



TESTING LABORATORY
CERTIFICATE#4323.01



FCC PART 15.247 TEST REPORT

For

AKUVOX (XIAMEN) NETWORKS CO., LTD.

10/F, No.56, Software Park II , Xiamen, China

FCC ID: 2AHCR-X916S

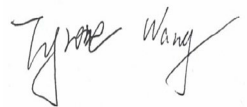
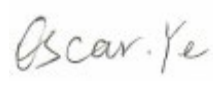
Report Type: Original Report	Product Type: Door Phone
Project Engineer:	<u>Tyrone Wang</u> 
Report Number:	<u>RXM201016050-00C</u>
Report Date:	<u>2021-04-14</u>
Reviewed By:	<u>Oscar Ye</u>  EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	5
MEASUREMENT UNCERTAINTY	5
TEST FACILITY	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	6
SPECIAL ACCESSORIES	6
EQUIPMENT MODIFICATIONS	6
SUPPORT EQUIPMENT LIST AND DETAILS	6
EXTERNAL I/O CABLE.....	7
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS.....	11
TEST EQUIPMENT LIST	12
FCC §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)	13
APPLICABLE STANDARD	13
CALCULATED FORMULARY:.....	13
CALCULATED DATA (WORST CASE):	13
FCC §15.203 – ANTENNA REQUIREMENT	14
APPLICABLE STANDARD	14
ANTENNA CONNECTOR CONSTRUCTION	14
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS	15
APPLICABLE STANDARD	15
EUT SETUP.....	15
EMI TEST RECEIVER SETUP.....	15
TEST PROCEDURE	16
FACTOR & MARGIN CALCULATION	16
TEST RESULTS SUMMARY	16
TEST DATA	16
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS.....	21
APPLICABLE STANDARD	21
EUT SETUP.....	21
EMI TEST RECEIVER SETUP.....	22
TEST PROCEDURE	22
CORRECTED AMPLITUDE & MARGIN CALCULATION	22
TEST RESULTS SUMMARY	22
TEST DATA	22
FCC §15.247(a) (1)-CHANNEL SEPARATION TEST	35
APPLICABLE STANDARD	35
TEST PROCEDURE	35
TEST DATA	35
FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH.....	41
APPLICABLE STANDARD	41

TEST PROCEDURE	41
TEST DATA	41
FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST	47
APPLICABLE STANDARD	47
TEST PROCEDURE	47
TEST DATA	47
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....	50
APPLICABLE STANDARD	50
TEST PROCEDURE	50
TEST DATA	50
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT.....	66
APPLICABLE STANDARD	66
TEST PROCEDURE	66
TEST DATA	66
FCC §15.247(d) - BAND EDGES TESTING	73
APPLICABLE STANDARD	73
TEST PROCEDURE	73
TEST DATA	73

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	AKUVOX (XIAMEN) NETWORKS CO., LTD.
Tested Model:	X916S
Product Type:	Door Phone
Power Supply:	DC 24V power by adapter or DC 48V power by POE
RF Function:	Classic BT
Operating Band/Frequency:	2402-2480 MHz
Maximum Output Power:	GFSK: 6.07 dBm π /4-DQPSK: 0.61 dBm 8DPSK: 1.15 dBm
Channel Number:	79
Channel Separation:	1 MHz
Modulation Type:	GFSK, π /4-DQPSK, 8DPSK
Antenna Type:	FPC Antenna
*Maximum Antenna Gain:	-2.3 dBi

Adapter Information:

Model: SW-0692

Input: AC100-240V~ 2.0A, 50/60Hz

Output: DC24V, 2.5A

Note1: The Maximum Antenna Gain was declared by the manufacturer.

*All measurement and test data in this report was gathered from production sample serial number: RXM201016050-1(Assigned by BACL, Kunshan). The EUT was received on 2020-10-16.

Objective

This test report is prepared on behalf of AKUVOX (XIAMEN) NETWORKS CO., LTD. in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine Compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS Submittal with FCC ID: 2AHCR-X916S

FCC Part 15.225 DXX submissions with FCC ID: 2AHCR-X916S

FCC Part 15B JAB submissions with FCC ID: 2AHCR-X916S

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

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°C
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:

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: secureCRT

GFSK, $\pi/4$ -DQPSK, 8DPSK Power level: default.

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
NETGEAR	POE	GS308P	4F217B5000891
HP	Notebook	4441s	2CE3130VWY
TP-LINK	Router	EC26CA652860	1153145002998
AnYong	Load	RXLG	N/A
FuShi	Switch	AR22PR-310B	N/A
Weishi	Entrance guard system	/	/
Schneider Electric	Relay	RXM2LB2BD	/
/	IC Card	/	/

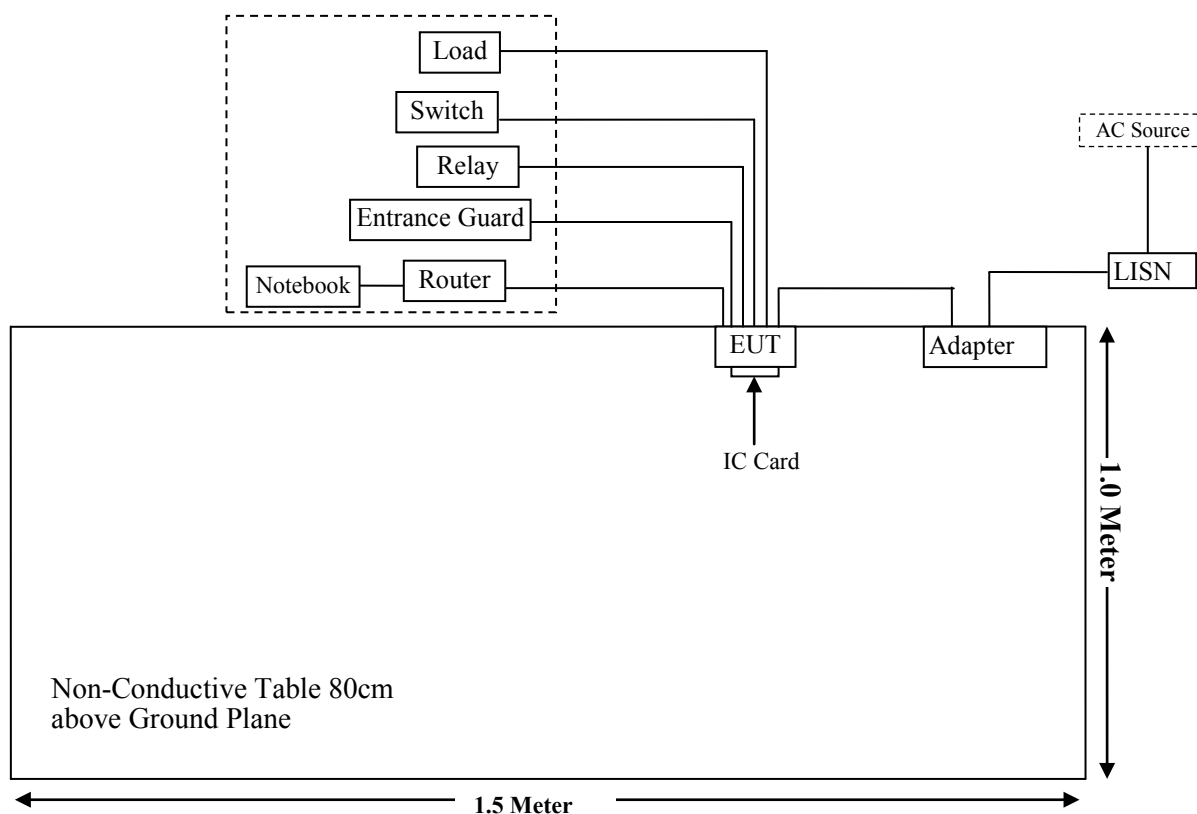
External I/O Cable

Cable Description	Length (m)	From Port	To
Power Cable	1.5	EUT	Adapter
RJ45 Cable	1.5	EUT	POE
Power Cable	1.0	POE	POE Adapter
RJ45 cable	10.0	EUT	Router
RJ45 cable	5.0	EUT	Notebook
Signal Cable	5.0	EUT	Entrance Guard
Signal Cable	5.0	EUT	Relay
Signal Cable	5.0	EUT	Switch
RJ45 cable	5.0	EUT	Notebook
Power supply cable	5.0	EUT	Load

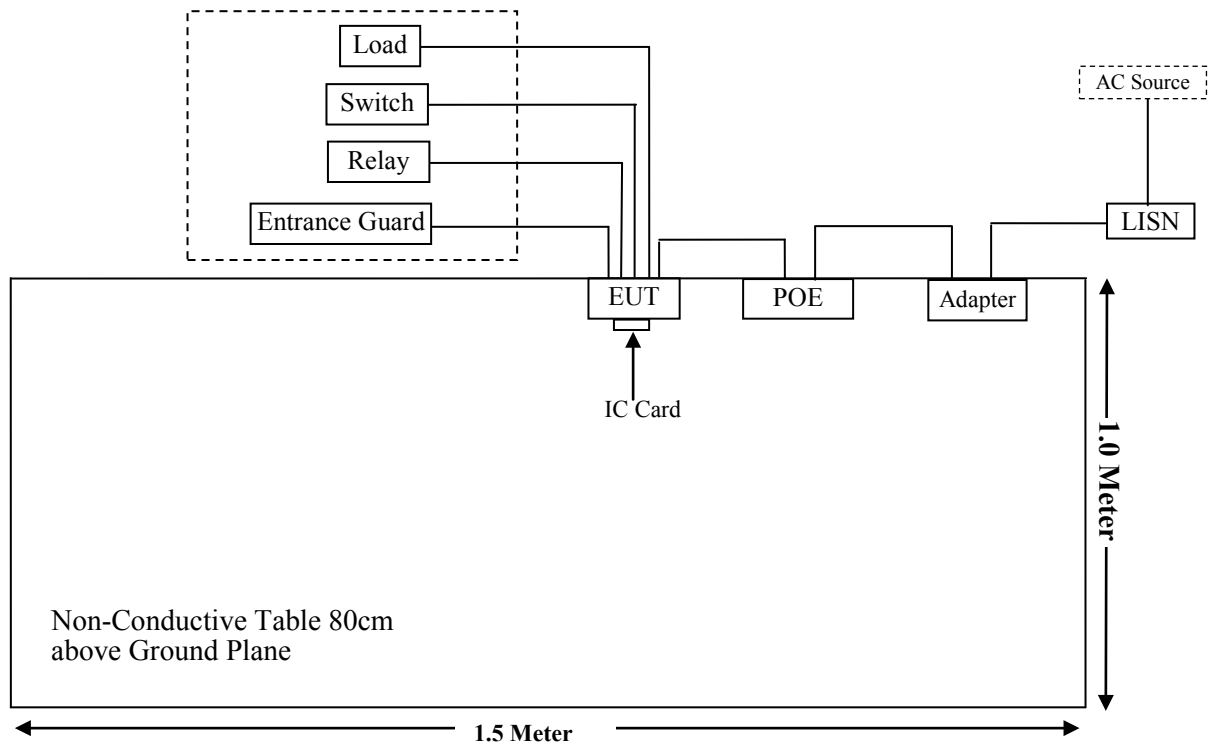
Block Diagram of Test Setup

For Conducted Emissions:

DC 24V power by Adapter:

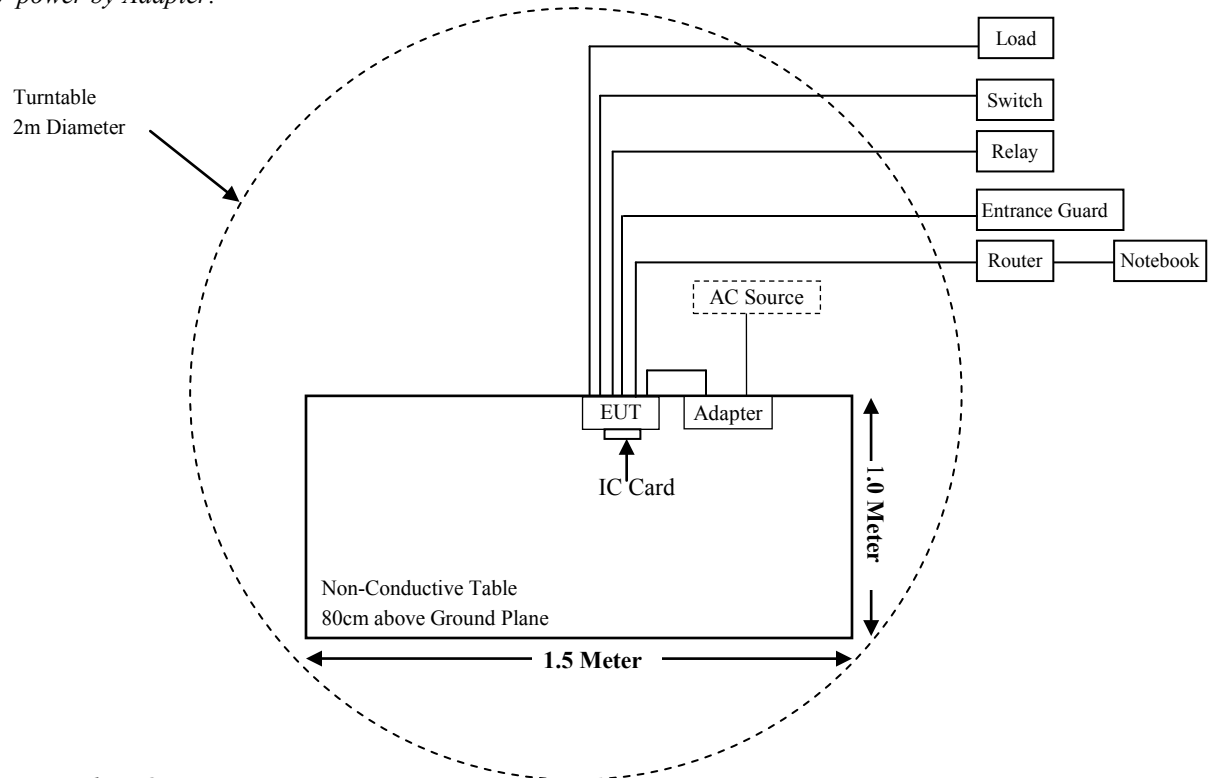


DC 48V power by POE:

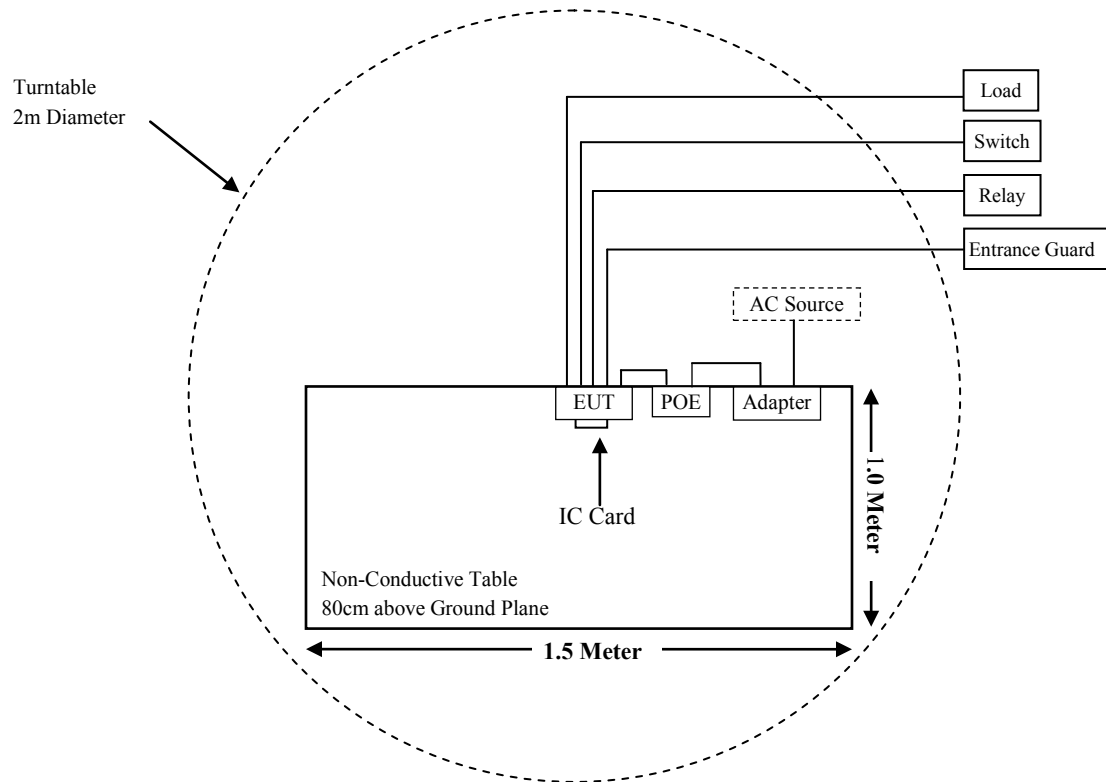


For Radiated Emissions (Below 1GHz):

DC 24V power by Adapter:

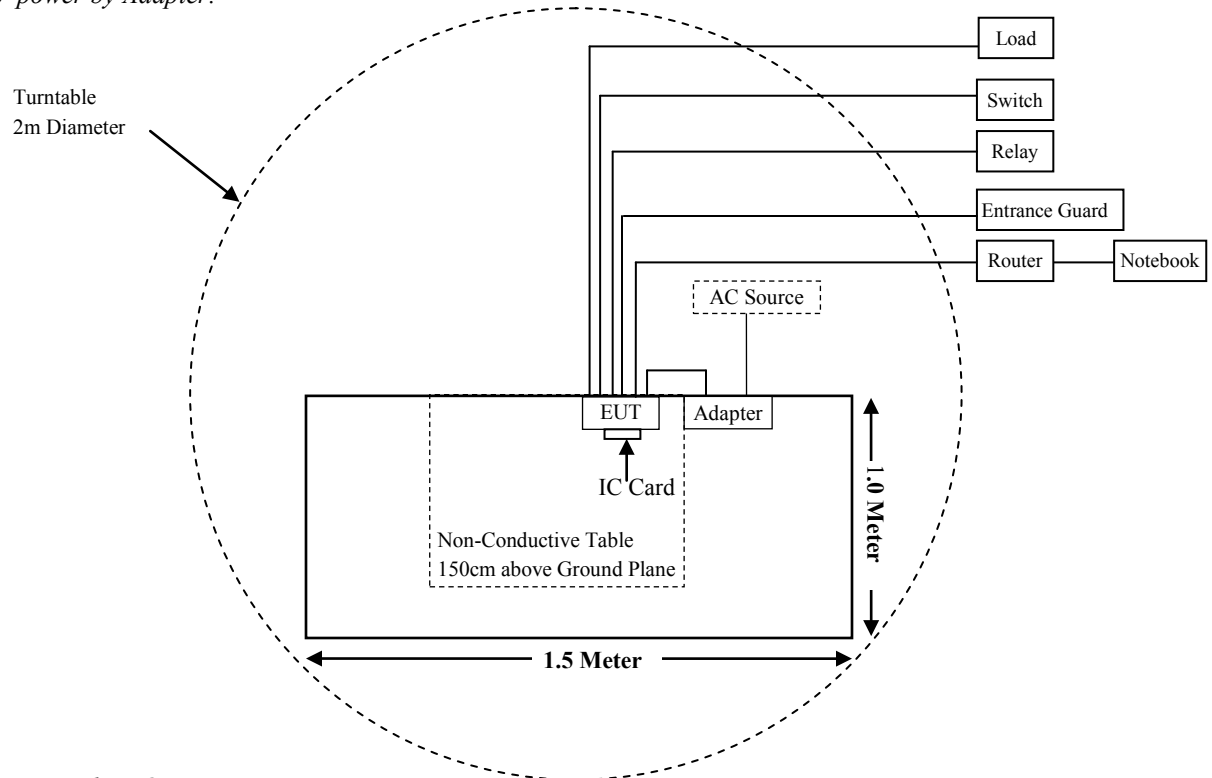


DC 48V power by POE:

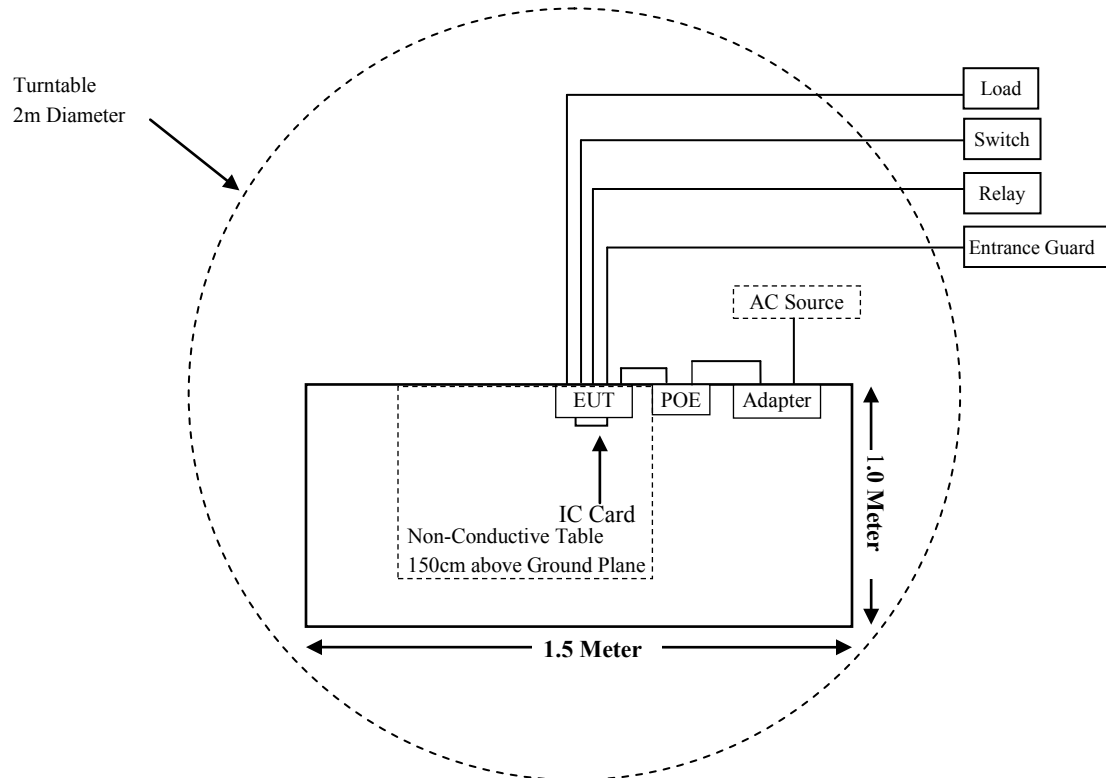


For Radiated Emissions (Above 1GHz):

DC 24V power by Adapter:



DC 48V power by POE:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (I), §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209 & §15.247(d)	Radiated Emissions & Restricted Bands Emissions	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	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	2020-11-27	2021-11-26
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2020-01-07	2023-01-06
Sonoma Instrument	Pre-amplifier	310N	171205	2020-08-14	2021-08-13
Rohde & Schwarz	Auto test Software	EMC32	V9	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2020-08-15	2021-08-14
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207/040	2020-04-01	2021-03-31
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2020-07-15	2023-07-14
ETS-LINDGREN	Horn Antenna	3116	2516	2020-01-07	2023-01-06
A.H.Systems,inc	Amplifier	PAM-0118P	512	2020-02-20	2021-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2020-03-22	2021-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2020-08-05	2021-08-04
Narda	Attenuator	10dB	100361	/	/
Rohde & Schwarz	Auto test Software	EMC32	006	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-6	011	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-11	012	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-12	013	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-13	100207/040	2020-04-01	2021-03-31
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2020-07-28	2021-07-27
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2019-11-27	2020-11-26
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2020-11-27	2021-11-26
Narda	Attenuator	10dB	010	2020-08-15	2021-08-14
AKUVOX (XIAMEN) NETWORKS CO., LTD.	RF Cable	AKUVOX (XIAMEN) NETWORKS CO., LTD. 01	C01	Each Time	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2020-07-28	2021-07-27
Rohde & Schwarz	LISN	ENV216	101115	2020-11-27	2021-11-26
Audix	Test Software	e3	V9	/	/
Rohde & Schwarz	Pulse limiter	ESH3-Z2	100552	2020-08-10	2021-08-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2020-08-15	2021-08-14

* **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).

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

Applicable Standard

According to subpart 15.247 (i) and subpart 1.1310, 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure				
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

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data (worst case):

BLE/BT:

Mode	Frequency Range (MHz)	Maximum Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	-2.30	0.59	4.00	2.51	20	0.0003	1.0
BT	2402-2480	-2.30	0.59	6.50	4.47	20	0.0005	1.0

Note: The tune up power were declared by the manufacturer.

Result: The device meet FCC MPE at 20 cm distance.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has an FPC antenna for Bluetooth, which the antenna gain is -2.3 dBi, fulfill the requirement of this section.

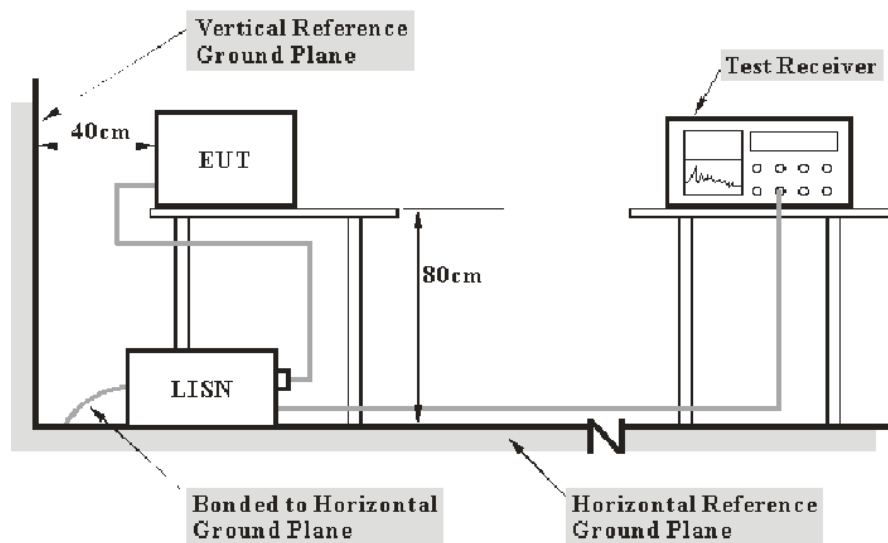
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



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

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

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

ANSI C63.10-2013 clause 6.2

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.

Factor & Margin Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation (dB). 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 FCC Part 15.207.

Test Data

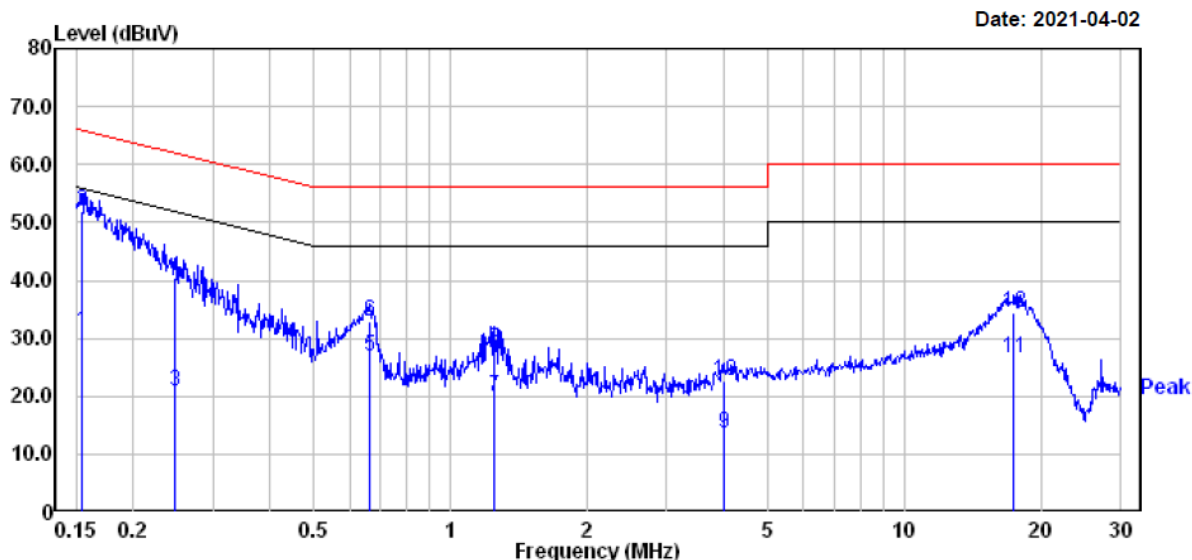
Environmental Conditions

Temperature:	24.6-25.2 °C
Relative Humidity:	46-50 %
ATM Pressure:	101.3-101.6 kPa

The testing was performed by Tyrone Wang on 2021-04-02.

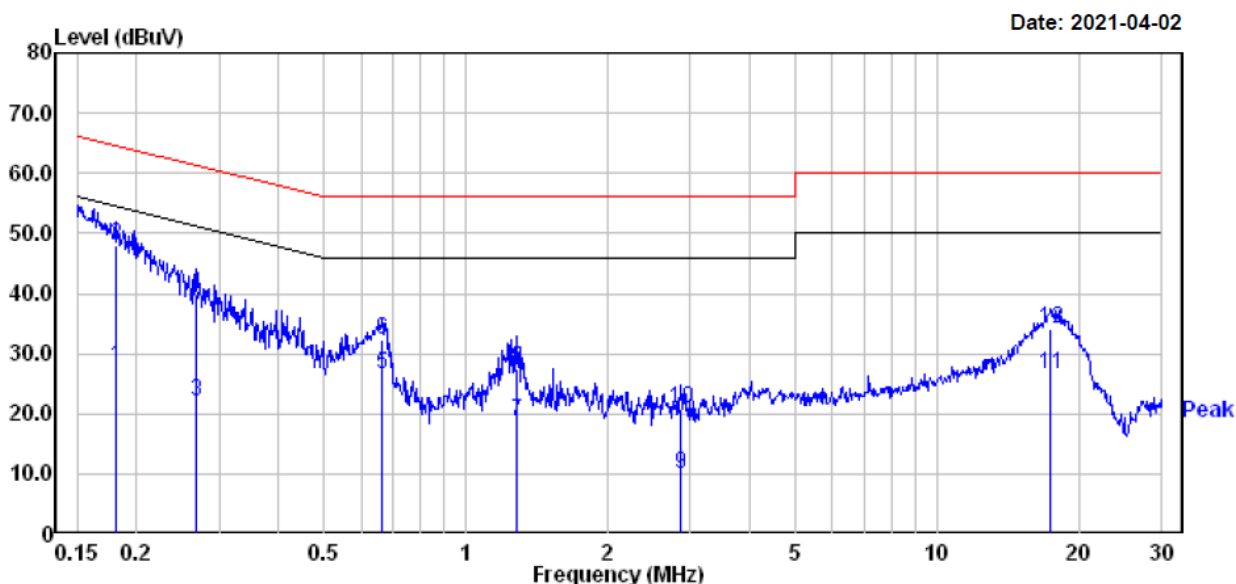
EUT operation mode: Transmitting in middle channel of GFSK mode (Worst case)

Powered by adapter:
AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.155	11.20	19.82	31.02	65.75	-34.73	Peak
2	0.155	32.14	19.82	51.96	65.75	-13.79	QP
3	0.248	0.86	19.82	20.68	61.82	-41.14	Peak
4	0.248	20.67	19.82	40.49	61.82	-21.33	QP
5	0.666	7.26	19.75	27.01	56.00	-28.99	Peak
6	0.666	13.21	19.75	32.96	56.00	-23.04	QP
7	1.254	0.21	19.82	20.03	56.00	-35.97	Peak
8	1.254	8.13	19.82	27.95	56.00	-28.05	QP
9	4.025	-5.78	19.47	13.69	56.00	-42.31	Peak
10	4.025	3.17	19.47	22.64	56.00	-33.36	QP
11	17.425	6.70	19.80	26.50	60.00	-33.50	Peak
12	17.425	14.66	19.80	34.46	60.00	-25.54	QP

AC 120V/60 Hz, Neutral

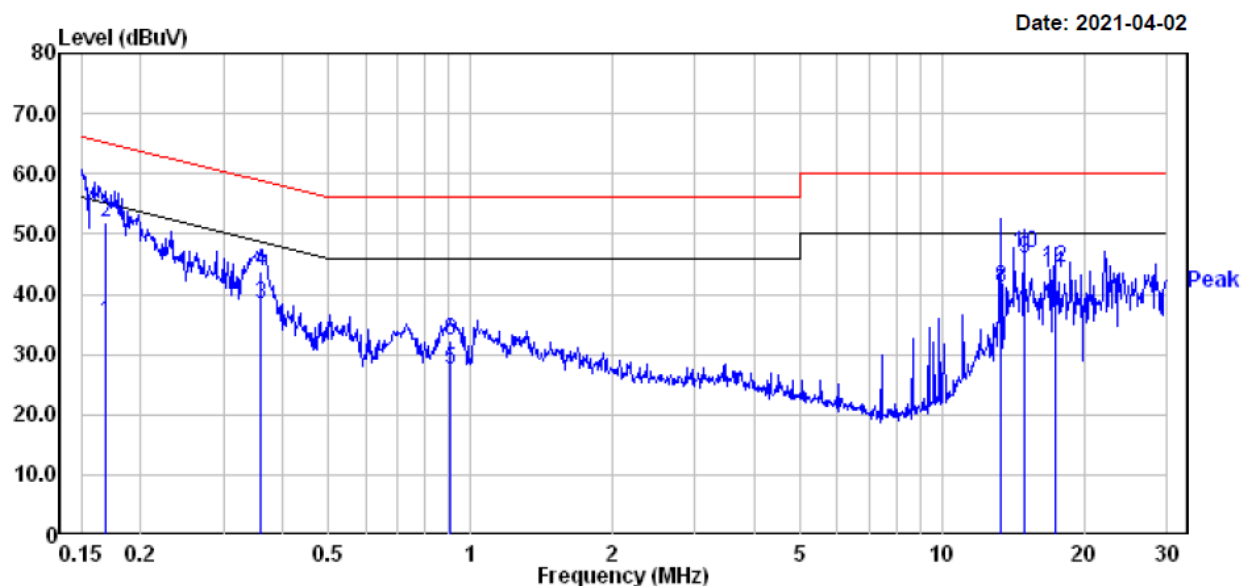


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.180	8.00	19.83	27.83	54.47	-26.64	Average
2	0.180	28.11	19.83	47.94	64.47	-16.53	QP
3	0.267	2.15	19.82	21.97	51.20	-29.23	Average
4	0.267	20.03	19.82	39.85	61.20	-21.35	QP
5	0.666	6.89	19.75	26.64	46.00	-19.36	Average
6	0.666	12.53	19.75	32.28	56.00	-23.72	QP
7	1.279	-1.03	19.82	18.79	46.00	-27.21	Average
8	1.279	7.76	19.82	27.58	56.00	-28.42	QP
9	2.854	-9.60	19.47	9.87	46.00	-36.13	Average
10	2.854	1.24	19.47	20.71	56.00	-35.29	QP
11	17.425	6.62	19.80	26.42	50.00	-23.58	Average
12	17.425	14.34	19.80	34.14	60.00	-25.86	QP

Note:

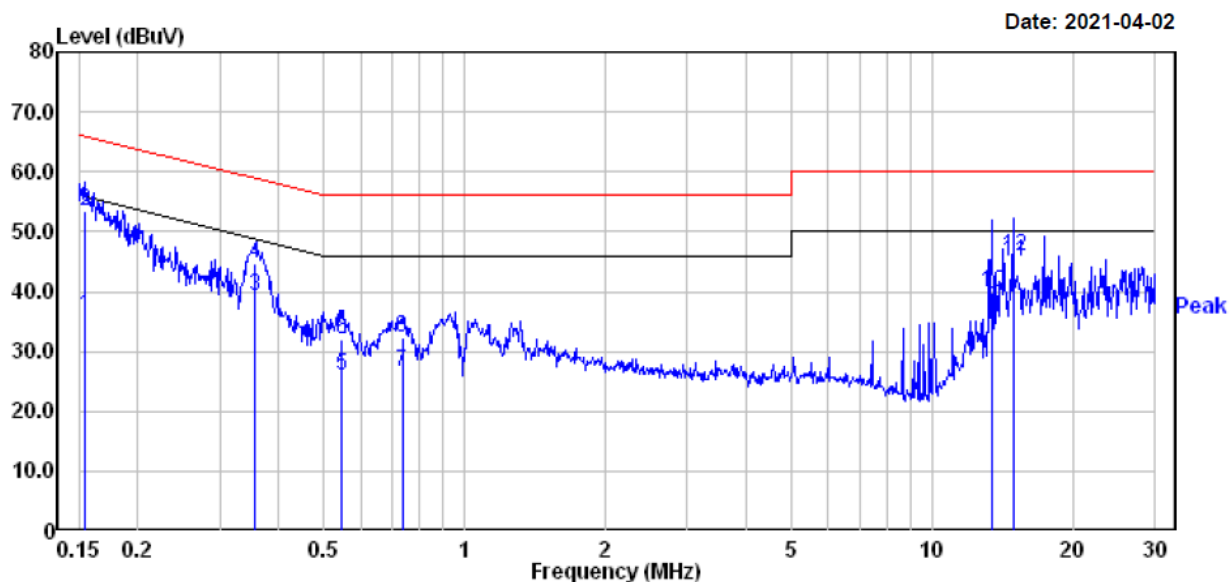
- 1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
- 2) Over Limit (dB) = Read level (dBUV) + Factor (dB) - Limit (dBUV)

Powered by POE:
AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.169	15.60	19.83	35.43	55.01	-19.58	Average
2	0.169	32.00	19.83	51.83	65.01	-13.18	QP
3	0.361	18.50	19.79	38.29	48.71	-10.42	Average
4	0.361	24.10	19.79	43.89	58.71	-14.82	QP
5	0.907	7.69	19.74	27.43	46.00	-18.57	Average
6	0.907	12.49	19.74	32.23	56.00	-23.77	QP
7	13.380	20.90	19.61	40.51	50.00	-9.49	Average
8	13.380	21.30	19.61	40.91	60.00	-19.09	QP
9	14.930	26.30	19.63	45.93	50.00	-4.07	Average
10	14.930	27.10	19.63	46.73	60.00	-13.27	QP
11	17.338	23.70	19.79	43.49	50.00	-6.51	Average
12	17.338	24.70	19.79	44.49	60.00	-15.51	QP

AC 120V/60 Hz, Neutral



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.154	16.20	19.82	36.02	55.79	-19.77	Average
2	0.154	33.70	19.82	53.52	65.79	-12.27	QP
3	0.357	19.30	19.80	39.10	48.80	-9.70	Average
4	0.357	24.80	19.80	44.60	58.80	-14.20	QP
5	0.545	6.20	19.75	25.95	46.00	-20.05	Average
6	0.545	12.30	19.75	32.05	56.00	-23.95	QP
7	0.736	6.70	19.73	26.43	46.00	-19.57	Average
8	0.736	12.60	19.73	32.33	56.00	-23.67	QP
9	13.447	17.50	19.61	37.11	50.00	-12.89	Average
10	13.447	20.20	19.61	39.81	60.00	-20.19	QP
11	14.930	25.50	19.63	45.13	50.00	-4.87	Average
12	14.930	26.20	19.63	45.83	60.00	-14.17	QP

Note:

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

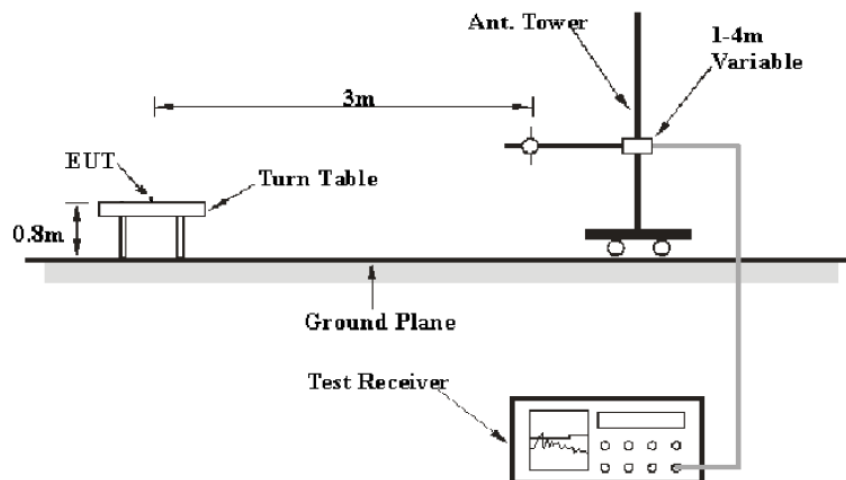
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

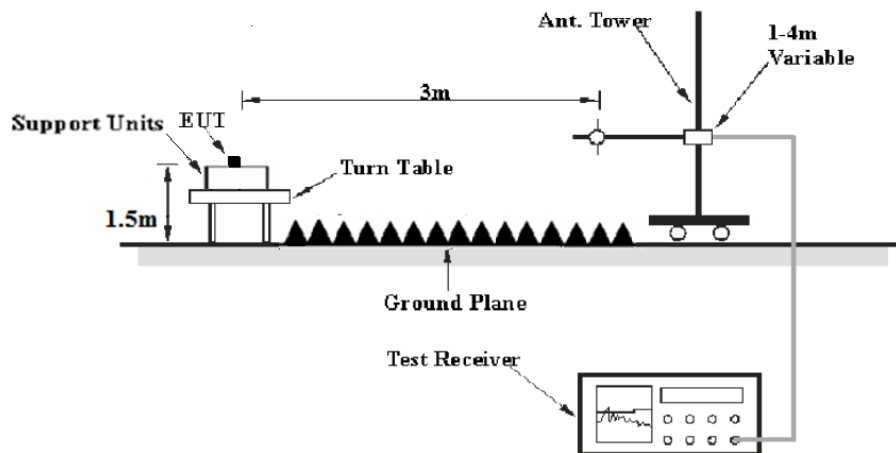
FCC §15.205; §15.209; §15.247(d)

EUT Setup

Below 1 GHz:



Above 1GHz:



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

EMI Test Receiver 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.

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 (dB μ V /m) = Meter Reading (dB μ V) + 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 (dB μ V/m) – Corrected Amplitude (dB μ V /m)

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Test Data

Environmental Conditions

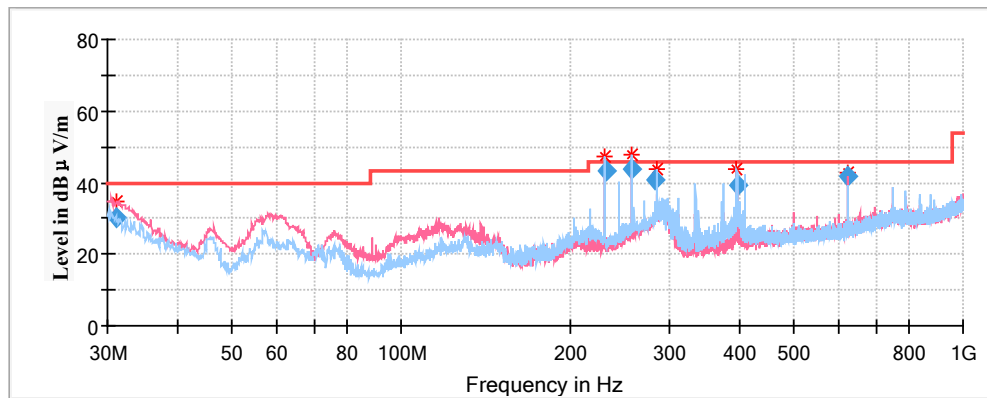
Temperature:	24.8~25 °C
Relative Humidity:	49 ~50 %
ATM Pressure:	101.1 ~101.2 kPa

The testing was performed by Tyrone Wang from 2020-10-27 to 2020-11-05.

EUT operation mode: Transmitting

Spurious Emission Test:**Powered by adapter:****30MHz-1GHz**

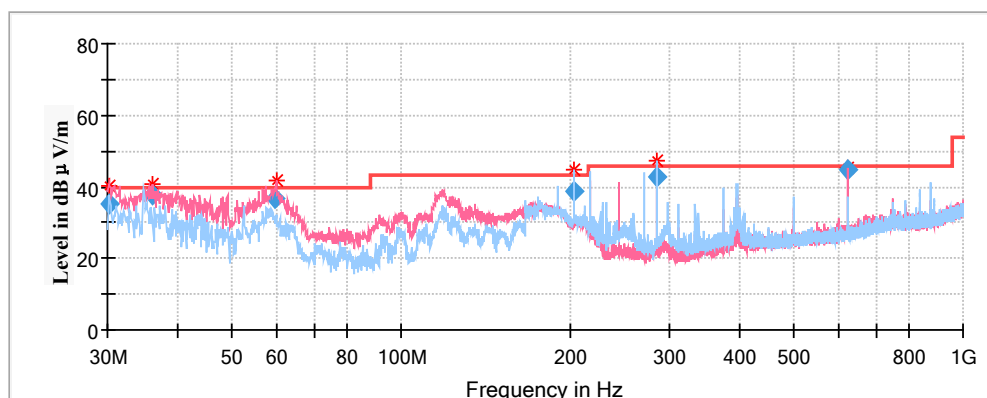
(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case middle channel of operation in the Z axis of orientation was recorded)



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	QuasiPeak (dBμV/m)	Height (cm)	Polar (H/V)				
31.227522	30.36	100.0	V	164.0	-4.5	40.00	9.64
230.995700	43.40	100.0	H	78.0	-12.0	46.00	2.60
256.630200	44.02	100.0	H	78.0	-11.8	46.00	1.98
283.976450	40.78	100.0	H	305.0	-11.2	46.00	5.22
396.086100	39.10	100.0	H	342.0	-8.1	46.00	6.90
625.001950	41.80	100.0	V	164.0	-4.2	46.00	4.20

Spurious Emission Test:**Powered by POE:****30MHz-1GHz**

(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case middle channel of operation in the Z axis of orientation was recorded)



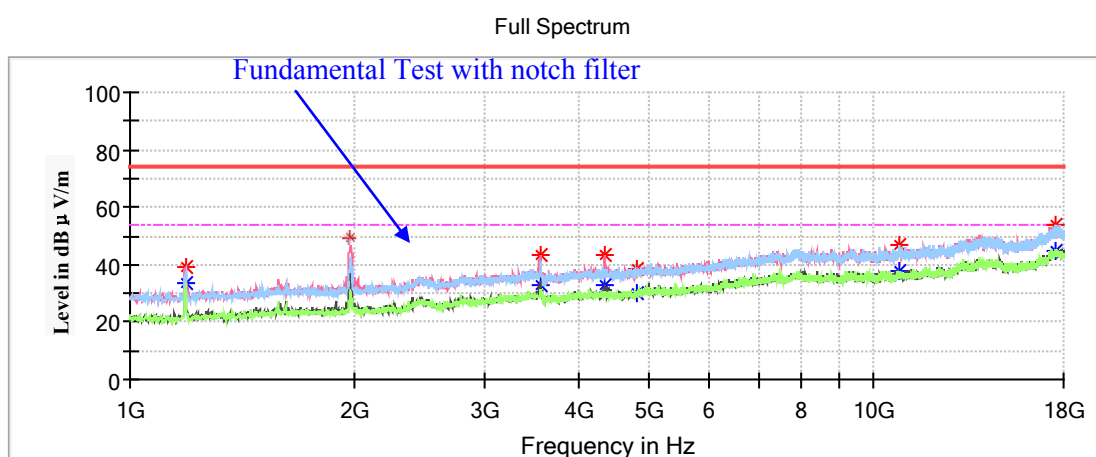
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	QuasiPeak (dB μ V/m)	Height (cm)	Polar (H/V)				
30.214703	35.36	100.0	V	139.0	-3.8	40.00	4.64
36.193850	37.58	100.0	V	157.0	-8.5	40.00	2.42
59.622000	36.88	100.0	V	199.0	-14.6	40.00	3.12
203.462200	38.89	100.0	H	170.0	-12.0	43.50	4.61
285.838250	42.71	100.0	H	139.0	-11.1	46.00	3.29
624.984550	44.98	100.0	V	175.0	-4.2	46.00	1.02

Powered by adapter:**1GHz-18GHz:**

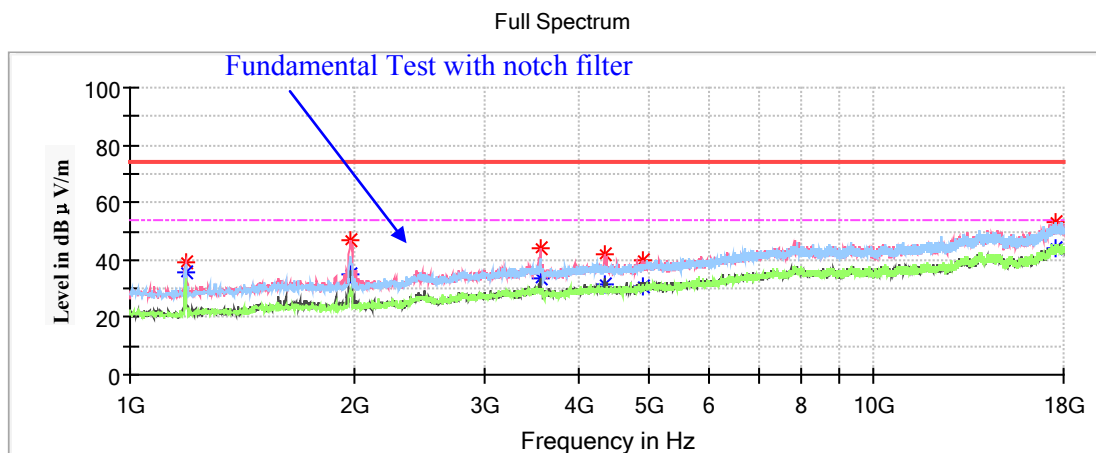
Pre-Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK modes of operation in the X,Y and Z axes of orientation, the worst case GFSK Mode in Z-axis of orientation was recorded

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 (dB μ V/m) = Corrected Factor (dB/m) + Reading (dB μ V)
 Margin (dB) = Limit (dB μ V/m) – Corrected Amplitude (dB μ V/m)

Low Channel: 2402MHz

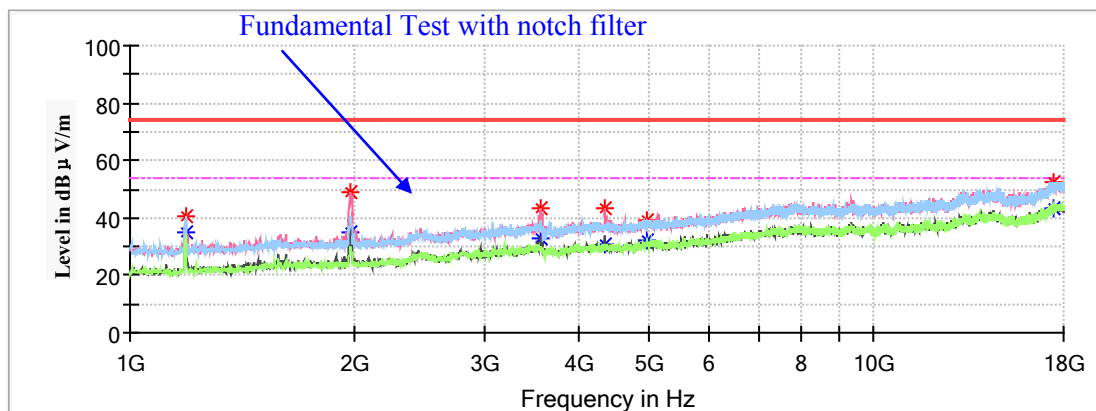
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1187.000000	---	33.68	150.0	V	159.0	-18.1	54.00	20.32
1187.000000	39.25	---	150.0	V	159.0	-18.1	74.00	34.75
3563.600000	---	32.69	150.0	V	358.0	-8.6	54.00	21.31
3563.600000	43.16	---	150.0	V	358.0	-8.6	74.00	30.84
4357.500000	43.36	---	200.0	V	291.0	-6.4	74.00	30.64
4357.500000	---	33.01	200.0	V	291.0	-6.4	54.00	20.99
4804.000000	---	29.78	200.0	V	36.0	-5.6	54.00	24.22
4804.000000	38.53	---	200.0	V	36.0	-5.6	74.00	35.47
10839.600000	---	37.65	150.0	H	308.0	2.7	54.00	16.35
10839.600000	46.85	---	150.0	H	308.0	2.7	74.00	27.15
17593.700000	---	44.64	200.0	V	242.0	8.9	54.00	9.36
17593.700000	53.72	---	200.0	V	242.0	8.9	74.00	20.28

Middle Channel: 2441MHz

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1187.000000	---	35.68	150.0	V	254.0	-18.1	54.00	18.32
1187.000000	39.41	---	150.0	V	254.0	-18.1	74.00	34.59
1974.100000	47.13	---	200.0	V	134.0	-14.6	74.00	26.87
1974.100000	---	34.81	200.0	V	134.0	-14.6	54.00	19.19
3565.300000	44.31	---	150.0	V	0.0	-8.6	74.00	29.69
3565.300000	---	33.57	150.0	V	0.0	-8.6	54.00	20.43
4357.500000	---	31.48	150.0	V	0.0	-6.4	54.00	22.52
4357.500000	42.29	---	150.0	V	0.0	-6.4	74.00	31.71
4882.000000	39.73	---	150.0	V	214.0	-5.4	74.00	34.27
4882.000000	---	30.56	150.0	V	214.0	-5.4	54.00	23.44
17583.500000	---	44.35	200.0	V	97.0	8.9	54.00	9.65
17583.500000	52.90	---	200.0	V	97.0	8.9	74.00	21.10

High Channel: 2480MHz

Full Spectrum



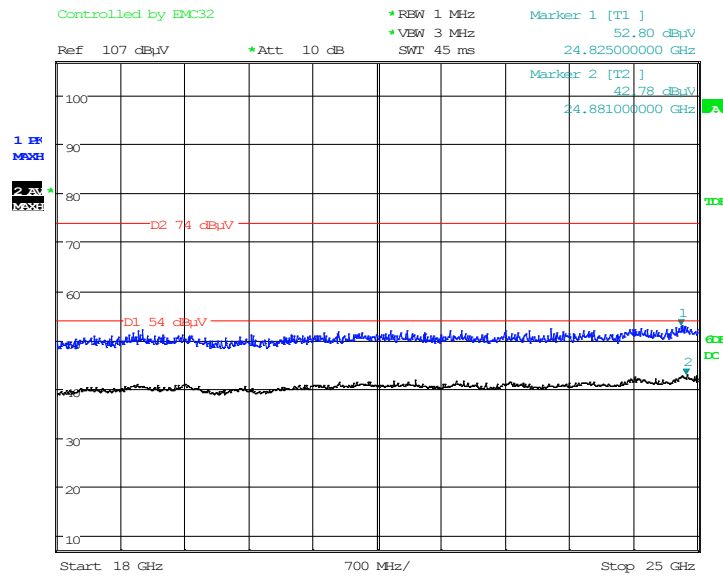
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1187.000000	40.90	---	150.0	H	115.0	-18.1	74.00	33.10
1187.000000	---	35.08	150.0	H	115.0	-18.1	54.00	18.92
1980.900000	---	35.26	150.0	V	129.0	-14.5	54.00	18.74
1980.900000	49.20	---	150.0	V	129.0	-14.5	74.00	24.80
3560.200000	43.42	---	200.0	V	0.0	-8.6	74.00	30.58
3560.200000	---	33.18	200.0	V	0.0	-8.6	54.00	20.82
4357.500000	---	31.01	200.0	V	345.0	-6.4	54.00	22.99
4357.500000	43.09	---	200.0	V	345.0	-6.4	74.00	30.91
4960.000000	39.20	---	150.0	H	270.0	-5.3	74.00	34.80
4960.000000	---	31.83	150.0	H	270.0	-5.3	54.00	22.17
17476.400000	---	43.18	150.0	H	204.0	8.8	54.00	10.82
17476.400000	52.74	---	150.0	H	204.0	8.8	74.00	21.26

Powered by adapter:

18GHz-25GHz:

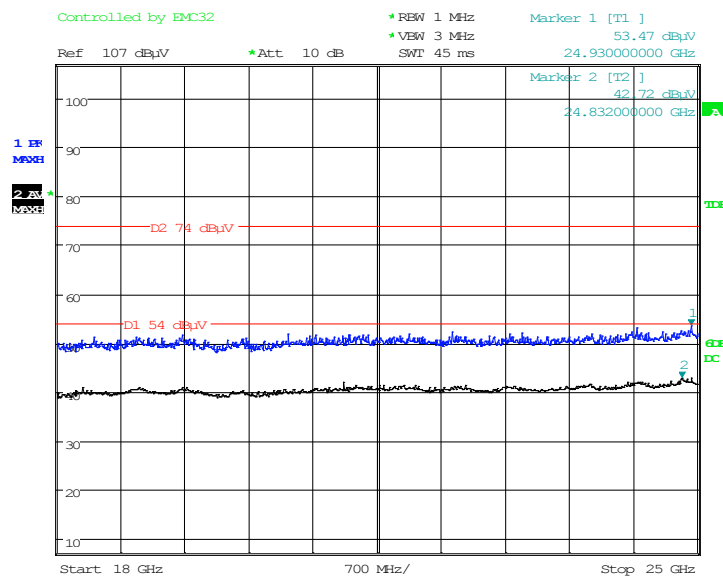
Pre-Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK modes of operation in the X,Y and Z axes of orientation, the worst case middle channel of GFSK Mode in Z-axis of orientation was recorded

Horizontal



Date: 5.NOV.2020 23:31:33

Vertical



Date: 5.NOV.2020 23:32:58

Fundamental Test & Restricted Bands Emissions:

Pre-Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK modes of operation in the X,Y and Z axes of orientation, the worst case GFSK Mode in Z-axis of orientation was recorded

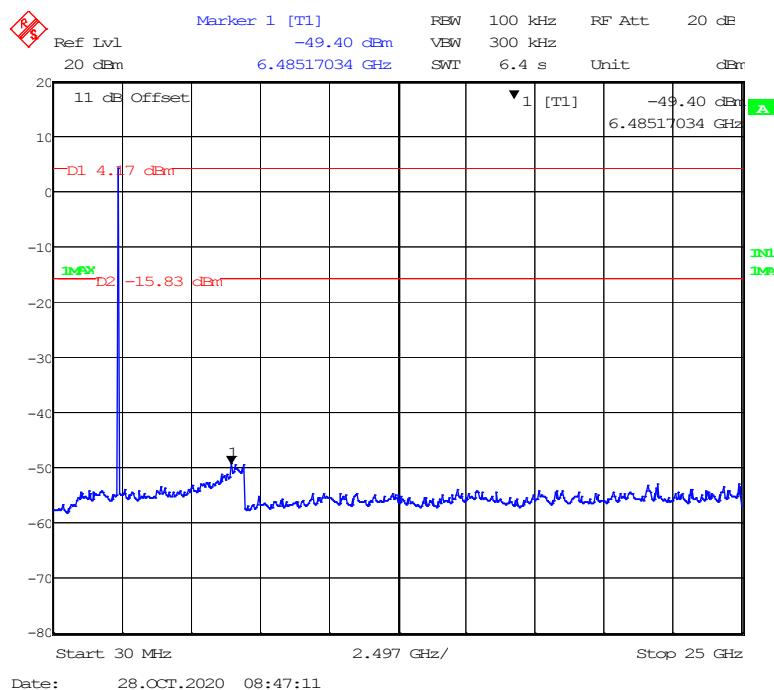
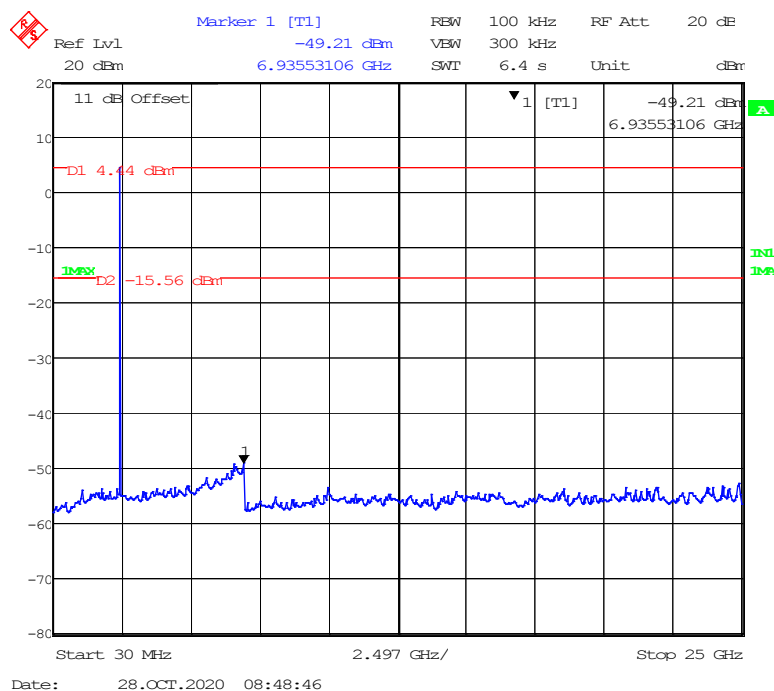
Note:

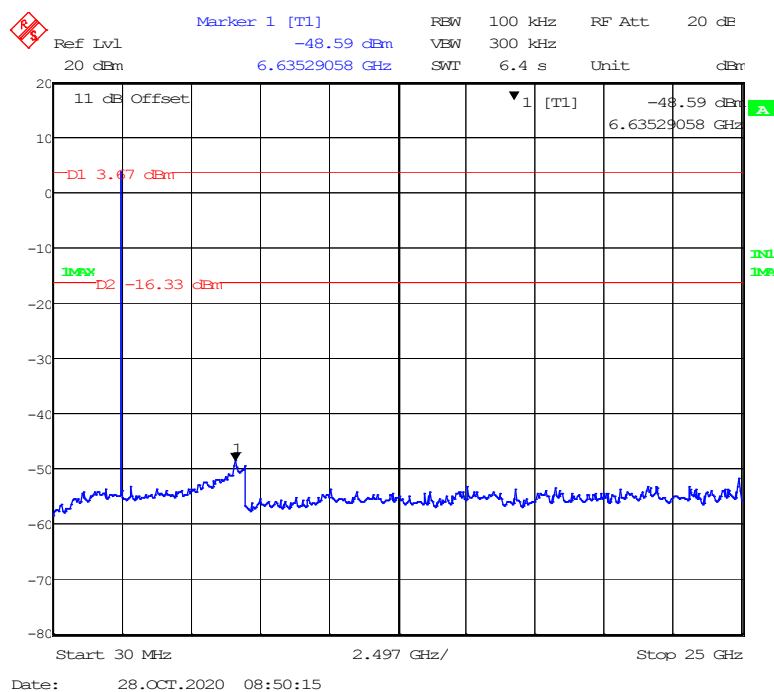
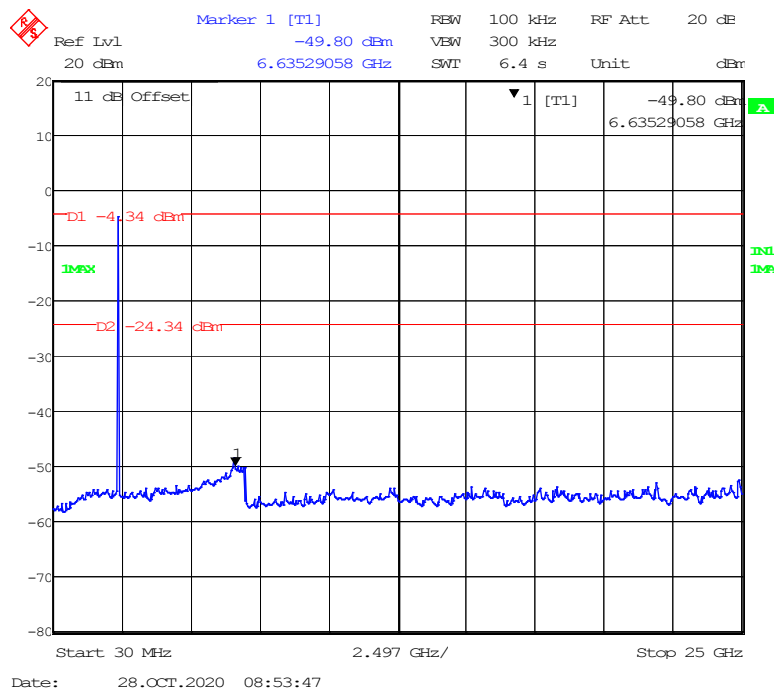
1. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)

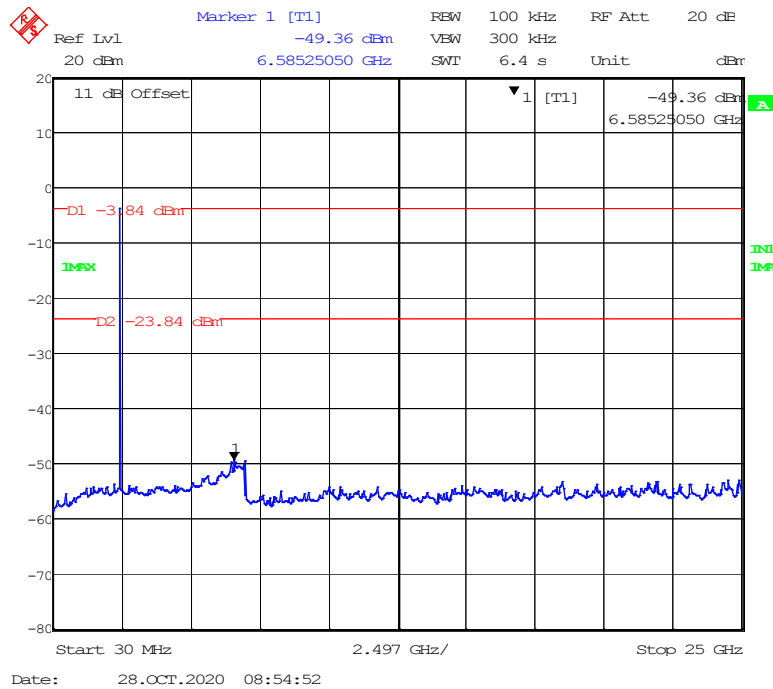
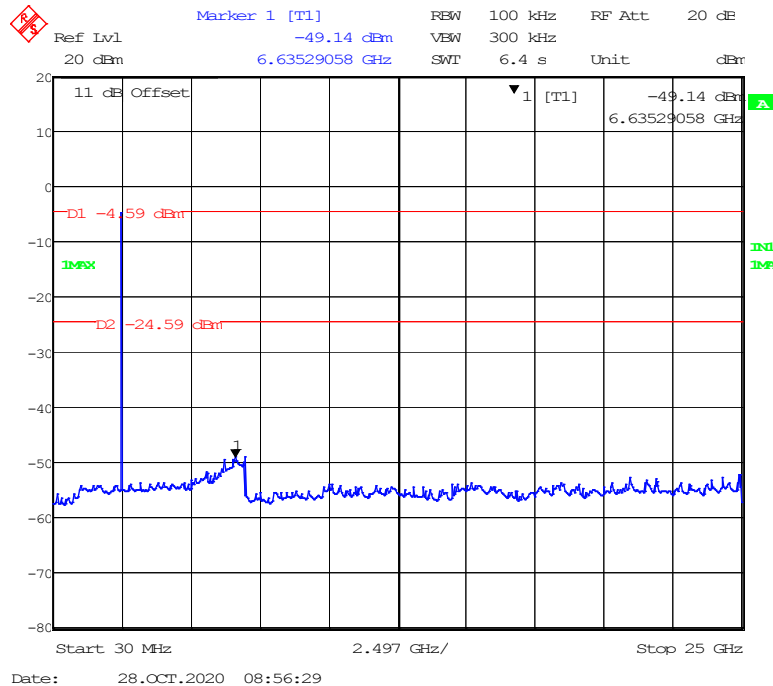
Corrected Amplitude (dB μ V /m) = Corrected Factor (dB/m) + Reading (dB μ V)

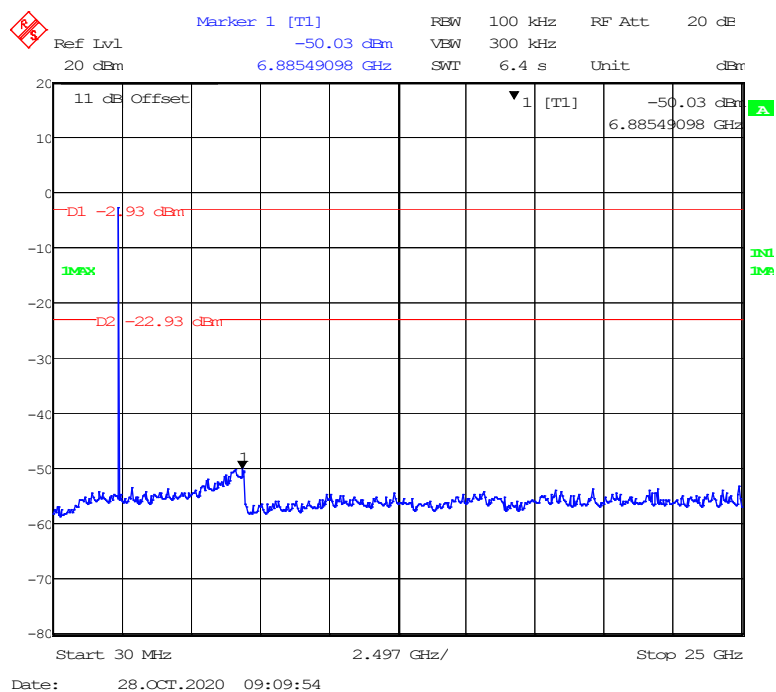
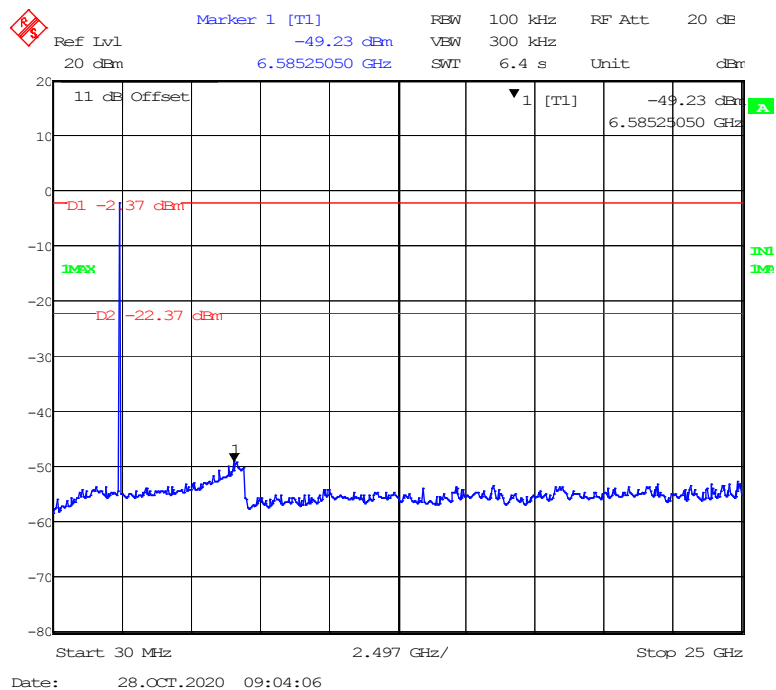
Margin (dB) = Limit (dB μ V/m) – Corrected Amplitude (dB μ V /m)

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								
2390.00	45.91	---	150.0	V	101.0	-2.9	74.00	28.09
2390.00	---	41.16	150.0	V	101.0	-2.9	54.00	12.84
High Channel: 2480MHz								
2483.50	45.68	---	200.0	H	314.0	-2.5	74.00	28.32
2483.50	---	41.66	200.0	H	314.0	-2.5	54.00	12.34

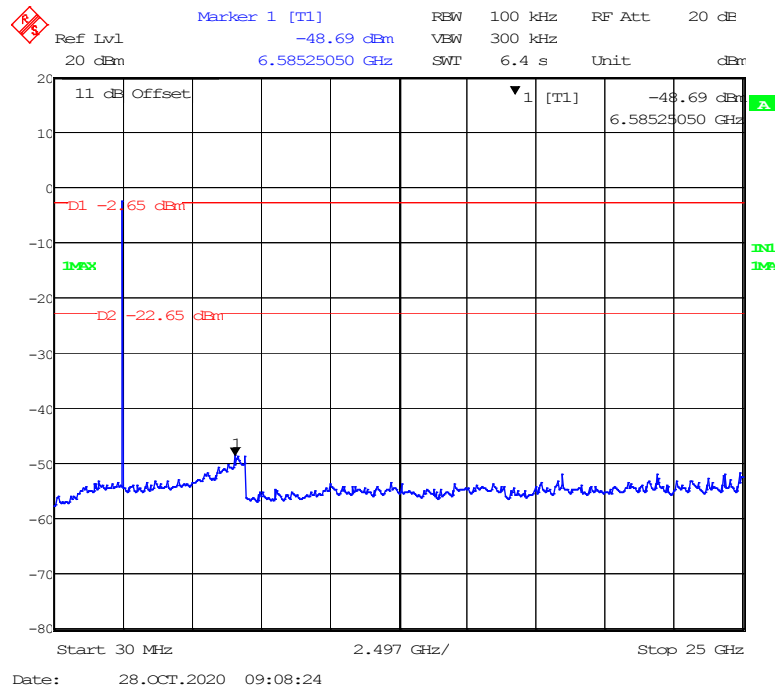
Conducted Spurious Emissions at Antenna Port**BDR (GFSK): Low Channel****BDR (GFSK): Middle Channel**

BDR (GFSK): High Channel**EDR ($\pi/4$ -DQPSK): Low Channel**

EDR ($\pi/4$ -DQPSK): Middle Channel**EDR ($\pi/4$ -DQPSK): High Channel**

EDR (8DPSK): Low Channel**EDR (8DPSK): Middle Channel**

EDR (8DPSK): High Channel



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

Applicable Standard

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

Test Procedure

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) $\geq$ 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:	24.5 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Tyrone Wang on 2020-10-28.

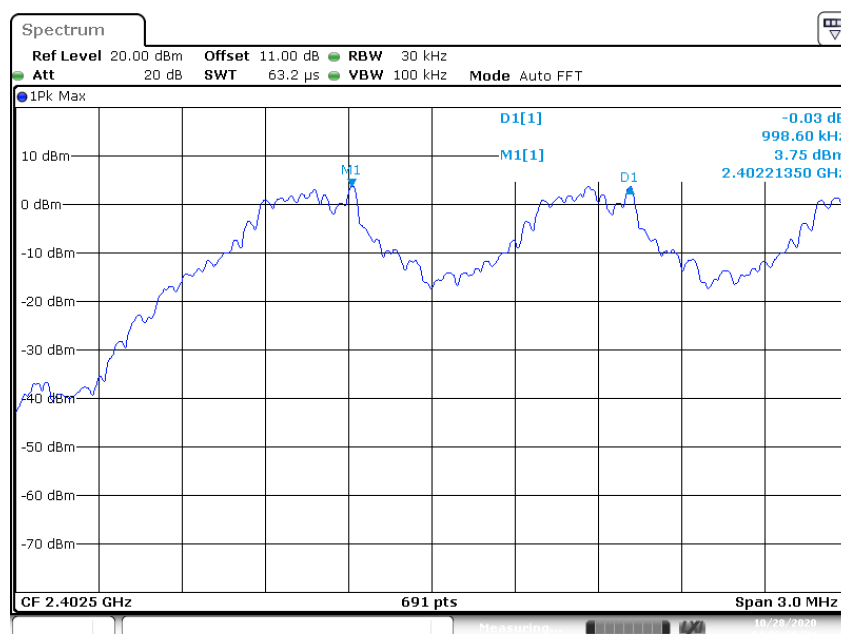
EUT operation mode: Transmitting

Test Result: Compliant.

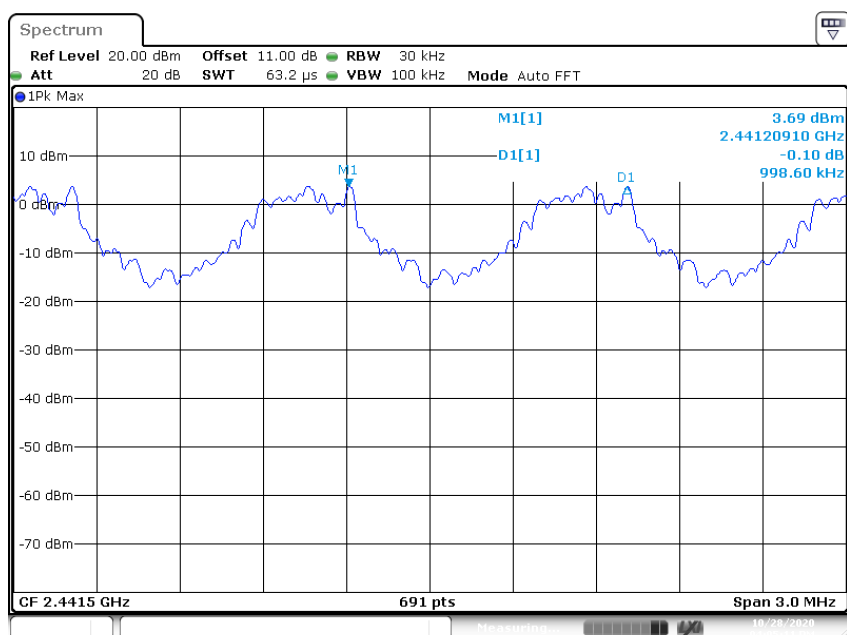
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR (GFSK)	Low	2402	0.999	0.701	Pass
	Adjacent	2403			
	Middle	2441	0.999	0.701	Pass
	Adjacent	2442			
	High	2480	0.999	0.701	Pass
	Adjacent	2479			
EDR ($\pi/4$ -DQPSK)	Low	2402	1.003	0.898	Pass
	Adjacent	2403			
	Middle	2441	1.003	0.898	Pass
	Adjacent	2442			
	High	2480	1.003	0.898	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.003	0.882	Pass
	Adjacent	2403			
	Middle	2441	1.003	0.882	Pass
	Adjacent	2442			
	High	2480	1.003	0.886	Pass
	Adjacent	2479			

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

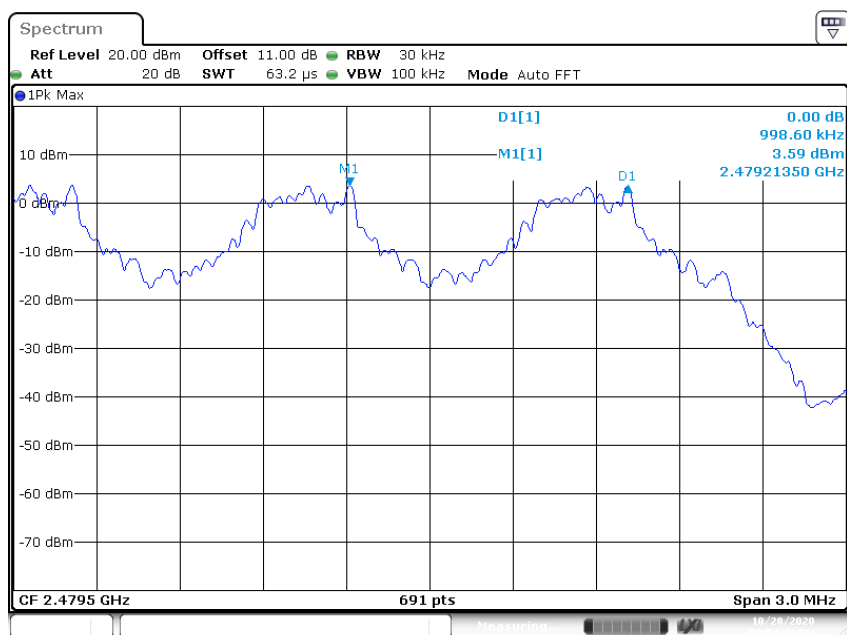
BDR (GFSK): Low Channel



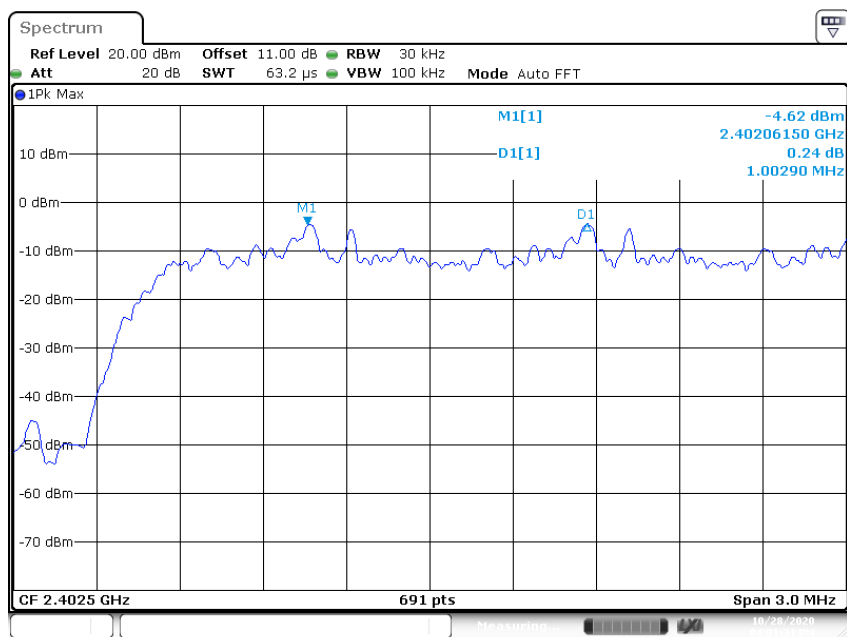
Date: 28.OCT.2020 16:02:36

BDR (GFSK): Middle Channel

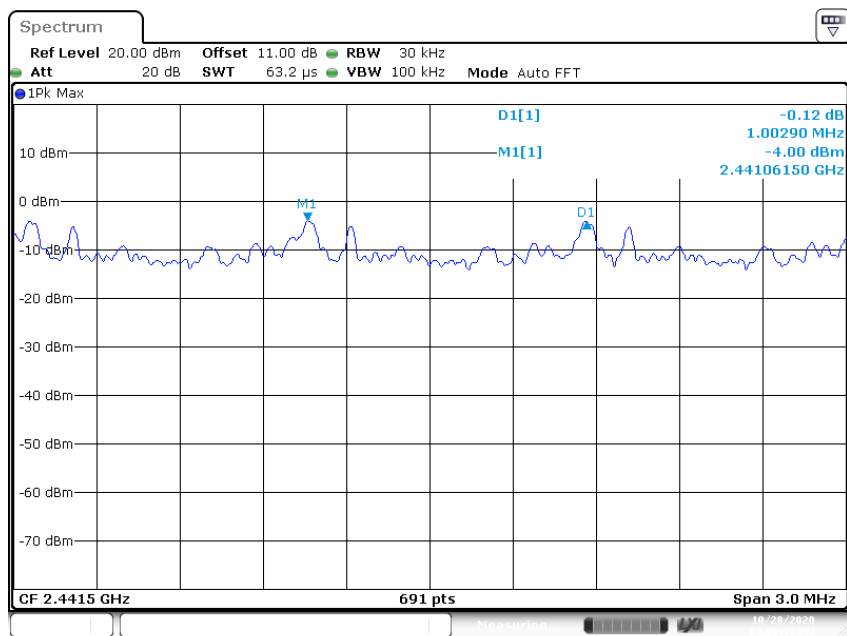
Date: 28.OCT.2020 16:05:12

BDR (GFSK): High Channel

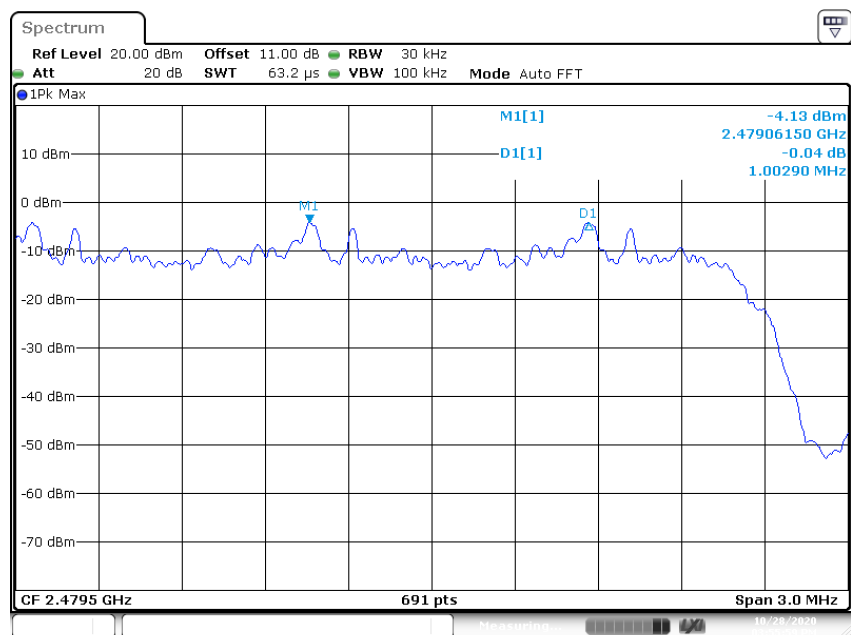
Date: 28.OCT.2020 15:54:43

EDR ($\pi/4$ -DQPSK): Low Channel

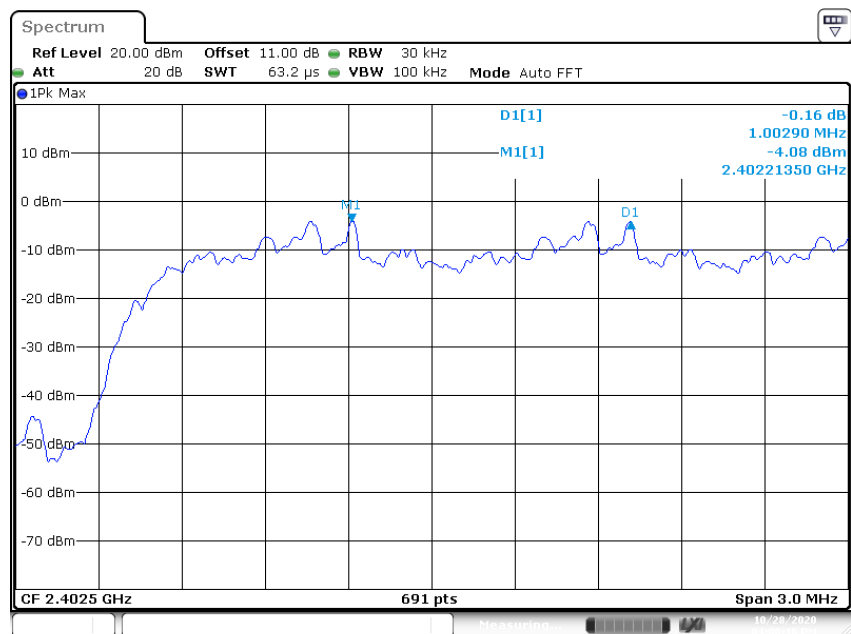
Date: 28.OCT.2020 16:01:32

EDR ($\pi/4$ -DQPSK): Middle Channel

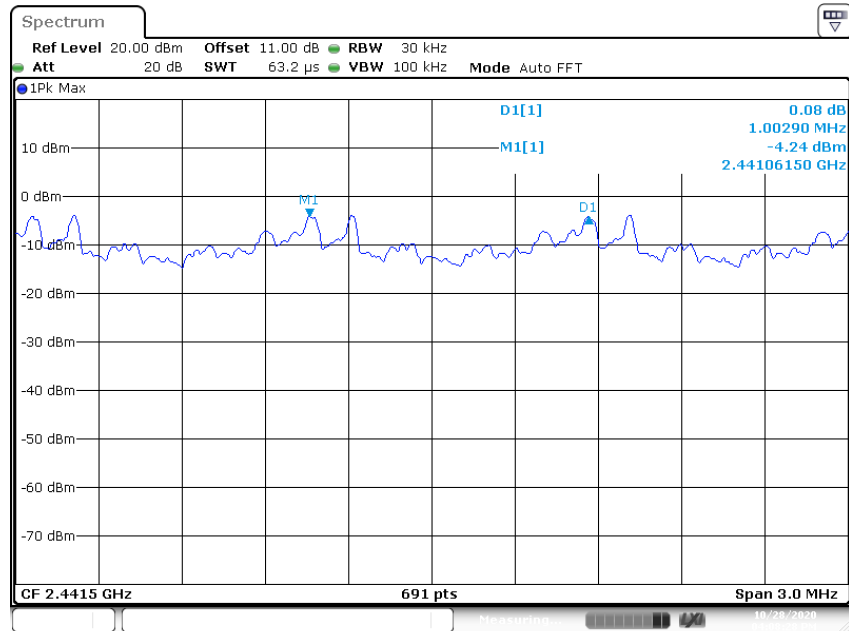
Date: 28.OCT.2020 16:06:33

EDR ($\pi/4$ -DQPSK): High Channel

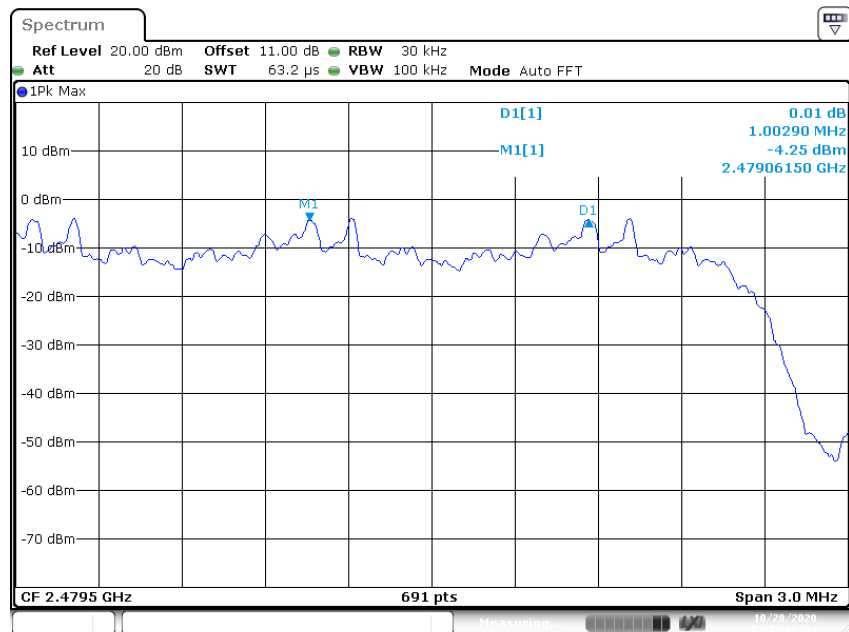
Date: 28.OCT.2020 15:55:59

EDR (8DPSK): Low Channel

Date: 28.OCT.2020 16:00:16

EDR (8DPSK): Middle Channel

Date: 28.OCT.2020 16:08:28

EDR (8DPSK): High Channel

Date: 28.OCT.2020 15:57:18

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

Applicable Standard

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

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	24.7 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

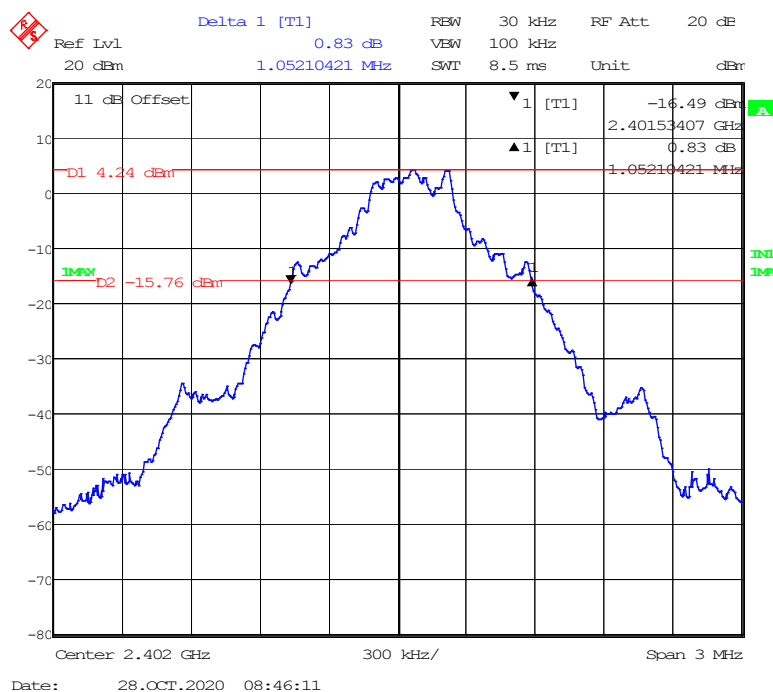
The testing was performed by Tyrone Wang on 2020-10-28.

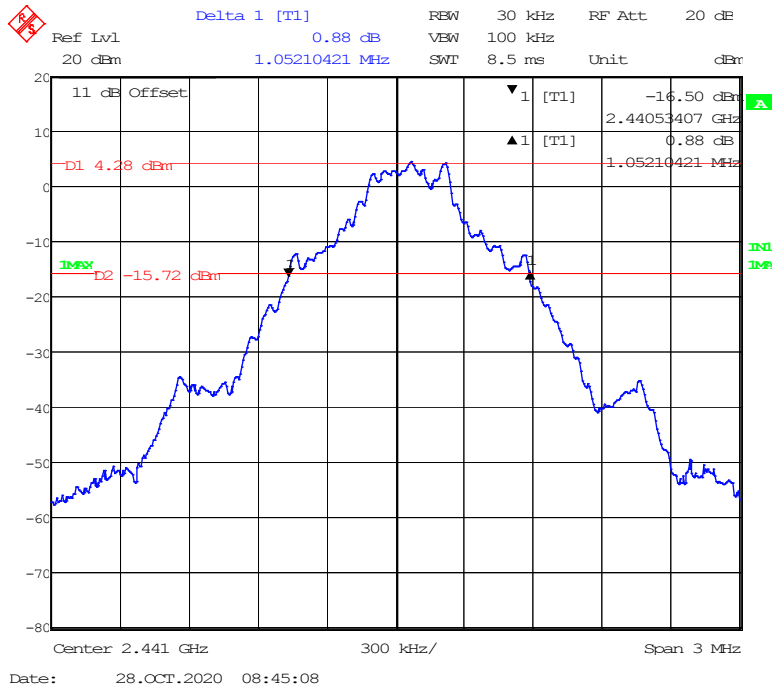
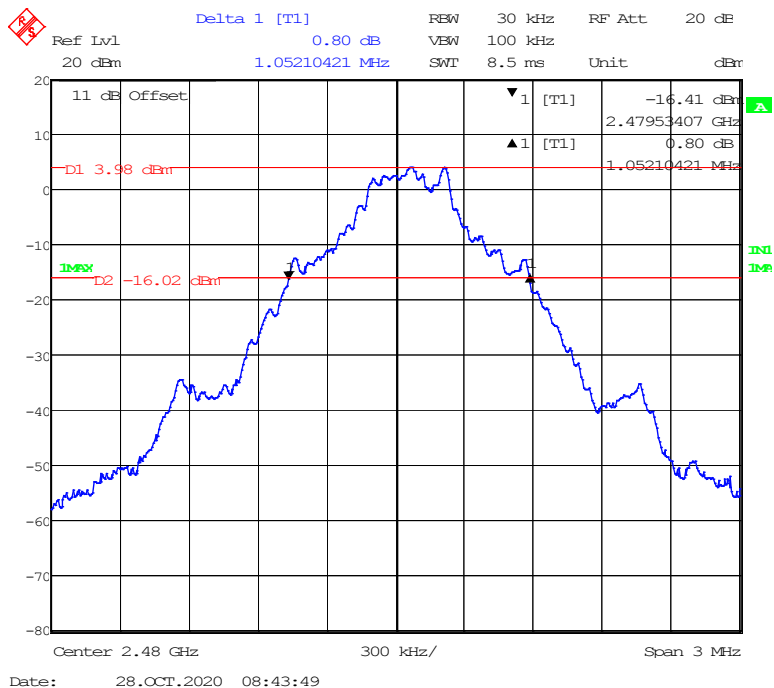
EUT operation mode: Transmitting

Test Result: Compliant.

Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	1.052
	Middle	2441	1.052
	High	2480	1.052
EDR ($\pi/4$ -DQPSK)	Low	2402	1.347
	Middle	2441	1.347
	High	2480	1.347
EDR (8DPSK)	Low	2402	1.323
	Middle	2441	1.323
	High	2480	1.329

BDR (GFSK): Low Channel



BDR (GFSK): Middle Channel**BDR (GFSK): High Channel**

Delta 1 [T1] 1.29 dB

Ref Lvl 10 dBm 1.34669339 MHz

REW 30 kHz RF Att 20 dB

SWT 8.5 ms Unit dBm

11 dB Offset

▼ 1 [T1] -24.68 dBm

▲ 1 [T1] 1.29 dB

1.34669339 MHz

D1 -3.81 dBm

D2 -23.81 dBm

INI IMP

Center 2.402 GHz 300 kHz/ Span 3 MHz

Date: 28.OCT.2020 08:39:12

Delta 1 [T1]

Ref Lvl 0.83 dB

10 dBm 1.34669339 MHz

REW 30 kHz RF Att 20 dB

SWT 8.5 ms Unit dBm

11 dB Offset

1 [T1] -24.27 dBm

2.44038377 GHz

0.83 dB

1.34669339 MHz

D1 -3.49 dBm

D2 -23.49 dBm

Center 2.441 GHz

300 kHz/

Span 3 MHz

Date: 28.OCT.2020 08:40:32

Delta 1 [T1]

Ref Lvl 0.81 dB

10 dBm 1.34669339 MHz

REW 30 kHz RF Att 20 dB

VIEW 100 kHz

SWT 8.5 ms Unit dBm

11 dB Offset

1 [T1] -24.50 dBm

2.47938377 GHz

0.81 dB

1.34669339 MHz

D1 -3.83 dBm

D2 -23.83 dBm

Center 2.48 GHz

300 kHz/

Span 3 MHz

Date: 28.OCT.2020 08:42:19

Delta 1 [T1] 0.62 dB

Ref Lvl 10 dBm

1.32264529 MHz

RBW 30 kHz

VBW 100 kHz

SWT 8.5 ms

RF Att 20 dB

Unit dBm

11 dB Offset

▼ 1 [T1] -24.04 dBm

▲ 1 [T1] 0.62 dB

1.32264529 MHz

D1 -3.8 dBm

D2 -23.8 dBm

Center 2.402 GHz

300 kHz/

Span 3 MHz

Date: 28.OCT.2020 08:37:03

Delta 1 [T1] 0.60 dB

Ref Lvl 10 dBm 1.32264529 MHz

BW 30 kHz RF Att 20 dB

VSW 100 kHz

SWT 8.5 ms Unit dBm

11 dB Offset

▼ 1 [T1] -23.81 dBm

▲ 1 [T1] 0.60 dB

1.32264529 MHz

D1 -3.44 dBm

D2 -23.44 dBm

Center 2.441 GHz 300 kHz/ Span 3 MHz

Date: 28.OCT.2020 08:35:39

Delta 1 [T1]

Ref Lvl 1.10 dB

10 dBm 1.32865731 MHz

RESW 30 kHz RF Att 20 dB

VBW 100 kHz

SWT 8.5 ms Unit dBm

11 dB Offset

1 [T1] -24.56 dBm

2.47938978 GHz

1 [T1] 1.10 dB

1.32865731 MHz

D1 -3.79 dBm

D2 -23.79 dBm

Center 2.48 GHz

300 kHz/

Span 3 MHz

Date: 28.OCT.2020 08:34:28

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

Applicable Standard

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

Test Procedure

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 $\geq$ 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:	24.6 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

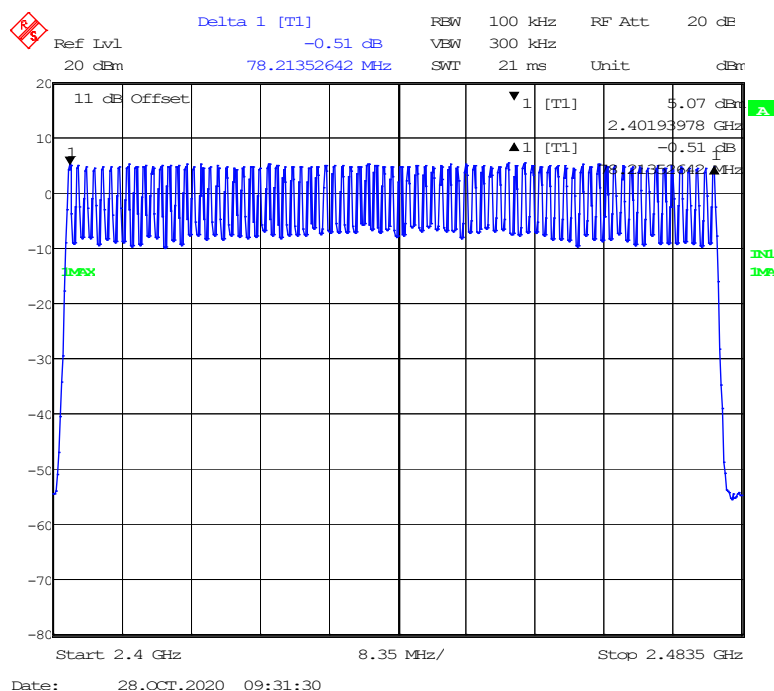
The testing was performed by Tyrone Wang on 2020-10-28.

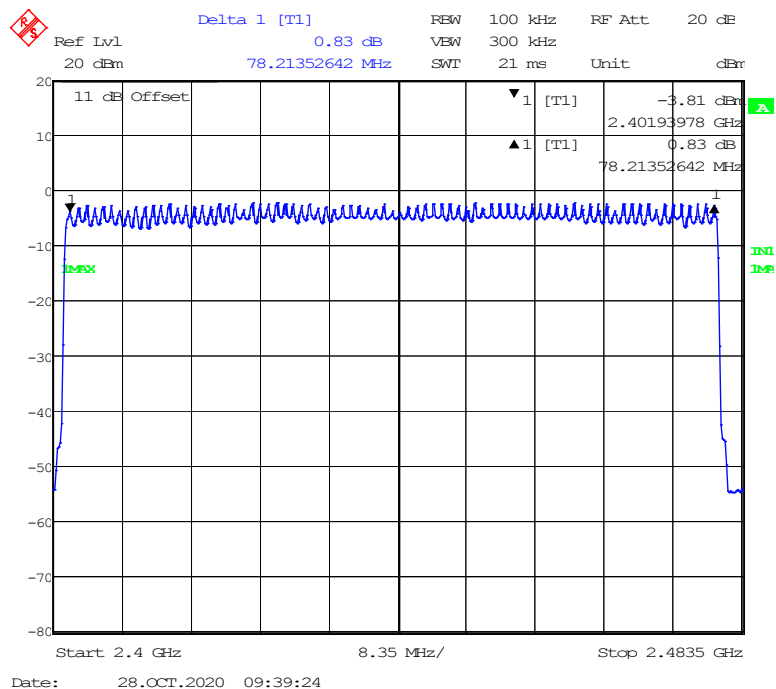
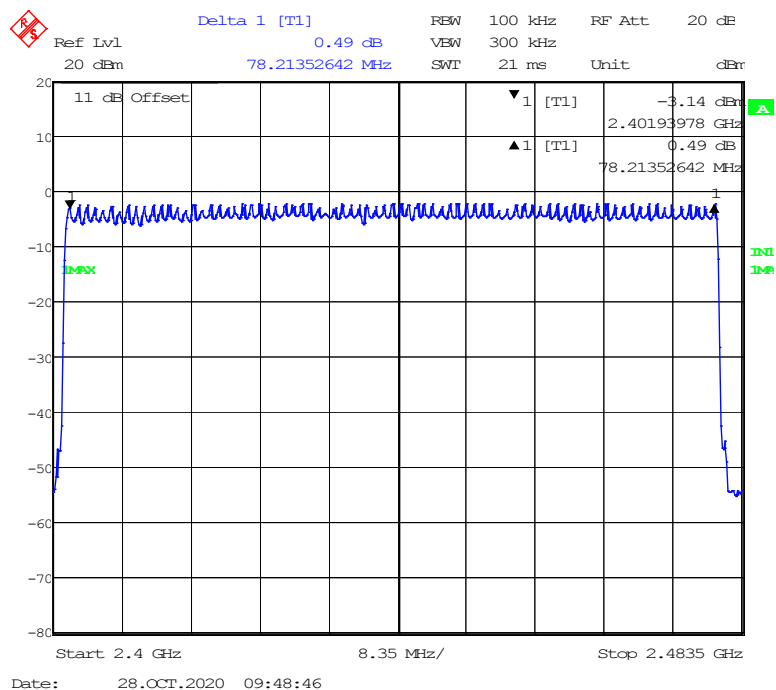
EUT operation mode: Hopping

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 ($\pi/4$ -DQPSK): Number of Hopping Channels**EDR (8DPSK): Number of Hopping Channels**

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

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

Test Procedure

The EUT 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 $\leq$ channel spacing and where possible RBW should be set $\geq 1 / T$, 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.

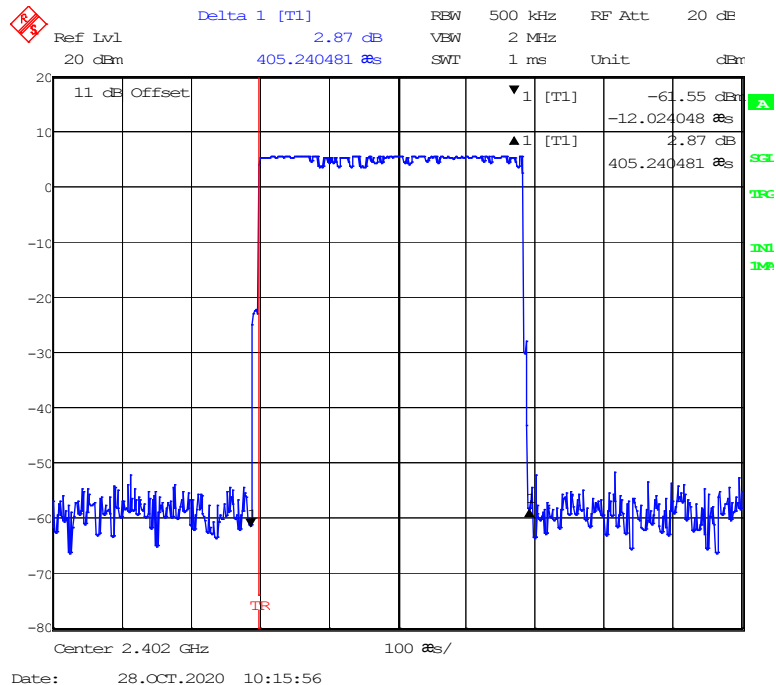
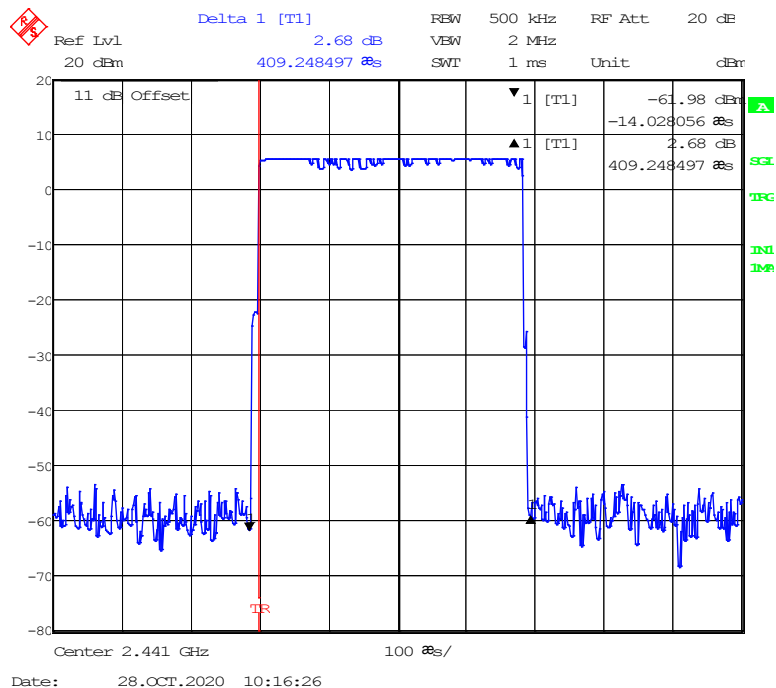
Test Data**Environmental Conditions**

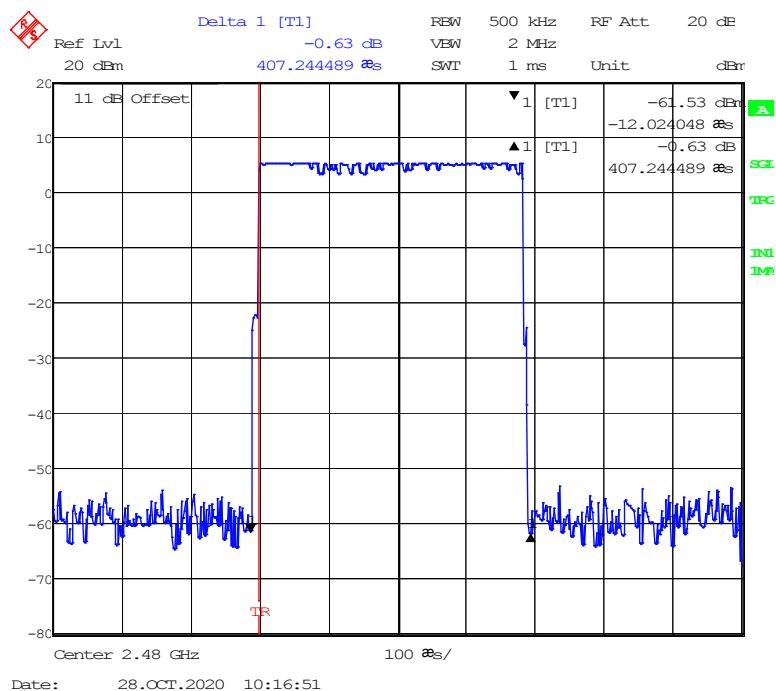
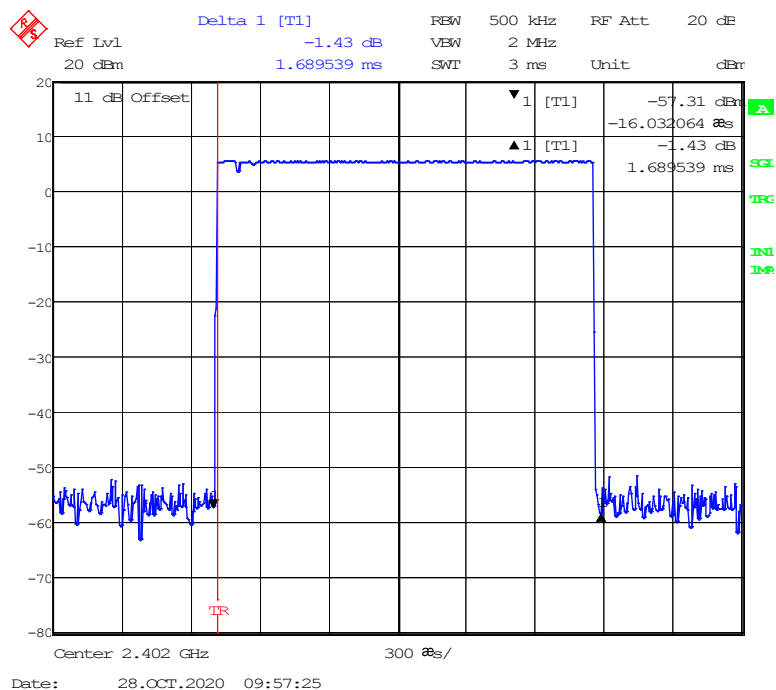
Temperature:	24.6 °C
Relative Humidity:	49 %
ATM Pressure:	101.1 kPa

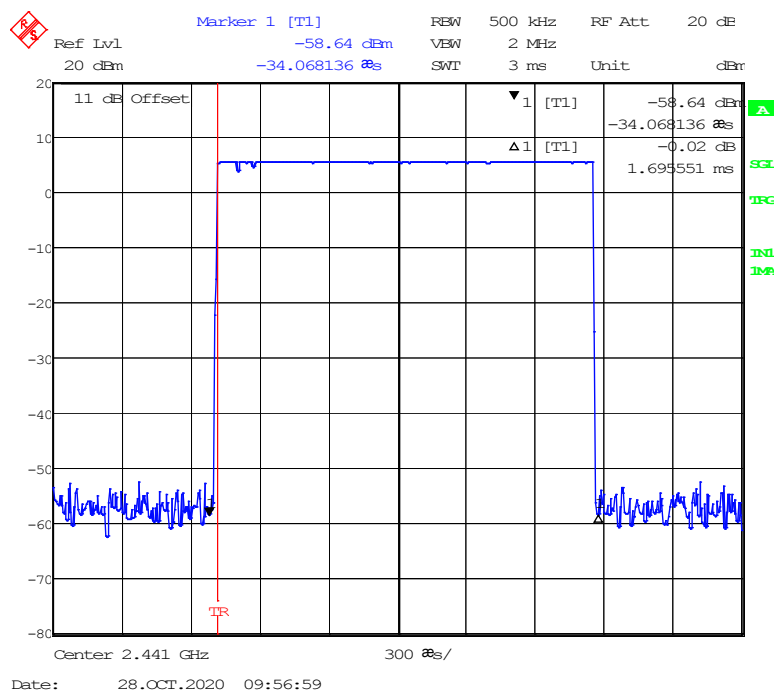
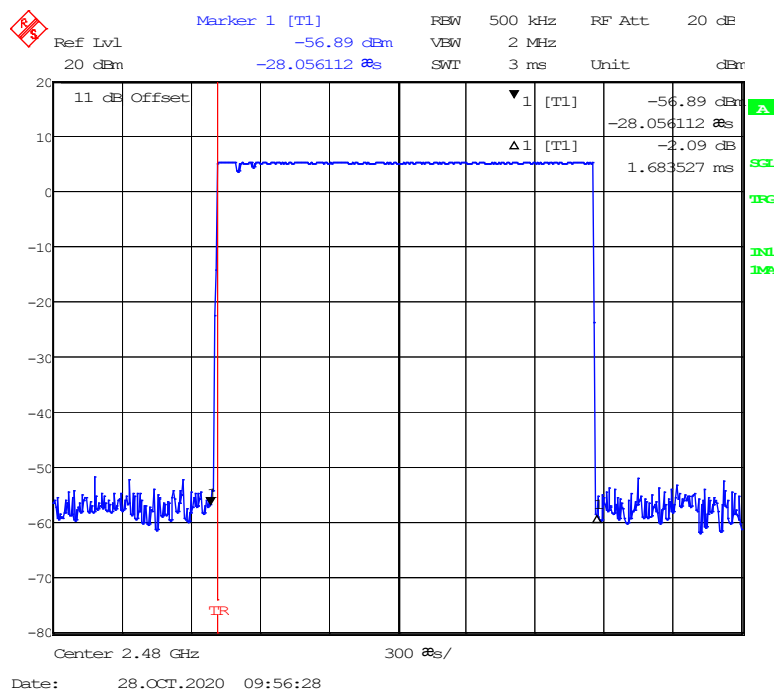
The testing was performed by Tyrone Wang on 2020-10-28.

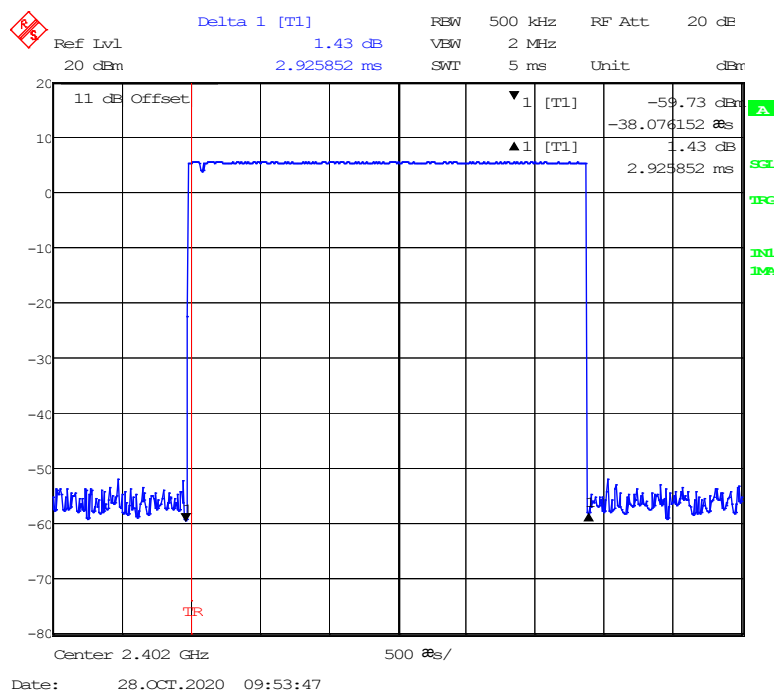
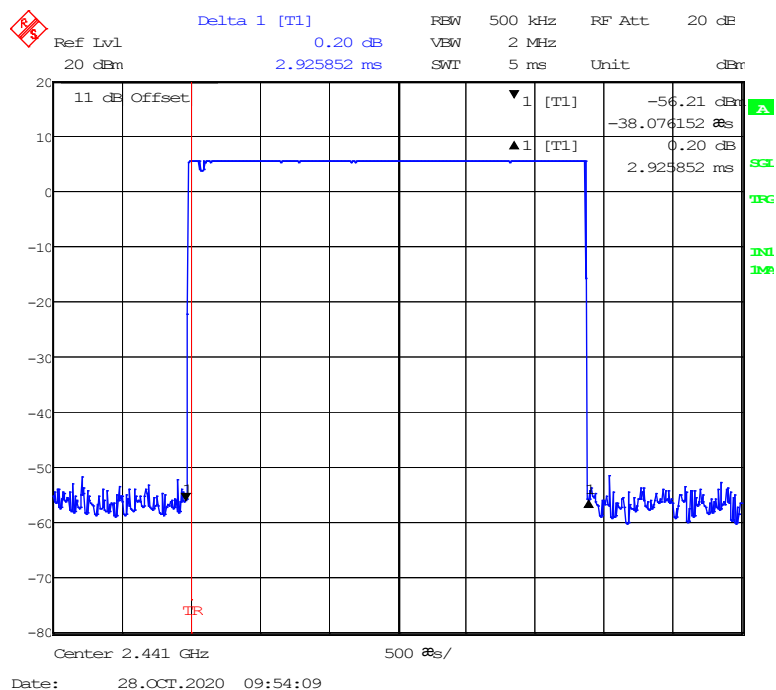
EUT operation mode: Hopping

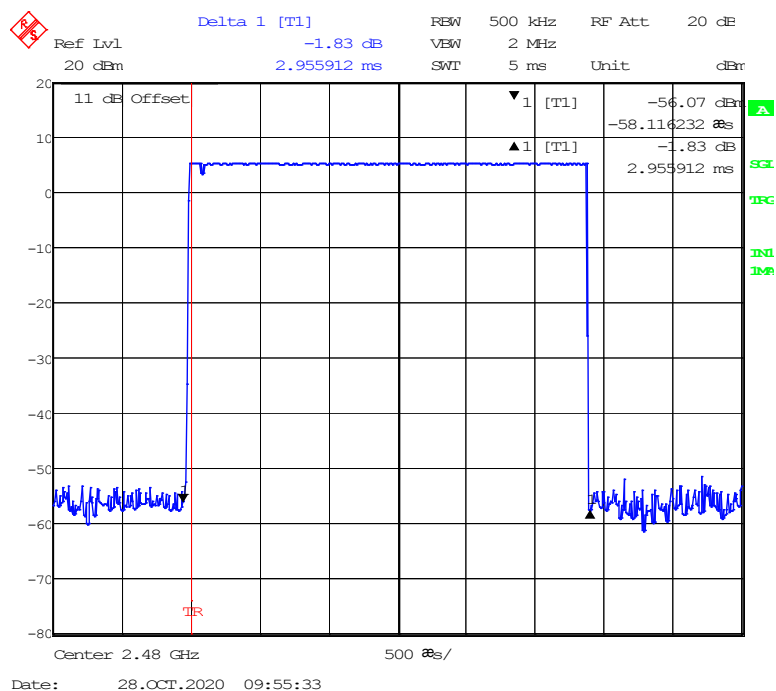
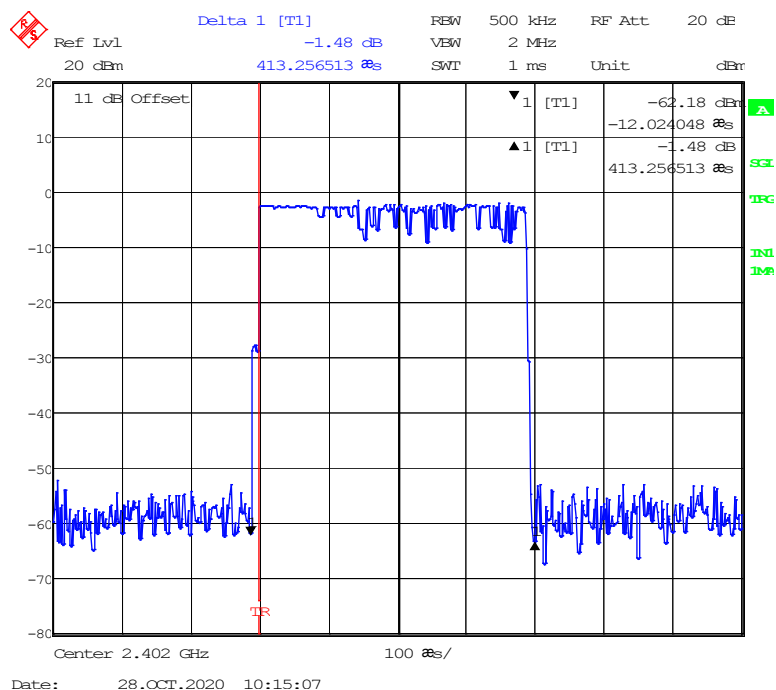
Mode		Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR (GFSK)	DH1	Low	0.405	0.130	0.4	Pass
		Middle	0.409	0.131	0.4	Pass
		High	0.407	0.130	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH3	Low	1.690	0.270	0.4	Pass
		Middle	1.696	0.271	0.4	Pass
		High	1.684	0.269	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH5	Low	2.926	0.312	0.4	Pass
		Middle	2.926	0.312	0.4	Pass
		High	2.956	0.315	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR ($\pi/4$ -DQPSK)	2DH1	Low	0.413	0.132	0.4	Pass
		Middle	0.411	0.132	0.4	Pass
		High	0.411	0.132	0.4	Pass
		Note: 2DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	2DH3	Low	1.672	0.268	0.4	Pass
		Middle	1.678	0.268	0.4	Pass
		High	1.678	0.268	0.4	Pass
		Note: 2DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	2DH5	Low	2.956	0.315	0.4	Pass
		Middle	2.946	0.314	0.4	Pass
		High	2.946	0.314	0.4	Pass
		Note: 2DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	3DH1	Low	0.417	0.133	0.4	Pass
		Middle	0.409	0.131	0.4	Pass
		High	0.411	0.132	0.4	Pass
		Note: 3 DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	3DH3	Low	1.678	0.268	0.4	Pass
		Middle	1.690	0.270	0.4	Pass
		High	1.678	0.268	0.4	Pass
		Note: 3DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	3DH5	Low	2.946	0.314	0.4	Pass
		Middle	2.976	0.317	0.4	Pass
		High	2.966	0.316	0.4	Pass
		Note: 3DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

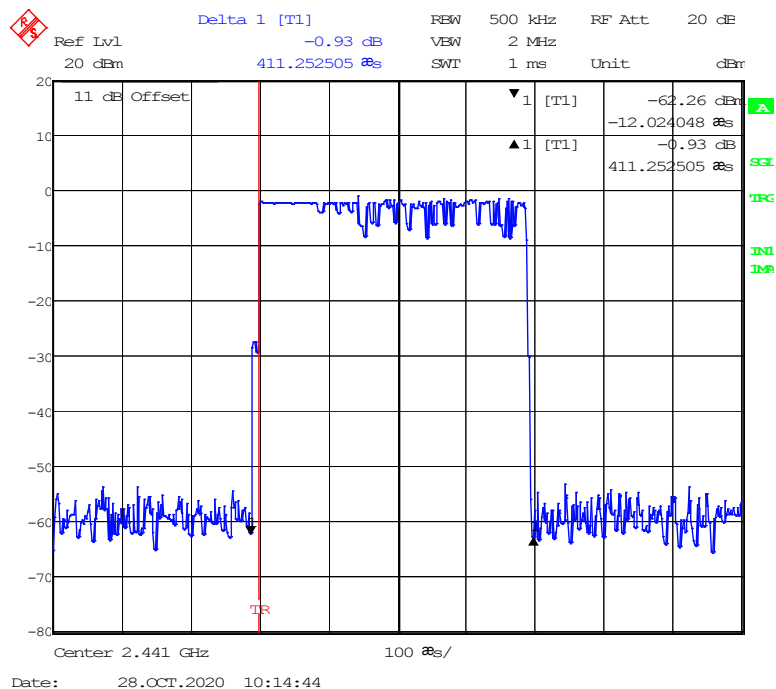
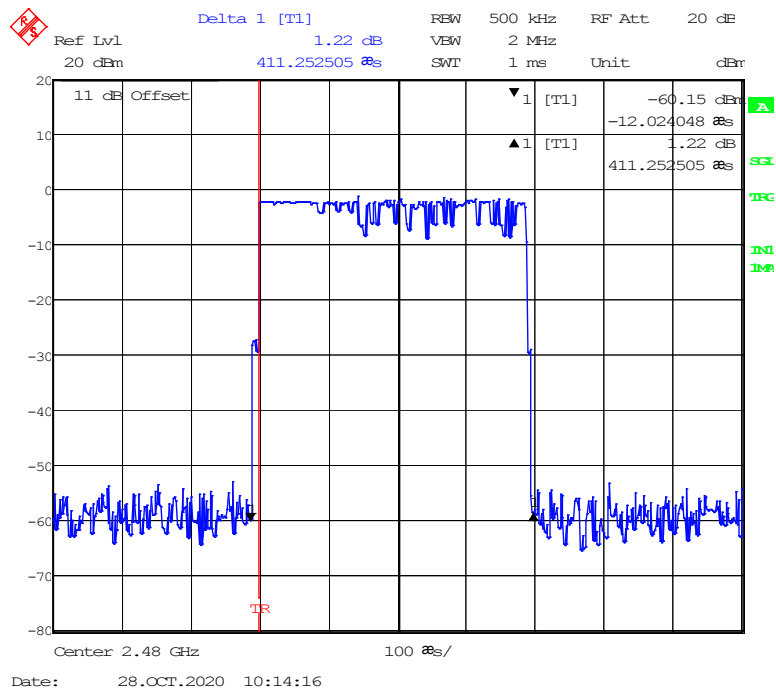
BDR (GFSK): Pulse time, Low Channel, DH1**BDR (GFSK): Pulse time, Middle Channel, DH1**

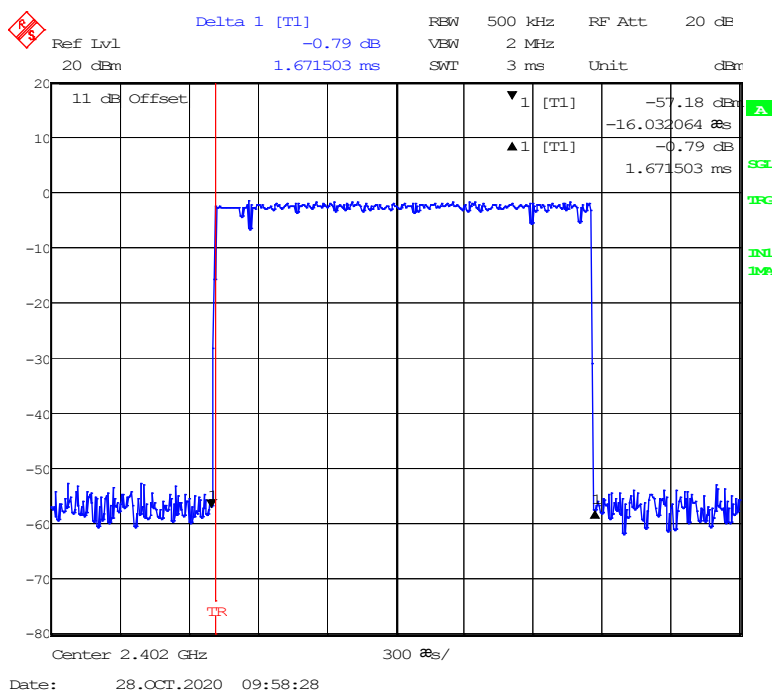
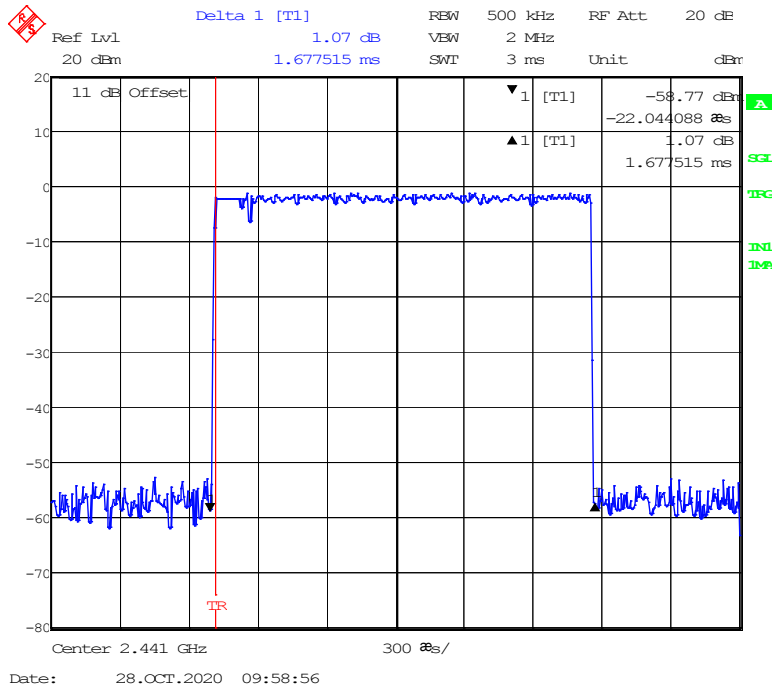
BDR (GFSK): Pulse time, High Channel, DH1**BDR (GFSK): Pulse time, Low Channel, DH3**

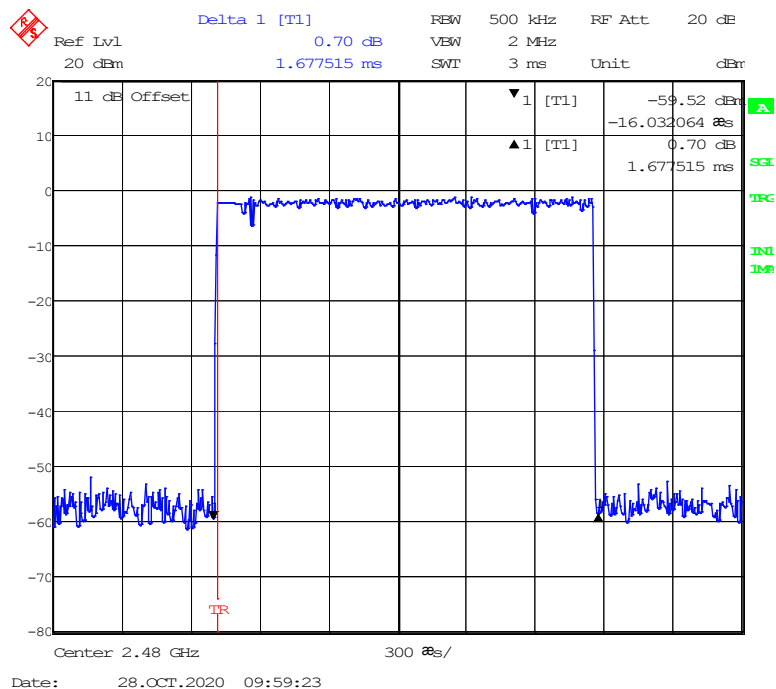
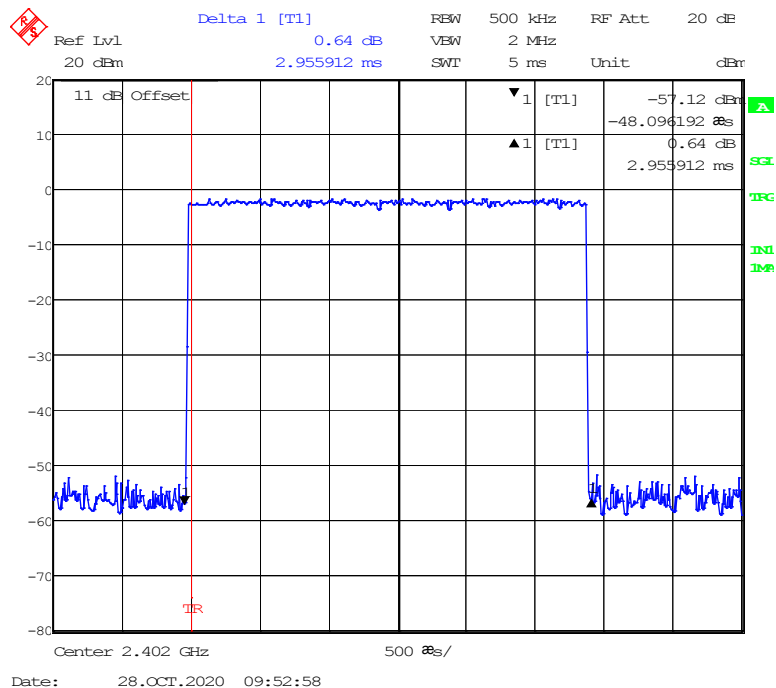
BDR (GFSK): Pulse time, Middle Channel, DH3**BDR (GFSK): Pulse time, High Channel, DH3**

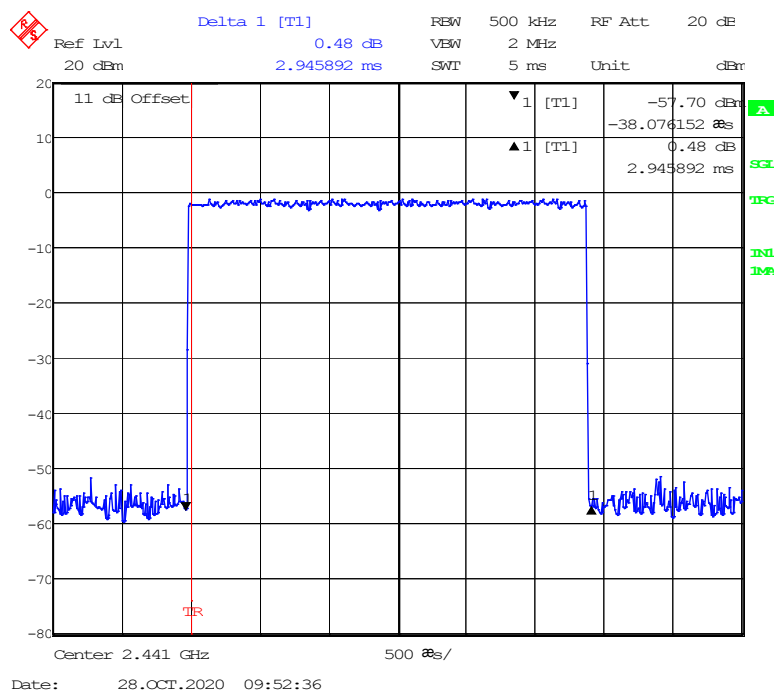
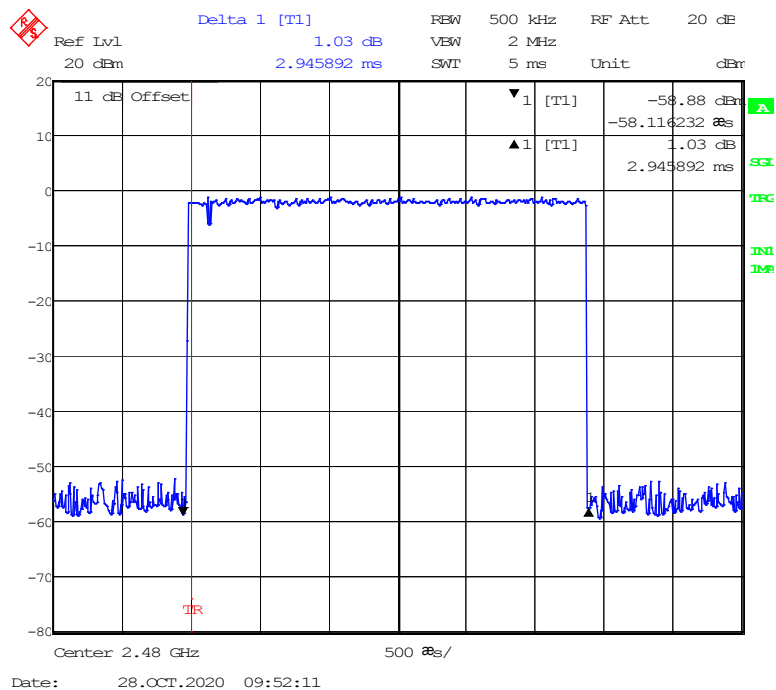
BDR (GFSK): Pulse time, Low Channel, DH5**BDR (GFSK): Pulse time, Middle Channel, DH5**

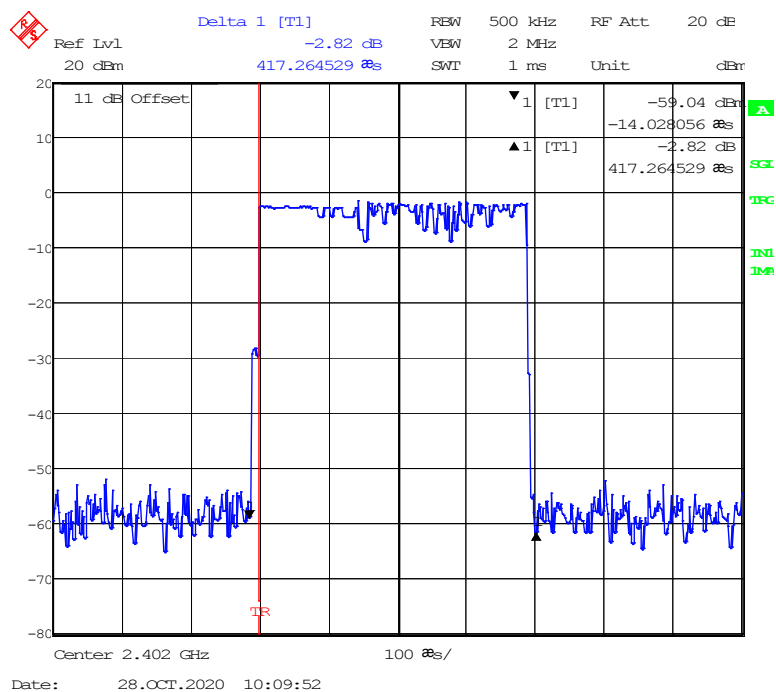
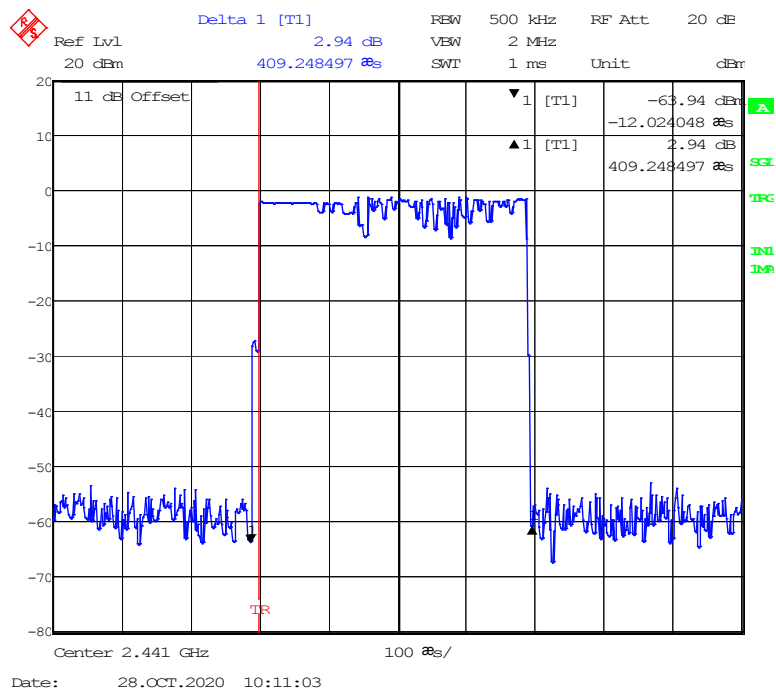
BDR (GFSK): Pulse time, High Channel, DH5**EDR ($\pi/4$ -DQPSK): Pulse time, Low Channel, 2DH1**

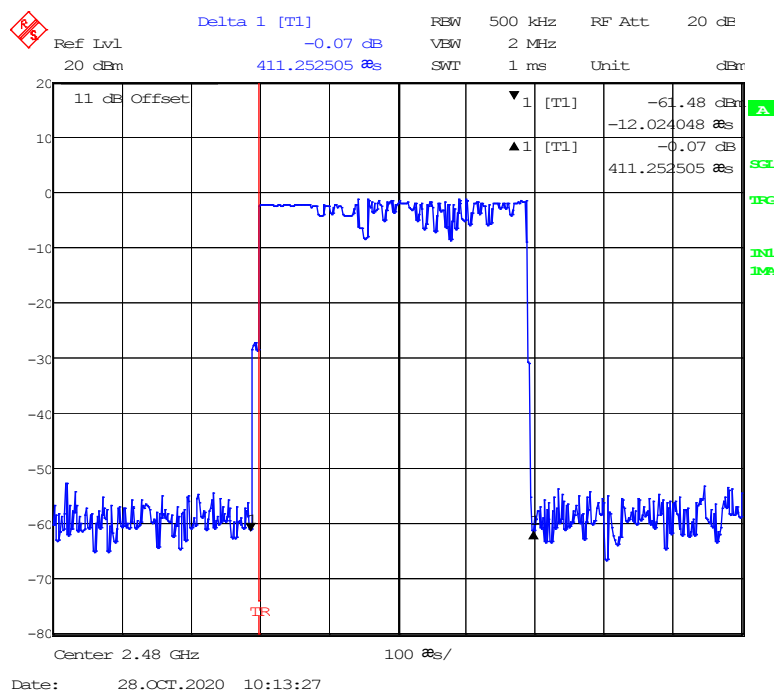
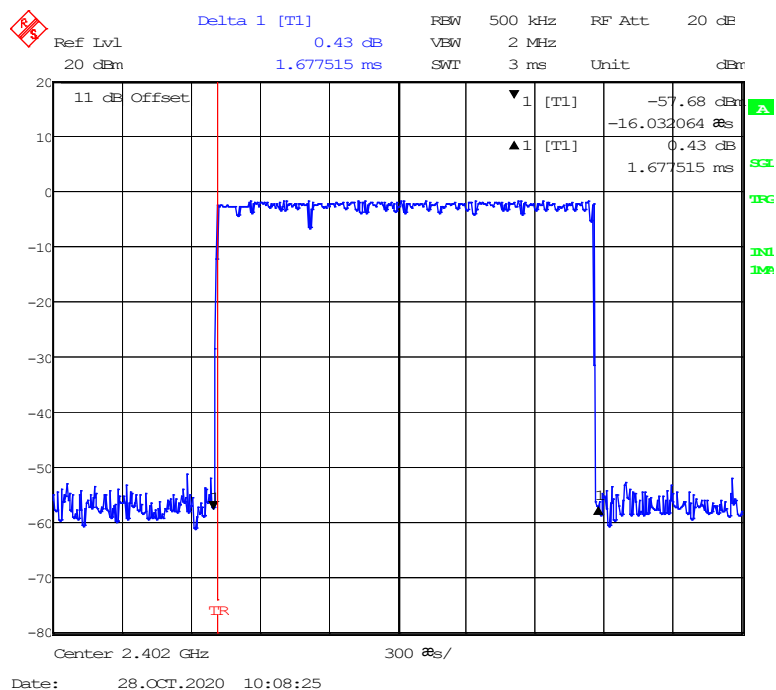
EDR ($\pi/4$ -DQPSK):Pulse time, Middle Channel, 2DH1**EDR ($\pi/4$ -DQPSK):Pulse time, High Channel, 2DH1**

EDR ($\pi/4$ -DQPSK):Pulse time, Low Channel, 2DH3EDR ($\pi/4$ -DQPSK):Pulse time, Middle Channel, 2DH3

EDR ($\pi/4$ -DQPSK):Pulse time, High Channel, 2DH3**EDR ($\pi/4$ -DQPSK):Pulse time, Low Channel, 2DH5**

EDR ($\pi/4$ -DQPSK):Pulse time, Middle Channel, 2DH5**EDR ($\pi/4$ -DQPSK):Pulse time, High Channel, 2DH5**

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

EDR (8DPSK): Pulse time, High Channel, 3DH1**EDR (8DPSK): Pulse time, Low Channel, 3DH3**

Ref Lvl 20 dBm

Delta 1 [T1] 0.46 dB

1.689539 ms

REW 500 kHz

VBW 2 MHz

SWT 3 ms

RF Att Unit dBm

11 dB Offset

▼ 1 [T1] -58.73 dBm

▲ 1 [T1] -28.056112 dBm

0.46 dB

1.689539 ms

Center 2.441 GHz

300 MHz

Date: 28.OCT.2020 10:07:56

Delta 1 [T1] 1.39 dB
 Ref Lvl 20 dBm
 1.677515 ms

RESW 500 KHz
 VSW 2 MHz
 SWT 3 ms

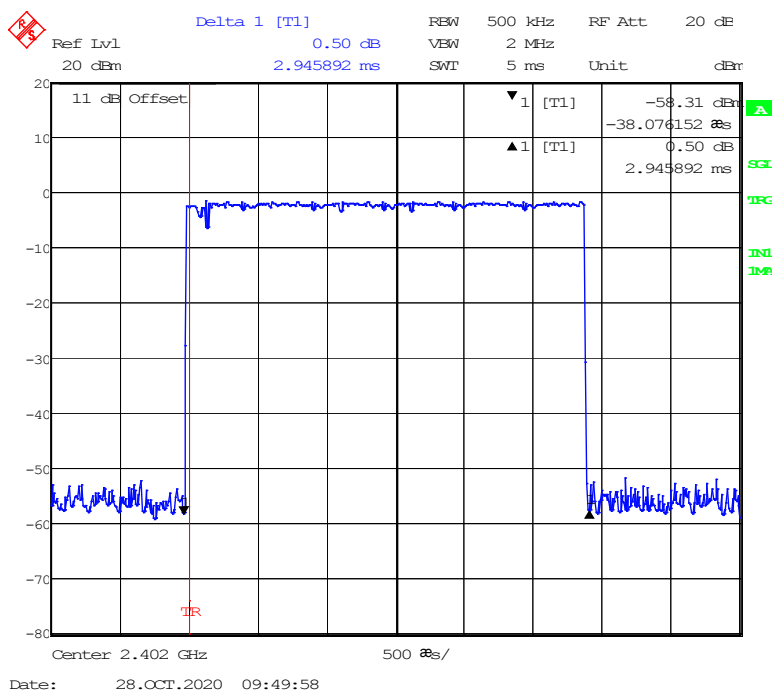
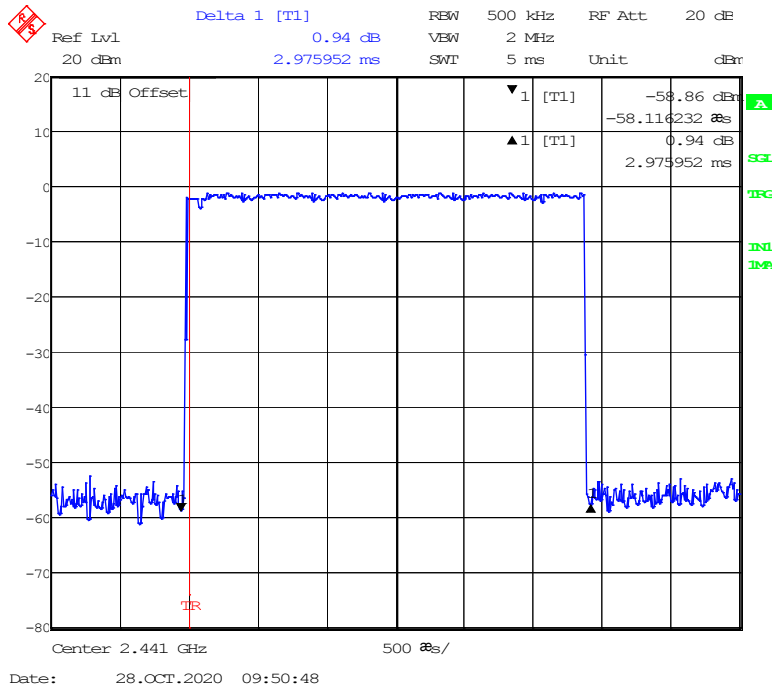
RF Att 20 dB
 Unit dBm

11 dB Offset

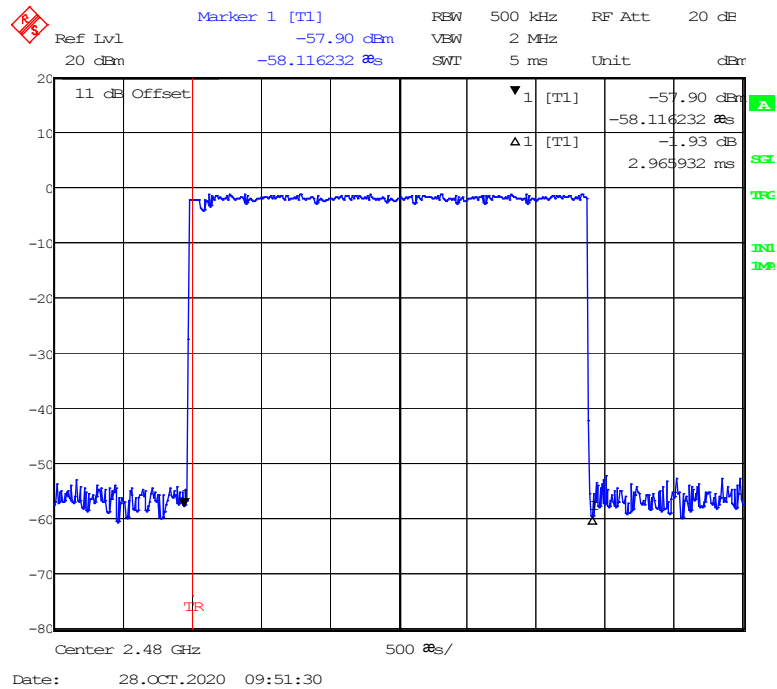
▼ 1 [T1] -58.62 dBm
 ▲ 1 [T1] -22.044088 dBm
 1.39 dB
 1.677515 ms

Center 2.48 GHz 300 kHz

Date: 28.OCT.2020 10:07:08

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

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



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

Applicable Standard

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

Test Procedure

- 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 $\geq$ 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:	24.7~24.9 °C
Relative Humidity:	50~52 %
ATM Pressure:	101.3~101.7 kPa

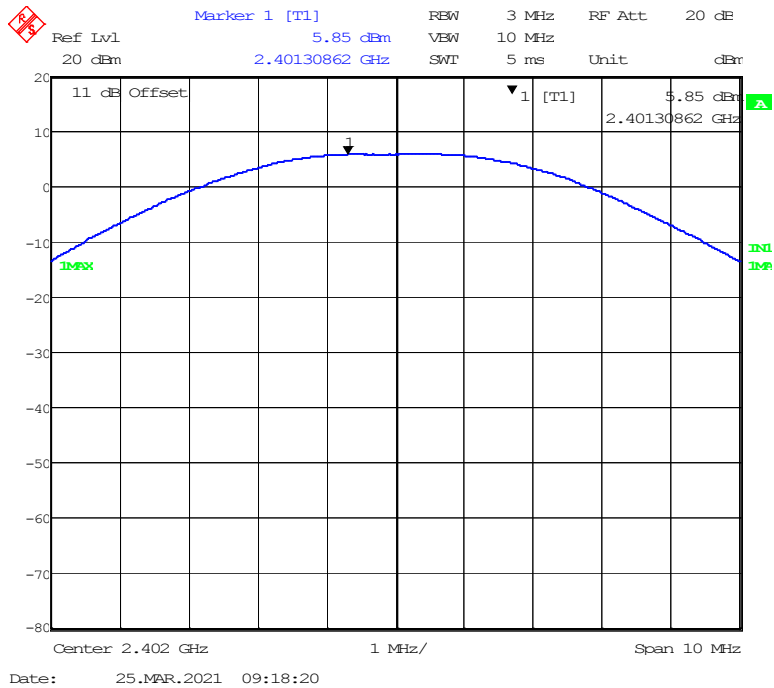
The testing was performed by Tyrone Wang from 2020-10-28 to 2021-03-25.

EUT operation mode: Transmitting

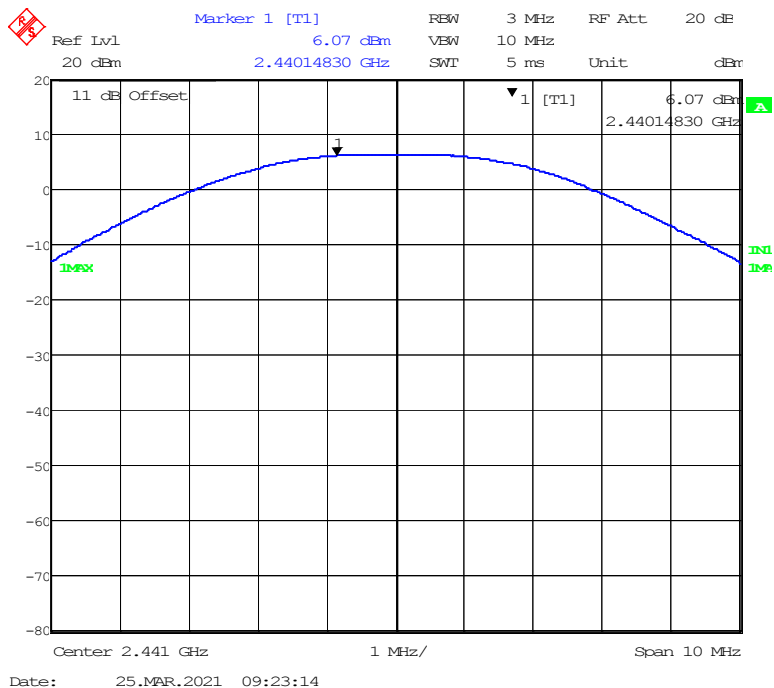
Test Result: Compliant.

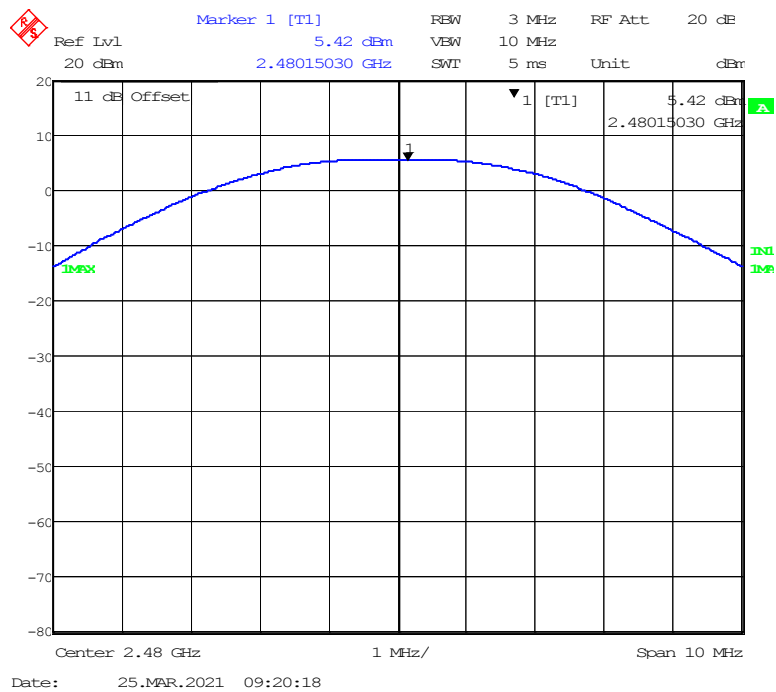
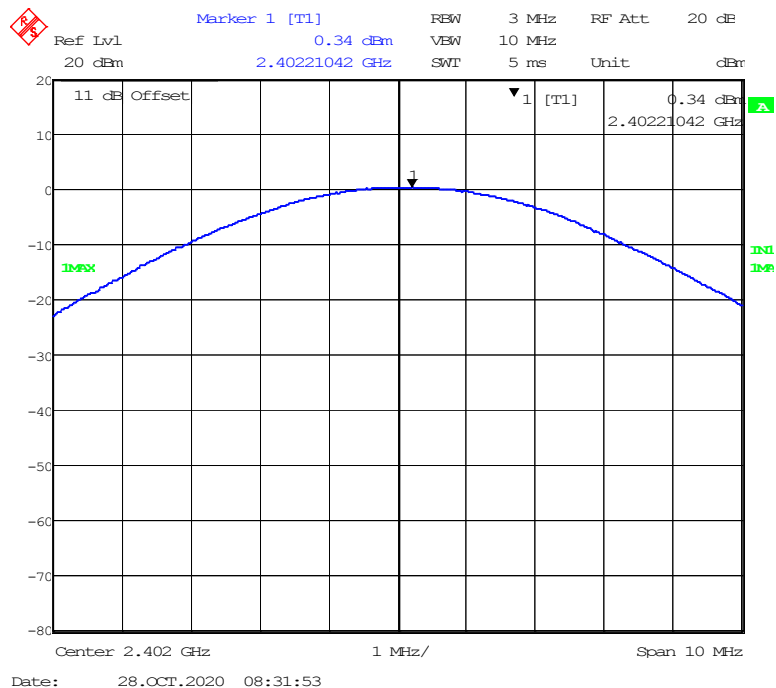
Mode	Frequency (MHz)	Output Power		Limit (mW)
		(dBm)	(mW)	
BDR (GFSK)	2402	5.85	3.85	125
	2441	6.07	4.05	125
	2480	5.42	3.48	125
EDR ($\pi/4$-DQPSK)	2402	0.34	1.08	125
	2441	0.61	1.15	125
	2480	0.47	1.11	125
EDR (8DPSK)	2402	0.88	1.22	125
	2441	1.15	1.30	125
	2480	0.88	1.22	125

BDR (GFSK): 2402MHz



BDR (GFSK): 2441MHz



BDR (GFSK): 2480MHz**EDR($\pi/4$ -DQPSK): 2402MHz**

Ref Lvl 20 dBm Marker 1 [T1] 0.61 dBm RESW 3 MHz VBW 10 MHz SWT 5 ms RF Att 20 dB Unit dBm

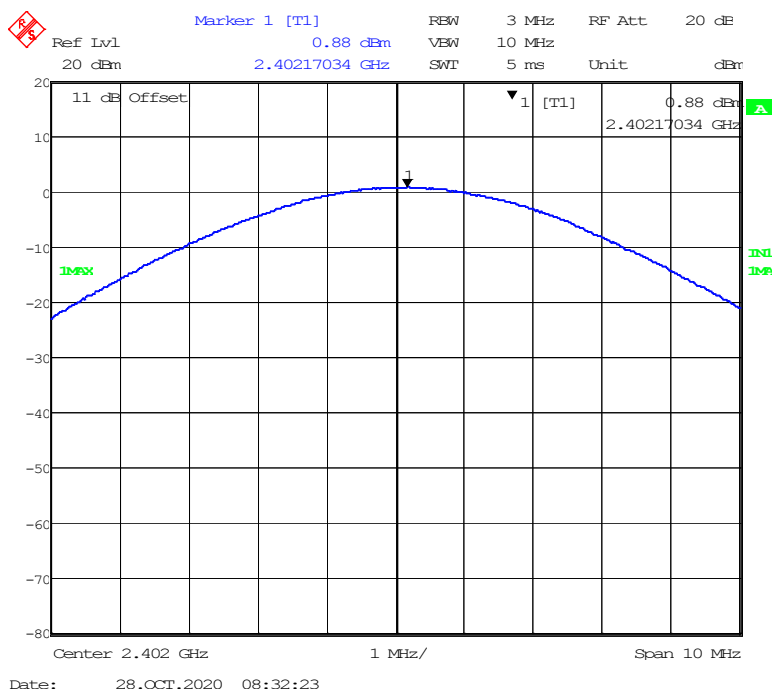
11 dB Offset 1 [T1] 0.61 dBm 2.44131062 GHz

Center 2.441 GHz 1 MHz/ Span 10 MHz

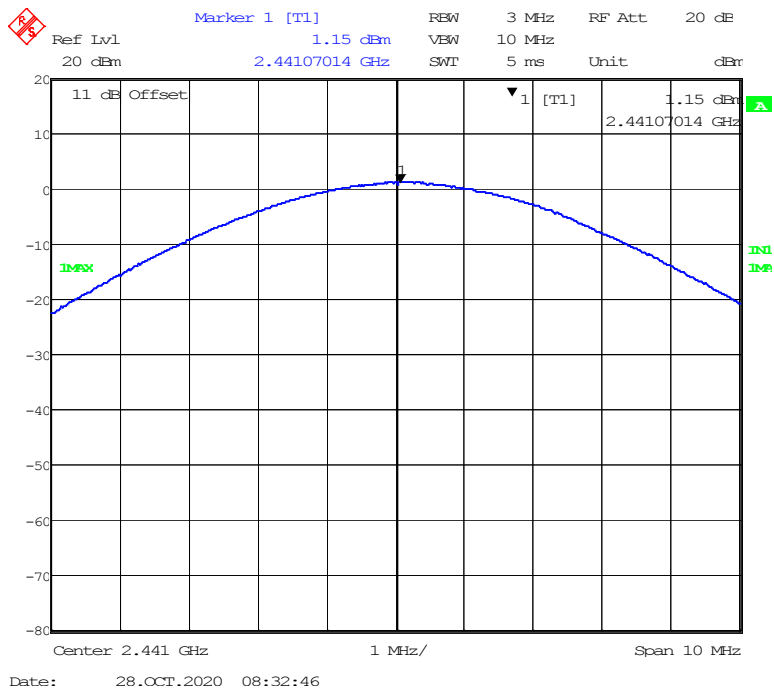
Date: 28.OCT.2020 08:31:26

Marker 1 [T1]
 Ref Lvl 20 dBm
 0.47 dBm
 2.48019038 GHz
 RBW 3 MHz
 VBW 10 MHz
 SWT 5 ms
 RF Att 20 dB
 Unit dBm
 11 dB Offset
 1 [T1]
 0.47 dBm
 2.48019038 GHz
 IMAX
 MIN
 Center 2.48 GHz
 1 MHz/
 Span 10 MHz
 Date: 28.OCT.2020 08:30:44

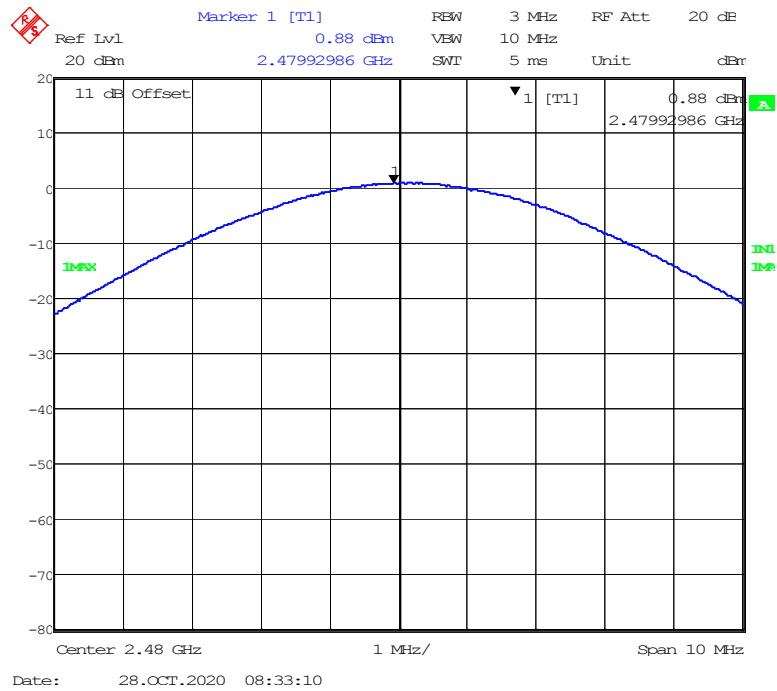
EDR(8DPSK): 2402MHz



EDR(8DPSK): 2441MHz



EDR(8DPSK): 2480MHz



FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

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

Test Procedure

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

Test Data

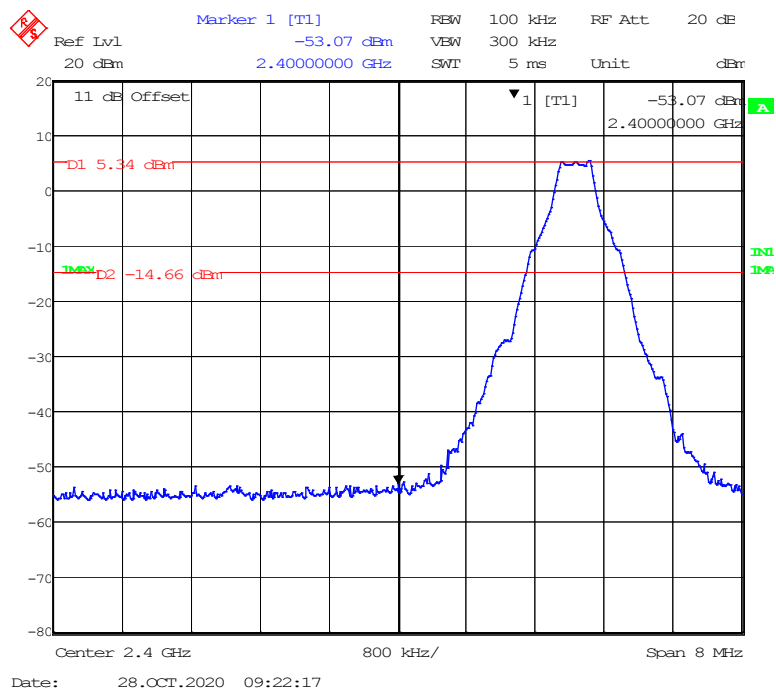
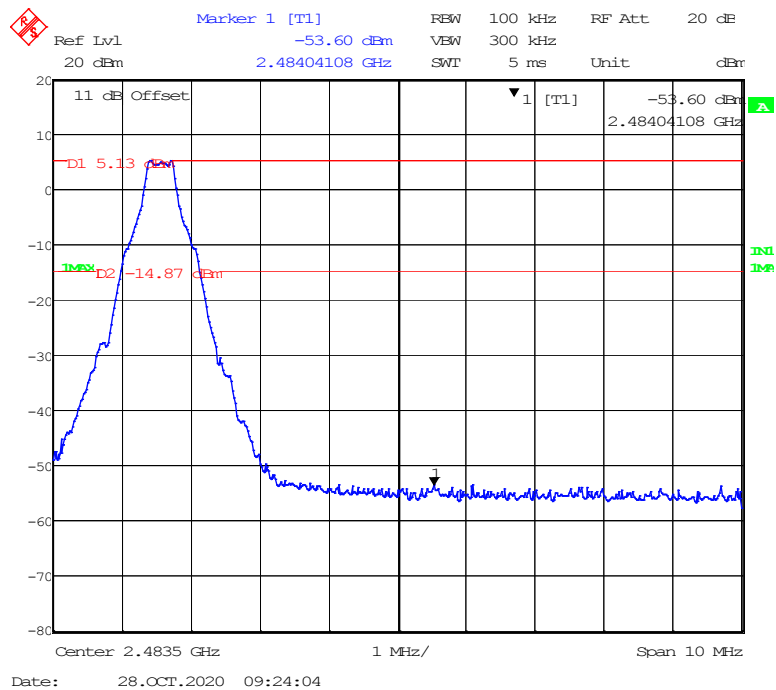
Environmental Conditions

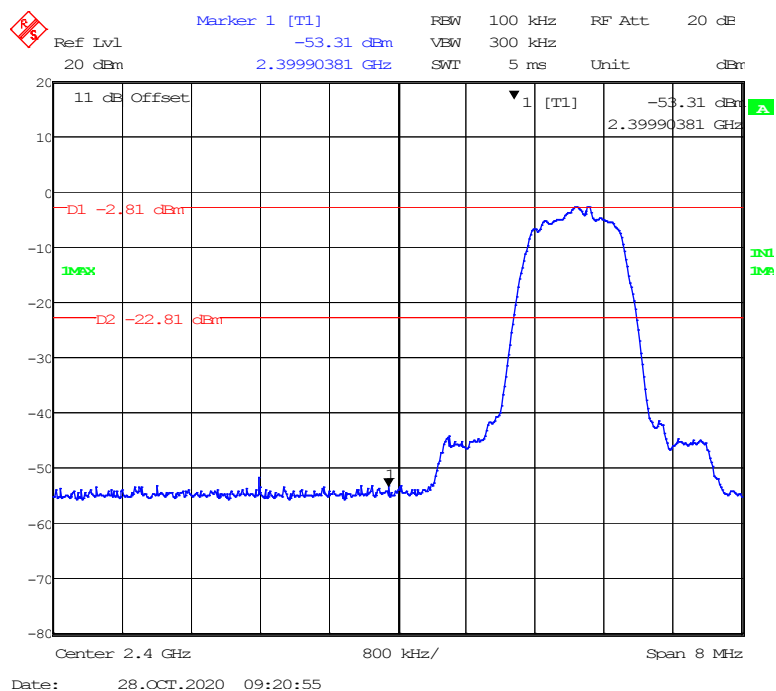
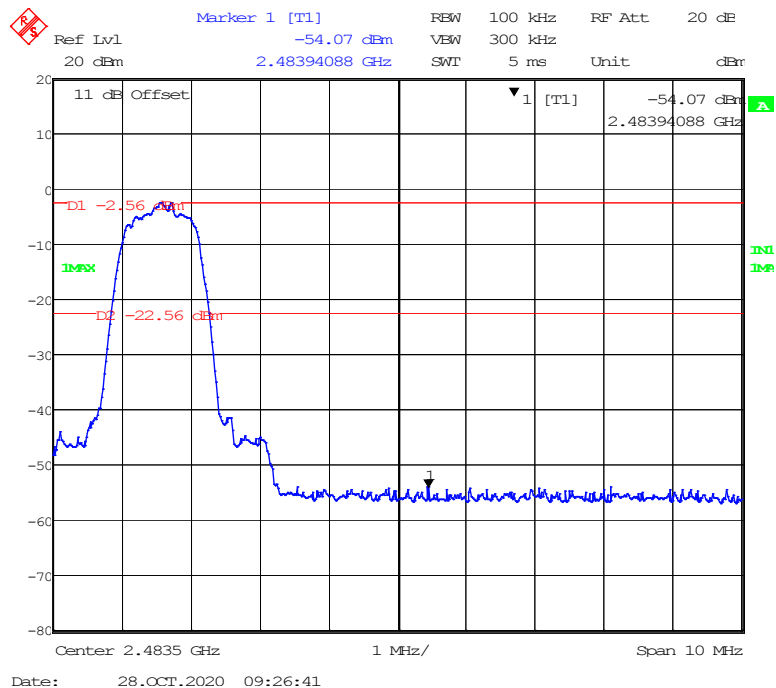
Temperature:	24.8°C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

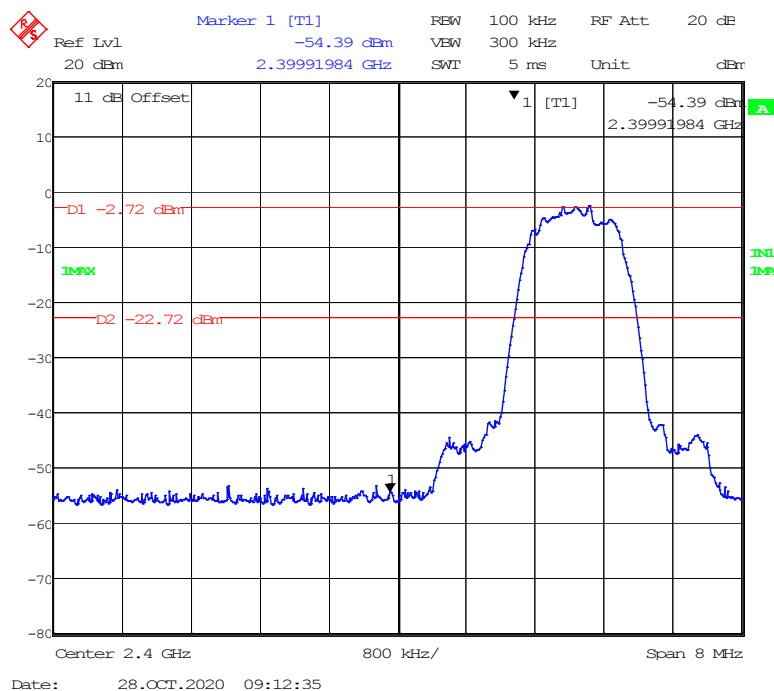
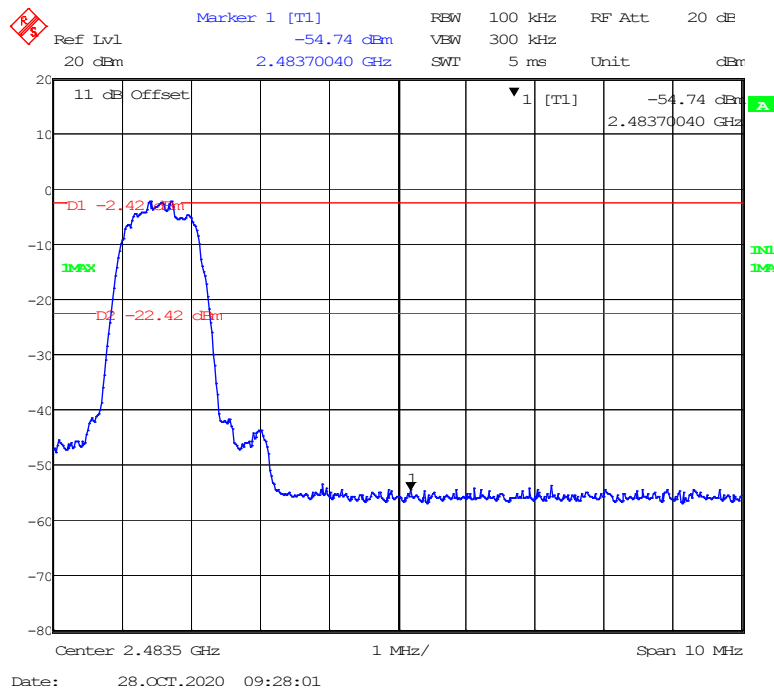
The testing was performed by Tyrone Wang on 2020-10-28.

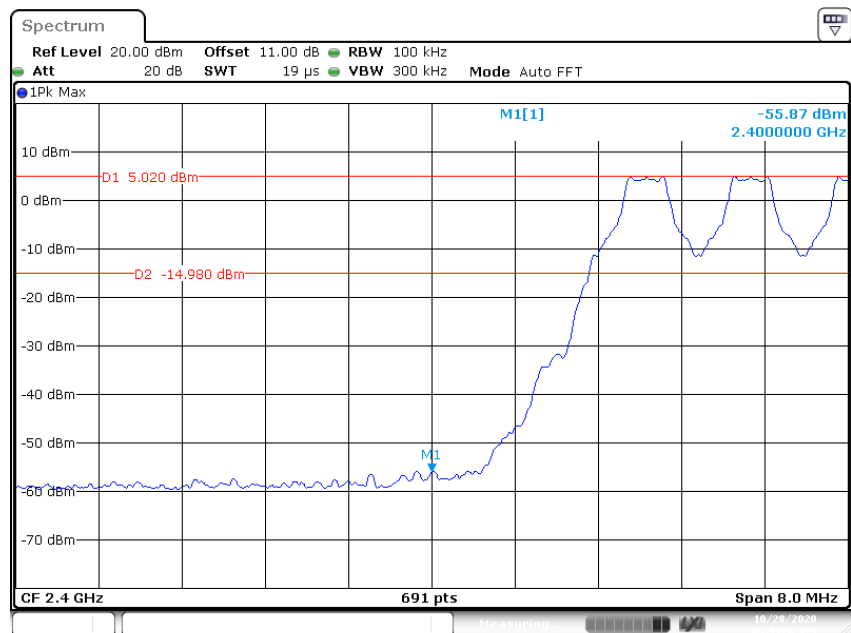
EUT operation mode: Transmitting & Hopping

Test Result: Compliant.

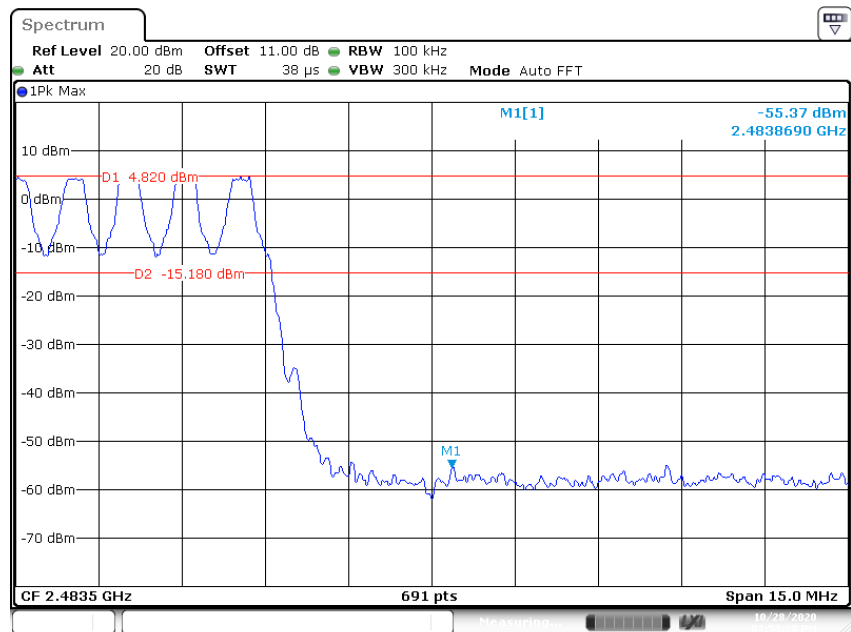
Band Edge**BDR (GFSK): Left Side - Transmitting****BDR (GFSK): Right Side - Transmitting**

EDR ($\pi/4$ -DQPSK): Left Side - Transmitting**EDR ($\pi/4$ -DQPSK): Right Side - Transmitting**

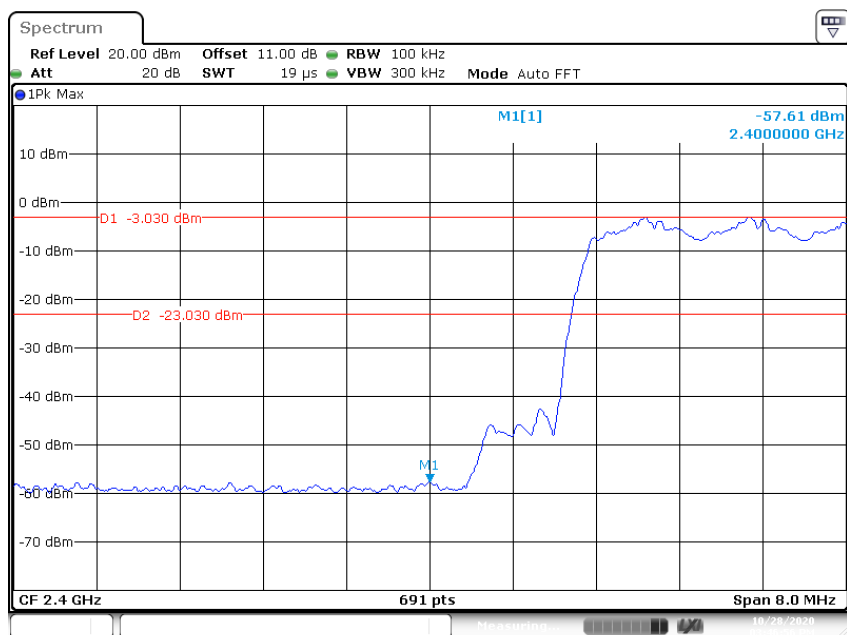
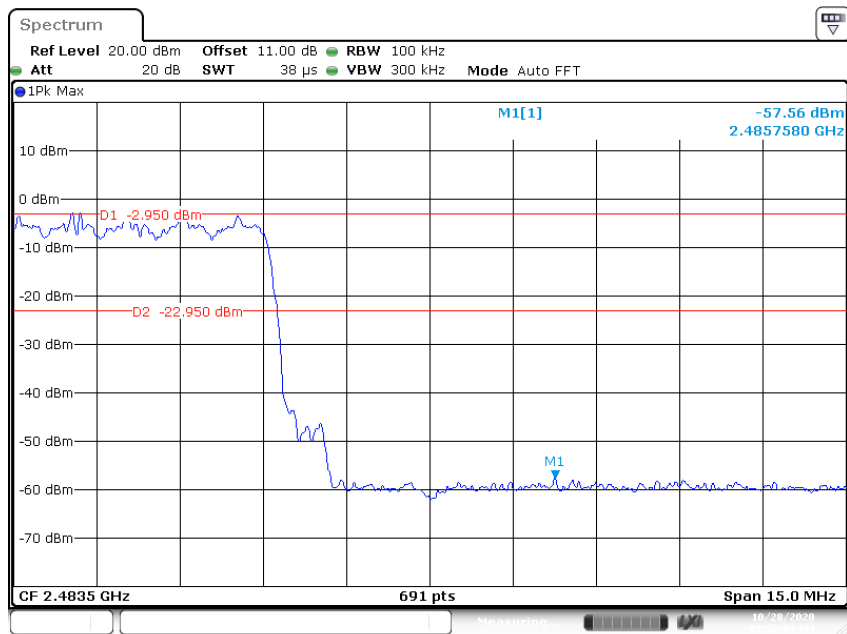
EDR (8DPSK): Left Side - Transmitting**EDR (8DPSK): Right Side - Transmitting**

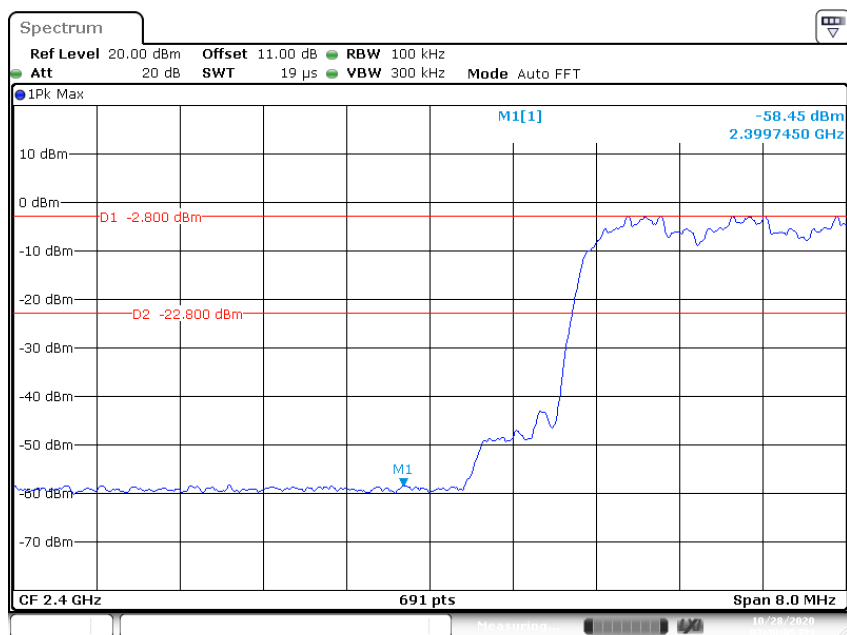
BDR (GFSK): Left Side - Hopping

Date: 28.OCT.2020 15:44:43

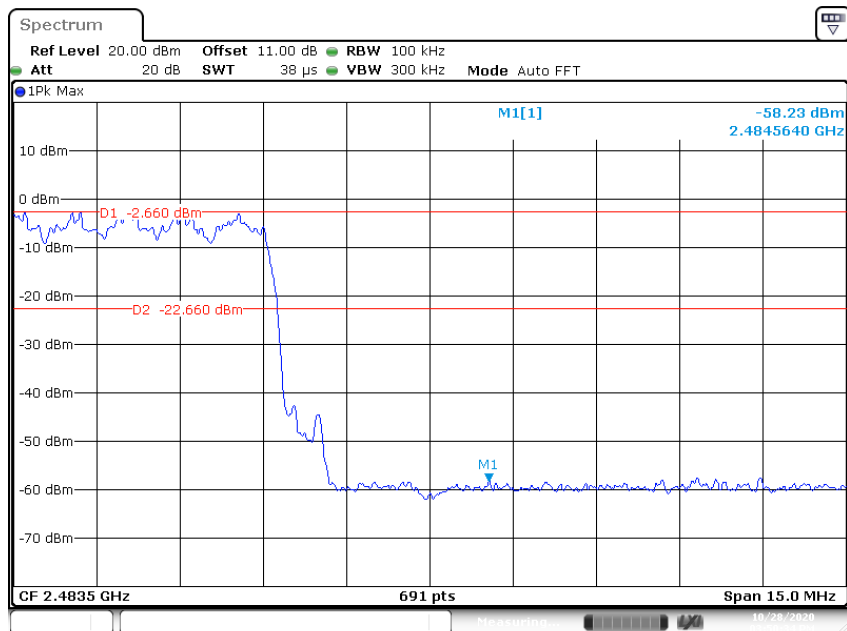
BDR (GFSK): Right Side- Hopping

Date: 28.OCT.2020 15:53:21

EDR ($\pi/4$ -DQPSK): Left Side- Hopping**EDR ($\pi/4$ -DQPSK): Right Side- Hopping**

EDR (8DPSK): Left Side- Hopping

Date: 28.OCT.2020 15:48:05

EDR (8DPSK): Right Side- Hopping

Date: 28.OCT.2020 15:50:35

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.
- 6: This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

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