TEST REPORT

Report Number. : 14888706-E2V3

Applicant	:	ENERGOUS CORPORATION 3590 NORTH FIRST STREET, SUITE 210, SAN JOSE, CA 95134, U.S.A.
Model	:	VN55, VN55-E
Brand	:	ENERGOUS
FCC ID	:	2ADNG-VN55
IC	:	23686-VN55
EUT Description	:	WIRELESS CHARGER
Test Standard(s)	:	FCC 47 CFR PART 15 C ISED RSS-247 ISSUE 3 ISED RSS-GEN ISSUE 5 + A1 + A2

Date Of Issue:
2023-10-30

Prepared by:
UL VERIFICATION SERVICES INC.
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ACCREDITED
CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-08-14	Initial Issue	-
V2	2023-10-17	Corrected FCC standard wording and revised Section 6.5 C2PC description. Added additional model number. Added Section model number difference description. Revised RSS 247 to Issue 3.	Tina Chu
V3	2023-10-30	Updated Section 10.2 to address TCB's question	Tina Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ENERGOUS CORPORATION
3590 NORTH FIRST STREET,
SUITE 210,
SAN JOSE, CA 95134, U.S.A.

EUT DESCRIPTION: WIRELESS CHARGER

MODEL: VN55, VN55-E(TESTED MODEL NUMBER)

BRAND: ENERGOUS

SERIAL NUMBER: D003778 (CONDUCTED/RADIATED)

SAMPLE RECEIPT DATE: 2023-07-13

DATE TESTED: 2023-07-14 TO 2023-07-24

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC 47 CFR Part 15 C	Complies
ISED RSS-247 Issue 3	Complies
ISED RSS-GEN Issue 5 + A1 + A2	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document.

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2. TEST RESULTS SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

Below is a list of the data provided by the customer:

1) Antenna gain and type (see section 6.3)
2) Cable Loss (see section 6.3)

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	RSS-GEN 6.7	99% OBW	Not performed	Antenna changed only, no impacted conducted test items
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW	Not performed	Antenna changed only, no impacted conducted test items
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power	Complies	None.
See Comment		Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	RSS-247 5.2 (b)	PSD	Not performed	Antenna changed only, no impacted conducted test items
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Not performed	Antenna changed only, no impacted conducted test items
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Complies	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Not performed	Antenna changed only, no impacted on the AC powerline test.

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A1 + A2, and RSS-247 Issue 3.

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, Certificate Number 0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☒	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
☐	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A			
☒	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A			

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5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22%
Power Spectral Density	2.47 dB
RF Power Measurement Direct Method Using Power Meter	1.3 dB (PK) / 0.45 dB (AV)
Unwanted Emissions, Conducted	1.94 dB
Worst Case Conducted Disturbance, 9kHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, 9kHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB
Time Domain Measurements	3.39%
Temperature	0.57˚C
Humidity	3.39%
DC Supply Voltages	0.57%

Uncertainty figures are valid to a confidence level of 95%.

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5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a stand-alone wireless charger with BLE and Zigbee 802.15.4 that is mounted on a ceiling. The wireless charger transmits power via a frequency hopping signal between 907MHz to 920MHz and a DTS Zigbee 802.15.4 signal between 2402MHz and 2480MHz, and charges multiple receivers at a time.

This report documents test results of the Bluetooth Low Energy radio portion (BLE only supports 1Mbps) of the wireless charger.

6.2. DESCRIPTION OF MODEL NUMBER DIFFERENCE

Model number: VN55: Original filing for EUT with internal antenna.
Model number: VN55-E: Class II permissive change filing for EUT with external antenna.
Tested model number: VN55-E.

6.3. MAXIMUM OUTPUT POWER

Refer to original test report 14262501-E2V2 for max output power.

6.4. DESCRIPTION OF AVAILABLE ANTENNAS AND CABLE LOSS

The antenna(s) gain and type, cable loss as provided by the manufacturer' are as follows:

The BLE radio utilizes one External Omni Dipole antenna, with a maximum gain of 6dBi.

Cable loss: 0.5 dB

6.5. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

This class II permissive change is to add a new external antenna type and the highest gain to support SISO for all technologies and additional range on the 900MHz radio from 917.2MHz-918.8MHz to 907MHz-920MHz via firmware changed.

6.6. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was dtm_ble_ant1_3dBm

The test utility software used during testing was dtm_ble_ant1_3dBm

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6.7. WORST-CASE CONFIGURATION AND MODE

Radiated band edge, harmonics, and spurious emissions from 1 GHz to 18GHz were performed with the EUT was set to transmit at the Low/Middle/High channels.

Radiated harmonics, and spurious emissions from 1 GHz to 18GHz were performed with the EUT was set to transmit at the Low/Mid/High channels with highest output power as worst-case scenario.

Radiated emission below 30MHz, below 1GHz, above 18GHz were performed with the EUT was set to transmit at the channel with highest output power as worst-case scenario.

The EUT is a ceiling mounted device, and it has one USB type C port for power only. The fundamental of the antenna was investigated in three orthogonal orientations X,Y(upright), it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Worst-case data rate as provided by the client was:
BLE: 1 Mbps.

WPT band and BLE transmit (beaconing) simultaneously, simultaneous operation result of the radiated emissions is documented in UL document 14888706-E1 WPT report.

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6.8. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID/ DoC**
Laptop	Dell	Precision 5520	FK7QHM2	DoC
Laptop AC/DC adapter	Dell	HA130PM130	CN-0V363H-CH200-84A-03QN-A01	DoC
AC/DC Switching Adapter	CUI Inc.	HDP-QB05010U	-	DoC

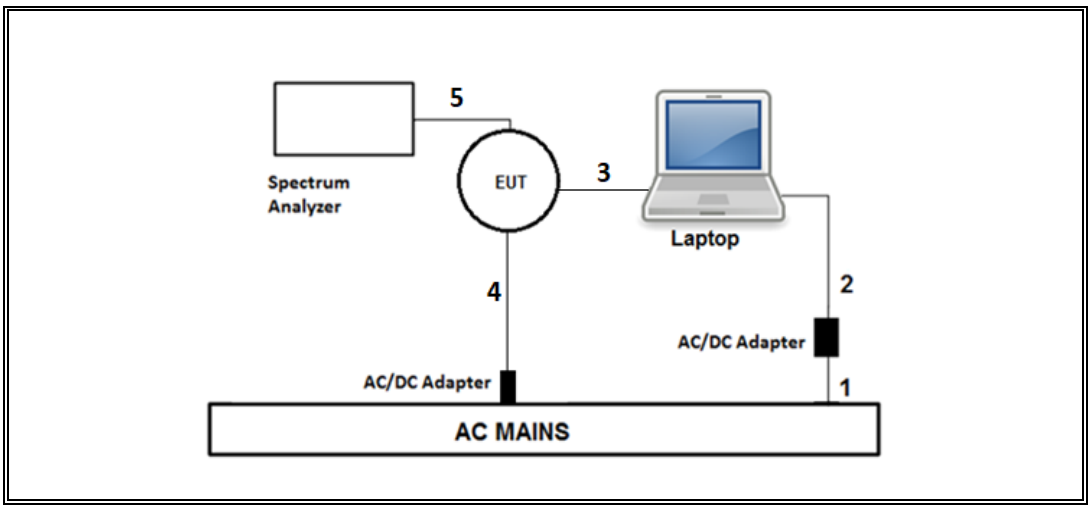
I/O CABLES (RF CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	AC	Un-shielded	1	AC Mains to AC/DC Adapter
2	DC	1	DC	Un-shielded	1.5	AC/DC Adapter to Laptop
3	USB to UART	1	USB A	Un-shielded	1.5	Laptop to EUT
4	USB	1	USB Type C	Shielded	1	EUT to AC/DC adapter
5	Antenna	1	SMA	Un-shielded	0.3	To spectrum analyzer

I/O CABLES (RF RADIATED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	USB Type C	Shielded	1	

TEST SETUP-RF CONDUCTED TEST

The EUT was powered by AC/DC adapter via USB cable. Test software exercised the EUT. Laptop was removed after test setup.

SETUP DIAGRAMS



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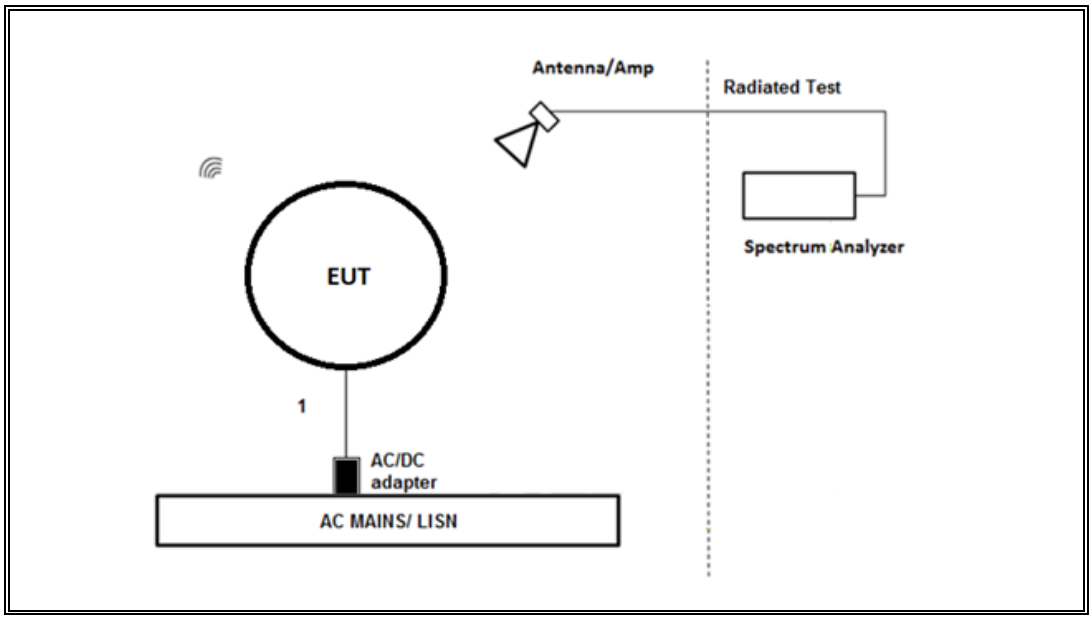
TEST SETUP- RADIATED TEST

The EUT was powered by AC/DC adapter via USB cable. Test software exercised the EUT. Laptop was removed after test setup.

SETUP DIAGRAM



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7. MEASUREMENT METHOD

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter

Output Power: ANSI C63.10 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Radiated emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1

Band-edge: ANSI C63.10 Subclause -11.13.3.4 Integration method -Trace averaging across ON and OFF times DC correction

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

KDB 558074 D01 15.247 Meas Guidance v05r02 Question 3 (a) DC correction application

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8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	170013	2023-07-28	2022-07-28
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	170015	2023-07-28	2022-07-28
Antenna, Broadband Hybrid, 30MHz to 3000MHz	Sunol Sciences Corp.	JB3	174374	2024-04-30	2023-04-05
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	29654	2024-07-31	2023-07-13
Thermometer	Control Company	14-650-118	160656	2024-04-30	2023-04-24
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	191429	2024-02-29	2023-02-15
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	206806	2023-10-07	2022-10-07
RF Filter Box, 1-18GHz	FREMONT	SAC-L1	171013	2023-10-31	2021-10-31
Thermometer - Digital	Control Company	14-650-118	175731	2024-02-29	2023-02-08
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	191429	2024-02-29	2023-02-15
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	199659	2023-12-06	2022-12-06
Rf Amplifier, 18-26.5GHz, 60dB gain	AMPLICAL	AMP18G26.5-60	234683	2024-03-29	2023-02-18
Spectrum Analyzer, PSA, 3Hz to 26.5GHz	Keysight Technologies Inc	E4440A	125178	2024-02-29	2023-02-06
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90757	2024-02-29	2023-02-03
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90419	2024-02-29	2023-02-03
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Rev 9.5, Jan 03, 2020		

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

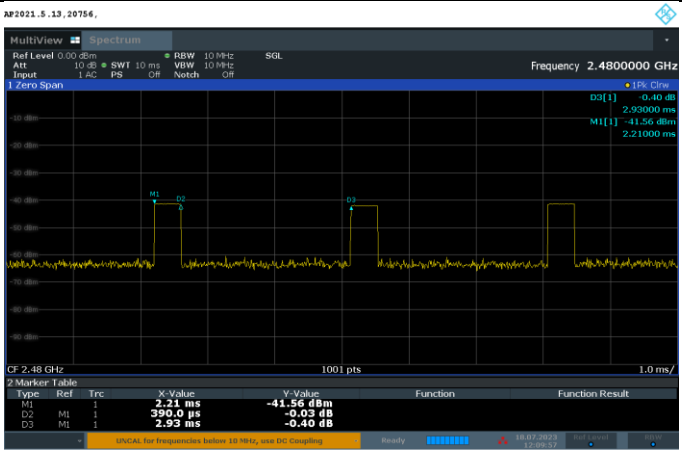
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

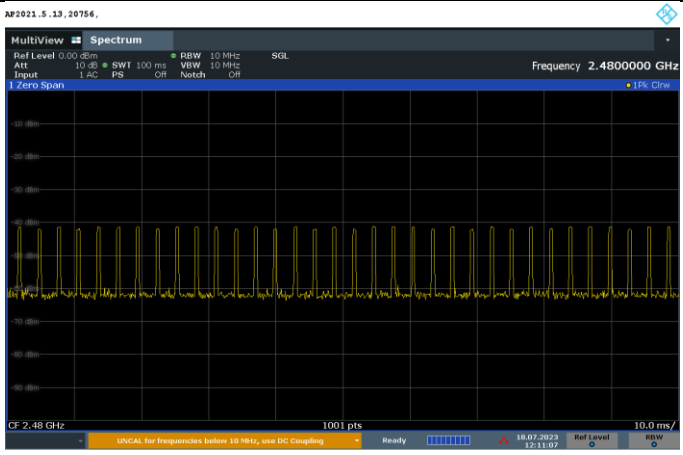
ON TIME AND DUTY CYCLE RESULTS

Test Engineer	20756 CW

Mode	ON Time B (msec)	Number of pulse per 100ms	Total ON Time per 100ms	Duty Cycle x	Duty Cycle Correction Factor (dB) , 20log(1/x)
BLE 1Mbps	0.39	34	13.26	0.1326	17.55



DUTY CYCLE BLE 1Mbps per 20ms



DUTY CYCLE BLE 1Mbps per 100ms

9.2. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

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RSS-247 5.4 (d)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

RESULTS

Tested By:	12485 GA, 27342 CH
Date:	2023-07-21

Application	Channel	Frequency (MHz)	Output Power Peak (dBm)		Total Peak power (dBm)	Limit (dBm)	Margin (dB)
			Ant1	Ant2	Ant1+ Ant2		
Orignal	Low	2402	18.03	17.39	20.73	30	-9.27
	Middle	2440	18.64	18.32	**21.49**	30	-8.51
	High	2480	18.13	17.44	20.81	30	-9.19
C2PC	Low	2402	21.44			30	-8.56
	Middle	2440	21.49			30	-8.51
	High	2480	20.49			30	-9.51

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9.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Gated average output power was read directly from power meter.

RESULTS

Tested By:	12485 GA, 27342 CH
Date:	2023-07-21

Application	Channel	Frequency (MHz)	Output Power Avg (dBm)		Total Avg power (dBm)
			Ant1	Ant2	Ant1+ Ant2
Orignal	Low	2402	17.88	17.27	20.60
	Middle	2440	18.50	18.28	**21.40**
	High	2480	17.93	17.29	20.63
C2PC	Low	2402	21.36		
	Middle	2440	21.40		
	High	2480	20.36		

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10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only. Blue color trace on plots: Parallel orientation. Green color trace on plots: Perpendicular orientation.

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

NOTE: The limits in FCC 47 CFR, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table), using the free space impedance of 377 Ohms. For example the measurement at frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to Y – 51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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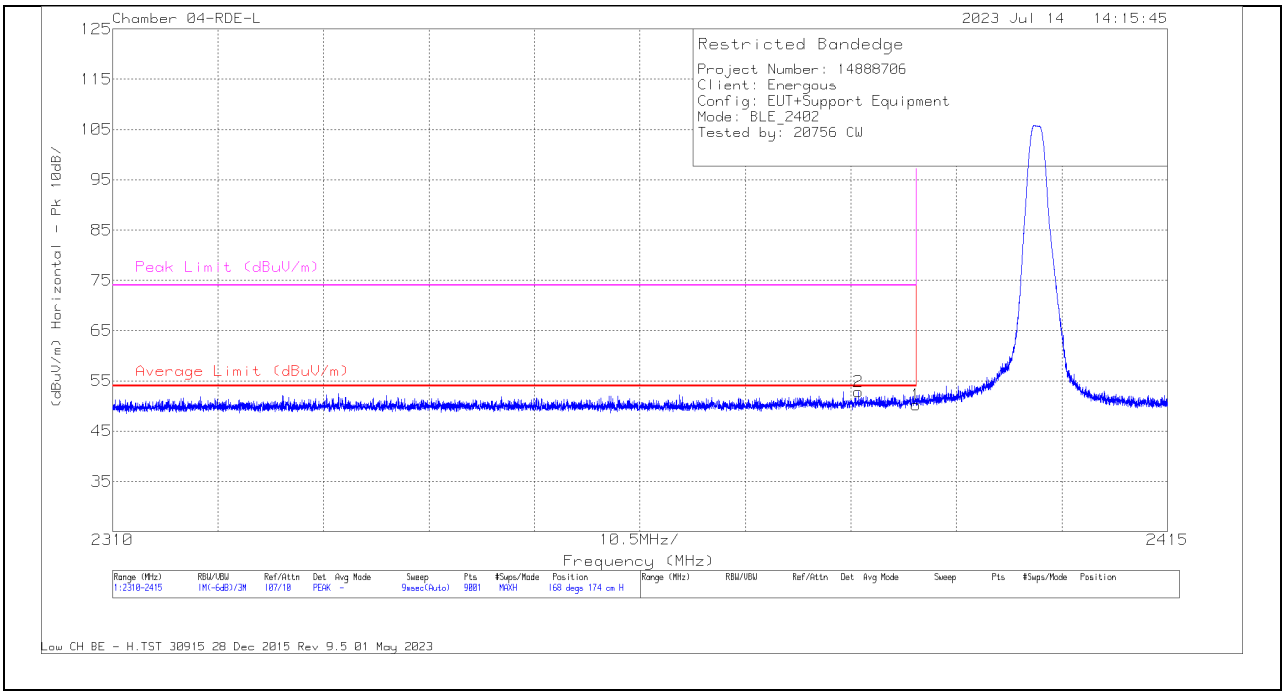
10.2. TRANSMITTER ABOVE 1 GHz

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB) 3mH	AMP/CBL(dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2390	37.04	Pk	32	-18.8	0	50.24	-	-	74	-23.76	168	174	H
2	* 2384.237	39.65	Pk	32	-18.8	0	52.85	-	-	74	-21.15	168	174	H
3	* 2390	37.04	Ave	32	-18.8	-17.55	32.69	54	-21.31	-	-	168	174	H
4	* 2358.231	39.65	Ave	32	-18.9	-17.55	35.2	54	-18.8	-	-	168	174	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

Ave = Pk- 20 Log (DC)
20 Log (.39*34/100) = -17.55

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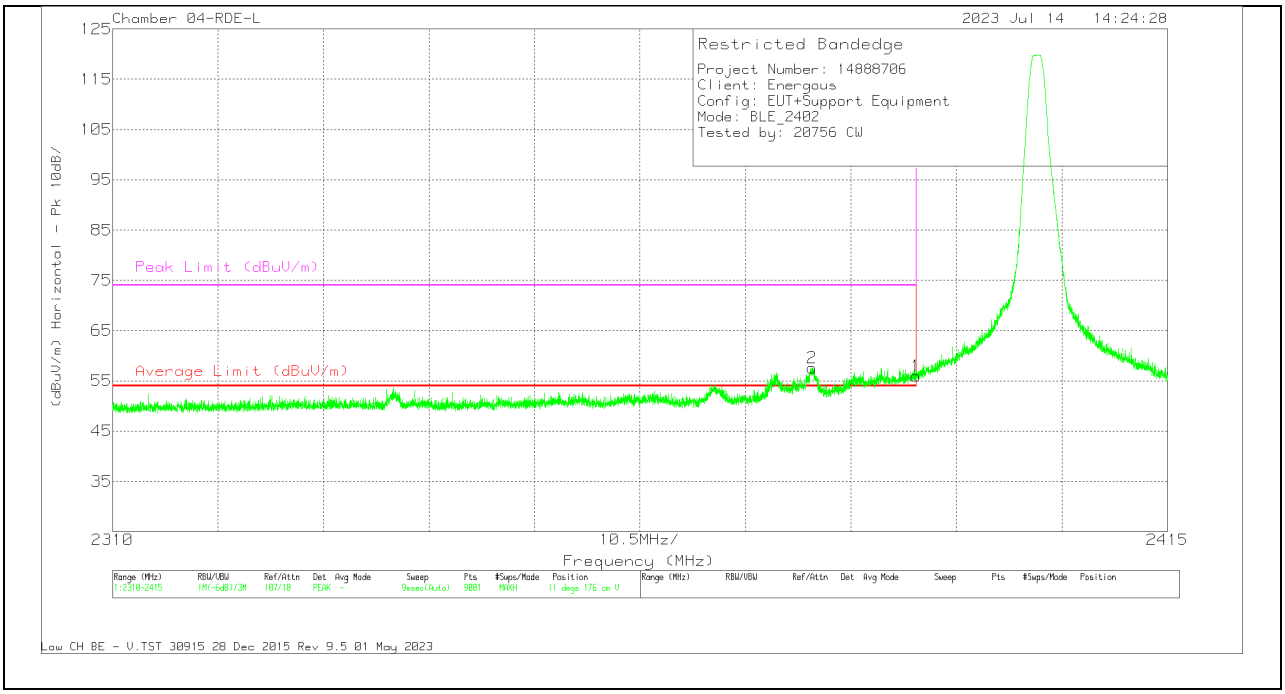
VERTICAL RESULT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB) 3mH	AMP/CBL (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2390	42.8	Pk	32	-18.8	0	56	-	-	74	-18	11	176	V
2	* 2379.652	44.39	Pk	32	-18.8	0	57.59	-	-	74	-16.41	11	176	V
3	* 2390	42.8	Ave	32	-18.8	-17.55	38.45	54	-15.55	-	-	11	176	V
4	* 2383.712	44.39	Ave	32	-18.8	-17.55	40.04	54	-13.96	-	-	11	176	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

Ave = Pk- 20 Log (DC)
20 Log (.39*34/100) = -17.55

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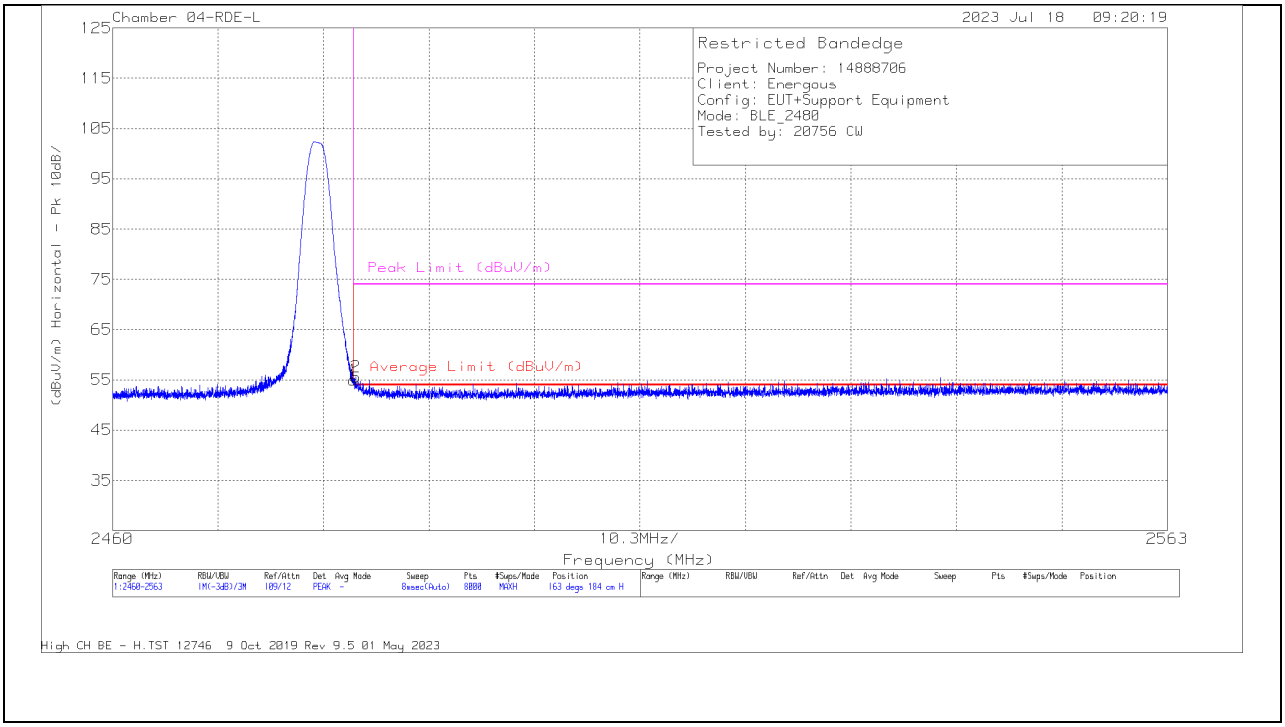
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB) 3mH	AMP/CBL(dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2483.5	35.36	Pk	32	-12.4	0	54.96	-	-	74	-19.04	163	184	H
2	* 2483.732	35.94	Pk	32	-12.4	0	55.54	-	-	74	-18.46	163	184	H
3	* 2483.5	35.36	Ave	32	-12.4	-17.55	37.41	54	-16.59	-	-	163	184	H
4	* 2483.526	35.94	Ave	32	-12.4	-17.55	37.99	54	-16.01	-	-	163	184	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

Ave = Pk- 20 Log (DC)
20 Log (.39*34/100) = -17.55

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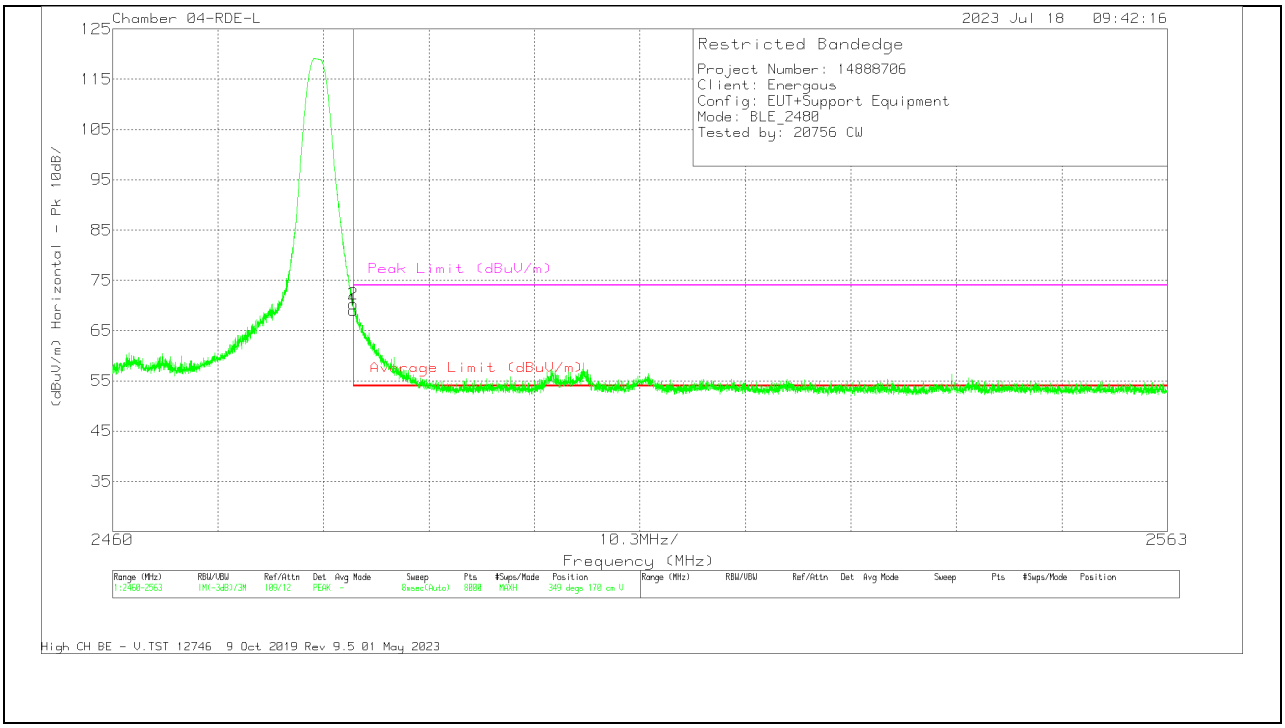
VERTICAL RESULT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB) 3mH	AMP/CBL(dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2483.5	49.4	Pk	32	-12.4	0	69	-	-	74	-5	349	170	V
2	* 2483.539	50.66	Pk	32	-12.4	0	70.26	-	-	74	-3.74	349	170	V
3	* 2483.5	49.4	Ave	32	-12.4	-17.55	51.45	54	-2.55	-	-	349	170	V
4	* 2483.539	50.66	Ave	32	-12.4	-17.55	52.71	54	-1.29	-	-	349	170	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

Ave = Pk- 20 Log (DC)
20 Log (.39*34/100) = -17.55

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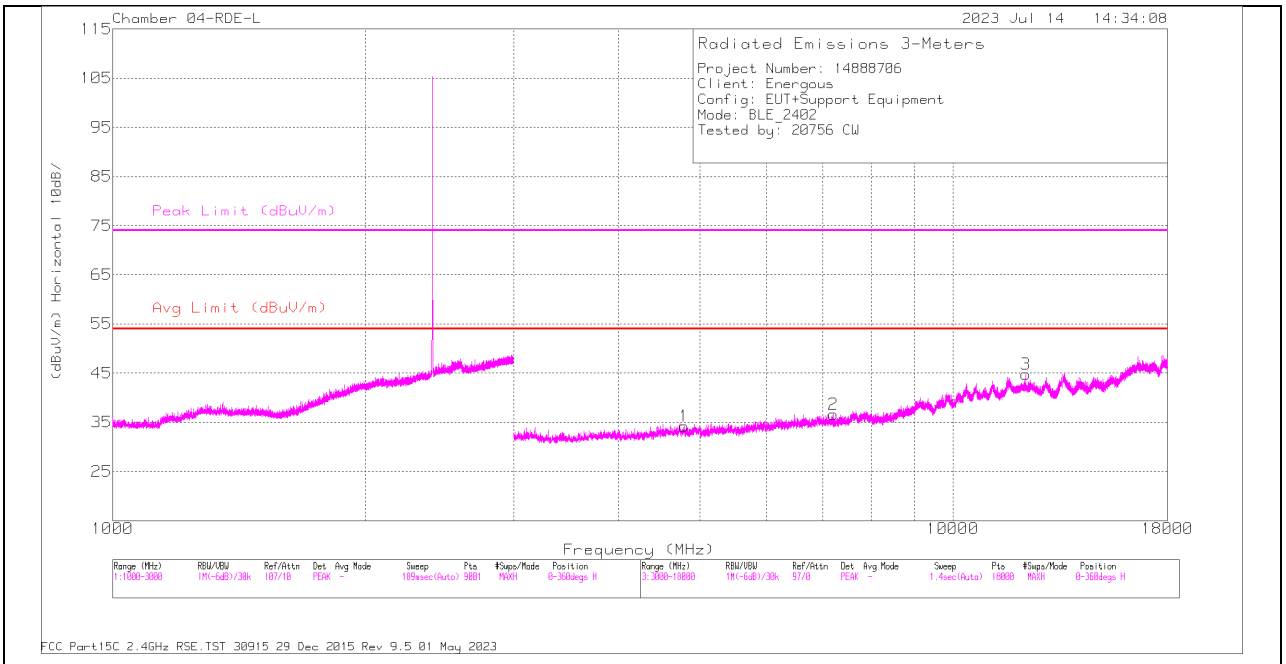
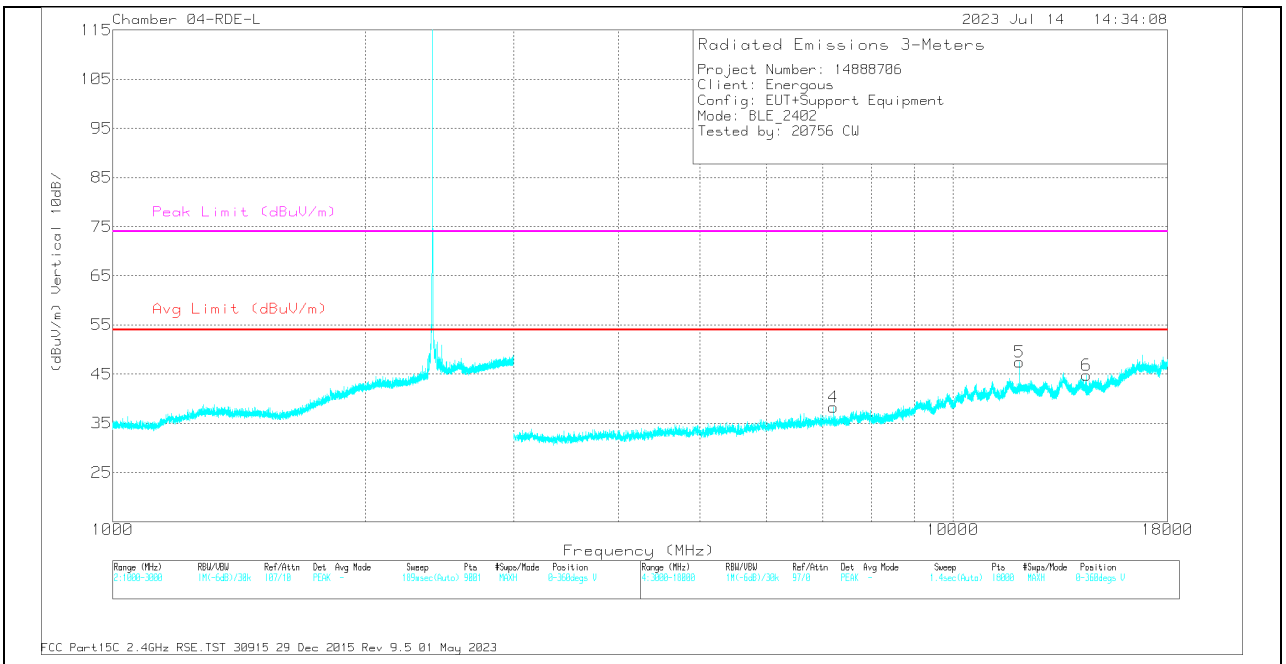
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB) 3mH	AMP/CBL (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4793.964	34.03	PK2	33.9	-25	0	42.93	-	-	74	-31.07	65	328	H
	* 4793.964	34.03	Ave	33.9	-25	-17.55	25.38	54	-28.62	-	-	65	328	H
2	7205.061	30.42	PK2	35.6	-21.6	0	44.42	-	-	-	-	185	280	H
	7205.061	30.42	Ave	35.6	-21.6	-17.55	26.87	-	-	-	-	185	280	H
3	* 12212.683	30.23	PK2	38.7	-16.5	0	52.43	-	-	74	-21.57	93	126	H
	* 12212.683	30.23	Ave	38.7	-16.5	-17.55	34.88	54	-19.12	-	-	93	126	H
4	7205.156	33.31	PK2	35.6	-21.6	0	47.31	-	-	-	-	278	296	V
	7205.156	33.31	Ave	35.6	-21.6	-17.55	29.76	-	-	-	-	278	296	V
5	* 12009.746	32.74	PK2	38.6	-16.5	0	54.84	-	-	74	-19.16	113	133	V
	* 12009.746	32.74	Ave	38.6	-16.5	-17.55	37.29	54	-16.71	-	-	113	133	V
6	14410.522	32.12	PK2	39.2	-16.1	0	55.22	-	-	-	-	116	118	V
	14410.522	32.12	Ave	39.2	-16.1	-17.55	37.67	-	-	-	-	116	118	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

Ave = Pk- 20 Log (DC)
20 Log (.39*34/100) = -17.55

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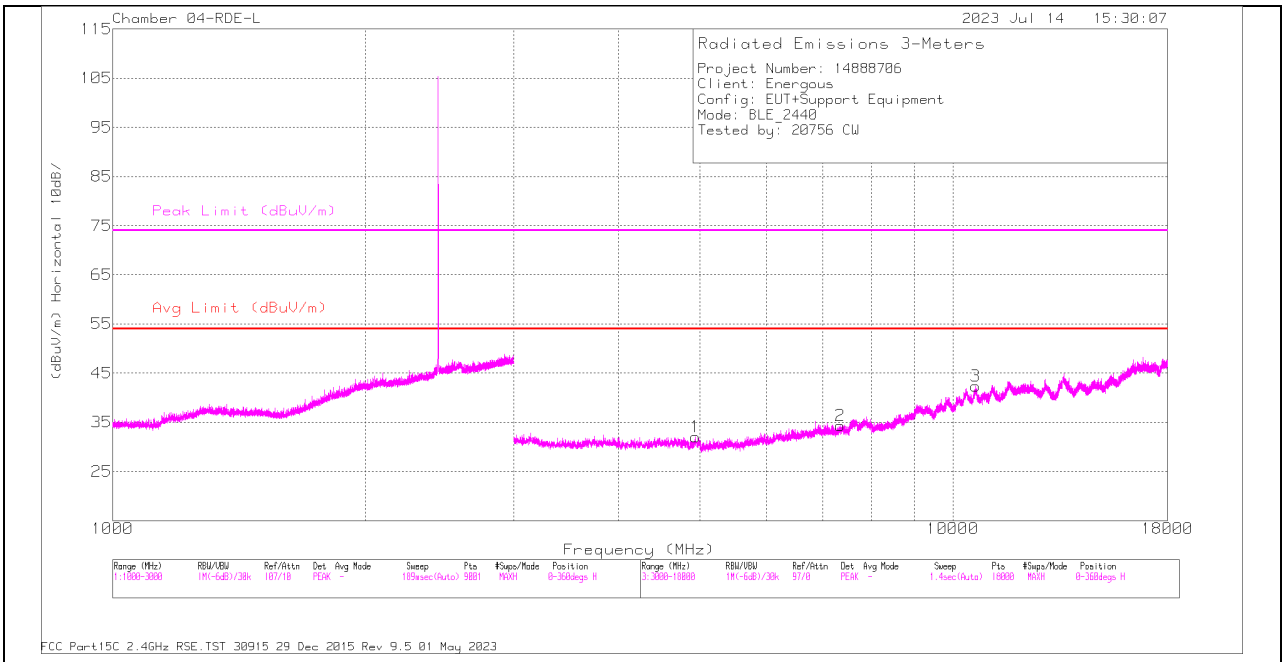
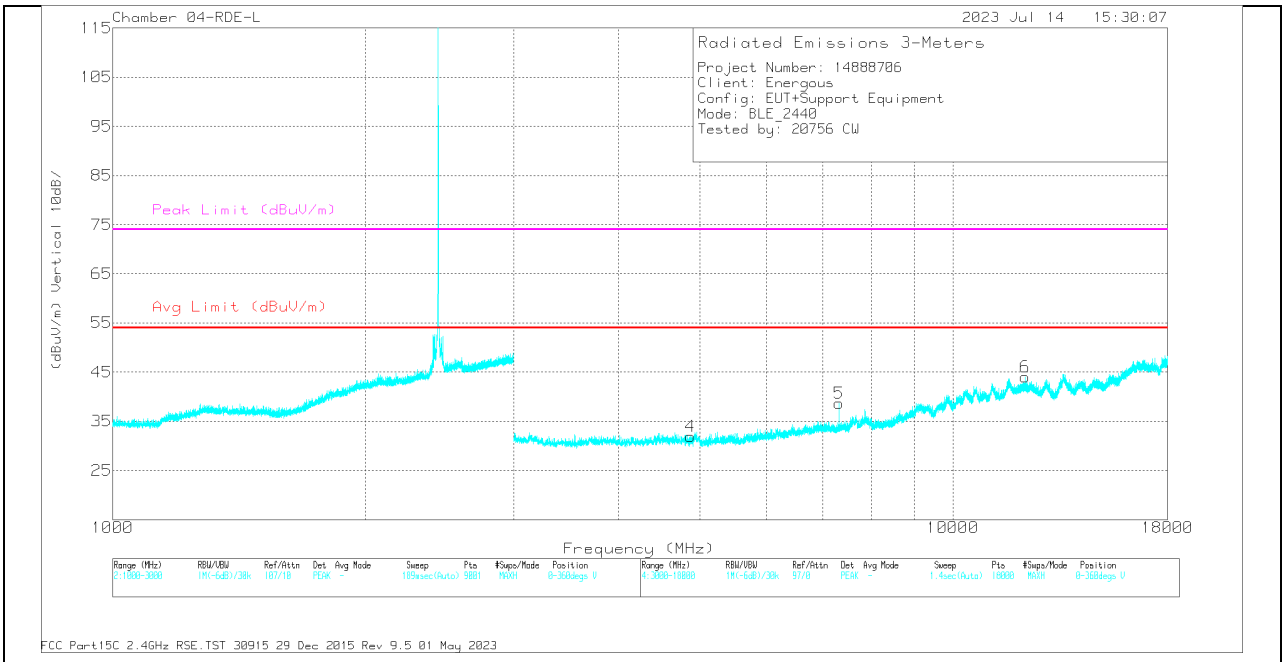
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB) 3mH	AMP/CBL (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4936.684	32.11	PK2	33.9	-23.8	0	42.21	-	-	74	-31.79	238	208	H
	* 4938.635	32.11	MAv1	33.9	-23.8	-17.55	24.66	54	-29.34	-	-	238	208	H
2	* 7336.041	29.99	PK2	35.6	-21	0	44.59	-	-	74	-29.41	173	301	H
	* 7338.638	29.99	MAv1	35.6	-20.9	-17.55	27.14	54	-26.86	-	-	173	301	H
3	* 10652.526	28.65	PK2	37.6	-14.7	0	51.55	-	-	74	-22.45	204	289	H
	* 10653.821	28.65	MAv1	37.6	-14.7	-17.55	34	54	-20	-	-	204	289	H
4	* 4873.89	33.79	PK2	33.9	-25.1	0	42.59	-	-	74	-31.41	8	334	V
	* 4873.89	33.79	Ave	33.9	-25.1	-17.55	25.04	54	-28.96	-	-	8	334	V
5	* 7319.164	31.35	PK2	35.6	-21.3	0	45.65	-	-	74	-28.35	168	103	V
	* 7319.164	31.35	Ave	35.6	-21.3	-17.55	28.1	54	-25.9	-	-	168	103	V
6	* 12199.468	31.05	PK2	38.7	-16.6	0	53.15	-	-	74	-20.85	102	130	V
	* 12199.468	31.05	Ave	38.7	-16.6	-17.55	35.6	54	-18.4	-	-	102	130	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

Ave = Pk- 20 Log (DC)
20 Log (.39*34/100) = -17.55

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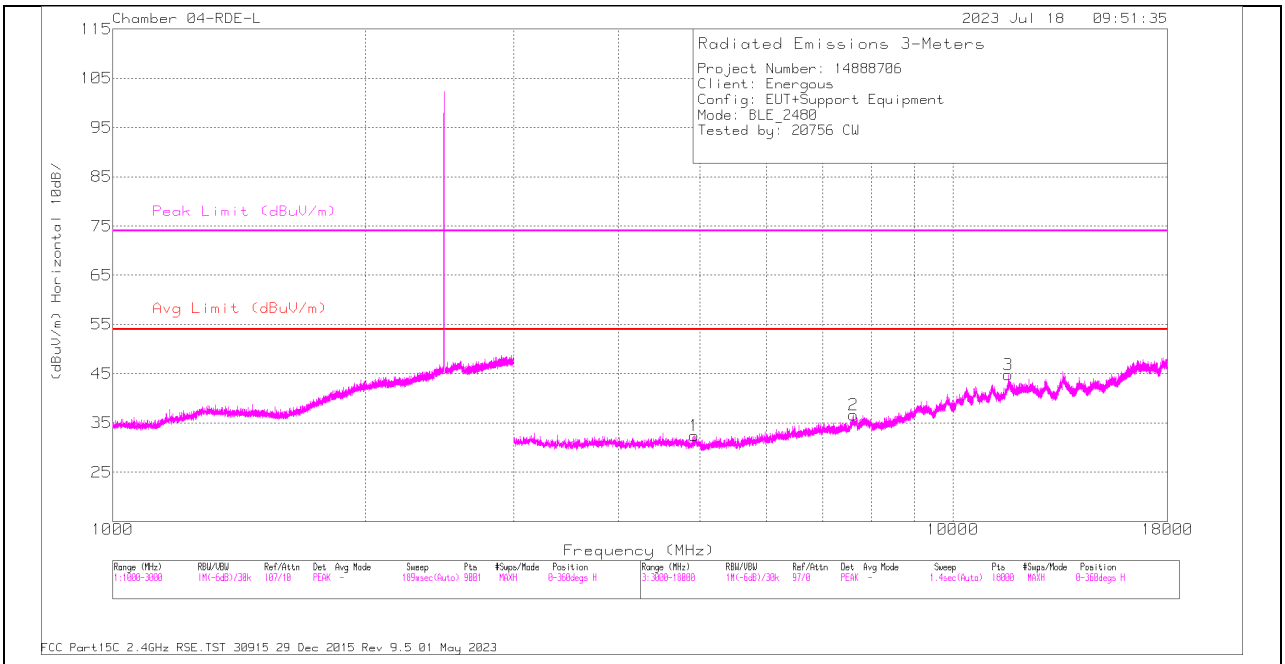
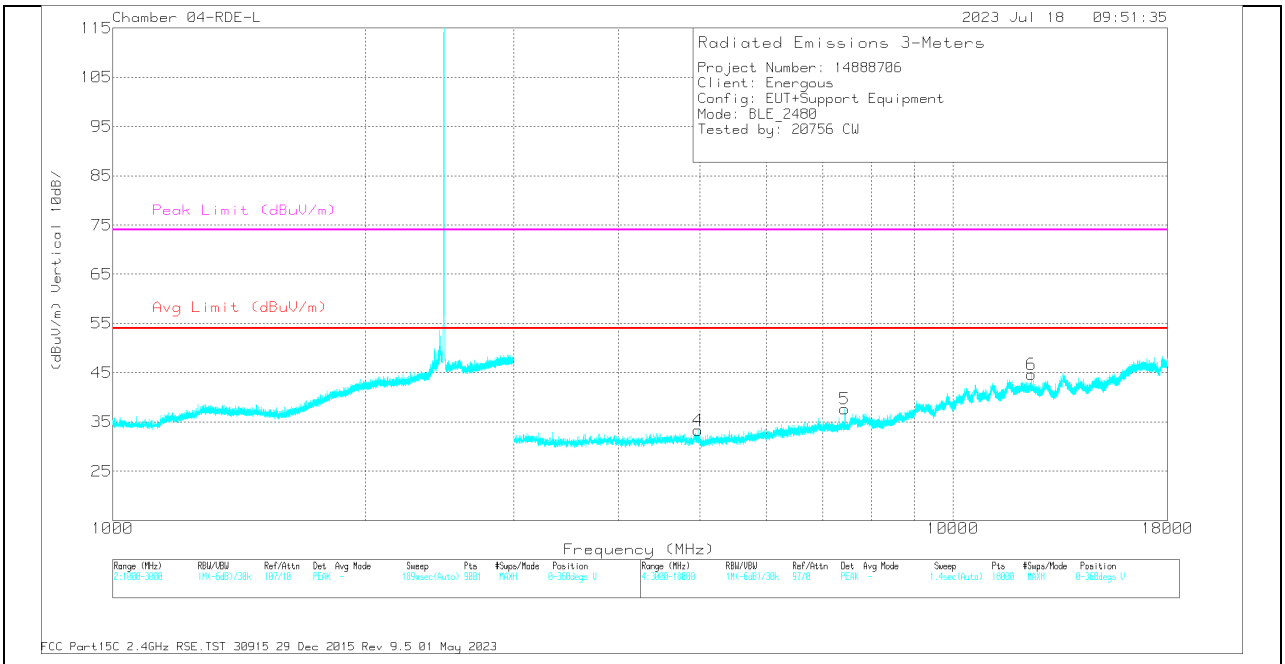
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB) 3mH	AMP/CBL (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4918.837	33.41	PK2	33.9	-24.4	0	42.91	-	-	74	-31.09	287	334	H
	* 4918.114	33.41	MAv1	33.9	-24.5	-17.55	25.26	54	-28.74	-	-	287	334	H
2	* 7609.317	28.61	PK2	35.7	-20	0	44.31	-	-	74	-29.69	60	217	H
	* 7611.402	28.61	MAv1	35.7	-20	-17.55	26.76	54	-27.24	-	-	60	217	H
3	* 11629.573	29.69	PK2	38.3	-15.7	0	52.29	-	-	74	-21.71	91	230	H
	* 11632.701	29.69	MAv1	38.3	-15.8	-17.55	-19.36	54	-19.36	-	-	91	230	H
4	* 4975.696	33.62	PK2	33.9	-24.4	0	43.12	-	-	74	-30.88	39	284	V
	* 4975.696	33.62	Ave	33.9	-24.4	-17.55	25.57	54	-28.43	-	-	39	284	V
5	* 7439.174	30.6	PK2	35.6	-21	0	45.2	-	-	74	-28.8	202	125	V
	* 7439.174	30.6	PK2	35.6	-21	-17.55	27.65	54	-26.35	-	-	202	125	V
6	* 12399.917	31.73	PK2	38.8	-16.1	0	54.43	-	-	74	-19.57	116	124	V
	* 12399.917	31.73	PK2	38.8	-16.1	-17.55	36.88	54	-17.12	-	-	116	124	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

Ave = Pk- 20 Log (DC)
20 Log (.39*34/100) = -17.55

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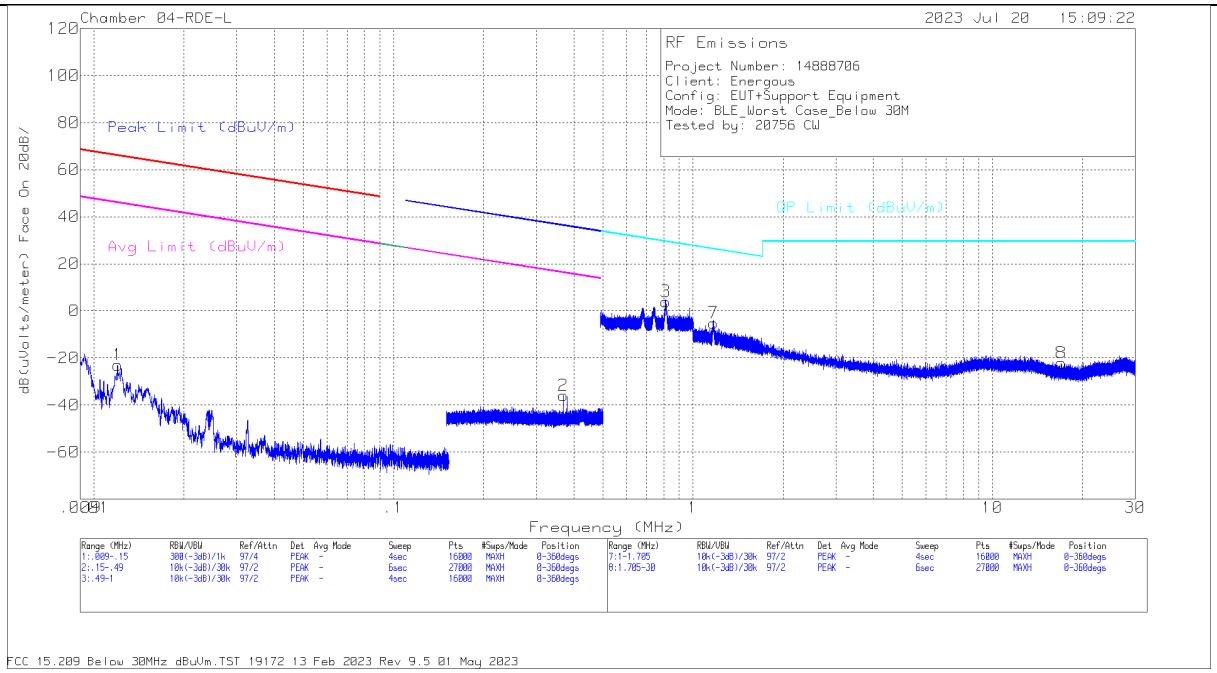
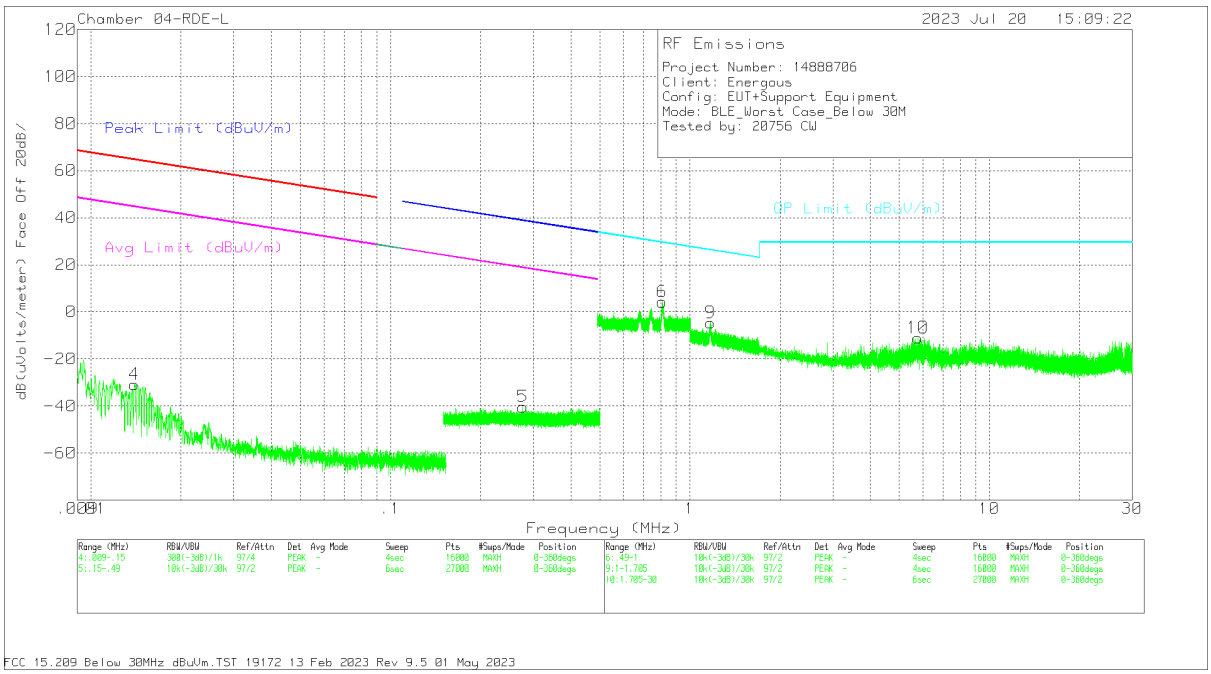
10.3. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)





ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

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Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna E(ACF)	CBL/AMP	Dist Corr 300m	Corrected Reading dB(uVolts/meter)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.012	26.32	Pk	60.1	-29.4	-80	-22.98	66	-88.98	46	-68.98	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna E(ACF)	CBL/AMP	Dist Corr 300m	Corrected Reading dB(uVolts/meter)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
2	.3695	19.75	Pk	56.2	-31.9	-80	-35.95	36.26	-72.21	16.26	-52.21	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna E(ACF)	CBL/AMP	Dist Corr 300m	Corrected Reading dB(uVolts/meter)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.014	19.09	Pk	59.9	-29.8	-80	-30.81	64.69	-95.5	44.69	-75.5	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna E(ACF)	CBL/AMP	Dist Corr 300m	Corrected Reading dB(uVolts/meter)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	.277	15.37	Pk	56.2	-31.9	-80	-40.33	38.76	-79.09	18.76	-59.09	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna E(ACF)	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.8127	19.43	Pk	56.4	-31.9	-40	3.93	29.42	-25.49	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna E(ACF)	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
6	.8082	19.8	Pk	56.4	-31.9	-40	4.3	29.47	-25.17	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Passive Loop Antenna E(ACF)	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
7	1.1705	20.76	Pk	45.9	-31.8	-40	-5.14	26.26	-31.4	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Passive Loop Antenna E(ACF)	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
8	16.9922	14.93	Pk	34.2	-31.3	-40	-22.17	29.5	-51.67	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Passive Loop Antenna E(ACF)	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
9	1.1709	21.28	Pk	45.9	-31.8	-40	-4.62	26.25	-30.87	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Passive Loop Antenna E(ACF)	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
10	5.7723	25.19	Pk	35.4	-31.6	-40	-11.01	29.5	-40.51	0-360

Pk - Peak detector

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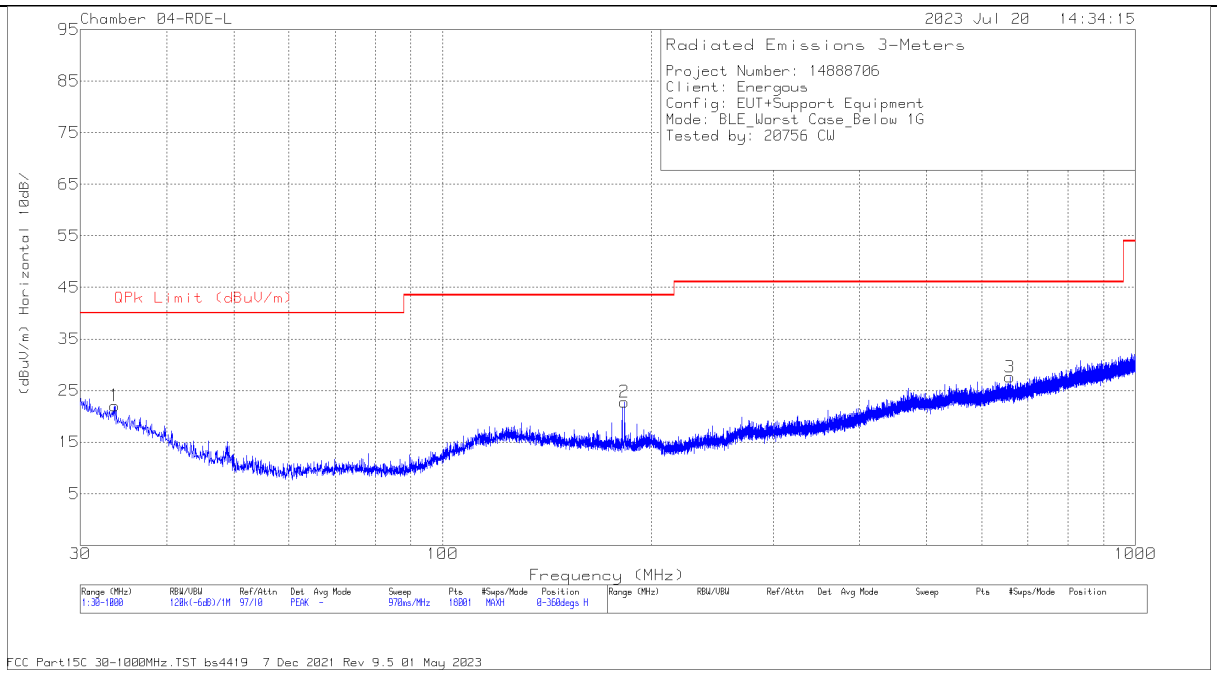
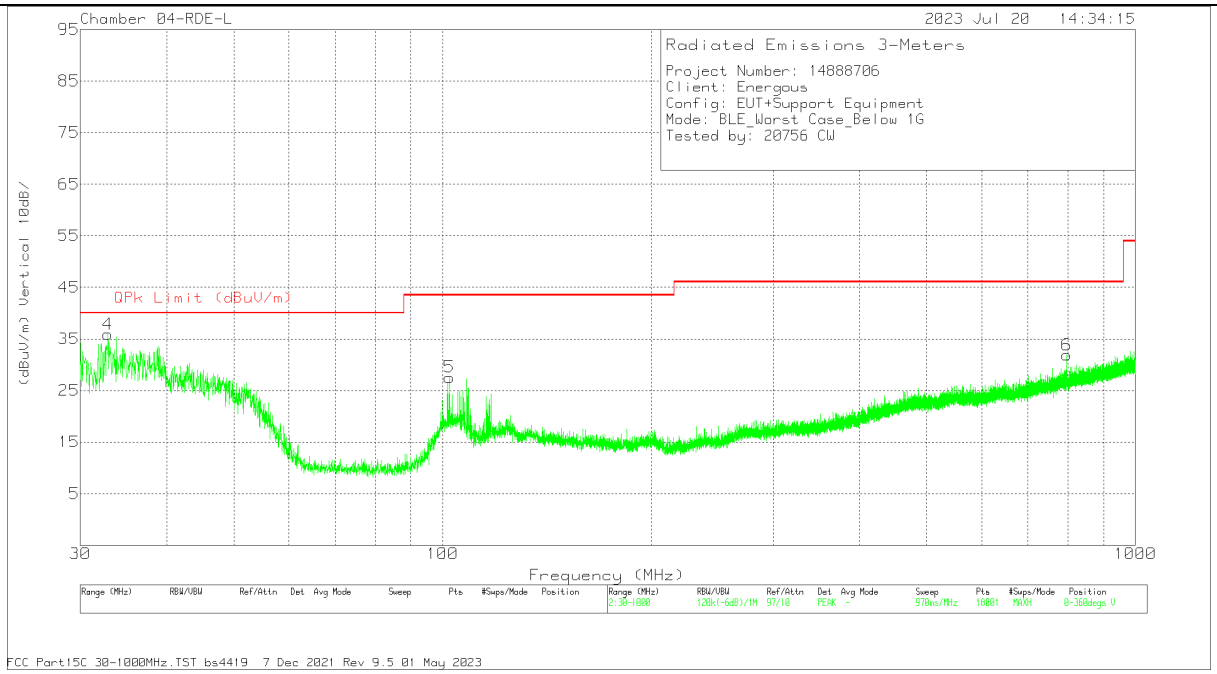
10.4. WORST CASE BELOW 1 GHZ

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

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Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	174374 ANSI ACF 10 m H UL_	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	33.6645	29.16	Pk	24	-31.1	22.06	40	-17.94	0-360	100	H
2	183.099	35.29	Pk	17.1	-29.6	22.79	43.52	-20.73	0-360	199	H
3	659.154	30.03	Pk	25.6	-28	27.63	46.02	-18.39	0-360	299	H
4	32.8561	42.2	Pk	24.8	-31.1	35.9	40	-4.1	0-360	99	V
	33.3172	34.16	Qp	24.4	-31.1	27.46	40	-12.54	353	101	V
5	102.319	41.26	Pk	16.7	-30.4	27.56	43.52	-15.96	0-360	200	V
6	796.84	32.19	Pk	27	-27.3	31.89	46.02	-14.13	0-360	99	V

Pk - Peak detector
QP- Quasi Peak detector

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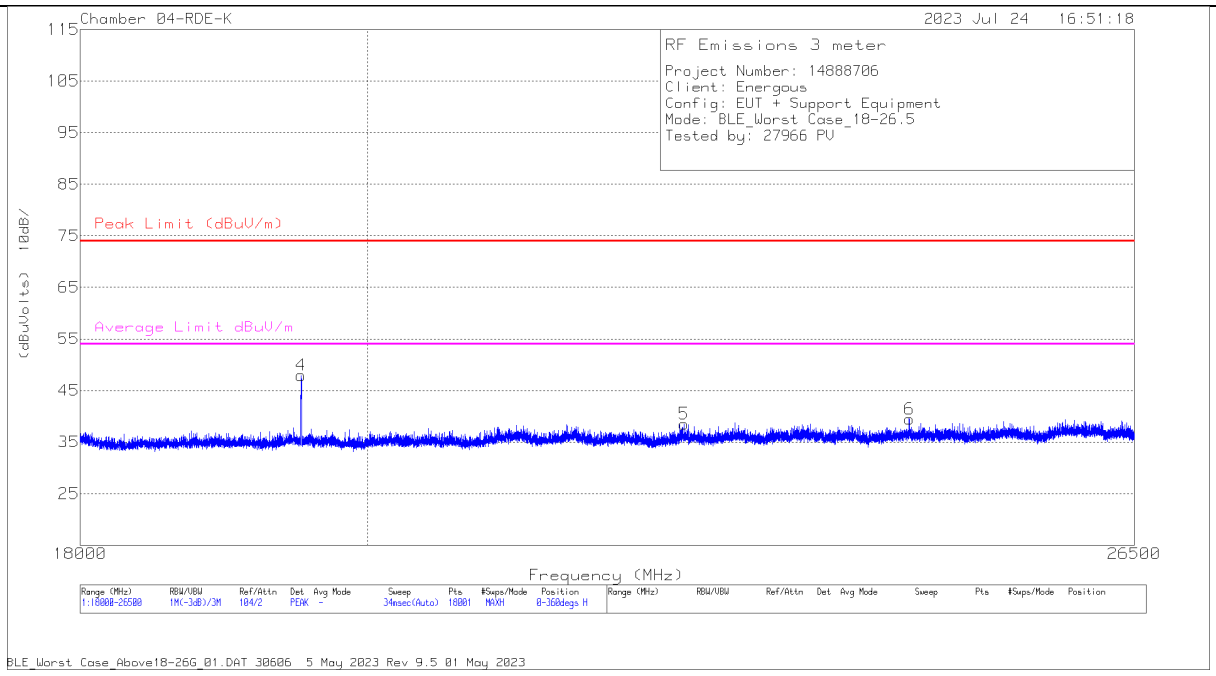
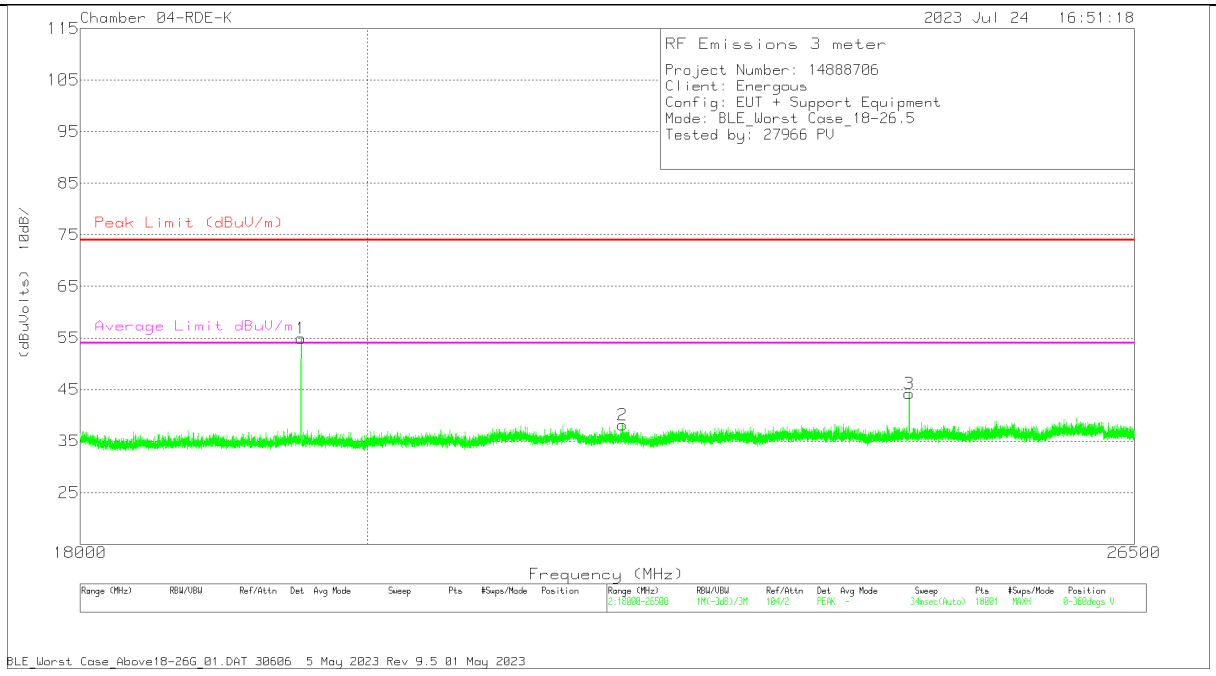
10.5. WORST CASE 18-26 GHZ

SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

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18 – 26GHz DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Horn ACF (dB/m)	234683 Amp/Cbl (dB)	Cables (dB)	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	PK Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 19517.811	66.28	Pk	32.6	-62.8	18.5	54.58	74	-19.42	-	-	49	105	V
	* 19517.811	58.79	RMS	32.6	-62.8	18.5	47.09	-	-	54	-6.91	49	105	V
2	21962.887	47.91	Pk	33.2	-62.5	19.5	38.11	74	-35.89	-	-	0-360	200	V
3	24398.136	52.12	Pk	33.9	-62.4	20.6	44.22	74	-29.78	-	-	0-360	101	V
4	* 19517.771	61.26	Pk	32.6	-62.8	18.5	49.56	74	-24.44	-	-	55	116	H
	* 19517.771	52.52	RMS	32.6	-62.8	18.5	40.82	-	-	54	-13.18	55	116	H
5	* 22464.859	48.01	Pk	33.3	-62.6	19.8	38.51	74	-35.49	-	-	0-360	101	H
6	24402.858	47.36	Pk	33.9	-62.4	20.6	39.46	74	-34.54	-	-	0-360	101	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

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