



FCC PART 15.247
RSS-GEN ISSUE 5, FEBRUARY 2021 AMENDMENT 2
RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Computime Ltd.

FCC: 6/F, Bldg 20E, Phase 3, Hong Kong Science Park, 20 Science Park East Ave, Shatin, New Territories, Shatin, Hong Kong

ISED: 6/F, Building 20E, Phase 3, Hong Kong Science Park, 20 Science Park East Avenue, Shatin, New Territories, Hong Kong

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Report Type: Original Report	Product Type: Baby Monitor – Monitor
Report Number: SZ4210901-45529E-RF	
Report Date: 2021-10-25	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Baby Monitor – Monitor
Tested Model	BDXNMBP01_BMQA01
Multiple Model	BDXNMBZ01_BMQA01, BDXCMB001_BMQB01
Model Differences	Refer to the DoS letter
HVIN	BMQA01A (for BDXNMBP01_BMQA01, BDXNMBZ01_BMQA01), BMQB01A (for BDXCMB001_BMQB01)
Frequency Range	2402-2480MHz
Maximum conducted Peak output power	14.63dBm
Modulation Technique	GFSK
Antenna Specification*	0dBi(It is provided by the applicant)
Voltage Range	DC3.8V from battery or DC 5.0V from adapter
Sample number	SZ4210901-45529E-RF-S1(conduction) SZ4210901-45529E-RF-S2(radiation)
Received date	2021-09-01
Sample/EUT Status	Good condition
Adapter information	Model: BQ05A-0501000-U Input: AC 100-240V~50/60Hz, Max.300mA Output: DC 5.0V, 1000mA

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission rules and RSS-GEN Issue 5, February 2021 Amendment 2 and RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209, 15.247 rules, RSS-GEN and RSS-247.

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-GEN Issue 5, February 2021 Amendment 2 and RSS-247, Issue 2, February 2017.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Line conducted emission		2.72dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
Temperature		1°C
Humidity		6%
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 Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A-2.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

Frequency List:

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 1, 19 and 39

EUT Exercise Software

“SecureCRTPortable.exe”* software was used to the EUT tested and power level is default*. The software and power level was provided by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

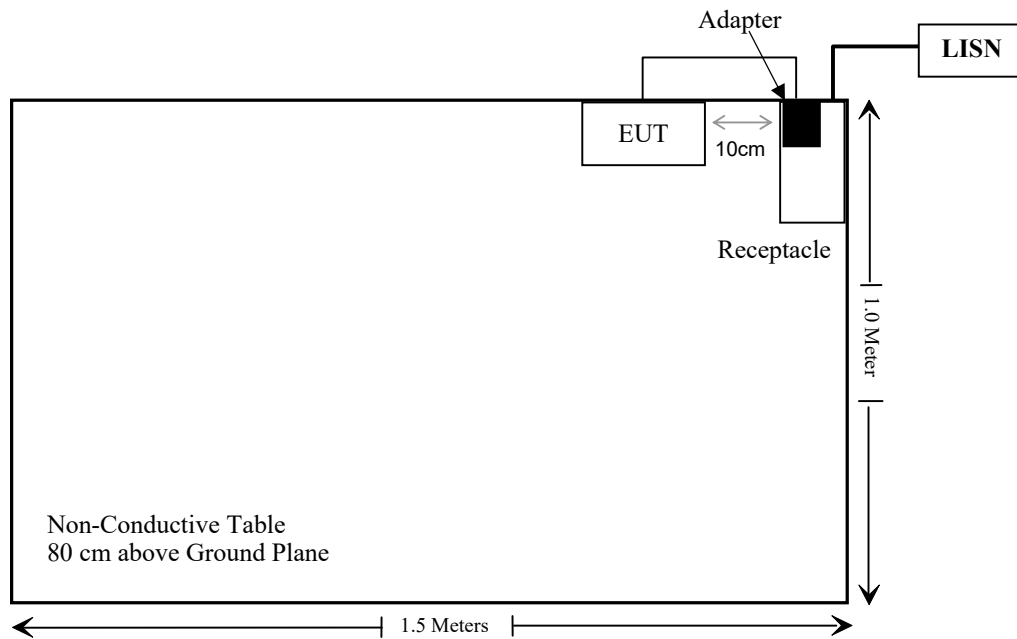
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-Shielding Un-Detachable USB Cable	2.0	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	ISED Rules	Description of Test	Result
§15.247 (i), §2.1091	RSS-102 § 2.5.2	Maximum Permissible Exposure(MPE) & 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	Test Receiver	ESPI3	100396	2020/12/24	2021/12/23
R & S	L.I.S.N.	ENV216	101314	2020/12/25	2021/12/24
Anritsu Corp	50ΩCoaxial Switch	MP59B	6200506474	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-2m	No.2	2020/12/25	2021/12/24
Conducted Emission Test Software:ES-K1 V1.71					
Radiated Emission Test					
Rohde& Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/12/24	2021/12/23
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2021/07/08	2022/07/07
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/28	2021/11/27
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/12/25	2021/12/24
SCHWARZBECK	LOOP ANTENNA	FMZB1516	1516131	2020/01/05	2023/01/04
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2023/01/04
OREGON SCIENTIFIC	Temperature & Humidity Meter	JB913R	GZ-WS004	2020/01/02	2023/01/01
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Radiated Emission Test Software: EZ_EMV V 1.1.4.2					
Unknown	RF Coaxial Cable	N-5m	No.3	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-5m	No.4	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.5	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.6	2020/12/25	2021/12/24
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2020/12/25	2021/12/24
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/12/24	2021/12/23
Rohde & Schwarz	Open Switch and Control Unit	OSP120 +OS P-B157	101244 + 100866	2020/12/24	2021/12/23

* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. 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) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

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

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

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

Frequency (MHz)	Antenna Gain		Tune Up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2402-2480	0	1	15.0	31.62	20	0.006	1.0

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

Result: Compliance

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.

Calculated Data:

The worst case is $f = 2402$ MHz:

The limit is $1.31 \times 10^{-2} f^{0.6834} \text{ W} = 2.68 \text{ W}$

The antenna gain is 0dBi.

The max tune-up conducted output power is $15.0 \text{ dBm} = 0.032 \text{ W} < 2.68 \text{ W}$

So the RF Exposure evaluation can be exempted.

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 one integral antenna arrangements which were permanently attached and the gain is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Type	Antenna Gain	Impedance
Dipole	0dBi	50 Ω

Result: Compliance.

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

Applicable Standard

FCC §15.207(a)

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 μ H / 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.

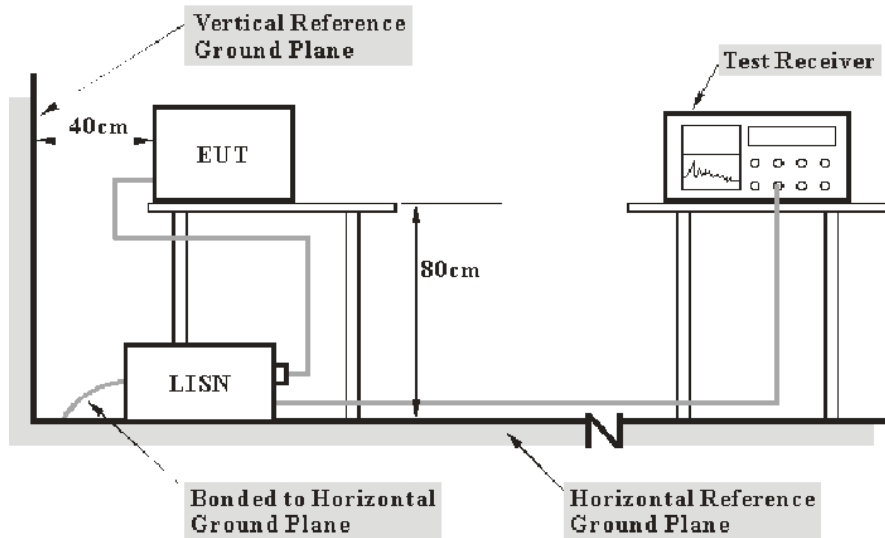
Table 4 - AC Power Lines Conducted Emission Limits		
Frequency range (MHz)	Conducted limit (dBμV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 ¹	56 to 46 ¹
0.5 – 5	56	46
5 – 30	60	50

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

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

Corrected Factor & Margin Calculation

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

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data

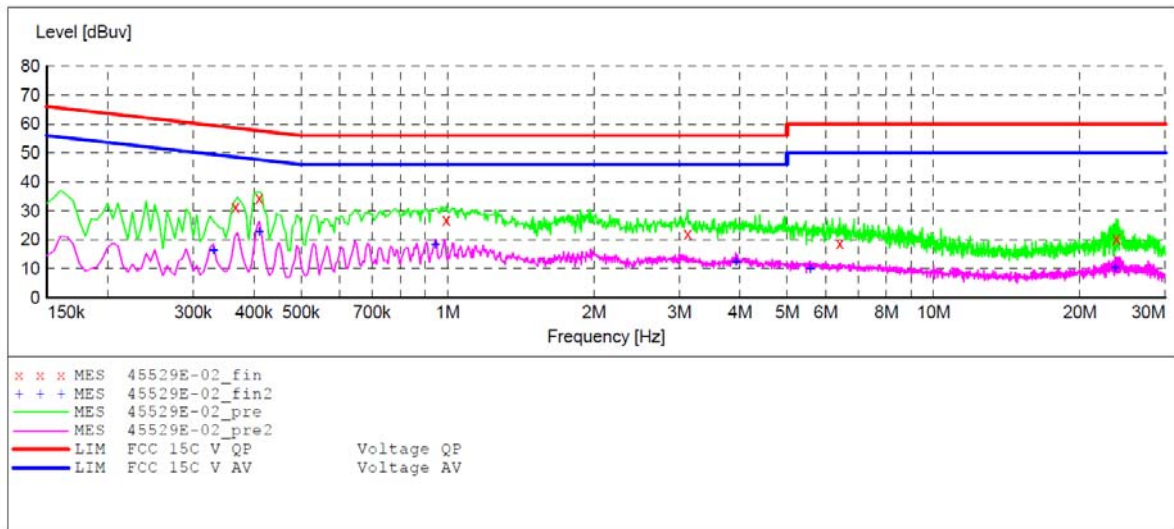
Environmental Conditions

Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-10-01.

EUT operation mode: Transmitting

AC 120V/60 Hz, Line



MEASUREMENT RESULT: "45529E-02_fin"

2021-10-1 11:08

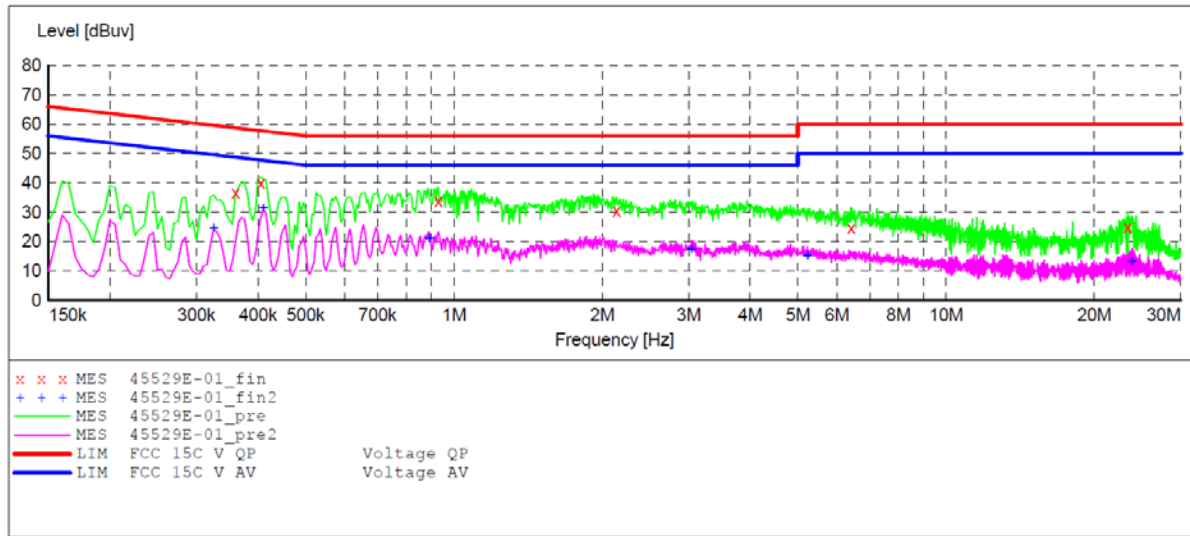
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.360000	31.30	10.9	59	27.7	QP	L1	GND
0.410000	34.70	11.0	58	23.3	QP	L1	GND
0.995000	26.90	11.1	56	29.1	QP	L1	GND
3.120000	22.10	11.3	56	33.9	QP	L1	GND
6.420000	18.70	11.5	60	41.3	QP	L1	GND
23.800000	20.50	11.7	60	39.5	QP	L1	GND

MEASUREMENT RESULT: "45529E-02_fin2"

2021-10-1 11:08

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.330000	16.80	10.9	50	33.2	AV	L1	GND
0.410000	23.10	11.0	48	24.9	AV	L1	GND
0.945000	18.20	11.1	46	27.8	AV	L1	GND
3.920000	12.30	11.4	46	33.7	AV	L1	GND
5.580000	9.70	11.5	50	40.3	AV	L1	GND
23.650000	10.40	11.7	50	39.6	AV	L1	GND

AC 120V/60 Hz, Neutral



MEASUREMENT RESULT: "45529E-01_fin"

2021-10-1 11:06

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.360000	36.80	10.9	59	22.2	QP	N	GND
0.405000	40.20	11.0	58	17.8	QP	N	GND
0.930000	33.90	11.1	56	22.1	QP	N	GND
2.140000	30.50	11.3	56	25.5	QP	N	GND
6.410000	24.60	11.5	60	35.4	QP	N	GND
23.400000	25.00	11.7	60	35.0	QP	N	GND

MEASUREMENT RESULT: "45529E-01_fin2"

2021-10-1 11:06

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.325000	25.10	10.9	50	24.9	AV	N	GND
0.410000	31.60	11.0	48	16.4	AV	N	GND
0.890000	21.10	11.1	46	24.9	AV	N	GND
3.040000	17.40	11.3	46	28.6	AV	N	GND
5.230000	15.10	11.4	50	34.9	AV	N	GND
23.850000	13.00	11.7	50	37.0	AV	N	GND

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

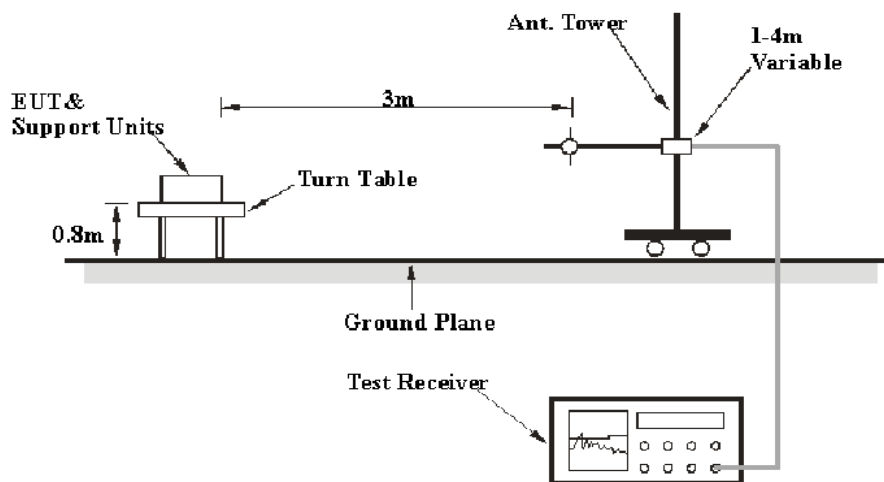
Applicable Standard

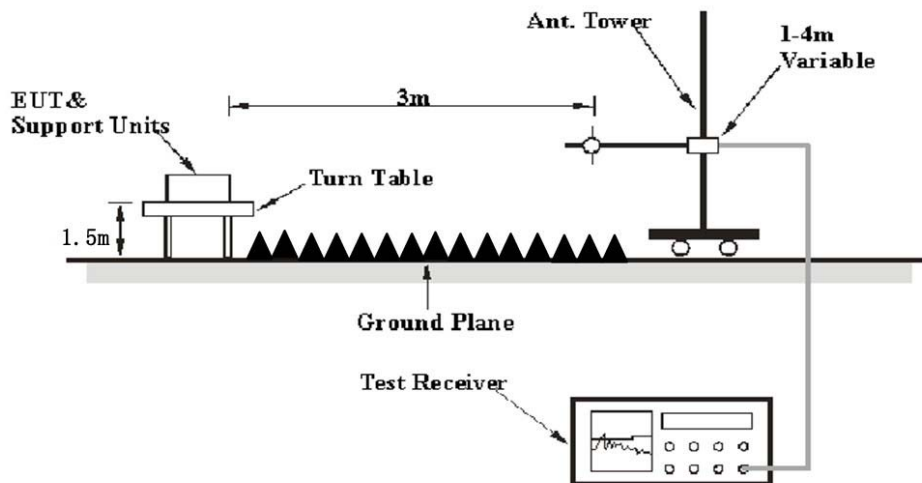
FCC §15.205; §15.209; §15.247(d) and RSS-247 §5.5

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

Below 1 GHz:



Above 1GHz:

The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, FCC 15.247 limits and RSS-247/RSS-Gen limits.

EMI Test Receiver & Spectrum Analyzer Setup

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

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

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 for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data

Environmental Conditions

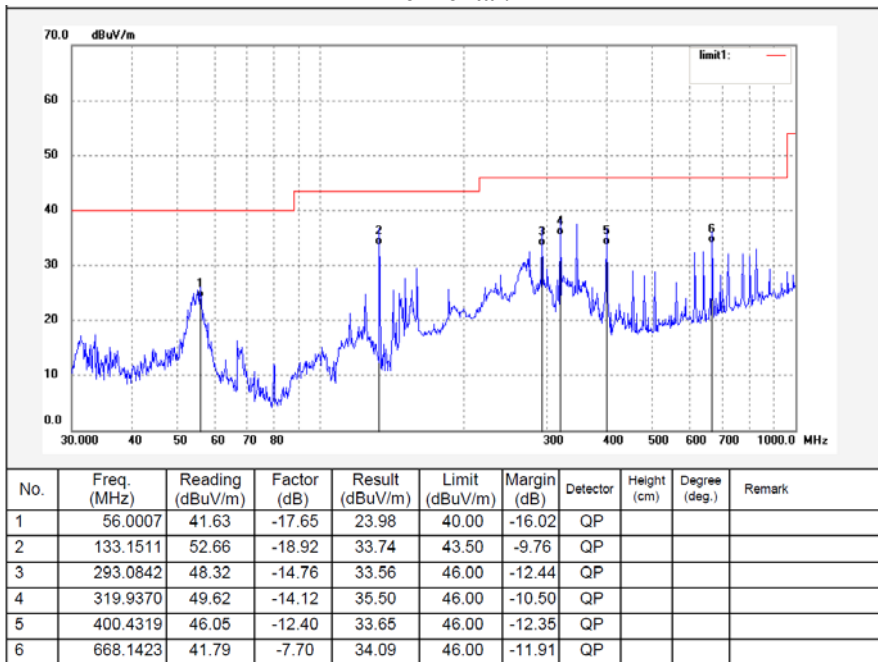
Temperature:	23~27.3 °C
Relative Humidity:	48~56 %
ATM Pressure:	101.0 kPa

The testing was performed by Icey Huang on 2021-10-01 for below 1GHz and Bin Deng on 2021-09-08 for above 1GHz.

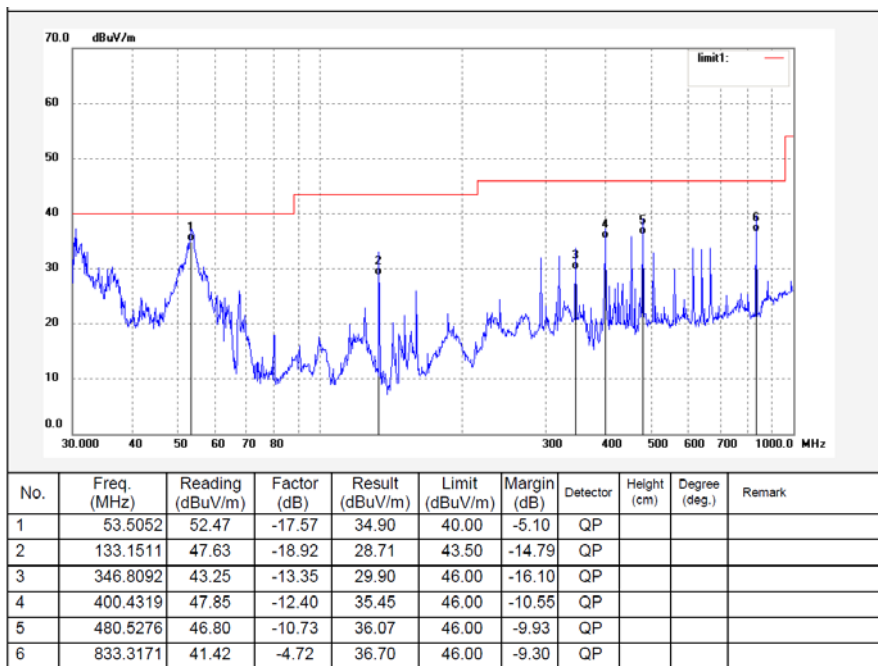
EUT operation mode: Transmitting

30MHz-1GHz: (worst case for Middle channel)

Horizontal:



Vertical



Above 1GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2402 MHz)									
2310	66.45	PK	301	1.1	H	-6.84	59.61	74	-14.39
2310	52.66	Ave.	301	1.1	H	-6.84	45.82	54	-8.18
2310	64.36	PK	263	2.1	V	-6.84	57.52	74	-16.48
2310	50.60	Ave.	263	2.1	V	-6.84	43.76	54	-10.24
2390	66.86	PK	232	2.2	H	-6.44	60.42	74	-13.58
2390	52.67	Ave.	232	2.2	H	-6.44	46.23	54	-7.77
2390	64.60	PK	58	1.6	V	-6.44	58.16	74	-15.84
2390	50.49	Ave.	58	1.6	V	-6.44	44.05	54	-9.95
4804	57.43	PK	259	2.5	H	2.81	60.24	74	-13.76
4804	35.27	Ave.	259	2.5	H	2.81	38.08	54	-15.92
4804	54.62	PK	156	1.4	V	2.81	57.43	74	-16.57
4804	32.77	Ave.	156	1.4	V	2.81	35.58	54	-18.42
7206	49.81	PK	325	1.2	H	7.46	57.27	74	-16.73
7206	27.68	Ave.	325	1.2	H	7.46	35.14	54	-18.86
7206	46.96	PK	135	2.5	V	7.46	54.42	74	-19.58
7206	24.85	Ave.	135	2.5	V	7.46	32.31	54	-21.69
9608	43.22	PK	176	1.3	H	10.54	53.76	74	-20.24
9608	40.62	PK	65	1.6	V	10.54	51.16	74	-22.84
Middle Channel (2440 MHz)									
4880	59.75	PK	125	2	H	3.04	62.79	74	-11.21
4880	36.53	Ave.	125	2	H	3.04	39.57	54	-14.43
4880	57.34	PK	265	2.2	V	3.04	60.38	74	-13.62
4880	34.21	Ave.	265	2.2	V	3.04	37.25	54	-16.75
7320	50.16	PK	55	1.1	H	8.29	58.45	74	-15.55
7320	26.86	Ave.	55	1.1	H	8.29	35.15	54	-18.85
7320	48.07	PK	238	2.4	V	8.29	56.36	74	-17.64
7320	24.67	Ave.	238	2.4	V	8.29	32.96	54	-21.04
9760	46.52	PK	35	1.8	H	11.95	58.47	74	-15.53
9760	28.08	Ave.	35	1.8	H	11.95	40.03	54	-13.97
9760	44.2	PK	235	2.2	V	11.95	56.15	74	-17.85
9760	25.73	Ave.	235	2.2	V	11.95	37.68	54	-16.32

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	PK/QP/Ave.		Height (m)	Polar (H/V)				
High Channel (2480 MHz)									
2483.5	65.89	PK	184	2.1	H	-5.96	59.93	74	-14.07
2483.5	52.31	Ave.	184	2.1	H	-5.96	46.35	54	-7.65
2483.5	63.78	PK	99	1.8	V	-5.96	57.82	74	-16.18
2483.5	50.39	Ave.	99	1.8	V	-5.96	44.43	54	-9.57
2500	65.65	PK	97	2.3	H	-5.88	59.77	74	-14.23
2500	51.76	Ave.	97	2.3	H	-5.88	45.88	54	-8.12
2500	63.23	PK	150	2.2	V	-5.88	57.35	74	-16.65
2500	49.45	Ave.	150	2.2	V	-5.88	43.57	54	-10.43
4960	60.11	PK	80	1.3	H	3.29	63.40	74	-10.60
4960	37.56	Ave.	80	1.3	H	3.29	40.85	54	-13.15
4960	58.06	PK	216	1.4	V	3.29	61.35	74	-12.65
4960	34.99	Ave.	216	1.4	V	3.29	38.28	54	-15.72
7440	50.61	PK	276	1.7	H	9.13	59.74	74	-14.26
7440	27.82	Ave.	276	1.7	H	9.13	36.95	54	-17.05
7440	48.03	PK	243	1.4	V	9.13	57.16	74	-16.84
7440	25.18	Ave.	243	1.4	V	9.13	34.31	54	-19.69
9920	49.24	PK	134	1.8	H	13.37	62.61	74	-11.39
9920	26.95	Ave.	134	1.8	H	13.37	40.32	54	-13.68
9920	46.91	PK	271	2.4	V	13.37	60.28	74	-13.72
9920	24.62	Ave.	271	2.4	V	13.37	37.99	54	-16.01

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Corrected. Amplitude- Limit

The other spurious emission which is in the noise floor level was not recorded.

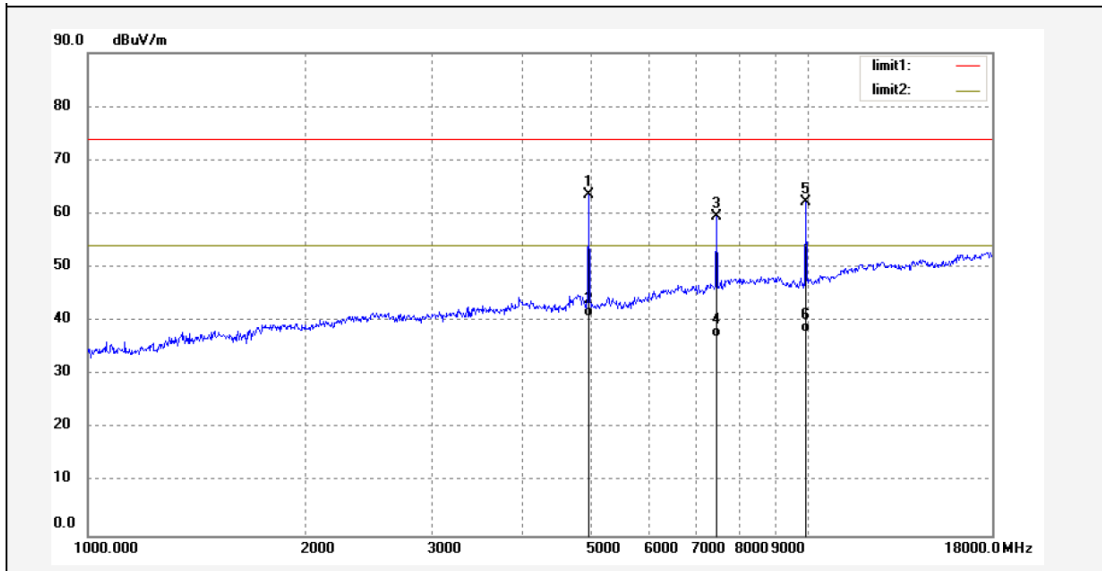
When the test result of peak was less than the limit of average, just peak value were recorded.

1-18GHz

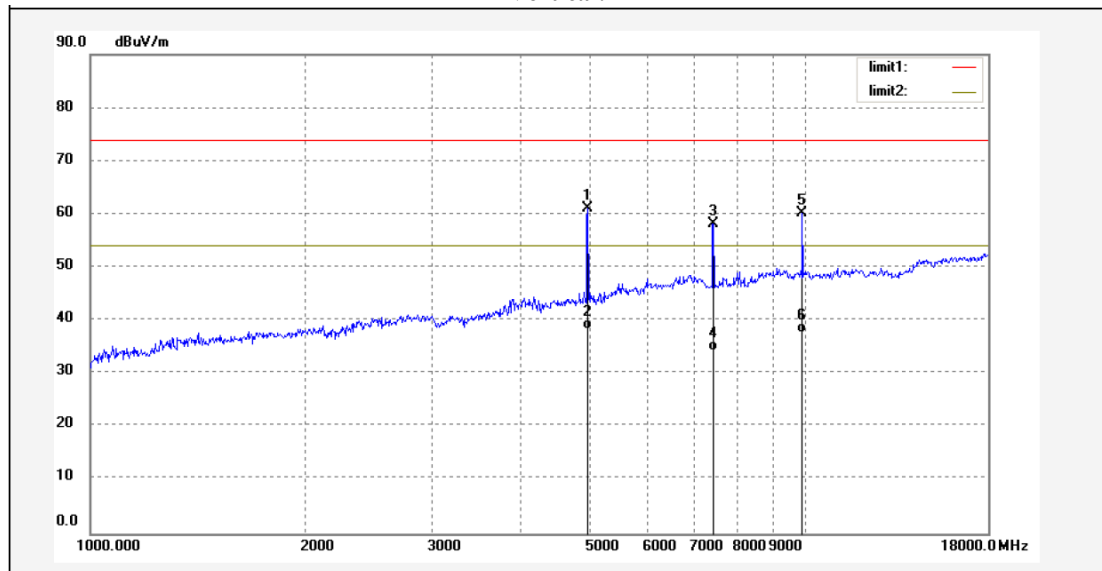
Pre-scan for Peak

High Channel

Horizontal:



Vertical:

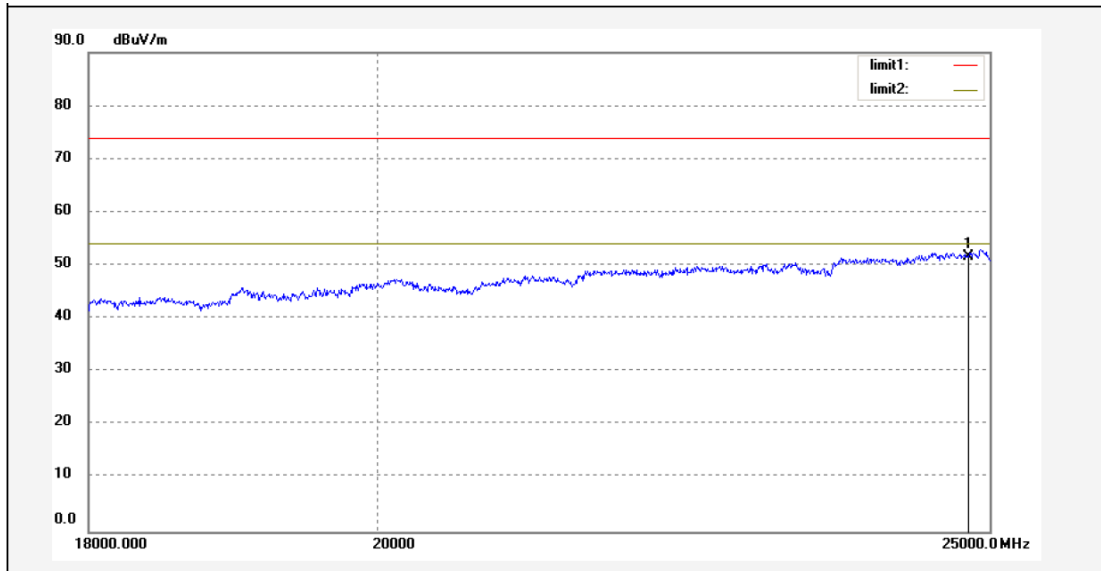


18-25GHz

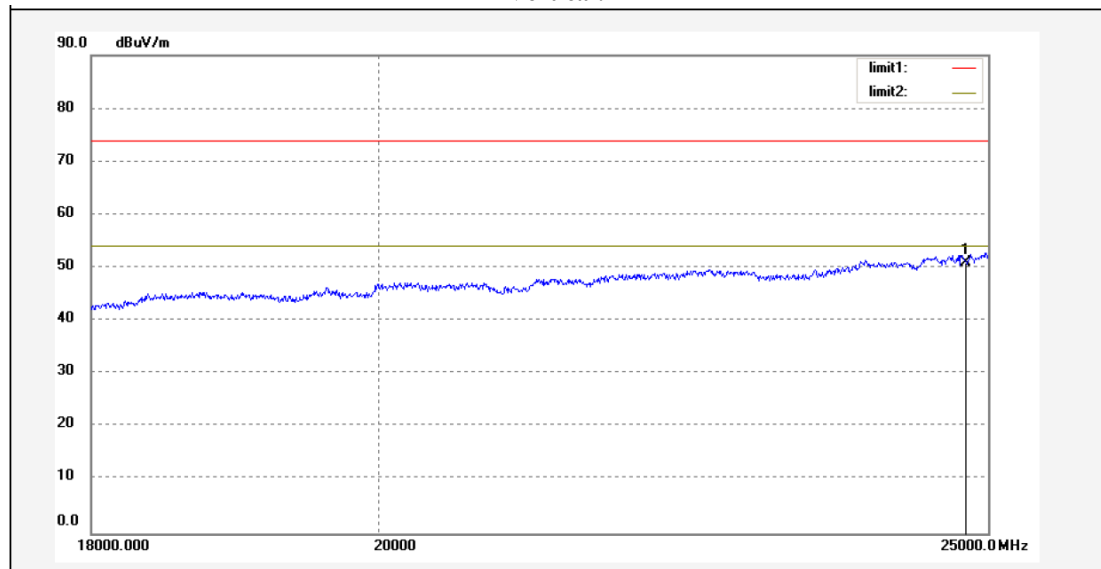
Pre-scan for Peak

High Channel

Horizontal:



Vertical:



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

Applicable Standard

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, 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

1. Set the EUT in transmitting mode, maxhold the channel and in Operating mode, RBW was set at 30 kHz, VBW \geq 3RBW max-hold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	27.9 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

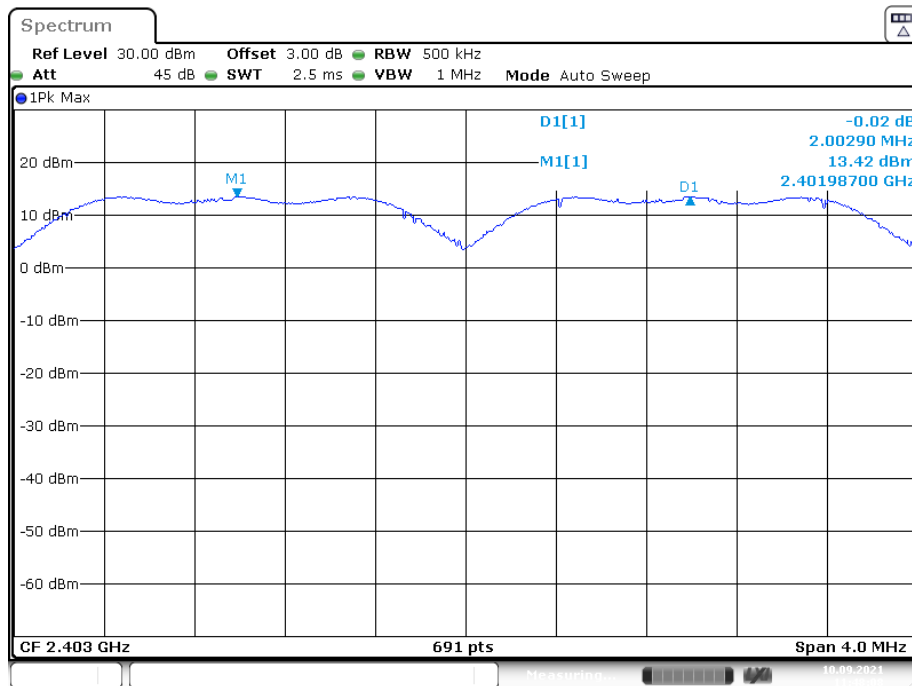
The testing was performed by Fan Yang on 2021-09-10.

EUT operation mode: Transmitting

Test Result: Compliant.

Channel	Channel Separation (MHz)	20 dBc BW (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Channel Separation Limit
GFSK				
Low	2.003	2.281	1.521	> two-thirds of the 20 dB bandwidth

Please refer to the below plots:



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

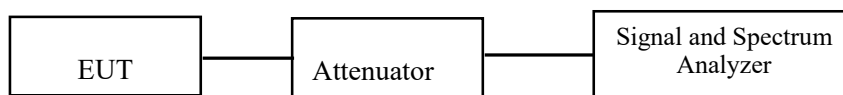
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency 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:	27.9 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-09-10.

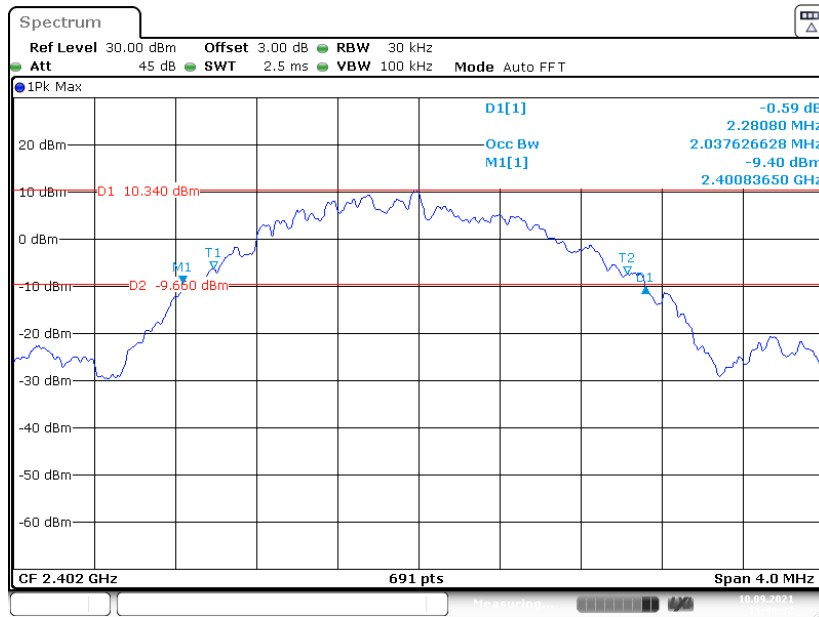
EUT operation mode: Transmitting

Test Result: Compliant.

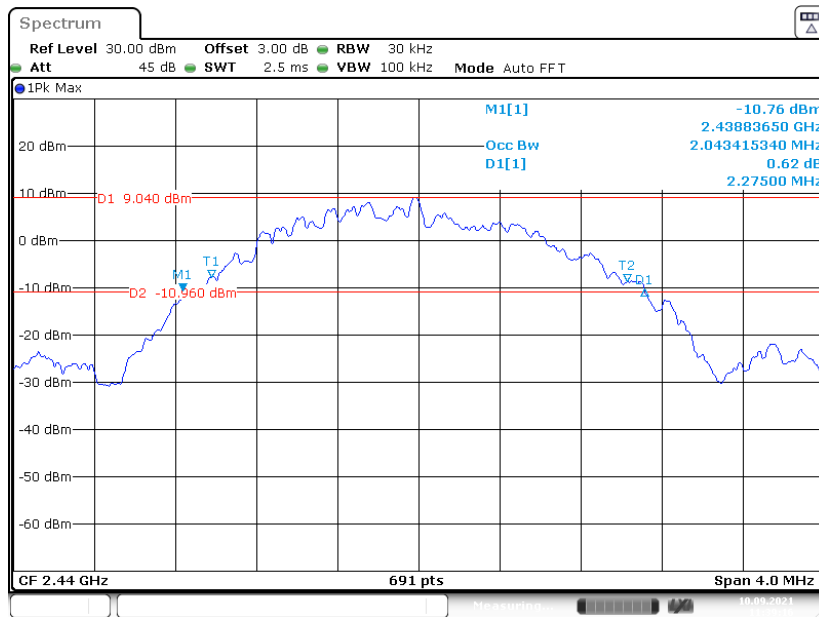
Test Mode	Channel[MHz]	20db EBW[MHz]	OBW[MHz]
GFSK	2402	2.281	2.038
	2440	2.275	2.043
	2480	2.275	2.043

Please refer to the below plots:

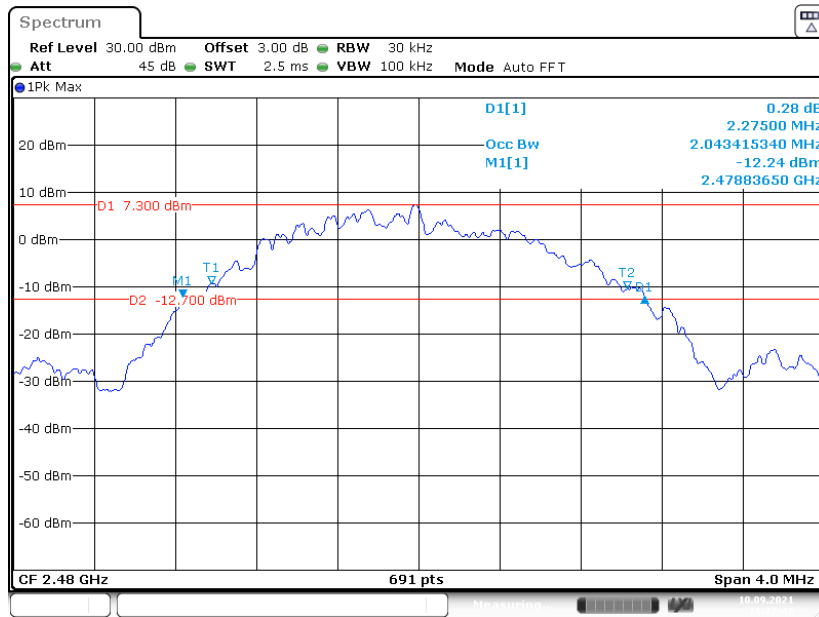
Low Channel



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

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

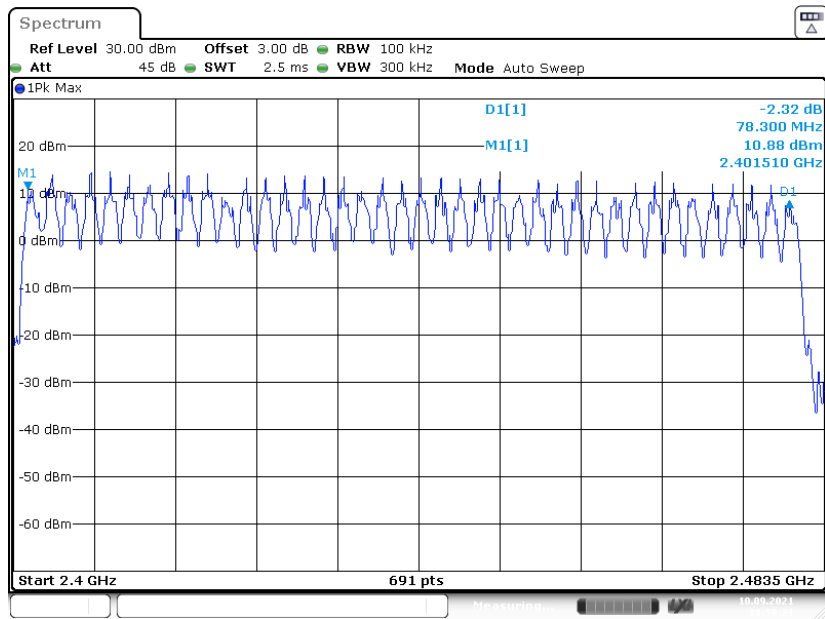
Temperature:	27.9 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-09-10.

EUT operation mode: Transmitting

Test Result: Compliant.

TestMode	Channel	Result[Num]	Limit[Num]	Verdict
GFSK	Middle	40	>=15	Pass



Date: 10.SEP.2021 11:50:21

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

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW $\geq 3 \times$ 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:	27.9 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-09-10.

EUT operation mode: Transmitting

Test Result: Compliant.

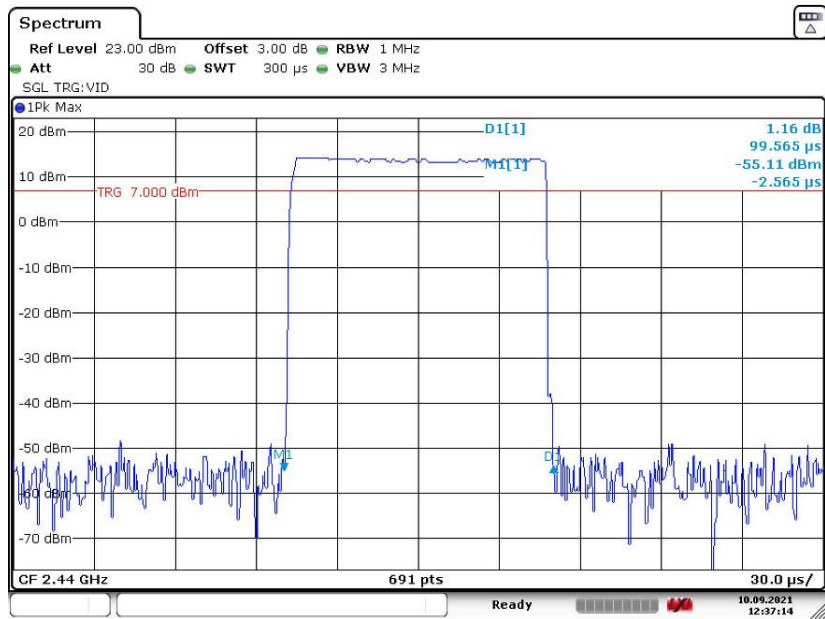
Test Mode	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
GFSK	Middle	0.100	150	0.015	≤ 0.4	Pass

Note: the observe period time= $0.4s \times 40 = 16s$

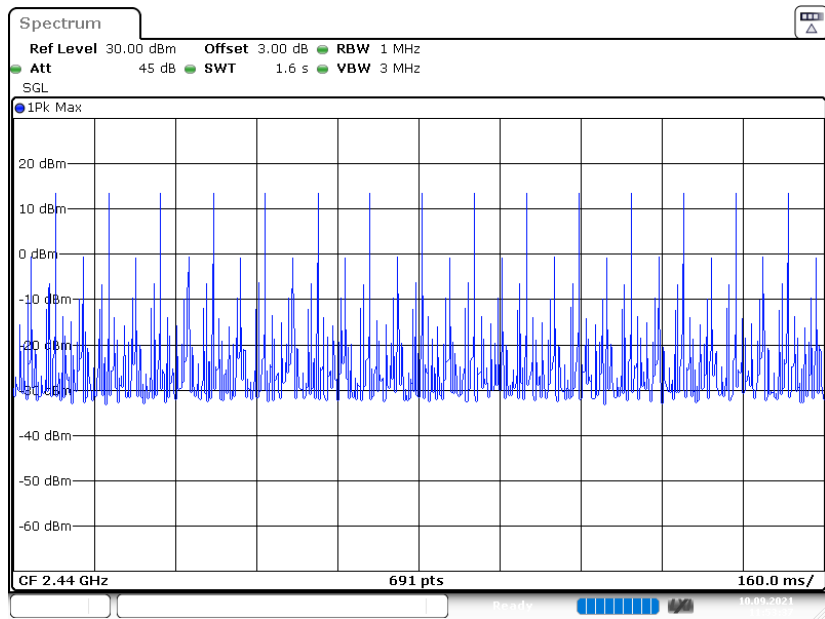
Result=BurstWidth*TotalHops

TotalHops=Hopping number in 1.6s*10

Hopping number in 1.6s= Total of highest signals in 1.6s (Second high signals were other channel)



Date: 10.SEP.2021 12:37:15



Date: 10.SEP.2021 11:53:37

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

Applicable Standard

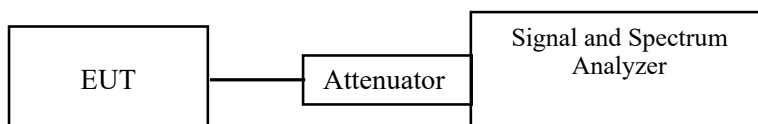
According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125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

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:	27.9 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

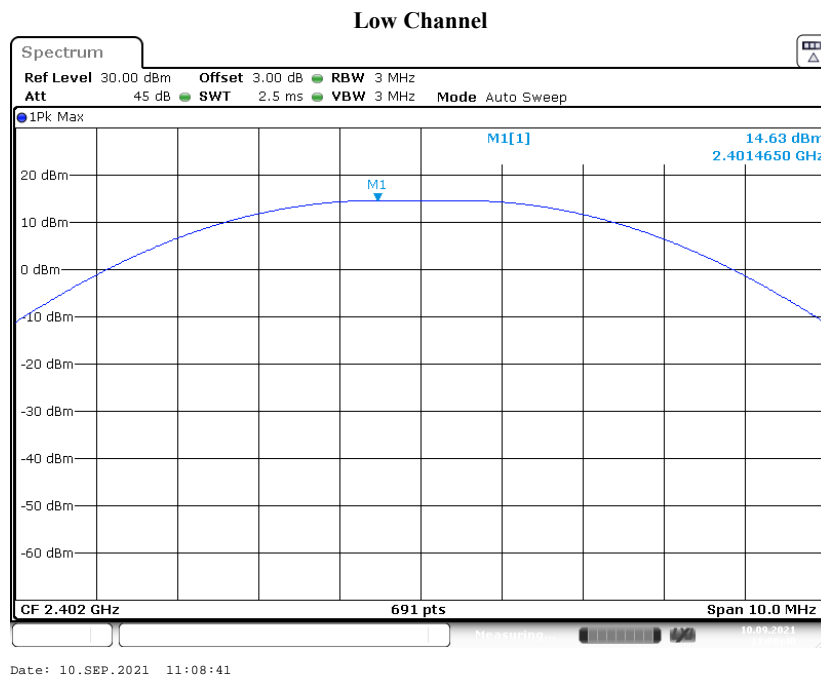
The testing was performed by Fan Yang on 2021-09-10

EUT operation mode: Transmitting

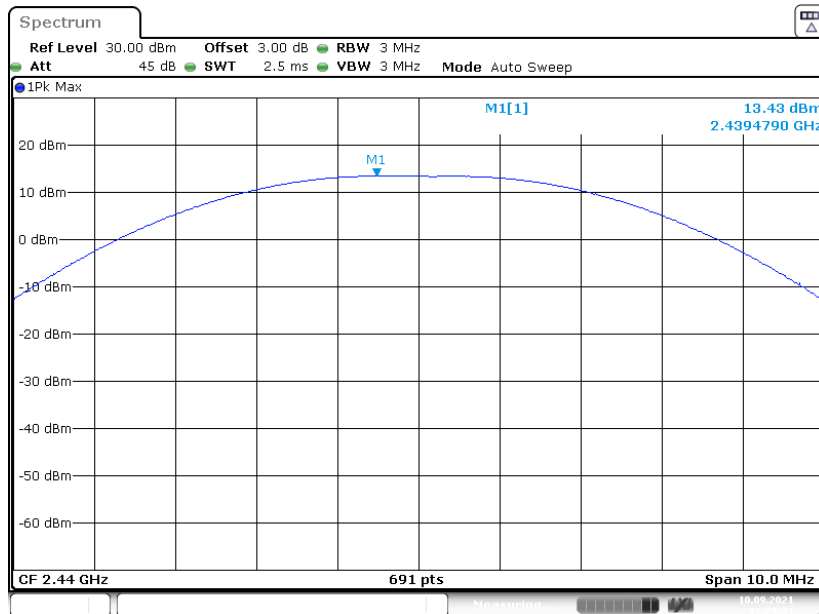
Test Result: Compliant.

Test Mode	Channel[MHz]	Result[dBm]	Limit[dBm]	Verdict
GFSK	2402	14.63	<21	Pass
	2440	13.43	<21	Pass
	2480	11.67	<21	Pass

Note: the antenna gain is 0dBi, the maximum conducted output power is 14.63dBm, the maximum EIRP=14.63dBm+0dBi=14.63dBm<36dBm, so it's compliance with ISED EIRP limit.

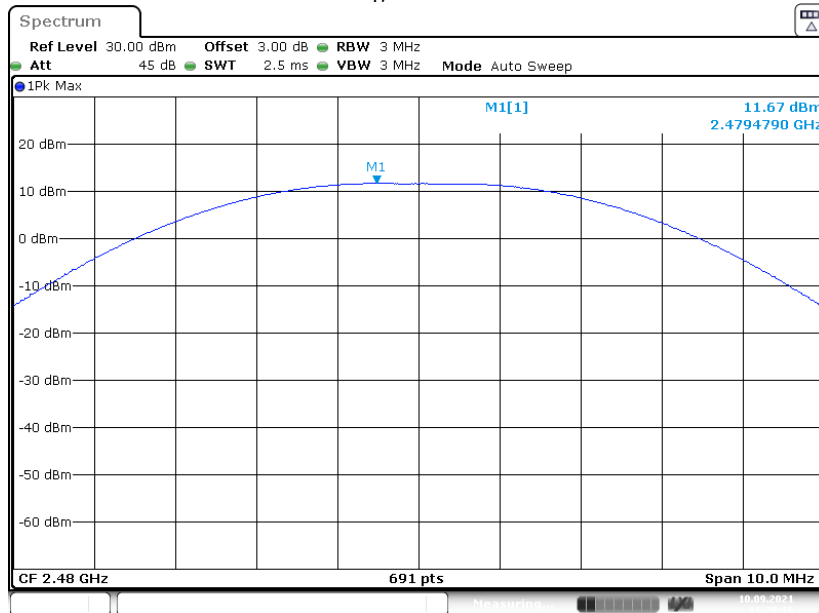


Middle Channel



Date: 10.SEP.2021 11:29:31

High Channel



Date: 10.SEP.2021 11:28:17

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

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:	27.9 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

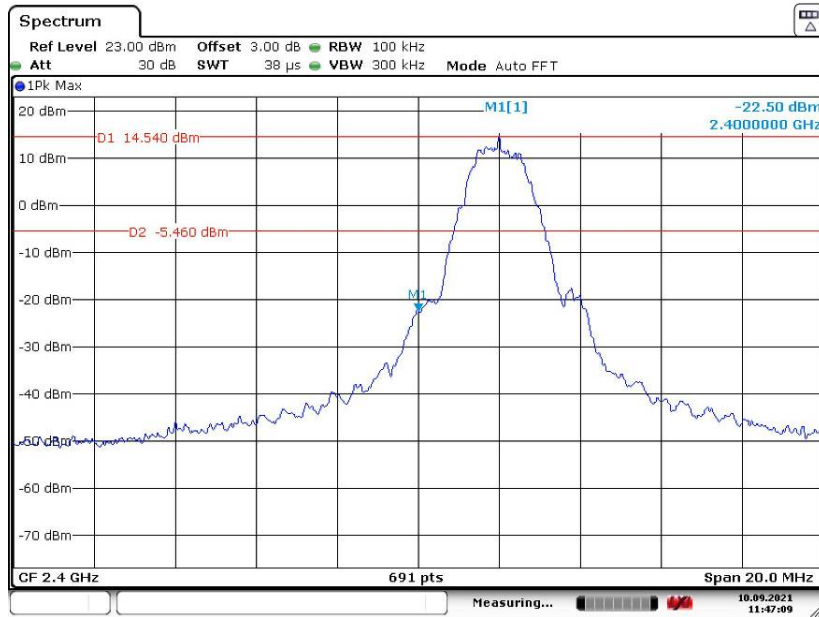
The testing was performed by Fan Yang on 2021-09-10.

EUT operation mode: Transmitting

Test Result: Compliant.

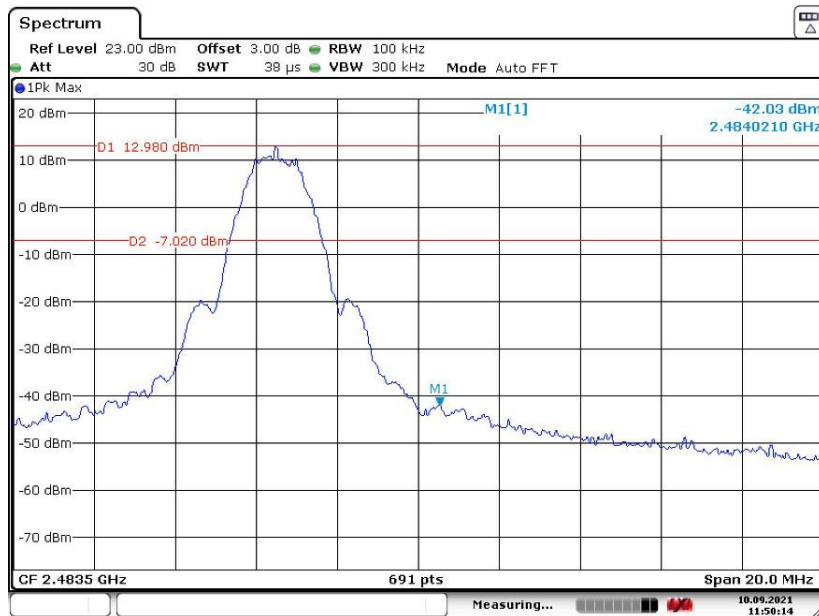
Conducted Band Edge Result:

GFSK_Low Channel



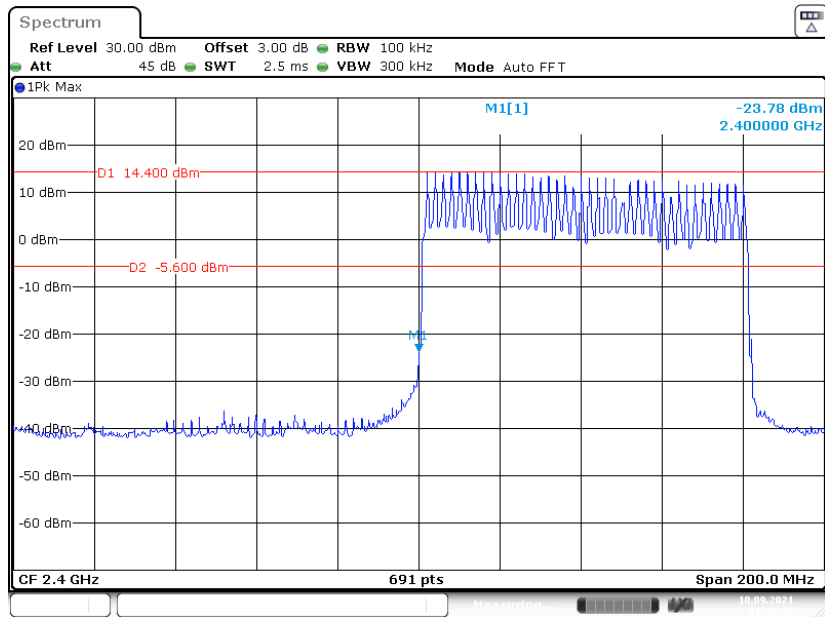
Date: 10.SEP.2021 11:47:09

GFSK_High Channel

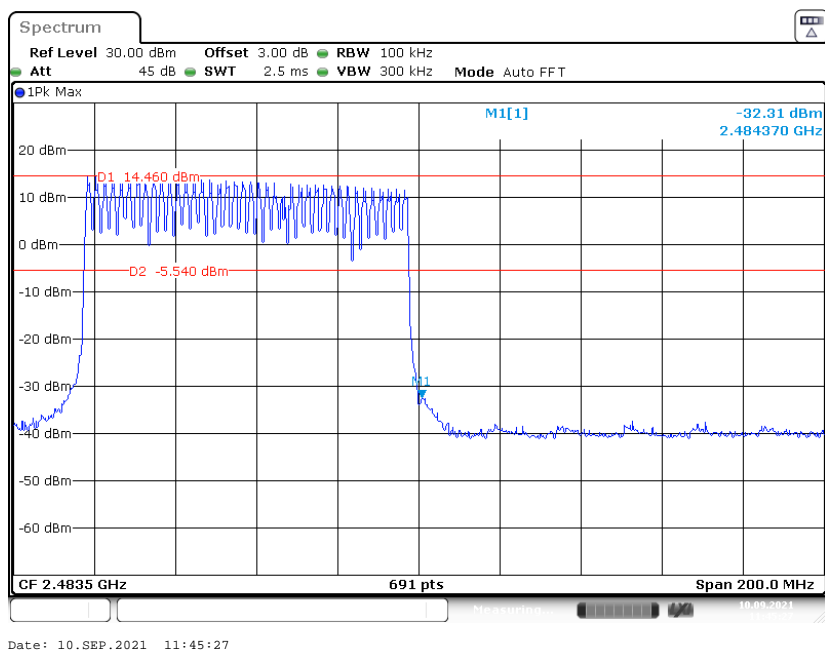


Date: 10.SEP.2021 11:50:14

GFSK_Hop_Low Channel



GFSK_Hop_High Channel



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