



TEST REPORT

Report Number. : R13304840-E7

Applicant : ENEL X SRL
Viali Di Tor Di Quinto 45/47
Roma, RM 191
Italy

Model : JuiceBox 3.0

Contains FCC ID : 2A5OVLB1DX

Contains IC : 28561LB1DX

EUT Description : EV Charger

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED RSS-247 ISSUE 2
ISED RSS-GEN ISSUE 5 + A1

Date Of Issue:

2022-12-19

Prepared by:

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2022-05-31	Initial Issue	Noah Bennett
V2	2022-11-18	Revised for TCB Submission	Noah Bennett
V3	2022-12-19	Separated setup photos and diagram from report	Brian Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ENEL X SRL
Viali Di Tor Di Quinto 45/47
Roma, RM 191
Italy

EUT DESCRIPTION: EV Charger

MODEL: JuiceBox 3.0

SERIAL NUMBER: Non-Serialized

SAMPLE RECEIPT DATE: 2021-12-13

DATE TESTED: 2022-03-22 to 2022-05-26

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Refer to Section 2
ISED RSS-247 Issue 2	Refer to Section 2
ISED RSS-GEN Issue 5 + A2	Refer to Section 2

UL LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
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Prepared By:



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2. TEST RESULTS SUMMARY

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

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 11.6.
See Comment	RSS-GEN 6.7	20dB BW/99% OBW	Not Performed.	See Note 1.
15.247 (a)(1)	RSS-247 (5.1) (b)	Hopping Frequency Separation		
15.247 (a)(1)(iii)	RSS-247 (5.1) (d)	Number of Hopping Channels		
15.247 (a)(1)(iii)	RSS-247 (5.1) (d)	Average Time of Occupancy		
15.247 (b)(1)	RSS-247 (5.4) (b)	Output Power		
See Comment		Average Power	For Reporting purposes only	See Note 2.
15.247 (d)	RSS-247 (5.5)	Conducted Spurious Emissions	Not Performed.	
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Compliant	
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions		

Note 1: This test report covered the assessment of the original radio module installed in a new host under FCC KDB 996369 D04 Module Integration Guide v02 to verify continued compliance. It is the responsibility of the end product manufacturer to provide the original module reports to show full compliance to the FCC 15.247 and RSS-247 requirements.

Note 2. The Module installed in the EUT was originally tested and certified at a different, higher power than as configured in this report. Therefore, power measurements were performed.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r01, KDB 414788 D01 Radiated Test Site v01r01, FCC KDB 996369 D04 Module Integration Guide v02 ,RSS-GEN Issue 5 + A1, and RSS-247 Issue 2.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 0751.06, 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
<input checked="" type="checkbox"/>	Building 2800 Suite Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

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)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%

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

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Final Voltage (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \text{LISN Insertion Loss}$$

$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is an Electric EV Charger, Model JuiceBox 3.0 with BLE/BT/2.4WLAN/RFID and WWAN capability.

This report only covers testing of the BT portion of the EUT.

6.2. MAXIMUM OUTPUT POWER

The module installed in the EUT was previously certified at a different, higher, power level than as configured in this report. Therefore, power measurements were performed. The EUT has Maximum output power as shown below:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	4.34	2.72
2402 - 2480	Enhanced DQPSK	4.25	2.66
2402 - 2480	Enhanced 8PSK	4.22	2.64

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

Type	Antenna Gain (dBi)
Dipole	1.4

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was "FCC_scripts_Ver4".

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the worst-case channels and data rates based on the original radio module manufacturer's report.

The EUT is intended to operate in only one orientation. Therefore, all final radiated testing was performed with the EUT in this orientation of operation.

The EUT was originally tested for compliance with a higher power setting than implemented in this EUT. Therefore, full radiated testing was done on the EUT at this new lower power setting. Please see the radio manufacture for the original power settings and test results.

Worst-case data rates as provided by the client were:

GFSK mode: DH5

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	T450	RTP0116PC0A2UQS	N/A
AC Adapter	Lenovo	ADLX65NCC2A	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Mains	1	Hardwired	Non-Shielded	<3m	Connects to AC Mains
2	EV Car Charger	1	Hardwired	Non-Shielded	<3m	Comes from EUT to charging port.

TEST SETUP

The EUT is configured via a test laptop before the tests. Test software exercised the radio card.

SETUP DIAGRAMS

Refer to document R13304840-EP2 for setup diagram.

7. TEST AND MEASUREMENT EQUIPMENT

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

Note: Testing was done when equipment was in calibration only. Equipment out of calibration was either not used or used before calibration was due.

Test Equipment Used - Wireless Conducted Measurement Equipment – Power Spotcheck

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Common Equipment					
PWM003	RF Power Meter	Keysight Technologies	N1911A	2021-08-30	2022-08-30
PWS005	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	N1921A	2021-05-27	2022-05-07
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2022-04-05	2023-04-05
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12
LISN003	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2021-08-16	2022-08-16
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2021-08-17	2022-08-17
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2022-04-05	2023-04-05
PS216	AC Power Source	Elgar	CW2501M	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (04 Mar 2021)		

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2021-08-19	2022-08-19
	30-1000 MHz				
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2021-08-30	2022-08-30
	1-18 GHz				
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-03-21	2023-03-21
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2022-11-04	2021-11-04
	Gain-Loss Chains				
C2-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2021-07-09	2022-07-09
C2-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2021-07-09	2022-07-09
C2-SAC03	Gain-loss string: 1-18GHz	Various	Various	2021-07-09	2022-07-09
C2-SAC04	Gain-loss string: 18-40GHz	Various	Various	2021-07-09	2022-07-09
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-03-08	2023-03-08
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2021-09-27	2022-09-27
PS216	AC Power Source	Elgar	CW2501M (s/n 1045A04231)	NA	NA
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA

8. MEASUREMENT METHODS

Duty cycle: ANSI C63.10 Subclause 11.6

Peak Output Power: ANSI C63.10-2013 Section 7.8.5

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

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause 6.10.5 and 11.12.1

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

Radiated Spurious Emissions: ANSI C63.10-2013 Section 6.3 – 6.6

9. ANTENNA PORT TEST RESULTS

9.1. DUTY CYCLE

Limits

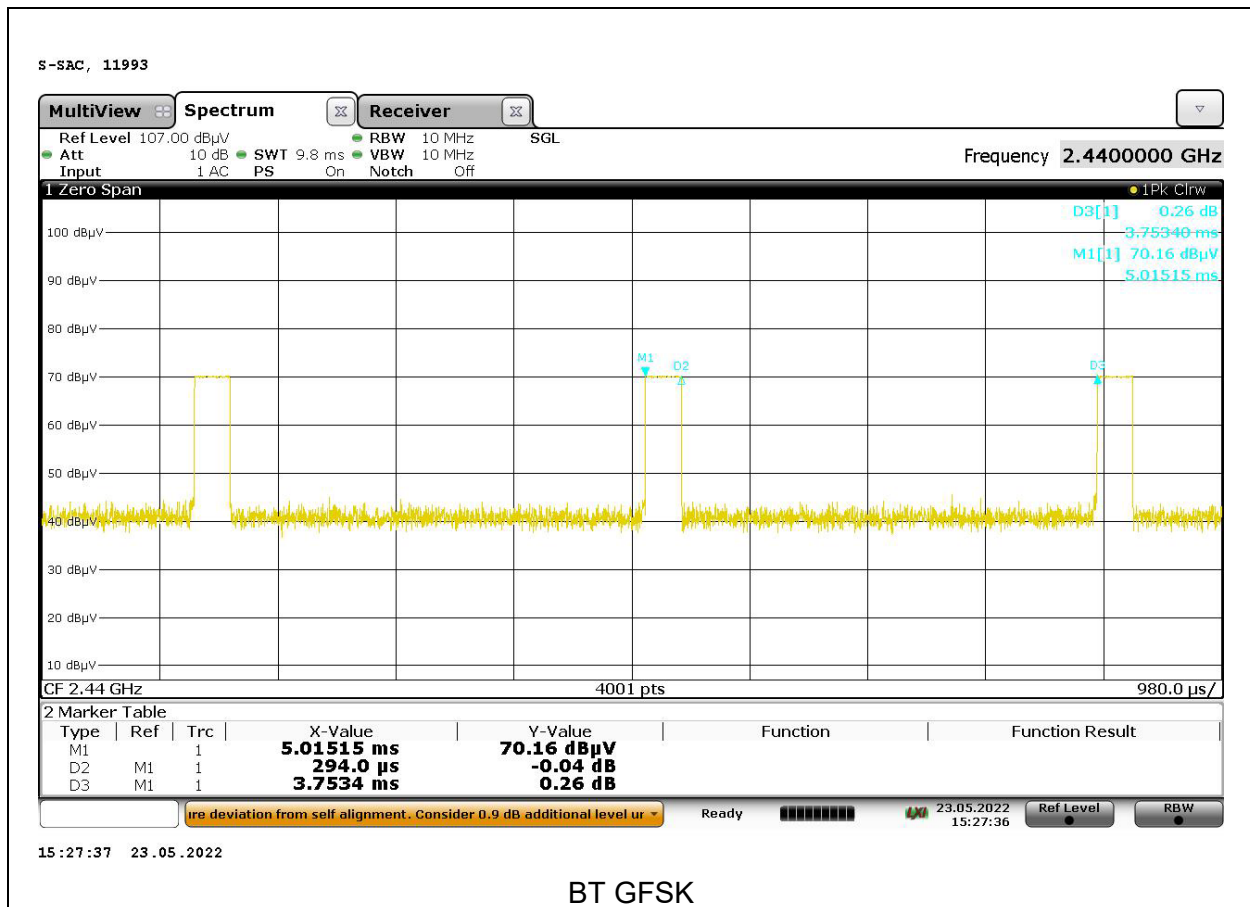
None – For Reporting Purposes Only.

Test Procedure

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6

Results

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	1/B Minimum VBW (kHz)
BT - GFSK	0.294	3.753	0.078	7.83	3.401



9.2. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

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 a SMA cable connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

RESULTS

9.2.1. BT (GFSK)

Chain 0

Tested By:	27465/40882
Date:	4/27/2022

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.30	30	-25.700
Middle	2441	4.34	30	-25.660
High	2480	4.28	30	-25.720

9.2.2. BT (DQPSK)

Chain 0

Tested By:	27465/40882
Date:	4/27/2022

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.25	30	-25.750
Middle	2441	4.15	30	-25.850
High	2480	4.18	30	-25.820

9.2.3. BT (8PSK)

Chain 0

Tested By:	27465/40882
Date:	4/27/2022

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.22	30	-25.780
Middle	2441	4.11	30	-25.890
High	2480	4.09	30	-25.910

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 a SMA cable connected to a power meter via wideband average power sensor. Gated average output power was read directly from power meter.

RESULTS

9.3.1. BT (GFSK)

Chain 0

Tested By:	27465/40882
Date:	4/27/2022

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	3.97
Middle	2441	3.99
High	2480	3.97

9.3.2. BT (DQPSK)

Chain 0

Tested By:	27465/40882
Date:	4/27/2022

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	3.87
Middle	2441	3.88
High	2480	3.84

9.3.3. BT (8PSK)

Chain 0

Tested By:	27465/40882
Date:	4/27/2022

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	3.89
Middle	2441	3.87
High	2480	3.76

10. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

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

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uA/m) at 3 m	Field Strength Limit (dBuA/m) at 3 m
0.009-0.490	6.37/F(kHz) @ 300 m	-
0.490-1.705	63.7/F(kHz) @ 30 m	-
1.705 - 30	0.08 @ 30m	-
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
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 3 MHz 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 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector 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.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

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.

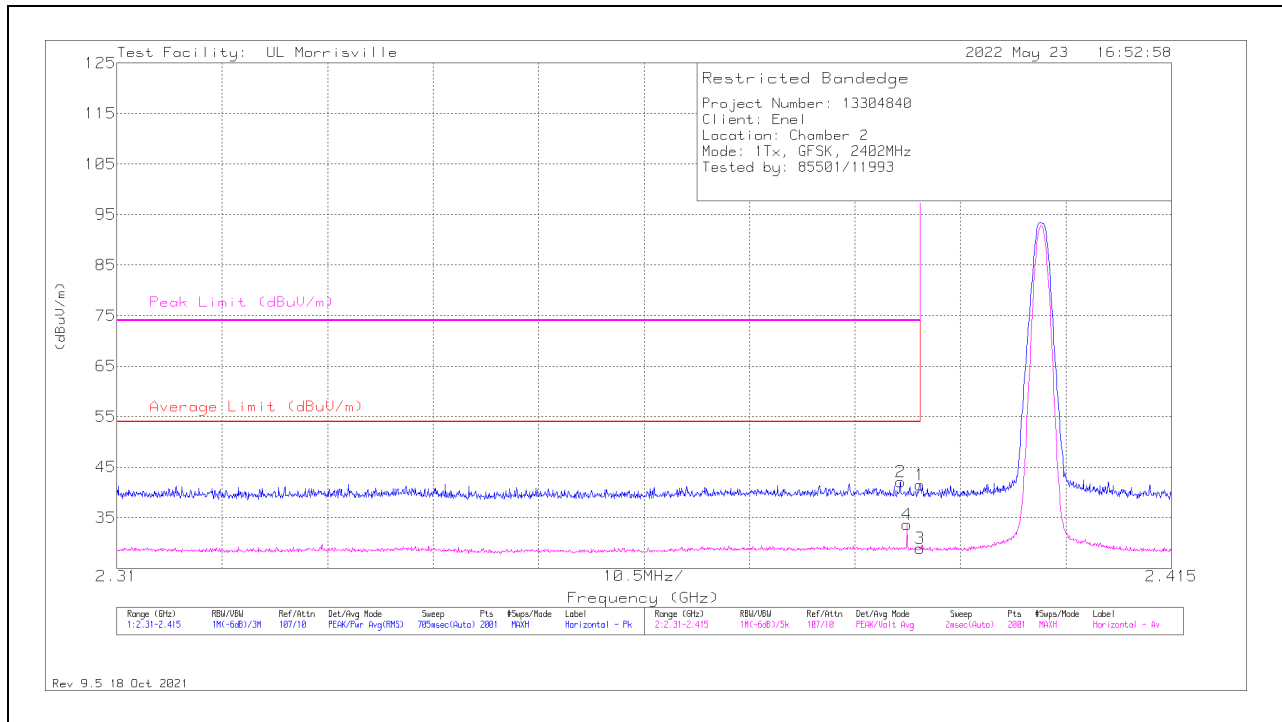
NOTE: The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table), using the free space impedance of 377 Ohms.

10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

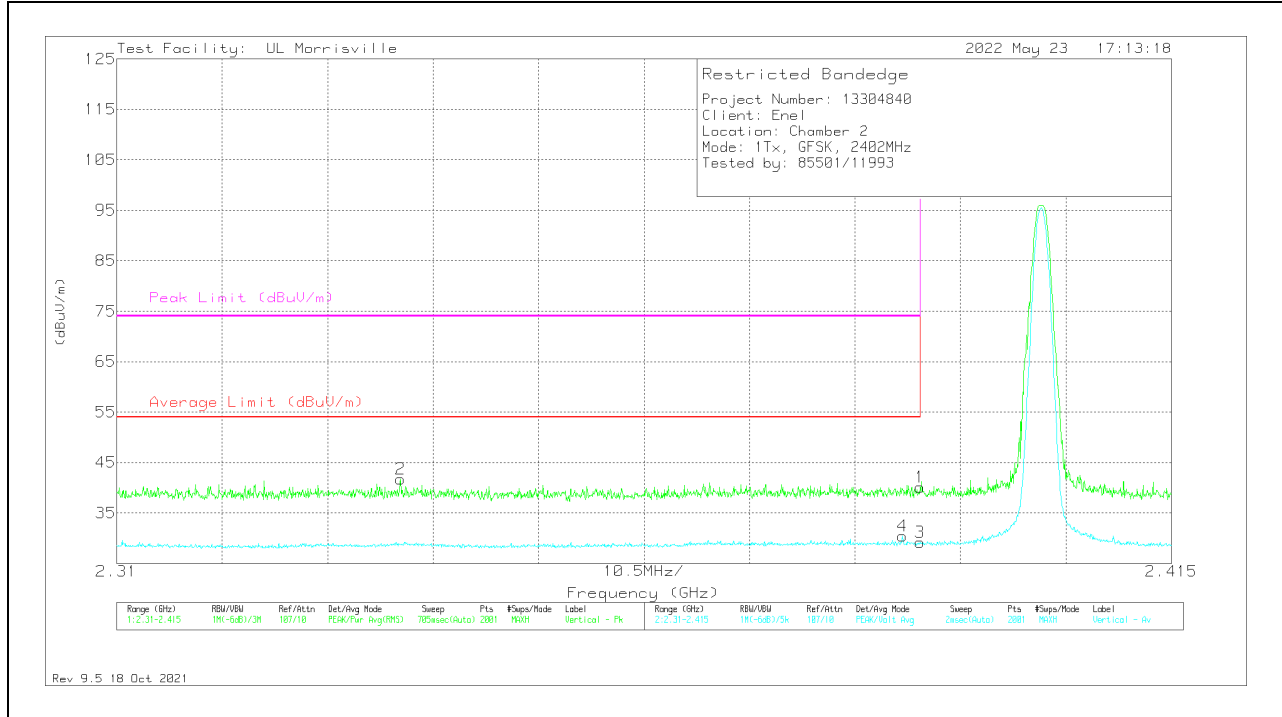
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	33.57	Pk	32	-24.1	41.47	-	-	74	-32.53	188	204	H
2	* ** 2.38802	34.21	Pk	32	-24.1	42.11	-	-	74	-31.89	188	204	H
3	* ** 2.38996	21	V1TV	32	-24.1	28.9	54	-25.1	-	-	188	204	H
4	* ** 2.3887	25.74	V1TV	32	-24.1	33.64	54	-20.36	-	-	188	204	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 V1TV: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

VERTICAL RESULT

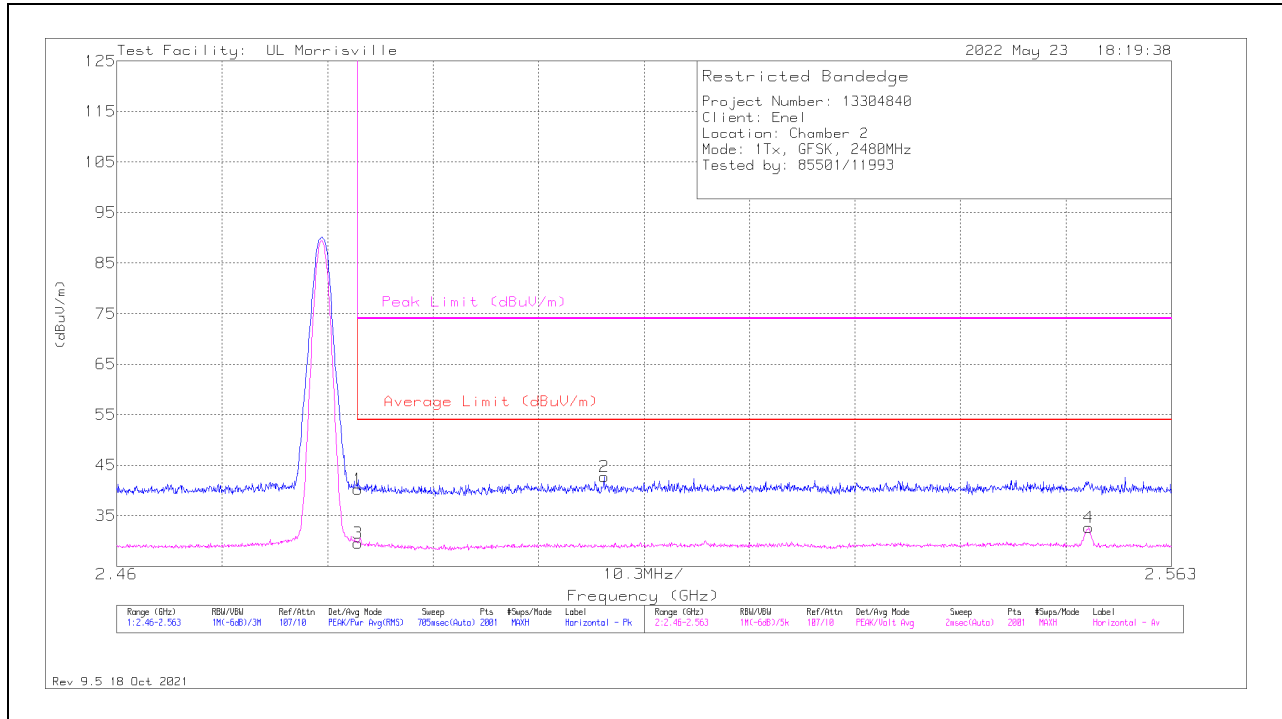


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	32.23	Pk	32	-24.1	40.13	-	-	74	-33.87	201	222	V
2	* ** 2.33825	33.69	Pk	31.9	-23.9	41.69	-	-	74	-32.31	201	222	V
3	* ** 2.38996	21.26	V1TV	32	-24.1	29.16	54	-24.84	-	-	201	222	V
4	* ** 2.38823	22.48	V1TV	32	-24.1	30.38	54	-23.62	-	-	201	222	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 V1TV: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

BANDEDGE (HIGH CHANNEL)

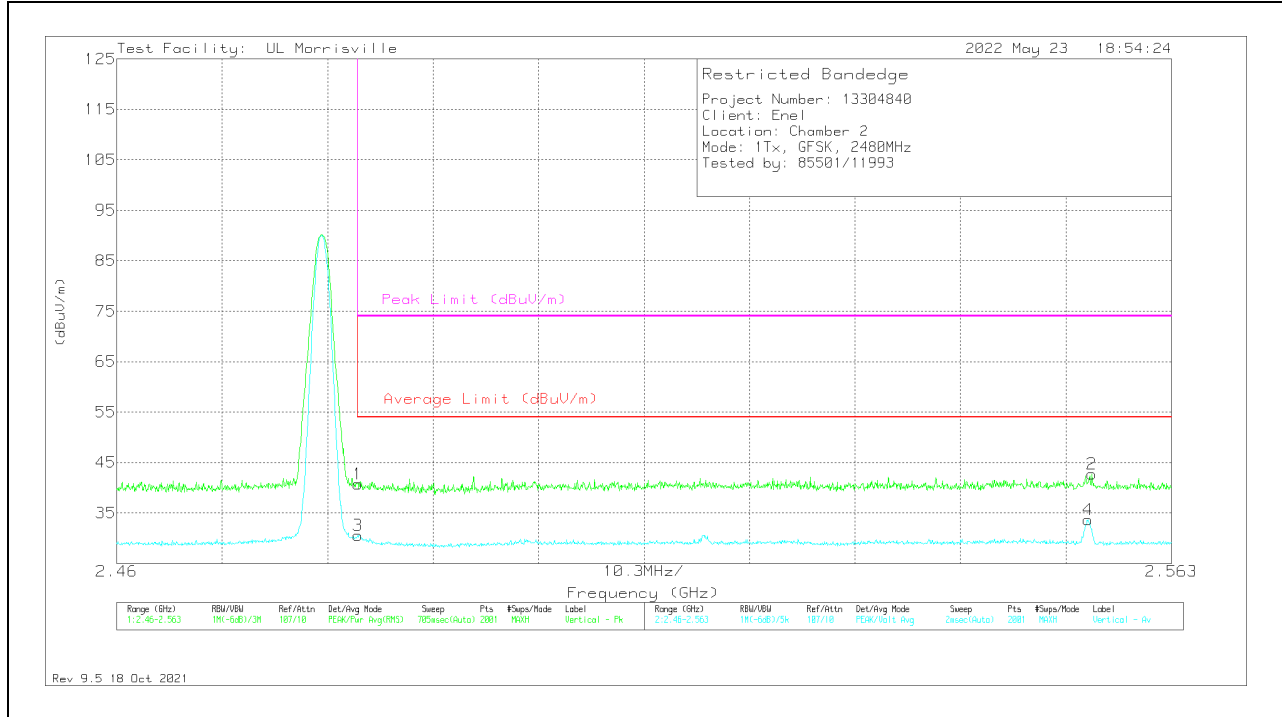
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	32.59	Pk	32.3	-24.6	40.29	-	-	74	-33.71	182	195	H
2	** 2.50759	35.03	Pk	32.4	-24.7	42.73	-	-	74	-31.27	182	195	H
3	* ** 2.48354	21.9	V1TV	32.3	-24.6	29.6	54	-24.4	-	-	182	195	H
4	** 2.55491	25.5	V1TV	32.5	-25.3	32.7	54	-21.3	-	-	182	195	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 V1TV: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

VERTICAL RESULT

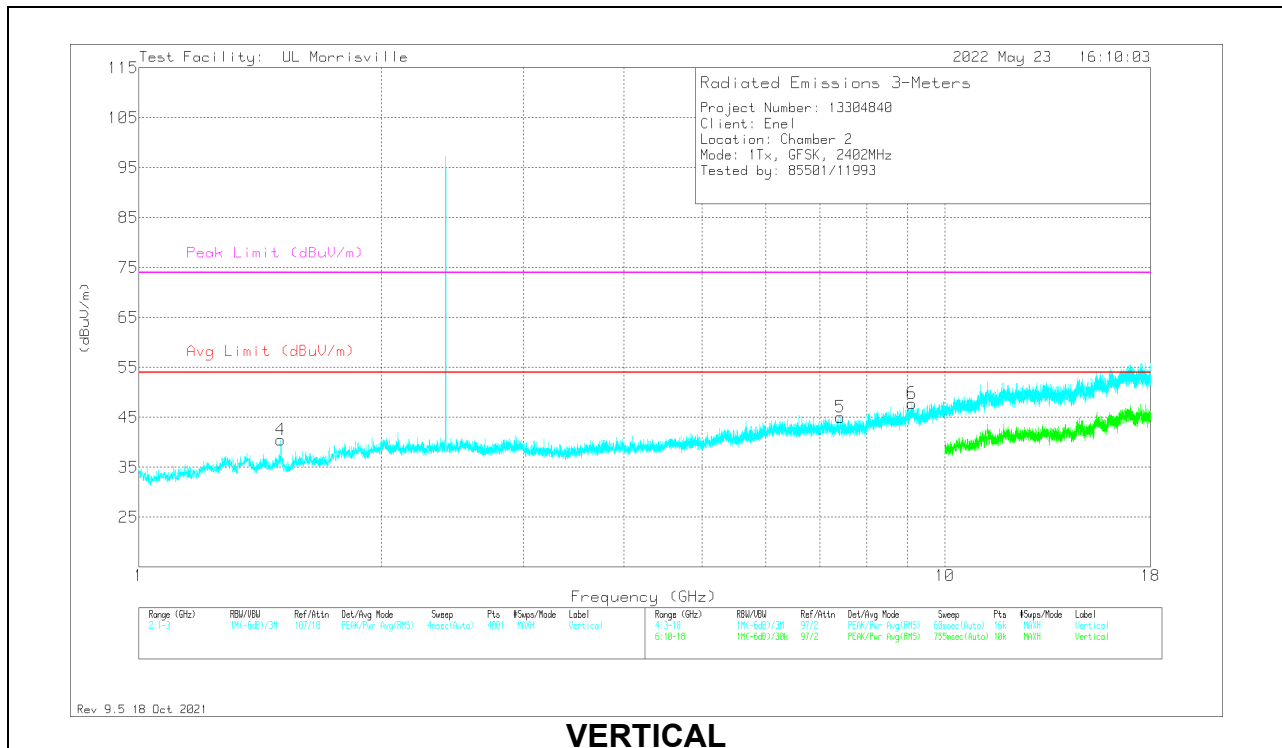
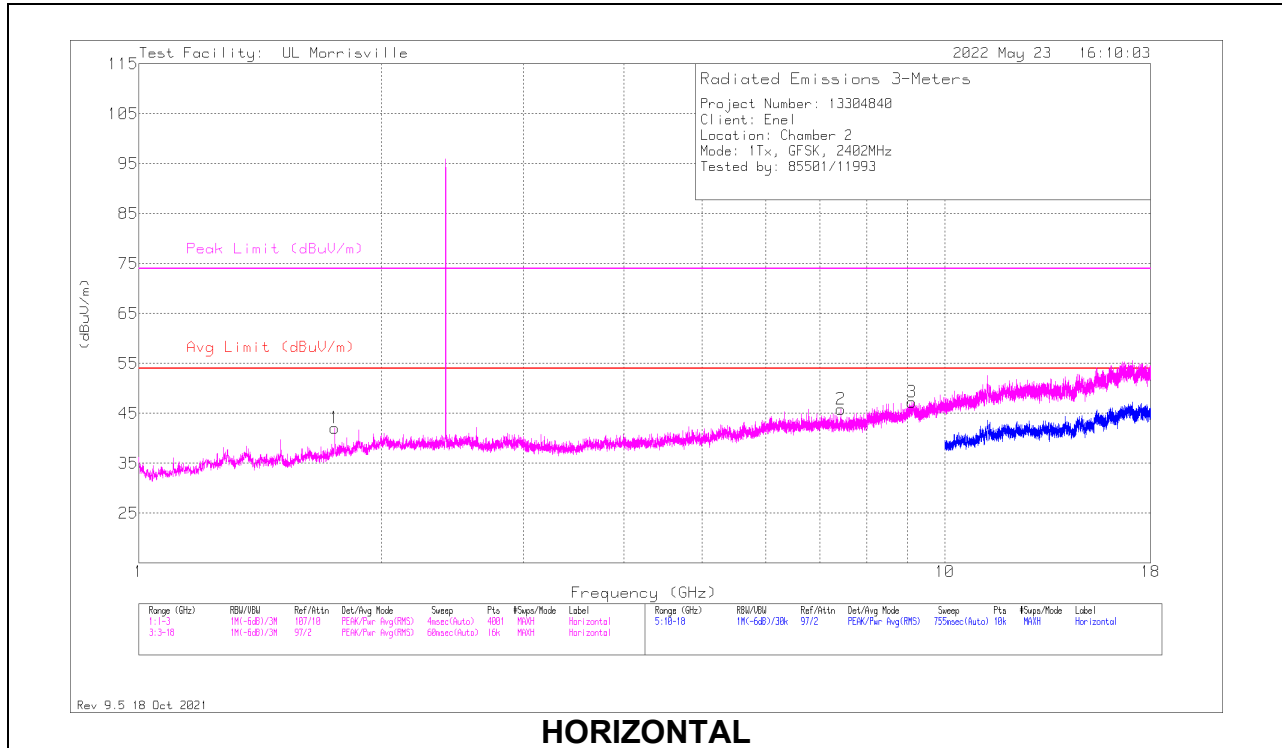


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	32.98	Pk	32.3	-24.6	40.68	-	-	74	-33.32	211	322	V
2	** 2.55522	35.47	Pk	32.5	-25.3	42.67	-	-	74	-31.33	211	322	V
3	* ** 2.48354	22.8	V1TV	32.3	-24.6	30.5	54	-23.5	-	-	211	322	V
4	** 2.55486	26.44	V1TV	32.5	-25.3	33.64	54	-20.36	-	-	211	322	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 V1TV: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

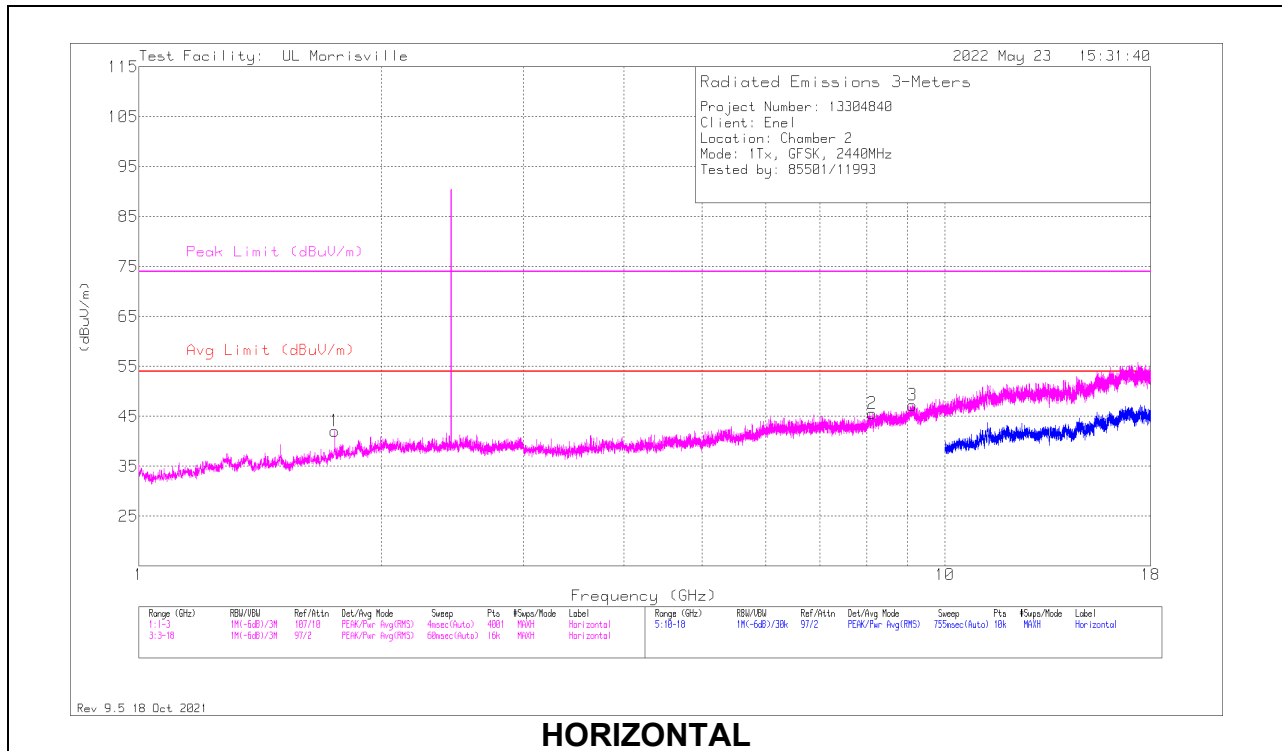
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 1.75	35.18	Pk	29.4	-22.5	0	42.08	54	-11.92	74	-31.92	0-360	199	H
4	*** 1.5	35.44	Pk	27.9	-22.8	0	40.54	54	-13.46	74	-33.46	0-360	199	V
5	*** 7.42125	36.14	Pk	35.6	-26.7	0	45.04	54	-8.96	74	-28.96	0-360	101	V
2	*** 7.42969	37.18	Pk	35.6	-27	0	45.78	54	-8.22	74	-28.22	0-360	199	H
6	*** 9.09938	36.85	Pk	36.2	-25.3	0	47.75	54	-6.25	74	-26.25	0-360	101	V
3	*** 9.10031	36.4	Pk	36.2	-25.3	0	47.3	54	-6.7	74	-26.7	0-360	199	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

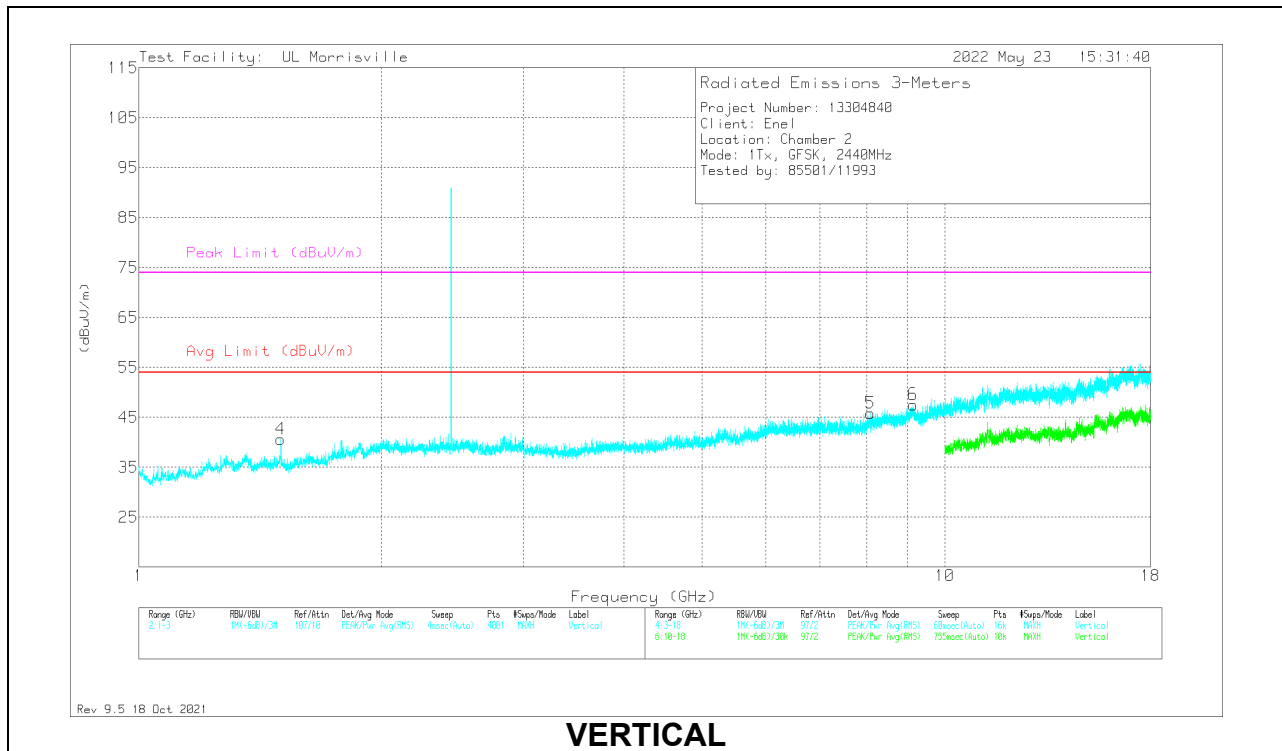
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

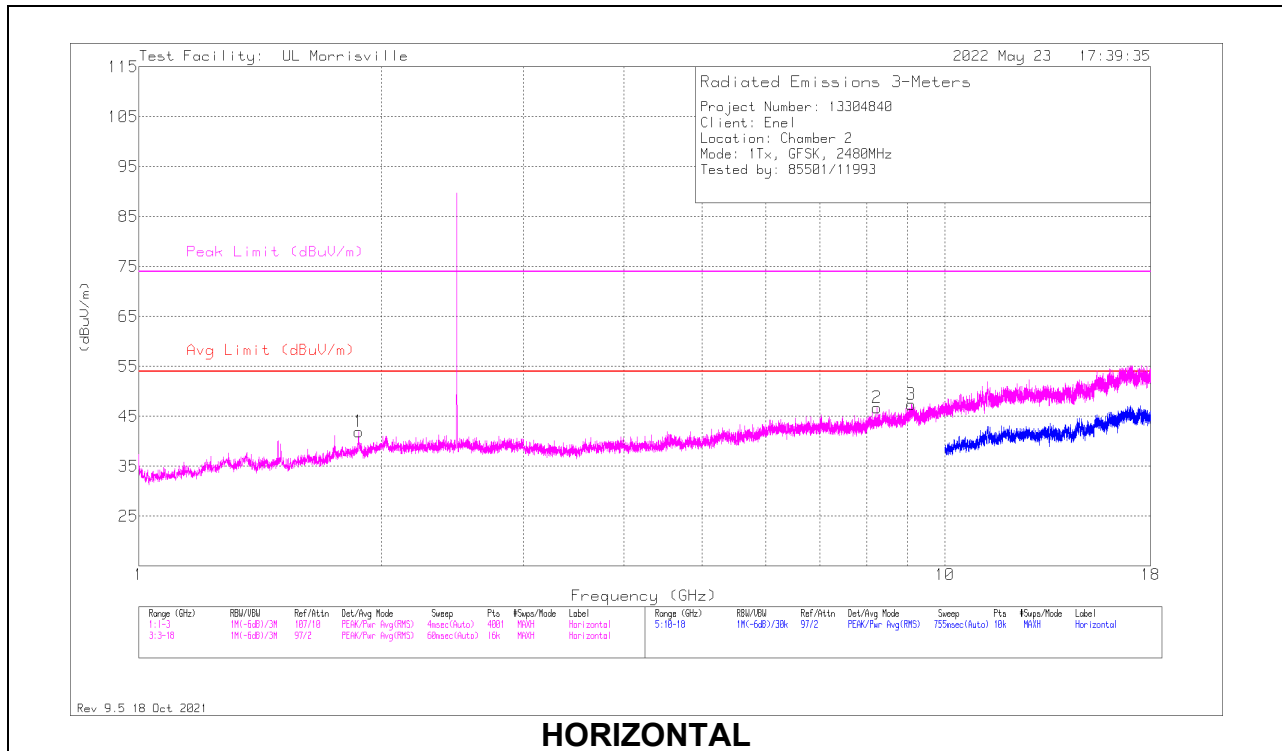
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 1.75	35.2	Pk	29.4	-22.5	42.1	54	-11.9	74	-31.9	0-360	199	H
4	*** 1.5	35.55	Pk	27.9	-22.8	40.65	54	-13.35	74	-33.35	0-360	199	V
5	*** 8.08313	36.34	Pk	35.8	-26.3	45.84	54	-8.16	74	-28.16	0-360	101	V
2	*** 8.12438	36.39	Pk	35.7	-26.5	45.59	54	-8.41	74	-28.41	0-360	200	H
3	*** 9.12188	36.6	Pk	36.2	-25.5	47.3	54	-6.7	74	-26.7	0-360	101	H
6	*** 9.13969	36.58	Pk	36.2	-25.2	47.58	54	-6.42	74	-26.42	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

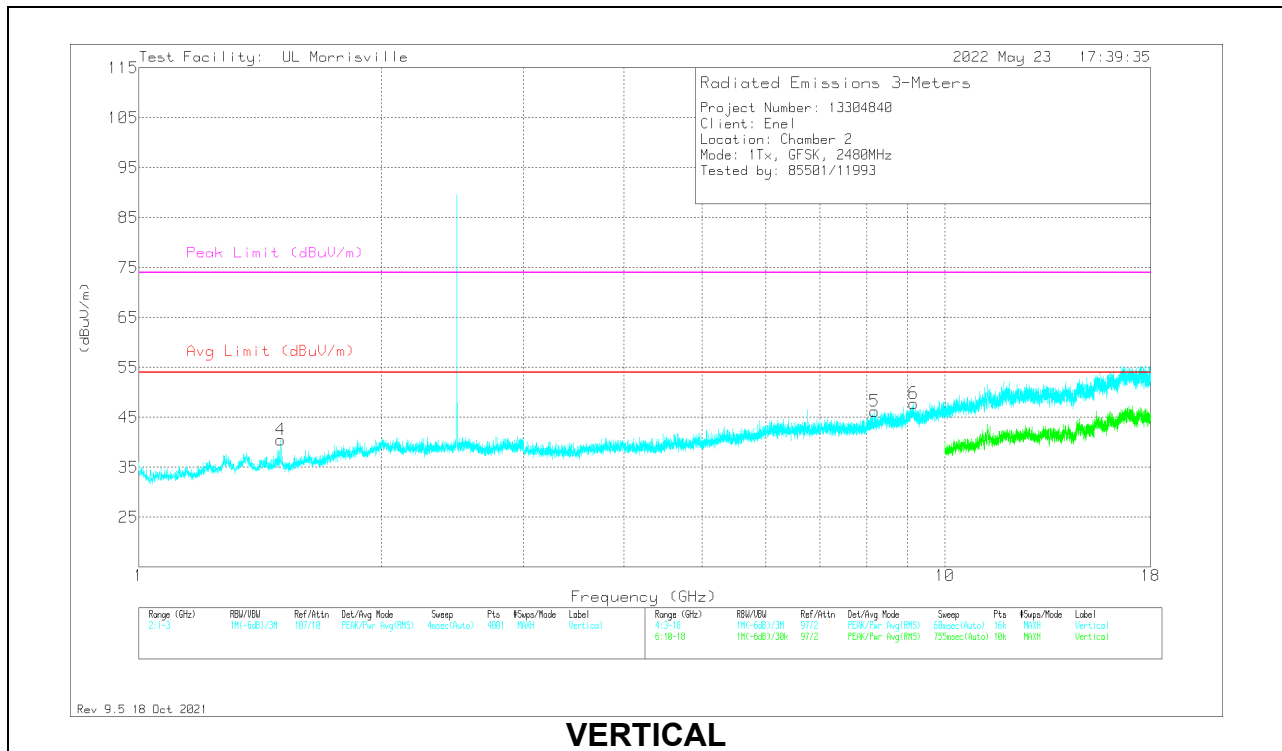
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 1.875	33.87	Pk	30.6	-22.5	0	41.97	54	-12.03	74	-32.03	0-360	200	H
4	*** 1.5005	35.48	Pk	27.8	-22.8	0	40.48	54	-13.52	74	-33.52	0-360	200	V
5	*** 8.18906	36.97	Pk	35.7	-26.5	0	46.17	54	-7.83	74	-27.83	0-360	101	V
2	*** 8.23875	37.73	Pk	35.8	-26.8	0	46.73	54	-7.27	74	-27.27	0-360	101	H
3	*** 9.08156	36.74	Pk	36.1	-25.4	0	47.44	54	-6.56	74	-26.56	0-360	200	H
6	*** 9.15188	36.47	Pk	36.3	-25	0	47.77	54	-6.23	74	-26.23	0-360	101	V

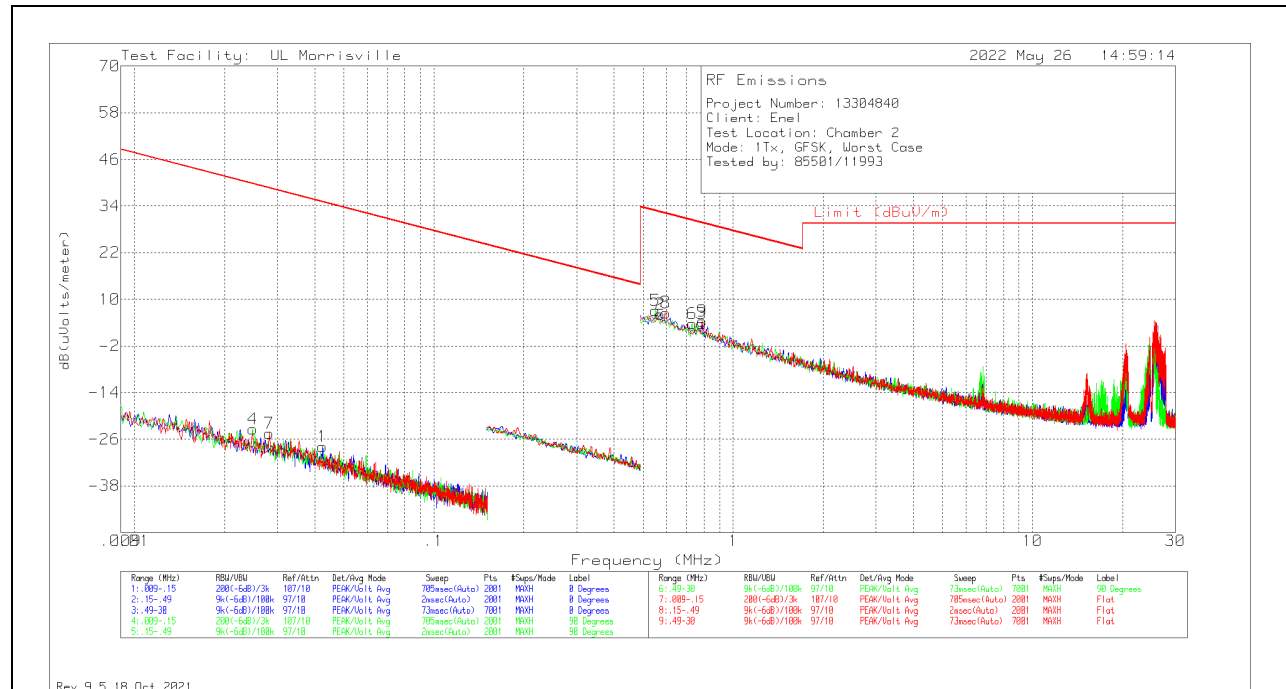
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

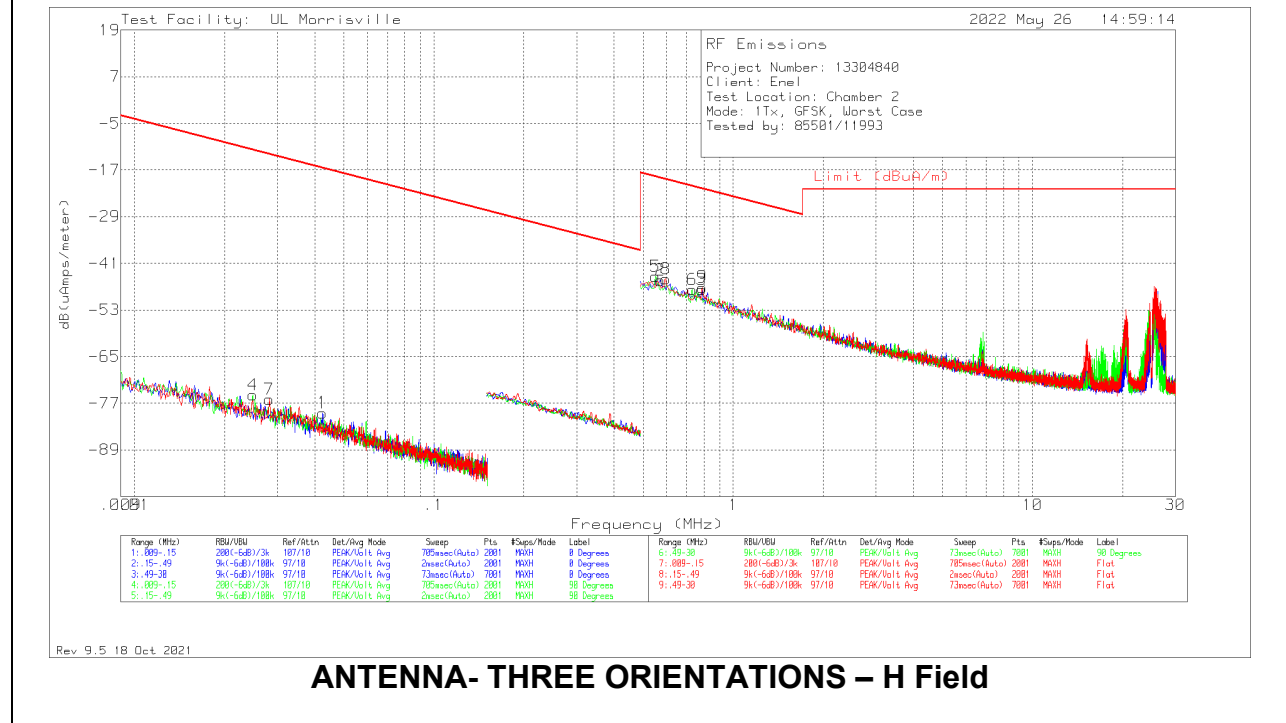
Pk - Peak detector

10.2. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- THREE ORIENTATIONS – E Field



ANTENNA- THREE ORIENTATIONS – H Field

Below 30MHz Data – E Field

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
4	.02483	42.79	Pk	13.7	.1	-80	-23.41	39.7	-63.11	0-360	90 degs
7	.02817	41.9	Pk	13.5	.1	-80	-24.5	38.61	-63.11	0-360	Flat
1	.04251	39.54	Pk	12.4	.1	-80	-27.96	35.03	-62.99	0-360	0 degs
5	.54902	35.78	Pk	11.2	.1	-40	7.08	32.81	-25.73	0-360	90 degs
2	.5701	34.79	Pk	11.2	.1	-40	6.09	32.48	-26.39	0-360	0 degs
8	.5954	35.15	Pk	11.2	.2	-40	6.55	32.11	-25.56	0-360	Flat
6	.73031	32.22	Pk	11.3	.2	-40	3.72	30.33	-26.61	0-360	90 degs
3	.78512	32.26	Pk	11.3	.2	-40	3.76	29.71	-25.95	0-360	0 degs
9	.78934	32.81	Pk	11.3	.2	-40	4.31	29.66	-25.35	0-360	Flat

Pk - Peak detector

Below 30MHz Data – H Field

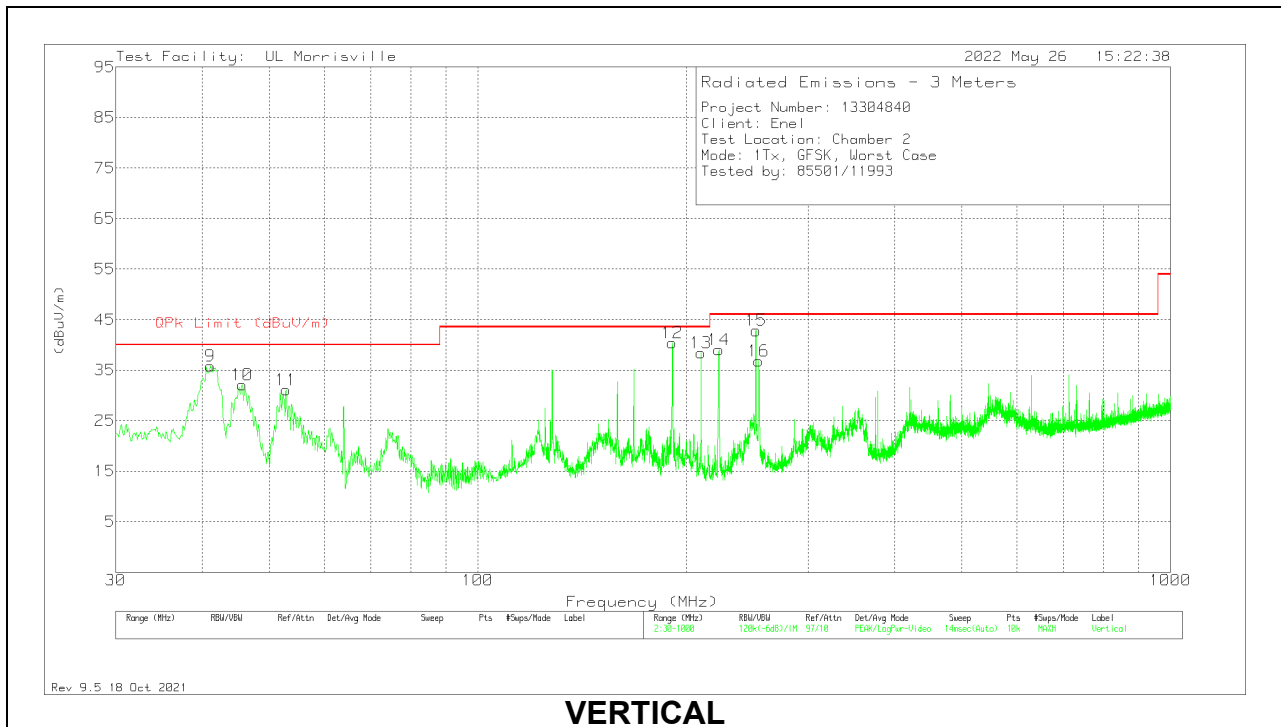
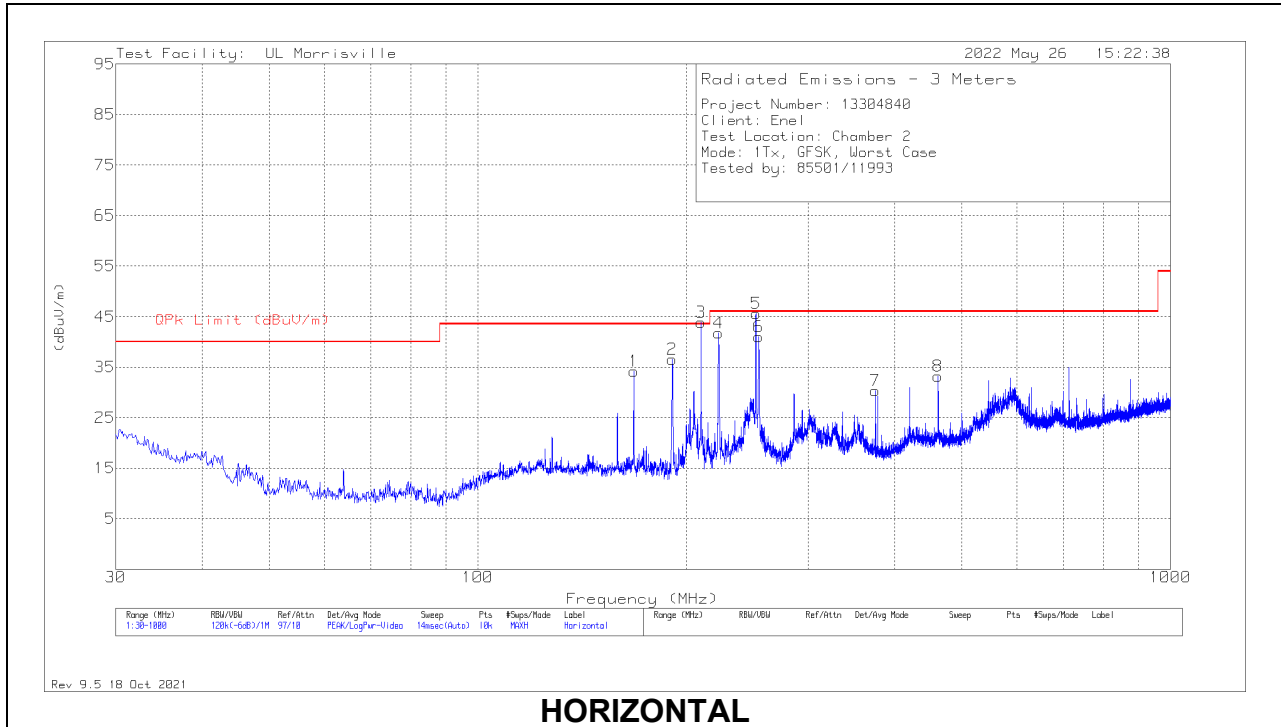
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
4	.02483	42.79	Pk	-37.8	.1	-80	-74.91	-11.8	-63.11	0-360	90 degs
7	.02817	41.9	Pk	-38	.1	-80	-76	-12.89	-63.11	0-360	Flat
1	.04251	39.54	Pk	-39.1	.1	-80	-79.46	-16.47	-62.99	0-360	0 degs
5	.54902	35.78	Pk	-40.3	.1	-40	-44.42	-18.69	-25.73	0-360	90 degs
2	.5701	34.79	Pk	-40.3	.1	-40	-45.41	-19.02	-26.39	0-360	0 degs
8	.5954	35.15	Pk	-40.3	.2	-40	-44.95	-19.39	-25.56	0-360	Flat
6	.73031	32.22	Pk	-40.2	.2	-40	-47.78	-21.17	-26.61	0-360	90 degs
3	.78512	32.26	Pk	-40.2	.2	-40	-47.74	-21.79	-25.95	0-360	0 degs
9	.78934	32.81	Pk	-40.2	.2	-40	-47.19	-21.84	-25.35	0-360	Flat

Pk - Peak detector

Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were $40 \cdot \log(\text{test distance} / \text{specification distance})$.

10.3. WORST CASE BELOW 1 GHZ

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



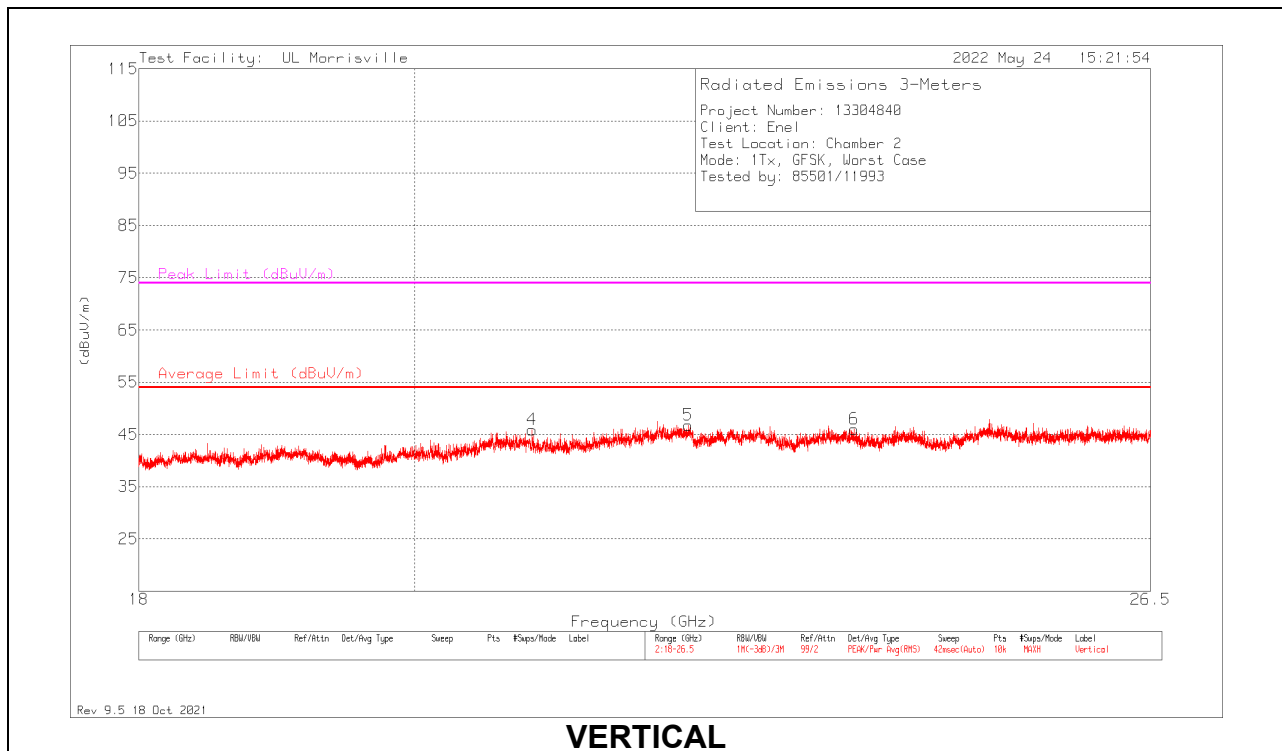
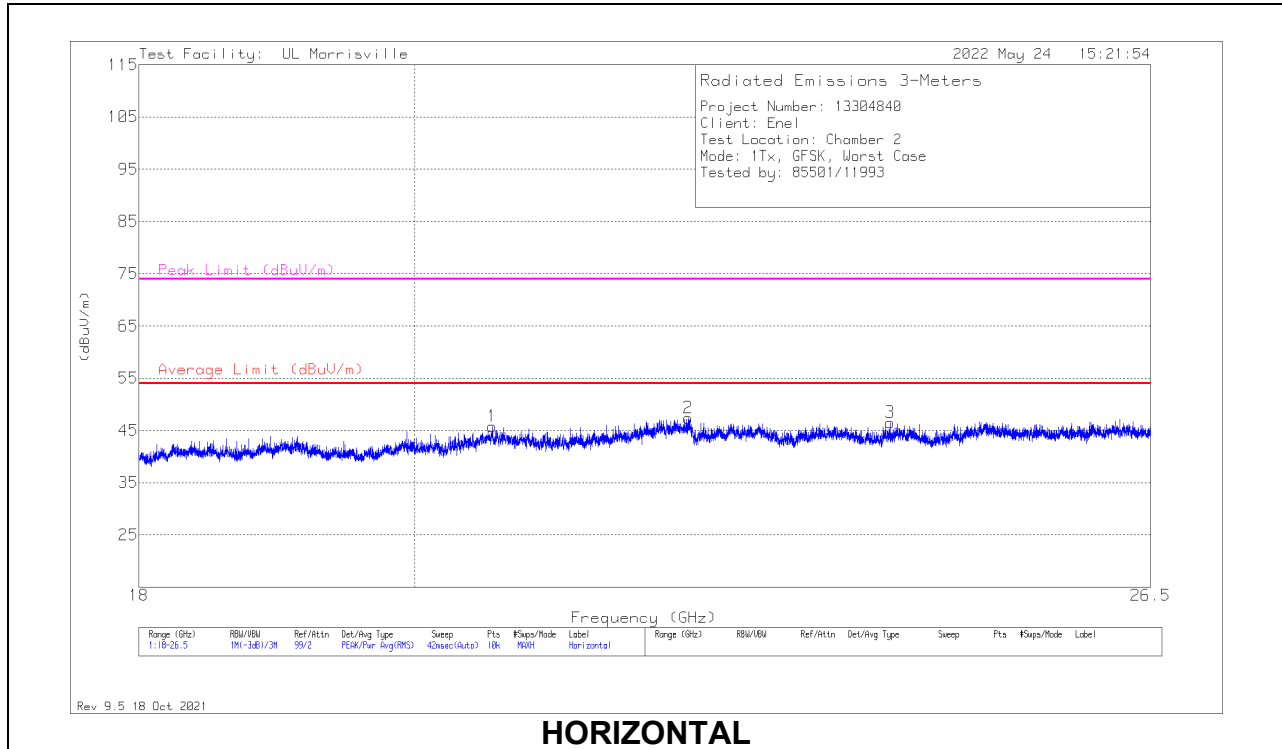
Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	41.1803	44.49	Qp	18.9	-31.5	31.89	40	-8.11	208	110	V
10	45.714	47.52	Pk	15.9	-31.3	32.12	40	-7.88	0-360	101	V
11	52.892	48.64	Pk	13.4	-31	31.04	40	-8.96	0-360	101	V
1	168.031	45.98	Pk	18	-29.8	34.18	43.52	-9.34	0-360	199	H
2	190.923	48.36	Pk	17.6	-29.4	36.56	43.52	-6.96	0-360	101	H
12	190.8026	43.32	Qp	17.6	-29.4	31.52	43.52	-12	261	204	V
3	210.0056	56.08	Qp	16.4	-29.4	43.08	43.52	-.44	313	119	H
13	210.0143	45.2	Qp	16.4	-29.4	32.2	43.52	-11.32	261	204	V
4	222.7067	51.45	Qp	16.8	-29.4	38.85	46.02	-7.17	153	122	H
14	222.836	51.69	Pk	16.8	-29.4	39.09	46.02	-6.93	0-360	101	V
5	252.0038	56.32	Qp	17.6	-29.2	44.72	46.02	-1.3	320	102	H
15	251.999	54.31	Qp	17.6	-29.2	42.71	46.02	-3.31	306	181	V
6	254.4594	47.58	Qp	17.6	-29.1	36.08	46.02	-9.94	331	109	H
16	254.555	48.26	Pk	17.7	-29.1	36.86	46.02	-9.16	0-360	199	V
7	375.029	37.51	Pk	21	-28.2	30.31	46.02	-15.71	0-360	101	H
8	462.038	38.06	Pk	23.2	-28.1	33.16	46.02	-12.86	0-360	299	H

Pk - Peak detector
 Qp - Quasi-Peak detector

10.4. WORST CASE 18-26 GHZ

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



18 – 26GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0063 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 20.60329	49.81	Pk	33.9	-37.9	45.81	54	-8.19	74	-28.19	0-360	101	H
2	* ** 22.20538	48.48	Pk	36.9	-38	47.38	54	-6.62	74	-26.62	0-360	149	H
3	* ** 23.98765	48.69	Pk	35	-37.2	46.49	54	-7.51	74	-27.51	0-360	299	H
4	* ** 20.92116	49.4	Pk	34.1	-37.6	45.9	54	-8.1	74	-28.1	0-360	250	V
5	* ** 22.20793	47.65	Pk	36.9	-37.8	46.75	54	-7.25	74	-27.25	0-360	250	V
6	* ** 23.66043	48.92	Pk	34.9	-37.8	46.02	54	-7.98	74	-27.98	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

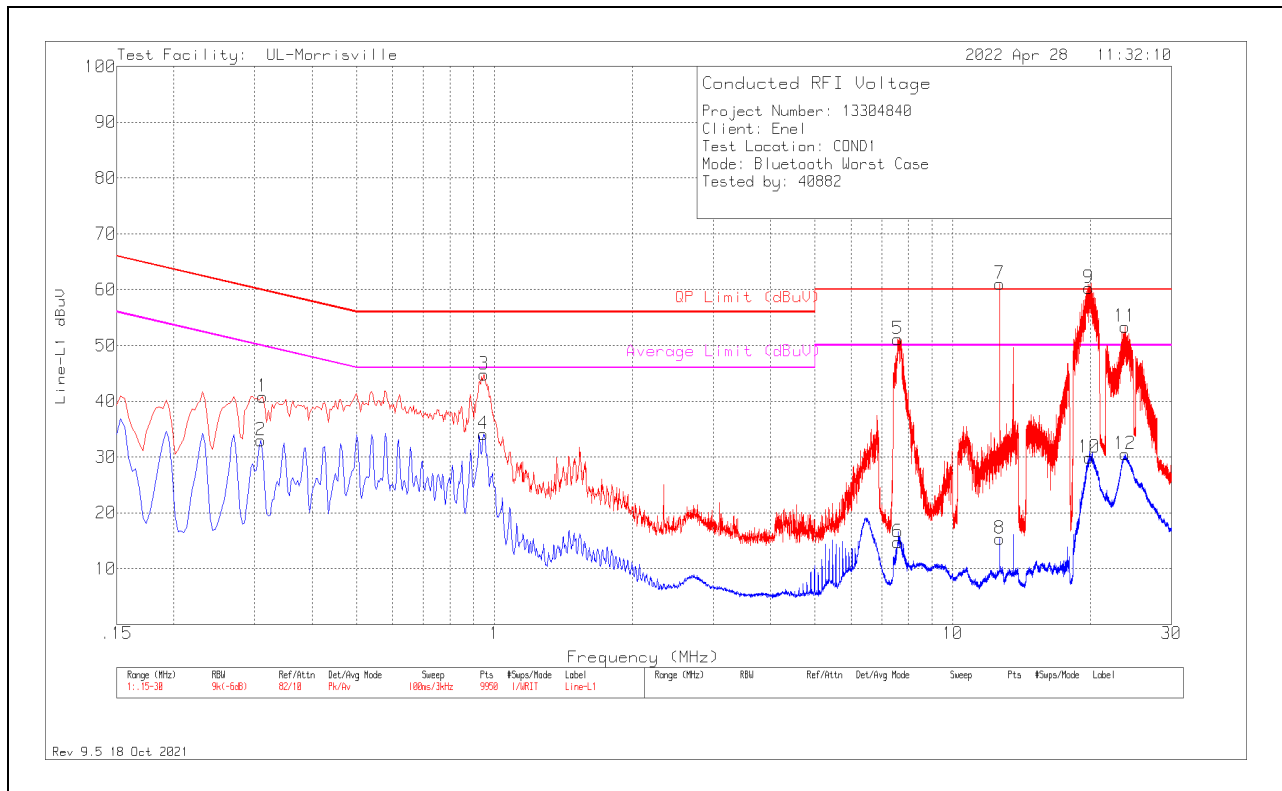
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

11.1.1. AC Power Line Norm

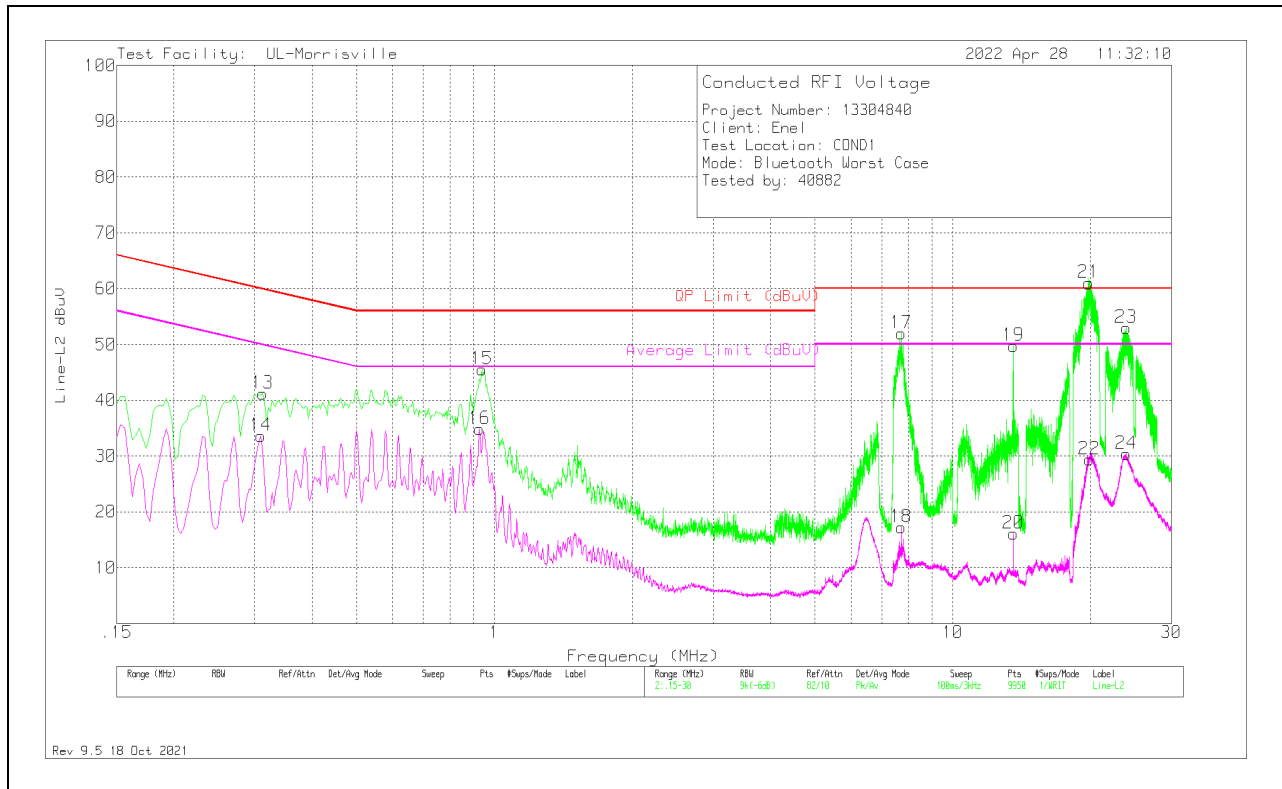
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)	
2	.309	23.11	Av	.1	9.8	33.01	-	-	50	-16.99	
1	.312	30.94	Pk	.1	9.8	40.84	59.92	-19.08	-	-	
4	.945	24.35	Av	0	9.8	34.15	-	-	46	-11.85	
3	.948	34.98	Pk	0	9.8	44.78	56	-11.22	-	-	
5	7.59	41.06	Pk	.1	10	51.16	60	-8.84	-	-	
6	7.59	4.66	Av	.1	10	14.76	-	-	50	-35.24	
7	12.6675	14.36	Qp	.1	10	24.46	60	-35.54	-	-	
8	12.672	5.23	Av	.1	10	15.33	-	-	50	-34.67	
9	19.8227	40.88	Qp	.2	10.1	51.18	60	-8.82	-	-	
10	19.854	19.58	Av	.2	10.1	29.88	-	-	50	-20.12	
11	23.754	43	Pk	.2	10.2	53.4	60	-6.6	-	-	
12	23.757	20.09	Av	.2	10.2	30.49	-	-	50	-19.51	

Pk – Peak detector
 Qp – Quasi-peak detector
 Av – Average detector

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
14	.309	23.69	Av	.1	9.8	33.59	-	-	50	-16.41
13	.312	31.26	Pk	.1	9.8	41.16	59.92	-18.76	-	-
16	.927	25	Av	0	9.8	34.8	-	-	46	-11.2
15	.939	35.74	Pk	0	9.8	45.54	56	-10.46	-	-
17	7.713	41.89	Pk	.1	10	51.99	60	-8.01	-	-
18	7.716	7.07	Av	.1	10	17.17	-	-	50	-32.83
20	13.56	6.02	Av	.1	10	16.12	-	-	50	-33.88
19	13.563	39.68	Pk	.1	10	49.78	60	-10.22	-	-
21	19.7962	40.63	Qp	.2	10.1	50.93	60	-9.07	-	-
22	19.848	19.04	Av	.2	10.1	29.34	-	-	50	-20.66
23	23.877	42.63	Pk	.2	10.2	53.03	60	-6.97	-	-
24	23.88	19.94	Av	.2	10.2	30.34	-	-	50	-19.66

Pk – Peak detector
 Qp – Quasi-peak detector
 Av – Average detector

12. SETUP PHOTOS

Refer to document R13304840-EP2 for setup photos.

END OF TEST REPORT