TEST REPORT

Applicant Name:	Chillax Care Limited
Address:	FCC:Room 118, Flat A, 8/F, William Industrial Building 23-25 Ng Fong Street, San Po Kong,Kowloon, Hong Kong IC:Room 118, Flat A, 8/F, William Industrial Building, 23-25 Ng Fong Street, San Po Kong KOWLOON Hongkong
Report Number:	SZ4240221-08602E-RFB
FCC ID:	2AZ8M-BCX685
IC	27169-BCX685

Test Standard (s)

FCC PART 15.247; RSS-GEN ISSUE 5, FEBRUARY 2021 AMENDMENT 2; RSS-247 ISSUE 3, AUGUST 2023

Sample Description

Product Type:	5" Smart 1080p Video Baby Monitor
Model No.:	DM685BU
Multiple Model(s) No.:	DM688BU
Trade Mark:	chillaxbaby
Date Received:	2024/02/21
Issue Date:	2024/05/10

Test Result:	Pass▲

▲ In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Jojo Guo
RF Engineer

Approved By:

Nancy Wang
RF Supervisor

Note: The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "▼".

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY **4**

GENERAL INFORMATION **5**

PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 5
OBJECTIVE 5
TEST METHODOLOGY 5
MEASUREMENT UNCERTAINTY 6
TEST FACILITY 6

SYSTEM TEST CONFIGURATION **7**

DESCRIPTION OF TEST CONFIGURATION 7
EUT EXERCISE SOFTWARE 7
SPECIAL ACCESSORIES 7
EQUIPMENT MODIFICATIONS 7
SUPPORT EQUIPMENT LIST AND DETAILS 7
EXTERNAL I/O CABLE 8
BLOCK DIAGRAM OF TEST SETUP 8

SUMMARY OF TEST RESULTS **10**

TEST EQUIPMENT LIST **11**

FCC §15.247 (I) & §1.1307 (B) (3) & §2.1091- MPE-BASED EXEMPTION **12**

APPLICABLE STANDARD 12
RESULT 13

RSS-102 § (2.5.2) –EXEMPTION LIMITS FOR ROUTINE EVALUATION-RF EXPOSURE EVALUATION **14**

APPLICABLE STANDARD 14
RESULT 14

FCC §15.203 & RSS-GEN §6.8– ANTENNA REQUIREMENT **15**

APPLICABLE STANDARD 15
ANTENNA CONNECTOR CONSTRUCTION 15

FCC §15.207 (A) & RSS-GEN §8.8 – AC LINE CONDUCTED EMISSIONS **16**

APPLICABLE STANDARD 16
EUT SETUP 17
EMI TEST RECEIVER SETUP 17
TEST PROCEDURE 17
FACTOR & OVER LIMIT CALCULATION 18
TEST DATA 18

FCC §15.205, §15.209 & §15.247(D) & RSS-247§ 5.5 – RADIATED EMISSIONS **23**

APPLICABLE STANDARD 23
EUT SETUP 23
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 24
TEST PROCEDURE 25
FACTOR & OVER LIMIT/MARGIN CALCULATION 25
TEST DATA 25

FCC §15.247(A) (1) & RSS-247 § 5.1 (B)-CHANNEL SEPARATION TEST 43
APPLICABLE STANDARD 43
TEST PROCEDURE 43
TEST DATA 43
FCC §15.247(A) (1) & RSS-GEN § 6.7 & RSS-247 § 5.1 (A)–99% OCCUPIED BANDWIDTH & 20 DB EMISSION BANDWIDTH 46
APPLICABLE STANDARD 46
TEST PROCEDURE 46
TEST DATA 47
FCC §15.247(A) (1) (III) & RSS-247 § 5.1 (D)-QUANTITY OF HOPPING CHANNEL TEST 50
APPLICABLE STANDARD 50
TEST PROCEDURE 50
TEST DATA 50
FCC §15.247(A) (1) (III) & RSS-247 § 5.1 (D) - TIME OF OCCUPANCY (DWELL TIME) 52
APPLICABLE STANDARD 52
TEST PROCEDURE 52
TEST DATA 52
FCC §15.247(B) (1) & RSS-247§ 5.1(B) &§ 5.4(B) - PEAK OUTPUT POWER MEASUREMENT 54
APPLICABLE STANDARD 54
TEST PROCEDURE 54
TEST DATA 54
FCC §15.247(D) & RSS-247 § 5.5 - BAND EDGES TESTING 57
APPLICABLE STANDARD 57
TEST PROCEDURE 57
TEST DATA 57
EUT PHOTOGRAPHS 60
TEST SETUP PHOTOGRAPHS 61

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZ4240221-08602E-RFB	Original Report	2024/05/10

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

HVIN	BCX685
FVIN	BUV1518
Product	5” Smart 1080p Video Baby Monitor
Tested Model	DM685BU
Multiple Model(s)	DM688BU
Frequency Range	2402-2476MHz
Maximum conducted Peak output power	5.51 dBm
Modulation Technique	GFSK
Antenna Specification*	1.45dBi (It is provided by the applicant)
Voltage Range	DC 5V from adapter
Sample number	2HU6-2 for Conducted and Radiated Emissions 2HU6-3 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	Adapter 1 Model: GQ12-050150-ZU Input: 100-240V~50/60Hz,0.4A Max Output: 5.0V,1.5A Adapter 2 Model:KA12C-0501500US Input: 100-240V,50/60HZ,0.35A Max Output:5.0V,1500mA
Note: The multiple models are electrically identical with the test model except for model name. Please refer to the declaration letter# for more detail, which was provided by manufacturer.	

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules and RSS-247 Issue 3, August 2023, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

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 RSS-247 Issue 3, August 2023, RSS-GEN Issue 5, Feb. 2021 Amendment 2 of the Innovation, Science and Economic Development Canada rules.

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

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Frequency		213.55 Hz(k=2, 95% level of confidence)
RF output power, conducted		0.72 dB(k=2, 95% level of confidence)
Unwanted Emission, conducted		1.75 dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9 kHz~150 KHz	3.94dB(k=2, 95% level of confidence)
	150 kHz ~30MHz	3.84dB(k=2, 95% level of confidence)
Radiated Emissions	9kHz - 30MHz	3.30dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	4.48dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	4.55dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	4.85dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.05dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.35dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.44dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.16dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 715558, the FCC Designation No. : CN5045.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0023.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

Channel list

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	13	2428	26	2454
1	2404	14	2430	27	2456
2	2406	15	2432	28	2458
3	2408	16	2434	29	2460
4	2410	17	2436	30	2462
5	2412	18	2438	31	2464
6	2414	19	**2440**	32	2466
7	2416	20	2442	33	2468
8	2418	21	2444	34	2470
9	2420	22	2446	35	2472
10	2422	23	2448	36	2474
11	2424	24	2450	37	**2476**
12	2426	25	2452		

EUT was test in channel 0, 19, 37.

EUT Exercise Software

No exercise software was used.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

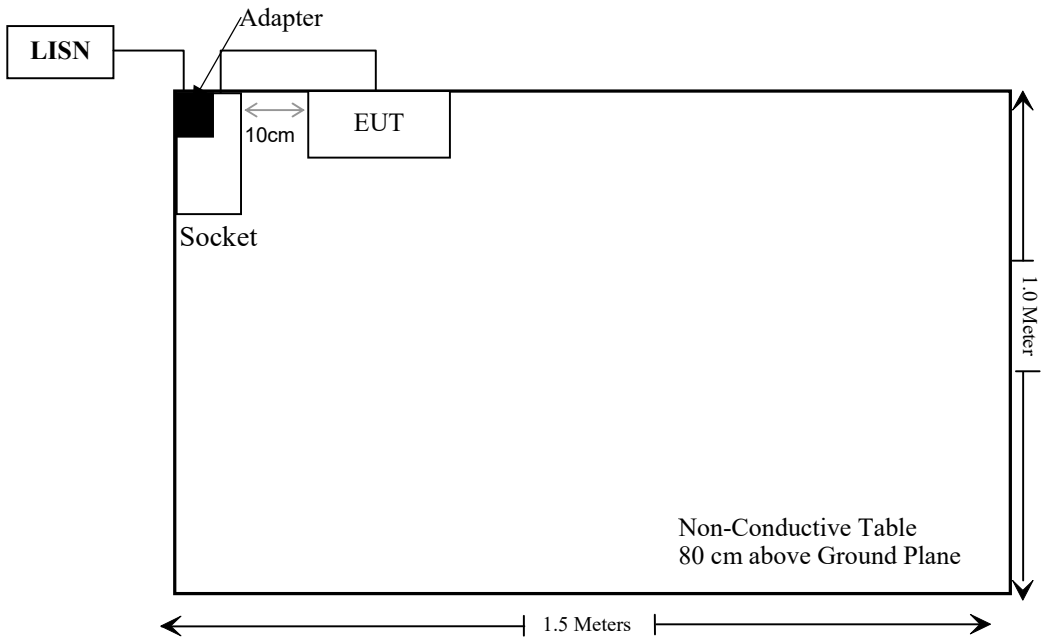
Manufacturer	Description	Model	Serial Number
Jisheng	Socket	505	Unknown

External I/O Cable

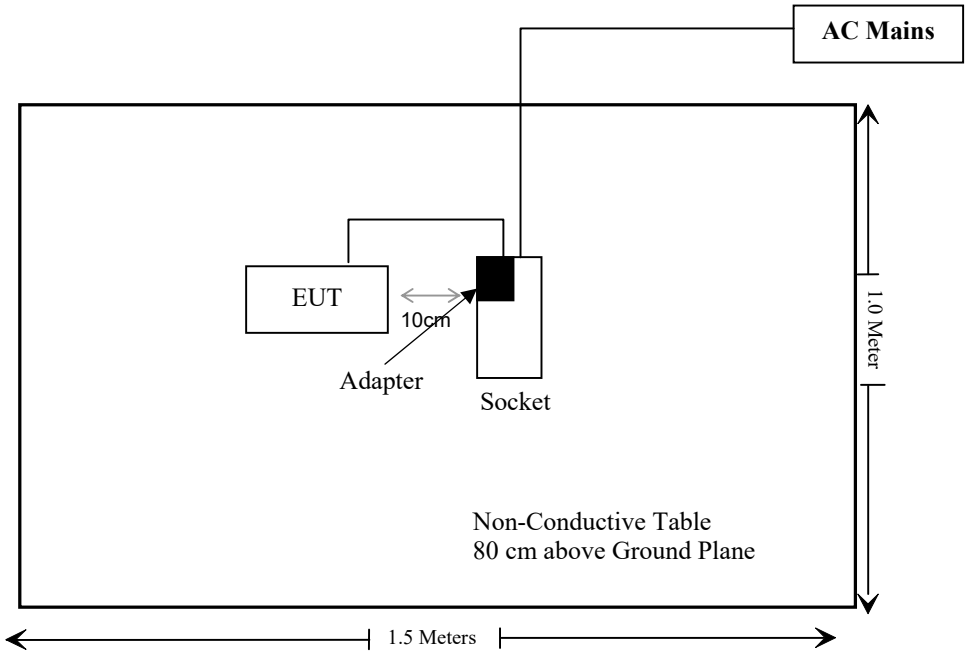
Cable Description	Length (m)	From Port	To
Un-shielding Un-Detachable DC Cable	1.8	Adapter	EUT
Un-shielding Un-Detachable AC Cable	1.8	AC Source	Socket

Block Diagram of Test Setup

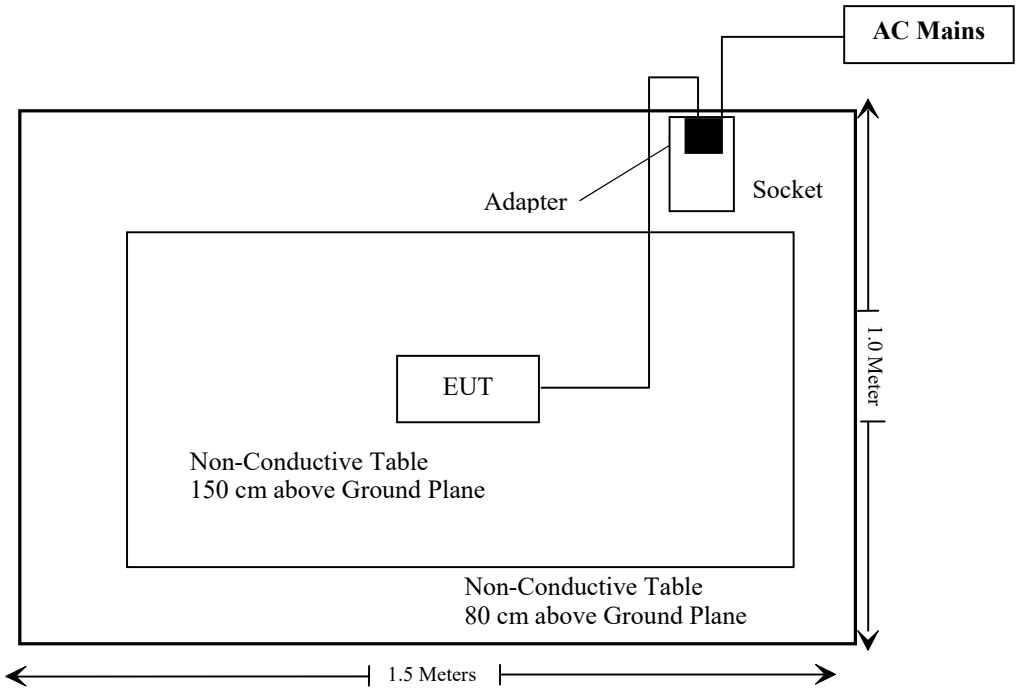
For Conducted Emission



For Radiated Emission below 1 GHz



For Radiated Emission above 1 GHz



SUMMARY OF TEST RESULTS

FCC Rules	ISEDC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (3) & §2.1091	RSS-102 § 2.5.2	MPE-Based Exemption & Exemption Limits For Routine Evaluation-RF Exposure Evaluation	Compliant
§15.203	RSS-Gen §6.8	Antenna Requirement	Compliant
§15.207(a)	RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
§15.205, §15.209 & §15.247(d)	RSS-247 § 5.5	Radiated Emissions	Compliant
§15.247(a)(1)	RSS- Gen§6.7, RSS-247 § 5.1 (a)	99% Occupied Bandwidth & 20 dB Emission Bandwidth	Compliant
§15.247(a)(1)	RSS-247 § 5.1 (b)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	RSS-247 § 5.1(b) &§ 5.4(b)	Peak Output Power Measurement	Compliant
§15.247(d)	RSS-247 § 5.5	Band edges	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2024/01/16	2025/01/15
Rohde & Schwarz	LISN	ENV216	101613	2024/01/16	2025/01/15
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2023/08/03	2024/08/02
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2023/08/03	2024/08/02
Audix	EMI Test software	E3	191218	NCR	NCR
Radiated Emissions Test					
R&S	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2023/06/08	2024/06/07
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2024/07/19
ETS	Passive Loop Antenna	6512	29604	2023/07/07	2024/07/06
Unknown	Cable	Chamber Cable 1	F-03-EM236	2023/08/03	2024/08/02
Unknown	Cable	Chamber Cable 4	EC-007	2023/08/03	2024/08/02
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2023/04/18	2024/04/17
COM-POWER	Pre-amplifier	PA-122	181919	2023/06/29	2024/06/28
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2024/07/25
Unknown	RF Cable	KMSE	0735	2023/10/08	2024/10/07
Unknown	RF Cable	UFA147	219661	2023/10/08	2024/10/07
Unknown	RF Cable	XH750A-N	J-10M	2023/10/08	2024/10/07
SNSD	2.4G Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2023/08/03	2024/08/02
A.H.System	Pre-amplifier	PAM-1840VH	190	2023/08/03	2024/08/02
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
RF conducted test					
R&S	Spectrum Analyzer	FSU26	200120	2024/01/08	2025/01/07
MARCONI	10dB Attenuator	6534/3	2942	2023/07/04	2024/07/03

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

FCC §15.247 (i) & §1.1307 (b) (3) & §2.1091- MPE-BASED EXEMPTION

Applicable Standard

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to λ/2π, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

f = frequency in MHz;
R = minimum separation distance from the body of a nearby person (appropriate units, e.g., m);

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Result

For worst case:

Mode	Frequency (MHz)	Tune up conducted power#	Antenna Gain#		ERP		Evaluation Distance (m)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
2.4G FHSS	2402-2476	6	1.45	-0.7	5.3	3.39	0.2	768
2.4G Wi-Fi	2412-2472	17	1.45	-0.7	16.3	42.66	0.2	768

Note 1: The tune-up power and antenna gain was declared by the applicant.
Note 2: 0dBd=2.15dBi.

The 2.4 G FHSS and 2.4G Wi-Fi can't transmit simultaneously.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant

RSS-102 § (2.5.2) –EXEMPTION LIMITS FOR ROUTINE EVALUATION-RF EXPOSURE EVALUATION

Applicable Standard

According to RSS-102 § (2.5.2):

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Result

Mode	Frequency (MHz)	Antenna Gain#	Conducted output power including Tune-up Tolerance#	EIRP including Tune-up Tolerance		Exemption limits (mW)	Exemption
		(dBi)	(dBm)	(dBm)	(mW)		
2.4G FHSS	2402-2476	1.45	6	7.45	5.56	2676	Yes
2.4G Wi-Fi	2412-2472	1.45	17	18.45	69.98	2684	Yes

Note: *The Maximum Conducted Power including Tune-up Tolerance was declared by manufacturer.*

The 2.4 G FHSS and 2.4G Wi-Fi can't transmit simultaneously.

So the device is compliance exemption from Routine Evaluation Limits –RF exposure Evaluation.

Result: Compliant

FCC §15.203 & RSS-GEN §6.8– 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.

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

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

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

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

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

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has an internal antenna arrangement which was permanently attached and the antenna gain# is 1.45dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Type	Antenna Gain#	Impedance
Monopole	1.45dBi	50Ω

Result: Compliant

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

Applicable Standard

FCC §15.207(a) & RSS-Gen §8.8

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 μH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

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

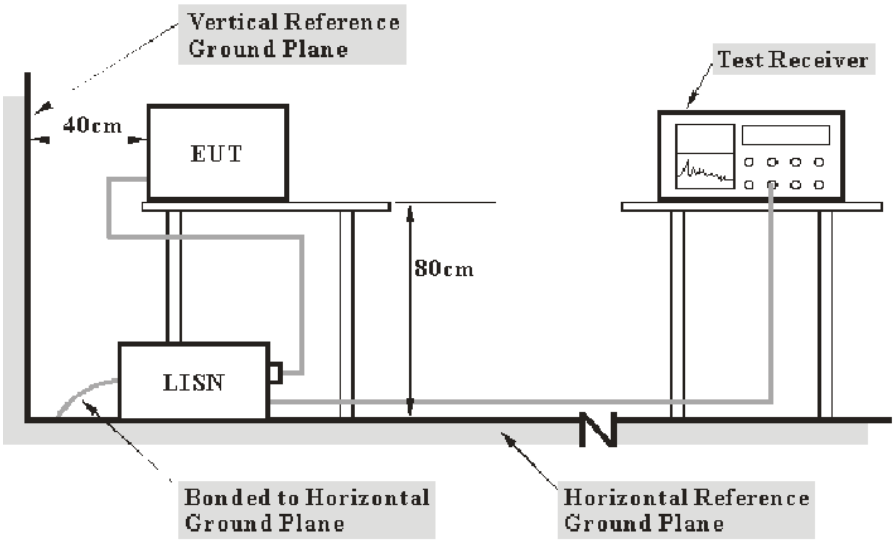
Note 1: The level decreases linearly with the logarithm of the frequency.

For an EUT with a permanent or detachable antenna operating between 150 kHz and 30 MHz, the AC power-line conducted emissions must be measured using the following configurations:

(a) Perform the AC power-line conducted emissions test with the antenna connected to determine compliance with the limits of table 4 outside the transmitter's fundamental emission band.

(b) Retest with a dummy load instead of the antenna to determine compliance with the limits of table 4 within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network that simulates the antenna in the fundamental frequency band.

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 and RSS-Gen limits.

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

The spacing between the peripherals was 10 cm.

EMI Test Receiver 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

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

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

Factor & Over Limit Calculation

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

Factor = LISN VDF + Cable Loss

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

Over Limit = Level – Limit
Level = Read Level + Factor

Note: The term "cable loss" refers to the combination of a cable and a 10dB transient limiter (attenuator).

Test Data

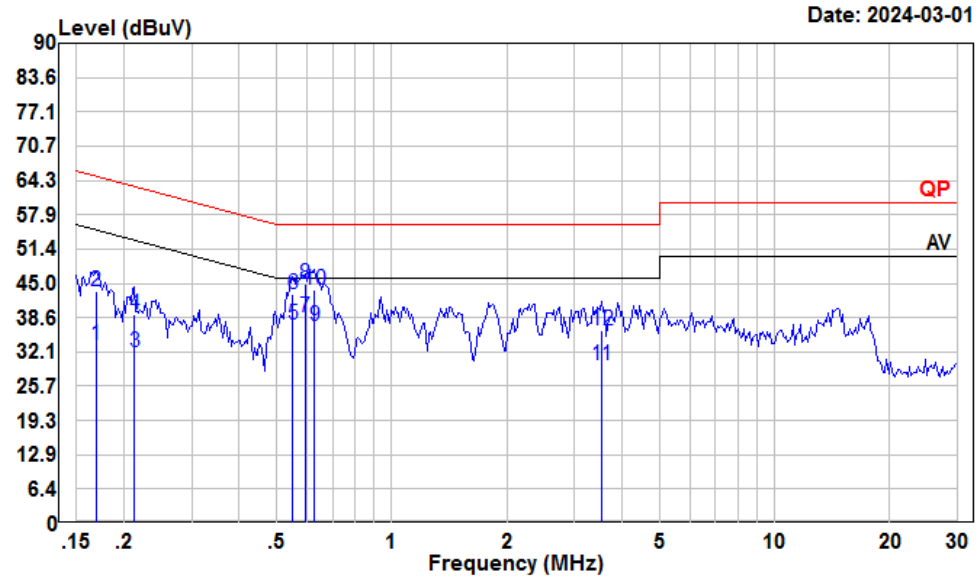
Temperature:	26 ℃
Relative Humidity:	45 %
ATM Pressure:	101 kPa

The testing was performed by Macy Shi on 2024-03-01.

EUT operation mode: Transmitting (Maximum output power mode, low channel)

For adapter 1:

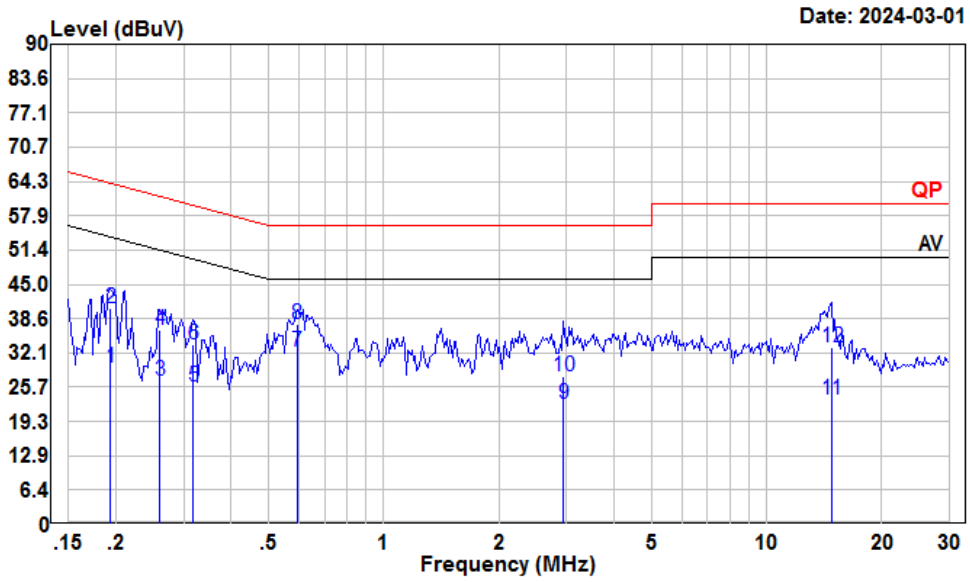
AC 120V/60 Hz, Line



Condition: Line
Project : SZ4240221-08602E-RF
Tester : Macy shi
Note : 2.4G Hopping

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.17	12.58	33.59	10.86	10.15	55.03	-21.44	Average
2	0.17	22.58	43.59	10.86	10.15	65.03	-21.44	QP
3	0.21	11.23	32.13	10.78	10.12	53.10	-20.97	Average
4	0.21	18.38	39.28	10.78	10.12	63.10	-23.82	QP
5	0.55	16.50	37.19	10.50	10.19	46.00	-8.81	Average
6	0.55	22.20	42.89	10.50	10.19	56.00	-13.11	QP
7	0.59	17.90	38.62	10.50	10.22	46.00	-7.38	Average
8	0.59	24.20	44.92	10.50	10.22	56.00	-11.08	QP
9	0.63	16.37	37.09	10.50	10.22	46.00	-8.91	Average
10	0.63	23.02	43.74	10.50	10.22	56.00	-12.26	QP
11	3.53	8.91	29.52	10.35	10.26	46.00	-16.48	Average
12	3.53	15.65	36.26	10.35	10.26	56.00	-19.74	QP

AC 120V/60 Hz, Neutral

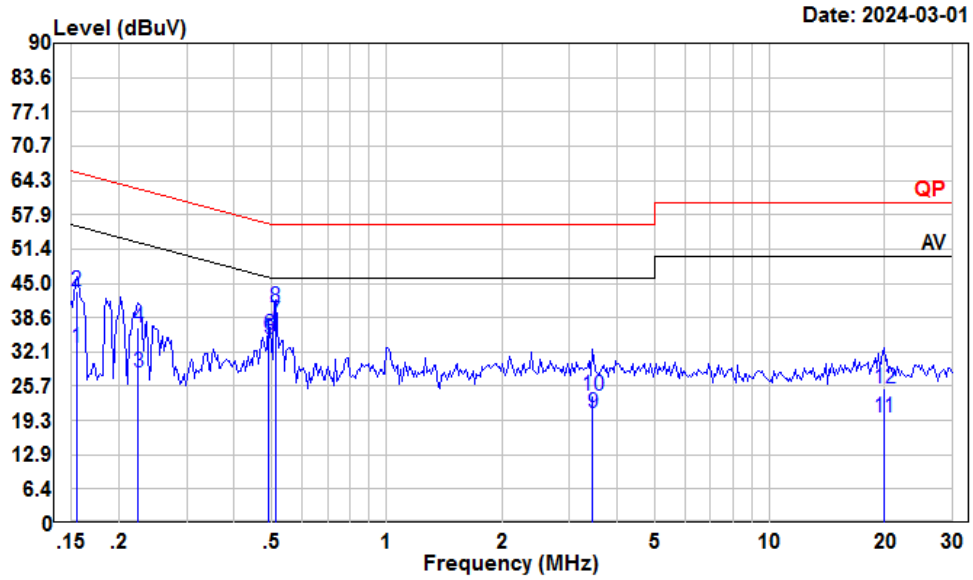


Condition: Neutral
Project : SZ4240221-08602E-RF
Tester : Macy shi
Note : 2.4G Hopping

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.19	8.85	29.37	10.42	10.10	53.89	-24.52	Average
2	0.19	20.14	40.66	10.42	10.10	63.89	-23.23	QP
3	0.26	6.14	26.82	10.49	10.19	51.42	-24.60	Average
4	0.26	15.75	36.43	10.49	10.19	61.42	-24.99	QP
5	0.32	5.28	25.96	10.55	10.13	49.75	-23.79	Average
6	0.32	13.18	33.86	10.55	10.13	59.75	-25.89	QP
7	0.59	11.37	32.29	10.70	10.22	46.00	-13.71	Average
8	0.59	16.61	37.53	10.70	10.22	56.00	-18.47	QP
9	2.95	1.96	22.62	10.40	10.26	46.00	-23.38	Average
10	2.95	7.21	27.87	10.40	10.26	56.00	-28.13	QP
11	14.75	2.50	23.41	10.80	10.11	50.00	-26.59	Average
12	14.75	12.19	33.10	10.80	10.11	60.00	-26.90	QP

For adapter 2:

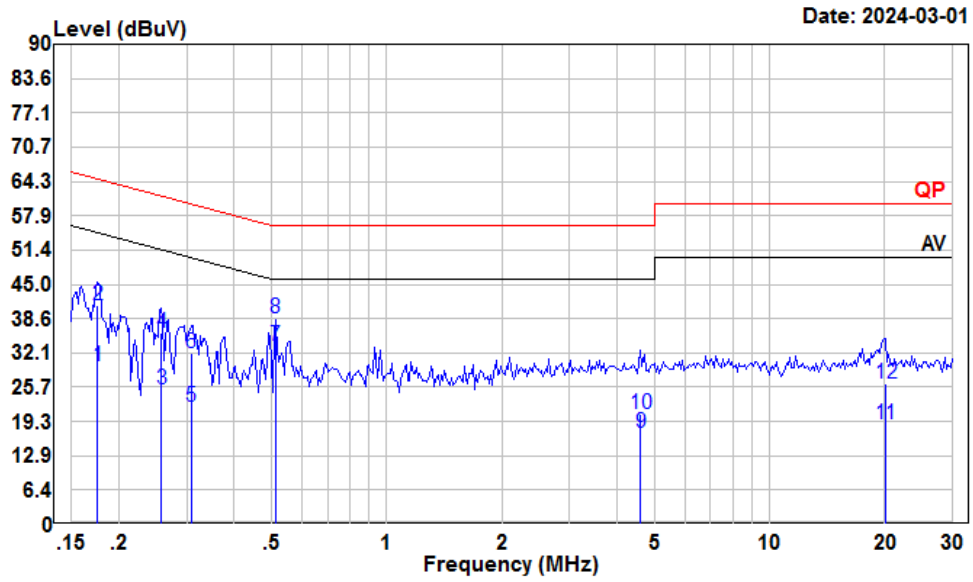
AC 120V/60 Hz, Line



Condition: Line
Project : SZ4240221-08602E-RF
Tester : Macy shi
Note : 2.4G Hopping

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.15	11.96	33.00	10.89	10.15	55.74	-22.74	Average
2	0.15	22.53	43.57	10.89	10.15	65.74	-22.17	QP
3	0.22	7.25	28.16	10.76	10.15	52.66	-24.50	Average
4	0.22	15.79	36.70	10.76	10.15	62.66	-25.96	QP
5	0.49	13.85	34.52	10.51	10.16	46.14	-11.62	Average
6	0.49	14.70	35.37	10.51	10.16	56.14	-20.77	QP
7	0.51	17.10	37.76	10.50	10.16	46.00	-8.24	Average
8	0.51	19.75	40.41	10.50	10.16	56.00	-15.59	QP
9	3.45	0.17	20.80	10.36	10.27	46.00	-25.20	Average
10	3.45	3.33	23.96	10.36	10.27	56.00	-32.04	QP
11	19.85	-1.11	19.89	10.89	10.11	50.00	-30.11	Average
12	19.85	4.43	25.43	10.89	10.11	60.00	-34.57	QP

AC 120V/60 Hz, Neutral



Condition: Neutral
Project : SZ4240221-08602E-RF
Tester : Macy shi
Note : 2.4G Hopping

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.18	8.96	29.59	10.49	10.14	54.68	-25.09	Average
2	0.18	20.46	41.09	10.49	10.14	64.68	-23.59	QP
3	0.26	4.73	25.41	10.48	10.20	51.51	-26.10	Average
4	0.26	15.18	35.86	10.48	10.20	61.51	-25.65	QP
5	0.31	1.33	22.00	10.54	10.13	50.02	-28.02	Average
6	0.31	11.30	31.97	10.54	10.13	60.02	-28.05	QP
7	0.51	12.54	33.40	10.70	10.16	46.00	-12.60	Average
8	0.51	17.70	38.56	10.70	10.16	56.00	-17.44	QP
9	4.60	-3.52	17.19	10.47	10.24	46.00	-28.81	Average
10	4.60	0.08	20.79	10.47	10.24	56.00	-35.21	QP
11	20.06	-2.11	18.70	10.70	10.11	50.00	-31.30	Average
12	20.06	5.71	26.52	10.70	10.11	60.00	-33.48	QP

FCC §15.205, §15.209 & §15.247(d) & RSS-247§ 5.5 – RADIATED EMISSIONS

Applicable Standard

FCC §15.205; §15.209; §15.247(d) and RSS-247 §5.5

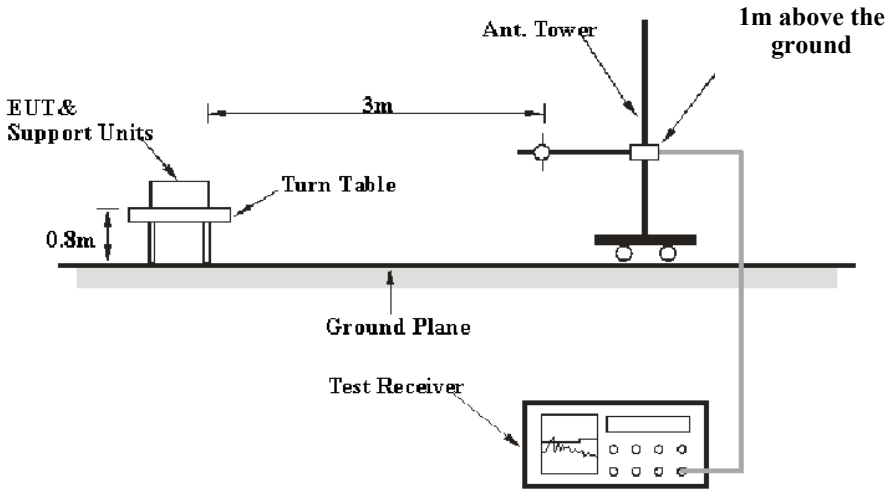
According to RSS-GEN § 8.10 & RSS-247 § 5.5

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

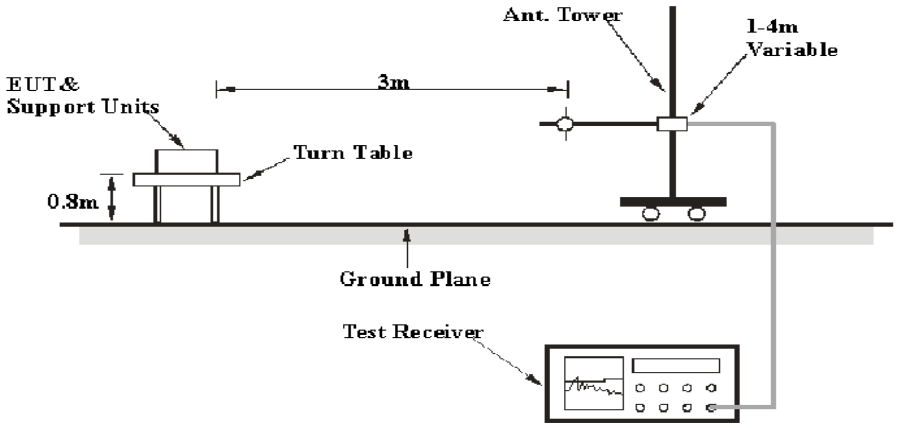
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either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

EUT Setup

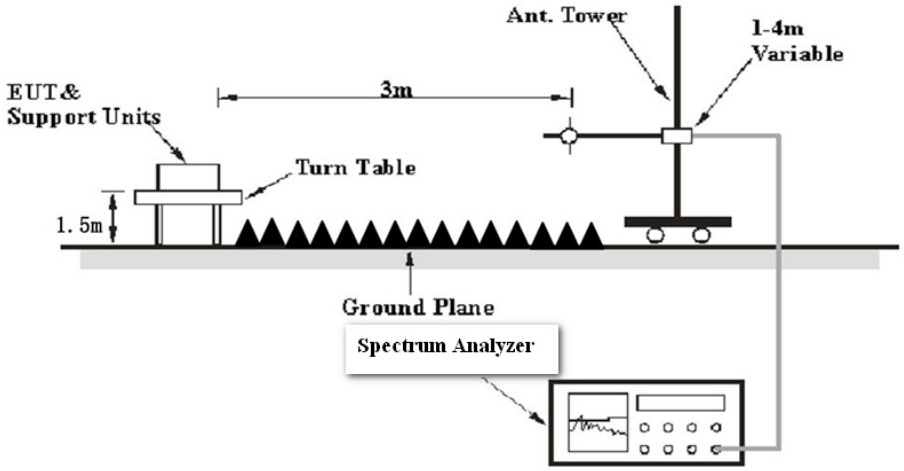
9 kHz-30MHz:



30MHz-1GHz:



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, FCC 15.247 limits and RSS-247/RSS-Gen limits.

EMI Test Receiver & Spectrum Analyzer Setup

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
9 kHz – 150 kHz	/	/	200 Hz	QP
	300 Hz	1 kHz	/	PK
150 kHz – 30 MHz	/	/	9 kHz	QP
	10 kHz	30 kHz	/	PK
30 MHz – 1000 MHz	/	/	120 kHz	QP
	100 kHz	300 kHz	/	PK
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

Test Procedure

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

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform a QP/Average measurement.

All emissions under the average limit and under the noise floor have not recorded in the report.

Factor & Over Limit/Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

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

Over Limit/Margin = Level/Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

Temperature:	22~25.6 ℃
Relative Humidity:	50~54 %
ATM Pressure:	101 kPa

The testing was performed by Anson Su on 2024-02-26 for below 1GHz and Tyler Wu on 2024-03-18 for above 1GHz

EUT operation mode: Transmitting

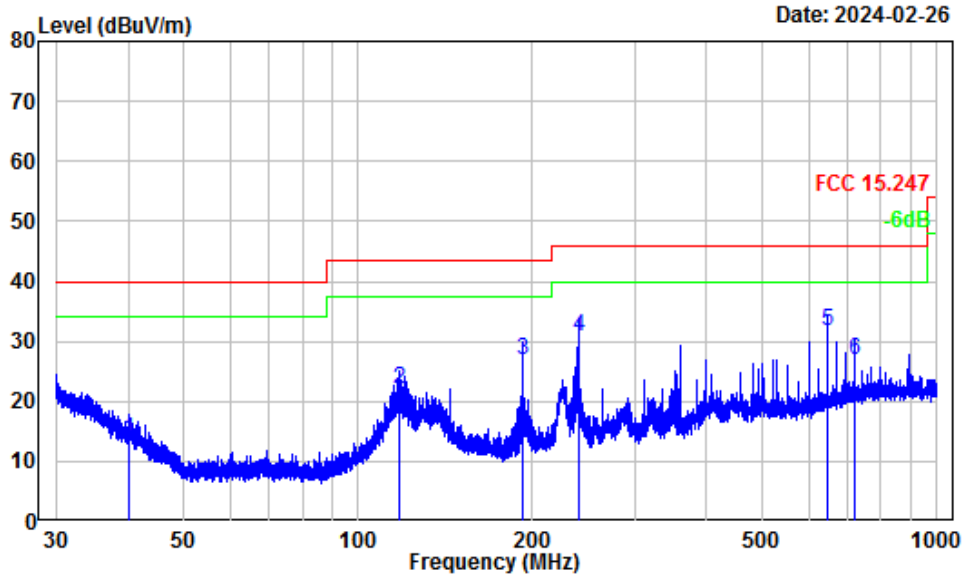
Pre-scan in the X, Y and Z axes of orientation, the worst case Z-axis of orientation was recorded.

For Adapter 1:
9 kHz-30MHz:*(maximum output power mode, low channel)*

For the radiated spurious emission below 30MHz, the emissions are 20dB below the limit or the noise floor which are not recorded.

30 MHz~1 GHz: *(maximum output power mode, low channel)*

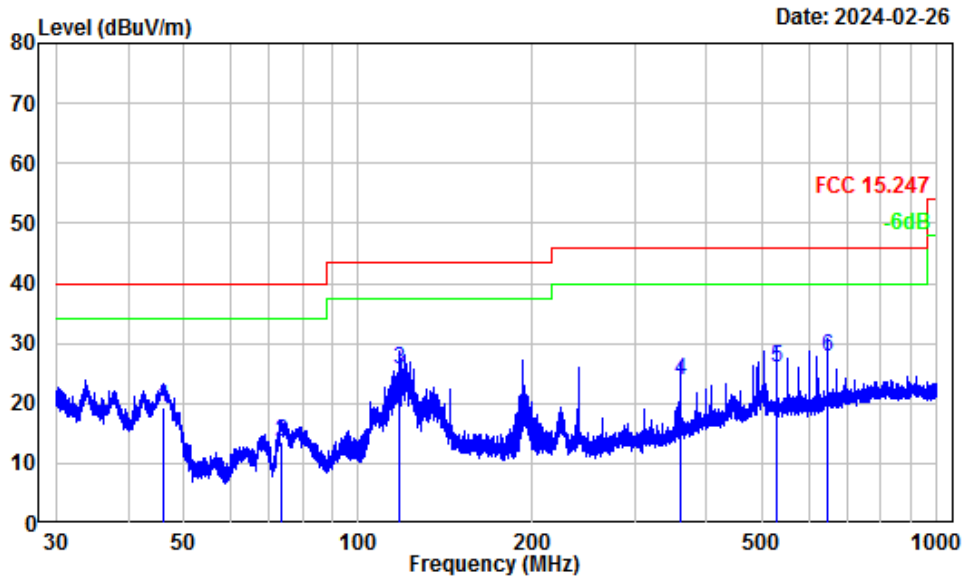
Horizontal



Site : chamber
Condition : 3m Horizontal
Project Number: SZ4240221-08602E-RF
Note : 2.4G Hopping
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	40.12	-11.59	25.25	13.66	40.00	-26.34	QP
2	118.03	-12.51	34.40	21.89	43.50	-21.61	QP
3	192.00	-14.44	41.20	26.76	43.50	-16.74	QP
4	239.99	-14.32	45.00	30.68	46.00	-15.32	QP
5	648.24	-6.71	38.31	31.60	46.00	-14.40	QP
6	720.15	-5.92	32.93	27.01	46.00	-18.99	QP

Vertical



Site : chamber
Condition : 3m Vertical
Project Number: SZ4240221-08602E-RF
Note : 2.4G Hopping
Tester : Anson Su

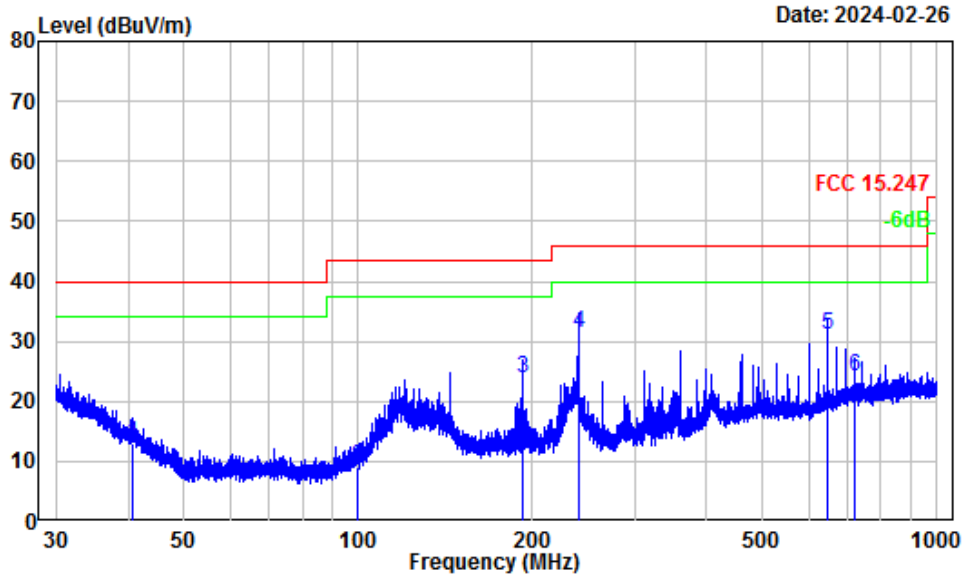
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	46.18	-16.51	35.69	19.18	40.00	-20.82	QP
2	73.65	-18.69	32.33	13.64	40.00	-26.36	QP
3	117.98	-13.07	38.62	25.55	43.50	-17.95	QP
4	360.13	-11.99	35.70	23.71	46.00	-22.29	QP
5	528.01	-8.36	34.31	25.95	46.00	-20.05	QP
6	648.24	-7.10	34.99	27.89	46.00	-18.11	QP

For Adapter 2：
9 kHz-30MHz *(maximum output power mode, low channel)***:**

For the radiated spurious emission below 30MHz, the emissions are 20dB below the limit or the noise floor which are not recorded.

30 MHz~1 GHz: *(maximum output power mode, low channel)*

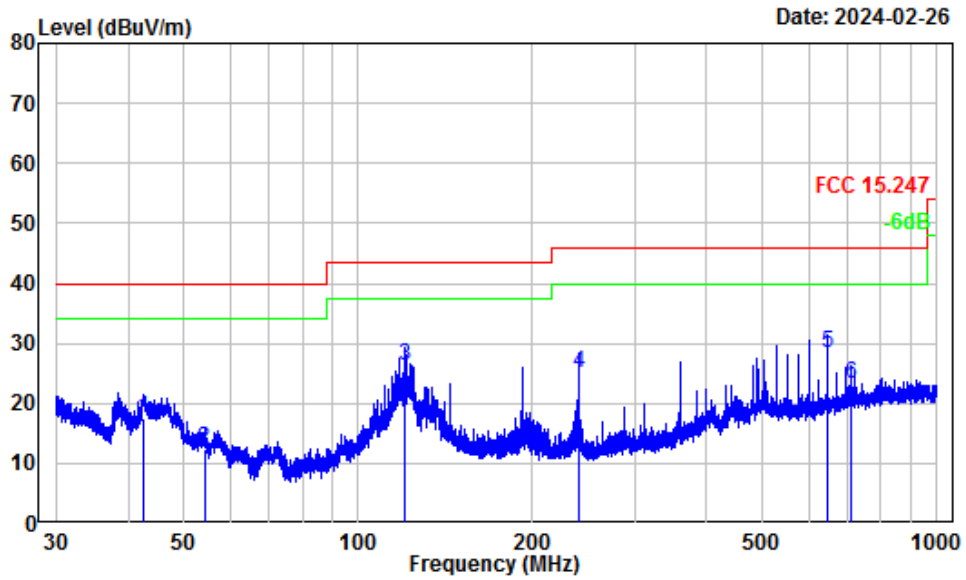
Horizontal



Site : chamber
Condition : 3m Horizontal
Project Number: SZ4240221-08602E-RF
Note : 2.4G Hopping
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	40.83	-12.04	25.14	13.10	40.00	-26.90	QP
2	99.79	-15.52	24.71	9.19	43.50	-34.31	QP
3	192.00	-14.44	38.21	23.77	43.50	-19.73	QP
4	239.99	-14.32	45.84	31.52	46.00	-14.48	QP
5	648.24	-6.71	37.75	31.04	46.00	-14.96	QP
6	720.15	-5.92	29.93	24.01	46.00	-21.99	QP

Vertical



Site : chamber
Condition : 3m Vertical
Project Number: SZ4240221-08602E-RF
Note : 2.4G Hopping
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	42.47	-14.41	31.87	17.46	40.00	-22.54	QP
2	54.17	-18.74	31.02	12.28	40.00	-27.72	QP
3	120.01	-12.77	38.92	26.15	43.50	-17.35	QP
4	239.99	-14.88	40.07	25.19	46.00	-20.81	QP
5	648.24	-7.10	35.62	28.52	46.00	-17.48	QP
6	708.56	-6.49	29.61	23.12	46.00	-22.88	QP

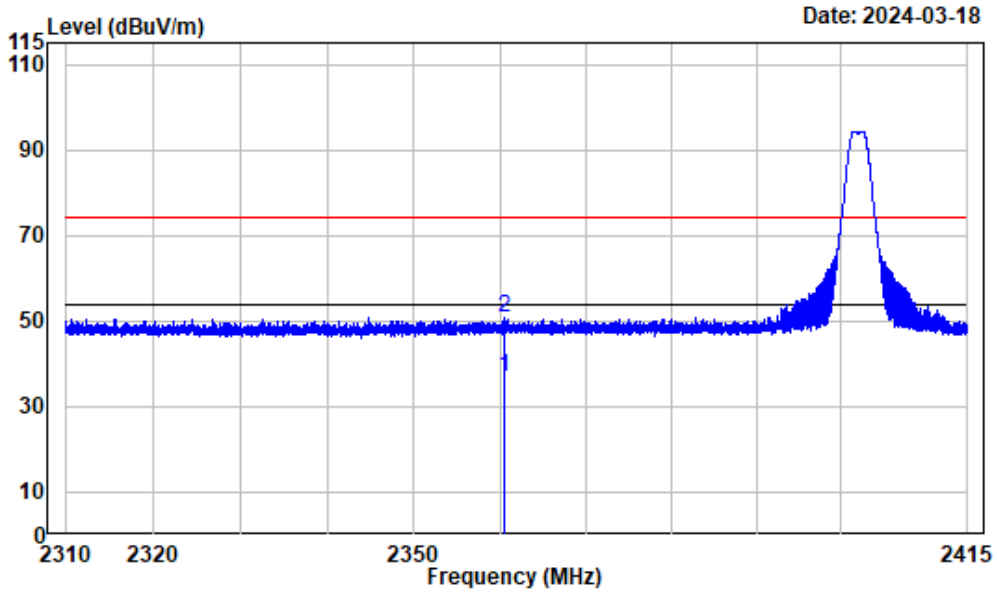
Above 1GHz:

Frequency (MHz)	Receiver		Polar (H / V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)					
Low Channel 2402MHz							
4804.00	46.07	PK	H	2.42	48.49	74	-25.51
4804.00	31.98	AV	H	2.42	34.40	54	-19.60
4804.00	46.29	PK	V	2.42	48.71	74	-25.29
4804.00	32.02	AV	V	2.42	34.44	54	-19.56
Middle Channel 2440MHz							
4880.00	46.05	PK	H	2.58	48.63	74	-25.37
4880.00	31.83	AV	H	2.58	34.41	54	-19.59
4880.00	46.17	PK	V	2.58	48.75	74	-25.25
4880.00	31.92	AV	V	2.58	34.50	54	-19.50
High Channel 2476MHz							
4952.00	46.02	PK	H	2.62	48.64	74	-25.36
4952.00	31.79	AV	H	2.62	34.41	54	-19.59
4952.00	45.74	PK	V	2.62	48.36	74	-25.64
4952.00	31.61	AV	V	2.62	34.23	54	-19.77

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude/Level = Factor + Reading
Margin = Corrected Amplitude/Level - Limit
The other spurious emission which is in the noise floor level was not recorded.

Test plots for Band Edge Measurements (Radiated):

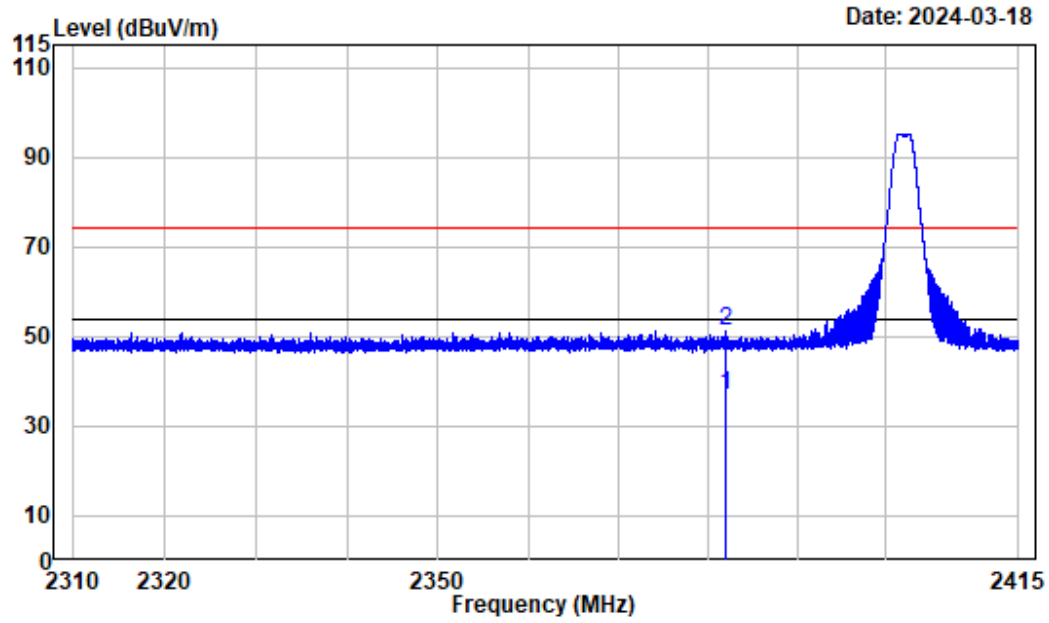
GFSK			
Test Channel:	**2402MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240221-08602E
Tester : Tyler
Note : 2.4G FHSS_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2360.452	-3.16	40.12	36.96	54.00	-17.04	Average
2	2360.452	-3.16	54.04	50.88	74.00	-23.12	peak

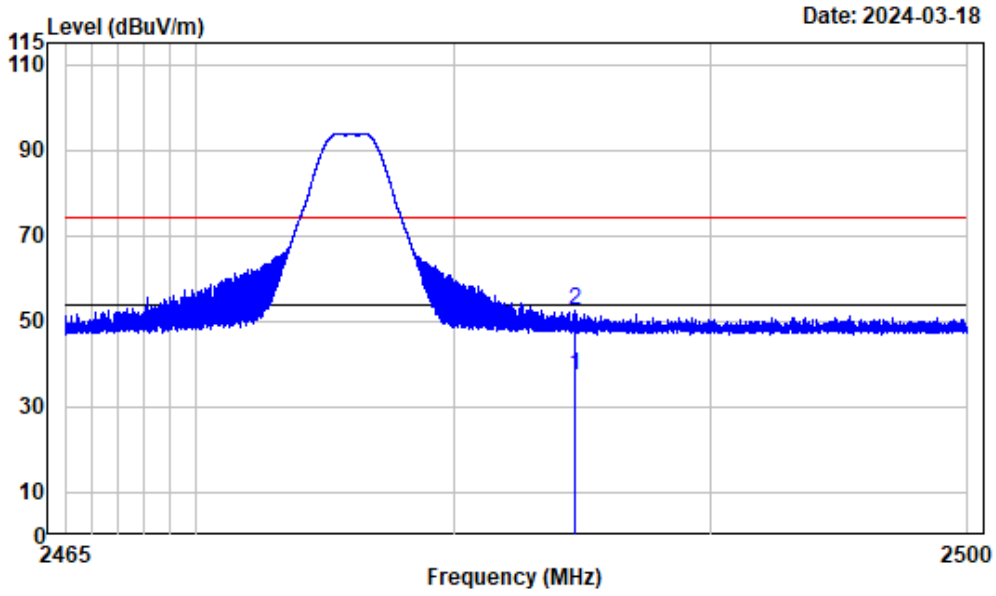
GFSK			
Test Channel:	**2402MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240221-08602E
Tester : Tyler
Note : 2.4G FHSS_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2382.017	-3.19	40.23	37.04	54.00	-16.96	Average
2	2382.017	-3.19	54.43	51.24	74.00	-22.76	peak

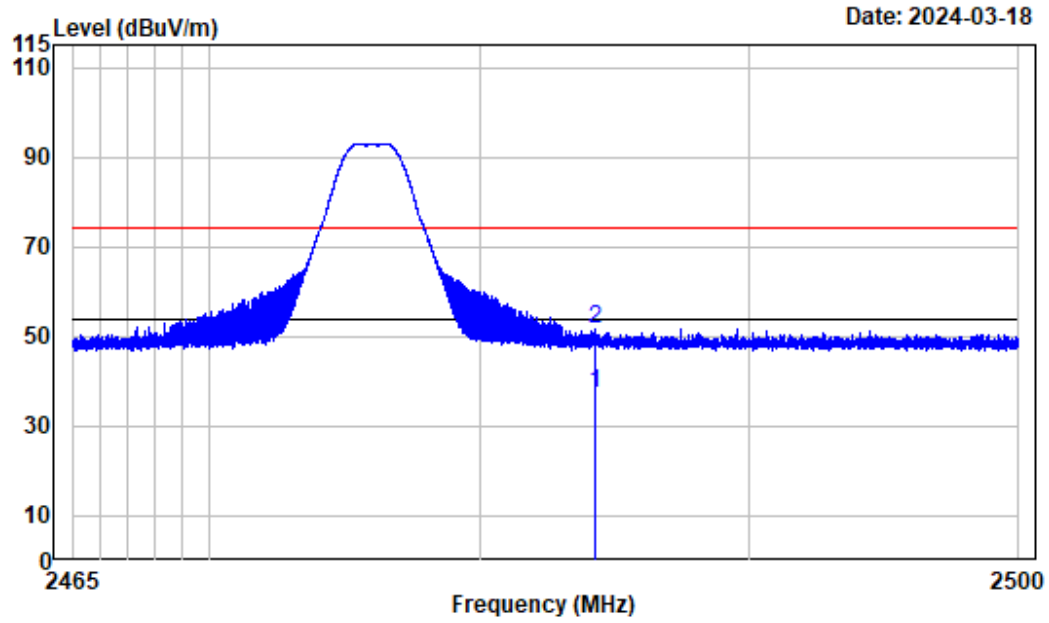
GFSK			
Test Channel:	**2476MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240221-08602E
Tester : Tyler
Note : 2.4G FHSS_2476

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2484.696	-3.17	40.46	37.29	54.00	-16.71	Average
2	2484.696	-3.17	55.72	52.55	74.00	-21.45	peak

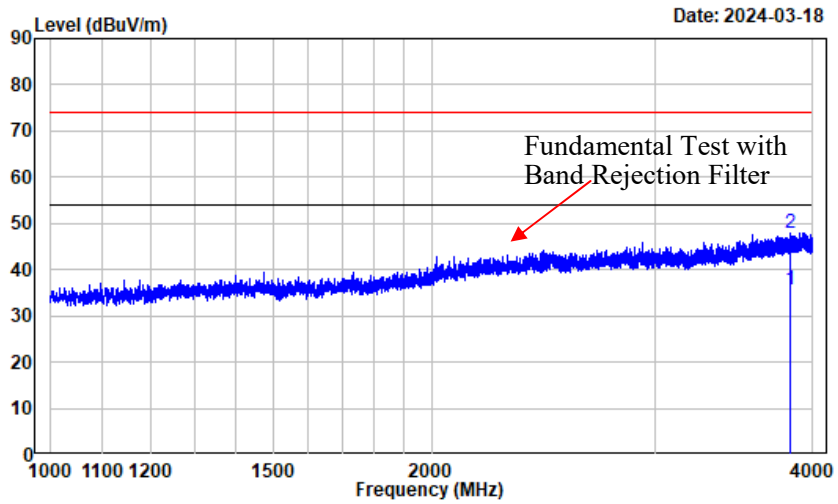
GFSK			
Test Channel:	**2476MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240221-08602E
Tester : Tyler
Note : 2.4G FHSS_2476

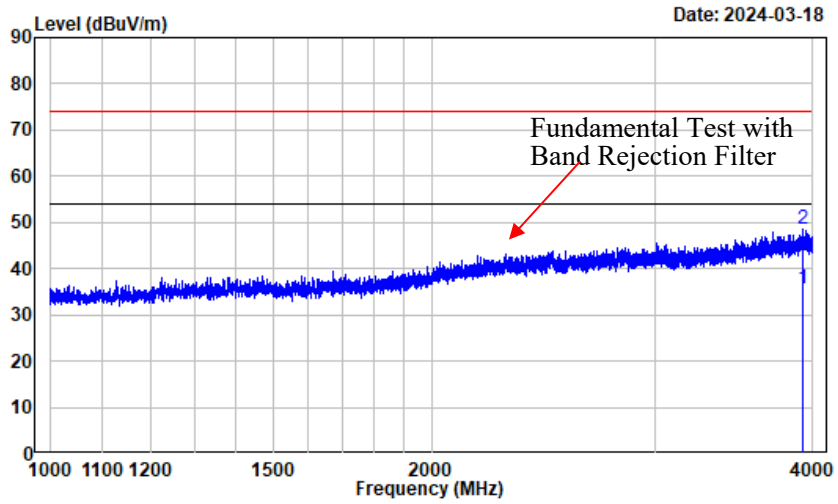
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2484.302	-3.17	40.41	37.24	54.00	-16.76	Average
2	2484.302	-3.17	54.84	51.67	74.00	-22.33	peak

Listed with the harmonic margin test plot: (Middle Channel)

Horizontal	
1-4GHz	

Condition : Horizontal
Project No.: SZ4240221-08602E
Tester : Tyler
Note : 2.4G FHSS_2440

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3837.625	-0.78	36.51	35.73	54.00	-18.27	Average
2	3837.625	-0.78	48.76	47.98	74.00	-26.02	Peak

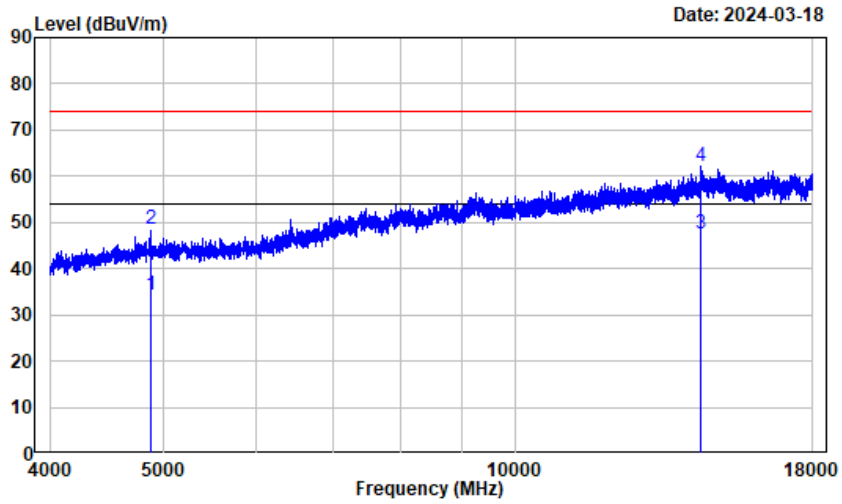
Vertical	
1-4GHz	

Condition : Vertical
Project No.: SZ4240221-08602E
Tester : Tyler
Note : 2.4G FHSS_2440

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3927.625	-0.32	36.00	35.68	54.00	-18.32	Average
2	3927.625	-0.32	48.85	48.53	74.00	-25.47	Peak

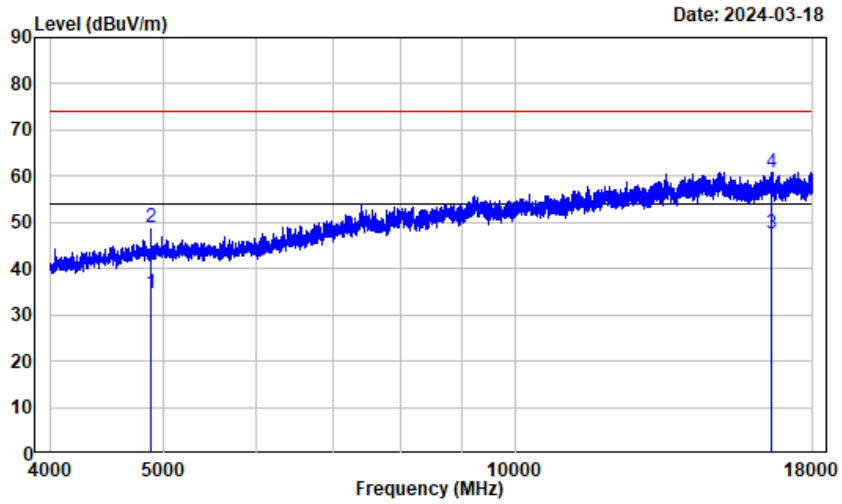
Horizontal

4-18GHz

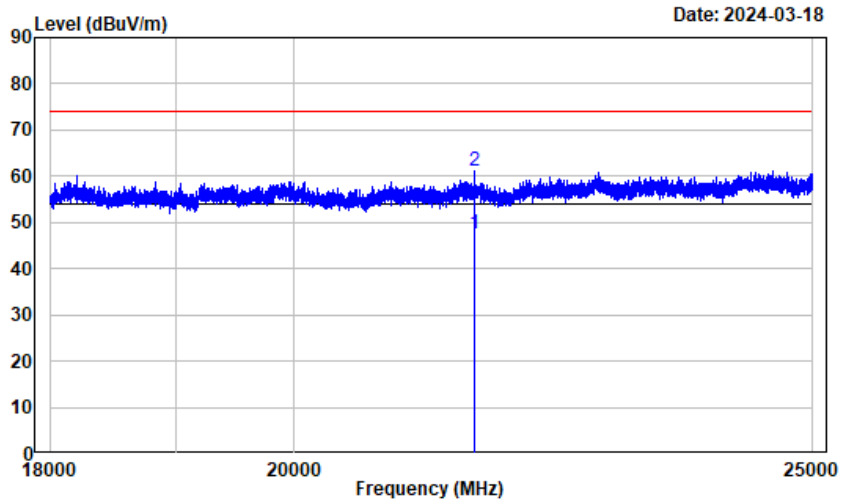


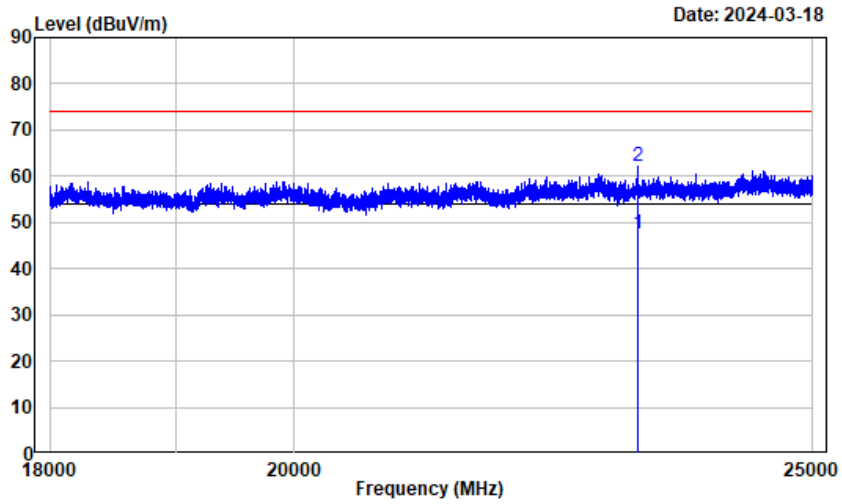
Condition : Horizontal
Project No.: SZ4240221-08602E
Tester : Tyler
Note : 2.4G FHSS_2440

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4880.000	2.58	31.83	34.41	54.00	-19.59	Average
2	4880.000	2.58	46.05	48.63	74.00	-25.37	Peak
3	14419.500	17.28	30.26	47.54	54.00	-6.46	Average
4	14419.500	17.28	44.72	62.00	74.00	-12.00	Peak

Vertical	
4-18GHz	 Condition : Vertical Project No.: SZ4240221-08602E Tester : Tyler Note : 2.4G FHSS_2440

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4880.000	2.58	31.92	34.50	54.00	-19.50	Average
2	4880.000	2.58	46.17	48.75	74.00	-25.25	Peak
3	16617.500	16.13	31.36	47.49	54.00	-6.51	Average
4	16617.500	16.13	44.71	60.84	74.00	-13.16	Peak

Horizontal	
18-25GHz	 Condition : Horizontal Project No.: SZ4240221-08602E Tester : Tyler Note : 2.4G FHSS_2440 | | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark | | | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | | | 1 | 21608.500 | 16.04 | 31.64 | 47.68 | 54.00 | -6.32 | Average | | 2 | 21608.500 | 16.04 | 45.17 | 61.21 | 74.00 | -12.79 | Peak |

Vertical	
18-25GHz	 Condition : Vertical Project No.: SZ4240221-08602E Tester : Tyler Note : 2.4G FHSS_2440 Freq / Factor / Read Level / Level / Limit Line / Over Limit / Remark MHz / dB/m / dBuV / dBuV/m / dBuV/m / dB 1 23188.750 17.34 30.27 47.61 54.00 -6.39 Average 2 23188.750 17.34 44.74 62.08 74.00 -11.92 Peak

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

Applicable Standard

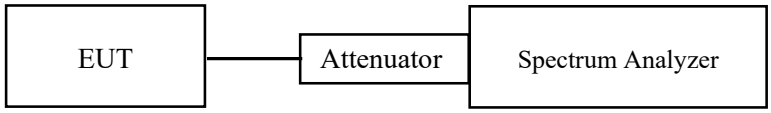
Frequency hopping systems (FHSs) shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies 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.

Test Procedure

According to ANSI C63.10-2013 section 7.8.2

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

Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.



Test Data

Environmental Conditions

Temperature:	24.1 ℃
Relative Humidity:	45 %
ATM Pressure:	101 kPa

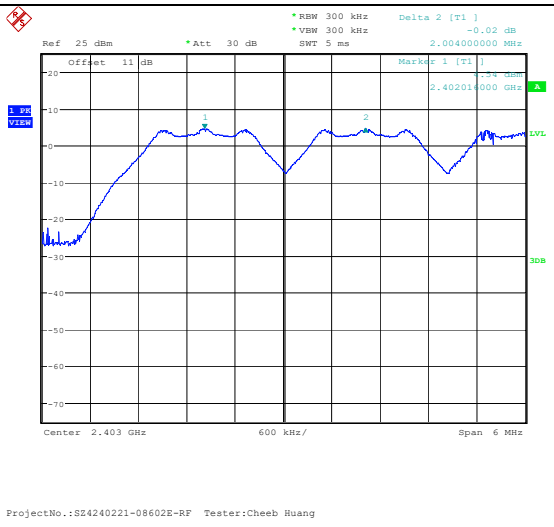
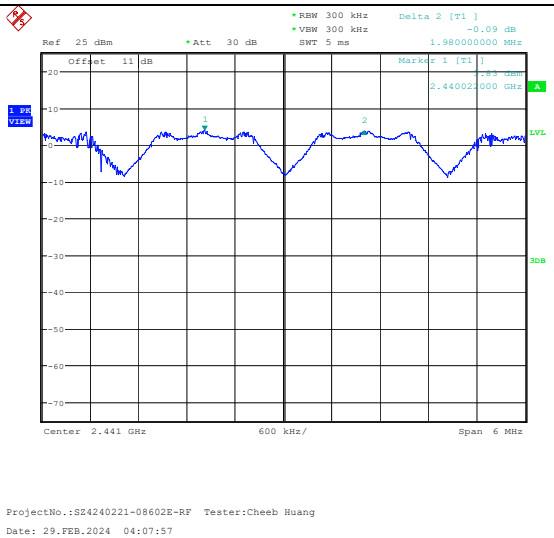
The testing was performed by Cheeb Huang on 2024-02-29.

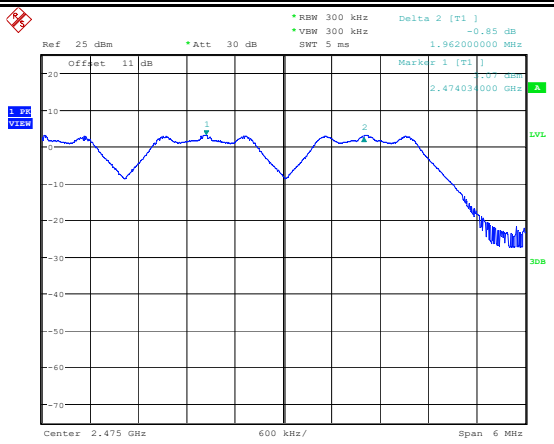
EUT operation mode: Transmitting

Test Result: Compliant

Test Channel	Test Frequency (MHz)	Channel Separation (MHz)	Limits (MHz)
Lowest	2402	2.004	1.388
Middle	2440	1.980	1.392
Highest	2476	1.962	1.388

Please refer to the below plots:

GFSK	
Low Channel	
Middle Channel	

High Channel	

FCC §15.247(a) (1) & RSS-GEN § 6.7 & RSS-247 § 5.1 (a)–99% OCCUPIED BANDWIDTH & 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.

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

In some cases, the "20 dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated 20 dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

Test Procedure

According to ANSI C63.10-2013 section 7.8.7

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.

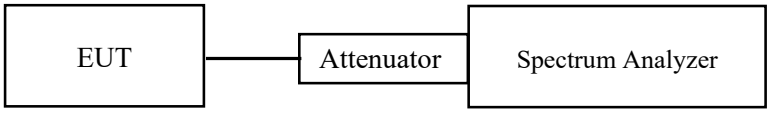
The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / 20 dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 20 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.
For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Test Data

Environmental Conditions

Temperature:	24.1 ℃
Relative Humidity:	45 %
ATM Pressure:	101 kPa

The testing was performed by Cheeb Huang on 2024-02-29.

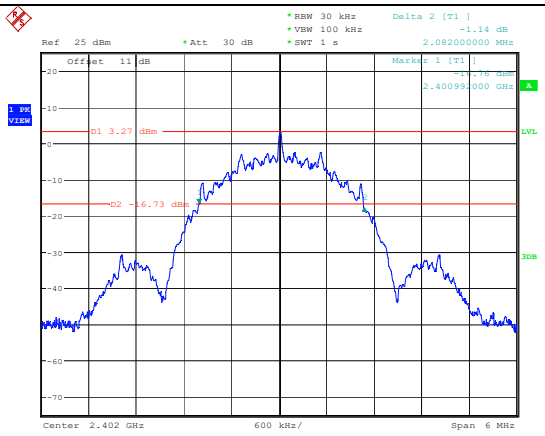
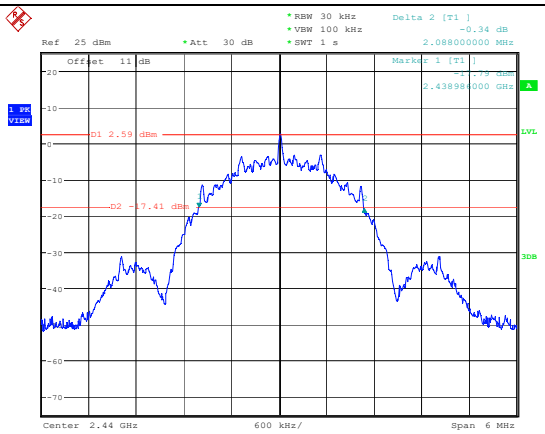
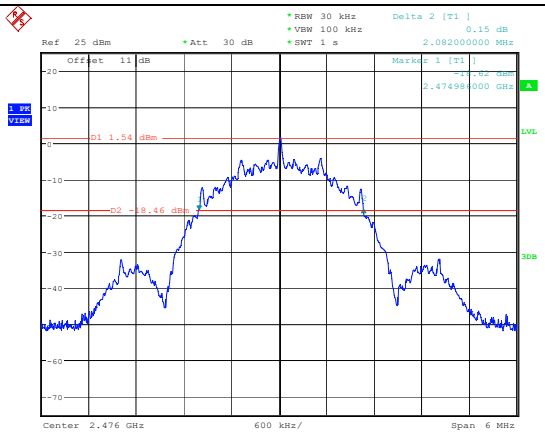
EUT operation mode: Transmitting

Test Result: Compliant

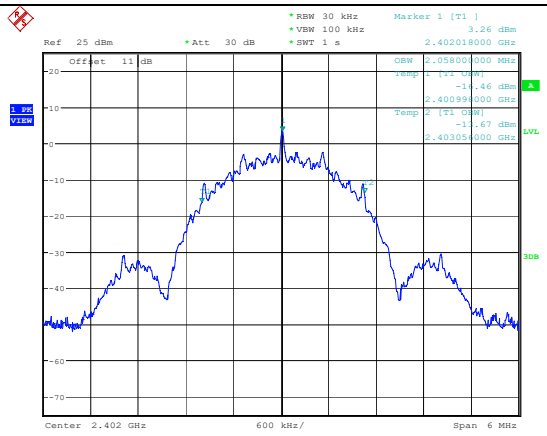
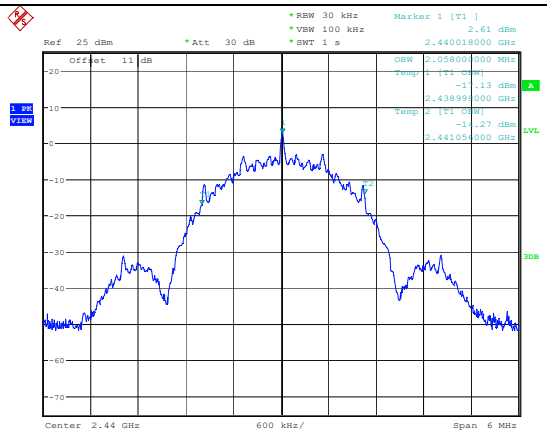
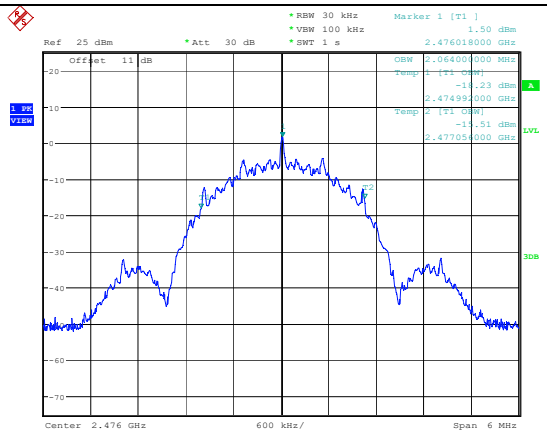
Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)	OBW (MHz)
GFSK	Low	2402	2.082	2.058
	Middle	2440	2.088	2.058
	High	2476	2.082	2.064

Please refer to the below plots:

20 dB Emission Bandwidth

GFSK	
Low Channel	
Middle Channel	
High Channel	

99% Occupied Bandwidth

GFSK	
Low Channel	
Middle Channel	
High Channel	

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

Applicable Standard

Frequency hopping systems (FHSs) 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.

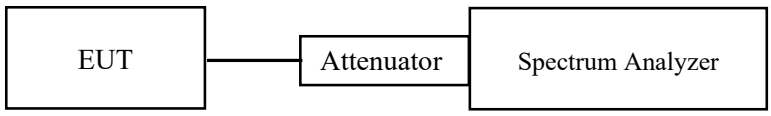
Test Procedure

According to ANSI C63.10-2013 section 7.8.3

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101 kPa

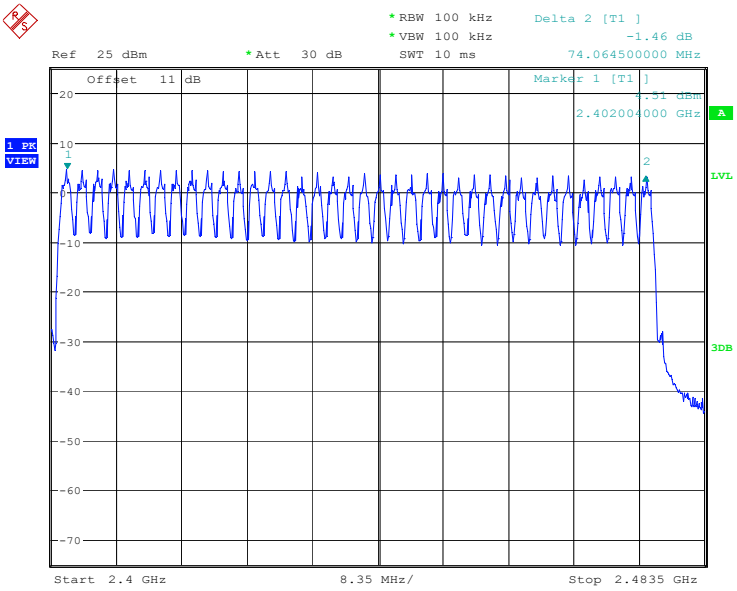
The testing was performed by Cheeb Huang on 2024-04-02.

EUT operation mode: Transmitting

Test Result: Compliant

Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
GFSK	2400-2483.5	38	≥15

Hopping Channel



ProjectNo.:SZ4240221-08602E-RF Tester:Cheeb Huang

Date: 2.APR.2024 11:07:07

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

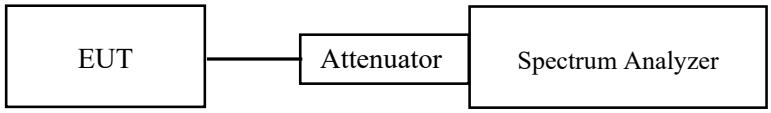
Applicable Standard

Frequency hopping systems (FHSs) 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

According to ANSI C63.10-2013 section 7.8.4

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses



Test Data

Environmental Conditions

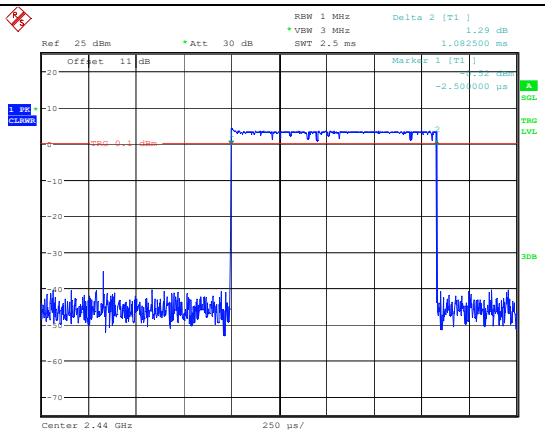
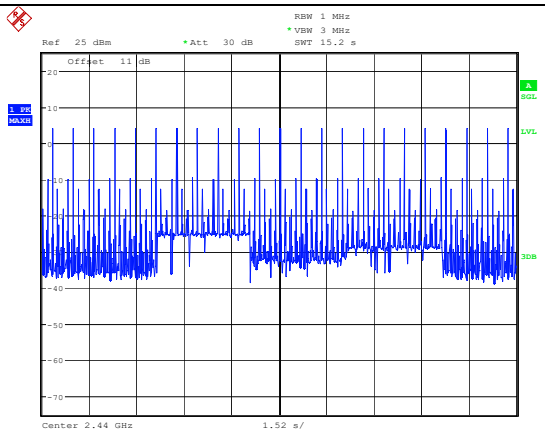
Temperature:	24.1~25 ℃
Relative Humidity:	45~50 %
ATM Pressure:	101 kPa

The testing was performed by Cheeb Huang on 2024-02-29 &2024-04-02.

EUT operation mode: Transmitting

Test Result: Compliant

Test Frequency (MHz)	Pulse width (ms)	Observation time (s)	Hopping Numbers in Observation time	Dwell Time (s)	Limit (s)
2440	1.083	15.2	23	0.025	0.400
Note: Observation time= Hopping Channel Number× 0.4 Note 2: Dwell Time = Pulse width *Hopping Numbers in Observation time					

GFSK	
Pulse Width	
Hopping Numbers in Observation time	

FCC §15.247(b) (1) & RSS-247§ 5.1(b) &§ 5.4(b) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

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

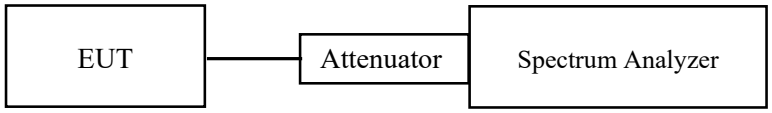
For frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W (see Section 5.4(e) for exceptions).

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

Test Procedure

According to ANSI C63.10-2013 section 7.8.5

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



Test Data

Environmental Conditions

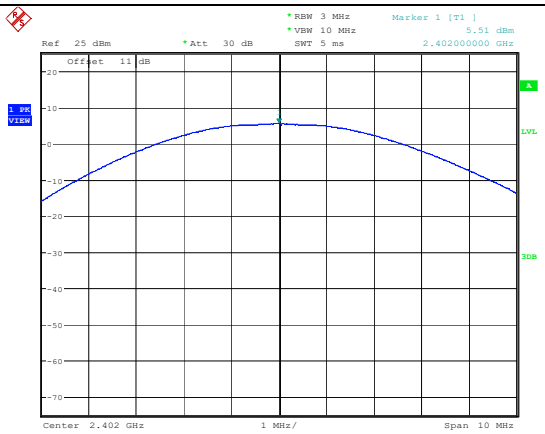
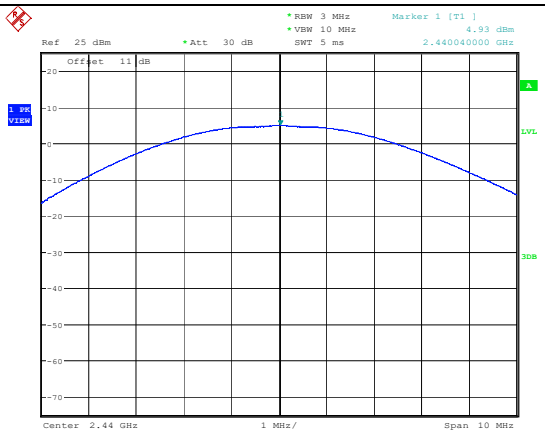
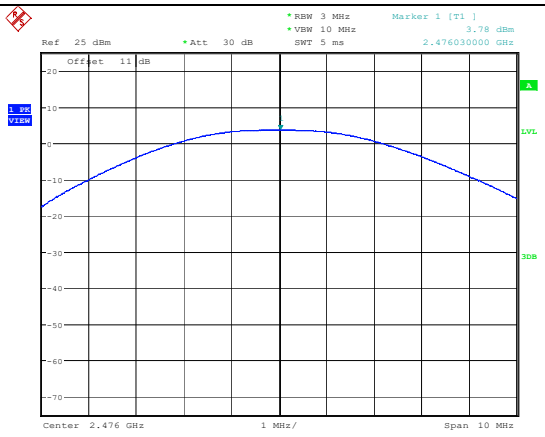
Temperature:	24.1 ℃
Relative Humidity:	45 %
ATM Pressure:	101 kPa

The testing was performed by Cheeb Huang on 2024-02-29.

EUT operation mode: Transmitting

Test Result: Compliant

Mode	Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
GFSK	Low	2402	5.51	21
	Middle	2440	4.93	21
	High	2476	3.78	21
Note: the antenna gain=1.45 dBi, the maximum EIRP=6.96 dBm<36dBm EIRP Limit for RSS-247:36 dBm				

GFSK	
Low Channel	
Middle Channel	
High Channel	

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

Applicable Standard

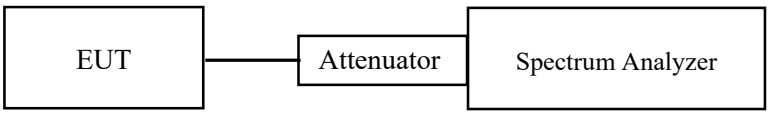
According to FCC §15.247(d) & RSS-247 § 5.5.

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)) & RSS-Gen.

Test Procedure

According to ANSI C63.10-2013 section 6.10

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

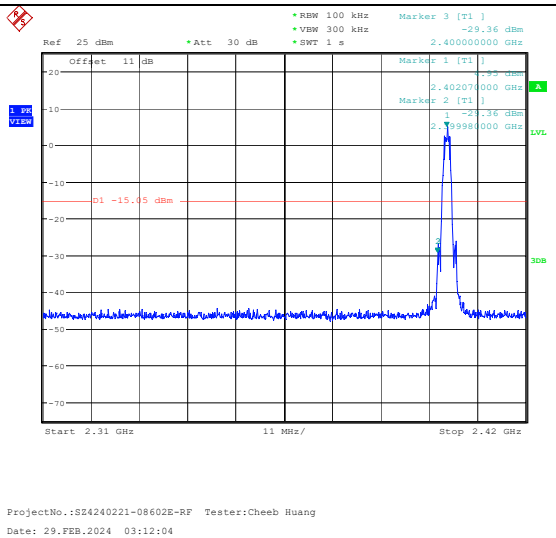
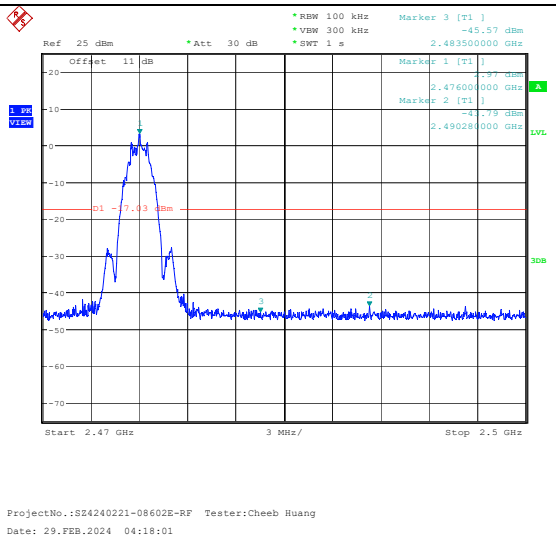
Temperature:	24.1 ℃
Relative Humidity:	45 %
ATM Pressure:	101 kPa

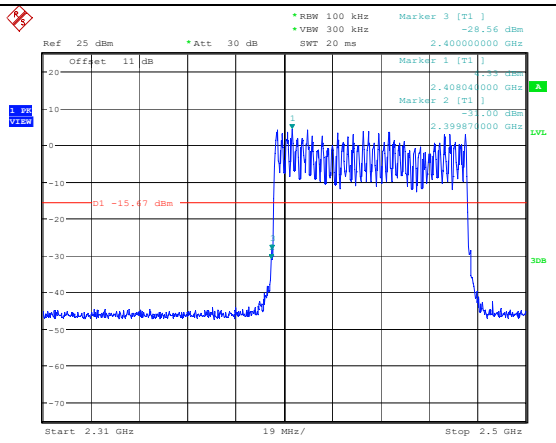
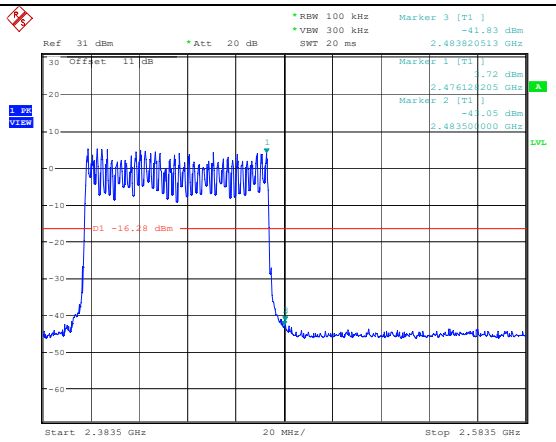
The testing was performed by Cheeb Huang from 2024-02-29 to 2024-04-15.

EUT operation mode: Transmitting

Test Result: Compliant

Conducted Band Edge Result:

Band Edge, Single Channel	
GFSK Left Side	
GFSK Right Side	

Band Edge, Hopping Channel	
GFSK Left Side	
GFSK Right Side	

EUT PHOTOGRAPHS

Please refer to the attachment SZ4240221-08602E-RF External photo and SZ4240221-08602E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment SZ4240221-08602E-RF Test Setup photo.

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