

FCC Test Report

Applicant : Shenzhen Seenda Technology Co., Ltd.

Address : 2nd Floor, Building C, Gelong Zhigu, Bulong
Road, Bantian Street, Longgang District,
Shenzhen City, Guangdong Province, China

Product Name : Ergonomic Wireless Trackball Mouse

Report Date : Sept. 29, 2024



Shenzhen Anbotek Compliance Laboratory Limited



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TEST REPORT

Applicant : Shenzhen Seenda Technology Co., Ltd.
Manufacturer : Shenzhen Seenda Technology Co., Ltd.
Product Name : Ergonomic Wireless Trackball Mouse
Model No. : EM01 NL, EM01 Pro, EM01 Plus, EM01 MAX
Trade Mark : ProtoArc
Rating(s) : Input: 5V= 1A (with DC 3.7V, 900mAh battery inside)
Test Standard(s) : FCC Part15 Subpart C, Section 15.247
Test Method(s) : ANSI C63.10: 2020

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of Receipt

May 27, 2024

Date of Test

May 27 ~ Jun. 24, 2024

Prepared By

Nian xiu Chen

(Nianxiu Chen)

Approved & Authorized Signer

Kingkong Jin

(Kingkong Jin)



Revision History

Report Version	Description	Issued Date
R00	Original Issue	Sept. 29, 2024



1. General Information

1.1. Client Information

Applicant	:	Shenzhen Seenda Technology Co., Ltd.
Address	:	2nd Floor, Building C, Gelong Zhigu, Bulong Road, Bantian Street, Longgang District, Shenzhen City, Guangdong Province, China
Manufacturer	:	Shenzhen Seenda Technology Co., Ltd.
Address	:	2nd Floor, Building C, Gelong Zhigu, Bulong Road, Bantian Street, Longgang District, Shenzhen City, Guangdong Province, China
Factory	:	Dongguan Dianxuntong Electronics Technology Co., Ltd
Address	:	3F,BLDG A,Guanhui Intelligent Science and Technology Industrial Park, Xiabian Village, Chang'an Town, Dongguan,Guangdong523876, CHINA

1.2. Description of Device (EUT)

Product Name	:	Ergonomic Wireless Trackball Mouse
Model No.	:	EM01 NL, EM01 Pro, EM01 Plus, EM01 MAX (Note: All samples are the same except the model number, so we prepare "EM01 NL" for test only.)
Trade Mark	:	ProtoArc
Test Power Supply	:	DC 5V from Adapter input AC 120V/60Hz/ DC 3.7V Battery inside
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Adapter	:	N/A
RF Specification		
Operation Mode	:	☐ DSSS ☒ FHSS
Operation Frequency	:	2403~2480 MHz
Number of Channel	:	16 Channels
Modulation Type	:	GFSK
Antenna Type	:	PCB Antenna
Antenna Gain(Peak)	:	2.34 dBi
Remark: 1) All of the RF specification are provided by customer. 2) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		



1.3. Auxiliary Equipment Used During Test

Description	Rating(s)
Adapter	Model: MDY-11-EX Input: 100-240V~0.7A,50-60Hz USB-A output: 5V= 3A, 9V= 3A,12V= 2.25A, 20V= 1.35A, 11V= 3A

1.4. Description of Test Configuration

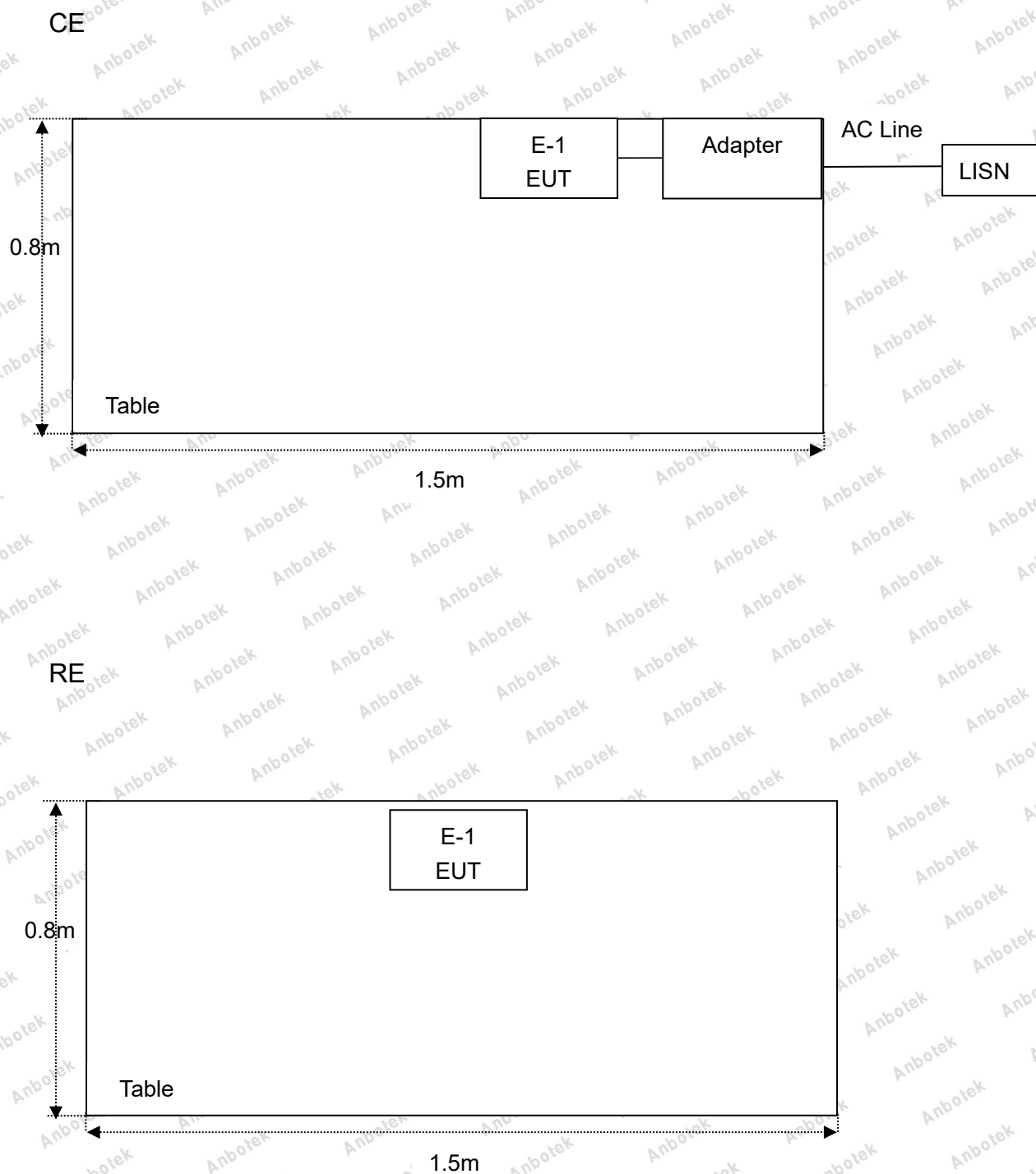
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
01	2403	05	2422	09	2441	13	2463
02	2407	06	2426	10	2445	14	2466
03	2414	07	2436	11	2453	15	2473
04	2419	08	2439	12	2459	16	2480

Note:

1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.
2. EUT was tested with channel 01, 09 and 16.



1.5. Description Of Test Setup



1.6. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Jan. 18, 2024	1 Year
2.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT00 1	Jan. 17, 2024	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Jan. 17, 2024	1 Year
4.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Jan. 23, 2024	1 Year
5.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 12, 2023	1 Year
6.	EMI Preamplifier	SKET Electronic	LNPA-0118G- 45	SKET-PA-002	Jan. 17, 2024	1 Year
7.	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	Oct. 16, 2022	3 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	345	Oct. 23, 2022	3 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 12, 2023	1 Year
10.	Horn Antenna	A-INFO	LB-180400-K F	J211060628	Oct. 12, 2023	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Jan. 17, 2024	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 12, 2023	1 Year
14.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 12, 2023	1 Year
15.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 12, 2023	1 Year
16.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 20, 2023	1 Year
17.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Oct. 16, 2023	1 Year
18.	Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102150	May. 06, 2024	1 Year



1.7. Measurement Uncertainty

Parameter	Uncertainty
Conducted emissions (AMN 150kHz~30MHz)	3.8dB
Occupied Bandwidth	925Hz
Conducted Output Power	0.76dB
Dwell Time	2%
Conducted Spurious Emission	1.24dB
Radiated spurious emissions (Below 30MHz)	3.53dB
Radiated spurious emissions (30MHz~1GHz)	Horizontal: 3.92dB; Vertical: 4.52dB
Radiated spurious emissions (above 1GHz)	1G-6GHz: 4.78dB; 6G-18GHz: 4.88dB 18G-40GHz: 5.68dB
The measurement uncertainty and decision risk evaluated according to AB/WI-RF-F-032. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

1.8. Description of Test Facility

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

FCC-Registration No.: 434132

Shenzhen Anbotek Compliance Laboratory Limited, 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 in our files. Registration No. 434132.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

Sogood Industrial Zone Laboratory & 1/F. of Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Subdistrict, Bao'an District, Shenzhen, Guangdong, China.



1.9. Disclaimer

1. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
2. The test report is invalid if there is any evidence and/or falsification.
3. The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
4. This document may not be altered or revised in any way unless done so by Anbotech and all revisions are duly noted in the revisions section.
5. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
6. The authenticity of the information provided by the customer is the responsibility of the customer and the laboratory is not responsible for its authenticity.

The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.



2. Summary of Test Results

Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Radiated Spurious Emission and Band Edge	PASS
15.247(b)(1)	Maximum Conducted Output Power	PASS
15.247(a)(1)	20dB Bandwidth	PASS
N/A	99% Occupied Bandwidth	Report only
15.247(a)(1)	Carrier Frequency Separation	PASS
15.247(a)(1)(iii)	Number of Hopping Channel	PASS
15.247(a)(1)(iii)	Dwell Time	PASS
15.247(d)	Conducted Spurious Emission and Band Edge	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		



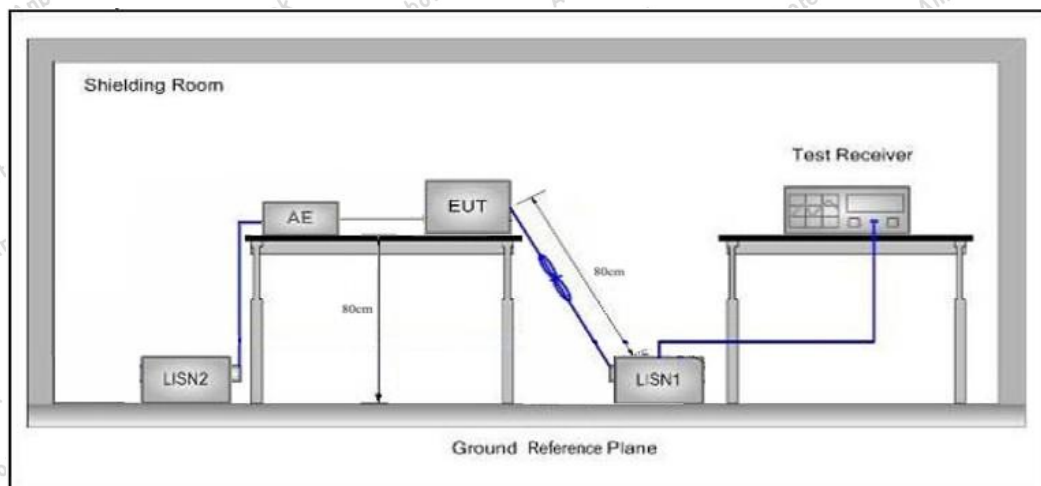
3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50

Remark: (1) *Decreasing linearly with logarithm of the frequency.
(2) The lower limit shall apply at the transition frequency.

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10: 2020 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

PASS

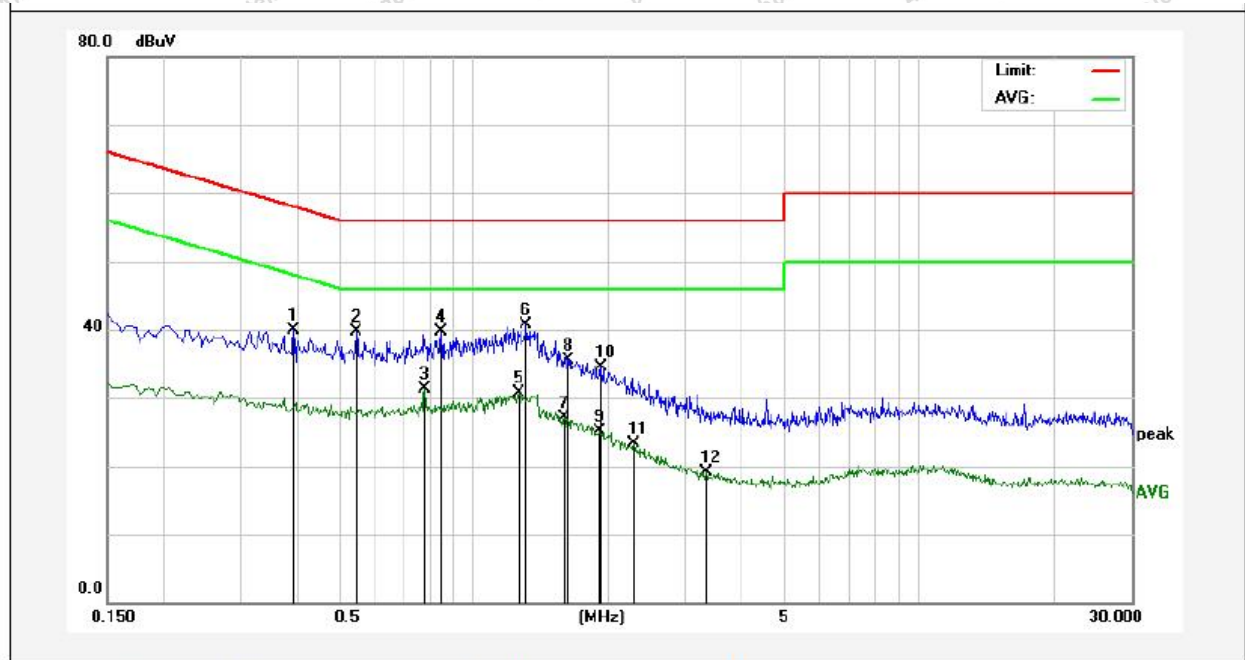
During the test, pre-scan all modes, only the worst case is recorded in the report.

Please to see the following pages.



Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: 2441MHz
Test Specification: DC 5V from Adapter input AC 120V/60Hz
Comment: Live Line
Temp.(°C)/Hum.(%RH): 23.5°C/57%RH

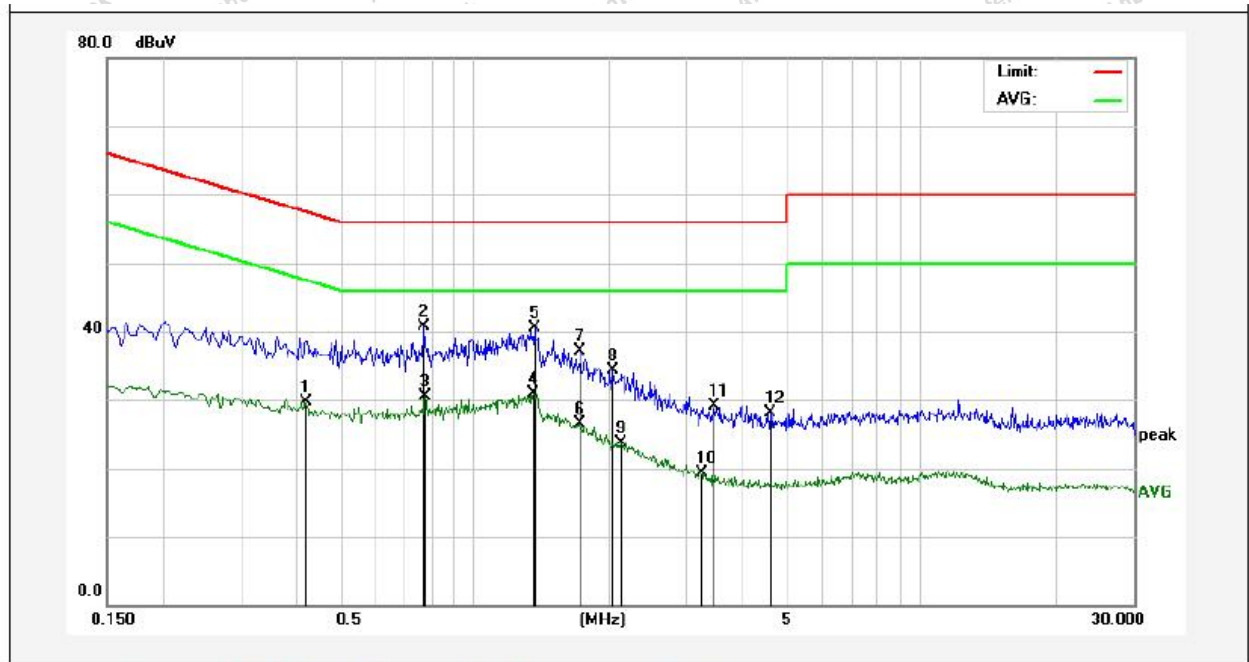


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.3940	22.08	17.81	39.89	57.98	-18.09	QP	
2	0.5460	21.82	17.85	39.67	56.00	-16.33	QP	
3	0.7780	13.36	17.86	31.22	46.00	-14.78	AVG	
4	0.8460	21.75	17.86	39.61	56.00	-16.39	QP	
5	1.2660	12.80	17.84	30.64	46.00	-15.36	AVG	
6	1.3140	22.79	17.84	40.63	56.00	-15.37	QP	
7	1.5980	9.29	17.84	27.13	46.00	-18.87	AVG	
8	1.6300	17.75	17.84	35.59	56.00	-20.41	QP	
9	1.9220	7.24	17.83	25.07	46.00	-20.93	AVG	
10	1.9300	16.67	17.83	34.50	56.00	-21.50	QP	
11	2.2940	5.38	17.83	23.21	46.00	-22.79	AVG	
12	3.3220	1.30	17.84	19.14	46.00	-26.86	AVG	



Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: 2441MHz
Test Specification: DC 5V from Adapter input AC 120V/60Hz
Comment: Neutral Line
Temp.(°C)/Hum.(%RH): 23.5°C/57%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.4180	11.86	17.82	29.68	47.49	-17.81	AVG	
2	0.7740	22.79	17.87	40.66	56.00	-15.34	QP	
3	0.7780	12.69	17.86	30.55	46.00	-15.45	AVG	
4	1.3580	13.00	17.84	30.84	46.00	-15.16	AVG	
5	1.3660	22.74	17.84	40.58	56.00	-15.42	QP	
6	1.7140	8.65	17.84	26.49	46.00	-19.51	AVG	
7	1.7260	19.35	17.84	37.19	56.00	-18.81	QP	
8	2.0420	16.52	17.83	34.35	56.00	-21.65	QP	
9	2.1420	5.94	17.83	23.77	46.00	-22.23	AVG	
10	3.2100	1.39	17.84	19.23	46.00	-26.77	AVG	
11	3.4500	11.33	17.84	29.17	56.00	-26.83	QP	
12	4.6140	10.17	17.85	28.02	56.00	-27.98	QP	



4. Radiation Spurious Emission and Band Edge Test

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

4.2. Test Setup

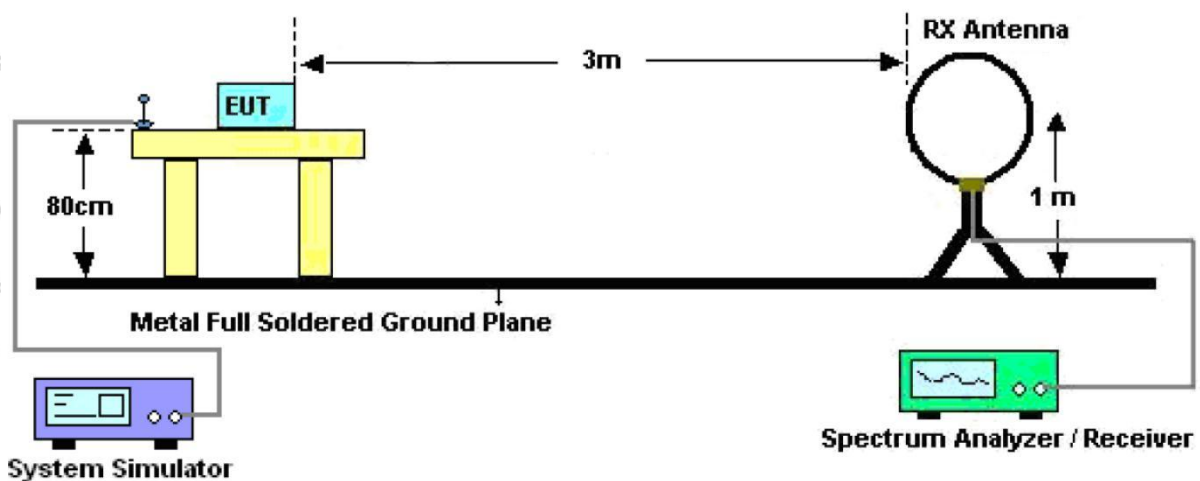


Figure 1. Below 30MHz



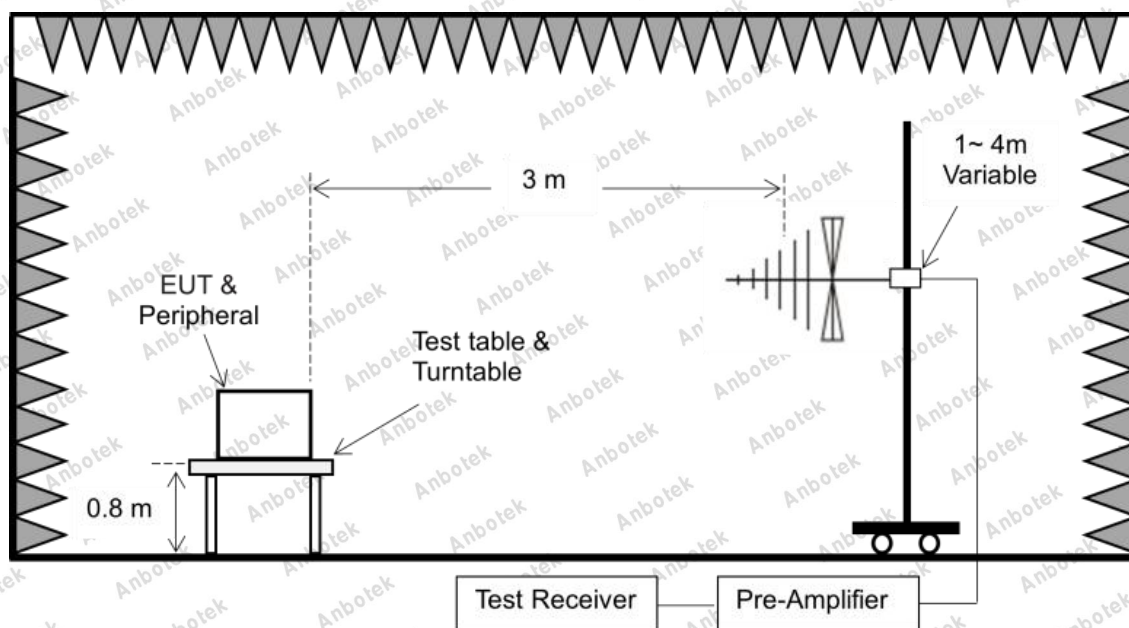


Figure 2: 30MHz to 1GHz

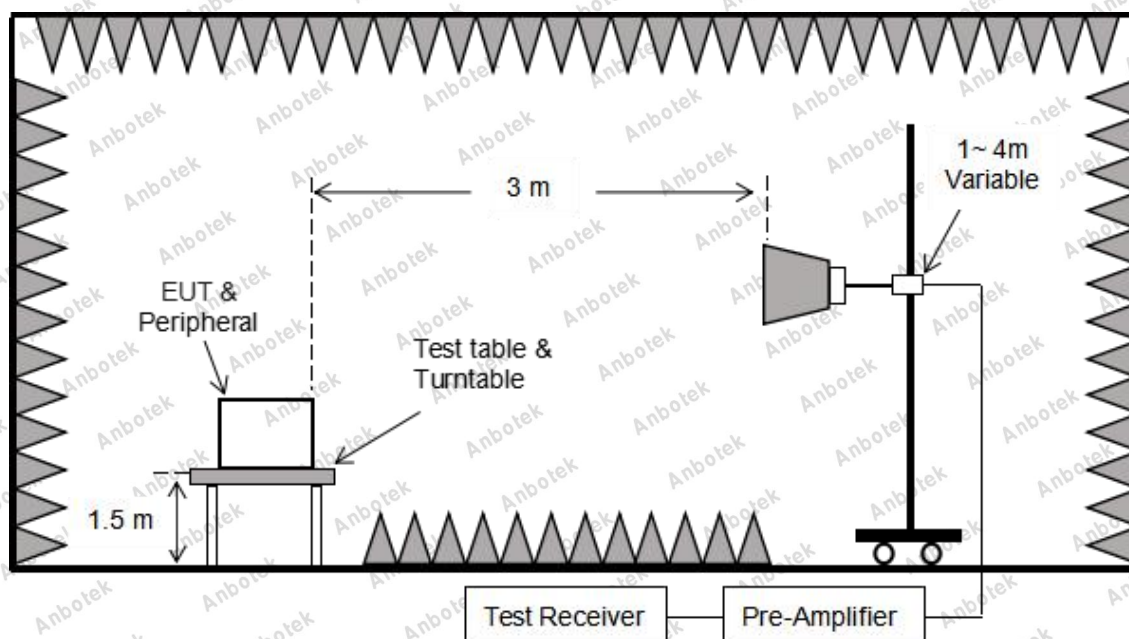


Figure 3: Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.



For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW = 30kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 120kHz, VBW = 300kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For above 1GHz, Set the spectrum analyzer as:

RBW = 1MHz, VBW = 1MHz, Detector = Peak, Trace mode = Max hold, Sweep - auto couple.

For average measurement: use duty cycle correction factor method (DCCF)

Average level = Peak level + DCCF

4.4. Test Data

PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

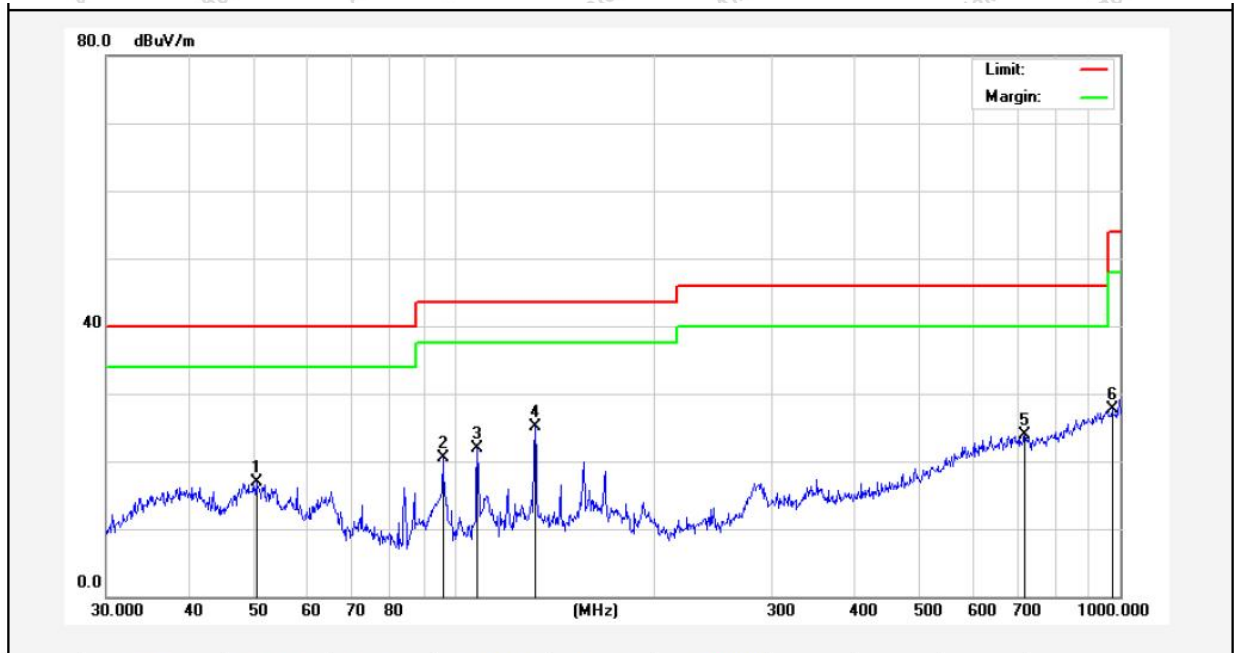
The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

During the test, pre-scan all modes, only the worst case is recorded in the report.



Test Results (30~1000MHz)

Test Mode: 2441MHz
Power Source: DC 3.7V Battery inside
Polarization: Vertical
Temp.(°C)/Hum.(%RH): 23.5°C/55%RH

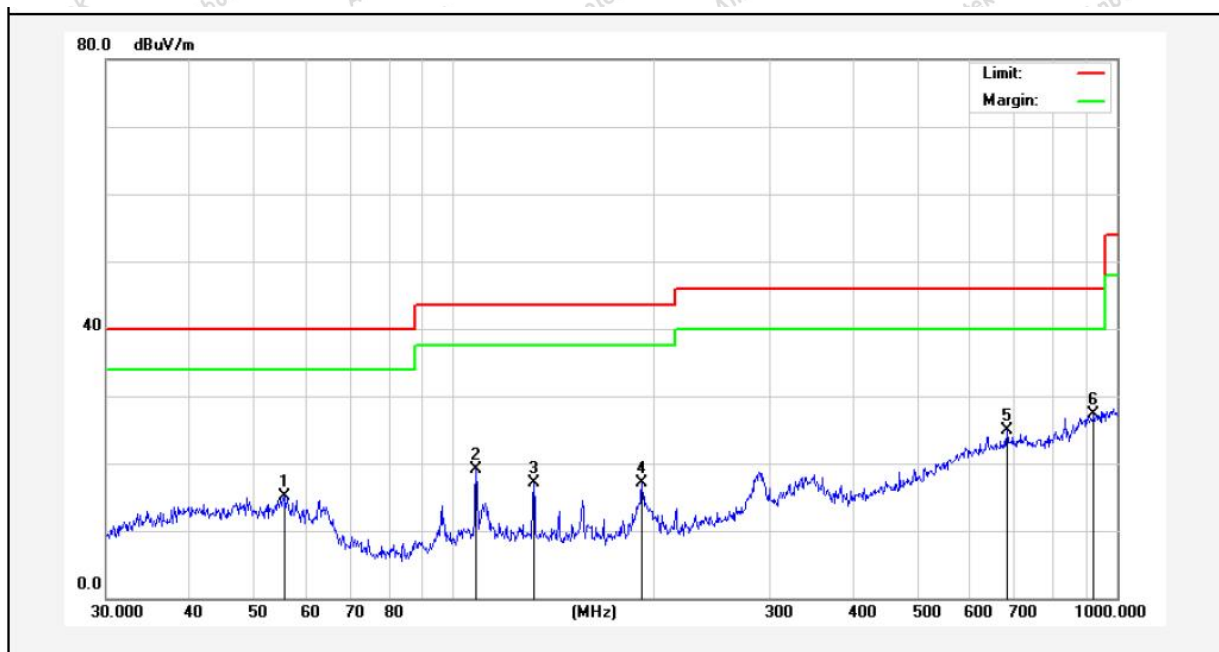


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	50.4089	32.80	-15.92	16.88	40.00	-23.12	QP			
2	96.0986	37.64	-17.08	20.56	43.50	-22.94	QP			
3	108.2667	39.79	-17.91	21.88	43.50	-21.62	QP			
4	132.2206	46.66	-21.63	25.03	43.50	-18.47	QP			
5	719.1995	33.63	-9.65	23.98	46.00	-22.02	QP			
6	972.3374	32.98	-5.26	27.72	54.00	-26.28	QP			



Test Results (30~1000MHz)

Test Mode: 2441MHz
Power Source: DC 3.7V Battery inside
Polarization: Horizontal
Temp.(°C)/Hum.(%RH): 23.5°C/55%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	55.6094	32.64	-17.61	15.03	40.00	-24.97	QP			
2	108.2667	41.95	-22.86	19.09	43.50	-24.41	QP			
3	132.2206	39.81	-22.63	17.18	43.50	-26.32	QP			
4	192.4186	39.74	-22.65	17.09	43.50	-26.41	QP			
5	682.3484	35.16	-10.18	24.98	46.00	-21.02	QP			
6	922.5157	33.23	-5.96	27.27	46.00	-18.73	QP			



Test Results (1GHz-25GHz)

Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4806.00	29.85	15.27	45.12	74.00	-28.88	Vertical
7209.00	30.96	18.09	49.05	74.00	-24.95	Vertical
9612.00	32.35	23.76	56.11	74.00	-17.89	Vertical
12015.00	*			74.00		Vertical
14418.00	*			74.00		Vertical
4806.00	30.20	15.27	45.47	74.00	-28.53	Horizontal
7209.00	30.82	18.09	48.91	74.00	-25.09	Horizontal
9612.00	29.70	23.76	53.46	74.00	-20.54	Horizontal
12015.00	*			74.00		Horizontal
14418.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4806.00	19.23	15.27	34.50	54.00	-19.50	Vertical
7209.00	19.99	18.09	38.08	54.00	-15.92	Vertical
9612.00	21.37	23.76	45.13	54.00	-8.87	Vertical
12015.00	*			54.00		Vertical
14418.00	*			54.00		Vertical
4806.00	18.55	15.27	33.82	54.00	-20.18	Horizontal
7209.00	19.88	18.09	37.97	54.00	-16.03	Horizontal
9612.00	19.01	23.76	42.77	54.00	-11.23	Horizontal
12015.00	*			54.00		Horizontal
14418.00	*			54.00		Horizontal



Test Results (1GHz-25GHz)

Test channel: Middle

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4882.00	29.87	15.42	45.29	74.00	-28.71	Vertical
7323.00	30.81	18.02	48.83	74.00	-25.17	Vertical
9764.00	31.36	23.80	55.16	74.00	-18.84	Vertical
12205.00	*			74.00		Vertical
14646.00	*			74.00		Vertical
4882.00	29.90	15.42	45.32	74.00	-28.68	Horizontal
7323.00	30.81	18.02	48.83	74.00	-25.17	Horizontal
9764.00	29.40	23.80	53.20	74.00	-20.80	Horizontal
12205.00	*			74.00		Horizontal
14646.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4882.00	18.96	15.42	34.38	54.00	-19.62	Vertical
7323.00	20.09	18.02	38.11	54.00	-15.89	Vertical
9764.00	21.23	23.80	45.03	54.00	-8.97	Vertical
12205.00	*			54.00		Vertical
14646.00	*			54.00		Vertical
4882.00	18.46	15.42	33.88	54.00	-20.12	Horizontal
7323.00	19.44	18.02	37.46	54.00	-16.54	Horizontal
9764.00	19.52	23.80	43.32	54.00	-10.68	Horizontal
12205.00	*			54.00		Horizontal
14646.00	*			54.00		Horizontal



Test Results (1GHz-25GHz)

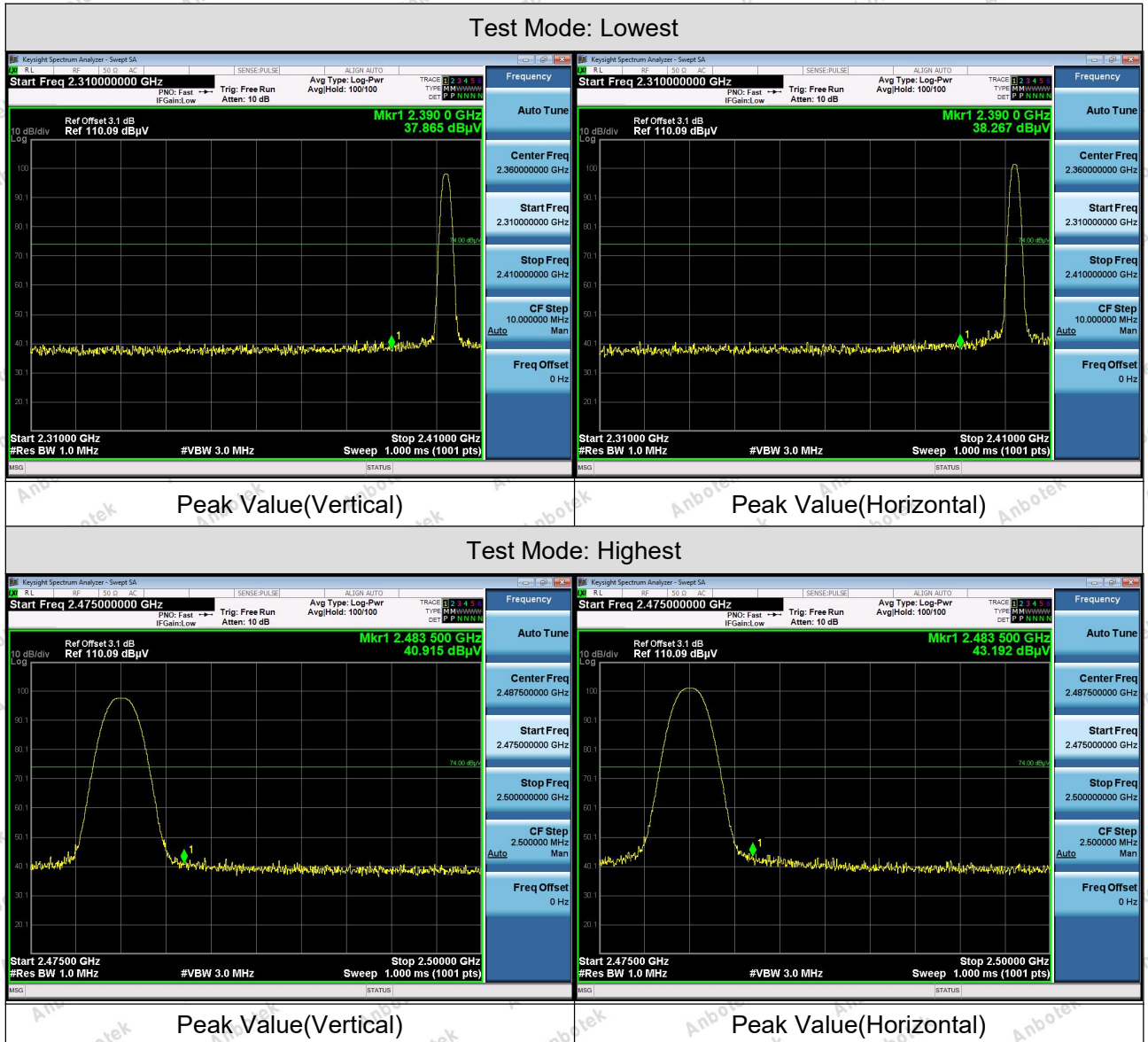
Test channel: Highest						
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4960.00	30.14	15.58	45.72	74.00	-28.28	Vertical
7440.00	30.82	17.93	48.75	74.00	-25.25	Vertical
9920.00	31.91	23.83	55.74	74.00	-18.26	Vertical
12400.00	*			74.00		Vertical
14880.00	*			74.00		Vertical
4960.00	29.97	15.58	45.55	74.00	-28.45	Horizontal
7440.00	30.84	17.93	48.77	74.00	-25.23	Horizontal
9920.00	30.08	23.83	53.91	74.00	-20.09	Horizontal
12400.00	*			74.00		Horizontal
14880.00	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4960.00	20.08	15.58	35.66	54.00	-18.34	Vertical
7440.00	21.10	17.93	39.03	54.00	-14.97	Vertical
9920.00	21.78	23.83	45.61	54.00	-8.39	Vertical
12400.00	*			54.00		Vertical
14880.00	*			54.00		Vertical
4960.00	19.90	15.58	35.48	54.00	-18.52	Horizontal
7440.00	20.81	17.93	38.74	54.00	-15.26	Horizontal
9920.00	19.42	23.83	43.25	54.00	-10.75	Horizontal
12400.00	*			54.00		Horizontal
14880.00	*			54.00		Horizontal

Remark:

1. Result = Reading + Factor
2. "*" means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.



Radiated Band Edge:



Note: When the PK measure result value is less than the AVG limit value, the AV measure result values test not applicable.

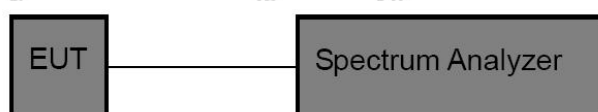


5. Maximum Conducted Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(1)
Test Limit	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. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.2. Test Setup



5.3. Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,
2. Spectrum Setting:
 - RBW > the 20 dB bandwidth of the emission being measured
 - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
 - VBW $\geq$ RBW
 - Sweep = auto
 - Detector function = peak
 - Trace = max hold

5.4. Test Data

Pass

Please Refer to Appendix for Details.

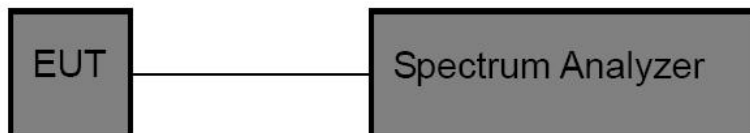


6. 20dB Bandwidth and 99% Occupied Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.247 (a)(1)
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6.2. Test Setup



6.3. Test Procedure

Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW $\geq 1\%$ of the 20 dB bandwidth.
3. Set the VBW $\geq$ RBW
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

6.4. Test Data

Pass

Please Refer to Appendix for Details.

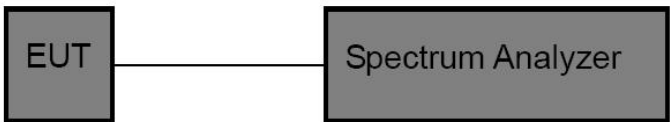


7. Carrier Frequency Separation Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

7.2. Test Setup



7.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW =approximately 30% of the channel spacing.
3. Set the VBW ≥ RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

7.4. Test Data

Pass

Please Refer to Appendix for Details.

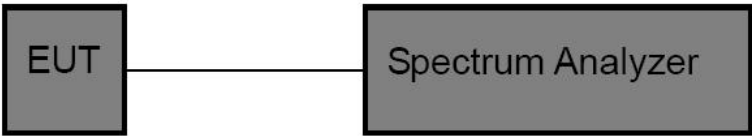


8. Number of Hopping Channel Test

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Limit	>15 channels

8.2. Test Setup



8.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer setting:

- 1. Span= the frequency band of operation
- 2. Set the RBW = less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- 3. Set the VBW ≥ RBW.
- 4. Sweep time = auto couple.
- 5. Detector function = peak.
- 6. Trace mode = max hold.
- 7. Allow trace to fully stabilize.

8.4. Test Data

Pass

Please Refer to Appendix for Details.

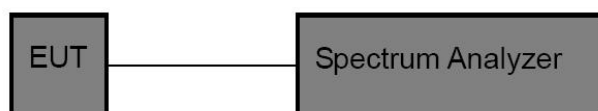


9. Dwell Time Test

9.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Limit	0.4 s

9.2. Test Setup



9.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW $\geq$ RBW.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = clear write.

9.4. Test Data

Pass

Please Refer to Appendix for Details.

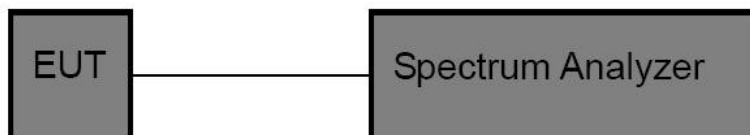


10. Conducted Spurious Emission and Band Edge Test

10.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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).

10.2. Test Setup



10.3. Test Procedure

The EUT must have its hopping/Non-hopping function enabled. Using the following spectrum analyzer setting:

1. Set the RBW = 100kHz.
2. Set the VBW = 300kHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

10.4. Test Data

Pass

Please Refer to Appendix for Details.



11. Antenna Requirement

11.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /247(c)
Requirement	1) 15.203 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, 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. 2) 15.247(c) (1)(i) requirement: 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 6 dBi.

11.2. Antenna Connected Construction

The antenna is PCB Antenna which permanently attached, and the best case gain of the antenna is 2.34dBi. It complies with the standard requirement.



APPENDIX I -- TEST SETUP PHOTOGRAPH

Please refer to separated files Appendix I -- Test Setup Photograph_RF

APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files Appendix II -- External Photograph

APPENDIX III -- INTERNAL PHOTOGRAPH

Please refer to separated files Appendix III -- Internal Photograph

----- End of Report -----

