ACCREDITED
TESTING LABORATORY
CERTIFICATE#4323.01

BACL
Bay Area Compliance Labs Corp.

RSS-GEN ISSUE 5, MARCH 2019
RSS-247 ISSUE 2, FEBRUARY 2017
TEST REPORT

For

Tersus GNSS Inc.

Rm 203, Building 2, No. 666 Zhangheng Road, Zhangjiang Hi-tech Park Pudong Shanghai, P.R.C
Shanghai 201200 China

IC: 25725-OSCAR

Report Type:	**Product Type:**
Original Report	Surveying GNSS Receiver

Project Engineer:	Chao Gao
Report Number:	RSHA191209001-08B
Report Date:	2021-03-24
Reviewed By:	Oscar Ye EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test

Applicant:	Tersus GNSS Inc.
Tested Model:	Oscar Ultimate
Series Model	Oscar Advanced, Oscar Basic
Product Type:	Surveying GNSS Receiver
Power Supply:	DC 9V~28V from external power supply and DC 7.4V from battery
RF Function:	Classic BT
Operating Band/Frequency:	2402-2480MHz
Channel Number:	79
Channel Separation:	1 MHz
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Antenna Type:	PCB antenna
*Maximum Antenna Gain:	1.0 dBi
Maximum Output Power:	12.12 dBm

Note: The maximum antenna gain is provided by the applicant.

Note: The difference between tested model and series model was explained in the attached declaration letter.

**All measurement and test data in this report was gathered from production sample serial number: RSHA191209001-1(Assigned by BACL, Kunshan). The EUT was received on 2019-12-09.*

Objective

This type approval report is prepared on behalf of *Tersus GNSS Inc.* in accordance with RSS-247 Issue 2, February 2017 and RSS-GEN Issue 5, March 2019 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

RSS-247 submissions with IC: 25725-OSCAR.
RSS-119 submissions with IC: 25725-OSCAR.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with RSS-247 Issue 2, February 2017 of the Innovation, Science and Economic Development Canada & RSS-GEN Issue 5, March 2019: General Requirements for Compliance of Radio Apparatus & ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01), the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Channel list for Bluetooth:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	40	2442
1	2403	…	…
…	…	…	…
…	…	78	2480
39	2441	/	/

EUT was tested with Channel 0, 39 and 78.

EUT Exercise Software

RF test software: Secure CRT

Mode	Channel	Frequency (MHz)	*Power Level Setting
BDR (GFSK)	Low	2402	0x07
	Middle	2441	0x07
	High	2480	0x07
EDR (π/4-DQPSK)	Low	2402	0x07
	Middle	2441	0x07
	High	2480	0x07
EDR (8DPSK)	Low	2402	0x07
	Middle	2441	0x07
	High	2480	0x07

Note: The power level setting was declared by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

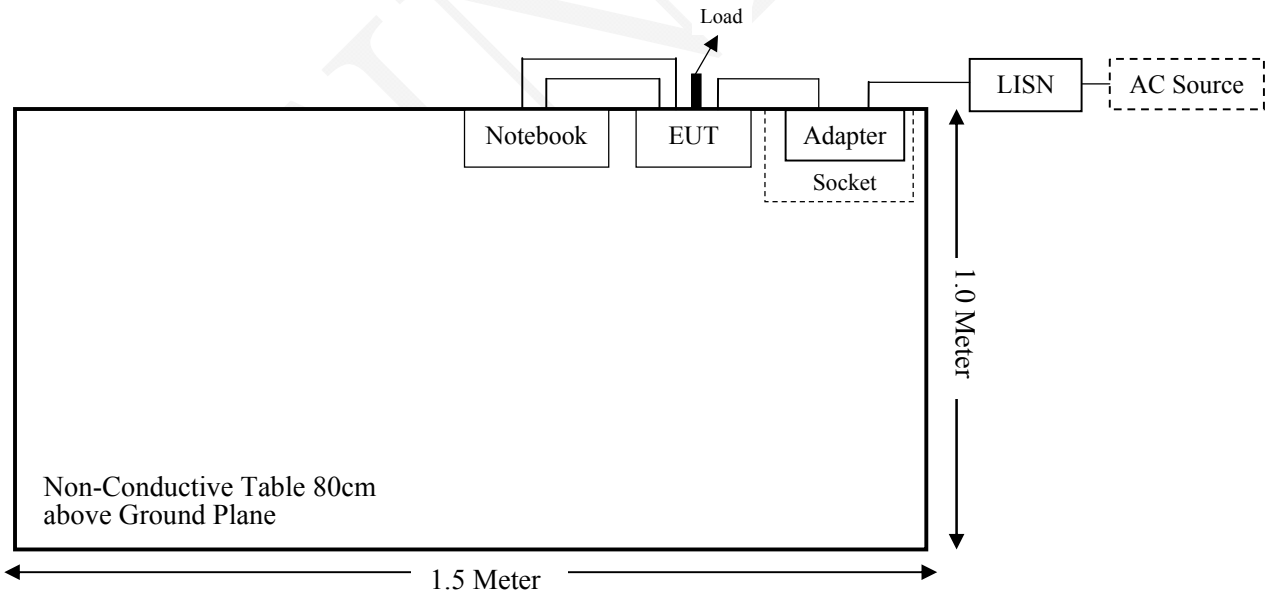
Manufacturer	Description	Model	Serial Number
DELL	Notebook	E6410	3094742521
SHENZHENTIANYIN ELECTRONICS CO.,LTD	Adapter	TPA-46B050100UVU	Unknown
Unknow	Load	Unknown	Unknown
Unknow	Socket	Unknown	Unknown

External I/O Cable

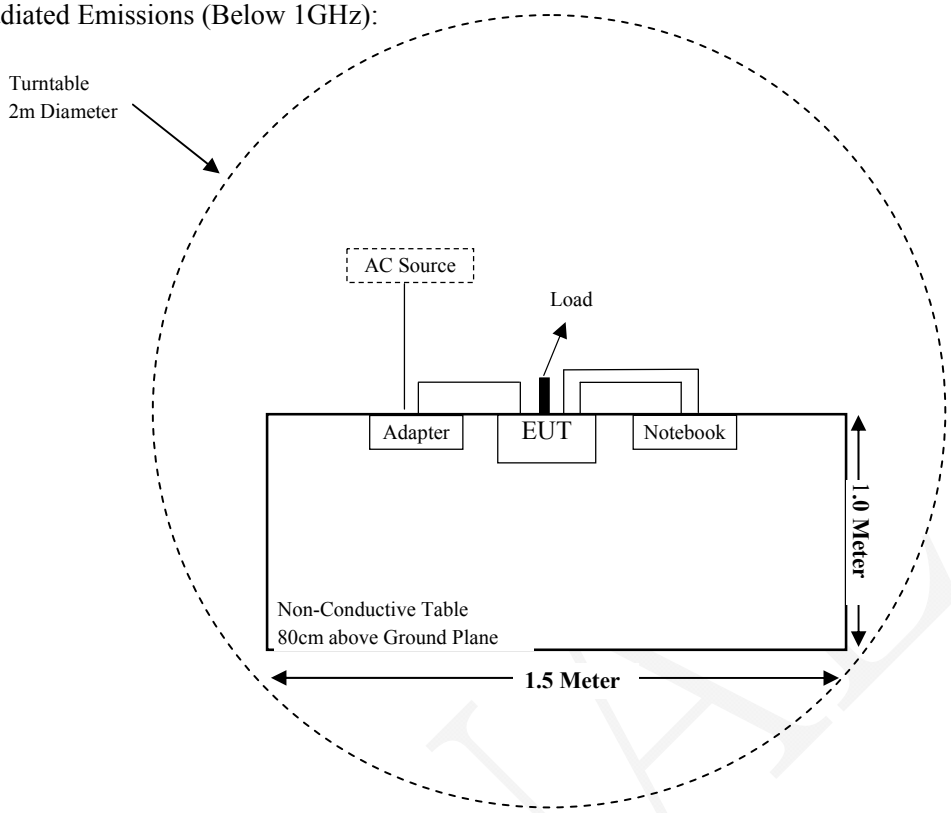
Cable Description	Length (m)	From Port	To
Data Cable	1.5	EUT	Notebook
Data Cable	1.0	EUT	Notebook
Power Cable	1.5	EUT	Adapter
Power Cable	1.0	Adapter	LISN/AC Source

Block Diagram of Test Setup

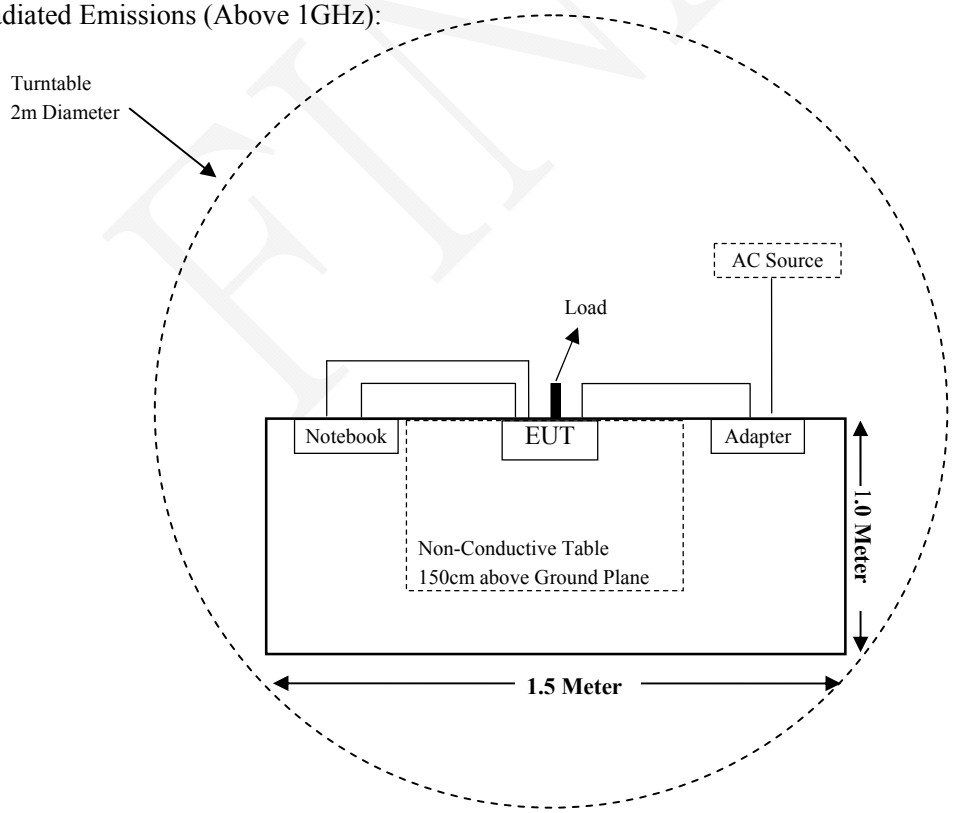
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

ISED RSS-247 & RSS-GEN Rules	Description of Test	Result
RSS-GEN Issue 5 Clause 6.8	Transmit Antenna	Compliant
RSS-102 Issue5 Clause 4	RF Exposure Evaluation	Compliant
RSS-GEN Issue 5 Clause 8.8	AC Power-line Conducted Emissions Limits	Compliant
RSS-247 Issue 2 Clause 5.5 RSS-GEN Issue 5 Clause 8.10	Unwanted Emissions & Restricted Frequency Bands	Compliant
RSS-247 Issue 2 Clause 5.1 a)	20dB Bandwidth	Compliant
RSS-GEN Issue 5 Clause 6.7	Occupied Bandwidth	Compliant
RSS-247 Issue 2 Clause 5.1 b)	Channel Separation Test	Compliant
RSS-247 Issue 2 Clause 5.1 d)	Quantity of Hopping Channel Test	Compliant
RSS-247 Issue 2 Clause 5.1 d)	Time of Occupancy (Dwell Time)	Compliant
RSS-247 Issue 2 Clause 5.4 b)	Transmitter Output Power Measurement	Compliant
RSS-247 Issue 2 Clause 5.5	Out of Band Emissions	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2019-12-14	2020-12-13
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2017-08-05	2020-08-04
Sonoma Instrument	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2019-04-01	2020-03-31
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3116	2516	2017-01-17	2020-01-16
A.H.Systems,inc	Amplifier	PAM-0118P	512	2019-08-14	2020-08-13
EM Electronics Corporation	Amplifier	EM18G40G	060726	2019-03-22	2020-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2019-08-05	2020-08-04
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-12-12	2020-12-11
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
RF Conducted Test					
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2018-12-14	2019-12-13
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2019-12-14	2020-12-13
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2019-07-28	2020-07-27
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Tersus GNSS Inc.	RF Cable	Tersus GNSS Inc.C01	C01	Each Time	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-08-05	2020-08-04
Rohde & Schwarz	LISN	ENV216	101115	2019-12-14	2020-12-13
Audix	Test Software	e3	V9	/	/
Rohde & Schwarz	Pulse limiter	ESH3-Z2	357.8810.52	2019-08-10	2020-08-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2019-08-15	2020-08-14

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

RSS-GEN ISSUE5 Clause 6.8 - TRANSMITTER ANTENNA

Applicable Standard

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has a PCB antenna which was permanently attached and the antenna gain is 1.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	Max. Antenna Gain	Input impedance
PCB	1.0 dBi	50Ω

Result: Compliant.

RSS-102 ISSUE 5 CLAUSE 4 – RF EXPOSURE EVALUATION

Applicable Standard

According to RSS-102 Clause 4:

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6

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)
0.003-10[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	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

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

S = PG/4 π R² = power density (in appropriate units, e.g. W/m^2);
P = power input to the antenna (in appropriate units, e.g., W);
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., m);

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

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

Test Result

RF exposure evaluation at 30 cm distance:

Based on Uncontrolled Environment:

Mode	Frequency Range (MHz)	Tune-up Conducted Power (dBm)	Antenna Gain (dBi)	Tune-up EIRP		Power Density (W/m^2)	RF Exp. Limit (W/m^2)	Ratio
				(dBm)	(W)			
802.11b	2412-2462	20.0	1.0	21.00	0.126	0.1113	5.3660	0.0207
802.11g	2412-2462	21.5	1.0	22.50	0.178	0.1572	5.3660	**0.0293**
802.11n-HT20	2412-2462	18.5	1.0	19.50	0.089	0.0788	5.3660	0.0147
802.11n-HT40	2422-2452	15.5	1.0	16.50	0.045	0.0395	5.3812	0.0073
BLE	2402-2480	10.0	1.0	11.00	0.013	0.0111	5.3508	0.0021
BT	2402-2480	12.5	1.0	13.50	0.022	0.0198	5.3508	0.0037
WCDMA Band II	1850-1910	24.0	1.0	25.00	0.316	0.2796	4.4763	0.0625
WCDMA Band V	824-849	24.0	1.0	25.00	0.316	0.2796	2.5756	**0.1086**
LTE Band 2	1850-1910	23.5	1.0	24.50	0.282	0.2492	4.4763	0.0557
LTE Band 4	1710-1755	23.5	1.0	24.50	0.282	0.2492	4.2419	0.0587
LTE Band 5	824-849	23.0	1.0	24.00	0.251	0.2221	2.5756	0.0862
LTE Band 12	699-716	23.0	1.0	24.00	0.251	0.2221	2.3017	0.0965
LTE Band 13	777-787	23.0	1.0	24.00	0.251	0.2221	2.4743	0.0898
LTE Band 17	704-716	23.0	1.0	24.00	0.251	0.2221	2.3130	0.0960

UHF: (Based on Controlled Environment)

Mode	Channel Spacing	Frequency Range (MHz)	Tune-up Conducted Power(dBm)	Antenna Gain	Tune-up EIRP		Power Density (W/m^2)	RF Exp. Limit (W/m^2)	Ratio
				(dBi)	(dBm)	(W)			
UHF	12.5 kHz	410~430	34.00	5.5	39.50	8.913	7.8794	13.07	0.6029
		450~470	33.50	5.5	39.00	7.943	7.0225	13.69	0.5130

Note:

1. The tune-up output power was declared by the Manufacturer.
2. The LTE/3G module IC: 5131A-LE910NAV2(Grant: 07/05/2016).
3. 2.4G Wi-Fi/BT/BLE, WCDMA and UHF can transmit simultaneously; the worst condition is as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0293+0.1086+0.6029=0.7408 < 1.0$$

Conclusion: The device meets RF exposure limits at 30 cm distance.

RSS-GEN ISSUE5 Clause 8.8 – AC POWER-LINE CONDUCTED EMISSIONS LIMITS

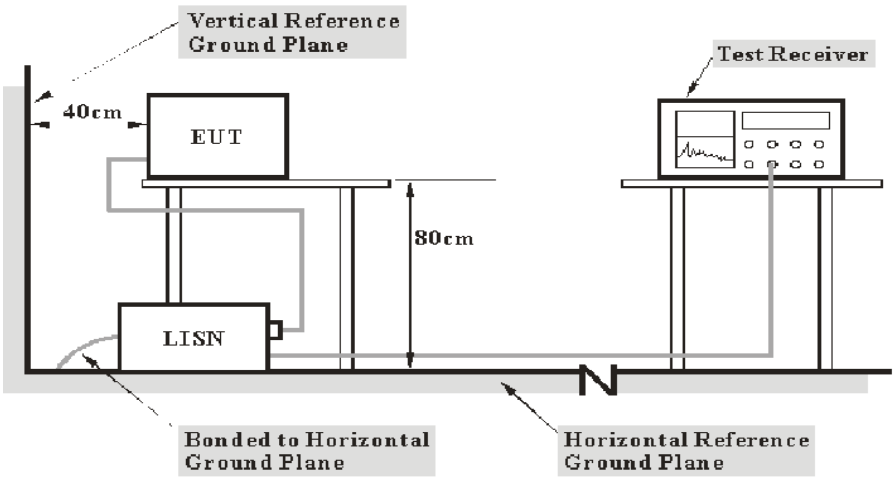
Applicable Standard

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 µH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.
For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Table 4 - AC Power Line Conducted Emissions Limits		
Frequency range (MHz)	**Conducted limit (dBµV)**	
	Quasi-Peak	**Average**
0.15 – 0.5	66 to 56[1]	56 to 46[1]
0.5 – 5	56	46
5 – 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

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 ANSI C63.10-2013.

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 Setup

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

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

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

Test Procedure

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

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

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

Factor & Over Limit Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

The "**Over Limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over Limit of 7dB means the emission is 7 dB above the limit. The equation for over Limit calculation is as follows:

Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

Test Results Summary

According to the recorded data in following table, the EUT complied with the RSS-GEN Issue 5.

Test Data

Environmental Conditions

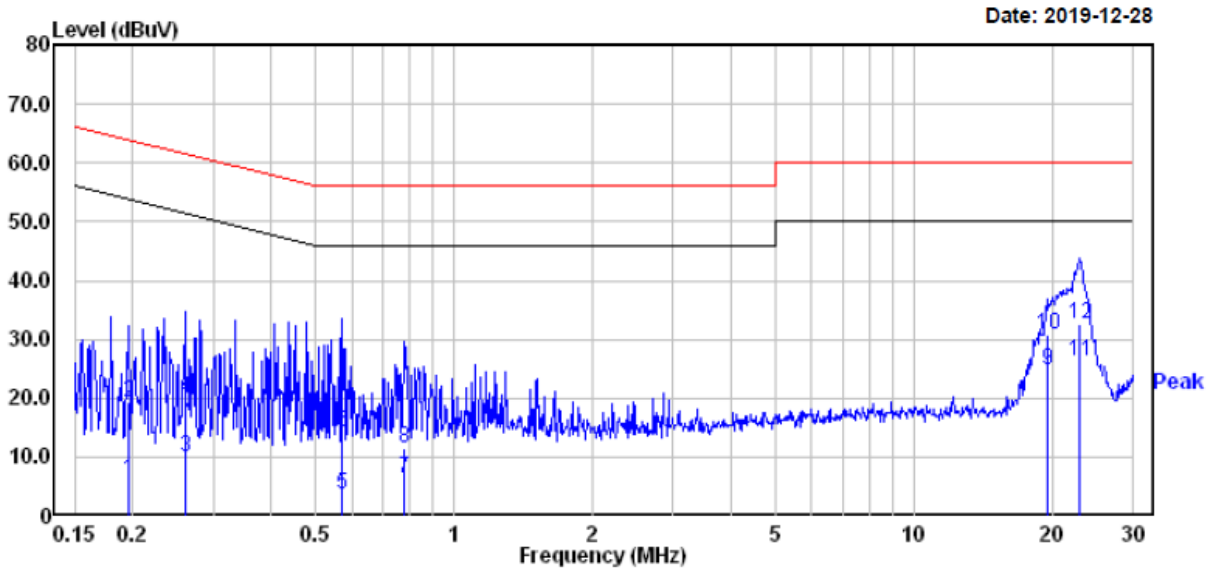
Temperature:	24.5 ℃
Relative Humidity:	52 %
ATM Pressure:	101.7 kPa

The testing was performed by Chao Gao on 2019-12-28.

Test Result: Compliant.

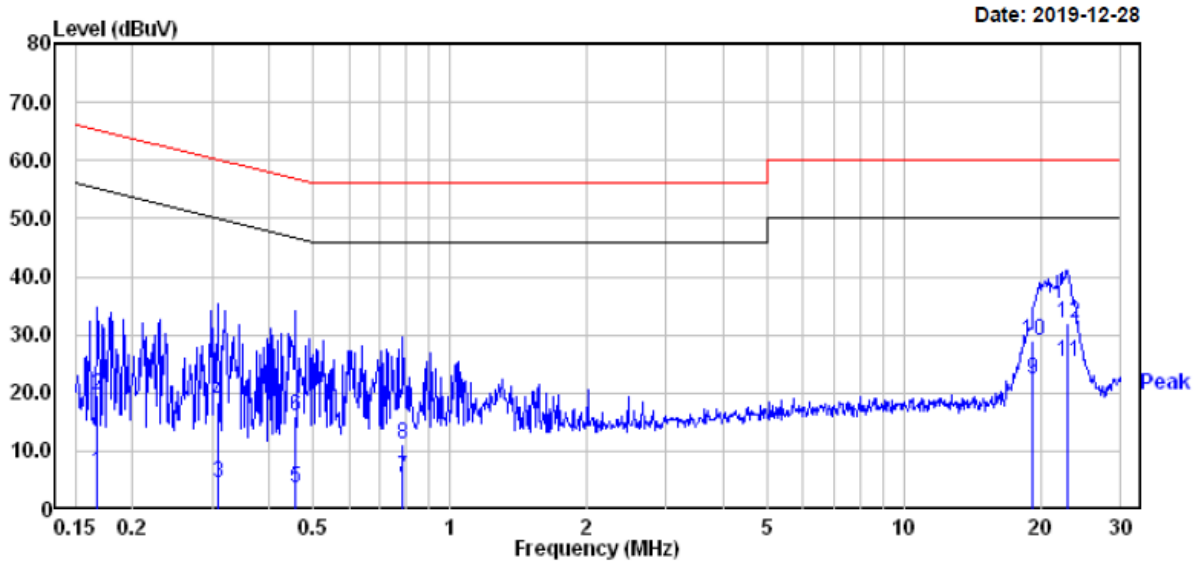
EUT operation mode: Transmitting in high channel of BDR(GFSK) mode (Worst case)

AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.197	-13.90	19.82	5.92	53.76	-47.84	Average
2	0.197	-0.40	19.82	19.42	63.76	-44.34	QP
3	0.260	-9.90	19.82	9.92	51.42	-41.50	Average
4	0.260	0.20	19.82	20.02	61.42	-41.40	QP
5	0.570	-16.20	19.75	3.55	46.00	-42.45	Average
6	0.570	-5.60	19.75	14.15	56.00	-41.85	QP
7	0.779	-13.40	19.71	6.31	46.00	-39.69	Average
8	0.779	-8.30	19.71	11.41	56.00	-44.59	QP
9	19.532	4.70	19.93	24.63	50.00	-25.37	Average
10	19.532	10.90	19.93	30.83	60.00	-29.17	QP
11	22.896	6.51	19.79	26.30	50.00	-23.70	Average
12	22.896	12.91	19.79	32.70	60.00	-27.30	QP

AC 120V/60 Hz, Neutral



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.168	-13.40	19.83	6.43	55.08	-48.65	Average
2	0.168	-0.30	19.83	19.53	65.08	-45.55	QP
3	0.308	-15.21	19.83	4.62	50.02	-45.40	Average
4	0.308	-1.31	19.83	18.52	60.02	-41.50	QP
5	0.459	-16.00	19.75	3.75	46.71	-42.96	Average
6	0.459	-3.80	19.75	15.95	56.71	-40.76	QP
7	0.788	-14.20	19.71	5.51	46.00	-40.49	Average
8	0.788	-8.40	19.71	11.31	56.00	-44.69	QP
9	19.224	2.40	19.91	22.31	50.00	-27.69	Average
10	19.224	9.10	19.91	29.01	60.00	-30.99	QP
11	23.018	5.61	19.78	25.39	50.00	-24.61	Average
12	23.018	12.21	19.78	31.99	60.00	-28.01	QP

Note:

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

RSS-247 ISSUE2 Clause 5.5 & RSS-GEN ISSUE5 Clause 8.10 – UNWANTED EMISSIONS & RESTRICTED FREQUENCY BANDS

Applicable Standard

According to RSS-247 Issue2 Clause 5.5

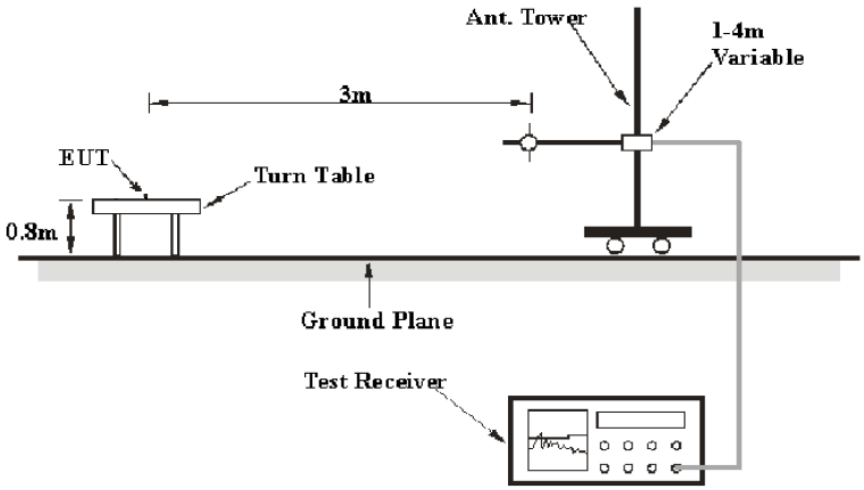
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either 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(4), 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.

According to RSS-GEN Issue5 Clause 8.10

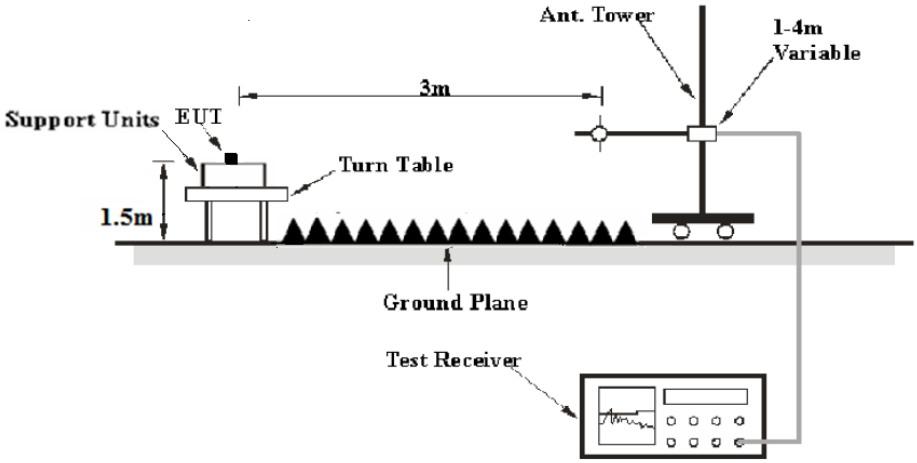
Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:
(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287;
(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the RSS-247 Issue2 Clause 5.5 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	PK
	1MHz	3 MHz	/	Ave.

Test Procedure

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

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

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude (dBμV/m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

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 (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Test Results Summary

According to the recorded data in following table, the EUT complied with the RSS-247 Issue2 Clause 5.5.

Test Data

Environmental Conditions

Temperature:	25.0~25.7 ℃
Relative Humidity:	49~52 %
ATM Pressure:	100.7~101.5 kPa

The testing was performed by Chao Gao from 2019-12-20 to 2019-12-23.

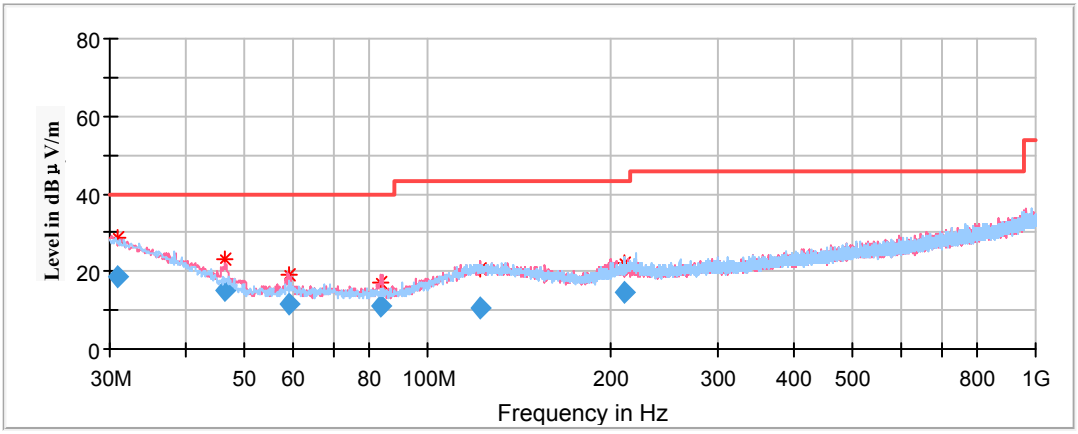
EUT operation mode: Transmitting

Test Result: Compliant.

Spurious Emission Test:

30MHz-1GHz:

Pre-Scan with GFSK, π/4-DQPSK, 8DPSK modes of operation in the X,Y and Z axes of orientation, the worst case ***high channel of BDR(GFSK) Mode in Z-axis of orientation*** *was recorded*



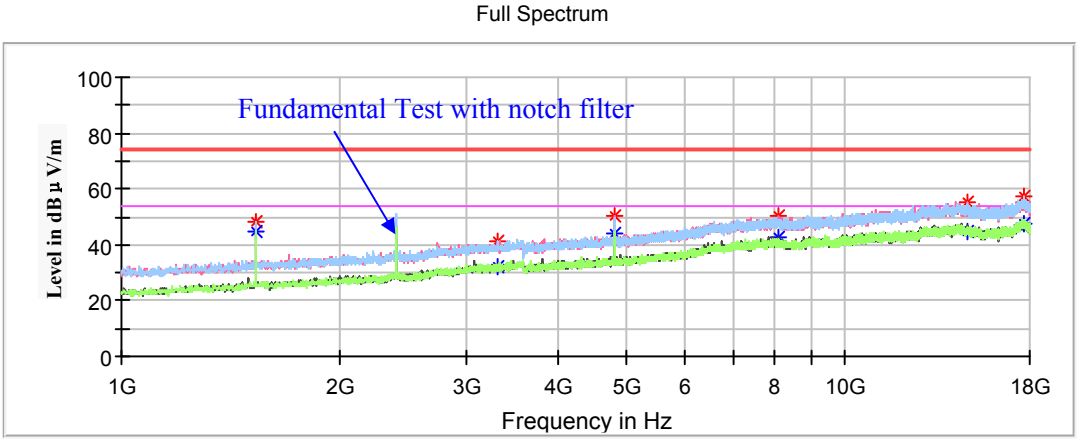
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	Quasi-peak (dBµV/m)	Height (cm)	Polar (H/V)				
30.82	18.60	100	V	315.0	-4.5	40.00	21.40
46.29	15.08	100	V	239.0	-15.0	40.00	24.92
59.07	11.79	100	V	274.0	-17.9	40.00	28.21
83.51	10.95	200	V	341.0	-17.7	40.00	29.05
121.94	10.77	200	V	253.0	-11.3	43.50	32.73
210.86	14.63	100	H	341.0	-12.3	43.50	28.87

1GHz-18GHz:

Pre-Scan with GFSK, π/4-DQPSK, 8DPSK modes of operation in the X,Y and Z axes of orientation, the worst case ***BDR(GFSK) Mode in Z-axis of orientation*** *was recorded*

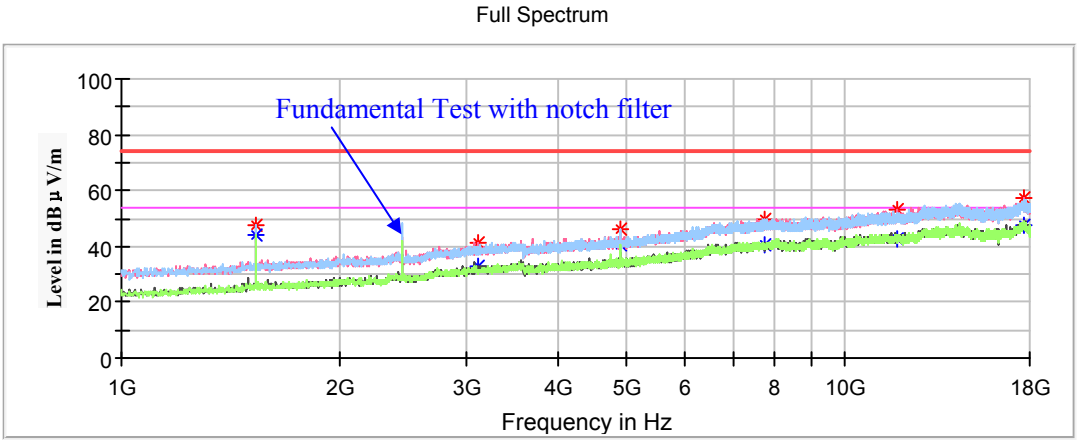
Note:
1. This test was performed with the 2.4-2.5 GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Low Channel: 2402MHz



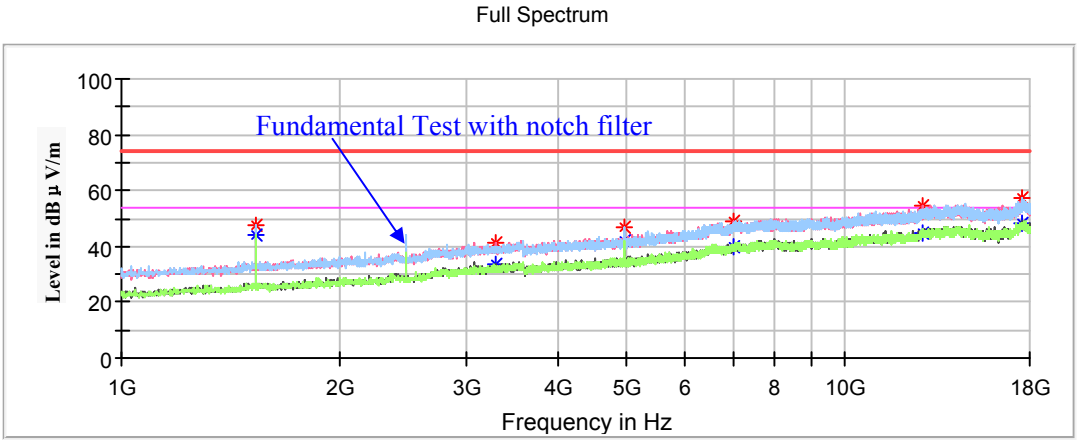
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.45	150	H	312.0	-9.8	54.00	9.55
1533.80	48.36	---	150	H	312.0	-9.8	74.00	25.64
3305.20	---	32.42	150	H	297.0	-3.9	54.00	21.58
3305.20	41.55	---	150	H	297.0	-3.9	74.00	32.45
4804.00	---	44.17	150	V	340.0	-0.6	54.00	9.83
4804.00	50.50	---	150	V	340.0	-0.6	74.00	23.50
8111.10	---	42.48	200	V	33.0	6.9	54.00	11.52
8111.10	50.04	---	200	V	33.0	6.9	74.00	23.96
14785.30	---	45.06	200	V	142.0	12.0	54.00	8.94
14785.30	55.10	---	200	V	142.0	12.0	74.00	18.90
17663.40	---	47.60	150	H	252.0	14.0	54.00	6.40
17663.40	57.12	---	150	H	252.0	14.0	74.00	16.88

Middle Channel: 2441MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	43.95	150	H	320.0	-9.8	54.00	10.05
1533.80	47.60	---	150	H	320.0	-9.8	74.00	26.40
3114.80	---	32.88	200	V	64.0	-4.2	54.00	21.12
3114.80	41.41	---	200	V	64.0	-4.2	74.00	32.59
4882.00	---	40.88	150	H	0.0	-0.4	54.00	13.12
4882.00	46.18	---	150	H	0.0	-0.4	74.00	27.82
7764.30	---	40.80	150	H	320.0	6.6	54.00	13.20
7764.30	49.80	---	150	H	320.0	6.6	74.00	24.20
11839.20	---	42.95	200	V	96.0	10.0	54.00	11.05
11839.20	53.37	---	200	V	96.0	10.0	74.00	20.63
17615.80	---	47.30	150	V	99.0	14.1	54.00	6.70
17615.80	57.17	---	150	V	96.0	14.1	74.00	16.83

High Channel: 2480MHz

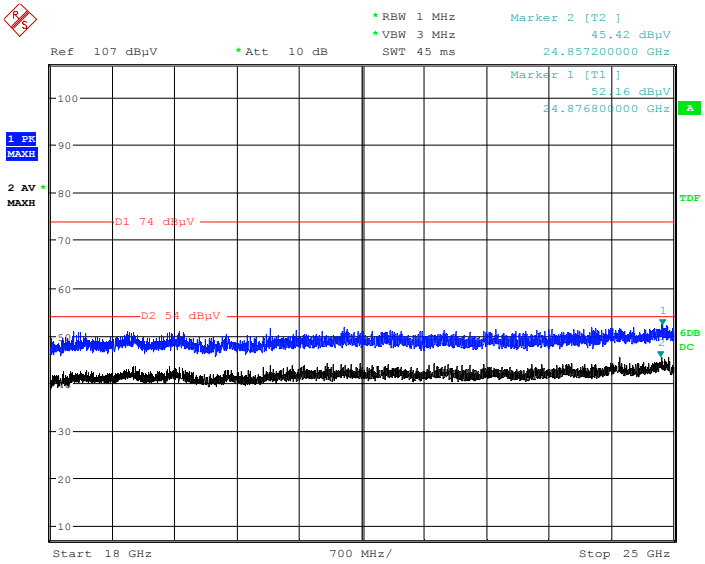


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.28	150	H	312.0	-9.8	54.00	9.72
1533.80	47.87	---	150	H	312.0	-9.8	74.00	26.13
3288.20	---	33.27	200	V	237.0	-3.9	54.00	20.73
3288.20	41.42	---	200	V	237.0	-3.9	74.00	32.58
4960.00	---	42.18	200	H	289.0	-0.3	54.00	11.82
4960.00	46.90	---	200	H	289.0	-0.3	74.00	27.10
6994.20	---	39.62	200	V	0.0	5.3	54.00	14.38
6994.20	48.94	---	200	V	0.0	5.3	74.00	25.06
12769.10	---	44.43	150	V	311.0	11.3	54.00	9.57
12769.10	54.44	---	150	V	311.0	11.3	74.00	19.56
17561.40	---	48.01	200	H	257.0	14.2	54.00	5.99
17561.40	57.15	---	200	H	257.0	14.2	74.00	16.85

18GHz-25GHz:

Pre-Scan with GFSK, π/4-DQPSK, 8DPSK modes of operation in the X,Y and Z axes of orientation,, the worst case ***high channel of BDR(GFSK) Mode in Z-axis of orientation*** *was recorded*

Horizontal



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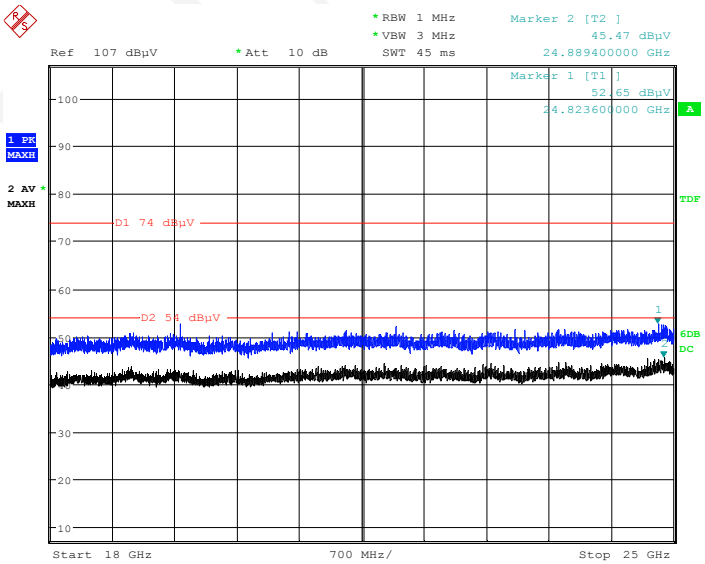
Vertical



Date: 21.DEC.2019 13:39:04

Restricted Bands Emissions:

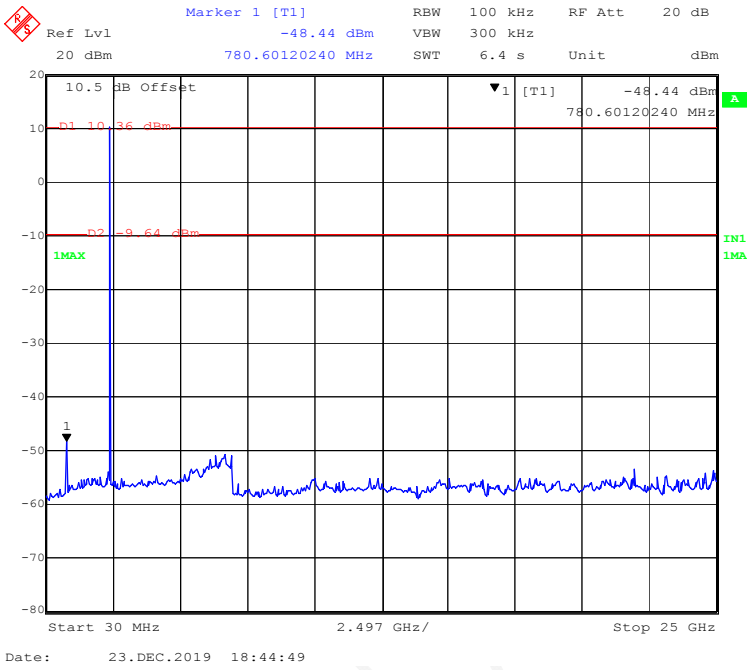
Pre-Scan with GFSK, π/4-DQPSK, 8DPSK modes of operation in the X,Y and Z axes of orientation, the worst case ***BDR(GFSK) Mode in Z-axis of orientation*** *was recorded*

Note:
1. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

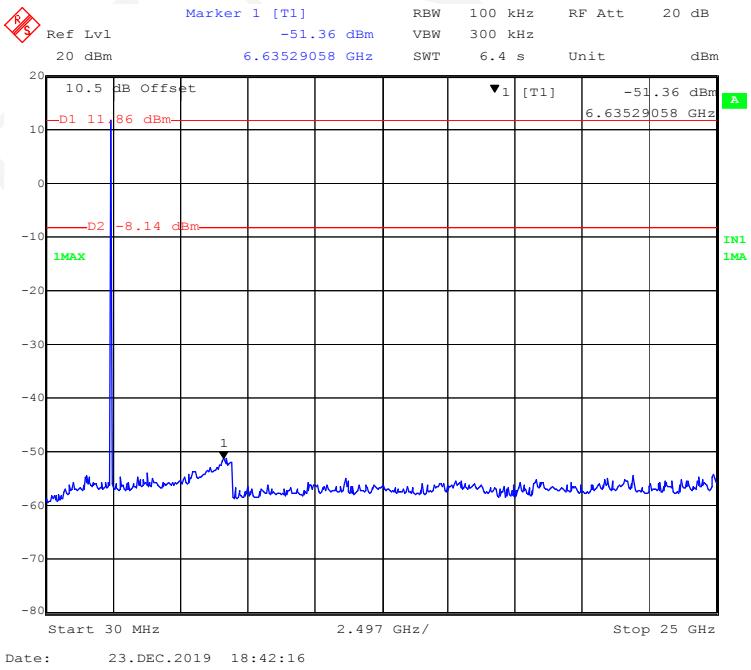
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
Low Channel: 2402MHz								
2390.000000	56.25	---	200.0	H	0.0	2.8	74.00	17.75
2390.000000	---	44.49	200.0	H	0.0	2.8	54.00	9.51
High Channel: 2480MHz								
2483.500000	52.80	---	150.0	H	309.0	3.0	74.00	21.20
2483.500000	---	43.93	150.0	H	309.0	3.0	54.00	10.07

Conducted Spurious Emissions at Antenna Port

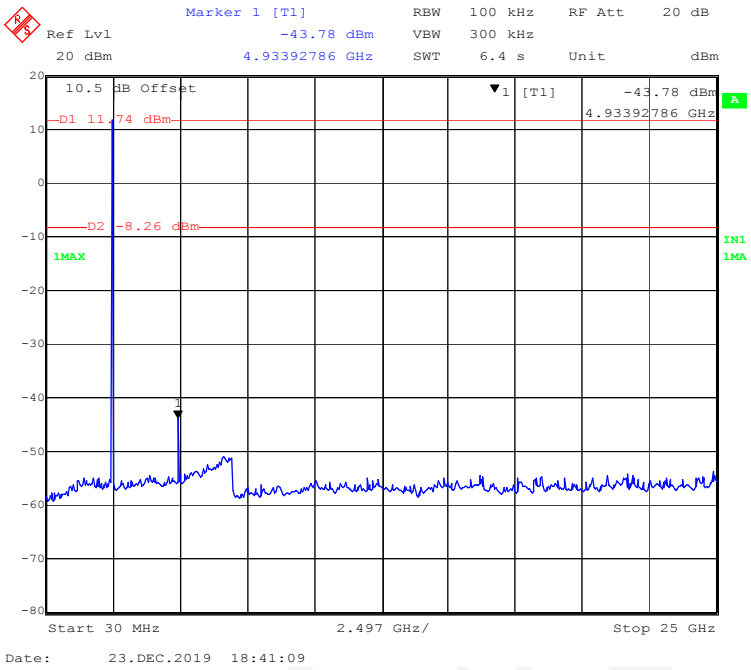
BDR (GFSK): Low Channel



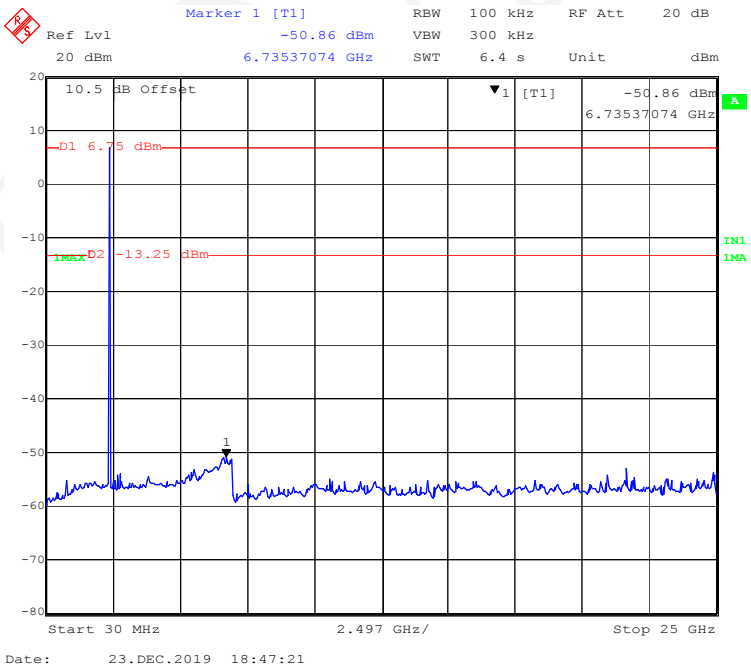
BDR (GFSK): Middle Channel



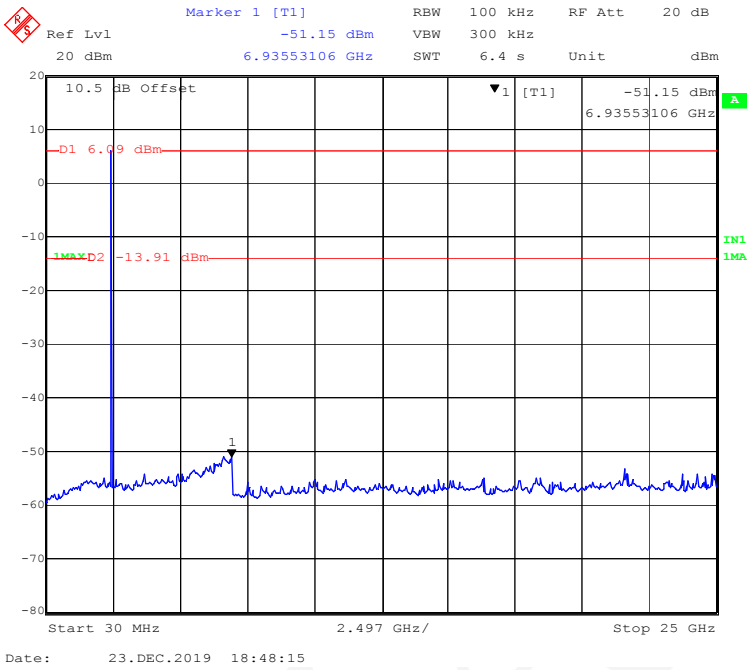
BDR (GFSK): High Channel



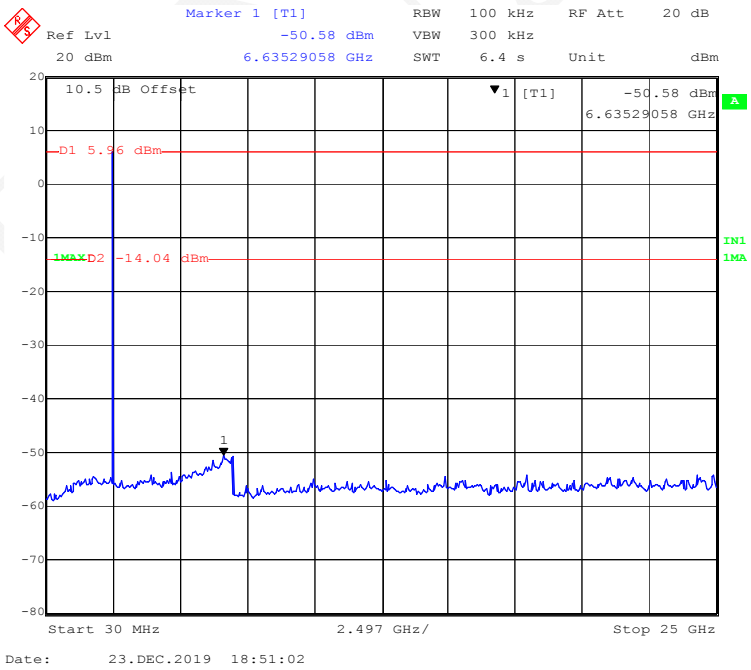
EDR (π/4-DQPSK): Low Channel



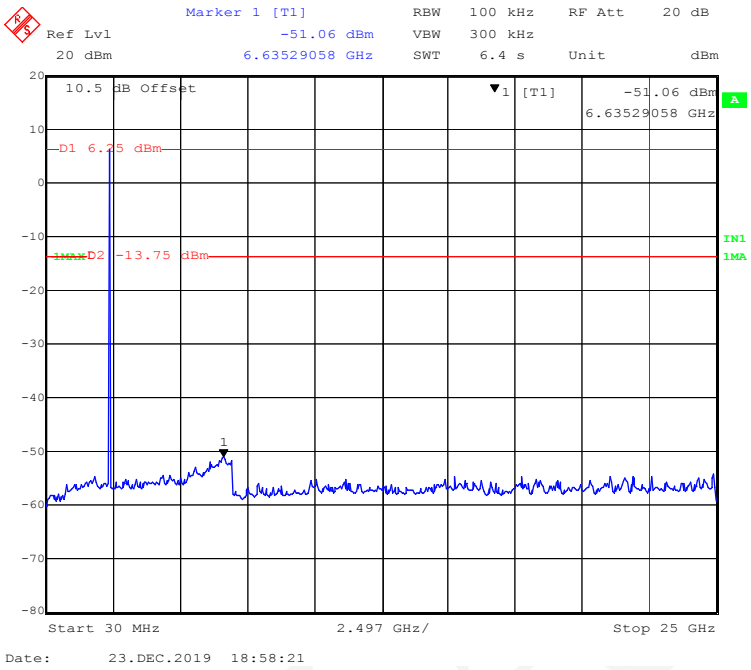
EDR (π/4-DQPSK): Middle Channel



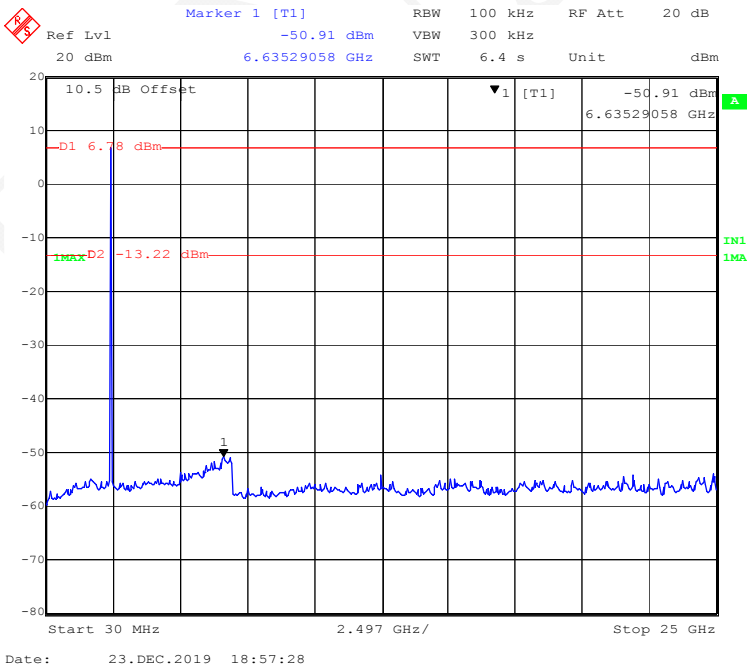
EDR (π/4-DQPSK): High Channel



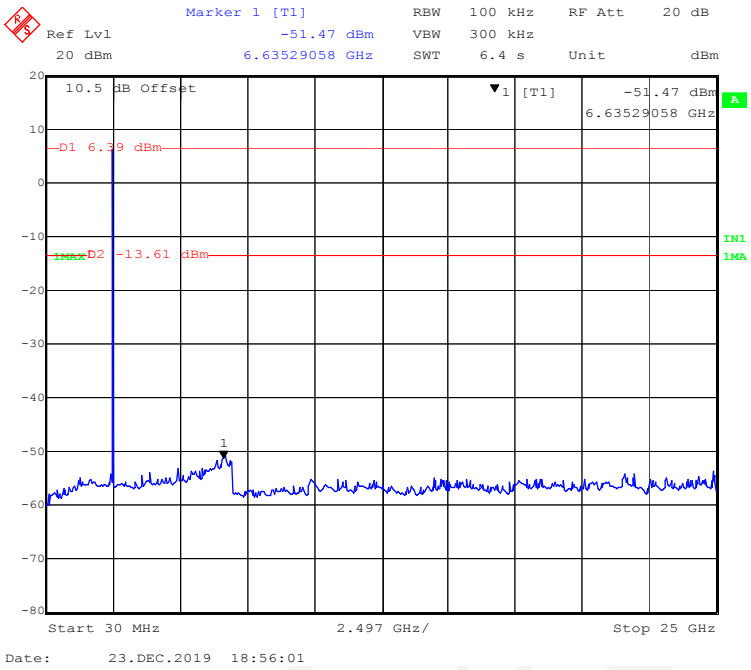
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): High Channel



RSS-247 ISSUE2 Clause 5.1 a) – 20 dB BANDWIDTH TEST

Applicable Standard

The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system's radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hop set. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	24.7 ℃
Relative Humidity:	52 %
ATM Pressure:	101.7 kPa

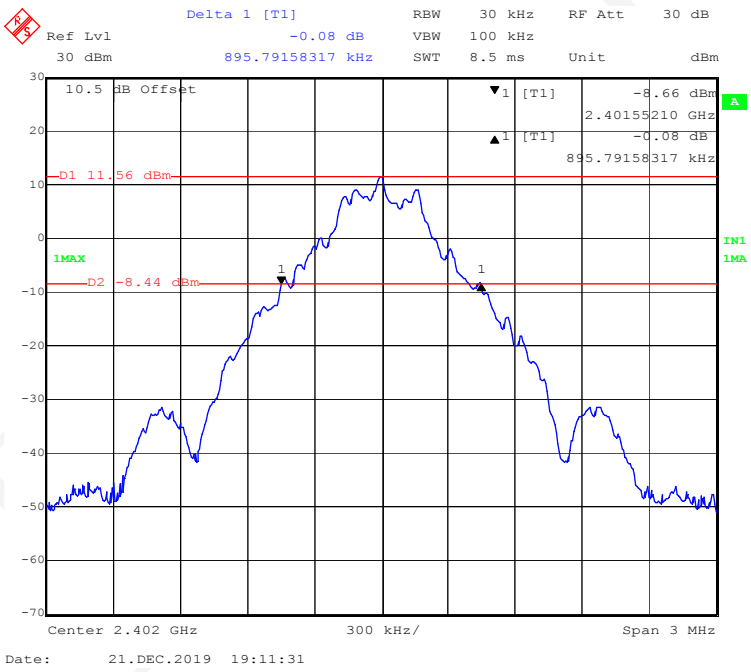
The testing was performed by Chao Gao on 2019-12-21.

EUT operation mode: Transmitting

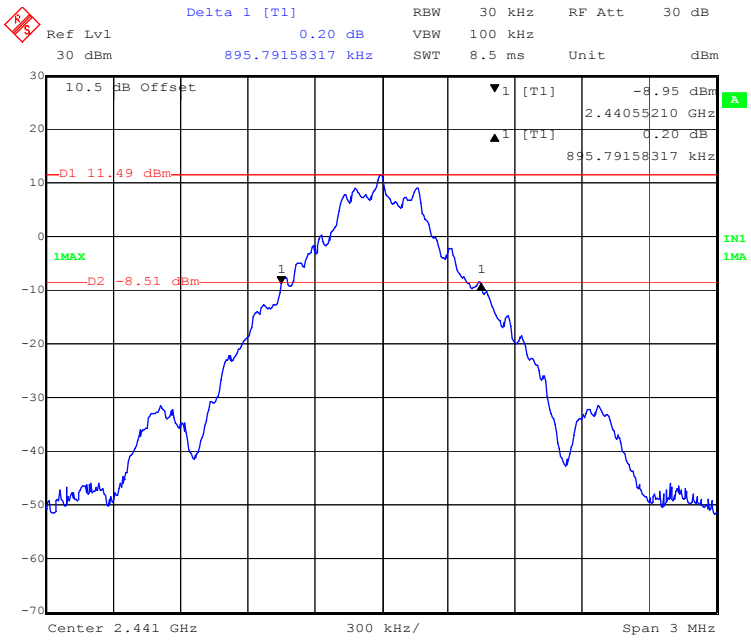
Test Result: Compliant.

Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.896
	Middle	2441	0.896
	High	2480	0.890
EDR (π/4-DQPSK)	Low	2402	1.208
	Middle	2441	1.208
	High	2480	1.214
EDR (8DPSK)	Low	2402	1.202
	Middle	2441	1.202
	High	2480	1.202

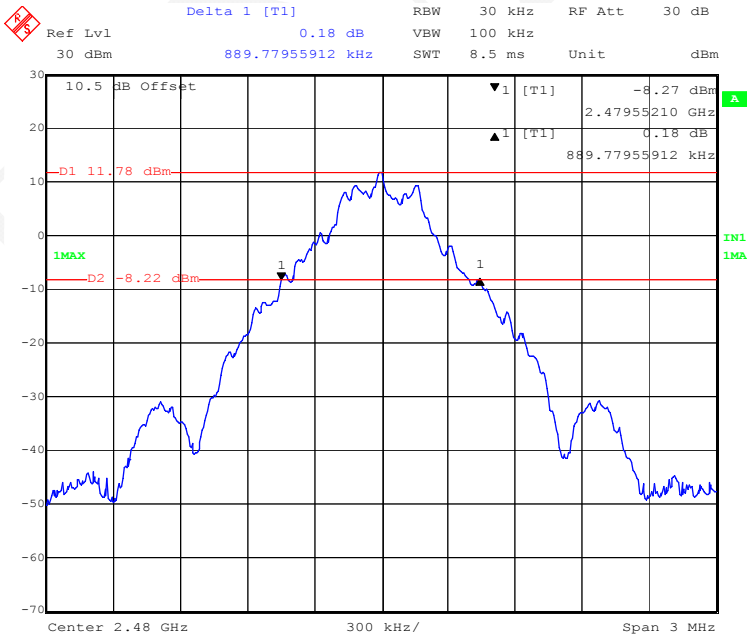
BDR (GFSK): Low Channel



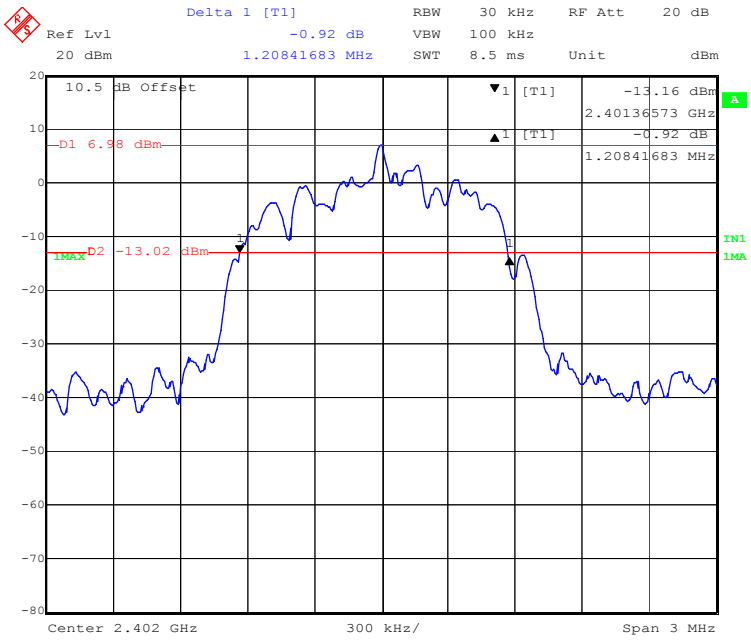
BDR (GFSK): Middle Channel



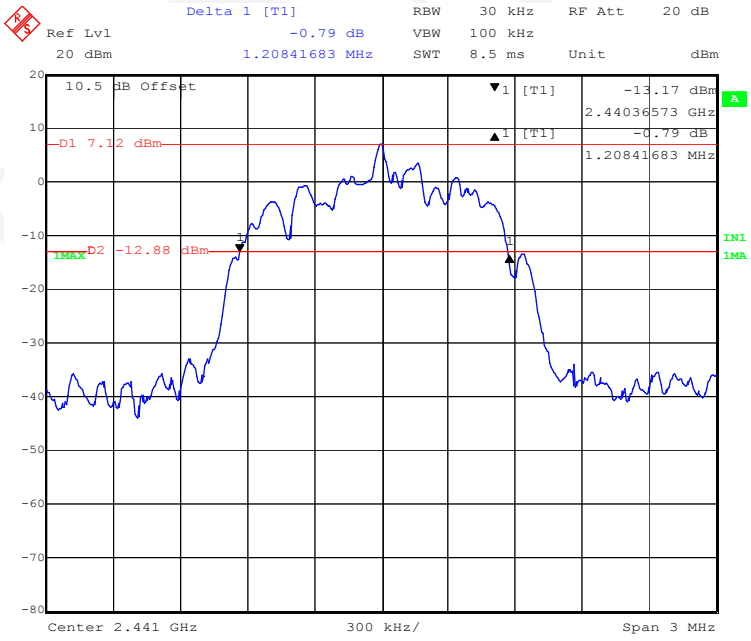
BDR (GFSK): High Channel



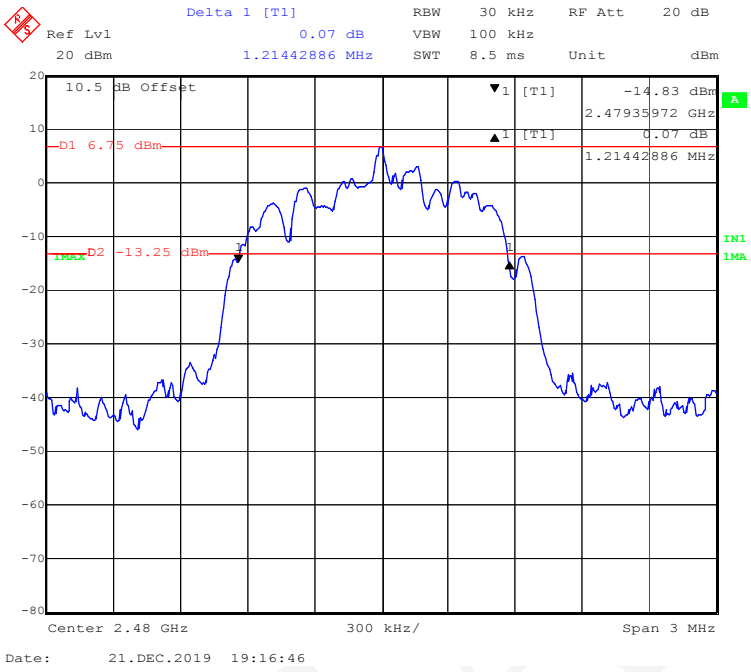
EDR (π/4-DQPSK): Low Channel



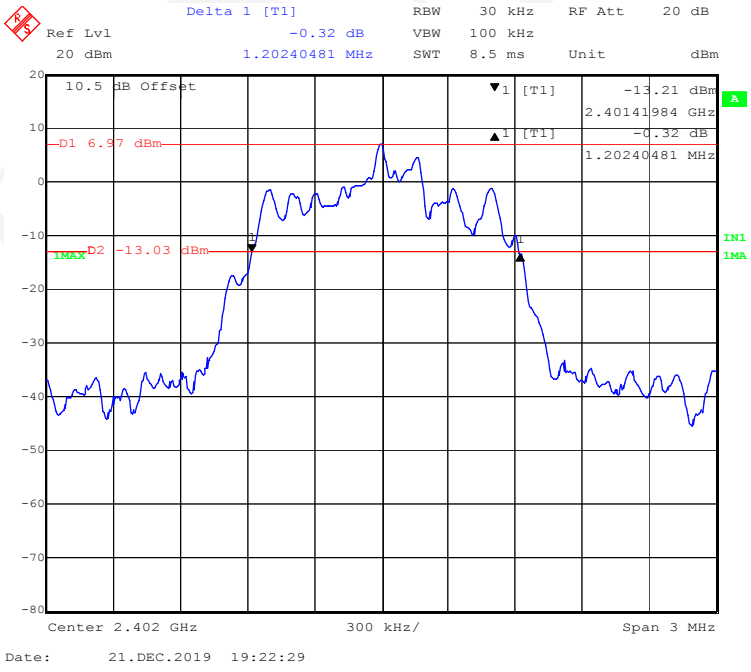
EDR(π/4-DQPSK): Middle Channel



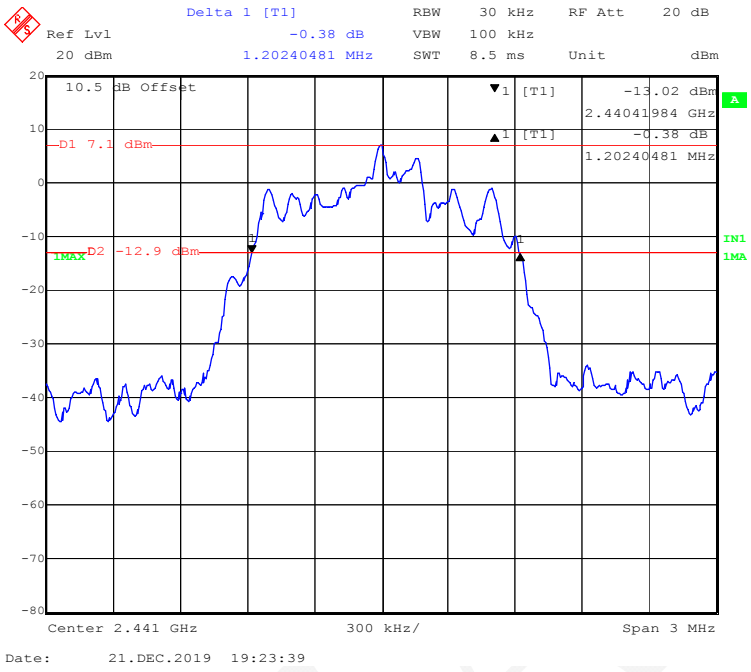
EDR (π/4-DQPSK): High Channel



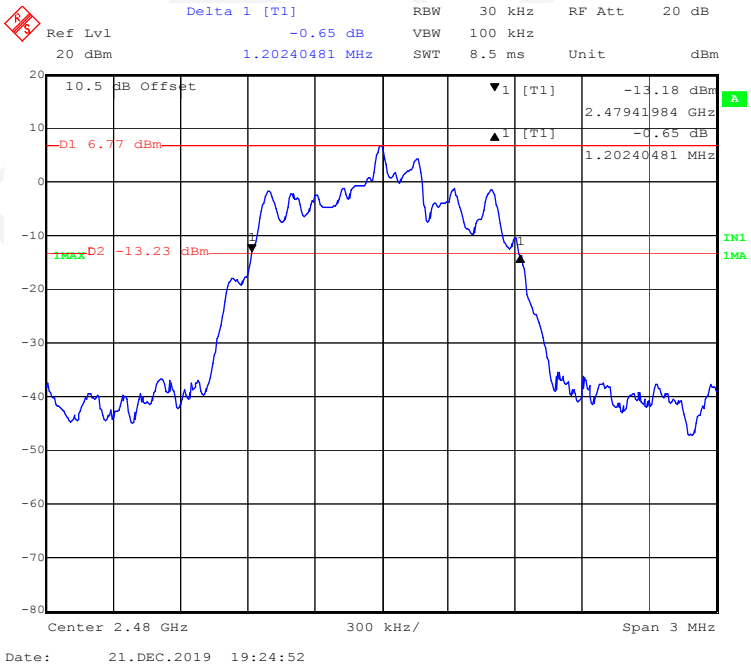
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): High Channel



RSS-GEN ISSUE 5 Clause 6.7 – OCCUPIED BANDWIDTH

Applicable Standard

According to RSS-GEN Issue 5 Clause 6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Test Procedure

The following conditions shall be observed for measuring the occupied bandwidth:

1. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
2. The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
3. The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied if the device is not transmitting continuously.
4. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test Data

Environmental Conditions

Temperature:	24.7-24.9 ℃
Relative Humidity:	50-52 %
ATM Pressure:	101.3-101.7 kPa

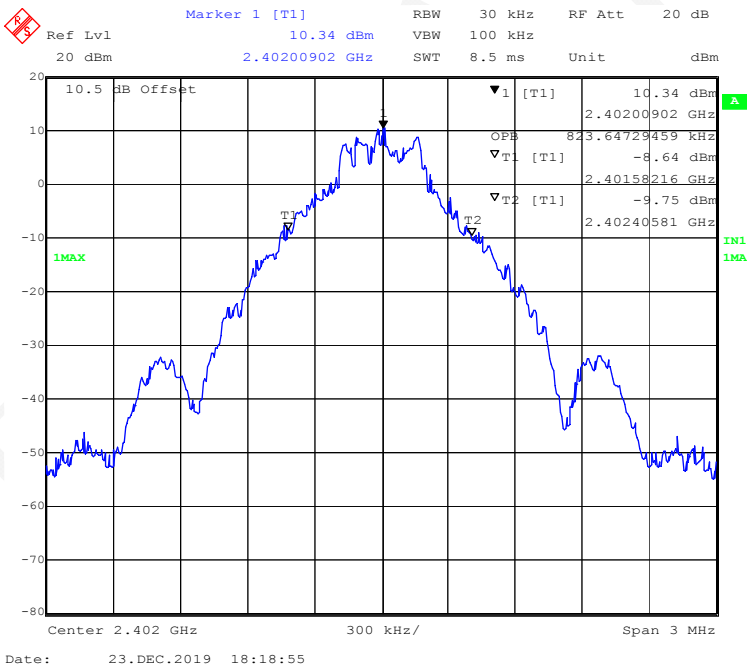
The testing was performed by Chao Gao from 2019-12-21 to 2019-12-23.

EUT operation mode: Transmitting

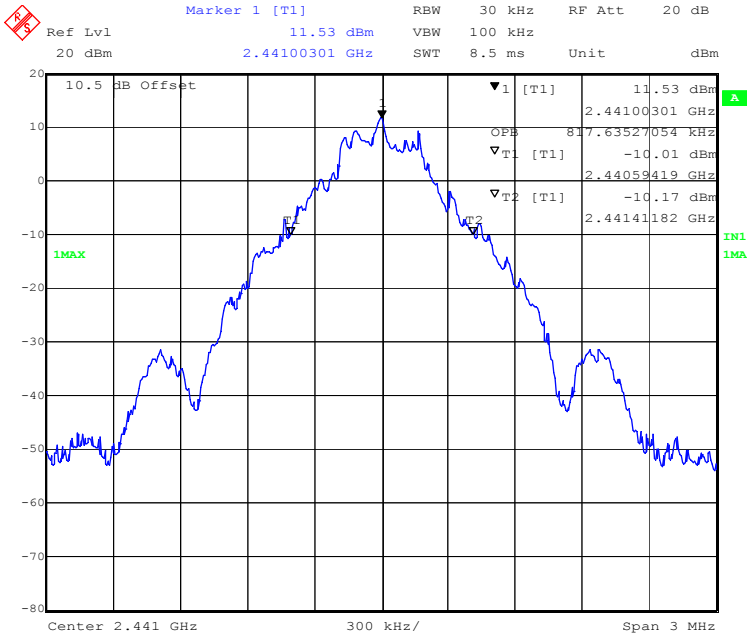
Test Result: Compliant.

Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.824
	Middle	2441	0.818
	High	2480	0.818
EDR (π/4-DQPSK)	Low	2402	1.154
	Middle	2441	1.154
	High	2480	1.154
EDR (8DPSK)	Low	2402	1.136
	Middle	2441	1.136
	High	2480	1.130

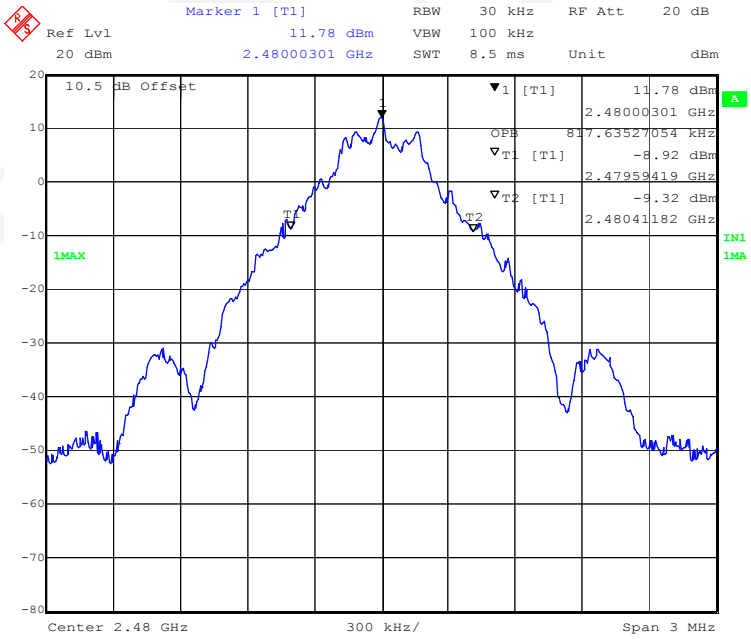
BDR (GFSK): Low Channel



BDR (GFSK): Middle Channel

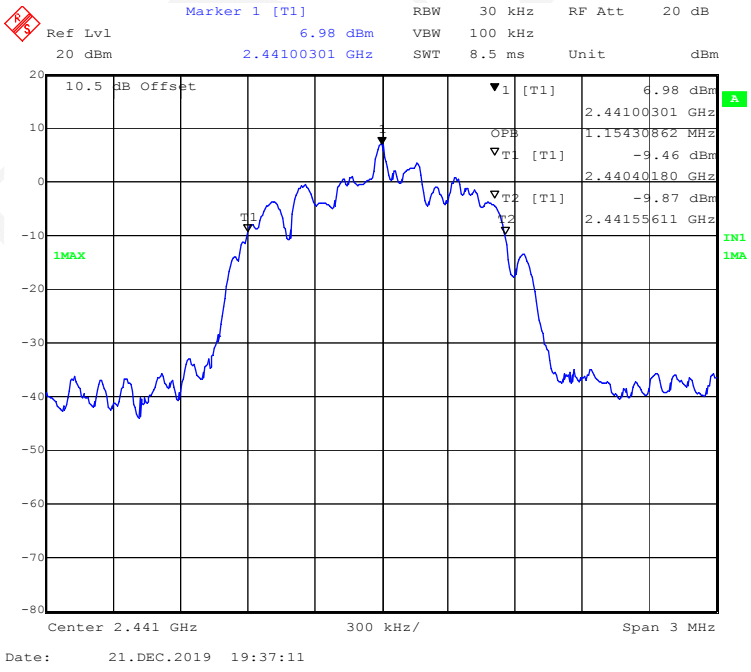


BDR (GFSK): High Channel



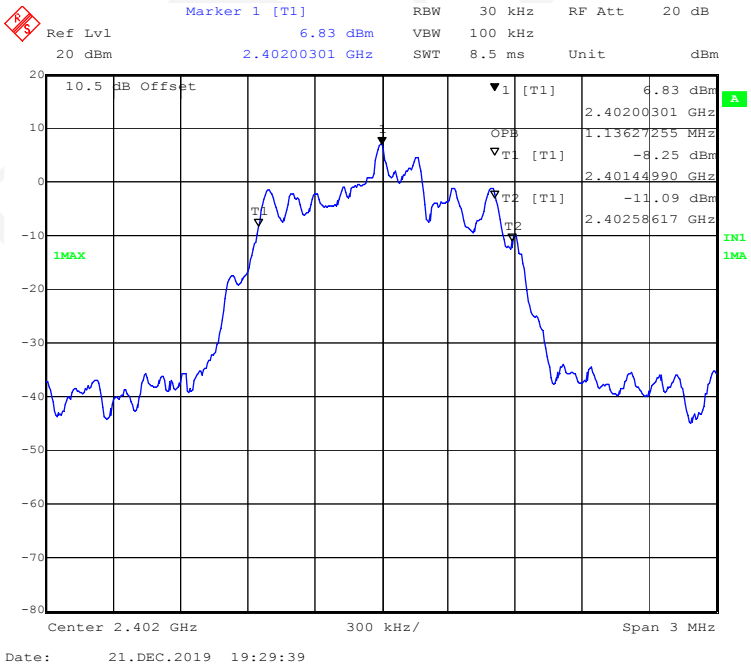
EDR (π/4-DQPSK): Low Channel

EDR(π/4-DQPSK): Middle Channel

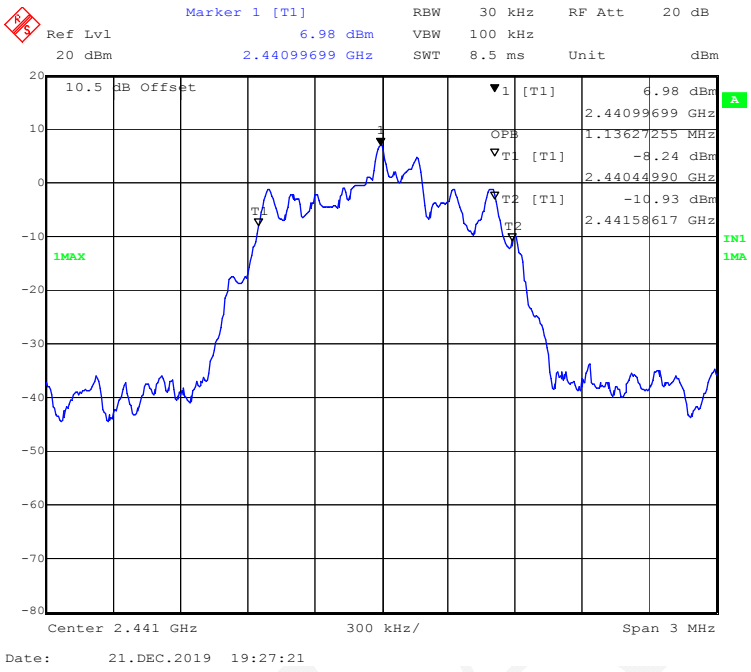


EDR (π/4-DQPSK): High Channel

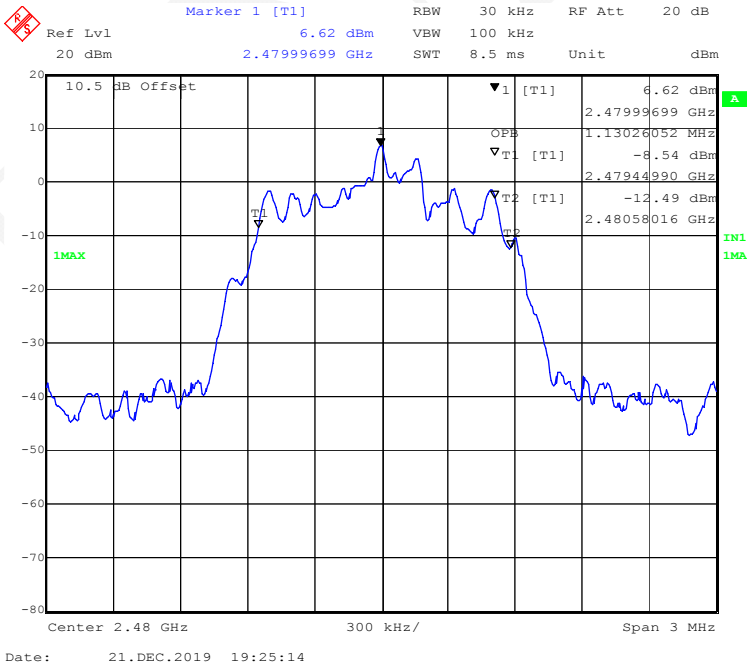
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): High Channel



RSS-247 ISSUE2 Clause 5.1 b) - CHANNEL SEPARATION TEST

Applicable Standard

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

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a. Span: Wide enough to capture the peaks of two adjacent channels.
b. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
c. Video (or average) bandwidth (VBW) ≥ RBW.
d. Sweep: Auto.
e. Detector function: Peak.
f. Trace: Max hold.
g. Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Test Data

Environmental Conditions

Temperature:	24.9 ℃
Relative Humidity:	52 %
ATM Pressure:	101.9 kPa

The testing was performed by Chao Gao on 2019-12-23.

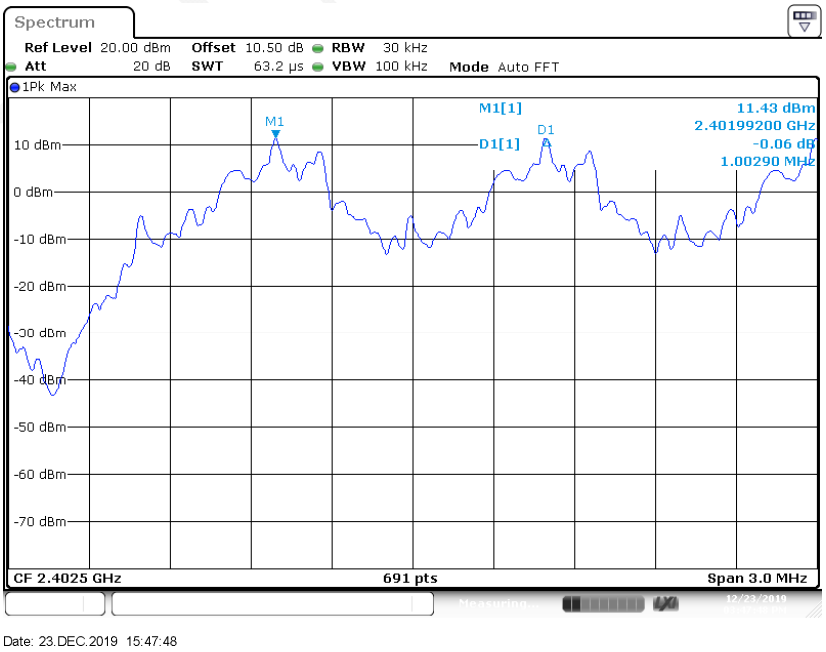
EUT operation mode: Transmitting

Test Result: Compliant.

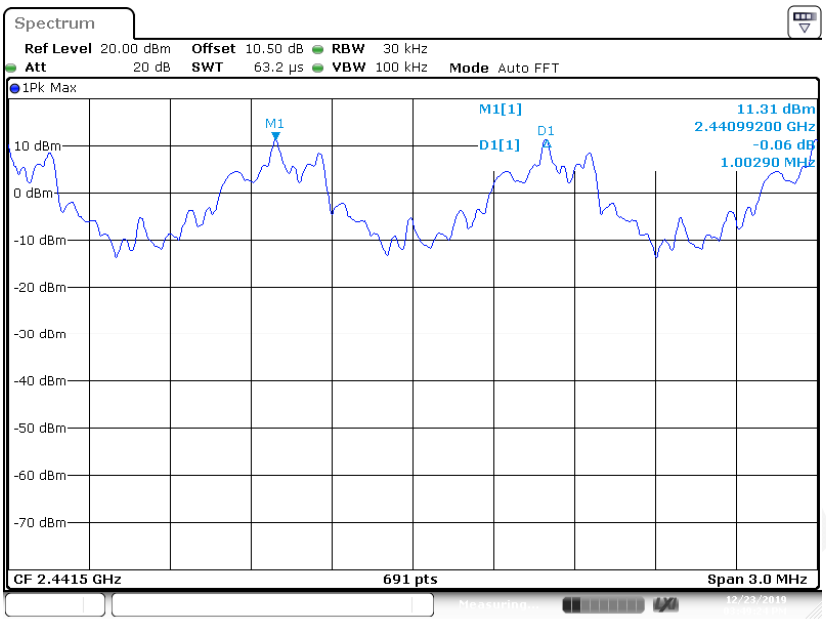
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.003	0.896	Pass
	Adjacent	2403			
	Middle	2441	1.003	0.896	Pass
	Adjacent	2442			
	High	2480	1.003	0.890	Pass
	Adjacent	2479			
EDR (π/4-DQPSK)	Low	2402	1.003	0.805	Pass
	Adjacent	2403			
	Middle	2441	1.003	0.805	Pass
	Adjacent	2442			
	High	2480	1.003	0.809	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.003	0.801	Pass
	Adjacent	2403			
	Middle	2441	1.003	0.801	Pass
	Adjacent	2442			
	High	2480	1.003	0.801	Pass
	Adjacent	2479			

Note: For BDR mode, Limit = 20 dB bandwidth, For BDR and EDR mode, Limit = 20 dB bandwidth*2/3

BDR (GFSK): Low Channel

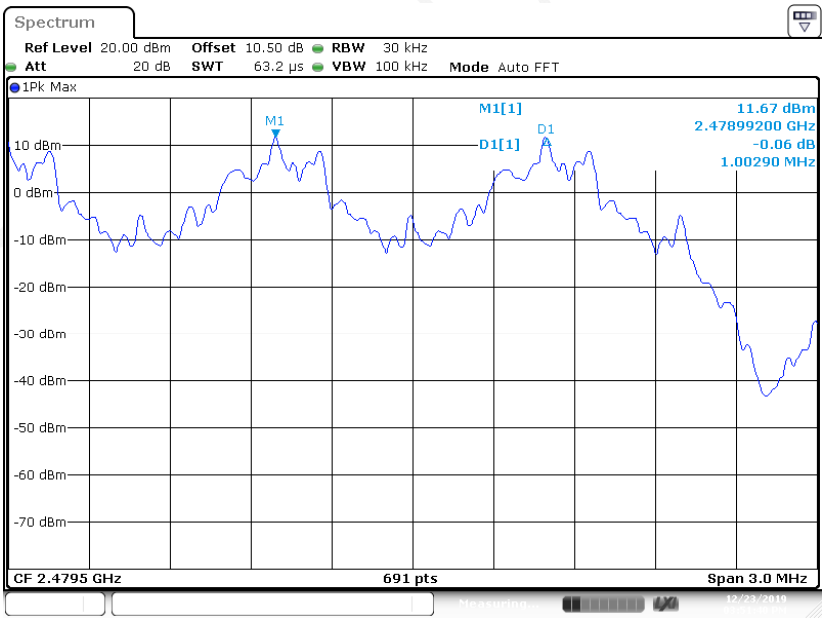


BDR (GFSK): Middle Channel



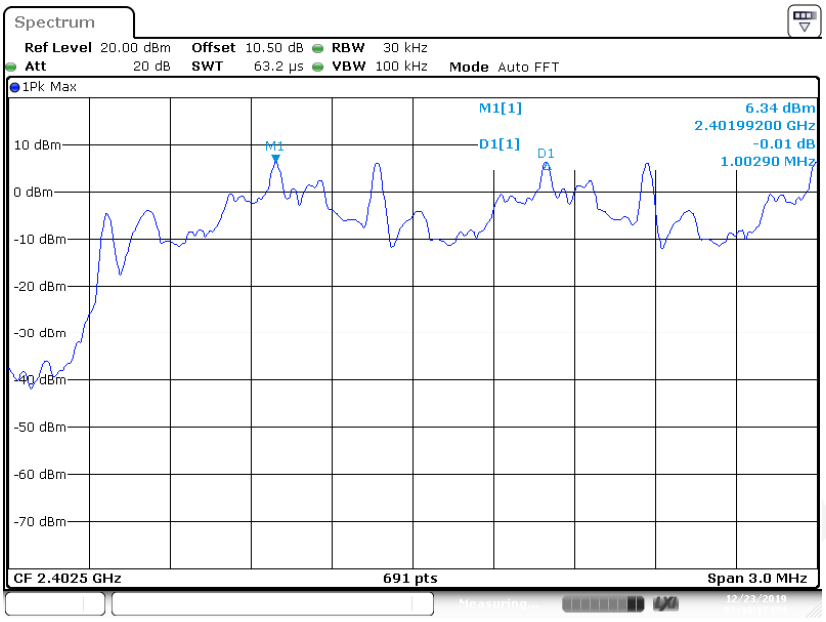
Date: 23.DEC.2019 15:49:24

BDR (GFSK): High Channel



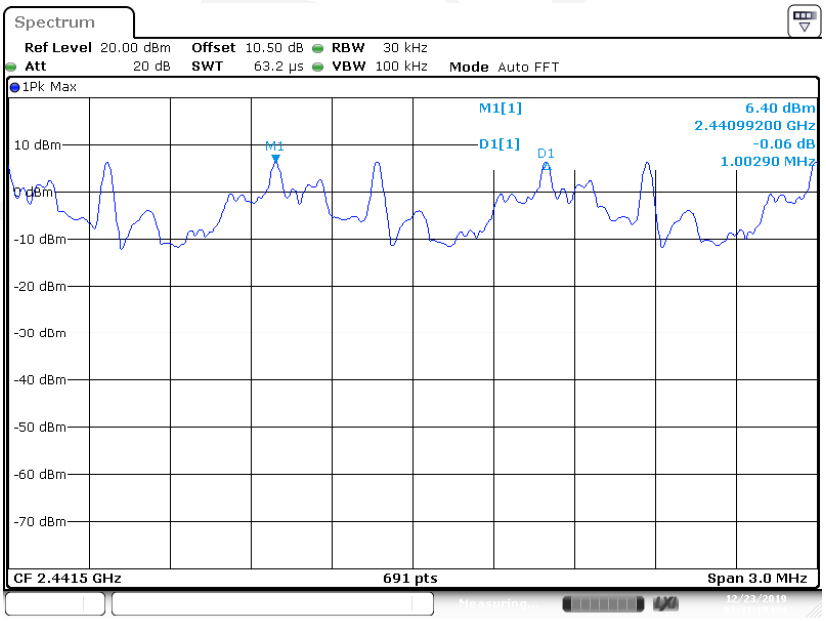
Date: 23.DEC.2019 15:51:40

EDR (π/4-DQPSK): Low Channel



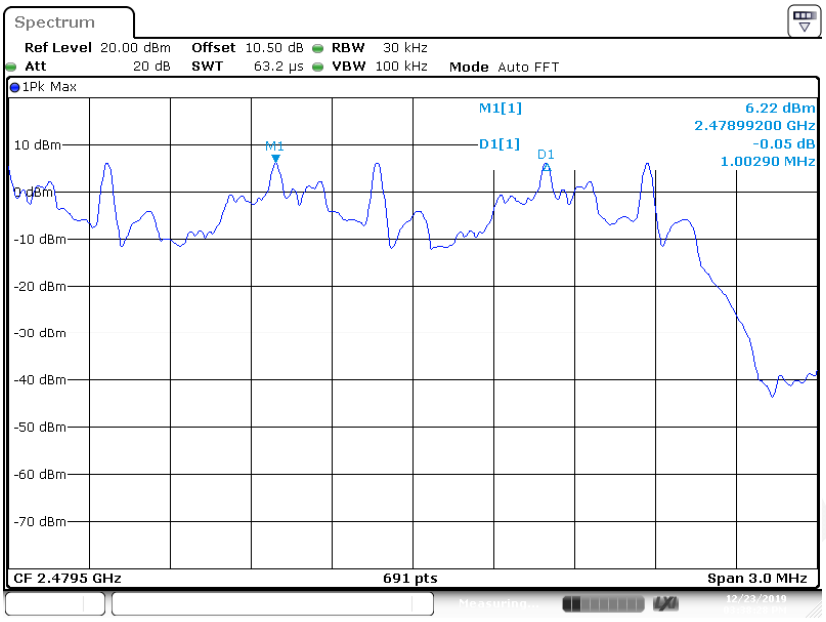
Date: 23.DEC.2019 15:44:17

EDR (π/4-DQPSK): Middle Channel



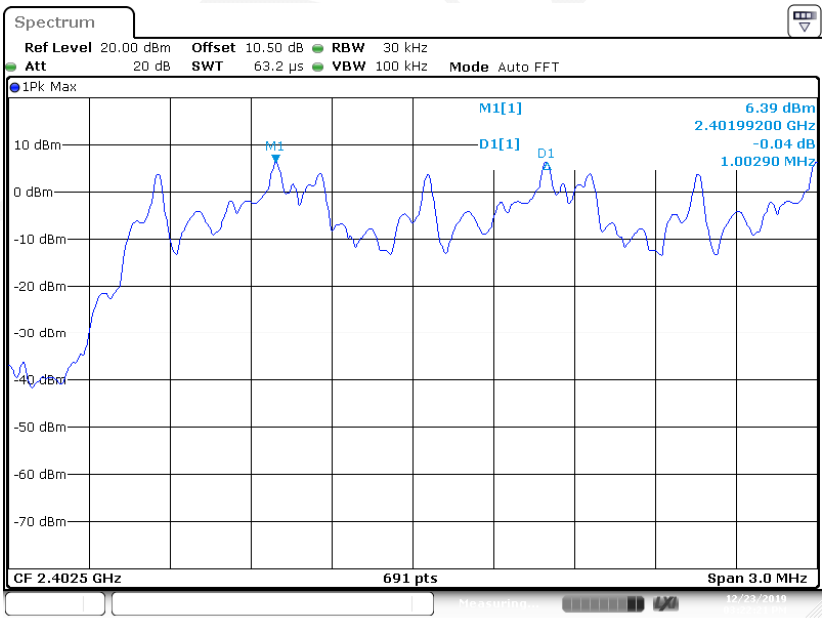
Date: 23.DEC.2019 15:41:19

EDR (π/4-DQPSK): High Channel



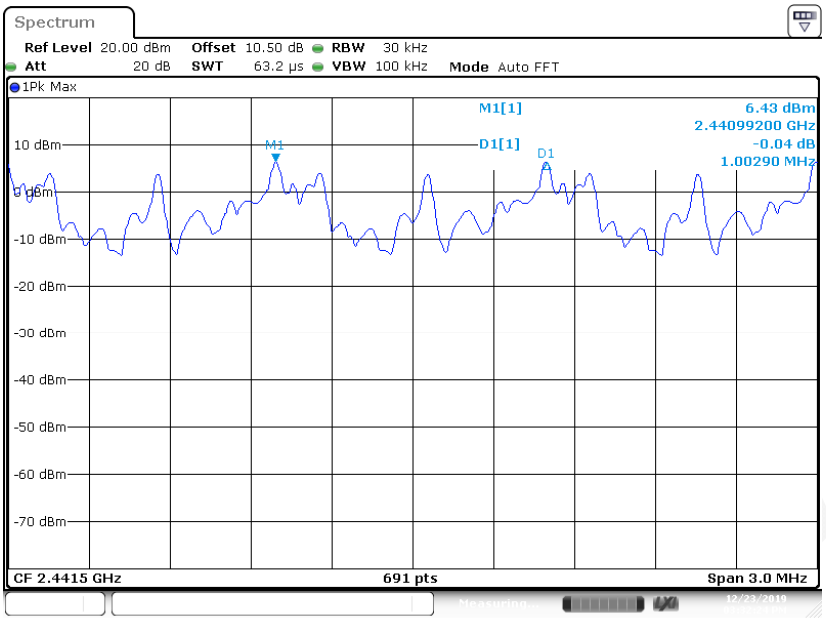
Date: 23.DEC.2019 15:38:28

EDR (8DPSK): Low Channel



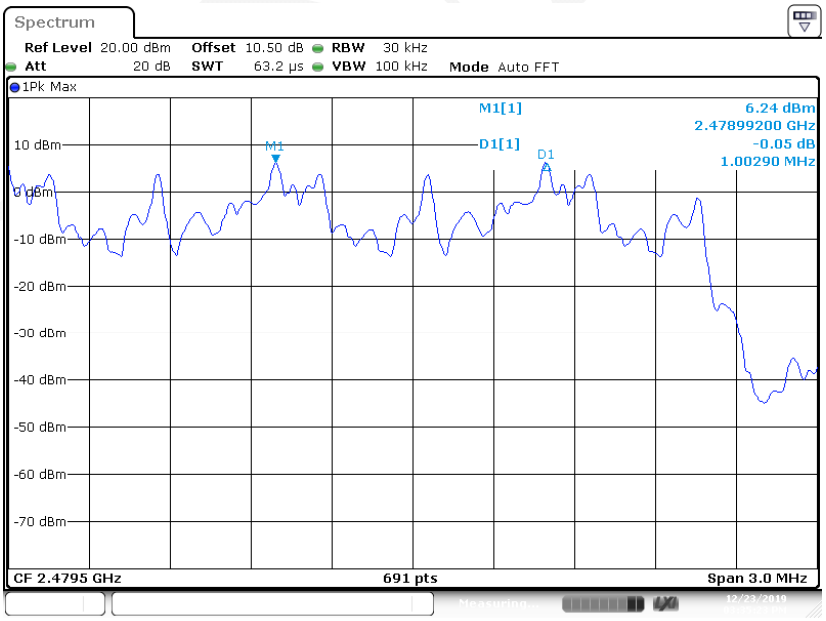
Date: 23.DEC.2019 15:22:21

EDR (8DPSK): Middle Channel



Date: 23.DEC.2019 15:32:24

EDR (8DPSK): High Channel



Date: 23.DEC.2019 15:35:23

RSS-247 ISSUE2 Clause 5.1 d) - QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

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 of0.4 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 shall have its hopping function enabled. Use the following spectrum analyzer settings:

a. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
b. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
c. VBW ≥ RBW.
d. Sweep: Auto.
e. Detector function: Peak.
f. Trace: Max hold.
g. Allow the trace to stabilize.

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies.

Test Data

Environmental Conditions

Temperature:	24.9 ℃
Relative Humidity:	52 %
ATM Pressure:	101.9 kPa

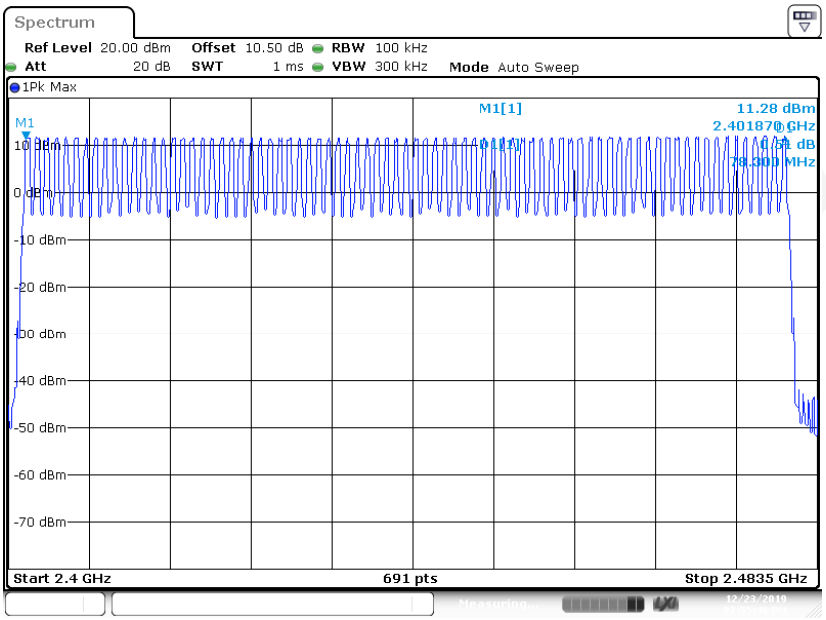
The testing was performed by Chao Gao on 2019-12-23.

EUT operation mode: Hopping

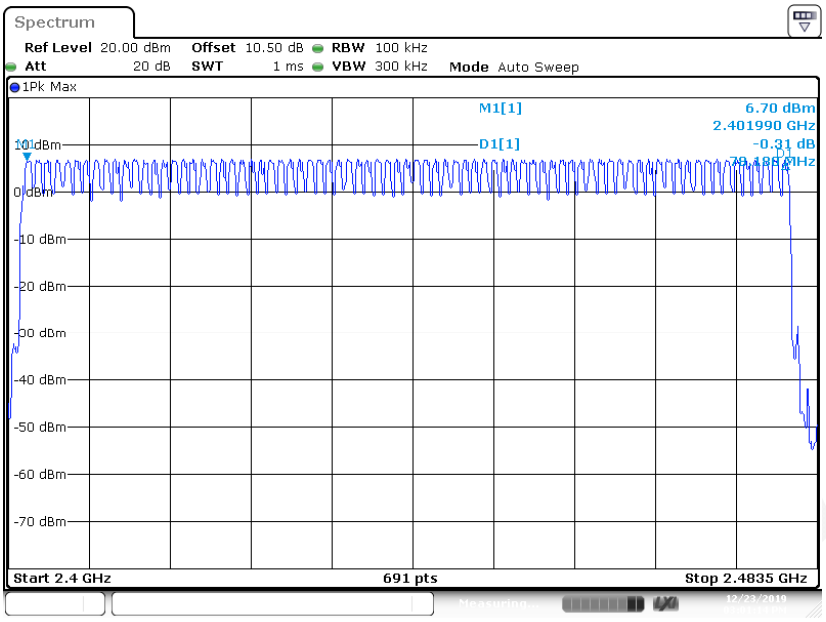
Test Result: Compliant.

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

BDR (GFSK): Number of Hopping Channels

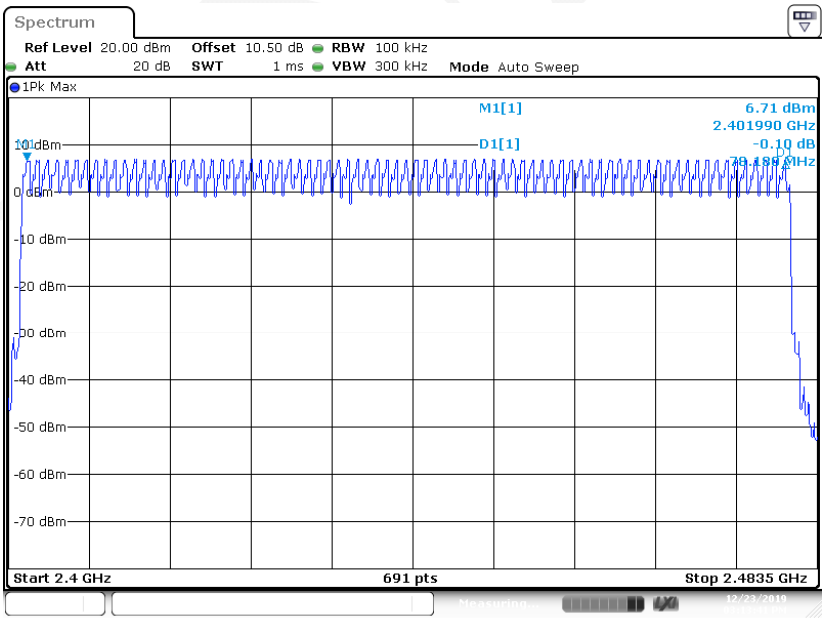


EDR (π/4-DQPSK): Number of Hopping Channels



Date: 23.DEC.2019 15:01:14

EDR (8DPSK): Number of Hopping Channels



Date: 23.DEC.2019 15:13:42

RSS-247 ISSUE2 Clause 5.1 d) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

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 of0.4 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 shall have its hopping function enabled. Use the following spectrum analyzer settings:

a Span: Zero span, centered on a hopping channel.
b RBW shall be ≤ channel spacing and where possible RBW should be set ≥ 1 / T, where T is the expected dwell time per channel.
c Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
d Detector function: Peak.
e Trace: Max hold.

Test Data

Environmental Conditions

Temperature:	24.9 ℃
Relative Humidity:	52 %
ATM Pressure:	101.9 kPa

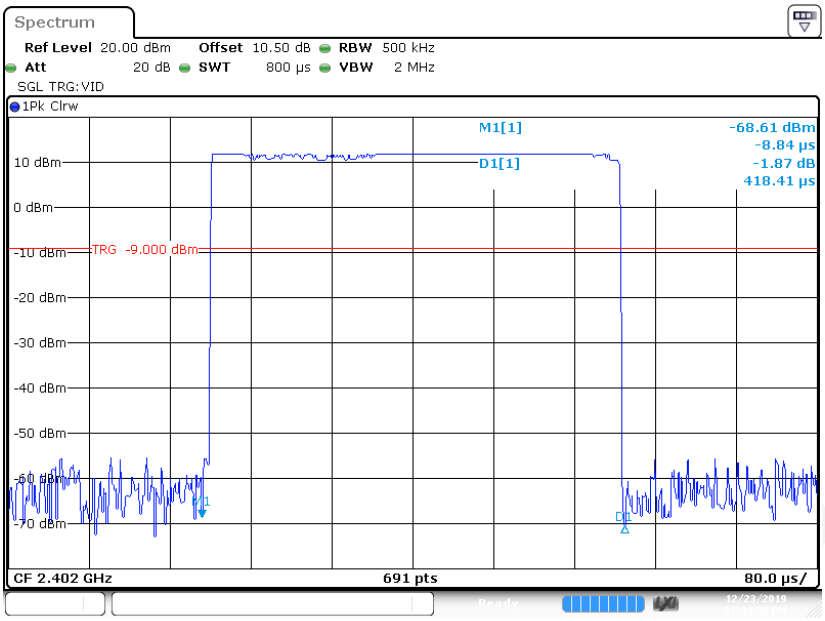
The testing was performed by Chao Gao on 2019-12-23.

EUT operation mode: Hopping

Test Result: Compliant.

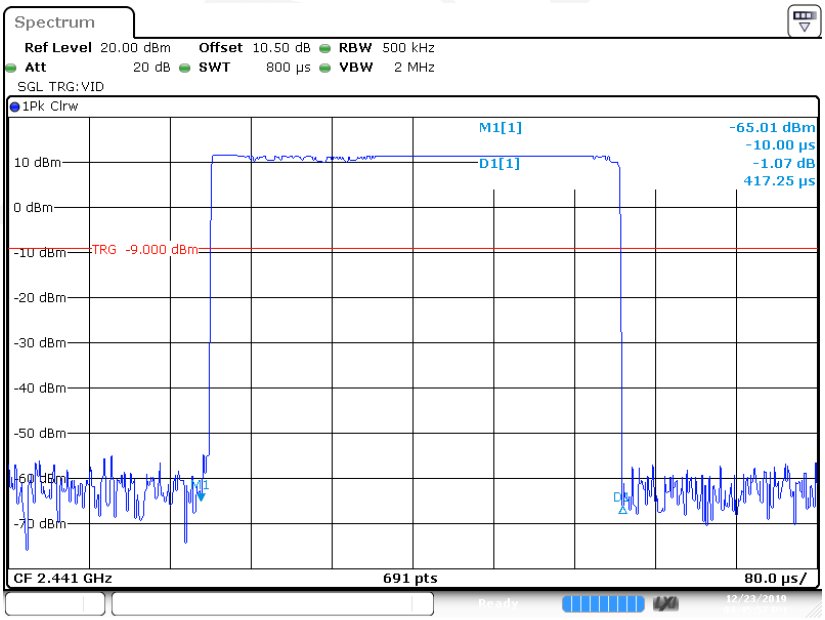
Mode		Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR (GFSK)	DH1	Low	0.418	0.134	0.4	Pass
		Middle	0.417	0.133	0.4	Pass
		High	0.422	0.135	0.4	Pass
		Note: DH1: Dwell time = Pulse time*(1600/2/79) *31.6S				
	DH3	Low	1.698	0.272	0.4	Pass
		Middle	1.680	0.269	0.4	Pass
		High	1.685	0.270	0.4	Pass
		Note: DH3: Dwell time = Pulse time*(1600/4/79) *31.6S				
	DH5	Low	2.946	0.314	0.4	Pass
		Middle	2.939	0.313	0.4	Pass
		High	2.933	0.313	0.4	Pass
		Note: DH5: Dwell time = Pulse time*(1600/6/79) *31.6S				
EDR (π/4-DQPSK)	2DH1	Low	0.424	0.136	0.4	Pass
		Middle	0.424	0.136	0.4	Pass
		High	0.431	0.138	0.4	Pass
		Note: 2DH1: Dwell time = Pulse time*(1600/2/79) *31.6S				
	2DH3	Low	1.685	0.270	0.4	Pass
		Middle	1.707	0.273	0.4	Pass
		High	1.702	0.272	0.4	Pass
		Note: 2DH3: Dwell time = Pulse time*(1600/4/79) *31.6S				
	2DH5	Low	2.939	0.313	0.4	Pass
		Middle	2.965	0.316	0.4	Pass
		High	2.965	0.316	0.4	Pass
		Note: 2DH5: Dwell time = Pulse time*(1600/6/79) *31.6S				
EDR (8DPSK)	3DH1	Low	0.427	0.137	0.4	Pass
		Middle	0.429	0.137	0.4	Pass
		High	0.437	0.140	0.4	Pass
		Note:3 DH1: Dwell time = Pulse time*(1600/2/79) *31.6S				
	3DH3	Low	1.693	0.271	0.4	Pass
		Middle	1.720	0.275	0.4	Pass
		High	1.728	0.276	0.4	Pass
		Note: 3DH3: Dwell time = Pulse time*(1600/4/79) *31.6S				
	3DH5	Low	3.004	0.320	0.4	Pass
		Middle	2.952	0.315	0.4	Pass
		High	2.959	0.316	0.4	Pass
		Note: 3DH5: Dwell time = Pulse time*(1600/6/79)* 31.6S				

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



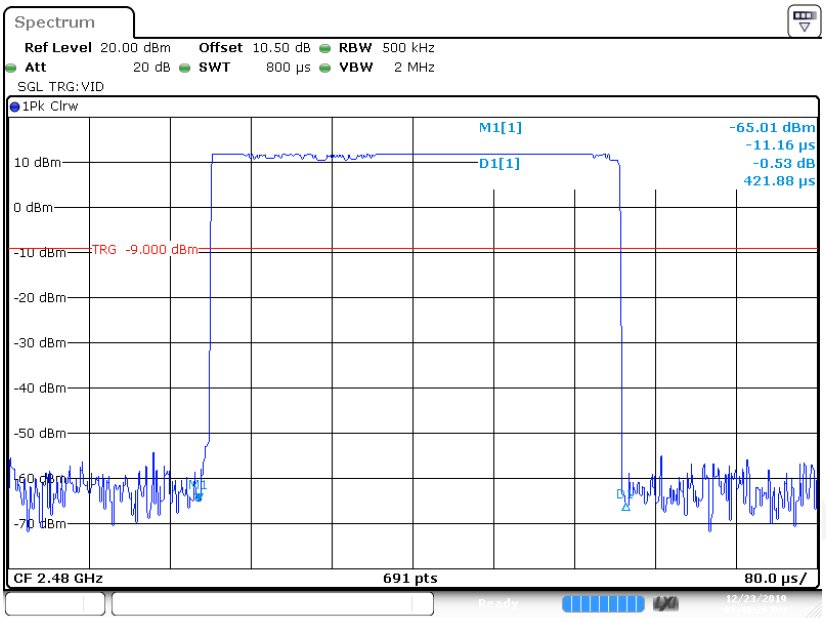
Date: 23.DEC.2019 16:44:58

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



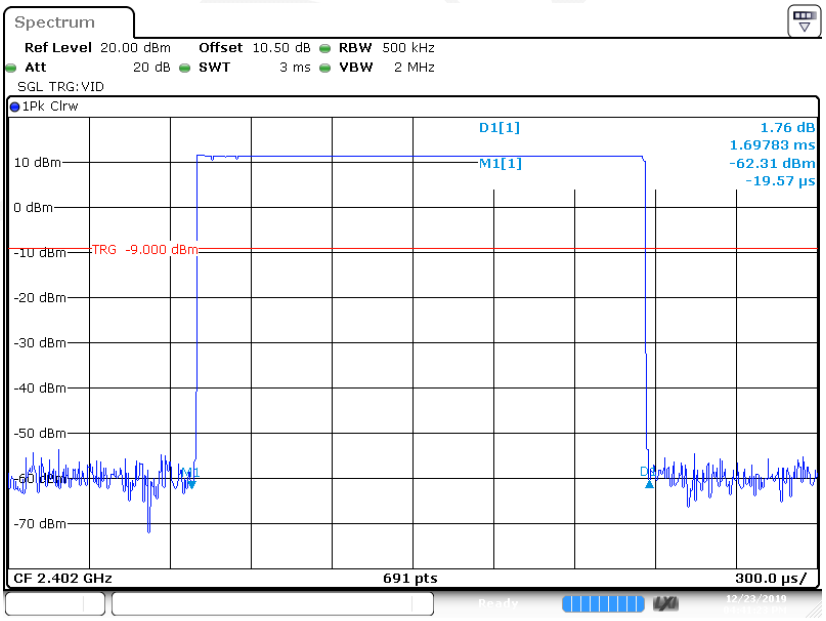
Date: 23.DEC.2019 16:45:57

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



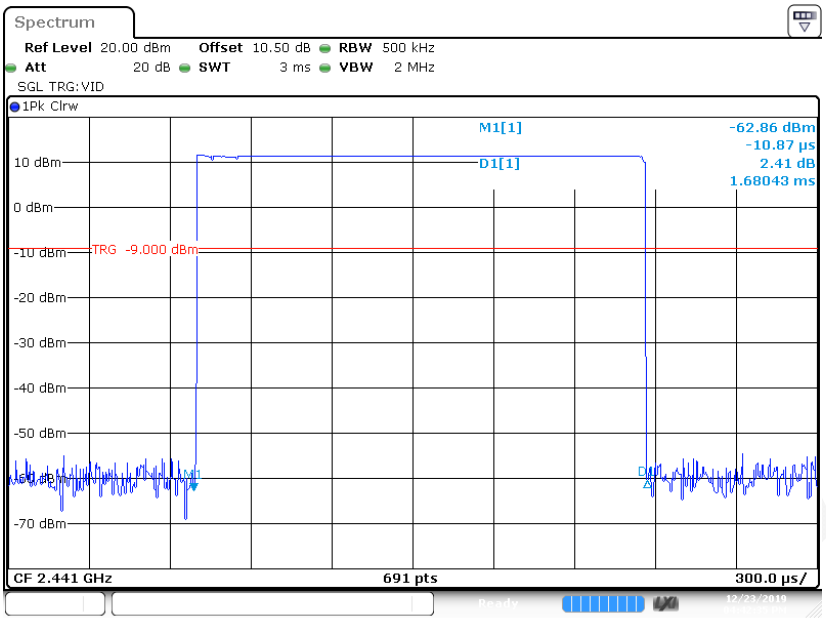
Date: 23.DEC.2019 16:48:27

BDR (GFSK): Pulse time, Low Channel, DH3



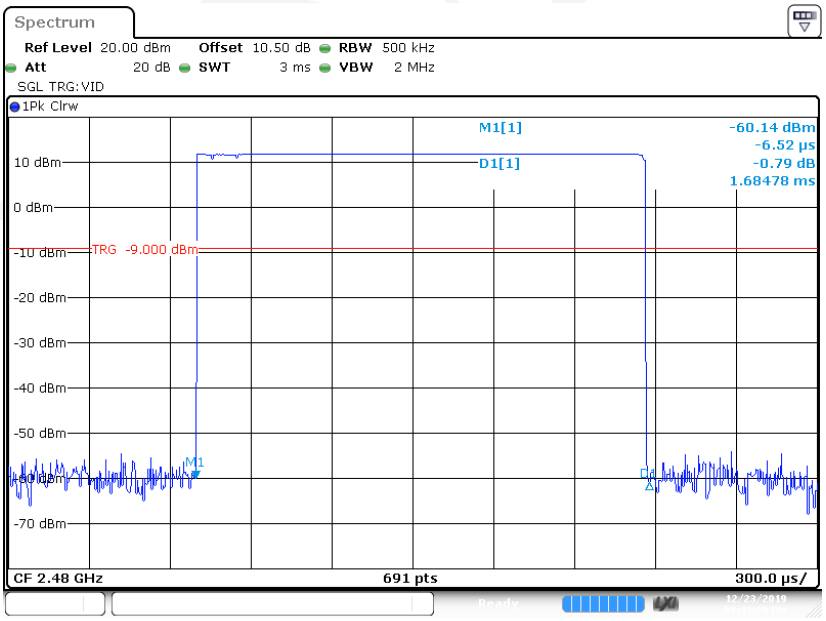
Date: 23.DEC.2019 16:41:23

BDR (GFSK): Pulse time, Middle Channel, DH3



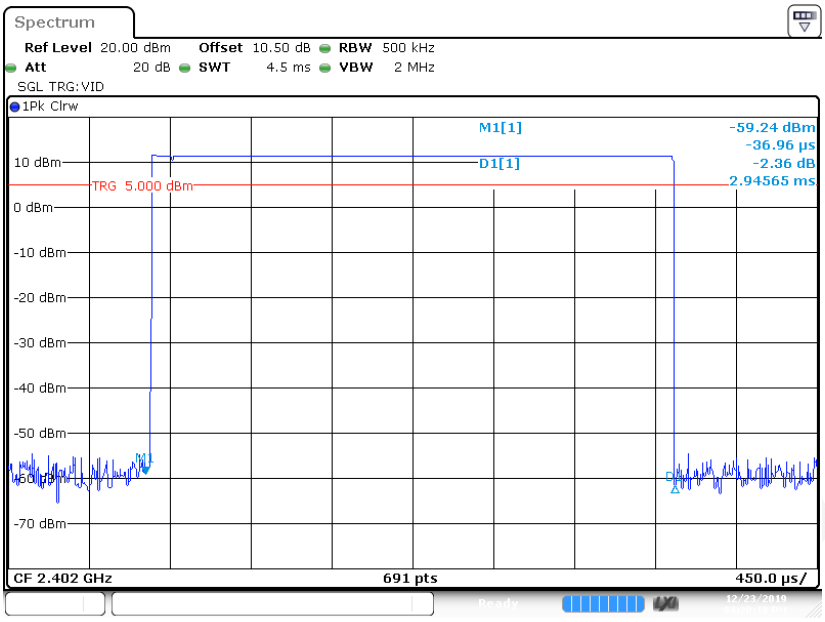
Date: 23.DEC.2019 16:42:36

BDR (GFSK): Pulse time, High Channel, DH3



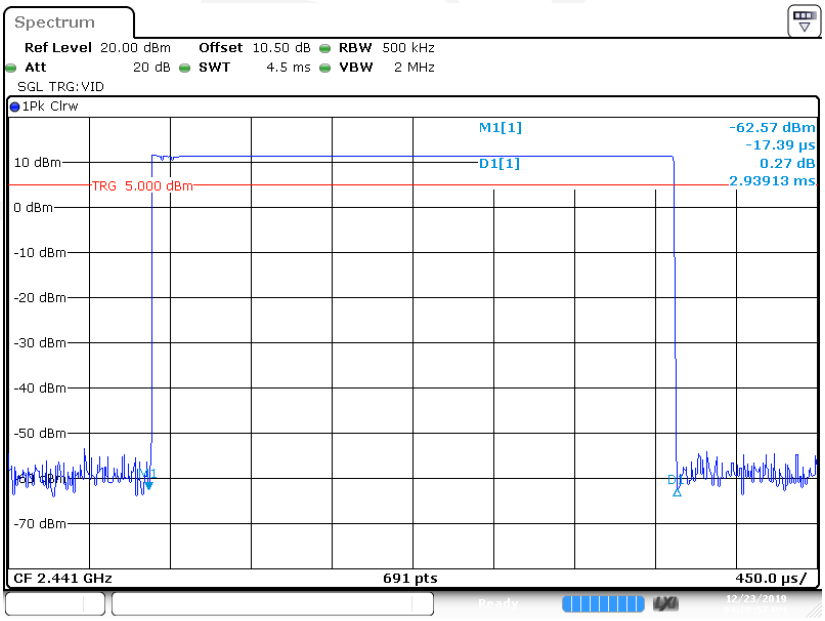
Date: 23.DEC.2019 16:43:29

BDR (GFSK): Pulse time, Low Channel, DH5



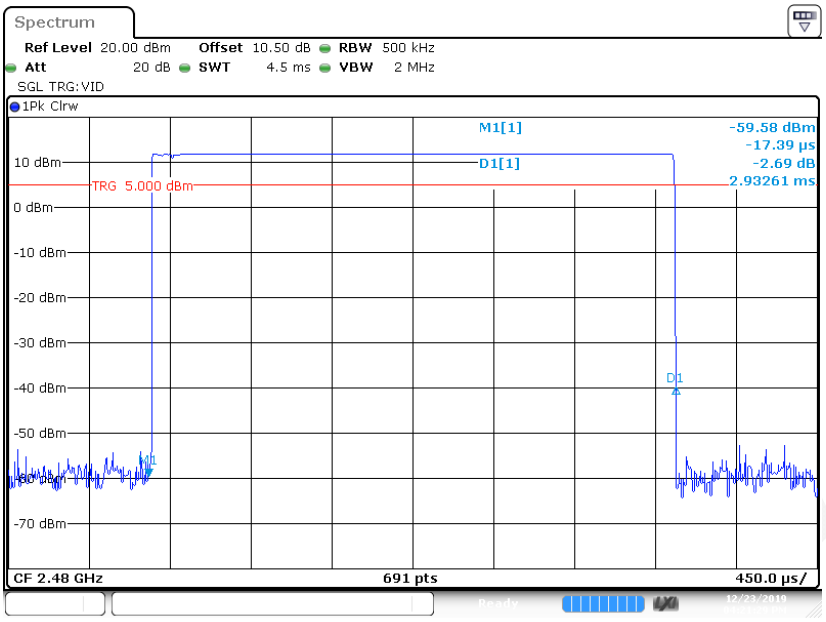
Date: 23.DEC.2019 16:20:18

BDR (GFSK): Pulse time, Middle Channel, DH5



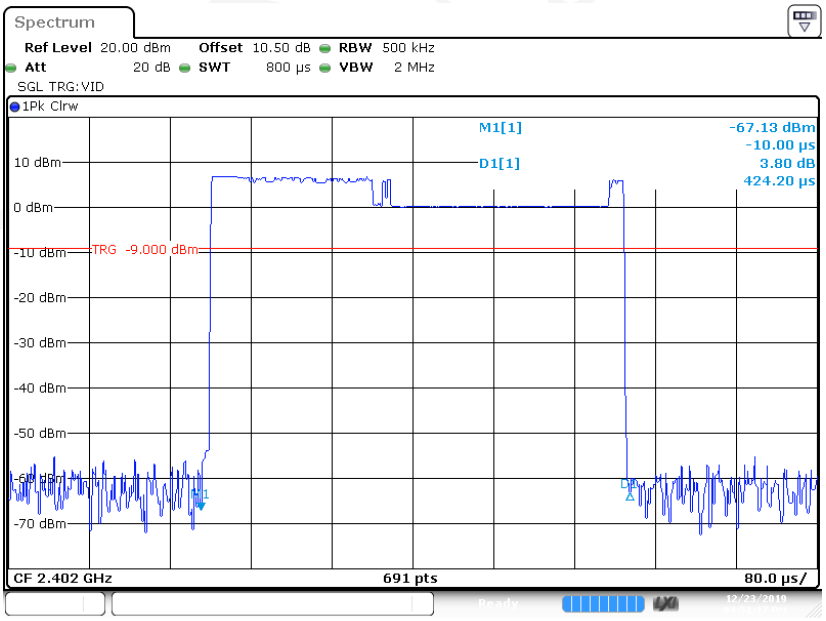
Date: 23.DEC.2019 16:20:57

BDR (GFSK): Pulse time, High Channel, DH5



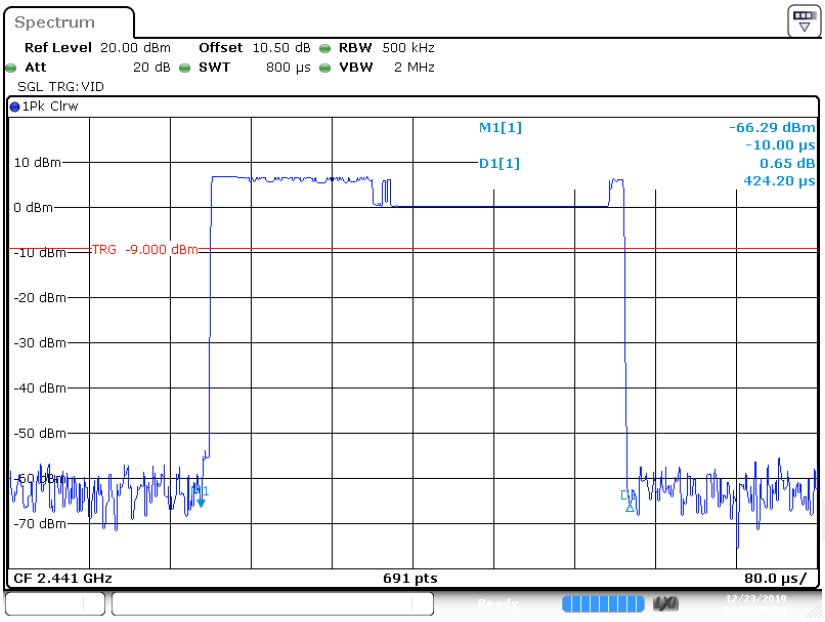
Date: 23.DEC.2019 16:21:29

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



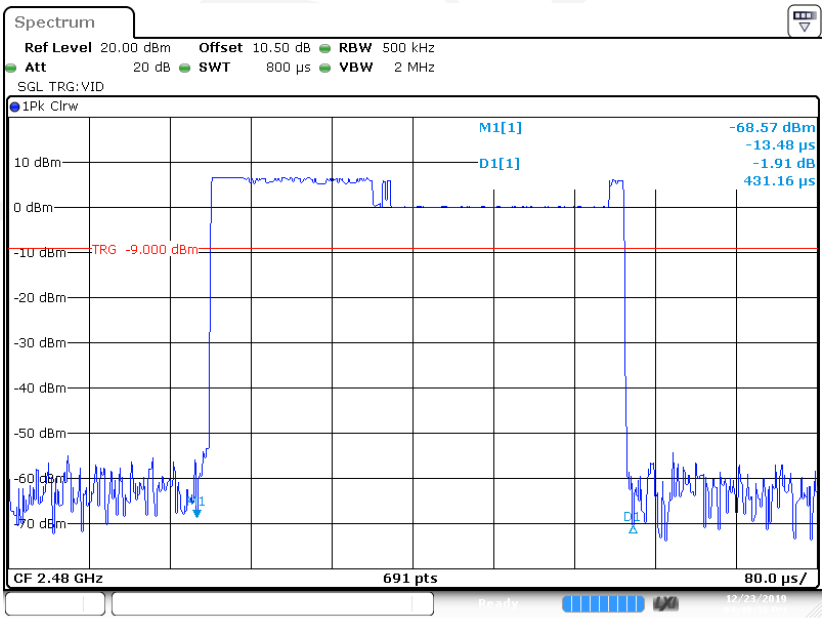
Date: 23.DEC.2019 16:51:18

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



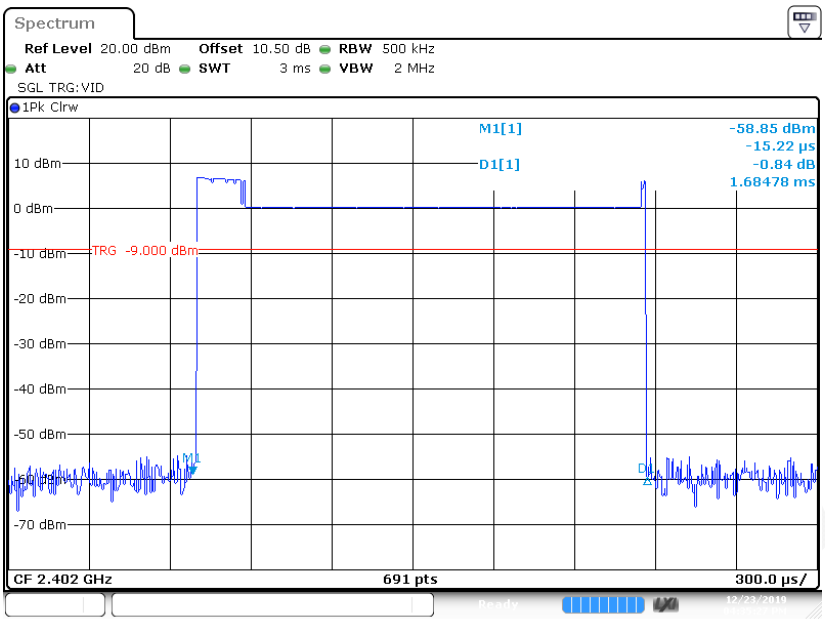
Date: 23.DEC.2019 16:50:40

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



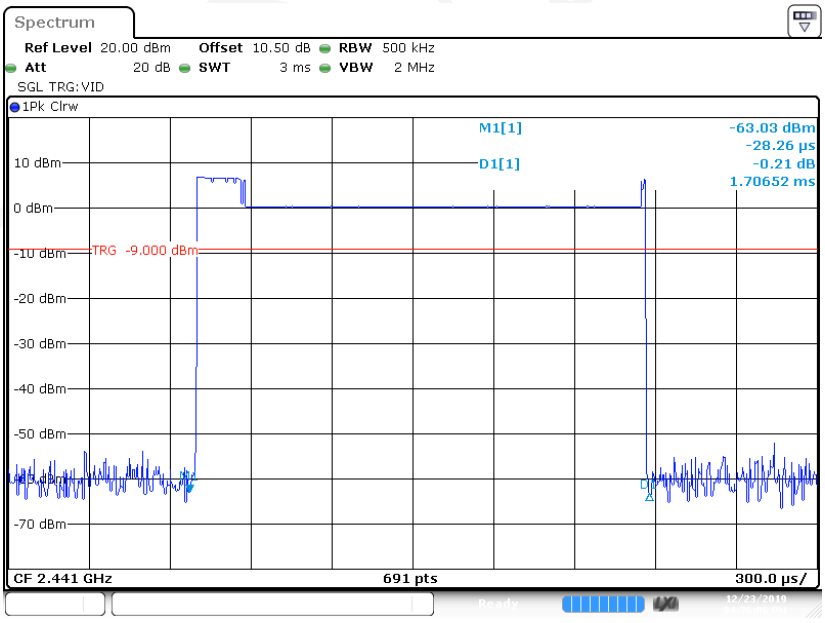
Date: 23.DEC.2019 16:49:36

EDR (π/4-DQPSK):Pulse time, Low Channel, 2DH3



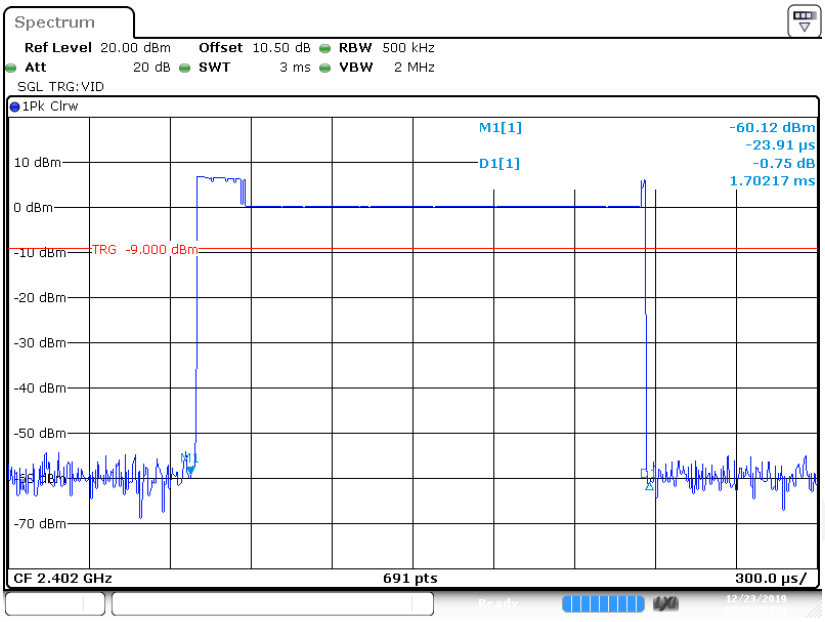
Date: 23.DEC.2019 16:35:27

EDR (π/4-DQPSK):Pulse time, Middle Channel, 2DH3



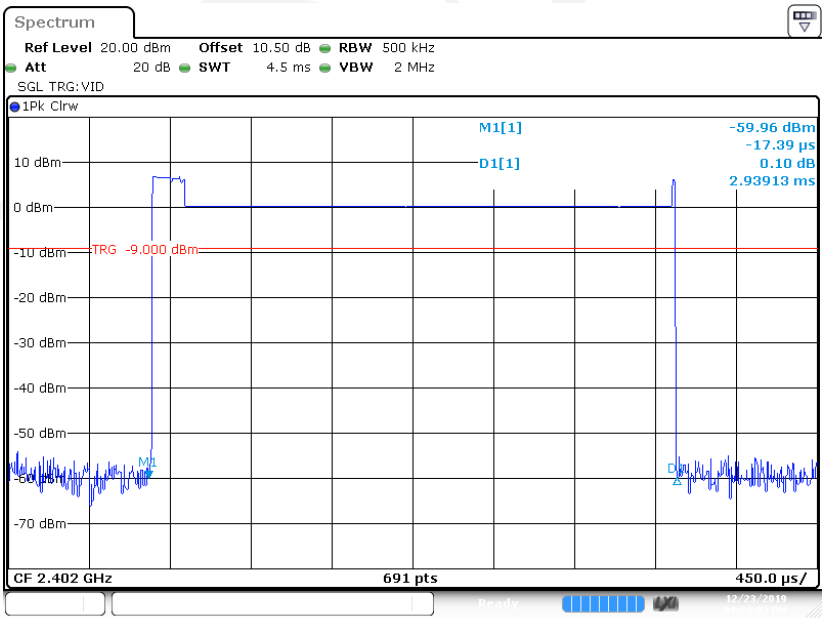
Date: 23.DEC.2019 16:36:06

EDR (π/4-DQPSK):Pulse time, High Channel, 2DH3



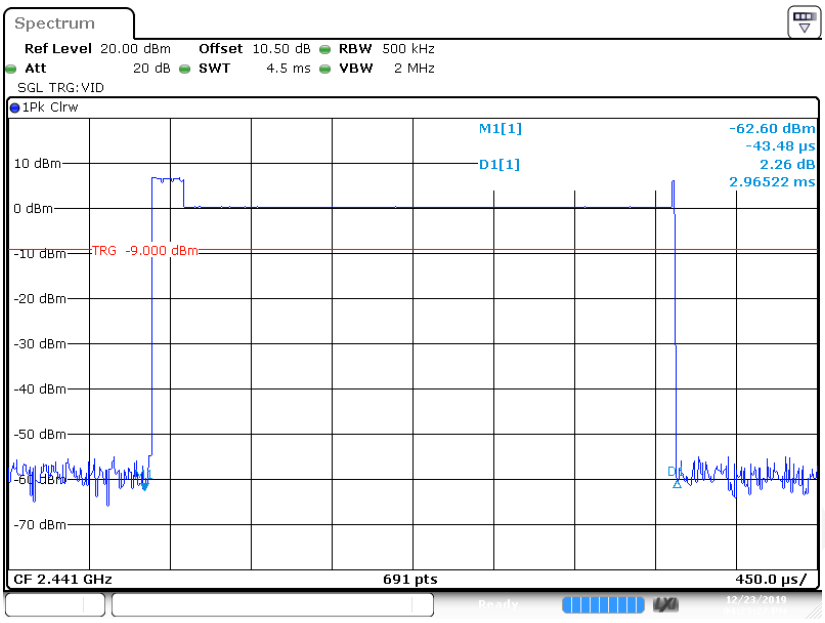
Date: 23.DEC.2019 16:36:43

EDR (π/4-DQPSK):Pulse time, Low Channel, 2DH5



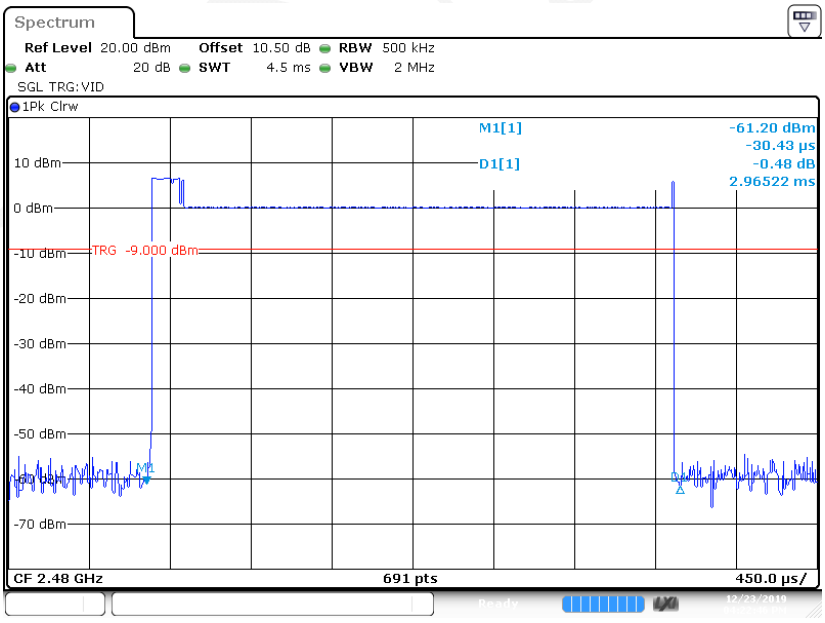
Date: 23.DEC.2019 16:24:03

EDR (π/4-DQPSK):Pulse time, Middle Channel, 2DH5



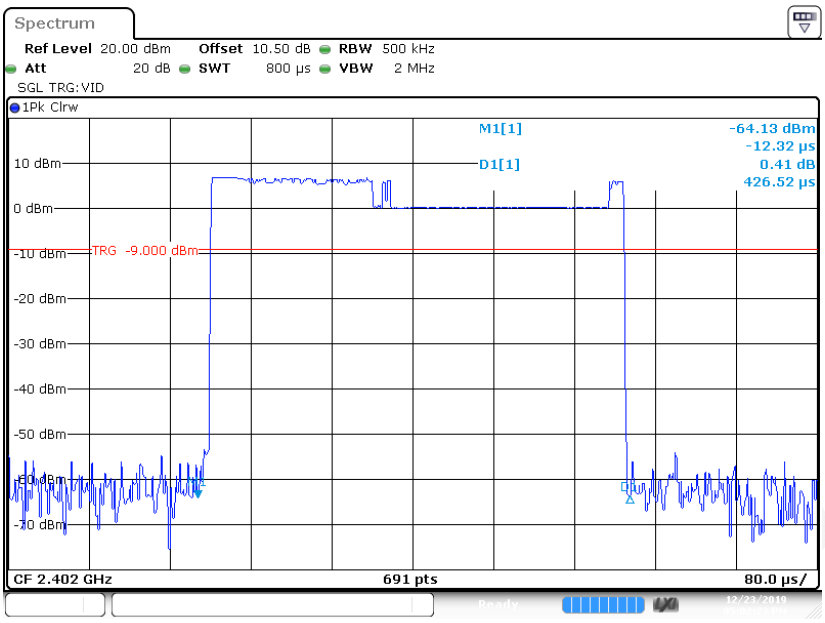
Date: 23.DEC.2019 16:23:27

EDR (π/4-DQPSK):Pulse time, High Channel, 2DH5



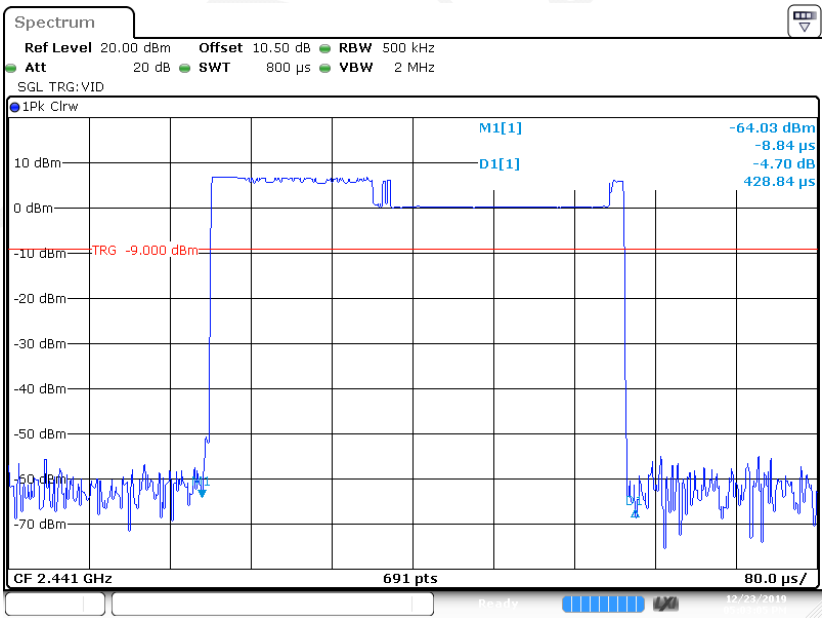
Date: 23.DEC.2019 16:22:46

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



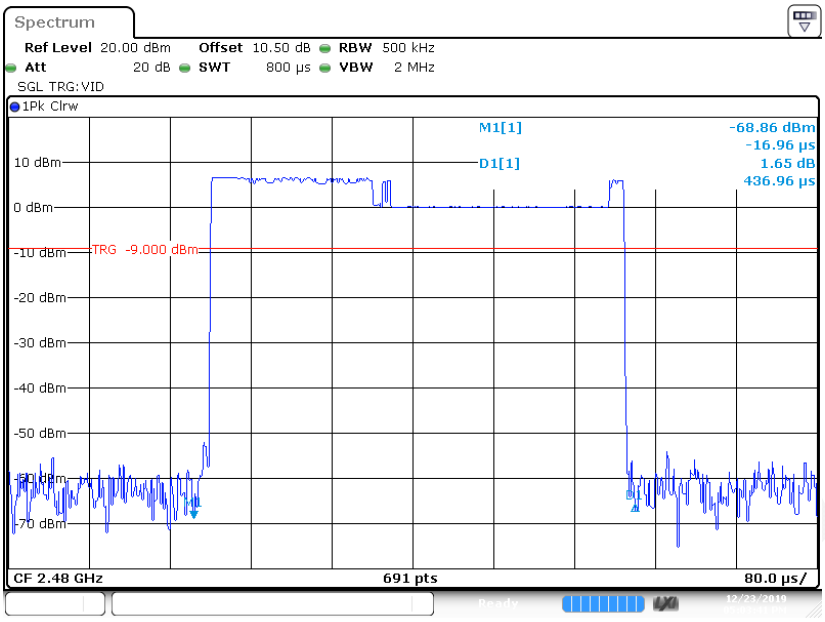
Date: 23.DEC.2019 17:02:24

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



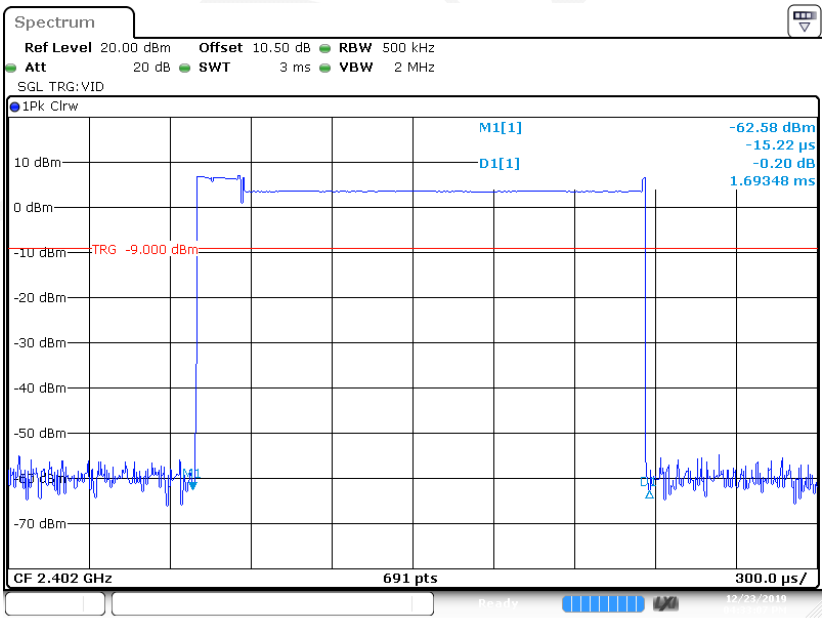
Date: 23.DEC.2019 17:03:05

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



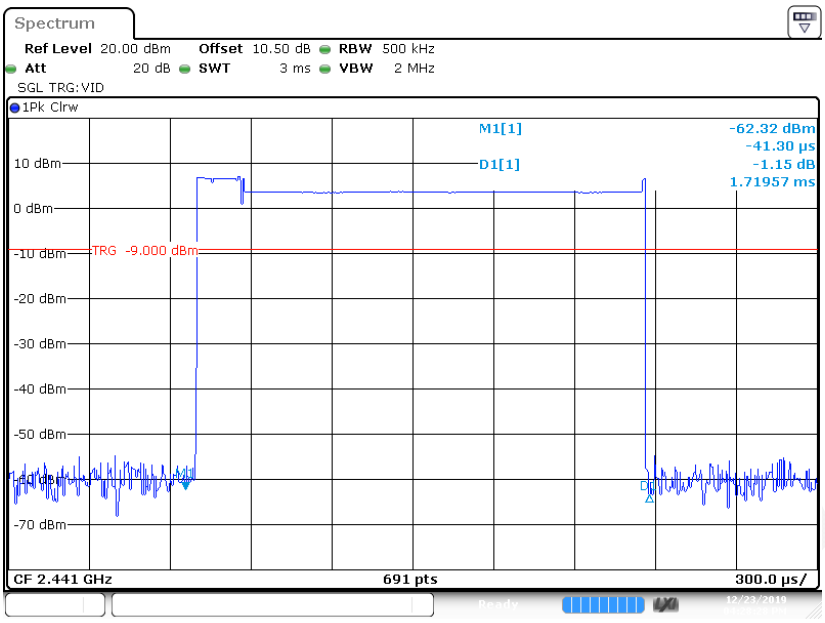
Date: 23.DEC.2019 17:03:40

EDR (8DPSK): Pulse time, Low Channel, 3DH3



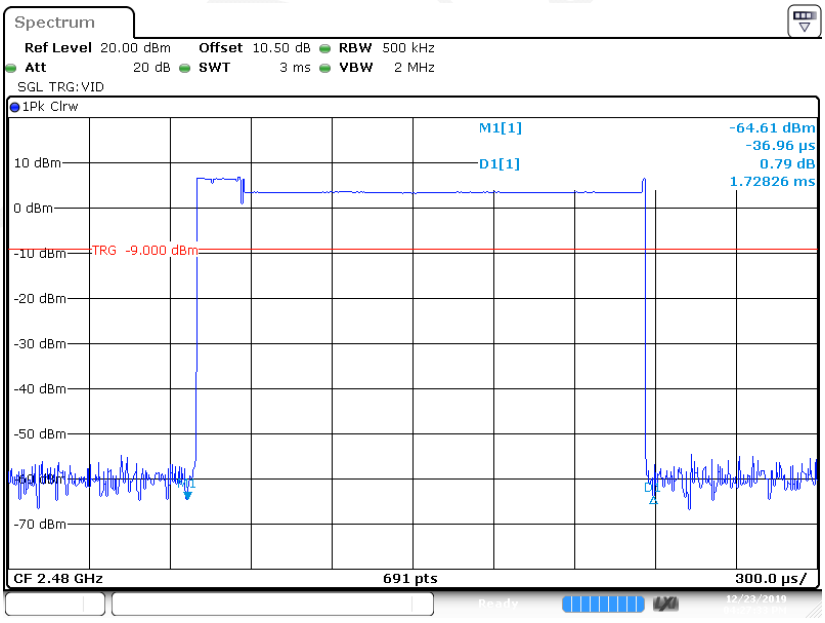
Date: 23.DEC.2019 16:33:08

EDR (8DPSK): Pulse time, Middle Channel, 3DH3



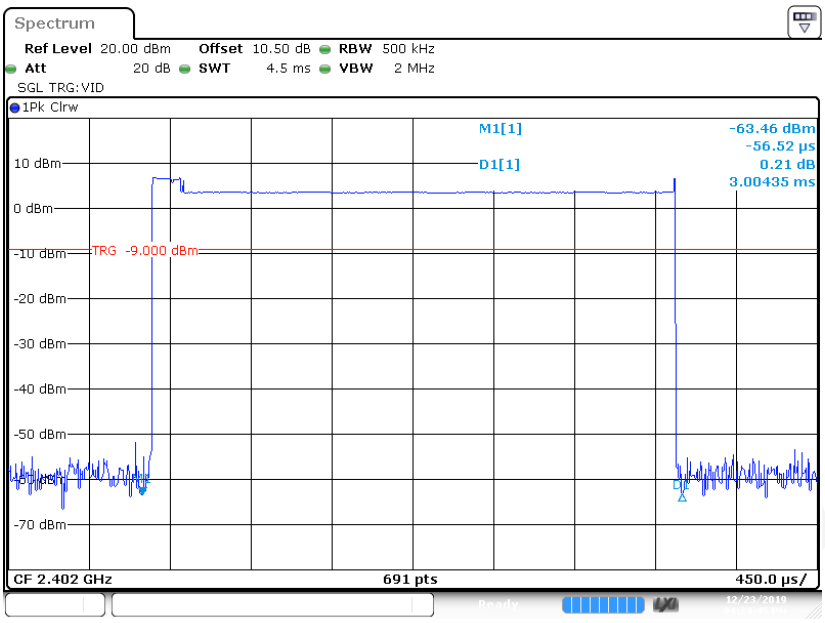
Date: 23.DEC.2019 16:28:28

EDR (8DPSK): Pulse time, High Channel, 3DH3



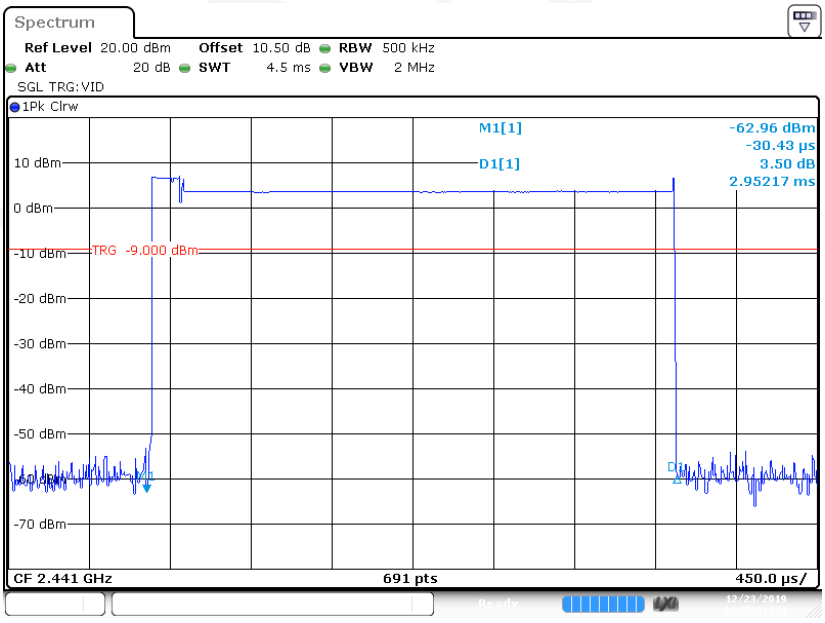
Date: 23.DEC.2019 16:27:33

EDR (8DPSK): Pulse time, Low Channel, 3DH5



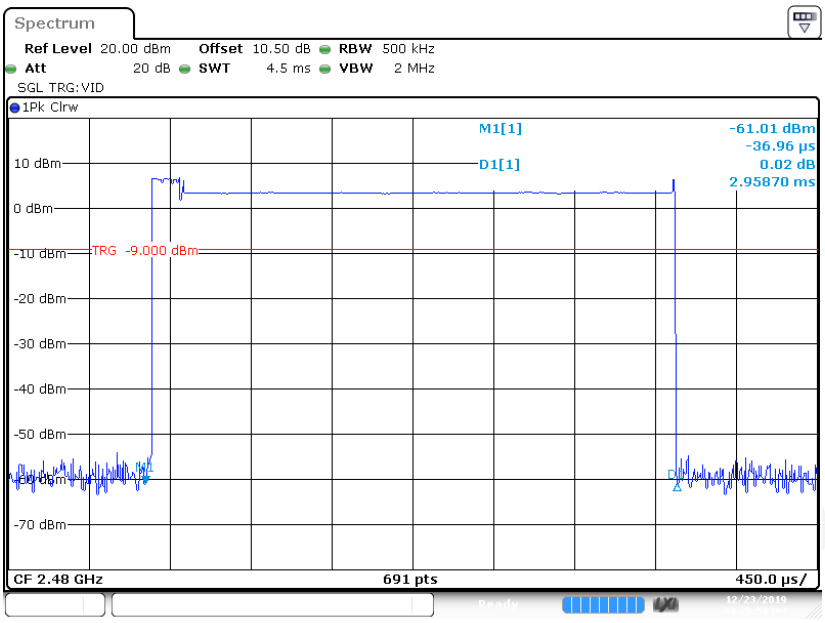
Date: 23.DEC.2019 16:24:46

EDR (8DPSK): Pulse time, Middle Channel, 3DH5



Date: 23.DEC.2019 16:25:21

EDR (8DPSK): Pulse time, High Channel, 3DH5



Date: 23.DEC.2019 16:25:59

RSS-247 ISSUE2 Clause 5.4 b)- TRANSMITTER OUTPUT POWER MEASUREMENT

Applicable Standard

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hop set uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hop set 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

a. Use the following spectrum analyzer settings:
   1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
   2) RBW > 20 dB bandwidth of the emission being measured.
   3) VBW ≥ RBW.
   4) Sweep: Auto.
   5) Detector function: Peak.
   6) Trace: Max hold.

b. Allow trace to stabilize.
c. Use the marker-to-peak function to set the marker to the peak of the emission.
d. The indicated level is the peak output power, after any corrections for external attenuators and cables.
e. A plot of the test results and setup description shall be included in the test report.

Test Data

Environmental Conditions

Temperature:	24.9 ℃
Relative Humidity:	52 %
ATM Pressure:	101.9 kPa

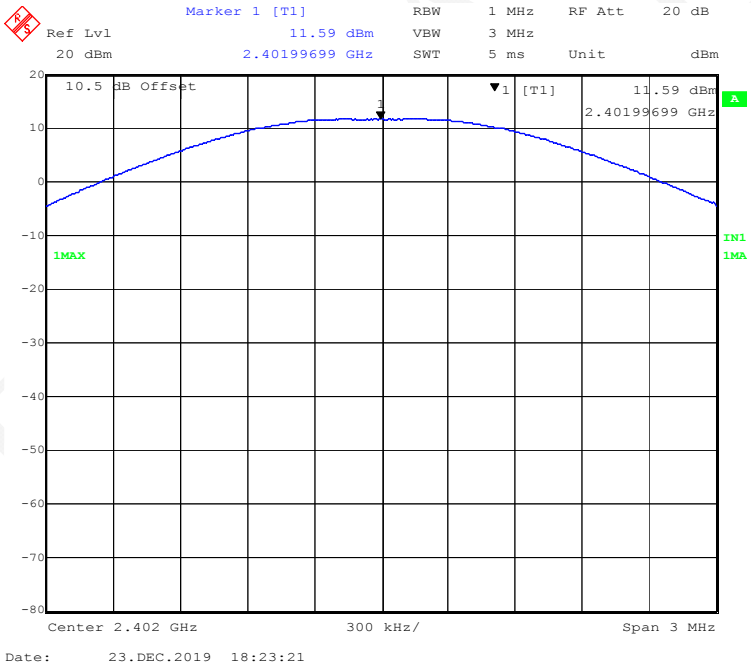
The testing was performed by Chao Gao on 2019-12-23.

EUT operation mode: Transmitting

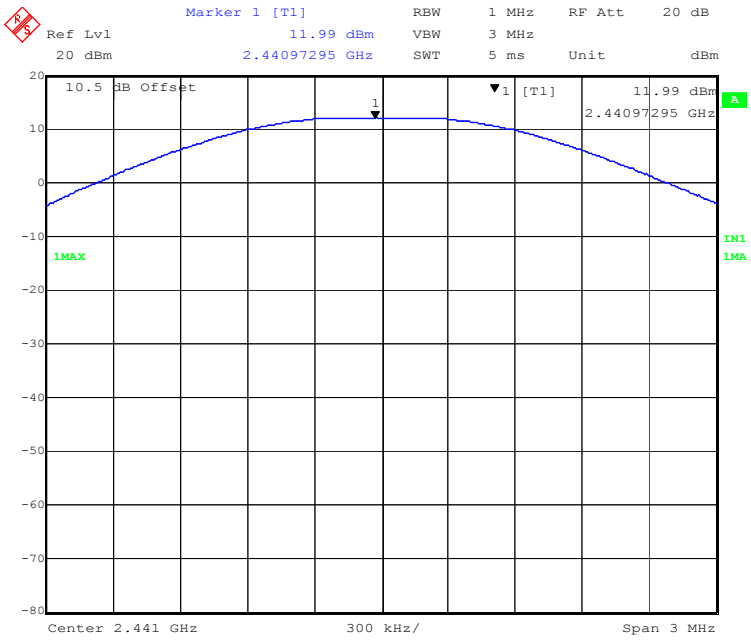
Test Result: Compliant.

Mode	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)
BDR (GFSK)	2402	11.59	30	1.00	12.59	36
	2441	11.99	30	1.00	12.99	36
	2480	12.12	30	1.00	13.12	36
EDR (π/4-DQPSK)	2402	8.86	21	1.00	9.86	36
	2441	9.10	21	1.00	10.10	36
	2480	8.86	21	1.00	9.86	36
EDR (8DPSK)	2402	9.35	21	1.00	10.35	36
	2441	9.48	21	1.00	10.48	36
	2480	9.48	21	1.00	10.48	36

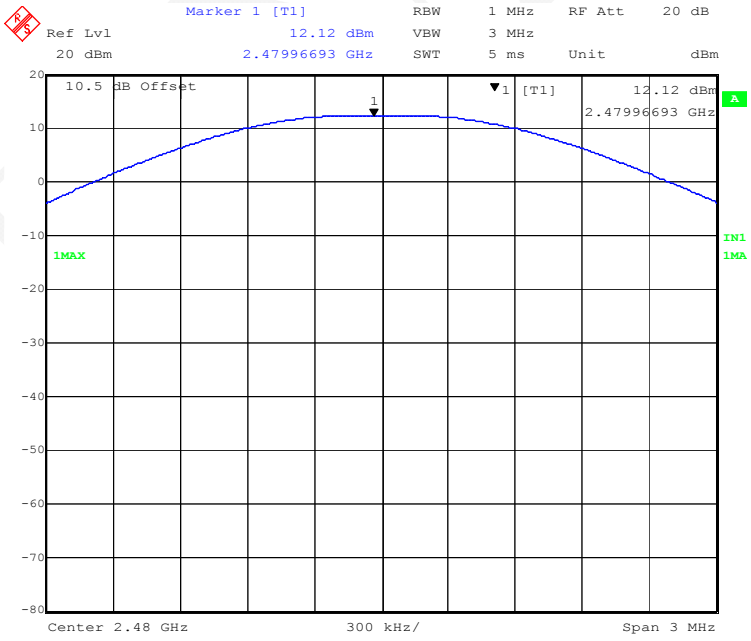
BDR (GFSK): 2402MHz



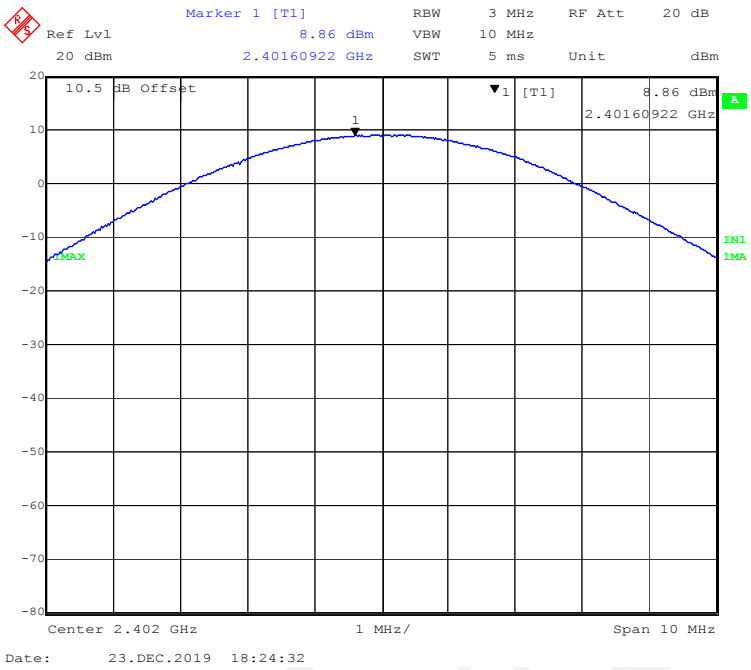
BDR (GFSK): 2441MHz



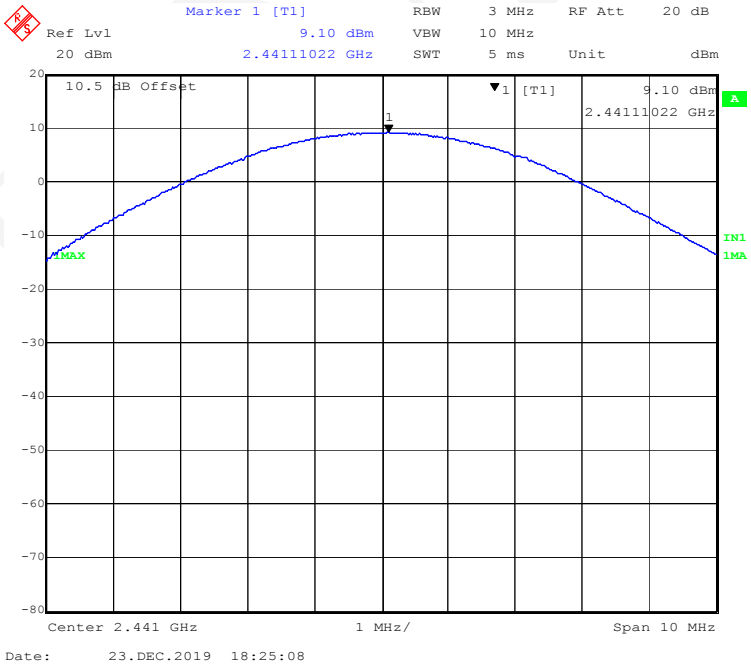
BDR (GFSK): 2480MHz



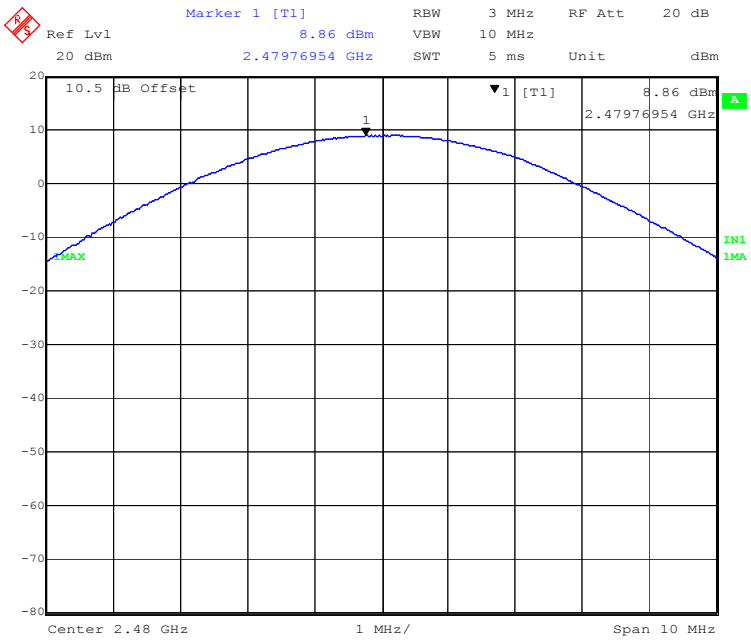
EDR(π/4-DQPSK): 2402MHz



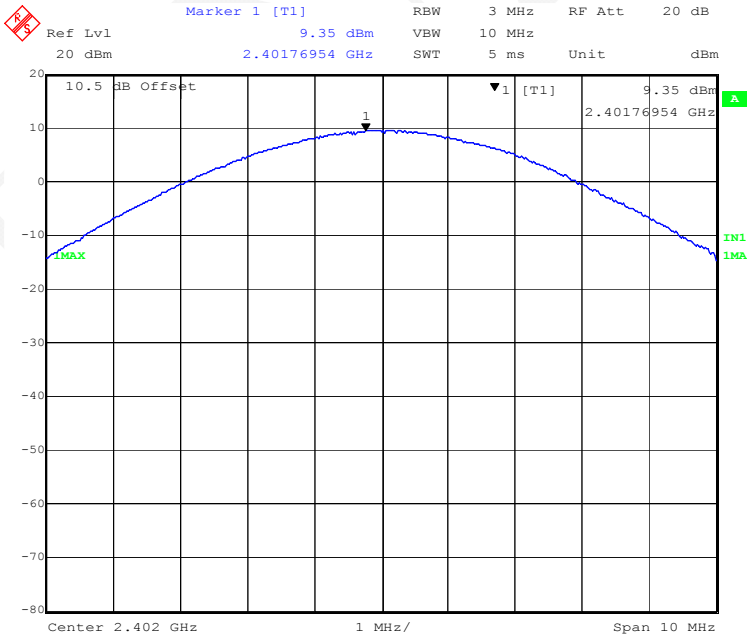
EDR(π/4-DQPSK): 2441MHz



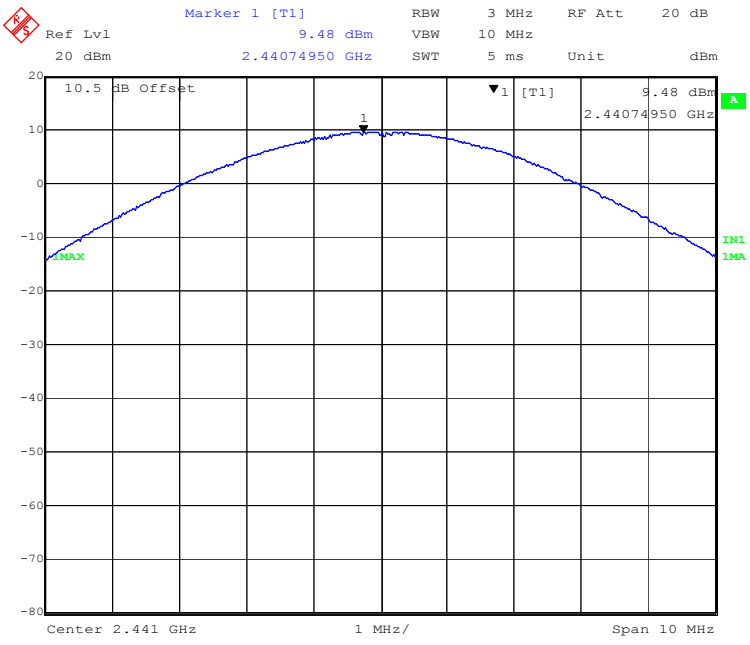
EDR(π/4-DQPSK): 2480MHz



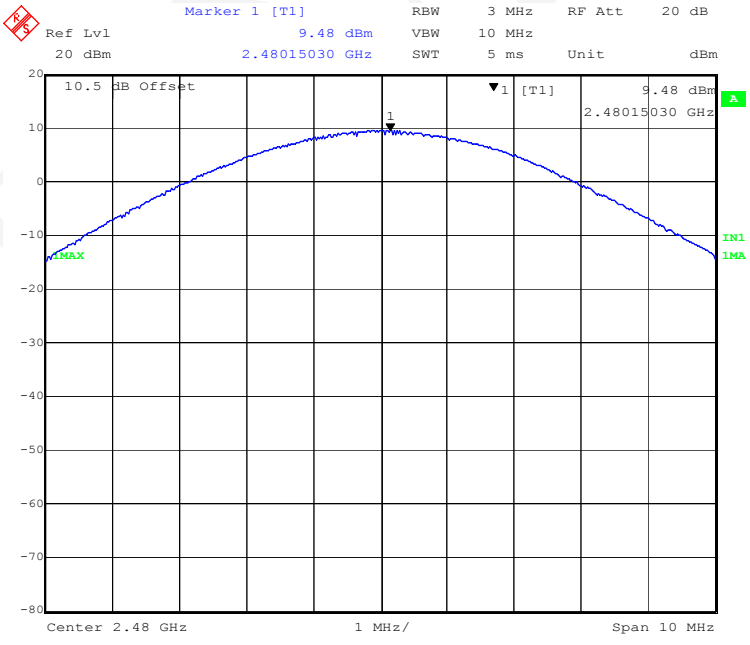
EDR(8DPSK): 2402MHz



EDR(8DPSK): 2441MHz



EDR(8DPSK): 2480MHz



RSS-247 ISSUE2 Clause 5.5 - OUT OF BAND EMISSIONS

Applicable Standard

According to RSS-247 Issue2 Clause5.5.

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 of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

Environmental Conditions

Temperature:	24.9 ℃
Relative Humidity:	52 %
ATM Pressure:	101.9 kPa

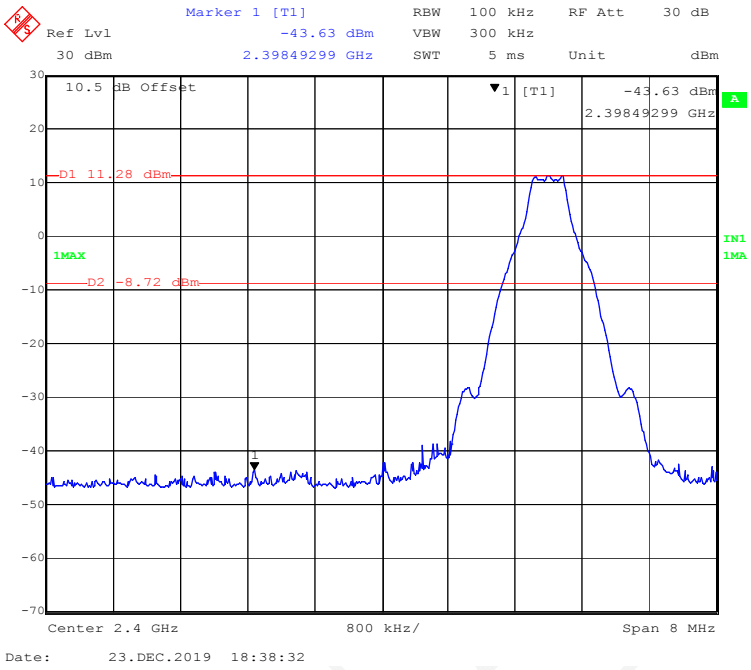
The testing was performed by Chao Gao on 2019-12-23.

EUT operation mode: Transmitting & Hopping

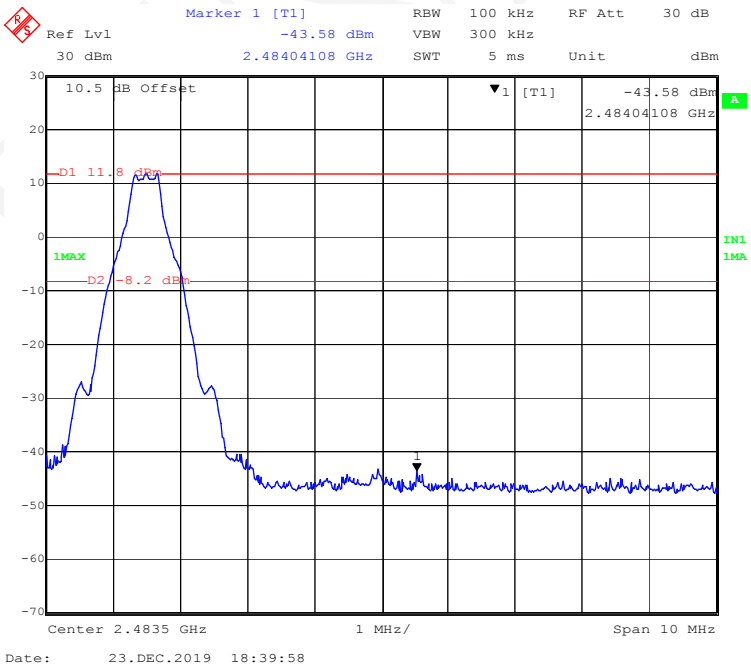
Test Result: Compliant.

Band Edge

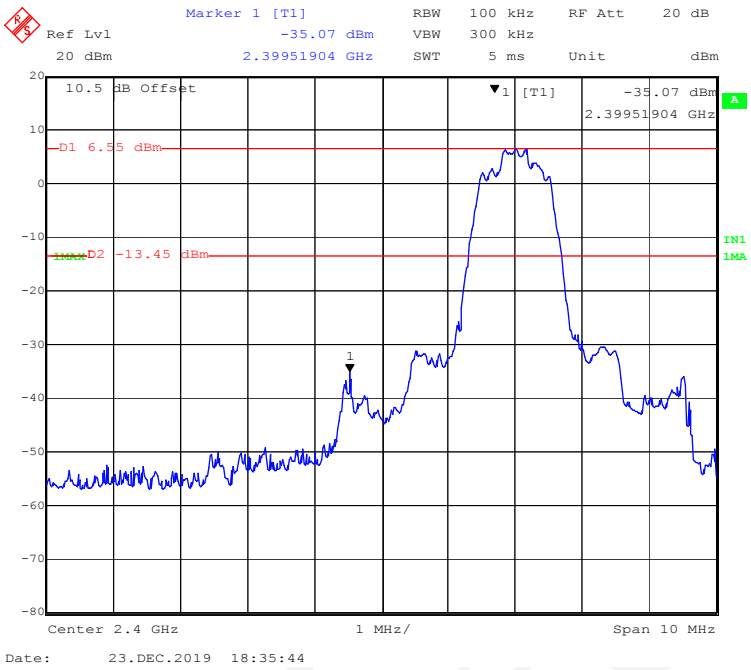
BDR (GFSK): Left Side



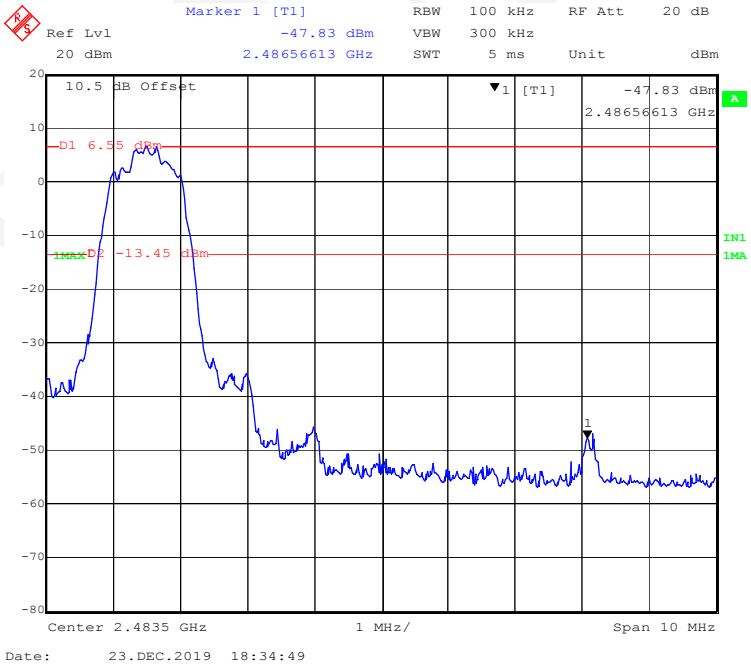
BDR (GFSK): Right Side



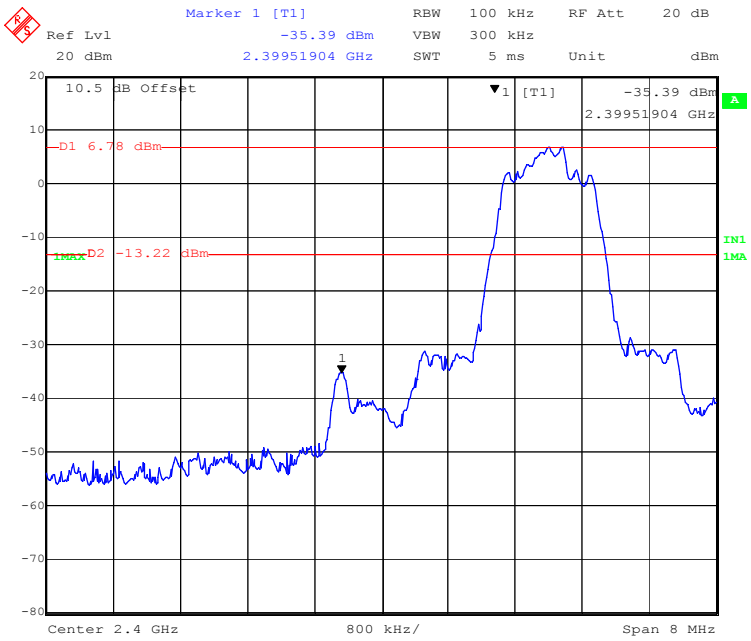
EDR (π/4-DQPSK): Left Side



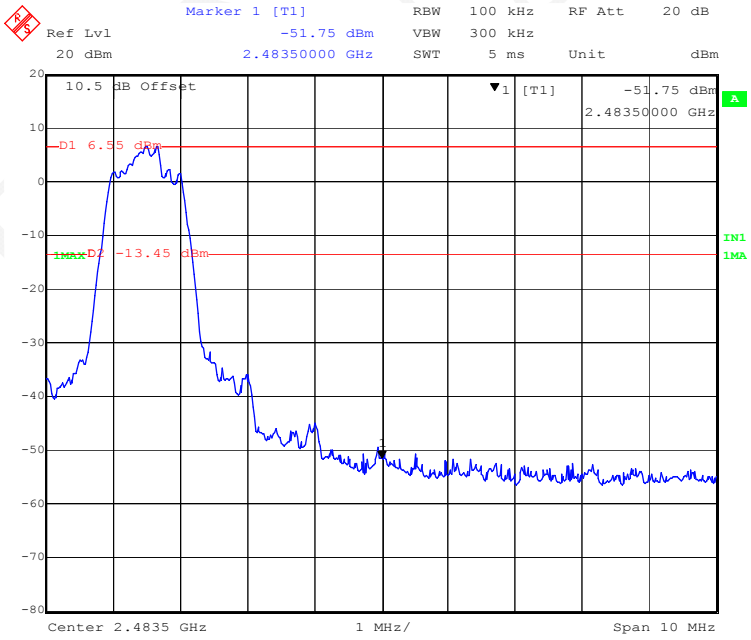
EDR (π/4-DQPSK): Right Side



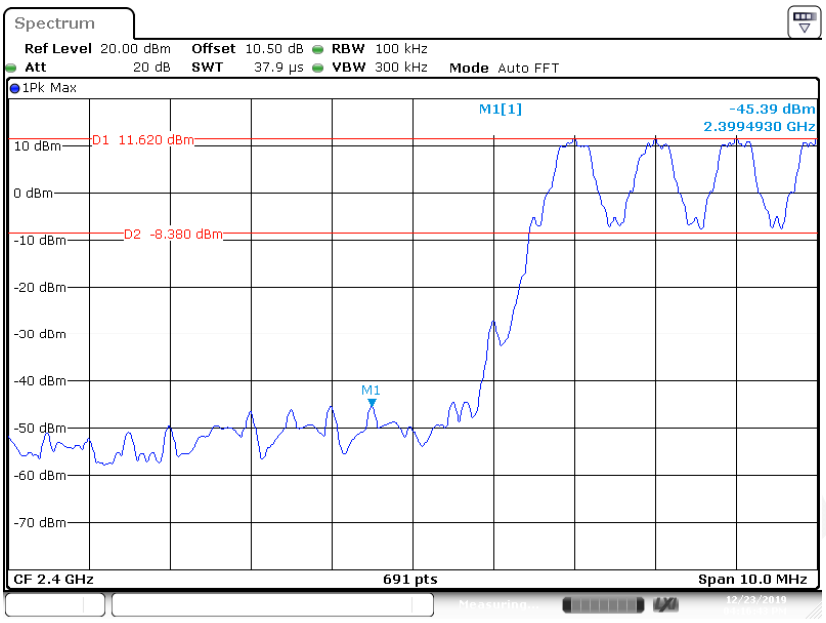
EDR (8DPSK): Left Side



EDR (8DPSK): Right Side

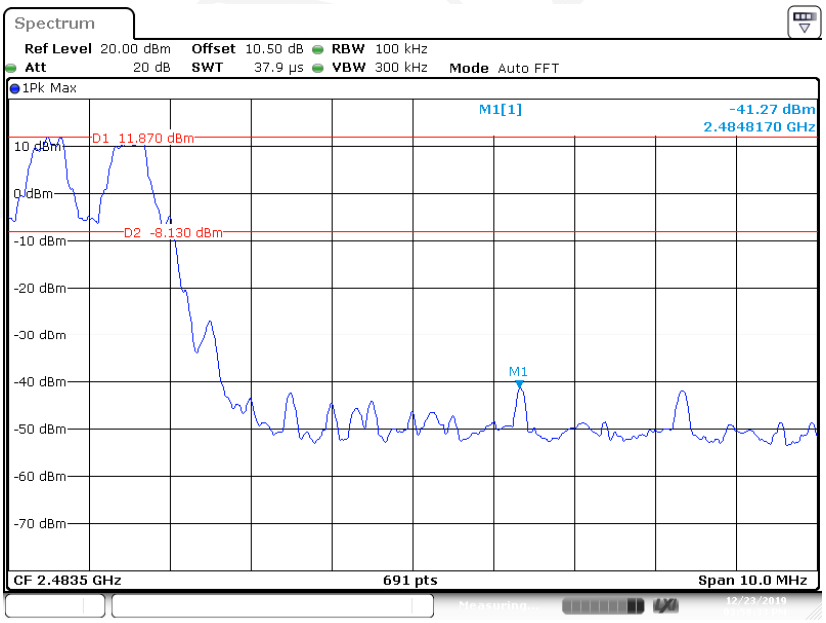


BDR (GFSK): Left Side - Hopping



Date: 23.DEC.2019 16:16:43

BDR (GFSK): Right Side- Hopping

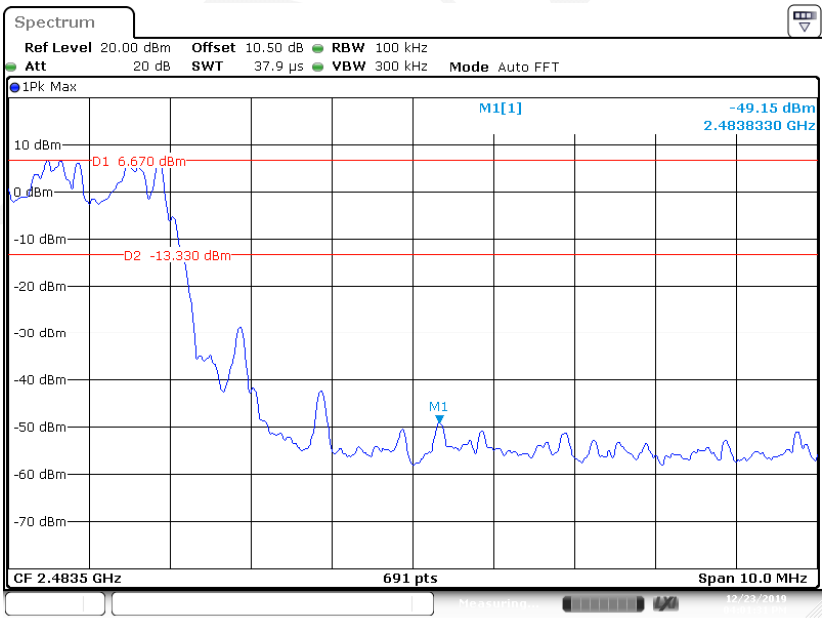


Date: 23.DEC.2019 15:58:32

EDR (π/4-DQPSK): Left Side- Hopping

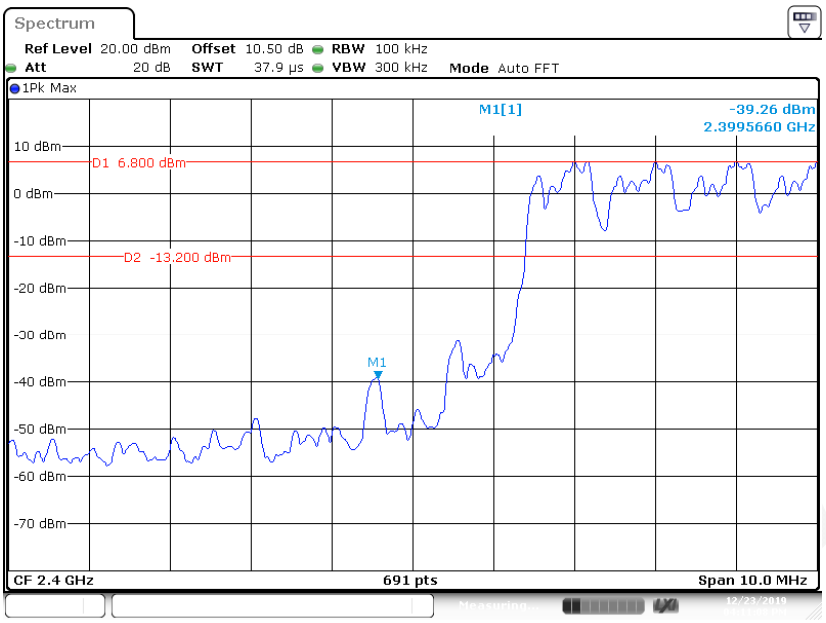
Date: 23.DEC.2019 16:14:38

EDR (π/4-DQPSK): Right Side- Hopping



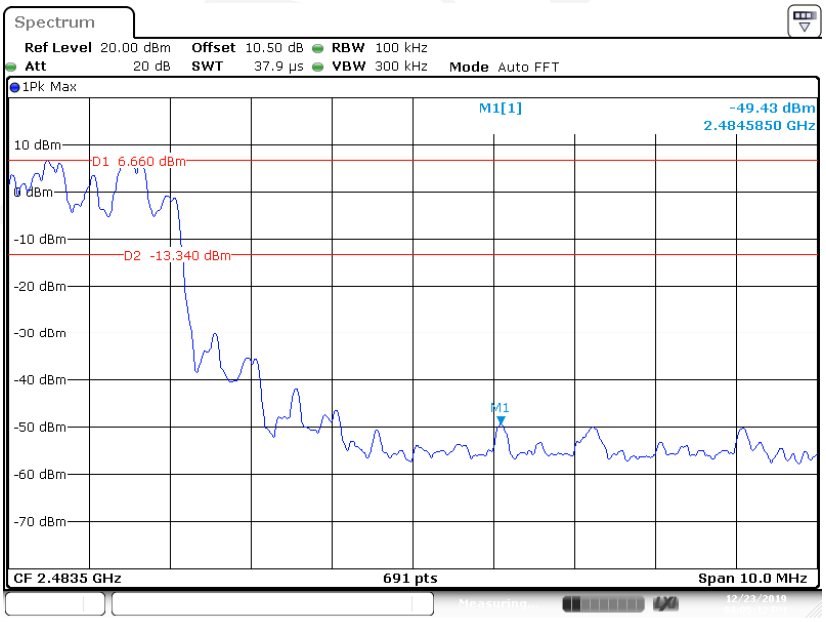
Date: 23.DEC.2019 16:01:31

EDR (8DPSK): Left Side- Hopping



Date: 23.DEC.2019 16:11:08

EDR (8DPSK): Right Side- Hopping



Date: 23.DEC.2019 16:05:12

Declarations

1: BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

2: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

3: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

5: This report cannot be reproduced except in full, without prior written approval of the Company.

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