

TEST REPORT

FCC ID: 2AOFVFS18CS

Product: 2.1CH Soundbar with wired subwoofer

Model No.: FS18CS

**Additional Model No.: FS18A,FS18AS,FS18C,FS68CS,FS68A,
FS68AS,FS68C,FS23CS,FS23A,FS23AS,FS23C,FS21CS,FS21A,
FS21AS,FS21C,FS22CS,FS22A,FS22AS,FS22C,FS62CS,FS62A,
FS62AS,FS62C,SB-2138**

Trade Mark: N/A

Report No.: TCT17171226E012

Issued Date: Dec. 25, 2017

Issued for:

FDY Electronics Limited

**15/F, Liuchuang Building II, No. 29, South Ring Road, South Area Hi-Tech
Zone, Nanshan District, Shenzhen, China**

Issued By:

Shenzhen Tongce Testing Lab.

**1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District,
Shenzhen, Guangdong, China**

TEL: +86-755-27673339

FAX: +86-755-27673332

Note: This report shall not be reproduced except in full, without the written approval of Shenzhen Tongce Testing Lab.

This document may be altered or revised by Shenzhen Tongce Testing Lab. personnel only, and shall be noted in the revision section of the document. The test results in the report only apply to the tested sample.

TABLE OF CONTENTS

1. Test Certification	3
2. Test Result Summary	4
3. EUT Description.....	5
4. Genera Information.....	6
4.1. TEST ENVIRONMENT AND MODE	6
4.2. DESCRIPTION OF SUPPORT UNITS	7
5. Facilities and Accreditations	8
5.1. FACILITIES	8
5.2. LOCATION	8
5.3. MEASUREMENT UNCERTAINTY	8
6. Test Results and Measurement Data	9
6.1. ANTENNA REQUIREMENT.....	9
6.2. CONDUCTED EMISSION	10
6.3. CONDUCTED OUTPUT POWER	14
6.4. 20dB OCCUPY BANDWIDTH	22
6.5. CARRIER FREQUENCIES SEPARATION	30
6.6. HOPPING CHANNEL NUMBER	38
6.7. DWELL TIME.....	41
6.8. PSEUDORANDOM FREQUENCY HOPPING SEQUENCE	48
6.9. CONDUCTED BAND EDGE MEASUREMENT	49
6.10. CONDUCTED SPURIOUS EMISSION MEASUREMENT.....	56
6.11. RADIATED SPURIOUS EMISSION MEASUREMENT	60
7. Appendix A: Photographs of Test Setup	75
8. Appendix B: Photographs of EUT	77

1. Test Certification

Product:	2.1CH Soundbar with wired subwoofer
Model No.:	FS18CS
Additional Model:	FS18A,FS18AS,FS18C,FS68CS,FS68A,FS68AS,FS68C,FS23CS,FS23A,FS23AS,FS23C,FS21CS,FS21A,FS21AS,FS21C,FS22CS,FS22A,FS22AS,FS22C,FS62CS,FS62A,FS62AS,FS62C,SB-2138
Applicant:	FDY Electronics Limited
Address:	15/F, Liuchuang Building II, No. 29, South Ring Road, South Area Hi-Tech Zone, Nanshan District, Shenzhen, China
Manufacturer:	FDY Electronics Limited
Address:	15/F, Liuchuang Building II, No. 29, South Ring Road, South Area Hi-Tech Zone, Nanshan District, Shenzhen, China
Date of Test:	Dec. 02 –Dec. 22, 2017
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Beryl Zhao

Date:

Dec. 22, 2017

Reviewed By:



Tomsin

Date:

Dec. 25, 2017

Approved By:

Date:

Dec. 25, 2017

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(1) §2.1046	PASS
20dB Occupied Bandwidth	§15.247 (a)(1) §2.1049	PASS
Carrier Frequencies Separation	§15.247 (a)(1)	PASS
Hopping Channel Number	§15.247 (a)(1)	PASS
Dwell Time	§15.247 (a)(1)	PASS
Radiated Emission	§15.205/§15.209 §2.1053, §2.1057	PASS
Band Edge	§15.247(d) §2.1051, §2.1057	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product Name:	2.1CH Soundbar with wired subwoofer
Model :	FS18CS
Additional Model:	FS18A,FS18AS,FS18C,FS68CS,FS68A,FS68AS,FS68C,FS23CS,FS23A,FS23AS,FS23C,FS21CS,FS21A,FS21AS,FS21C,FS22CS,FS22A,FS22AS,FS22C,FS62CS,FS62A,FS62AS,FS62C,SB-2138
Trade Mark:	N/A
Bluetooth version :	3.0
Operation Frequency:	2402-2480MHz
Transfer Rate:	1Mbps, 2Mbps,3Mbps
Number of Channel:	79
Modulation Type:	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Modulation Technology:	FHSS
Antenna Type:	PCB Antenna
Antenna Gain:	0dBi
Power Supply:	AC 120V 60Hz

Operation Frequency each of channel for GFSK, $\pi/4$ -DQPSK, 8DPSK

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
...	...	...	...	...	...	...	...
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
...	...	...	...	...	...	...	...
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz	-	
Remark: Channel 0, 39 & 78 have been tested for GFSK, π/4-DQPSK, 8DPSK modulation mode.							

4. General Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations with Fully-charged battery
The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Modulation type	Mode
1Mbps	Mode 1、Mode 2、Mode 3、Mode 4
2Mbps	
3Mbps	

Pretest Mode	Description
Mode 1	CH00
Mode 2	CH39
Mode 3	CH78
Mode 4	Normal Hopping

For Conducted Emission	
Final Test Mode	Description
Mode 4	Normal Hopping

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH00
Mode 2	CH39
Mode 3	CH78
Mode 4	Normal Hopping

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The data rate was set in 1Mbps, 2 Mbps, 3 Mbps for radiated emission due to the highest RF output power.
- (3) Record the worst case of each test item in this report.

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

Tel: 86-755-27673339

5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^{\circ}\text{C}$
7	Humidity	$\pm 1.0\%$

6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:

FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

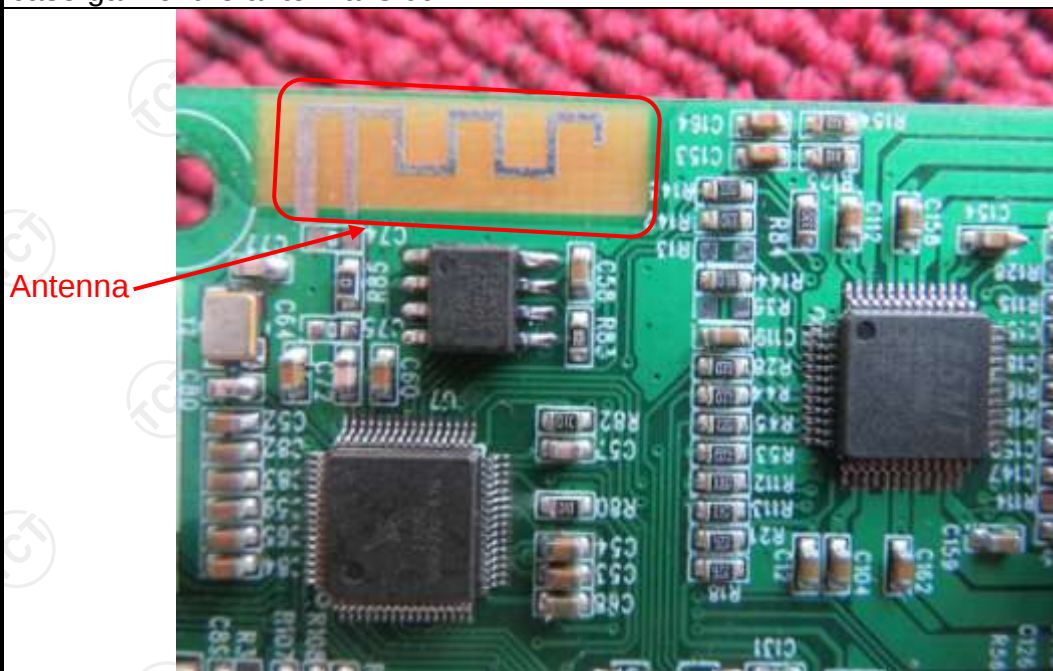
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

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

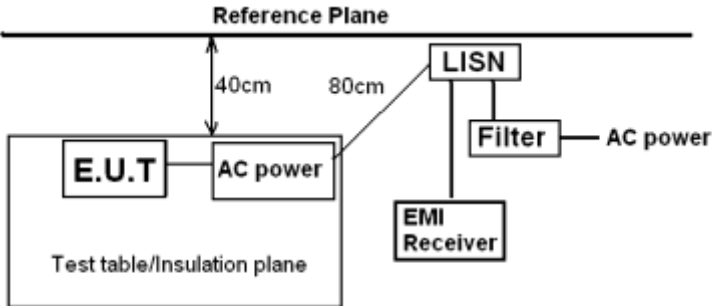
E.U.T Antenna:

The Bluetooth antenna is a PCB antenna which permanently attached, and the best case gain of the antenna is 0dBi.



6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Setup:	Reference Plane  Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m														
Test Mode:	Refer to item 4.1														
Test Procedure:	1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.														
Test Result:	PASS														

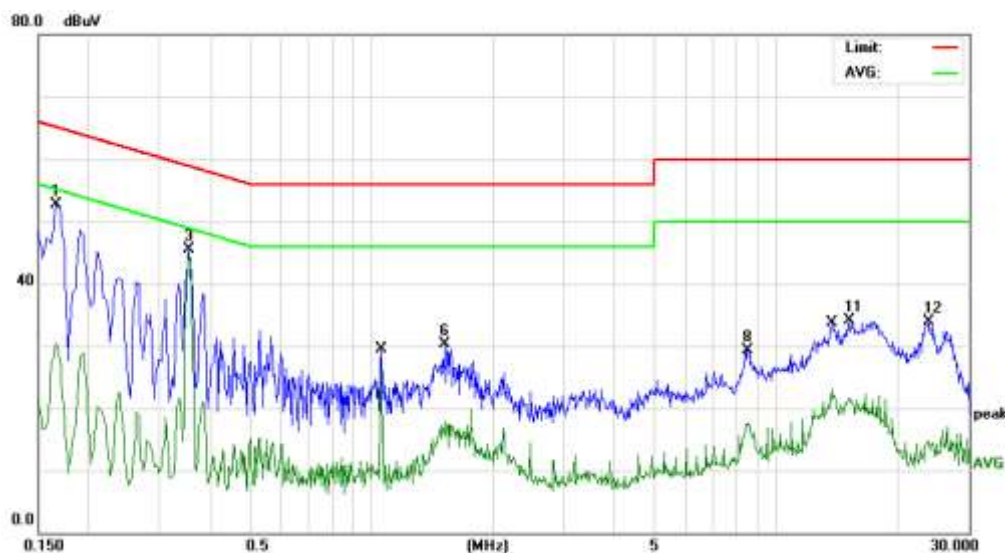
6.2.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.2.3. Test data

Please refer to following diagram for individual
Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector
1		0.1660	42.17	10.44	52.61	65.15	-12.54	peak
2		0.1660	20.11	10.44	30.55	55.15	-24.60	AVG
3		0.3540	35.13	10.42	45.55	58.87	-13.32	peak
4	*	0.3540	34.42	10.42	44.84	48.87	-4.03	AVG
5		1.0580	15.75	10.34	26.09	46.00	-19.91	AVG
6		1.5140	20.08	10.31	30.39	56.00	-25.61	peak
7		1.5140	7.58	10.31	17.89	46.00	-28.11	AVG
8		8.5099	19.19	10.20	29.39	60.00	-30.61	peak
9		8.5499	7.45	10.20	17.65	50.00	-32.35	AVG
10		13.7659	12.93	10.16	23.09	50.00	-26.91	AVG
11		15.1779	24.00	10.15	34.15	60.00	-25.85	peak
12		23.8819	23.83	10.10	33.93	60.00	-26.07	peak

Note:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

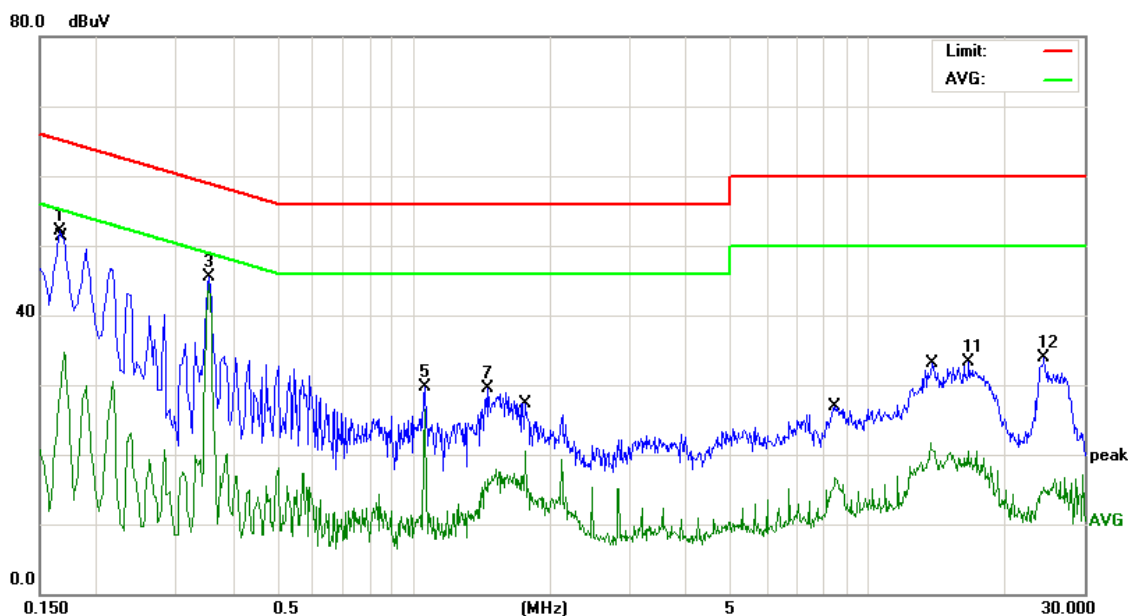
Margin (dB) = Measurement (dBμV) – Limits (dBμV)

Q.P. =Quasi-Peak

AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector
1		0.1660	41.57	10.44	52.01	65.15	-13.14	peak
2		0.1700	24.28	10.44	34.72	54.96	-20.24	AVG
3		0.3540	35.09	10.42	45.51	58.87	-13.36	peak
4	*	0.3540	34.12	10.42	44.54	48.87	-4.33	AVG
5		1.0580	19.31	10.34	29.65	56.00	-26.35	peak
6		1.0580	16.16	10.34	26.50	46.00	-19.50	AVG
7		1.4620	19.20	10.32	29.52	56.00	-26.48	peak
8		1.7660	10.27	10.30	20.57	46.00	-25.43	AVG
9		8.4819	6.53	10.20	16.73	50.00	-33.27	AVG
10		13.7659	11.48	10.16	21.64	50.00	-28.36	AVG
11		16.7219	23.15	10.14	33.29	60.00	-26.71	peak
12		24.4740	23.74	10.10	33.84	60.00	-26.16	peak

Note1:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

Margin (dB) = Measurement (dBμV) – Limits (dBμV)

Q.P. =Quasi-Peak AVG =average

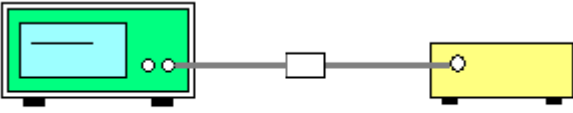
* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

Note2:

Measurements were conducted in all three channels (high, middle, low) and three modulation (GFSK, Pi/4 DQPSK, 8DPSK), and the worst case Mode (Lowest channel and GFSK) was submitted only.

6.3. Conducted Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013
Limit:	Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (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.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
Test Result:	PASS

6.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

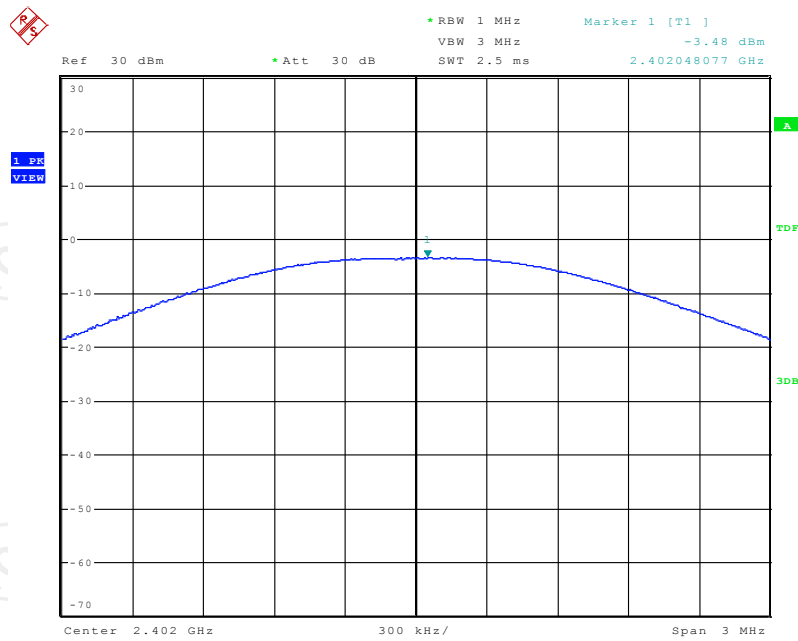
GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-3.48	30	PASS
Middle	-2.84	30	PASS
Highest	-2.83	30	PASS

Pi/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-5.00	20.97	PASS
Middle	-3.79	20.97	PASS
Highest	-3.96	20.97	PASS

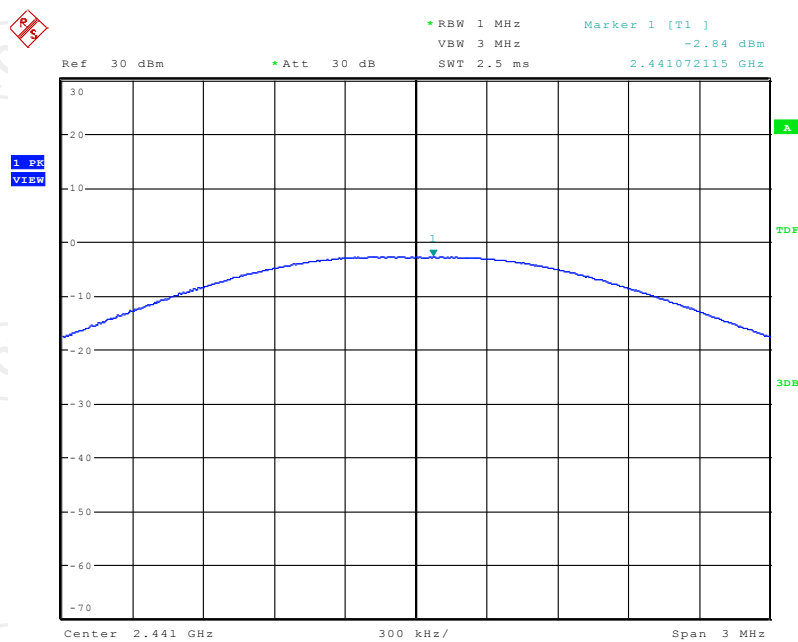
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-5.00	20.97	PASS
Middle	-3.81	20.97	PASS
Highest	-4.04	20.97	PASS

Test plots as follows:

Lowest channel



Middle channel



Highest channel



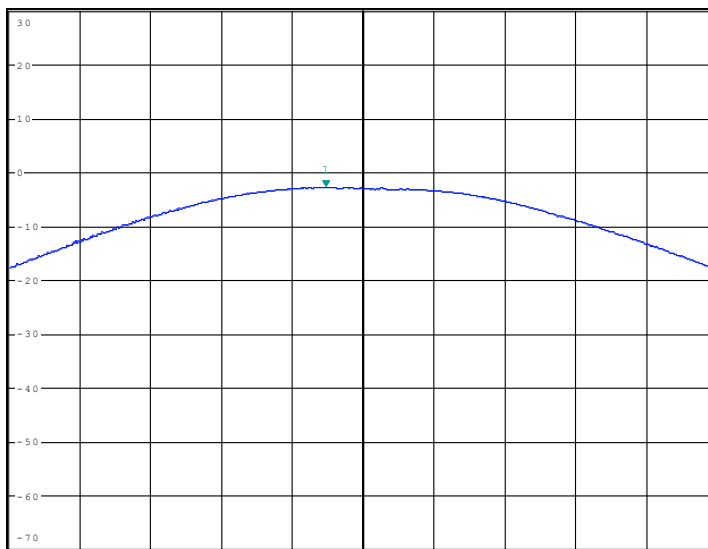
RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms

Marker 1 [T1]
-2.83 dBm
2.479841346 GHz

Ref 30 dBm

Att 30 dB

1 PK
V:2V

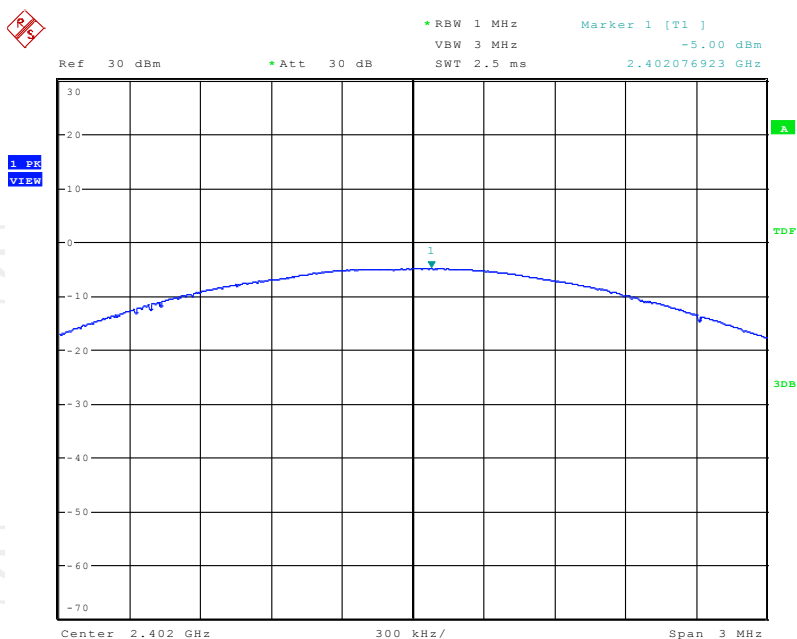


Center 2.48 GHz

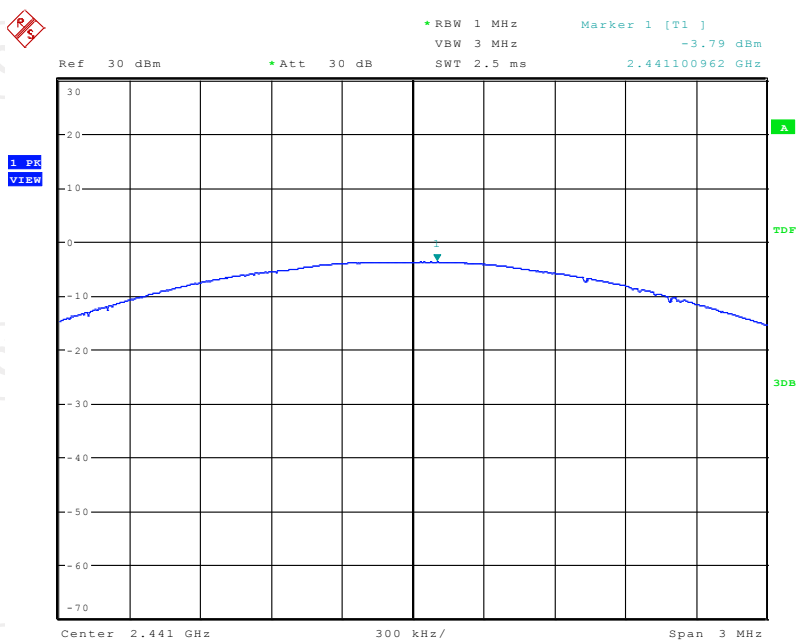
300 kHz /

Span 3 MHz

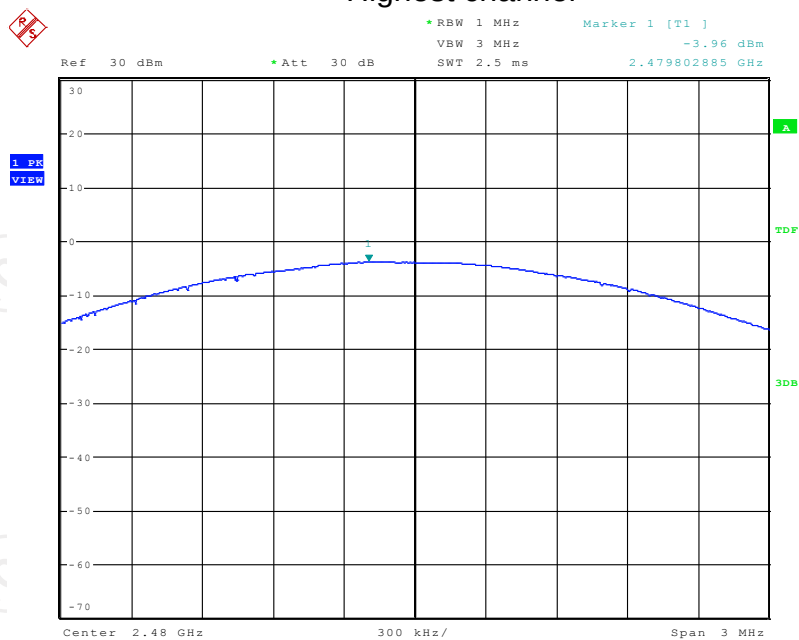
Lowest channel



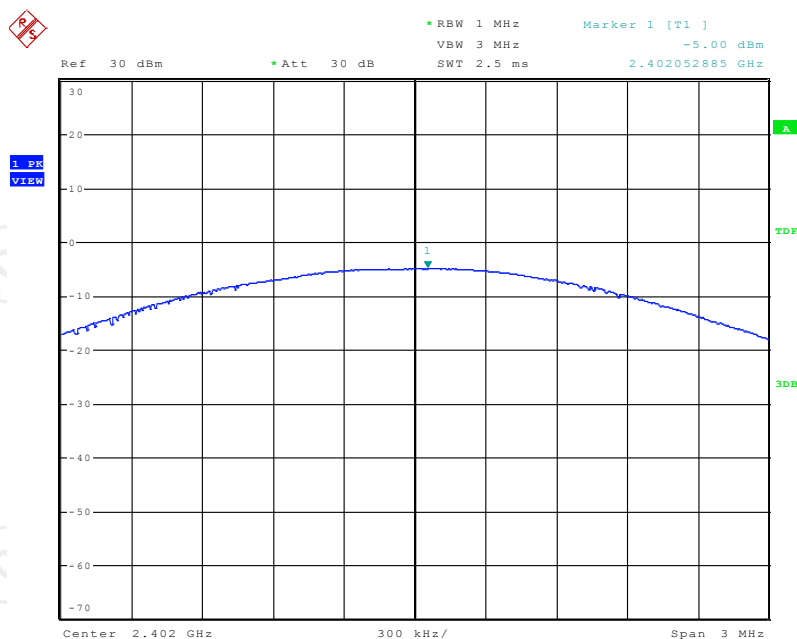
Middle channel



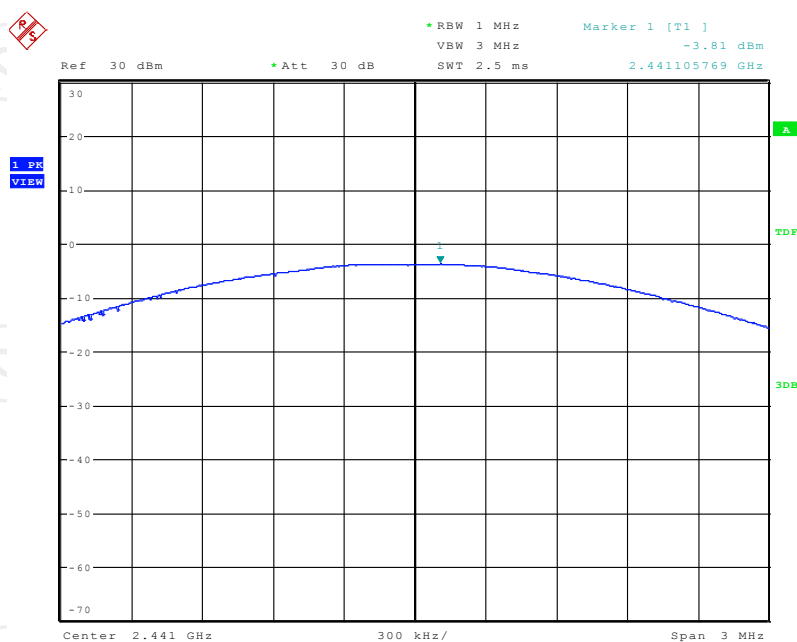
Highest channel



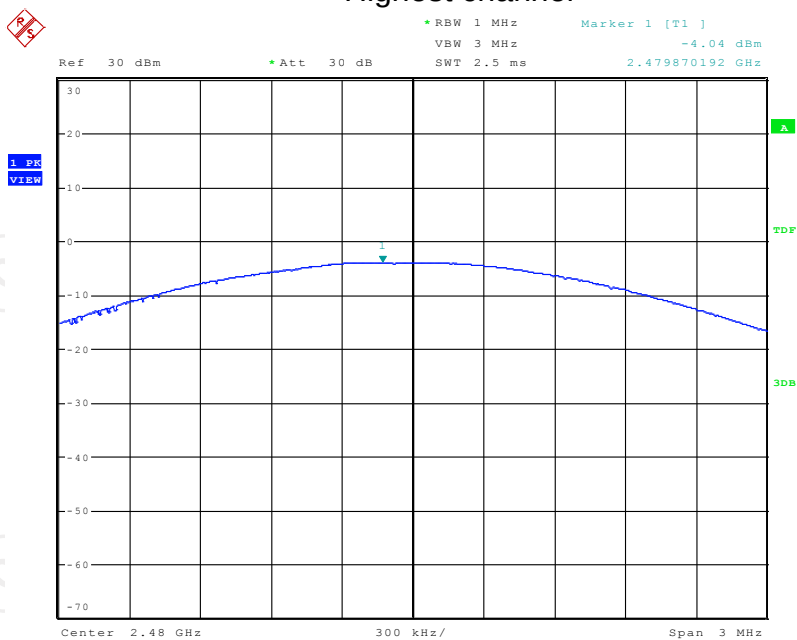
Lowest channel



Middle channel

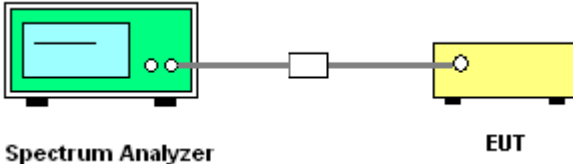


Highest channel



6.4. 20dB Occupancy Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows ANSI C63.10:2013 Measurement Guidelines. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel; $1\% \leq RBW \leq 5\%$ of the 20 dB bandwidth; $VBW \geq 3RBW$; Sweep = auto; Detector function = peak; Trace = max hold. 5. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

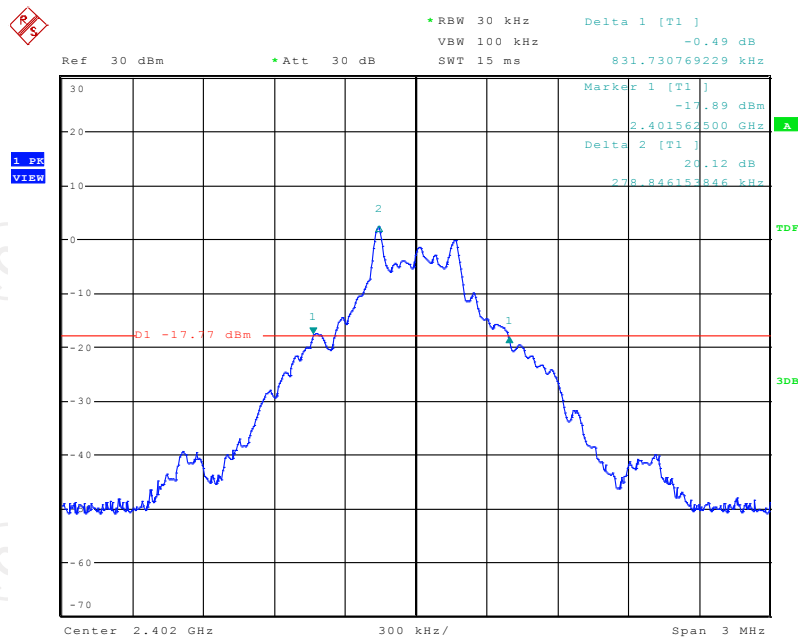
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.4.3. Test data

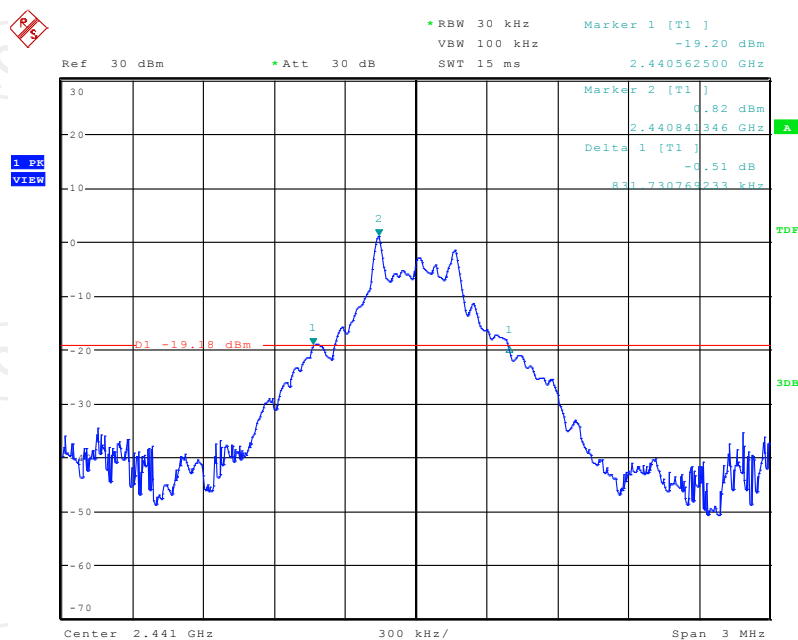
Test channel	20dB Occupy Bandwidth (kHz)			
	GFSK	$\pi/4$ -DQPSK	8DPSK	Conclusion
Lowest	832	1139	1135	PASS
Middle	832	1139	1139	PASS
Highest	832	1135	1130	PASS

Test plots as follows:

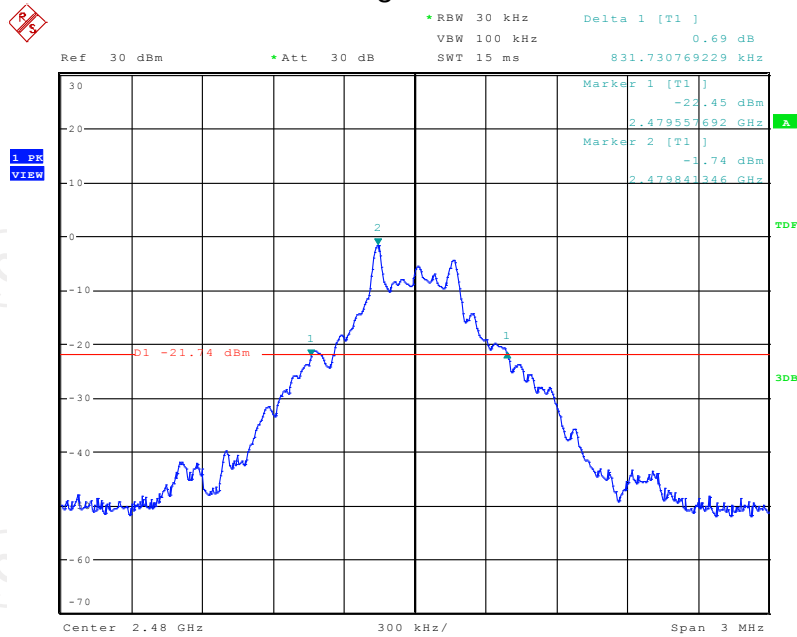
Lowest channel



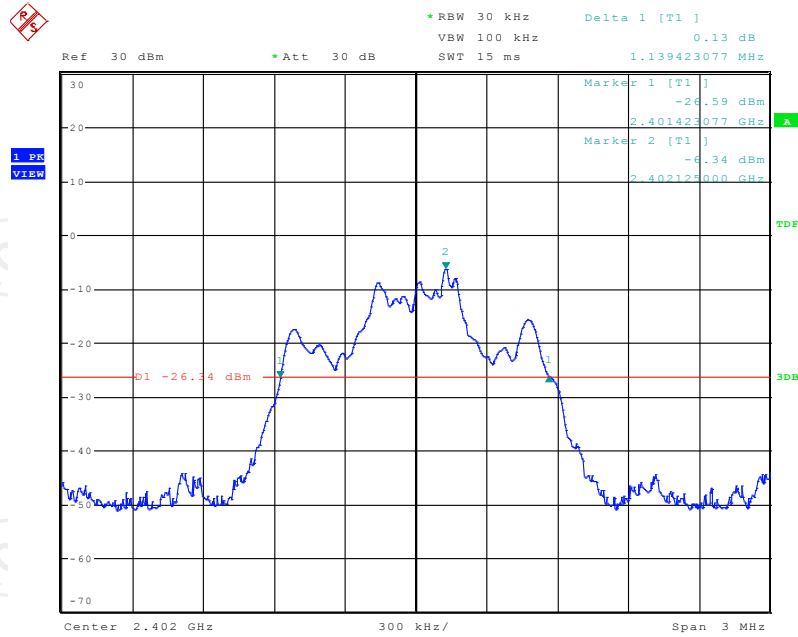
Middle channel



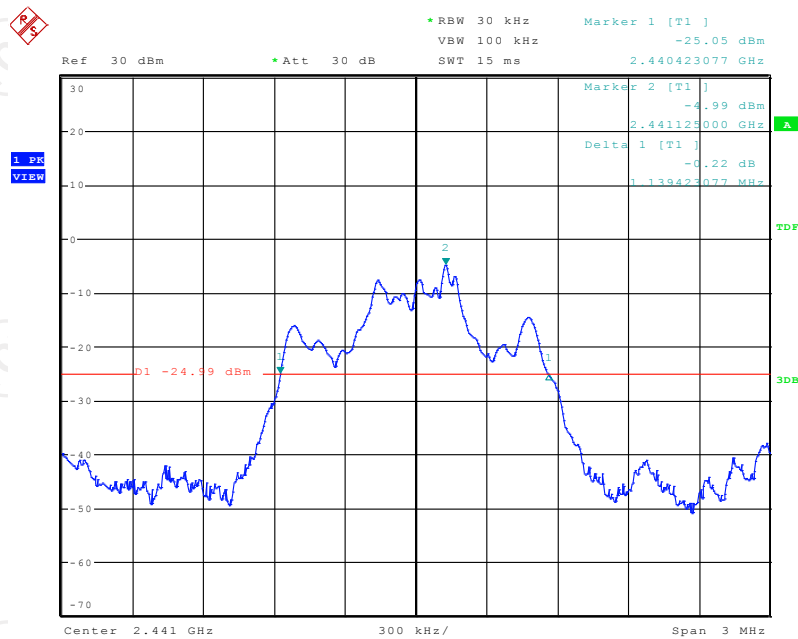
Highest channel



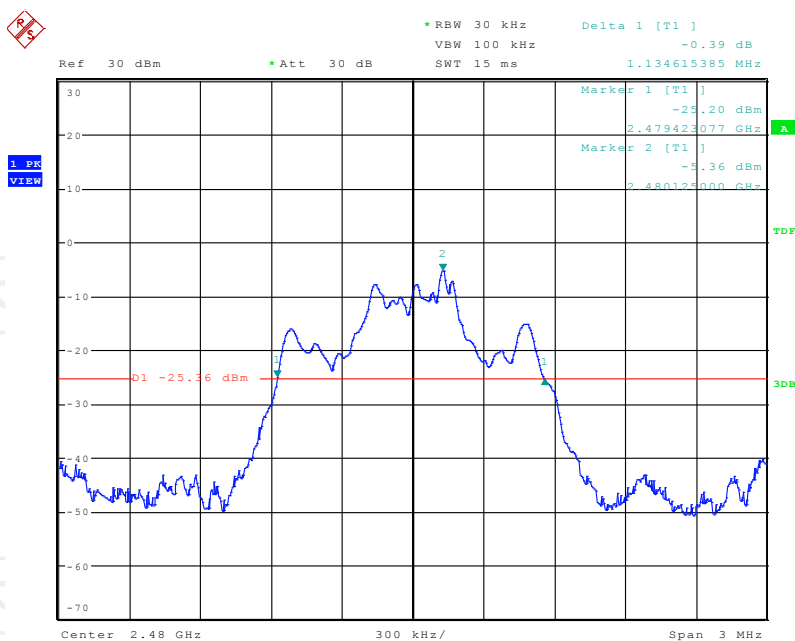
Lowest channel



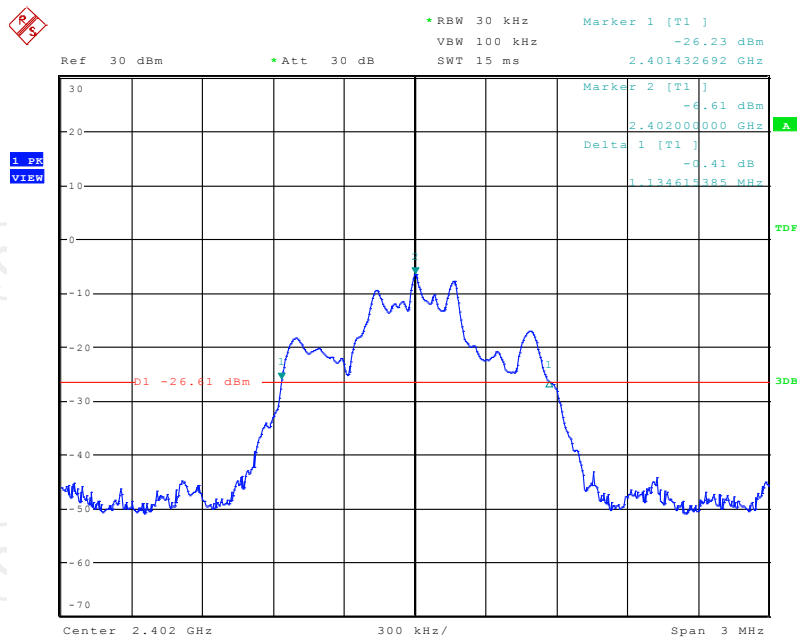
Middle channel



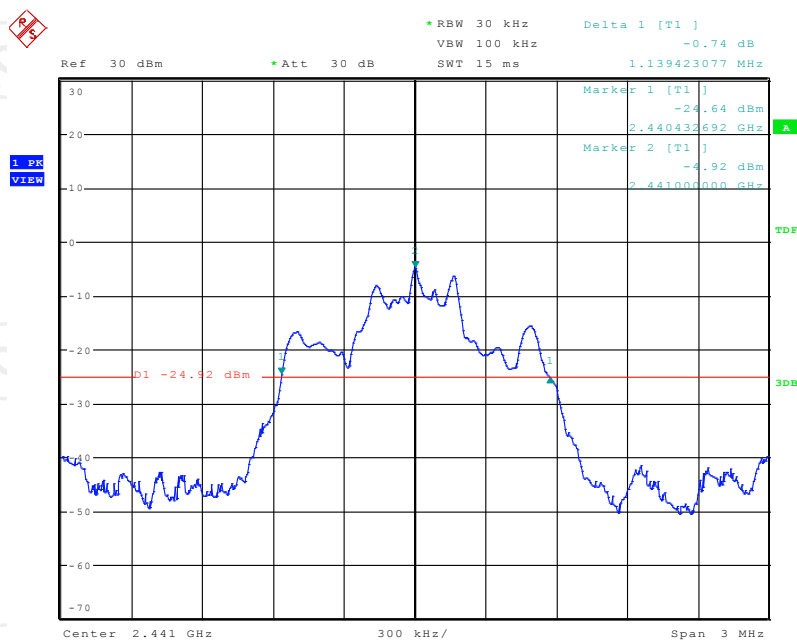
Highest channel



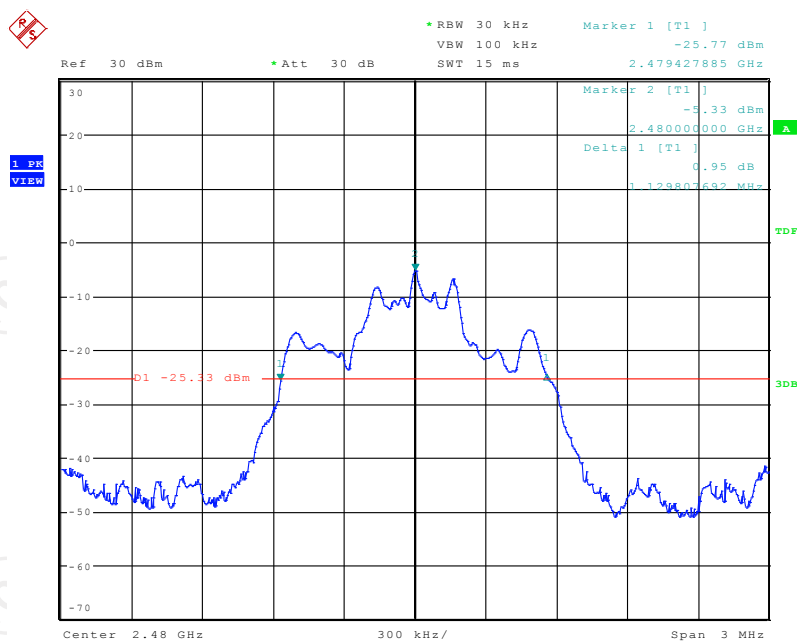
Lowest channel



Middle channel

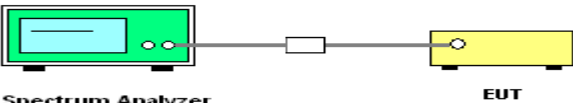


Highest channel



6.5. Carrier Frequencies Separation

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Limit:	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.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	1. The testing follows ANSI C63.10:2013 Measurement Guidelines. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Enable the EUT hopping function. 5. Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels; RBW is set to approximately 30% of the channel spacing, adjust as necessary to best identify the center of each individual channel; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold. 6. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Record the value in report.
Test Result:	PASS

6.5.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.5.3. Test data

GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	832	PASS
Middle	1003	832	PASS
Highest	1000	832	PASS

Pi/4 DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	759	PASS
Middle	1000	759	PASS
Highest	1000	759	PASS

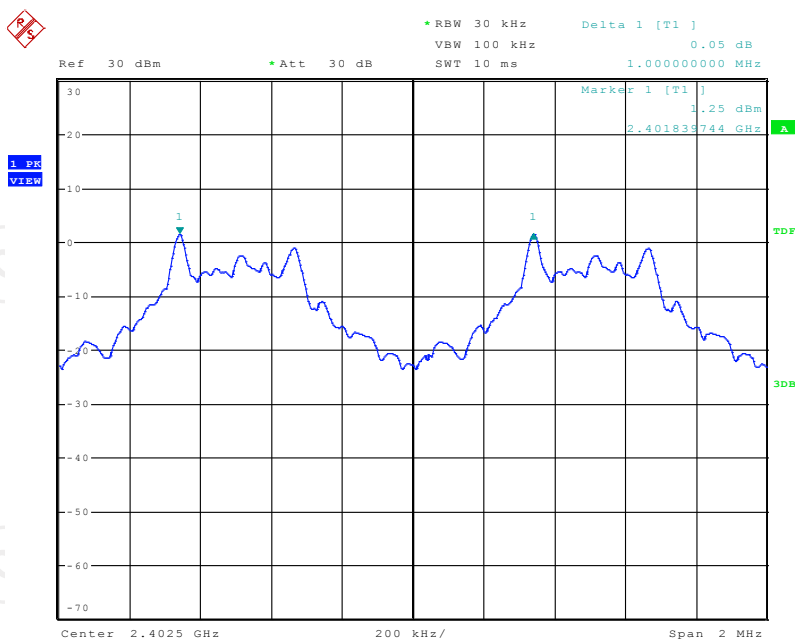
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	759	PASS
Middle	1003	759	PASS
Highest	1003	759	PASS

Note: According to section 6.4

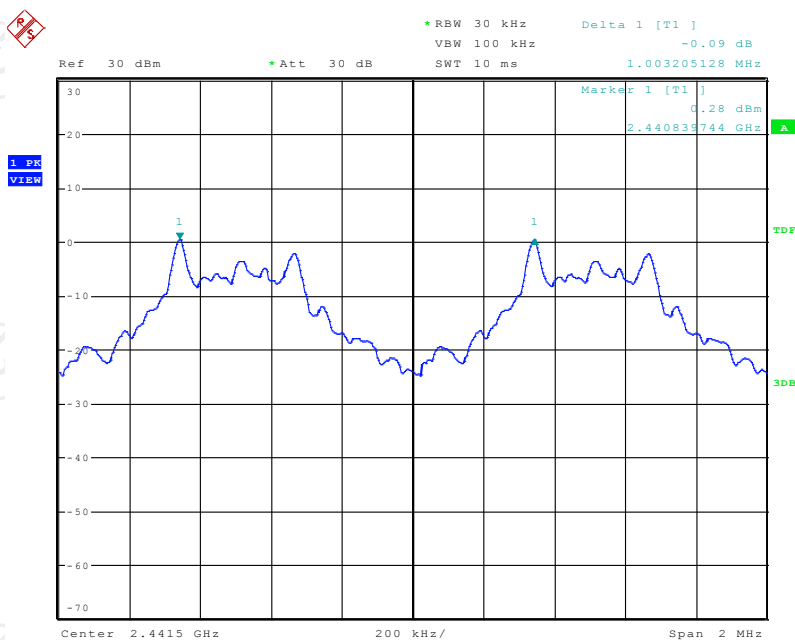
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	832	832
$\pi/4$ -DQPSK	1139	759
8DPSK	1139	759

Test plots as follows:

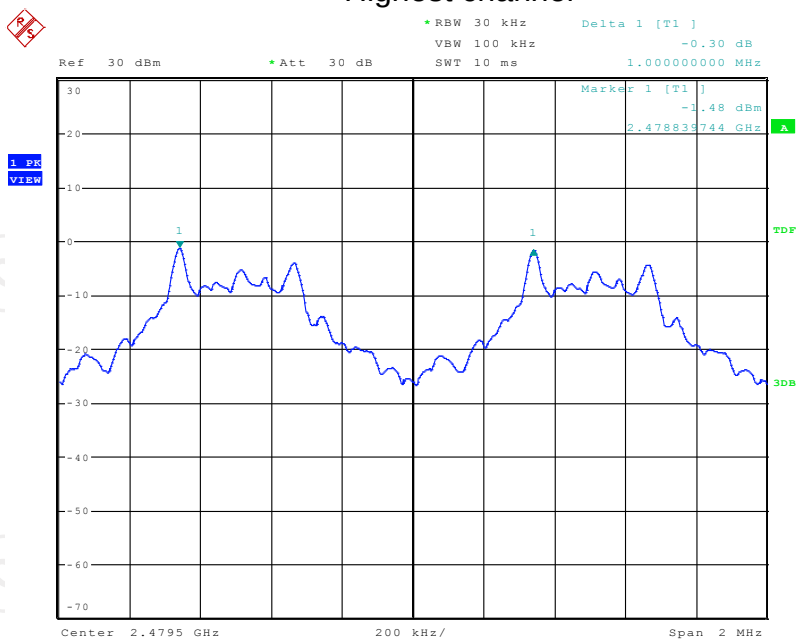
Lowest channel



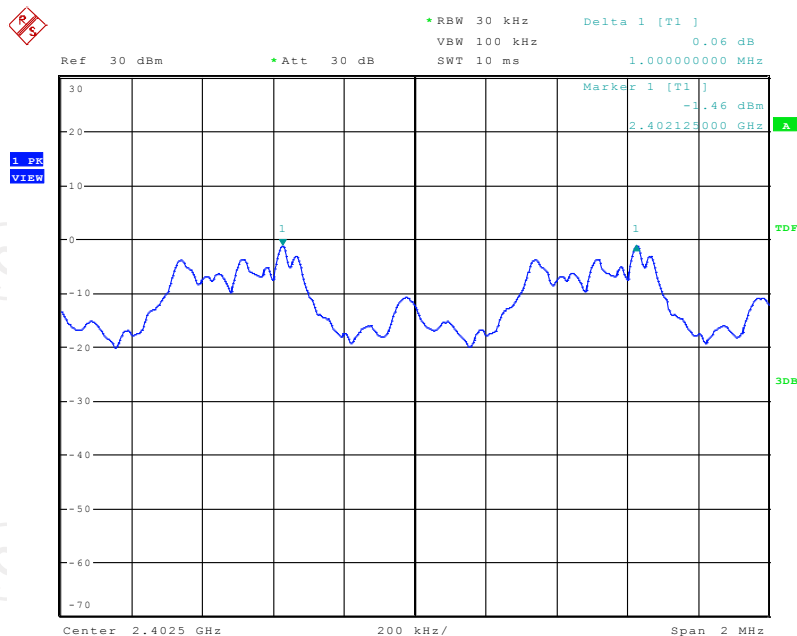
Middle channel



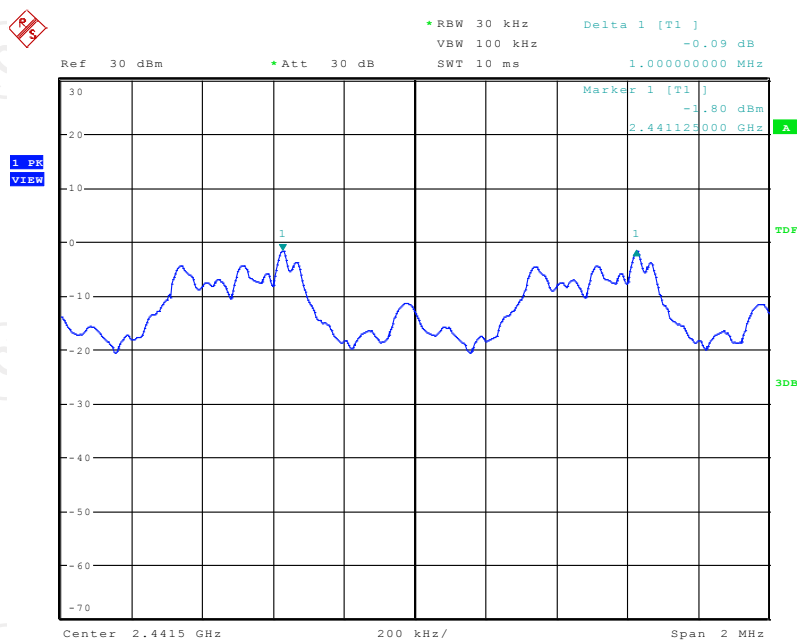
Highest channel



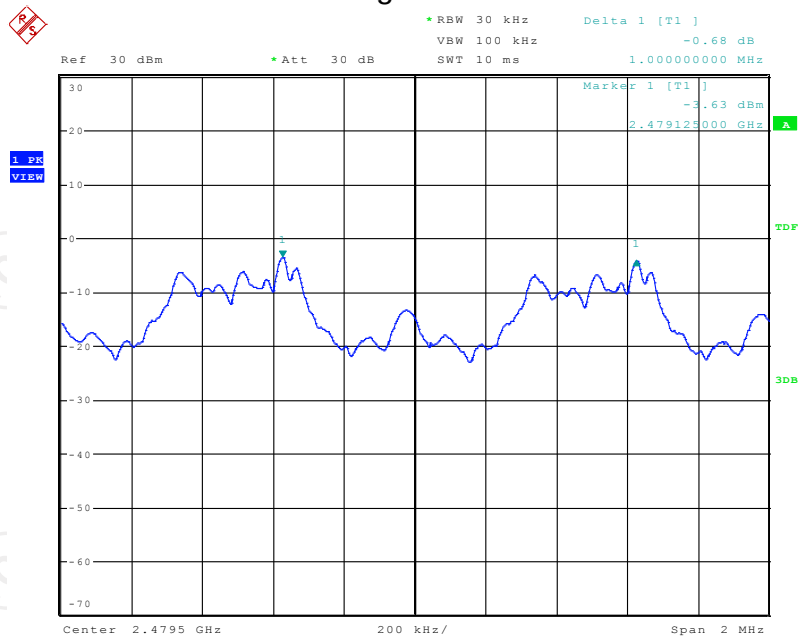
Lowest channel



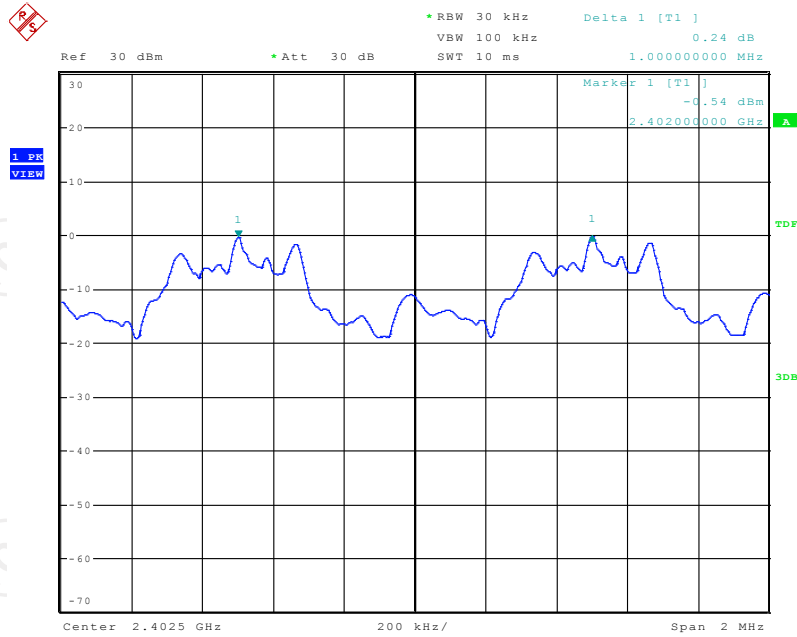
Middle channel



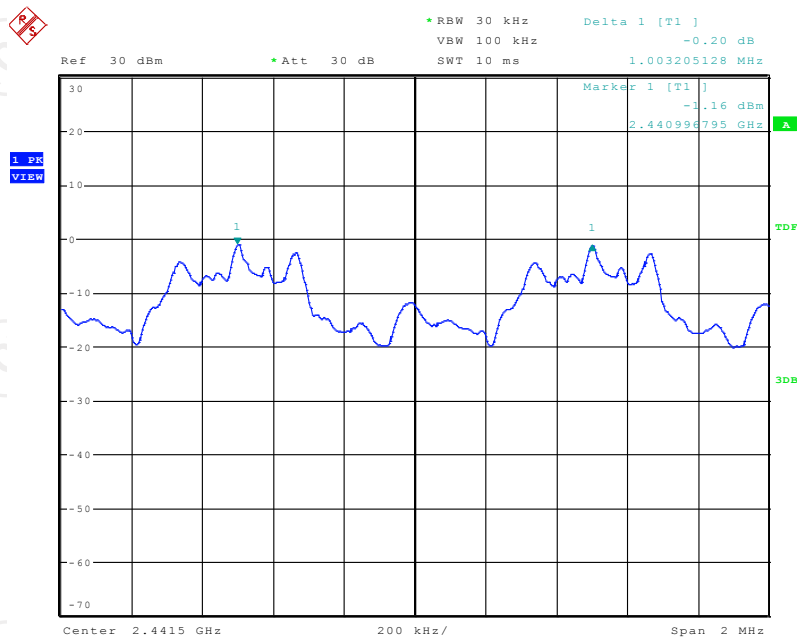
Highest channel



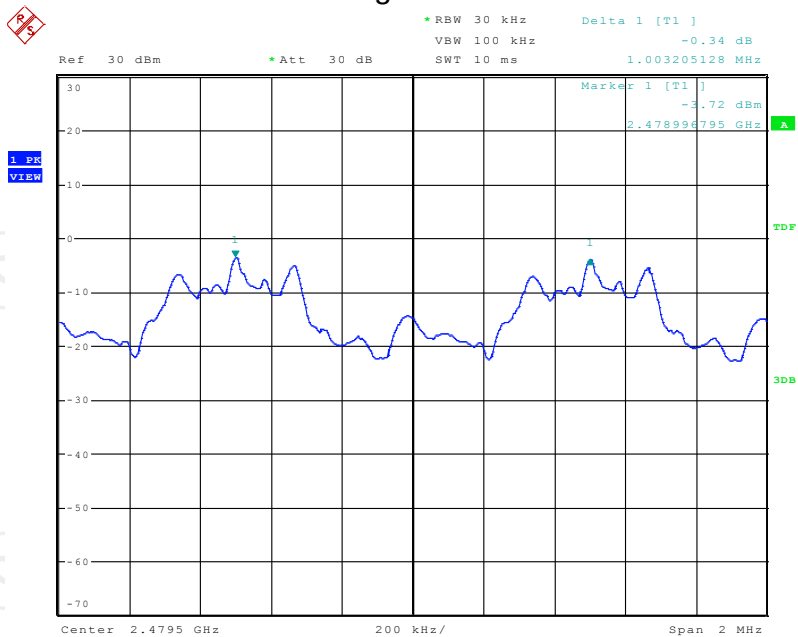
Lowest channel



Middle channel

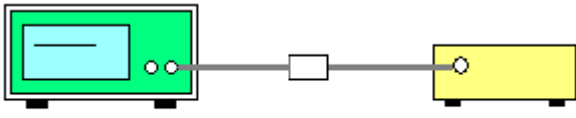


Highest channel



6.6. Hopping Channel Number

6.6.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Limit:	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	1. The testing follows ANSI C63.10:2013 Measurement Guidelines. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Enable the EUT hopping function. 5. Use the following spectrum analyzer settings: Span = the frequency band of operation; set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold. 6. The number of hopping frequency used is defined as the number of total channel. 7. Record the measurement data in report.
Test Result:	PASS

6.6.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

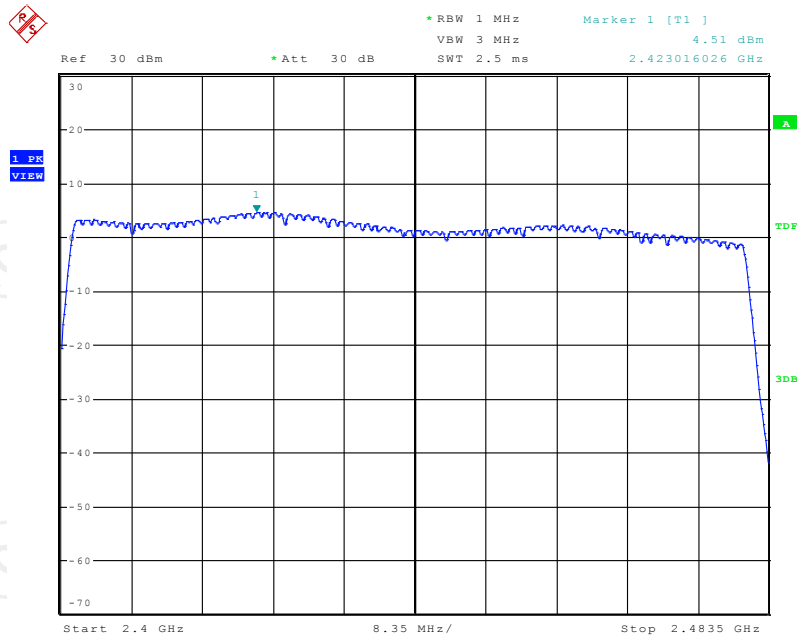
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.6.3. Test data

Mode	Hopping channel numbers	Limit	Result
GFSK, P/4-DQPSK, 8DPSK	79	15	PASS

Test plots as follows:

GFSK



6.7. Dwell Time

6.7.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Limit:	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.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	1. The testing follows ANSI C63.10:2013 Measurement Guidelines. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Enable the EUT hopping function. 5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; 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; VBW $\geq$ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold. 6. Measure and record the results in the test report.
Test Result:	PASS

6.7.2. Test Instruments

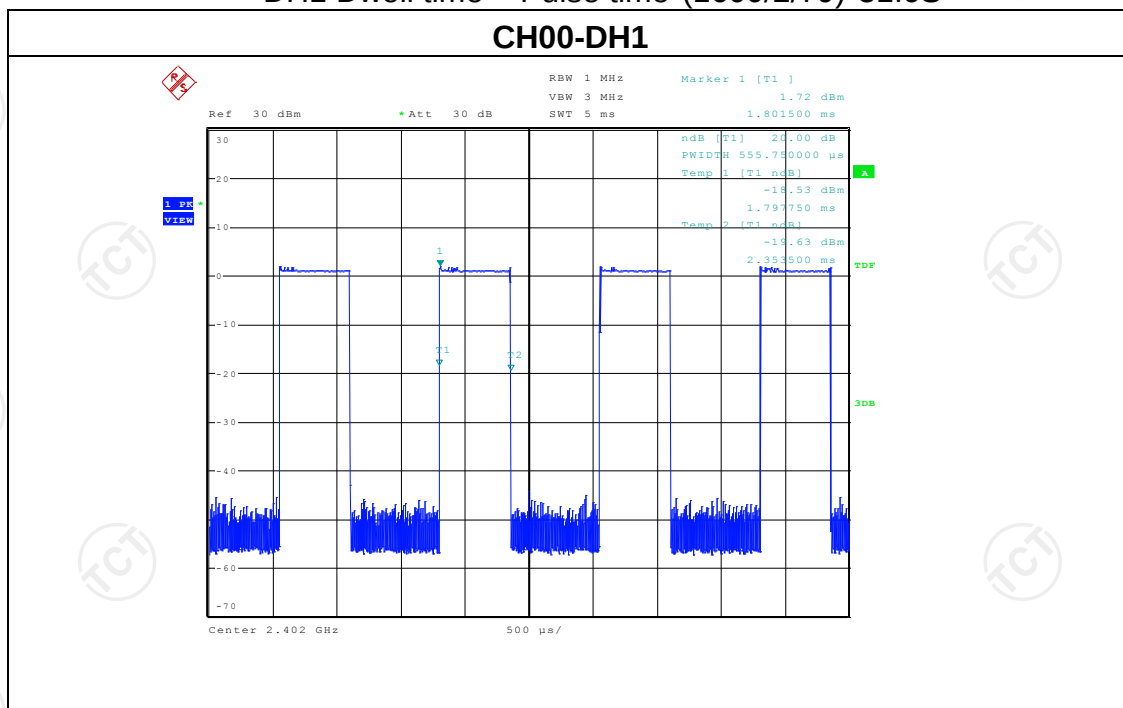
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

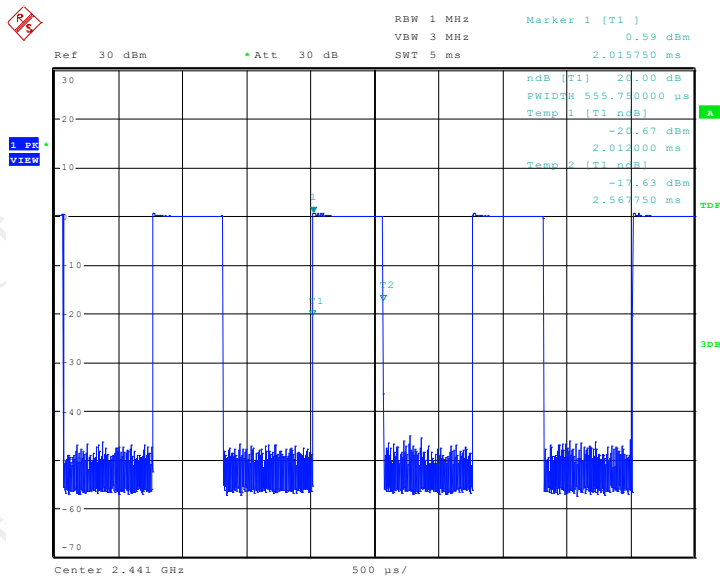
6.7.3. Test Data

Data Packet	Frequency	Pulse time(ms)	Dwell Time(S)	Limits (S)
DH1	2402MHz	0.556	0.178	0.4
DH1	2441MHz	0.556	0.178	0.4
DH1	2480MHz	0.556	0.178	0.4

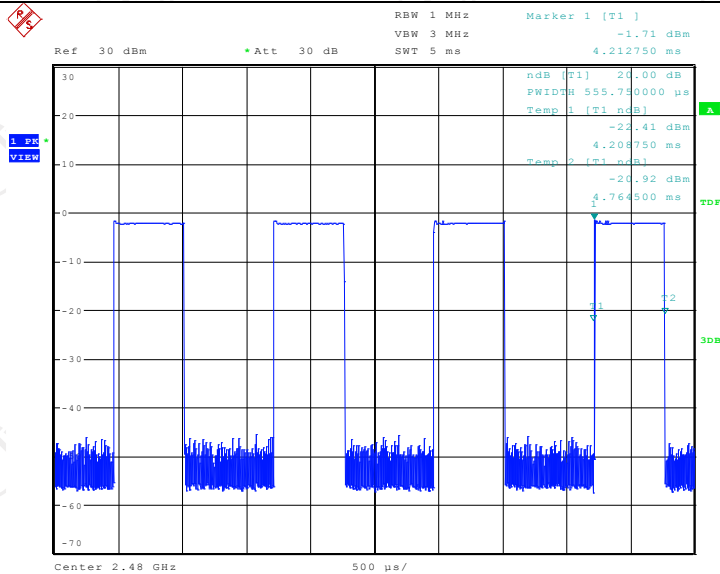
DH1 Dwell time = Pulse time*(1600/2/79)*31.6S



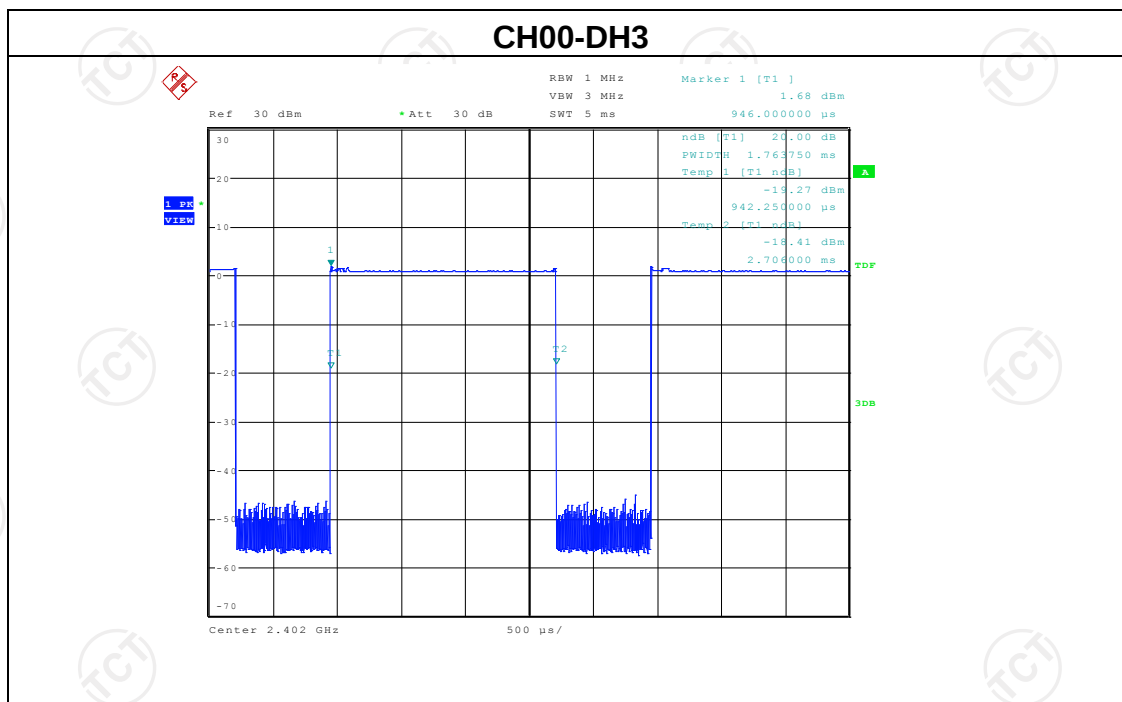
CH39-DH1



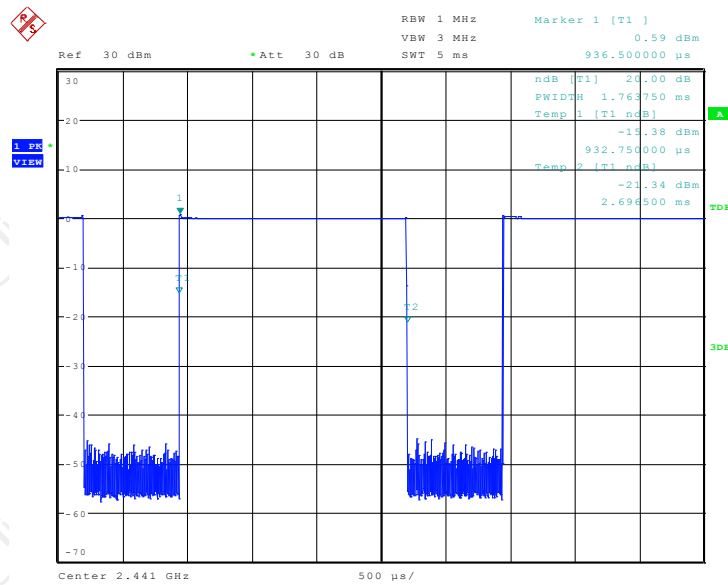
CH78-DH1



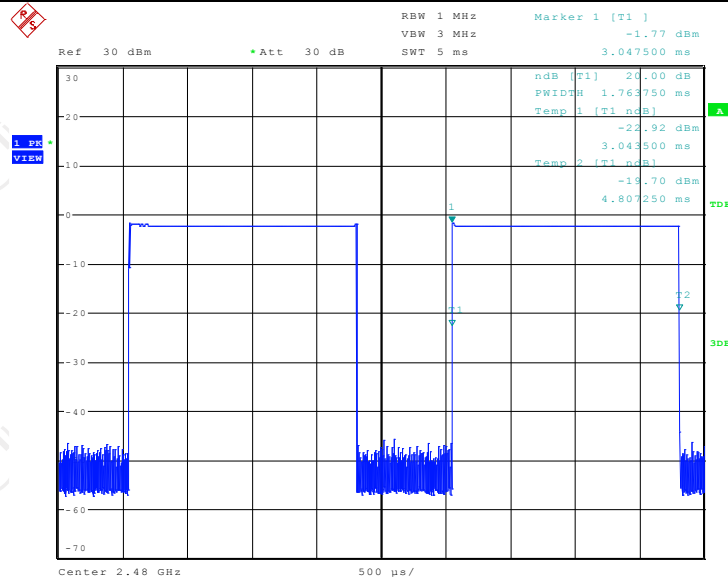
Data Packet	Frequency	Pulse time(ms)	Dwell Time(S)	Limits (S)
DH3	2402MHz	1.764	0.282	0.4
DH3	2441MHz	1.764	0.282	0.4
DH3	2480MHz	1.764	0.282	0.4



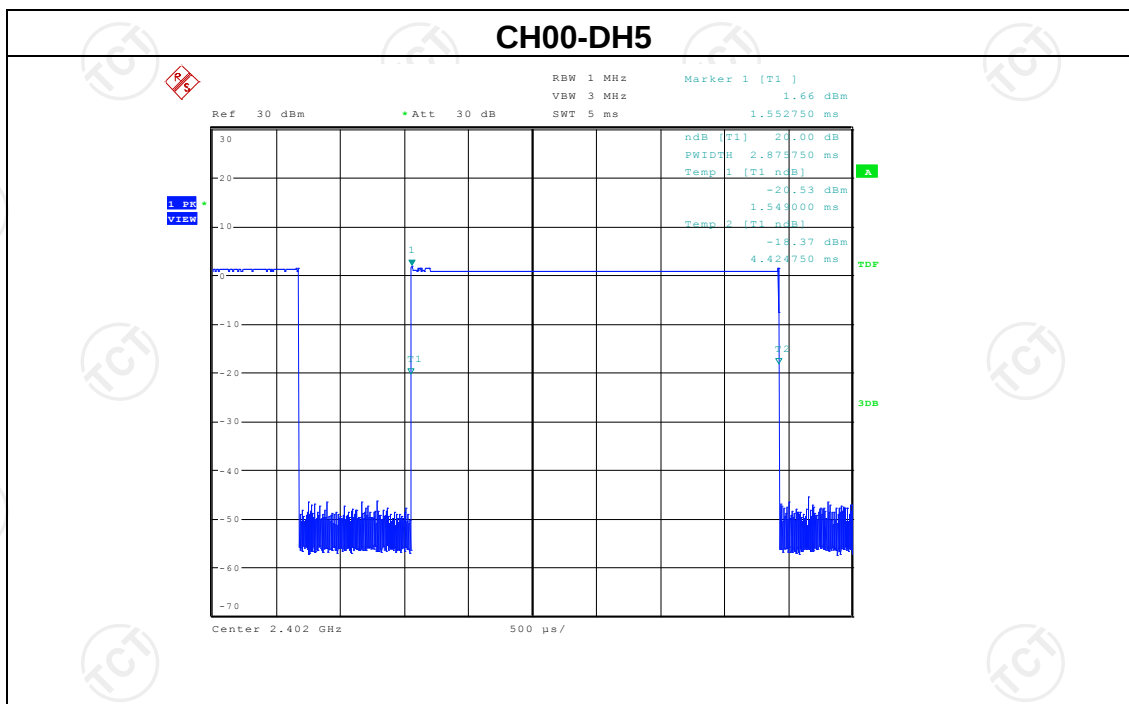
CH39-DH3



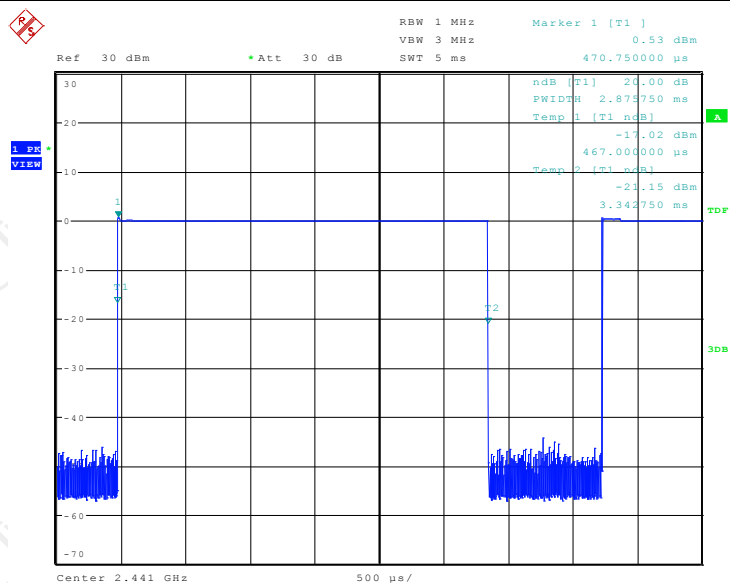
CH78-DH3



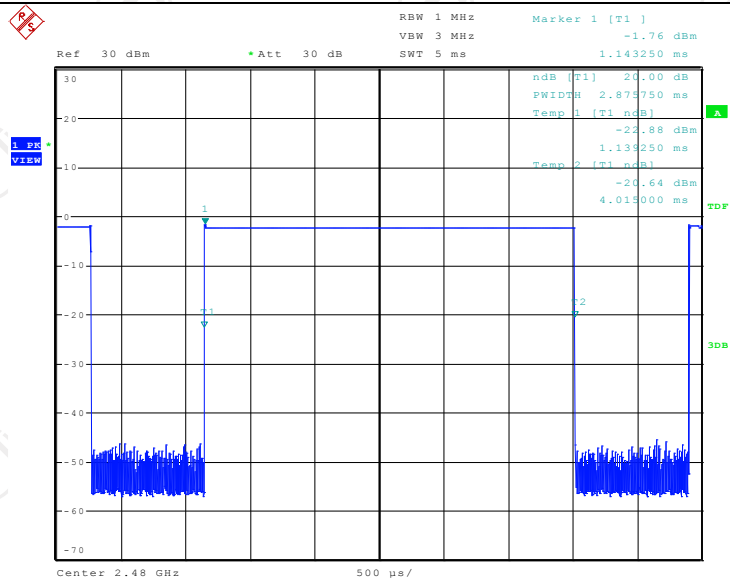
Data Packet	Frequency	Pulse time(ms)	Dwell Time(S)	Limits (S)
DH5	2402MHz	2.876	0.307	0.4
DH5	2441MHz	2.876	0.307	0.4
DH5	2480MHz	2.876	0.307	0.4



CH39-DH5



CH78-DH5



6.8. Pseudorandom Frequency Hopping Sequence

Test Requirement:

FCC Part15 C Section 15.247 (a)(1) requirement:

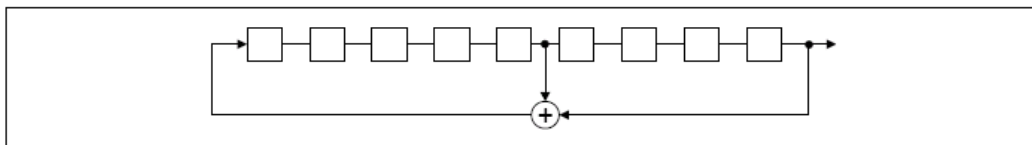
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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 Pseudorandom 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.

EUT Pseudorandom Frequency Hopping Sequence

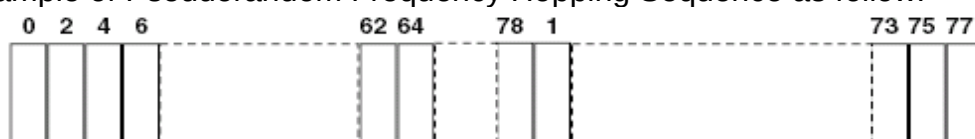
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: $2^9 - 1 = 511$ bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



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

6.9. Conducted Band Edge Measurement

6.9.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of ANSI C63.10:2013 Measurement Guidelines. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Set RBW = 100 kHz ($\geq 1\%$ span=10MHz), VBW = 300 kHz ($\geq$RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used. 4. Enable hopping function of the EUT and then repeat step 2 and 3. 5. Measure and record the results in the test report.
Test Result:	PASS

6.9.2. Test Instruments

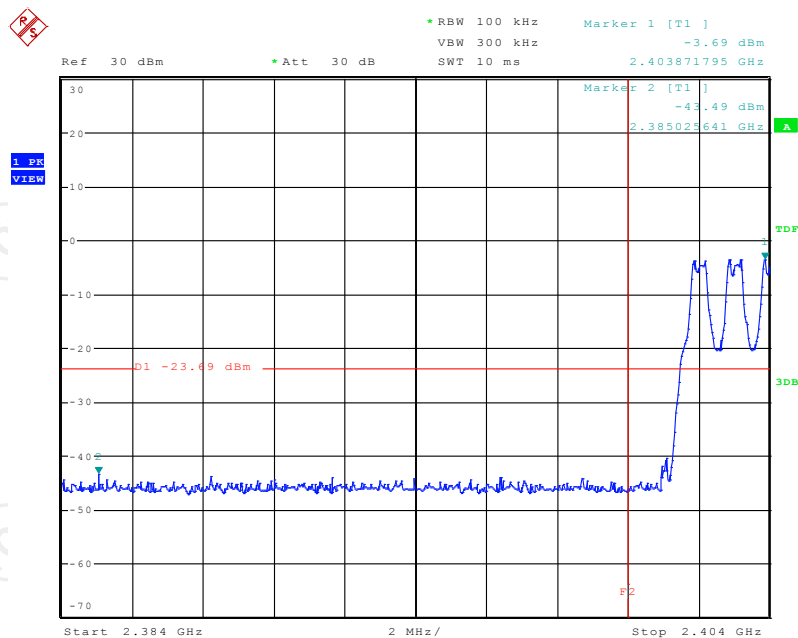
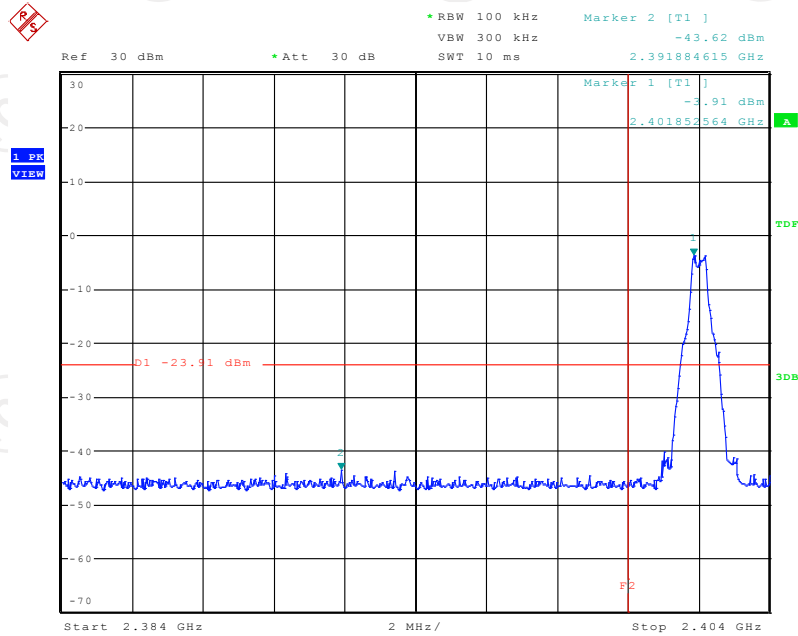
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.9.3. Test Data

GFSK Modulation

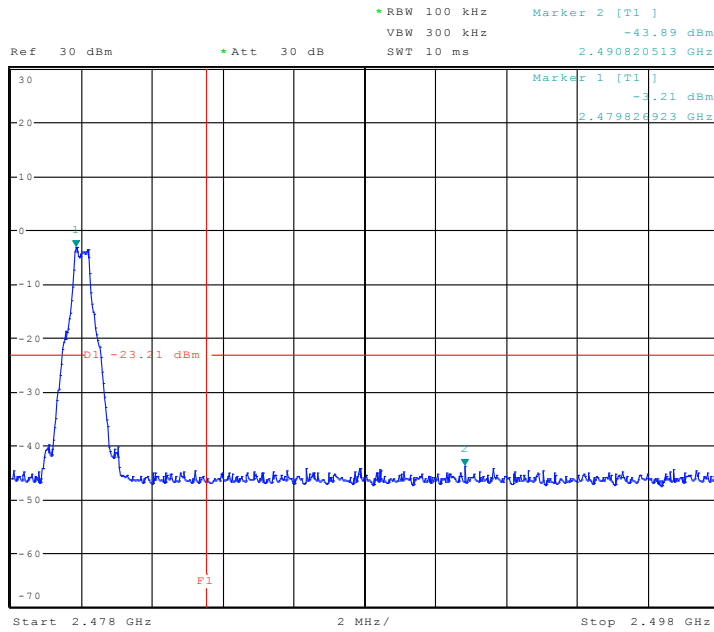
Channel: Low



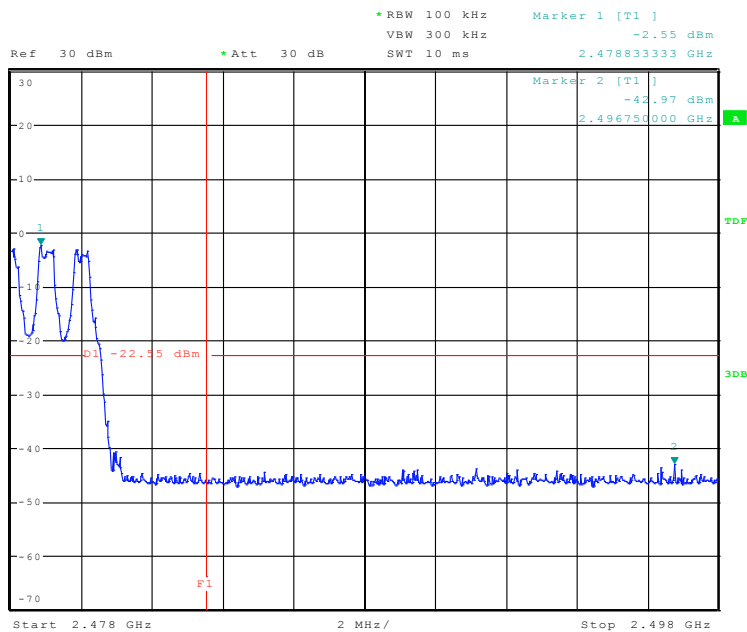
Channel: High



1 PR
VIEW

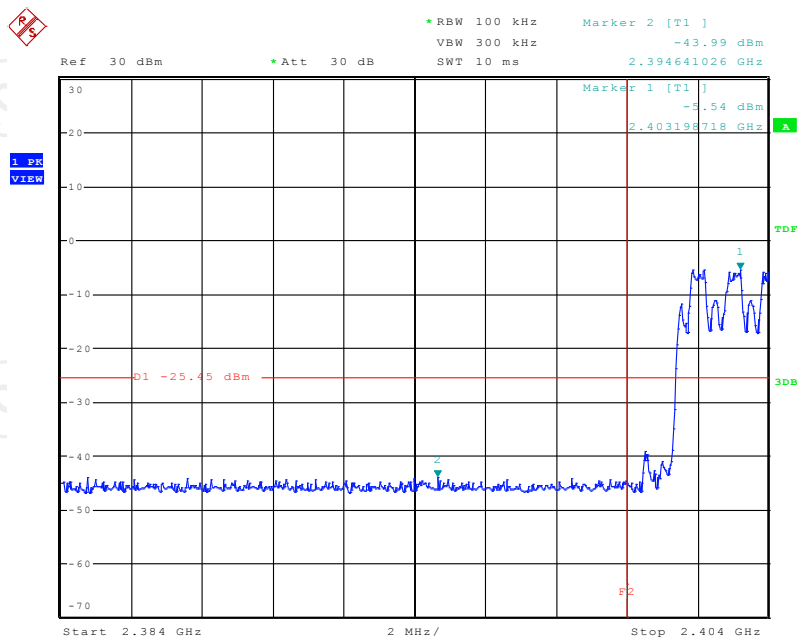
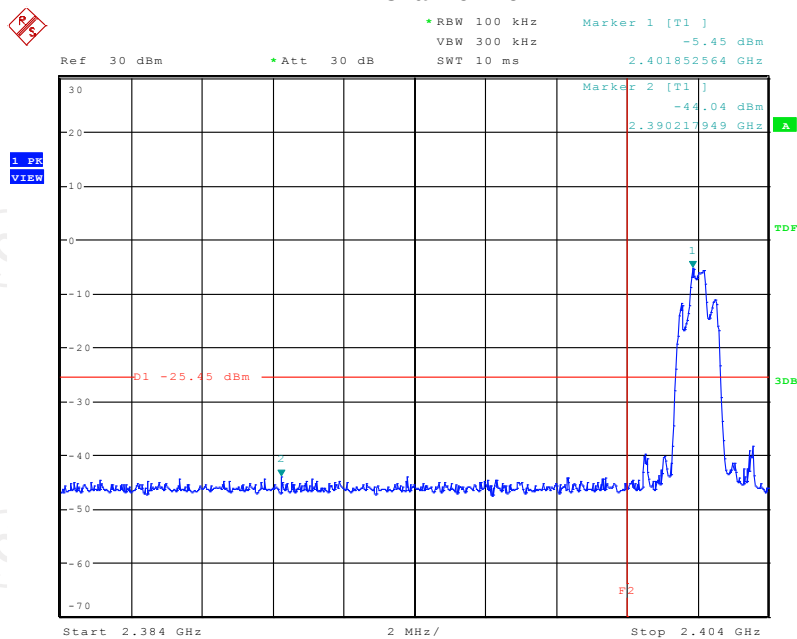


1 PR
VIEW



Pi/4QPSK Modulation

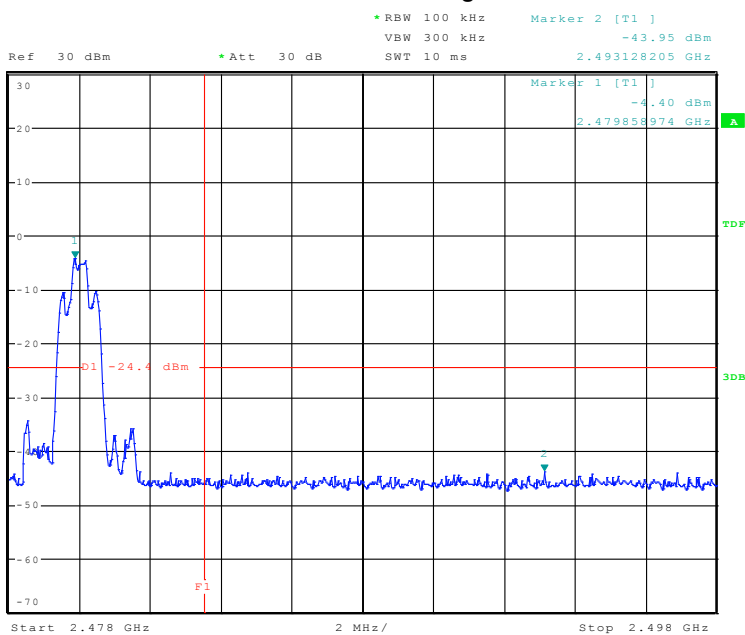
Channel: Low



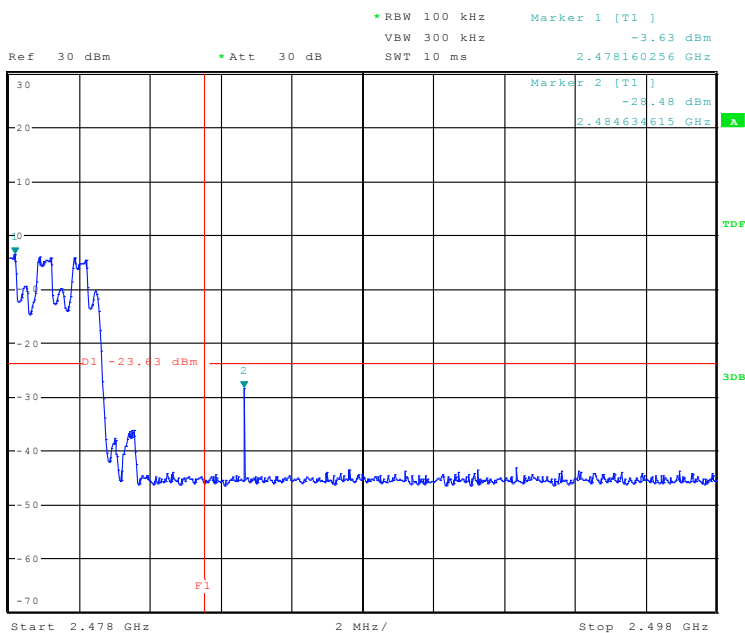
Channel: High



1 PR
VIEW

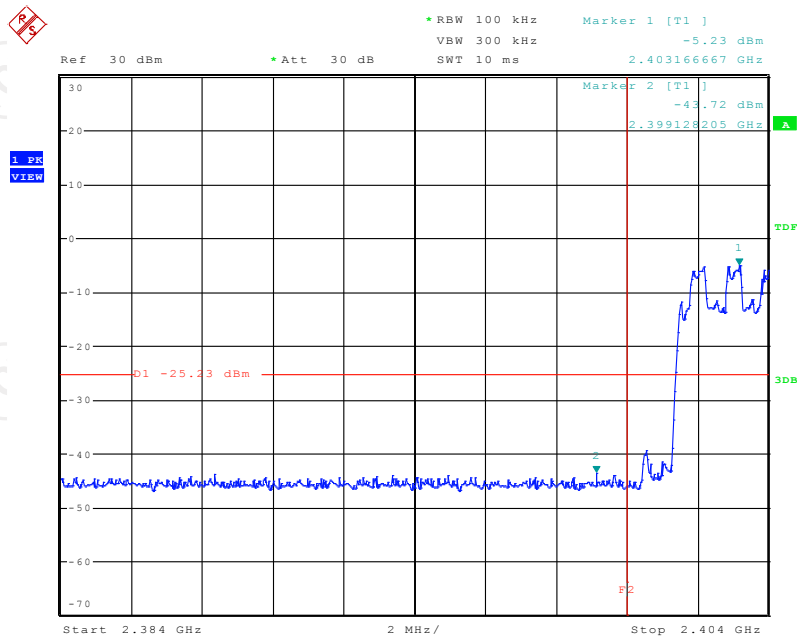
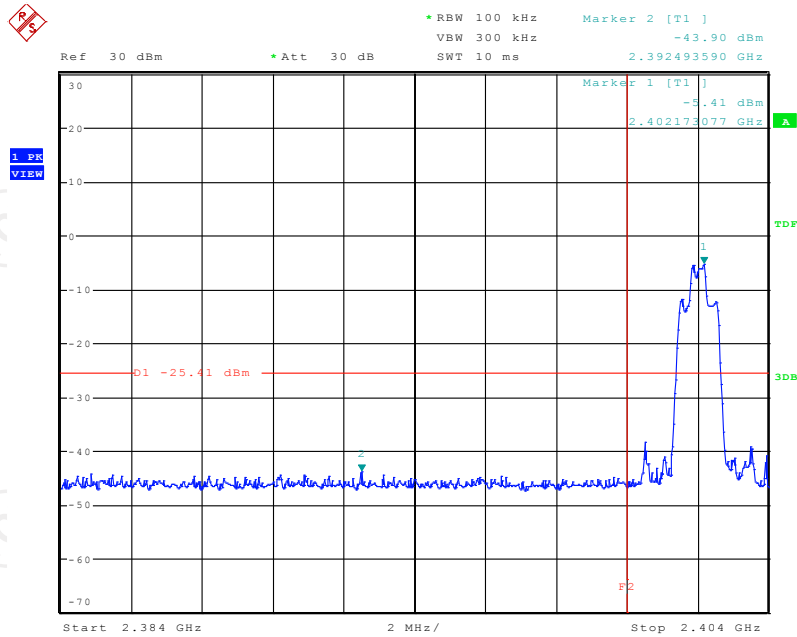


1 PR
VIEW



8DPSK Modulation

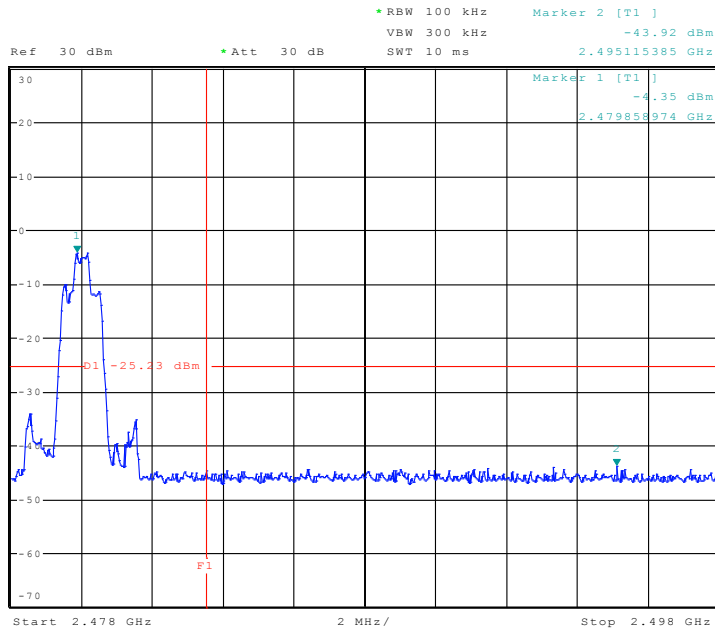
Channel: Low



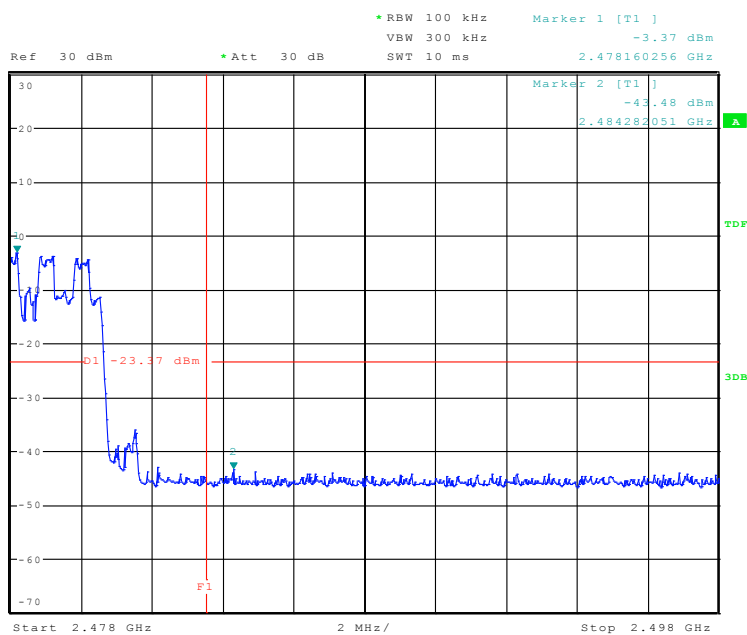
Channel: High



1 PR
VIEW

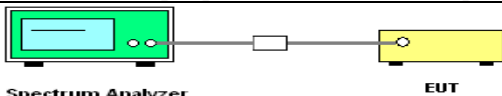


1 PR
VIEW



6.10. Conducted Spurious Emission Measurement

6.10.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the guidelines in Spurious RF Conducted Emissions of ANSI C63.10:2013 Measurement Guidelines 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. 5. Measure and record the results in the test report. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

6.10.2. Test Instruments

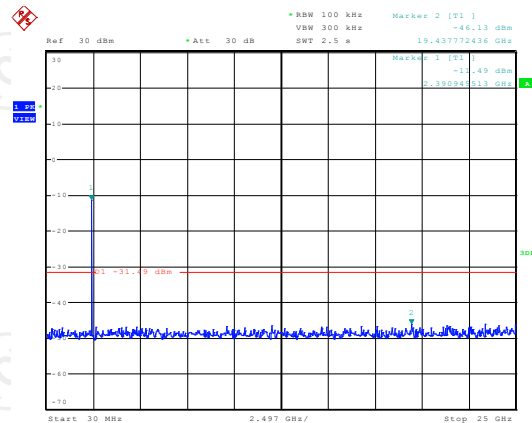
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ	200061	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.10.3. Test Data

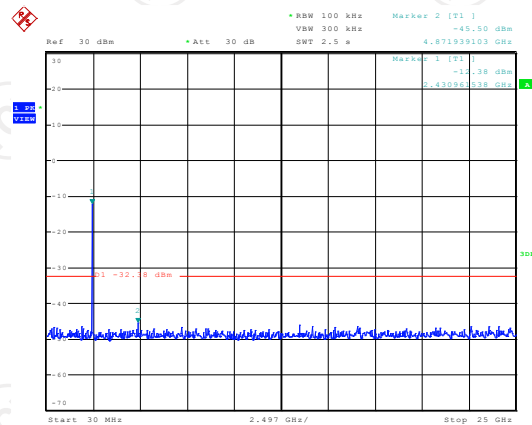
GFSK mode

Lowest Channel



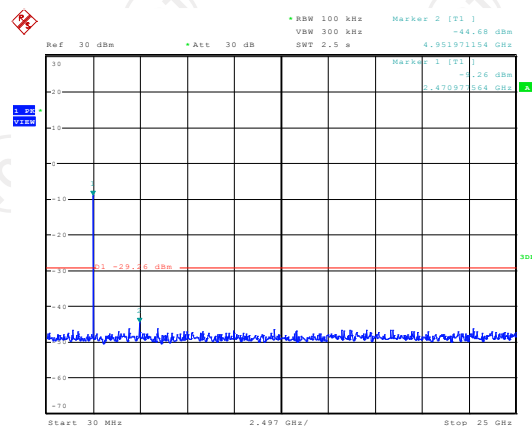
Date: 14.DEC.2017 13:46:57

Middle Channel



Date: 14.DEC.2017 13:49:02

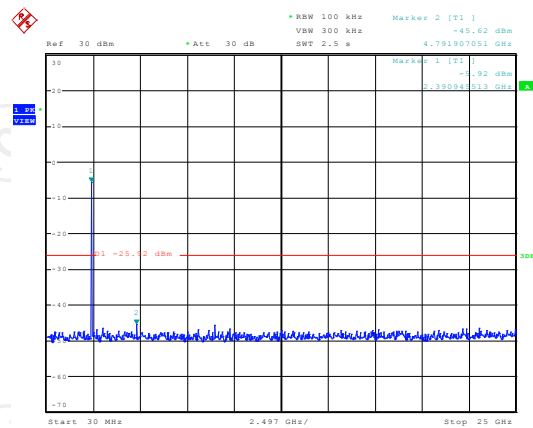
Highest Channel



Date: 14.DEC.2017 13:54:52

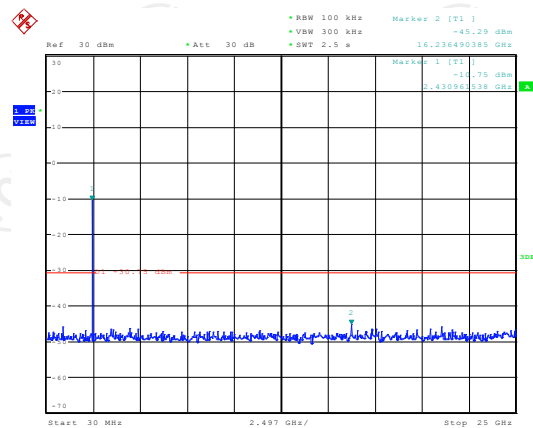
Pi/4DQPSK mode

Lowest Channel



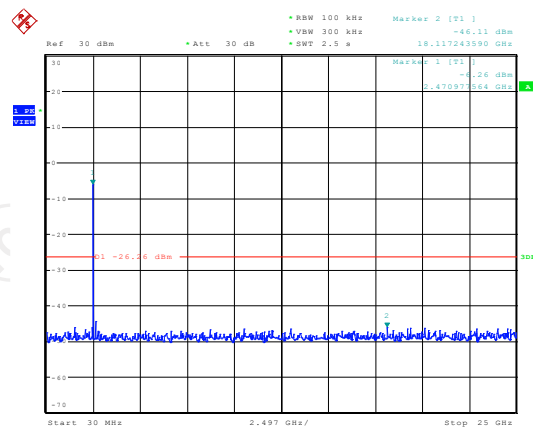
Date: 14.DEC.2017 13:57:32

Middle Channel



Date: 14.DEC.2017 16:20:30

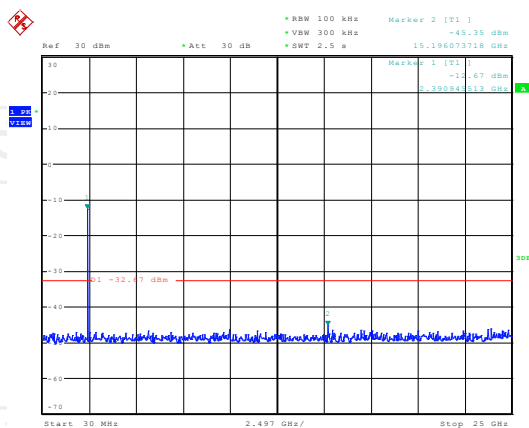
Highest Channel



Date: 14.DEC.2017 16:23:06

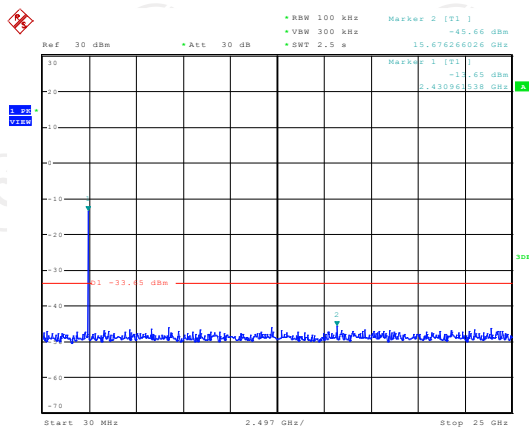
8DPSK mode

Lowest Channel



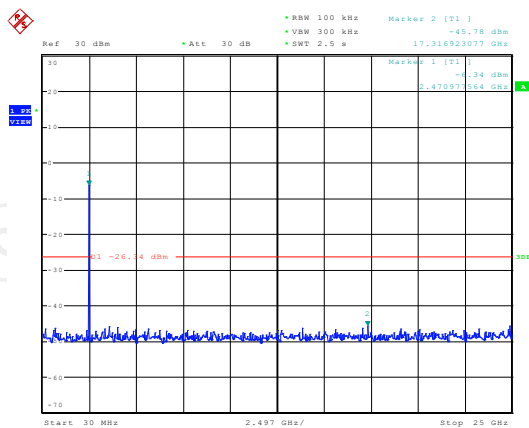
Date: 14.DEC.2017 16:24:24

Middle Channel



Date: 14.DEC.2017 16:26:03

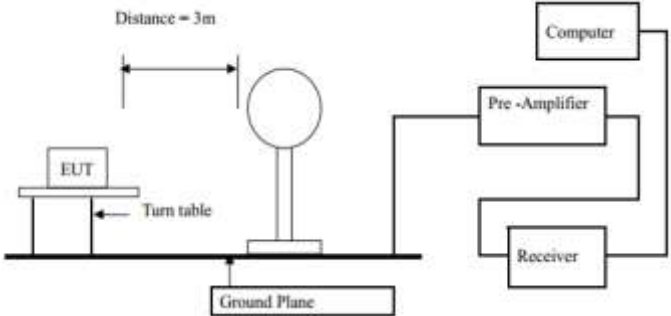
Highest Channel

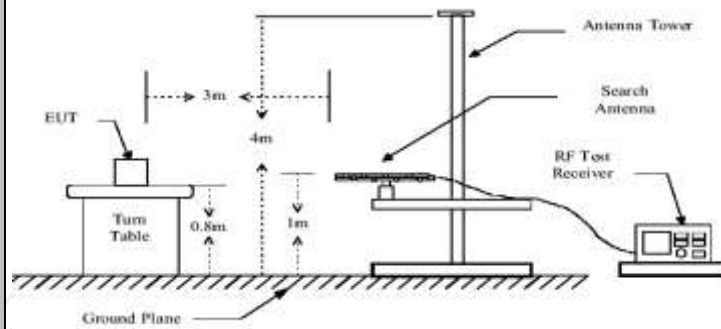


Date: 14.DEC.2017 16:27:20

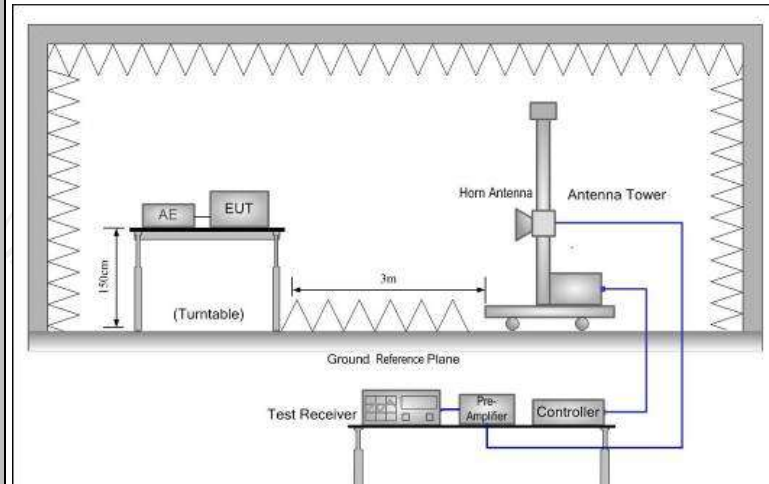
6.11. Radiated Spurious Emission Measurement

6.11.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Frequency Range:	9 kHz to 25 GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit:	Frequency		Field Strength (microvolts/meter)		Measurement Distance (meters)
	0.009-0.490		2400/F(KHz)		300
	0.490-1.705		24000/F(KHz)		30
	1.705-30		30		30
	30-88		100		3
	88-216		150		3
	216-960		200		3
	Above 960		500		3
	Frequency		Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
	Above 1GHz		500	3	Average
Test setup:	For radiated emissions below 30MHz				
	 Distance = 3m EUT Turn table Ground Plane Computer Pre-Amplifier Receiver 30MHz to 1GHz				



Above 1GHz



Test Mode:

Transmitting mode with modulation

Test Procedure:

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10:2013 Measurement Guidelines.

2. For the radiated emission test below 1GHz:

The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.

For the radiated emission test above 1GHz:

Place the measurement antenna on a turntable with 1.5 meter above ground, which is 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. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=100 kHz for $f < 1$ GHz, RBW=1MHz for $f > 1$GHz ; VBW$\geq$RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak (3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time = $N_1 \cdot L_1 + N_2 \cdot L_2 + \dots + N_{n-1} \cdot L_{n-1} + N_n \cdot L_n$ Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + $20 \cdot \log(\text{Duty cycle})$ Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
Test results:	PASS

6.11.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ	200061	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

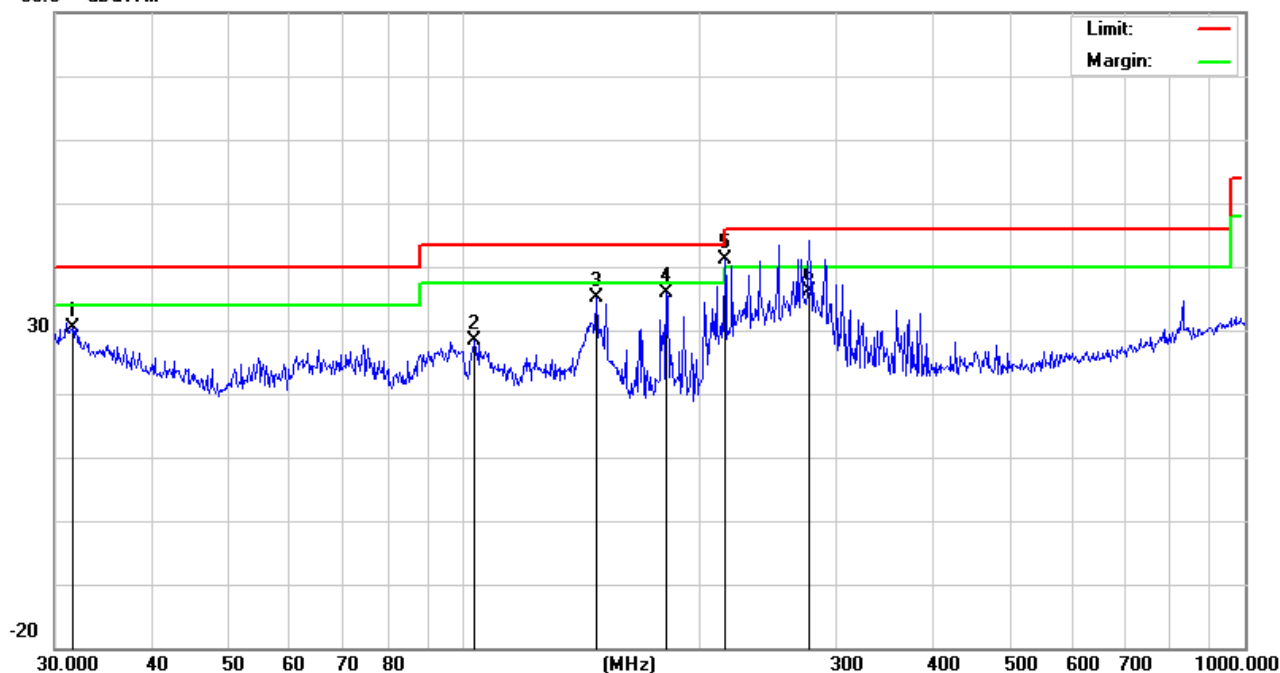
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

Please refer to following diagram for individual

Below 1GHz

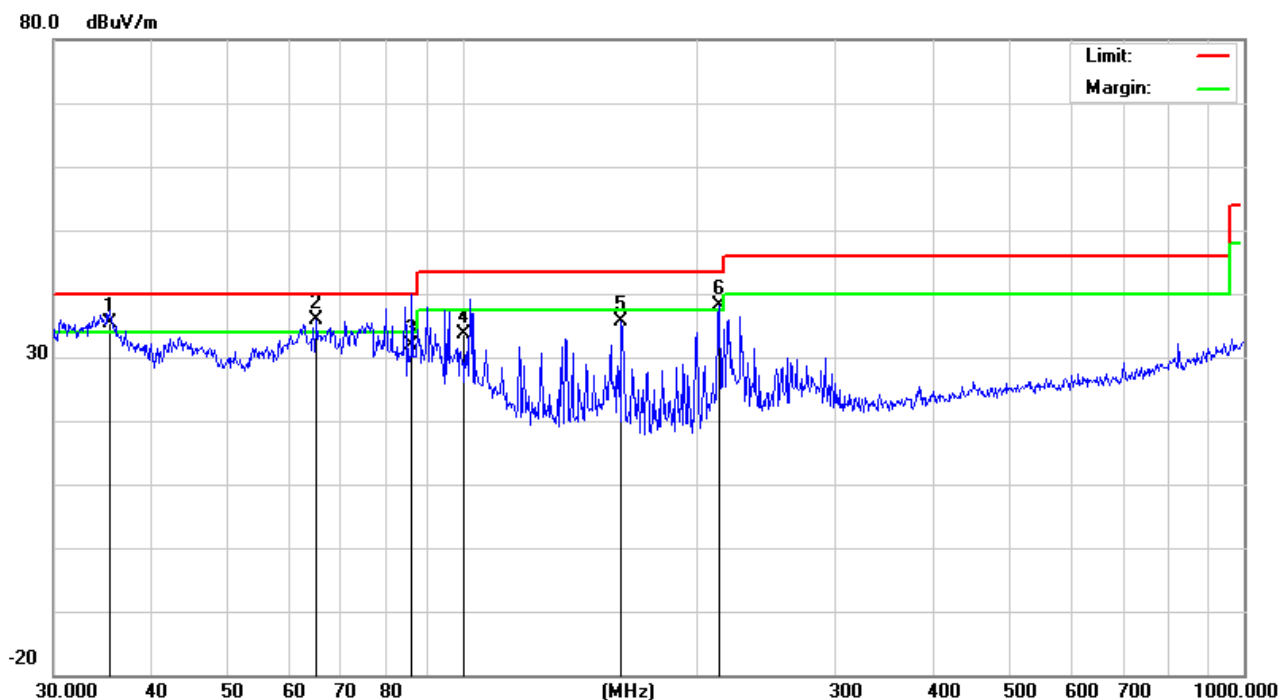
Horizontal:

80.0 dBuV/m



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		31.6202	26.28	4.17	30.45	40.00	-9.55	peak
2		103.4421	31.41	-3.15	28.26	43.50	-15.24	peak
3		147.9214	39.86	-4.81	35.05	43.50	-8.45	peak
4		181.9202	42.84	-7.06	35.78	43.50	-7.72	peak
5	*	216.0240	47.38	-6.27	41.11	46.00	-4.89	peak
6		276.5335	39.39	-3.37	36.02	46.00	-9.98	QP

Vertical:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1	!	35.3750	32.69	2.65	35.34	40.00	-4.66	QP
2	*	65.1145	42.51	-6.61	35.90	40.00	-4.10	peak
3		86.1401	38.37	-6.40	31.97	40.00	-8.03	QP
4		100.1130	37.41	-3.80	33.61	43.50	-9.89	QP
5		159.7844	41.46	-5.77	35.69	43.50	-7.81	peak
6	!	213.0151	44.49	-6.41	38.08	43.50	-5.42	peak

Note: 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported

2. Measurements were conducted in all three channels (high, middle, low) and three modulation (GFSK, Pi/4 DQPSK, 8DPSK) and the worst case Mode (Lowest channel and GFSK) was submitted only.

Above 1GHz

Test Mode	Mode 1 TX(1Mbps)	Frequency	2402MHz
-----------	------------------	-----------	---------

Freq. (MHz)	Ant. Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4804	V	58.93	41.93	74	54	-15.07	-12.07
7206	V	58.94	39.16	74	54	-15.06	-14.84
4804	H	59.14	40.42	74	54	-14.86	-13.58
7206	H	58.46	39.46	74	54	-15.54	-14.54

Test Mode	Mode 2 TX(1Mbps)	Frequency	2441MHz
-----------	------------------	-----------	---------

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4882	V	58.72	41.67	74	54	-15.28	-12.33
7323	V	58.81	40.01	74	54	-15.19	-13.99
4882	H	59.01	39.61	74	54	-14.99	-14.39
7323	H	59.89	40.89	74	54	-14.11	-13.11

Test Mode	Mode 3 TX(1Mbps)	Frequency	2480MHz
-----------	------------------	-----------	---------

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4960	V	59.26	40.60	74	54	-14.74	-13.40
7440	V	58.85	40.35	74	54	-15.15	-13.65
4960	H	58.69	39.76	74	54	-15.31	-14.24
7440	H	58.06	39.06	74	54	-15.94	-14.94

Remark:

All emissions not reported were more than 20dB below the specified limit or in the noise floor.

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

TEST RESULTS (Restricted Bands Requirements):

Test result for 1Mbps Mode:

Test Mode	TX /Mode1-1Mbps(CH0)	Polarization	Vertical
-----------	----------------------	--------------	----------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2387	63.21	-8.76	54.45	74	19.55	peak
2387	55.78	-8.76	47.02	54	6.98	AVG
2390	60.62	-8.73	51.89	74	22.11	peak
2390	57.91	-8.73	49.18	54	4.82	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Mode1-1Mbps(CH0)	Polarization	Horizontal
-----------	----------------------	--------------	------------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2384	60.63	-8.76	51.87	74	22.13	peak
2384	54.52	-8.76	45.76	54	8.24	AVG
2390	61.12	-8.73	52.39	74	21.61	peak
2390	57.97	-8.73	49.24	54	4.76	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Mode 3-1Mbps(CH78)	Polarization	Vertical
-----------	------------------------	--------------	----------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	63.27	-8.17	55.10	74	18.90	peak
2483.5	54.32	-8.17	46.15	54	7.85	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Mode 3-1Mbps(CH78)	Polarization	Horizontal
-----------	------------------------	--------------	------------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	61.40	-8.17	53.23	74	20.77	peak
2483.5	53.83	-8.17	45.66	54	8.34	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test result for 2Mbps Mode:

Test Mode	TX /Mode1-2Mbps(CH0)	Polarization	Vertical
-----------	----------------------	--------------	----------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2387	61.53	-8.76	52.77	74	21.23	peak
2387	54.65	-8.76	45.89	54	8.11	AVG
2390	61.55	-8.73	52.82	74	21.18	peak
2390	55.89	-8.73	47.16	54	6.84	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Mode1-2Mbps(CH0)	Polarization	Horizontal
-----------	----------------------	--------------	------------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2384	63.67	-8.76	54.91	74	19.09	peak
2384	54.14	-8.76	45.38	54	8.62	AVG
2390	59.73	-8.73	51.00	74	23.00	peak
2390	54.24	-8.73	45.51	54	8.49	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Mode3-2Mbps(CH78)	Polarization	Vertical
-----------	-----------------------	--------------	----------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	61.30	-8.17	53.13	74	20.87	peak
2483.5	54.24	-8.17	46.07	54	7.93	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Mode3-2Mbps(CH78)	Polarization	Horizontal
-----------	-----------------------	--------------	------------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	60.63	-8.17	52.46	74	21.54	peak
2483.5	53.08	-8.17	44.91	54	9.09	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test result for 3Mbps Mode:

Test Mode	TX /Model 1-3Mbps(CH0)	Polarization	Vertical
-----------	------------------------	--------------	----------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2387	62.38	-8.76	53.62	74	20.38	peak
2387	54.65	-8.76	45.89	54	8.11	AVG
2390	63.03	-8.73	54.30	74	19.70	peak
2390	55.02	-8.73	46.29	54	7.71	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Mode 1-3Mbps(CH0)	Polarization	Horizontal
-----------	-----------------------	--------------	------------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2384	60.91	-8.76	52.15	74	21.85	peak
2384	53.04	-8.76	44.28	54	9.72	AVG
2390	63.78	-8.73	55.05	74	18.95	peak
2390	54.25	-8.73	45.52	54	8.48	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Model 3-3Mbps(CH78)	Polarization	Vertical
-----------	-------------------------	--------------	----------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	61.73	-8.17	53.56	74	20.44	peak
2483.5	54.13	-8.17	45.96	54	8.04	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	TX /Model 3-3Mbps(CH78)	Polarization	Horizontal
-----------	-------------------------	--------------	------------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	64.88	-8.17	56.71	74	17.29	peak
2483.5	53.71	-8.17	45.54	54	8.46	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test result for hopping mode:

Test Mode	hopping mode-1Mbps	Polarization	Vertical
-----------	--------------------	--------------	----------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2387	62.83	-8.76	54.07	74	19.93	peak
2387	55.30	-8.76	46.54	54	7.46	AVG
2390	61.83	-8.73	53.10	74	20.90	peak
2390	55.28	-8.73	46.55	54	7.45	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	Hopping mode-1Mbps	Polarization	Horizontal
-----------	--------------------	--------------	------------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2387	60.71	-8.76	51.95	74	22.05	peak
2387	54.59	-8.76	45.83	54	8.17	AVG
2390	59.48	-8.73	50.75	74	23.25	peak
2390	55.49	-8.73	46.76	54	7.24	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	Hopping mode-1Mbps	Polarization	Vertical
-----------	--------------------	--------------	----------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	61.38	-8.17	53.21	74	20.79	peak
2483.5	54.15	-8.17	45.98	54	8.02	AVG

Remark:

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Test Mode	Hopping mode-1Mbps	Polarization	Horizontal
-----------	--------------------	--------------	------------

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	64.07	-8.17	55.90	74	18.10	peak
2483.5	54.69	-8.17	46.52	54	7.48	AVG

Remark:

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

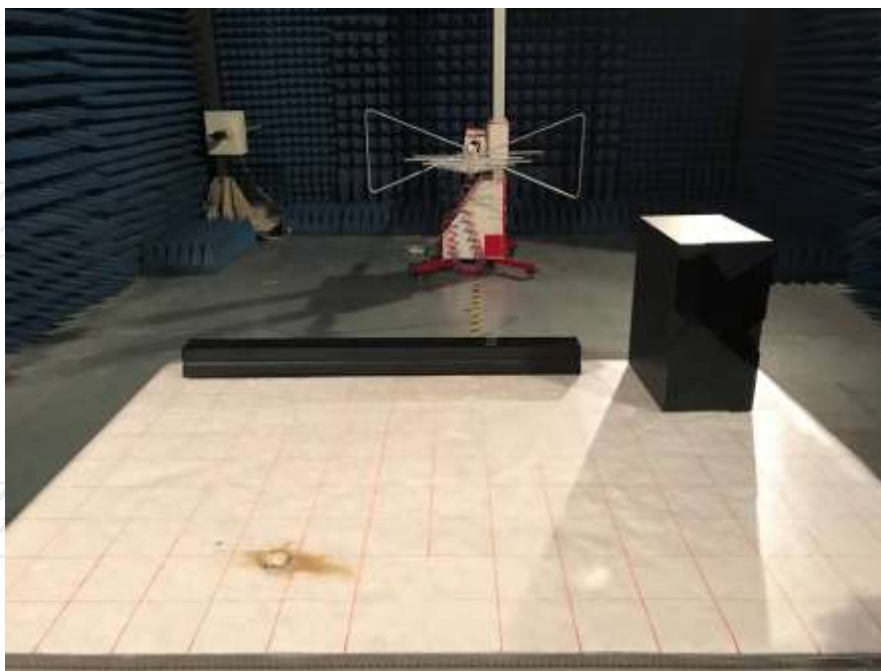
All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Note:

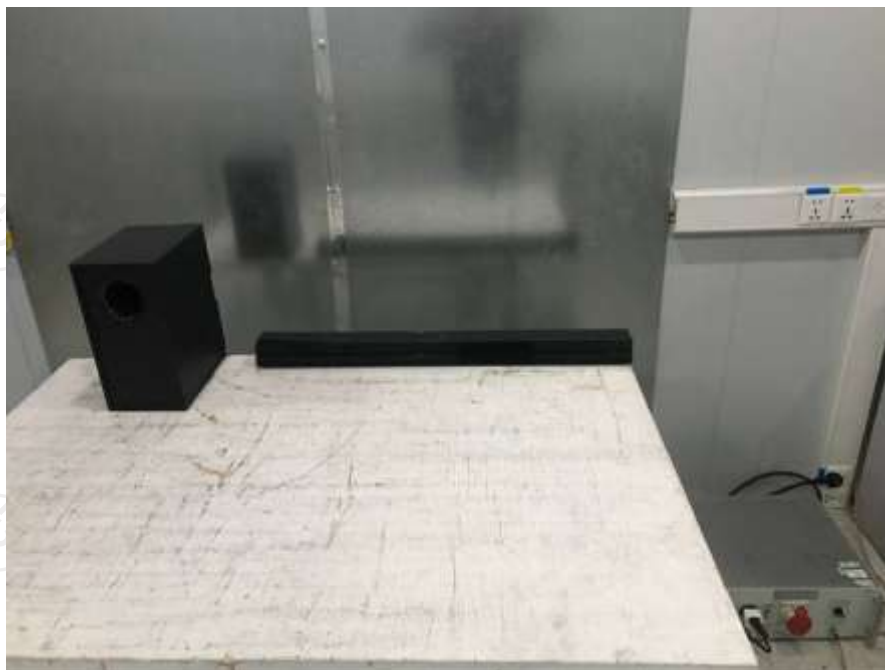
1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “---”in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.
6. Measurements were conducted in all three modulation (GFSK, Pi/4 DQPSK, 8DPSK), and the worst case Mode (GFSK) was submitted only.

7. Appendix A: Photographs of Test Setup

Radiated Emission



Conducted Emission



8. Appendix B: Photographs of EUT External Photos



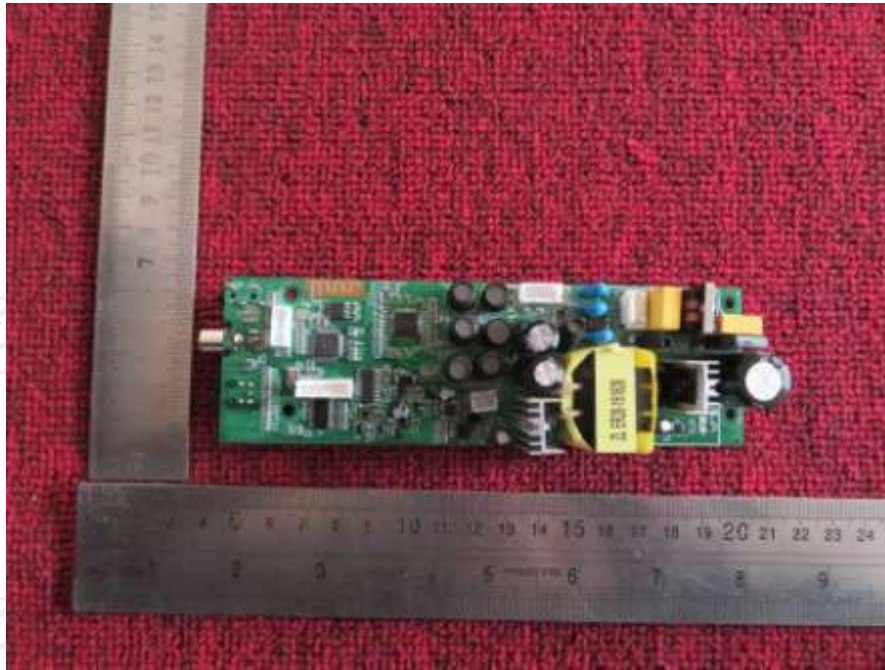


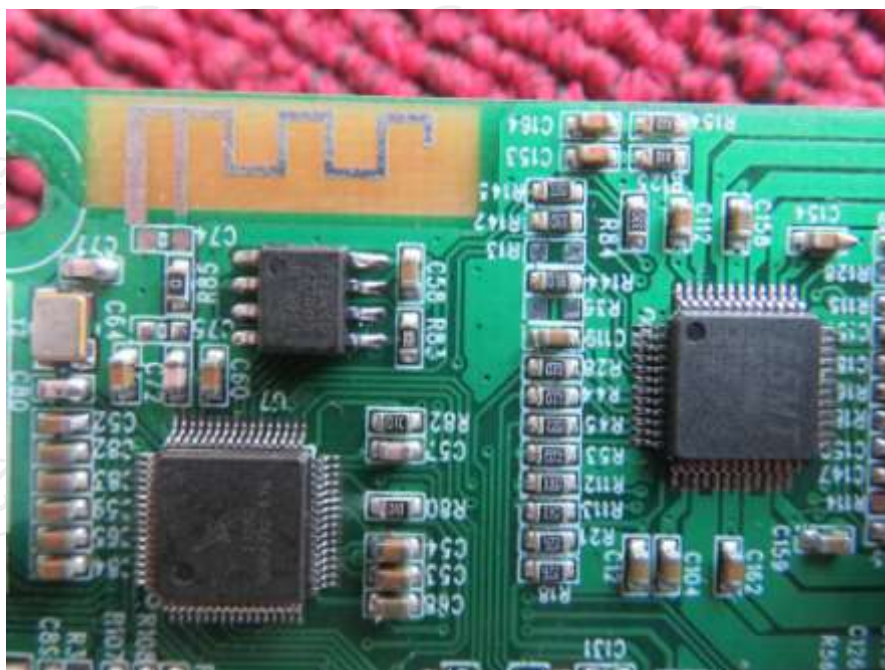


Internal Photos









*******END OF REPORT*******