

TEST REPORT

Report Number. : 14571599-E1V1

Applicant : DISH TECHNOLOGIES LLC
90 INVERNESS CIRCLE EAST
ENGLEWOOD, CO 80112, UNITED STATES

Model : D25

Brand : DISH

FCC ID : DKNHRT4

EUT Description : WHOLE HOME DVR ACCESSORY

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
2023-01-27

Prepared by:
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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-01-27	Initial Issue	---

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: DISH TECHNOLOGIES LLC
90 INVERNESS CIRCLE EAST
ENGLEWOOD, CO 80112, UNITED STATES

EUT DESCRIPTION: WHOLE HOME DVR ACCESSORY

MODEL: D25

BRAND: DISH

SERIAL NUMBER: CONDUCTED: R525010J20027L
RADIATED: R525010J20020L

SAMPLE RECEIPT DATE: 2023-01-12

DATE TESTED: 2023-01-13 TO 2023-01-20

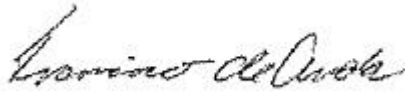
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies

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.

Approved & Released For
UL Verification Services Inc. By:



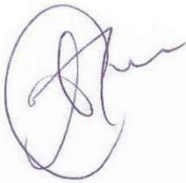
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2. TEST RESULTS SUMMARY

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.

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
15.247 (a) (2)	6dB BW	complies	None.
15.247 (b) (3)	Output Power	complies	None.
See Comment	Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	PSD	complies	None.
15.247 (d)	Conducted Spurious Emissions	complies	None.
15.209, 15.205	Radiated Emissions	complies	None.
15.207	AC Mains Conducted Emissions	complies	None.

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 v05r02, KDB 414788 D01 Radiated Test Site v01r01.

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
<input checked="" type="checkbox"/>	Building 1: 47173 Benicia Street, Fremont, CA 94538	US0104	2324A	550739
<input type="checkbox"/>	Building 2: 47266 Benicia Street, Fremont, CA 94538	US0104	2324A	550739
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd, Fremont, CA 94538	US0104	2324A	550739

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	2.84 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 %

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

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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a Whole Home DVR Accessory with BLE and BT radios.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	9.45	8.81

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes an PCB Inverted F antenna, with a maximum gain of 4.92 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT software/ firmware installed during testing was Anker C.

The test utility software used during testing was RTLBTAPP.

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 highest power on low, middle and high channels.

The EUT is a desktop device, therefore, all final radiated testing was performed with the EUT in X orientation.

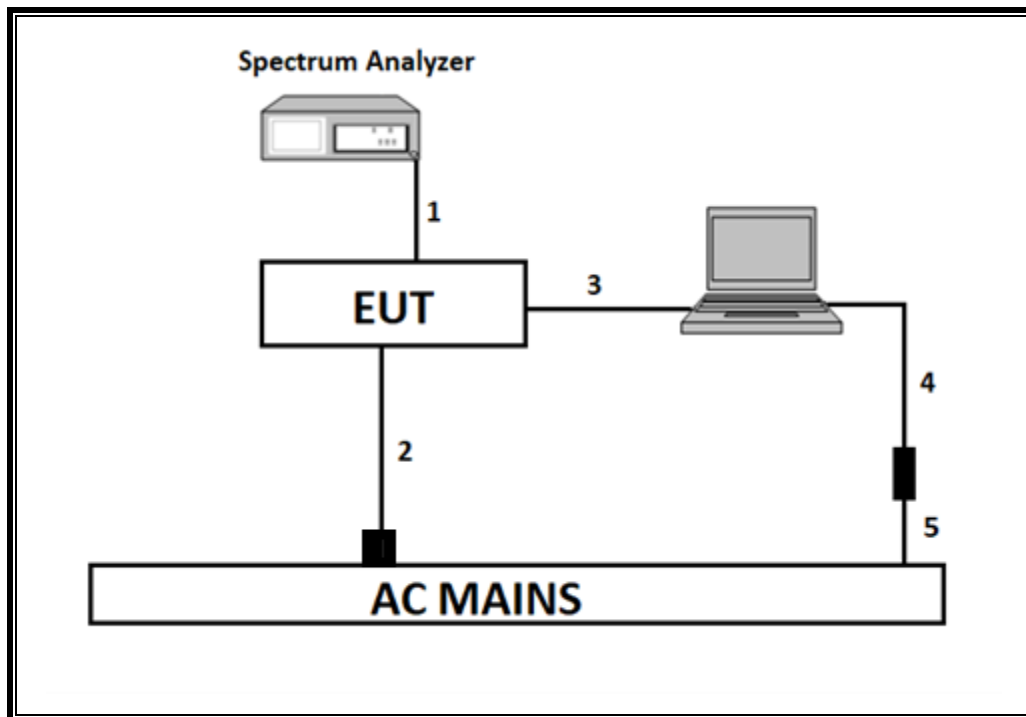
EUT supports only 1Mbps data rate. Only this mode was investigated.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT						
Description	Manufacturer	Model	Serial Number	FCC ID/ DoC		
Laptop	HP	EliteBook 8470P	N/A	DoC		
AC/DC Adapter	HP	N/A	N/A	DoC		
USB to UART cable	N/A	N/A	N/A	DoC		
AC/DC Adapter	LITEON	PB-1180-6ES1	ETC2007008933	DoC		
TV Emulator	DISH	TV Emulator	D52-12	DoC		
USB Flash Drive	SanDisk	32 GB	BM200126825Z	DoC		
I/O CABLES (CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	RF	Un-shielded	0.2	To spectrum analyzer
2	DC	1	Barrel	Un-shielded	1.8	EUT to AC/DC adapter Mains
3	UART	1	USB	Un-shielded	2.1	USB adapter to laptop
4	DC	1	AC	Un-shielded	1.7	
5	AC	1	AC	Un-shielded	1.8	
I/O CABLES (RADIATED TEST/AC POWER LINE EMISSIONS)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	Barrel	Un-shielded	1.8	EUT to AC/DC adapter Mains
2	HDMI	1	HDMI	shielded	2.5	EUT to Emulator

SETUP DIAGRAMS

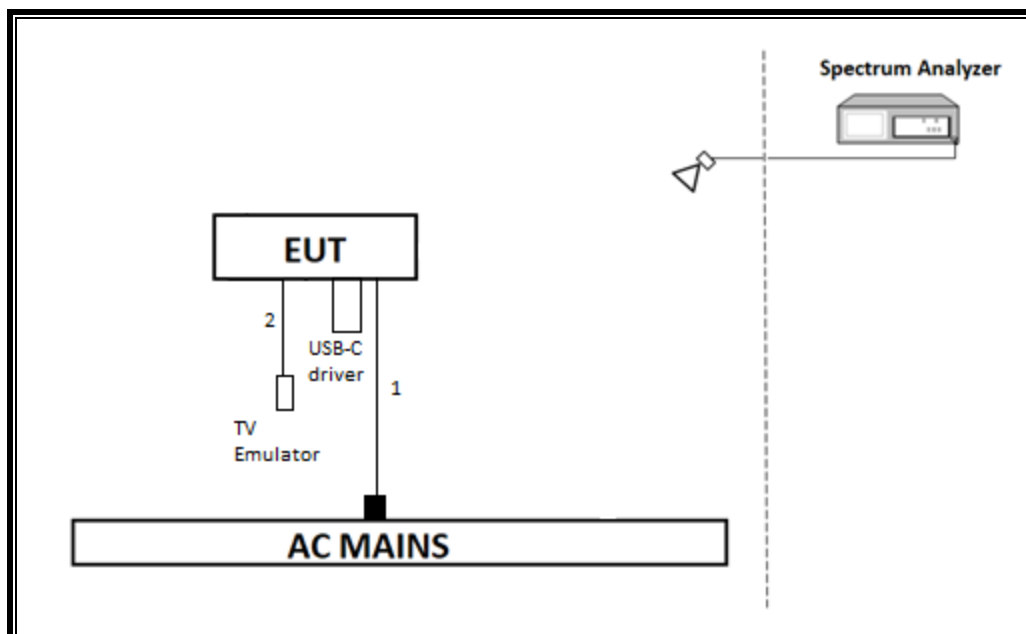
CONDUCTED TEST SETUP DIAGRAM



TEST SETUP

The EUT is connected to a test laptop by USB to UART cable adapter during the tests. Test software exercised the radio card.

RADIATED TEST/AC POWER LINE EMISSIONS SETUP DIAGRAM



TEST SETUP

The EUT is connected to support equipment and AC powered. Test software exercised the radio card, laptop is removed during the test.

7. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW \geq DTS BW

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)

PSD: ANSI C63.10 Subclause -11.10.2 Method PKPSD (peak PSD)

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

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

Conducted emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.2

Band-edge: ANSI C63.10 Section 6.10

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

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

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, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB1	80293	2023-08-09	2022-08-09
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	29654	2023-04-24	2022-04-24
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	206806	2023-10-07	2022-10-07
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	223083	2023-10-25	2022-10-25
Amplifier, 100MHz-18GHz	AMPLICAL	AMP0.1G18-47-20	185686	2023-04-19	2022-04-19
RF Filter Box, 1-18GHz	FREMONT	SAC-L1	185686	2023-06-24	2022-06-24
EMI TEST RECEIVER, with B8 option	Rohde & Schwarz	ESW44	169937	2023-02-20	2022-02-20
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169927	2023-02-16	2022-02-16
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	172364	2023-03-08	2022-03-08
Amplifier 18-26.5GHz, +5Vdc, 60dB min	AMPLICAL	AMP18G26.5-60	215705	2023-02-26	2022-02-26
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	219909	2023-05-10	2022-05-10
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	219911	2023-05-10	2022-05-10
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent Technologies	N9030A	80396	2023-02-01	2022-02-01
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1268	2023-02-03	2022-02-03
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90419	2023-03-02	2022-03-02
10dB Fixed Attenuator	Pasternack Enterprises	PE7087-10	178557	Verified/characterized before use	
AC Line Conducted					
LISN	Fischer Custom Communications, Inc	FCC-LISN-50/250-25-2-01-480V	175765	2023-01-25	2022-01-25
EMI TEST RECEIVER	Rohde & Schwarz	ESR	93091	2023-02-21	2022-02-21
Transient Limiter	Com-Power	TBFL1	207996	2023-07-15	2022-07-15
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Ver 2015-12-28, 2020-04-15, 2015-12-29, 2022-10-25, 2021-12-07, 2022-05-18		
Antenna Port Software	UL	UL RF	AP2022-08-16		
AC Line Conducted Software	UL	UL EMC	Rev 9.5, 2022-02-17		

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

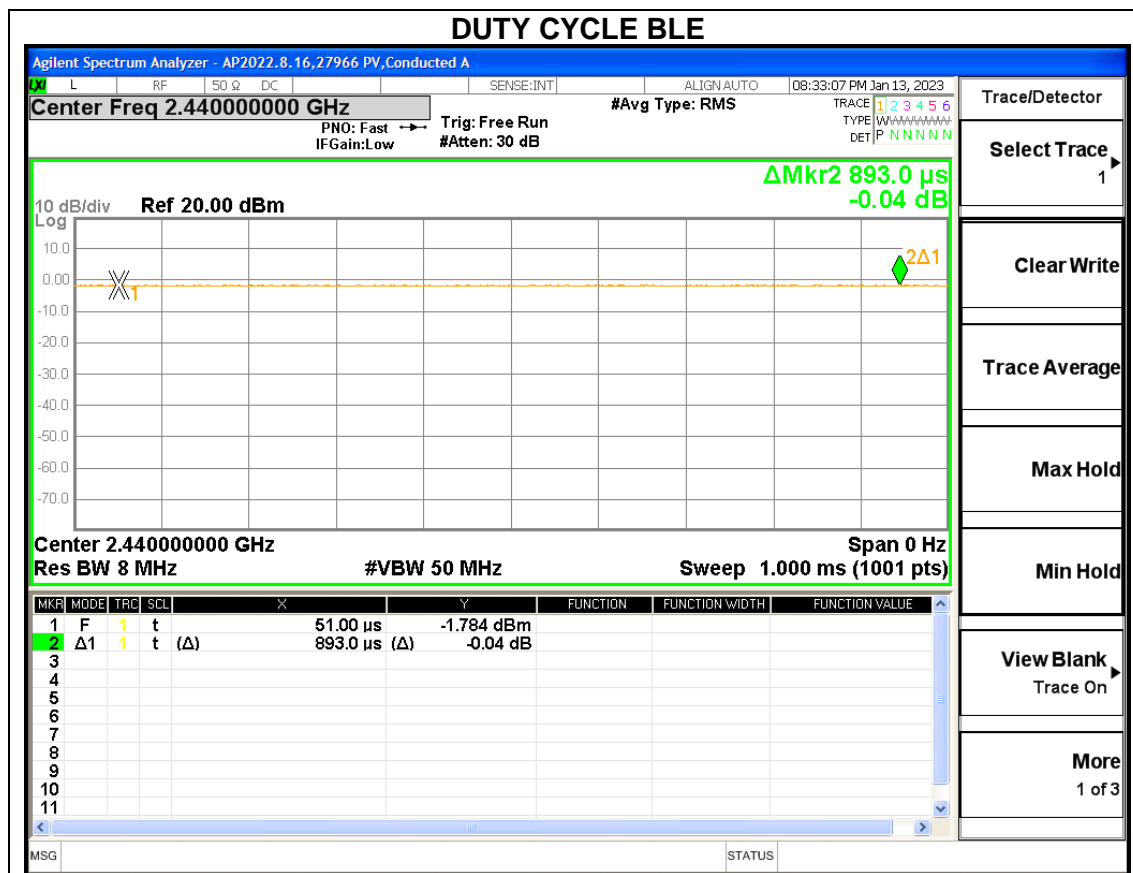
None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
BLE	0.893	0.893	1.000	100.00	0.00	0.010



9.2. 6 dB BANDWIDTH

LIMITS

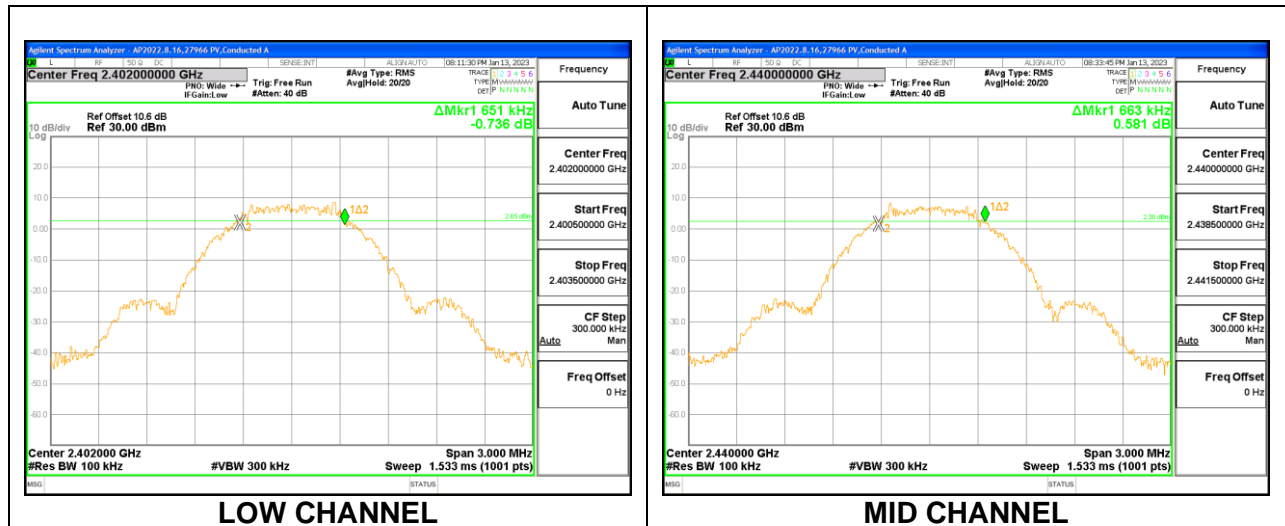
FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

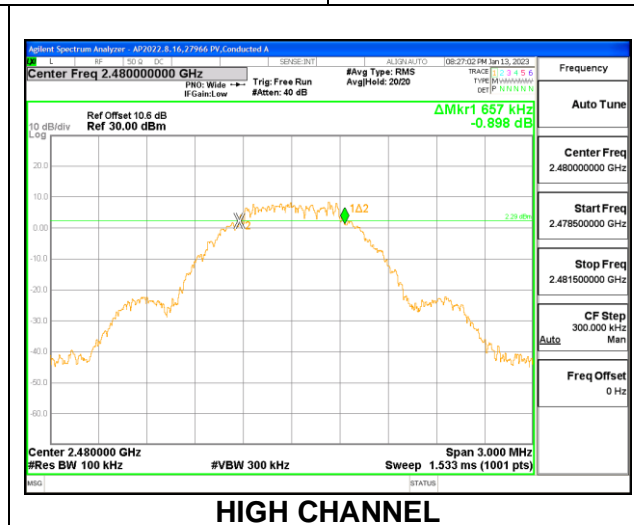
9.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6510	0.5
Middle	2440	0.6630	0.5
High	2480	0.6570	0.5



LOW CHANNEL

MID CHANNEL



HIGH CHANNEL

9.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

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

9.3.1. BLE (1Mbps)

Tested By:	27966 PV
Date:	2023-01-13

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.36	30	-20.64
Middle	2440	9.31	30	-20.69
High	2480	9.45	30	-20.55

9.4. 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

9.4.1. BLE (1Mbps)

Tested By:	27966 PV
Date:	2023-01-13

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	9.14
Middle	2440	9.11
High	2480	9.22

9.5. POWER SPECTRAL DENSITY

LIMITS

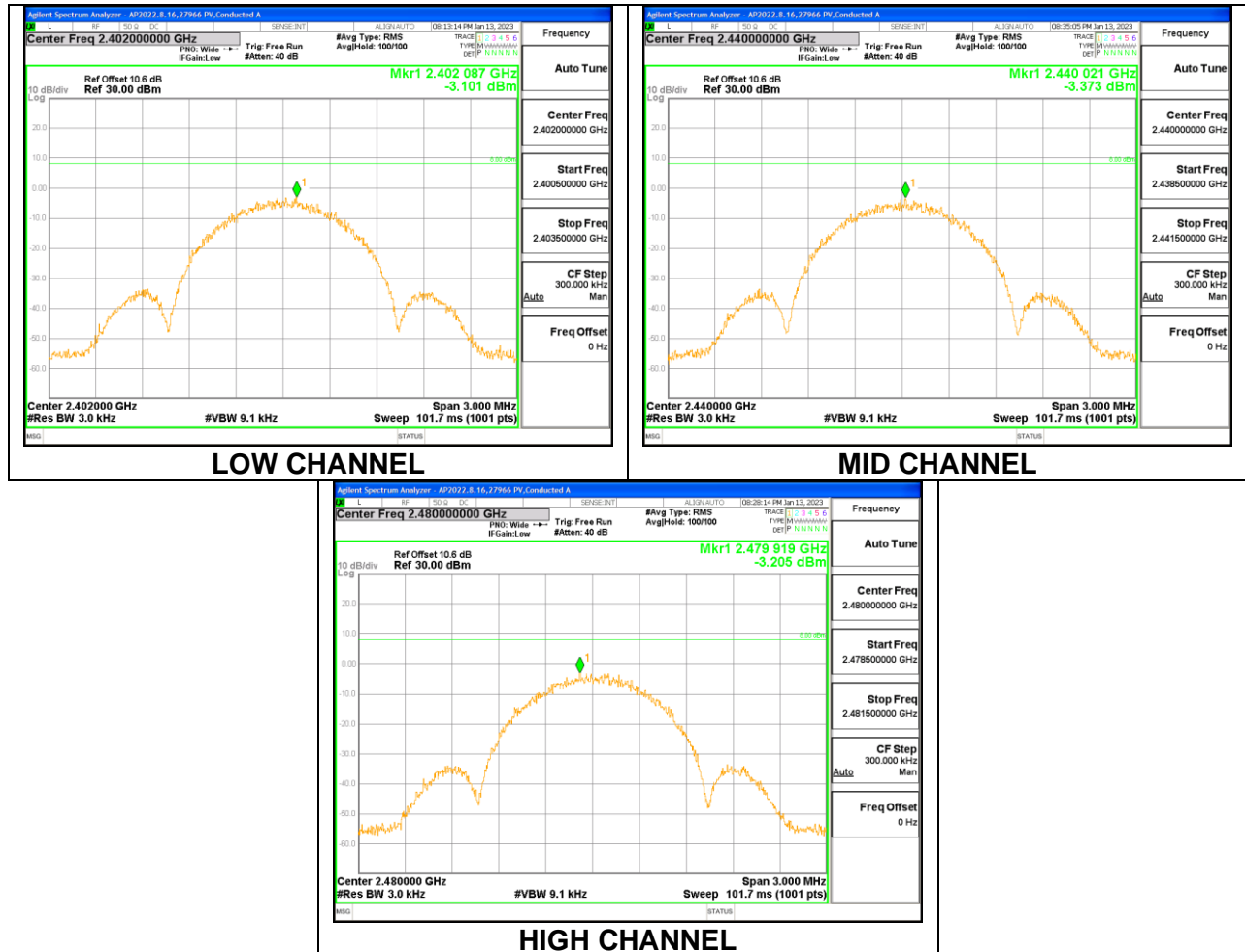
FCC §15.247 (e)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

9.5.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-3.10	8	-11.10
Middle	2440	-3.37	8	-11.37
High	2480	-3.21	8	-11.21



9.6. CONDUCTED SPURIOUS EMISSIONS

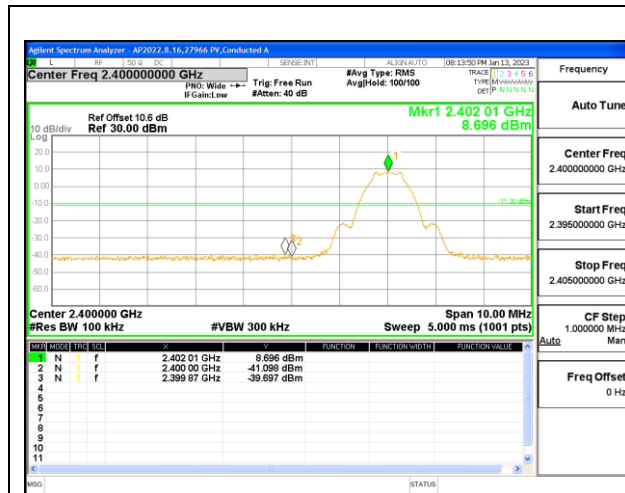
LIMITS

FCC §15.247 (d)

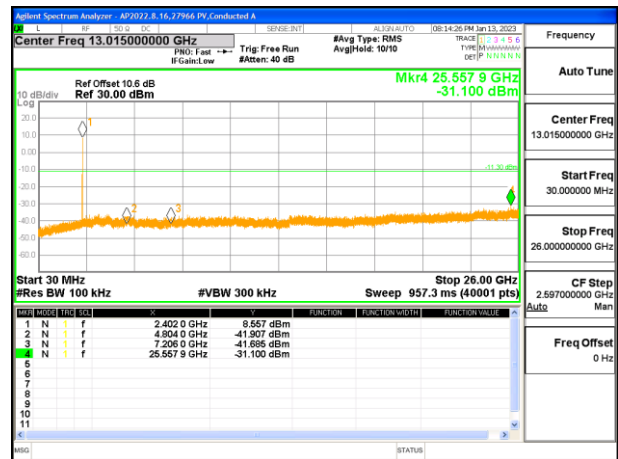
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dBc.

RESULTS

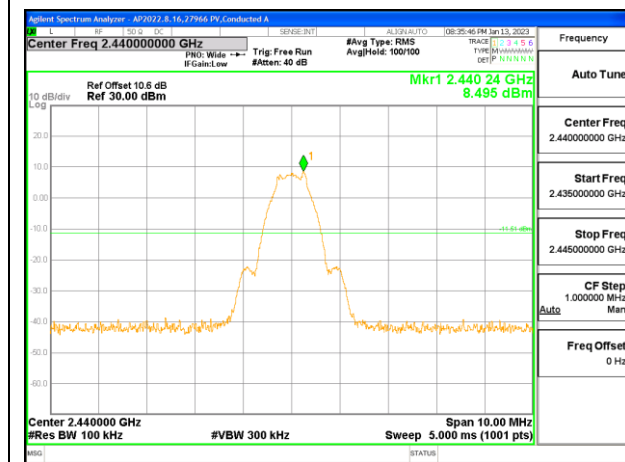
9.6.1. BLE (1Mbps)



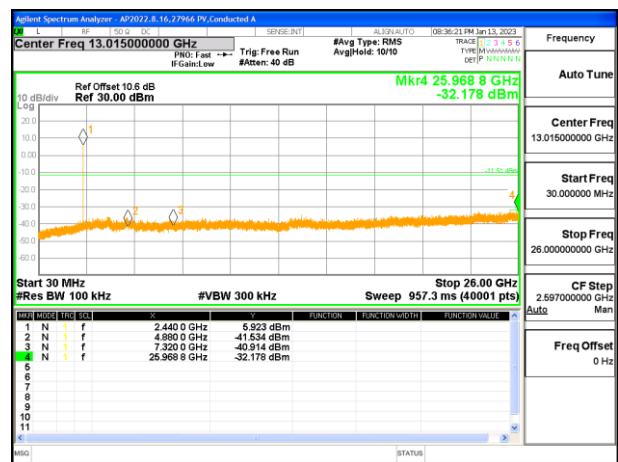
LOW CHANNEL BANDEDGE



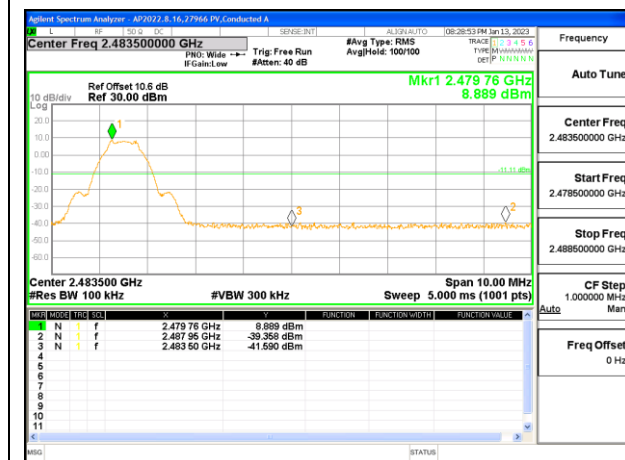
OUT-OF-BAND LOW CHANNEL



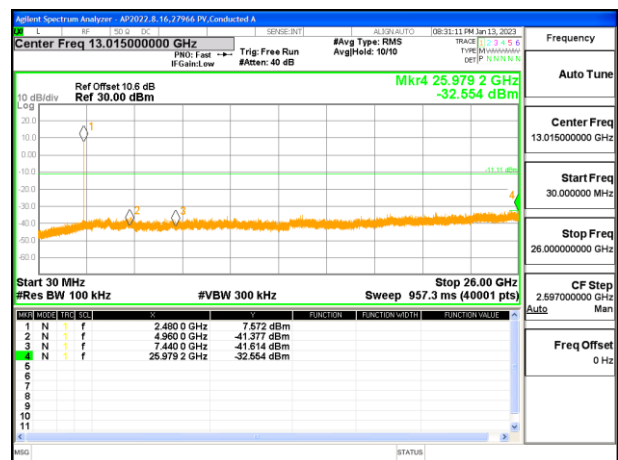
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

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

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.

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.

KDB 558074 D01 15.247 Meas Guidance v05r02

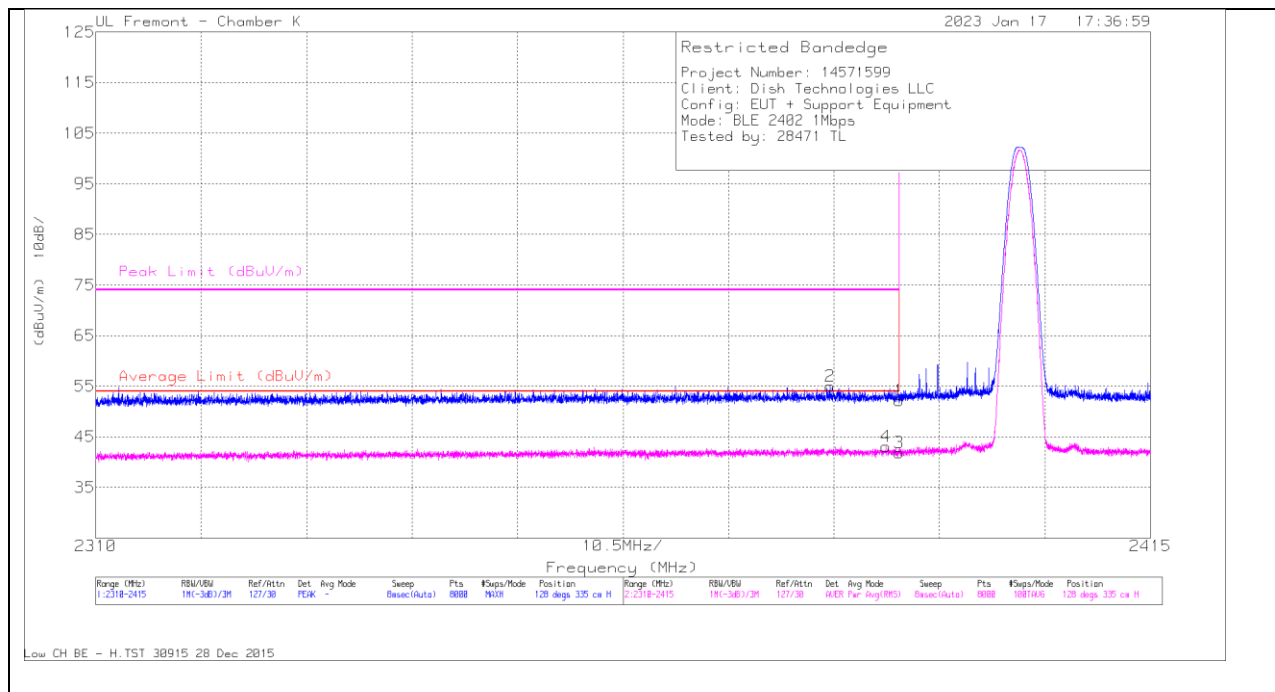
Use of a duty cycle correction factor (DCCF) is permitted for calculating average radiated field strength emission levels for an FHSS device in 15.247. This DCCF can be applied when the field strength limit (e.g., within a Government Restricted band) and the conditions specified in Section 15.35(c) can be satisfied. The average radiated field strength is calculated by subtracting the DCCF from the maximum radiated field strength level as determined through measurement. The maximum radiated field strength level represents the worst-case (maximum amplitude) RMS measurement of the emission(s) during continuous transmission (i.e., not including any time intervals during which the transmitter is off or is transmitting at a reduced power level). It is also acceptable to apply the DCCF to a measurement performed with a peak detector instead of the specified RMS power averaging detector. Note that Section 15.35(c) specifies that the DCCF shall represent the worst-case (greatest duty cycle) over any 100 msec transmission period.

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT

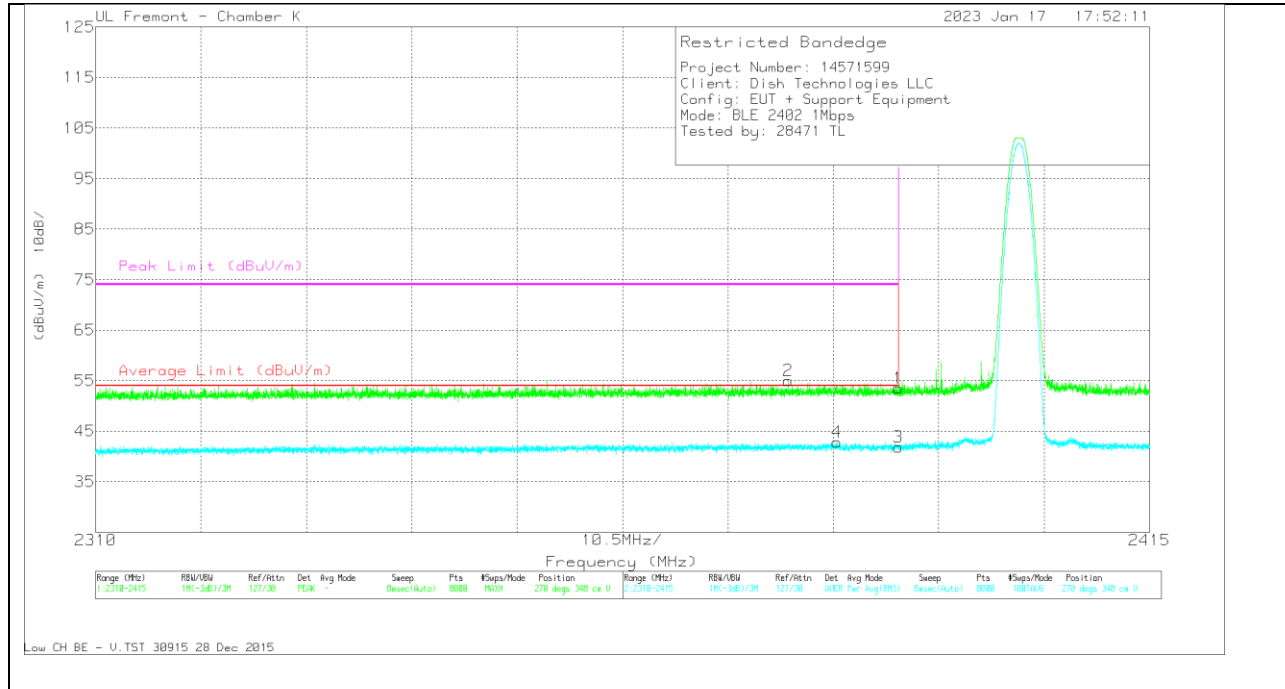


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	223083 ACF (dB) 3mH	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	* 2390	55.25	PK	31.8	-34.9	52.15	-	-	74	-21.85	128	335	H
2	* 2383.131	58.05	PK	31.8	-34.8	55.05	-	-	74	-18.95	128	335	H
3	* 2390	44.94	RMS	31.8	-34.9	41.84	54	-12.16	-	-	128	335	H
4	* 2388.657	46.12	RMS	31.8	-34.8	43.12	54	-10.88	-	-	128	335	H

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

VERTICAL RESULT



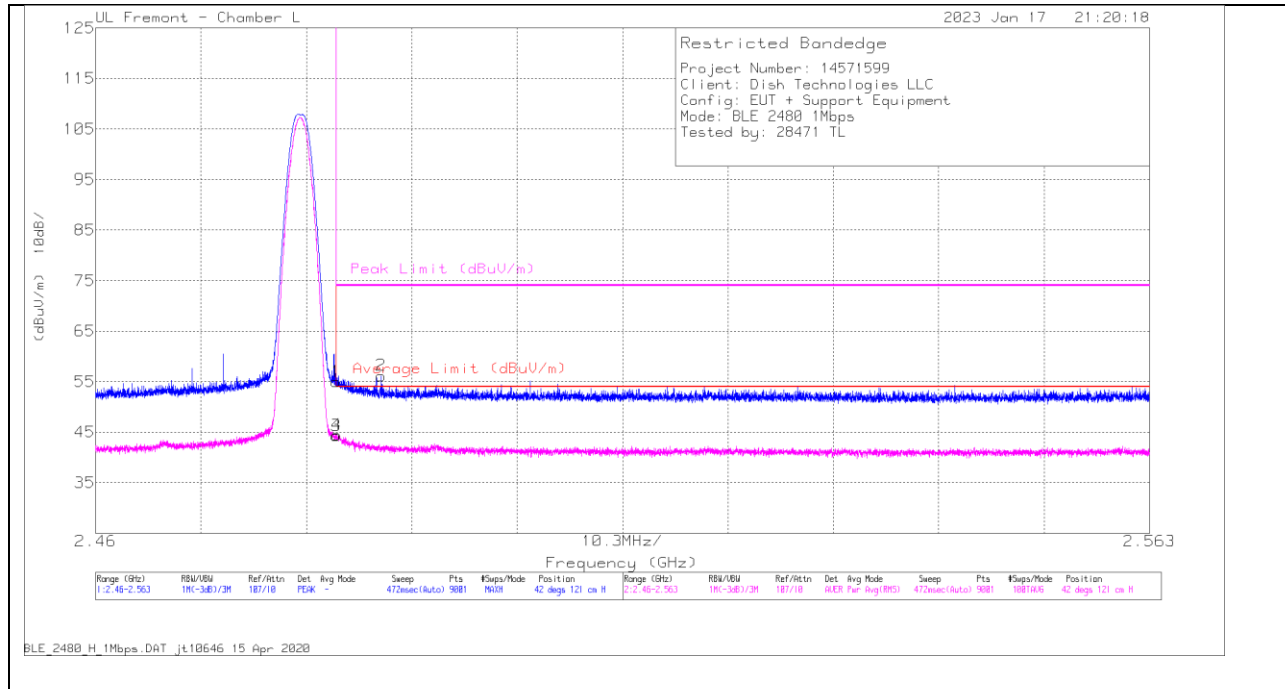
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	223083 ACF (dB) 3MHz	Amp/CbI/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	* 2390	56.65	Pk	31.8	-34.9	53.55	-	-	74	-20.45	270	348	V
2	* 2379.009	58.09	Pk	31.8	-34.9	54.99	-	-	74	-19.01	270	348	V
3	* 2390	44.91	RMS	31.8	-34.9	41.81	54	-12.19	-	-	270	348	V
4	* 2383.839	45.85	RMS	31.8	-34.8	42.85	54	-11.15	-	-	270	348	V

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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

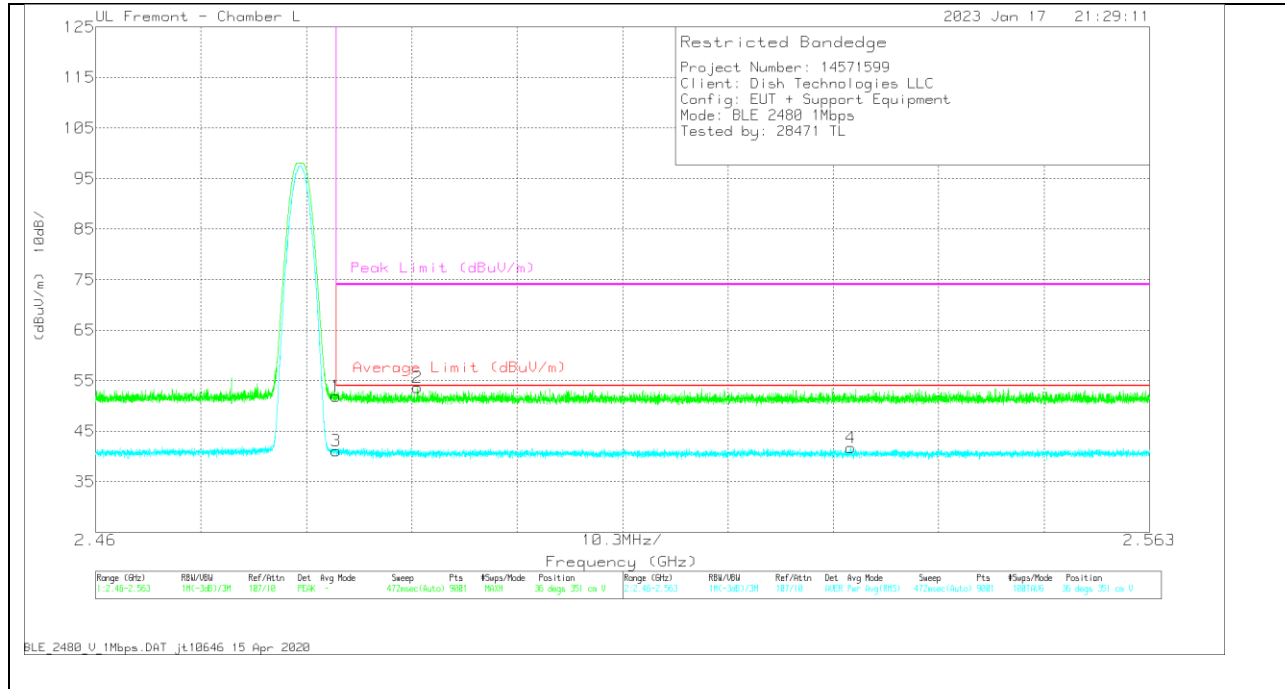


Trace Markers

Range 1: Horizontal - Pk 2460 - 2563MHz													
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Horn 1mH (dB) 206806	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	* 2483.5	42.37	Pk		-19.9	54.97	-	-	74	-19.03	42	121	H
2	* 2487.923	43.59	Pk		-19.9	56.19	-	-	74	-17.81	42	121	H
3	* 2483.5	31.69	RMS		-19.9	44.29	54	-9.71	-	-	42	121	H
4	* 2483.552	31.81	RMS		-19.9	44.41	54	-9.59	-	-	42	121	H

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

VERTICAL RESULT



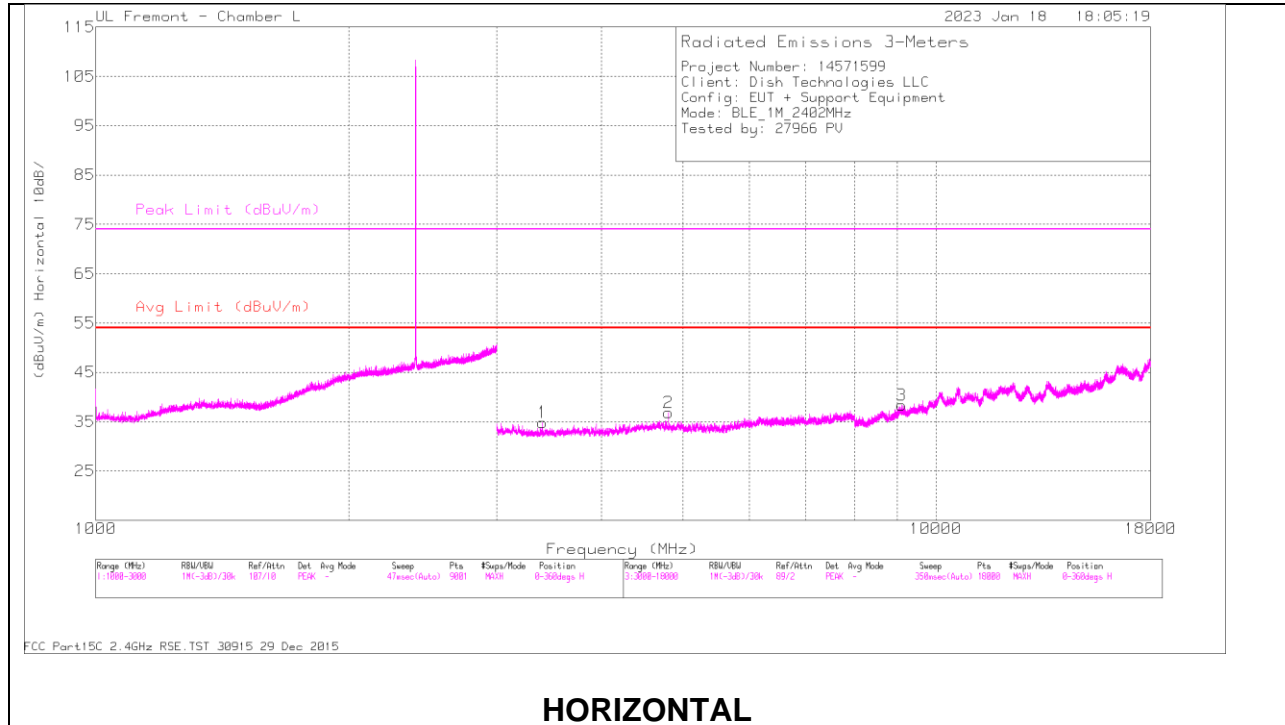
Trace Markers

Range 1: Horizontal - Pk 2460 - 2563MHz													
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Horn 1mH (dB) 206806	Amp/Gbl/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	* 2483.5	39.26	Pk	32.5	-19.9	51.86	-	-	74	-22.14	36	351	V
2	* 2491.471	41.04	Pk	32.5	-19.9	53.64	-	-	74	-20.36	36	351	V
3	* 2483.5	28.48	RMS	32.5	-19.9	41.08	54	-12.92	-	-	36	351	V
4	2533.814	29.07	RMS	32.5	-19.9	41.67	54	-12.33	-	-	36	351	V

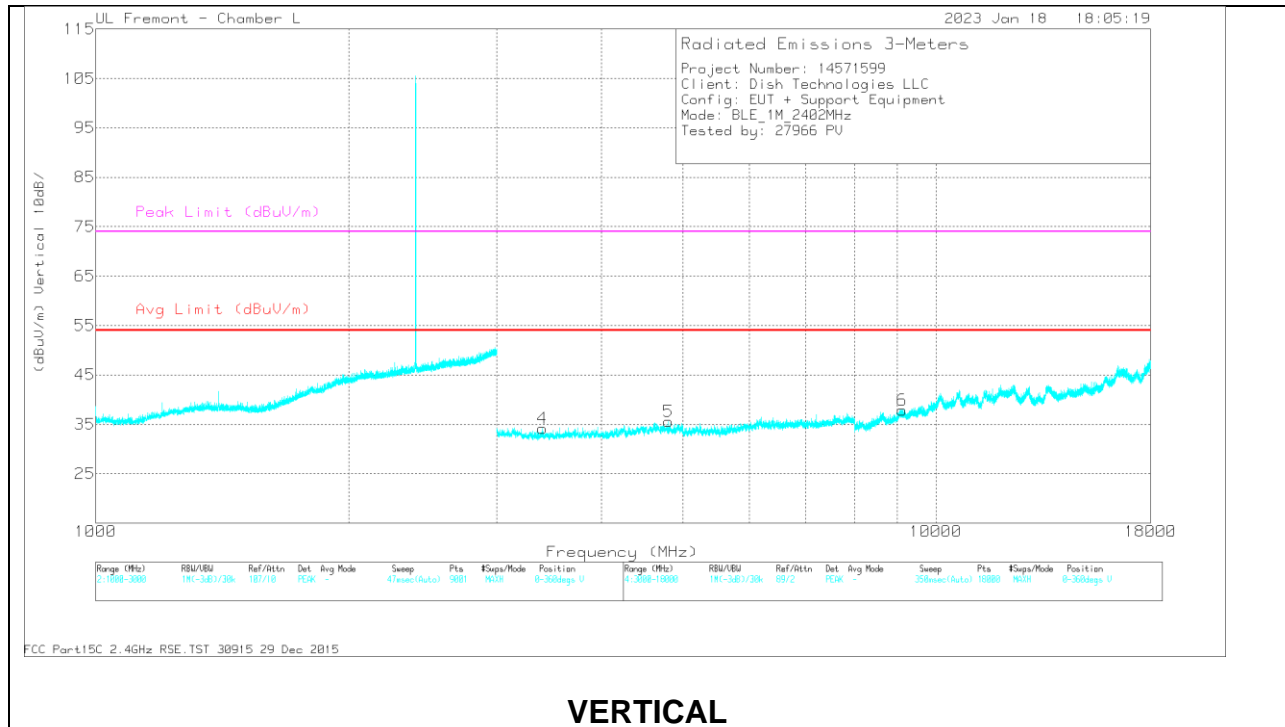
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



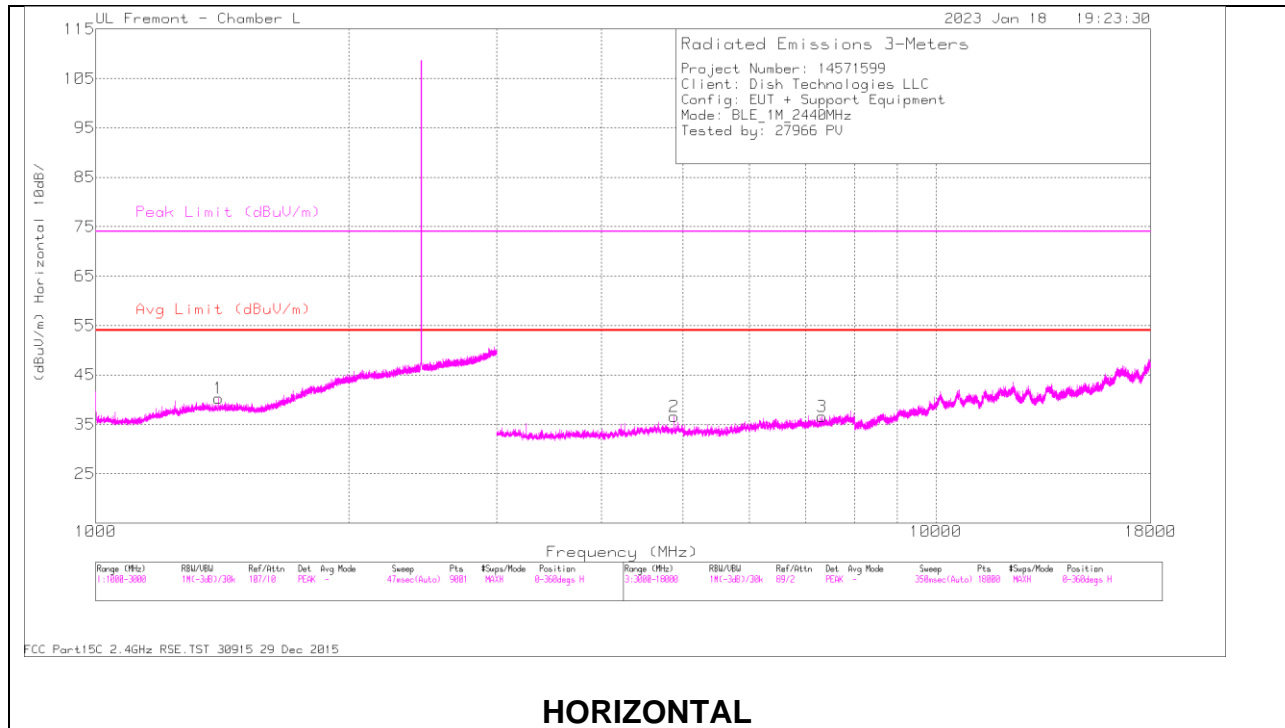
VERTICAL

RADIATED EMISSIONS

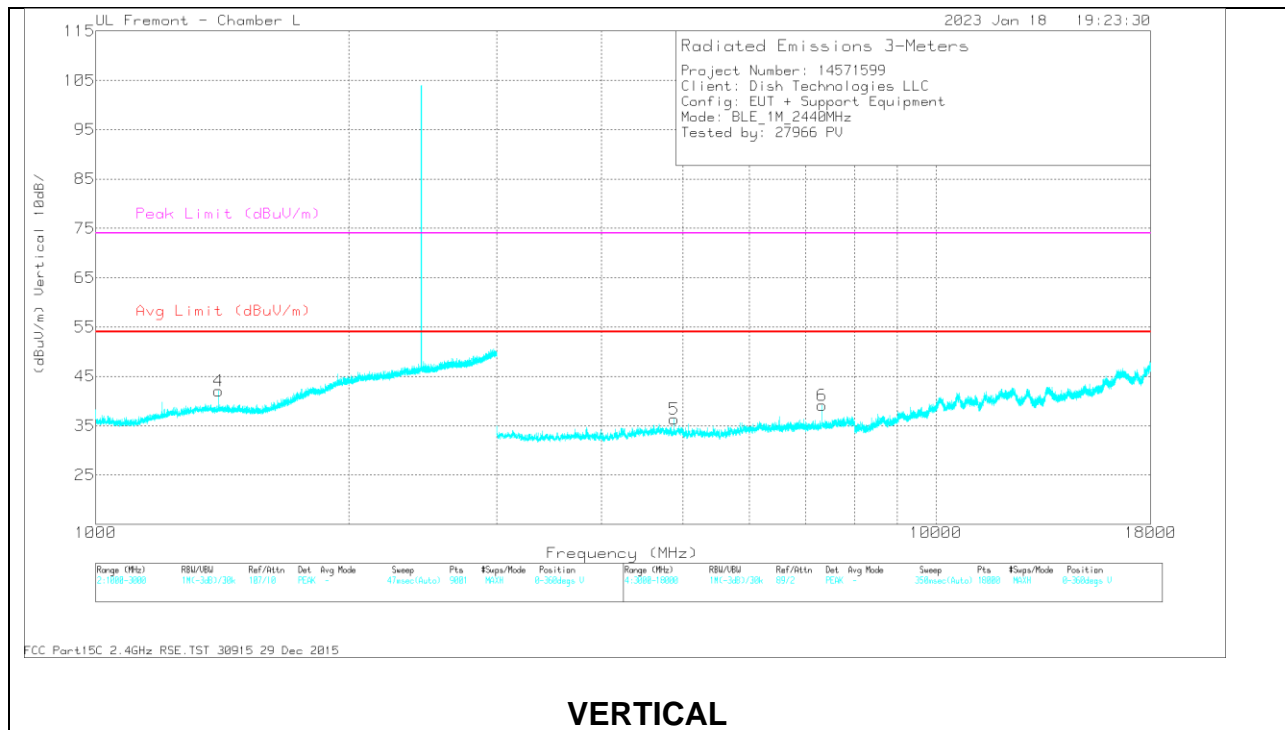
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF(dB) 1mH	Amp/Cbl/Filtr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3399.994	39.24	PK2	33.2	-27.8	44.64	-	-	-	-	117	101	H
	3399.889	29.11	MAv1	33.2	-27.8	34.51	-	-	-	-	117	101	H
2	* 4803.627	39.07	PK2	34.5	-26.5	47.07	-	-	74	-26.93	1	146	H
	* 4803.782	28.34	MAv1	34.5	-26.5	36.34	54	-17.66	-	-	1	146	H
3	* 9097.072	30.97	PK2	36.5	-19.5	47.97	-	-	74	-26.03	346	149	H
	* 9098.06	19.35	MAv1	36.5	-19.5	36.35	54	-17.65	-	-	346	149	H
4	3399.538	38.45	PK2	33.2	-27.8	43.85	-	-	-	-	122	252	V
	3399.876	28.15	MAv1	33.2	-27.8	33.55	-	-	-	-	122	252	V
5	* 4803.651	38.06	PK2	34.5	-26.5	46.06	-	-	74	-27.94	157	105	V
	* 4803.887	28.05	MAv1	34.5	-26.5	36.05	54	-17.95	-	-	157	105	V
6	* 9117.645	30.65	PK2	36.5	-19.3	47.85	-	-	74	-26.15	151	244	V
	* 9118.328	18.85	MAv1	36.5	-19.3	36.05	54	-17.95	-	-	151	244	V

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

MID CHANNEL RESULTS



HORIZONTAL



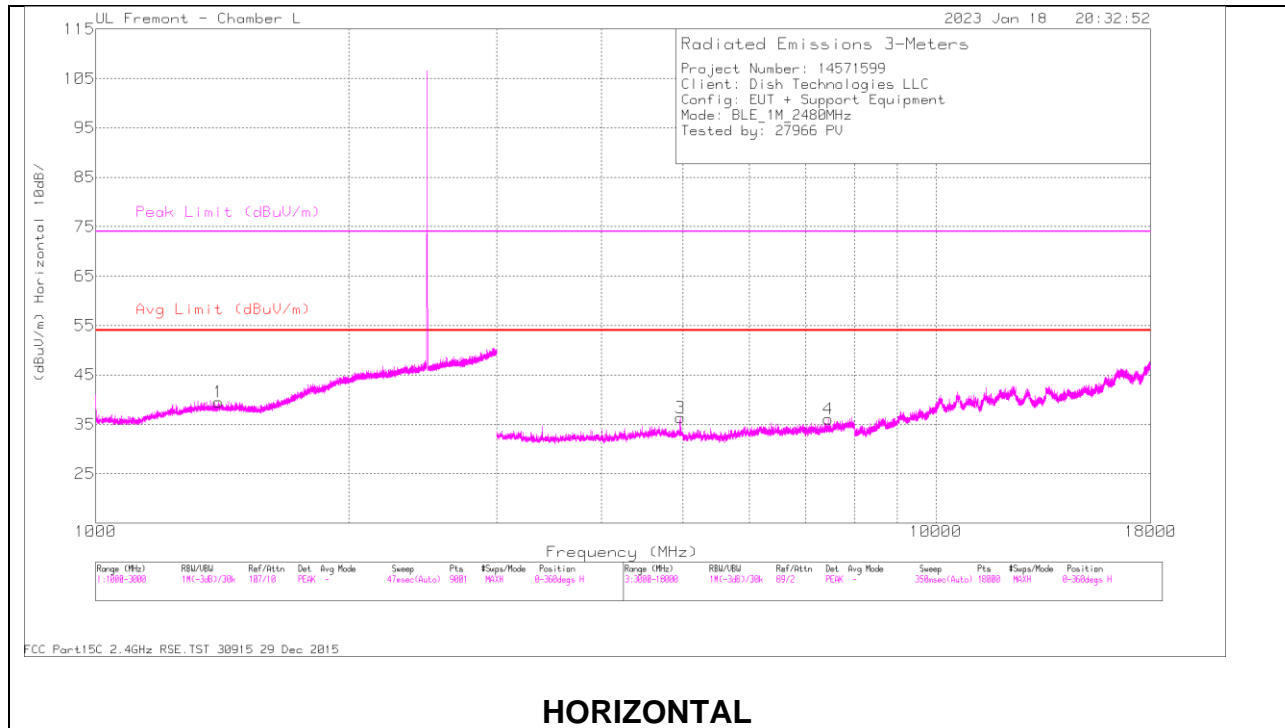
VERTICAL

RADIATED EMISSIONS

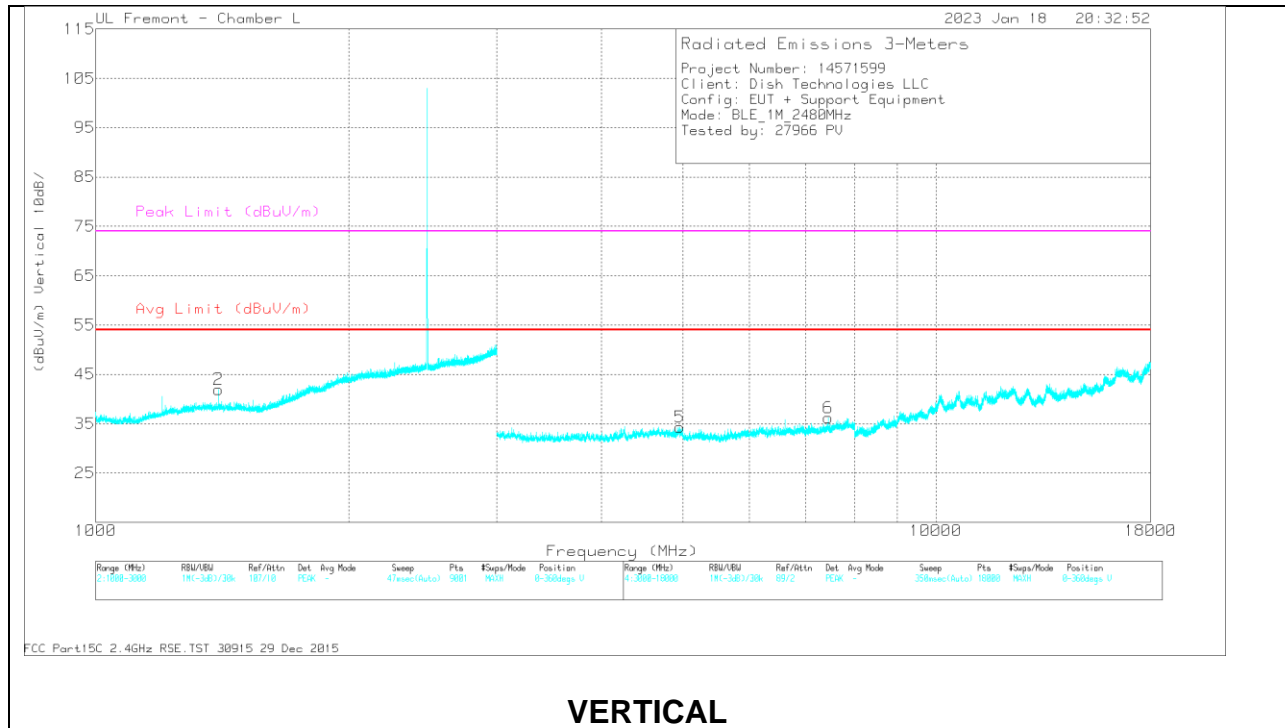
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF(dB) 1mH	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1400.279	36.73	PK2	28.9	-16.1	49.53	-	-	74	-24.47	108	358	H
	* 1399.977	25.33	MAv1	28.9	-16.1	38.13	54	-15.87	-	-	108	358	H
2	* 4879.66	36.69	PK2	34.4	-26.4	44.69	-	-	74	-29.31	360	105	H
	* 4879.877	26.17	MAv1	34.4	-26.4	34.17	54	-19.83	-	-	360	105	H
3	* 7320.699	33.68	PK2	35.9	-22.8	46.78	-	-	74	-27.22	100	117	H
	* 7319.148	22.74	MAv1	35.9	-22.7	35.94	54	-18.06	-	-	100	117	H
4	* 1399.995	37.01	PK2	28.9	-16.1	49.81	-	-	74	-24.19	121	274	V
	* 1399.887	26.41	MAv1	28.9	-16.1	39.21	54	-14.79	-	-	121	274	V
5	* 4879.695	38.07	PK2	34.4	-26.4	46.07	-	-	74	-27.93	103	127	V
	* 4880.162	27.88	MAv1	34.4	-26.4	35.88	54	-18.12	-	-	103	127	V
6	* 7319.283	36.68	PK2	35.9	-22.7	49.88	-	-	74	-24.12	125	112	V
	* 7320.508	25.94	MAv1	35.9	-22.8	39.04	54	-14.96	-	-	125	112	V

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

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF(dB) 1mH	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	* 1399.968	36.5	PK2	28.9	-16.1	49.3	-	-	74	-24.7	333	393	H
	* 1399.926	25.54	MAv1	28.9	-16.1	38.34	54	-15.66	-	-	333	393	H
2	* 1401.443	36.84	PK2	28.9	-16.1	49.64	-	-	74	-24.36	26	127	V
	* 1399.862	26.02	MAv1	28.9	-16.1	38.82	54	-15.18	-	-	26	127	V
3	* 4959.282	37.57	PK2	34.4	-25.4	46.57	-	-	74	-27.43	1	103	H
	* 4959.99	27.43	MAv1	34.4	-25.4	36.43	54	-17.57	-	-	1	103	H
4	* 7439.068	34.33	PK2	36	-22.5	47.83	-	-	74	-26.17	104	106	H
	* 7440.64	23.88	MAv1	36	-22.5	37.38	54	-16.62	-	-	104	106	H
5	* 7440.226	34.67	PK2	36	-22.5	48.17	-	-	74	-25.83	129	185	V
	* 7439.289	24.1	MAv1	36	-22.5	37.6	54	-16.4	-	-	129	185	V
6	* 4956.806	34.97	PK2	34.4	-25.3	44.07	-	-	74	-29.93	5	222	V
	* 4959.668	23.17	MAv1	34.4	-25.4	32.17	54	-21.83	-	-	5	222	V

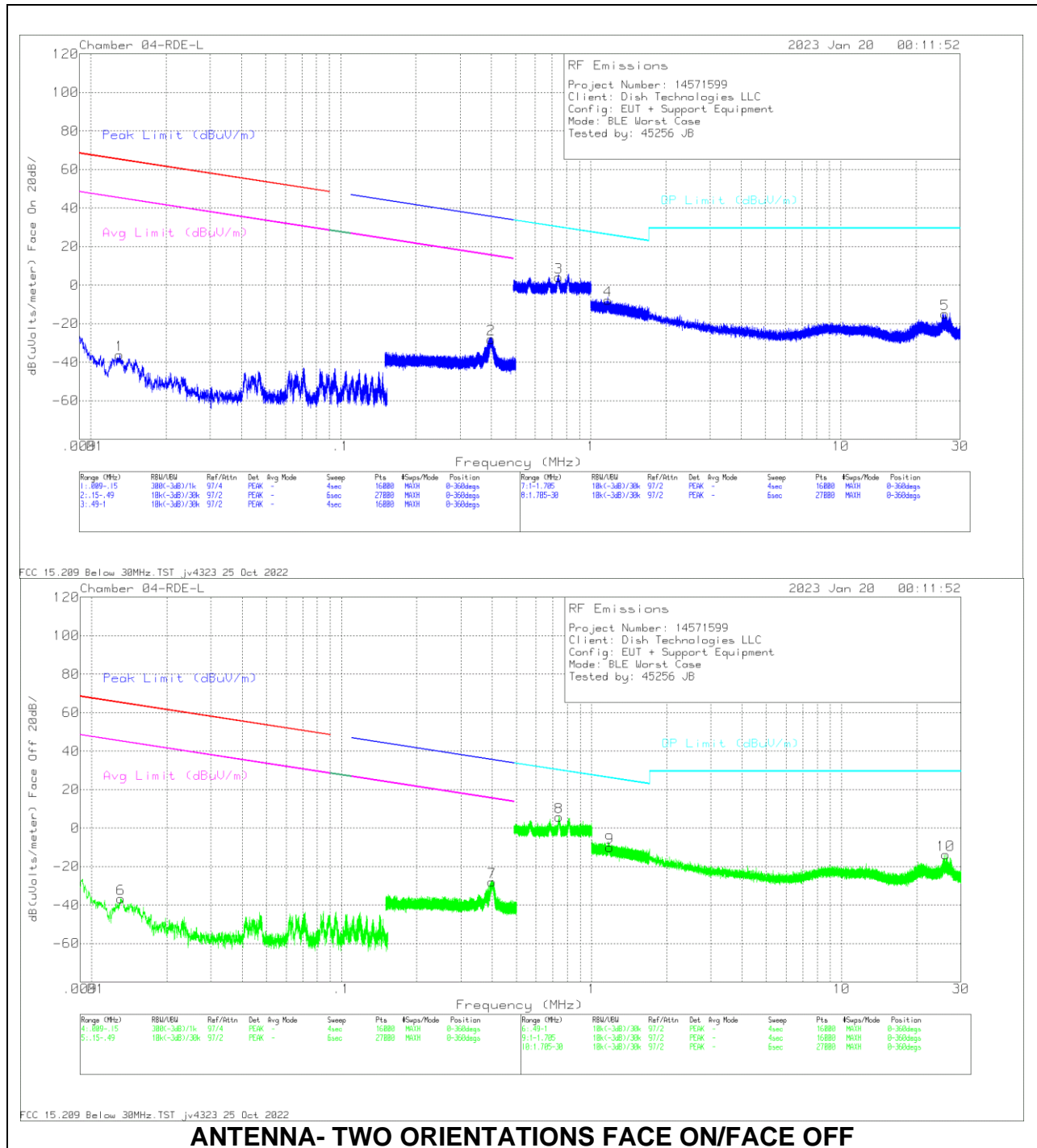
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

10.3. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



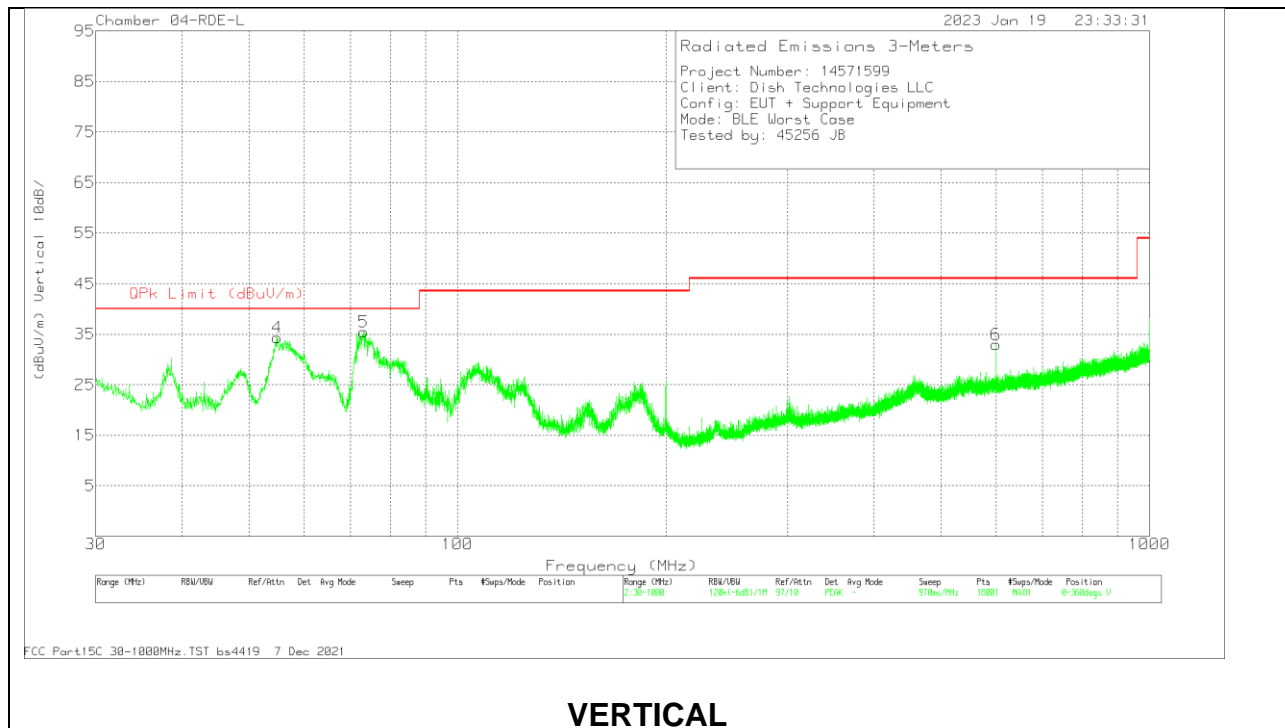
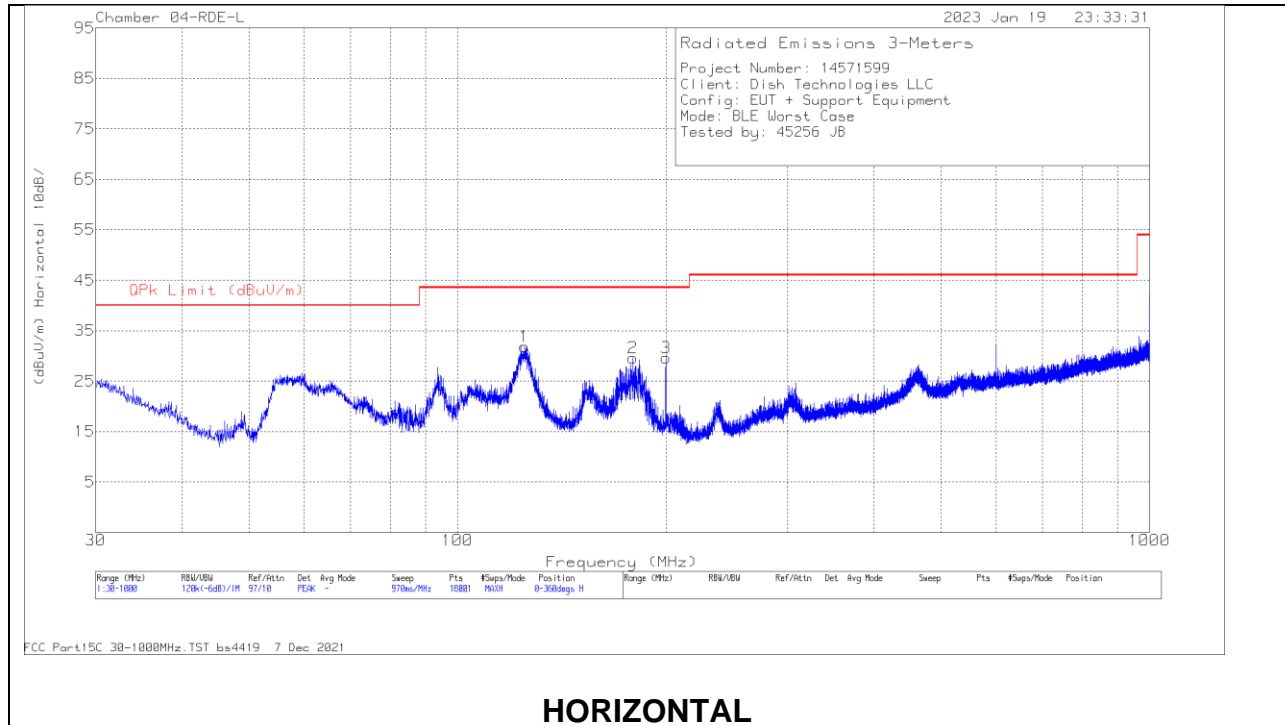
Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (IACP)	Amp/Cbl (dB)	Dist Corr 300m (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.0131	13.79	Pk	59.9	-29.7	-80	-36.01	65.27	-101.28	45.27	-81.28	-	-	-	-	-	-	0-360
2	.3995	27.8	Pk	56.1	-32	-80	-28.1	-	-	-	-	-	-	35.58	-63.68	15.58	-43.68	0-360
3	.744	19.82	Pk	56.2	-31.9	-40	4.12	-	-	-	-	30.18	-26.06	-	-	-	-	0-360
6	.0131	13.05	Pk	59.9	-29.7	-80	-36.75	65.25	-102	45.25	-82	-	-	-	-	-	-	0-360
7	.3996	27.83	Pk	56.1	-32	-80	-27.97	-	-	-	-	-	-	35.57	-63.54	15.57	-43.54	0-360
8	.7404	21.37	Pk	56.2	-31.9	-40	5.67	-	-	-	-	30.22	-24.55	-	-	-	-	0-360
4	1.1702	17.97	Pk	46	-31.9	-40	-7.93	-	-	-	-	26.26	-34.19	-	-	-	-	0-360
5	26.0888	23.2	Pk	33.2	-31.3	-40	-14.9	-	-	-	-	29.5	-44.4	-	-	-	-	0-360
9	1.1817	15.88	Pk	46	-31.9	-40	-10.02	-	-	-	-	26.18	-36.2	-	-	-	-	0-360
10	26.0878	24.3	Pk	33.2	-31.3	-40	-13.8	-	-	-	-	29.5	-43.3	-	-	-	-	0-360

Pk = Peak detector

10.4. WORST CASE BELOW 1 GHZ

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



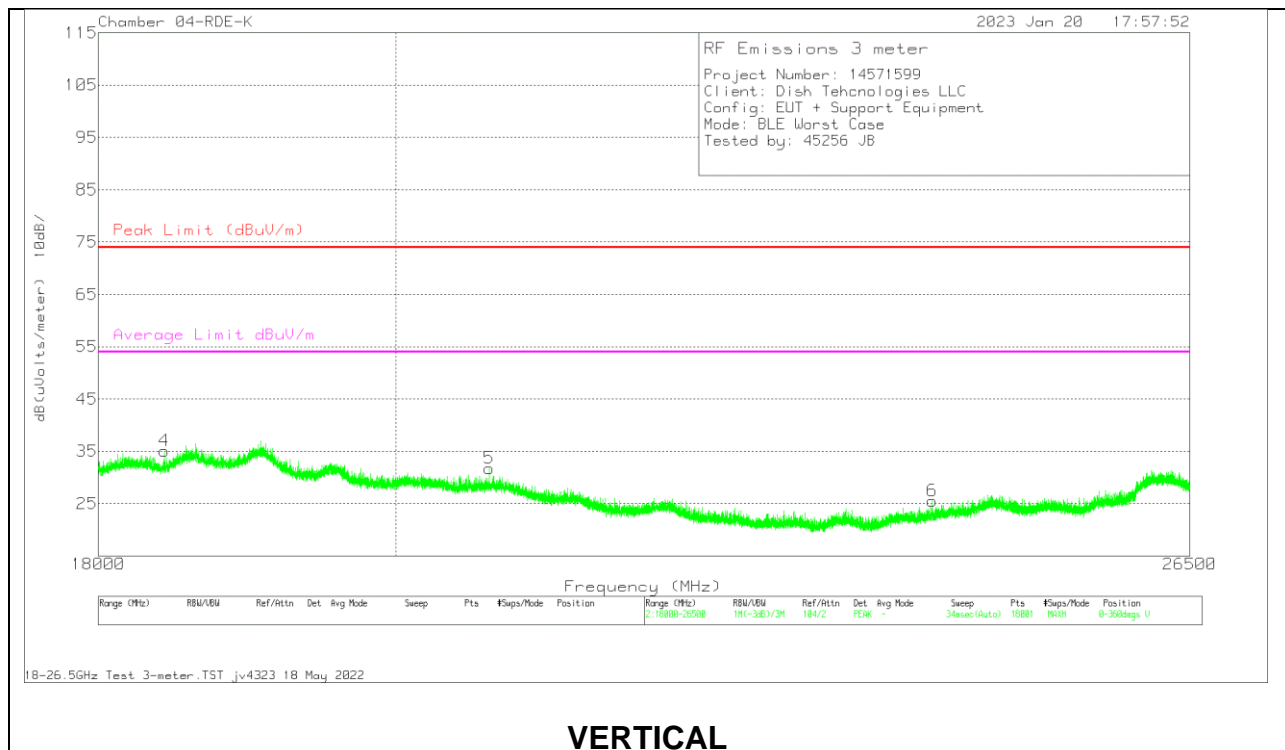
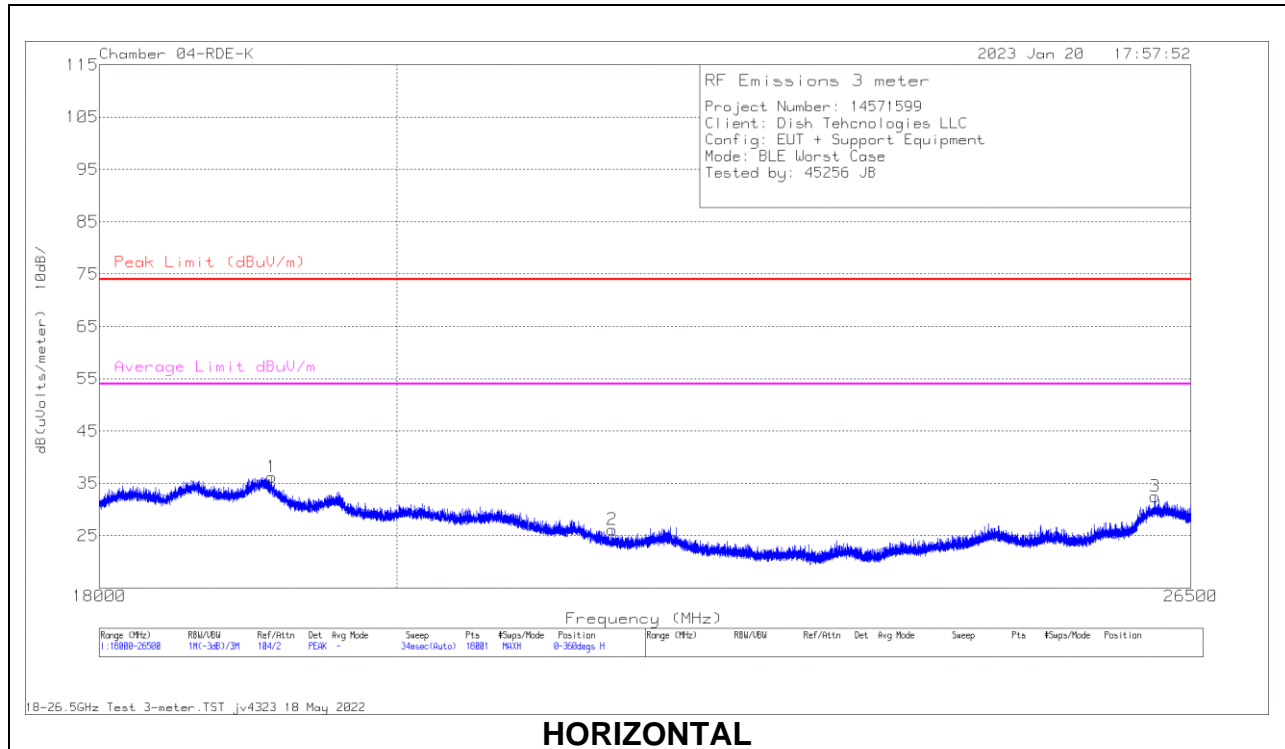
Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	80293 ACF (dB)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	125.114	42.01	Pk	20.3	-30.5	31.81	43.52	-11.71	0-360	199	H
2	179.219	42.03	Pk	17.8	-30.2	29.63	43.52	-13.89	0-360	101	H
3	199.966	40.42	Pk	19.3	-30.1	29.62	43.52	-13.9	0-360	101	H
4	54.8428	51.89	Pk	13.5	-31.1	34.29	40	-5.71	0-360	101	V
	55.0006	48.28	Qp	13.5	-31.1	30.68	40	-9.32	17	142	V
5	73.1112	52.03	Pk	14.3	-30.9	35.43	40	-4.57	0-360	101	V
	73.2342	49.78	Qp	14.3	-30.9	33.18	40	-6.82	115	109	V
6	599.984	35.93	Pk	25.2	-28.2	32.93	46.02	-13.09	0-360	101	V

Pk - Peak detector
 Qp - Quasi-Peak detector

10.5. WORST CASE 18-26 GHZ

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



18 – 26GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	172364 AF (dB)	215705 amp/cbl (dB)	Cables (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Average Limit dBuV/m	Margin (dB)
1	* 19135.222	46.15	Pk	32.7	-60.8	18.1	36.15	74	-37.85	54	-17.85
2	21589.832	33.92	Pk	33.4	-60.3	19.1	26.12	74	-47.88	54	-27.88
3	26168.024	37.33	Pk	34.7	-60.8	21.2	32.43	74	-41.57	54	-21.57
4	* 18424.528	45.41	Pk	32.6	-60.7	17.8	35.11	74	-38.89	54	-18.89
5	* 20673.249	39.24	Pk	33.2	-59.5	18.8	31.74	74	-42.26	54	-22.26
6	24189.886	32.35	Pk	34.1	-61.2	20.3	25.55	74	-48.45	54	-28.45

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

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	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

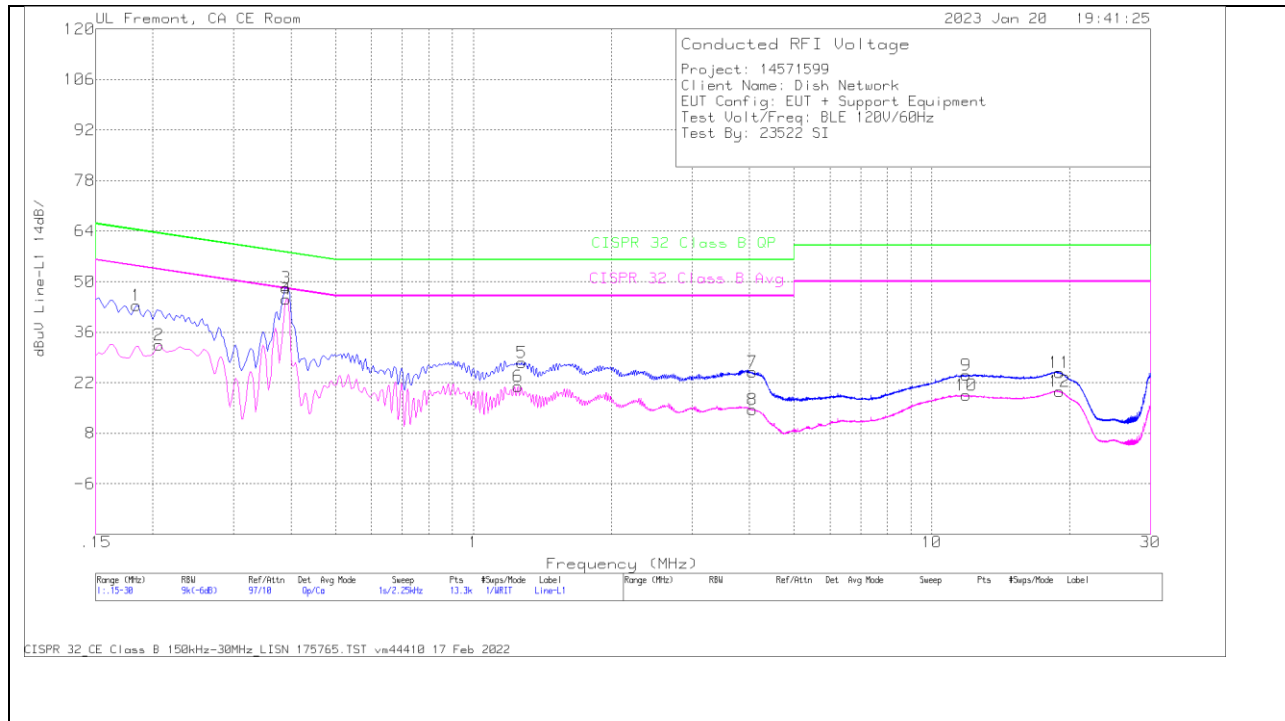
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

LINE 1 RESULTS



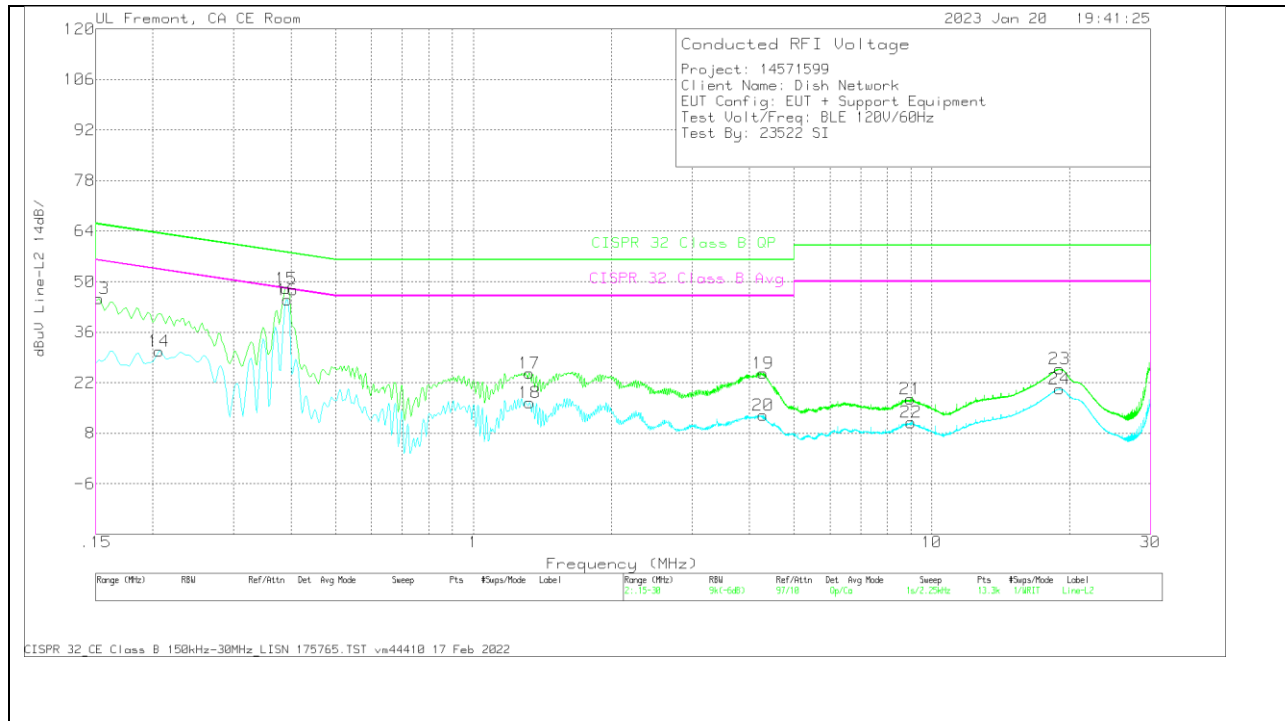
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	175765 LISN L1	C1&C3 cable path loss	207996 Limiter with short cabl	Corrected Reading dBuV	CISPR 32 Class B QP	Margin (dB)	CISPR 32 Class B Avg	Margin (dB)
2	.2063	23.03	Ca	0	0	9.4	32.43	-	-	53.35	-20.92
4	.3908	35.81	Ca	0	.1	9.3	45.21	-	-	48.05	-2.84
6	1.2525	11.62	Ca	0	.1	9.3	21.02	-	-	46	-24.98
8	4.0673	5.13	Ca	0	.1	9.3	14.53	-	-	46	-31.47
10	11.8928	8.86	Ca	.1	.2	9.3	18.46	-	-	50	-31.54
12	18.9983	9.88	Ca	.1	.3	9.3	19.58	-	-	50	-30.42
1	.1838	33.9	Qp	.1	0	9.4	43.4	64.31	-20.91	-	-
3	.3908	38.9	Qp	0	.1	9.3	48.3	58.05	-9.75	-	-
5	1.275	18.2	Qp	0	.1	9.3	27.6	56	-28.4	-	-
7	4.065	15.53	Qp	0	.1	9.3	24.93	56	-31.07	-	-
9	11.8928	14.47	Qp	.1	.2	9.3	24.07	60	-35.93	-	-
11	18.9758	15.11	Qp	.1	.3	9.3	24.81	60	-35.19	-	-

Qp - Quasi-Peak detector

Ca - CISPR average detection

NOTE: CISPR 32 limit is the same as FCC15.207

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	175765 LISN L2	C2&C3 cable path loss	207996 Limiter with short cabl	Corrected Reading dBuV	CISPR 32 Class B QP	Margin (dB)	CISPR 32 Class B Avg	Margin (dB)
14	.2063	21.27	Ca	0	0	9.4	30.67	-	-	53.35	-22.68
16	.393	35.57	Ca	0	.1	9.3	44.97	-	-	48	-3.03
18	1.3268	7.1	Ca	0	.1	9.3	16.5	-	-	46	-29.5
20	4.2833	3.61	Ca	0	.1	9.3	13.01	-	-	46	-32.99
22	9.0083	1.48	Ca	0	.2	9.3	10.98	-	-	50	-39.02
24	18.9769	10.52	Ca	.1	.3	9.3	20.22	-	-	50	-29.78
13	.1523	35.77	Qp	.1	0	9.4	45.27	65.88	-20.61	-	-
15	.3908	38.66	Qp	0	.1	9.3	48.06	58.05	-9.99	-	-
17	1.3245	15.24	Qp	0	.1	9.3	24.64	56	-31.36	-	-
19	4.2833	15.23	Qp	0	.1	9.3	24.63	56	-31.37	-	-
21	8.9745	8.03	Qp	0	.2	9.3	17.53	60	-42.47	-	-
23	18.9758	16.13	Qp	.1	.3	9.3	25.83	60	-34.17	-	-

Qp - Quasi-Peak detector

Ca - CISPR average detection

NOTE: CISPR 32 limit is the same as FCC15.207