FCC Part 15.247

TEST REPORT

For

AAEON Technology Inc.

5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist., New Taipei City 23145, Taiwan, R.O.C

FCC ID: OHBRTC1010

Report Type Original Report	**Product Type:** Rugged Tablet Computer
Report Producer :	**Himiko Chen**
Report Number :	**RLK1808003-00C**
Report Date :	**2018/11/07**
Reviewed By:	**Jerry Chang**
Prepared By:	**Bay Area Compliance Laboratories Corp.(Taiwan)** **70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,** **New Taipei City 22183, Taiwan, R.O.C.** **Tel: +886 (2)2647 6898** **Fax: +886 (2) 2647 6895** **www.bacl.com.tw**

***Note**: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Taiwan)*

Revision History

Revision	Report Number	Issue Date	Description	Author/Revised by
1.0	RLK1808003-00C	2018/11/07	Original Report	Himiko Chen

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	**AAEON Technology Inc.** 5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist., New Taipei City 23145, Taiwan, R.O.C
Manufacturer	**AAEON Technology Inc**. 5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist., New Taipei City 23145, Taiwan, R.O.C
Brand(Trade) Name	AAEON
Product (Equipment)	Rugged Tablet Computer
Model Name	RTC-1010
Series Model	xRTC-1010x(x - Where x may be any combination of alphanumeric characters or "-"or blank.)
Model Discrepancy	For marketing purpose
EUT Function	BT: BR+EDR
Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79 Channels
Output Power	BT BR(GFSK) Mode: -12.14 dBm (0.000061W) BT EDR(π/4-DQPSK) Mode: -11.86 dBm(0.000065W) BT EDR(8-DPSK) Mode: -11.48 dBm (0.000071W)
Received Date	Aug. 17, 2018.
Date of Test	Aug. 17, 2018 ~ Nov. 07, 2018
Related Submittal(s)/Grant(s)	FCC Part 15.225 DXX with FCC ID : OHBRTC1010 FCC Part 15.247 DTS with FCC ID : OHBRTC1010
Modulation Type	BT BR Mode: GFSK BT EDR-2M Mode: π/4-DQPSK BT EDR-3M Mode: 8-DPSK

**All measurement and test data in this report was gathered from production sample serial number: 1808003 (Assigned by BACL, Taiwan).*

**Model Discrepancy,*

The major electrical and mechanical constructions of series models are identical to the basic model, except different Market segmentation. The model, RTC-1010 is the testing sample, and the final test data are shown on this test report.

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☒ AC 120V/60Hz ☒ Adapter *Brand Name: FSP* *Model: FSP036-DHAN3* *I/P: 100-240Vac,1.2A* *O/P: 12Vdc, 3A* ☐ By Power Core
	☐ DC Type ☐ DC Power Supply ☒ Battery : *(1) Rechargeable Li-polymer Battery* *Brand Name: Getac* *Model: RTC600S* *7.4V ⎓ 1530mAh* *(2) Rechargeable Li-polymer Battery* *Brand Name: AAEON* *Model: RTC1200* *14.4V ⎓ 2270mAh* ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System

**The worst was Adapter mode*

1.3 Objective and Test Methodology

The Objective of this Test Report was to document the compliance of the AAEON Technology Inc. Displays (Model: RTC-1010, xRTC-1010x(x - Where x may be any combination of alphanumeric characters or "-"or blank.)) to the requirements of the following Standards:

-Part 2, Subpart J, Part 15, Subparts A and C, section 15.247 of the Federal Communication Commission's rules.

- ANSI C63.10-2013 of t American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power with Power Meter	± 0.55 dB
Occupied Channel Bandwidth	± 4.45 %
RF Conducted test with Spectrum	± 1.45 dB
AC Power Line Conducted Emission	± 4.64 dB
Radiated Below 1G	± 5.83 dB
Radiated Above 1G-18G	± 5.35 dB
Radiated Above 18G-40G	± 4.49 dB

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

☒ 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☒ 68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

2 System Test Configuration

2.1 Description of Test Configuration

The system was configured for testing in testing mode which was provided by manufacturer.

No special accessory, No modification was made to the EUT and No special equipment used during test.

For BR/EDR mode, there are totally 79 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	**39**	**2441**
1	2403	-	-
2	2404	-	-
3	2405	-	-
4	2406	76	2478
-	-	77	2479
38	2440	**78**	**2480**

For BT BR/EDR modes: Channel 0, 39 and 78 were tested.
Radiated below 1G were tested worst output power mode.

2.2 Description of Worst Test Configuration

Modulation Used for Conformance Test	
Configuration	**Data Rate**
BR (GFSK) mode	1 Mbps
EDR (π/4-DQPSK) mode	2 Mbps
EDR (8DPSK) mode	3 Mbps

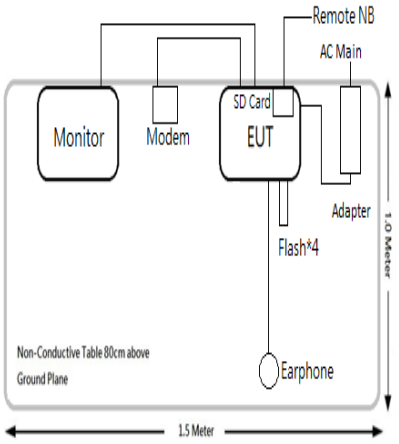
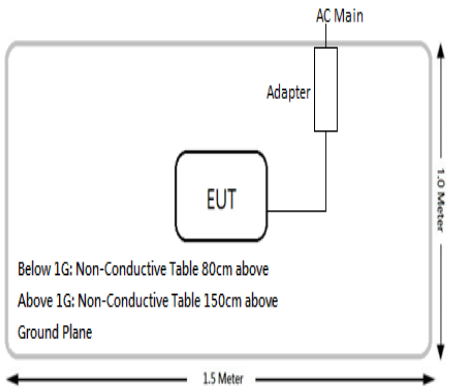
Worst Case of Power Setting			
EUT Exercise Software	wl		
Configuration	**Low CH**	**Mid CH**	**High CH**
BR (GFSK) mode	Default	Default	Default
EDR (π/4-DQPSK) mode	Default	Default	Default
EDR (8DPSK) mode	Default	Default	Default

2.3 Support Equipment List and Cable List

No.	Description	Manufacturer	Model Number	BSMI	FCC ID
A	monitor	DELL	P2415Q	N/A	NA
B	Adapter	FSP	FSP036-DHAN3	NA	NA
C	Modem	NA	TY5600	NA	NA
D	SD Card	Transcend	4GB	NA	NA
E	NB	DELL	Latitude E5470	R33002	DoC
F	Flash drive*4	Transcend	64G	NA	NA
G	Earphone	NA	NA	NA	NA

No.	Description	Shielded Type	Ferrite Core	Length (M)
1	HDIM to Micro Cable	Non-Shielded	No	1.5
2	DC Cable	Non-Shielded	No	1.8
3	COM Cable	Non-Shielded	No	1.8
4	LAN Cable	Non-Shielded	No	10
5	Earphone Cable	Non-Shielded	No	1.8

2.4 Block Diagram of Test Setup

Conduction	Radiation
	

3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.247(i), §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247 (a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance

4 FCC §15.247(i), § 2.1093 - RF Exposure

4.1 Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance v06
The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·
[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

4.2 RF Exposure Evaluation Result

For BT BR/EDR Mode Worst:

Frequency (MHz)	Tune-up Power		Evaluation Distance (mm)	SAR Exclusion Result	SAR Exclusion Limit
	(dBm)	(mW)			(1g SAR)
2402-2480	-11.00	0.079	5	0.253	3

Therefore, the stand-alone SAR evaluation for BT (BR/EDR) is not necessary.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

According to § 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 user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6 dBi

5.2 Antenna List and Details

Manufacturer	Model	Antenna Type	Antenna Gain	Result
SINBON	A9704203	PIFA Antenna	1.60 dBi	Compliance

The EUT has an internal antenna arrangement, fulfill the requirement of this section.

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standard

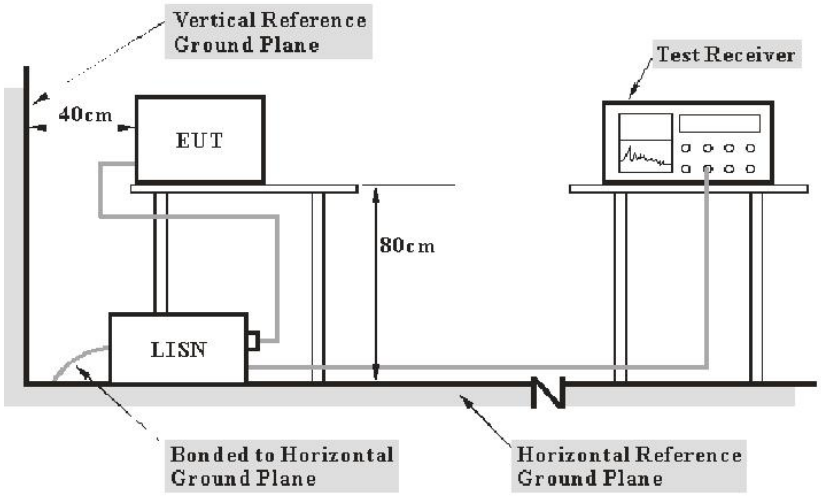
According to FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.
Note 2: A linear average detector is required

6.2 EUT Setup and Test Procedure



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

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

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	Receiver RBW
150 kHz - 30 MHz	9 kHz

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.

6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date	Calibration Due Date
LISN	Rohde & Schwarz	ENV216	101612	2018/02/22	2019/02/21
LISN	Rohde & Schwarz	ENV216	101248	2018/06/27	2019/06/26
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2017/11/06	2018/11/05
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2018/08/03	2019/08/02
RF Cable	EMEC	EM-CB5D	001	2018/07/02	2019/07/01
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

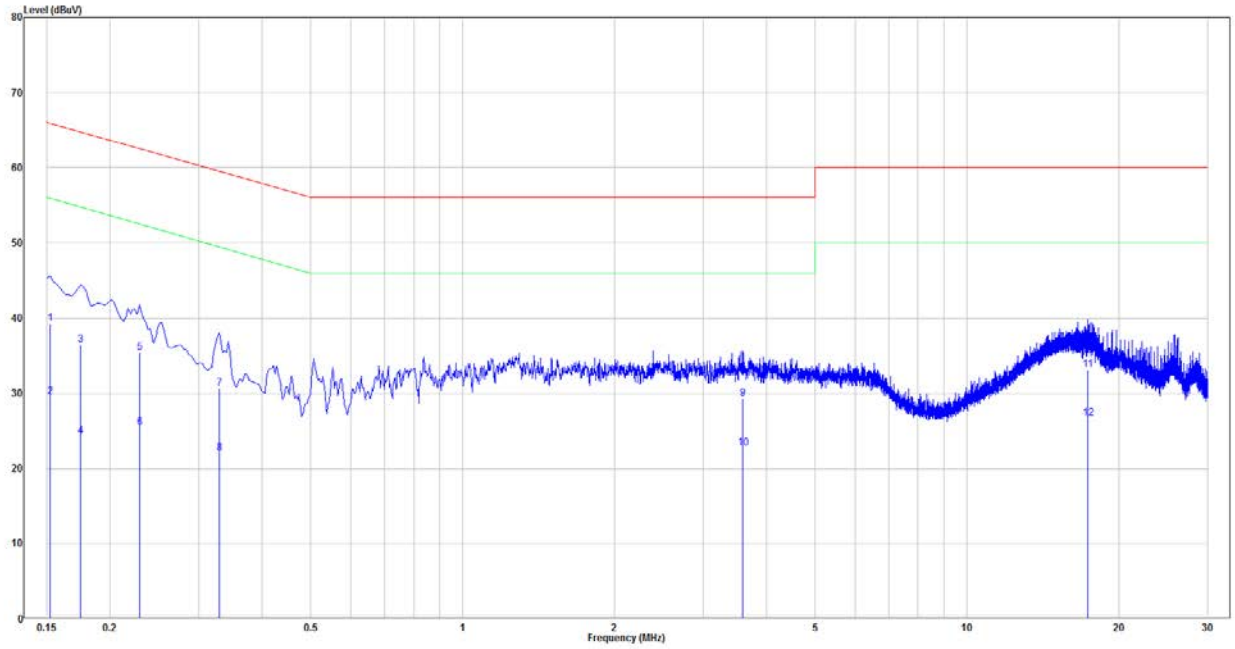
6.4 Test Environmental Conditions

Temperature:	22 ℃
Relative Humidity:	42 %
ATM Pressure:	1010 hPa

The testing was performed by Ray Huang on 2018-08-23.

6.5 AC Line Conducted Emission Test Plot and Data

Mode: AC 120V/60 Hz, BT mode, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.152	19.81	19.45	39.26	65.88	-26.62	QP
2	0.152	10.06	19.45	29.51	55.88	-26.37	Average
3	0.175	17.00	19.46	36.46	64.73	-28.27	QP
4	0.175	4.87	19.46	24.33	54.73	-30.40	Average
5	0.229	15.98	19.46	35.44	62.50	-27.06	QP
6	0.229	5.99	19.46	25.45	52.50	-27.05	Average
7	0.330	11.18	19.47	30.65	59.45	-28.80	QP
8	0.330	2.52	19.47	21.99	49.45	-27.46	Average
9	3.599	9.66	19.58	29.24	56.00	-26.76	QP
10	3.599	3.14	19.58	22.72	46.00	-23.28	Average
11	17.353	13.38	19.77	33.16	60.00	-26.84	QP
12	17.353	6.94	19.77	26.72	50.00	-23.28	Average

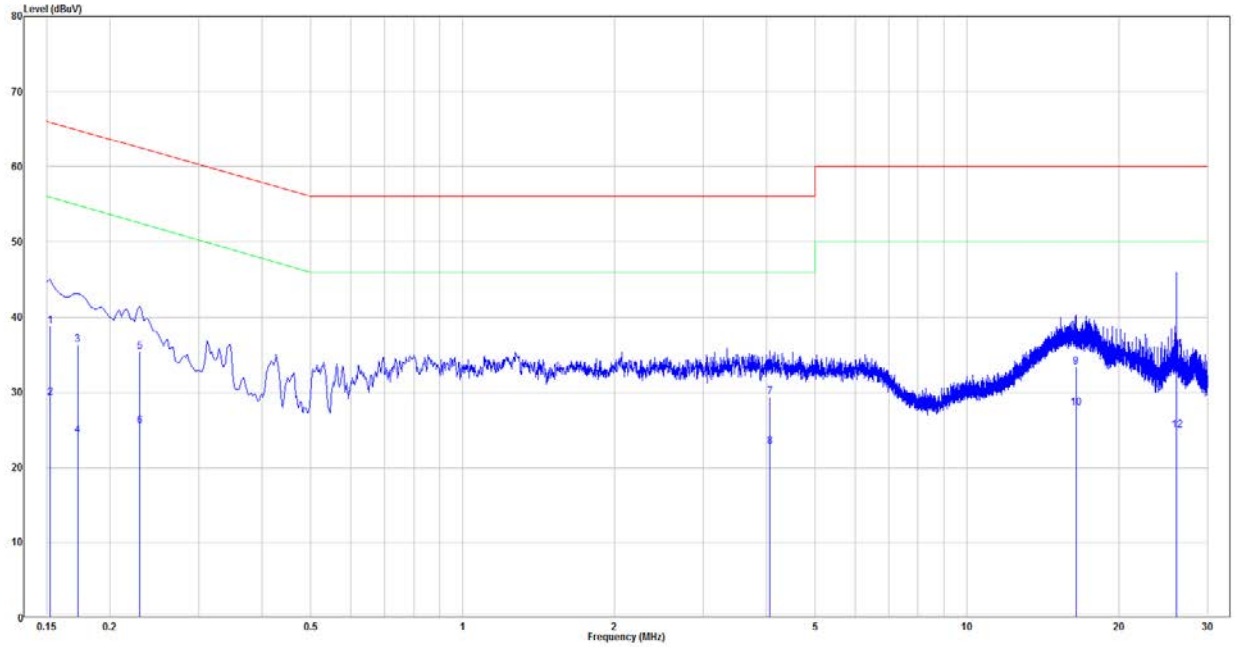
Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Mode: AC 120V/60 Hz, Wi-Fi mode, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.152	19.33	19.44	38.77	65.88	-27.11	QP
2	0.152	9.79	19.44	29.23	55.88	-26.65	Average
3	0.172	16.87	19.45	36.32	64.84	-28.52	QP
4	0.172	4.83	19.45	24.28	54.84	-30.56	Average
5	0.229	15.92	19.46	35.38	62.50	-27.12	QP
6	0.229	6.05	19.46	25.51	52.50	-26.99	Average
7	4.065	9.81	19.58	29.38	56.00	-26.62	QP
8	4.065	3.23	19.58	22.81	46.00	-23.19	Average
9	16.446	13.63	19.79	33.42	60.00	-26.58	QP
10	16.446	8.08	19.79	27.87	50.00	-22.13	Average
11	26.002	15.65	19.95	35.60	60.00	-24.40	QP
12	26.002	5.04	19.95	24.99	50.00	-25.01	Average

Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

7 FCC §15.209, §15.205, §15.247(d) – Spurious Emissions

7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

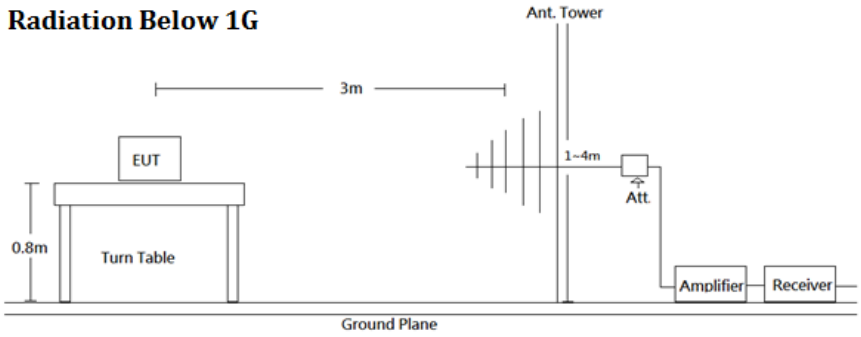
Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

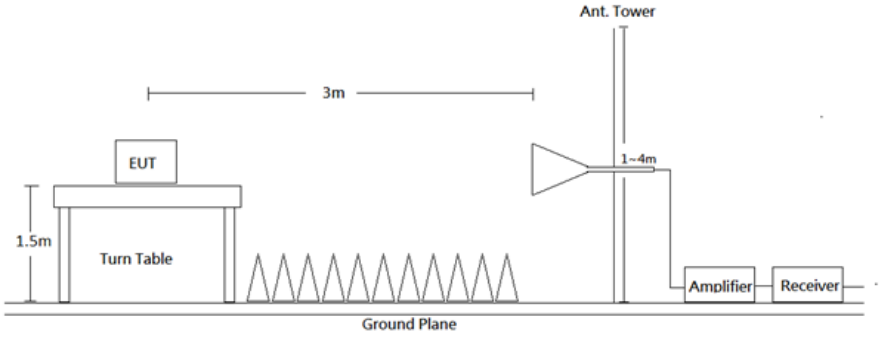
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

7.2 EUT Setup and Test Procedure

Radiation Below 1G



Radiation Above 1G



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Measurement method
30-1000 MHz	120 kHz	/	QP
Above 1 GHz	1 MHz	3 MHz	PK
	1 MHz	10 Hz	Ave

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

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

7.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
966A Room					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2017/12/20	2018/12/19
Horn Antenna	EMCO	3115	9311-4158	2018/04/20	2019/04/19
Horn Antenna	ETS-Lindgren	3116	62638	2017/09/13	2018/09/12
Preamplifier	Sonoma	310N	130602	2018/07/04	2019/07/03
Preamplifier	EM Electronics Corp.	EM01G18G	060657	2017/12/14	2018/12/13
Microware Preamplifier	EM Electronics Corporation	EM18G40G	060656	2018/01/15	2019/01/14
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2017/11/06	2018/11/05
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Micro flex Cable	UTIFLEX	FSCM 64639 / (2M)	93D0127	2018/07/31	2019/07/30
Micro flex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2017/11/10	2018/11/09
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/05	2019/03/04
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/17	2019/01/16
20 dB Attenuator	NCL	BW-S20W5+	ATT-20-01	Each Use	/
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	060772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2018/05/04	2019/05/03
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

7.4 Test Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	55.4 %
ATM Pressure:	1015 hPa

The testing was performed by Leo Cheng from 2018-09-06 to 2018-11-07.

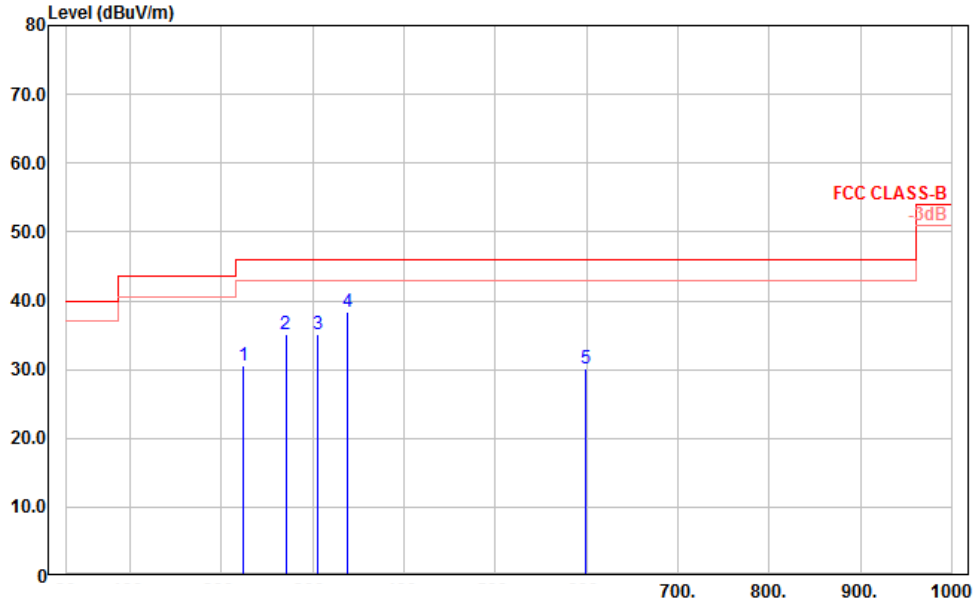
7.5 Radiated Emission Test Plot and Data

BT Mode: Transmitting Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis)*

Below 1G (30 MHz-1 GHz) test the output power worst mode:

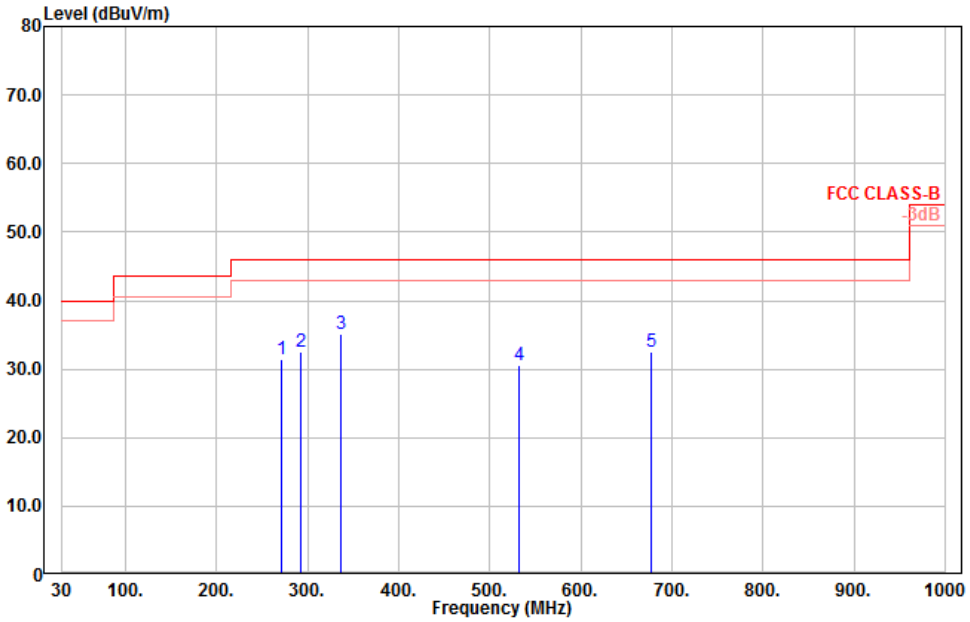
Worst case is EDR-3Mbps (8DPSK) Low Channel

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	224.900	30.49	46.00	-15.51	50.79	-20.30	Peak
2	270.560	35.06	46.00	-10.94	53.38	-18.32	Peak
3	305.480	35.05	46.00	-10.95	53.15	-18.10	Peak
4	338.460	38.36	46.00	-7.64	55.79	-17.43	Peak
5	599.390	30.15	46.00	-15.85	42.95	-12.80	Peak

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	270.650	31.39	46.00	-14.61	49.71	-18.32	Peak
2	292.350	32.56	46.00	-13.44	50.79	-18.23	Peak
3	337.350	35.06	46.00	-10.94	52.49	-17.43	Peak
4	532.640	30.58	46.00	-15.42	44.33	-13.75	Peak
5	677.210	32.43	46.00	-13.57	43.85	-11.42	Peak

BR-1Mbps mode (GFSK):

Low Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2352.900	22.11	54.00	-31.89	30.72	-8.61	Average
2352.900	35.76	74.00	-38.24	44.37	-8.61	Peak
2402.100	46.65			55.37	-8.72	Average
2402.100	81.76			90.48	-8.72	Peak
4804.000	28.87	54.00	-25.13	29.98	-1.11	Average
4804.000	41.69	74.00	-32.31	42.80	-1.11	Peak
7206.000	31.77	54.00	-22.23	28.56	3.21	Average
7206.000	44.84	74.00	-29.16	41.63	3.21	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2327.800	20.87	54.00	-33.13	29.42	-8.55	Average
2327.800	35.41	74.00	-38.59	43.96	-8.55	Peak
2402.100	53.69			62.41	-8.72	Average
2402.100	87.33			96.05	-8.72	Peak
4804.000	28.91	54.00	-25.09	30.01	-1.10	Average
4804.000	42.44	74.00	-31.56	43.54	-1.10	Peak
7206.000	31.69	54.00	-22.31	28.48	3.21	Average
7206.000	45.03	74.00	-28.97	41.82	3.21	Peak

Mid Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.920	21.96	54.00	-32.04	30.65	-8.69	Average
2389.920	35.76	74.00	-38.24	44.45	-8.69	Peak
2441.040	47.12			55.88	-8.76	Average
2441.040	81.68			90.44	-8.76	Peak
2538.480	21.13	54.00	-32.87	29.87	-8.74	Average
2538.480	35.45	74.00	-38.55	44.19	-8.74	Peak
4882.000	29.03	54.00	-24.97	29.89	-0.86	Average
4882.000	41.85	74.00	-32.15	42.71	-0.86	Peak
7323.000	32.49	54.00	-21.51	28.94	3.55	Average
7323.000	46.07	74.00	-27.93	42.52	3.55	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2373.120	21.24	54.00	-32.76	29.90	-8.66	Average
2373.120	35.14	74.00	-38.86	43.80	-8.66	Peak
2441.280	49.08			57.84	-8.76	Average
2441.280	87.27			96.03	-8.76	Peak
2542.320	21.21	54.00	-32.79	29.94	-8.73	Average
2542.320	34.54	74.00	-39.46	43.27	-8.73	Peak
4882.000	29.26	54.00	-24.74	30.14	-0.88	Average
4882.000	42.19	74.00	-31.81	43.07	-0.88	Peak
7323.000	32.63	54.00	-21.37	29.08	3.55	Average
7323.000	46.16	74.00	-27.84	42.61	3.55	Peak

High Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.080	45.40			54.18	-8.78	Average
2480.080	79.32			88.10	-8.78	Peak
2485.440	20.93	54.00	-33.07	29.71	-8.78	Average
2485.440	32.87	74.00	-41.13	41.65	-8.78	Peak
4960.000	29.21	54.00	-24.79	29.95	-0.74	Average
4960.000	42.36	74.00	-31.64	43.10	-0.74	Peak
7440.000	32.60	54.00	-21.40	28.63	3.97	Average
7440.000	45.29	74.00	-28.71	41.32	3.97	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.000	48.12			56.90	-8.78	Average
2480.000	85.30			94.08	-8.78	Peak
2488.160	21.13	54.00	-32.87	29.91	-8.78	Average
2488.160	33.08	74.00	-40.92	41.86	-8.78	Peak
4960.000	29.25	54.00	-24.75	29.99	-0.74	Average
4960.000	42.92	74.00	-31.08	43.66	-0.74	Peak
7440.000	32.59	54.00	-21.41	28.56	4.03	Average
7440.000	46.58	74.00	-27.42	42.55	4.03	Peak

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

EDR mode (π/4-DQPSK):

Low Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2388.800	21.95	54.00	-32.05	30.64	-8.69	Average
2388.800	36.38	74.00	-37.62	45.07	-8.69	Peak
2401.900	54.19			62.91	-8.72	Average
2401.900	82.37			91.09	-8.72	Peak
4804.000	28.96	54.00	-25.04	30.07	-1.11	Average
4804.000	42.07	74.00	-31.93	43.18	-1.11	Peak
7206.000	31.85	54.00	-22.15	28.64	3.21	Average
7206.000	45.14	74.00	-28.86	41.93	3.21	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2345.600	21.39	54.00	-32.61	29.98	-8.59	Average
2345.600	36.72	74.00	-37.28	45.31	-8.59	Peak
2402.200	57.16			65.88	-8.72	Average
2402.200	87.60			96.32	-8.72	Peak
4804.000	28.98	54.00	-25.02	30.09	-1.11	Average
4804.000	42.15	74.00	-31.85	43.26	-1.11	Peak
7206.000	31.89	54.00	-22.11	28.68	3.21	Average
7206.000	44.97	74.00	-29.03	41.76	3.21	Peak

Mid Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.200	21.94	54.00	-32.06	30.63	-8.69	Average
2389.200	36.34	74.00	-37.66	45.03	-8.69	Peak
2441.040	53.99			62.75	-8.76	Average
2441.040	82.00			90.76	-8.76	Peak
2527.440	21.41	54.00	-32.59	30.17	-8.76	Average
2527.440	34.57	74.00	-39.43	43.33	-8.76	Peak
4882.000	29.17	54.00	-24.83	30.05	-0.88	Average
4882.000	42.21	74.00	-31.79	43.09	-0.88	Peak
7323.000	32.52	54.00	-21.48	28.97	3.55	Average
7323.000	46.18	74.00	-27.82	42.63	3.55	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2339.040	21.53	54.00	-32.47	30.11	-8.58	Average
2339.040	34.66	74.00	-39.34	43.24	-8.58	Peak
2440.800	56.64			65.40	-8.76	Average
2440.800	86.56			95.32	-8.76	Peak
2538.480	21.42	54.00	-32.58	30.16	-8.74	Average
2538.480	34.81	74.00	-39.19	43.55	-8.74	Peak
4882.000	29.13	54.00	-24.87	29.99	-0.86	Average
4882.000	42.46	74.00	-31.54	43.32	-0.86	Peak
7323.000	32.34	54.00	-21.66	28.79	3.55	Average
7323.000	45.58	74.00	-28.42	42.03	3.55	Peak

High Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.840	52.61			61.39	-8.78	Average
2479.840	79.59			88.37	-8.78	Peak
2486.480	20.89	54.00	-33.11	29.68	-8.79	Average
2486.480	35.22	74.00	-38.78	44.01	-8.79	Peak
4960.000	29.13	54.00	-24.87	29.87	-0.74	Average
4960.000	42.42	74.00	-31.58	43.16	-0.74	Peak
7440.000	32.62	54.00	-21.38	28.65	3.97	Average
7440.000	45.53	74.00	-28.47	41.56	3.97	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.920	55.77			64.55	-8.78	Average
2479.920	85.03			93.81	-8.78	Peak
2498.720	21.26	54.00	-32.74	30.07	-8.81	Average
2498.720	34.85	74.00	-39.15	43.66	-8.81	Peak
4960.000	29.09	54.00	-24.91	29.83	-0.74	Average
4960.000	42.49	74.00	-31.51	43.23	-0.74	Peak
7440.000	32.71	54.00	-21.29	28.74	3.97	Average
7440.000	45.59	74.00	-28.41	41.62	3.97	Peak

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

EDR mode (8-DPSK):

Low Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.500	35.87	74.00	-38.13	44.56	-8.69	Peak
2389.500	35.87	74.00	-38.13	44.56	-8.69	Peak
2402.100	46.65			55.37	-8.72	Average
2402.100	81.83			90.55	-8.72	Peak
4804.000	28.78	54.00	-25.22	29.89	-1.11	Average
4804.000	42.00	74.00	-32.00	43.11	-1.11	Peak
7206.000	31.94	54.00	-22.06	28.73	3.21	Average
7206.000	44.47	74.00	-29.53	41.26	3.21	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2381.200	21.16	54.00	-32.84	29.84	-8.68	Average
2381.200	36.12	74.00	-37.88	44.80	-8.68	Peak
2402.100	49.27			57.99	-8.72	Average
2402.100	87.73			96.45	-8.72	Peak
4804.000	28.89	54.00	-25.11	30.00	-1.11	Average
4804.000	43.11	74.00	-30.89	44.22	-1.11	Peak
7206.000	32.08	54.00	-21.92	28.87	3.21	Average
7206.000	45.50	74.00	-28.50	42.29	3.21	Peak

Mid Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2388.960	21.92	54.00	-32.08	30.61	-8.69	Average
2388.960	35.42	74.00	-38.58	44.11	-8.69	Peak
2441.040	46.58			55.34	-8.76	Average
2441.040	81.96			90.72	-8.76	Peak
2538.000	20.88	54.00	-33.12	29.62	-8.74	Average
2538.000	36.11	74.00	-37.89	44.85	-8.74	Peak
4882.000	29.08	54.00	-24.92	29.96	-0.88	Average
4882.000	42.28	74.00	-31.72	43.16	-0.88	Peak
7323.000	32.52	54.00	-21.48	28.97	3.55	Average
7323.000	46.41	74.00	-27.59	42.86	3.55	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2369.040	21.68	54.00	-32.32	30.33	-8.65	Average
2369.040	35.49	74.00	-38.51	44.14	-8.65	Peak
2441.280	48.86			57.62	-8.76	Average
2441.280	86.90			95.66	-8.76	Peak
2484.240	21.43	54.00	-32.57	30.21	-8.78	Average
2484.240	35.23	74.00	-38.77	44.01	-8.78	Peak
4882.000	29.04	54.00	-24.96	29.92	-0.88	Average
4882.000	41.84	74.00	-32.16	42.72	-0.88	Peak
7323.000	32.45	54.00	-21.55	28.90	3.55	Average
7323.000	46.24	74.00	-27.76	42.69	3.55	Peak

High Channel

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.000	45.84			54.62	-8.78	Average
2480.000	80.27			89.05	-8.78	Peak
2484.720	20.83	54.00	-33.17	29.62	-8.79	Average
2484.720	35.32	74.00	-38.68	44.11	-8.79	Peak
4960.000	29.24	54.00	-24.76	29.98	-0.74	Average
4960.000	41.75	74.00	-32.25	42.49	-0.74	Peak
7440.000	32.65	54.00	-21.35	28.68	3.97	Average
7440.000	45.73	74.00	-28.27	41.76	3.97	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.000	48.24			57.02	-8.78	Average
2480.000	85.55			94.33	-8.78	Peak
2495.680	21.52	54.00	-32.48	30.32	-8.80	Average
2495.680	35.25	74.00	-38.75	44.05	-8.80	Peak
4960.000	29.19	54.00	-24.81	29.93	-0.74	Average
4960.000	43.07	74.00	-30.93	43.81	-0.74	Peak
7440.000	32.41	54.00	-21.59	28.44	3.97	Average
7440.000	45.37	74.00	-28.63	41.40	3.97	Peak

Result = Reading + Correct Factor

Margin = Result – Limit

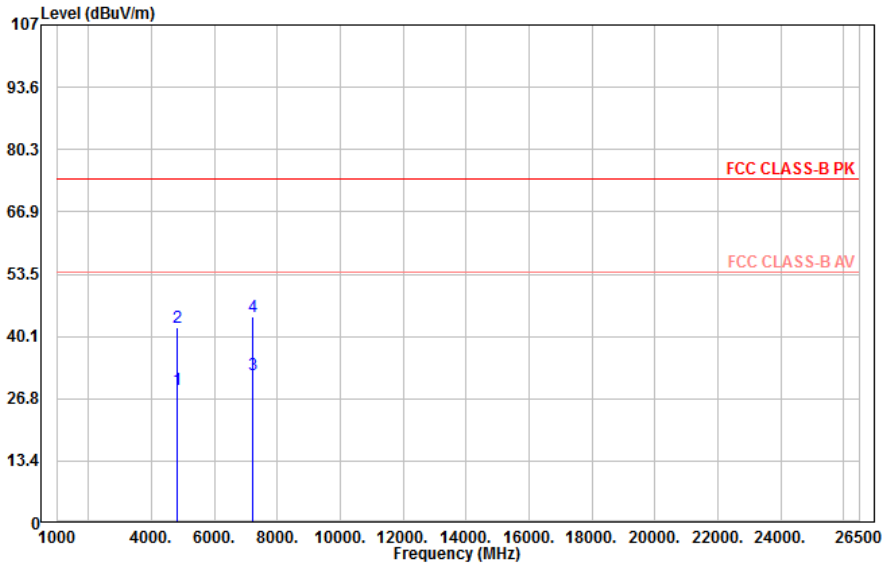
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Above 1G (1 GHz-26.5 GHz) test the output power worst mode:

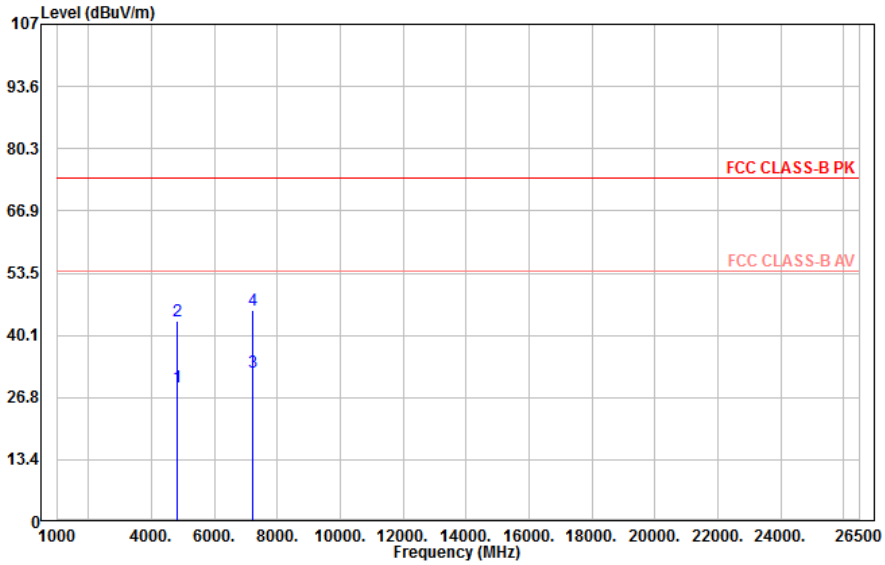
Worst case is EDR-3Mbps (8DPSK) Low channel)

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	4804.000	28.78	54.00	-25.22	29.89	-1.11	Average
2	4804.000	42.00	74.00	-32.00	43.11	-1.11	Peak
3	7206.000	31.94	54.00	-22.06	28.73	3.21	Average
4	7206.000	44.47	74.00	-29.53	41.26	3.21	Peak

Vertical



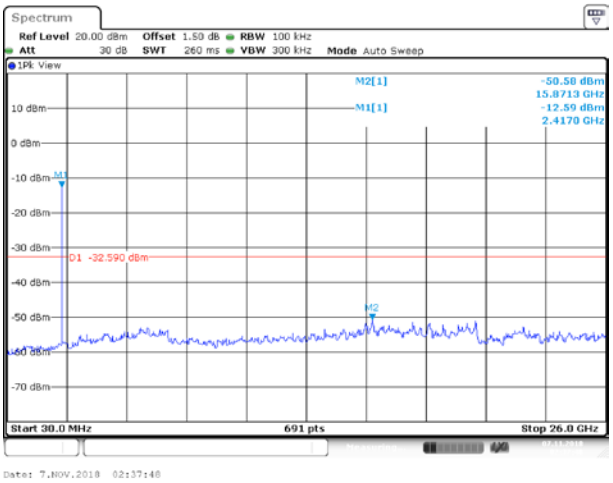
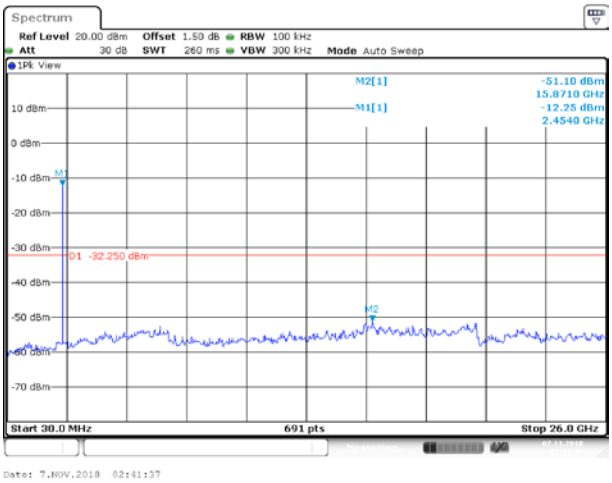
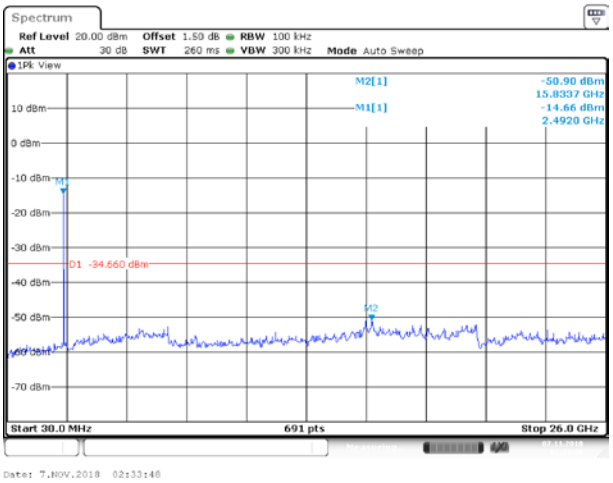
	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	4804.000	28.89	54.00	-25.11	30.00	-1.11	Average
2	4804.000	43.11	74.00	-30.89	44.22	-1.11	Peak
3	7206.000	32.08	54.00	-21.92	28.87	3.21	Average
4	7206.000	45.50	74.00	-28.50	42.29	3.21	Peak

Conducted Spurious Emissions:

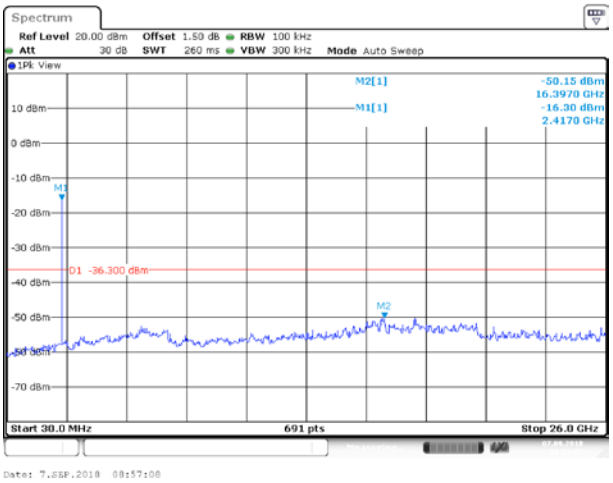
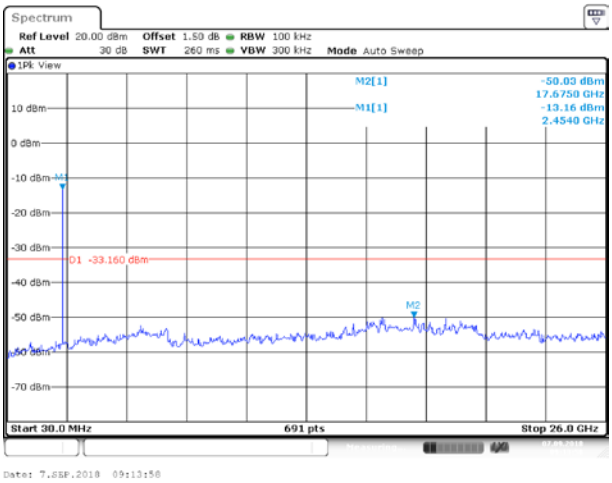
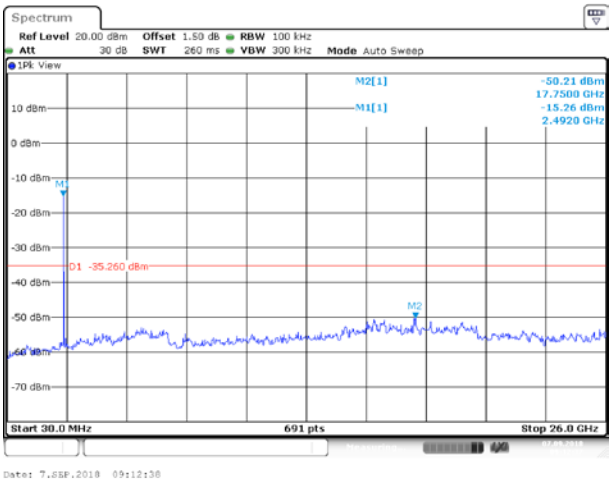
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR mode (GFSK)				
Low	2402	37.99	≥ 20	Compliance
Mid	2441	38.85	≥ 20	Compliance
High	2480	36.24	≥ 20	Compliance
EDR mode (π/4-DQPSK)				
Low	2402	33.85	≥ 20	Compliance
Mid	2441	36.87	≥ 20	Compliance
High	2480	34.95	≥ 20	Compliance
EDR mode (8DPSK)				
Low	2402	35.50	≥ 20	Compliance
Mid	2441	34.21	≥ 20	Compliance
High	2480	36.78	≥ 20	Compliance

Please refer to the following plots

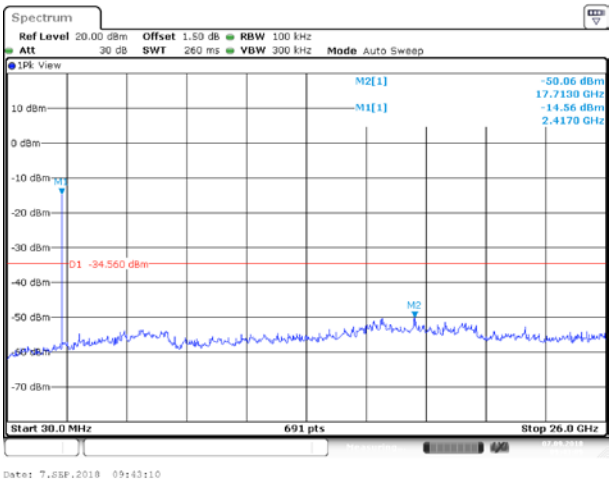
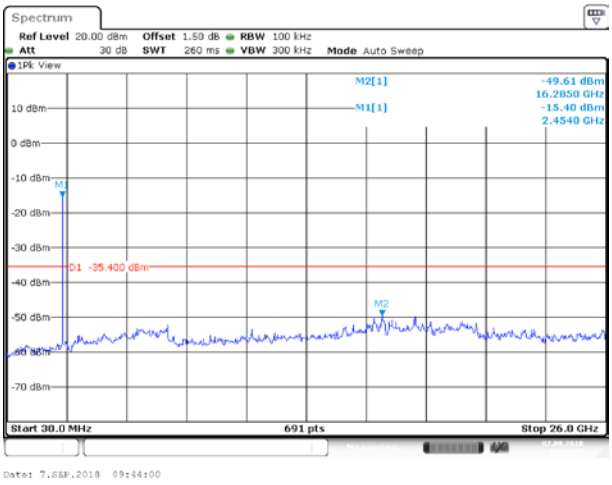
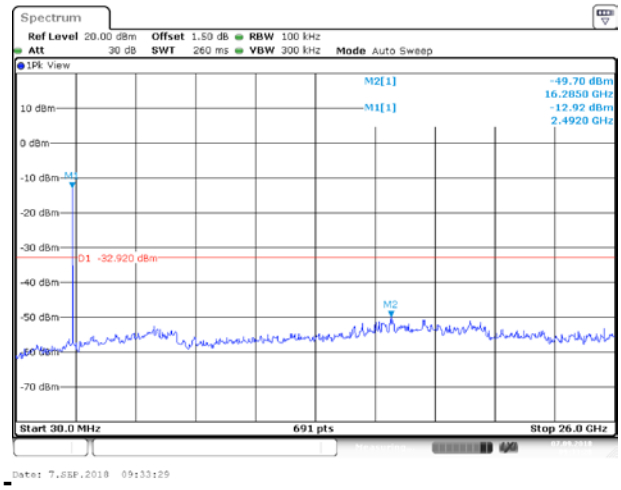
BR mode (GFSK):

Low Channel	Middle Channel
	
High Channel	
	

EDR mode (π/4-DQPSK):

Low Channel	Middle Channel
	
High Channel	
	

EDR mode (8DPSK):

Low Channel	Middle Channel
	
High Channel	
	

8 FCC §15.247(a)(1) – 20 dB Emission Bandwidth

8.1 Applicable Standard

According to FCC §15.247(a) (1) the maximum 20 dB bandwidth of the hopping channel shall be presented.

8.2 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.

8.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2017/11/15	2018/11/14
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

8.4 Test Environmental Conditions

Temperature:	25.2 ℃
Relative Humidity:	54 %
ATM Pressure:	1015 hPa

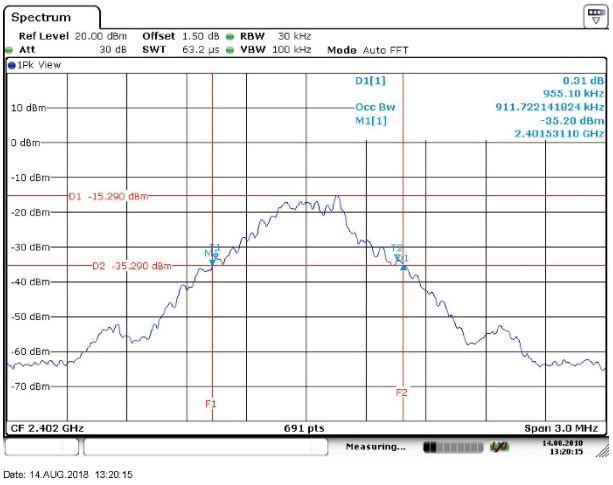
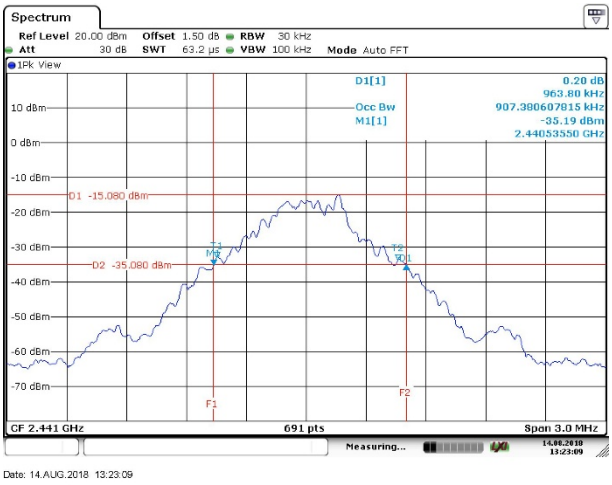
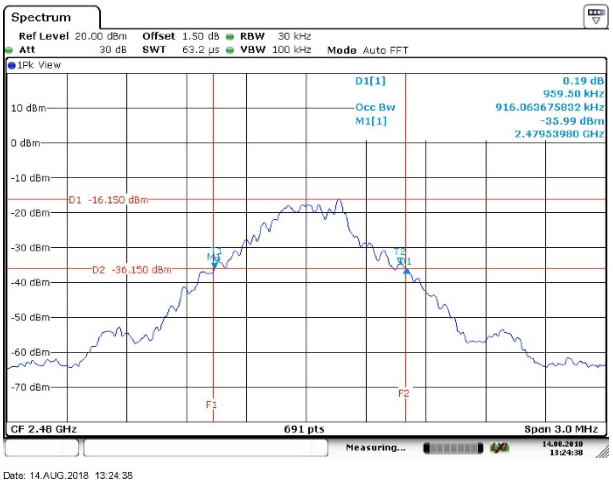
The testing was performed by Eric Lee from 2018-09-07 to 2018-09-14.

8.5 Test Results

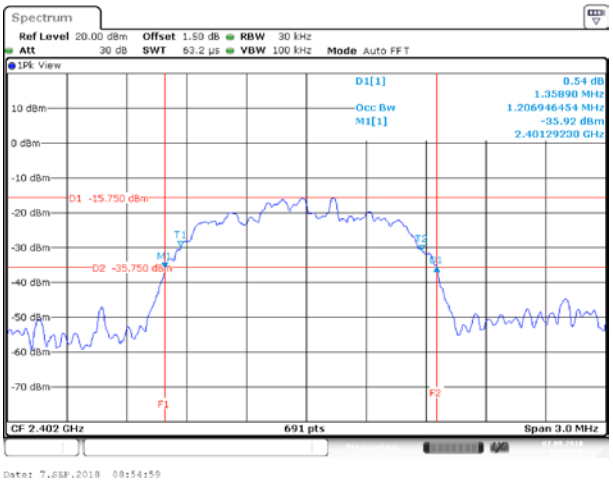
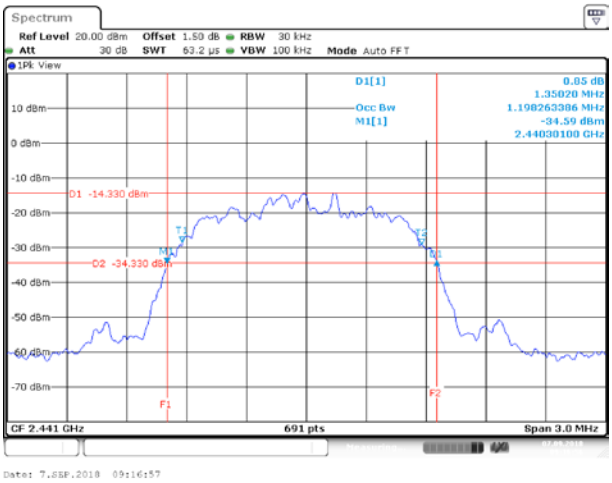
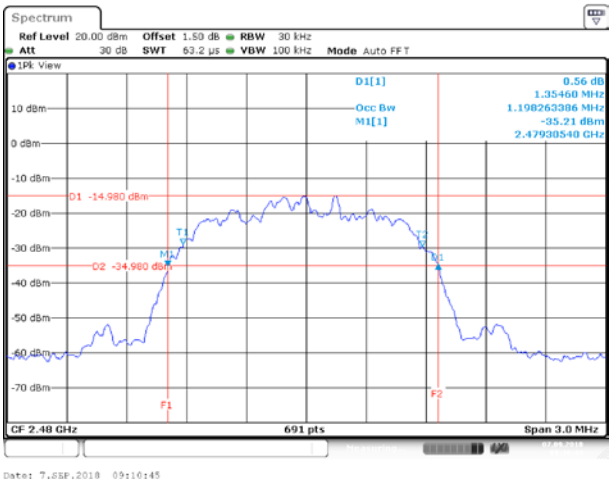
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	20 dB Bandwidth (MHz)
BR Mode (GFSK)			
Low	2402	0.9117	0.9551
Middle	2441	0.9074	0.9638
High	2480	0.9161	0.9595
EDR Mode (π/4-DQPSK)			
Low	2402	1.2069	1.3589
Middle	2441	1.1983	1.3502
High	2480	1.1983	1.3546
EDR Mode (8DPSK)			
Low	2402	1.1983	1.3198
Middle	2441	1.1983	1.3242
High	2480	1.1983	1.3198

Please refer to the following plots

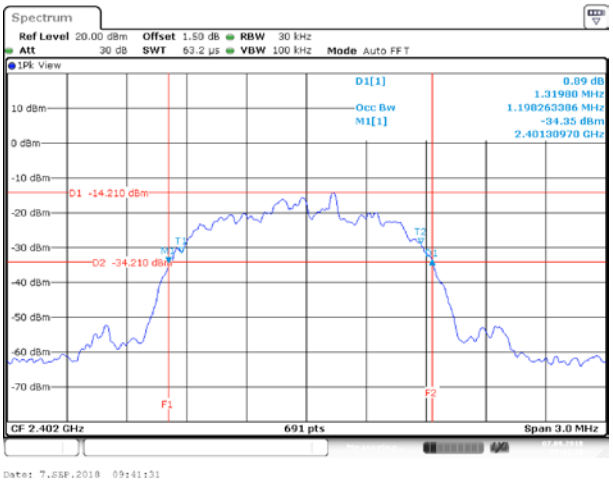
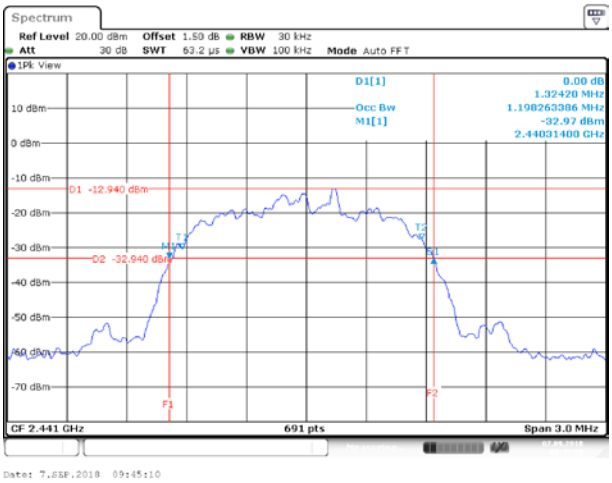
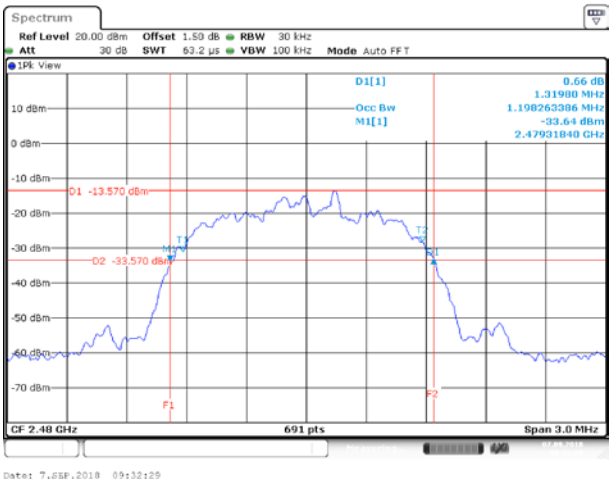
BR Mode (GFSK):

Low Channel	Middle Channel
	
High Channel	
	

EDR Mode (π/4-DQPSK):

Low Channel	Middle Channel
	
High Channel	
	

EDR Mode (8DPSK):

Low Channel	Middle Channel
	
High Channel	
	

9 FCC §15.247(a)(1) – Channel Separation Test

9.1 Applicable Standard

According to FCC §15.247(a) (1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. 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.

9.2 Test Procedure

Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≈ 30% of the channel spacing, adjust as necessary to best identify the center of each individual channel
Video (or Average) Bandwidth (VBW) ≥RBW
Sweep = auto
Detector function = peak Trace = max hold

9.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSU26	101140	2017/11/15	2018/11/14
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

9.4 Test Environmental Conditions

Temperature:	25.2 ℃
Relative Humidity:	54 %
ATM Pressure:	1015 hPa

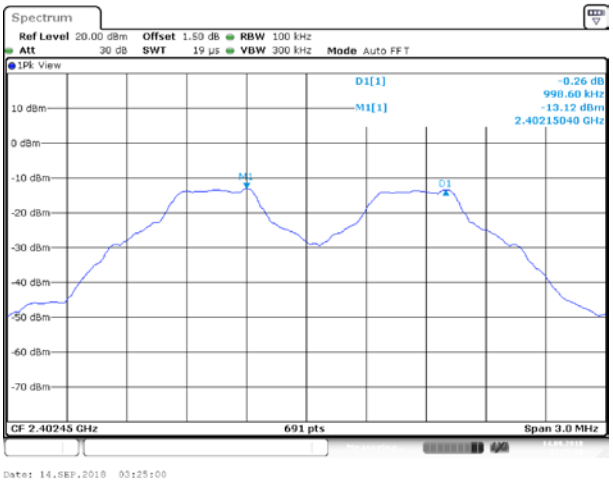
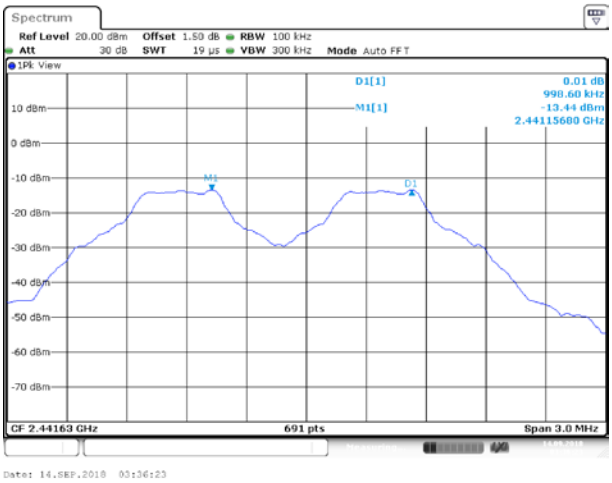
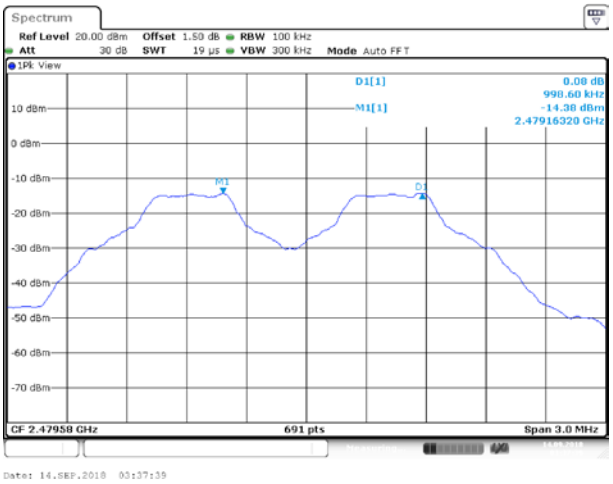
The testing was performed by Eric Lee from 2018-09-07 to 2018-09-14.

9.5 Test Results

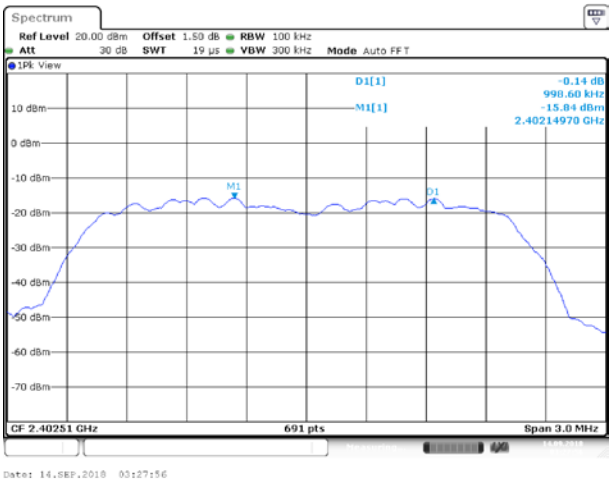
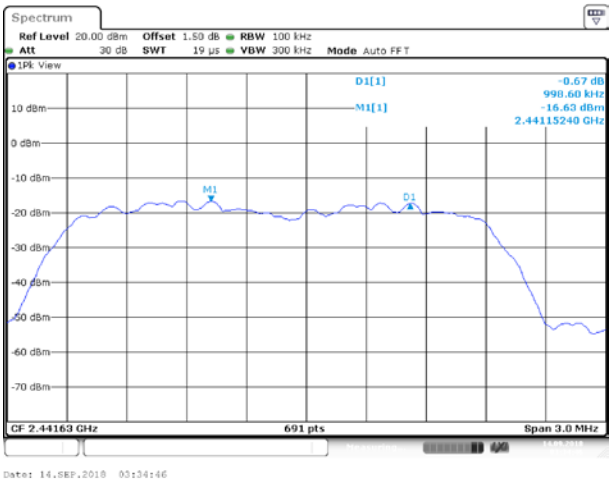
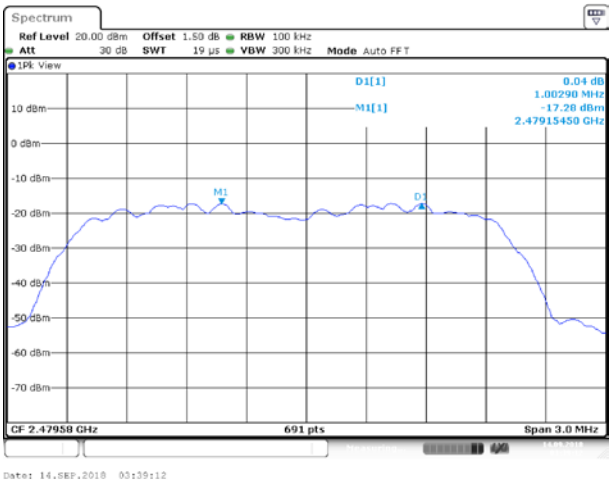
Channel	Channel Separation (MHz)	20 dBc BW (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Limit (dBm)	Result
BR mode (GFSK)					
Low	0.9986	0.9551	0.637	>two-thirds of the 20 dB bandwidth	Compliance
Middle	0.9986	0.9638	0.643	>two-thirds of the 20 dB bandwidth	Compliance
High	0.9986	0.9595	0.640	>two-thirds of the 20 dB bandwidth	Compliance
EDR mode (π/4-DQPSK)					
Low	0.9986	1.3589	0.906	>two-thirds of the 20 dB bandwidth	Compliance
Middle	0.9986	1.3502	0.900	>two-thirds of the 20 dB bandwidth	Compliance
High	1.0029	1.3546	0.903	>two-thirds of the 20 dB bandwidth	Compliance
EDR mode (8DPSK)					
Low	0.9986	1.3198	0.880	>two-thirds of the 20 dB bandwidth	Compliance
Middle	0.9986	1.3242	0.883	>two-thirds of the 20 dB bandwidth	Compliance
High	0.9986	1.3198	0.880	>two-thirds of the 20 dB bandwidth	Compliance

Please refer to the following plots

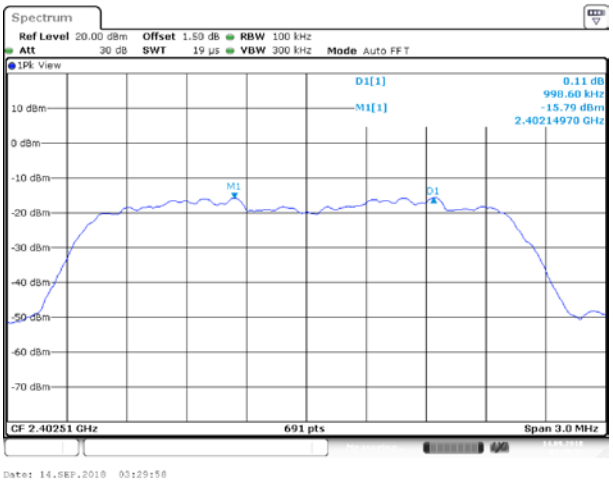
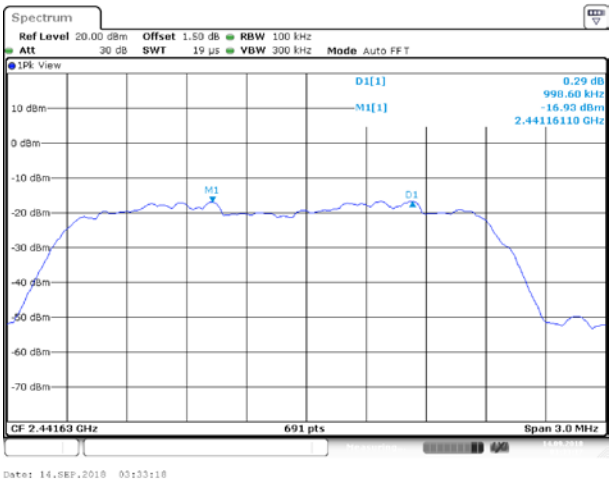
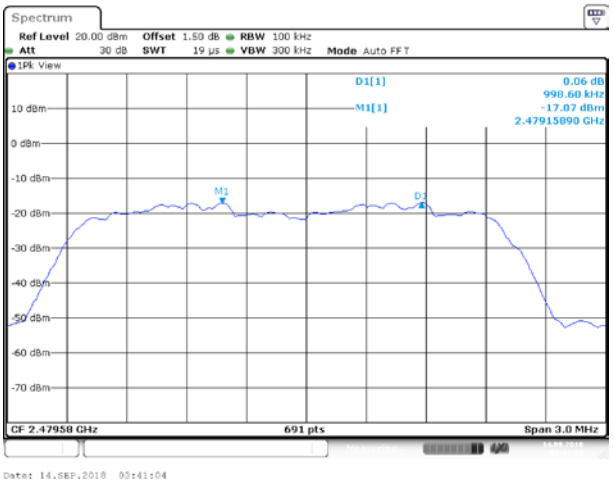
BR mode (GFSK):

Low Channel	Middle Channel
	
High Channel	
	

EDR mode (π/4-DQPSK):

Low Channel	Middle Channel
	
High Channel	
	

EDR mode (8-DPSK):

Low Channel	Middle Channel
	
High Channel	
	

10 FCC §15.247(a)(1)(iii) – Time of Occupancy (Dwell Time)

10.1 Applicable Standard

According to FCC §15.247(a) (1)(iii).

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

10.2 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel
RBW ≤ channel spacing and where possible RBW should be set >> 1/T, where T is the expected dwell time per channel
Sweep = as necessary to capture the entire dwell time per hopping channel Detector function = peak
Trace = max hold
Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.
Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements.
Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:
(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) x (period specified in the requirements / analyzer sweep time)
The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

10.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSU26	101140	2017/11/15	2018/11/14
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI)*.

10.4 Test Environmental Conditions

Temperature:	25.2 ℃
Relative Humidity:	54 %
ATM Pressure:	1015 hPa

The testing was performed by Eric Lee from 2018-09-07 to 2018-09-14.

10.5 Test Results

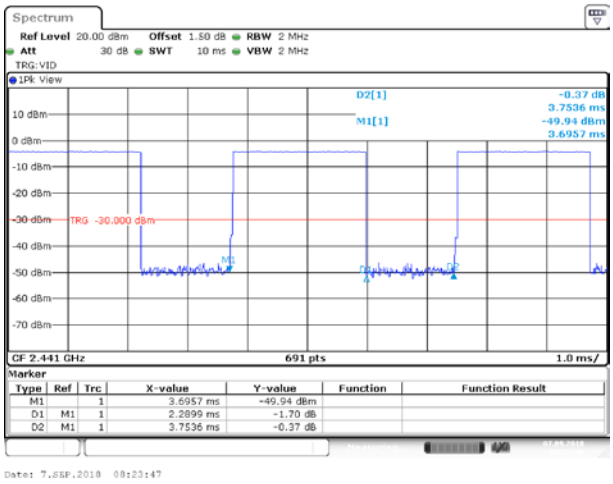
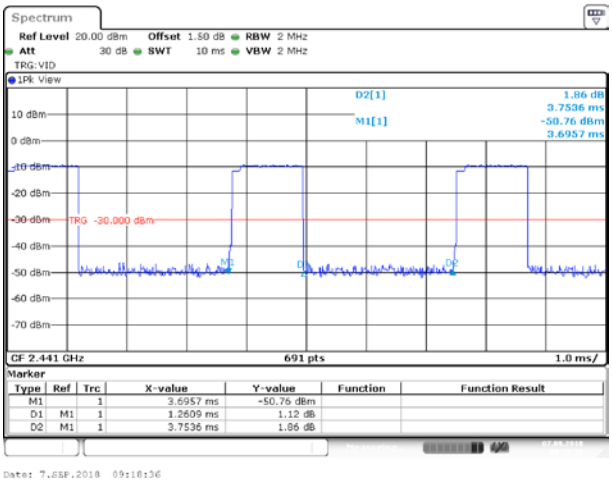
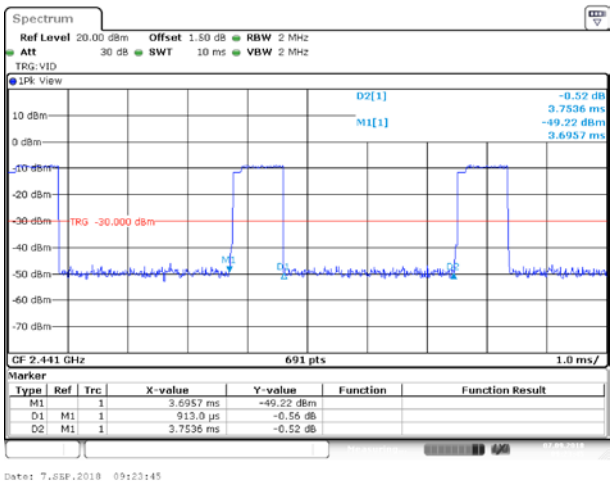
Mode	Pulse Time (ms)	Number of Pulse in [0.4 x N sec]	Dwell Time in [0.4 x N sec] (s)	Dwell Time Limits (s)	Result
BR mode (GFSK) : 2402-2480 MHz					
DH5	2.2899	106.7	0.244	<0.4	Compliance
EDR mode (π/4-DQPSK) : 2402-2480 MHz					
2DH5	1.2609	106.7	0.134	<0.4	Compliance
EDR mode (8DPSK) : 2402-2480 MHz					
3DH5	0.9130	106.7	0.097	<0.4	Compliance

**Number of Pulse in [0.4 x N sec] = 1600/79/6*(0.4*79)*

**Dwell Time in [0.4 x N sec] = (Pulse Time * Number of Pulse in [0.4 x N sec])/1000*

** Bluetooth ACL packets can be 1, 3, or 5 time slots. The DH1 packet can cover a single time slot. The DH3 packet can cover up to 3 time slots. The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle. A maximum length packet has duration of 5 time slots. The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms.*

Please refer to the following plots

DH5: Pulse Width	2DH5: Pulse Width
	
3DH5: Pulse Width	
	

11 FCC §15.247(a)(1)(iii) –Quantity of hopping channel Test

11.1 Applicable Standard

According to FCC §15.247(a) (1) (iii).

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

11.2 Test Procedure

Span = the frequency band of operation
RBW < 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller VBW ≥ RBW
Sweep = auto
Detector function = peak Trace = max hold

11.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSU26	101140	2017/11/15	2018/11/14
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

11.4 Test Environmental Conditions

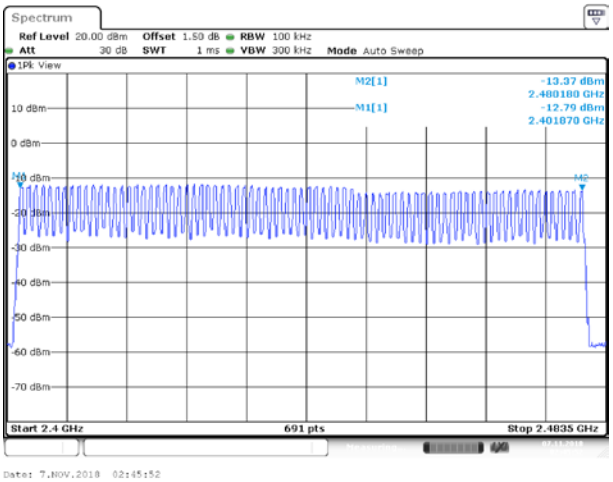
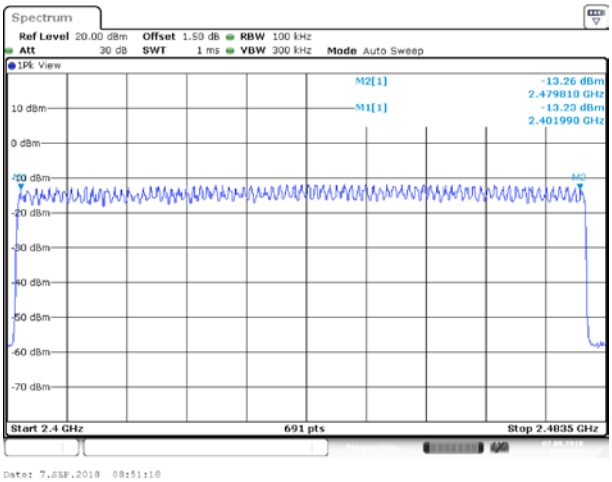
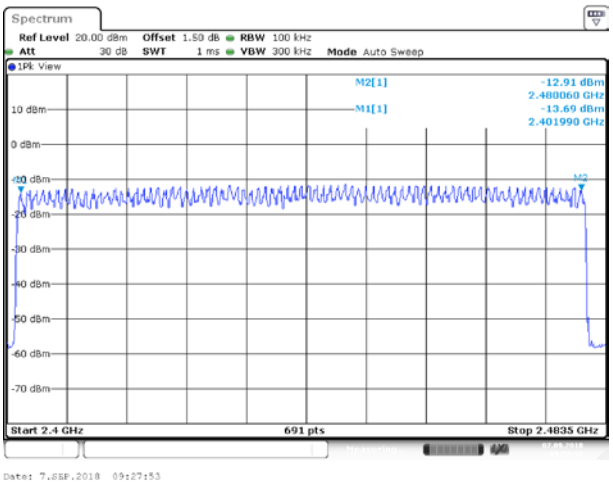
Temperature:	25.2 ℃
Relative Humidity:	54 %
ATM Pressure:	1015 hPa

The testing was performed by Eric Lee from 2018-09-07 to 2018-11-07.

11.5 Test Results

Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit (CH)	Result
GFSK	2402-2480	79	>15	Compliance
π/4-DQPSK	2402-2480	79	>15	Compliance
8DPSK	2402-2480	79	>15	Compliance

Please refer to the following plots

BR mode (GFSK)	EDR mode (π/4-DQPSK)
	
EDR mode (8DPSK)	
	

12 FCC §15.247(b)(1) – Maximum Output Power

12.1 Applicable Standard

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

12.2 Test Procedure

Place the EUT on a bench and set it in transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an Power sensor.

12.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2018/03/07	2019/03/06
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

12.4 Test Environmental Conditions

Temperature:	25.2 ℃
Relative Humidity:	54 %
ATM Pressure:	1015 hPa

The testing was performed by Eric Lee from 2018-09-07 to 2018-09-14.

12.5 Test Results

Channel	Frequency (MHz)	Maximum peak Conducted Output Power (dBm)	Limit (dBm)	Result
BR mode (GFSK)				
Low	2402	-12.31	21	Compliance
Middle	2441	-12.14	21	Compliance
High	2480	-12.26	21	Compliance
EDR mode (π/4-DQPSK)				
Low	2402	-11.86	21	Compliance
Middle	2441	-12.87	21	Compliance
High	2480	-13.45	21	Compliance
EDR mode (8DPSK)				
Low	2402	-11.48	21	Compliance
Middle	2441	-12.63	21	Compliance
High	2480	-13.27	21	Compliance

13 FCC §15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

13.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c)

.

13.2 Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
RBW = 100 kHz VBW = 300 kHz
Sweep = coupled
Detector function = peak Trace = max hold

13.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSU26	101140	2017/11/15	2018/11/14
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

13.4 Test Environmental Conditions

Temperature:	25.2 ℃
Relative Humidity:	54 %
ATM Pressure:	1015 hPa

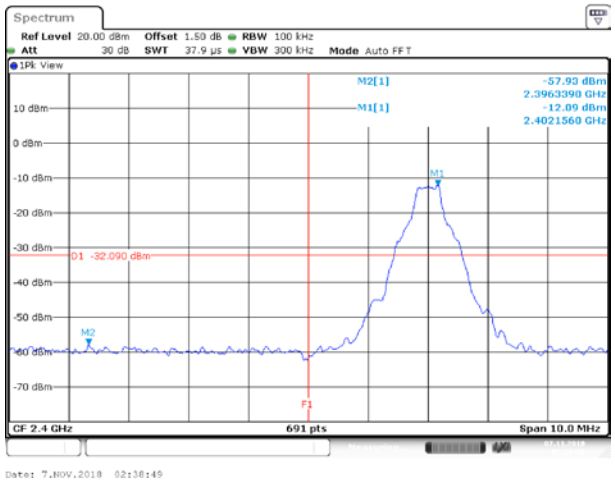
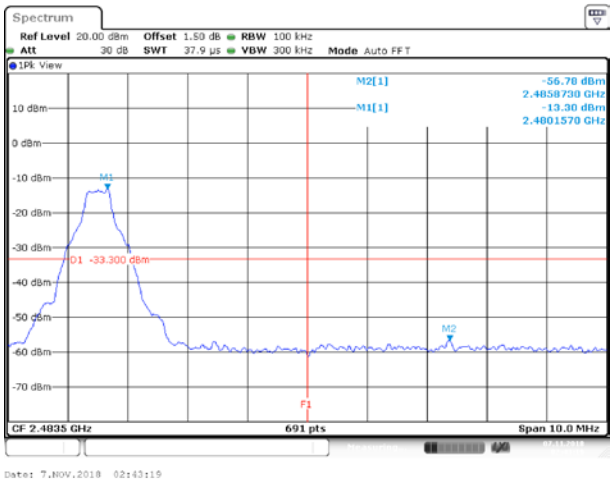
The testing was performed by Eric Lee from 2018-09-07 to 2018-09-14.

13.5 Test Results

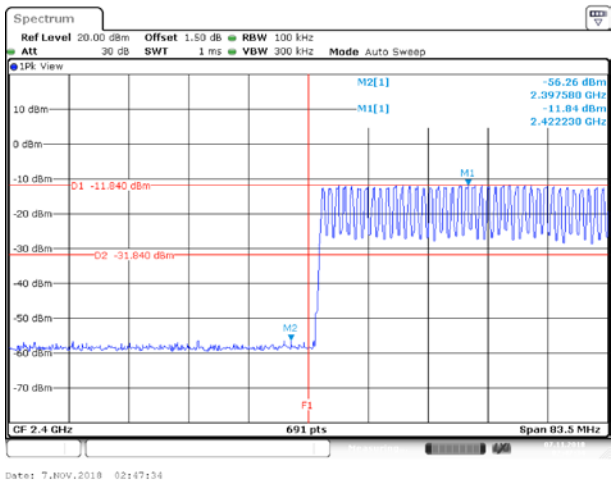
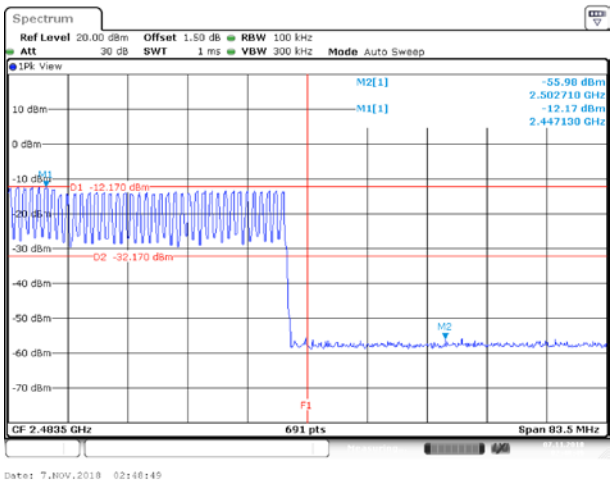
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR mode (GFSK)				
Low	2402	45.84	≥ 20	Compliance
High	2480	43.48	≥ 20	Compliance
BR Hopping mode (GFSK)				
Low	2402	44.42	≥ 20	Compliance
High	2480	43.81	≥ 20	Compliance
EDR mode (π/4-DQPSK)				
Low	2402	44.86	≥ 20	Compliance
High	2480	44.46	≥ 20	Compliance
EDR Hopping mode (π/4-DQPSK)				
Low	2402	44.66	≥ 20	Compliance
High	2480	44.03	≥ 20	Compliance
EDR mode (8DPSK)				
Low	2402	44.50	≥ 20	Compliance
High	2480	44.91	≥ 20	Compliance
EDR Hopping mode (8DPSK)				
Low	2402	44.53	≥ 20	Compliance
High	2480	44.35	≥ 20	Compliance

Please refer to the following plots

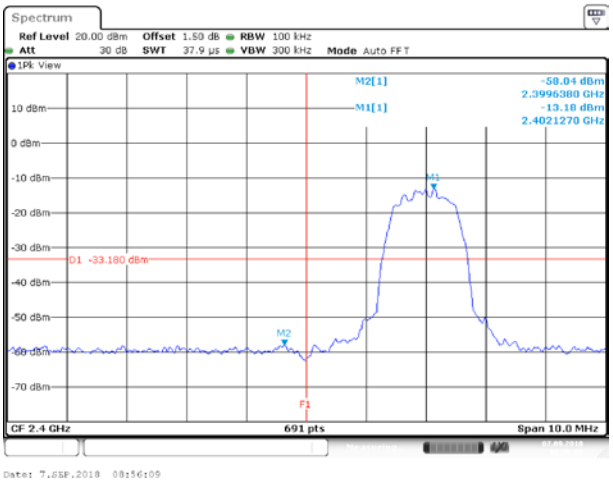
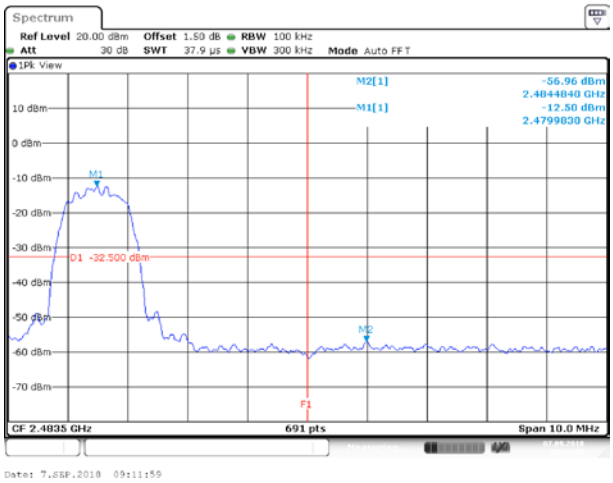
BR mode (GFSK):

Band Edge, Left Side	Band Edge, Right Side
	

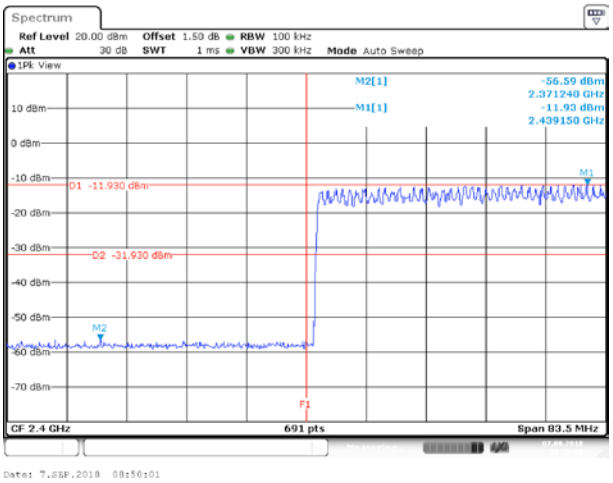
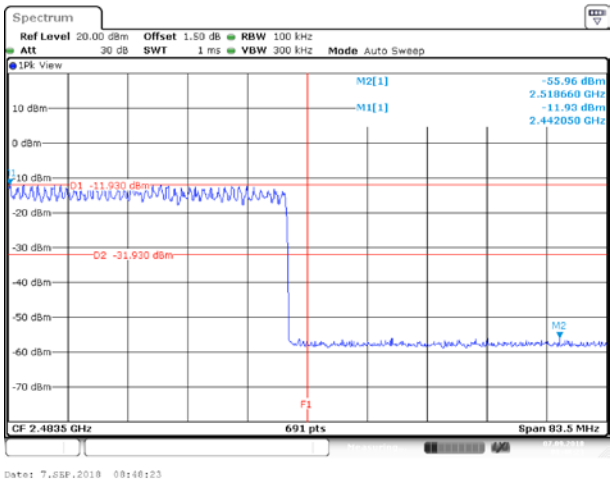
BR Hopping mode (GFSK):

Band Edge, Left Side	Band Edge, Right Side
	

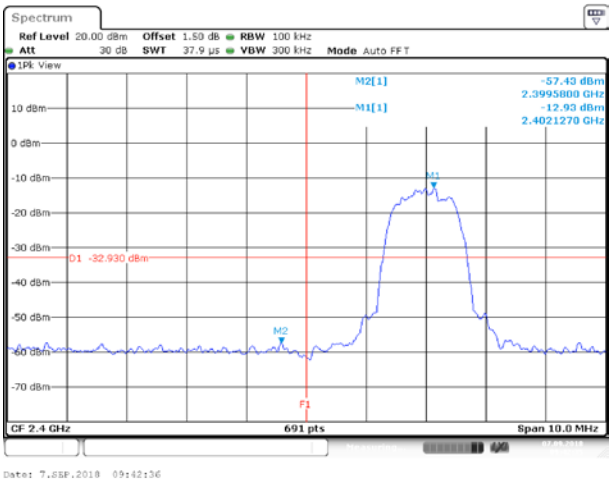
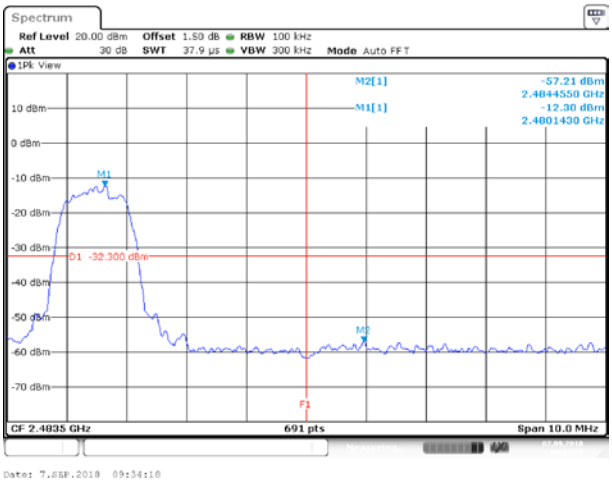
EDR mode (π/4-DQPSK):

Band Edge, Left Side	Band Edge, Right Side
	

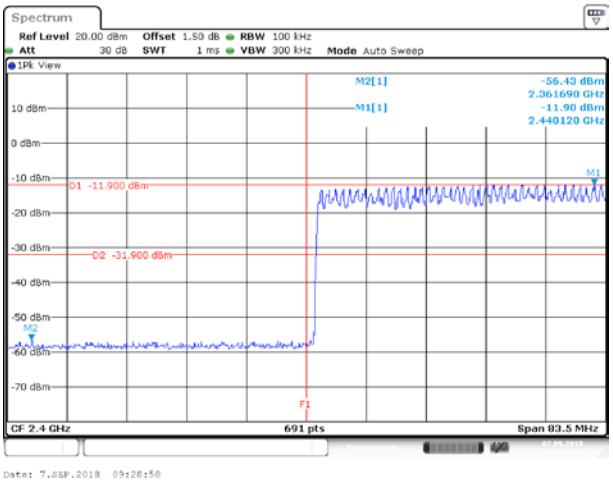
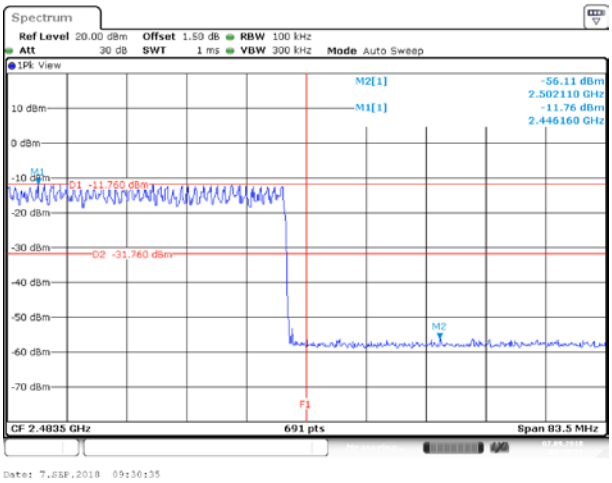
EDR Hopping mode (π/4-DQPSK):

Band Edge, Left Side	Band Edge, Right Side
	

EDR mode (8DPSK):

Band Edge, Left Side	Band Edge, Right Side
	

EDR Hopping mode (8DQSK):

Band Edge, Left Side	Band Edge, Right Side
	

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