FCC PART 15.247
RSS-GEN, ISSUE 4, NOVEMBER 2014
RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

DT Research, Inc.

6F, NO.1, NingPo E. St. Taipei, 100 Taiwan

FCC ID: YE3801I
IC: 7647A-801I

Report Type:	**Product Name:**
Original Report	Mobile Tablet

Report Number:	RDG171205015-00A
Report Date:	2018-01-06
Reviewed By:	Jerry Zhang EMC Manager Jerry Zhang
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

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Mobile Tablet
EUT Model:		DT301A
FCC ID:		YE3801I
IC:		7647A-801I
Rated Input Voltage:		DC 11.4V from battery or DC 19V from Adapter
Adapter Information	**Model:**	A11-065N1A
	Input:	100-240V~1.7A, 50/60Hz
	Output:	DC 19V, 3.42A 65W
External Dimension:		Length (28.5cm)*Width (20cm)*High (5.4cm)
Serial Number:		171205015
EUT Received Date:		2017.12.07

Objective

This report is prepared on behalf of ***DT Research, Inc.*** 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: YE3801I.
FCC Part 15E NII submissions with FCC ID: YE3801I.
FCC Part 22H, 24E, 27 PCB submissions with FCC ID: YE3801I.
RSS-247 DTSs, RSS-247 LE-LAN, RSS-130, RSS-132, RSS-133, RSS-139 submissions with IC: 7647A-801I.

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℃
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.

The device have a Bluetooth transmitter with BDR(GFSK), EDR(π/4-DQPSK&8DPSK) and a long range hopping transmitter(FSK).

The long range hopping transmitter employs 76 channels as below table:

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	**2401.683**	19	2419.185	38	2436.693	57	2454.201
1	2402.607	20	2420.107	39	2437.613	58	2455.121
2	2403.525	21	2421.029	40	2438.535	59	2456.041
3	2404.445	22	2421.949	41	2439.455	60	2456.963
4	2405.367	23	2422.869	42	2440.379	61	2457.887
5	2406.287	24	2423.789	43	2441.301	62	2458.808
6	2407.209	25	2424.713	44	2442.223	63	2459.73
7	2408.129	26	2425.633	45	2443.143	64	2460.652
8	2409.055	27	2426.557	46	2444.065	65	2461.572
9	2409.973	28	2427.477	47	2444.985	66	2462.492
10	2410.893	29	2428.399	48	2445.905	67	2463.414
11	2411.817	30	2429.321	49	2446.827	68	2464.336
12	2412.737	31	2430.245	50	2447.749	69	2465.256
13	2413.659	32	2431.165	51	2448.669	70	2466.178
14	2414.579	33	2432.085	52	2449.591	71	2467.100
15	2415.499	34	2433.007	53	2450.515	72	2468.020
16	2416.419	35	2433.927	54	2451.435	73	2468.944
17	2417.341	36	2434.847	55	2452.355	74	2469.866
18	2418.263	**37**	**2435.771**	56	2453.279	**75**	**2470.788**

Channel 0, 37 and channel 75 were tested.

EUT Exercise Software

The software ' QRCT.exe' was use for Bluetooth test, which was provided by manufacturer. The maximum power level was configured by the software as below table:

Test Software Version	QRCT.exe		
Test Frequency	2402MHz	2441MHz	2480MHz
GFSK	9	9	9
π/4-DQPSK	9	9	9
8-DPSK	9	9	9

And the software ' wincom.exe' was use for long range hopping transmitter test, which was provided by manufacturer. The maximum power level was configured by the software as below table:

Test Software Version	wincom.exe		
Test Frequency	2401.683 MHz	2435.771 MHz	2470.788 MHz
Power Level Setting	9	9	9

Equipment Modifications

No modification was made to the EUT.

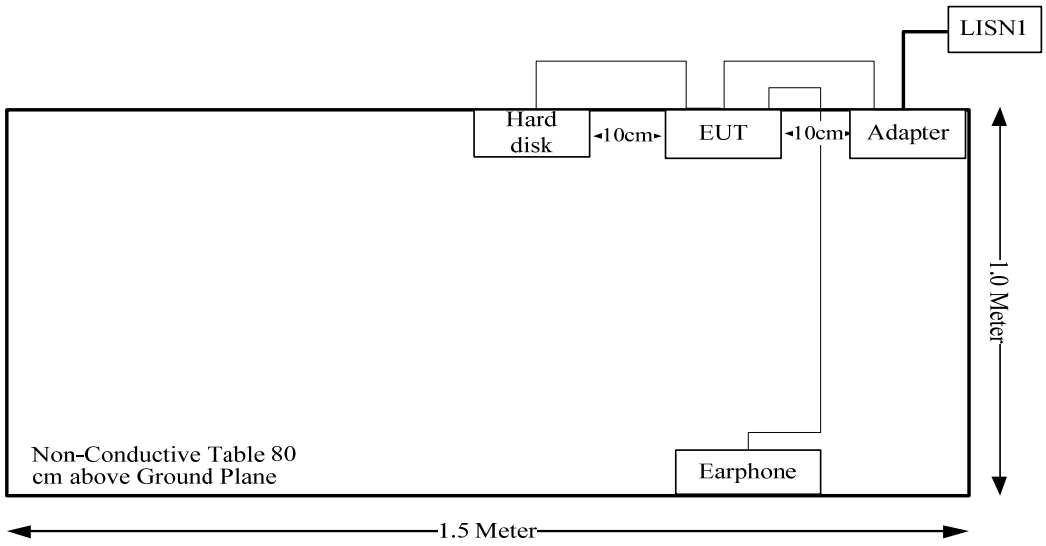
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Keenion	Earphone	KDM-911	6951812200215
TOSHIBA	HDD	DTP105	247BSYVUSRE8

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Earphone Cable	No	No	1.26	EUT	Earphone
USB Cable	yes	No	1.0	EUT	HDD

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093 RSS-102 Clause 4	RF Exposure	Compliance
FCC §15.247 (i) & §1.1310 & §2.1091 RSS-102 Clause 4	Maximum Permissable Exposure (MPE)	Compliance[Note]
FCC§15.203 RSS-GEN Clause 8.3	Antenna Requirement	Compliance
FCC§15.207 (a) RSS-Gen Clause 8.8	Conducted Emissions	Compliance
FCC§15.205, §15.209, §15.247(d) RSS-247 Clause 5.5, RSS-Gen Clause 8.10	Spurious Emissions	Compliance
FCC§15.247 (a)(1) RSS-247 Clause 5.1 b) RSS-Gen Clause 6.6	Emission Bandwidth	Compliance
FCC§15.247(a)(1) RSS-247 Clause 5.1 b)	Channel Separation Test	Compliance
FCC§15.247(a)(1)(iii) RSS-247 Clause 5.1 d)	Time of Occupancy (Dwell Time)	Compliance
FCC§15.247(a)(1)(iii) RSS-247 Clause 5.1 d)	Quantity of hopping channel Test	Compliance
FCC§15.247(b)(1) RSS-247 Clause 5.4 b)	Peak Output Power Measurement	Compliance
FCC§15.247(d) RSS-247 Clause 5.5	Band Edges	Compliance

Note: the Long Range Hopping Transmitter was not for potable use, it is used for distance measurement when fixed in the holder. Please refer to the use manual for detailly.

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

Applicable Standard

According to§15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to 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

F**or Bluetooth:**

Compliant, please refer to the SAR report: RDG171205015-20.

FCC §15.247 (i) , §1.1310 , §2.1091& RSS-102 §4- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	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;

According to §1.1310 and §2.1091 RF exposure is calculated.

According to RSS-102 § 4Table 4, RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
$0.003\text{-}10^{21}$	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Calculation Formula:

Prediction of power density at the distance of the applicable MPE limit:
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

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

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

Calculated Data:

For Mobile Use Condition:

Mode	Frequency (MHz)	Antenna Gain		Tune-up Power		Evaluation Distance (cm)	Power Density		MPE Limit		Ratio($S_i/S_{limit,i}$)	
		(dBi)	(numeric)	(dBm)	(mW)		(mW/cm^2)	(W/m^2)	FCC (mW/cm^2)	RSS-102 (W/m^2)	FCC	RSS-102
Bluetooth	2402-2480	3	2.00	6	3.98	20	0.00	0.02	1.0	5.35	0.002	0.003
Long Range Transmitter	2401.683-2470.788	1.64	1.46	17	50.12	20	0.01	0.15	1.0	5.35	0.015	0.027
WLAN 2.4GHz Main Chain	2412-2462	1.4	1.38	20	100.00	20	0.03	0.27	1.0	5.37	0.027	0.051
WLAN 2.4GHz Aux Chain	2412-2462	3	2.00	20	100.00	20	0.04	0.40	1.0	5.37	0.040	0.074
WLAN 5GHz Main Chain	5150-5850	4.98	3.15	14.8	30.20	20	0.02	0.19	1.0	9.05	0.019	0.021
WLAN 5GHz AuxChain	5150-5850	4.98	3.15	14.8	30.20	20	0.02	0.19	1.0	9.05	0.019	0.021
CDMA 850	824-849	0.4	1.10	24	251.19	20	0.05	0.55	0.55	2.58	0.100	0.213
CDMA1900	1850-1910	4	2.51	24	251.19	20	0.13	1.26	1.0	4.48	0.126	0.281
WCDMA Band 2	1850-1910	4	2.51	23	199.53	20	0.10	1.00	1.0	4.48	0.100	0.223
WCDMA Band 5	824-849	0.4	1.10	23	199.53	20	0.04	0.44	0.55	2.58	0.079	0.169
LTE Band 2	1850-1910	4	2.51	23.9	245.47	20	0.12	1.23	1.0	4.48	0.123	0.274
LTE Band 4	1710-1755	3	2.00	24.8	302.00	20	0.12	1.20	1.0	4.24	0.120	0.283
LTE Band 5	824-849	0.4	1.10	24.4	275.42	20	0.06	0.60	0.55	2.58	0.109	0.233
LTE Band 13	777-787	-0.3	0.93	24.1	257.04	20	0.05	0.48	0.518	2.47	0.092	0.193
LTE Band 17	704-716	-3.6	0.44	24	251.19	20	0.02	0.22	0.47	2.31	0.047	0.094

The WLAN or Bluetooth and LTE, Long range transmitter can transmit simultaneously:
WLAN 2.4G band and 5G band can`t transmit simultaneously
WLAN and Bluetooth can`t transmit simultaneously

For FCC:

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

$=S_{\text{WLAN Main Chain-2.4}}/S_{\text{limit- WLAN Main Chain-2.4}} + S_{\text{WLAN Aux Chain-2.4}}/S_{\text{limit- WLAN Aux Chain-2.4}} + S_{\text{long}}/S_{\text{limit-long}} + S_{\text{CDMA1900}}/S_{\text{limit-CDMA1900}}$

=0.027+0.04+0.015+0.126
=0.208
< 1.0

For RSS-102:

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

$=S_{\text{WLAN Main Chain-2.4}}/S_{\text{limit- WLAN Main Chain-2.4}} + S_{\text{WLAN Aux Chain-2.4}}/S_{\text{limit- WLAN Aux Chain-2.4}} + S_{\text{long}}/S_{\text{limit-long}} + S_{\text{LTE Band 4}}/S_{\text{limit-LTE Band 4}}$

=0.051+0.074+0.027+0.283
=0.435
< 1.0

Result: Compliance, The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance ≥20 cm.

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 Bluetooth, the antenna gain is 3.0 dBi; one external antenna with RP-SMA connector for Long Range Hopping Transmitter, the antenna gain is 1.64dBi, all of them fulfill the requirement of this section. Please refer to the EUT photos.

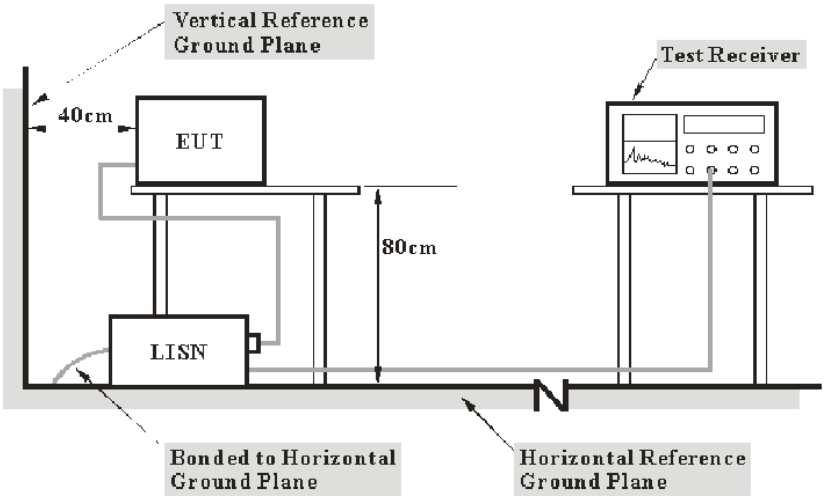
Result: Compliance.

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:

Margin = Limit – 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	2016-12-11	2017-12-11
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-09-25	2018-09-25
R&S	Two-line V-network	ENV 216	3560.6550.12	2016-12-08	2017-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	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).

Test Data

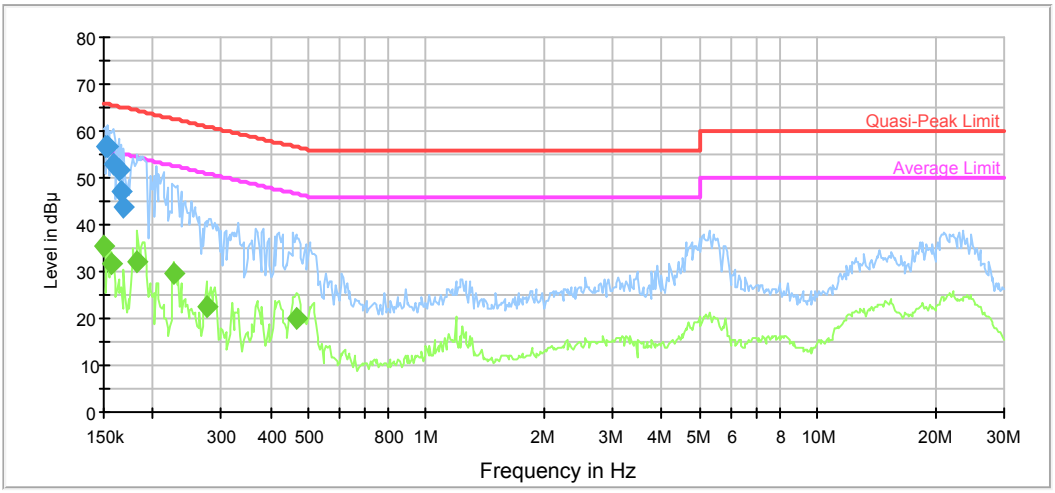
Environmental Conditions

Temperature:	24.8 °C
Relative Humidity:	40 %
ATM Pressure:	101.2 kPa

The testing was performed by Alex You on 2017-12-07.

Test Mode: *Transmitting(Long Range Hopping Transmitter with High channel+π/4-DQPSK high channel was the worst)*

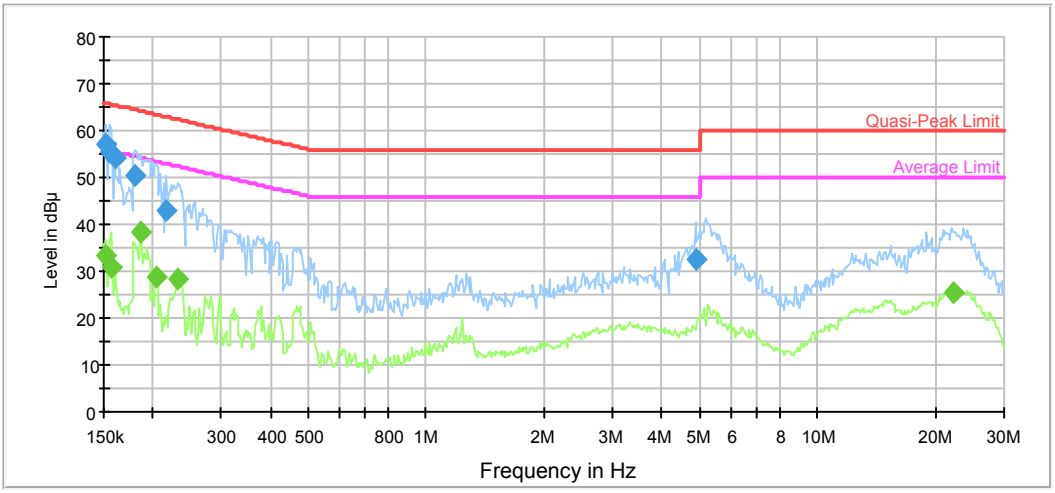
AC120V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	56.7	9.000	L1	11.2	9.2	65.9	Compliance
0.153629	56.6	9.000	L1	11.1	9.2	65.8	Compliance
0.158604	52.8	9.000	L1	11.1	12.7	65.5	Compliance
0.163741	51.7	9.000	L1	11.0	13.6	65.3	Compliance
0.166371	47.0	9.000	L1	11.0	18.1	65.1	Compliance
0.169044	43.7	9.000	L1	10.9	21.3	65.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	35.3	9.000	L1	11.2	20.7	56.0	Compliance
0.157346	31.7	9.000	L1	11.1	23.9	55.6	Compliance
0.183065	32.1	9.000	L1	10.8	22.2	54.3	Compliance
0.227007	29.7	9.000	L1	10.5	22.9	52.6	Compliance
0.274848	22.7	9.000	L1	10.2	28.3	51.0	Compliance
0.465037	20.1	9.000	L1	9.9	26.5	46.6	Compliance

AC120V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	57.2	9.000	N	11.1	8.7	65.9	Compliance
0.154858	55.4	9.000	N	11.1	10.3	65.7	Compliance
0.159873	54.3	9.000	N	11.0	11.2	65.5	Compliance
0.180171	50.3	9.000	N	10.8	14.2	64.5	Compliance
0.216409	42.9	9.000	N	10.5	20.1	63.0	Compliance
4.879149	32.5	9.000	N	9.8	23.5	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	33.5	9.000	N	11.1	22.4	55.9	Compliance
0.157346	30.8	9.000	N	11.1	24.8	55.6	Compliance
0.187494	38.3	9.000	N	10.7	15.8	54.1	Compliance
0.204669	28.6	9.000	N	10.6	24.8	53.4	Compliance
0.230654	28.2	9.000	N	10.4	24.2	52.4	Compliance
22.351451	25.5	9.000	N	10.1	24.5	50.0	Compliance

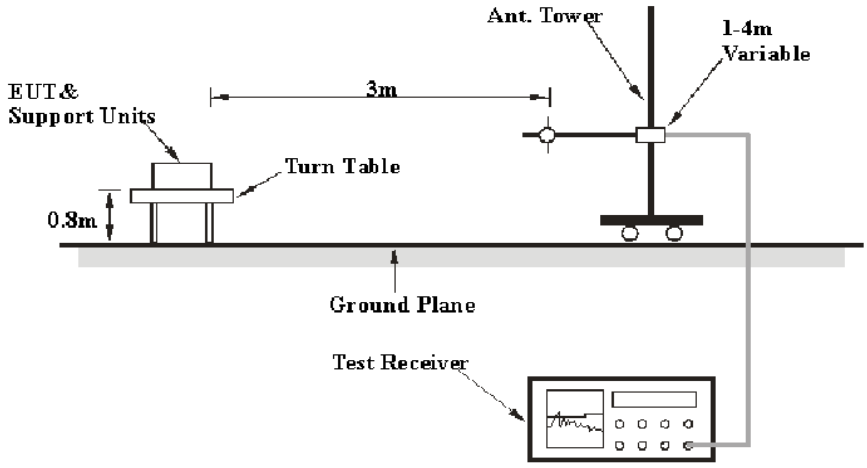
FCC §15.209, §15.205 & §15.247(d) & RSS-247 CLAUSE 5.5&RSS-GEN CLAUSE 8.10 - SPURIOUS EMISSIONS

Applicable Standard

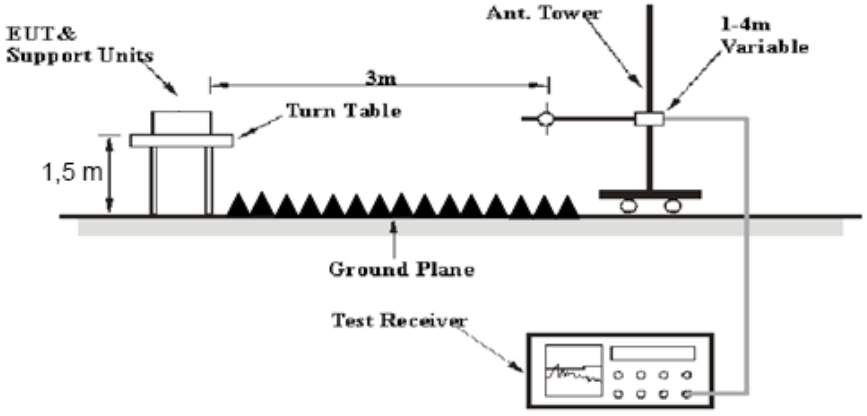
FCC §15.247 (d); §15.209; §15.205 and RSS-247 Clause 5.5, RSS-GEN Clause 8.10

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
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2018-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
R&S	Spectrum Analyzer	E4440A	SG43360054	2017-12-08	2018-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-02 1304	2016-11-18	2019-11-18
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Chengdu Ouli	Band Rejection Filter	2400-2483.5	002	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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

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

Margin = Limit – Corrected Amplitude

Test Data

Environmental Conditions

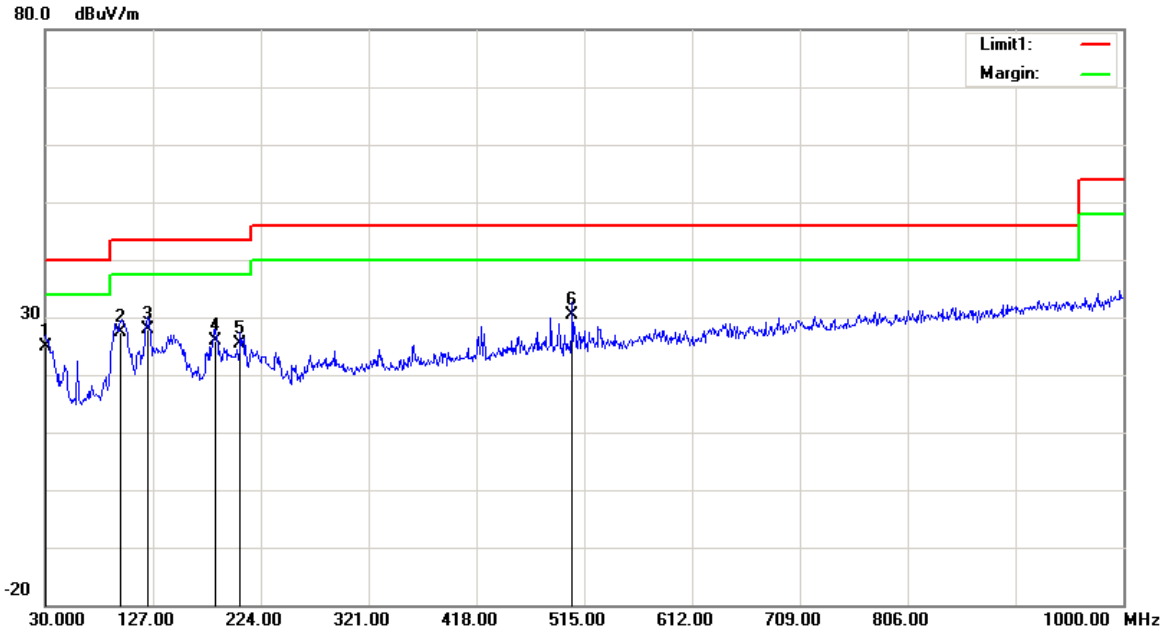
Temperature:	20.1~26.8 °C
Relative Humidity:	30.8~37 %
ATM Pressure:	102~102.2 kPa

** The testing was performed by Sunny Cen & Kakaxi Chen from 2017-12-15 to 2017-12-18.*

Test Mode: Transmitting

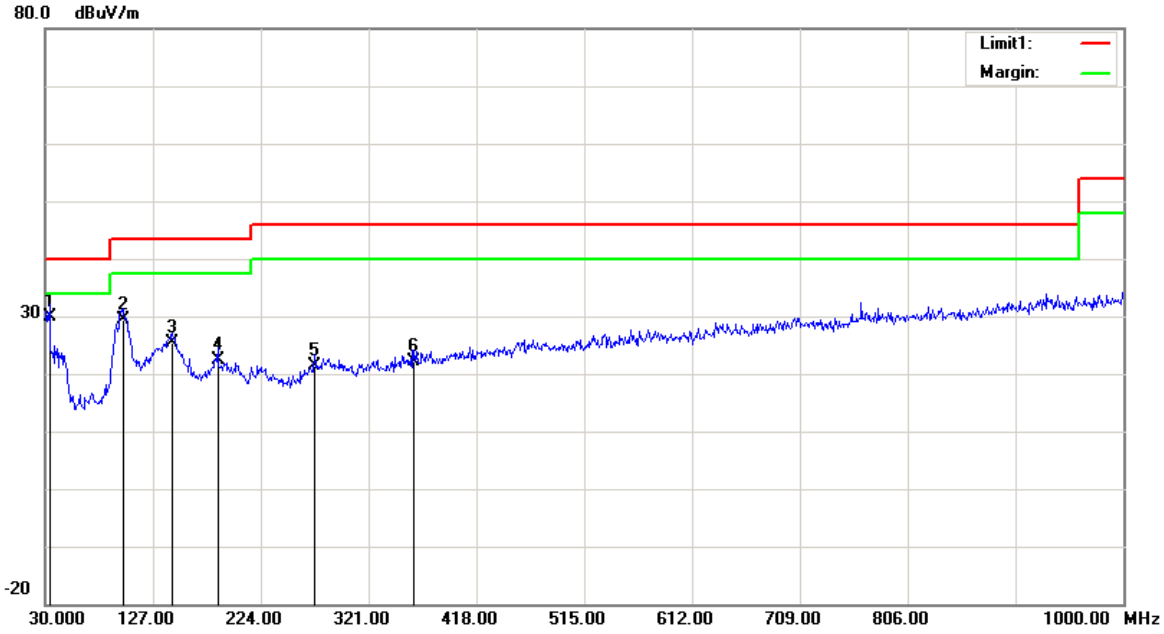
1) 30MHz-1GHz(*(Long Range Hopping Transmitter with High channel+π/4-DQPSK high channel was the worst)*

Horizontal:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.9700	24.45	QP	0.35	24.80	40.00	15.20
97.9000	36.32	QP	-9.02	27.30	43.50	16.20
122.1500	32.79	QP	-4.79	28.00	43.50	15.50
183.2600	33.81	QP	-8.01	25.80	43.50	17.70
205.5700	32.35	QP	-7.05	25.30	43.50	18.20
504.3300	31.21	QP	-0.91	30.30	46.00	15.70

Vertical:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
33.8800	31.85	QP	-1.85	30.00	40.00	10.00
99.8400	37.65	QP	-8.25	29.40	43.50	14.10
144.4600	31.80	QP	-6.40	25.40	43.50	18.10
185.2000	30.46	QP	-7.96	22.50	43.50	21.00
272.5000	25.13	QP	-3.83	21.30	46.00	24.70
361.7400	25.00	QP	-2.90	22.10	46.00	23.90

2)1GHz-25GHz:

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	66.38	PK	H	28.10	1.80	0.00	96.28	N/A	N/A
2402.00	56.13	AV	H	28.10	1.80	0.00	86.03	N/A	N/A
2402.00	65.34	PK	V	28.10	1.80	0.00	95.24	N/A	N/A
2402.00	55.06	AV	V	28.10	1.80	0.00	84.96	N/A	N/A
2390.00	24.57	PK	H	28.08	1.80	0.00	54.45	74.00	19.55
2390.00	13.42	AV	H	28.08	1.80	0.00	43.3	54.00	10.7
4804.00	48.26	PK	H	32.91	3.17	37.20	47.14	74.00	26.86
4804.00	34.74	AV	H	32.91	3.17	37.20	33.62	54.00	20.38
7206.00	47.46	PK	H	35.74	4.82	37.23	50.79	74.00	23.21
7206.00	33.52	AV	H	35.74	4.82	37.23	36.85	54.00	17.15
5918.50	45.52	PK	H	34.27	3.80	37.24	46.35	74.00	27.65
5918.50	33.68	AV	H	34.27	3.80	37.24	34.51	54.00	19.49
Middle Channel: 2441 MHz									
2441.00	67.39	PK	H	28.18	1.82	0.00	97.39	N/A	N/A
2441.00	57.28	AV	H	28.18	1.82	0.00	87.28	N/A	N/A
2441.00	65.76	PK	V	28.18	1.82	0.00	95.76	N/A	N/A
2441.00	55.43	AV	V	28.18	1.82	0.00	85.43	N/A	N/A
4882.00	48.15	PK	H	33.06	3.27	37.21	47.27	74.00	26.73
4882.00	34.29	AV	H	33.06	3.27	37.21	33.41	54.00	20.59
7323.00	47.44	PK	H	36.04	4.62	37.38	50.72	74.00	23.28
7323.00	33.58	AV	H	36.04	4.62	37.38	36.86	54.00	17.14
5899.00	46.47	PK	H	34.26	3.79	37.22	47.3	74.00	26.7
5899.00	33.45	AV	H	34.26	3.79	37.22	34.28	54.00	19.72
6125.00	46.58	PK	H	34.28	4.06	37.27	47.65	74.00	26.35
6125.00	33.34	AV	H	34.28	4.06	37.27	34.41	54.00	19.59
High Channel: 2480 MHz									
2480.00	67.57	PK	H	28.26	1.84	0.00	97.67	N/A	N/A
2480.00	57.13	AV	H	28.26	1.84	0.00	87.23	N/A	N/A
2480.00	65.83	PK	V	28.26	1.84	0.00	95.93	N/A	N/A
2480.00	55.49	AV	V	28.26	1.84	0.00	85.59	N/A	N/A
2483.50	25.73	PK	H	28.27	1.84	0.00	55.84	74.00	18.16
2483.50	13.64	AV	H	28.27	1.84	0.00	43.75	54.00	10.25
4960.00	48.42	PK	H	33.22	3.23	37.25	47.62	74.00	26.38
4960.00	34.85	AV	H	33.22	3.23	37.25	34.05	54.00	19.95
7440.00	47.74	PK	H	36.34	4.41	37.52	50.97	74.00	23.03
7440.00	33.53	AV	H	36.34	4.41	37.52	36.76	54.00	17.24
5985.00	46.49	PK	H	34.29	3.82	37.31	47.29	74.00	26.71
5985.00	33.37	AV	H	34.29	3.82	37.31	34.17	54.00	19.83

EDR Mode (π/4-DQPSK):

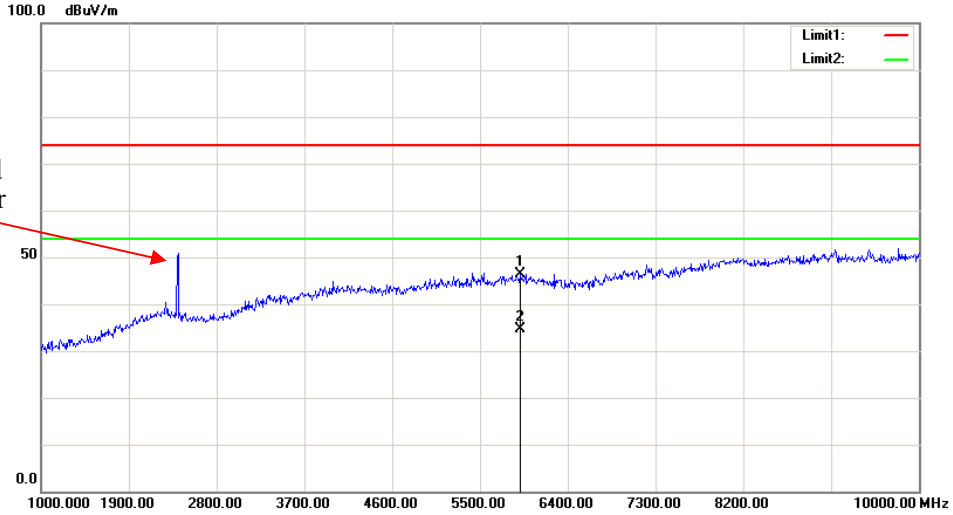
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	67.13	PK	H	28.10	1.80	0.00	97.03	N/A	N/A
2402.00	57.02	AV	H	28.10	1.80	0.00	86.92	N/A	N/A
2402.00	64.54	PK	V	28.10	1.80	0.00	94.44	N/A	N/A
2402.00	54.49	AV	V	28.10	1.80	0.00	84.39	N/A	N/A
2390.00	25.82	PK	H	28.08	1.80	0.00	55.7	74.00	18.3
2390.00	13.37	AV	H	28.08	1.80	0.00	43.25	54.00	10.75
4804.00	48.18	PK	H	32.91	3.17	37.20	47.06	74.00	26.94
4804.00	34.83	AV	H	32.91	3.17	37.20	33.71	54.00	20.29
7206.00	47.57	PK	H	35.74	4.82	37.23	50.9	74.00	23.1
7206.00	33.69	AV	H	35.74	4.82	37.23	37.02	54.00	16.98
5965.00	46.51	PK	H	34.29	3.82	37.29	47.33	74.00	26.67
5965.00	33.39	AV	H	34.29	3.82	37.29	34.21	54.00	19.79
Middle Channel: 2441 MHz									
2441.00	67.78	PK	H	28.18	1.82	0.00	97.78	N/A	N/A
2441.00	57.46	AV	H	28.18	1.82	0.00	87.46	N/A	N/A
2441.00	65.38	PK	V	28.18	1.82	0.00	95.38	N/A	N/A
2441.00	55.27	AV	V	28.18	1.82	0.00	85.27	N/A	N/A
4882.00	48.29	PK	H	33.06	3.27	37.21	47.41	74.00	26.59
4882.00	34.51	AV	H	33.06	3.27	37.21	33.63	54.00	20.37
7323.00	47.61	PK	H	36.04	4.62	37.38	50.89	74.00	23.11
7323.00	33.51	AV	H	36.04	4.62	37.38	36.79	54.00	17.21
5899.00	46.57	PK	H	34.26	3.79	37.22	47.4	74.00	26.6
5899.00	33.61	AV	H	34.26	3.79	37.22	34.44	54.00	19.56
6125.00	46.77	PK	H	34.28	4.06	37.27	47.84	74.00	26.16
6125.00	33.53	AV	H	34.28	4.06	37.27	34.6	54.00	19.4
High Channel: 2480 MHz									
2480.00	68.02	PK	H	28.26	1.84	0.00	98.12	N/A	N/A
2480.00	57.84	AV	H	28.26	1.84	0.00	87.94	N/A	N/A
2480.00	65.38	PK	V	28.26	1.84	0.00	95.48	N/A	N/A
2480.00	55.16	AV	V	28.26	1.84	0.00	85.26	N/A	N/A
2483.50	25.93	PK	H	28.27	1.84	0.00	56.04	74.00	17.96
2483.50	13.86	AV	H	28.27	1.84	0.00	43.97	54.00	10.03
4960.00	48.28	PK	H	33.22	3.23	37.25	47.48	74.00	26.52
4960.00	34.84	AV	H	33.22	3.23	37.25	34.04	54.00	19.96
7440.00	47.39	PK	H	36.34	4.41	37.52	50.62	74.00	23.38
7440.00	33.73	AV	H	36.34	4.41	37.52	36.96	54.00	17.04
5985.00	46.67	PK	H	34.29	3.82	37.31	47.47	74.00	26.53
5985.00	33.29	AV	H	34.29	3.82	37.31	34.09	54.00	19.91

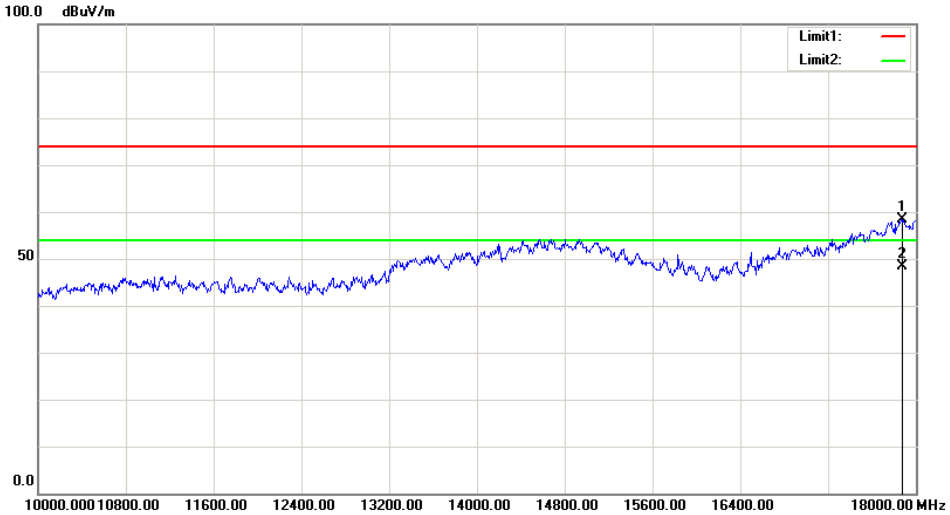
2EDR Mode (8-DPSK):

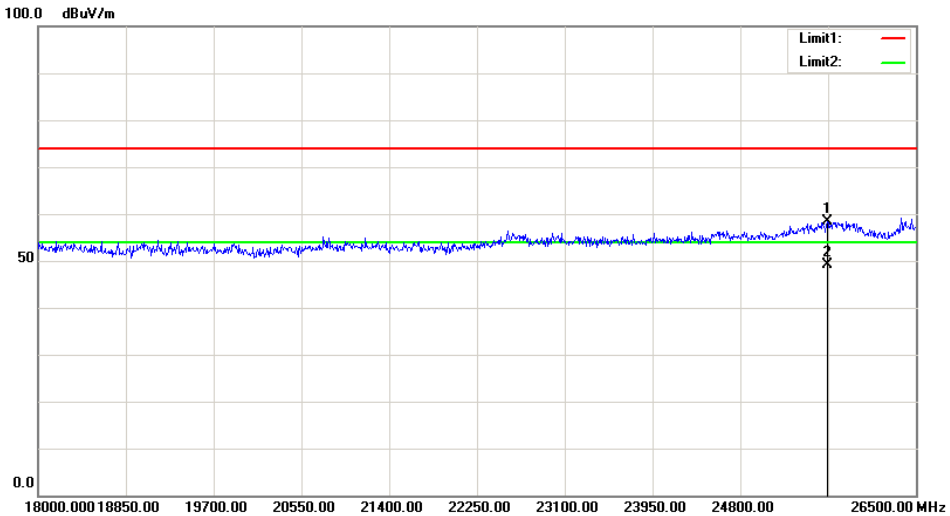
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	66.19	PK	H	28.10	1.80	0.00	96.09	N/A	N/A
2402.00	56.32	AV	H	28.10	1.80	0.00	86.22	N/A	N/A
2402.00	63.35	PK	V	28.10	1.80	0.00	93.25	N/A	N/A
2402.00	54.26	AV	V	28.10	1.80	0.00	84.16	N/A	N/A
2390.00	25.64	PK	H	28.08	1.80	0.00	55.52	74.00	18.48
2390.00	13.84	AV	H	28.08	1.80	0.00	43.72	54.00	10.28
4804.00	48.56	PK	H	32.91	3.17	37.20	47.44	74.00	26.56
4804.00	34.54	AV	H	32.91	3.17	37.20	33.42	54.00	20.58
7206.00	47.59	PK	H	35.74	4.82	37.23	50.92	74.00	23.08
7206.00	33.63	AV	H	35.74	4.82	37.23	36.96	54.00	17.04
5965.00	46.42	PK	H	34.29	3.82	37.29	47.24	74.00	26.76
5965.00	33.52	AV	H	34.29	3.82	37.29	34.34	54.00	19.66
Middle Channel: 2441 MHz									
2441.00	68.39	PK	H	28.18	1.82	0.00	98.39	N/A	N/A
2441.00	58.26	AV	H	28.18	1.82	0.00	88.26	N/A	N/A
2441.00	65.43	PK	V	28.18	1.82	0.00	95.43	N/A	N/A
2441.00	55.23	AV	V	28.18	1.82	0.00	85.23	N/A	N/A
4882.00	48.44	PK	H	33.06	3.27	37.21	47.56	74.00	26.44
4882.00	34.68	AV	H	33.06	3.27	37.21	33.8	54.00	20.2
7323.00	47.49	PK	H	36.04	4.62	37.38	50.77	74.00	23.23
7323.00	33.55	AV	H	36.04	4.62	37.38	36.83	54.00	17.17
5899.00	46.26	PK	H	34.26	3.79	37.22	47.09	74.00	26.91
5899.00	33.36	AV	H	34.26	3.79	37.22	34.19	54.00	19.81
6125.00	46.54	PK	H	34.28	4.06	37.27	47.61	74.00	26.39
6125.00	33.43	AV	H	34.28	4.06	37.27	34.5	54.00	19.5
High Channel: 2480 MHz									
2480.00	67.68	PK	H	28.26	1.84	0.00	97.78	N/A	N/A
2480.00	57.49	AV	H	28.26	1.84	0.00	87.59	N/A	N/A
2480.00	65.54	PK	V	28.26	1.84	0.00	95.64	N/A	N/A
2480.00	55.38	AV	V	28.26	1.84	0.00	85.48	N/A	N/A
2483.50	25.46	PK	H	28.27	1.84	0.00	55.57	74.00	18.43
2483.50	13.79	AV	H	28.27	1.84	0.00	43.9	54.00	10.1
4960.00	48.54	PK	H	33.22	3.23	37.25	47.74	74.00	26.26
4960.00	34.78	AV	H	33.22	3.23	37.25	33.98	54.00	20.02
7440.00	47.74	PK	H	36.34	4.41	37.52	50.97	74.00	23.03
7440.00	33.71	AV	H	36.34	4.41	37.52	36.94	54.00	17.06
5985.00	46.36	PK	H	34.29	3.82	37.31	47.16	74.00	26.84
5985.00	33.44	AV	H	34.29	3.82	37.31	34.24	54.00	19.76

Worst plots(*π/4-DQPSK* High channel)
Horizontal

Fundamental Test with Band Rejection Filter

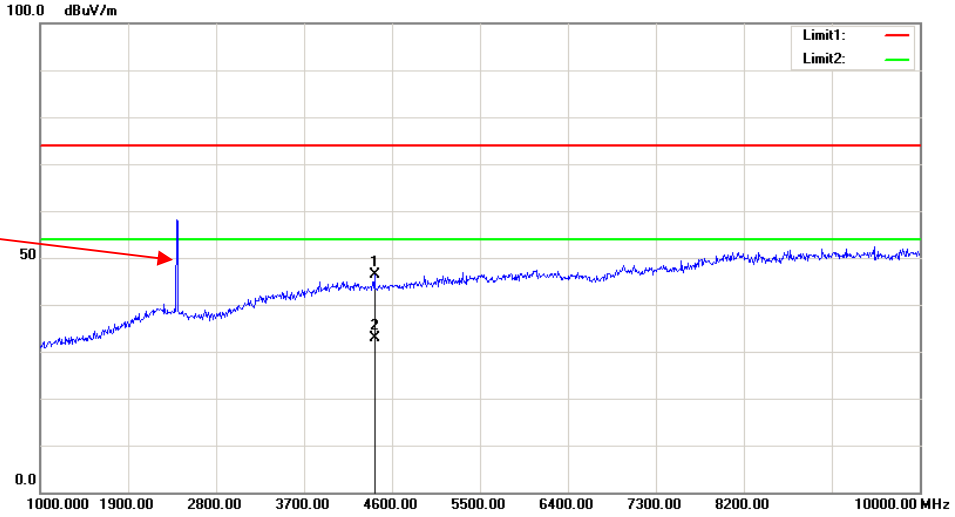


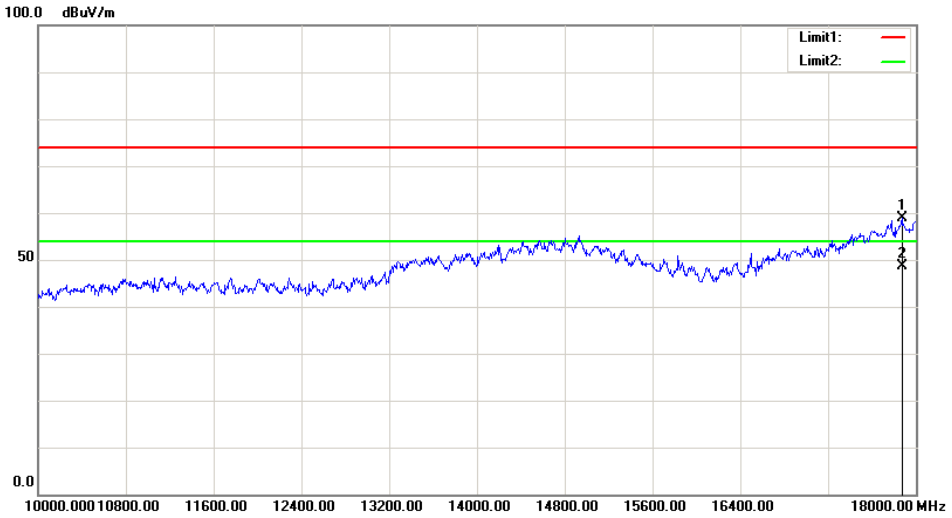


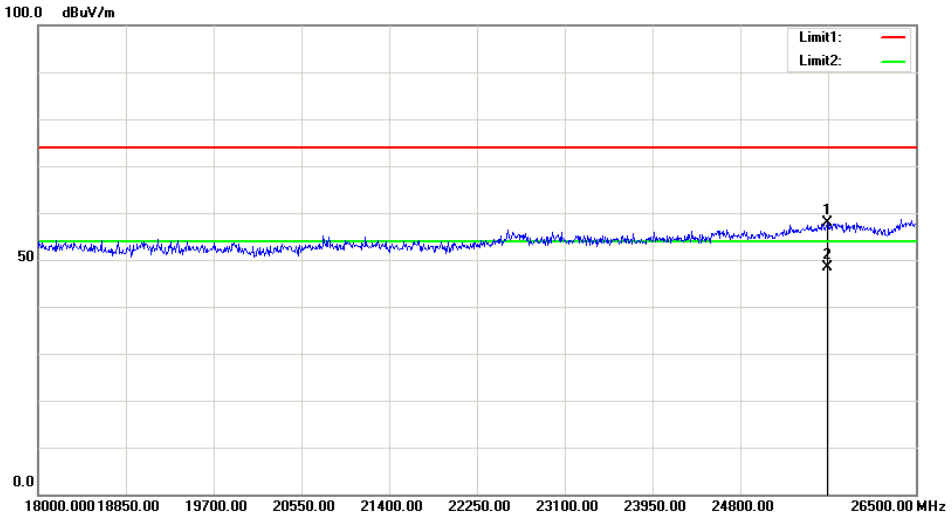


Vertical

Fundamental Test with Band Rejection Filter





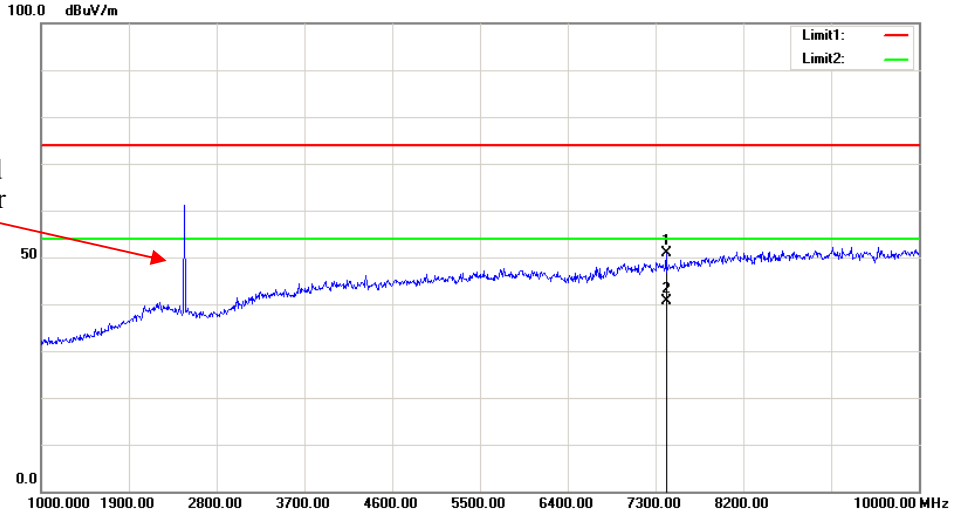


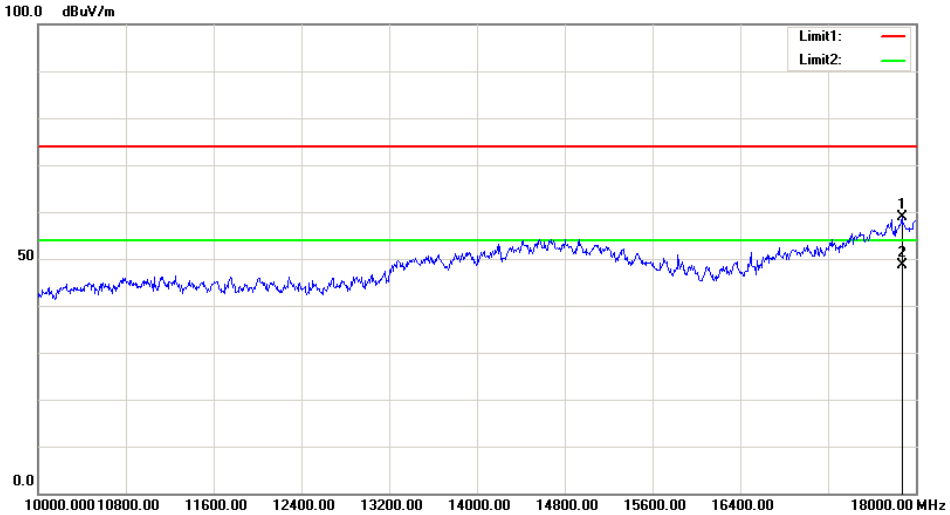
Long Range Hopping Transmitter:

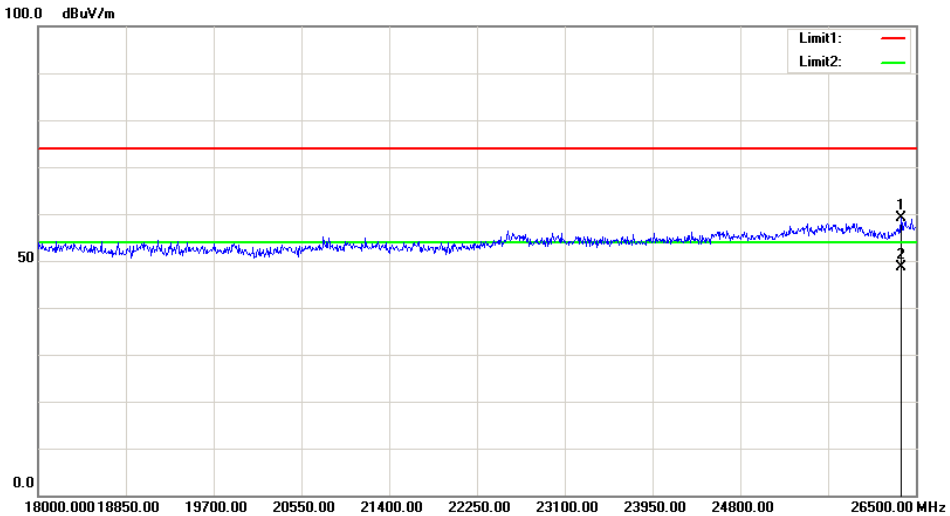
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB)					
Low Channel: 2401.683 MHz									
2401.683	74.32	PK	H	28.10	1.80	0.00	104.22	N/A	N/A
2401.683	73.54	AV	H	28.10	1.80	0.00	103.44	N/A	N/A
2401.683	79.65	PK	V	28.10	1.80	0.00	109.55	N/A	N/A
2401.683	78.70	AV	V	28.10	1.80	0.00	108.60	N/A	N/A
2390.000	29.80	PK	V	28.08	1.80	0.00	59.68	74.00	14.32
2390.000	13.32	AV	V	28.08	1.80	0.00	43.20	54.00	10.80
4803.366	47.22	PK	V	32.91	3.16	37.20	46.09	74.00	27.91
4803.366	35.69	AV	V	32.91	3.16	37.20	34.56	54.00	19.44
7205.049	54.24	PK	V	35.73	4.82	37.23	57.56	74.00	16.44
7205.049	47.35	AV	V	35.73	4.82	37.23	50.67	54.00	3.33
4659.000	46.54	PK	V	32.62	3.06	37.10	45.12	74.00	28.88
4659.000	35.71	AV	V	32.62	3.06	37.10	34.29	54.00	19.71
Middle Channel: 2435.771 MHz									
2435.771	75.42	PK	H	28.17	1.82	0.00	105.41	N/A	N/A
2435.771	74.61	AV	H	28.17	1.82	0.00	104.60	N/A	N/A
2435.771	81.64	PK	V	28.17	1.82	0.00	111.63	N/A	N/A
2435.771	80.01	AV	V	28.17	1.82	0.00	110.00	N/A	N/A
4871.542	46.87	PK	V	33.04	3.26	37.21	45.96	74.00	28.04
4871.542	35.49	AV	V	33.04	3.26	37.21	34.58	54.00	19.42
7307.313	55.46	PK	V	36.00	4.65	37.36	58.75	74.00	15.25
7307.313	47.86	AV	V	36.00	4.65	37.36	51.15	54.00	2.85
5123.000	46.85	PK	V	33.50	3.54	37.36	46.53	74.00	27.47
5123.000	36.57	AV	V	33.50	3.54	37.36	36.25	54.00	17.75
High Channel: 2470.788 MHz									
2470.788	74.37	PK	H	28.24	1.84	0.00	104.45	N/A	N/A
2470.788	73.54	AV	H	28.24	1.84	0.00	103.62	N/A	N/A
2470.788	83.22	PK	V	28.24	1.84	0.00	113.30	N/A	N/A
2470.788	81.71	AV	V	28.24	1.84	0.00	111.79	N/A	N/A
2483.500	26.75	PK	V	28.27	1.84	0.00	56.86	74.00	17.14
2483.500	13.91	AV	V	28.27	1.84	0.00	44.02	54.00	9.98
4941.576	46.59	PK	V	33.18	3.25	37.23	45.79	74.00	28.21
4941.576	35.79	AV	V	33.18	3.25	37.23	34.99	54.00	19.01
7412.364	57.68	PK	V	36.27	4.46	37.49	60.92	74.00	13.08
7412.364	50.45	AV	V	36.27	4.46	37.49	53.69	54.00	0.31
4566.000	46.69	PK	V	32.43	3.07	37.13	45.06	74.00	28.94
4566.000	35.58	AV	V	32.43	3.07	37.13	33.95	54.00	20.05

Worst plots(High channel)
Horizontal

Fundamental Test with Band Rejection Filter

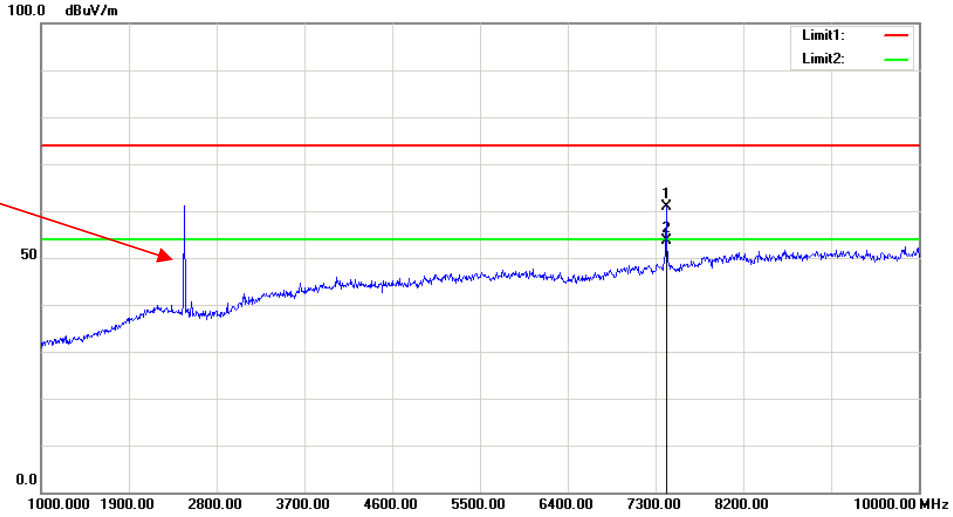


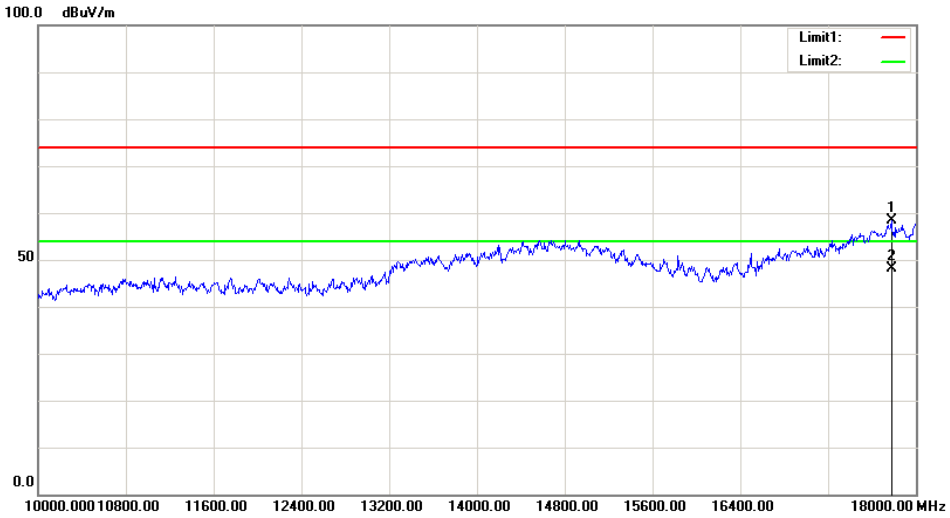


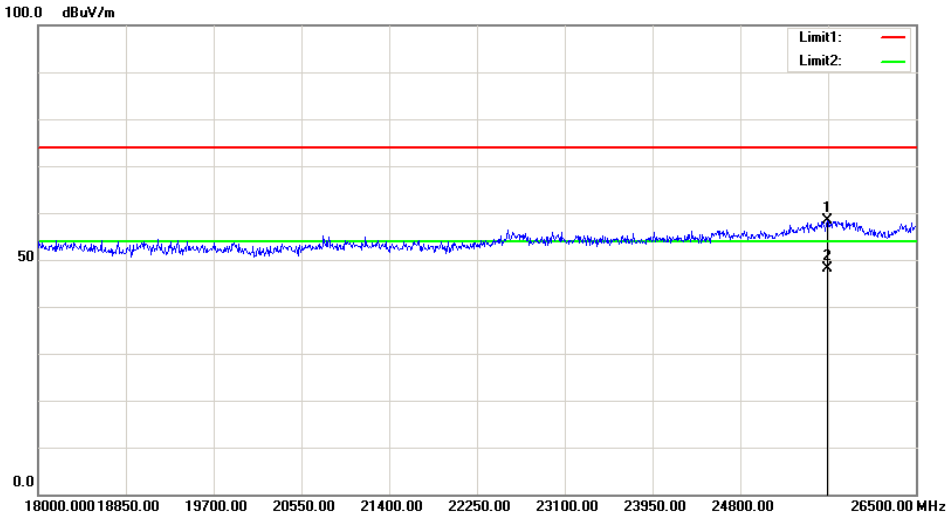


Vertical

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)&RSS-247 Clause 5.1 b)

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.5~25.5 °C
Relative Humidity:	32~49 %
ATM Pressure:	101.4~102.9 kPa

** The testing was performed by Andy Huang on 2017-12-04 and 2018-01-23.*

Test Result: Compliance.

Please refer to following tables and plots

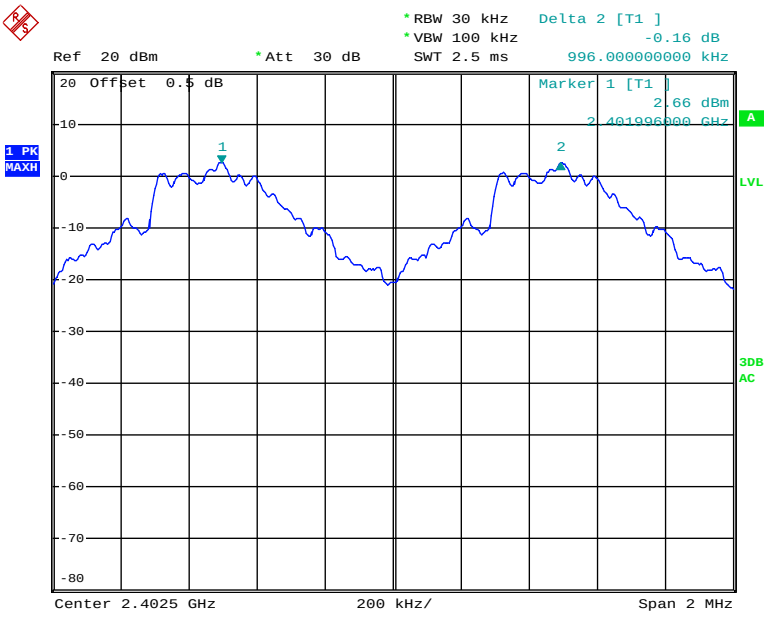
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
BDR (GFSK)	Low	2402	0.996	0.59
	Middle	2441	1.000	0.59
	High	2480	1.000	0.59
EDR (π/4-DQPSK)	Low	2402	1.000	0.85
	Middle	2441	1.004	0.84
	High	2480	1.004	0.85
EDR (8-DPSK)	Low	2402	1.004	0.81
	Middle	2441	1.000	0.81
	High	2480	1.004	0.81

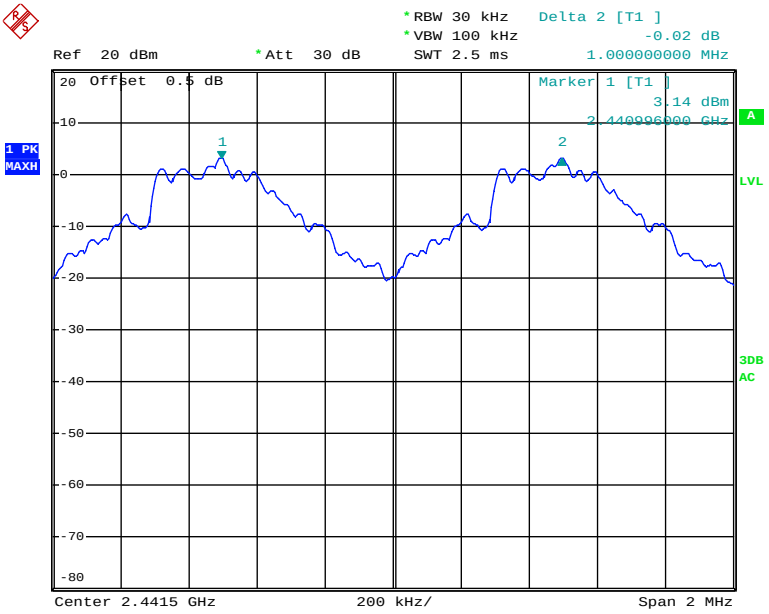
Note: Limit= (2/3) × 20dB bandwidth

BDR Mode (GFSK):

Low Channel

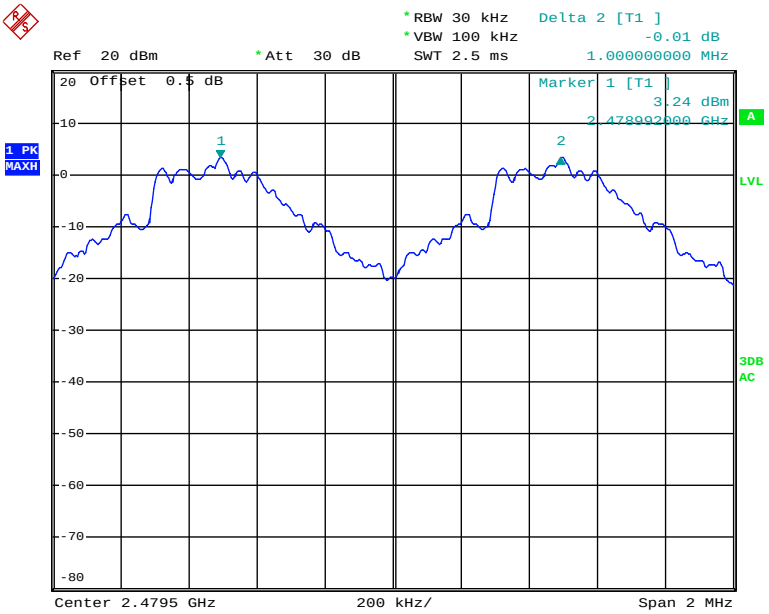


Middle Channel



Date: 4.DEC.2017 21:34:46

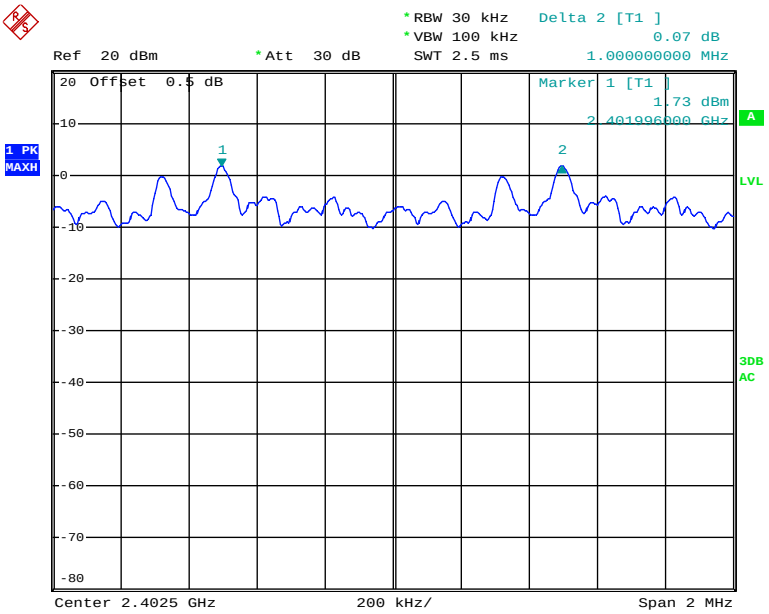
High Channel



Date: 4.DEC.2017 21:38:15

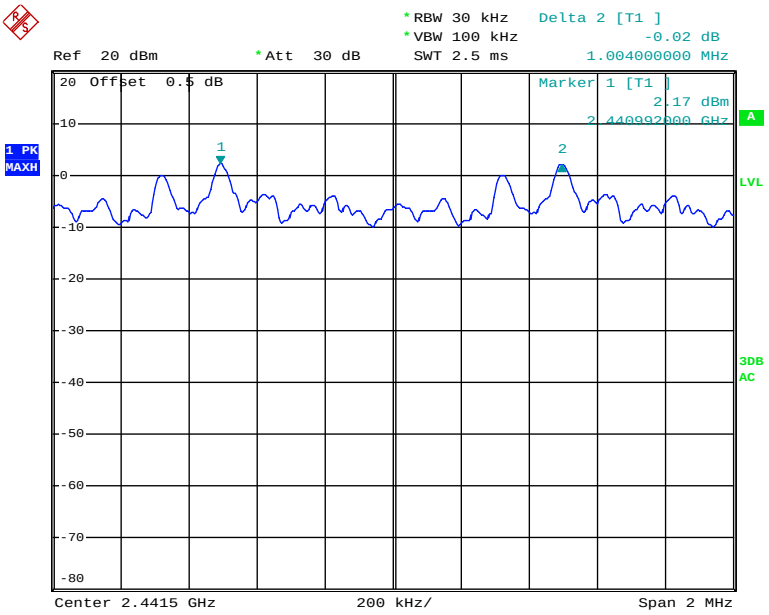
EDR Mode (π/4-DQPSK):

Low Channel



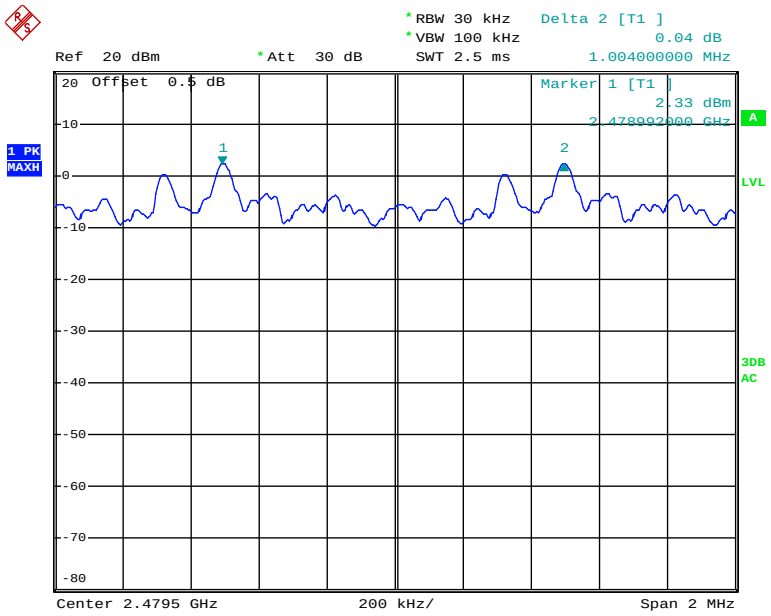
Date: 4.DEC.2017 21:44:55

Middle Channel



Date: 4.DEC.2017 21:43:08

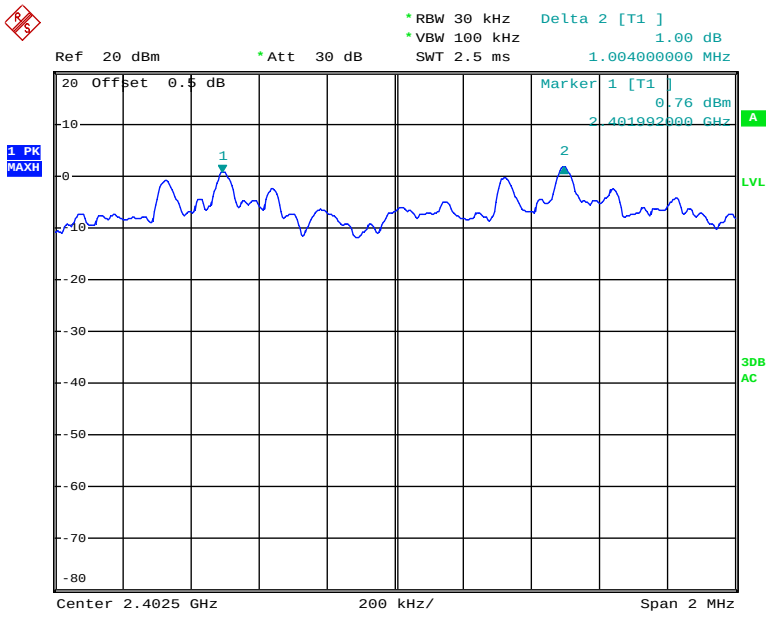
High Channel



Date: 4.DEC.2017 21:41:34

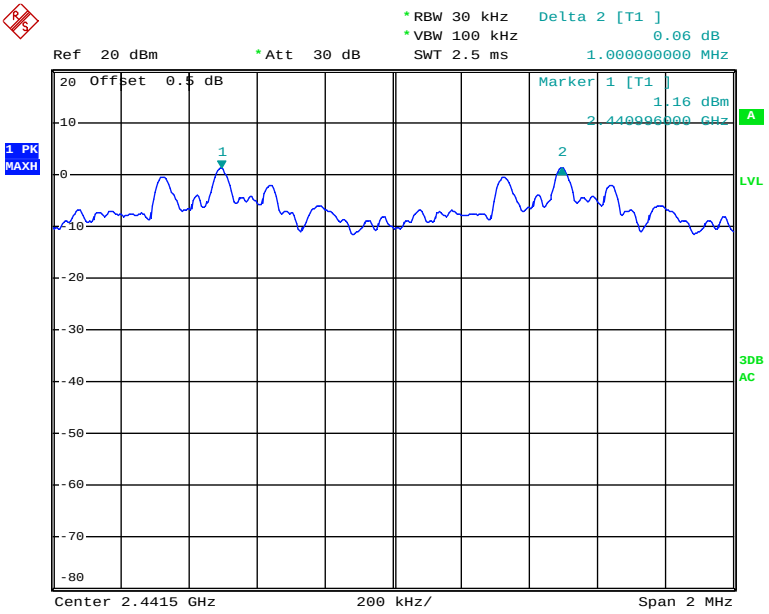
EDR Mode (8-DPSK):

Low Channel



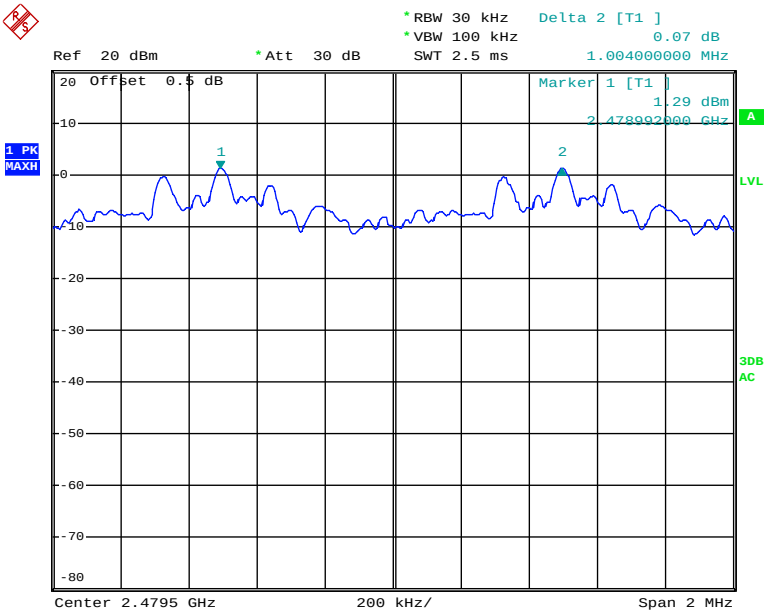
Date: 4.DEC.2017 21:46:32

Middle Channel



Date: 4.DEC.2017 21:55:26

High Channel

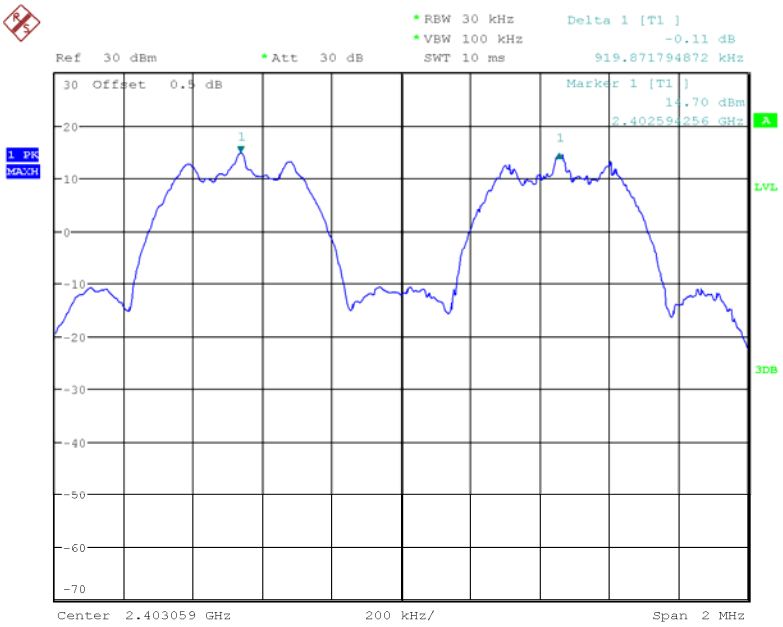


Date: 4.DEC.2017 21:57:08

Long Range Hopping Transmitter:

Test Frequency (MHz)	Adjacent Channel (MHz)	Channel Separation Result (MHz)	Limit (MHz)
2402.607	2403.525	0.92	0.38

Low Channel



FCC §15.247(a) (1) & RSS-247 CLUASE 5.1&RSS-GEN CLAUSE 6.6 – 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 Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.5~25.5 °C
Relative Humidity:	32 %
ATM Pressure:	101.4~102.9 kPa

** The testing was performed by Andy Huang on 2017-12-04 and 2018-01-23.*

Test Result: Compliance.

Please refer to following tables and plots

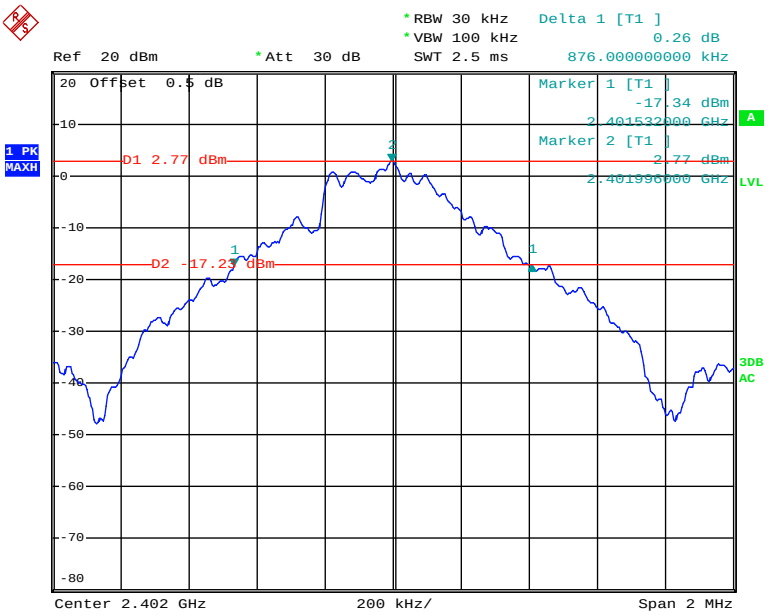
Test Mode: Transmitting for BT3.0

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% occupied Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.88	0.86
	Middle	2441	0.88	0.86
	High	2480	0.88	0.85
EDR Mode (π/4-DQPSK)	Low	2402	1.27	1.17
	Middle	2441	1.26	1.18
	High	2480	1.27	1.17
EDR Mode (8-DPSK)	Low	2402	1.22	1.15
	Middle	2441	1.22	1.15
	High	2480	1.22	1.15
Long Range Hopping Transmitter	Low	2401.683	0.574	0.526
	Middle	2435.771	0.567	0.535
	High	2470.788	0.571	0.545

20dB Bandwidth:

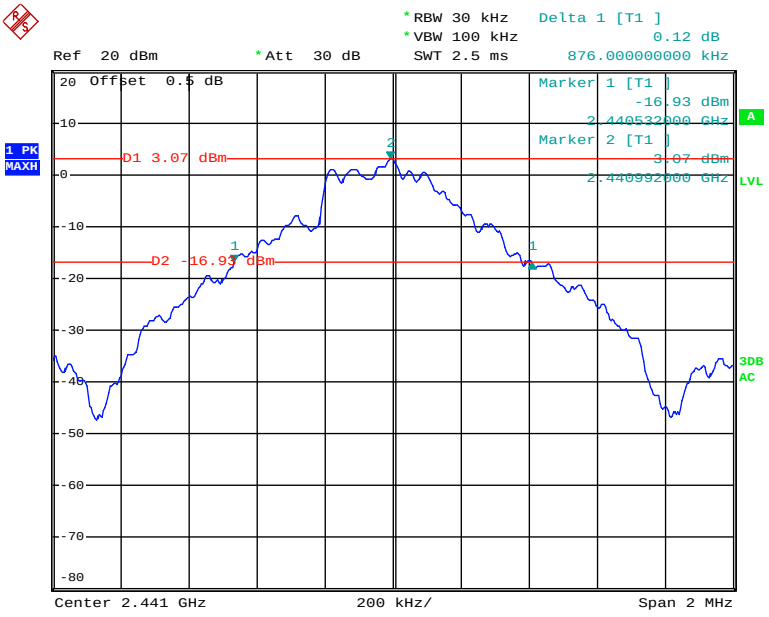
BDR Mode (GFSK):

Low Channel



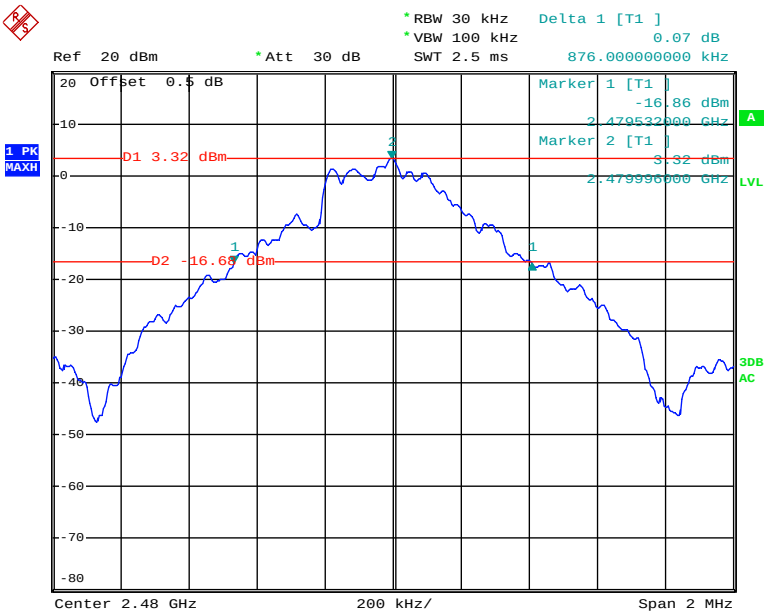
Date: 4.DEC.2017 19:47:57

Middle Channel



Date: 4.DEC.2017 20:08:43

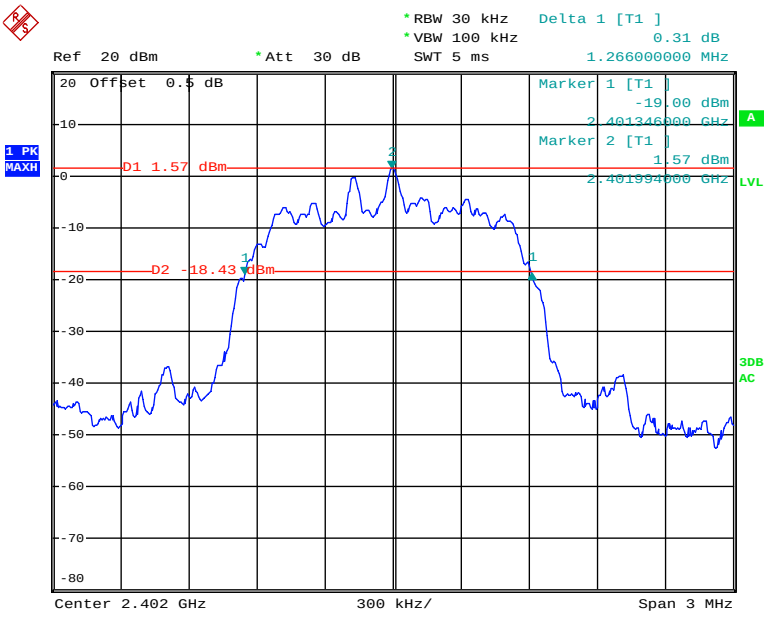
High Channel



Date: 4.DEC.2017 20:09:56

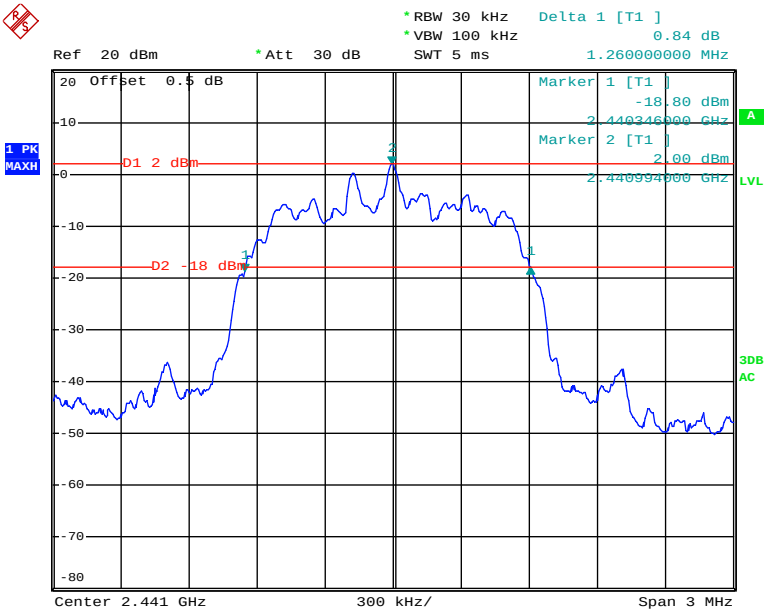
EDR Mode (π/4-DQPSK):

Low Channel



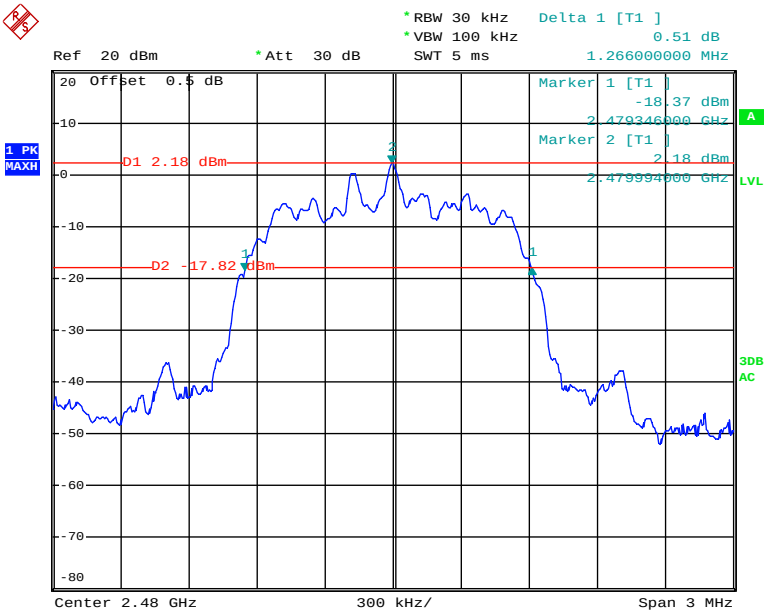
Date: 4.DEC.2017 20:12:12

Middle Channel



Date: 4.DEC.2017 20:13:35

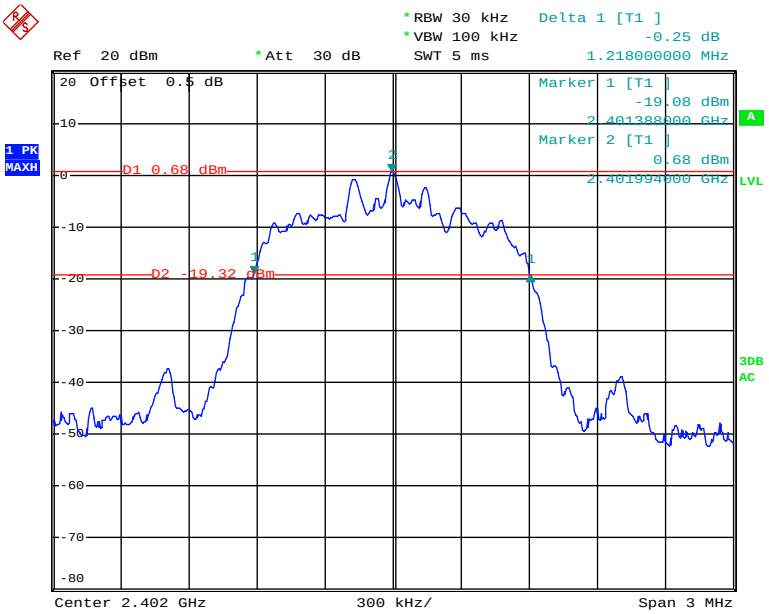
High Channel



Date: 4.DEC.2017 20:15:08

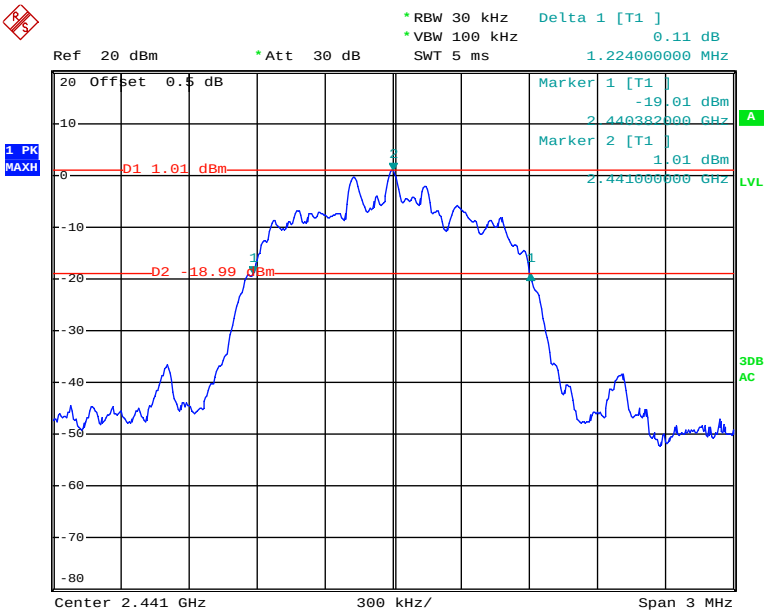
EDR Mode (8-DPSK):

Low Channel



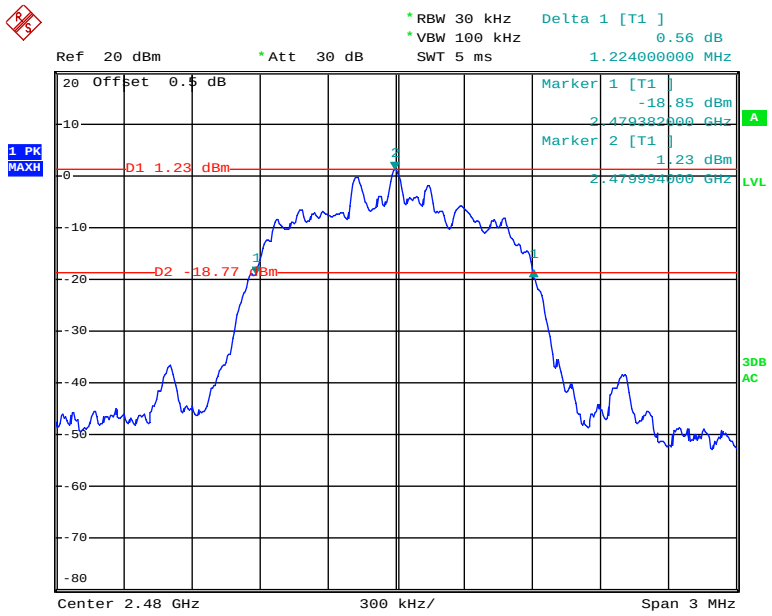
Date: 4.DEC.2017 20:17:20

Middle Channel



Date: 4.DEC.2017 20:18:41

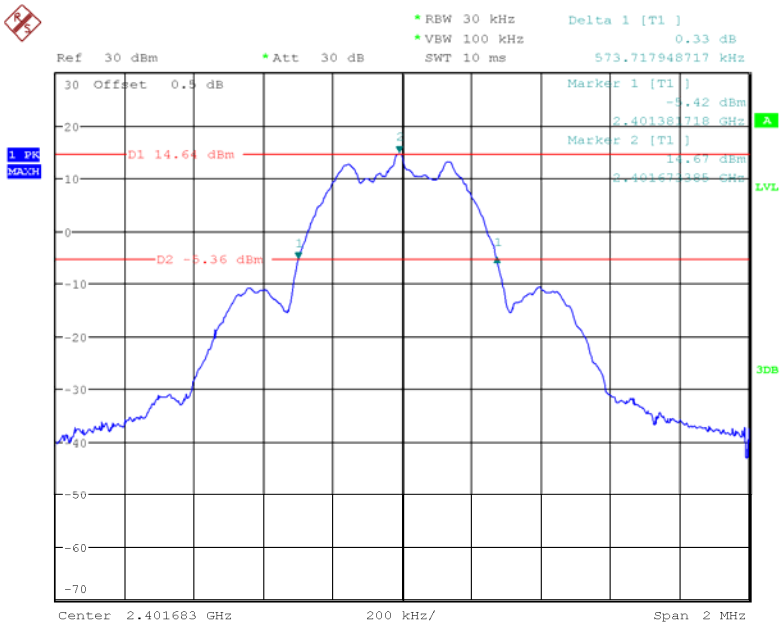
High Channel



Date: 4.DEC.2017 20:19:48

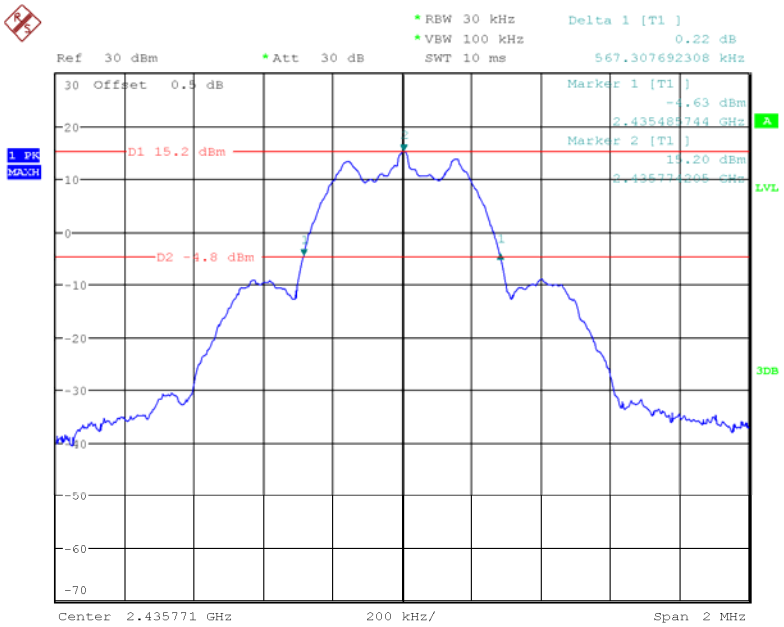
Long Range Hopping Transmitter:

Low Channel



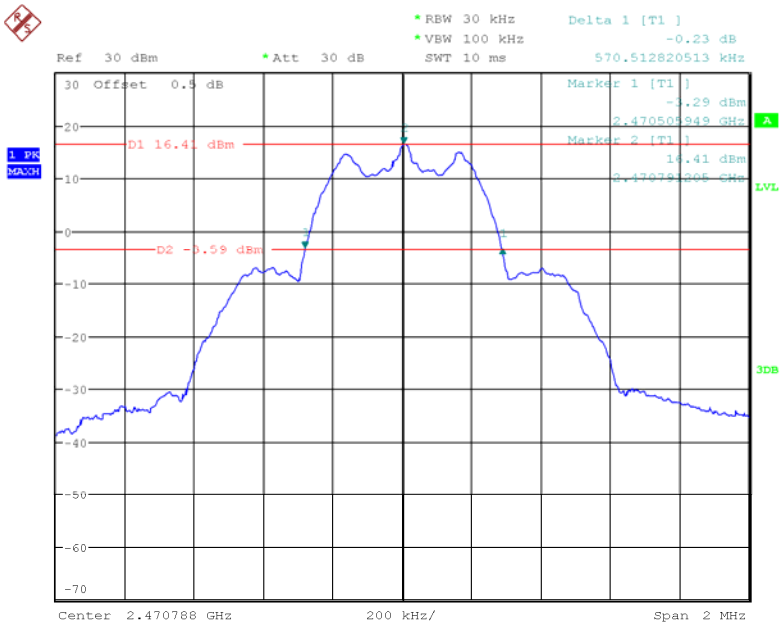
Date: 23.JAN.2018 17:34:35

Middle Channel



Date: 23.JAN.2018 17:31:50

High Channel

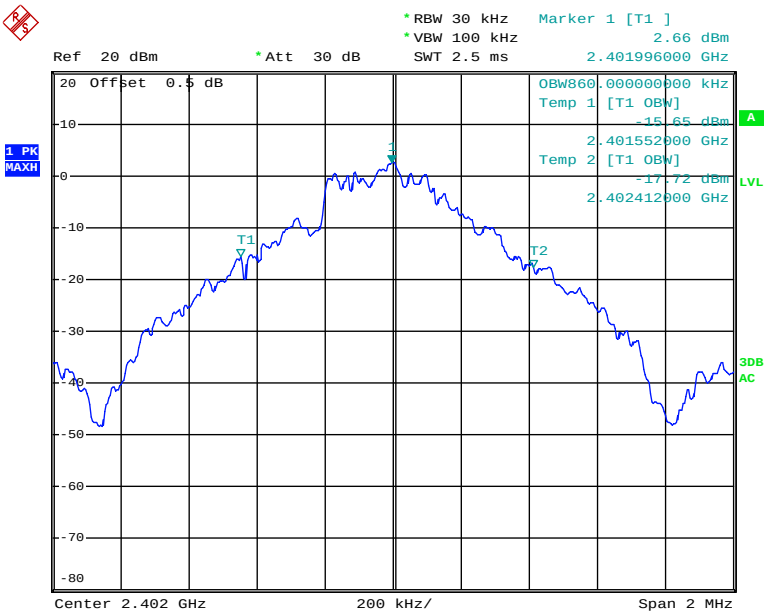


Date: 23.JAN.2018 17:30:50

99% Occupied Bandwidth:

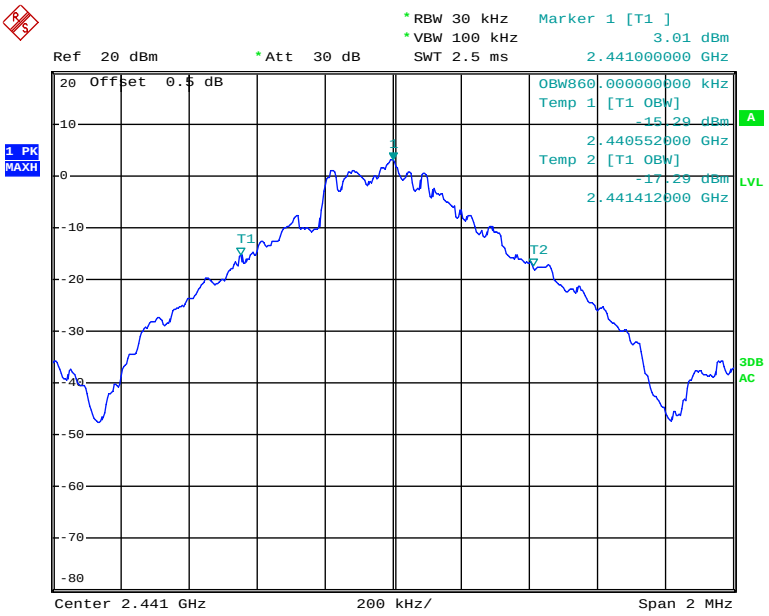
BDR Mode (GFSK):

Low Channel



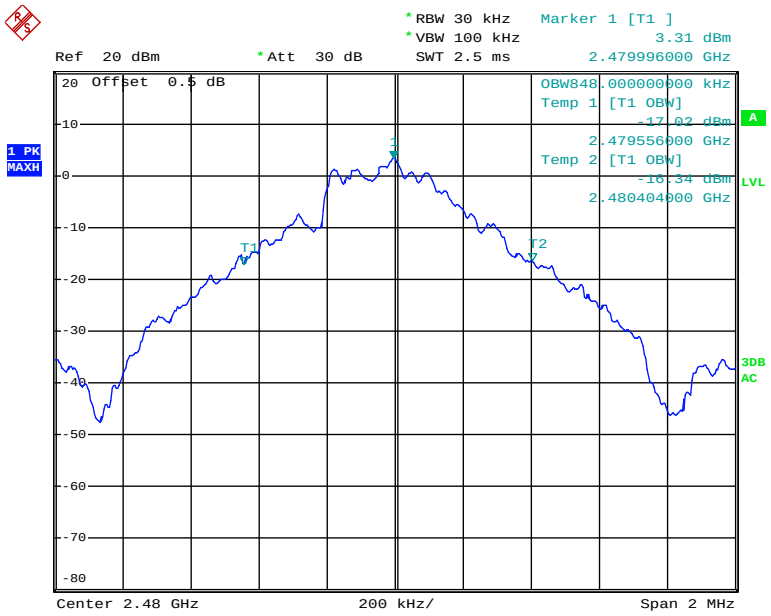
Date: 4.DEC.2017 19:48:07

Middle Channel



Date: 4.DEC.2017 20:08:53

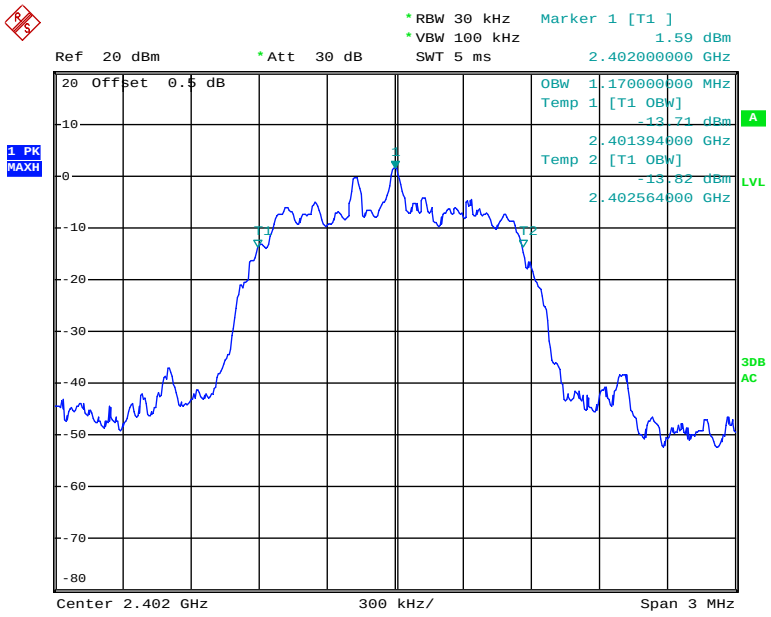
High Channel



Date: 4.DEC.2017 20:10:08

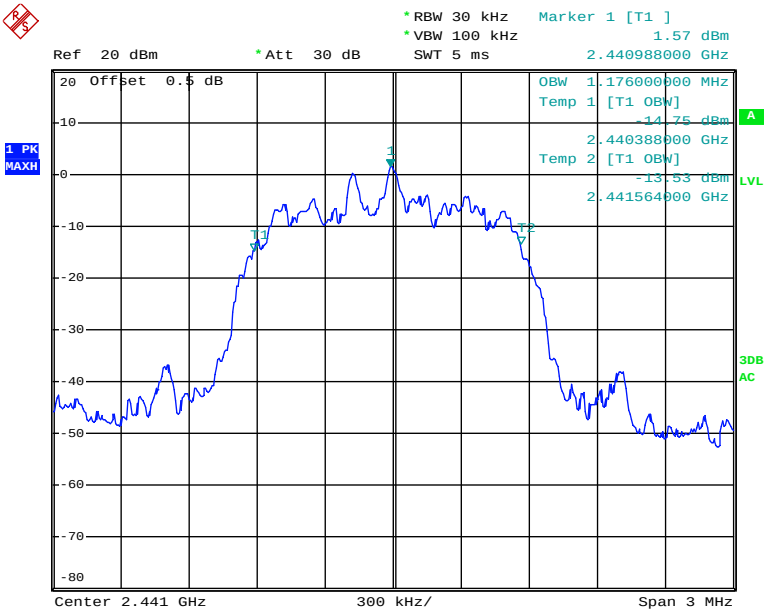
EDR Mode (π/4-DQPSK):

Low Channel



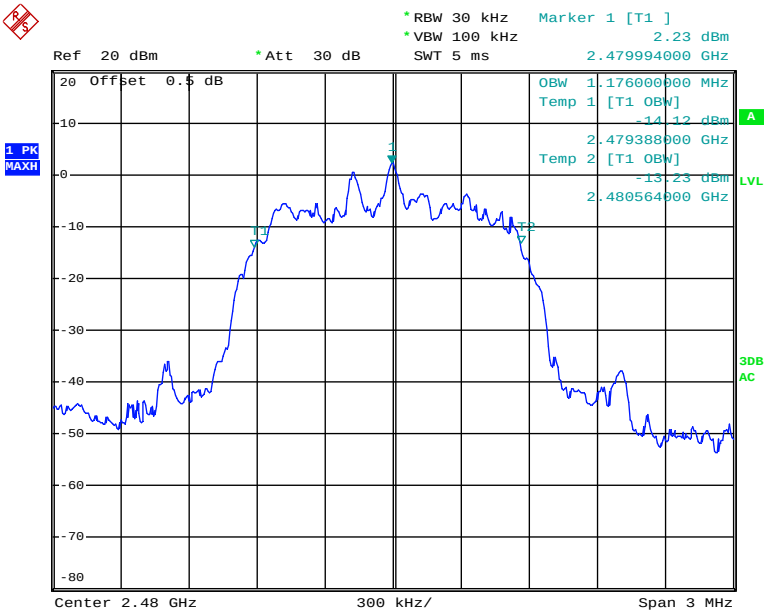
Date: 4.DEC.2017 20:12:23

Middle Channel



Date: 4.DEC.2017 20:13:44

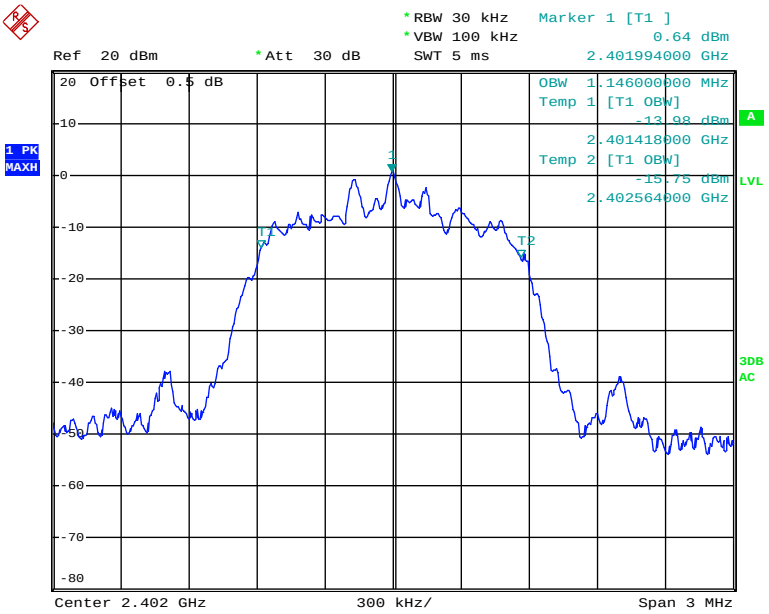
High Channel



Date: 4.DEC.2017 20:15:18

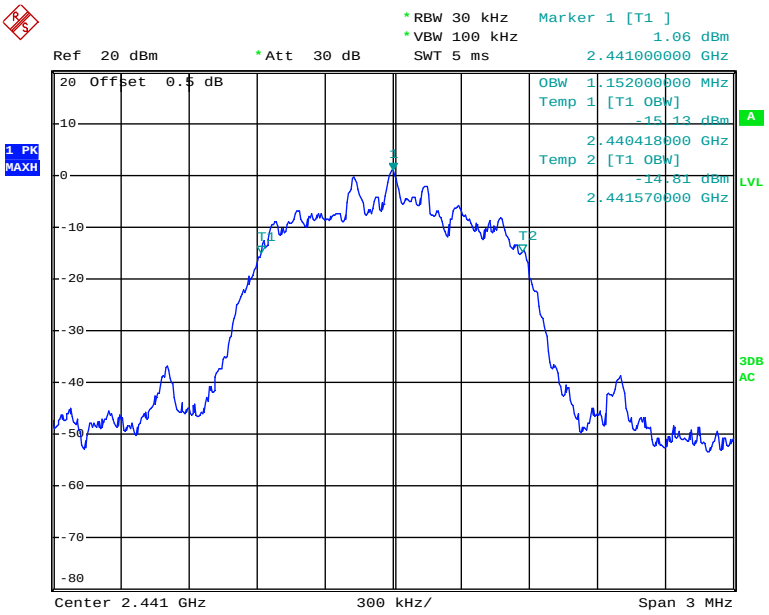
EDR Mode (8-DPSK):

Low Channel



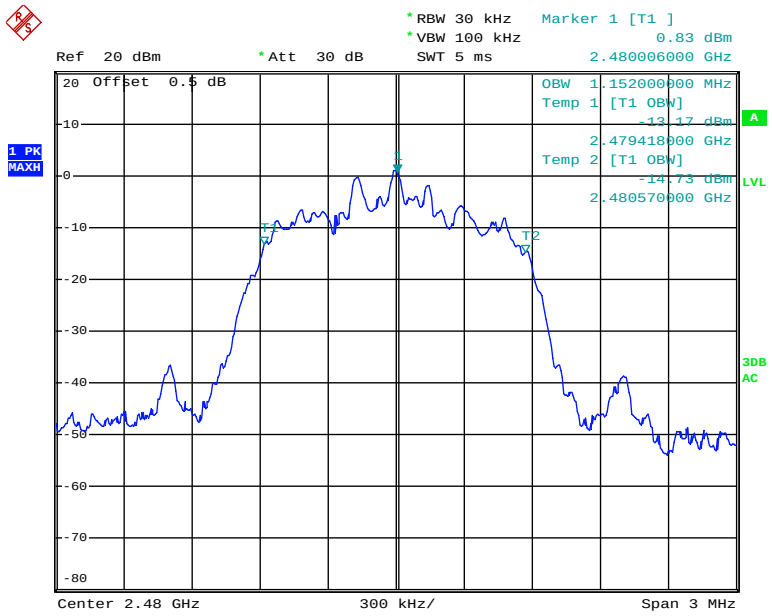
Date: 4.DEC.2017 20:17:31

Middle Channel



Date: 4.DEC.2017 20:18:50

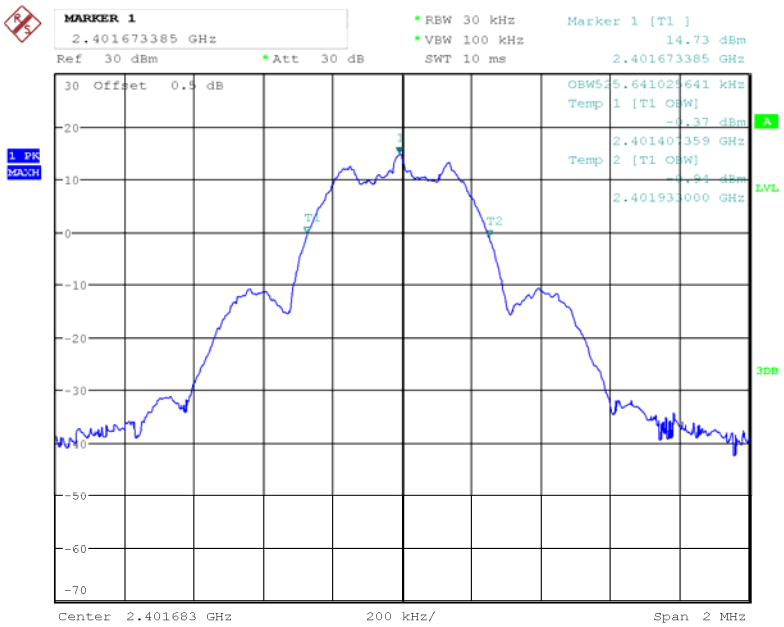
High Channel



Date: 4.DEC.2017 20:19:59

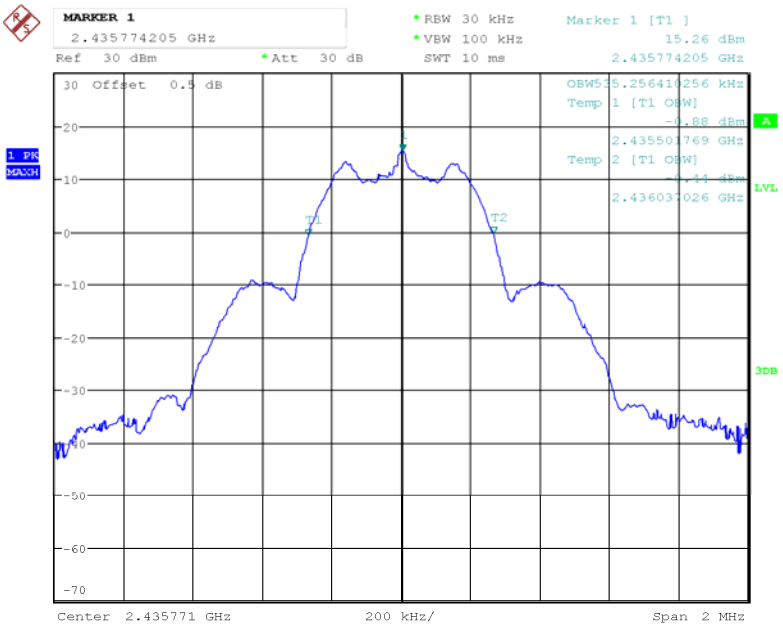
Long Range Hopping Transmitter:

Low Channel



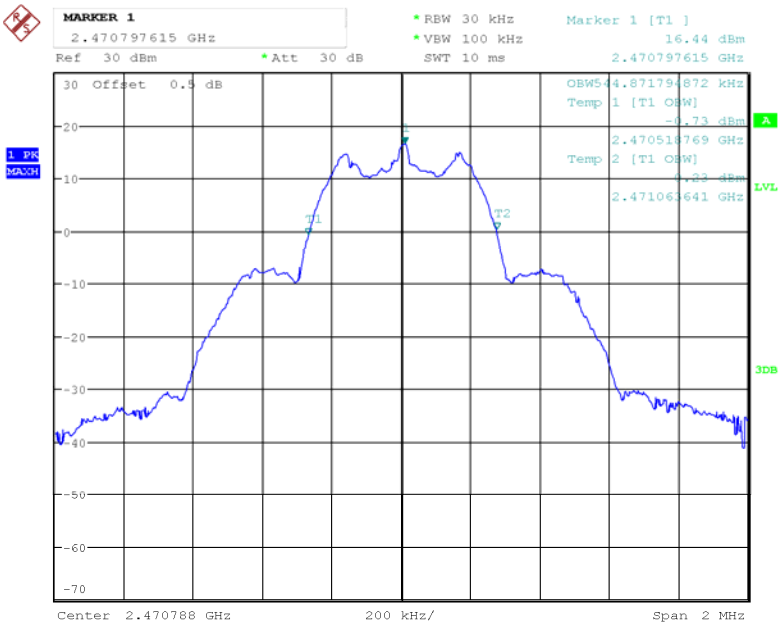
Date: 23.JAN.2018 17:32:50

Middle Channel



Date: 23.JAN.2018 17:32:09

High Channel



Date: 23.JAN.2018 17:29:46

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) &RSS-247 Clause 5.1 d)

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.5~25.5 °C
Relative Humidity:	32~49 %
ATM Pressure:	101.4~102.9 kPa

** The testing was performed by Andy Huang on 2017-12-04 and 2017-12-20.*

Test Result: Compliance.

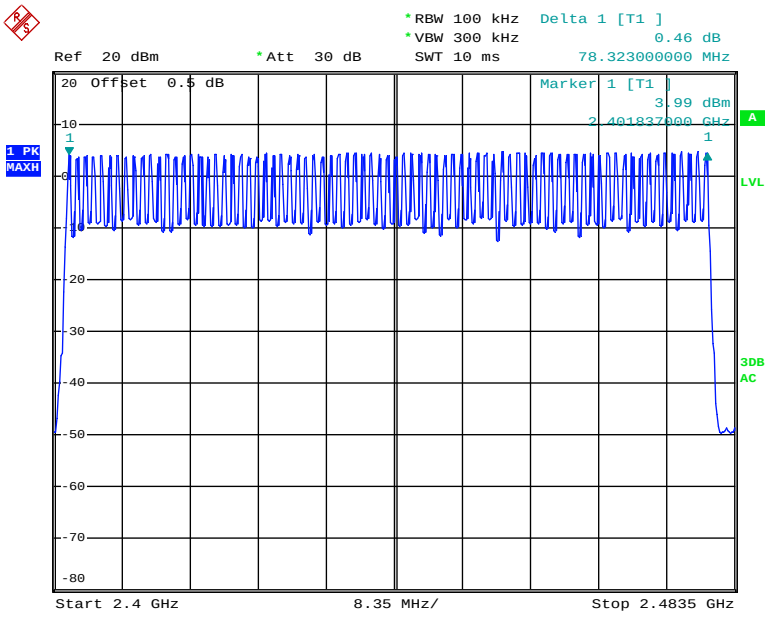
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

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

Number of Hopping Channels

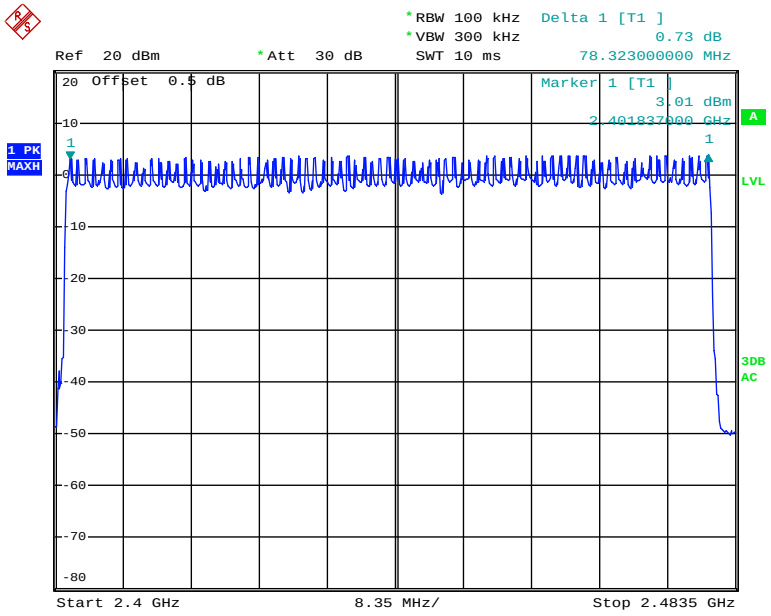


Date: 4.DEC.2017 20:50:46

EDR Mode (π/4-DQPSK):

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

Number of Hopping Channels

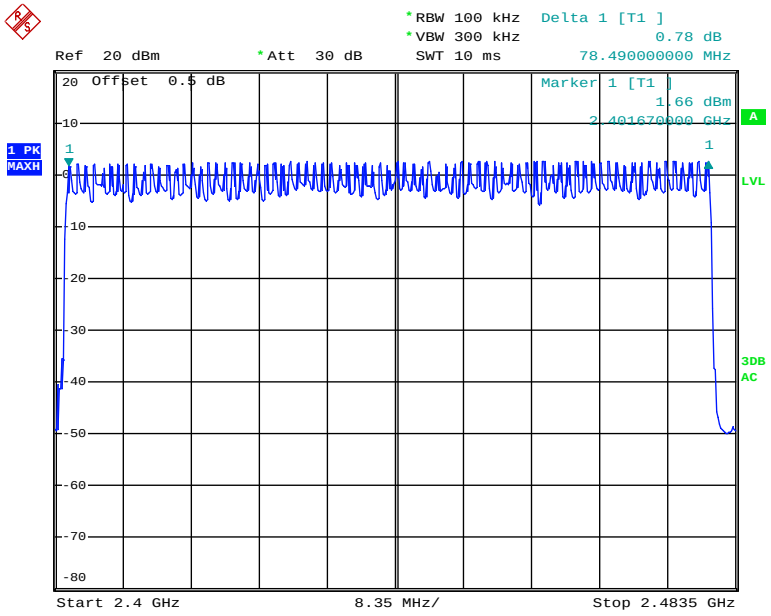


Date: 4.DEC.2017 21:05:17

EDR Mode (8-DPSK):

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

Number of Hopping Channels

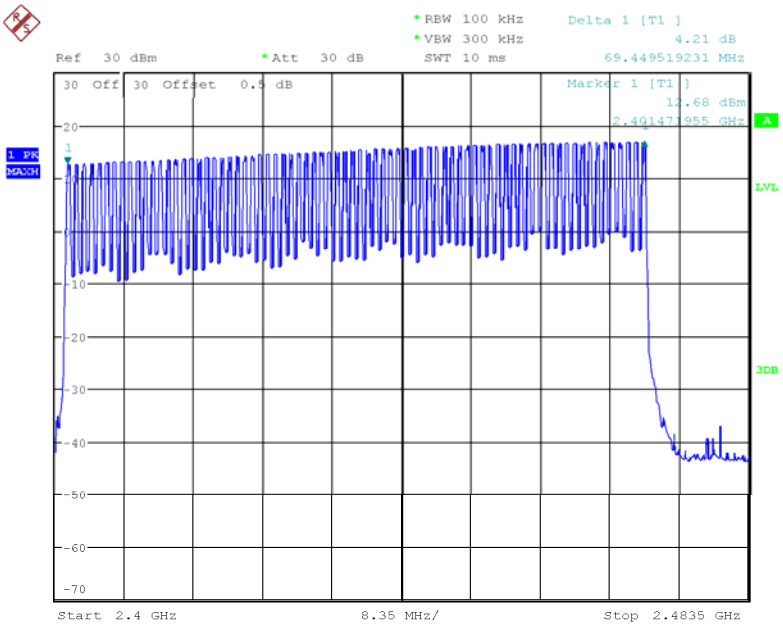


Date: 4.DEC.2017 21:09:01

Long Range Hopping Transmitter:

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	75	≥15

Number of Hopping Channels



Date: 20.DEC.2017 14:02:07

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

Applicable Standard

According to FCC §15.247(a) (1) (iii) & RSS-247 Clause 5.1 d)

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

Test Procedure

The EUT was worked in channel hopping; 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 Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.5~25.5 °C
Relative Humidity:	32~49 %
ATM Pressure:	102.9~101.4 kPa

** The testing was performed by Andy Huang on 2017-12-04 and 2018-01-23.*

Test Result: Compliance.

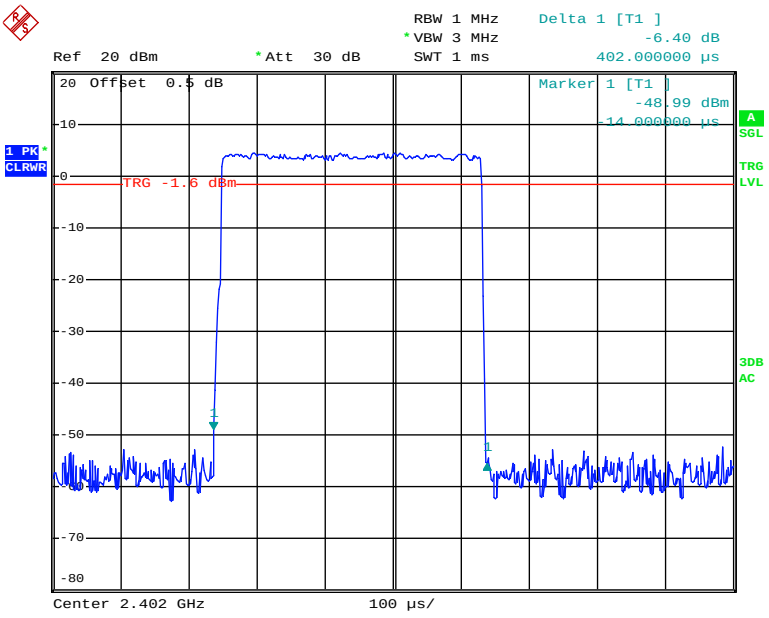
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

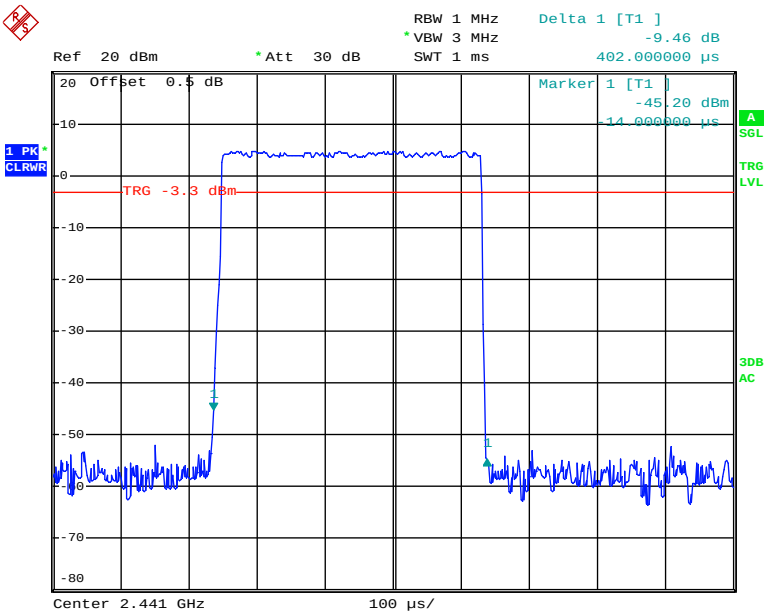
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.402	0.129	0.4	Compliance
	Middle	0.402	0.129	0.4	Compliance
	High	0.402	0.129	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.668	0.267	0.4	Compliance
	Middle	1.668	0.267	0.4	Compliance
	High	1.674	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.920	0.311	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) × (1600/6/79) ×31.6 s				

DH1: Low Channel



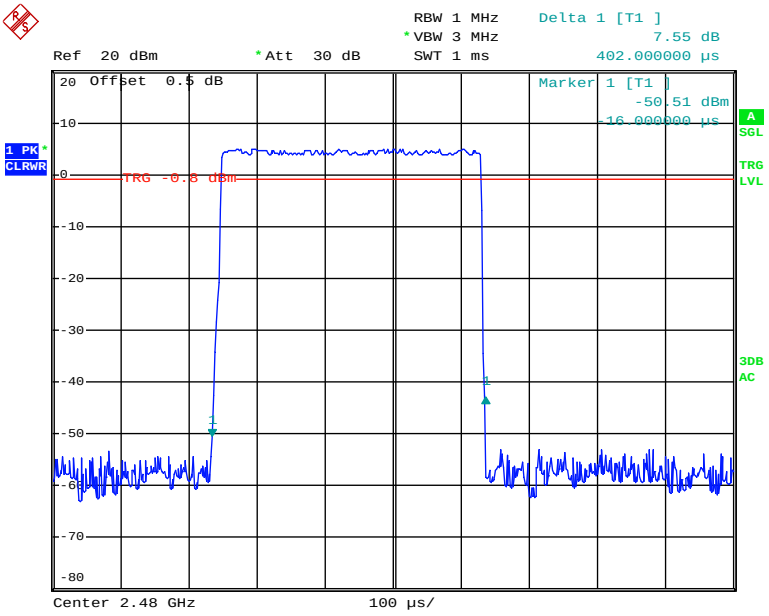
Date: 4.DEC.2017 20:27:30

DH1: Middle Channel



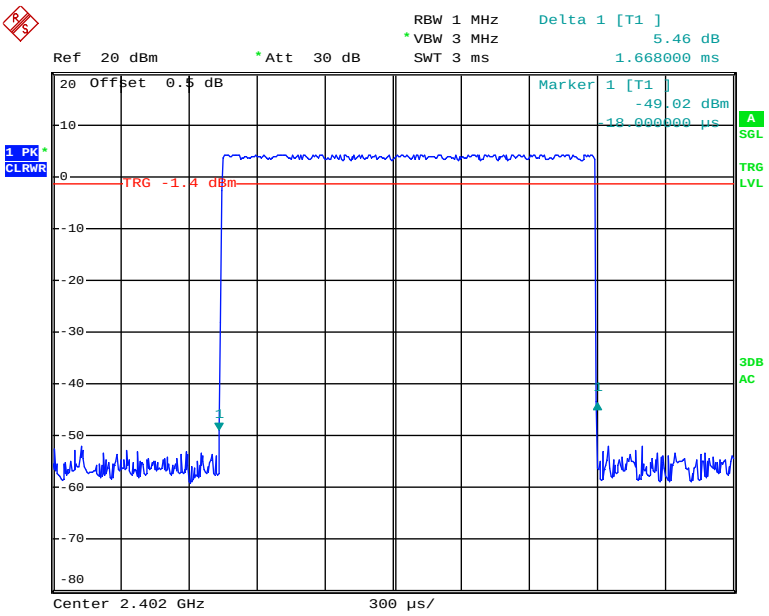
Date: 4.DEC.2017 20:27:36

DH1: High Channel



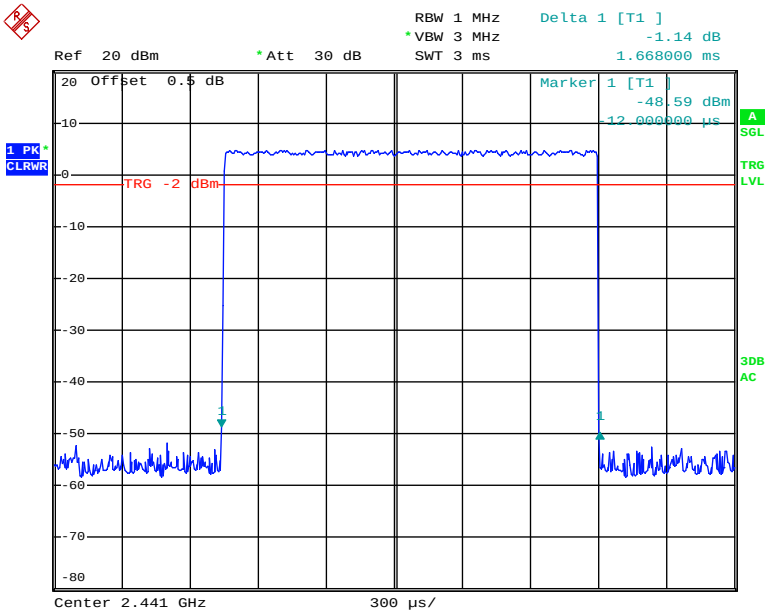
Date: 4.DEC.2017 20:27:51

DH3: Low Channel



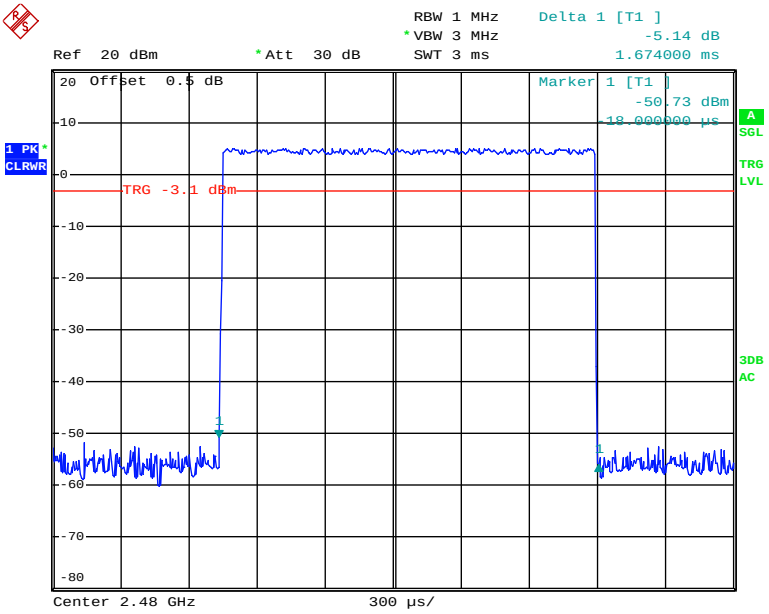
Date: 4.DEC.2017 20:34:28

DH3: Middle Channel



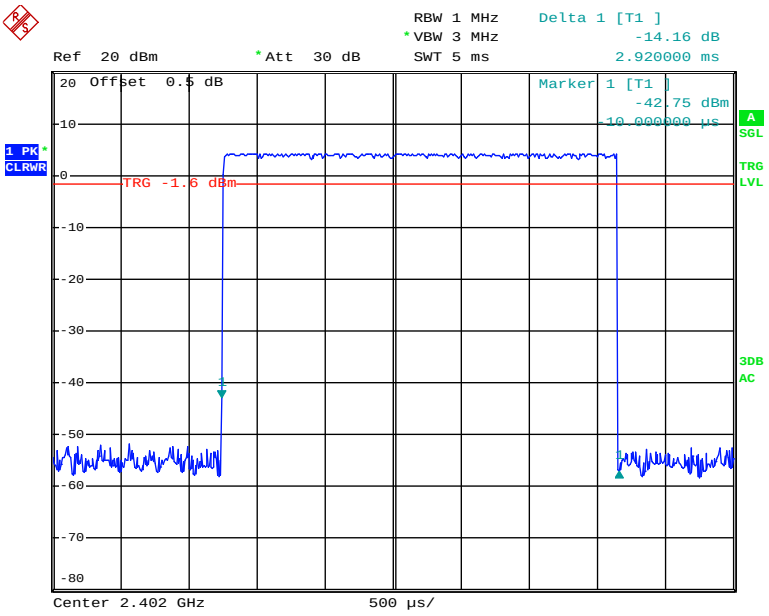
Date: 4.DEC.2017 20:34:35

DH3: High Channel



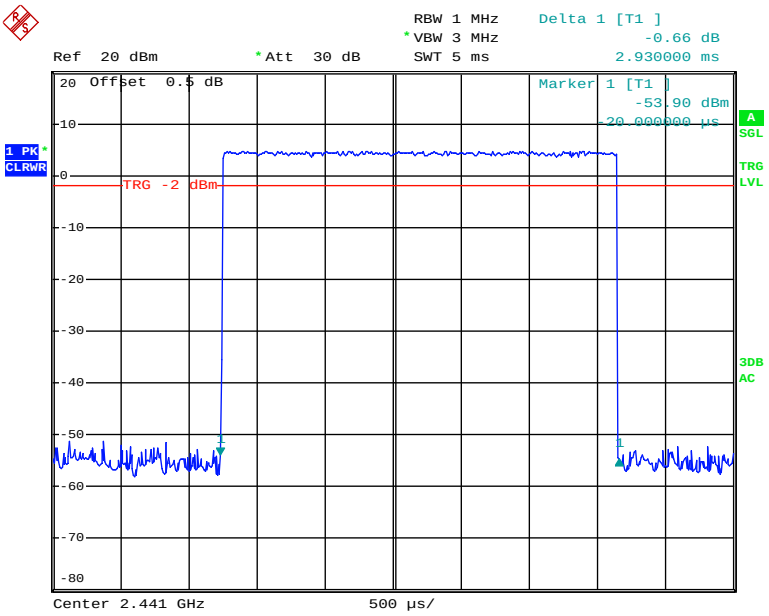
Date: 4.DEC.2017 20:34:44

DH5: Low Channel



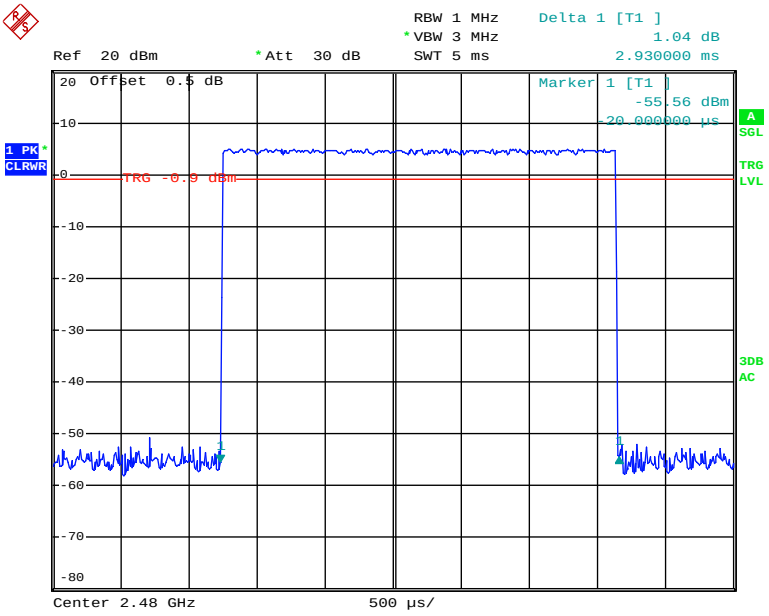
Date: 4.DEC.2017 20:38:17

DH5: Middle Channel



Date: 4.DEC.2017 20:38:24

DH5: High Channel

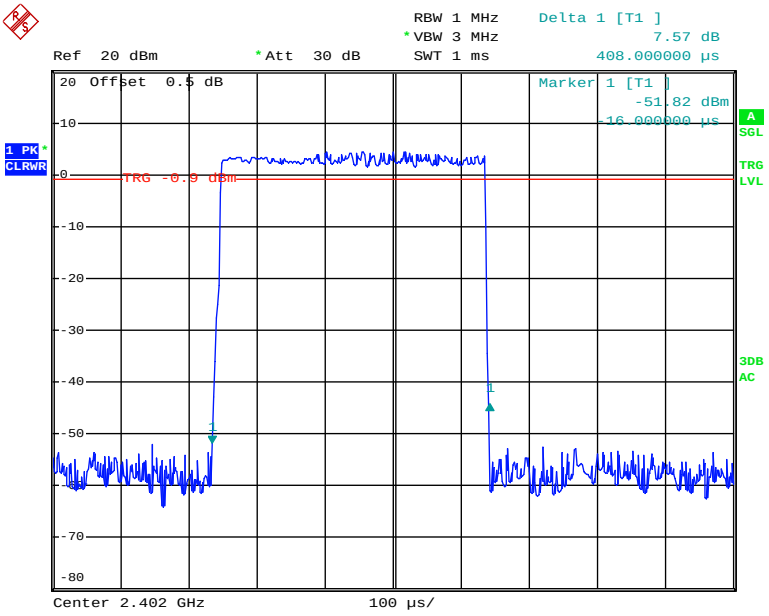


Date: 4.DEC.2017 20:38:30

EDR Mode (π/4-DQPSK):

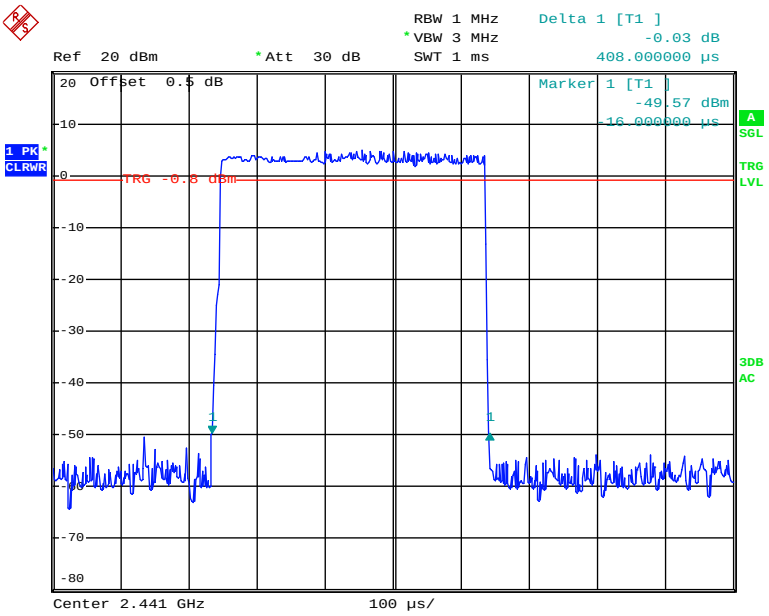
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.408	0.131	0.4	Compliance
	Middle	0.408	0.131	0.4	Compliance
	High	0.410	0.131	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
2DH3	Low	1.674	0.268	0.4	Compliance
	Middle	1.680	0.269	0.4	Compliance
	High	1.674	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
2DH5	Low	2.920	0.311	0.4	Compliance
	Middle	2.930	0.313	0.4	Compliance
	High	2.950	0.315	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

2DH1: Low Channel



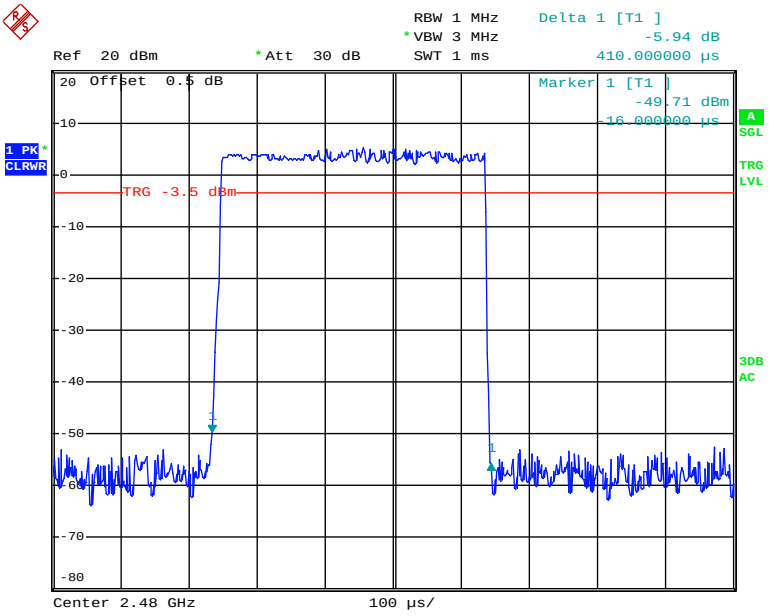
Date: 4.DEC.2017 20:29:13

2DH1: Middle Channel



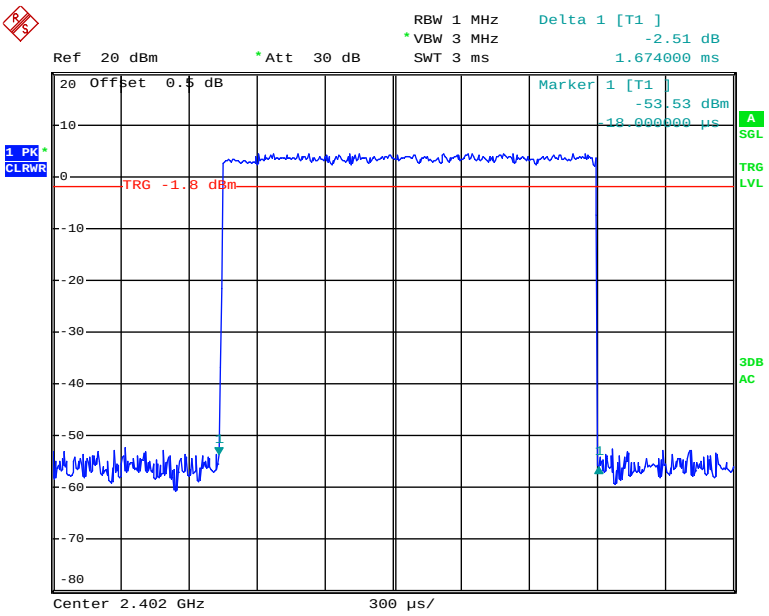
Date: 4.DEC.2017 20:29:20

2DH1: High Channel



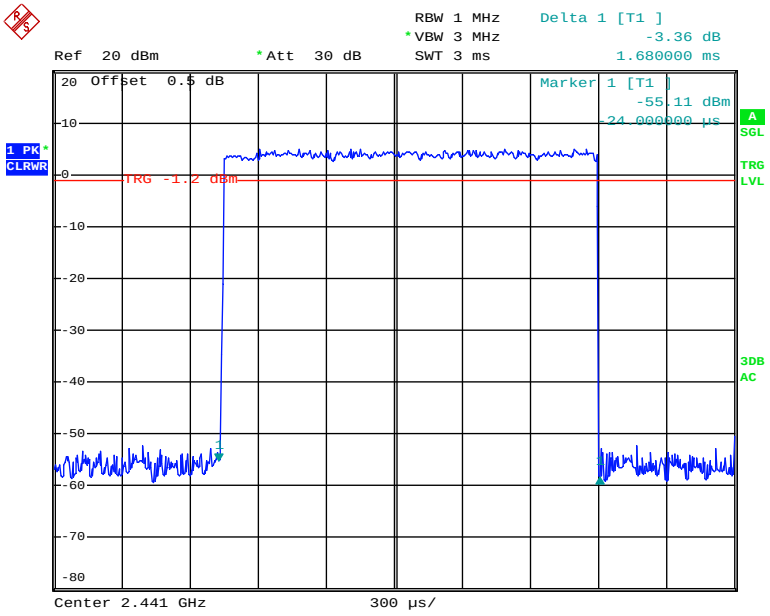
Date: 4.DEC.2017 20:29:26

2DH3: Low Channel



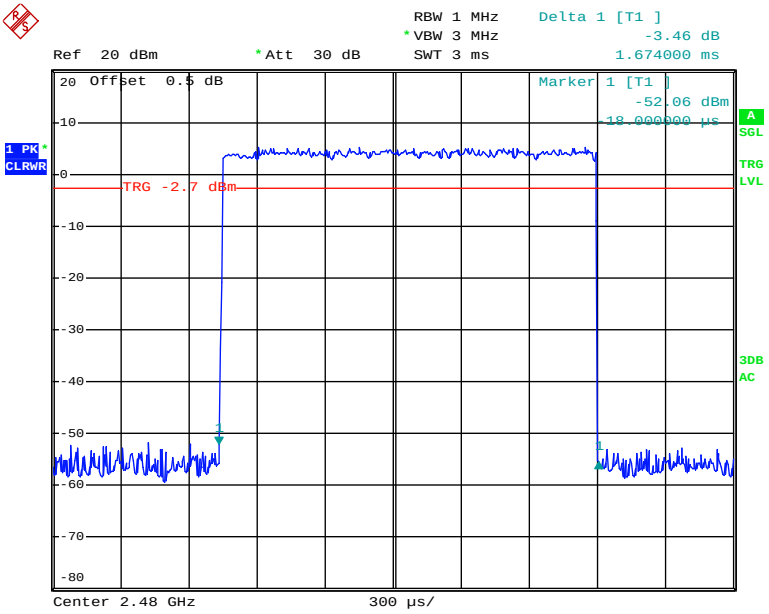
Date: 4.DEC.2017 20:35:26

2DH3: Middle Channel



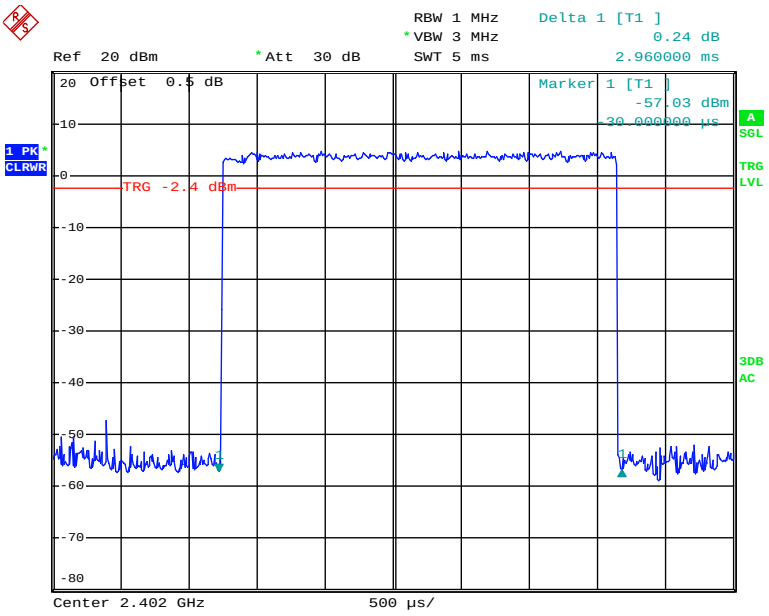
Date: 4.DEC.2017 20:36:23

2DH3: High Channel



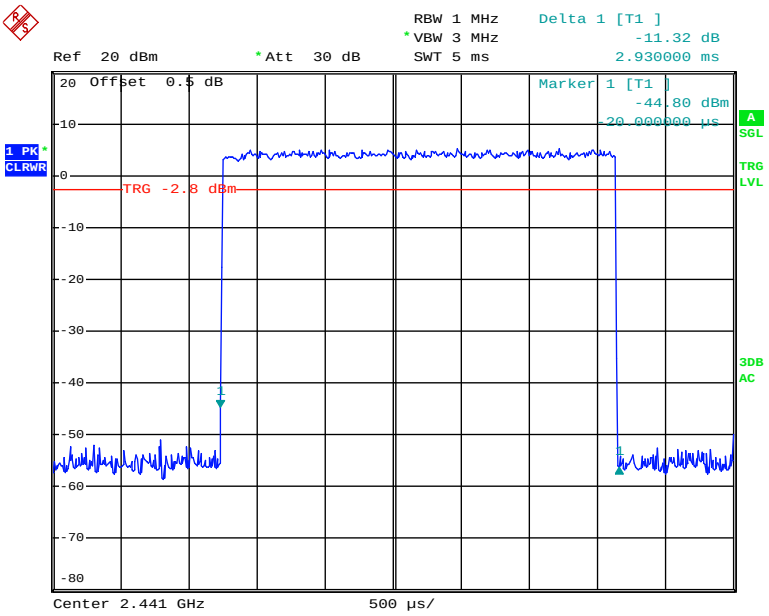
Date: 4.DEC.2017 20:36:31

2DH5: Low Channel



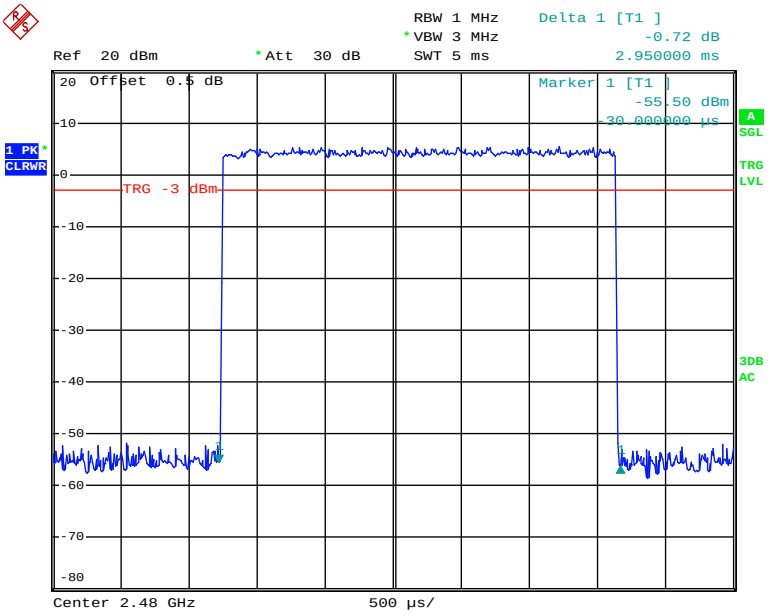
Date: 4.DEC.2017 20:42:43

2DH5: Middle Channel



Date: 4.DEC.2017 20:42:53

2DH5: High Channel

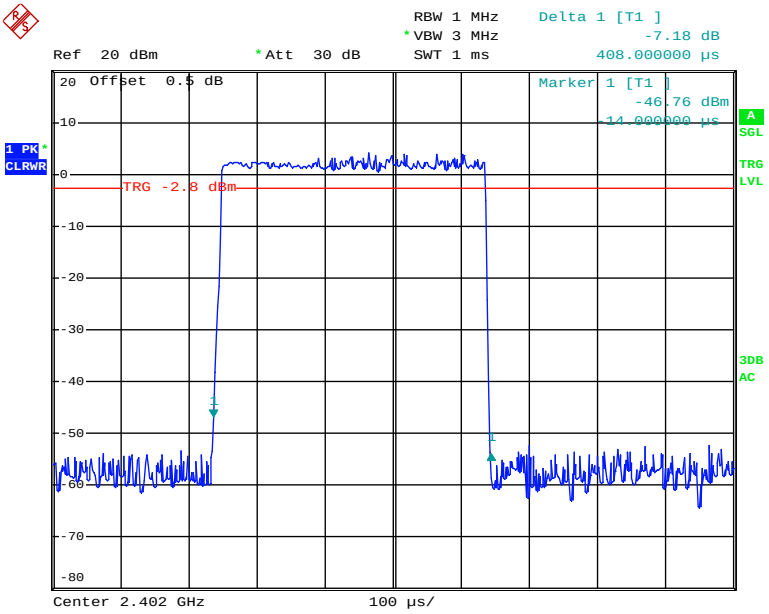


Date: 4.DEC.2017 20:43:23

EDR Mode (8-DPSK):

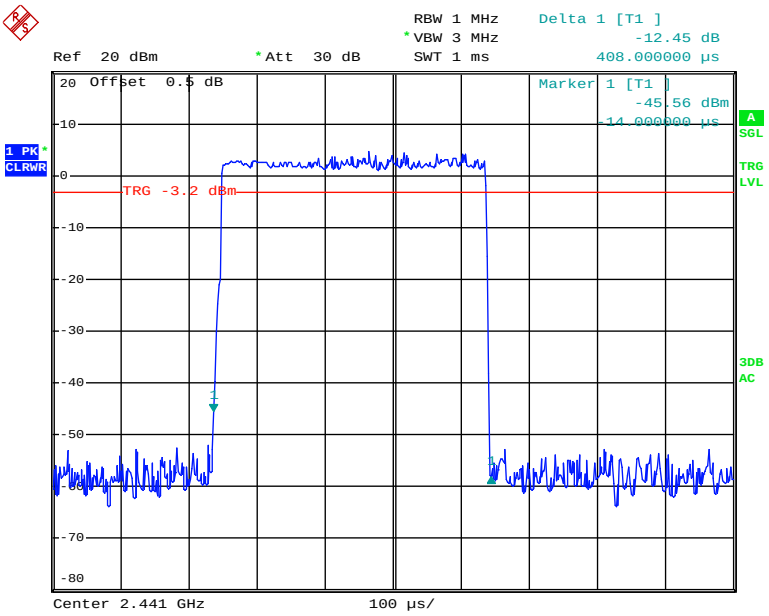
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.408	0.131	0.4	Compliance
	Middle	0.408	0.131	0.4	Compliance
	High	0.408	0.131	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
3DH3	Low	1.668	0.267	0.4	Compliance
	Middle	1.674	0.268	0.4	Compliance
	High	1.668	0.267	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	2.930	0.313	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

3DH1: Low Channel



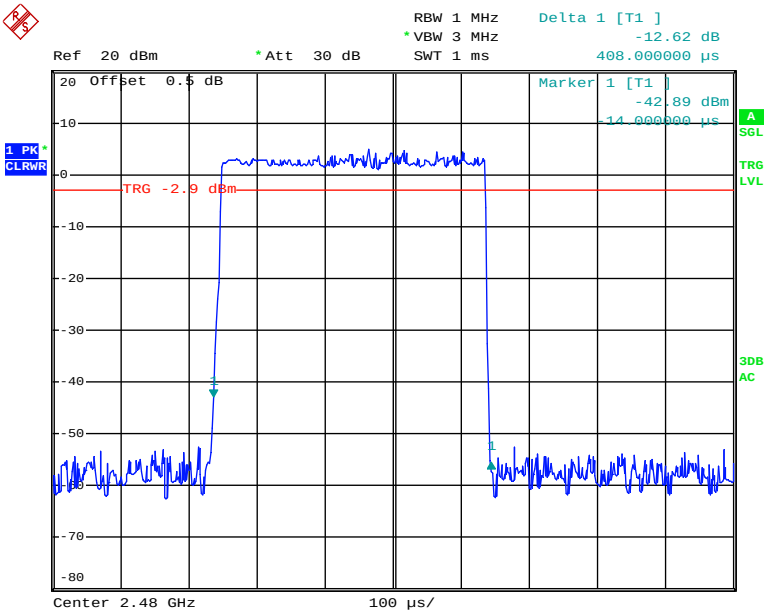
Date: 4.DEC.2017 20:30:06

3DH1: Middle Channel



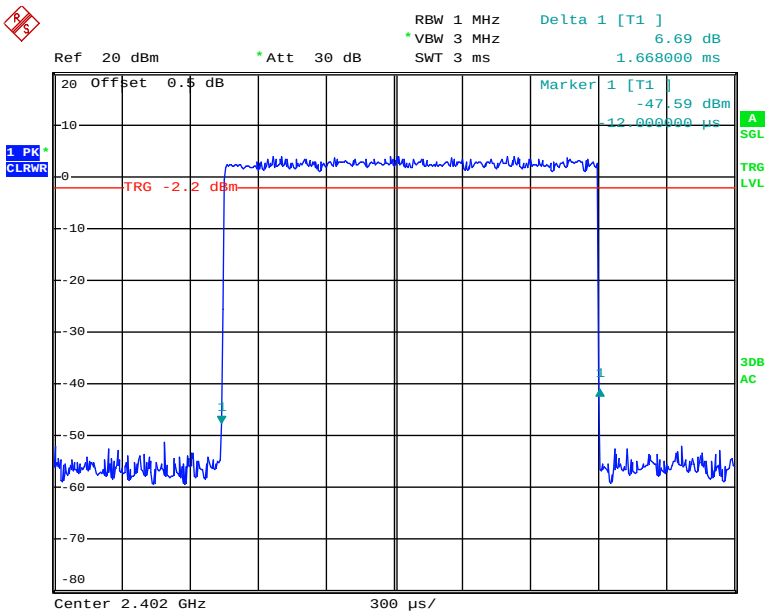
Date: 4.DEC.2017 20:30:13

3DH1: High Channel



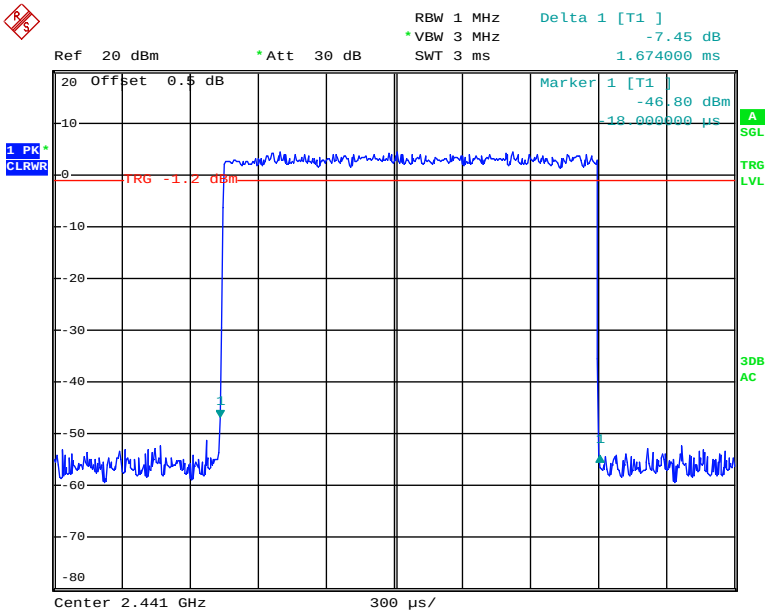
Date: 4.DEC.2017 20:30:26

3DH3: Low Channel



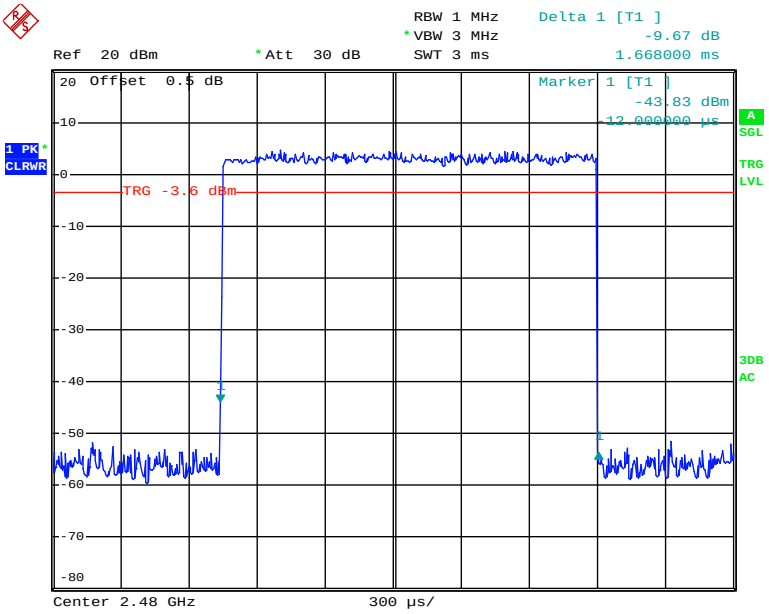
Date: 4.DEC.2017 20:37:12

3DH3: Middle Channel



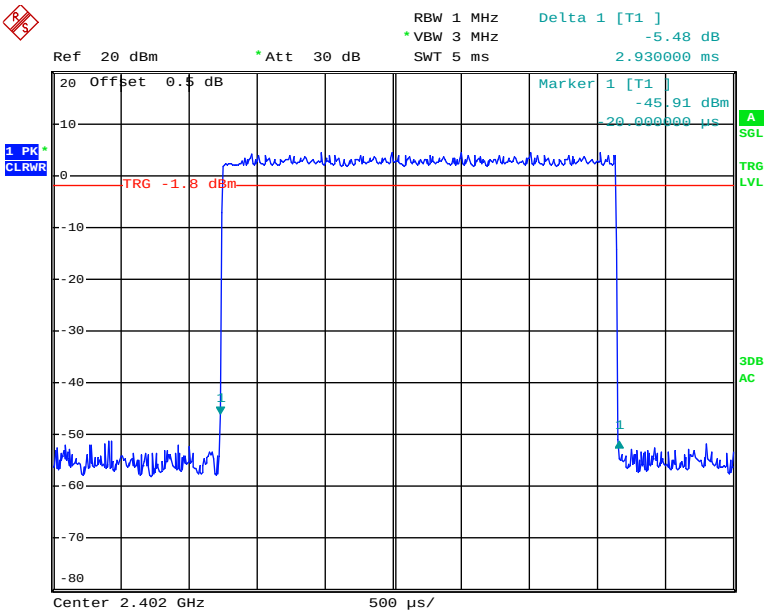
Date: 4.DEC.2017 20:37:18

3DH3: High Channel



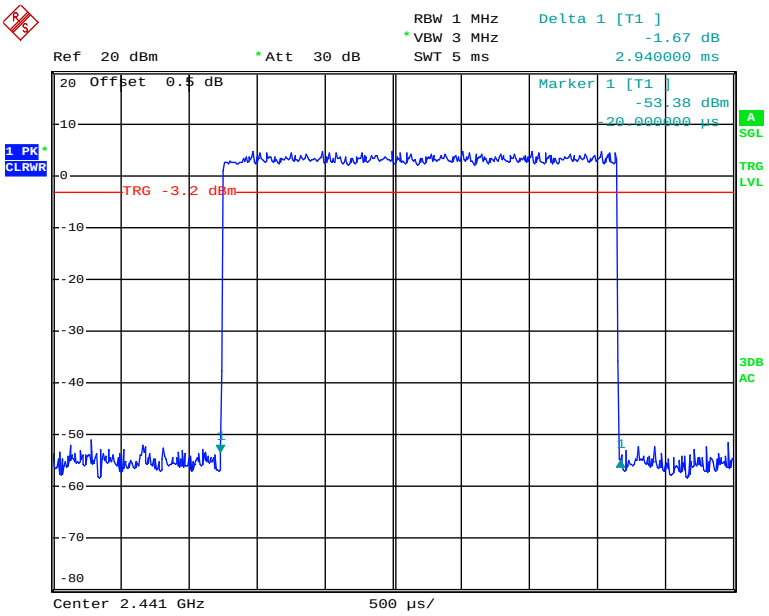
Date: 4.DEC.2017 20:37:25

3DH5: Low Channel



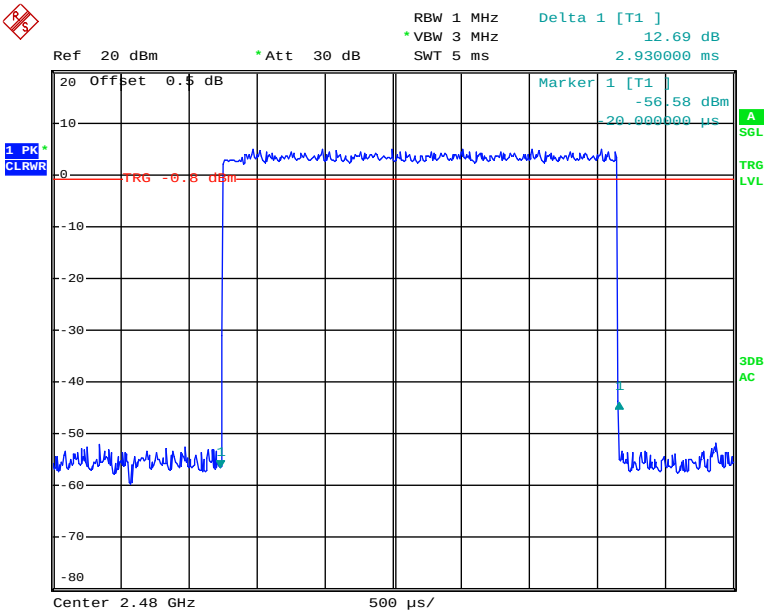
Date: 4.DEC.2017 20:44:05

3DH5: Middle Channel



Date: 4.DEC.2017 20:44:13

3DH5: High Channel

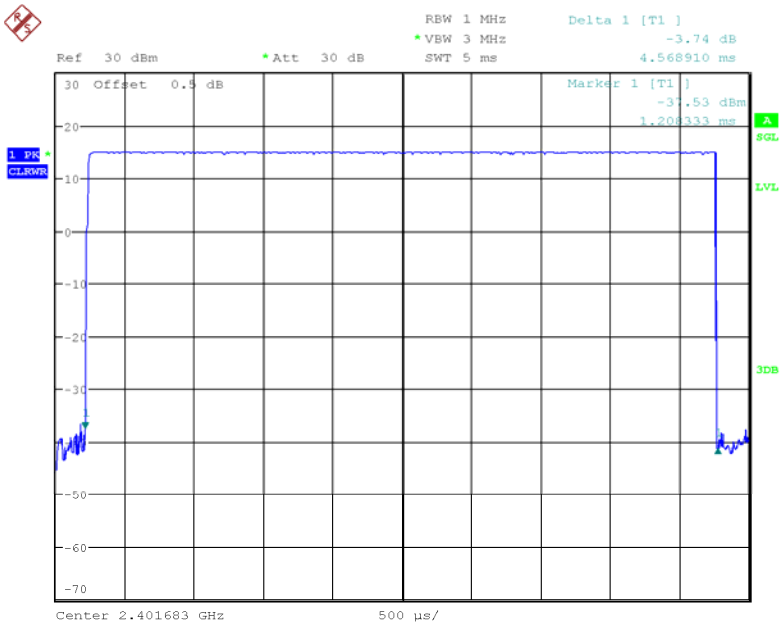


Date: 4.DEC.2017 20:44:22

Long Range Hopping Transmitter

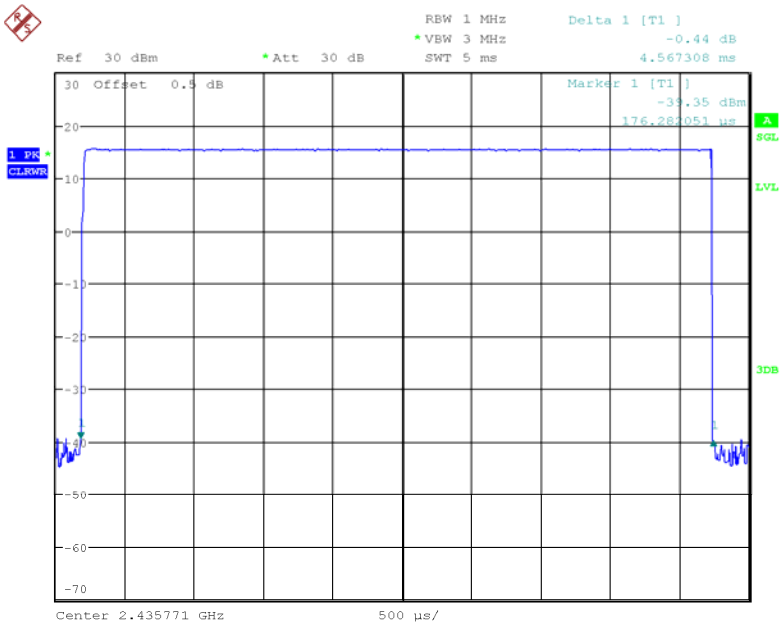
Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
Low	4.569	0.183	0.4	Compliance
Middle	4.567	0.183	0.4	Compliance
High	4.567	0.183	0.4	Compliance
Note:Hopping rate=100/s in total channels, which declared by manufacturer Dwell time=Pulse time (s) × (100/76) ×(0.4×76)				

Low Channel



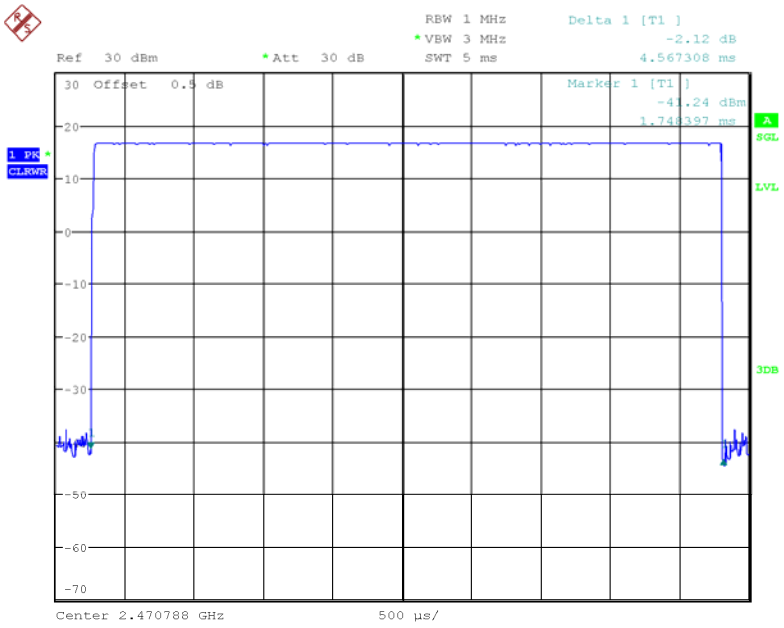
Date: 23.JAN.2018 17:46:44

Middle Channel



Date: 23.JAN.2018 17:45:30

High Channel



Date: 23.JAN.2018 17:48:59

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

Applicable Standard

According to FCC §15.247(b) (1)

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 Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.5~25.5 °C
Relative Humidity:	32~49 %
ATM Pressure:	102.9~101.4 kPa

** The testing was performed by Andy Huang on 2017-12-04 and 2018-01-23.*

Test Result: Compliance.

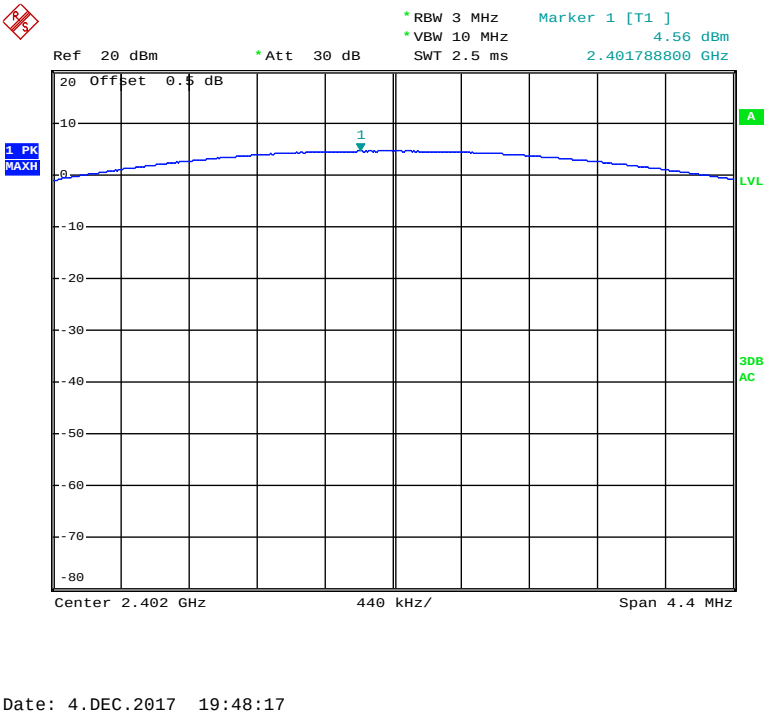
Test Mode: Transmitting

Mode	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	4.56	21
	2441	4.92	21
	2480	5.11	21
EDR Mode (π/4-DQPSK)	2402	5.23	21
	2441	5.66	21
	2480	5.84	21
EDR Mode (8-DPSK)	2402	4.89	21
	2441	5.32	21
	2480	5.5	21
Long Range Hopping Transmitter	2401.683	15.07	21
	2435.771	15.61	21
	2470.788	16.52	21

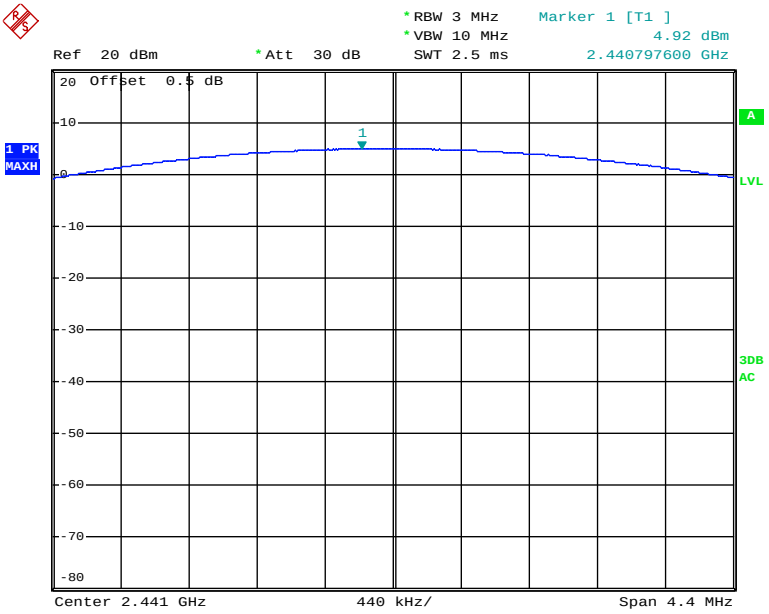
Note: The data above was tested in conducted mode.

BDR Mode (GFSK):

Low Channel

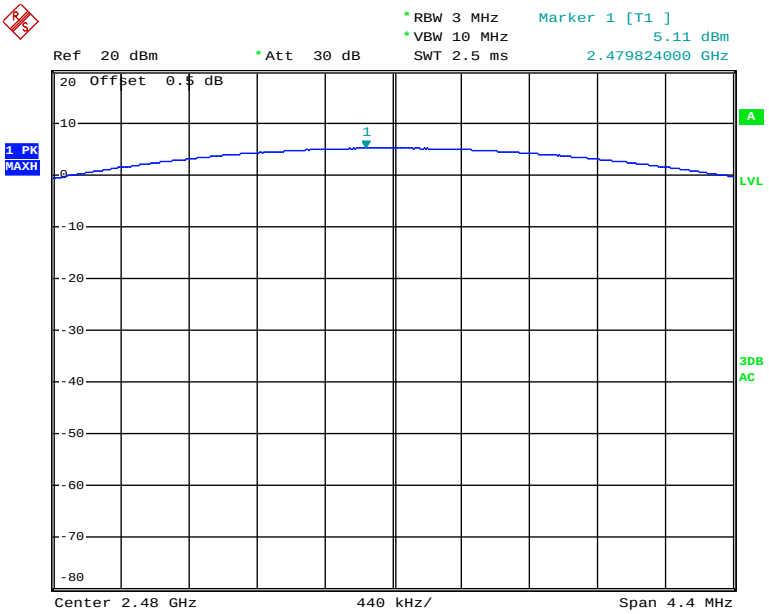


Middle Channel



Date: 4.DEC.2017 20:09:03

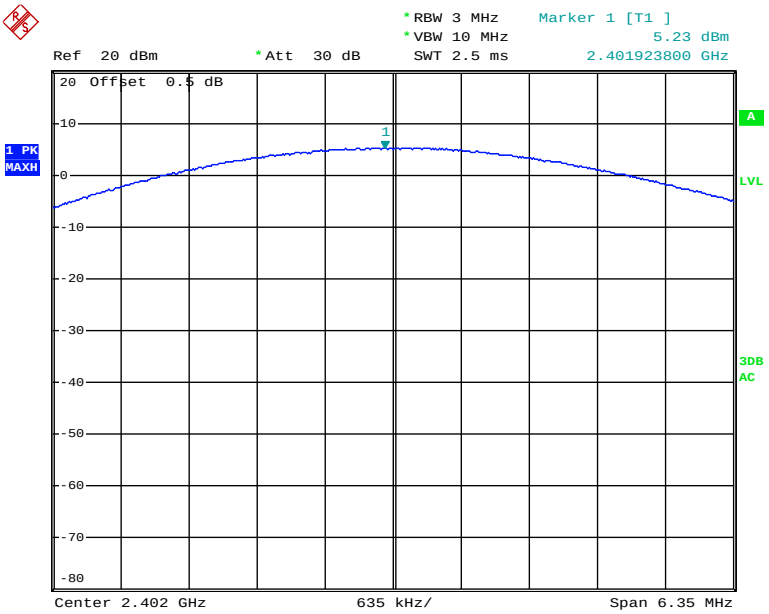
High Channel



Date: 4.DEC.2017 20:10:19

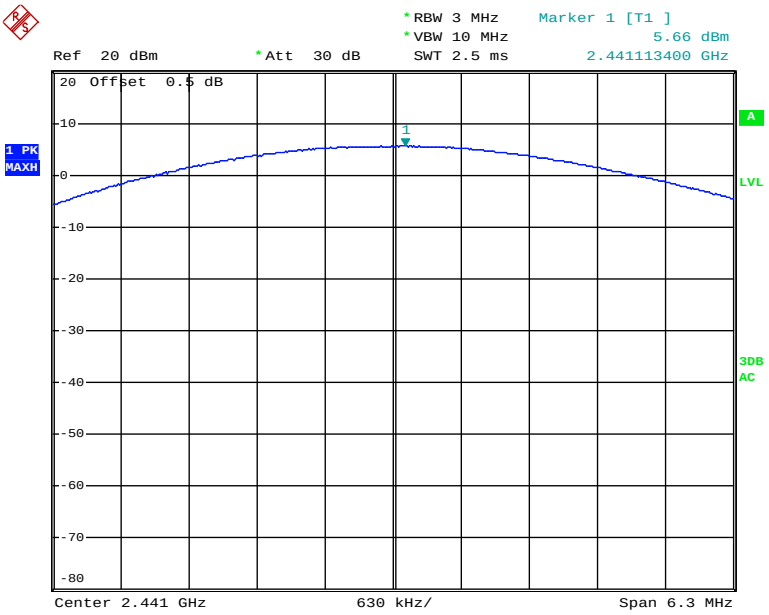
EDR Mode (π/4-DQPSK):

Low Channel



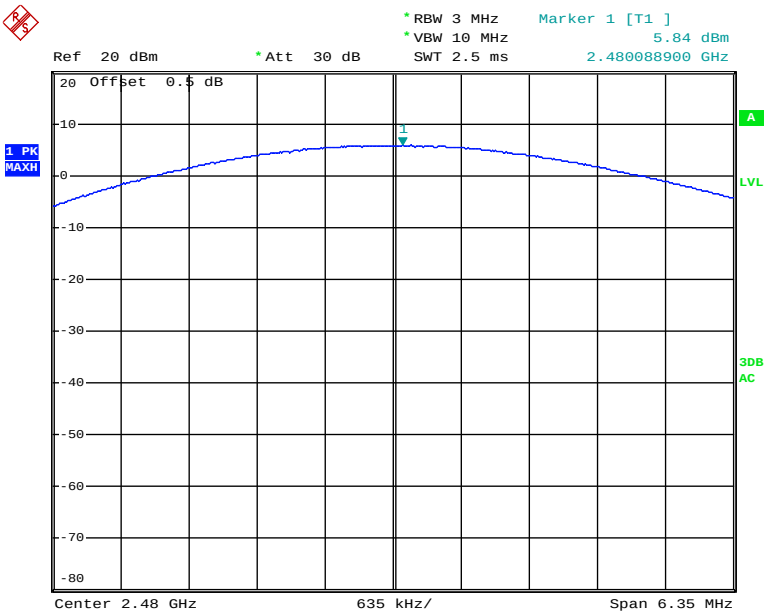
Date: 4.DEC.2017 20:12:34

Middle Channel



Date: 4.DEC.2017 20:13:54

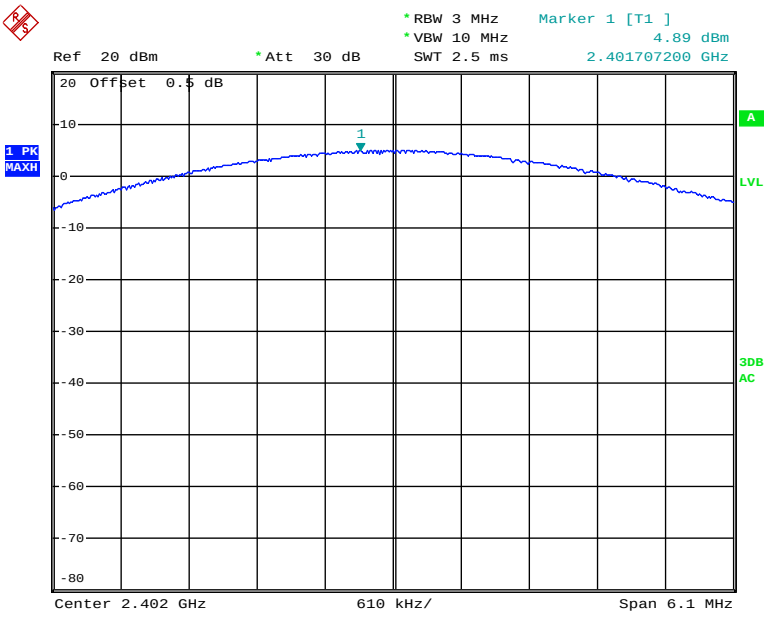
High Channel



Date: 4.DEC.2017 20:15:29

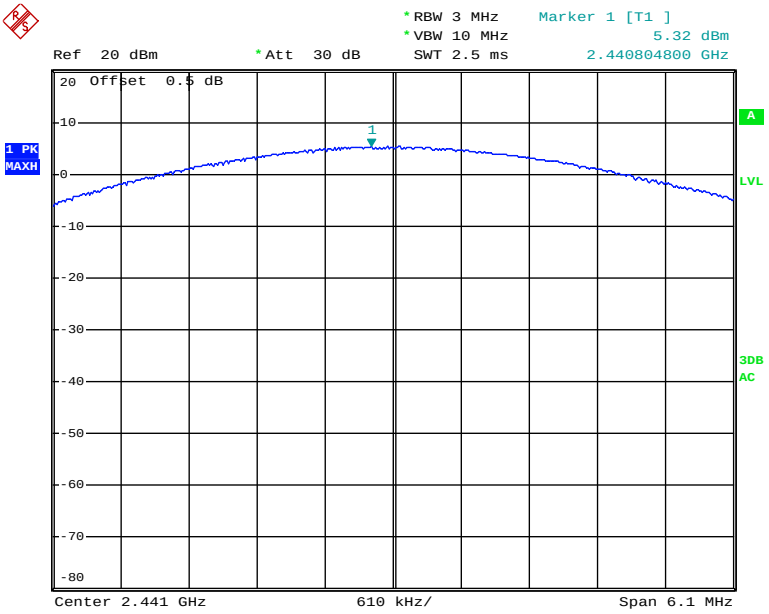
EDR Mode (8-DPSK):

Low Channel



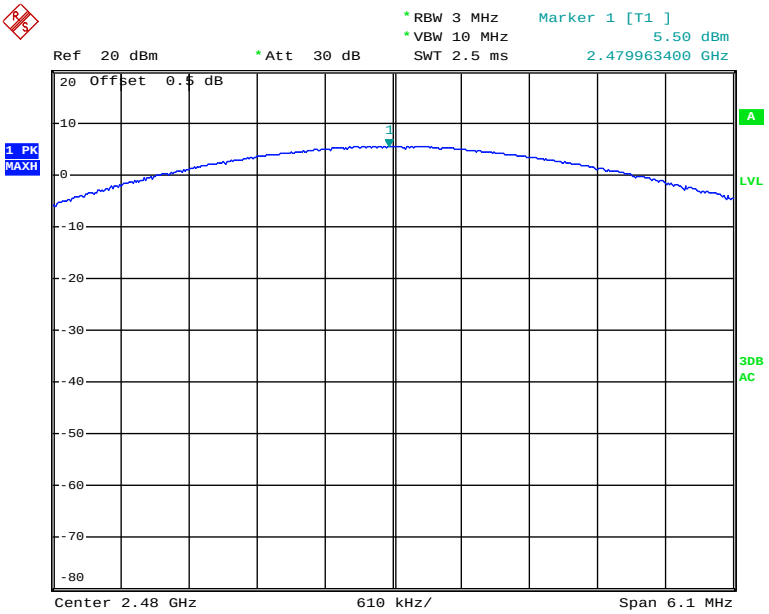
Date: 4.DEC.2017 20:17:41

Middle Channel



Date: 4.DEC.2017 20:19:01

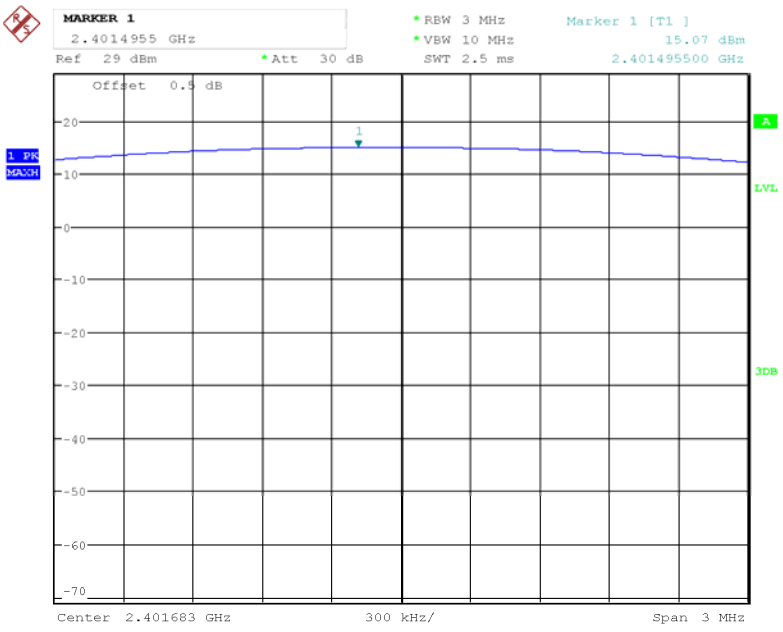
High Channel



Date: 4.DEC.2017 20:20:09

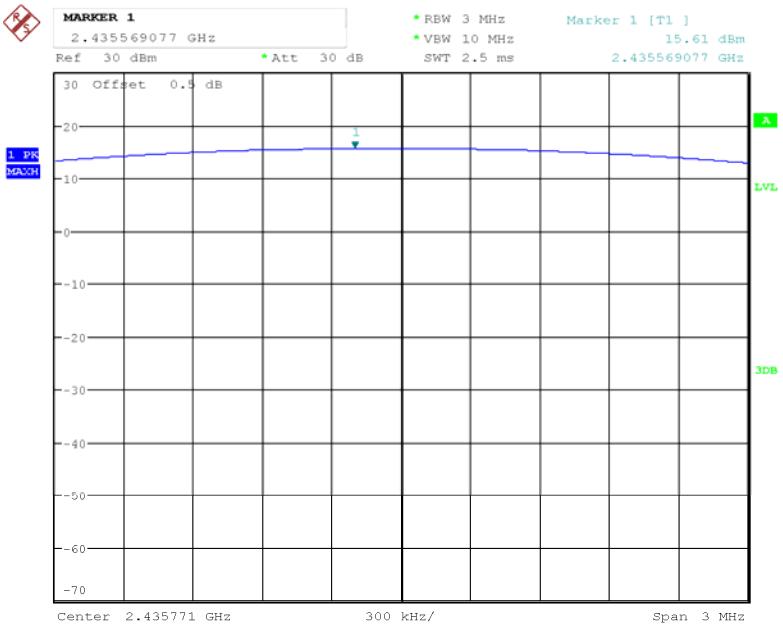
Long Range Hopping Transmitter:

Low Channel



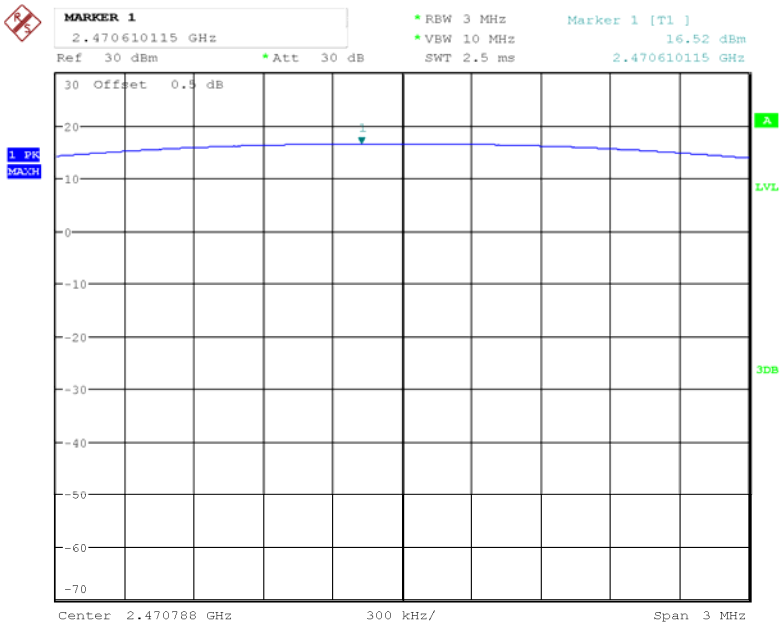
Date: 23.JAN.2018 17:20:50

Middle Channel



Date: 23.JAN.2018 17:28:17

High Channel



Date: 23.JAN.2018 17:29:08

FCC §15.247(d) - 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 Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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

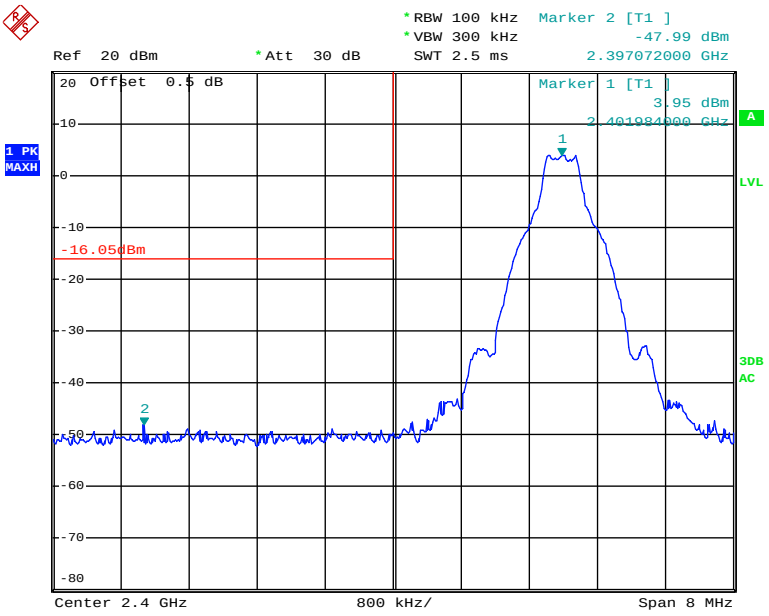
Temperature:	22.5~25.5 °C
Relative Humidity:	32~49 %
ATM Pressure:	102.9~101.4 kPa

** The testing was performed by Andy Huang from 2017-12-04 to 2018-01-03.*

Test Result: Compliance

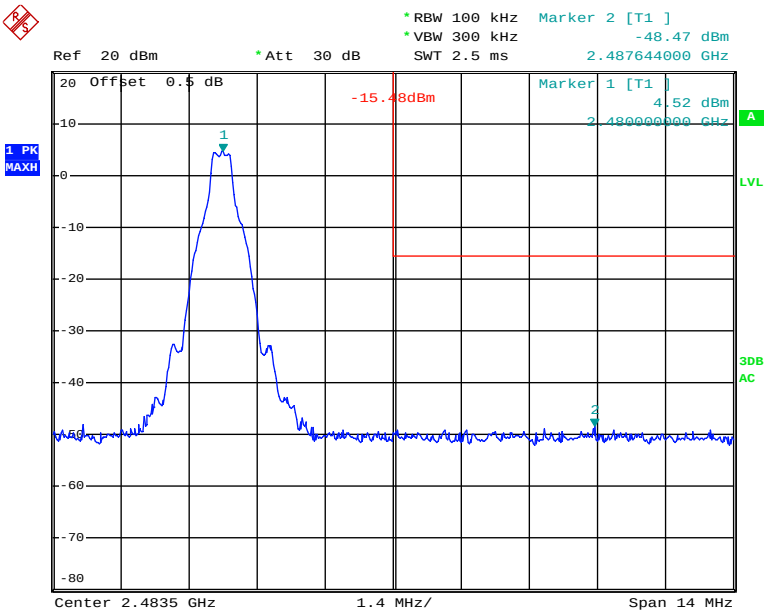
Single Channel:
BDR Mode (GFSK):

Band Edge, Left Side



Date: 4.DEC.2017 19:48:39

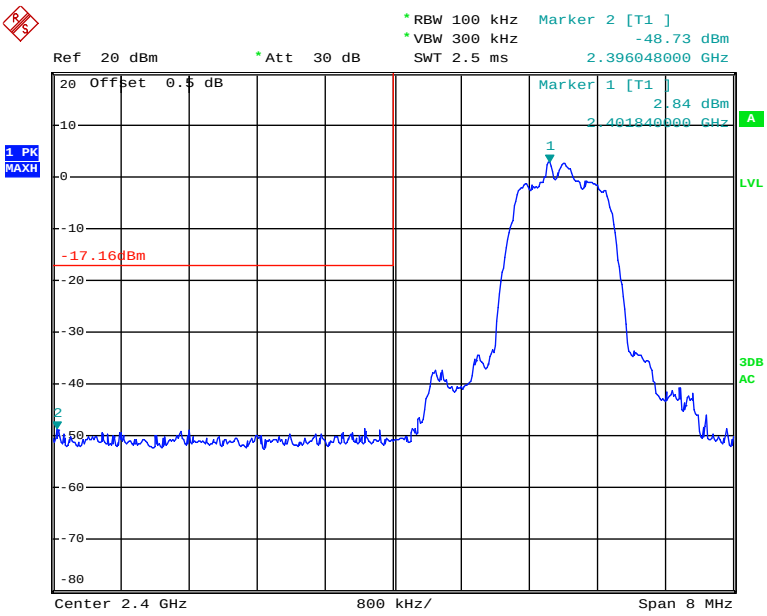
Band Edge, Right Side



Date: 4.DEC.2017 20:10:46

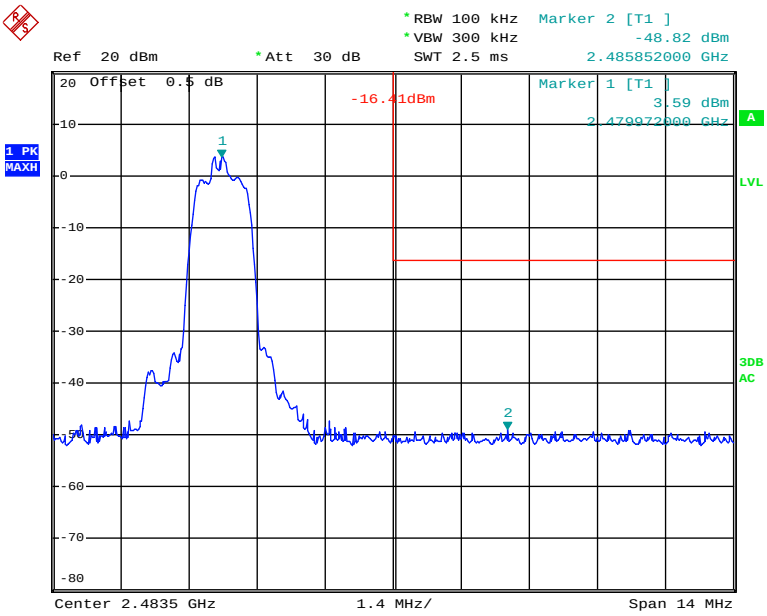
EDR Mode (π/4-DQPSK):

Band Edge, Left Side



Date: 4.DEC.2017 20:12:49

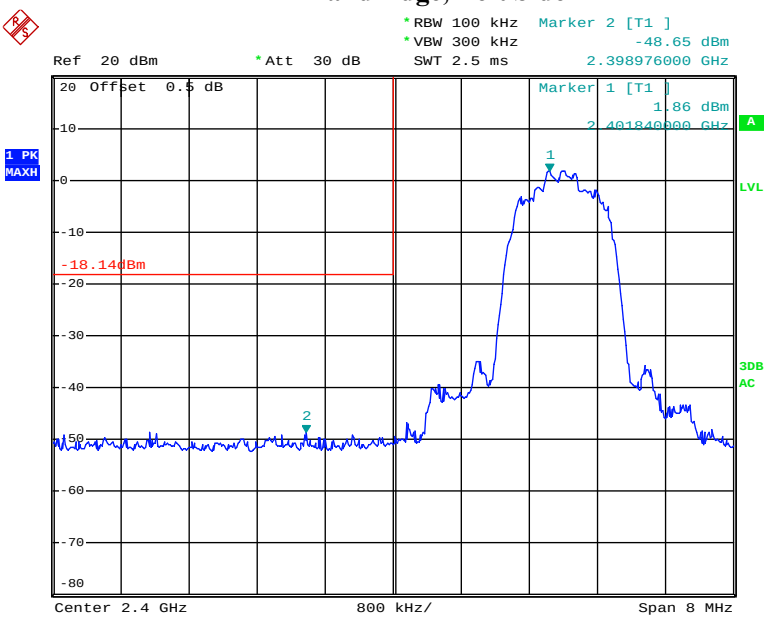
Band Edge, Right Side



Date: 4.DEC.2017 20:15:49

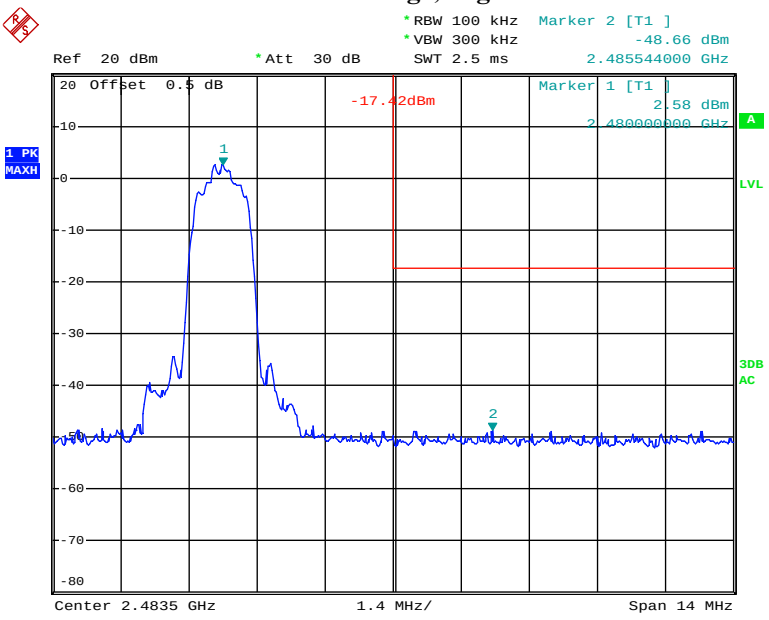
EDR Mode (8-DPSK):

Band Edge, Left Side



Date: 4.DEC.2017 20:17:56

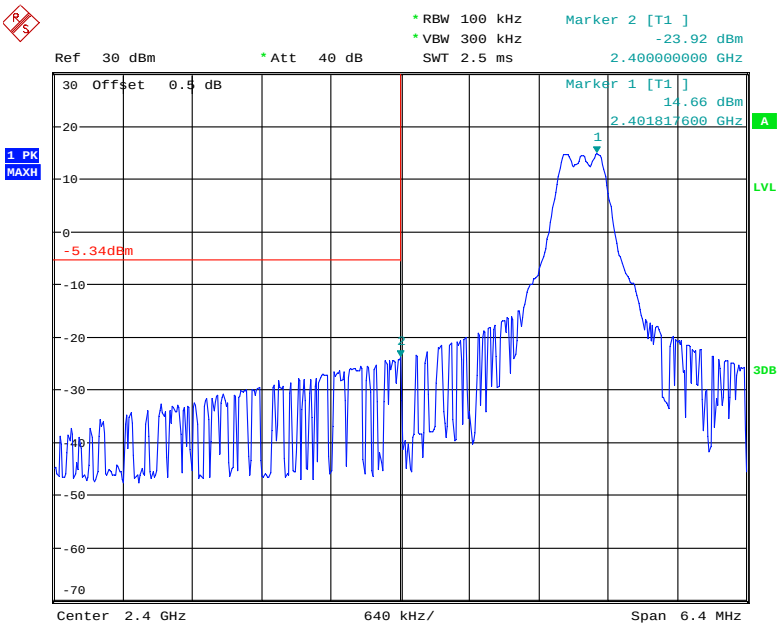
Band Edge, Right Side



Date: 4.DEC.2017 20:20:31

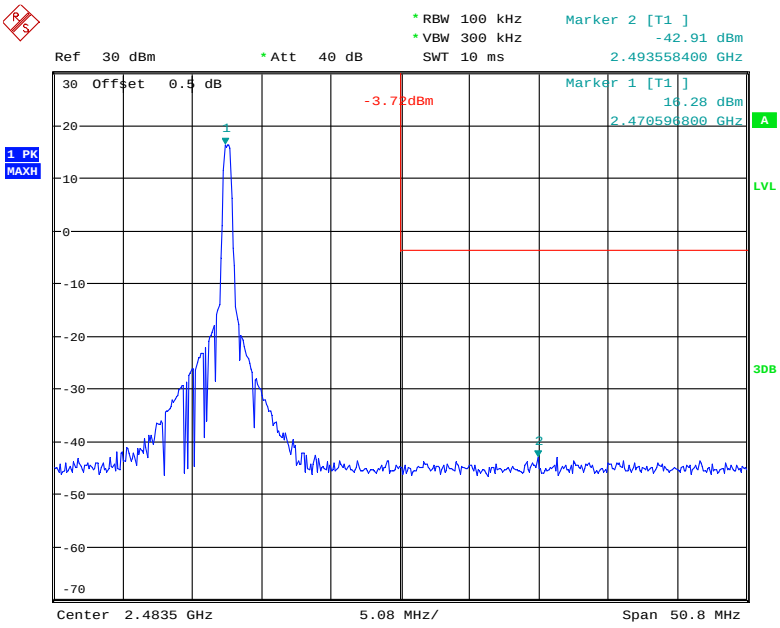
Long Range Hopping Transmitter

Band Edge, Left Side



Date: 20.DEC.2017 13:35:03

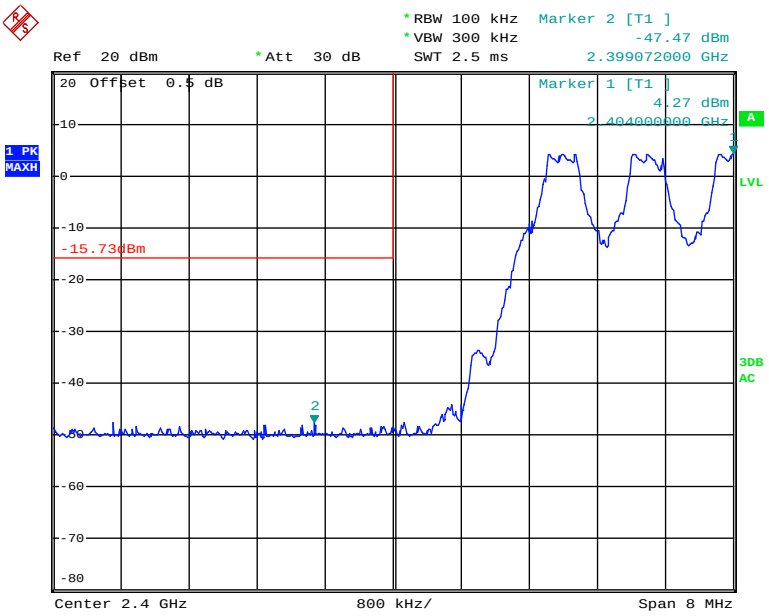
Band Edge, Right Side



Date: 20.DEC.2017 13:31:45

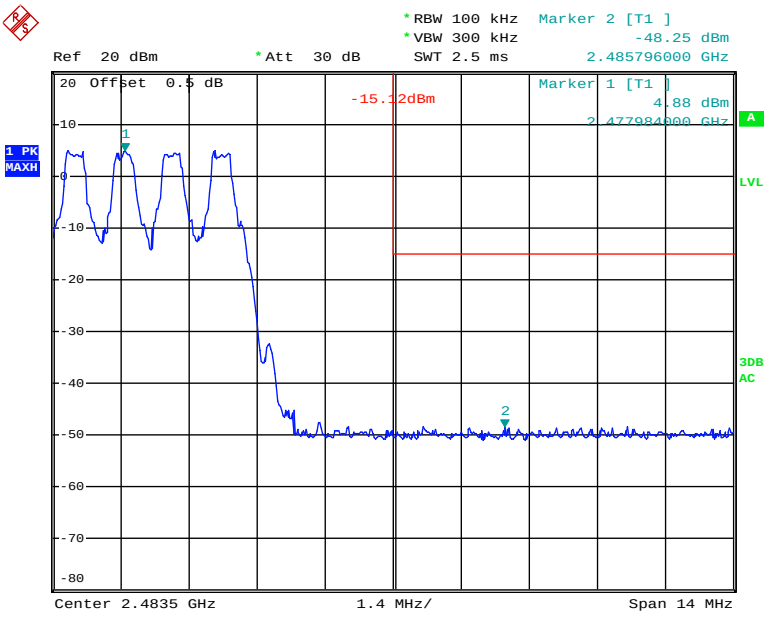
Frequency Hopping:
BDR Mode (GFSK):

Band Edge, Left Side



Date: 3.JAN.2018 12:14:19

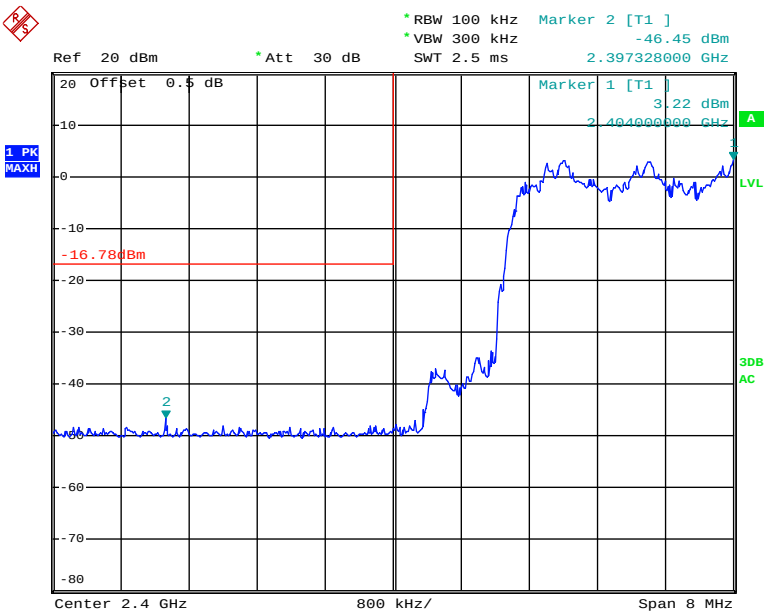
Band Edge, Right Side



Date: 3.JAN.2018 12:16:17

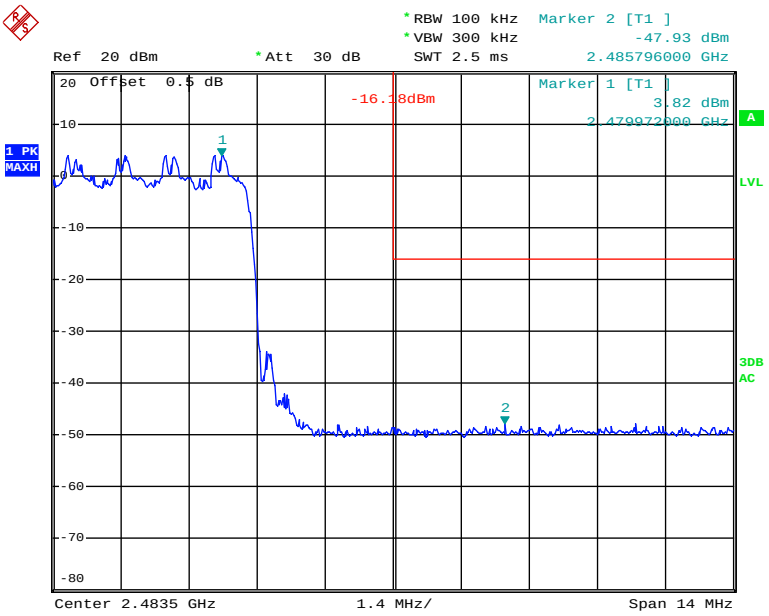
EDR Mode (π/4-DQPSK):

Band Edge, Left Side



Date: 3.JAN.2018 12:20:38

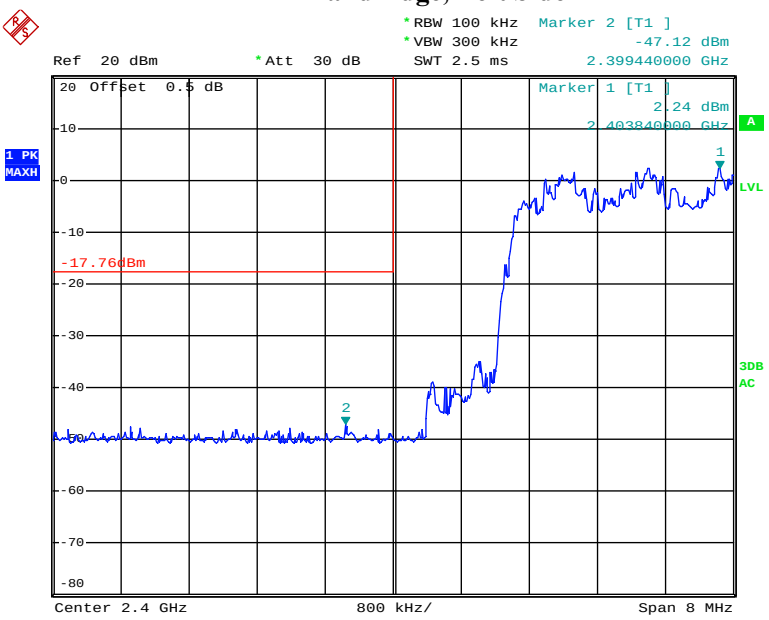
Band Edge, Right Side



Date: 3.JAN.2018 12:25:33

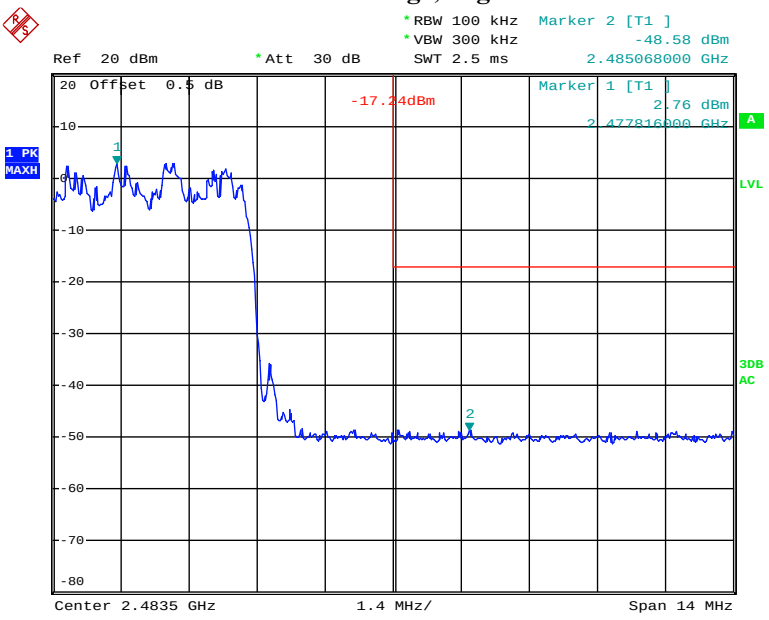
EDR Mode (8-DPSK):

Band Edge, Left Side



Date: 3.JAN.2018 12:28:48

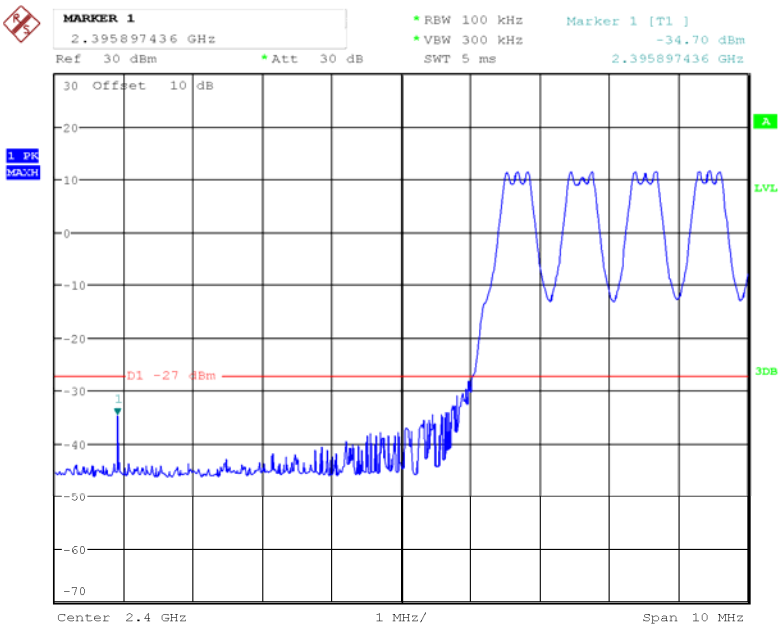
Band Edge, Right Side



Date: 3.JAN.2018 12:33:23

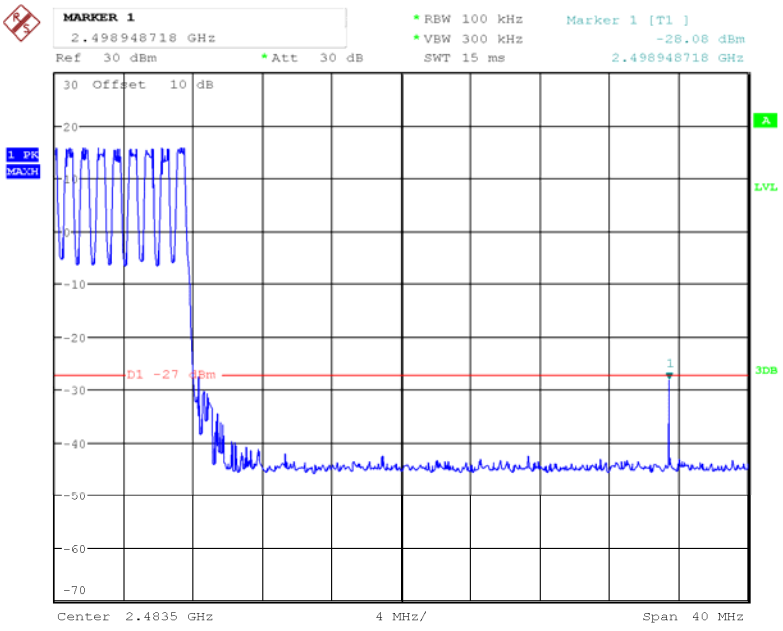
Long Range Hopping Transmitter(the emissions are under more than 20dB than the fundamental)

Band Edge, Left Side



Date: 20.DEC.2017 15:08:47

Band Edge, Right Side



Date: 20.DEC.2017 15:05:23

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