



**FCC 47 CFR PART 15 SUBPART C
ISED RSS-210 ISSUE 10**

CERTIFICATION TEST REPORT

For

3000 Series, 4000 Series

**MODEL NUMBER: HX369SR, HX369W1, HX369BK, HX369DP, HX369AB, HX369FG,
HX368W1, HX368DP, HX368BK, HX369LB**

FCC ID: 2ADZNHX36

IC: 20109-HX36

REPORT NUMBER: 4790458026-1

ISSUE DATE: June 30, 2022

Prepared for

**Philips Oral Healthcare, Inc. (FCC)
22100 Bothell-Everett Highway Bothell Washington 98021 United States
Philips Oral Healthcare (ISED)
22100 Bothell-Everett Highway Bothell US 98021 United States Of America
(Excluding The States Of Alaska)**

Prepared by

**UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch
Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-
Tech Development Zone Dongguan, 523808, People's Republic of China**

Tel: +86 769 22038881

Fax: +86 769 33244054

Website: www.ul.com



Revision History

Rev.	Issue Date	Revisions	Revised By
V0	6/30/2022	Initial Issue	



Summary of Test Results			
Clause	Test Items	FCC Rules	Test Results
1	Transmitter 99% Emission Bandwidth / 20dB Bandwidth	RSS-Gen 6.7/ Part 15.215 (c)	PASS
2	Transmitter Frequency Stability (Temperature & Voltage Variation)	CFR 47 FCC §15.225(e) ISED RSS-Gen Clause 6.11 ISED RSS-210 Annex B.6	PASS
3	Fundamental Field Strength	CFR 47 FCC §15.225(a)(b)(c)(d) ISED RSS-Gen Clause 6.12 ISED RSS-210 Annex B.6	PASS
4	Radiated Emissions	CFR 47 FCC§15.209(a) CFR 47 FCC§15.225(d) ISED RSS-Gen Clause 6.13 ISED RSS-210 Annex B.6	PASS
5	Band Edge Radiated Emissions	CFR 47 FCC §15.209(a) CFR 47 FCC §15.225(c)(d) ISED RSS-Gen Clause 6.13 ISED RSS-210 Annex B.6	PASS
6	Antenna Requirement	CFR 47 FCC §15.203 ISED RSS-Gen Clause 6.8	Pass
Note 1: This test report is only published to and used by the applicant, and it is not for evidence purpose in China. Note 2: The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C, ISED RSS-210 Issue 9 and ISED RSS-GEN Issue 5 > when <Accuracy Method> decision rule is applied.			



TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	7
3. FACILITIES AND ACCREDITATION	7
4. CALIBRATION AND UNCERTAINTY	8
4.1. MEASURING INSTRUMENT CALIBRATION	8
4.2. MEASUREMENT UNCERTAINTY	8
5. EQUIPMENT UNDER TEST	9
5.1. DESCRIPTION OF EUT	9
5.2. MAXIMUM FIELD STRENGTH	10
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	10
5.4. TEST ENVIRONMENT	11
5.5. DESCRIPTION OF TEST SETUP	12
5.6. MEASURING INSTRUMENT AND SOFTWARE USED	14
6. ANTENNA PORT TEST RESULTS	15
6.1. 99% & 20dB BANDWIDTH	15
6.2. TRANSMITTER FREQUENCY STABILITY	17
7. RADIATED EMISSION TEST RESULTS	19
7.1. FIELD STRENGTH OF INTENTIONAL EMISSIONS	26
7.2. SPURIOUS EMISSIONS BELOW 1GHz AND ABOVE 30MHz	27
7.3. SPURIOUS EMISSIONS BELOW 30MHz	29
8. ANTENNA REQUIREMENTS	32



1. ATTESTATION OF TEST RESULTS

FCC

Applicant Information

Company Name: Philips Oral Healthcare, Inc.
Address: 22100 Bothell-Everett Highway Bothell Washington 98021 United States

ISED

Applicant Information

Company Name: Philips Oral Healthcare
Address: 22100 Bothell-Everett Highway Bothell US 98021 United States Of America (Excluding The States Of Alaska)

FCC

Manufacturer Information

Company Name: Philips Oral Healthcare, Inc.
Address: 22100 Bothell-Everett Highway Bothell Washington 98021 United States

ISED

Manufacturer Information

Company Name: Philips Oral Healthcare
Address: 22100 Bothell-Everett Highway Bothell US 98021 United States Of America (Excluding The States Of Alaska)

EUT Information

EUT Name: 3000 Series, 4000 Series
Model: HX369SR
Series Model: HX369W1, HX369BK, HX369DP, HX369AB, HX369FG, HX368W1, HX368DP, HX368BK, HX369LB
Model Difference: Please refer to clause 5.1. Description of EUT
Brand: Sonicare
Sample Received Date: June 23, 2022
Sample Status: Normal
Sample ID: 5086977
Date of Tested: June 27, 2022 ~ June 30, 2022



APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART C	PASS
ISED RSS-210 Issue 10	PASS
ISED RSS-GEN Issue 5	PASS

Prepared By:

Kebo Zhang

Kebo Zhang
Project Engineer

Checked By:

Denny Huang

Denny Huang
Senior Project Engineer

Approved By:

Stephen Guo

Stephen Guo
Laboratory Manager



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 414788 D01 Radiated Test Site v01r01, FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, ISED RSS-210 Issue 10 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. 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 ISED (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 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046. 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
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.
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 recognize 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
Conduction emission	3.62 dB
Radiation Emission test (include Fundamental emission) (9KHz-30MHz)	2.2 dB
Radiation Emission test (include Fundamental emission) (30MHz-1GHz)	4.00 dB
Radiation Emission test (1GHz to 26GHz) (include Fundamental emission)	5.78 dB (1 GHz-18 GHz)
	5.23 dB (18 GHz-26 GHz)
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

EUT Name	3000 Series, 4000 Series
Model	HX369SR
Series Model:	HX369W1, HX369BK, HX369DP, HX369AB, HX369FG, HX368W1, HX368DP, HX368BK, HX369LB
Model difference:	HX369W1, HX369BK, HX369DP, HX369AB, HX369FG, HX368W1, HX368DP, HX368BK and HX369LB have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction with HX369SR. The difference lies only the color and toothbrush head. The EUT will have two PCB version, one use IC CS32L010 chip, the other use MM32F0010 IC chip. CS32L010 & MM32F0010 have the same technical construction including radio frequency part, electrical construction and mechanical construction, the difference lies only the main IC part, main IC Layout and component layout is different. Otherwise, MM32F0010 PCB layout has touch wake up function, but it is not related components, in fact do not have this function; CS32L010 PCB layout have removed the function of touch wake up, so PCB layout don't have the components.
Note:	Two PCB version has been considered, only the worst case PCB version (CS32L010) was recorded in this report.
Operation Frequency	13.56MHz
Modulation	BPSK
Battery	DC 3.6 V

Model list

EUT Name	Model
3000 Series	HX368W1
3000 Series	HX368DP
3000 Series	HX368BK
4000 Series	HX369SR
4000 Series	HX369W1
4000 Series	HX369BK
4000 Series	HX369DP
4000 Series	HX369AB
4000 Series	HX369FG
4000 Series	HX369LB



5.2. MAXIMUM FIELD STRENGTH

Frequency (MHz)	Max Peak field strength (dB μ V/m)
13.56	5.48

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
13.56	Enameled copper wire antenna	0



5.4. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	45 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	0 ~ 40°C
Voltage:	VL	DC 3.06 V
	VN	DC 3.6 V
	VH	DC 4.14 V

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



5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Remarks
1	Adapter	CAUTION	WAA2001	Input: 100-240 Vac, 50/60Hz, 3.5W Output: 5Vdc, 2.5W

I/O CABLES

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

ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	charging base	PHILIPS	HX6110 ABA3 01211115	Input: 4.75-5.25 Vdc, 0.3A, 1.5W MAX

TEST SETUP

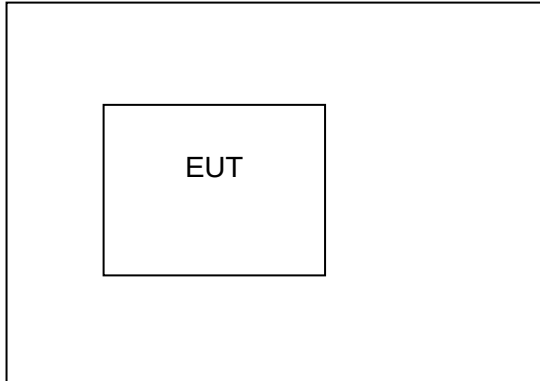
The EUT can't transmit the NFC signal when in charging.

New battery has been used during measurement.

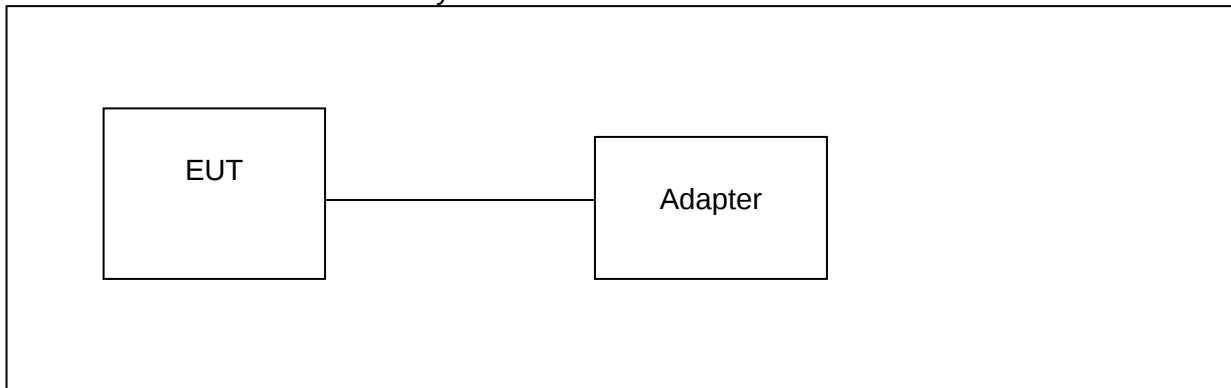
Note: Test was performed with tag and without tag, but only the worst case data (with tag) was recorded in the report.

SETUP DIAGRAM FOR TESTS

For other test



For Conducted Emission test only



**5.6. MEASURING INSTRUMENT AND SOFTWARE USED**

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
EMI Test Receiver	R&S	ESR3	101961	Oct.30, 2021	Oct.29, 2022
Two-Line V-Network	R&S	ENV216	101983	Oct.30, 2021	Oct.29, 2022
Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Oct.30, 2021	Oct.29, 2022
Software					
Description			Manufacturer	Name	Version
Test Software for Conducted Emissions			Farad	EZ-EMC	Ver. UL-3A1

Radiated Emissions							
Equipment		Manufacturer	Model No.	Serial No.	Last Cal.	Due Date	
MXE EMI Receiver		KESIGHT	N9038A	MY56400036	Oct.30, 2021	Oct.29, 2022	
Hybrid Log Periodic Antenna		TDK	HLP-3003C	130959	Aug.02, 2021	Aug.01, 2024	
Preamplifier		HP	8447D	2944A09099	Oct.30, 2021	Oct.29, 2022	
Loop antenna		Schwarzbeck	1519B	00008	Dec.14, 2021	Dec.13, 2024	
Preamplifier		TDK	PA-02-001-3000	TRS-302-00050	Oct.31, 2021	Oct.30, 2022	
Preamplifier		Mini-Circuits	ZX60-83LN-S+	SUP01201941	Oct.31, 2021	Oct.30, 2022	
Software							
Description			Manufacturer		Name	Version	
Test Software for Radiated Emissions			Farad		EZ-EMC	Ver. UL-3A1	
Other instruments							
Used	Equipment		Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☒	Temperature & Humidity Chamber		SANMOOD	SG-80-CC-2	2088	Nov.10, 2021	Nov.09, 2022

6. ANTENNA PORT TEST RESULTS

6.1. 99% & 20dB BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C RSS-247 ISSUE 2		
Section	Test Item	Limit
ANSI C63.10 Section 6.9.2	20dB% Bandwidth	For reporting purposes only.
ISED RSS-Gen Clause 6.7 Issue 5	99 % Occupied Bandwidth	For reporting purposes only.

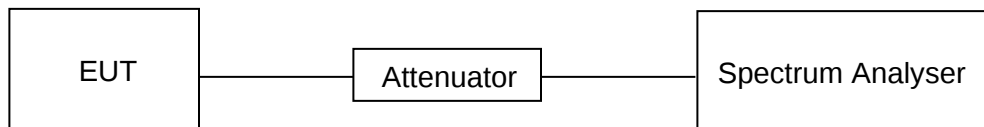
TEST PROCEDURE

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	For 20dB Occupied Bandwidth: 1% to 5% of the 20 dB bandwidth For 99% Occupied Bandwidth: 1% to 5% of the occupied bandwidth
VBW	For 20dB Occupied Bandwidth: approximately 3×RBW For 99% Occupied Bandwidth: ≥ 3×RBW
Span	Between 2 times and 5 times the 20dB OBW. Between 1.5 times and 5.0 times the 99% OBW.
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 99%/20dB relative to the maximum level measured in the fundamental emission.

TEST SETUP

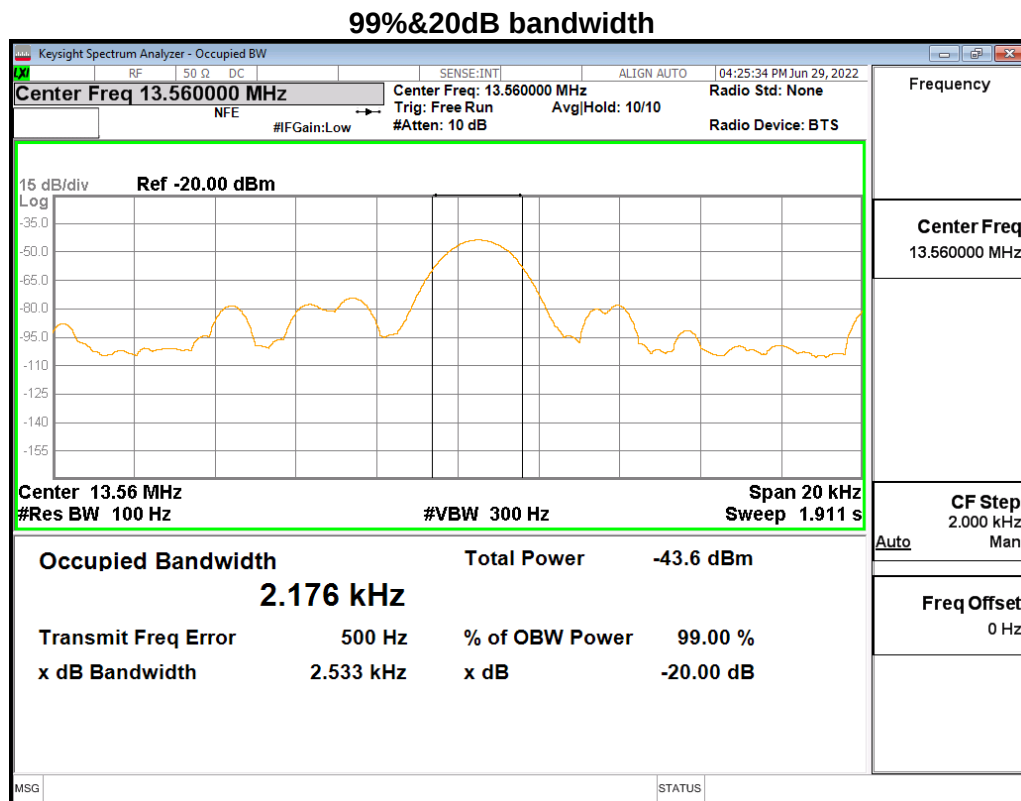


**TEST ENVIRONMENT**

Temperature	23.5 °C	Relative Humidity	58 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.6 V

RESULTS

Frequency (MHz)	99% Occupied Bandwidth (kHz)	20dB bandwidth (kHz)
13.56	2.176	2.533



6.2. TRANSMITTER FREQUENCY STABILITY

LIMITS

CFR 47 FCC §15.225(e)
ISED RSS-210 Annex B B.6

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of 0 degrees to + 40 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

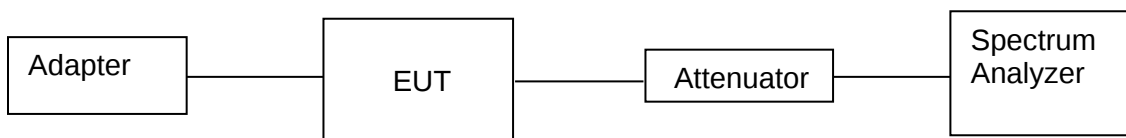
TEST SETUP AND PROCEDURE

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	10 kHz
VBW	$\geq 3 \times \text{RBW}$
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

Allow the trace to stabilize, find the peak value of the power envelope and record the frequency, then calculated the frequency drift.

TEST SETUP



**TEST RESULTS**

Maximum frequency error of the EUT with variations in ambient temperature

Temperature (°C)	Time after Start-up			
	0 minutes	2 minutes	5 minutes	10 minutes
0	13.5603	13.5599	13.5598	13.5599
10	13.5601	13.5603	13.5599	13.5603
20	13.5605	13.5611	13.5605	13.5608
30	13.5611	13.5602	13.5610	13.5601
40	13.5598	13.605	13.5600	13.5603
Maximum frequency error	0.0081%	0.0081%	0.0074%	0.0059%
Limit	0.01%			
Result	Pass	Pass	Pass	Pass

Maximum frequency error of the EUT with declared battery operation voltage at a temperature of 20 degrees C.

Supply Voltage by Battery	Time after Start-up			
	0 minutes	2 minutes	5 minutes	10 minutes
4.14 Vdc	13.5599	13.5595	13.5599	13.5602
3.6 Vdc	13.5603	13.5601	13.5603	13.5609
3.06 Vdc	13.5610	13.5611	13.5605	13.5598
Maximum frequency error	0.0074%	0.0081%	0.0037%	0.0066%
Limit	0.01%			
Result	Pass	Pass	Pass	Pass



7. RADIATED EMISSION TEST RESULTS

LIMITS

Fundamental field strength

FCC Reference:	Part 15.225(a)(b)(c)(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 & RSS-210 B.6 & RSS-GEN Clause 8.9
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)	Measured Distance (Meters)
13.553-13.567	15848	84	30
13.410-13.553/13.567-13.710	334	50.47	30
13.110-13.410/13.710-14.010	106	40.51	30

Note(s):

1. The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

2. The limit is specified at a test distance of 30 meters. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).



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

ISED General field strength limits at frequencies below 30 MHz

Table 6 – General field strength limits at frequencies below 30 MHz		
Frequency	Magnetic field strength (H-Field) (μA/m)	Measurement distance (m)
9 - 490 kHz ^{Note 1}	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

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 30MHz.

Restricted bands of operation

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c

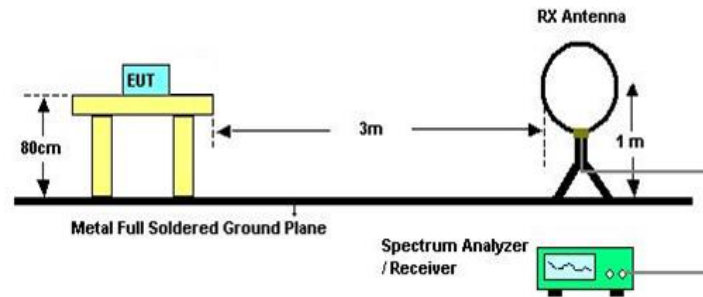


Table 7 – Restricted frequency bands ^{Note 1}		
MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

TEST SETUP AND PROCEDURE

Below 30 MHz

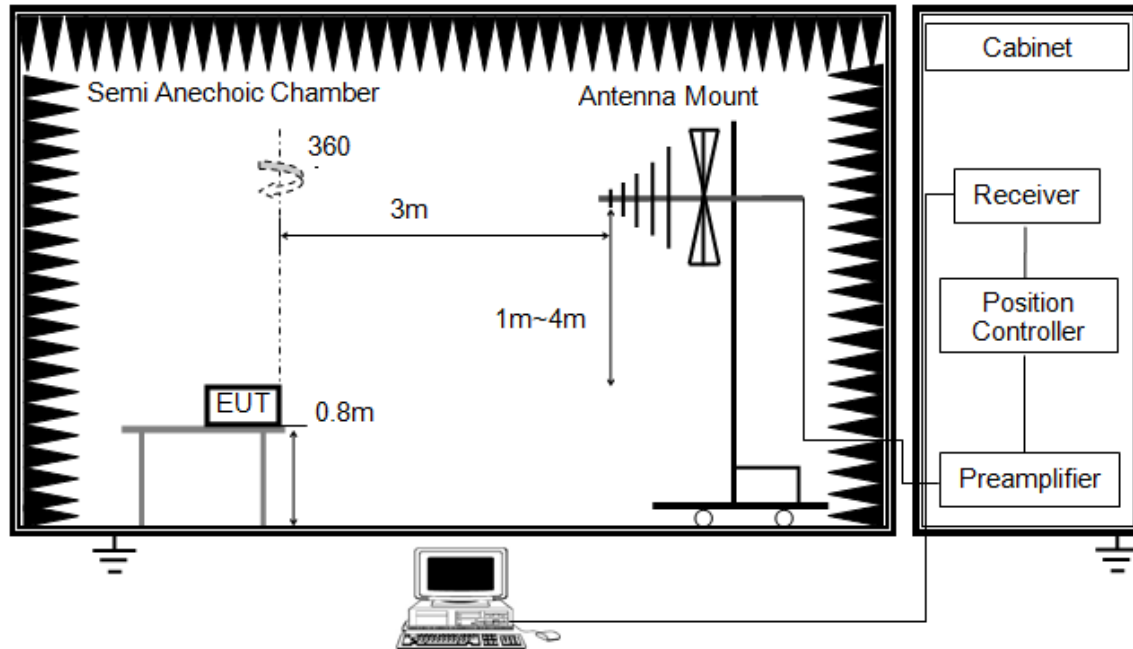


The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto
Trace	Max hold

- The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.
- 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.
- The EUT was placed on a turntable with 80 cm above ground.
- The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.
- The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
- For measurement below 1 GHz, 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 and average 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 and average detector and reported.
- Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field 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 site based on KDB 414788.
- The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω ; For example, the measurement frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to $Y-51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1G

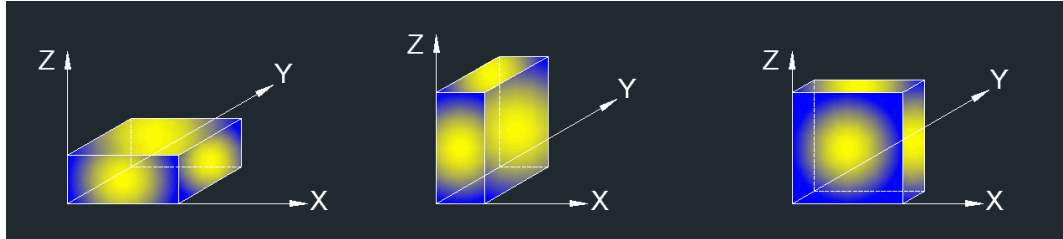


The setting of the spectrum analyser

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

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.
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 80cm above ground.
4. 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.
5. 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.
6. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
7. 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.

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.

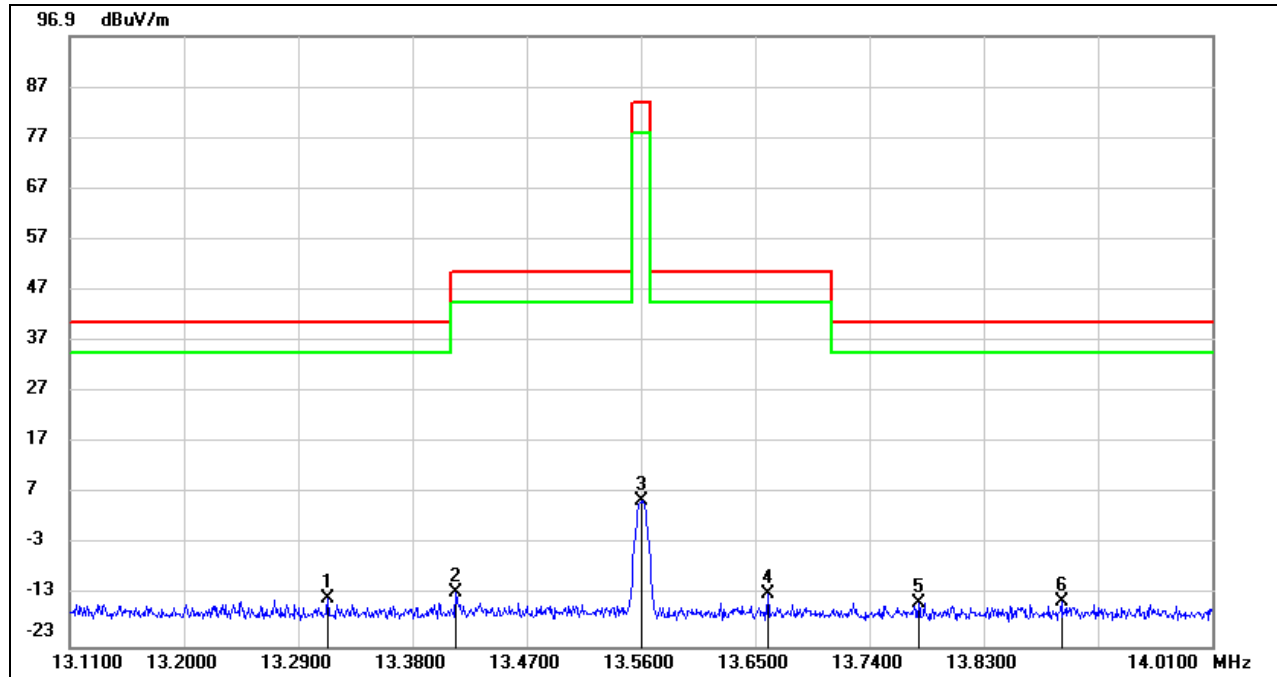
TEST ENVIRONMENT

Temperature	22.1 °C	Relative Humidity	56 %
Atmosphere Pressure	101kPa	Test Voltage	DC 3.6 V

RESULTS

7.1. FIELD STRENGTH OF INTENTIONAL EMISSIONS

FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOOP ANTENNA FACE ON TO THE EUT)



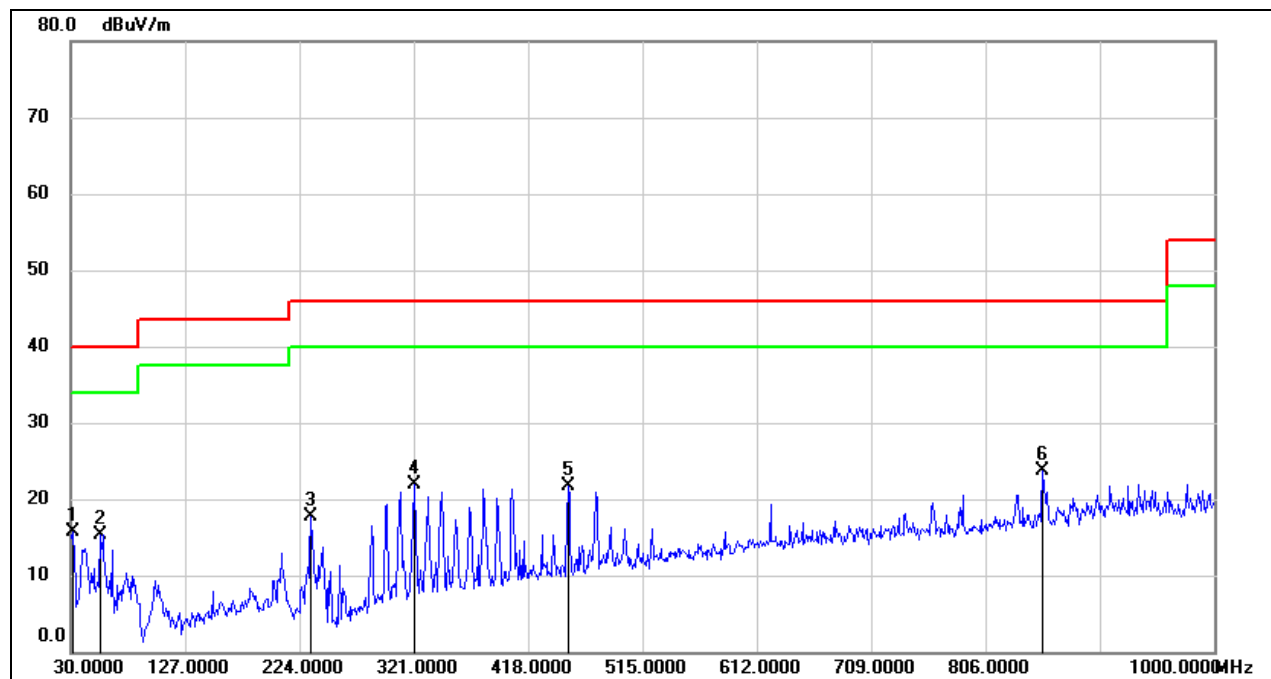
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.3134	47.80	-61.40	-13.60	40.51	-54.11	peak
2	13.4142	48.94	-61.40	-12.46	50.47	-62.93	peak
3	13.5609	66.89	-61.41	5.48	84.00	-78.52	peak
4	13.6599	48.52	-61.41	-12.89	50.47	-63.36	peak
5	13.7787	46.93	-61.43	-14.50	40.51	-55.01	peak
6	13.8912	47.17	-61.43	-14.26	40.51	-54.77	peak

Note: 1. Result Level = Read Level + Correct Factor.

2. 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.

7.2. SPURIOUS EMISSIONS BELOW 1GHz AND ABOVE 30MHz

SPURIOUS EMISSIONS (HORIZONTAL)

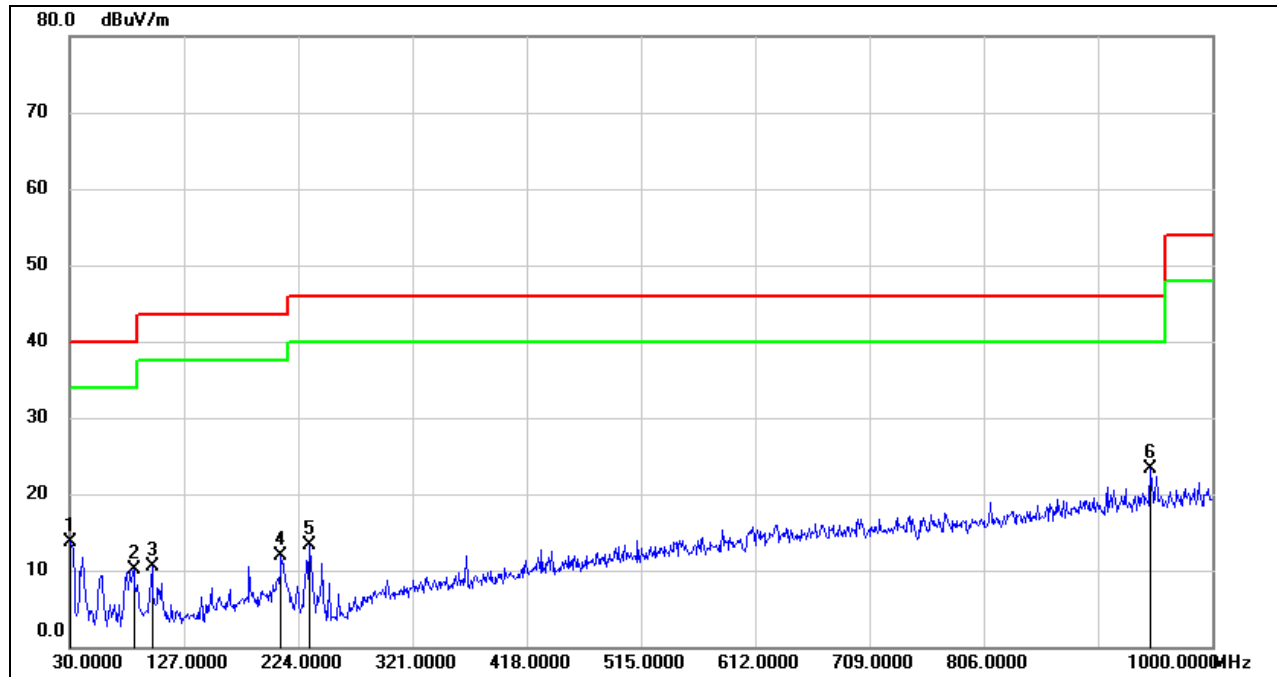


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	31.9400	34.92	-19.13	15.79	40.00	-24.21	QP
2	55.2200	36.00	-20.63	15.37	40.00	-24.63	QP
3	233.7000	36.49	-18.85	17.64	46.00	-28.36	QP
4	321.9700	36.61	-14.75	21.86	46.00	-24.14	QP
5	451.9500	34.06	-12.42	21.64	46.00	-24.36	QP
6	854.5000	29.76	-6.14	23.62	46.00	-22.38	QP

Note: 1. Result Level = Read Level + Correct Factor.



HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



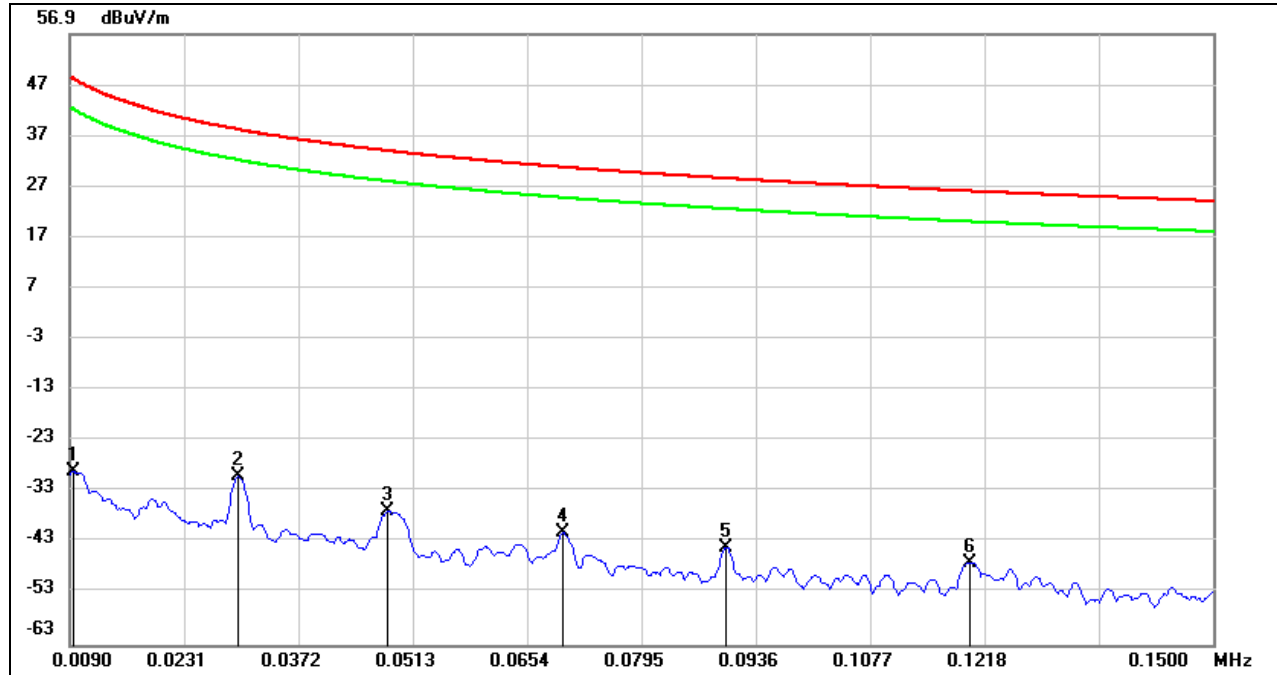
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.9700	32.71	-19.04	13.67	40.00	-26.33	QP
2	84.3200	31.78	-21.63	10.15	40.00	-29.85	QP
3	99.8399	31.66	-21.15	10.51	43.50	-32.99	QP
4	209.4500	29.18	-17.23	11.95	43.50	-31.55	QP
5	233.7000	32.13	-18.85	13.28	46.00	-32.72	QP
6	947.6200	27.72	-4.43	23.29	46.00	-22.71	QP

Note: 1. Result Level = Read Level + Correct Factor.

7.3. SPURIOUS EMISSIONS BELOW 30MHz

SPURIOUS EMISSIONS (LOOP ANTENNA FACE ON TO THE EUT)

9 kHz~ 150 kHz



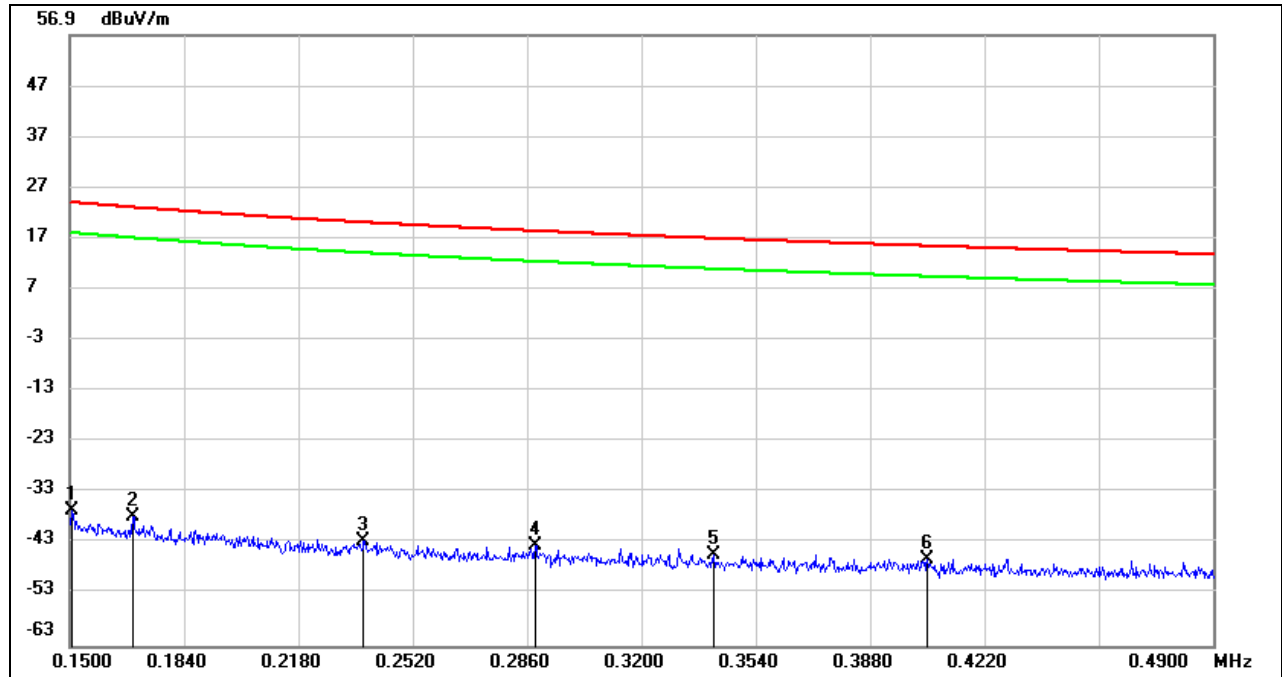
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	FCC Result (dBuV/m)	FCC Limit (dBuV/m)	ISED Result (dBuA/m)	ISED Limit (dBuA/m)	Margin (dB)	Remark
1	0.0094	72.28	-101.33	-29.05	48.05	-80.55	-3.45	-77.10	peak
2	0.0297	71.02	-101.11	-30.09	38.15	-81.59	-13.35	-68.24	peak
3	0.0482	64.44	-101.36	-36.92	33.94	-88.42	-17.56	-70.86	peak
4	0.0698	59.83	-100.98	-41.15	30.72	-92.65	-20.78	-71.87	peak
5	0.0899	57.11	-101.12	-44.01	28.53	-95.51	-22.97	-72.54	peak
6	0.1200	54.56	-101.53	-46.97	26.02	-98.47	-25.48	-72.99	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.

150 kHz ~ 490 kHz



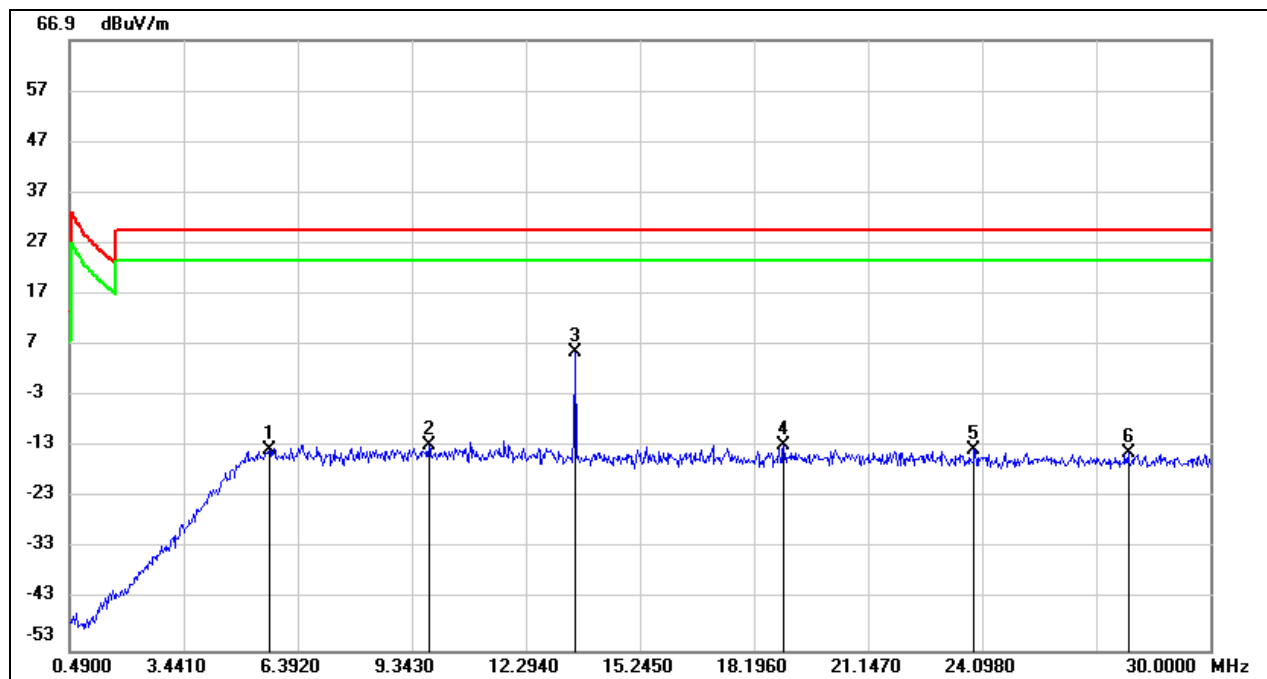
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	FCC Result (dBuV/m)	FCC Limit (dBuV/m)	ISED Result (dBuA/m)	ISED Limit (dBuA/m)	Margin (dB)	Remark
1	0.1507	65.32	-101.89	-36.57	24.04	-88.07	-27.46	-60.61	peak
2	0.1686	64.17	-101.87	-37.70	23.07	-89.20	-28.43	-60.77	peak
3	0.2374	59.35	-101.80	-42.45	20.09	-93.95	-31.41	-62.54	peak
4	0.2884	58.26	-101.77	-43.51	18.40	-95.01	-33.10	-61.91	peak
5	0.3414	56.48	-101.76	-45.28	16.94	-96.78	-34.56	-62.22	peak
6	0.4050	55.69	-101.74	-46.05	15.45	-97.55	-36.05	-61.50	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.

490kHz ~ 30MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	FCC Result (dBuV/m)	FCC Limit (dBuV/m)	ISED Result (dBuA/m)	ISED Limit (dBuA/m)	Margin (dB)	Remark
1	5.6543	48.16	-61.83	-13.67	29.54	-65.17	-21.96	-43.21	peak
2	9.7857	48.52	-61.23	-12.71	29.54	-64.21	-21.96	-42.25	peak
3	13.5629	66.82	-61.41	5.41	29.54	-46.09	-21.96	-24.13	peak
4	18.9633	48.39	-61.17	-12.78	29.54	-64.28	-21.96	-42.32	peak
5	23.8914	47.50	-61.00	-13.50	29.54	-65.00	-21.96	-43.04	peak
6	27.8753	46.63	-60.79	-14.16	29.54	-65.66	-21.96	-43.70	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. About the Fundamental emission test result please refer to section 7.1.



8. 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.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS

Complies

END OF REPORT