CTC Laboratories, Inc.

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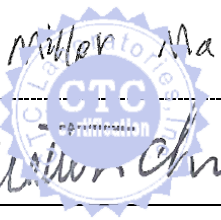
TEST REPORT

Report No. ·····:	**CTC20230015E01**
FCC ID·····:	**2ATXW-BT200PRO**
IC·····:	**7181A-BT200PRO**
Applicant·····:	**SERENE GROUP, INC**
Address·····:	3401 E University Dr. STE 206 Denton, TX 76208, America
Manufacturer·····:	**ShenZhen Go Honger Tech Co. Ltd**
Address·····:	Building 6, Huidebao Industrial Park, South of Dawaihuan Road, Guangming Street, Guangming District, Shenzhen · China
Product Name·····:	**TV SOUNDBOX**
Trade Mark·····:	/
Model/Type reference·····:	BT-200 Pro
Listed Model(s) ·····:	BT-200B Pro, BT-200G Pro, BT-200 Pro Plus, BT-200B Pro Plus BT-200G Pro Plus
Standard·····:	**FCC CFR Title 47 Part 15 Subpart C Section 15.247 RSS 247 Issue 2**
Date of receipt of test sample…:	January 22, 2024
Date of testing……...:	January 22, 2024~February 26, 2024
Date of issue……....:	February 26, 2024
Result……:	**PASS**

Compiled by: (Printed name+signature)	Zoe Xie	
Supervised by: (Printed name+signature)	Miller Ma	
Approved by: (Printed name+signature)	Walter Chen	

Testing Laboratory Name……:	**CTC Laboratories, Inc.**
Address……..:	1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

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1. 7TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.
RSS 247 Issue 2: Standard Specifications for Frequency Hopping Systems (FHSs) and Digital Transmission Systems (DTSs) Operating in the Bands 902-928MHz, 2400-2483.5MHz and 5725-5850MHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
RSS-Gen Issue 5: 2018: General Requirements for Compliance of Radio Apparatus

1.2. Report version

Revised No.	Date of issue	Description
01	February 26, 2024	Original

1.3. Test Description

FCC Part 15 Subpart C (15.247) / RSS 247 Issue 2				
Test Item	Standard Section		Result	Test Engineer
	FCC	IC		
Antenna Requirement	15.203	/	Pass	Alicia Liu
Conducted Emission	15.207	RSS-Gen 8.8	Pass	Eva Feng
Conducted Band Edge and Spurious Emissions	15.247(d)	RSS 247 5.5	Pass	Alicia Liu
Radiated Band Edge and Spurious Emissions	15.205&15.209& 15.247(d)	RSS 247 5.5	Pass	Alicia Liu
6dB Bandwidth	15.247(a)(2)	RSS 247 5.2 (a)	Pass	Alicia Liu
99% Occupied Bandwidth	/	RSS-Gen 6.7	Pass	Alicia Liu
Conducted Max Output Power	15.247(b)(3)	RSS 247 5.4 (d)	Pass	Alicia Liu
Power Spectral Density	15.247(e)	RSS 247 5.2 (b)	Pass	Alicia Liu
Transmitter Radiated Spurious	15.209&15.247(d)	RSS 247 5.5& RSS-Gen 8.9	Pass	Alicia Liu

Note: The measurement uncertainty is not included in the test result.

1.4. Test Facility

CTC Laboratories, Inc.

Add: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements fo r the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained inour files. Registration 951311, Aug 26, 2017.

1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.08 dB	(1)
Radiated Emissions 30~1000MHz	4.51 dB	(1)
Radiated Emissions 1~18GHz	5.84 dB	(1)
Radiated Emissions 18~40GHz	6.12 dB	(1)
Occupied Bandwidth	---------	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

1.6. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	21°C ~ 27°C
Relative Humidity:	40% ~ 60%
Air Pressure:	101kPa

2. GENERAL INFORMATION

2.1. Client Information

Applicant:	SERENE GROUP, INC
Address:	3401 E University Dr. STE 206 Denton, TX 76208, America
Manufacturer:	ShenZhen Go Honger Tech Co. Ltd
Address:	Building 6, Huidebao Industrial Park, South of Dawaihuan Road, Guangming Street, Guangming District, Shenzhen，China

2.2. General Description of EUT

Product Name/PMN:	TV SOUNDBOX
Trade Mark:	/
Model/Type reference/HVIN:	BT-200 Pro
Listed Model(s):	BT-200B Pro, BT-200G Pro, BT-200 Pro Plus, BT-200B Pro Plus BT-200G Pro Plus
Power supply:	DC 3.7V from Battery and DC 5V from USB
Adapter model:	/
Hardware version:	/
Software version:	/
Serial number:	S-01
GFSK	
Modulation:	GFSK
Operation frequency:	2403MHz~2478MHz
Channel number:	26
Min. Channel separation:	1MHz
Antenna type:	Integral antenna
Antenna gain:	-0.62dBi

2.3. Accessory Equipment information

Equipment Information			
Name	Model	S/N	Manufacturer
Adapter	AS1201A-0502000	/	FUSHIGANG
/	/	/	/
/	/	/	/
Cable Information			
Name	Shielded Type	Ferrite Core	Length
USB cable	unshielded	No	0.8m
/	/	/	/
Test Software Information			
Name	Versions	Power Level	/
/	/	/	/

2.4. Operation state

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. GFSK, 26 channels are provided to the EUT. Channels 01/13/26 were selected for testing.
Operation Frequency List:

Channel	Frequency(GHz)	Channel	Frequency(GHz)
1	2.403	14	2.442
2	2.406	15	2.445
3	2.409	16	2.448
4	2.412	17	2.451
5	2.415	18	2.454
6	2.418	19	2.457
7	2.421	20	2.460
8	2.424	21	2.463
9	2.427	22	2.466
10	2.430	23	2.469
11	2.433	24	2.472
12	2.436	25	2.475
13	2.439	26	2.478

Note: The display in grey were the channel selected for testing.

Test mode

For RF test items:
The engineering test program was provided and enabled to make EUT continuous transmit(100% duty cycle).
For AC power line conducted emissions:
The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.
For Radiated spurious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

2.5. Measurement Instruments List

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Dec. 23, 2024
2	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Dec. 23, 2024
3	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 23, 2024
4	Signal Generator	Agilent	E8257D	MY46521908	Dec. 23, 2024
5	Power Sensor	Agilent	U2021XA	MY5365004	Dec. 23, 2024
6	Power Sensor	Agilent	U2021XA	MY5365006	Dec. 23, 2024
7	High and low temperature box	ESPEC	MT3035	N/A	Dec. 23, 2024
8	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	102414	Dec. 23, 2024
9	300328 v2.2.2 test system	TONSCEND	v2.6	/	/

Radiated emission(3m chamber 2)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Dec. 23, 2024
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 23, 2024
3	Spectrum Analyzer	R&S	FSU26	100105	Dec. 23, 2024
4	Spectrum Analyzer	R&S	FSV40-N	101331	Dec. 23, 2024
5	Pre-Amplifier	SONOMA	310	186194	Dec. 23, 2024
6	Low Noise Pre-Amplifier	EMCI	EMC051835	980075	Dec. 23, 2024
7	Test Receiver	R&S	ESCI7	100967	Dec. 23, 2024

Radiated emission(3m chamber 3)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-759	Dec. 23, 2024
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 23, 2024
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 23, 2024
4	Broadband Premplifier	SCHWARZBECK	BBV9743B	259	Dec. 23, 2024
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 23, 2024
6	Loop Antenna	ZHINAN	ZN30900A	/	Dec. 23, 2024

Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101112	Dec. 23, 2024
2	LISN	R&S	ENV216	101113	Dec. 23, 2024
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 23, 2024

Note:1. The Cal. Interval was one year.
2. The cable loss has calculated in test result which connection between each test instruments.

3. TEST ITEM AND RESULTS

3.1. Conducted Emission

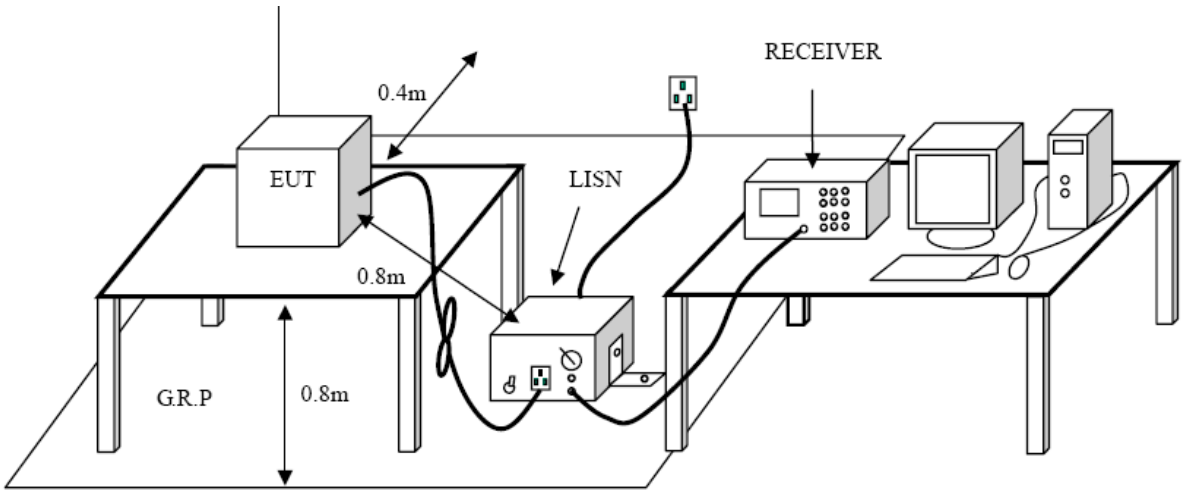
Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.207/ RSS - Gen 8.8

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Configuration



Test Procedure

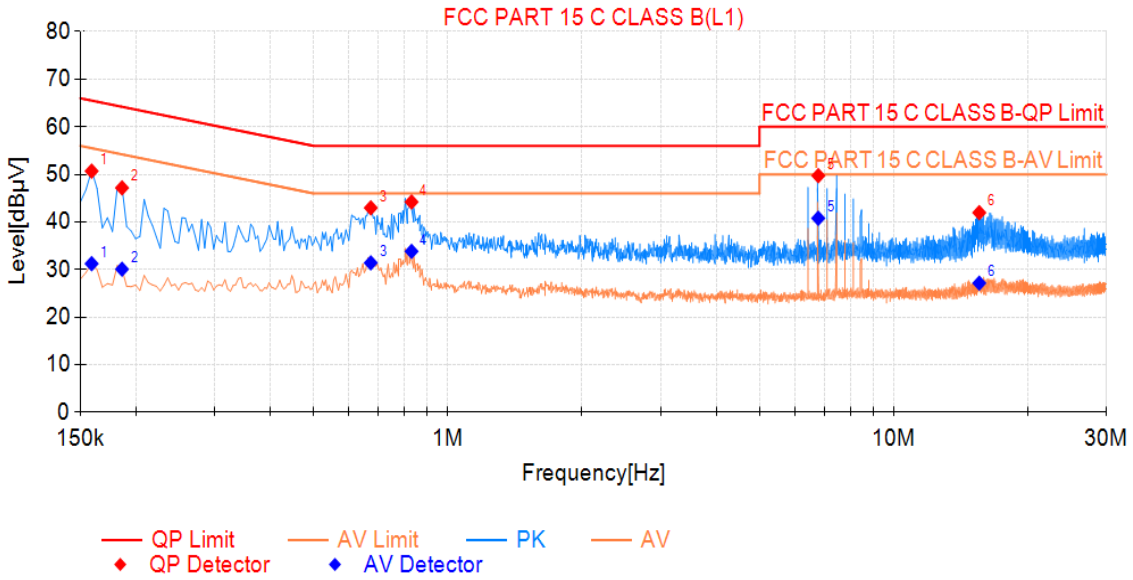
1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

Test Mode:

Please refer to the clause 2.4.

Test Results

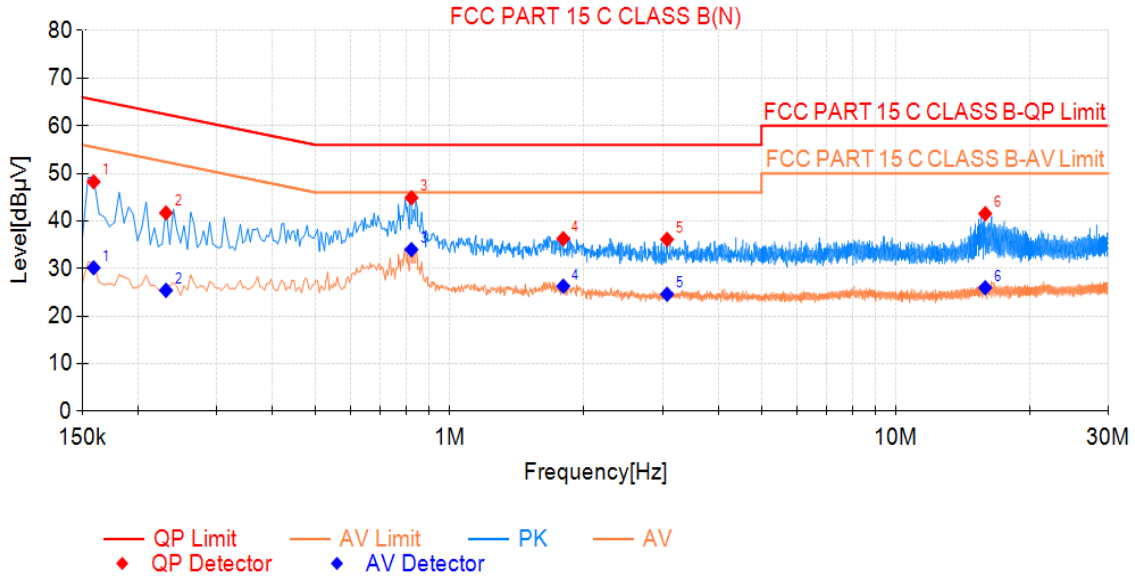
Test Voltage:	AC 120V/60 Hz
Terminal:	Line



NO.	Freq. [MHz]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.159	50.69	65.52	14.83	31.25	55.52	24.27	PASS
2	0.186	47.18	64.21	17.03	30.09	54.21	24.12	PASS
3	0.672	42.97	56.00	13.03	31.42	46.00	14.58	PASS
4	0.830	44.21	56.00	11.79	33.84	46.00	12.16	PASS
5	6.774	49.73	60.00	10.27	40.79	50.00	9.21	PASS
6	15.554	41.97	60.00	18.03	27.16	50.00	22.84	PASS

1.Correct level = Cable lose level + Pulse Limiter Factor level + Artificial Mains Factor level
2.Value level = Read Level+ Correct Factor level
3.Margin level = Value level-Limit level

Test Voltage:	AC 120V/60 Hz
Terminal:	Neutral



NO.	Freq. [MHz]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.159	48.24	65.52	17.28	30.16	55.52	25.36	PASS
2	0.231	41.71	62.41	20.70	25.42	52.41	26.99	PASS
3	0.821	44.88	56.00	11.12	33.98	46.00	12.02	PASS
4	1.797	36.28	56.00	19.72	26.31	46.00	19.69	PASS
5	3.071	36.14	56.00	19.86	24.61	46.00	21.39	PASS
6	15.873	41.54	60.00	18.46	25.97	50.00	24.03	PASS

1.Correct level = Cable lose level + Pulse Limiter Factor level + Artificial Mains Factor level
2.Value level = Read Level+ Correct Factor level
3.Margin level = Value level-Limit level

3.2. Radiated Emission

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.209/ RSS – Gen 8.9

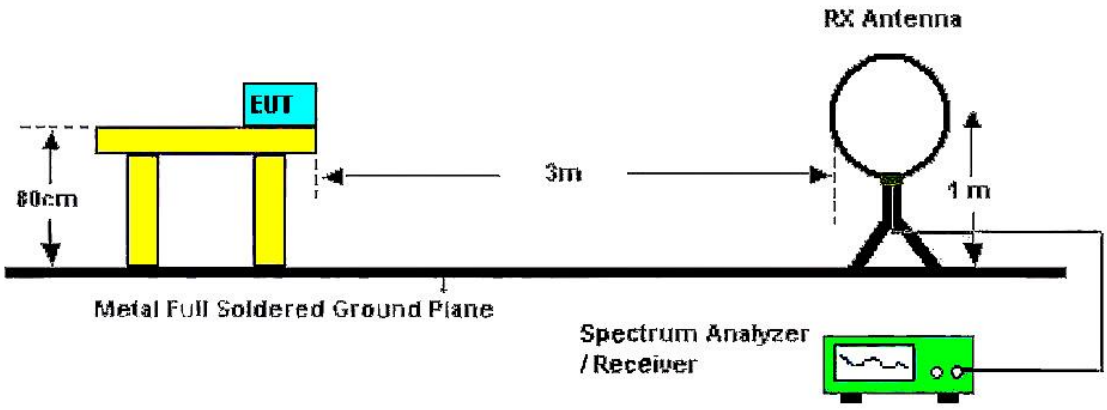
Frequency	Limit (dBuV/m @3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
Above 1 GHz	54.00	Average
	74.00	Peak

Note:

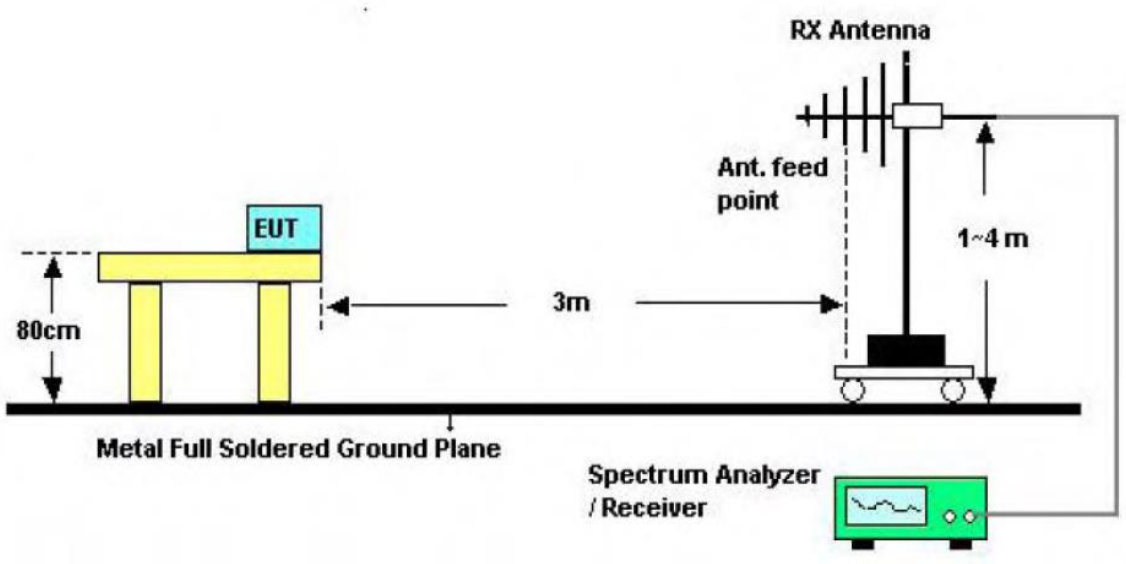
(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

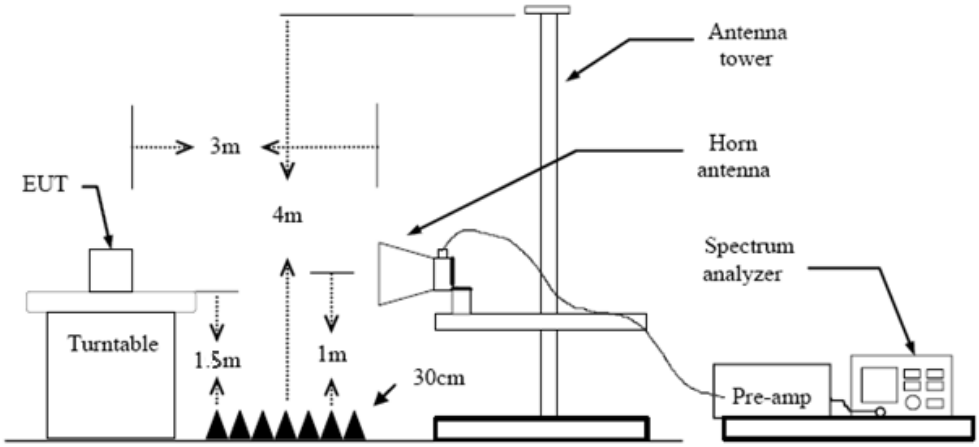
Test Configuration



Below 30MHz Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup

Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable(from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings

(1) Span shall wide enough to fully capture the emission being measured;
(2) Below 1 GHz:
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
(3) From 1 GHz to 10th harmonic:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW≥1/T Peak detector for Average value.
Note 1: For the 1/T& Duty Cycle please refer to clause 3.8 Duty Cycle.

Test Mode

Please refer to the clause 2.4.

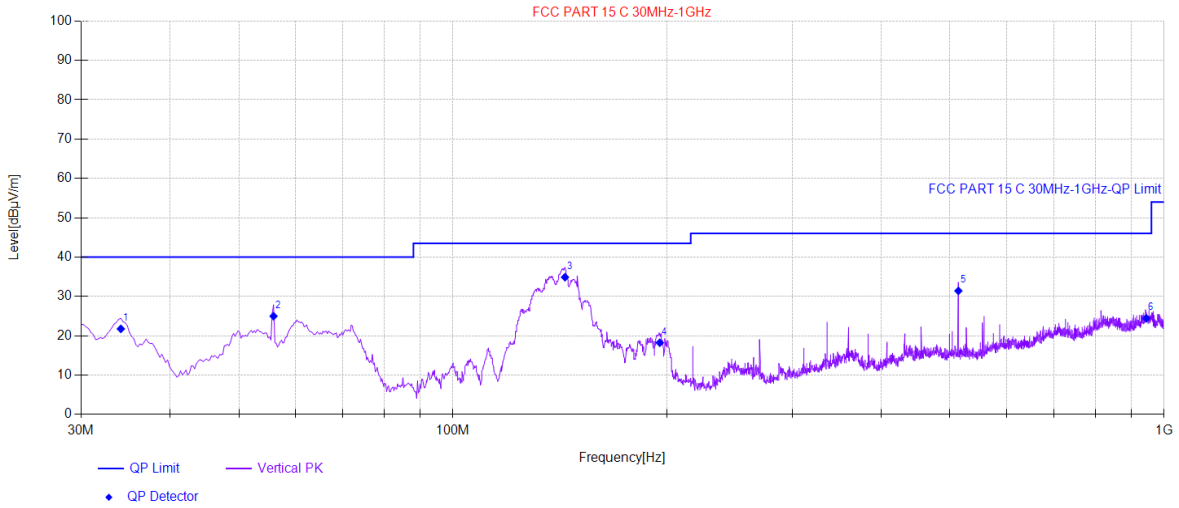
Test Result

9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS
Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

30MHz-1GHz

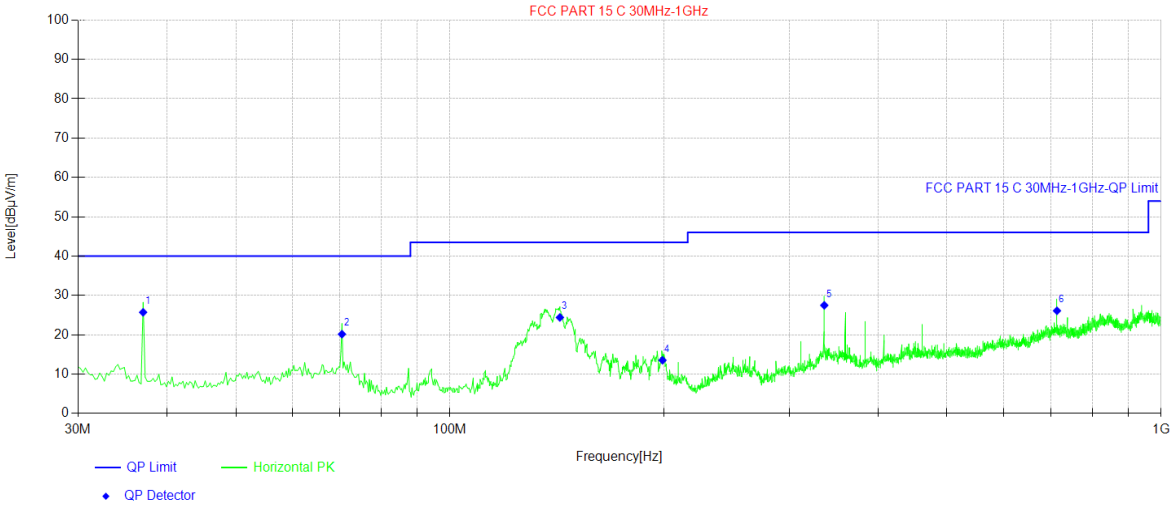
Ant. Pol.	Vertical
Test Mode:	GFSK Mode 2403MHz
Remark:	Only worse case is reported



NO.	Freq. [MHz]	QP Reading [dBµV]	Factor [dB/m]	QP Measure Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity	Verdict
1	34.12	39.94	-18.17	21.77	40.00	18.23	Vertical	PASS
2	55.95	42.76	-17.78	24.98	40.00	15.02	Vertical	PASS
3	143.73	51.16	-16.27	34.89	43.50	8.61	Vertical	PASS
4	195.39	37.19	-18.96	18.23	43.50	25.27	Vertical	PASS
5	513.79	41.27	-9.85	31.42	46.00	14.58	Vertical	PASS
6	943.98	26.64	-2.20	24.44	46.00	21.56	Vertical	PASS

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Measure Level= Read Level+ Factor
3.Margin = Limit -Measure Level

Ant. Pol.	Horizontal
Test Mode:	TX GFSK Mode 2403MHz
Remark:	Only worse case is reported



NO.	Freq. [MHz]	QP Reading [dBµV]	Factor [dB/m]	QP Measure Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity	Verdict
1	37.03	43.55	-17.83	25.72	40.00	14.28	Horizontal	PASS
2	70.50	39.51	-19.35	20.16	40.00	19.84	Horizontal	PASS
3	142.76	40.7	-16.29	24.41	43.50	19.09	Horizontal	PASS
4	199.02	32.71	-19.17	13.54	43.50	29.96	Horizontal	PASS
5	336.04	42.08	-14.59	27.49	46.00	18.51	Horizontal	PASS
6	713.85	31.73	-5.62	26.11	46.00	19.89	Horizontal	PASS

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Measure Level= Read Level+ Factor
3.Margin = Limit -Measure Level

Above 1GHz

Frequency (MHz)	Reading (dBuV)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2403MHz							
4806	58.17	-4.86	53.31	74	-20.69	H	PK
4806	42.9	-4.86	38.04	54	-15.96	H	AV
7209	54.31	1.6	55.91	74	-18.09	H	PK
7209	39.86	1.6	41.46	54	-12.54	H	AV
4806	61	-4.86	56.14	74	-17.86	V	PK
4806	40.9	-4.86	36.04	54	-17.96	V	AV
7209	51.95	1.6	53.55	74	-20.45	V	PK
7209	40.1	1.6	41.7	54	-12.3	V	AV
Middle Channel-2439MHz							
4878	58.02	-4.87	53.15	74	-20.85	H	PK
4878	41.14	-4.87	36.27	54	-17.73	H	AV
7317	52.19	1.51	53.7	74	-20.3	H	PK
7317	38.16	1.51	39.67	54	-14.33	H	AV
4878	58.11	-4.87	53.24	74	-20.76	V	PK
4878	41.31	-4.87	36.44	54	-17.56	V	AV
7317	55.3	1.51	56.81	74	-17.19	V	PK
7317	37.87	1.51	39.38	54	-14.62	V	AV
High Channel-2478MHz							
4956	58.53	-4.26	54.27	74	-19.73	H	PK
4956	41.43	-4.26	37.17	54	-16.83	H	AV
7434	53.02	1.69	54.71	74	-19.29	H	PK
7434	37.5	1.69	39.19	54	-14.81	H	AV
4956	56.9	-4.26	52.64	74	-21.36	V	PK
4956	41.47	-4.26	37.21	54	-16.79	V	AV
7434	52.2	1.69	53.89	74	-20.11	V	PK
7434	38.3	1.69	39.99	54	-14.01	V	AV

Remarks:
1. Correct (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2. Measure Level= Read Level+ Correct Factor
3. Margin = Measure Level-Limit
4. Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3h Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

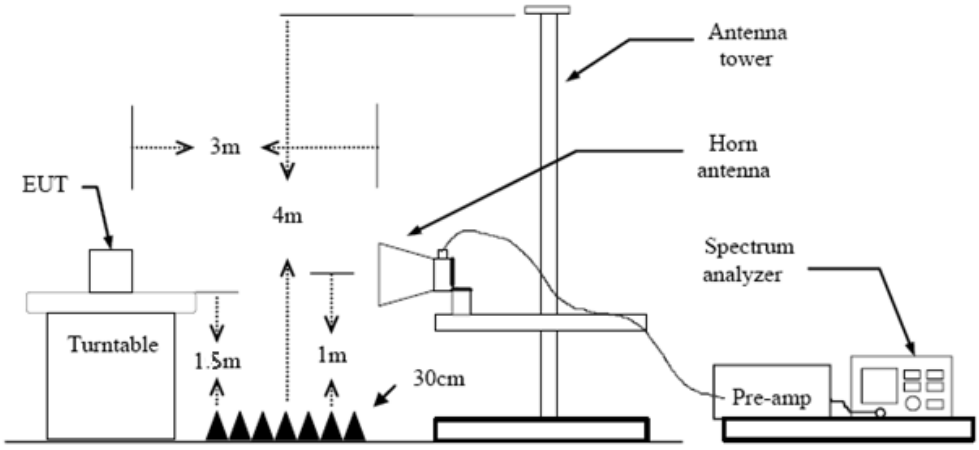
3.3. Band Edge Emissions (Radiated)

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d)/ RSS 247 5.5:

Restricted Frequency Band (MHz)	(dBuV/m)(at 3m)	
	Peak	Average
2310 ~ 2390	74	54
2483.5 ~ 2500	74	54

Test Configuration



Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
   RBW=1MHz, VBW=3MHz Peak detector for Peak value.
   RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

   Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 3.8 Duty Cycle.

Test Mode

Please refer to the clause 2.4.

Test Results

Test channel					2403MHz				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Measure value
2310.00	30.10	28.05	6.62	37.59	27.18	74.00	-46.82	Vertical	Peak
2390.03	31.99	27.65	6.75	37.59	28.80	74.00	-45.20	Vertical	Peak
2310.00	30.91	28.05	6.62	37.59	27.99	74.00	-46.01	Horizontal	Peak
2390.03	31.37	27.65	6.75	37.59	28.18	74.00	-45.82	Horizontal	Peak
2310.00	24.46	28.05	6.62	37.59	21.54	54.00	-32.46	Vertical	Average
2390.03	25.42	27.65	6.75	37.59	22.23	54.00	-31.77	Vertical	Average
2310.00	24.27	28.05	6.62	37.59	21.35	54.00	-32.65	Horizontal	Average
2390.03	24.09	27.65	6.75	37.59	20.90	54.00	-33.10	Horizontal	Average

Test channel					2478MHz				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Measure value
2483.50	51.66	27.26	6.83	37.59	48.16	74.00	-25.84	Vertical	Peak
2500.00	30.31	27.20	6.84	37.59	26.76	74.00	-47.24	Vertical	Peak
2483.50	50.33	27.26	6.83	37.59	46.83	74.00	-27.17	Horizontal	Peak
2500.00	30.99	27.20	6.84	37.59	27.44	74.00	-46.56	Horizontal	Peak
2483.50	49.35	27.26	6.83	37.59	45.85	54.00	-8.15	Vertical	Average
2500.00	22.64	27.20	6.84	37.59	19.09	54.00	-34.91	Vertical	Average
2483.50	46.84	27.26	6.83	37.59	43.34	54.00	-10.66	Horizontal	Average
2500.00	22.72	27.20	6.84	37.59	19.17	54.00	-34.83	Horizontal	Average

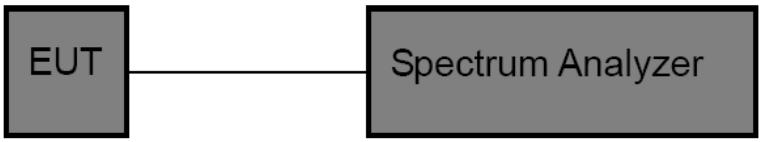
Remarks:
1. Measure Level= Read Level+ Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2. Margin = Measure Level-Limit

3.4. Band edge and Spurious Emissions (Conducted)

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):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, based on either an RF conducted or a radiated measurement.

Test Configuration



Test Procedure

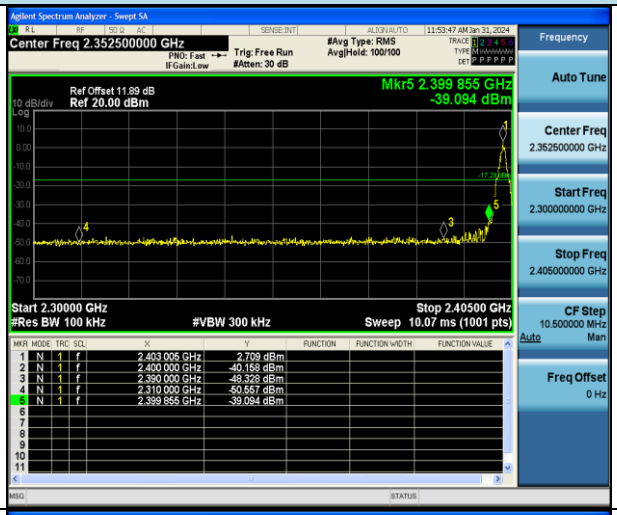
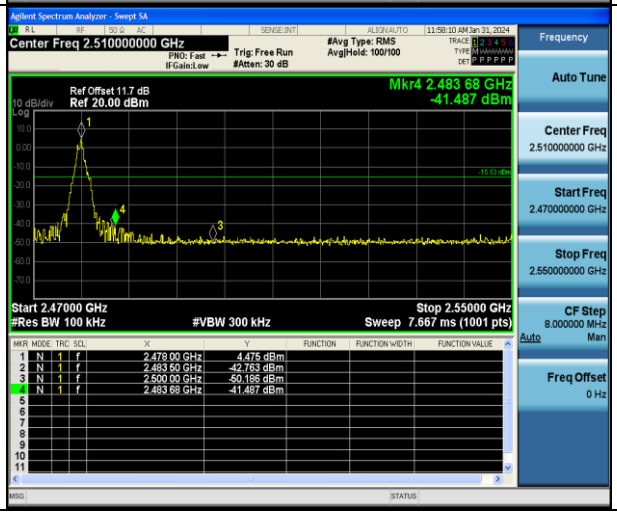
1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   RBW = 100 kHz, VBW ≥ RBW, scan up through 10th harmonic.
   Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

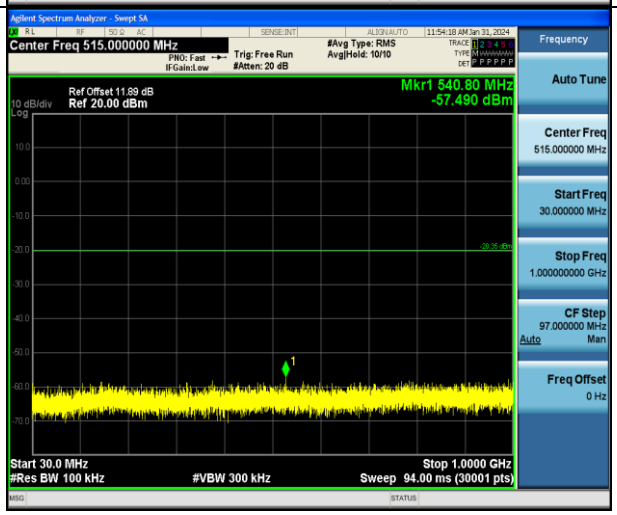
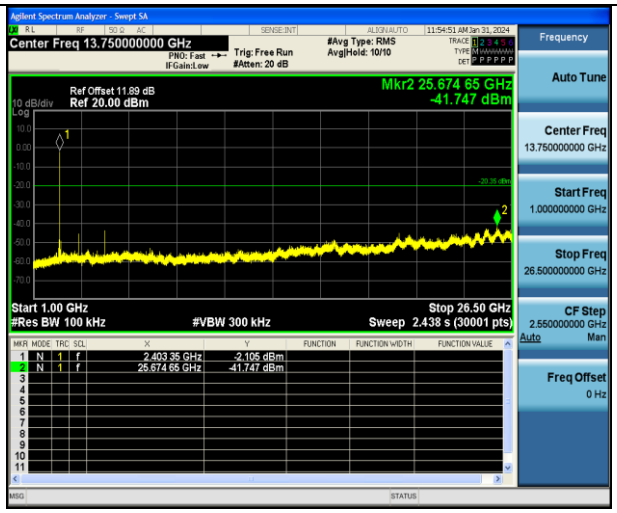
Test Mode

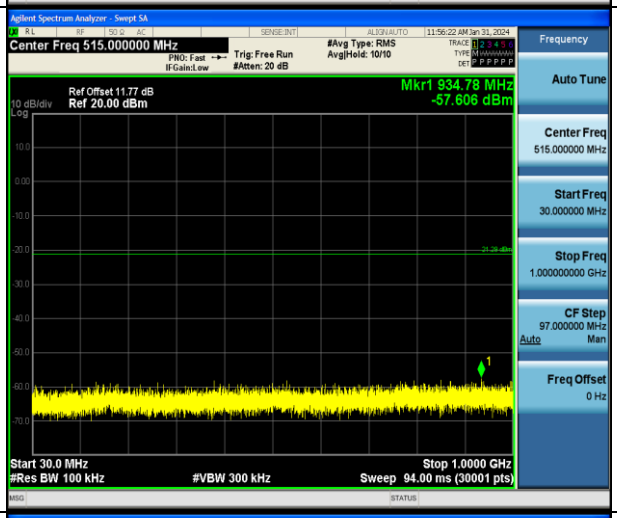
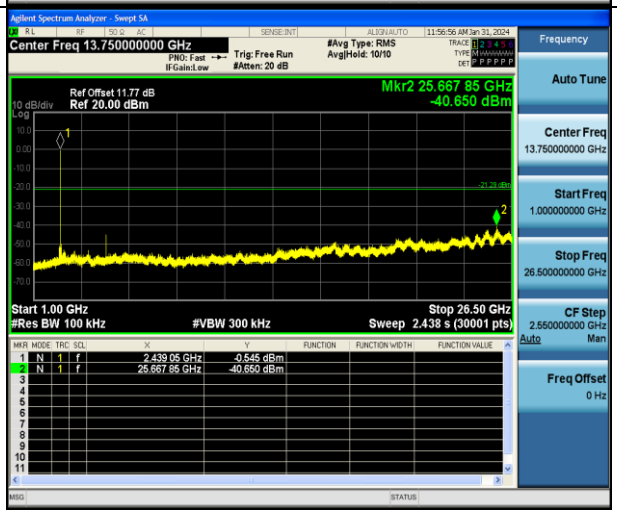
Please refer to the clause 2.4.

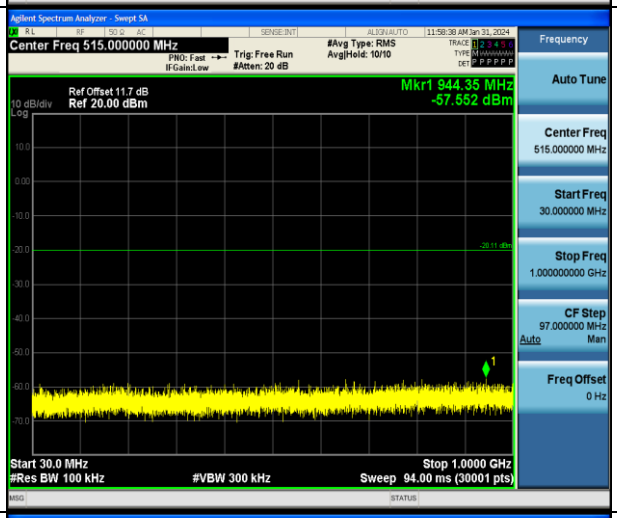
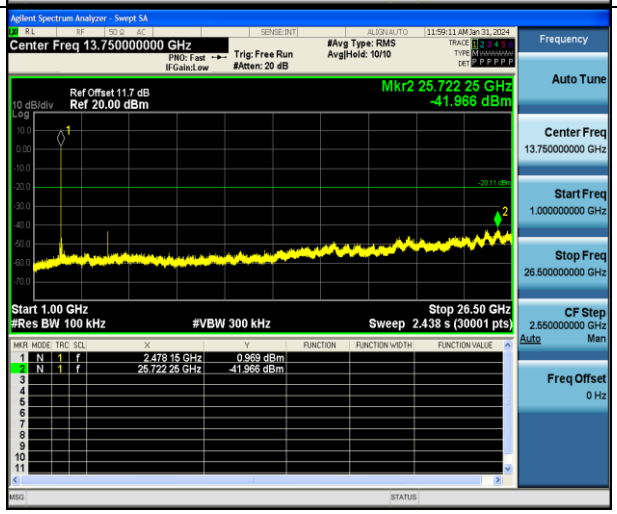
Test Results

(1) Band edge Conducted Test

Test Item:	Band edge	
Low		
High		

Test Item:	SE	
Low Reference level		
Low 30MHz~1000MHz		
Low 1GHz~26GHz		

Middle Reference level		
Middle 30MHz~1000MHz		
Middle 1GHz~26GHz		

High Reference level		
High 30MHz~1000MHz		
High 1GHz~26GHz		

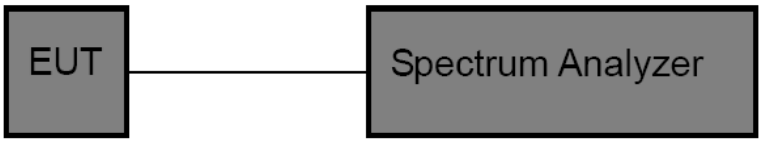
3.5. DTS Bandwidth

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2)/ RSS-247 5.2 a:

Test Item	Limit	Frequency Range(MHz)
DTS Bandwidth	>=500 KHz (6dB bandwidth)	2400~2483.5

Test Configuration



Test Procedure

5. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
6. DTS Spectrum Setting:
   (1) Set RBW = 100 kHz.
   (2) Set the video bandwidth (VBW) ≥ 3 RBW.
   (3) Detector = Peak.
   (4) Trace mode = Max hold.
   (5) Sweep = Auto couple.
   OCB Spectrum Setting:
   (1) Set RBW = 1% ~ 5% occupied bandwidth.
   (2) Set the video bandwidth (VBW) ≥ 3 RBW.
   (3) Detector = Peak.
   (4) Trace mode = Max hold.
   (5) Sweep = Auto couple.

Test Mode

Please refer to the clause 2.4.

Test Results

Test Mode	Channel	DTS BW[MHz]	OBW[MHz]	Limit[MHz]	Verdict
GFSK	Low	1.044	2.5440	>=0.5	PASS
	Middle	0.968	2.4820	>=0.5	PASS
	High	0.884	2.4583	>=0.5	PASS

Low		 Agilent Spectrum Analyzer - Swept SA Center Freq 2.403000000 GHz PNO: Wide IFGain:Low Trig: Free Run #Atten: 40 dB #Avg Type: RMS Avg|Hold: 100/100 11:52:59 AM Jan 31, 2024 Ref Offset 11.89 dB 10 dB/div Ref 30.00 dBm ΔMkr3 1.044 MHz 0.091 dB Center 2.403000 GHz #Res BW 100 kHz #VBW 300 kHz Span 4.000 MHz Sweep 1.000 ms (1001 pts) 1 N 1 f 2.402 372 GHz -3.222 dBm 2 N 1 f 2.402 996 GHz 2.722 dBm 3 Δ1 1 f (Δ) 1.044 MHz (Δ) 0.091 dB Frequency Auto Tune Center Freq 2.403000000 GHz Start Freq 2.401000000 GHz Stop Freq 2.405000000 GHz CF Step 400.000 kHz Auto Man Freq Offset 0 Hz MSG STATUS  Agilent Spectrum Analyzer - Occupied BW Center Freq 2.403000000 GHz Center Freq: 2.403000000 GHz Trig: Free Run Avg|Hold: 100/100 #IFGain:Low #Atten: 40 dB Radio Std: None Radio Device: BTS 11:53:04 AM Jan 31, 2024 Ref Offset 11.89 dB 10 dB/div Ref 30.00 dBm Mkr1 2.403016 GHz 1.5066 dBm Center 2.403 GHz #Res BW 43 kHz #VBW 130 kHz Span 4 MHz Sweep 2.067 ms Occupied Bandwidth 2.5440 MHz Total Power 8.63 dBm Transmit Freq Error -14.036 kHz OBW Power 99.00 % x dB Bandwidth 3.160 MHz x dB -26.00 dB Frequency Center Freq 2.403000000 GHz CF Step 400.000 kHz Auto Man Freq Offset 0 Hz MSG STATUS
Middle		 Agilent Spectrum Analyzer - Swept SA Center Freq 2.439000000 GHz PNO: Wide IFGain:Low Trig: Free Run #Atten: 40 dB #Avg Type: RMS Avg|Hold: 100/100 11:55:32 AM Jan 31, 2024 Ref Offset 11.77 dB 10 dB/div Ref 30.00 dBm ΔMkr3 968 kHz 0.252 dB Center 2.439000 GHz #Res BW 100 kHz #VBW 300 kHz Span 4.000 MHz Sweep 1.000 ms (1001 pts) 1 N 1 f 2.438 440 GHz -2.554 dBm 2 N 1 f 2.439 000 GHz 3.401 dBm 3 Δ1 1 f (Δ) 968 kHz (Δ) 0.252 dB Frequency Auto Tune Center Freq 2.439000000 GHz Start Freq 2.437000000 GHz Stop Freq 2.441000000 GHz CF Step 400.000 kHz Auto Man Freq Offset 0 Hz MSG STATUS

		 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.439000000 GHz Center Freq: 2.439000000 GHz Trig: Free Run Avg|Hold: 100/100 #Atten: 40 dB Radio Std: None Radio Device: BTS Ref Offset 11.77 dB 10 dB/div Ref 30.00 dBm Mkr1 2.439 GHz 3.4693 dBm Center 2.439 GHz #Res BW 43 kHz #VBW 130 kHz Span 4 MHz Sweep 2.067 ms Occupied Bandwidth 2.4820 MHz Total Power 9.88 dBm Transmit Freq Error -22.821 kHz OBW Power 99.00 % x dB Bandwidth 3.159 MHz x dB -26.00 dB Frequency Center Freq 2.439000000 GHz CF Step 400.000 kHz Auto Man Freq Offset 0 Hz
High		 Agilent Spectrum Analyzer - Swept SA Center Freq 2.478000000 GHz PNO: Wide IFGain:Low #Avg Type: RMS Trig: Free Run Avg|Hold: 100/100 #Atten: 40 dB Ref Offset 11.7 dB 10 dB/div Ref 30.00 dBm ΔMkr3 884 kHz -0.089 dB Center 2.478000 GHz #Res BW 100 kHz #VBW 300 kHz Span 4.000 MHz Sweep 1.000 ms (1001 pts) 1 N 1 f 2.477 532 GHz -1.464 dBm 2 N 1 f 2.478 004 GHz 4.424 dBm 3 Δ1 1 f (Δ) 884 kHz (Δ) -0.089 dB Frequency Auto Tune Center Freq 2.478000000 GHz Start Freq 2.476000000 GHz Stop Freq 2.480000000 GHz CF Step 400.000 kHz Auto Man Freq Offset 0 Hz Agilent Spectrum Analyzer - Occupied BW Center Freq 2.478000000 GHz Center Freq: 2.478000000 GHz Trig: Free Run Avg|Hold: 100/100 #Atten: 40 dB Radio Std: None Radio Device: BTS Ref Offset 11.7 dB 10 dB/div Ref 30.00 dBm Mkr1 2.478 GHz 4.4888 dBm Center 2.478 GHz #Res BW 43 kHz #VBW 130 kHz Span 4 MHz Sweep 2.067 ms Occupied Bandwidth 2.4583 MHz Total Power 10.8 dBm Transmit Freq Error -35.081 kHz OBW Power 99.00 % x dB Bandwidth 3.150 MHz x dB -26.00 dB Frequency Center Freq 2.478000000 GHz CF Step 400.000 kHz Auto Man Freq Offset 0 Hz	

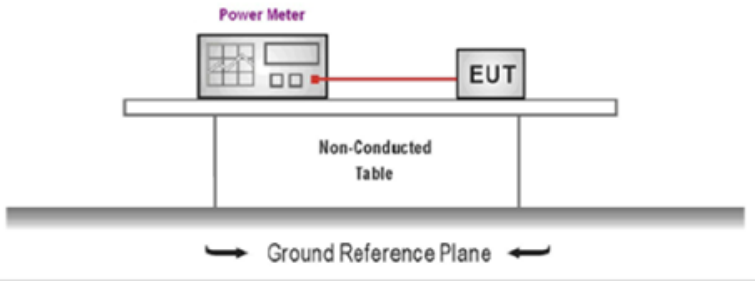
3.6. Peak Output Power

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3)/ RSS-247 5.4 d:

Section	Test Item	Limit	Frequency Range(MHz)
CFR 47 FCC 15.247(b)(3)	Maximum conducted output power	1 Watt or 30dBm	2400~2483.5
ISED RSS-247 5.4 d	EIRP	4 Watt or 36dBm	2400~2483.5

Test Configuration



Test Procedure

1. The EUT was tested according to ANSI C63.10: 2013 and KDB 558074 D01 for compliance to FCC 47 CFR 15.247 requirements.
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter.
3. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.
4. Record the measurement data.

Test Mode

Please refer to the clause 2.4.

Test Result

Test Mode	Channel	Result[dBm]	Limit[dBm]	Verdict
GFSK	Low	3.53	<=30	PASS
	Middle	4.04	<=30	PASS
	High	4.77	<=30	PASS

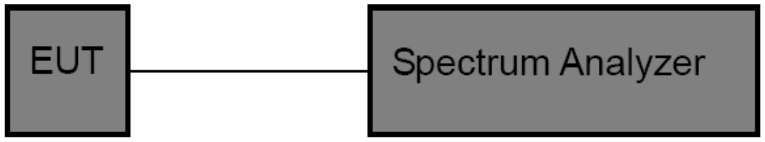
3.7. Power Spectral Density

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e)/ RSS-247 5.2 b:

Test Item	Limit	Frequency Range(MHz)
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
3. Spectrum Setting:

Set analyzer center frequency to DTS channel center frequency.
Set the span to 1.5 times the DTS bandwidth.
Set the RBW to: 3 kHz
Set the VBW to: 10 kHz
Detector: peak
Sweep time: auto
Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

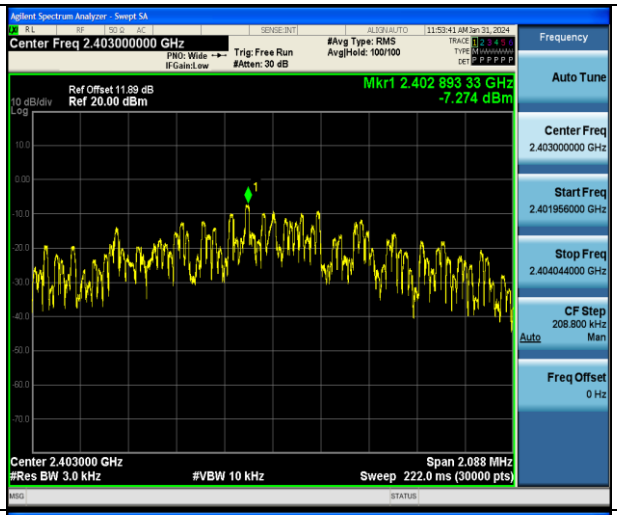
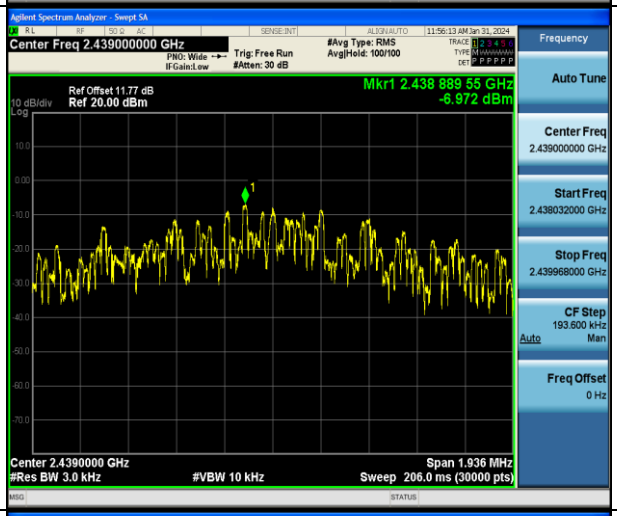
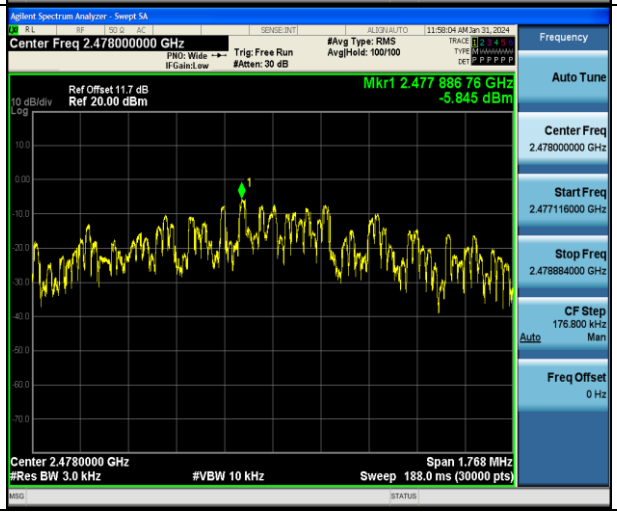
Test Mode

Please refer to the clause 2.4.

Test Result

Test Mode	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
GFSK	Low	-7.27	<=8	PASS
	Middle	-6.97	<=8	PASS
	High	-5.85	<=8	PASS

Test plot as follows:

Low			
Middle			
High			

3.8. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 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 antenna that uses a unique coupling to the intentional radiator, 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.
FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):
(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

This product has a FPC antenna, fulfill the requirement of this section.

**************************THE END**************************