date: 28.MAR.2019 09:22:24

8. NUMBER OF HOPPING FREQUENCY TEST

8.1. Block Diagram of Test Setup



8.2. The Requirement For Section 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

8.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4. Operating Condition of EUT

8.4.1. Setup the EUT and simulator as shown as Section 8.1.

8.4.2. Turn on the power of all equipment.

8.4.3. Let the EUT work in TX (Hopping on) modes measure it.

8.5. Test Procedure

8.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

8.5.2. Set the spectrum analyzer as Span=90MHz, RBW=100 kHz, VBW=300 kHz.

8.5.3. Max hold, view and count how many channel in the band.

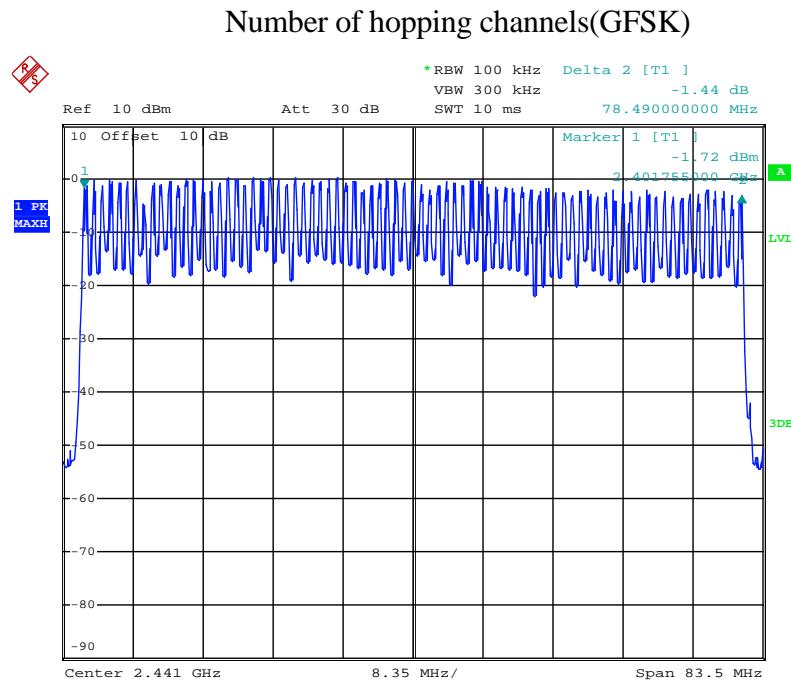
8.6. Test Result

Total number of hopping channel (GFSK mode)	Measurement result(CH)	Limit(CH)
	79	≥ 15

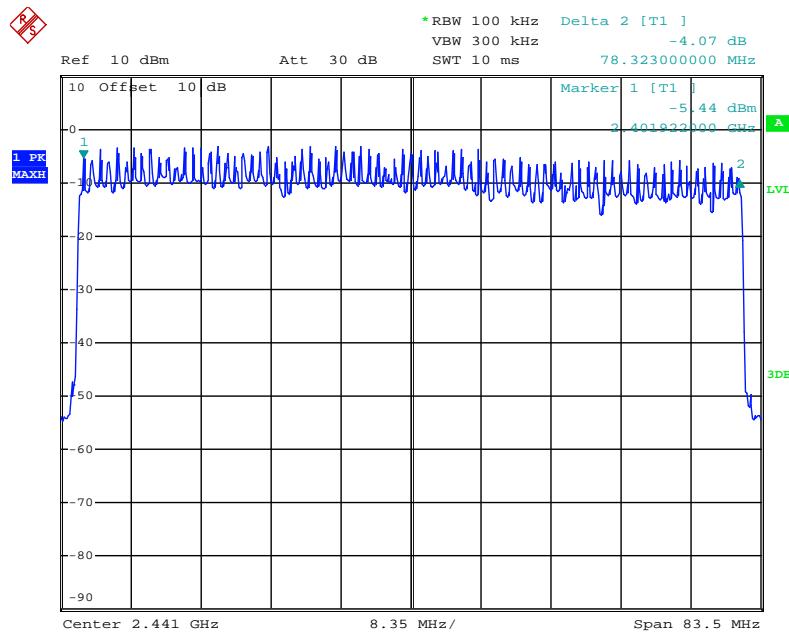
Total number of hopping channel ($\pi/4$ DQPSK mode)	Measurement result(CH)	Limit(CH)
	79	≥ 15

Total number of hopping channel (8DPSK mode)	Measurement result(CH)	Limit(CH)
	79	≥ 15

The spectrum analyzer plots are attached as below.

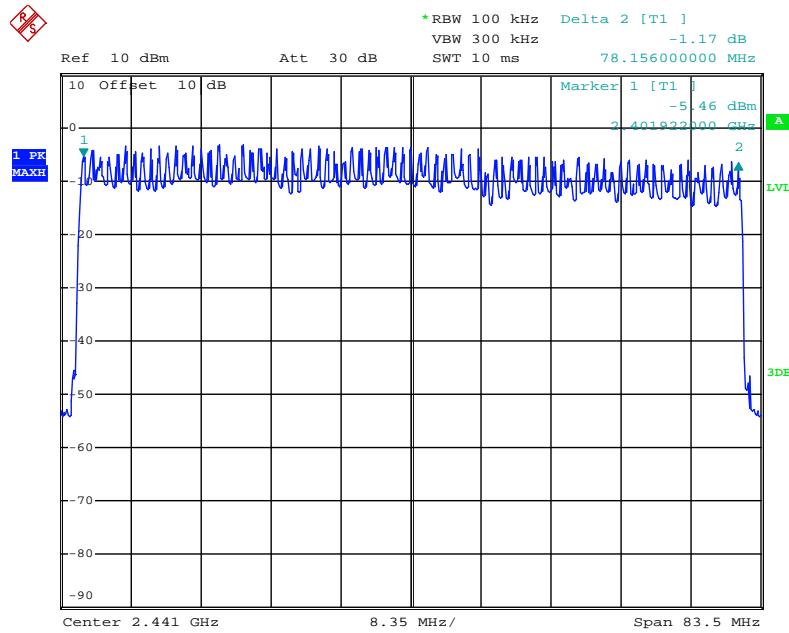


Date: 27.MAR.2019 13:48:38

Number of hopping channels($\pi/4$ DQPSK)

Date: 27.MAR.2019 13:53:09

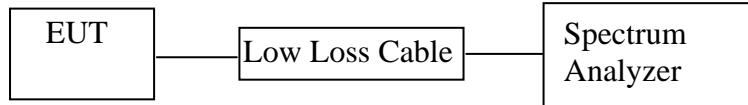
Number of hopping channels(8DPSK)



Date: 27.MAR.2019 13:55:04

9. DWELL TIME TEST

9.1. Block Diagram of Test Setup



(EUT: Massage Chair)

9.2. The Requirement For Section 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

9.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4. Operating Condition of EUT

9.4.1. Setup the EUT and simulator as shown as Section 9.1.

9.4.2. Turn on the power of all equipment.

9.4.3. Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

9.5. Test Procedure

9.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

9.5.2. Set center frequency of spectrum analyzer = operating frequency.

9.5.3. Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz, Adjust Sweep=5ms, 10ms, 15ms. Get the pulse time.

9.5.4. Repeat above procedures until all frequency measured were complete.

9.6. Test Result

GFSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2402	0.430	137.60	400
	2441	0.430	137.60	400
	2480	0.430	137.60	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2*79)) \times 31.6$				
DH3	2402	1.710	273.60	400
	2441	1.690	270.40	400
	2480	1.710	273.60	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4*79)) \times 31.6$				
DH5	2402	2.980	317.87	400
	2441	2.980	317.87	400
	2480	2.960	315.73	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6*79)) \times 31.6$				

$\pi/4$ DQPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
2DH1	2402	0.440	140.80	400
	2441	0.450	144.00	400
	2480	0.450	144.00	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2*79)) \times 31.6$				
2DH3	2402	1.730	276.80	400
	2441	1.730	276.80	400
	2480	1.730	276.80	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4*79)) \times 31.6$				
2DH5	2402	3.020	322.13	400
	2441	2.990	318.93	400
	2480	3.000	320.00	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6*79)) \times 31.6$				

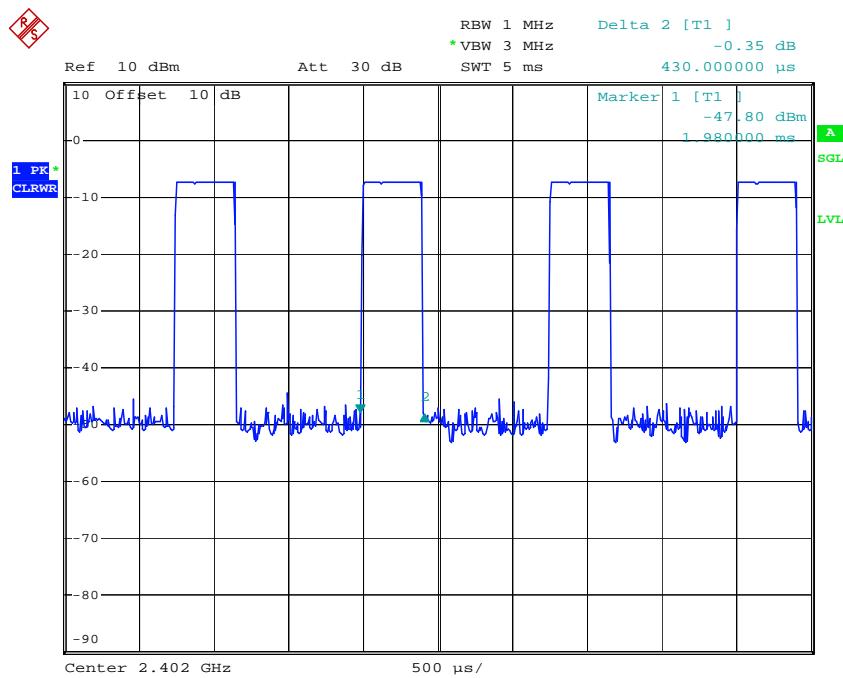
8DPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
3DH1	2402	0.440	140.80	400
	2441	0.450	144.00	400
	2480	0.450	144.00	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2*79)) \times 31.6$				
3DH3	2402	1.710	273.60	400
	2441	1.670	267.20	400
	2480	1.720	275.20	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4*79)) \times 31.6$				
3DH5	2402	3.000	320.00	400
	2441	2.950	314.67	400
	2480	2.990	318.93	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6*79)) \times 31.6$				

The spectrum analyzer plots are attached as below.

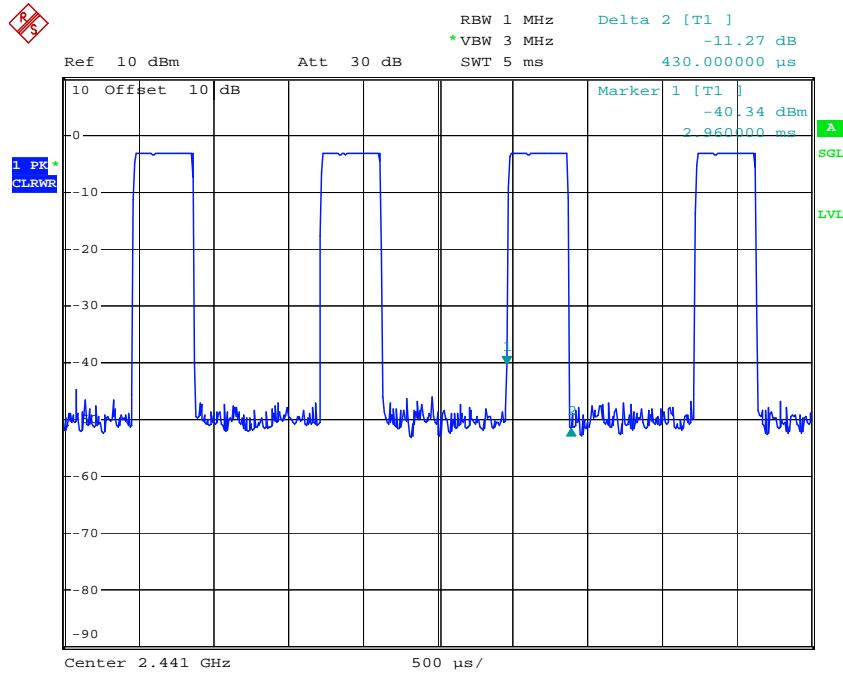
GFSK Mode

DH1 Low channel



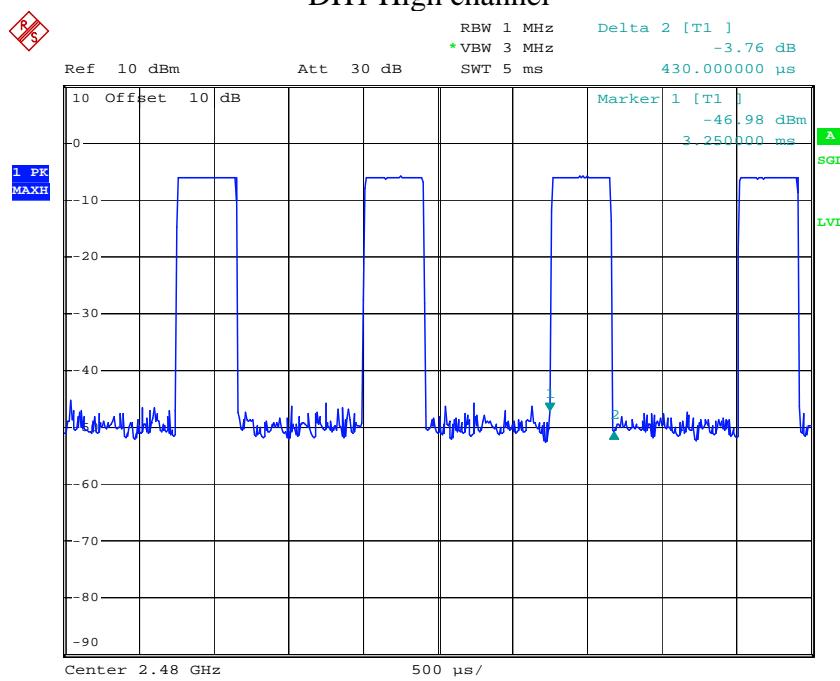
Comment A:
Date: 27.MAR.2019 16:36:56

DH1 Middle channel

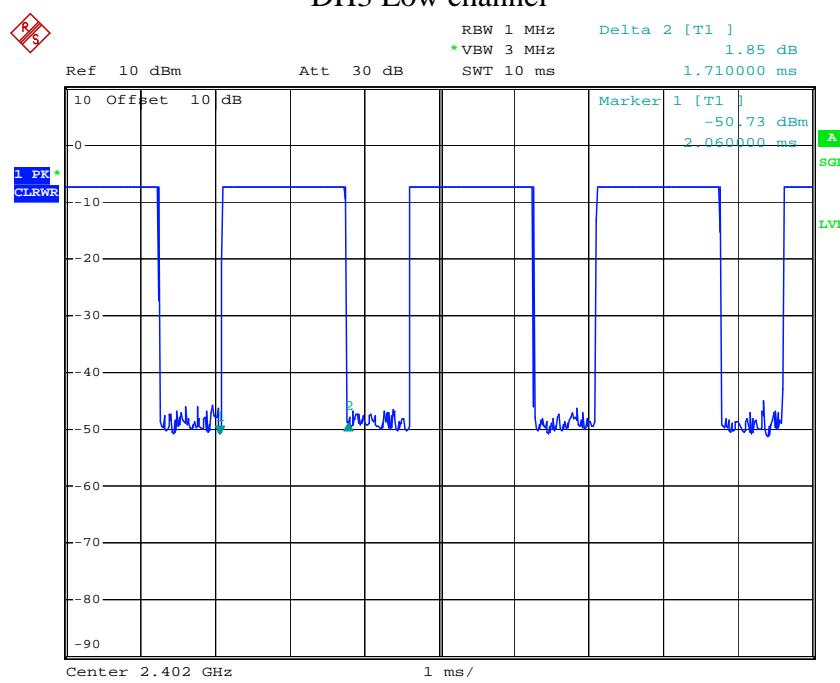


Comment A:
Date: 27.MAR.2019 16:48:33

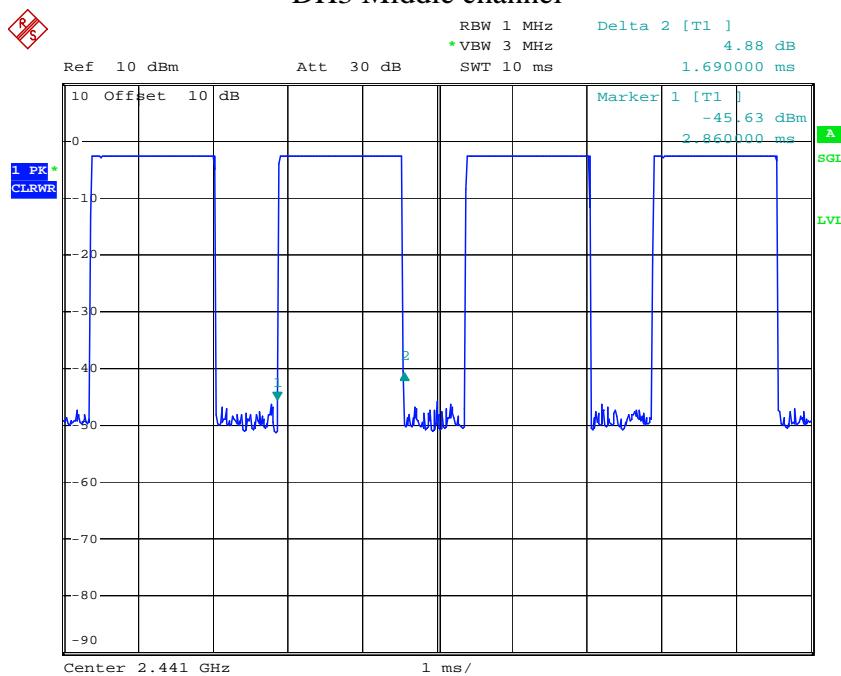
DH1 High channel



DH3 Low channel

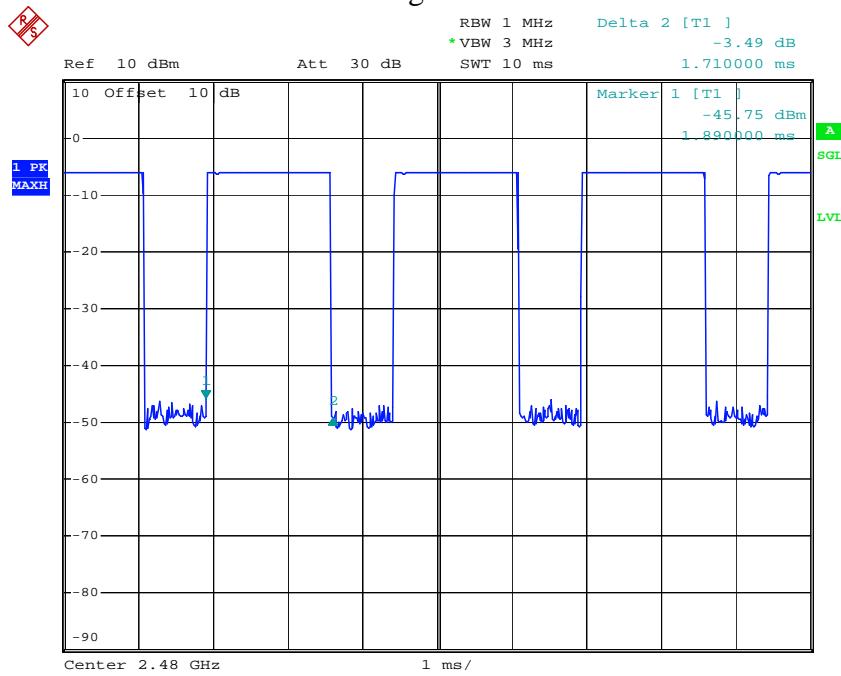


DH3 Middle channel



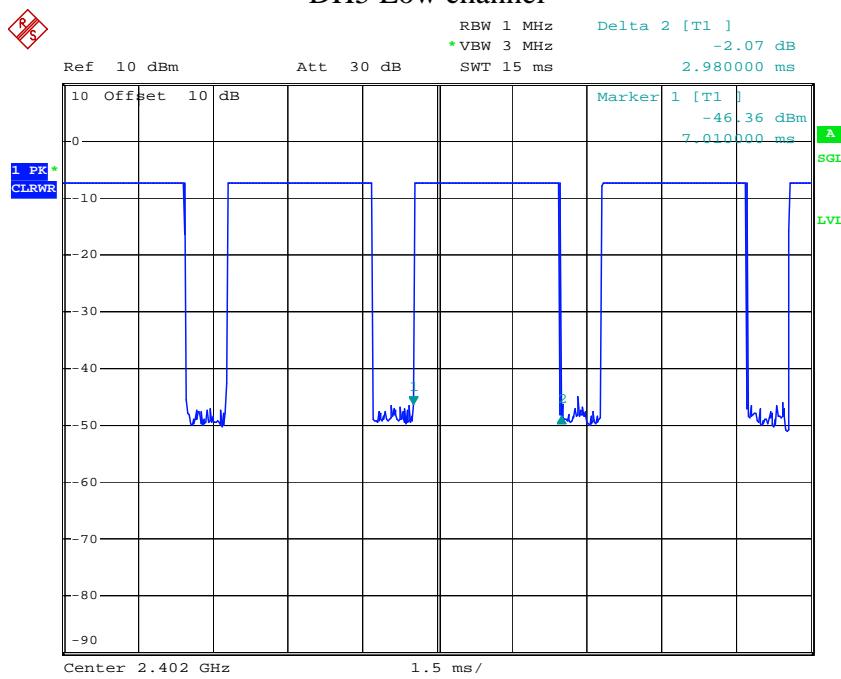
Comment A:
Date: 27.MAR.2019 16:50:10

DH3 High channel

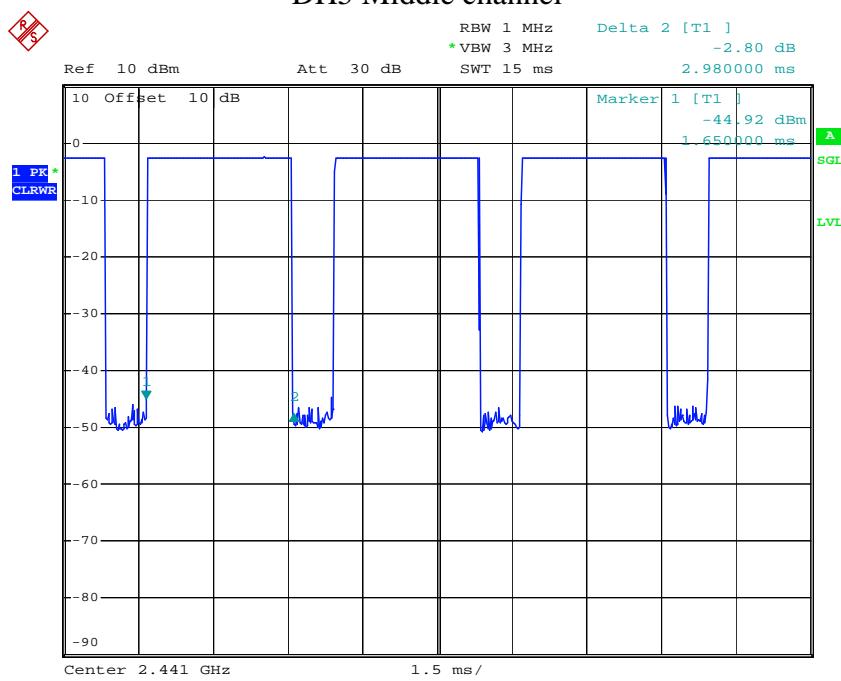


Comment A:
Date: 27.MAR.2019 17:18:20

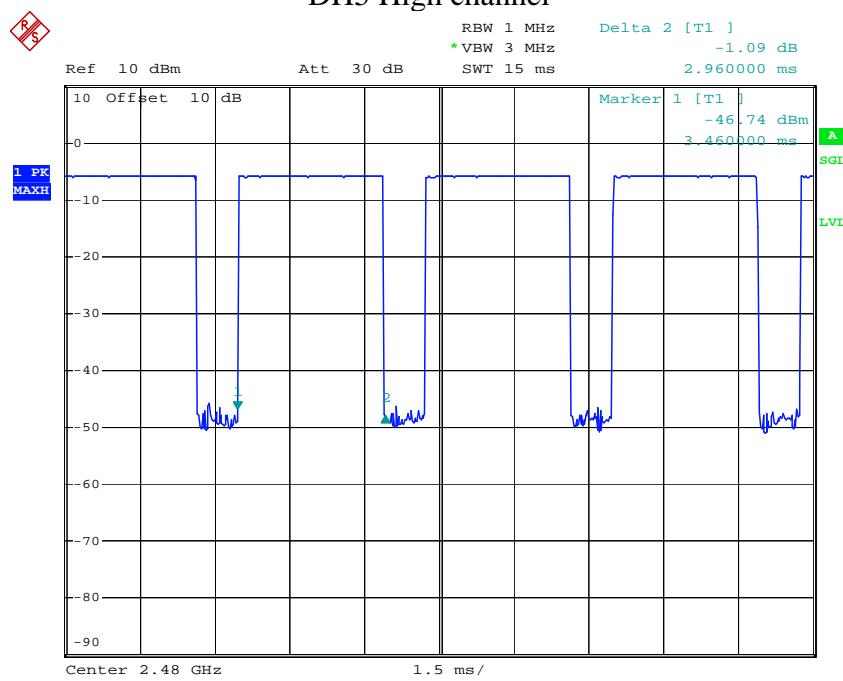
DH5 Low channel



DH5 Middle channel



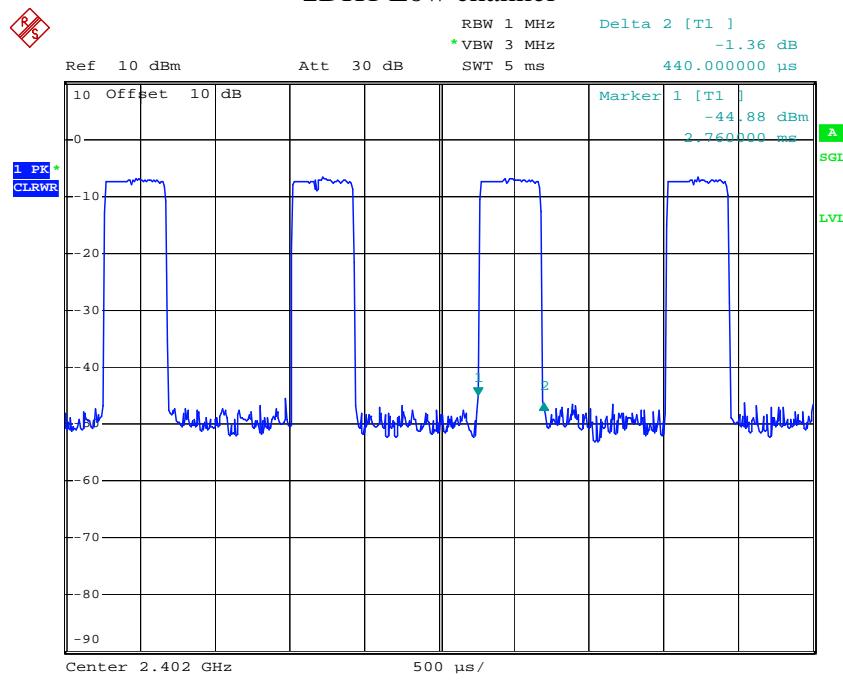
DH5 High channel



Comment A:
 Date: 27.MAR.2019 17:19:17

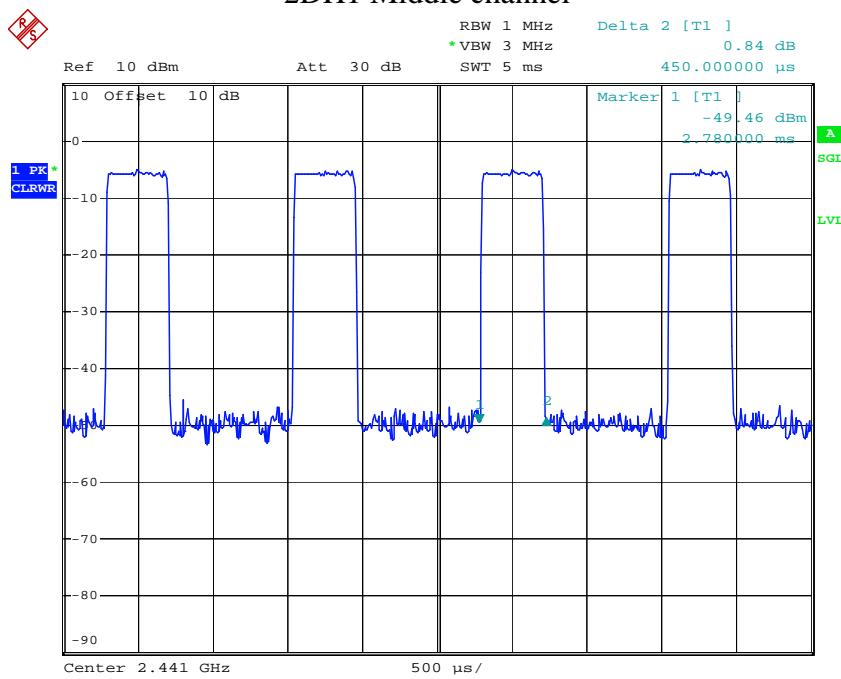
 $\pi/4$ DQPSK Mode

2DH1 Low channel

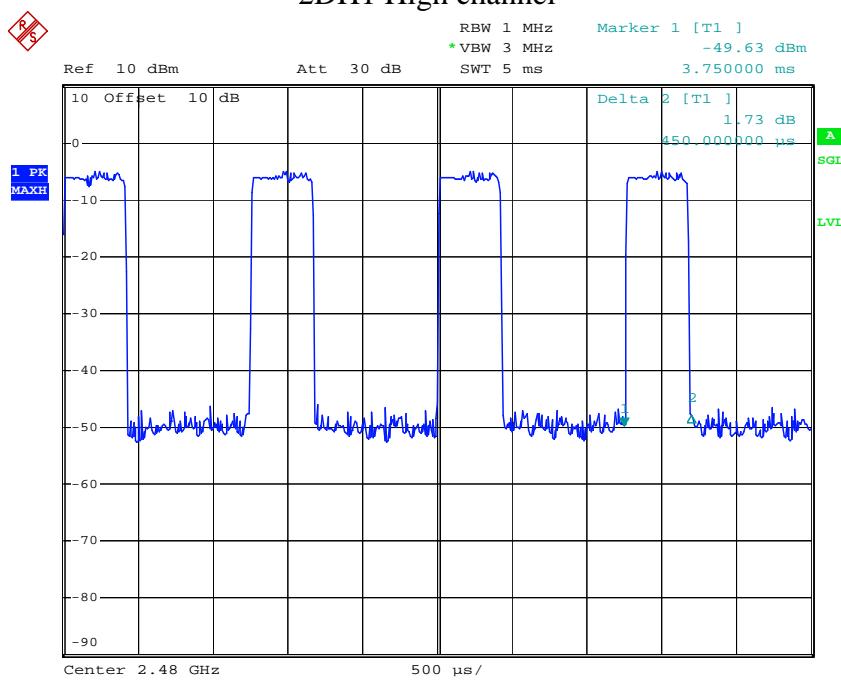


Comment A:
 Date: 27.MAR.2019 16:40:40

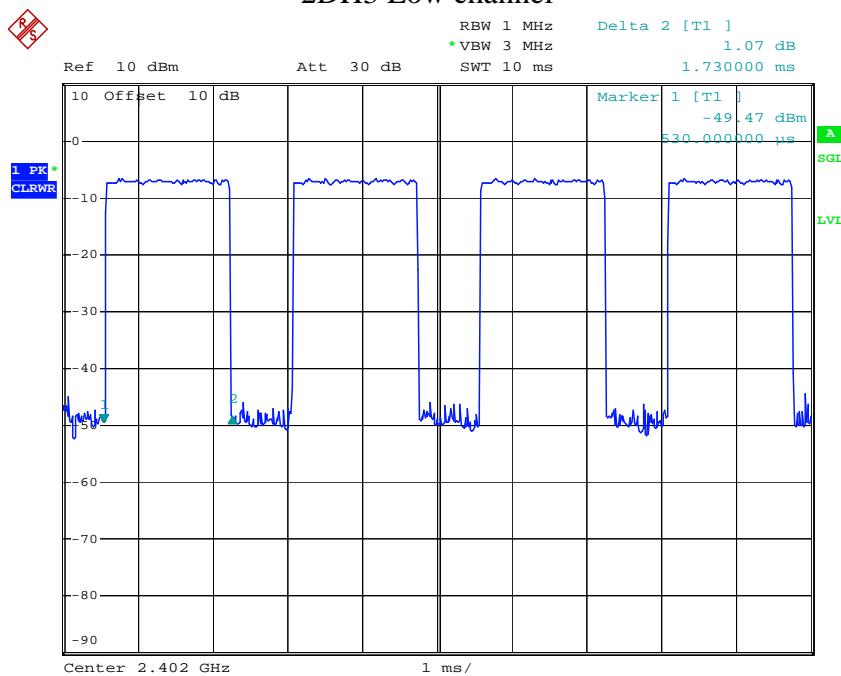
2DH1 Middle channel



2DH1 High channel

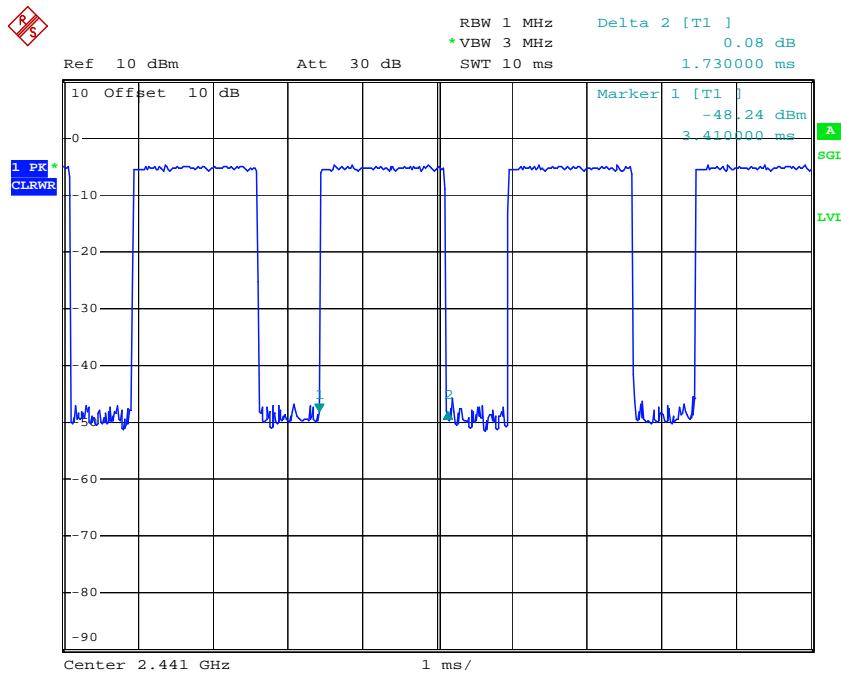


2DH3 Low channel



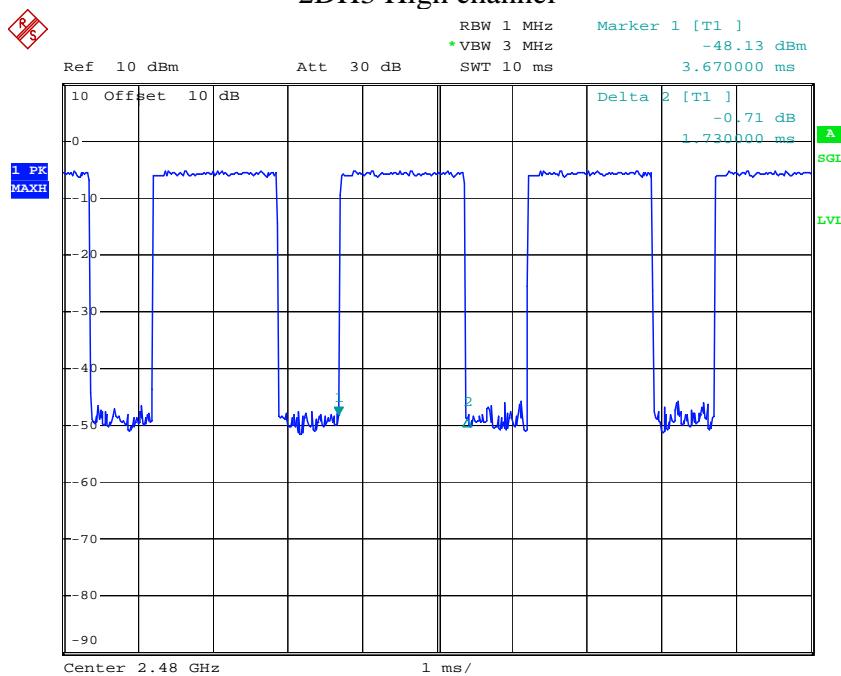
Comment A:
Date: 27.MAR.2019 16:41:38

2DH3 Middle channel



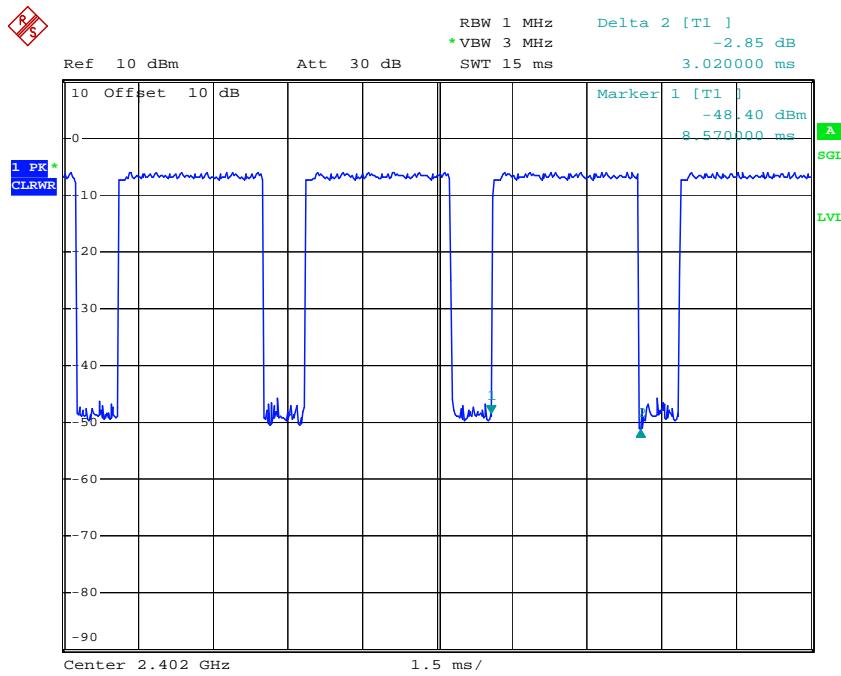
Comment A:
Date: 27.MAR.2019 16:52:59

2DH3 High channel



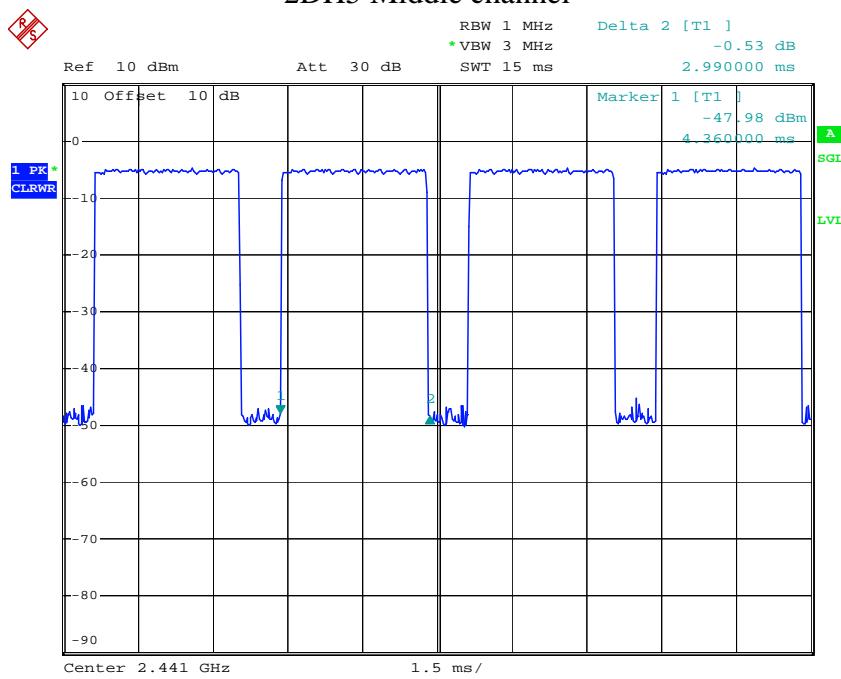
Comment A:
Date: 27.MAR.2019 17:14:15

2DH5 Low channel

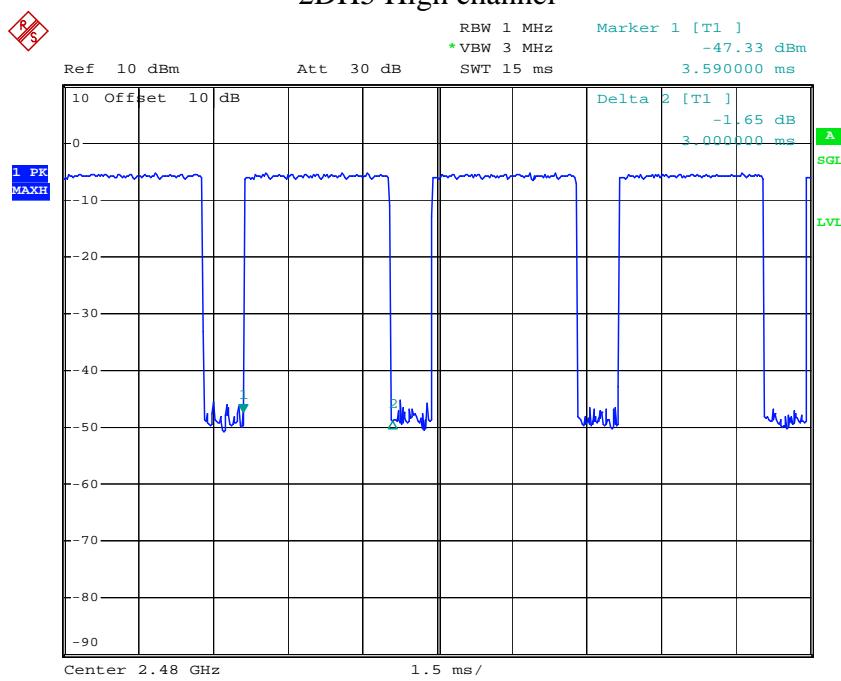


Comment A:
Date: 27.MAR.2019 16:42:59

2DH5 Middle channel

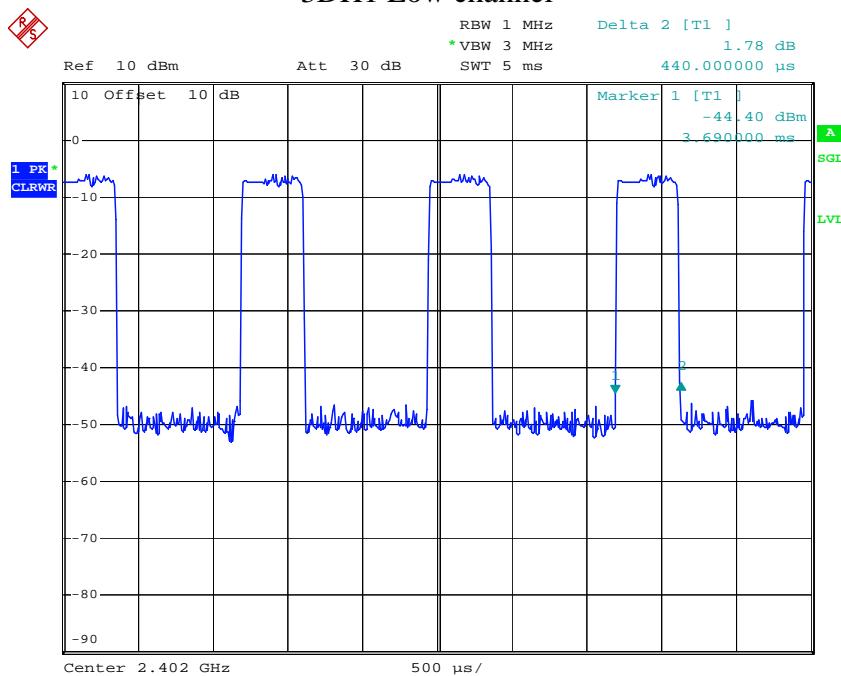


2DH5 High channel



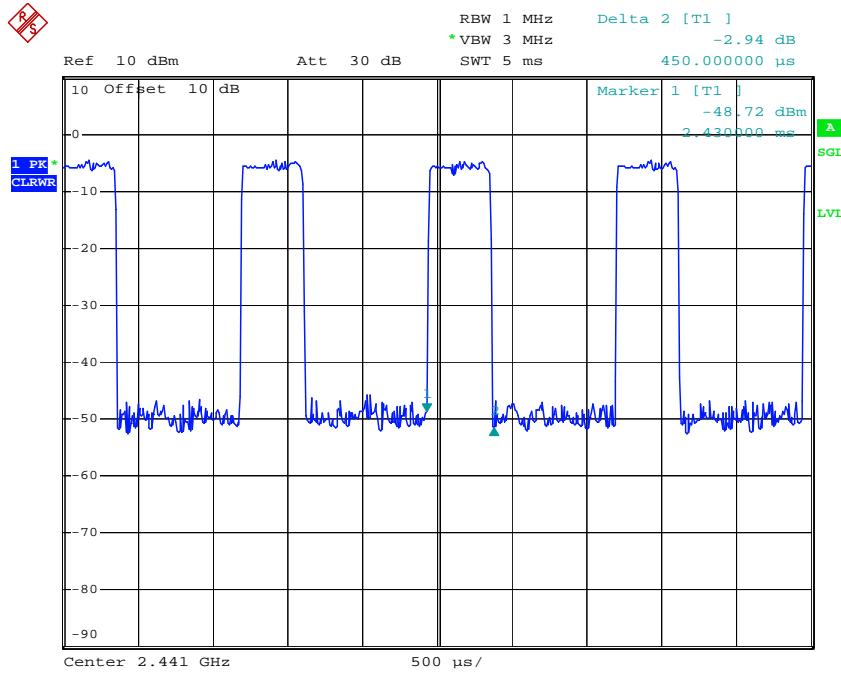
8DPSK Mode

3DH1 Low channel



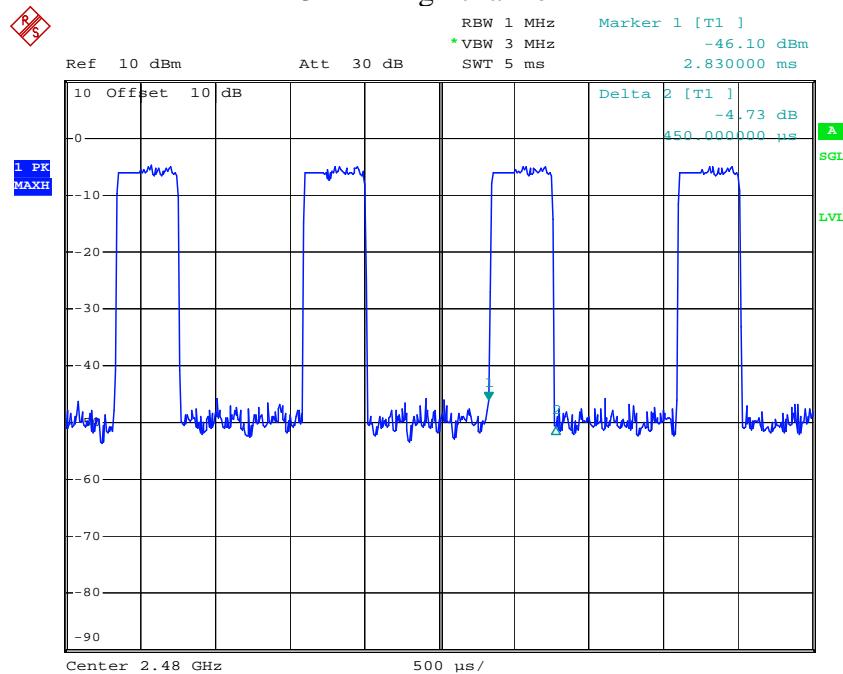
Comment A:
Date: 27.MAR.2019 16:43:54

3DH1 Middle channel



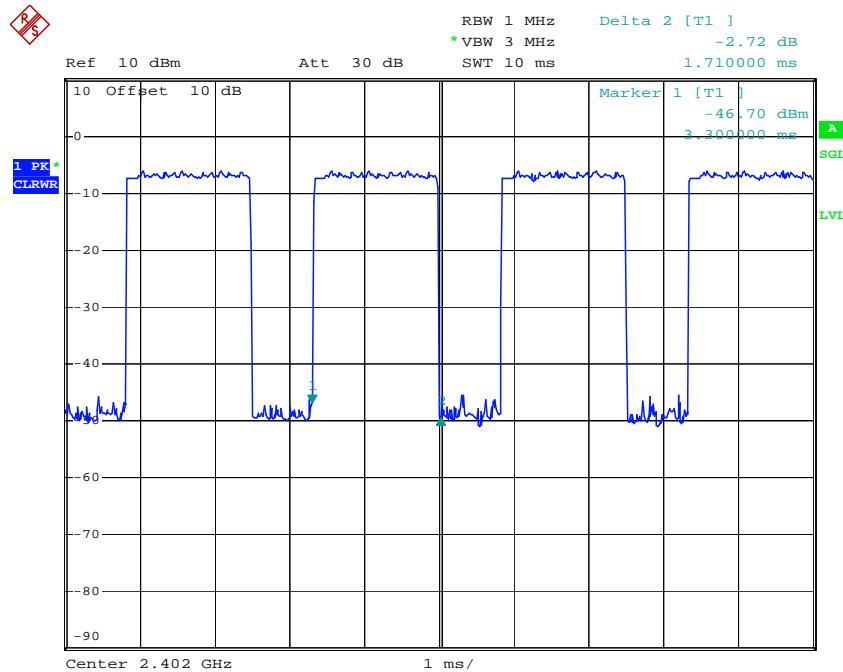
Comment A:
Date: 27.MAR.2019 16:55:04

3DH1 High channel



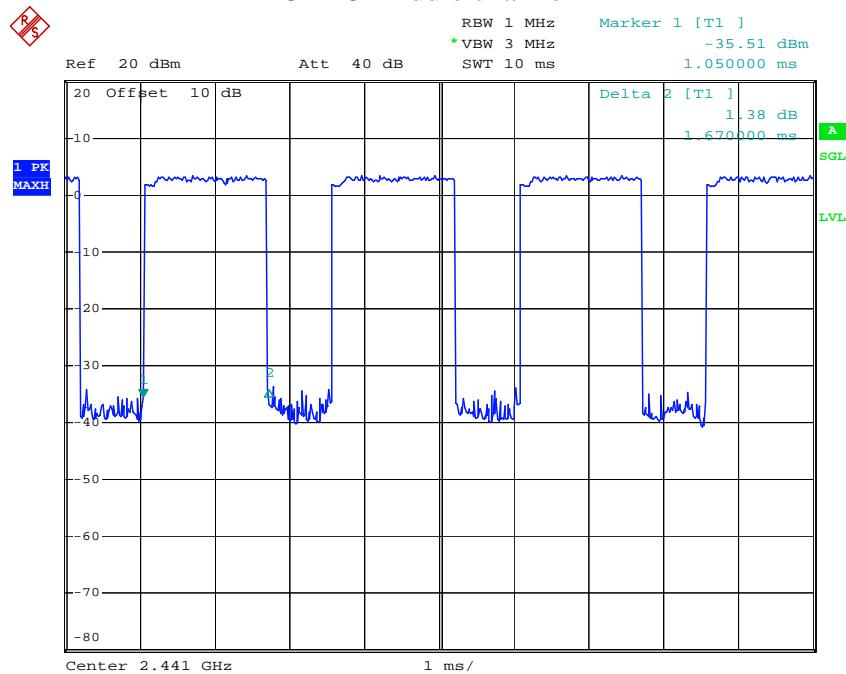
Comment A:
Date: 27.MAR.2019 17:12:02

3DH3 Low channel

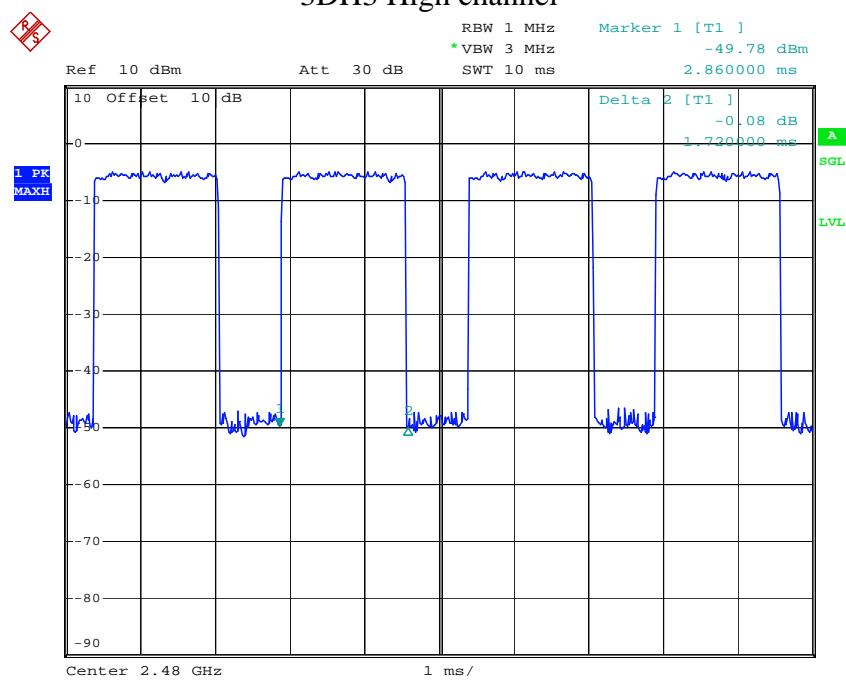


Comment A:
Date: 27.MAR.2019 16:44:45

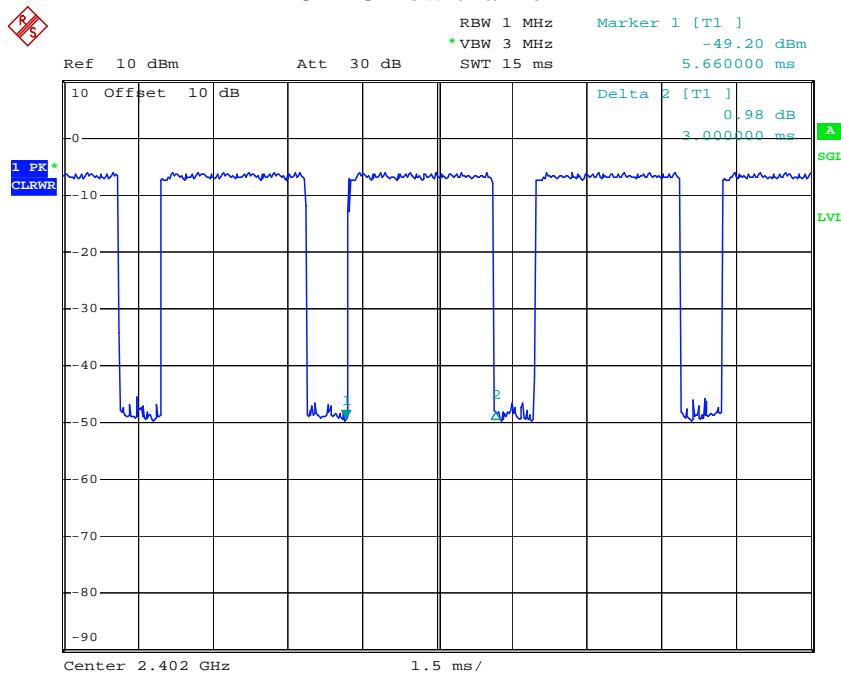
3DH3 Middle channel



3DH3 High channel

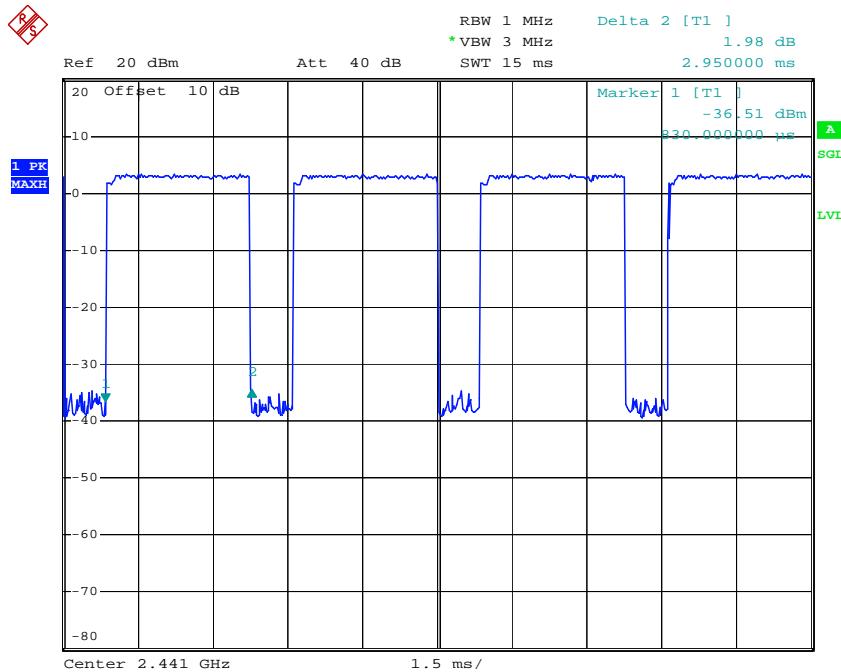


3DH5 Low channel



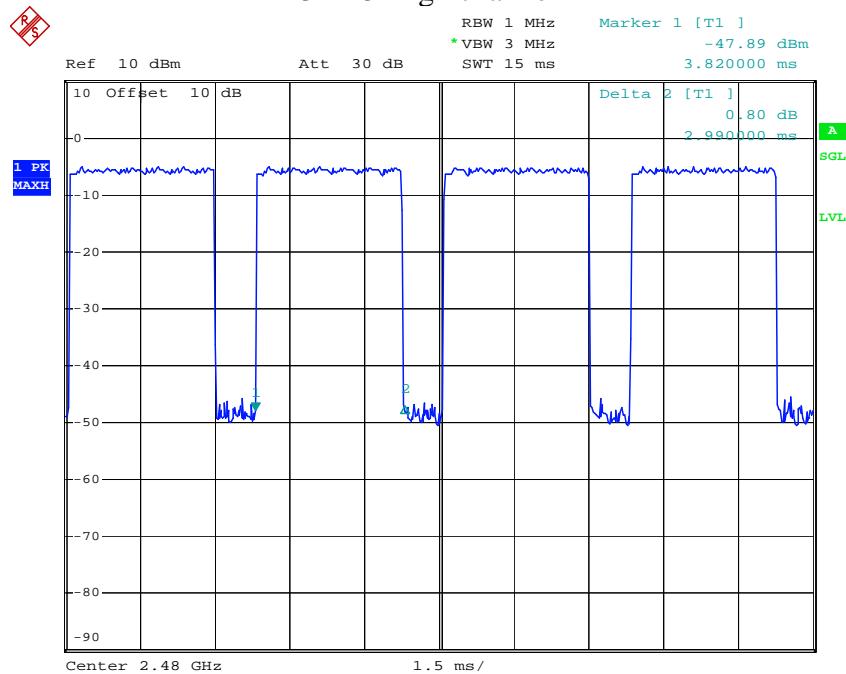
Comment A:
Date: 27.MAR.2019 16:46:00

3DH5 Middle channel



Comment A:
Date: 10.SEP.2018 20:14:17

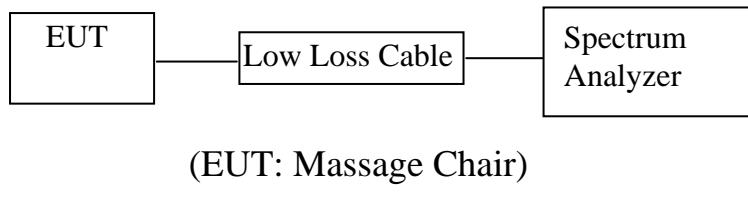
3DH5 High channel



Comment A:
Date: 27.MAR.2019 17:09:36

10.MAXIMUM PEAK OUTPUT POWER TEST

10.1.Block Diagram of Test Setup



10.2.The Requirement For Section 15.247(b)(1)

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

10.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.4.Operating Condition of EUT

10.4.1.Setup the EUT and simulator as shown as Section 10.1.

10.4.2.Turn on the power of all equipment.

10.4.3.Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

10.5.Test Procedure

10.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

10.5.2.Set RBW of spectrum analyzer to 3MHz and VBW to 10MHz for GFSK mode

10.5.3.Set RBW of spectrum analyzer to 3MHz and VBW to 10MHz for $\pi/4$ DQPSK mode.

10.5.4.Measurement the maximum peak output power.

10.6. Test Result

GFSK Mode

Frequency (MHz)	Maximum peak conducted output power (dBm)	Maximum peak conducted output power (W)	Limits dBm / W
2402	-2.58	0.00055	21 / 0.125
2441	-0.93	0.00081	21 / 0.125
2480	-3.13	0.00049	21 / 0.125

$\pi/4$ DQPSK Mode

Frequency (MHz)	Maximum peak conducted output power (dBm)	Maximum peak conducted output power (W)	Limits dBm / W
2402	-4.96	0.00032	21 / 0.125
2441	-3.13	0.00049	21 / 0.125
2480	-5.45	0.00029	21 / 0.125

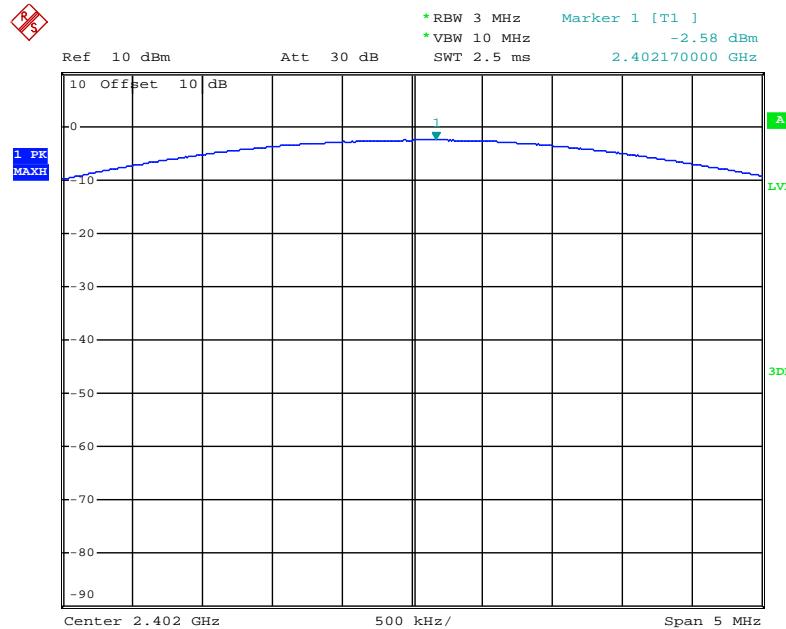
8DPSK Mode

Frequency (MHz)	Maximum peak conducted output power (dBm)	Maximum peak conducted output power (W)	Limits dBm / W
2402	-4.26	0.00037	21 / 0.125
2441	-2.58	0.00055	21 / 0.125
2480	-5.14	0.00031	21 / 0.125

The spectrum analyzer plots are attached as below.

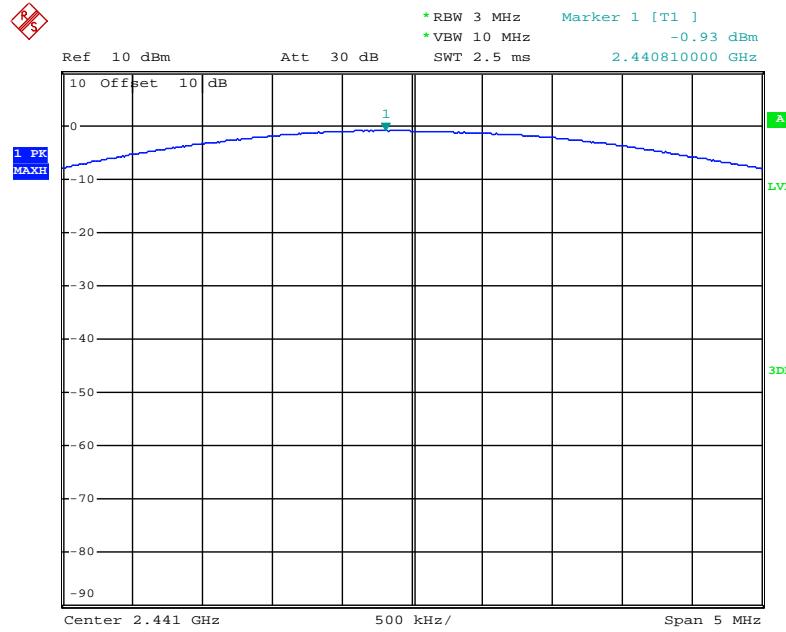
GFSK Mode

Low channel



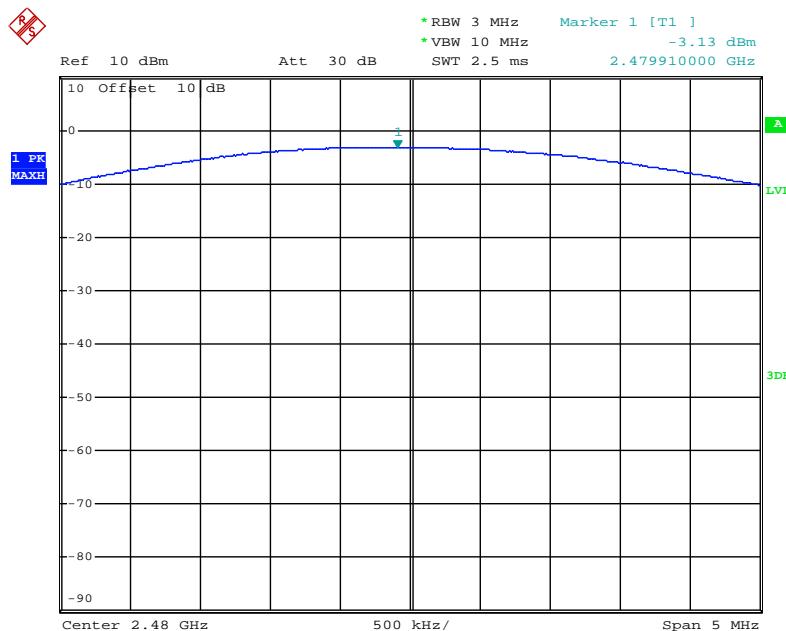
Date: 28.MAR.2019 08:57:15

Middle channel



Date: 28.MAR.2019 08:58:01

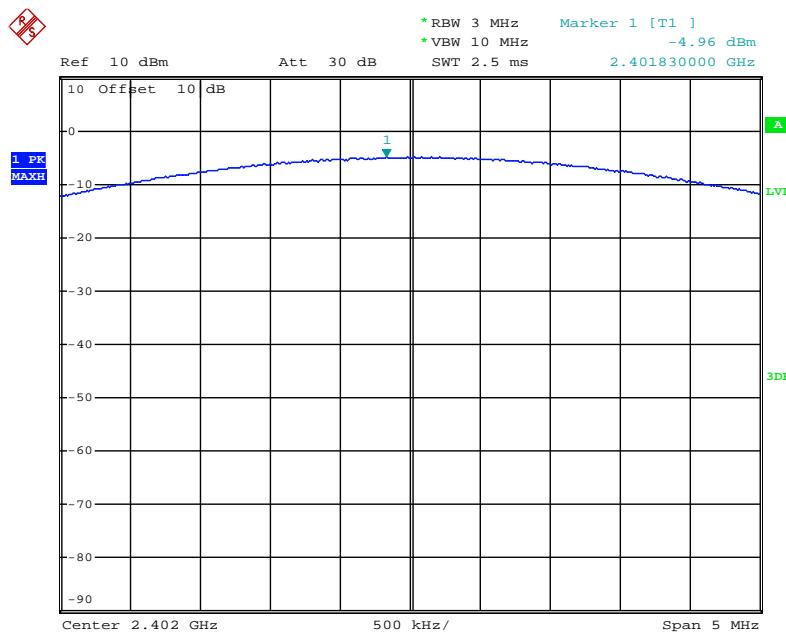
High channel



Date: 28.MAR.2019 08:58:40

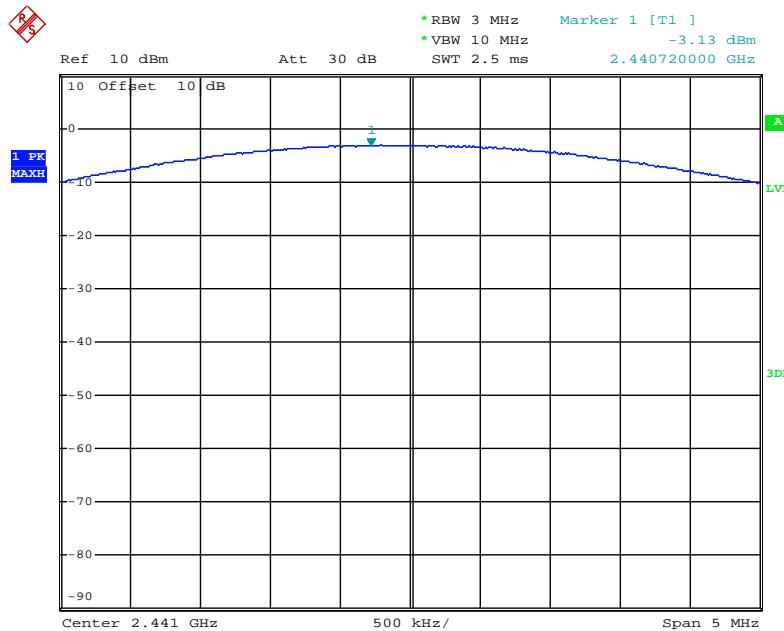
 $\pi/4$ DQPSK Mode

Low channel



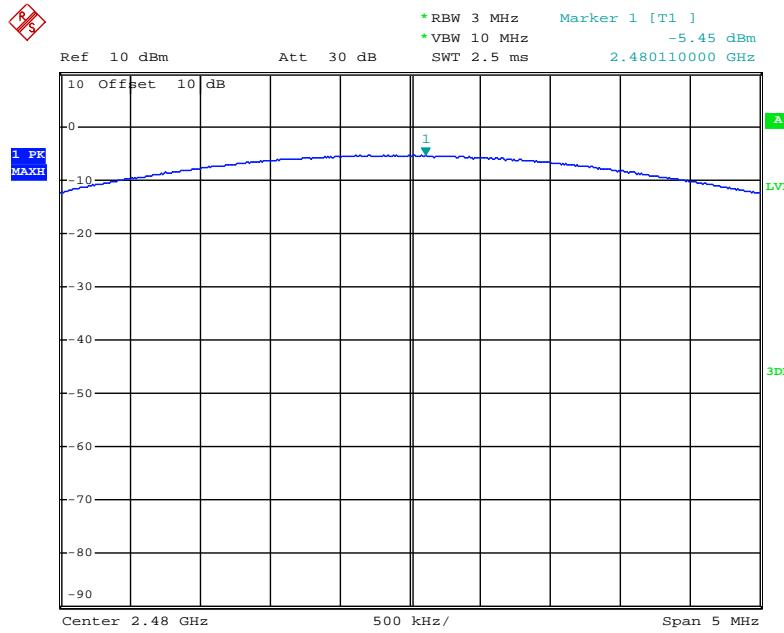
Date: 28.MAR.2019 09:00:38

Middle channel



Date: 28.MAR.2019 09:00:09

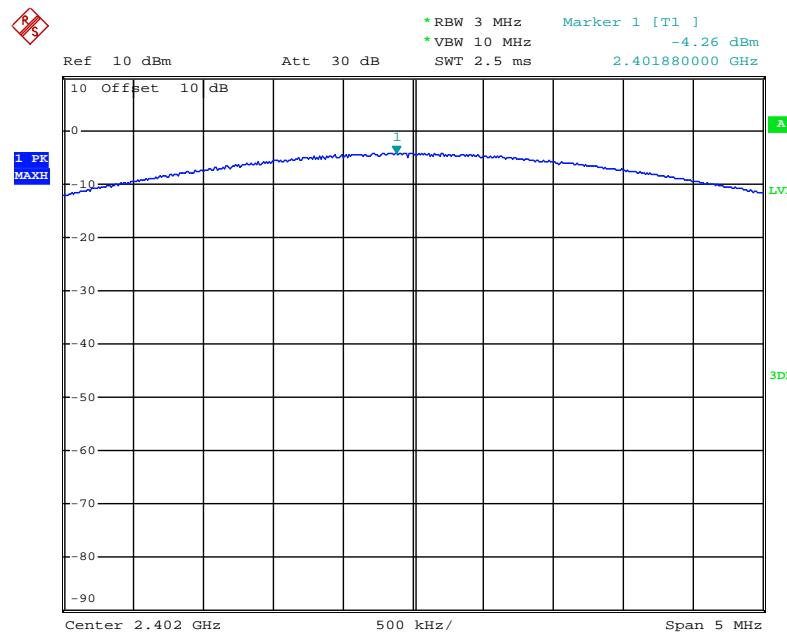
High channel



Date: 28.MAR.2019 08:59:33

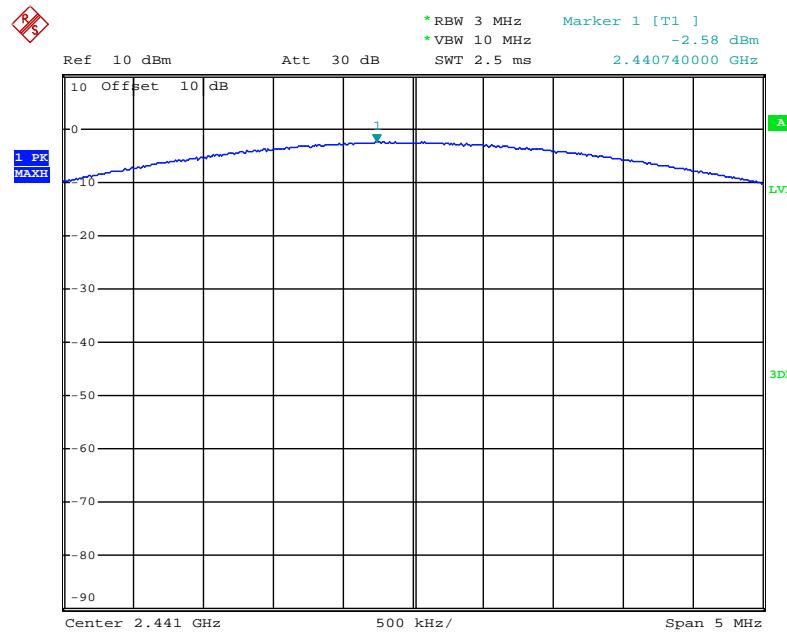
8DPSK Mode

Low channel



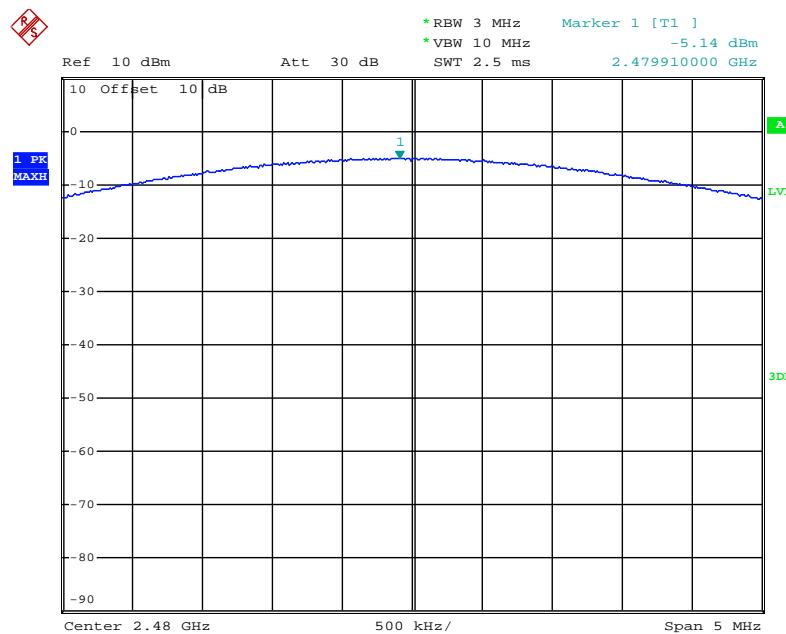
Date: 28.MAR.2019 09:01:38

Middle channel



Date: 28.MAR.2019 09:02:12

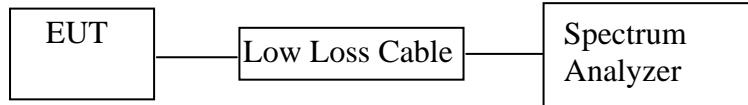
High channel



Date: 28.MAR.2019 09:03:42

11.BAND EDGE COMPLIANCE TEST

11.1.Block Diagram of Test Setup



(EUT: Massage Chair)

11.2.The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

11.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.4.Operating Condition of EUT

11.4.1.Setup the EUT and simulator as shown as Section 11.1.

11.4.2.Turn on the power of all equipment.

11.4.3.Let the EUT work in TX (Hopping off, Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2480MHz TX frequency to transmit.

11.5. Test Procedure

11.5.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

11.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz with convenient frequency span including 100 kHz bandwidth from band edge.

11.5.3. The band edges was measured and recorded.

11.6. Test Result

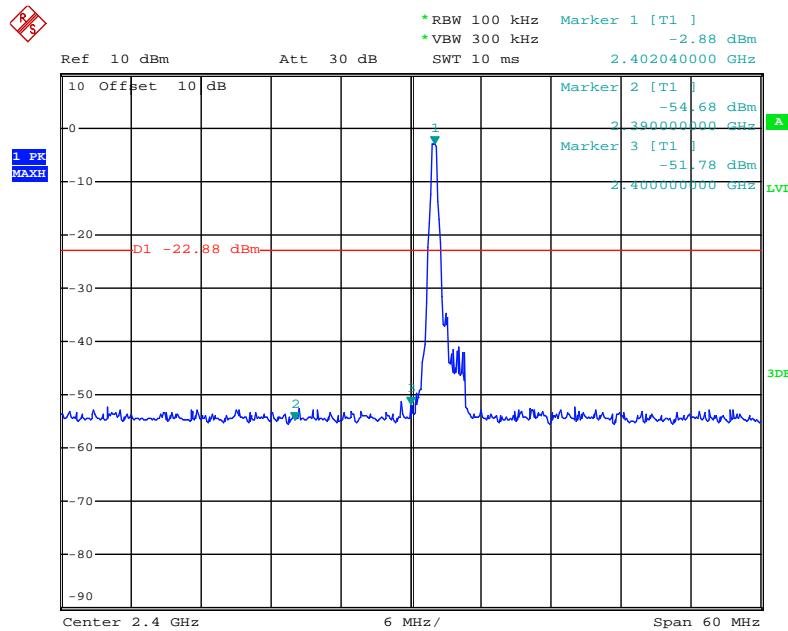
Non-hopping mode (worse case)

Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
GFSK mode		
2400.00	48.90	> 20dBc
2483.50	50.79	> 20dBc
$\pi/4$ DQPSK		
2400.00	48.45	> 20dBc
2483.5	48.00	> 20dBc
8DPSK mode		
2400.00	47.12	> 20dBc
2483.5	47.15	> 20dBc

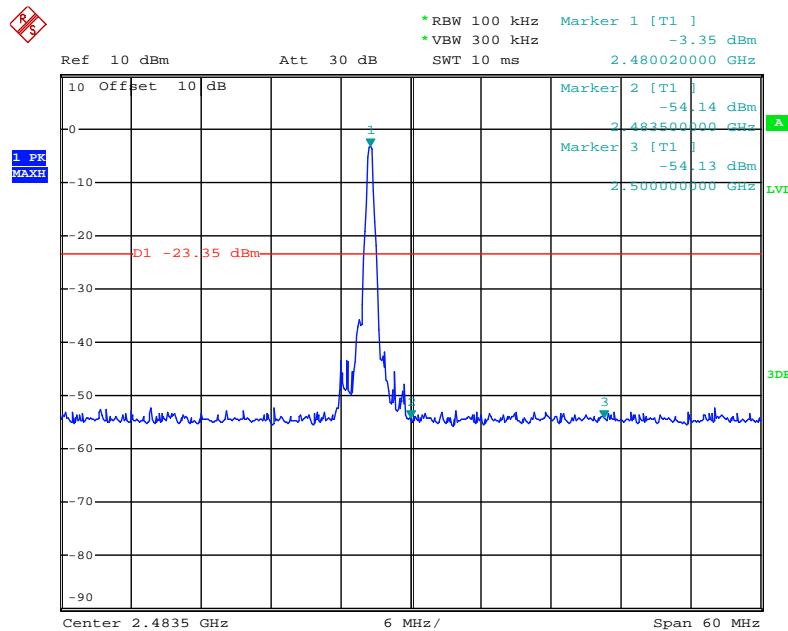
The spectrum analyzer plots are attached as below.

Non-hopping mode

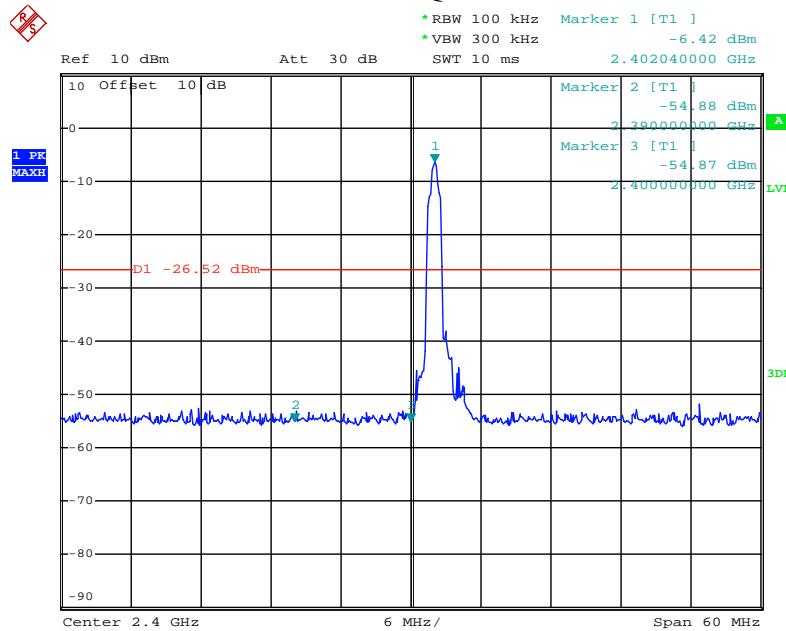
GFSK mode



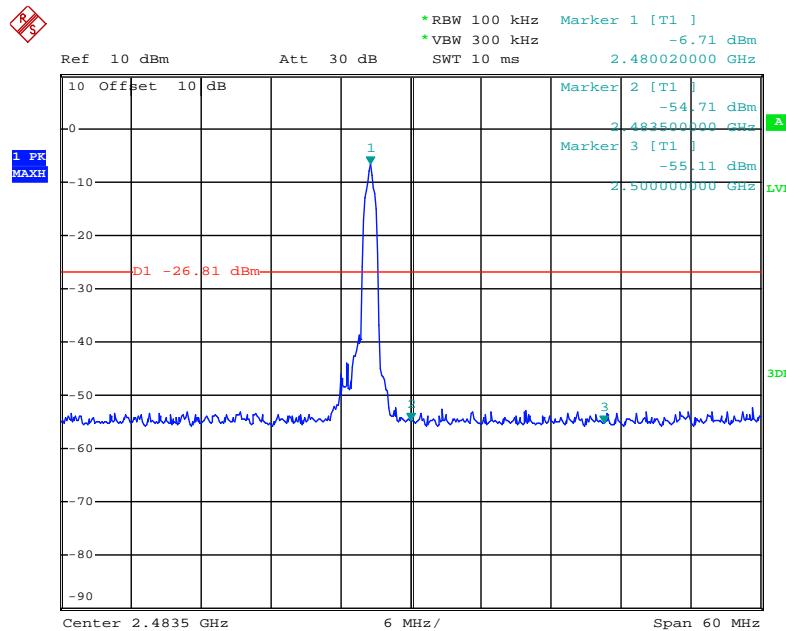
Date: 28.MAR.2019 09:11:32



Date: 28.MAR.2019 09:10:10

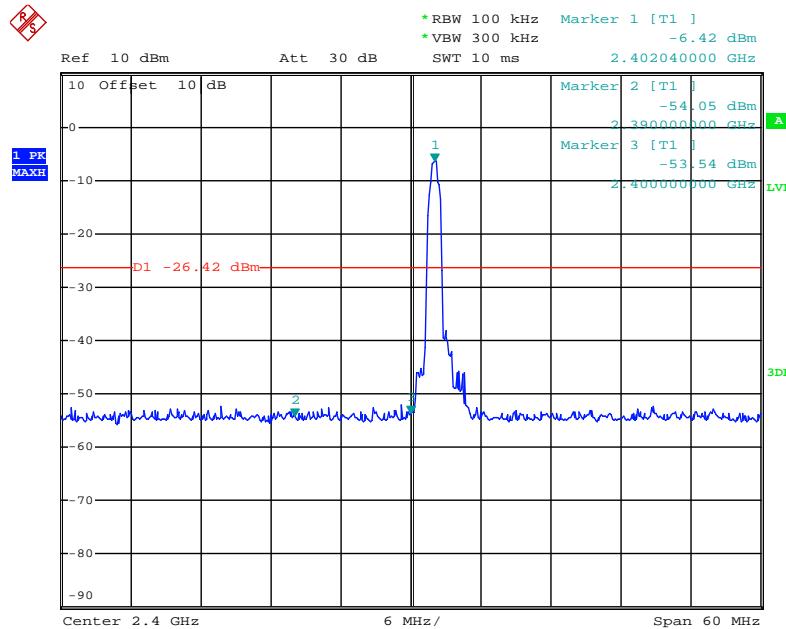
$\pi/4$ DQPSK mode

Date: 28.MAR.2019 09:08:16

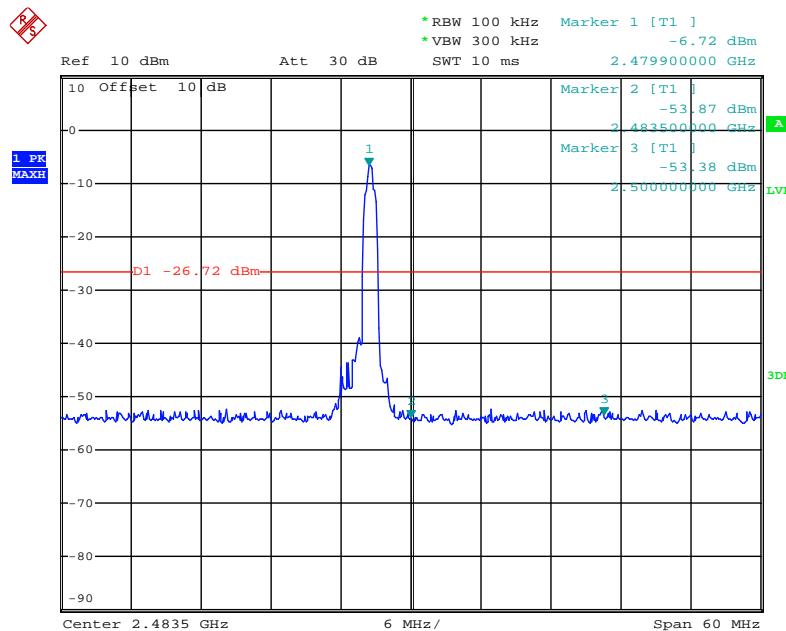


Date: 28.MAR.2019 09:09:16

8DPSK mode



Date: 28.MAR.2019 09:06:42



Date: 28.MAR.2019 09:05:32

Radiated Band Edge Result

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:
Result = Reading + Corrected Factor
3. Display the measurement of peak values.

Test Procedure:

The EUT and its simulators are placed on a turntable, which is 0.1 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Let the EUT work in TX (Hopping off, Hopping on) modes measure it.
We select 2402MHz, 2480MHz TX frequency to transmit(Hopping off mode).
We select 2402-2480MHz TX frequency to transmit(Hopping on mode).

During the radiated emission test, the spectrum analyzer was set with the following configurations:

- 1.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
- 2.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- 3.All modes of operation were investigated and the worst-case emissions are reported.

Non-hopping mode



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Job No.: FRANK2019 #647

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:34:17

EUT: Massage Chair

Engineer Signature:

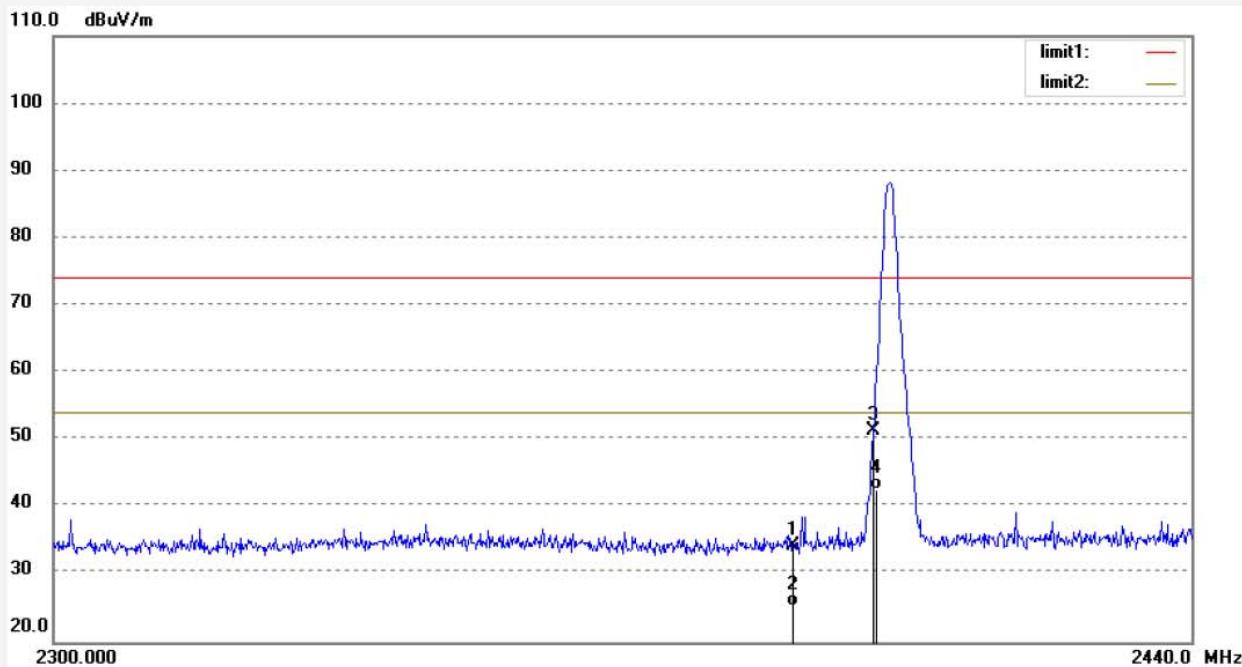
Mode: TX 2402MHz(GFSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	40.67	-6.32	34.35	74.00	-39.65	peak	200	116	
2	2390.000	31.54	-6.32	25.22	54.00	-28.78	AVG	250	62	
3	2400.000	57.59	-6.27	51.32	74.00	-22.68	peak	200	119	
4	2400.000	48.96	-6.27	42.69	54.00	-11.31	AVG	250	102	

Job No.: FRANK2019 #648

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:35:28

EUT: Massage Chair

Engineer Signature:

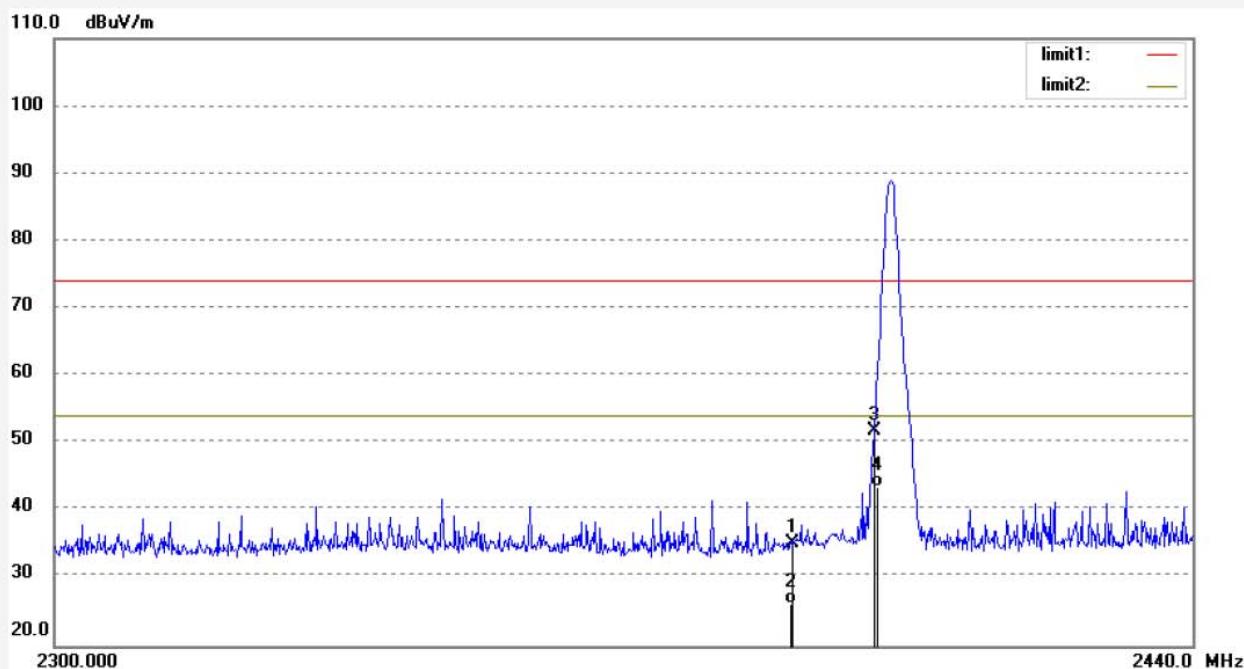
Mode: TX 2402MHz(GFSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	41.52	-6.32	35.20	74.00	-38.80	peak	150	331	
2	2390.000	32.54	-6.32	26.22	54.00	-27.78	AVG	150	91	
3	2400.000	58.09	-6.27	51.82	74.00	-22.18	peak	150	221	
4	2400.000	49.68	-6.27	43.41	54.00	-10.59	AVG	150	162	

Job No.: FRANK2019 #638

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:17:47

EUT: Massage Chair

Engineer Signature:

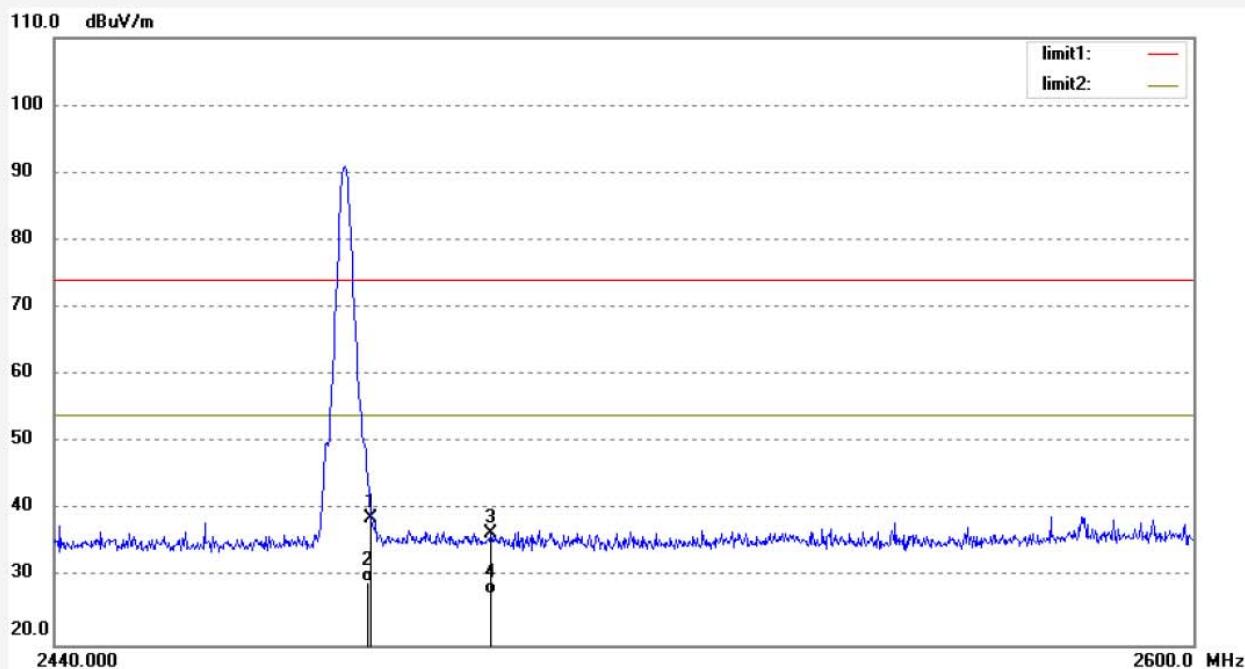
Mode: TX 2480MHz(GFSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	44.64	-5.89	38.75	74.00	-35.25	peak	200	249	
2	2483.500	35.15	-5.89	29.26	54.00	-24.74	AVG	250	203	
3	2500.000	42.38	-5.81	36.57	74.00	-37.43	peak	200	142	
4	2500.000	33.45	-5.81	27.64	54.00	-26.36	AVG	250	71	

Job No.: FRANK2019 #637

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:16:30

EUT: Massage Chair

Engineer Signature:

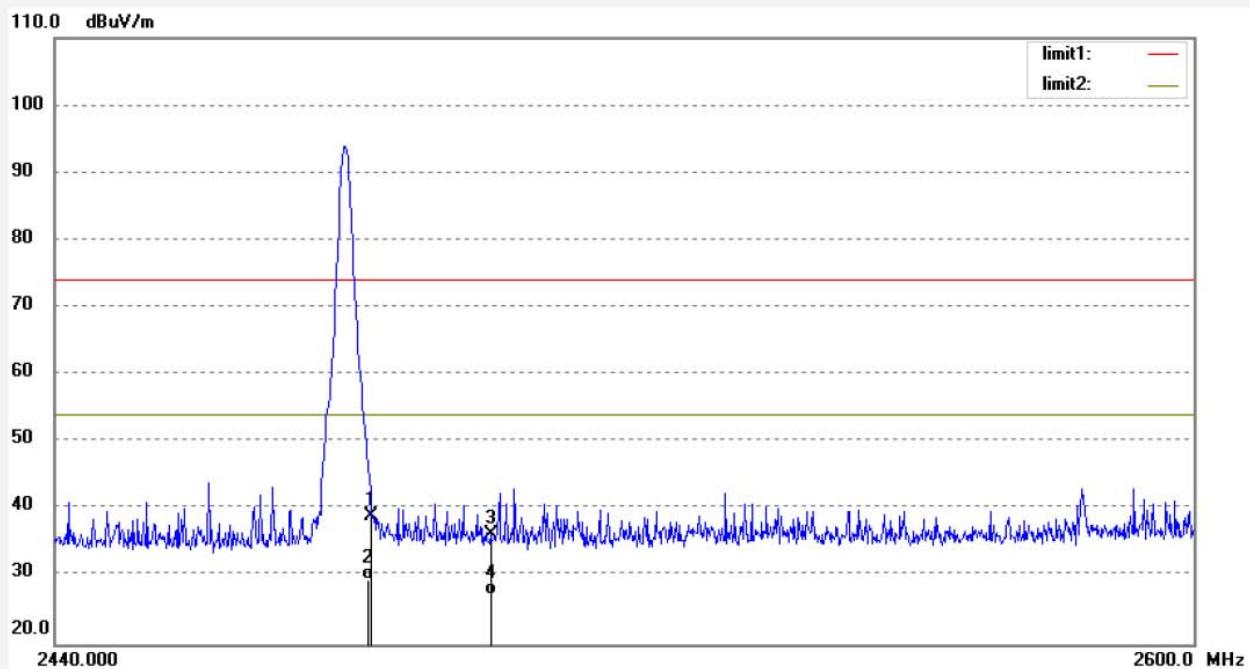
Mode: TX 2480MHz(GFSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	44.99	-5.89	39.10	74.00	-34.90	peak	150	41	
2	2483.500	35.45	-5.89	29.56	54.00	-24.44	AVG	150	94	
3	2500.000	42.10	-5.81	36.29	74.00	-37.71	peak	150	69	
4	2500.000	33.10	-5.81	27.29	54.00	-26.71	AVG	150	102	

Job No.: FRANK2019 #646

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:32:48

EUT: Massage Chair

Engineer Signature:

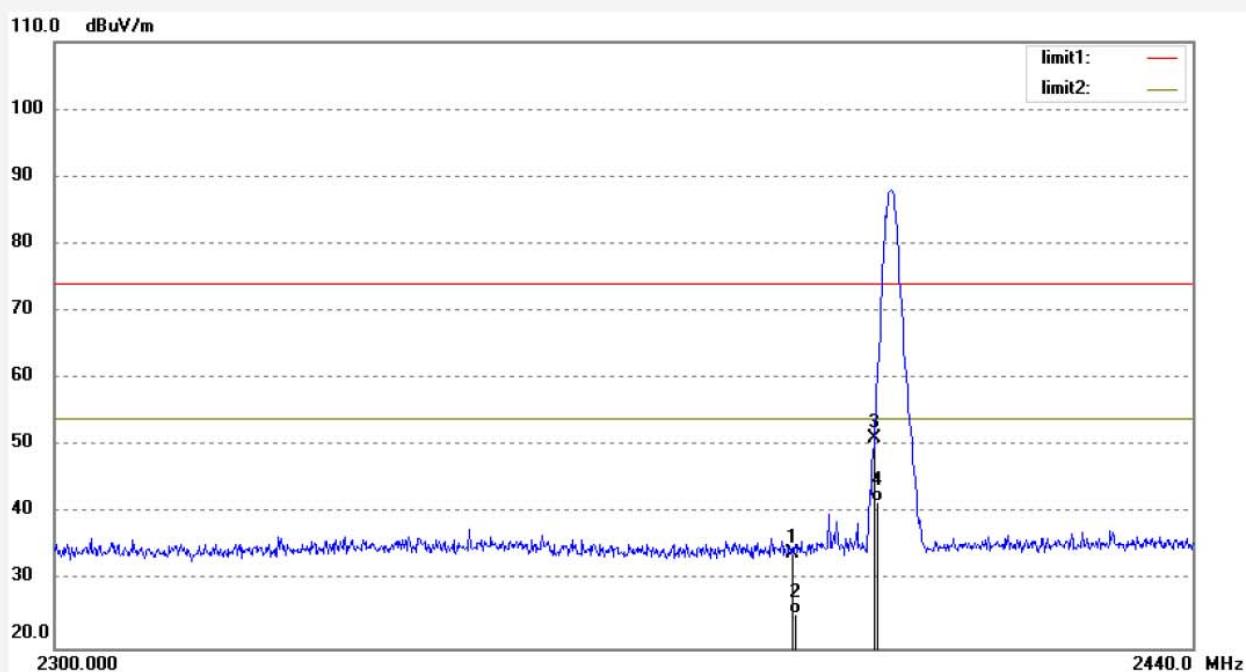
Mode: TX 2402MHz($\pi/4$ DQPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	40.41	-6.32	34.09	74.00	-39.91	peak	250	213	
2	2390.000	31.48	-6.32	25.16	54.00	-28.84	AVG	250	99	
3	2400.000	57.47	-6.27	51.20	74.00	-22.80	peak	200	219	
4	2400.000	47.98	-6.27	41.71	54.00	-12.29	AVG	250	103	

Job No.: FRANK2019 #645

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:31:23

EUT: Massage Chair

Engineer Signature:

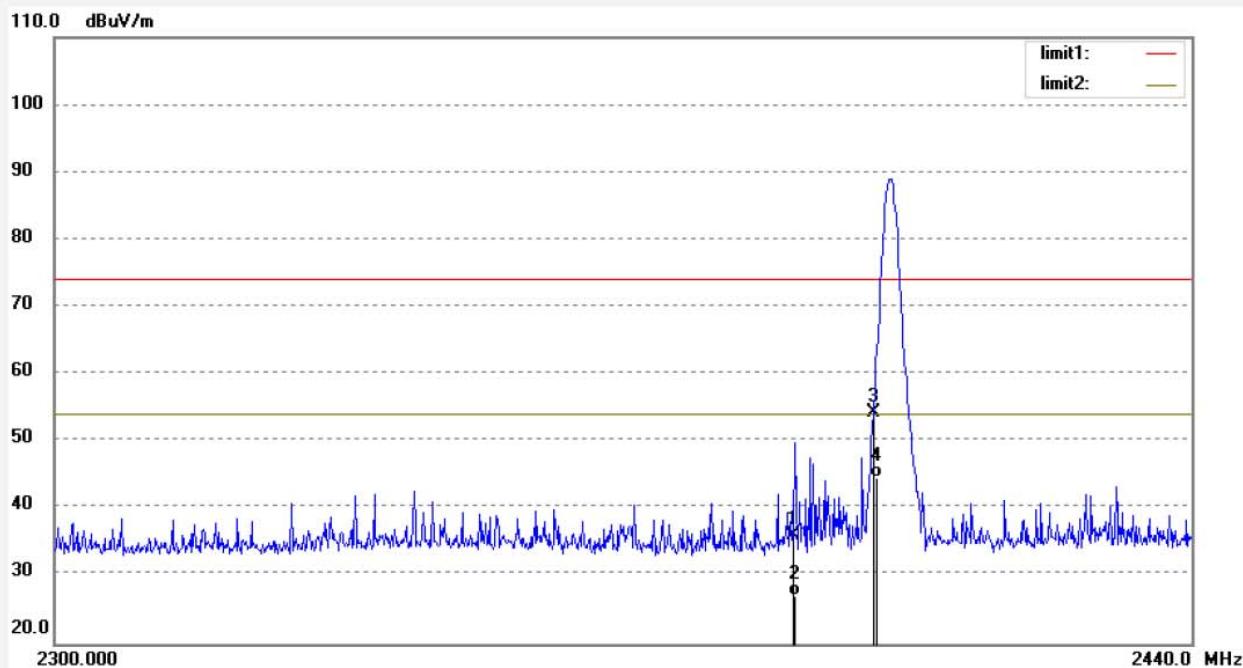
Mode: TX 2402MHz($\pi/4$ DQPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	42.51	-6.32	36.19	74.00	-37.81	peak	150	99	
2	2390.000	33.48	-6.32	27.16	54.00	-26.84	AVG	150	159	
3	2400.000	60.57	-6.27	54.30	74.00	-19.70	peak	150	332	
4	2400.000	50.98	-6.27	44.71	54.00	-9.29	AVG	150	201	

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Job No.: FRANK2019 #639

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:20:44

EUT: Massage Chair

Engineer Signature:

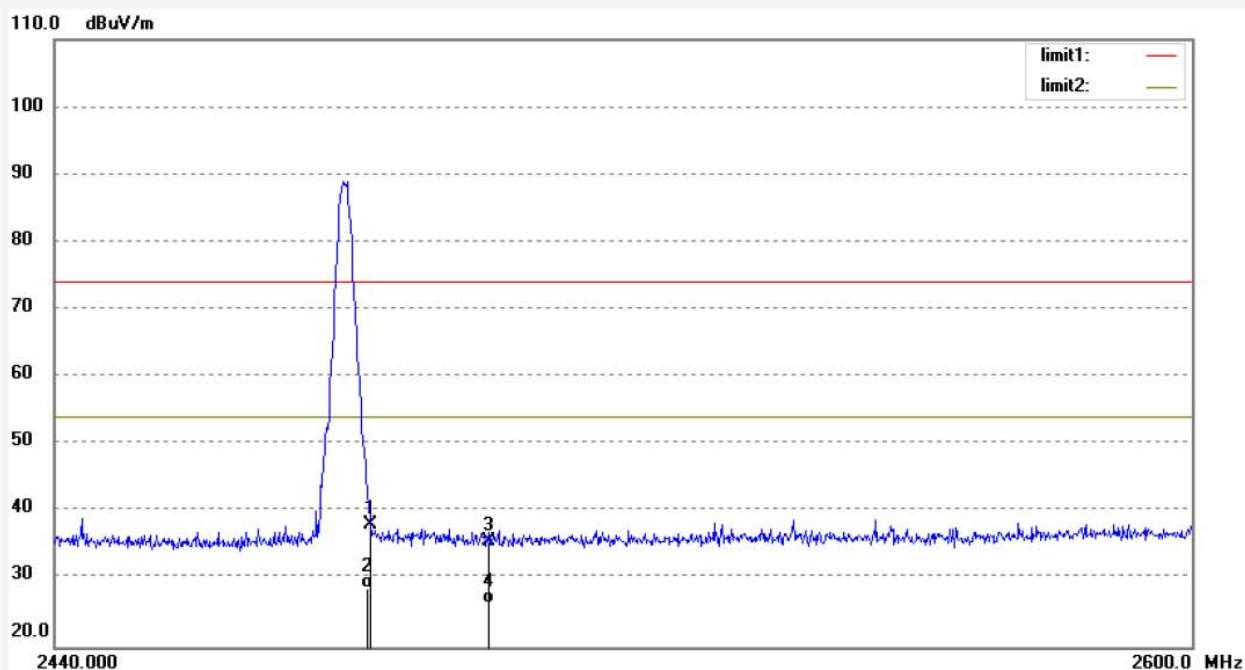
Mode: TX 2480MHz($\pi/4$ DQPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	43.90	-5.89	38.01	74.00	-35.99	peak	200	315	
2	2483.500	34.45	-5.89	28.56	54.00	-25.44	AVG	250	69	
3	2500.000	41.56	-5.81	35.75	74.00	-38.25	peak	200	112	
4	2500.000	32.33	-5.81	26.52	54.00	-27.48	AVG	250	101	

Job No.: FRANK2019 #640

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:21:58

EUT: Massage Chair

Engineer Signature:

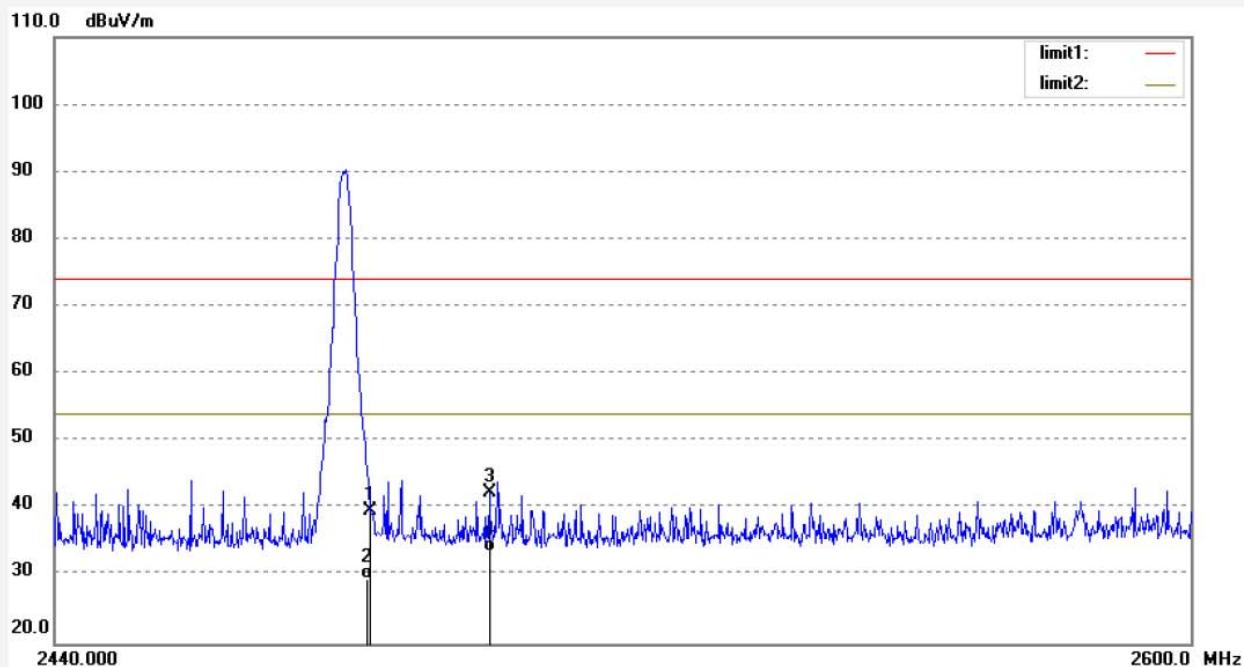
Mode: TX 2480MHz($\pi/4$ DQPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	45.59	-5.89	39.70	74.00	-34.30	peak	150	332	
2	2483.500	35.45	-5.89	29.56	54.00	-24.44	AVG	150	141	
3	2500.000	48.13	-5.81	42.32	74.00	-31.68	peak	150	95	
4	2500.000	39.48	-5.81	33.67	54.00	-20.33	AVG	150	102	

Job No.: FRANK2019 #643

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:27:50

EUT: Massage Chair

Engineer Signature:

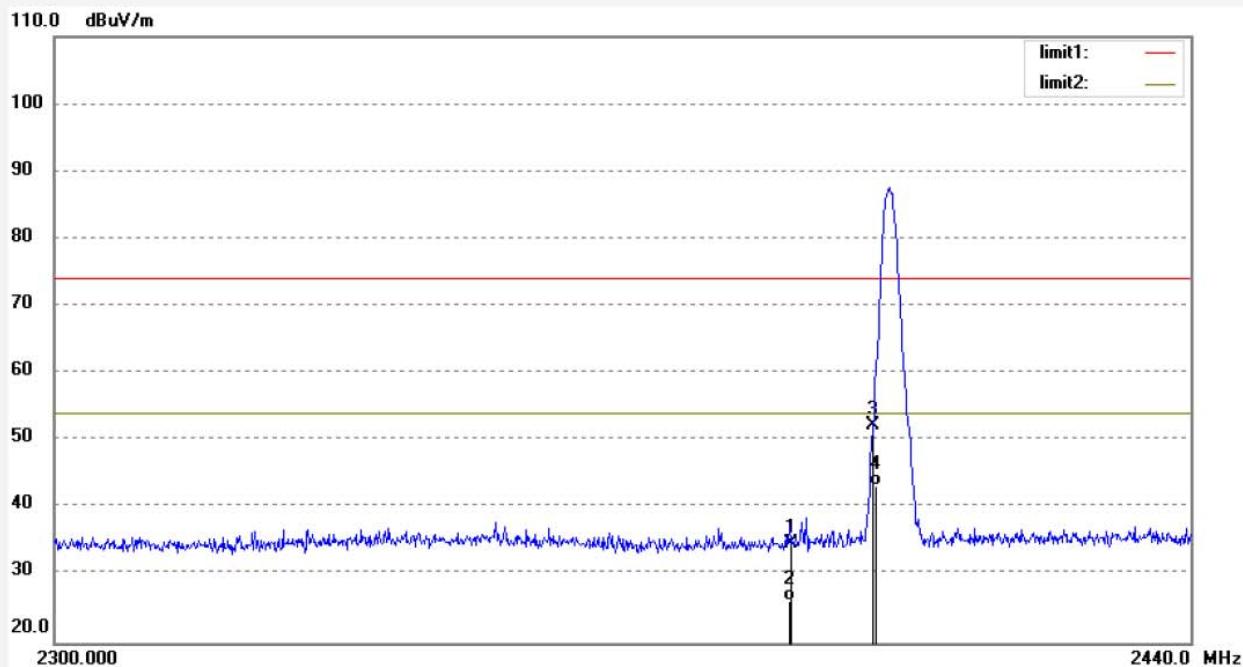
Mode: TX 2402MHz(8DPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	41.16	-6.32	34.84	74.00	-39.16	peak	200	185	
2	2390.000	32.48	-6.32	26.16	54.00	-27.84	AVG	250	66	
3	2400.000	58.48	-6.27	52.21	74.00	-21.79	peak	200	229	
4	2400.000	49.65	-6.27	43.38	54.00	-10.62	AVG	250	103	

Job No.: FRANK2019 #644

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:30:06

EUT: Massage Chair

Engineer Signature:

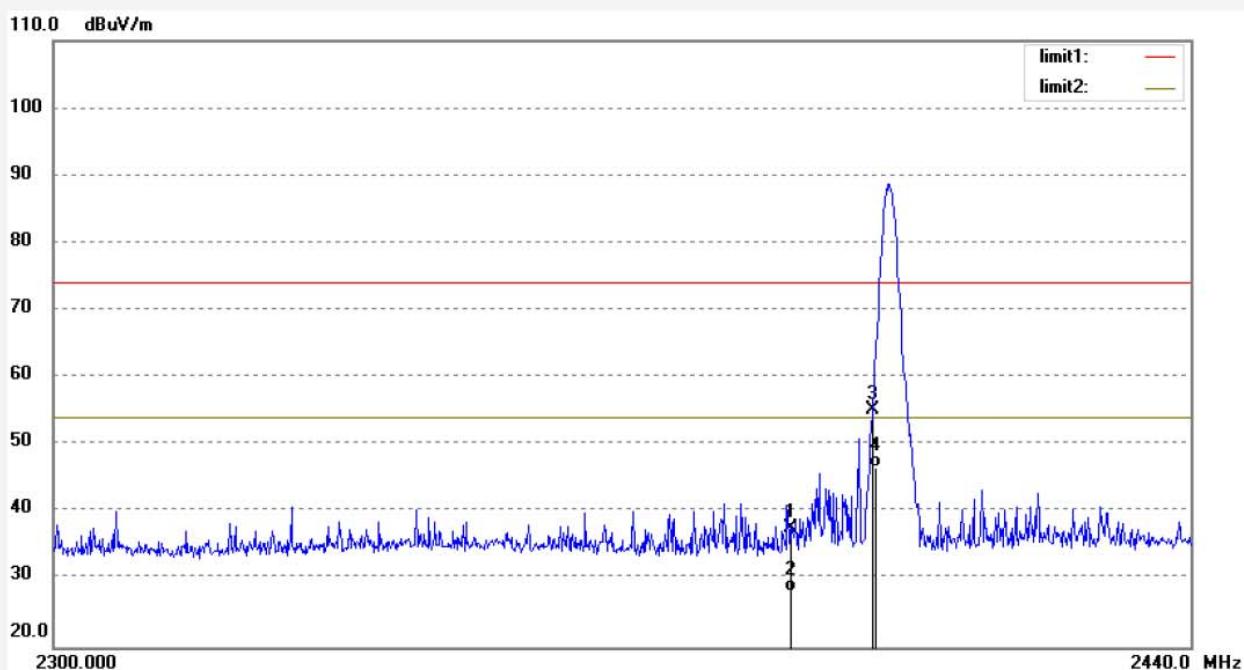
Mode: TX 2402MHz(8DPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	43.98	-6.32	37.66	74.00	-36.34	peak	150	144	
2	2390.000	34.64	-6.32	28.32	54.00	-25.68	AVG	150	95	
3	2400.000	61.46	-6.27	55.19	74.00	-18.81	peak	150	229	
4	2400.000	52.89	-6.27	46.62	54.00	-7.38	AVG	150	103	

Job No.: FRANK2019 #642

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:25:14

EUT: Massage Chair

Engineer Signature:

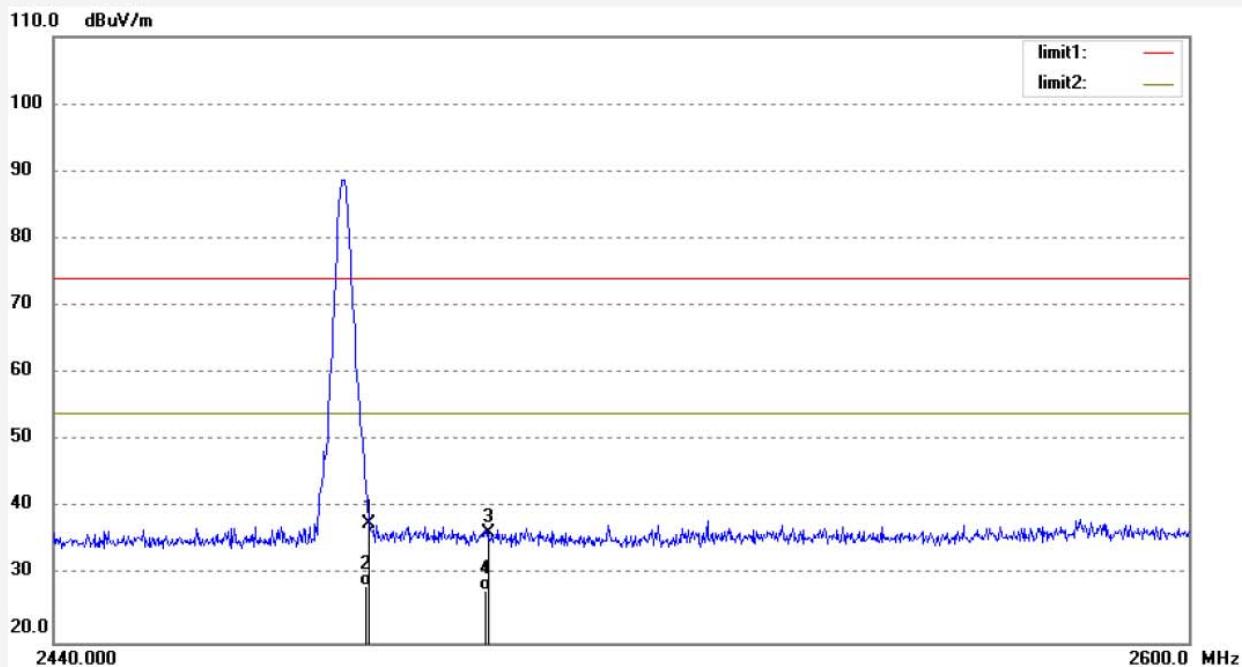
Mode: TX 2480MHz(8DPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	43.54	-5.89	37.65	74.00	-36.35	peak	200	163	
2	2483.500	34.41	-5.89	28.52	54.00	-25.48	AVG	250	95	
3	2500.000	42.22	-5.81	36.41	74.00	-37.59	peak	200	221	
4	2500.000	33.48	-5.81	27.67	54.00	-26.33	AVG	250	103	

Site: 1# Chamber

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Job No.: FRANK2019 #641

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:23:56

EUT: Massage Chair

Engineer Signature:

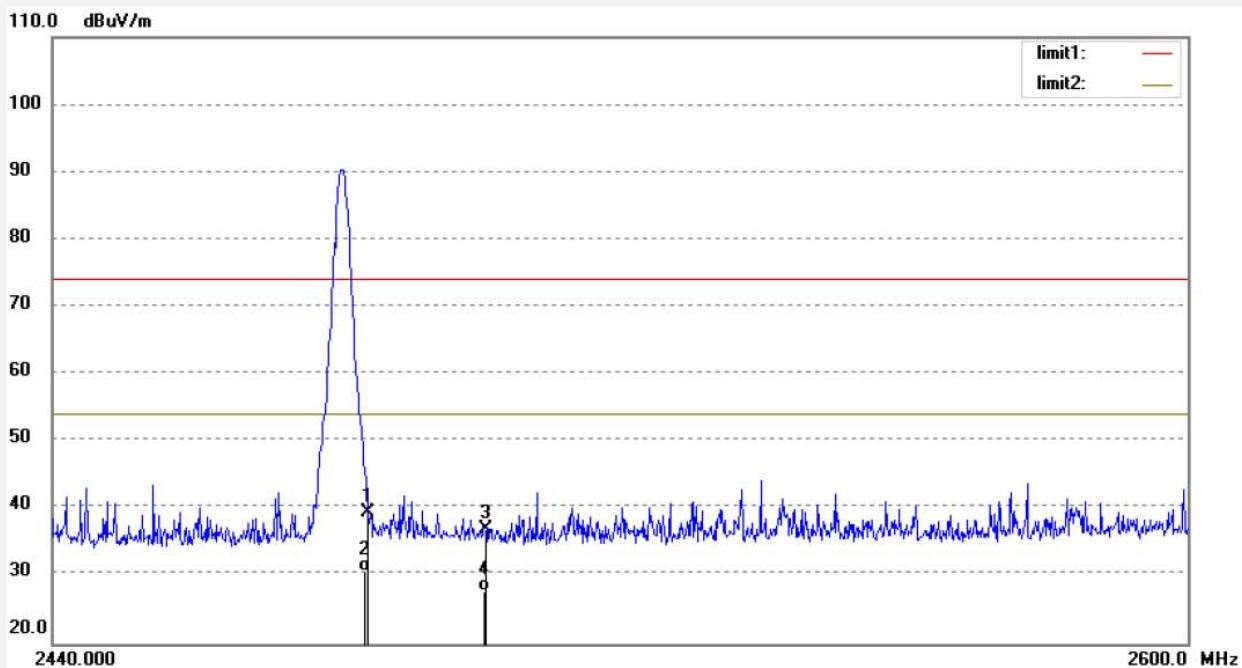
Mode: TX 2480MHz(8DPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	45.45	-5.89	39.56	74.00	-34.44	peak	150	96	
2	2483.500	36.48	-5.89	30.59	54.00	-23.41	AVG	150	112	
3	2500.000	42.83	-5.81	37.02	74.00	-36.98	peak	150	63	
4	2500.000	33.55	-5.81	27.74	54.00	-26.26	AVG	150	103	

hopping mode



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Job No.: FRANK2019 #650

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:39:48

EUT: Massage Chair

Engineer Signature:

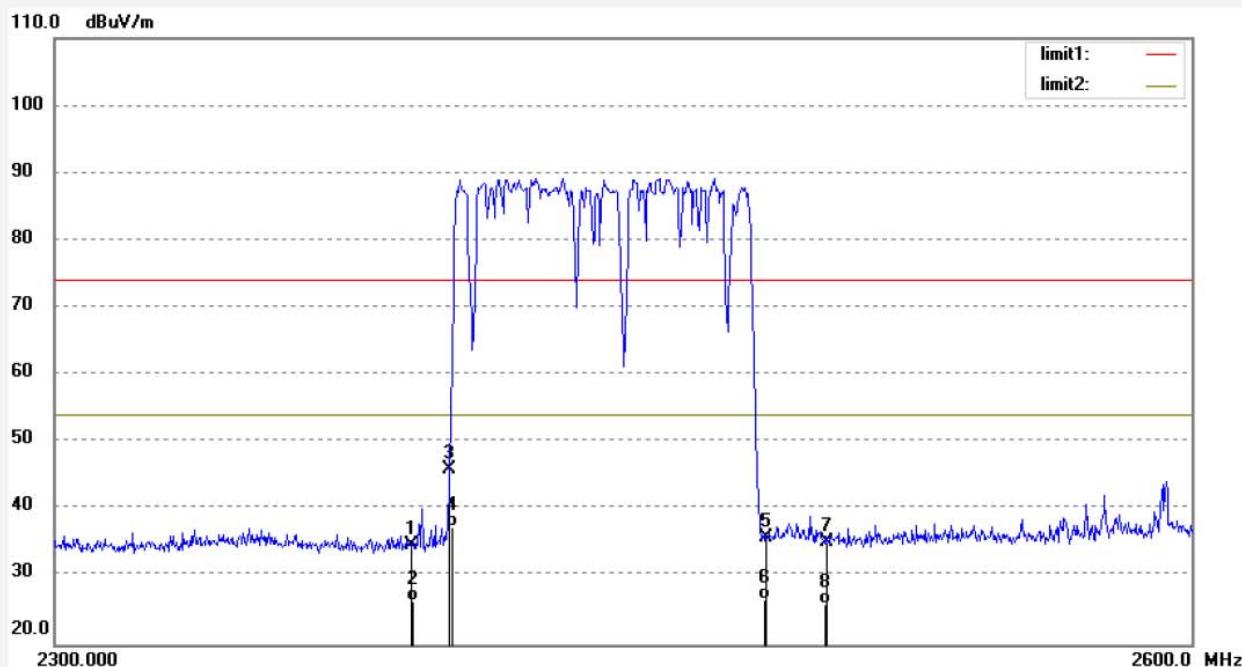
Mode: HOPPING(GFSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	41.08	-6.32	34.76	74.00	-39.24	peak	200	109	
2	2390.000	32.65	-6.32	26.33	54.00	-27.67	AVG	200	335	
3	2400.000	52.28	-6.27	46.01	74.00	-27.99	peak	200	201	
4	2400.000	43.65	-6.27	37.38	54.00	-16.62	AVG	200	119	
5	2483.500	41.83	-5.89	35.94	74.00	-38.06	peak	200	66	
6	2483.500	32.48	-5.89	26.59	54.00	-27.41	AVG	200	200	
7	2500.000	40.98	-5.81	35.17	74.00	-38.83	peak	200	116	
8	2500.000	31.88	-5.81	26.07	54.00	-27.93	AVG	250	302	

Job No.: FRANK2019 #649

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:37:59

EUT: Massage Chair

Engineer Signature:

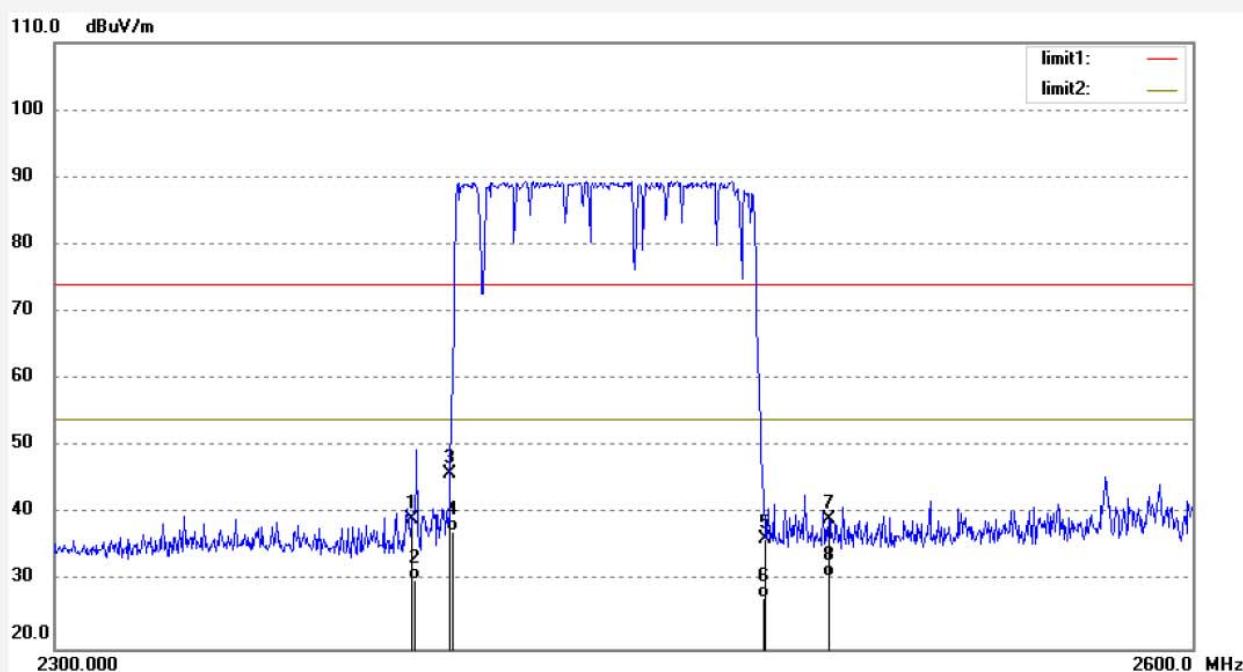
Mode: HOPPING(GFSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	45.50	-6.32	39.18	74.00	-34.82	peak	150	103	
2	2390.000	36.45	-6.32	30.13	54.00	-23.87	AVG	150	52	
3	2400.000	52.22	-6.27	45.95	74.00	-28.05	peak	150	109	
4	2400.000	43.70	-6.27	37.43	54.00	-16.57	AVG	150	331	
5	2483.500	42.20	-5.89	36.31	74.00	-37.69	peak	150	201	
6	2483.500	33.45	-5.89	27.56	54.00	-26.44	AVG	150	96	
7	2500.000	45.09	-5.81	39.28	74.00	-34.72	peak	150	164	
8	2500.000	36.48	-5.81	30.67	54.00	-23.33	AVG	150	50	

Job No.: FRANK2019 #651

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:41:50

EUT: Massage Chair

Engineer Signature:

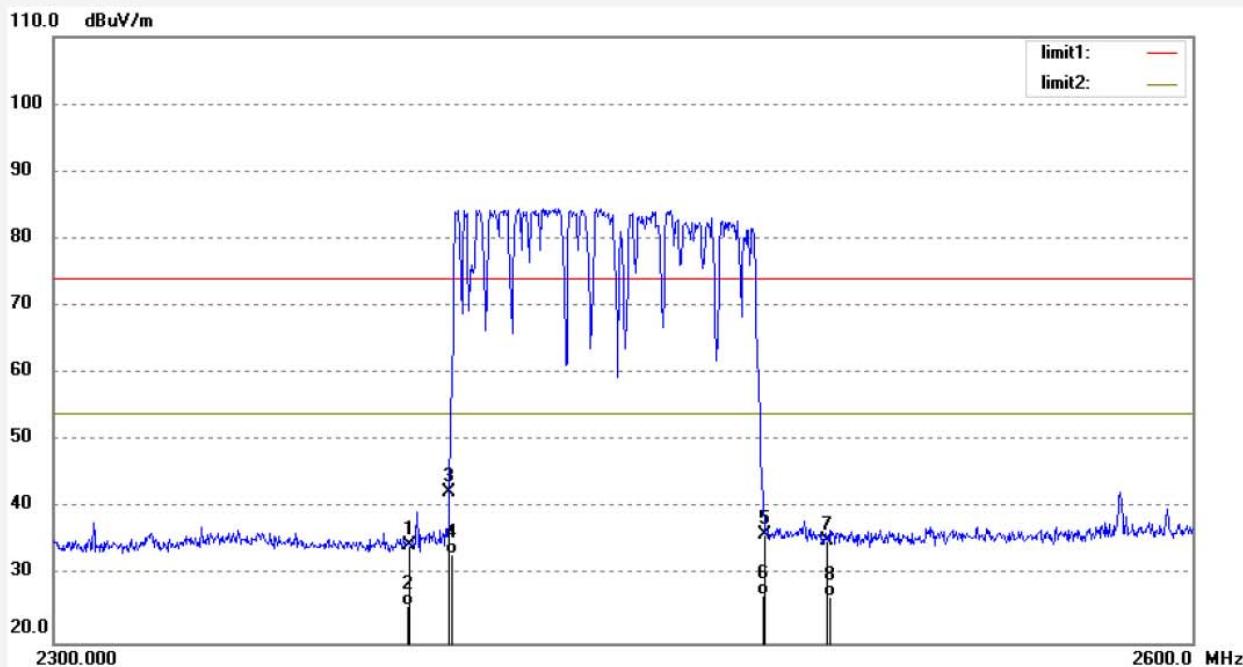
Mode: HOPPING($\pi/4$ DQPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	40.86	-6.32	34.54	74.00	-39.46	peak	200	66	
2	2390.000	31.84	-6.32	25.52	54.00	-28.48	AVG	200	328	
3	2400.000	48.72	-6.27	42.45	74.00	-31.55	peak	200	69	
4	2400.000	39.48	-6.27	33.21	54.00	-20.79	AVG	200	149	
5	2483.500	41.93	-5.89	36.04	74.00	-37.96	peak	200	214	
6	2483.500	32.98	-5.89	27.09	54.00	-26.91	AVG	200	99	
7	2500.000	41.02	-5.81	35.21	74.00	-38.79	peak	200	229	
8	2500.000	32.78	-5.81	26.97	54.00	-27.03	AVG	200	103	

Job No.: FRANK2019 #652

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:43:28

EUT: Massage Chair

Engineer Signature:

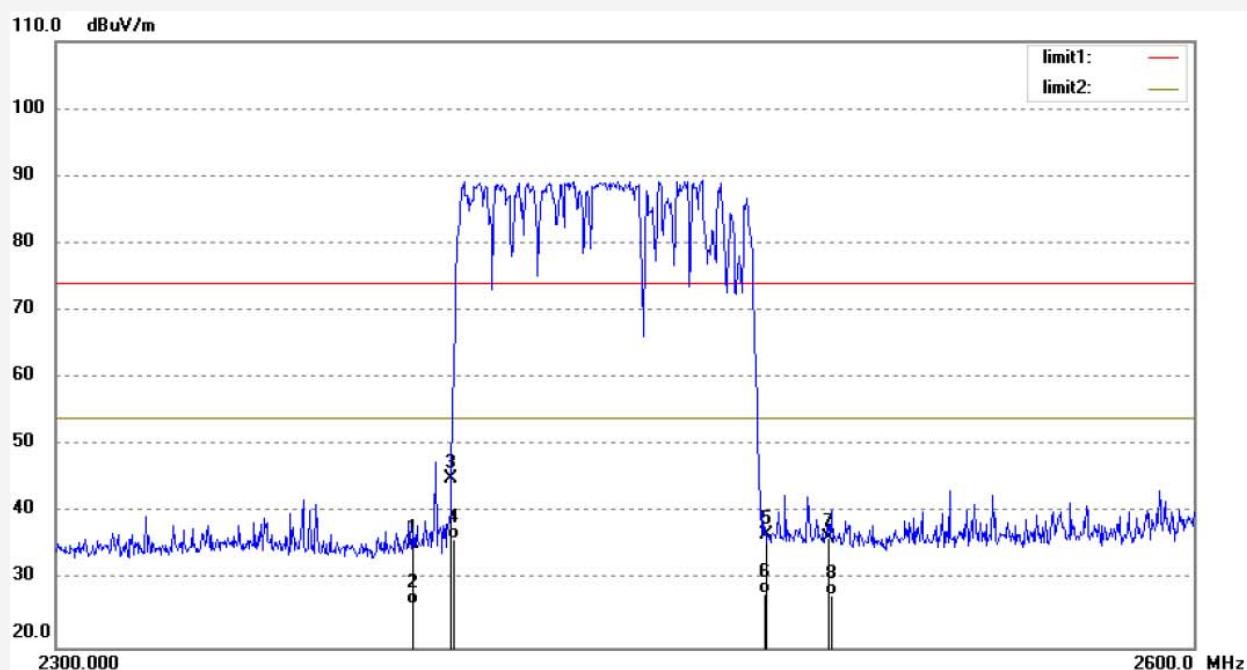
Mode: HOPPING($\pi/4$ DQPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGY GROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	41.67	-6.32	35.35	74.00	-38.65	peak	150	216	
2	2390.000	32.84	-6.32	26.52	54.00	-27.48	AVG	150	93	
3	2400.000	51.29	-6.27	45.02	74.00	-28.98	peak	150	106	
4	2400.000	42.45	-6.27	36.18	54.00	-17.82	AVG	150	219	
5	2483.500	42.59	-5.89	36.70	74.00	-37.30	peak	150	62	
6	2483.500	33.78	-5.89	27.89	54.00	-26.11	AVG	150	119	
7	2500.000	42.06	-5.81	36.25	74.00	-37.75	peak	150	92	
8	2500.000	33.54	-5.81	27.73	54.00	-26.27	AVG	150	103	

Job No.: FRANK2019 #654

Polarization: Horizontal

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:47:15

EUT: Massage Chair

Engineer Signature:

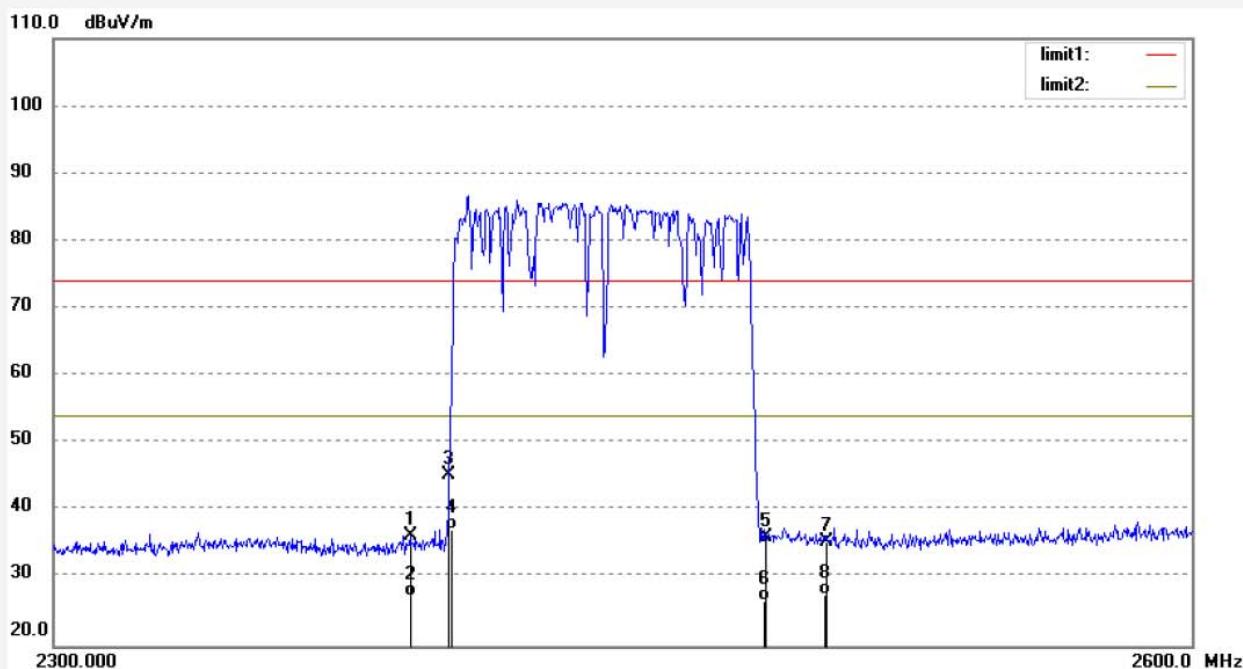
Mode: HOPPING(8DPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGYGROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	42.52	-6.32	36.20	74.00	-37.80	peak	200	187	
2	2390.000	33.54	-6.32	27.22	54.00	-26.78	AVG	200	302	
3	2400.000	51.69	-6.27	45.42	74.00	-28.58	peak	200	119	
4	2400.000	43.49	-6.27	37.22	54.00	-16.78	AVG	200	32	
5	2483.500	41.87	-5.89	35.98	74.00	-38.02	peak	200	352	
6	2483.500	32.54	-5.89	26.65	54.00	-27.35	AVG	200	201	
7	2500.000	41.16	-5.81	35.35	74.00	-38.65	peak	200	221	
8	2500.000	33.45	-5.81	27.64	54.00	-26.36	AVG	200	103	

Job No.: FRANK2019 #653

Polarization: Vertical

Standard: FCC PK

Power Source: AC 120V/60Hz

Test item: Radiation Test

Date: 2019/03/27

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 17:45:34

EUT: Massage Chair

Engineer Signature:

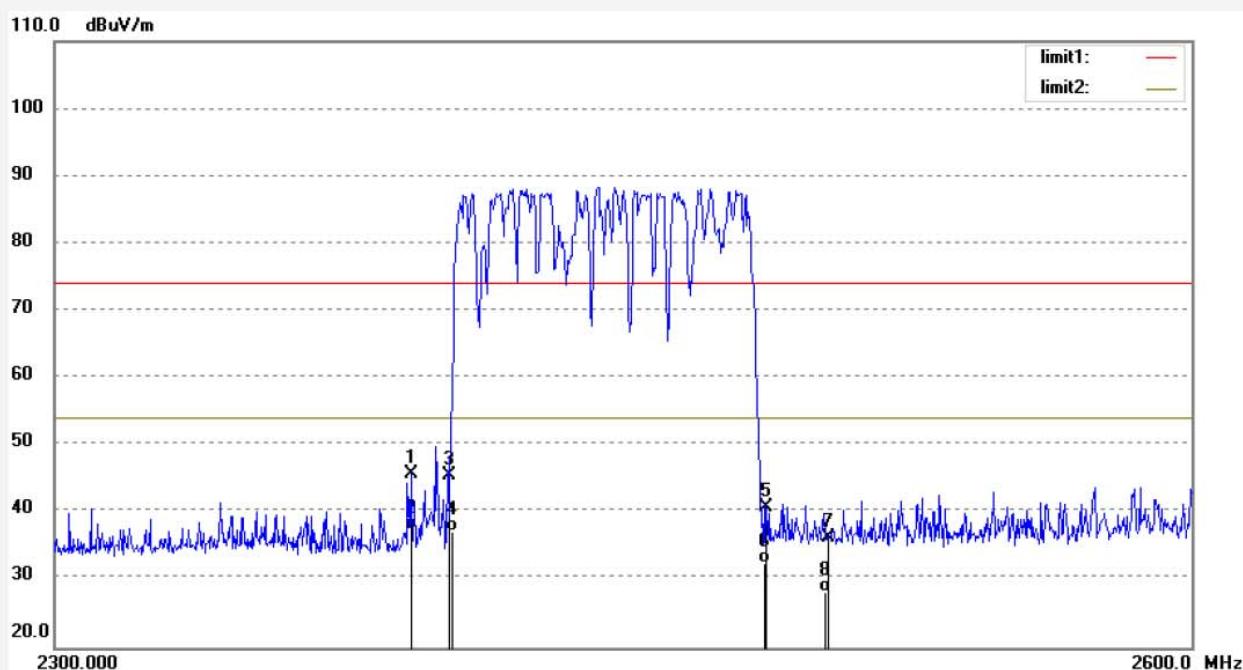
Mode: HOPPING(8DPSK)

Distance: 3m

Model: HUGCHAIR-2000US

Manufacturer: XIAMEN COMFORT SCIENCE&TECHNOLOGYGROUP CO., LTD

Note: Report NO.:ATE20190291



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	52.04	-6.32	45.72	74.00	-28.28	peak	150	103	
2	2390.000	43.78	-6.32	37.46	54.00	-16.54	AVG	150	92	
3	2400.000	51.84	-6.27	45.57	74.00	-28.43	peak	150	116	
4	2400.000	43.49	-6.27	37.22	54.00	-16.78	AVG	150	332	
5	2483.500	46.75	-5.89	40.86	74.00	-33.14	peak	150	210	
6	2483.500	38.48	-5.89	32.59	54.00	-21.41	AVG	150	116	
7	2500.000	42.22	-5.81	36.41	74.00	-37.59	peak	150	66	
8	2500.000	33.97	-5.81	28.16	54.00	-25.84	AVG	150	201	

12.RADIATED EMISSION TEST

12.1.Block Diagram of Test Setup

12.1.1.Block diagram of connection between the EUT and peripherals

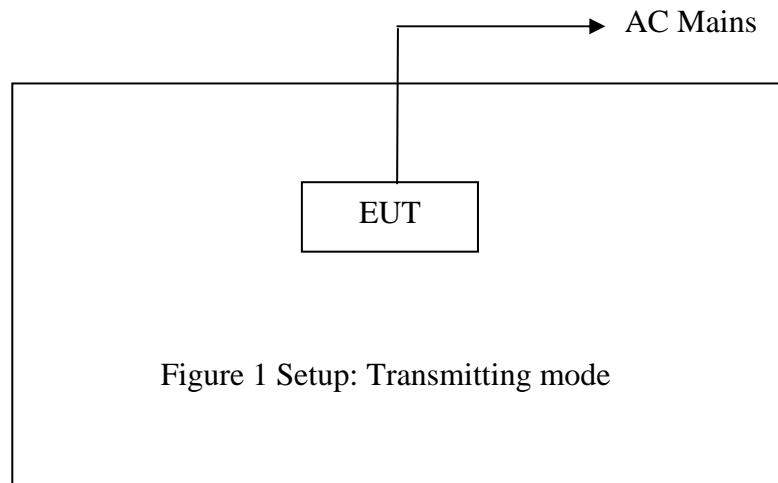
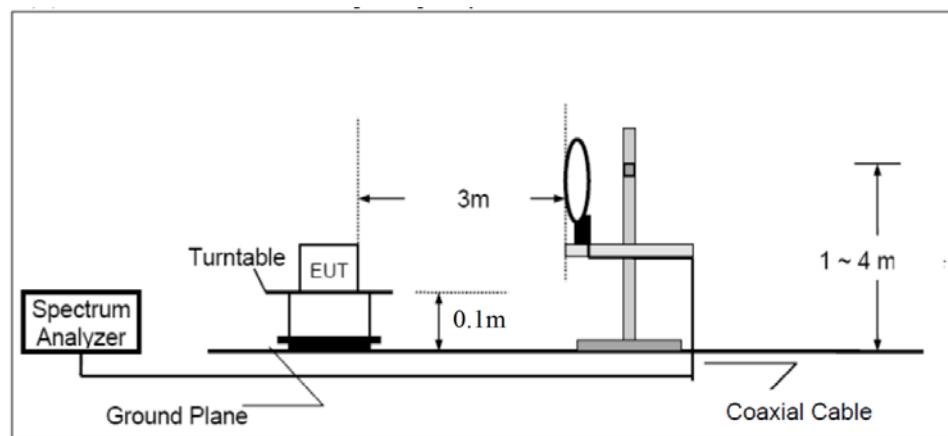


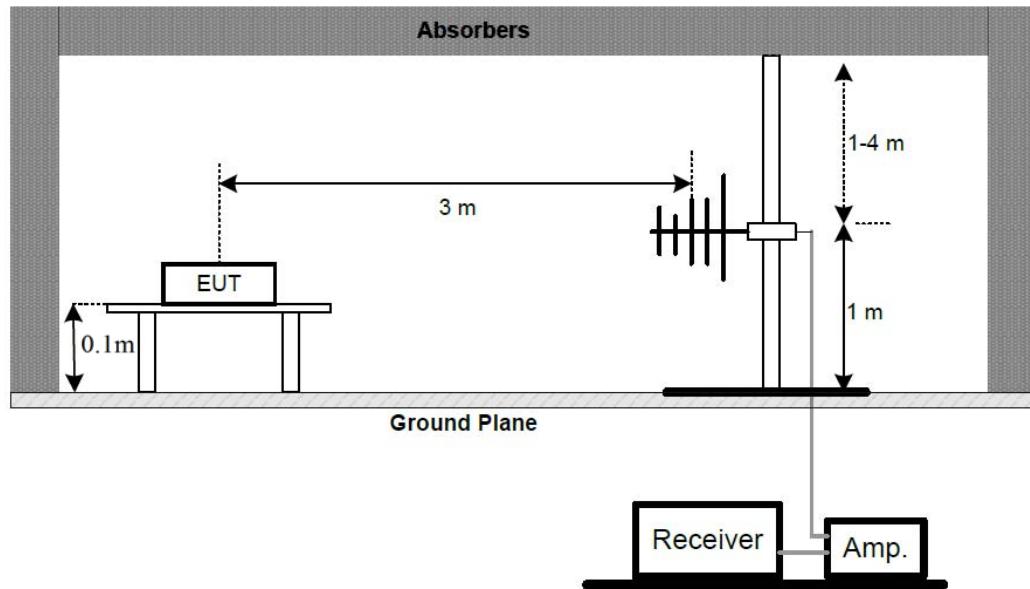
Figure 1 Setup: Transmitting mode

12.1.2.Semi-Anechoic Chamber Test Setup Diagram

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



(B) Radiated Emission Test Set-Up, Frequency below 1GHz



(C) Radiated Emission Test Set-Up, Frequency Above 1GHz

