



# FCC PART 15.247 TEST REPORT

For

## Xoopar Limited

Room 1608-09, Jin Wei Building 4051 Jiabin Road Luohu Area, Shenzhen, China

**FCC ID: YOAXP81014**

<b>Report Type:</b> Original Report	<b>Product Name:</b> POWER NOTE Speaker & Power Bank
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<b>Report Number:</b> <u>RDG170705801</u>	
<b>Report Date:</b> <u>2017-07-13</u>	
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

The **Xoopar Limited's** product, model number: **XP81014 (FCC ID: YOAXP81014)** (the "EUT") in this report was a **POWER NOTE Speaker & Power Bank**, which was measured approximately: 4.5 cm (L) × 4.5 cm (W) × 10.5 cm (H), rated input voltage: DC3.7V from battery.

*\*All measurement and test data in this report was gathered from final production sample, serial number: 170705801 (assigned by the BAACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-04-05, and EUT conformed to test requirement.*

### Objective

This report is prepared on behalf of **Xoopar Limited** in accordance with Part 2, Subpart J, Part 15, Subparts A, and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the Bluetooth BDR and EDR mode of EUT compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

### Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

### 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.

### Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.62dB
Unwanted Emissions, radiated	30M~200MHz: 4.7 dB for Horizontal, 4.7 dB for Vertical 200M~1GHz: 6.0 dB for Horizontal, 6.0 for Vertical 1G~6GHz: 5.13 dB, 6G~26.5GHz: 5.47 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.17 dB (150 kHz to 30 MHz)

## **Test Facility**

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, 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 engineering mode.

### EUT Exercise Software

Test software: 'FCCAssist 2.4 ' was used in test, the maximum power was configured as below setting:

Test Software Version	FCCAssist 2.4		
Test Frequency	2402MHz	2441MHz	2480MHz
GFSK	10	10	10
$\pi/4$ -DQPSK	10	10	10
8PSK	10	10	10

### Equipment Modifications

No modification was made to the EUT.

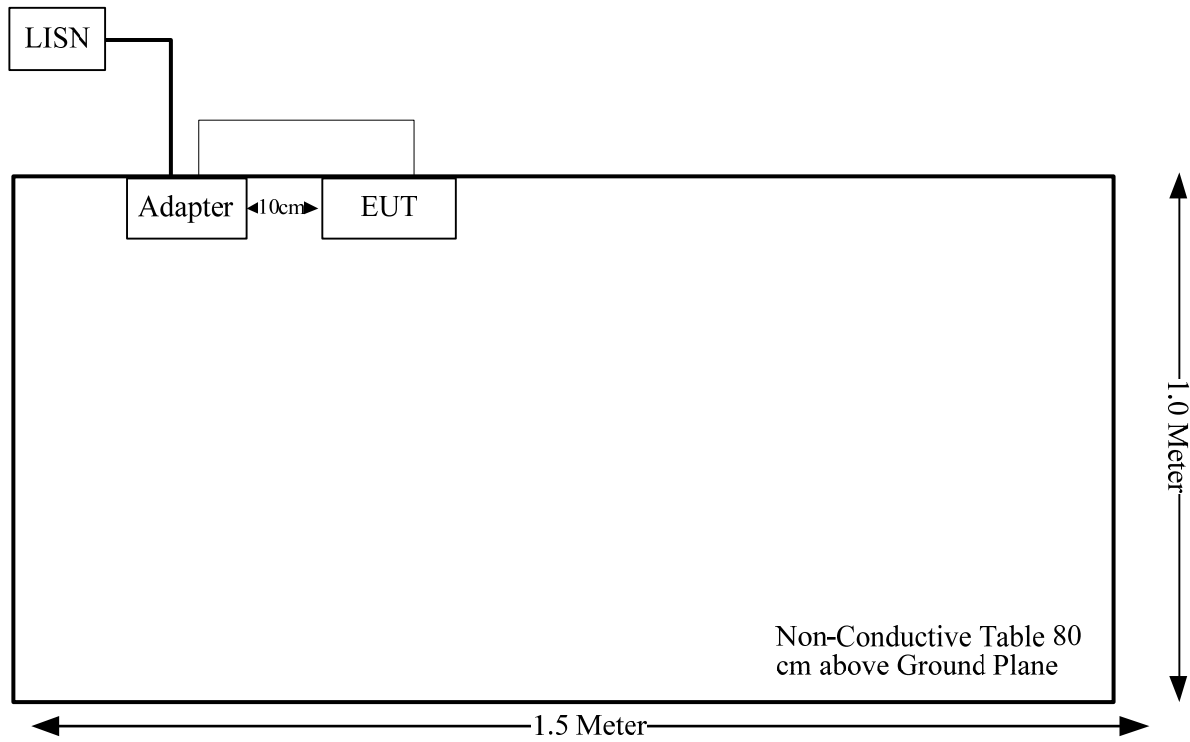
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HuaJin	AC Adapter	HJ-0501000E1-US	/

### External Cable

Cable Description	Shielding Type	Ferrite Core	Length (cm)	From Port	To
/	/	/	/	/	/

### Block Diagram of Test Setup



## **SUMMARY OF TEST RESULTS**

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<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	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)	Time of Occupancy (Dwell Time)	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) & §1.1310 & §2.1093- RF EXPOSURE**

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### **Applicable Standard**

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

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

### **Measurement Result**

The max conducted power including tune-up tolerance is 0 dBm (1.0 mW).  
 $[(\text{max. power of channel, mW}) / (\text{min. test separation distance, mm})] [\sqrt{f(\text{GHz})}]$   
 $= 1/5 * (\sqrt{2.480}) = 0.3 < 3.0$

**So the stand-alone SAR evaluation is not necessary.**

## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **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 use of a standard antenna jack or electrical connector is prohibited.

### **Antenna Connector Construction**

The EUT has one internal antenna arrangement for BT, and the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

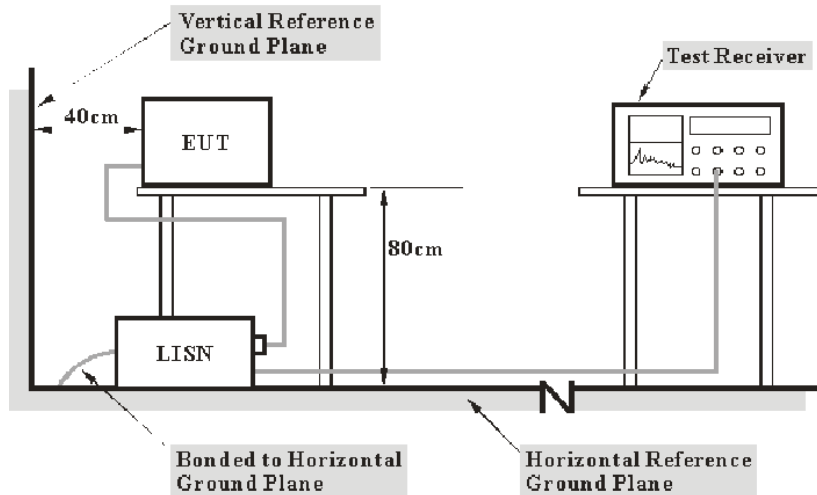
**Result:** Compliance.

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

FCC§15.207(a)

### 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 is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to the LISN with a 120 V/60 Hz AC power.

### 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

During the conducted emission test, the adapter was connected to the outlet of the first LISN.

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,

$V_C$ : 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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2016-12-02	2017-12-01
Unknown	Conducted Cable	Unknown	NO.5	2016-11-10	2017-11-09
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	DE14781	2016-10-31	2017-10-30
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

## Test Data

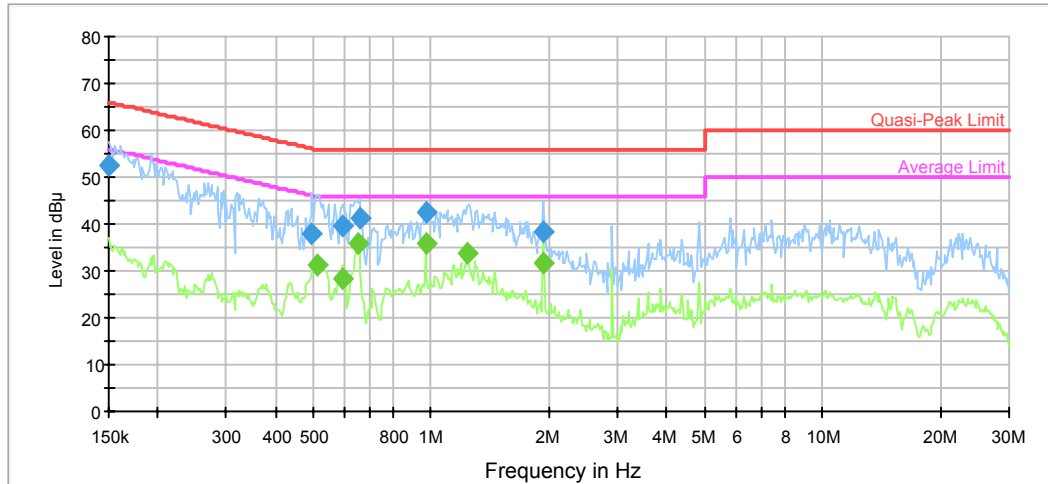
### Environmental Conditions

<b>Temperature:</b>	26.3°C
<b>Relative Humidity:</b>	60 %
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Kevin Hu on 2017-07-10.*

Test Mode: Transmitting

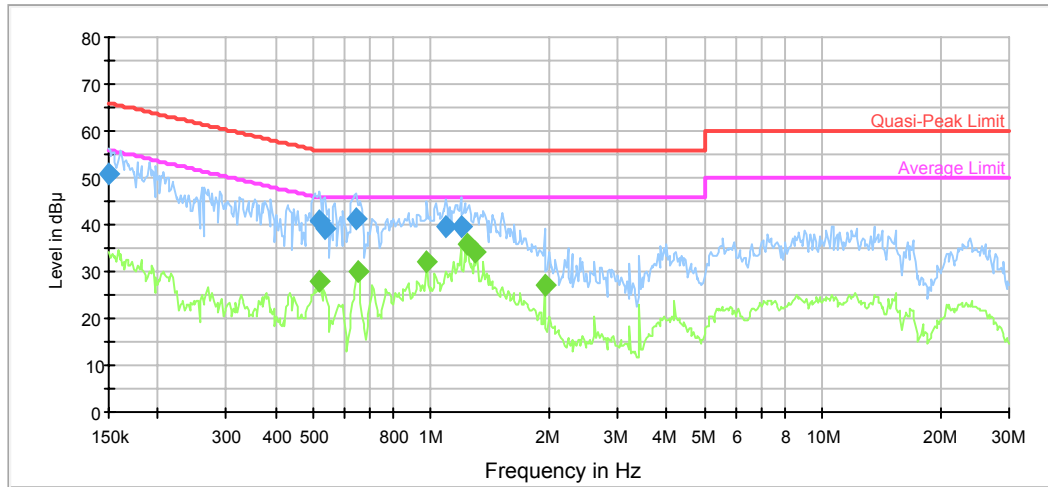
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	52.3	9.000	L1	19.7	13.7	66.0	Compliance
0.495646	37.7	9.000	L1	19.7	18.3	56.1	Compliance
0.595338	39.5	9.000	L1	19.8	16.5	56.0	Compliance
0.655073	41.4	9.000	L1	19.7	14.6	56.0	Compliance
0.967957	42.3	9.000	L1	19.7	13.7	56.0	Compliance
1.936076	38.3	9.000	L1	19.8	17.7	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.511698	31.3	9.000	L1	19.7	14.7	46.0	Compliance
0.595338	28.5	9.000	L1	19.8	17.5	46.0	Compliance
0.649874	35.7	9.000	L1	19.7	10.3	46.0	Compliance
0.967957	36.0	9.000	L1	19.7	10.0	46.0	Compliance
1.239175	33.8	9.000	L1	19.7	12.2	46.0	Compliance
1.936076	31.6	9.000	L1	19.8	14.4	46.0	Compliance

**AC120 V, 60 Hz, Neutral:**



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	50.7	9.000	N	19.7	15.3	66.0	Compliance
0.519918	41.0	9.000	N	19.6	15.0	56.0	Compliance
0.536756	39.2	9.000	N	19.6	16.8	56.0	Compliance
0.644717	41.4	9.000	N	19.6	14.6	56.0	Compliance
1.090848	39.4	9.000	N	19.7	16.6	56.0	Compliance
1.190776	39.7	9.000	N	19.6	16.3	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.515791	28.0	9.000	N	19.6	18.0	46.0	Compliance
0.649874	29.9	9.000	N	19.6	16.1	46.0	Compliance
0.975701	32.0	9.000	N	19.7	14.0	46.0	Compliance
1.239175	35.7	9.000	N	19.6	10.3	46.0	Compliance
1.289541	34.2	9.000	N	19.6	11.8	46.0	Compliance
1.951564	27.3	9.000	N	19.7	18.7	46.0	Compliance

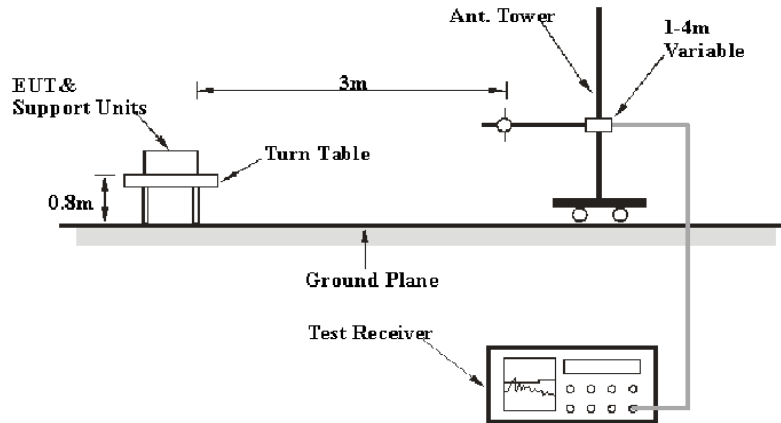
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

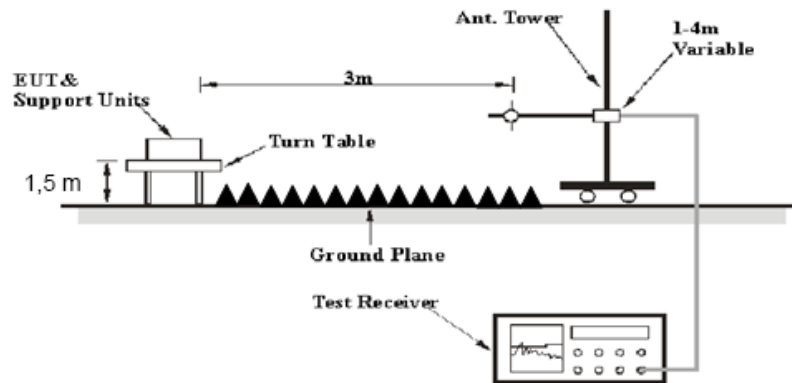
FCC §15.247 (d); §15.209; §15.205;

### EUT Setup

#### Below 1GHz:



#### Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup 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.

## 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	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

## 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.

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A121808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2015-06-16	2018-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
Unknown	RF Cable (below 1GHz)	Unknown	NO.1	2016-11-10	2017-11-09
Unknown	RF Cable (below 1GHz)	Unknown	NO.4	2016-11-10	2017-11-09
Unknown	RF Cable (above 1GHz)	Unknown	NO.2	2016-11-10	2017-11-09

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".



### 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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	26.3°C
<b>Relative Humidity:</b>	60 %
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Kevin Hu on 2017-07-10.*

*Test Mode: Transmitting*

**30MHz-25GHz:**  
**BDR Mode (GFSK):**

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB)					
Low Channel: 2402 MHz									
2402	64.84	PK	H	23.53	3.00	0.00	91.37	N/A	N/A
2402	52.66	AV	H	23.53	3.00	0.00	79.19	N/A	N/A
2402	62.11	PK	V	23.53	3.00	0.00	88.64	N/A	N/A
2402	50.05	AV	V	23.53	3.00	0.00	76.58	N/A	N/A
2390	29.53	PK	H	23.57	3.00	0.00	56.10	74.00	17.90
2390	17.95	AV	H	23.57	3.00	0.00	44.52	54.00	9.48
4804	53.26	PK	H	30.77	5.12	26.87	62.28	74.00	11.72
4804	41.20	AV	H	30.77	5.12	26.87	50.22	54.00	3.78
7206	38.06	PK	H	34.71	6.16	26.35	52.58	74.00	21.42
7206	23.11	AV	H	34.71	6.16	26.35	37.63	54.00	16.37
5335	39.14	PK	H	32.00	5.36	26.70	49.80	74.00	24.20
5335	24.09	AV	H	32.00	5.36	26.70	34.75	54.00	19.25
191.99	48.60	QP	H	12.22	0.88	27.80	33.90	43.50	9.60
129.91	46.09	QP	H	14.93	0.73	28.15	33.60	43.50	9.90
Middle Channel: 2441 MHz									
2441	64.57	PK	H	23.40	3.00	0.00	90.97	N/A	N/A
2441	52.01	AV	H	23.40	3.00	0.00	78.41	N/A	N/A
2441	62.15	PK	V	23.40	3.00	0.00	88.55	N/A	N/A
2441	50.08	AV	V	23.40	3.00	0.00	76.48	N/A	N/A
4882	52.52	PK	H	31.02	5.09	26.87	61.76	74.00	12.24
4882	41.14	AV	H	31.02	5.09	26.87	50.38	54.00	3.62
7323	38.21	PK	H	34.95	6.22	26.40	52.98	74.00	21.02
7323	23.28	AV	H	34.95	6.22	26.40	38.05	54.00	15.95
5475	39.15	PK	H	32.26	5.50	26.62	50.29	74.00	23.71
5475	23.96	AV	H	32.26	5.50	26.62	35.10	54.00	18.90
6315	38.06	PK	H	33.22	6.07	26.58	50.77	74.00	23.23
6315	23.04	AV	H	33.22	6.07	26.58	35.75	54.00	18.25
191.99	48.50	QP	H	12.22	0.88	27.80	33.80	43.50	9.70
129.91	46.09	QP	H	14.93	0.73	28.15	33.60	43.50	9.90
High Channel: 2480 MHz									
2480	64.91	PK	H	23.27	2.99	0.00	91.17	N/A	N/A
2480	52.23	AV	H	23.27	2.99	0.00	78.49	N/A	N/A
2480	62.46	PK	V	23.27	2.99	0.00	88.72	N/A	N/A
2480	50.32	AV	V	23.27	2.99	0.00	76.58	N/A	N/A
2483.5	30.65	PK	H	23.26	2.99	0.00	56.90	74.00	17.10
2483.5	19.00	AV	H	23.26	2.99	0.00	45.25	54.00	8.75
4960	52.75	PK	H	31.27	5.05	26.88	62.19	74.00	11.81
4960	41.36	AV	H	31.27	5.05	26.88	50.80	54.00	3.20
7440	38.48	PK	H	35.18	6.27	26.45	53.48	74.00	20.52
7440	23.56	AV	H	35.18	6.27	26.45	38.56	54.00	15.44
5755	39.01	PK	H	32.61	5.74	26.64	50.72	74.00	23.28
5755	23.82	AV	H	32.61	5.74	26.64	35.53	54.00	18.47
191.99	48.50	QP	H	12.22	0.88	27.80	33.80	43.50	9.70
129.91	46.49	QP	H	14.93	0.73	28.15	34.00	43.50	9.50

EDR Mode ( $\pi/4$ -DQPSK):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector	Polar (H/V)	Factor (dB)					
Low Channel: 2402 MHz									
2402	64.05	PK	H	23.53	3.00	0.00	90.58	N/A	N/A
2402	50.87	AV	H	23.53	3.00	0.00	77.40	N/A	N/A
2402	62.56	PK	V	23.53	3.00	0.00	89.09	N/A	N/A
2402	50.05	AV	V	23.53	3.00	0.00	76.58	N/A	N/A
2390	30.22	PK	H	23.57	3.00	0.00	56.79	74.00	17.21
2390	17.89	AV	H	23.57	3.00	0.00	44.46	54.00	9.54
4804	53.26	PK	H	30.77	5.12	26.87	62.28	74.00	11.72
4804	39.77	AV	H	30.77	5.12	26.87	48.79	54.00	5.21
7206	37.86	PK	H	34.71	6.16	26.35	52.38	74.00	21.62
7206	22.75	AV	H	34.71	6.16	26.35	37.27	54.00	16.73
5465	38.20	PK	H	32.24	5.49	26.63	49.30	74.00	24.70
5465	23.75	AV	H	32.24	5.49	26.63	34.85	54.00	19.15
191.99	48.90	QP	H	12.22	0.88	27.80	34.20	43.50	9.30
129.91	46.59	QP	H	14.93	0.73	28.15	34.10	43.50	9.40
Middle Channel: 2441 MHz									
2441	63.53	PK	H	23.40	3.00	0.00	89.93	N/A	N/A
2441	50.92	AV	H	23.40	3.00	0.00	77.32	N/A	N/A
2441	62.58	PK	V	23.40	3.00	0.00	88.98	N/A	N/A
2441	50.05	AV	V	23.40	3.00	0.00	76.45	N/A	N/A
4882	53.51	PK	H	31.02	5.09	26.87	62.75	74.00	11.25
4882	40.02	AV	H	31.02	5.09	26.87	49.26	54.00	4.74
7323	38.26	PK	H	34.95	6.22	26.40	53.03	74.00	20.97
7323	23.15	AV	H	34.95	6.22	26.40	37.92	54.00	16.08
5315	38.80	PK	H	31.97	5.34	26.71	49.40	74.00	24.60
5315	24.35	AV	H	31.97	5.34	26.71	34.95	54.00	19.05
6285	37.93	PK	H	33.19	6.06	26.59	50.59	74.00	23.41
6285	23.09	AV	H	33.19	6.06	26.59	35.75	54.00	18.25
191.99	48.80	QP	H	12.22	0.88	27.80	34.10	43.50	9.40
129.91	46.09	QP	H	14.93	0.73	28.15	33.60	43.50	9.90
High Channel: 2480 MHz									
2480	63.69	PK	H	23.27	2.99	0.00	89.95	N/A	N/A
2480	50.73	AV	H	23.27	2.99	0.00	76.99	N/A	N/A
2480	63.14	PK	V	23.27	2.99	0.00	89.40	N/A	N/A
2480	50.96	AV	V	23.27	2.99	0.00	77.22	N/A	N/A
2483.5	28.58	PK	H	23.26	2.99	0.00	54.83	74.00	19.17
2483.5	18.99	AV	H	23.26	2.99	0.00	45.24	54.00	8.76
4960	53.71	PK	H	31.27	5.05	26.88	63.15	74.00	10.85
4960	40.22	AV	H	31.27	5.05	26.88	49.66	54.00	4.34
7440	38.67	PK	H	35.18	6.27	26.45	53.67	74.00	20.33
7440	23.56	AV	H	35.18	6.27	26.45	38.56	54.00	15.44
5965	38.11	PK	H	32.86	5.93	26.66	50.24	74.00	23.76
5965	23.71	AV	H	32.86	5.93	26.66	35.84	54.00	18.16
191.99	48.50	QP	H	12.22	0.88	27.80	33.80	43.50	9.70
129.91	46.49	QP	H	14.93	0.73	28.15	34.00	43.50	9.50

EDR Mode (8-DPSK):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB)					
Low Channel: 2402 MHz									
2402	64.33	PK	H	23.53	3.00	0.00	90.86	N/A	N/A
2402	51.15	AV	H	23.53	3.00	0.00	77.68	N/A	N/A
2402	62.84	PK	V	23.53	3.00	0.00	89.37	N/A	N/A
2402	50.33	AV	V	23.53	3.00	0.00	76.86	N/A	N/A
2390	30.50	PK	H	23.57	3.00	0.00	57.07	74.00	16.93
2390	18.17	AV	H	23.57	3.00	0.00	44.74	54.00	9.26
4804	53.54	PK	H	30.77	5.12	26.87	62.56	74.00	11.44
4804	40.05	AV	H	30.77	5.12	26.87	49.07	54.00	4.93
7206	38.14	PK	H	34.71	6.16	26.35	52.66	74.00	21.34
7206	23.03	AV	H	34.71	6.16	26.35	37.55	54.00	16.45
5415	38.62	PK	H	32.15	5.44	26.66	49.55	74.00	24.45
5415	24.17	AV	H	32.15	5.44	26.66	35.10	54.00	18.90
191.99	48.60	QP	H	12.22	0.88	27.80	33.90	43.50	9.60
129.91	46.49	QP	H	14.93	0.73	28.15	34.00	43.50	9.50
Middle Channel: 2441 MHz									
2441	63.81	PK	H	23.40	3.00	0.00	90.21	N/A	N/A
2441	51.20	AV	H	23.40	3.00	0.00	77.60	N/A	N/A
2441	62.86	PK	V	23.40	3.00	0.00	89.26	N/A	N/A
2441	50.33	AV	V	23.40	3.00	0.00	76.73	N/A	N/A
4882	53.79	PK	H	31.02	5.09	26.87	63.03	74.00	10.97
4882	40.30	AV	H	31.02	5.09	26.87	49.54	54.00	4.46
7323	38.54	PK	H	34.95	6.22	26.40	53.31	74.00	20.69
7323	23.43	AV	H	34.95	6.22	26.40	38.20	54.00	15.80
5435	38.86	PK	H	32.18	5.46	26.65	49.85	74.00	24.15
5435	24.41	AV	H	32.18	5.46	26.65	35.40	54.00	18.60
6215	38.25	PK	H	33.12	6.03	26.60	50.80	74.00	23.20
6215	23.41	AV	H	33.12	6.03	26.60	35.96	54.00	18.04
191.99	48.90	QP	H	12.22	0.88	27.80	34.20	43.50	9.30
129.91	46.59	QP	H	14.93	0.73	28.15	34.10	43.50	9.40
High Channel: 2480 MHz									
2480	63.97	PK	H	23.27	2.99	0.00	90.23	N/A	N/A
2480	51.01	AV	H	23.27	2.99	0.00	77.27	N/A	N/A
2480	63.42	PK	V	23.27	2.99	0.00	89.68	N/A	N/A
2480	51.24	AV	V	23.27	2.99	0.00	77.50	N/A	N/A
2483.5	28.86	PK	H	23.26	2.99	0.00	55.11	74.00	18.89
2483.5	19.27	AV	H	23.26	2.99	0.00	45.52	54.00	8.48
4960	53.99	PK	H	31.27	5.05	26.88	63.43	74.00	10.57
4960	40.50	AV	H	31.27	5.05	26.88	49.94	54.00	4.06
7440	38.95	PK	H	35.18	6.27	26.45	53.95	74.00	20.05
7440	23.84	AV	H	35.18	6.27	26.45	38.84	54.00	15.16
5465	39.04	PK	H	32.24	5.49	26.63	50.14	74.00	23.86
5465	24.64	AV	H	32.24	5.49	26.63	35.74	54.00	18.26
191.99	48.90	QP	H	12.22	0.88	27.80	34.20	43.50	9.30
129.91	46.39	QP	H	14.93	0.73	28.15	33.90	43.50	9.60

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

### **Applicable Standard**

Frequency hopping systems shall have hopping 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 Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

### **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 Data**

#### **Environmental Conditions**

<b>Temperature:</b>	22.9°C
<b>Relative Humidity:</b>	45.4 %
<b>ATM Pressure:</b>	100.6 kPa

*The testing was performed by Kevin Hu on 2017-04-12.*

**Test Result:** Compliance.

Please refer to following tables and plots

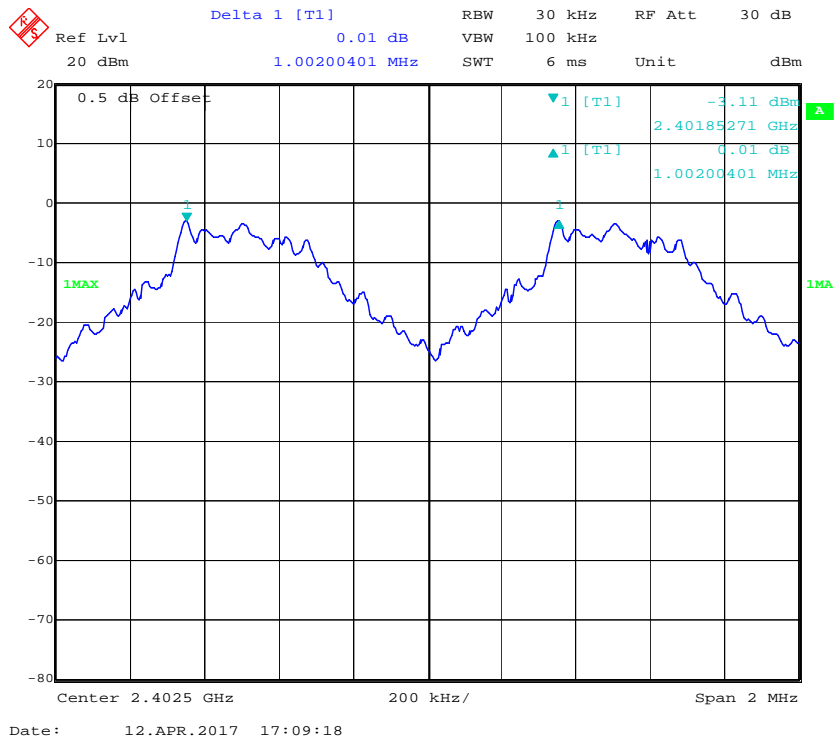
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
BDR (GFSK)	Low	2402	1.002	0.59
	Middle	2441	0.998	0.62
	High	2480	1.002	0.59
EDR (π/4-DQPSK)	Low	2402	1.006	0.84
	Middle	2441	1.002	0.85
	High	2480	1.002	0.85
EDR (8DPSK)	Low	2402	1.002	0.84
	Middle	2441	1.002	0.85
	High	2480	1.006	0.85

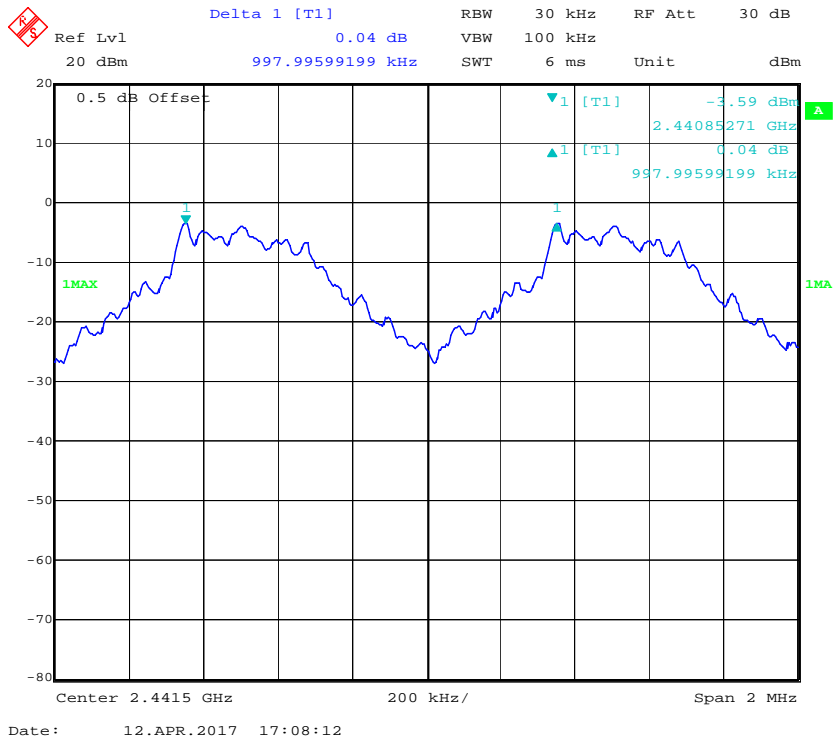
Note: Limit= (2/3) × 20dB bandwidth

BDR Mode (GFSK):

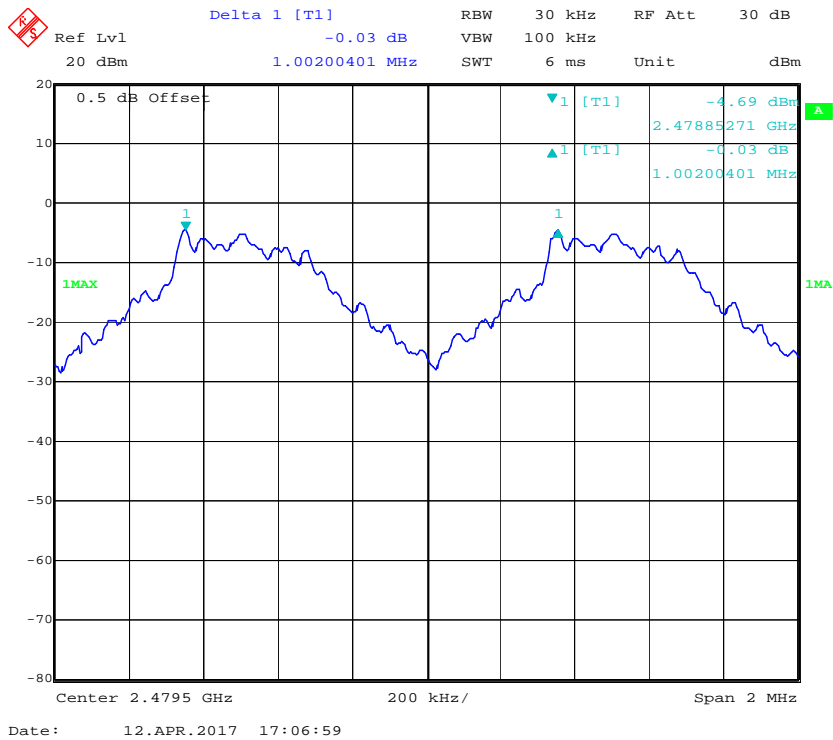
Low Channel



### Middle Channel

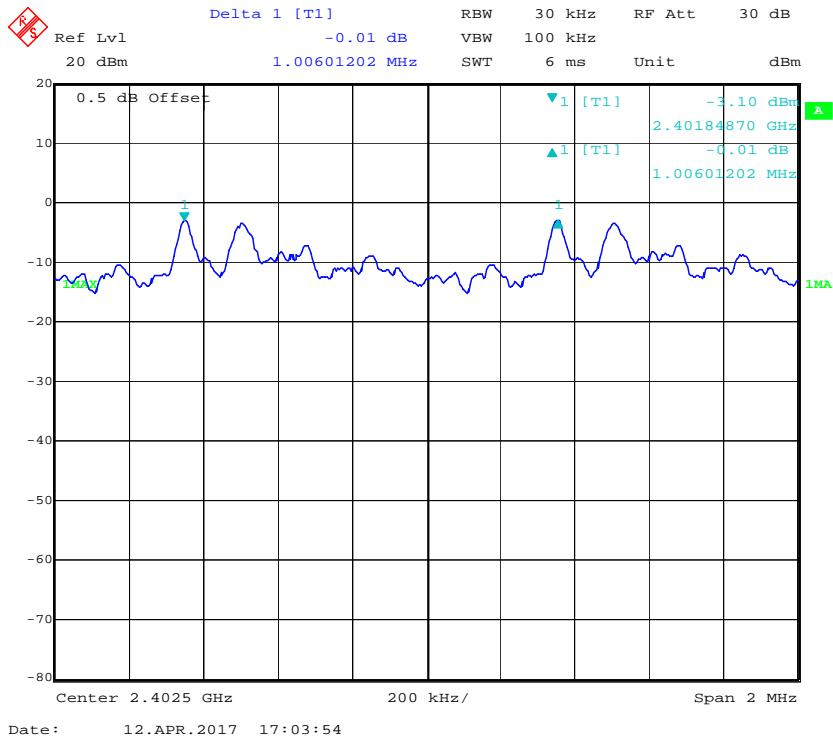


### High Channel

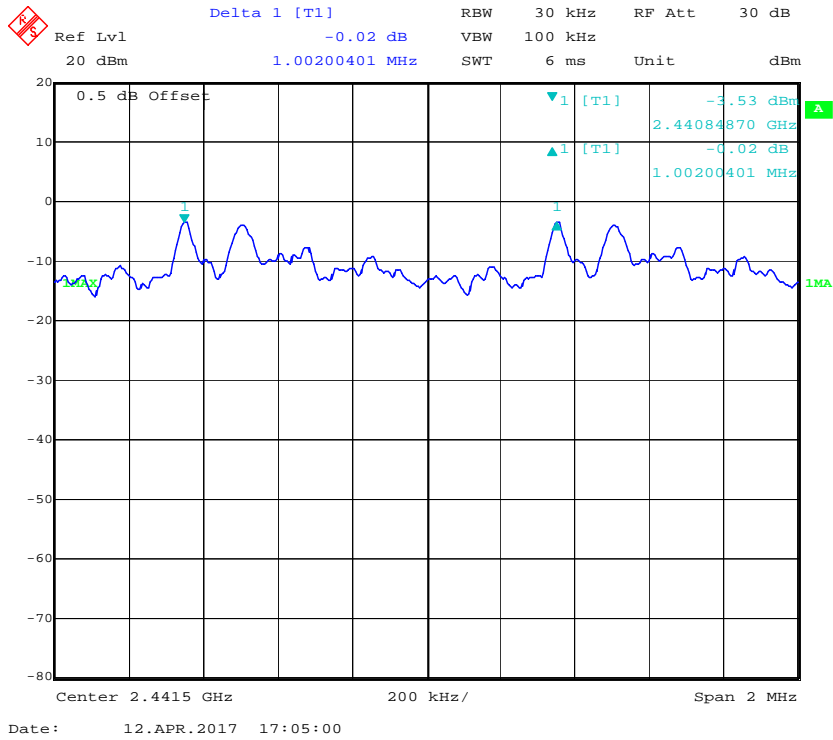


EDR Mode ( $\pi/4$ -DQPSK):

### Low Channel

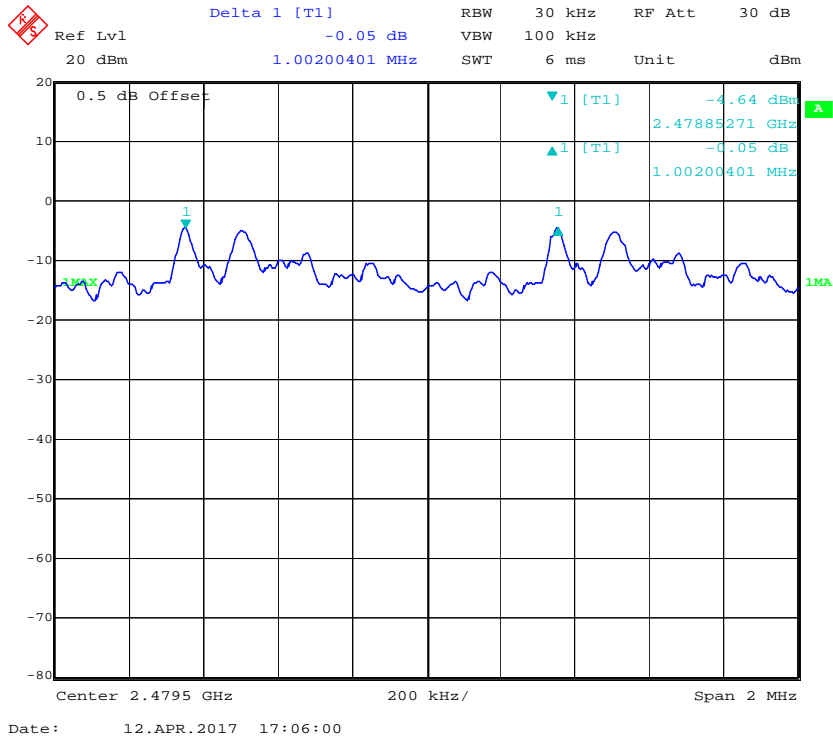


### Middle Channel



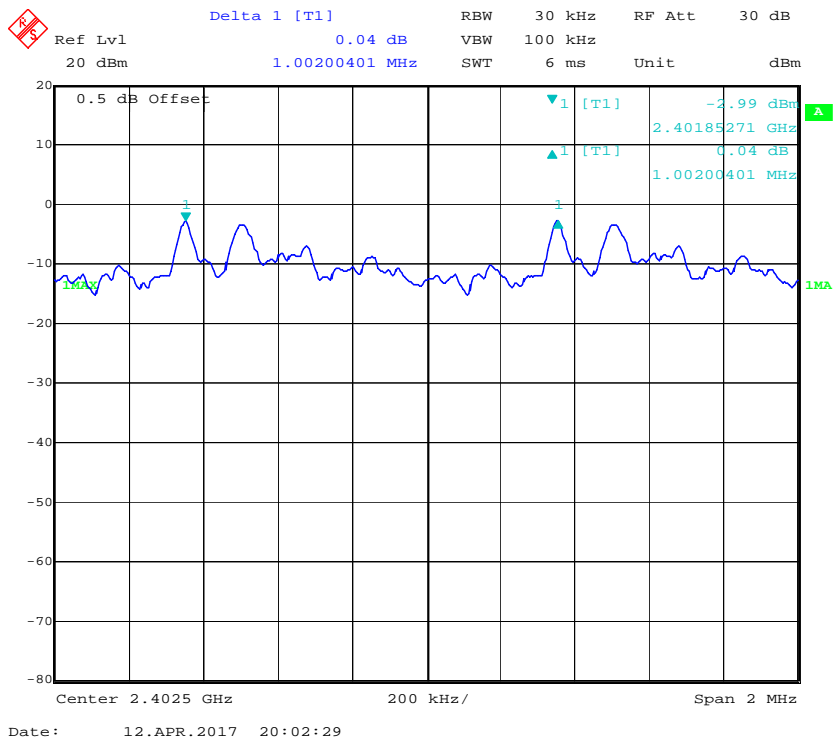


### High Channel

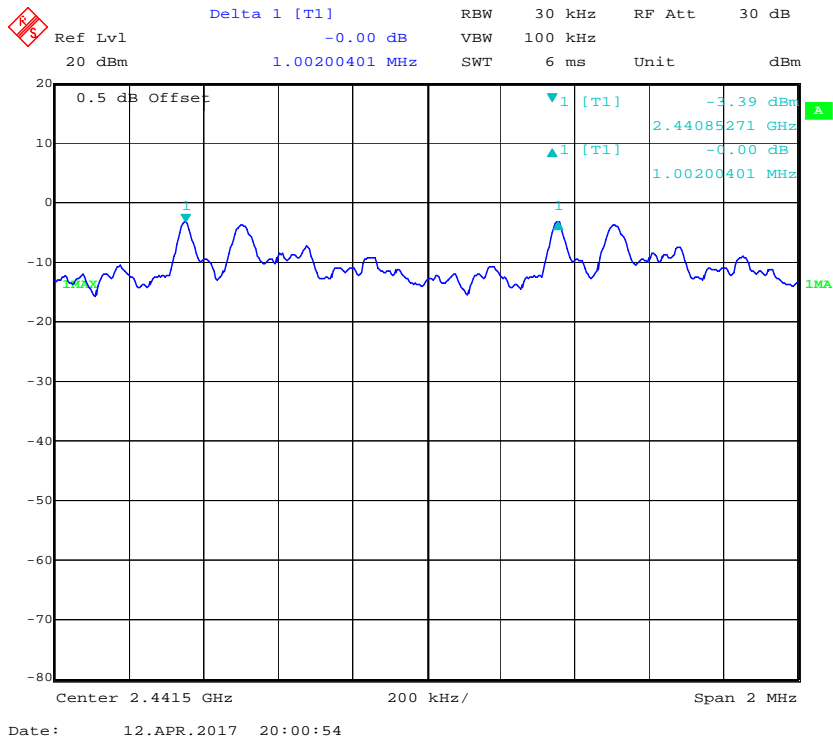


### EDR Mode (8-DPSK):

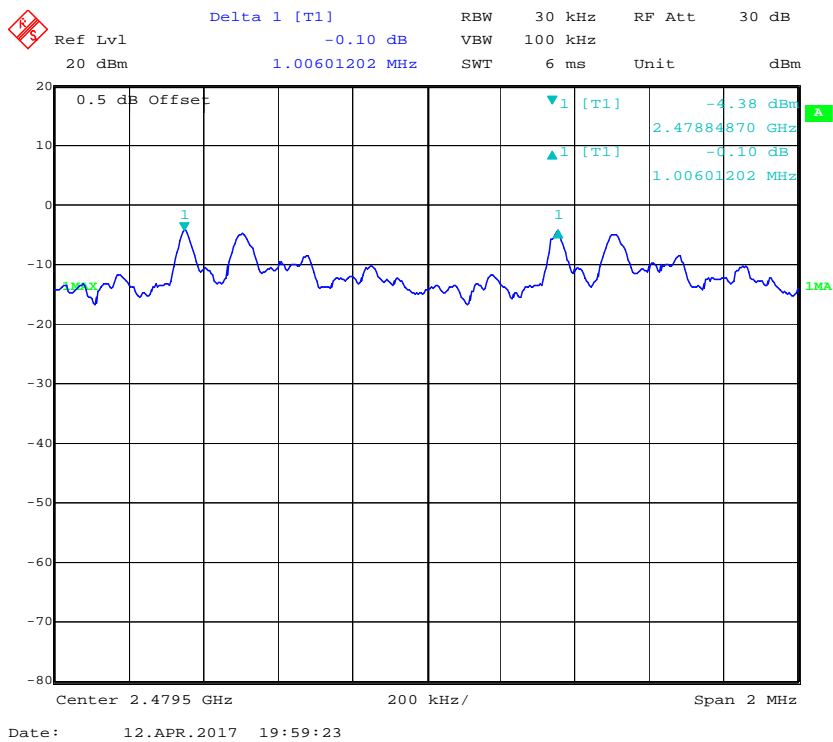
### Low Channel



### 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**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	22.9°C
<b>Relative Humidity:</b>	45.4 %
<b>ATM Pressure:</b>	100.6 kPa

*The testing was performed by Kevin Hu on 2017-04-12.*

**Test Result:** Compliance.

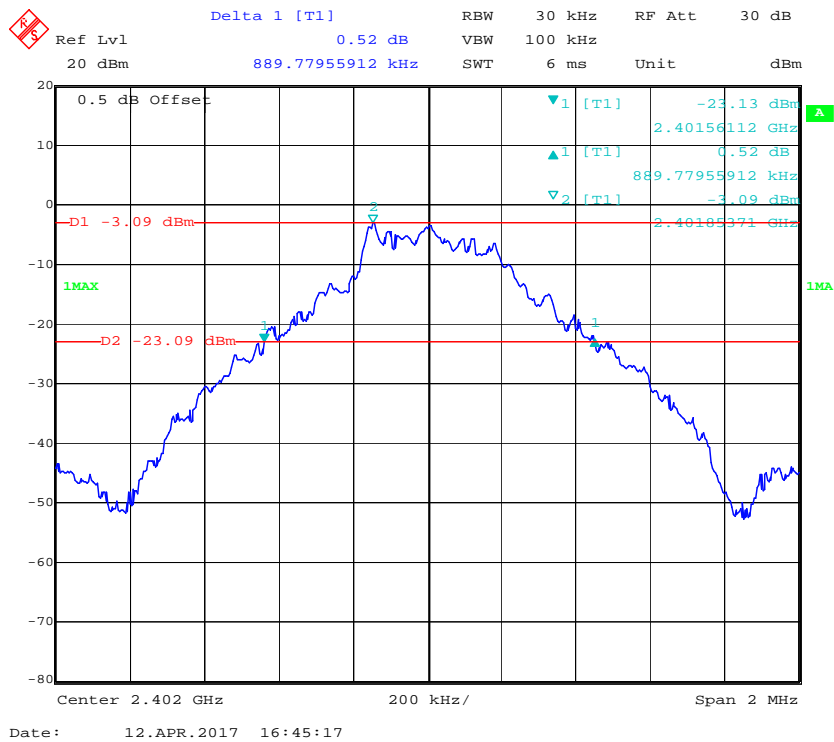
Please refer to following tables and plots

Test Mode: Transmitting

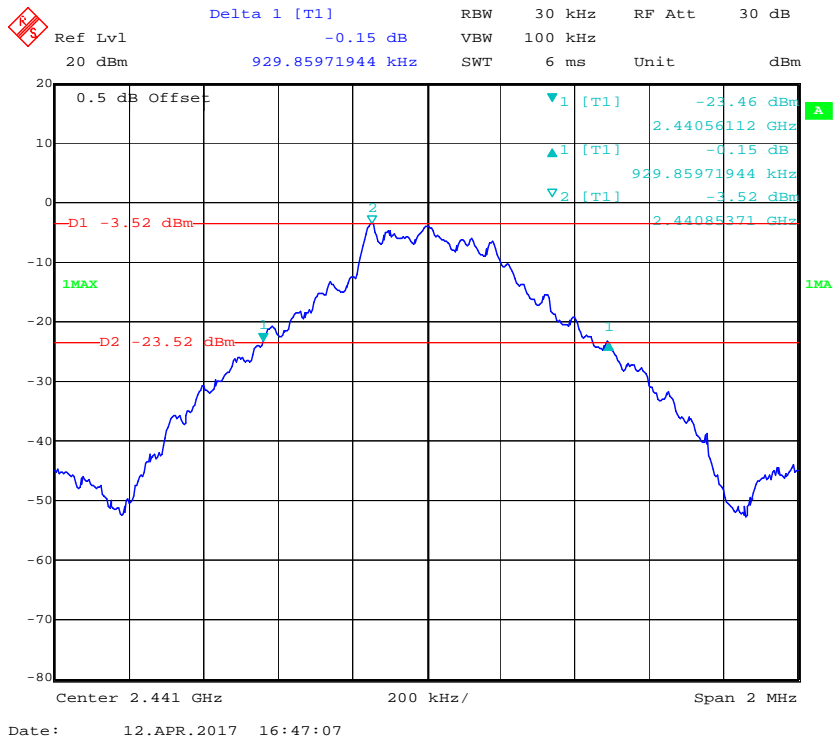
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.89
	Middle	2441	0.93
	High	2480	0.89
EDR Mode ( $\pi/4$ -DQPSK)	Low	2402	1.26
	Middle	2441	1.27
	High	2480	1.27
EDR Mode (8-DPSK)	Low	2402	1.26
	Middle	2441	1.27
	High	2480	1.27

BDR Mode (GFSK):

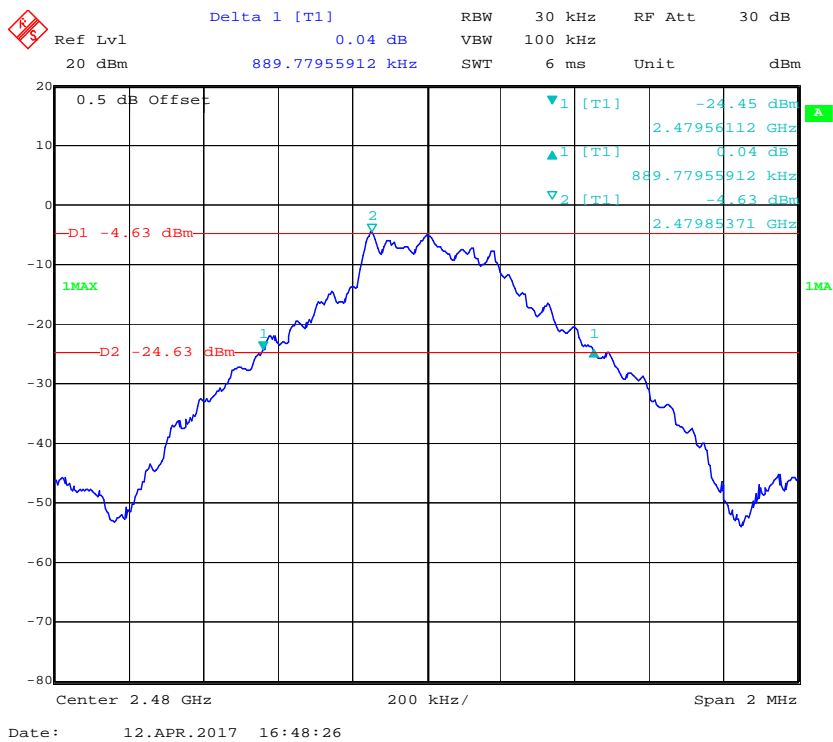
Low Channel



### Middle Channel



### High Channel

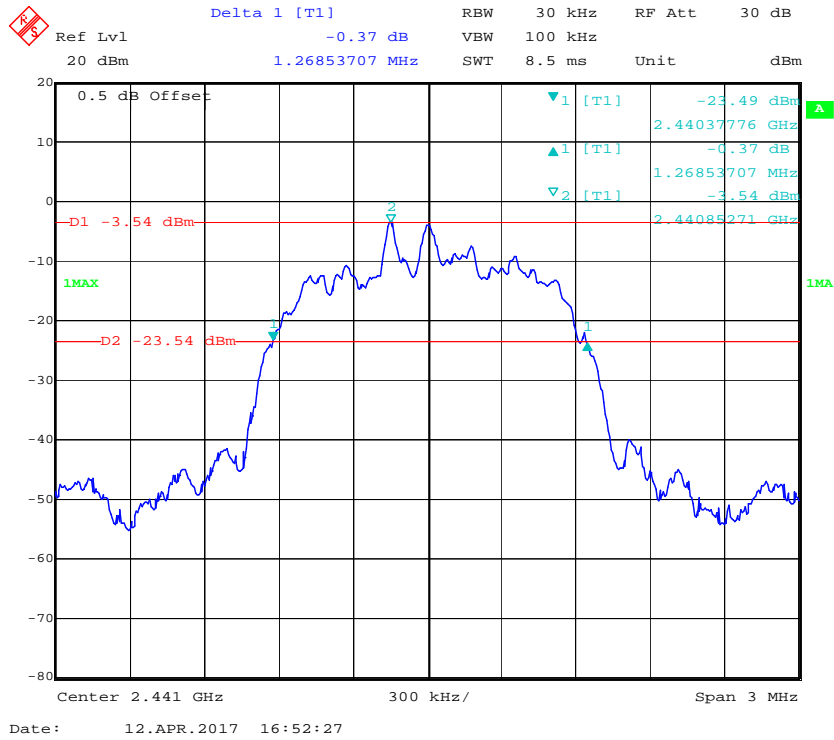


EDR Mode ( $\pi/4$ -DQPSK):

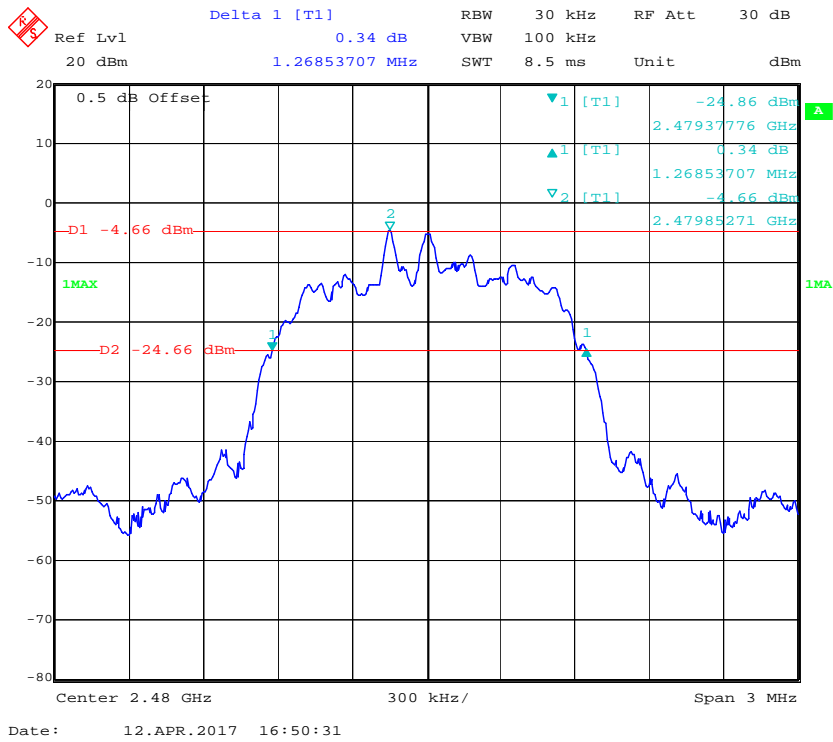
### Low Channel



### Middle Channel



### High Channel

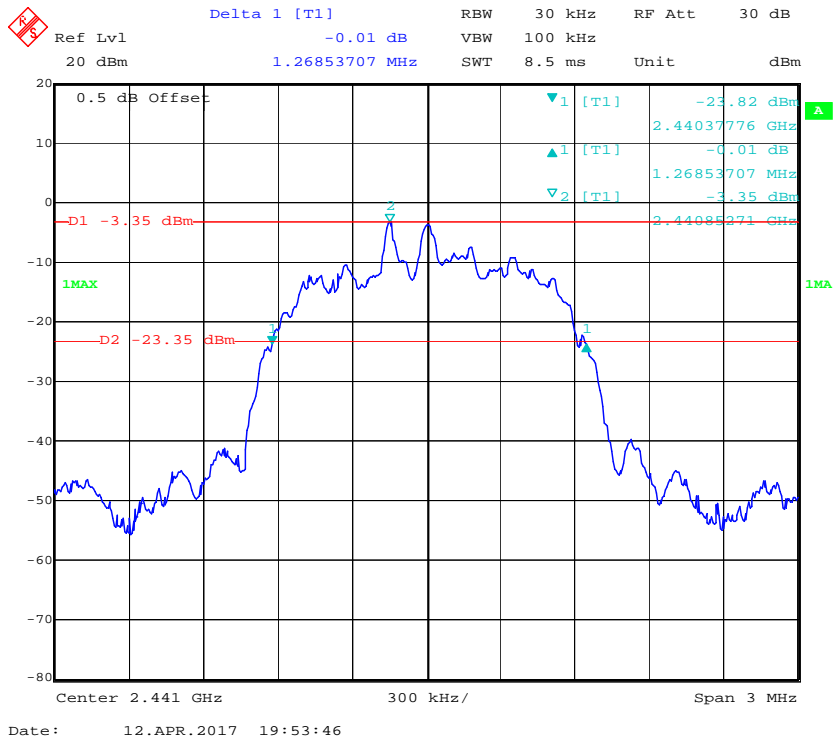


EDR Mode (8-DPSK):

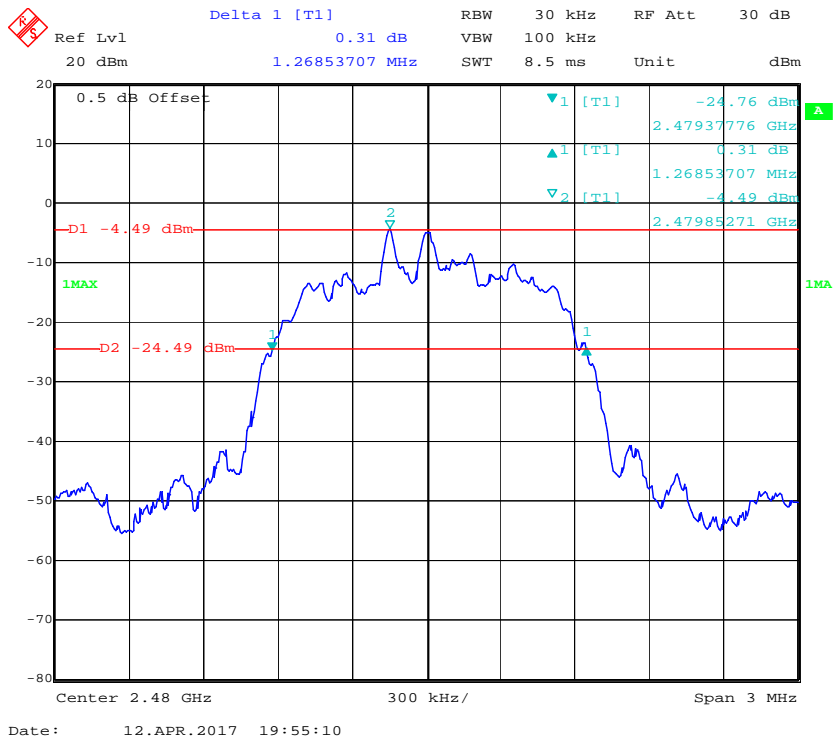
### Low Channel



### 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**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BAACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	22.9°C
<b>Relative Humidity:</b>	45.4 %
<b>ATM Pressure:</b>	100.6 kPa

*The testing was performed by Kevin Hu on 2017-04-12.*

**Test Result:** Compliance.

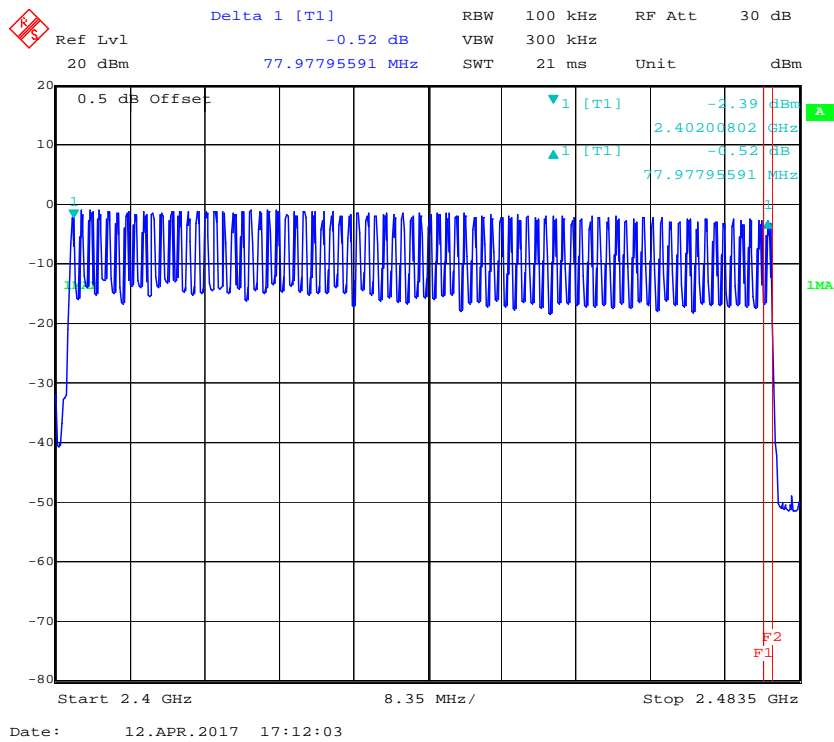
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

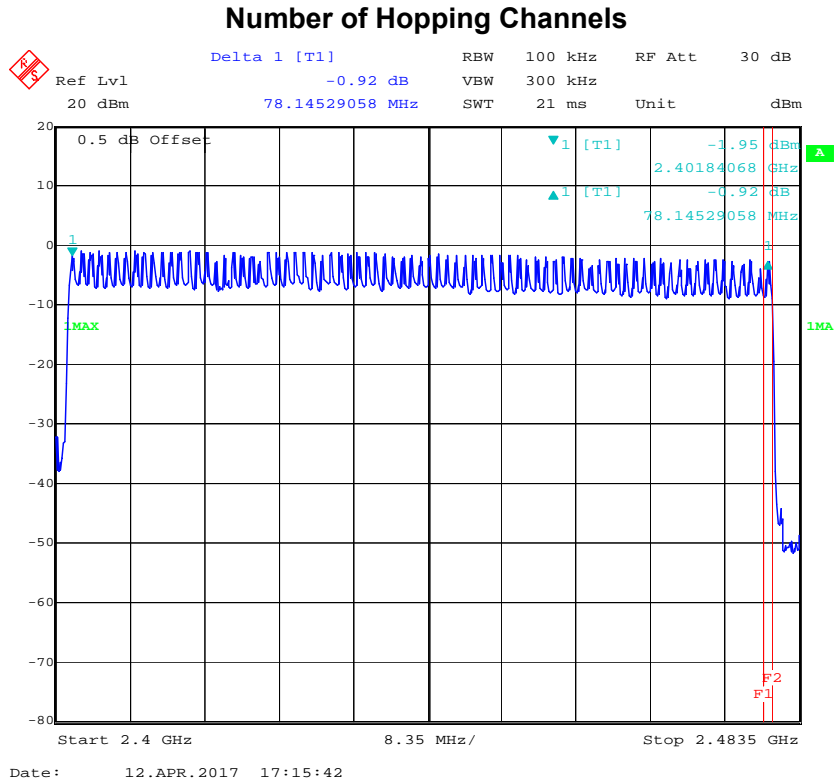
Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

### Number of Hopping Channels



EDR Mode ( $\pi/4$ -DQPSK):

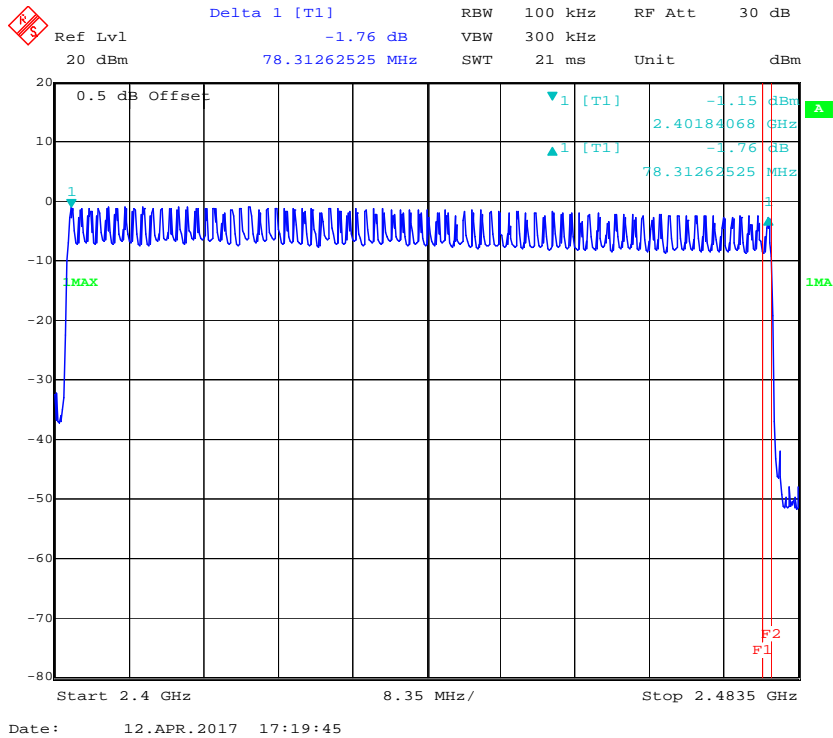
Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	$\geq 15$



EDR Mode (8-DPSK):

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	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. The time of single pulses was tested.

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	22.9°C
<b>Relative Humidity:</b>	45.4 %
<b>ATM Pressure:</b>	100.6 kPa

*The testing was performed by Kevin Hu on 2017-04-12.*

**Test Result:** Compliance.

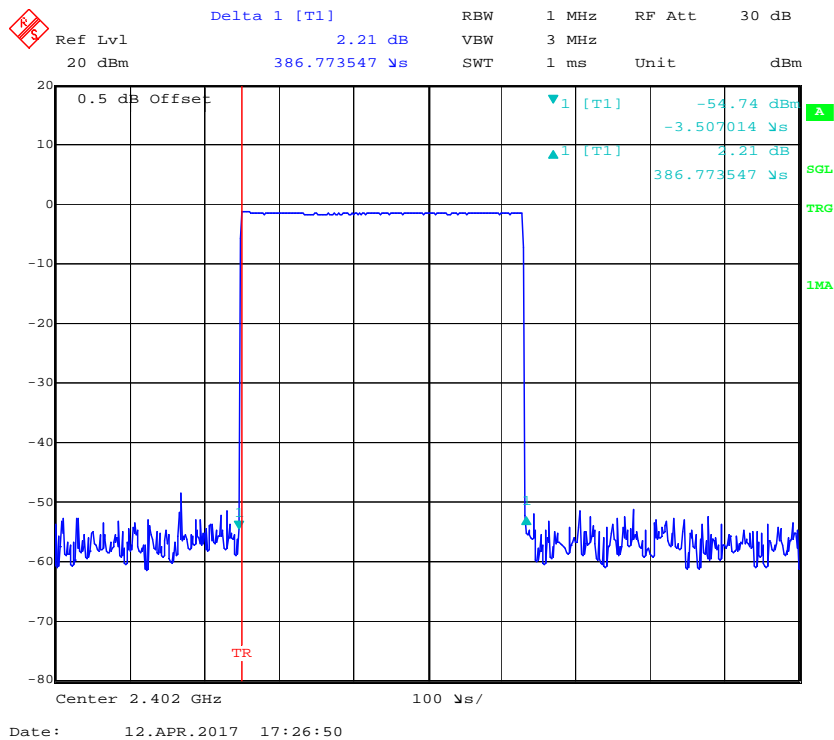
Please refer to following tables and plots

Test Mode: Transmitting

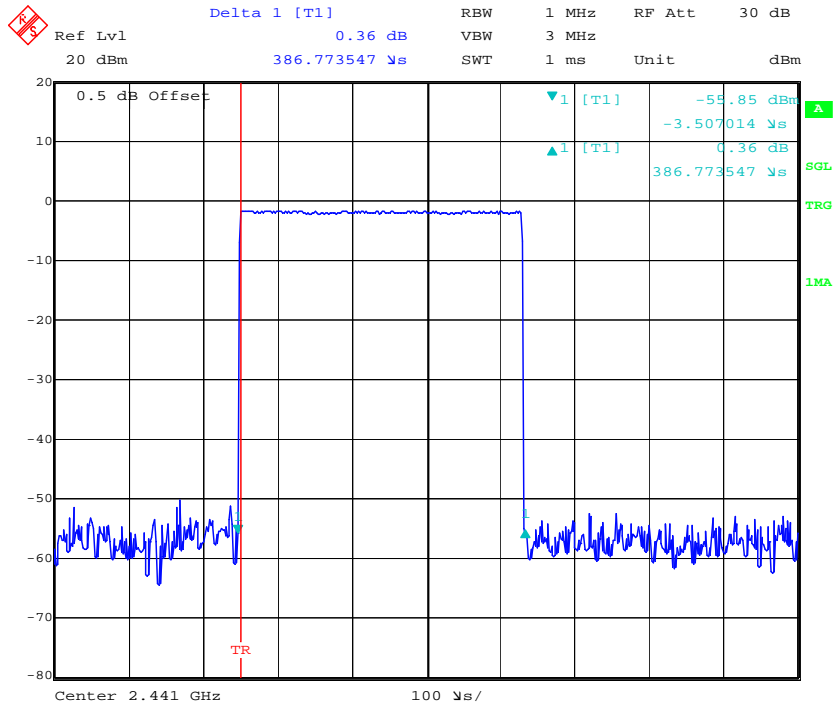
BDR Mode (GFSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.387	0.124	0.4	Compliance
	Middle	0.387	0.124	0.4	Compliance
	High	0.387	0.124	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.653	0.264	0.4	Compliance
	Middle	1.653	0.264	0.4	Compliance
	High	1.653	0.264	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.916	0.311	0.4	Compliance
	Middle	2.916	0.310	0.4	Compliance
	High	2.916	0.310	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

DH1: Low Channel

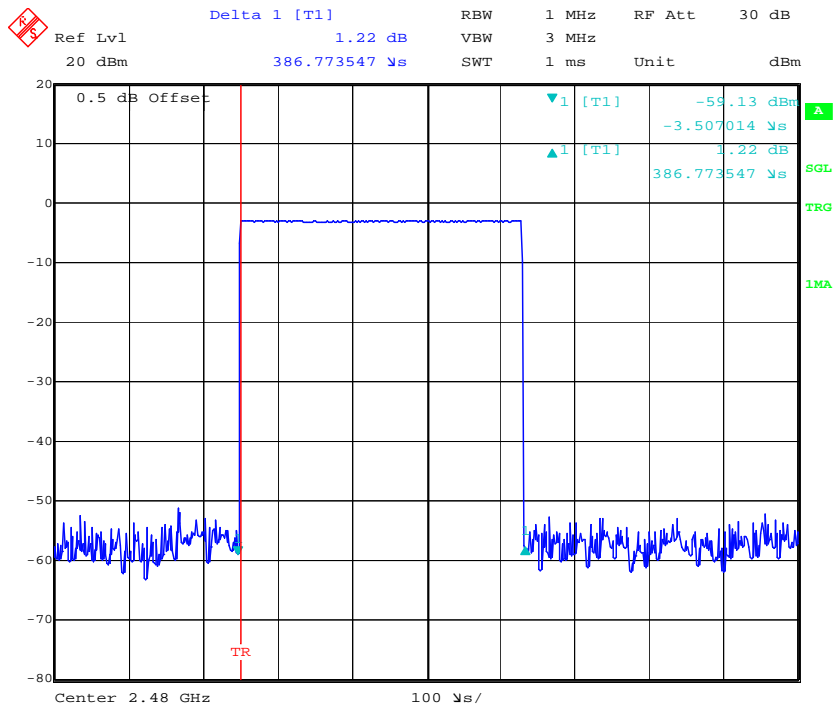


### DH1: Middle Channel



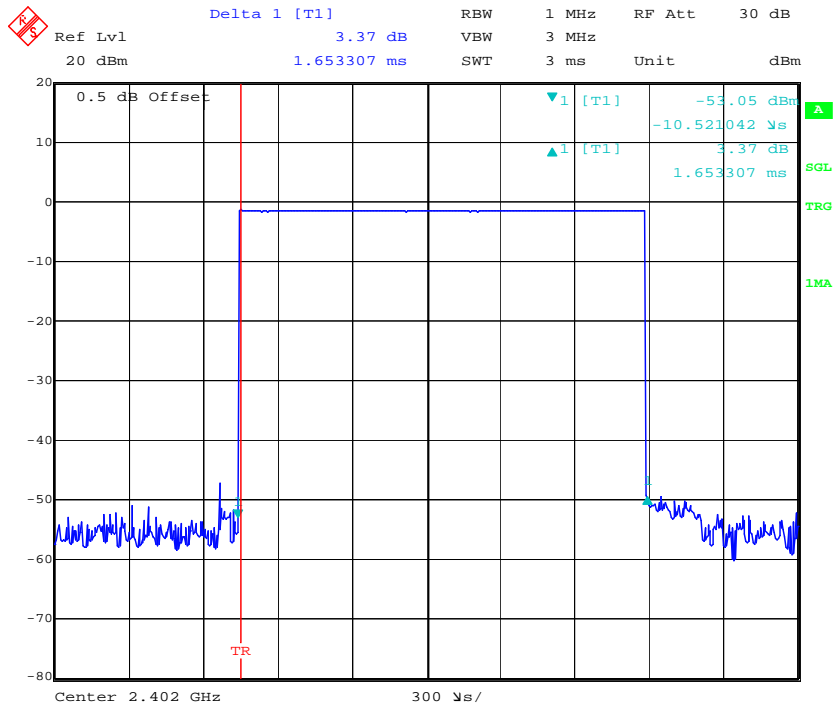
Date: 12.APR.2017 17:27:02

### DH1: High Channel



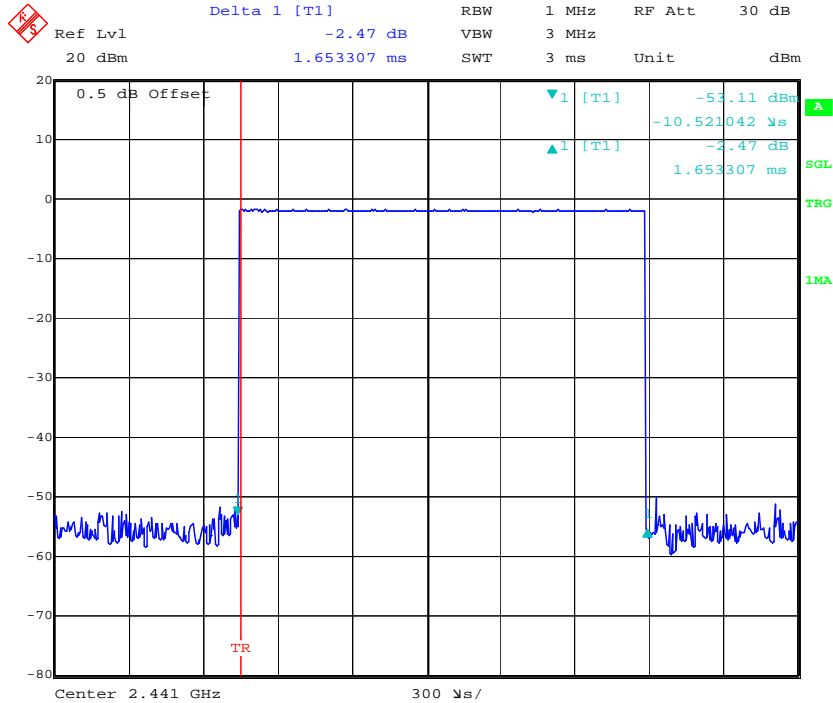
Date: 12.APR.2017 17:27:14

### DH3: Low Channel



Date: 12.APR.2017 17:27:35

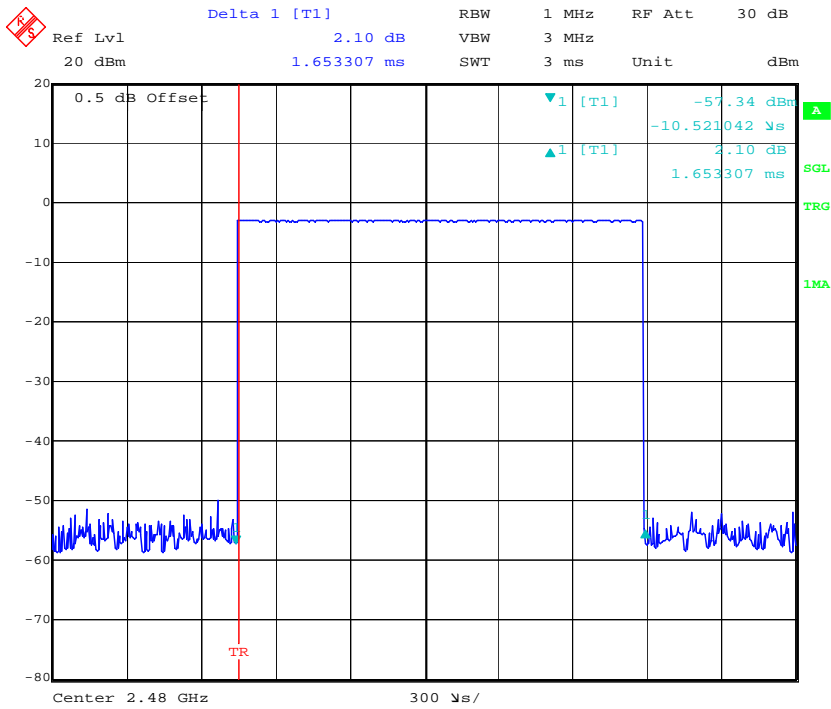
### DH3: Middle Channel



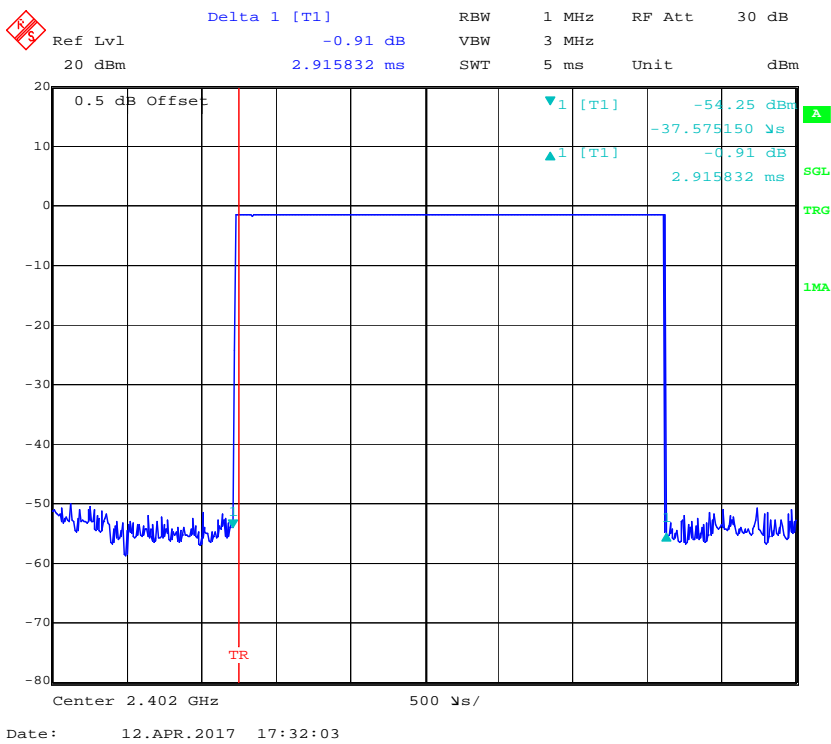
Date: 12.APR.2017 17:27:47



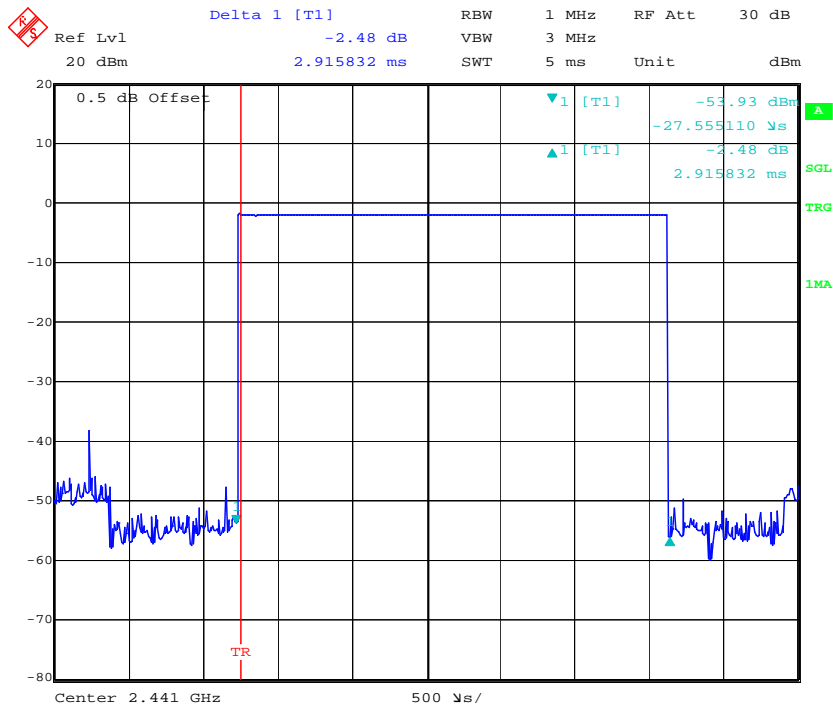
### DH3: High Channel



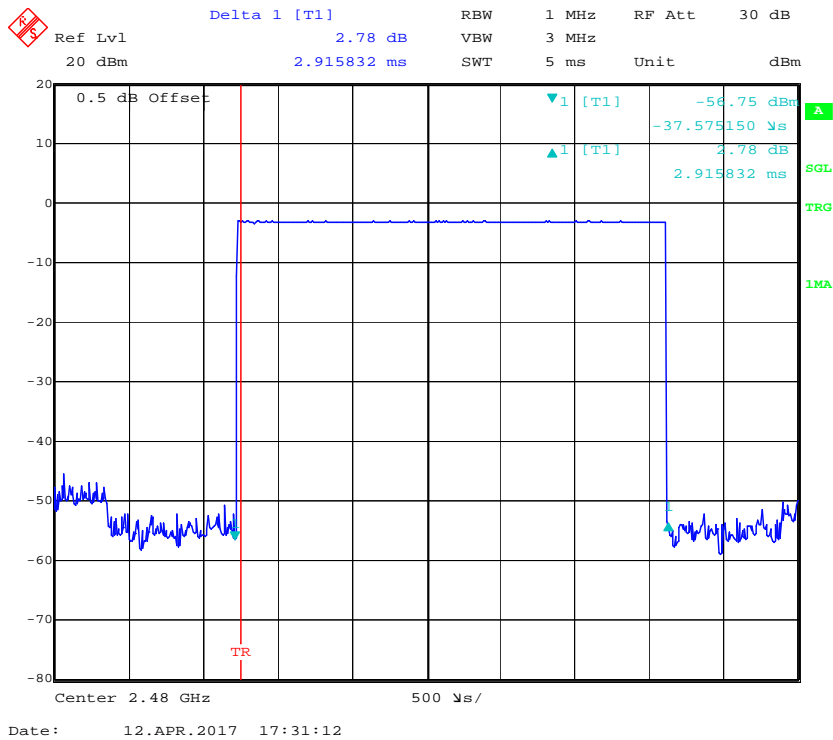
### DH5: Low Channel



### DH5: Middle Channel



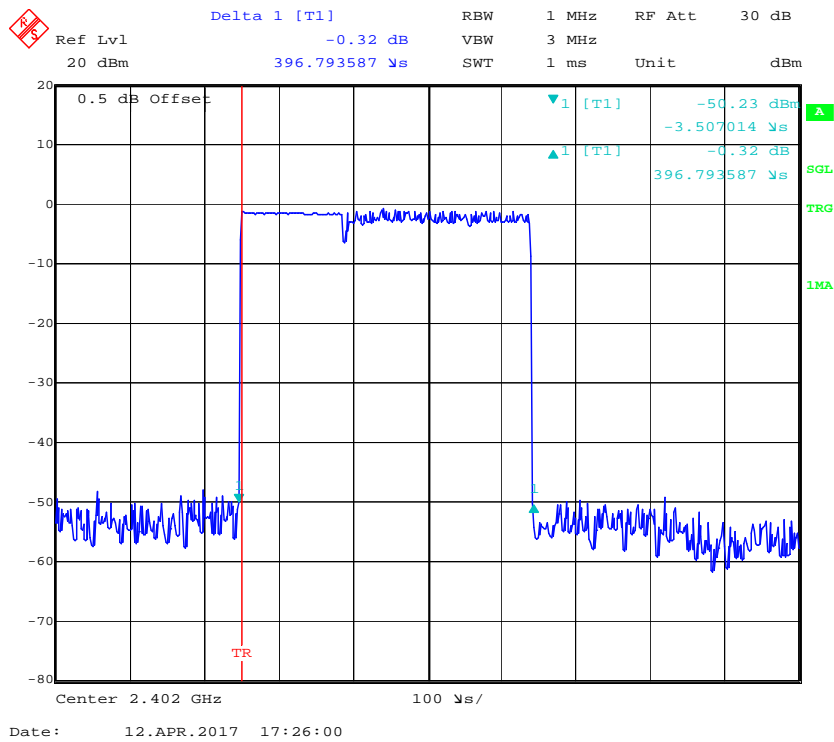
### DH5: High Channel



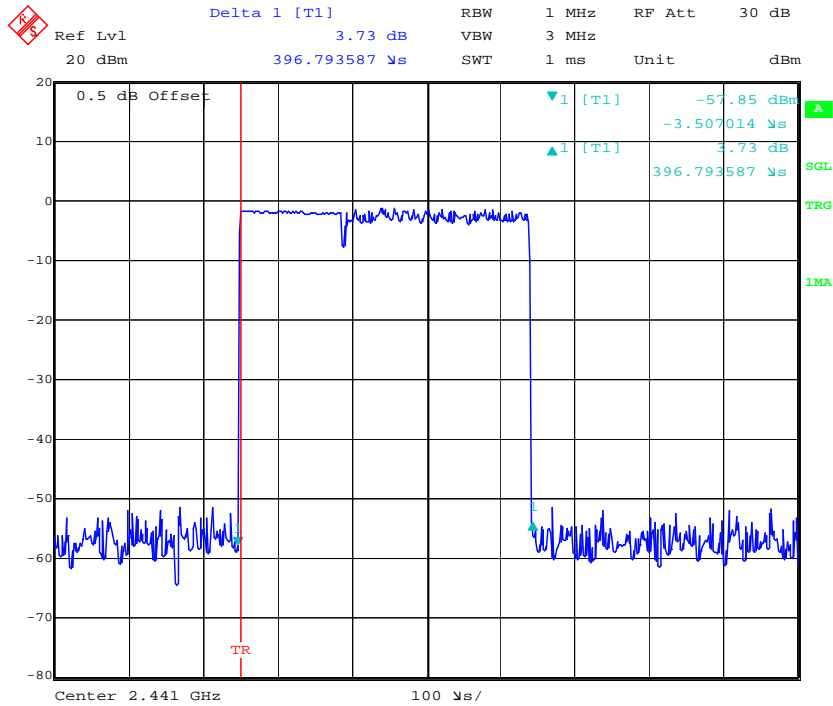
EDR Mode ( $\pi/4$ -DQPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.397	0.127	0.4	Compliance
	Middle	0.397	0.127	0.4	Compliance
	High	0.397	0.127	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
2DH3	Low	1.659	0.265	0.4	Compliance
	Middle	1.659	0.265	0.4	Compliance
	High	1.659	0.265	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
2DH5	Low	2.916	0.311	0.4	Compliance
	Middle	2.916	0.311	0.4	Compliance
	High	2.916	0.311	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

2DH1: Low Channel

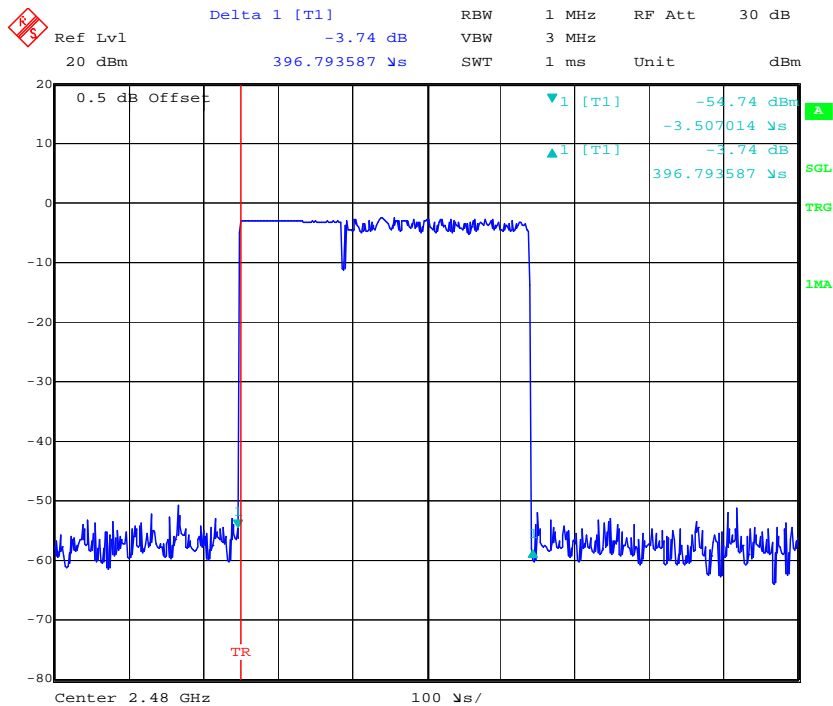


### 2DH1: Middle Channel



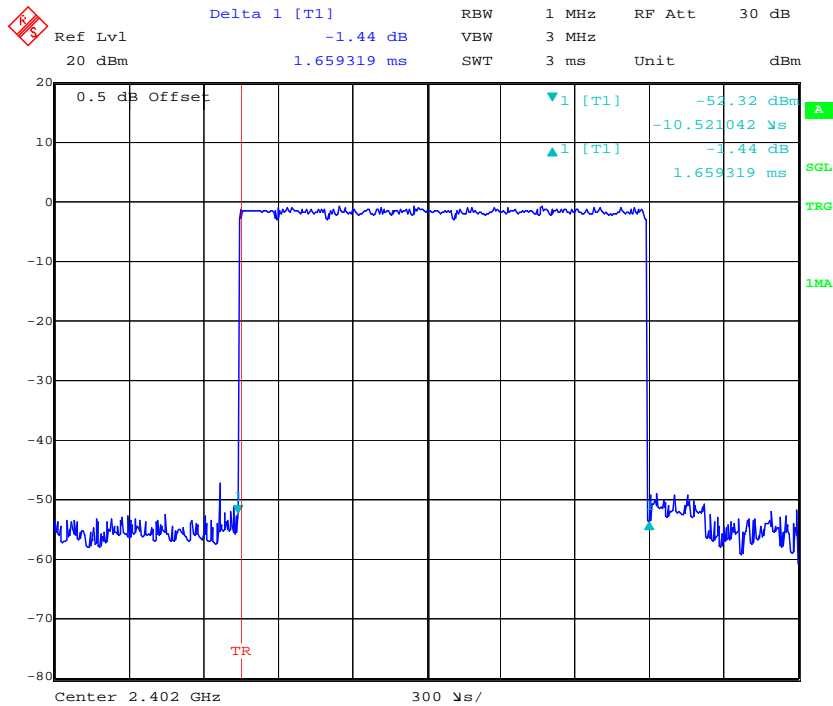
Date: 12.APR.2017 17:26:12

### 2DH1: High Channel



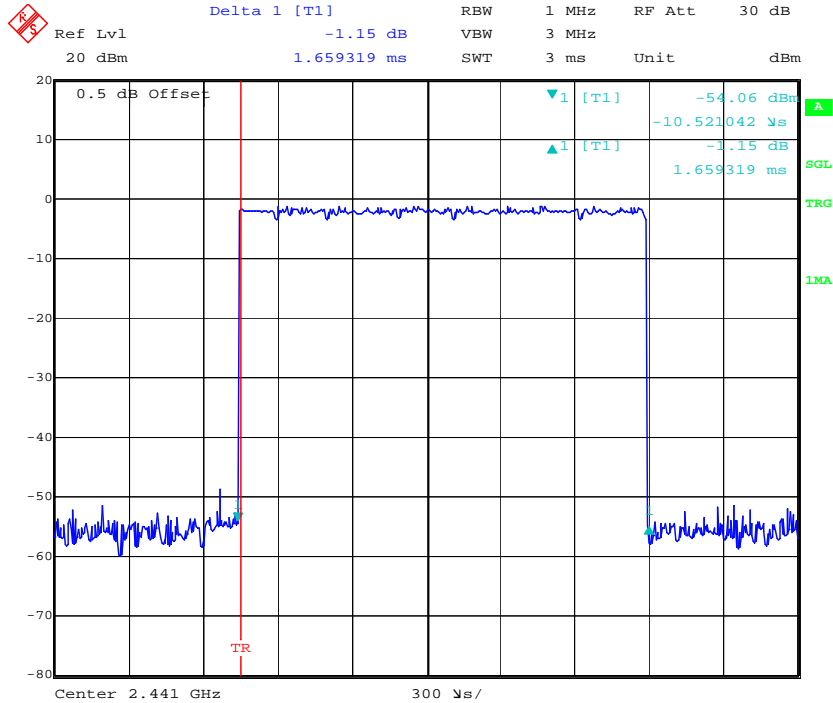
Date: 12.APR.2017 17:26:24

### 2DH3: Low Channel



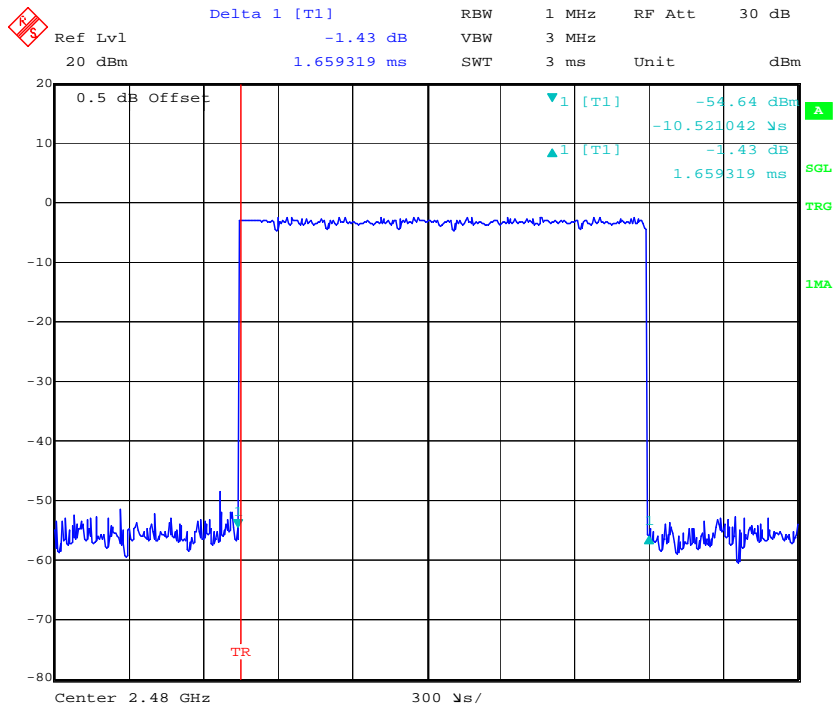
Date: 12.APR.2017 17:25:08

### 2DH3: Middle Channel

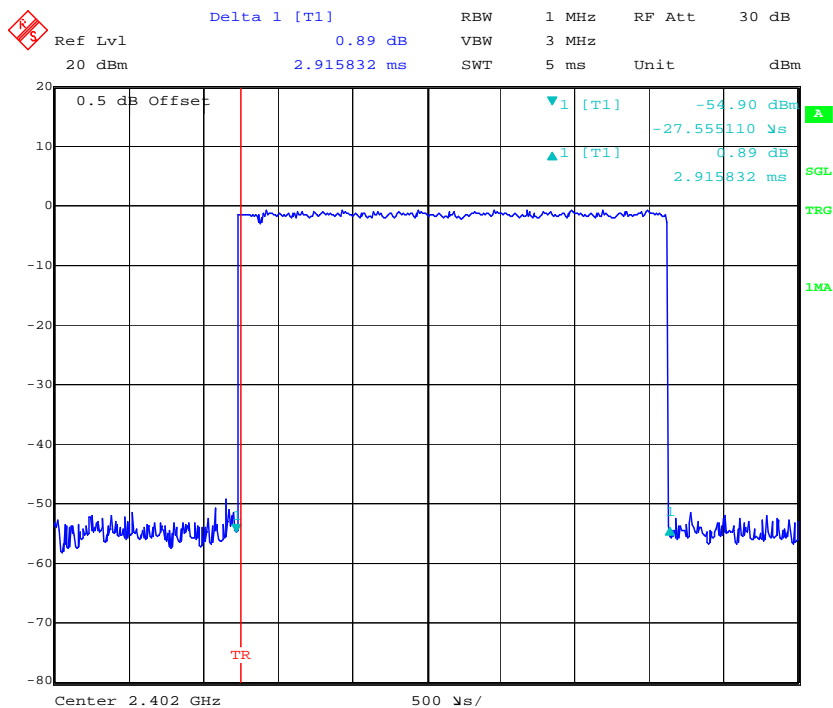


Date: 12.APR.2017 17:25:20

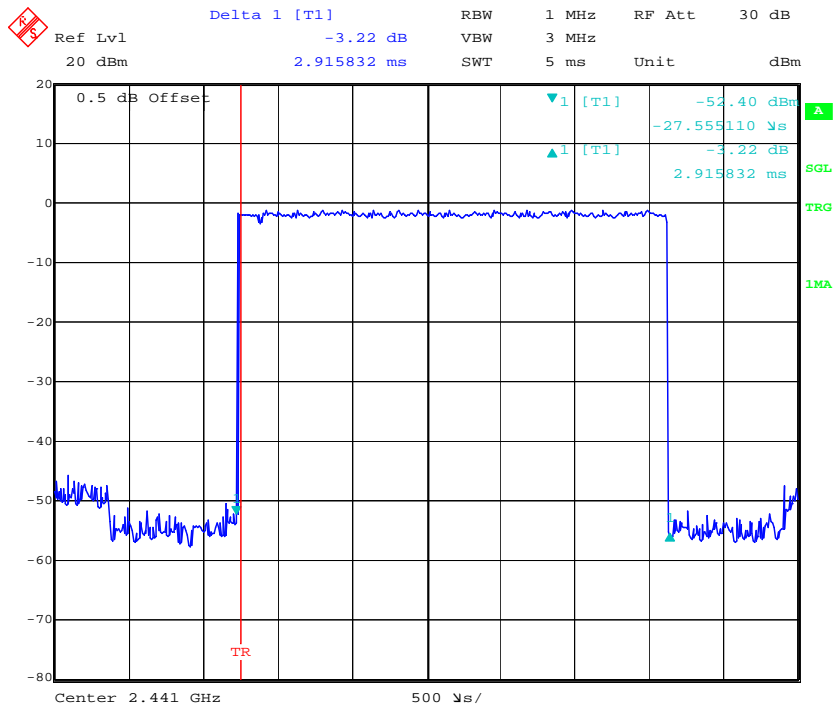
### 2DH3: High Channel



### 2DH5: Low Channel

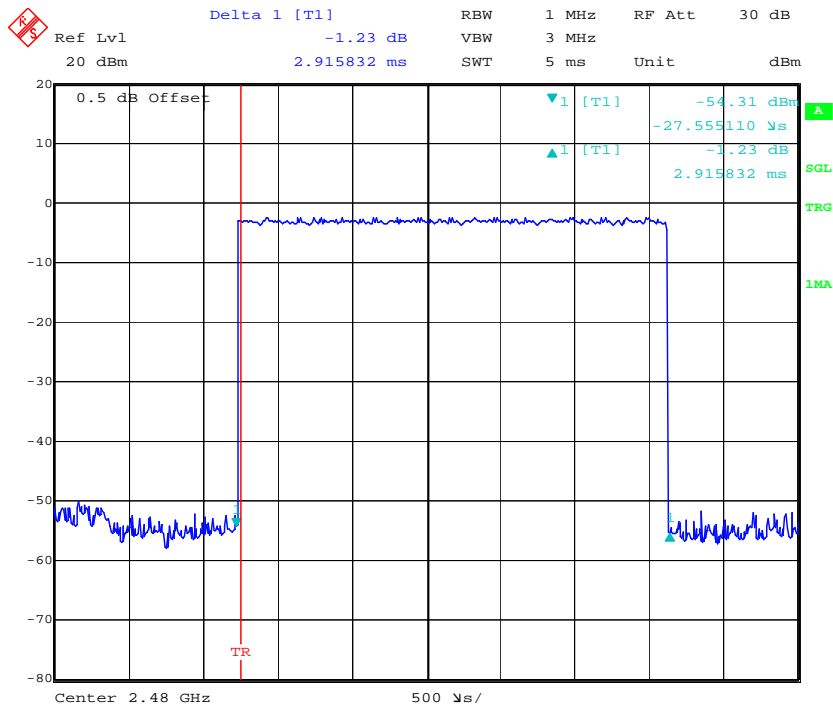


### 2DH5: Middle Channel



Date: 12.APR.2017 17:36:11

### 2DH5: High Channel

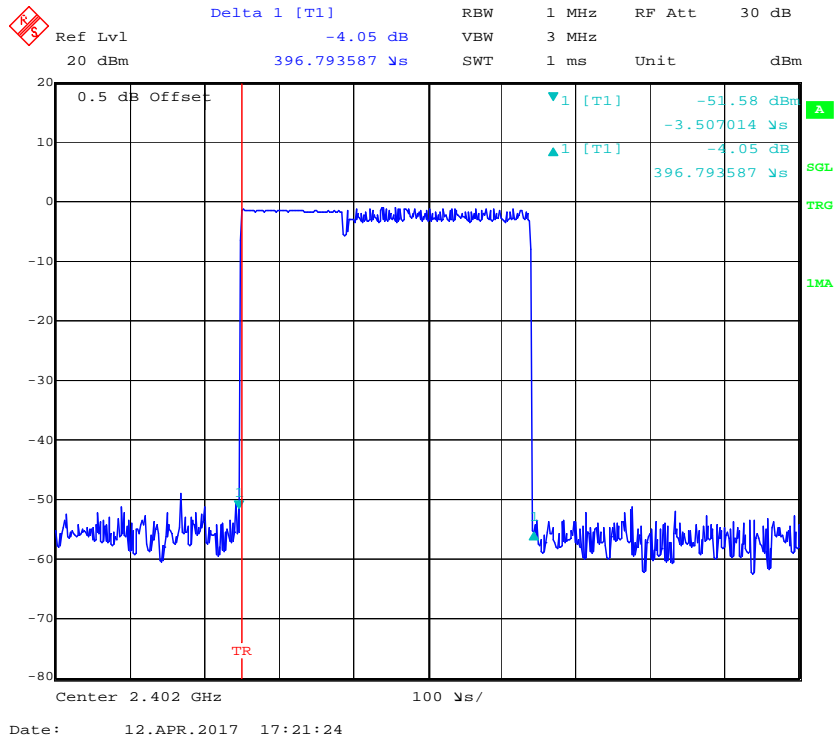


Date: 12.APR.2017 17:34:44

EDR Mode (8-DPSK):

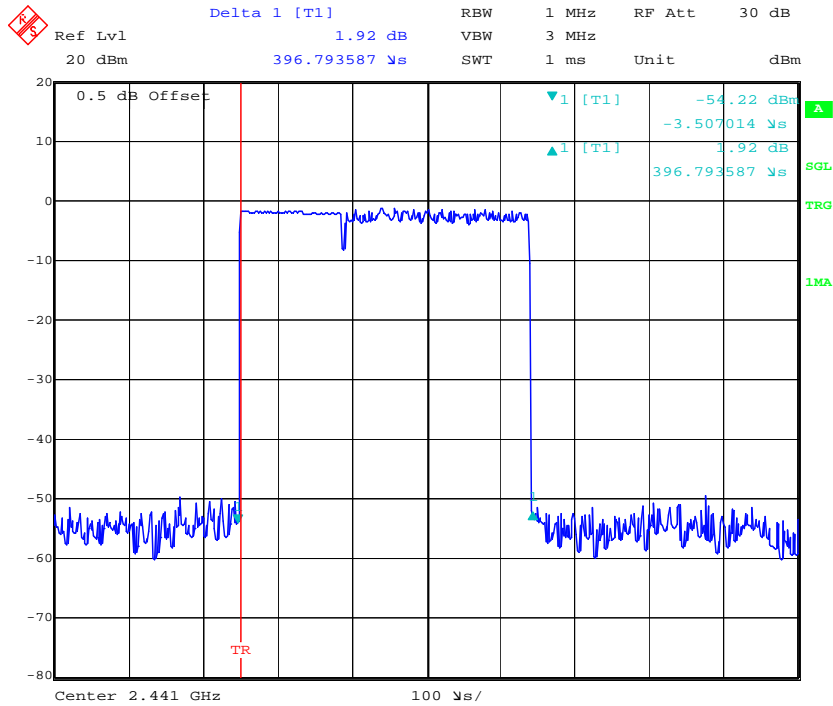
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.397	0.127	0.4	Compliance
	Middle	0.397	0.127	0.4	Compliance
	High	0.397	0.127	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
3DH3	Low	1.659	0.265	0.4	Compliance
	Middle	1.659	0.265	0.4	Compliance
	High	1.659	0.265	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
3DH5	Low	2.916	0.311	0.4	Compliance
	Middle	2.916	0.311	0.4	Compliance
	High	2.916	0.311	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

3DH1: Low Channel



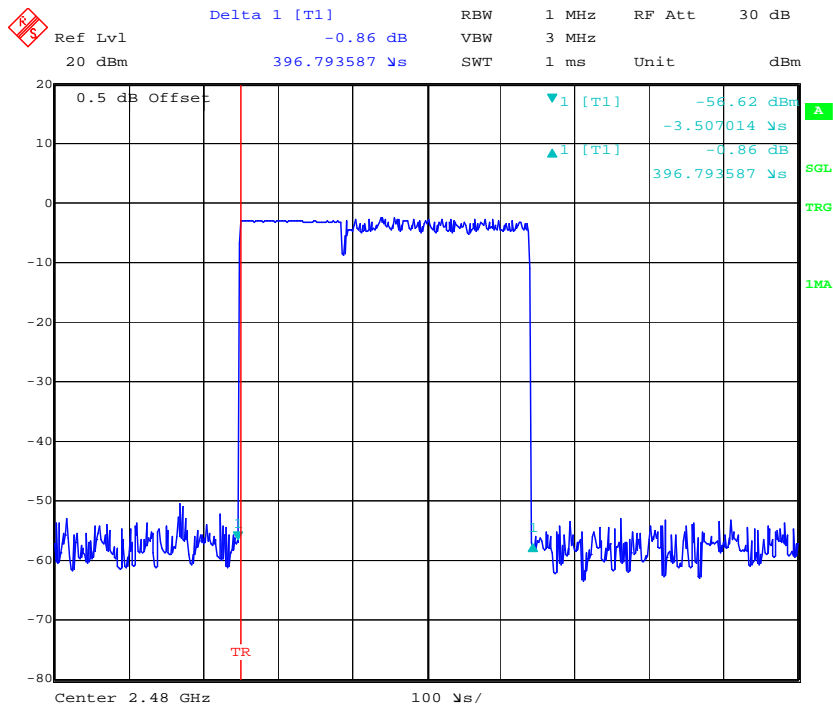


### 3DH1: Middle Channel



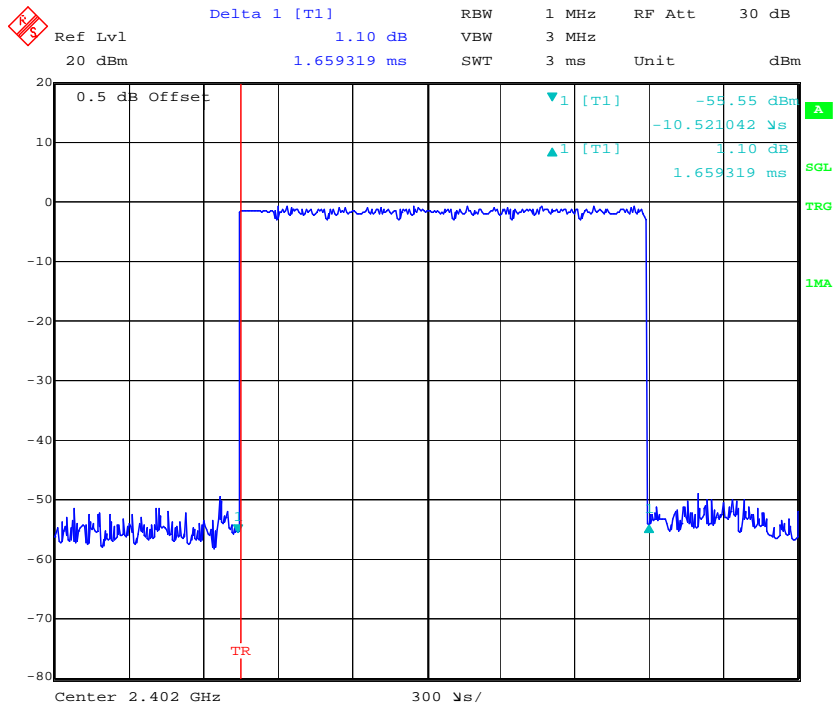
Date: 12.APR.2017 17:21:36

### 3DH1: High Channel

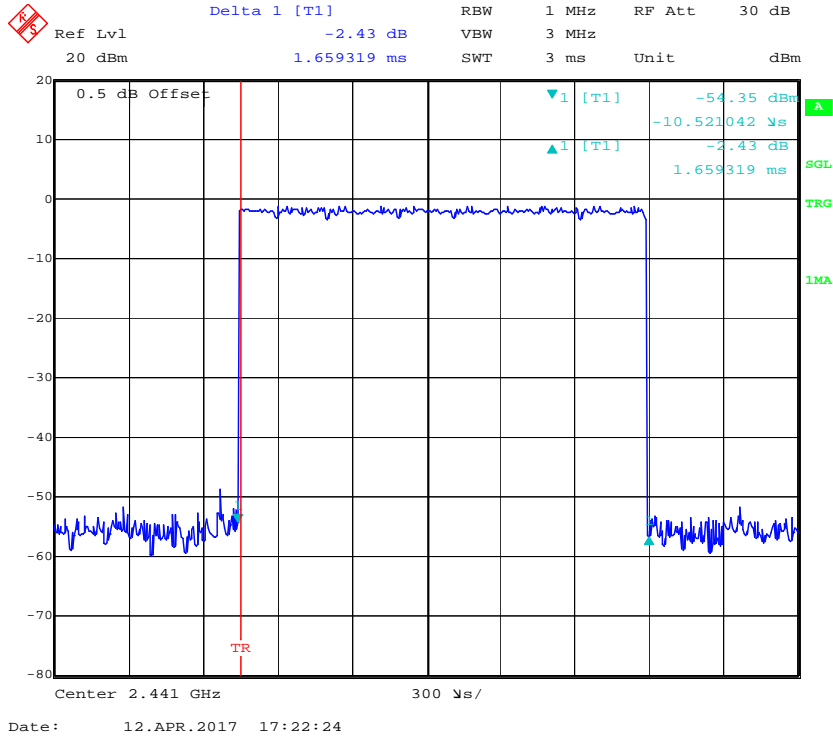


Date: 12.APR.2017 17:21:48

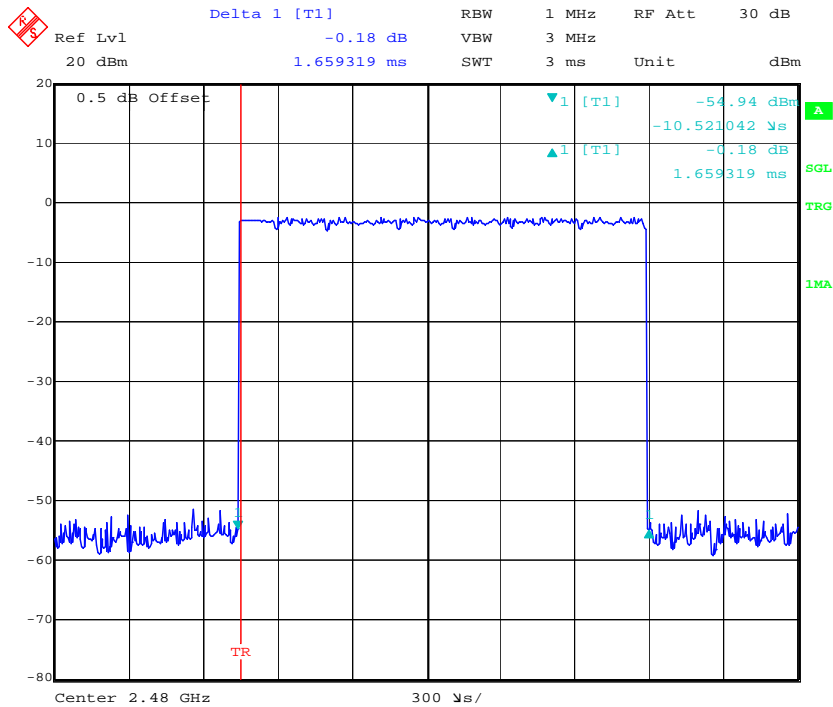
### 3DH3: Low Channel



### 3DH3: Middle Channel

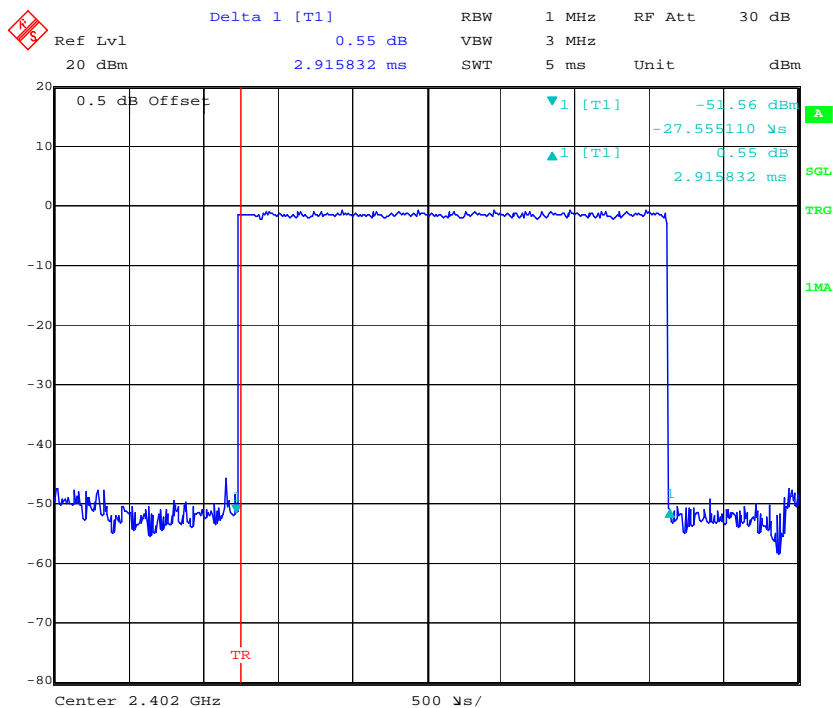


### 3DH3: High Channel



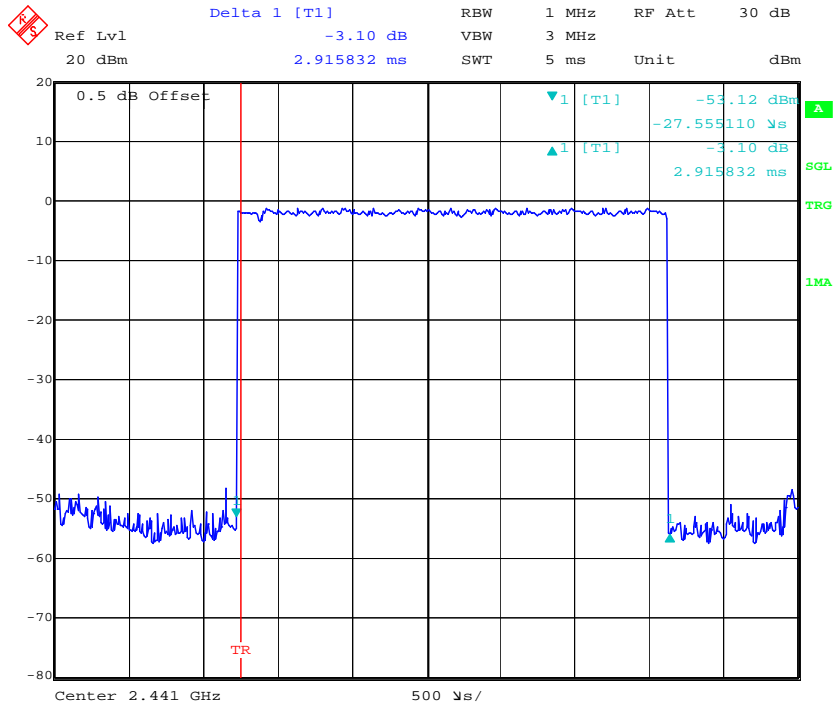
Date: 12.APR.2017 17:22:35

### 3DH5: Low Channel



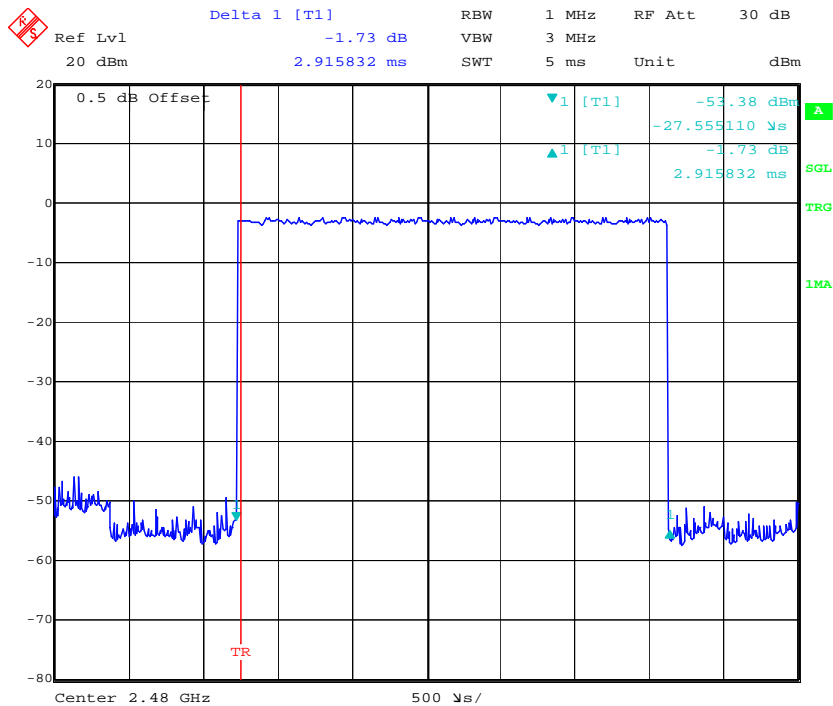
Date: 12.APR.2017 17:23:40

### 3DH5: Middle Channel



Date: 12.APR.2017 17:23:52

### 3DH5: High Channel



Date: 12.APR.2017 17:24:04

## 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 one test equipment.
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	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	22.9°C
<b>Relative Humidity:</b>	45.4 %
<b>ATM Pressure:</b>	100.6 kPa

*The testing was performed by Kevin Hu on 2017-04-12.*

**Test Result:** Compliance.

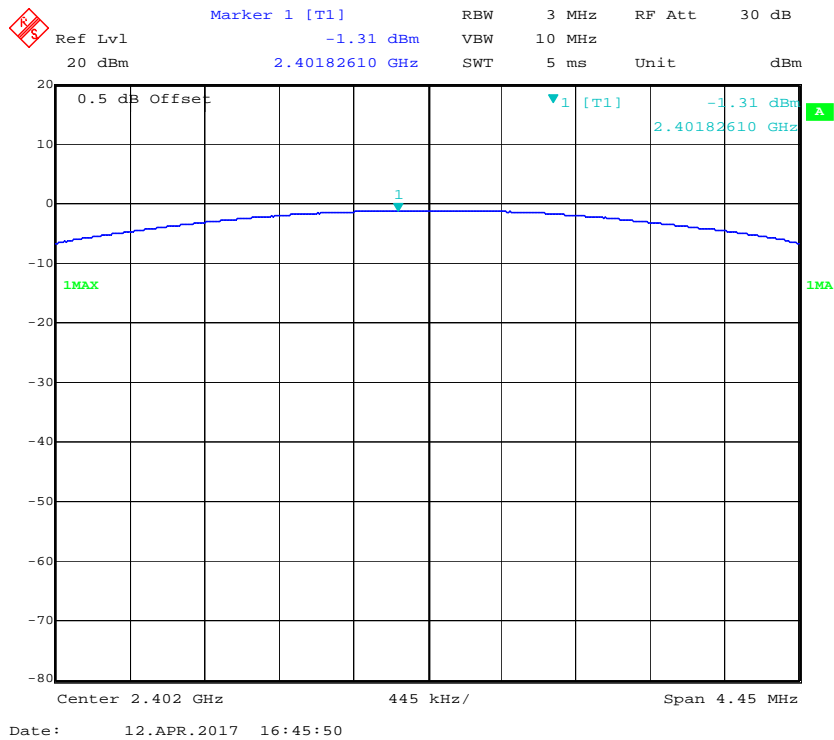
Test Mode: Transmitting

Mode	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	-1.31	30
	2441	-1.80	30
	2480	-2.91	30
EDR Mode ( $\pi/4$ -DQPSK)	2402	-0.23	30
	2441	-0.59	30
	2480	-1.80	30
EDR Mode (8-DPSK)	2402	-0.11	30
	2441	-0.47	30
	2480	-1.55	30

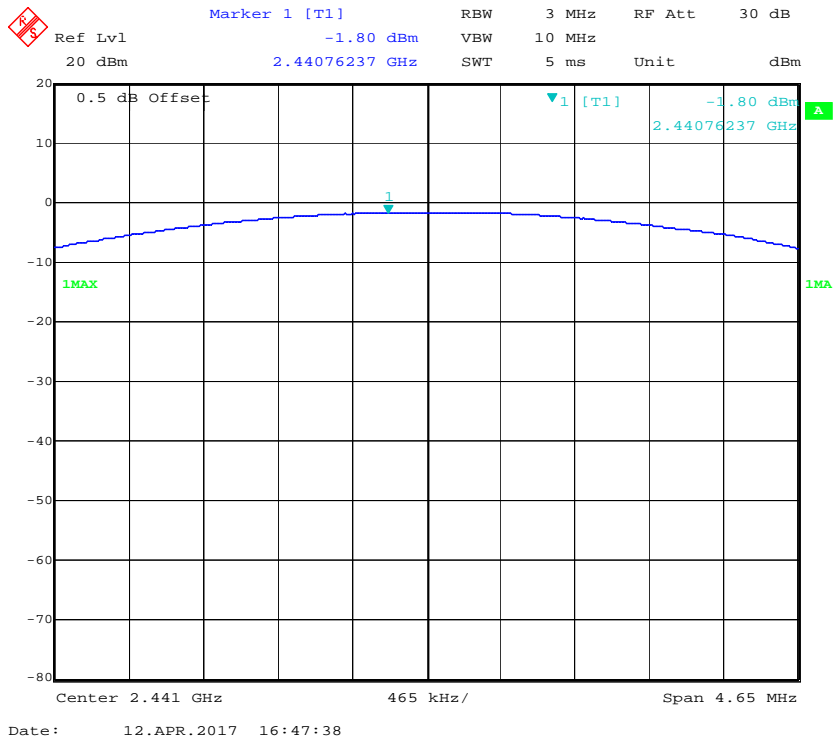
Note: The data above was tested in conducted mode.

BDR Mode (GFSK):

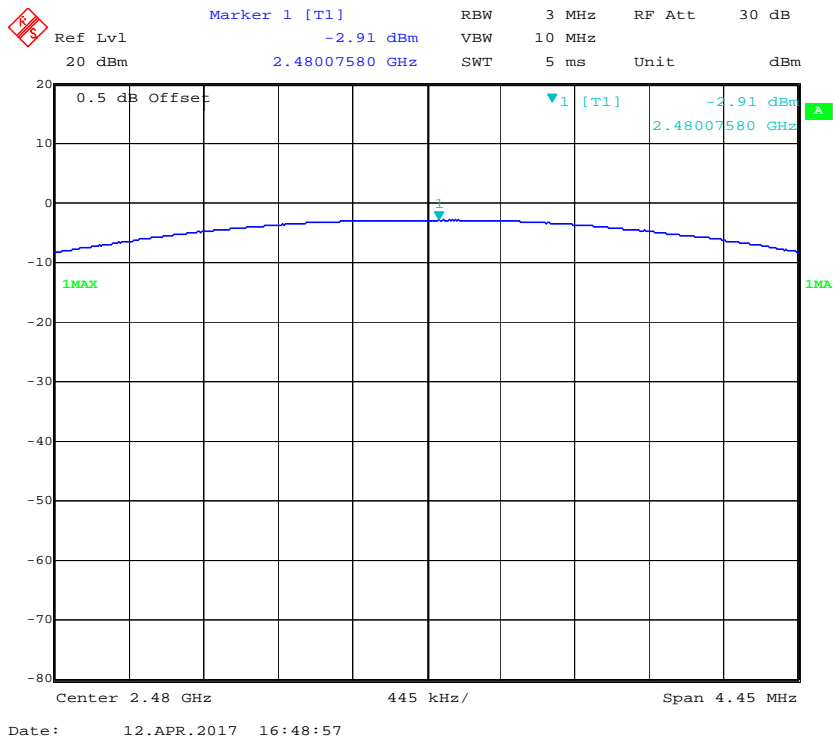
Low Channel



### Middle Channel

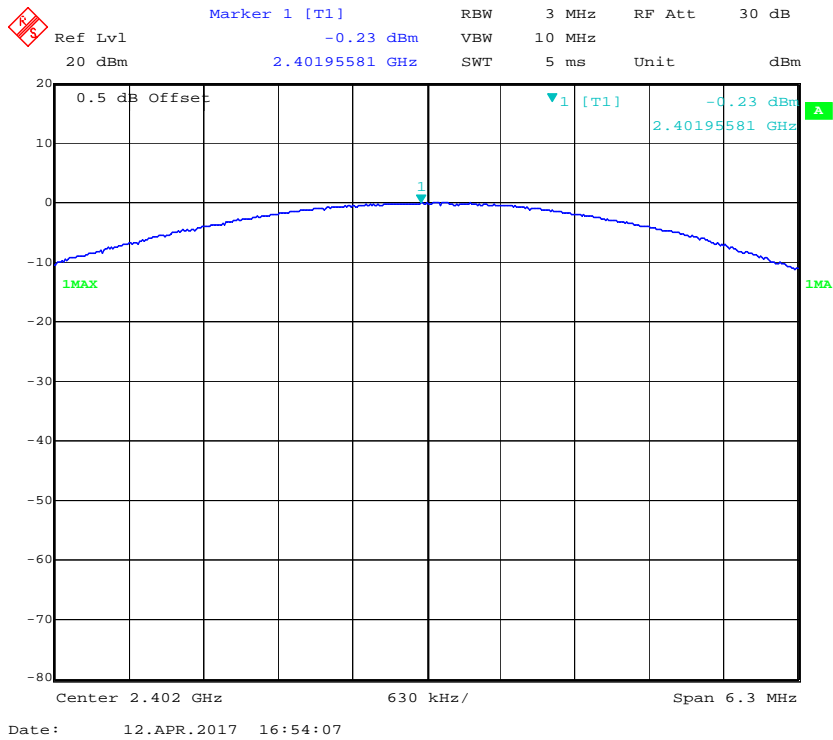


### High Channel

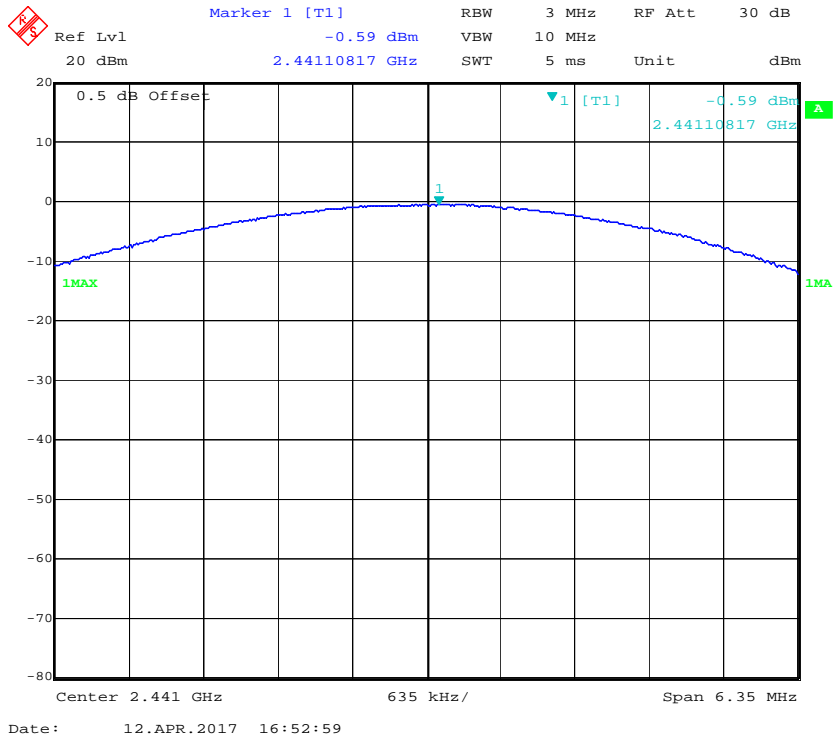


EDR Mode ( $\pi/4$ -DQPSK):

Low Channel

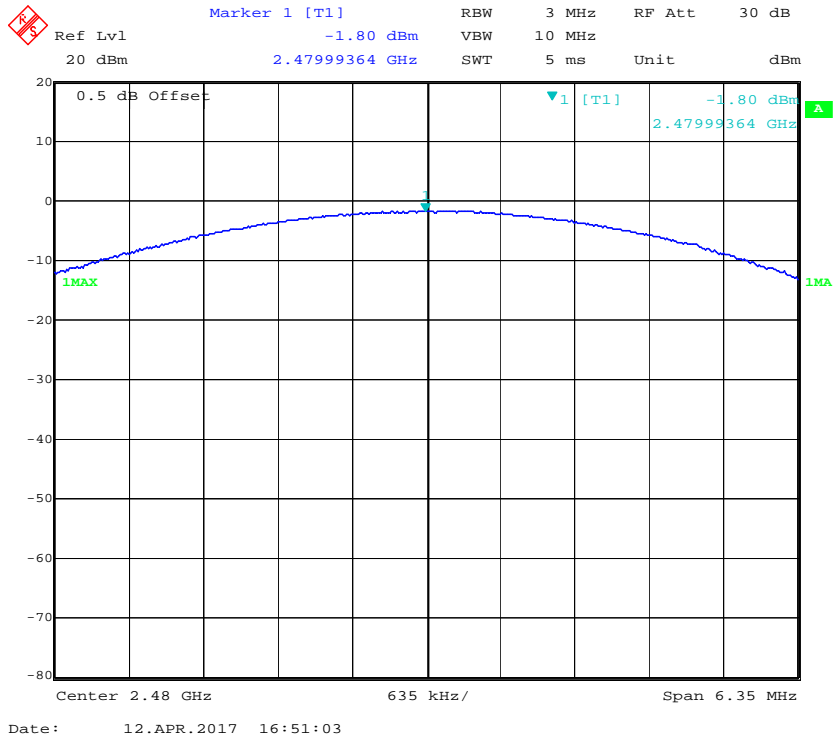


Middle Channel



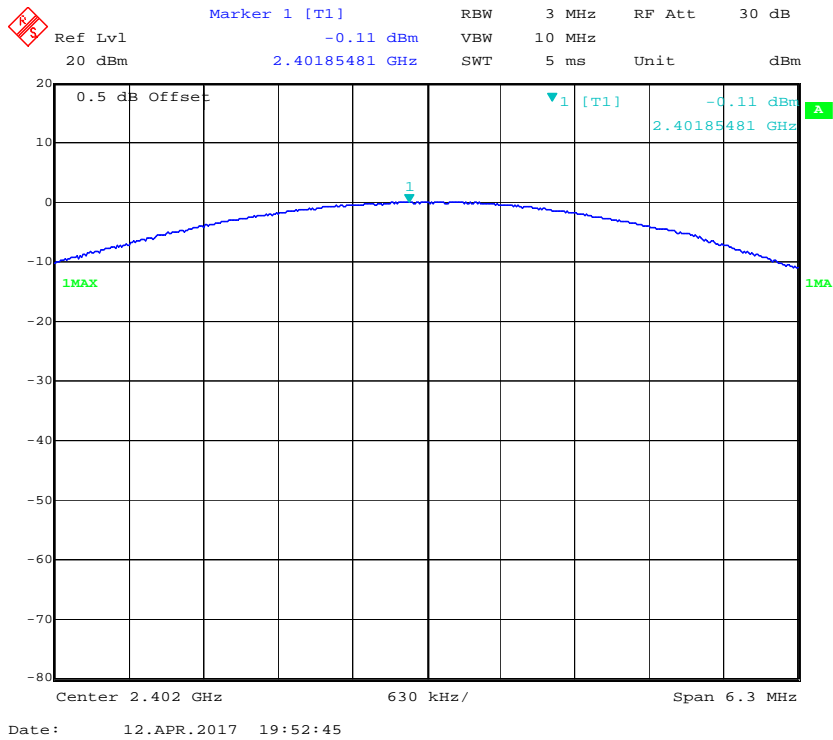


### High Channel

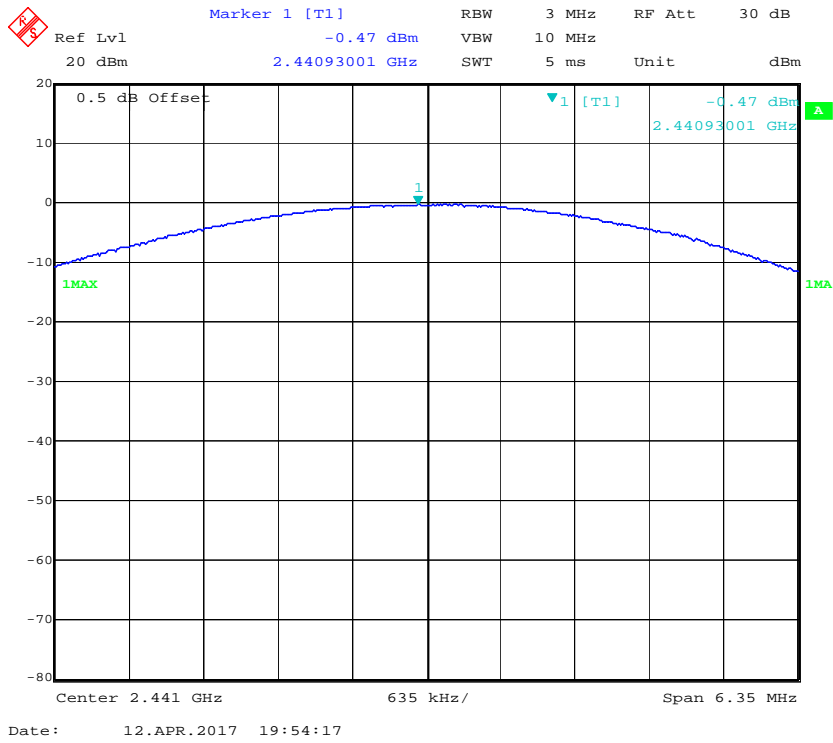


### EDR Mode (8-DPSK):

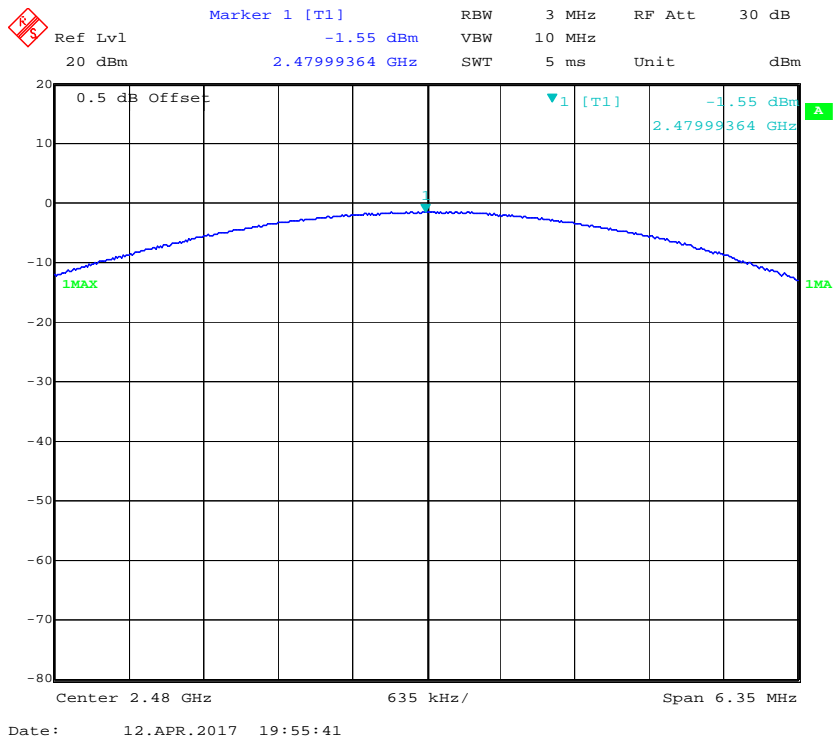
### Low Channel



### Middle Channel



### 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 RBW/VBW of spectrum analyzer to 100/300 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	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

**Test Data**

**Environmental Conditions**

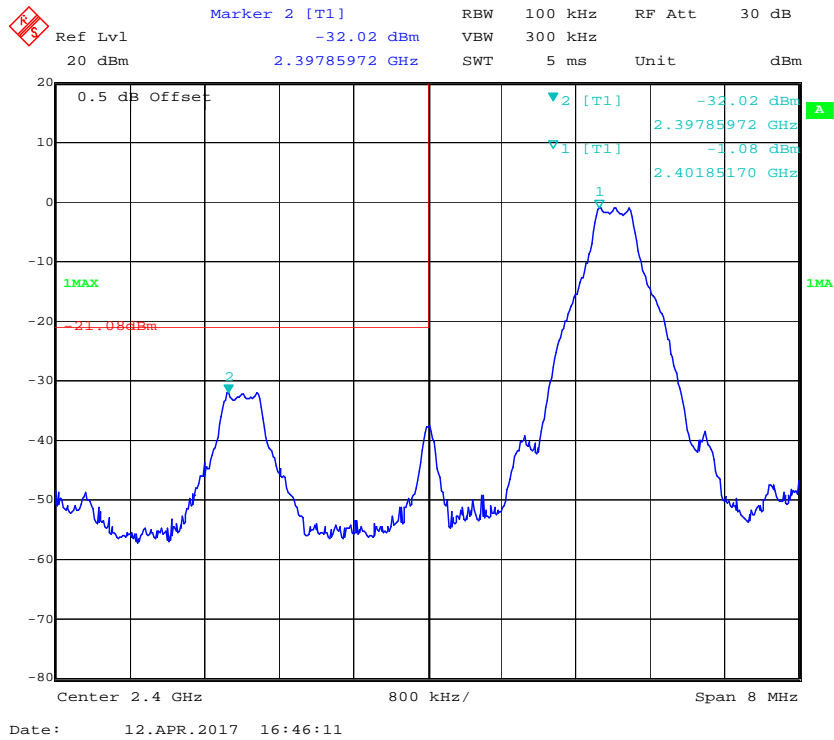
<b>Temperature:</b>	22.9°C
<b>Relative Humidity:</b>	45.4 %
<b>ATM Pressure:</b>	100.6 kPa

The testing was performed by Kevin Hu on 2017-04-12.

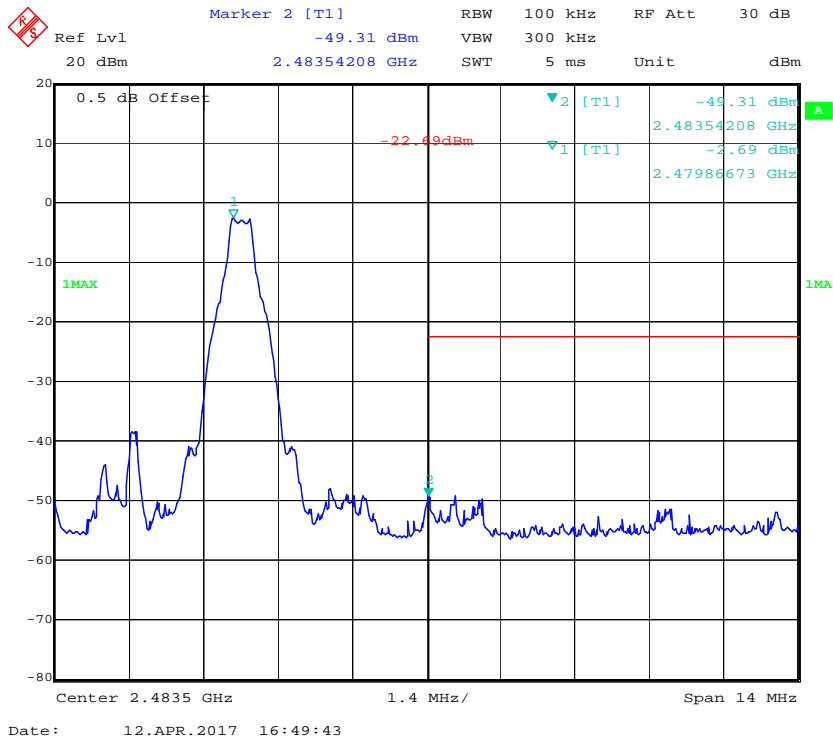
**Test Result:** Compliance

*BDR Mode (GFSK):*

**Band Edge, Left Side**

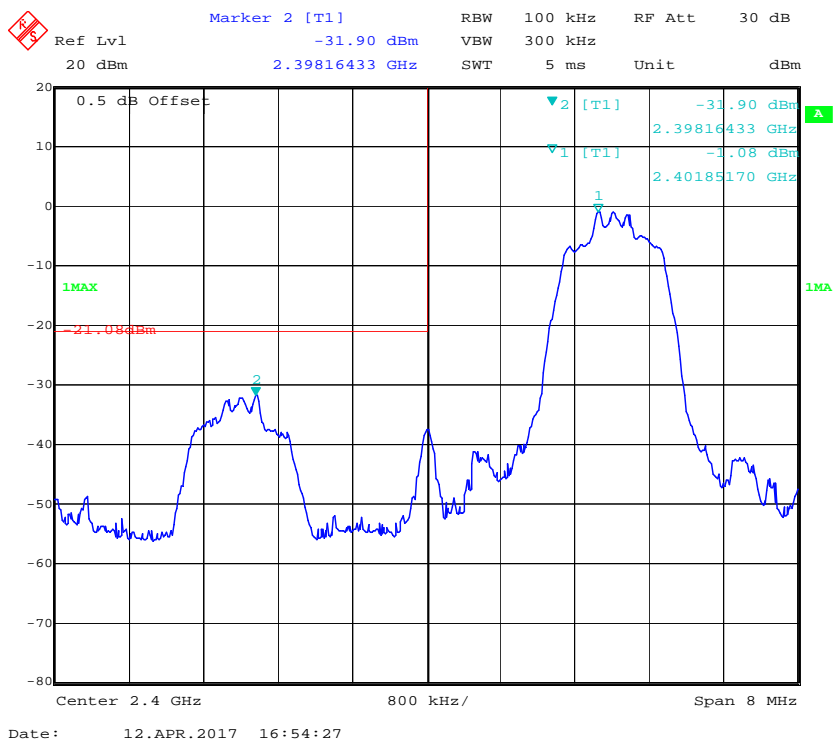


### Band Edge, Right Side

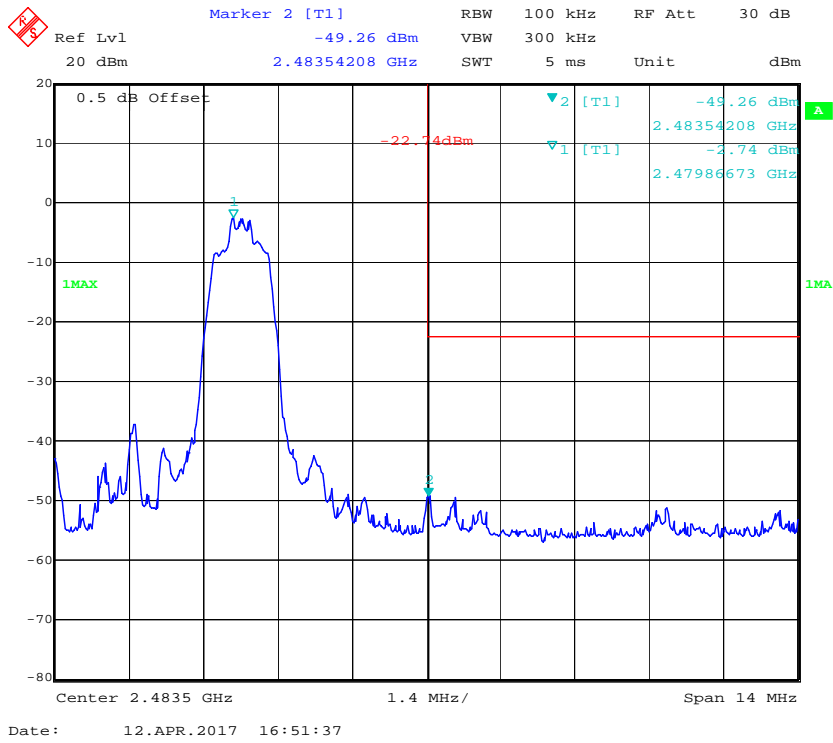


### EDR Mode ( $\pi/4$ -DQPSK):

### Band Edge, Left Side

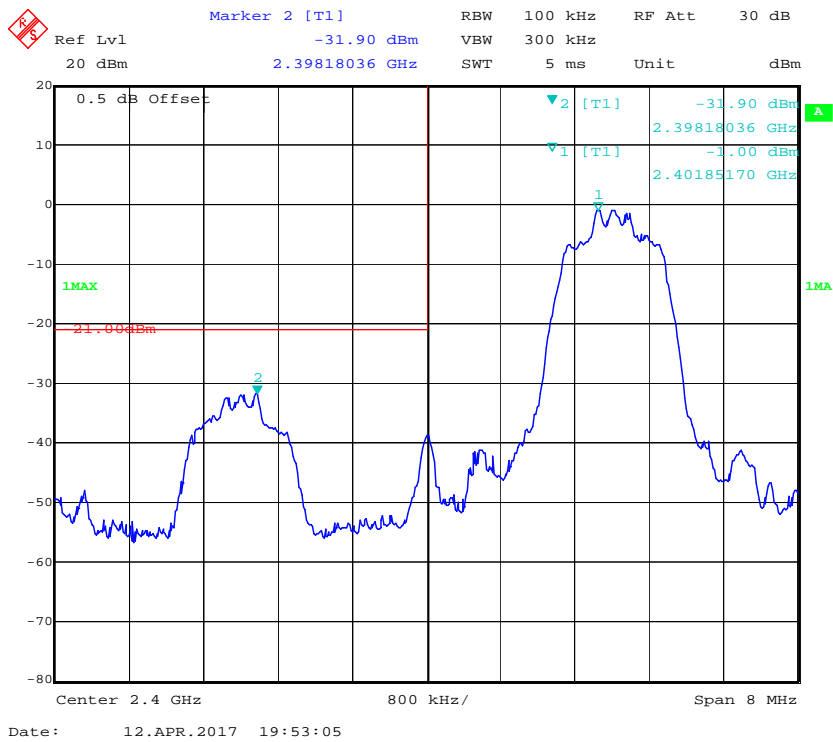


### Band Edge, Right Side

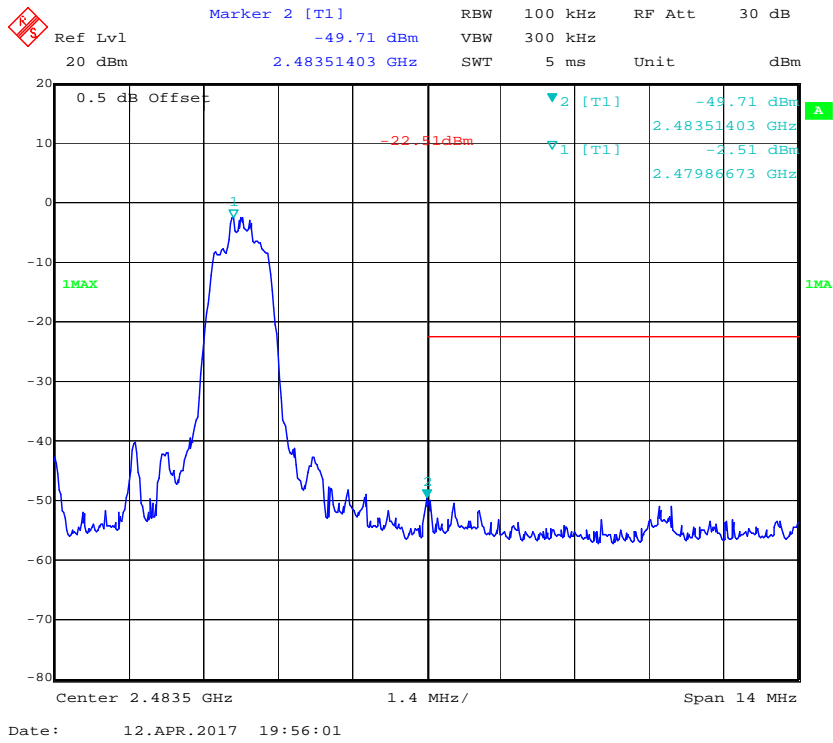


### EDR Mode (8-DPSK):

### Band Edge, Left Side



### Band Edge, Right Side



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