FCC PART 15.247
TEST REPORT

For

Grandstream Networks, Inc.

126 Brookline Ave, 3rd Floor Boston, MA 02215, USA

FCC ID: YZZGXV3275V3

Report Type:	**Product Type:**
Original Report	IP Multimedia Phone

Report Number: RSZ170927003-00B

Report Date: 2018-01-08

Reviewed By: Candy Li
RF Engineer

Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen)
6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China
Tel: +86-755-33320018
Fax: +86-755-33320008
www.baclcorp.com.cn

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TABLE OF CONTENTS

GENERAL INFORMATION **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
OBJECTIVE 4
RELATED SUBMITTAL(S)/GRANT(S) 4
TEST METHODOLOGY 4
MEASUREMENT UNCERTAINTY 5
TEST FACILITY 5
SYSTEM TEST CONFIGURATION **6**
DESCRIPTION OF TEST CONFIGURATION 6
EUT EXERCISE SOFTWARE 6
SPECIAL ACCESSORIES 6
EQUIPMENT MODIFICATIONS 6
SUPPORT EQUIPMENT LIST AND DETAILS 6
EXTERNAL I/O CABLE 6
BLOCK DIAGRAM OF TEST SETUP 7
SUMMARY OF TEST RESULTS **8**
TEST EQUIPMENT LIST **9**
FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE) **10**
APPLICABLE STANDARD 10
RESULT 10
FCC §15.203 – ANTENNA REQUIREMENT **11**
APPLICABLE STANDARD 11
ANTENNA CONNECTOR CONSTRUCTION 11
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS **12**
APPLICABLE STANDARD 12
EUT SETUP 12
EMI TEST RECEIVER SETUP 12
TEST PROCEDURE 12
CORRECTED FACTOR & MARGIN CALCULATION 13
TEST RESULTS SUMMARY 13
TEST DATA 13
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS **20**
APPLICABLE STANDARD 20
EUT SETUP 20
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 21
TEST PROCEDURE 21
CORRECTED AMPLITUDE & MARGIN CALCULATION 21
TEST RESULTS SUMMARY 22
TEST DATA 22
FCC §15.247(a) (1)-CHANNEL SEPARATION TEST **27**
APPLICABLE STANDARD 27
TEST PROCEDURE 27
TEST DATA 27

FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH 34
APPLICABLE STANDARD 34
TEST PROCEDURE 34
TEST DATA 34
FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST 40
APPLICABLE STANDARD 40
TEST PROCEDURE 40
TEST DATA 40
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME) 43
APPLICABLE STANDARD 43
TEST PROCEDURE 43
TEST DATA 43
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT 59
APPLICABLE STANDARD 59
TEST PROCEDURE 59
TEST DATA 59
FCC §15.247(d) - BAND EDGES TESTING 61
APPLICABLE STANDARD 61
TEST PROCEDURE 61
TEST DATA 61

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Grandstream Networks, Inc.'s* product, model number: *GXV3275 (FCC ID: YZZGXV3275V3)* in this report was an *IP Multimedia Phone,* which was measured approximately: 25.2 cm (L) × 21.1 cm (W) × 8.4 cm (H), rated with input voltage: DC 12V from adapter or DC 48 V powered by POE supply.

Adapter 1 Information:
Model: F18W8-120150SPAUY
Input: AC 100-240V, 50/60Hz, 0.6A
Output: DC 12V, 1.5 A

Adapter 2 Information:
Model: H18US1200150A
Input: AC 100-240V, 50/60Hz, 0.8A
Output: DC 12V, 1.5 A

**All measurement and test data in this report was gathered from production sample serial number: 1702164 (Assigned by BACL, shenzhen).The EUT supplied by the applicant was received on 2017-09-27.*

Objective

This test report is prepared on behalf of *Grandstream Networks, Inc. i*n 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)

FCC Part 15.247 DTS and Part 15B JBP submissions with FCC ID: YZZGXV3275V3.

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

Measurement Uncertainty

Parameter	uncertainty
Occupied Channel Bandwidth	±5%
RF Output Power with Power meter	±0.5dB
RF conducted test with spectrum	±1.5dB
AC Power Lines Conducted Emissions	±1.95dB
All emissions, radiated	±4.88dB
Temperature	±3℃
Humidity	±6%
Supply voltages	±0.4%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

Bay Area Compliance Laboratories Corp. (Shenzhen) has been accredited to ISO/IEC 17025 by CNAS (Lab code: L2408). And accredited to ISO/IEC 17025 by NVLAP (Lab code: 200707-0), the FCC Designation No. CN5001 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. 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. (Shenzhen) was registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT Exercise Software

Software "RF test tool" was used.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

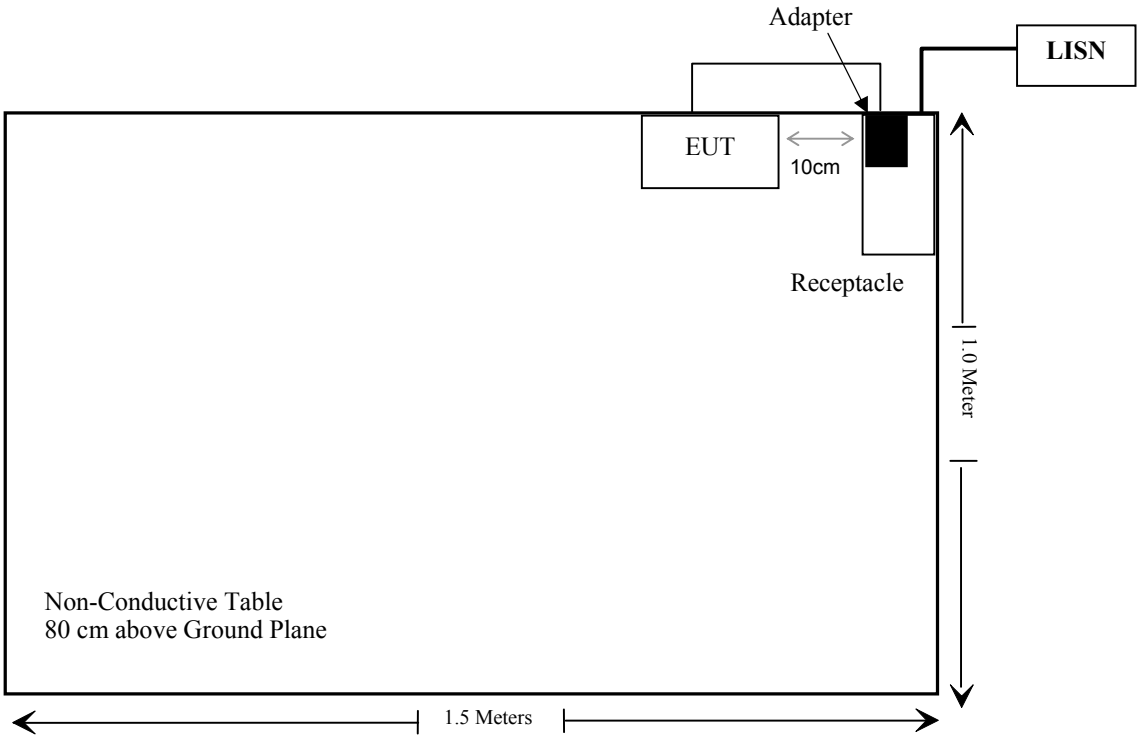
Manufacturer	Description	Model	Serial Number
N/A	N/A	N/A	N/A

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-Shielding Un-detachable DC Cable	2.5	EUT	Adapter

Block Diagram of Test Setup

For conducted emission: (Adapter)



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	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
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2017-08-04	2018-08-04
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2016-12-07	2017-12-07
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2017-05-21	2017-11-19
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
N/A	Conducted Emission Cable	N/A	UF A210B-1-0720-504504	2017-05-12	2017-11-12
Radiated Emission Test					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2014-12-29	2017-12-28
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2017-04-24	2018-04-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-05-21	2018-05-21
HP	Amplifier	HP8447E	1937A01046	2017-05-21	2017-11-19
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2014-12-17	2017-12-16
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2016-12-07	2017-12-07
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	104PEA	218124002	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	1	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	2	2017-05-22	2017-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2014-12-29	2017-12-28
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
RF Conducted Test					
Agilent	P-Series Power Meter	N1912A	MY5000448	2016-12-05	2017-12-05
Agilent	Wideband Power Sensor	N1921A	MY54210016	2016-12-05	2017-12-05
WEINSCHEL	3 dB Attenuator	N/A	N/A	2017-05-21	2017-11-19
WEINSCHEL	3 dB Attenuator	N/A	N/A	2017-11-19	2018-05-21
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2016-12-05	2017-12-05
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03 -101746-zn	2017-08-17	2018-08-17
Ducommun technologies	RF Cable	RG-214	3	2017-05-22	2017-11-22

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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)

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	2	1.58	8.0	6.31	20	0.002	1

Note: The conducted power is the tune-up power of the Max Conducted Output Power

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

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, which was permanently attached and the antenna gain is 2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

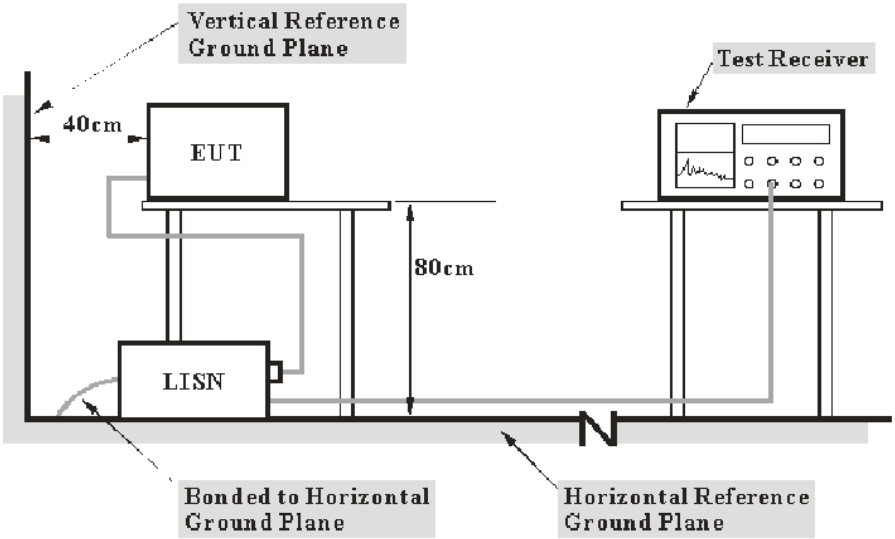
Result: Compliance.

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.

The spacing between the peripherals was 10 cm.

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:

Correction Factor = LISN VDF + Cable Loss + 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:

Margin = Limit – Corrected Amplitude

Test Results Summary

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

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

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

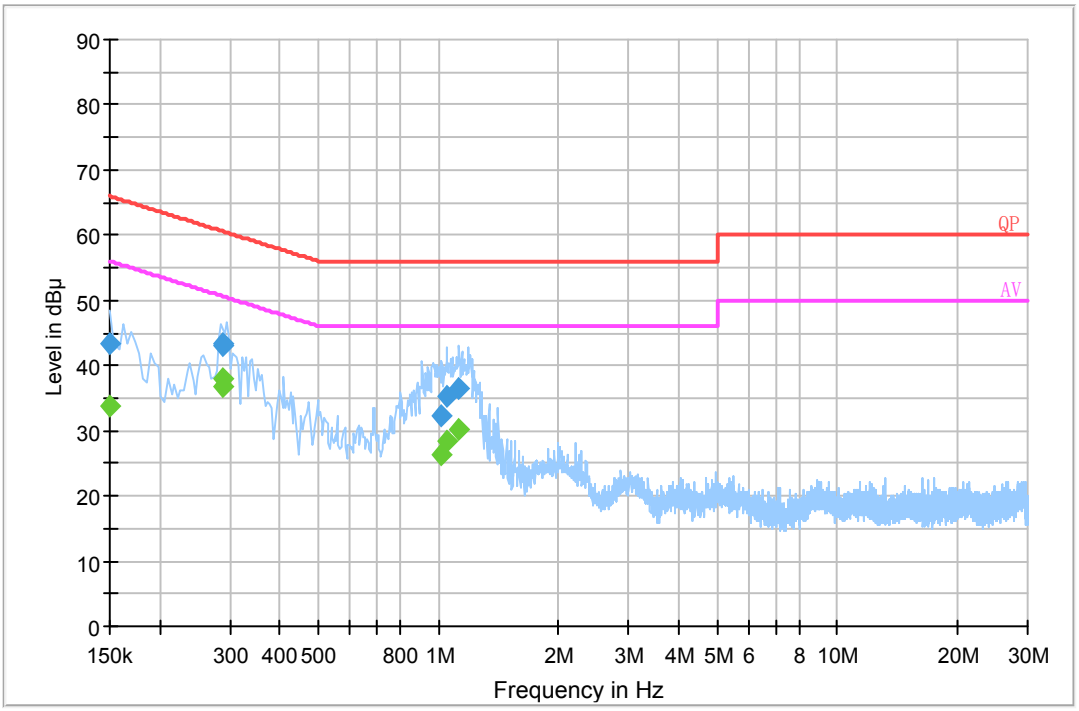
Temperature:	26 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-10-09.

EUT operation mode: Transmitting

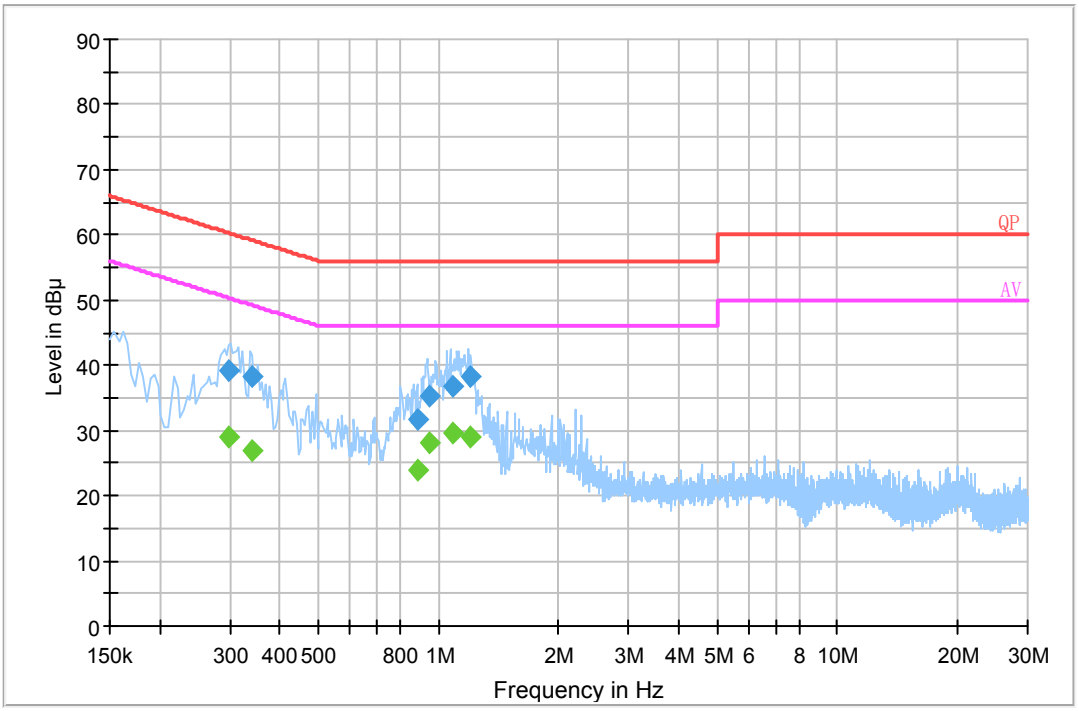
Powered by Adapter 1

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.150000	43.5	20.2	66.0	22.5	QP
0.286500	43.5	20.2	60.6	17.1	QP
0.289500	43.1	20.2	60.5	17.4	QP
1.010850	32.4	20.1	56.0	23.6	QP
1.050250	35.3	20.1	56.0	20.7	QP
1.125110	36.6	20.1	56.0	19.4	QP
0.150000	33.8	20.2	56.0	22.2	Ave.
0.286500	36.7	20.2	50.6	13.9	Ave.
0.289500	37.8	20.2	50.5	12.7	Ave.
1.010850	26.4	20.1	46.0	19.6	Ave.
1.050250	28.5	20.1	46.0	17.5	Ave.
1.125110	30.3	20.1	46.0	15.7	Ave.

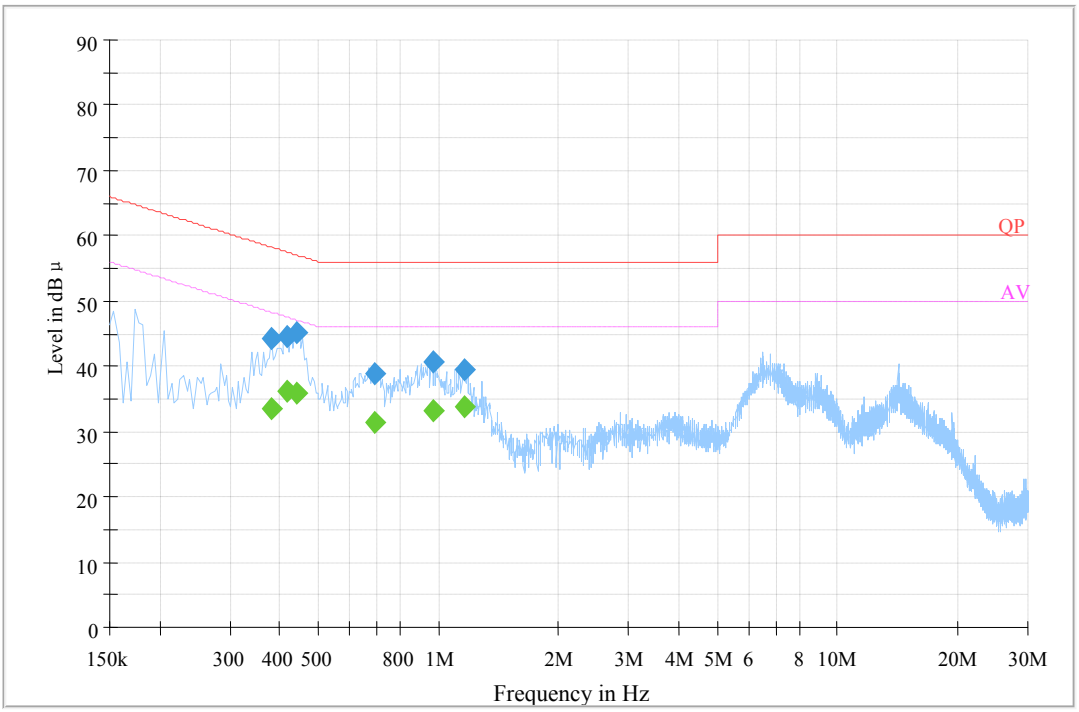
AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.297470	39.1	20.2	60.3	21.2	QP
0.340930	38.4	20.2	59.2	20.8	QP
0.888710	31.7	20.1	56.0	24.3	QP
0.943930	35.3	20.1	56.0	20.7	QP
1.086050	36.9	20.1	56.0	19.1	QP
1.204150	38.3	20.1	56.0	17.7	QP
0.297470	29.1	20.2	50.3	21.2	Ave.
0.340930	27.0	20.2	49.2	22.2	Ave.
0.888710	23.9	20.1	46.0	22.1	Ave.
0.943930	28.2	20.1	46.0	17.8	Ave.
1.086050	29.7	20.1	46.0	16.3	Ave.
1.204150	29.2	20.1	46.0	16.8	Ave.

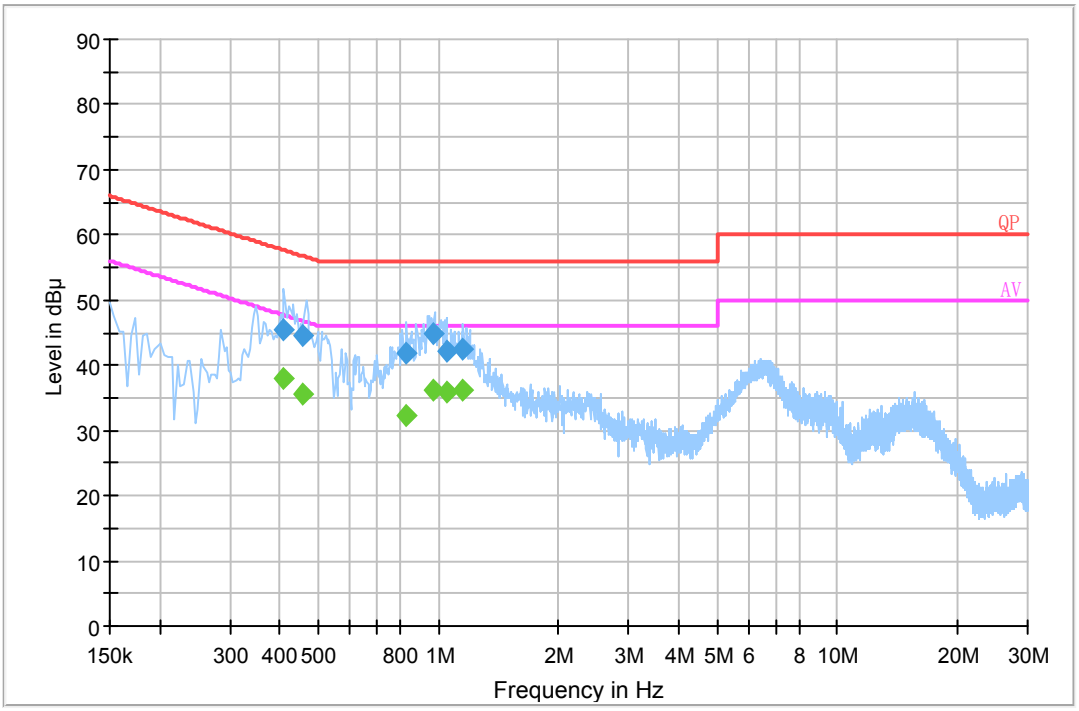
Powered by Adapter 2

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.380270	44.4	20.2	58.3	13.9	QP
0.419610	44.5	20.2	57.5	13.0	QP
0.439370	45.1	20.2	57.1	12.0	QP
0.691650	39.0	20.0	56.0	17.0	QP
0.971630	40.4	20.1	56.0	15.6	QP
1.160330	39.5	20.1	56.0	16.5	QP
0.380270	33.6	20.2	48.3	14.7	Ave.
0.419610	36.2	20.2	47.5	11.3	Ave.
0.439370	36.0	20.2	47.1	11.1	Ave.
0.691650	31.5	20.0	46.0	14.5	Ave.
0.971630	33.0	20.1	46.0	13.0	Ave.
1.160330	33.9	20.1	46.0	12.1	Ave.

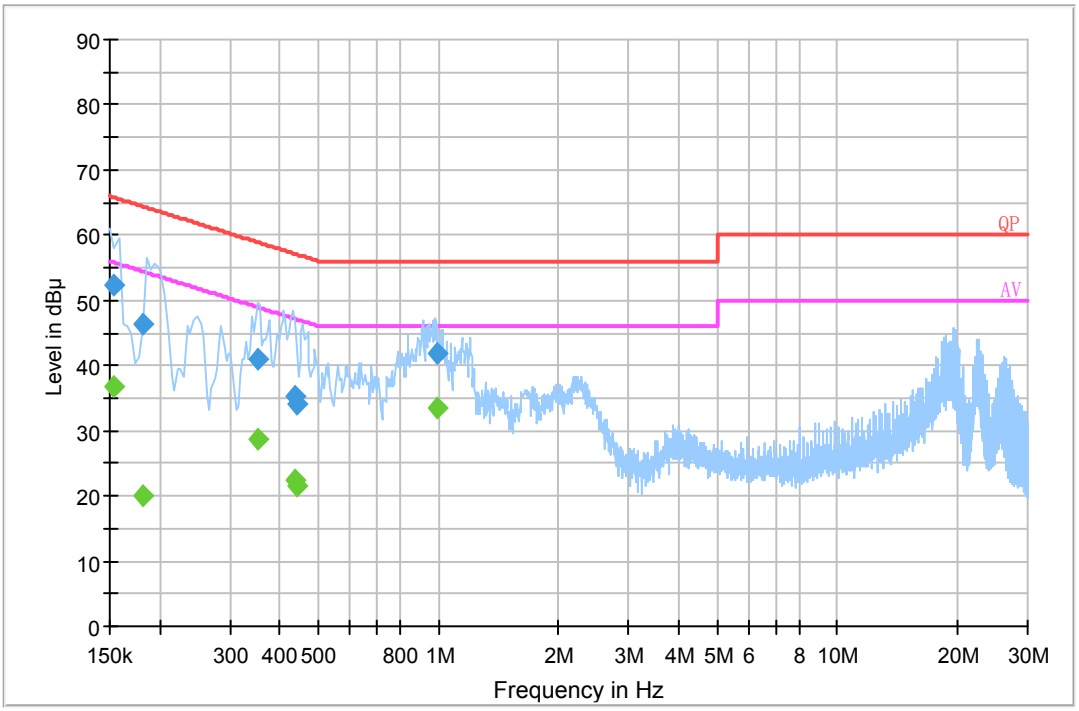
AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.407850	45.4	20.2	57.7	12.3	QP
0.459010	44.6	20.2	56.7	12.1	QP
0.829550	41.8	20.0	56.0	14.2	QP
0.967330	44.8	20.1	56.0	11.2	QP
1.046250	42.1	20.1	56.0	13.9	QP
1.152690	42.5	20.1	56.0	13.5	QP
0.407850	38.1	20.2	47.7	9.6	Ave.
0.459010	35.5	20.2	46.7	11.2	Ave.
0.829550	32.1	20.0	46.0	13.9	Ave.
0.967330	36.1	20.1	46.0	9.9	Ave.
1.046250	36.0	20.1	46.0	10.0	Ave.
1.152690	36.1	20.1	46.0	9.9	Ave.

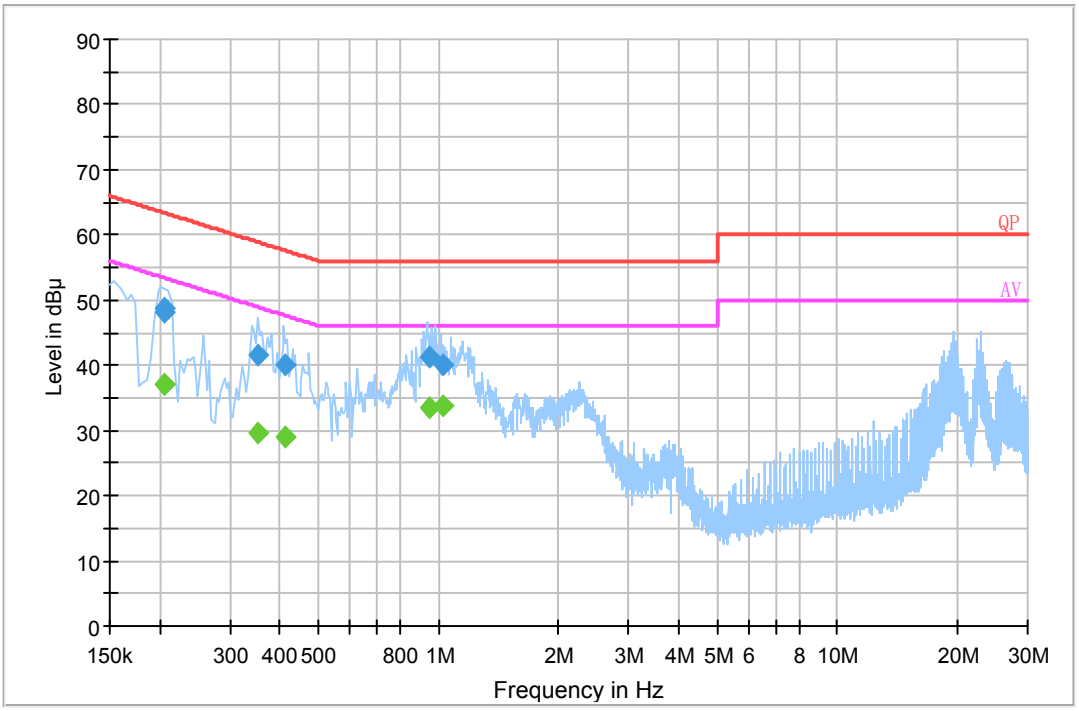
Powered by POE

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.154000	52.4	20.2	65.8	13.4	QP
0.181500	46.4	20.2	64.4	18.0	QP
0.352690	40.8	20.2	58.9	18.1	QP
0.435550	35.3	20.2	57.1	21.8	QP
0.439490	34.2	20.2	57.1	22.9	QP
0.987210	41.8	20.1	56.0	14.2	QP
0.154000	36.7	20.2	55.8	19.1	Ave.
0.181500	20.0	20.2	54.4	34.4	Ave.
0.352690	28.8	20.2	48.9	20.1	Ave.
0.435550	22.4	20.2	47.1	24.7	Ave.
0.439490	21.7	20.2	47.1	25.4	Ave.
0.987210	33.6	20.1	46.0	12.4	Ave.

AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.205000	48.2	20.2	63.4	15.2	QP
0.205500	48.9	20.2	63.4	14.5	QP
0.352690	41.4	20.2	58.9	17.5	QP
0.411850	40.0	20.2	57.6	17.6	QP
0.948010	41.1	20.1	56.0	14.9	QP
1.022790	40.2	20.1	56.0	15.8	QP
0.205000	37.1	20.2	53.4	16.3	Ave.
0.205500	37.0	20.2	53.4	16.4	Ave.
0.352690	29.6	20.2	48.9	19.3	Ave.
0.411850	29.0	20.2	47.6	18.6	Ave.
0.948010	33.4	20.1	46.0	12.6	Ave.
1.022790	33.8	20.1	46.0	12.2	Ave.

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

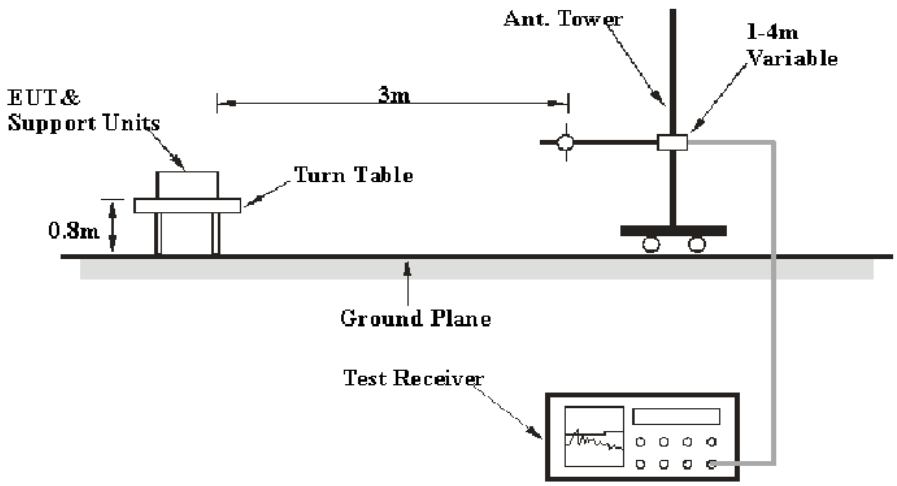
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

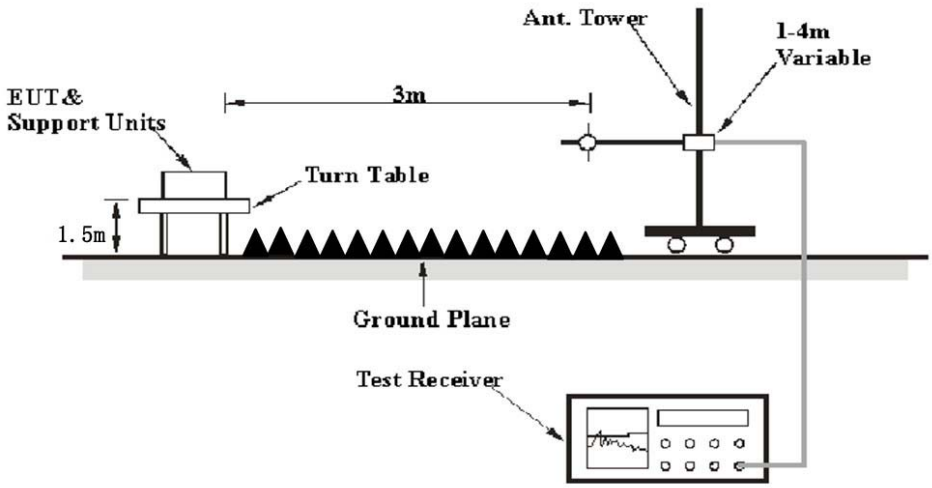
FCC §15.205; §15.209; §15.247(d)

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	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	PK

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:

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 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

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

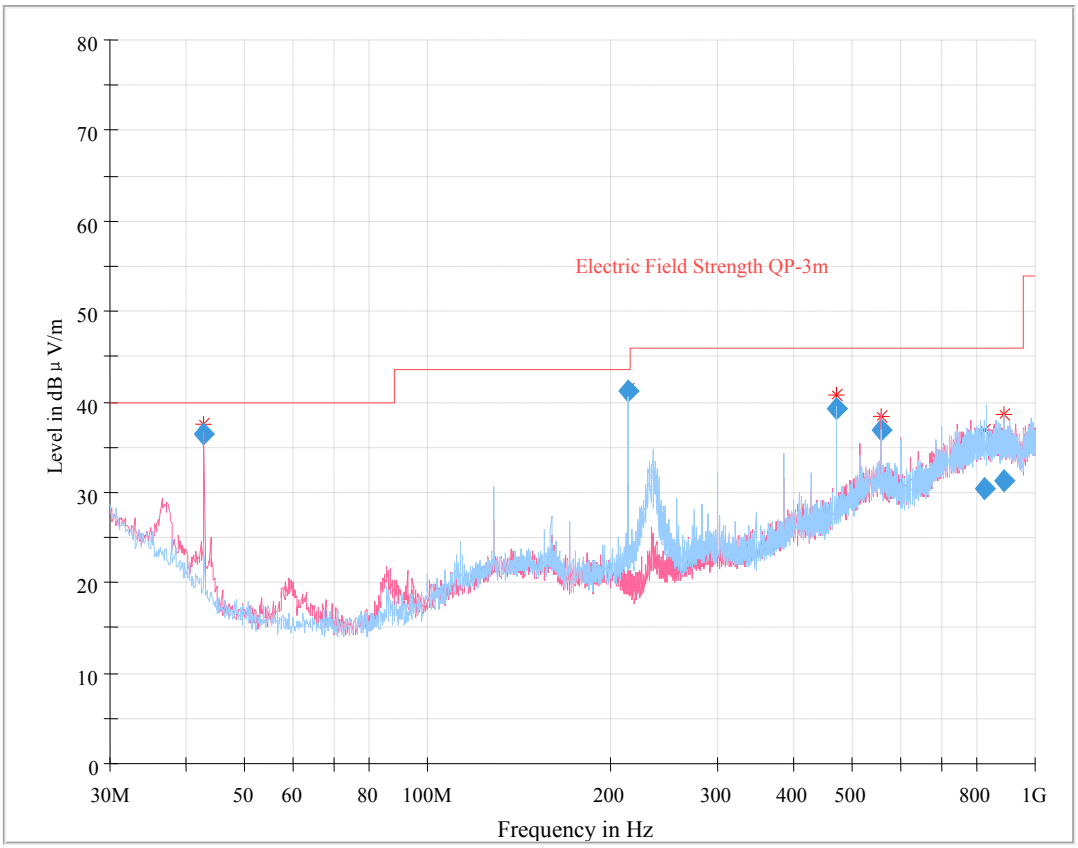
Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-10-12.
EUT operation mode: Transmitting

30 MHz~1 GHz: *(BDR Mode, Low channel)*



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
42.850250	36.47	100.0	V	68.0	-8.3	40.00	3.53
214.294875	41.15	138.0	H	340.0	-6.4	43.50	2.35
471.439500	39.23	104.0	H	114.0	1.4	46.00	6.77
557.158000	36.91	114.0	V	20.0	4.7	46.00	9.09
828.030000	30.37	265.0	V	35.0	9.0	46.00	15.63
888.545750	31.18	331.0	H	323.0	9.6	46.00	14.82

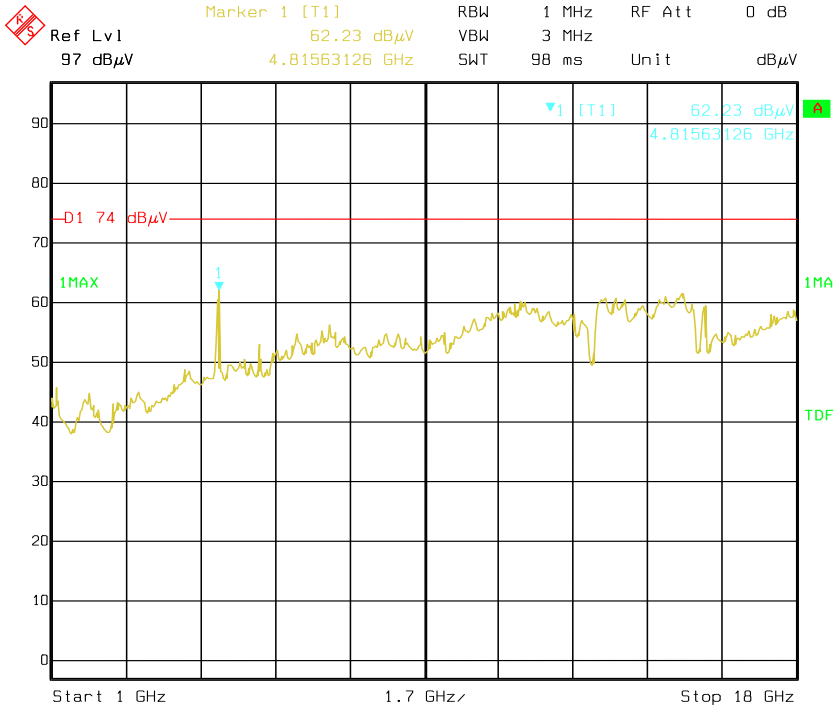
1 GHz - 25 GHz: (*Scan with GFSK, π/4-DQPSK, 8-DPSK mode, the worst case was GFSK mode*)

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
Low Channel (2402 MHz)									
2402.00	65.47	PK	15	2.3	H	33.92	99.39	/	/
2402.00	54.08	Ave.	15	2.3	H	33.92	88.00	/	/
2402.00	59.09	PK	255	2.4	V	33.92	93.01	/	/
2402.00	47.67	Ave.	255	2.4	V	33.92	81.59	/	/
2322.50	28.10	PK	282	1.7	H	33.83	61.93	74	12.07
2322.50	13.71	Ave.	282	1.7	H	33.83	47.54	54	6.46
2383.90	27.28	PK	158	1.4	H	33.92	61.20	74	12.80
2383.90	13.69	Ave.	158	1.4	H	33.92	47.61	54	6.39
2493.78	27.32	PK	166	1.8	H	34.08	61.40	74	12.60
2493.78	13.23	Ave.	166	1.8	H	34.08	47.31	54	6.69
4804.00	56.91	PK	14	1.8	H	5.84	62.75	74	11.25
4804.00	36.78	Ave.	14	1.8	H	5.84	42.62	54	11.38

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2441 MHz)									
2441.00	65.65	PK	139	1.1	H	33.92	99.57	/	/
2441.00	55.11	Ave.	139	1.1	H	33.92	89.03	/	/
2441.00	58.88	PK	95	2.1	V	33.92	92.80	/	/
2441.00	47.54	Ave.	95	2.1	V	33.92	81.46	/	/
2368.67	27.81	PK	330	1.9	H	33.92	61.73	74	12.27
2368.67	13.68	Ave.	330	1.9	H	33.92	47.60	54	6.40
2343.18	27.28	PK	170	1.8	H	33.83	61.11	74	12.89
2343.18	13.69	Ave.	170	1.8	H	33.83	47.52	54	6.48
2496.19	27.62	PK	79	1.1	H	34.08	61.70	74	12.30
2496.19	13.25	Ave.	79	1.1	H	34.08	47.33	54	6.67
4882.00	54.41	PK	241	1.7	H	6.21	60.62	74	13.38
4882.00	35.86	Ave.	241	1.7	H	6.21	42.07	54	11.93
High Channel (2480 MHz)									
2480.00	66.23	PK	36	1.9	H	34.08	100.31	/	/
2480.00	55.64	Ave.	36	1.9	H	34.08	89.72	/	/
2480.00	58.93	PK	63	1.4	V	34.08	93.01	/	/
2480.00	47.61	Ave.	63	1.4	V	34.08	81.69	/	/
2331.00	27.24	PK	299	1.7	H	33.83	61.07	74	12.93
2331.00	13.70	Ave.	299	1.7	H	33.83	47.53	54	6.47
2483.56	38.01	PK	9	1.4	H	34.08	72.09	74	1.91
2483.56	14.65	Ave.	9	1.4	H	34.08	48.73	54	5.27
2486.28	33.88	PK	201	2.1	H	34.08	67.96	74	6.04
2486.28	14.57	Ave.	201	2.1	H	34.08	48.65	54	5.35
4960.00	45.08	PK	258	2.1	H	7.82	52.90	74	21.10
4960.00	30.53	Ave.	258	2.1	H	7.82	38.35	54	15.65

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.

Pre-scan with Low channel
Horizontal



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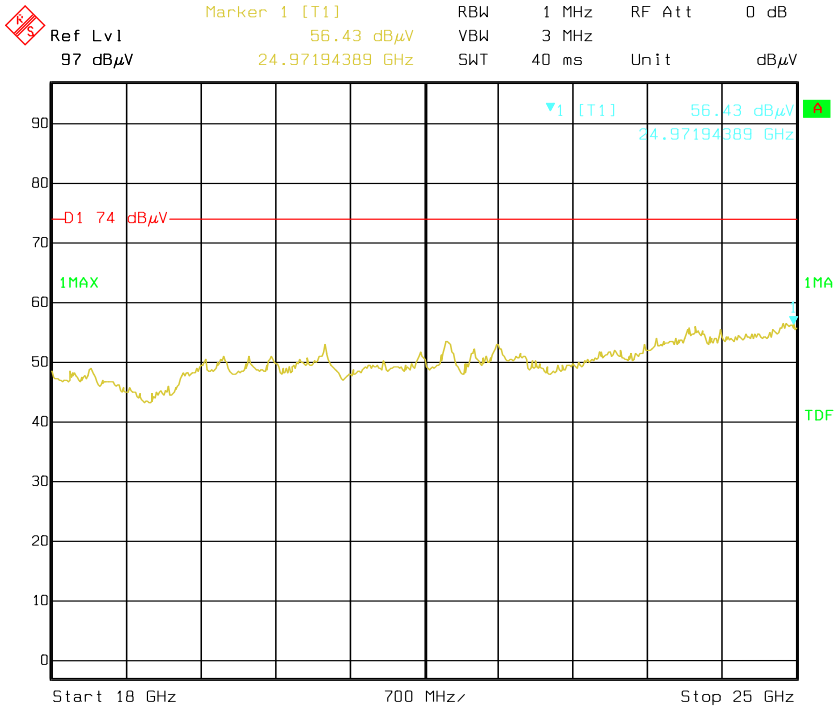
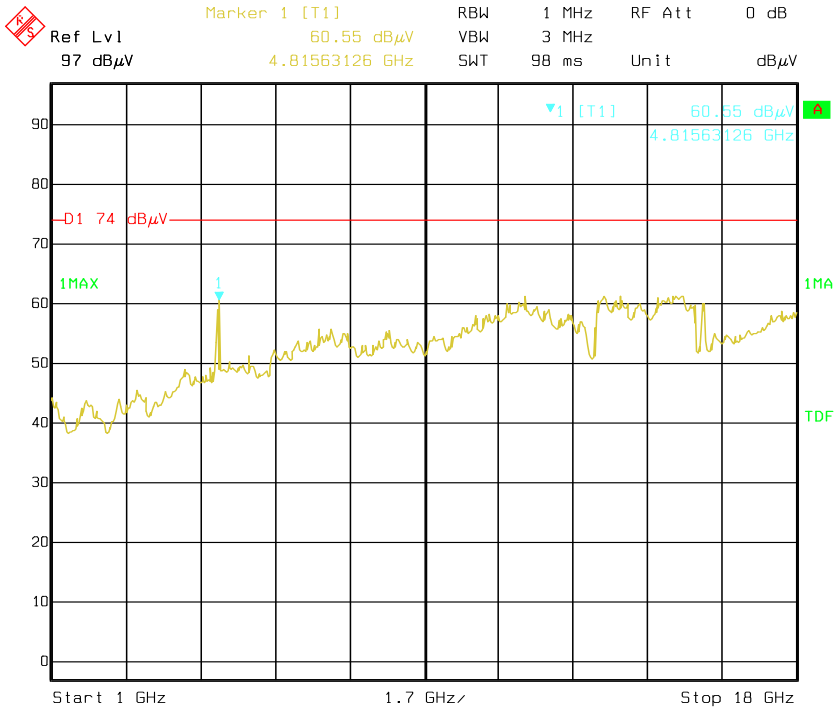


Date: 12.OCT.2017 10:31:34

Vertical



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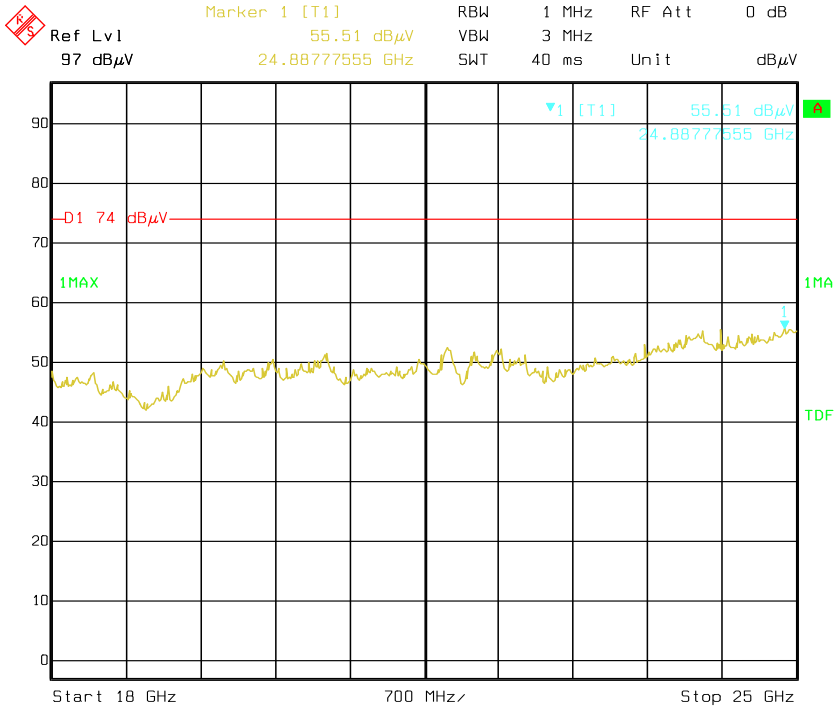


Date: 12.OCT.2017 10:29:22

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 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:	25 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-10-10.

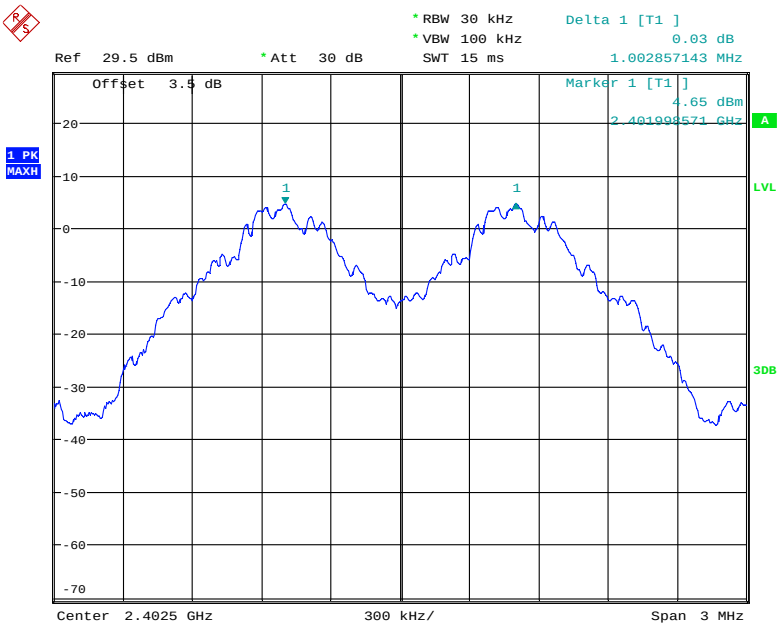
EUT operation mode: Transmitting

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

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	≥Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.003	0.697	Pass
	Adjacent	2403			
	Middle	2441	1.003	0.702	Pass
	Adjacent	2442			
	High	2480	1.003	0.699	Pass
	Adjacent	2479			
EDR (π/4-DQPSK)	Low	2402	1.003	0.897	Pass
	Adjacent	2403			
	Middle	2441	0.999	0.900	Pass
	Adjacent	2442			
	High	2480	0.999	0.901	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.003	0.865	Pass
	Adjacent	2403			
	Middle	2441	0.999	0.865	Pass
	Adjacent	2442			
	High	2480	1.003	0.865	Pass
	Adjacent	2479			

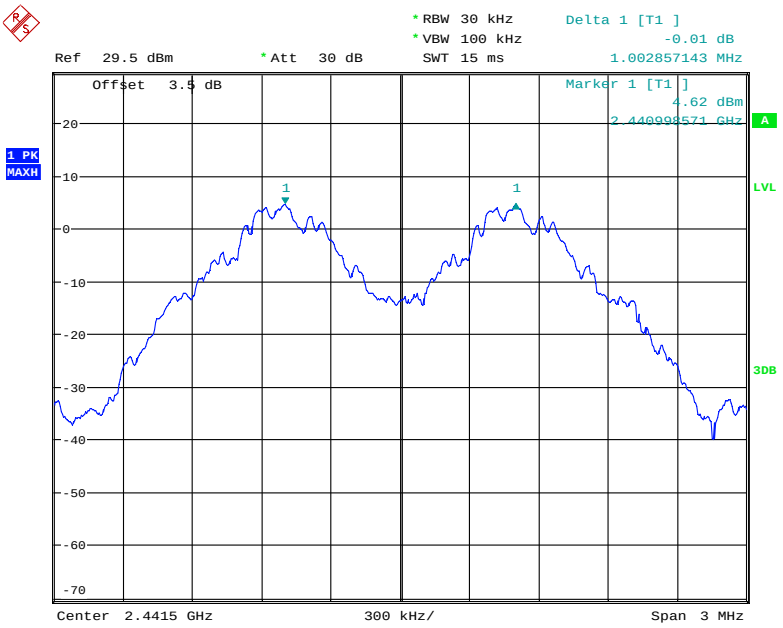
Note: Limit = 20 dB bandwidth *2/3

BDR (GFSK): Low Channel



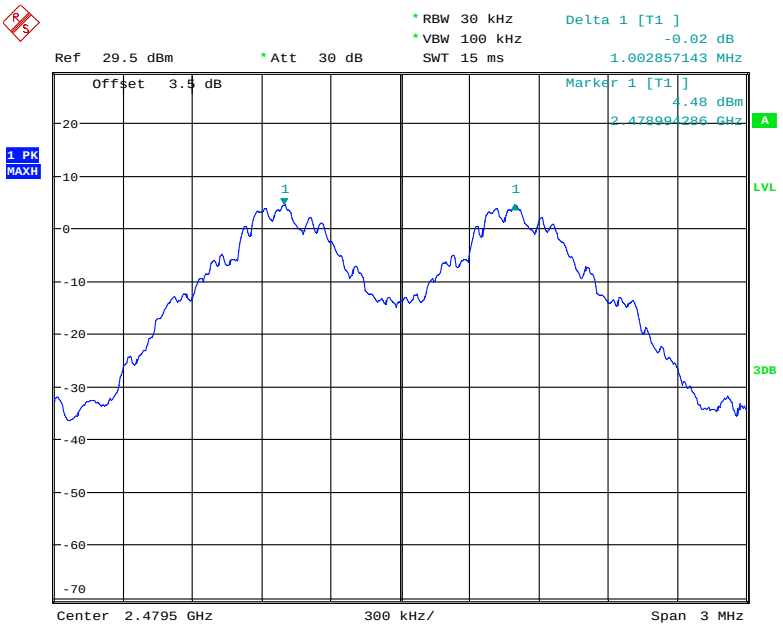
Date: 10.OCT.2017 21:03:05

BDR (GFSK): Middle Channel



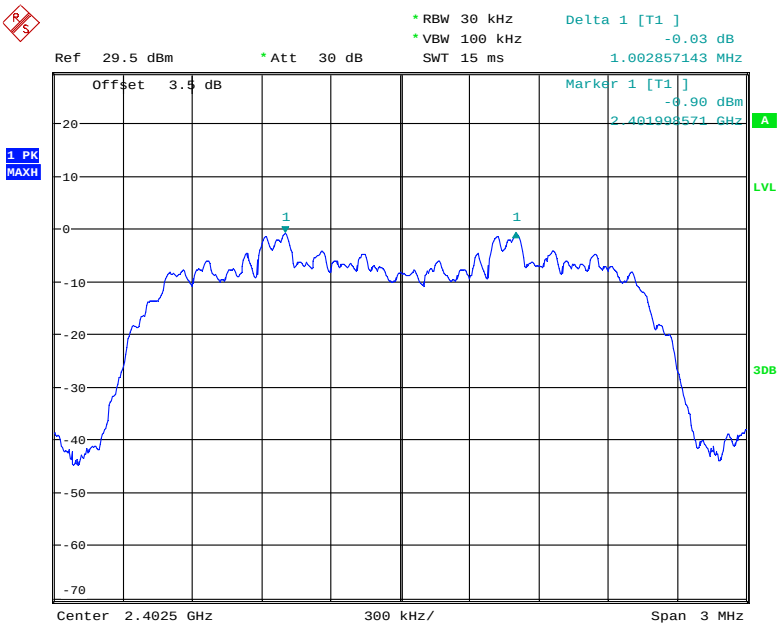
Date: 10.OCT.2017 21:06:36

BDR (GFSK): High Channel



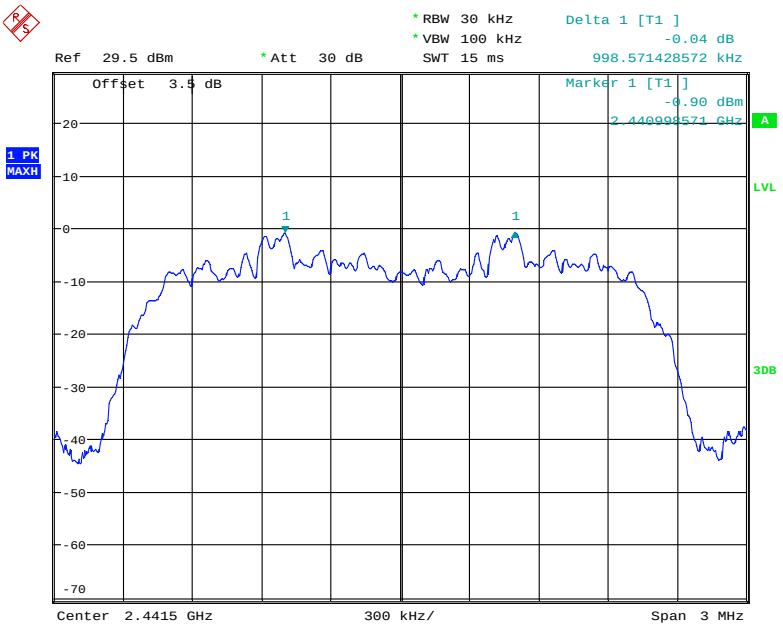
Date: 10.OCT.2017 21:08:39

EDR (π/4-DQPSK): Low Channel



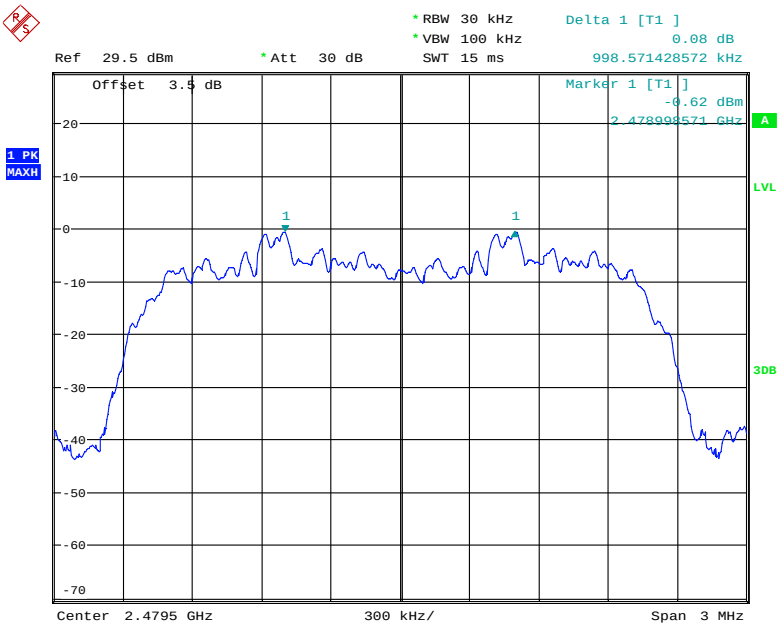
Date: 10.OCT.2017 21:11:34

EDR (π/4-DQPSK): Middle Channel



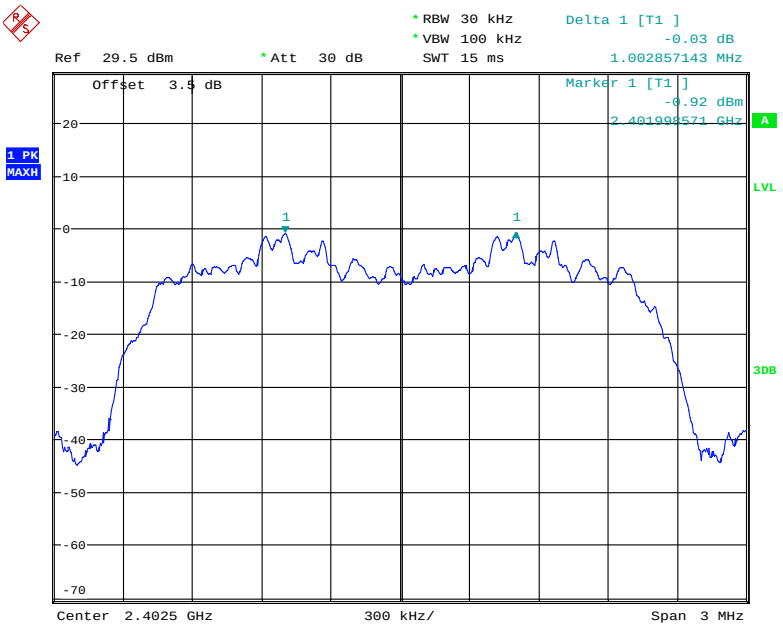
Date: 10.OCT.2017 21:10:47

EDR (π/4-DQPSK): High Channel



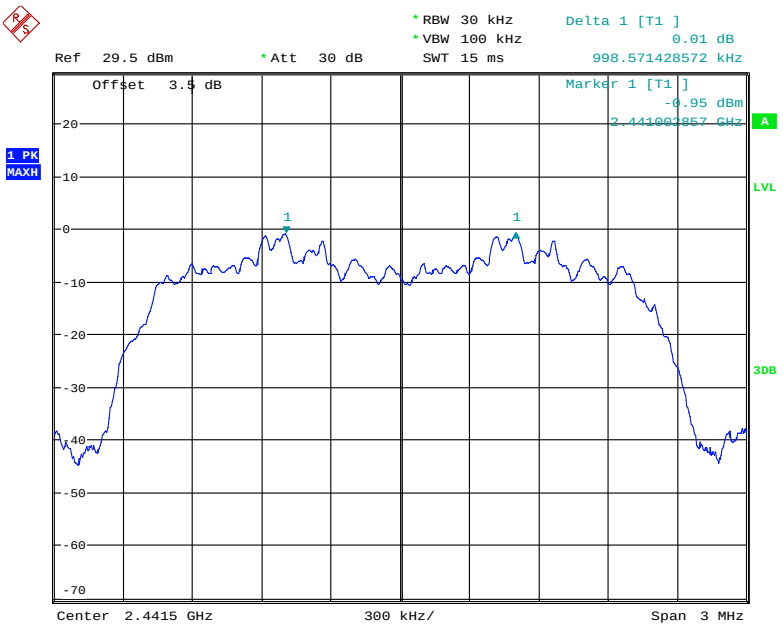
Date: 10.OCT.2017 21:09:55

EDR (8DPSK): Low Channel



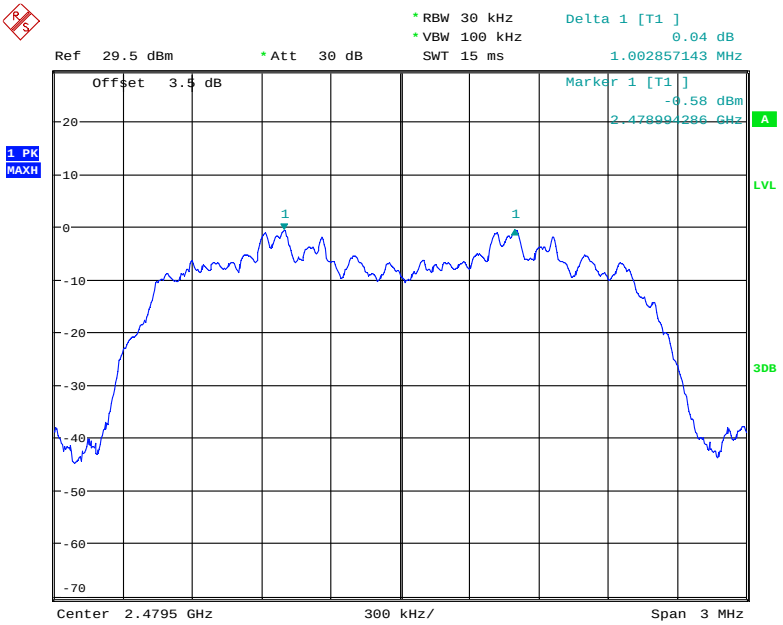
Date: 10.OCT.2017 21:12:52

EDR (8DPSK): Middle Channel



Date: 10.OCT.2017 21:14:38

EDR (8DPSK): High Channel



Date: 10.OCT.2017 21:15:32

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:	25 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

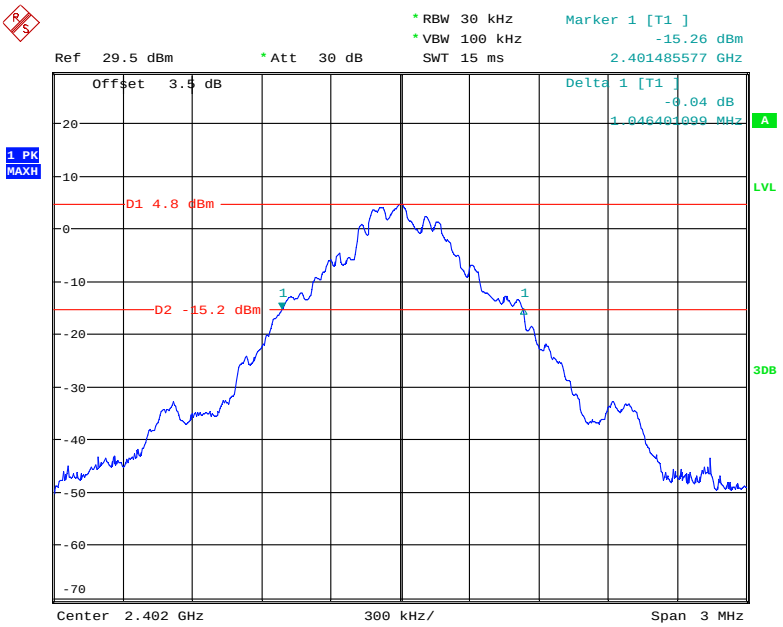
The testing was performed by Simon Wang on 2017-10-10.

EUT operation mode: Transmitting

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

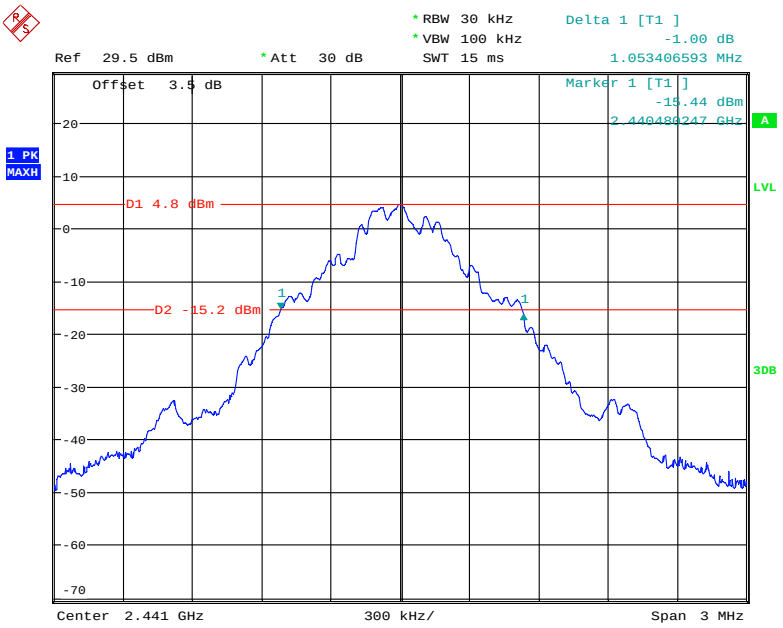
Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	1.046
	Middle	2441	1.053
	High	2480	1.049
EDR (π/4-DQPSK)	Low	2402	1.346
	Middle	2441	1.35
	High	2480	1.351
EDR (8DPSK)	Low	2402	1.298
	Middle	2441	1.298
	High	2480	1.298

BDR (GFSK): Low Channel



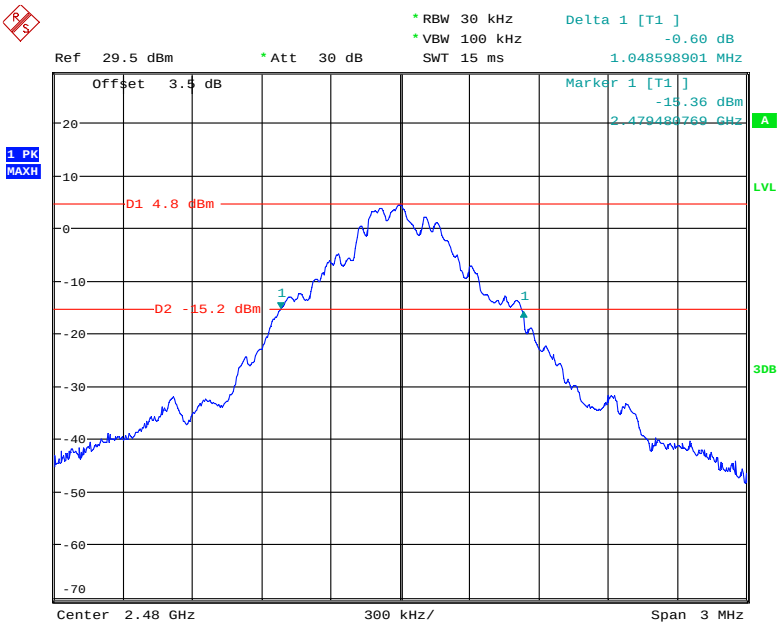
Date: 10.OCT.2017 20:45:08

BDR (GFSK): Middle Channel



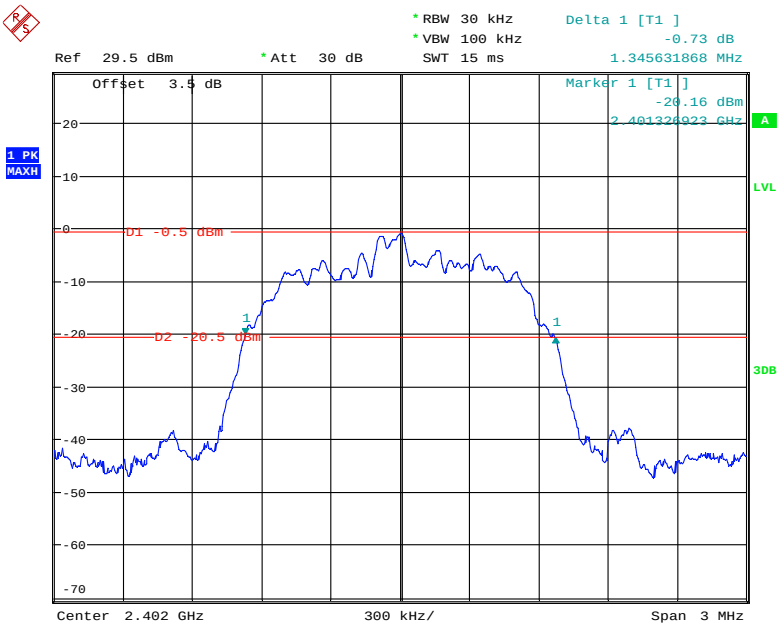
Date: 10.OCT.2017 20:44:24

BDR (GFSK): High Channel



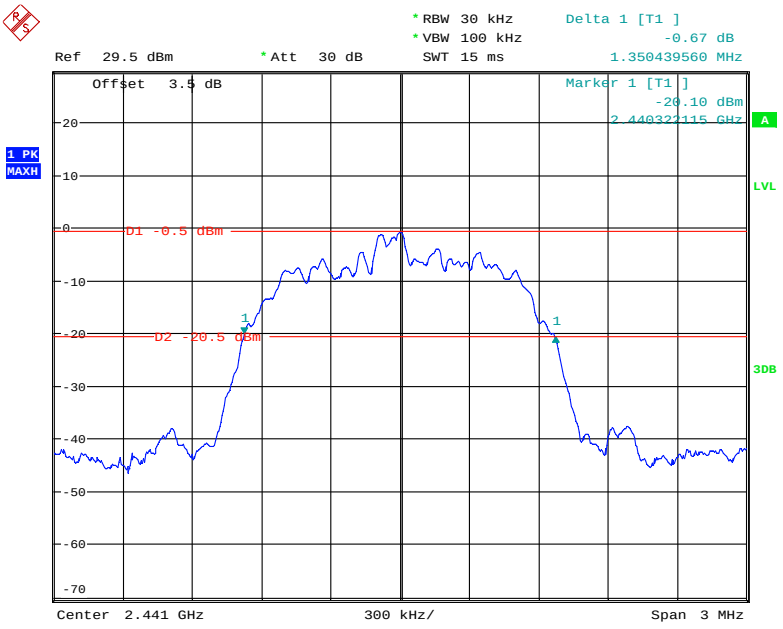
Date: 10.OCT.2017 20:45:40

EDR (π/4-DQPSK): Low Channel



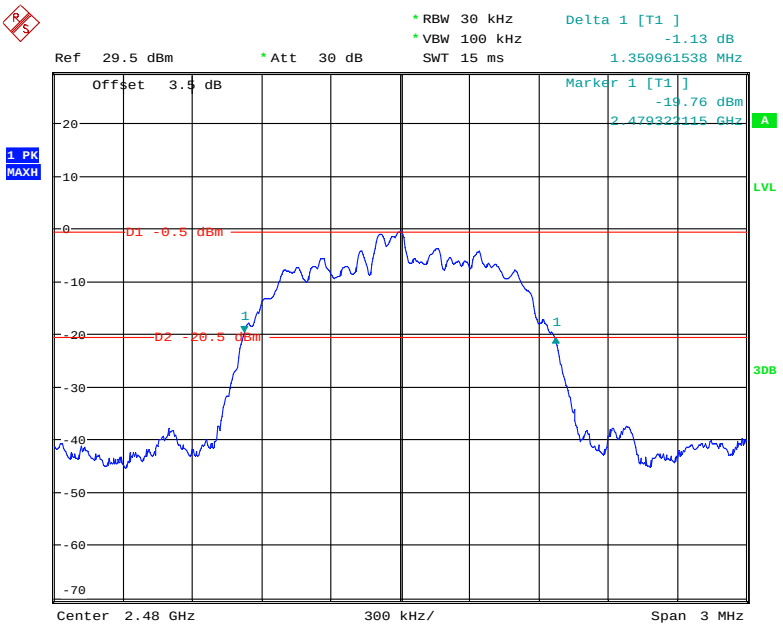
Date: 10.OCT.2017 20:52:27

EDR (π/4-DQPSK): Middle Channel



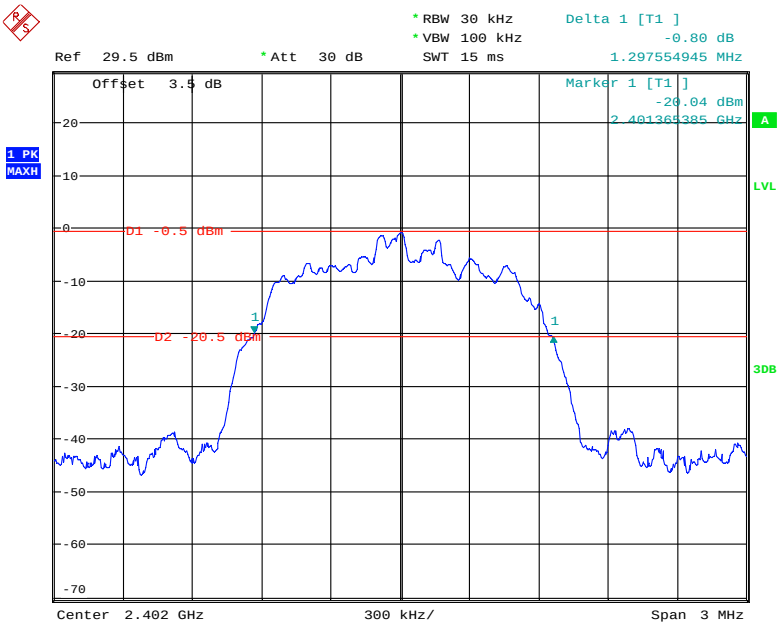
Date: 10.OCT.2017 20:51:42

EDR (π/4-DQPSK): High Channel



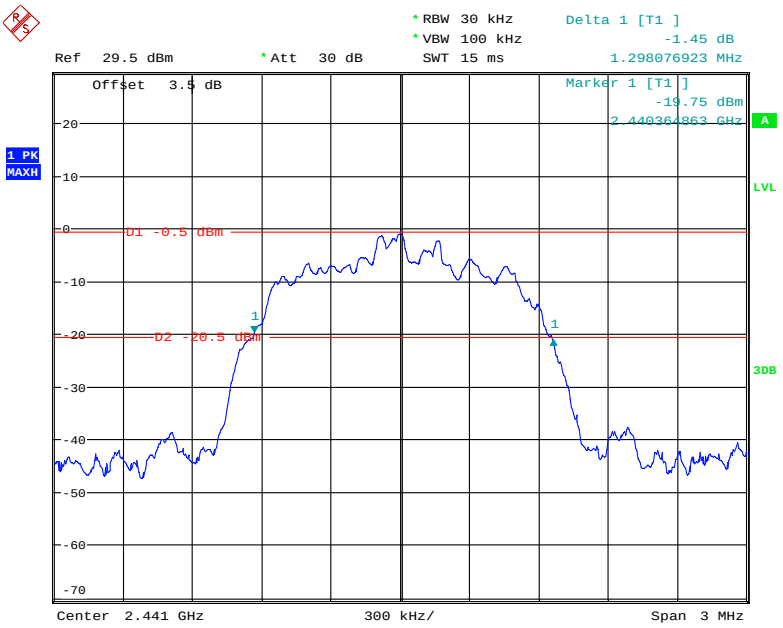
Date: 10.OCT.2017 20:46:42

EDR (8DPSK): Low Channel



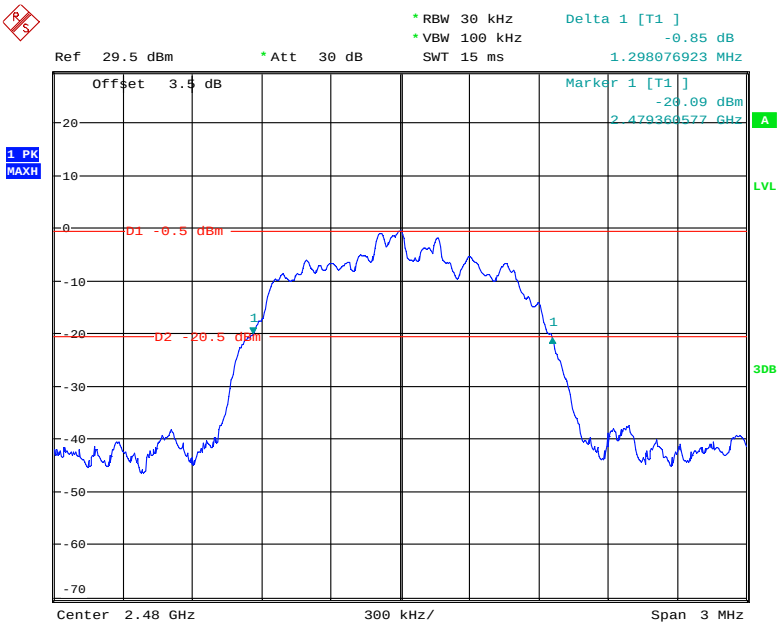
Date: 10.OCT.2017 20:53:22

EDR (8DPSK): Middle Channel



Date: 10.OCT.2017 20:54:16

EDR (8DPSK): High Channel



Date: 10.OCT.2017 20:54:50

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 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

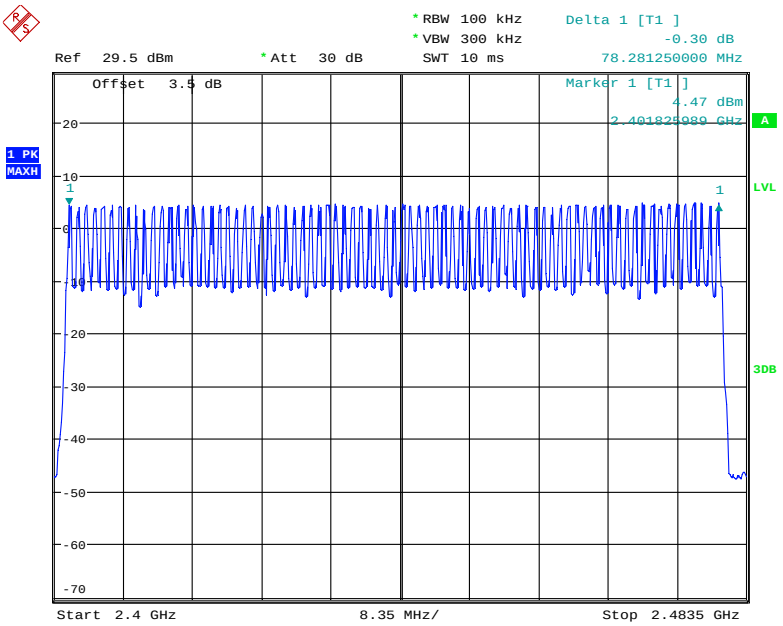
The testing was performed by Simon Wang on 2017-10-10.

EUT operation mode: Transmitting

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

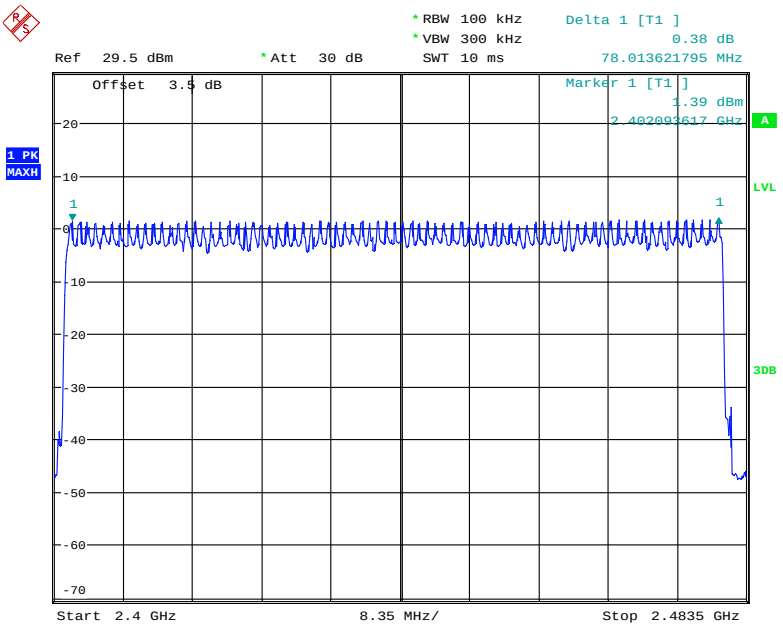
Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	≥15
EDR (π/4-DQPSK)	2400-2483.5	79	≥15
EDR (8DPSK)	2400-2483.5	79	≥15

BDR (GFSK): Number of Hopping Channels



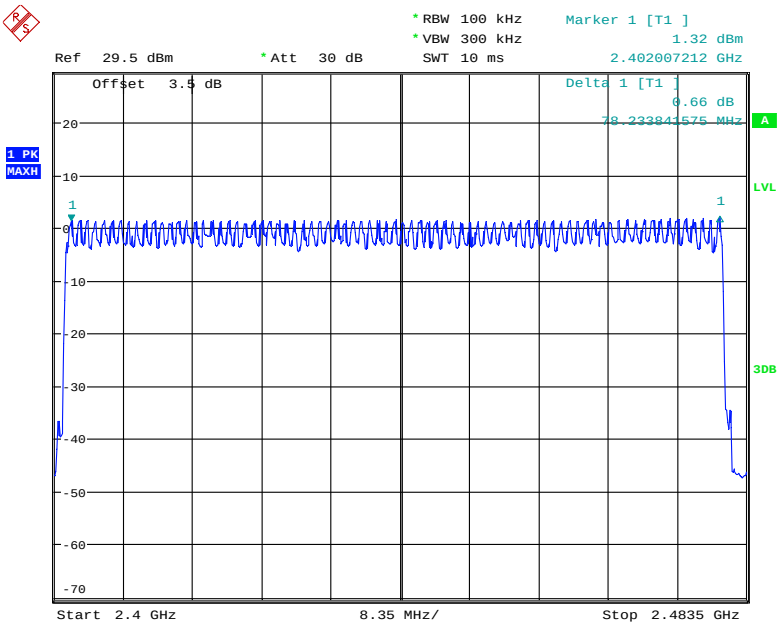
Date: 10.OCT.2017 21:20:27

EDR (π/4-DQPSK): Number of Hopping Channels



Date: 10.OCT.2017 21:26:17

EDR (8DPSK): Number of Hopping Channels



Date: 10.OCT.2017 21:33:42

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

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

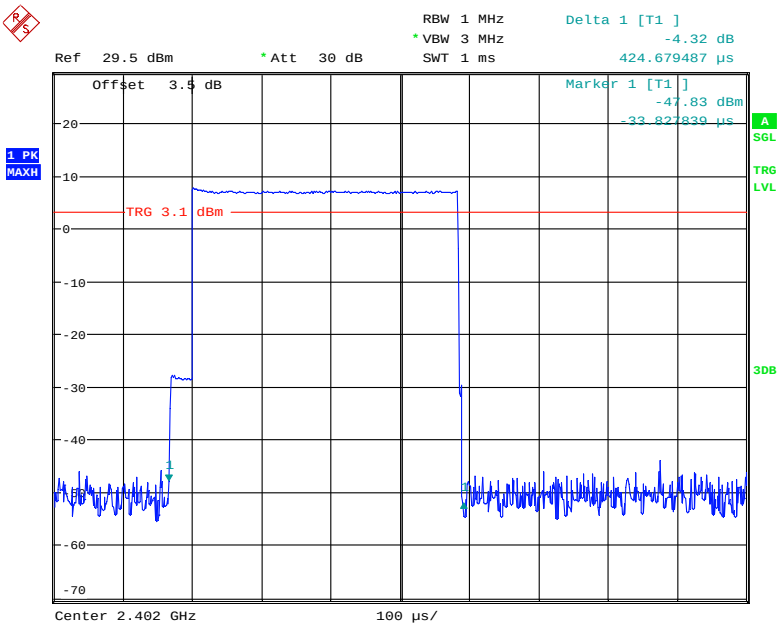
The testing was performed by Simon Wang on 2017-10-10.

EUT operation mode: Transmitting

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

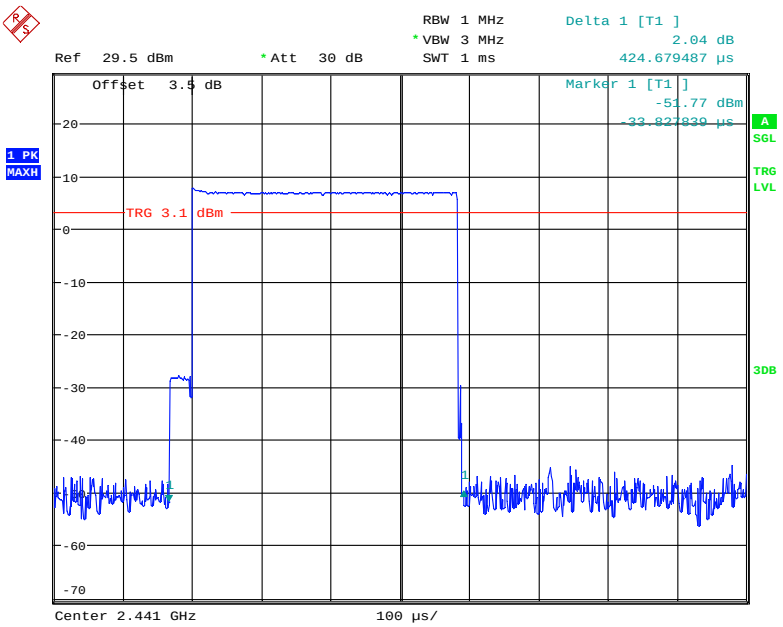
Mode		Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
BDR (GFSK)	DH 1	Low	0.425	0.136	0.4	Pass
		Middle	0.425	0.136	0.4	Pass
		High	0.425	0.136	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.689	0.270	0.4	Pass
		Middle	1.689	0.270	0.4	Pass
		High	1.689	0.270	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.947	0.314	0.4	Pass
		Middle	2.947	0.314	0.4	Pass
		High	2.947	0.314	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (π/4-DQPSK)	2DH 1	Low	0.429	0.137	0.4	Pass
		Middle	0.429	0.137	0.4	Pass
		High	0.429	0.137	0.4	Pass
		Note: 2DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	2DH 3	Low	1.689	0.270	0.4	Pass
		Middle	1.689	0.270	0.4	Pass
		High	1.689	0.270	0.4	Pass
		Note: 2DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	2DH 5	Low	2.947	0.314	0.4	Pass
		Middle	2.947	0.314	0.4	Pass
		High	2.947	0.314	0.4	Pass
		Note:2DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	3DH 1	Low	0.429	0.137	0.4	Pass
		Middle	0.429	0.137	0.4	Pass
		High	0.429	0.137	0.4	Pass
		Note: 3DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	3DH 3	Low	1.689	0.270	0.4	Pass
		Middle	1.689	0.270	0.4	Pass
		High	1.689	0.270	0.4	Pass
		Note: 3DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	3DH 5	Low	2.947	0.314	0.4	Pass
		Middle	2.947	0.314	0.4	Pass
		High	2.947	0.314	0.4	Pass
		Note: 3DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

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



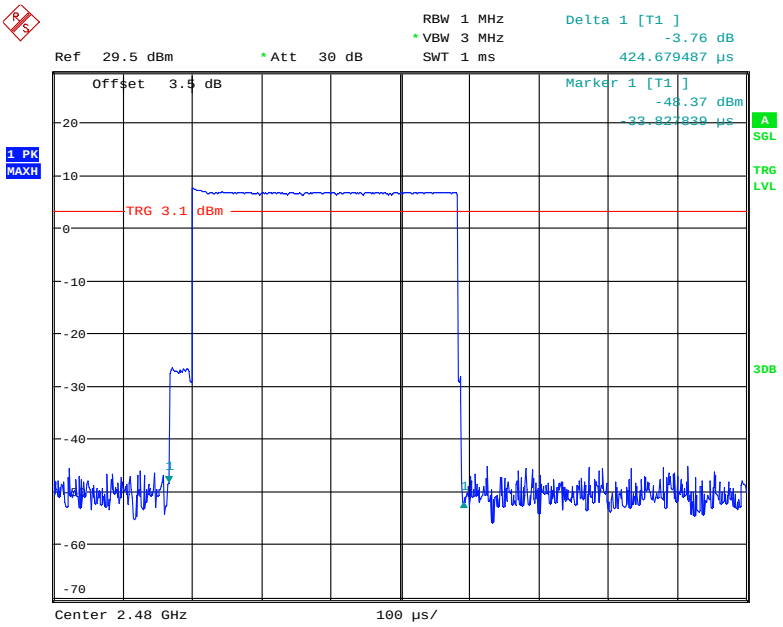
Date: 10.OCT.2017 21:35:34

Pulse time, Middle Channel, DH1



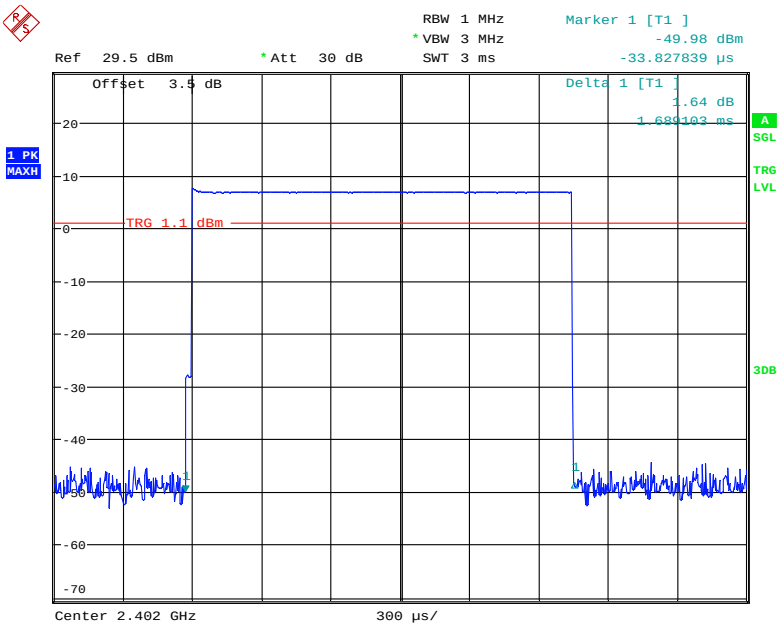
Date: 10.OCT.2017 21:36:30

Pulse time, High Channel, DH1



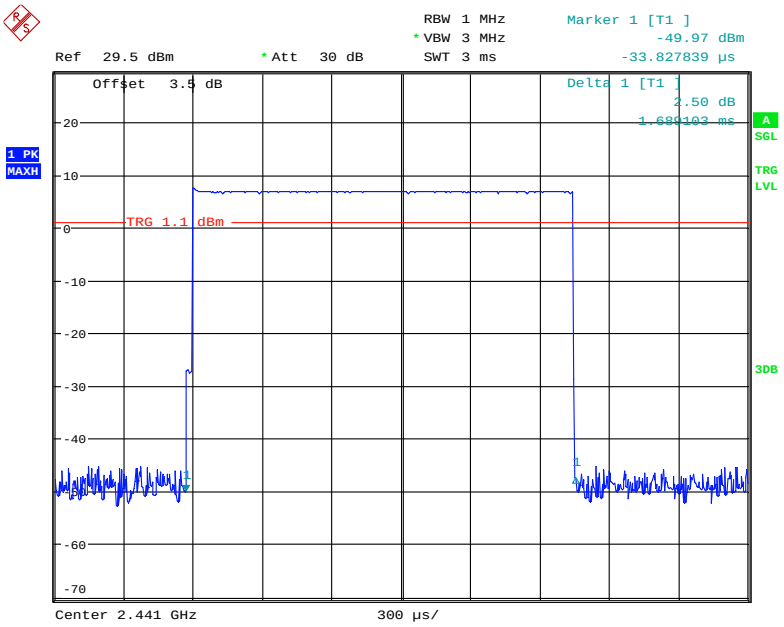
Date: 10.OCT.2017 21:36:48

Pulse time, Low Channel, DH3



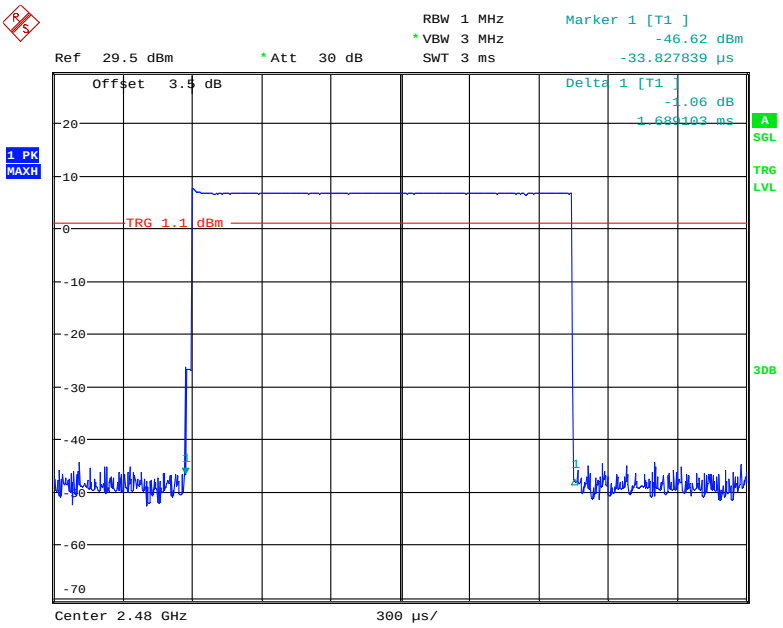
Date: 10.OCT.2017 21:40:54

Pulse time, Middle Channel, DH3



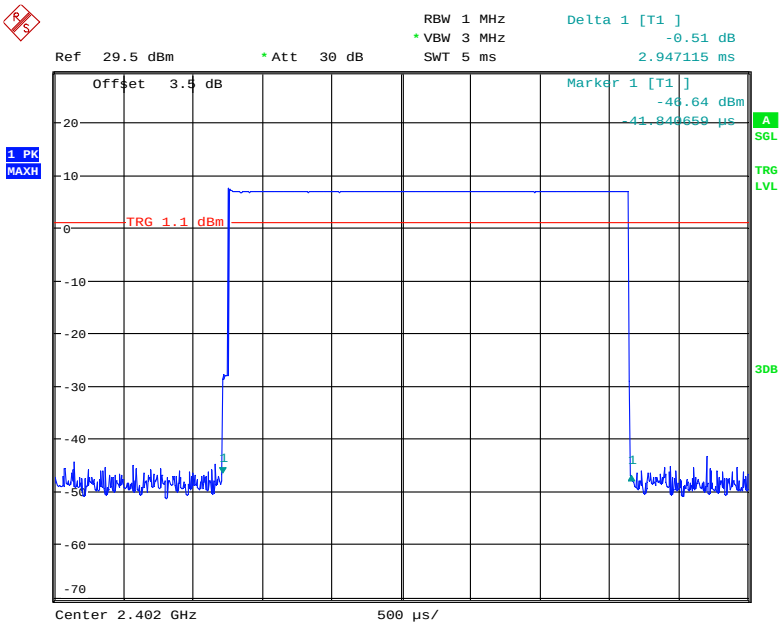
Date: 10.OCT.2017 21:40:43

Pulse time, High Channel, DH3



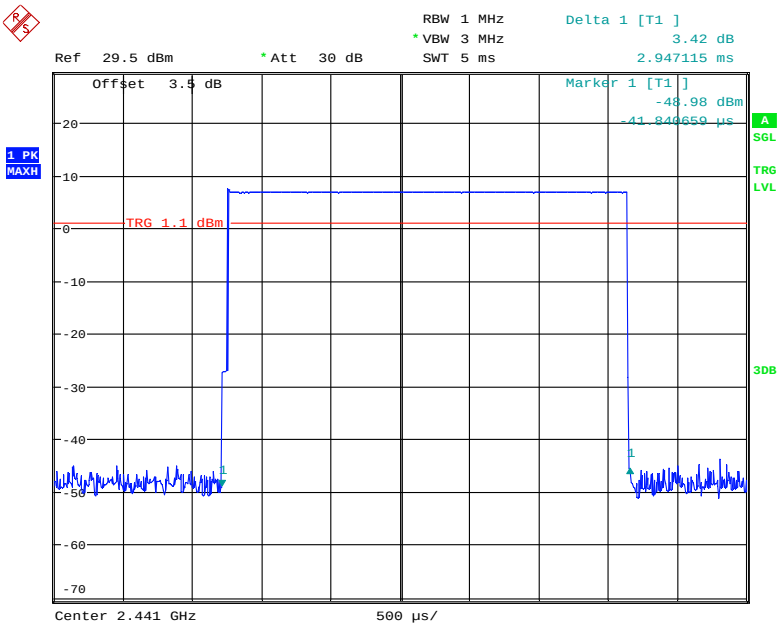
Date: 10.OCT.2017 21:40:26

Pulse time, Low Channel, DH5



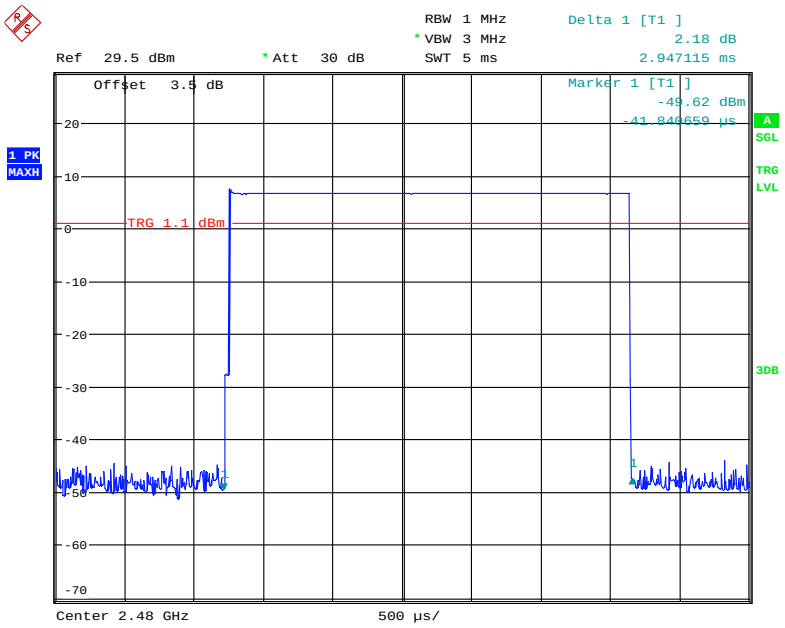
Date: 10.OCT.2017 21:44:08

Pulse time, Middle Channel, DH5



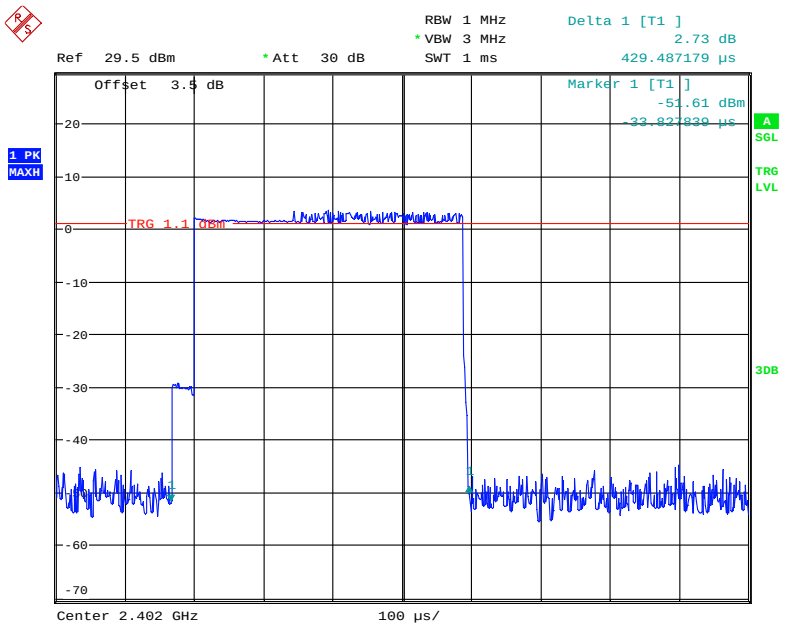
Date: 10.OCT.2017 21:44:27

Pulse time, High Channel, DH5



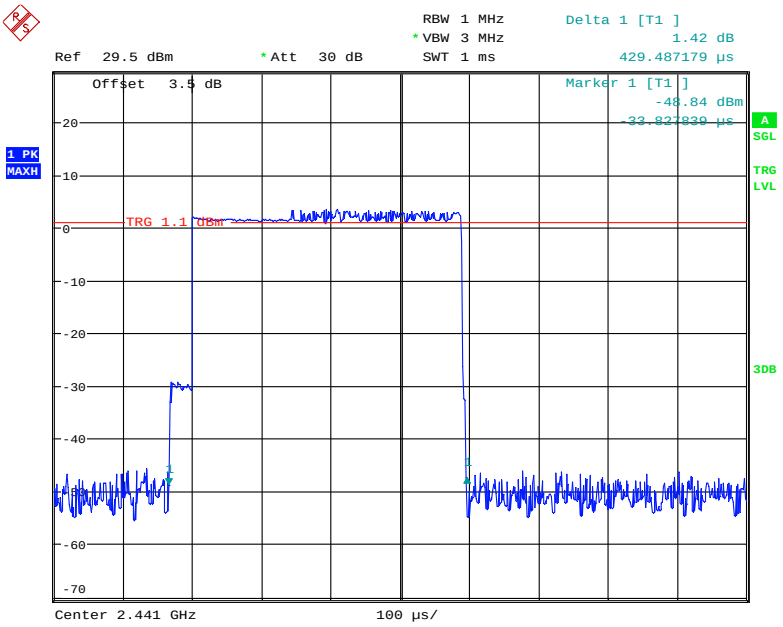
Date: 10.OCT.2017 21:44:37

EDR (π/4-DQPSK): Pulse time, Low Channel, 2DH1



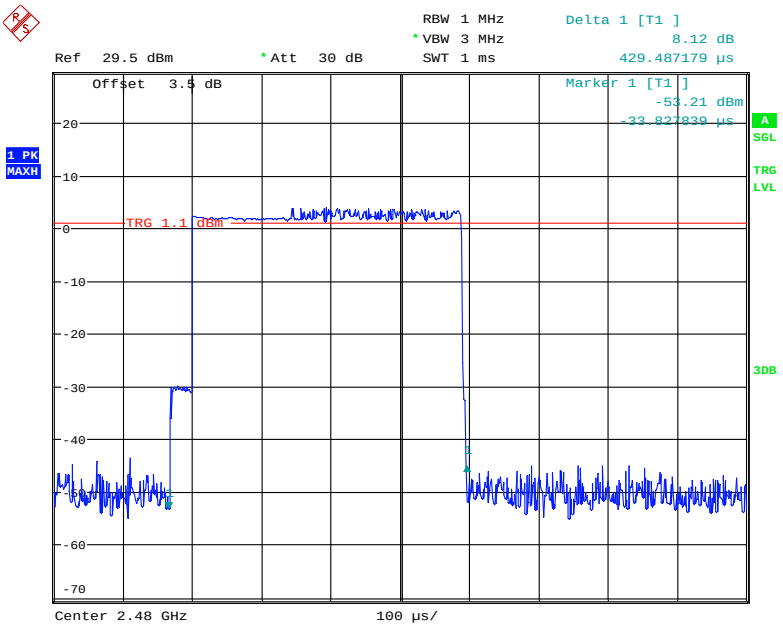
Date: 10.OCT.2017 21:37:58

Pulse time, Middle Channel, 2DH1



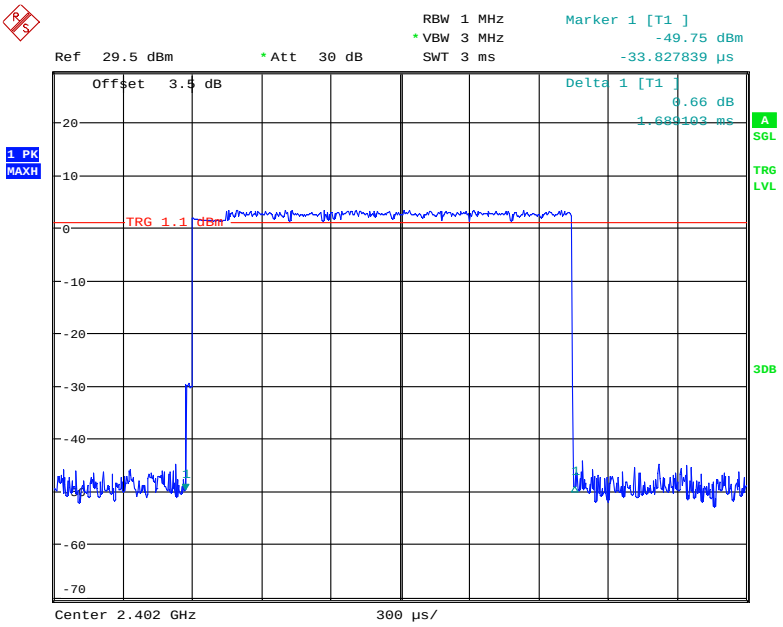
Date: 10.OCT.2017 21:37:46

Pulse time, High Channel, 2DH1



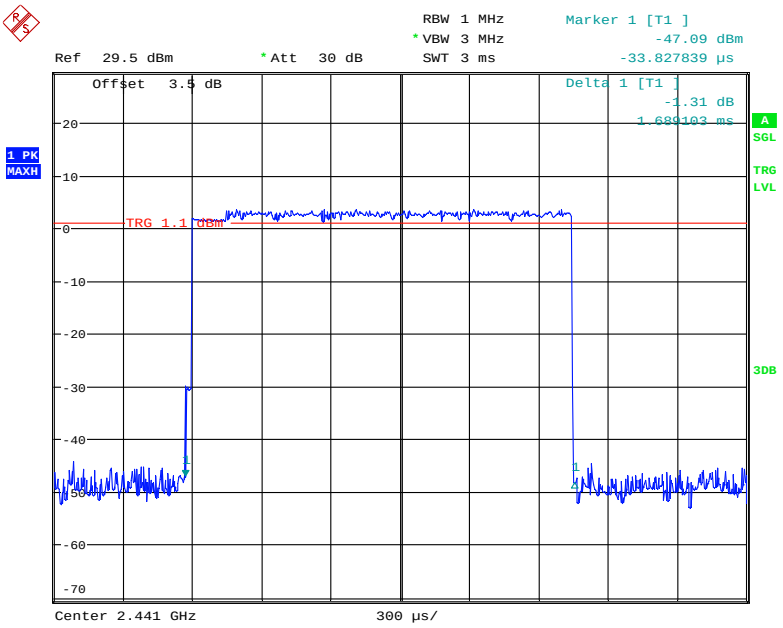
Date: 10.OCT.2017 21:37:27

Pulse time, Low Channel, 2DH3



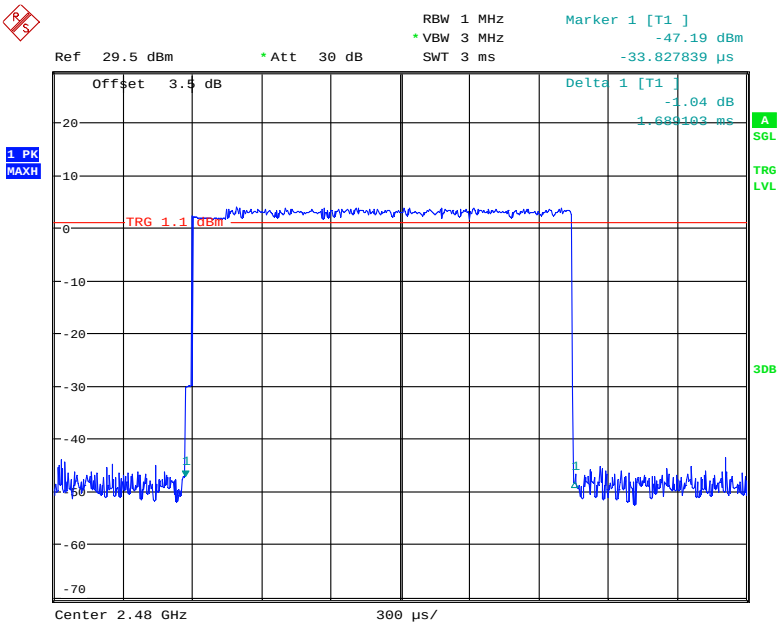
Date: 10.OCT.2017 21:41:26

Pulse time, Middle Channel, 2DH3



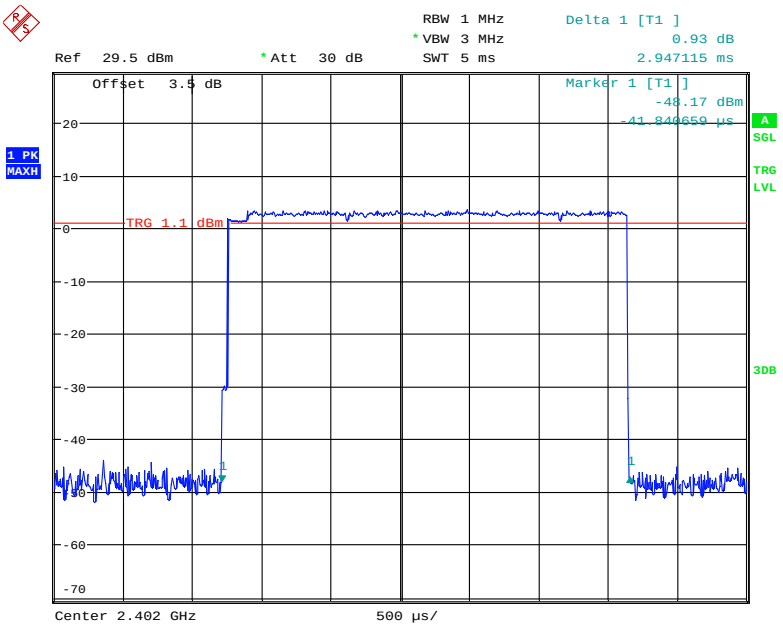
Date: 10.OCT.2017 21:41:49

Pulse time, High Channel, 2DH3



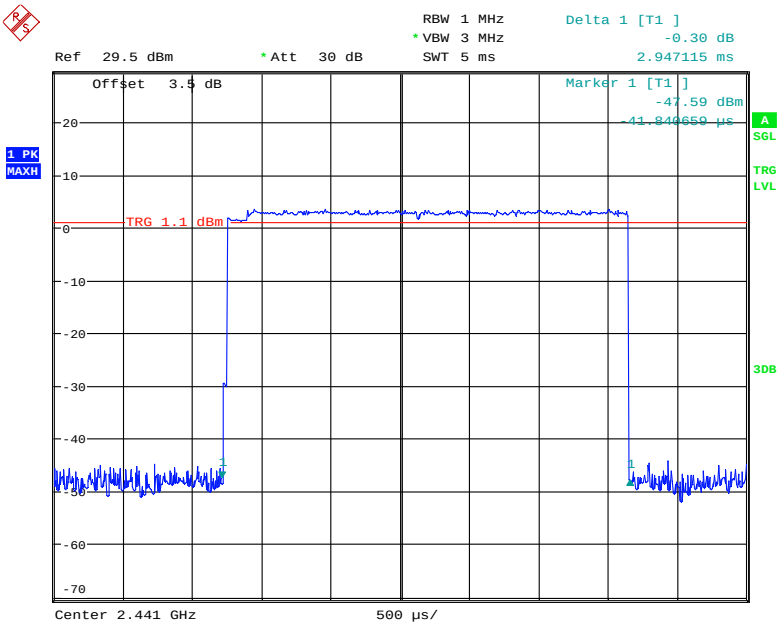
Date: 10.OCT.2017 21:42:16

Pulse time, Low Channel, 2DH5



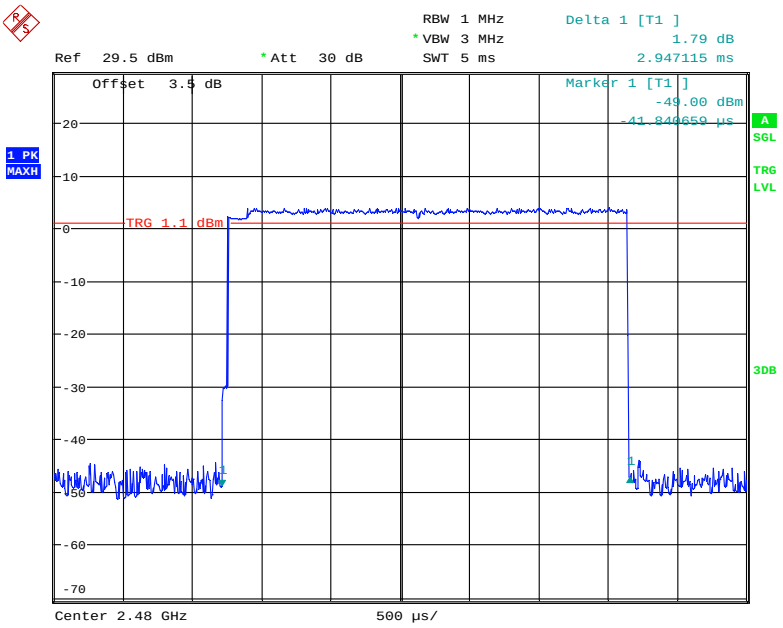
Date: 10.OCT.2017 21:45:32

Pulse time, Middle Channel, 2DH5



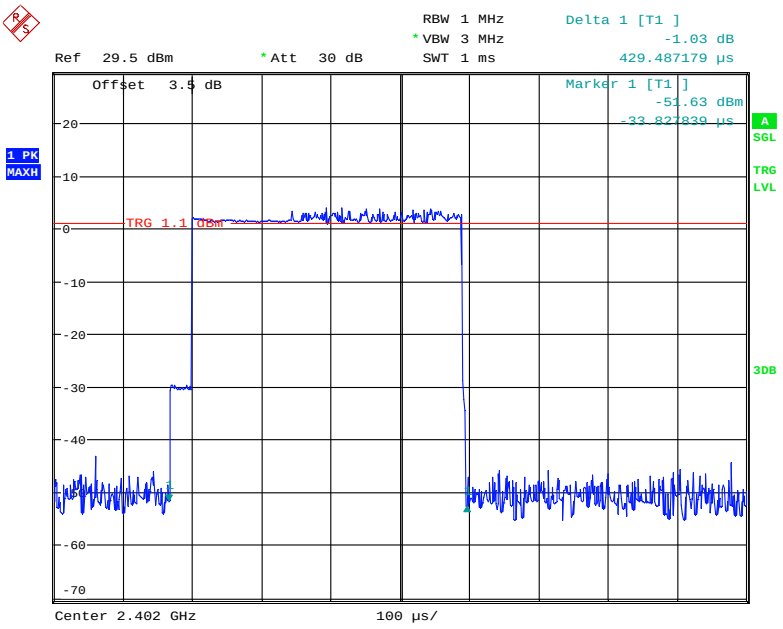
Date: 10.OCT.2017 21:45:21

Pulse time, High Channel, 2DH5



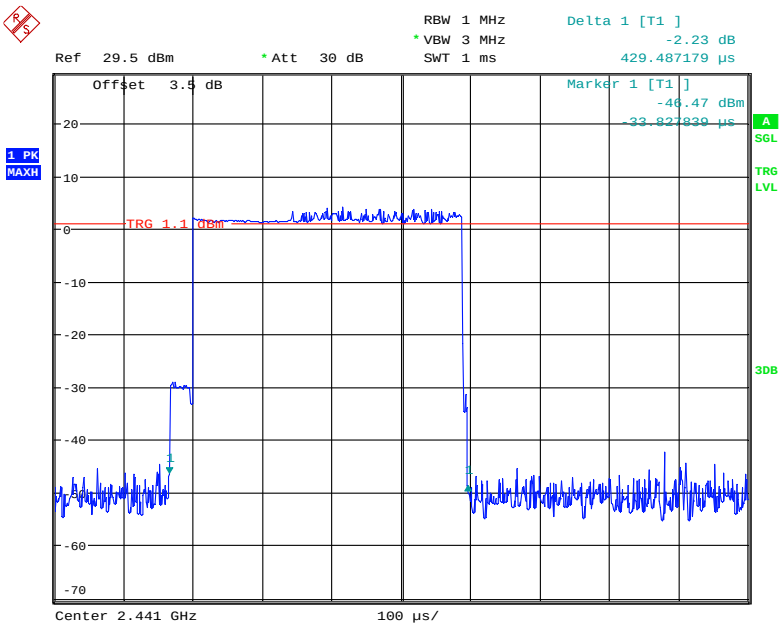
Date: 10.OCT.2017 21:45:11

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



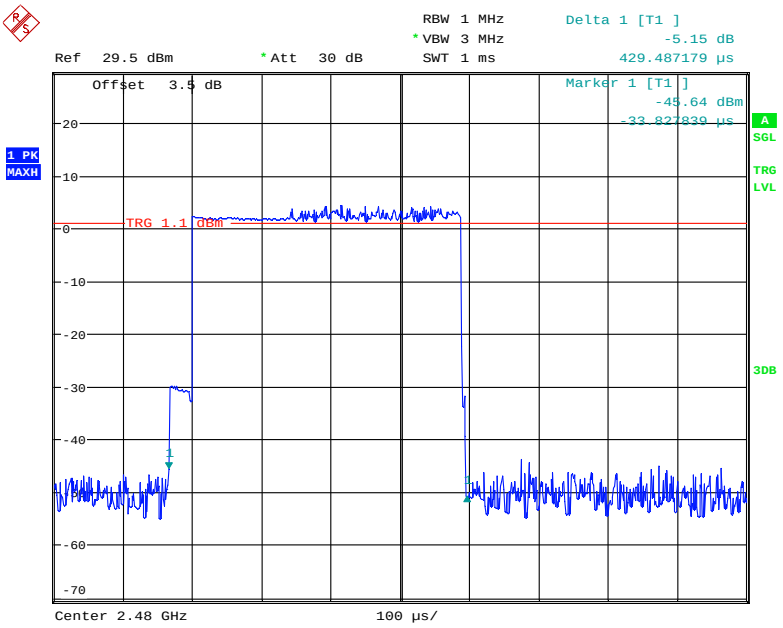
Date: 10.OCT.2017 21:38:19

Pulse time, Middle Channel, 3DH1



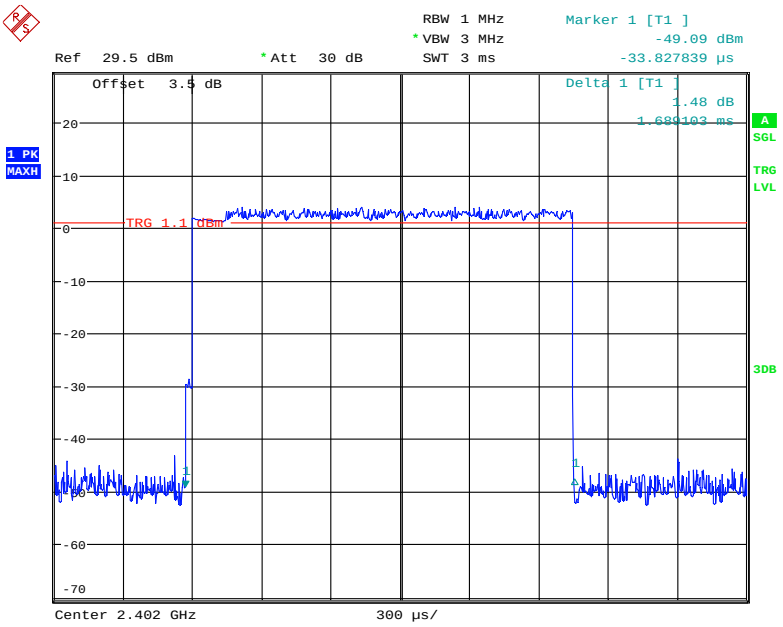
Date: 10.OCT.2017 21:38:28

Pulse time, High Channel, 3DH1



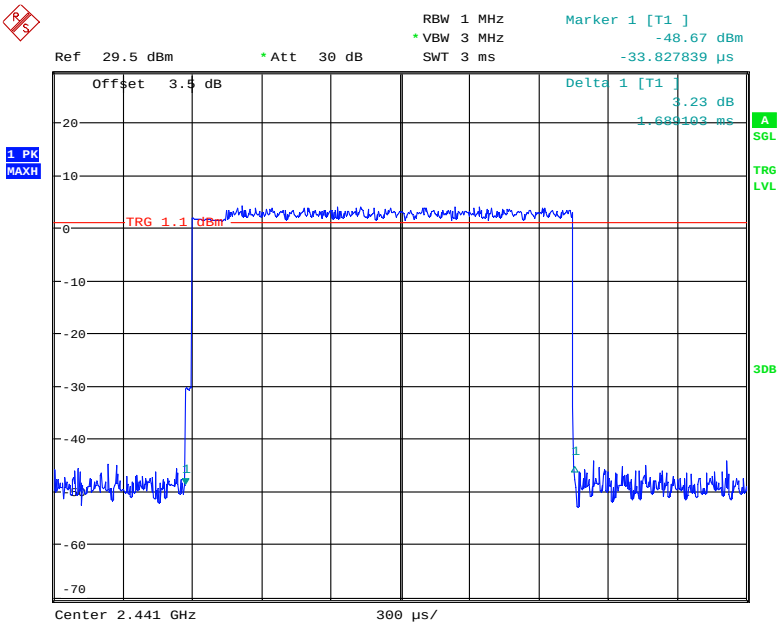
Date: 10.OCT.2017 21:38:39

Pulse time, Low Channel, 3DH3



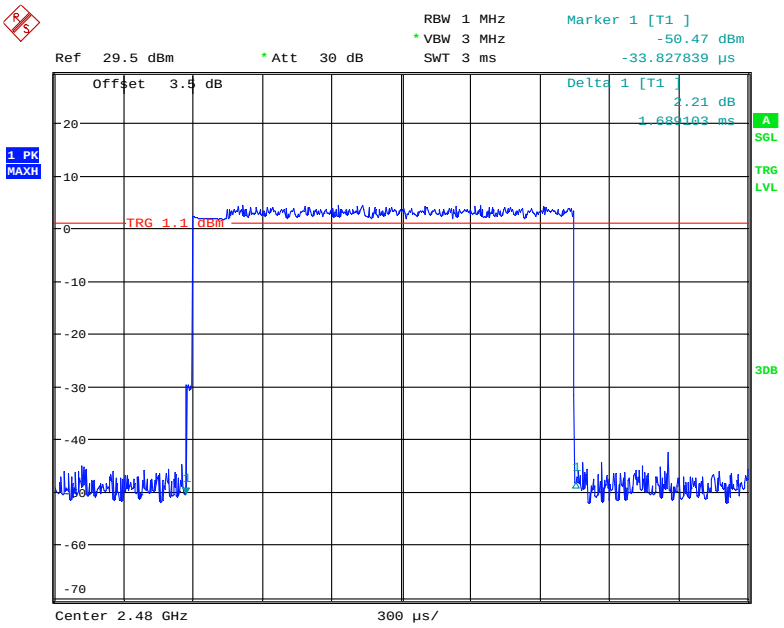
Date: 10.OCT.2017 21:43:12

Pulse time, Middle Channel, 3DH3



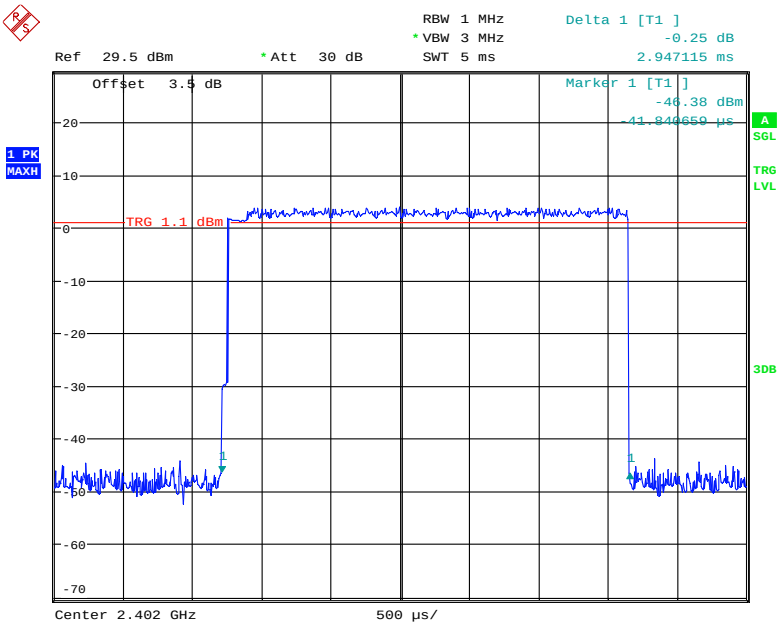
Date: 10.OCT.2017 21:43:03

Pulse time, High Channel, 3DH3



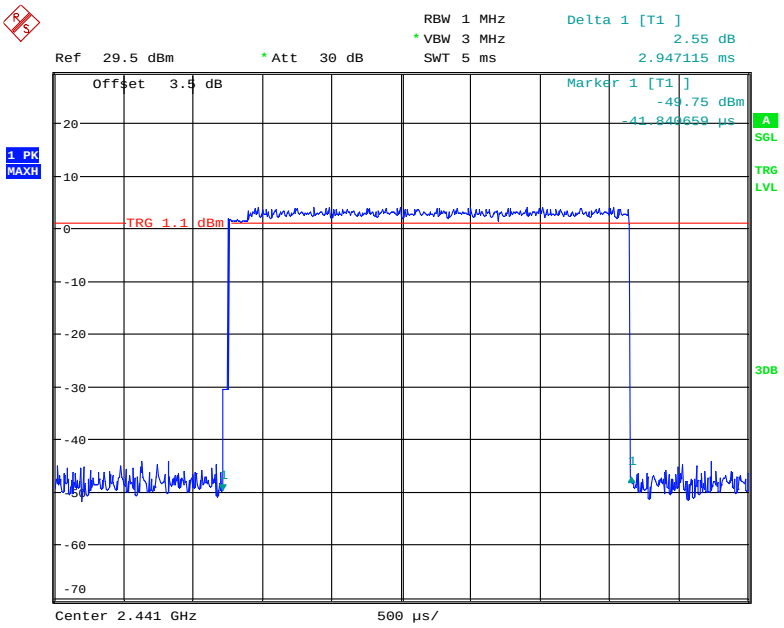
Date: 10.OCT.2017 21:42:51

Pulse time, Low Channel, 3DH5



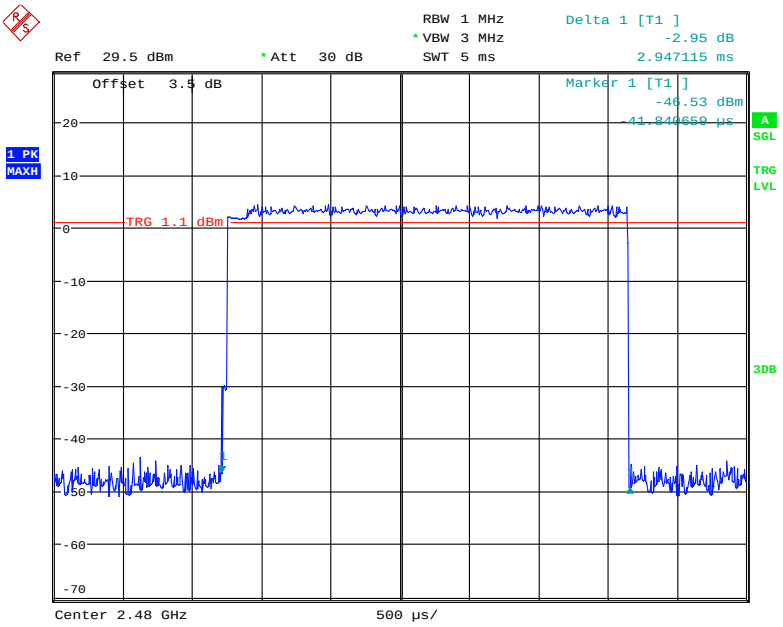
Date: 10.OCT.2017 21:45:52

Pulse time, Middle Channel, 3DH5



Date: 10.OCT.2017 21:46:04

Pulse time, High Channel, 3DH5



Date: 10.OCT.2017 21:46:13

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:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-10-11.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table.

Mode	Channel	Frequency (MHz)	Peak Output Power		Limit (mW)
			(dBm)	(mW)	
BDR (GFSK)	Low	2402	7.83	6.07	1000
	Middle	2441	7.77	5.98	1000
	High	2480	7.76	5.97	1000
EDR (π/4-DQPSK)	Low	2402	4.24	2.65	1000
	Middle	2441	4.23	2.65	1000
	High	2480	4.63	2.90	1000
EDR (8DPSK)	Low	2402	4.73	2.97	1000
	Middle	2441	4.51	2.82	1000
	High	2480	4.53	2.84	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:	24~25 ℃
Relative Humidity:	48~54 %
ATM Pressure:	100.0~101.0 kPa

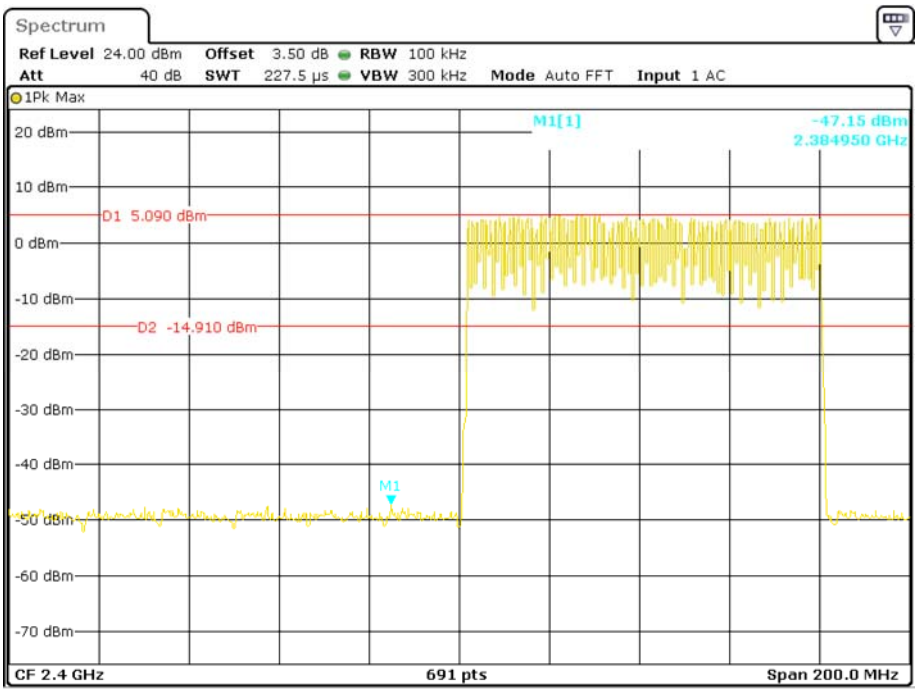
The testing was performed by Simon Wang from 2017-10-10 to 2018-01-05.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following plots.

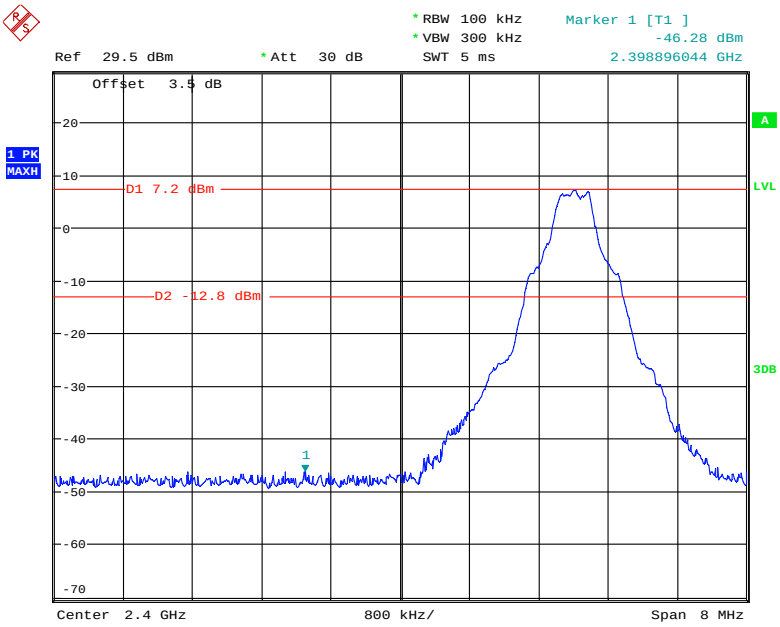
BDR (GFSK): Band Edge-Left Side

Hopping



Date: 5.JAN.2018 13:10:51

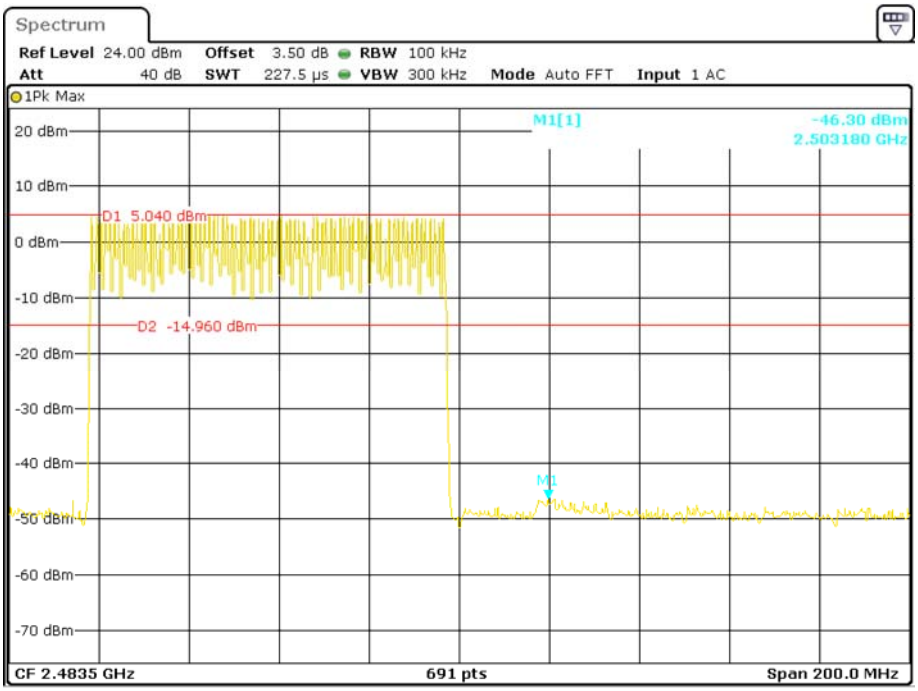
Single



Date: 10.OCT.2017 21:00:24

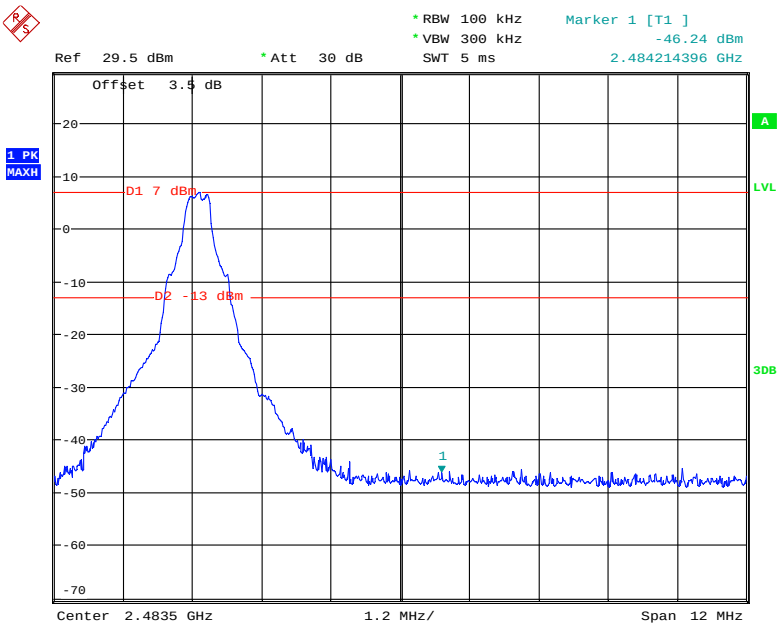
BDR (GFSK): Band Edge-Right Side

Hopping



Date: 5.JAN.2018 13:13:08

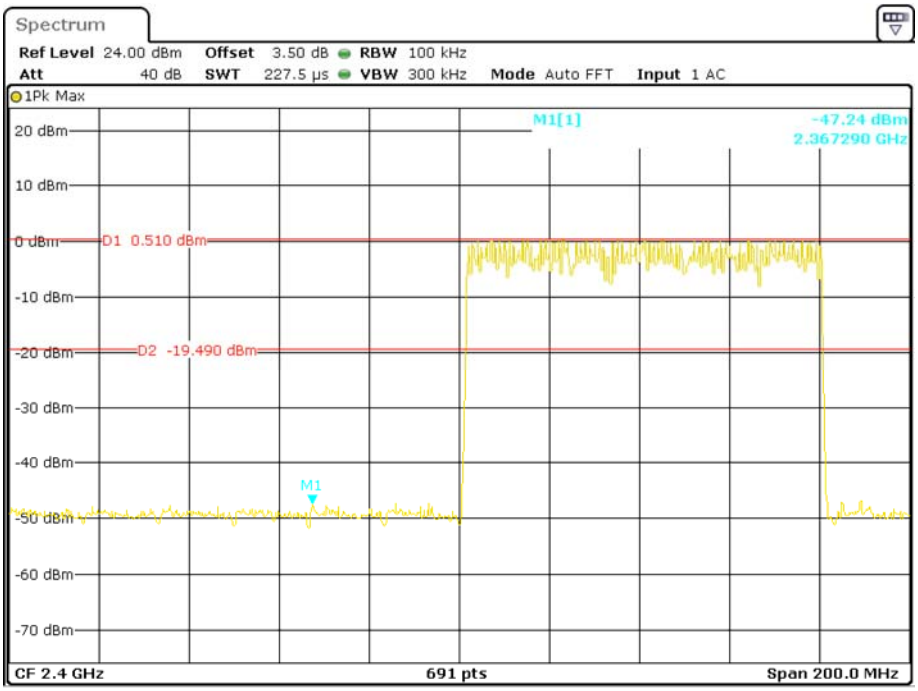
Single



Date: 10.OCT.2017 20:59:35

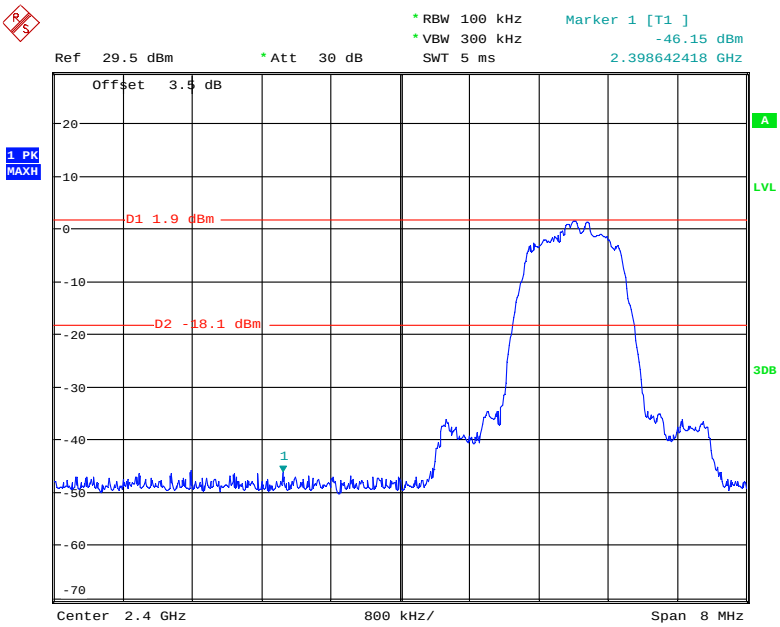
EDR (π/4-DQPSK): Band Edge-Left Side

Hopping



Date: 5.JAN.2018 13:18:32

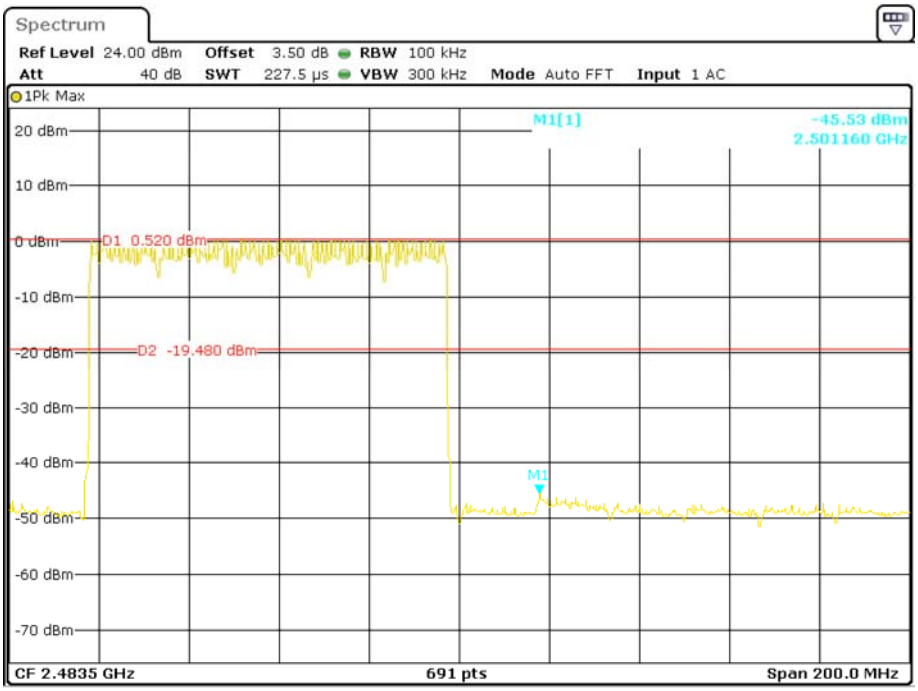
Single



Date: 10.OCT.2017 20:57:06

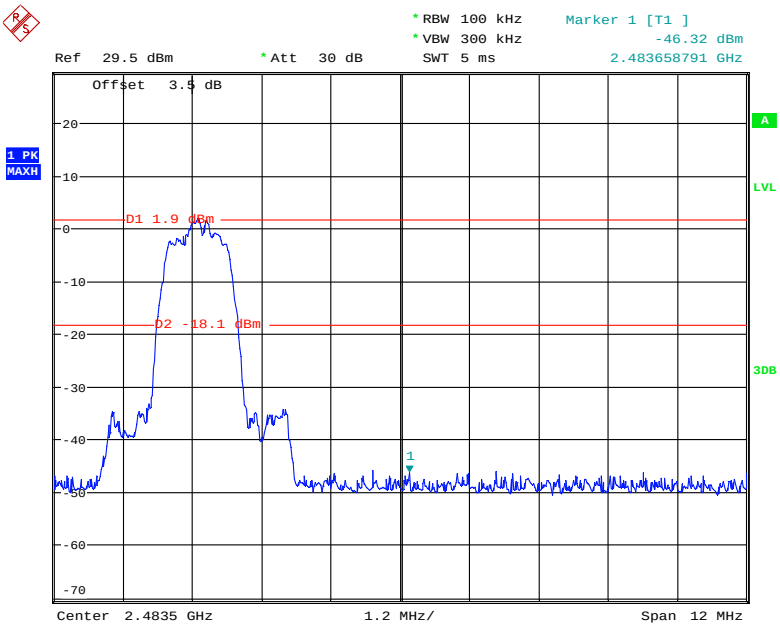
EDR (π/4-DQPSK): Band Edge-Right Side

Hopping



Date: 5.JAN.2018 13:16:46

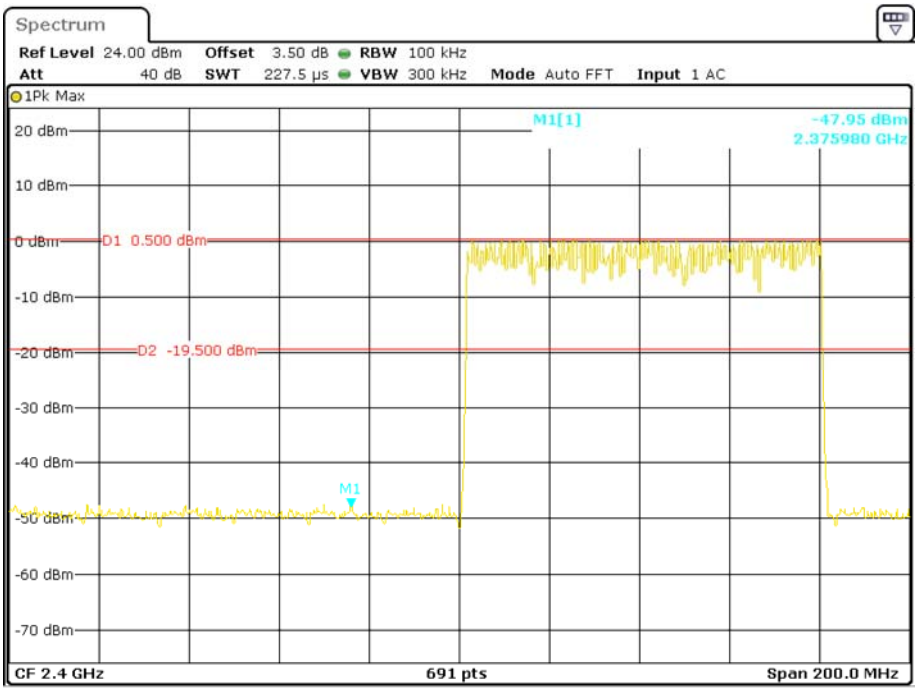
Single



Date: 10.OCT.2017 20:57:45

EDR (8DPSK): Band Edge-Left Side

Hopping



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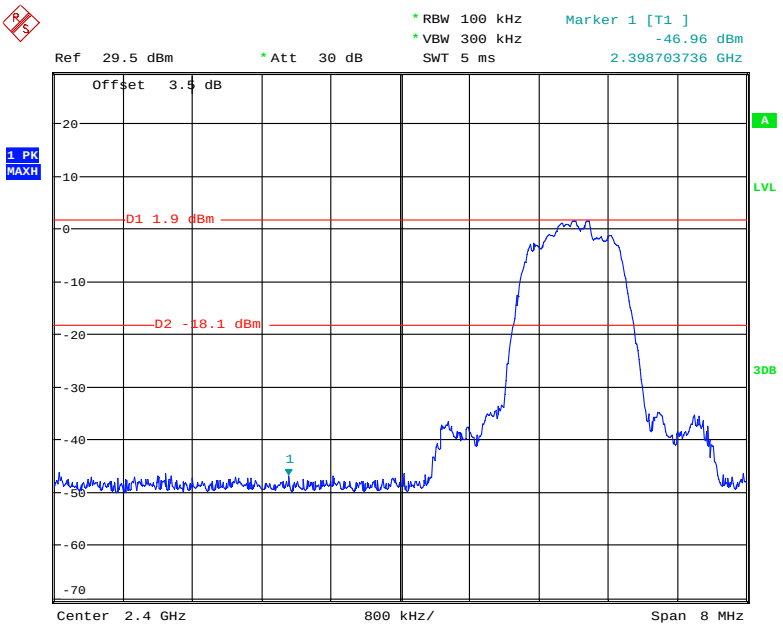
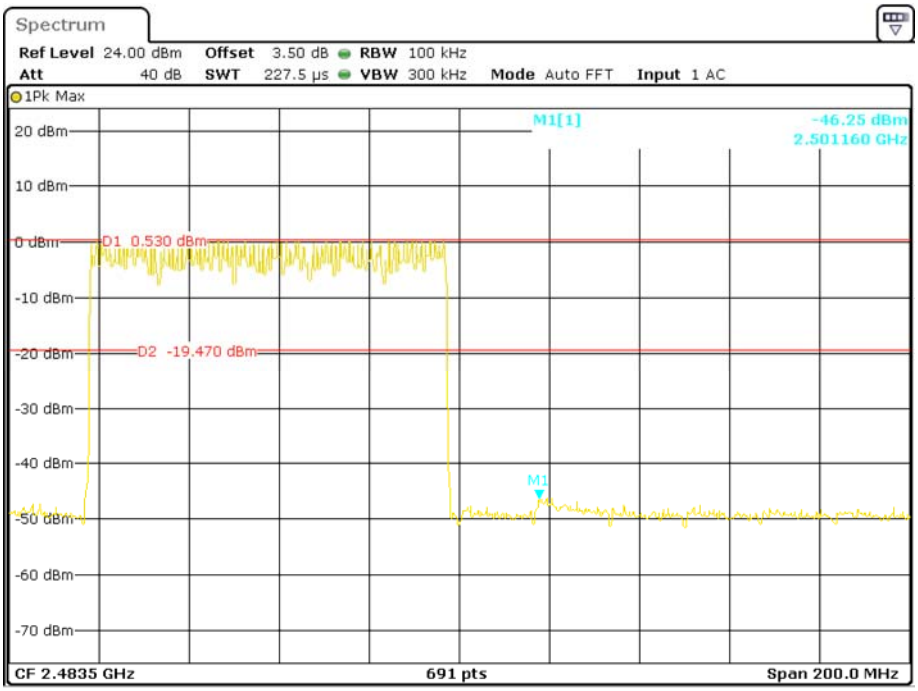
Single



Date: 10.OCT.2017 20:56:29

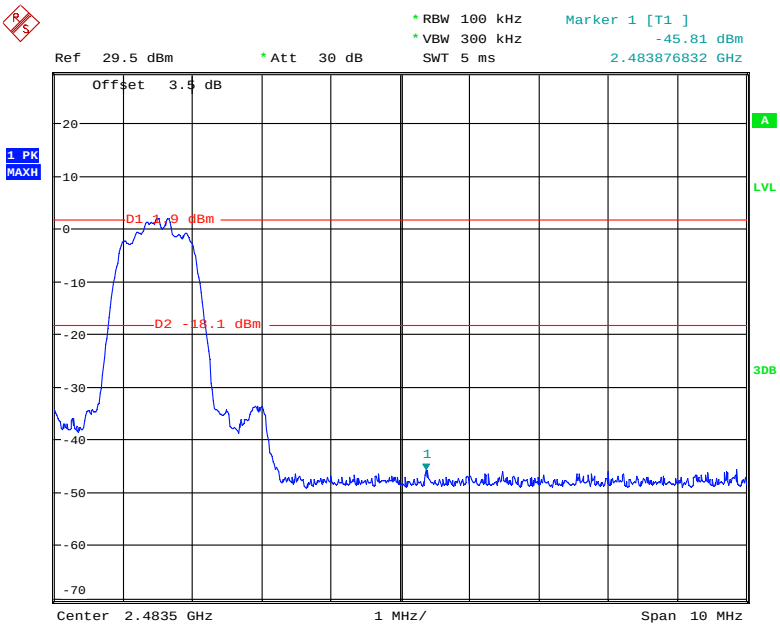
EDR (8DPSK): Band Edge-Right Side

Hopping



Date: 5.JAN.2018 13:22:08

Single



Date: 10.OCT.2017 20:55:47

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