FCC PART 15.247

TEST REPORT

For

Sierra Monitor Corporation

1991 Tarob Court, Milpitas CA 95035-6840, UNITED STATES

FCC ID: 2AIVJ-FPAC34
Model Number: FPA-C34, FPA-W34

Report Type:	**Product Name:**
Original Report	M2M Gateway

Test Engineer:	Kevin Hu Mill Chen
Report Number:	RSC160616002-0F
Report Date:	2016-07-21
Reviewed By:	Henry Ding EMC Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: +86-28-65525123 Fax: +86-28-65525125 www.baclcorp.com

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GENERAL INFORMATION

The ***Sierra Monitor Corporation***'s product, model number: ***FPA-C34 (FCC ID: 2AIVJ-FPAC34)*** or the "EUT" as referred to in this report was the **M2M Gateway,** which has a plastic enclosure. The highest frequency was 2.48 GHz.

Mechanical Description of EUT

The EUT was measured approximately 100 mm L x 78 mm W x 28 mm H.

Rated input voltage: DC 12-24V.

The products, test model: FPA-C34, multiple model: FPA-W34, FPA-C34-XXXX, FPA-W34-XXXX, Where X can be used as "0-9"for application software changes or marketing purposes only. Their differences were presented in Product Difference Statement provided by the applicant. And we selected FPA-C34 to fully test.

**All measurement and test data in this report was gathered from final production sample, serial number: 160616002/03 (Assigned by Chengdu BACL). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-06-20, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of **Sierra Monitor Corporation** accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15B JBP submissions with FCC ID: 2AIVJ-FPAC34.
FCC Part 15.247 DTS submissions with FCC ID: 2AIVJ-FPAC34.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any radiation on emissions measurement is:

30M~200MHz: ±4.7 dB;
200M~1GHz: ±6.0 dB;
1G-6GHz: ±5.13dB；
6G~25GHz: ±5.47dB；
And the uncertainty will not be taken into consideration for all test data recorded in the report.

Test Facility

The test site used by BACL to collect test data is located in the 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT Exercise Software

The software “putty_V0.63.0.0.43510830.exe” was used for testing, which was provided by manufacturer.

Test Mode	Test Software Version	putty_V0.63.0.0.43510830.exe		
GFSK	Test Frequency	2402MHz	2441MHz	2480MHz
	Data Rate	DH5	DH5	DH5
π/4-DQPSK	Test Frequency	2402MHz	2441MHz	2480MHz
	Data Rate	2DH5	2DH5	2DH5
8DPSK	Test Frequency	2402MHz	2441MHz	2480MHz
	Data Rate	3DH5	3DH5	3DH5

Equipment Modifications

No modification was made to the EUT by BACL.

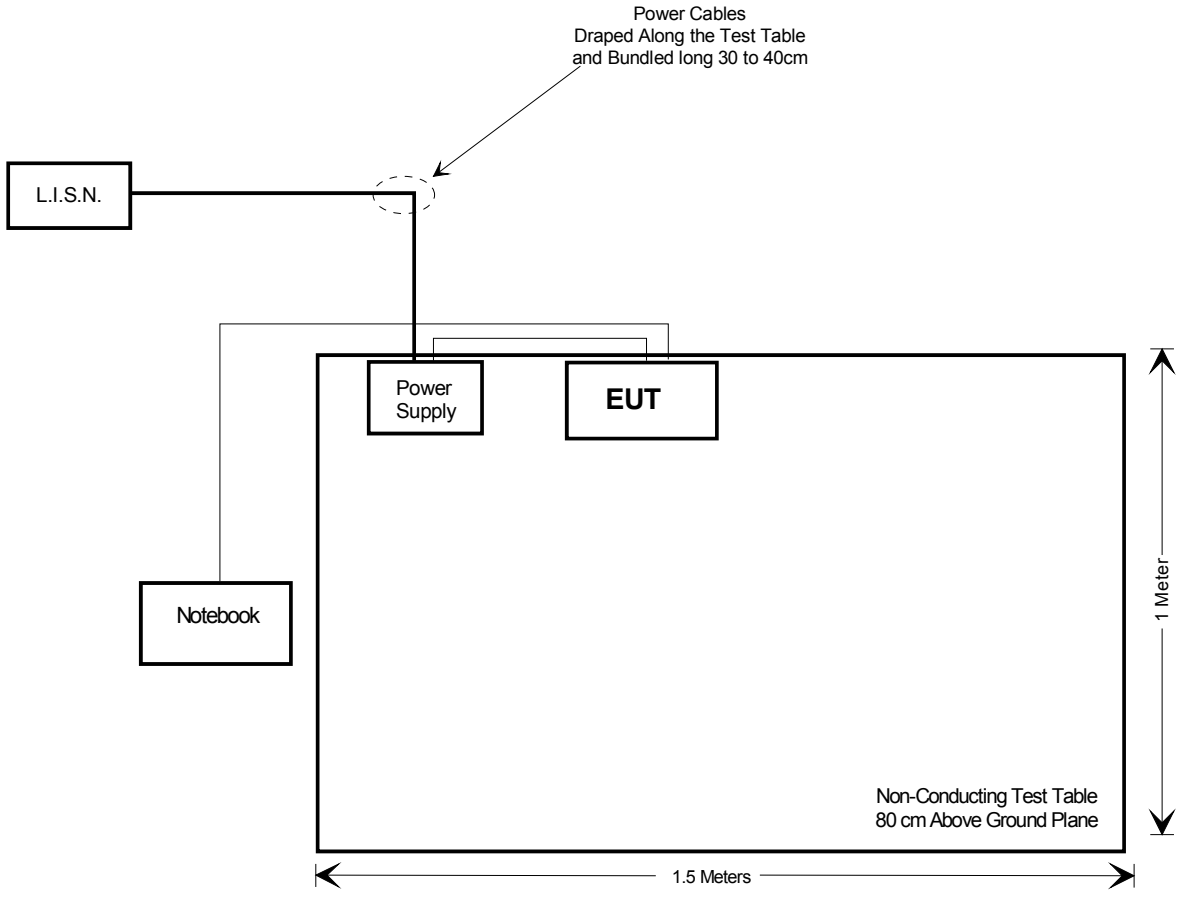
Local Support Equipment List and Details

Manufacturer	Description	Model Number	Serial Number
Anthin	Power Supply	AP1315-1212	None
DELL	Notebook	C640	5P804A00

External I/O Cable

Cable Description	Length (m)	From	To
Unshielded RJ45 Cable	3	EUT	Notebook
Power Supply Cable	2	EUT	Power Supply

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247(i), §2.1091 & §1.1307(b)(1)	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band Edges	Compliance

FCC §15.247 (I), §2.1091 & §1.1307(B)(1) - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	-	-	f/1500	30
1500–100,000	-	-	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:
S = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

The rated turn-up output power and antenna gain in the below table:

Bluetooth + GSM (FCC ID: RI7HE910)

Worst case

Mode	Frequency	Antenna Gain		Conducted Power		Evaluation Distance	Power Density	Limit	MPE Ratios
	MHz	dBi	numeric	dBm	mW	cm	mW/cm^2	mW/cm^2	(%)
BT	2402-2480	2	1.58	7.00	5.01	20	0.002	1.0	0.2
GSM	824-849	2.7	1.86	29.20	831.76	20	0.308	0.55	**56.0**
Total sum of MPE ratios (%)									56.2

For Bluetooth and GSM module, Bluetooth and WCDMA transmit simultaneously, two modes were tested, the worst case for MPE was chosen to be added up.
For GSM mode, the worst case for MPE was chosen to be added up.

Result: 56.2 %<1, the device meet FCC MPE at 20 cm distance.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has two external antennas, which are installed one 2G/3G antenna and one WIFI/BT antenna, Which must be professionally installed and declared by the applicant, and complied with 15.203, please refer to EUT external photos and following table:

RF Module	Manufacturer	Model Name	Connector Type	Max. Antenna Gain
Test Model: FPA-C34				
WIFI/BT Antenna	Dongguan Guoxu Electronics Communication Co.,Ltd.	GX042S.100001.S01	SMA Female	2 dBi
2G/3G Antenna	Cortec Technology Inc.	GX042S.100001.S01	SMA Female	2.7dBi
Multi-listing Model: FPA-W34				
WIFI/BT Antenna	Dongguan Guoxu Electronics Communication Co.,Ltd.	GX042S.100001.S01	SMA Female	2 dBi

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

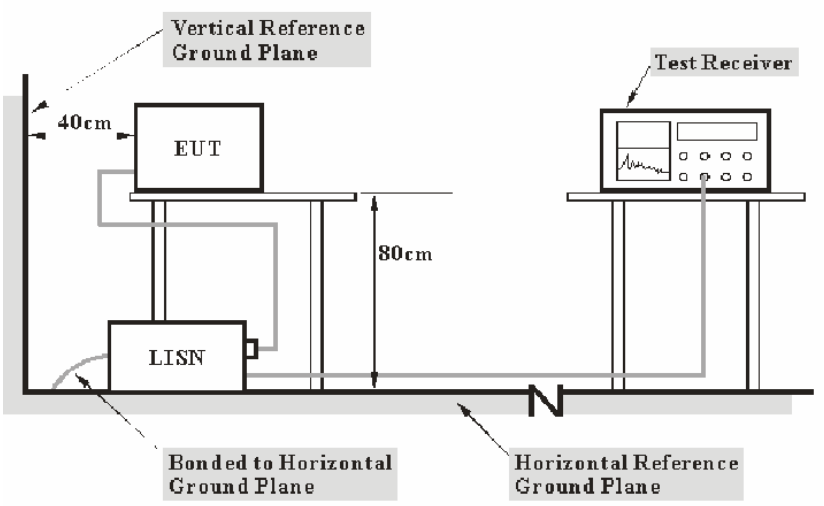
If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit.

Based on CISPR 16-4-2:2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Chengdu) is ±3.17 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement		U_{cispr}
Conducted disturbance at mains port using AMN	(150 kHz to 30 MHz)	3.4 dB

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT was according to ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The power cables and external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

DC 12V power source was provided to EUT.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$

Herein,s
V_C: corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN or ISN

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2015-12-02	2016-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2015-12-02	2016-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.12	None	None
N/A	Conducted Cable	NO.5	N/A	2015-11-10	2016-11-09

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

3.2 dB at **0.465682 MHz** in the **Neutral** conducted mode

Test Data

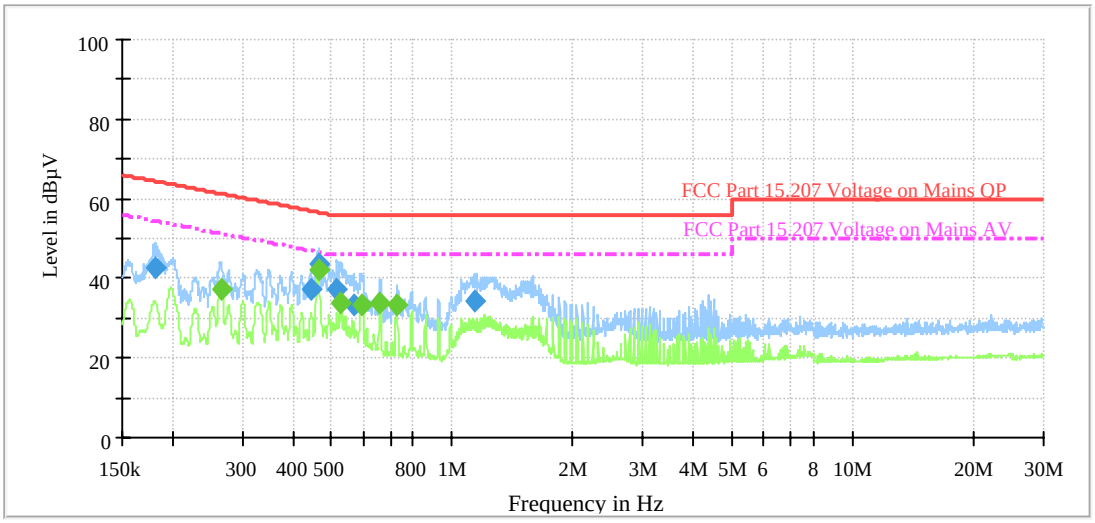
Environmental Conditions

Temperature:	27 °C
Relative Humidity:	62 %
ATM Pressure:	94.8 kPa

The testing was performed by Kevin Hu on 2016-06-27.

Test Mode: Transmitting

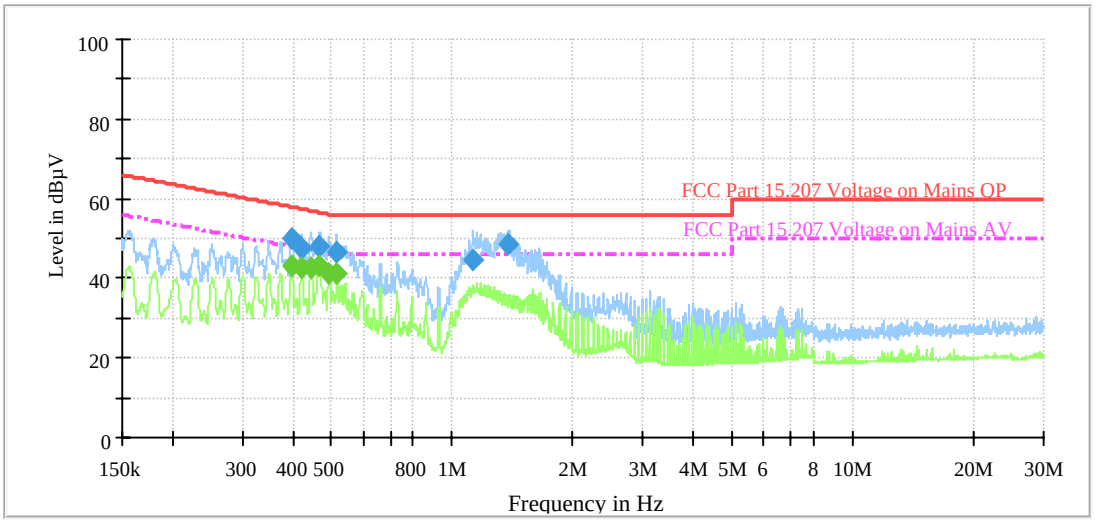
Line



Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.182443	42.5	9.000	L1	18.9	21.9	64.4
0.444766	37.2	9.000	L1	19.9	19.8	57.0
0.465682	43.4	9.000	L1	19.9	13.2	56.6
0.514607	37.2	9.000	L1	20.0	18.8	56.0
0.567537	33.5	9.000	L1	20.0	22.5	56.0
1.132989	34.2	9.000	L1	20.0	21.8	56.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.264560	37.2	9.000	L1	19.3	14.1	51.3
0.462899	42.0	9.000	L1	19.9	4.6	46.6
0.528149	34.0	9.000	L1	20.0	12.0	46.0
0.594226	33.4	9.000	L1	20.0	12.6	46.0
0.660604	34.0	9.000	L1	20.0	12.0	46.0
0.727096	33.1	9.000	L1	19.9	12.9	46.0

Neutral



Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.395309	50.1	9.000	N	19.9	7.9	58.0
0.419728	47.6	9.000	N	19.9	9.9	57.5
0.467547	48.0	9.000	N	19.9	8.6	56.6
0.515636	46.7	9.000	N	19.9	9.3	56.0
1.128471	44.9	9.000	N	20.0	11.1	56.0
1.372546	48.6	9.000	N	20.0	7.4	56.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.396892	43.3	9.000	N	19.9	4.6	47.9
0.420568	42.8	9.000	N	19.9	4.6	47.4
0.443879	42.7	9.000	N	19.9	4.3	47.0
0.465682	43.4	9.000	N	19.9	**3.2**	46.6
0.492477	41.4	9.000	N	19.9	4.7	46.1
0.516668	41.1	9.000	N	19.9	4.9	46.0

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If U_{lab} is less than or equal to U_{cispr} of Table 2, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 2, then:
–compliance is deemed to occur if no measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit.

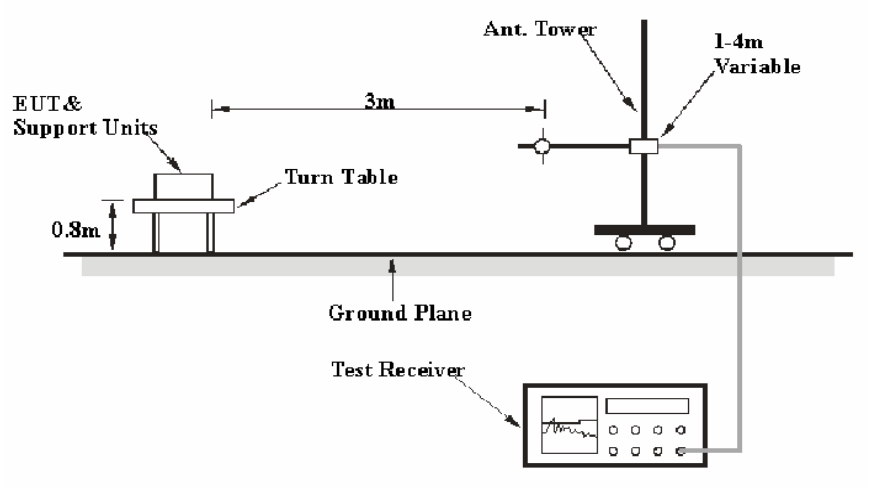
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:
30M~200MHz: ±4.7 dB ;
200M~1GHz: ±6.0 dB ;
1G-6GHz: ±5.13dB;
6G~25GHz: ±5.47 dB;

Table 2 – Values of U_{cispr}

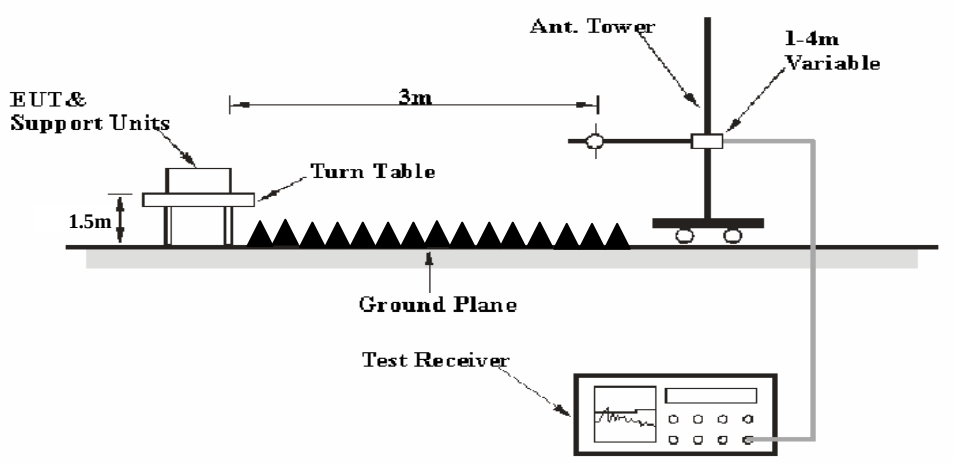
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters Semi-Anechoic Chamber, using the setup in accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

DC 12V power source was provided to EUT.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Receiver Reading + Cable loss + Antenna Factor – Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit-Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2015-12-02	2016-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
EM TEST	Horn Antenna	3115	003-6076	2015-12-02	2016-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
HP	Amplifier	8449B	3008A00277	2016-04-09	2019-04-08
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2015-11-10	2016-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2015-11-10	2016-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2015-11-10	2016-11-09
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09
Rohde & Schwarz	EMC32	N/A	V 8.54.0	N/A	N/A

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

5.78 dB at **4804 MHz** in the **Vertical** polarization

Test Data

Environmental Conditions

Temperature:	28 °C
Relative Humidity:	52 %
ATM Pressure:	94.6 kPa

The testing was performed by Kevin Hu on 2016-06-24.

Test Mode: Transmitting (worst case)

30 MHz to 25 GHz
Test Model: FPA-C34
BDR Mode (GFSK)

Frequency (MHz)	Receiver		Rx Antenna		Cable Loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	FCC 15.247	
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBµV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	70.23	PK	V	25.65	3.90	0.00	99.78	N/A	N/A
2402	55.61	AV	V	25.65	3.90	0.00	85.16	N/A	N/A
2402	68.52	PK	H	25.65	3.90	0.00	98.07	N/A	N/A
2402	53.54	AV	H	25.65	3.90	0.00	83.09	N/A	N/A
2390	31.86	PK	V	25.61	3.84	0.00	61.31	74.00	12.69
2390	14.37	AV	V	25.61	3.84	0.00	43.82	54.00	10.18
4804	43.63	PK	V	30.59	4.67	26.35	52.54	74.00	21.46
4804	31.41	AV	V	30.59	4.67	26.35	40.32	54.00	13.68
7206	45.74	PK	V	34.09	6.50	26.91	59.42	74.00	14.58
7206	31.36	AV	V	34.09	6.50	26.91	45.04	54.00	8.96
9608	40.39	PK	V	35.96	8.75	27.21	57.89	74.00	16.11
9608	28.68	AV	V	35.96	8.75	27.21	46.18	54.00	7.82
1210	55.39	PK	V	22.85	2.65	23.33	57.56	74.00	16.44
1210	40.68	AV	V	22.85	2.65	23.33	42.85	54.00	11.15
47.36	43.35	QP	V	9.79	0.88	28.02	26.00	40.00	14.00
Middle Channel: 2441 MHz									
2441	66.35	PK	V	25.75	3.99	0.00	96.09	N/A	N/A
2441	51.74	PK	V	25.75	3.99	0.00	81.48	N/A	N/A
2441	67.02	PK	H	25.75	3.99	0.00	96.76	N/A	N/A
2441	53.52	AV	H	25.75	3.99	0.00	83.26	N/A	N/A
4882	45.23	PK	V	30.79	4.75	26.58	54.19	74.00	19.81
4882	30.74	AV	V	30.79	4.75	26.58	39.70	54.00	14.30
7323	45.74	PK	V	34.38	6.72	26.95	59.89	74.00	14.11
7323	29.36	AV	V	34.38	6.72	26.95	43.51	54.00	10.49
9764	40.39	PK	V	36.33	8.58	27.32	57.98	74.00	16.02
9764	25.68	AV	V	36.33	8.58	27.32	43.27	54.00	10.73
1210	45.74	PK	V	22.85	2.65	23.33	47.91	74.00	26.09
1210	33.36	AV	V	22.85	2.65	23.33	35.53	54.00	18.47
1527	55.74	PK	V	23.65	3.04	23.56	58.87	74.00	15.13
1527	41.36	AV	V	23.65	3.04	23.56	44.49	54.00	9.51
47.36	45.52	QP	V	9.79	0.88	28.02	28.17	40.00	11.83
High Channel: 2480 MHz									
2480	72.52	PK	V	25.85	3.82	0.00	102.19	N/A	N/A
2480	58.46	AV	V	25.85	3.82	0.00	88.13	N/A	N/A
2480	67.86	PK	H	25.85	3.82	0.00	97.53	N/A	N/A
2480	52.83	AV	H	25.85	3.82	0.00	82.50	N/A	N/A
2483.5	29.35	PK	V	25.86	3.80	0.00	59.01	74.00	14.99
2483.5	14.75	AV	V	25.86	3.80	0.00	44.41	54.00	9.59
4960	51.03	PK	V	31.00	4.70	26.71	60.02	74.00	13.98
4960	35.36	AV	V	31.00	4.70	26.71	44.35	54.00	9.65
7440	42.74	PK	V	34.66	6.95	27.06	57.29	74.00	16.71
7440	31.36	AV	V	34.66	6.95	27.06	45.91	54.00	8.09
9920	42.39	PK	V	36.71	8.41	27.35	60.16	74.00	13.84
9920	28.68	AV	V	36.71	8.41	27.35	46.45	54.00	7.55
1210	45.39	PK	V	22.85	2.65	23.33	47.56	74.00	26.44
1210	32.68	AV	V	22.85	2.65	23.33	34.85	54.00	19.15
47.36	43.65	QP	V	9.79	0.88	28.02	26.30	40.00	13.70

EDR Mode (π/4-DQPSK)

Frequency (MHz)	Receiver		Rx Antenna		Cable Loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	67.21	PK	V	25.65	3.90	0.00	96.76	N/A	N/A
2402	57.85	AV	V	25.65	3.90	0.00	87.40	N/A	N/A
2402	65.41	PK	H	25.65	3.90	0.00	94.96	N/A	N/A
2402	55.16	AV	H	25.65	3.90	0.00	84.71	N/A	N/A
2390	25.74	PK	V	25.61	3.84	0.00	55.19	74.00	18.81
2390	15.36	AV	V	25.61	3.84	0.00	44.81	54.00	9.19
4804	38.39	PK	V	30.59	4.67	26.35	47.30	74.00	26.70
4804	28.68	AV	V	30.59	4.67	26.35	37.59	54.00	16.41
7206	44.74	PK	V	34.09	6.50	26.91	58.42	74.00	15.58
7206	29.36	AV	V	34.09	6.50	26.91	43.04	54.00	10.96
9608	38.39	PK	V	35.96	8.75	27.21	55.89	74.00	18.11
9608	29.31	AV	V	35.96	8.75	27.21	46.81	54.00	7.19
1210	51.39	PK	V	22.85	2.65	23.33	53.56	74.00	20.44
1210	41.68	AV	V	22.85	2.65	23.33	43.85	54.00	10.15
47.36	43.86	QP	V	9.79	0.88	28.02	26.51	40.00	13.49
Middle Channel: 2441 MHz									
2441	67.21	PK	V	25.75	3.99	0.00	96.95	N/A	N/A
2441	57.85	PK	V	25.75	3.99	0.00	87.59	N/A	N/A
2441	65.41	PK	H	25.75	3.99	0.00	95.15	N/A	N/A
2441	55.16	AV	H	25.75	3.99	0.00	84.90	N/A	N/A
4882	39.04	PK	V	30.79	4.75	26.58	48.00	74.00	26.00
4882	28.71	AV	V	30.79	4.75	26.58	37.67	54.00	16.33
7323	45.74	PK	V	34.38	6.72	26.95	59.89	74.00	14.11
7323	30.36	AV	V	34.38	6.72	26.95	44.51	54.00	9.49
9764	42.39	PK	V	36.33	8.58	27.32	59.98	74.00	14.02
9764	28.68	AV	V	36.33	8.58	27.32	46.27	54.00	7.73
1210	53.74	PK	V	22.85	2.65	23.33	55.91	74.00	18.09
1210	37.36	AV	V	22.85	2.65	23.33	39.53	54.00	14.47
1527	52.74	PK	V	23.65	3.04	23.56	55.87	74.00	18.13
1527	35.36	AV	V	23.65	3.04	23.56	38.49	54.00	15.51
47.36	41.35	QP	V	9.79	0.88	28.02	24.00	40.00	16.00
High Channel: 2480 MHz									
2480	66.71	PK	V	25.85	3.82	0.00	96.38	N/A	N/A
2480	56.08	AV	V	25.85	3.82	0.00	85.75	N/A	N/A
2480	63.28	PK	H	25.85	3.82	0.00	92.95	N/A	N/A
2480	54.06	AV	H	25.85	3.82	0.00	83.73	N/A	N/A
2483.5	25.74	PK	V	25.86	3.80	0.00	55.40	74.00	18.60
2483.5	13.36	AV	V	25.86	3.80	0.00	43.02	54.00	10.98
4960	38.39	PK	V	31.00	4.70	26.71	47.38	74.00	26.62
4960	28.68	AV	V	31.00	4.70	26.71	37.67	54.00	16.33
7440	40.74	PK	V	34.66	6.95	27.06	55.29	74.00	18.71
7440	26.36	AV	V	34.66	6.95	27.06	40.91	54.00	13.09
9920	38.39	PK	V	36.71	8.41	27.35	56.16	74.00	17.84
9920	28.68	AV	V	36.71	8.41	27.35	46.45	54.00	7.55
1210	53.39	PK	V	22.85	2.65	23.33	55.56	74.00	18.44
1210	36.68	AV	V	22.85	2.65	23.33	38.85	54.00	15.15
47.36	42.42	QP	V	9.79	0.88	28.02	25.07	40.00	14.93

EDR Mode (8DPSK)

Frequency (MHz)	Receiver		Rx Antenna		Cable Loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	67.21	PK	V	25.65	3.90	0.00	96.76	N/A	N/A
2402	57.85	AV	V	25.65	3.90	0.00	87.40	N/A	N/A
2402	65.41	PK	H	25.65	3.90	0.00	94.96	N/A	N/A
2402	55.16	AV	H	25.65	3.90	0.00	84.71	N/A	N/A
2390	25.74	PK	V	25.61	3.84	0.00	55.19	74.00	18.81
2390	15.36	AV	V	25.61	3.84	0.00	44.81	54.00	9.19
4804	42.81	PK	V	30.59	4.67	26.35	51.72	74.00	22.28
4804	30.59	AV	V	30.59	4.67	26.35	39.50	54.00	14.50
7206	45.74	PK	V	34.09	6.50	26.91	59.42	74.00	14.58
7206	30.54	AV	V	34.09	6.50	26.91	44.22	54.00	9.78
9608	40.39	PK	V	35.96	8.75	27.21	57.89	74.00	16.11
9608	27.86	AV	V	35.96	8.75	27.21	45.36	54.00	8.64
1210	54.57	PK	V	22.85	2.65	23.33	56.74	74.00	17.26
1210	39.86	AV	V	22.85	2.65	23.33	42.03	54.00	11.97
47.36	42.53	QP	V	9.79	0.88	28.02	25.18	40.00	14.82
Middle Channel: 2441 MHz									
2441	67.21	PK	V	25.75	3.99	0.00	96.95	N/A	N/A
2441	57.85	PK	V	25.75	3.99	0.00	87.59	N/A	N/A
2441	65.41	PK	H	25.75	3.99	0.00	95.15	N/A	N/A
2441	55.16	AV	H	25.75	3.99	0.00	84.90	N/A	N/A
4882	49.23	PK	V	30.79	4.75	26.58	58.19	74.00	15.81
4882	34.33	AV	V	30.79	4.75	26.58	43.29	54.00	10.71
7323	36.33	PK	V	34.38	6.72	26.95	50.48	74.00	23.52
7323	21.54	AV	V	34.38	6.72	26.95	35.69	54.00	18.31
9764	40.39	PK	V	36.33	8.58	27.32	57.98	74.00	16.02
9764	25.68	AV	V	36.33	8.58	27.32	43.27	54.00	10.73
1210	45.74	PK	V	22.85	2.65	23.33	47.91	74.00	26.09
1210	33.36	AV	V	22.85	2.65	23.33	35.53	54.00	18.47
1527	55.74	PK	V	23.65	3.04	23.56	58.87	74.00	15.13
1527	41.36	AV	V	23.65	3.04	23.56	44.49	54.00	9.51
47.36	41.52	QP	V	9.79	0.88	28.02	24.17	40.00	15.83
High Channel: 2480 MHz									
2480	66.71	PK	V	25.85	3.82	0.00	96.38	N/A	N/A
2480	56.08	AV	V	25.85	3.82	0.00	85.75	N/A	N/A
2480	63.28	PK	H	25.85	3.82	0.00	92.95	N/A	N/A
2480	54.06	AV	H	25.85	3.82	0.00	83.73	N/A	N/A
2483.5	25.74	PK	V	25.86	3.80	0.00	55.40	74.00	18.60
2483.5	15.36	AV	V	25.86	3.80	0.00	45.02	54.00	8.98
4960	38.39	PK	V	31.00	4.70	26.71	47.38	74.00	26.62
4960	28.68	AV	V	31.00	4.70	26.71	37.67	54.00	16.33
7440	40.74	PK	V	34.66	6.95	27.06	55.29	74.00	18.71
7440	26.36	AV	V	34.66	6.95	27.06	40.91	54.00	13.09
9920	42.39	PK	V	36.71	8.41	27.35	60.16	74.00	13.84
9920	28.68	AV	V	36.71	8.41	27.35	46.45	54.00	7.55
1210	49.39	PK	V	22.85	2.65	23.33	51.56	74.00	22.44
1210	36.68	AV	V	22.85	2.65	23.33	38.85	54.00	15.15
47.36	39.16	QP	V	9.79	0.88	28.02	21.81	40.00	18.19

3G Module, FCC ID: RI7HE910

For co-location evaluation data (Bluetooth + GSM transmitting simultaneously)

Worst case

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
85.65	43.21	QP	V	13.37	0.26	26.20	30.64	40.00	9.36
2400	55.26	PK	V	23.20	2.56	26.85	54.17	74.00	19.83
2400	40.43	AV	V	23.20	2.56	26.85	39.34	54.00	14.66
2483.5	50.38	PK	V	23.20	2.57	26.85	49.30	74.00	24.70
2483.5	32.59	AV	V	23.20	2.57	26.85	31.51	54.00	22.49
4804	42.36	PK	V	38.00	6.34	23.80	62.90	74.00	11.10
4804	27.68	AV	V	38.00	6.34	23.80	48.22	54.00	**5.78**
7206	31.18	PK	V	43.00	6.45	22.40	58.23	74.00	15.77
7206	18.54	AV	V	43.00	6.45	22.40	45.59	54.00	8.41
9608	42.62	PK	V	37.00	0.26	26.20	53.68	74.00	20.32
9608	31.52	AV	V	37.00	4.10	26.55	46.07	54.00	7.93

Multi-listing Model: FPA-W34

BDR Mode (GFSK)

Frequency (MHz)	Receiver		Rx Antenna		Cable Loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	67.56	PK	V	25.65	3.90	0.00	97.11	N/A	N/A
2402	57.14	AV	V	25.65	3.90	0.00	86.69	N/A	N/A
2402	65.27	PK	H	25.65	3.90	0.00	94.82	N/A	N/A
2402	55.61	AV	H	25.65	3.90	0.00	85.16	N/A	N/A
2390	23.71	PK	V	25.61	3.84	0.00	53.16	74.00	20.84
2390	14.67	AV	V	25.61	3.84	0.00	44.12	54.00	9.88
4804	38.32	PK	V	30.59	4.67	26.35	47.23	74.00	26.77
4804	27.69	AV	V	30.59	4.67	26.35	36.60	54.00	17.40
7206	44.79	PK	V	34.09	6.50	26.91	58.47	74.00	15.53
7206	30.41	AV	V	34.09	6.50	26.91	44.09	54.00	9.91
9608	40.39	PK	V	35.96	8.75	27.21	57.89	74.00	16.11
9608	27.73	AV	V	35.96	8.75	27.21	45.23	54.00	8.77
1210	54.44	PK	V	22.85	2.65	23.33	56.61	74.00	17.39
1210	39.73	AV	V	22.85	2.65	23.33	41.90	54.00	12.10
47.36	42.4	QP	V	9.79	0.88	28.02	25.05	40.00	14.95
Middle Channel: 2441 MHz									
2441	66.31	PK	V	25.75	3.99	0.00	96.05	N/A	N/A
2441	60.18	PK	V	25.75	3.99	0.00	89.92	N/A	N/A
2441	64.34	PK	H	25.75	3.99	0.00	94.08	N/A	N/A
2441	54.16	AV	H	25.75	3.99	0.00	83.90	N/A	N/A
4882	38.14	PK	V	30.79	4.75	26.58	47.10	74.00	26.90
4882	27.08	AV	V	30.79	4.75	26.58	36.04	54.00	17.96
7323	45.97	PK	V	34.38	6.72	26.95	60.12	74.00	13.88
7323	29.59	AV	V	34.38	6.72	26.95	43.74	54.00	10.26
9764	40.62	PK	V	36.33	8.58	27.32	58.21	74.00	15.79
9764	25.91	AV	V	36.33	8.58	27.32	43.50	54.00	10.50
1210	45.97	PK	V	22.85	2.65	23.33	48.14	74.00	25.86
1210	33.59	AV	V	22.85	2.65	23.33	35.76	54.00	18.24
1527	55.97	PK	V	23.65	3.04	23.56	59.10	74.00	14.90
1527	41.59	AV	V	23.65	3.04	23.56	44.72	54.00	9.28
47.36	44.52	QP	V	9.79	0.88	28.02	27.17	40.00	12.83
High Channel: 2480 MHz									
2480	65.99	PK	V	25.85	3.82	0.00	95.66	N/A	N/A
2480	54.71	AV	V	25.85	3.82	0.00	84.38	N/A	N/A
2480	62.37	PK	H	25.85	3.82	0.00	92.04	N/A	N/A
2480	53.98	AV	H	25.85	3.82	0.00	83.65	N/A	N/A
2483.5	25.34	PK	V	25.86	3.80	0.00	55.00	74.00	19.00
2483.5	14.56	AV	V	25.86	3.80	0.00	44.22	54.00	9.78
4960	36.84	PK	V	31.00	4.70	26.71	45.83	74.00	28.17
4960	27.64	AV	V	31.00	4.70	26.71	36.63	54.00	17.37
7440	42.21	PK	V	34.66	6.95	27.06	56.76	74.00	17.24
7440	30.83	AV	V	34.66	6.95	27.06	45.38	54.00	8.62
9920	41.86	PK	V	36.71	8.41	27.35	59.63	74.00	14.37
9920	28.15	AV	V	36.71	8.41	27.35	45.92	54.00	8.08
1210	44.86	PK	V	22.85	2.65	23.33	47.03	74.00	26.97
1210	32.15	AV	V	22.85	2.65	23.33	34.32	54.00	19.68
47.36	42.82	QP	V	9.79	0.88	28.02	25.47	40.00	14.53

EDR Mode (π/4-DQPSK)

Frequency (MHz)	Receiver		Rx Antenna		Cable Loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	66.85	PK	V	25.65	3.90	0.00	96.40	N/A	N/A
2402	55.36	AV	V	25.65	3.90	0.00	84.91	N/A	N/A
2402	64.91	PK	H	25.65	3.90	0.00	94.46	N/A	N/A
2402	54.47	AV	H	25.65	3.90	0.00	84.02	N/A	N/A
2390	24.13	PK	V	25.61	3.84	0.00	53.58	74.00	20.42
2390	13.74	AV	V	25.61	3.84	0.00	43.19	54.00	10.81
4804	38.67	PK	V	30.59	4.67	26.35	47.58	74.00	26.42
4804	26.39	AV	V	30.59	4.67	26.35	35.30	54.00	18.70
7206	44.02	PK	V	34.09	6.50	26.91	57.70	74.00	16.30
7206	29.36	AV	V	34.09	6.50	26.91	43.04	54.00	10.96
9608	37.71	PK	V	35.96	8.75	27.21	55.21	74.00	18.79
9608	28.63	AV	V	35.96	8.75	27.21	46.13	54.00	7.87
1210	50.71	PK	V	22.85	2.65	23.33	52.88	74.00	21.12
1210	41	AV	V	22.85	2.65	23.33	43.17	54.00	10.83
47.36	43.18	QP	V	9.79	0.88	28.02	25.83	40.00	14.17
Middle Channel: 2441 MHz									
2441	68.53	PK	V	25.75	3.99	0.00	98.27	N/A	N/A
2441	60.91	PK	V	25.75	3.99	0.00	90.65	N/A	N/A
2441	65.37	PK	H	25.75	3.99	0.00	95.11	N/A	N/A
2441	55.27	AV	H	25.75	3.99	0.00	85.01	N/A	N/A
4882	38.34	PK	V	30.79	4.75	26.58	47.30	74.00	26.70
4882	28.36	AV	V	30.79	4.75	26.58	37.32	54.00	16.68
7323	45.45	PK	V	34.38	6.72	26.95	59.60	74.00	14.40
7323	29.78	AV	V	34.38	6.72	26.95	43.93	54.00	10.07
9764	42.1	PK	V	36.33	8.58	27.32	59.69	74.00	14.31
9764	28.39	AV	V	36.33	8.58	27.32	45.98	54.00	8.02
1210	53.45	PK	V	22.85	2.65	23.33	55.62	74.00	18.38
1210	37.07	AV	V	22.85	2.65	23.33	39.24	54.00	14.76
1527	52.45	PK	V	23.65	3.04	23.56	55.58	74.00	18.42
1527	35.07	AV	V	23.65	3.04	23.56	38.20	54.00	15.80
47.36	41.06	QP	V	9.79	0.88	28.02	23.71	40.00	16.29
High Channel: 2480 MHz									
2480	67.68	PK	V	25.85	3.82	0.00	97.35	N/A	N/A
2480	55.82	AV	V	25.85	3.82	0.00	85.49	N/A	N/A
2480	61.74	PK	H	25.85	3.82	0.00	91.41	N/A	N/A
2480	55.91	AV	H	25.85	3.82	0.00	85.58	N/A	N/A
2483.5	26.48	PK	V	25.86	3.80	0.00	56.14	74.00	17.86
2483.5	14.25	AV	V	25.86	3.80	0.00	43.91	54.00	10.09
4960	38.93	PK	V	31.00	4.70	26.71	47.92	74.00	26.08
4960	28.36	AV	V	31.00	4.70	26.71	37.35	54.00	16.65
7440	40.42	PK	V	34.66	6.95	27.06	54.97	74.00	19.03
7440	26.04	AV	V	34.66	6.95	27.06	40.59	54.00	13.41
9920	37.75	PK	V	36.71	8.41	27.35	55.52	74.00	18.48
9920	28.04	AV	V	36.71	8.41	27.35	45.81	54.00	8.19
1210	53.07	PK	V	22.85	2.65	23.33	55.24	74.00	18.76
1210	36.36	AV	V	22.85	2.65	23.33	38.53	54.00	15.47
47.36	43.22	QP	V	9.79	0.88	28.02	25.87	40.00	14.13

EDR Mode (8DPSK)

Frequency (MHz)	Receiver		Rx Antenna		Cable Loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	67.35	PK	V	25.65	3.90	0.00	96.90	N/A	N/A
2402	56.16	AV	V	25.65	3.90	0.00	85.71	N/A	N/A
2402	64.71	PK	H	25.65	3.90	0.00	94.26	N/A	N/A
2402	54.69	AV	H	25.65	3.90	0.00	84.24	N/A	N/A
2390	24.16	PK	V	25.61	3.84	0.00	53.61	74.00	20.39
2390	13.83	AV	V	25.61	3.84	0.00	43.28	54.00	10.72
4804	38.66	PK	V	30.59	4.67	26.35	47.57	74.00	26.43
4804	27.84	AV	V	30.59	4.67	26.35	36.75	54.00	17.25
7206	45.33	PK	V	34.09	6.50	26.91	59.01	74.00	14.99
7206	29.54	AV	V	34.09	6.50	26.91	43.22	54.00	10.78
9608	41.35	PK	V	35.96	8.75	27.21	58.85	74.00	15.15
9608	28.16	AV	V	35.96	8.75	27.21	45.66	54.00	8.34
1210	55.24	PK	V	22.85	2.65	23.33	57.41	74.00	16.59
1210	40.07	AV	V	22.85	2.65	23.33	42.24	54.00	11.76
47.36	43	QP	V	9.79	0.88	28.02	25.65	40.00	14.35
Middle Channel: 2441 MHz									
2441	67.91	PK	V	25.75	3.99	0.00	97.65	N/A	N/A
2441	60.74	PK	V	25.75	3.99	0.00	90.48	N/A	N/A
2441	64.31	PK	H	25.75	3.99	0.00	94.05	N/A	N/A
2441	54.71	AV	H	25.75	3.99	0.00	84.45	N/A	N/A
4882	38.36	PK	V	30.79	4.75	26.58	47.32	74.00	26.68
4882	28.19	AV	V	30.79	4.75	26.58	37.15	54.00	16.85
7323	36.55	PK	V	34.38	6.72	26.95	50.70	74.00	23.30
7323	21.18	AV	V	34.38	6.72	26.95	35.33	54.00	18.67
9764	40.39	PK	V	36.33	8.58	27.32	57.98	74.00	16.02
9764	25.15	AV	V	36.33	8.58	27.32	42.74	54.00	11.26
1210	45.22	PK	V	22.85	2.65	23.33	47.39	74.00	26.61
1210	34.52	AV	V	22.85	2.65	23.33	36.69	54.00	17.31
1527	54.13	PK	V	23.65	3.04	23.56	57.26	74.00	16.74
1527	40.42	AV	V	23.65	3.04	23.56	43.55	54.00	10.45
47.36	41.86	QP	V	9.79	0.88	28.02	24.51	40.00	15.49
High Channel: 2480 MHz									
2480	67.49	PK	V	25.85	3.82	0.00	97.16	N/A	N/A
2480	54.77	AV	V	25.85	3.82	0.00	84.44	N/A	N/A
2480	61.08	PK	H	25.85	3.82	0.00	90.75	N/A	N/A
2480	54.37	AV	H	25.85	3.82	0.00	84.04	N/A	N/A
2483.5	25.43	PK	V	25.86	3.80	0.00	55.09	74.00	18.91
2483.5	14.21	AV	V	25.86	3.80	0.00	43.87	54.00	10.13
4960	36.15	PK	V	31.00	4.70	26.71	45.14	74.00	28.86
4960	28.13	AV	V	31.00	4.70	26.71	37.12	54.00	16.88
7440	41.75	PK	V	34.66	6.95	27.06	56.30	74.00	17.70
7440	25.63	AV	V	34.66	6.95	27.06	40.18	54.00	13.82
9920	43.53	PK	V	36.71	8.41	27.35	61.30	74.00	12.70
9920	26.89	AV	V	36.71	8.41	27.35	44.66	54.00	9.34
1210	49.73	PK	V	22.85	2.65	23.33	51.90	74.00	22.10
1210	36.18	AV	V	22.85	2.65	23.33	38.35	54.00	15.65
47.36	39.54	QP	V	9.79	0.88	28.02	22.19	40.00	17.81

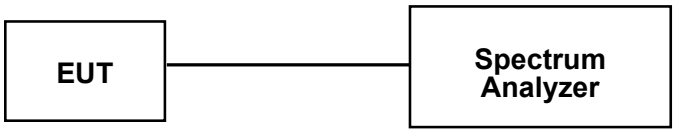
FCC §15.247(a) (1) - CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 30 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace
3. Measure the channel separation.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	30 °C
Relative Humidity:	52 %
ATM Pressure:	94.3 kPa

The testing was performed by Mill Chen on 2016-07-19.

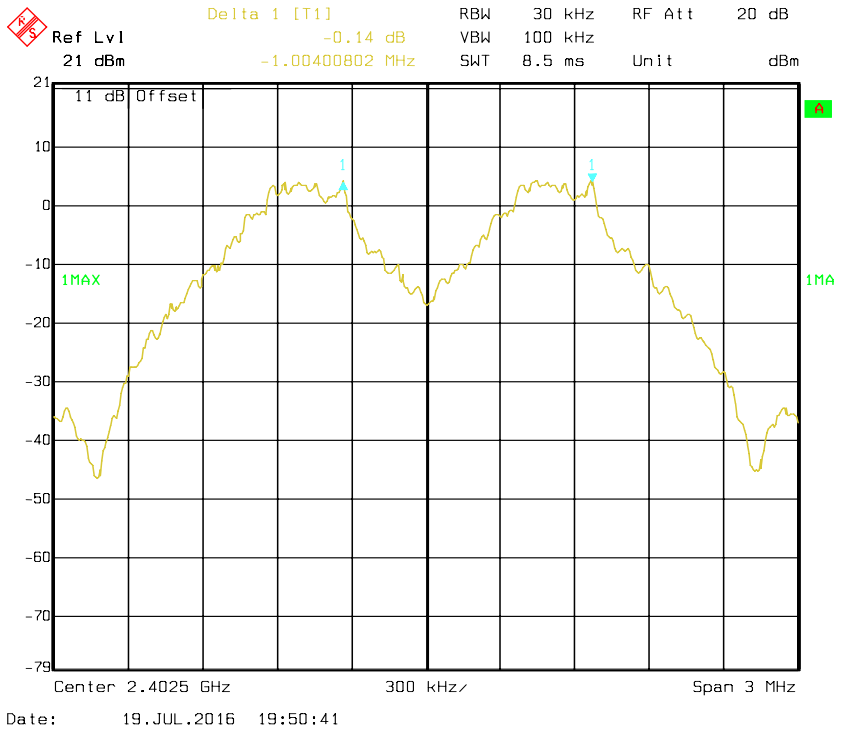
Test Mode: Transmitting

BDR Mode (GFSK)

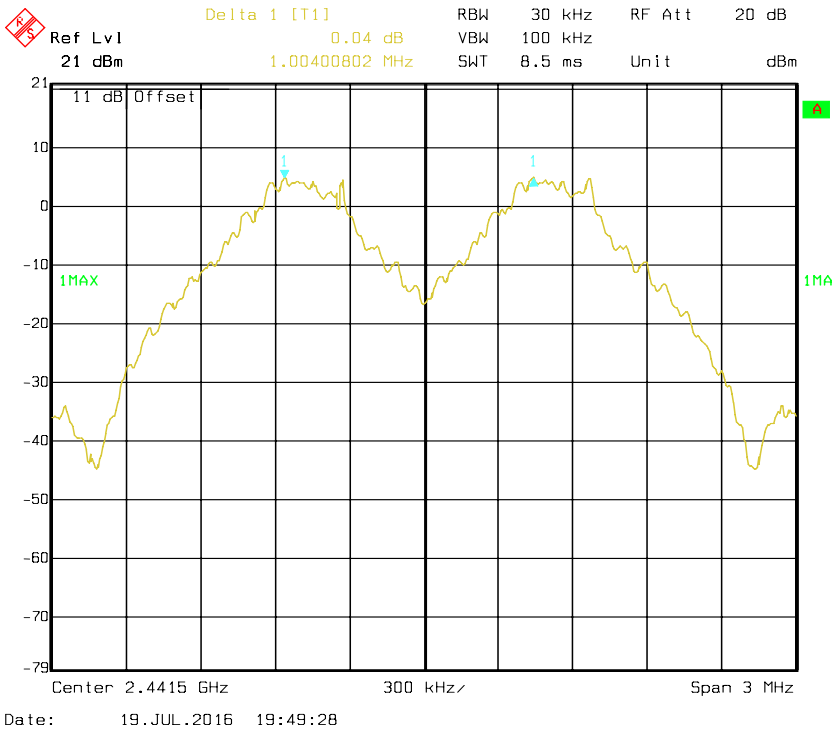
Channel	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR Mode (GFSK)	Low	2402	1.0040	0.6406	Pass
	Adjacent	2403			
	Middle	2441	1.0040	0.6406	Pass
	Adjacent	2442			
	High	2480	1.0040	0.6406	Pass
	Adjacent	2479			

Please refer to the following plots:

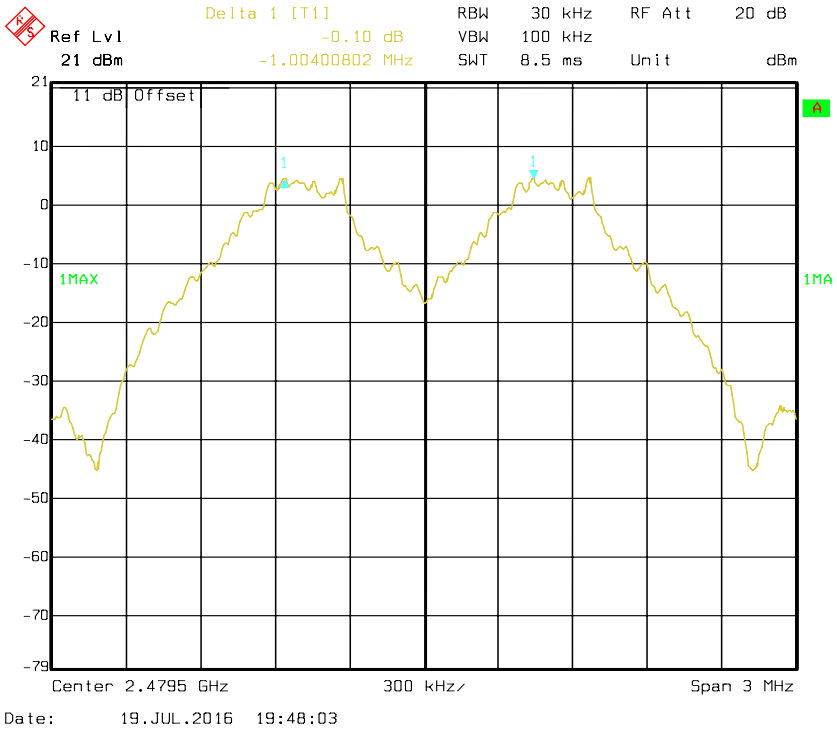
Low Channel



Middle Channel



High Channel

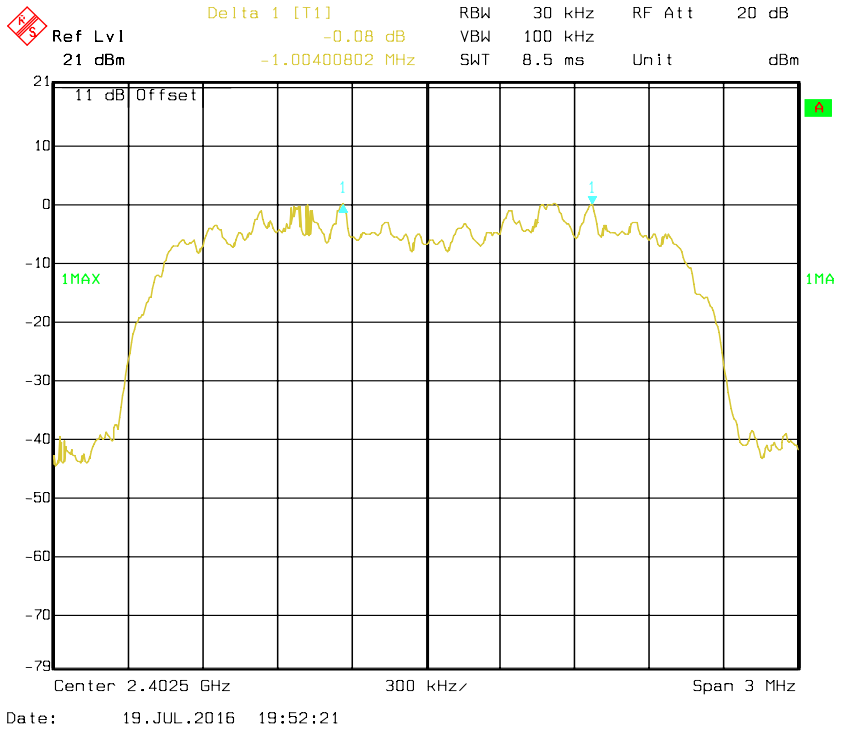


EDR Mode (π/4-DQPSK)

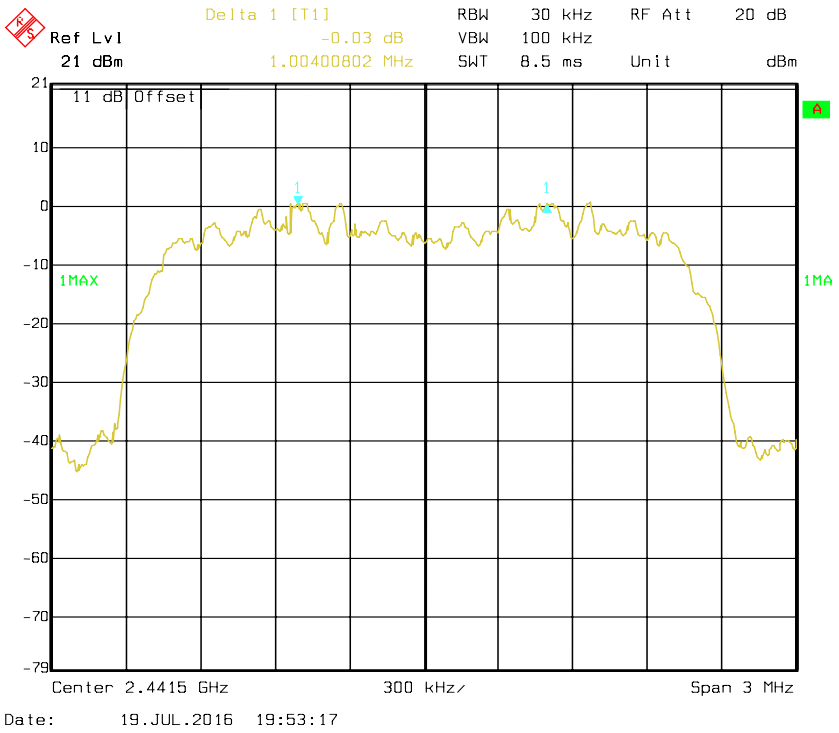
Channel	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
EDR Mode (π/4-DQPSK)	Low	2402	1.0040	0.8933	Pass
	Adjacent	2403			
	Middle	2441	1.0040	0.8933	Pass
	Adjacent	2442			
	High	2480	1.0100	0.8933	Pass
	Adjacent	2479			

Please refer to the following plots:

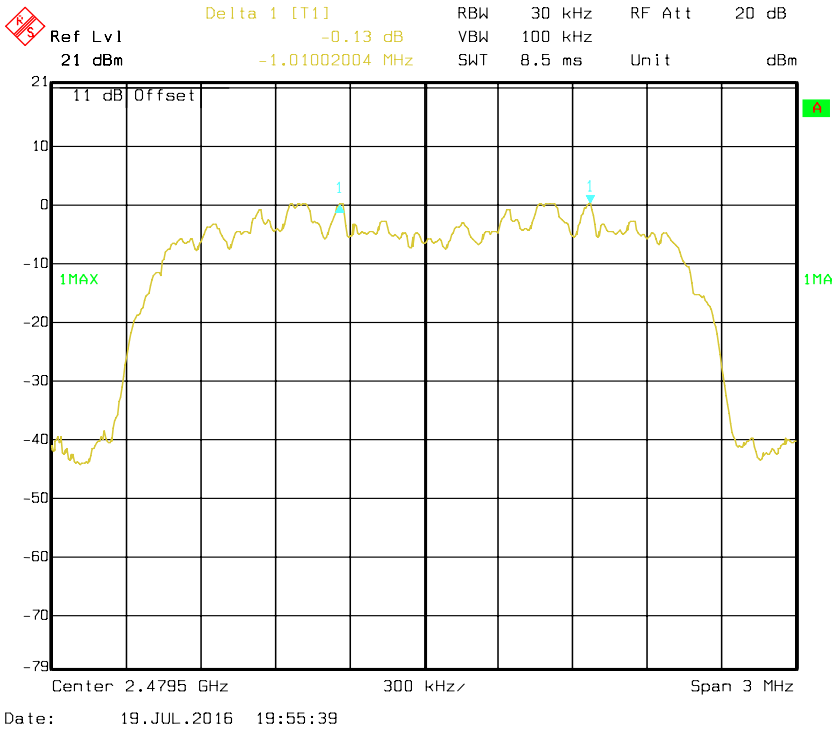
Low Channel



Middle Channel



High Channel

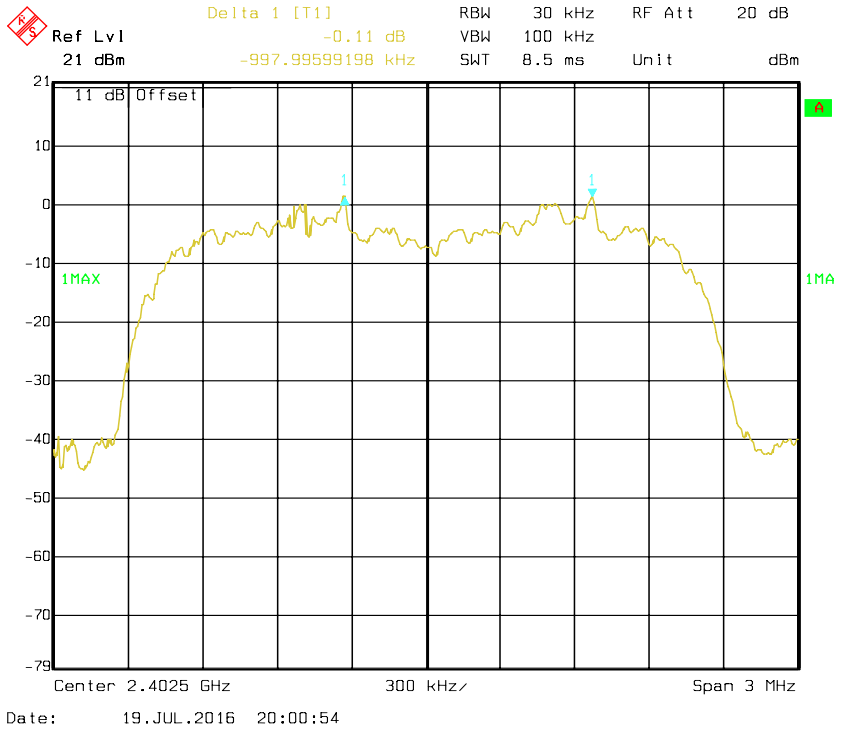


EDR Mode (8DPSK)

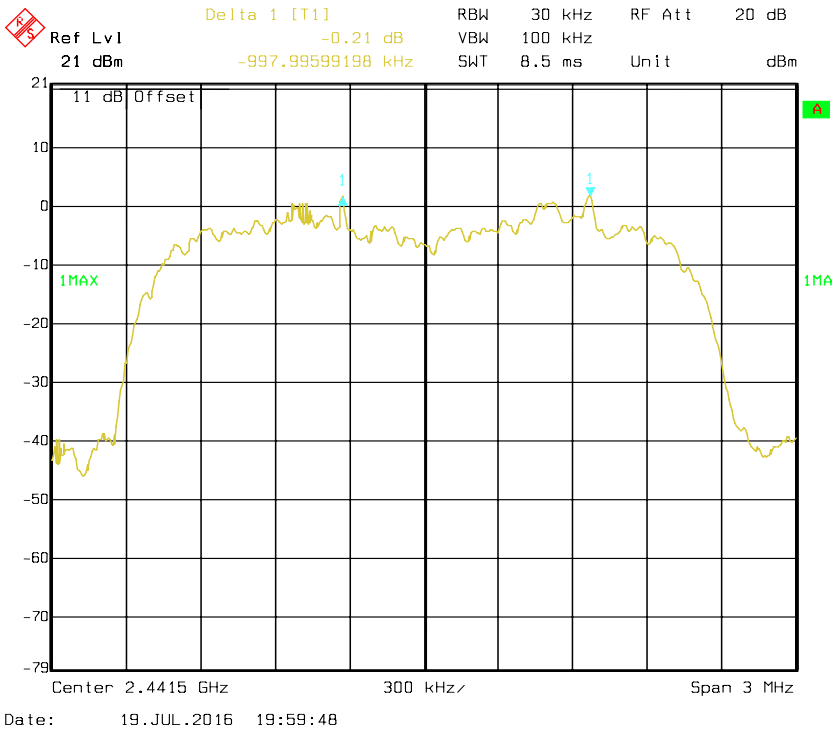
Channel	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
EDR Mode (8DPSK)	Low	2402	0.9970	0.8693	Pass
	Adjacent	2403			
	Middle	2441	0.9970	0.8693	Pass
	Adjacent	2442			
	High	2480	0.9970	0.8693	Pass
	Adjacent	2479			

Please refer to the following plots:

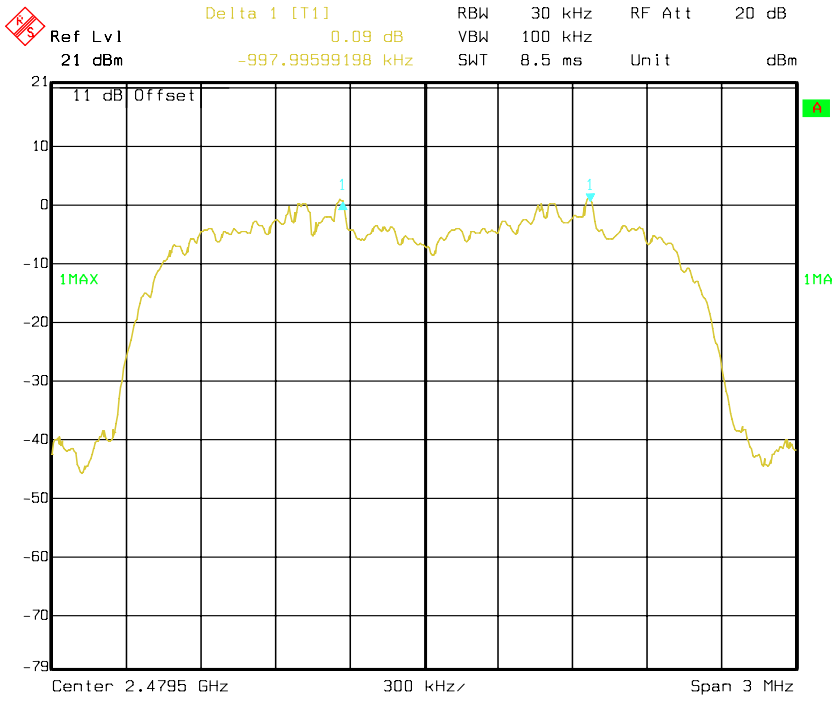
Low Channel



Middle Channel



High Channel



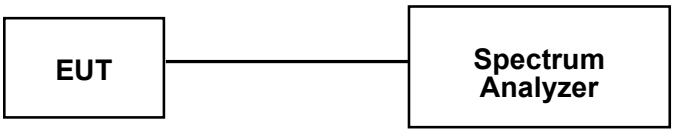
FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING

Applicable Standard

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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT.
   Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	30 °C
Relative Humidity:	52 %
ATM Pressure:	94.3 kPa

The testing was performed by Mill Chen on 2016-07-19.

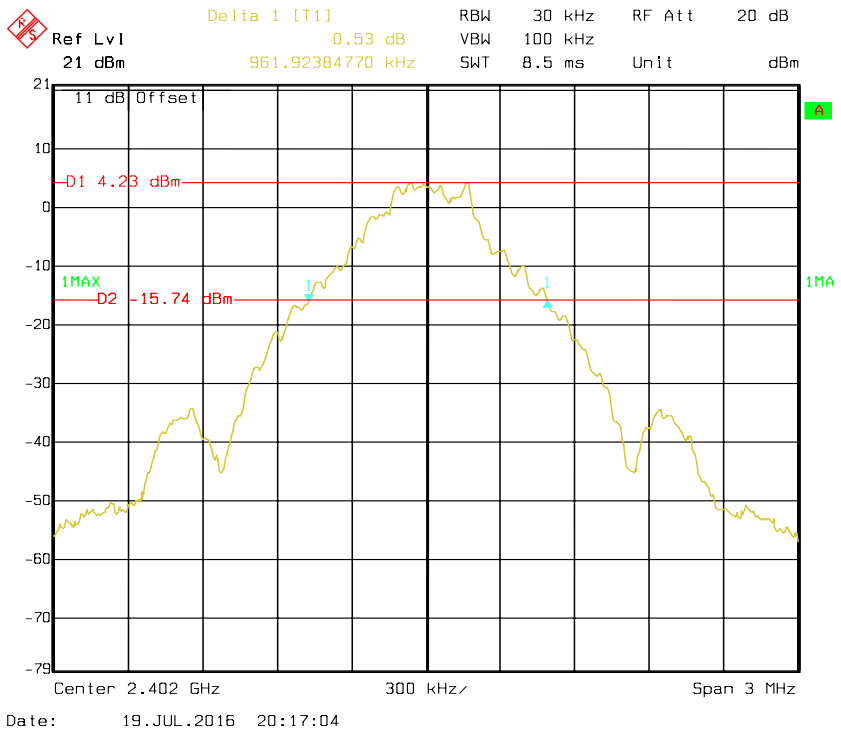
Test Mode: Transmitting

BDR Mode (GFSK)

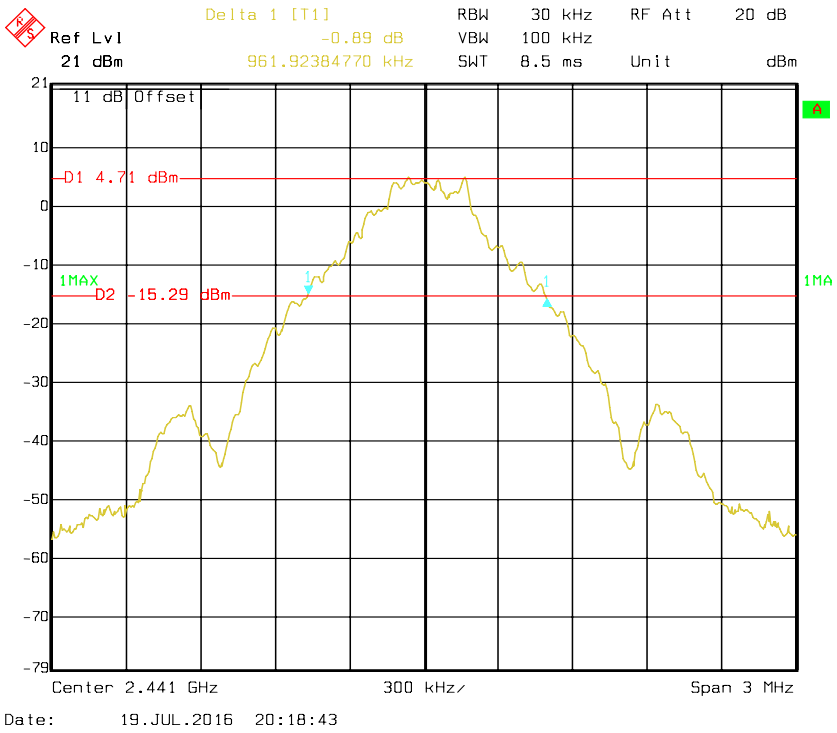
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.961
	Middle	2441	0.961
	High	2480	0.955

Please refer to the following plots

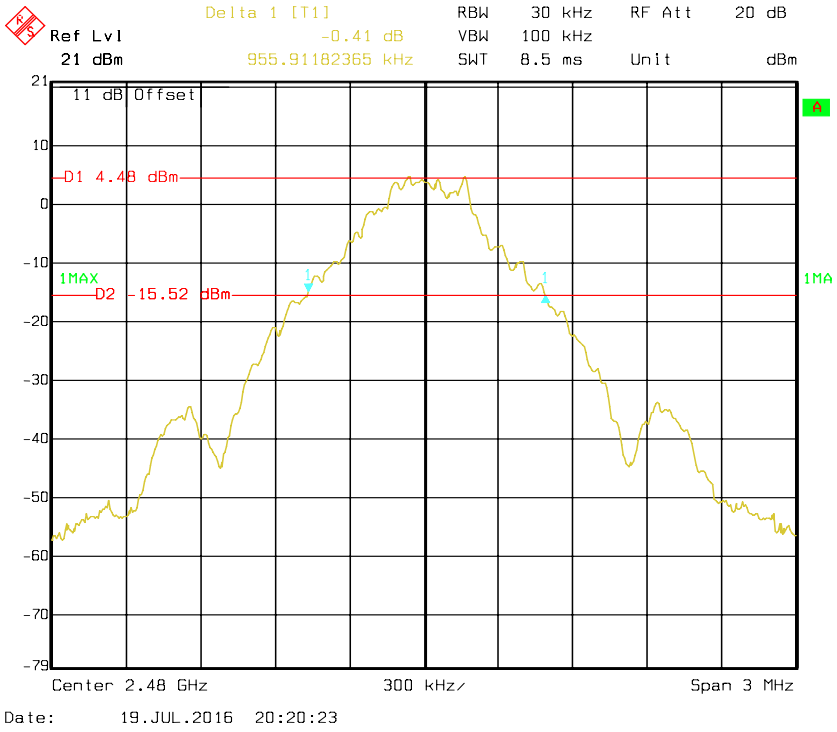
Low Channel



Middle Channel



High Channel

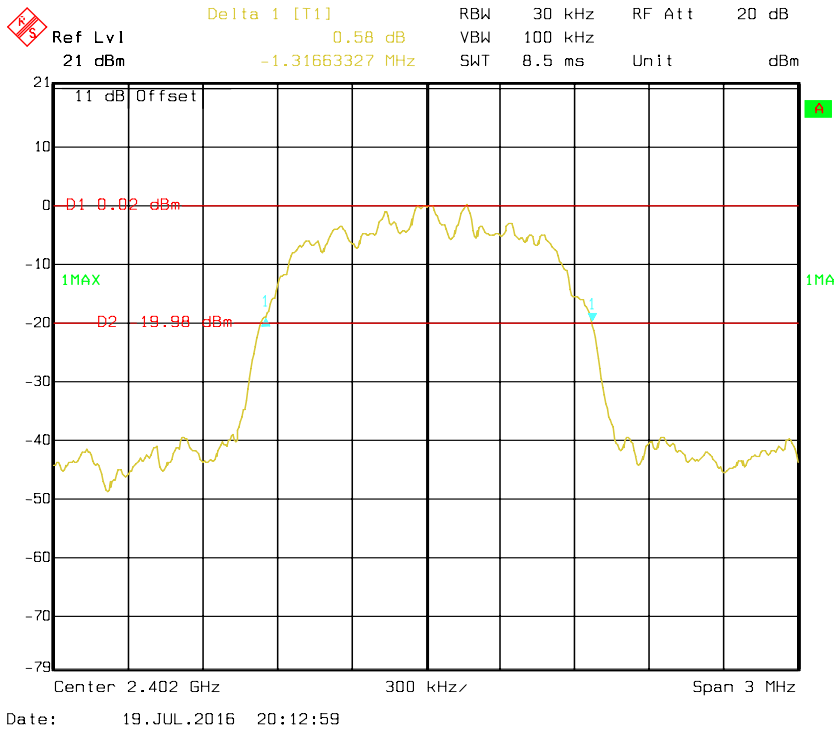


EDR Mode (π/4-DQPSK)

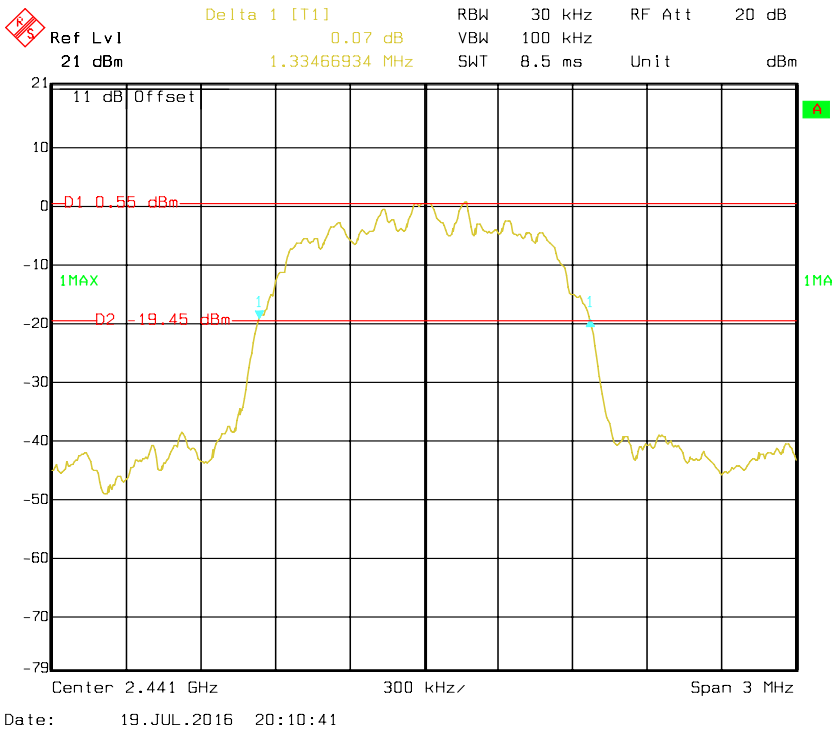
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
EDR Mode (π/4-DQPSK)	Low	2402	1.316
	Middle	2441	1.334
	High	2480	1.340

Please refer to the following plots

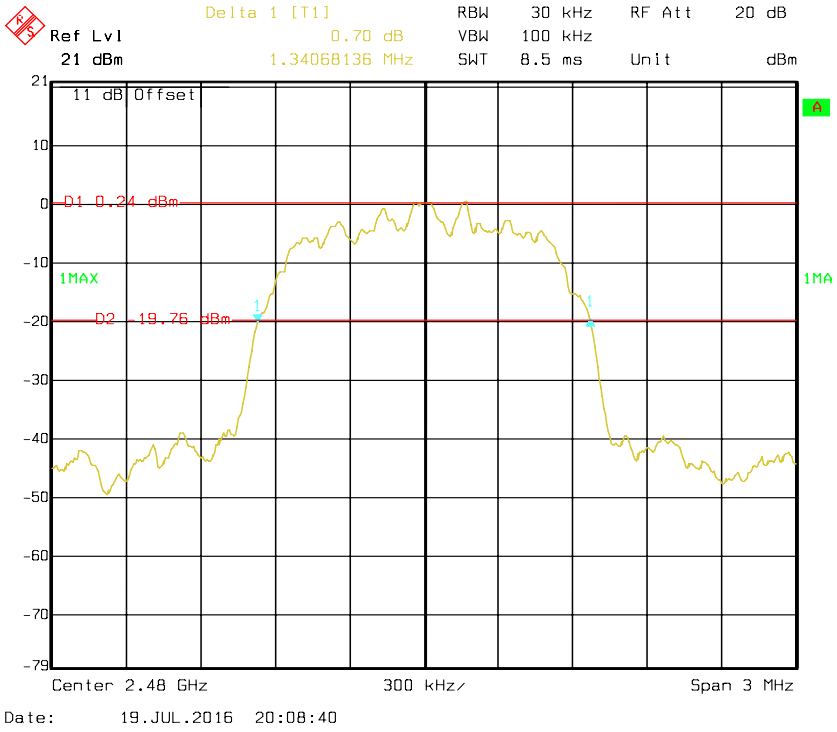
Low Channel



Middle Channel



High Channel

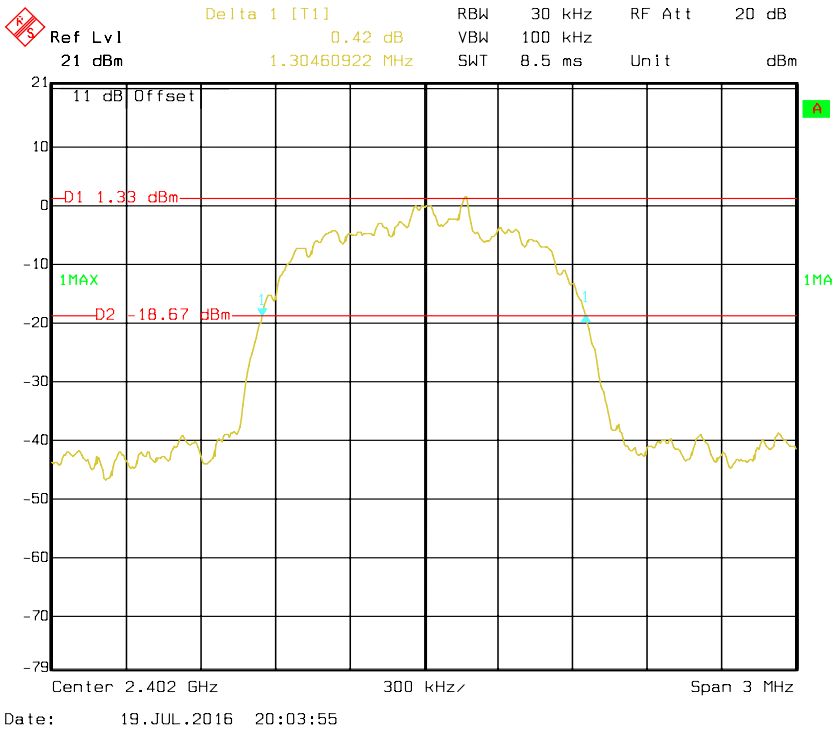


EDR Mode (8DPSK)

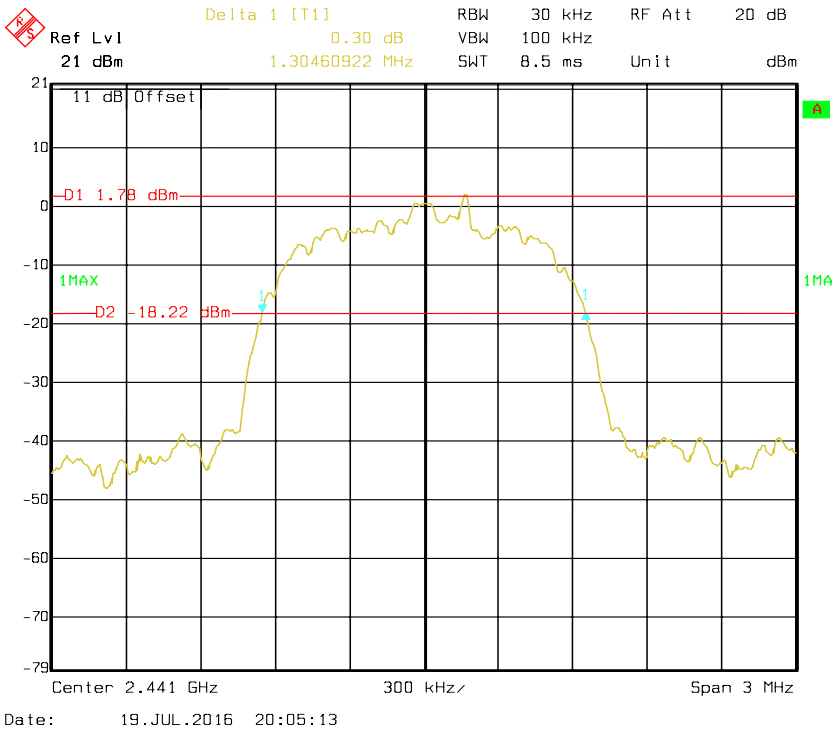
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
EDR Mode (8DPSK)	Low	2402	1.304
	Middle	2441	1.304
	High	2480	1.304

Please refer to the following plots

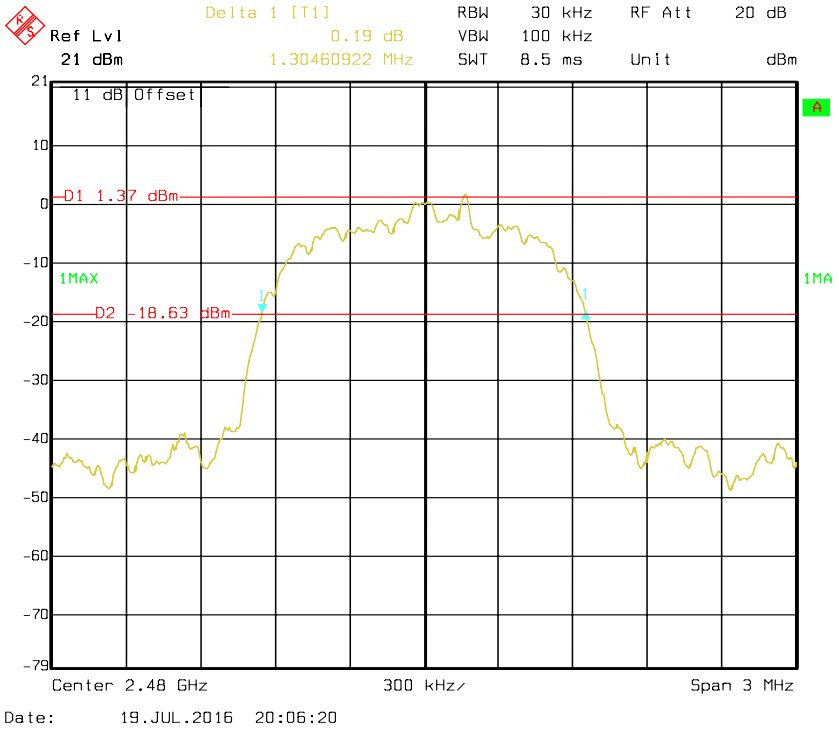
Low Channel



Middle Channel



High Channel



FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

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.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Temperature:	30 °C
Relative Humidity:	52 %
ATM Pressure:	94.3 kPa

The testing was performed by Mill Chen on 2016-07-19.

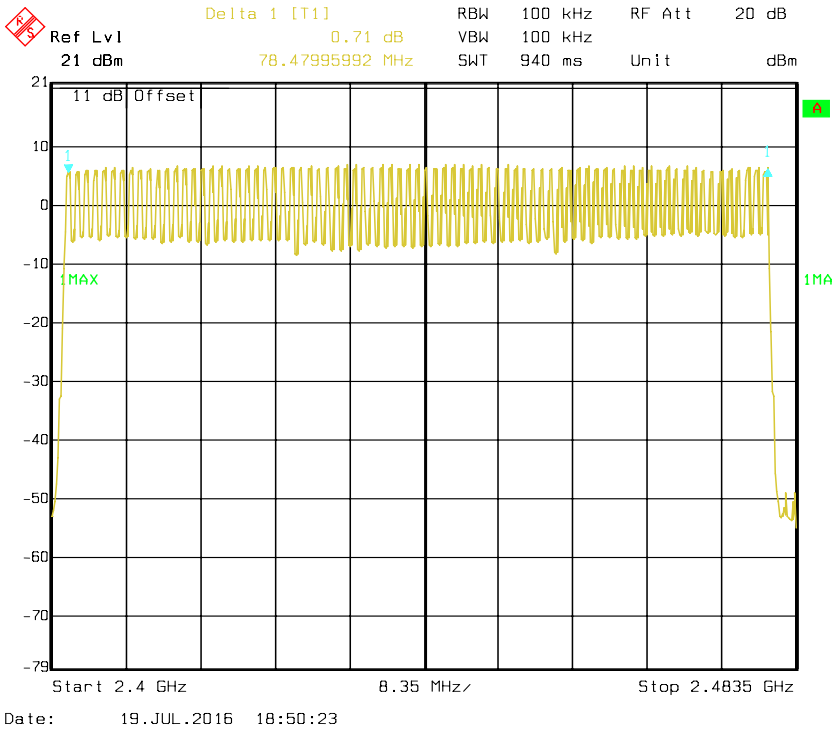
Test Mode: Transmitting

BDR Mode (GFSK)

Test Result: Compliance, Please refer to following table and plots.

Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit
BDR Mode (GFSK)	2400-2483.50	79	≥15

Number of Hopping Channels

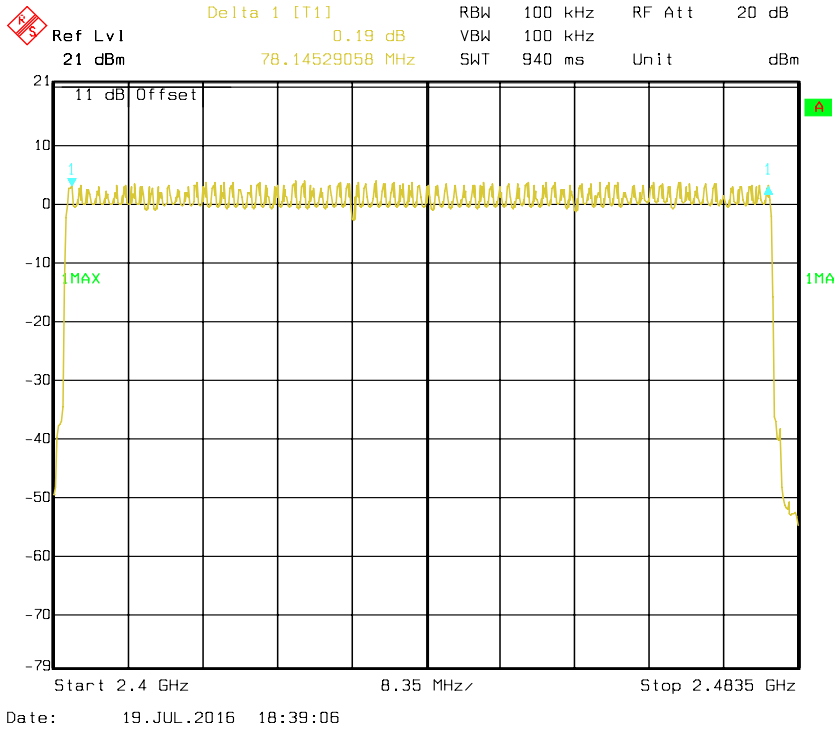


EDR Mode (π/4-DQPSK)

Test Result: Compliance, Please refer to following table and plots.

Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit
EDR Mode (π/4-DQPSK)	2400-2483.50	79	≥15

Number of Hopping Channels

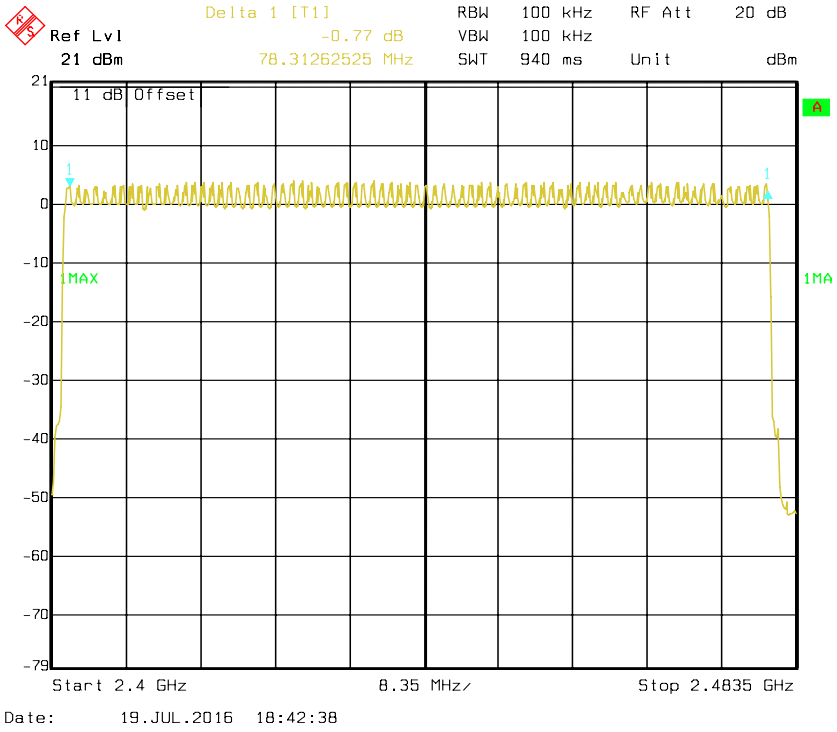


EDR Mode (8DPSK)

Test Result: Compliance, Please refer to following table and plots.

Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit
EDR Mode (8DPSK)	2400-2483.50	79	≥15

Number of Hopping Channels



FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz 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.

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 * channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell Time= time slot length * hope rate/ number of hopping channels * 31.6s
Hop rate=1600/s

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	30 °C
Relative Humidity:	52 %
ATM Pressure:	94.3 kPa

The testing was performed by Mill Chen on 2016-07-19.

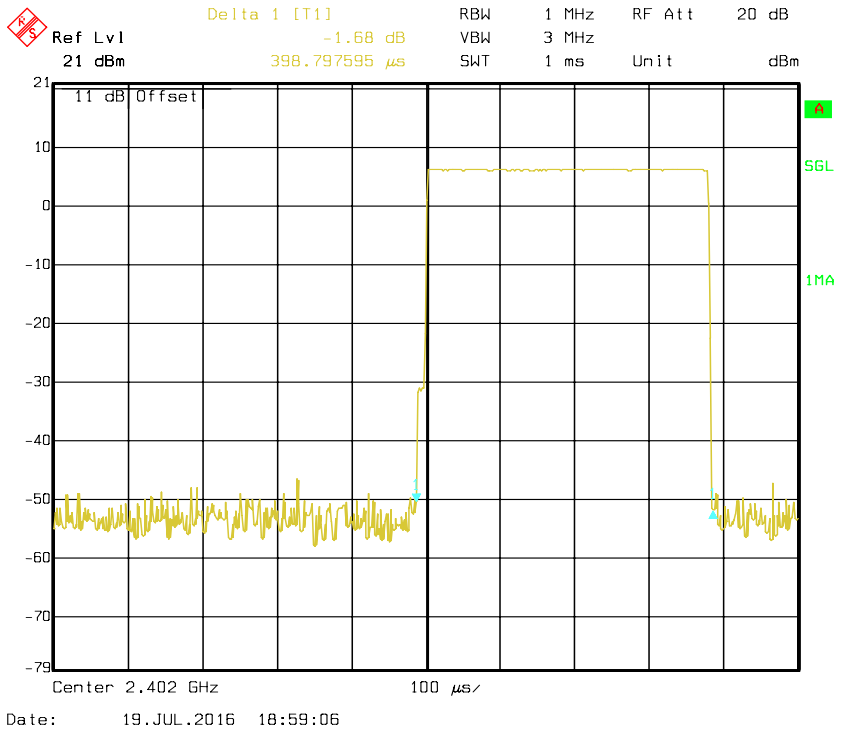
Test Mode: Transmitting

BDR Mode (GFSK):

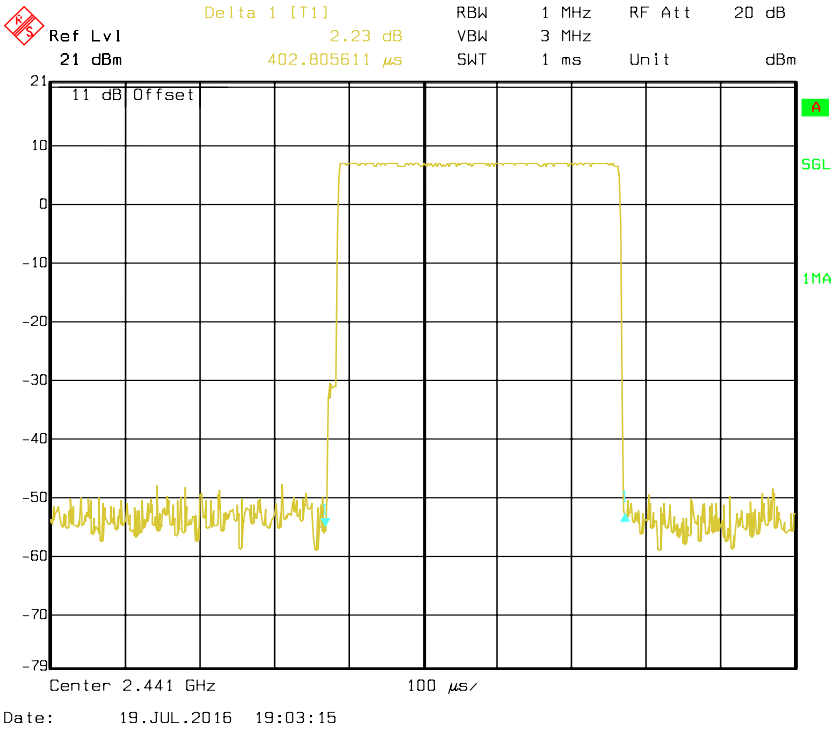
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.398	0.127	0.4	Pass
	Middle	0.402	0.129	0.4	Pass
	High	0.267	0.085	0.4	Pass
	Note: DH1:Dwell time = Minimum Frequency Occupation *(1600/2/79)*31.6s				
DH3	Low	1.667	0.267	0.4	Pass
	Middle	1.667	0.267	0.4	Pass
	High	1.661	0.266	0.4	Pass
	Note: DH3:Dwell time = Minimum Frequency Occupation *(1600/4/79)*31.6s				
DH5	Low	2.917	0.311	0.4	Pass
	Middle	2.925	0.312	0.4	Pass
	High	2.933	0.313	0.4	Pass
	Note: DH5:Dwell time = Minimum Frequency Occupation *(1600/6/79)*31.6s				

Please refer to the following plots.

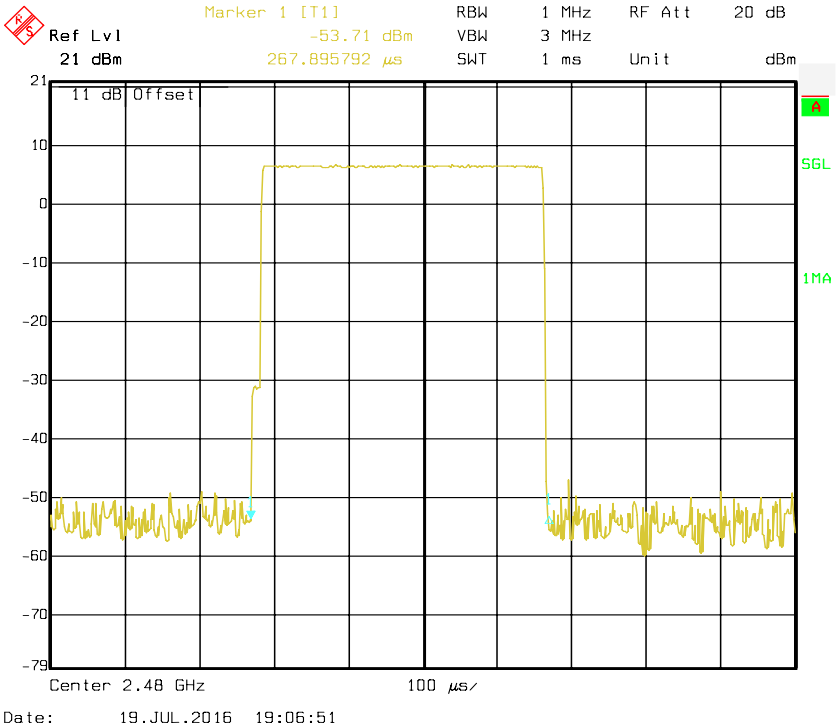
DH1: Low Channel



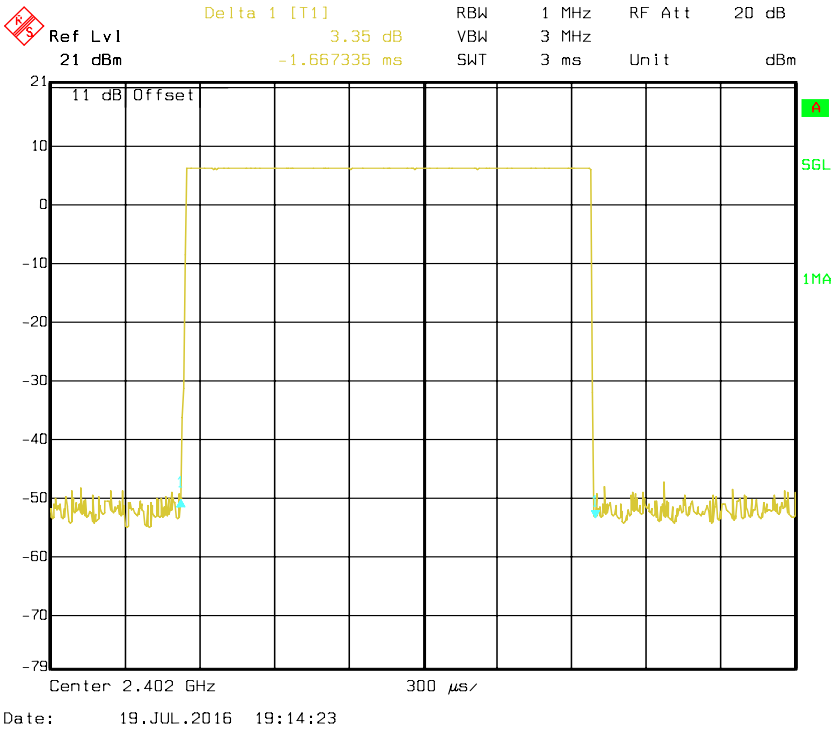
DH1: Middle Channel



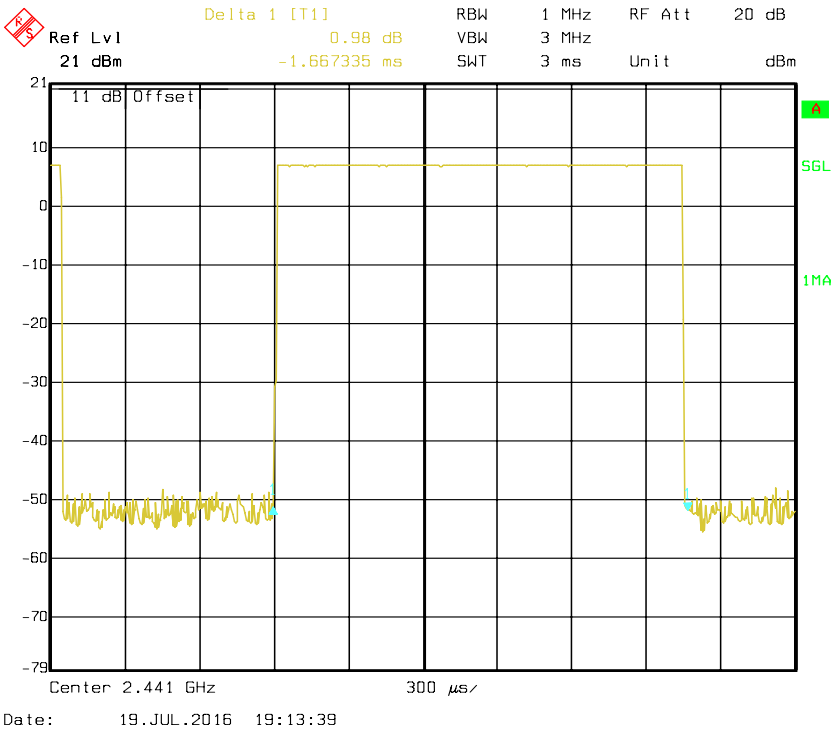
DH1: High Channel



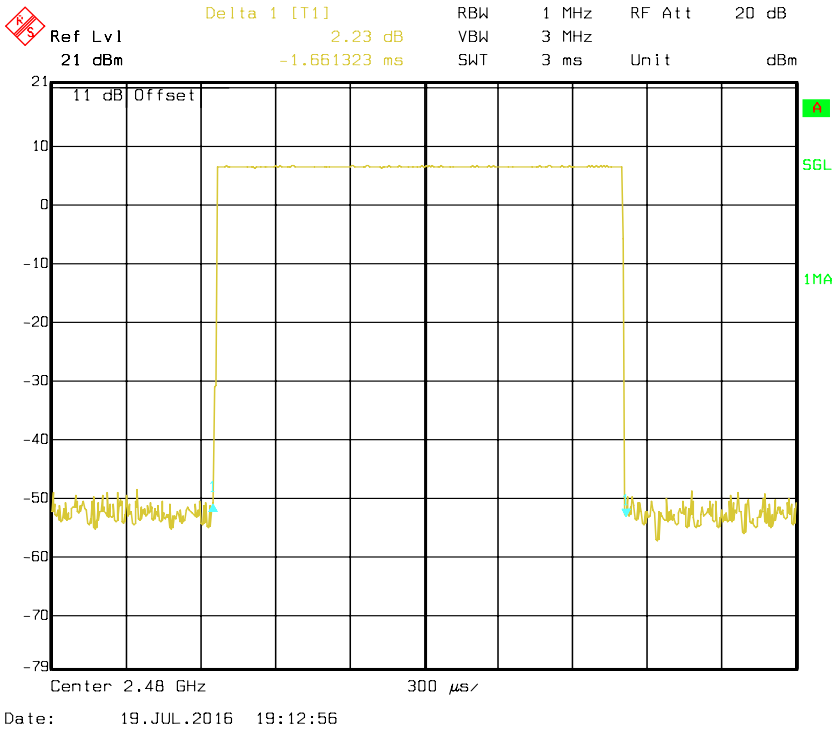
DH3: Low Channel



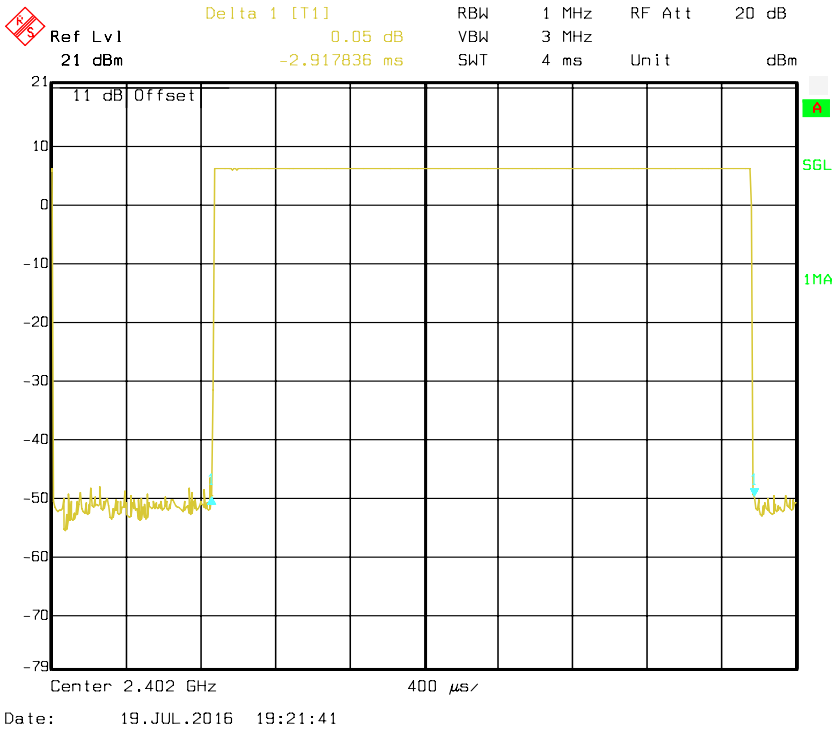
DH3: Middle Channel



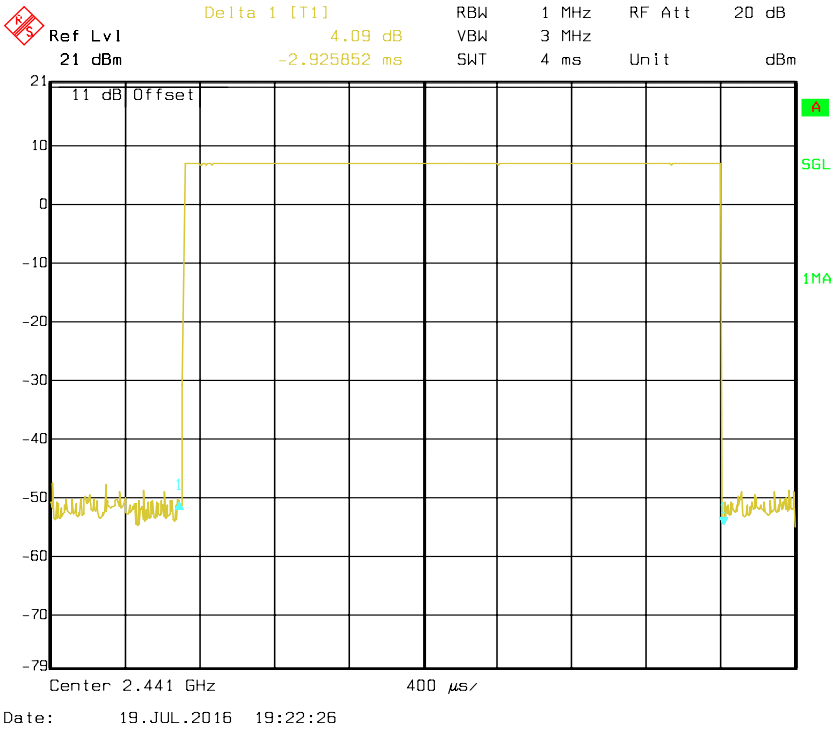
DH3: High Channel



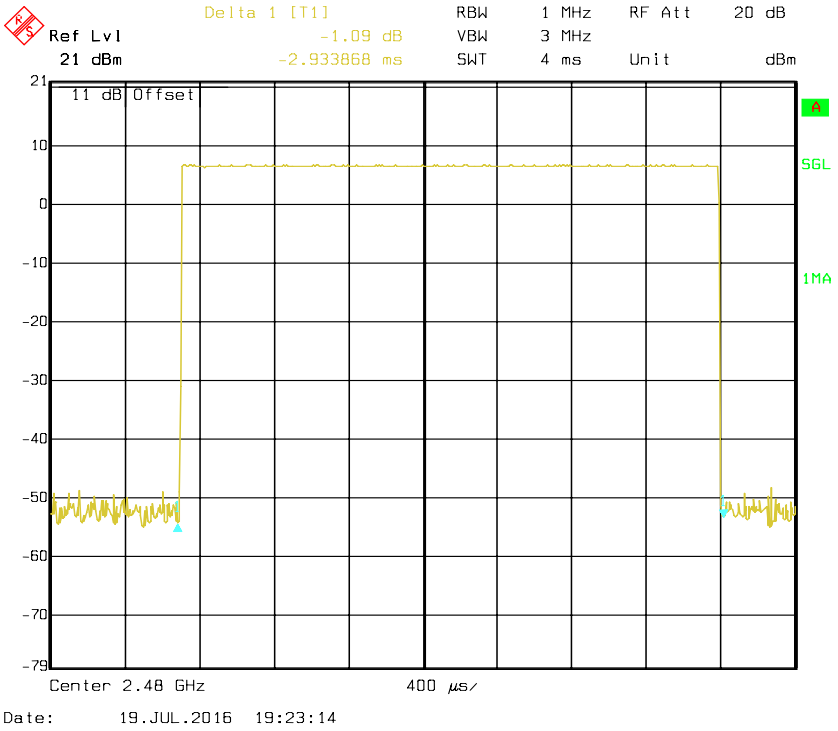
DH5: Low Channel



DH5: Middle Channel



DH5: High Channel

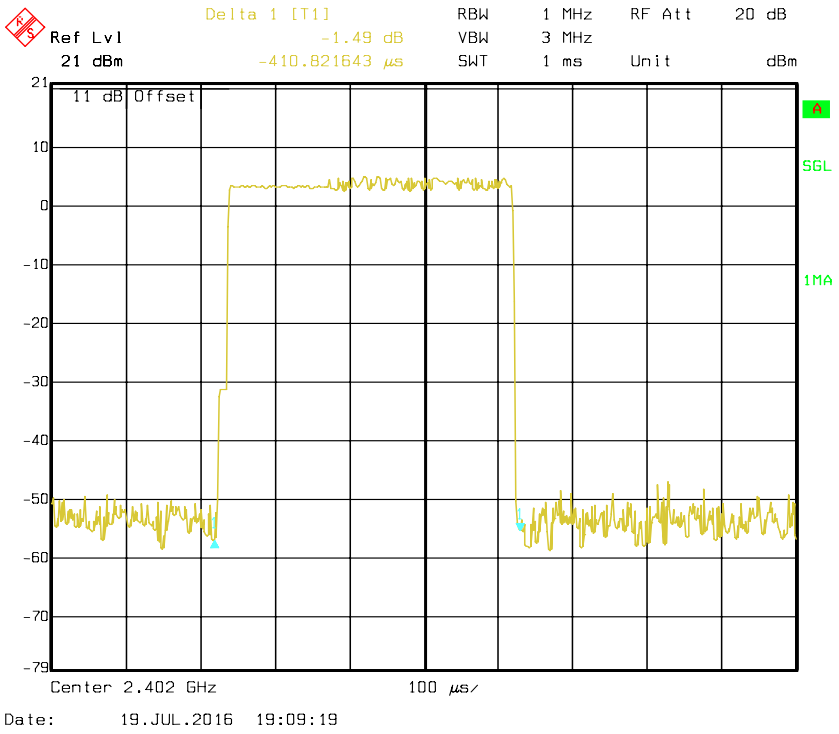


EDR Mode (π/4-DQPSK):

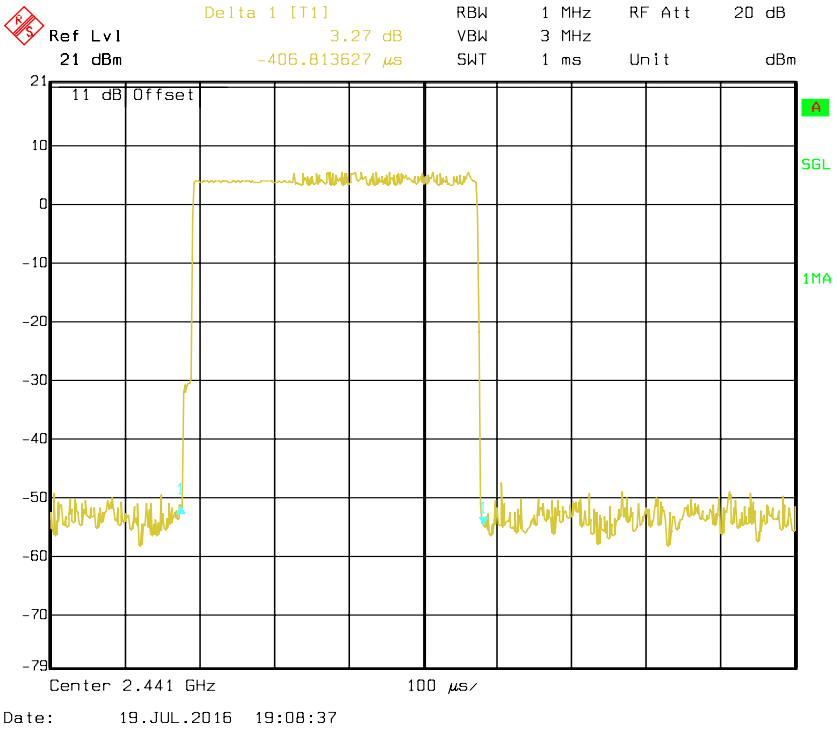
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.410	0.131	0.4	Pass
	Middle	0.405	0.130	0.4	Pass
	High	0.406	0.130	0.4	Pass
	Note: DH1:Dwell time = Minimum Frequency Occupation *(1600/2/79)*31.6s				
2DH3	Low	1.667	0.267	0.4	Pass
	Middle	1.661	0.266	0.4	Pass
	High	1.667	0.267	0.4	Pass
	Note: DH3:Dwell time = Minimum Frequency Occupation *(1600/4/79)*31.6s				
2DH5	Low	2.933	0.313	0.4	Pass
	Middle	2.917	0.311	0.4	Pass
	High	2.925	0.312	0.4	Pass
	Note: DH5:Dwell time = Minimum Frequency Occupation *(1600/6/79)*31.6s				

Please refer to the following plots.

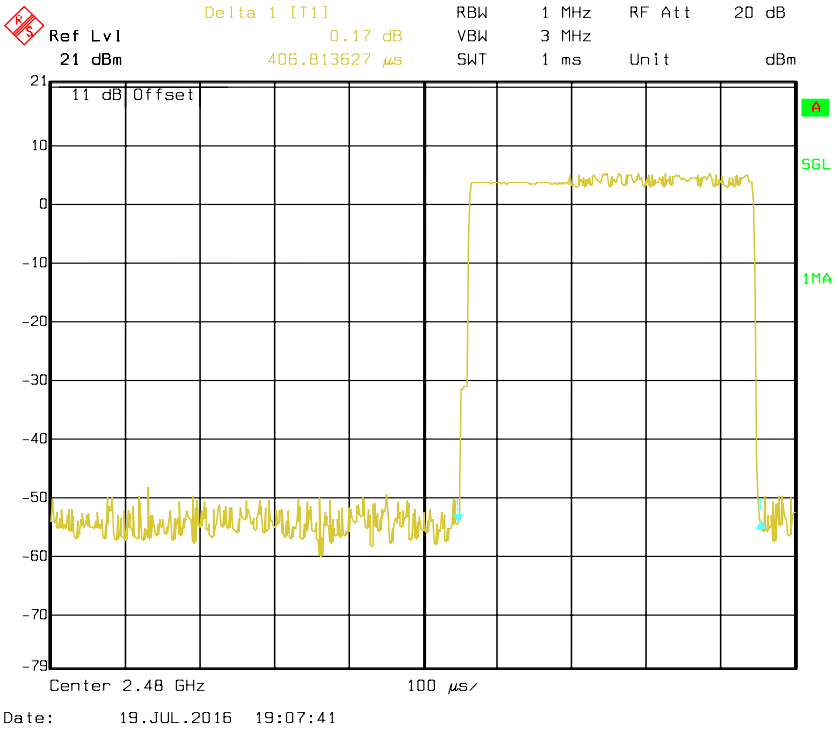
2DH1: Low Channel



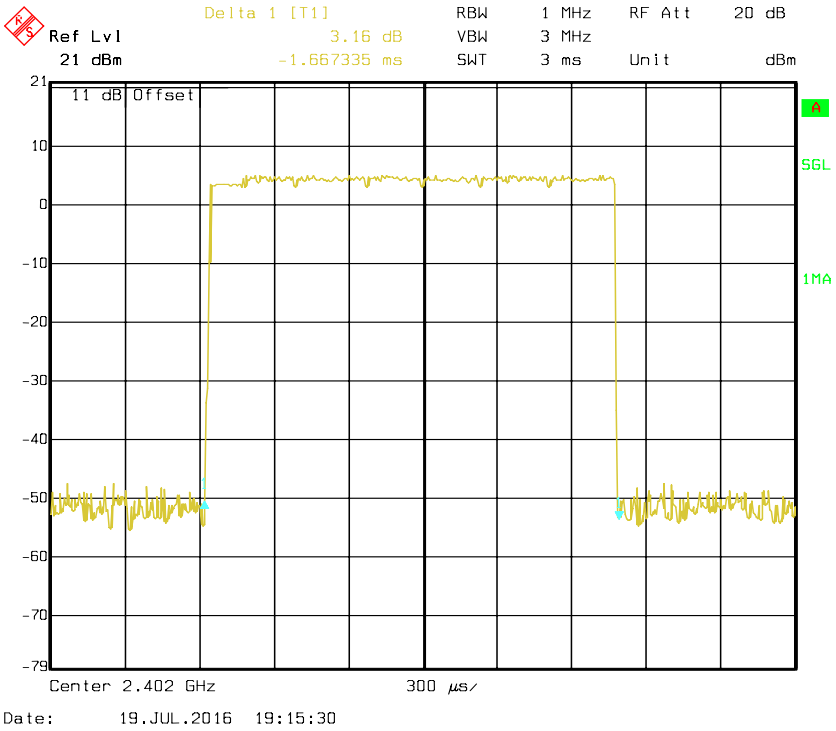
2DH1: Middle Channel



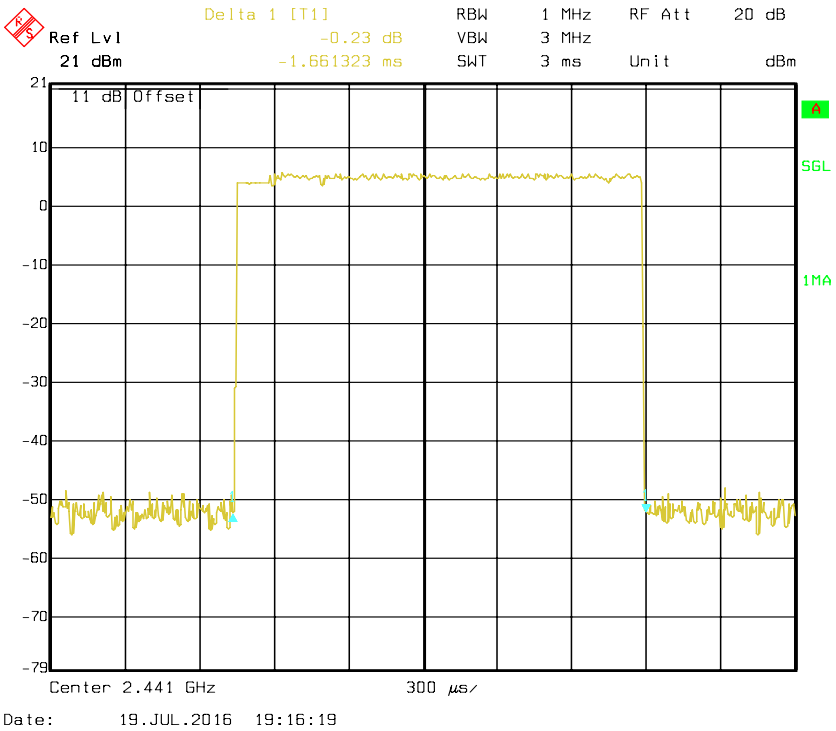
2DH1: High Channel



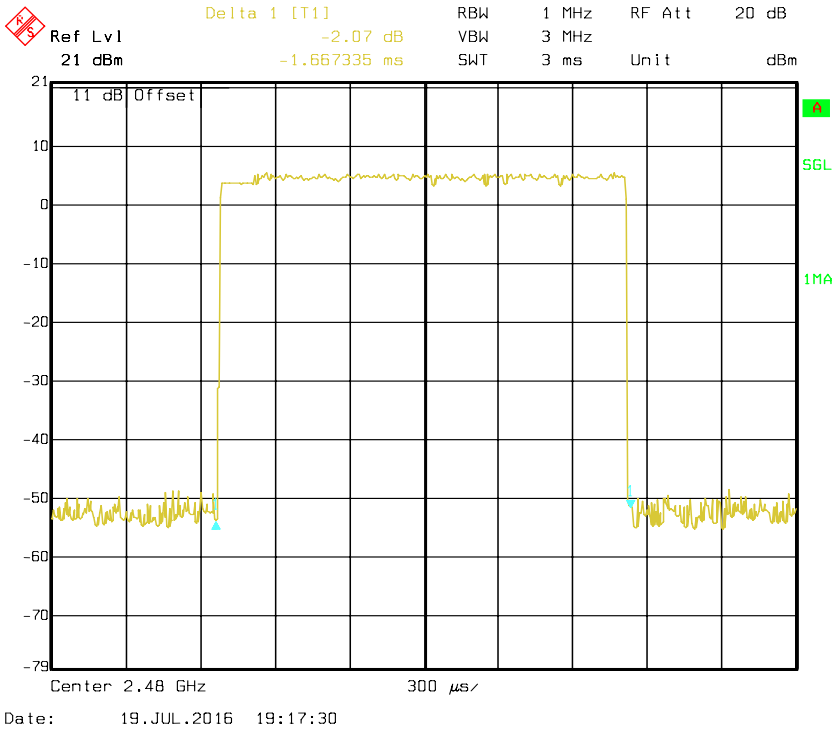
2DH3: Low Channel



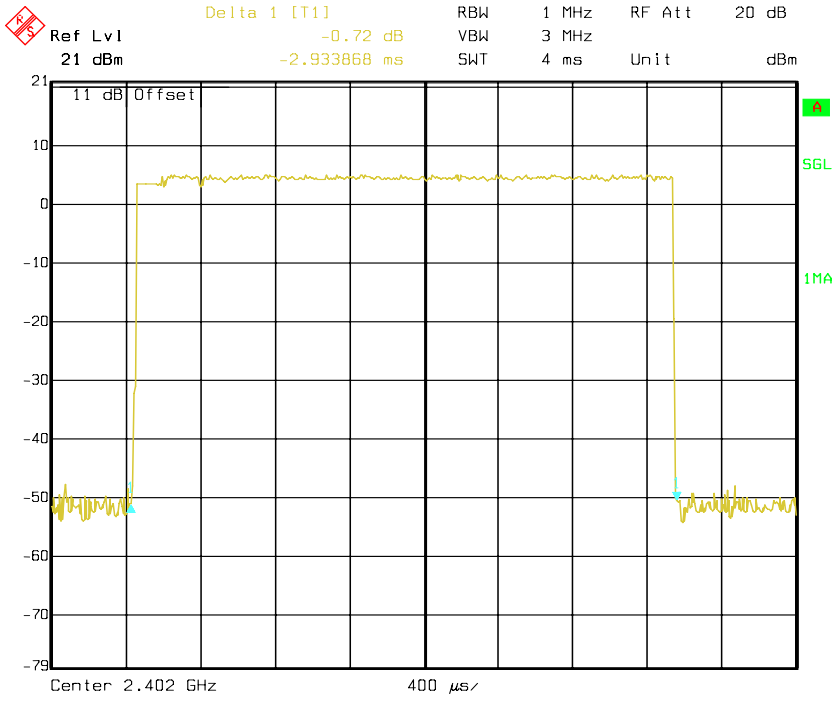
2DH3: Middle Channel



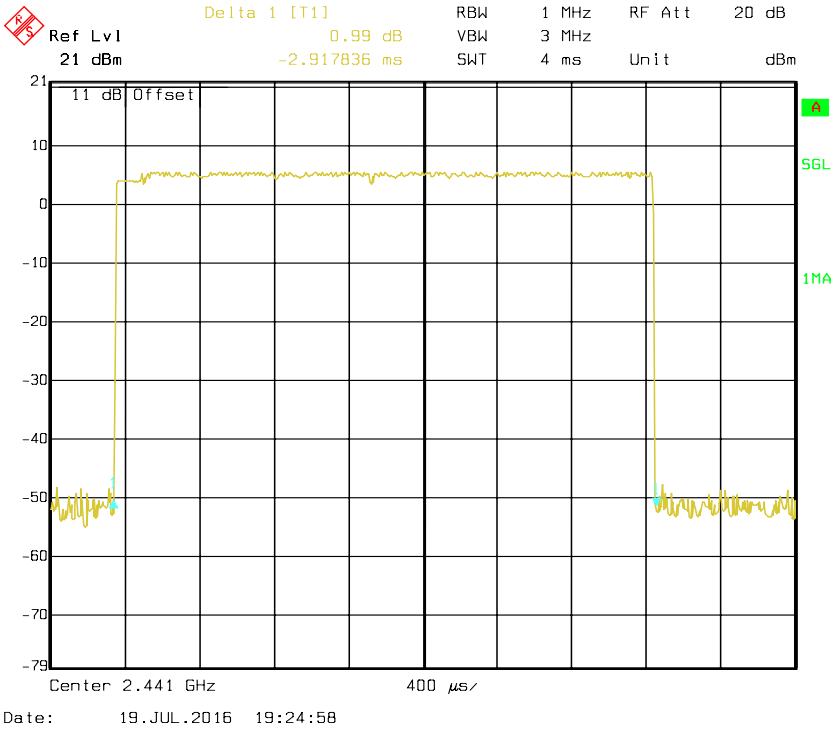
2DH3: High Channel



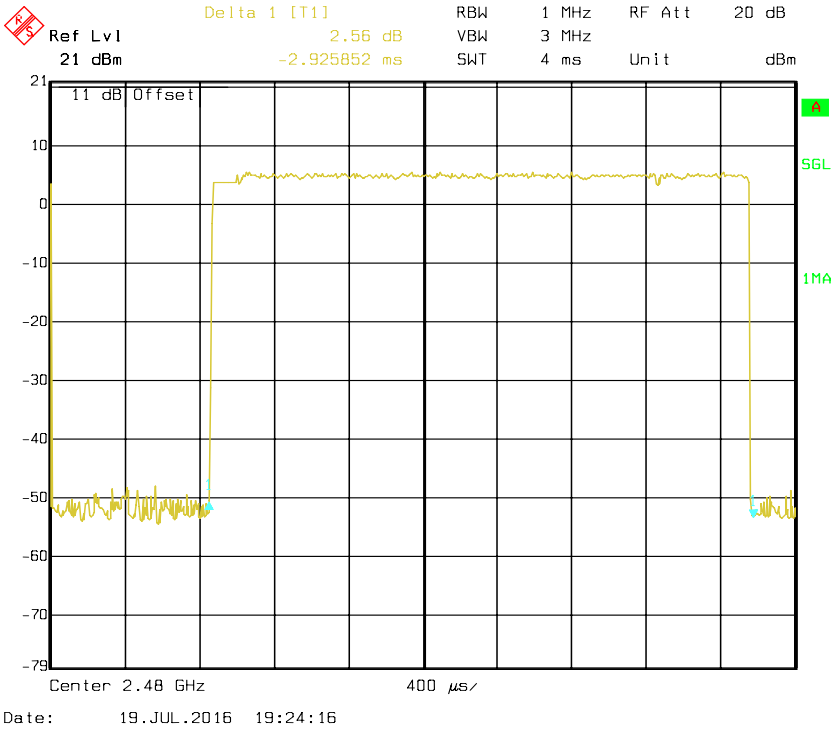
2DH5: Low Channel



2DH5: Middle Channel



2DH5: High Channel

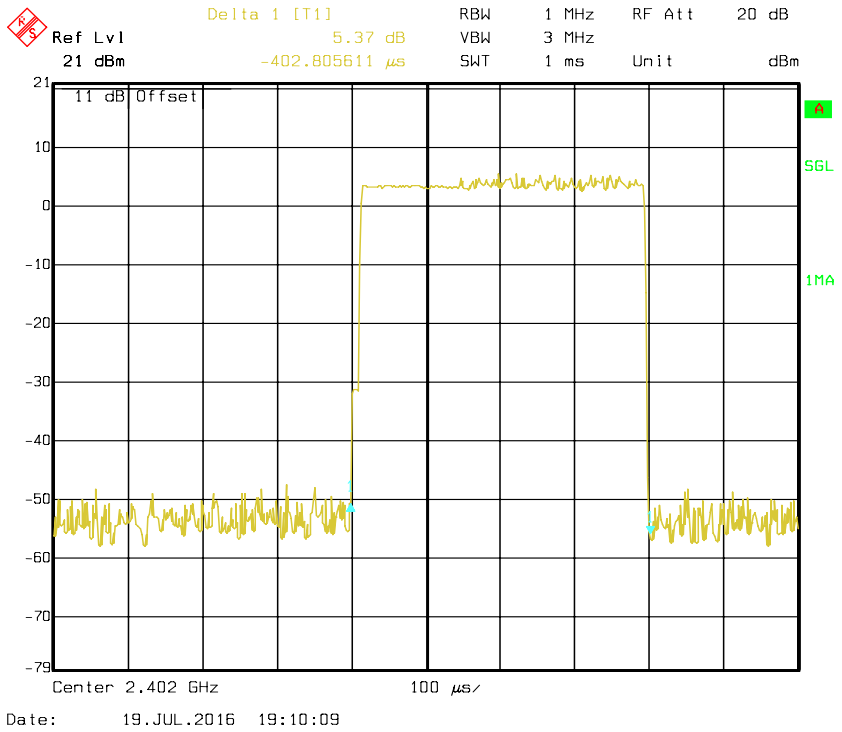


EDR Mode (8DPSK):

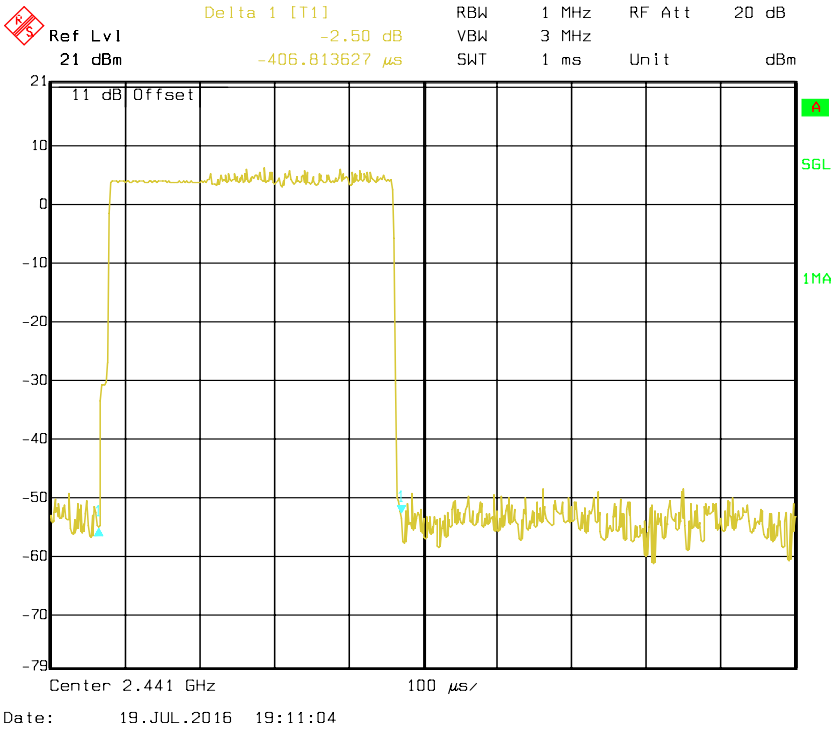
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.402	0.129	0.4	Pass
	Middle	0.406	0.130	0.4	Pass
	High	0.404	0.129	0.4	Pass
	Note: DH1:Dwell time = Minimum Frequency Occupation *(1600/2/79)*31.6s				
3DH3	Low	1.667	0.267	0.4	Pass
	Middle	1.661	0.266	0.4	Pass
	High	1.667	0.267	0.4	Pass
	Note: DH3:Dwell time = Minimum Frequency Occupation *(1600/4/79)*31.6s				
3DH5	Low	2.917	0.311	0.4	Pass
	Middle	2.925	0.312	0.4	Pass
	High	2.925	0.312	0.4	Pass
	Note: DH5:Dwell time = Minimum Frequency Occupation *(1600/6/79)*31.6s				

Please refer to the following plots.

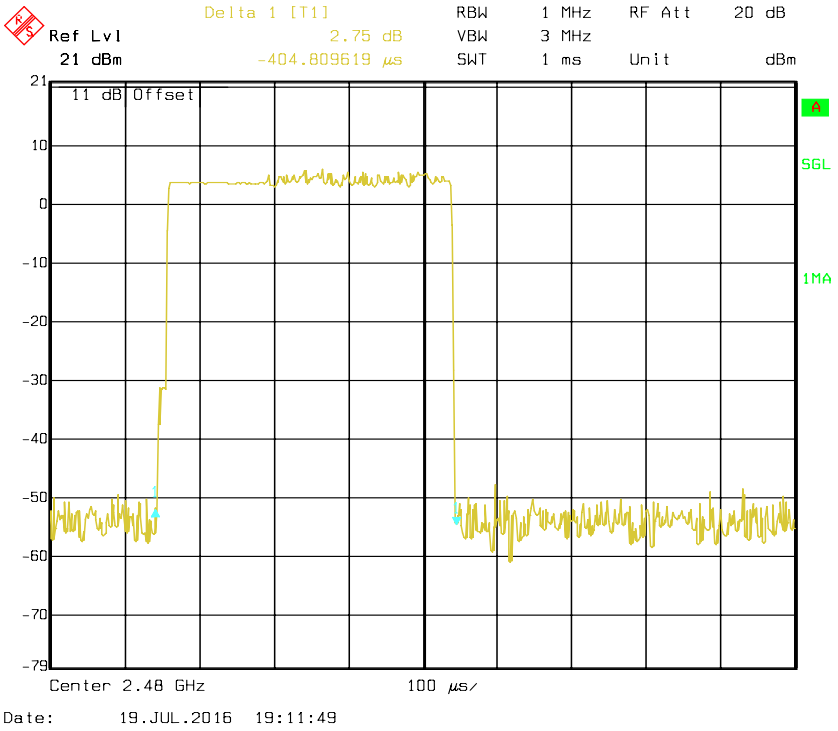
3DH1: Low Channel



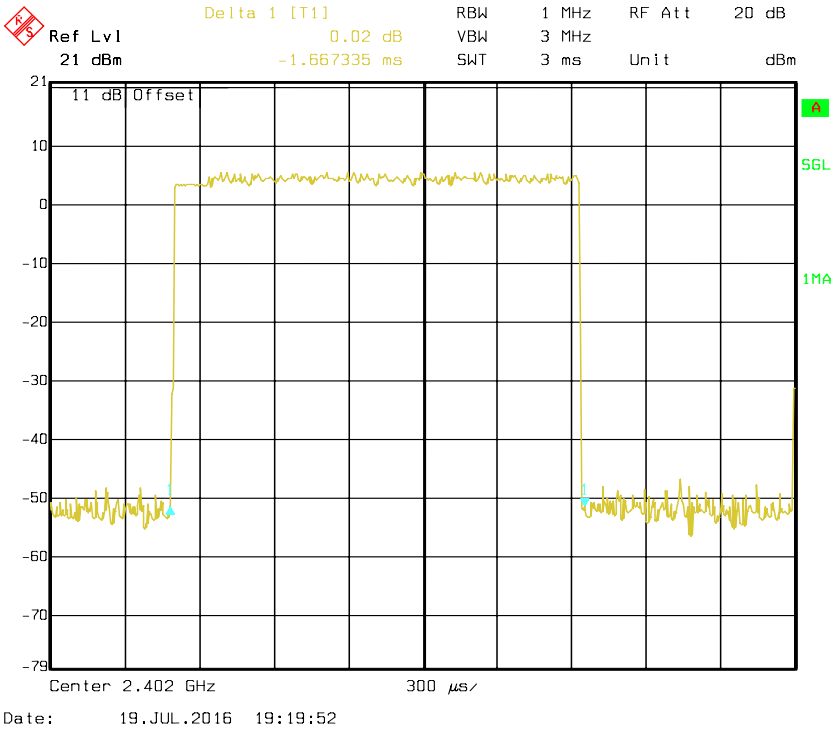
3DH1: Middle Channel



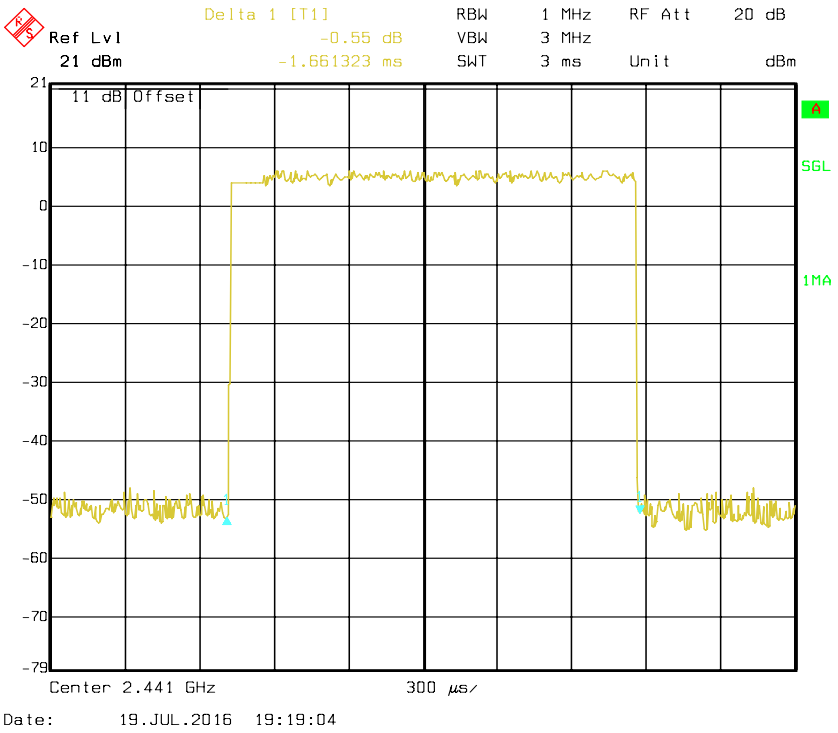
3DH1: High Channel



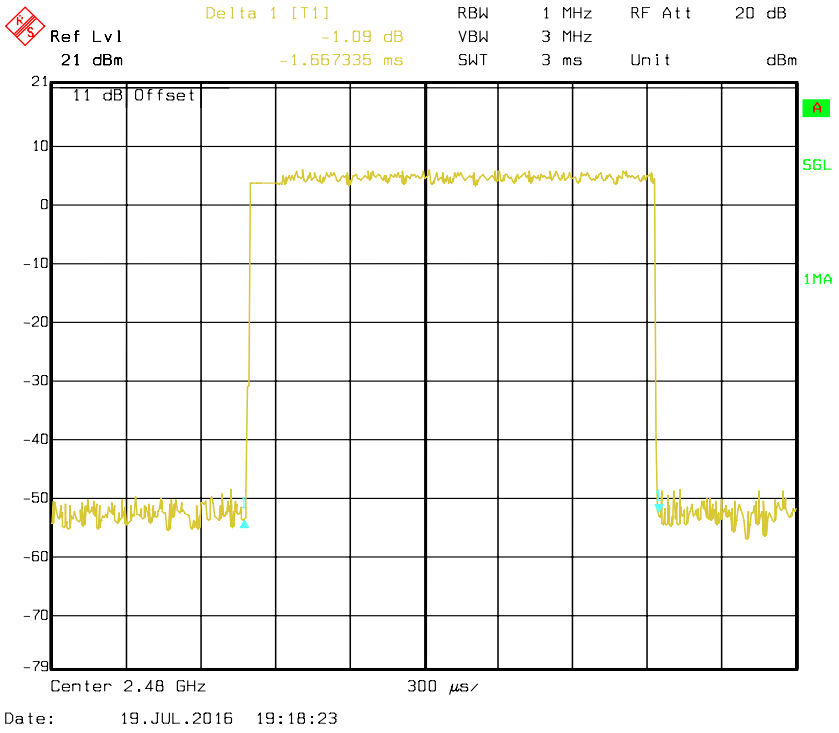
3DH3: Low Channel



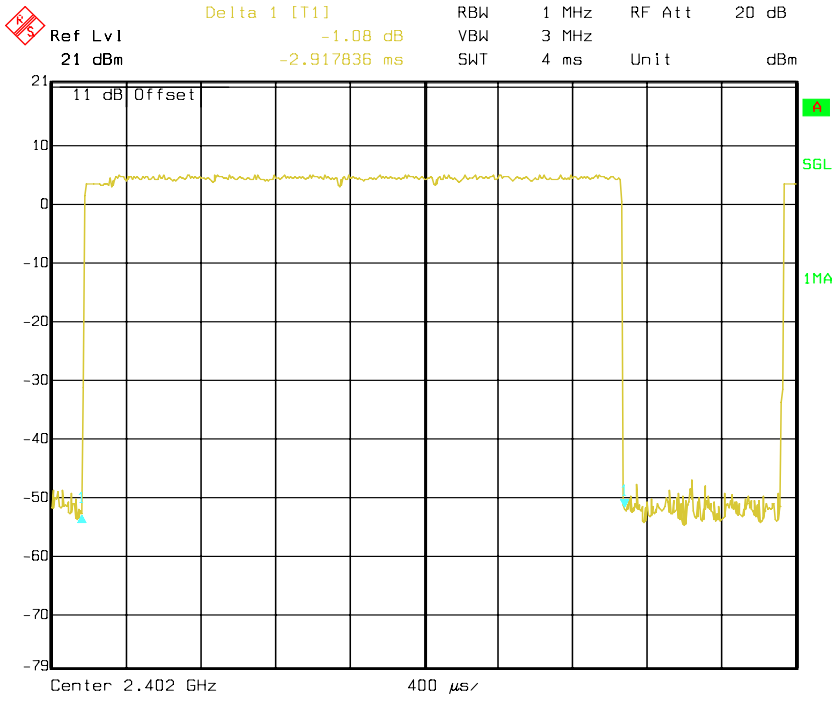
3DH3: Middle Channel



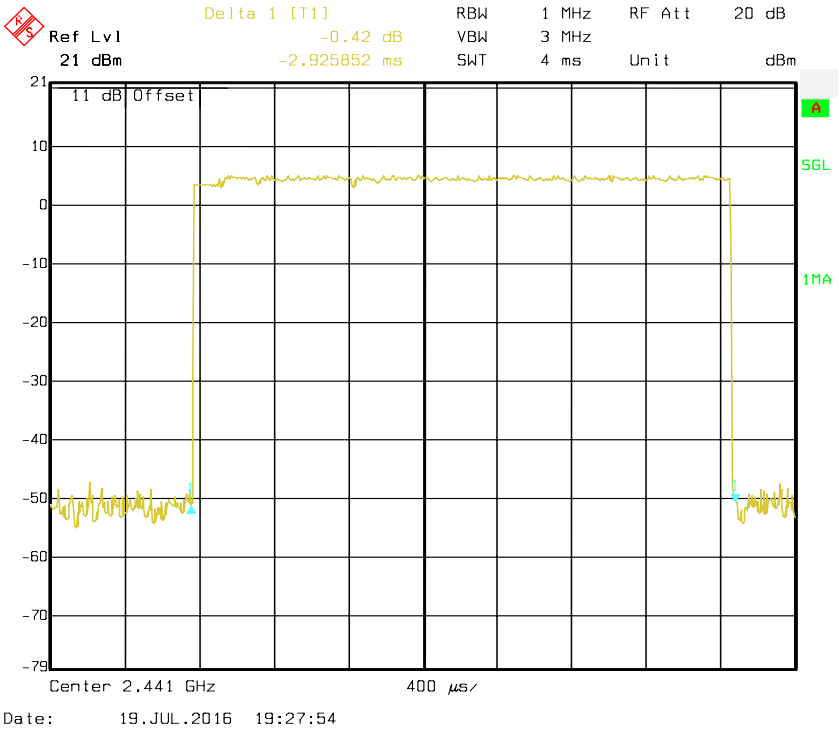
3DH3: High Channel



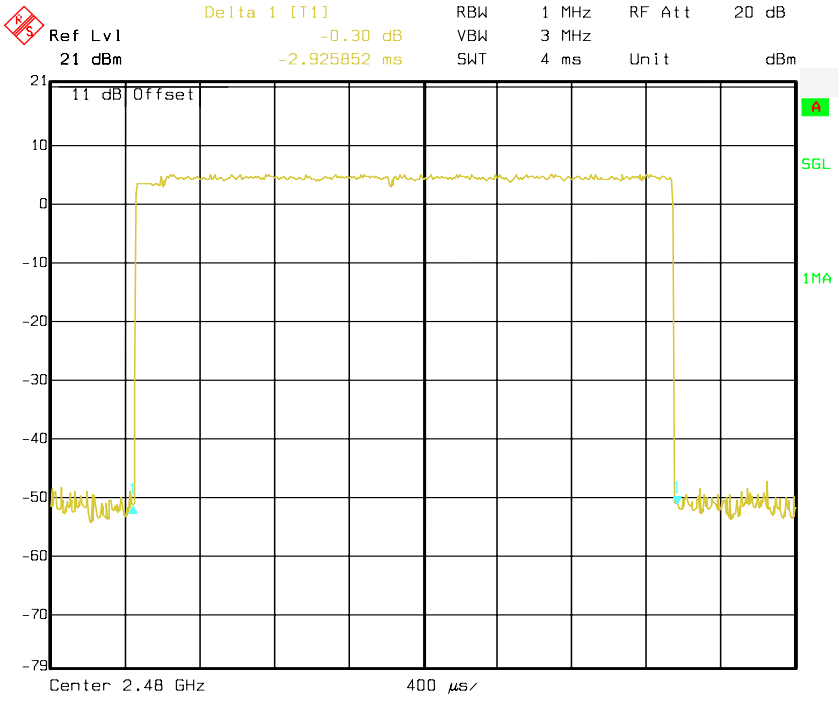
3DH5: Low Channel



3DH5: Middle Channel



3DH5: High Channel



FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §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

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI test receiver.
3. Add a correction factor to the display.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	30 °C
Relative Humidity:	62 %
ATM Pressure:	94.5 kPa

The testing was performed by Mill Chen on 2016-07-12.

Test Mode: Transmitting

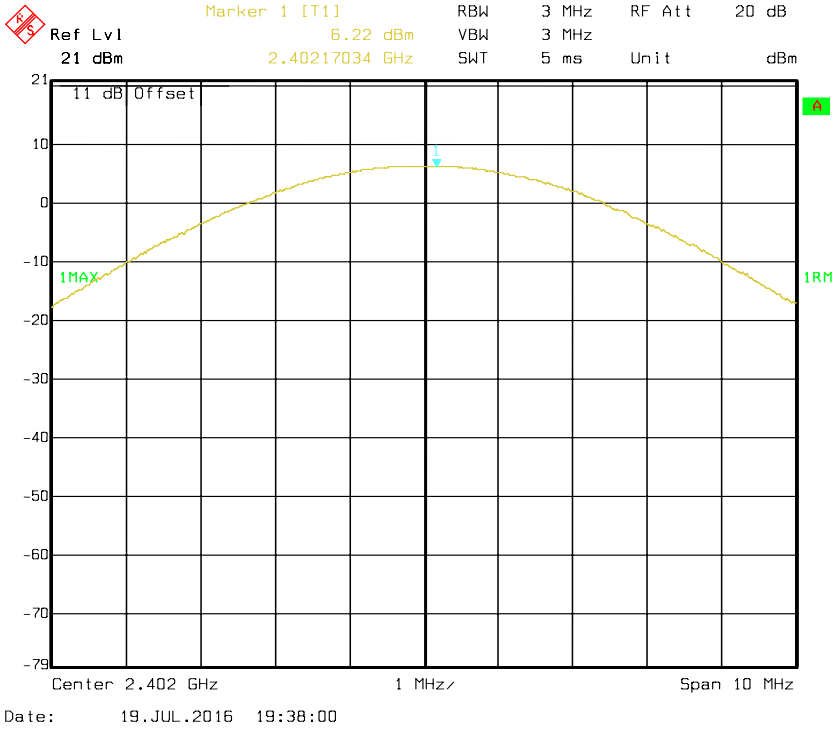
BDR Mode (GFSK):

Mode	Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)
BDR Mode (GFSK)	Low	2402	6.22	30
	Middle	2441	6.77	30
	High	2480	6.51	30

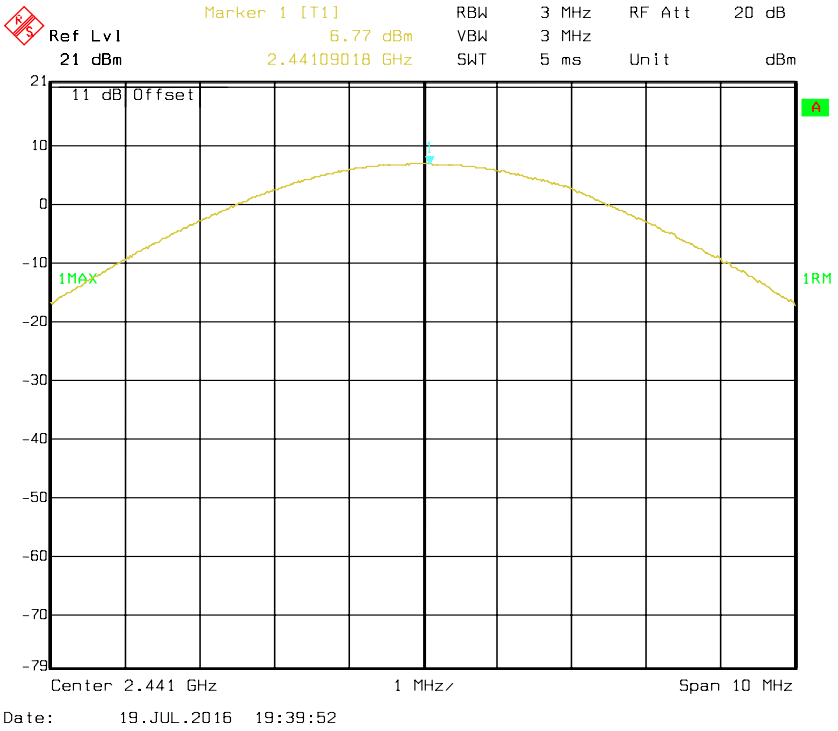
Note: The data above was tested in conducted mode.

Please refer to the following plots.

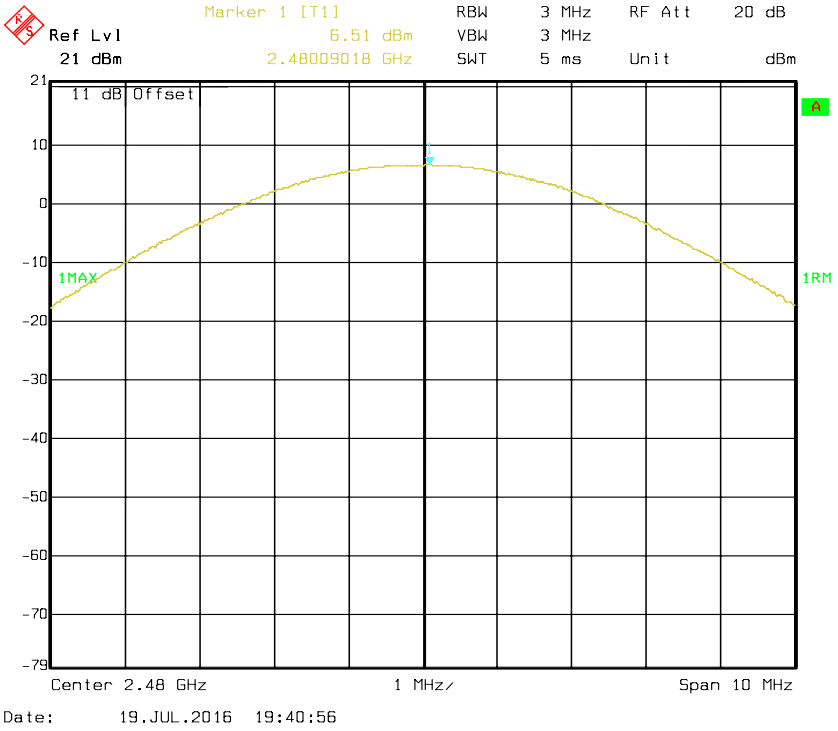
Output Power, Low Channel



Output Power, Middle Channel



Output Power, High Channel



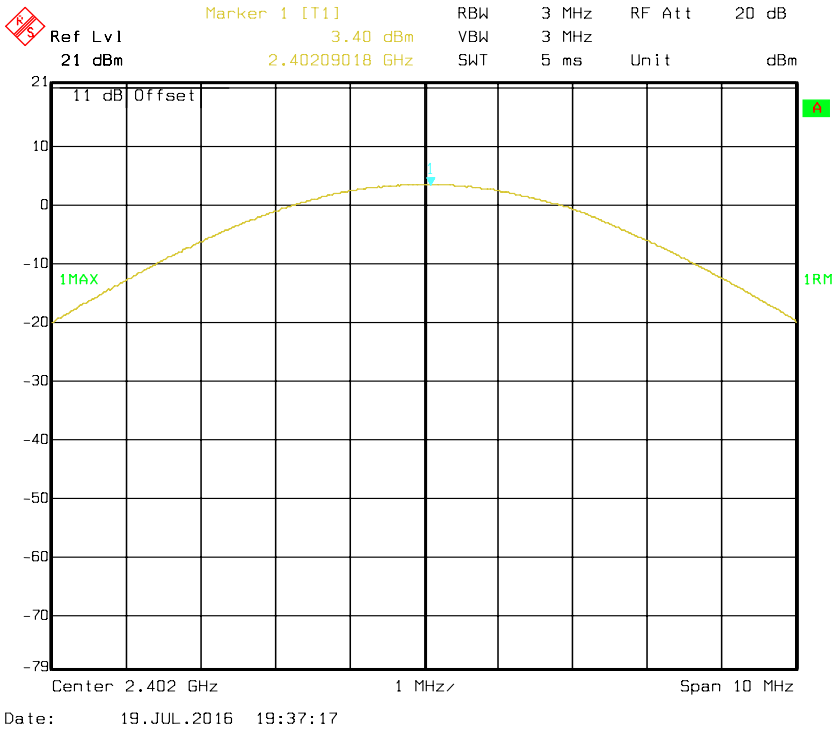
EDR Mode (π/4-DQPSK):

Mode	Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)
EDR Mode (π/4-DQPSK)	Low	2402	3.4	30
	Middle	2441	3.95	30
	High	2480	3.72	30

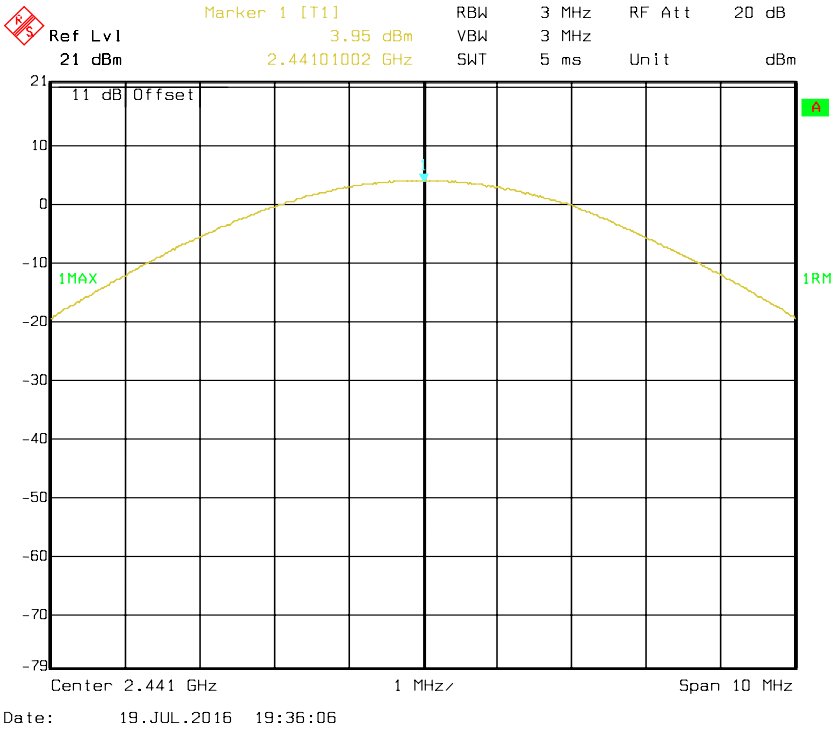
Note: The data above was tested in conducted mode.

Please refer to the following plots.

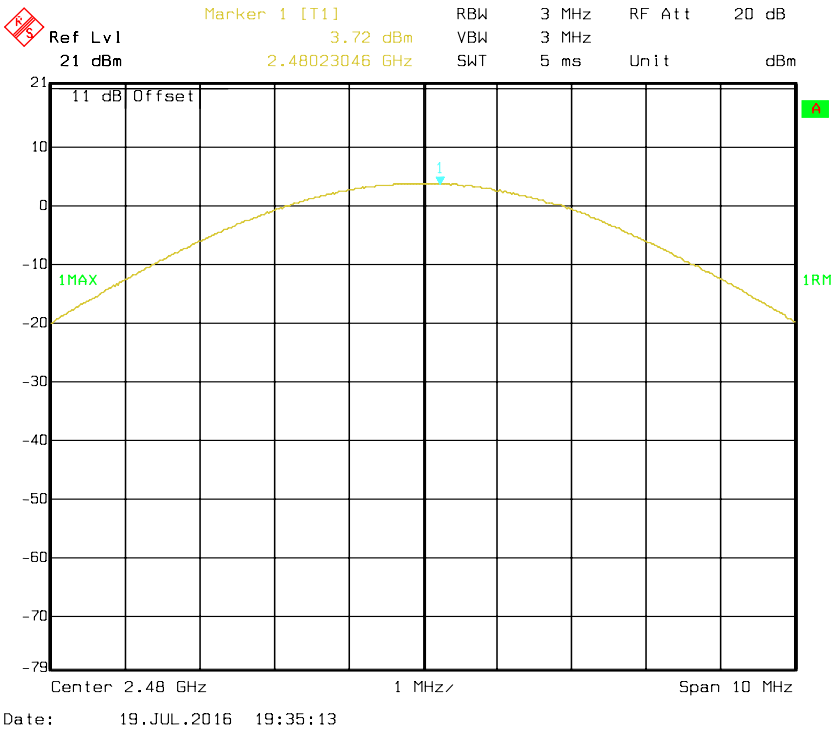
Output Power, Low Channel



Output Power, Middle Channel



Output Power, High Channel



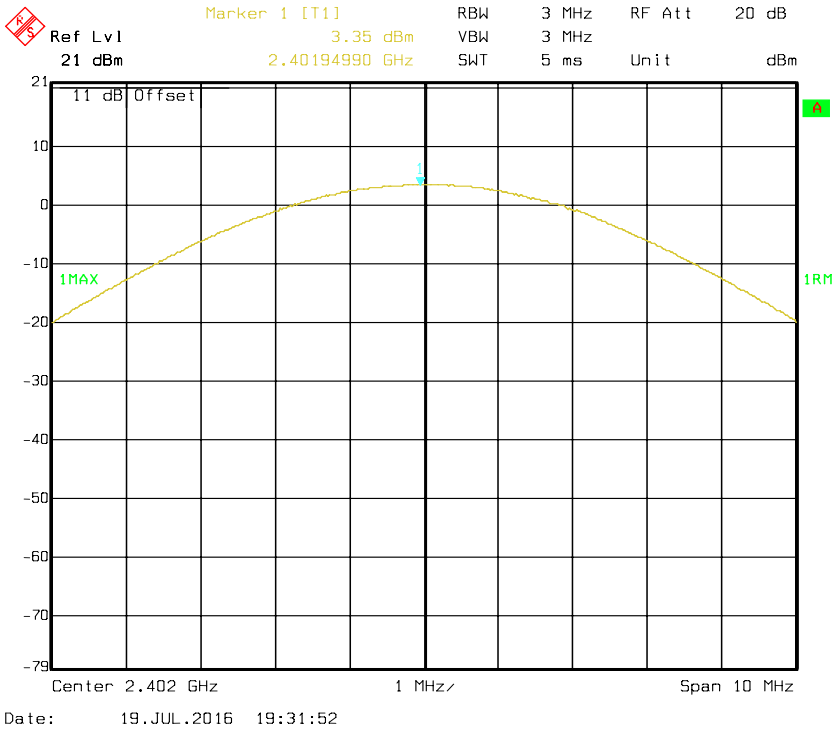
EDR Mode (8DPSK):

Mode	Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)
EDR Mode (8DPSK)	Low	2402	3.35	30
	Middle	2441	3.91	30
	High	2480	3.67	30

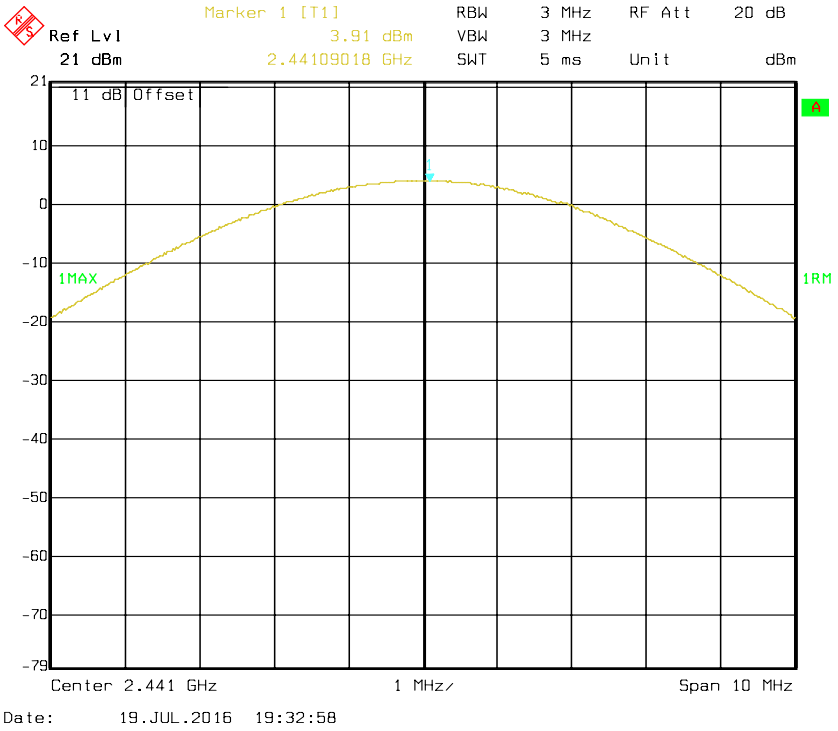
Note: The data above was tested in conducted mode.

Please refer to the following plots.

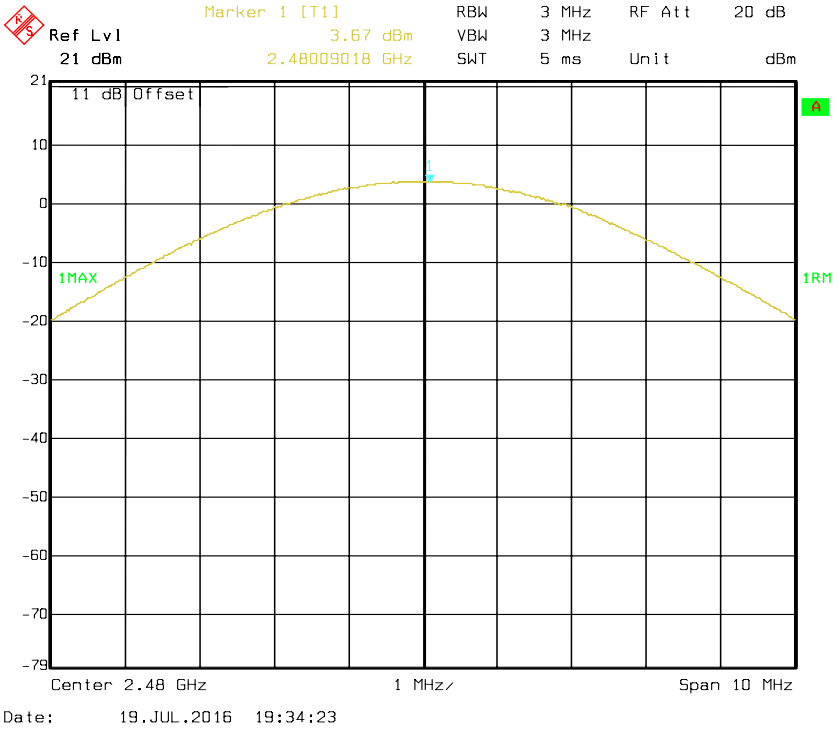
Output Power, Low Channel



Output Power, Middle Channel



Output Power, High Channel



FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

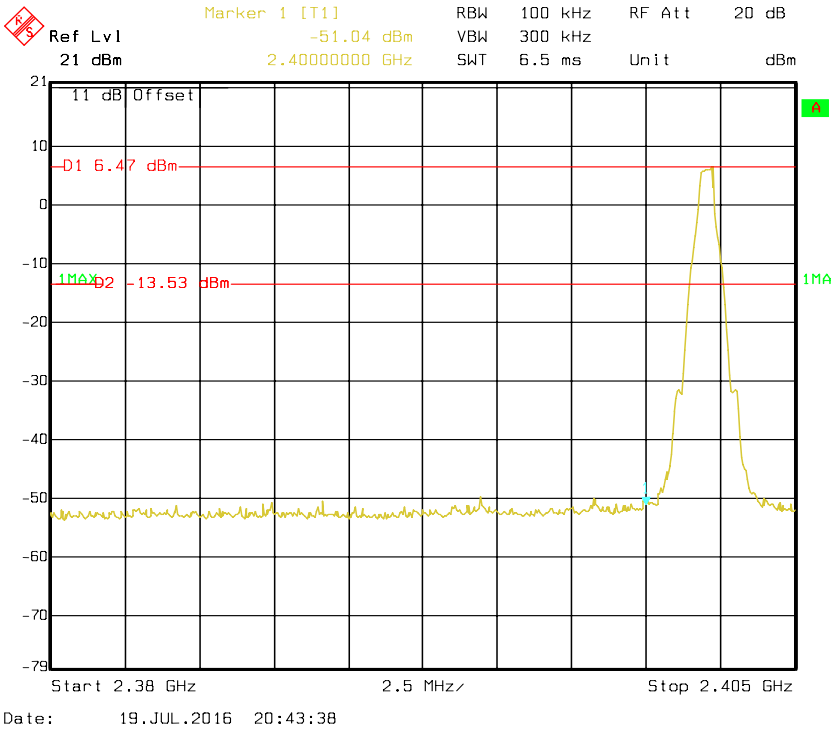
Temperature:	30 °C
Relative Humidity:	52 %
ATM Pressure:	94.3 kPa

The testing was performed by Mill Chen on 2016-07-19.

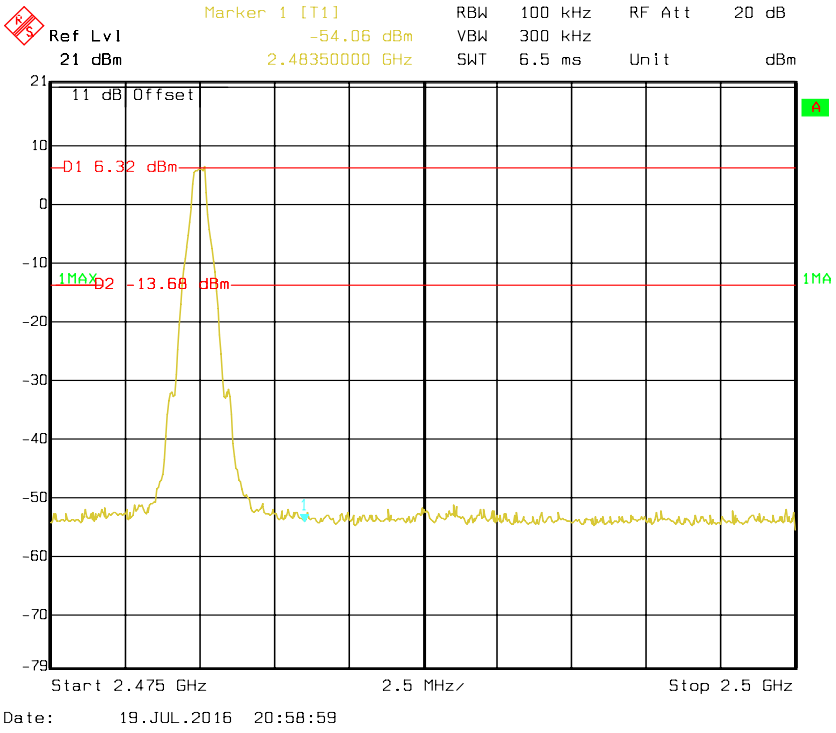
Test Mode: Transmitting

BDR Mode (GFSK):

Band Edge, Left Side

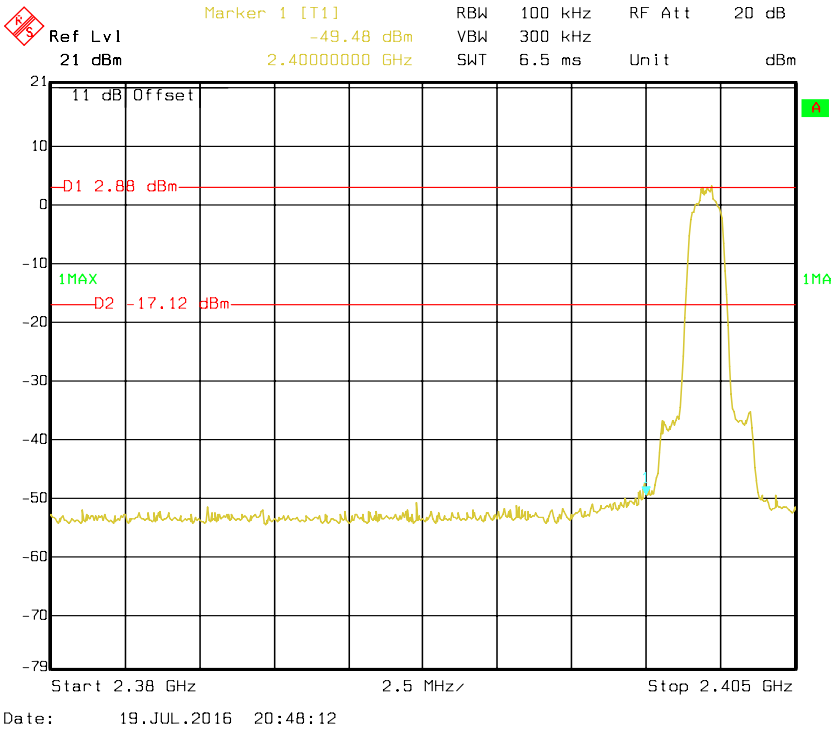


Band Edge, Right Side

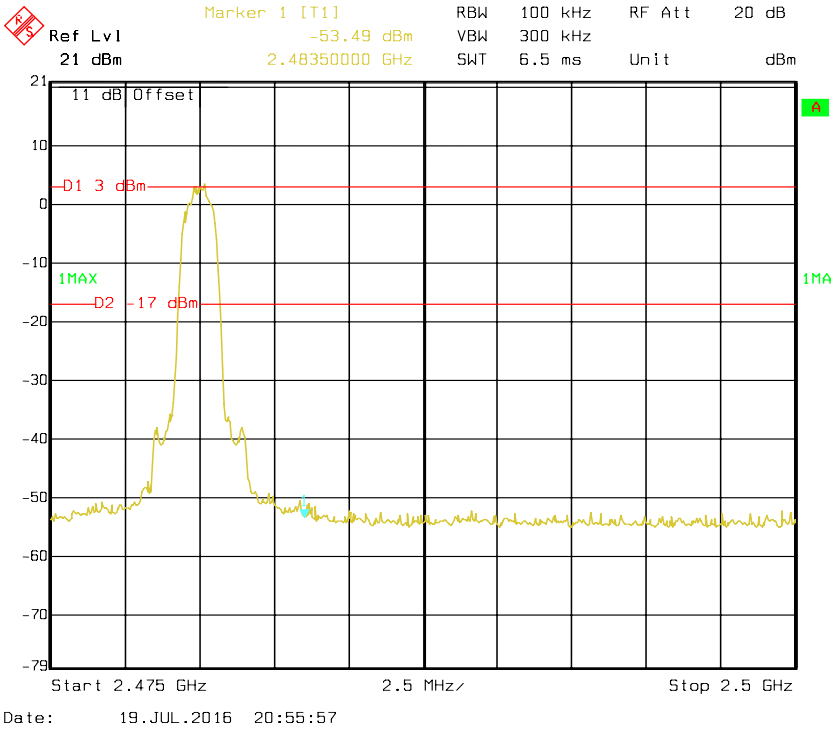


EDR Mode (π/4-DQPSK):

Band Edge, Left Side

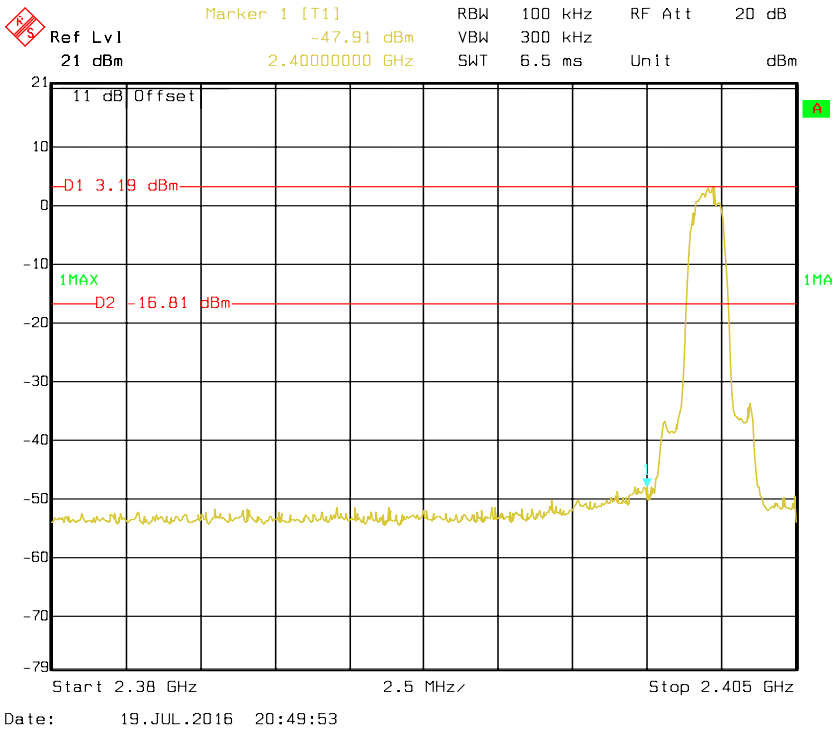


Band Edge, Right Side

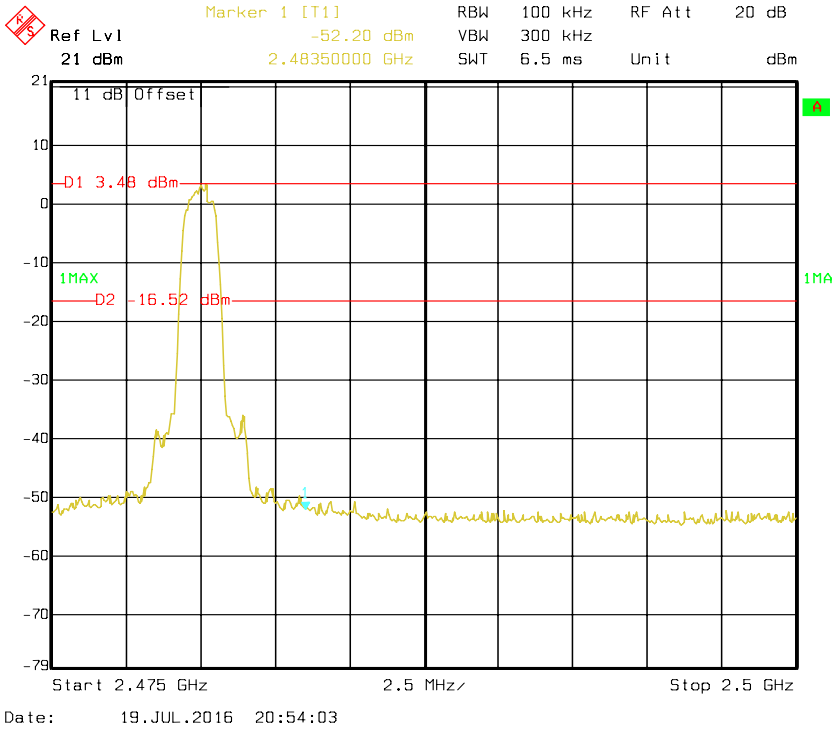


EDR Mode (8DPSK):

Band Edge, Left Side



Band Edge, Right Side



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