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

CERTIFICATION TEST REPORT

For

Range Extender

MODEL NUMBER: 5AT2S8

FCC ID: 2AB2Q5AT2S8
IC: 10256A-5AT2S8

REPORT NUMBER: 4789271162.1-2

ISSUE DATE: December 10, 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

Test Result: PASS

*For the detail, please refer to page 11.

Revision History

Rev.	Issue Date	Revisions	Revised By
V0	12/10/2019	Initial Issue	

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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

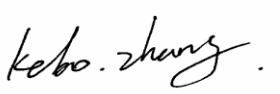
Company Name:	LEEDARSON LIGHTING CO., LTD.
Address:	Xingtai Industrial Zone, Economic Development Zone, Changtai County, Zhangzhou City, Fujian Province, P.R China

EUT Information

EUT Name:	Range Extender
Model:	5AT2S8
Sample Received Date:	December 2, 2019
Sample Status:	Normal
Sample ID:	2718937
Date of Tested:	December 2~10, 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

Prepared By:



Kebo Zhang
Project 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	**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. **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 **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 Delcaration of Conformity (DoC) and Certification rules **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. **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

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 OFS.

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	Range Extender	
Model Name	5AT2S8	
Data Rates/Modulation	908.4 MHz:40kbps/FSK	
	908.42 MHz:9.6kbps/FSK	
	916.0 MHz:100kbps/GFSK	
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 Band (MHz)	Number of Transmit Chains (NTX)	Operation Frequency (MHz)	Channel Number	Max. Emissions Field Strength (dBµV/m)
902-928	1	908.4-916	2[3]	93.03

5.3. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 908.4~916MHz				
Test Software		sscom		
Modulation Type	Transmit Antenna Number	Test Software Setting Value		
		916MHz	908.42MHz	908.4MHz
FSK&GFSK	1	13(raw)	13(raw)	13(raw)

Note:
1. raw is the test software setting description provide by customer.
2. All tests executed under maximum input levels.

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. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel Number	Test Channel
Z-wave	CH 1, CH 2, CH 3/ Low, Middle, High	908.4MHz, 908.42MHz, 916MHz

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	908.4~916	Monopole Antenna	0.8

5.7. 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

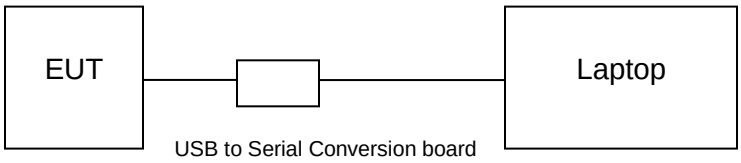
ACCESSORY

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



5.8. MEASURING INSTRUMENT AND SOFTWARE USED

For the previous calibration information

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec.10,2018	Dec.10,2019
☑	Two-Line V-Network	R&S	ENV216	101983	Dec.10,2018	Dec.10,2019
☑	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Dec.10,2018	Dec.10,2019
Software						
Used	Description		Manufacturer	Name	Version	
☑	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.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.10,2018	Dec.10,2019
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17, 2018	Sep.17, 2021
☑	Preamplifier	HP	8447D	2944A09099	Dec.10,2018	Dec.10,2019
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec.10,2018	Dec.10,2019
☑	Horn Antenna	TDK	HRN-0118	130939	Sep.17, 2018	Sep.17, 2021
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.10,2018	Dec.10,2019
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.10,2018	Dec.10,2019
☑	Loop antenna	Schwarzbeck	1519B	00008	Jan.07, 2019	Jan.07, 2022
☑	High Pass Filter	Wi	WHJ10-882-980-10000-40SS	82345	Dec.10,2018	Dec.10,2019
Software						
Used	Description		Manufacturer	Name	Version	
☑	Test Software for Radiated disturbance		Farad	EZ-EMC	Ver. UL-3A1	
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec.10,2018	Dec.10,2019

For the last calibration information

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec.05,2019	Dec.05,2020
☑	Two-Line V-Network	R&S	ENV216	101983	Dec.05,2019	Dec.05,2020
☑	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Dec.05,2019	Dec.05,2020
Software						
Used	Description		Manufacturer	Name	Version	
☑	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.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.06,2019	Dec.06,2020
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17, 2018	Sep.17, 2021
☑	Preamplifier	HP	8447D	2944A09099	Dec.05,2019	Dec.05,2020
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec.05,2019	Dec.05,2020
☑	Horn Antenna	TDK	HRN-0118	130939	Sep.17, 2018	Sep.17, 2021
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.05,2019	Dec.05,2020
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.05,2019	Dec.05,2020
☑	Loop antenna	Schwarzbeck	1519B	00008	Jan.07, 2019	Jan.07, 2022
☑	High Pass Filter	Wi	WHJ10-882-980-10000-40SS	82345	Dec.05,2019	Dec.05,2020
Software						
Used	Description		Manufacturer	Name	Version	
☑	Test Software for Radiated disturbance		Farad	EZ-EMC	Ver. UL-3A1	
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec.06,2019	Dec.06,2020

6. SUMMARY OF TEST RESULTS

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	20dB Bandwidth	FCC Part 15.215(c)	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
5	Antenna Requirement	FCC Part 15.203 RSS-GEN Clause 6.8	Pass
"N/A" denotes test is not applicable in this test report.			

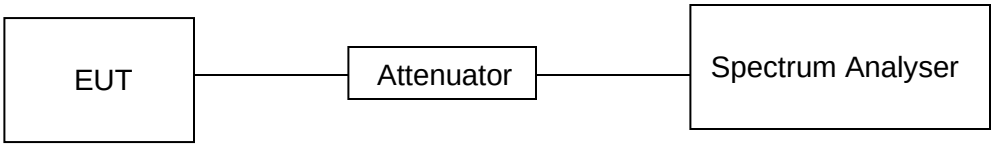
7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only

TEST SETUP

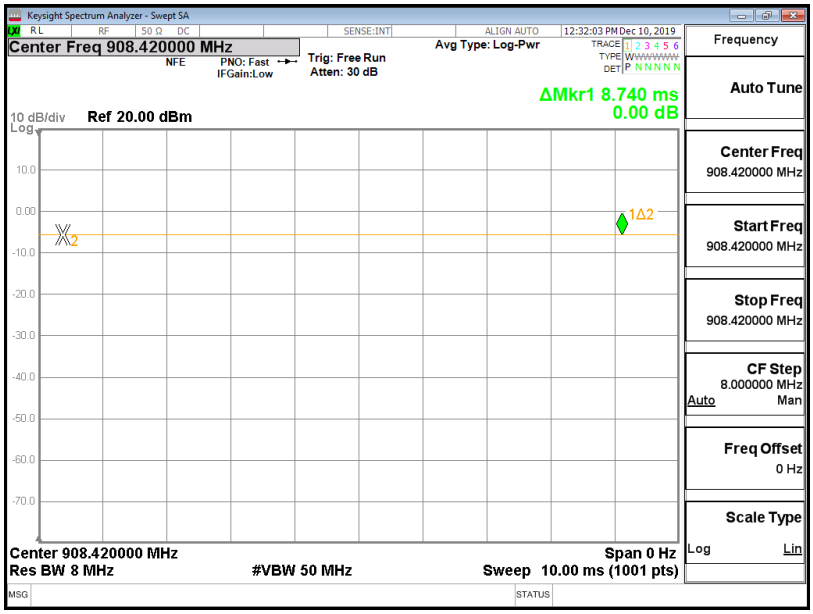


RESULTS

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 15.215(c)	20dB Bandwidth	for reporting purposes only	902-928 MHz
RSS-Gen Clause 6.7	99% Bandwidth	N/A	902-928MHz

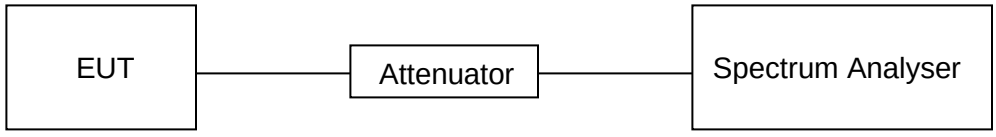
TEST PROCEDURE

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	≥ 3×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.

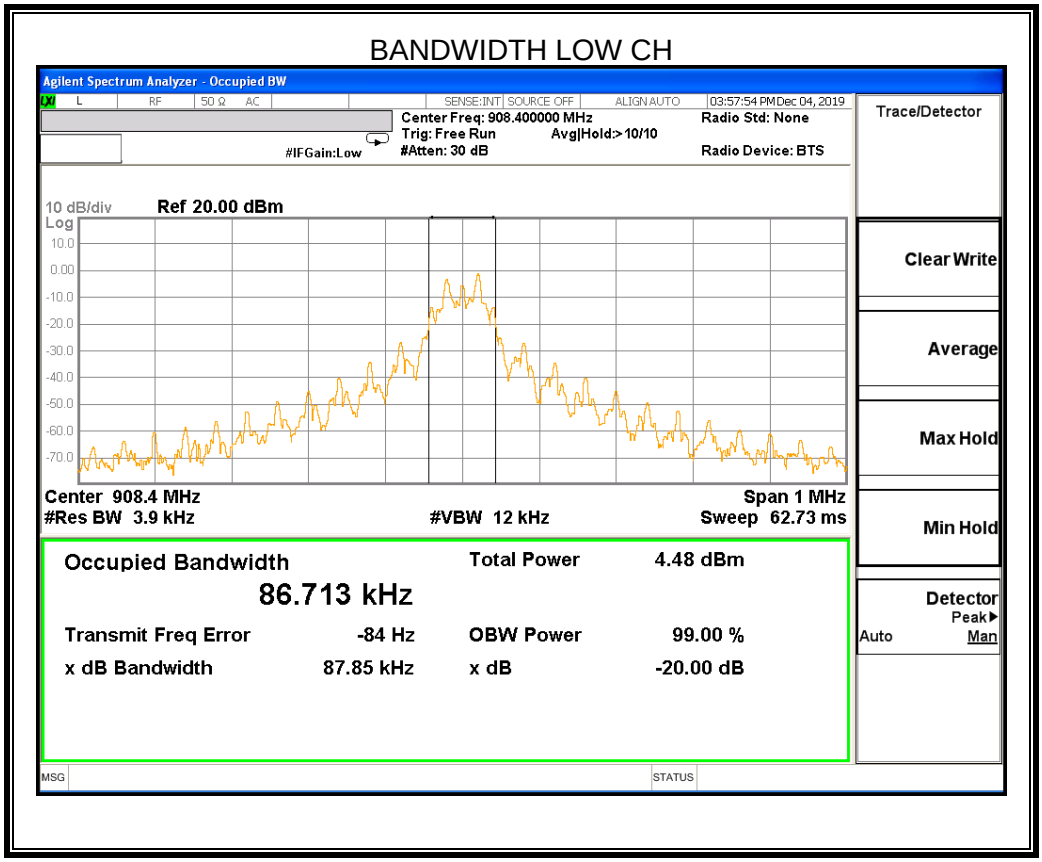
TEST SETUP



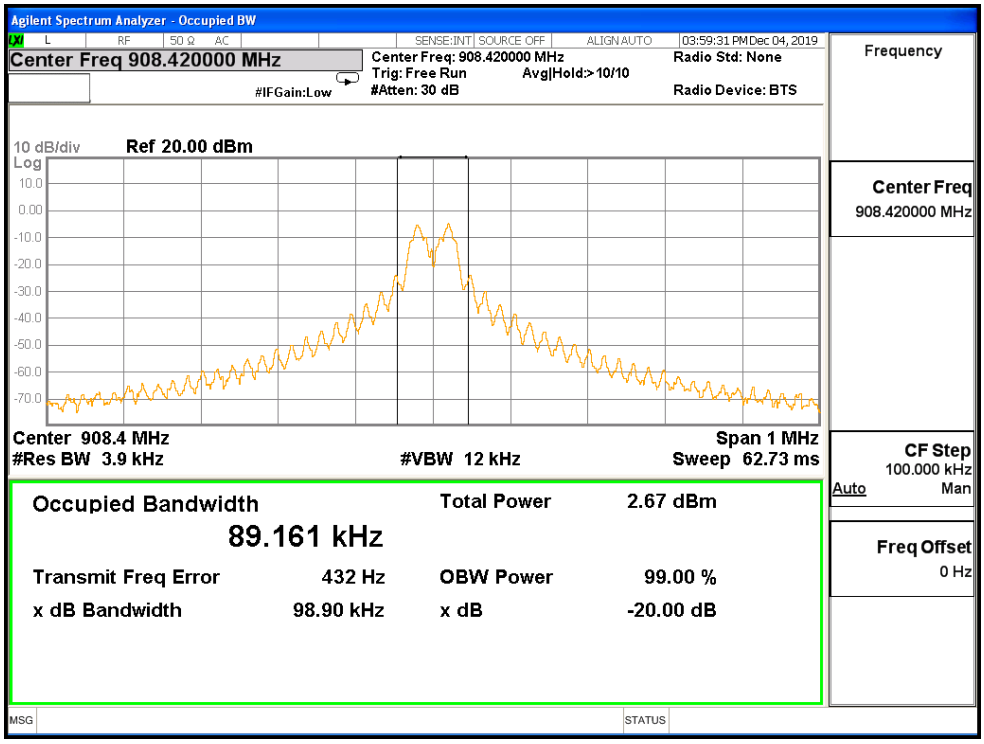
RESULTS

Channel	20dB bandwidth (KHz)	99% bandwidth (KHz)	Result
Low	87.85	86.713	Pass
Middle	98.90	89.161	Pass
High	124.4	109.12	Pass

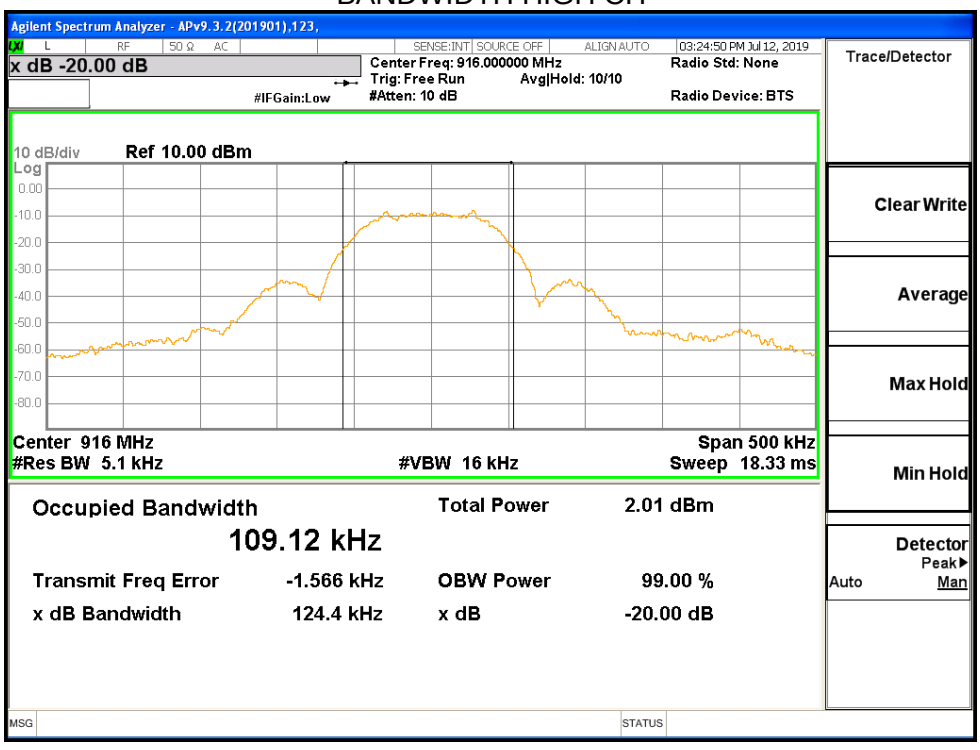
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



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
Please refer to ISED RSS-GEN Clause 8.9 and Clause 8.10

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

Radiation Disturbance Test Limit for FCC (Class B)(9kHz-1GHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation

factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

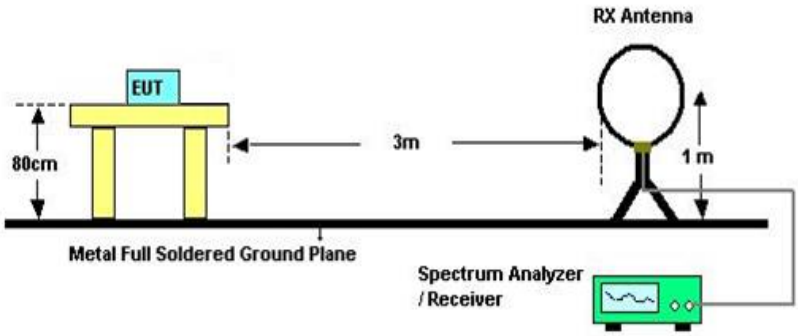
Radiation Disturbance Test Limit for FCC (Above 1GHz)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	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. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80cm 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.

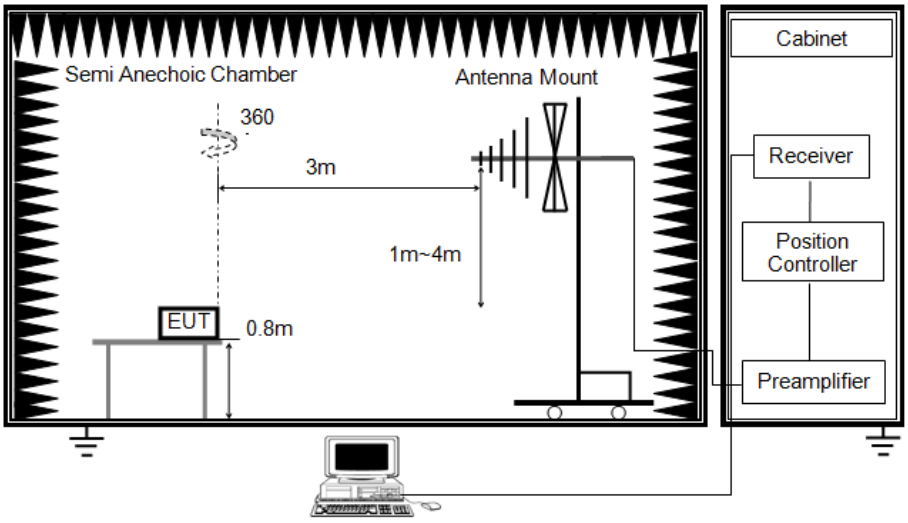
5. Measurement = Reading Level + Correct Factor

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.

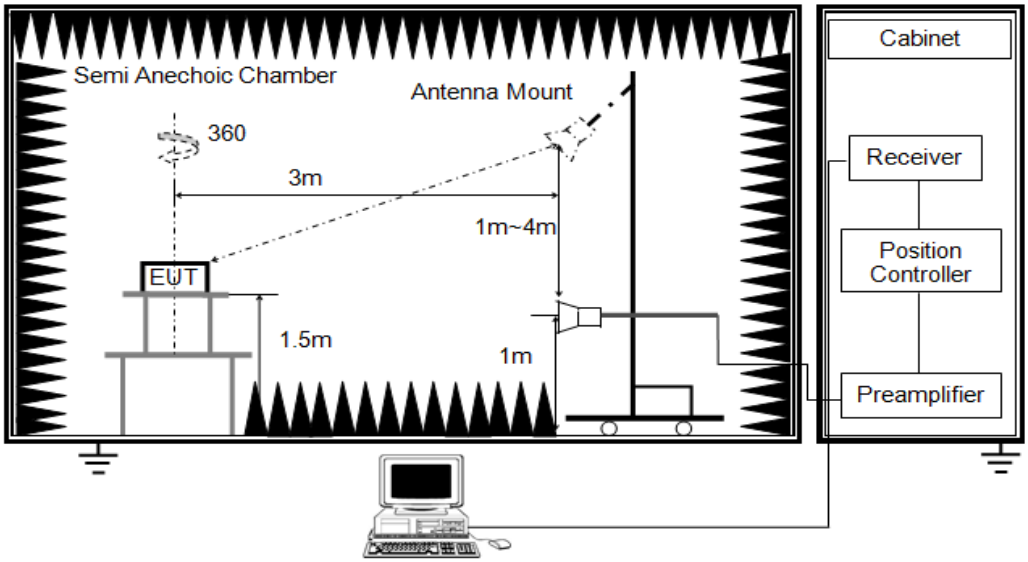
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

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.

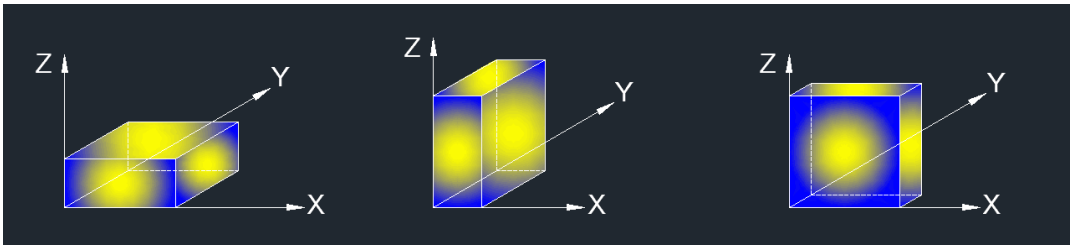
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

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)

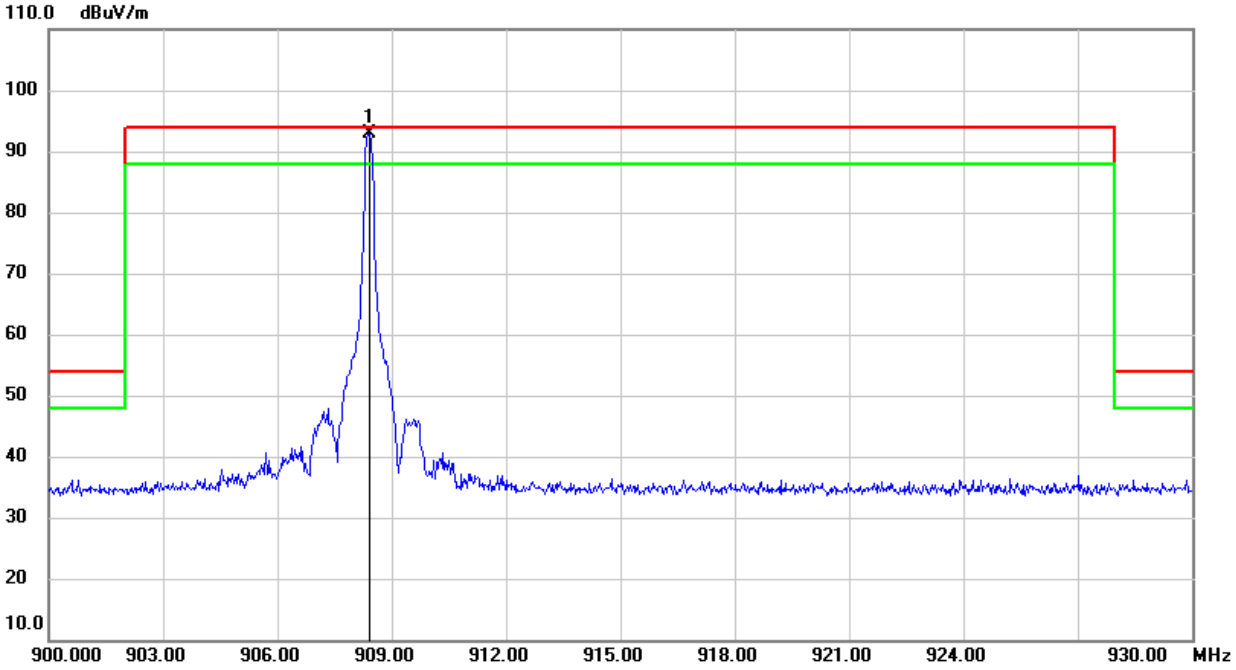
X axis, Y axis, Z axis positions:



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.

8.2. FIELD STRENGTH OF INTENTIONAL EMISSIONS

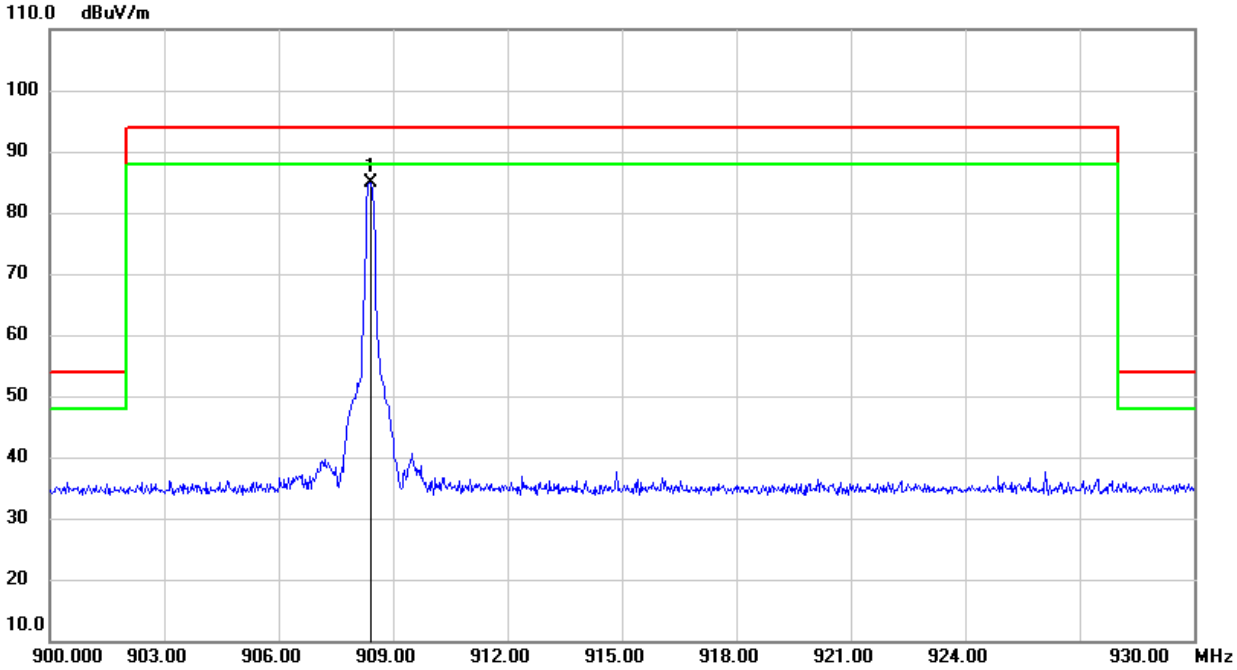
FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	908.4000	96.98	-4.00	92.98	94.00	-1.02	QP

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

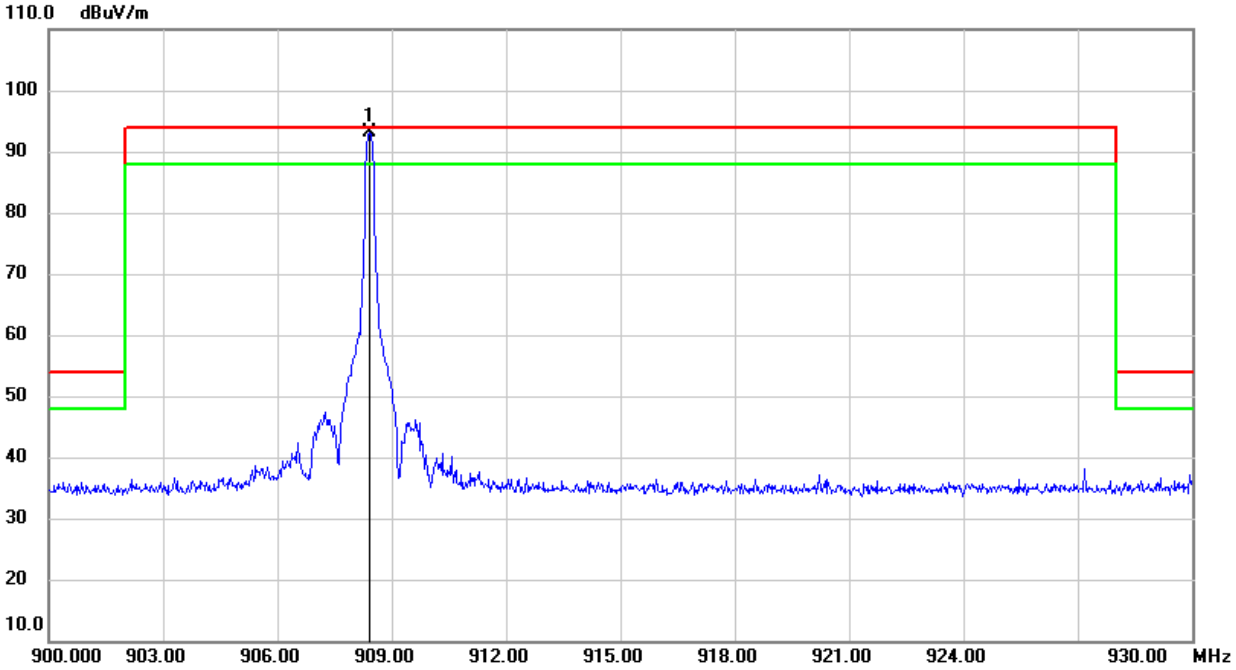
FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	908.4000	88.92	-4.00	84.92	94.00	-9.08	QP

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

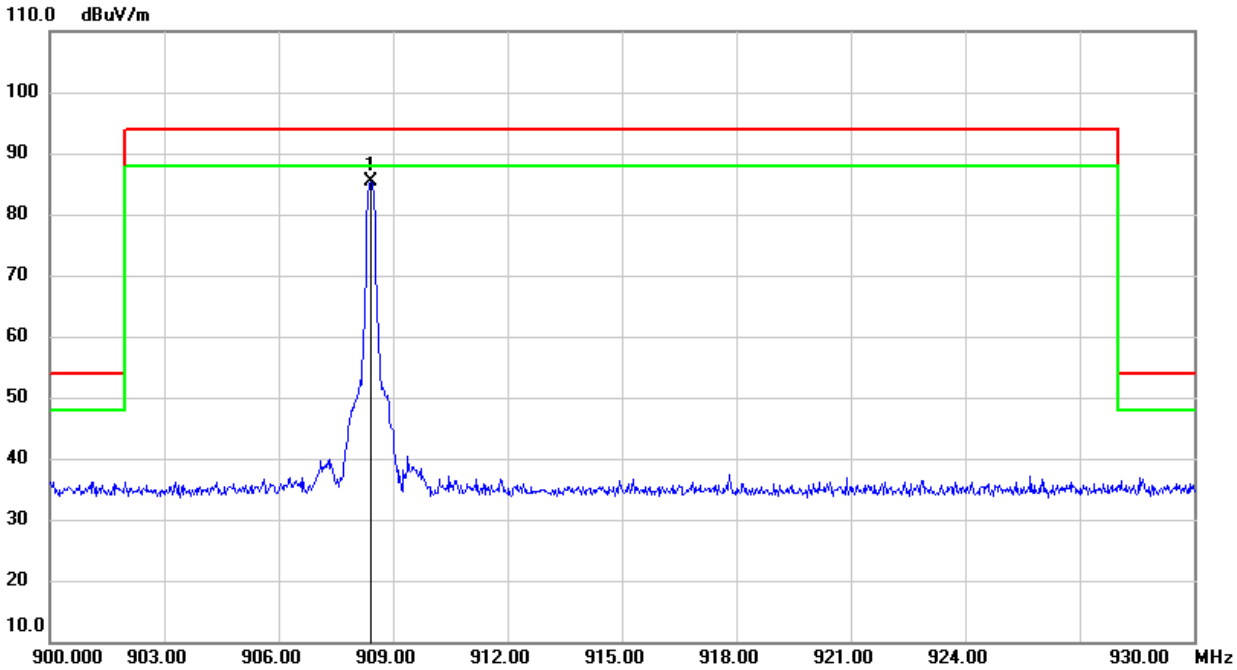
FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	908.4200	97.02	-3.99	93.03	94.00	-0.97	QP

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

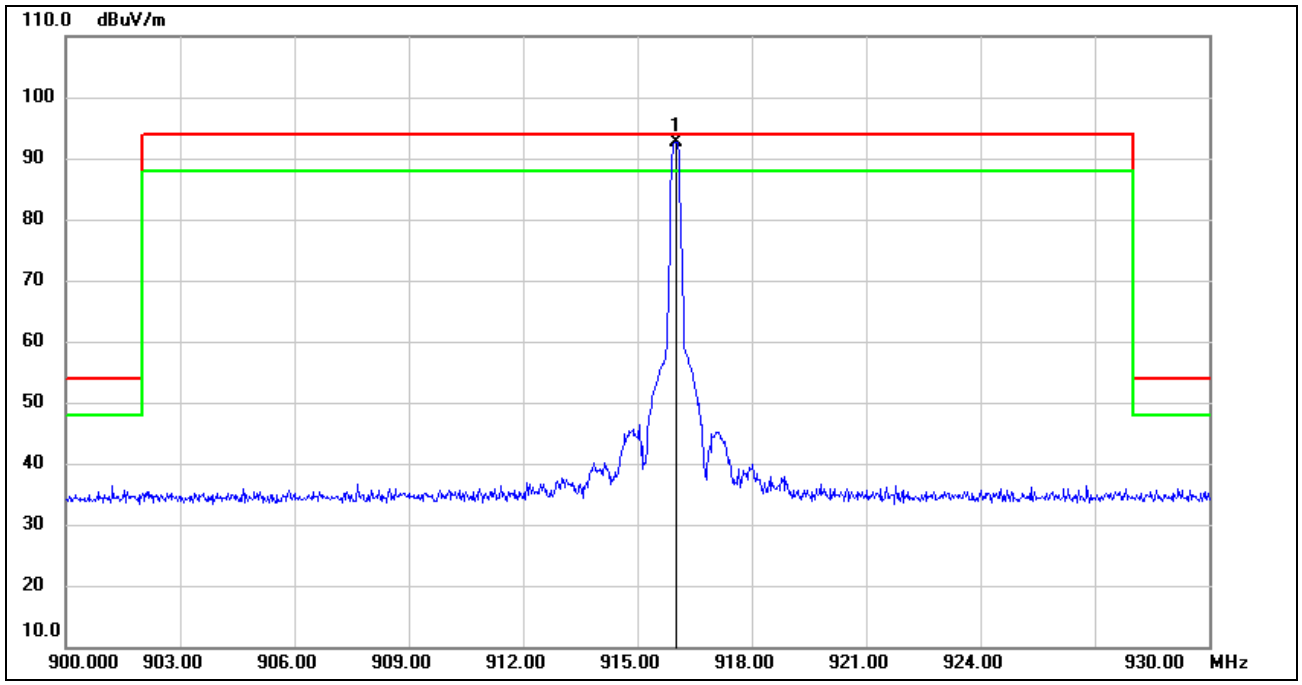
FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	908.4200	89.28	-3.99	85.29	94.00	-8.71	QP

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

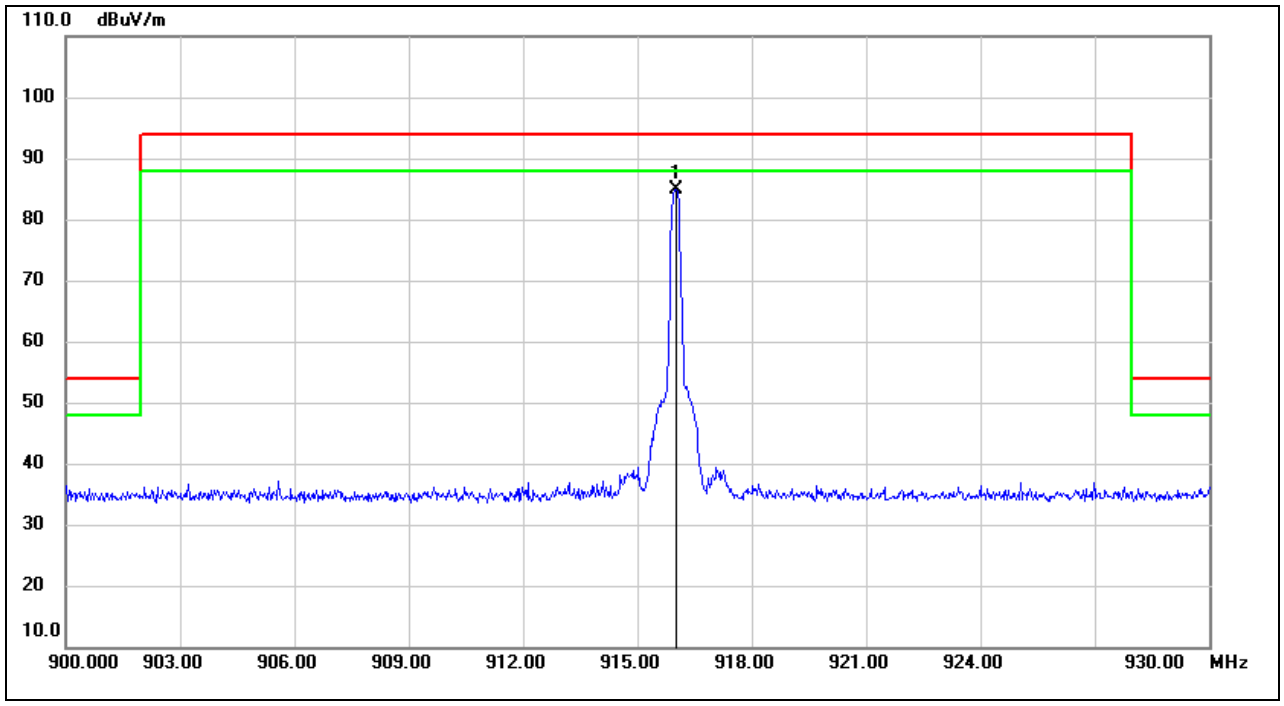
FIELD STRENGTH OF INTENTIONAL EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	916.0200	96.63	-3.89	92.74	94.00	-1.26	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	916.0200	88.67	-3.89	84.78	94.00	-9.22	QP

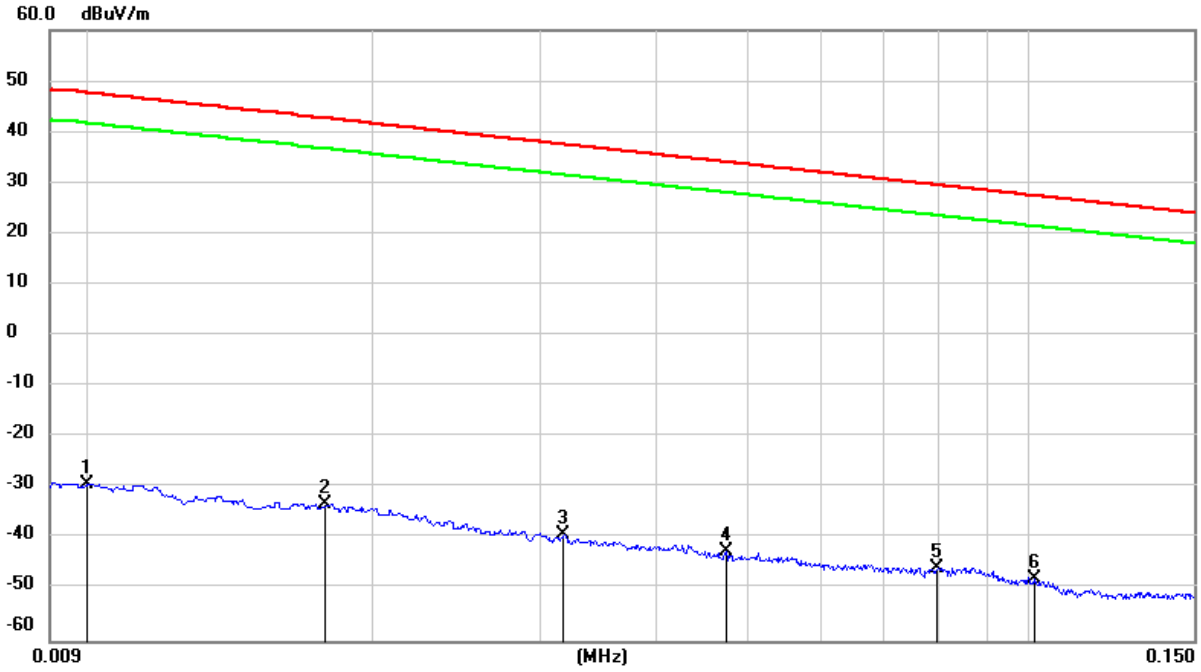
Note: 1. Measurement = Reading Level + Correct Factor.
2. QP detector.

8.3. SPURIOUS EMISSIONS BELOW 30M

SPURIOUS EMISSIONS

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

9kHz~ 150kHz



No.	Frequency	Reading	Correct	FCC Result	FCC Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.0100	72.22	-101.40	-29.18	47.60	-53.55	-17.88	-76.78	peak
2	0.0177	68.12	-101.35	-33.23	42.64	-56.9	-25.74	-75.87	peak
3	0.0318	62.34	-101.40	-39.06	37.55	-58.37	-21.96	-76.61	peak
4	0.0475	58.94	-101.47	-42.53	34.07	-62.52	-21.96	-76.60	peak
5	0.0796	56.03	-101.63	-45.60	29.58	-63.22	-21.96	-75.18	peak
6	0.1014	54.06	-101.79	-47.73	27.48	-62.73	-21.96	-75.21	peak

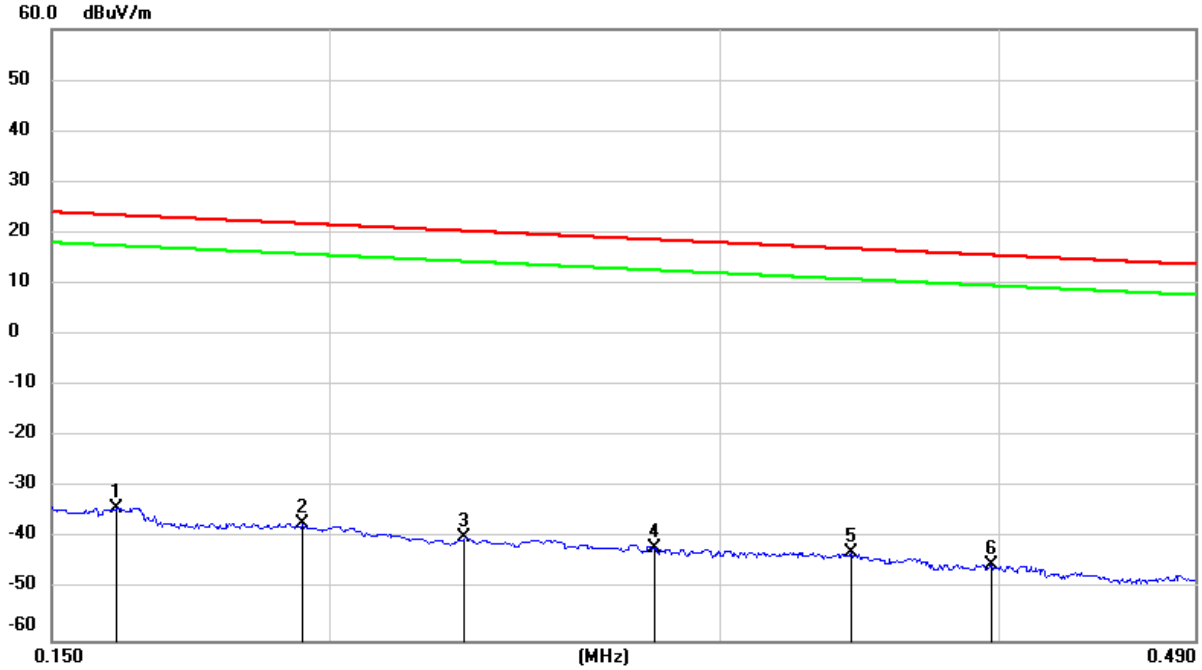
Note: 1. Measurement = Reading Level + Correct Factor.

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.

4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

150kHz ~ 490kHz



No.	Frequency	Reading	Correct	FCC Result	FCC Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.1604	67.68	-101.65	-33.97	23.50	-85.47	-28.00	-57.47	peak
2	0.1945	64.69	-101.70	-37.01	21.82	-88.51	-29.68	-58.83	peak
3	0.2300	62.01	-101.77	-39.76	20.37	-91.26	-31.13	-60.13	peak
4	0.2797	59.91	-101.83	-41.92	18.67	-93.42	-32.83	-60.59	peak
5	0.3431	59.17	-101.90	-42.73	16.89	-94.23	-34.61	-59.62	peak
6	0.3970	56.86	-101.96	-45.10	15.63	-96.6	-35.87	-60.73	peak

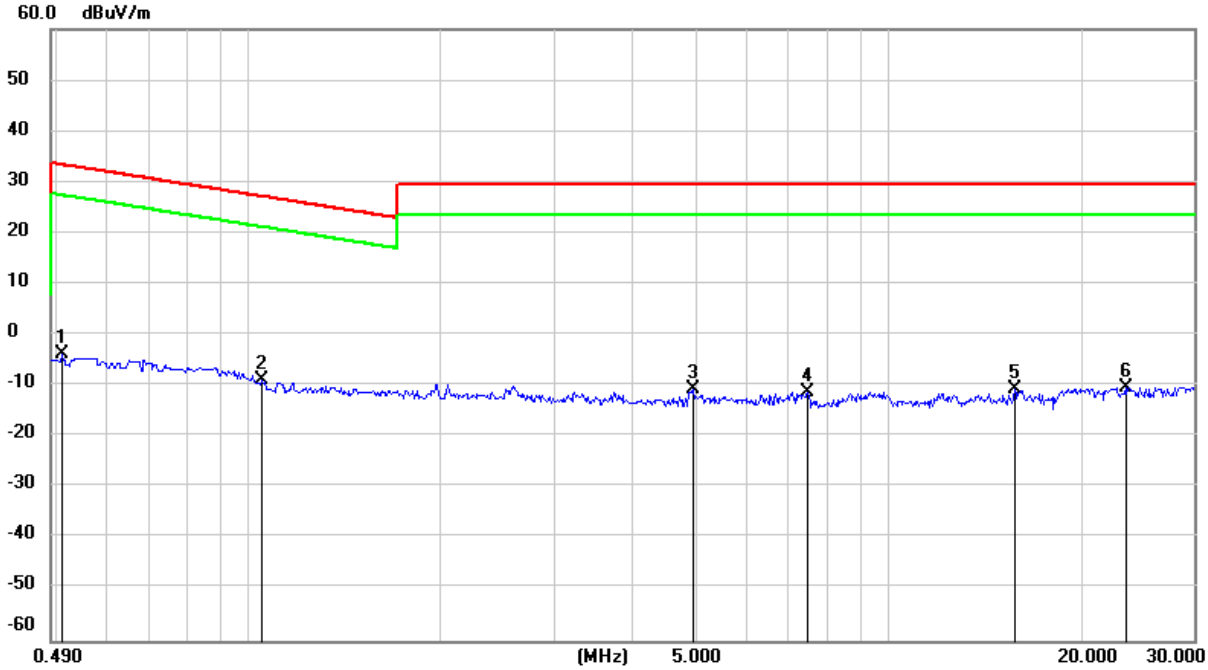
Note: 1. Measurement = Reading Level + Correct Factor.

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.

4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

490kHz ~ 30MHz



No.	Frequency	Reading	Correct	FCC Result	FCC Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.5106	58.30	-62.07	-3.77	33.44	-55.27	-18.06	-37.21	peak
2	1.0443	53.53	-62.25	-8.72	27.23	-60.22	-24.27	-35.95	peak
3	4.9481	50.79	-61.47	-10.68	29.54	-62.18	-21.96	-40.22	peak
4	7.4839	49.97	-61.15	-11.18	29.54	-62.68	-21.96	-40.72	peak
5	15.7759	50.25	-60.99	-10.74	29.54	-62.24	-21.96	-40.28	peak
6	23.4783	50.24	-60.56	-10.32	29.54	-61.82	-21.96	-39.86	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.

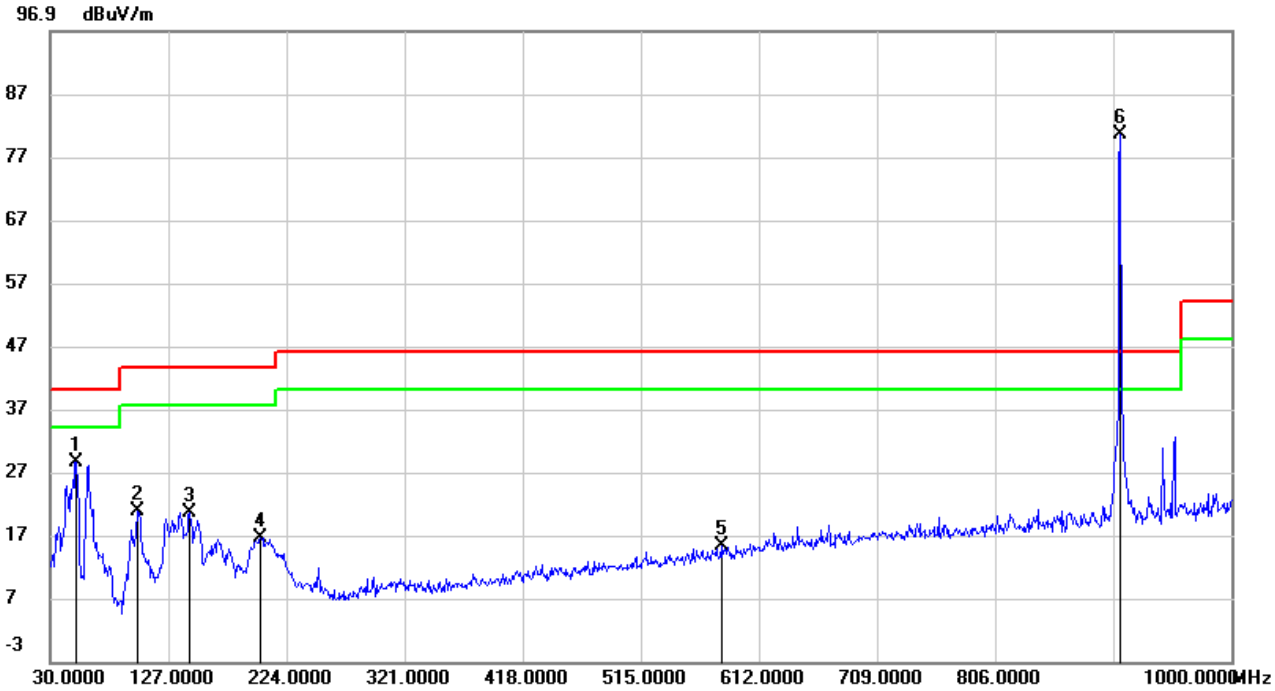
3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

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

8.4. SPURIOUS EMISSIONS BELOW 1 GHz

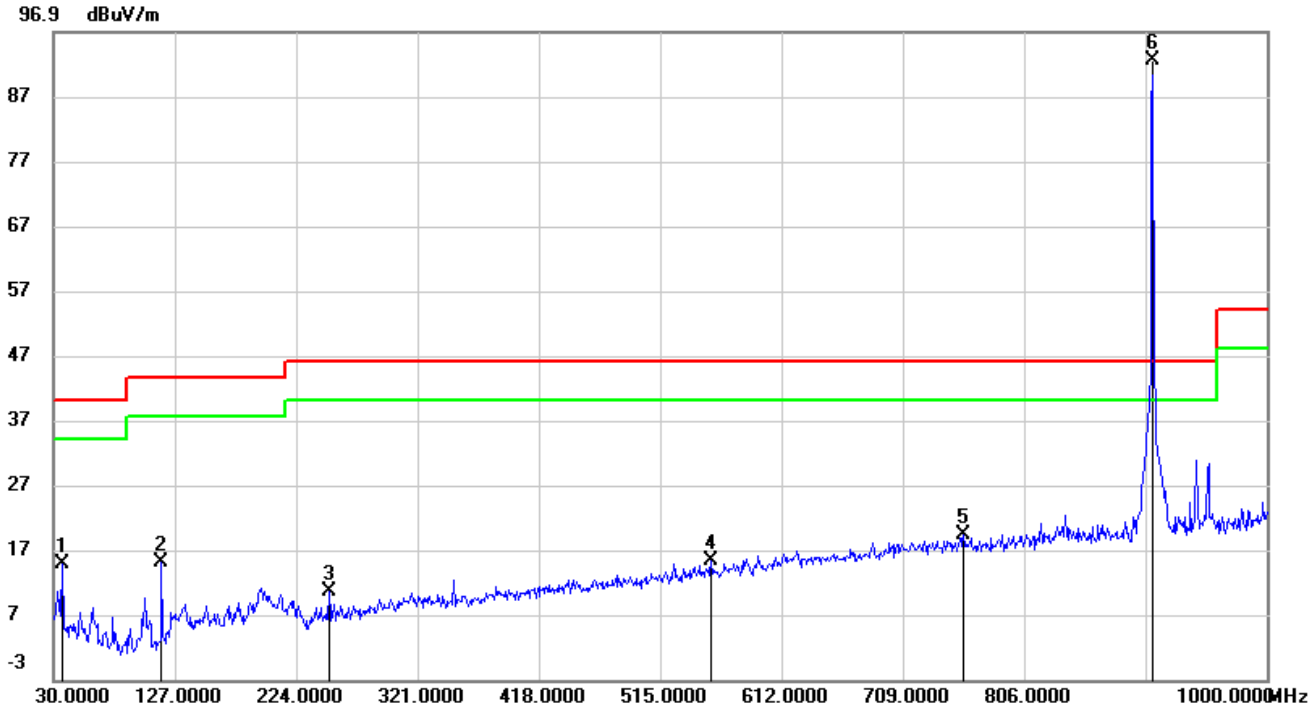
SPURIOUS EMISSIONS BELOW 1GHZ (WORST-CASE MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	51.3400	47.01	-18.50	28.51	40.00	-11.49	QP
2	101.7800	42.55	-21.75	20.80	43.50	-22.70	QP
3	144.4600	39.30	-18.78	20.52	43.50	-22.98	QP
4	202.6600	32.62	-16.05	16.57	43.50	-26.93	QP
5	580.9600	24.03	-8.71	15.32	46.00	-30.68	QP
6	908.4200	84.40	-3.99	80.41	/	/	Fundamental

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.
4. About the Fundamental emission test result please refer to section 8.2.

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



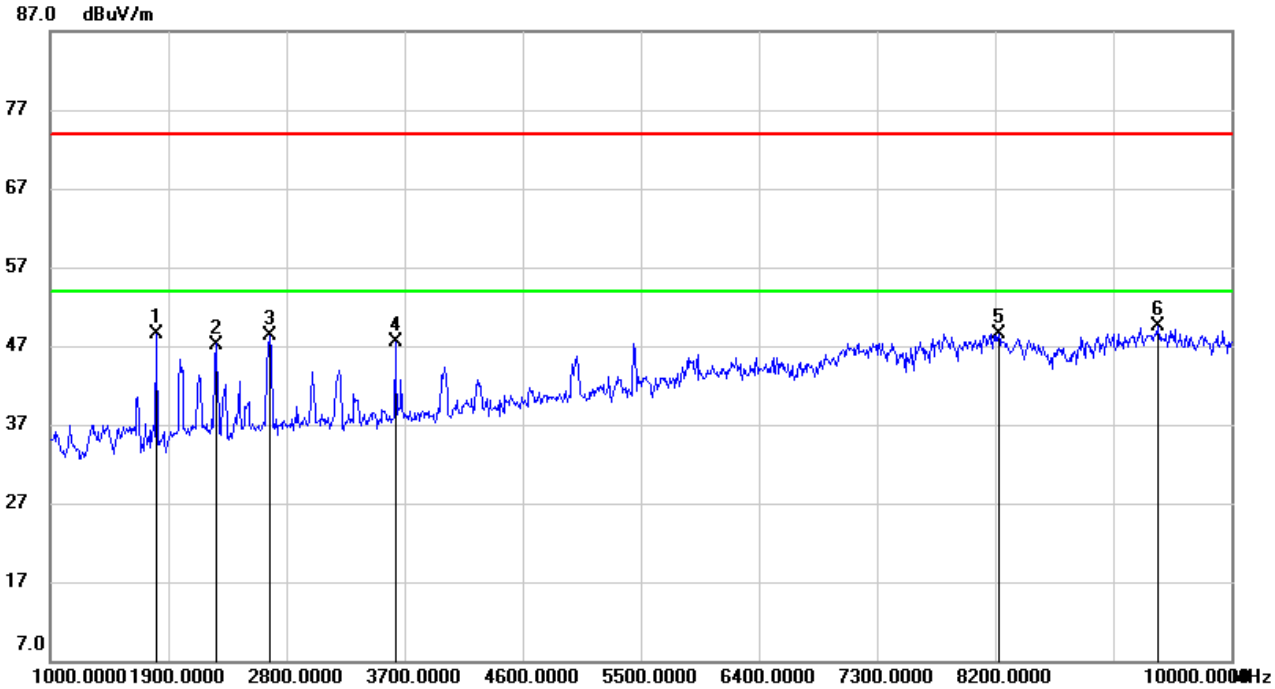
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	36.7900	32.53	-17.71	14.82	40.00	-25.18	QP
2	116.3300	35.93	-21.01	14.92	43.50	-28.58	QP
3	250.1900	26.69	-16.12	10.57	46.00	-35.43	QP
4	555.7400	24.56	-9.37	15.19	46.00	-30.81	QP
5	757.5000	25.07	-5.81	19.26	46.00	-26.74	QP
6	908.4200	96.49	-3.99	92.50	/	/	Fundamental

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
4. About the Fundamental emission test result please refer to section 8.2.

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

8.5. SPURIOUS EMISSIONS 1 ~ 10GHz

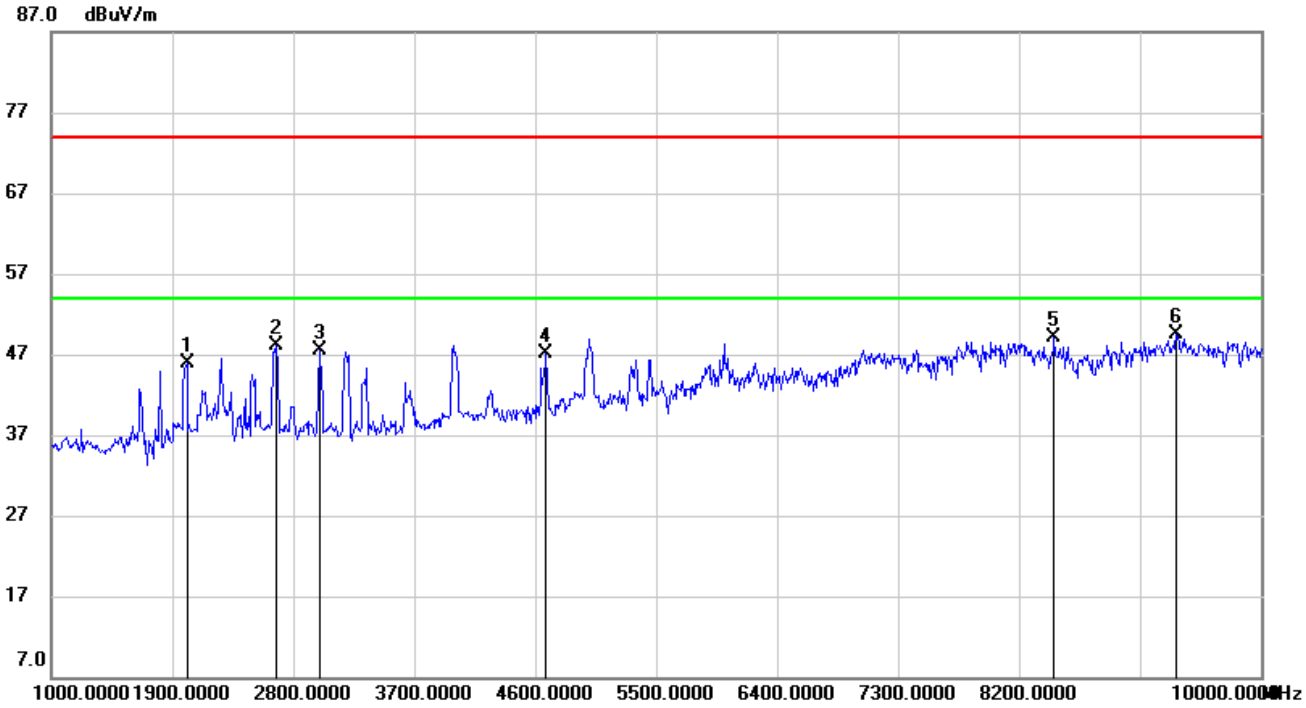
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1810.000	59.31	-10.90	48.41	74.00	-25.59	peak
2	2260.000	56.83	-9.63	47.20	74.00	-26.80	peak
3	2674.000	56.45	-8.08	48.37	74.00	-25.63	peak
4	3628.000	52.16	-4.63	47.53	74.00	-26.47	peak
5	8227.000	39.42	9.12	48.54	74.00	-25.46	peak
6	9442.000	39.19	10.30	49.49	74.00	-24.51	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.

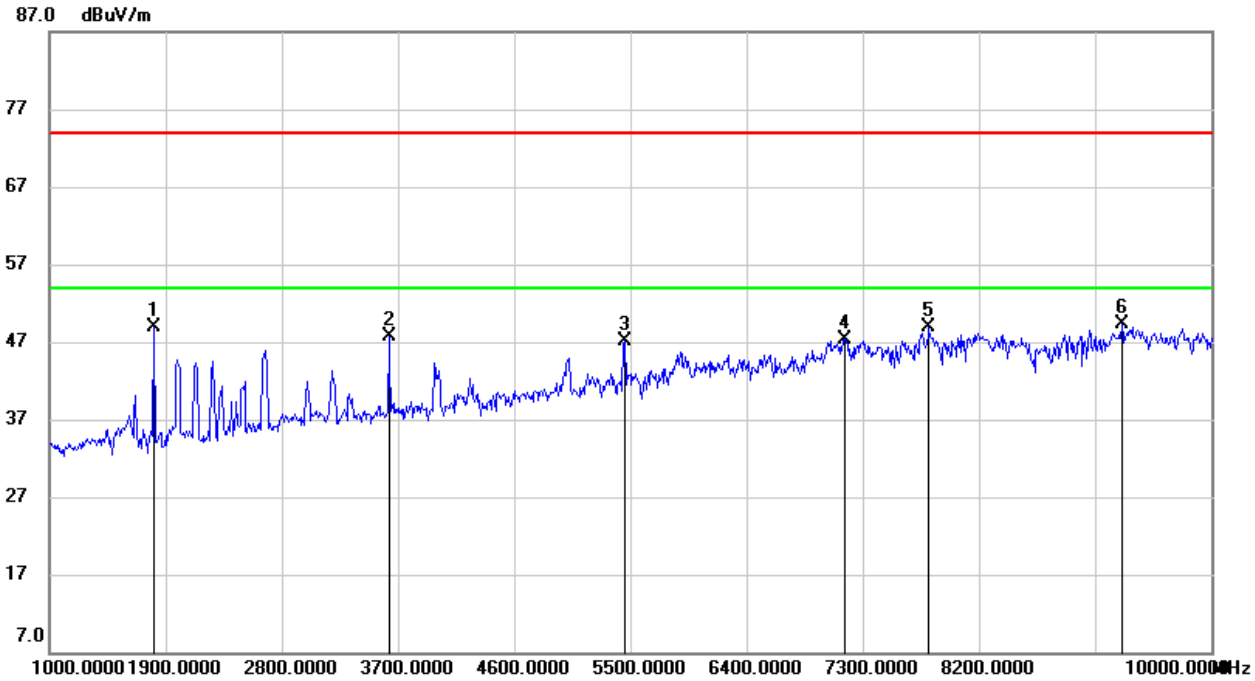
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2008.000	56.68	-10.81	45.87	74.00	-28.13	peak
2	2674.000	56.14	-8.08	48.06	74.00	-25.94	peak
3	2998.000	53.83	-6.27	47.56	74.00	-26.44	peak
4	4681.000	48.53	-1.47	47.06	74.00	-26.94	peak
5	8461.000	40.56	8.52	49.08	74.00	-24.92	peak
6	9370.000	39.39	10.10	49.49	74.00	-24.51	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.

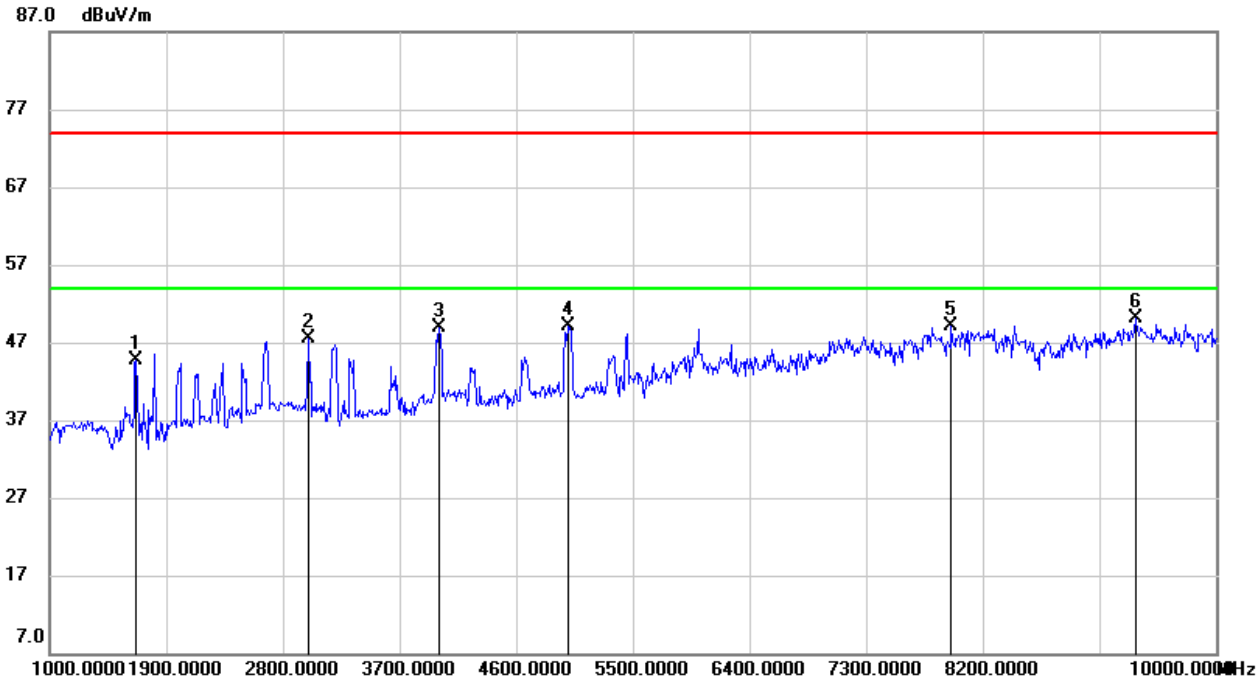
HARMONICS AND SPURIOUS EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1810.000	59.72	-10.90	48.82	74.00	-25.18	peak
2	3628.000	52.27	-4.63	47.64	74.00	-26.36	peak
3	5455.000	45.42	1.67	47.09	74.00	-26.91	peak
4	7156.000	40.91	6.44	47.35	74.00	-26.65	peak
5	7813.000	40.38	8.49	48.87	74.00	-25.13	peak
6	9307.000	39.53	9.76	49.29	74.00	-24.71	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.

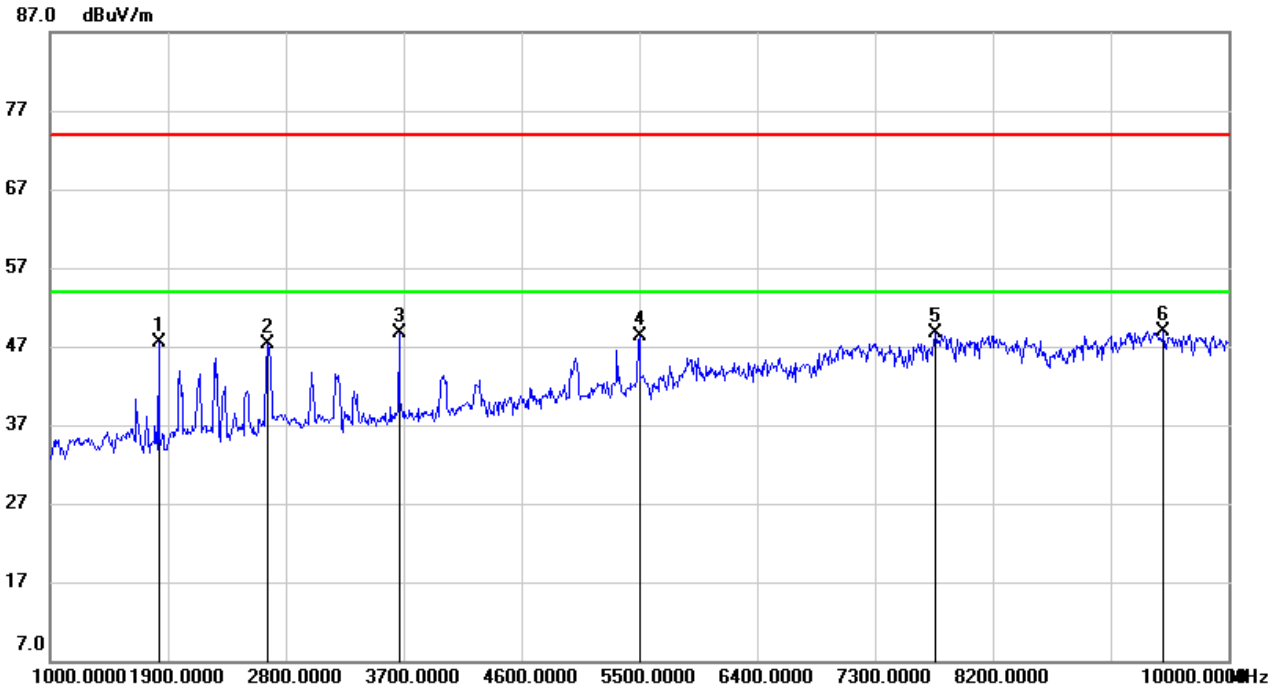
HARMONICS AND SPURIOUS EMISSIONS (MIDDLE CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1666.000	56.79	-12.09	44.70	74.00	-29.30	peak
2	2998.000	53.74	-6.27	47.47	74.00	-26.53	peak
3	4006.000	53.00	-4.07	48.93	74.00	-25.07	peak
4	5005.000	49.09	-0.04	49.05	74.00	-24.95	peak
5	7957.000	41.21	7.95	49.16	74.00	-24.84	peak
6	9379.000	40.04	10.14	50.18	74.00	-23.82	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.

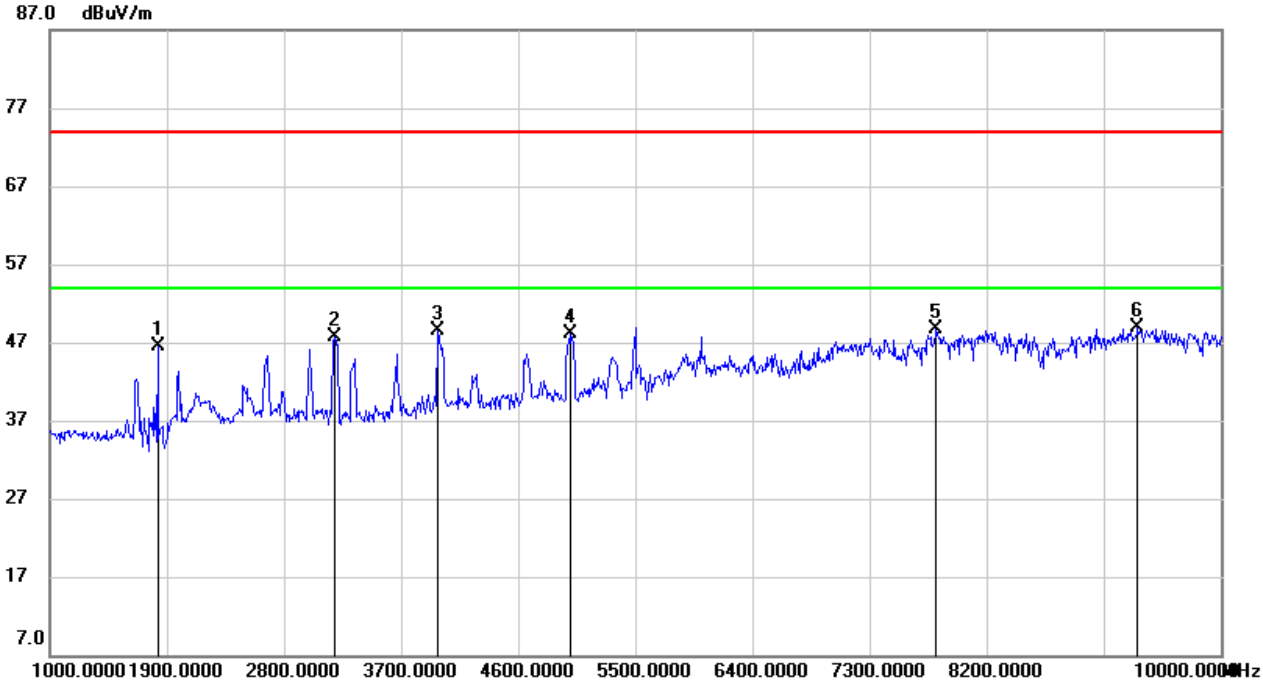
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1828.000	58.40	-10.88	47.52	74.00	-26.48	peak
2	2665.000	55.43	-8.15	47.28	74.00	-26.72	peak
3	3664.000	53.14	-4.34	48.80	74.00	-25.20	peak
4	5500.000	46.05	2.33	48.38	74.00	-25.62	peak
5	7759.000	40.62	8.01	48.63	74.00	-25.37	peak
6	9505.000	38.50	10.35	48.85	74.00	-25.15	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	1828.000	57.44	-10.88	46.56	74.00	-27.44	peak
2	3187.000	53.57	-5.93	47.64	74.00	-26.36	peak
3	3979.000	52.66	-4.10	48.56	74.00	-25.44	peak
4	4996.000	48.11	-0.09	48.02	74.00	-25.98	peak
5	7813.000	40.17	8.49	48.66	74.00	-25.34	peak
6	9361.000	38.82	10.04	48.86	74.00	-25.14	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.

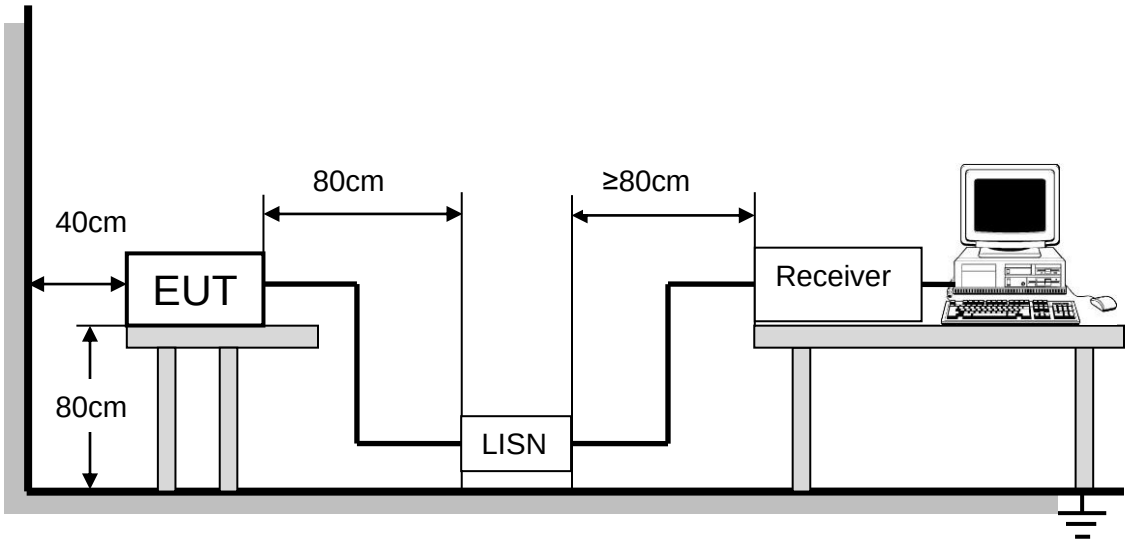
9. AC POWER LINE CONDUCTED EMISSIONS

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



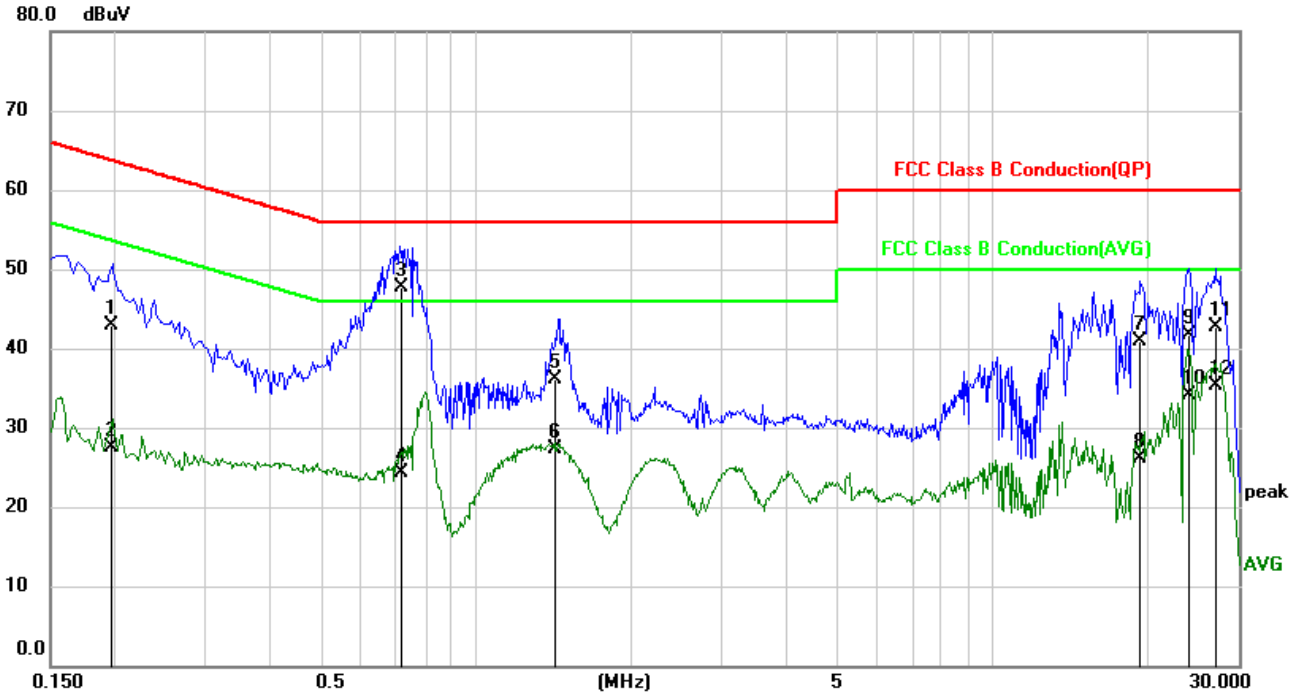
The EUT is put on a table of non-conducting material that is 80mm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) 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)

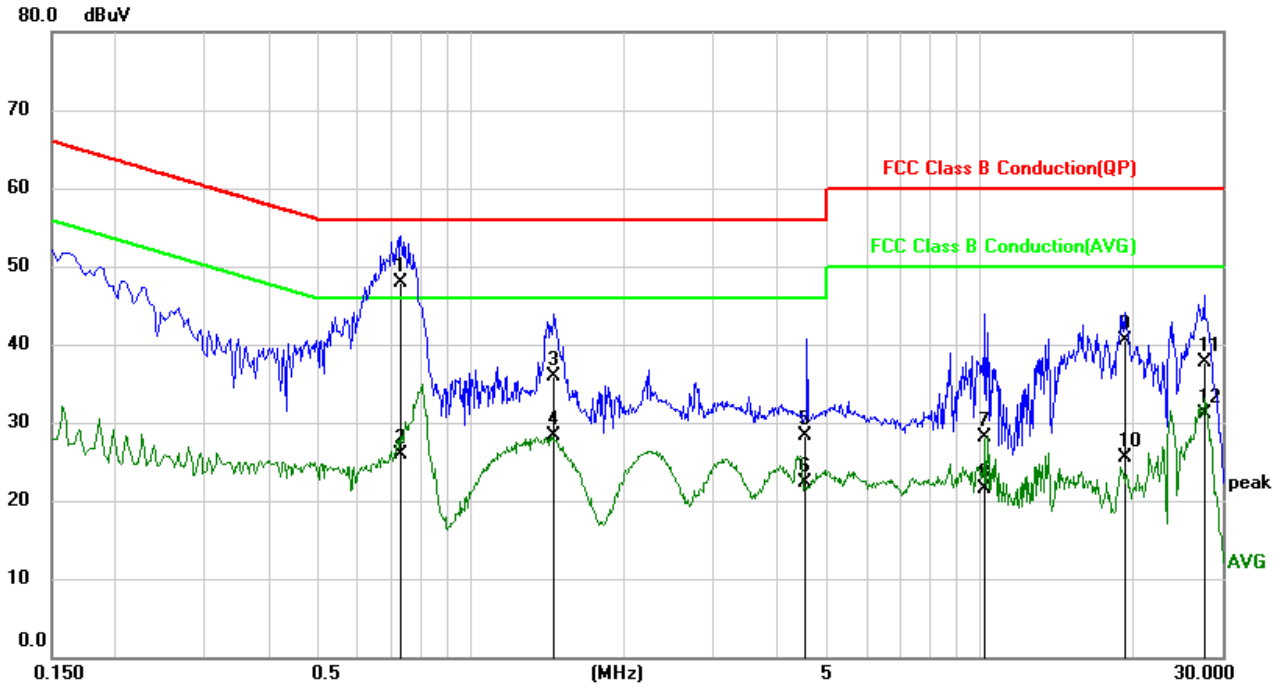
LINE N RESULTS



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1962	33.35	9.60	42.95	63.77	-20.82	QP
2	0.1962	17.92	9.60	27.52	53.77	-26.25	AVG
3	0.7189	38.05	9.60	47.65	56.00	-8.35	QP
4	0.7189	14.67	9.60	24.27	46.00	-21.73	AVG
5	1.4321	26.58	9.61	36.19	56.00	-19.81	QP
6	1.4321	17.67	9.61	27.28	46.00	-18.72	AVG
7	19.4017	30.73	10.21	40.94	60.00	-19.06	QP
8	19.4017	15.99	10.21	26.20	50.00	-23.80	AVG
9	24.1078	31.71	10.09	41.80	60.00	-18.20	QP
10	24.1078	23.95	10.09	34.04	50.00	-15.96	AVG
11	27.0669	32.67	9.99	42.66	60.00	-17.34	QP
12	27.0669	25.34	9.99	35.33	50.00	-14.67	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	0.7329	38.37	9.60	47.97	56.00	-8.03	QP
2	0.7329	16.31	9.60	25.91	46.00	-20.09	AVG
3	1.4497	26.35	9.61	35.96	56.00	-20.04	QP
4	1.4497	18.71	9.61	28.32	46.00	-17.68	AVG
5	4.5248	18.58	9.67	28.25	56.00	-27.75	QP
6	4.5248	12.59	9.67	22.26	46.00	-23.74	AVG
7	10.2709	18.37	9.75	28.12	60.00	-31.88	QP
8	10.2709	11.73	9.75	21.48	50.00	-28.52	AVG
9	19.2991	30.37	10.08	40.45	60.00	-19.55	QP
10	19.2991	15.33	10.08	25.41	50.00	-24.59	AVG
11	27.5905	27.85	9.87	37.72	60.00	-22.28	QP
12	27.5905	21.26	9.87	31.13	50.00	-18.87	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