

FCC PART 15.247 TEST REPORT

For

Shenzhen Excera Technology Co., Ltd.

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Shenzhen

FCC ID: 2AE6CEM8100U2

Report Type: Original Report	Product Type: Digital Mobile Radio
Report Number: RSZ170508003-00B	
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Shenzhen Excera Technology Co., Ltd.* 's product, model number: *EM8100 U2* (FCC ID: *2AE6CEM8100U2*) in this report is a *Digital Mobile Radio* which was measured approximately: 174 mm (L) * 190 mm (W) * 60 mm (H), rated with input voltage: DC 13.6 V from DC power supply.

** All measurement and test data in this report was gathered from production sample serial number: 1700928 (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2017-05-08.*

Objective

This test report is prepared on behalf of *Shenzhen Excera Technology 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, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 90 TNB and FCC Part 15.247 DTS submissions with FCC ID: 2AE6CEM8100U2.

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 at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
RF conducted test with spectrum		±0.9dB
RF Output Power with Power meter		±0.5dB
Radiated emission	30MHz~1GHz	±5.91dB
	Above 1G	±4.92dB
Occupied Bandwidth		±0.5kHz
Temperature		±1.0°C
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) has been accredited to ISO/IEC 17025 by CNAS(Lab code: L9963). And accredited to ISO/IEC 17025 by A2LA(Lab code: 4323.01), the FCC Designation No. CN1185 under the KDB 974614 D01.

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.

Bay Area Compliance Laboratories Corp. (Kunshan) was registered with ISED Canada under ISED Canada Registration Number 3062E.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode.

EUT Exercise Software

“bluetest 3” exercise software was used.

Special Accessories

No special accessory.

Equipment Modifications

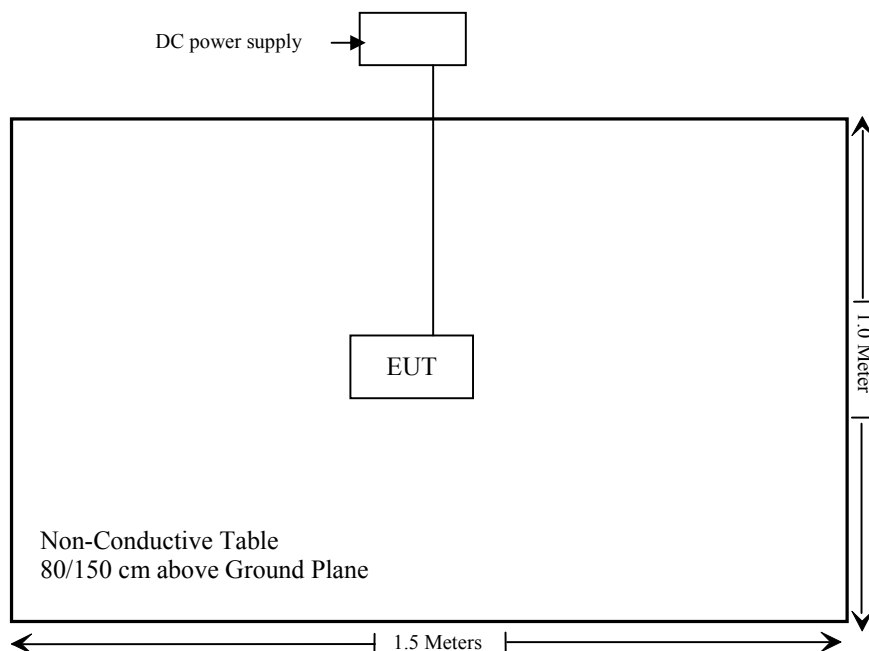
No modification was made to the EUT tested.

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable DC Cable	1.5	DC Power supply	EUT

Block Diagram of Test Setup

For radiated emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i) & §1.1307 (b) (1) & §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§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

Note: The EUT is powered by DC power.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiation test					
Sonoma Instrument	Amplifier	330	171377	2016-12-12	2017-12-12
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-25
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-09-08	2017-09-08
EMCO	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-25
ETS	Horn Antenna	3115	6229	2016-12-12	2019-12-12
R&S	Auto test Software	EMC32	V 09.10.0	NCR	NCR
haojintech	Coaxial Cable	Cable-1	001	2016-12-12	2017-12-12
haojintech	Coaxial Cable	Cable-2	002	2016-12-12	2017-12-12
haojintech	Coaxial Cable	Cable-3	003	2016-12-12	2017-12-12
MICRO-COAX	Coaxial Cable	Cable-4	004	2016-12-12	2017-12-12
MICRO-COAX	Coaxial Cable	Cable-5	005	2016-12-12	2017-12-12
RF Conducted test					
BACL	TS 8997 Cable-01	T-KS-EMC086	T-KS-EMC086	2016-12-09	2017-12-08
BACL	RF cable	KS-LAB-012	KS-LAB-012	2016-12-15	2017-12-15
WEINSCHEL	3dB Attenuator	5326	N/A	2016-06-18	2017-06-18
Agilent	Power Meter	N1912A	MY5000492	2016-11-17	2017-11-16
Agilent	Power Sensor	N1921A	MY54210024	2016-11-17	2017-11-16
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-21

*** 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) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

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/f ²)	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

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

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:

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

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2402-2480	-0.5	0.89	7.5	5.62	60	0.0001	1

Simultaneous transmitting consideration:

Refer to the part 90 TNB report, the highest MPE for UHF band is 1.13 mW/cm²

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0001/1 + 1.13/1.5 = 0.7534 < 1$$

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 60cm from nearby persons.

Result: Compliance

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.

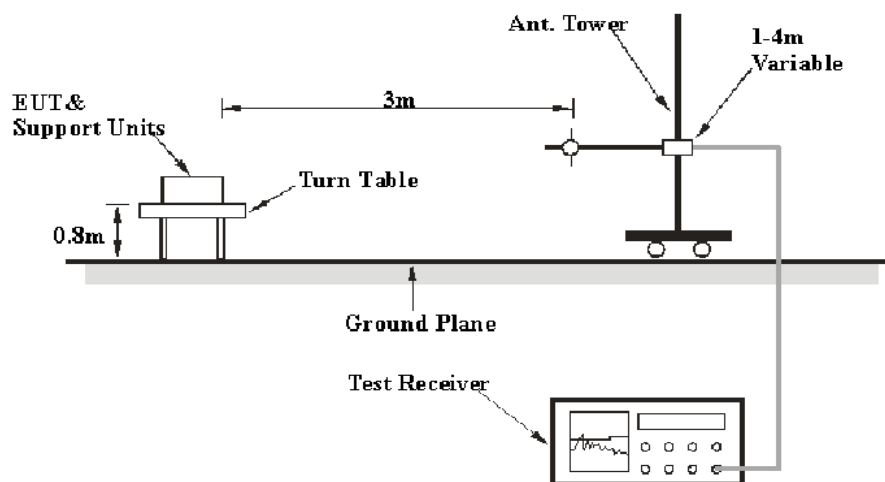
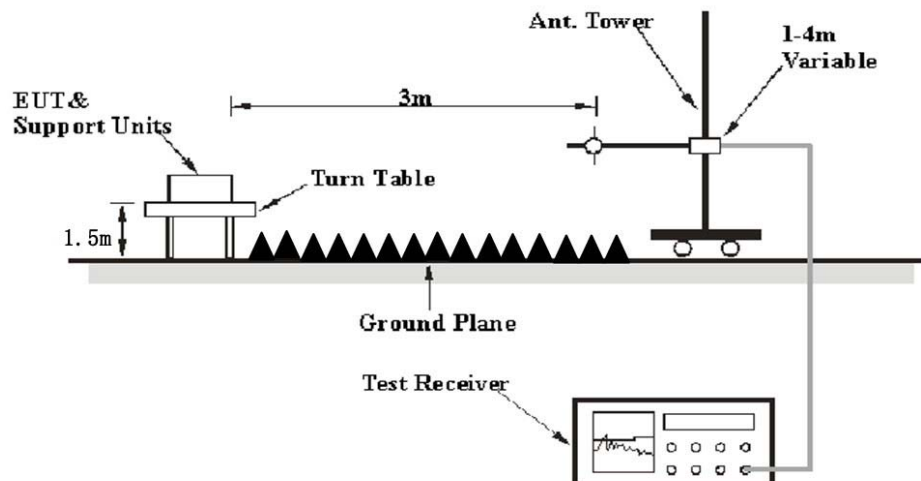
Antenna Connector Construction

The EUT has one internal antenna arrangement for bluetooth which was permanently attached and the antenna gain is -0.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

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, 205 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	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave.

Test Procedure

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

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.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cisp}}r$$

In BAEL, $U_{(L_m)}$ is less than $U_{\text{cisp}}r$, if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data**Environmental Conditions**

Temperature:	26 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Layne Li on 2017-05-22.

EUT operation mode: Transmitting

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

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 (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2402 MHz)									
478.92	23.51	QP	79	1.1	H	4.39	27.90	46	18.1
2402.00	86.2	PK	354	1.3	H	-6.19	80.01	/	/
2402.00	75.86	Ave.	354	1.3	H	-6.19	69.67	/	/
2402.00	95.95	PK	148	1.1	V	-6.19	89.76	/	/
2402.00	85.59	Ave.	148	1.1	V	-6.19	79.40	/	/
2314.96	68.42	PK	301	2.2	V	-6.42	62.00	74	12
2314.96	54.45	Ave.	301	2.2	V	-6.42	48.03	54	5.97
2338.53	67.71	PK	68	2.1	V	-6.42	61.29	74	12.71
2338.53	54.44	Ave.	68	2.1	V	-6.42	48.02	54	5.98
2493.05	67.25	PK	247	1.5	V	-5.97	61.28	74	12.72
2493.05	54.05	Ave.	247	1.5	V	-5.97	48.08	54	5.92
4804.00	53.82	PK	4	2.3	V	1.6	55.42	74	18.58
4804.00	39.06	Ave.	4	2.3	V	1.6	40.66	54	13.34

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 (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2441 MHz)									
478.92	21.92	QP	180	1.8	H	4.39	26.31	46	19.69
2441.00	85.51	PK	22	2.1	H	-6.19	79.32	/	/
2441.00	74.78	Ave.	22	2.1	H	-6.19	68.59	/	/
2441.00	96.19	PK	216	2.4	V	-6.19	90.00	/	/
2441.00	85.47	Ave.	216	2.4	V	-6.19	79.28	/	/
2354.88	67.72	PK	82	2.0	V	-6.19	61.53	74	12.47
2354.88	54.31	Ave.	82	2.0	V	-6.19	48.12	54	5.88
2361.94	67.6	PK	95	1.2	V	-6.19	61.41	74	12.59
2361.94	54.3	Ave.	95	1.2	V	-6.19	48.11	54	5.89
2487.89	67.46	PK	242	2.1	V	-5.97	61.49	74	12.51
2487.89	54.01	Ave.	242	2.1	V	-5.97	48.04	54	5.96
4882.00	53	PK	322	1.1	V	1.83	54.83	74	19.17
4882.00	38.45	Ave.	322	1.1	V	1.83	40.28	54	13.72
High Channel (2480 MHz)									
478.92	21.99	QP	356	1.7	H	4.39	26.38	46	19.62
2480.00	84.6	PK	229	2.0	H	-5.97	78.63	/	/
2480.00	73.94	Ave.	229	2.0	H	-5.97	67.97	/	/
2480.00	96.16	PK	30	2.1	V	-5.97	90.19	/	/
2480.00	86.03	Ave.	30	2.1	V	-5.97	80.06	/	/
2360.24	67.83	PK	308	1.1	V	-6.19	61.64	74	12.36
2360.24	54.28	Ave.	308	1.1	V	-6.19	48.09	54	5.91
2485.59	67.23	PK	38	1.2	V	-5.97	61.26	74	12.74
2485.59	54.01	Ave.	38	1.2	V	-5.97	48.04	54	5.96
2484.98	67.63	PK	136	2.1	V	-5.97	61.66	74	12.34
2484.98	54.02	Ave.	136	2.1	V	-5.97	48.05	54	5.95
4960.00	53.01	PK	9	1.5	V	2.06	55.07	74	18.93
4960.00	38.87	Ave.	9	1.5	V	2.06	40.93	54	13.07

Note:

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

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB to the limit was not recorded.

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:	24 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Alisa Gao on 2017-05-29.

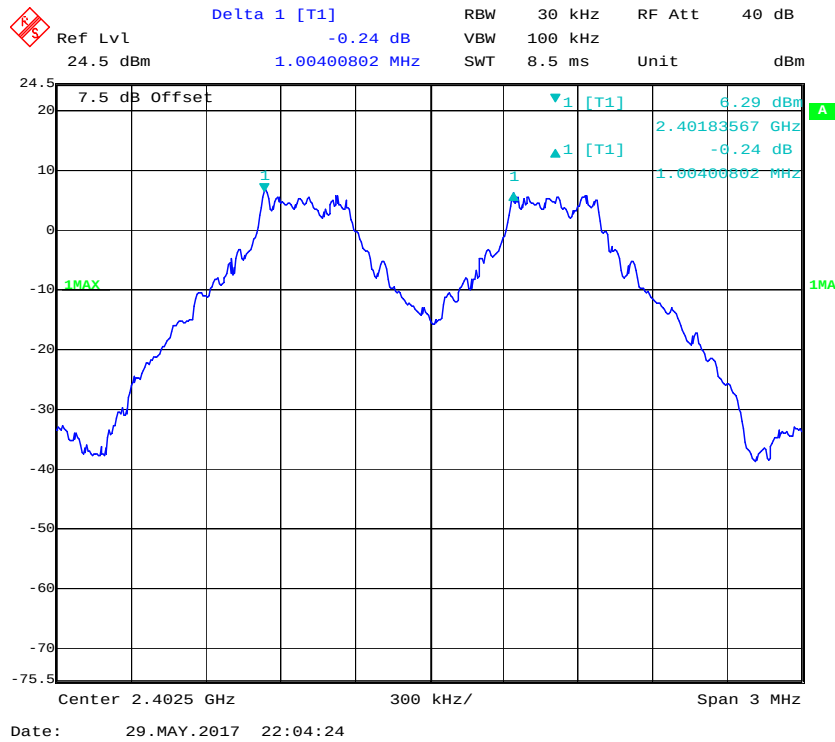
EUT operation mode: Transmitting

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

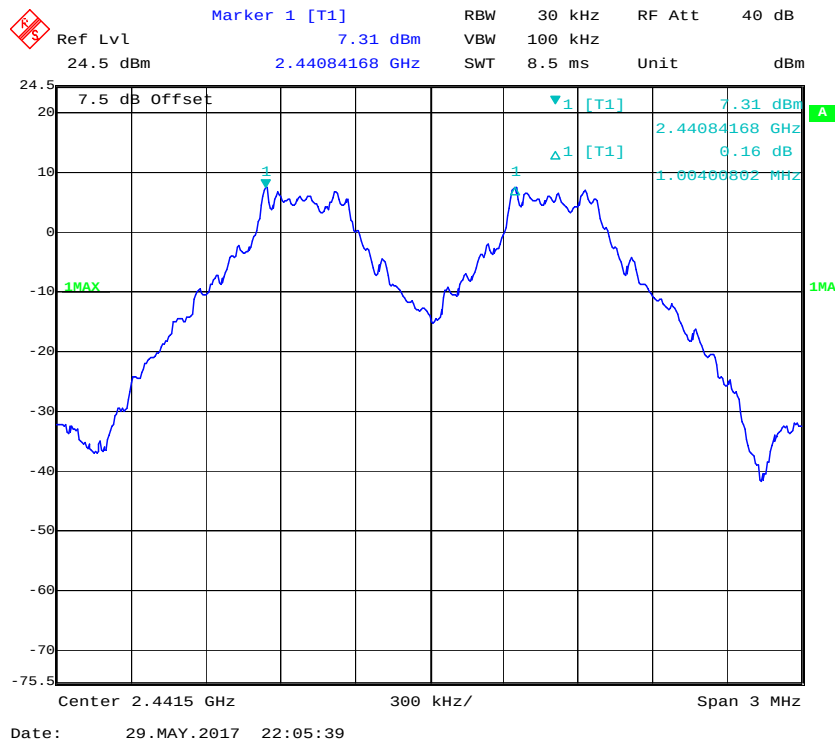
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	≥Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.004	0.558	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.572	Pass
	Adjacent	2442			
	High	2480	1.004	0.585	Pass
	Adjacent	2479			
EDR (π/4-DQPSK)	Low	2402	1.004	0.807	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.809	Pass
	Adjacent	2442			
	High	2480	1.004	0.809	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.004	0.807	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.812	Pass
	Adjacent	2442			
	High	2480	1.004	0.817	Pass
	Adjacent	2479			

Note: Limit = 20 dB bandwidth *2/3

BDR (GFSK): Low Channel



BDR (GFSK): Middle Channel



7.5 dB Offset

Ref Lvl 24.5 dBm

Marker 1 [T1] 7.43 dBm

2.47884168 GHz

RBW 30 kHz

VBW 100 kHz

SWT 8.5 ms

RF Att 40 dB

Unit dBm

1 [T1] 7.43 dBm

2.47884168 GHz

Δ1 [T1] -6.06 dB

1.00400002 MHz

1MAX

1A

Center 2.4795 GHz

300 kHz/

Span 3 MHz

Date: 29.MAY.2017 22:06:26

Delta 1 [T1] 0.79 dB

Ref Lvl 24.5 dBm

1.00400802 MHz

RBW 30 kHz

VBW 100 kHz

RF Att 40 dB

SWT 8.5 ms

Unit dBm

7.5 dB Offset

1 [T1] 4.69 dBm

2.40184770 GHz

0.79 dB

1.00400802 MHz

1MAX

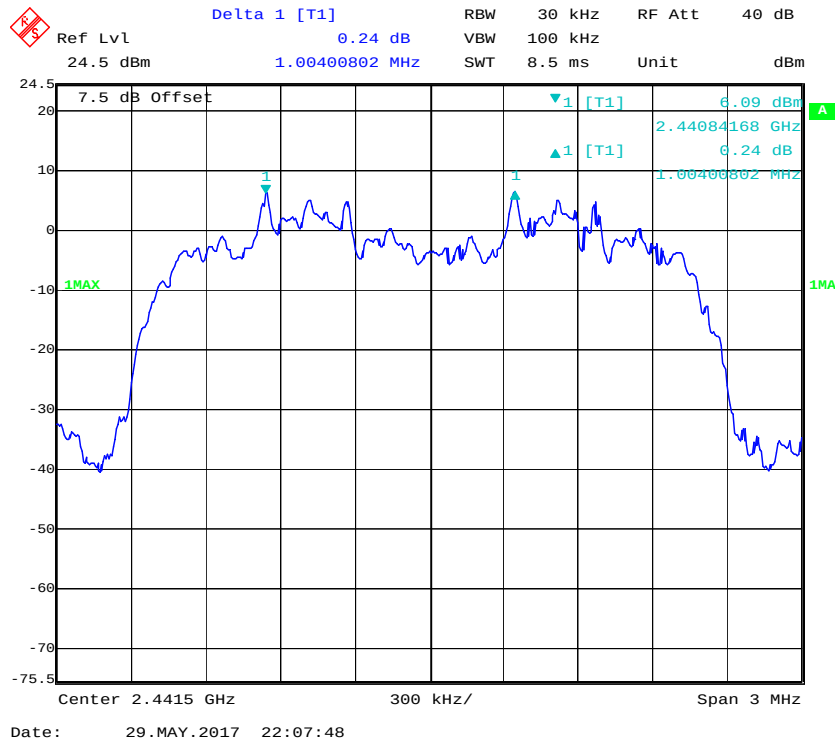
Center 2.4025 GHz

300 kHz/

Span 3 MHz

Date: 29.MAY.2017 22:08:46

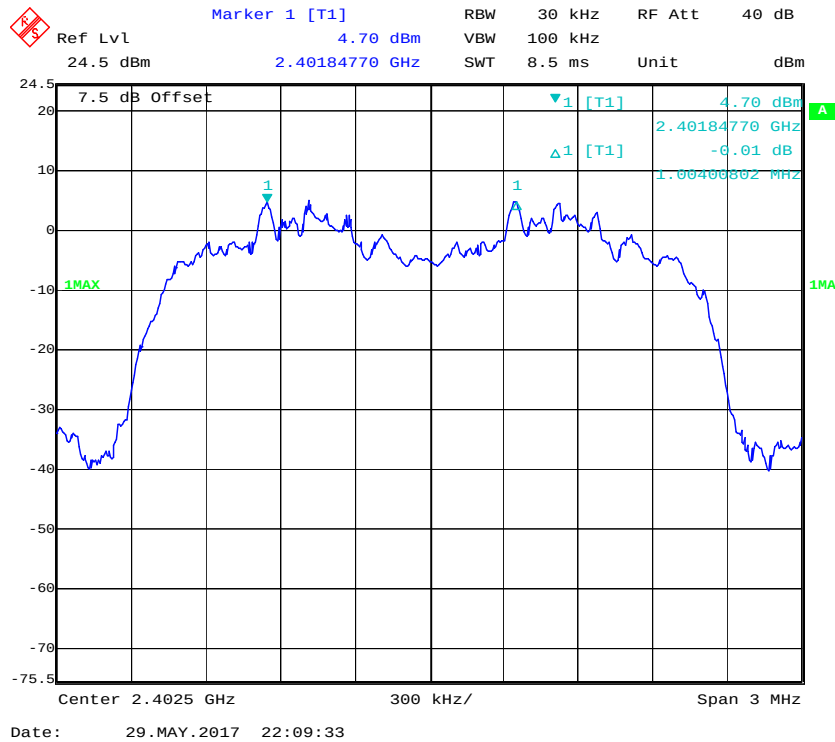
EDR ($\pi/4$ -DQPSK): Middle Channel



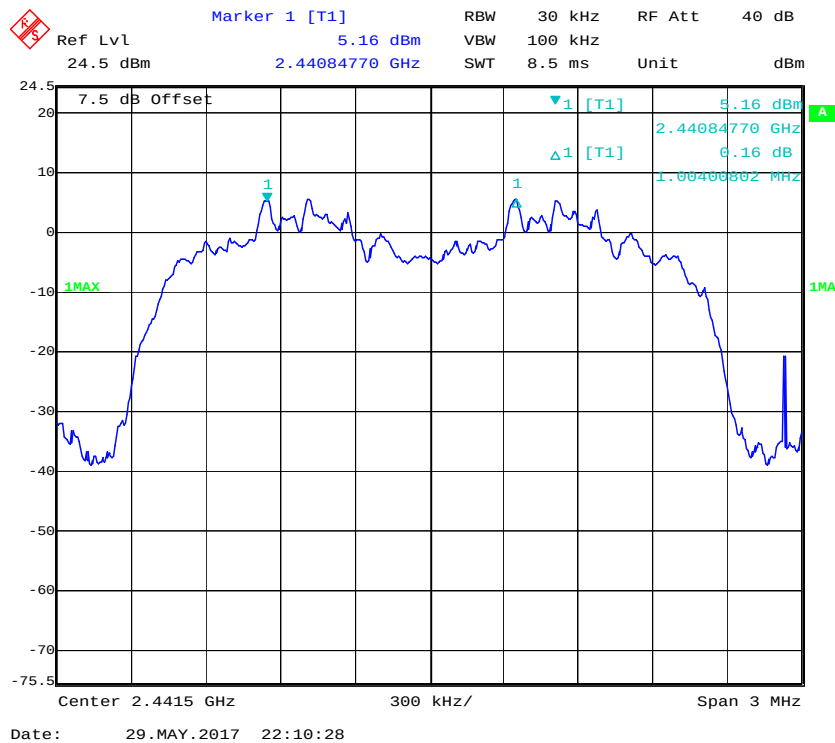
EDR ($\pi/4$ -DQPSK): High Channel



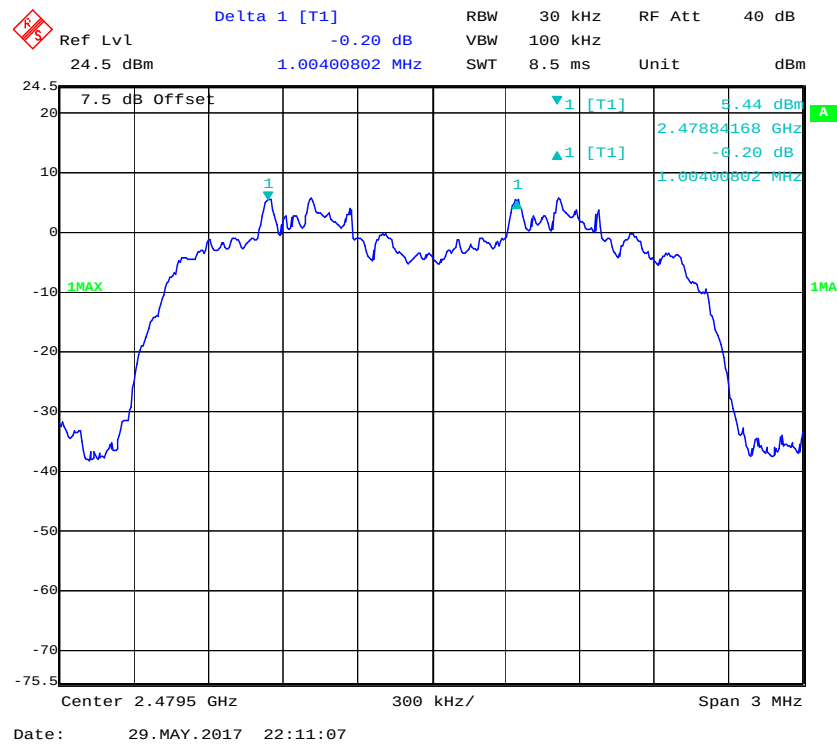
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): 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:	24 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

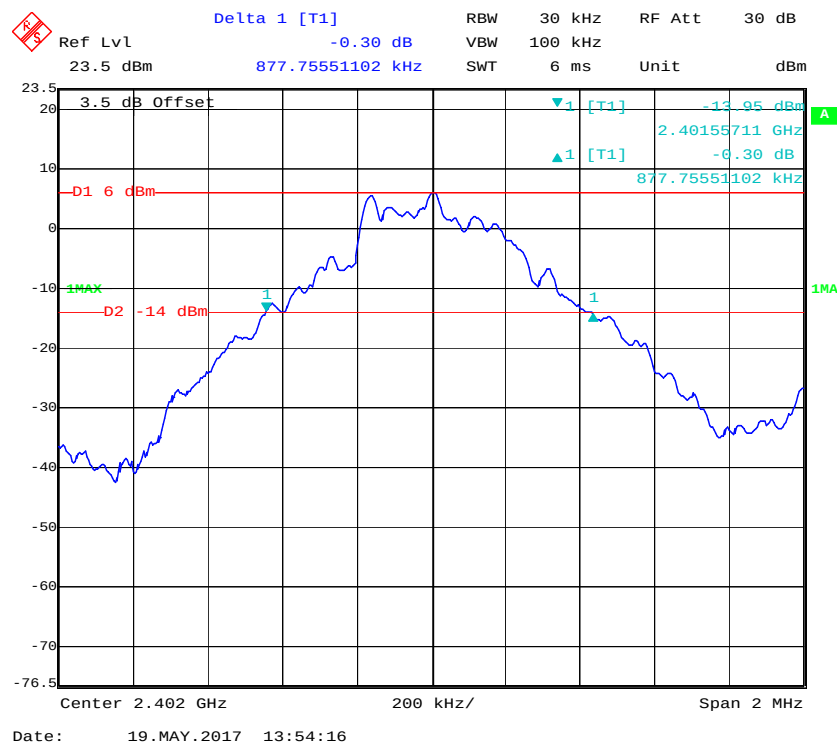
The testing was performed by Alisa Gao on 2017-05-19.

EUT operation mode: Transmitting

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

Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.878
	Middle	2441	0.858
	High	2480	0.878
EDR ($\pi/4$-DQPSK)	Low	2402	1.210
	Middle	2441	1.214
	High	2480	1.214
EDR (8DPSK)	Low	2402	1.210
	Middle	2441	1.218
	High	2480	1.226

BDR (GFSK): Low Channel



Delta 1 [T1] -0.75 dB
 Ref Lvl 23.5 dBm
 857.71543086 KHz
 RBW 30 kHz RF Att 30 dB
 VBW 100 kHz
 SWT 6 ms Unit dBm

3.5 dB Offset
 D1 7.2 dBm
 D2 -12.8 dBm
 1 [T1] -12.65 dBm
 2.44055711 GHz
 -0.75 dB
 857.71543086 KHz
 1 [T1]

Center 2.441 GHz
 200 kHz/
 Span 2 MHz

Date: 19.MAY.2017 13:52:54

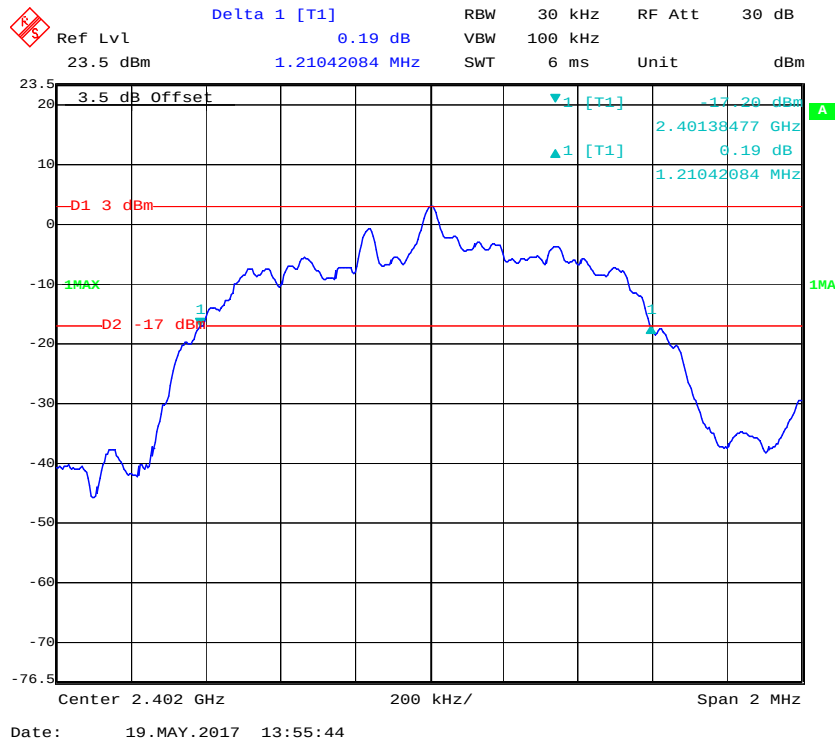
Delta 1 [T1]
 Ref Lvl 0.12 dB
 23.5 dBm 877.75551102 KHz
 RBW 30 KHz RF Att 30 dB
 VBW 100 KHz SWT 6 ms Unit dBm

3.5 dB Offset
 -D1 7.3 dBm
 -D2 -12.7 dBm
 1 [T1]
 1 [T1]
 2.47955311 GHz
 0.12 dB
 877.75551102 KHz
 1MA

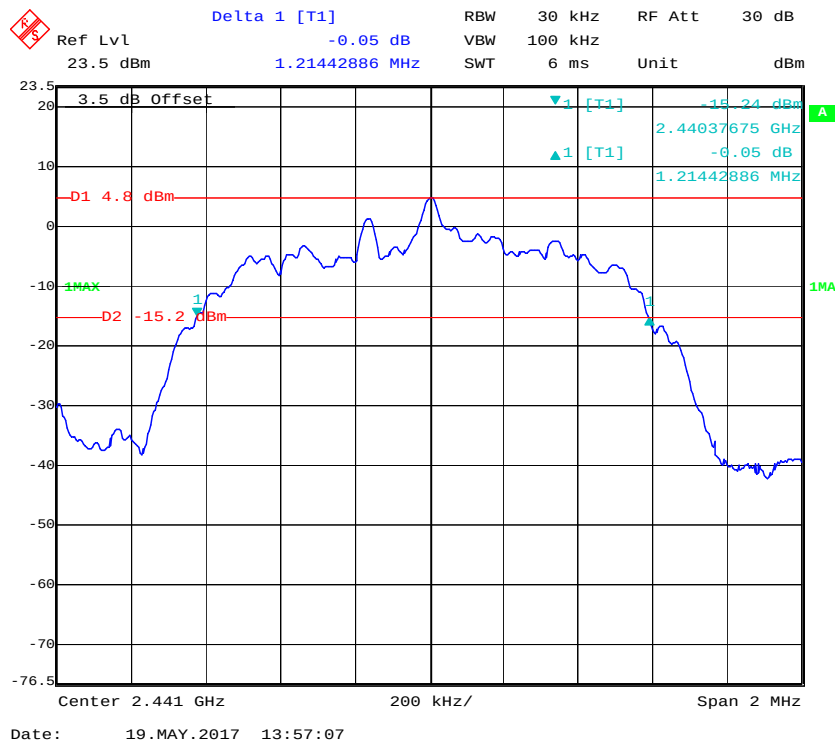
Center 2.48 GHz
 200 kHz/
 Span 2 MHz

Date: 19.MAY.2017 13:51:11

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



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



Ref Lvl 23.5 dBm
Delta 1 [T1] 0.47 dB
1.21442886 MHz
3.5 dB Offset

RBW 30 kHz
VBW 100 kHz
SWT 6 ms
RF Att 30 dB
Unit dBm

23.5
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76.5

3.5 dB Offset

D1 6.1 dBm

D2 -13.9 dBm

1 MAX

1 [T1]

1 [T1]

2.47937675 GHz
6.47 dB
1.21442886 MHz

Center 2.48 GHz
200 kHz/
Span 2 MHz

Date: 19.MAY.2017 14:02:18

Delta 1 [T1] 0.79 dB

Ref Lvl 23.5 dBm

RBW 30 kHz

VSWR 100

RF Att 30 dB

Unit dBm

3.5 dB Offset

D1 2.9 dBm

D2 -17.1 dBm

1 [T1]

2.40141283 GHz

0.79 dB

1.21042084 MHz

Center 2.402 GHz

200 kHz/

Span 2 MHz

Date: 19.MAY.2017 14:26:13

[illegible]

Delta 1 [T1]

Ref Lvl 0.16 dB

23.5 dBm 1.22645291 MHz

RBW 30 kHz RF Att 30 dB

VBW 100 kHz

SWT 6 ms Unit dBm

3.5 dB Offset

D1 6.2 dBm

D2 -13.8 dBm

1 [T1]

1 [T1]

2.47940080 GHz

0.16 dB

1.22645291 MHz

Center 2.48 GHz

200 kHz/

Span 2 MHz

Date: 19.MAY.2017 14:06:22

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:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

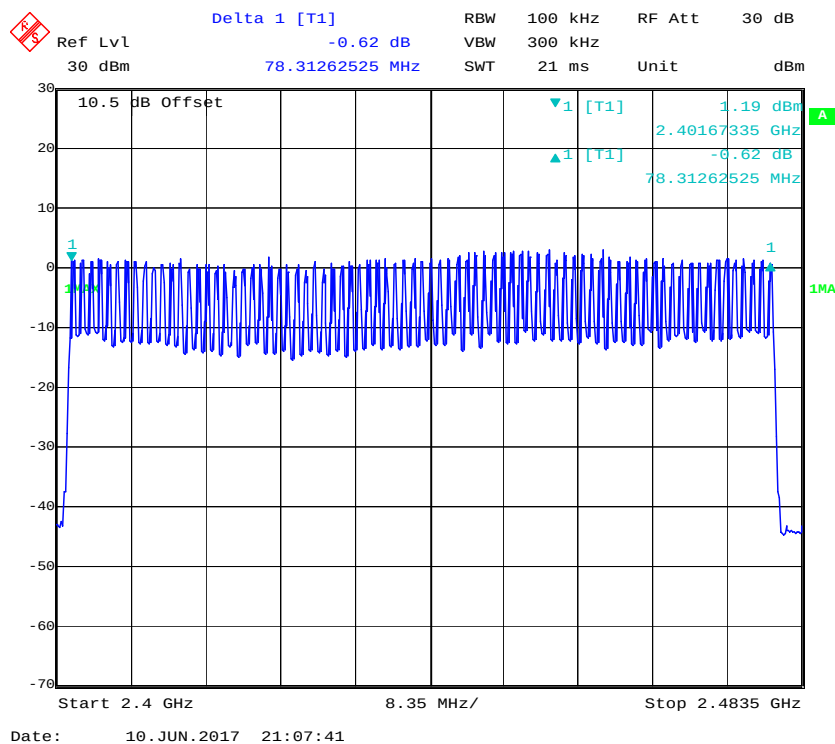
The testing was performed by Alisa Gao on 2017-06-10.

EUT operation mode: Transmitting

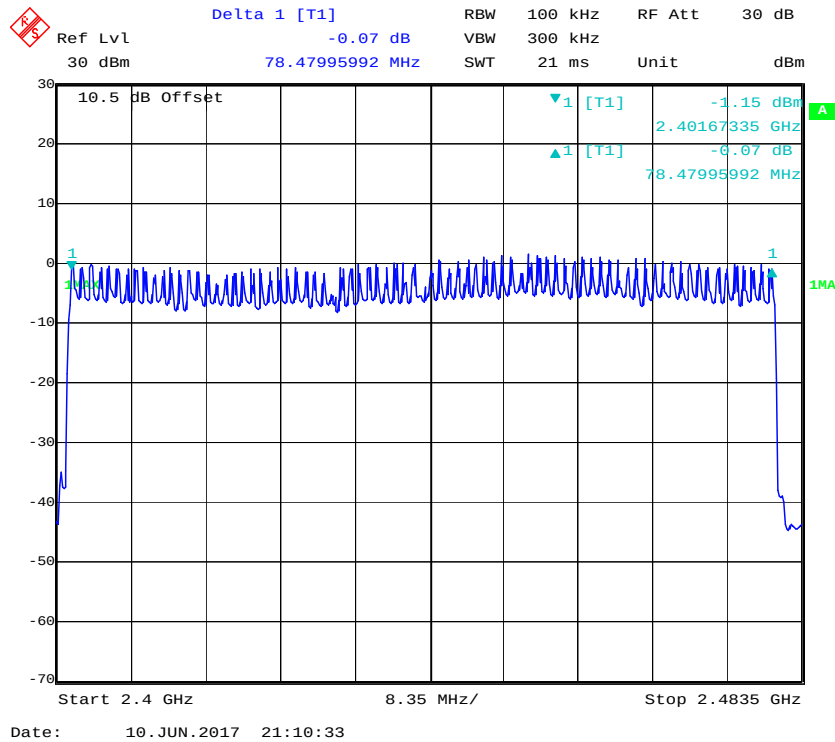
Test Result: Compliance. Please refer to following table and plots.

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 (8DPSK)	2400-2483.5	79	≥ 15

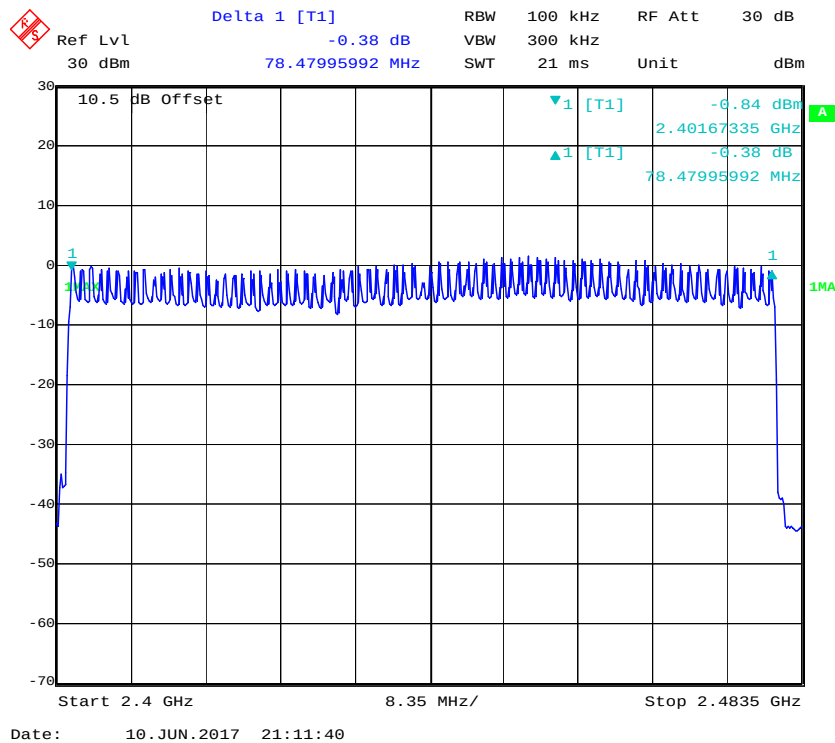
BDR (GFSK): Number of Hopping Channels



EDR ($\pi/4$ -DQPSK): Number of Hopping Channels



EDR (8DPSK): 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 quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

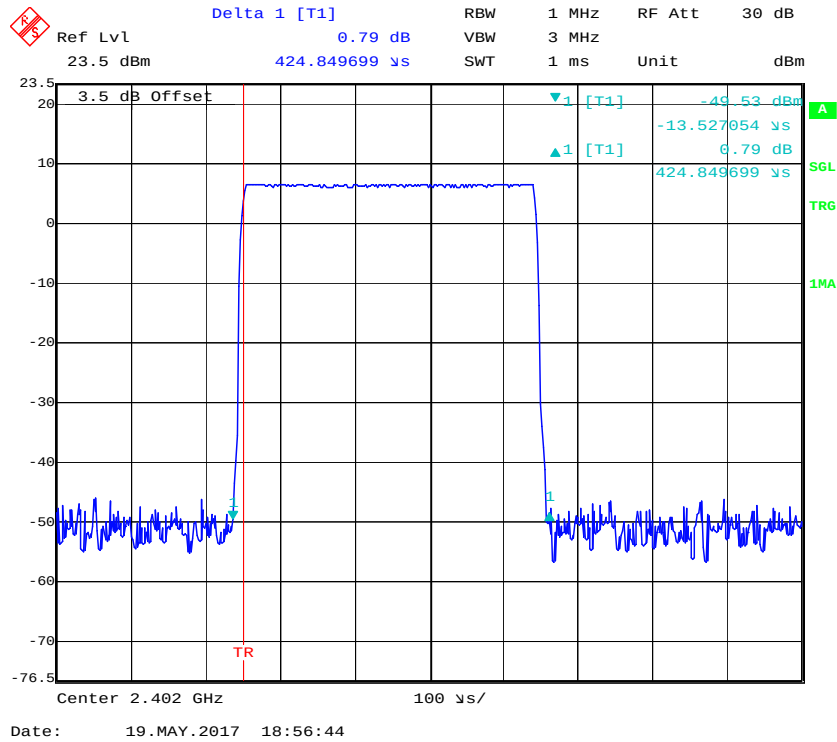
The testing was performed by Alisa Gao on 2017-05-19.

EUT operation mode: Transmitting

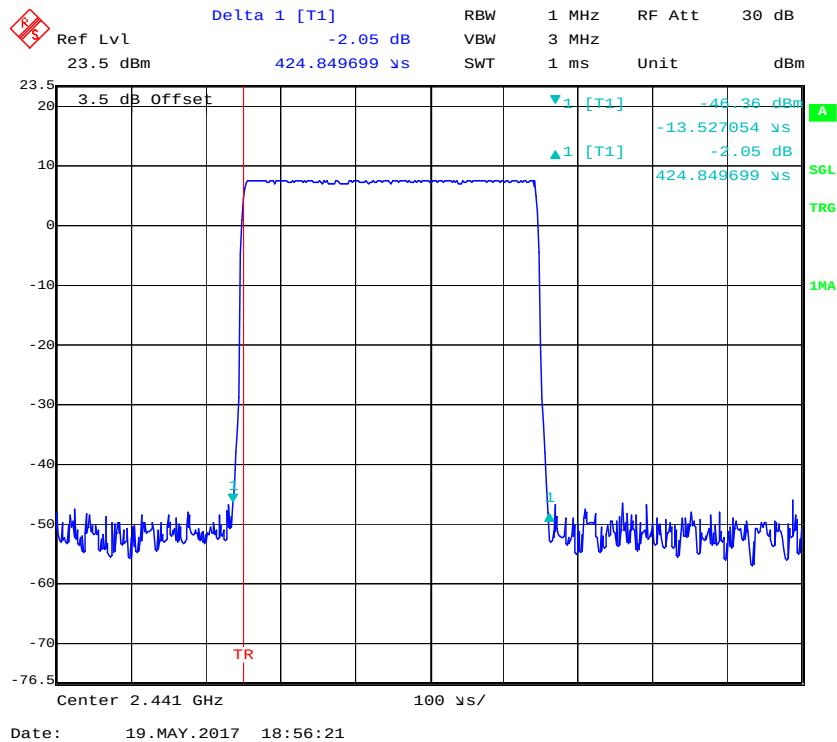
Test Result: Compliance. Please refer to following table and plots.

Mode		Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
BDR (GFSK)	DH 1	Low	0.425	0.136	0.4	Pass
		Middle	0.425	0.136	0.4	Pass
		High	0.425	0.136	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6s				
	DH 3	Low	1.697	0.272	0.4	Pass
		Middle	1.697	0.272	0.4	Pass
		High	1.697	0.272	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6s				
	DH 5	Low	2.950	0.315	0.4	Pass
		Middle	2.950	0.315	0.4	Pass
		High	2.950	0.315	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6s				
EDR ($\pi/4$ -DQPSK)	2DH 1	Low	0.437	0.140	0.4	Pass
		Middle	0.437	0.140	0.4	Pass
		High	0.437	0.140	0.4	Pass
		Note: 2DH1:Dwell time = Pulse time*(1600/2/79)*31.6s				
	2DH 3	Low	1.707	0.273	0.4	Pass
		Middle	1.707	0.273	0.4	Pass
		High	1.707	0.273	0.4	Pass
		Note: 2DH3:Dwell time = Pulse time*(1600/4/79)*31.6s				
	2DH 5	Low	2.960	0.316	0.4	Pass
		Middle	2.960	0.316	0.4	Pass
		High	2.960	0.316	0.4	Pass
		Note: 2DH5:Dwell time = Pulse time*(1600/6/79)*31.6s				
EDR (8DPSK)	3DH 1	Low	0.431	0.138	0.4	Pass
		Middle	0.431	0.138	0.4	Pass
		High	0.431	0.138	0.4	Pass
		Note: 3DH1:Dwell time = Pulse time*(1600/2/79)*31.6s				
	3DH 3	Low	1.717	0.275	0.4	Pass
		Middle	1.717	0.275	0.4	Pass
		High	1.717	0.275	0.4	Pass
		Note: 3DH3:Dwell time = Pulse time*(1600/4/79)*31.6s				
	3DH 5	Low	2.960	0.316	0.4	Pass
		Middle	2.960	0.316	0.4	Pass
		High	2.960	0.316	0.4	Pass
		Note: 3DH5:Dwell time = Pulse time*(1600/6/79)*31.6s				

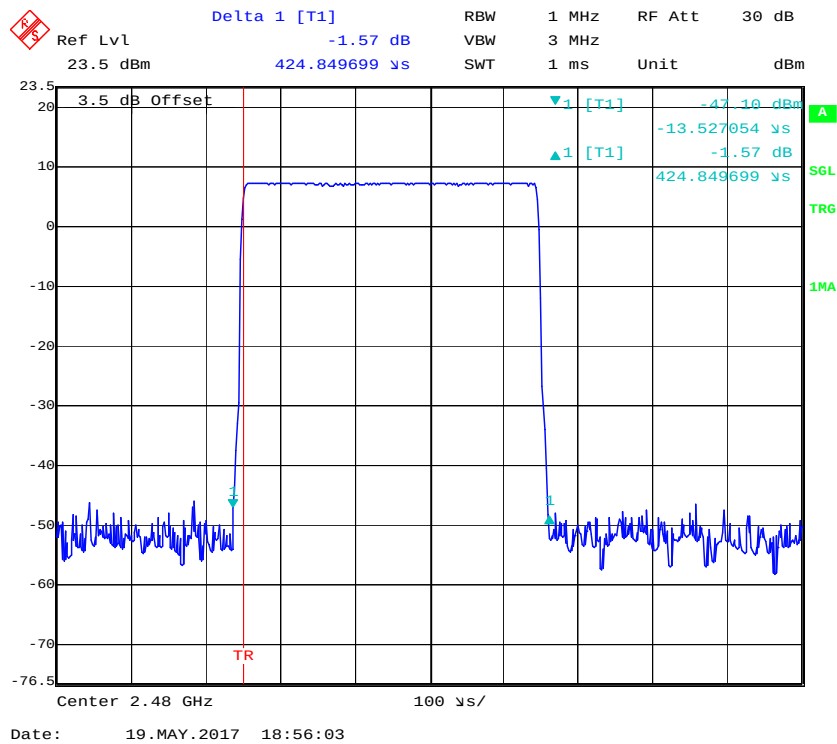
BDR (GFSK): Pulse time, Low Channel, DH1



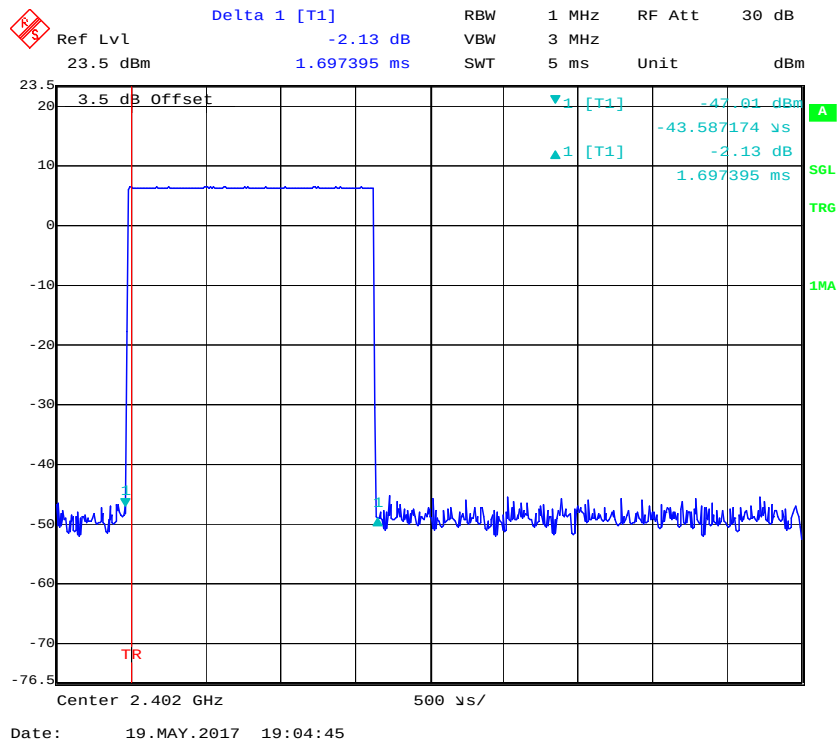
Pulse time, Middle Channel, DH1



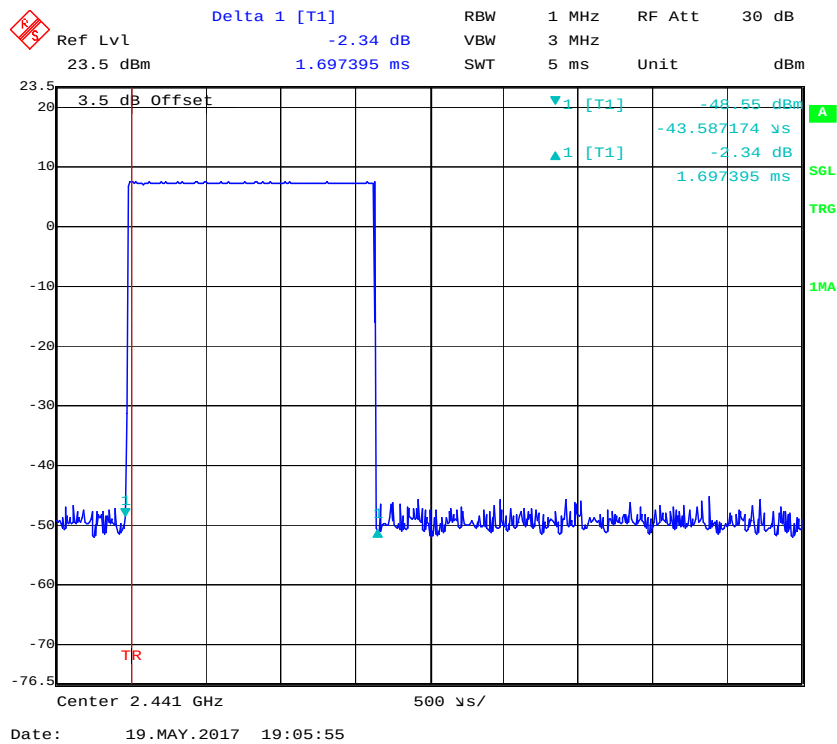
Pulse time, High Channel, DH1



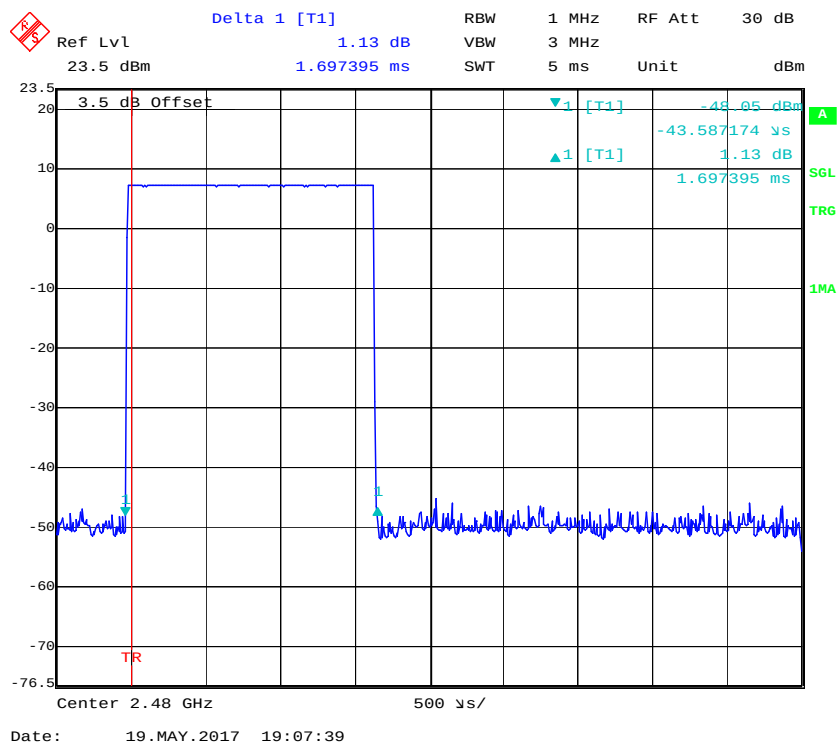
Pulse time, Low Channel, DH3



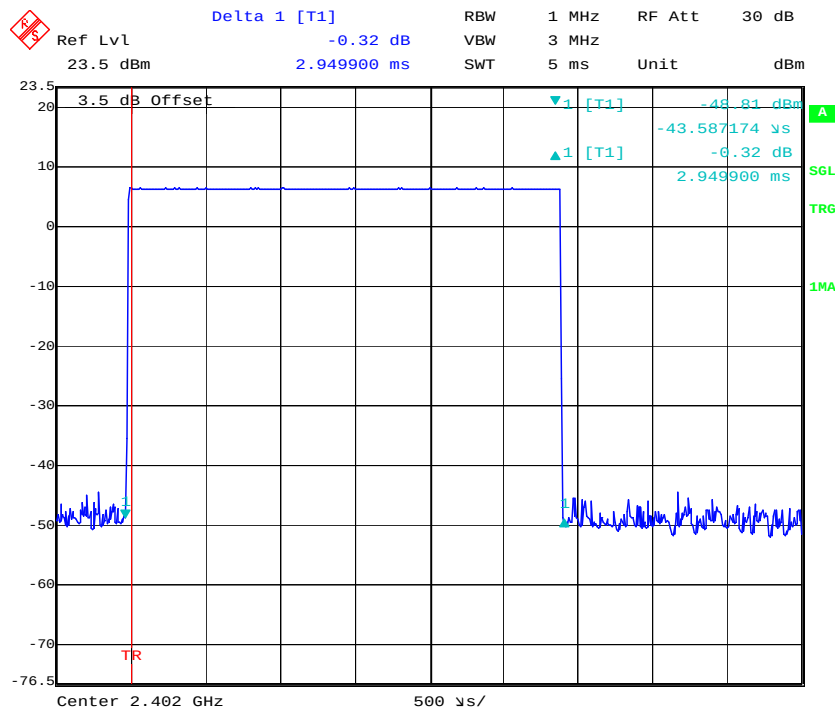
Pulse time, Middle Channel, DH3



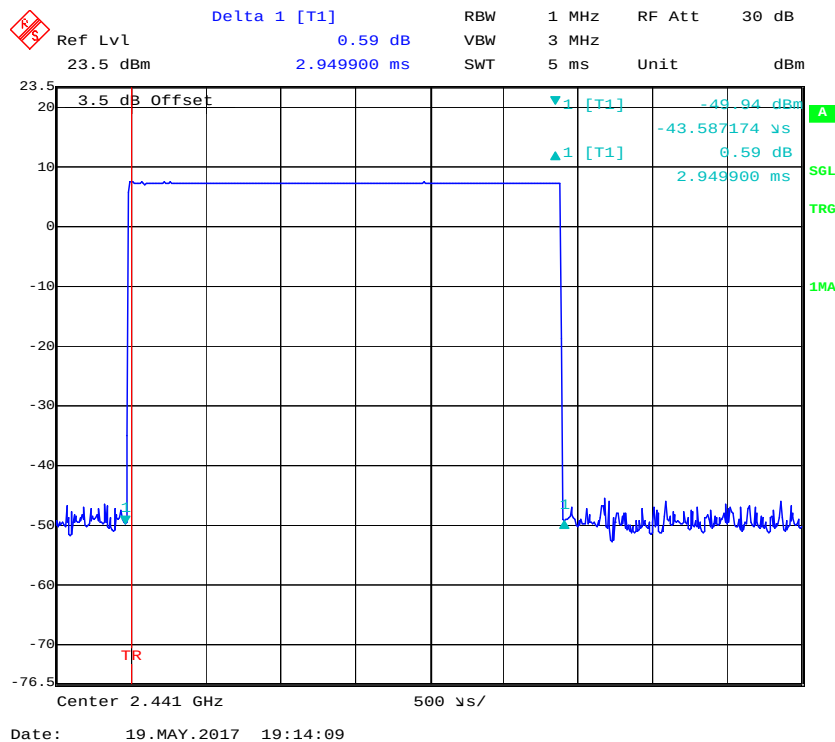
Pulse time, High Channel, DH3



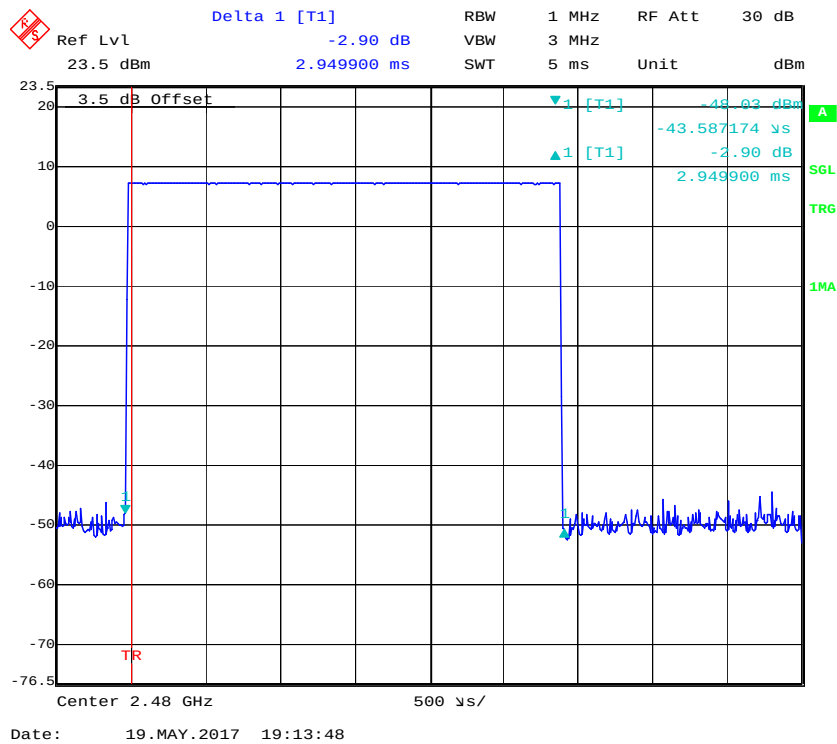
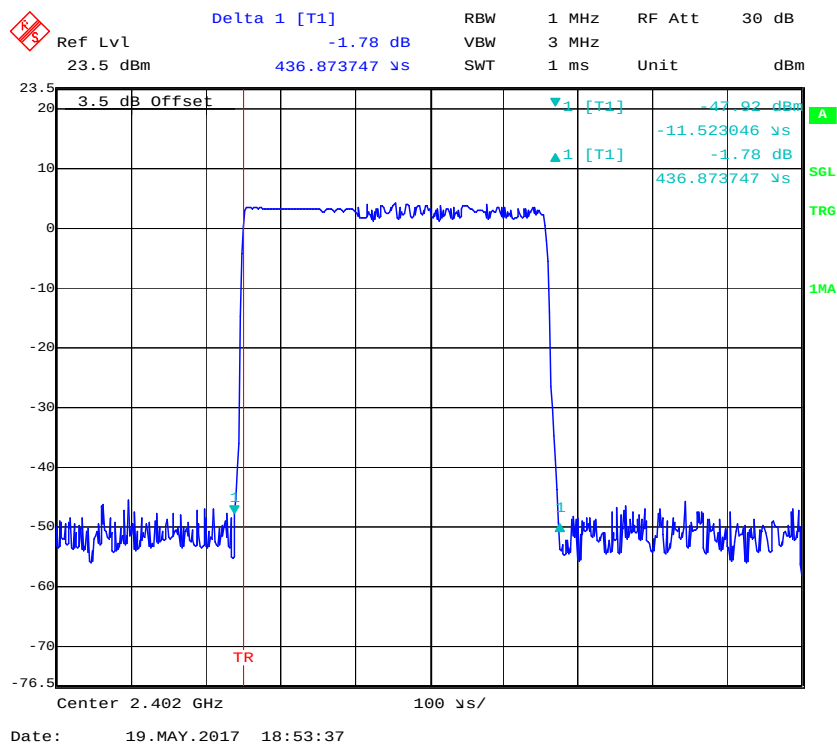
Pulse time, Low Channel, DH5



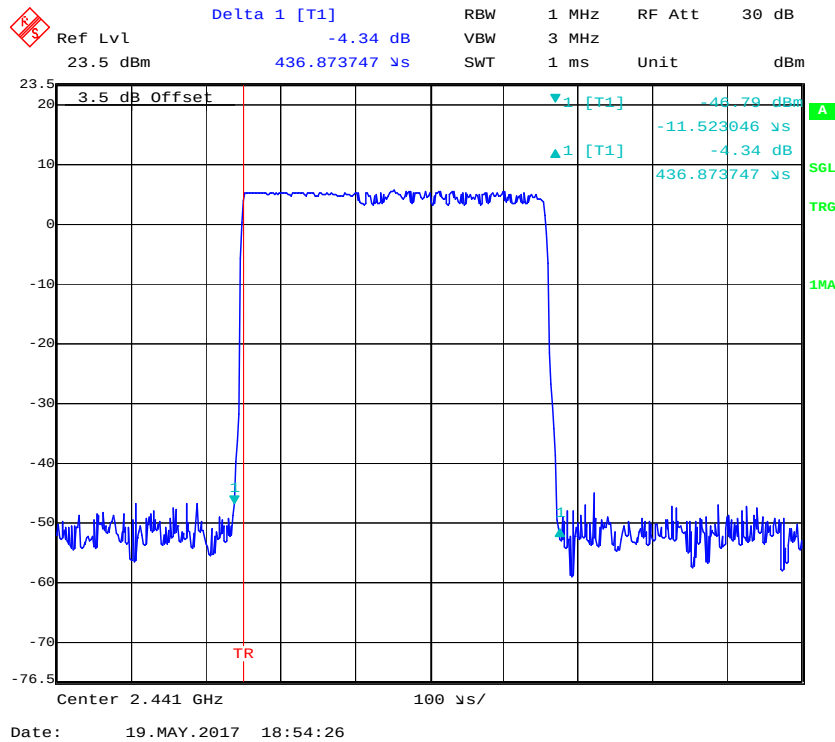
Pulse time, Middle Channel, DH5



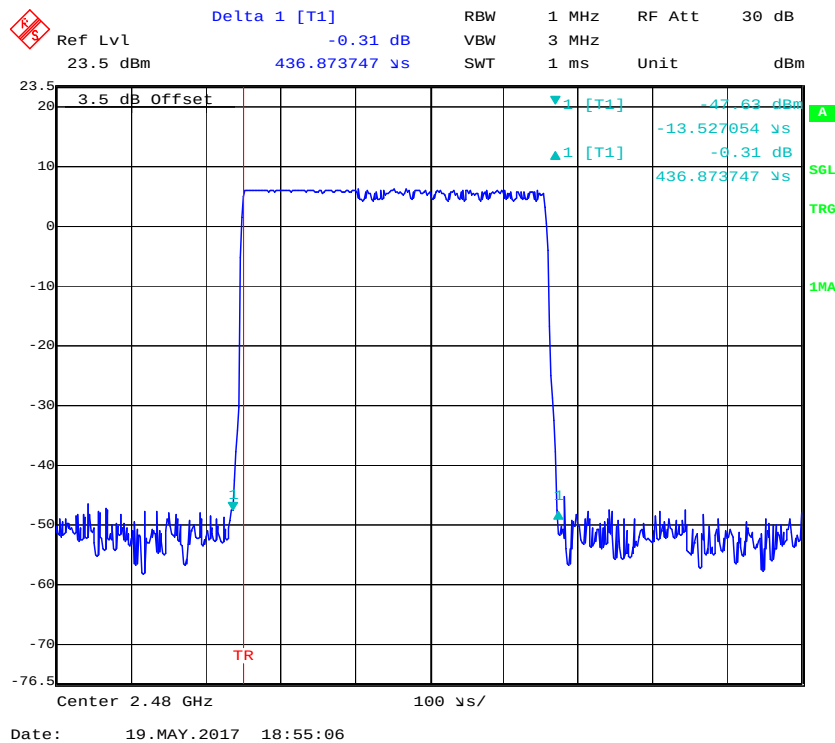
Pulse time, High Channel, DH5

EDR ($\pi/4$ -DQPSK):
Pulse time, Low Channel, 2DH1

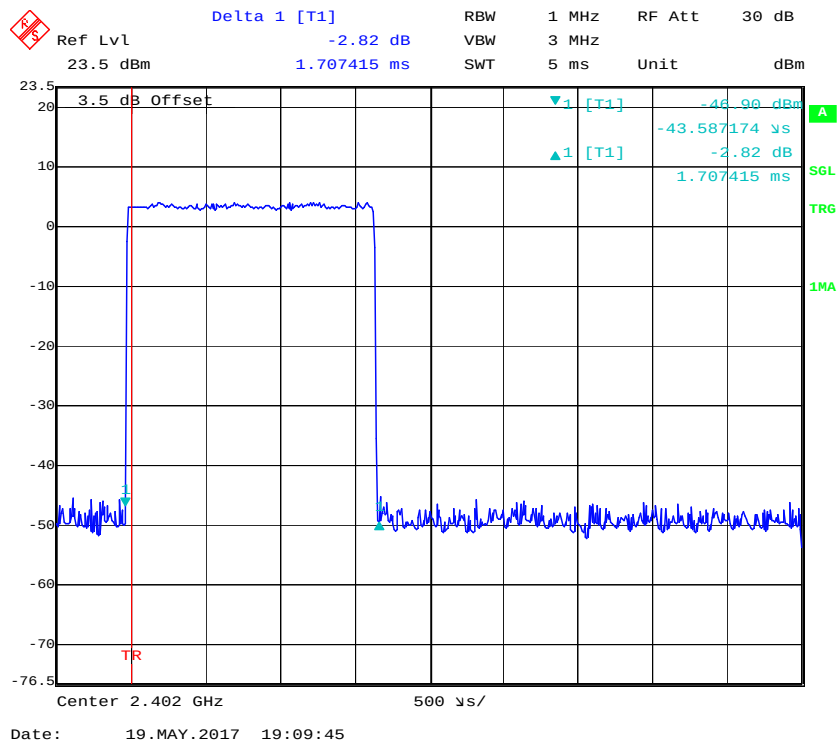
Pulse time, Middle Channel, 2DH1



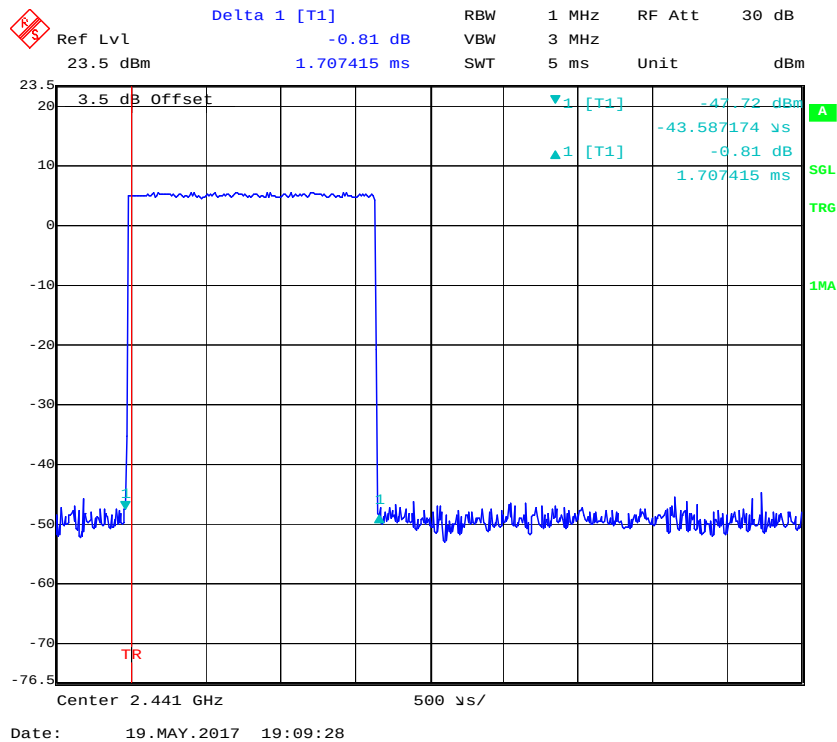
Pulse time, High Channel, 2DH1



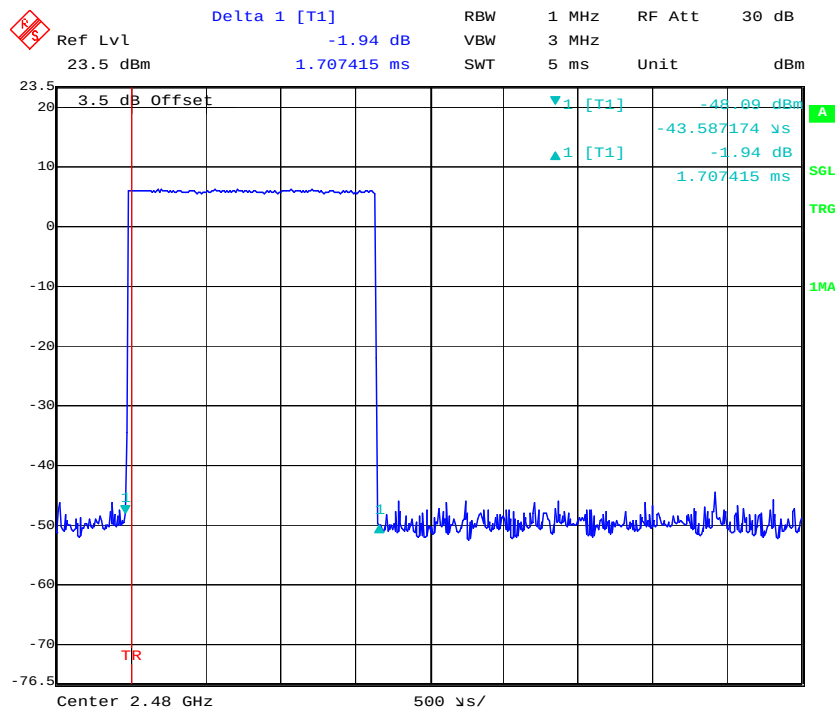
Pulse time, Low Channel, 2DH3



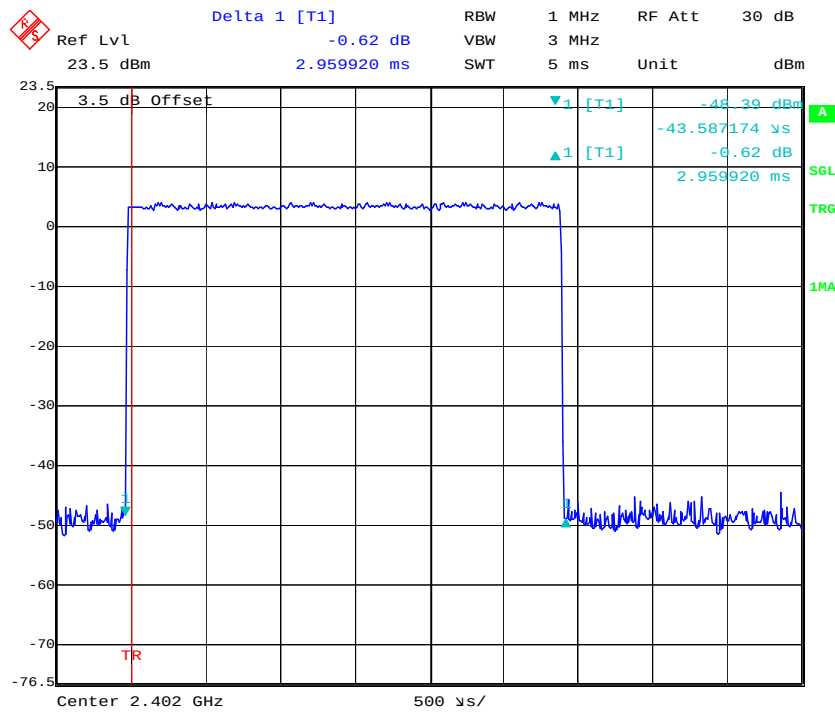
Pulse time, Middle Channel, 2DH3



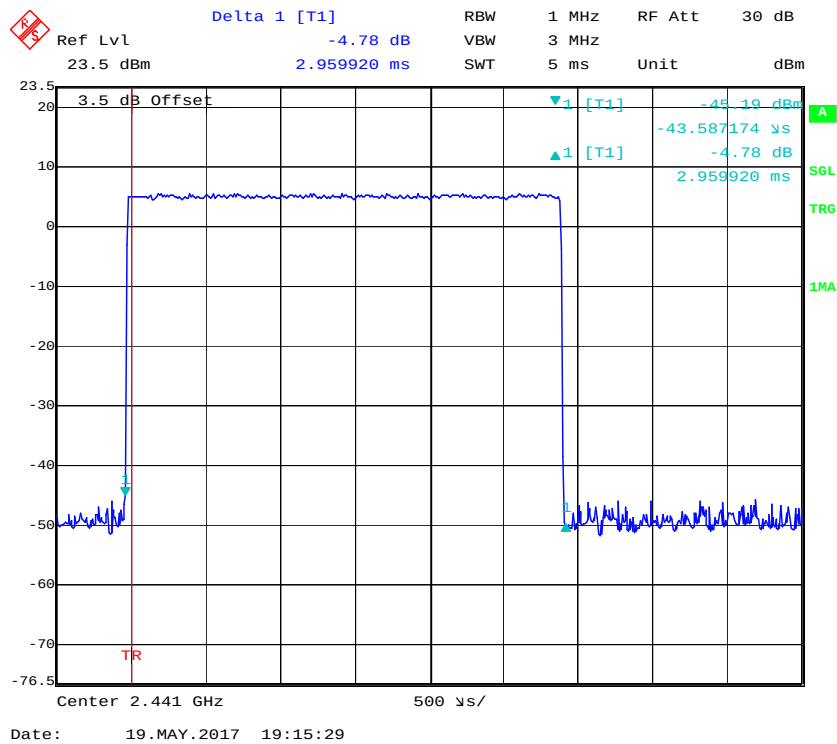
Pulse time, High Channel, 2DH3



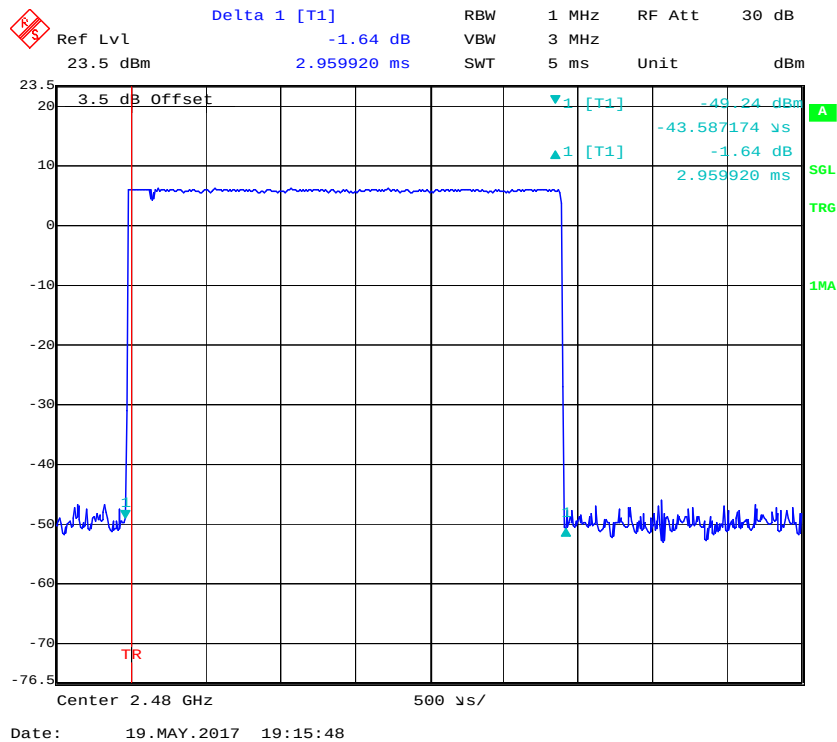
Pulse time, Low Channel, 2DH5



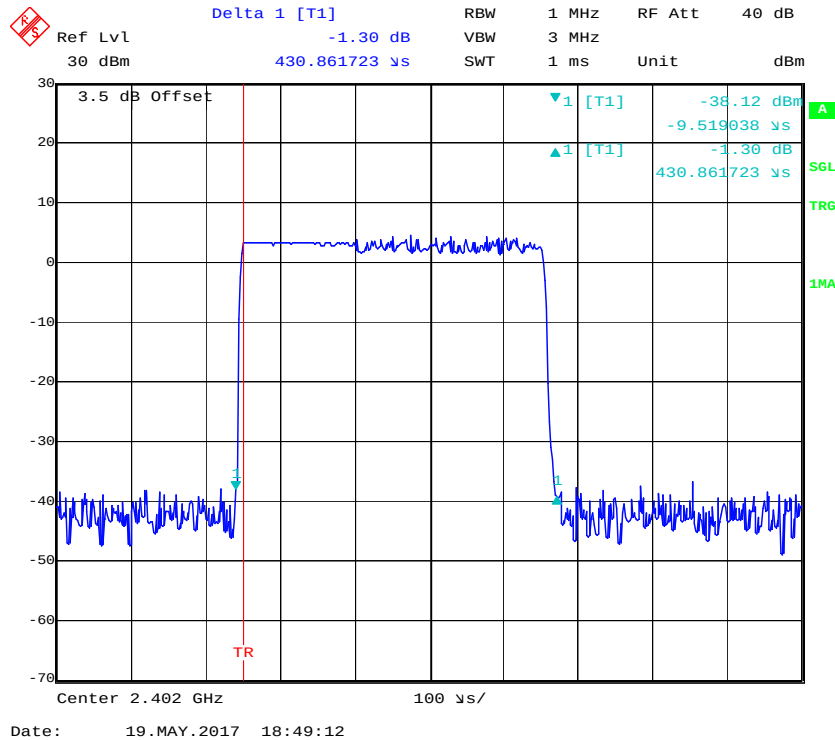
Pulse time, Middle Channel, 2DH5



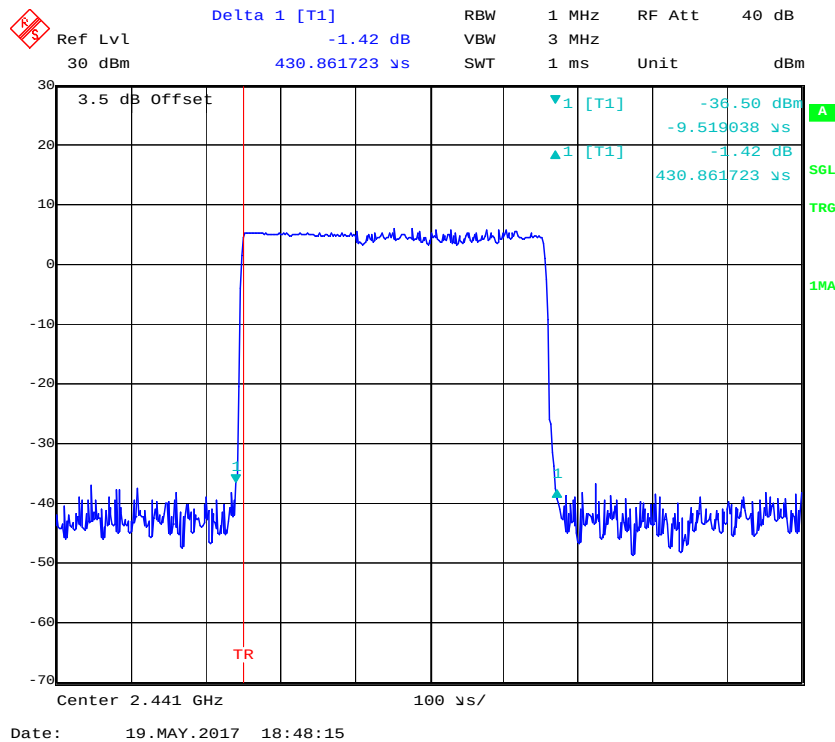
Pulse time, High Channel, 2DH5



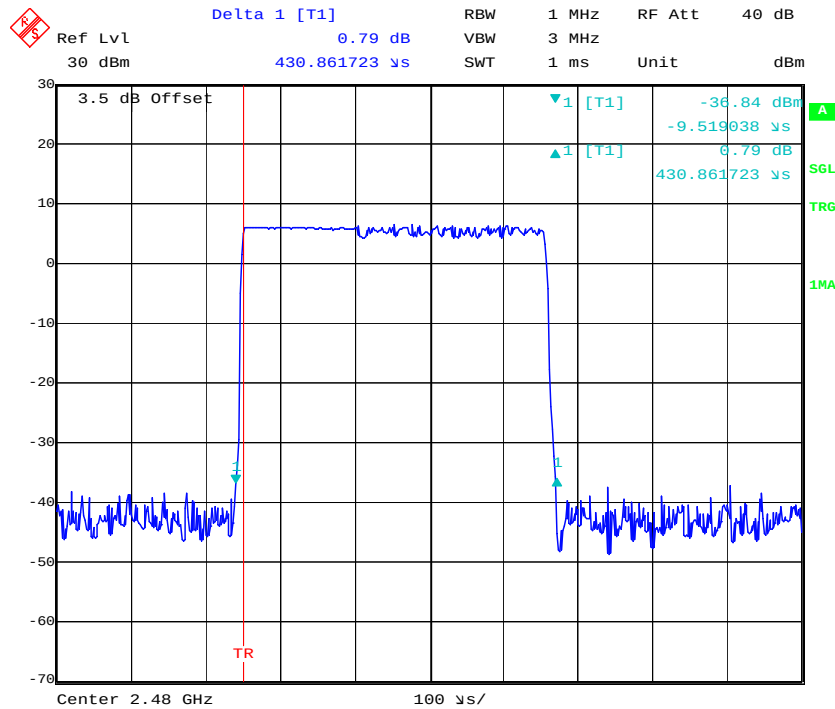
EDR (8DPSK): Pulse time, Low Channel, 3DH1



Pulse time, Middle Channel, 3DH1

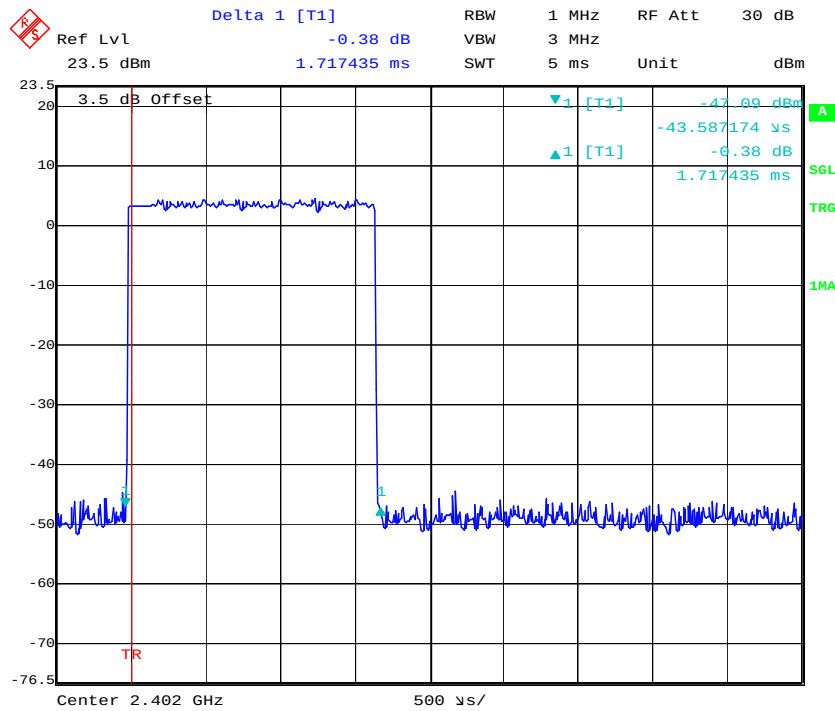


Pulse time, High Channel, 3DH1



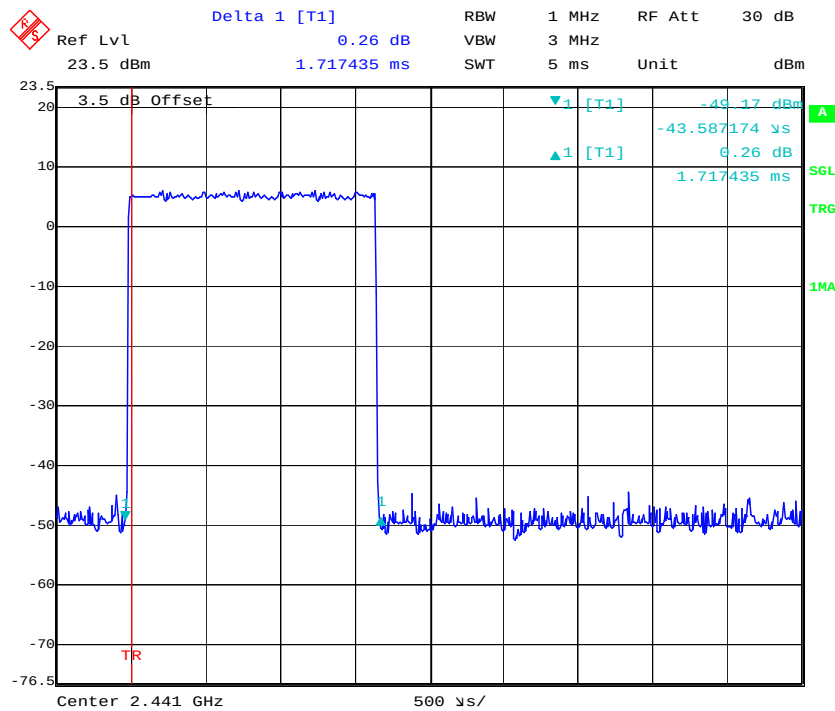
Date: 19.MAY.2017 18:48:57

Pulse time, Low Channel, 3DH3

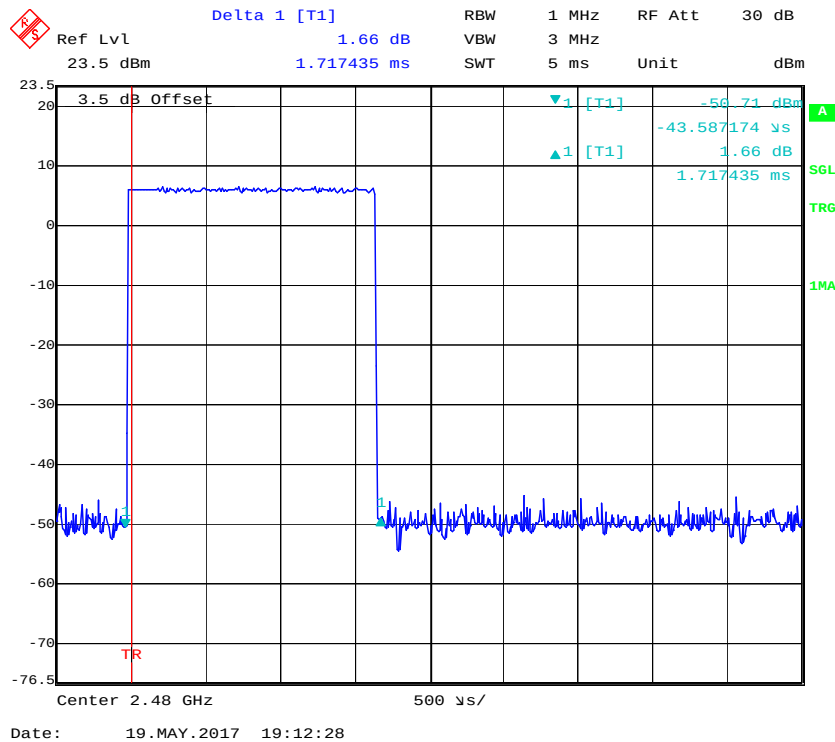


Date: 19.MAY.2017 19:11:40

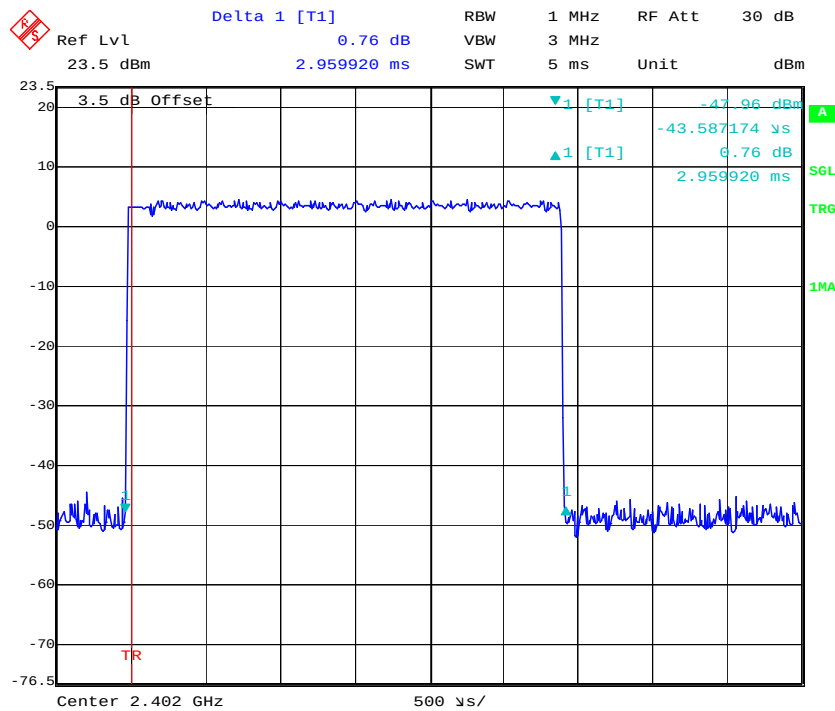
Pulse time, Middle Channel, 3DH3



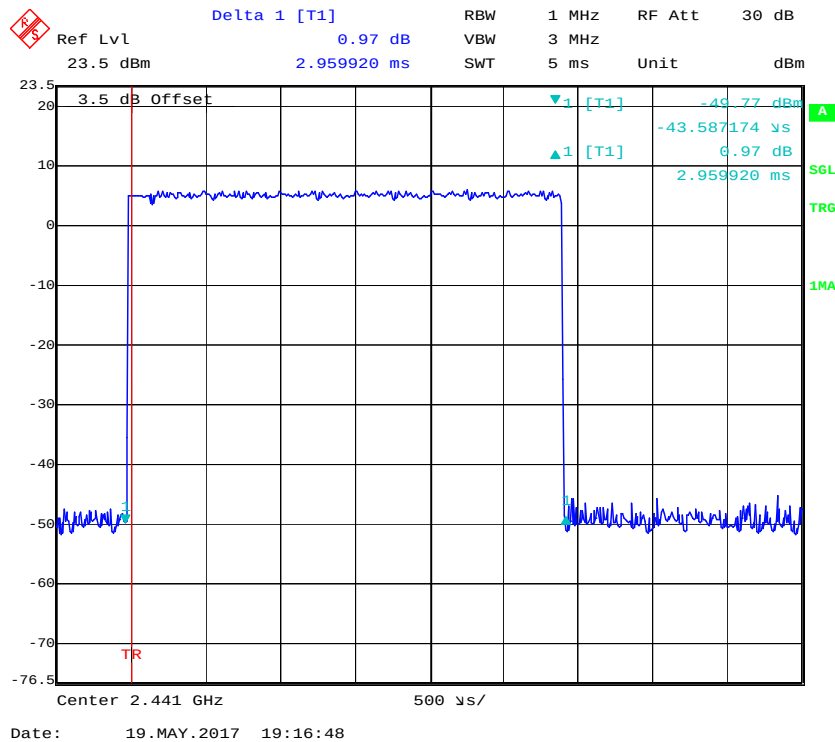
Pulse time, High Channel, 3DH3



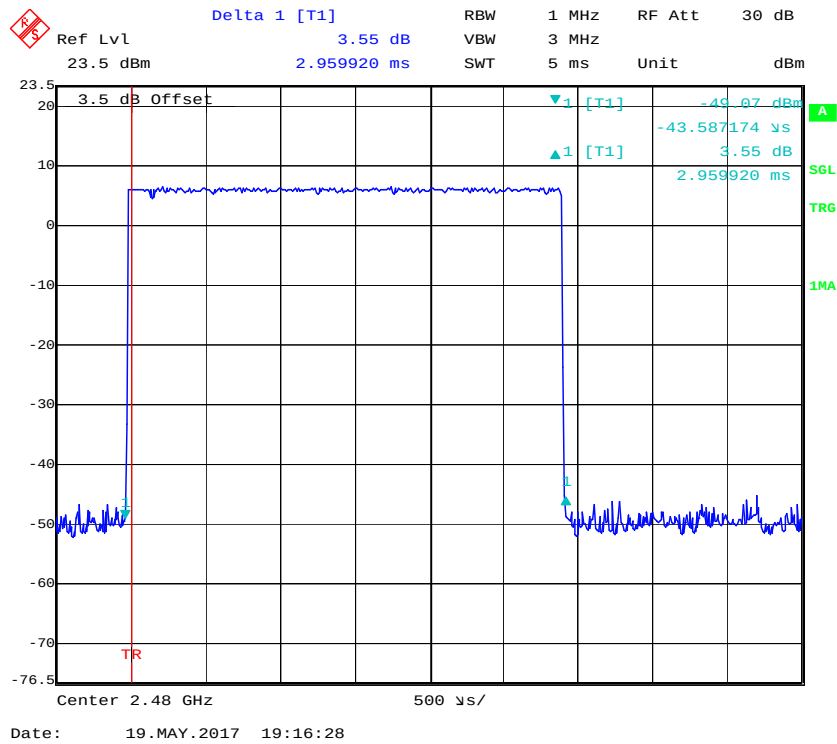
Pulse time, Low Channel, 3DH5



Pulse time, Middle Channel, 3DH5



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:	25 °C
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Alisa Gao on 2017-05-19.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table.

Mode	Channel	Frequency (MHz)	Reading Power (dBm)	Peak Output Power (mW)	Limit (mW)
BDR (GFSK)	Low	2402	7.11	5.14	1000
	Middle	2441	7.08	5.11	1000
	High	2480	7.04	5.06	1000
EDR ($\pi/4$-DQPSK)	Low	2402	7.11	5.14	1000
	Middle	2441	7.13	5.16	1000
	High	2480	7.09	5.12	1000
EDR (8DPSK)	Low	2402	7.27	5.33	1000
	Middle	2441	7.26	5.32	1000
	High	2480	7.22	5.27	1000

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

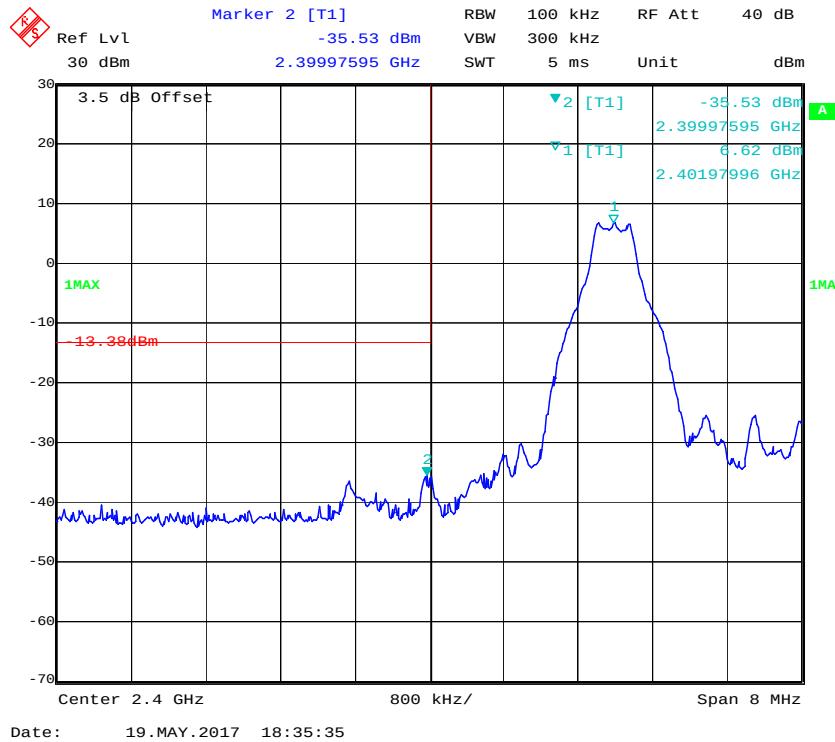
Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Alisa Gao on 2017-05-19.

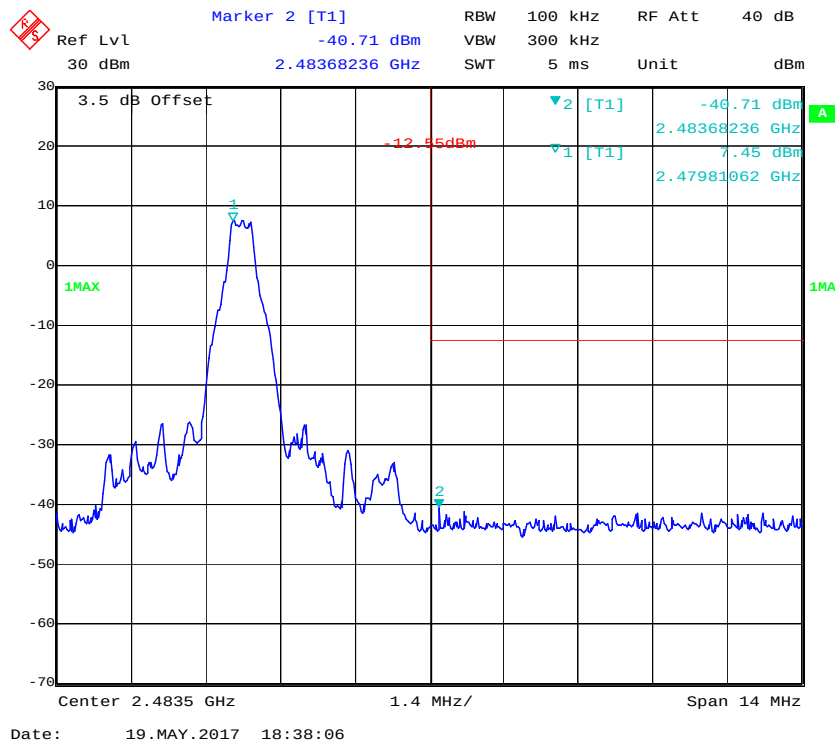
EUT operation mode: Transmitting

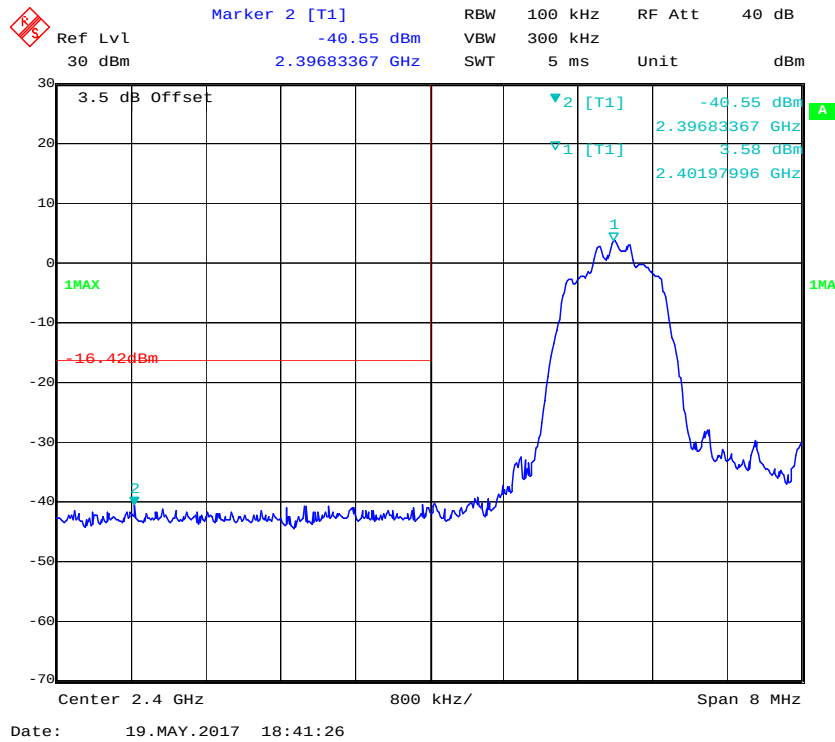
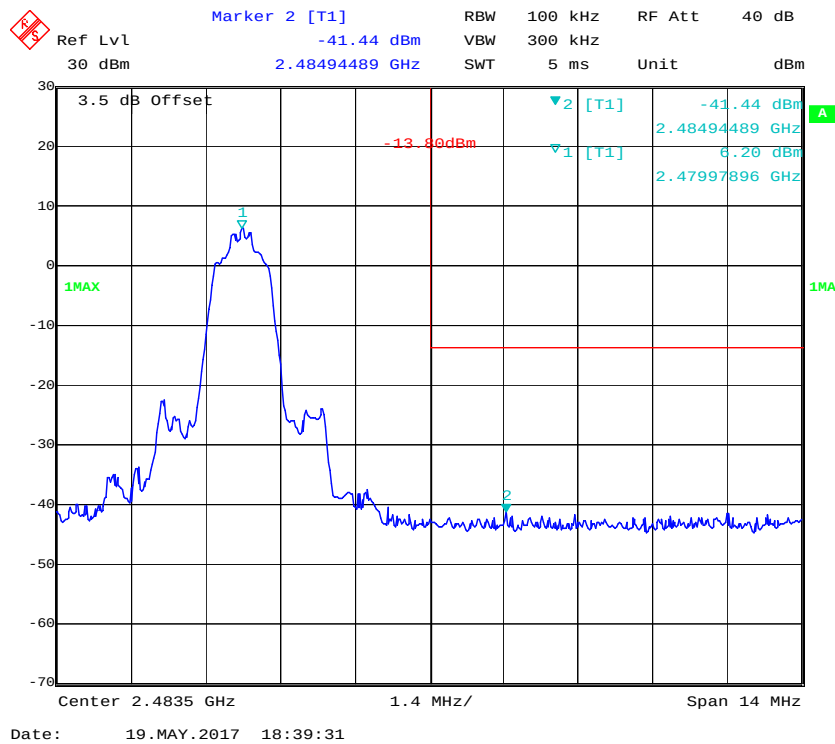
Test Result: Compliance. Please refer to following plots.

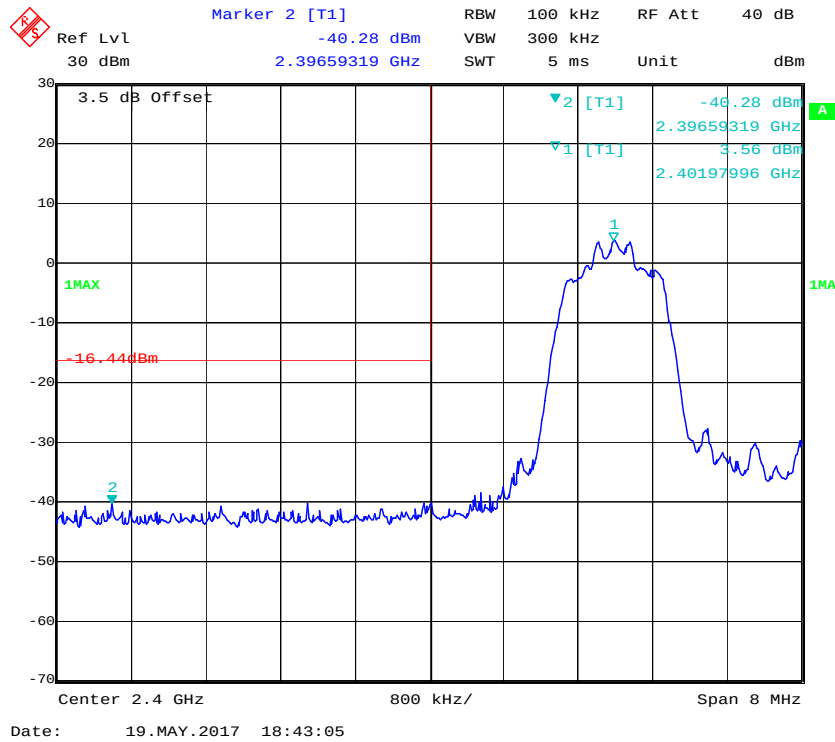
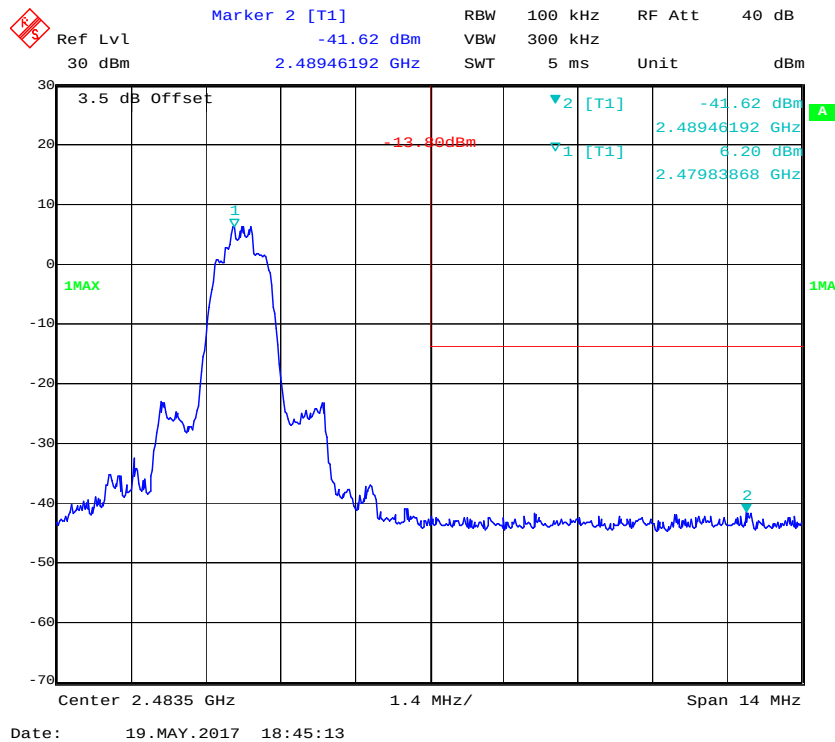
BDR (GFSK): Band Edge-Left Side



BDR (GFSK): Band Edge-Right Side



EDR ($\pi/4$ -DQPSK): Band Edge-Left SideEDR ($\pi/4$ -DQPSK): Band Edge-Right Side

EDR (8DPSK): Band Edge-Left Side**BDR (8DPSK): Band Edge-Right Side********* END OF REPORT *******