

Test Report

FCC ID: 2AQRH-UITM1808

Date of issue: Aug. 16, 2018

Report Number:	MTi180815E073
Sample Description:	Transmitter Wall
Model(s):	UTL-BK-IWBRM5339
Applicant:	Sector 5, Inc.
Address:	2000 Duke Street, Suite 110 Alexandria, VA 22314, USA
Date of Test:	June 28, 2018 – Aug. 16, 2018

Shenzhen Microtest Co., Ltd.
<http://www.mtitest.com>

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Test Result Certification

Applicant's name: Sector 5, Inc.

Address: 2000 Duke Street, Suite 110 Alexandria, VA 22314, USA

Manufacture's name: SHENZHEN WISEBRIGHT POWER SUPPLY CO., LTD.

Address: RM 805, R&D BLDG, EVOC INDUSTRIAL PARK, NO.11 GAOXIN ROAD, GUANGMING DISTRICT, SHENZHEN, GUANGDONG, CHINA

Product name: Transmitter Wall

Trademark: N/A

Model name: UTL-BK-IWBRM5339

Standards: FCC Part 15C

Test Procedure: ANSI C63.10-2013

This device described above has been tested by Shenzhen Microtest Co., Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Tested by:



Demi Mu

Aug. 16, 2018

Reviewed by:



Blue Zheng

Aug. 16, 2018

Approved by:



Smith Chen

Aug. 16, 2018

1 GENERAL INFORMATION

1.1 Feature of equipment under test (EUT)

Product name:	Transmitter Wall
Model name:	UTL-BK-IWBRM5339
Operation frequency:	115 – 205 kHz
Modulation type:	Load modulation
Antenna type:	Coil Antenna
Power supply:	DC12V from adapter
Adapter information:	Model:GM25-120200-1A Input:100-240V 50/60Hz 1.0A Output: 12V 2.0A
Model difference:	N/A

1.2 Test mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test mode	Description
Mode 1	Charger mode

Note: The test modes were carried out for all operation modes. The final test mode of the EUT was the worst test mode for EMI, and its test data was showed.

1.3 EUT test setup

See photographs of the test setup in the report for the actual setup and connections between EUT and support equipment.

1.4 Ancillary equipment

Equipment	Model	S/N	Manufacturer
Adapter	GM25-120200-1A	/	/

1.5 Measurement Uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %, $U=2 \times U_c(y)$

Conducted emission(150kHz~30MHz)	± 2.5 dB
Radiated emission(30MHz~1GHz)	± 4.2 dB
Radiated emission(9kHz~30MHz)	± 3.4 dB
Temperature	± 1 degree
Humidity	± 5 %

2 SUMMARY OF TEST RESULT

Item	FCC Part No.	Description of Test	Result
1	FCC PART 15.203	Antenna requirement	Pass
2	FCC PART 15.207	Conducted emission	Pass
3	FCC PART 15.209	Radiated emission	Pass
4	FCC Part 15.215	20dB bandwidth	Pass

2.1 Operation channel list

Channel List

Channel	Frequency (kHz)
Low	115
Middle	145
High	205

2.2 Test channel

Channel	Frequency (kHz)
Middle	145

3 TEST FACILITIES AND ACCREDITATIONS

3.1 Test laboratory

Test Laboratory	Shenzhen Microtest Co., Ltd
Location	No.102A & 302A, East Block, Hengfang Industrial Park, Xingye Road, Xixiang, Bao'an District, Shenzhen, Guangdong, China
FCC Registration No.:	448573

3.2 Environmental conditions

Temperature:	20°C~30°C
Humidity	30%~70%
Atmospheric pressure	98kPa~101kPa

3.3 Test software

Software Name	Manufacturer	Model	Version
RF Test System	Farad	LZ-RF	Lz_Rf 3A3

4 LIST OF TEST EQUIPMENT

Equipment No.	Equipment Name	Manufacturer	Model	Serial No.	Calibration date	Due date
MTI-E001	Spectrum Analyzer	Agilent	E4407B	MY41441082	2017/09/18	2018/09/17
MTI-E002	CMU 200 universal radio communication tester	Rohde&schwarz	CMU 200	114587	2017/09/18	2018/09/17
MTI-E004	EMI Test Receiver	Rohde&schwarz	ESPI	1000314	2017/09/18	2018/09/17
MTI-E006	Broadband antenna	schwarabeck	VULB9163	872	2017/09/18	2018/09/17
MTI-E007	Horn antenna	schwarabeck	BBHA9120D	1201	2017/09/18	2018/09/17
MTI-E014	amplifier	America	8447D	3113A06150	2017/09/18	2018/09/17
MTI-E015	Conduction Immunity Signal Generator	Schloder	CDG6000	126A1343/2015	2017/09/18	2018/09/17
MTI-E016	Coupled decoupling network	Schloder	CDA M2/M3	A2210332/2015	2017/09/18	2018/09/17
MTI-E032	Comprehensive test instrument	Rohde&schwarz	CMW500	124192	2018/04/13	2019/04/12
MTI-E034	amplifier	Agilent	8449B	3008A02400	2017/08/22	2018/08/21
MTI-E040	Spectrum analyzer	Agilent	N9020A	MY49100060	2018/03/04	2019/03/04
MTI-E041	Signal generator	Agilent	N5182A	MY49060455	2018/02/22	2019/02/22
MTI-E042	Analog signal generator	Agilent	E4421B	GB40051240	2018/02/22	2019/02/22
MTI-E043	Power probe	Dare Instruments	RPR3006W	16I00054SN016	2018/02/28	2019/02/28
MTI-E047	10dB attenuator	Mini-Circuits	UNAT-10+	15542	2018/05/23	2019/05/23
MTI-E049	spectrum analyzer	Rohde&schwarz	FSP-38	100019	2017/09/18	2018/09/17
MTI-E050	PSG Signal generator	Agilent	E8257D	MY46520873	2018/04/24	2019/04/23
MTI-E051	Active Loop Antenna 9kHz - 30MHz	Schwarzbeek	FMZB 1519 B	00044	2018//2/26	2019/02/25
MTI-E052	18-40GHz amplifier	Chengdu step Micro Technology	ZLNA-18-40G-21	1608001	2017/09/18	2018/09/17
MTI-E053	15-40G Antenna	Schwarzbeek	BBHA9170	BBHA9170582	2017/09/18	2018/09/17
Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).						

5 TEST RESULTS

5.1.1 Antenna requirement

5.1.2 Standard requirement

15.203 requirement: For intentional device, according to 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

5.1.3 EUT Antenna

The EUT antenna is Coil Antenna. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.

5.2 Conducted emission

5.2.1 Limits

For the following equipment, when designed to be connected to the public utility (AC) power line the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies shall not exceed the limits in the following tables. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.5 -5	56	46
5 -30	60	50

Note: the limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

5.2.2 Test Procedures

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

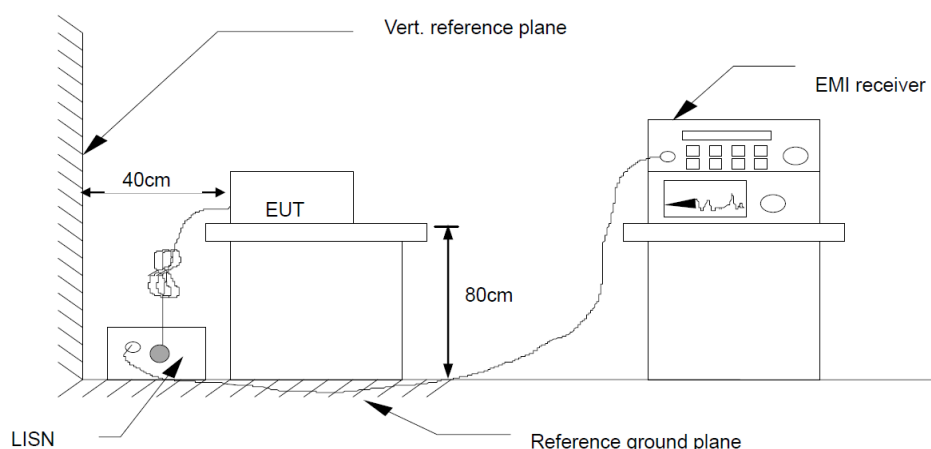
Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN is at least 80 cm from nearest part of EUT chassis.

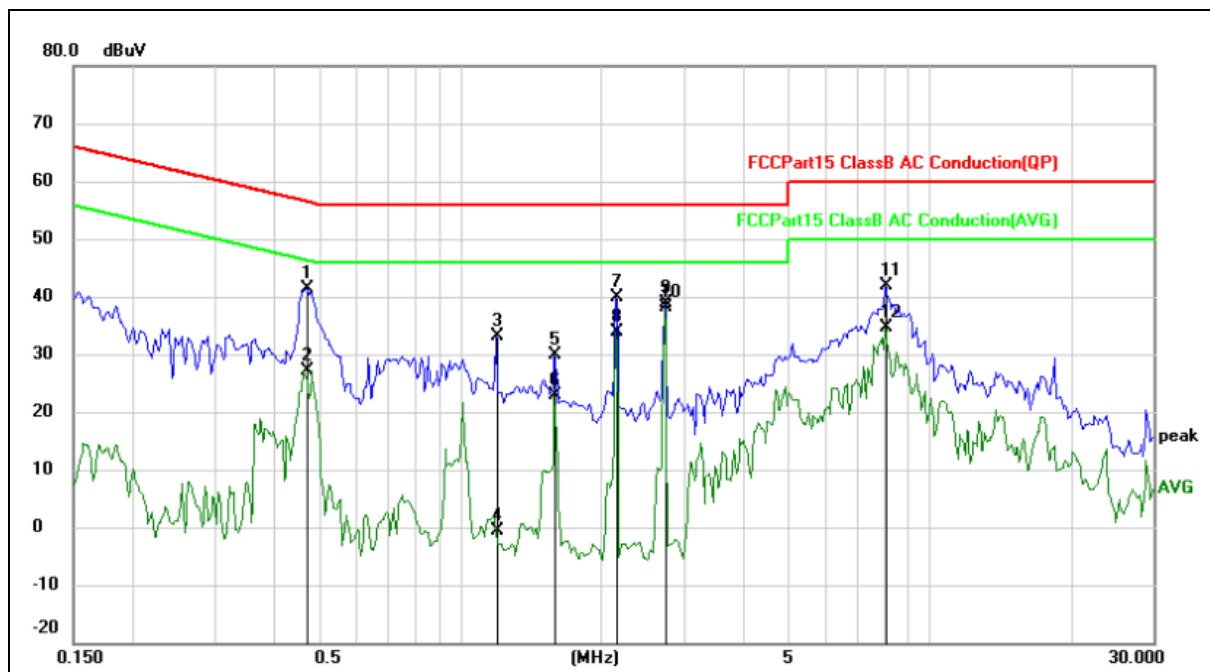
For the actual test configuration, please refer to the related Item – photographs of the test setup.

5.2.3 Test Setup



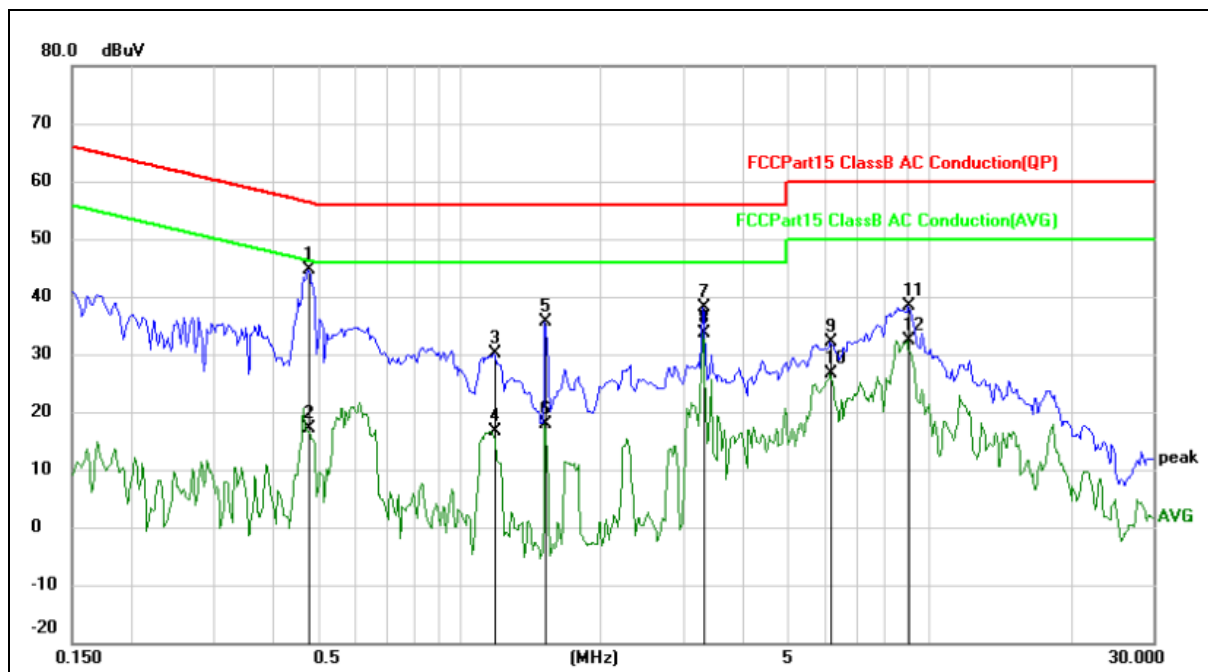
5.2.4 Test Result

Temperature:	27°C	Relative Humidity:	65%
Pressure:	101kPa	Phase:	L
Test voltage:	DC 12V from adapter AC 120V 60Hz	Test mode:	Mode 1



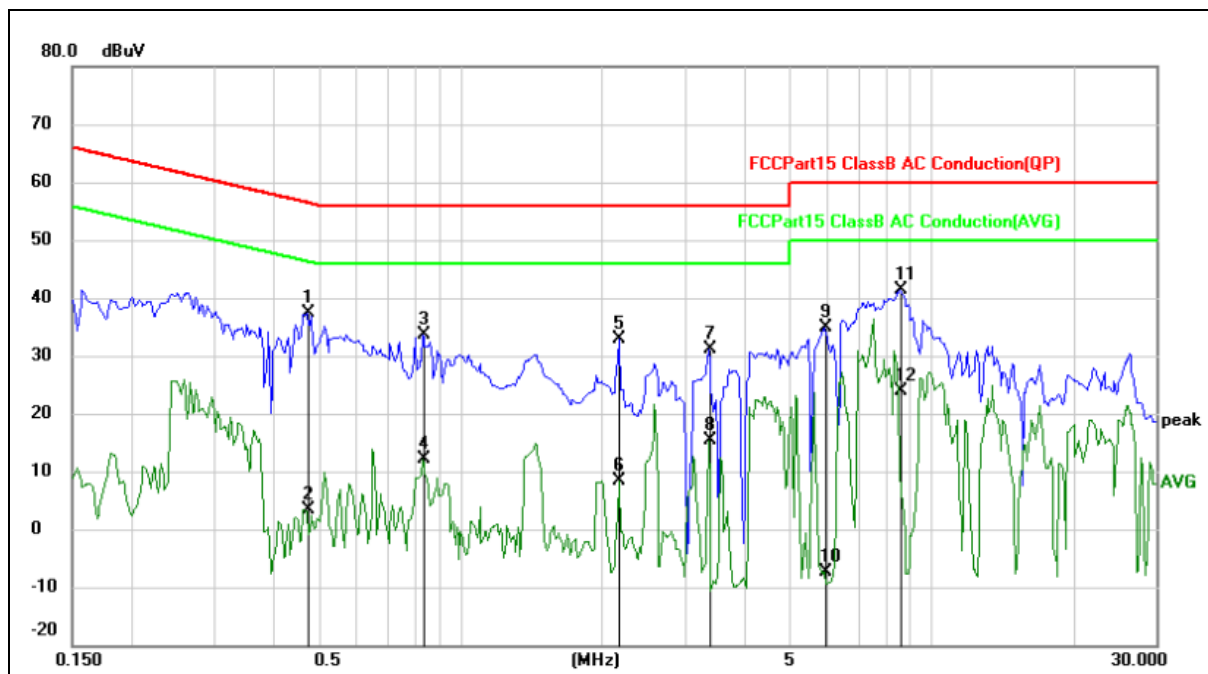
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.4703	41.46	-0.03	41.43	56.51	-15.08	QP	
2		0.4703	27.11	-0.03	27.08	46.51	-19.43	AVG	
3		1.1930	33.27	-0.04	33.23	56.00	-22.77	QP	
4		1.1930	-0.65	-0.04	-0.69	46.00	-46.69	AVG	
5		1.5875	29.81	-0.04	29.77	56.00	-26.23	QP	
6		1.5875	22.88	-0.04	22.84	46.00	-23.16	AVG	
7		2.1538	40.02	-0.05	39.97	56.00	-16.03	QP	
8		2.1538	33.81	-0.05	33.76	46.00	-12.24	AVG	
9		2.7320	38.86	-0.05	38.81	56.00	-17.19	QP	
10	*	2.7320	38.14	-0.05	38.09	46.00	-7.91	AVG	
11		8.0272	41.98	-0.07	41.91	60.00	-18.09	QP	
12		8.0272	34.66	-0.07	34.59	50.00	-15.41	AVG	

Temperature:	27°C	Relative Humidity:	65%
Pressure:	101kPa	Phase:	N
Test voltage:	DC 12V from adapter AC 120V 60Hz	Test mode:	Mode 1



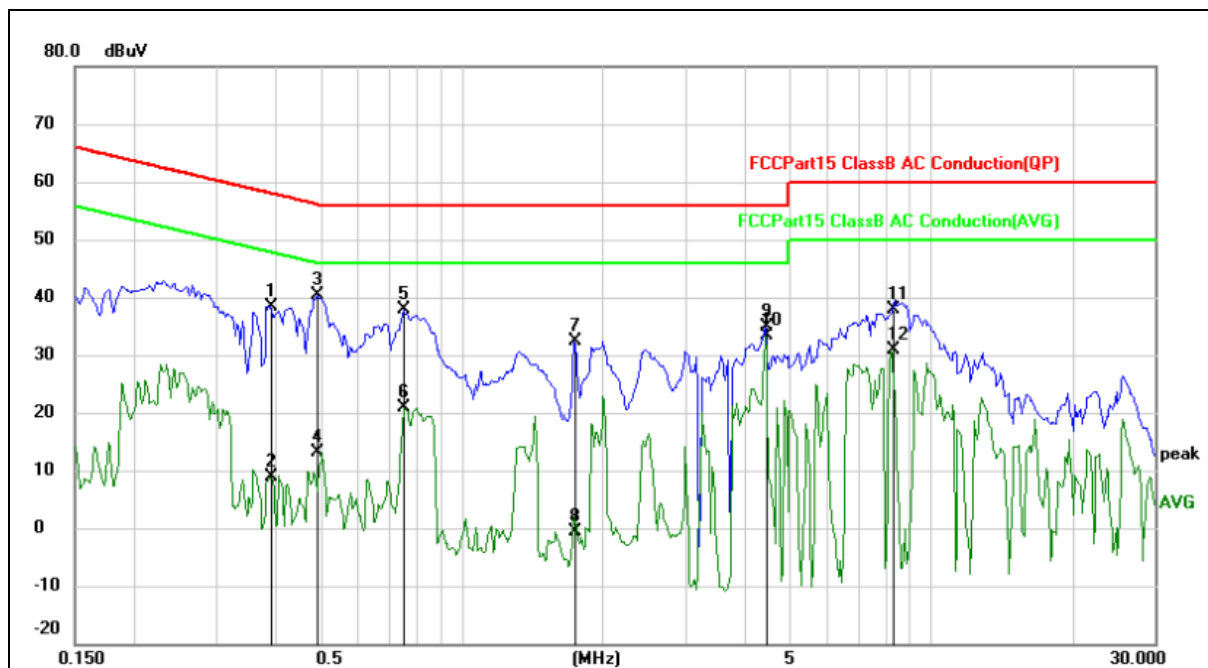
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.4781	44.65	-0.03	44.62	56.37	-11.75	QP	
2		0.4781	17.17	-0.03	17.14	46.37	-29.23	AVG	
3		1.1891	30.09	-0.04	30.05	56.00	-25.95	QP	
4		1.1891	16.56	-0.04	16.52	46.00	-29.48	AVG	
5		1.5250	35.70	-0.04	35.66	56.00	-20.34	QP	
6		1.5250	17.99	-0.04	17.95	46.00	-28.05	AVG	
7		3.3047	38.16	-0.04	38.12	56.00	-17.88	QP	
8		3.3047	33.66	-0.04	33.62	46.00	-12.38	AVG	
9		6.1719	32.11	-0.05	32.06	60.00	-27.94	QP	
10		6.1719	26.59	-0.05	26.54	50.00	-23.46	AVG	
11		9.0156	38.51	-0.07	38.44	60.00	-21.56	QP	
12		9.0156	32.42	-0.07	32.35	50.00	-17.65	AVG	

Temperature:	27°C	Relative Humidity:	65%
Pressure:	101kPa	Phase:	L
Test voltage:	DC 12V from adapter AC 240V 60Hz	Test mode:	Mode 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector Comment
1		0.4742	37.32	-0.03	37.29	56.44	-19.15	QP
2		0.4742	3.46	-0.03	3.43	46.44	-43.01	AVG
3		0.8336	33.64	-0.03	33.61	56.00	-22.39	QP
4		0.8336	12.18	-0.03	12.15	46.00	-33.85	AVG
5		2.1773	33.00	-0.05	32.95	56.00	-23.05	QP
6		2.1773	8.38	-0.05	8.33	46.00	-37.67	AVG
7		3.3711	31.18	-0.04	31.14	56.00	-24.86	QP
8		3.3711	15.38	-0.04	15.34	46.00	-30.66	AVG
9		5.9297	34.92	-0.05	34.87	60.00	-25.13	QP
10		5.9297	-7.35	-0.05	-7.40	50.00	-57.40	AVG
11	*	8.5664	41.42	-0.07	41.35	60.00	-18.65	QP
12		8.5664	24.05	-0.07	23.98	50.00	-26.02	AVG

Temperature:	27℃	Relative Humidity:	65%
Pressure:	101kPa	Phase:	N
Test voltage:	DC 12V from adapter AC 240V 60Hz	Test mode:	Mode 1



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.3922	38.49	-0.03	38.46	58.02	-19.56	QP	
2		0.3922	8.87	-0.03	8.84	48.02	-39.18	AVG	
3		0.4938	40.37	-0.03	40.34	56.10	-15.76	QP	
4		0.4938	13.05	-0.03	13.02	46.10	-33.08	AVG	
5		0.7516	37.85	-0.03	37.82	56.00	-18.18	QP	
6		0.7516	20.98	-0.03	20.95	46.00	-25.05	AVG	
7		1.7398	32.48	-0.04	32.44	56.00	-23.56	QP	
8		1.7398	-0.51	-0.04	-0.55	46.00	-46.55	AVG	
9		4.4531	35.05	-0.05	35.00	56.00	-21.00	QP	
10	*	4.4531	33.40	-0.05	33.35	46.00	-12.65	AVG	
11		8.2789	38.03	-0.07	37.96	60.00	-22.04	QP	
12		8.2789	30.94	-0.07	30.87	50.00	-19.13	AVG	

5.3 Radiated emission

5.3.1 Limits

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

5.3.2 Test Procedures

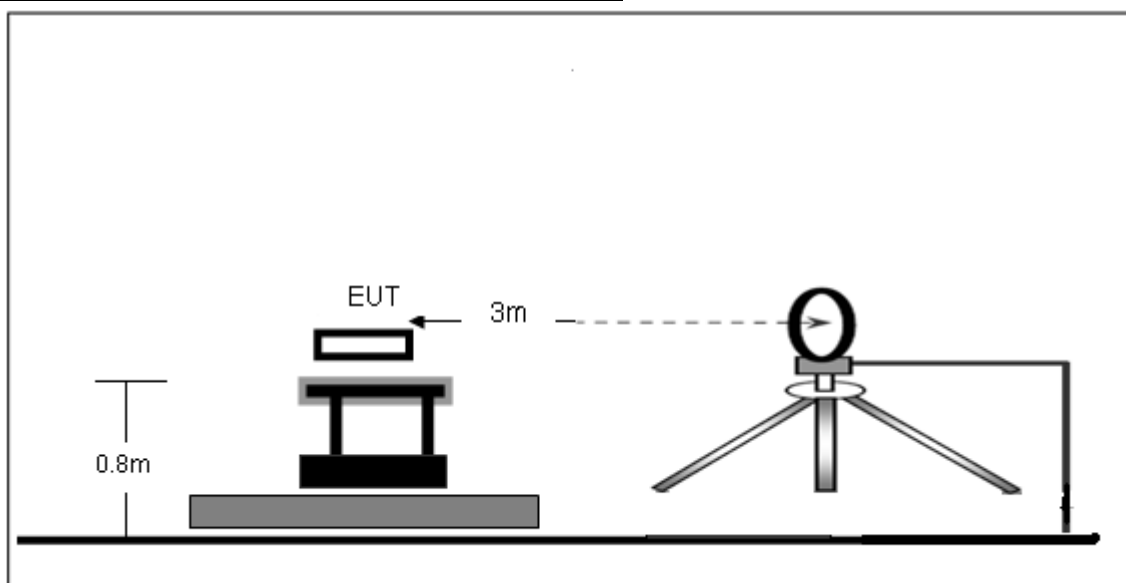
1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 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) From 9KHz to 30MHz:
RBW=10KHz, VBW =30KHz, Sweep time= Auto, Trace = max hold,
Detector function = peak
§ 15.209(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
 - (3) 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.
 - (4) From 1 GHz to 10th harmonic:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW=3MHz RMS detector for Average value.

Note:

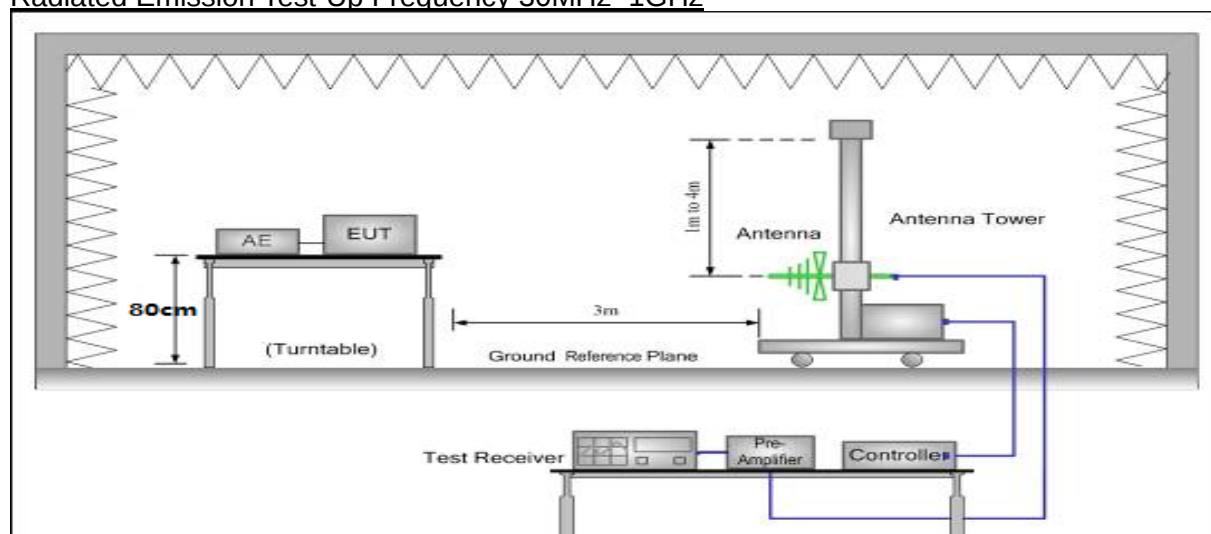
1. According to 15.31(f)(2) $300\text{m Result(dBuV/m)} = 3\text{m Result(dBuV/m)} - 40\log(300/3)\text{(dBuV/m)}$
2. According to 15.209(d), the measurement were tested by using Quasi peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1GHz in these bands on measurement employing an average detector.
3. The limit above was calculated based on table of 15.309(a)

5.3.3 Test Setup

Radiated Emission Test-Up Frequency Below 30MHz



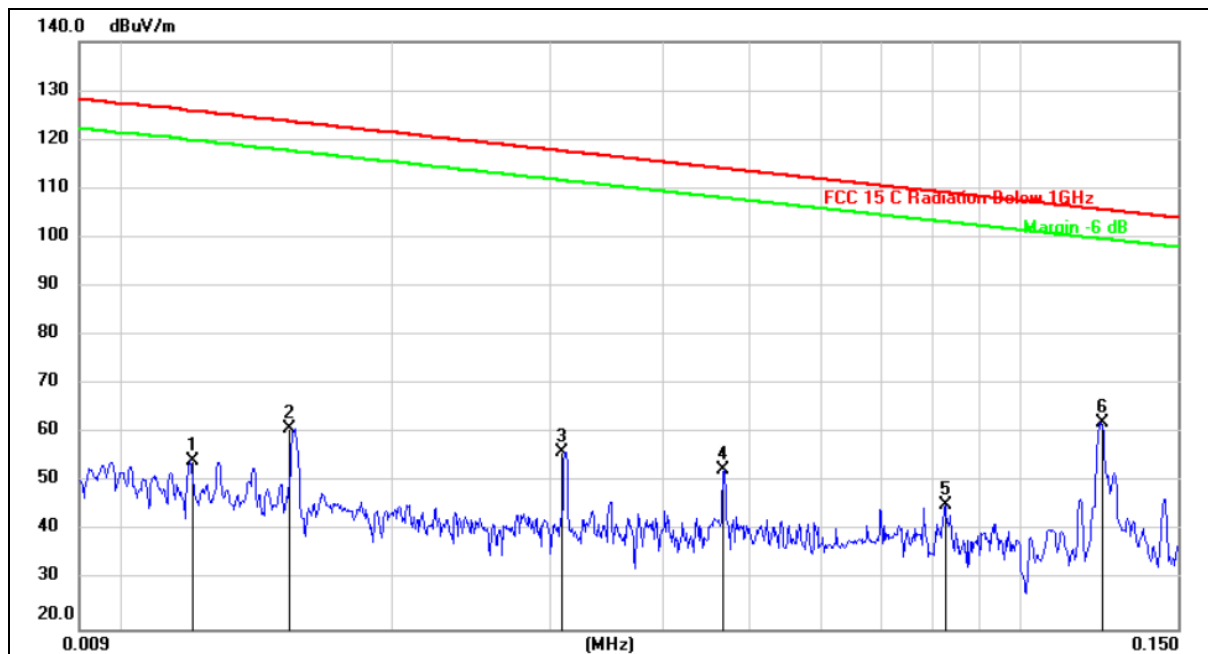
Radiated Emission Test-Up Frequency 30MHz~1GHz



5.3.4 Test Result

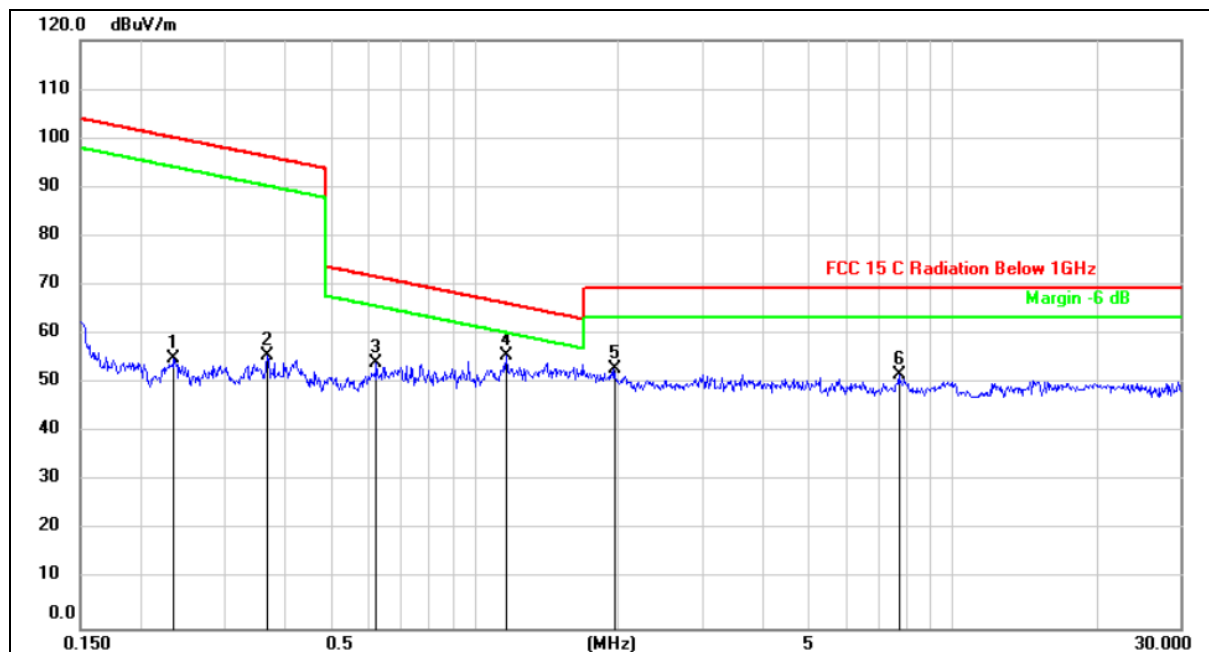
Frequency range (9kHz – 30MHz)

Temperature:	23℃	Relative Humidity:	59%
Pressure:	101kPa	Polarization:	Horizontal
Test voltage:	DC 12V from adapter	Test mode:	Mode 1



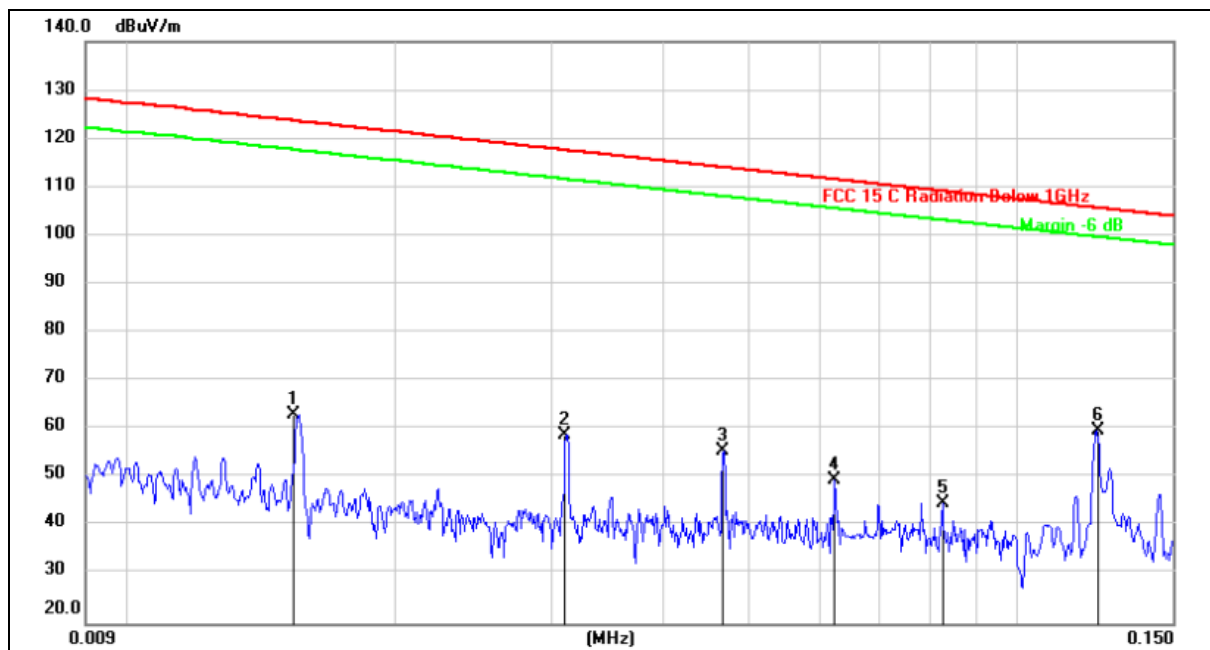
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dBuV/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		0.0120	34.05	20.37	54.42	125.84	-71.42	peak
2		0.0154	40.37	20.62	60.99	123.69	-62.70	peak
3		0.0309	35.79	20.42	56.21	117.67	-61.46	peak
4		0.0468	32.16	20.43	52.59	114.09	-61.50	peak
5		0.0826	24.86	20.44	45.30	109.18	-63.88	peak
6	*	0.1232	41.71	20.43	62.14	105.72	-43.58	peak

Temperature:	23°C	Relative Humidity:	59%
Pressure:	101kPa	Polarization:	Horizontal
Test voltage:	DC 12V from adapter	Test mode:	Mode 1



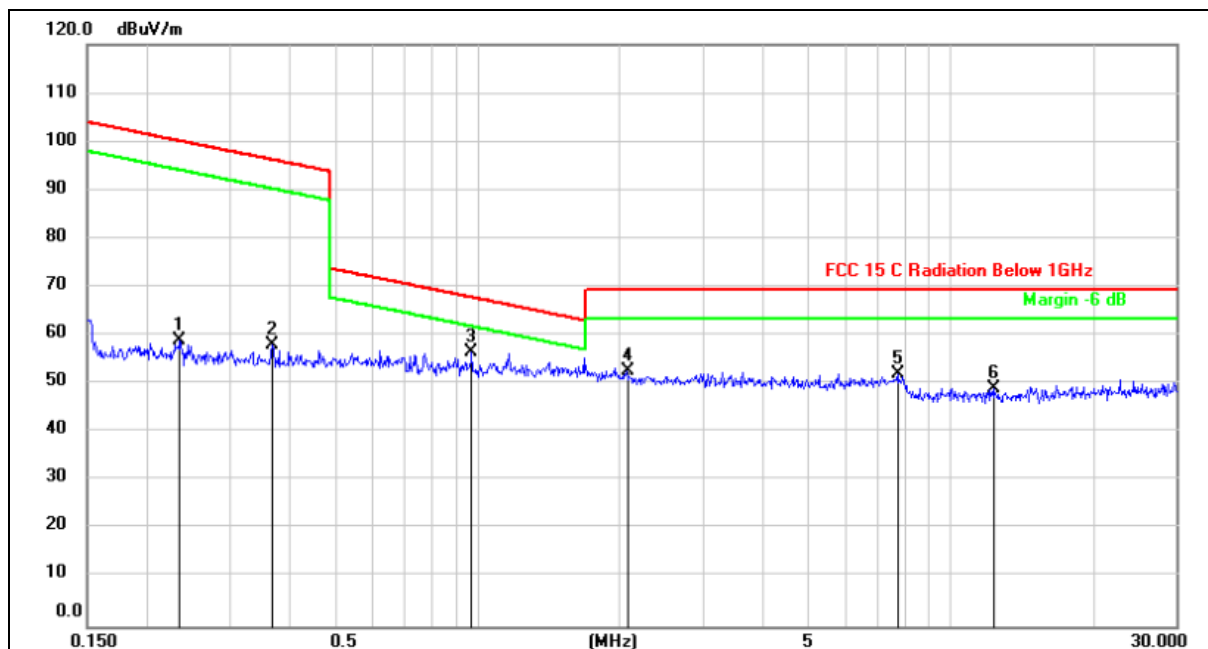
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector
1		0.2353	34.58	20.34	54.92	100.14	-45.22	peak
2		0.3689	35.22	20.32	55.54	96.25	-40.71	peak
3		0.6238	33.91	20.29	54.20	71.71	-17.51	peak
4	*	1.1653	35.38	20.26	55.64	66.30	-10.66	peak
5		1.9593	32.57	20.25	52.82	69.50	-16.68	peak
6		7.7278	31.34	20.35	51.69	69.50	-17.81	peak

Temperature:	23℃	Relative Humidity:	59%
Pressure:	101kPa	Polarization:	Vertical
Test voltage:	DC 12V from adapter	Test mode:	Mode 1



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dBuV/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		0.0154	42.37	20.62	62.99	123.69	-60.70	peak
2		0.0310	38.29	20.42	58.71	117.64	-58.93	peak
3		0.0468	35.16	20.43	55.59	114.09	-58.50	peak
4		0.0625	29.15	20.43	49.58	111.59	-62.01	peak
5		0.0826	24.36	20.44	44.80	109.18	-64.38	peak
6	*	0.1232	39.21	20.43	59.64	105.72	-46.08	peak

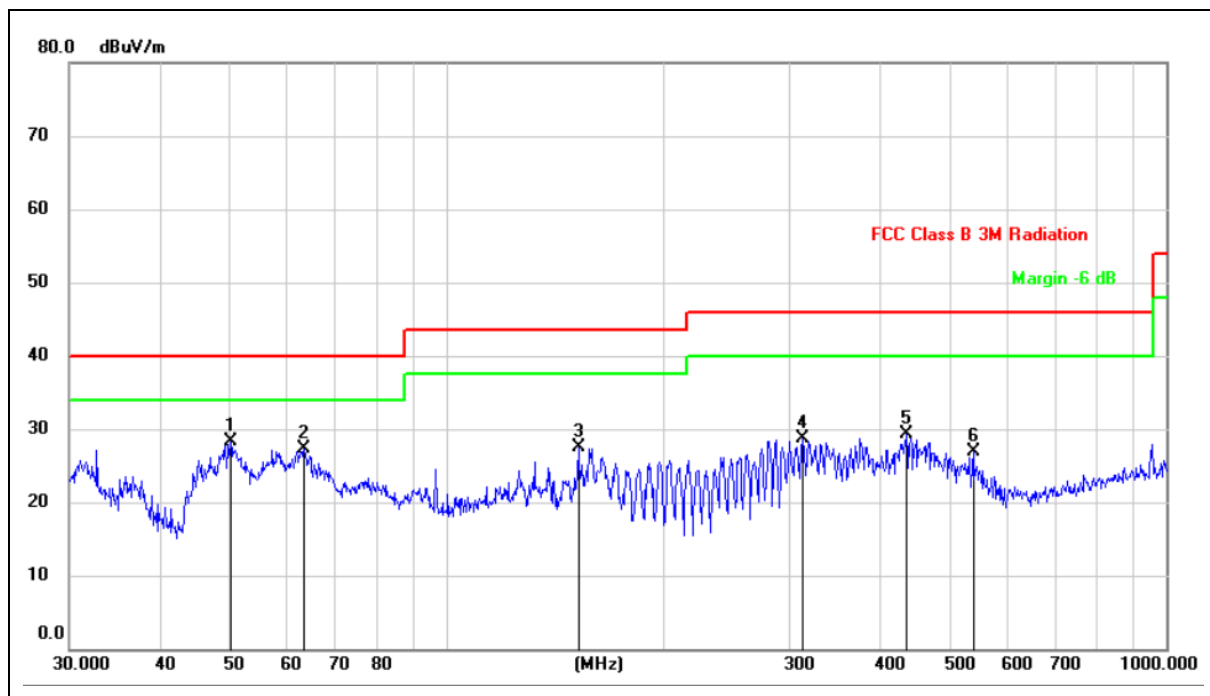
Temperature:	23℃	Relative Humidity:	59%
Pressure:	101kPa	Polarization:	Vertical
Test voltage:	DC 12V from adapter	Test mode:	Mode 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector
1		0.2353	38.58	20.34	58.92	100.14	-41.22	peak
2		0.3690	37.72	20.32	58.04	96.25	-38.21	peak
3	*	0.9735	36.16	20.26	56.42	67.85	-11.43	peak
4		2.0659	32.34	20.25	52.59	69.50	-16.91	peak
5		7.7278	31.84	20.35	52.19	69.50	-17.31	peak
6		12.3835	28.59	20.36	48.95	69.50	-20.55	peak

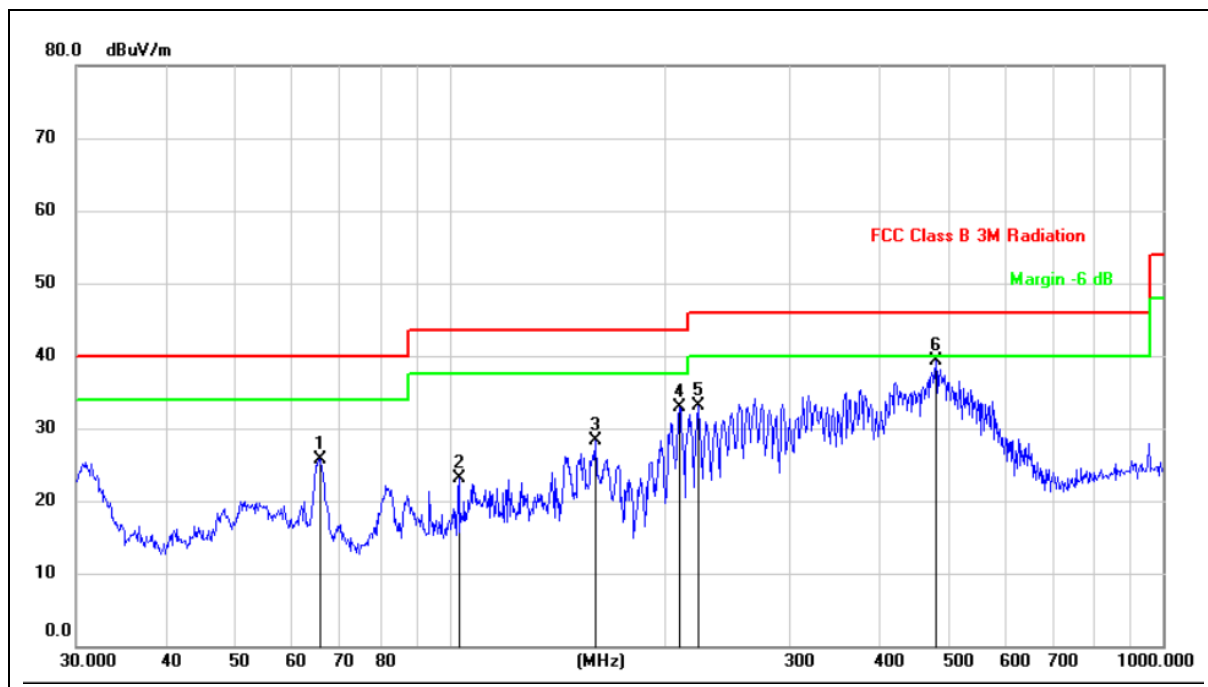
Frequency range (30MHz – 1GHz)

Temperature:	23℃	Relative Humidity:	59%
Pressure:	101kPa	Polarization:	Vertical
Test voltage:	DC 12V from adapter	Test mode:	Mode 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector
1	*	50.2324	37.99	-9.70	28.29	40.00	-11.71	QP
2		63.5356	39.41	-12.06	27.35	40.00	-12.65	QP
3		152.6641	40.86	-13.36	27.50	43.50	-16.00	QP
4		313.2760	36.98	-8.35	28.63	46.00	-17.37	QP
5		435.5898	35.27	-6.02	29.25	46.00	-16.75	QP
6		539.4773	32.37	-5.39	26.98	46.00	-19.02	QP

Temperature:	23℃	Relative Humidity:	59%
Pressure:	101kPa	Polarization:	Horizontal
Test voltage:	DC 12V from adapter	Test mode:	Mode 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector
1		65.8031	38.40	-12.63	25.77	40.00	-14.23	QP
2		103.0800	34.55	-11.44	23.11	43.50	-20.39	QP
3		160.3454	42.45	-14.07	28.38	43.50	-15.12	QP
4		210.0482	44.20	-11.38	32.82	43.50	-10.68	QP
5		222.9502	44.11	-10.94	33.17	46.00	-12.83	QP
6	*	480.5276	44.68	-5.36	39.32	46.00	-6.68	QP

5.4 Occupied bandwidth

5.4.1 Test method

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW $\geq 1\%$ of the 20 dB bandwidth

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

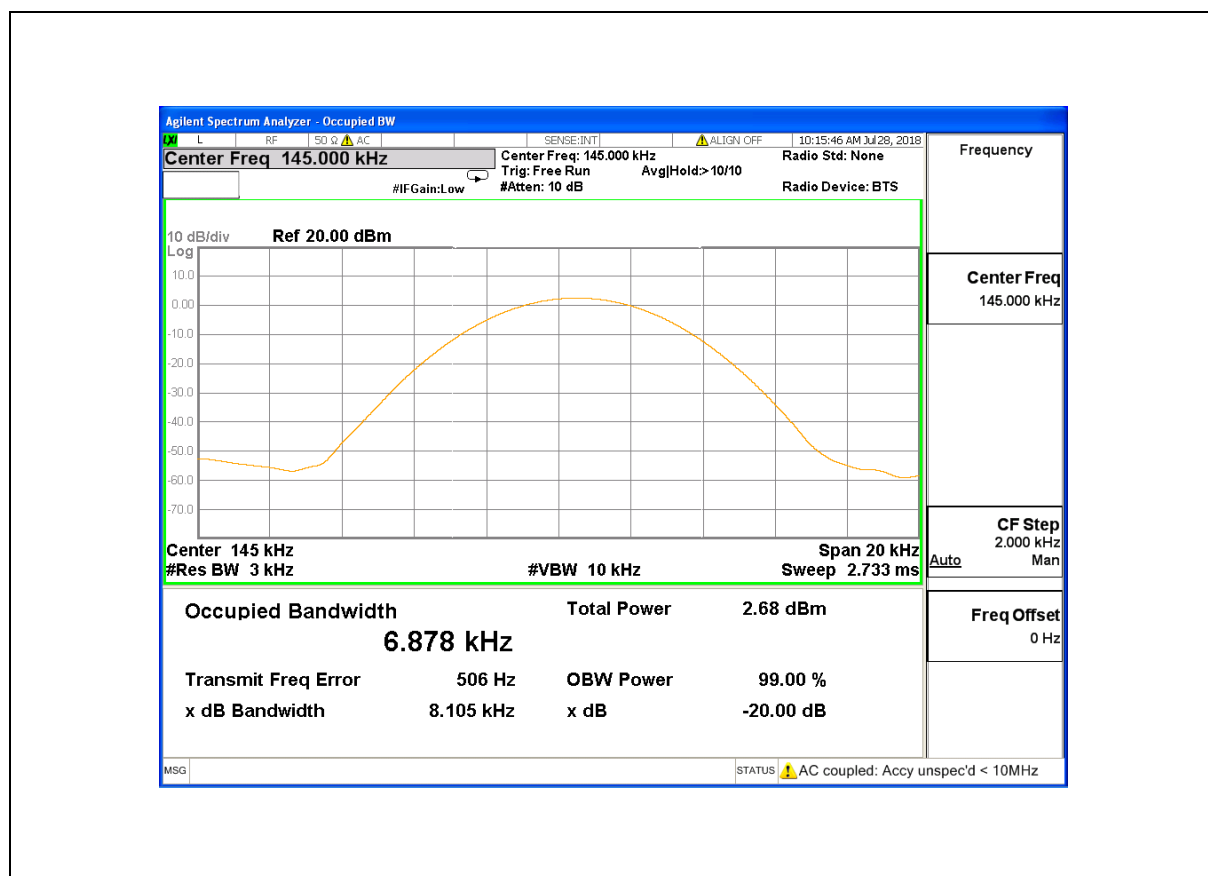
Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth and 99% occupied bandwidth of the emission.

5.4.2 Test result

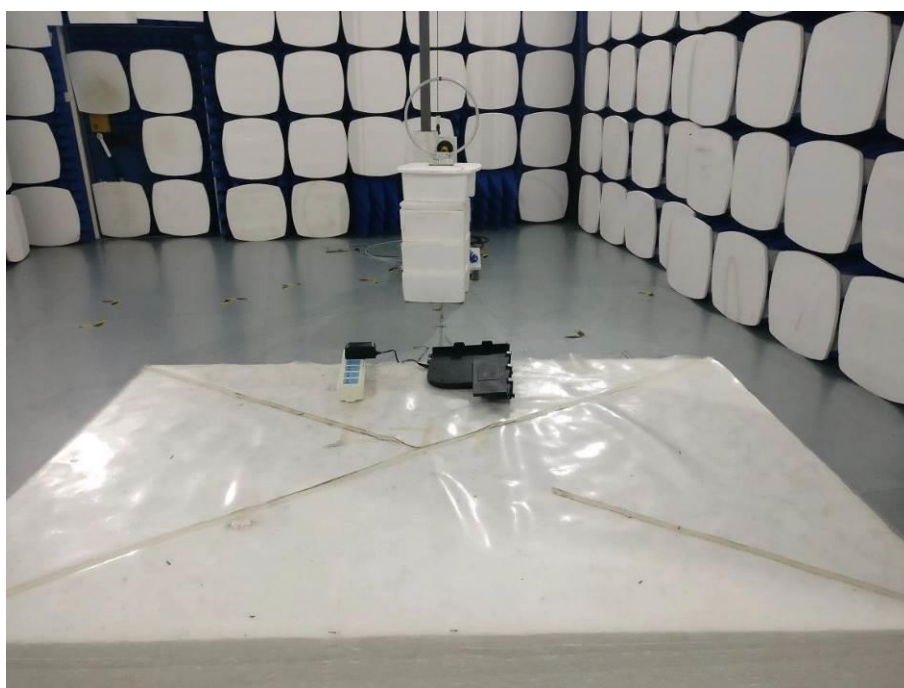
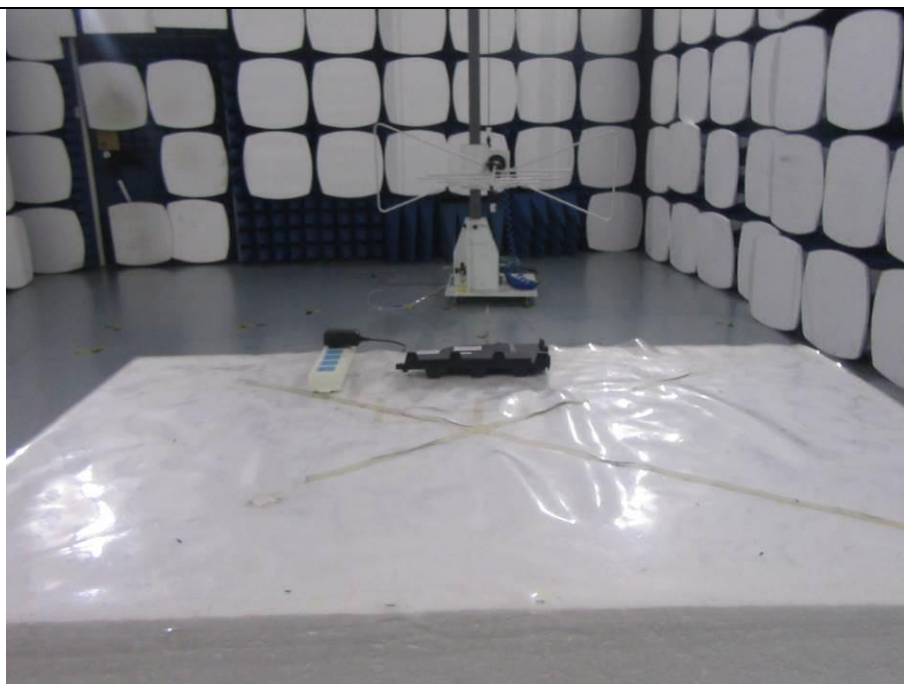
Frequency (kHz)	20dB emission bandwidth (kHz)	99% occupied bandwidth (kHz)
145	8.105	6.878

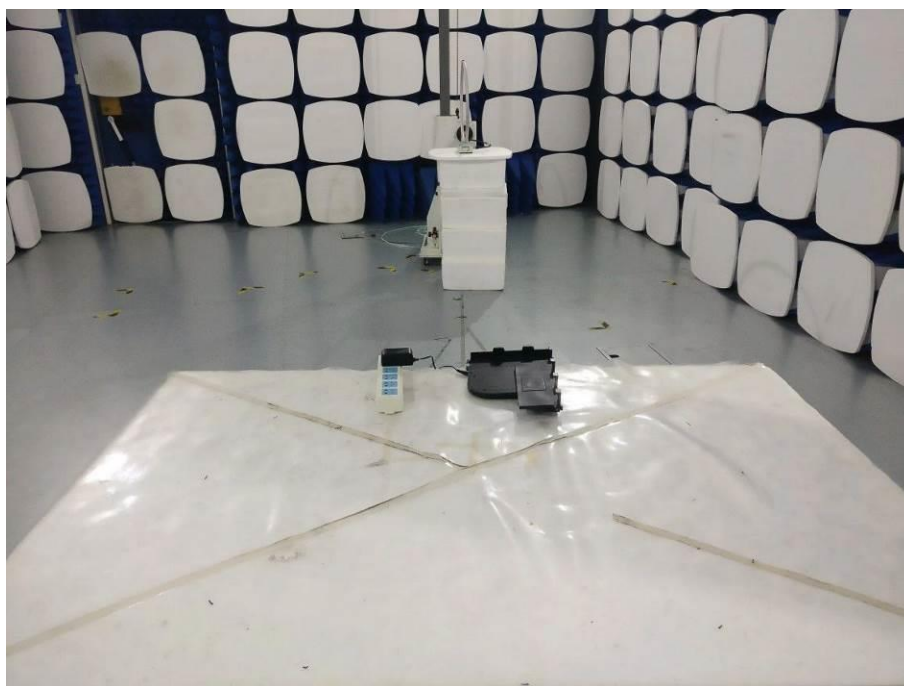
Test plots as below



Photographs of the Test Setup

Radiated emission





Conducted emission



Photographs of the EUT

See the APPENDIX 1: EUT PHOTO in the report NO.: MTi180815E073-1

----END OF REPORT----