TEST REPORT

Report Number.: 14441108-E1V1

Applicant	:	DISH TECHNOLOGIES LLC 90 INVERNESS CIRCLE EAST ENGLEWOOD, CO 80112, UNITED STATES
Model	:	D35
Brand	:	DISH
FCC ID	:	DKNP27TJ
EUT Description	:	TV SET TOP BOX CLIENT
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date of Issue:
2022-09-27

Prepared by:
UL VERIFICATION SERVICES INC.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

ACCREDITED
CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2022-09-27	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: TV SET TOP BOX CLIENT

MODEL: D35

BRAND: DISH

SERIAL NUMBER: CONDUCTED: E4EXVJ03001G
RADIATED: E4EXVH00558D

SAMPLE RECEIPT DATE: 2022-09-08

DATE TESTED: 2022-09-09 TO 2022-09-19

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. 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.

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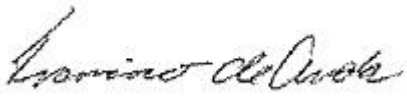
Approved & Released For
UL Verification Services Inc. By:



Francisco de Anda
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Consumer Technology Division
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Prepared By:

Gerardo Abrego
Senior Test Engineer
Consumer Technology Division
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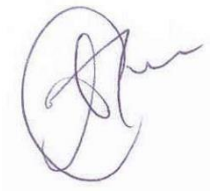
Reviewed By:



Tina Chu
Senior Project Engineer
Consumer Technology Division
UL Verification Services Inc.

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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)

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
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
☐	Building 1: 47173 Benicia Street, Fremont, CA 94538	US0104	2324A	550739
☐	Building 2: 47266 Benicia Street, Fremont, CA 94538	US0104	22541	550739
☒	Building 4: 47658 Kato Rd, Fremont, CA 94538	US0104	2324B	550739

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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}
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

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

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a TV Set Top Box Client with RF4CE Zigbee, BLE (2Mbps), 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)
2425-2475	RF4CE Zigbee	11.82	15.21

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes a PCB Inverted F antenna, with a maximum gain of 4.1 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was TL8656_V0008.

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.

This EUT supports BLE/BT + Zigbee simultaneous transmission, radiated emission test was performed.

Data rate provided by manufacturer: 250kbps, O-QPSK modulation.

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID/ DoC**
AC/DC Adapter(EUT)	NetBit	NBC25A120210VU	222109	DoC
Router	D-Link	EBR-2310	F311388010596	DoC
Router Adapter	D-Link	AF0605	LF4R07082717180	DoC
TV Emulator	DISH	TV Emulator	D52-12	
Laptop: Radiated colocation test	HP	Elitebook 740	N/A	DoC
AC/DC Adapter(Laptop): Radiated colocation test	HP	HSTNN-DA40	N/A	DoC
USB Flash Drive	Sandisk	Cruzer Glide 16GB	SDCZ60-016G	DoC

I/O CABLES (CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	Barrel	Un-shielded	1.5	EUT to AC/DC adapter Mains
2	Antenna	1	RF	Un-shielded	0.2	To spectrum analyzer

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	1.5	EUT to AC/DC adapter Mains
2	HDMI	1	HDMI	shielded	2.5	EUT to Emulator
3	RJ45	1	RJ45	Un-shielded	More than 3	EUT to Ethernet Router
4	Coaxial RF	1	Coaxial RF	shielded	1	75 ohm load terminated BNC port on coaxial cable
5	DC	1	Barrel	Un-shielded	1.8	Ethernet router to AC/DC Adapter

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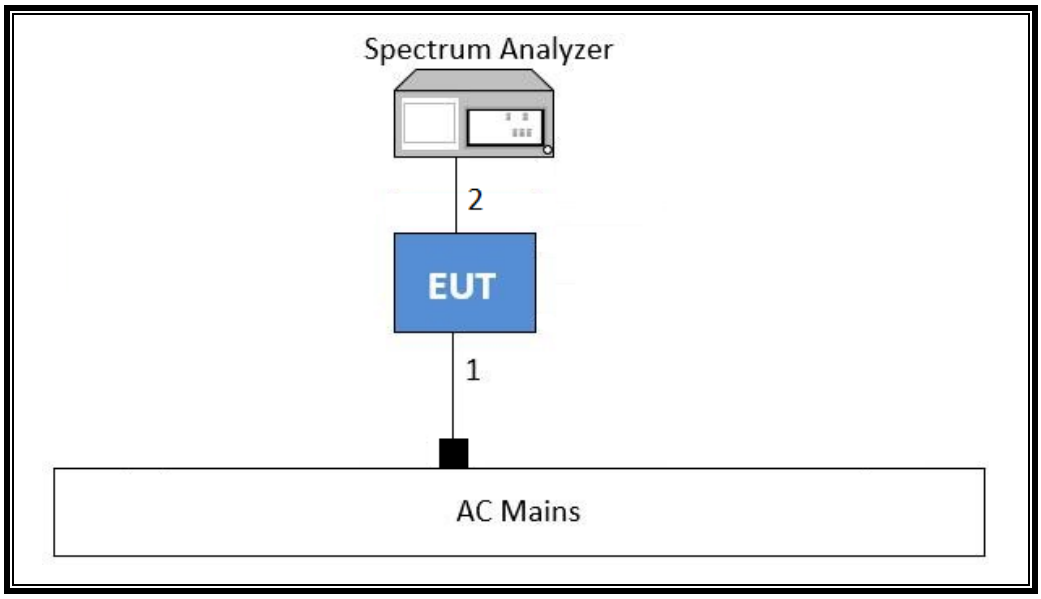
CONDUCTED TEST SETUP DIAGRAM



TEST SETUP

The EUT is connected to support equipment and AC powered. Upon power up the EUT, the Zigbee radio is exercised.

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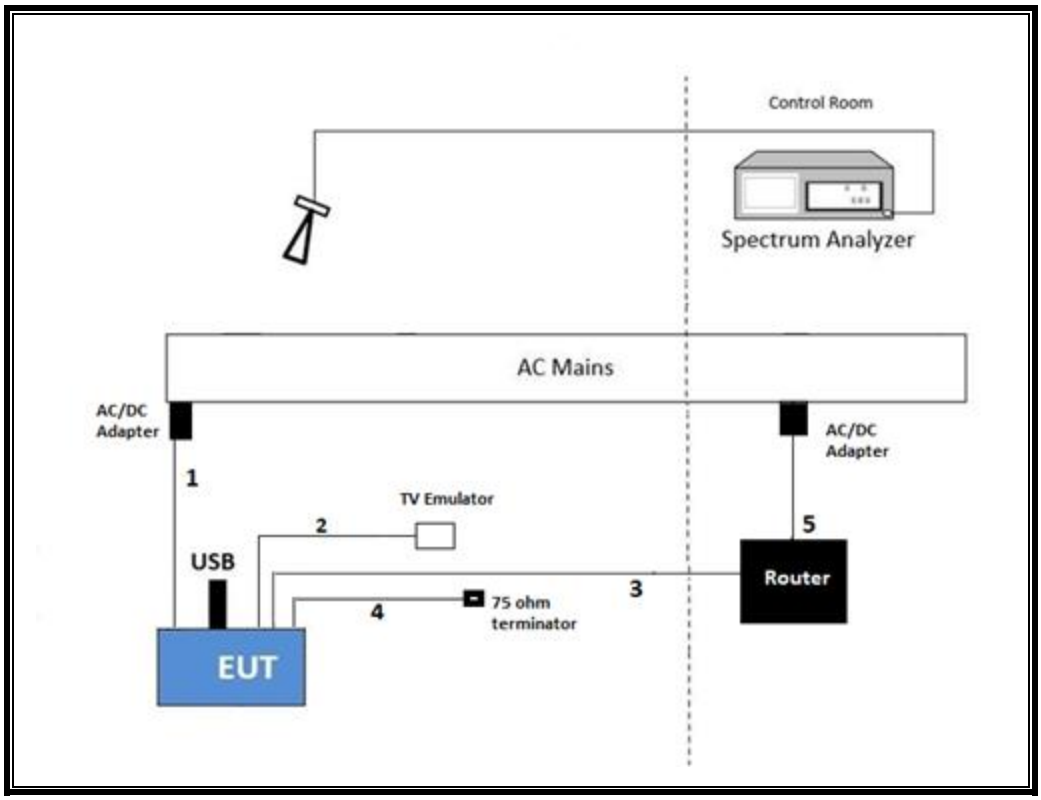
RADIATED TEST/AC POWER LINE EMISSIONS SETUP DIAGRAM



TEST SETUP

The EUT is connected to a test laptop by USB to UART cable adapter, support equipment and powered by AC/DC adapter during the tests. Test software exercised the BT radio card. Laptop was removed during the testing.

Power cycling the EUT to select Zigbee radio mode/channel.

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7. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Section 11.8.1

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

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

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

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

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

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

Band-edge: ANSI C63.10 Section 6.10

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

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

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8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment were 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	219909	2023-05-10	2022-05-10
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO-METRICS	EM-6872	219911	2023-05-10	2022-05-10
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	81138	2022-10-13	2021-10-13
Rf Amplifier, 18-26.5GHz, 60dB gain	AMPLICAL	AMP18G26.5-60	215705	2023-02-26	2022-02-26
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169927	2023-02-16	2022-02-16
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB1	82258	2022-10-01	2021-10-01
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	170648	2023-02-10	2022-02-10
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	80403	2023-06-08	2022-06-08
RF Filter Box, 1-18GHz	UL-FR1	NA	171389	2023-05-31	2022-05-31
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	201497	2023-02-18	2022-02-18
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A	80396	2023-02-01	2022-02-01
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90388	2023-01-24	2022-01-24
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90733	2023-01-24	2022-01-24
AC Line Conducted					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
LISN	Fischer Custom Communications, Inc	FCC-LISN-50/250-25-2-01-480V	175765	2023-01-26	2022-01-26
EMI TEST RECEIVER	Rohde & Schwarz	ESR	93091	2023-02-21	2022-02-21
Transient Limiter	TE	TBFL1	207996	2023-07-15	2022-07-15
Test Software List					
Description	**Manufacturer**	**Model**	**Version**		
Radiated Software	UL	UL EMC	Sept 15 2022, Dec 28 2015, Dec 29 2015, Jul 6 2022, Jul 15, 2014		
Antenna Port Software	UL	UL RF	AP2022.8.16		
AC Line Conducted Software	UL	UL EMC	Feb 17, 2022		

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

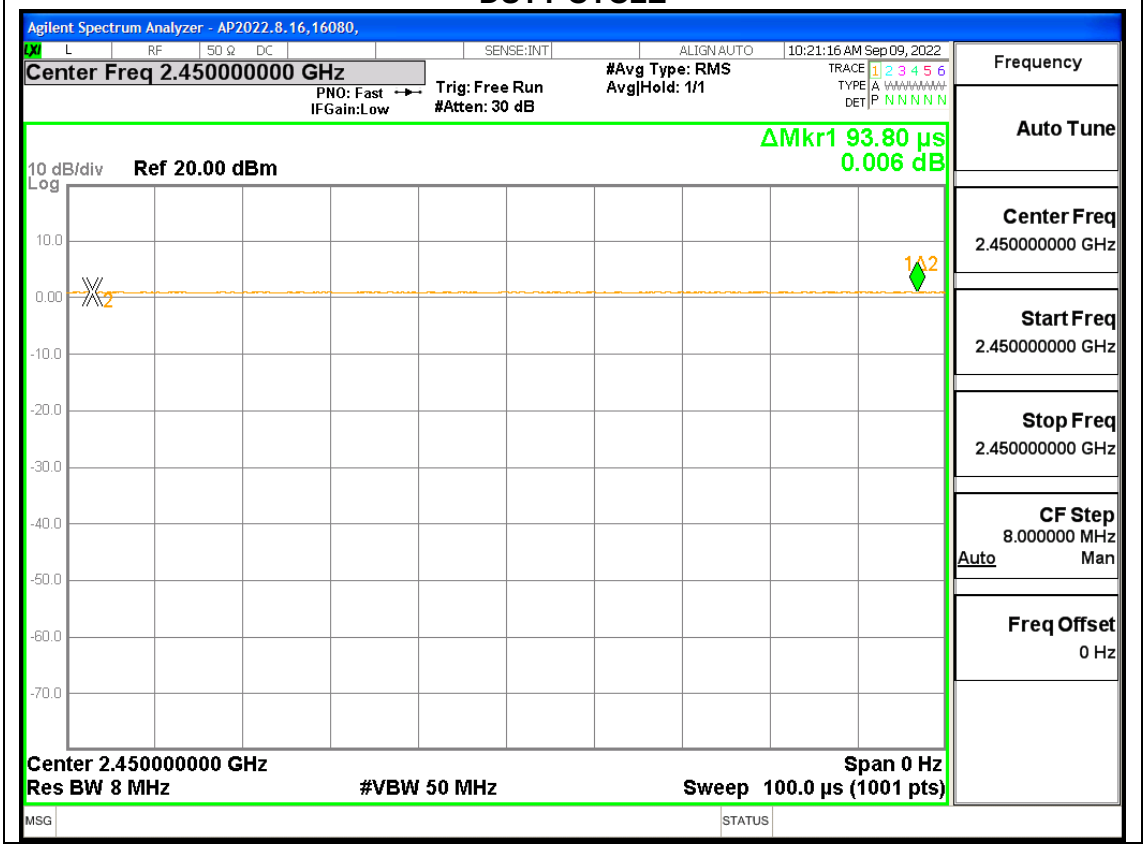
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

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						
ZIGBEE	1.00000	1.00000	1.000	100.00	0.00	0.010

DUTY CYCLE



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9.2. 6 dB BANDWIDTH

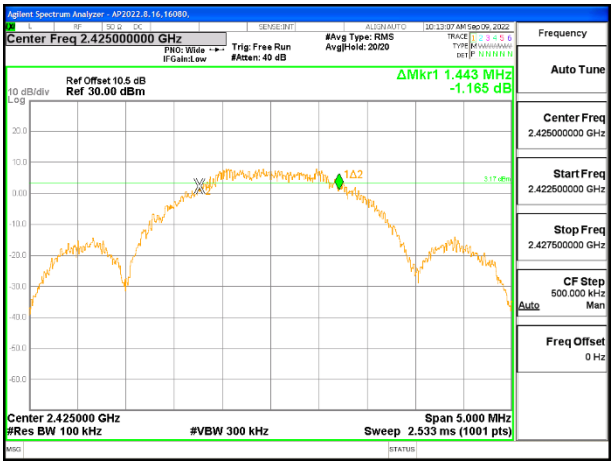
LIMITS

FCC §15.247 (a) (2)

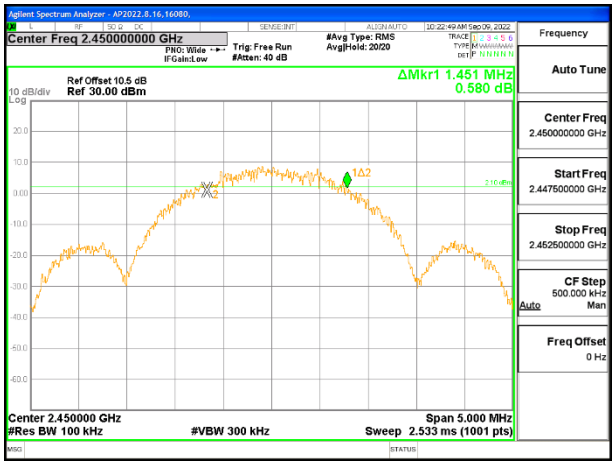
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

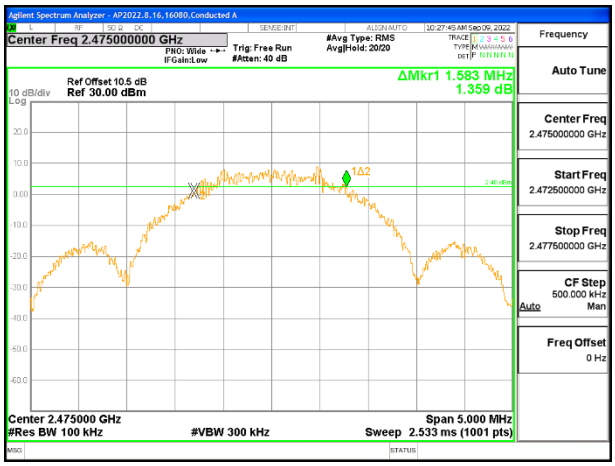
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2425	1.443	0.5
Middle	2450	1.451	0.5
High	2475	1.583	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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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

Tested By:	12485 GA
Date:	2022-09-09

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2425	11.82	30	-18.180
Middle	2450	11.77	30	-18.230
High	2475	11.76	30	-18.240

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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

Tested By:	12485 GA
Date:	2022-09-09

Channel	Frequency (MHz)	AV power (dBm)
Low	2425	11.45
Middle	2450	11.38
High	2475	11.33

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9.5. POWER SPECTRAL DENSITY

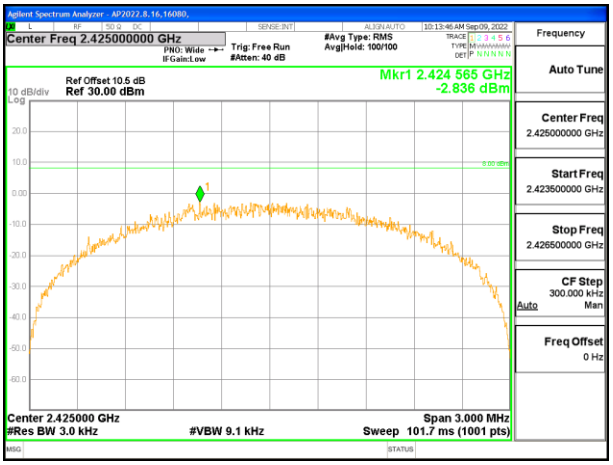
LIMITS

FCC §15.247 (e)

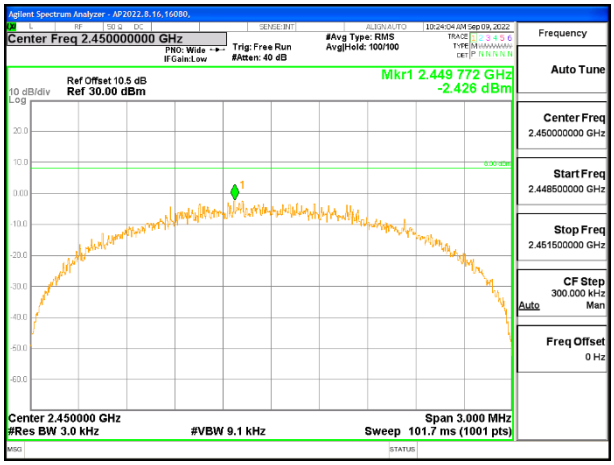
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

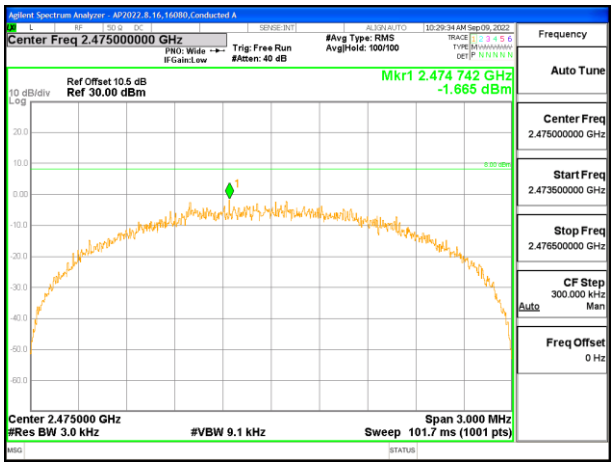
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2425	-2.836	8	-10.836
Middle	2450	-2.426	8	-10.426
High	2475	-1.665	8	-9.665



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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

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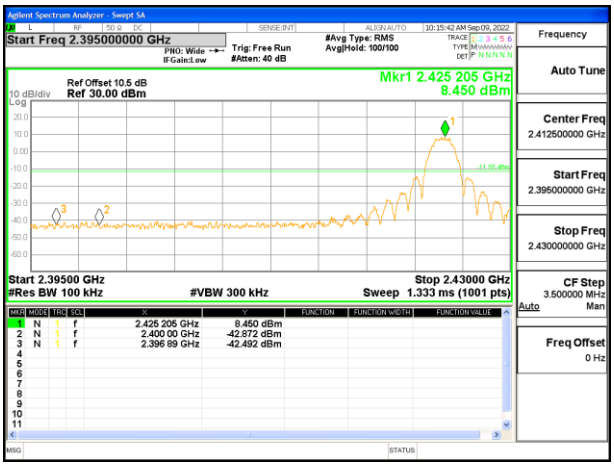
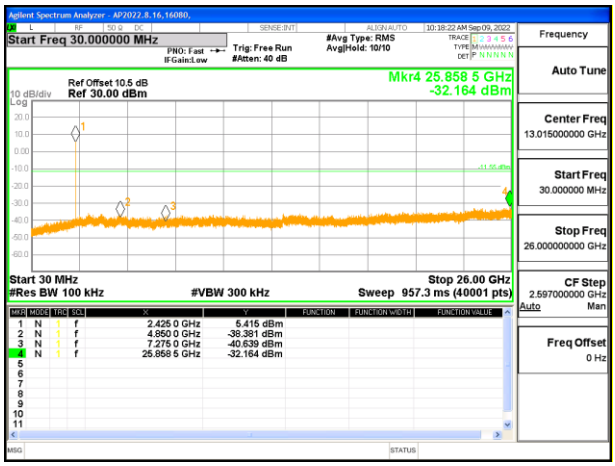
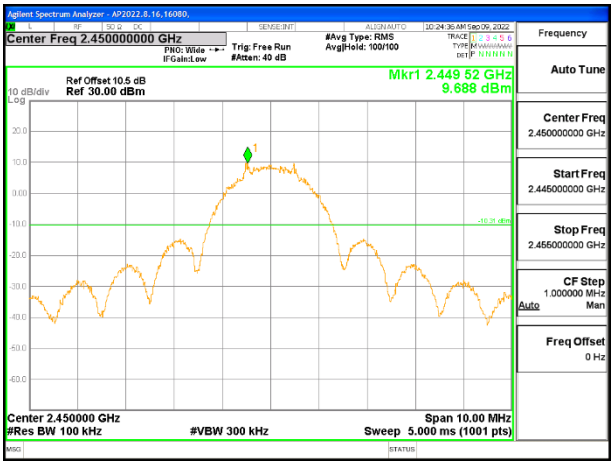


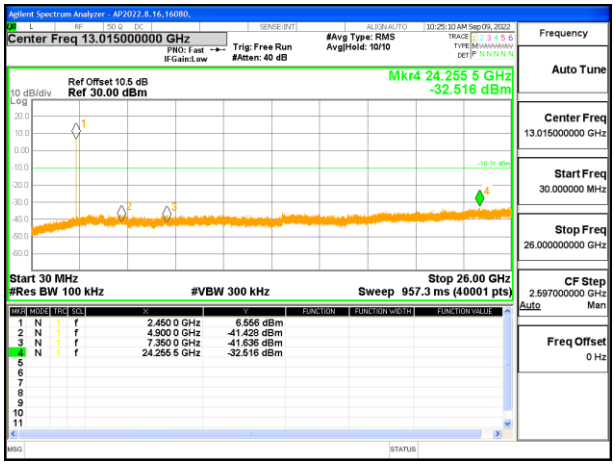
LOW CHANNEL BANDEDGE



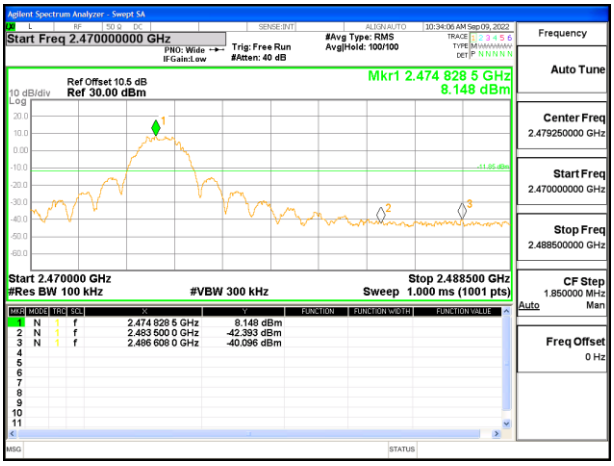
OUT-OF-BAND LOW CHANNEL



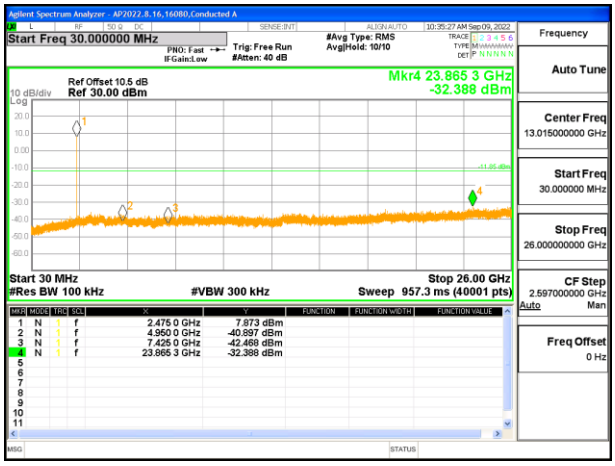
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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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.

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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.

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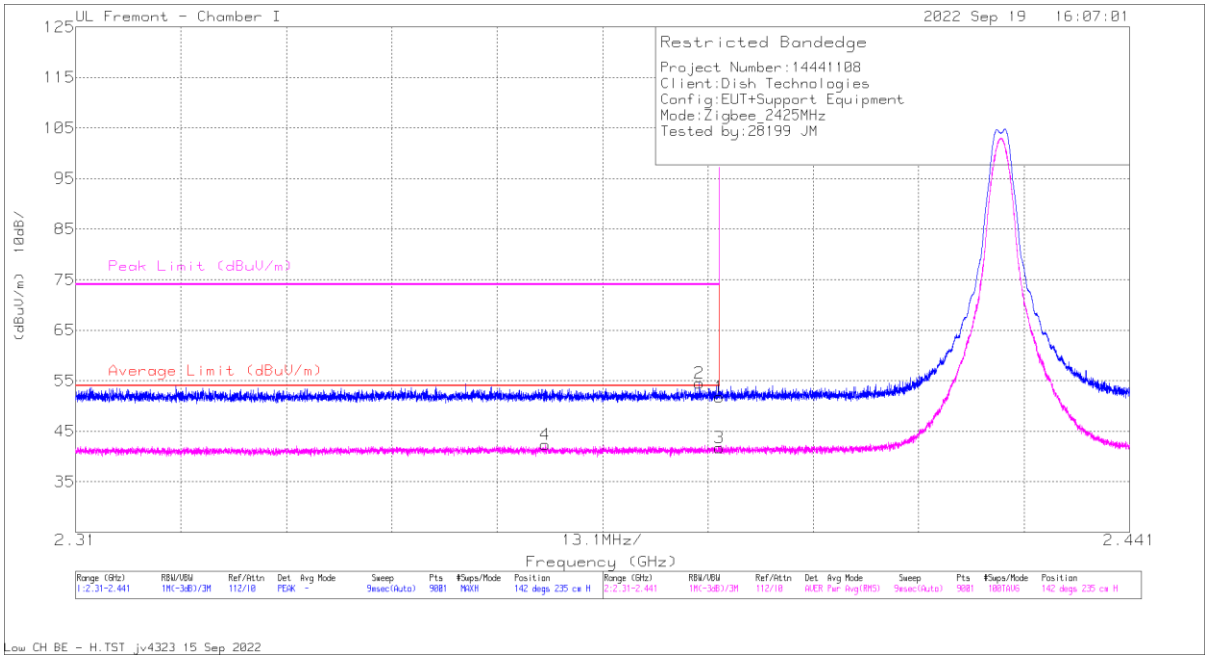
10.2. TRANSMITTER ABOVE 1 GHz

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	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	* 2.39	40.03	Pk	32.3	-20.6	51.73	-	-	74	-22.27	142	235	H
2	* 2.38754	42.88	Pk	32.2	-20.6	54.48	-	-	74	-19.52	142	235	H
3	* 2.39	29.99	RMS	32.3	-20.6	41.69	54	-12.31	-	-	142	235	H
4	* 2.36837	30.66	RMS	32.2	-20.5	42.36	54	-11.64	-	-	142	235	H

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

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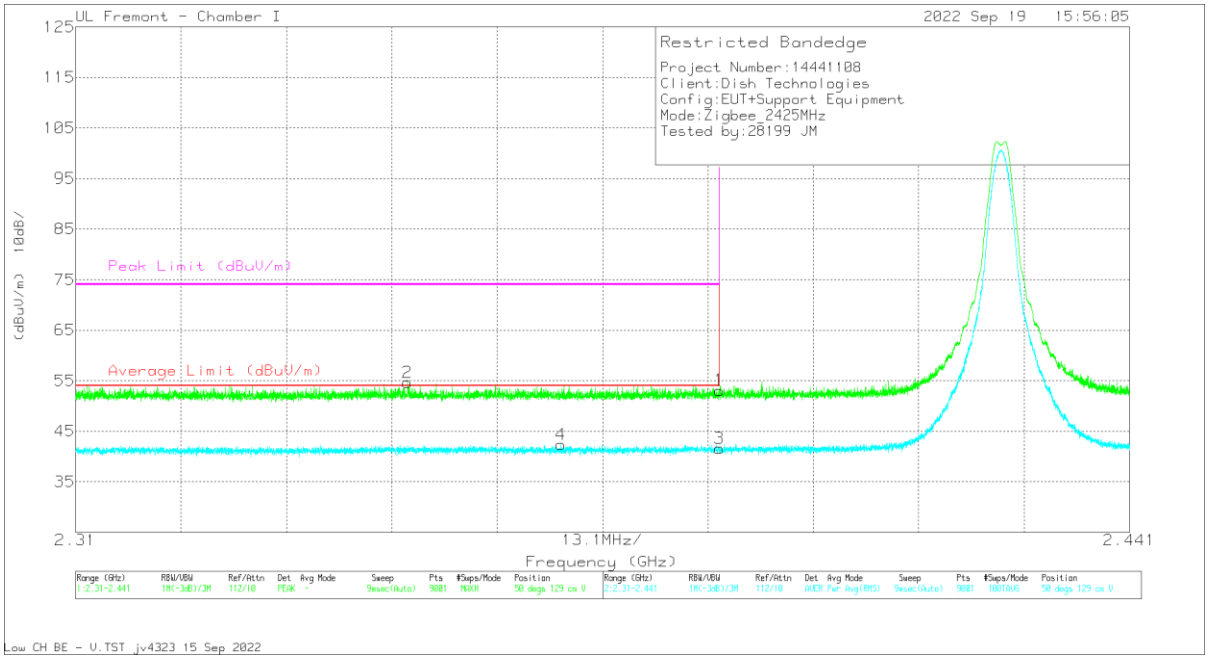
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	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	* 2.39	41.38	Pk	32.3	-20.6	53.08	-	-	74	-20.92	50	129	V
2	* 2.351252	42.82	Pk	32.2	-20.4	54.62	-	-	74	-19.38	50	129	V
3	* 2.39	29.94	RMS	32.3	-20.6	41.64	54	-12.36	-	-	50	129	V
4	* 2.370335	30.78	RMS	32.1	-20.5	42.38	54	-11.62	-	-	50	129	V

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

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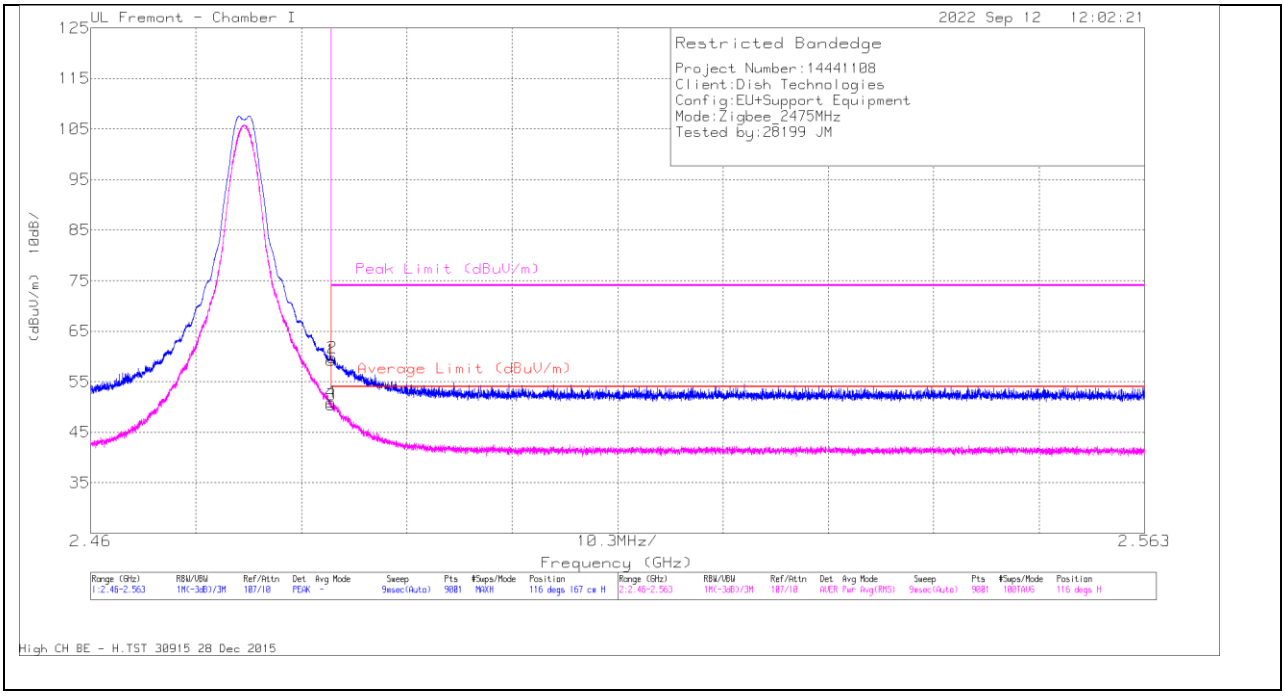
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	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	* 2.4835	47.72	Pk	32.6	-21.1	59.22	-	-	74	-14.78	116	167	H
2	* 2.483643	48.22	Pk	32.6	-21.1	59.72	-	-	74	-14.28	116	167	H
3	* 2.4835	38.95	RMS	32.6	-21.1	50.45	54	-3.55	-	-	116	167	H
4	* 2.483506	39.4	RMS	32.6	-21.1	50.9	54	-3.1	-	-	116	167	H

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

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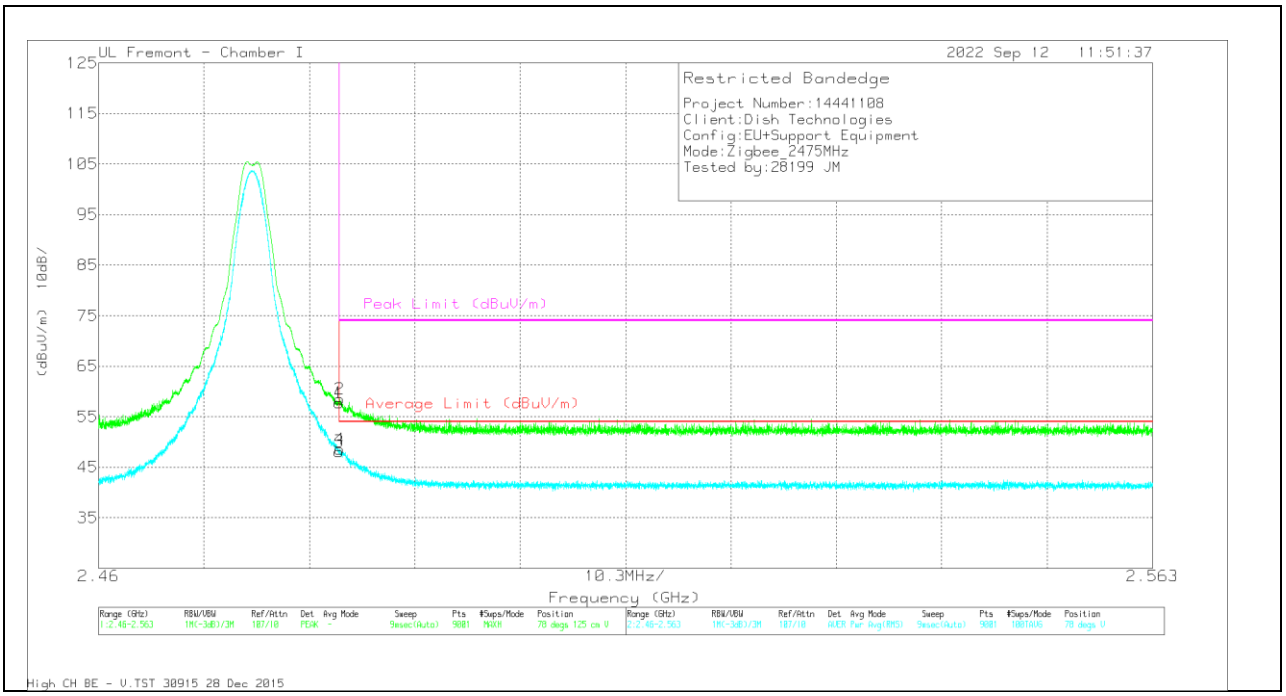
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	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	* 2.4835	46.29	Pk	32.6	-21.1	57.79	-	-	74	-16.21	78	125	V
2	* 2.48354	46.96	Pk	32.6	-21.1	58.46	-	-	74	-15.54	78	125	V
3	* 2.4835	36.62	RMS	32.6	-21.1	48.12	54	-5.88	-	-	78	125	V
4	* 2.483552	37.06	RMS	32.6	-21.1	48.56	54	-5.44	-	-	78	125	V

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

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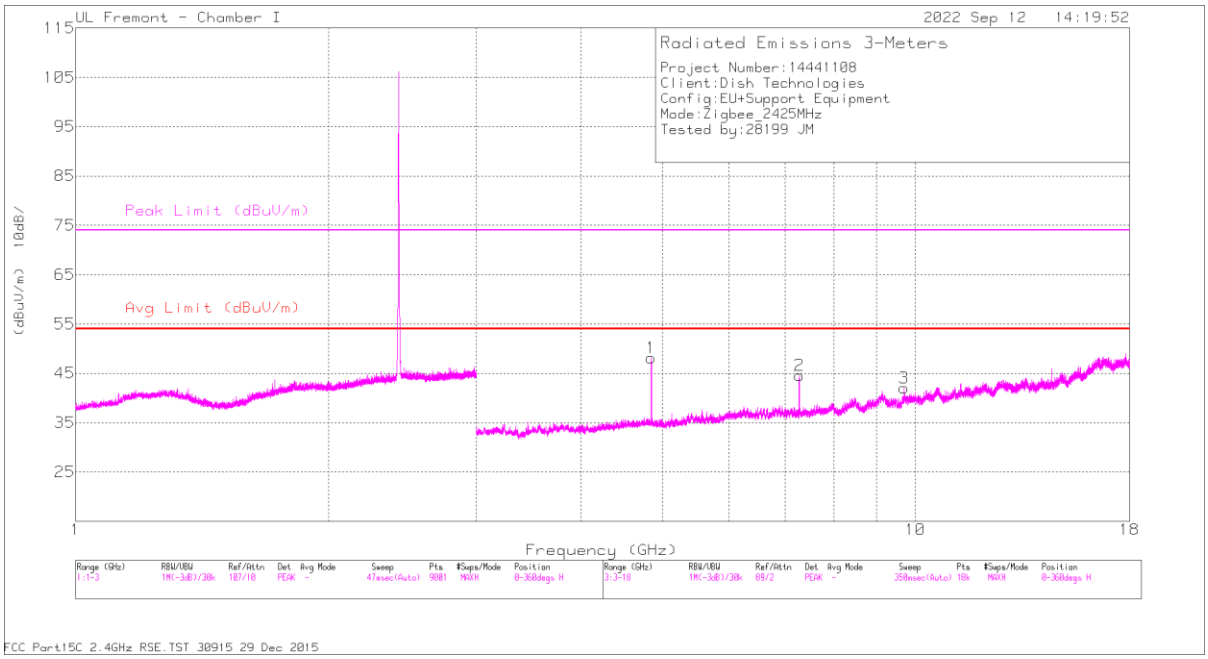
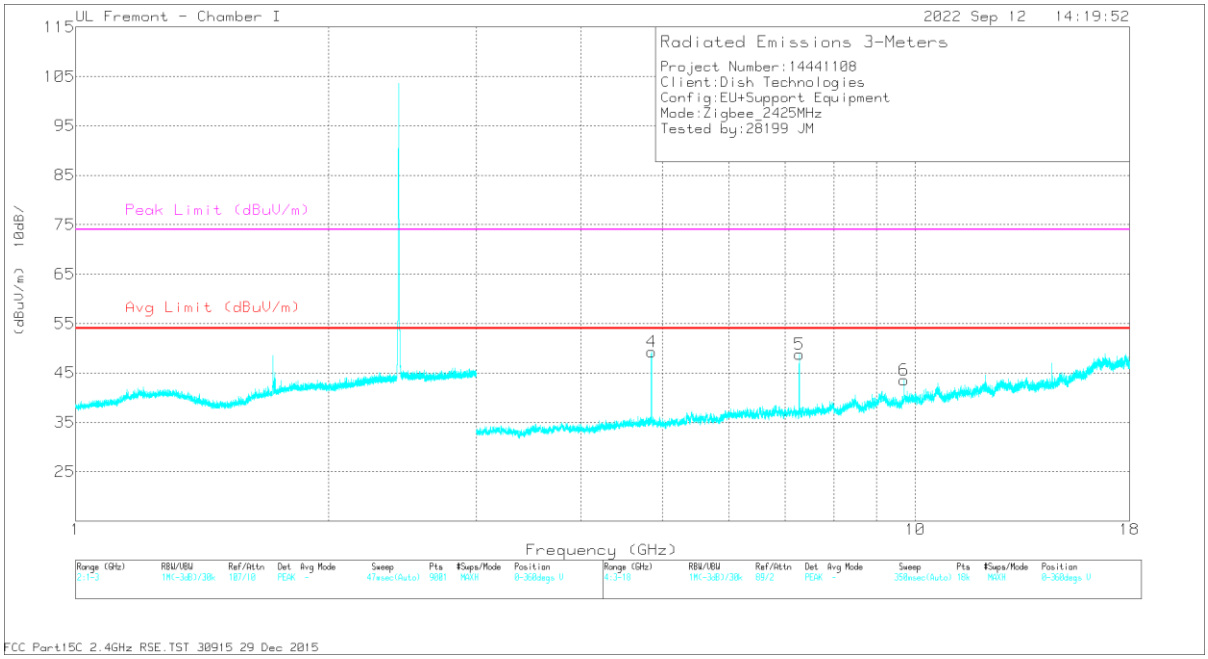
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.848993	47.8	PK2	34.5	-27.8	54.5	-	-	74	-19.5	254	232	H
	* 4.849013	41.55	MAv1	34.5	-27.8	48.25	54	-5.75	-	-	254	232	H
2	* 7.27658	41.68	PK2	36	-25.9	51.78	-	-	74	-22.22	244	105	H
	* 7.276277	33.28	MAv1	36	-25.9	43.38	54	-10.62	-	-	244	105	H
3	9.701395	35.85	PK2	37.2	-21.4	51.65	-	-	-	-	103	117	H
	9.701946	25.77	MAv1	37.2	-21.4	41.57	-	-	-	-	103	117	H
4	* 4.849007	48.37	PK2	34.5	-27.8	55.07	-	-	74	-18.93	115	101	V
	* 4.849035	42.28	MAv1	34.5	-27.8	48.98	54	-5.02	-	-	115	101	V
5	* 7.276472	44.79	PK2	36	-25.9	54.89	-	-	74	-19.11	350	109	V
	* 7.276317	38.24	MAv1	36	-25.9	48.34	54	-5.66	-	-	350	109	V
6	9.698007	37.32	PK2	37.2	-21.5	53.02	-	-	-	-	336	103	V
	9.698087	28.21	MAv1	37.2	-21.5	43.91	-	-	-	-	336	103	V

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

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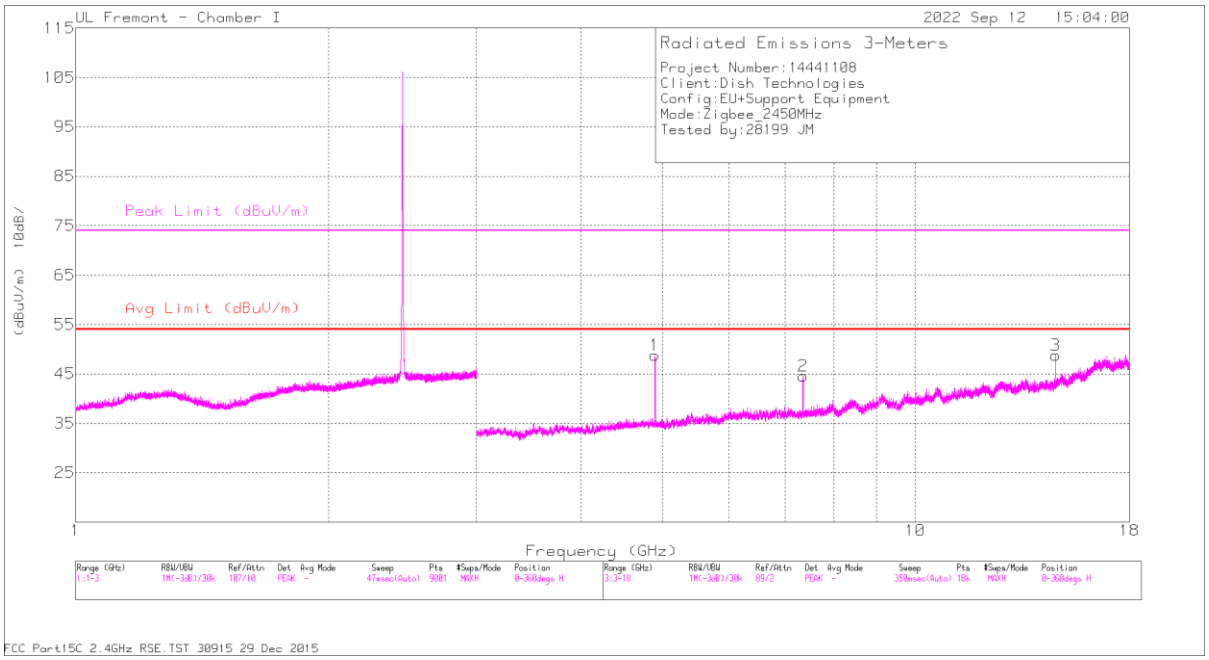
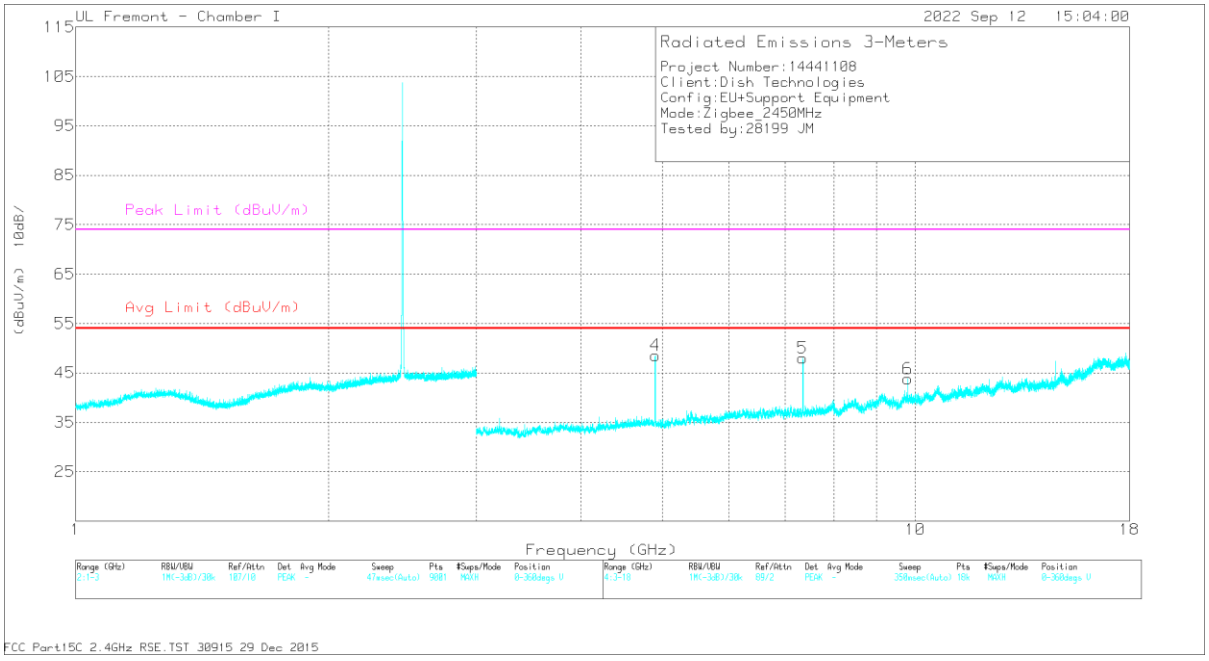
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

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Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.899118	47.68	PK2	34.6	-28.1	54.18	-	-	74	-19.82	234	128	H
	* 4.899146	41.5	MAv1	34.6	-28.1	48	54	-6	-	-	234	128	H
2	* 7.351613	42.18	PK2	36	-25.6	52.58	-	-	74	-21.42	117	115	H
	* 7.351265	34.24	MAv1	36	-25.6	44.64	54	-9.36	-	-	117	115	H
3	14.703003	39.4	PK2	40.1	-23.1	56.4	-	-	-	-	215	109	H
	14.702843	30.53	MAv1	40.1	-23.1	47.53	-	-	-	-	215	109	H
4	* 4.900982	47.54	PK2	34.5	-28.1	53.94	-	-	74	-20.06	280	104	V
	* 4.899076	41.37	MAv1	34.6	-28.1	47.87	54	-6.13	-	-	280	104	V
5	* 7.348599	44.86	PK2	36	-25.6	55.26	-	-	74	-18.74	354	128	V
	* 7.348503	37.74	MAv1	36	-25.6	48.14	54	-5.86	-	-	354	128	V
6	9.798145	36.71	PK2	37.3	-22.3	51.71	-	-	-	-	259	127	V
	9.798081	27.12	MAv1	37.3	-22.3	42.12	-	-	-	-	259	127	V

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

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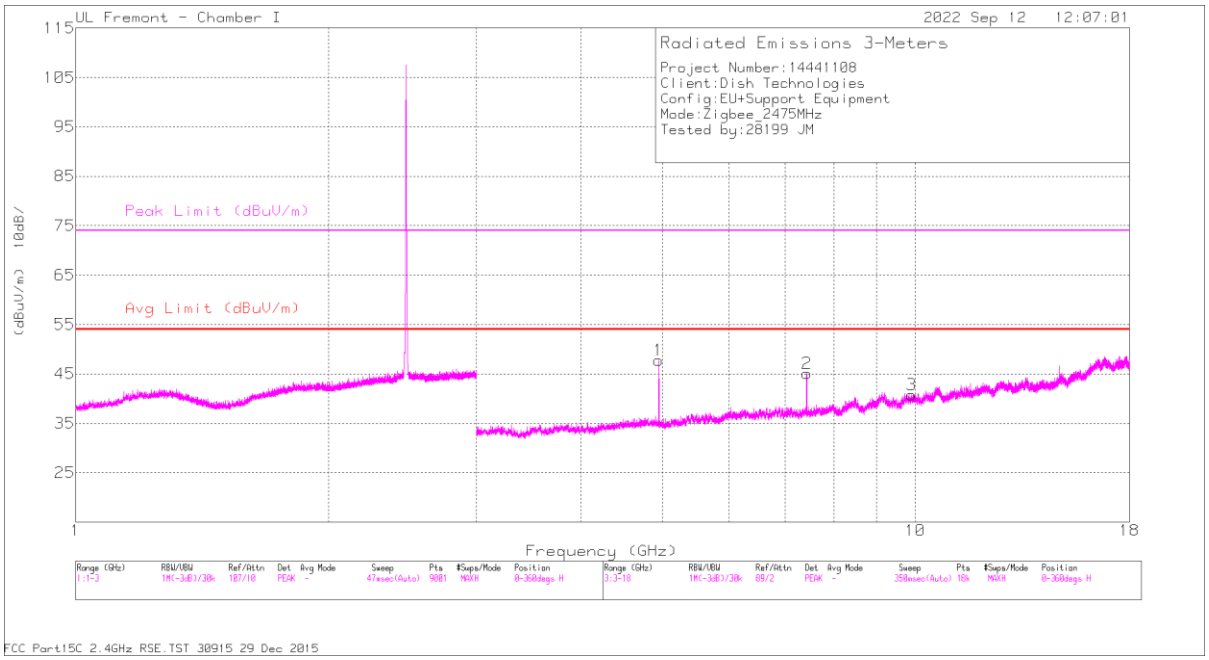
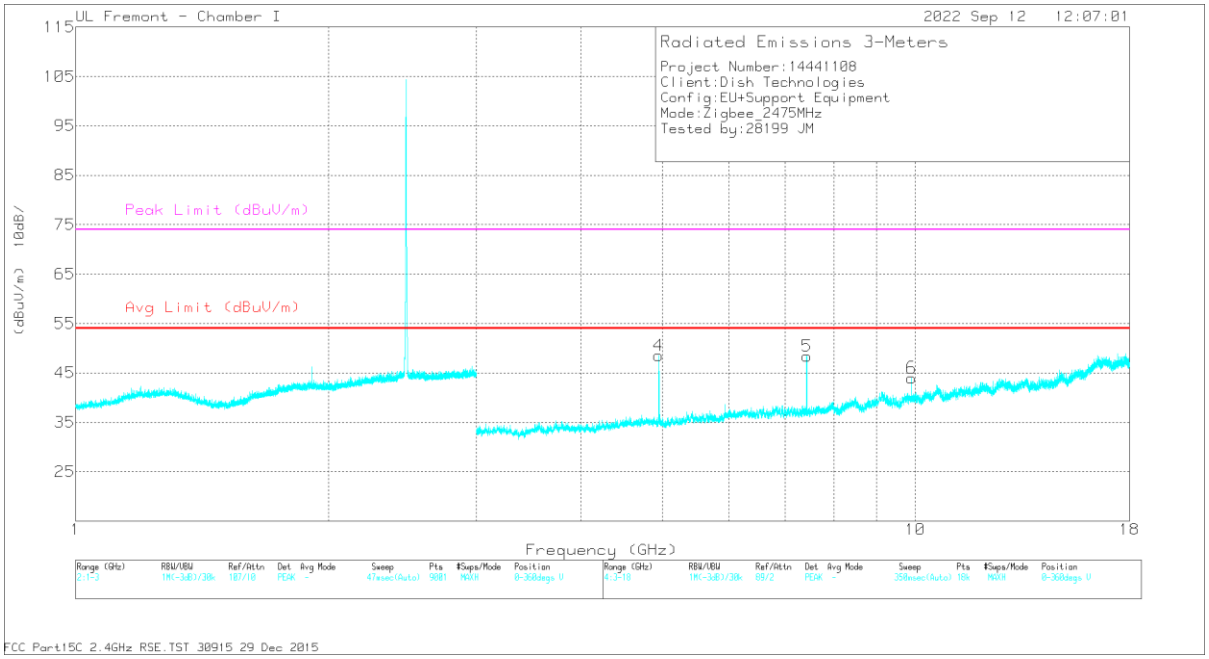
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

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Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.95094	47.58	PK2	34.5	-28.5	53.58	-	-	74	-20.42	239	147	H
	* 4.949015	41.14	MAv1	34.5	-28.5	47.14	54	-6.86	-	-	239	147	H
2	* 7.426409	41.05	PK2	36	-24.8	52.25	-	-	74	-21.75	123	236	H
	* 7.426341	32.89	MAv1	36	-24.8	44.09	54	-9.91	-	-	123	236	H
3	9.901275	37.16	PK2	37.4	-22.9	51.66	-	-	-	-	101	140	H
	9.898106	25.98	MAv1	37.4	-22.8	40.58	-	-	-	-	101	140	H
4	* 4.949052	47.77	PK2	34.5	-28.5	53.77	-	-	74	-20.23	262	104	V
	* 4.949036	41.1	MAv1	34.5	-28.5	47.1	54	-6.9	-	-	262	104	V
5	* 7.426481	42.81	PK2	36	-24.8	54.01	-	-	74	-19.99	199	113	V
	* 7.426369	35.33	MAv1	36	-24.8	46.53	54	-7.47	-	-	199	113	V
6	9.897651	37.94	PK2	37.4	-22.9	52.44	-	-	-	-	253	120	V
	9.89805	28.42	MAv1	37.4	-22.8	43.02	-	-	-	-	253	120	V

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

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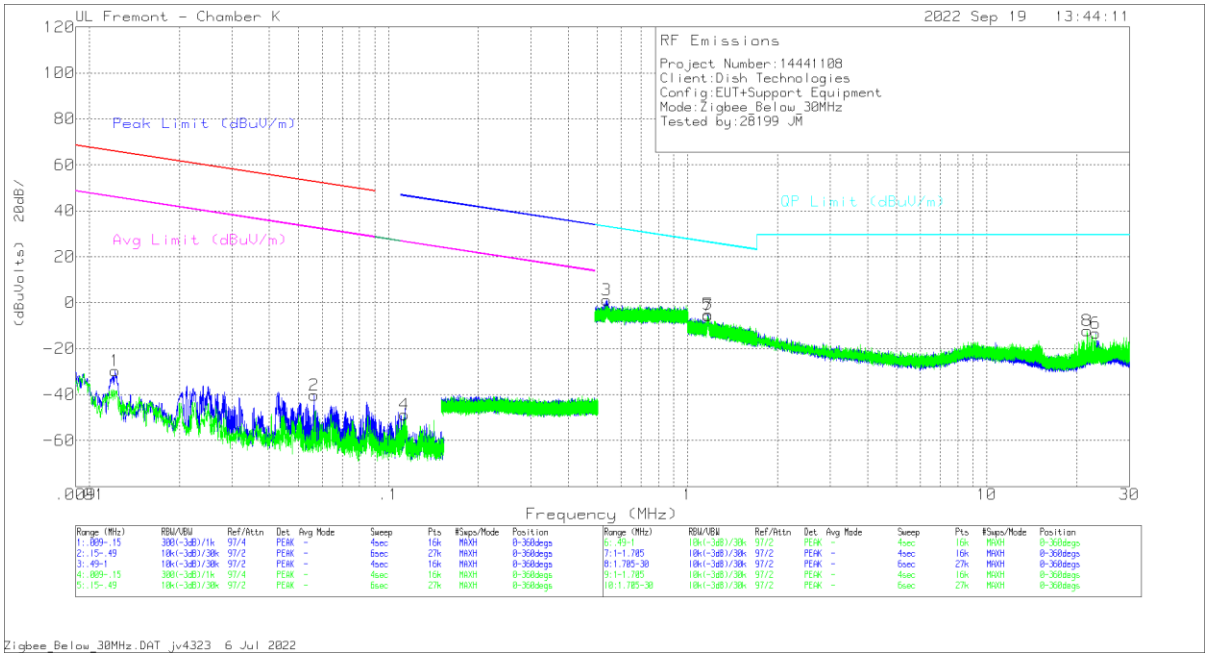
10.3. WORST CASE BELOW 30MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna E(ACF)	Amp/Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.0122	21.41	Pk	60	-31	-80	-29.59	65.85	-95.44	45.85	-75.44	-	-	-	-	0-360
2	.0565	15.5	Pk	56.5	-32.2	-80	-40.2	52.54	-92.74	32.54	-72.74	-	-	-	-	0-360
4	.113	7.63	Pk	55.7	-32.2	-80	-48.87	-	-	-	-	46.57	-95.44	26.57	-75.44	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna E(ACF)	Amp/Cbl (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.5368	17.05	Pk	56.1	-32.1	-40	1.05	33.01	-31.96	0-360
5	1.1683	20.9	Pk	46	-32.1	-40	-5.2	26.27	-31.47	0-360
6	23.1272	24.79	Pk	33.6	-31.6	-40	-13.21	29.5	-42.71	0-360
7	1.1717	20.45	Pk	46	-32.1	-40	-5.65	26.25	-31.9	0-360
8	21.6642	25.3	Pk	34	-31.6	-40	-12.3	29.5	-41.8	0-360

Pk - Peak detector

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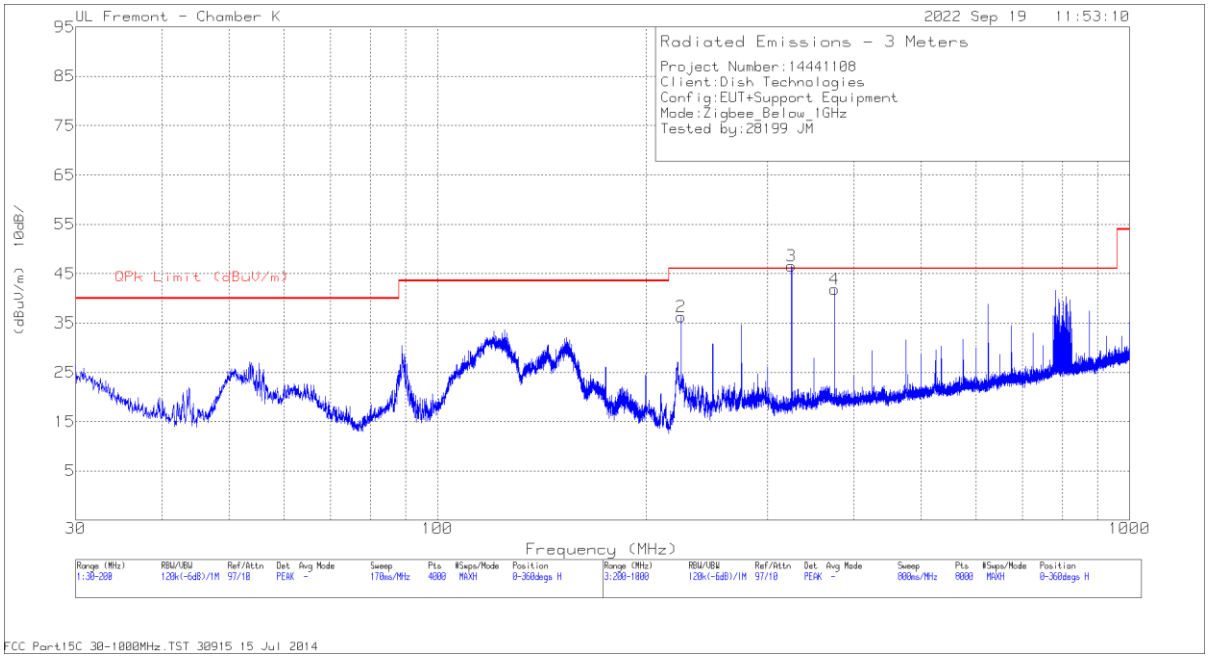
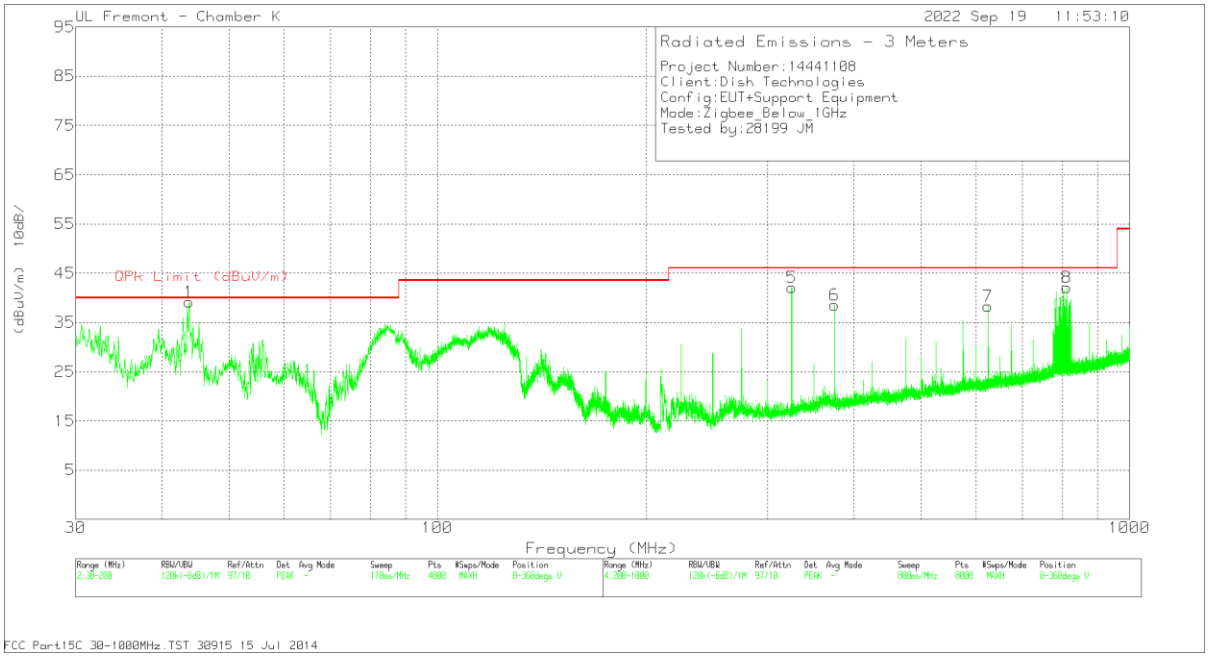
10.4. WORST CASE BELOW 1 GHz

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	82258 ACF (dB)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	43.7932	51.24	Qp	17.3	-31.4	37.14	40	-2.86	72	97	V
2	224.903	48.95	Pk	17.5	-30.2	36.25	46.02	-9.77	0-360	101	H
3	* 325.002	54.63	Qp	20.4	-29.7	45.33	46.02	-.69	130	97	H
4	374.997	51.08	Qp	21.5	-29.4	43.18	46.02	-2.84	89	98	H
5	* 324.998	50.78	Qp	20.4	-29.7	41.48	46.02	-4.54	104	97	V
6	374.923	46.4	Pk	21.5	-29.4	38.5	46.02	-7.52	0-360	199	V
7	624.955	41.43	Pk	25.6	-28.7	38.33	46.02	-7.69	0-360	99	V
8	813.309	37.94	Qp	28	-27.9	38.04	46.02	-7.98	86	108	V

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

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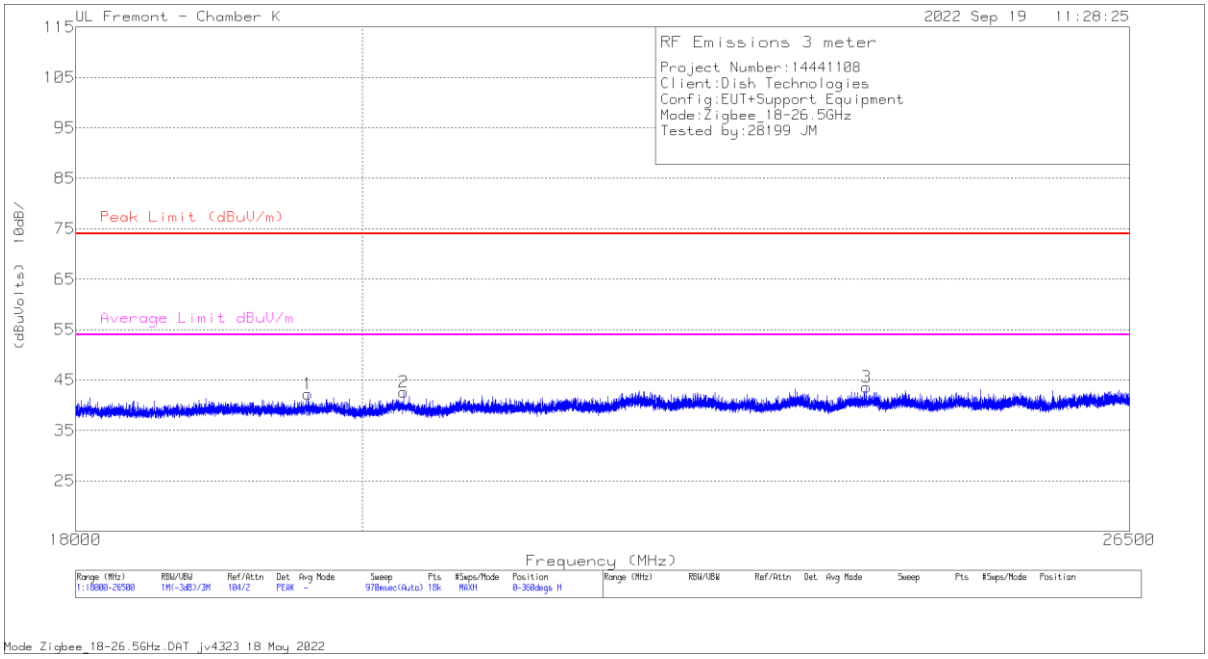
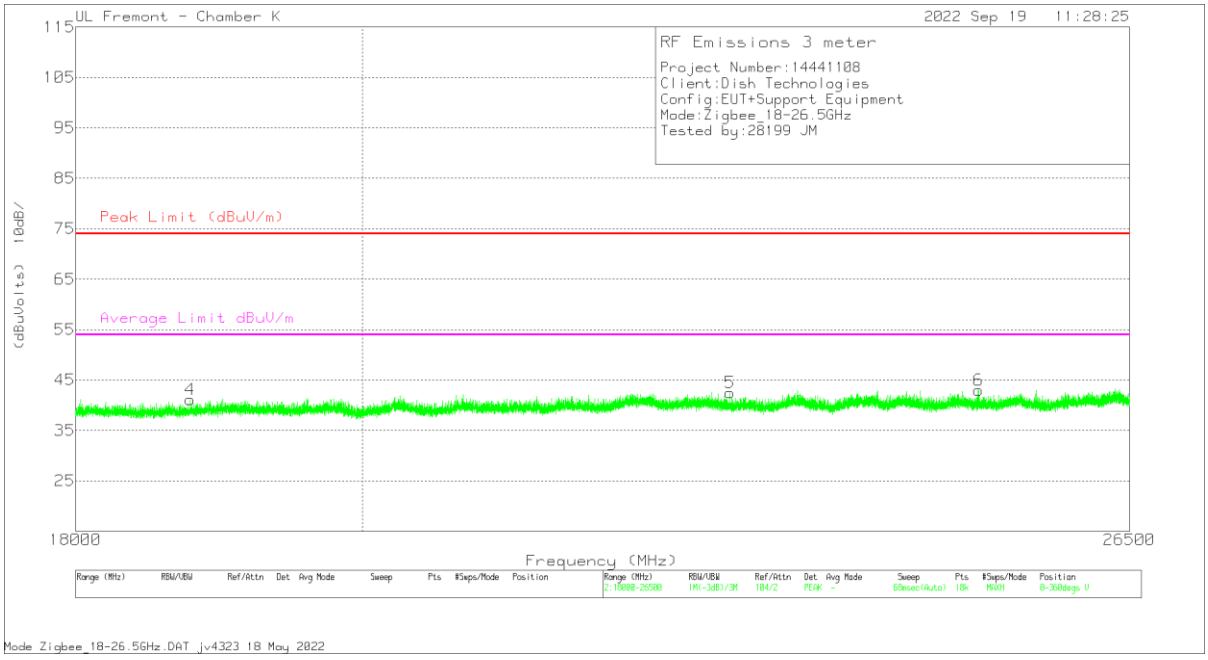
10.5. WORST CASE 18-26 GHz

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



HORIZONTAL



VERTICAL

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18 – 26GHz DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	81138 AF (dB/m)	215705 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	* 19603.666	52.15	Pk	32.8	-61	18.3	42.25	74	-31.75	54	-11.75	0-360	100	H
2	* 20303.499	51.03	Pk	33	-60	18.6	42.63	74	-31.37	54	-11.37	0-360	200	H
3	24062.386	50.61	Pk	33.9	-61.2	20.3	43.61	74	-30.39	54	-10.39	0-360	100	H
4	* 18772.083	51.39	Pk	32.5	-60.7	17.9	41.09	74	-32.91	54	-12.91	0-360	200	V
5	* 22886.553	50.42	Pk	33.5	-61.1	19.7	42.52	74	-31.48	54	-11.48	0-360	200	V
6	25069.636	49.2	Pk	34.3	-61.2	20.7	43	74	-31	54	-11	0-360	100	V

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

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10.6. SPURIOUS EMISSIONS FOR CO-LOCATION

TEST-CASE CONDITIONS

Mode	Frequency (MHz)
BT GFSK	2441
Zigbee	2450

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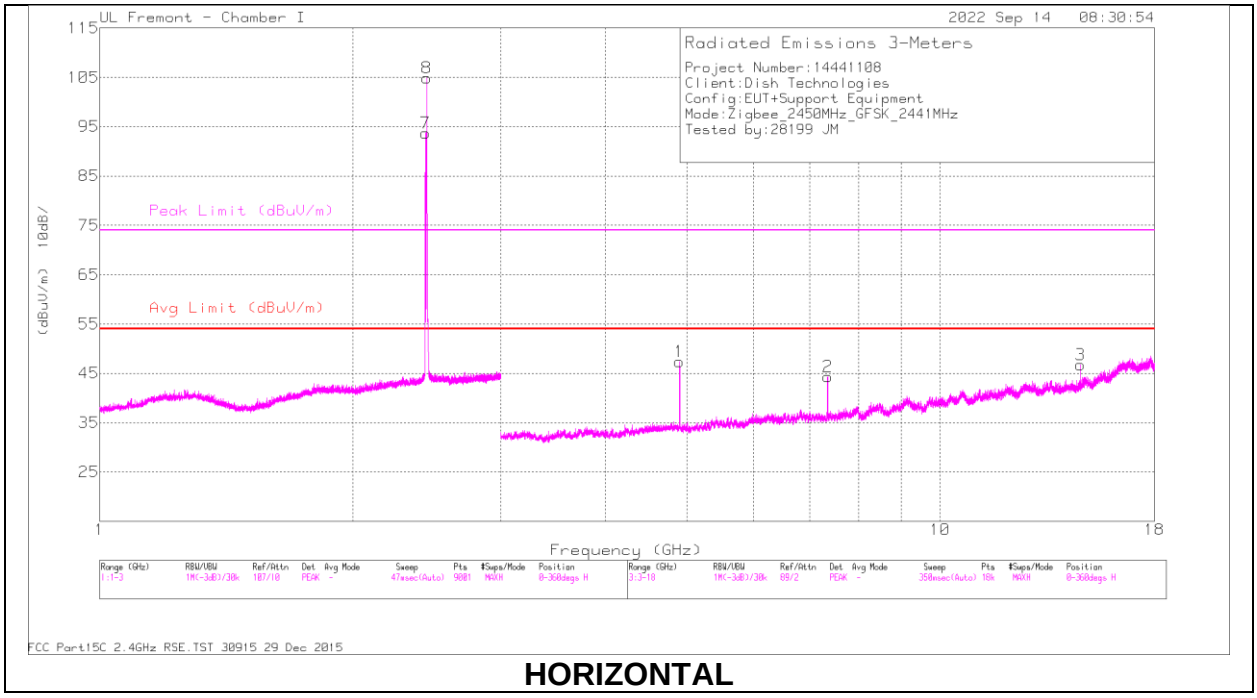
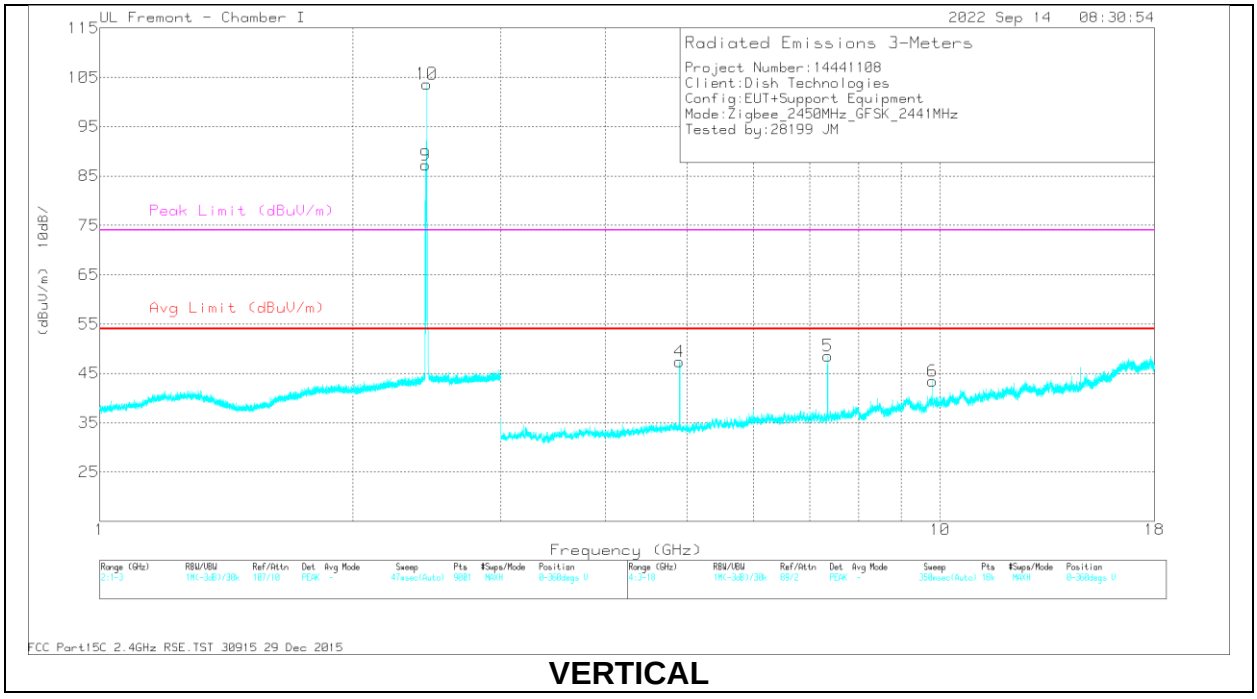
HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz



HORIZONTAL



VERTICAL

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Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl/Fltr (dB)	DC (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.898864	46.59	PK2	34.6	-28.1	-	53.09	-	-	74	-20.91	254	136	H
	* 4.900954	40.03	MAv1	34.5	-28.1	0	46.43	54	-7.57	-	-	254	136	H
2	* 7.351461	41.3	PK2	36	-25.6	-	51.7	-	-	74	-22.3	275	101	H
	* 7.351301	33.13	MAv1	36	-25.6	0	43.53	54	-10.47	-	-	275	101	H
3	14.702807	38.87	PK2	40.1	-23.1	-	55.87	-	-	-	-	219	115	H
	14.702736	29.96	MAv1	40.1	-23.1	0	46.96	-	-	-	-	219	115	H
4	* 4.901018	47.39	PK2	34.5	-28.1	-	53.79	-	-	74	-20.21	266	111	V
	* 4.899052	41.3	MAv1	34.6	-28.1	0	47.8	54	-6.2	-	-	266	111	V
5	* 7.351589	44.29	PK2	36	-25.6	-	54.69	-	-	74	-19.31	356	110	V
	* 7.351281	37.34	MAv1	36	-25.6	0	47.74	54	-6.26	-	-	356	110	V
6	9.798029	36.89	PK2	37.3	-22.3	-	51.89	-	-	-	-	336	113	V
	9.797961	27.21	MAv1	37.3	-22.3	0	42.21	-	-	-	-	336	113	V

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

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11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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

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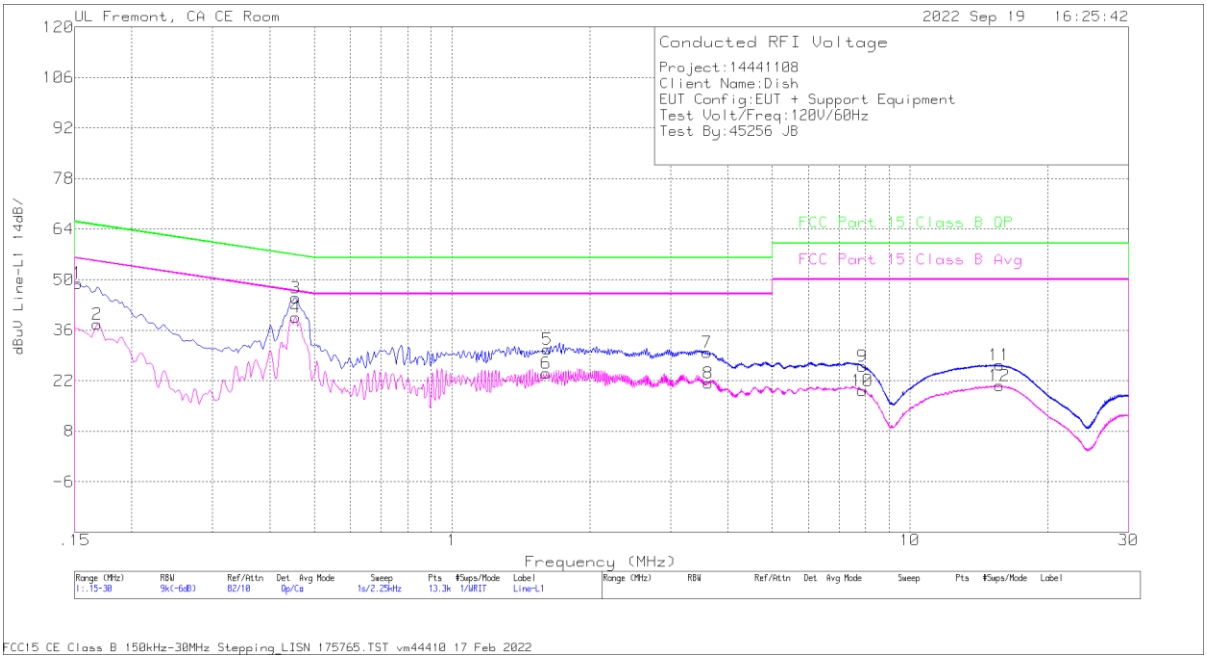
LINE 1 RESULTS



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	FCC Part 15 Class B QP	QP Margin (dB)	FCC Part 15 Class B Avg	Av(CISPR)Margin (dB)
2	.168	28.12	Ca	.1	0	9.4	37.62	-	-	55.06	-17.44
4	.456	30.17	Ca	0	.1	9.3	39.57	-	-	46.77	-7.2
6	1.6058	14.67	Ca	0	.1	9.3	24.07	-	-	46	-21.93
8	3.6285	11.99	Ca	0	.1	9.3	21.39	-	-	46	-24.61
10	7.8743	9.81	Ca	0	.2	9.3	19.31	-	-	50	-30.69
12	15.6638	11.06	Ca	.1	.2	9.3	20.66	-	-	50	-29.34
1	.1523	39.54	Qp	.1	0	9.4	49.04	65.88	-16.84	-	-
3	.456	35.49	Qp	0	.1	9.3	44.89	56.77	-11.88	-	-
5	1.6148	21.25	Qp	0	.1	9.3	30.65	56	-25.35	-	-
7	3.6015	20.45	Qp	0	.1	9.3	29.85	56	-26.15	-	-
9	7.881	16.55	Qp	0	.2	9.3	26.05	60	-33.95	-	-
11	15.6638	16.75	Qp	.1	.2	9.3	26.35	60	-33.65	-	-

Qp - Quasi-Peak detector
Ca - CISPR average detection

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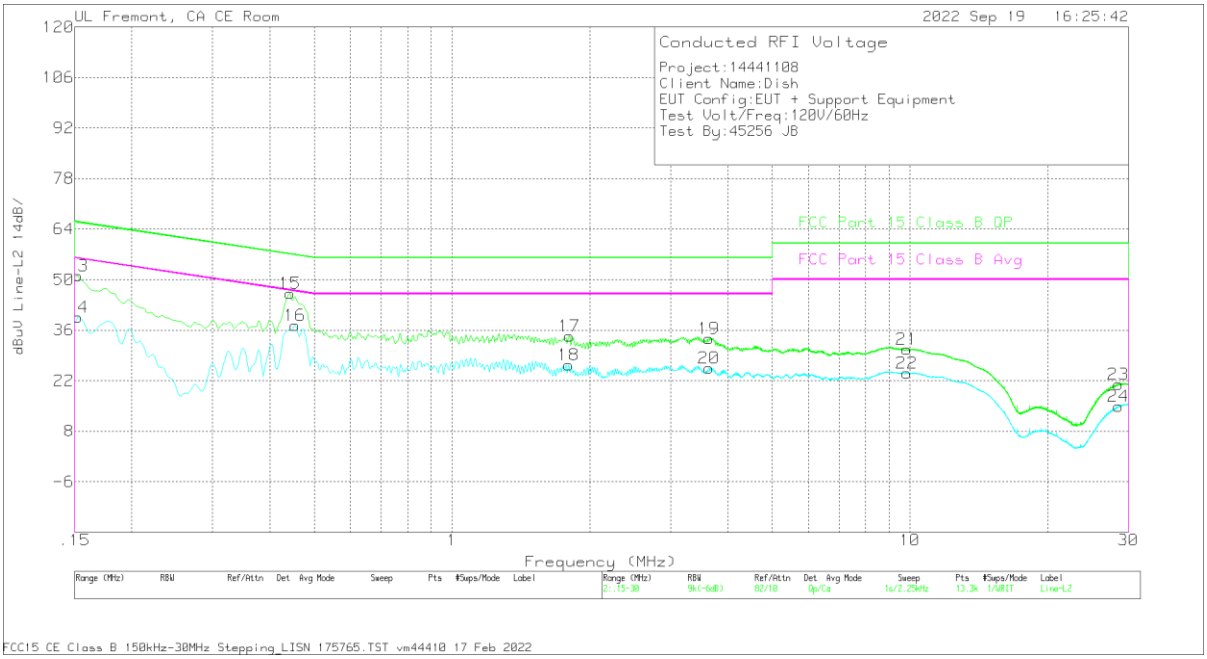
LINE 2 RESULTS



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	FCC Part 15 Class B QP	QP Margin (dB)	FCC Part 15 Class B Avg	Av(CISPR)Margin (dB)
14	.1523	30.1	Ca	.1	0	9.4	39.6	-	-	55.88	-16.28
16	.4538	27.96	Ca	0	.1	9.3	37.36	-	-	46.81	-9.45
18	1.797	16.99	Ca	0	.1	9.3	26.39	-	-	46	-19.61
20	3.642	16.1	Ca	0	.1	9.3	25.5	-	-	46	-20.5
22	9.8509	14.6	Ca	0	.2	9.3	24.1	-	-	50	-25.9
24	28.5428	4.96	Ca	.2	.3	9.4	14.86	-	-	50	-35.14
13	.1523	41.48	Qp	.1	0	9.4	50.98	65.88	-14.9	-	-
15	.4425	36.72	Qp	0	.1	9.3	46.12	57.01	-10.89	-	-
17	1.806	25.01	Qp	0	.1	9.3	34.41	56	-21.59	-	-
19	3.6443	24.23	Qp	0	.1	9.3	33.63	56	-22.37	-	-
21	9.852	21.18	Qp	0	.2	9.3	30.68	60	-29.32	-	-
23	28.5124	11.09	Qp	.2	.3	9.4	20.99	60	-39.01	-	-

Qp - Quasi-Peak detector
Ca - CISPR average detection

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