Vista Labs
TEST • CERTIFY • COMPLY

Phone: +1 (949) 393-1123
Web: www.vista-compliance.com
Email: info@vista-compliance.com

RF Test Report

Test Report Number	SRF-21021741-LC-FCC-RF
FCC ID	CO6-GK-HP
Applicant	SpotterRF, LLC
Applicant Address	720 Timpanogos Parkway, Orem, UT 84097, USA
Product Name	Ground Surveillance Radar
Model (s)	GK400
Family Model (s)	GK300, GK350, GK450, GK500
Date of Receipt	04/15/2021
Date of Test	04/15/2021 – 05/24/2021
Report Issue Date	05/24/2021
Test Standards	47 CFR Part 15.249
Test Result	**PASS**

Issued by:

Vista Compliance Laboratories
1261 Puerta Del Sol, San Clemente, CA 92673 USA
www.vista-compliance.com

Daniel Bruno (Test Technician)	**David Zhang (Technical Manager)**

REVISION HISTORY

Report Number	Version	Description	Issued Date
SRF-21021741-LC-FCC-RF	01	Initial report	05/24/2021

TABLE OF CONTENTS

1 Test Summary

Test Item	Test Requirement	Test Method	Result
Antenna Requirement	47 CFR Part 15.203	N/A	Pass
Conducted Emissions	47 CFR Part 15,207	ANSI C63.10 (2013)	Pass
20 dB Bandwidth	47CFR Part 15.215	ANSI C63.10 (2013)	Pass
Occupied Bandwidth	47CFR Part 15.249(e)	ANSI C63.10 (2013)	Pass
Fundamental Field Strength and Radiated Spurious Emission	47CFR Part 15.249	ANSI C63.10 (2013)	Pass

2 General Information

2.1 Applicant

Applicant	SpotterRF, LLC
Applicant address	720 Timpanogos Parkway, Orem, UT 84097, USA
Manufacturer	SpotterRF, LLC
Manufacturer Address	720 Timpanogos Parkway, Orem, UT 84097, USA

2.2 Product information

Product Name	Ground Surveillance Radar
Model Number	GK400
Family Models	GK300, GK350, GK450, GK500
Serial Number	SP61422
Frequency Band	24.005 – 24.240 GHz
Type of modulation	Continuous Wave
Equipment Class	DXX
Antenna Information	Integral PCB patch antenna, 12 dBi gain
Clock Frequencies	N/A
Input Power	24VDC, 5A
Power Adapter Manufacturer/Model	AC/DC adapter: Phoenix Contract / PS/1AC/24DC/5 PoE Injector: L-COM / BTD-CAT6-P1
Power Adapter SN	3014893014
Hardware version	N/A
Software version	N/A
Simultaneous Transmission	N/A
Additional Info	K1 Mode: 24.005-24.080 GHz K2 Mode: 24.085-24.160 GHz K3 Mode: 24.165-24.240 GHz Manufacturer declares that the family of models including GK300, GK350, GK400, GK450, and GK500 are electrically identical with the only difference between models being the displayed coverage area. The differences on these variants does not affect any product radio or EMC performance. The model of GK400 was tested as worst-case representative.

2.3 Test standard and method

Test standard	47 CFR Part 15.249
Test method	ANSI C63.10: 2013

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

Test Condition	Temperature	Humidity	Atmospheric Pressure
RF Testing	23.5°C	58.2%	996 mbar

3 Modification of EUT / Deviations from Standards

N/A

4 Test Configuration and Operation

4.1 EUT Test Configuration

The EUT is powered by an external PoE injector. It is connected to a test laptop through a RJ45 cable and receives test commands for RF measurement.

The following software was used for testing and to monitor EUT performance.

Software	Description
EMISoft Vasona	EMC/RF Spurious emission test software used during testing

4.2 Supporting Equipment

Description	Manufacturer	Model #	Serial #
Laptop	Dell	XPS / G1H5102	34917771602
PoE Injector	BTD-CAT6-P1	L-COM	N/A
AC/DC Power supply	PSA60R-240	PHIHONG	P4040093A1

5 Uncertainty of Measurement

Test item	Measurement Uncertainty (dB)
AC Conducted Emissions (150K-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
Radiated Emission (above 40GHz)	±3.5 dB

6 Test Results

6.1 Antenna Requirement

6.1.1 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.

6.1.2 Result

Analysis:

- EUT uses Integral PCB patch antenna. No standard RF connector is used.

Conclusion:

- EUT complies with antenna requirement in § 15.203.

6.2 Conducted Emissions

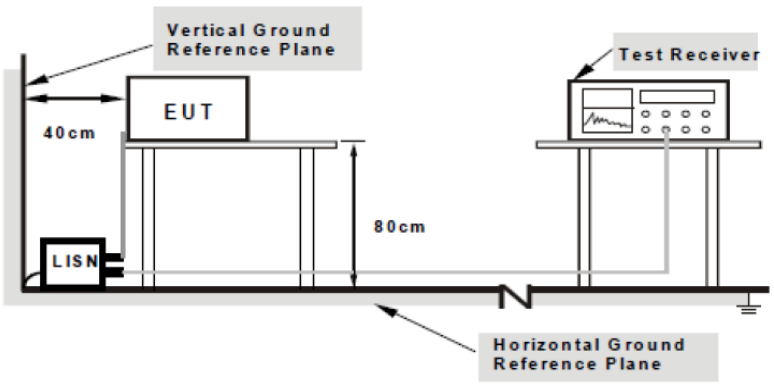
6.2.1 Requirement

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 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.

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: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.			

6.2.2 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.

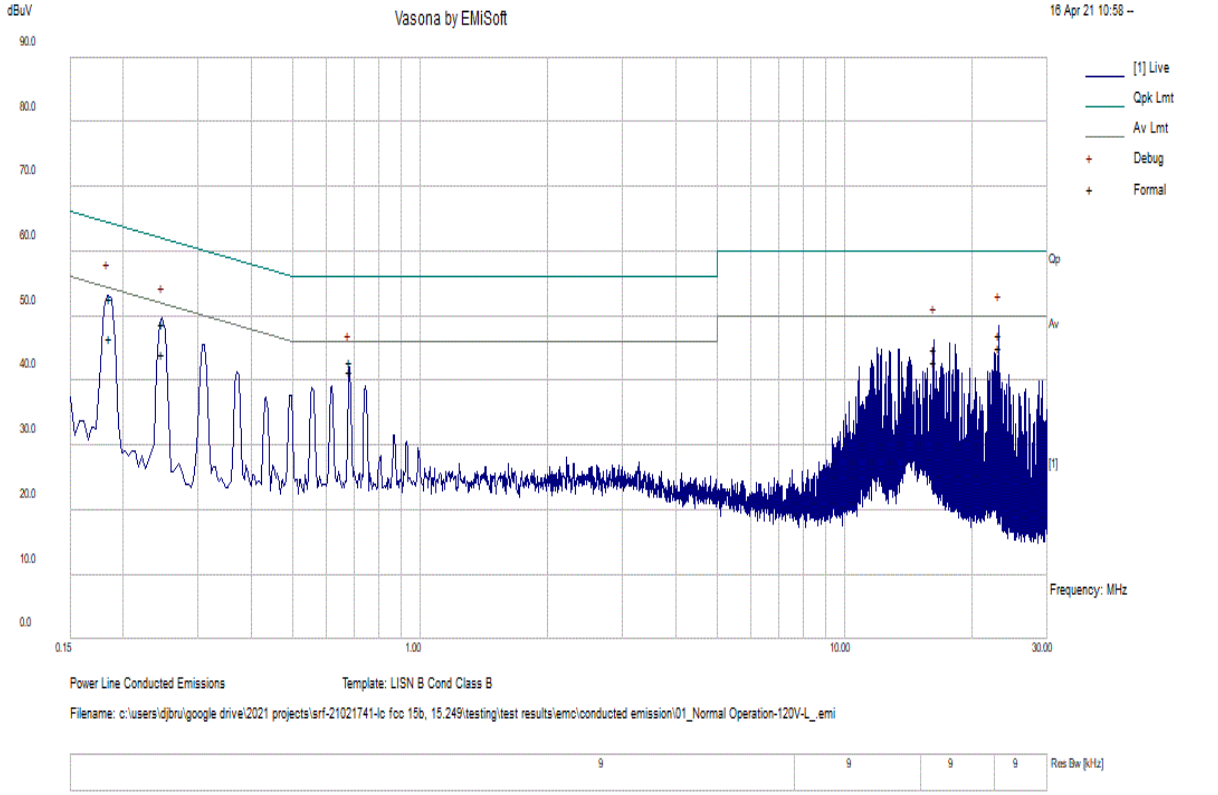
6.2.3 Test Procedure

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.

6.2.4 Test Result

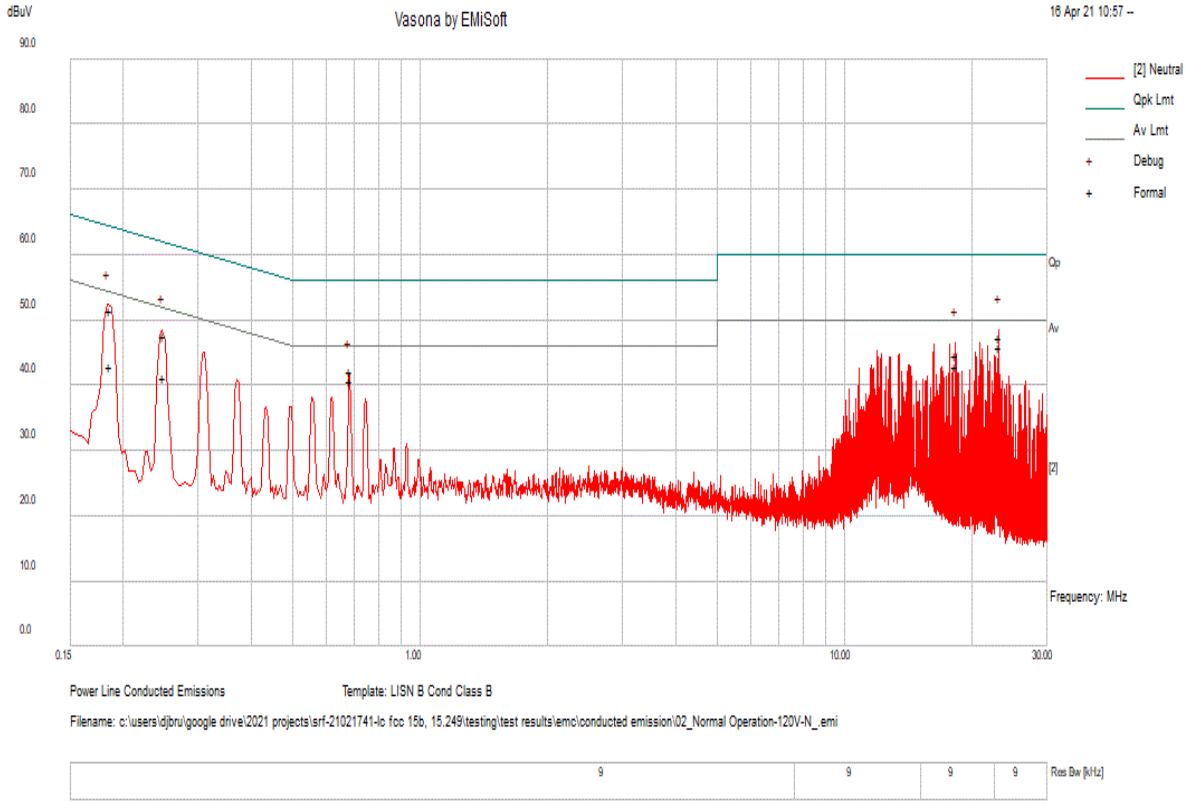
CONDUCTED EMISSIONS

Test Standard:	LISN B Cond Class B	Mode:	Normal Operation
Frequency Range:	0.15 - 30MHz	Test Date:	04/15/2021 – 05/24/2021
Line:	Live	Test Personnel:	Daniel Bruno
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass/Fail
0.186	42.40	10.1	0.2	52.7	Quasi Peak	Live	64.20	-11.5	Pass
23.128	35.70	10.8	0.6	47.1	Quasi Peak	Live	60.00	-12.9	Pass
0.248	38.50	10.1	0.2	48.8	Quasi Peak	Live	61.80	-13.1	Pass
16.228	34.00	10.7	0.3	45	Quasi Peak	Live	60.00	-15	Pass
0.682	32.70	10.1	0.1	42.9	Quasi Peak	Live	56.00	-13.1	Pass
0.186	36.40	10.1	0.2	46.6	Average	Live	54.20	-7.6	Pass
23.128	33.70	10.8	0.6	45.1	Average	Live	50.00	-4.9	Pass
0.248	33.80	10.1	0.2	44.1	Average	Live	51.80	-7.8	Pass
16.228	32.00	10.7	0.3	43.1	Average	Live	50.00	-6.9	Pass
0.682	31.30	10.1	0.1	41.5	Average	Live	46.00	-4.5	Pass

Test Standard:	LISN B Cond Class B	Mode:	Normal Operation
Frequency Range:	0.15 - 30MHz	Test Date:	04/15/2021 – 05/24/2021
Line:	Neutral	Test Personnel:	Daniel Bruno
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass/Fail
23.128	36.00	10.8	0.6	47.4	Quasi Peak	Neutral	60.00	-12.6	Pass
0.186	41.30	10.1	0.2	51.6	Quasi Peak	Neutral	64.20	-12.6	Pass
0.249	37.30	10.1	0.2	47.6	Quasi Peak	Neutral	61.80	-14.2	Pass
18.243	33.60	10.7	0.5	44.8	Quasi Peak	Neutral	60.00	-15.2	Pass
0.682	32.10	10.1	0.1	42.3	Quasi Peak	Neutral	56.00	-13.7	Pass
23.128	34.50	10.8	0.6	46	Average	Neutral	50.00	-4	Pass
0.186	32.70	10.1	0.2	42.9	Average	Neutral	54.20	-11.3	Pass
0.249	30.90	10.1	0.2	41.2	Average	Neutral	51.80	-10.6	Pass
18.243	31.80	10.7	0.5	43	Average	Neutral	50.00	-7	Pass
0.682	30.60	10.1	0.1	40.8	Average	Neutral	46.00	-5.2	Pass

6.3 20 dB Bandwidth

6.3.1 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.

6.3.2 Test Setup

6.3.3 Test Procedure

According to subclause 6.9.2 of ANSI C63.10-2013:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

d) Steps a) through c) might require iteration to adjust within the specified tolerances.

e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "-xx dB down" requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.

f) Set detection mode to peak and trace mode to max hold.

g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

h) Determine the "−xx dB down amplitude" using [(reference value) - xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.

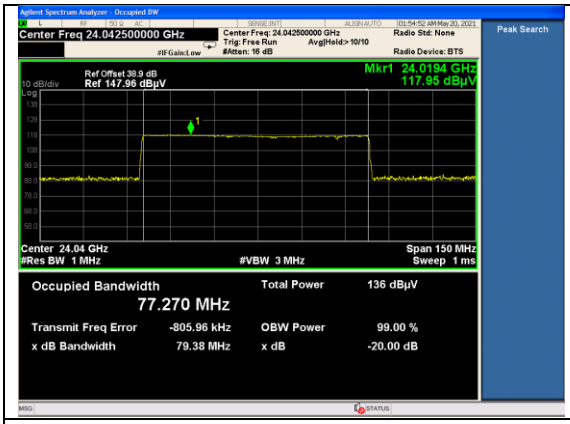
i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).

j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-xx dB down amplitude" determined in step h). If a marker is below this "-xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "-xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

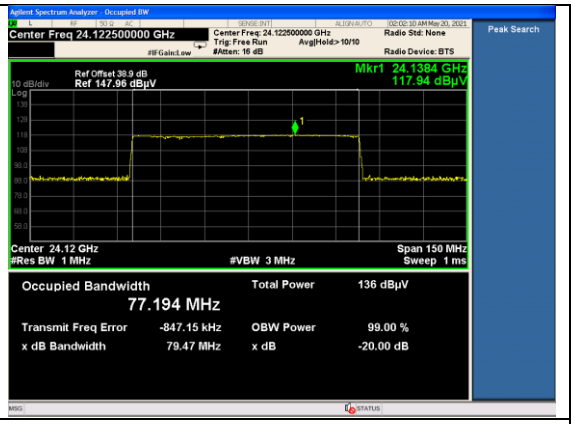
k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labelled. Tabular data may be reported in addition to the plot(s).

6.3.4 Test Result

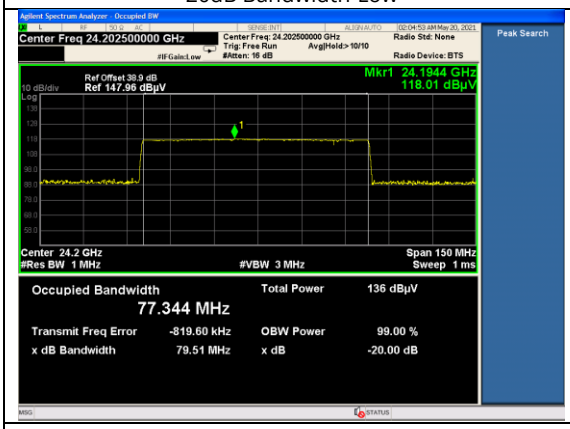
Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Frequency Lower (MHz)	Frequency Upper (MHz)	Result
Low	24040	79.38	24000.31	24079.69	Pass
Mid	24120	79.47	24080.27	24159.74	Pass
High	24200	79.51	24160.25	24239.76	Pass



20dB Bandwidth-Low



20dB Bandwidth-Mid



20dB Bandwidth-High

6.4 Occupied Bandwidth (99%)

6.4.1 Requirement

The 99% OBW is for reporting purpose only. The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

6.4.2 Test Procedure

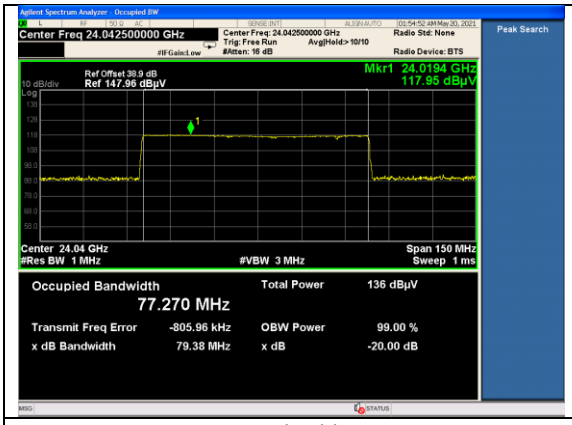
According to subclause 6.9.3 of ANSI C63.10-2013:

1. Set RBW = 1% to 5% of the actual occupied BW.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Span = large enough to capture all products of the modulation process
7. Allow the trace to stabilize.
8. Use automatic bandwidth measurement capability on instrument to obtain BW result.

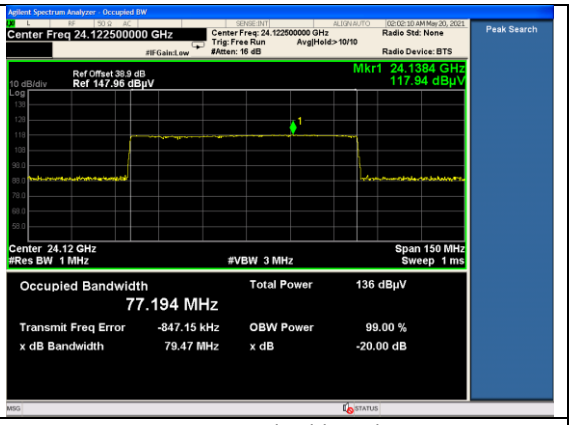
6.4.3 Test Setup

6.4.4 Test Results

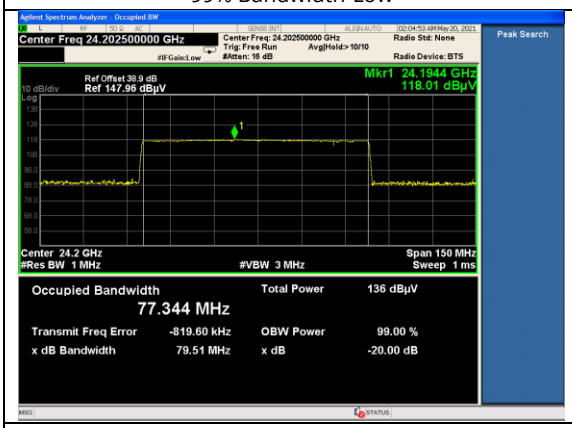
Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Limit (MHz)	Result
Low	24040	77.270	Reference only	N/A
Mid	24120	77.194	Reference only	N/A
High	24200	77.344	Reference only	N/A



99% Bandwidth-Low



99% Bandwidth-Mid



99% Bandwidth-High

6.5 Fundamental Field Strength and Radiated Spurious Emission

6.5.1 Requirement

§ 15.249 (a)

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(c) Field strength limits are specified at a distance of 3 meters.

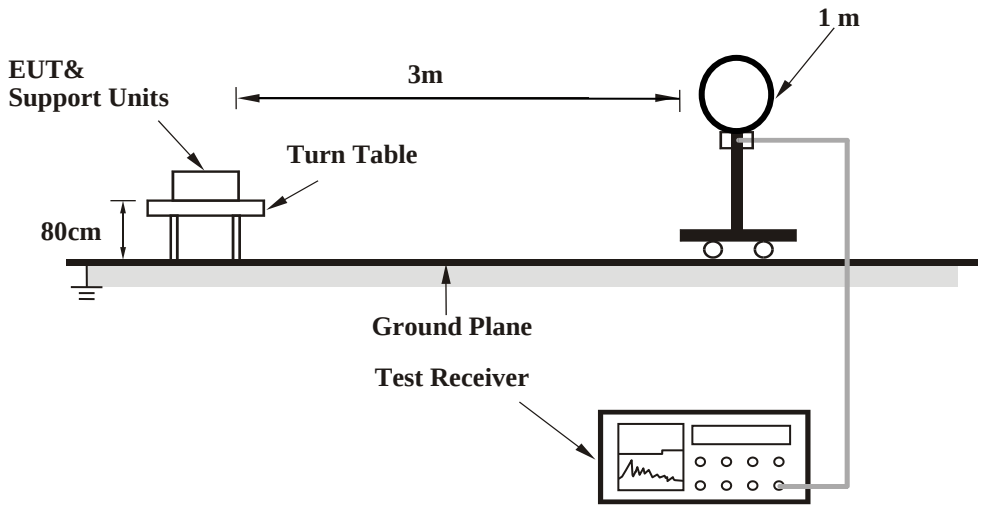
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Frequency Range (MHZ)	Field Strength (μV/m)
0.009~0.490	2400/F(kHz)
0.490~1.705	24000/F(kHz)
1.705~30.0	30
30 – 88	100
88 – 216	150
216 960	200
Above 960	500

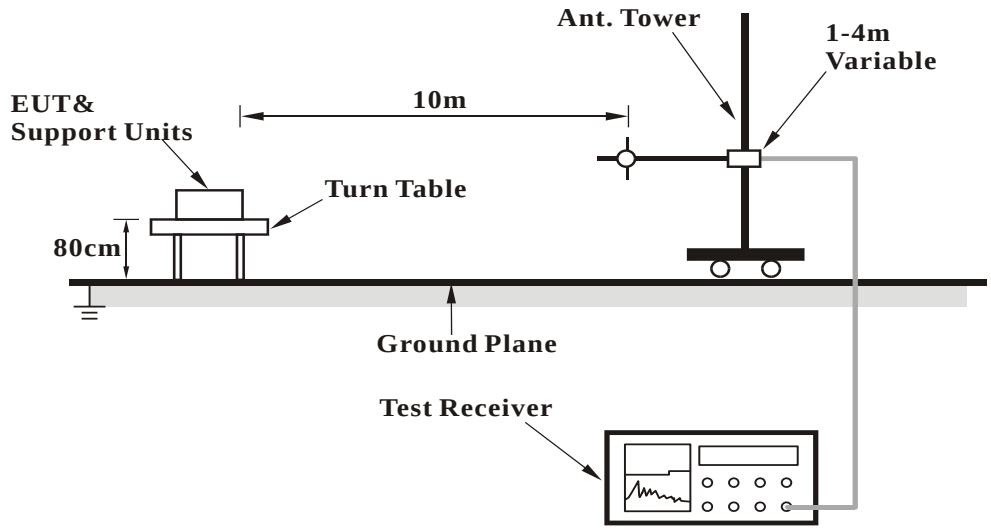
(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth

6.5.2 Test Setup

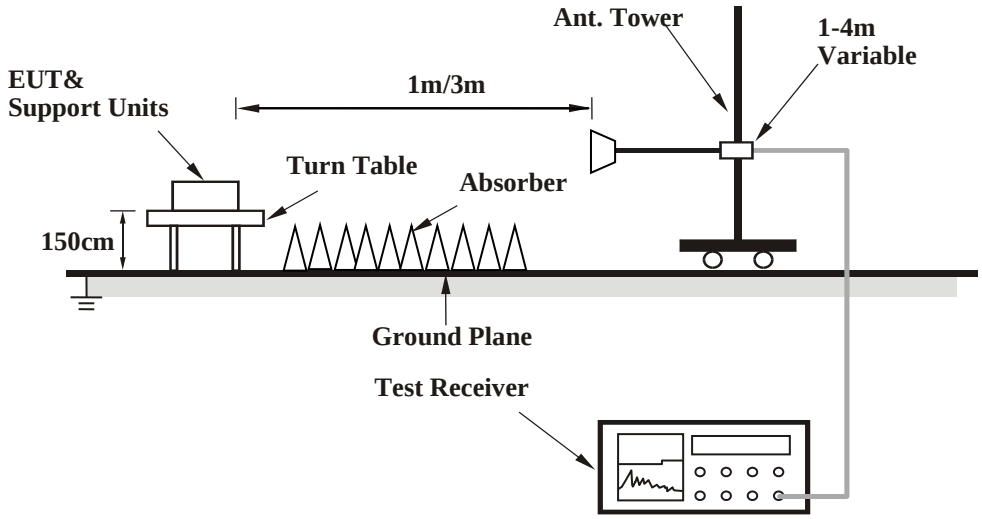
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



6.5.3 Test Procedure

According to subclause 11.12.2.7, Radiated spurious emission measurements, in 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.

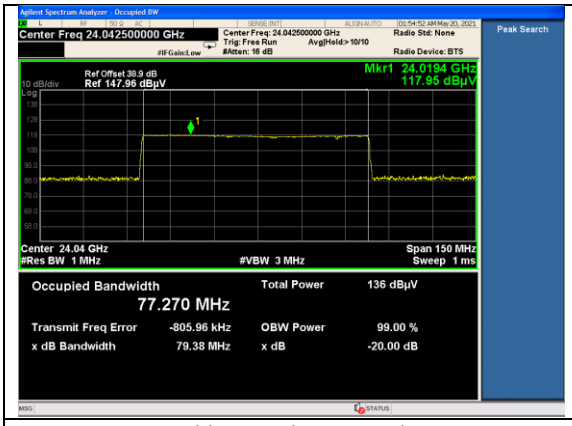
b. The EUT was then rotated to the direction that gave the maximum emission.

c. Finally, the antenna height was adjusted to the height that gave the maximum emission.

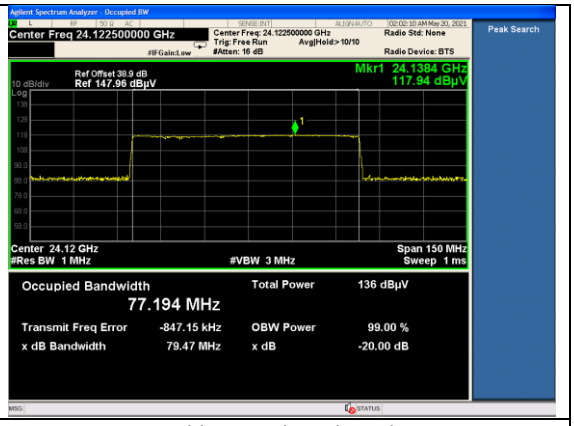
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 300 Hz for frequencies below 150KHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 kHz for frequency between 150KHz – 30MHz.
5. The resolution bandwidth and video bandwidth 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.

6.5.4 Test Result

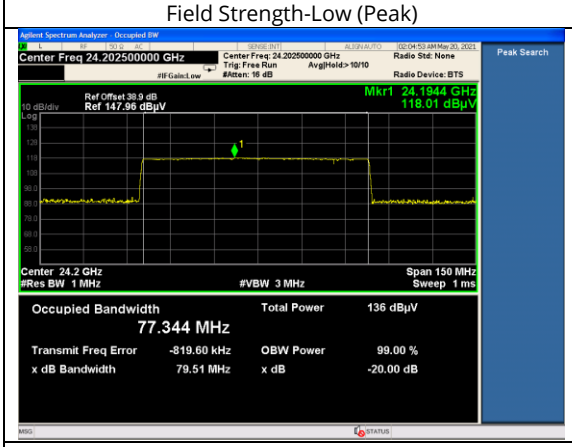
FUNDAMENTAL FIELD STRENGTH



Field Strength-Low (Peak)



Field Strength-Mid (Peak)



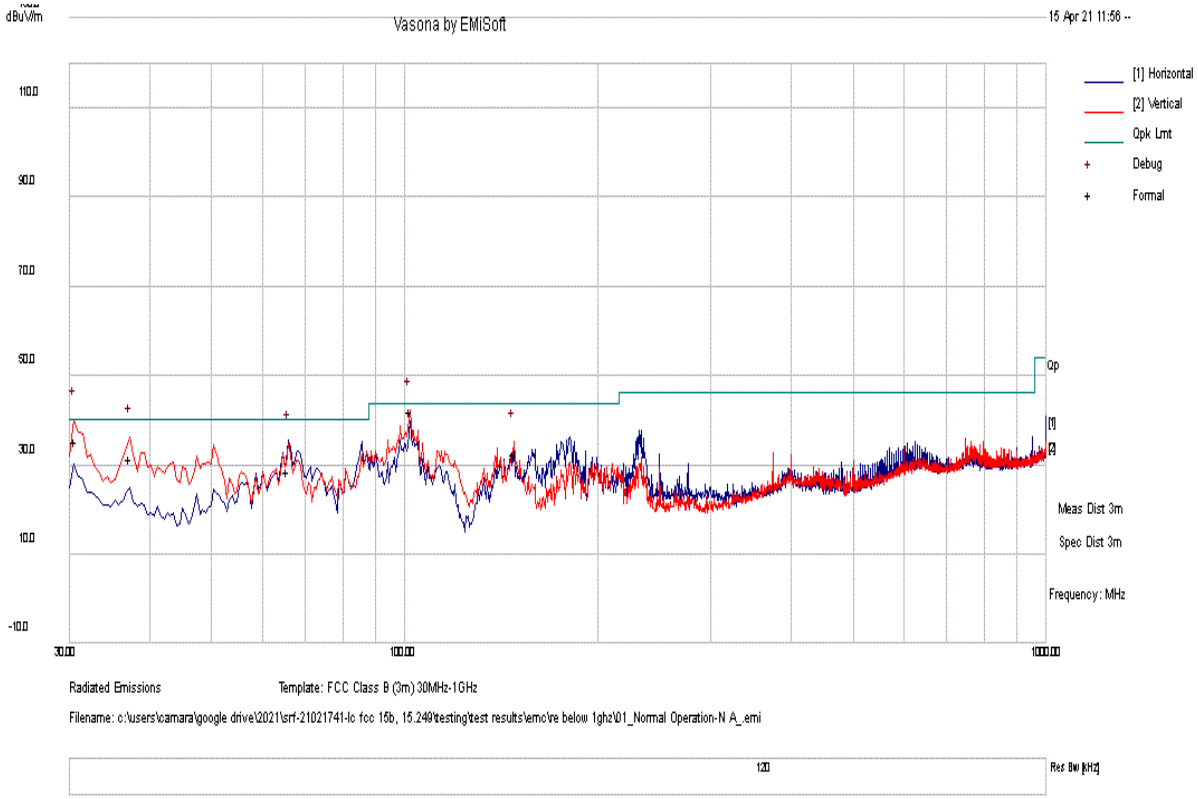
Field Strength-High (Peak)

Test Channel	Frequency MHz	Level dBuV/m	Measurement Type	Limit dBuV/m	Margin dB	Pass/Fail
Low	24040	117.95	Peak	128	-10.05	Pass
Mid	24120	117.94	Peak	128	-10.06	Pass
High	24200	118.01	Peak	128	-9.99	Pass
Low	24040	93.76	Average	108	-14.24	Pass
Mid	24120	94.07	Average	108	-13.93	Pass
High	24200	89.74	Average	108	-18.26	Pass

RADIATED EMISSIONS BELOW 1 GHZ

Test Standard:	15.209, 15.249	Mode:	Radiated Emission
Frequency Range:	30 MHz - 1 GHz	Test Date:	04/15/2021 – 05/24/2021
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Daniel Bruno
Remark:	N/A	Test Result:	Pass

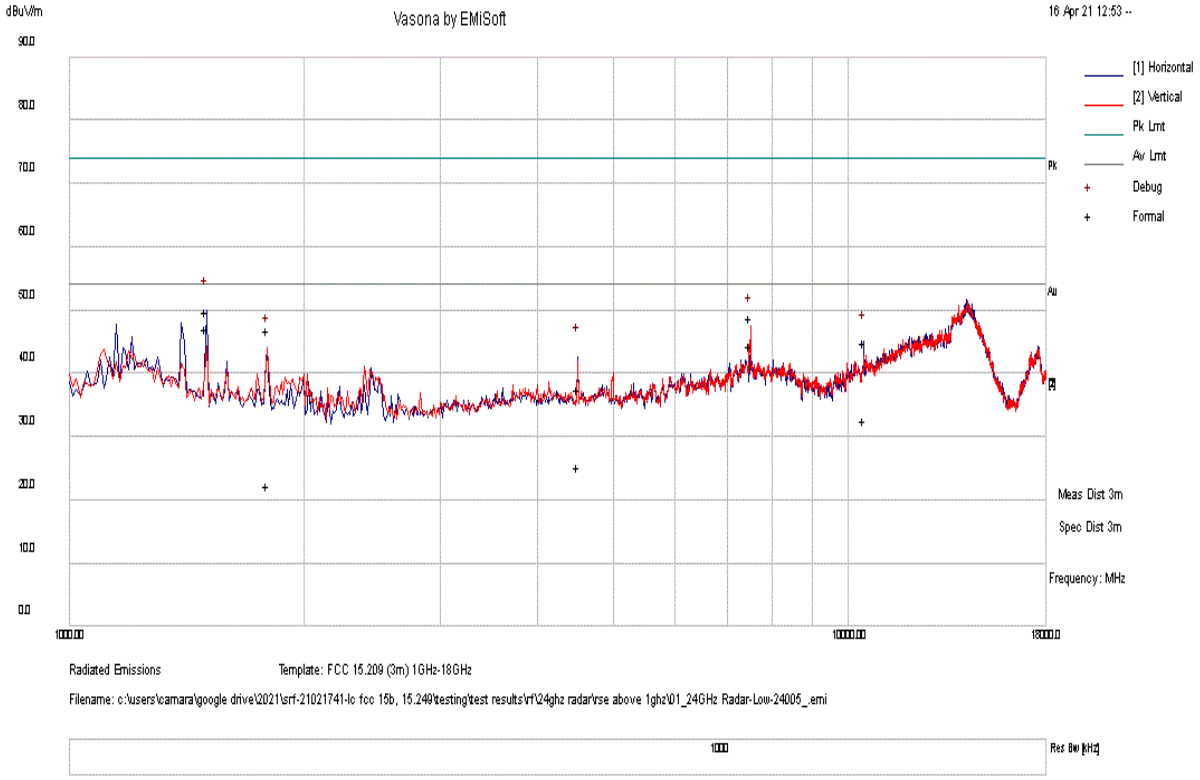
Radiated Emission



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
30.618	45	2.2	-11.9	35.4	Quasi Max	V	129	83	40	-4.6	Pass
101.879	57.5	3.6	-19	42.1	Quasi Max	V	100	275	43.5	-1.4	Pass
37.354	44.7	2.5	-15.6	31.5	Quasi Max	V	148	169	40	-8.5	Pass
65.708	46	3.1	-20.3	28.8	Quasi Max	V	104	27	40	-11.2	Pass
148.099	46.2	4.2	-17.8	32.6	Quasi Max	V	128	164	43.5	-10.9	Pass
30.618	45	2.2	-11.9	35.4	Quasi Max	V	129	83	40	-4.6	Pass

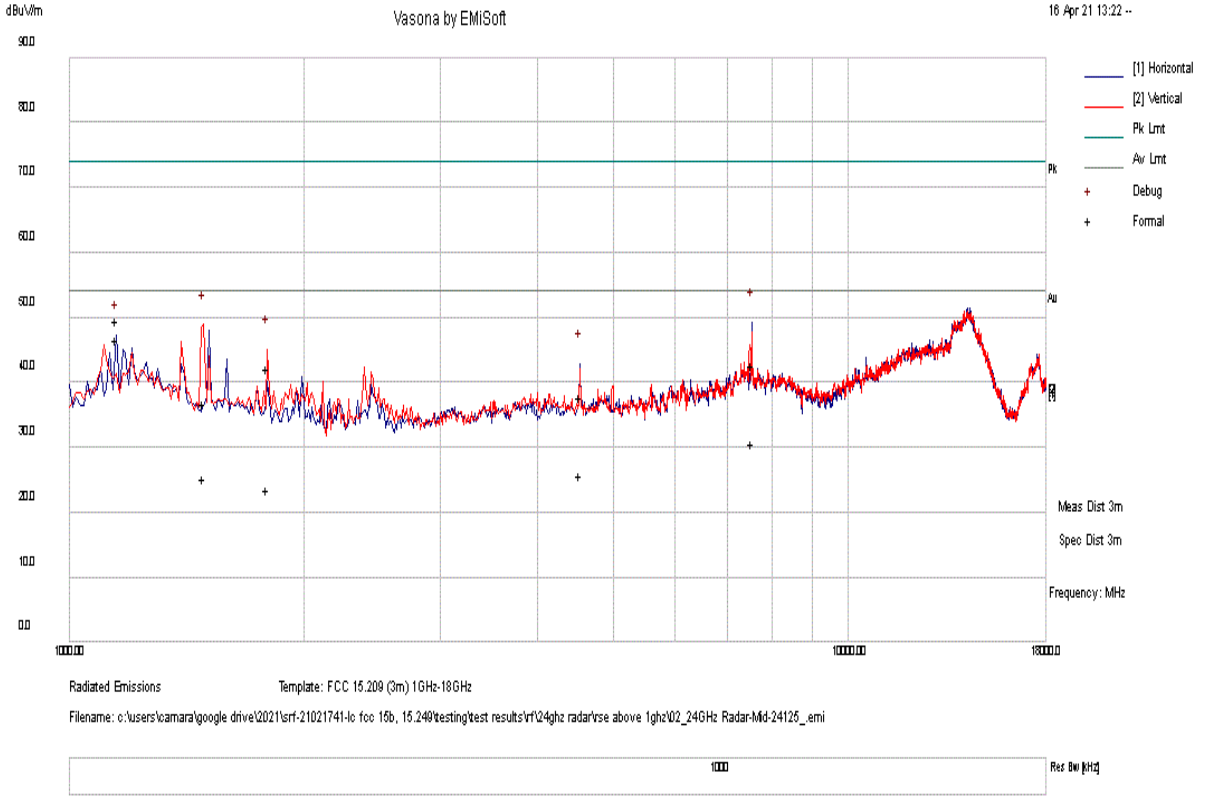
RADIATED EMISSIONS ABOVE 1 GHZ

Test Standard:	15.209, 15.249	Mode:	Radiated Emission
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/15/2021 – 05/24/2021
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Daniel Bruno
Remark:	Low CH	Test Result:	Pass



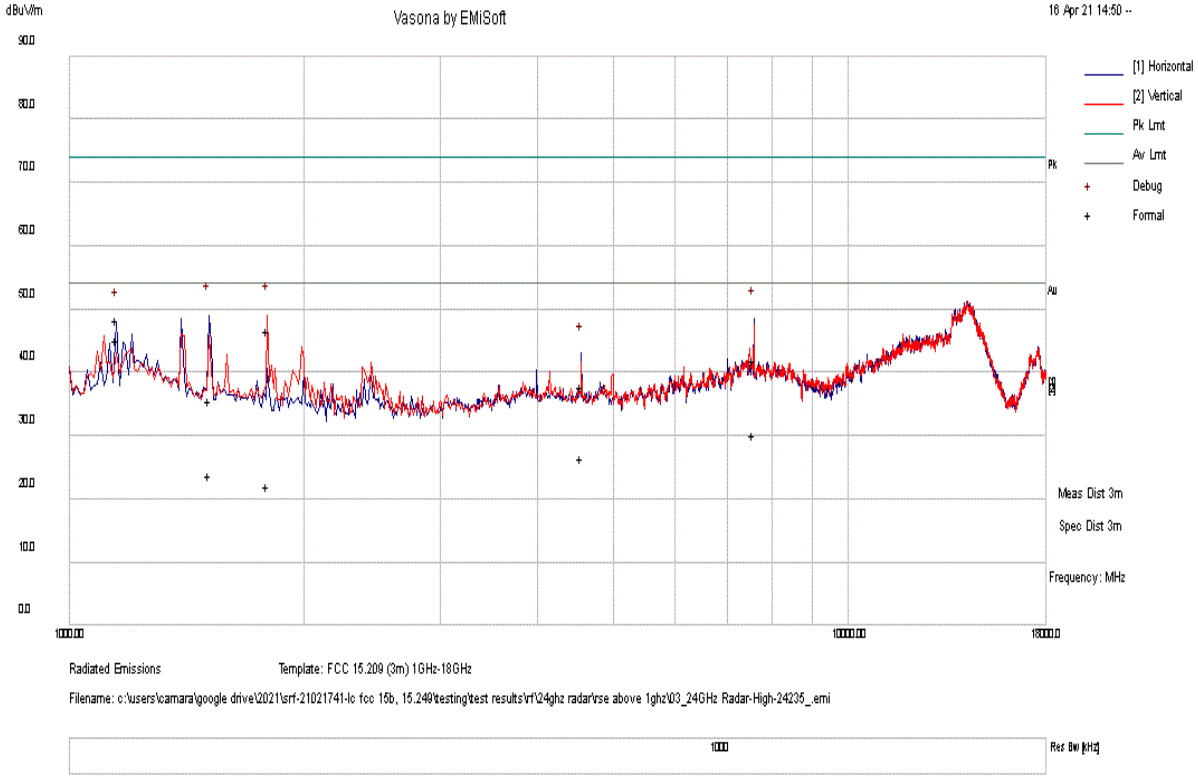
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1500.073	43.5	14.9	-8.5	49.8	Peak Max	H	173	230	74	-24.2	Pass
7501.613	27.0	21.0	0.8	48.8	Peak Max	V	179	34	74	-25.2	Pass
10497.583	19.6	23.1	2.1	44.8	Peak Max	H	117	56	74	-29.2	Pass
1797.038	41.6	14.5	-9.1	47.0	Peak Max	V	340	174	74	-27.0	Pass
4506.04	23.7	17.3	-3.5	37.6	Peak Max	H	342	107	74	-36.4	Pass
1500.073	40.9	14.9	-8.5	47.3	Average Max	H	173	230	54	-6.7	Pass
7501.613	22.6	21.0	0.8	44.4	Average Max	V	179	34	54	-9.6	Pass
10497.583	7.5	23.1	2.1	32.7	Average Max	H	117	56	54	-21.3	Pass
1797.038	16.9	14.5	-9.1	22.3	Average Max	V	340	174	54	-31.7	Pass
4506.04	11.5	17.3	-3.5	25.3	Average Max	H	342	107	54	-28.7	Pass

Test Standard:	15.209, 15.249	Mode:	Radiated Emission
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/15/2021 – 05/24/2021
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Daniel Bruno
Remark:	Mid CH	Test Result:	Pass



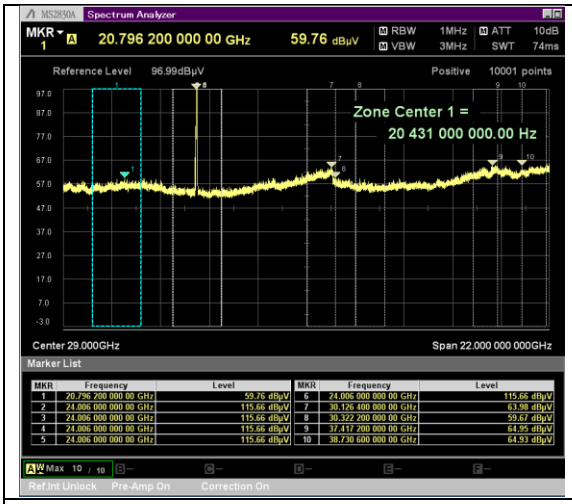
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
7532.715	20.9	21.0	0.7	42.6	Peak Max	H	195	330	74	-31.4	Pass
1489.3	30.4	14.8	-8.4	36.9	Peak Max	V	240	57	74	-37.1	Pass
1149.93	40.5	14.2	-5.1	49.6	Peak Max	H	204	360	74	-24.4	Pass
1798.415	36.7	14.5	-9.1	42.2	Peak Max	V	112	209	74	-31.8	Pass
4529.022	23.9	17.3	-3.4	37.8	Peak Max	H	107	224	74	-36.2	Pass
7532.715	9.0	21.0	0.7	30.7	Average Max	H	195	330	54	-23.3	Pass
1489.3	18.9	14.8	-8.4	25.4	Average Max	V	240	57	54	-28.6	Pass
1149.93	37.6	14.2	-5.1	46.8	Average Max	H	204	360	54	-7.2	Pass
1798.415	18.1	14.5	-9.1	23.5	Average Max	V	112	209	54	-30.5	Pass
4529.022	11.8	17.3	-3.4	25.8	Average Max	H	107	224	54	-28.2	Pass

Test Standard:	15.209, 15.249	Mode:	Radiated Emission
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/15/2021 – 05/24/2021
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Daniel Bruno
Remark:	High CH	Test Result:	Pass

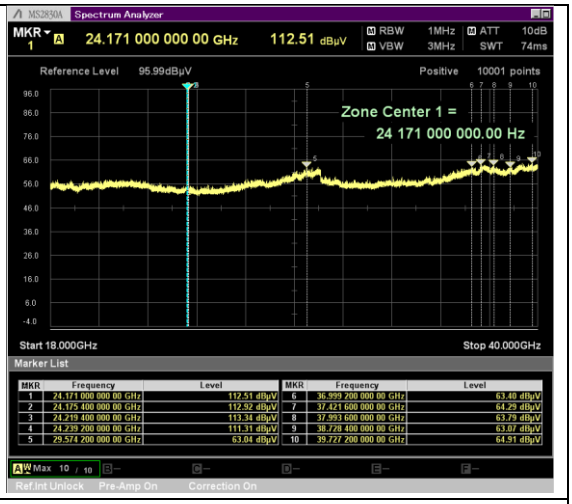


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1511.488	29.5	14.8	-8.6	35.7	Peak Max	H	100	163	74	-38.3	Pass
1795.423	41.3	14.5	-9.1	46.7	Peak Max	V	399	330	74	-27.3	Pass
7576.453	20.5	21.1	0.6	42.1	Peak Max	H	101	0	74	-31.9	Pass
1149.918	39.3	14.2	-5.1	48.4	Peak Max	H	119	360	74	-25.6	Pass
4548.776	23.7	17.3	-3.3	37.8	Peak Max	H	215	196	74	-36.2	Pass
1511.488	17.5	14.8	-8.6	23.8	Average Max	H	100	163	54	-30.2	Pass
1795.423	16.8	14.5	-9.1	22.2	Average Max	V	399	330	54	-31.8	Pass
7576.453	8.6	21.1	0.6	30.2	Average Max	H	101	0	54	-23.8	Pass
1149.918	36.2	14.2	-5.1	45.3	Average Max	H	119	360	54	-8.7	Pass
4548.776	12.4	17.3	-3.3	26.5	Average Max	H	215	196	54	-27.5	Pass

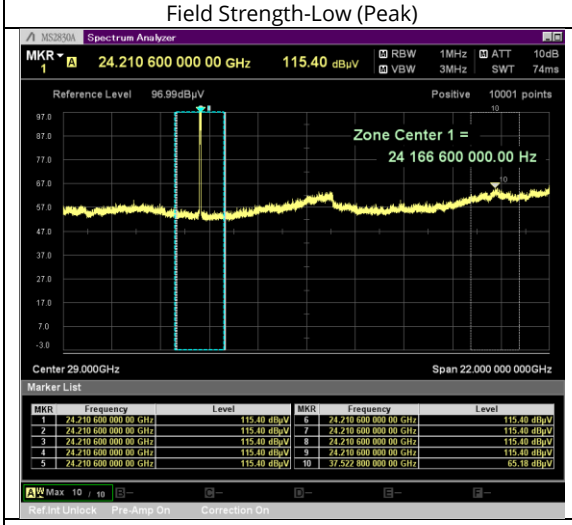
RADIATED EMISSIONS (18-40GHZ)



Field Strength-Low (Peak)



Field Strength-Mid (Peak)



Field Strength-High (Peak)

Test Channel	Frequency MHz	Level dBuV/m	Measurement Type	Limit dBuV/m	Margin dB	Pass/Fail
Low	37575.60	64.95	Peak	74	-9.05	Pass
Mid	30089.00	63.04	Peak	74	-10.96	Pass
High	37577.80	65.18	Peak	74	-8.82	Pass
Low	37575.60	53.08	Average	54	-0.92	Pass
Mid	30089.00	51.05	Average	54	-2.95	Pass
High	37577.80	52.14	Average	54	-1.86	Pass

Note:
The emission at around 24 GHz is fundamental emission. No other outstanding emission was found except noise floor.

RADIATED EMISSIONS (40-60GHZ)

Test Channel	Frequency MHz	Level dBuV/m	Measurement Type	Limit dBuV/m	Margin dB	Pass/Fail
Low	48004	71.48	Peak	88	-16.52	Pass
Mid	48300	70.94	Peak	88	-17.06	Pass
High	48470	70.83	Peak	88	-17.17	Pass
Low	48004	56.04	Average	68	-11.96	Pass
Mid	48300	56.53	Average	68	-11.47	Pass
High	48470	56.51	Average	68	-11.49	Pass

Note:
The emission at around 24 GHz is fundamental emission. No other outstanding emission was found except noise floor.

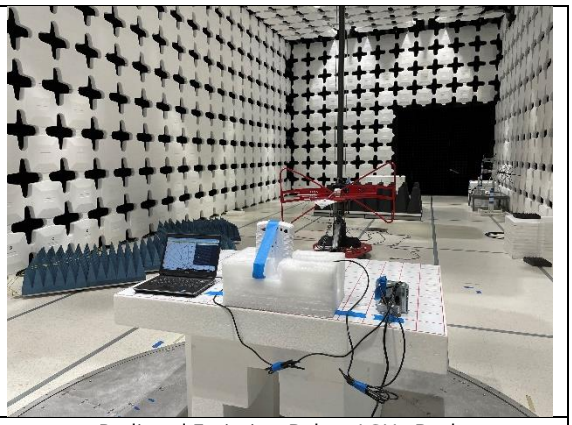
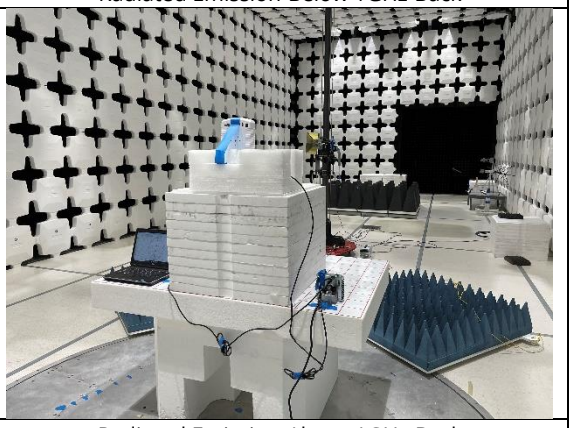
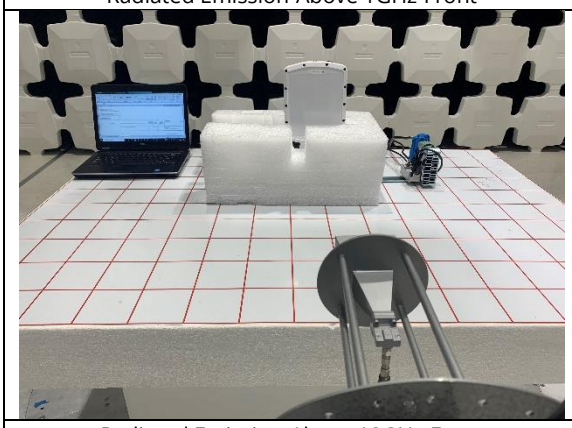
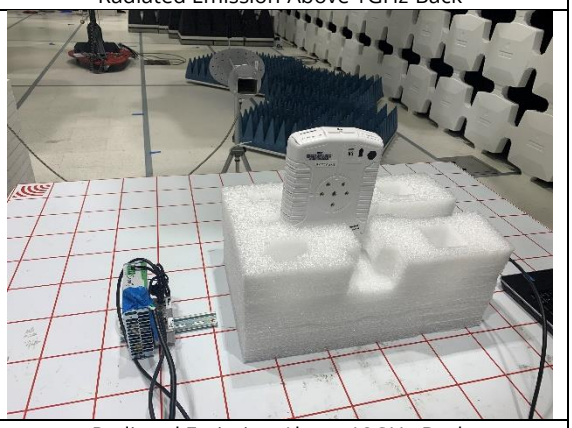
RADIATED EMISSIONS (60-90GHZ)

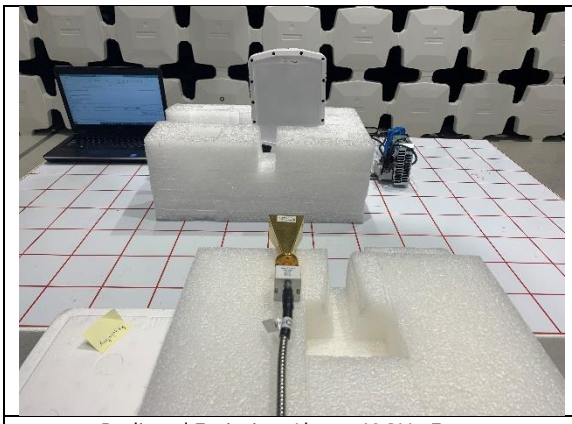
Test Channel	Frequency MHz	Level dBuV/m	Measurement Type	Limit dBuV/m	Margin dB	Pass/Fail
Low	72015	74.80	Peak	88	-13.2	Pass
Mid	72367.5	74.66	Peak	88	-13.34	Pass
High	72705	74.59	Peak	88	-13.41	Pass
Low	72015	59.61	Average	68	-8.39	Pass
Mid	72367.5	59.63	Average	68	-8.37	Pass
High	72705	59.63	Average	68	-8.37	Pass

RADIATED EMISSIONS (90-100GHZ)

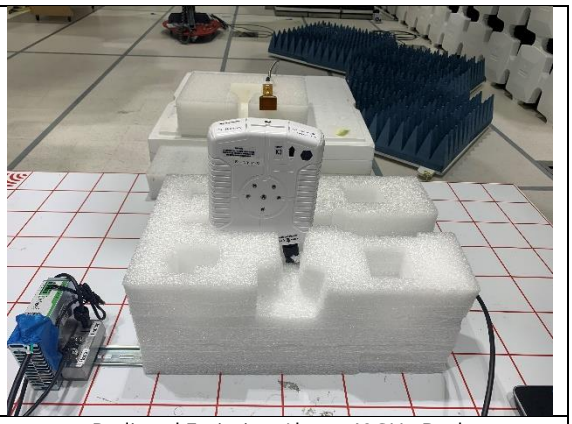
Test Channel	Frequency MHz	Level dBuV/m	Measurement Type	Limit dBuV/m	Margin dB	Pass/Fail
Low	92020	71.71	Peak	88	-16.29	Pass
Mid	96490	71.20	Peak	88	-16.8	Pass
High	96940	71.07	Peak	88	-16.93	Pass
Low	92020	52.99	Average	68	-15.01	Pass
Mid	96490	53.15	Average	68	-14.85	Pass
High	96940	57.56	Average	68	-10.44	Pass

7 EUT and Test Setup Photos

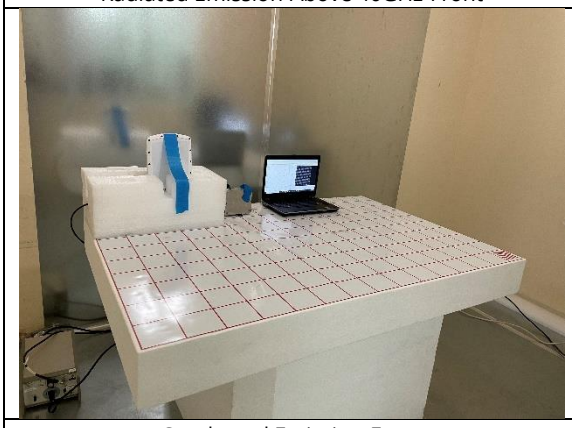
	
Radiated Emission-Below 1GHz-Front	Radiated Emission-Below 1GHz-Back
	
Radiated Emission-Above 1GHz-Front	Radiated Emission-Above 1GHz-Back
	
Radiated Emission-Above 18GHz-Front	Radiated Emission-Above 18GHz-Back



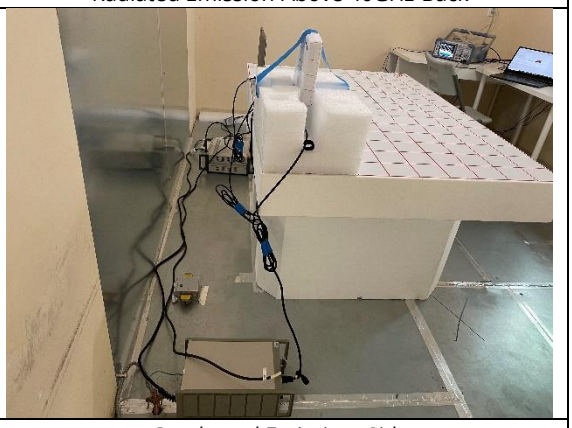
Radiated Emission-Above 40GHz-Front



Radiated Emission-Above 40GHz-Back



Conducted Emission-Front



Conducted Emission -Side

8 Test Instrument List

Equipment	Manufacturer	Model	Instrument Number	Cal. Date	Cal. Due
Semi-Anechoic Chamber	ETS-Lindgren	10M	VL001	10/18/19	10/18/21
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A	N/A
Spectrum Analyzer	Keysight	N9020A	MY50110074	6/17/20	6/17/21
EMC Test Receiver	R&S	ESL6	100230	6/14/20	6/14/21
LISN (9KHz – 30MHz)	EMCO	3816/2	9705-1066	5/4/21	5/4/22
LISN (9KHz – 30MHz)	Com-Power	LI-550C	20140050	01/29/2021	01/29/2022
LISN (9KHz – 30MHz)	Com-Power	LI-550C	20140051	01/29/2021	01/29/2022
Bi-Log Antenna	ETS-Lindgren	3142E	217921	11/15/2020	11/15/2021
Horn Antenna (1-18GHz)	Electro-Metrics	EM-6961	6292	5/14/2021	5/14/2022
Horn Antenna (18-40GHz)	Com-Power	AH-840	101109	6/24/20	6/24/21
Preamplifier	RF Bay, Inc.	LPA-10-20	11180621	7/16/2020	7/16/2021
True RMS Multi-meter	UNI-T	UT181A	C173014829	5/5/2021	5/5/2022
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	5/15/2021	5/15/2022
RF Attenuator	Pasternack	PE7005-3	VL061	7/16/2020	7/16/2021
Preamplifier 100KHz - 40GHz	Aeroflex	33711-392-77150-11	064	7/16/2020	7/16/2021
EM Center Control	ETS-Lindgren	7006-001	160136	N/A	N/A
Turn Table	ETS-Lindgren	2181-3.03	VL002	N/A	N/A
Boresight Antenna Tower	ETS-Lindgren	2171B	VL003	N/A	N/A
Loop Antenna (9k-30MHz)	Com-Power	AL-130	121012	5/16/21	5/16/22
RE test cable(below 6GHz)	Vista	RE-6GHz-01	RE-6GHz-01	7/16/2020	7/16/2021
RE test cable (1-18GHz)	PhaseTrack	II-240	RE-18GHz-01	7/16/2020	7/16/2021
RE test cable (>18GHz)	Sucoflex	104	344903/4	7/16/2020	7/16/2021
Pulse limiter	Com-Power	LIT-930A	531727	7/16/2020	7/16/2021
CE test cable #1	FIRST RF	FRF-C-1002-001	CE-6GHz-01	7/16/2020	7/16/2021
CE test cable#2	FIRST RF	FRF-C-1002-001	CE-6GHz-02	7/16/2020	7/16/2021
Vector Signal Generator	Keysight	N5182A	US47080548	6/17/20	6/17/21
RF Power Amplifier (80-1000MHz)	Ophir	5226FE	1013/1815	N/A	N/A
RF Power Amplifier (700-6000MHz)	Ophir	5293FE	1063/1815	N/A	N/A
Horn Antenna (1-18GHz)	FT-RF	HA-07M18G-NF	180010HA	N/A	N/A
Horn Antenna (40-60GHz)	OML.Inc	M19RH	19121801-19	12/13/2019	12/13/2022
Harmonic Mixer (40-60GHz)	OML.Inc	M19HWA	191213-1-19	12/13/2019	12/13/2022
Horn Antenna (60-90GHz)	OML.Inc	M12RH	19121801-12	12/13/2019	12/13/2022

Harmonic Mixer (60-90GHz)	OML.Inc	M12HWA	191213-1-12	12/13/2019	12/13/2022
Horn Antenna (90-140GHz)	OML.Inc	M08RH	19121801-08	12/13/2019	12/13/2022
Harmonic Mixer (90-140GHz)	OML.Inc	M08HWA	191213-1-08	12/13/2019	12/13/2022