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

CERTIFICATION TEST REPORT

For

Customer Display (Square Register)

MODEL NUMBER: SPS4-01, SPS4-01-A

FCC ID: 2AF3K-SPS4

IC: 21827-SPS4

REPORT NUMBER: 4789598114.1-5

ISSUE DATE: October 09, 2020

Prepared for

Square, Inc. (FCC)
1455 Market St, Suite 600, San Francisco, California, United States 94103

Square Canada, Inc. (ISED)
5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	10/09/2020	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 §5.225(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	Conducted Emission Test for AC Power Port	CFR 47 FCC §15.207 ISED RSS-Gen Clause 8.8	PASS
7	Antenna Requirement	CFR 47 FCC §15.203 ISED RSS-Gen Clause 6.3	Pass
This test report is only published to and used by the applicant, and it is not for evidence purpose in China.			

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1. ATTESTATION OF TEST RESULTS

FCC
Applicant Information

Company Name:	Square, Inc.
Address:	1455 Market St, Suite 600, San Francisco, California, United States 94103

ISED
Applicant Information

Company Name:	Square Canada, Inc.
Address:	5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada

FCC
Manufacturer Information

Company Name:	Square, Inc.
Address:	1455 Market St, Suite 600, San Francisco, California, United States 94103

ISED
Manufacturer Information

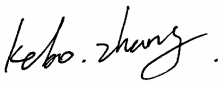
Company Name:	Square Canada, Inc.
Address:	5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada

EUT Information

EUT Name:	Customer Display (Square Register)
Customer Display Model:	Model for US: SPS4-01 Model for Canada: SPS4-01-A
Brand:	SQUARE
Sample Received Date:	August 17, 2020
Sample Status:	Normal
Sample ID:	2809002
Date of Tested:	August 17~ September 15, 2020

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
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 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. **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	Customer Display (Square Register)		
Customer Display Model	Model for US: SPS4-01		
	Model for Canada: SPS4-01-A		
Product Description	The EUT is a customer display for the Square Register System.		
Operation Frequency	13.56MHz		
Modulation	ASK		
Rating	Power Adapter	Input	100~240V,50/60Hz,1.2A
		Output	12Vdc,4.0A

5.2. MAXIMUM FIELD STRENGTH

Frequency (MHz)	Max Peak field strength (dBμV/m)
13.56	76.60

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
13.56	line antenna	0

5.4. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28°C
Voltage:	VL	AC 132V, 60Hz
	VN	AC 120V, 60Hz
	VH	AC 108V, 60Hz

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	P/N
/	/	/	/	/

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	1.0 m	/
2	USB	/	/	2.0 m	Customer display cable

ACCESSORY

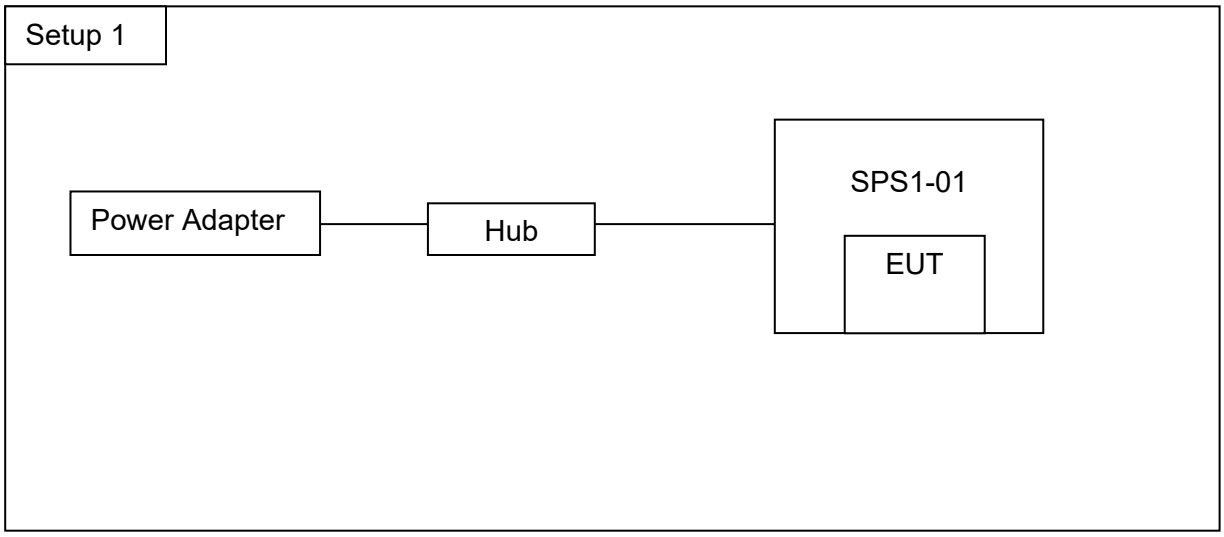
Item	Accessory	Brand Name	Model Name	Description
1	Power Adapter	SQUARE	SWB2-01	Input: 100-240V,50/60Hz, 1.2A Output: 12Vdc, 4A
2	Hub	SQUARE	SHF3-01	Hub Output X5: 5Vdc, 2.5A Output For Register: 12Vdc, 2.3A
3	Square Register	SQUARE	SPS1-01	/

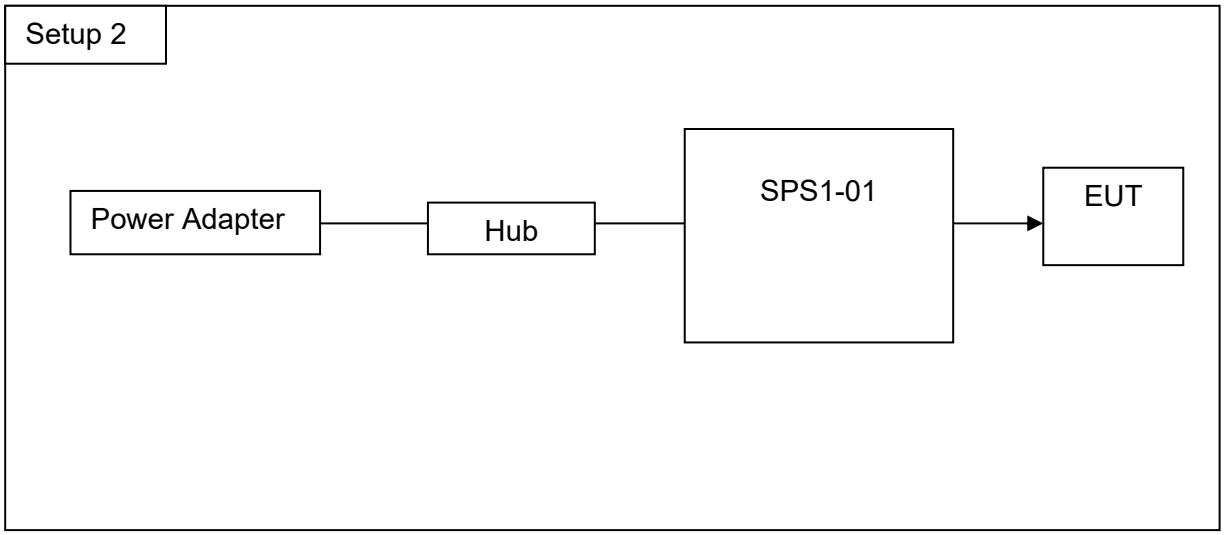
TEST SETUP

The EUT can work in an engineering mode though the software inside.

Note: The EUT has two way to transmit the NFC signal, one is work in an engineering mode though the software inside and the other one is used the tag to approach the NFC antenna. Both the two way had been tested, but only the worst data (work in an engineering mode) was recorded in the report.

SETUP DIAGRAM FOR TESTS





Note: There are two Settings for the sample and both settings have Pre-Scanned, only the worst cases (Setup 1) were recorded in the report.

5.6. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec. 5, 2019	Dec. 5, 2020
☑	Two-Line V-Network	R&S	ENV216	101983	Dec. 5, 2019	Dec. 5, 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. 5, 2019	Dec. 5, 2020
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17,2018	Sep.17,2021
☑	Preamplifier	HP	8447D	2944A09099	Dec. 5, 2019	Dec. 5, 2020
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec. 5, 2019	Dec. 5, 2020
☑	Loop antenna	Schwarzbeck	1519B	00008	Jan.07,2019	Jan.07, 2022
☑	Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	Dec. 5, 2019	Dec. 5, 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	R&S	FSV40	101117	Dec. 6, 2019	Dec. 6, 2020
☑	DC power supply	Keysight	E3642A	MY55159130	Dec. 6, 2019	Dec. 6, 2020
☑	Temperature & Humidity Chamber	SANMOOD	SG-80-CC-2	2088	Dec. 6, 2019	Dec. 6, 2020

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.
RSS-Gen Clause 6.7	99% Bandwidth	For reporting purposes only.

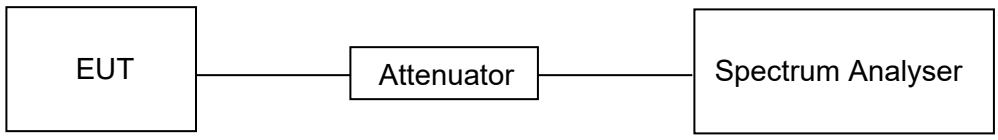
TEST PROCEDURE

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



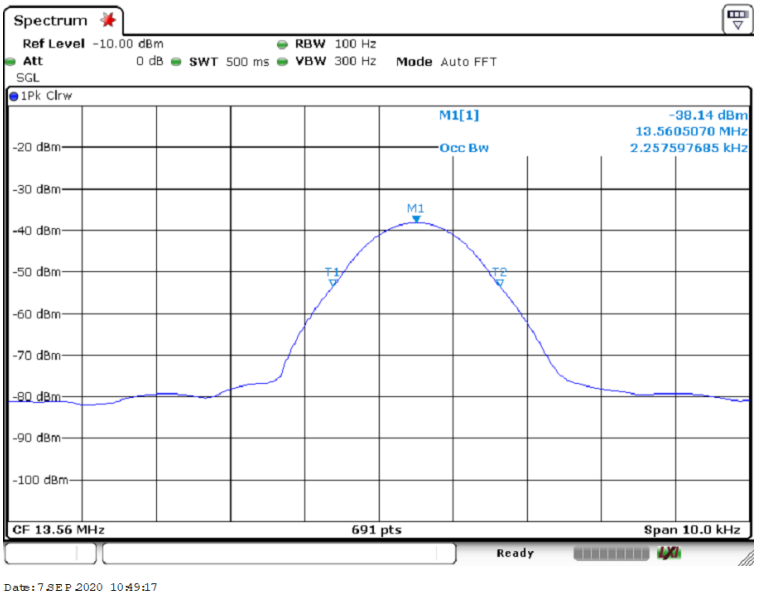
TEST ENVIRONMENT

Temperature	23.1°C	Relative Humidity	62%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

Frequency (MHz)	99% bandwidth (kHz)	20dB bandwidth (kHz)
13.56	2.26	2.52

99% bandwidth



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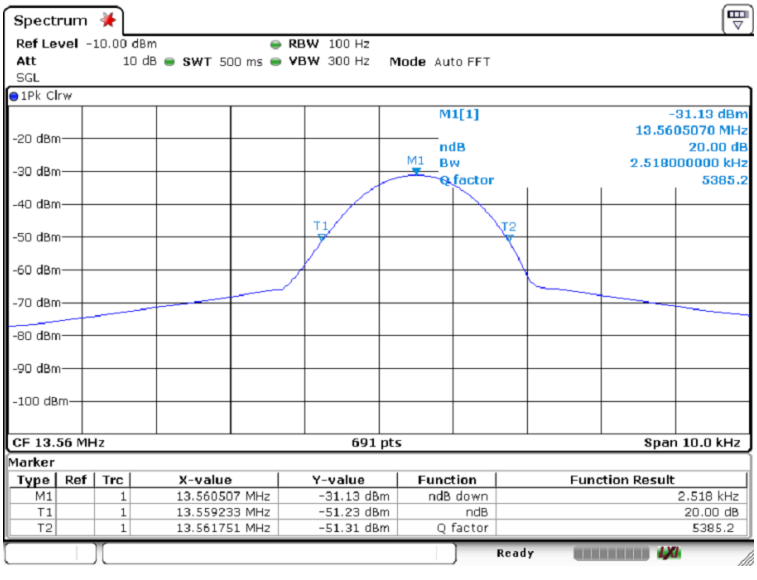
20dB bandwidth



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6.2. TRANSMITTER FREQUENCY STABILITY

LIMITS

CFR 47 FCC §15.225(e)

ISED RSS-210 Annex B B.5

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 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.

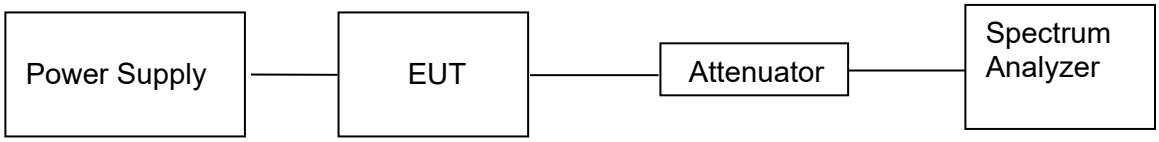
TEST SETUP AND PROCEDURE

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	10KHz
VBW	≥3 × 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
-20	13.5613	13.5602	13.5603	13.5605
-10	13.5612	13.5602	13.5602	13.5604
0	13.5606	13.5603	13.5606	13.5605
10	13.5609	13.5602	13.5602	13.5604
20	13.5606	13.5602	13.5606	13.5605
30	13.5610	13.5601	13.5601	13.5606
40	13.5604	13.5602	13.5601	13.5609
50	13.5605	13.5609	13.5609	13.5609
Maximum frequency error	0.0096%	0.0066%	0.0066%	0.0066%
Limit	0.01%			
Result	Pass	Pass	Pass	Pass

Maximum frequency error of the EUT with variations in nominal operating voltage at an ambient normal temperature

Supply Voltage (V)	Time after Start-up			
	0 minutes	2 minutes	5 minutes	10 minutes
AC 120	13.5605	13.5607	13.5608	13.5607
AC 138	13.5603	13.5605	13.5607	13.5606
AC 102	13.5606	13.5607	13.5607	13.5608
Maximum frequency error	0.0044%	0.0052%	0.0058%	0.0059%
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 (uV/m)	Field Strength (dBuV/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) / RSS-Gen Section 6.4, 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: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c

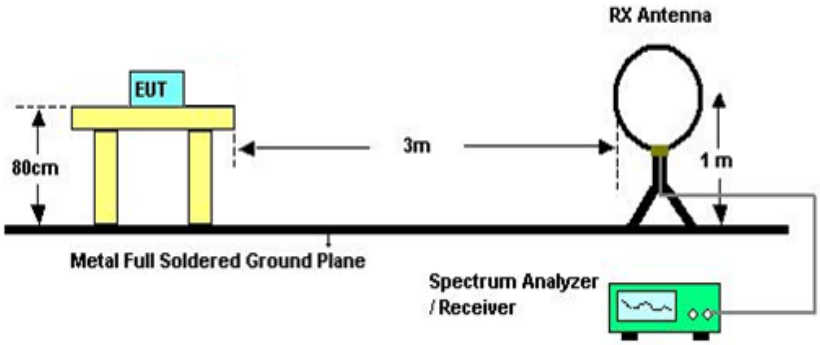
IC Restricted bands please refer to ISED RSS-GEN Clause 8.10

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 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 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1m height antenna tower.

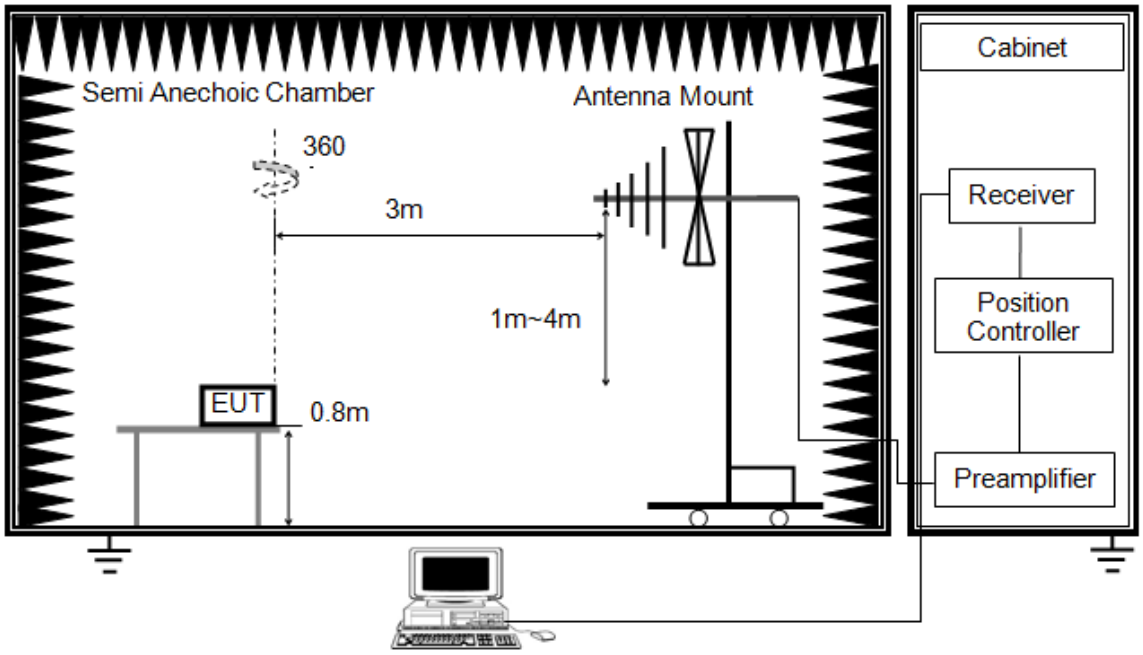
5. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

6. 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.

7. 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 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

8. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open field site. Therefore, the 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 80cm above ground.

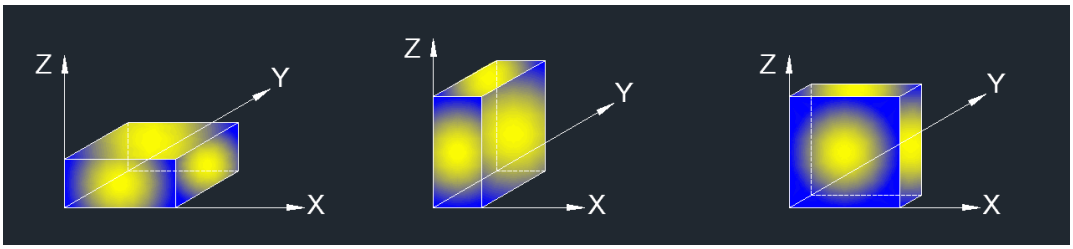
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

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.

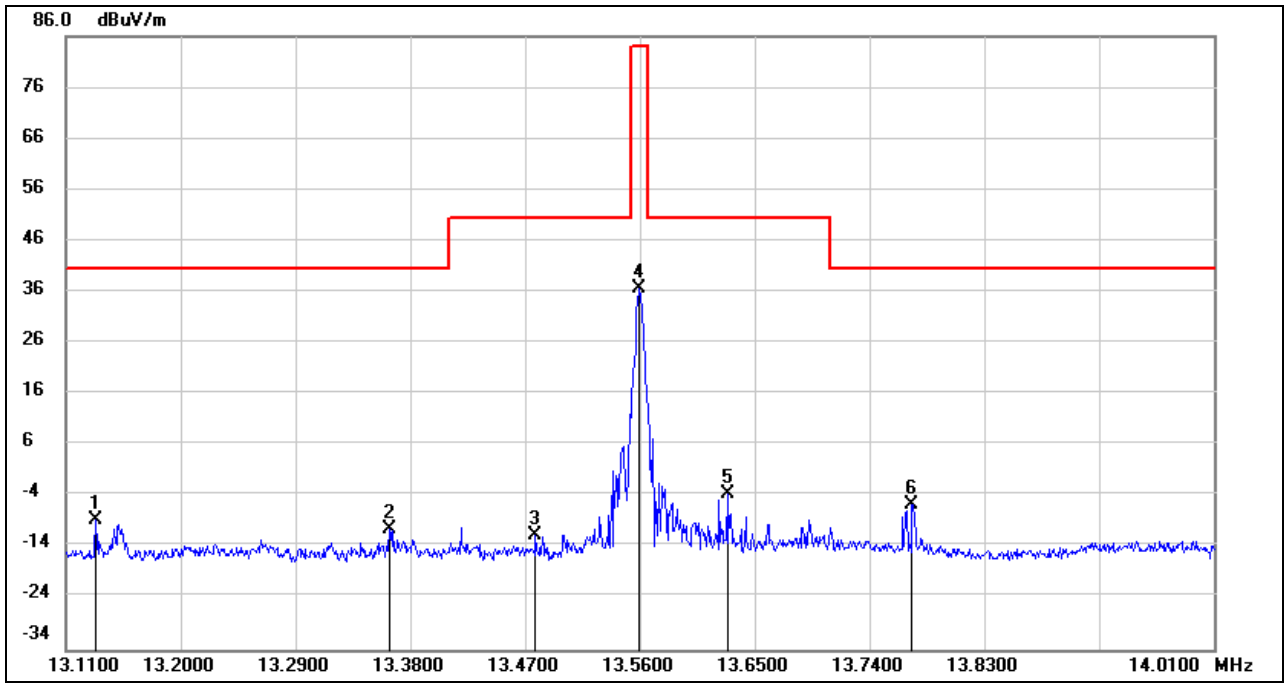
TEST ENVIRONMENT

Temperature	24.2°C	Relative Humidity	66%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60HZ

RESULTS

7.1. FIELD STRENGTH OF INTENTIONAL EMISSIONS

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

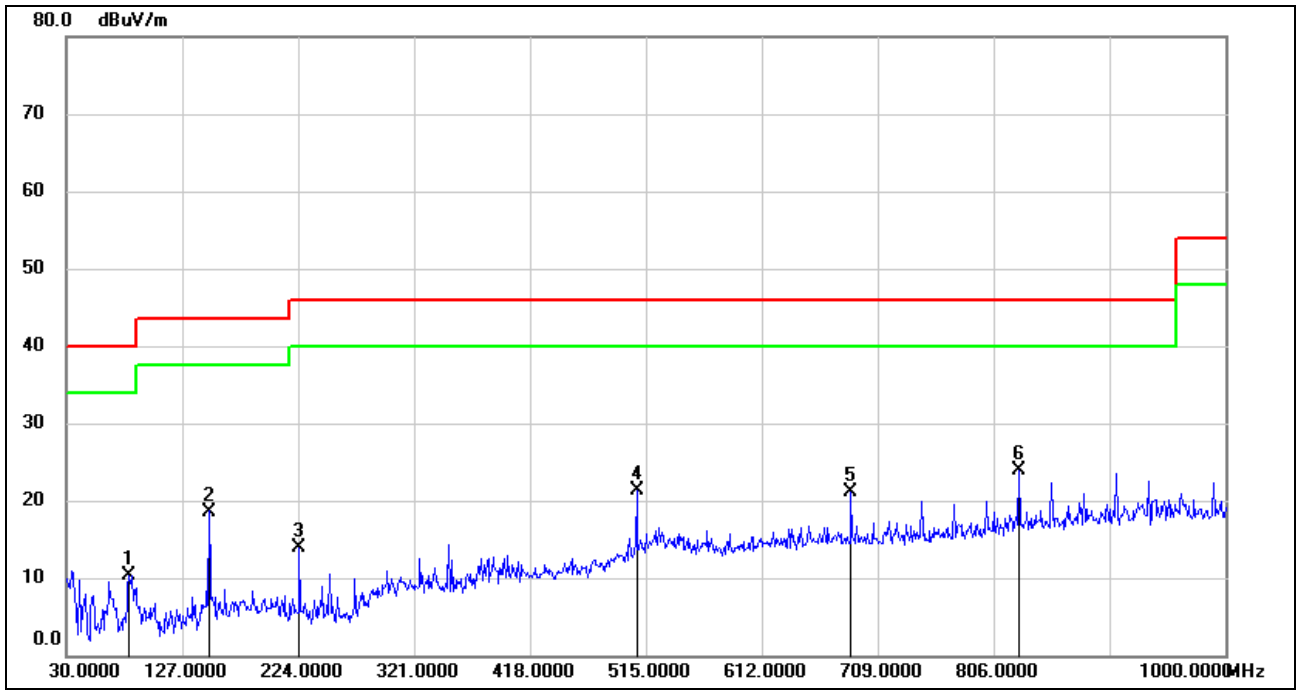


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.1333	52.88	-61.63	-8.75	40.51	-49.26	peak
2	13.3636	51.31	-61.63	-10.32	40.51	-50.83	peak
3	13.4779	49.99	-61.63	-11.64	50.47	-62.11	peak
4	13.5591	98.20	-61.62	36.58	84.00	-47.42	peak
5	13.6282	57.98	-61.61	-3.63	50.47	-54.10	peak
6	13.7733	55.94	-61.62	-5.68	40.51	-46.19	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

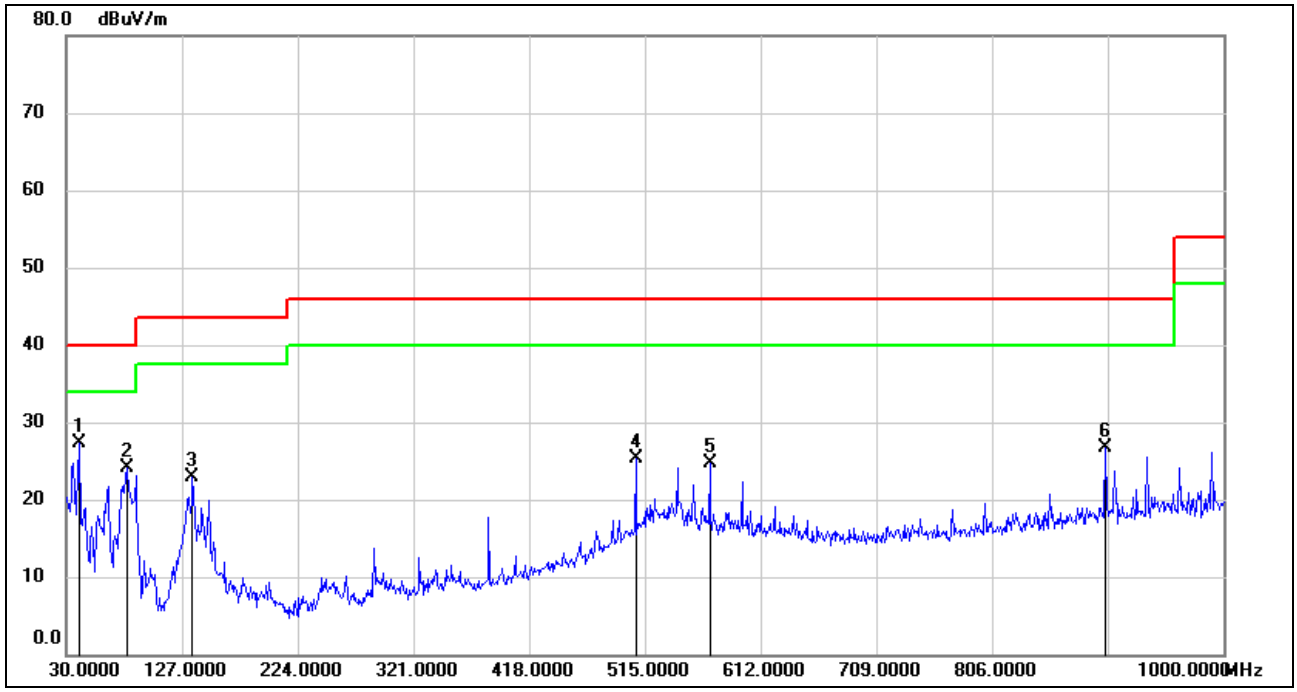
SPURIOUS EMISSIONS (HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	82.3800	32.02	-21.65	10.37	40.00	-29.63	QP
2	149.3100	37.13	-18.53	18.60	43.50	-24.90	QP
3	224.9700	32.54	-18.72	13.82	46.00	-32.18	QP
4	507.2400	32.71	-11.34	21.37	46.00	-24.63	QP
5	686.6900	30.09	-8.95	21.14	46.00	-24.86	QP
6	827.3400	31.15	-7.22	23.93	46.00	-22.07	QP

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

HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



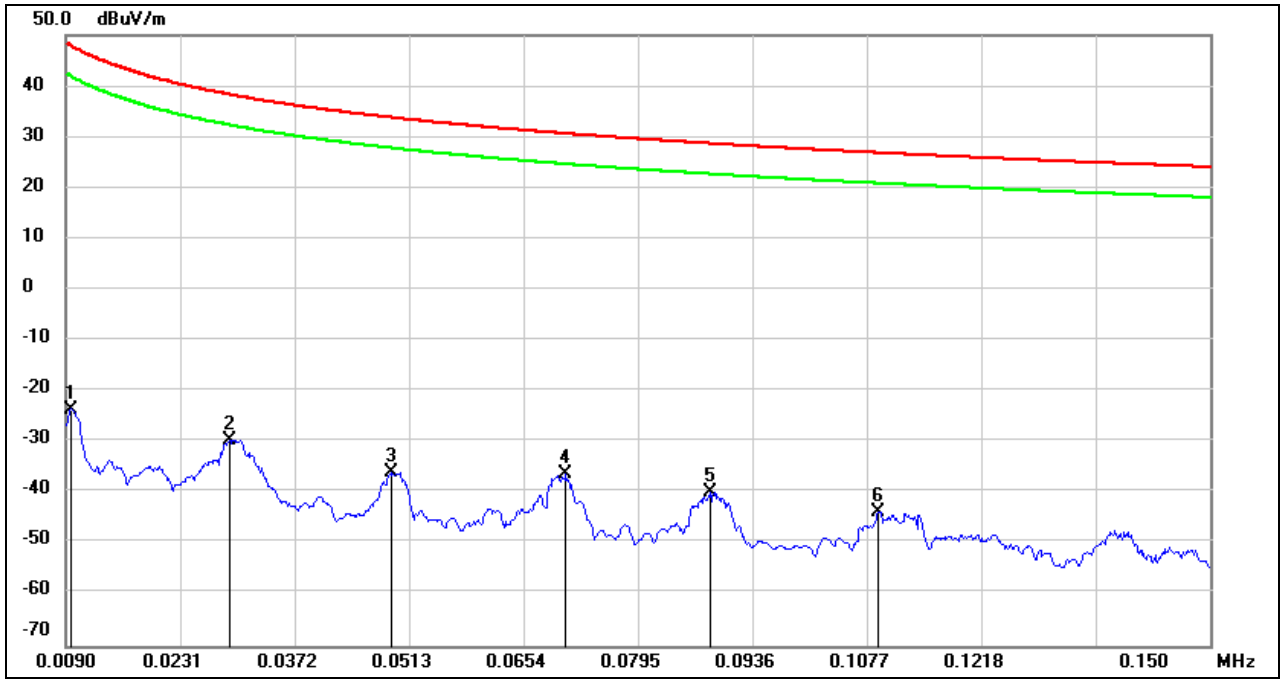
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	40.6699	47.45	-20.14	27.31	40.00	-12.69	QP
2	80.4400	45.59	-21.53	24.06	40.00	-15.94	QP
3	135.7300	42.14	-19.28	22.86	43.50	-20.64	QP
4	507.2400	36.64	-11.34	25.30	46.00	-20.70	QP
5	569.3200	35.19	-10.39	24.80	46.00	-21.20	QP
6	901.0600	32.37	-5.64	26.73	46.00	-19.27	QP

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

7.3. SPURIOUS EMISSIONS BELOW 30MHz

SPURIOUS EMISSIONS (LOOP ANTENNA FACE ON TO THE EUT)

9kHz~ 150kHz



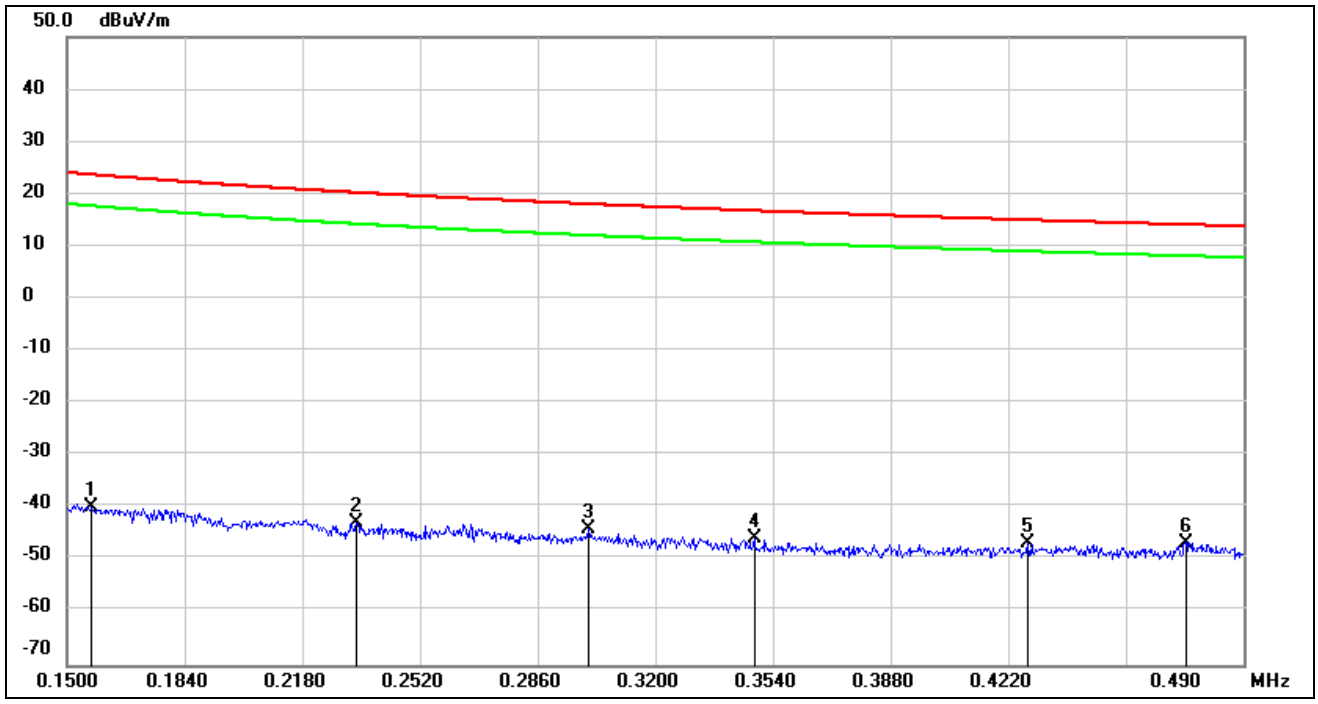
No.	Frequency	Reading	Correct	FCC Result	FCC Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.0097	77.84	-101.46	-23.62	47.82	-75.12	-3.68	-71.44	peak
2	0.0291	71.60	-101.10	-29.50	38.32	-81	-13.18	-67.82	peak
3	0.0490	65.51	-101.37	-35.86	33.80	-87.36	-17.7	-69.66	peak
4	0.0704	64.71	-100.97	-36.26	30.65	-87.76	-20.85	-66.91	peak
5	0.0883	61.18	-101.09	-39.91	28.68	-91.41	-22.82	-68.59	peak
6	0.1091	57.75	-101.40	-43.65	26.85	-95.15	-24.65	-70.50	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

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.

150kHz ~ 490kHz



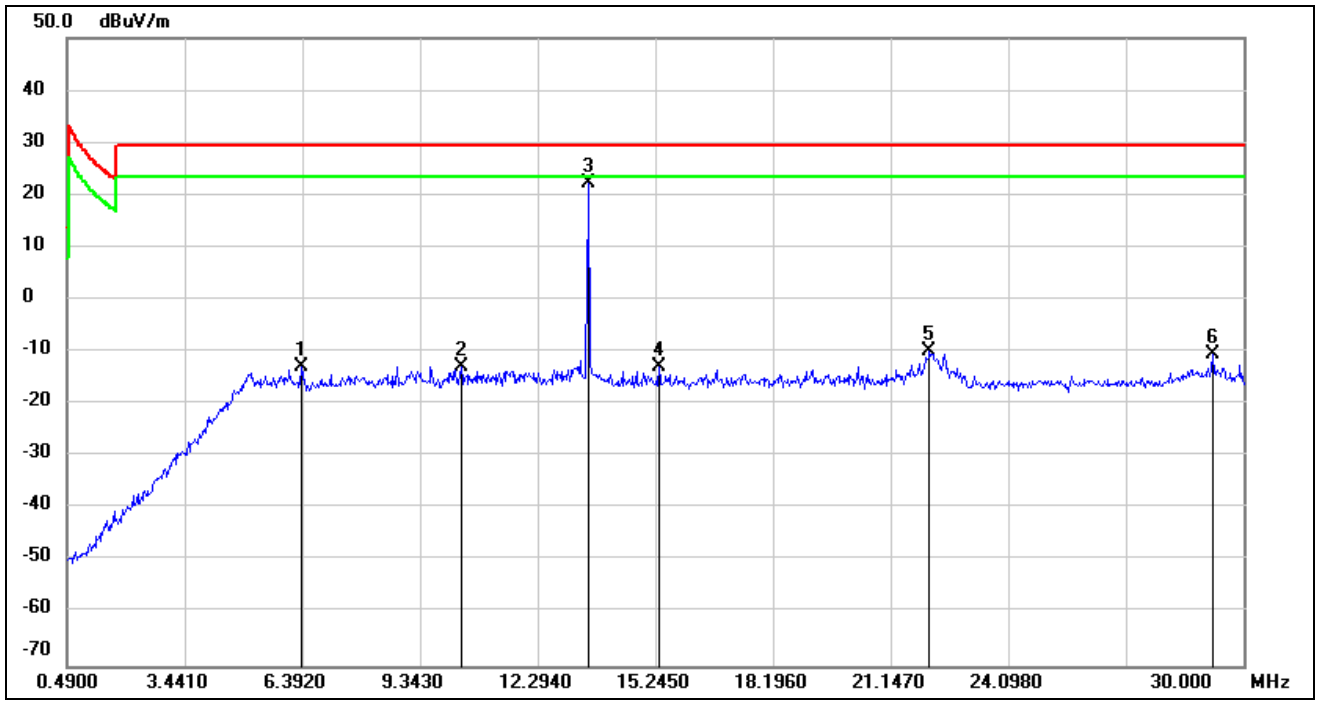
No.	Frequency	Reading	Correct	FCC Result	FCC Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.1570	62.02	-101.88	-39.86	23.68	-91.36	-27.82	-63.54	peak
2	0.2336	58.98	-101.81	-42.83	20.23	-94.33	-31.27	-63.06	peak
3	0.3004	57.61	-101.77	-44.16	18.05	-95.66	-33.45	-62.21	peak
4	0.3483	55.82	-101.76	-45.94	16.76	-97.44	-34.74	-62.70	peak
5	0.4277	54.88	-101.73	-46.85	14.98	-98.35	-36.52	-61.83	peak
6	0.4732	55.11	-101.71	-46.60	14.10	-98.1	-37.4	-60.70	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

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	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	6.3624	48.88	-61.74	-12.86	29.54	-64.36	-21.96	-42.40	peak
2	10.3757	48.51	-61.22	-12.71	29.54	-64.21	-21.96	-42.25	peak
3	13.5629	83.61	-61.41	22.20	-	-	-	-	Fundamental
4	15.3335	48.67	-61.47	-12.80	29.54	-64.3	-21.96	-42.34	peak
5	22.1206	51.05	-61.04	-9.99	29.54	-61.49	-21.96	-39.53	peak
6	29.2327	50.31	-60.71	-10.40	29.54	-61.9	-21.96	-39.94	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

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. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

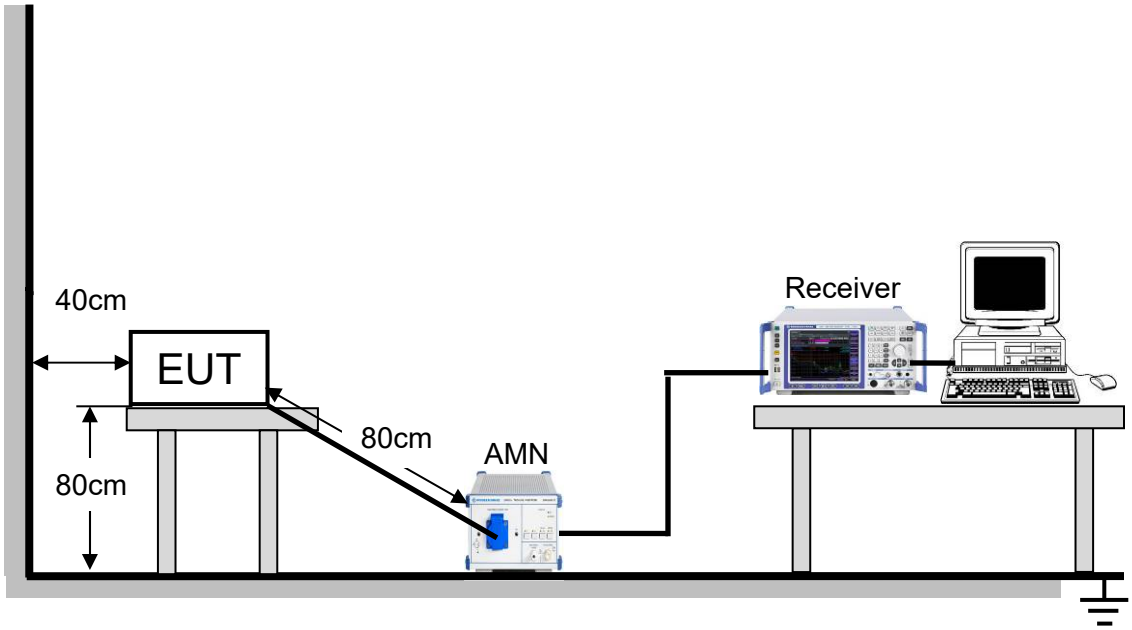
FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

TEST SETUP AND PROCEDURE



The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

1. The testing follows the guidelines in ANSI C63.10-2013.

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

3. 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.

4. 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.

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

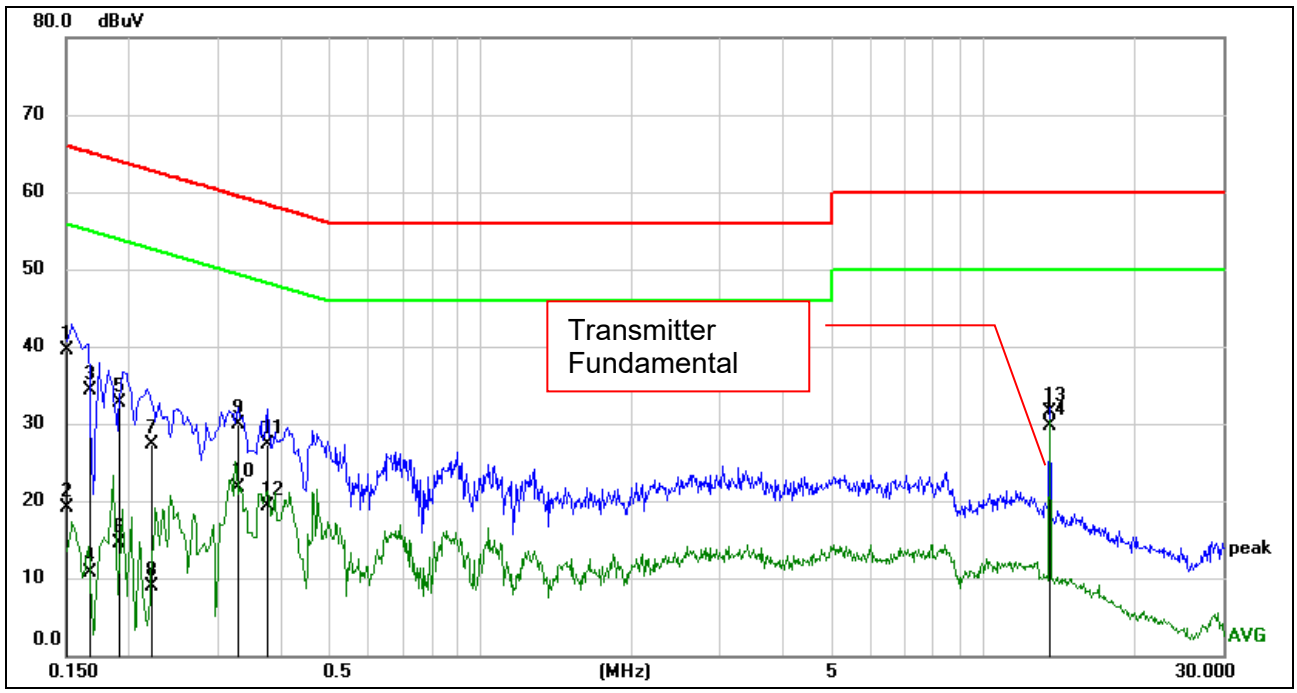
6. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

7. 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	23.1°C	Relative Humidity	55%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60Hz

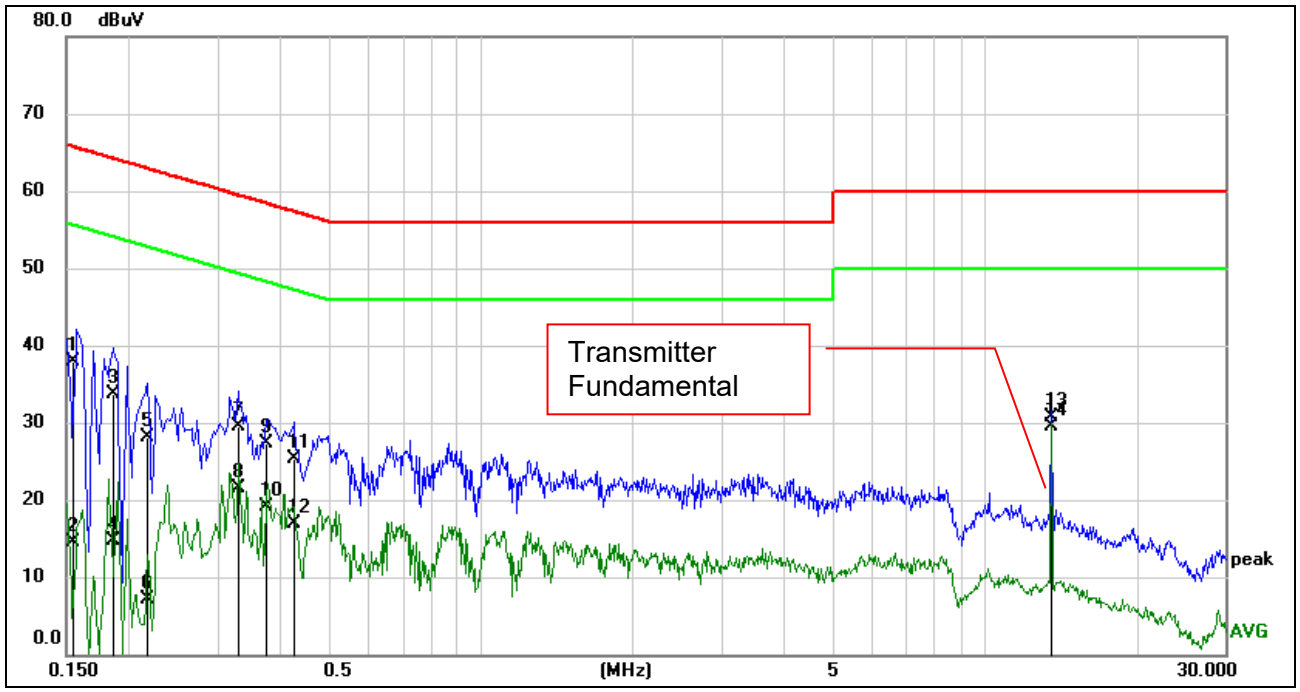
LINE N RESULTS with modified sample (transmitter terminated into a dummy load)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1507	39.42	0.01	39.43	65.96	-26.53	QP
2	0.1507	19.02	0.01	19.03	55.96	-36.93	AVG
3	0.1680	34.22	0.01	34.23	65.06	-30.83	QP
4	0.1680	10.62	0.01	10.63	55.06	-44.43	AVG
5	0.1905	32.70	0.01	32.71	64.01	-31.30	QP
6	0.1905	14.51	0.01	14.52	54.01	-39.49	AVG
7	0.2226	27.26	0.01	27.27	62.72	-35.45	QP
8	0.2226	8.87	0.01	8.88	52.72	-43.84	AVG
9	0.3277	29.90	0.01	29.91	59.51	-29.60	QP
10	0.3277	21.69	0.01	21.70	49.51	-27.81	AVG
11	0.3778	27.39	0.01	27.40	58.33	-30.93	QP
12	0.3778	19.30	0.01	19.31	48.33	-29.02	AVG
13	13.5605	31.37	0.06	31.43	60.00	-28.57	QP
14	13.5605	29.70	0.06	29.76	50.00	-20.24	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

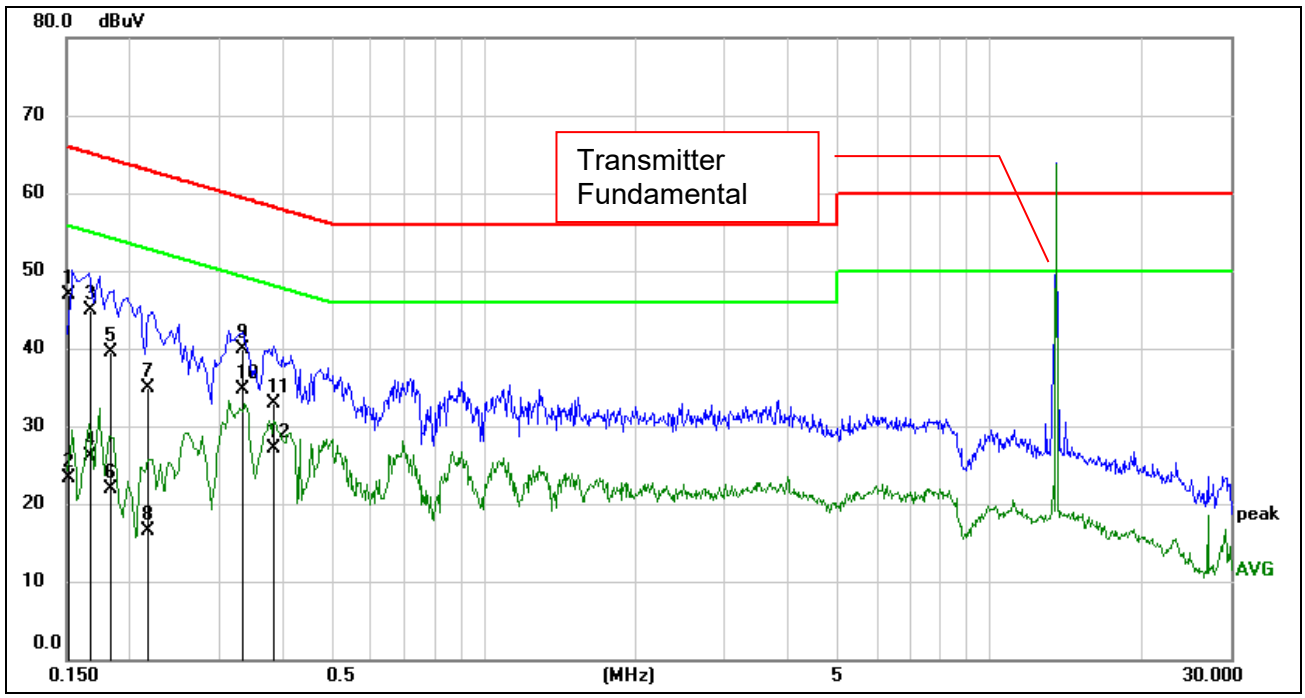
LINE L RESULTS with modified sample (transmitter terminated into a dummy load)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1543	37.84	0.01	37.85	65.77	-27.92	QP
2	0.1543	14.56	0.01	14.57	55.77	-41.20	AVG
3	0.1848	33.67	0.01	33.68	64.27	-30.59	QP
4	0.1848	14.70	0.01	14.71	54.27	-39.56	AVG
5	0.2164	28.13	0.01	28.14	62.96	-34.82	QP
6	0.2164	7.01	0.01	7.02	52.96	-45.94	AVG
7	0.3285	29.44	0.01	29.45	59.49	-30.04	QP
8	0.3285	21.48	0.01	21.49	49.49	-28.00	AVG
9	0.3734	27.32	0.01	27.33	58.42	-31.09	QP
10	0.3734	19.02	0.01	19.03	48.42	-29.39	AVG
11	0.4247	25.31	0.01	25.32	57.36	-32.04	QP
12	0.4247	16.93	0.01	16.94	47.36	-30.42	AVG
13	13.5605	30.74	0.06	30.80	60.00	-29.20	QP
14	13.5605	29.54	0.06	29.60	50.00	-20.40	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

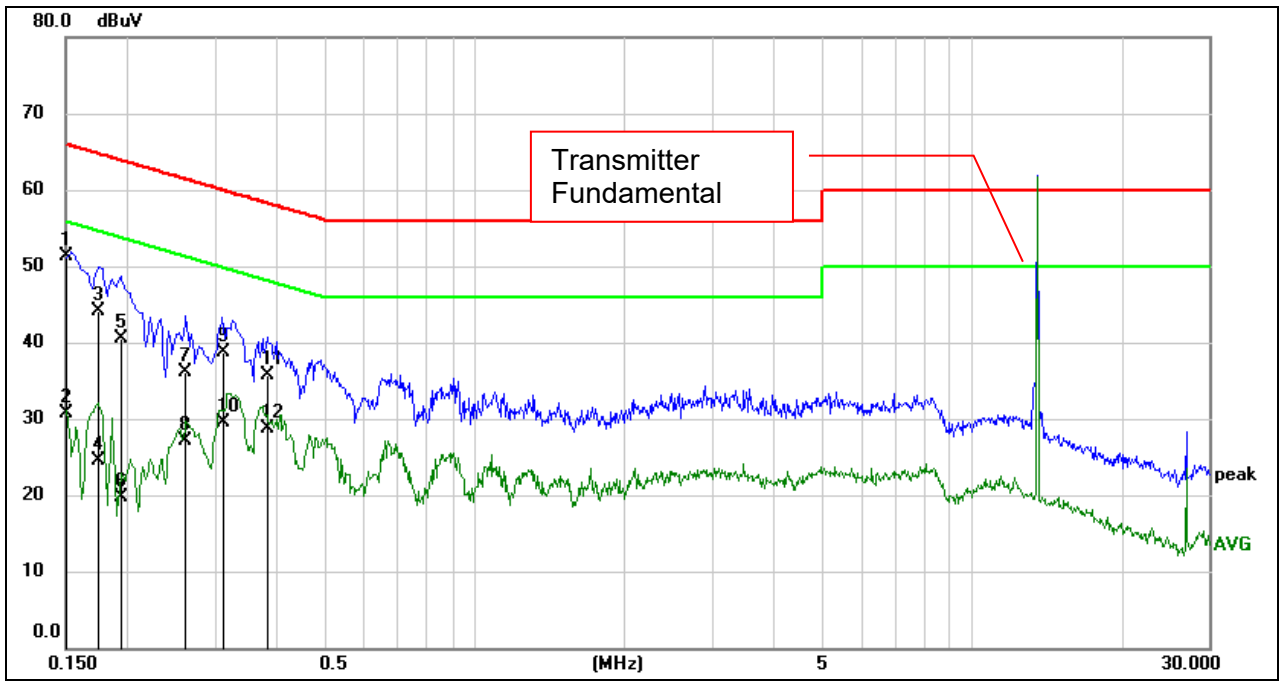
LINE N RESULTS with unmodified sample (antenna present)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1508	37.32	9.61	46.93	65.96	-19.03	QP
2	0.1508	13.69	9.61	23.30	55.96	-32.66	AVG
3	0.1669	35.20	9.61	44.81	65.11	-20.30	QP
4	0.1669	16.51	9.61	26.12	55.11	-28.99	AVG
5	0.1833	29.98	9.61	39.59	64.33	-24.74	QP
6	0.1833	12.32	9.61	21.93	54.33	-32.40	AVG
7	0.2171	25.31	9.60	34.91	62.93	-28.02	QP
8	0.2171	6.92	9.60	16.52	52.93	-36.41	AVG
9	0.3327	30.35	9.60	39.95	59.38	-19.43	QP
10	0.3327	25.01	9.60	34.61	49.38	-14.77	AVG
11	0.3861	23.21	9.60	32.81	58.15	-25.34	QP
12	0.3861	17.49	9.60	27.09	48.15	-21.06	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

LINE L RESULTS with unmodified sample (antenna present)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	41.62	9.61	51.23	66.00	-14.77	QP
2	0.1500	21.09	9.61	30.70	56.00	-25.30	AVG
3	0.1734	34.52	9.61	44.13	64.80	-20.67	QP
4	0.1734	14.89	9.61	24.50	54.80	-30.30	AVG
5	0.1938	30.88	9.60	40.48	63.87	-23.39	QP
6	0.1938	10.09	9.60	19.69	53.87	-34.18	AVG
7	0.2615	26.51	9.60	36.11	61.38	-25.27	QP
8	0.2615	17.52	9.60	27.12	51.38	-24.26	AVG
9	0.3124	29.15	9.60	38.75	59.91	-21.16	QP
10	0.3124	19.92	9.60	29.52	49.91	-20.39	AVG
11	0.3840	26.11	9.60	35.71	58.19	-22.48	QP
12	0.3840	19.14	9.60	28.74	48.19	-19.45	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

9. 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