FCC PART 15.247

TEST REPORT

For

Chengdu XGimi Technology Co., Ltd.

5F, Building A7, Tianfu Software Park, Tianfu Avenue, Hi-tech Zone, Chengdu, China

FCC ID: 2AFENXG08X

Report Type:	**Equipment Name:**
Original Report	LED Projector

Report Number:	RSC170821002E
Report Date:	2018-01-05
Reviewed By:	Sula Huang Engineering Director
Prepared By:	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: +86-28-65525123 Fax: +86-28-65525125 www.baclcorp.com

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Chengdu XGimi Technology Co., Ltd.***'s product, model number: **XG08X (FCC ID: 2AFENXG08X)** or the "EUT" as referred to in this report was the **LED Projector**.

Mechanical Description of EUT

The EUT was measured approximately: 345 mm (L) x 338 mm (W) x 57 mm (H).
Rated input voltage: DC 19V from adapter.

AC Adapter information:
Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD.
Model: HDZ1201-3C
Input: 100-240V AC, 50/60Hz
Current: 2.0A Max
Output: +19V DC, 6.32A

Note: The products, test model: XG08X, multiple models: XG07X, XG09X, XG10X, XG11X. Their differences were presented in Product Difference Statement provided by the applicant of this report. So we selected model XG08X to fully test.

**All measurement and test data in this report was gathered from final production sample, serial number: 170821002/01 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-08-14, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of ***Chengdu XGimi Technology 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 Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submissions with FCC ID: 2AFENXG08X
FCC Part 15.407 NII submissions with FCC ID: 2AFENXG08X
FCC Part 15.249 DXX submissions with FCC ID: 2AFENB914C

Measurement Uncertainty

Item			Uncertainty
AC power line conducted emission			2.71 dB
Radiated Emission(Field Strength)	30MHz-200MHz	H	4.57 dB
		V	4.81 dB
	200MHz-1GHz	H	5.69 dB
		V	6.07 dB
	1GHz-6GHz		5.49 dB
	6GHz-18GHz		5.57 dB
	18GHz-40GHz		5.48 dB
Conducted RF Power			±0.61dB
Power Spectrum Density			±0.61dB
Occupied Bandwidth			±5%
Conducted Emission			±1.5dB
Humidity			±5%
Temperature			±1℃

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.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Chengdu) to collect test data is located No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 910975, the FCC Designation No. : CN1186.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062C-1.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode.

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

Test software: “DRTU” installed in device was used during test, the setting was configured as below:

Test Software Version		DRTU		
Test Frequency		2402MHz	2441MHz	2480MHz
GFSK	Power Level	Default	Default	Default
π/4-DQPSK	Power Level	Default	Default	Default
8PSK	Power Level	Default	Default	Default

Local Support Equipment List and Details

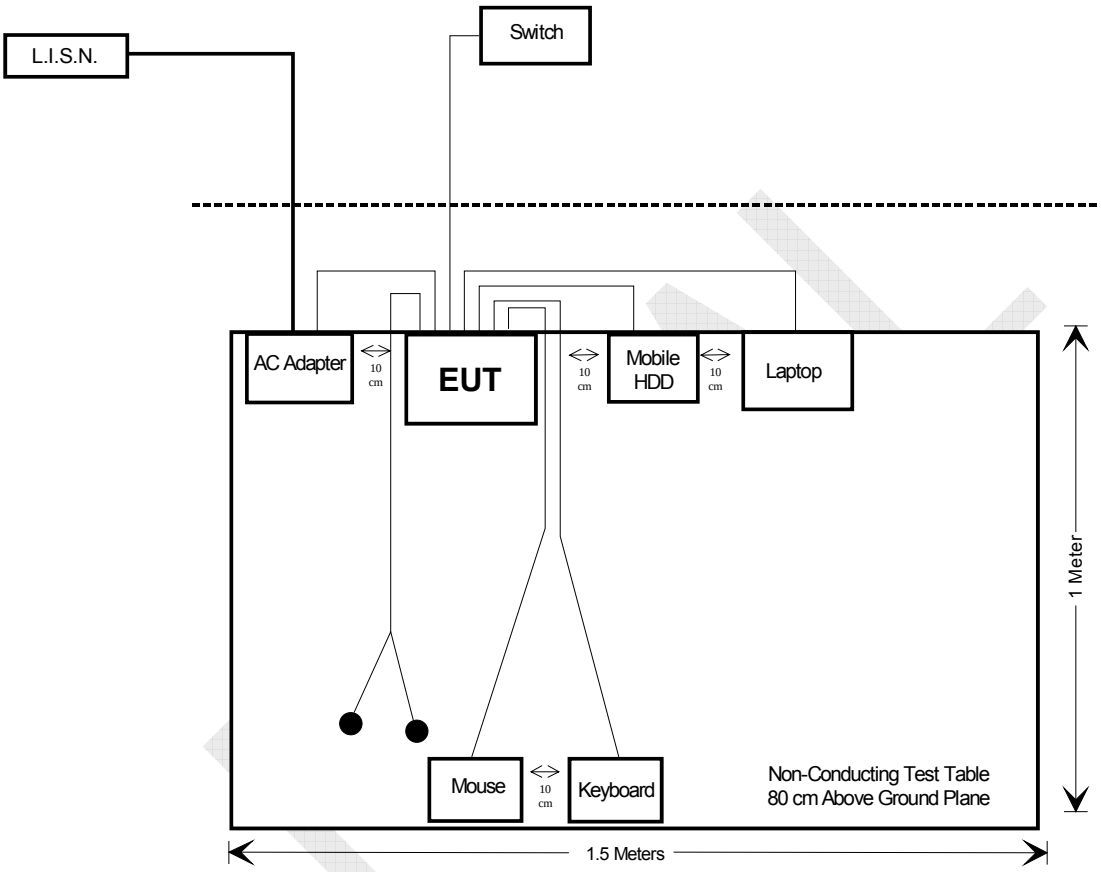
Manufacturer	Description	Model Number	Serial Number
SONY	Laptop	SVF143A1QT	None
Logitech	Mouse	M-U0004	810-001808
TOSHIBA	Mobile HDD	V637020-A	1297FHOYSRE8
LAPOP	Keyboard	JT-505	JT5056UBD200312
HUAWEI	Earphone	P9	None
DL	Switch	DL-S1005PM	None

External I/O Cable

Cable Description	Length (m)	From / Port	To
Unshielded Power Cable	1.2	AC Adapter	EUT
Unshielded USB Cable	1.8	EUT/USB Port	Keyboard
Unshielded USB Cable	1.8	EUT/USB Port	Mouse
Unshielded USB Cable	0.3	EUT/USB Port	Mobile HDD
Shielded HDMI Cable	1.2	EUT / HDMI Port	Laptop
Unshielded RJ45 Cable	5.0	EUT / LAN Port	Switch
Unshielded Earphone Cable	1.0	EUT	Earphone

Block Diagram of Test Setup

AC Power Lines Conducted Emissions Test



Test Equipments List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2017-05-20	2018-05-19
Rohde & Schwarz	RF Limiter	ESH3Z2	DE14781	2017-11-10	2018-11-09
N/A	Conducted Cable	NO.5	N/A	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
Radiated Emissions Test					
Sonoma	Pre-Amplifier	310N	186684	2017-08-18	2018-08-17
Rohde & Schwarz	EMI Test Receiver	ESIB 40	100215	2017-09-12	2018-09-11
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2017-05-20	2018-05-19
Sunol Sciences	Broadband Antenna	JB3	A121808	2017-05-18	2020-05-17
ETS	Horn Antenna	3115	003-6076	2017-05-19	2020-05-18
A.H.Systems,inc	Horn Antenna	SAS-574	505	2016-12-02	2017-12-01
Mini-circuits	Pre-Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
Quinstar	Pre-Amplifier	QLW-18405536-JO	15964004001	2017-05-20	2018-05-19
Sinoscite.,Co Ltd	Reject Band Filter	BSF 2402-2480MN	0898-005	2017-11-10	2018-11-09
INMET	Attenuator	N-6dB	/	2017-11-10	2018-11-09
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2017-11-10	2018-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2017-11-10	2018-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2017-09-26	2018-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2017-05-18	2018-05-17
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2017-11-10	2018-11-09
N/A	RF Cable	NO.3	N/A	2017-11-09	2018-11-08
E-Microwave	DC Block	EMDCB-00036	OE01304225	Each Time	/
N/A	RF Cable	N/A	N/A	Each Time	/

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

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band Edges	Compliance

FCC §15.247 & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 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.

Per 447498 D01 General RF Exposure Guidance v06**,** simultaneous transmission MPE test exclusion applies when the sum of the MPE for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0.

Calculated Formulary:

Predication of MPE limit at a given distance

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

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

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

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

Calculated Data:

MPE evaluation for single transmission:

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
WLAN	2412-2462	5.60	3.63	16.00	39.81	20	0.029	1.0
	5150-5250	7.20	5.25	14.00	25.12	20	0.026	1.0
	5725-5850	7.20	5.25	15.00	31.62	20	0.033	1.0
BT3.0	2402-2480	5.60	3.63	4.00	2.51	20	0.002	1.0
BLE	2402-2480	5.60	3.63	1.00	1.26	20	0.001	1.0

Note: Wi-Fi (2.4G) & Wi-Fi (5G) or Wi-Fi & Bluetooth can not transmit simultaneously.

Result: MPE evaluation of single transmission meets the requirement of standard.

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 used three built in FPC antennas (antenna 1: Bluetooth, 2.4G&5GHz Wi-Fi; antenna 2: 2.4G/5G Wi-Fi; antenna 3: 2.4G-RX), which connected to the main board with IPEX socket, fulfill the requirement of this section. Please refer to the EUT internal photos and the below table for detail.

Antenna Information

Antenna Model Number	Manufacturer	Band	Antenna Gain	Antenna type	Connector
AG-041533-1286 FPC(31.7mm x 23.4mm)	ZHONGSHAN B&T TECHONOLOGY Co.,Ltd	Wi-Fi 2.4GHz/Bluetooth	5.6dBi	Omni-directional	IPEX
		Wi-Fi 5GHz	7.2dBi	Omni-directional	IPEX
AG-041533-1285 FPC(25.6mm x 24.5mm)	ZHONGSHAN B&T TECHONOLOGY Co.,Ltd	Wi-Fi 2.4GHz	4.3dBi	Omni-directional	IPEX
		Wi-Fi 5GHz	6.7dBi	Omni-directional	IPEX
AG-041533-1287 FPC(26.9mm x 17.2mm)	ZHONGSHAN B&T TECHONOLOGY Co.,Ltd	2.4G-RX	0.5 dBi	Omni-directional	IPEX

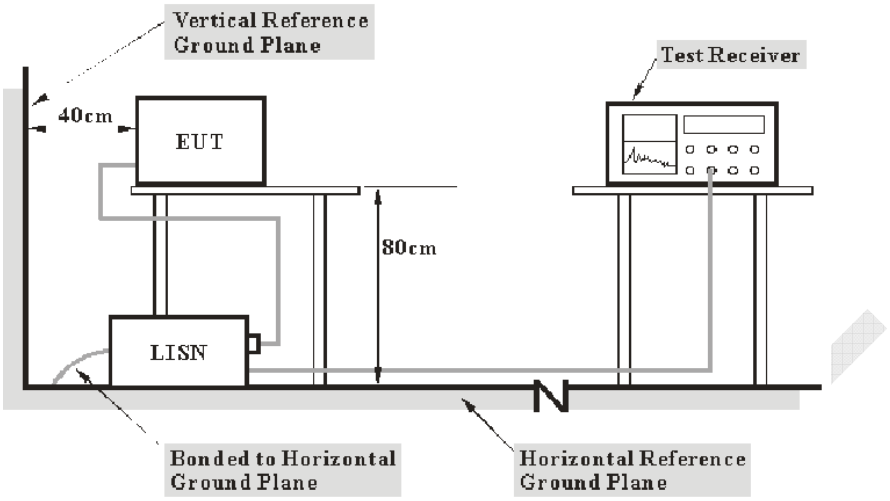
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 V/60 Hz AC power source.

EMI Test Receiver Setup

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

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

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

Test Procedure

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

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$

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

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

Margin = Limit – Corrected Amplitude

Test Data

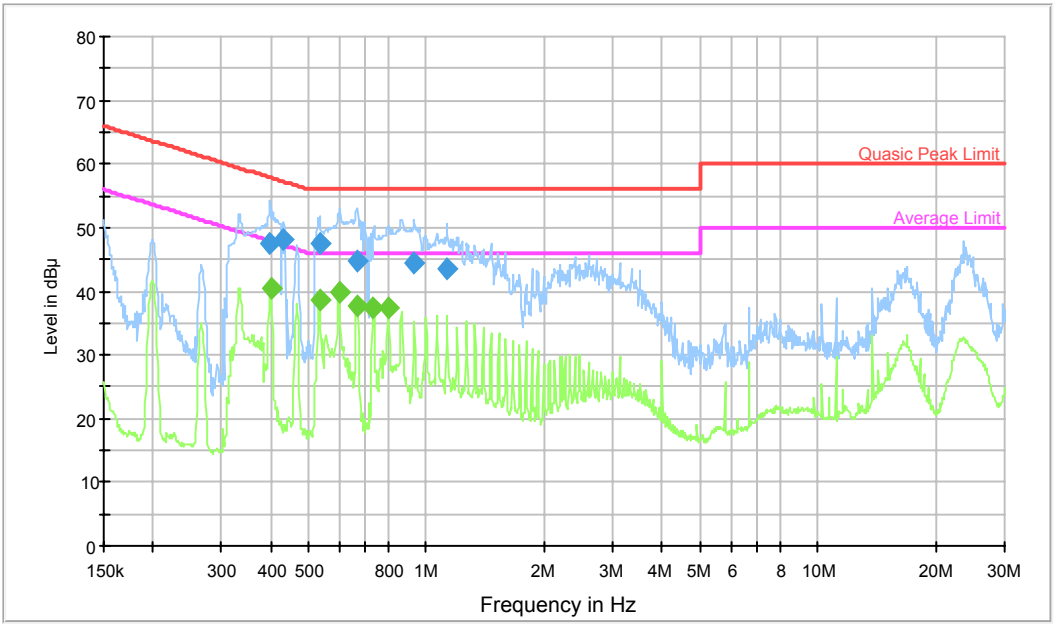
Environmental Conditions

Temperature:	20 °C
Relative Humidity:	60 %
ATM Pressure:	96.4 kPa

The testing was performed by Tom Tang on 2017-11-29.

Test Mode: Transmitting

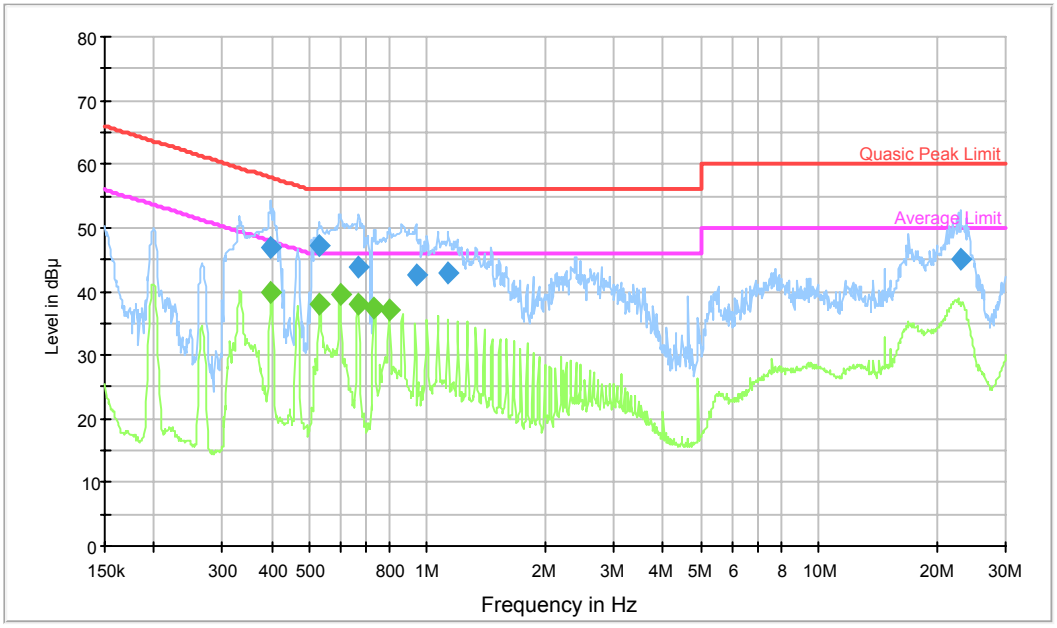
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.398888	47.4	9.000	L1	19.8	10.4	57.9
0.432041	48.0	9.000	L1	19.8	9.2	57.2
0.533841	47.6	9.000	L1	19.8	8.4	56.0
0.664915	44.8	9.000	L1	19.8	11.2	56.0
0.929819	44.5	9.000	L1	19.8	11.5	56.0
1.130707	43.7	9.000	L1	19.7	12.3	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.400484	40.4	9.000	L1	19.8	7.4	47.8
0.533841	38.7	9.000	L1	19.8	7.3	46.0
0.599363	39.9	9.000	L1	19.8	6.1	46.0
0.664915	37.6	9.000	L1	19.8	8.4	46.0
0.731772	37.5	9.000	L1	19.8	8.5	46.0
0.798946	37.3	9.000	L1	19.7	8.7	46.0

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.397299	46.8	9.000	N	19.5	11.1	57.9
0.529596	47.1	9.000	N	19.5	8.9	56.0
0.667575	44.0	9.000	N	19.5	12.0	56.0
0.937272	42.7	9.000	N	19.5	13.3	56.0
1.130707	42.9	9.000	N	19.5	13.1	56.0
23.030502	45.2	9.000	N	20.1	14.8	60.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.398888	39.8	9.000	N	19.5	8.1	47.9
0.531715	38.1	9.000	N	19.5	7.9	46.0
0.599363	39.7	9.000	N	19.5	6.3	46.0
0.664915	37.9	9.000	N	19.5	8.1	46.0
0.731772	37.4	9.000	N	19.5	8.6	46.0
0.798946	37.0	9.000	N	19.5	9.0	46.0

Note:
1) Corrected Amplitude = Reading + Correction Factor
2) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter
3) Margin = Limit – Corrected Amplitude

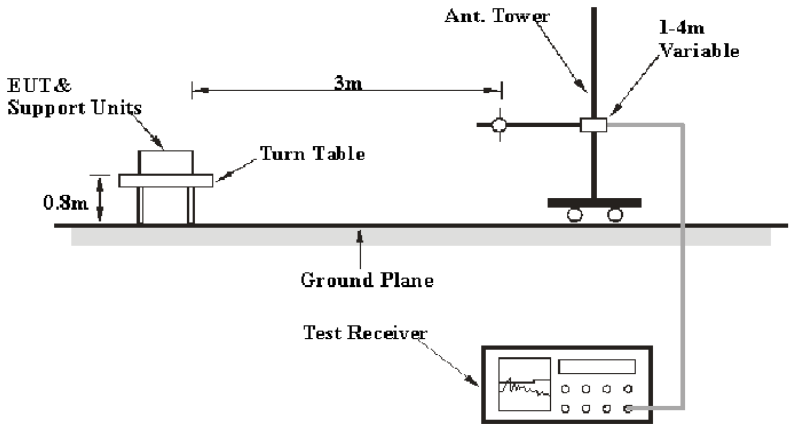
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

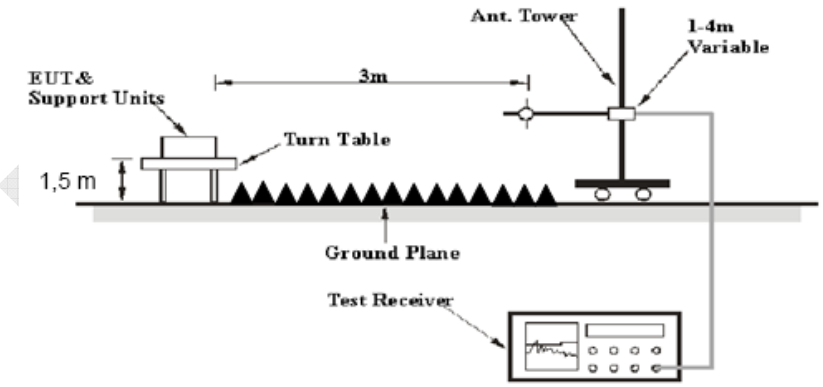
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



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

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

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 V/60 Hz AC power source.

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 setup was 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 1GHz	1MHz	3 MHz	/	PK
	1MHz	3MHz	/	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.

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

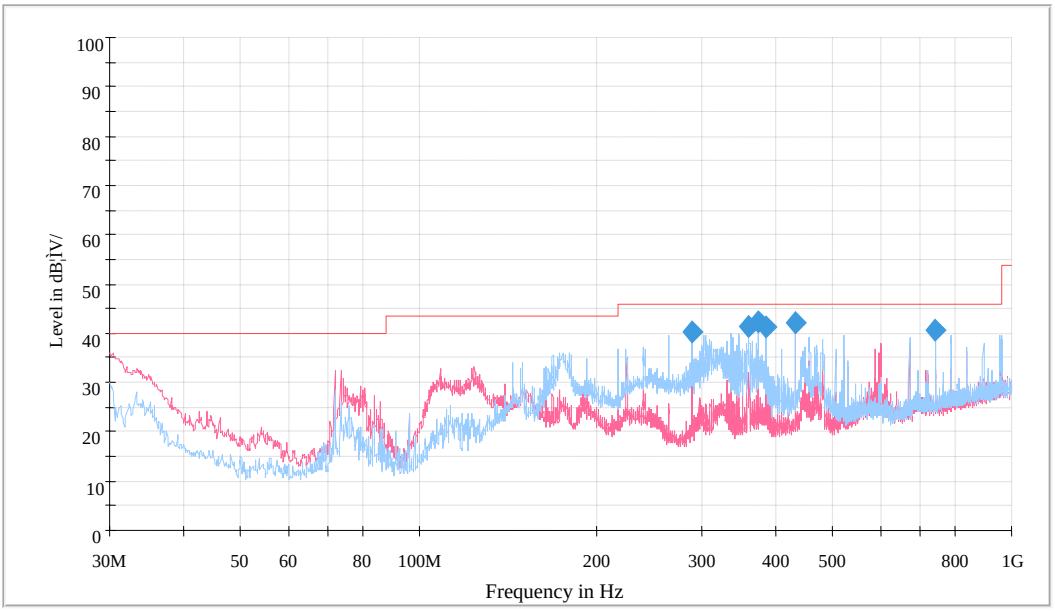
Environmental Conditions

Temperature:	19 °C
Relative Humidity:	58 %
ATM Pressure:	96.4 kPa

** The testing was performed by Tom Tang on 2017-11-30.*

Test Mode: Transmitting (middle channel of GFSK mode)-Worst Case

30 MHz to 1 GHz:



Frequency (MHz)	QuasicPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dBµV/m)
288.262500	40.0	101.0	H	36.0	-11.0	6.0	46.0
360.563750	41.8	110.0	H	52.0	-9.8	*4.2	46.0
373.125300	43.0	139.0	H	98.0	-9.6	*3.0	46.0
384.171250	42.8	145.0	H	54.0	-9.3	*3.2	46.0
432.157500	43.1	103.0	H	87.0	-9.0	*2.9	46.0
744.563680	41.4	149.0	H	248.0	-8.0	*4.2	46.0

**Within measurement uncertainty!*

1GHz-25GHz:

BDR Mode (GFSK):

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBμV	PK/AV	H/V	(dB/m)	dB	dB	dBμV/m	dBμV/m	dB
Frequency:2402 MHz									
2402	63.82	PK	H	28.71	3.00	0.00	95.53	N/A	N/A
2402	53.78	AV	H	28.71	3.00	0.00	85.49	N/A	N/A
2402	71.28	PK	V	28.71	3.00	0.00	102.99	N/A	N/A
2402	59.87	AV	V	28.71	3.00	0.00	91.58	N/A	N/A
2390	23.49	PK	V	28.67	3.00	0.00	55.16	74.00	18.84
2390	15.41	AV	V	28.67	3.00	0.00	47.08	54.00	6.92
4804	37.22	PK	V	33.85	5.12	26.87	49.32	74.00	24.68
4804	19.53	AV	V	33.85	5.12	26.87	31.63	54.00	22.37
7206	32.97	PK	V	36.39	6.16	26.35	49.17	74.00	24.83
7206	18.34	AV	V	36.39	6.16	26.35	34.54	54.00	19.46
Frequency: 2441MHz									
2441	63.12	PK	H	28.82	3.00	0.00	94.94	N/A	N/A
2441	53.26	AV	H	28.82	3.00	0.00	85.08	N/A	N/A
2441	70.89	PK	V	28.82	3.00	0.00	102.71	N/A	N/A
2441	59.25	AV	V	28.82	3.00	0.00	91.07	N/A	N/A
4882	37.15	PK	V	34.07	5.09	26.87	49.44	74.00	24.56
4882	19.53	AV	V	34.07	5.09	26.87	31.82	54.00	22.18
7323	31.84	PK	V	36.55	6.22	26.40	48.21	74.00	25.79
7323	18.44	AV	V	36.55	6.22	26.40	34.81	54.00	19.19
Frequency:2480MHz									
2480	62.47	PK	H	28.94	2.99	0.00	94.40	N/A	N/A
2480	52.02	AV	H	28.94	2.99	0.00	83.95	N/A	N/A
2480	69.06	PK	V	28.94	2.99	0.00	100.99	N/A	N/A
2480	58.25	AV	V	28.94	2.99	0.00	90.18	N/A	N/A
2483.5	29.41	PK	V	28.95	2.99	0.00	61.35	74.00	12.65
2483.5	13.48	AV	V	28.95	2.99	0.00	45.42	54.00	8.58
4960	34.89	PK	V	34.29	5.05	26.88	47.35	74.00	26.65
4960	19.51	AV	V	34.29	5.05	26.88	31.97	54.00	22.03
7440	34.11	PK	V	36.72	6.27	26.45	50.65	74.00	23.35
7440	19.97	AV	V	36.72	6.27	26.45	36.51	54.00	17.49

EDR Mode (π/4-DQPSK):

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBμV	PK/AV	H/V	(dB/m)	dB	dB	dBμV/m	dBμV/m	dB
Frequency:2402 MHz									
2402	60.42	PK	H	28.71	3.00	0.00	92.13	N/A	N/A
2402	48.24	AV	H	28.71	3.00	0.00	79.95	N/A	N/A
2402	67.73	PK	V	28.71	3.00	0.00	99.44	N/A	N/A
2402	54.44	AV	V	28.71	3.00	0.00	86.15	N/A	N/A
2390	29.85	PK	V	28.67	3.00	0.00	61.52	74.00	12.48
2390	15.41	AV	V	28.67	3.00	0.00	47.08	54.00	6.92
4804	34.65	PK	V	33.85	5.12	26.87	46.75	74.00	27.25
4804	20.52	AV	V	33.85	5.12	26.87	32.62	54.00	21.38
7206	32.51	PK	V	36.39	6.16	26.35	48.71	74.00	25.29
7206	18.39	AV	V	36.39	6.16	26.35	34.59	54.00	19.41
Frequency:2441 MHz									
2441	60.12	PK	H	28.82	3.00	0.00	91.94	N/A	N/A
2441	48.01	AV	H	28.82	3.00	0.00	79.83	N/A	N/A
2441	66.87	PK	V	28.82	3.00	0.00	98.69	N/A	N/A
2441	54.16	AV	V	28.82	3.00	0.00	85.98	N/A	N/A
4882	34.32	PK	V	34.07	5.09	26.87	46.61	74.00	27.39
4882	20.02	AV	V	34.07	5.09	26.87	32.31	54.00	21.69
7323	32.16	PK	V	36.55	6.22	26.40	48.53	74.00	25.47
7323	18.21	AV	V	36.55	6.22	26.40	34.58	54.00	19.42
Frequency:2480 MHz									
2480	59.86	PK	H	28.94	2.99	0.00	91.79	N/A	N/A
2480	47.51	AV	H	28.94	2.99	0.00	79.44	N/A	N/A
2480	67.19	PK	V	28.94	2.99	0.00	99.12	N/A	N/A
2480	54.77	AV	V	28.94	2.99	0.00	86.70	N/A	N/A
2483.5	29.79	PK	V	28.95	2.99	0.00	61.73	74.00	12.27
2483.5	15.41	AV	V	28.95	2.99	0.00	47.35	54.00	6.65
4960	34.24	PK	V	34.29	5.05	26.88	46.70	74.00	27.30
4960	19.58	AV	V	34.29	5.05	26.88	32.04	54.00	21.96
7440	34.65	PK	V	36.72	6.27	26.45	51.19	74.00	22.81
7440	19.54	AV	V	36.72	6.27	26.45	36.08	54.00	17.92

EDR Mode (8-DPSK):

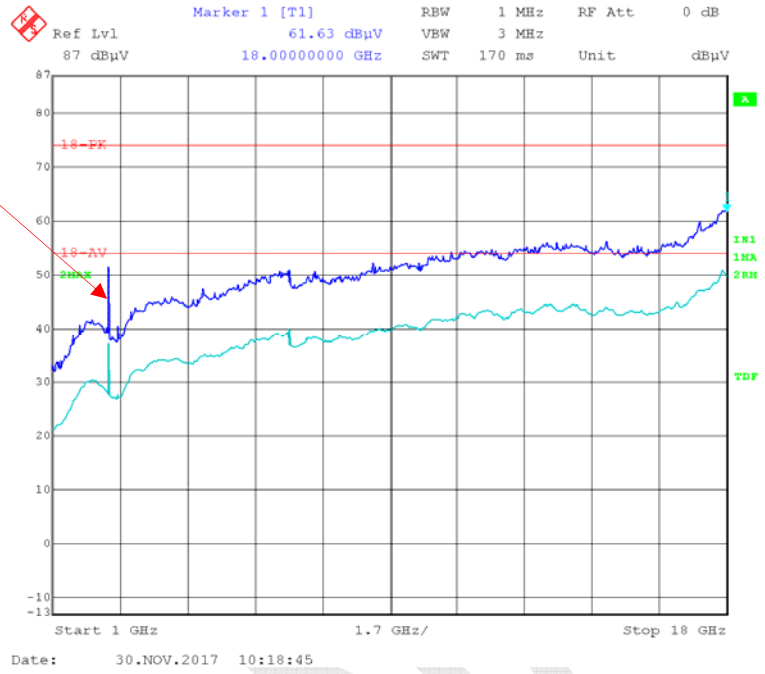
Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	(dB/m)	dB	dB	dBµV/m	dBµV/m	dB
Frequency:2402 MHz									
2402	59.17	PK	H	28.71	3.00	0.00	90.88	N/A	N/A
2402	46.68	AV	H	28.71	3.00	0.00	78.39	N/A	N/A
2402	66.73	PK	V	28.71	3.00	0.00	98.44	N/A	N/A
2402	54.02	AV	V	28.71	3.00	0.00	85.73	N/A	N/A
2390	29.93	PK	V	28.67	3.00	0.00	61.60	74.00	12.40
2390	15.41	AV	V	28.67	3.00	0.00	47.08	54.00	6.92
4804	36.34	PK	V	33.85	5.12	26.87	48.44	74.00	25.56
4804	20.52	AV	V	33.85	5.12	26.87	32.62	54.00	21.38
7206	32.82	PK	V	36.39	6.16	26.35	49.02	74.00	24.98
7206	18.45	AV	V	36.39	6.16	26.35	34.65	54.00	19.35
Frequency: 2441 MHz									
2441	59.05	PK	H	28.82	3.00	0.00	90.87	N/A	N/A
2441	46.32	AV	H	28.82	3.00	0.00	78.14	N/A	N/A
2441	66.47	PK	V	28.82	3.00	0.00	98.29	N/A	N/A
2441	53.87	AV	V	28.82	3.00	0.00	85.69	N/A	N/A
4882	36.10	PK	V	34.07	5.09	26.87	48.39	74.00	25.61
4882	20.23	AV	V	34.07	5.09	26.87	32.52	54.00	21.48
7323	32.52	PK	V	36.55	6.22	26.40	48.89	74.00	25.11
7323	18.34	AV	V	36.55	6.22	26.40	34.71	54.00	19.29
Frequency: 2480 MHz									
2480	59.65	PK	H	28.94	2.99	0.00	91.58	N/A	N/A
2480	46.54	AV	H	28.94	2.99	0.00	78.47	N/A	N/A
2480	65.12	PK	V	28.94	2.99	0.00	97.05	N/A	N/A
2480	52.75	AV	V	28.94	2.99	0.00	84.68	N/A	N/A
2483.5	29.87	PK	V	28.95	2.99	0.00	61.81	74.00	12.19
2483.5	15.41	AV	V	28.95	2.99	0.00	47.35	54.00	6.65
4960	34.39	PK	V	34.29	5.05	26.88	46.85	74.00	27.15
4960	19.58	AV	V	34.29	5.05	26.88	32.04	54.00	21.96
7440	33.45	PK	V	36.72	6.27	26.45	49.99	74.00	24.01
7440	19.50	AV	V	36.72	6.27	26.45	36.04	54.00	17.96

Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude
Spurious emissions more than 20 dB below the limit were not reported.

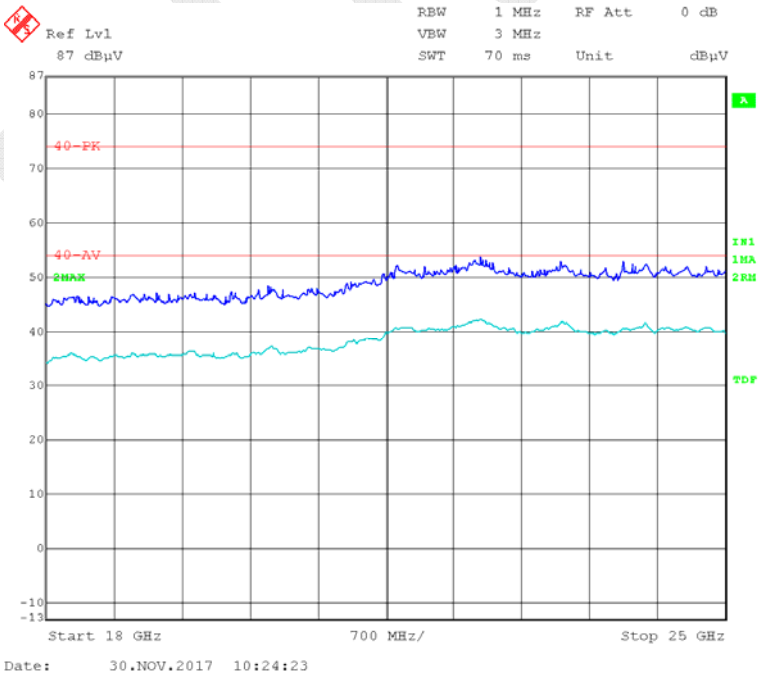
Please refer to the below pre-scan plot of worst case:

BDR Mode (GFSK): Low Channel_Horizontal_1GHz-18GHz

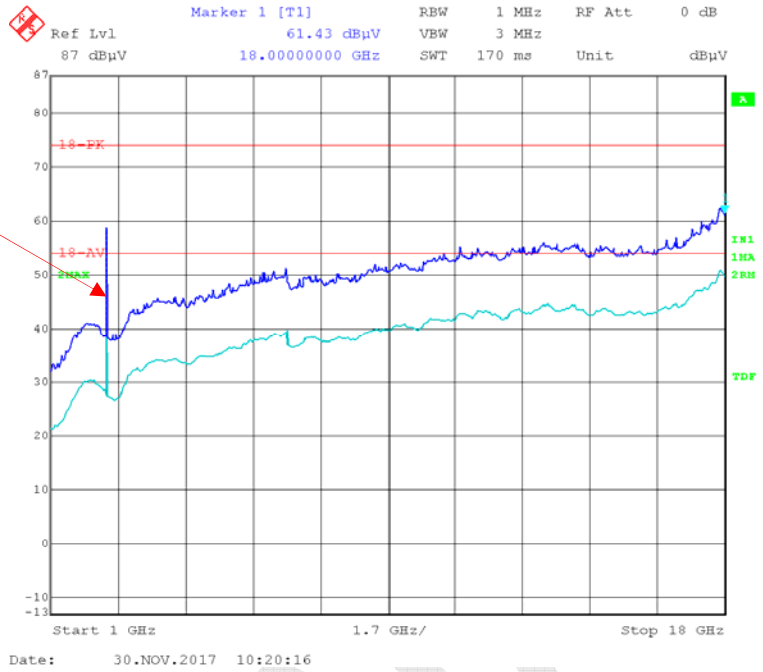
Fundamental with Reject Band Filter



BDR Mode (GFSK): Low Channel_Horizontal_18GHz-25GHz

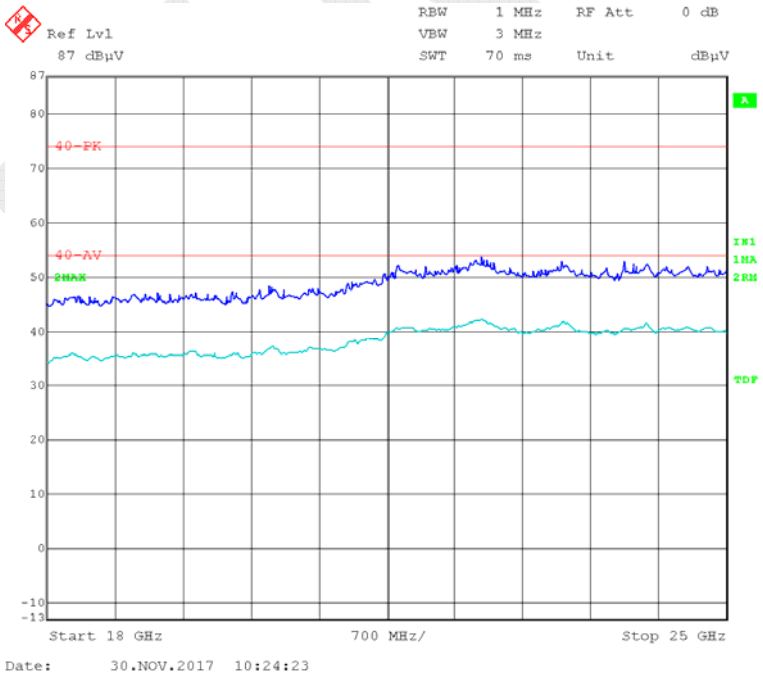


BDR Mode (GFSK): Low Channel_Vertical_1GHz-18GHz



Fundamental with Reject Band Filter

BDR Mode (GFSK): Low Channel_Vertical_18GHz-25GHz



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

Applicable Standard

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

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	18 °C
Relative Humidity:	54 %
ATM Pressure:	96.5 kPa

** The testing was performed by Tom Tang on 2017-12-02.*

Test Result: Compliance.

Please refer to following tables and plots.

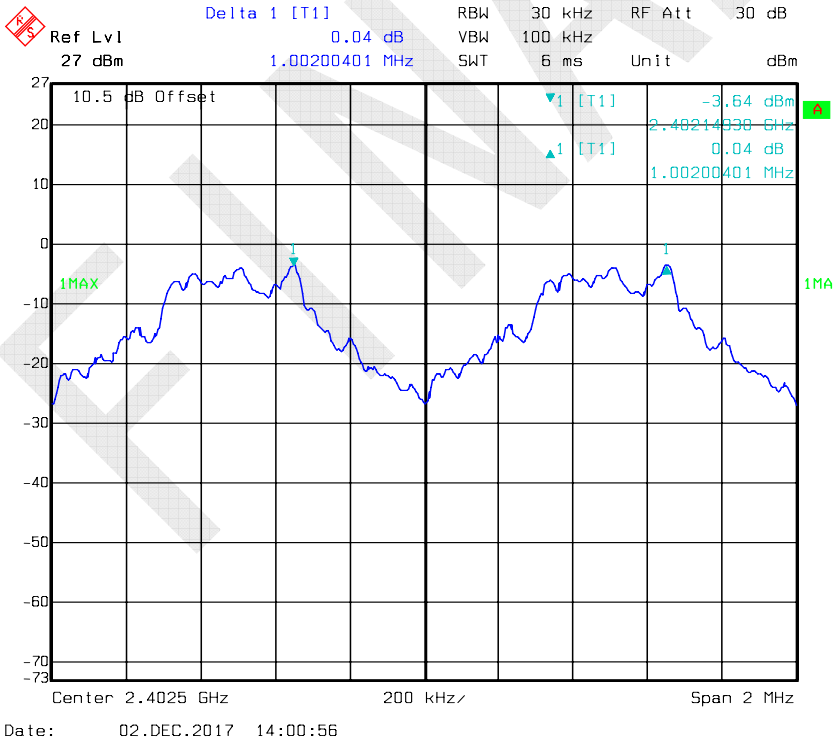
Test Mode: Transmitting

Mode	Channel	Frequency	Channel Separation	Limit
		MHz	MHz	MHz
BDR (GFSK)	Low	2402	1.002	0.63
	Middle	2441	1.002	0.61
	High	2480	1.002	0.63
EDR (π/4-DQPSK)	Low	2402	1.002	0.96
	Middle	2441	1.002	0.97
	High	2480	1.006	0.96
EDR (8DPSK)	Low	2402	1.002	0.98
	Middle	2441	1.002	0.98
	High	2480	1.006	0.98

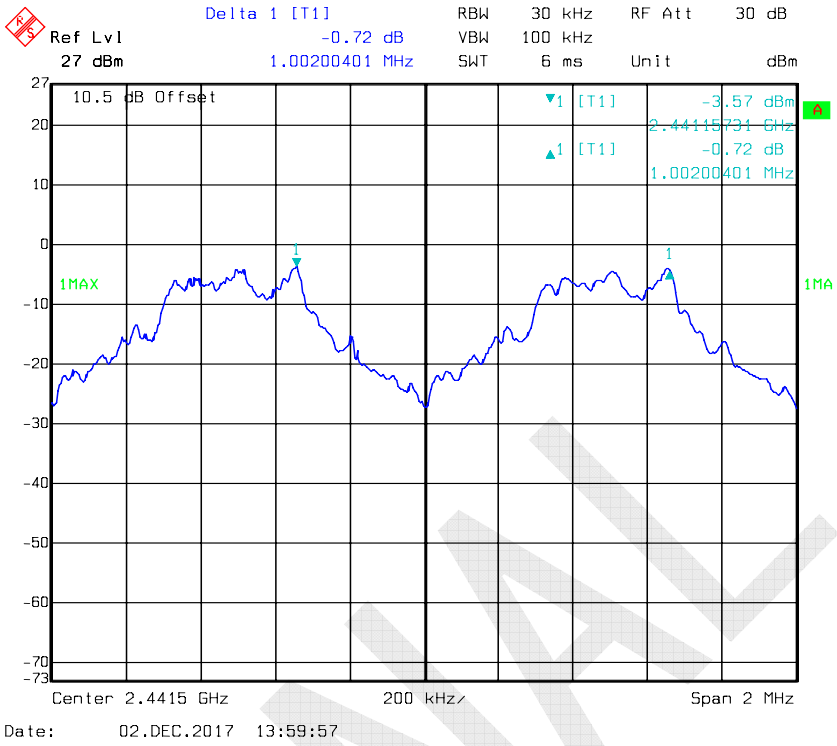
Note: Limit= (2/3) × 20dB bandwidth

BDR Mode (GFSK):

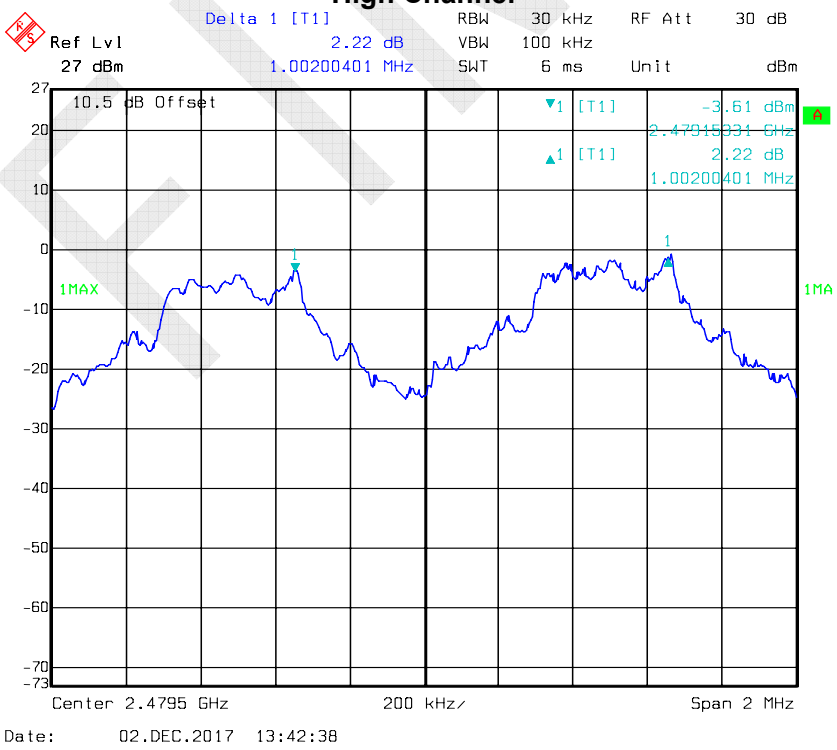
Low Channel



Middle Channel

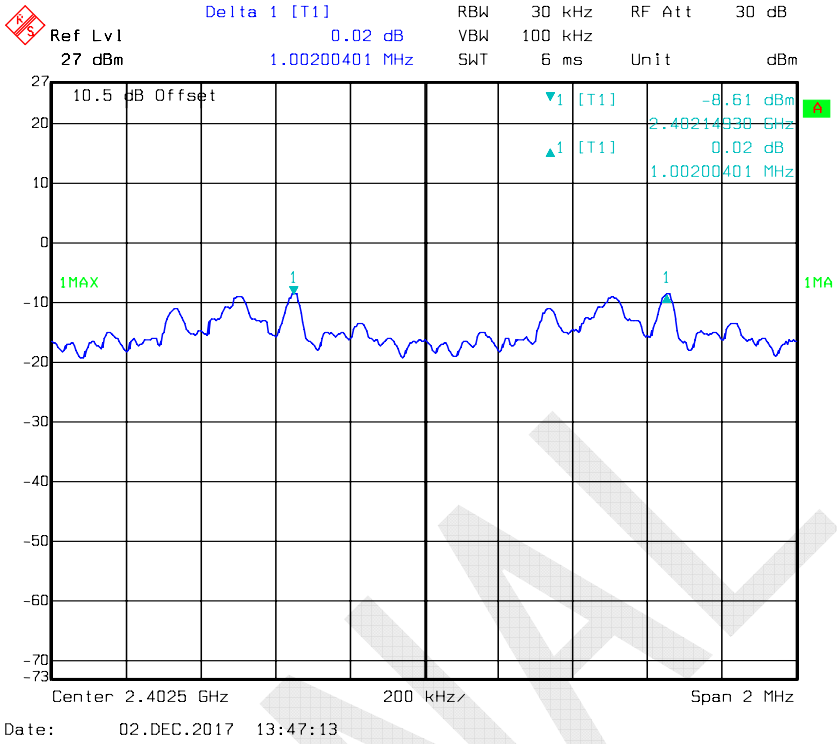


High Channel

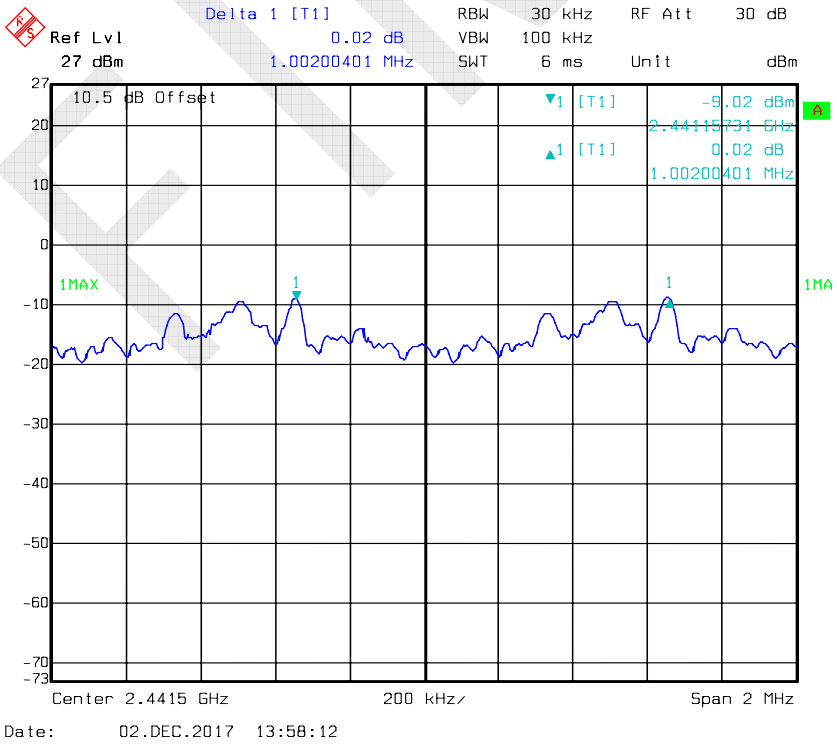


EDR Mode (π/4-DQPSK):

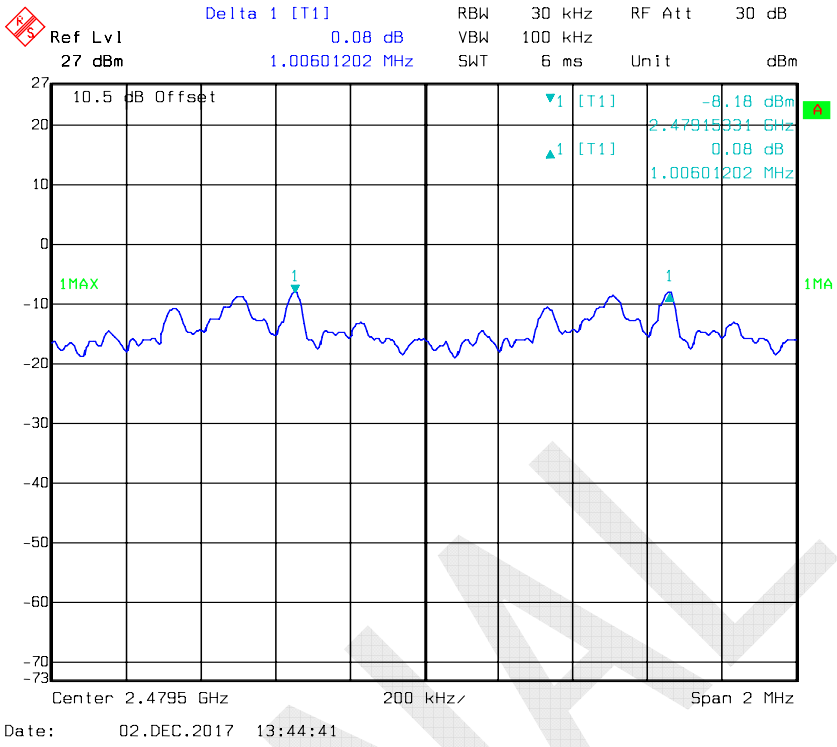
Low Channel



Middle Channel

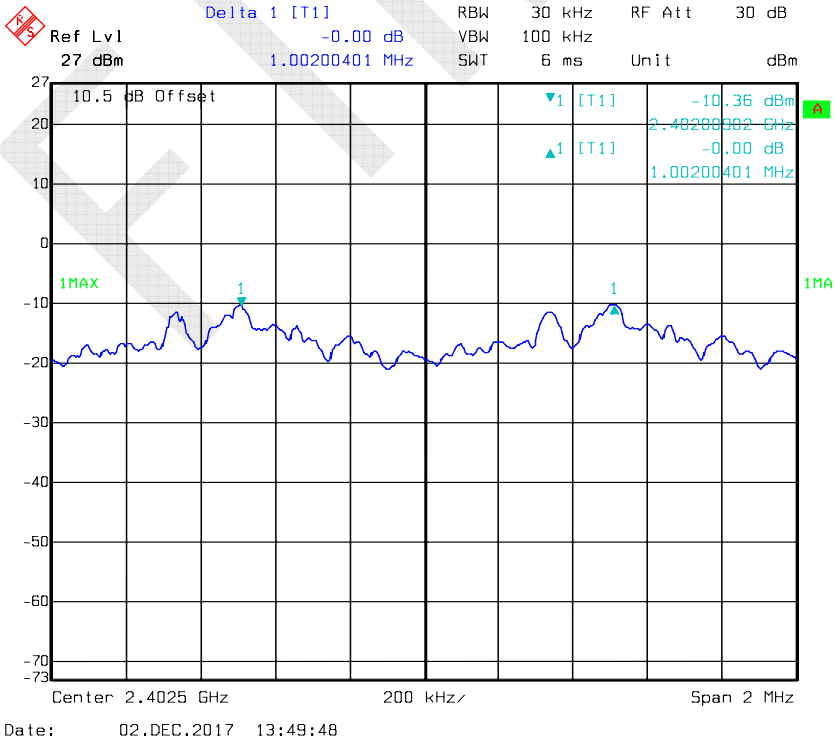


High Channel

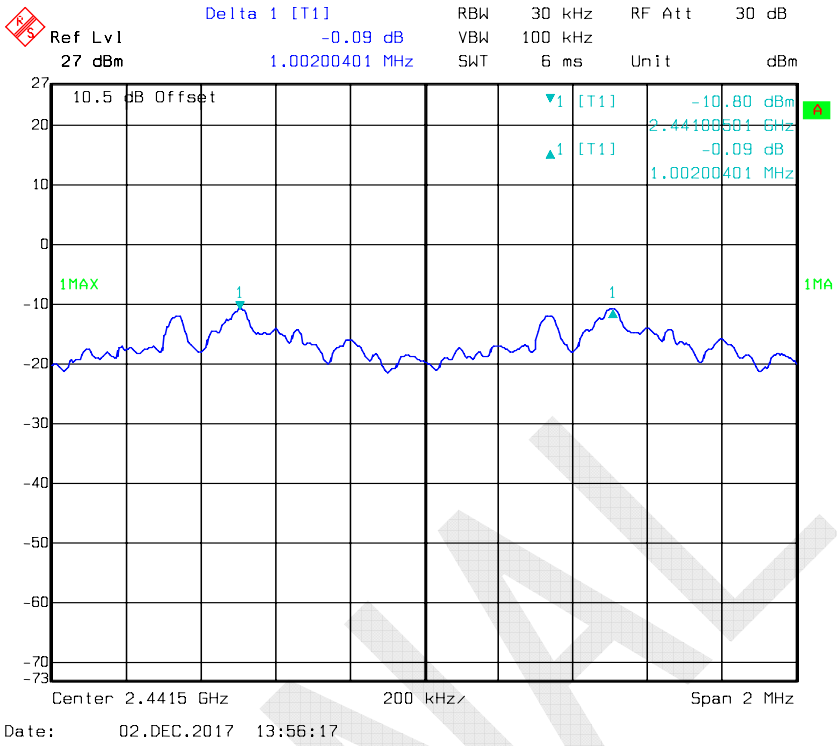


EDR Mode (8-DPSK):

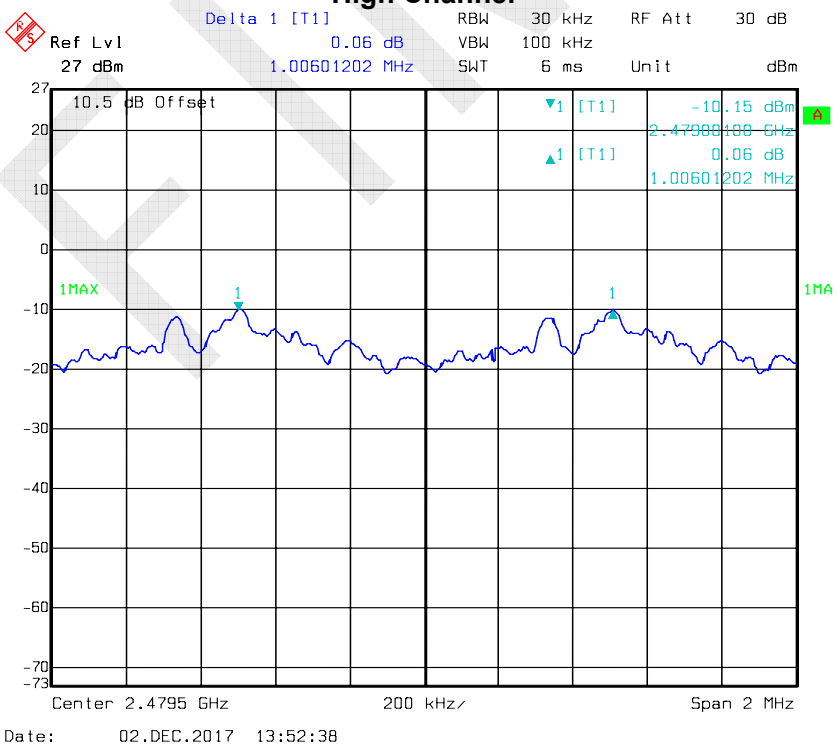
Low Channel



Middle Channel



High Channel



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

Applicable Standard

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

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	18 °C
Relative Humidity:	54 %
ATM Pressure:	96.8 kPa

** The testing was performed by Tom Tang on 2017-12-01.*

Test Result: Compliance.

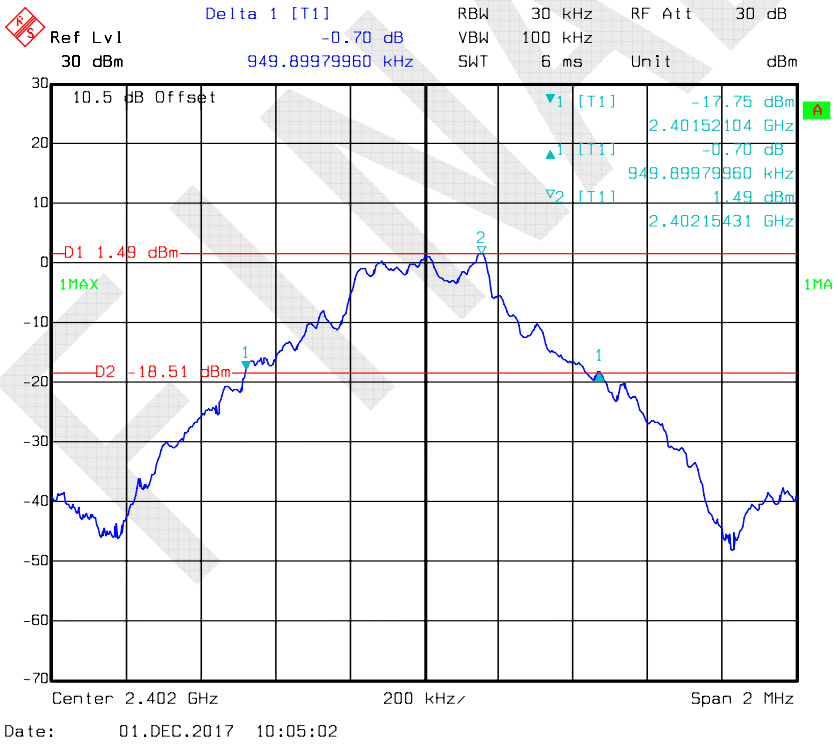
Please refer to following tables and plots

Test Mode: Transmitting

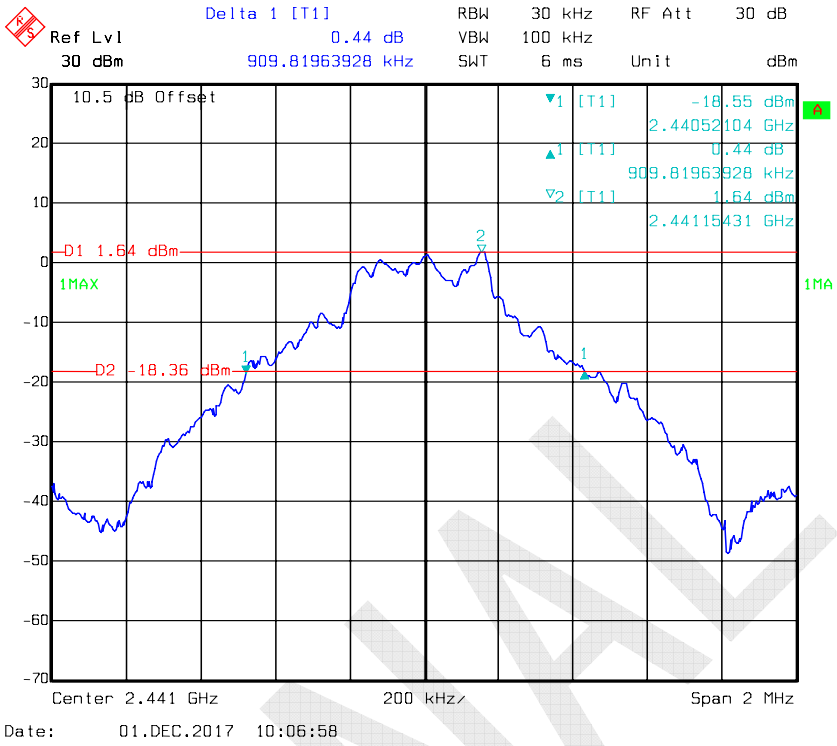
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.95
	Middle	2441	0.91
	High	2480	0.95
EDR Mode (π/4-DQPSK)	Low	2402	1.44
	Middle	2441	1.45
	High	2480	1.44
EDR Mode (8-DPSK)	Low	2402	1.47
	Middle	2441	1.47
	High	2480	1.47

BDR Mode (GFSK):

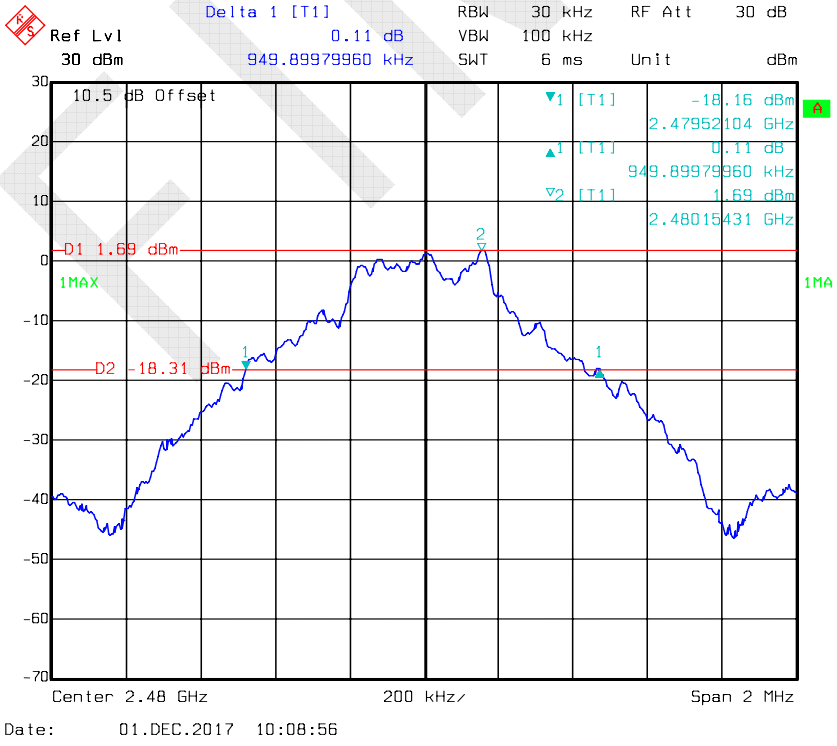
Low Channel



Middle Channel

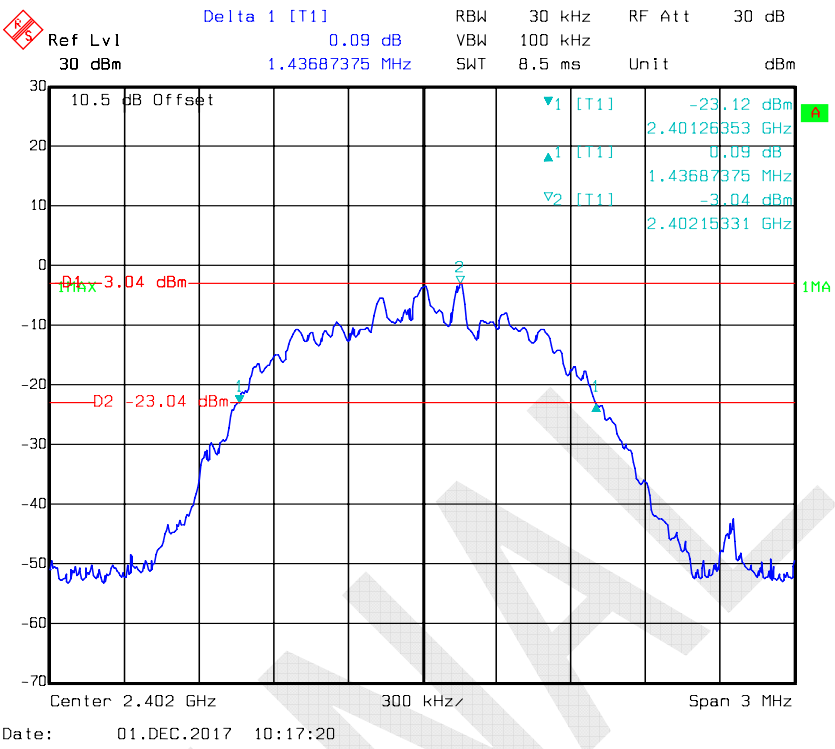


High Channel

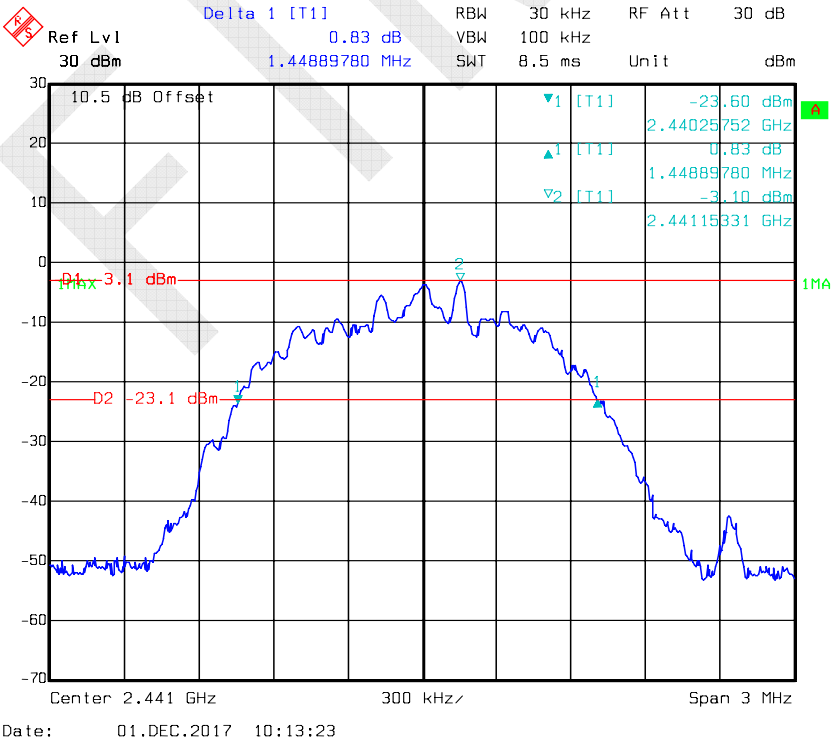


EDR Mode (π/4-DQPSK):

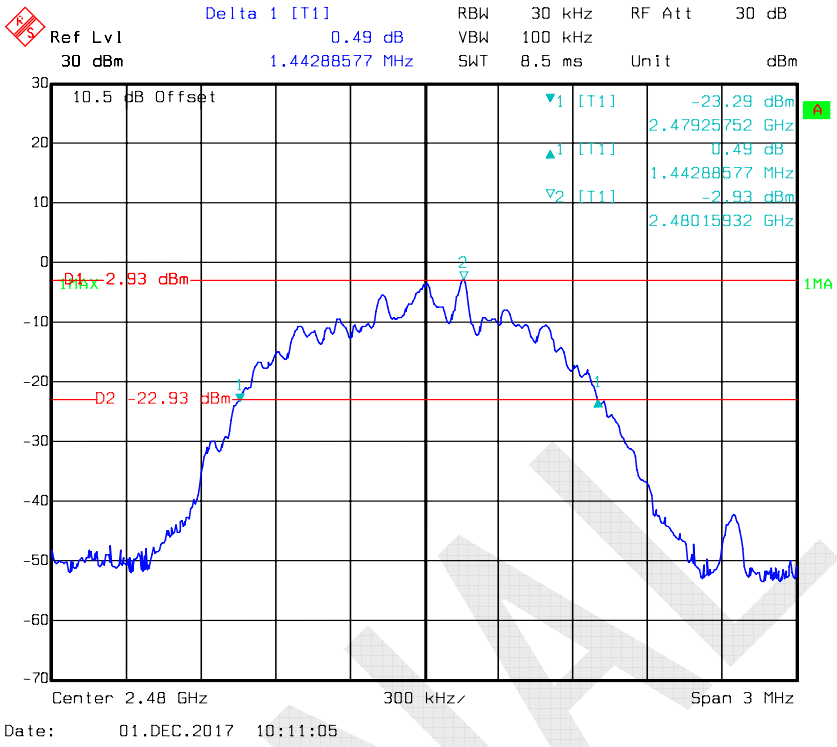
Low Channel



Middle Channel

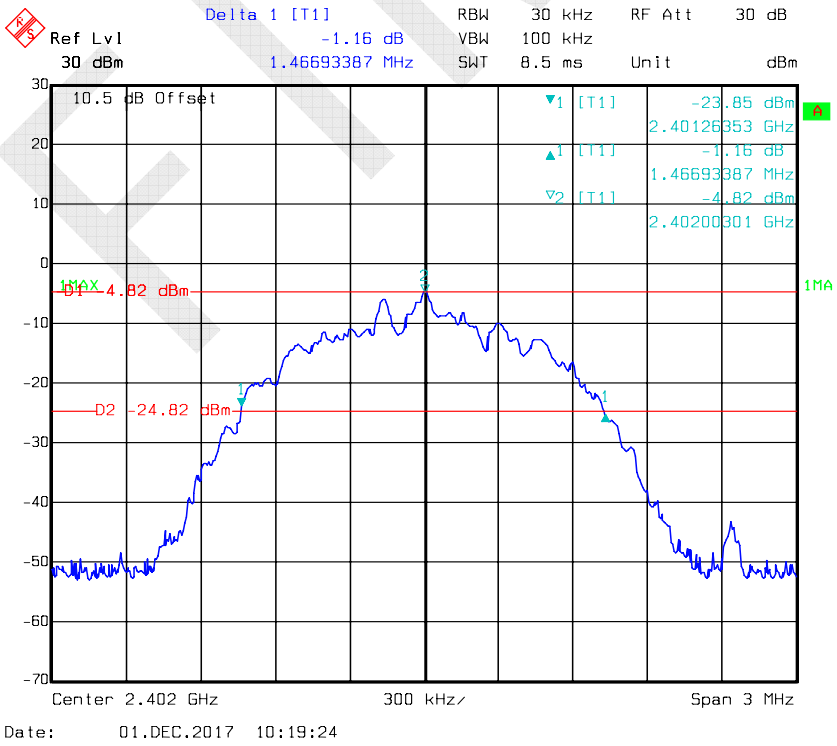


High Channel

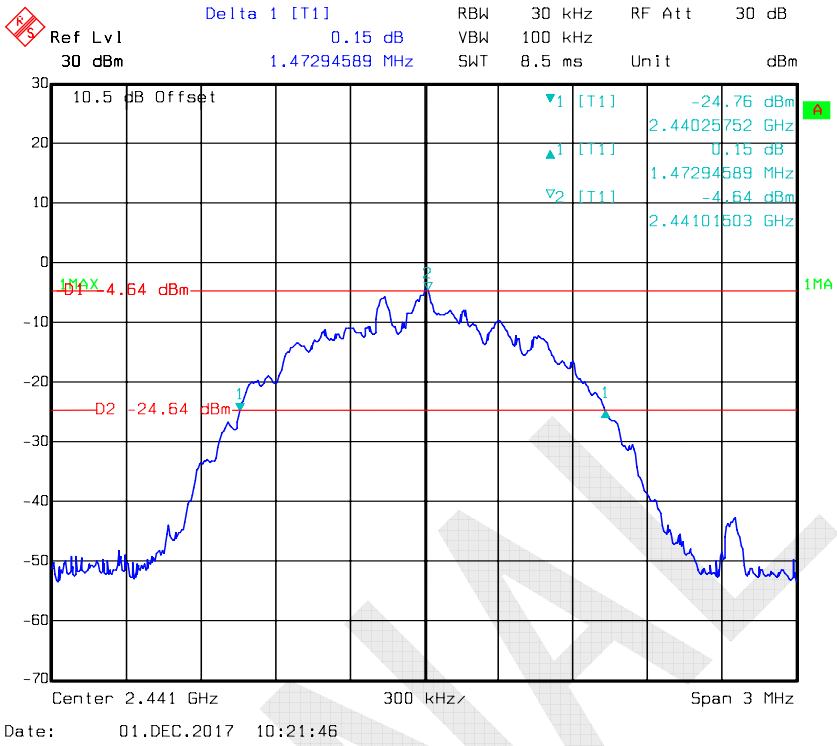


EDR Mode (8-DPSK):

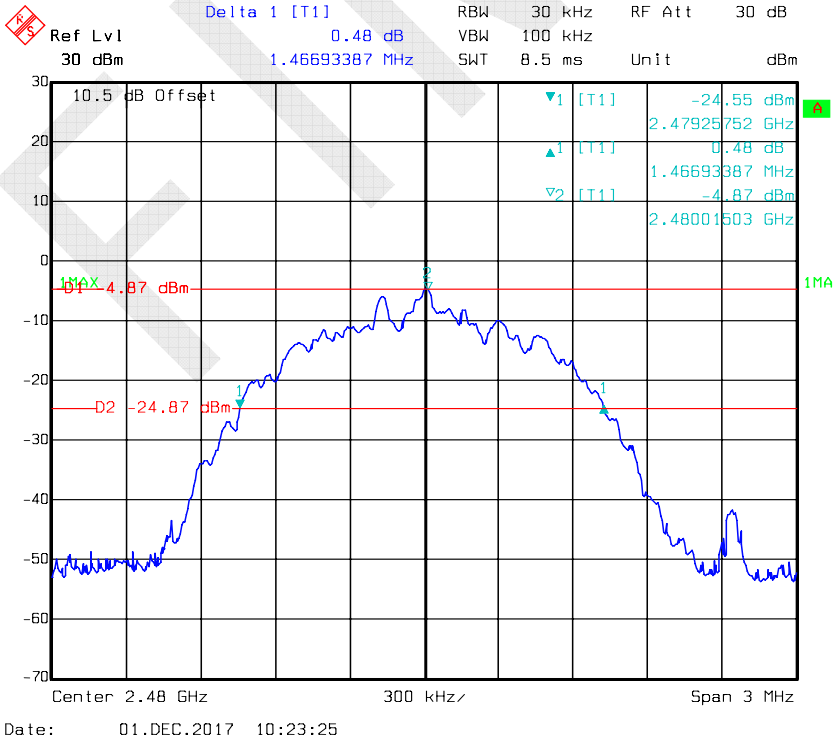
Low Channel



Middle Channel



High Channel



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

Applicable Standard

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

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	18 °C
Relative Humidity:	54 %
ATM Pressure:	96.5 kPa

** The testing was performed by Tom Tang on 2017-12-02.*

Test Result: Compliance.

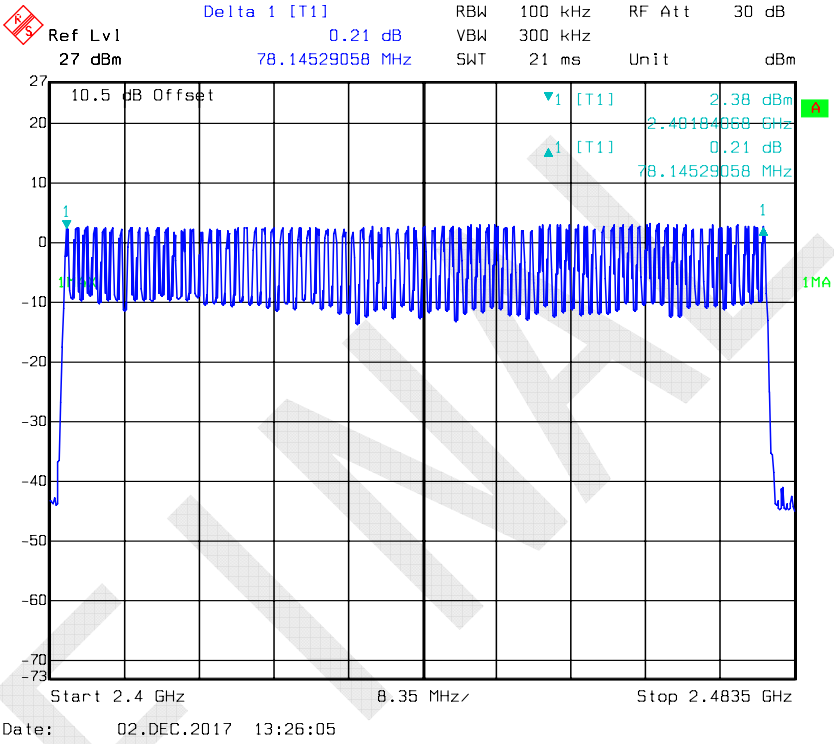
Please refer to following tables and plots.

Test Mode: Transmitting

BDR Mode (GFSK):

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

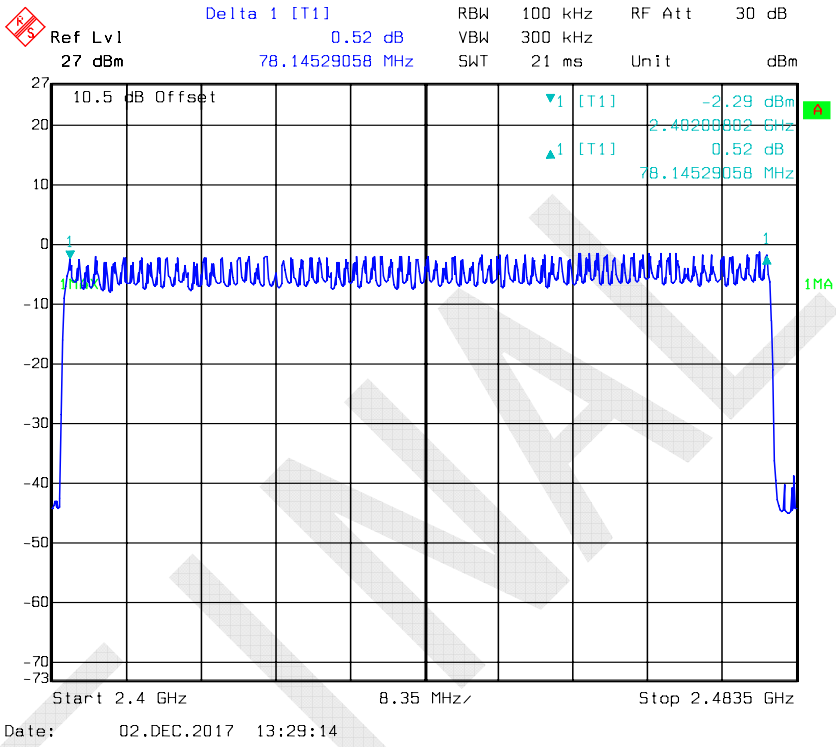
Number of Hopping Channels



EDR Mode (π/4-DQPSK):

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

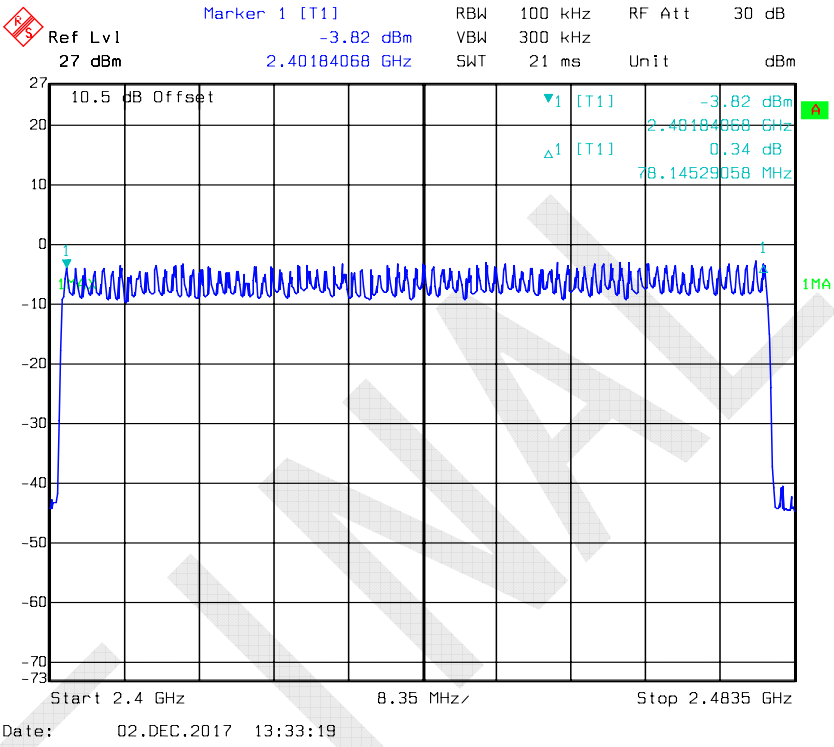
Number of Hopping Channels



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 hopping mode, Spectrum Analyzer SPAN was set as 0, the time of single pulse was tested.

Test Data

Environmental Conditions

Temperature:	18 °C
Relative Humidity:	54 %
ATM Pressure:	96.5 kPa

** The testing was performed by Tom Tang on 2017-12-02.*

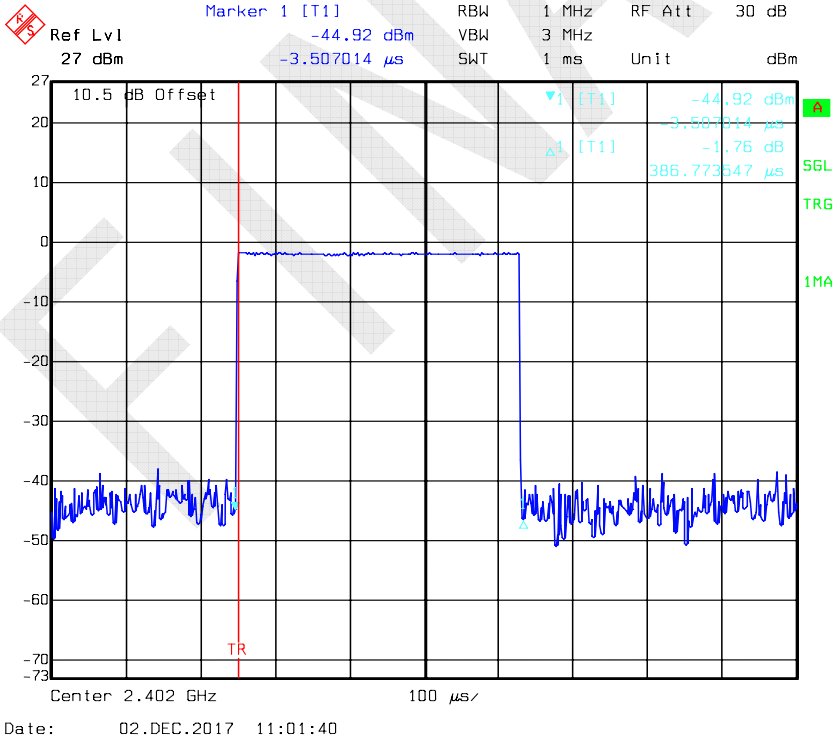
Test Result: Compliance. Please refer to following tables and plots

Test Mode: Transmitting

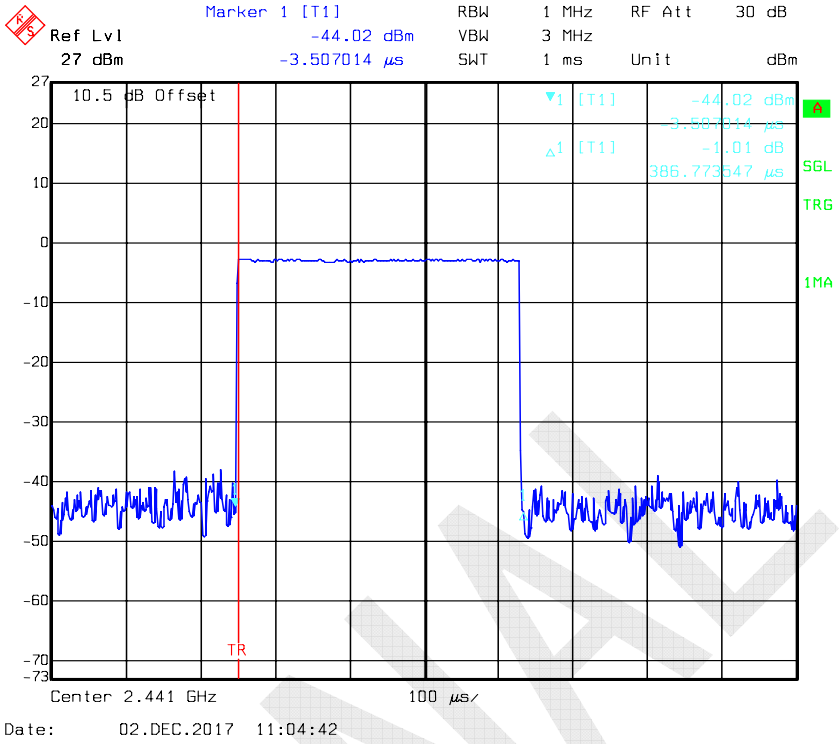
BDR Mode (GFSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.387	0.124	0.4	Compliance
	Middle	0.387	0.124	0.4	Compliance
	High	0.387	0.124	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.655	0.265	0.4	Compliance
	Middle	1.655	0.265	0.4	Compliance
	High	1.655	0.265	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.914	0.311	0.4	Compliance
	Middle	2.914	0.311	0.4	Compliance
	High	2.914	0.311	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

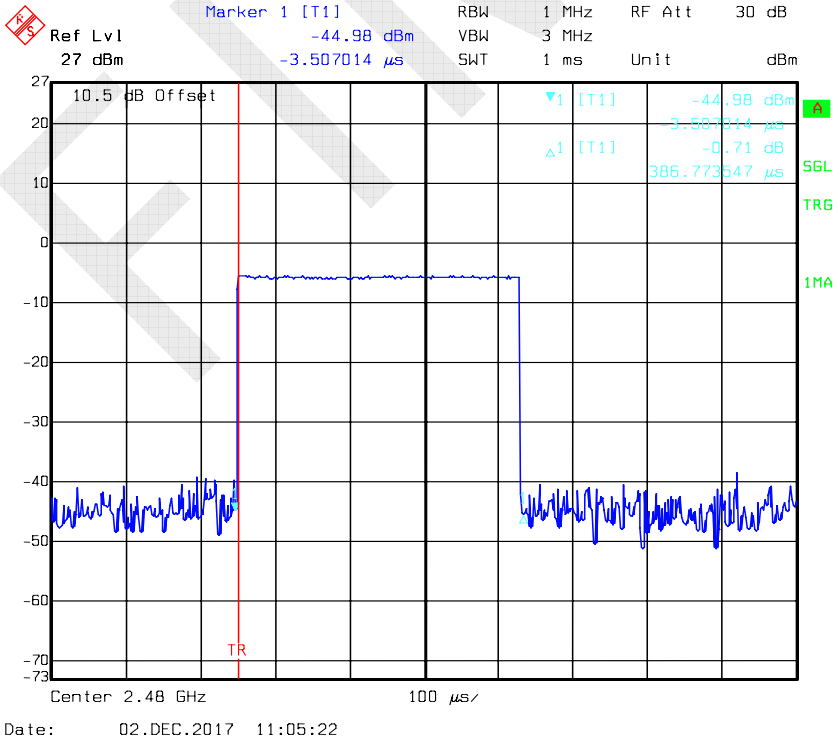
DH1: Low Channel



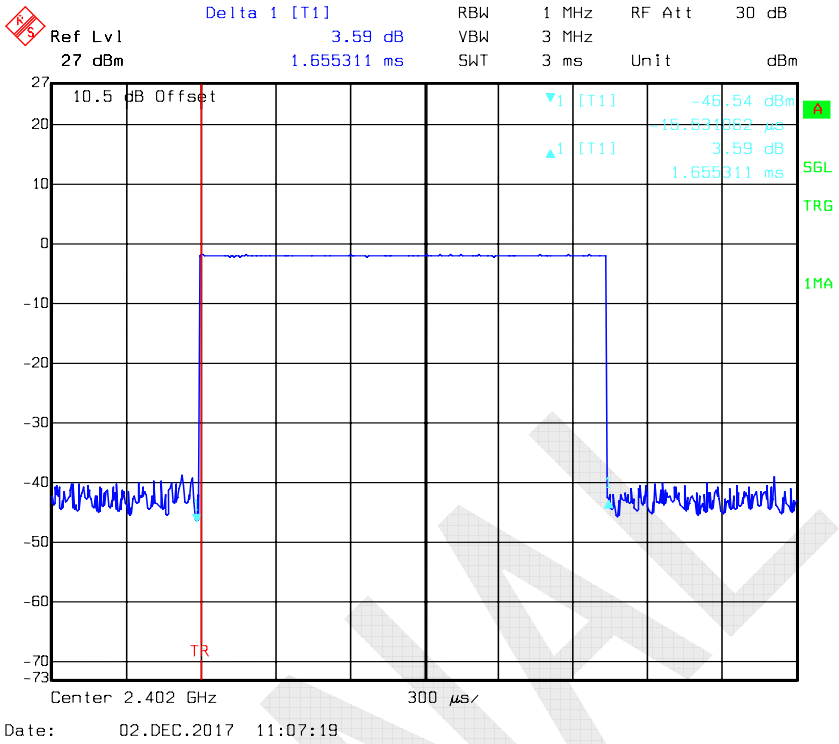
DH1: Middle Channel



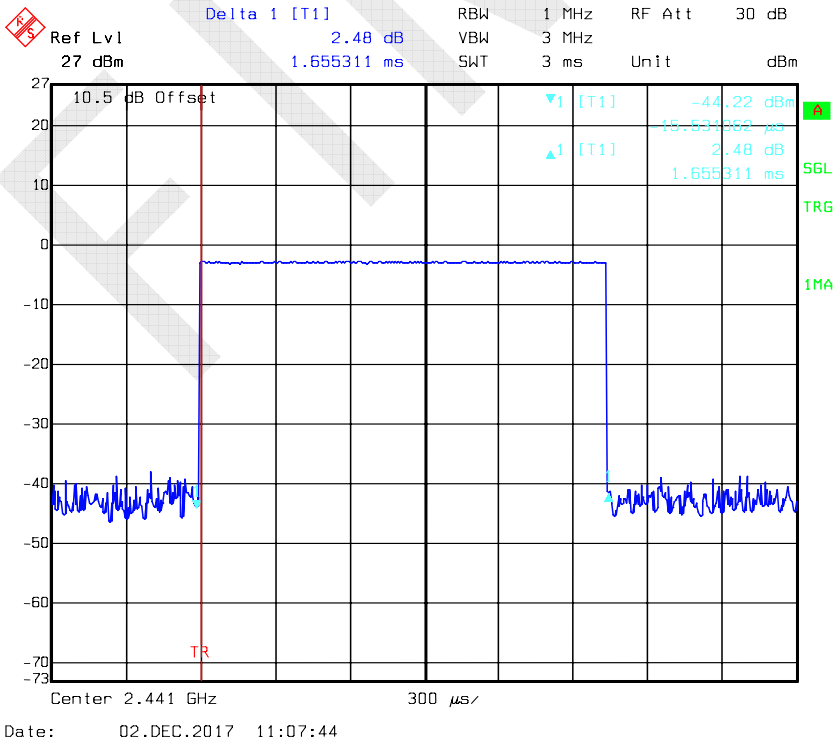
DH1: High Channel



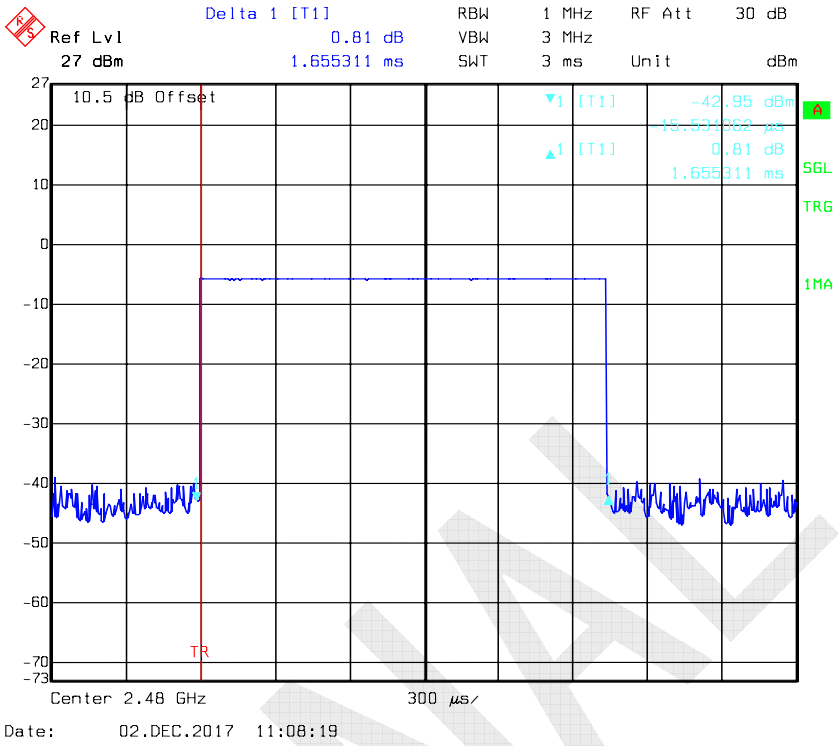
DH3: Low Channel



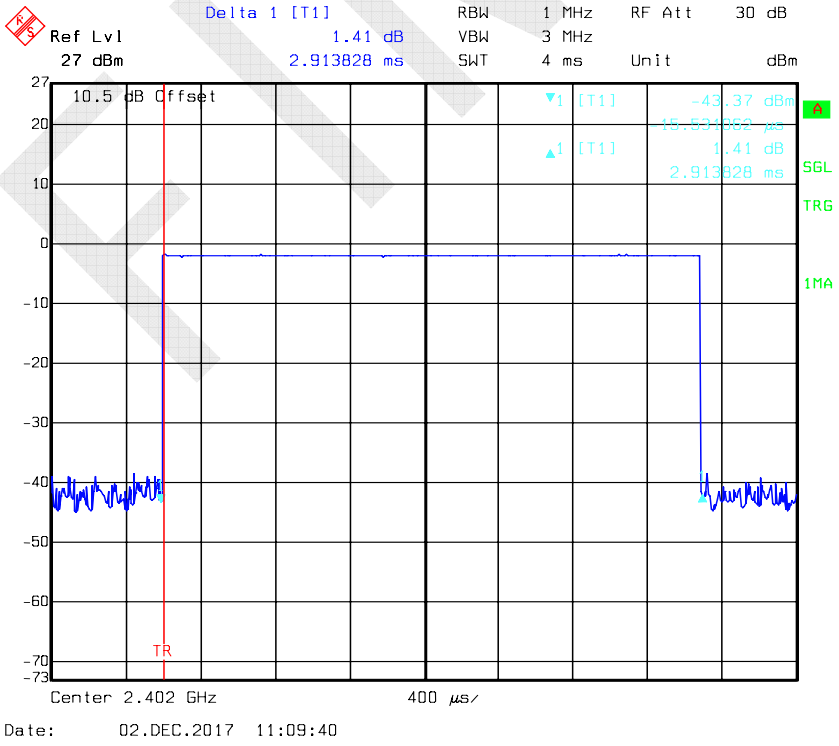
DH3: Middle Channel



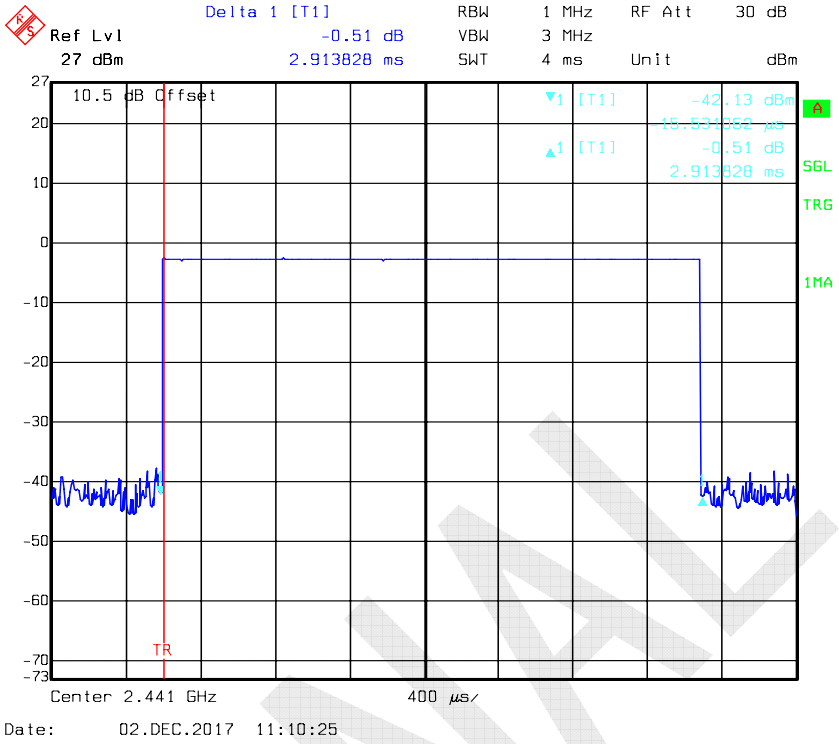
DH3: High Channel



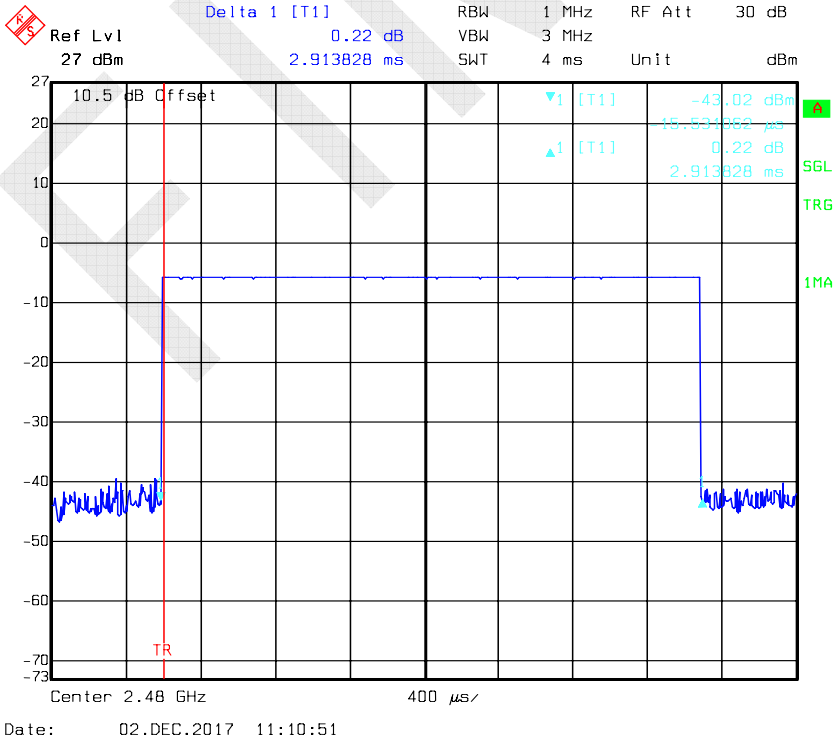
DH5: Low Channel



DH5: Middle Channel



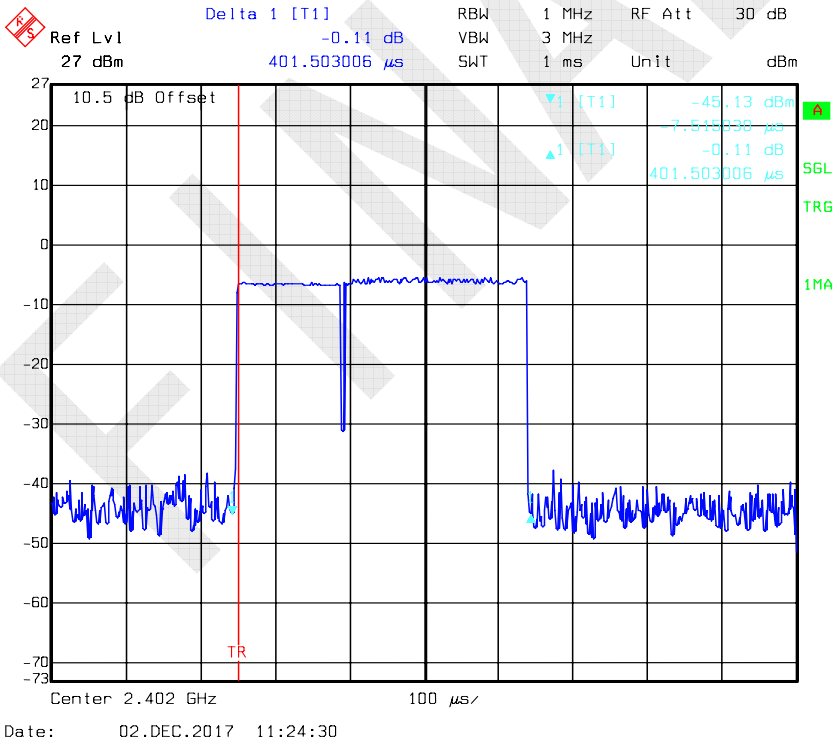
DH5: High Channel



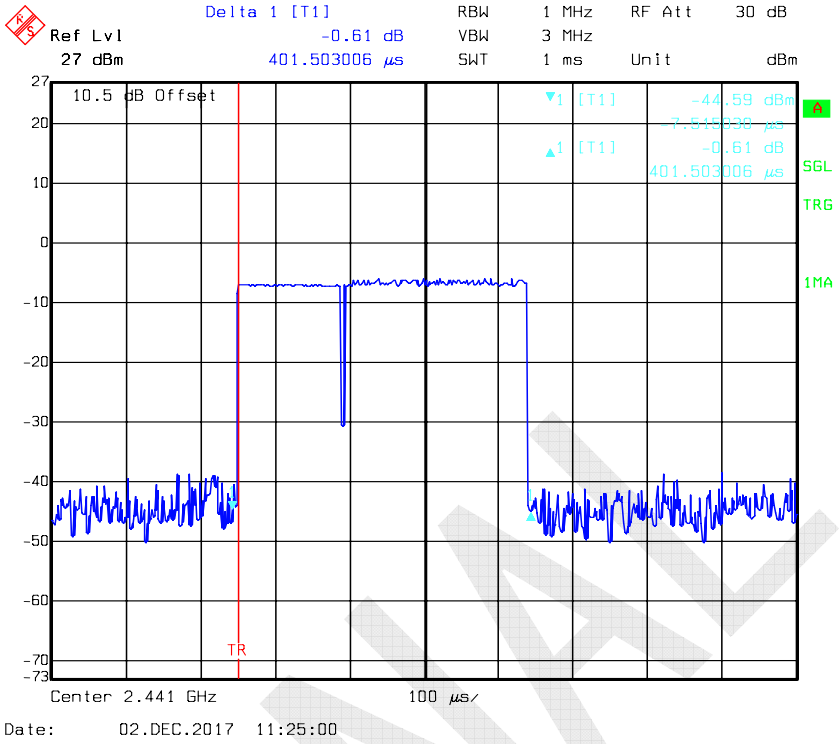
EDR Mode (π/4-DQPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.402	0.129	0.4	Compliance
	Middle	0.402	0.129	0.4	Compliance
	High	0.402	0.129	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
2DH3	Low	1.664	0.266	0.4	Compliance
	Middle	1.664	0.266	0.4	Compliance
	High	1.664	0.266	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
2DH5	Low	2.923	0.312	0.4	Compliance
	Middle	2.923	0.312	0.4	Compliance
	High	2.923	0.312	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

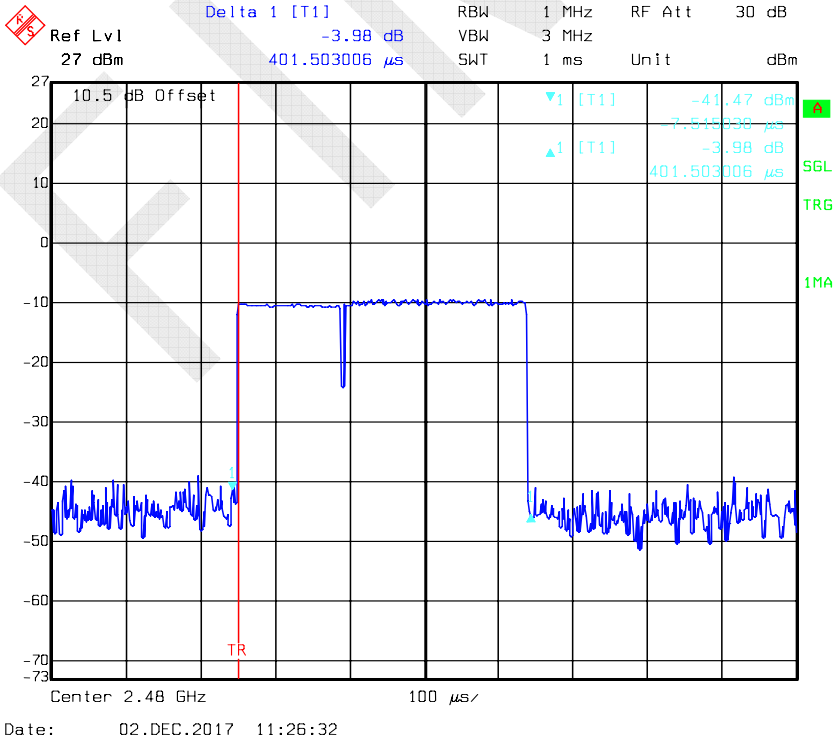
2DH1: Low Channel



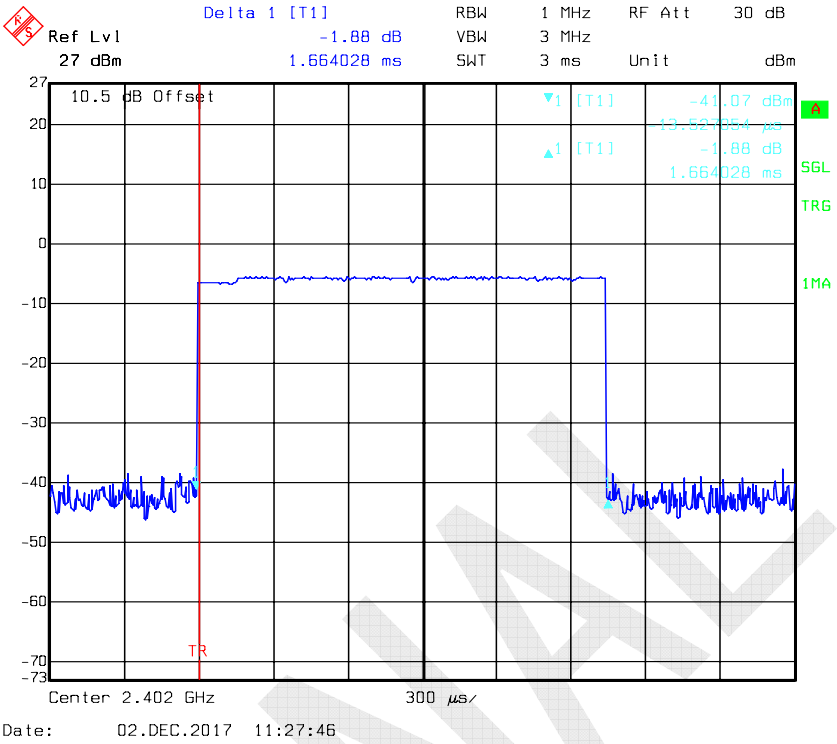
2DH1: Middle Channel



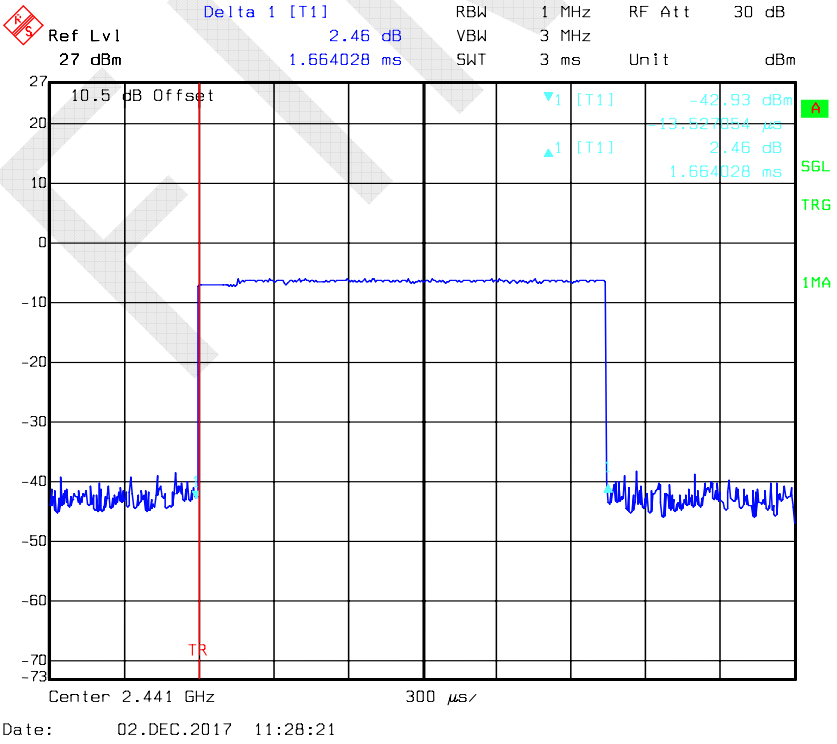
2DH1: High Channel



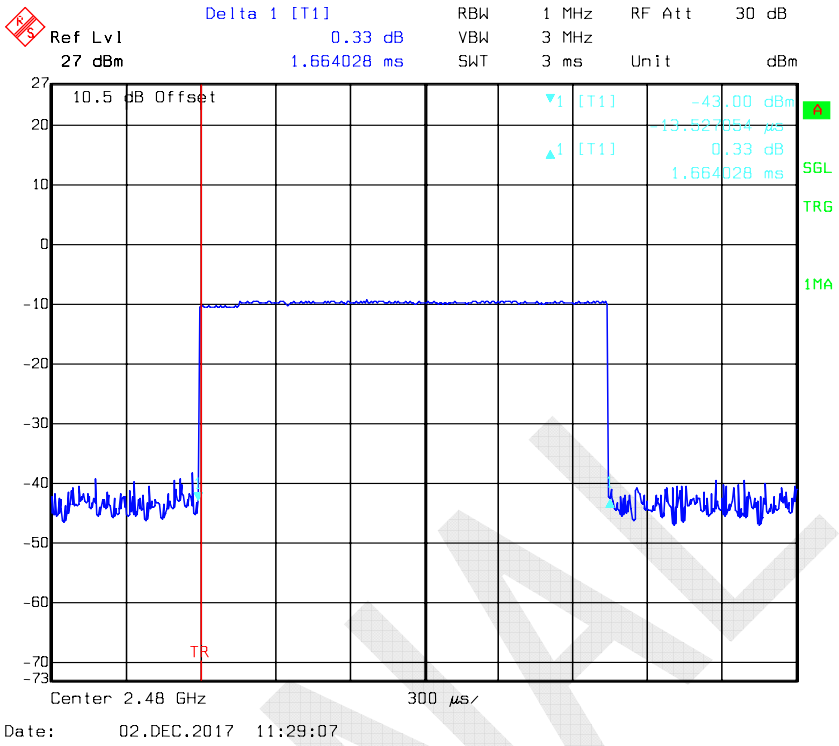
2DH3: Low Channel



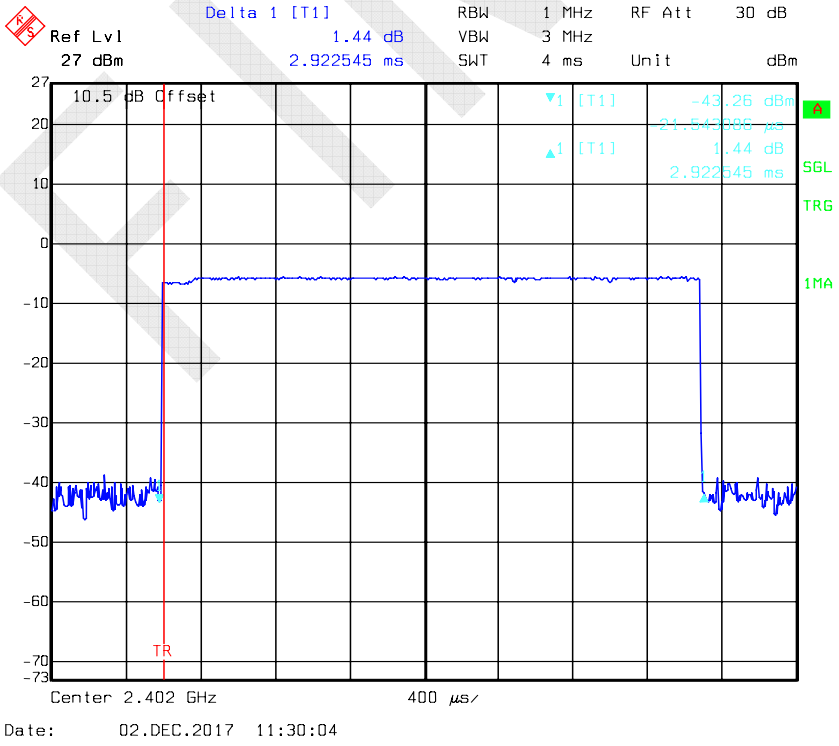
2DH3: Middle Channel



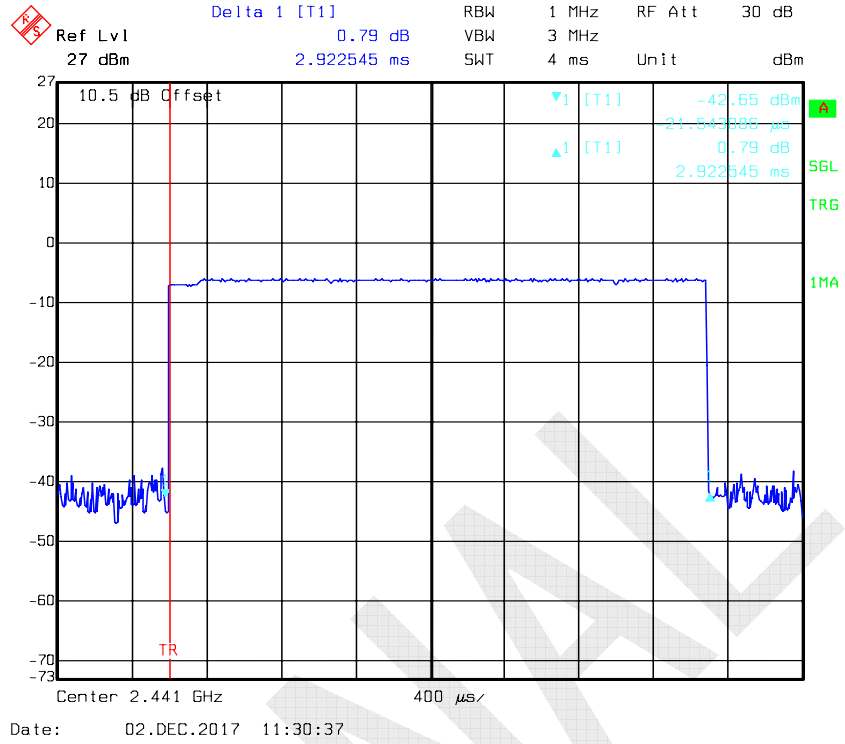
2DH3: High Channel



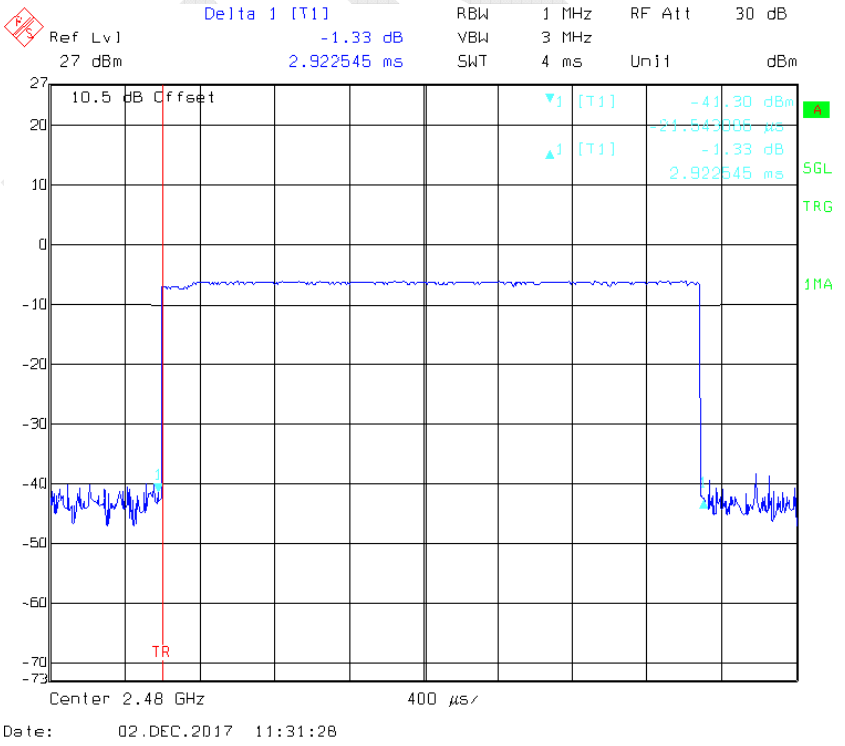
2DH5: Low Channel



2DH5: Middle Channel



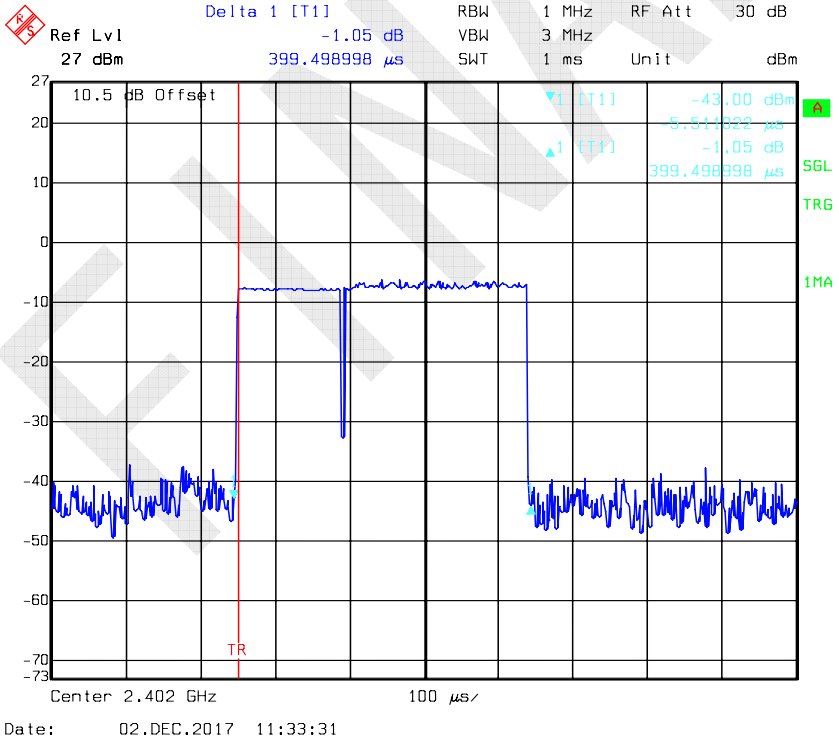
2DH5: High Channel



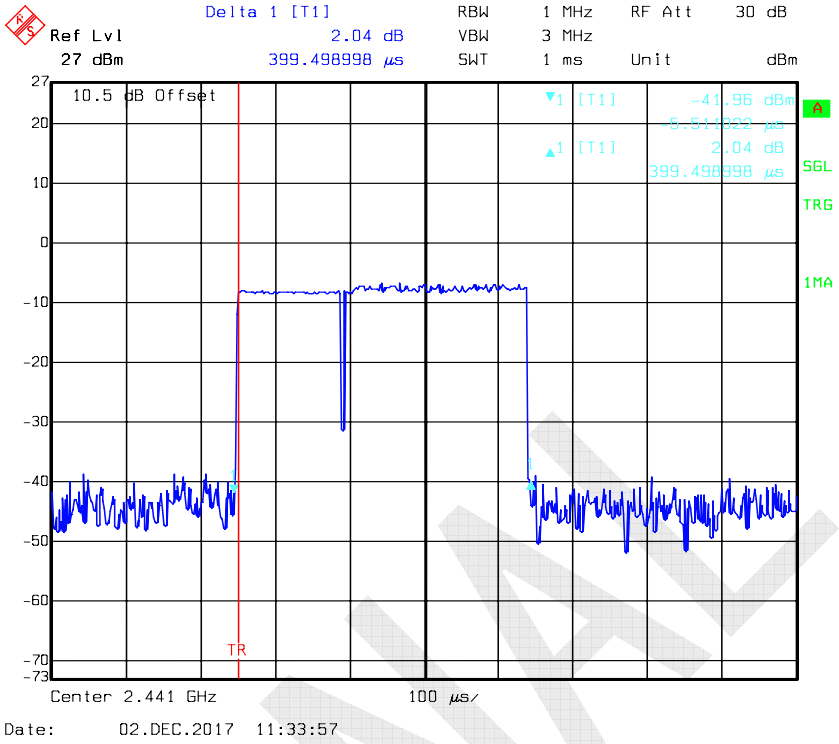
EDR Mode (8-DPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.399	0.128	0.4	Compliance
	Middle	0.399	0.128	0.4	Compliance
	High	0.399	0.128	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
3DH3	Low	1.650	0.264	0.4	Compliance
	Middle	1.650	0.264	0.4	Compliance
	High	1.650	0.264	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
3DH5	Low	2.917	0.311	0.4	Compliance
	Middle	2.917	0.311	0.4	Compliance
	High	2.917	0.311	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

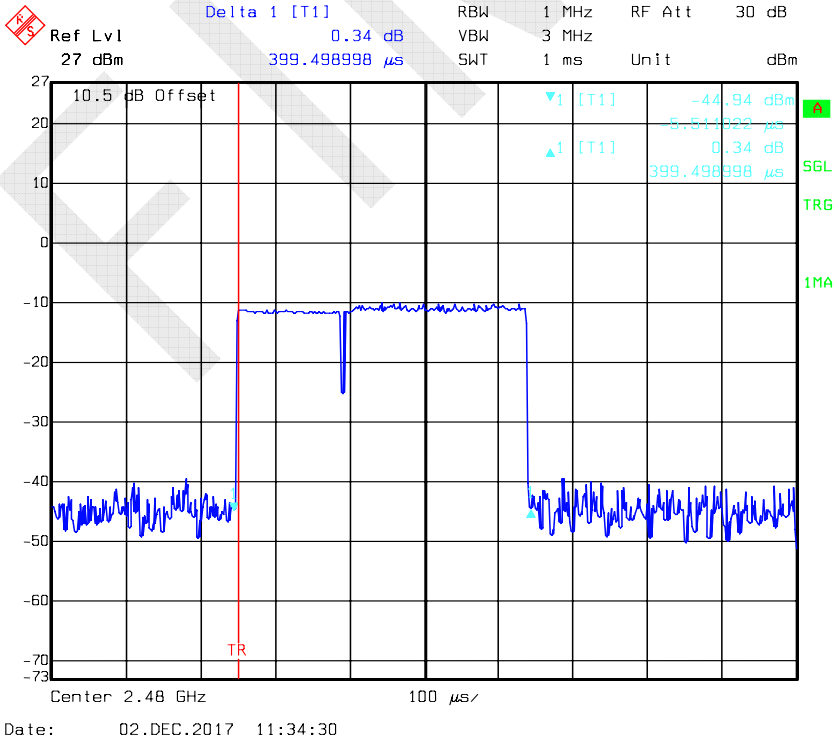
3DH1: Low Channel



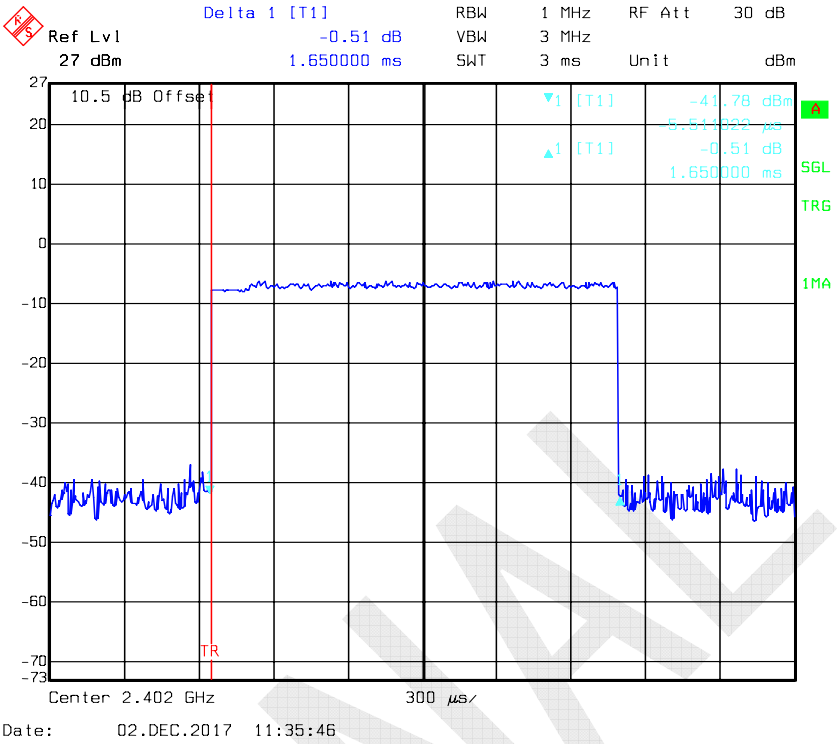
3DH1: Middle Channel



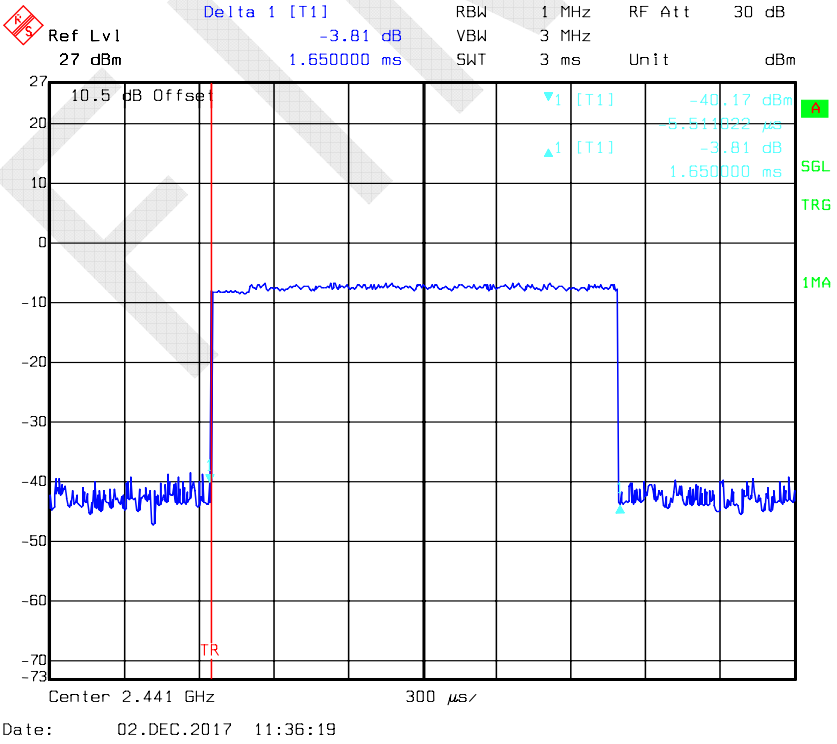
3DH1: High Channel



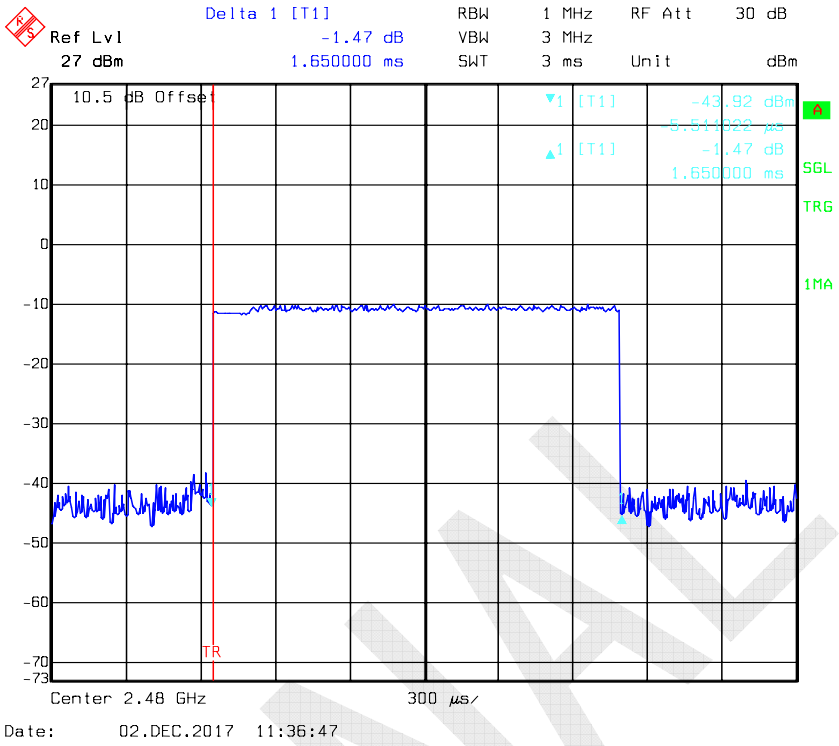
3DH3: Low Channel



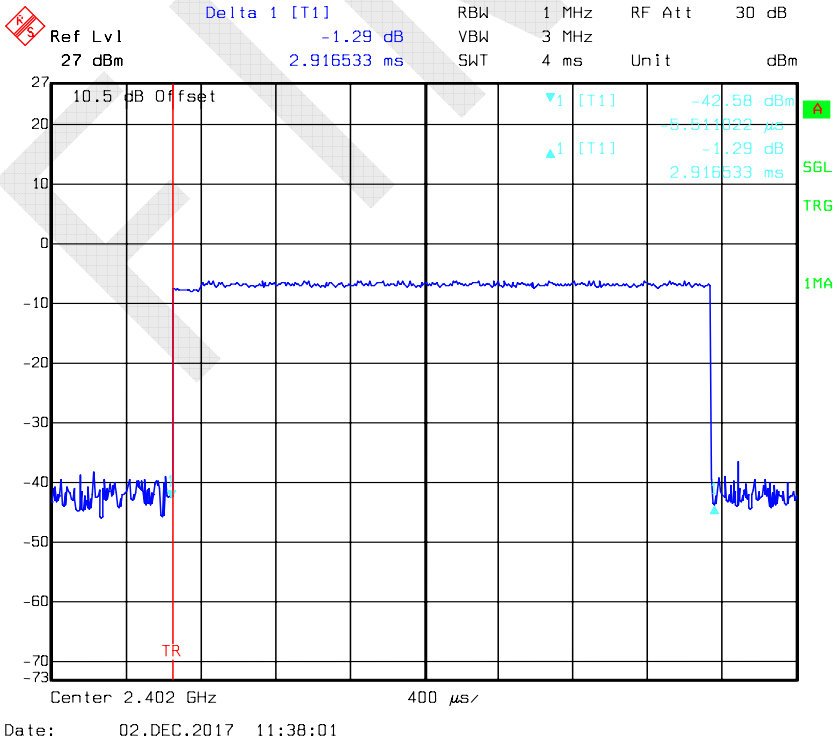
3DH3: Middle Channel



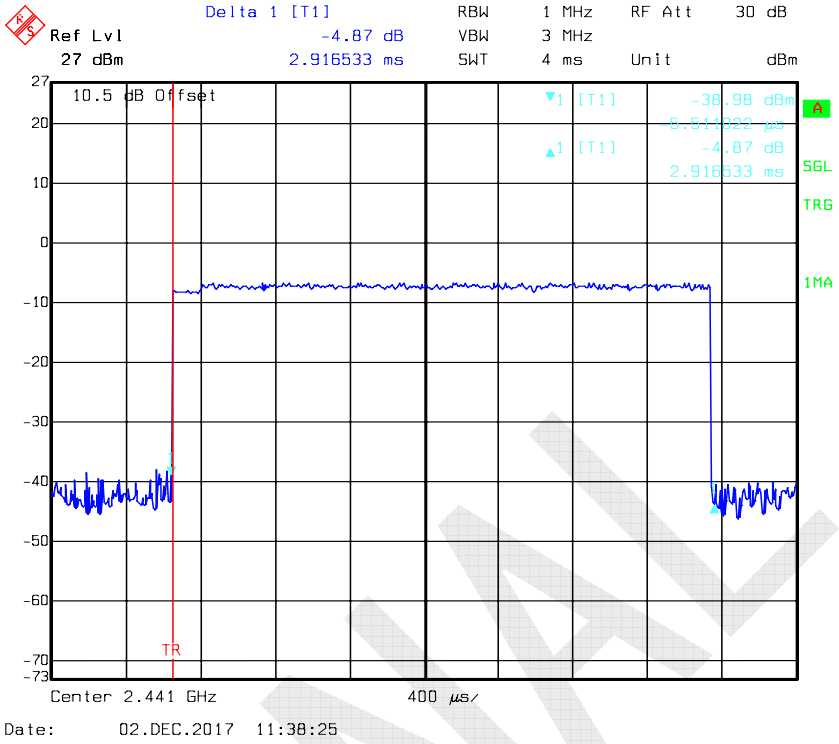
3DH3: High Channel



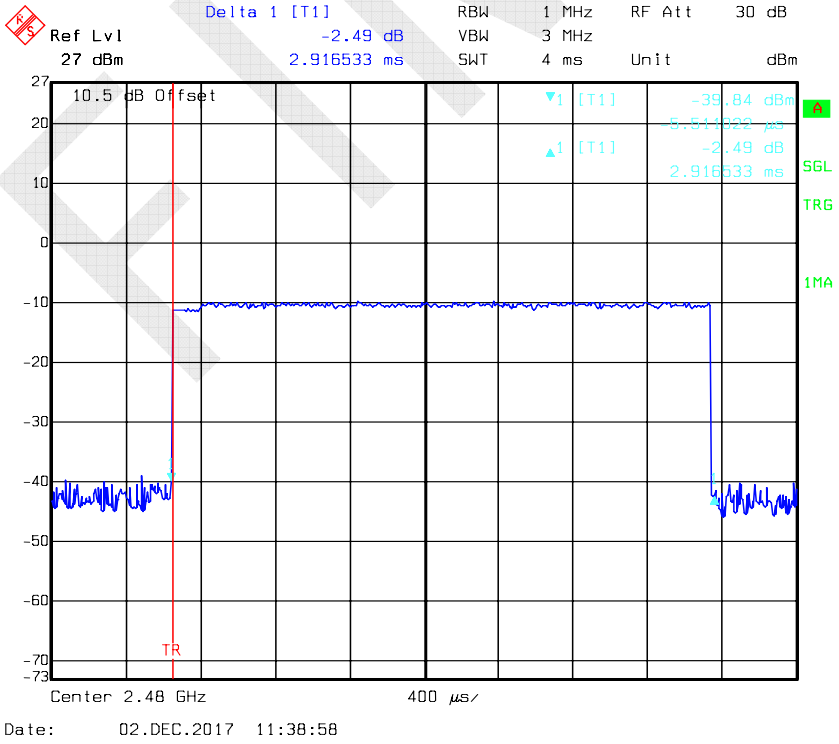
3DH5: Low Channel



3DH5: Middle Channel



3DH5: High Channel



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

Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	18 °C
Relative Humidity:	54 %
ATM Pressure:	96.8 kPa

** The testing was performed by Tom Tang on 2017-12-01.*

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

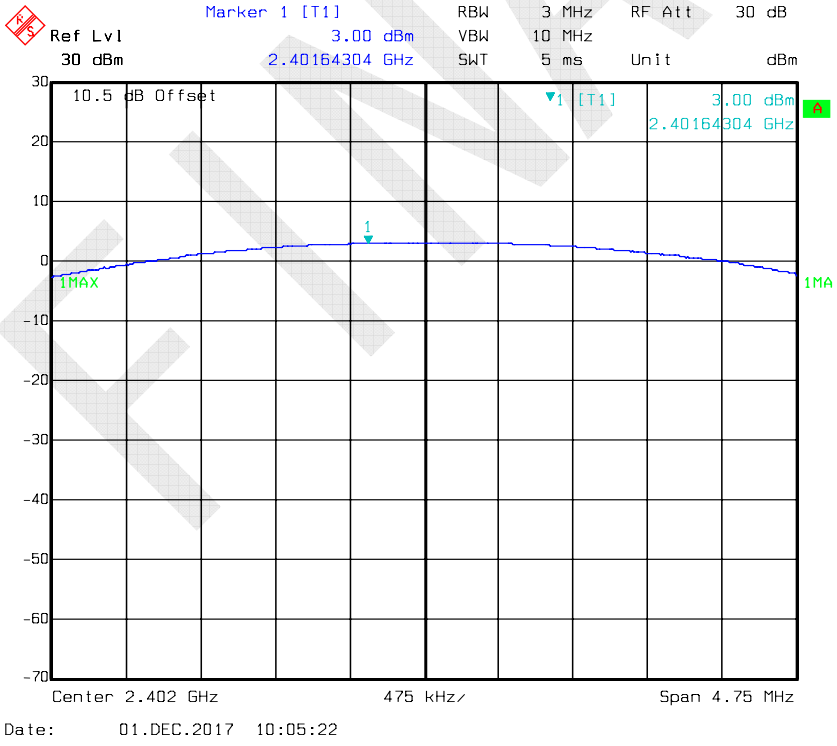
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	Low	2402	3.00	21
	Middle	2441	3.13	21
	High	2480	3.13	21
EDR Mode (π/4-DQPSK)	Low	2402	0.75	21
	Middle	2441	0.88	21
	High	2480	0.62	21
EDR Mode (8-DPSK)	Low	2402	-0.32	21
	Middle	2441	-0.18	21
	High	2480	-0.32	21

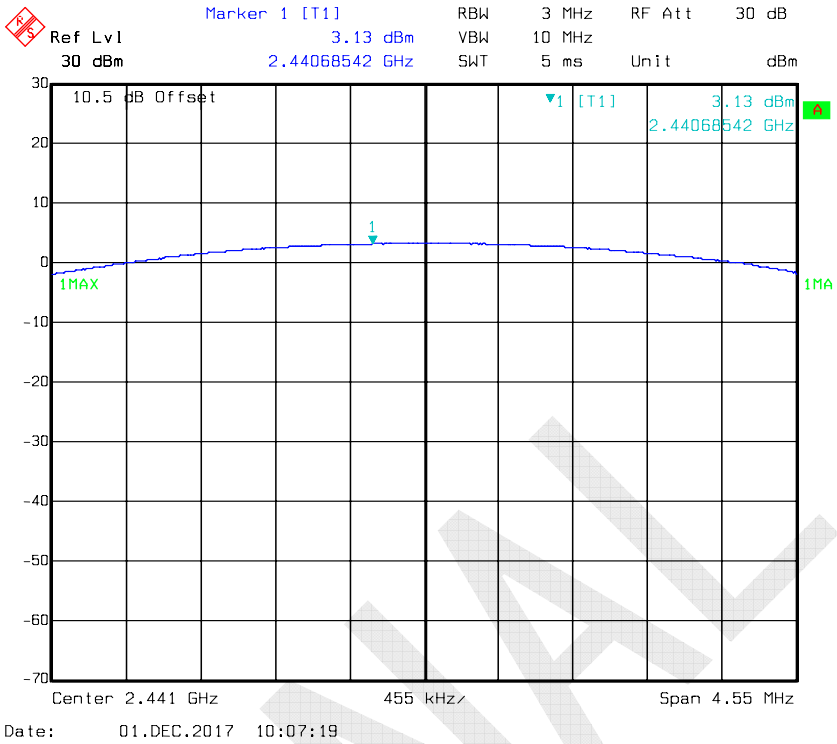
Note: The data above was tested in conducted mode.

BDR Mode (GFSK):

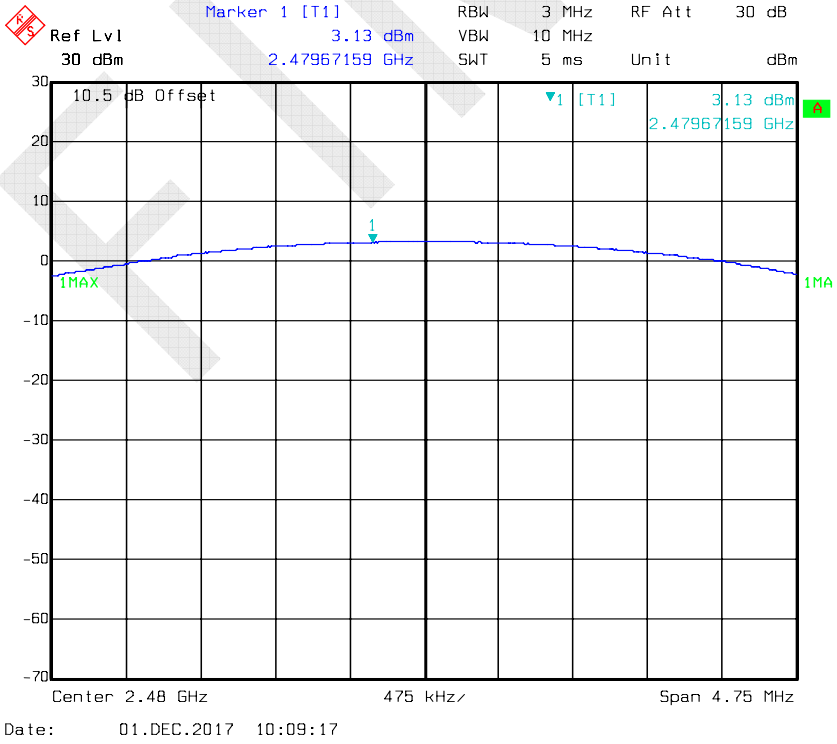
Low Channel



Middle Channel

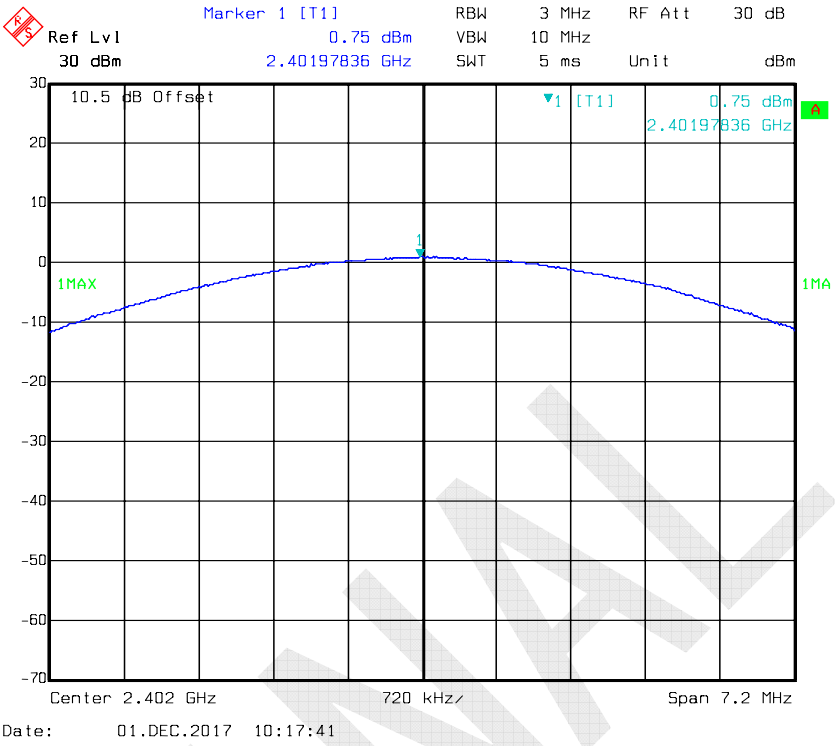


High Channel

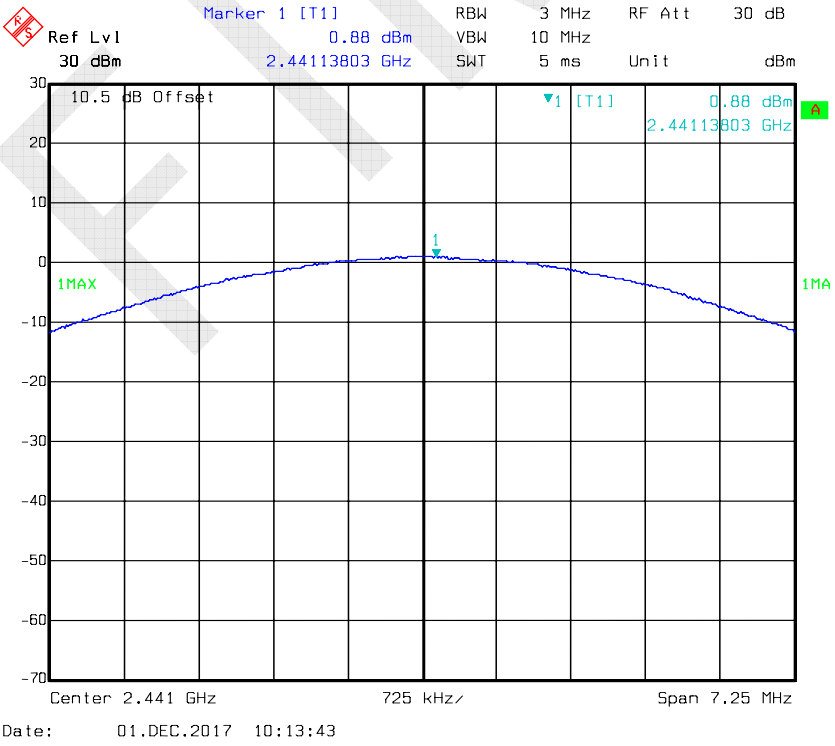


EDR Mode (π/4-DQPSK):

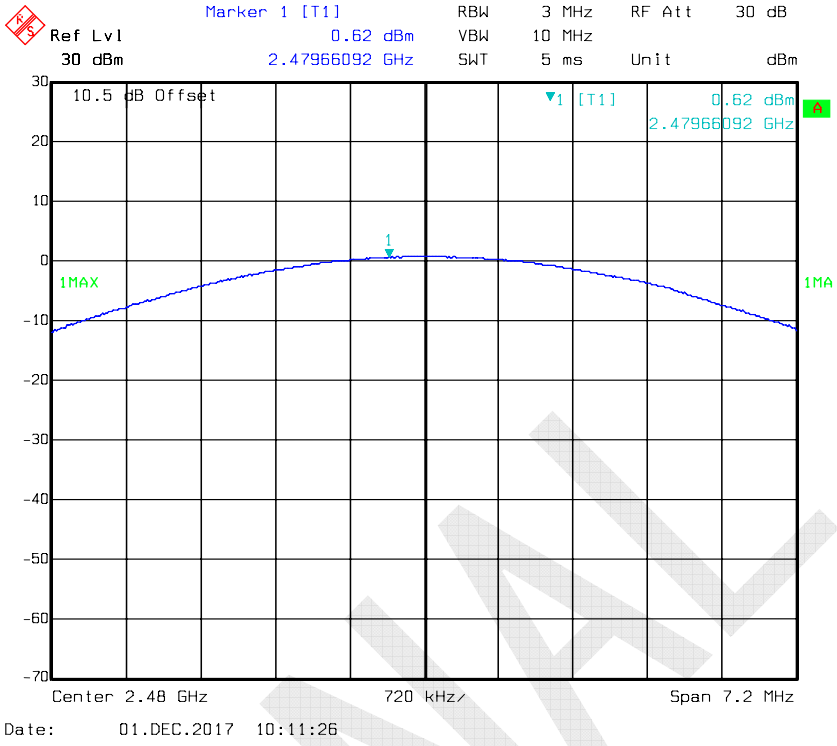
Low Channel



Middle Channel

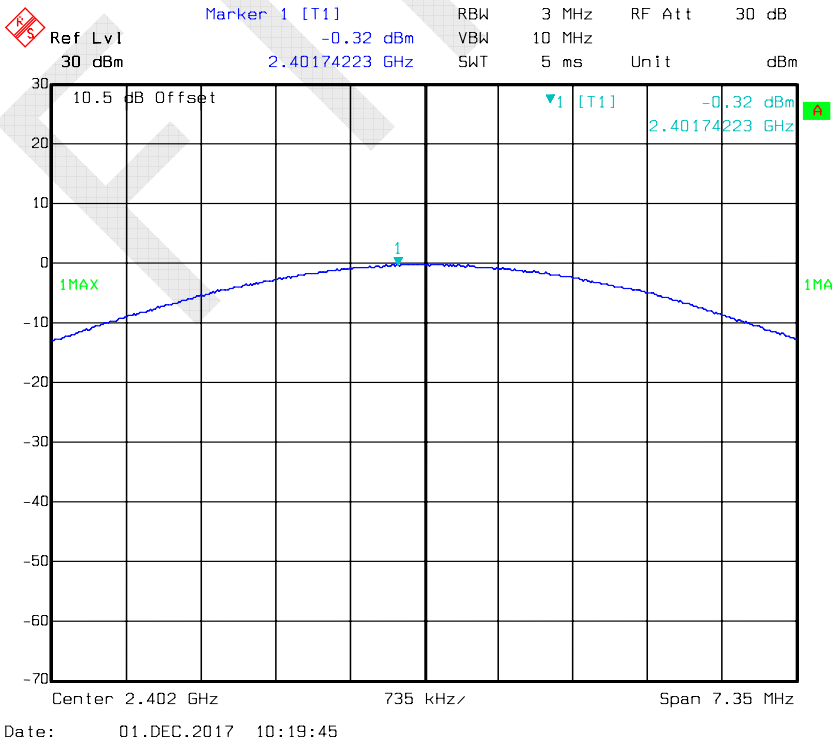


High Channel

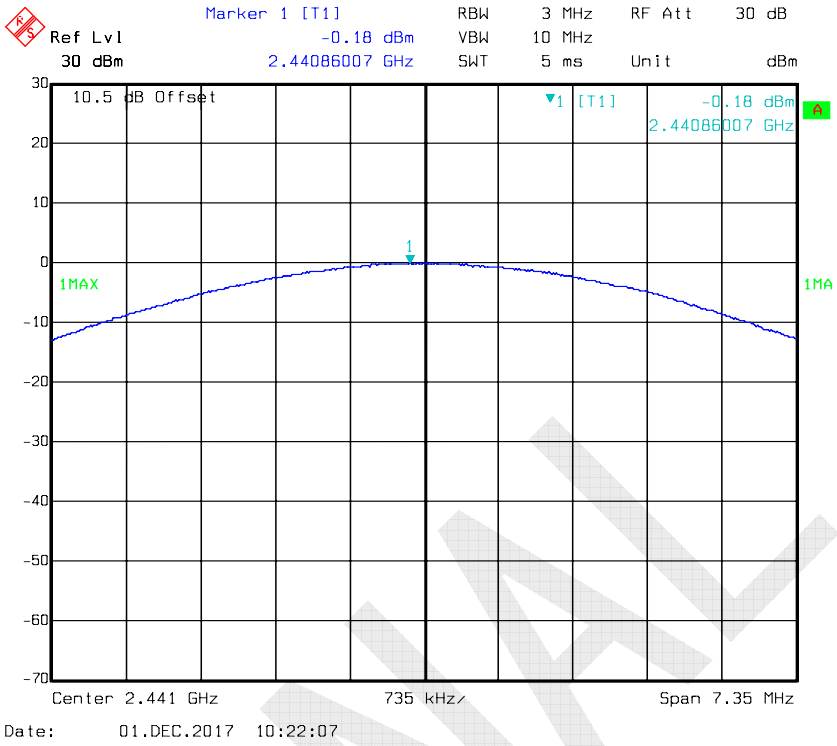


EDR Mode (8-DPSK):

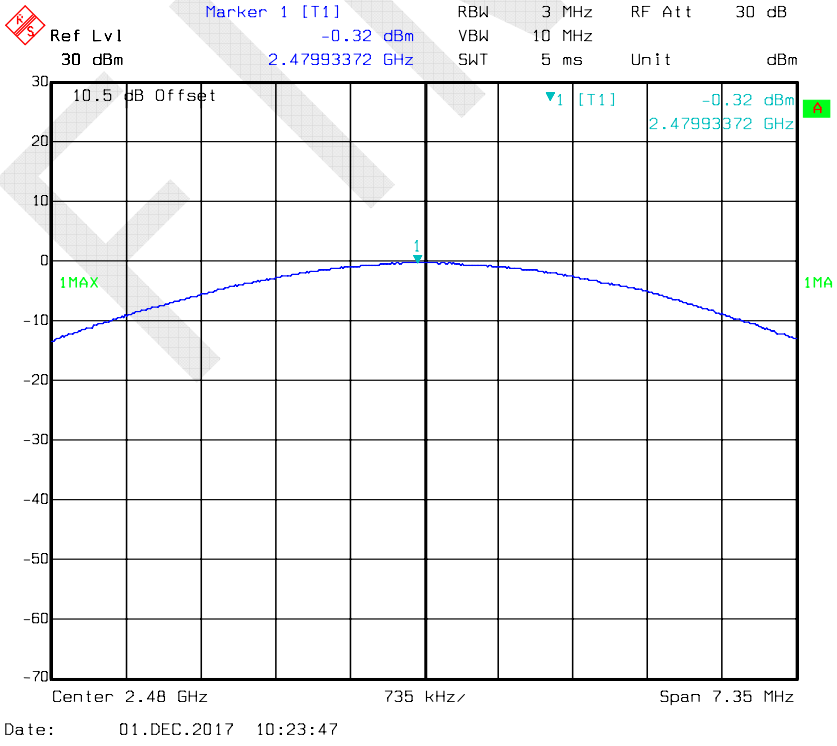
Low Channel



Middle Channel



High Channel



FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW=100 kHz; VBW=300 kHz.
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

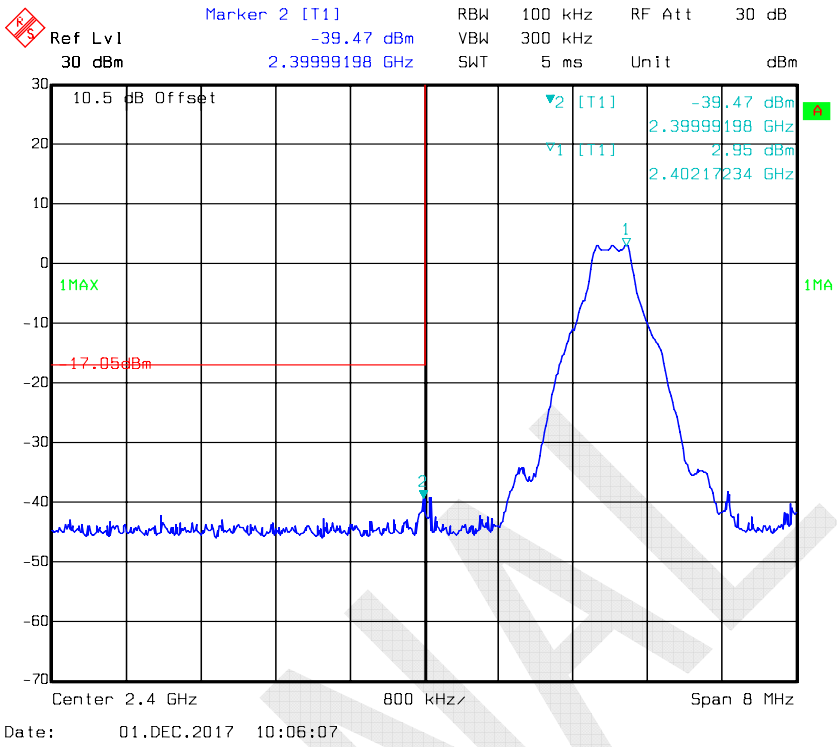
Temperature:	18 °C
Relative Humidity:	54 %
ATM Pressure:	96.8 kPa

** The testing was performed by Tom Tang on 2017-12-01.*

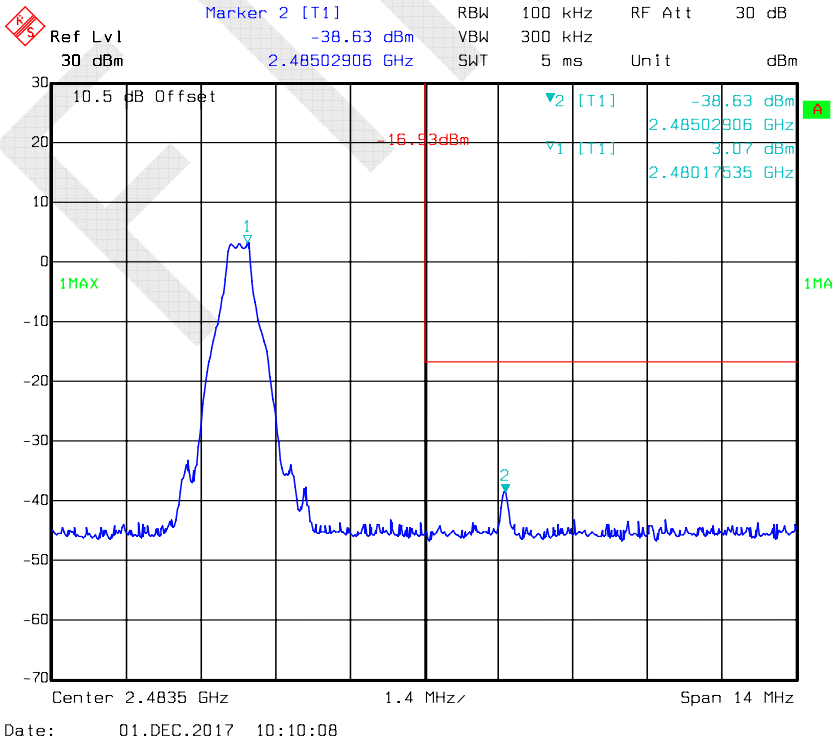
Test Result: Compliance. Please refer to the below plots:

BDR Mode (GFSK):

Band Edge, Left Side

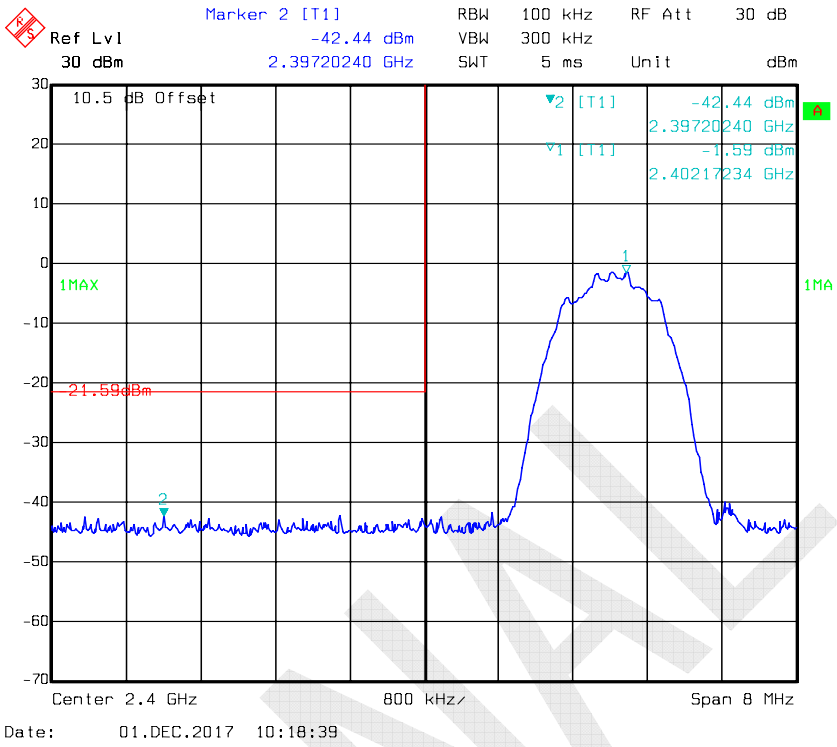


Band Edge, Right Side

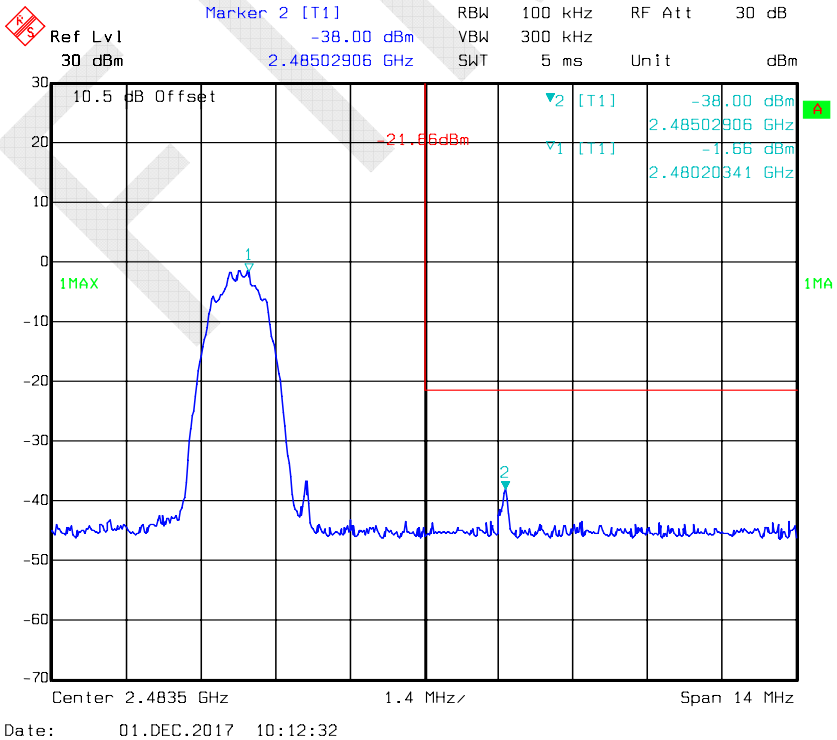


EDR Mode (π/4-DQPSK):

Band Edge, Left Side

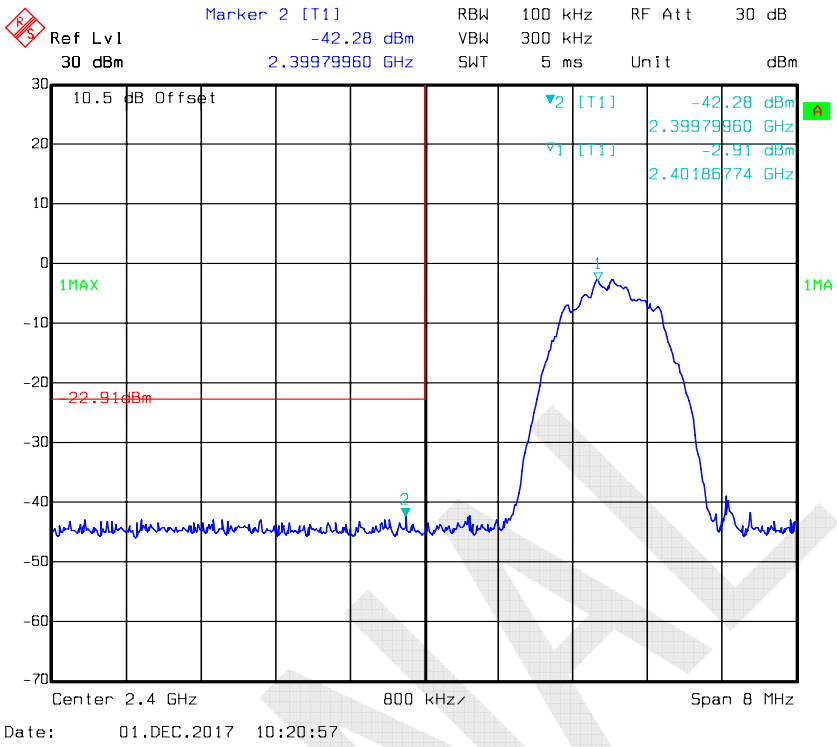


Band Edge, Right Side

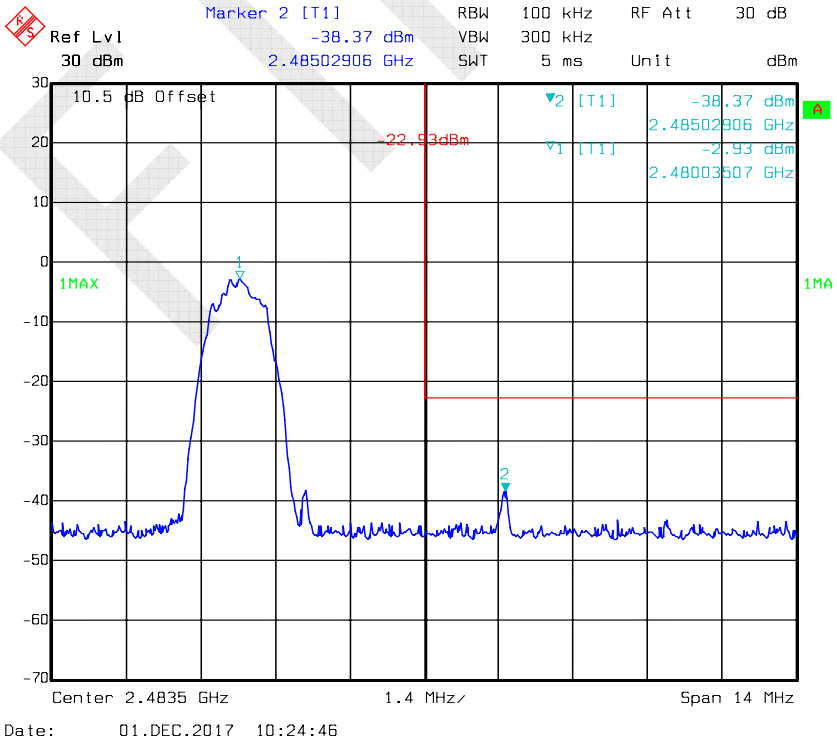


EDR Mode (8-DPSK):

Band Edge, Left Side



Band Edge, Right Side



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