RJ Brands LLC

RF TEST REPORT

Report Type:
FCC Part 15.247 & ISED RSS-247 RF report

Model:
CQ60-QPR-01,CQ60-QPR-02,CQ60-QPR-03

REPORT NUMBER:
230302238SHA-001

ISSUE DATE:
July 13, 2023

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.:230302238SHA-001

Applicant:	RJ Brands LLC
	200 Performance Drive,Mahwah,NJ 07495 USA
Manufacturer:	RJ Brands LLC
	200 Performance Drive,Mahwah,NJ 07495 USA
Manufacturer Site:	Chefman Smart Tech (Hangzhou) Co., Ltd
	Dalu Industrial Park, Hangzhou City, Zhejiang Province
Product Name:	Smart Thermometer CHEF PROBE
Type/Model:	CQ60-QPR-01,CQ60-QPR-02,CQ60-QPR-03
FCC ID:	2A2YP-CQ60QPROBE
IC:	27740-CQ60QPROBE

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2021): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2020): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-247 Issue 2 (February 2017): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (February 2021) Amendment 2: General Requirements for Compliance of Radio Apparatus

PREPARED BY:	**REVIEWED BY:**
Project Engineer	Reviewer
Dylan Tang	Wakeyou Wang

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Revision History

Report No.	Version	Description	Issued Date
230302238SHA-001	Rev. 01	Initial issue of report	July 13, 2023

TEST REPORT

Measurement result summary

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-247 Issue 2 Clause 5.2	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	RSS-247 Issue 2 Clause 5.4	Pass
Power spectrum density	15.247(e)	RSS-247 Issue 2 Clause 5.2	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 2 Clause 5.5	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.207(a)	RSS-Gen Issue 5 Clause 8.8	Pass
Occupied bandwidth	-	RSS-Gen Issue 5 Clause 6.6	Tested
Antenna requirement	15.203	-	Pass

Notes: 1: NA =Not Applicable

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Smart Thermometer CHEF PROBE
Type/Model:	CQ60-QPR-01, CQ60-QPR-02, CQ60-QPR-03
Description of EUT:	The EUT is Smart Thermometer CHEF PROBE, it supports Bluetooth function. The differences between CQ60-QPR-01 CQ60-QPR-02 and CQ60-QPR-03 is that the decal number/color on the ceramic handle. the models PCB layout and circuit design is the same. so choose CQ60-QPR-01 to test as representative.
Rating:	DC 3V, 0.03A
Category of EUT:	Class B
EUT type:	☒ Table top ☐ Floor standing
Product Marketing Name:	CQ60-QPR-01, CQ60-QPR-02, CQ60-QPR-03
HVIN:	CQ60-QPR-01, CQ60-QPR-02, CQ60-QPR-03
Software Version:	V2.0.0
Hardware Version:	B
Serial numbers:	0230708-12-001(for radiation sample), 0230708-12-002(for conduction sample)
Sample received date:	March 25, 2023
Date of test:	March 25, 2023~ July 6, 2023

1.2 Technical Specification

Frequency Range:	2402-2480MHz
Support Standards:	IEEE 802.15.1
Type of Modulation:	GFSK
Channel Number:	3
Data Rate:	1Mbps
Antenna Information:	-13.71dBi, Metal antenna

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	NVLAP Accreditation Lab NVLAP LAB CODE: 200849-0
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)
ANSI C63.10 (2020)
RSS-247 Issue 2 (February 2017)
RSS-Gen Issue 5 (April 2018)
KDB 558074 (v05)

2.2 Mode of operation during the test

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)				2402 ~ 2480			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
37	**2402**	**38**	**2426**	**39**	**2480**	-	-

Data rate VS Power:
The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter			
Test Software	-		
Working Mode	BLE		
Test Channel	2402MHz	2426MHz	2480MHz
Power Setting	default	default	default

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Radiated test mode: EUT transmitted signal with BT antenna;

Conducted test mode: EUT transmitted signal from BT RF port connected to SPA directly;

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	23°C	52% RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Radiated Emissions in restricted frequency bands	22°C	55% RH
Power line conducted emission	21°C	52% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
☐	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
☐	A.M.N.	R&S	ENV4200	EC 3558	2024-06-05
☐	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2023-12-07
☐	Shielded room	Zhongyu	-	EC 2838	2024-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESIB 26	EC 3045	2023-07-18
☑	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2023-08-23
☐	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC 5262	2024-06-15
☑	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2023-12-07
☑	Horn antenna	Tonscend	bha9120d	EC 6432-2	2024-02-15
☑	Horn antenna	ETS	3116c	EC 5955	2024-06-16
☑	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-07-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2024-03-05
☑	PXA Signal Analyzer	Keysight	N9030B	EC 6078	2024-06-15
☑	Vector Signal Generator	Agilent	N5182B	EC 5175	2024-03-05
☑	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2024-03-05
☑	Test Receiver	R&S	ESCI 7	EC 4501	2024-03-05
☐	Universal Radio Communication Tester	R&S	CMW500	EC 6209	2024-01-30
☐	Universal Radio Communication Tester	R&S	CMW500	EC5944	2024-03-05
☑	Signal generator	Agilent	N5182A	EC 6172	2023-08-09
☑	Signal generator	Agilent	N5181A	EC 6171	2023-08-09
☑	Climate chamber	GWS	MT3065	EC 6021	2024-03-06
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-24
☑	Pressure meter	YM3	Shanghai Mengde	EC 4620	2023-09-13

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB

3 Minimum 6dB bandwidth

Test result: Pass

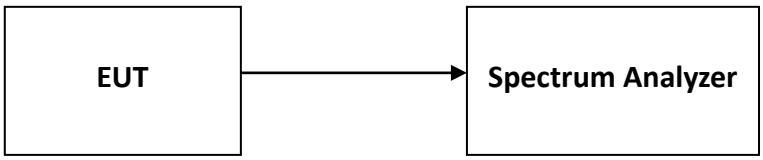
3.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.3 Test Configuration



3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A

4 Maximum conducted output power and e.i.r.p.

Test result: Pass

4.1 Limit

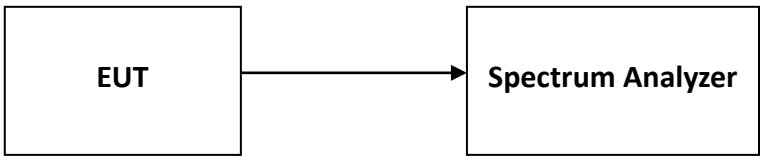
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ 3 × RBW.
c) Set span ≥ 3 x RBW
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

4.3 Test Configuration



4.4 Test Results of Maximum conducted output power

Please refer to Appendix A

5 Power spectrum density

Test result: **Pass**

5.1 Limit

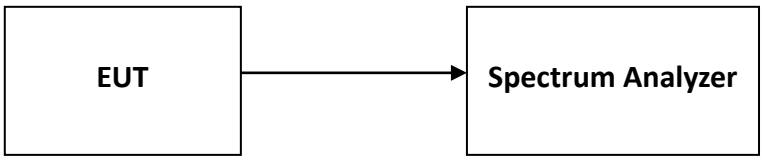
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

5.2 Measurement Procedure

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3 × RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3 Test Configuration



5.4 Test Results of Power spectrum density

Please refer to Appendix A

6 Emission outside the frequency band

Test result: **Pass**

6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

6.2 Measurement Procedure

Reference level measurement

Establish a reference level by using the following procedure:

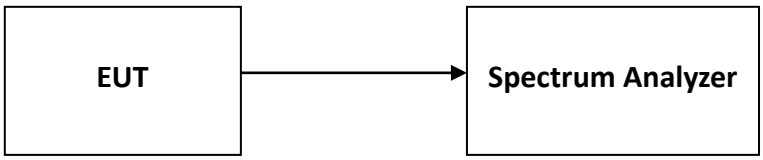
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Emission level measurement

a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

6.3 Test Configuration



6.4 The results of Emission outside the frequency band

Please refer to Appendix A

7 Radiated Emissions in restricted frequency bands

Test result: **Pass**

7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Measurement Procedure

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

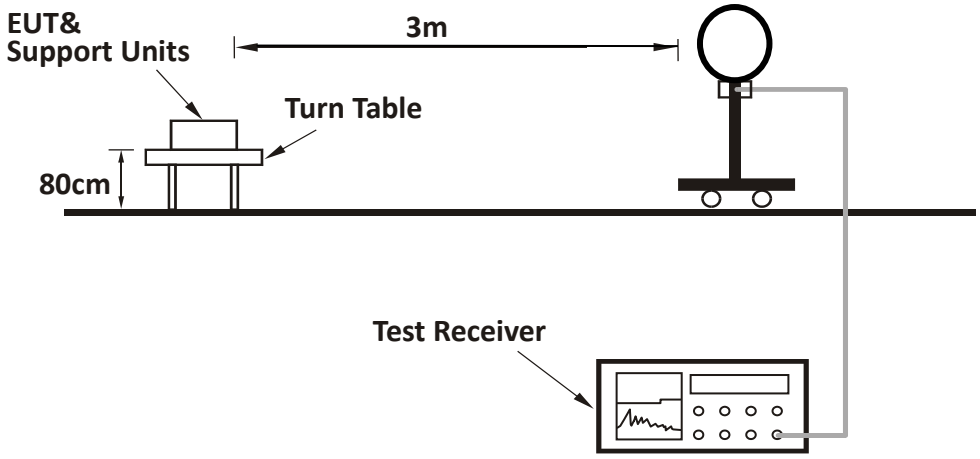
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

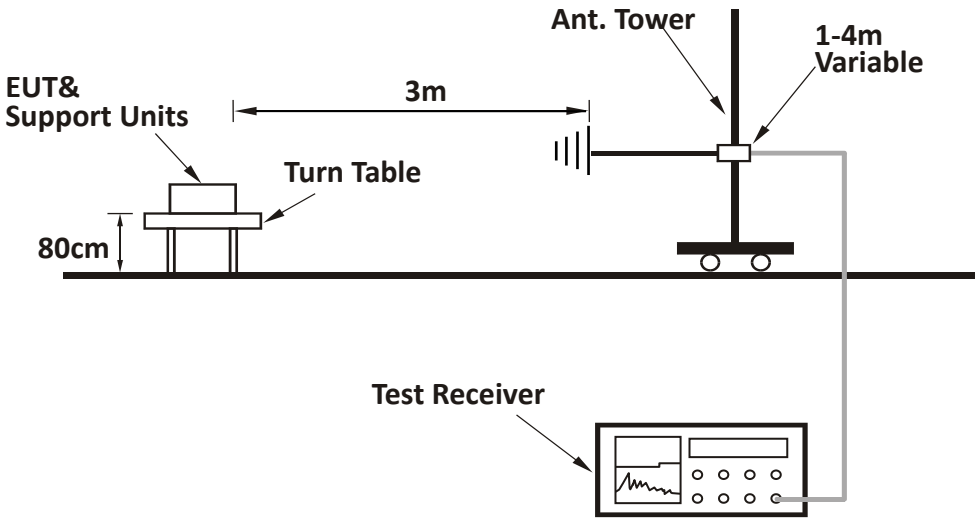
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported

7.3 Test Configuration

For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



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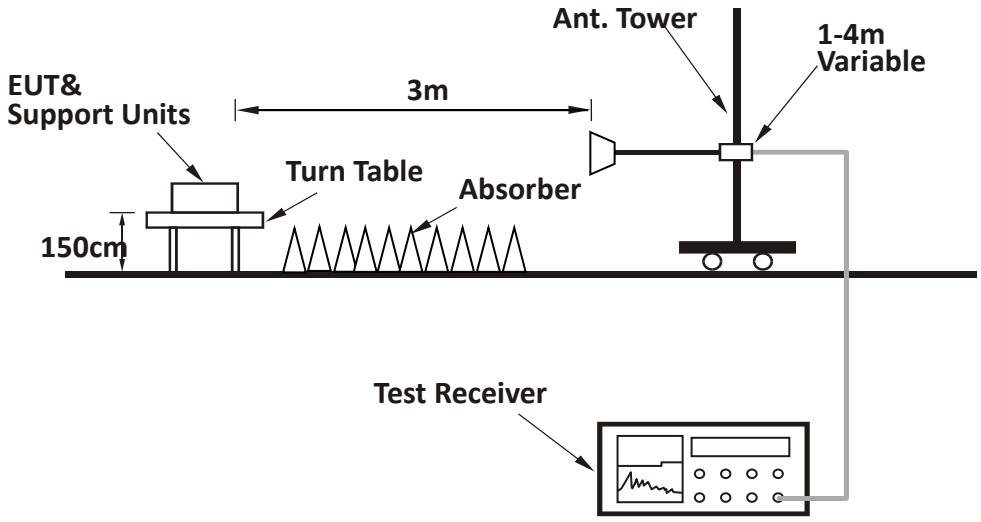
For Radiated emission above 1GHz:

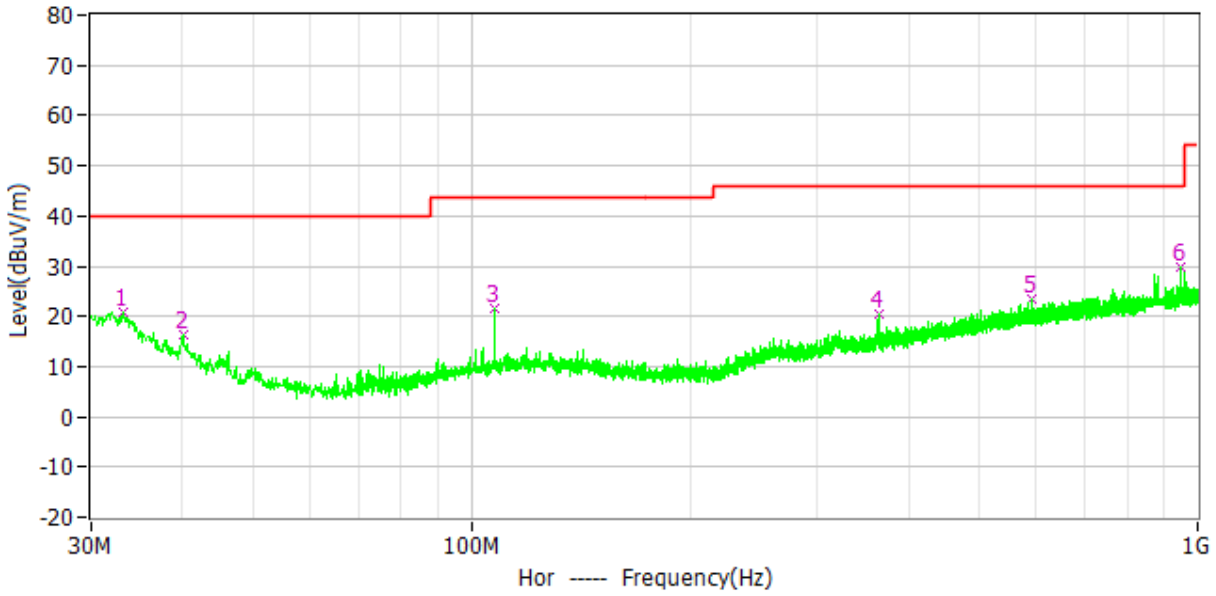


7.4 Test Results of Radiated Emissions

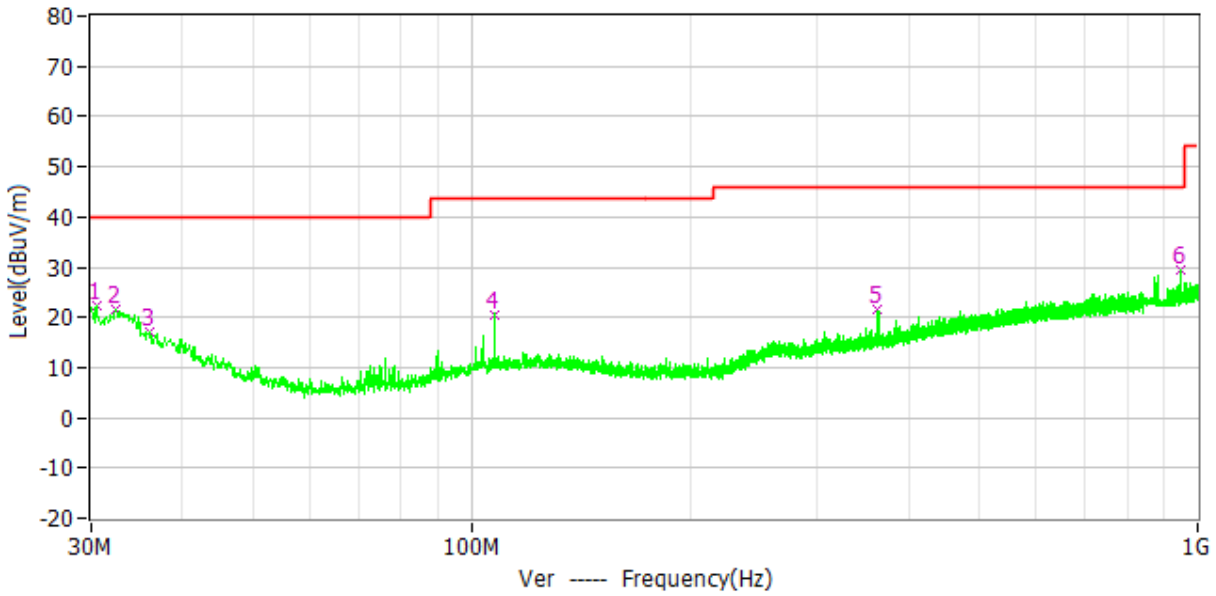
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



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Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	33.201	20.8	19.4	40.0	19.2	PK
H	40.185	16.2	15.0	40.0	23.8	PK
H	107.600	21.4	13.1	43.5	22.1	PK
H	363.389	20.5	17.5	46.0	25.5	PK
H	590.466	23.4	21.9	46.0	22.6	PK
H	948.396	29.7	24.8	46.0	16.3	PK
V	30.485	22.2	21.1	40.0	17.8	PK
V	32.425	21.4	19.9	40.0	18.6	PK
V	36.111	17.2	17.5	40.0	22.8	PK
V	107.600	20.6	13.1	43.5	22.9	PK
V	362.613	21.4	17.5	46.0	24.6	PK
V	948.396	29.3	24.8	46.0	16.7	PK

Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.00	32.5	82.3	Fundamental	/	PK
	V	2402.00	32.5	98.1	Fundamental	/	PK
	H	2390.00	32.5	47.6	74.00	26.4	PK
	V	2390.00	32.5	49.3	74.00	24.7	PK
	H	4804.00	-14.3	40.9	74.00	33.1	PK
	H	7206.00	-8.7	42.6	74.00	31.4	PK
	V	4804.00	-14.3	53.6	74.00	20.4	PK
	V	7206.00	-8.7	47.4	74.00	26.6	PK
M	H	4852.00	-14.1	37.0	74.00	37.0	PK
	H	7278.00	-8.5	39.4	74.00	34.6	PK
	V	4852.00	-14.1	44.0	74.00	30.0	PK
	V	7278.00	-8.5	40.2	74.00	33.8	PK
H	H	2480.00	32.8	82.9	Fundamental	/	PK

	V	2480.00	32.8	94.7	Fundamental	/	PK
	H	2483.50	32.9	49.3	74.00	24.7	PK
	V	2483.50	32.9	53.1	74.00	20.9	PK
	H	4960.00	-13.7	38.2	74.00	35.8	PK
	H	7440.00	-8.2	39.6	74.00	34.4	PK
	V	4960.00	-13.7	49.2	74.00	24.8	PK
	V	7440.00	-8.2	39.8	74.00	34.2	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (- Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

8 Occupied Bandwidth

Test result: **Tested**

8.1 Limit

None

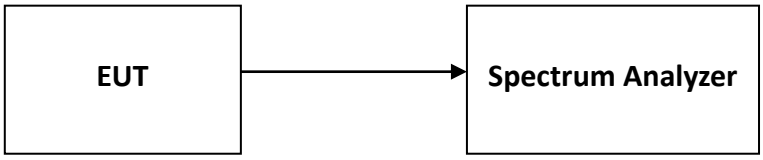
8.2 Measurement Procedure

The occupied bandwidth per RSS-Gen was measured using the Spectrum Analyzer.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

8.3 Test Configuration



8.4 The results of Occupied Bandwidth

Please refer to Appendix A

9 Antenna requirement

Requirement:
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.

Result:
EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

********** END **********