FCC PART 15.247

TEST REPORT

For

Shenzhen Genvict Technologies Co.,Ltd

12th Floor, Block A, Tsinghua Hi-tech Park, Nanshan District,Shenzhen, Guangdong,China

FCC ID: 2AL59WB-L20B

Report Type:	**Product Name:**
Original Report	DSRC

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Report Number:	RDG170516801B
Report Date:	2017-08-02
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Shenzhen Genvict Technologies Co.,Ltd*** 's product, model number: ***WB-L20B (FCC ID: 2AL59WB-L20B)*** or the "EUT" in this report was a ***DSRC,*** which was measured approximately: 17.5 cm (L) x 14.5 cm (W) x 3 cm (H), rated input voltage: DC 9-16V.

**All measurement and test data in this report was gathered from final production sample, serial number: 170516801 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-05-17, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of ***Shenzhen Genvict Technologies Co.,Ltd*** 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 Rules Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 95 submissions with FCC ID: 2AL59WB-L20B.
FCC Part 15C DTS submissions with FCC ID: 2AL59WB-L20B.

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”.

All of the measurements detailed in this Test Report were performed by Bay Area Compliance Laboratories Corp. (Chengdu).

The Bay Area Compliance Laboratories Corp. Chengdu’s measurement Uncertainties (calculated for a k=2 Coverage Factor corresponding to approximately 95% Coverage) were as follows:

-For all of the AC Line Conducted Emissions Tests reported herein: ±3.17 dB.

-For of all of the Direct Antenna Conducted Emissions Tests reported herein: ±0.56 dB.

-For of all of the direct Radiated Emissions Tests reported herein are:
30 MHz to 200 MHz: ±4.7 dB;
200 MHz to 1 GHz: ±6.0 dB;
1 GHz to 6 GHz: ±5.13dB; and,
6 GHz to 40 GHz: ±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 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 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

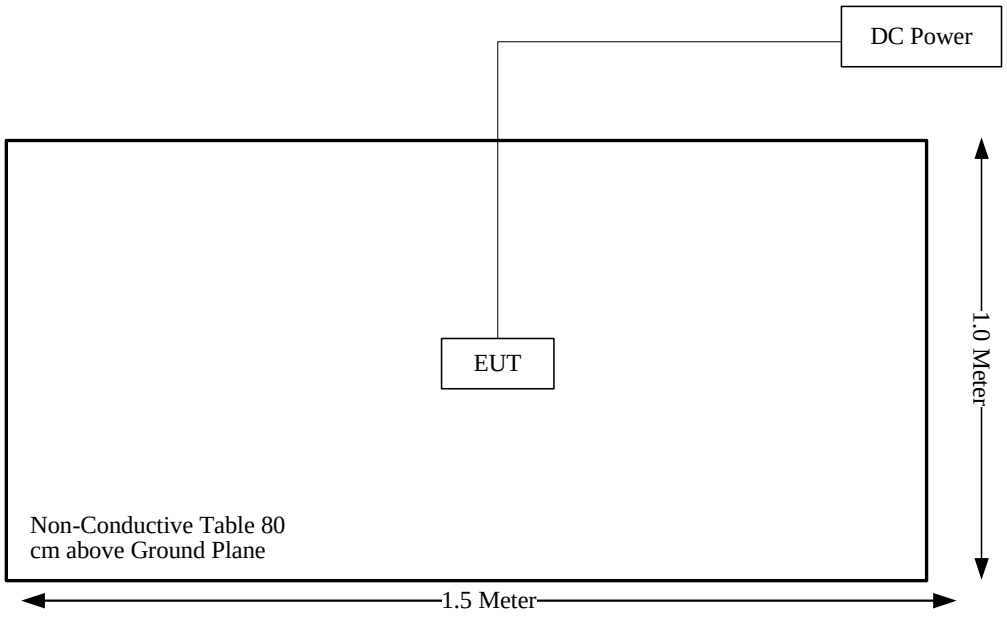
The engineering mode configured the maximum power as default setting.

Equipment Modifications

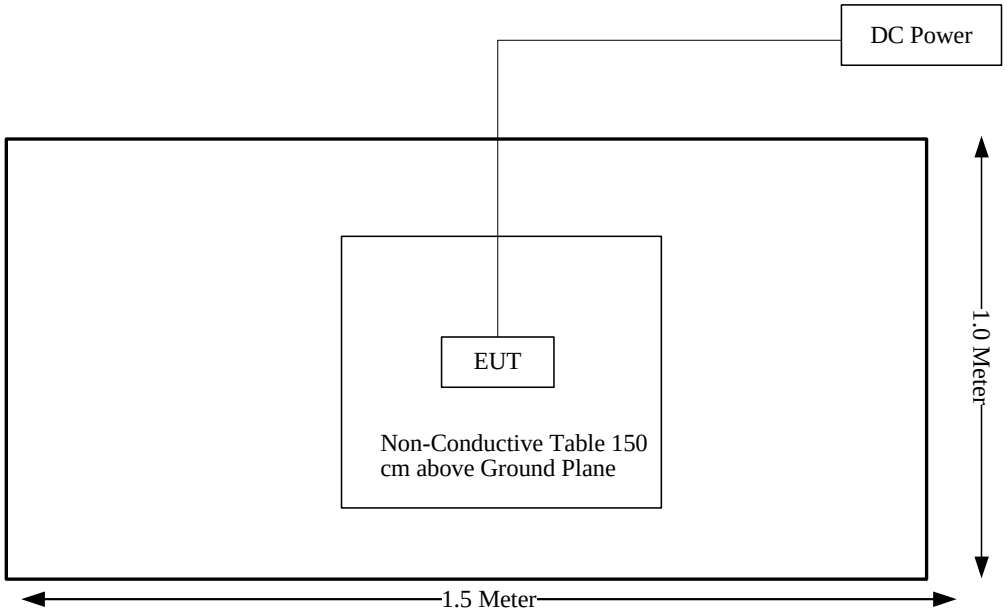
No modification was made to the EUT.

Block Diagram of Test Setup

Below 1GHz:



Above 1GHz:


DC Power
EUT
Non-Conductive Table 150 cm above Ground Plane
1.0 Meter
1.5 Meter

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Not Applicable
§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

Note:
Not Applicable: The EUT is powered by vehicle battery.

FCC §15.247 (i) & §1.1310 & §2.1091- 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
$S = PG/4\pi R^2$ = 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);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

Module	Frequency (MHz)	Antenna Gain		Tune-up Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G	2402-2480	3	2.00	15	31.62	20.00	0.0126	1.0
	2412-2462	3	2.00	15	31.62	20.00	0.0126	1.0
DSRC	5860-5920	5	3.14	0	1.0	20.00	0.0006	1.0

Note: The maximum tune-up power including tolerance was declared by manufacturer.

The WLAN or Bluetooth can transmit simultaneously with DSRC:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$=S_{2.4}/S_{limit\text{-}2.4} + S_{DSRC}/S_{limit\text{-}DSRC}$
$=0.0126/1+0.0006/1$
$=0.0132$
< 1.0

Result: 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 use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has one external antenna with a unique connector coupling to the EUT, and the antenna gain is 3.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

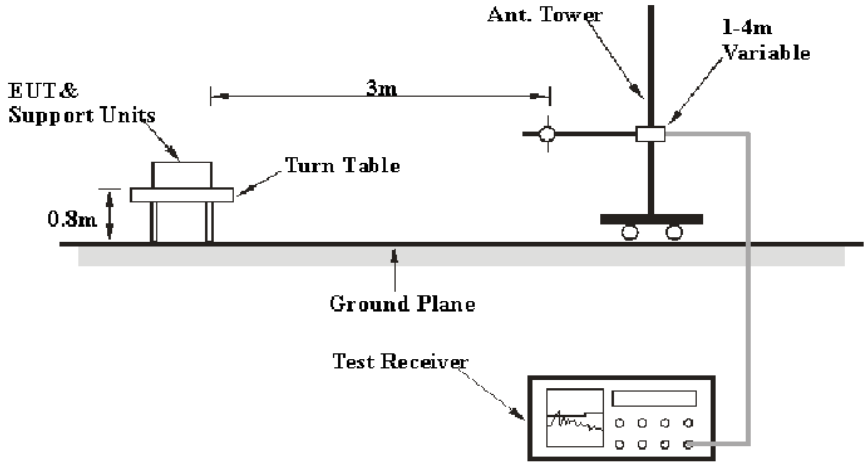
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

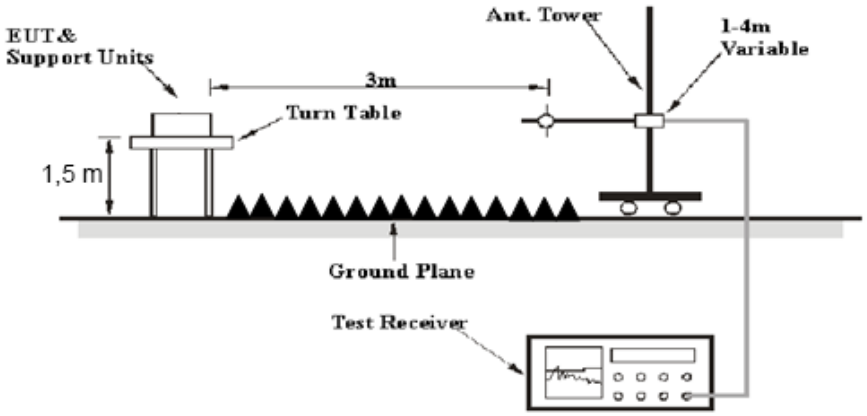
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber 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	2017-06-16	2020-06-15
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	966-1	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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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 Data

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lorin Bian on 2017-07-12.*

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	68.26	PK	H	23.53	3.00	0.00	94.79	N/A	N/A
2402	57.34	AV	H	23.53	3.00	0.00	83.87	N/A	N/A
2402	82.12	PK	V	23.53	3.00	0.00	108.65	N/A	N/A
2402	70.76	AV	V	23.53	3.00	0.00	97.29	N/A	N/A
2390	31.23	PK	V	23.57	3.00	0.00	57.8	74	16.2
2390	18.88	AV	V	23.57	3.00	0.00	45.45	54	8.55
4804	56.46	PK	V	30.77	5.12	26.87	65.48	74	8.52
4804	42.68	AV	V	30.77	5.12	26.87	51.7	54	2.3
7206	40.36	PK	V	34.71	6.16	26.35	54.88	74	19.12
7206	27.85	AV	V	34.71	6.16	26.35	42.37	54	11.63
2374	45.45	PK	V	23.63	3.01	26.87	45.22	74	28.78
2374	34.68	AV	V	23.63	3.01	26.87	34.45	54	19.55
500.45	38.94	QP	H	18.10	1.61	28.82	29.83	46.00	16.17
625.58	43.48	QP	H	19.91	1.90	28.85	36.44	46.00	9.56
Middle Channel: 2441 MHz									
2441	69.11	PK	H	23.40	3.00	0.00	95.51	N/A	N/A
2441	57.84	AV	H	23.40	3.00	0.00	84.24	N/A	N/A
2441	83.49	PK	V	23.40	3.00	0.00	109.89	N/A	N/A
2441	72.12	AV	V	23.40	3.00	0.00	98.52	N/A	N/A
4882	54.40	PK	V	31.02	5.09	26.87	63.64	74	10.36
4882	40.66	AV	V	31.02	5.09	26.87	49.9	54	4.1
2344	45.83	PK	V	23.73	3.01	26.87	45.7	74	28.3
2344	35.80	AV	V	23.73	3.01	26.87	35.67	54	18.33
2156	46.84	PK	V	24.37	3.03	26.84	47.4	74	26.6
2156	36.50	AV	V	24.37	3.03	26.84	37.06	54	16.94
500.45	39.21	QP	H	18.10	1.61	28.82	30.10	46.00	15.90
625.58	43.62	QP	H	19.91	1.90	28.85	36.58	46.00	9.42
High Channel: 2480 MHz									
2480	71.41	PK	H	23.27	2.99	0.00	97.67	N/A	N/A
2480	60.65	AV	H	23.27	2.99	0.00	86.91	N/A	N/A
2480	83.58	PK	V	23.27	2.99	0.00	109.84	N/A	N/A
2480	72.93	AV	V	23.27	2.99	0.00	99.19	N/A	N/A
2483.5	34.70	PK	V	23.26	2.99	0.00	60.95	74	13.05
2483.5	23.08	AV	V	23.26	2.99	0.00	49.33	54	4.67
4960	52.19	PK	V	31.27	5.05	26.88	61.63	74	12.37
4960	39.90	AV	V	31.27	5.05	26.88	49.34	54	4.66
7440	36.95	PK	V	35.18	6.27	26.45	51.95	74	22.05
7440	26.13	AV	V	35.18	6.27	26.45	41.13	54	12.87
4135	51.43	PK	V	29.22	5.01	26.63	59.03	74	14.97
4135	40.64	AV	V	29.22	5.01	26.63	48.24	54	5.76
500.45	40.05	QP	H	18.10	1.61	28.82	30.94	46.00	15.06
625.58	44.04	QP	H	19.91	1.90	28.85	37.00	46.00	9.00

2EDR Mode (π/4-DQPSK):

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	68.25	PK	H	23.53	3.00	0.00	94.78	N/A	N/A
2402	57.25	AV	H	23.53	3.00	0.00	83.78	N/A	N/A
2402	82.12	PK	V	23.53	3.00	0.00	108.65	N/A	N/A
2402	70.54	AV	V	23.53	3.00	0.00	97.07	N/A	N/A
2390	31.83	PK	V	23.57	3.00	0.00	58.4	74	15.6
2390	18.94	AV	V	23.57	3.00	0.00	45.51	54	8.49
4804	56.29	PK	V	30.77	5.12	26.87	65.31	74	8.69
4804	41.57	AV	V	30.77	5.12	26.87	50.59	54	3.41
7206	40.95	PK	V	34.71	6.16	26.35	55.47	74	18.53
7206	28.34	AV	V	34.71	6.16	26.35	42.86	54	11.14
3258	45.24	PK	V	25.64	3.82	26.50	48.2	74	25.8
3258	35.43	AV	V	25.64	3.82	26.50	38.39	54	15.61
500.45	39.58	QP	H	18.10	1.61	28.82	30.47	46.00	15.53
625.58	44.48	QP	H	19.91	1.90	28.85	37.44	46.00	8.56
Middle Channel: 2441 MHz									
2441	69.17	PK	H	23.40	3.00	0.00	95.57	N/A	N/A
2441	57.37	AV	H	23.40	3.00	0.00	83.77	N/A	N/A
2441	83.12	PK	V	23.40	3.00	0.00	109.52	N/A	N/A
2441	72.60	AV	V	23.40	3.00	0.00	99	N/A	N/A
4882	54.58	PK	V	31.02	5.09	26.87	63.82	74	10.18
4882	36.11	AV	V	31.02	5.09	26.87	45.35	54	8.65
2342	46.28	PK	V	23.74	3.01	26.87	46.16	74	27.84
2342	36.09	AV	V	23.74	3.01	26.87	35.97	54	18.03
3248	48.15	PK	V	25.59	3.80	26.50	51.04	74	22.96
3248	37.64	AV	V	25.59	3.80	26.50	40.53	54	13.47
500.45	39.11	QP	H	18.10	1.61	28.82	30.00	46.00	16.00
625.58	44.92	QP	H	19.91	1.90	28.85	37.88	46.00	8.12
High Channel: 2480 MHz									
2480	70.04	PK	H	23.27	2.99	0.00	96.3	N/A	N/A
2480	59.04	AV	H	23.27	2.99	0.00	85.3	N/A	N/A
2480	81.63	PK	V	23.27	2.99	0.00	107.89	N/A	N/A
2480	71.56	AV	V	23.27	2.99	0.00	97.82	N/A	N/A
2483.5	34.69	PK	V	23.26	2.99	0.00	60.94	74	13.06
2483.5	23.06	AV	V	23.26	2.99	0.00	49.31	54	4.69
4960	51.09	PK	V	31.27	5.05	26.88	60.53	74	13.47
4960	38.86	AV	V	31.27	5.05	26.88	48.3	54	5.7
7440	37.13	PK	V	35.18	6.27	26.45	52.13	74	21.87
7440	26.53	AV	V	35.18	6.27	26.45	41.53	54	12.47
2288	52.09	PK	V	23.92	3.02	26.86	52.17	74	21.83
2288	41.25	AV	V	23.92	3.02	26.86	41.33	54	12.67
500.45	39.77	QP	H	18.10	1.61	28.82	30.66	46.00	15.34
625.58	42.05	QP	H	19.91	1.90	28.85	35.01	46.00	10.99

3EDR 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	68.85	PK	H	23.53	3.00	0.00	95.38	N/A	N/A
2402	57.65	AV	H	23.53	3.00	0.00	84.18	N/A	N/A
2402	82.36	PK	V	23.53	3.00	0.00	108.89	N/A	N/A
2402	70.81	AV	V	23.53	3.00	0.00	97.34	N/A	N/A
2390	31.58	PK	V	23.57	3.00	0.00	58.15	74	15.85
2390	19.07	AV	V	23.57	3.00	0.00	45.64	54	8.36
4804	55.66	PK	V	30.77	5.12	26.87	64.68	74	9.32
4804	42.10	AV	V	30.77	5.12	26.87	51.12	54	2.88
7206	40.34	PK	V	34.71	6.16	26.35	54.86	74	19.14
7206	28.29	AV	V	34.71	6.16	26.35	42.81	54	11.19
2675	46.46	PK	V	23.55	3.14	26.72	46.43	74	27.57
2675	35.33	AV	V	23.55	3.14	26.72	35.3	54	18.7
500.45	40.04	QP	H	18.10	1.61	28.82	30.93	46.00	15.07
625.58	42.19	QP	H	19.91	1.90	28.85	35.15	46.00	10.85
Middle Channel: 2441 MHz									
2441	69.80	PK	H	23.40	3.00	0.00	96.2	N/A	N/A
2441	57.87	AV	H	23.40	3.00	0.00	84.27	N/A	N/A
2441	83.85	PK	V	23.40	3.00	0.00	110.25	N/A	N/A
2441	72.08	AV	V	23.40	3.00	0.00	98.48	N/A	N/A
4882	54.10	PK	V	31.02	5.09	26.87	63.34	74	10.66
4882	35.96	AV	V	31.02	5.09	26.87	45.2	54	8.8
2377	45.76	PK	V	23.62	3.00	26.87	45.51	74	28.49
2377	36.17	AV	V	23.62	3.00	26.87	35.92	54	18.08
2364	48.35	PK	V	23.66	3.01	26.87	48.15	74	25.85
2364	37.26	AV	V	23.66	3.01	26.87	37.06	54	16.94
500.45	40.88	QP	H	18.10	1.61	28.82	31.77	46.00	14.23
625.58	42.61	QP	H	19.91	1.90	28.85	35.57	46.00	10.43
High Channel: 2480 MHz									
2480	70.32	PK	H	23.27	2.99	0.00	96.58	N/A	N/A
2480	61.33	AV	H	23.27	2.99	0.00	87.59	N/A	N/A
2480	82.72	PK	V	23.27	2.99	0.00	108.98	N/A	N/A
2480	72.52	AV	V	23.27	2.99	0.00	98.78	N/A	N/A
2483.5	34.92	PK	V	23.26	2.99	0.00	61.17	74	12.83
2483.5	22.62	AV	V	23.26	2.99	0.00	48.87	54	5.13
4960	52.73	PK	V	31.27	5.05	26.88	62.17	74	11.83
4960	39.44	AV	V	31.27	5.05	26.88	48.88	54	5.12
7440	39.55	PK	V	35.18	6.27	26.45	54.55	74	19.45
7440	28.53	AV	V	35.18	6.27	26.45	43.53	54	10.47
2643	54.39	PK	V	23.49	3.12	26.75	54.25	74	19.75
2643	43.88	AV	V	23.49	3.12	26.75	43.74	54	10.26
500.45	40.41	QP	H	18.10	1.61	28.82	31.30	46.00	14.70
625.58	43.05	QP	H	19.91	1.90	28.85	36.01	46.00	9.99

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 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 Attenuator	3dB	3dB-1	Each Time	/
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

Temperature:	28.2 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lorin Bian on 2017-06-23.*

Test Result: Compliance.

Please refer to following tables and plots

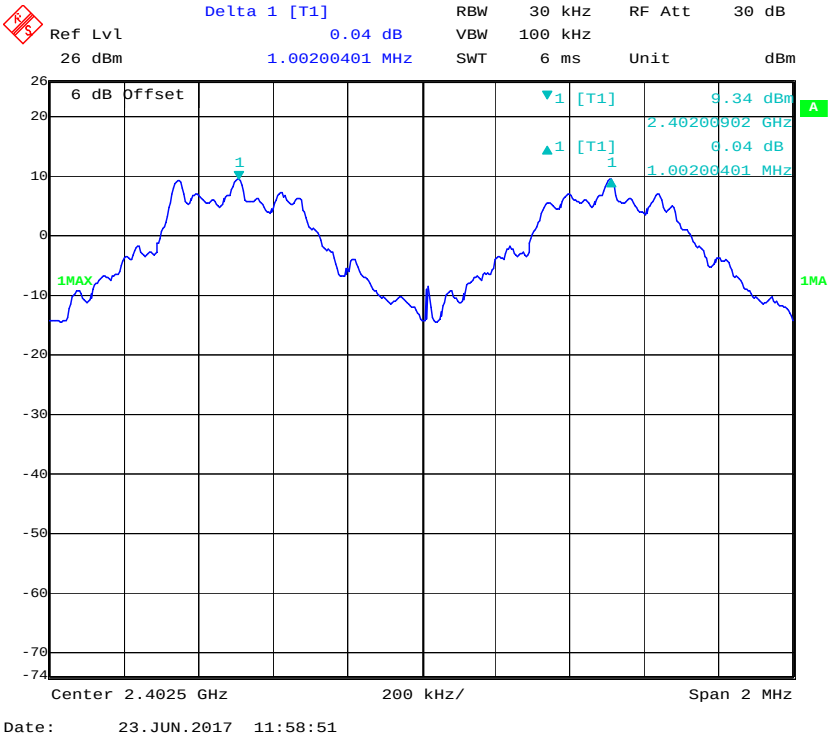
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
BDR (GFSK)	Low	2402	1.002	0.59
	Middle	2441	1.002	0.59
	High	2480	1.002	0.59
EDR (π/4-DQPSK)	Low	2402	1.002	0.83
	Middle	2441	1.002	0.84
	High	2480	1.002	0.83
EDR (8DPSK)	Low	2402	1.002	0.82
	Middle	2441	1.002	0.82
	High	2480	1.002	0.82

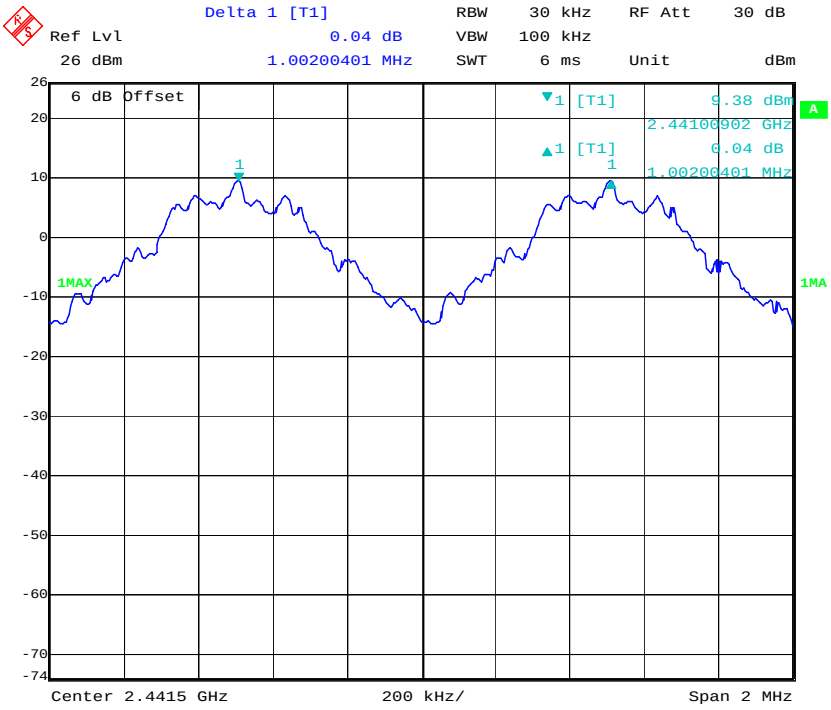
Note: Limit= (2/3) × 20dB bandwidth

BDR Mode (GFSK):

Low Channel

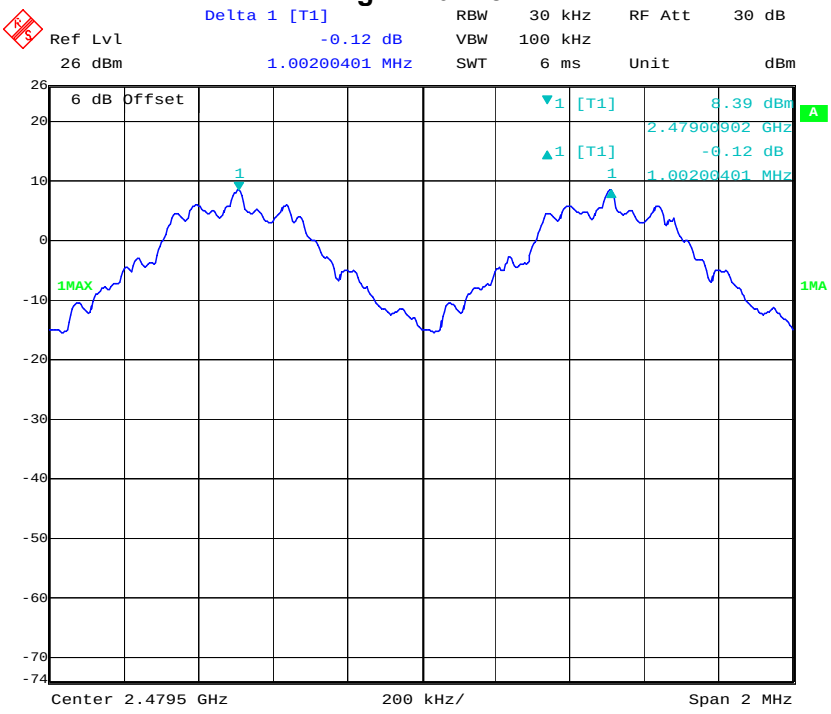


Middle Channel



Date: 23.JUN.2017 12:00:25

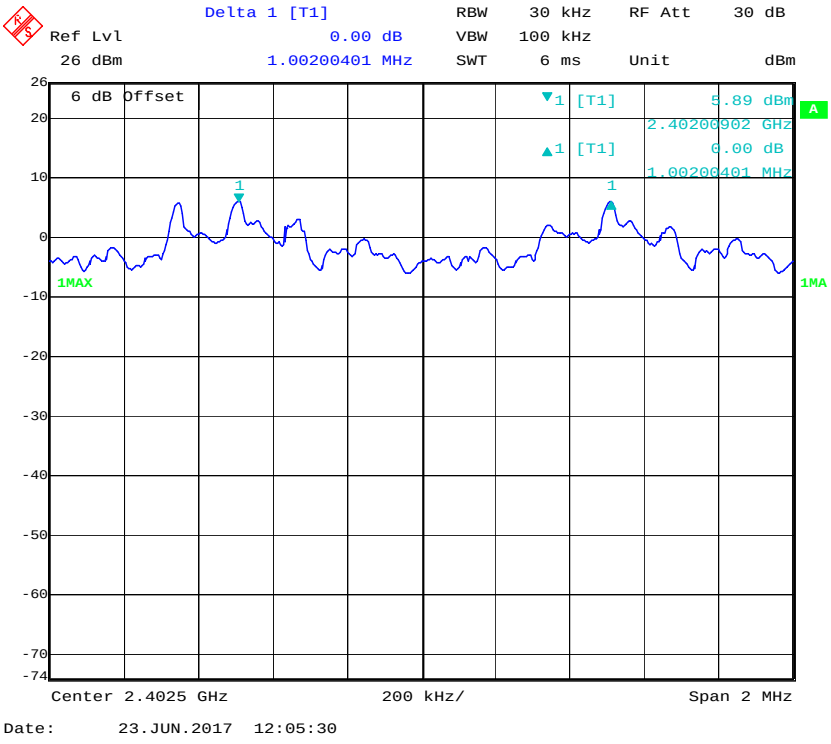
High Channel



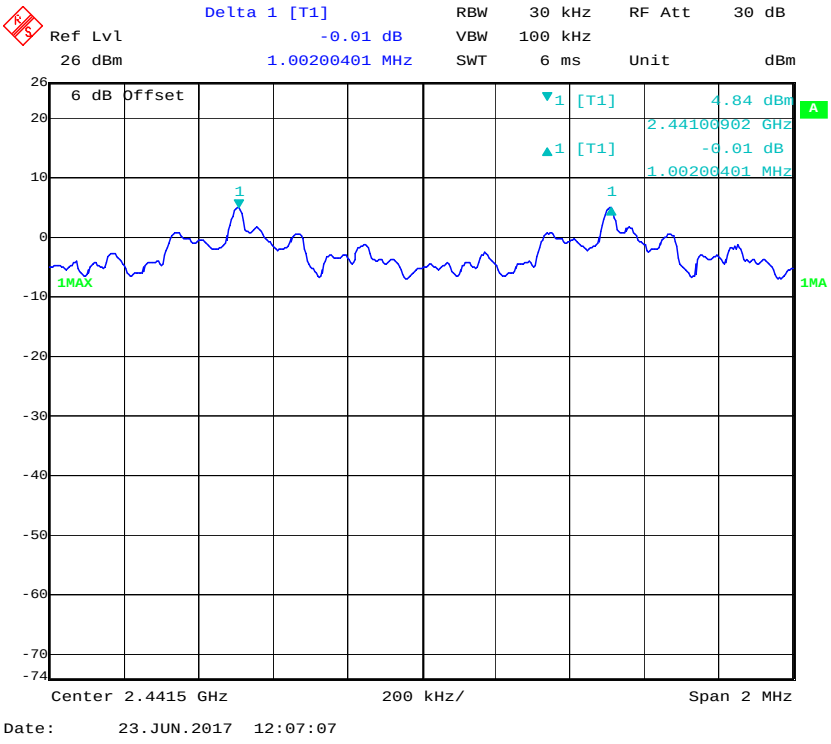
Date: 23.JUN.2017 12:02:07

EDR Mode (π/4-DQPSK):

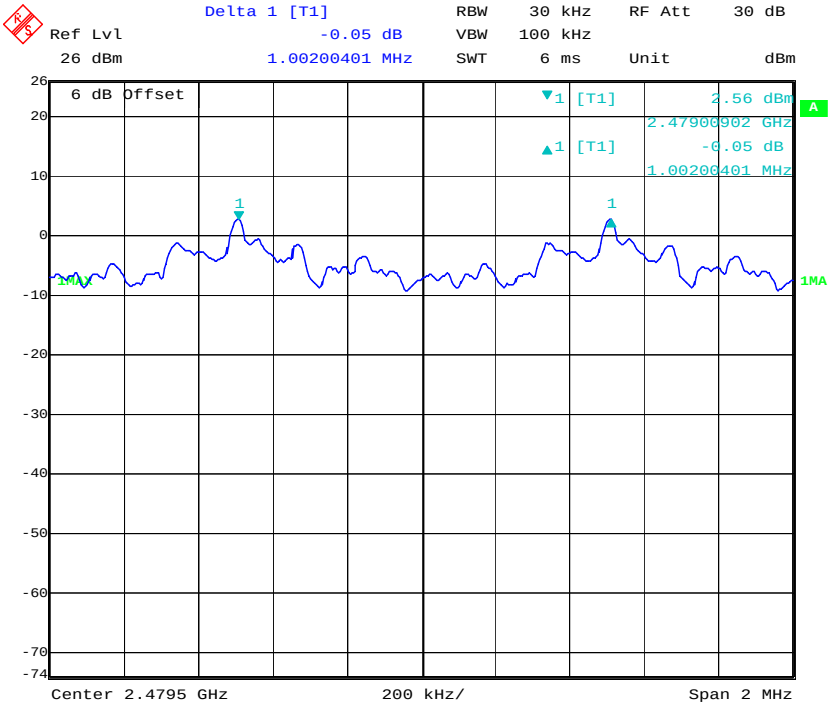
Low Channel



Middle Channel

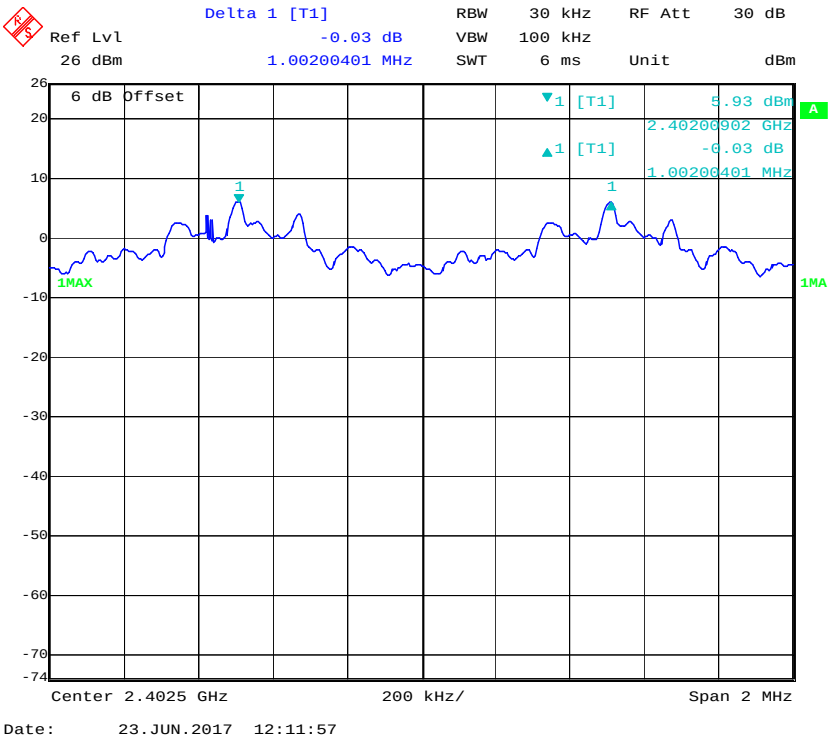


High Channel

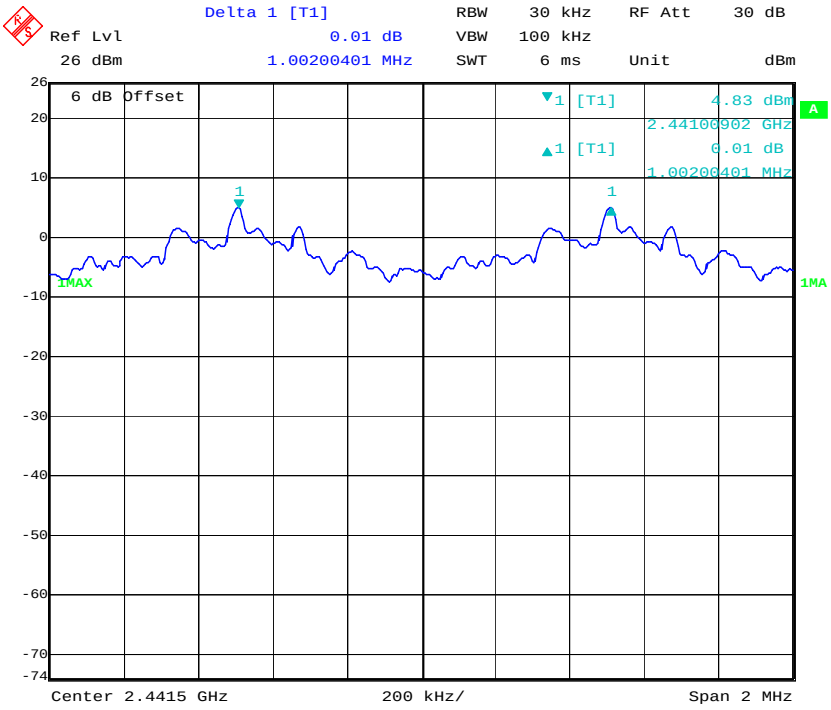


EDR Mode (8-DPSK):

Low Channel

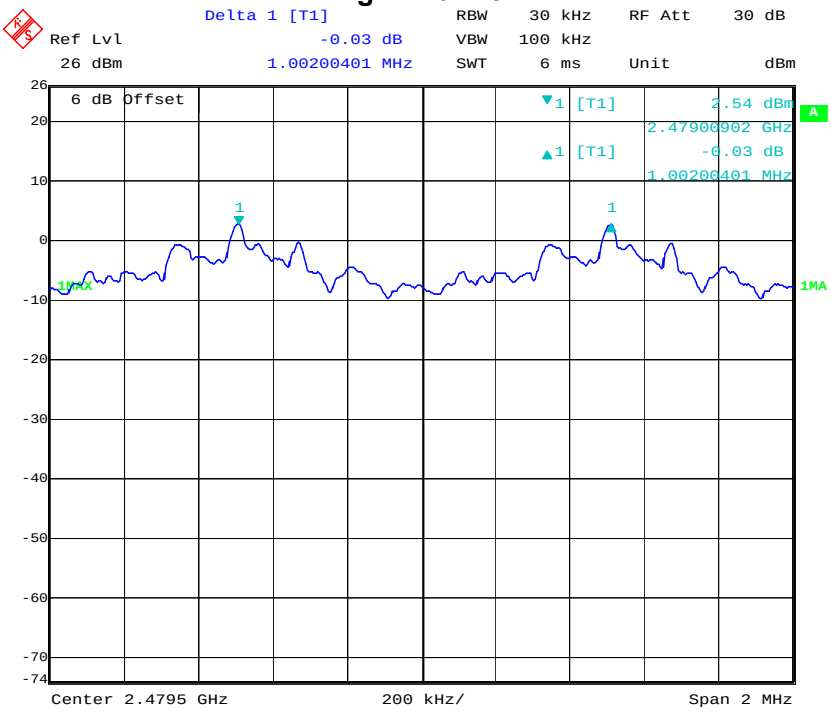


Middle Channel



Date: 23.JUN.2017 12:15:53

High Channel



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

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	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Attenuator	3dB	3dB-1	Each Time	/
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

Temperature:	28.2 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lorin Bian on 2017-06-23.*

Test Result: Compliance.

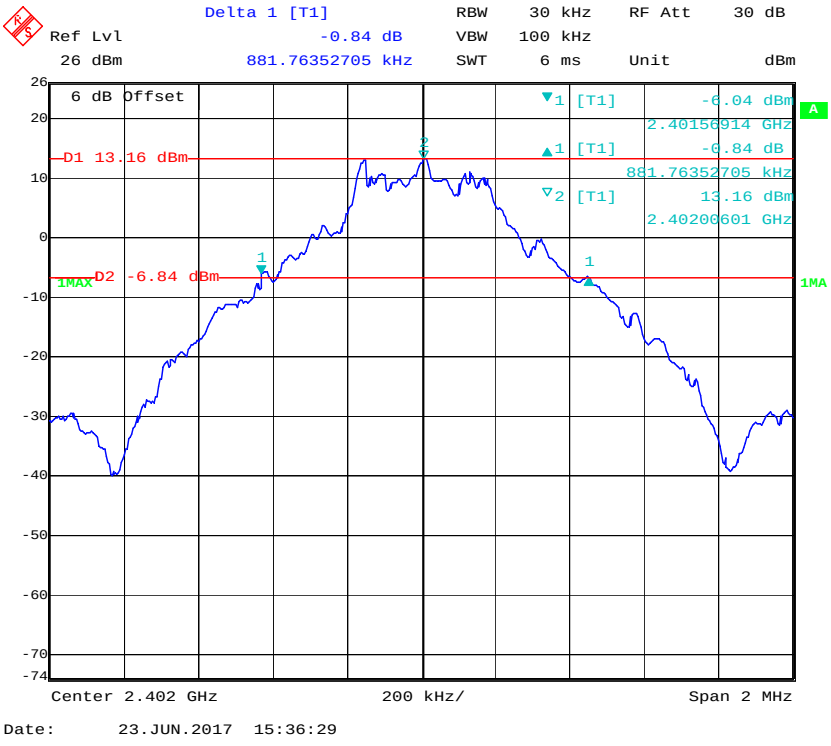
Please refer to following tables and plots

Test Mode: Transmitting

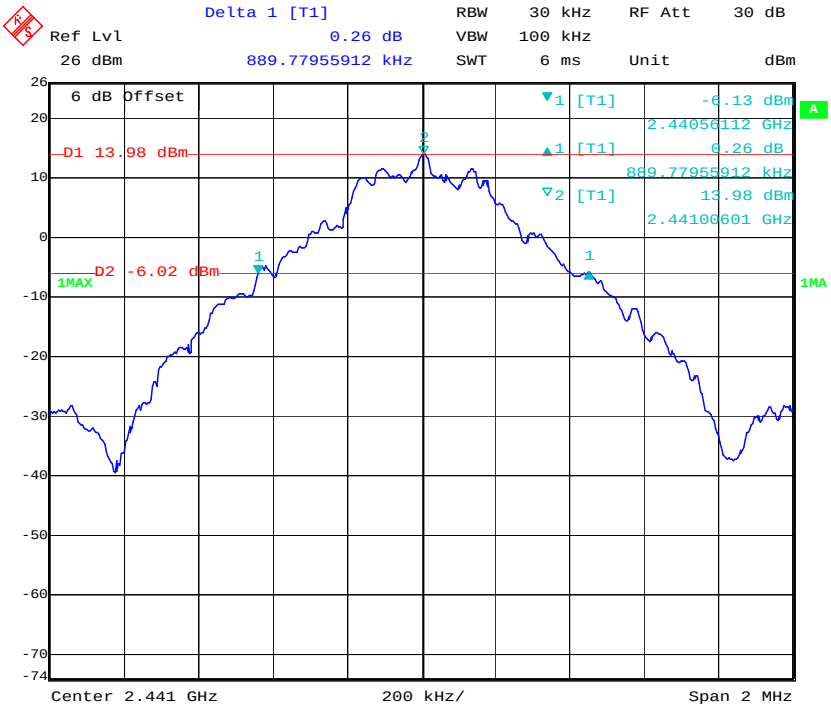
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.88
	Middle	2441	0.89
	High	2480	0.89
EDR Mode (π/4-DQPSK)	Low	2402	1.25
	Middle	2441	1.26
	High	2480	1.25
EDR Mode (8-DPSK)	Low	2402	1.23
	Middle	2441	1.23
	High	2480	1.23

BDR Mode (GFSK):

Low Channel

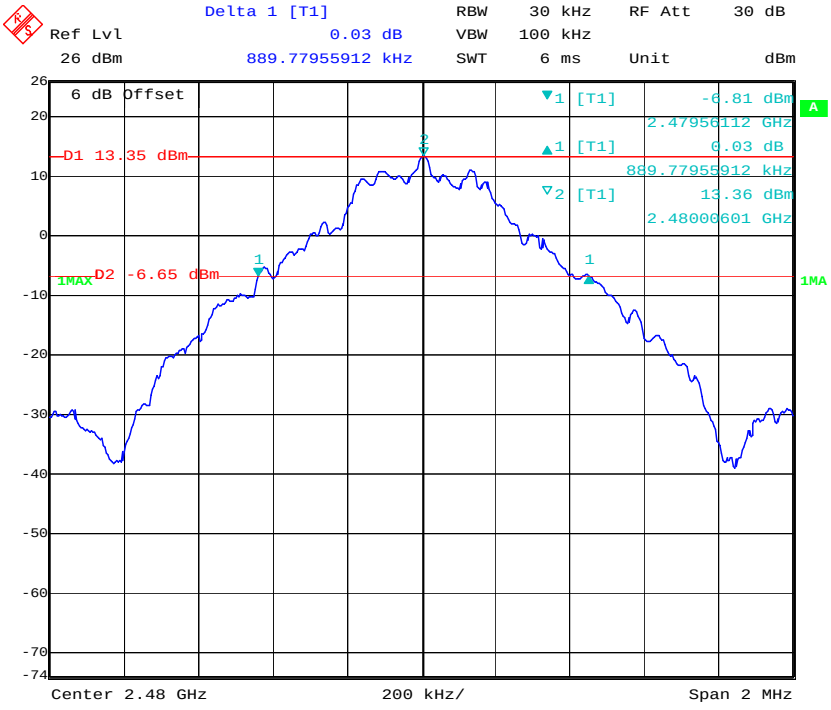


Middle Channel



Date: 23.JUN.2017 15:38:53

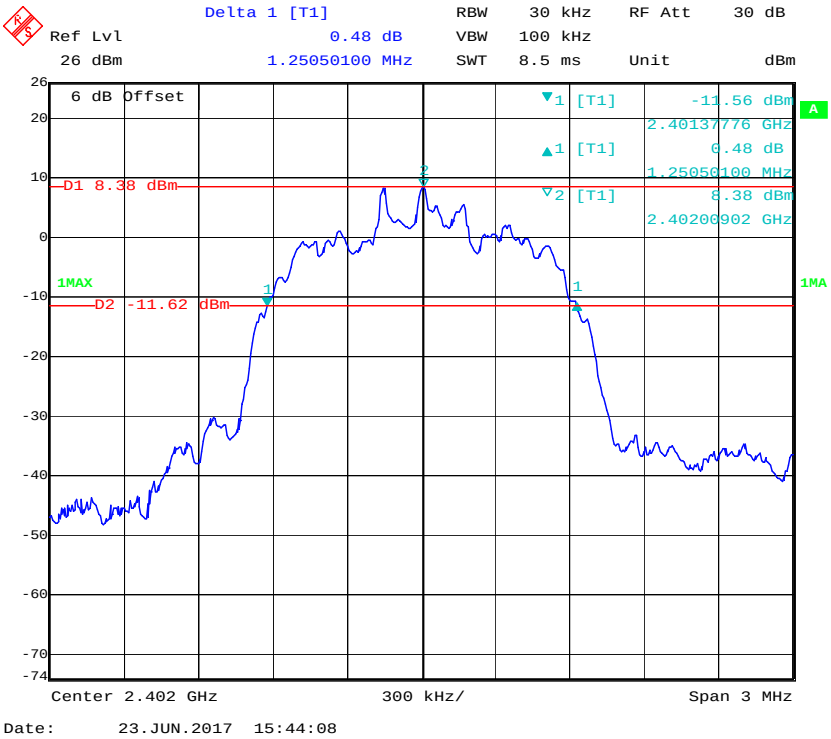
High Channel



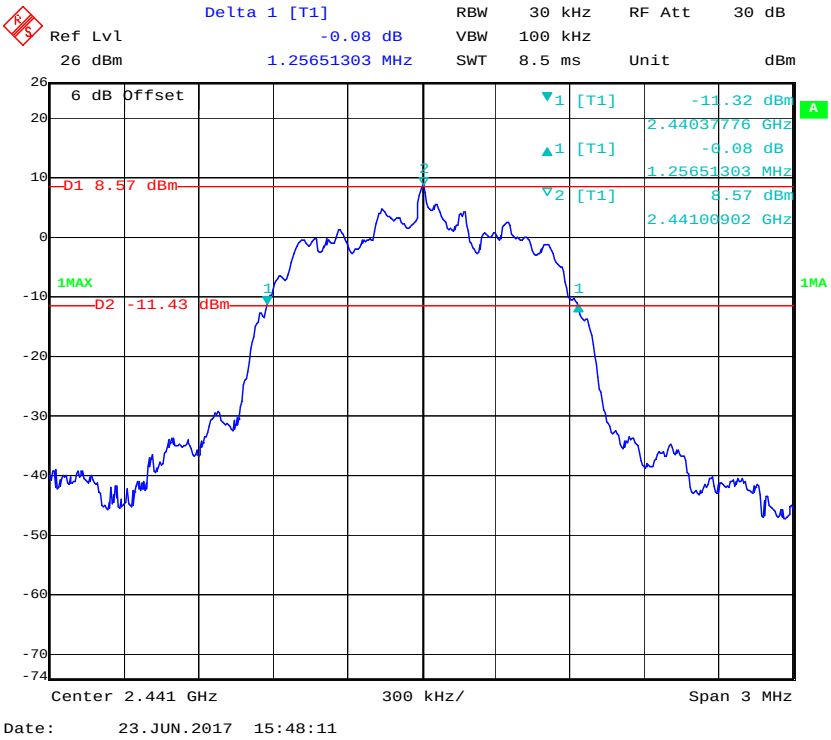
Date: 23.JUN.2017 15:40:45

EDR Mode (π/4-DQPSK):

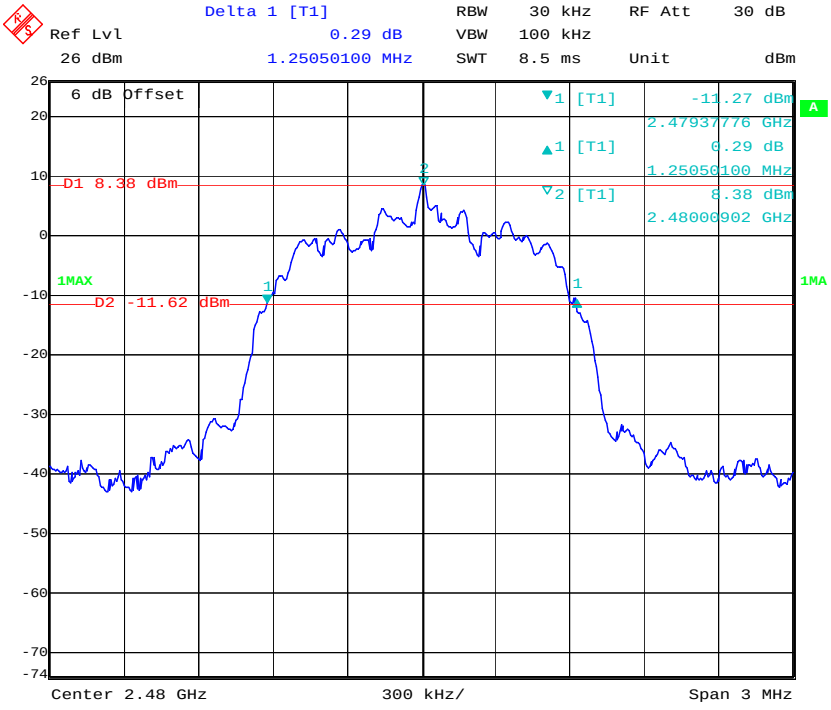
Low Channel



Middle Channel

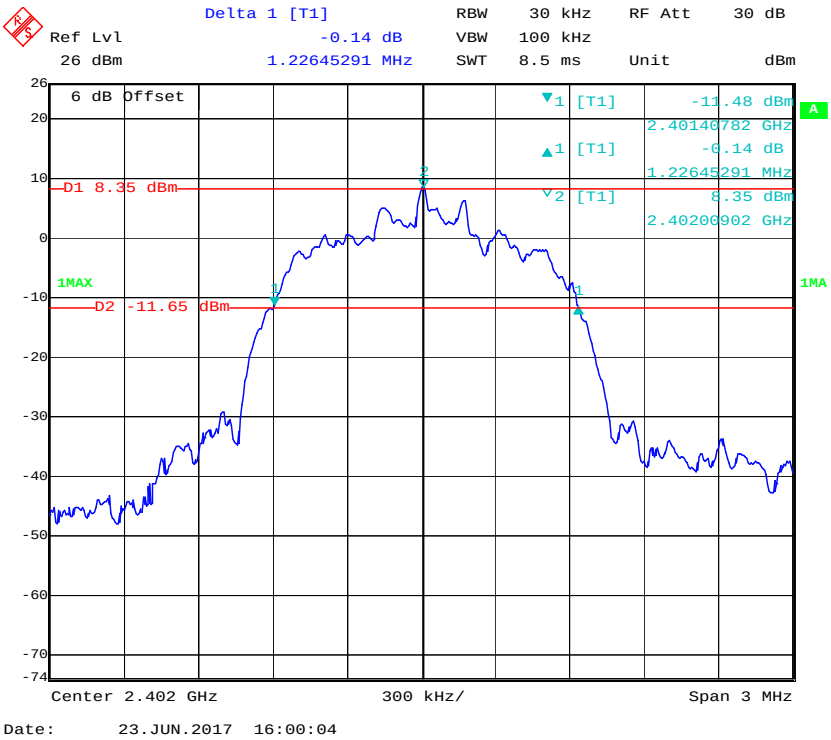


High Channel

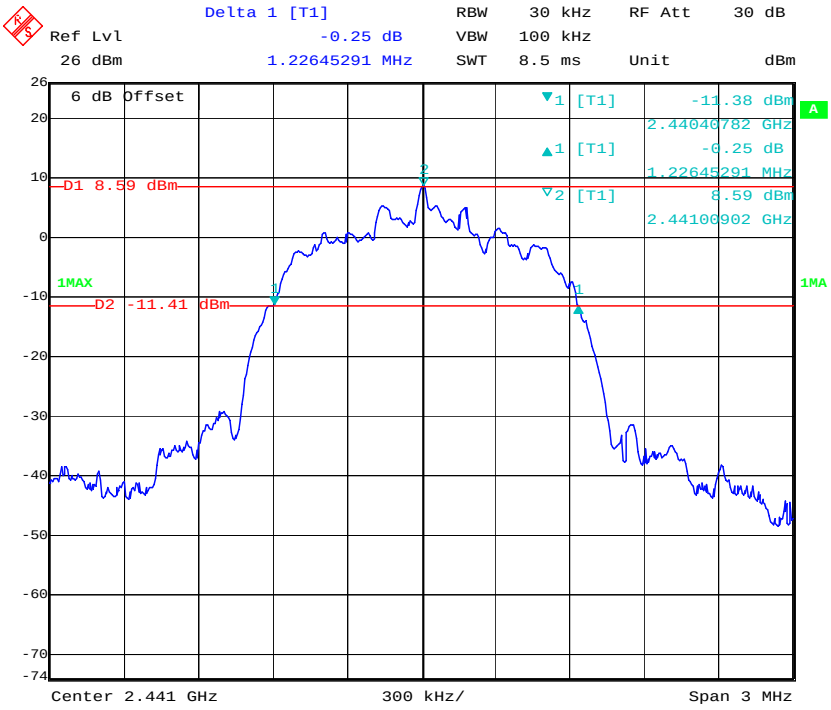


EDR Mode (8-DPSK):

Low Channel

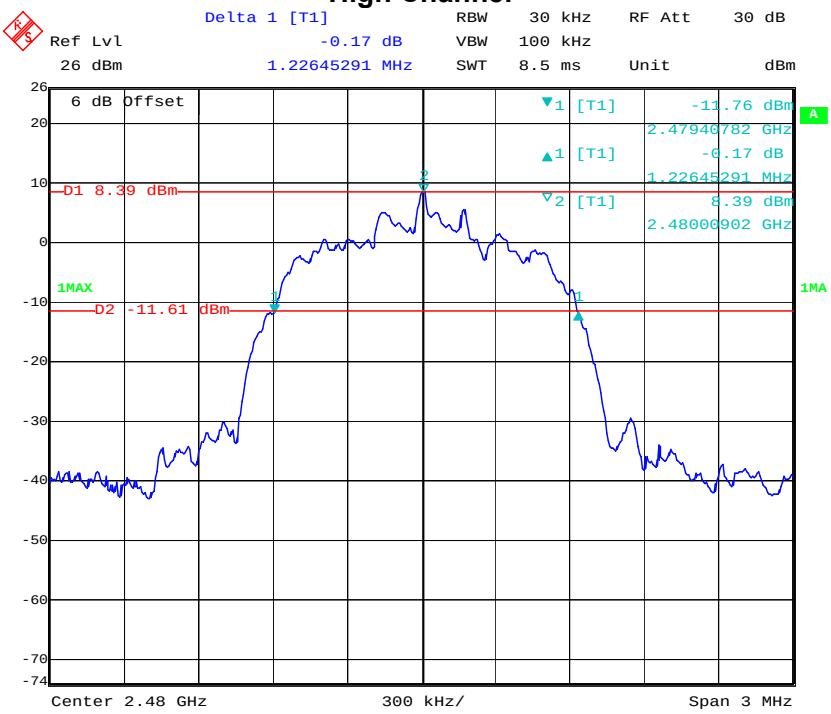


Middle Channel



Date: 23.JUN.2017 15:58:30

High Channel



Date: 23.JUN.2017 15:56:26

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	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Attenuator	3dB	3dB-1	Each Time	/
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

Temperature:	28.2 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lorin Bian on 2017-06-23.*

Test Result: Compliance.

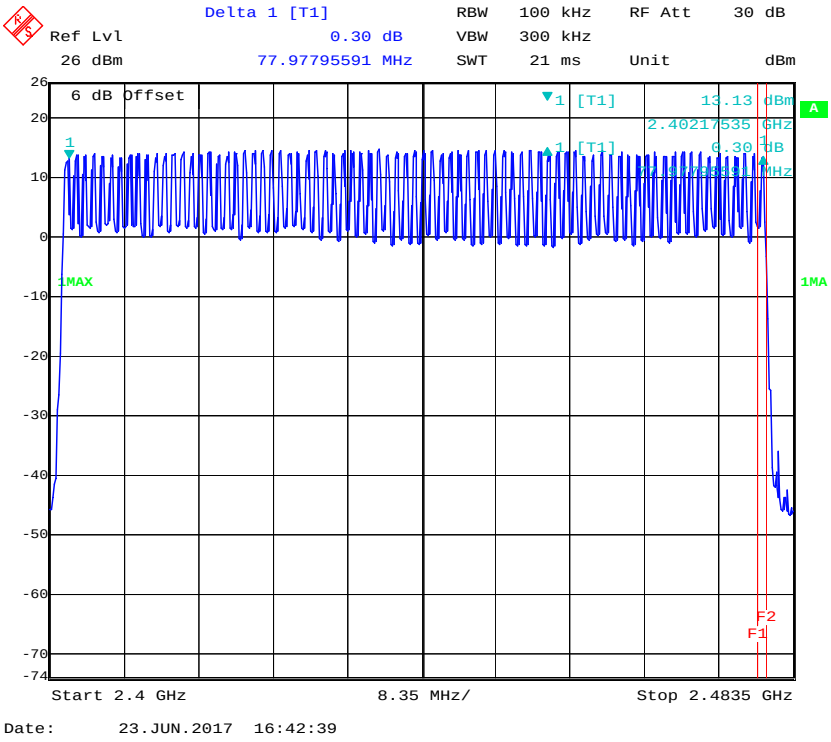
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

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

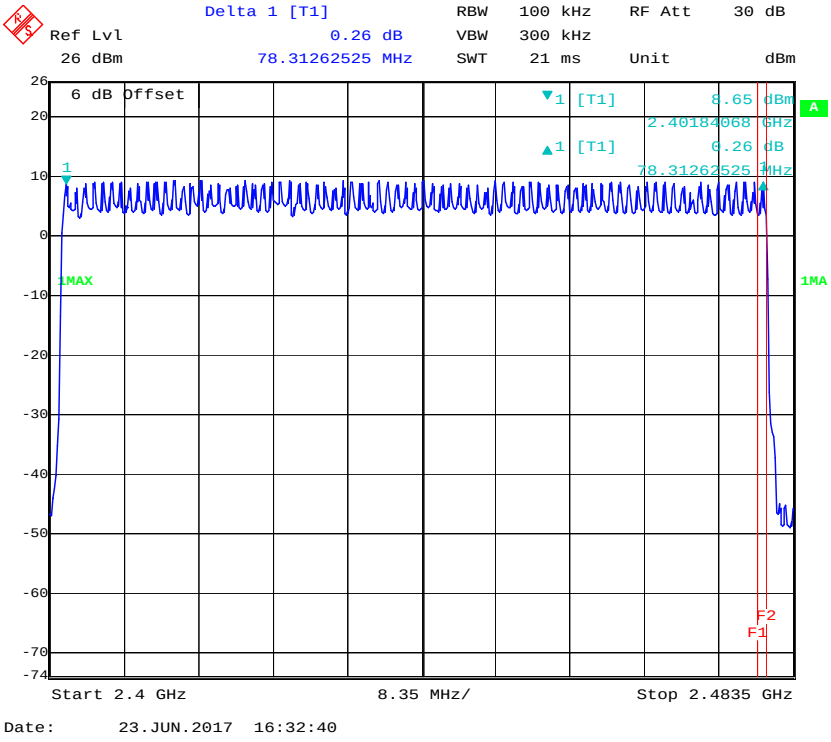
Number of Hopping Channels



EDR Mode (π/4-DQPSK):

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

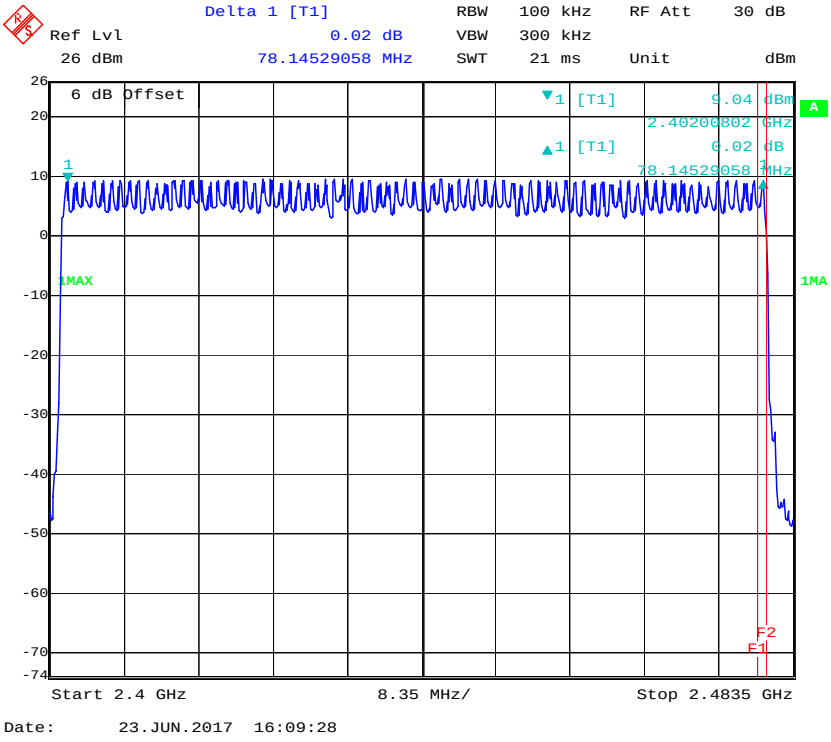
Number of Hopping Channels



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; the time of single pulses was tested.

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 Attenuator	3dB	3dB-1	Each Time	/
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

Temperature:	28.2 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lorin Bian on 2017-06-23.*

Test Result: Compliance.

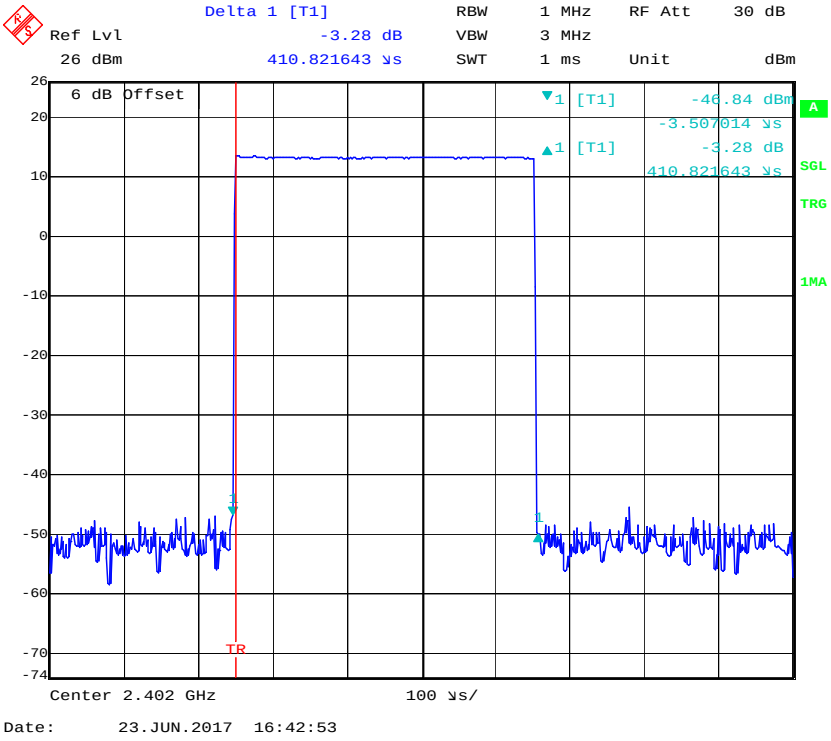
Please refer to following tables and plots

Test Mode: Transmitting

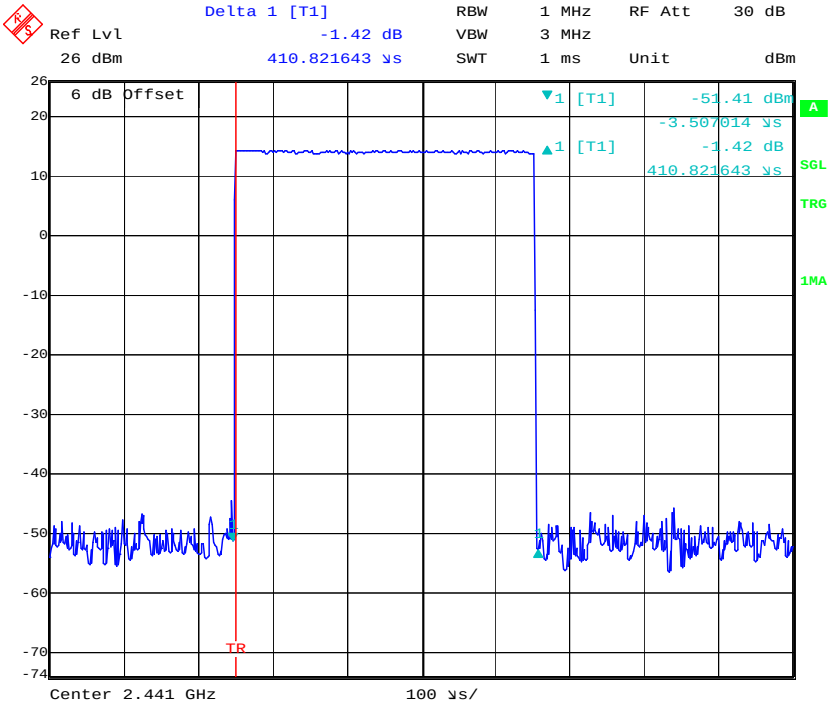
BDR Mode (GFSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.411	0.132	0.4	Compliance
	Middle	0.411	0.132	0.4	Compliance
	High	0.411	0.132	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.677	0.268	0.4	Compliance
	Middle	1.677	0.268	0.4	Compliance
	High	1.677	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.936	0.313	0.4	Compliance
	Middle	2.946	0.313	0.4	Compliance
	High	2.936	0.314	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

DH1: Low Channel

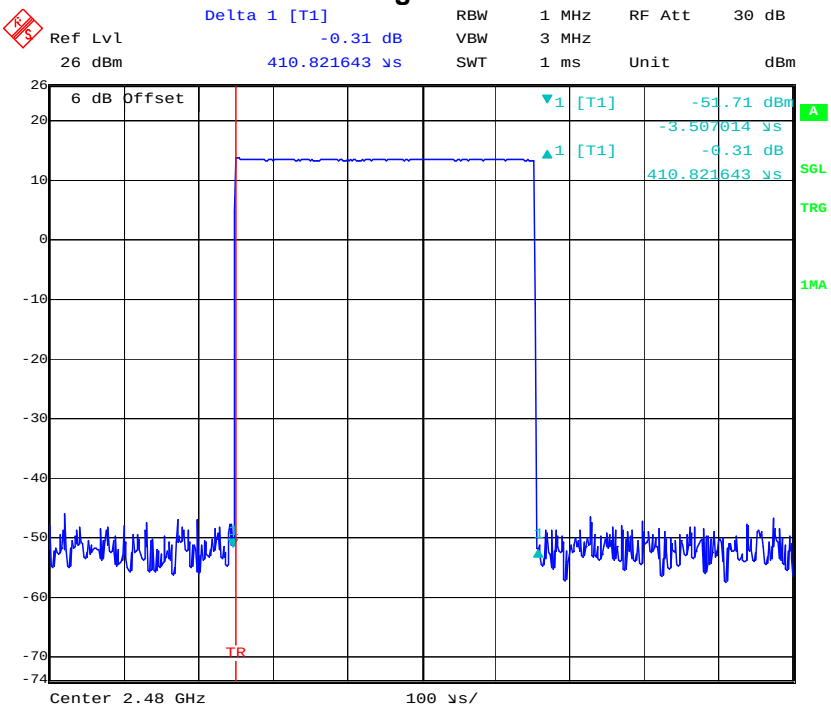


DH1: Middle Channel



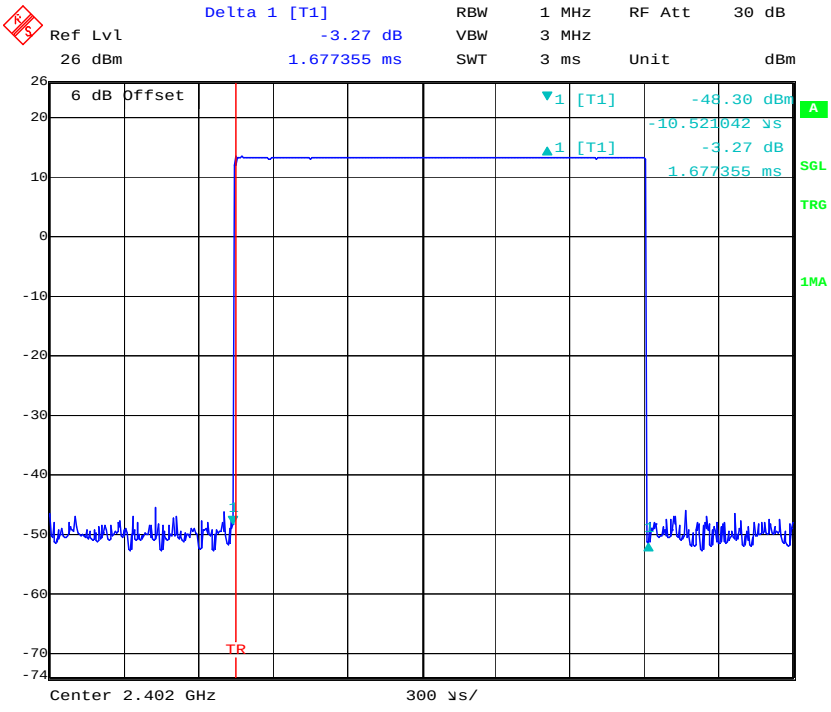
Date: 23.JUN.2017 16:43:04

DH1: High Channel

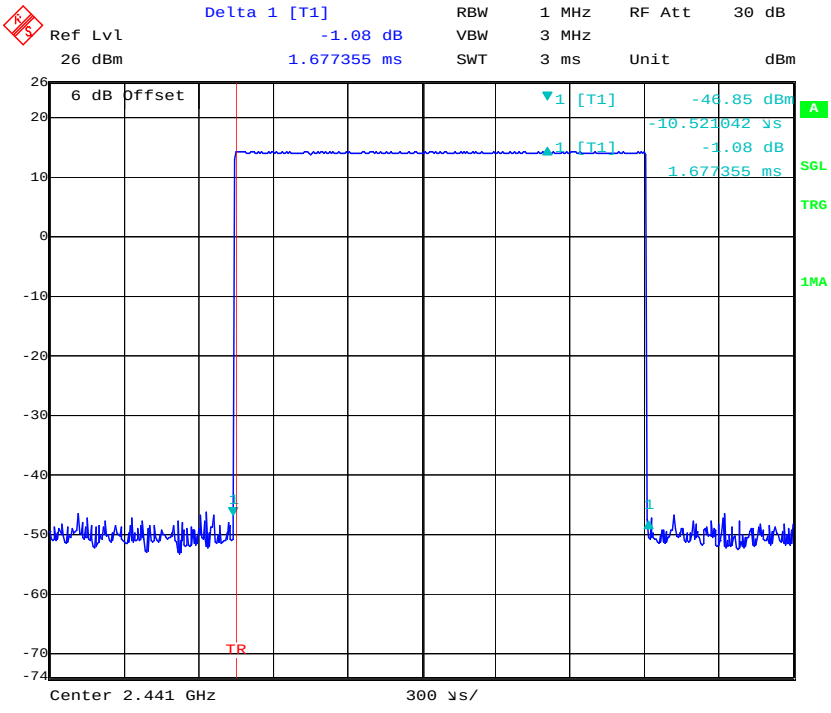


Date: 23.JUN.2017 16:43:40

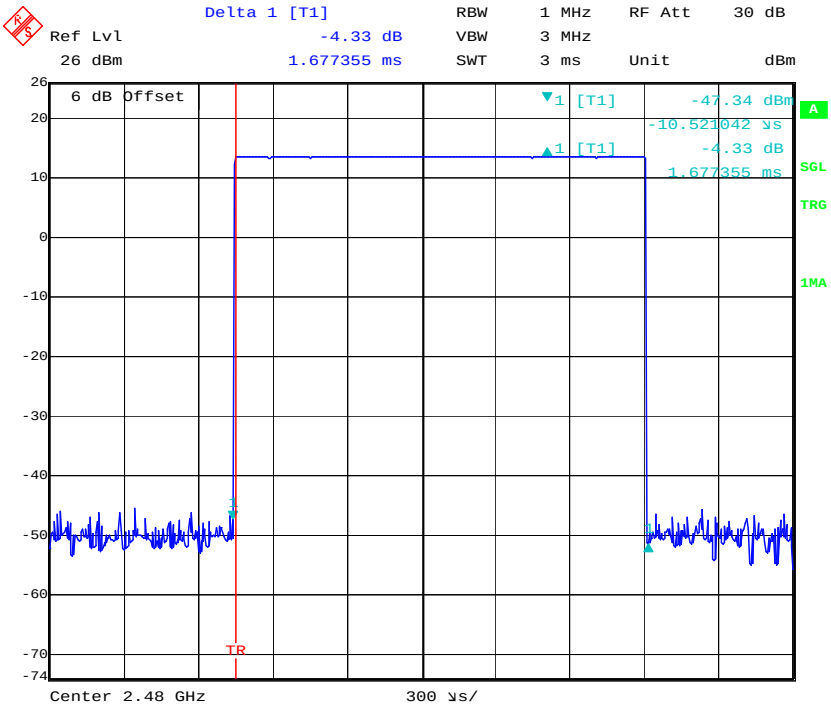
DH3: Low Channel



DH3: Middle Channel

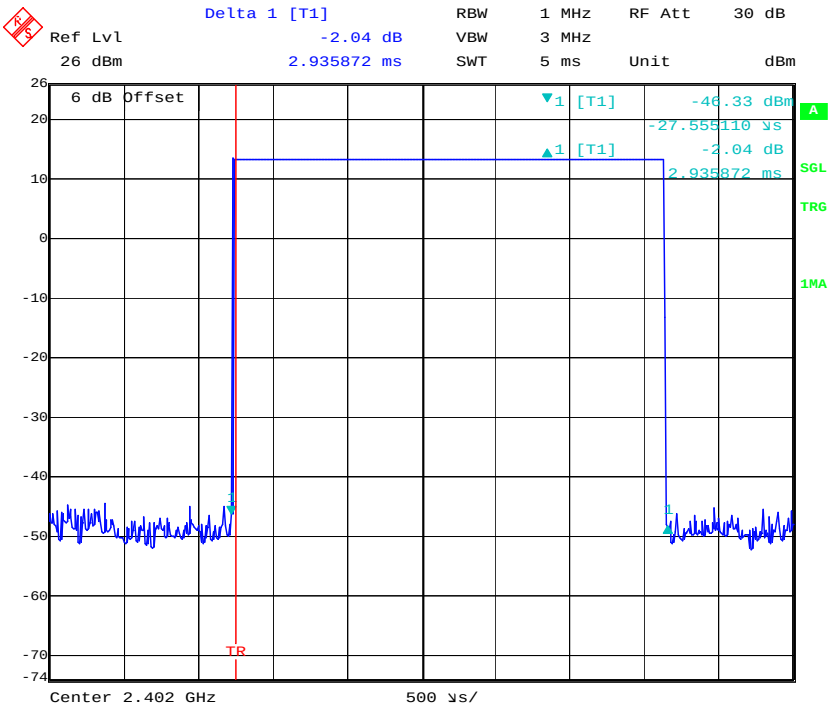


DH3: High Channel



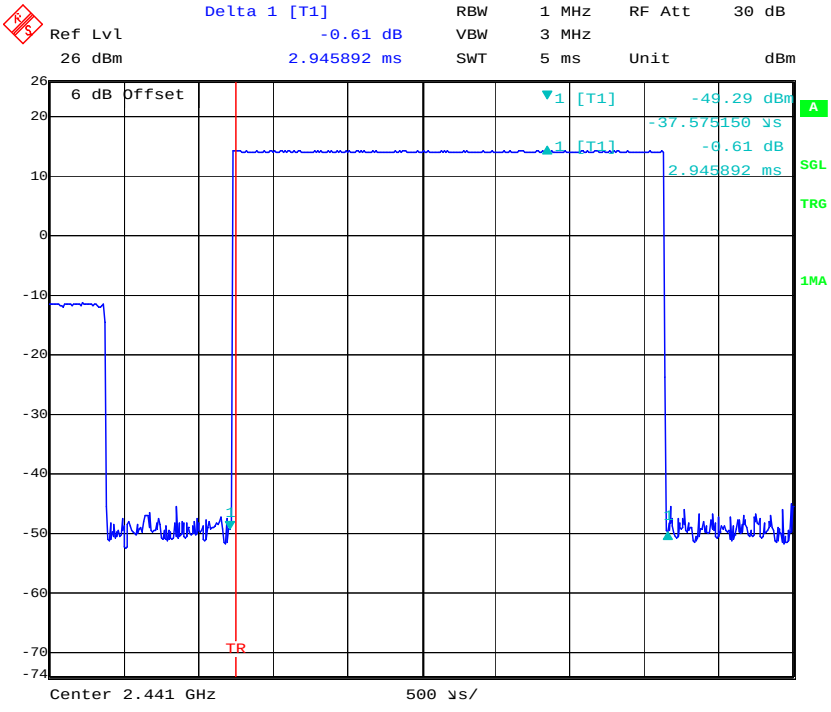
Date: 23.JUN.2017 16:45:19

DH5: Low Channel



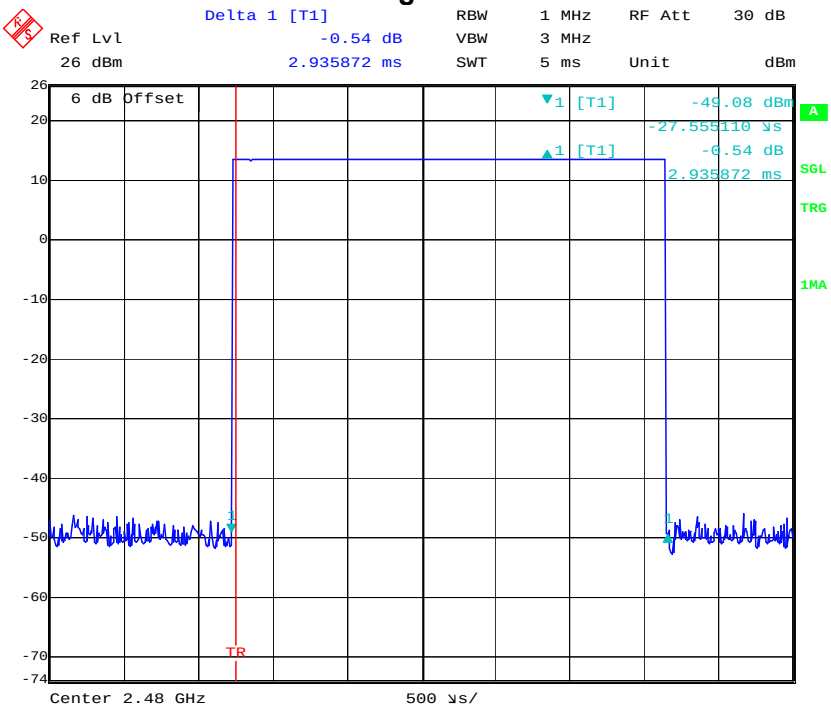
Date: 23.JUN.2017 16:46:29

DH5: Middle Channel



Date: 23.JUN.2017 16:47:00

DH5: High Channel

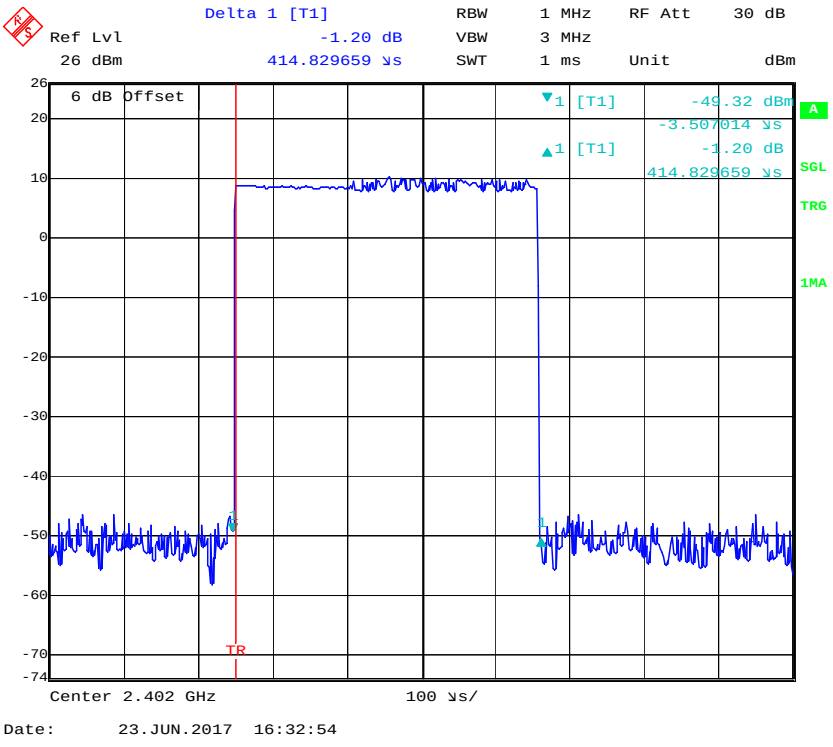


Date: 23.JUN.2017 16:47:11

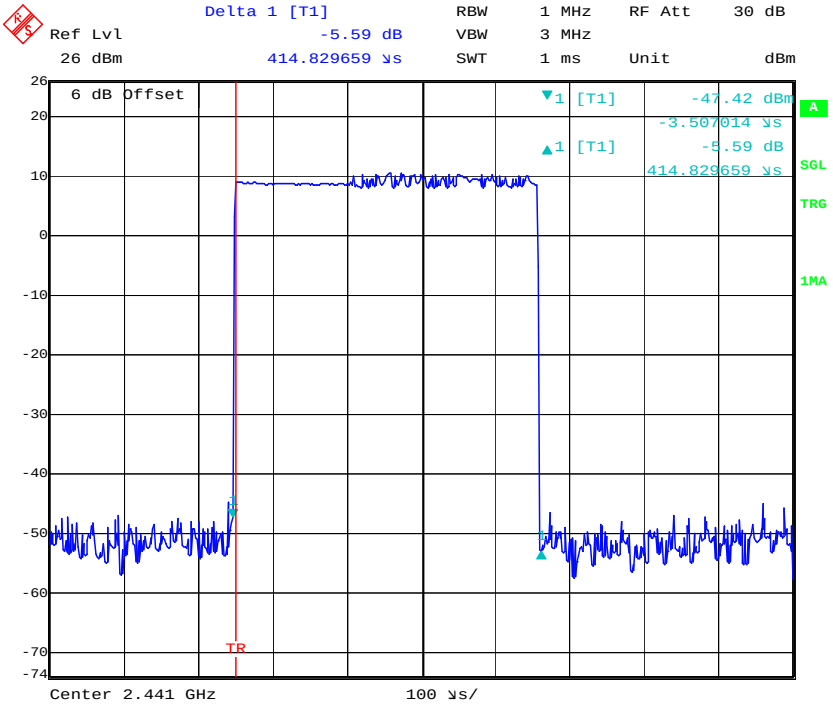
EDR Mode (π/4-DQPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.415	0.133	0.4	Compliance
	Middle	0.415	0.133	0.4	Compliance
	High	0.415	0.133	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
2DH3	Low	1.677	0.268	0.4	Compliance
	Middle	1.677	0.268	0.4	Compliance
	High	1.677	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
2DH5	Low	2.936	0.313	0.4	Compliance
	Middle	2.936	0.313	0.4	Compliance
	High	2.936	0.313	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

2DH1: Low Channel

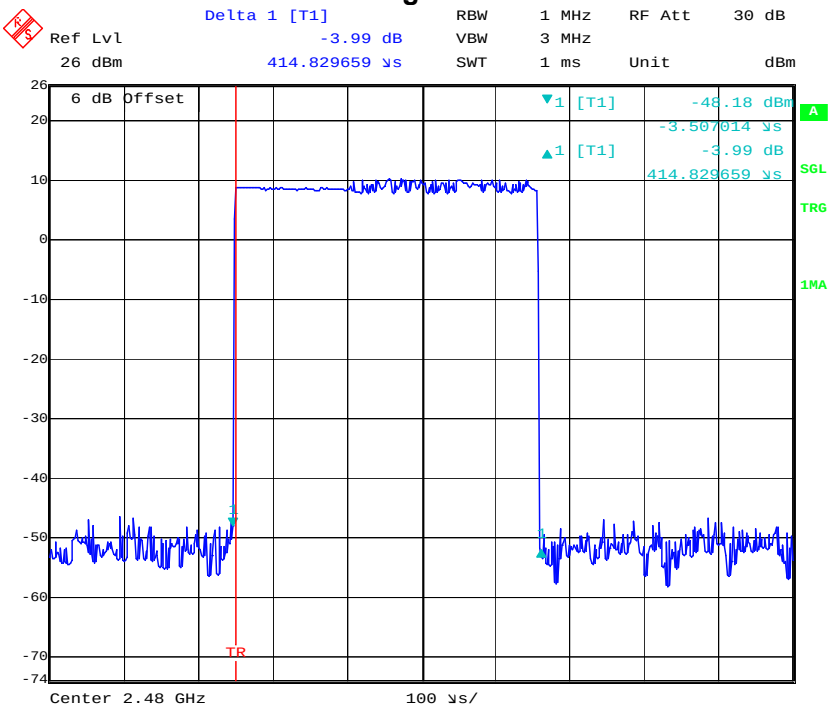


2DH1: Middle Channel



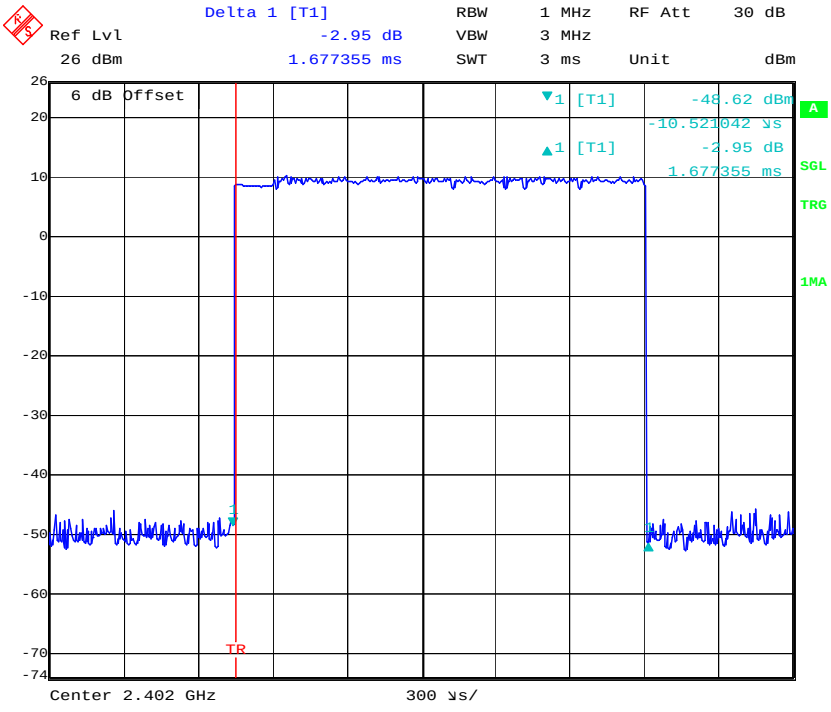
Date: 23.JUN.2017 16:33:06

2DH1: High Channel



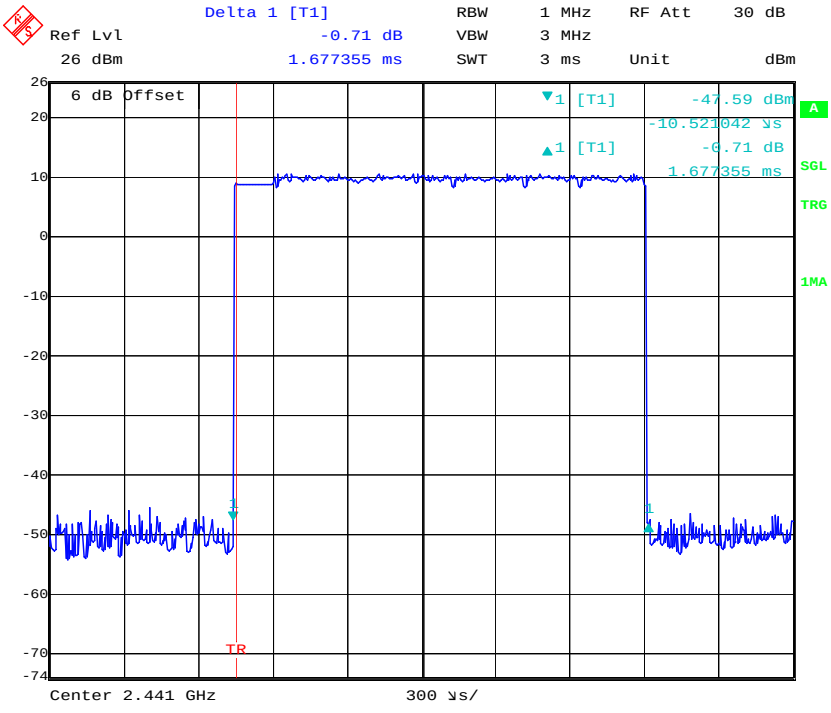
Date: 23.JUN.2017 16:33:18

2DH3: Low Channel



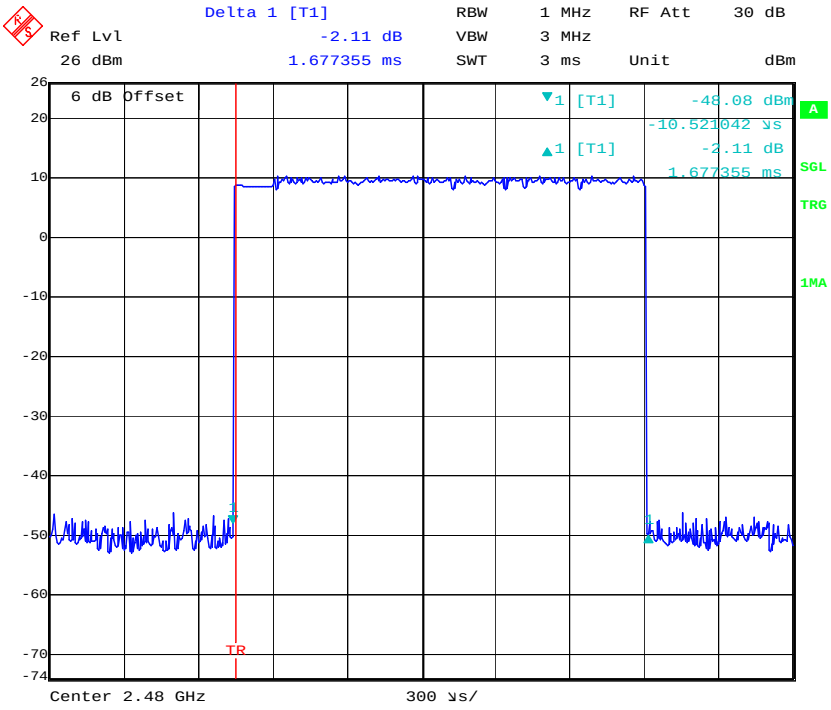
Date: 23.JUN.2017 16:34:42

2DH3: Middle Channel



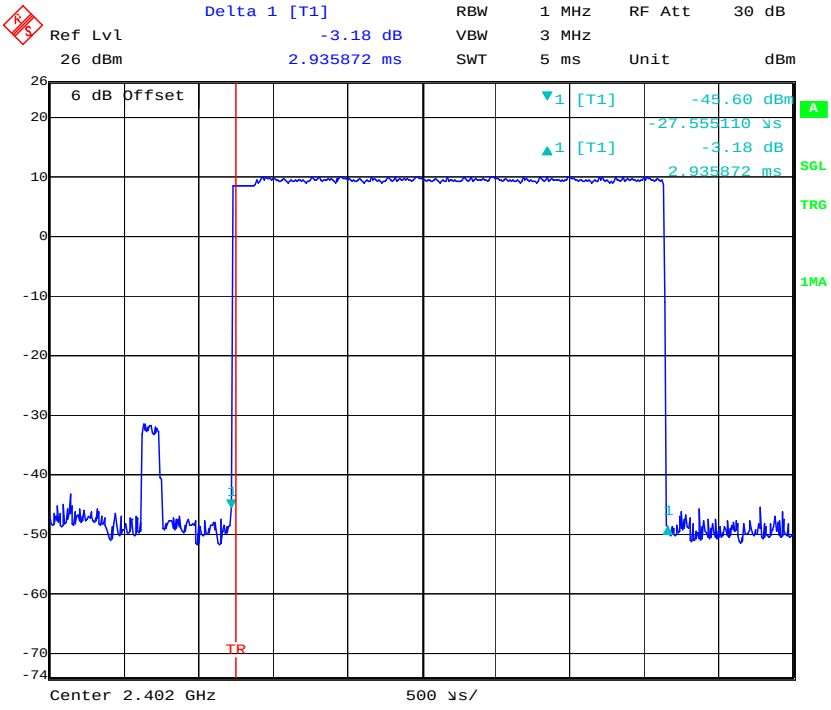
Date: 23.JUN.2017 16:35:38

2DH3: High Channel



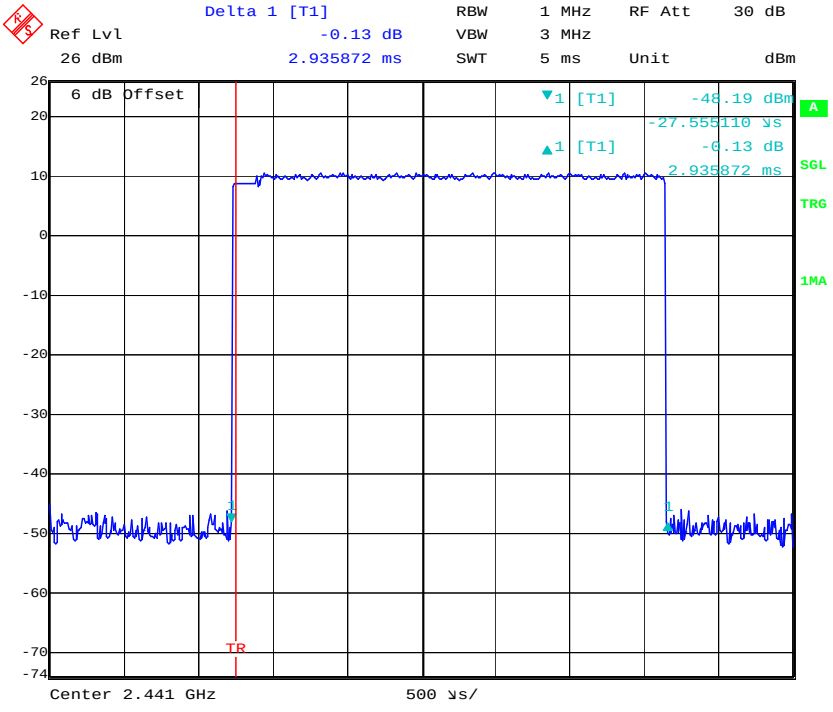
Date: 23.JUN.2017 16:35:49

2DH5: Low Channel



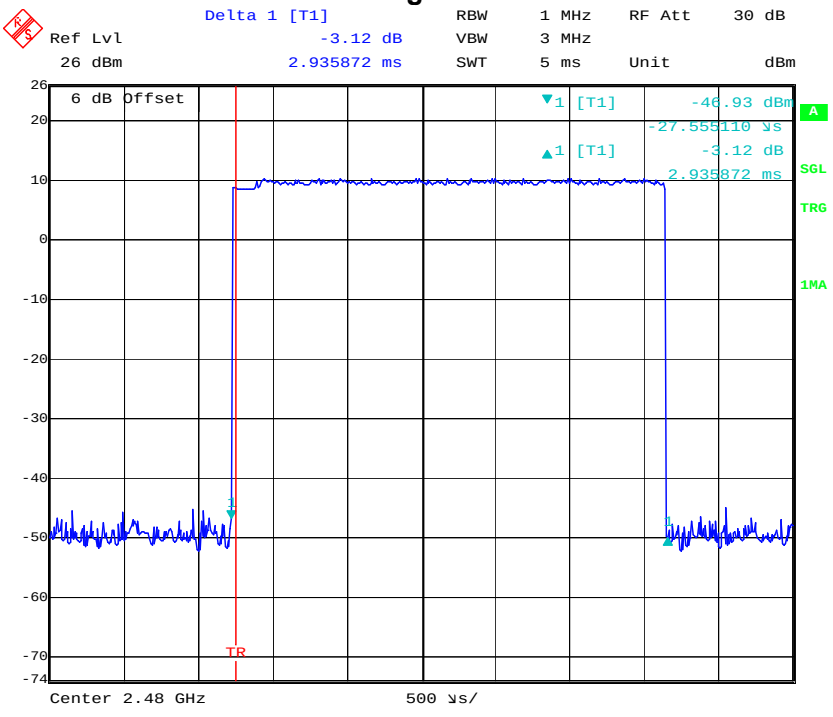
Date: 23.JUN.2017 16:38:12

2DH5: Middle Channel



Date: 23.JUN.2017 16:38:24

2DH5: High Channel

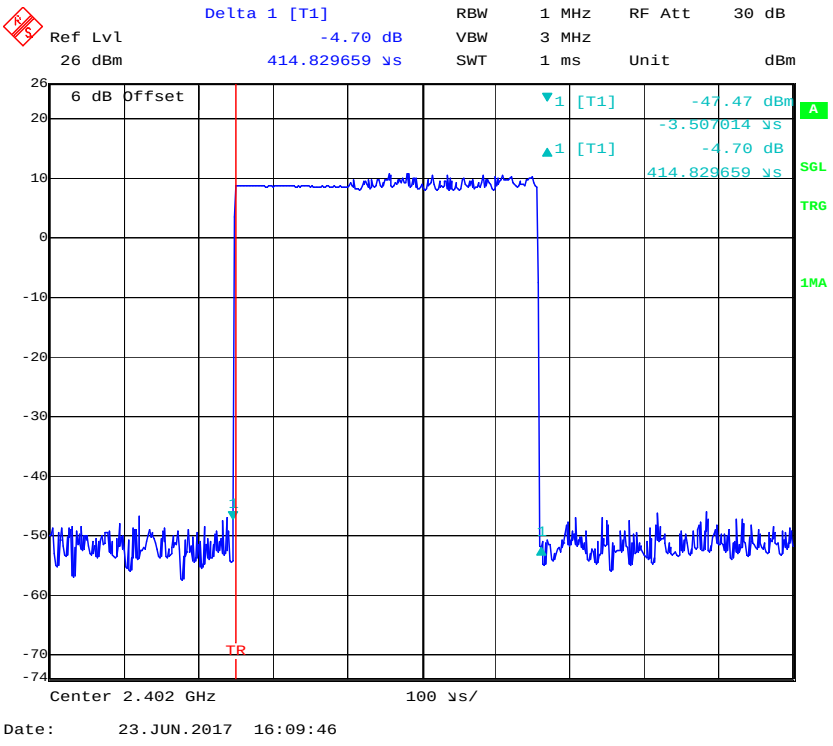


Date: 23.JUN.2017 16:38:35

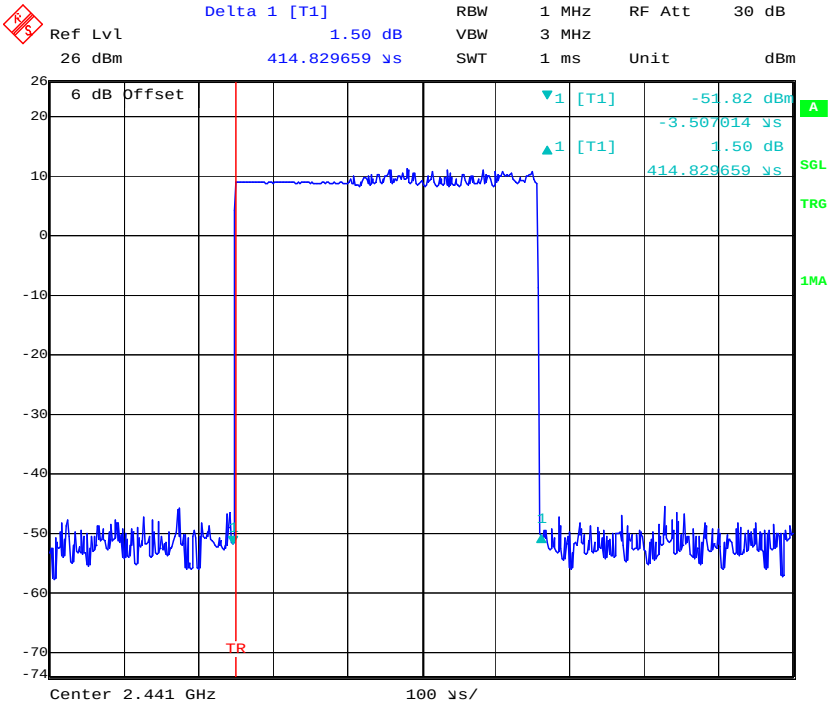
EDR Mode (8-DPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.415	0.133	0.4	Compliance
	Middle	0.415	0.133	0.4	Compliance
	High	0.415	0.133	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
3DH3	Low	1.677	0.268	0.4	Compliance
	Middle	1.677	0.268	0.4	Compliance
	High	1.677	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
3DH5	Low	2.946	0.314	0.4	Compliance
	Middle	2.946	0.314	0.4	Compliance
	High	2.936	0.313	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

3DH1: Low Channel

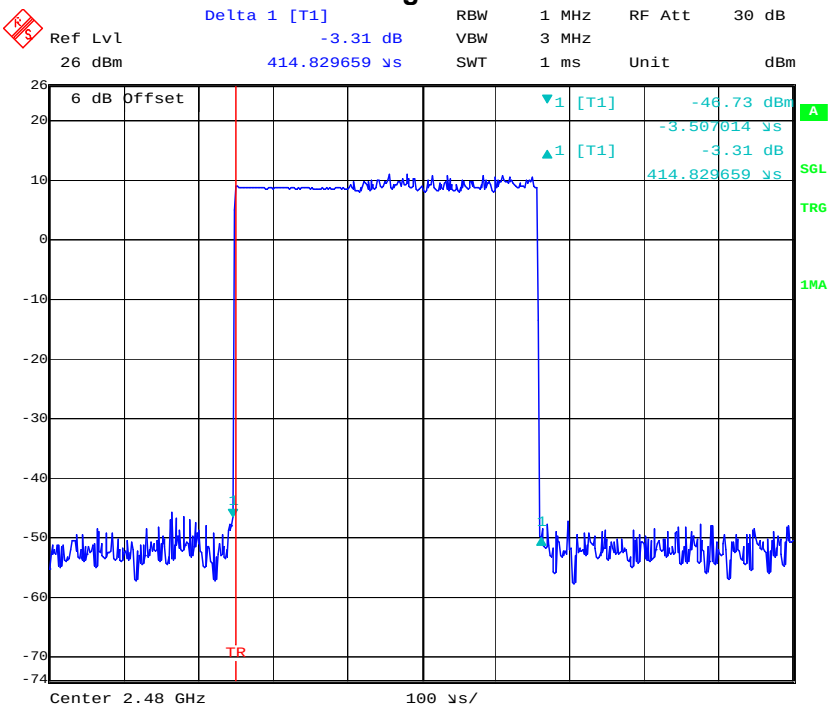


3DH1: Middle Channel



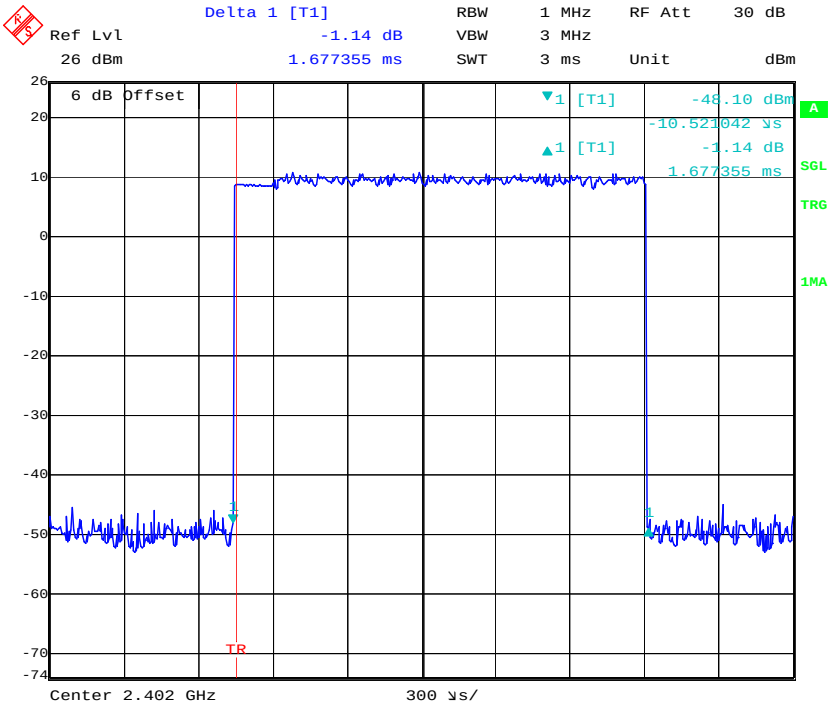
Date: 23.JUN.2017 16:09:58

3DH1: High Channel



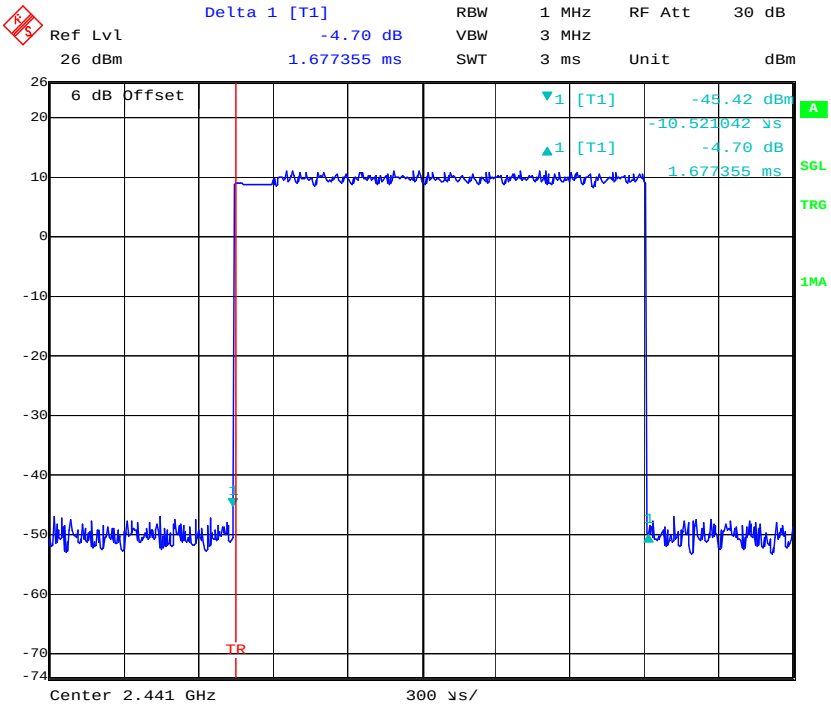
Date: 23.JUN.2017 16:10:12

3DH3: Low Channel



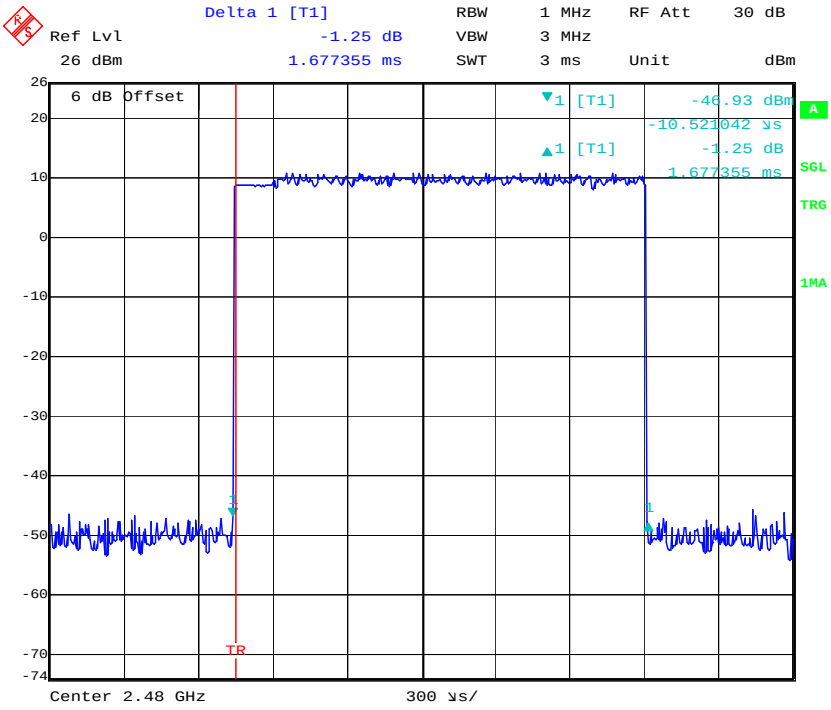
Date: 23.JUN.2017 16:28:31

3DH3: Middle Channel

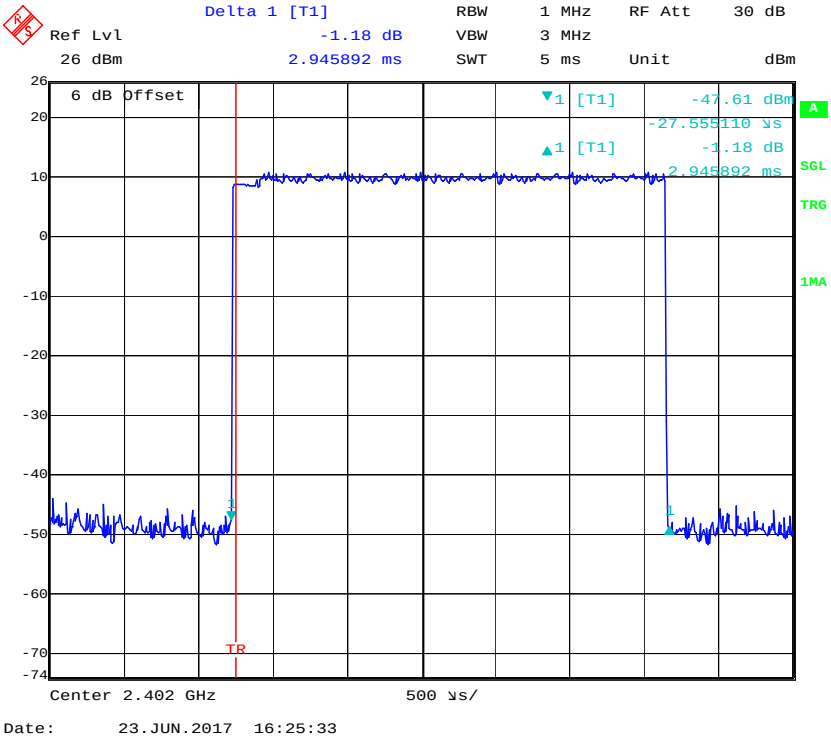


Date: 23.JUN.2017 16:28:44

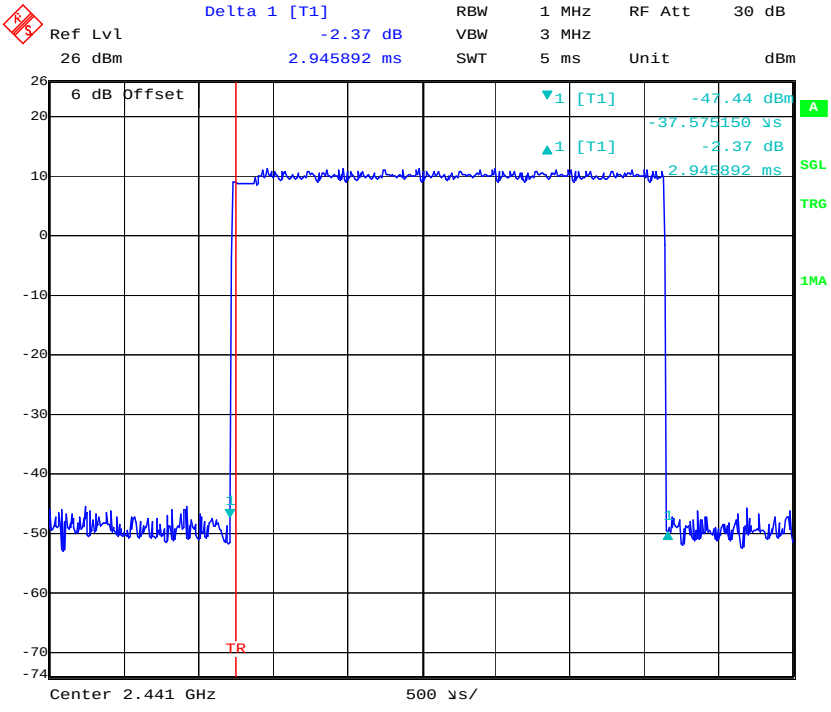
3DH3: High Channel



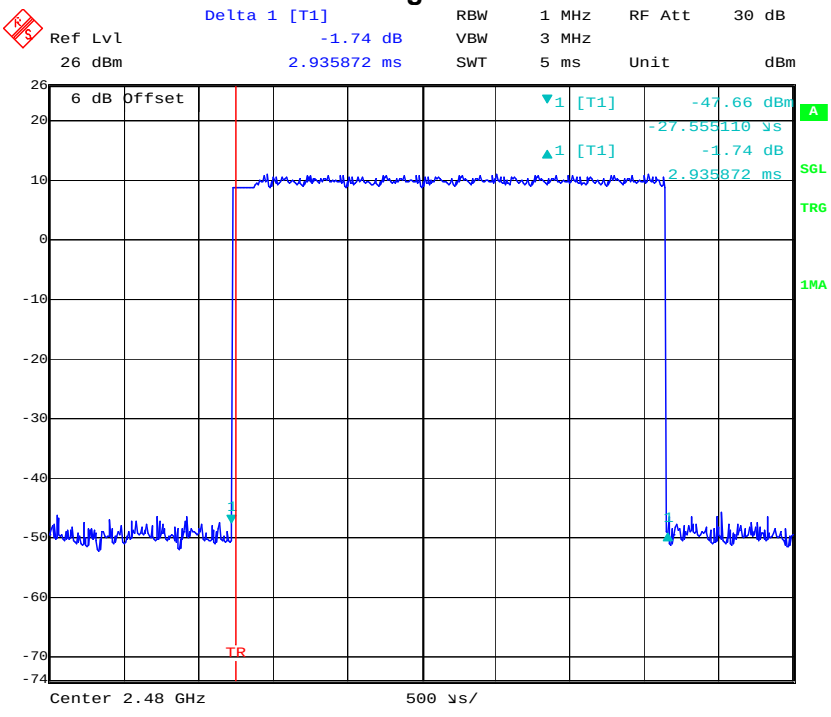
3DH5: Low Channel



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 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 Attenuator	3dB	3dB-1	Each Time	/
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

Temperature:	28.2 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lorin Bian on 2017-06-23.*

Test Result: Compliance.

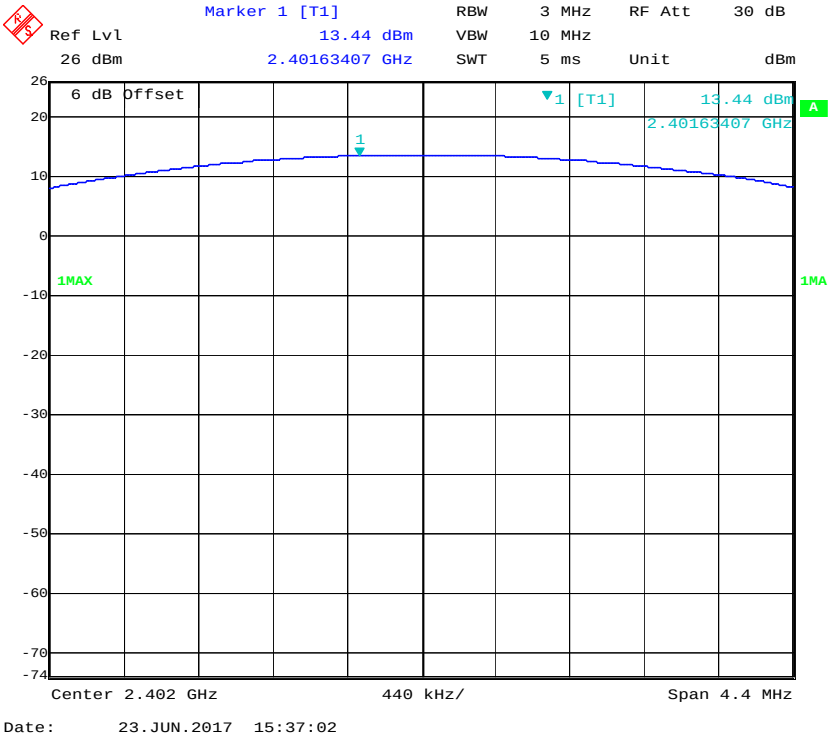
Test Mode: Transmitting

Mode	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	13.44	30
	2441	14.25	30
	2480	13.78	30
EDR Mode (π/4-DQPSK)	2402	10.65	30
	2441	11.04	30
	2480	10.9	30
EDR Mode (8-DPSK)	2402	11.16	30
	2441	11.65	30
	2480	11.38	30

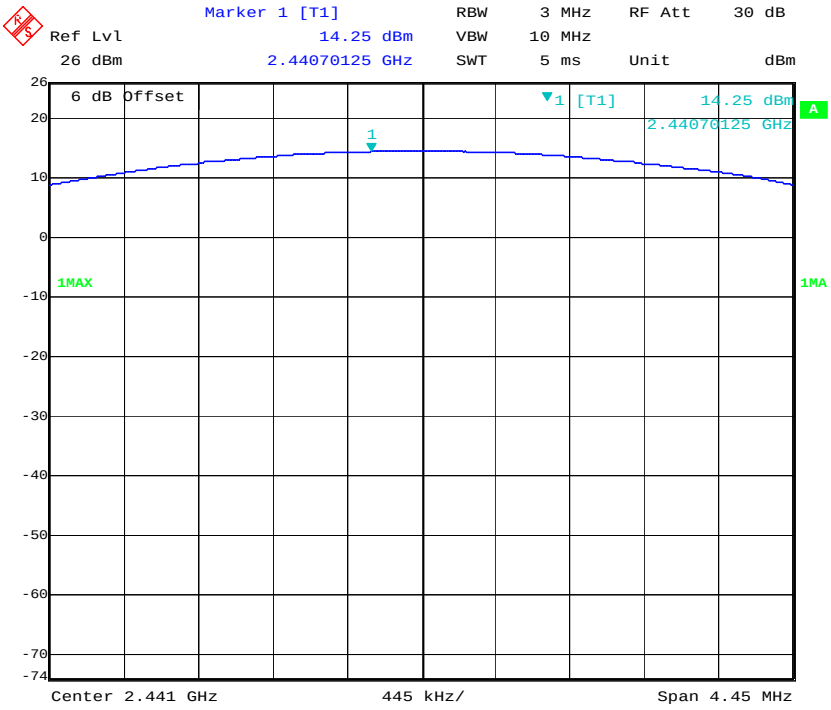
Note: The data above was tested in conducted mode.

BDR Mode (GFSK):

Low Channel

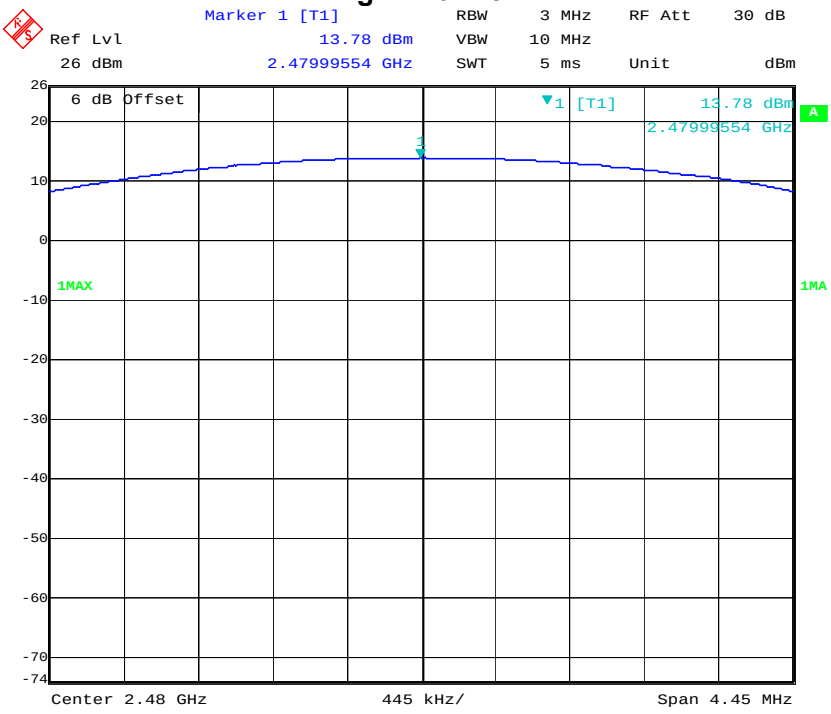


Middle Channel



Date: 23.JUN.2017 15:39:25

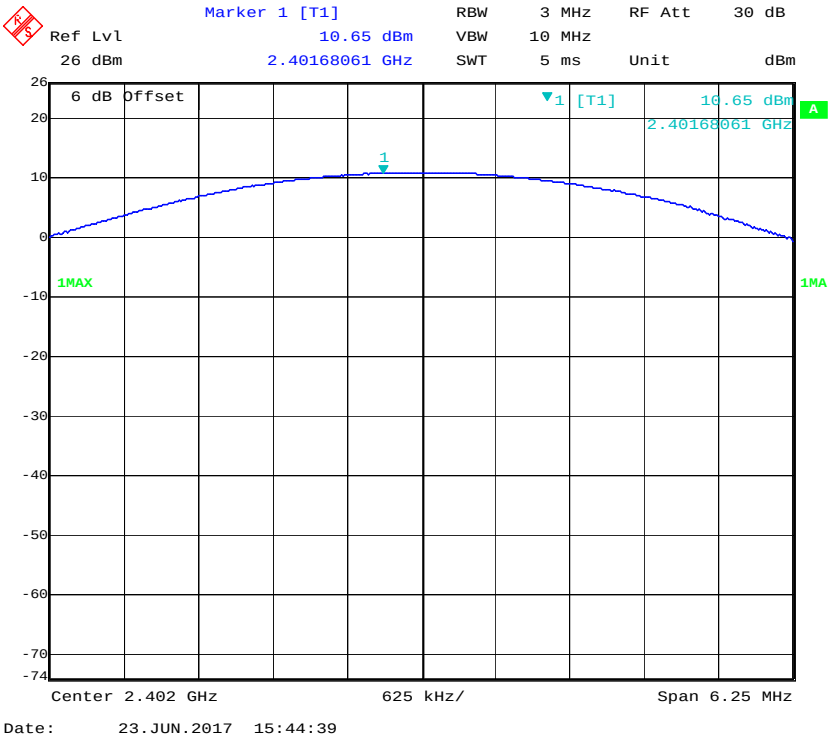
High Channel



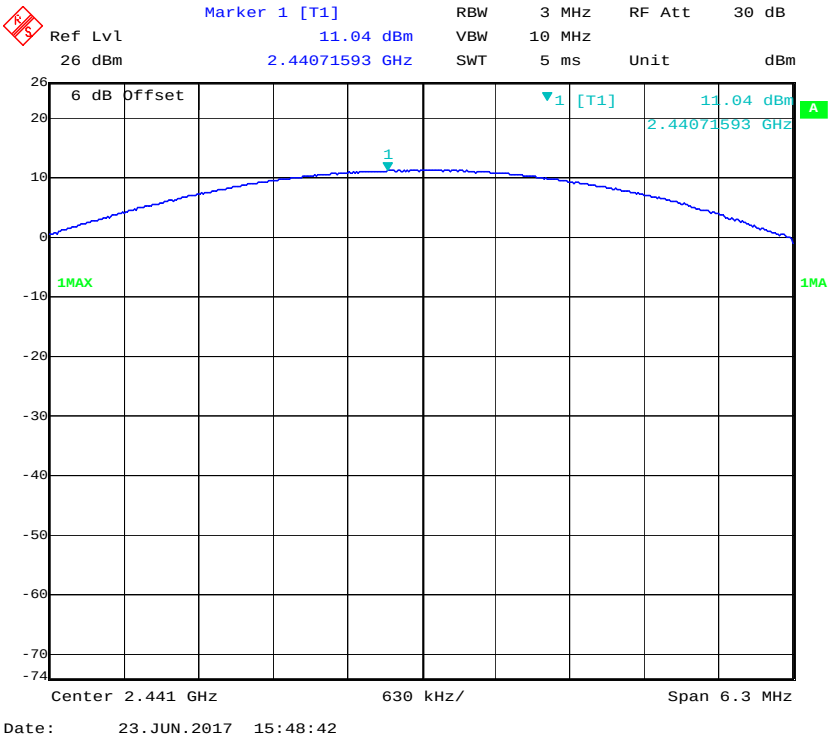
Date: 23.JUN.2017 15:41:18

EDR Mode (π/4-DQPSK):

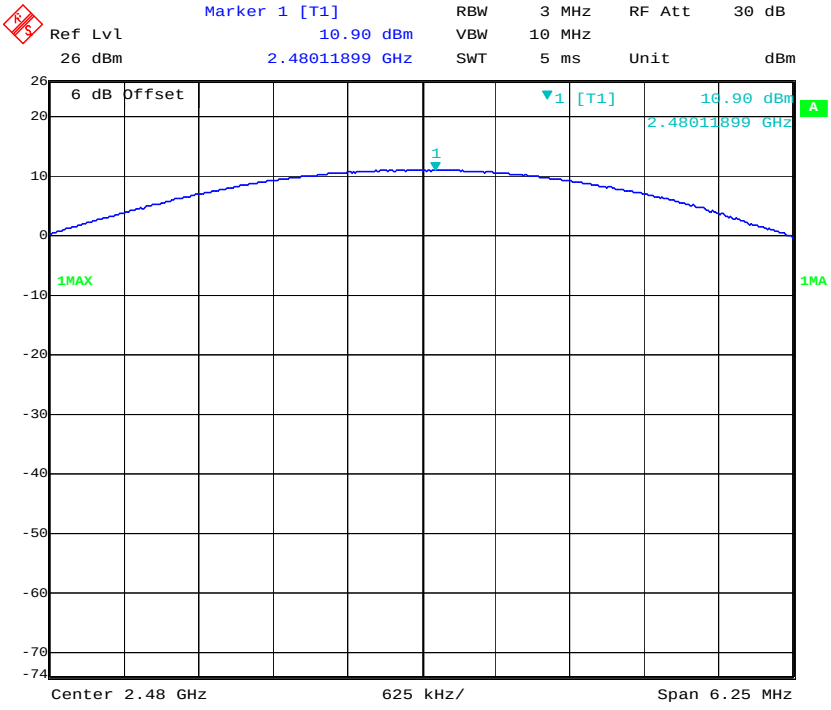
Low Channel



Middle Channel

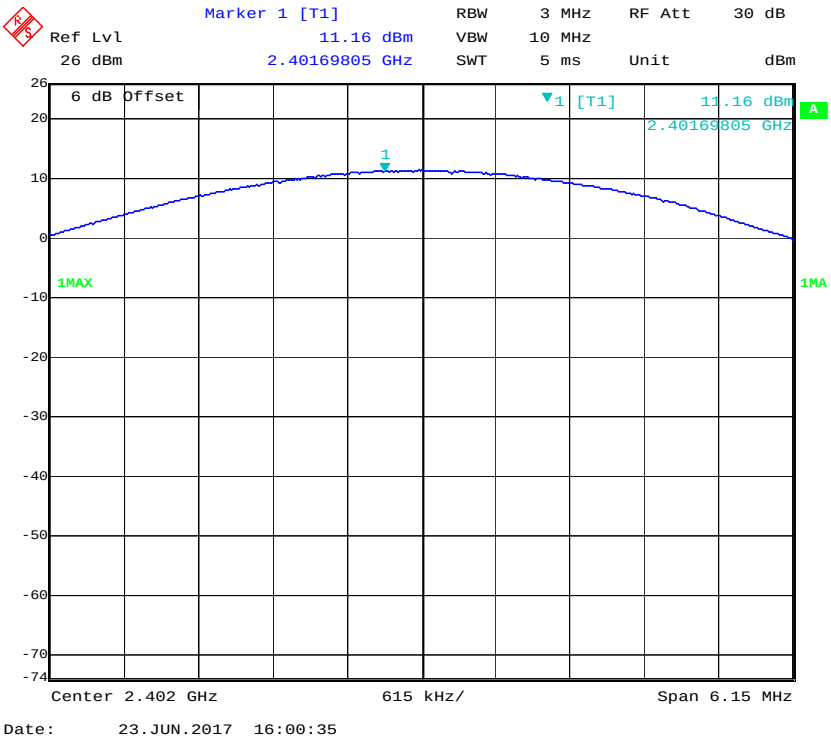


High Channel

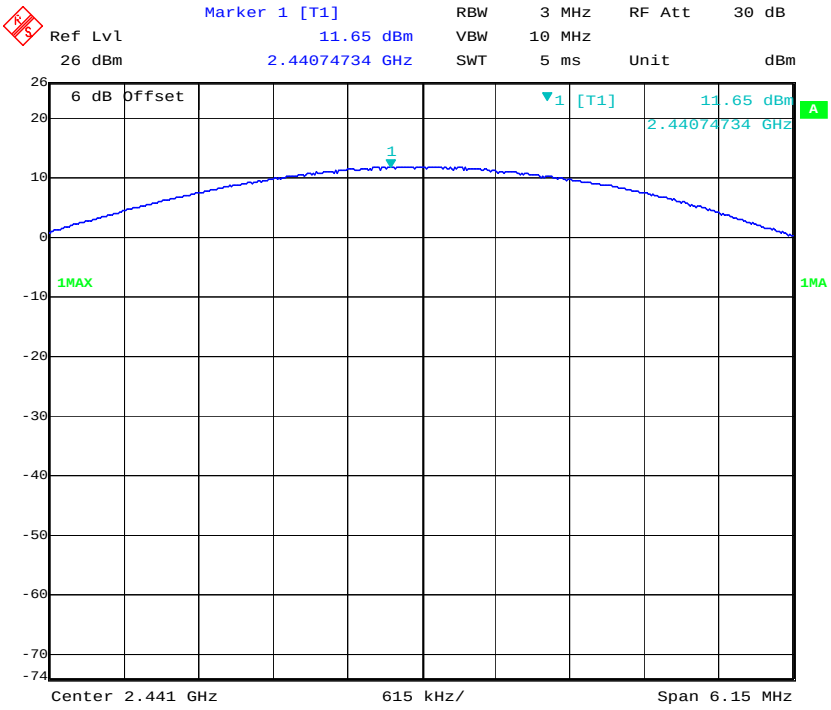


EDR Mode (8-DPSK):

Low Channel

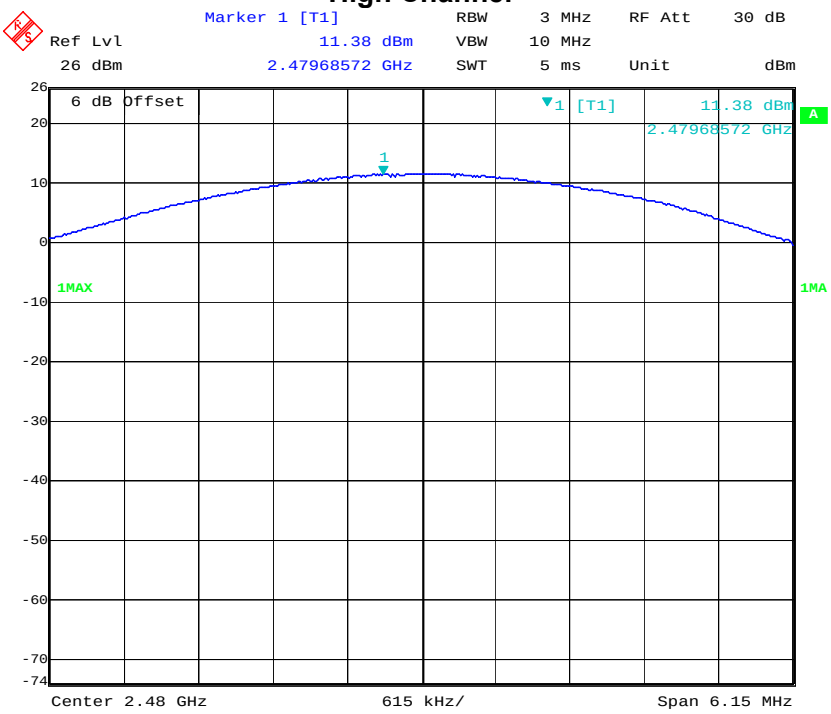


Middle Channel



Date: 23.JUN.2017 15:59:02

High Channel



Date: 23.JUN.2017 15:56:58

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 Attenuator	3dB	3dB-1	Each Time	/
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

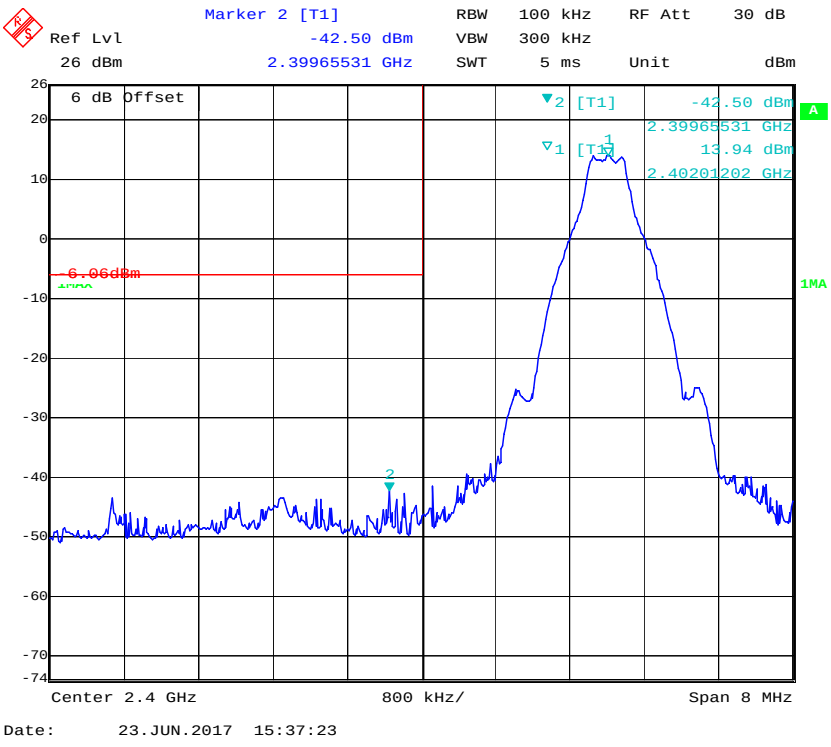
Temperature:	28.2 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lorin Bian on 2017-06-23.*

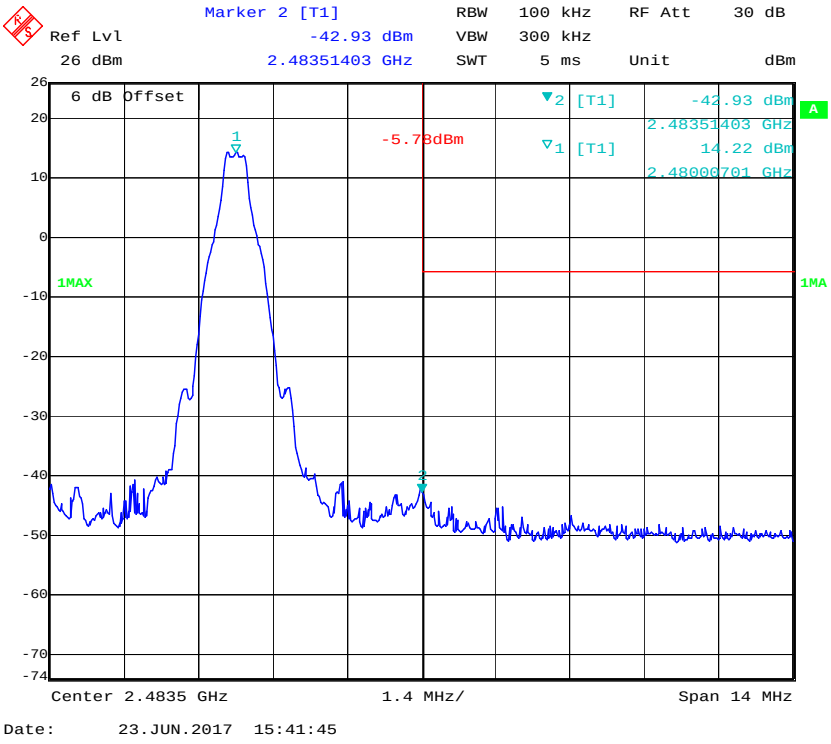
Test Result: Compliance

BDR Mode (GFSK):

Band Edge, Left Side

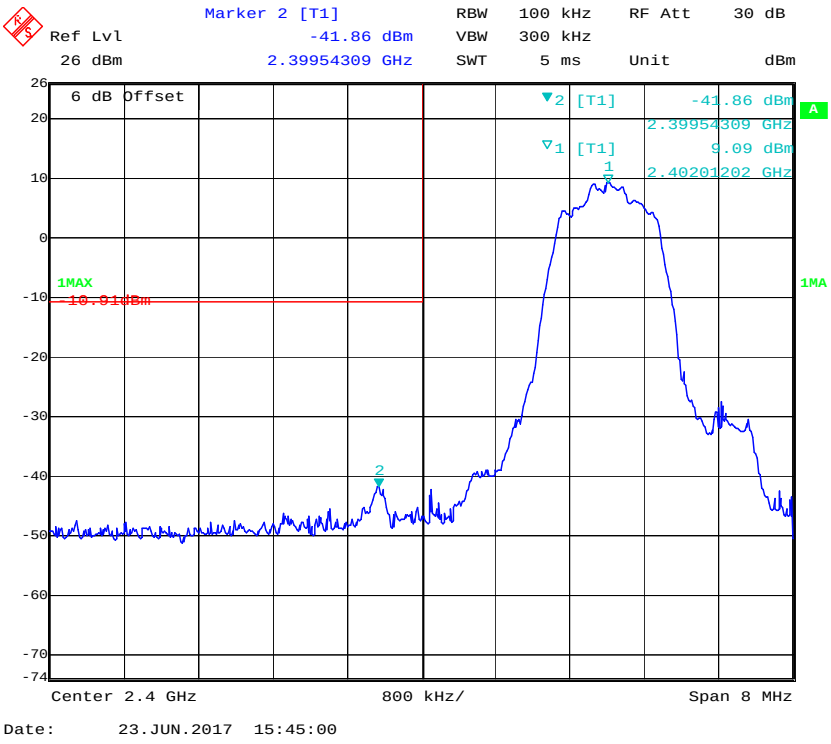


Band Edge, Right Side

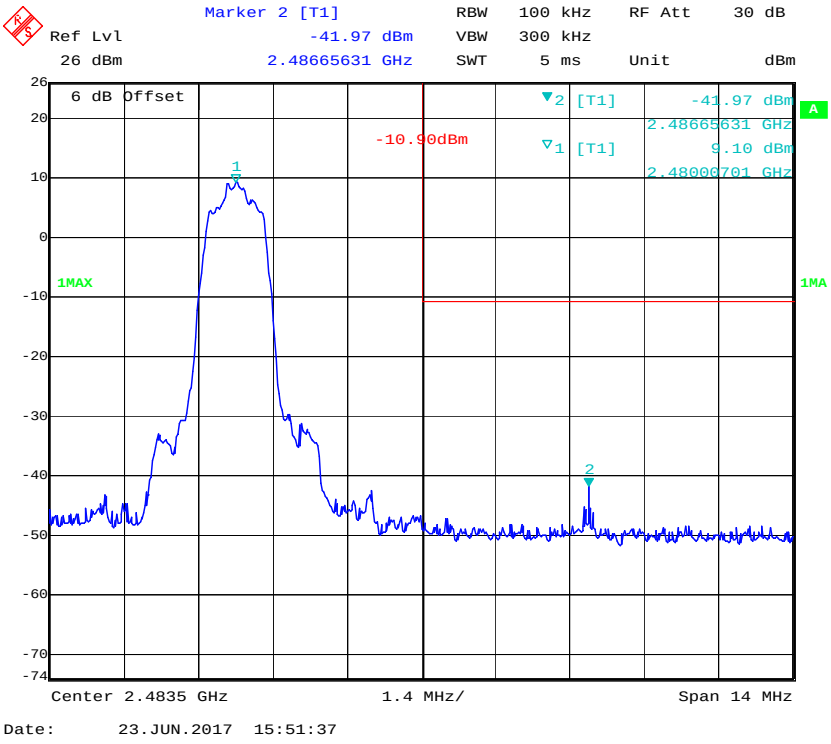


EDR Mode (π/4-DQPSK):

Band Edge, Left Side

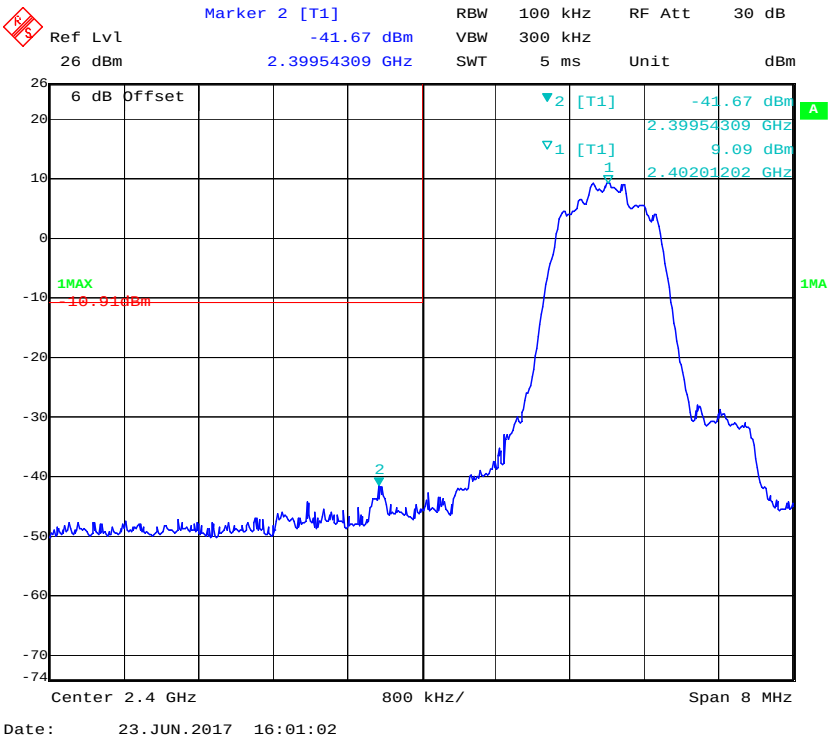


Band Edge, Right Side

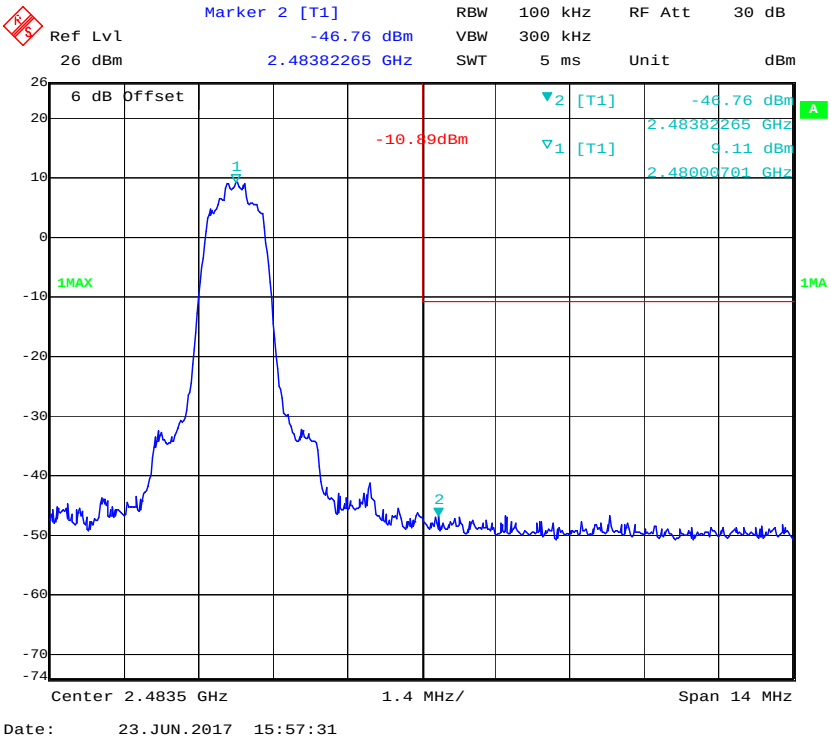


EDR Mode (8-DPSK):

Band Edge, Left Side



Band Edge, Right Side



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