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Test Report

Certification

FCC ID	OMD800-002 OMD803-001
Equipment Under Test	LT-800-072, LT-803-072
Test Report Serial No	V069122_01
Dates of Test	June 13, 14 and 19th, 2023
Report Issue Date	July 20, 2023

Test Specifications:	Applicant:
FCC Part 15, Subpart C	Listen Technologies 14912 Heritagecrest Way Bluffdale, UT 84065-4818 U.S.A.

NVLAP LAB CODE 100272-0

Certification of Engineering Report

This report has been prepared by VPI Laboratories, Inc. to document compliance of the device described below with the requirements of Federal Communications Commission (FCC) Part 15, Subpart C. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

Applicant	Listen Technologies
Manufacturer	Listen Technologies
Brand Name	Listen
Model Number	LT-800-072, LT-803-072
FCC ID	OMD800-002 OMD803-001

On this 20th day of July 2023, I, individually and for VPI Laboratories, Inc., certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

Although NVLAP has accredited the VPI Laboratories, Inc. EMC testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

VPI Laboratories, Inc.

Tested by: Benjamin N. Antczak

Reviewed by: Jason Stewart

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	July 20, 2023

Table of Contents

1 Client Information

1.1 Applicant

Company Name	Listen Technologies Corp. 14912 Heritage Crest Way Bluffdale, UT, 84065 U.S.A.
Contact Name	Jeff Waldvogel
Title	Compliance Engineer

1.2 Manufacturer

Company Name	Listen Technologies Corp. 14912 Heritage Crest Way Bluffdale, UT, 84065 U.S.A.
Contact Name	Jeff Waldvogel
Title	Compliance Engineer

2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	Listen
Model Number	LT-800-072, LT-803-072
Serial Number	I22C1380569
Dimensions (cm)	23.0 x 21.5 x 4.5

2.2 Description of EUT

The LT-800-072 is a professionally installed transmitter used for auditory assistance. The LT-800-072 operates in the ranges of 72.0 – 73.0 MHz, 74.6 – 74.8 MHz, and 75.2 – 76.0 MHz using a total of 57 channels, 17 designated as wide band and 40 designated as narrow band. A table of designated channels and frequencies is shown below. The LT-800-072 receives power from AC Mains via EDACPOWER ELEC. EA1024G1-120 power adapter which contains a molded ferrite on the DC side before connecting to the EUT.

The LT-803-072 is an electrically identical variant that is software limited to only 3 Wide Band Channels. (Only channels A, E, and H)

The LT-800-072 provides two inputs, one for connection to a microphone and the second for line level inputs. A monitor port using a stereo phono plug connector is available for headset connection. A mixed output port is provided using RCA-type connectors. Antenna connection is made using either a telescoping monopole screw mount located in the center of the PCB or using a BNC connection for a remote mount antenna on the rear panel of the EUT.

The LT-800-072 was tested using a remote mount dipole antenna with 1 meter elements. This antenna was found to exhibit the worst-case emissions in previous testing. Other antennas include a one meter telescoping monopole that connects directly to the PCB, a dipole antenna with 31 cm elements that connects to the BNC, and a remote dipole antenna with flexible 1 meter elements that connects to the EUT via 25 feet of RG58U coaxial cable to the BNC connectors.

Wide Band		Narrow Band			
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
A	72.1	1	72.025	21	75.425
B	72.3	2	72.075	22	75.475
C	72.5	3	72.125	23	75.525
D	72.7	4	72.175	24	75.575
E	72.9	5	72.225	25	75.625
F	75.5	6	72.275	26	75.675
G	75.7	7	72.325	27	75.725
H	75.9	8	72.375	28	75.775
I	74.7	9	72.425	29	75.825

Wide Band		Narrow Band			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
J	75.3	10	72.475	30	75.875
K	72.2	11	72.525	31	75.925
N	72.4	12	72.575	32	75.975
O	72.6	13	72.625	33	74.625
P	72.8	14	72.675	34	74.675
R	75.4	15	72.725	35	74.725
S	75.6	16	72.775	36	74.775
T	75.8	17	72.825	37	75.225
		18	72.875	38	75.725
		19	72.925	39	75.325
		20	72.975	40	75.375

This report covers the circuitry of the devices subject to FCC Part 15, Subpart C. The circuitry of the device subject to FCC Subpart B was found to be compliant and is covered in VPI Laboratories, Inc. report V069121.

2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

Brand Name Model Number Serial Number	Description	Name of Interface Ports / Interface Cables
BN: Listen MN: LT-800-072 (Note 1) SN: I22C1380569	Audio Assistance Transmitter	See Section 2.4
BN: Samsung MN: GalaxyTab3 SN: N/A	Tablet with 1kHz Tone Generator	Input 2 / 3.5mm to RCA Cable (Note 2)

Notes: (1) EUT

(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

2.4 Interface Ports on EUT

Name of Ports	No. of Ports Fitted to EUT	Cable Description/Length
Input 1	1 of 1	XLR to 150Ω Termination / 1 meter
Input 2	1 of 1	3.5mm to RCA / 1 meter
Mix Output	1 of 1	RCA to 1kΩ termination / 1 meter

2.5 Modification Incorporated/Special Accessories on EUT

There were no modifications or special accessories required to comply with the specification.

2.6 Deviation from Test Standard

There were no deviations from the test specification.

3 Test Specification, Methods and Procedures

3.1 Test Specification

Title	FCC PART 15, Subpart C (47 CFR 15) 15.203, 15.207, and 15.237 Limits and methods of measurement of radio interference characteristics of radio frequency devices.
Purpose of Test	The tests were performed to demonstrate initial compliance

3.2 Methods & Procedures

3.2.1 §15.203 Antenna Requirement

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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

3.2.2 §15.207 Conducted Limits

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.50*	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

Table 1: Limits for conducted emissions at mains ports of Class B ITE.

3.2.3 §15.237 Operation in the bands 72.0–73.0 MHz, 74.6–74.8 MHz, and 75.3–76.0 MHz

a) The Intentional radiator shall be restricted to use as an auditory assistance device.

b) Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the above specified frequency ranges.

c) The field strength of any emissions within the permitted 200 kHz band shall not exceed 80 millivolts/meter at 3 meters. The field strength of an emissions radiated on any frequency outside of the specified 200 kHz band shall meet the general radiated limits specified in §15.209. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

3.3 Test Procedure

VPI Laboratories, Inc. is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Lab Code: 100272-0, which is effective until September 30, 2024. VPI Laboratories, Inc. carries FCC Accreditation Designation Number US5263. VPI Laboratories main office is located at 313 W 12800 S, Suite 311, Draper, UT 84020. The testing was performed according to the procedures in ANSI C63.10-2013, KDB 558074, and 47 CFR Part 15.

4 Operation of EUT During Testing

4.1 Operating Environment

Power Supply	120 VAC
AC Mains Frequency	60 Hz

4.2 Operating Modes

The EUT transmitted constantly at maximum power using a 1kHz test tone externally generated by a Tablet and modulated by the EUT at each of the channels to be tested. A narrow band channel and a wide band channel were chosen for testing in each of the 3 operating bands when testing the LT-800C-072. The wide-band channels used in testing were C, I, and H. The narrow-band channels used in testing were 11, 25, and 35. Each antenna was tested, and worst case was found to be the remote LA-122 antenna connected to BNC via 25 feet of RG58U coaxial cable.

4.3 EUT Exercise Software

No special software was required to exercise the EUT.

5 Summary of Test Results

5.1 FCC Part 15, Subpart C

5.1.1 Summary of Tests

Section	Environmental Phenomena	Frequency Range (MHz)	Result
15.203	Antenna Requirements	Structural requirement	Complied
15.207	Conducted Disturbance at Mains Ports	0.15 to 30	Complied
15.237(a)	Device Usage	N/A	Complied
15.237(b)	Fundamental Emission Operating Band	72.0-73.0 74.6-74.8 75.2-76.0	Complied
15.237(d)	Fundamental Field Strength	72.0-73.0 74.6-74.8 75.2-76.0	Complied
15.237(d)	Field Strength of Spurious Emissions	0.009 - 1000	Complied

5.2 Result

In the configuration tested, the EUT complied with the requirements of the specification.

6 Measurements, Examinations and Derived Results

6.1 General Comments

This section contains the test results only. Details of the test methods used and a list of the test equipment used during the measurements can be found in Section 7 of this report.

When calculations in this report require EUT antenna gains, those values have been provided by the manufacturer unless otherwise noted.

6.2 Test Results

6.2.1 §15.203 Antenna Requirements

The EUT is a professionally installed and maintained system. Either a direct connect screw-on antenna or antennas connected to the base unit via a coaxial cable with a BNC connectors are provided by the manufacturer.

Result

The EUT complied with the specification.

6.2.2 §15.207 Conducted Emissions at AC Mains Ports (Hot Lead)

Frequency (MHz)	Detector	Receiver Reading (dBµV)	Correction Factor (dB)	Measured Level (dBµV)	Class B Limit (dBµV)	Margin (dB)
0.15	Quasi-Peak (Note 2)	42.1	9.9	52.0	65.8	-13.8
0.15	Average (Note 2)	27.3	9.9	37.2	55.8	-18.6
0.16	Quasi-Peak (Note 2)	41.8	9.9	51.7	65.5	-13.8
0.16	Average (Note 2)	28.2	9.9	38.1	55.5	-17.4
0.20	Peak (Note 1)	37.8	9.9	47.7	53.5	-5.8
0.48	Peak (Note 1)	31.6	10.0	41.5	46.3	-4.7
0.51	Quasi-Peak (Note 2)	33.5	10.0	43.4	56.0	-12.6
0.51	Average (Note 2)	23.1	10.0	33.0	46.0	-13.0
0.53	Quasi-Peak (Note 2)	32.2	10.0	42.1	56.0	-13.9
0.53	Average (Note 2)	22.0	10.0	31.9	46.0	-14.1
0.64	Peak (Note 1)	30.2	10.0	40.2	46.0	-5.8
0.96	Peak (Note 1)	28.7	10.0	38.6	46.0	-7.4
1.4	Peak (Note 1)	28.3	10.0	38.3	46.0	-7.7
1.7	Peak (Note 1)	28.6	10.0	38.6	46.0	-7.4
2.2	Peak (Note 1)	28.8	10.0	38.8	46.0	-7.2
3.9	Peak (Note 1)	28.1	10.2	38.3	46.0	-7.7
5.0	Peak (Note 1)	27.7	10.3	37.9	50.0	-12.1

Frequency (MHz)	Detector	Receiver Reading (dBµV)	Correction Factor (dB)	Measured Level (dBµV)	Class B Limit (dBµV)	Margin (dB)
12.7	Peak (Note 1)	26.3	10.7	37.0	50.0	-13.0
13.3	Peak (Note 1)	26.1	10.8	36.9	50.0	-13.2
17.9	Peak (Note 1)	32.6	11.1	43.7	50.0	-6.3
21.1	Peak (Note 1)	25.0	11.4	36.3	50.0	-13.7
26.7	Peak (Note 1)	22.0	11.8	33.8	50.0	-16.2

Note 1: The reference detector used for the measurements was Quasi-Peak or Peak and the data was compared to the average limit; therefore, the EUT was deemed to meet both the average and quasi-peak limits.
Note 2: The reference detector used for the measurements was quasi-peak and average and the data was compared to the respective limits.

Result

The EUT complied with the specification limit by a margin of 4.7 dB.

6.2.3 §15.207 Conducted Emissions at AC Mains Ports (Neutral Lead)

Frequency (MHz)	Detector	Receiver Reading (dBµV)	Correction Factor (dB)	Measured Level (dBµV)	Class B Limit (dBµV)	Margin (dB)
0.15	Quasi-Peak (Note 2)	42.4	9.9	52.4	65.8	-13.4
0.15	Average (Note 2)	27.4	9.9	37.3	55.8	-18.5
0.16	Quasi-Peak (Note 2)	42.5	9.9	52.4	65.7	-13.2
0.16	Average (Note 2)	29.3	9.9	39.2	55.7	-16.5
0.20	Peak (Note 1)	38.3	9.9	48.2	53.5	-5.3
0.51	Quasi-Peak (Note 2)	33.7	10.0	43.6	56.0	-12.4
0.51	Average (Note 2)	22.6	10.0	32.6	46.0	-13.4
0.52	Quasi-Peak (Note 2)	33.1	10.0	43.0	56.0	-13.0
0.52	Average (Note 2)	23.0	10.0	32.9	46.0	-13.1
0.64	Peak (Note 1)	30.2	10.0	40.2	46.0	-5.8
0.96	Peak (Note 1)	29.3	10.0	39.3	46.0	-6.7
1.3	Peak (Note 1)	29.2	10.0	39.2	46.0	-6.8
1.5	Peak (Note 1)	29.0	10.0	39.0	46.0	-7.0
1.8	Peak (Note 1)	28.5	10.0	38.5	46.0	-7.5
4.9	Peak (Note 1)	26.9	10.3	37.2	46.0	-8.8
13.4	Peak (Note 1)	25.7	10.8	36.5	50.0	-13.5
17.7	Peak (Note 1)	30.7	11.1	41.7	50.0	-8.3
21.2	Peak (Note 1)	23.3	11.4	34.7	50.0	-15.3

Frequency (MHz)	Detector	Receiver Reading (dBµV)	Correction Factor (dB)	Measured Level (dBµV)	Class B Limit (dBµV)	Margin (dB)
26.3	Peak (Note 1)	22.0	11.8	33.8	50.0	-16.2
30.0	Peak (Note 1)	14.5	12.1	26.6	50.0	-23.4

Note 1: The reference detector used for the measurements was Quasi-Peak or Peak and the data was compared to the average limit; therefore, the EUT was deemed to meet both the average and quasi-peak limits.
Note 2: The reference detector used for the measurements was quasi-peak and average and the data was compared to the respective limits.

Result

The EUT complied with the specification limit by a margin of 5.3 dB.

6.2.1 §15.237(a) Device Usage

The EUT is an auditory assistance device.

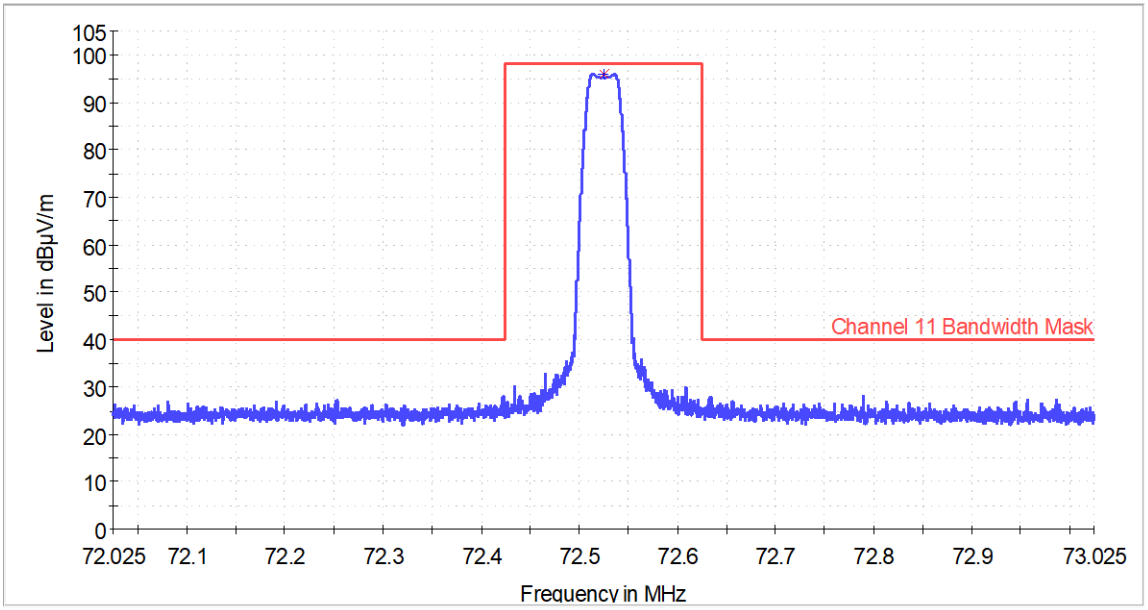
Result

The EUT complied with the specification.

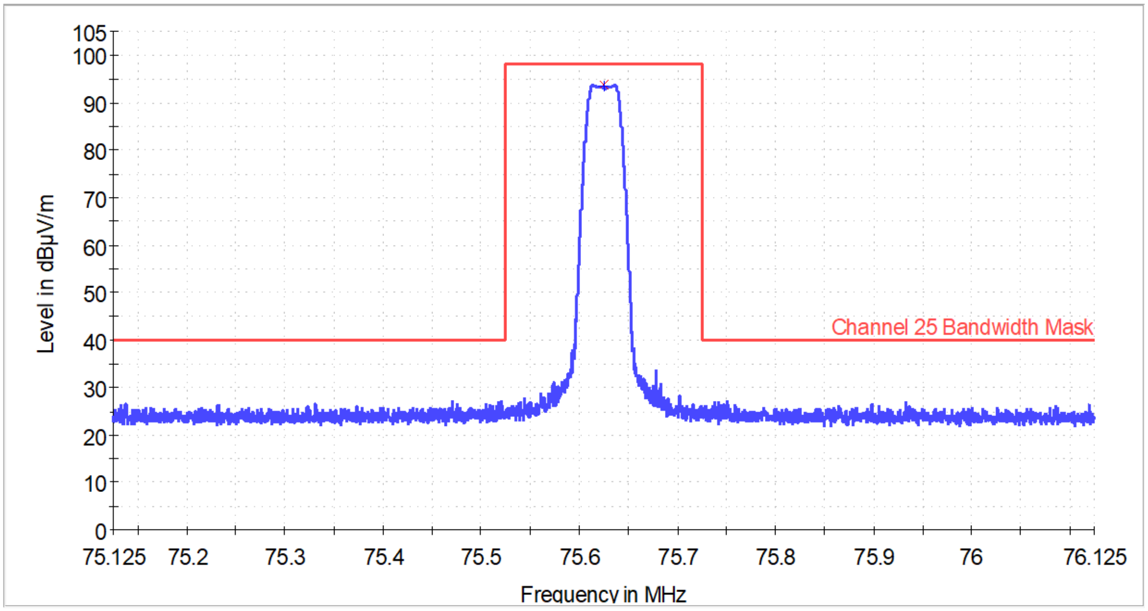
6.2.2 §15.237(b) Fundamental Emission Operating Band

The plots below show the fundamental emission residing fully within a 200 kHz band that is centered on the emission. Plots below utilize max-peak detector with a 10kHz RBW and 30kHz VBW. No emissions were seen exceeding the average limits.

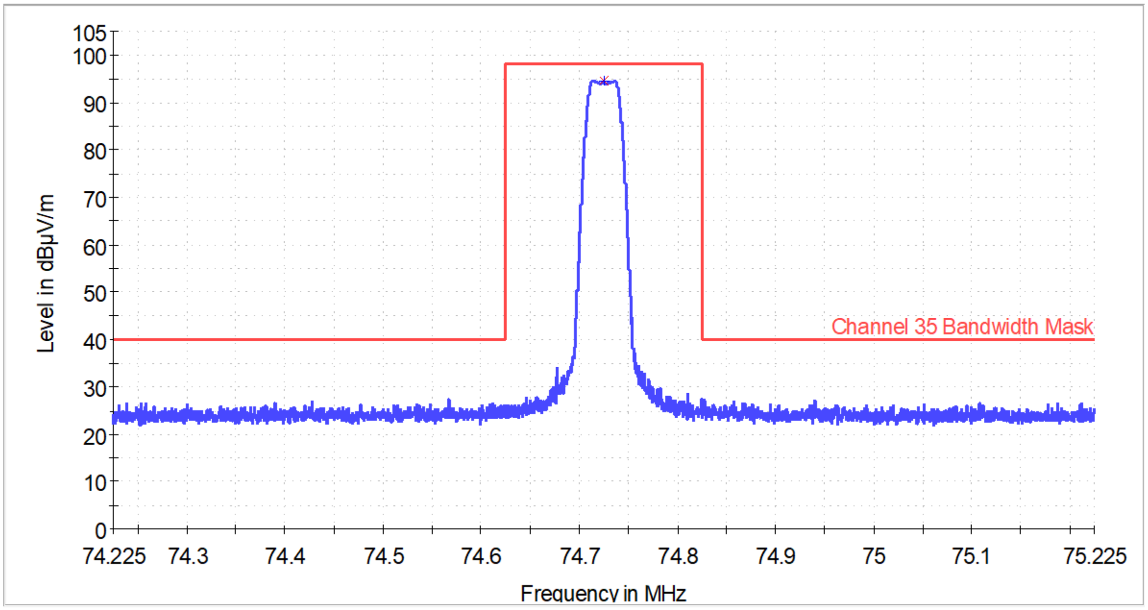
Antenna LA-122 (BNC Port Worst Case):



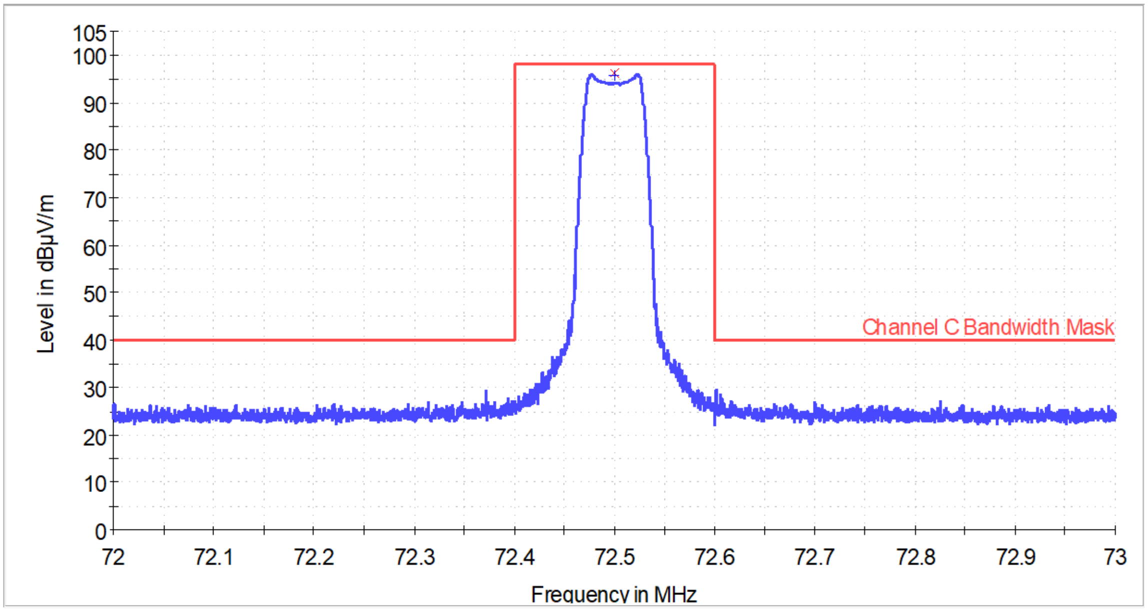
Plot 1: Channel 11 Emission Band, Antenna LA-122



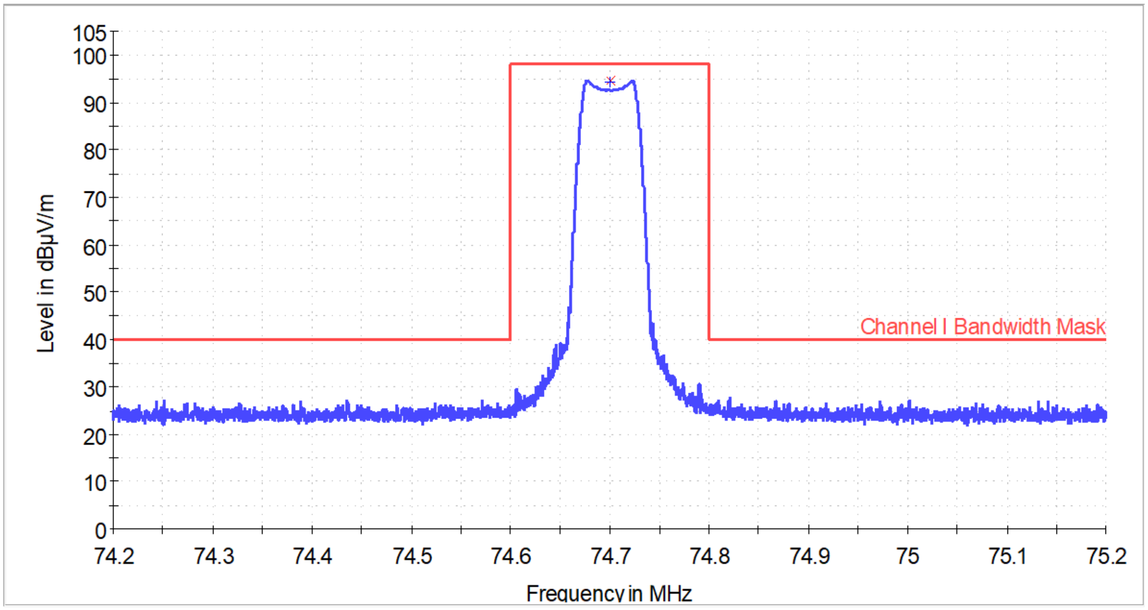
Plot 2: Channel 25 Emission Band, Antenna LA-122



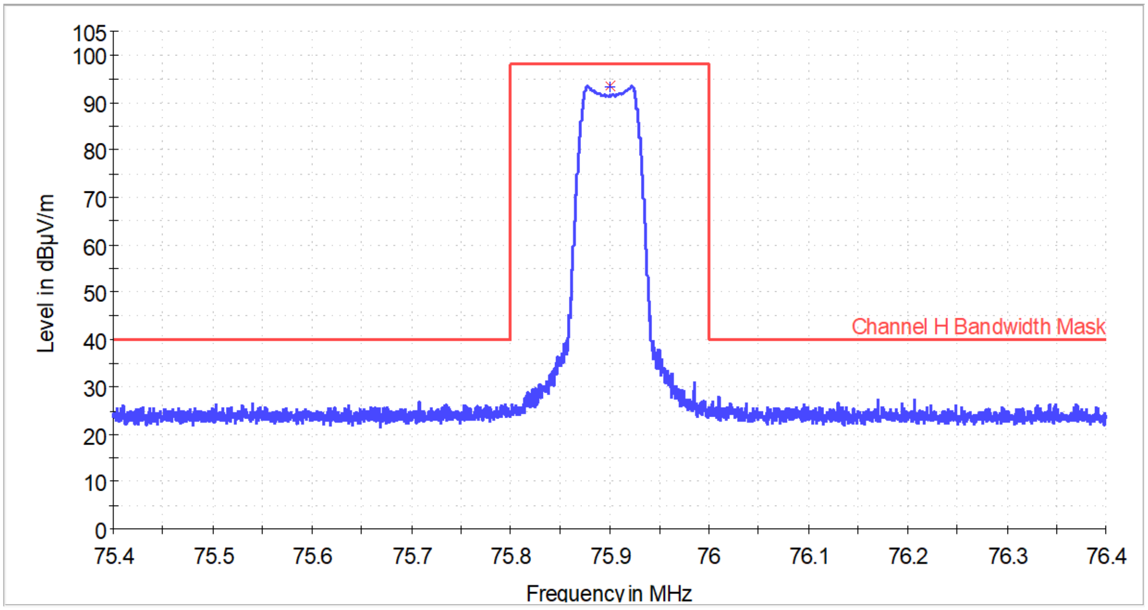
Plot 3: Channel 35 Emission Band, Antenna LA-122



Plot 4: Channel C Emission Band, Antenna LA-122

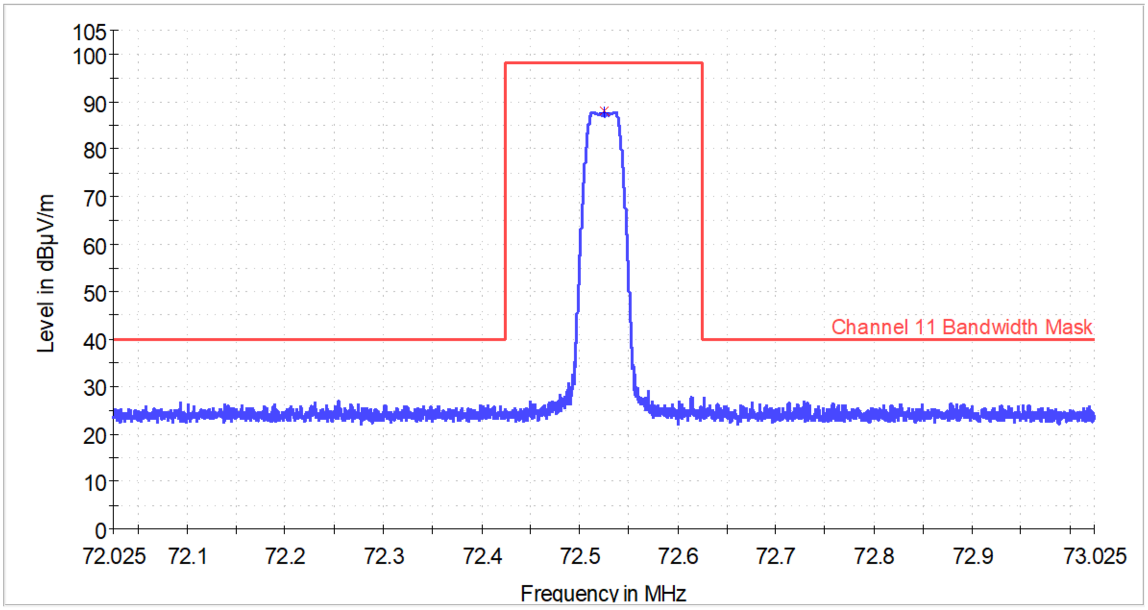


Plot 5: Channel I Emission Band, Antenna LA-122

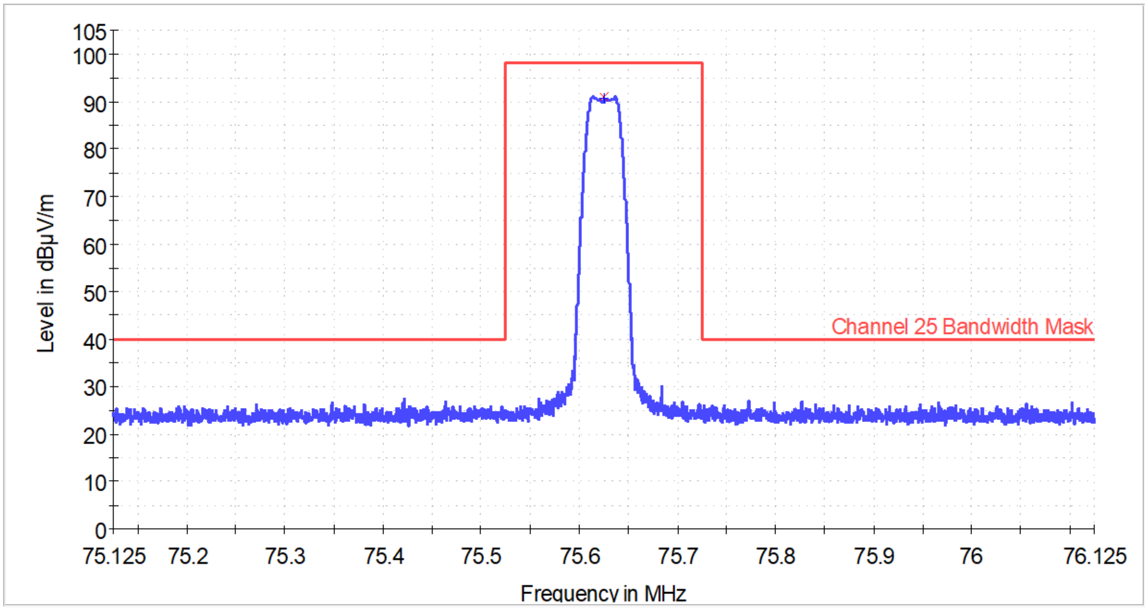


Plot 6: Channel H Emission Band, Antenna LA-122

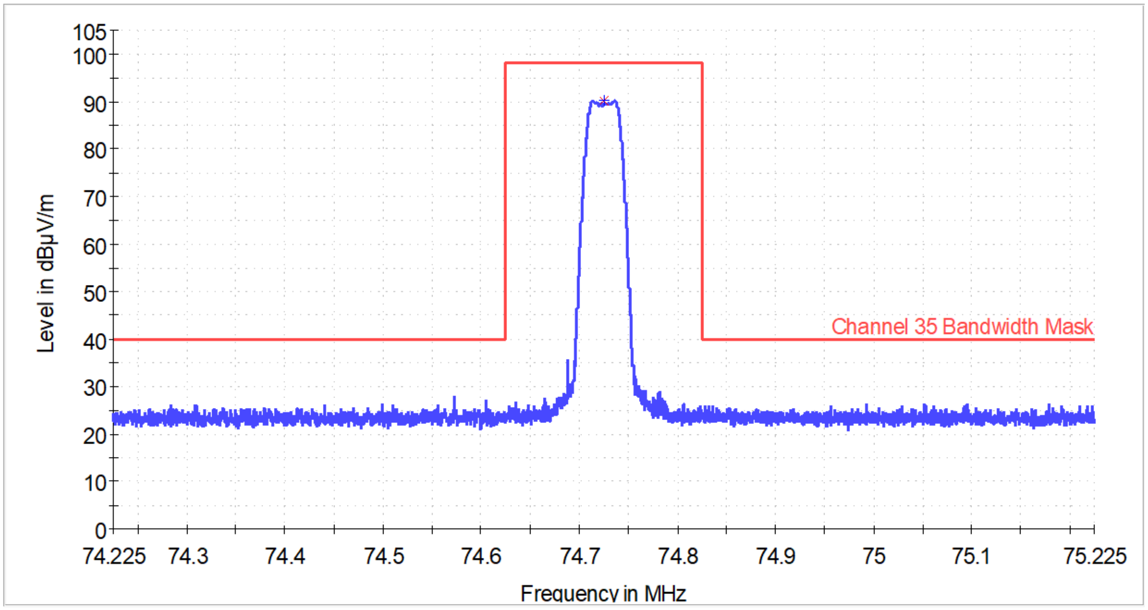
Antenna LA-106 (Top Port Worst Case):



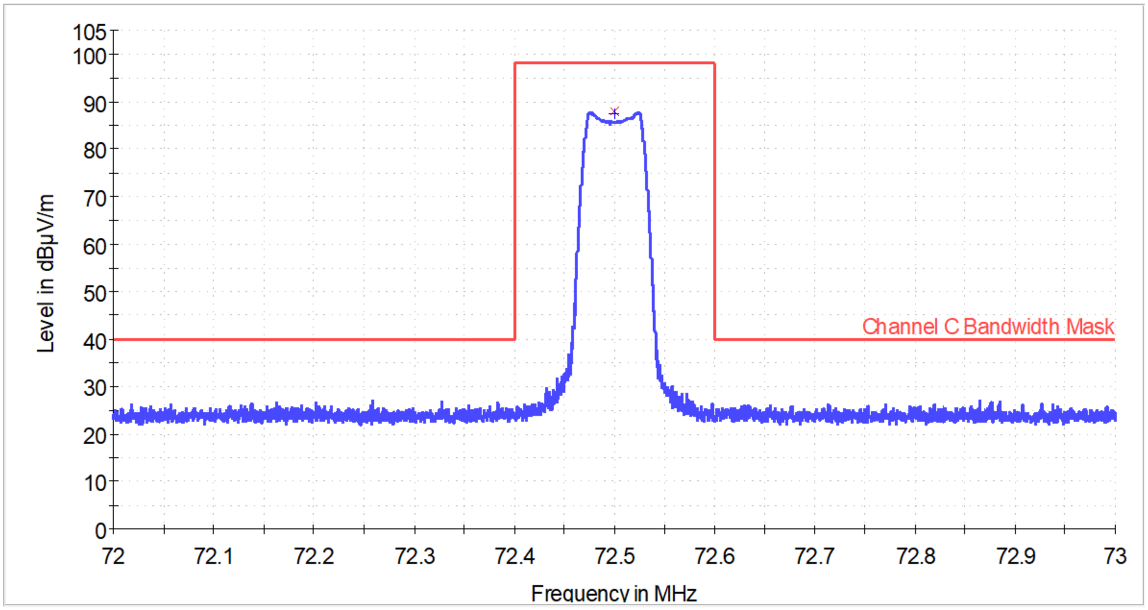
Plot 7: Channel 11 Emission Band, Antenna LA-106



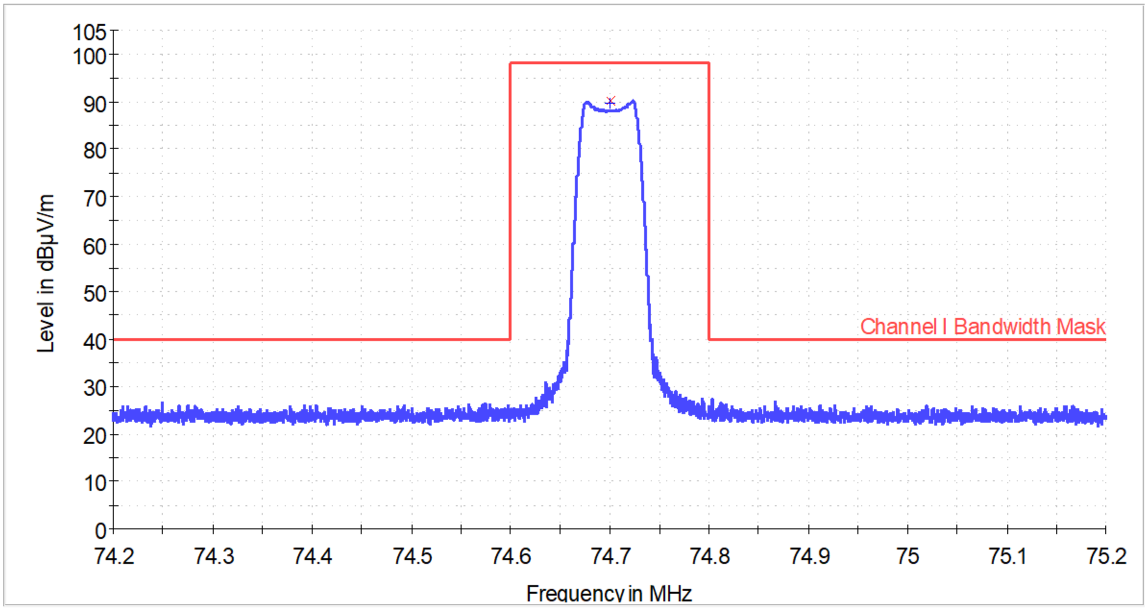
Plot 8: Channel 25 Emission Band, Antenna LA-106



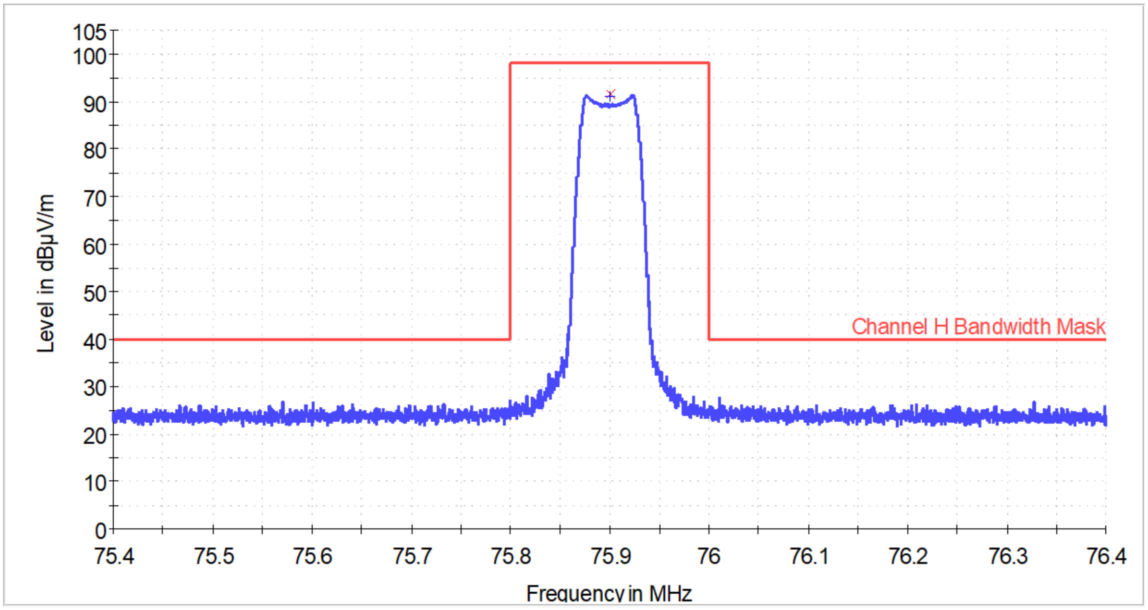
Plot 9: Channel 35 Emission Band, Antenna LA-106



Plot 10: Channel C Emission Band, Antenna LA-106

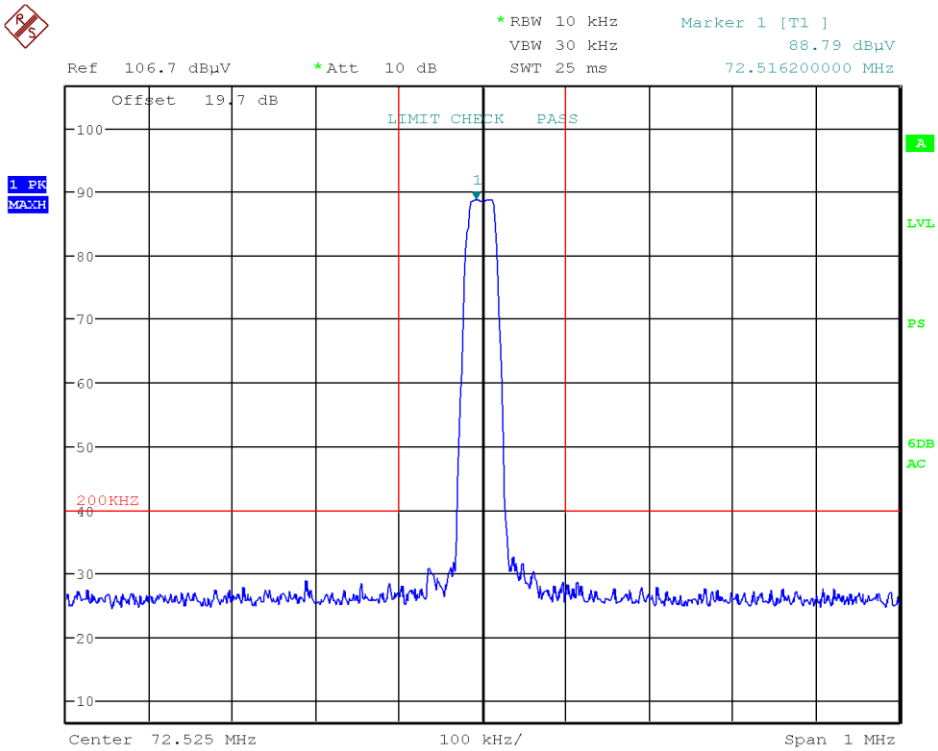


Plot 11: Channel I Emission Band, Antenna LA-106

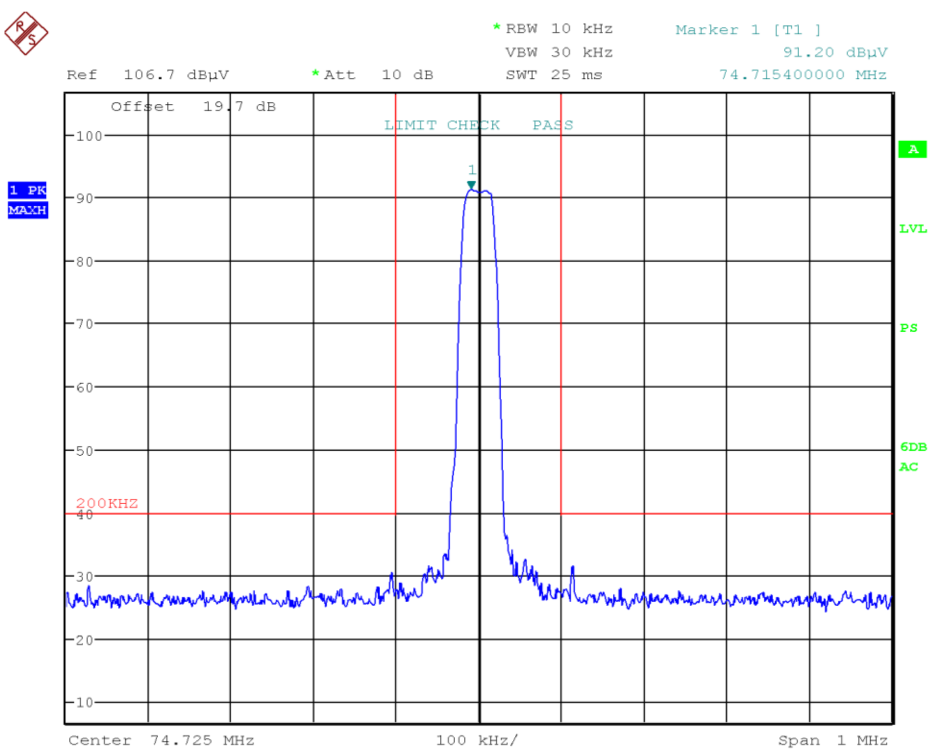


Plot 12: Channel H Emission Band, Antenna LA-106

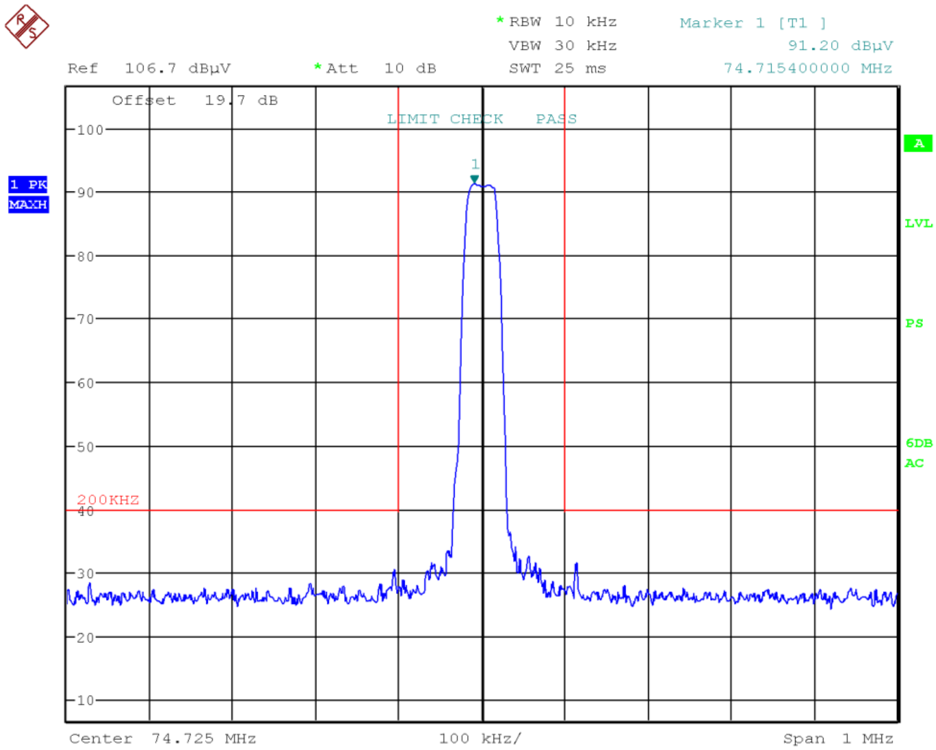
Antenna LA-123:



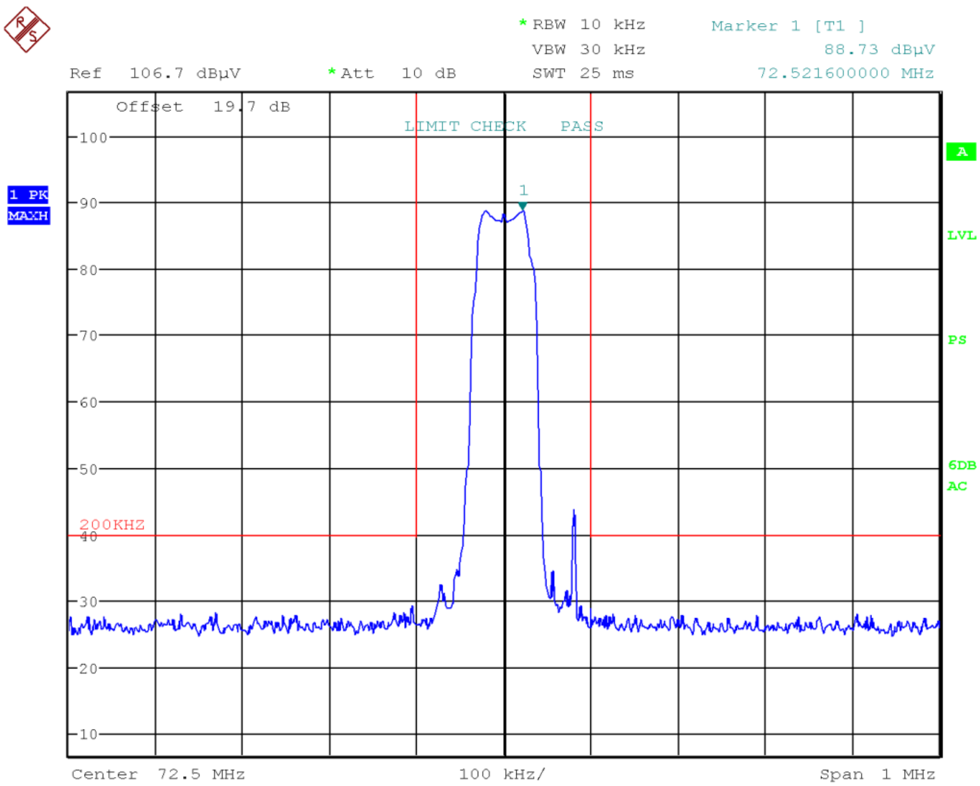
Plot 13: Channel 11 Emission Band, Antenna LA-123



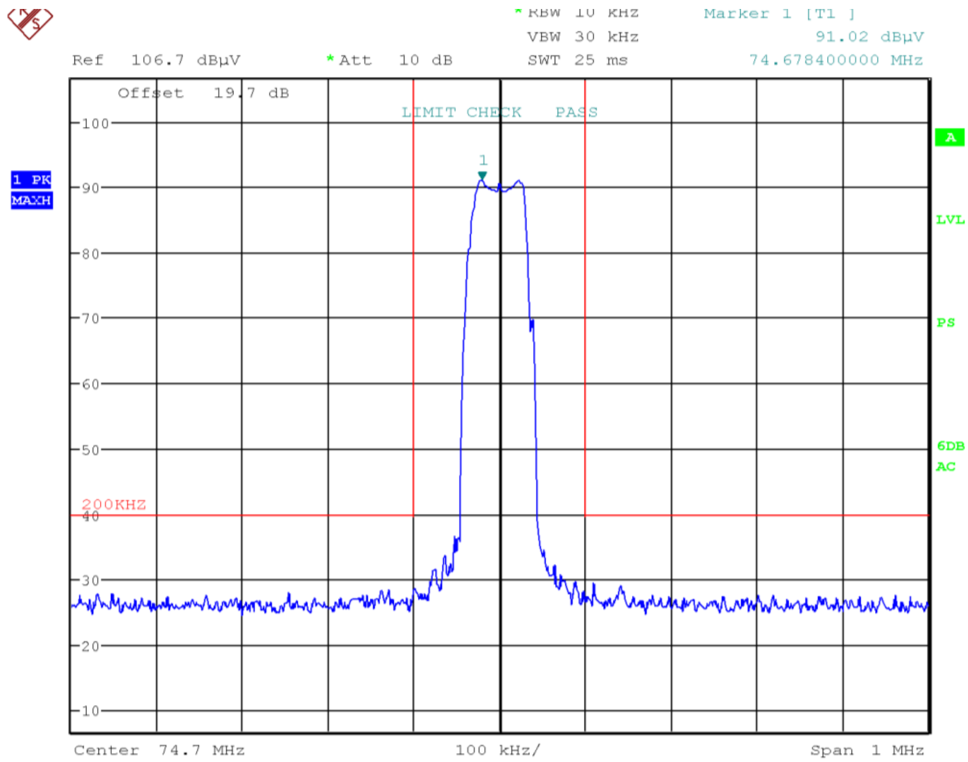
Plot 14: Channel 25 Emission Band, Antenna LA-123



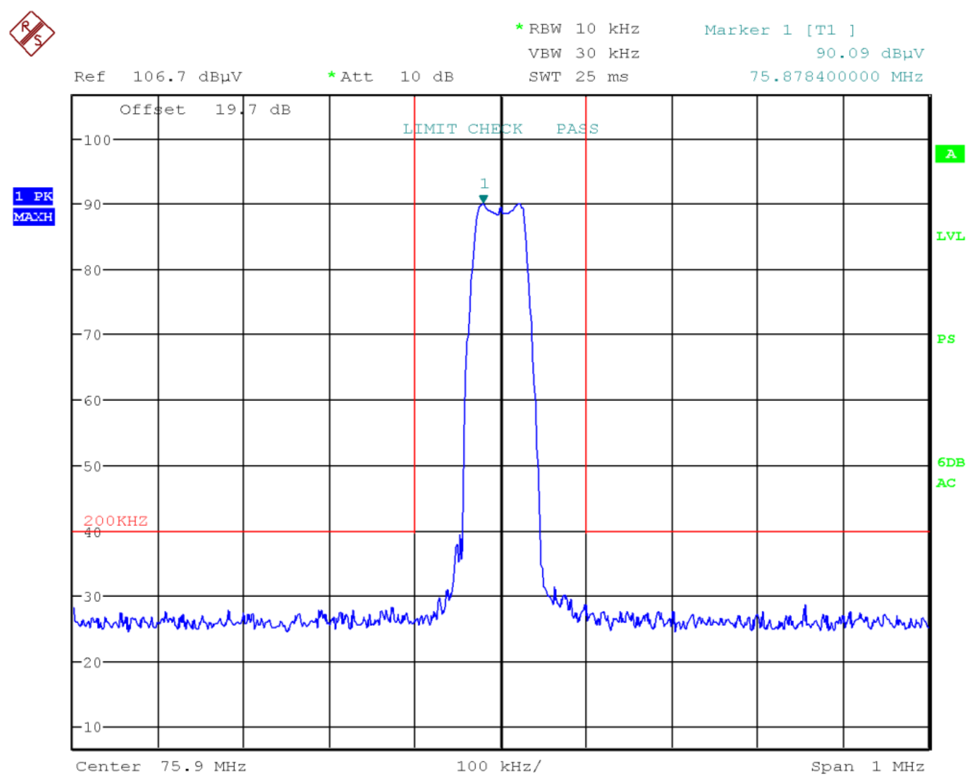
Plot 15: Channel 35 Emission Band, Antenna LA-123



Plot 16: Channel C Emission Band, Antenna LA-123



Plot 17: Channel I Emission Band, Antenna LA-123



Plot 18: Channel H Emission Band, Antenna LA-123

6.2.3 §15.237(c) Fundamental and Spurious Emission Field Strengths

The table below shows the emissions from the EUT measured at 3 meters for each of the channels tested. The highest emission seen at each of the frequencies is shown below and the polarity of the antenna reported.

6.2.3.1 Transmitting at Channel 11

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
72.5	Peak	Vertical	81.2	14.8	96.0	118.1	-22.1
72.5	Average	Vertical	81.1	14.8	95.9	98.1	-2.2
145.1	Peak	Vertical	34.1	-9.4	24.7	43.5	-18.8
217.6	Peak	Vertical	28.0	-6.8	21.2	46.0	-22.8
290.1	Peak	Vertical	27.8	-4.6	23.2	46.0	-23.1
362.5	Peak	Vertical	23.8	-0.9	22.9	46.0	-21.3
435.2 (Note 1)	Peak	Vertical	23.8	0.9	24.7	46.0	-17.4
507.5 (Note 1)	Peak	Vertical	25.4	3.2	28.6	46.0	-13.8
580.0 (Note 1)	Peak	Vertical	27.4	4.8	32.2	46.0	-15.1
652.7 (Note 1)	Peak	Vertical	24	6.9	30.9	46.0	-13.2
725.3 (Note 1)	Peak	Horizontal	24.3	8.5	32.8	46.0	-22.8
Note 1: No emission was detected above the noise floor measurement.							

6.2.3.2 Transmitting at Channel 25

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
75.6	Peak	Vertical	79.1	14.7	93.8	118.1	-24.3
75.6	Average	Vertical	78.9	14.7	93.6	98.1	-4.5
151.3	Peak	Vertical	29.2	-8.5	20.7	43.5	-22.8
226.9	Peak	Vertical	26.9	-6.3	20.6	46.0	-25.4

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
302.3 (Note 1)	Peak	Horizontal	28.7	-4.2	24.5	46.0	-21.5
378.1 (Note 1)	Peak	Horizontal	27.2	-0.3	26.9	46.0	-19.1
453.8 (Note 1)	Peak	Horizontal	24.8	1.8	26.6	46.0	-19.4
529.4 (Note 1)	Peak	Horizontal	26.9	5.2	32.1	46.0	-13.9
604.9 (Note 1)	Peak	Vertical	27.2	6.3	33.5	46.0	-12.5
680.6 (Note 1)	Peak	Vertical	24.1	8.5	32.6	46.0	-13.4
756.3 (Note 1)	Peak	Vertical	23.8	8.8	32.6	46.0	-13.4
Note 1: No emission was detected above the noise floor measurement.							

6.2.3.3 Transmitting at Channel 35

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
74.7	Peak	Vertical	80.0	14.7	94.7	118.1	-23.4
74.7	Average	Vertical	79.8	14.7	94.5	98.1	-3.6
149.5	Peak	Vertical	32.3	-8.8	23.5	43.5	-20.0
224.2	Peak	Vertical	28.9	-6.5	22.4	46.0	-23.6
298.9	Peak	Horizontal	26.1	-4.4	21.7	46.0	-24.3
373.6 (Note 1)	Peak	Vertical	26.7	-0.5	26.2	46.0	-19.8
448.3 (Note 1)	Peak	Vertical	24.3	1.4	25.7	46.0	-20.3
523.1 (Note 1)	Peak	Vertical	26.6	4.6	31.2	46.0	-14.8
597.9 (Note 1)	Peak	Horizontal	25.3	5.8	31.1	46.0	-14.9

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
672.5 (Note 1)	Peak	Horizontal	22.9	8.0	30.9	46.0	-15.1
747.3 (Note 1)	Peak	Vertical	24.2	8.5	32.7	46.0	-13.3
Note 1: No emission was detected above the noise floor measurement.							

6.2.3.4 Transmitting at Channel C

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
72.5	Peak	Vertical	81.4	14.8	96.2	118.1	-21.9
72.5	Average	Vertical	80.8	14.8	95.6	98.1	-2.5
145.0	Peak	Vertical	33.5	-9.4	24.1	43.5	-19.4
217.5	Peak	Horizontal	27.8	-6.8	21.0	46.0	-25.0
290.3	Peak	Horizontal	30.0	-4.6	25.4	46.0	-20.6
362.6 (Note 1)	Peak	Horizontal	26.0	-0.9	25.1	46.0	-20.9
435.0 (Note 1)	Peak	Horizontal	25.4	0.9	26.3	46.0	-19.7
507.5 (Note 1)	Peak	Horizontal	27.0	3.2	30.2	46.0	-15.8
580.0 (Note 1)	Peak	Vertical	23.9	4.8	28.7	46.0	-17.3
652.5 (Note 1)	Peak	Vertical	23.0	6.9	29.9	46.0	-16.1
725.0 (Note 1)	Peak	Vertical	23.5	8.5	32.0	46.0	-14.0
Note 1: No emission was detected above the noise floor measurement.							

6.2.3.5 Transmitting at Channel I

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
74.7	Peak	Vertical	80.0	14.7	94.7	118.1	-23.4
74.7	Average	Vertical	79.5	14.7	94.2	98.1	-3.9
149.4	Peak	Vertical	8.7	15.3	24.0	43.5	-19.5
223.9	Peak	Vertical	28.2	-6.5	21.7	46.0	-24.3
298.7	Peak	Vertical	26.4	-4.4	22.0	46.0	-24.0
373.5 (Note 1)	Peak	Horizontal	25.7	-0.6	25.1	46.0	-20.9
447.1 (Note 1)	Peak	Vertical	26.7	1.4	28.1	46.0	-17.9
521.6 (Note 1)	Peak	Vertical	26.4	4.5	30.9	46.0	-15.1
596.6 (Note 1)	Peak	Horizontal	26.2	5.7	31.9	46.0	-14.1
670.5 (Note 1)	Peak	Horizontal	25.9	7.8	33.7	46.0	-12.3
745.0 (Note 1)	Peak	Vertical	22.9	8.5	31.4	46.0	-14.6
Note 1: No emission was detected above the noise floor measurement.							

6.2.3.6 Transmitting at Channel H

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
75.9	Peak	Vertical	78.9	14.7	93.6	118.1	-24.5
75.9	Average	Vertical	78.4	14.7	93.1	98.1	-5.0
151.8	Peak	Vertical	30.3	-8.3	22	43.5	-21.5
227.7	Peak	Vertical	26.9	-6.3	20.6	46.0	-25.4
303.6	Peak	Vertical	26.5	-4.1	22.4	46.0	-23.6
379.4 (Note 1)	Peak	Horizontal	24.6	-0.2	24.4	46.0	-21.6

Frequency (MHz)	Detection Mode	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
455.5 (Note 1)	Peak	Horizontal	25.9	1.9	27.8	46.0	-18.2
531.3 (Note 1)	Peak	Vertical	26.4	5.3	31.7	46.0	-14.3
607.2 (Note 1)	Peak	Vertical	25.0	6.4	31.4	46.0	-14.6
682.1 (Note 1)	Peak	Horizontal	25.0	8.6	33.6	46.0	-12.4
759.0 (Note 1)	Peak	Vertical	24.3	8.9	33.2	46.0	-12.8
Note 1: No emission was detected above the noise floor measurement.							

Result

The EUT complied with the specification.

6.3 Sample Measurement Calculations

6.3.1 Filed Strength Calculations

The field strength is calculated by adding the *Correction Factor* (*Antenna Factor* + *Cable Factor*), to the measured level from the receiver. The receiver amplitude reading is compensated for any amplifier gain. When an average measurement requires an average measurement correction value, it is also accounted for. The basic equation with a sample calculation is shown below:

Receiver Amplitude Reading=Receiver Reading-Amplifier Gain

Correction Factor=Antenna Factor + Cable Factor

Field Strength=Receiver Amplitude Reading + Correction Factor [+Average Correction Value]

Example

Assuming a *Receiver Reading* of 42.5 dBμV is obtained from the receiver, the *Amplifier Gain* is 26.5 dB the *Antenna Factor* is 4.5 dB, and the *Cable Factor* is 4.0 dB. The *Field Strength* is calculated by subtracting the *Amplifier Gain* and adding the *Correction Factor*, giving a *Field Strength* of 24.5 dBμV/m.

$$Receiver\ Amplitude\ Reading = 42.5 - 26.5 = 16.0\ \text{dB}\mu\text{V/m}$$

$$Correction\ Factor = 4.5 + 4.0 = 8.5\ \text{dB}$$

$$Field\ Strength = 16.0 + 8.5 = 24.5\ \text{dB}\mu\text{V/m}$$

6.3.2 Conducted Measurement Value Calculations

A conducted emission value is calculated by adding the *Correction Factor* (*LISN Transducer Factor* + *Cable Factor*) to the measured value from the receiver. The LISN contains an internal 10dB (nominal) attenuation accounted for in the LISN Transducer Factor. Amplifiers are not utilized for this measurement. The basic equation with a sample calculation is shown below:

Correction Factor = LISN Transducer Factor + Cable Factor

Conducted Emission Value = Receiver Amplitude Reading + Correction Factor

Example

Assuming a *Receiver Reading* of 20.8 dBμV is obtained from the receiver, *LISN Transducer Factor* is 10.1 dB, and the *Cable Factor* is 0.3 dB. The *Conducted Emissions Value* is calculated by adding the *Correction Factor*, giving a *Conducted Emissions Value* of 31.2 dBμV.

$$Receiver\ Amplitude\ Reading = 20.8\ \text{dB}\mu\text{V}$$

$$Correction\ Factor = 10.1 + 0.3 = 10.4\ \text{dB}$$

$$Conducted\ Emissions\ Value = 20.8 + 10.4 = 31.2\ \text{dB}\mu\text{V}$$

7 Test Procedures and Test Equipment

7.1 Conducted Emissions at Mains Ports

The conducted emissions at mains and telecommunications ports from the EUT were measured using a spectrum analyzer with a quasi-peak adapter for peak, quasi-peak and average readings. The quasi-peak adapter uses a bandwidth of 9 kHz, with the spectrum analyzer's resolution bandwidth set at 100 kHz, for readings in the 150 kHz to 30 MHz frequency ranges.

The conducted emissions at mains ports measurements are performed in a screen room using a (50 Ω/50 µH) Line Impedance Stabilization Network (LISN).

Where mains flexible power cords are longer than 1 m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

Where the EUT is a collection of devices with each device having its own power cord, the point of connection for the LISN is determined from the following rules:

- Each power cord, which is terminated in a mains supply plug, shall be tested separately.
- Power cords, which are not specified by the manufacturer to be connected via a host unit, shall be tested separately.
- Power cords which are specified by the manufacturer to be connected via a host unit or other power supplying equipment shall be connected to that host unit and the power cords of that host unit connected to the LISN and tested.
- Where a special connection is specified, the necessary hardware to effect the connection is supplied by the manufacturer for the testing purpose.
- When testing equipment with multiple mains cords, those cords not under test are connected to an artificial mains network (AMN) different than the AMN used for the mains cord under test.

For testing, desktop EUT are placed on a non-conducting table at least 0.8 meters from the metallic floor and placed 40 cm from the vertical coupling plane (copper plating in the wall behind EUT table). Floor standing equipment is placed directly on the earth grounded floor.

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer/Receiver	Rohde & Schwarz	ESU40	V033119	08/24/2022	08/24/2023
Spectrum Analyzer/ Signal Analyzer	Rohde & Schwarz	FSV40	V044352	03/08/2022	03/08/2024
LISN	Teseq	NNB 51	V045406	12/05/2022	12/05/2023
Conductance Cable Wanship Upper Site	VPI Labs	Cable J	V034832	12/23/2022	12/23/2023
EMC32 Measurement Software	Rohde & Schwarz	10.60.20	N/A	N/A	N/A

Table 2: List of equipment used for conducted emissions testing at mains ports.

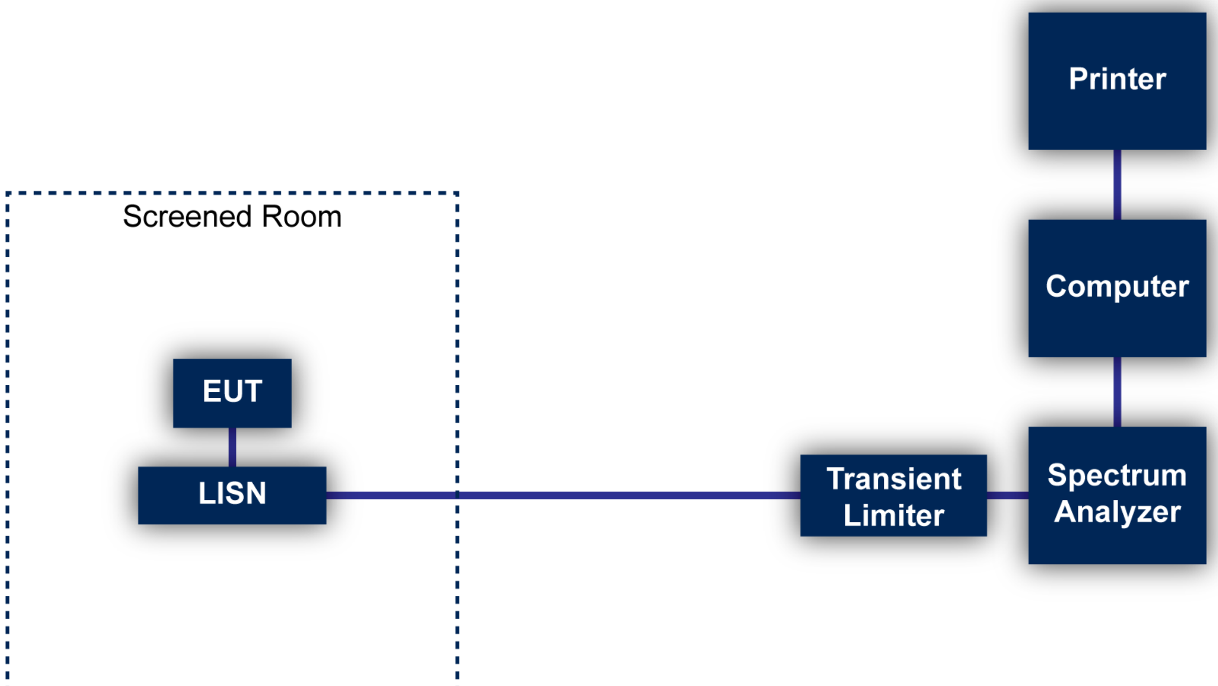


Figure 1: Conducted Emissions Test

7.2 Direct Connection at the Antenna Port Tests

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer/Receiver	Rohde & Schwarz	ESU40	V033119	08/26/2021	08/26/2022
Spectrum Analyzer/ Signal Analyzer	Rohde & Schwarz	FSV40	V044352	03/08/2022	03/08/2023
6 dB Attenuator	Pasternack	PE7004-6	V033645	01/10/2022	01/10/2023
Low Loss Cable	N/A	N/A	V034173	01/10/2022	01/10/2023

7.2.1 Test Configuration Block Diagram

Figure 2: Direct Connection at the Antenna Port Test

7.3 Radiated Emissions

The radiated emissions from the EUT were measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings.

A preamplifier with a fixed gain of 51 dB was used to increase the sensitivity of the measuring instrumentation. The quasi-peak adapter uses a bandwidth of 120 kHz, with the spectrum analyzer's resolution bandwidth set at 1 MHz, for readings in the 30 to 1000 MHz frequency ranges. For frequencies below 30 MHz, a 9 kHz resolution Bandwidth was used.

A loop antenna was used to measure frequencies below 30 MHz. A biconilog antenna was used to measure the frequency range of 30 to 1000 MHz, at a distance of 3 meters from the EUT. The readings obtained by these antennas are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors. A double-ridged guide antenna was used to measure the emissions at frequencies above 1000 MHz at a distance of 3 and/or 1 meter from the EUT.

The configuration of the EUT was varied to find the maximum radiated emission. The EUT was connected to the peripherals listed in Section 2.3 via the interconnecting cables listed in Section 2.4. A technician manually manipulated these interconnecting cables to obtain worst-case radiated emissions. The EUT was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there were multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

Desktop EUT are measured on a non-conducting table 0.8 meters above the ground plane. For frequencies above 1000 MHz, the EUT is placed on a table 1.5 meters above the ground plane. The table is placed on a turntable, which is level with the ground plane. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

For radiated emissions testing that is performed at distances closer than the specified distance; an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer/Receiver	Rohde & Schwarz	ESU40	V033119	08/26/2021	08/26/2022
Spectrum Analyzer/ Signal Analyzer	Rohde & Schwarz	FSV40	V044352	03/08/2022	03/08/2023
Loop Antenna	EMCO	6502	V034216	02/03/2021	02/03/2023
Biconilog Antenna	EMCO	3142E	V057461	7/21/2021	07/21/2023
3142E Power Amplifier	EMCO	3142E-PA	V036056	05/19/2022	05/19/2023
Double Ridged Guide Antenna	EMCO	3115	V033469	01/25/2021	01/25/2023
Standard Gain Horn	ETS-Lindgren	3160-09	V034223	ICO	ICO
High Frequency Amplifier	Miteq	AFS4-001018000-35-10P-4	V033997	01/10/2022	01/10/2023
Band Filter	Pasternack	PE8716	V067581	3/15/2023	3/15/2024
Band Filter	Pasternack	PE8718	V067508	3/15/2023	3/15/2024

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
900 MHz High Pass Filter	Micro-Tronics	HPM50108-03	V034185	01/10/2022	01/10/2023
2.4 GHz High Pass Filter	Micro-Tronics	HPM50111-03	V034183	01/10/2022	01/10/2023
2.4 GHz Notch Filter	Micro-Tronics	BRM50702-03	V034213	01/10/2022	01/10/2023
6’ High Frequency Cable	Microcoax	UFB197C-0-0720-000000	V033638	01/10/2022	01/10/2023
20’ High Frequency Cable	Microcoax	UFB197C-1-3120-000000	V033979	01/10/2022	01/10/2023
3 Meter Radiated Emissions Cable Wanship Upper Site	Microcoax	UFB205A-0-4700-000000	V033639	01/10/2022	01/10/2023
EMC32 Test Software	Rohde & Schwarz	10.60.20	N/A	N/A	N/A

Table 3: List of equipment used for radiated emissions testing.

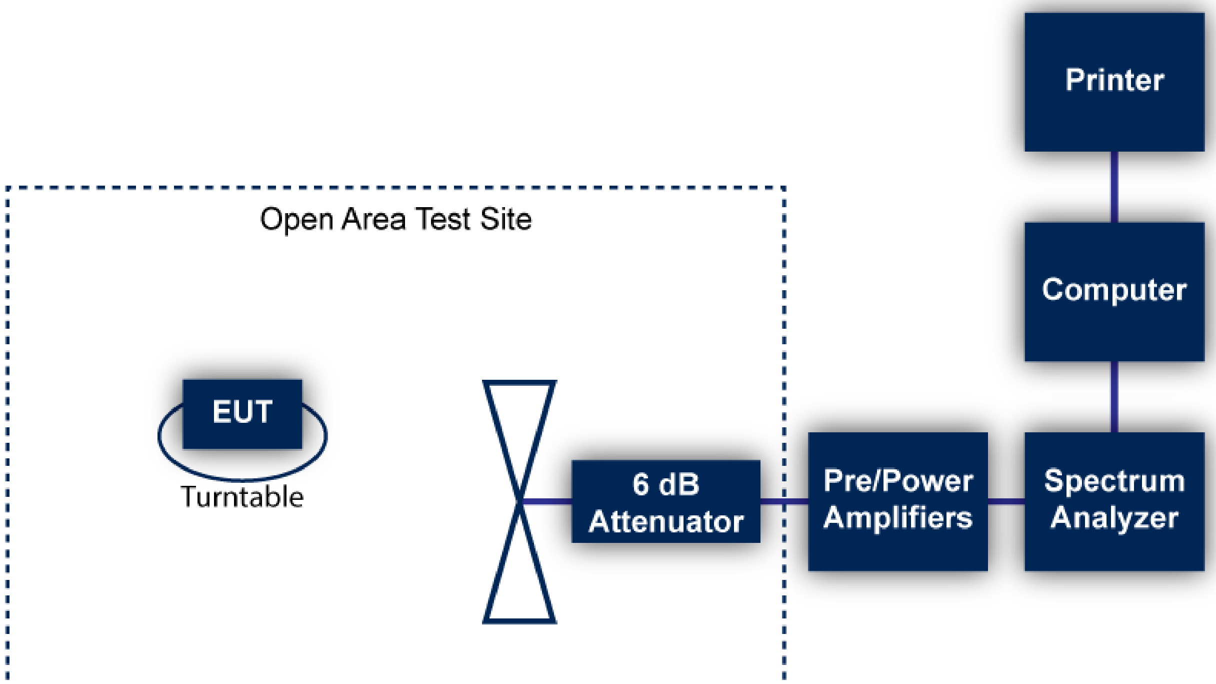


Figure 3: Radiated Emissions Test

7.4 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or VPI Laboratories, Inc. personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and

Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

7.5 Measurement Uncertainty

Test	Uncertainty (±dB)	Confidence (%)
Conducted Emissions	2.8	95
Radiated Emission (9 kHz to 30 MHz)	3.3	95
Radiated Emissions (30 MHz to 1 GHz)	3.4	95
Radiated Emissions (1 GHz to 18 GHz)	5.0	95
Radiated Emissions (18 GHz to 40 GHz)	4.1	95

8 Photographs

--- End of Report ---