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

TEST REPORT

For

Meizhou Guo Wei Electronics Co., Ltd.

AD1 Section, Economic Development Area, Dongsheng Industrial District, Meizhou, Guangdong, China.

FCC ID: 2ARRB-VM34PU
IC: 20353-VM34PU

Report Type:	**Product Type:**
Original Report	Video baby monitor

Report Number:	SZ1210218-04519EB
Report Date:	2021-05-11
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Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Video baby monitor
Tested Model	VM34PU
Multiple Models	VM483XLPU
Model Differences	Refer to the DoS letter
HVIN	VM34PU
Frequency Range	2402~2477MHz
Maximum conducted Peak output power	15.07dBm
Modulation Technique	GFSK
Antenna Specification*	0dBi (It is provided by the applicant)
Voltage Range	DC3.7V from battery or DC 5.0V from adapter
Date of Test	2021-03-01 to 2021-05-01
Sample serial number	SZ1210218-04521E-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2021-02-18
Sample/EUT Status	Good condition
Adapter1 information	Model: BQ05A-0501000-U Input: 100-240V,50/60Hz Max, 300mA Output: DC 5.0V, 1000mA
Adapter2 information	Model: YWK-AD050100-U Input: 100-240V, 50/60Hz, 0.3A 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 Commissions 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 and RSS-GEN, 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 2and RSS-247, Issue 2, February 2017.

For Radiated Emissions testing, please refer to DA 00-705 Released March 30, 2000, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

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 Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1℃
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 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 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.: 342867, the FCC Designation No.: CN1221.

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.

Frequency List

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	12	2445
2	2404	13	2450
3	2406	14	2455
4	2408	15	2460
5	2410	16	2465
6	2415	17	2467
7	2420	18	2469
8	2425	19	2471
9	2430	20	2473
10	2435	21	2475
11	2440	22	2477

EUT was tested with Channel 1, 11 and 22.

EUT Exercise Software

“Teraterm”* software was used and the 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

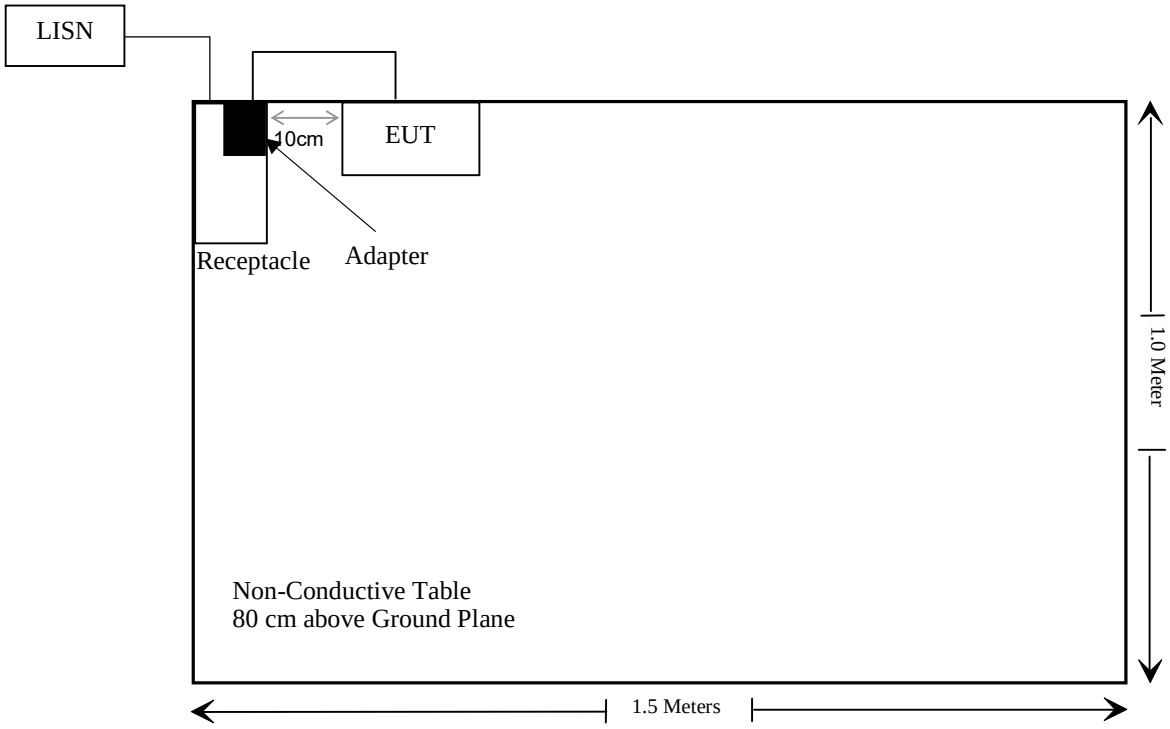
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Un-detachable DC Cable	1.5	EUT	Adapter

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	RSS-247/RSS-Gen Rules	Description of Test	Result
§ 1.1307 , §2.1093	RSS-102	RF Exposure (SAR)	Compliance
§15.203	RSS-Gen §6.8	Antenna Requirement	Compliance
§15.207(a)	RSS-Gen §8.8	AC Line Conducted Emissions	Compliance
§15.205, §15.209 & §15.247(d)	RSS-247 § 5.5	Radiated Emissions	Compliance
§15.247(a)(1)	RSS- Gen§6.7, RSS-247 § 5.1 (a)	99% OCCUPIED BANDWIDTH & 20 dB Emission Bandwidth	Compliance
§15.247(a)(1)	RSS-247 § 5.1 (b)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	RSS-247 § 5.1(b) &§ 5.4(b)	Peak Output Power Measurement	Compliance
§15.247(d)	RSS-247 § 5.5	Band edges	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2020/11/29	2021/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2020/11/29	2021/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2020/12/22	2023/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2020/11/29	2021/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2020/11/29	2021/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2020/11/29	2021/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/29	2021/11/28
Sunol Sciences	Horn Antenna	3115	9107-3694	2021/01/15	2024/01/14
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2020/11/29	2021/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2020/11/29	2021/11/28
SNSD	Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2020/04/20	2021/04/20
Ducommun Technolagies	Horn antenna	ARH-4223-02	1007726-02 1304	2020/12/06	2023/12/05
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200982	2020/08/04	2021/08/03
WEINSCHEL	10dB Attenuator	5324	AU3842	2020/11/29	2021/11/28
Unknown	RF Cable	Unknown	2301 276	2020/11/29	2021/11/28

*** 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 §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: SZ1210218-04519E-20.

RSS-102 – RF EXPOSURE

Applicable Standard

According to RSS-102, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

Test Result

Compliance, please refer to the SAR report: SZ1210218-04519E-20.

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 arrangement, which was permanently attached and the antenna gain is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Type	Antenna Gain	Impedance
Dipole	0dBi	50 Ω

Result: Pass

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 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

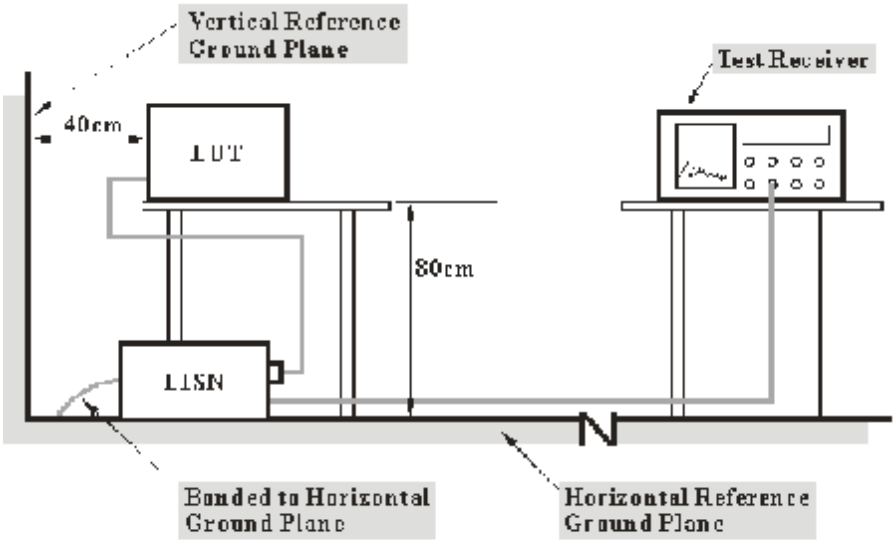
Note 1: The level decreases linearly with the logarithm of the frequency.

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 & RSS-247/RSS-Gen limits.

The spacing between the peripherals was 10 cm.

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

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:

Correction Factor = LISN VDF + Cable Loss + 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:

Margin = Limit – Corrected Amplitude

Test Data

Environmental Conditions

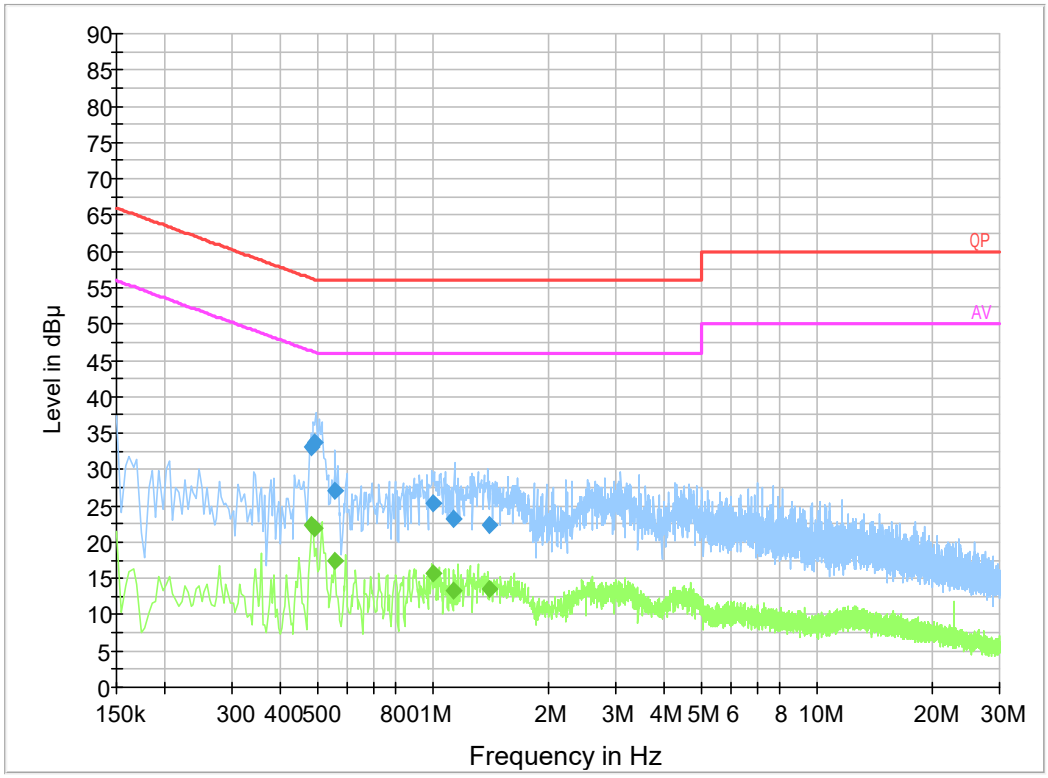
Temperature:	25 ℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li from 2021-03-03 to 2021-03-16.

EUT operation mode: Charging & transmitting

Adapter1-Model: BQ05A-0501000-U

AC 120V/60 Hz, Line



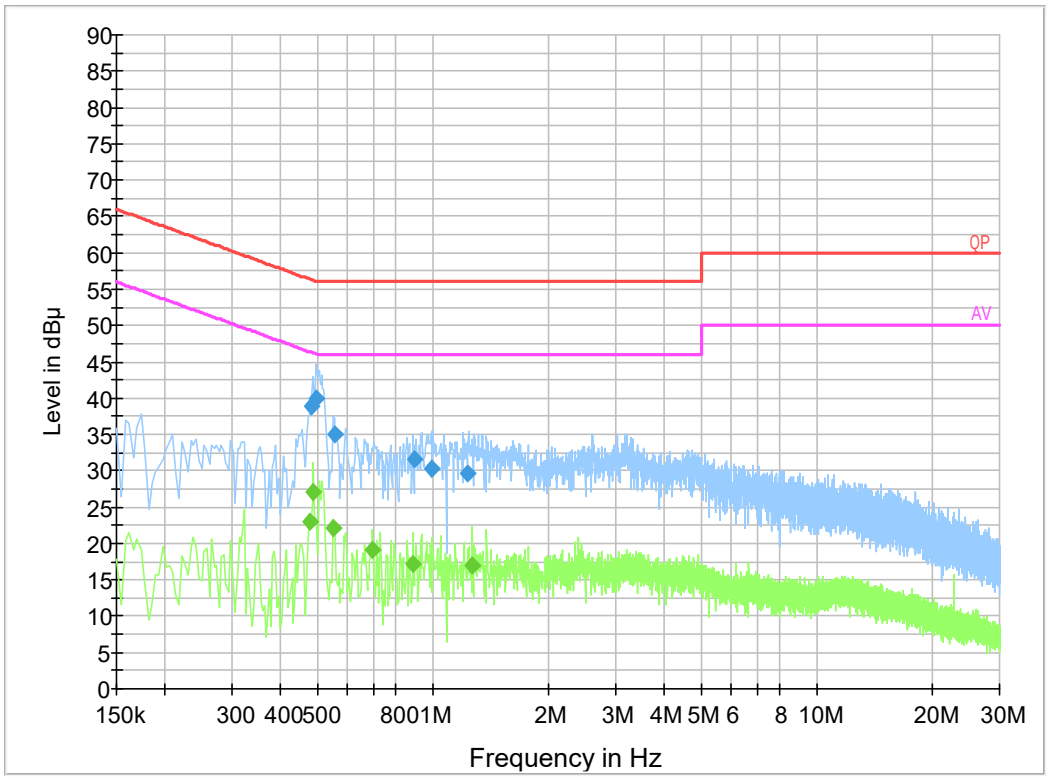
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.485170	33.1	9.000	L1	19.8	23.2	56.3
0.490530	33.7	9.000	L1	19.8	22.5	56.2
0.557630	27.1	9.000	L1	19.8	28.9	56.0
1.007030	25.2	9.000	L1	19.9	30.8	56.0
1.136870	23.1	9.000	L1	19.8	32.9	56.0
1.409090	22.4	9.000	L1	19.8	33.6	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.485170	22.4	9.000	L1	19.8	23.9	46.3
0.490530	22.0	9.000	L1	19.8	24.2	46.2
0.557630	17.4	9.000	L1	19.8	28.6	46.0
1.007030	15.6	9.000	L1	19.9	30.4	46.0
1.136870	13.3	9.000	L1	19.8	32.7	46.0
1.409090	13.5	9.000	L1	19.8	32.5	46.0

AC 120V/60 Hz, Neutral



Final Result 1

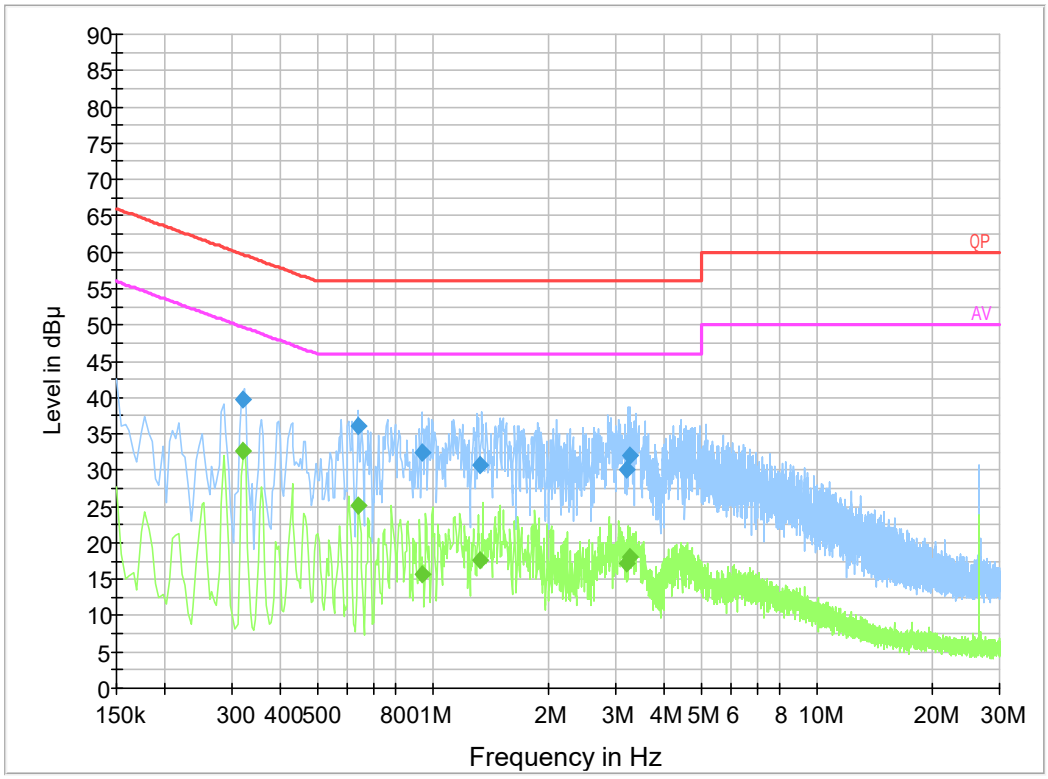
Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.482830	39.0	9.000	N	19.8	17.3	56.3
0.498530	39.9	9.000	N	19.8	16.1	56.0
0.558250	35.0	9.000	N	19.8	21.0	56.0
0.900650	31.7	9.000	N	19.7	24.3	56.0
0.991150	30.3	9.000	N	19.8	25.7	56.0
1.227370	29.6	9.000	N	19.8	26.4	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.478000	23.1	9.000	N	19.8	23.3	46.4
0.490000	27.1	9.000	N	19.8	19.1	46.2
0.550000	22.0	9.000	N	19.8	24.0	46.0
0.698000	19.1	9.000	N	19.8	26.9	46.0
0.890000	17.1	9.000	N	19.7	28.9	46.0
1.270000	16.9	9.000	N	19.8	29.1	46.0

Adapter2-Model: YWK-AD050100-U

AC 120V/60 Hz, Line



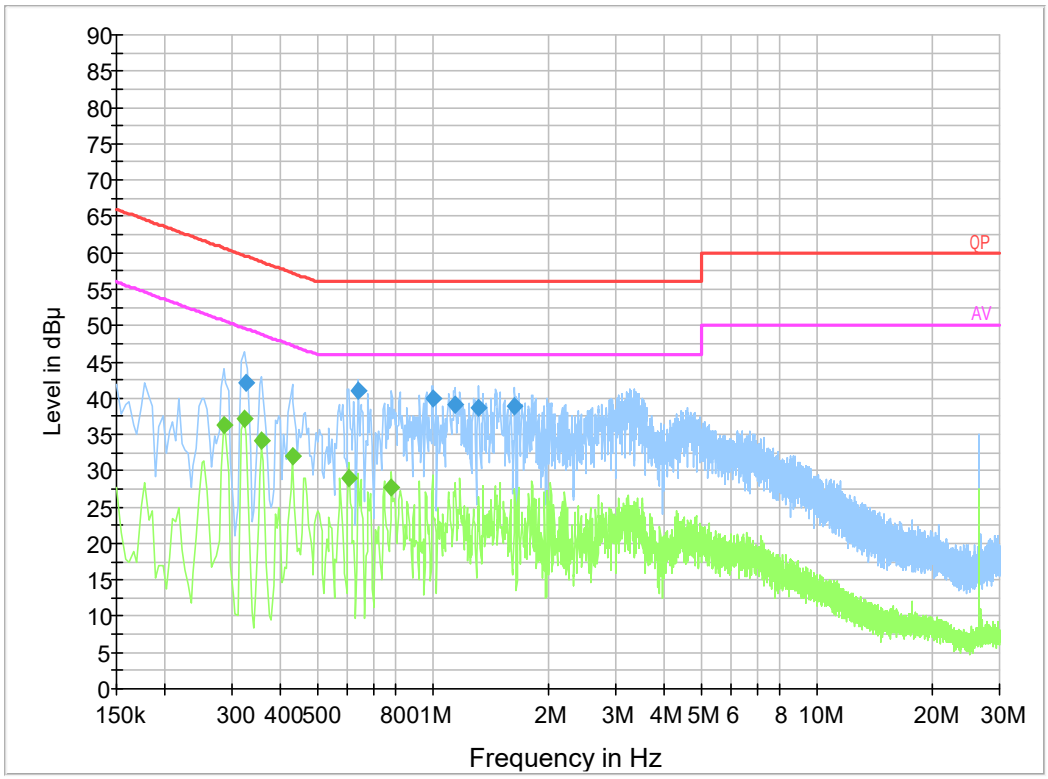
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.321170	39.7	9.000	L1	19.8	20.0	59.7
0.640370	36.2	9.000	L1	19.8	19.8	56.0
0.943930	32.5	9.000	L1	19.8	23.5	56.0
1.333870	30.8	9.000	L1	19.8	25.2	56.0
3.209670	30.0	9.000	L1	19.9	26.0	56.0
3.261070	32.1	9.000	L1	19.9	23.9	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.321170	32.6	9.000	L1	19.8	17.1	49.7
0.640370	25.2	9.000	L1	19.8	20.8	46.0
0.943930	15.7	9.000	L1	19.8	30.3	46.0
1.333870	17.5	9.000	L1	19.8	28.5	46.0
3.209670	17.2	9.000	L1	19.9	28.8	46.0
3.261070	18.1	9.000	L1	19.9	27.9	46.0

AC 120V/60 Hz, Neutral



Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.325170	42.2	9.000	N	19.8	17.4	59.6
0.640370	41.1	9.000	N	19.8	14.9	56.0
0.998970	40.0	9.000	N	19.8	16.0	56.0
1.140810	39.1	9.000	N	19.8	16.9	56.0
1.310230	38.7	9.000	N	19.8	17.3	56.0
1.637490	38.8	9.000	N	19.8	17.2	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.286000	36.2	9.000	N	19.7	14.4	50.6
0.322000	37.1	9.000	N	19.8	12.6	49.7
0.358000	34.1	9.000	N	19.9	14.7	48.8
0.430000	32.0	9.000	N	19.8	15.3	47.3
0.606000	28.9	9.000	N	19.8	17.1	46.0
0.782000	27.8	9.000	N	19.8	18.2	46.0

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

Applicable Standard

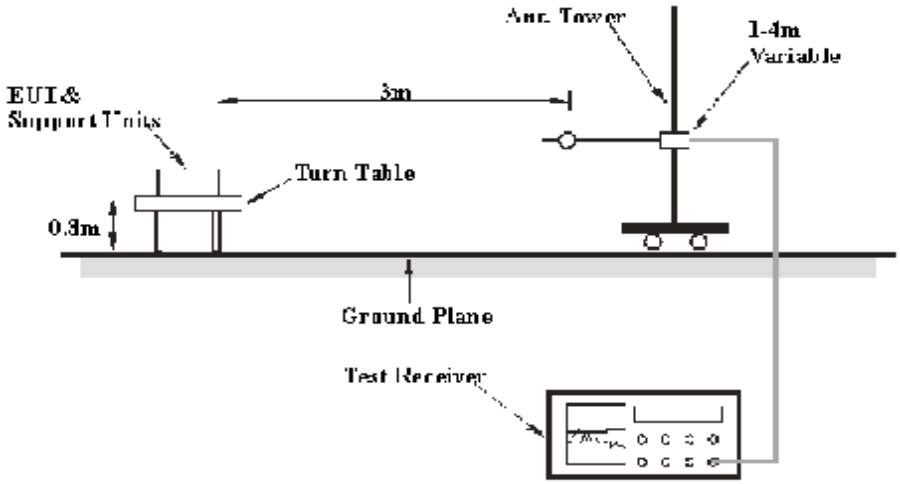
FCC §15.205; §15.209; §15.247(d)

According to RSS-247 §5.5

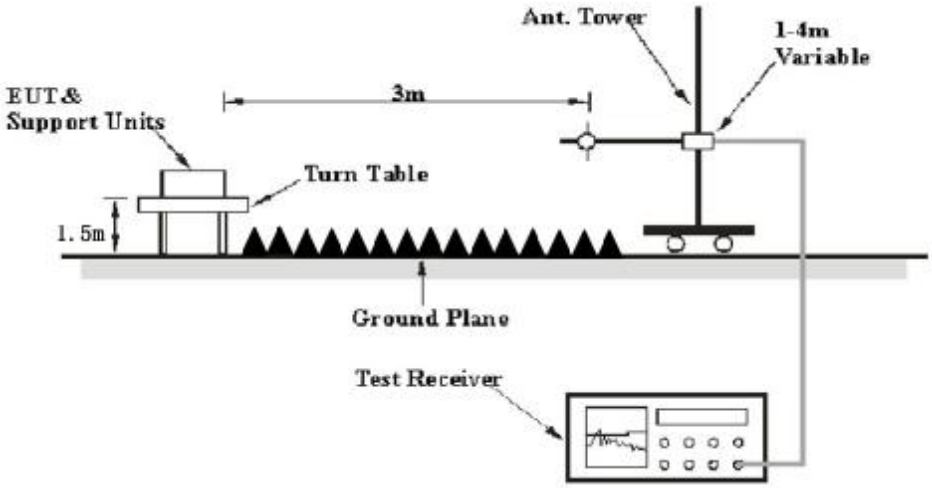
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either 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 and FCC 15.247 & RSS-247/RSS-Gen limits.

EMI Test Receiver & Spectrum Analyzer Setup

During the radiated emission test, according to the DA 00-705 Released March 30, 2000, 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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit – Corrected Amplitude

Test Data

Environmental Conditions

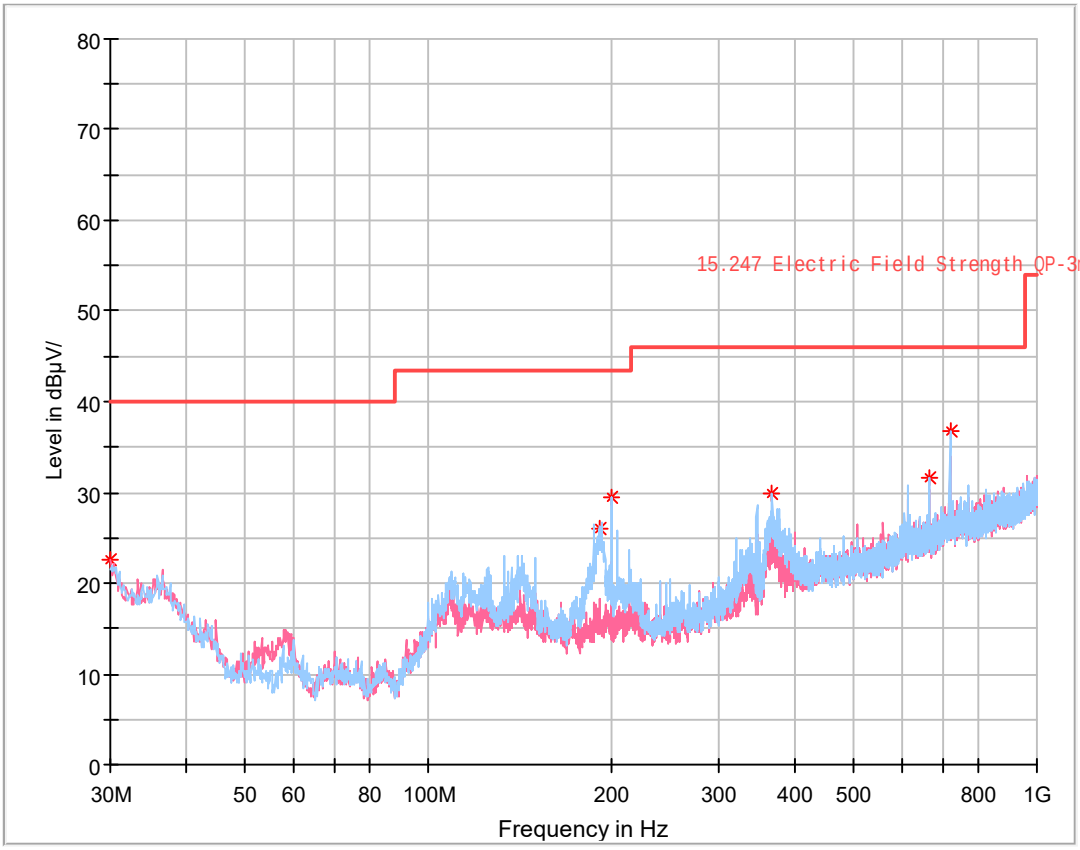
Temperature:	24~24.1 ℃
Relative Humidity:	44~56%
ATM Pressure:	101.1~101.2 kPa

The testing was performed by Harris He on 2021-03-01 for below 1GHz and by Alan He on 2021-03-26 for above 1GHz.

EUT operation mode: Transmitting

30 MHz~1 GHz:

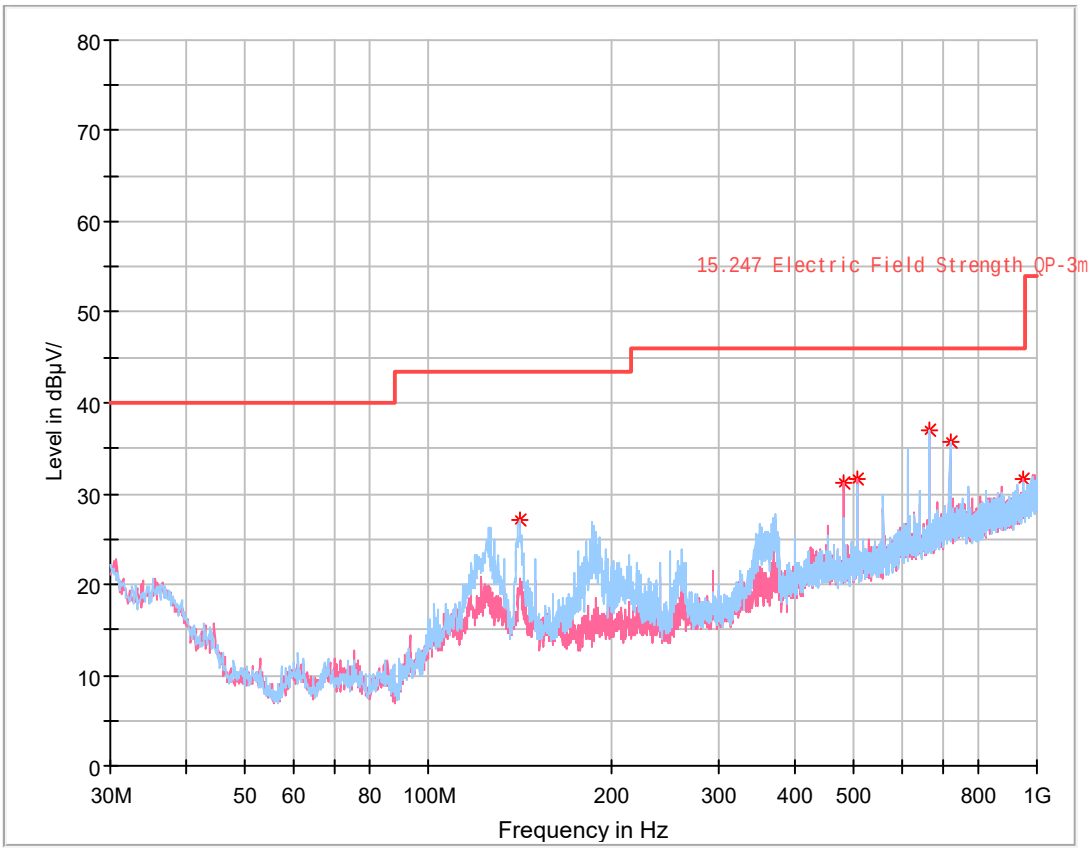
Adapter1-Model: BQ05A-0501000-U



Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.000000	22.56	40.00	17.44	200.0	V	323.0	-3.5
190.898750	25.92	43.50	17.58	300.0	H	36.0	-12.2
199.992500	29.45	43.50	14.05	300.0	H	175.0	-11.0
367.681250	29.98	46.00	16.02	300.0	H	166.0	-8.3
666.683750	31.55	46.00	14.45	400.0	H	35.0	-2.1
720.033750	36.73	46.00	9.27	300.0	H	110.0	-1.1

Adapter2-Model: YWK-AD050100-U



Critical_Freqs

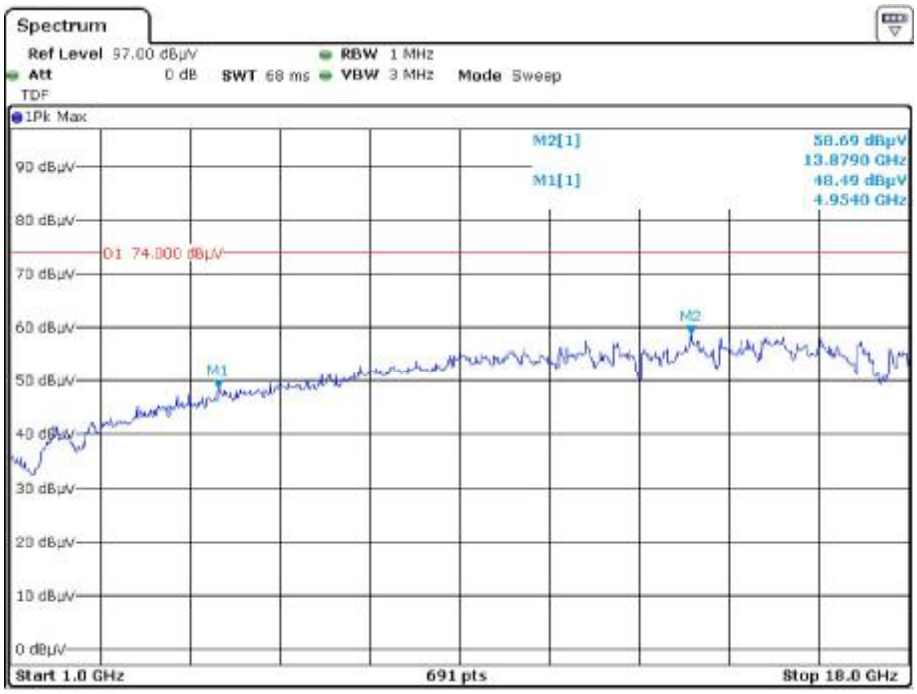
Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
140.943750	27.03	43.50	16.47	300.0	H	0.0	-10.8
666.683750	36.99	46.00	9.01	300.0	H	48.0	-2.1
720.155000	35.59	46.00	10.41	300.0	H	59.0	-1.1
480.080000	31.14	46.00	14.86	300.0	V	79.0	-5.3
506.633750	31.57	46.00	14.43	300.0	V	167.0	-5.0
952.591250	31.65	46.00	14.35	300.0	V	300.0	1.7

1 GHz - 25 GHz:

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)									
2318.51	28.05	PK	17	2.0	H	31.64	59.69	74	14.31
2318.51	14.80	Ave.	17	2.0	H	31.64	46.44	54	7.56
2485.62	28.14	PK	266	1.3	H	32.13	60.27	74	13.73
2485.62	13.63	Ave.	266	1.3	H	32.13	45.76	54	8.24
4804.00	43.08	PK	322	1.5	H	6.28	49.36	74	24.64
4804.00	28.37	Ave.	322	1.5	H	6.28	34.65	54	19.35
Middle Channel (2440 MHz)									
4880.00	43.01	PK	21	2.4	H	6.76	49.77	74	24.23
4880.00	28.51	Ave.	21	2.4	H	6.76	35.27	54	18.73
High Channel (2477 MHz)									
2322.10	27.57	PK	241	2.0	H	31.64	59.21	74	14.79
2322.10	13.79	Ave.	241	2.0	H	31.64	45.43	54	8.57
2484.13	28.24	PK	70	1.8	H	32.13	60.37	74	13.63
2484.13	14.42	Ave.	70	1.8	H	32.13	46.55	54	7.45
4954.00	43.06	PK	106	1.1	H	6.80	49.86	74	24.14
4954.00	28.56	Ave.	106	1.1	H	6.80	35.36	54	18.64

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude
The other spurious emission which is 20dB to the limit was not recorded.

Pre-scan with High channel Peak
Horizontal



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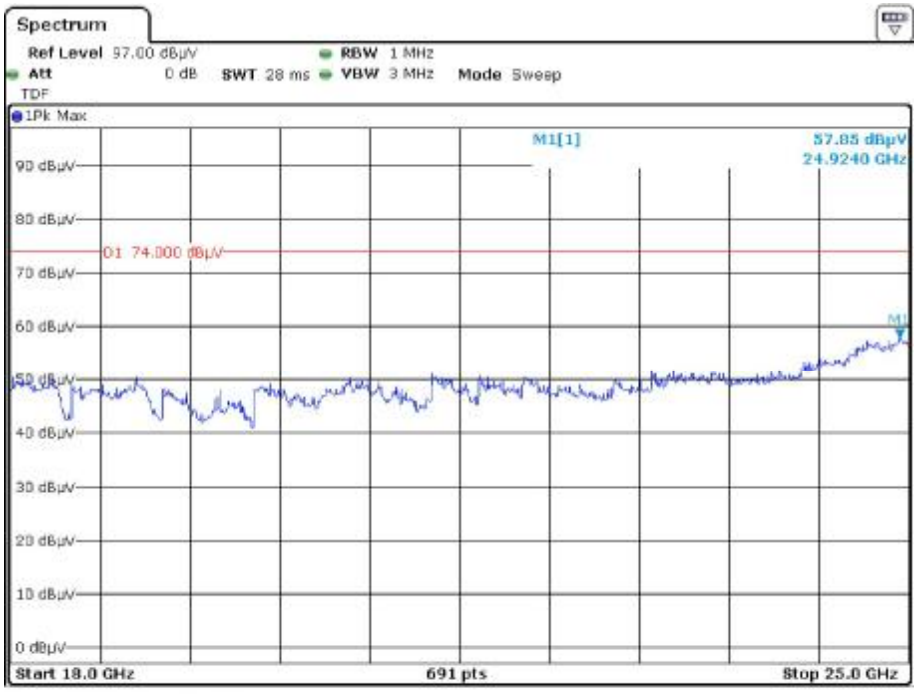

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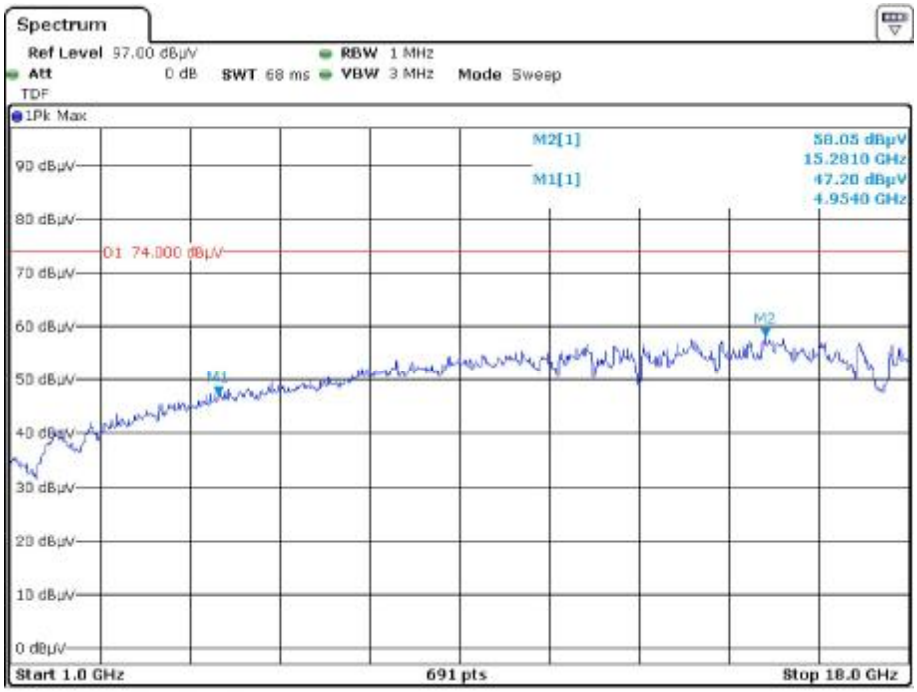
Vertical



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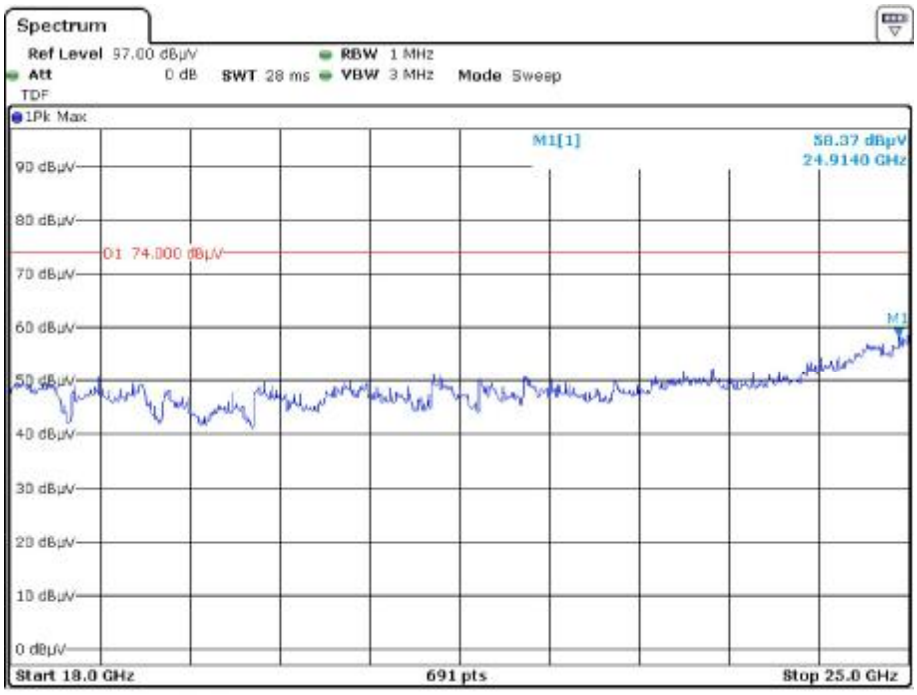

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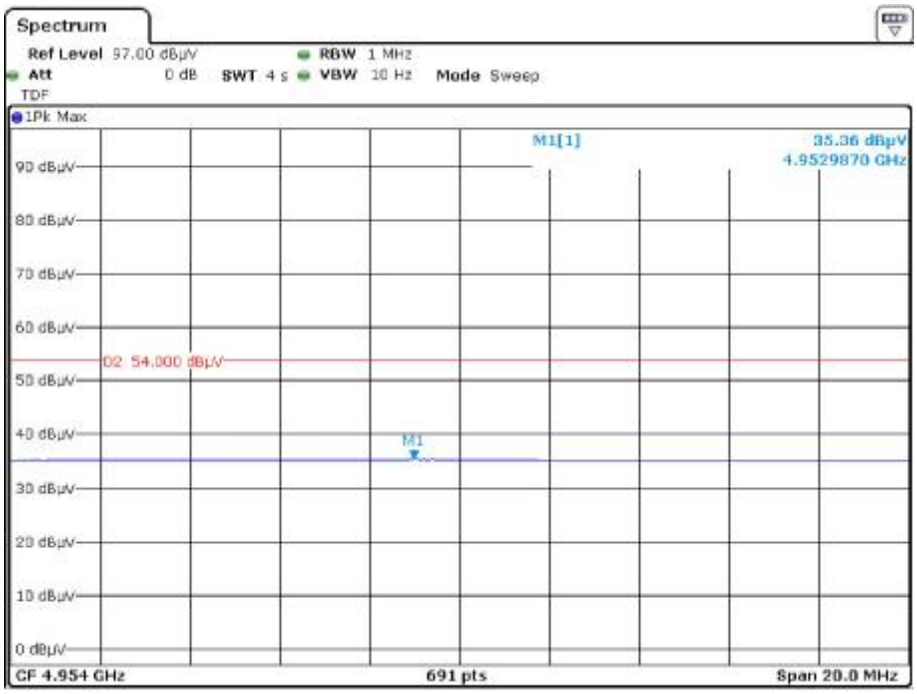
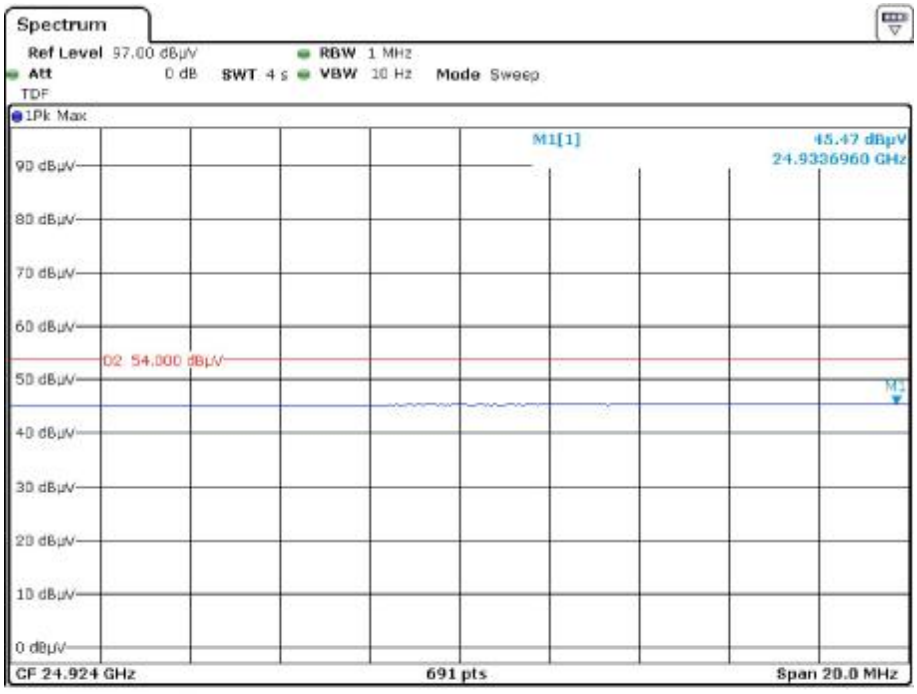
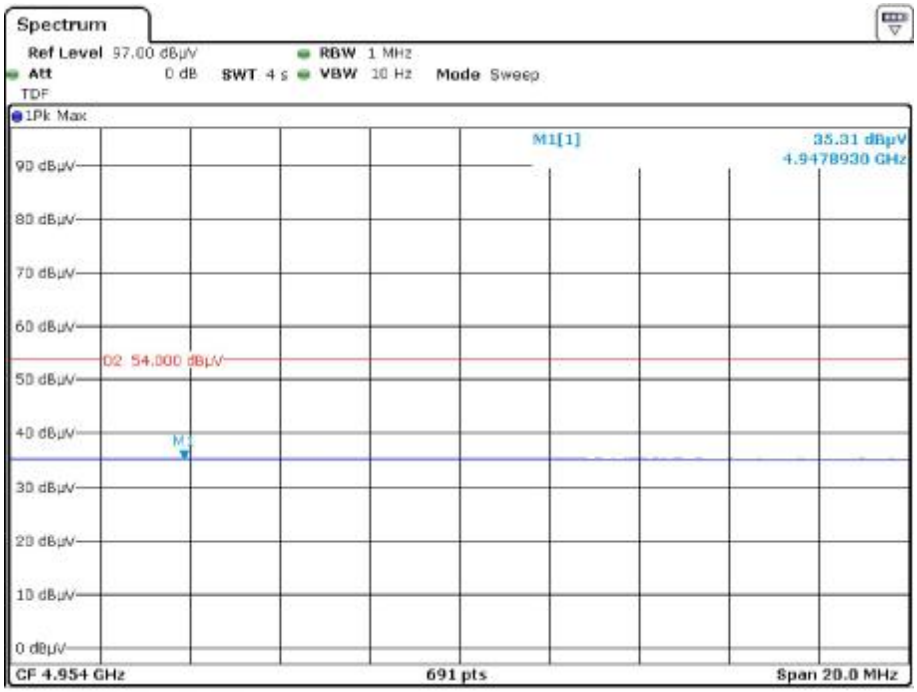
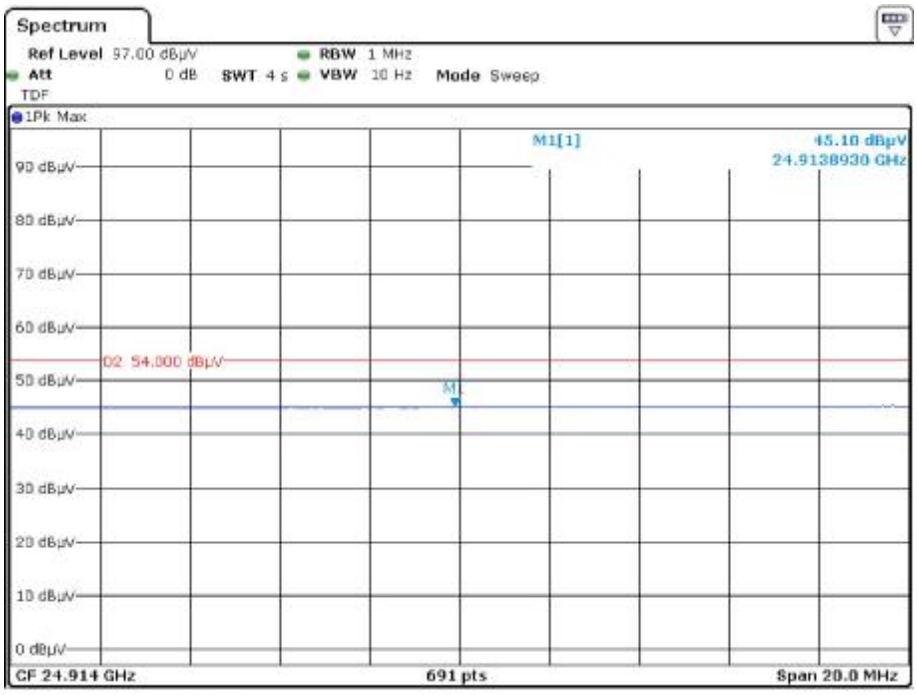
Average
Horizontal





Vertical


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB SWT 4 s VBW 10 Hz Mode Sweep
TDF
1Pk Max
M1[1] 35.31 dBµV
4.9478930 GHz
90 dBµV
80 dBµV
70 dBµV
60 dBµV
D2 54.000 dBµV
50 dBµV
40 dBµV
M1
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 4.954 GHz
691 pts
Span 20.0 MHz
Date: 26.MAR.2021 08:09:26


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB SWT 4 s VBW 10 Hz Mode Sweep
TDF
1Pk Max
M1[1] 45.10 dBµV
24.9138930 GHz
90 dBµV
80 dBµV
70 dBµV
60 dBµV
D2 54.000 dBµV
50 dBµV
M1
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 24.914 GHz
691 pts
Span 20.0 MHz
Date: 26.MAR.2021 08:53:38

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

Applicable Standard

Frequency hopping systems 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.

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. 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, max hold the channel.
2. Set the adjacent channel of the EUT and max hold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	27.8 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

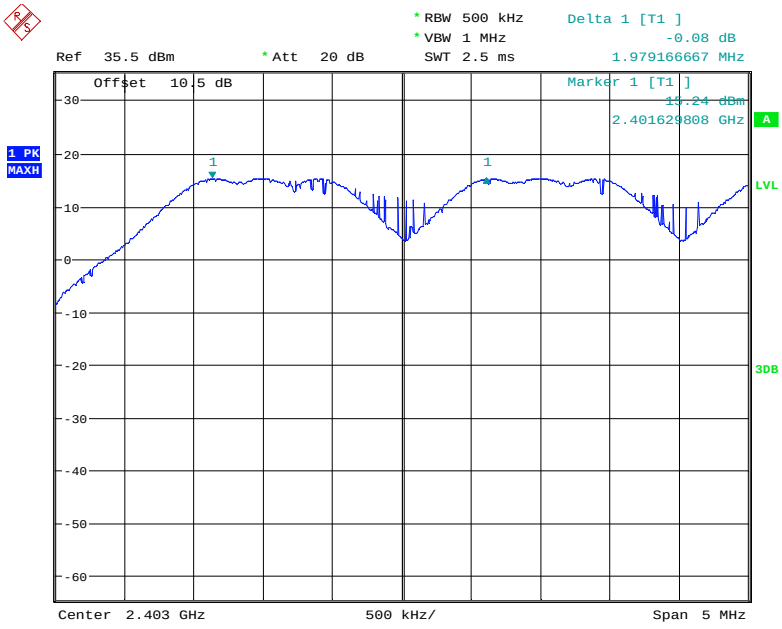
The testing was performed by Coco Liu on 2021-04-27

EUT operation mode: Transmitting

Test Result: Pass

Please refer to following table and plots.

Channel	Channel Separation (MHz)	20 dBc BW (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Channel Separation Limit
Hopping	1.979	2.635	1.757	> two-thirds of the 20 dB bandwidth



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:

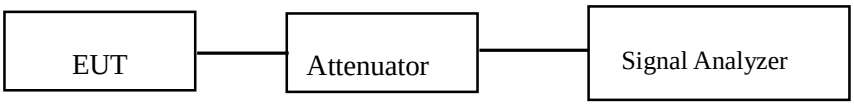
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• 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:	27.8 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu on 2021-04-26 and 2021-05-01.

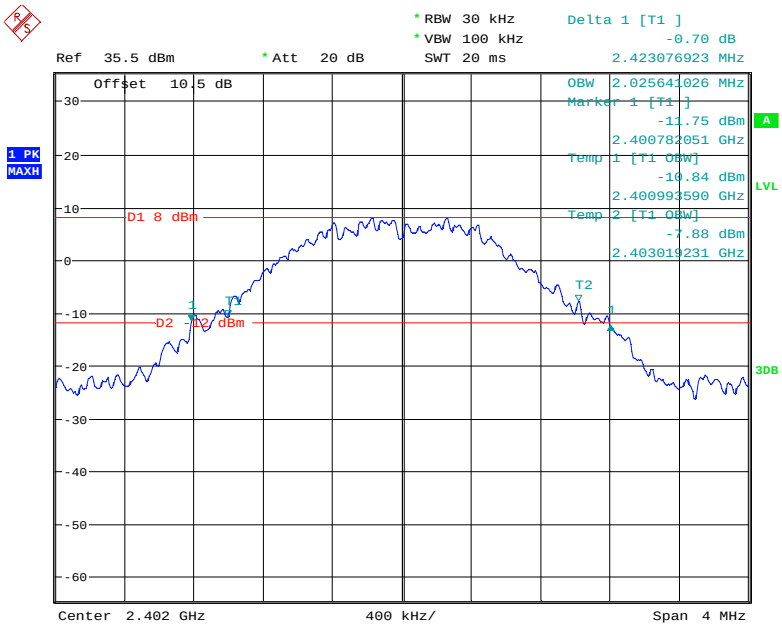
EUT operation mode: Transmitting

Test Result: Pass

Please refer to following table and plots.

Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)
Low	2402	2.423	2.026
Middle	2440	2.596	2.122
High	2477	2.635	2.237

20 dB Emission Bandwidth&99% Emission Bandwidth, Low Channel



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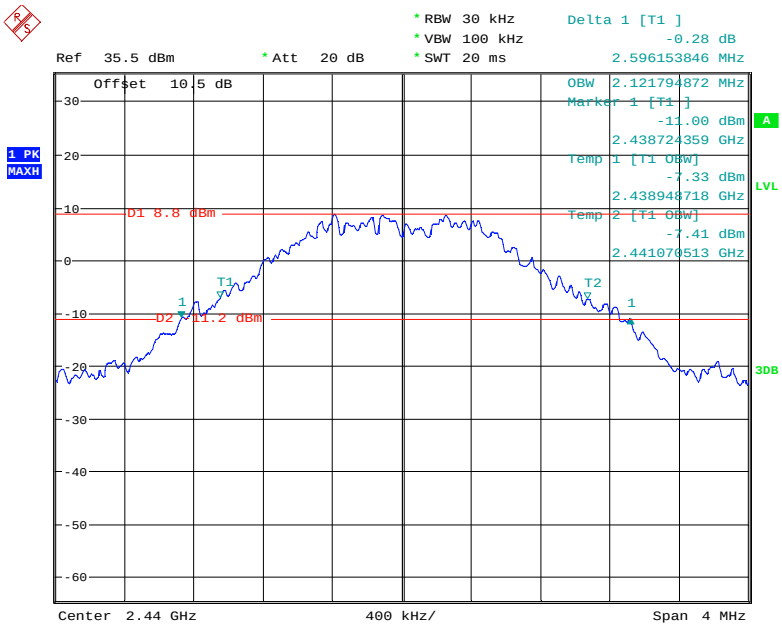
20 dB Emission Bandwidth&99% Emission Bandwidth, Middle Channel



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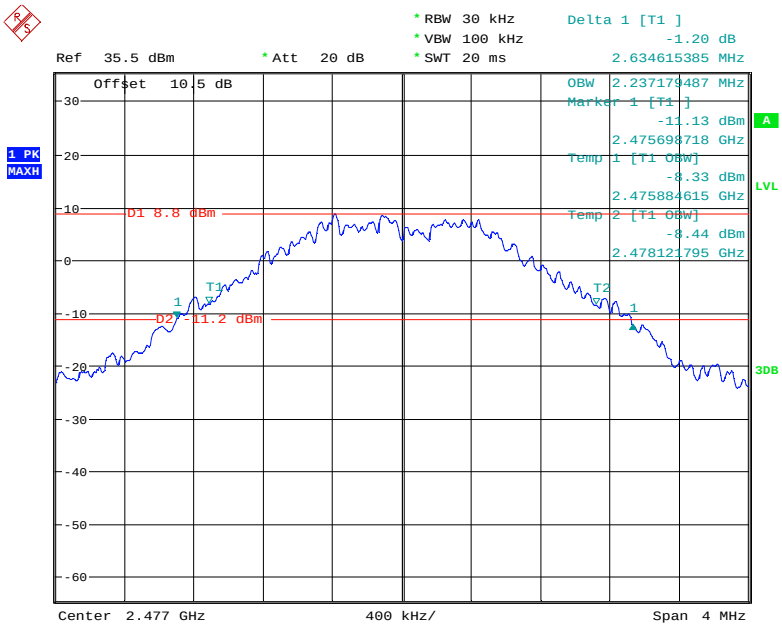
20 dB Emission Bandwidth&99% Emission Bandwidth, High Channel



Date: 1.MAY.2021 11:02:06

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:	27.8 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu on 2021-04-27.

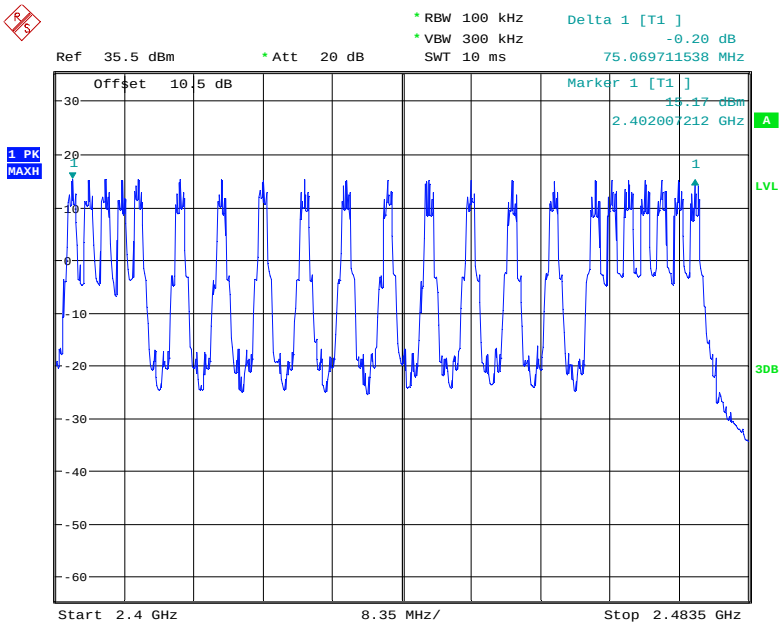
EUT operation mode: Transmitting

Test Result: Pass

Please refer to following table and plots.

Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
2400-2483.5	22	≥15

Number of Hopping Channels



Date: 27.APR.2021 16:05:12

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 ≥ 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:	27.8 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu from 2021-04-27 to 2021-04-29.

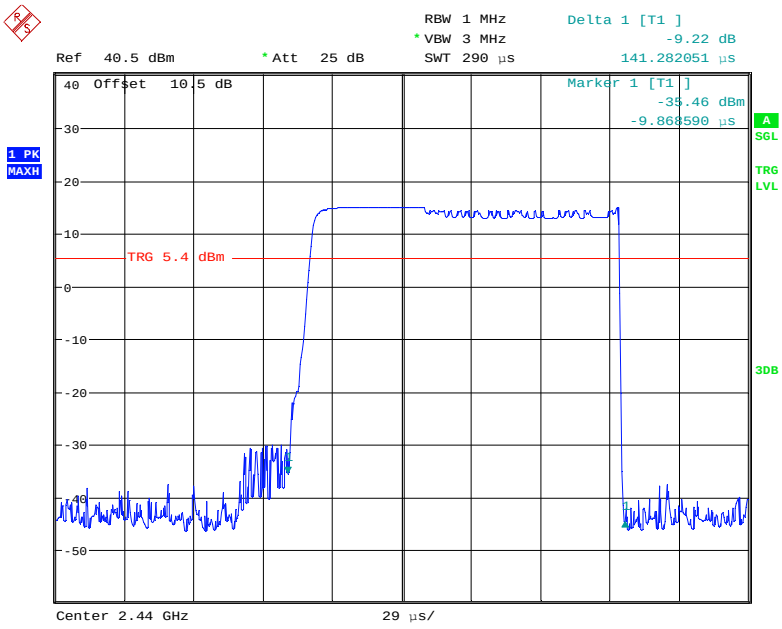
EUT operation mode: Transmitting

Test Result: Pass

Please refer to following table and plots

Channel	Burst Width [ms]	Total Hops [Num]	Result [s]	Limit [s]	Verdict
Middle	0.141	130	0.018	<=0.4	PASS

Note 1: A period time=0.4*22=8.8(S), Result=Burst Width*Total hops
Note 2: Total hops=Hopping Number in 0.88s*10
Note 3: Hopping Number in 0.88s=Total of highest signals in 0.88s (Second high signals were other channel)



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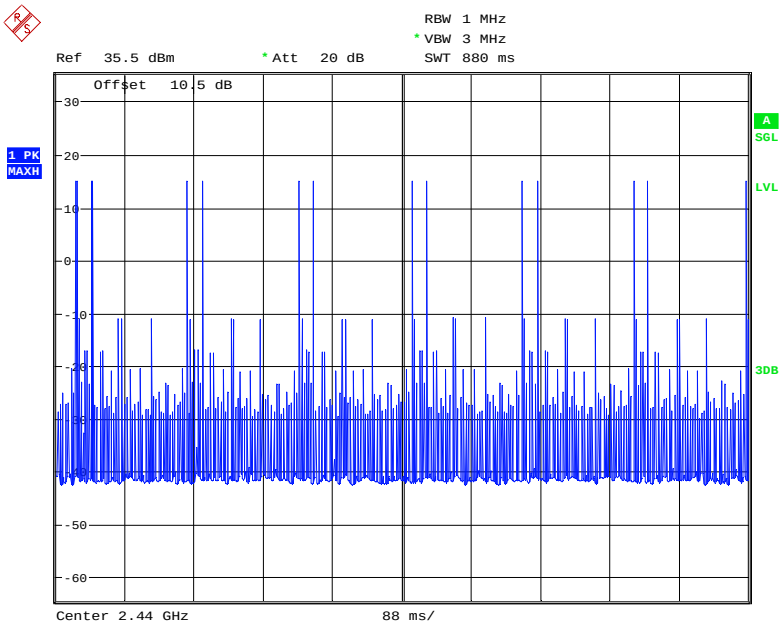


Date: 27.APR.2021 15:56:14

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

Applicable Standard

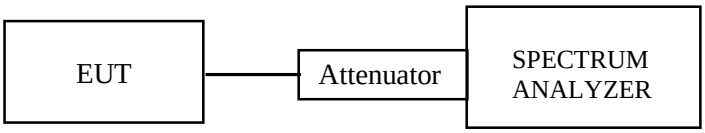
According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 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 it 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:	27.8 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu on 2021-04-25.

EUT operation mode: Transmitting

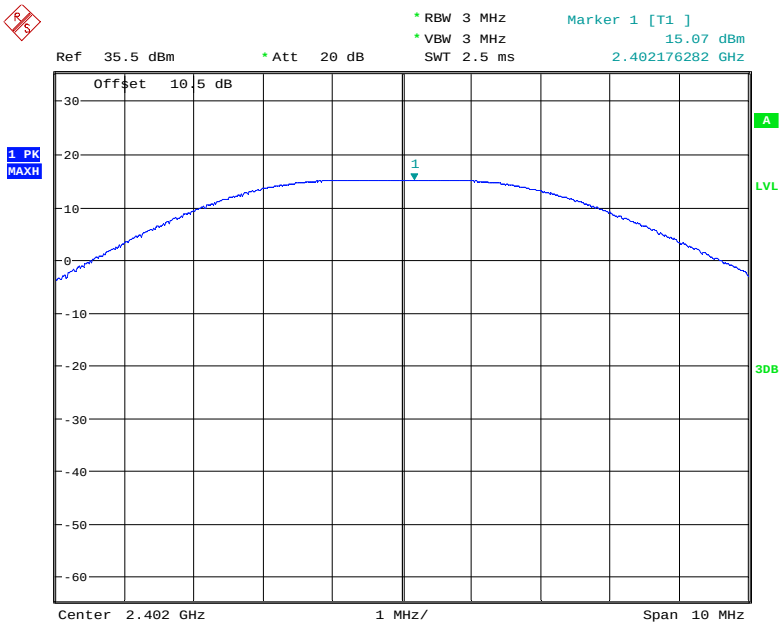
Test Result: Pass

Please refer to following table.

Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Limit (dBm)
Low	2402	15.07	21
Middle	2440	14.97	21
High	2477	14.96	21

Note: The antenna gain is 0dBi. The maximum EIRP=15.07+0dBi=15.07dBm, less than 36dBm, so it's compliance with the ISED EIRP limit.

Low Channel



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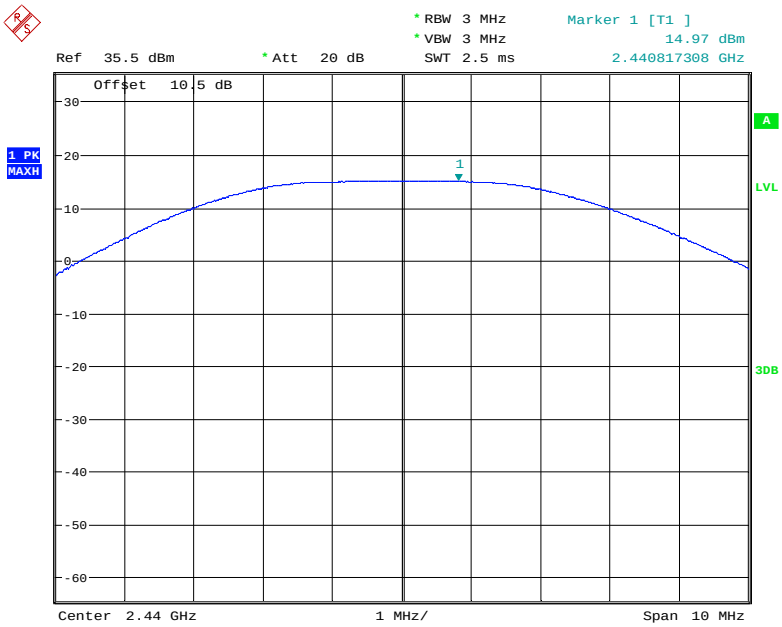
Middle Channel



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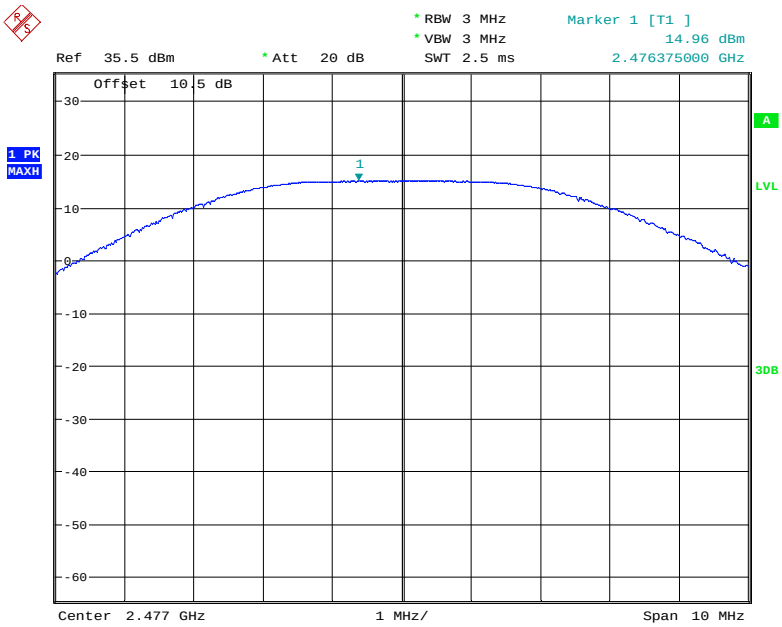
High Channel



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

Applicable Standard

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

According to 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(e), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	27.8 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu on 2021-04-27.

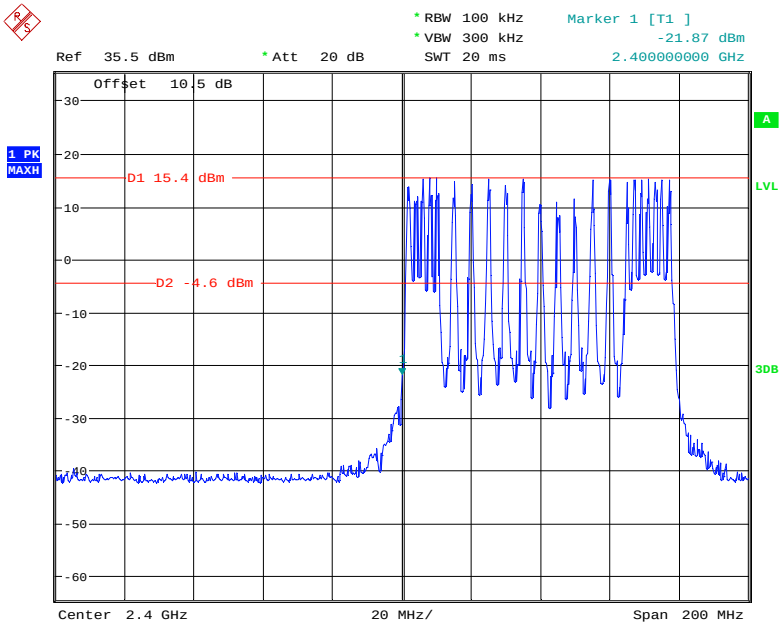
EUT operation mode: Transmitting

Test Result: Pass

Please refer to following plots.

Band Edge-Left Side

Hopping



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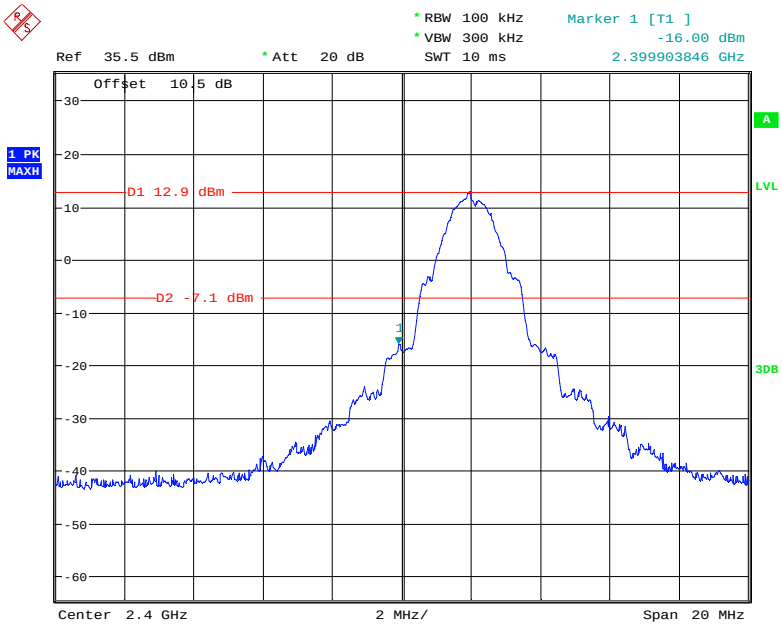
Single



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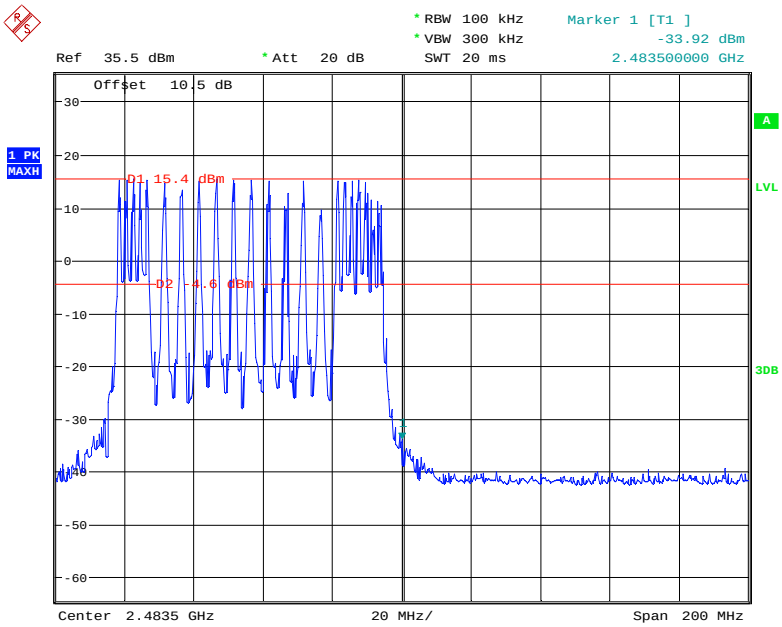
Band Edge-Right Side

Hopping



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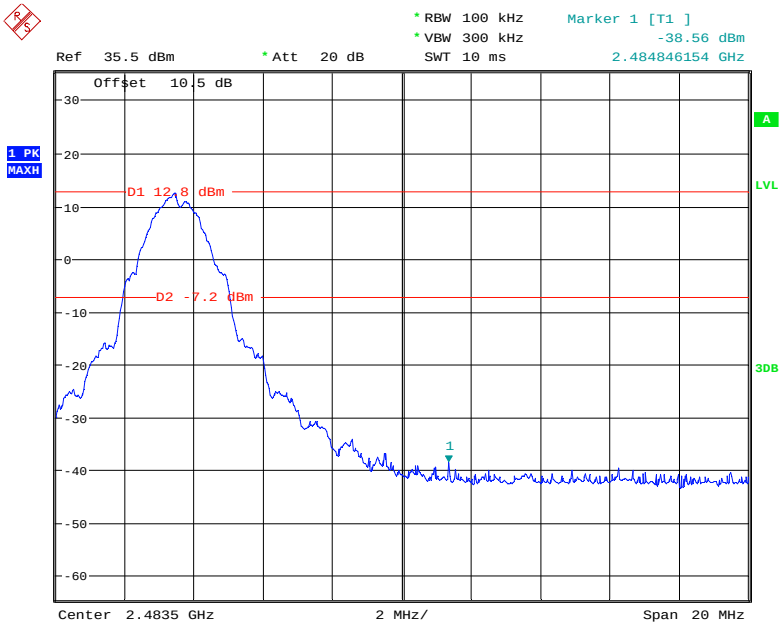

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