

FCC RF TEST REPORT



Test Report Number..... FLR-19111521-LC-RF-FCC-Radar

Applicant..... **FLIR Commercial Systems Inc.**

Applicant Address..... 6769 Hollister Ave, Goleta, CA 93117

Product Name..... Elara Radar

Model Number..... R290

Family Product/Model..... N/A

FCC ID..... 2AS9Q-R290

Date of EUT received..... 01/08/2020

Date of Test..... 01/08/2020 - 02/12/2020

Report Issue Date..... 02/21/2020

Test Standards..... 47CFR Part 15.245

Test Result..... Pass

Issued By:

Vista Laboratories

1261 Puerta Del Sol, San Clemente, CA 92673 USA

www.vista-compliance.com

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report. This report is not to be reproduced by any means except in full and in any case not without the written approval of Vista Laboratories.

Tested by:

Daniel Bruno/Test Engineer

Approved By:

David Zhang/Technical Manager

Report Number:	FLR-19111521-LC-RF-FCC-Radar
Product:	Elara Radar
Model Number:	R290



Laboratory Introduction

Vista Labs is an A2LA accredited 17025 compliant regulatory compliance testing laboratories (Cert. number: 4848-01) strategically located in Orange County, providing services in the electrical and telecommunication industries. Vista labs is also recognized testing facility for Australia (ACMA), Chinese Taipei (BSMI), Chinese Taipei (NCC), Hong Kong (OFCA), Israel (MOC), Korea (RRA), Singapore (IMDA), Vietnam (MIC), etc.

Our comprehensive testing services include safety testing, EMC emission and susceptibility testing, RF and wireless testing (including DFS).

As your partner, Vista investigates appropriate test standards, develops test plans, performs troubleshooting & failure analysis, reviews documentation, and provides test reports for a complete compliance testing and certification package.



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REVISION HISTORY

Revision	Issue Date	Description	Note
Original	02/20/2020	Original release	N/A

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1 General Information

1.1 Applicant

Applicant:	FLIR Commercial Systems Inc.
Applicant address:	6769 Hollister Ave, Goleta, CA 93117
Manufacturer:	FLIR Commercial Systems Inc.
Manufacturer Address:	6769 Hollister Ave, Goleta, CA 93117

1.2 Product information

Product Name	Elara Radar
Model Number	R290
Family Model Number	N/A
Serial Number	N/A
Frequency Band	2.4GHz Wi-Fi: 802.11b/g/n-20MHz: 2412-2462MHz 24GHz Radar: 24075 – 24175 MHz
Type of modulation	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g: OFDM-CCK (BPSK, QPSK, 16QAM, 64QAM) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 24GHz Radar: FMCW
Equipment Class/ Category	DTS
Maximum output power	Wi-Fi: 17.79 dBm 24GHz Radar: 25 dBm EIRP
Antenna Information	Wi-Fi PCB antenna: -6 dBi 24GHz Radar: Internal Patch Antenna, 11 dBi
Clock Frequencies	N/A
Port/Connectors	PoE, DC in
Input Power	48VDC (PoE), 12VDC (DC input), 24VAC (AC input)
Power Adapter Manu/Model	N/A
Power Adapter SN	N/A
Hardware version	N/A
Software version	N/A
Simultaneous Transmission	N/A
Additional Info	N/A

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1.3 Test standard and method

Test standard	47CFR Part 15.245
Test method	ANSI C63.10: 2013

1.4 Test Purpose and statement

The purpose of this test report is intended to demonstrate the compliance of product listed in section 1.2, received from company listed in section 1.1, to the requirements of standard and method listed in section 1.3. Based on our test results, we conclude that the product tested complies with the requirements of the standards indicated.

2 Test site information

Lab performing tests	Vista Laboratories
Lab Address	1261 Puerta Del Sol, San Clemente, CA 92673 USA
Phone Number	+1 (949) 393-1123
Website	www.Vista-compliance.com

Test condition	Test Engineer	Test Environment	Test Date
Radiated	Daniel Bruno	23.5°C / 58.2%/996 mbar	01/08/2020 - 02/12/2020
Conducted Emission	Daniel Bruno	23.5°C / 58.2%/996 mbar	01/08/2020 - 02/12/2020

3 Modification of EUT

The EUT is an engineering test sample with normal radar operation function. No modification on the hardware.

4 Test configuration and operation

4.1 EUT test configuration

EUT was powered by external 12VDC (through battery or AC/DC adapter for testing purpose).

4.2 EUT test mode

Radio	Channel	Frequency (MHz)	Mode
24GHz Radar	1	24075 – 24175 MHz	Continuous Sweeping

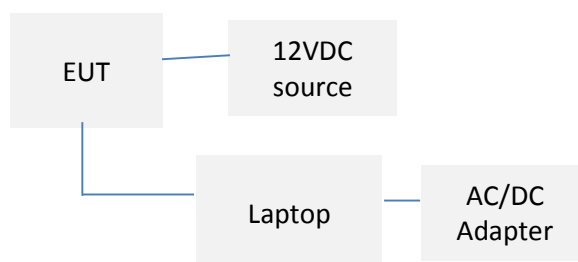
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4.3 Supporting Equipment

Index	Description	Model	S/N	Brand	Remark
1	Laptop	G752V	F9N0CY758592398	ASUS	Remote access
2	AC/DC adapter	ETSA120500UD	ETSA120500UDC-P5P-SZ	V-Infinity	-
3	12VDC Battery	526CCA	JCH20011619127	EverStart	-

4.4 EUT setup diagram



4.5 EUT operation

The control of EUT is either through the Linux WL command or Web UI on test laptop.

4.6 Test software

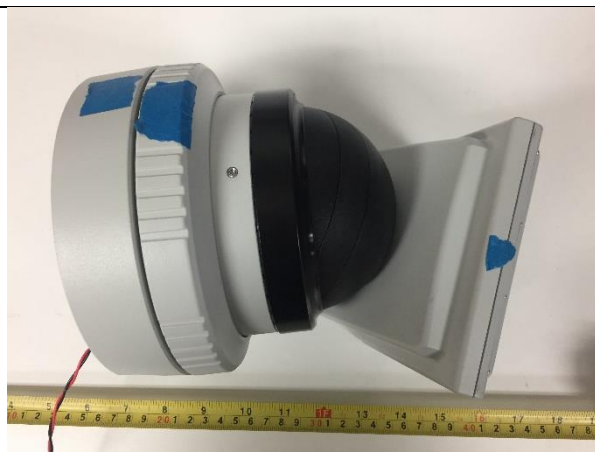
Index	Description	Remark
1	Web UI	Remote access to EUT
2	EMISoft Vasona 6.0049	EMC/Spurious emission test software used during testing

5 EUT and test setup pictures

5.1 EUT pictures



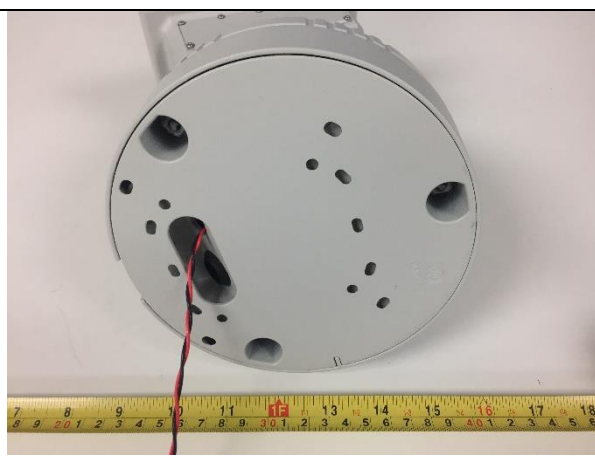
EUT Top View



EUT Bottom View



EUT Front View



EUT Rear View



EUT Left Side View

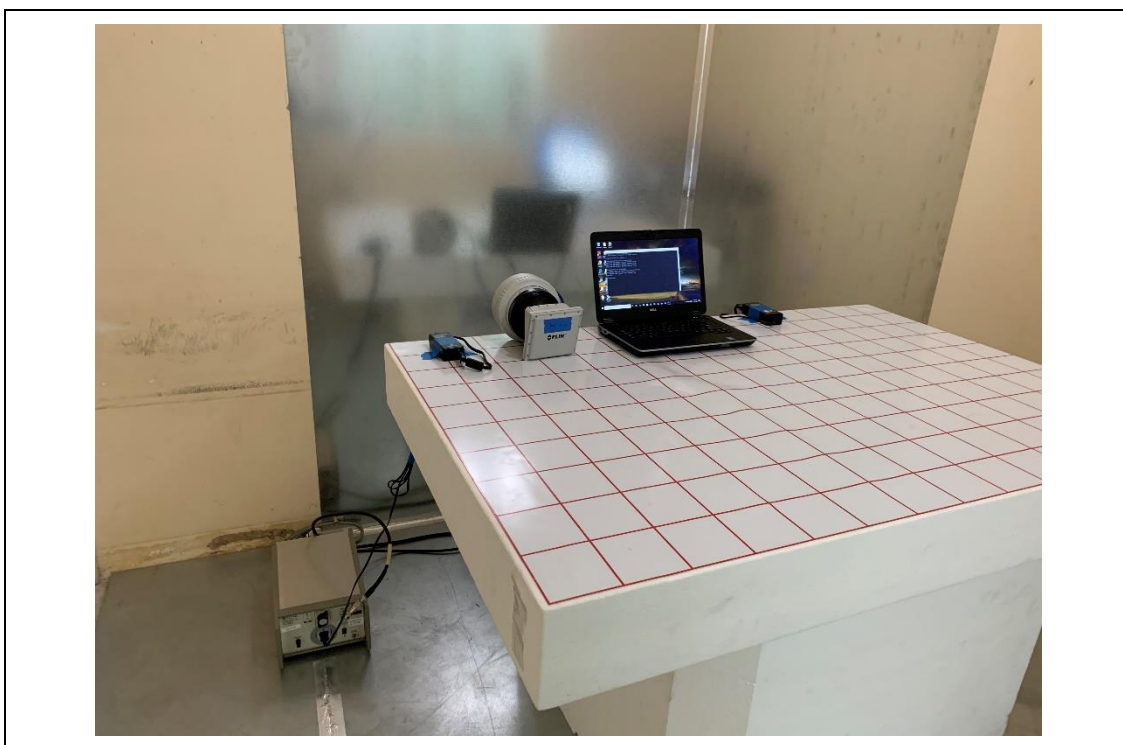


EUT Right Side View

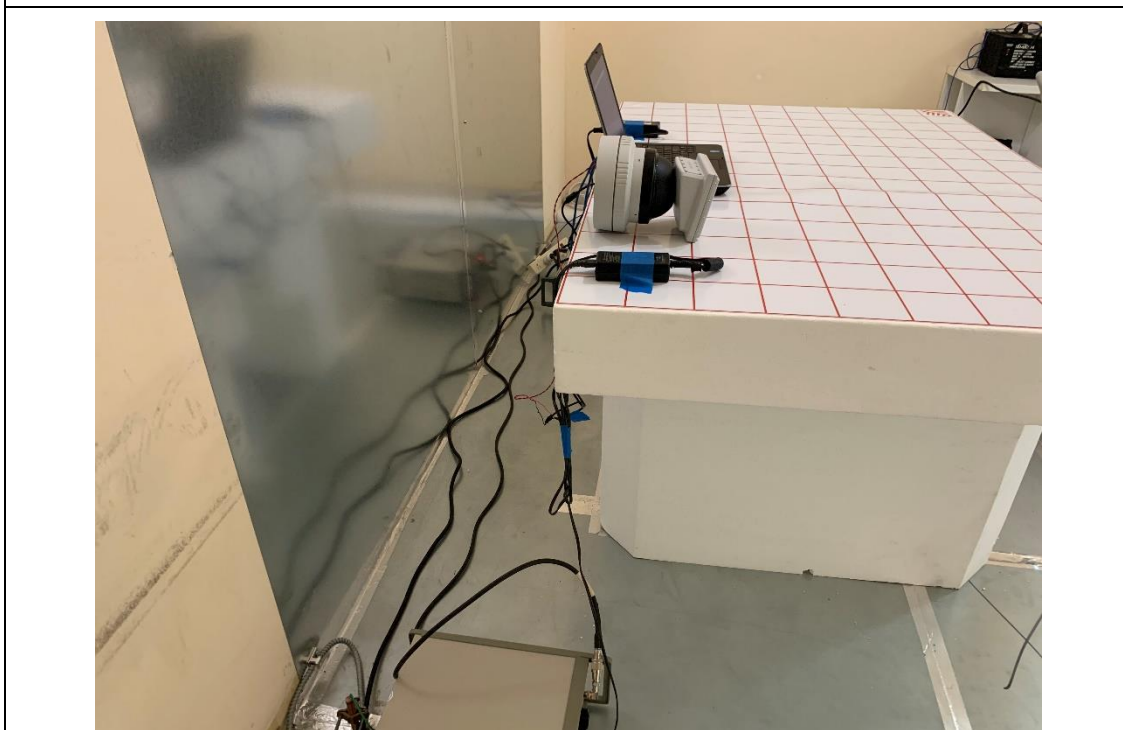
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5.2 EUT test setup pictures



AC Line Conducted Emission setup – Front



AC Line Conducted Emission setup – Rear

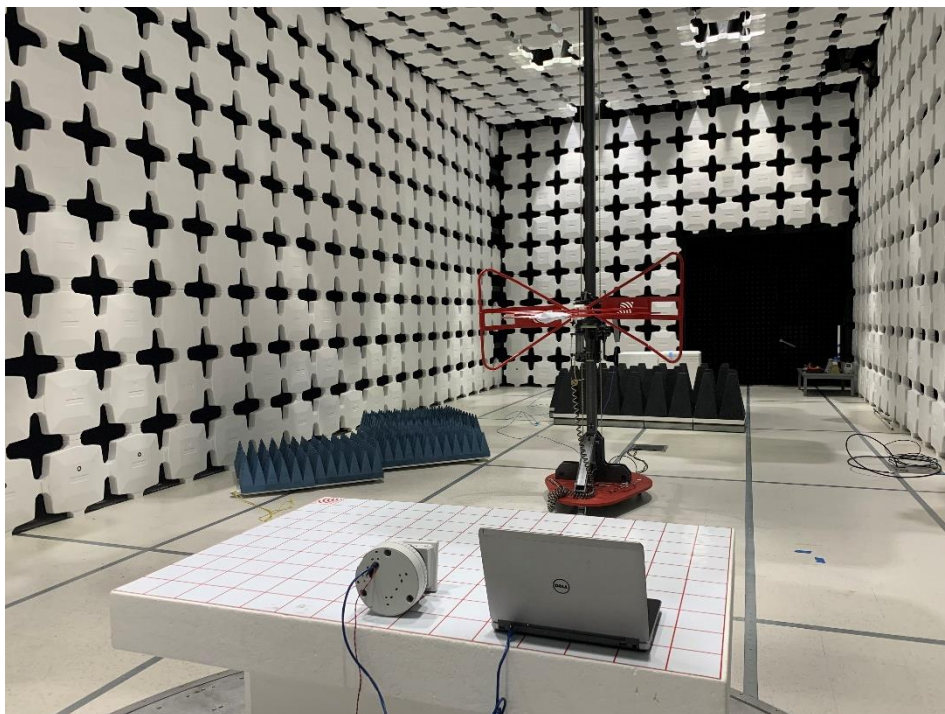
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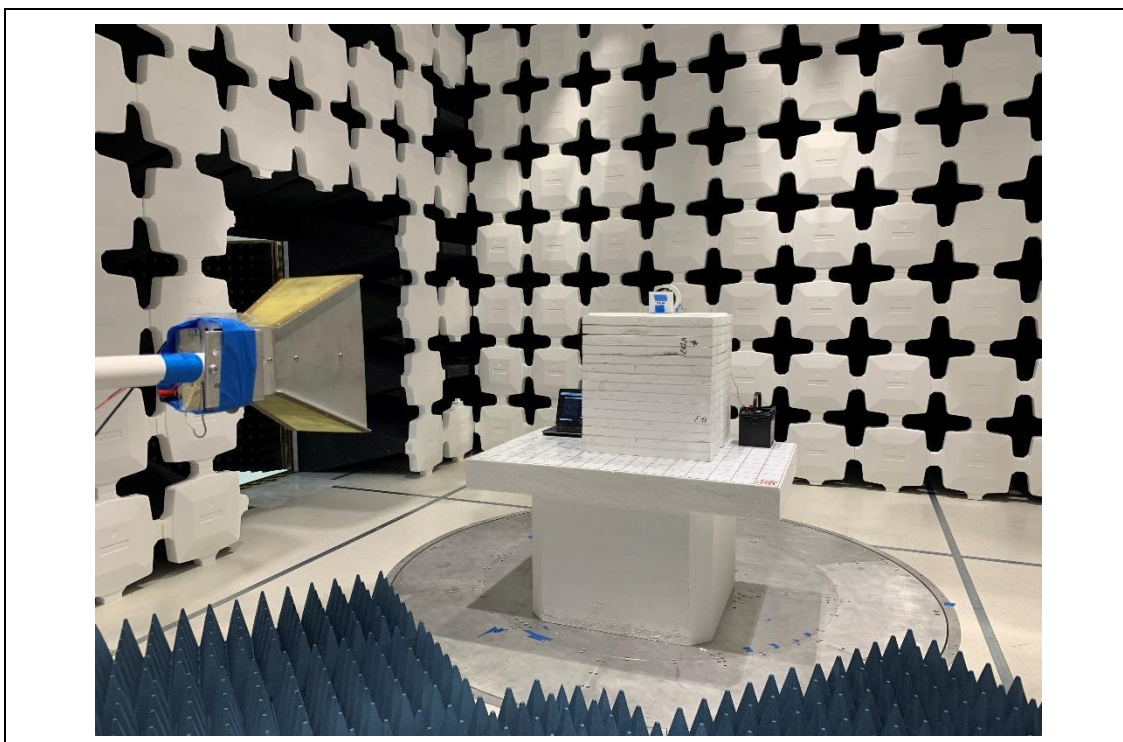


Radiated Emissions Below 1GHz setup – Front

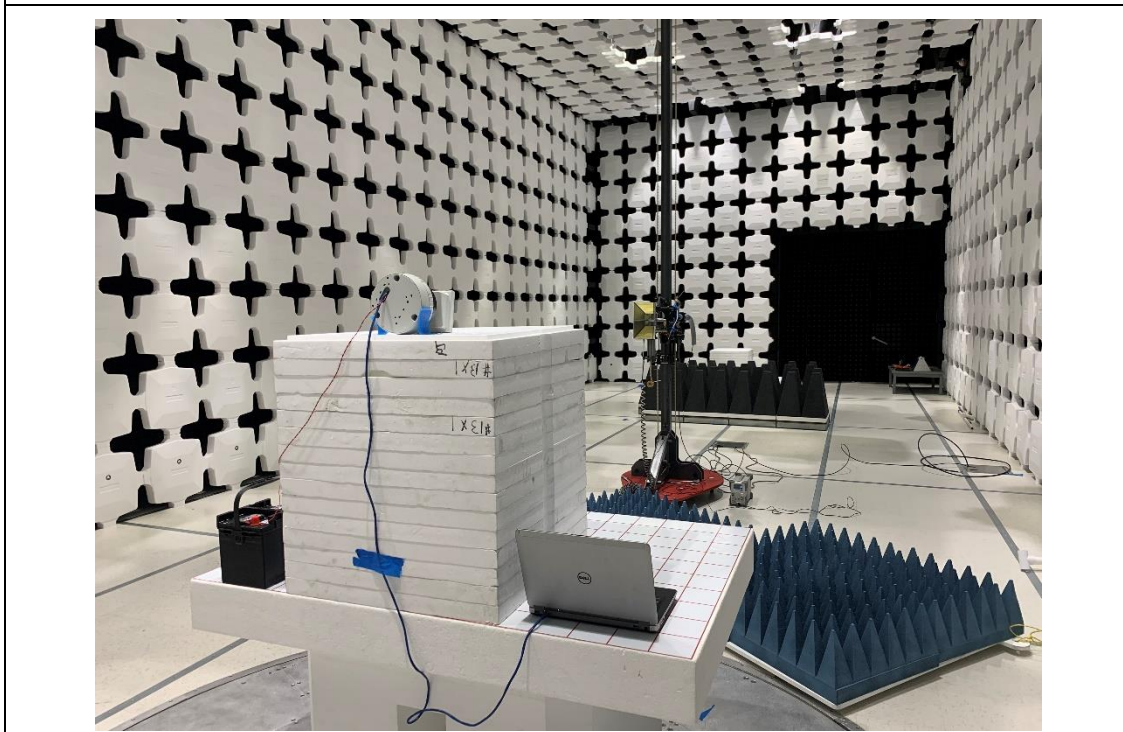


Radiated Emissions Below 1GHz setup – Rear

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Radiated Emissions Above 1GHz setup – Front



Radiated Emissions Above 1GHz setup – Rear

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6 Test Summary

FCC Rules	Test Item	Section	Verdict
§15.203	Antenna Requirement	8.1	Pass
§15.215 (c)	20 dB Emission Bandwidth	8.2	Pass
§15.245	Fundamental Field Strength	8.3	Pass
§15.205, §15.209, §15.245	Radiated Emissions & Unwanted Emissions into Restricted Frequency Bands	8.4	Pass
§15.207 (a)	AC Power Line Conducted Emissions	8.5	Pass

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7 Uncertainty of Measurement

Test item	Measurement Uncertainty (dB)
RF Output Power (Conducted)	±1.2 dB
Power Spectral Density	±0.9 dB
Unwanted Emission (conducted)	±2.6 dB
Occupied Channel Bandwidth	±5 %
Radiated Emission (9KHz-30MHz)	±3.5 dB
Radiated Emission (30MHz-1GHz)	±4.6 dB
Radiated Emission (1-18GHz)	±4.9 dB
Radiated Emission (18-40GHz)	±3.5 dB

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8 Test summary and result

8.1 Antenna Requirement

8.1.1 Requirement

Per § 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.

8.1.2 Result

Analysis:

- For Wi-Fi, EUT has one removable PCB trace antennas which connect to the main board through unique U.FL RF connectors.
- For 24GHz Radar, the antenna is internal patch antenna which is not removable.

Conclusion:

EUT complies with antenna requirement in § 15.203.

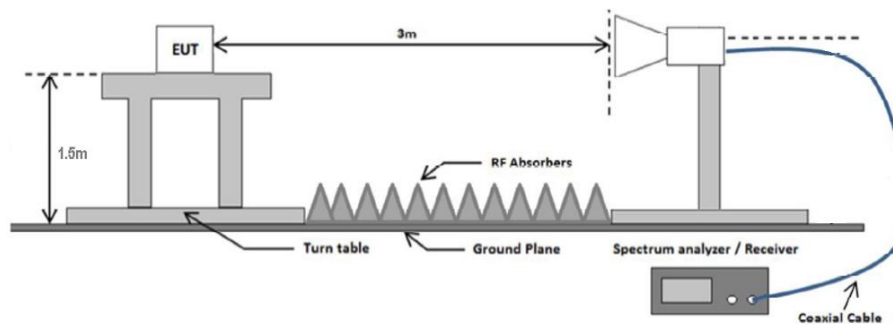
8.2 Emission Bandwidth

8.2.1 Requirement

§ 15.215 (c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

8.2.2 Test setup



8.2.3 Test Procedure

According to section subclause 6.9 of ANSI C63.10-2013:

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 20 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW $\geq 3 \times$ RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

1. Set RBW = 1MHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Use automatic bandwidth measurement capability on instrument to obtain BW result.

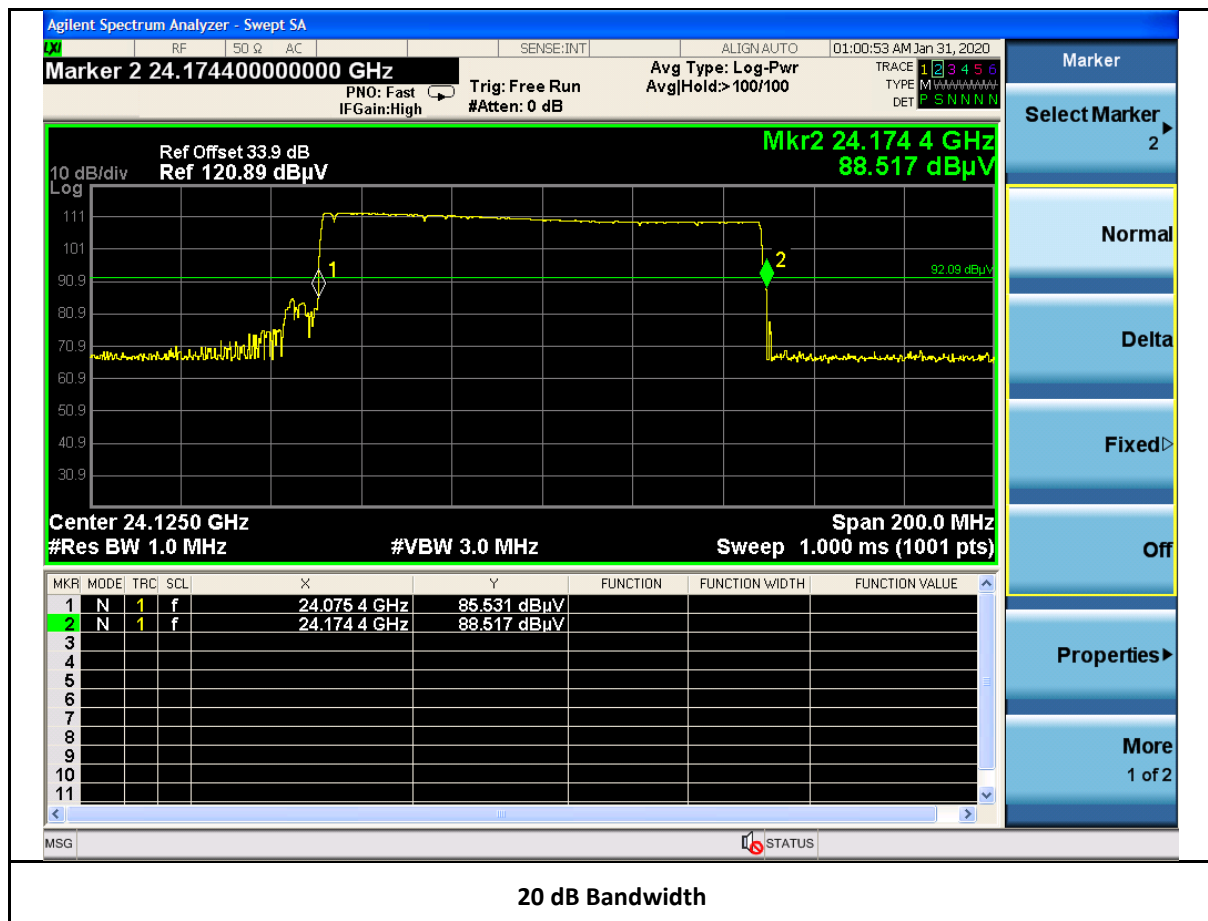
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8.2.4 Test Result

Frequency (MHz)	20 dB BW (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	Frequency Range Limit (MHz)	Result
24125	103.2	24075.4	24174.4	24075-24175	Pass

8.2.5 Test Plots



8.3 Fundamental Field Strength

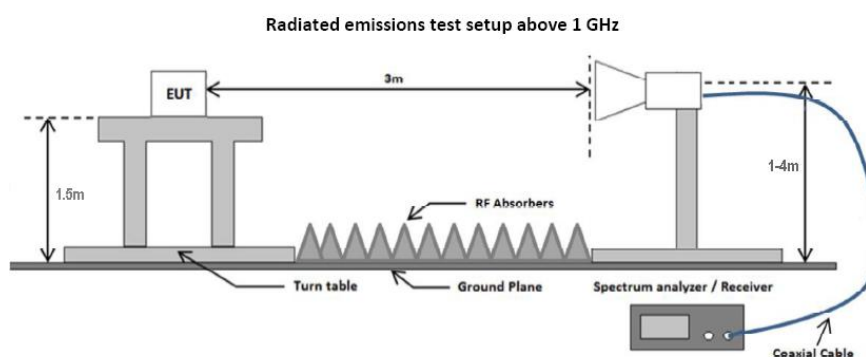
8.3.1 Requirement

§ 15.245

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
902–928	500	1.6
2435–2465	500	1.6
5785–5815	500	1.6
10500–10550	2500	25.0
24075–24175	2500	25.0

8.3.2 Test setup



8.3.3 Test Procedure

The radiated emissions tests were performed in the 3-meter semi-anechoic chamber test site, using the setup in accordance with ANSI C63.10-2013

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
 - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
 - b. The EUT was then rotated to the direction that gave the maximum emission.
 - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 300 Hz for frequency below 150KHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 kHz for frequency between 150KHz – 30MHz.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-Peak detection at frequency between 30MHz - 1GHz.
6. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak and average measurement at frequency above 1GHz.
7. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

8.3.4 Test Result

Frequency MHz	Raw dB	Cable dB	AF dB	Level dBuV/m	Det	Pol deg	Limit dBuV/m	Margin dB
24125	71.107	4.73	36.25	112.087	Peak	V	148	-35.91
24125	71.091	4.73	36.25	112.071	Average	V	128	-15.93

Note: Measurement were performed under both horizontal and vertical polarization. Only the worst case result under vertical polarization is presented here.

8.4 Radiated Spurious Emissions

8.4.1 Requirement

Per § 15.245

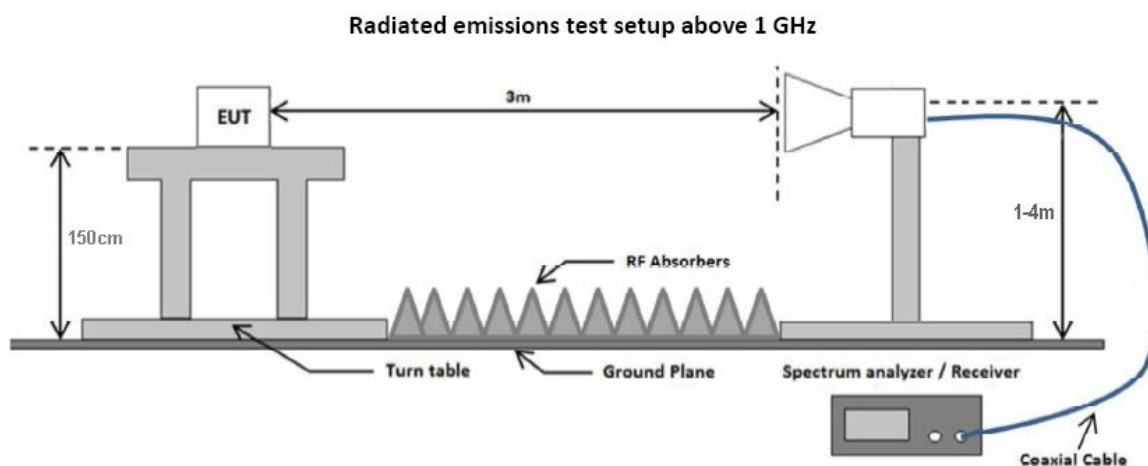
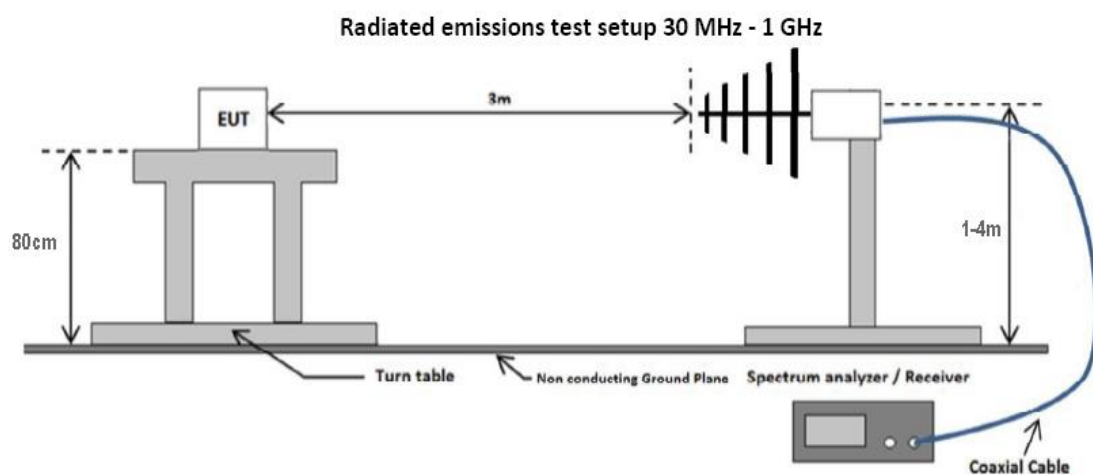
(a) Operation under the provisions of this section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
902–928	500	1.6
2435–2465	500	1.6
5785–5815	500	1.6
10500–10550	2500	25.0
24075–24175	2500	25.0

- (1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:
 - (i) For the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.
 - (ii) For all other field disturbance sensors, 7.5 mV/m.
 - (iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075-24175 MHz band, fully comply with the limits given in §15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment, vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations, or railroad locomotives, railroad cars and other equipment which travels on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g., putting a vehicle into reverse gear, activating a turn signal, etc.).
- (2) Field strength limits are specified at a distance of 3 meters.
- (3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
- (4) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

8.4.2 Test setup



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8.4.3 Test Procedure

The radiated emissions tests were performed in the 3-meter semi-anechoic chamber test site, using the setup in accordance with ANSI C63.10-2013. Boresight antenna mast was used during the scanning to point to EUT to maximize the emission. The process will be repeated in 3 EUT orientations.

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
 - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
 - b. The EUT was then rotated to the direction that gave the maximum emission.
 - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 300 Hz for frequency below 150KHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 kHz for frequency between 150KHz – 30MHz.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-Peak detection at frequency between 30MHz - 1GHz.
6. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak and average measurement at frequency above 1GHz.
7. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

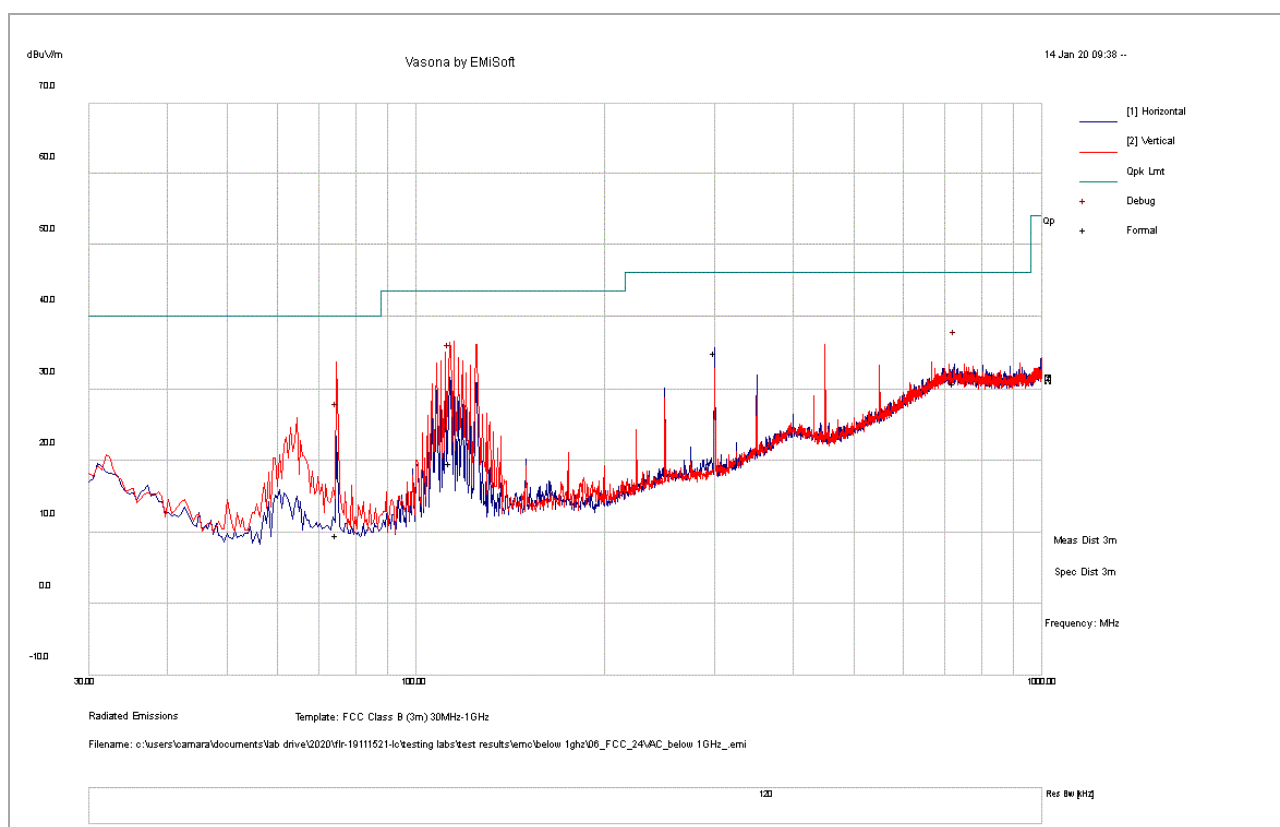
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8.4.4 Test Result

30-1000MHz test result

Test Standard:	15.209	Mode:	Transmitting
Frequency Range:	30-1000MHz	Test Date:	01/14/2020
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Daniel Bruno
Remark:	N/A	Test Result:	Pass



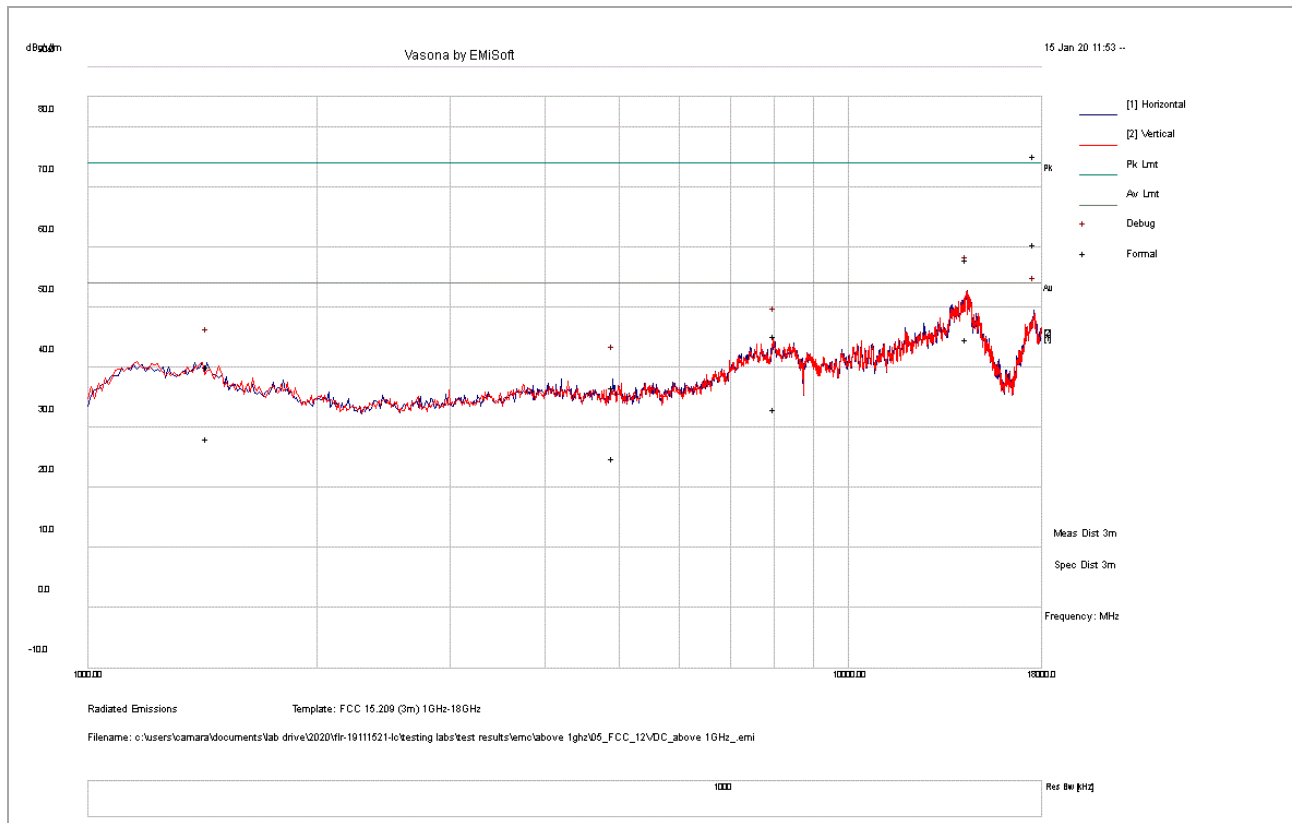
Frequency MHz	Raw dB	Cable dB	AF dB	Level dBuV/m	Det	Pol deg	Height cm	Table deg	Limit dBuV/m	Margin dB
299.98	48.20	5.70	-18.70	35.20	QP	H	100	62	46.00	-10.80
113.27	39.20	3.80	-23.30	19.70	QP	H	381	224	43.50	-23.80
723.98	30.00	7.30	-6.50	30.80	QP	H	386	264	46.00	-15.20
74.67	30.80	3.20	-24.40	9.70	QP	H	198	316	40.00	-30.30

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1GHz – 18GHz test result

Test Standard:	15.209	Mode:	Transmitting
Frequency Range:	1GHz-18GHz	Test Date:	01/15/2020
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Daniel Bruno
Remark:	N/A	Test Result:	Pass



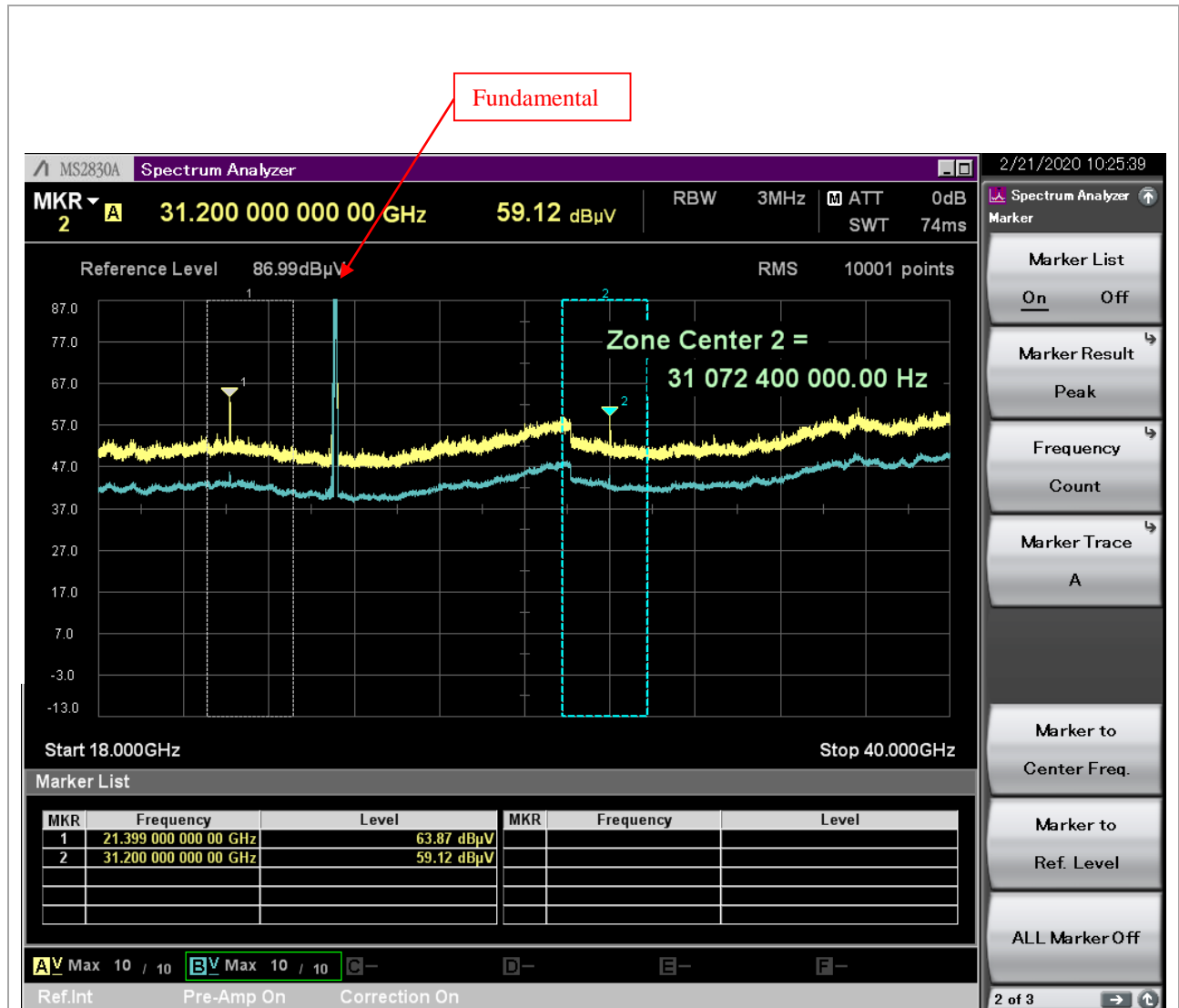
Frequency MHz	Raw dB	Cable dB	AF dB	Level dBuV/m	Det	Pol deg	Height cm	Table deg	Limit dBuV/m	Margin dB
14334.99	28.90	26.50	2.40	57.90	PK	V	339	257	74	-16.10
8010.92	30.20	21.30	-6.20	45.30	PK	V	134	198	74	-28.70
1434.45	46.60	14.80	-21.10	40.20	PK	V	285	252	74	-33.80
4906.76	32.60	17.40	-13.30	36.70	PK	V	269	194	74	-37.30
14334.99	15.80	26.50	2.40	44.80	AV	V	339	257	54	-9.20
8010.92	18.00	21.30	-6.20	33.00	AV	V	134	198	54	-21.00
1434.45	34.50	14.80	-21.10	28.10	AV	V	285	252	54	-25.90
4906.76	20.70	17.40	-13.30	24.90	AV	V	269	194	54	-29.10

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18GHz – 40GHz test result

Test Standard:	15.209	Mode:	Transmitting
Frequency Range:	18GHz-40GHz	Test Date:	02/21/2020
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	David Zhang
Remark:	N/A	Test Result:	Pass



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Spurious Emission

40-60GHz band

Frequency GHz	Raw dB	Cable dB	AF dB	Level dBuV/m	Det	Pol deg	Height cm	Table deg	Limit dBuV/m	Margin dB
42.56	36.48	0	31.49	67.97	PK	H/V	150	0	74	-6.03
51.53	36.62	0	32.15	68.77	PK	H/V	150	0	54	-5.23
42.56	20.24	0	31.49	51.73	AV	H/V	150	0	54	-2.27
51.53	20.68	0	32.15	52.83	AV	H/V	150	0	54	-1.17

60-100GHz band

Frequency GHz	Raw dB	Cable dB	AF dB	Level dBuV/m	Det	Pol deg	Height Cm	Table deg	Limit dBuV/m	Margin dB
66.00	25.90	0	38.22	64.12	PK	H/V	150	0	74	-9.88
78.68	33.11	0	36.38	69.49	PK	H/V	150	0	74	-4.51
66.00	11.11	0	38.22	49.33	AV	H/V	150	0	54	-4.67
78.68	16.72	0	36.38	53.10	AV	H/V	150	0	54	-0.9

8.5 Conducted Emissions

8.5.1 Requirement

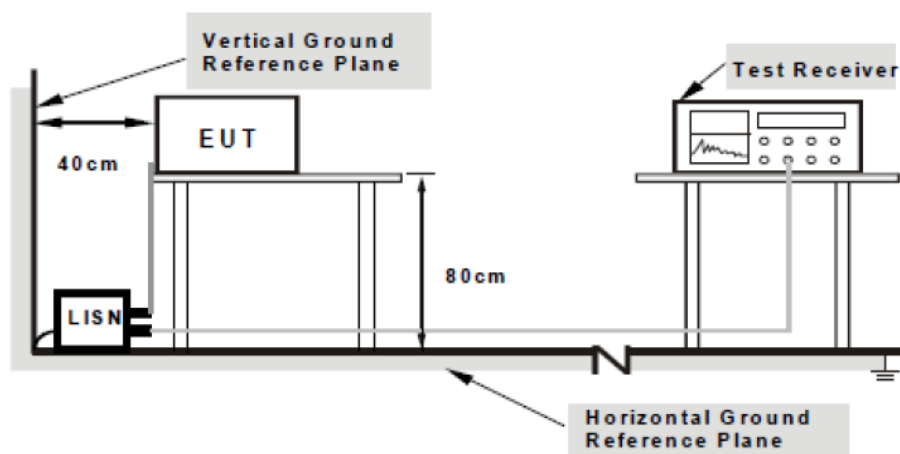
Per § 15.207 (a), an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/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.

Limits for Conducted Emissions at the Mains Ports

Section	Frequency ranges (MHz)	Limit (dBuV)	
		QP	Average
Class B devices	0.15 – 0.5	66 – 56	56 – 46
	0.5 – 5	56	46
	5 - 30	60	50

NOTE 1 The lower limit shall apply at the transition frequencies.

8.5.2 Test setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

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8.5.3 Test Procedure

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment was powered separately from another main supply.
5. The EUT was switched on and allowed to warm up to its normal operating condition.
6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
7. High peaks, relative to the limit line, were then selected.
8. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made
9. All possible modes of operation were investigated. Only the worst case emissions were measured and reported. All other emissions were relatively insignificant.

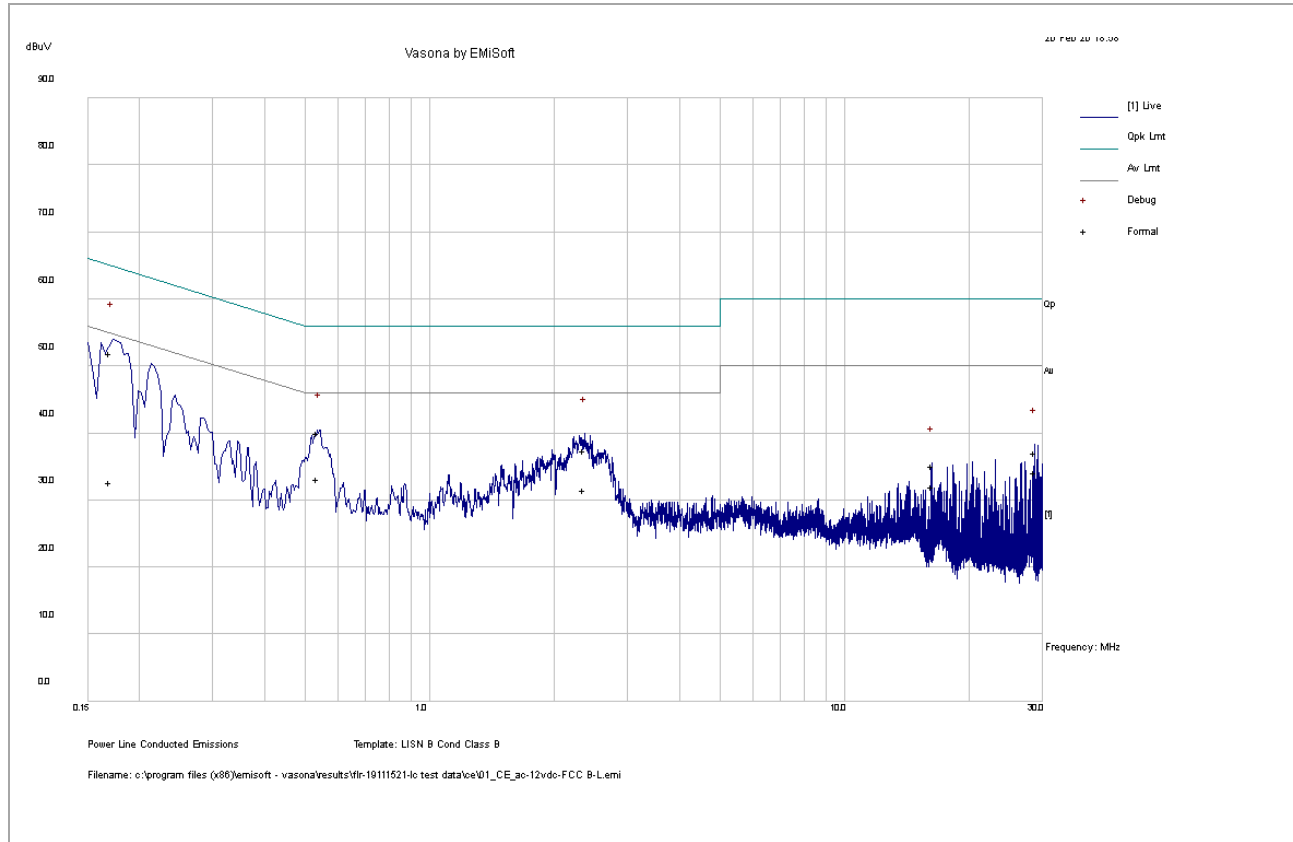
Report Number: FLR-19111521-LC-RF-FCC-Radar
Product: Elara Radar
Model Number: R290



8.5.4 Test Result

Live Line

Test Standard:	47CFR 15.207	Mode:	Line
Frequency Range:	0.15-30MHz	Test Date:	01/17/2020
Antenna Type/Polarity:	N/A	Test Personnel:	Daniel Bruno
Remark:	120VAC, 60Hz	Test Result:	Pass



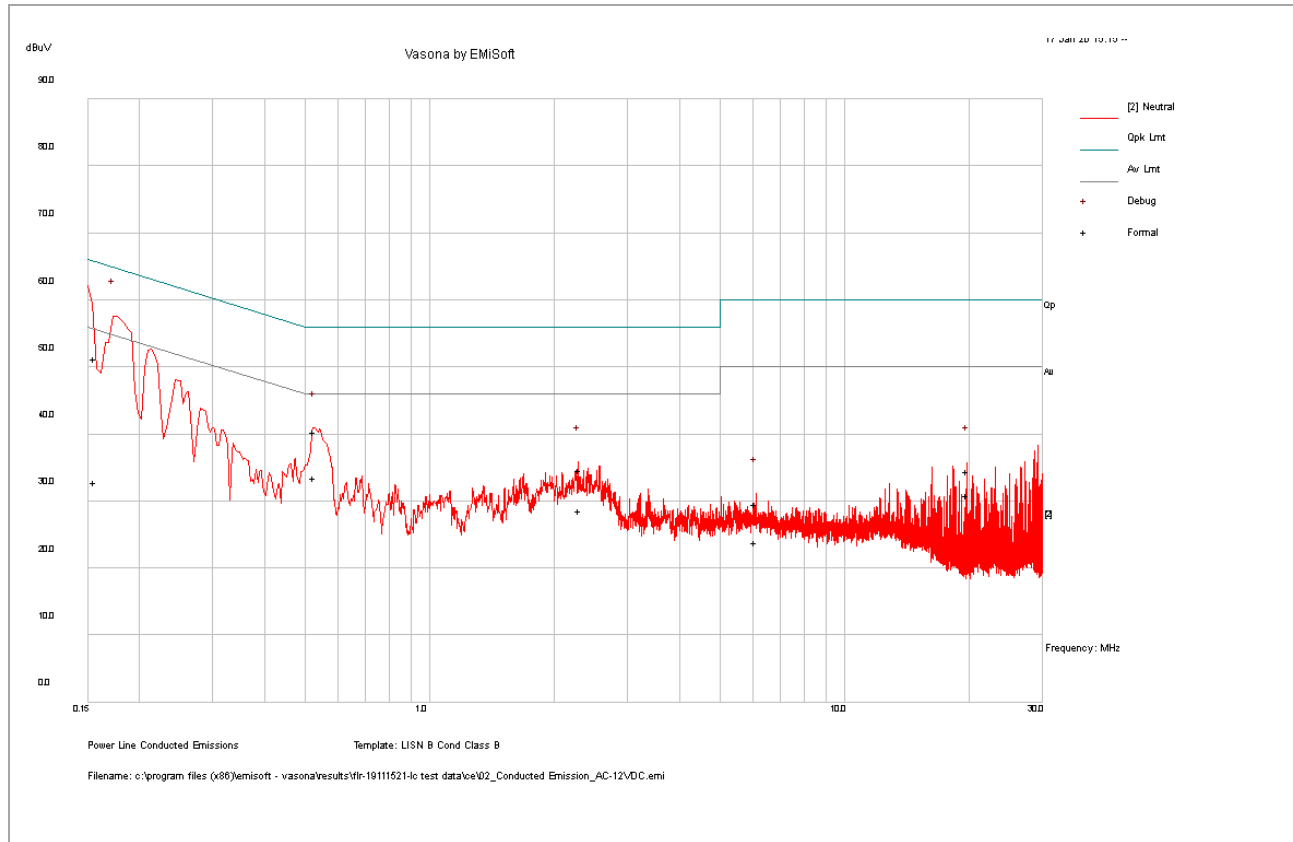
Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV/m)	Meas. Type	Line	Limit (dBuV/m)	Margin (dB)	Pass /Fail
0.17	41.64	10.07	0.22	51.94	QP	Live	64.96	-13.02	Pass
0.54	29.85	10.11	0.10	40.07	QP	Live	56.00	-15.93	Pass
2.35	27.08	10.24	0.11	37.44	QP	Live	56.00	-18.56	Pass
28.69	25.34	10.90	0.84	37.09	QP	Live	60.00	-22.91	Pass
16.23	24.10	10.68	0.34	35.12	QP	Live	60.00	-24.88	Pass
0.17	22.34	10.07	0.22	32.63	AV	Live	54.96	-22.33	Pass
0.54	22.87	10.11	0.10	33.09	AV	Live	46.00	-12.91	Pass
2.35	21.24	10.24	0.11	31.60	AV	Live	46.00	-14.40	Pass
28.69	22.34	10.90	0.84	34.08	AV	Live	50.00	-15.92	Pass
16.23	20.98	10.68	0.34	32.00	AV	Live	50.00	-18.00	Pass

Report Number: FLR-19111521-LC-RF-FCC-Radar
Product: Elara Radar
Model Number: R290



Neutral Line

Test Standard:	47CFR 15.207	Mode:	Neutral
Frequency Range:	0.15-30MHz	Test Date:	01/17/2020
Antenna Type/Polarity:	N/A	Test Personnel:	Daniel Bruno
Remark:	120VAC, 60Hz	Test Result:	Pass



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV/m)	Meas. Type	Line	Limit (dBuV/m)	Margin (dB)	Pass /Fail
0.16	40.93	10.07	0.24	51.24	QP	Neutral	65.69	-14.45	Pass
0.53	30.15	10.11	0.11	40.37	QP	Neutral	56.00	-15.63	Pass
19.71	23.11	10.76	0.53	34.40	QP	Neutral	60.00	-25.60	Pass
2.29	24.34	10.24	0.11	34.69	QP	Neutral	56.00	-21.31	Pass
6.11	19.00	10.44	0.16	29.61	QP	Neutral	60.00	-30.39	Pass
0.16	22.51	10.07	0.24	32.82	AV	Neutral	55.69	-22.87	Pass
0.53	23.20	10.11	0.11	33.42	AV	Neutral	46.00	-12.58	Pass
19.71	19.62	10.76	0.53	30.91	AV	Neutral	50.00	-19.09	Pass
2.29	18.28	10.24	0.11	28.63	AV	Neutral	46.00	-17.37	Pass
6.11	13.28	10.44	0.16	23.88	AV	Neutral	50.00	-26.12	Pass

Report Number:	FLR-19111521-LC-RF-FCC-Radar
Product:	Elara Radar
Model Number:	R290



9 Test instrument list

Equipment	Manufacturer	Model	Serial Number	Cal. Date	Cal. Due
Semi-Anechoic Chamber	ETS-Lindgren	10M	VL001	5/11/2019	5/11/2020
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A	N/A
Spectrum Analyzer	Keysight	N9020A	MY50110074	5/4/2019	5/4/2020
EMC Test Receiver	R&S	ESL6	100230	5/7/2019	5/7/2020
Bi-Log Antenna	ETS-Lindgren	3142E	217921	11/15/2019	11/15/2020
Horn Antenna	AH Systems	SAS-571	433	8/14/2019	8/14/2020
Horn Antenna	Electro-Metrics	EM-6961	6292	5/2/2019	5/2/2020
Horn Antenna (18-40GHz)	Com-Power	AH-840	101109	5/2/2019	5/2/2020
Preamplifier	RF Bay, Inc.	LPA-10-20	11180621	N/A	N/A
True RMS Multi-meter	UNI-T	UT181A	C173014829	5/10/2019	5/10/2020
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	5/9/2019	5/9/2020
RF Attenuator	Pasternack	PE7005-3	VL061	N/A	N/A
USB RF Power Sensor	Radi Power	RPR3006W	00159859	5/10/2019	5/10/2020
USB RF Power Sensor	ETS-Lindgren	7002-006	00151268	5/10/2019	5/10/2020
2.4GHz Notch Filter	Micro-Tronics	BRM50702	G332	N/A	N/A
5GHz Notch Filter	Micro-Tronics	BRM50716	G239	N/A	N/A
Smart Fieldmeter	EMC Test Design	RFP-04CE	248/116	N/A	N/A
Synthesized Signal Generator (10MHz - 40GHz)	Anritsu	68367C A/NV	11625	5/10/19	5/10/2020
Spectrum Analyser (9kHz-43GHz)	Anritsu	MS2830A	6201145210	5/10/19	5/10/2020
Spectrum Analyser (9kHz-40GHz)	Rohde & Schwarz	FSP38	100630	5/10/19	5/10/2020
2 x Attenuator - 10dB	Pasternack	PE7005-10	VL059-1, VL059-2	N/A	N/A
Attenuator - 20dB	Pasternack	PE7005-20	VL060	N/A	N/A
Attenuator - 3dB	Pasternack	PE7005-3	VL060	N/A	N/A
Wideband Radio Communicator	Rohde & Schwarz	CMW500	147508	5/8/2019	5/8/2020
Attenuator - 30dB	JFW Industries, Inc	50HF-030 SMA	VL085	N/A	N/A
Temperature/Humidity Chamber	Thermotron	SM-8-8200	40991	9/8/2019	9/8/2020
Mixer	OML	M19HW/A	U91205-1	11/18/2019	11/18/2020
Mixer	OML	M15HW/A	V91205-1	11/18/2019	11/18/2020
Mixer	OML	M12HW/A	E91205-1	11/18/2019	11/18/2020
Standard Horn	OML	M19RH	U91205-A	11/18/2019	11/18/2020
Standard Horn	OML	M15RH	V91205-A	11/18/2019	11/18/2020
Standard Horn	OML	M12RH	E91205-A	11/18/2019	11/18/2020