



**FCC 47 CFR PART 15 SUBPART C
ISED RSS-210 ISSUE 9**

CERTIFICATION TEST REPORT

For

z-wave extender

MODEL NUMBER: 4AR1S70EN0

**FCC ID: 2AB2QBHARP002
IC: 10256A-BHARP002**

REPORT NUMBER: 4788997489.1-1

ISSUE DATE: July 12, 2019

Prepared for

**LEEDARSON LIGHTING CO., LTD.
Xingtai Industrial Zone, Economic Development Zone, Changtai County,
Zhangzhou City, Fujian Province, P.R.China**

Prepared by

**UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch
Room 101, Building 10, Innovation Technology Park,
Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
Tel: +86 769 33817100
Fax: +86 769 33244054
Website: www.ul.com**

Revision History

Rev.	Issue Date	Revisions	Revised By
V0	07/12/2019	Initial Issue	

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION.....	5
4. CALIBRATION AND UNCERTAINTY.....	6
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. MEASUREMENT UNCERTAINTY	6
5. EQUIPMENT UNDER TEST.....	7
5.1. DESCRIPTION OF EUT	7
5.2. MAXIMUM EMISSIONS FIELD STRENGTH	7
5.3. THE WORSE CASE POWER SETTING PARAMETER.....	8
5.4. TEST ENVIRONMENT	8
5.5. DESCRIPTION OF AVAILABLE ANTENNAS	9
5.6. DESCRIPTION OF TEST SETUP	9
5.7. MEASURING INSTRUMENT AND SOFTWARE USED	10
6. SUMMARY OF TEST RESULTS.....	11
7. ANTENNA PORT TEST RESULTS	12
7.1. ON TIME AND DUTY CYCLE.....	12
7.2. 20 dB AND 99% BANDWIDTH.....	13
8. RADIATED TEST RESULTS.....	16
8.1. LIMITS AND PROCEDURE.....	16
8.2. FIELD STRENGTH OF INTENTIONAL EMISSIONS.....	22
8.3. SPURIOUS EMISSIONS BELOW 30M	28
8.4. SPURIOUS EMISSIONS BELOW 1 GHz	31
8.5. SPURIOUS EMISSIONS 1 ~ 10GHz.....	33
9. AC POWER LINE CONDUCTED EMISSIONS.....	39
10. ANTENNA REQUIREMENTS	42

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: LEEDARSON LIGHTING CO., LTD.
Address: Xingtai Industrial Zone, Economic Development Zone, Changtai County, Zhangzhou City, Fujian Province, P.R.China

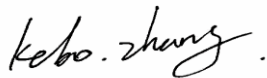
Manufacturer Information

Company Name: LEEDARSON LIGHTING CO., LTD.
Address: Xingtai Industrial Zone, Economic Development Zone, Changtai County, Zhangzhou City, Fujian Province, P.R.China

EUT Name: z-wave extender
Brand: /
Model: 4AR1S70EN0
Sample Status: Normal
Sample Received Date: May 8, 2019
Date of Tested: May 9~July 12, 2019

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS
ISED RSS-210 Issue 9	PASS
ISED RSS-GEN Issue 5	PASS

Tested By:



Kebo Zhang
Engineer

Checked By:



Shawn Wen
Laboratory Leader

Approved By:



Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, ISED RSS-210 Issue 9 and RSS-GEN Issue 5

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	<p>A2LA (Certificate No.: 4102.01) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA.</p> <p>IAS (Lab Code: TL-702) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has demonstrated compliance with ISO/IEC Standard 17025:2005, General requirements for the competence of testing and calibration laboratories</p> <p>FCC (FCC Designation No.: CN1187) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules</p> <p>IC(Company No.: 21320) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320.</p> <p>VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B, the VCCI registration No. is C-20012 and T-20011</p>
---------------------------	---

Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OATS.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.90dB
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.2dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.52dB
Uncertainty for Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	5.04dB(1-6GHz)
	5.30dB (6GHz-18Gz)
	5.23dB (18GHz-26Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Equipment	z-wave extender	
Model Name	4AR1S70EN0	
Data Rates	908.4 MHz:40kbps	
	908.42 MHz:9.6kbps	
	916.0 MHz:100kbps	
Transmit Channel Tested:	Channel ID	Channel Frequency(MHz)
	1	908.40
	2	908.42
	3	916.00
Power Supply	AC120V, 60Hz	

5.2. MAXIMUM EMISSIONS FIELD STRENGTH

Frequency Range (MHz)	Number of Transmit Chains (NTX)	Frequency (MHz)	Channel Number	Max. Emissions Field Strength (dB μ V/m)
902-928	1	908.4-916	3[3]	92.54

5.3. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter				
Test Software		UartAssis		
Test Mode	Transmit Antenna Number	Test Channel		
		CH 1	CH 2	CH 3
Z-WAVE	1	17	17	17

5.4. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28°C
Voltage :	VL	N/A
	VN	AC120V,60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
 VN= Nominal Voltage
 VH= Upper Extreme Test Voltage
 TN= Normal Temperature

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	908.4~916	Built-in	-2.59

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name
1	Laptop	ThinkPad	T460S
2	USB to Serial Conversion board	N/A	N/A

I/O CABLES

No.	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	N/A	N/A	N/A	N/A	N/A

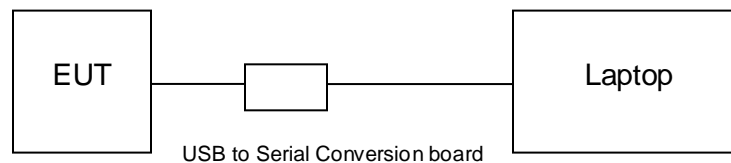
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

TEST SETUP

The EUT can work in an engineer mode with a software through a table PC.

SETUP DIAGRAM FOR TESTS



5.7. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	101961	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Two-Line V- Network	R&S	ENV216	101983	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Dec.10,2018	Dec.10,2019
Software						
Used	Description		Manufacturer	Name	Version	
<input checked="" type="checkbox"/>	Test Software for Conducted disturbance		Farad	EZ-EMC	Ver. UL-3A1	
Radiated Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17, 2018	Sep.17, 2021
<input checked="" type="checkbox"/>	Preamplifier	HP	8447D	2944A09099	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	EMI Measurement Receiver	R&S	ESR26	101377	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Horn Antenna	TDK	HRN-0118	130939	Sep.17, 2018	Sep.17, 2021
<input checked="" type="checkbox"/>	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Aug.11, 2018	Aug.11, 2021
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-0118	TRS-305- 00066	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-2	TRS-307- 00003	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Loop antenna	Schwarzbeck	1519B	00008	Jan.01,2019	Dec.07, 2022
Software						
Used	Description		Manufacturer	Name	Version	
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance		Farad	EZ-EMC	Ver. UL-3A1	

6. SUMMARY OF TEST RESULTS

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	20dB Bandwidth	FCC Part 2.1049	Pass
2	99%dB Bandwidth	RSS-Gen Clause 6.7	Pass
3	TX Spurious Emission	FCC 15.249 (a)(d)(e) FCC 15.209 FCC 15.205 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	Pass
4	Conducted Emission Test For AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	Pass

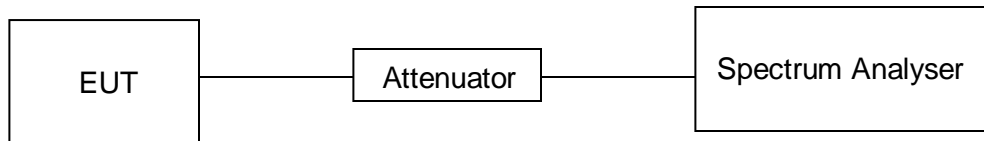
7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only

TEST SETUP



RESULTS

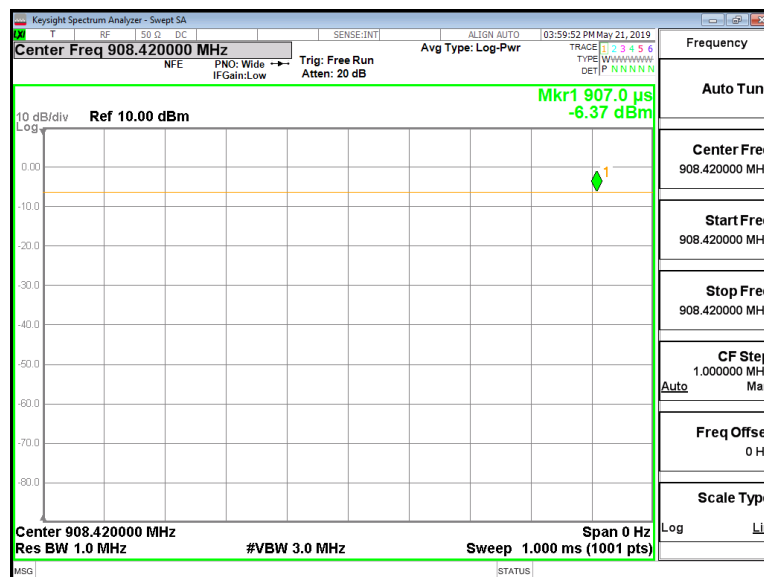
Test Channel	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	minimum VBW 1/T (KHz)
MID	1	1	1	100%	0	0.01

Note: Duty Cycle Correction Factor=10log(1/x).

Where: x is Duty Cycle (Linear)

Where: T is On Time (transmit duration)

ON TIME AND DUTY CYCLE MID



7.2. 20 dB AND 99% BANDWIDTH

LIMITS

FCC Part15 (15.249) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.249(d)	Bandwidth	for reporting purposes only	902-928 MHz
RSS-Gen Clause 6.6	99% Bandwidth	N/A	902-928MHz

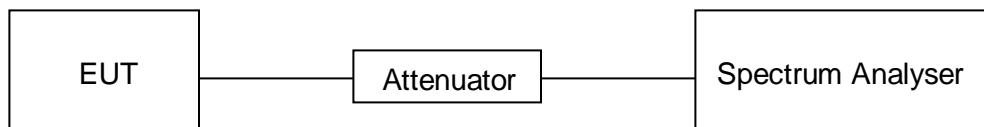
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	1% to 5% of the occupied bandwidth
VBW	$\geq 3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto couple

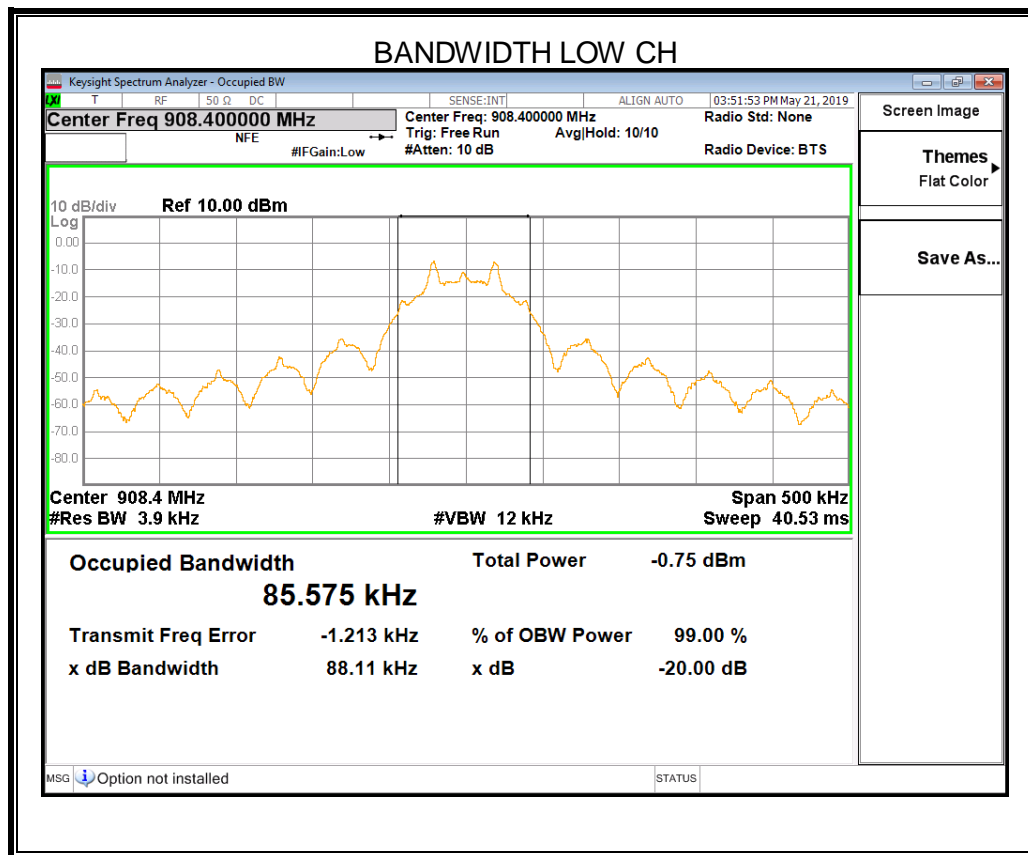
Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

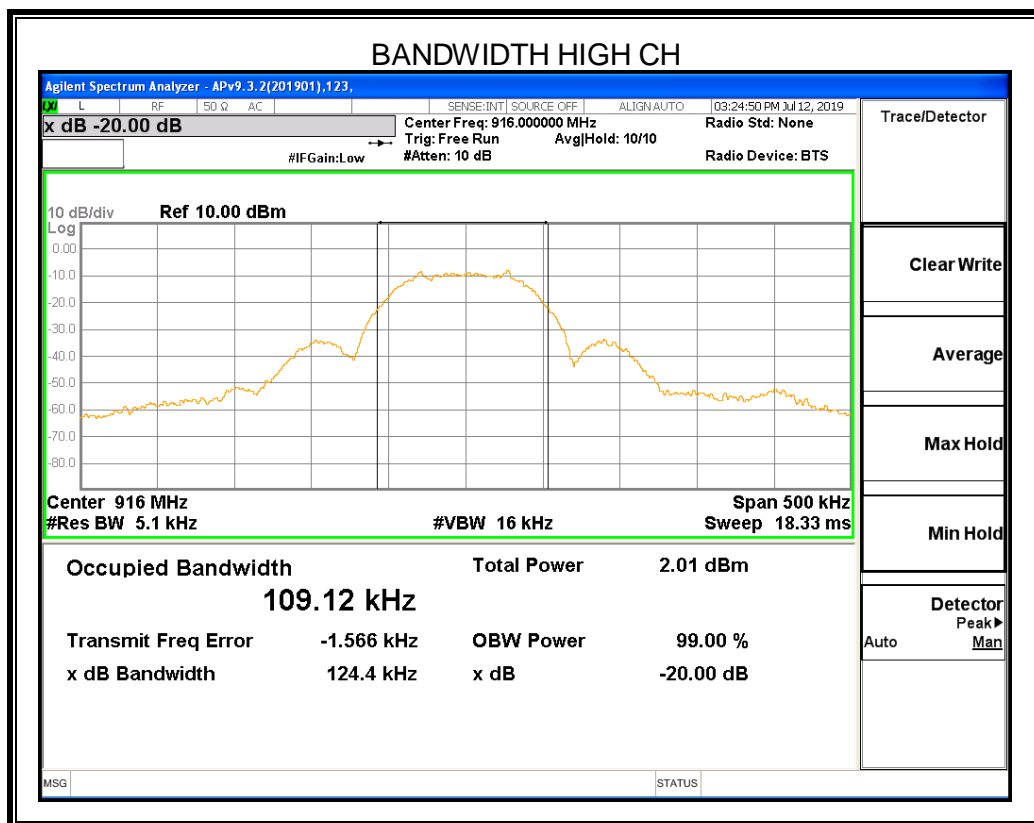
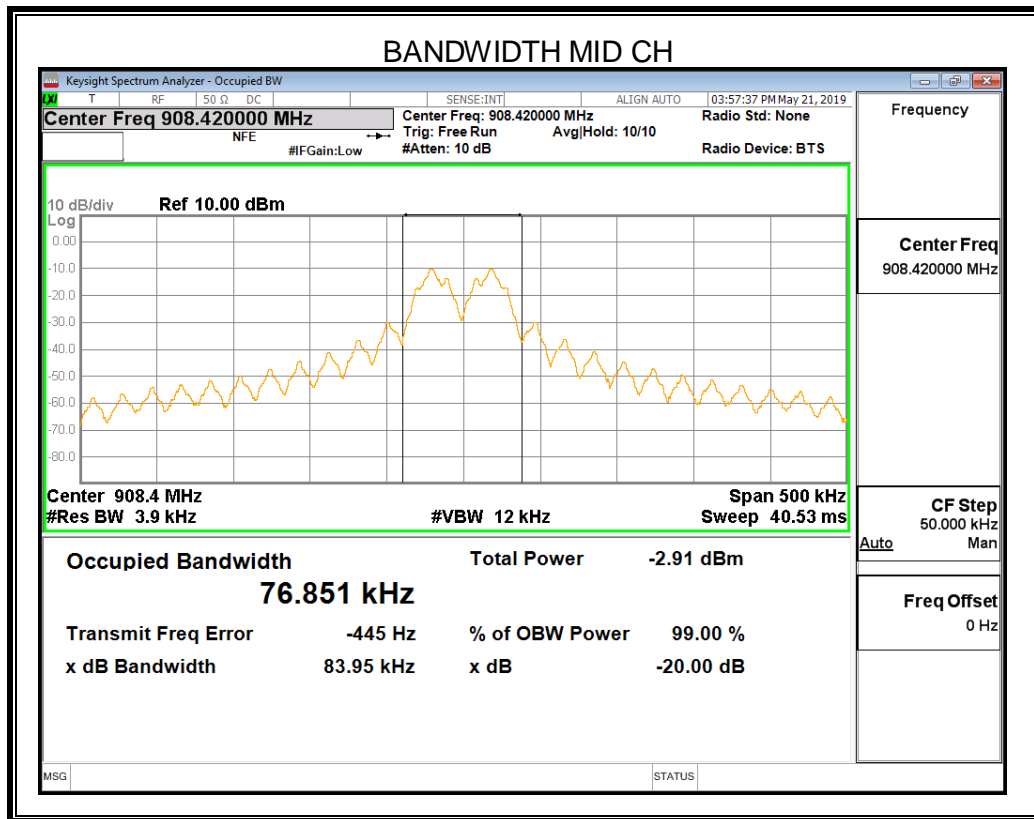
TEST SETUP



RESULTS

Channel	20dB bandwidth (KHz)	99% bandwidth (KHz)	Result
Low	88.11	85.575	Pass
Middle	83.95	76.851	Pass
High	124.40	109.12	Pass





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

Please refer to FCC §15.205 and §15.209

Please refer to FCC §15.249 (a)(d)(e)

RSS-210 Issue 9 Clause Annex B B.10

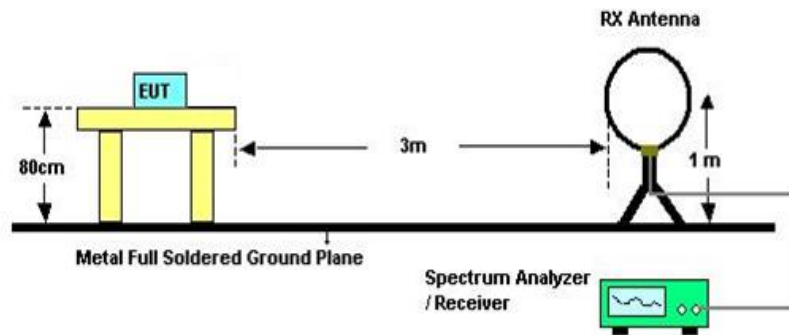
The field strength of emissions from intentional radiators operated within these frequency bands			
Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3

Emissions radiated outside of the specified frequency bands		
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	Quasi-Peak
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54
Above 1000	500	Peak
		74
Above 1000	500	Average
		54

About Restricted bands of operation please refer to RSS-Gen section 8.10 and FCC §15.205 (a)

TEST SETUP AND PROCEDURE

Below 30MHz



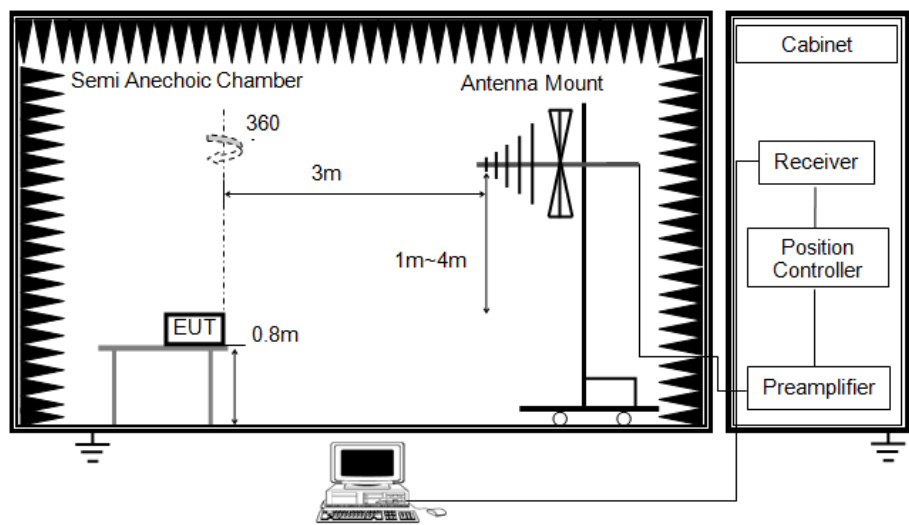
The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then 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. Three polarizations(Horizontal, Face-on and Face-off)of the antenna are set to make the measurement. At least a pre-check to show that parallel to the ground if is not worst case and that face-on and face-off are worst case.
check in 3 polarizations, at least a pre-check to show that parallel to the ground if is not worst case and that face-on and face-off are worst case
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Measurement = Reading Level + Correct Factor
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. 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.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)
8. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open are test site. Therefore sufficient tests were

made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

Below 1G

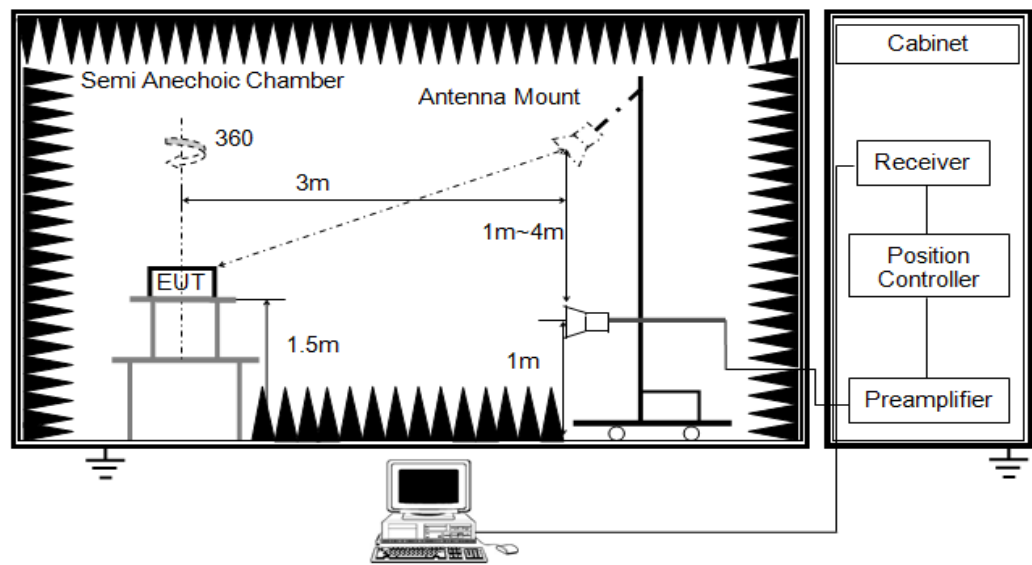


The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. 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. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Measurement = Reading Level + Correct Factor
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. 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.
7. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

ABOVE 1G

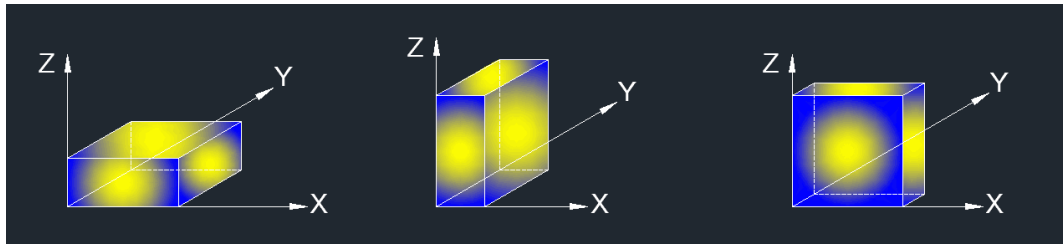


The setting of the spectrum analyser

RBW	1M MHz
VBW	PEAK: 3M AVG: See Note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. 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. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For average power measurement, set the detector to AVG, while maintaining all of the other instrument settings, if the duty cycle of the EUT is less than 98%, the Duty Cycle Correction Factor shall be added to the measured emission levels. For the Duty Cycle and Correction Factor please refer to clause 7.1.ON TIME AND DUTY CYCLE.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

X axis, Y axis, Z axis positions:

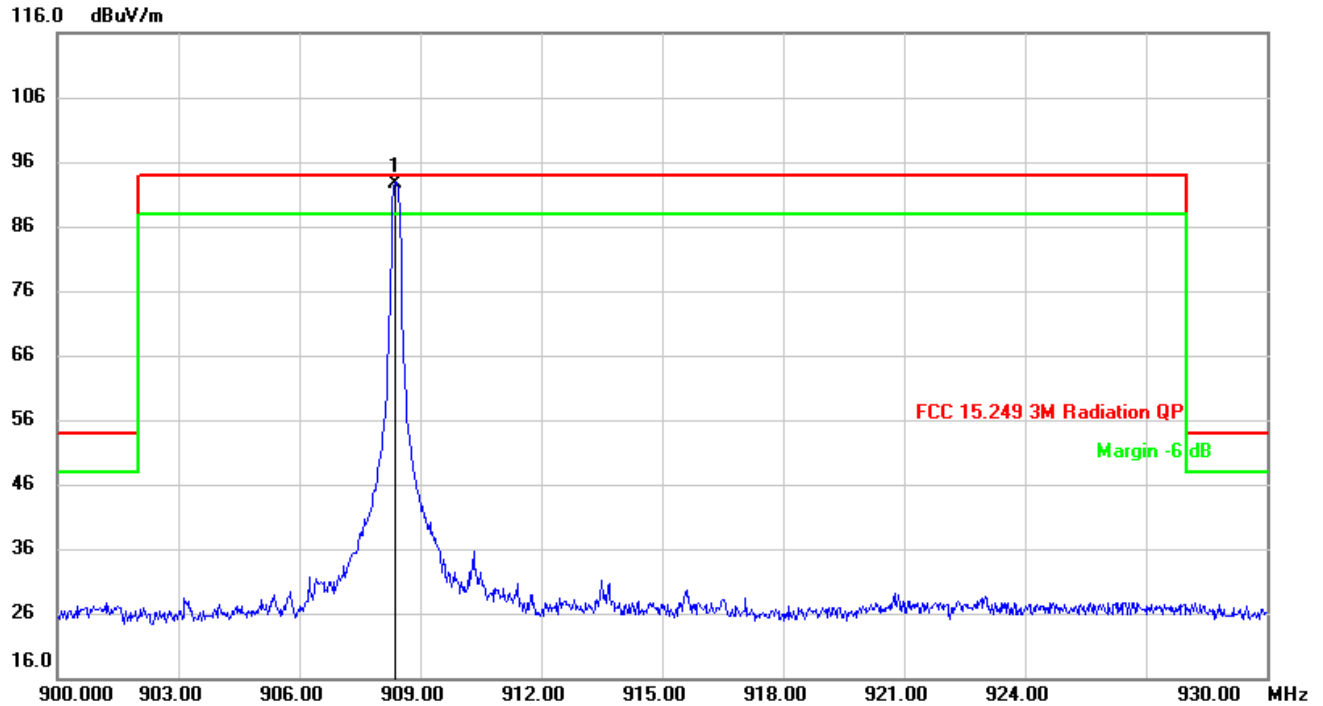


Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: All the EUT's emissions had been evaluated for simultaneous transmission with the other transmitter and there were no any additional or worse emissions found.

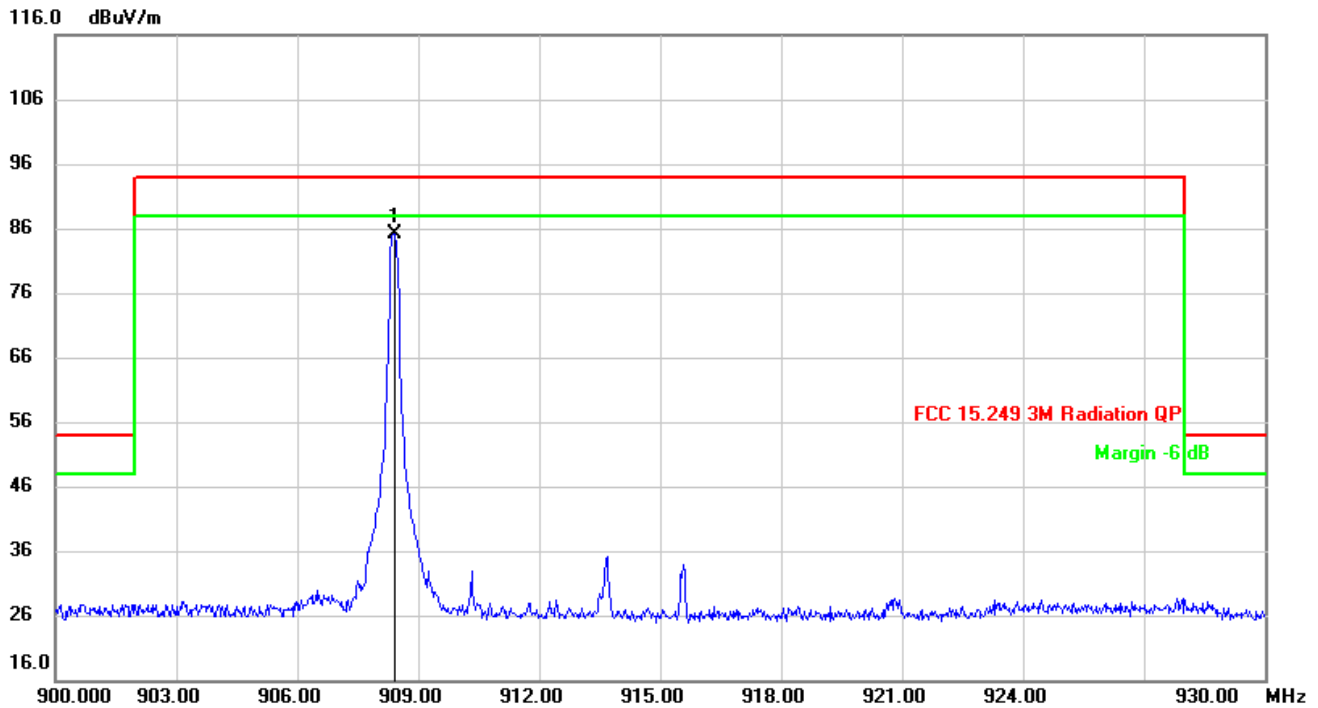
8.2. FIELD STRENGTH OF INTENTIONAL EMISSIONS

FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, HORIZONTAL)



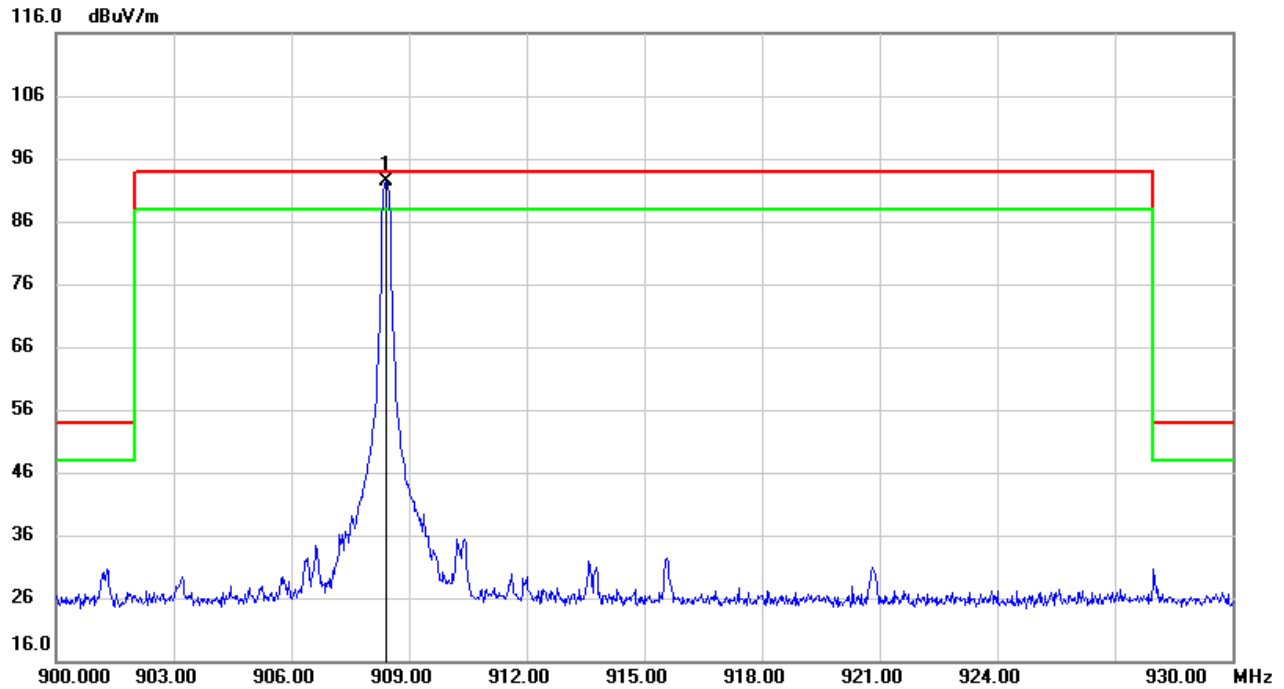
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	908.3700	96.54	-4.00	92.54	94.00	-1.46	QP

Note: 1. Measurement = Reading Level + Correct Factor.
2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, VERTICAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	908.4000	89.20	-4.00	85.20	94.00	-8.80	QP

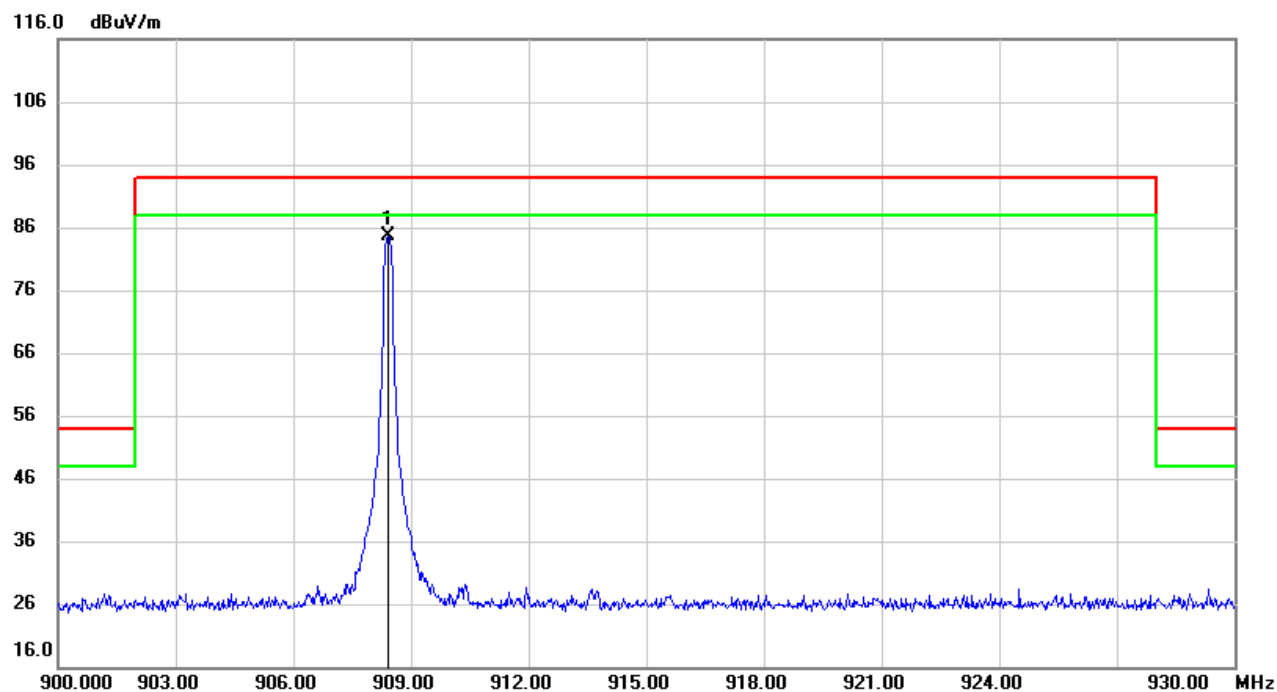
Note: 1. Measurement = Reading Level + Correct Factor.
 2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	908.4300	96.33	-3.99	92.34	94.00	-1.66	QP

Note: 1. Measurement = Reading Level + Correct Factor.

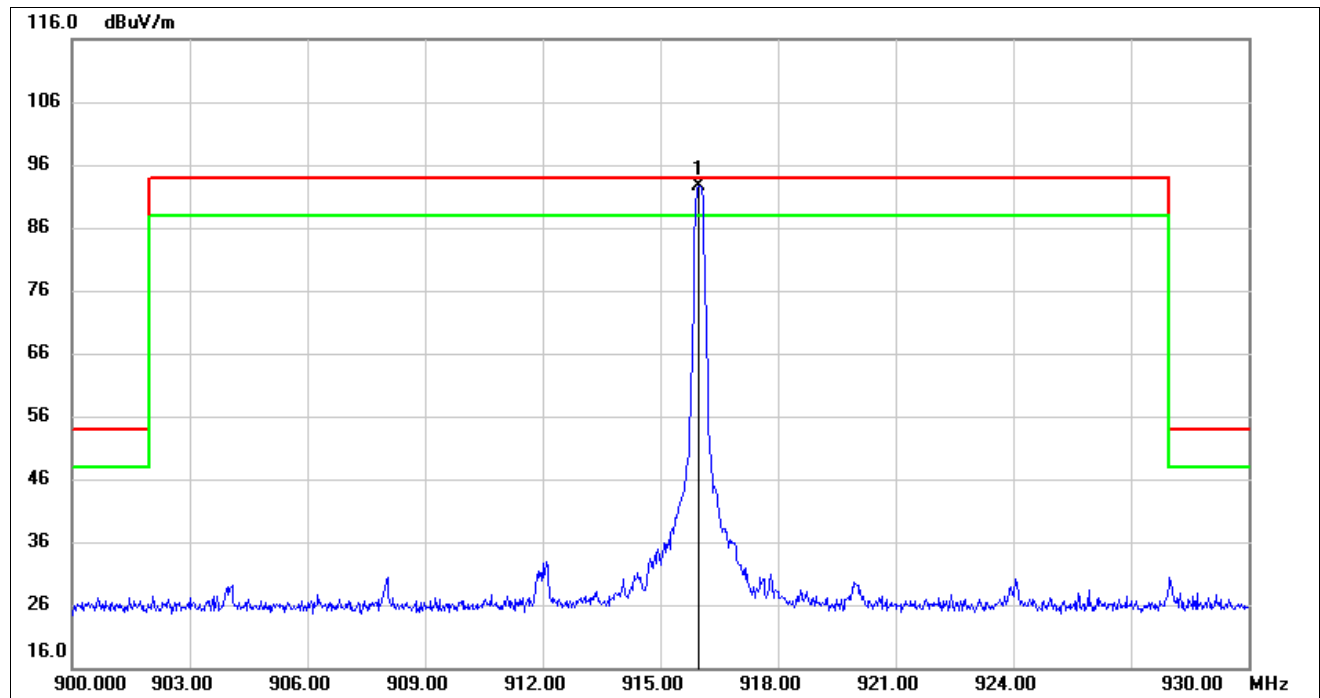
2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, VERTICAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	908.4300	88.52	-3.99	84.53	94.00	-9.47	QP

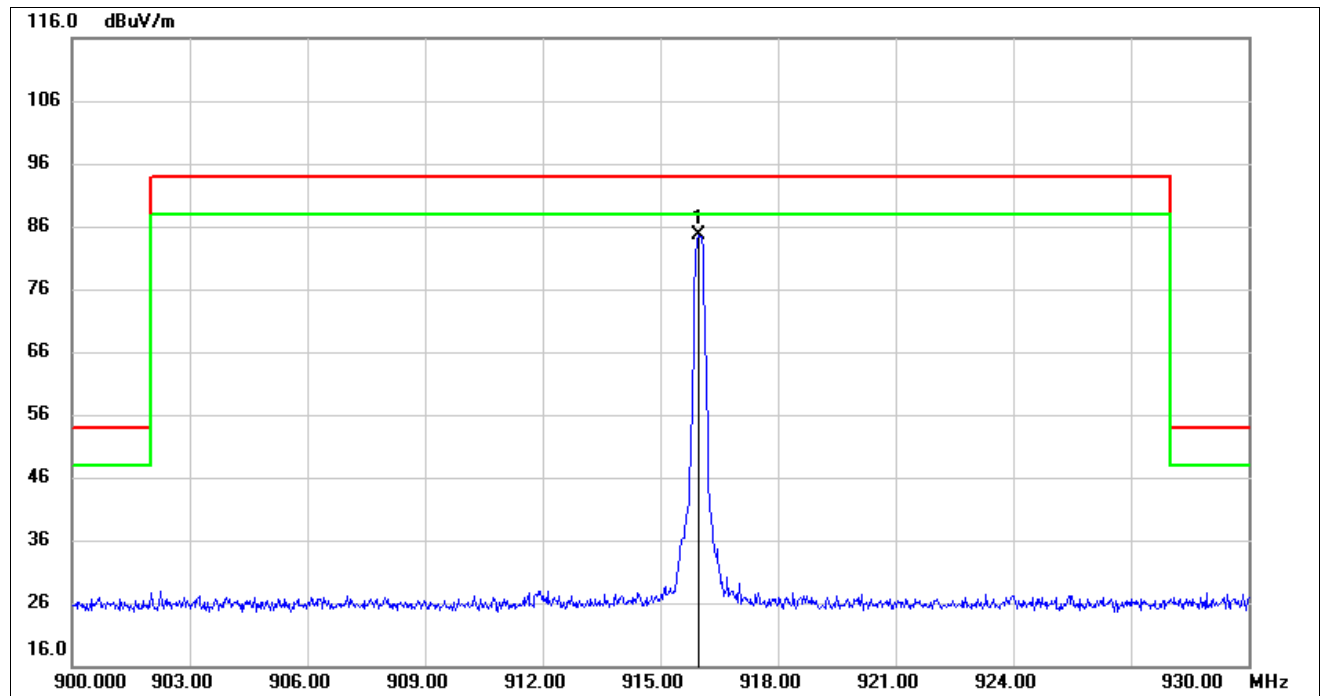
Note: 1. Measurement = Reading Level + Correct Factor.

2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (HIGH CHANNEL, HORIZONTAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	915.9600	96.41	-3.89	92.52	94.00	-1.48	QP

Note: 1. Measurement = Reading Level + Correct Factor.
 2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (HIGH CHANNEL, VERTICAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	915.9600	88.41	-3.89	84.52	94.00	-9.48	QP

Note: 1. Measurement = Reading Level + Correct Factor.

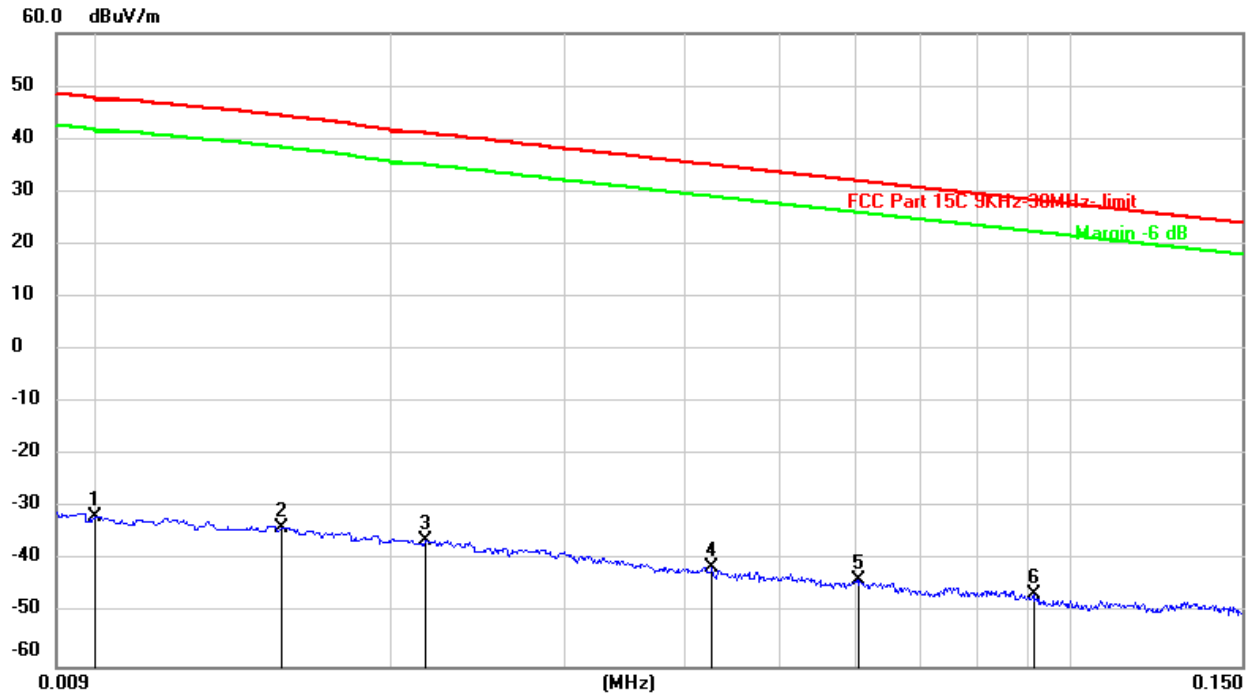
2. QP detector.

8.3. SPURIOUS EMISSIONS BELOW 30M

SPURIOUS EMISSIONS

(LOW CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9kHz~150kHz

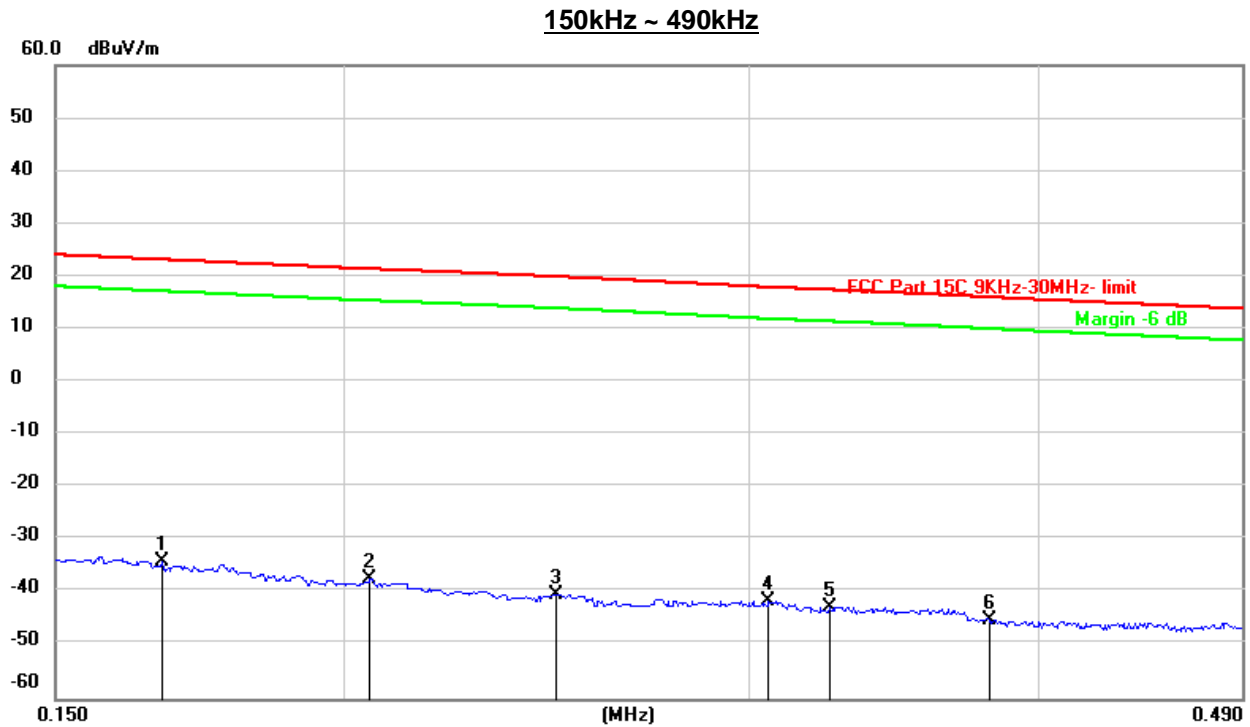


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0100	69.72	-101.40	-31.68	47.60	-79.28	peak
2	0.0154	67.49	-101.37	-33.88	44.35	-78.23	peak
3	0.0216	65.19	-101.35	-36.16	41.02	-77.18	peak
4	0.0427	60.14	-101.45	-41.31	35.04	-76.35	peak
5	0.0604	57.92	-101.52	-43.60	31.99	-75.59	peak
6	0.0913	55.34	-101.73	-46.39	28.40	-74.79	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

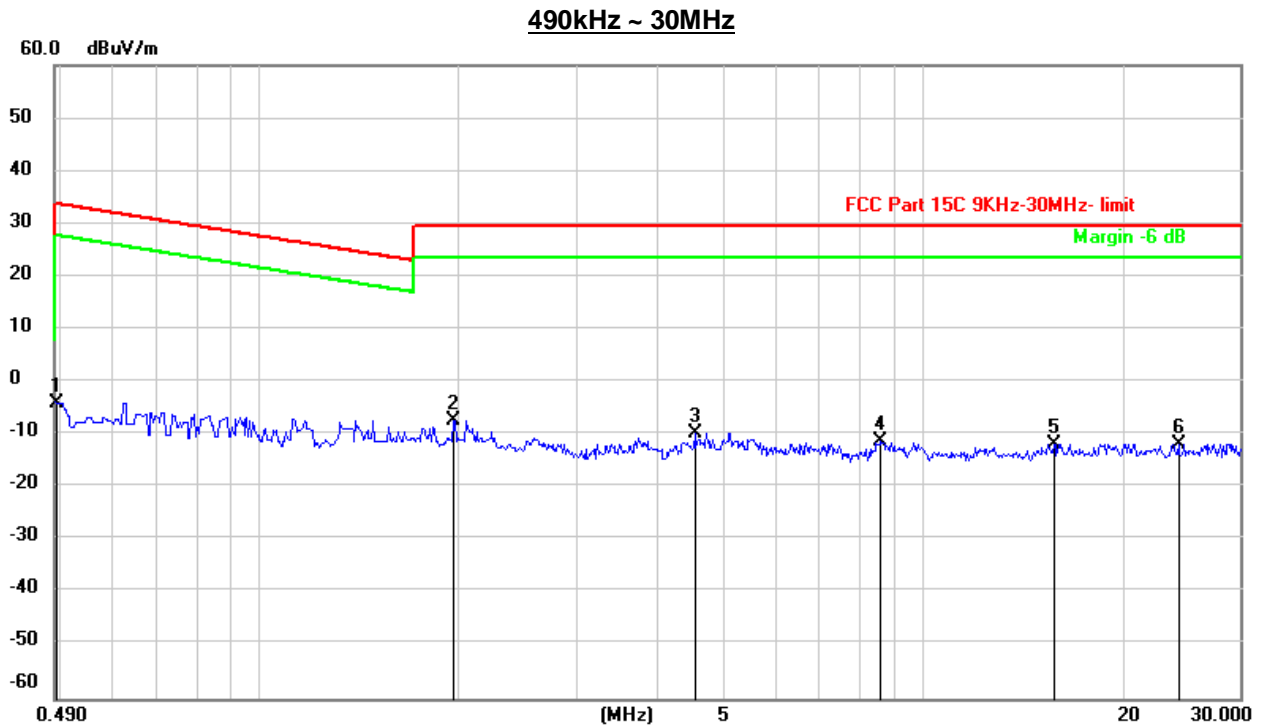


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1669	67.65	-101.66	-34.01	23.16	-57.17	peak
2	0.2053	64.30	-101.73	-37.43	21.39	-58.82	peak
3	0.2472	61.45	-101.80	-40.35	19.92	-60.27	peak
4	0.3057	60.26	-101.86	-41.60	17.92	-59.52	peak
5	0.3245	59.25	-101.88	-42.63	17.45	-60.08	peak
6	0.3809	56.91	-101.94	-45.03	16.04	-61.07	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.4939	58.14	-62.06	-3.92	33.74	-37.66	peak
2	1.9522	54.61	-61.84	-7.23	29.54	-36.77	peak
3	4.5327	51.82	-61.42	-9.60	29.54	-39.14	peak
4	8.6348	49.60	-60.99	-11.39	29.54	-40.93	peak
5	15.7759	49.25	-60.99	-11.74	29.54	-41.28	peak
6	24.3045	48.80	-60.51	-11.71	29.54	-41.25	peak

Note: 1. Measurement = Reading Level + Correct Factor.

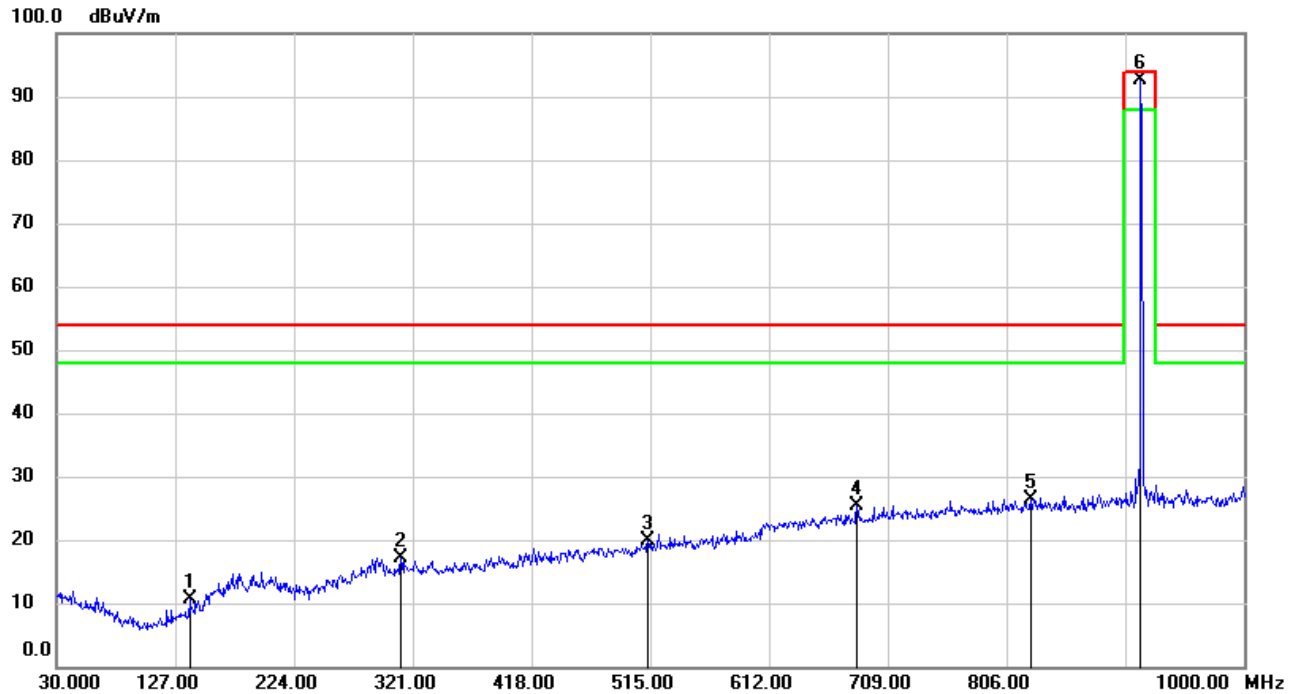
2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

Note: All the modes had been tested, but only the worst data recorded in the report.

8.4. SPURIOUS EMISSIONS BELOW 1 GHz

SPURIOUS EMISSIONS BELOW 1GHz (WORST-CASE HIGH CHANNEL, HORIZONTAL)

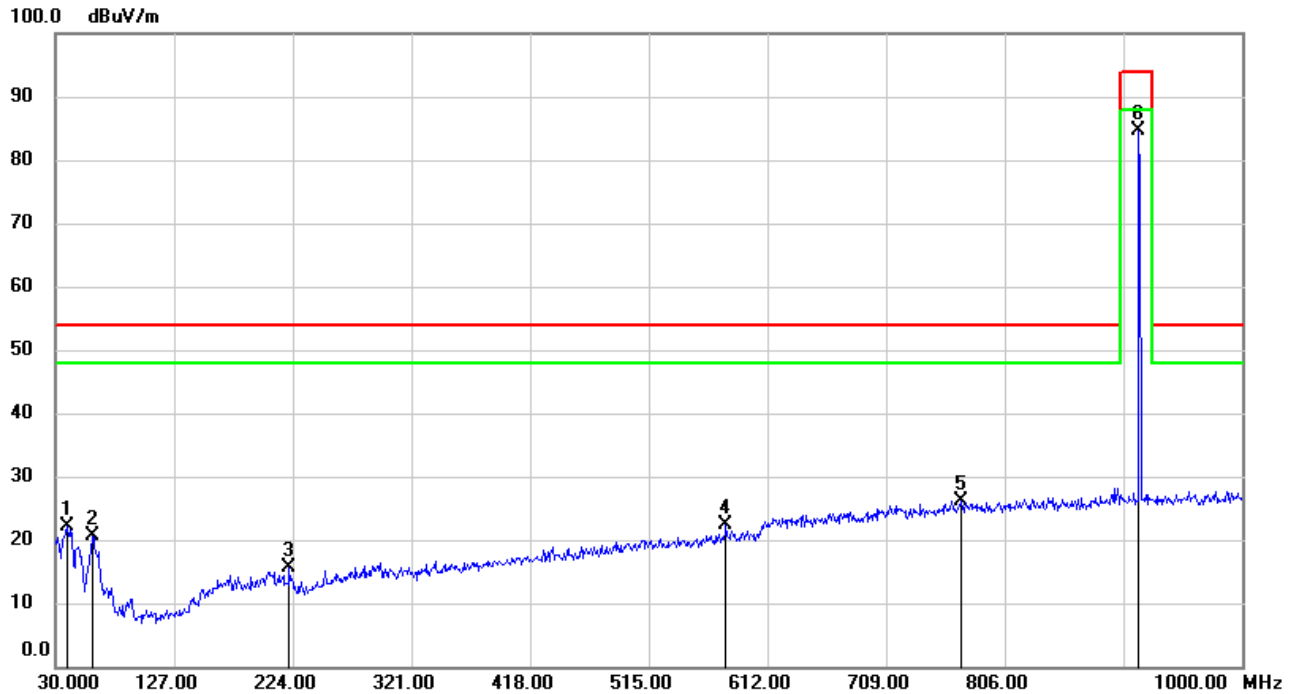


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	138.6400	29.88	-19.26	10.62	54.00	-43.38	QP
2	311.3000	30.81	-13.77	17.04	54.00	-36.96	QP
3	513.0600	30.07	-10.13	19.94	54.00	-34.06	QP
4	683.7800	32.22	-6.92	25.30	54.00	-28.70	QP
5	825.4000	31.31	-4.86	26.45	54.00	-27.55	QP
6	915.6100	96.65	-3.90	92.75	94.00	-1.25	QP

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

SPURIOUS EMISSIONS BELOW 1GHz (WORST-CASE HIGH CHANNEL, VERTICAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	39.7000	40.03	-17.93	22.10	54.00	-31.90	QP
2	60.0700	40.05	-19.46	20.59	54.00	-33.41	QP
3	221.0900	32.54	-17.02	15.52	54.00	-38.48	QP
4	578.0500	31.07	-8.77	22.30	54.00	-31.70	QP
5	770.1100	32.06	-5.82	26.24	54.00	-27.76	QP
6	915.6100	88.50	-3.90	84.60	94.00	-9.40	QP

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

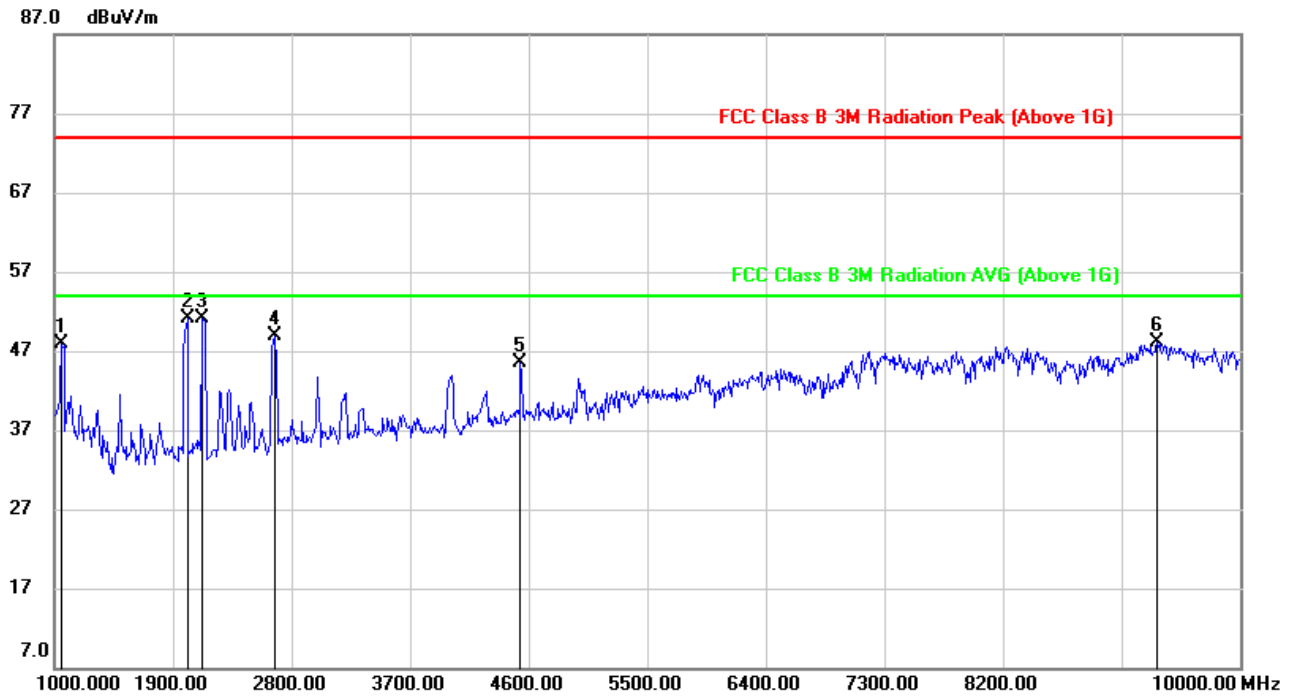
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

Note: All the modes had been tested, but only the worst data recorded in the report.

8.5. SPURIOUS EMISSIONS 1 ~ 10GHz

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)

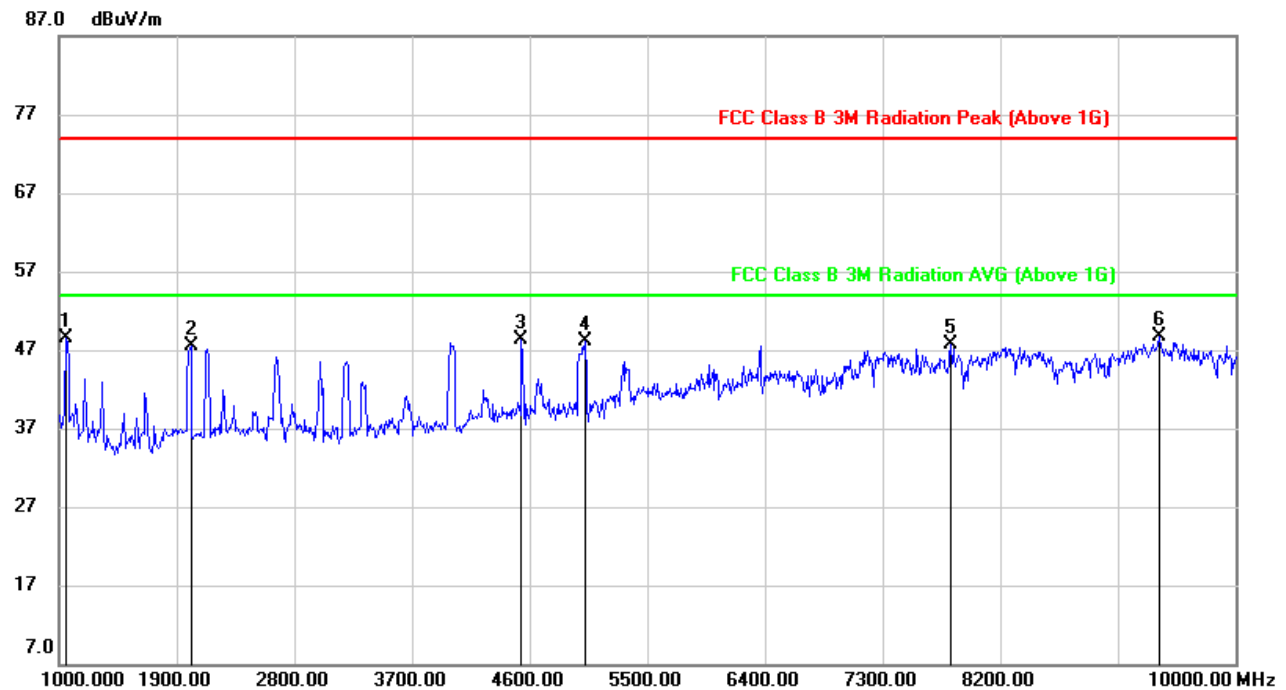


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1054.000	62.51	-14.52	47.99	74.00	-26.01	peak
2	2008.000	61.85	-10.81	51.04	74.00	-22.96	peak
3	2116.000	61.26	-10.14	51.12	74.00	-22.88	peak
4	2674.000	57.06	-8.08	48.98	74.00	-25.02	peak
5	4537.000	47.52	-2.07	45.45	74.00	-28.55	peak
6	9370.000	38.09	10.10	48.19	74.00	-25.81	peak

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

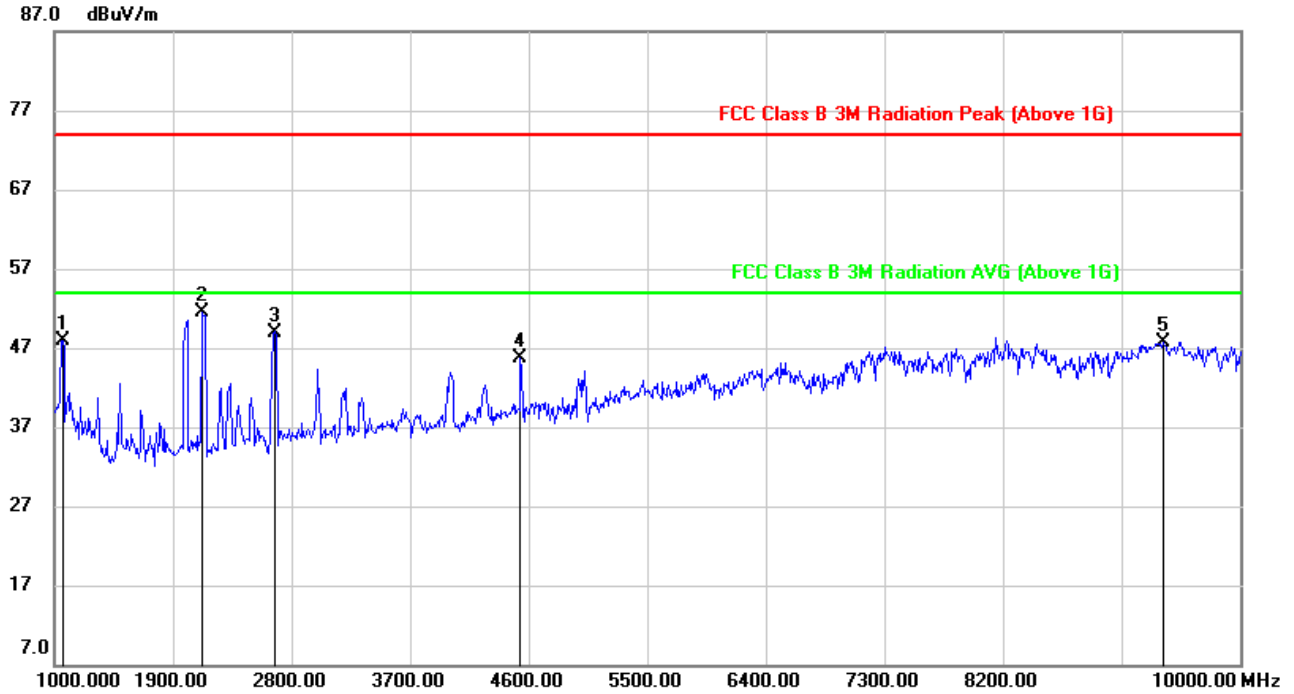
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1054.000	63.05	-14.52	48.53	74.00	-25.47	peak
2	2008.000	58.33	-10.81	47.52	74.00	-26.48	peak
3	4537.000	50.41	-2.07	48.34	74.00	-25.66	peak
4	5023.000	48.03	-0.01	48.02	74.00	-25.98	peak
5	7822.000	39.22	8.44	47.66	74.00	-26.34	peak
6	9415.000	38.36	10.27	48.63	74.00	-25.37	peak

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

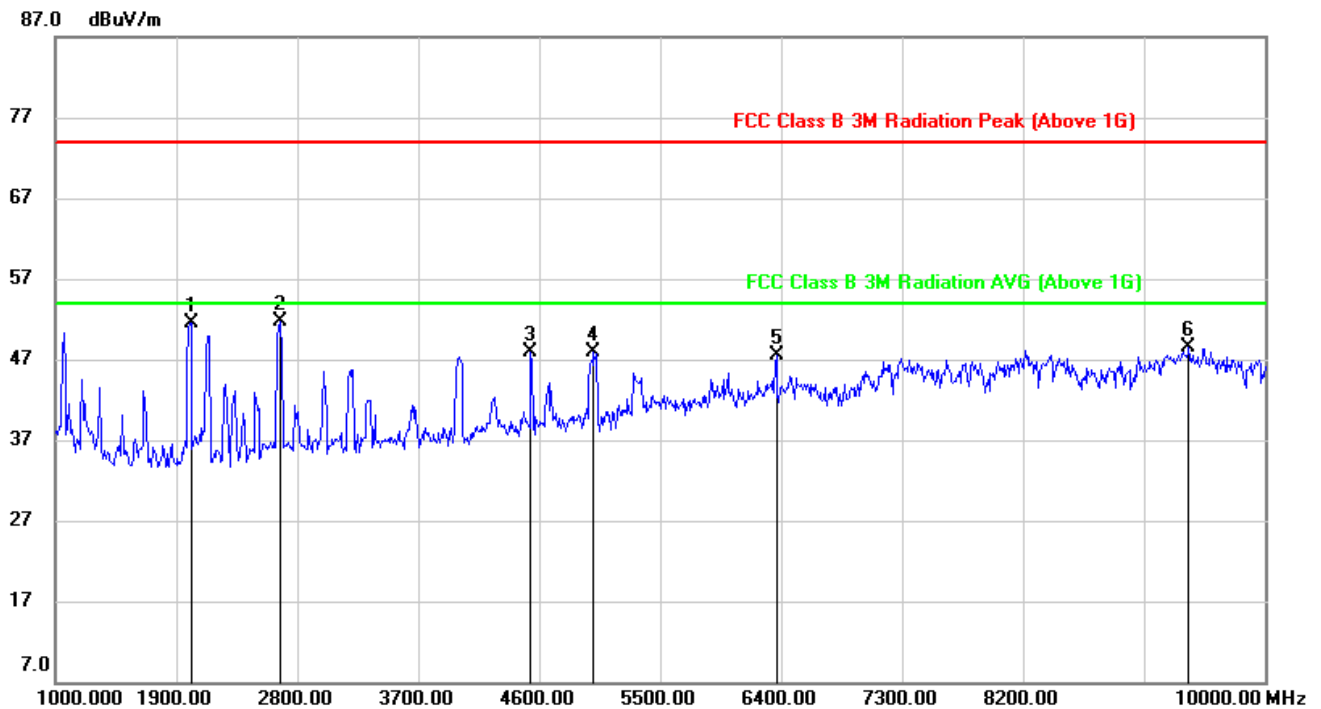
HARMONICS AND SPURIOUS EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1063.000	62.44	-14.51	47.93	74.00	-26.07	peak
2	2116.000	61.66	-10.14	51.52	74.00	-22.48	peak
3	2674.000	57.08	-8.08	49.00	74.00	-25.00	peak
4	4537.000	47.79	-2.07	45.72	74.00	-28.28	peak
5	9415.000	37.53	10.27	47.80	74.00	-26.20	peak

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

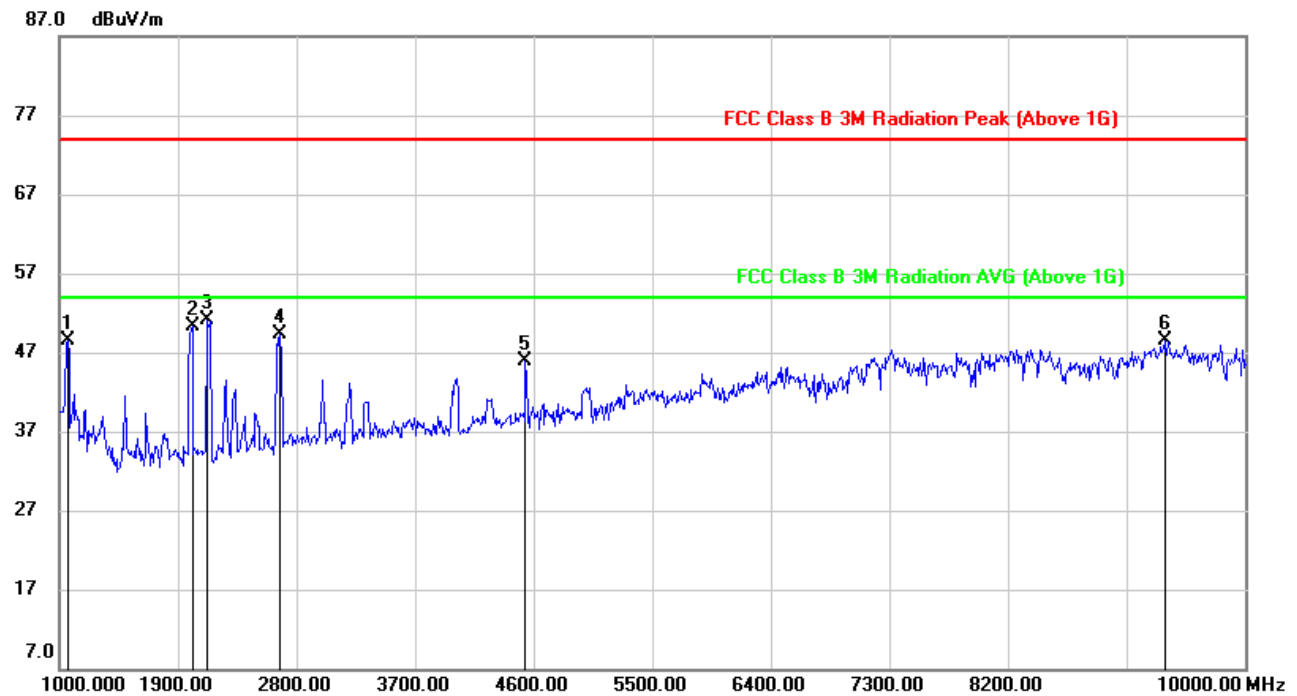
HARMONICS AND SPURIOUS EMISSIONS (MIDDLE CHANNEL, VERTICAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2008.000	62.40	-10.81	51.59	74.00	-22.41	peak
2	2674.000	59.74	-8.08	51.66	74.00	-22.34	peak
3	4537.000	49.95	-2.07	47.88	74.00	-26.12	peak
4	5005.000	47.87	-0.04	47.83	74.00	-26.17	peak
5	6364.000	43.18	4.40	47.58	74.00	-26.42	peak
6	9433.000	38.19	10.30	48.49	74.00	-25.51	peak

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

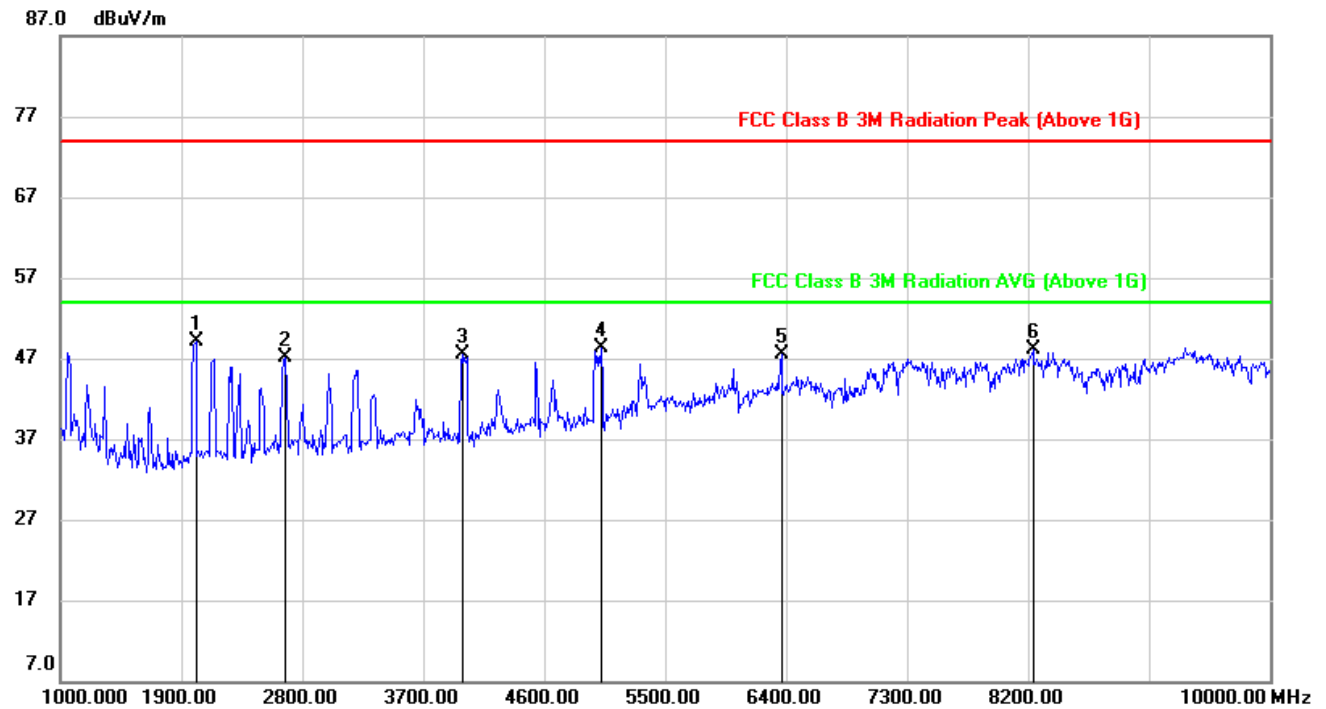
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1063.000	63.07	-14.51	48.56	74.00	-25.44	peak
2	2008.000	61.02	-10.81	50.21	74.00	-23.79	peak
3	2116.000	61.26	-10.14	51.12	74.00	-22.88	peak
4	2674.000	57.35	-8.08	49.27	74.00	-24.73	peak
5	4537.000	47.88	-2.07	45.81	74.00	-28.19	peak
6	9388.000	38.37	10.18	48.55	74.00	-25.45	peak

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2008.000	59.98	-10.81	49.17	74.00	-24.83	peak
2	2674.000	55.27	-8.08	47.19	74.00	-26.81	peak
3	3997.000	51.66	-4.09	47.57	74.00	-26.43	peak
4	5023.000	48.27	-0.01	48.26	74.00	-25.74	peak
5	6364.000	43.13	4.40	47.53	74.00	-26.47	peak
6	8236.000	38.99	9.03	48.02	74.00	-25.98	peak

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

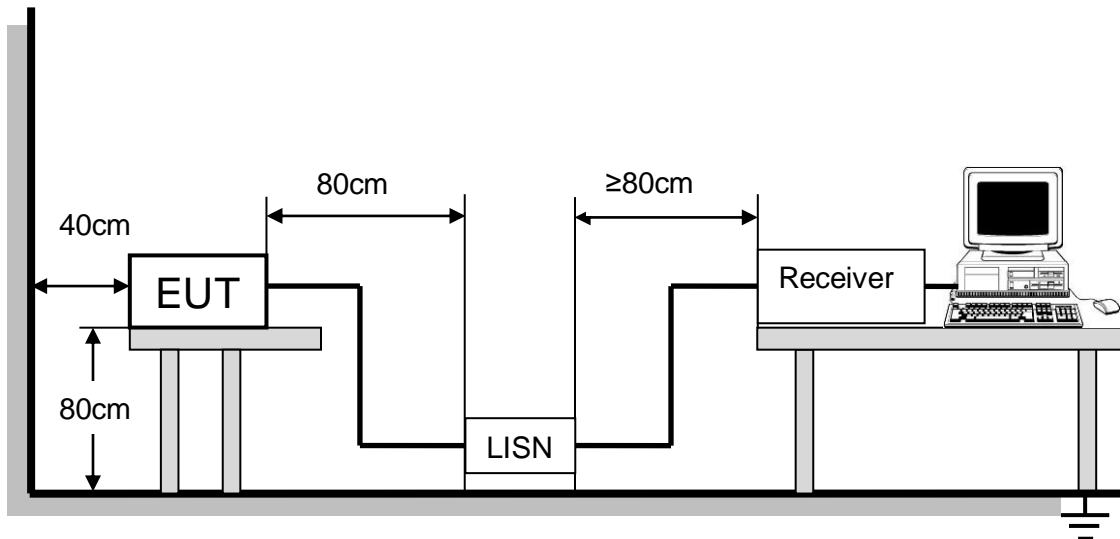
9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a) and RSS-Gen Clause 8.8.

FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST SETUP AND PROCEDURE

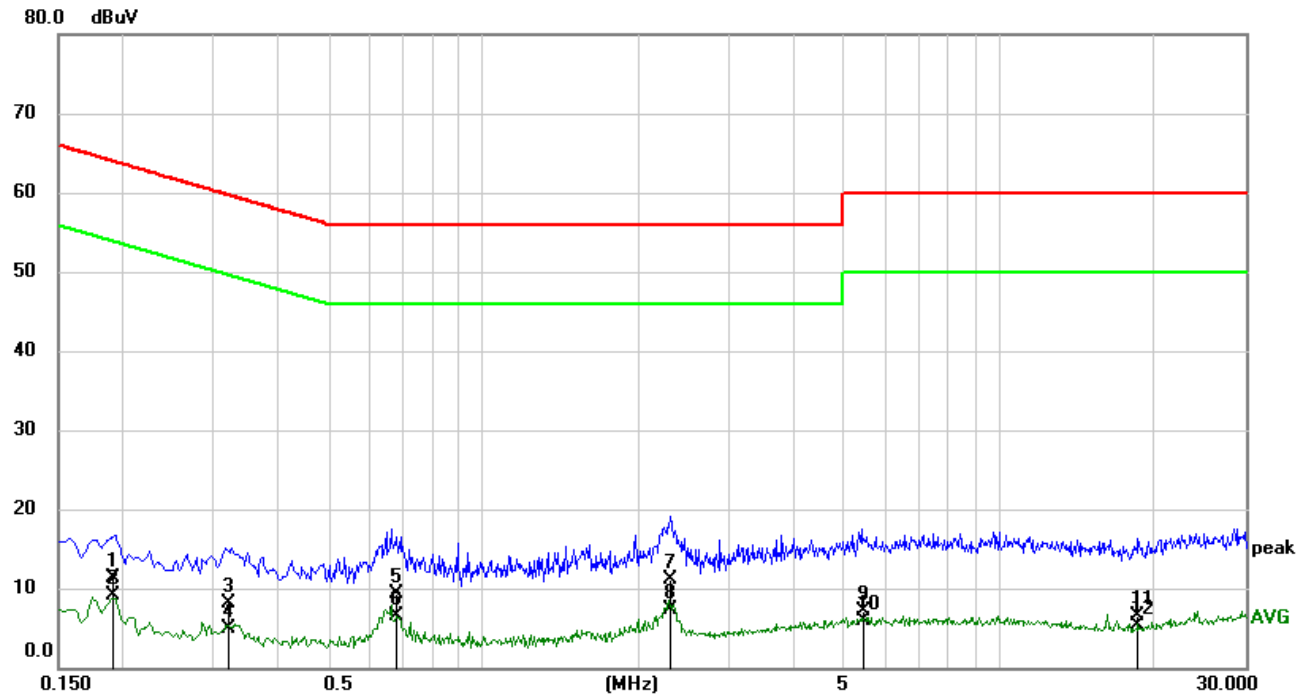


The EUT is put on a table of non-conducting material that is 80mm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST ENVIRONMENT

Temperature	23°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

TEST RESULTS (MID CHANNEL, WORST-CASE CONFIGURATION)**LINE N RESULTS**

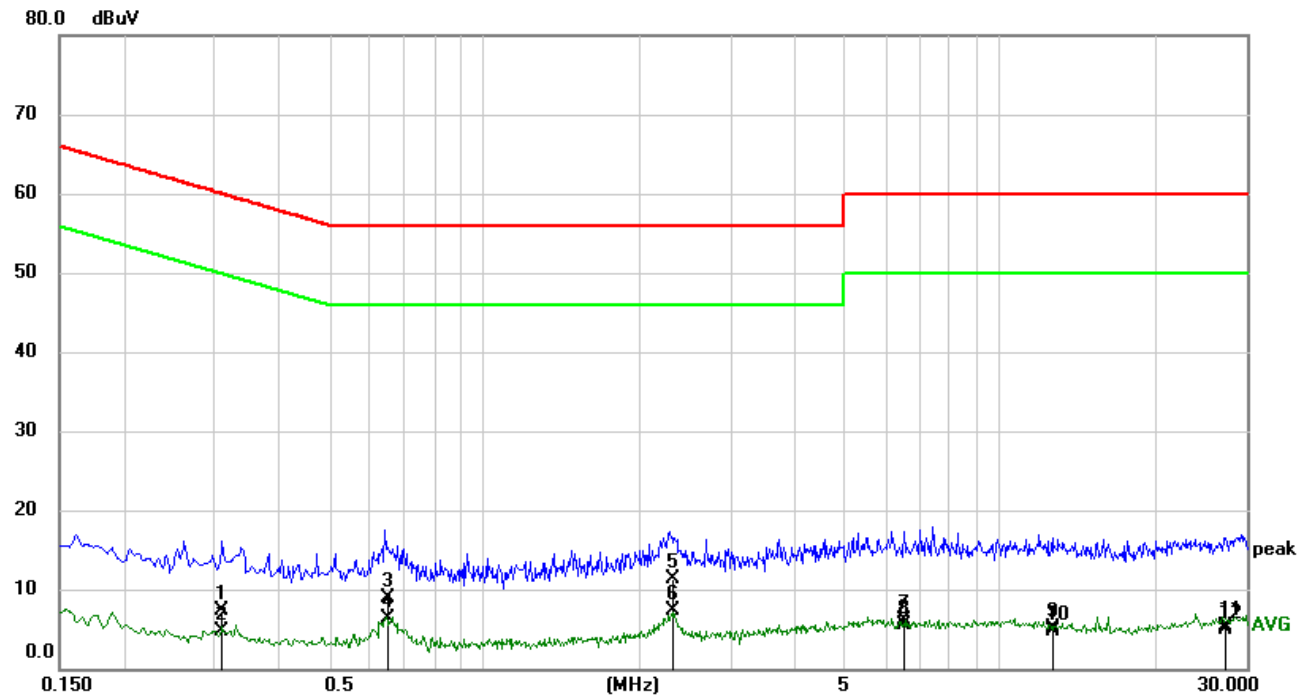
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1907	1.72	9.60	11.32	64.01	-52.69	QP
2	0.1907	-0.56	9.60	9.04	54.01	-44.97	AVG
3	0.3209	-1.59	9.60	8.01	59.68	-51.67	QP
4	0.3209	-4.66	9.60	4.94	49.68	-44.74	AVG
5	0.6774	-0.37	9.60	9.23	56.00	-46.77	QP
6	0.6774	-3.13	9.60	6.47	46.00	-39.53	AVG
7	2.3024	1.57	9.63	11.20	56.00	-44.80	QP
8	2.3024	-2.33	9.63	7.30	46.00	-38.70	AVG
9	5.4634	-2.58	9.69	7.11	60.00	-52.89	QP
10	5.4634	-3.77	9.69	5.92	50.00	-44.08	AVG
11	18.5740	-3.74	10.15	6.41	60.00	-53.59	QP
12	18.5740	-4.83	10.15	5.32	50.00	-44.68	AVG

Note: 1. Result = Reading +Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).

4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

LINE L RESULTS

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.3110	-2.34	9.60	7.26	59.94	-52.68	QP
2	0.3110	-4.97	9.60	4.63	49.94	-45.31	AVG
3	0.6511	-0.70	9.60	8.90	56.00	-47.10	QP
4	0.6511	-3.22	9.60	6.38	46.00	-39.62	AVG
5	2.3031	1.69	9.63	11.32	56.00	-44.68	QP
6	2.3031	-2.38	9.63	7.25	46.00	-38.75	AVG
7	6.5177	-3.50	9.70	6.20	60.00	-53.80	QP
8	6.5177	-4.20	9.70	5.50	50.00	-44.50	AVG
9	12.5543	-4.67	9.79	5.12	60.00	-54.88	QP
10	12.5543	-5.16	9.79	4.63	50.00	-45.37	AVG
11	27.3958	-4.61	9.88	5.27	60.00	-54.73	QP
12	27.3958	-4.92	9.88	4.96	50.00	-45.04	AVG

Note: 1. Result = Reading +Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).

4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

Note: All the modes had been tested, but only the worst data recorded in the report.

10. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

RESULTS

Complies

END OF REPORT