

FCC PART 15.247 TEST REPORT

For

Anhui Inno-Sign International Co., Ltd

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Anhui, China

FCC ID: 2ANFN-62104

Report Type: Original Report	Product Type: TRITAN BOTTLE WITH 3W WIRELESS SPEAKER
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Report Number: RSHA170816015-00A	
Report Date: 2017-08-28	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Anhui Inno-Sign International Co., Ltd
Tested Model	62104
Product Type	TRITAN BOTTLE WITH 3W WIRELESS SPEAKER
Dimension	62 mm(W)×69 mm(H)
Power Supply	DC 3.7V from battery and DC 5.0V charging by USB port

**All measurement and test data in this report was gathered from production sample serial number: 20170816015 (Assigned by the BACL. The EUT supplied by the applicant was received on 2017-08-16)*

Objective

This test report is prepared on behalf of Anhui Inno-Sign International Co., Ltd in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

N/A

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. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	4.88dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road,Kunshan,Jiangsu province,China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. 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.: 815570. 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

Channel list for Bluetooth:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	40	2442
1	2403	...	...
...	...	...	...
...	...	77	2479
39	2441	78	2480

EUT was tested with Channel 0, 39 and 78.

EUT Exercise Software

RF Test Tool: FCCAssist

GFSK: Power level 6

π /4-DQPSK: Power level 6

8-DPSK: Power level 6

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

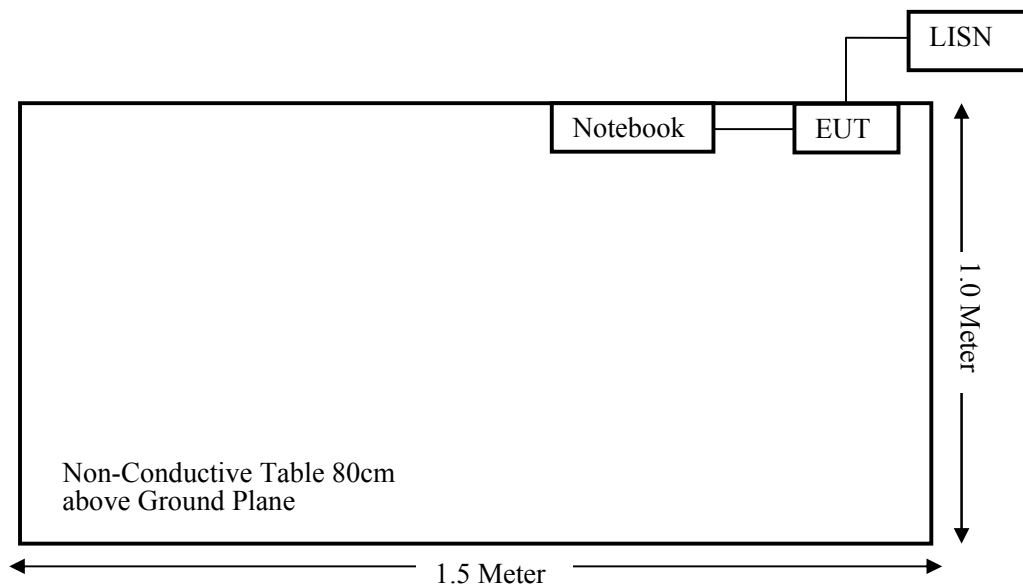
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152

External I/O Cable

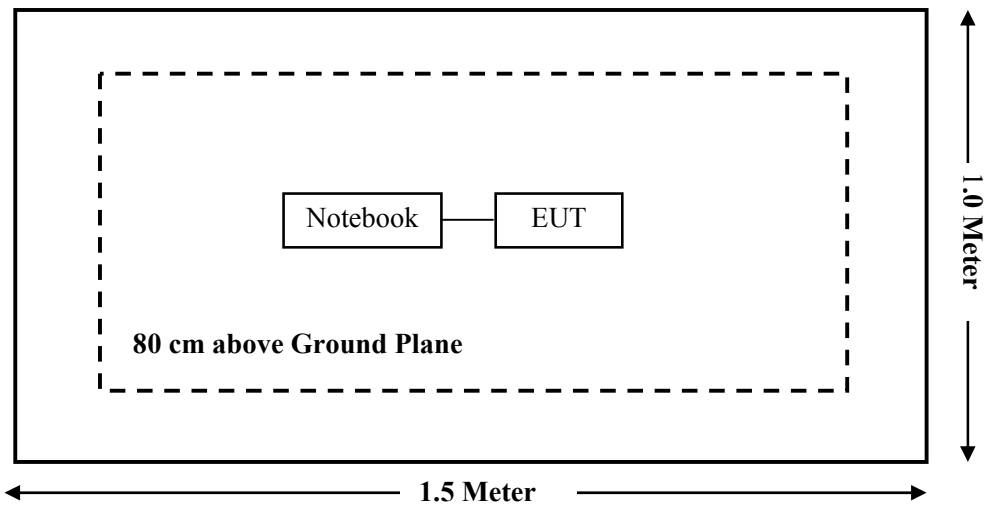
Cable Description	Length (m)	From Port	To
USB Cable	0.3	EUT	Notebook

Block Diagram of Test Setup

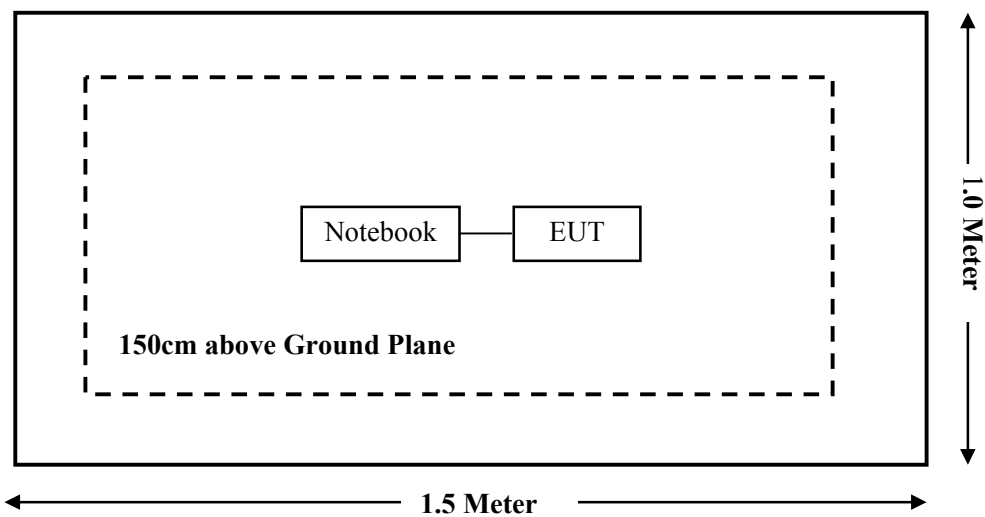
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1310 & §2.1093	RF EXPOSURE	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)	20 dB Emission 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

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber 1#)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Sunol Sciences	Broadband Antenna	JB3	A040914-2	2016-01-09	2019-01-08
Sonoma Instrument	Pre-amplifier	310N	171205	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2017-08-15	2018-08-14
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-24
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
Heatsink Required	Amplifier	QLW-18405536-J0	15964001009	2016-12-12	2017-12-11
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2017-08-15	2018-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-20
Inno-Sign	RF Cable	N/A	N/A	2017-08-23	2018-08-22
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2016-10-10	2017-10-09
Rohde & Schwarz	LISN	ENV216	3560655016	2016-11-25	2017-11-24
BACL	BACL-EMC	V1.0	CE001	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2017-01-10	2018-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2017-08-15	2018-08-14

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i), §1.1310& §2.1093 –RF EXPOSURE

Applicable Standard

According to §2.1093 and §1.1307(b)(1), 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:

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

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

- $f(\text{GHz})$ 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
- When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Measurement Result

Mode	Frequency Range	Conducted Average power	Conducted Average power	Minimum test separation distance required for the exposure conditions
	(MHz)	(dBm)	(mW)	(mm)
BT	2402-2480	-3.00	0.50	5.00

Note: Turn up power:

BDR: -6 ± 1 dBm,

EDR: -4.5 ± 1.5 dBm

which are declared by the manufacturer.

Result: $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})]$

- $[\sqrt{f(\text{GHz})}] = 0.5/5 \cdot \sqrt{2.48} = \mathbf{0.16} < \mathbf{3.0}$. So no SAR test is needed.

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 a PCB antenna arrangement for Bluetooth, which the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

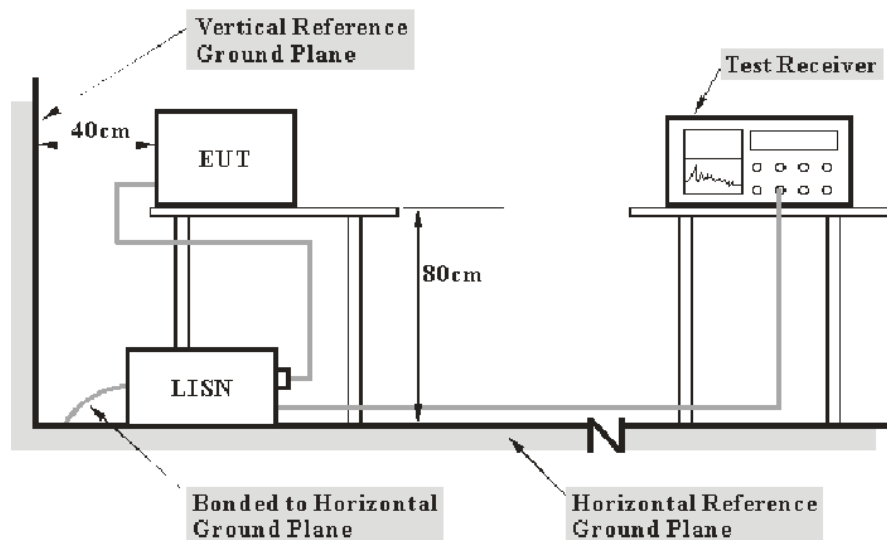
Result: Compliance.

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 measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

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 LISN.

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

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

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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

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

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

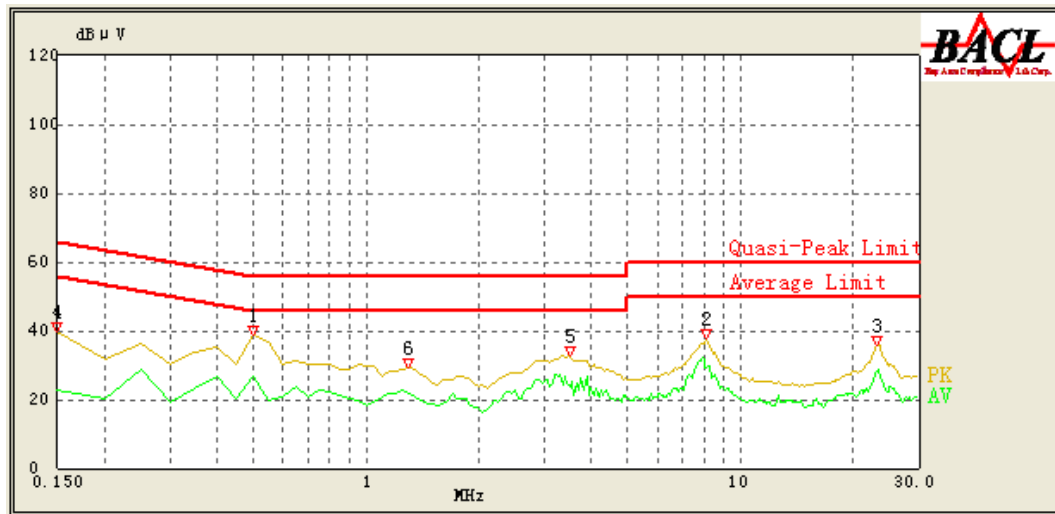
Environmental Conditions

Temperature:	23.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

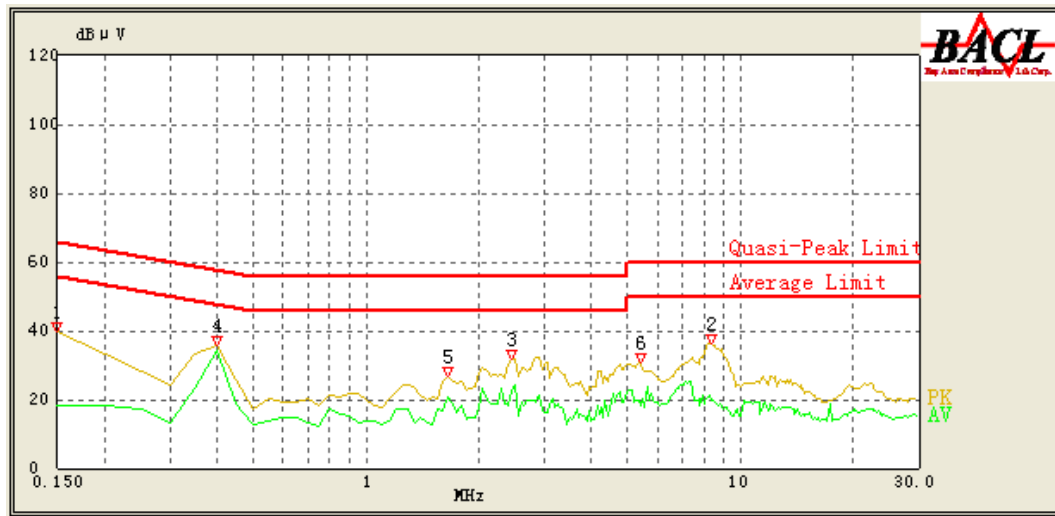
The testing was performed by Ada Yu on 2017-08-24.

EUT operation mode: Transmitting in middle channel of 8-DPSK (Worst case)

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Correction (dB)	Limit (dBμV)	Margin (dB)	Comment
0.500	38.88	QP	9.000	L1	16.08	56.00	17.12	Compliance
0.500	26.52	AV	9.000	L1	16.08	46.00	19.48	Compliance
8.100	37.74	QP	9.000	L1	16.01	60.00	22.26	Compliance
8.100	29.07	AV	9.000	L1	16.01	50.00	20.93	Compliance
23.250	35.98	QP	9.000	L1	16.45	60.00	24.02	Compliance
23.300	28.68	AV	9.000	L1	16.45	50.00	21.32	Compliance
0.150	39.58	QP	9.000	L1	16.06	66.00	26.42	Compliance
0.150	22.52	AV	9.000	L1	16.06	56.00	33.48	Compliance
3.500	32.60	QP	9.000	L1	15.85	56.00	23.40	Compliance
3.500	23.70	AV	9.000	L1	15.85	46.00	22.30	Compliance
1.300	29.42	QP	9.000	L1	15.87	56.00	26.58	Compliance
1.300	21.64	AV	9.000	L1	15.87	46.00	24.36	Compliance

AC 120V/60 Hz, Neutral

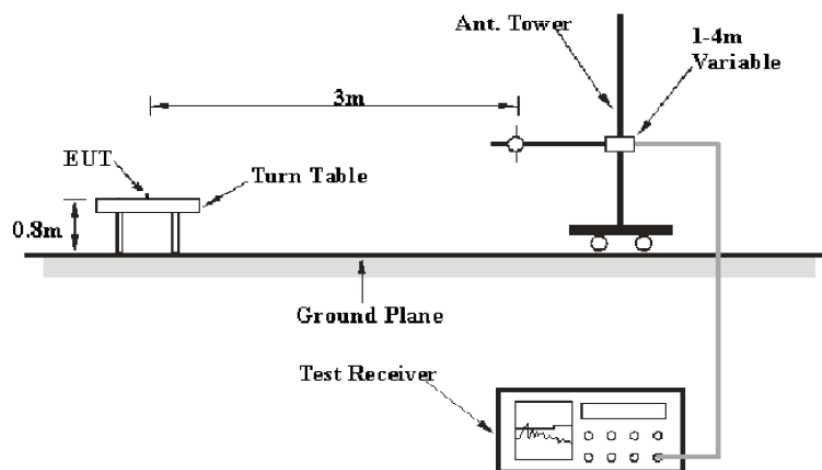
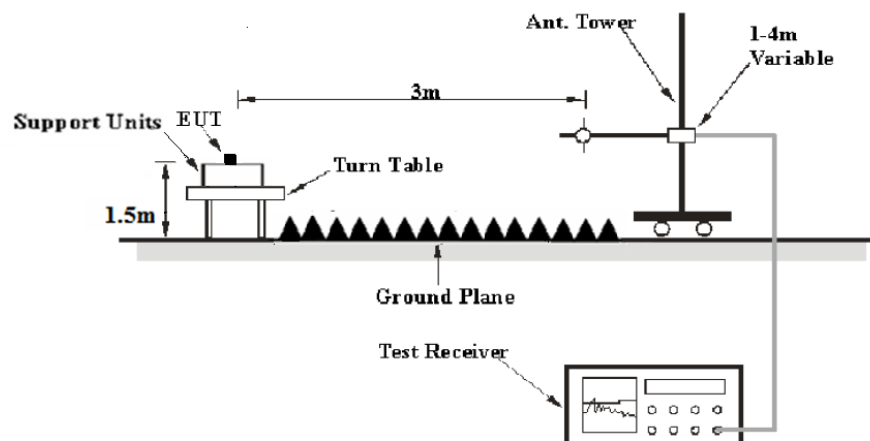
Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Correction (dB)	Limit (dBμV)	Margin (dB)	Comment
0.150	39.55	QP	9.000	N	16.06	66.00	26.45	Compliance
0.150	18.46	AV	9.000	N	16.06	56.00	37.54	Compliance
8.350	36.13	QP	9.000	N	15.95	60.00	23.87	Compliance
8.350	19.79	AV	9.000	N	15.95	50.00	30.21	Compliance
2.450	31.65	QP	9.000	N	15.90	56.00	24.35	Compliance
2.450	22.20	AV	9.000	N	15.90	46.00	23.80	Compliance
0.400	35.83	QP	9.000	N	16.09	58.86	23.03	Compliance
0.400	34.35	AV	9.000	N	16.09	48.86	14.51	Compliance
1.650	26.69	QP	9.000	N	15.92	56.00	29.31	Compliance
1.650	20.62	AV	9.000	N	15.92	46.00	25.38	Compliance
5.400	30.77	QP	9.000	N	15.88	60.00	29.23	Compliance
5.400	18.15	AV	9.000	N	15.88	50.00	31.85	Compliance

Note:

- 1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
- 2) Corrected Amplitude = Reading + Corr.
- 3) Margin = Limit –Corrected Amplitude

FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS**Applicable Standard**

FCC §15.205; §15.209; §15.247(d)

EUT Setup**Below 1 GHz:****Above 1GHz:**

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

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

Frequency Range	RBW	Video B/W	Detector
1GHz – 25GHz	1MHz	3 MHz	PK
	1MHz	10 Hz	Ave.

Test Procedure

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

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

Corrected Amplitude & Margin Calculation

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

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

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 Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Test Data**Environmental Conditions**

Temperature:	23.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Ada Yu on 2017-08-24.

EUT operation mode: Transmitting

30MH -25 GHz: (Scan with GFSK, $\pi/4$ -DQPSK, 8-DPSK mode, the worst case is 8-DPSK Mode)

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
Low Channel (2402 MHz)									
349.25	36.84	QP	216	244	V	-9.83	27.01	46	18.99
2402.00	96.66	PK	145	215	V	-6.19	90.47	/	/
2402.00	89.97	Ave	145	215	V	-6.19	83.78	/	/
2402.00	95.63	PK	26	202	H	-6.19	89.44	/	/
2402.00	89.17	Ave	26	202	H	-6.19	82.98	/	/
2390.00	42.55	PK	278	241	V	-6.22	36.33	74	37.67
2390.00	28.27	Ave	278	241	V	-6.22	22.05	54	31.95
1893.48	42.72	PK	90	115	H	-8.06	34.66	74	39.34
1893.48	29.20	Ave	90	115	H	-8.06	21.14	54	32.86
1268.00	43.59	PK	196	229	V	-10.85	32.74	74	41.26
1268.00	29.59	Ave	196	229	V	-10.85	18.74	54	35.26
4804.00	42.96	PK	176	133	H	1.61	44.57	74	29.43
4804.00	28.83	Ave	176	133	H	1.61	30.44	54	23.56
7206.00	40.65	PK	64	159	H	7.55	48.20	74	25.80
7206.00	26.46	Ave	64	159	H	7.55	34.01	54	19.99

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
Middle Channel (2441 MHz)									
349.25	36.83	QP	15	203	V	-9.83	27.00	46	19.00
2441.00	96.60	PK	19	111	V	-6.17	90.43	/	/
2441.00	89.82	Ave	19	111	V	-6.17	83.65	/	/
2441.00	95.57	PK	82	125	H	-6.17	89.40	/	/
2441.00	89.13	Ave	82	125	H	-6.17	82.96	/	/
1334.00	42.45	PK	163	153	H	-10.45	32.00	74	42.00
1334.00	28.39	Ave	163	153	H	-10.45	17.94	54	36.06
3684.00	42.65	PK	348	192	H	-1.34	41.31	74	32.69
3684.00	28.82	Ave	348	192	H	-1.34	27.48	54	26.52
4882.00	44.69	PK	163	190	V	1.79	46.48	74	27.52
4882.00	32.02	Ave	163	190	V	1.79	33.81	54	20.19
6663.00	42.56	PK	35	216	H	6.38	48.94	74	25.06
6663.00	28.75	Ave	35	216	H	6.38	35.13	54	18.87
7323.00	41.48	PK	332	136	H	7.67	49.15	74	24.85
7323.00	28.94	Ave	332	136	H	7.67	36.61	54	17.39
High Channel (2480MHz)									
349.25	36.89	QP	279	195	V	-9.83	27.06	46	18.94
2480.00	95.68	PK	72	145	V	-6.01	89.67	/	/
2480.00	89.13	Ave	72	145	V	-6.01	83.12	/	/
2480.00	94.80	PK	122	210	H	-6.01	88.79	/	/
2480.00	88.37	Ave	122	210	H	-6.01	82.36	/	/
2483.50	44.46	PK	114	152	H	-6.01	38.45	74	35.55
2483.50	31.74	Ave	114	152	H	-6.01	25.73	54	28.27
2689.00	44.34	PK	106	121	H	-4.94	39.40	74	34.60
2689.00	32.06	Ave	106	121	H	-4.94	27.12	54	26.88
4960.00	44.38	PK	318	146	V	1.97	46.35	74	27.65
4960.00	30.28	Ave	318	146	V	1.97	32.25	54	21.75
6348.00	43.57	PK	243	222	H	5.35	48.92	74	25.08
6348.00	29.68	Ave	243	222	H	5.35	35.03	54	18.97
7440.00	41.85	PK	206	147	H	7.79	49.64	74	24.36
7440.00	27.57	Ave	206	147	H	7.79	35.36	54	18.64

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

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 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Procedure

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.

Test Data**Environmental Conditions**

Temperature:	23.4 °C
Relative Humidity:	49 %
ATM Pressure:	101.1 kPa

The testing was performed by Ada Yu on 2017-08-23.

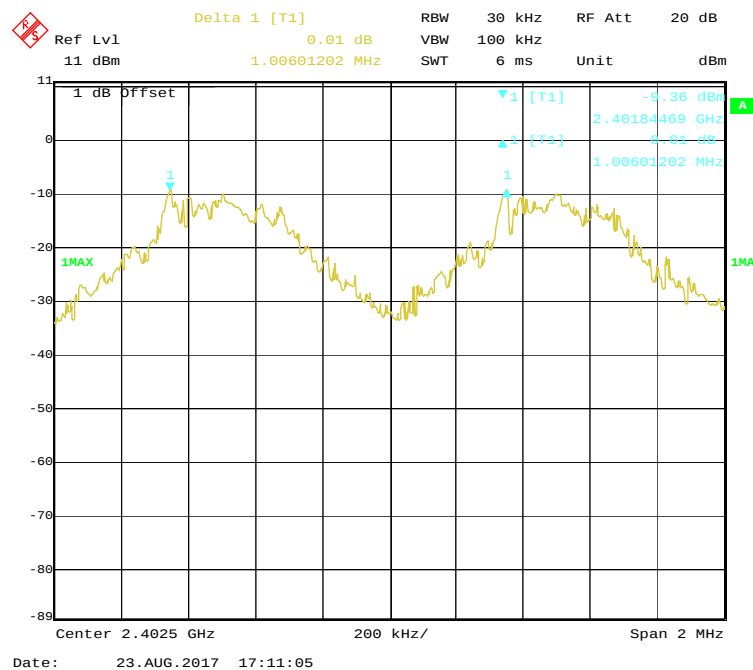
EUT operation mode: Hopping

Test Result: Compliance.

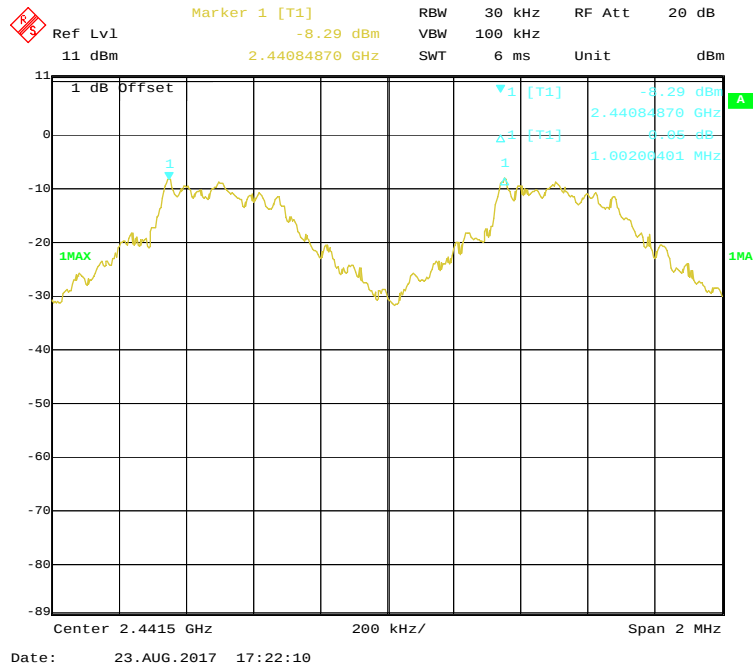
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.006	0.553	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.553	Pass
	Adjacent	2442			
	High	2480	1.002	0.553	Pass
	Adjacent	2479			
EDR ($\pi/4$-DQPSK)	Low	2402	0.998	0.846	Pass
	Adjacent	2403			
	Middle	2441	0.998	0.842	Pass
	Adjacent	2442			
	High	2480	0.998	0.846	Pass
	Adjacent	2479			
EDR (8-DPSK)	Low	2402	1.010	0.842	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.846	Pass
	Adjacent	2442			
	High	2480	1.003	0.846	Pass
	Adjacent	2479			

Note: Limit = 20 dB bandwidth*2/3

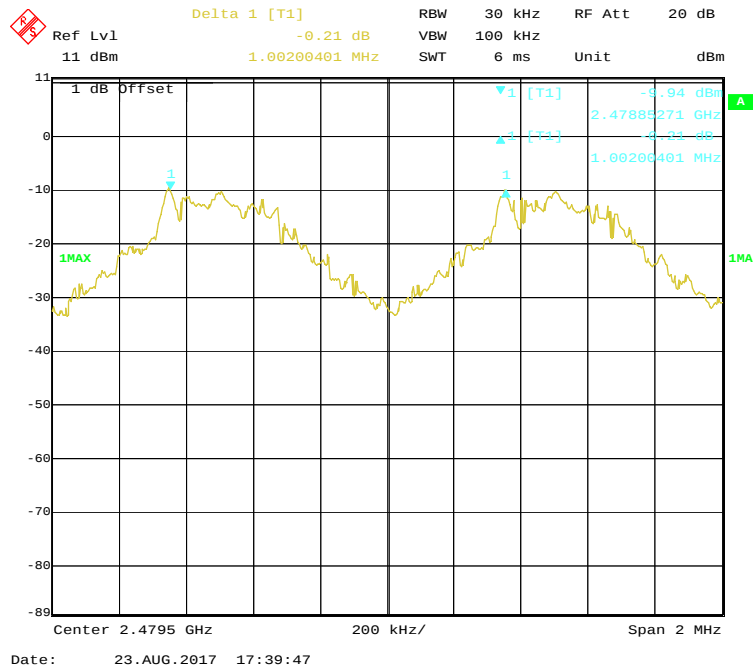
BDR (GFSK): Low Channel



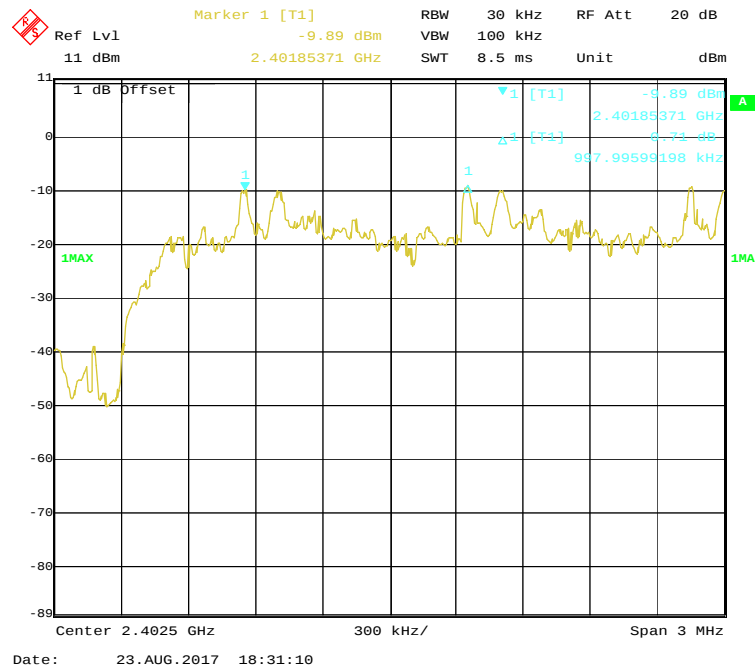
BDR (GFSK): Middle Channel



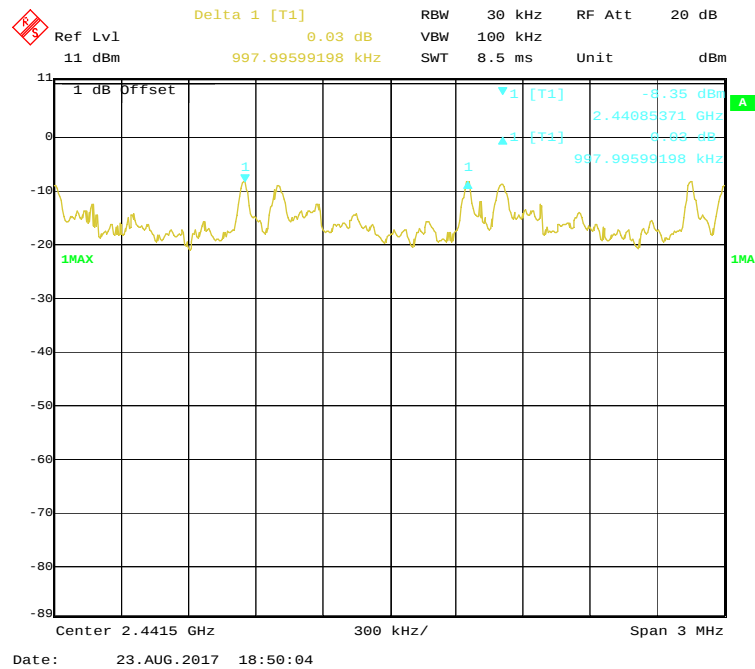
BDR (GFSK): High Channel

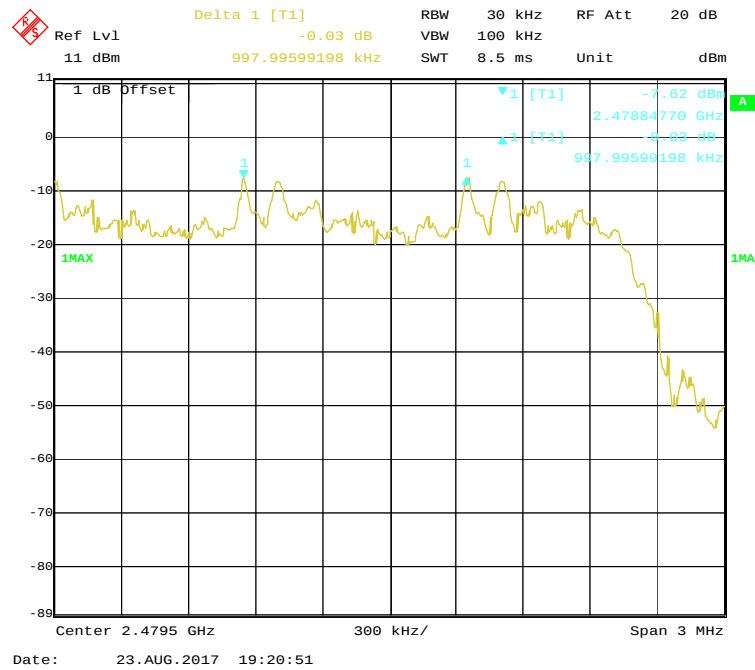
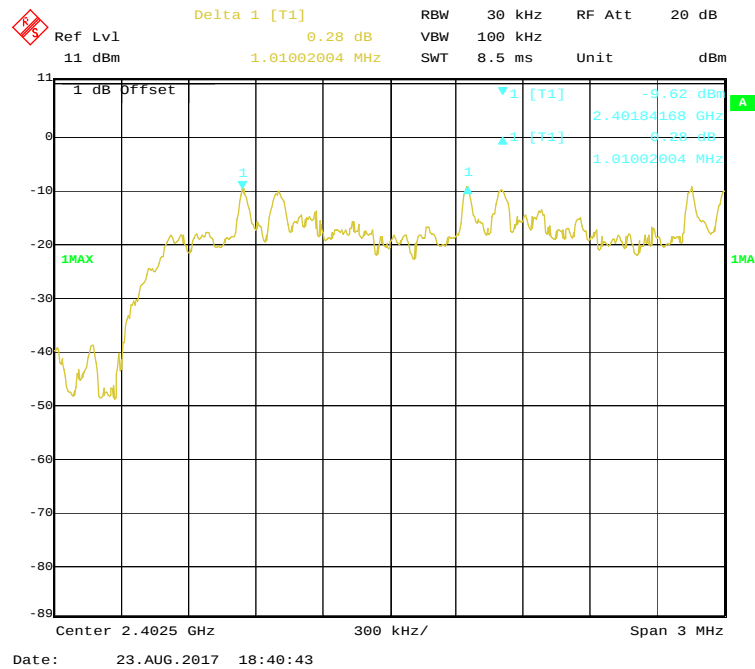


EDR ($\pi/4$ -DQPSK): Low Channel

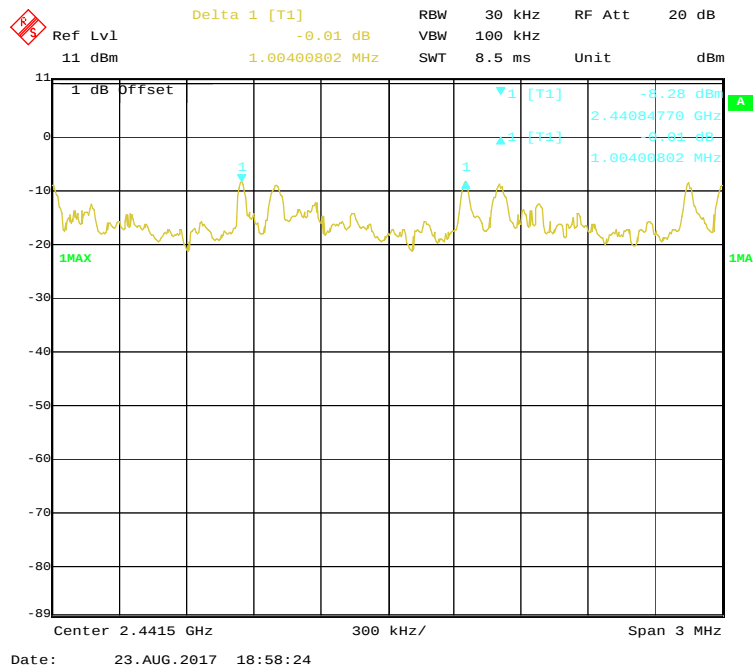


EDR ($\pi/4$ -DQPSK): Middle Channel

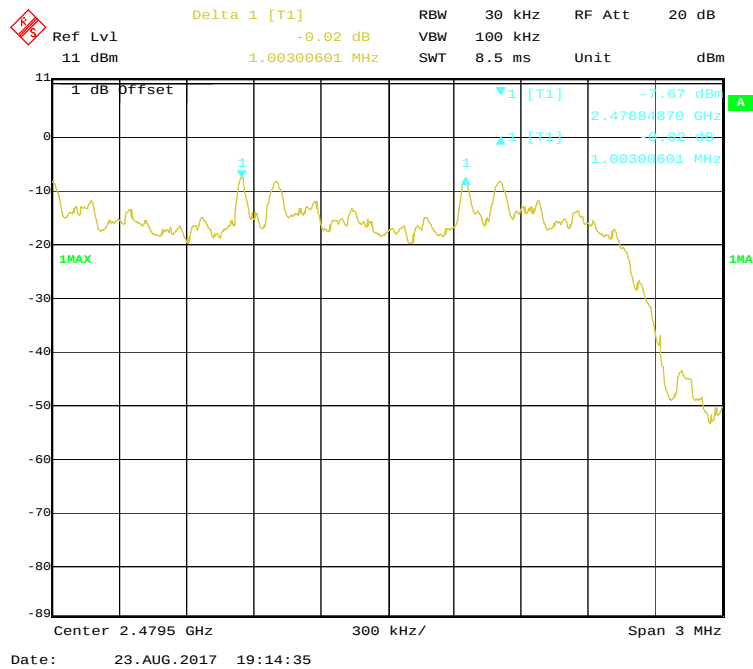


EDR ($\pi/4$ -DQPSK): High Channel**EDR (8-DPSK): Low Channel**

EDR (8-DPSK): Middle Channel



EDR (8-DPSK): High Channel



FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH**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 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. 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 Data**Environmental Conditions**

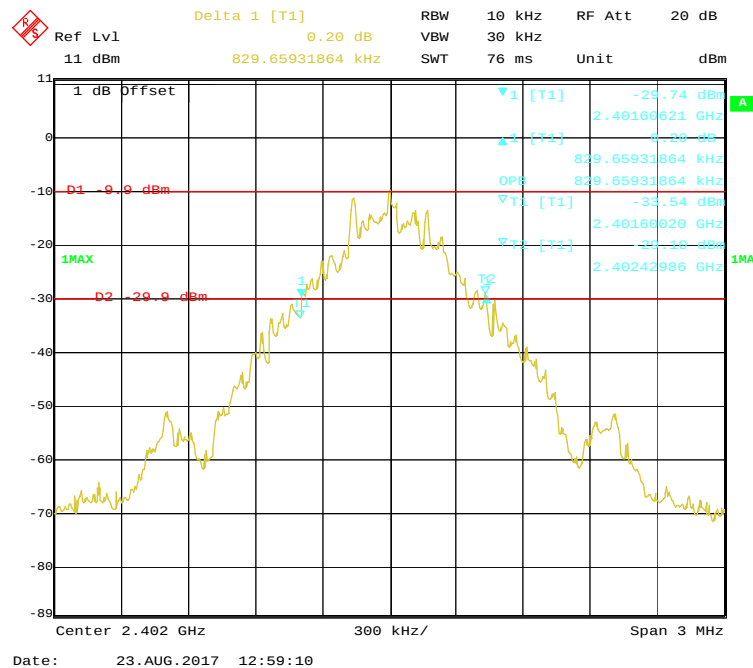
Temperature:	23.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Ada Yu on 2017-08-23.

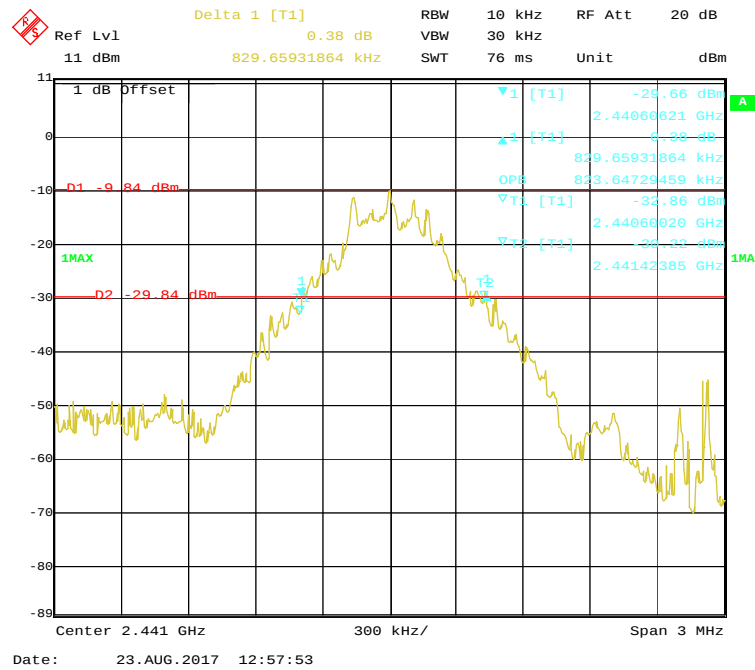
EUT operation mode: Transmitting

Test Result: Compliance.

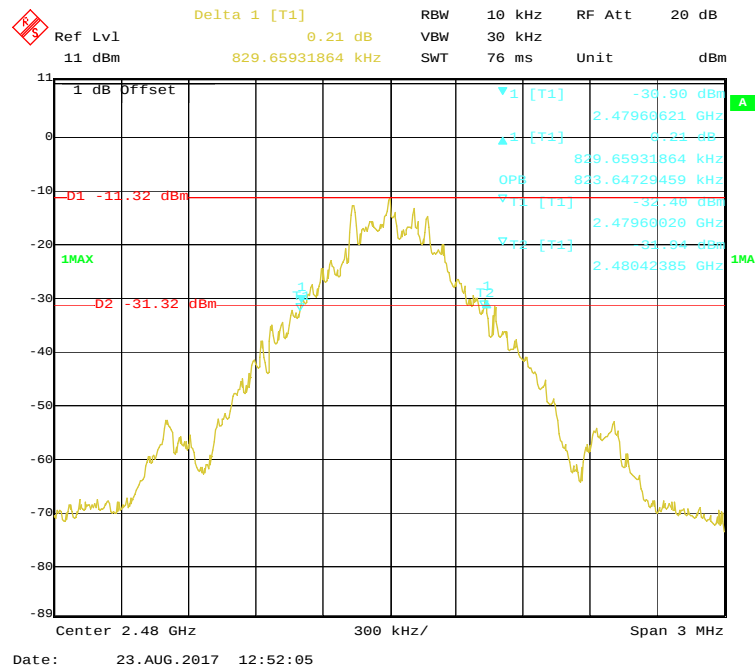
Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.830
	Middle	2441	0.830
	High	2480	0.830
EDR ($\pi/4$-DQPSK)	Low	2402	1.269
	Middle	2441	1.263
	High	2480	1.269
EDR (8-DPSK)	Low	2402	1.263
	Middle	2441	1.269
	High	2480	1.269

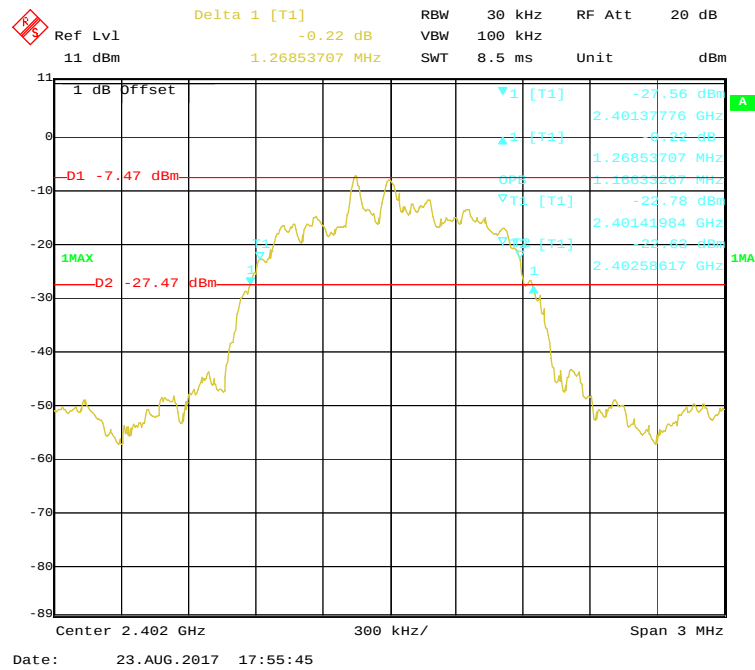
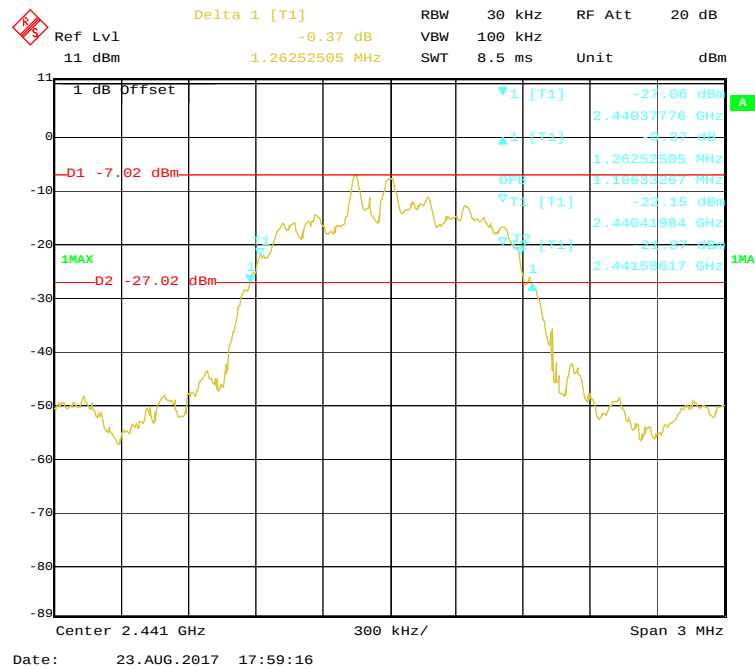
BDR (GFSK): Low Channel

BDR (GFSK): Middle Channel

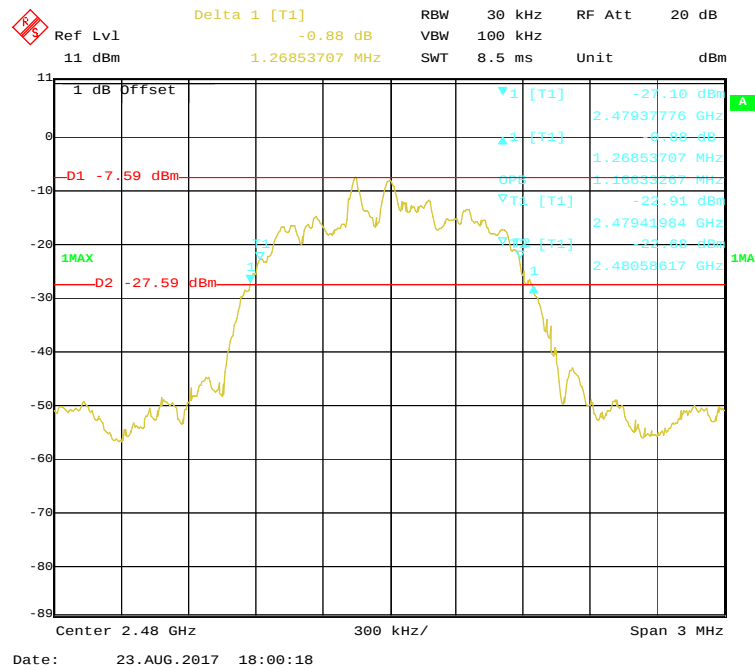


BDR (GFSK): High Channel

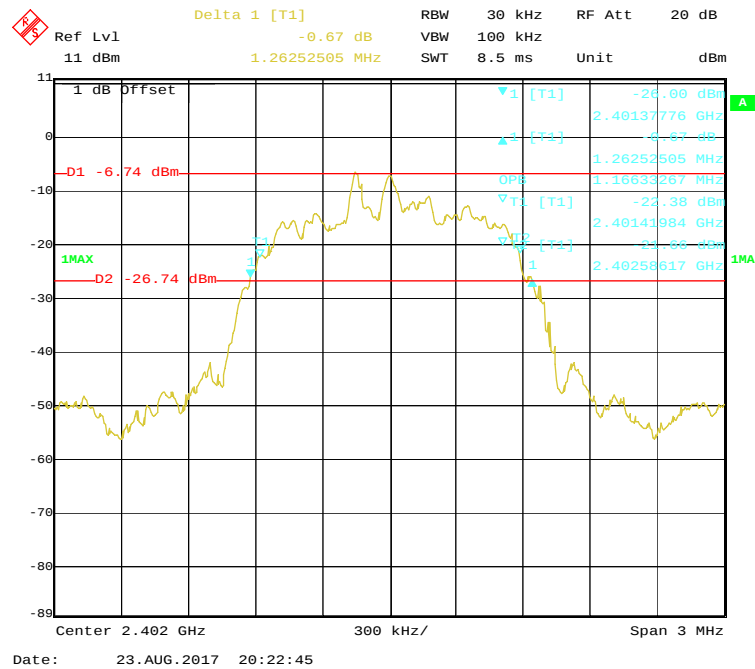


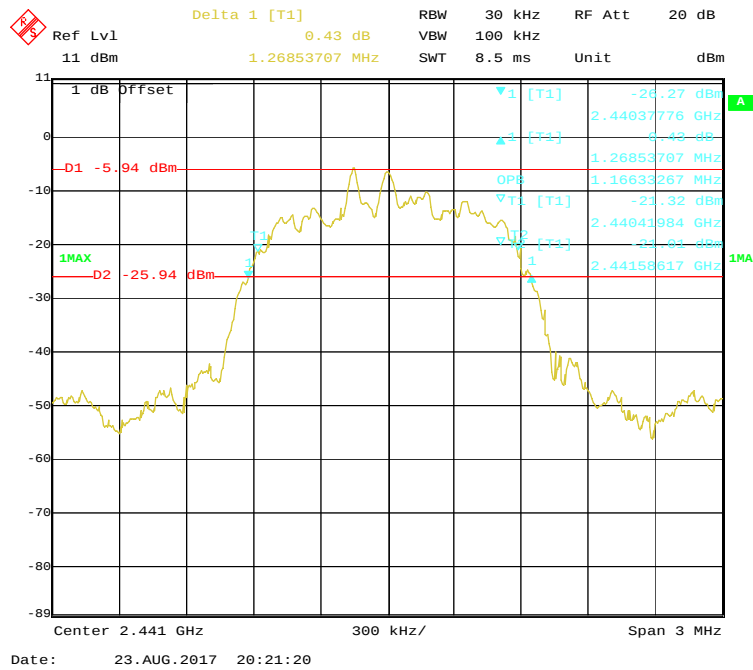
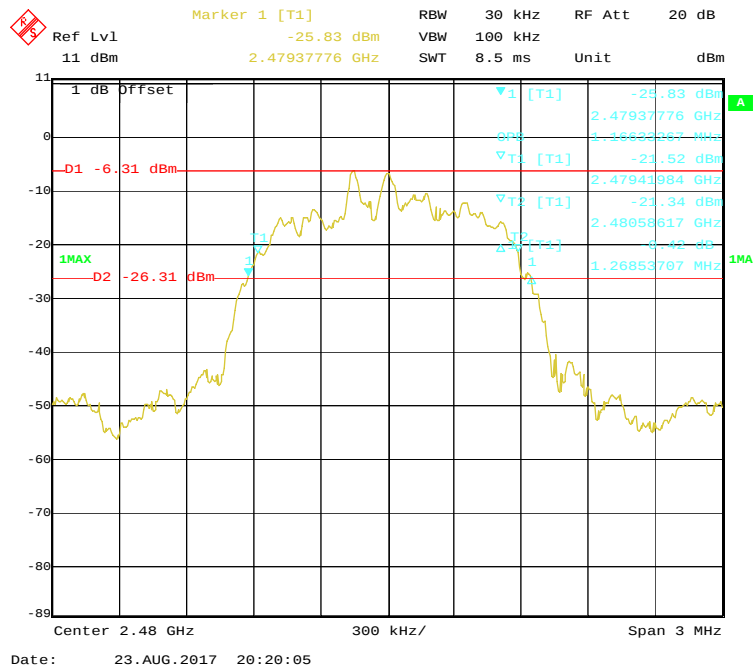
EDR ($\pi/4$ -DQPSK): Low Channel**EDR($\pi/4$ -DQPSK): Middle Channel**

EDR ($\pi/4$ -DQPSK): High Channel



EDR (8-DPSK): Low Channel



EDR (8-DPSK): Middle Channel**EDR (8-DPSK): 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 Data**Environmental Conditions**

Temperature:	23.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

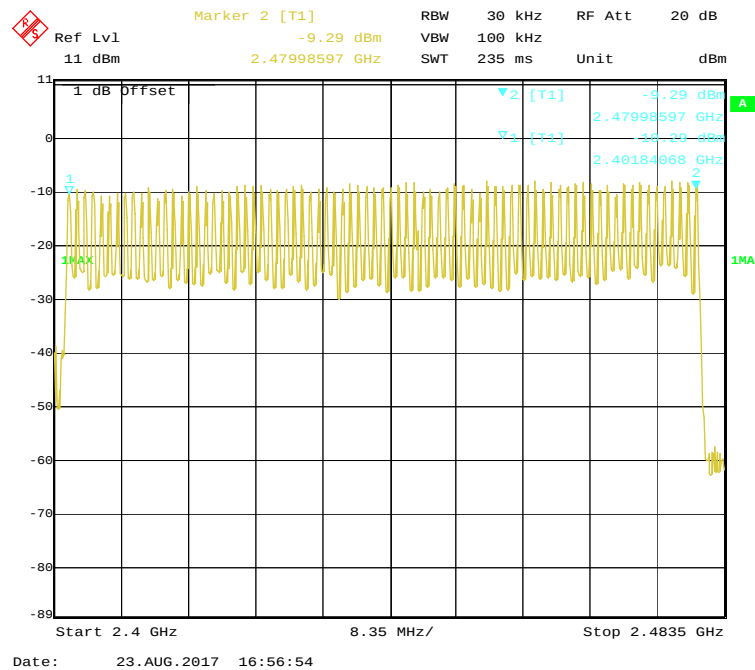
The testing was performed by Ada Yu on 2017-08-23.

EUT operation mode: Hopping

Test Result: Compliance.

Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	≥ 15
EDR ($\pi/4$ -DQPSK)	2400-2483.5	79	≥ 15
EDR (8-DPSK)	2400-2483.5	79	≥ 15

BDR (GFSK): Number of Hopping Channels



Ref Lvl 11 dBm
 11 dBm
 2.40185371 GHz
 RBW 30 kHz
 VBW 100 kHz
 SWT 235 ms
 RF Att 20 dB
 Unit dBm

Marker 1 [T1]
 -9.33 dBm
 2.40185371 GHz

1 dB Offset
 1MAX
 1 [T1]
 2.47998597 GHz

Start 2.4 GHz
 8.35 MHz/
 Stop 2.4835 GHz

Date: 23.AUG.2017 18:24:58

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

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	23.4 °C
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Ada Yu on 2017-08-23.

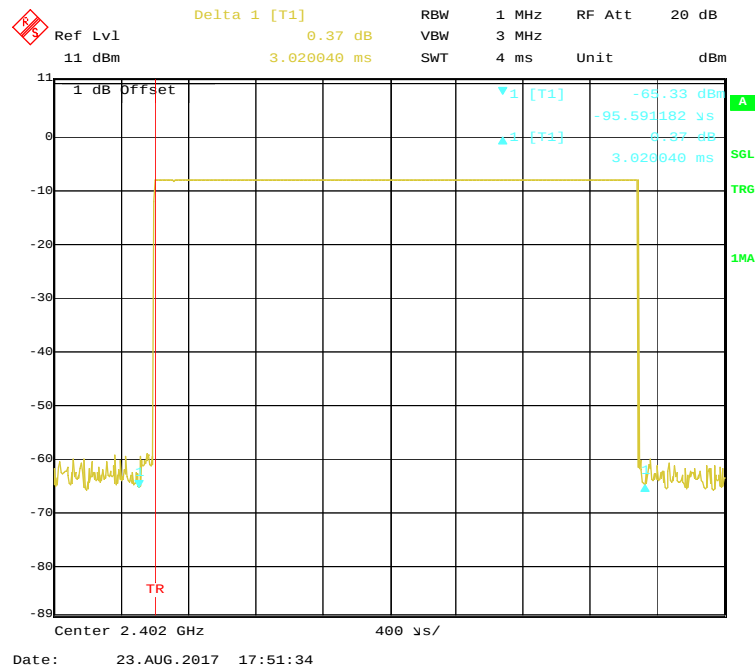
EUT operation mode: Hopping

Test Result: Compliance.

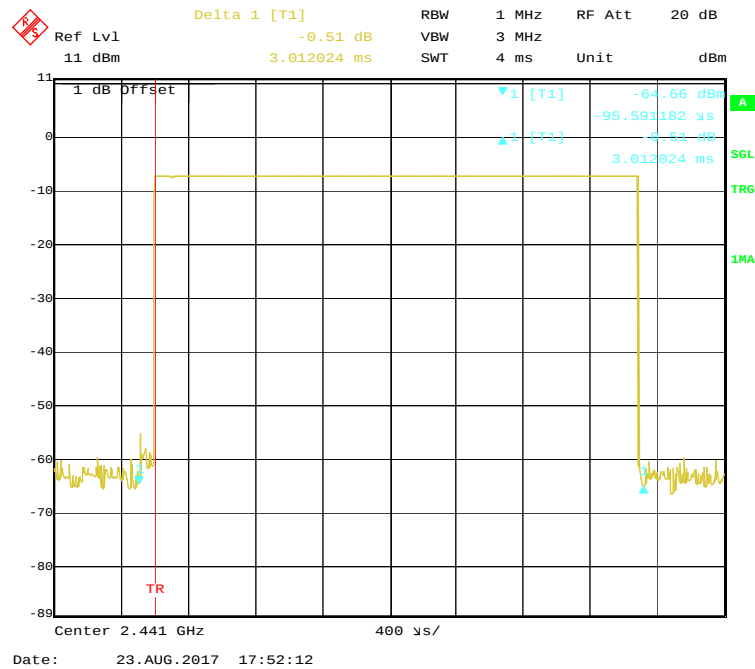
The EUT was tested in DH1, DH3, DH5, 2DH1, 2DH3, 2DH5, 3DH1, 3DH3 & 3DH5 mode, and the worst case DH5, 2DH5 & 3DH5 were recored.

Mode		Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR (GFSK)	DH5	Low	3.020	0.322	0.4	Pass
		Middle	3.012	0.321	0.4	Pass
		High	2.996	0.320	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR ($\pi/4$ -DQPSK)	2DH5	Low	2.913	0.311	0.4	Pass
		Middle	2.937	0.313	0.4	Pass
		High	3.017	0.322	0.4	Pass
		Note: 2DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8-DPSK)	3DH5	Low	2.953	0.315	0.4	Pass
		Middle	2.953	0.315	0.4	Pass
		High	3.009	0.321	0.4	Pass
		Note: 3DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

BDR (GFSK): Pulse time, Low Channel, DH5



BDR (GFSK): Pulse time, Middle Channel, DH5



Delta 1 [T1] -0.07 dB

Ref Lvl 11 dBm

RBW 1 MHz

VBW 3 MHz

SWT 4 ms

Unit dBm

20 dB

1 dB Offset

1 [T1] -64.09 dBm

3 [T1] -95.591182 us

2.995992 ms

Center 2.48 GHz

400 us/

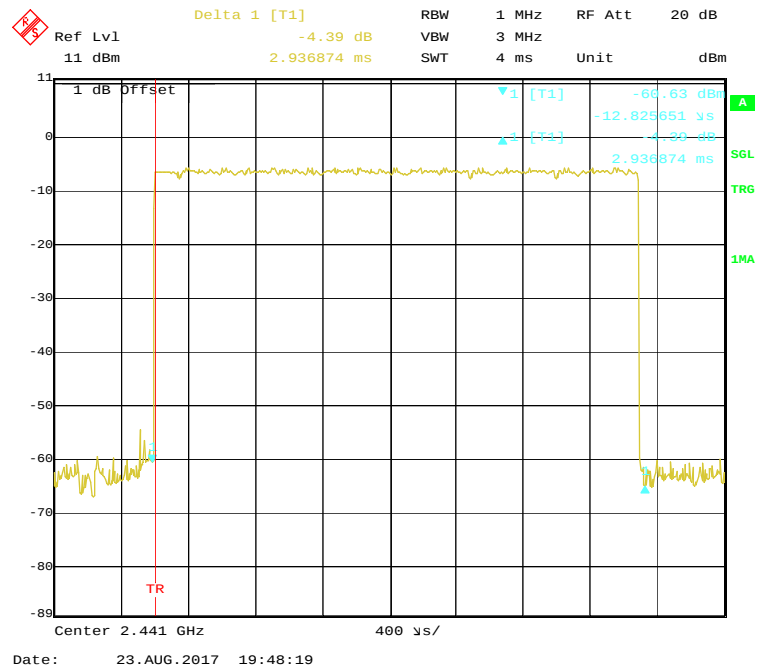
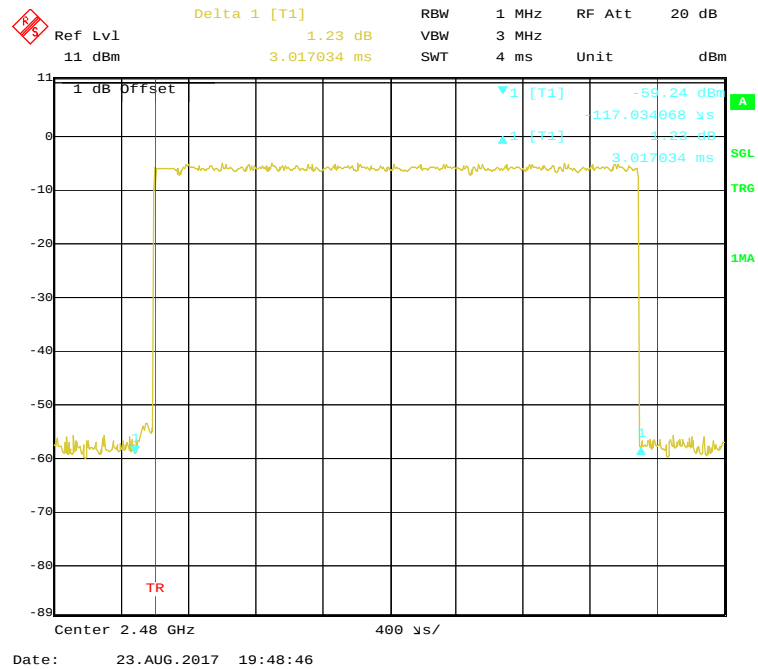
Date: 23. AUG. 2017 17:52:52

Delta 1 [T1] -2.19 dB
 RBW 1 MHz RF Att 20 dB
 Ref Lvl 11 dBm
 11 dBm 2.912826 ms
 VBW 3 MHz
 SWT 4 ms Unit dBm

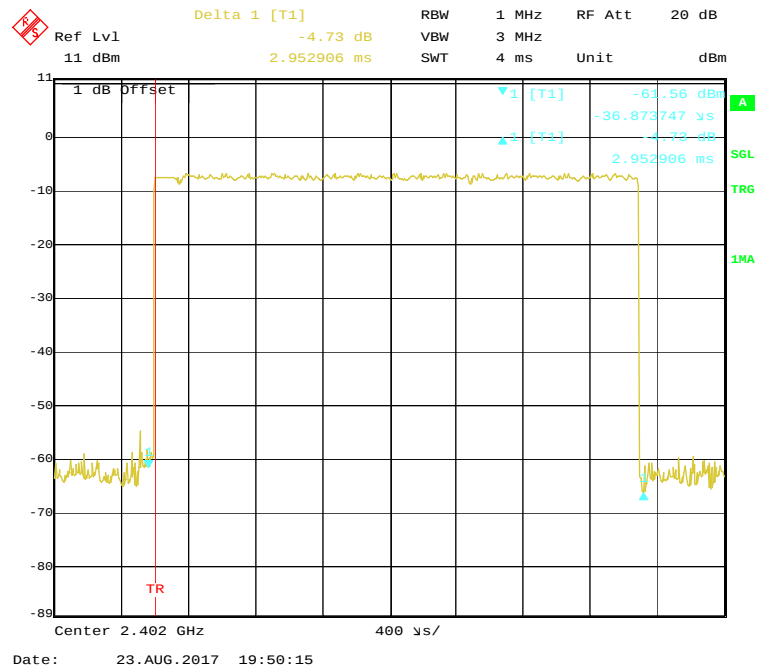
1 dB Offset
 1 [T1] -12.825651 dBm
 1 [T1] -12.825651 dBm
 2.912826 ms
 TRG
 1MA

Center 2.402 GHz 400 μ s/

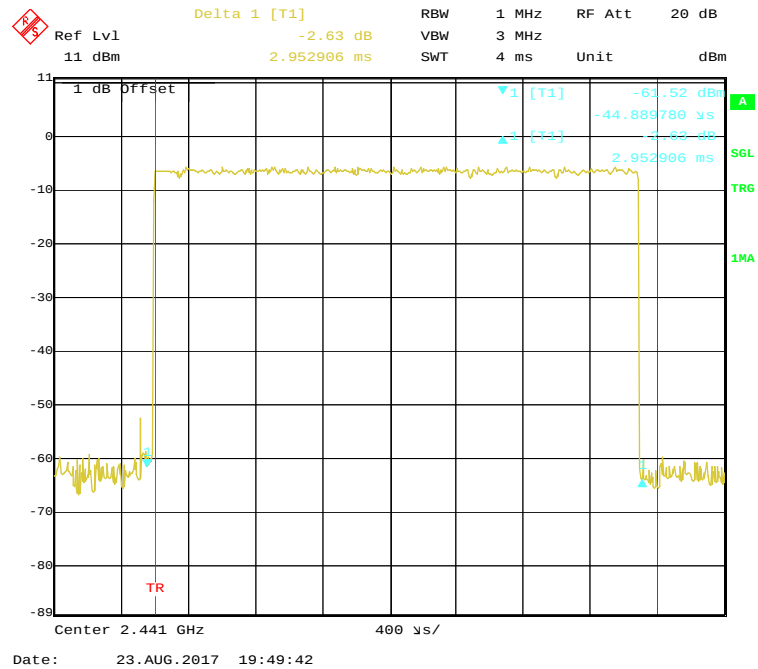
Date: 23.AUG.2017 19:47:37

EDR ($\pi/4$ -DQPSK):Pulse time, Middle Channel, 2DH5**EDR ($\pi/4$ -DQPSK):Pulse time, High Channel, 2DH5**

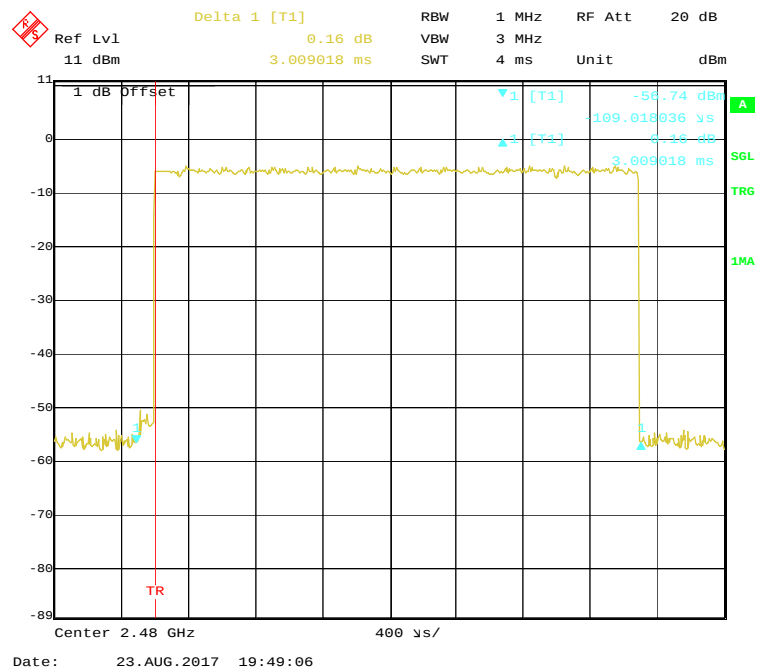
EDR (8-DPSK): Pulse time, Low Channel, 3DH5



EDR (8-DPSK): Pulse time, Middle Channel, 3DH5



EDR (8-DPSK): Pulse time, High Channel, 3DH5



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. And 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 Data

Environmental Conditions

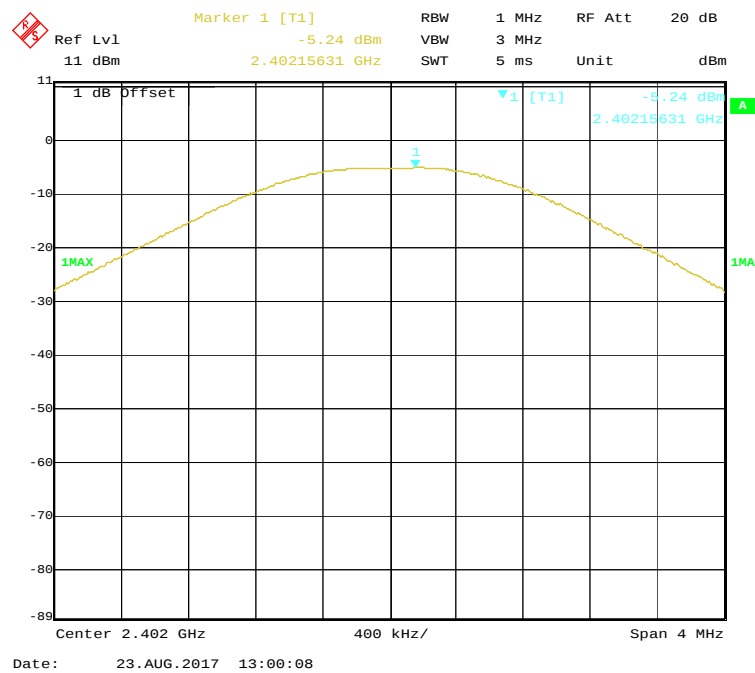
Temperature:	23.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

The testing was performed by Ada Yu on 2017-08-23.

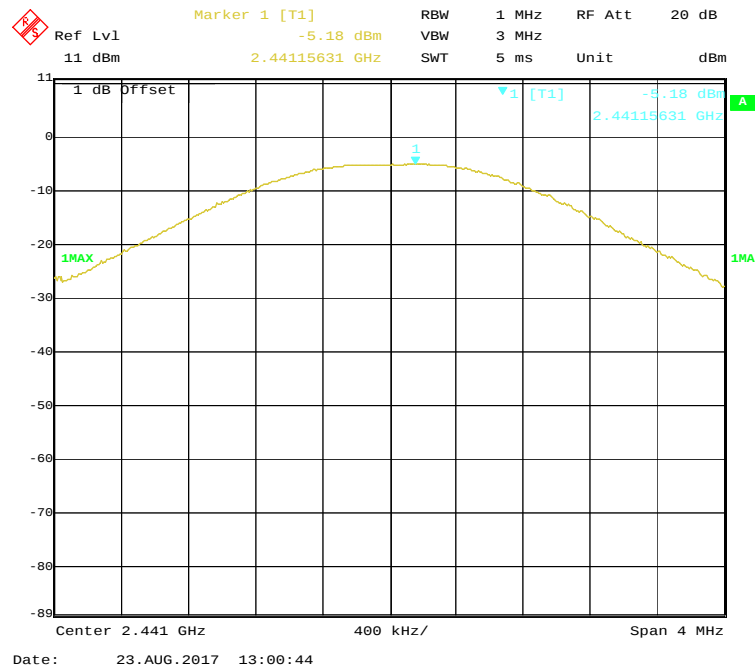
EUT operation mode: Transmitting

Test Result: Compliance.

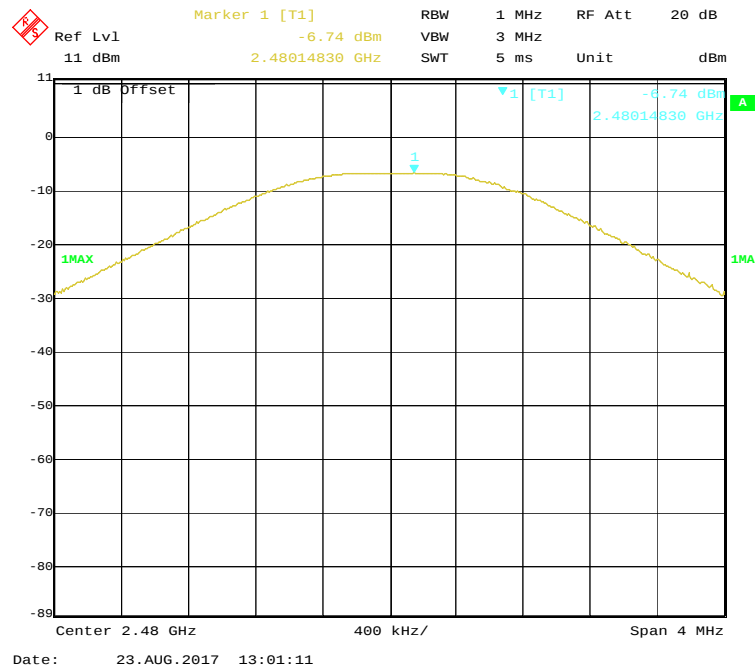
Mode	Channel	Frequency (MHz)	Output Power		Limit (mW)
			(dBm)	(mW)	
BDR (GFSK)	Low	2402	-5.24	0.30	1000
	Middle	2441	-5.18	0.30	1000
	High	2480	-6.74	0.21	1000
EDR ($\pi/4$-DQPSK)	Low	2402	-4.84	0.33	1000
	Middle	2441	-4.45	0.36	1000
	High	2480	-5.10	0.31	1000
EDR (8-DPSK)	Low	2402	-3.94	0.40	1000
	Middle	2441	-3.21	0.48	1000
	High	2480	-3.59	0.44	1000

BDR (GFSK): Low Channel

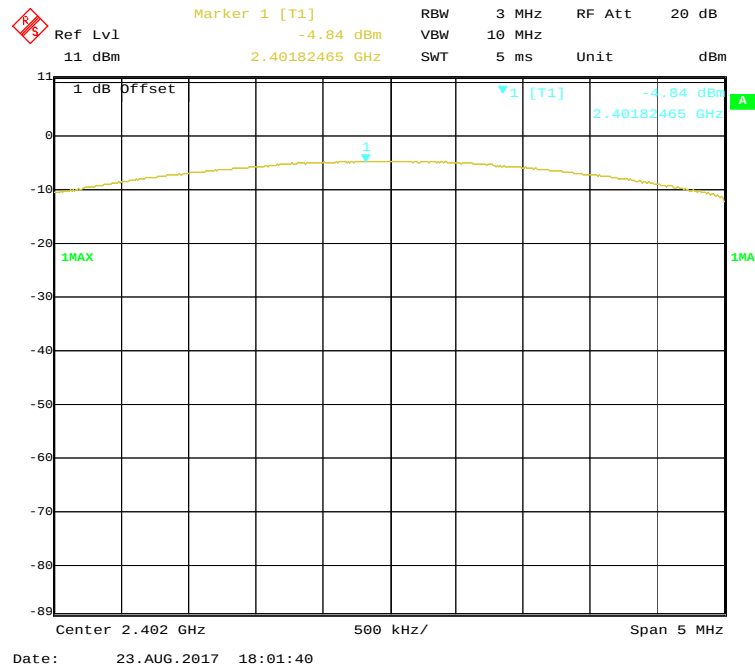
BDR (GFSK): Middle Channel



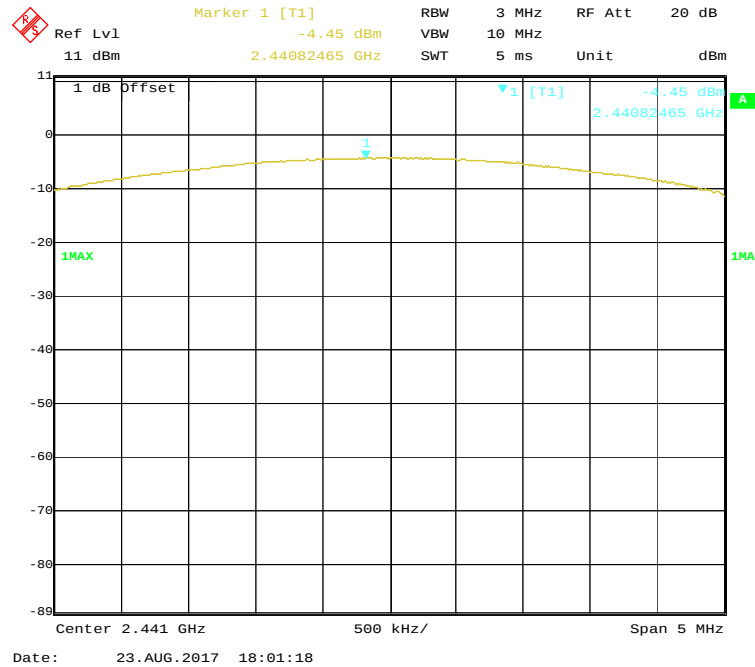
BDR (GFSK): High Channel



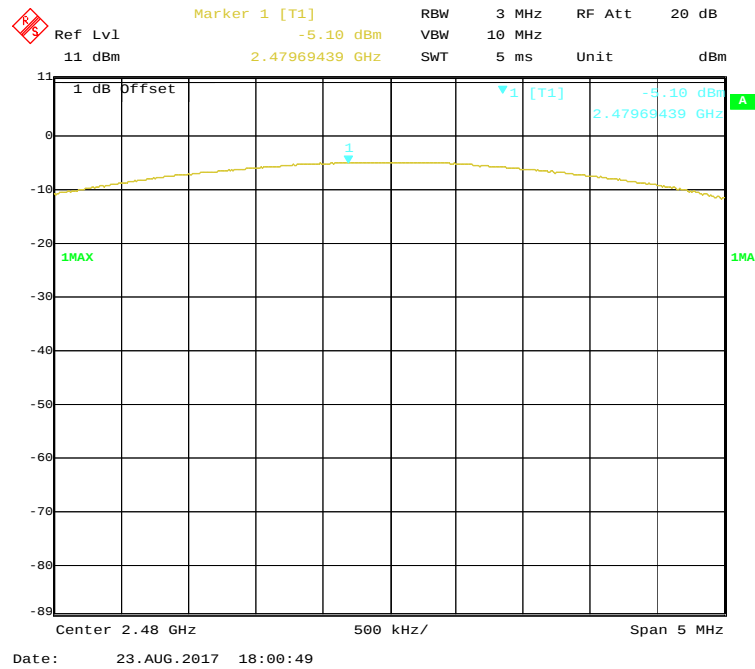
EDR($\pi/4$ -DQPSK): Low Channel



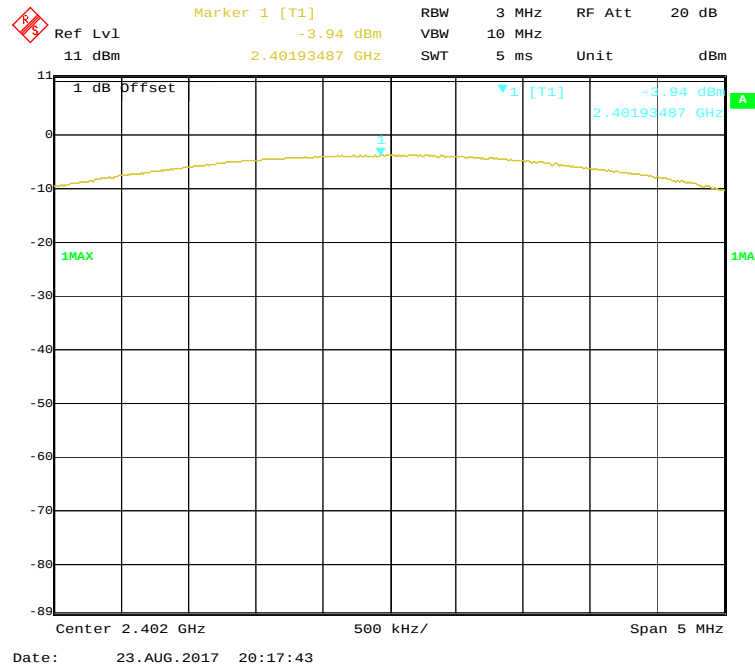
EDR($\pi/4$ -DQPSK): Middle Channel



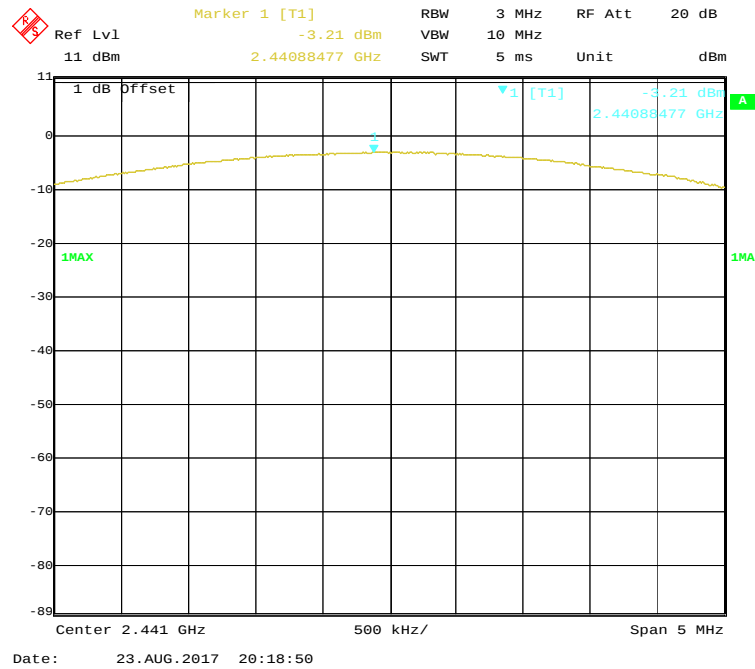
EDR($\pi/4$ -DQPSK): High Channel



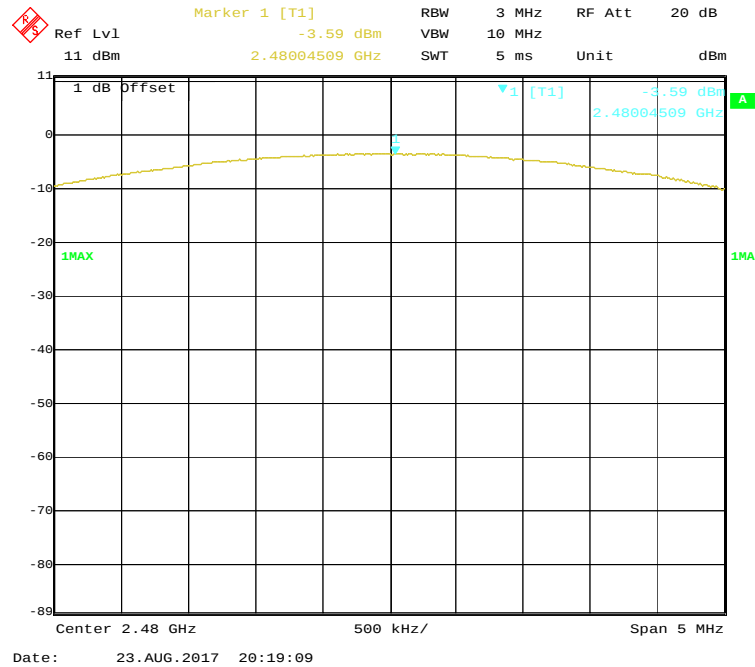
EDR(8-DPSK): Low Channel



EDR(8-DPSK): Middle Channel



EDR(8-DPSK): 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 of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

Environmental Conditions

Temperature:	23.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

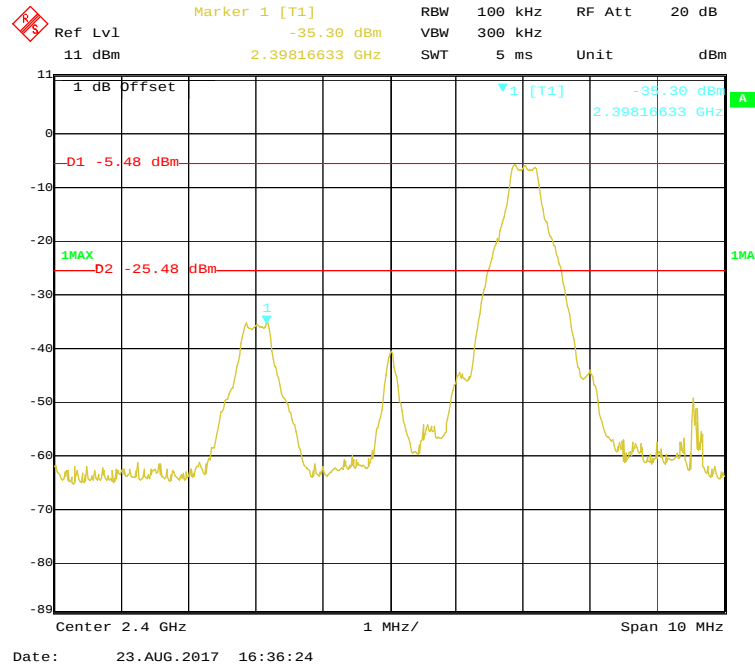
The testing was performed by Ada Yu on 2017-08-23.

EUT operation mode: Transmitting & Hopping

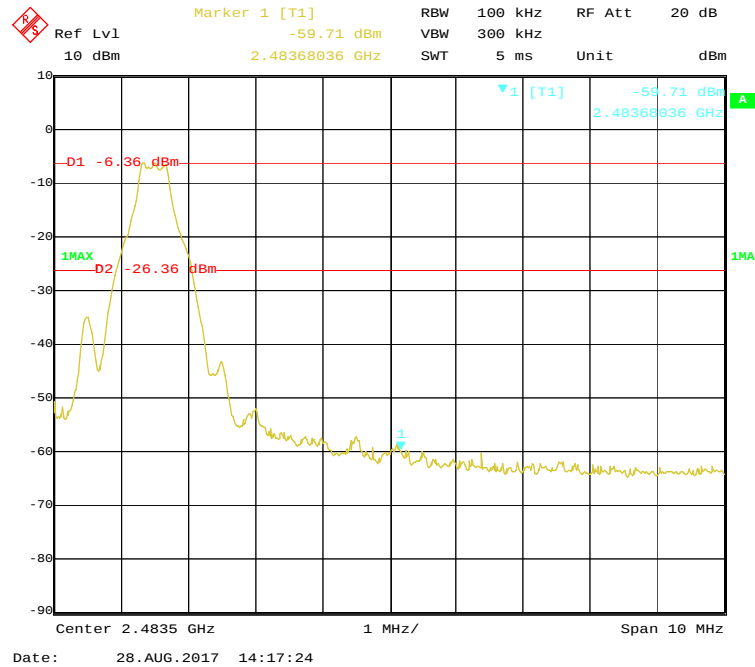
Test Result: Compliance.

Band Edge

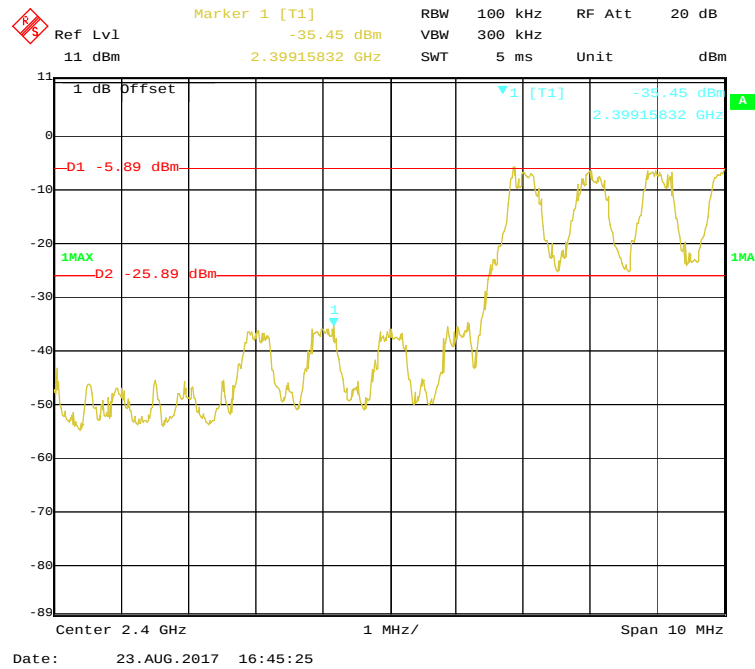
BDR (GFSK): Left Side



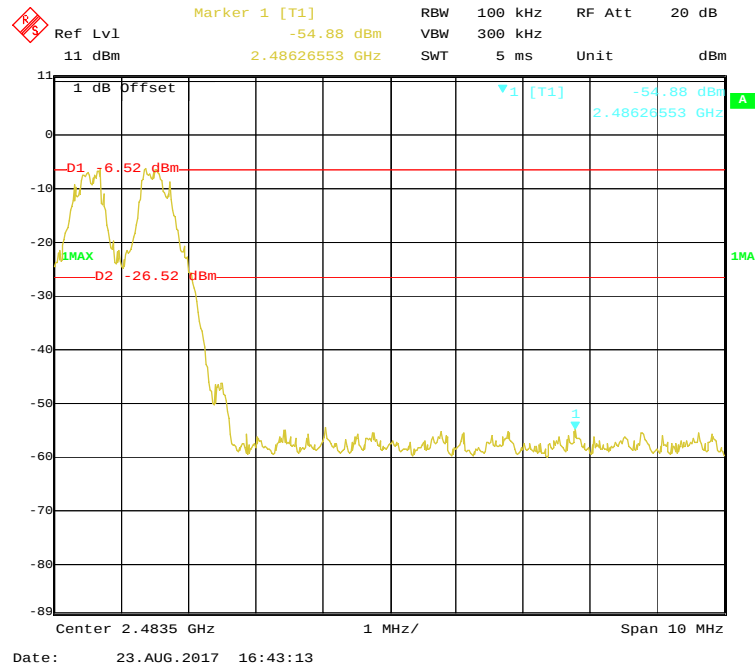
BDR (GFSK): Right Side

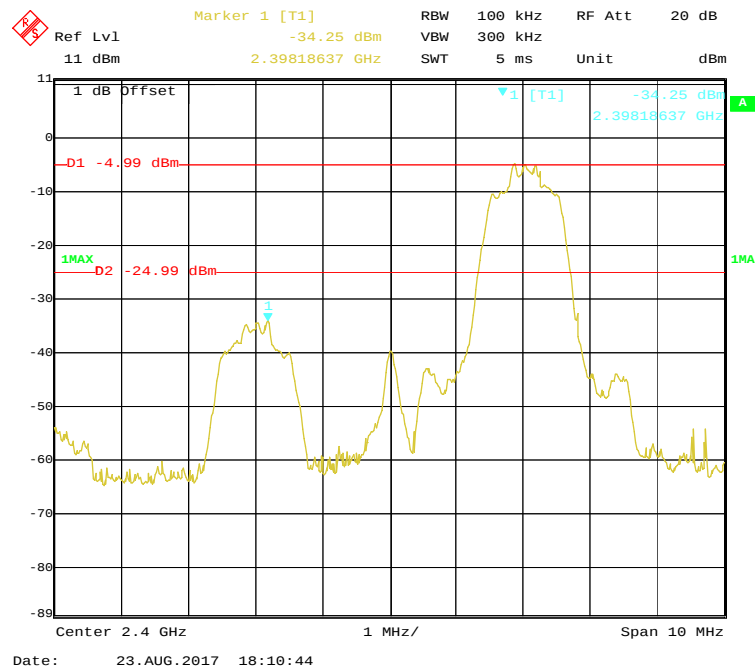
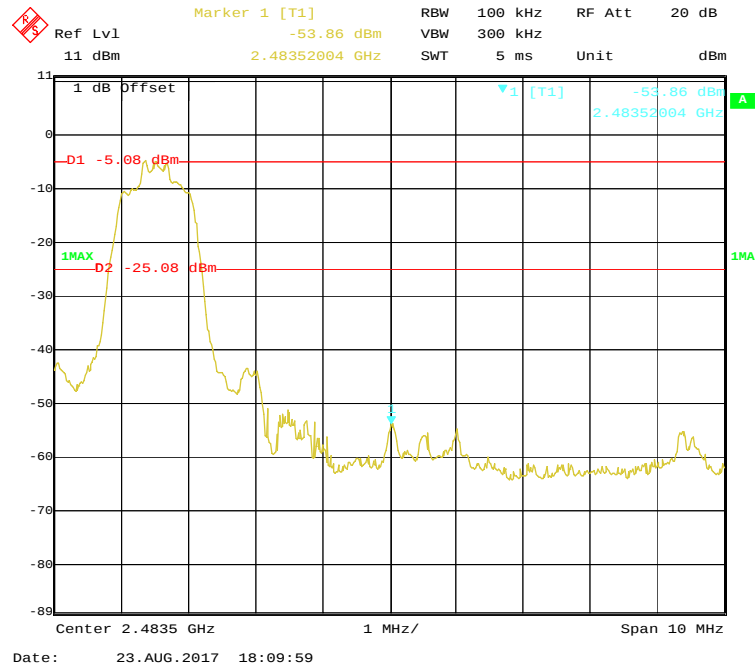


BDR (GFSK): Left Side-Hopping

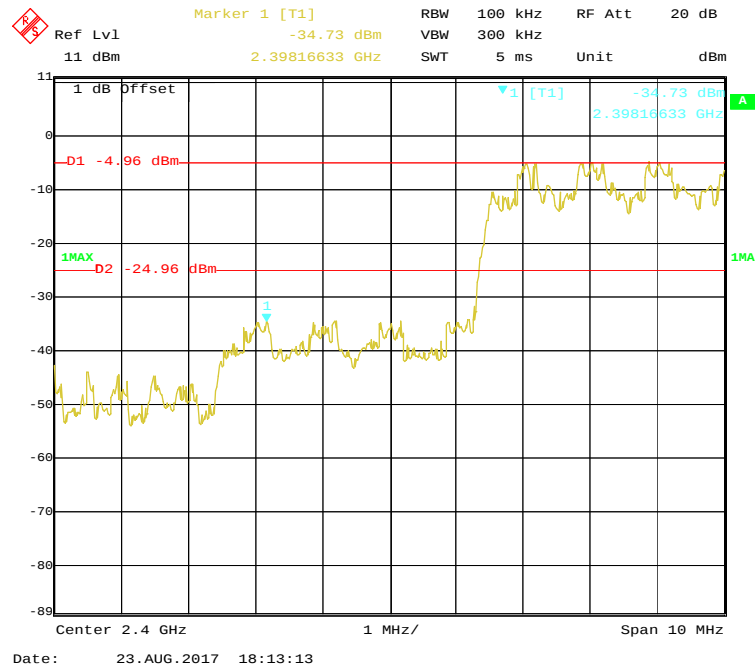


BDR (GFSK): Right Side-Hopping

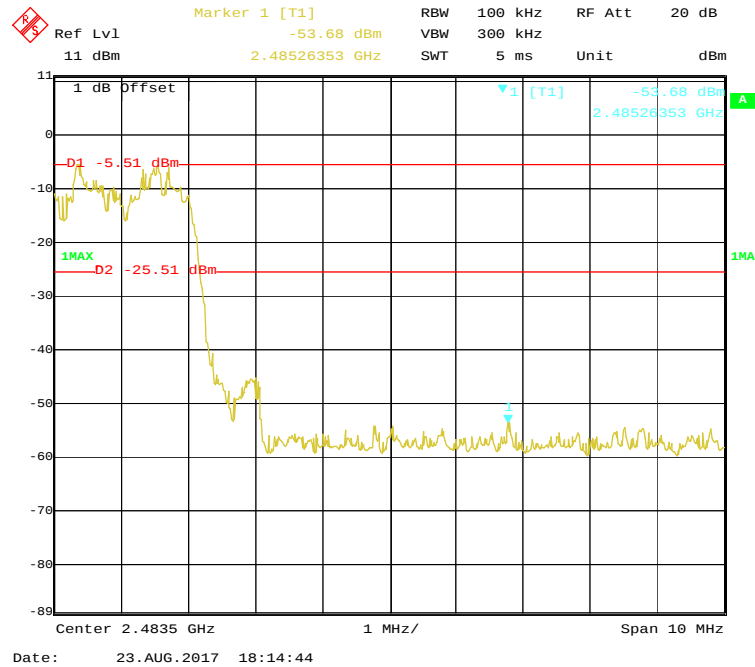


EDR ($\pi/4$ -DQPSK): Left Side**EDR ($\pi/4$ -DQPSK): Right Side**

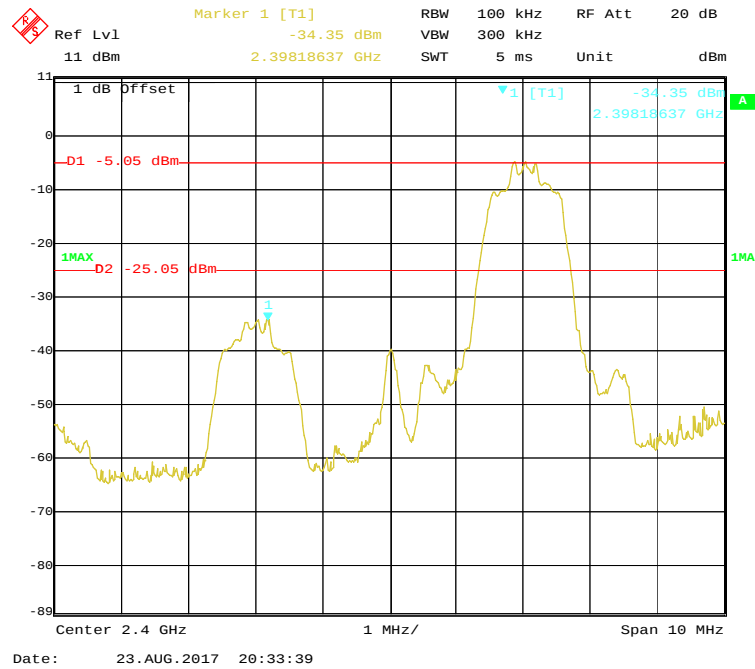
EDR ($\pi/4$ -DQPSK): Left Side-Hopping



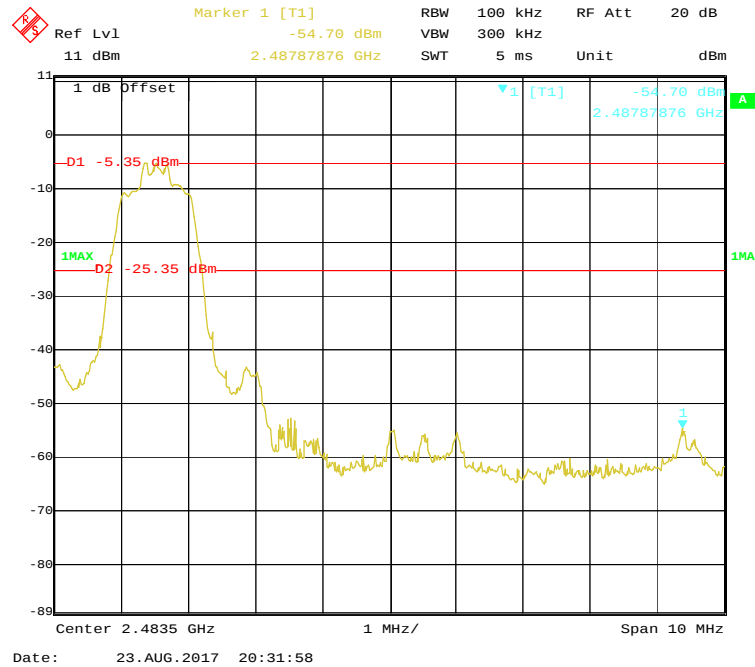
EDR ($\pi/4$ -DQPSK): Right Side-Hopping



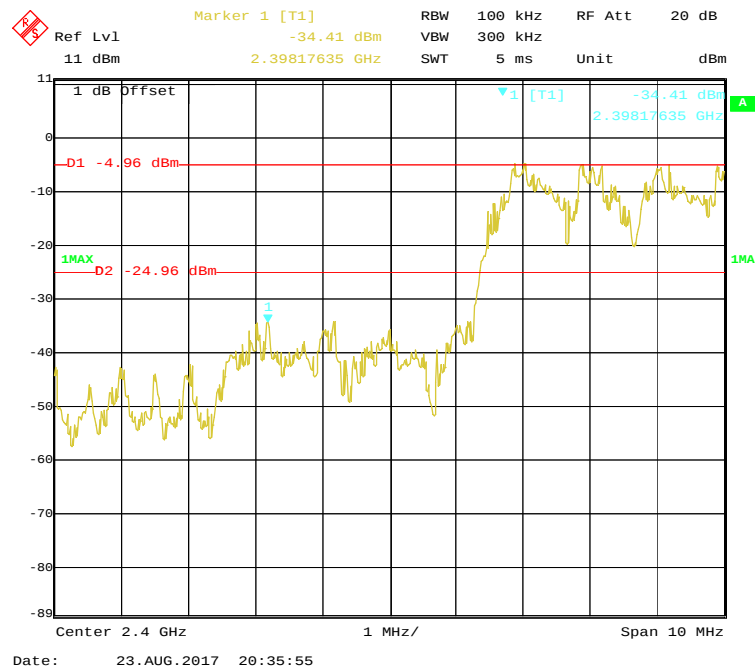
EDR (8-DPSK): Left Side



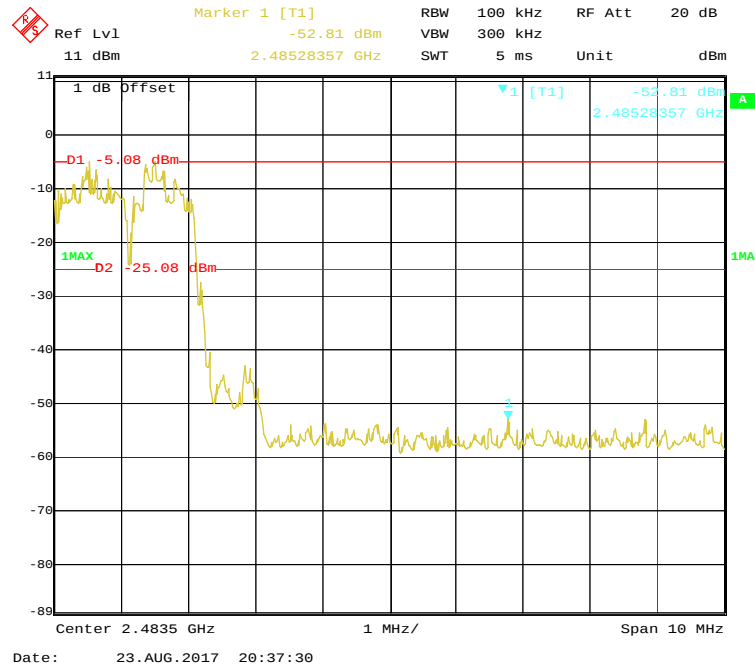
BDR (8-DPSK): Right Side



EDR (8-DPSK): Left Side-Hopping



BDR (8-DPSK): Right Side-Hopping



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