

FCC PART 15.247

RSS-GEN, ISSUE 4, NOVEMBER 2014

RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Fujian Landi Commercial Equipment Co., Ltd.

Building 17, Section A, Software Park, No. 89 Software Road, Gulou District, Fuzhou Municipality,
Fujian Province, P.R. China.

FCC ID: 2AG6N-APOSA8-BLWF
IC: 23725-APOSA8BLWF

Report Type: Original Report	Product Name: APOS A8
Report Number: RXM171225055-00B	
Report Date: 2018-03-14	
Reviewed By:	Jerry Zhang EMC Manager <i>Jerry Zhang</i>
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*”

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	5
MEASUREMENT UNCERTAINTY	5
TEST FACILITY	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	6
EQUIPMENT MODIFICATIONS	6
SUPPORT EQUIPMENT LIST AND DETAILS	6
SUPPORT CABLE LIST AND DETAILS	6
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS	8
FCC §15.247 (i) & §1.1310 & §2.1093& RSS-102 CLAUSE 4- RF EXPOSURE.....	9
APPLICABLE STANDARD	9
TEST RESULT	9
FCC §15.203& RSS-GEN CLAUSE 8.3 - ANTENNA REQUIREMENT	10
APPLICABLE STANDARD	10
ANTENNA CONNECTOR CONSTRUCTION	10
FCC §15.207 (a) & RSS-GEN CLAUSE 8.8- AC LINE CONDUCTED EMISSIONS.....	11
APPLICABLE STANDARD	11
EUT SETUP	11
EMI TEST RECEIVER SETUP.....	11
TEST PROCEDURE	11
CORRECTED AMPLITUDE & MARGIN CALCULATION	12
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST DATA	12
FCC §15.209, §15.205 & §15.247(d) & RSS-247 CLAUSE 5.5,RSS -GEN CLAUSE 8.10-SPURIOUS EMISSIONS	17
APPLICABLE STANDARD	17
EUT SETUP	17
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	18
TEST PROCEDURE	18
TEST EQUIPMENT LIST AND DETAILS.....	18
CORRECTED AMPLITUDE & MARGIN CALCULATION	19
TEST DATA	19
FCC §15.247(a) (1) & RSS-247 CLAUSE 5.1 b)- CHANNEL SEPARATION TEST	29
APPLICABLE STANDARD	29
TEST EQUIPMENT LIST AND DETAILS.....	29
TEST PROCEDURE	29
TEST DATA	29
FCC §15.247(a) (1) & RSS-247 CLUASE 5.1 b) &RSS-GEN CLAUSE 6.6- 20 dB BANDWIDTH TESTING.....	36

APPLICABLE STANDARD	36
TEST PROCEDURE	36
TEST EQUIPMENT LIST AND DETAILS.....	36
TEST DATA	37
FCC §15.247(a) (1) (iii) & RSS-247 CLAUSE 5.1 d)- QUANTITY OF HOPPING CHANNEL TEST.....	48
APPLICABLE STANDARD	48
TEST PROCEDURE	48
TEST EQUIPMENT LIST AND DETAILS.....	48
TEST DATA	49
FCC §15.247(a) (1) (iii) & & RSS-247 Clause 5.1 d)- TIME OF OCCUPANCY (DWELL TIME).....	52
APPLICABLE STANDARD	52
TEST PROCEDURE	52
TEST EQUIPMENT LIST AND DETAILS.....	52
TEST DATA	52
FCC §15.247(b) (1) & RSS-247 Clause 5.4 b) - PEAK OUTPUT POWER MEASUREMENT	68
APPLICABLE STANDARD	68
TEST PROCEDURE	68
TEST EQUIPMENT LIST AND DETAILS.....	68
TEST DATA	68
FCC §15.247(d)& RSS-247 Clause 5.5 - BAND EDGES TESTING	74
APPLICABLE STANDARD	74
TEST PROCEDURE	74
TEST EQUIPMENT LIST AND DETAILS.....	75
TEST DATA	75

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		APOS A8
EUT Model:		APOS A8-I94A4
FCC ID:		2AG6N-APOSA8-BLWF
IC:		23725-APOSA8BLWF
Rated Input Voltage:		DC7.2V from battery or DC 5V from USB port
Adapter #1 Information	Model:	HKA00505010-XA
	Input:	AC 100-240V, 50/60Hz, 0.2A
	Output:	DC 5V, 1.0A
Adapter #2 Information	Model:	HKC0115021-2D
	Input:	AC 100-240V, 50/60Hz, 0.5A
	Output:	DC 5V, 2A
External Dimension:		Length (183mm)*Width (84mm)*High (64mm)
Serial Number:		171225055
EUT Received Date:		2018.1.26

Objective

This report is prepared on behalf of **Fujian Landi Commercial Equipment Co., Ltd.** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules and RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

The tests were performed in order to determine the Bluetooth BDR and EDR mode of EUT compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules and RSS-247, Issue 2, February 2017, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AG6N-APOSA8-BLWF.
FCC Part 15E NII submissions with FCC ID: 2AG6N-APOSA8-BLWF.
FCC Part 15C DXX submissions with FCC ID: 2AG6N-APOSA8-BLWF.
RSS-247 DTSs, RSS-247 LE-LAN, RSS-210 submissions with IC: 23725-APOSA8BLWF.

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”, And RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, 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. : 897218,the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode , which was provided by manufacuter.

EUT Exercise Software

The test software 'QRCT ' configured the maximum power level as below setting:

Test Software Version	QRCT		
Test Frequency	2402MHz	2441MHz	2480MHz
GFSK	9	9	9
$\pi/4$ -DQPSK	9	9	9
8DPSK	9	9	9

Equipment Modifications

No modification was made to the EUT.

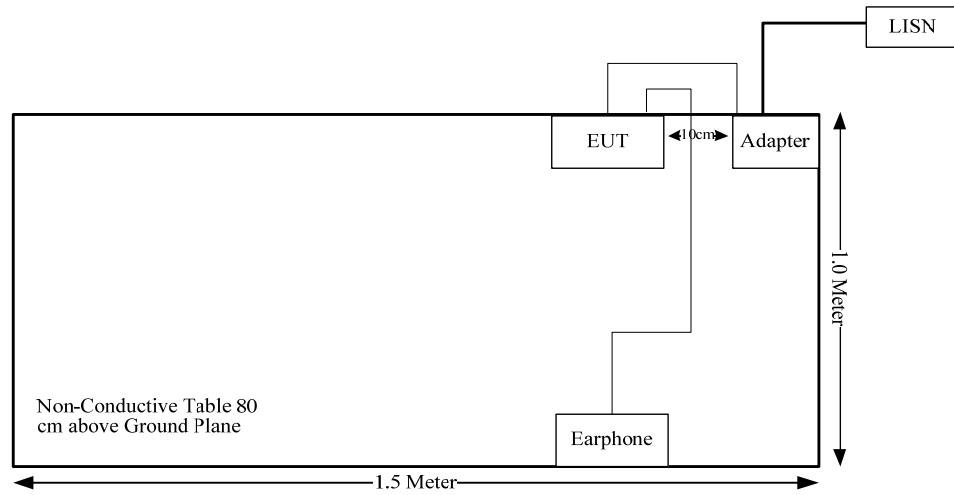
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HUAWEI	Earphone	/	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB cable	yes	No	0.8	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i) & §1.1310 & §2.1093 RSS-102 Clause 4	RF Exposure	Compliance
§15.203 RSS-GEN Clause 8.3	Antenna Requirement	Compliance
§15.207 (a) RSS-Gen Clause 8.8	Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d) RSS-247 Clause 5.5, RSS-Gen Clause 8.10	Spurious Emissions	Compliance
§15.247 (a)(1) RSS-247 Clause 5.1 b) RSS-Gen Clause 6.6	20 dB Bandwidth	Compliance
§15.247(a)(1) RSS-247 Clause 5.1 b)	Channel Separation Test	Compliance
§15.247(a)(1)(iii) RSS-247 Clause 5.1 d)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii) RSS-247 Clause 5.1 d)	Quantity of hopping channel Test	Compliance
§15.247(b)(1) RSS-247 Clause 5.4 b)	Peak Output Power Measurement	Compliance
§15.247(d) RSS-247 Clause 5.5	Band Edges	Compliance

FCC §15.247 (i) & §1.1310 & §2.1093& RSS-102 CLAUSE 4- RF EXPOSURE**Applicable Standard**

According to §15.247(i), §1.1310 and §2.1093.

According to RSS-102 Clause 4 Table 3, SAR limits for device used by the general public.

Body Region	Average SAR (W/Kg)	Averaging Time (minutes)	Mass Average (g)
Whole Body	0.08	6	Whole Body
Localized Head, Neck and Trunk	1.6	6	1
Localized Limbs	4	6	10

Test Result

Compliant, please refer to the SAR report: RXM171225055-20.

FCC §15.203& RSS-GEN CLAUSE 8.3 - 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.

According to RSS-Gen §8.3, The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

Antenna Connector Construction

The EUT has one internal antenna arrangement for BT, and the antenna gain is 2.31 dBi in 2.4GHz band, fulfill the requirement of this section. Please refer to the EUT photos.

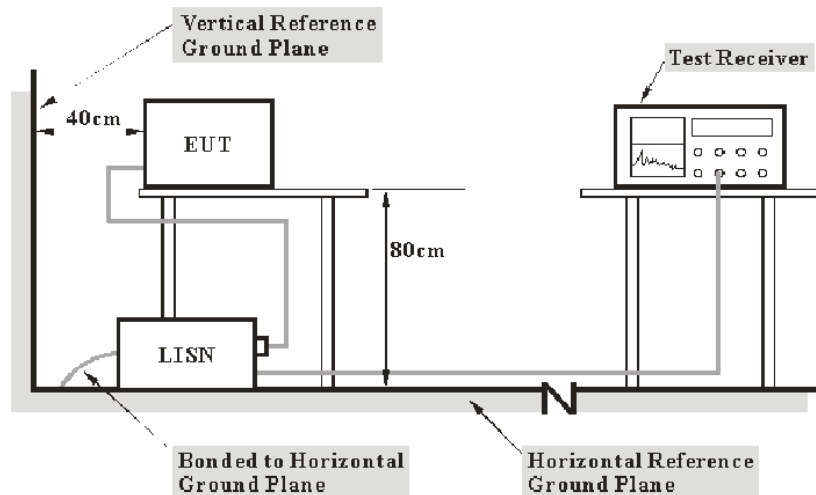
Result: Compliance.

FCC §15.207 (a) & RSS-GEN CLAUSE 8.8– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a) and RSS-GEN CLAUSE 8.8.

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 and RSS-Gen limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with 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:

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2017-12-11	2018-12-11
N/A	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2017-12-8	2018-12-8
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-9-25	2018-9-25

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

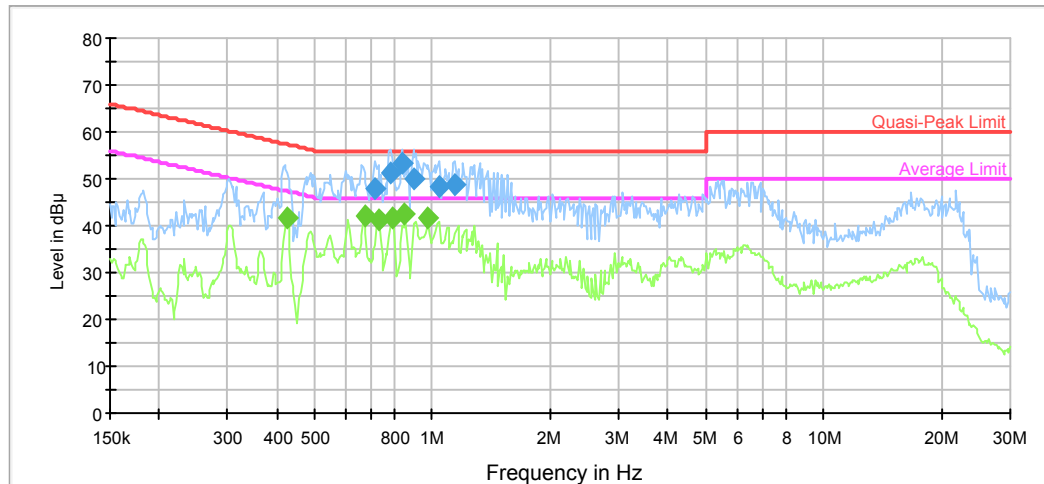
Test Data

Environmental Conditions

Temperature:	19.6 °C
Relative Humidity:	26 %
ATM Pressure:	102.1 kPa

The testing was performed by Alex You on 2018-02-06.

Model Number: APOS A8-I94A4
Port: L
Test Mode: Transmitting
Power Source: AC 120V/60Hz
Note: Adapter #1



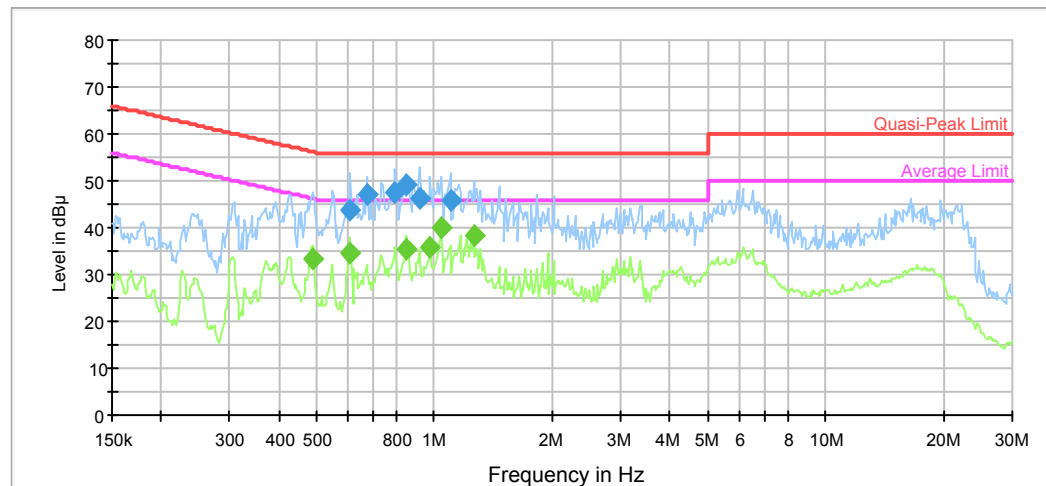
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.715082	48.1	9.000	L1	9.8	7.9	56.0
0.780588	51.5	9.000	L1	9.8	4.5	56.0
0.838622	53.2	9.000	L1	9.8	2.8	56.0
0.893821	50.0	9.000	L1	9.8	6.0	56.0
1.039922	48.4	9.000	L1	9.8	7.6	56.0
1.144267	48.6	9.000	L1	9.8	7.4	56.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.426011	41.5	9.000	L1	9.9	5.8	47.3
0.670921	41.9	9.000	L1	9.8	4.1	46.0
0.726569	41.2	9.000	L1	9.8	4.8	46.0
0.793127	41.8	9.000	L1	9.8	4.2	46.0
0.852094	42.5	9.000	L1	9.8	3.5	46.0
0.975701	41.8	9.000	L1	9.8	5.2	46.0

Model Number: APOS A8-I94A4
Port: N
Test Mode: Transmitting
Power Source: AC 120V/60Hz
Note: Adapter #1



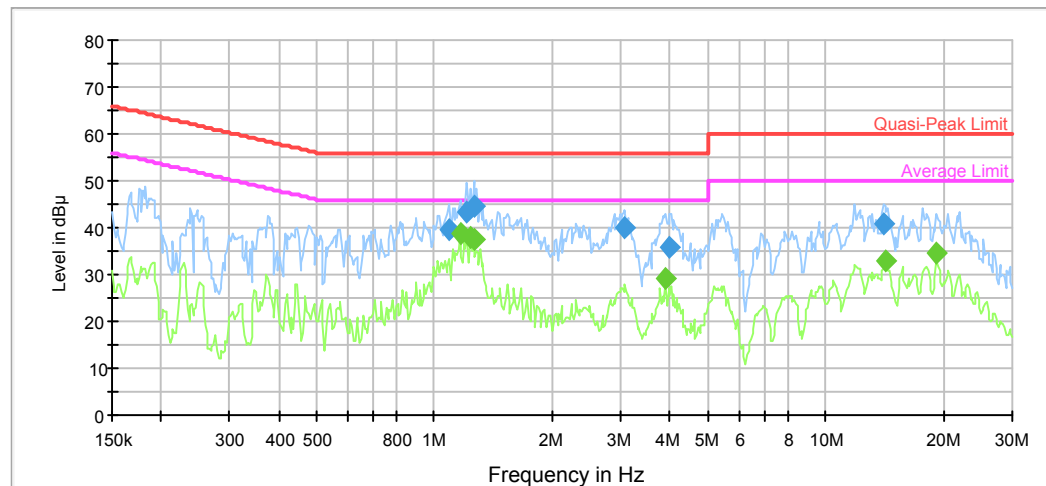
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.609741	43.5	9.000	N	9.8	12.5	56.0
0.670921	47.1	9.000	N	9.8	8.9	56.0
0.793127	47.6	9.000	N	9.8	8.4	56.0
0.852094	49.3	9.000	N	9.8	6.7	56.0
0.915445	46.3	9.000	N	9.8	9.7	56.0
1.099574	46.0	9.000	N	9.8	10.0	56.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.487810	33.2	9.000	N	9.9	13.0	46.2
0.609741	34.8	9.000	N	9.8	11.2	46.0
0.852094	35.5	9.000	N	9.8	10.5	46.0
0.975701	35.6	9.000	N	9.8	10.4	46.0
1.039922	39.9	9.000	N	9.8	6.1	46.0
1.259081	38.3	9.000	N	9.8	7.7	46.0

Model Number: APOS A8-I94A4
Port: L
Test Mode: Transmitting
Power Source: AC 120V/60Hz
Note: Adapter #2



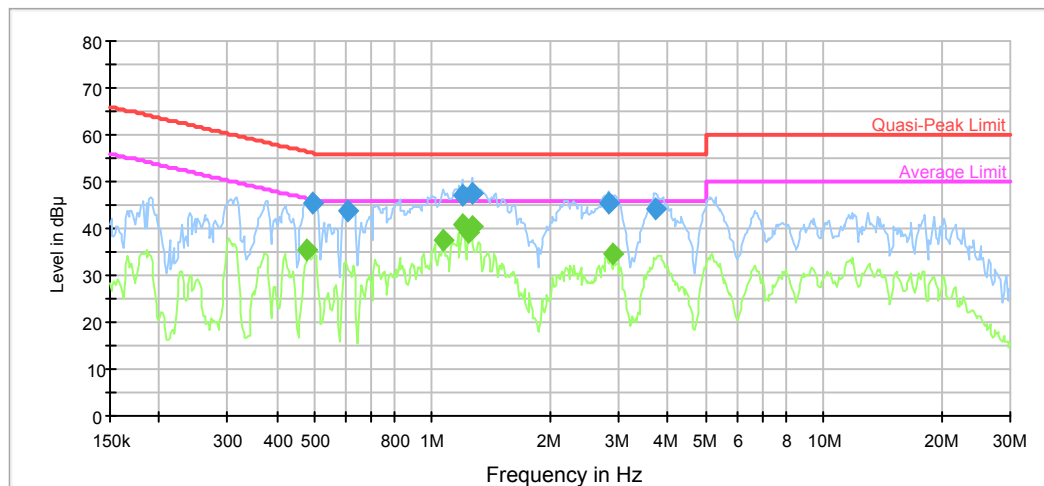
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
1.090848	39.7	9.000	L1	9.8	16.3	56.0
1.209904	43.4	9.000	L1	9.8	12.6	56.0
1.259081	44.5	9.000	L1	9.8	11.5	56.0
3.073500	40.1	9.000	L1	9.8	15.9	56.0
3.997889	36.0	9.000	L1	9.8	20.0	56.0
14.079747	40.7	9.000	L1	9.9	19.3	60.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
1.162648	38.8	9.000	L1	9.8	7.2	46.0
1.239175	37.9	9.000	L1	9.8	8.1	46.0
1.259081	37.5	9.000	L1	9.8	8.5	46.0
3.903455	29.3	9.000	L1	9.8	16.7	46.0
14.192385	33.0	9.000	L1	9.9	17.0	50.0
19.211249	34.4	9.000	L1	10.1	15.6	50.0

Model Number: APOS A8-I94A4
Port: N
Test Mode: Transmitting
Power Source: AC 120V/60Hz
Note: Adapter #2



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.491712	45.3	9.000	N	9.9	10.8	56.1
0.609741	43.7	9.000	N	9.8	12.3	56.0
1.190776	46.9	9.000	N	9.8	9.1	56.0
1.259081	47.7	9.000	N	9.8	8.3	56.0
2.815577	45.3	9.000	N	9.8	10.7	56.0
3.721226	44.3	9.000	N	9.8	11.7	56.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.480097	35.3	9.000	N	9.9	11.0	46.3
1.065081	37.3	9.000	N	9.8	8.7	46.0
1.190776	41.0	9.000	N	9.8	5.0	46.0
1.239175	39.1	9.000	N	9.8	6.9	46.0
1.259081	40.5	9.000	N	9.8	5.5	46.0
2.906762	34.6	9.000	N	9.8	11.4	46.0

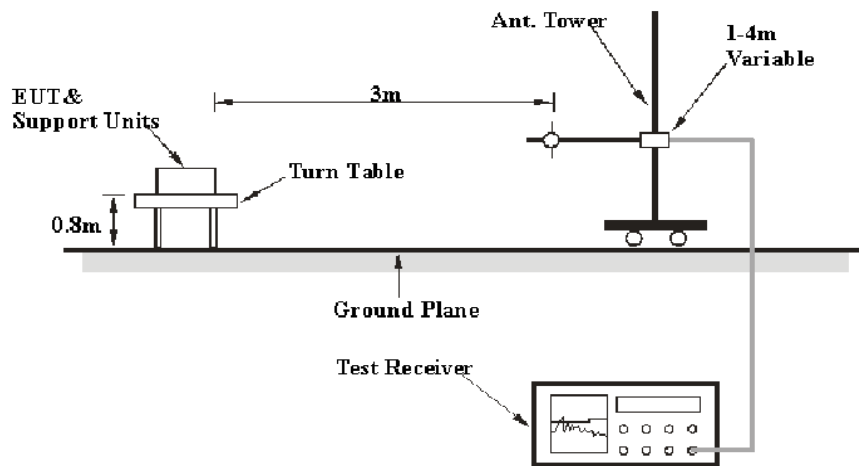
FCC §15.209, §15.205 & §15.247(d) & RSS-247 CLAUSE 5.5, RSS -GEN CLAUSE 8.10-SPURIOUS EMISSIONS

Applicable Standard

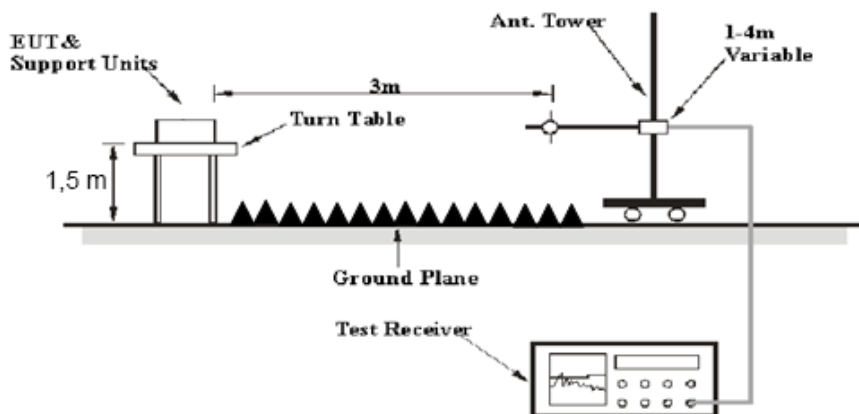
FCC §15.247 (d); §15.209; §15.205 and RSS-247 Clause 5.5, RSS-GEN Clause 8.10

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits and RSS-247 Clause 5.5, RSS-GEN Clause 8.10 limits.

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

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz - 1 GHz, peak and average detection modes for frequencies above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Agilent	Spectrum Analyzer	E4440A	SG43360054	2018-01-04	2019-01-04
N/A	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2017-06-27	2018-06-27
MITEQ	Amplifier	AFS42-00101800- 25-S-42	2001271	2017-09-05	2018-09-05
Chengdu OuLi	Band Rejector Filter	2400-2483.5	001	2017-09-05	2018-09-05

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

Corrected Amplitude & Margin Calculation

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

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

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

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

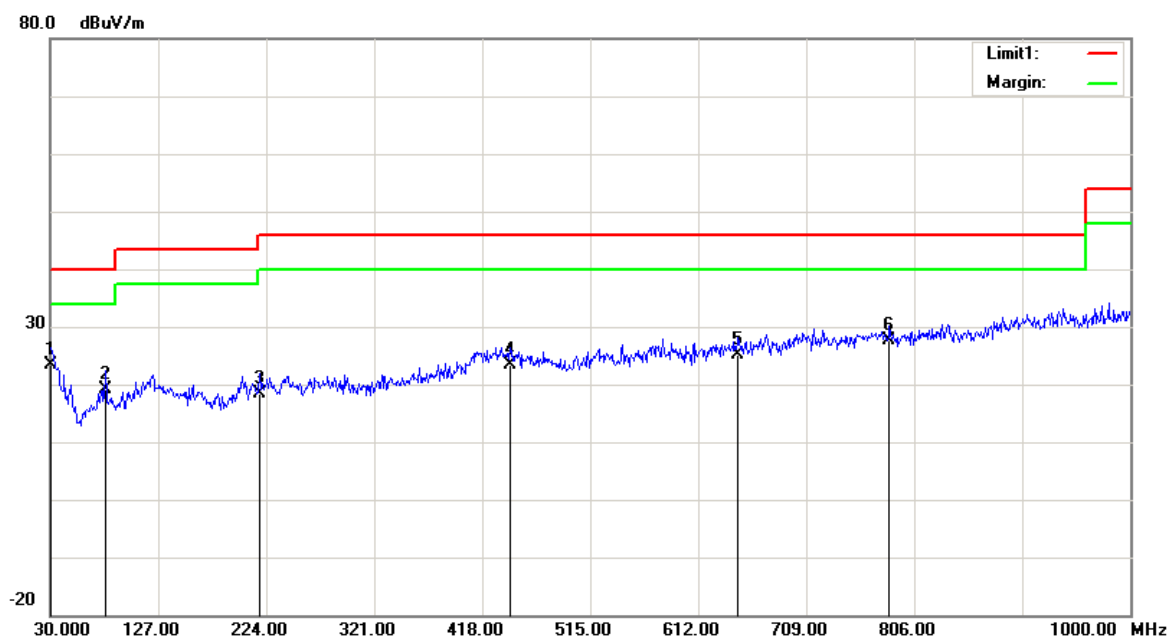
Test Data

Environmental Conditions

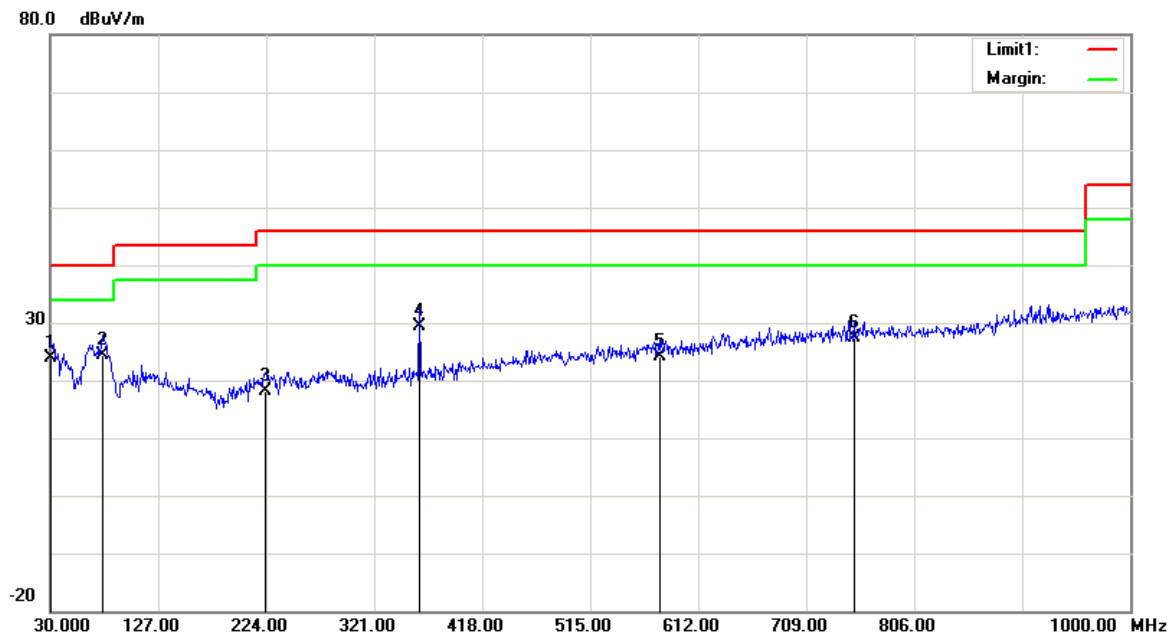
Temperature:	18.3 °C
Relative Humidity:	38 %
ATM Pressure:	102 kPa

** The testing was performed by Steve Zuo on 2018-02-03.*

Test Mode: Transmitting

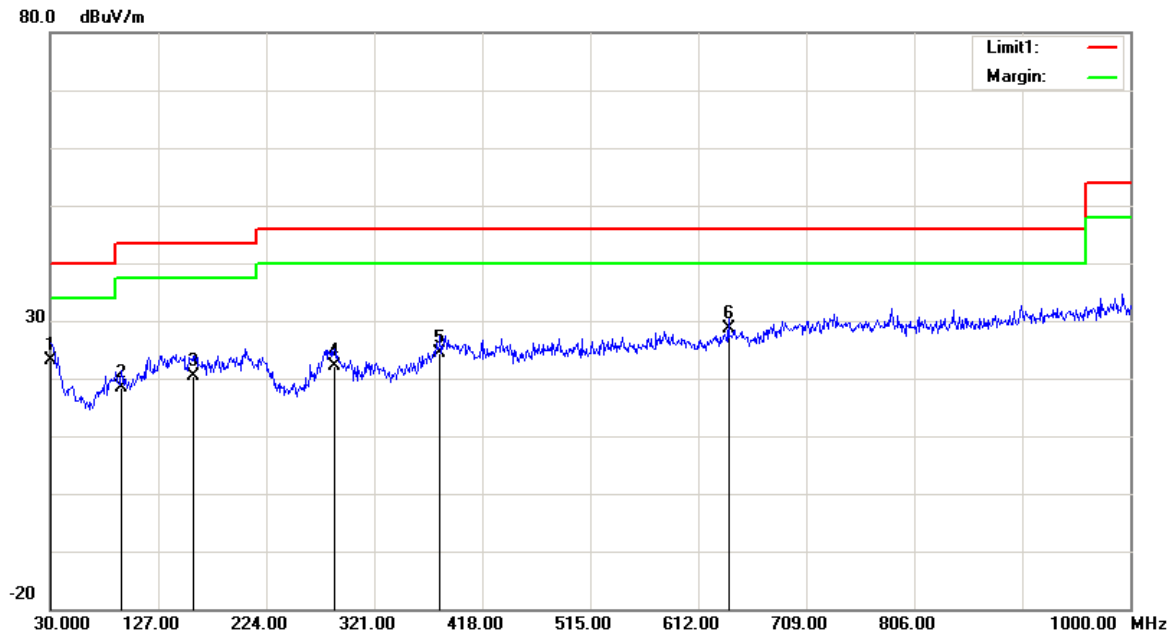
1) 30MHz-1GHz(GFSK High channel was the worst)*Adapter #1***Horizontal:**

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	22.32	QP	1.08	23.40	40.00	16.60
79.4700	30.31	QP	-11.11	19.20	40.00	20.80
218.1800	25.37	QP	-6.97	18.40	46.00	27.60
443.2200	24.90	QP	-1.60	23.30	46.00	22.70
647.8900	23.43	QP	1.67	25.10	46.00	20.90
783.6900	24.02	QP	3.58	27.60	46.00	18.40

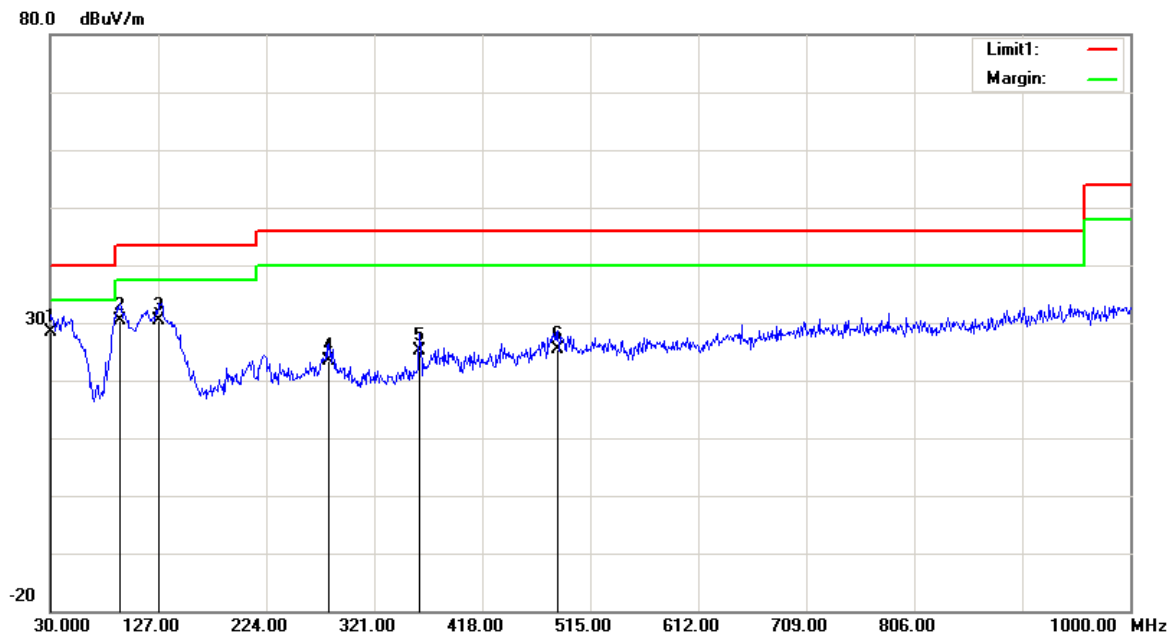
Vertical:

Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	23.65	QP	0.35	24.00	40.00	16.00
77.5300	35.38	QP	-11.08	24.30	40.00	15.70
223.0300	24.97	QP	-6.77	18.20	46.00	27.80
361.7400	32.20	QP	-2.90	29.30	46.00	16.70
577.0800	23.46	QP	0.64	24.10	46.00	21.90
751.6800	24.08	QP	3.32	27.40	46.00	18.60

Adapter #2

Horizontal:

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.9700	22.75	QP	0.35	23.10	40.00	16.90
94.0200	28.58	QP	-10.08	18.50	43.50	25.00
158.0400	26.77	QP	-6.47	20.30	43.50	23.20
285.1100	25.90	QP	-3.80	22.10	46.00	23.90
380.1700	26.94	QP	-2.64	24.30	46.00	21.70
639.1600	26.77	QP	1.83	28.60	46.00	17.40

Vertical:

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.9700	27.95	QP	0.35	28.30	40.00	11.70
92.0800	41.00	QP	-10.60	30.40	43.50	13.10
127.9700	35.31	QP	-5.01	30.30	43.50	13.20
280.2600	27.01	QP	-3.61	23.40	46.00	22.60
361.7400	28.00	QP	-2.90	25.10	46.00	20.90
485.9000	26.63	QP	-1.13	25.50	46.00	20.50

2)1GHz-25GHz(Adapter #1 was the worst):*BDR Mode (GFSK):*

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	73.23	PK	H	28.10	1.80	0.00	103.13	N/A	N/A
2402.00	63.49	AV	H	28.10	1.80	0.00	93.39	N/A	N/A
2402.00	73.18	PK	V	28.10	1.80	0.00	103.08	N/A	N/A
2402.00	63.24	AV	V	28.10	1.80	0.00	93.14	N/A	N/A
2390.00	24.86	PK	H	28.08	1.80	0.00	54.74	74.00	19.26
2390.00	13.57	AV	H	28.08	1.80	0.00	43.45	54.00	10.55
4804.00	47.62	PK	H	32.91	3.17	37.20	46.50	74.00	27.50
4804.00	35.47	AV	H	32.91	3.17	37.20	34.35	54.00	19.65
7206.00	46.53	PK	H	35.74	4.82	37.23	49.86	74.00	24.14
7206.00	35.89	AV	H	35.74	4.82	37.23	39.22	54.00	14.78
3200.50	51.57	PK	H	30.58	2.19	36.98	47.36	74.00	26.64
3200.50	38.83	AV	H	30.58	2.19	36.98	34.62	54.00	19.38
Middle Channel: 2441 MHz									
2441.00	73.39	PK	H	28.18	1.82	0.00	103.39	N/A	N/A
2441.00	63.57	AV	H	28.18	1.82	0.00	93.57	N/A	N/A
2441.00	73.16	PK	V	28.18	1.82	0.00	103.16	N/A	N/A
2441.00	63.24	AV	V	28.18	1.82	0.00	93.24	N/A	N/A
4882.00	47.45	PK	H	33.06	3.27	37.21	46.57	74.00	27.43
4882.00	35.48	AV	H	33.06	3.27	37.21	34.60	54.00	19.40
7323.00	46.70	PK	H	36.04	4.62	37.38	49.98	74.00	24.02
7323.00	34.49	AV	H	36.04	4.62	37.38	37.77	54.00	16.23
High Channel: 2480 MHz									
2480.00	71.86	PK	H	28.26	1.84	0.00	101.96	N/A	N/A
2480.00	61.65	AV	H	28.26	1.84	0.00	91.75	N/A	N/A
2480.00	71.53	PK	V	28.26	1.84	0.00	101.63	N/A	N/A
2480.00	61.48	AV	V	28.26	1.84	0.00	91.58	N/A	N/A
2483.50	25.76	PK	H	28.27	1.84	0.00	55.87	74.00	18.13
2483.50	14.13	AV	H	28.27	1.84	0.00	44.24	54.00	9.76
4960.00	47.64	PK	H	33.22	3.23	37.25	46.84	74.00	27.16
4960.00	35.29	AV	H	33.22	3.23	37.25	34.49	54.00	19.51
7440.00	46.35	PK	H	36.34	4.41	37.52	49.58	74.00	24.42
7440.00	34.33	AV	H	36.34	4.41	37.52	37.56	54.00	16.44

EDR Mode ($\pi/4$ -DQPSK):

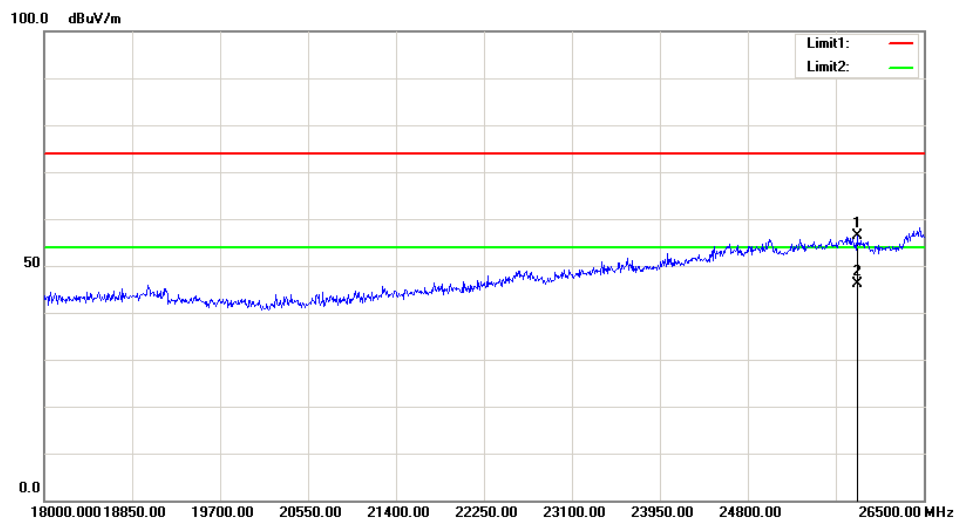
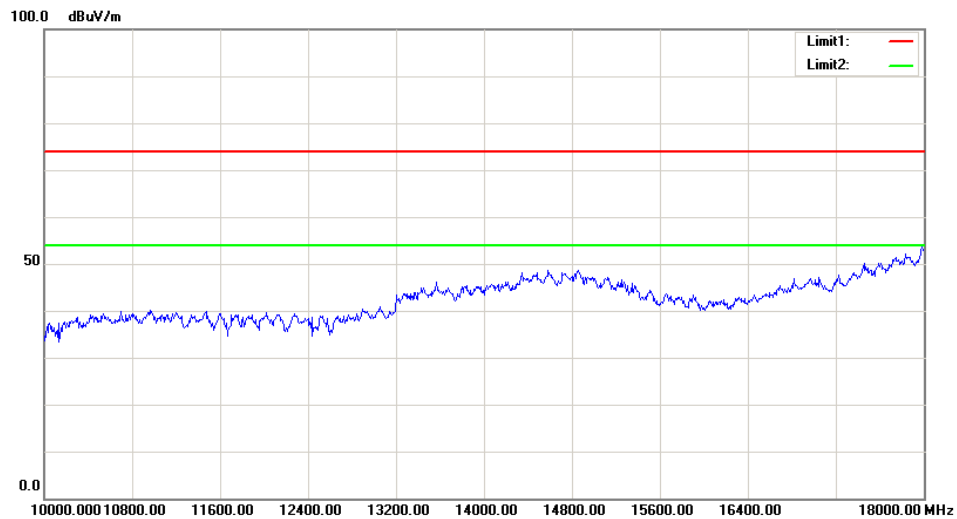
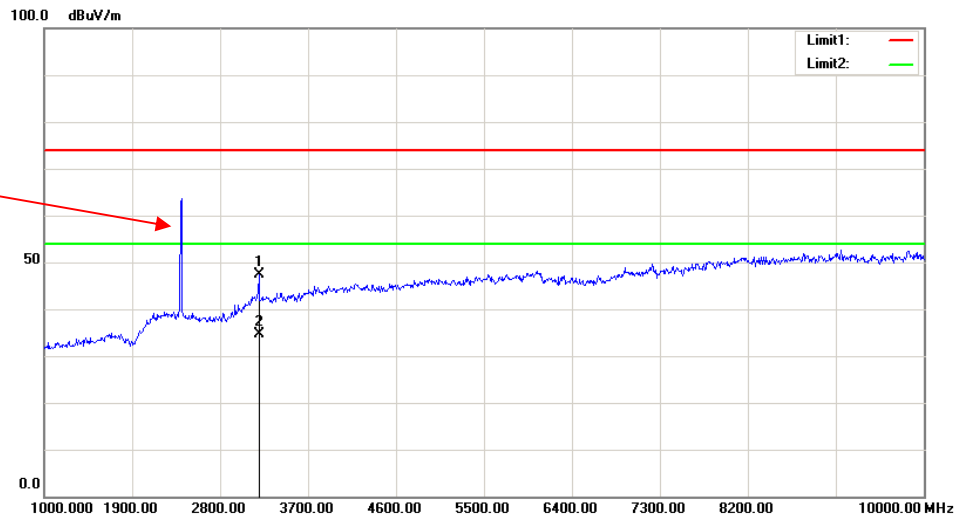
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	73.89	PK	H	28.10	1.80	0.00	103.79	N/A	N/A
2402.00	63.54	AV	H	28.10	1.80	0.00	93.44	N/A	N/A
2402.00	72.16	PK	V	28.10	1.80	0.00	102.06	N/A	N/A
2402.00	62.34	AV	V	28.10	1.80	0.00	92.24	N/A	N/A
2390.00	25.69	PK	H	28.08	1.80	0.00	55.57	74.00	18.43
2390.00	13.48	AV	H	28.08	1.80	0.00	43.36	54.00	10.64
4804.00	47.71	PK	H	32.91	3.17	37.20	46.59	74.00	27.41
4804.00	35.23	AV	H	32.91	3.17	37.20	34.11	54.00	19.89
7206.00	46.19	PK	H	35.74	4.82	37.23	49.52	74.00	24.48
7206.00	34.14	AV	H	35.74	4.82	37.23	37.47	54.00	16.53
Middle Channel: 2441 MHz									
2441.00	74.64	PK	H	28.18	1.82	0.00	104.64	N/A	N/A
2441.00	64.58	AV	H	28.18	1.82	0.00	94.58	N/A	N/A
2441.00	72.79	PK	V	28.18	1.82	0.00	102.79	N/A	N/A
2441.00	62.85	AV	V	28.18	1.82	0.00	92.85	N/A	N/A
4882.00	47.70	PK	H	33.06	3.27	37.21	46.82	74.00	27.18
4882.00	35.11	AV	H	33.06	3.27	37.21	34.23	54.00	19.77
7323.00	46.15	PK	H	36.04	4.62	37.38	49.43	74.00	24.57
7323.00	34.06	AV	H	36.04	4.62	37.38	37.34	54.00	16.66
High Channel: 2480 MHz									
2480.00	72.75	PK	H	28.26	1.84	0.00	102.85	N/A	N/A
2480.00	62.46	AV	H	28.26	1.84	0.00	92.56	N/A	N/A
2480.00	69.54	PK	V	28.26	1.84	0.00	99.64	N/A	N/A
2480.00	59.48	AV	V	28.26	1.84	0.00	89.58	N/A	N/A
2483.50	25.94	PK	H	28.27	1.84	0.00	56.05	74.00	17.95
2483.50	14.52	AV	H	28.27	1.84	0.00	44.63	54.00	9.37
4960.00	47.54	PK	H	33.22	3.23	37.25	46.74	74.00	27.26
4960.00	35.03	AV	H	33.22	3.23	37.25	34.23	54.00	19.77
7440.00	46.11	PK	H	36.34	4.41	37.52	49.34	74.00	24.66
7440.00	33.96	AV	H	36.34	4.41	37.52	37.19	54.00	16.81

EDR Mode (8-DPSK):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	73.92	PK	H	28.10	1.80	0.00	103.82	N/A	N/A
2402.00	63.88	AV	H	28.10	1.80	0.00	93.78	N/A	N/A
2402.00	72.39	PK	V	28.10	1.80	0.00	102.29	N/A	N/A
2402.00	62.45	AV	V	28.10	1.80	0.00	92.35	N/A	N/A
2390.00	25.76	PK	H	28.08	1.80	0.00	55.64	74.00	18.36
2390.00	13.59	AV	H	28.08	1.80	0.00	43.47	54.00	10.53
4804.00	47.49	PK	H	32.91	3.17	37.20	46.37	74.00	27.63
4804.00	35.00	AV	H	32.91	3.17	37.20	33.88	54.00	20.12
7206.00	46.16	PK	H	35.74	4.82	37.23	49.49	74.00	24.51
7206.00	34.12	AV	H	35.74	4.82	37.23	37.45	54.00	16.55
Middle Channel: 2441 MHz									
2441.00	74.62	PK	H	28.18	1.82	0.00	104.62	N/A	N/A
2441.00	64.78	AV	H	28.18	1.82	0.00	94.78	N/A	N/A
2441.00	73.42	PK	V	28.18	1.82	0.00	103.42	N/A	N/A
2441.00	63.54	AV	V	28.18	1.82	0.00	93.54	N/A	N/A
4882.00	47.31	PK	H	33.06	3.27	37.21	46.43	74.00	27.57
4882.00	34.86	AV	H	33.06	3.27	37.21	33.98	54.00	20.02
7323.00	46.29	PK	H	36.04	4.62	37.38	49.57	74.00	24.43
7323.00	34.16	AV	H	36.04	4.62	37.38	37.44	54.00	16.56
High Channel: 2480 MHz									
2480.00	74.64	PK	H	28.26	1.84	0.00	104.74	N/A	N/A
2480.00	64.82	AV	H	28.26	1.84	0.00	94.92	N/A	N/A
2480.00	70.84	PK	V	28.26	1.84	0.00	100.94	N/A	N/A
2480.00	60.67	AV	V	28.26	1.84	0.00	90.77	N/A	N/A
2483.50	25.49	PK	H	28.27	1.84	0.00	55.60	74.00	18.40
2483.50	14.35	AV	H	28.27	1.84	0.00	44.46	54.00	9.54
4960.00	47.35	PK	H	33.22	3.23	37.25	46.55	74.00	27.45
4960.00	34.87	AV	H	33.22	3.23	37.25	34.07	54.00	19.93
7440.00	46.19	PK	H	36.34	4.41	37.52	49.42	74.00	24.58
7440.00	33.95	AV	H	36.34	4.41	37.52	37.18	54.00	16.82

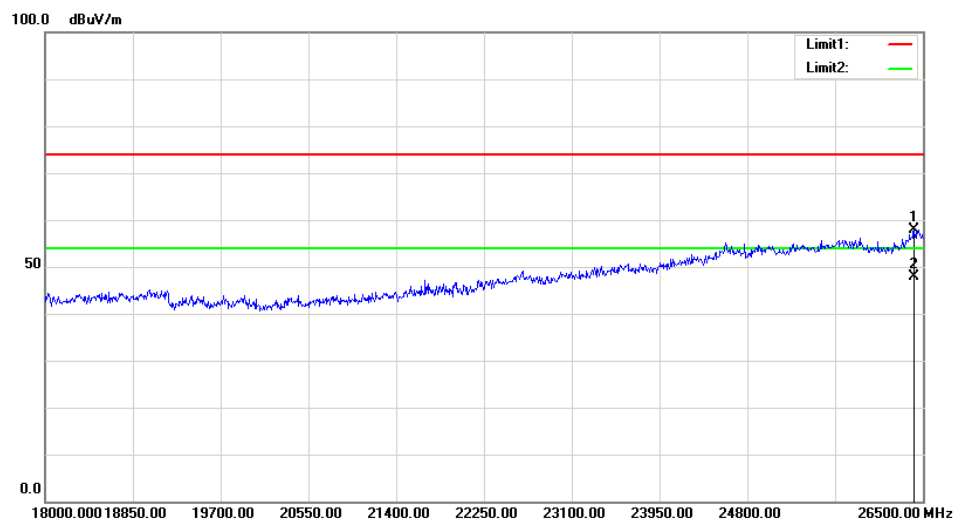
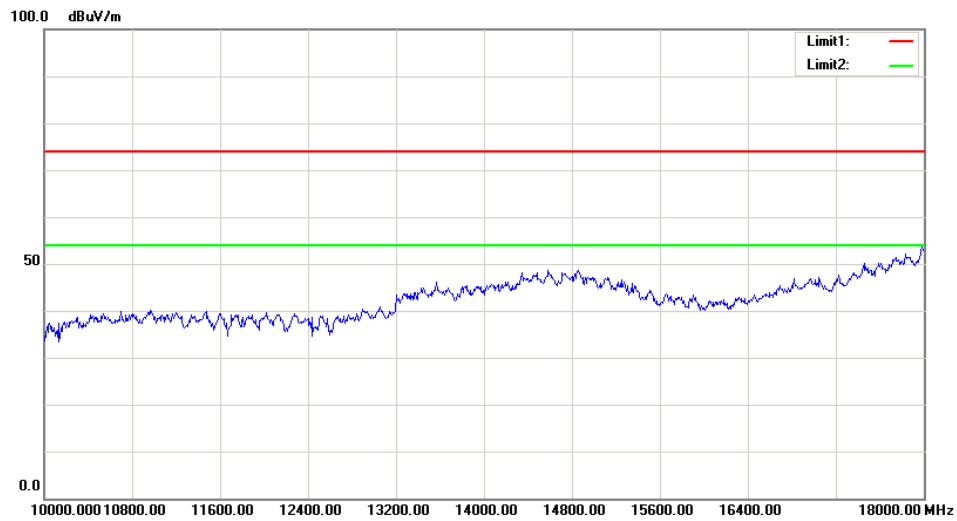
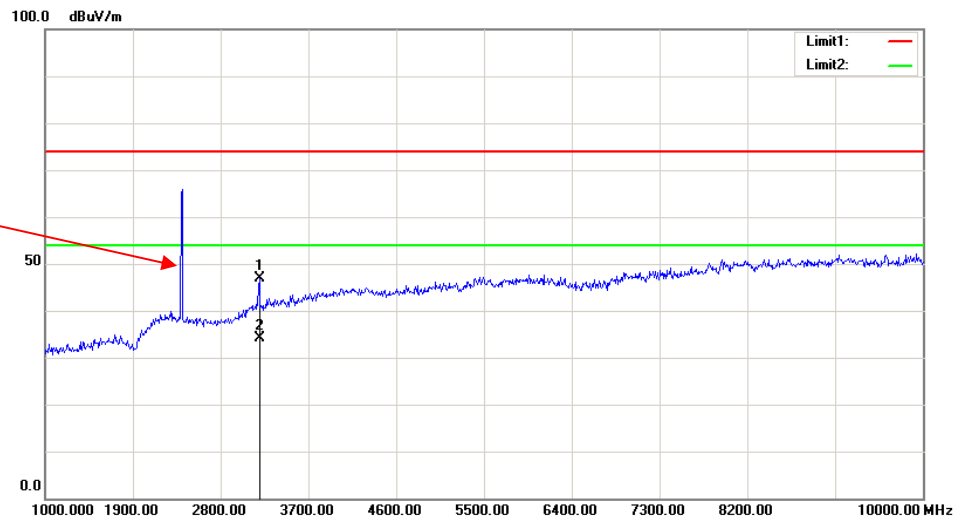
Worst plots(GFSK Low channel) **Horizontal**

Fundamental
Test with Band
Rejection Filter



Vertical

Fundamental
Test with Band
Rejection Filter



FCC §15.247(a) (1) & RSS-247 CLAUSE 5.1 b)- CHANNEL SEPARATION TEST

Applicable Standard

According to FCC §15.247(a) (1):

Frequency hopping systems shall have hopping 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.

According to RSS-247 Clause 5.1 b):

- b) FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/

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

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:	22.7 °C
Relative Humidity:	40 %
ATM Pressure:	102.2 kPa

* The testing was performed by George Pang on 2018-01-29.

Test Result: Compliance.

Please refer to following tables and plots

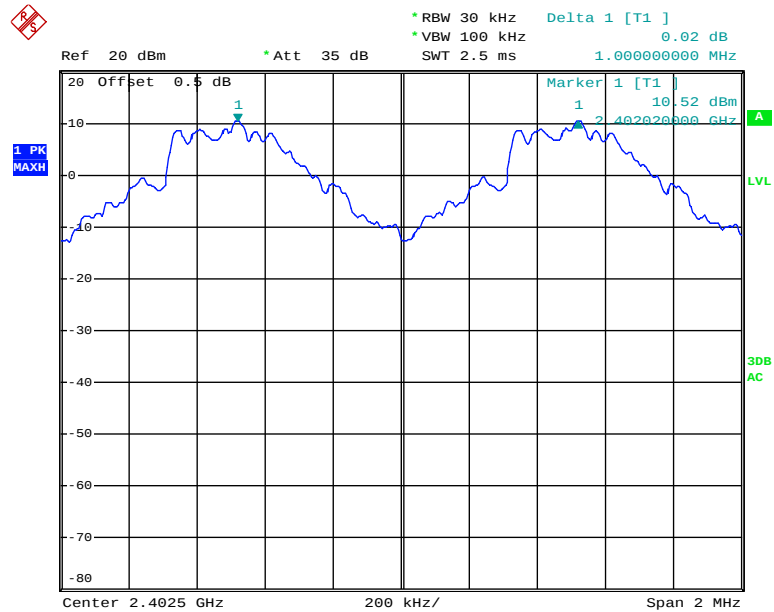
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
<i>BDR</i> (<i>GFSK</i>)	Low	2402	1.000	0.59
	Middle	2441	1.004	0.62
	High	2480	1.000	0.62
EDR ($\pi/4$ -DQPSK)	Low	2402	1.000	0.84
	Middle	2441	1.000	0.84
	High	2480	1.000	0.84
<i>EDR</i> (<i>8-DPSK</i>)	Low	2402	1.000	0.81
	Middle	2441	1.004	0.81
	High	2480	1.000	0.81

Note: Limit= (2/3) × 20dB bandwidth

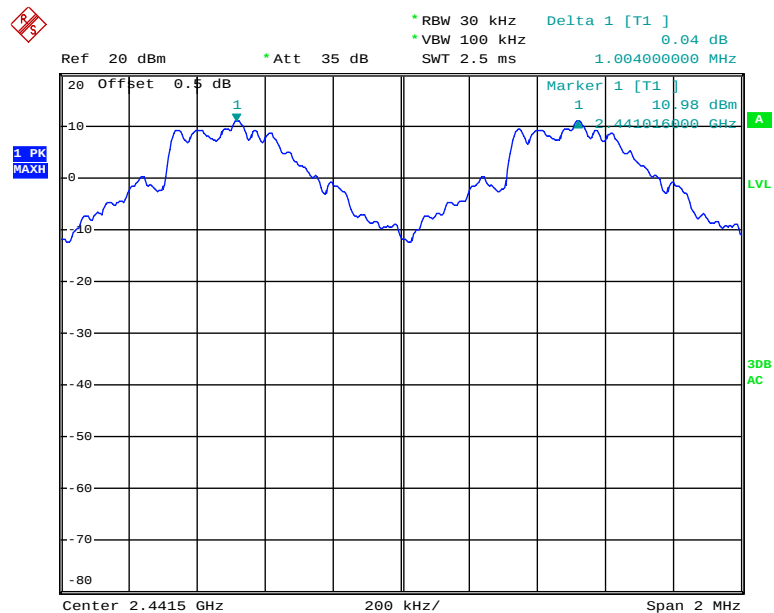
BDR Mode (GFSK):

Low Channel



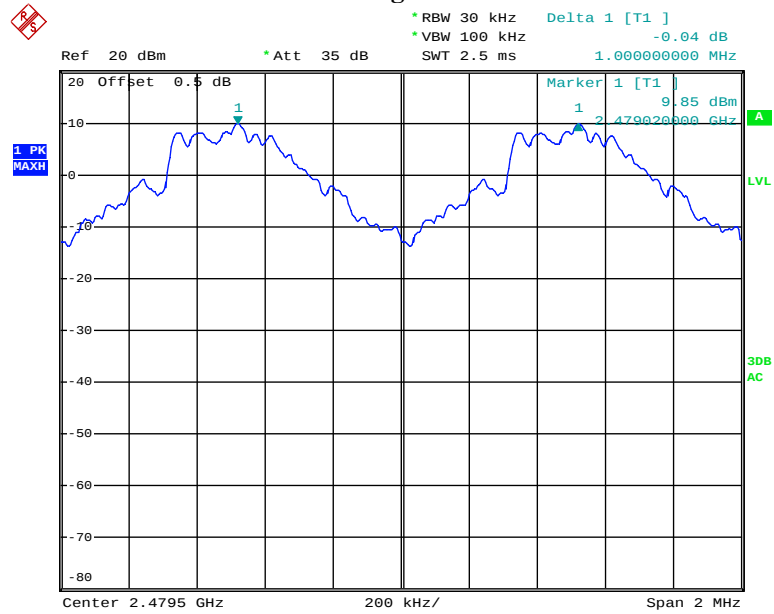
Date: 29.JAN.2018 14:33:44

Middle Channel



Date: 29.JAN.2018 14:35:06

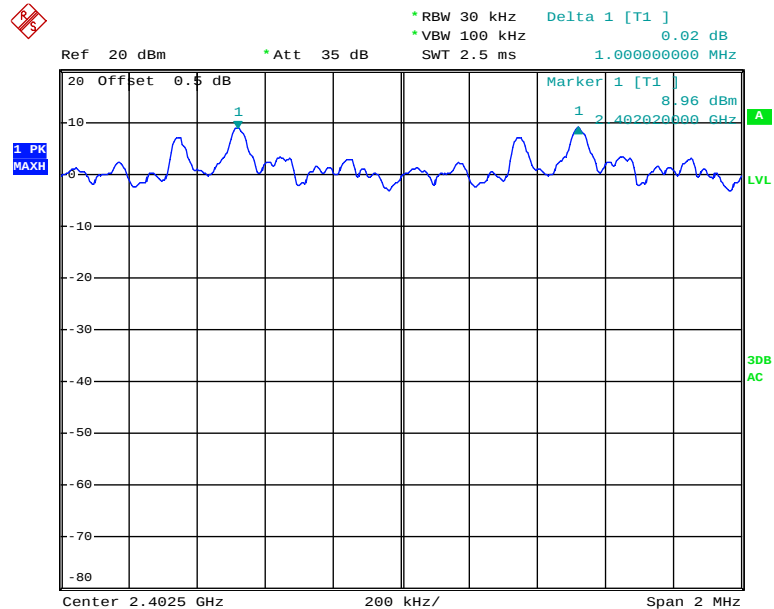
High Channel



Date: 29.JAN.2018 14:36:17

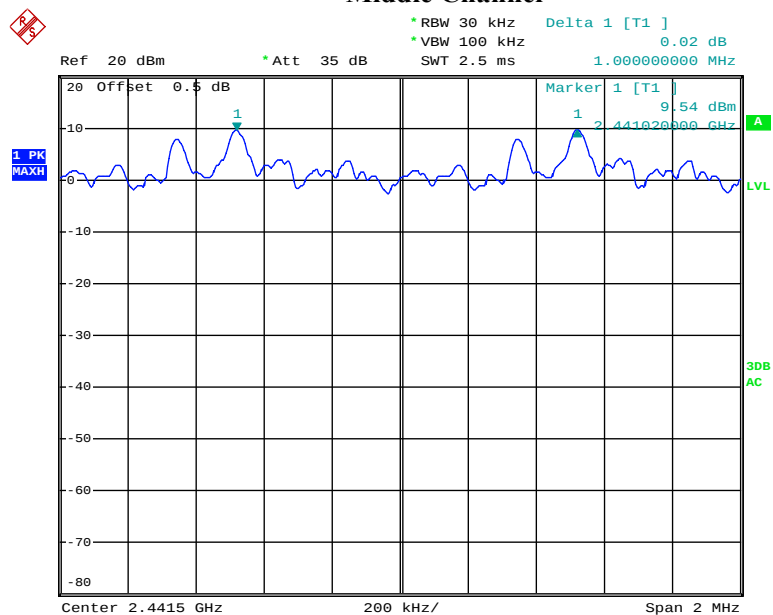
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



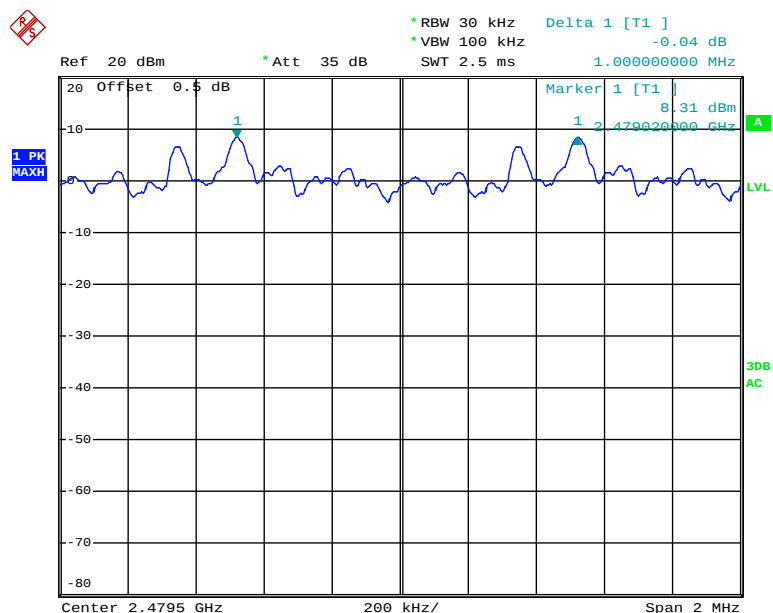
Date: 29.JAN.2018 14:39:53

Middle Channel



Date: 29.JAN.2018 14:38:46

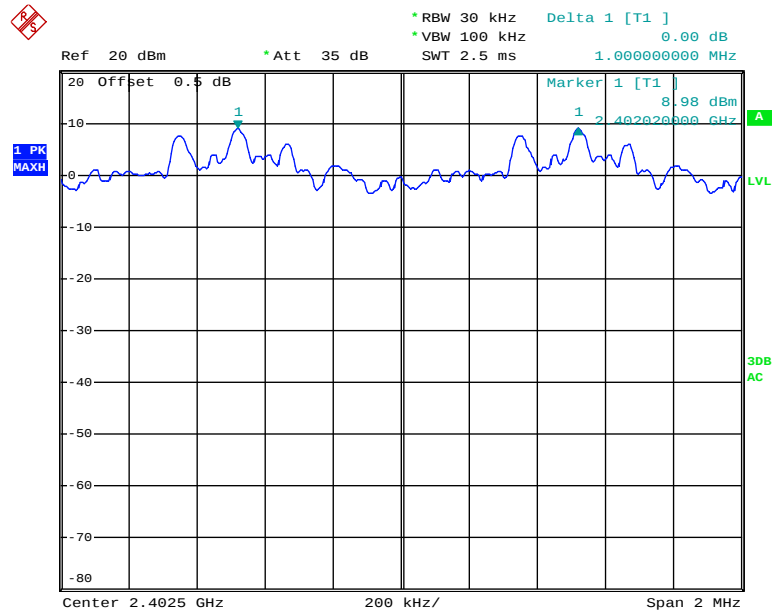
High Channel



Date: 29.JAN.2018 14:37:24

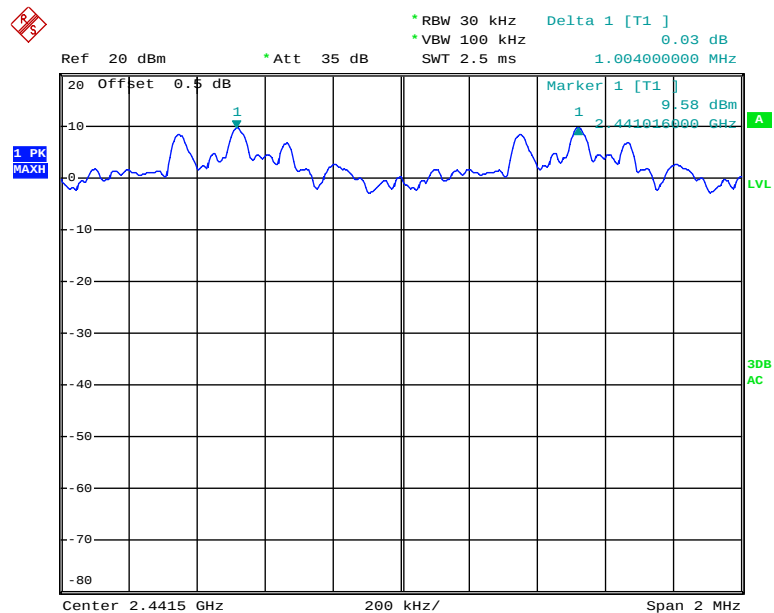
EDR Mode (8-DPSK):

Low Channel

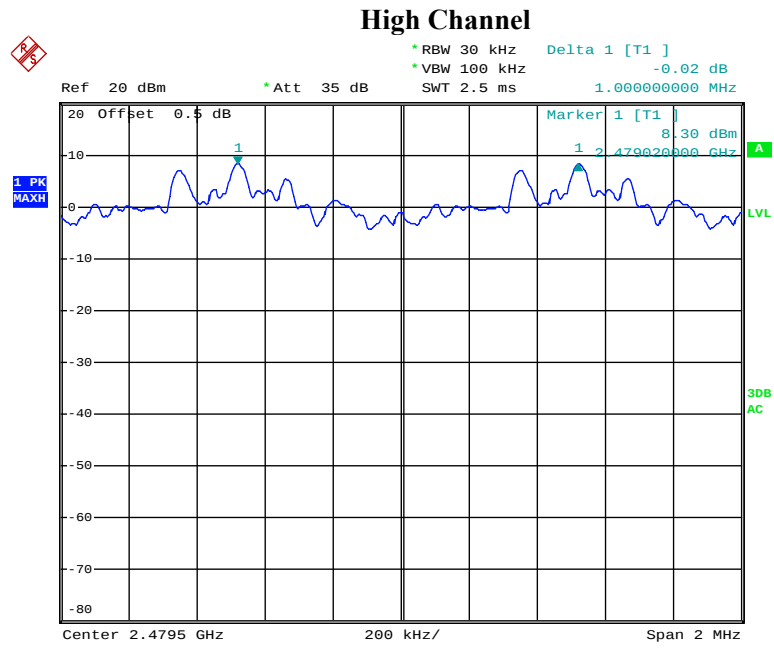


Date: 29.JAN.2018 14:40:56

Middle Channel



Date: 29.JAN.2018 14:42:14



Date: 29.JAN.2018 14:43:16

FCC §15.247(a) (1) & RSS-247 CLAUSE 5.1 b) & RSS-GEN CLAUSE 6.6– 20 dB BANDWIDTH TESTING

Applicable Standard

According to FCC §15.247(a) (1):

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.

According to RSS-247 Clause 5.1 b):

- b) FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W.

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. Use Occupied bandwidth test function, measure the 99% Occupied bandwidth.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/

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

Test Data**Environmental Conditions**

Temperature:	22.7 °C
Relative Humidity:	40 %
ATM Pressure:	102.2 kPa

** The testing was performed by George Pang on 2018-01-29.*

Test Result: Compliance.

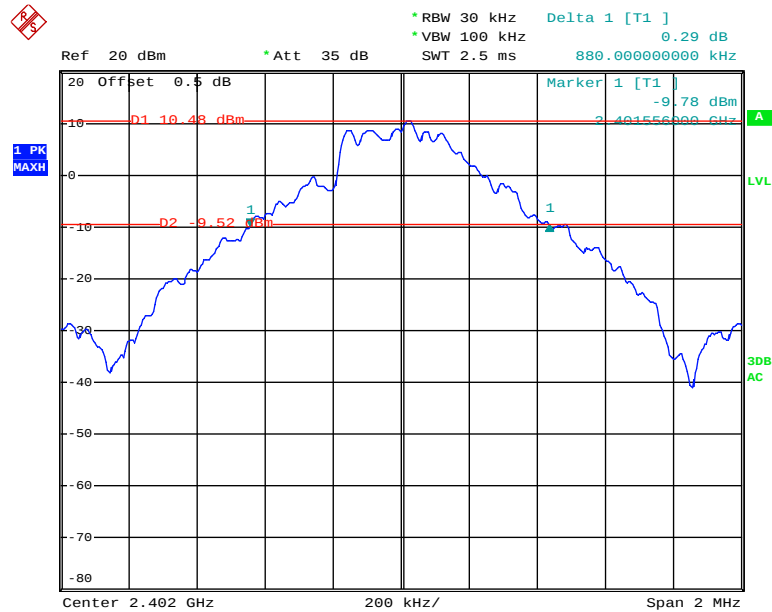
Please refer to following tables and plots

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% occupied Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.88	0.85
	Middle	2441	0.93	0.85
	High	2480	0.93	0.85
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.26	1.17
	Middle	2441	1.26	1.17
	High	2480	1.26	1.17
EDR Mode (8-DPSK)	Low	2402	1.22	1.15
	Middle	2441	1.22	1.15
	High	2480	1.22	1.15

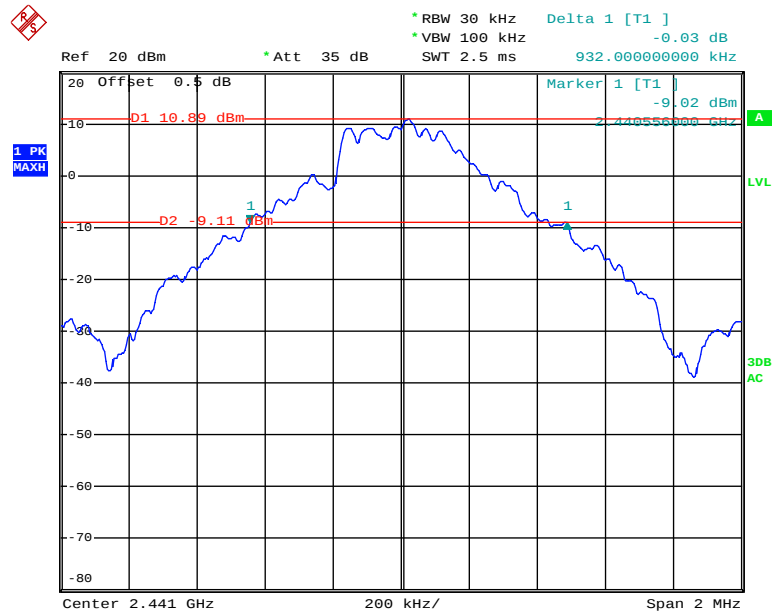
BDR Mode (GFSK):

Low Channel



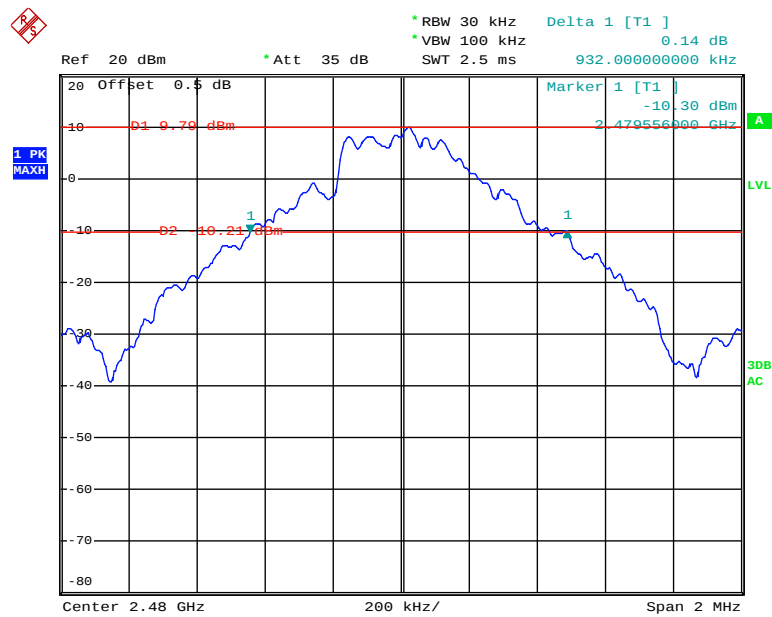
Date: 29.JAN.2018 13:40:41

Middle Channel



Date: 29.JAN.2018 13:42:45

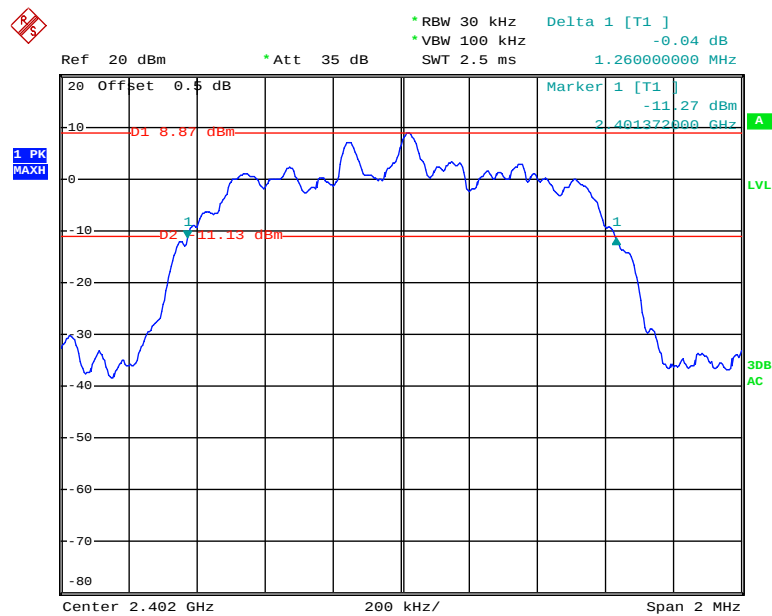
High Channel



Date: 29.JAN.2018 13:44:17

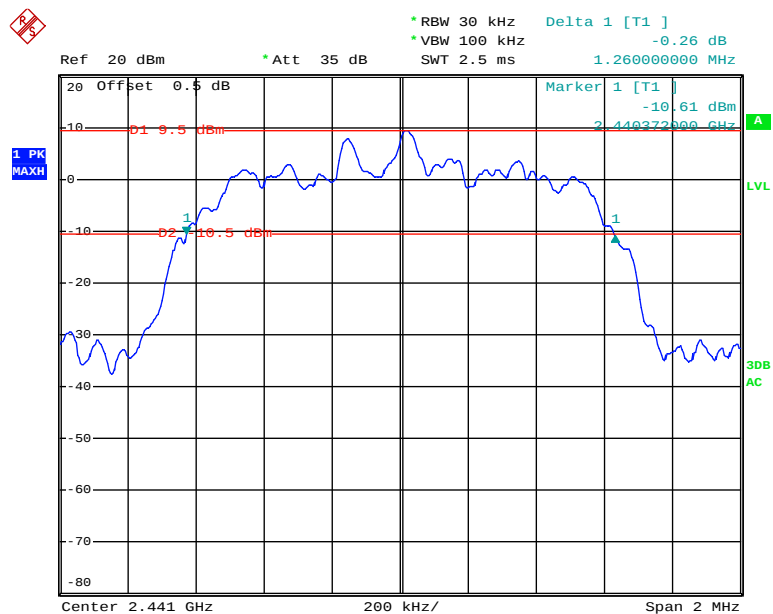
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



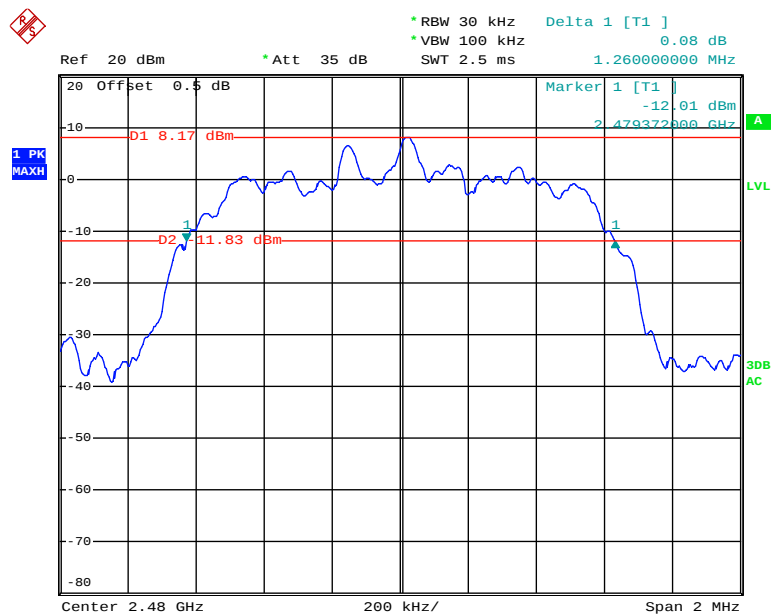
Date: 29.JAN.2018 13:51:04

Middle Channel



Date: 29.JAN.2018 13:49:38

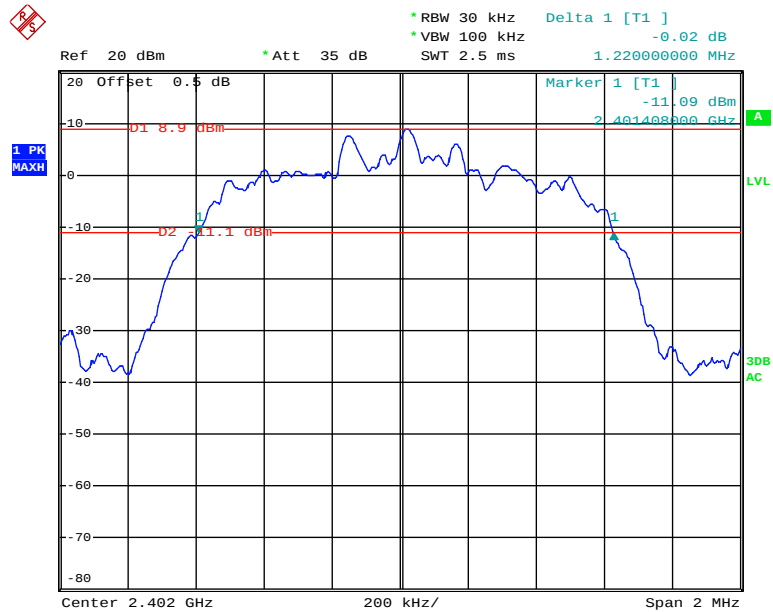
High Channel



Date: 29.JAN.2018 13:46:14

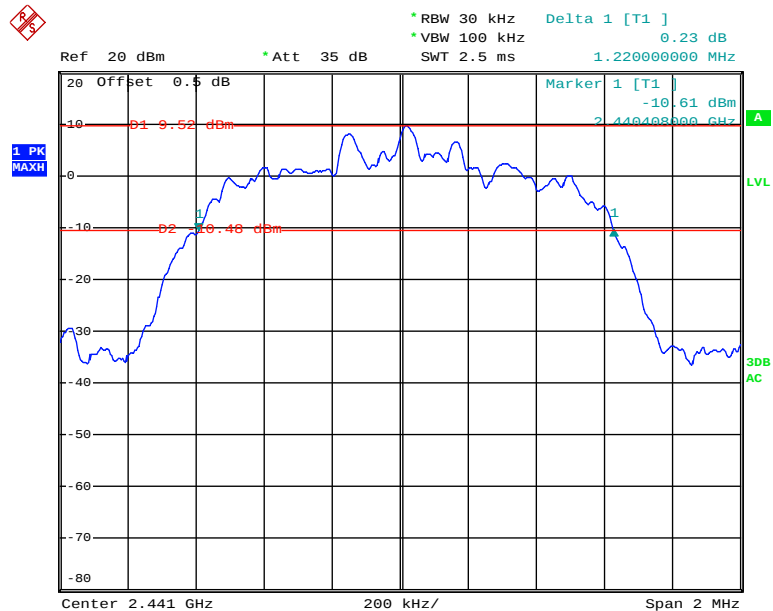
EDR Mode (8-DPSK):

Low Channel



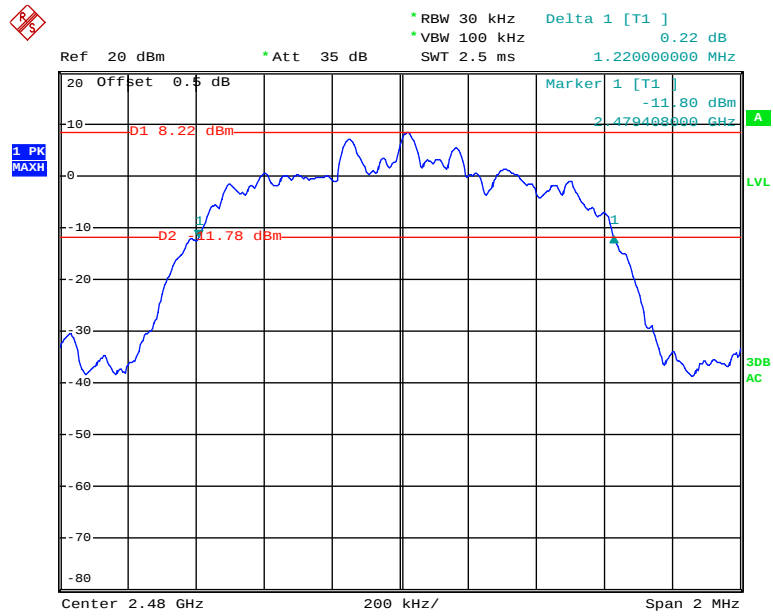
Date: 29.JAN.2018 13:52:50

Middle Channel



Date: 29.JAN.2018 13:54:50

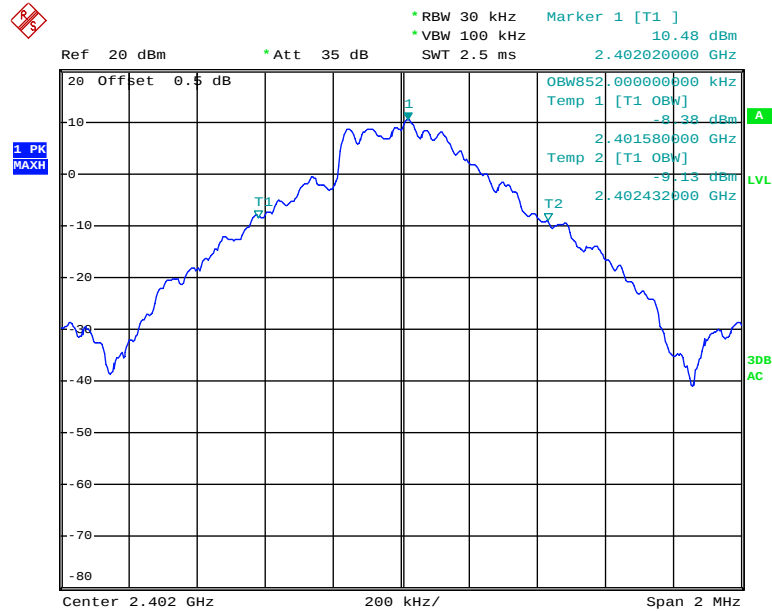
High Channel



Date: 29.JAN.2018 13:56:13

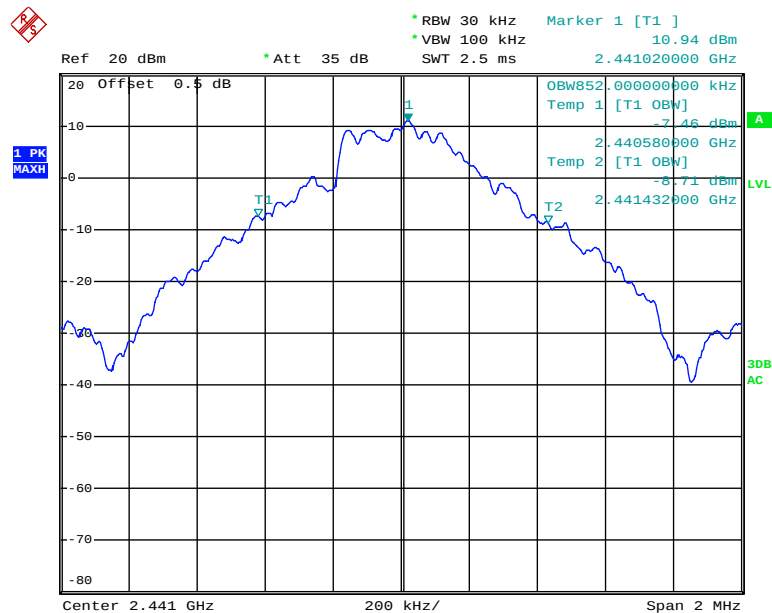
99% Occupied Bandwidth:
BDR Mode (GFSK):

Low Channel



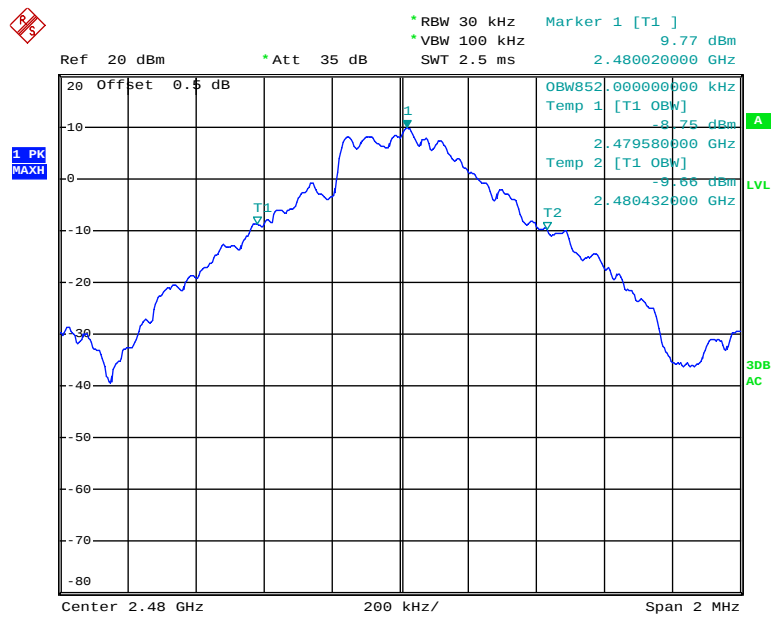
Date: 29.JAN.2018 13:41:00

Middle Channel



Date: 29.JAN.2018 13:43:04

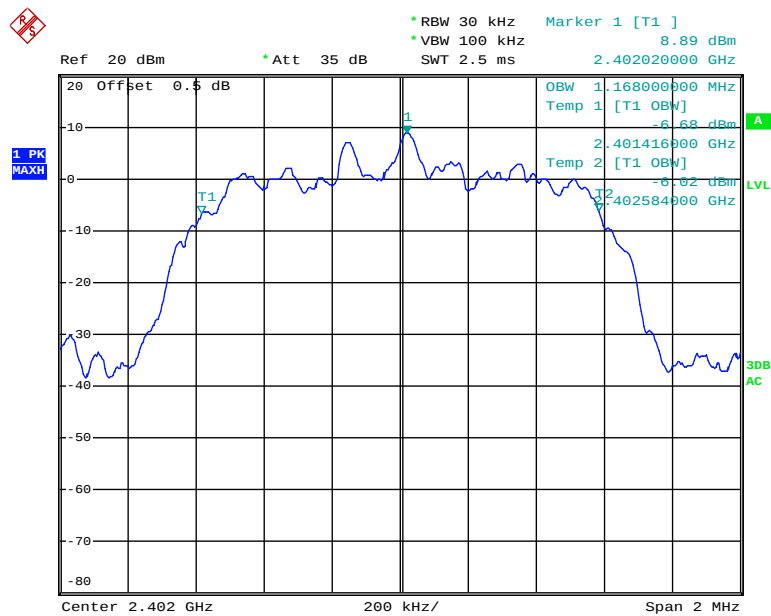
High Channel



Date: 29.JAN.2018 13:44:36

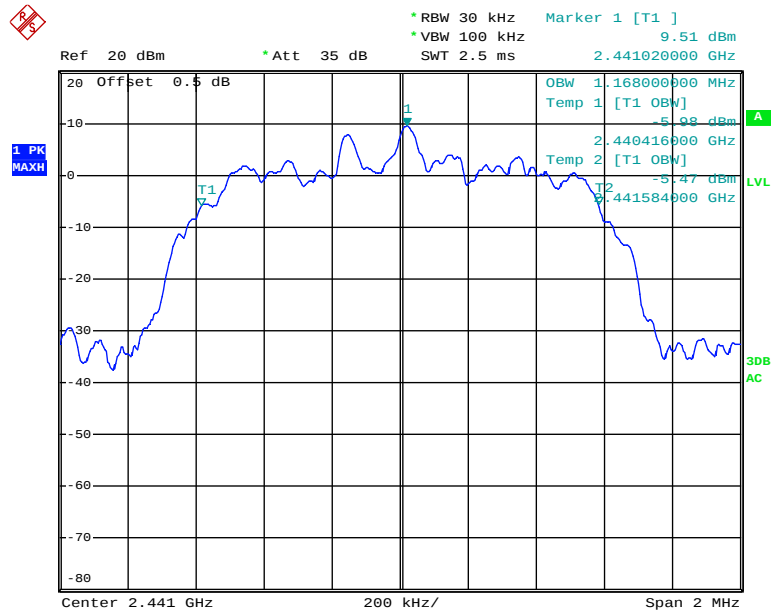
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



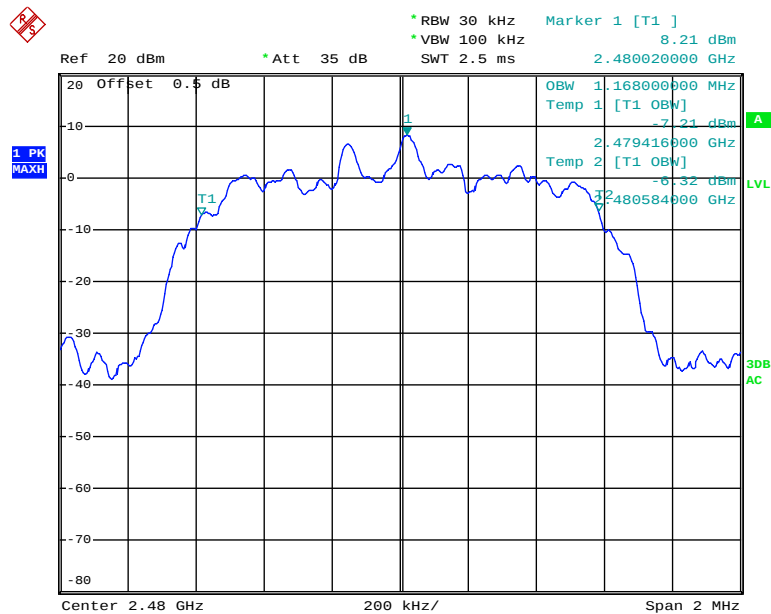
Date: 29.JAN.2018 13:51:20

Middle Channel



Date: 29.JAN.2018 13:49:58

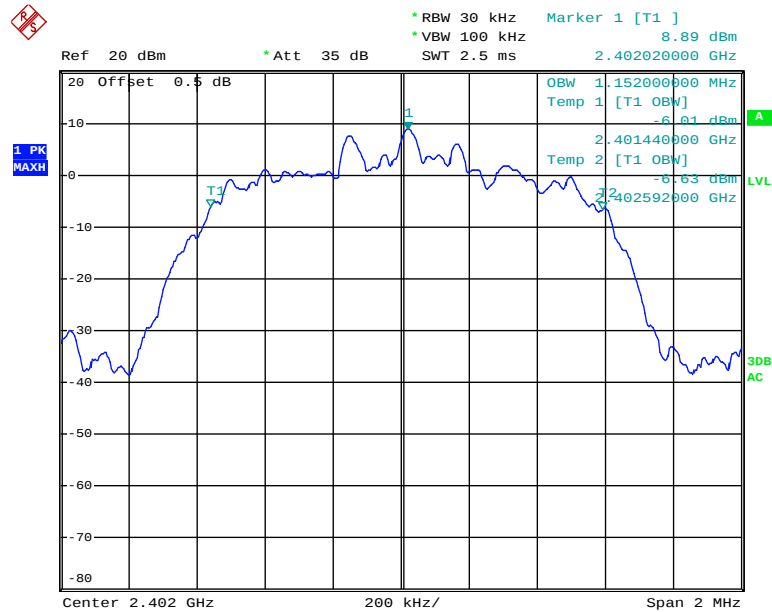
High Channel



Date: 29.JAN.2018 13:46:34

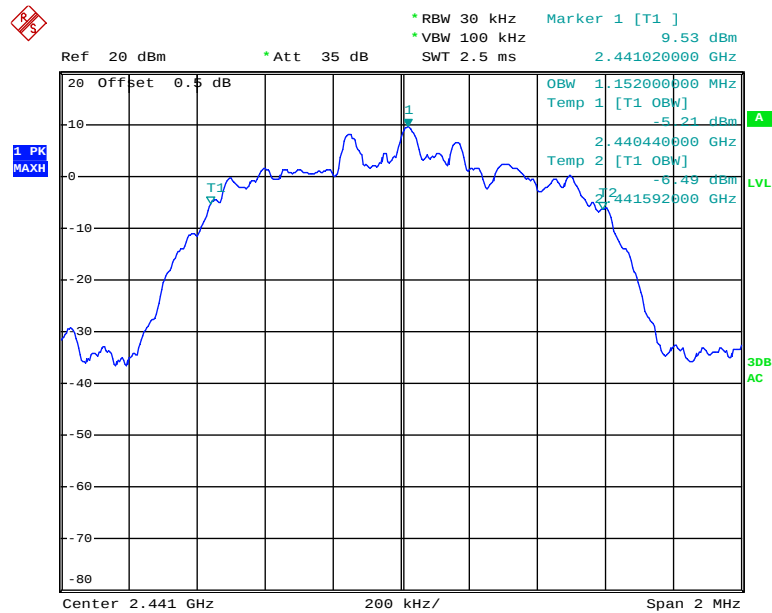
EDR Mode (8-DPSK):

Low Channel



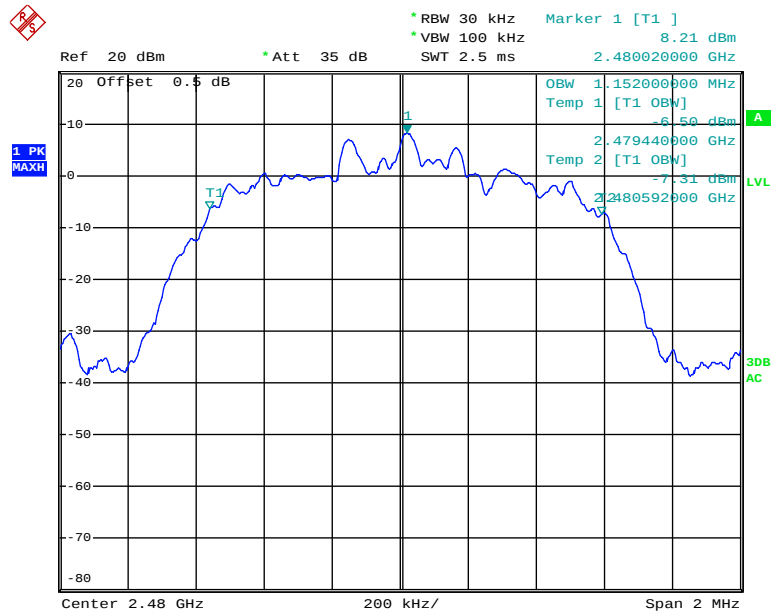
Date: 29.JAN.2018 13:53:14

Middle Channel



Date: 29.JAN.2018 13:55:06

High Channel



Date: 29.JAN.2018 13:56:32

FCC §15.247(a) (1) (iii) & RSS-247 CLAUSE 5.1 d)- QUANTITY OF HOPPING CHANNEL TEST**Applicable Standard**

According to FCC §15.247(a) (1) (iii)

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.

According to RSS-247 Clause 5.1 d)

- d) FHSs operating in the band 2400-2483.5 MHz shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/

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

Test Data**Environmental Conditions**

Temperature:	22.7 °C
Relative Humidity:	40 %
ATM Pressure:	102.2 kPa

* The testing was performed by George Pang on 2018-01-29.

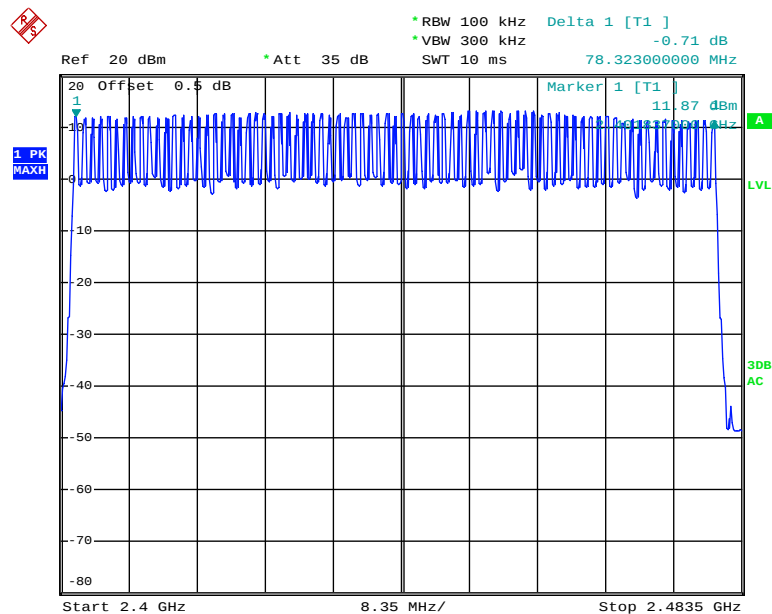
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

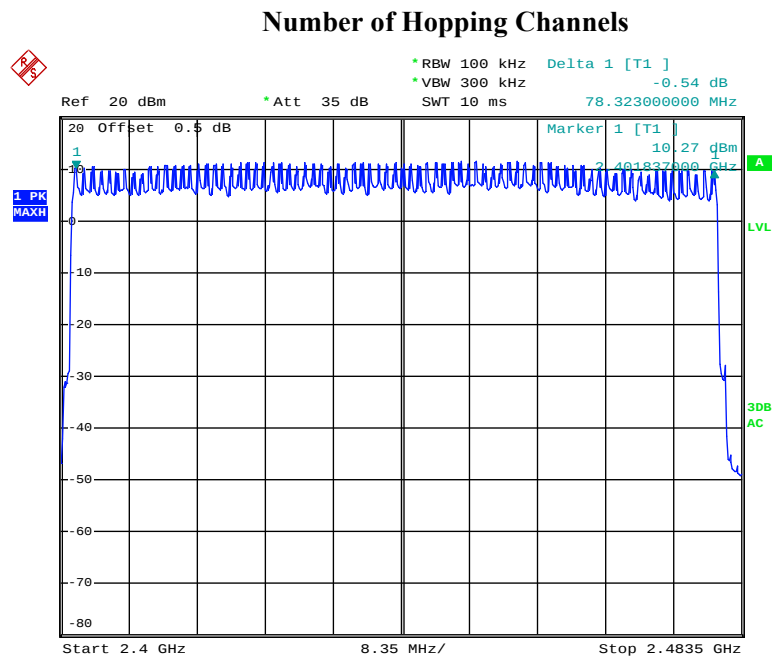
Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Number of Hopping Channels

Date: 29.JAN.2018 14:03:02

EDR Mode ($\pi/4$ -DQPSK):

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

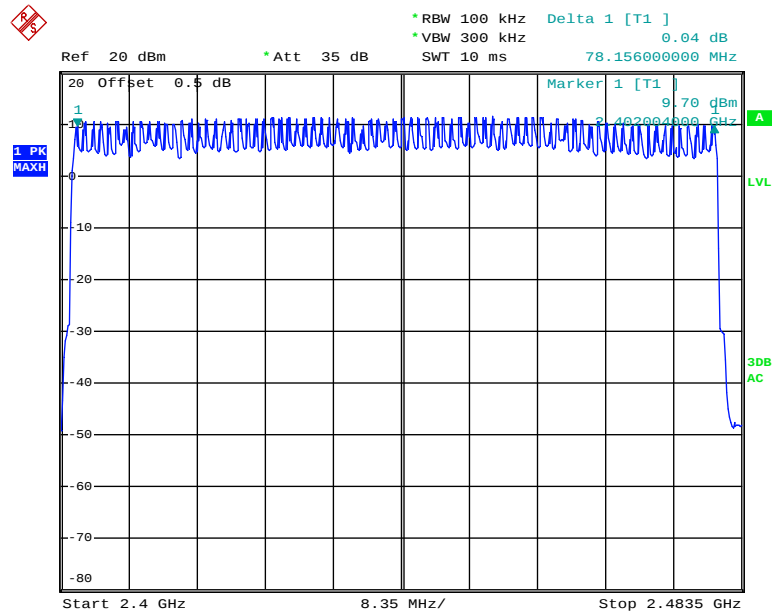


Date: 29.JAN.2018 14:10:12

EDR Mode (8-DPSK):

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

Number of Hopping Channels



Date: 29.JAN.2018 14:16:26

FCC §15.247(a) (1) (iii) & RSS-247 Clause 5.1 d)- TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

According to FCC §15.247(a) (1) (iii)

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.

According to RSS-247 Clause 5.1 d)

- d) FHSs operating in the band 2400-2483.5 MHz shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

Test Procedure

The EUT was worked in channel hopping; the time of single pulses was tested.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	22.7 °C
Relative Humidity:	40 %
ATM Pressure:	102.2 kPa

* The testing was performed by George Pang on 2018-01-29.

Test Result: Compliance.

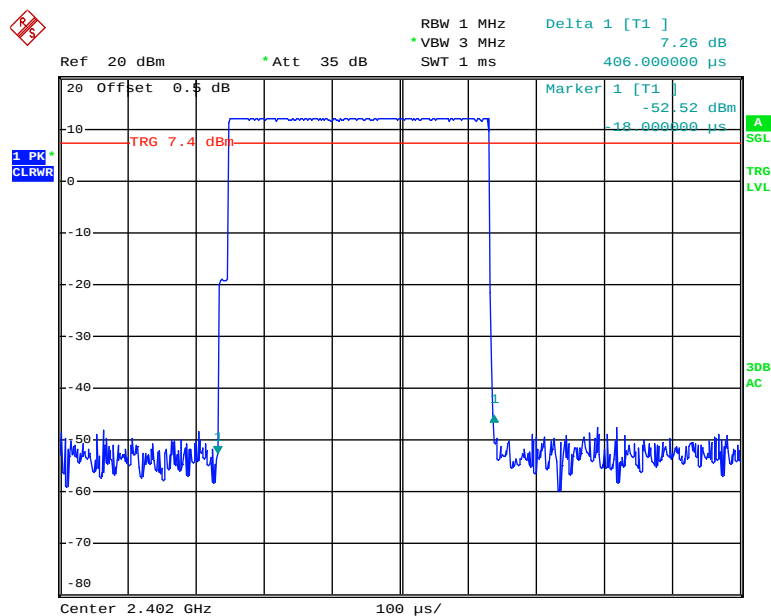
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

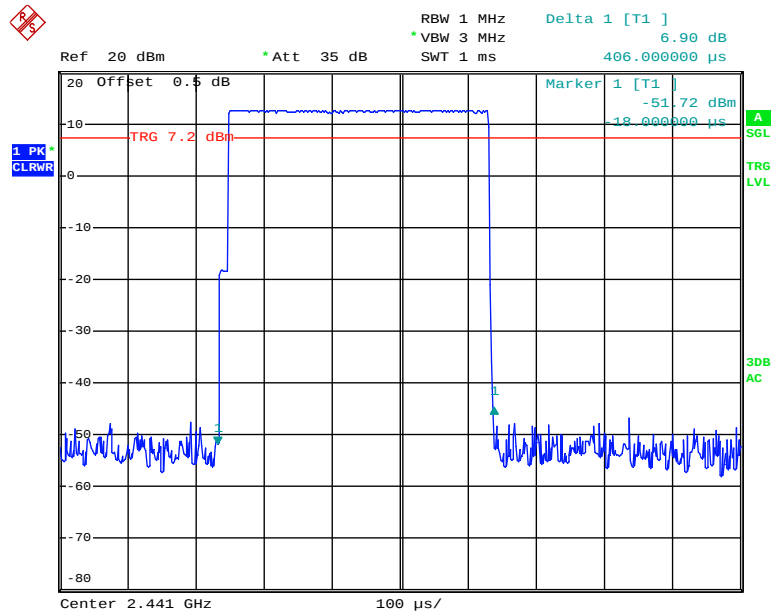
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.406	0.13	0.4	Compliance
	Middle	0.406	0.13	0.4	Compliance
	High	0.406	0.13	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
DH3	Low	1.674	0.268	0.4	Compliance
	Middle	1.674	0.268	0.4	Compliance
	High	1.674	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
DH5	Low	2.930	0.313	0.4	Compliance
	Middle	2.930	0.313	0.4	Compliance
	High	2.930	0.313	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

DH1: Low Channel



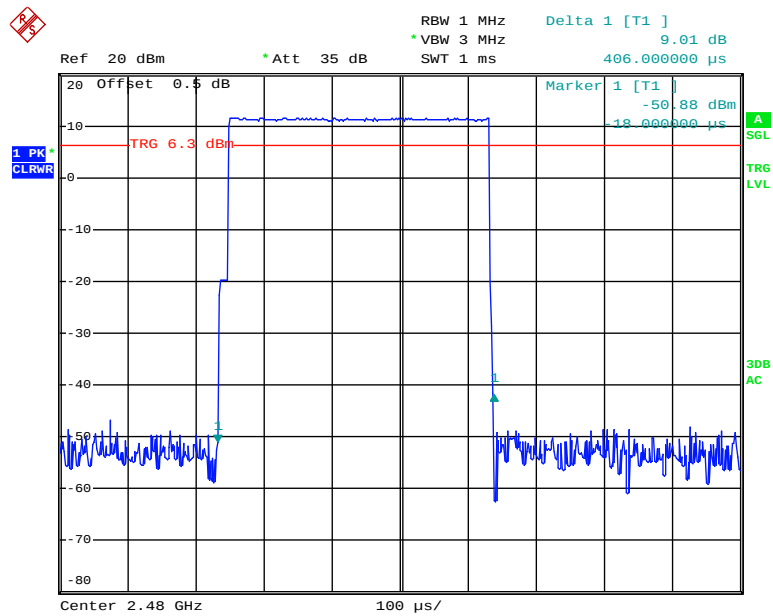
Date: 29.JAN.2018 14:03:21

DH1: Middle Channel



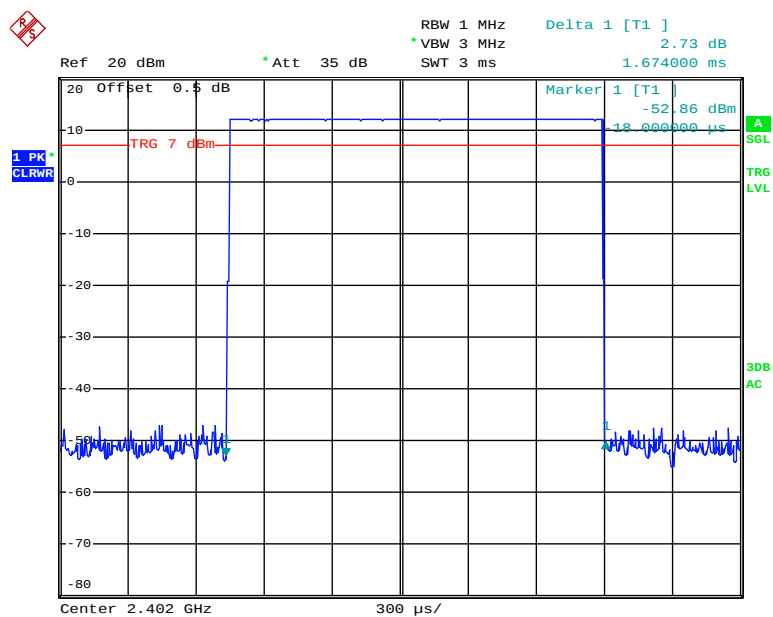
Date: 29.JAN.2018 14:03:26

DH1: High Channel



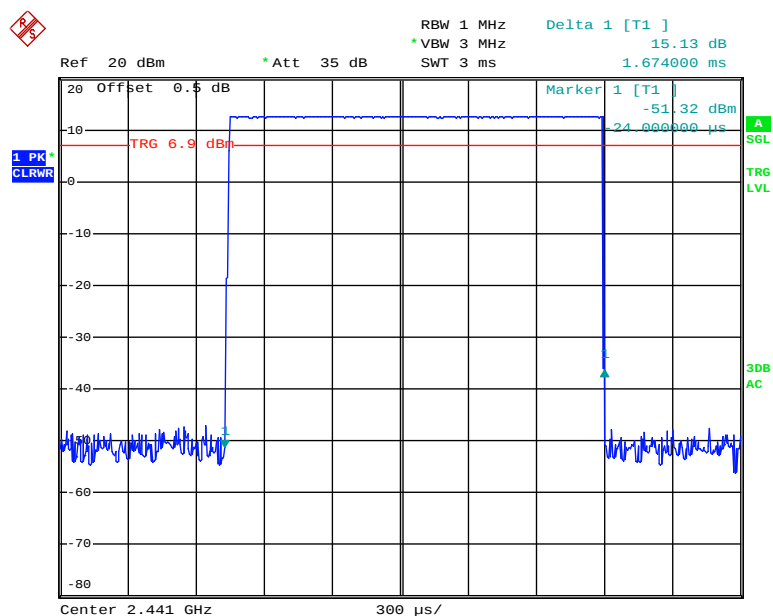
Date: 29.JAN.2018 14:03:32

DH3: Low Channel



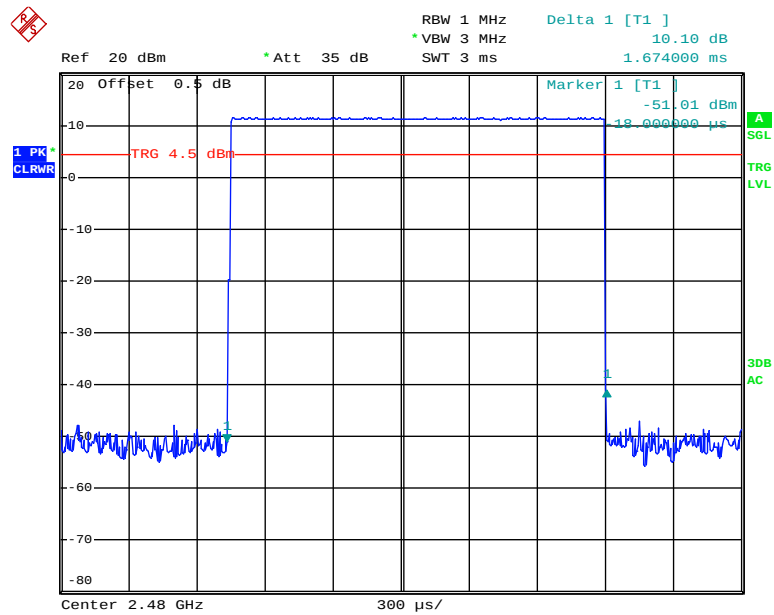
Date: 29.JAN.2018 14:04:09

DH3: Middle Channel



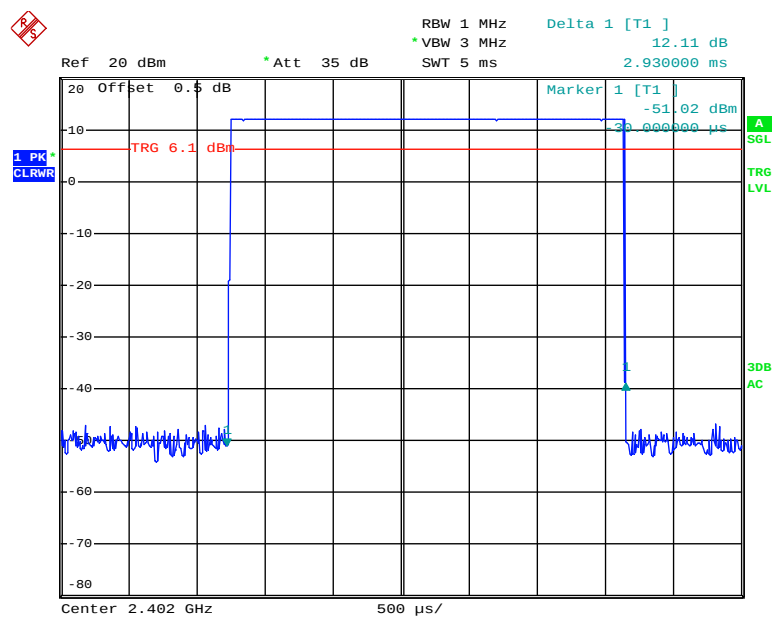
Date: 29.JAN.2018 14:04:14

DH3: High Channel



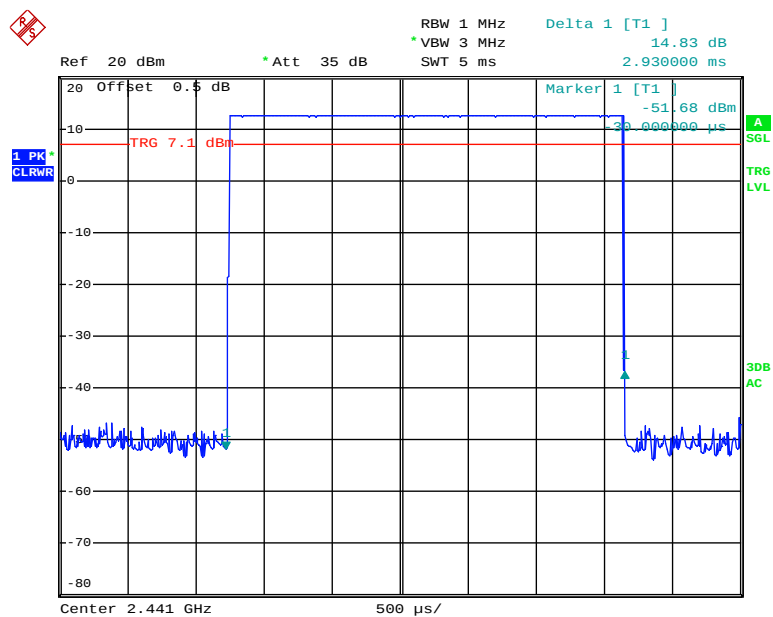
Date: 29.JAN.2018 14:04:19

DH5: Low Channel



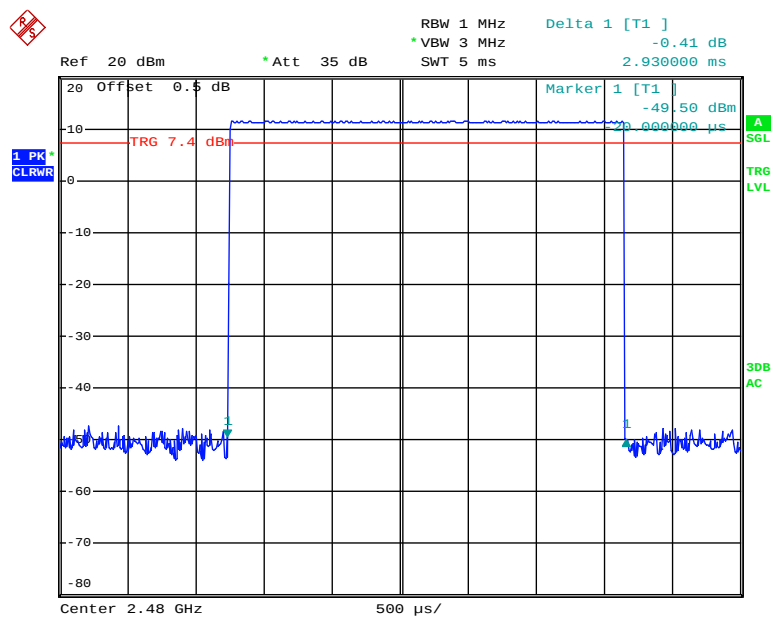
Date: 29.JAN.2018 14:04:51

DH5: Middle Channel



Date: 29.JAN.2018 14:04:55

DH5: High Channel

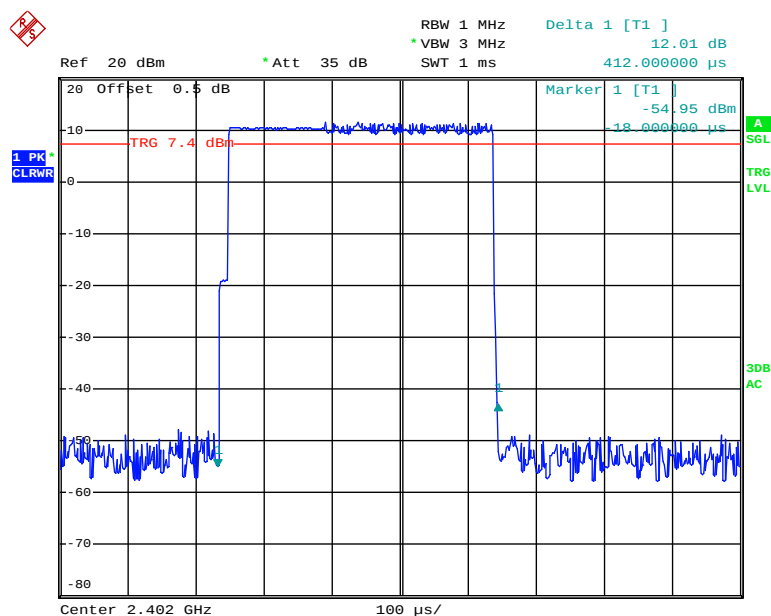


Date: 29.JAN.2018 14:05:01

EDR Mode ($\pi/4$ -DQPSK):

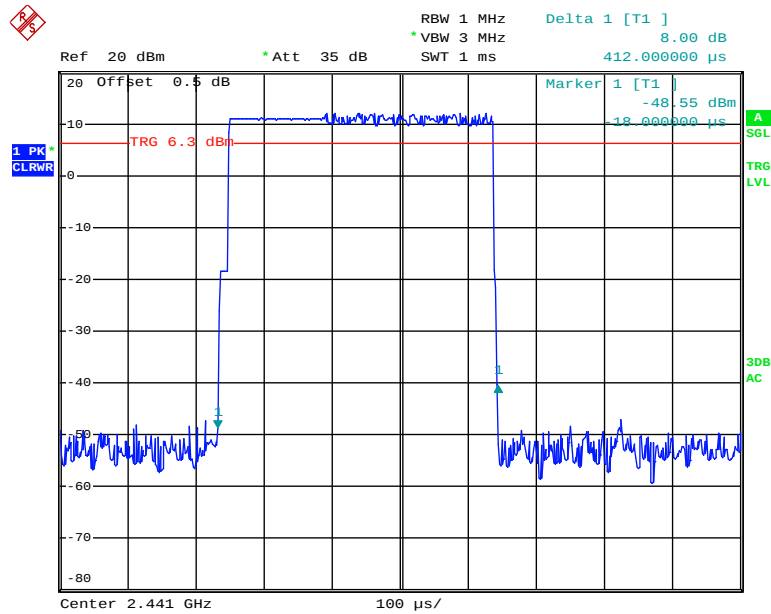
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.412	0.132	0.4	Compliance
	Middle	0.412	0.132	0.4	Compliance
	High	0.412	0.132	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
2DH3	Low	1.674	0.268	0.4	Compliance
	Middle	1.680	0.269	0.4	Compliance
	High	1.674	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
2DH5	Low	2.930	0.313	0.4	Compliance
	Middle	2.930	0.313	0.4	Compliance
	High	2.940	0.314	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

2DH1: Low Channel



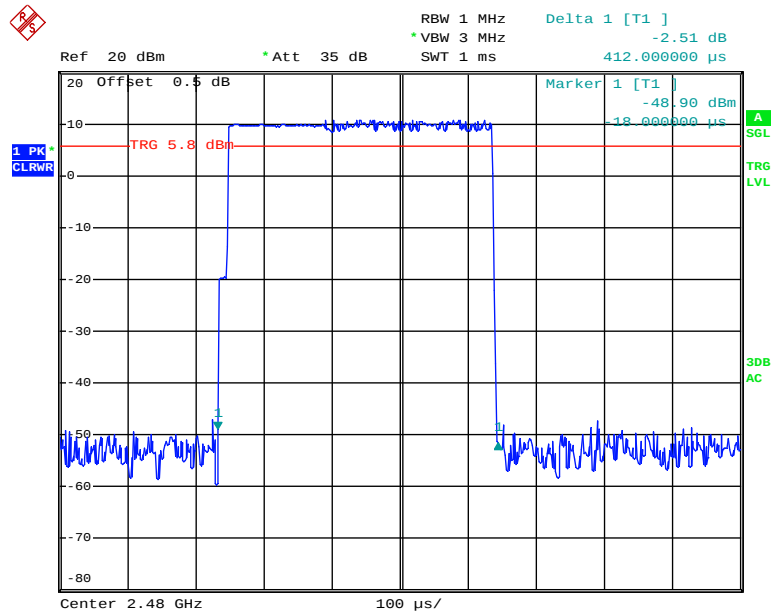
Date: 29.JAN.2018 14:10:20

2DH1: Middle Channel

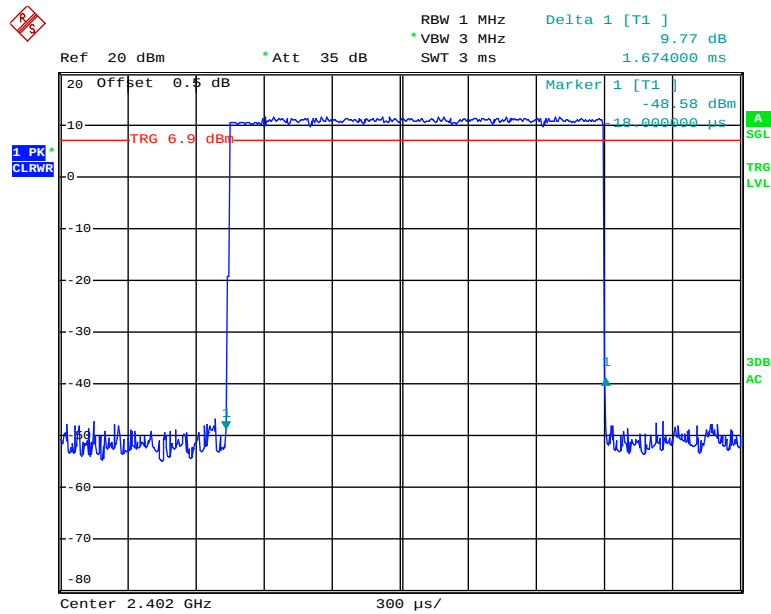


Date: 29.JAN.2018 14:10:32

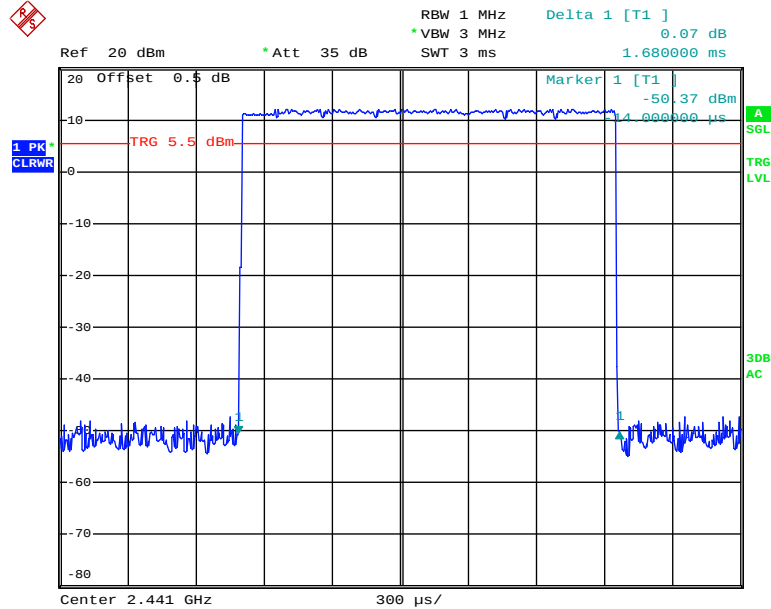
2DH1: High Channel



Date: 29.JAN.2018 14:10:46

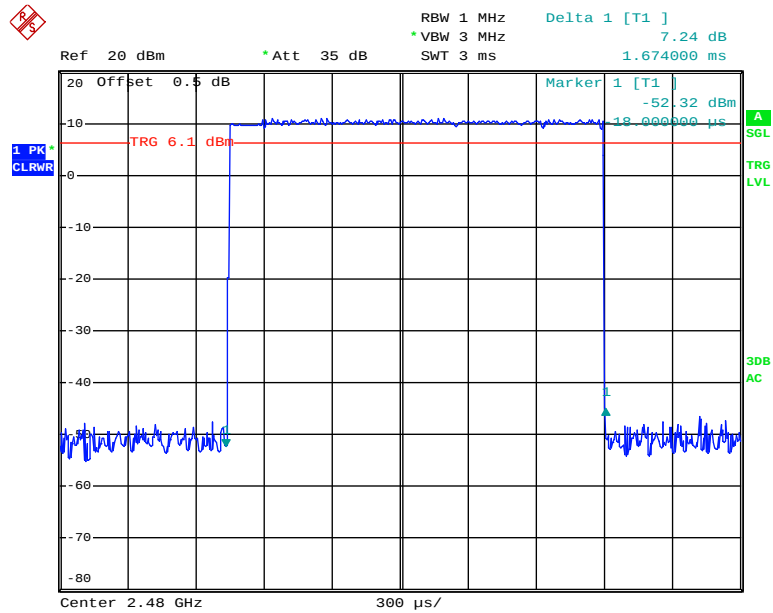
2DH3: Low Channel

Date: 29.JAN.2018 14:11:46

2DH3: Middle Channel

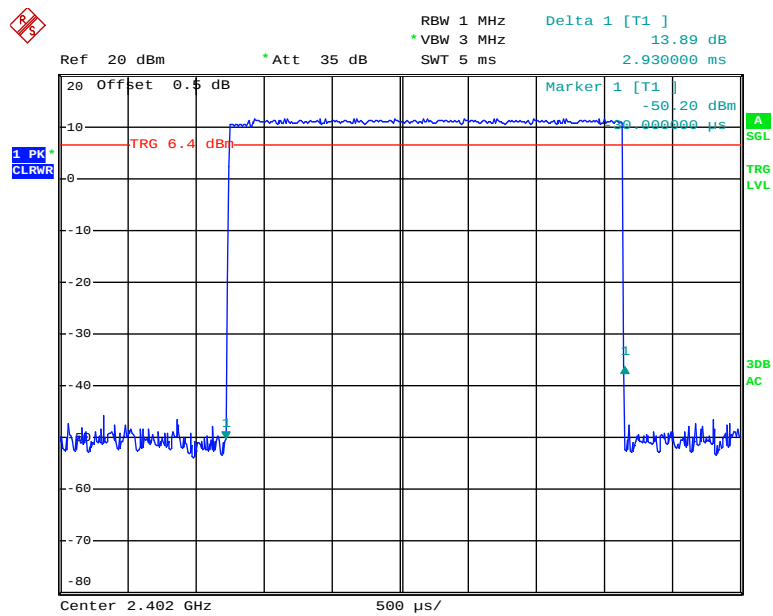
Date: 29.JAN.2018 14:27:05

2DH3: High Channel



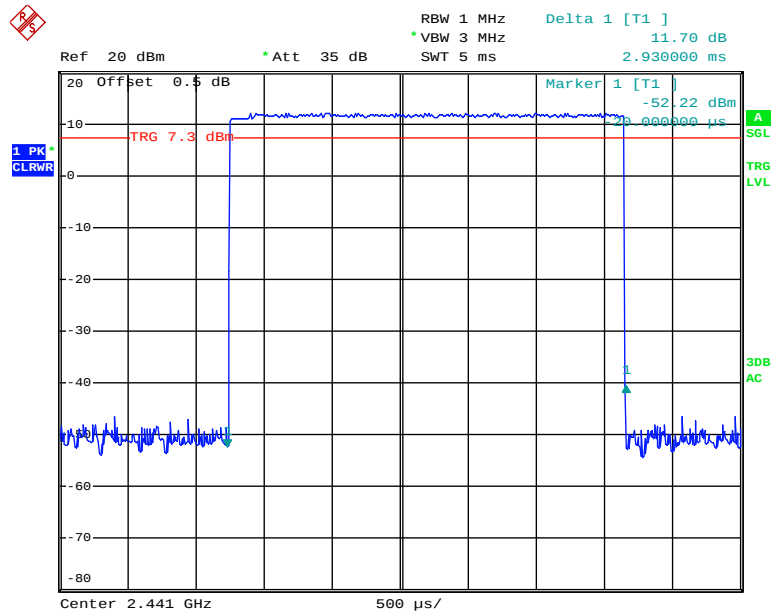
Date: 29.JAN.2018 14:11:55

2DH5: Low Channel



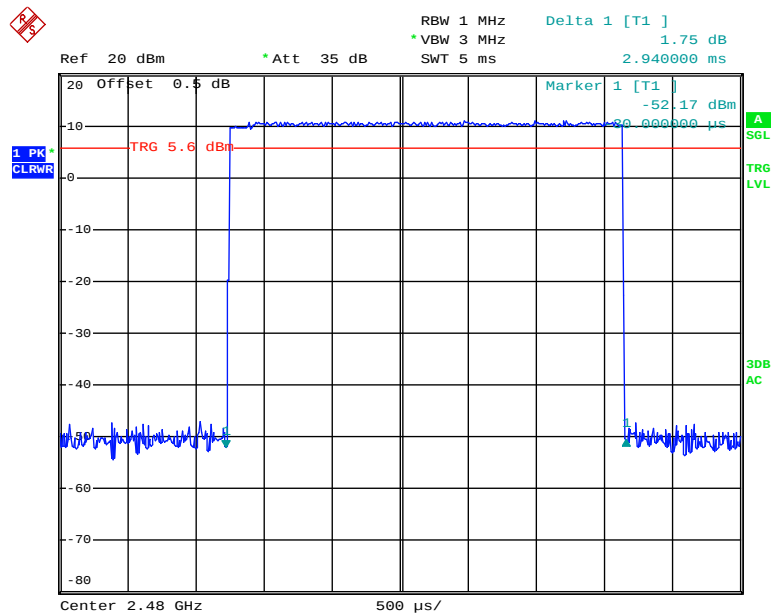
Date: 29.JAN.2018 14:12:23

2DH5: Middle Channel



Date: 29.JAN.2018 14:12:28

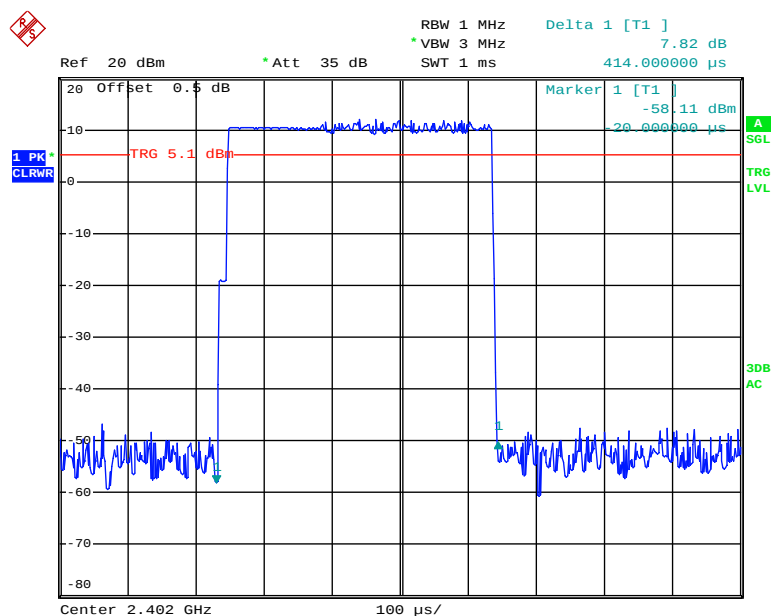
2DH5: High Channel



Date: 29.JAN.2018 14:12:33

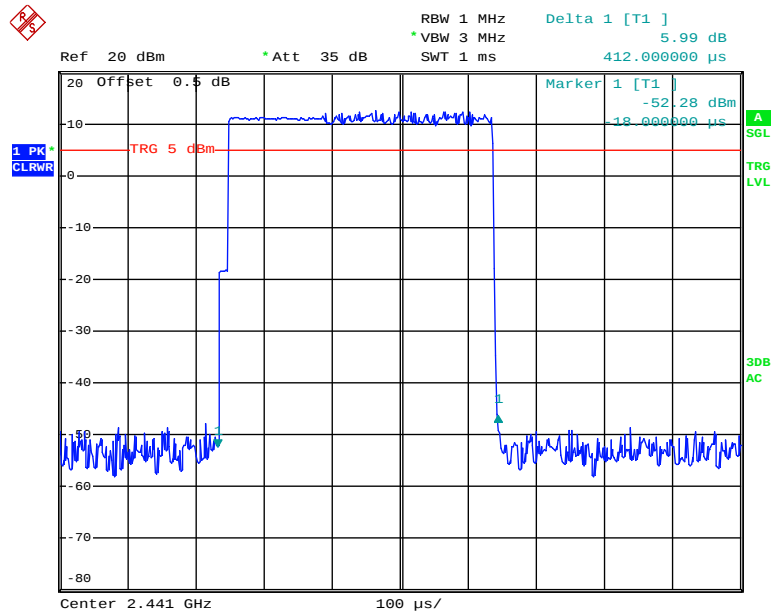
EDR Mode (8-DPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.414	0.132	0.4	Compliance
	Middle	0.412	0.132	0.4	Compliance
	High	0.412	0.132	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) × 31.6 s				
3DH3	Low	1.674	0.268	0.4	Compliance
	Middle	1.674	0.268	0.4	Compliance
	High	1.680	0.269	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) × 31.6 s				
3DH5	Low	2.930	0.313	0.4	Compliance
	Middle	2.940	0.314	0.4	Compliance
	High	2.940	0.314	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) × 31.6 s				

3DH1: Low Channel

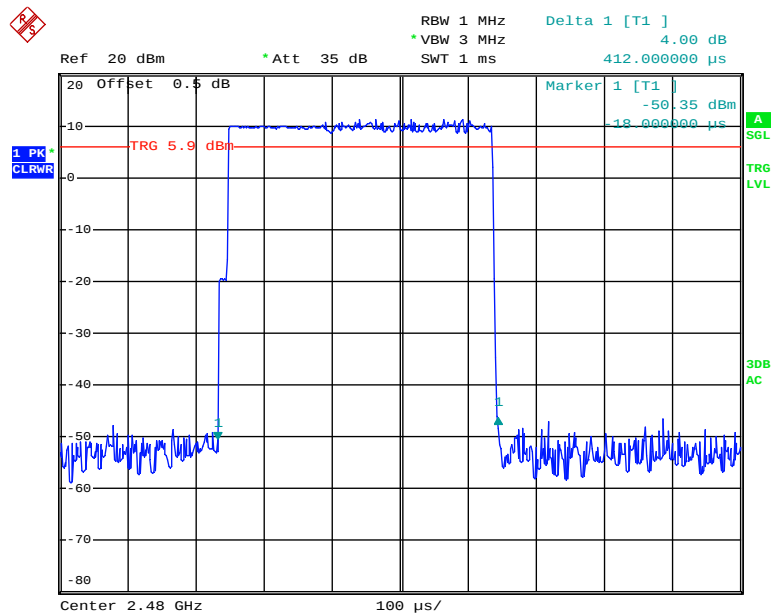
Date: 29.JAN.2018 14:16:42

3DH1: Middle Channel



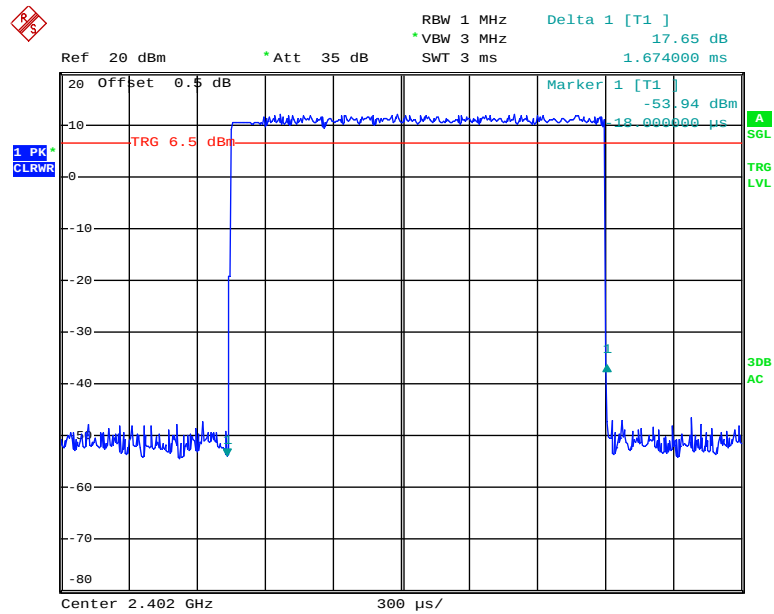
Date: 29.JAN.2018 14:16:54

3DH1: High Channel



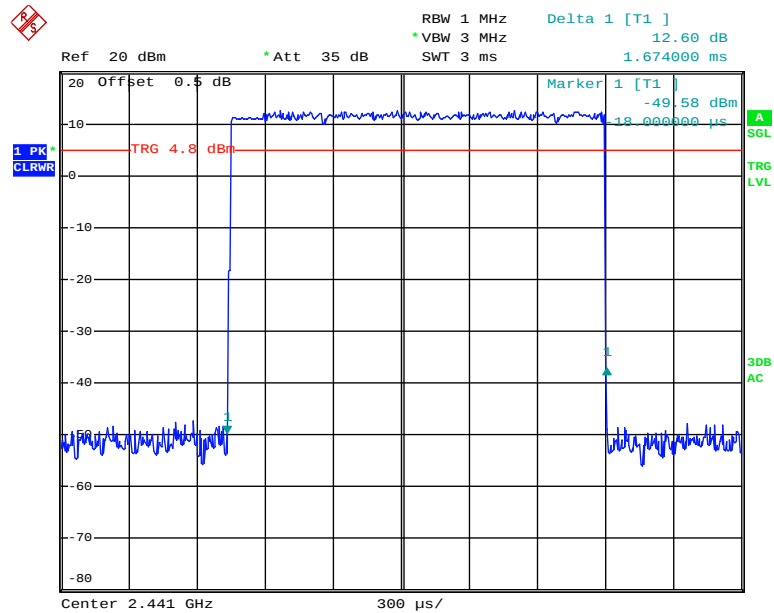
Date: 29.JAN.2018 14:16:59

3DH3: Low Channel



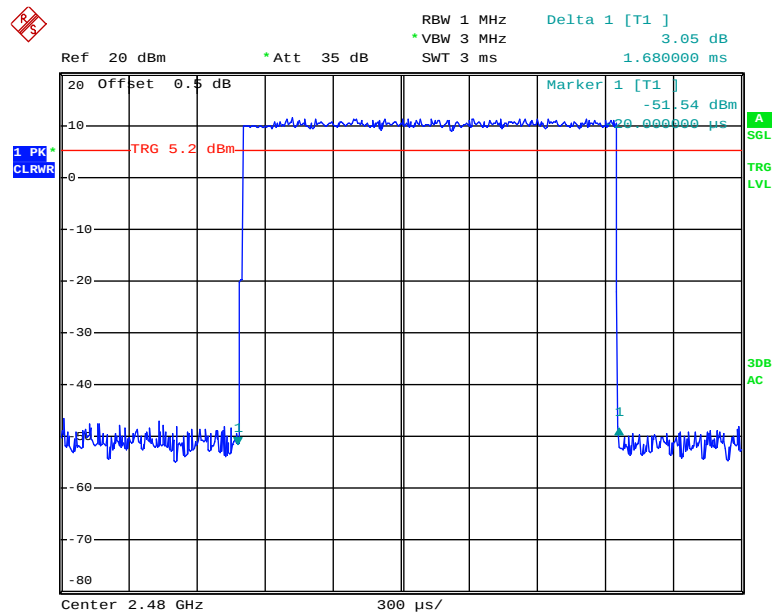
Date: 29.JAN.2018 14:17:29

3DH3: Middle Channel



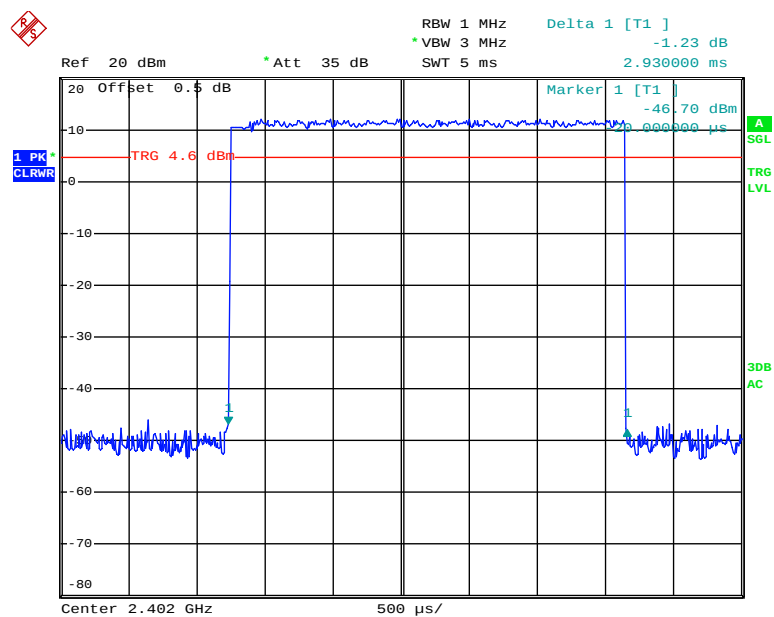
Date: 29.JAN.2018 14:17:33

3DH3: High Channel



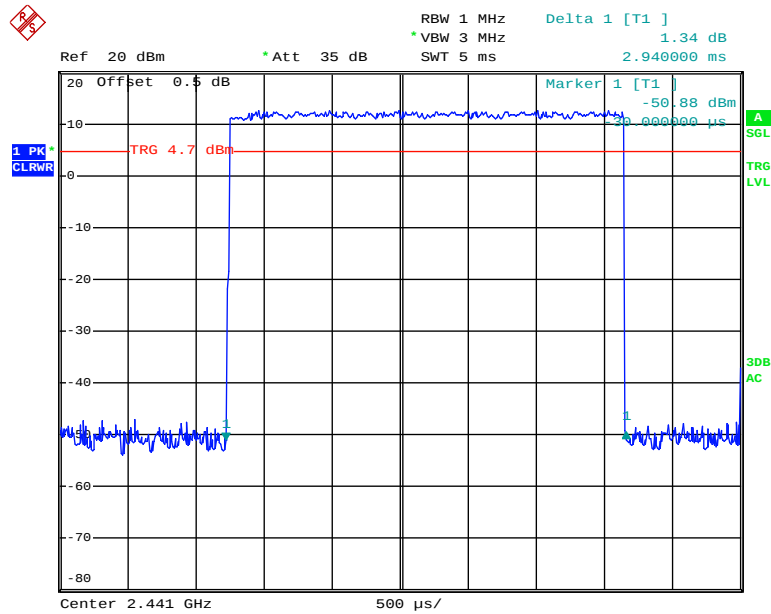
Date: 29.JAN.2018 14:25:34

3DH5: Low Channel



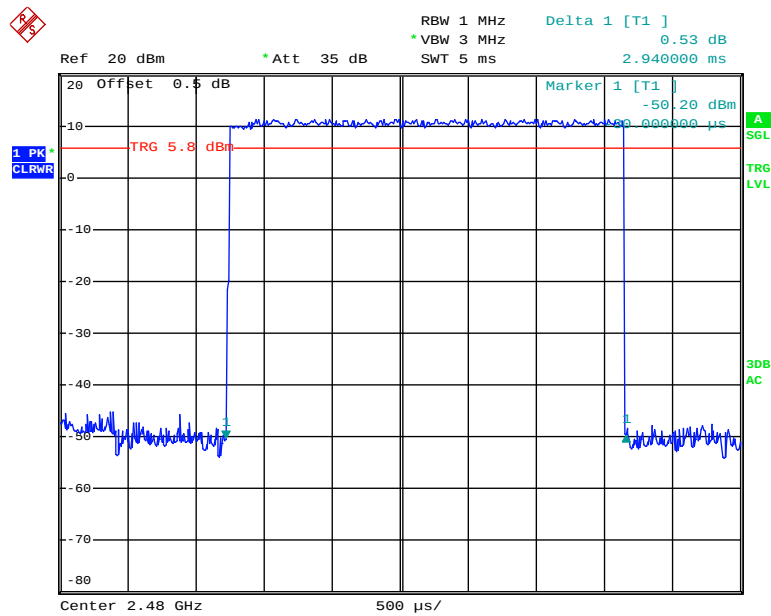
Date: 29.JAN.2018 14:22:29

3DH5: Middle Channel



Date: 29.JAN.2018 14:18:11

3DH5: High Channel



Date: 29.JAN.2018 14:18:15

FCC §15.247(b) (1) & RSS-247 Clause 5.4 b) - 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

According to RSS-247 Clause 5.4 b)

- b) For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	22.7 °C
Relative Humidity:	40 %
ATM Pressure:	102.2 kPa

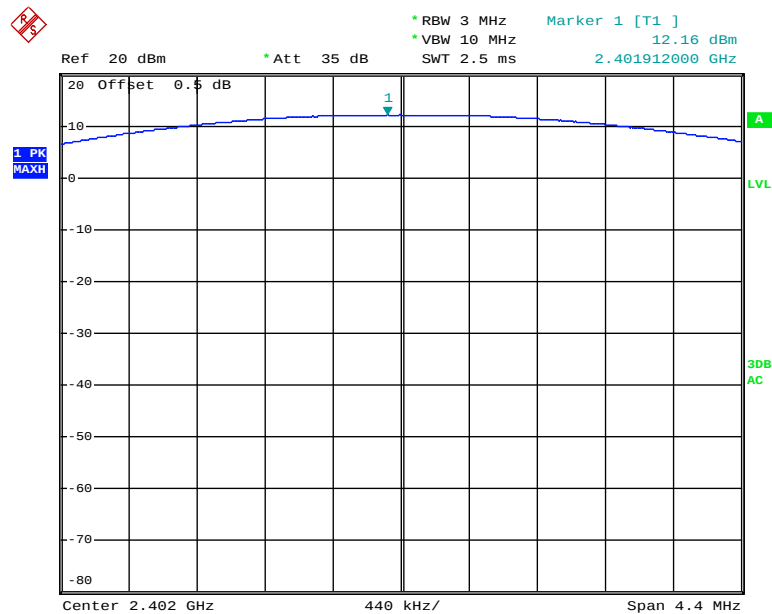
* The testing was performed by George Pang on 2018-01-29.

Test Result: Compliance.

Test Mode: Transmitting

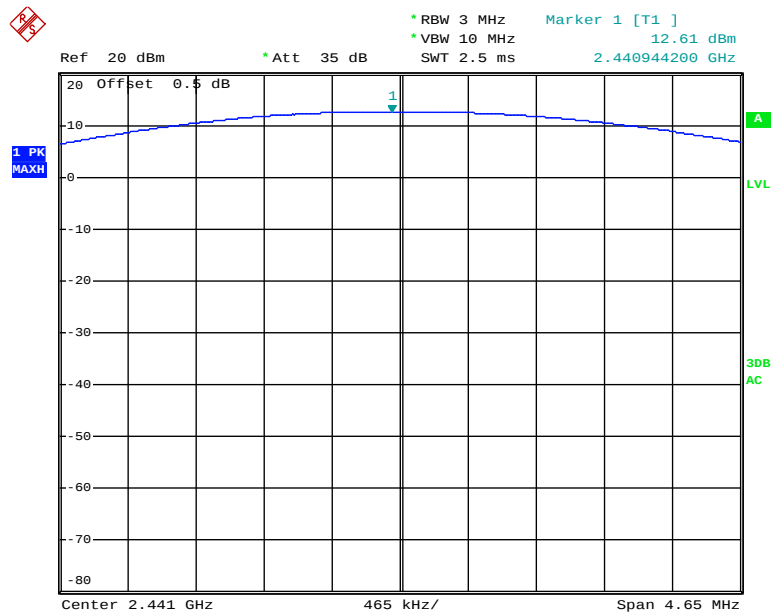
Mode	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	12.16	21
	2441	12.61	21
	2480	11.52	21
EDR Mode ($\pi/4$ -DQPSK)	2402	12.10	21
	2441	12.58	21
	2480	11.48	21
EDR Mode (8-DPSK)	2402	12.49	21
	2441	12.92	21
	2480	11.85	21

Note: The data above was tested in conducted mode.

BDR Mode (GFSK):**Low Channel**

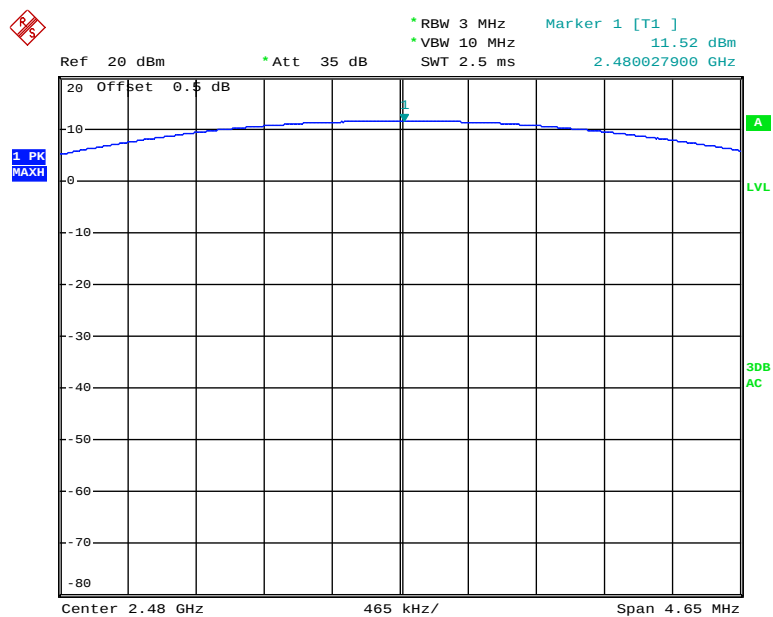
Date: 29.JAN.2018 13:41:14

Middle Channel



Date: 29.JAN.2018 13:43:18

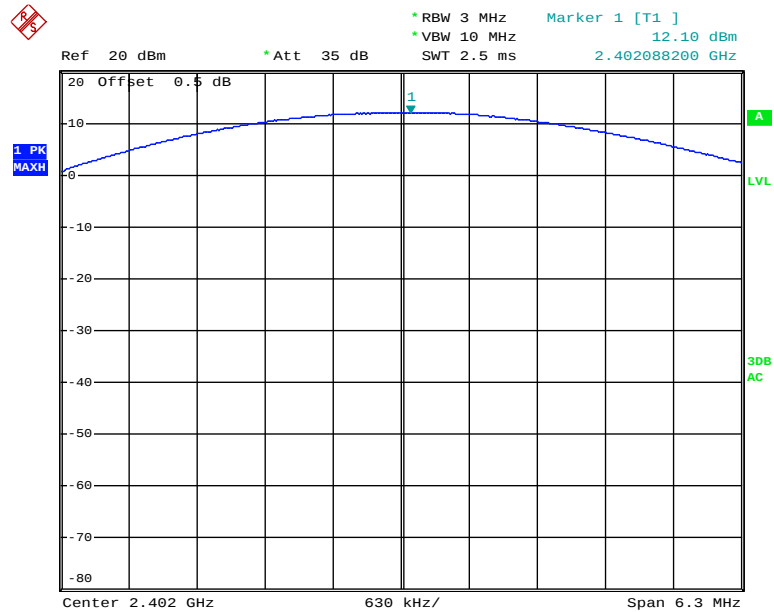
High Channel



Date: 29.JAN.2018 13:44:51

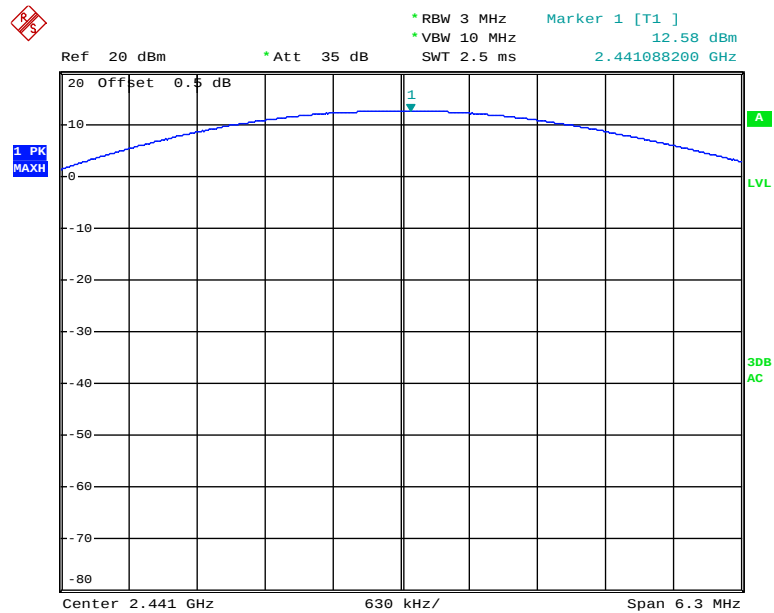
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



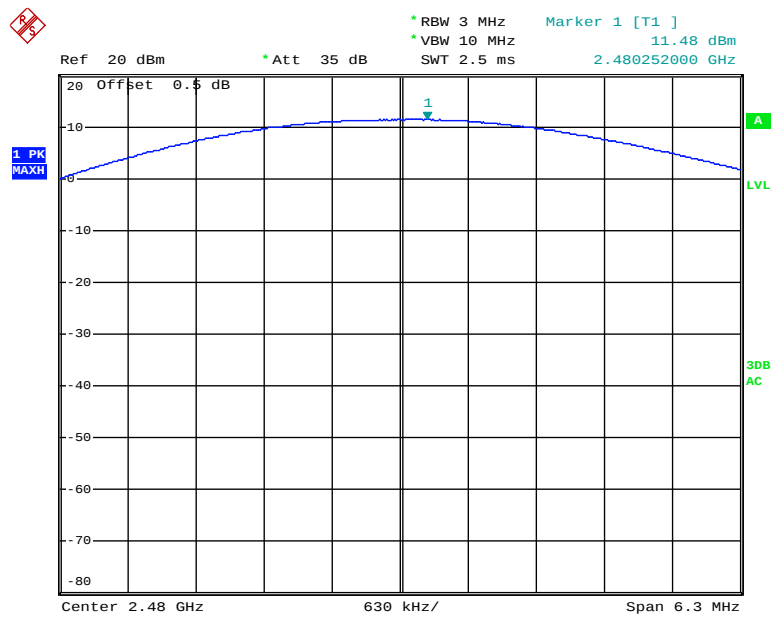
Date: 29.JAN.2018 13:51:37

Middle Channel



Date: 29.JAN.2018 13:50:16

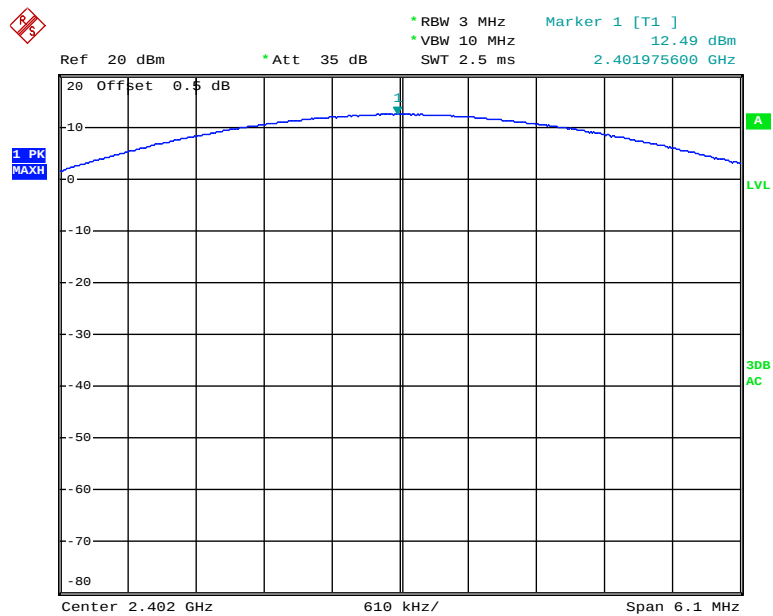
High Channel



Date: 29.JAN.2018 13:46:51

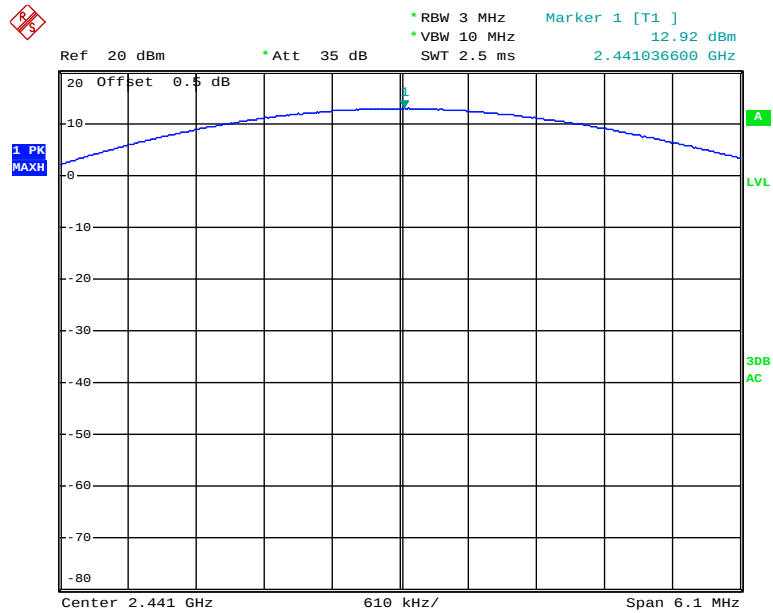
EDR Mode (8-DPSK):

Low Channel



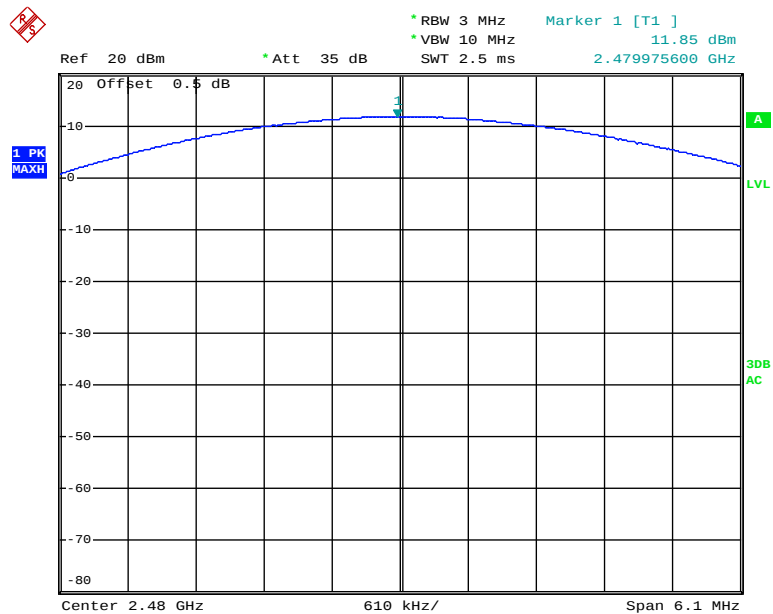
Date: 29.JAN.2018 13:53:31

Middle Channel



Date: 29.JAN.2018 13:55:24

High Channel



Date: 29.JAN.2018 13:56:50

FCC §15.247(d)& RSS-247 Clause 5.5 - BAND EDGES TESTING

Applicable Standard

According to FCC §15.247(d)

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)).

According to RSS-247 Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW/ VBW of spectrum analyzer to 100/300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/

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

Test Data

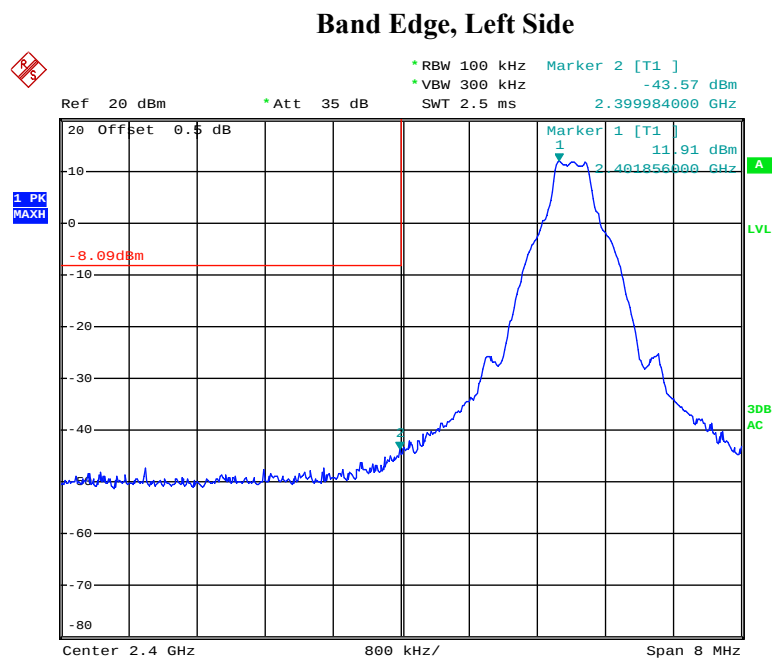
Environmental Conditions

Temperature:	22.7 °C
Relative Humidity:	40 %
ATM Pressure:	102.2 kPa

* The testing was performed by George Pang on 2018-01-29.

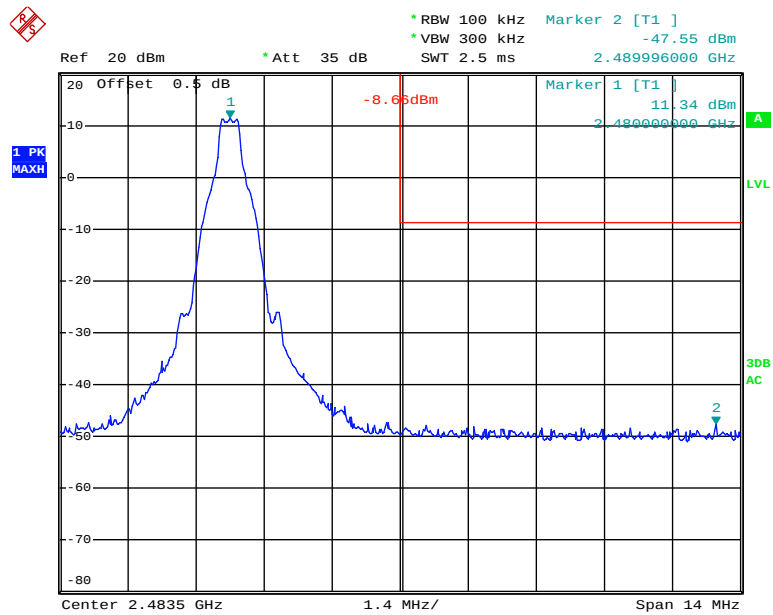
Test Result: Compliance

Single Channel Mode,
BDR Mode (GFSK):



Date: 29.JAN.2018 13:41:41

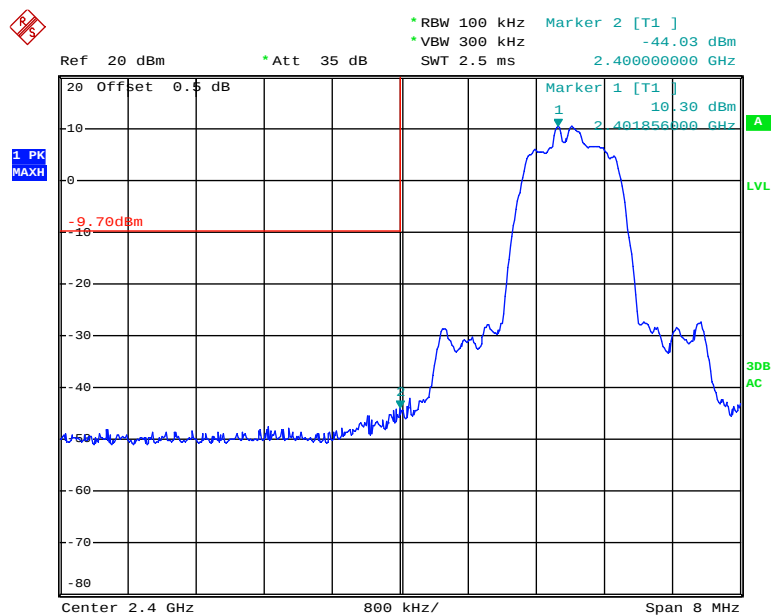
Band Edge, Right Side



Date: 29.JAN.2018 13:45:25

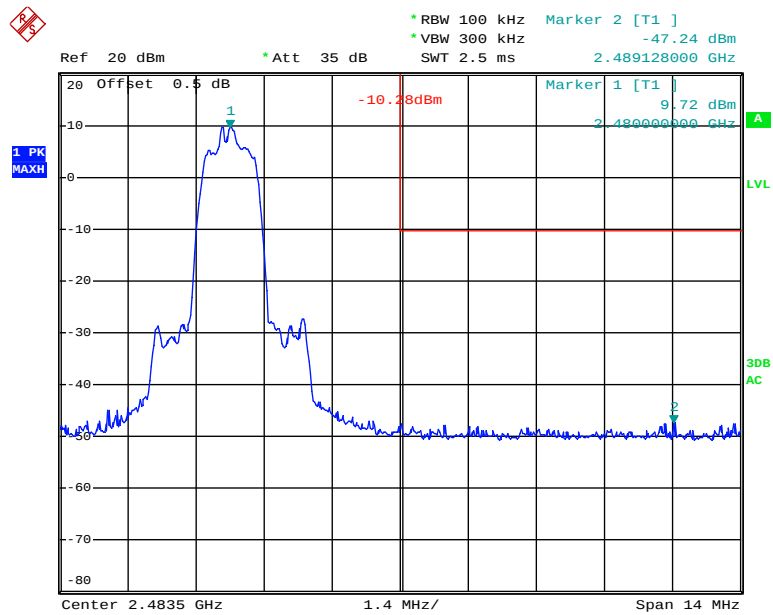
EDR Mode ($\pi/4$ -DQPSK):

Band Edge, Left Side



Date: 29.JAN.2018 13:52:07

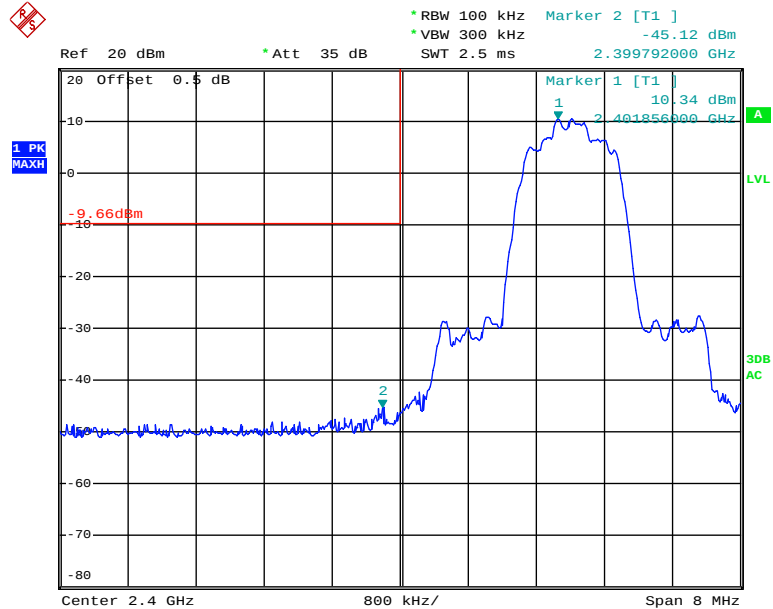
Band Edge, Right Side



Date: 29.JAN.2018 13:47:25

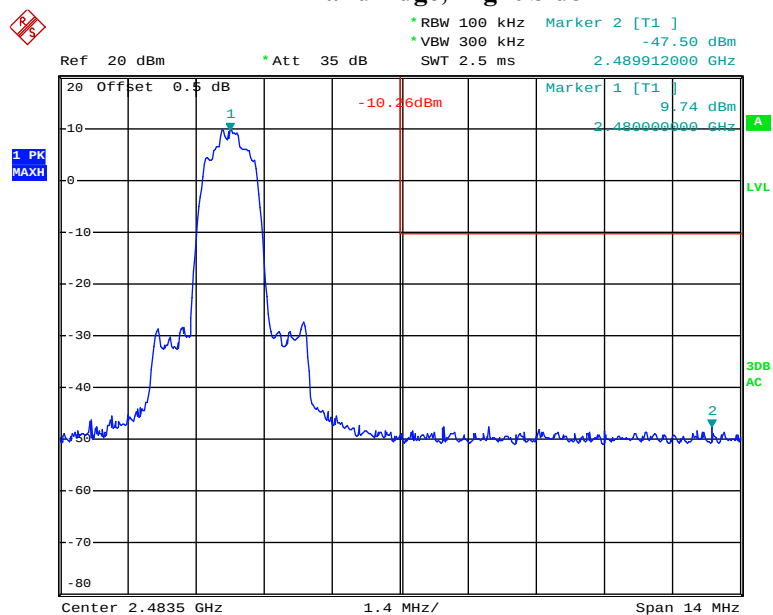
EDR Mode (8-DPSK):

Band Edge, Left Side



Date: 29.JAN.2018 13:53:54

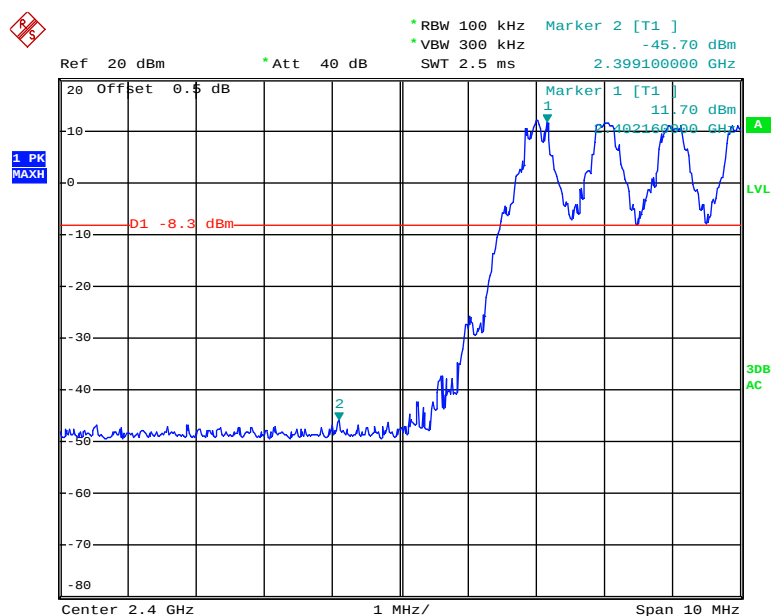
Band Edge, Right Side



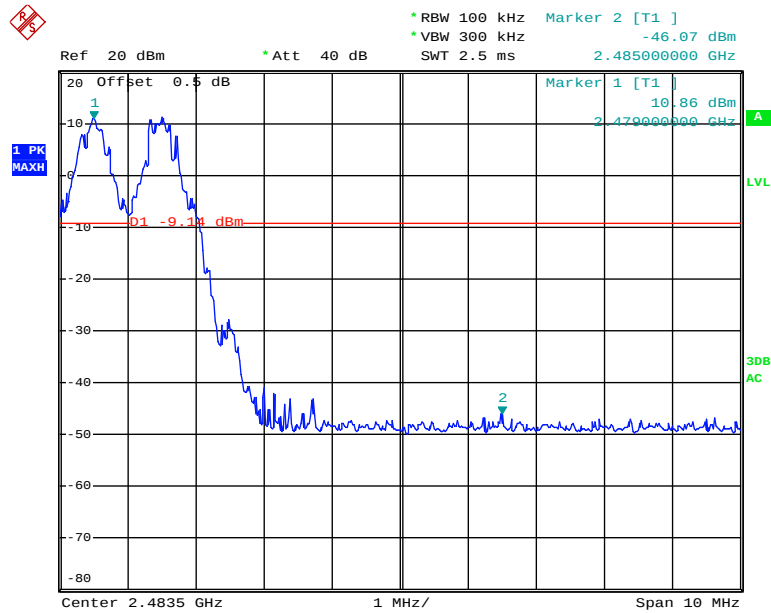
Date: 29.JAN.2018 13:57:20

Hopping Mode,
BDR Mode (GFSK):

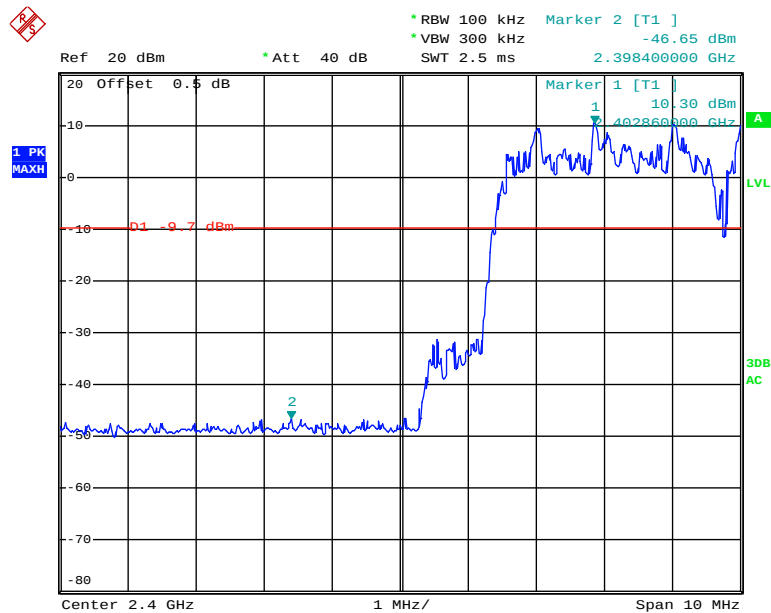
Band Edge, Left Side



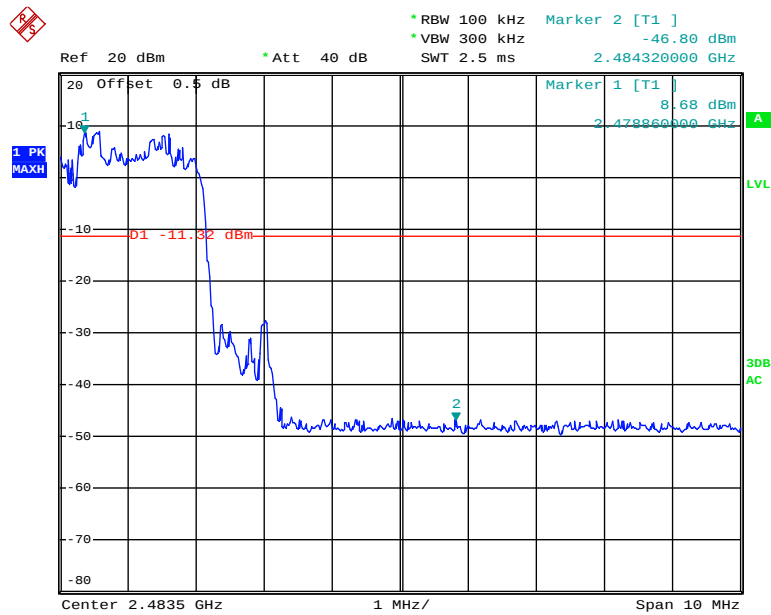
Date: 29.JAN.2018 13:16:22

Band Edge, Right Side

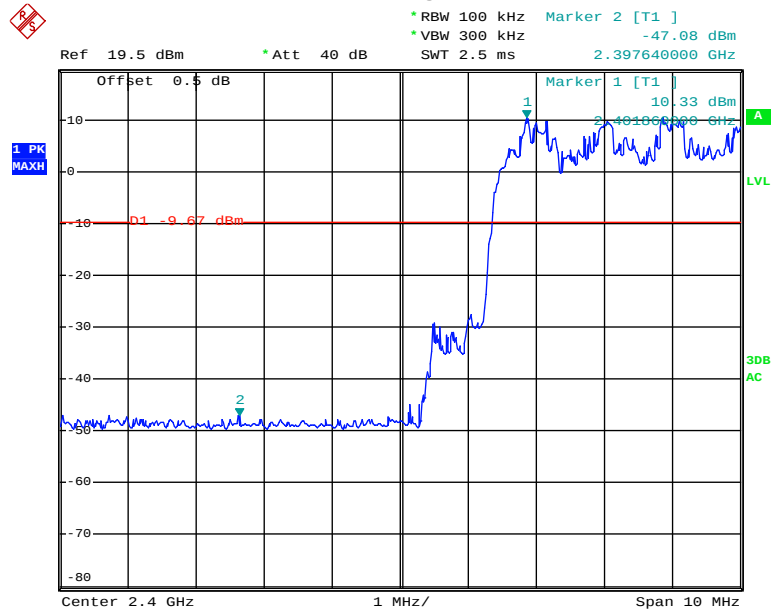
Date: 29.JAN.2018 13:17:20

*EDR Mode ($\pi/4$ -DQPSK):***Band Edge, Left Side**

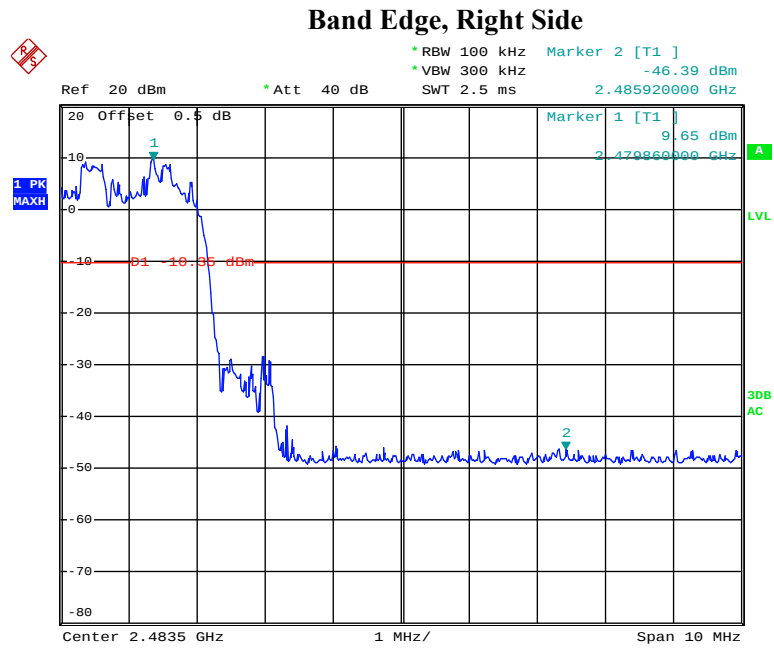
Date: 29.JAN.2018 13:14:19

Band Edge, Right Side

Date: 29.JAN.2018 13:11:51

*EDR Mode (8-DPSK)***Band Edge, Left Side**

Date: 29.JAN.2018 13:06:59



Date: 29.JAN.2018 13:09:09

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