



TEST REPORT

Report Number: 13658336-E4V2

Applicant : AliveCor
444 Castro Street Suite 600
Mountain View, CA, 94041
US

Model : AC-021

Brand : AliveCor

FCC ID : 2ASFFAC021

IC : 25747-AC021

EUT Description : KardiaMobile Card with BLE functionality

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

Date Of Issue:

May 11, 2021

Prepared by:

UL VERIFICATION SERVICES

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NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	4/5/2021	Initial Issue	---
V2	5/11/2021	EUT Retested to higher power	Henry Lau Jose Martinez

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: AliveCor
444 Castro Street Suite 600
Mountain View, CA, 94041
US

EUT DESCRIPTION: KardiaMobile card with BLE Functionality

MODEL: AC-021

BRAND: AliveCor

SERIAL NUMBER: proto 1(Radiated), proto 2(conducted)

SAMPLE RECEIPT DATE: January 27, 2021

DATE TESTED: FEBRUARY 2, 2021 – MAY 10, 2021

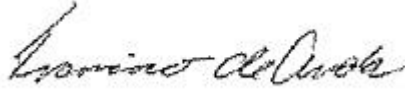
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5 + A1	Complies

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.

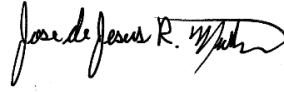
This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
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Reviewed 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	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	RSS-GEN 6.7	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW	Pass	None.
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power	Pass	None.
See Comment		Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	RSS-247 5.2 (b)	PSD	Pass	None.
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Pass	None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Pass	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Not Applicable	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, RSS-GEN Issue 5 + A1, and RSS-247 Issue 2.

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0, 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 type="checkbox"/>	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	208313
<input type="checkbox"/>	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	22541	208313
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	US0104	2324B	208313

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)

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

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + 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 a battery powered single electrode device that is used to record, store, and transfer electrocardiogram (ECG) rhythms. The ECG data is transmitted to the Kardia app on a smart device via BLE communication.

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	3.68	2.33

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes an Monopole PCBA Meander antenna, with a maximum gain of 2 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 2.0.9.

The test utility software used during testing was nRF Connect version 3.6.1

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 fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Data rate(s) provided by manufacturer: 1Mbps / 2Mbps

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer/Brand	Model	Serial Number	FCC ID
Laptop	Lenovo	L480	PF1HON0E	DoC
AC/DC Adapter	Lenovo	92P1156	11S92P1156Z1ZDXN0B3N98	DoC
Battery Pack	AliveCor	N/A	N/A	N/A

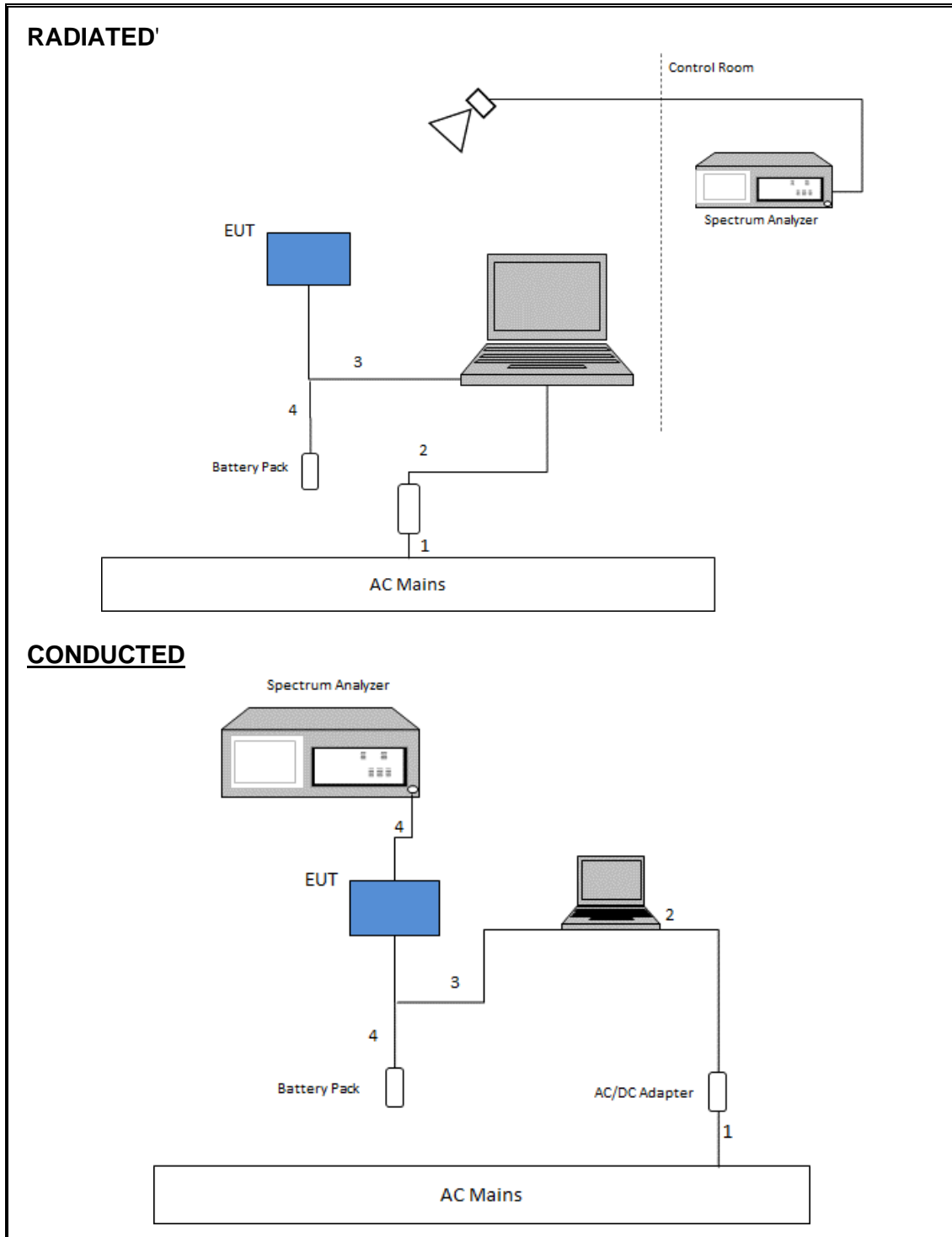
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	unshielded	0.5	to AC/DC Adapter
2	DC	1	DC	shielded	0.5	to Laptop
3	USB	1	Typr A	shielded	1	EUT to Latop
4	wire	1	Soldered/ Spliced	unshielded	0.5	Discreet wires from EUT to Battery pack

TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card. The RF cable was removed from the antenna port for Radiated testing.

SETUP DIAGRAMS



7. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Subclause -11.8.1

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

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

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, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	T863	08/31/2021	08/31/2020
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179367	2/21/2022	2/21/2021
Amplifier, 100MHz-18GHz	AMPLICAL	AMP0.1G18-47-20	PRE0197319	04/08/2022	04/08/21
Antenna, Broadband Hybrid, 30MHz to 3000MHz	Sunol Sciences Corp.	JB3	PRE0184052	11/19/2021	11/19/2020
Amplifier, 9KHz to 1GHz, 32dB	Sonoma	310	PRE0180174	12/29/2021	12/29/2020
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179372	2/25/2021*	2/25/2020
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179367	2/21/2022	2/21/2021
Antenna Horn, 18 to 26GHz	ARA	MWH-1826	T447	9/24/2021	9/24/2020
Amplifier, 18-26.5	AMPLICAL	AMP18G26.5-60	PRE0181238	6/7/2021	6/7/2020
Antenna, Passive Loop 30Hz to 1MHz	ELETRO METRICS	EM-6871	PRE0179465	7/27/2021	7/27/2020
Antenna, Passive Loop 100kHz to 30MHz	ELETRO METRICS	EM-6872	PRE0179467	7/27/2021	7/27/2020
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	T1227	3/16/2022	3/16/2021
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1269	1/25/2022	1/25/2021
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight Technologies Inc	E4446A	T123	01/22/2022	01/22/2021

*Test performed within calibration period.

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, Apr 30, 2020
Antenna Port Software	UL	UL RF	Ver 2021.4.9

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

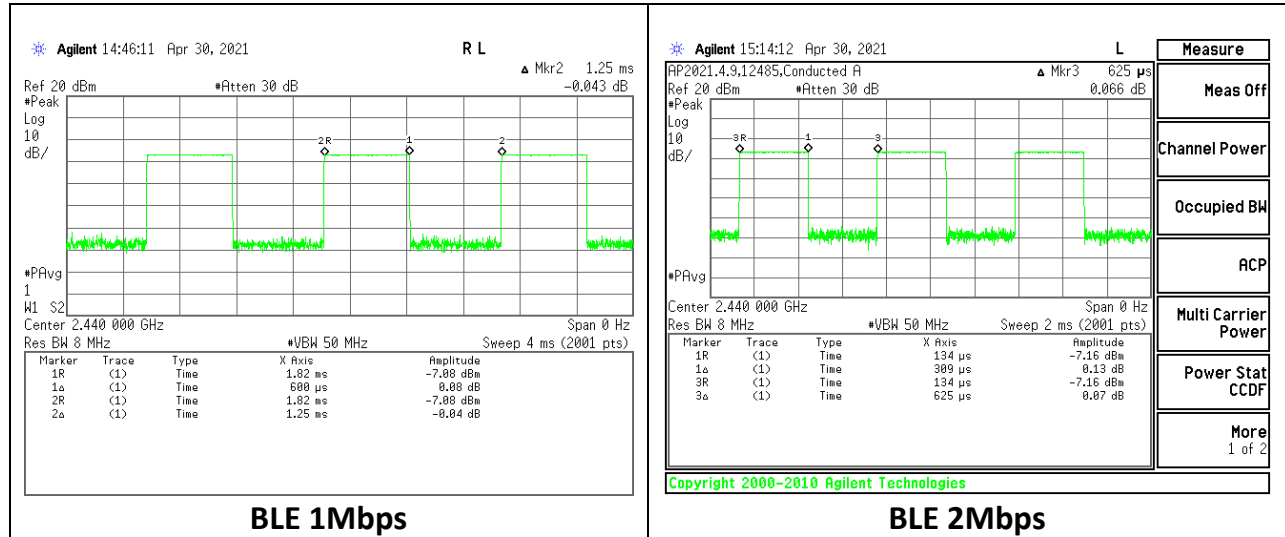
PROCEDURE

ANSI C63.10, Section 11.6 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 1Mbps	0.600	1.250	0.480	48.00%	3.19	1.667
BLE 2Mbps	0.3090	0.6250	0.494	49.44%	3.06	3.236

DUTY CYCLE PLOTS



9.2. 99% BANDWIDTH

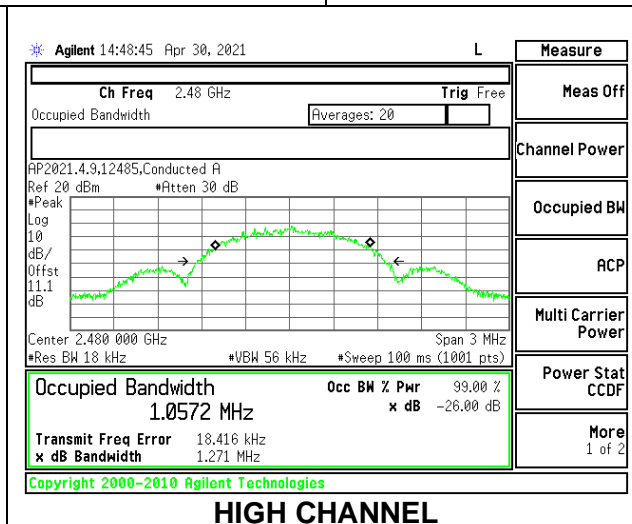
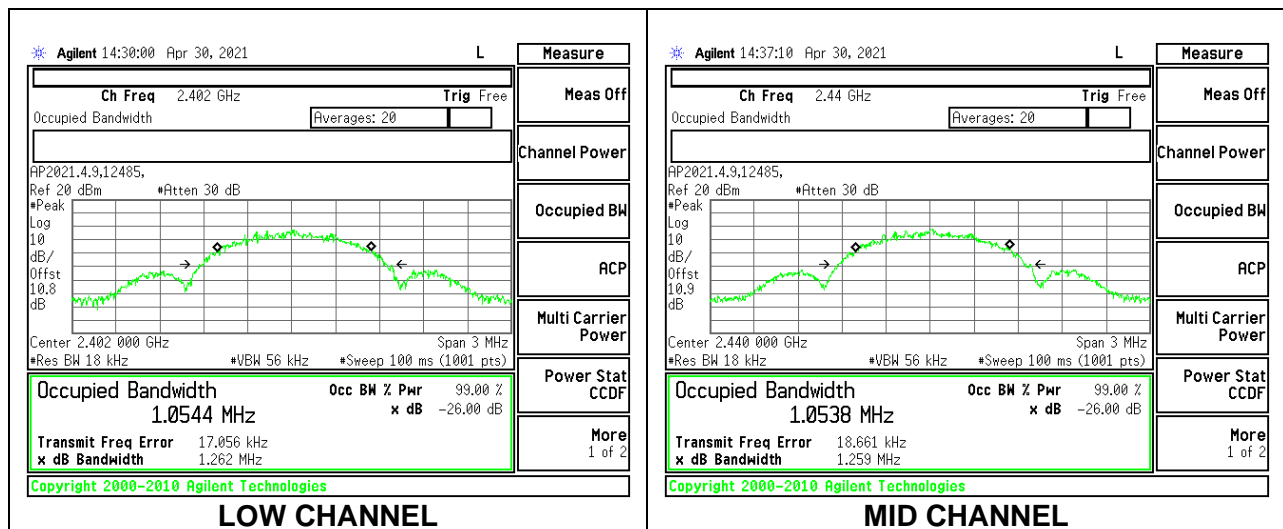
LIMITS

None; for reporting purposes only.

RESULTS

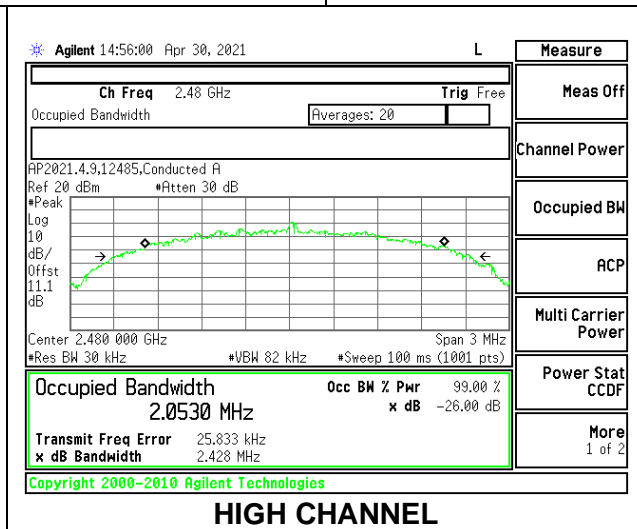
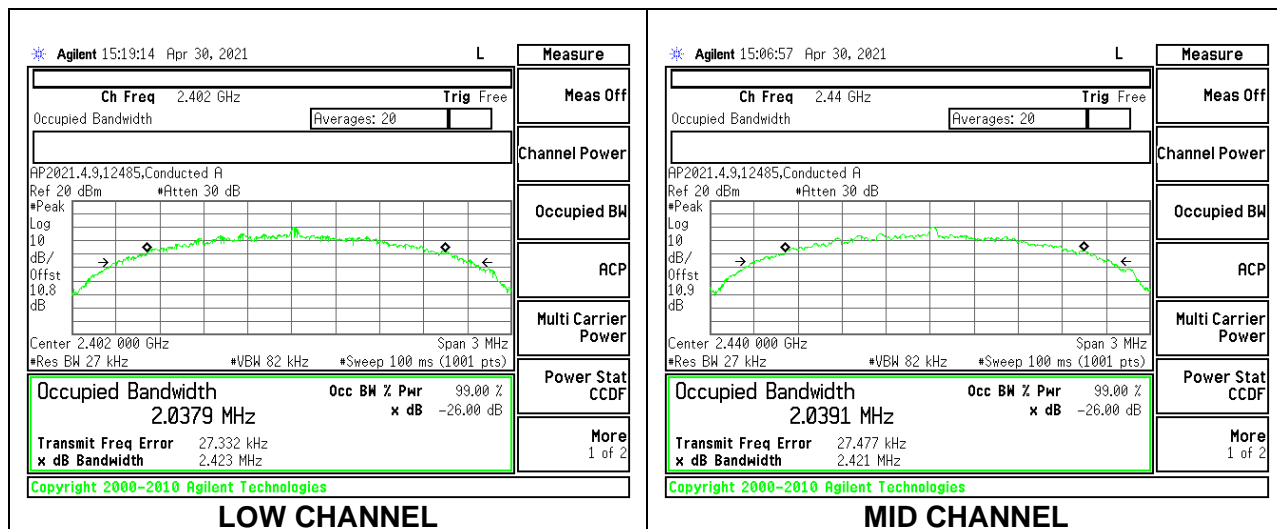
9.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0544
Middle	2440	1.0538
High	2480	1.0572



9.2.2. BLE (2Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	2.0379
Middle	2440	2.0391
High	2480	2.0530



9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

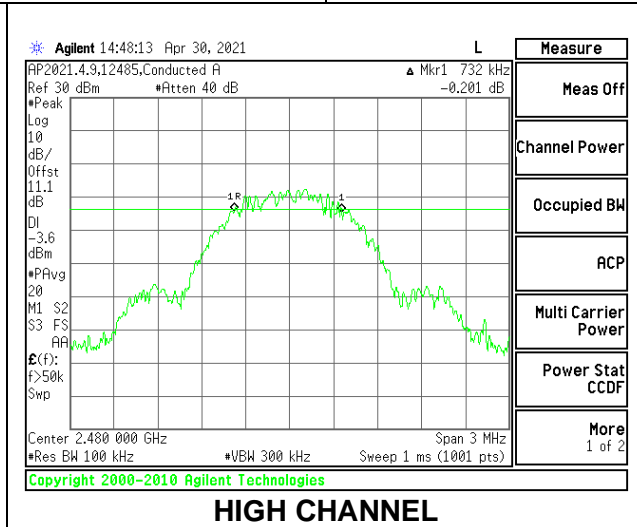
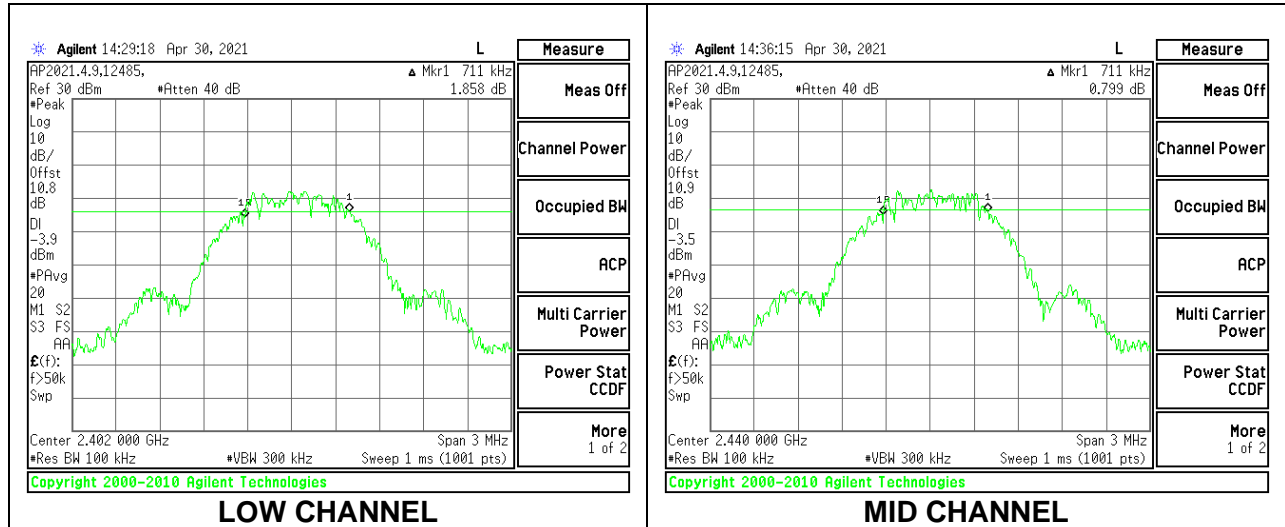
RSS-247 5.2 (a)

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

RESULTS

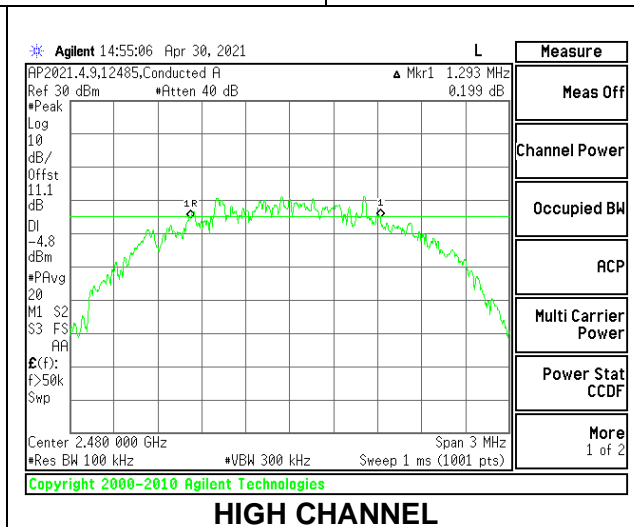
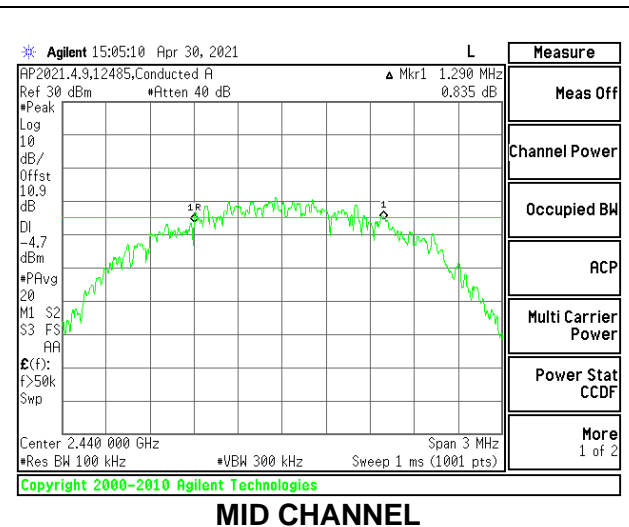
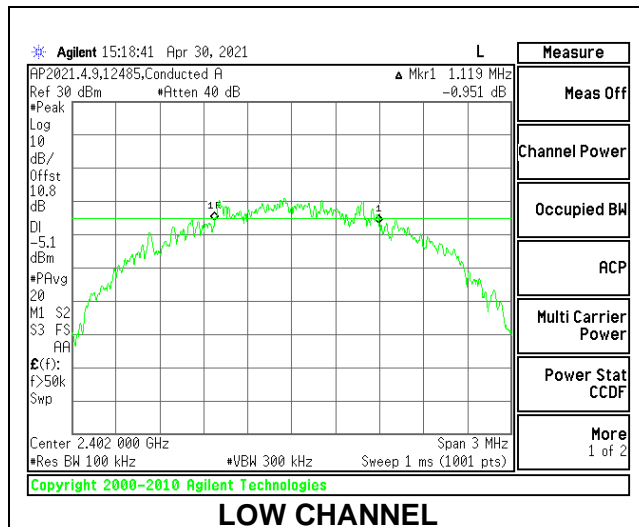
9.3.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.711	0.5
Middle	2440	0.711	0.5
High	2480	0.732	0.5



9.3.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.119	0.5
Middle	2440	1.290	0.5
High	2480	1.293	0.5



9.4. 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 cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.8 dB cable) was entered as an offset in the power meter to allow for a peak reading of power.

RESULTS

9.4.1. BLE (1Mbps)

Tested By:	12485 GA
Date:	4/30/2021

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.64	30	-26.360
Middle	2440	3.63	30	-26.370
High	2480	3.66	30	-26.340

9.4.2. BLE (2Mbps)

Tested By:	12485 GA
Date:	4/30/2021

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.68	30	-26.320
Middle	2440	3.62	30	-26.380
High	2480	3.62	30	-26.380

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.8 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

9.5.1. BLE (1Mbps)

Tested By:	12485 GA
Date:	4/30/2021

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	3.52
Middle	2440	3.49
High	2480	3.53

9.5.2. BLE (2Mbps)

Tested By:	12485 GA
Date:	4/30/2021

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	3.52
Middle	2440	3.5
High	2480	3.51

9.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

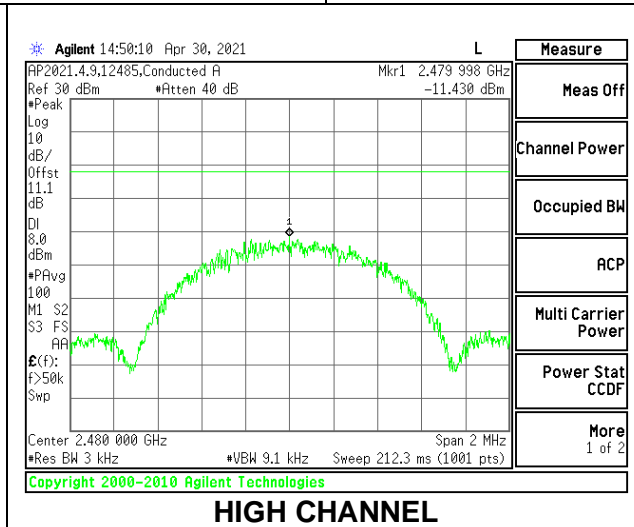
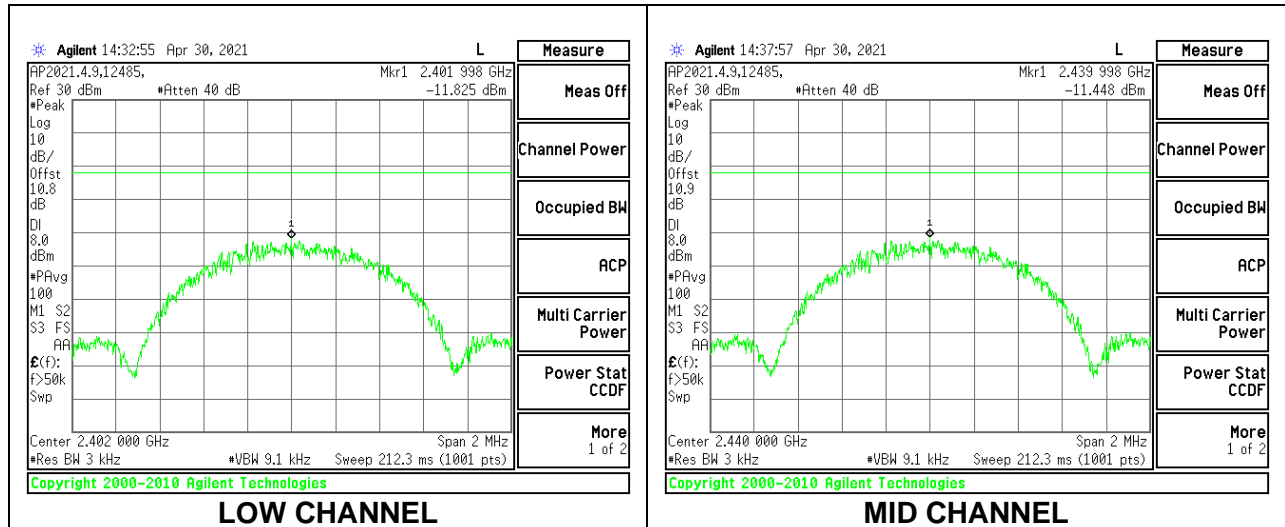
RSS-247 (5.2) (b)

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

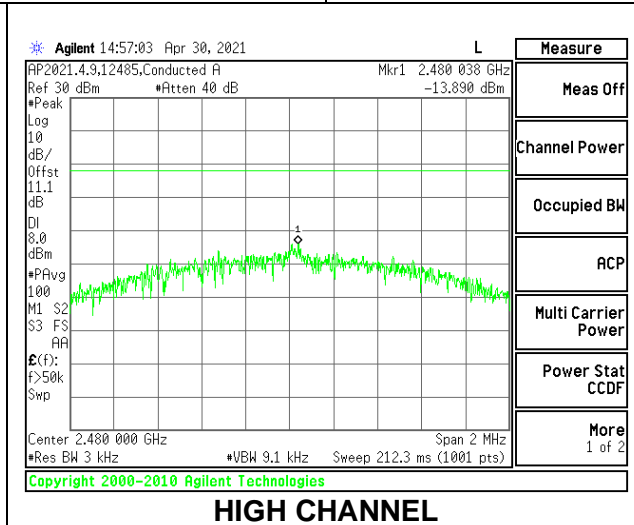
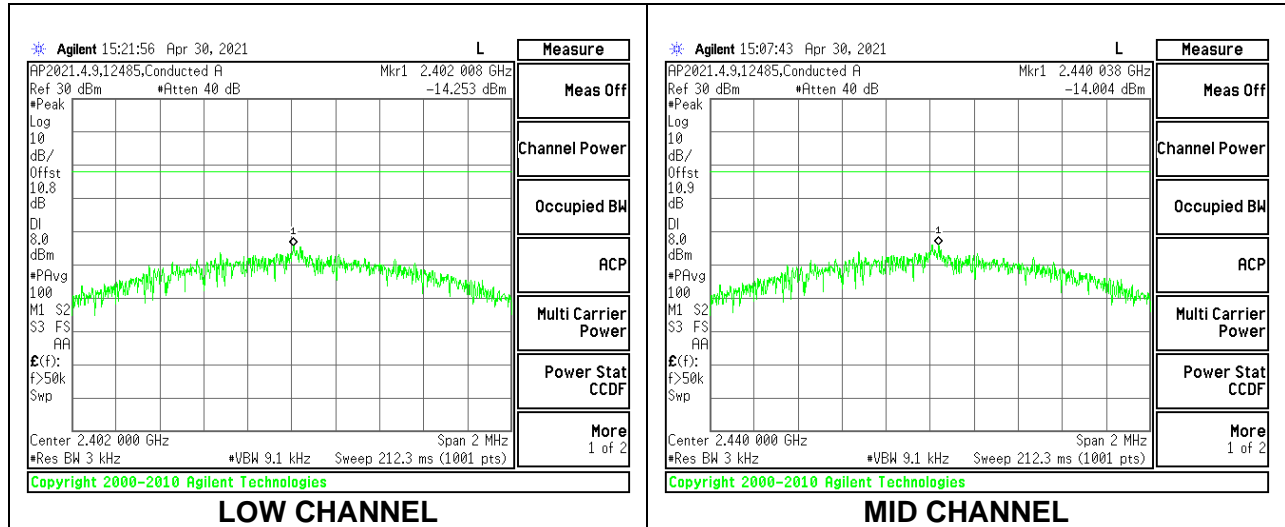
9.6.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-11.825	8	-19.83
Middle	2440	-11.448	8	-19.45
High	2480	-11.430	8	-19.43



9.6.2. BLE (2Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-14.253	8	-22.25
Middle	2440	-14.004	8	-22.00
High	2480	-13.890	8	-21.89



9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

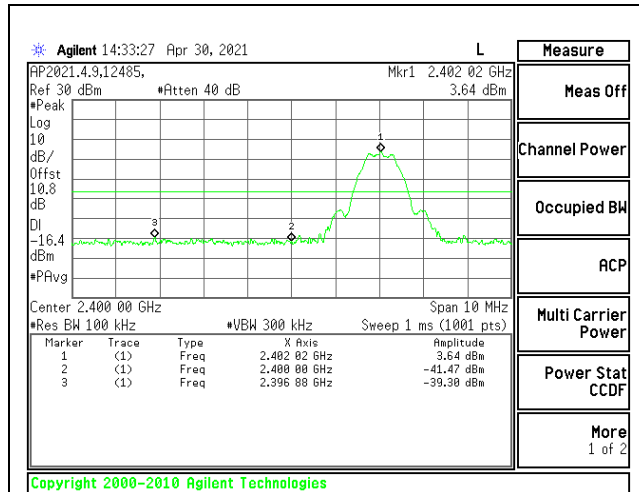
FCC §15.247 (d)

RSS-247 5.5

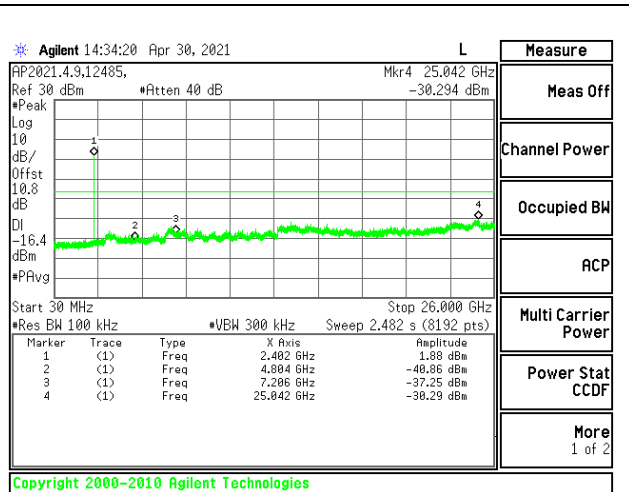
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dBc.

RESULTS

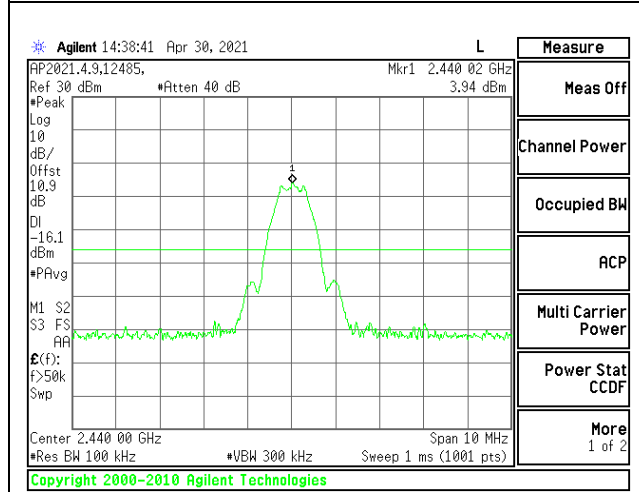
9.7.1. BLE (1Mbps)



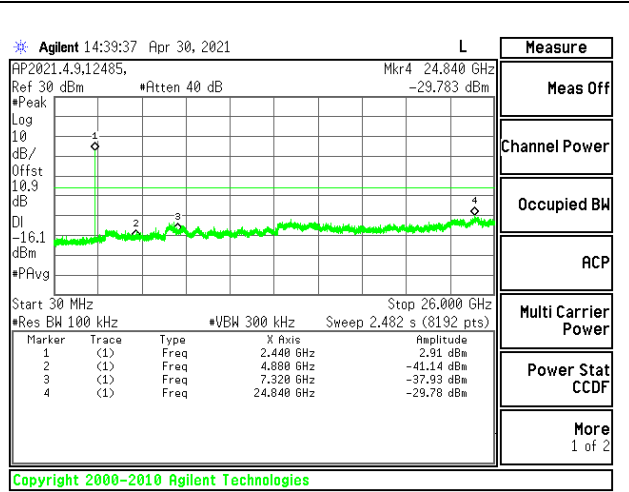
LOW CHANNEL BANDEDGE



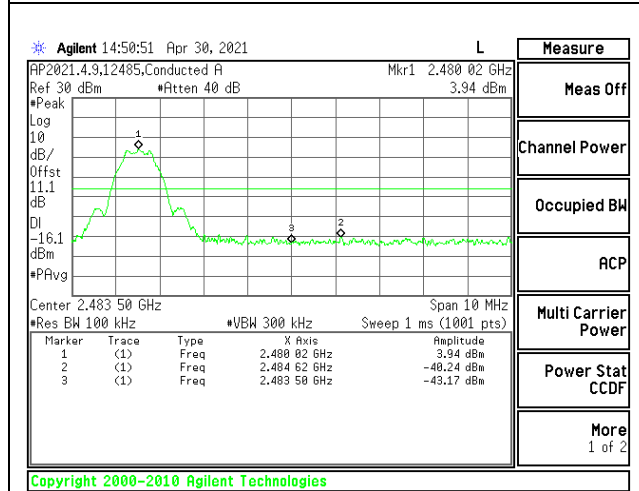
OUT-OF-BAND LOW CHANNEL



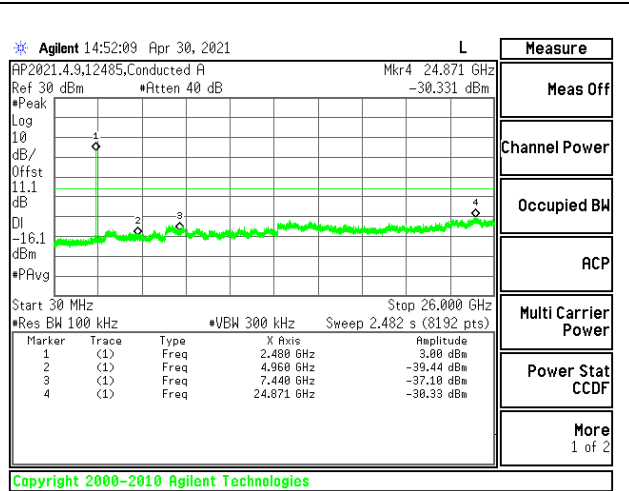
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

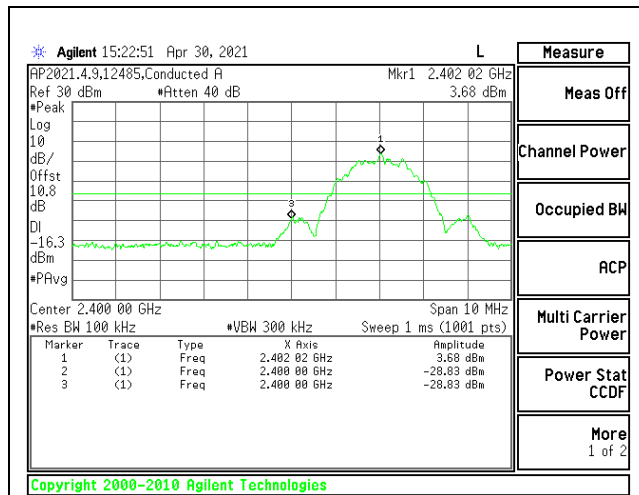


HIGH CHANNEL BANDEDGE

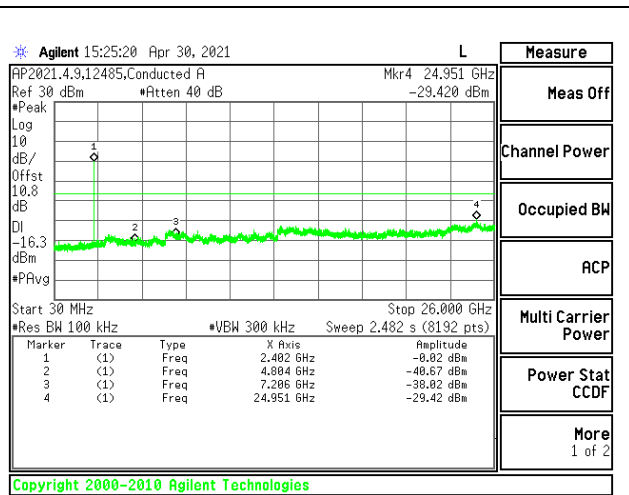


OUT-OF-BAND HIGH CHANNEL

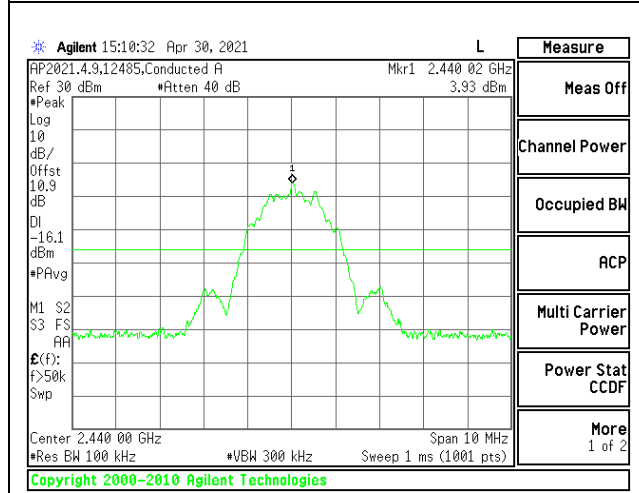
9.7.2. BLE (2Mbps)



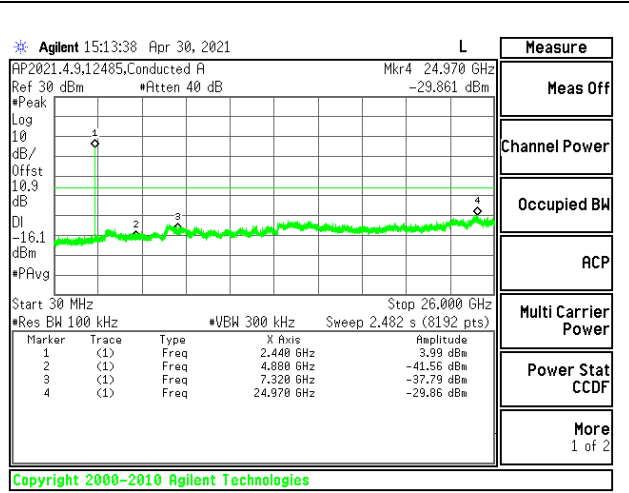
LOW CHANNEL BANDEGE



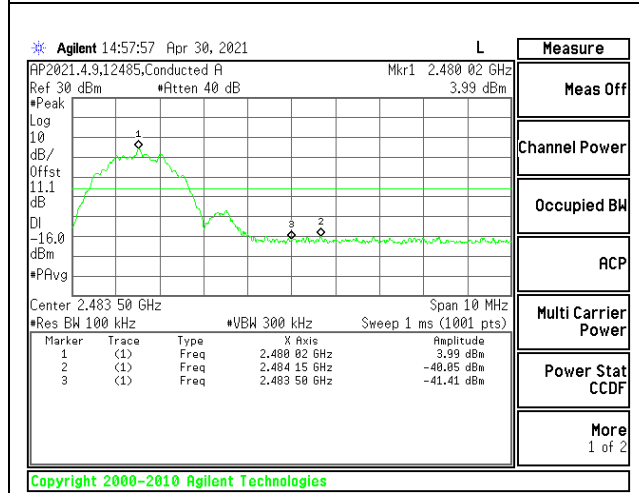
OUT-OF-BAND LOW CHANNEL



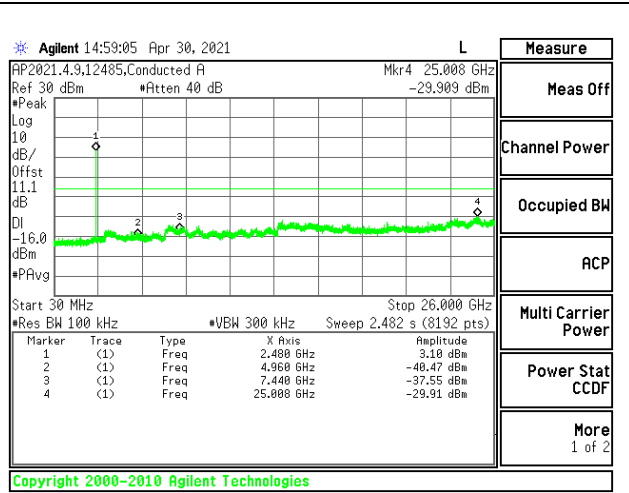
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEGE



OUT-OF-BAND HIGH CHANNEL

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

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

TEST PROCEDURE

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

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

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

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

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

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

2D antenna use - 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.

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. For example the measurement at frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to $Y - 51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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.

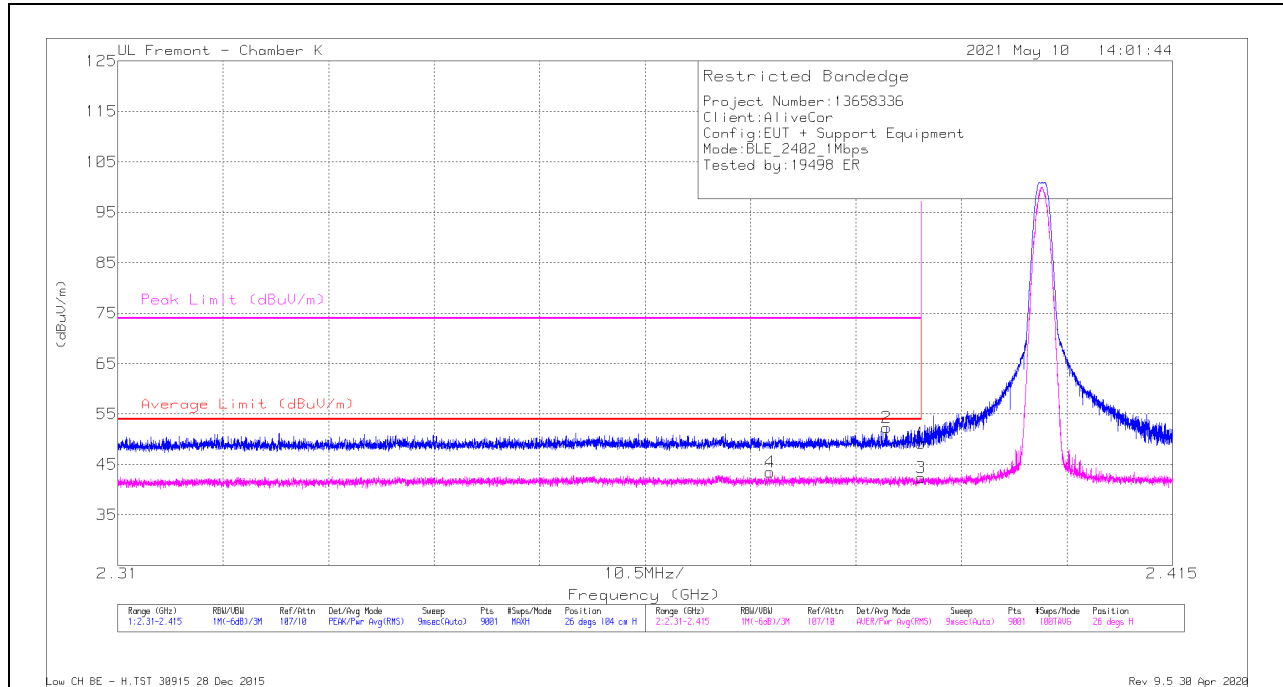
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

Antenna 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



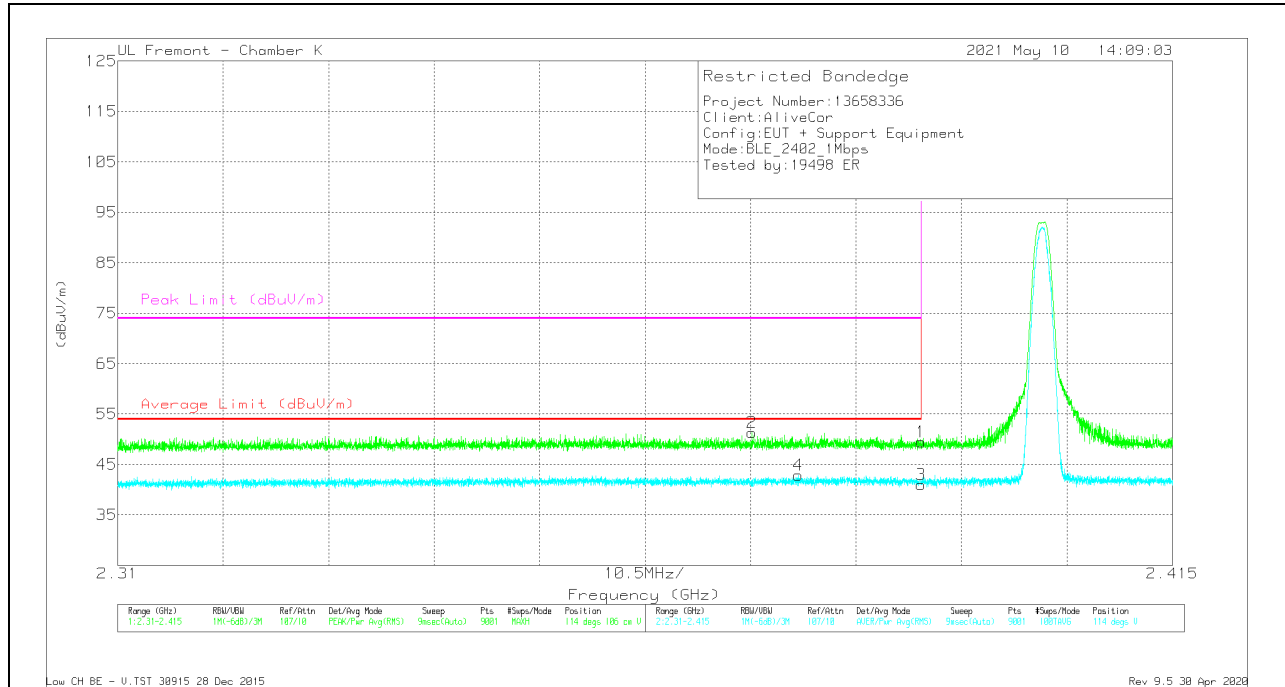
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AFT863 (dBm)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	51.17	Pk	32.4	-34.4	0	49.17	-	-	74	-24.83	26	104	H
2	* 2.38652	54.33	Pk	32.4	-34.4	0	52.33	-	-	74	-21.67	26	104	H
3	* 2.38999	41.24	RMS	32.4	-34.4	3.19	42.43	54	-11.57	-	-	26	104	H
4	* 2.37495	42.37	RMS	32.4	-34.5	3.19	43.46	54	-10.54	-	-	26	104	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT

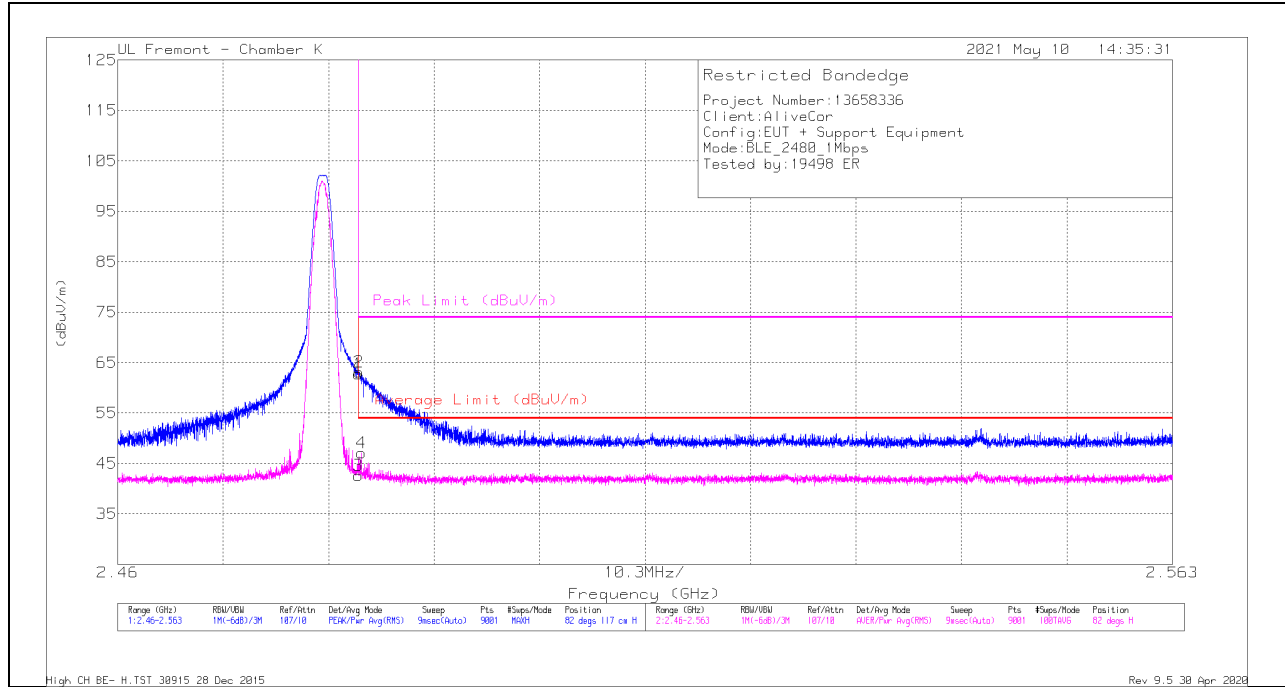


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Chl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	51.43	Pk	32.4	-34.4	0	49.43	-	-	74	-24.57	114	106	V
2	* 2.37314	53.4	Pk	32.4	-34.5	0	51.3	-	-	74	-22.7	114	106	V
3	* 2.38999	39.8	RMS	32.4	-34.4	3.19	40.99	54	-13.01	-	-	114	106	V
4	* 2.37775	41.76	RMS	32.4	-34.5	3.19	42.85	54	-11.15	-	-	114	106	V

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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

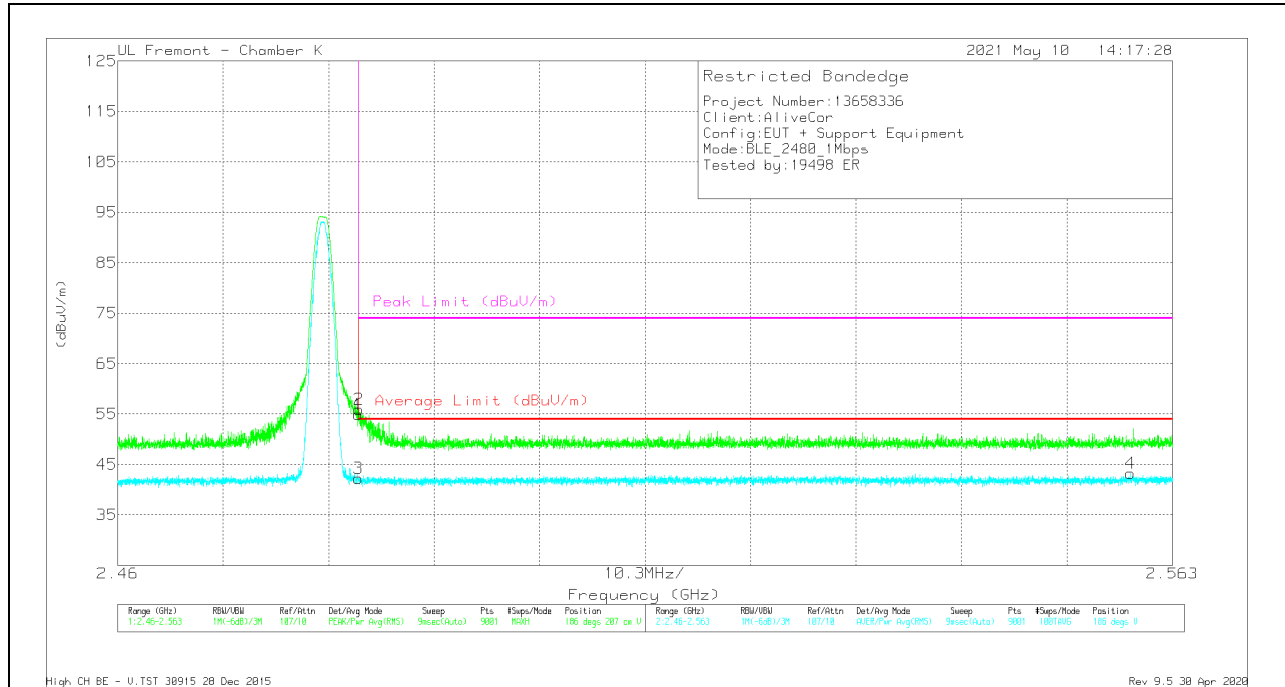


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	64.29	Pk	32.5	-34	0	62.79	-	-	74	-11.21	82	117	H
2	* 2.48357	64.64	Pk	32.5	-34	0	63.14	-	-	74	-10.86	82	117	H
3	* 2.48351	40.96	RMS	32.5	-34	3.19	42.65	54	-11.35	-	-	82	117	H
4	* 2.4838	45.39	RMS	32.5	-34	3.19	47.08	54	-6.92	-	-	82	117	H

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

Pk - Peak detector
 RMS - RMS detection

VERTICAL RESULT

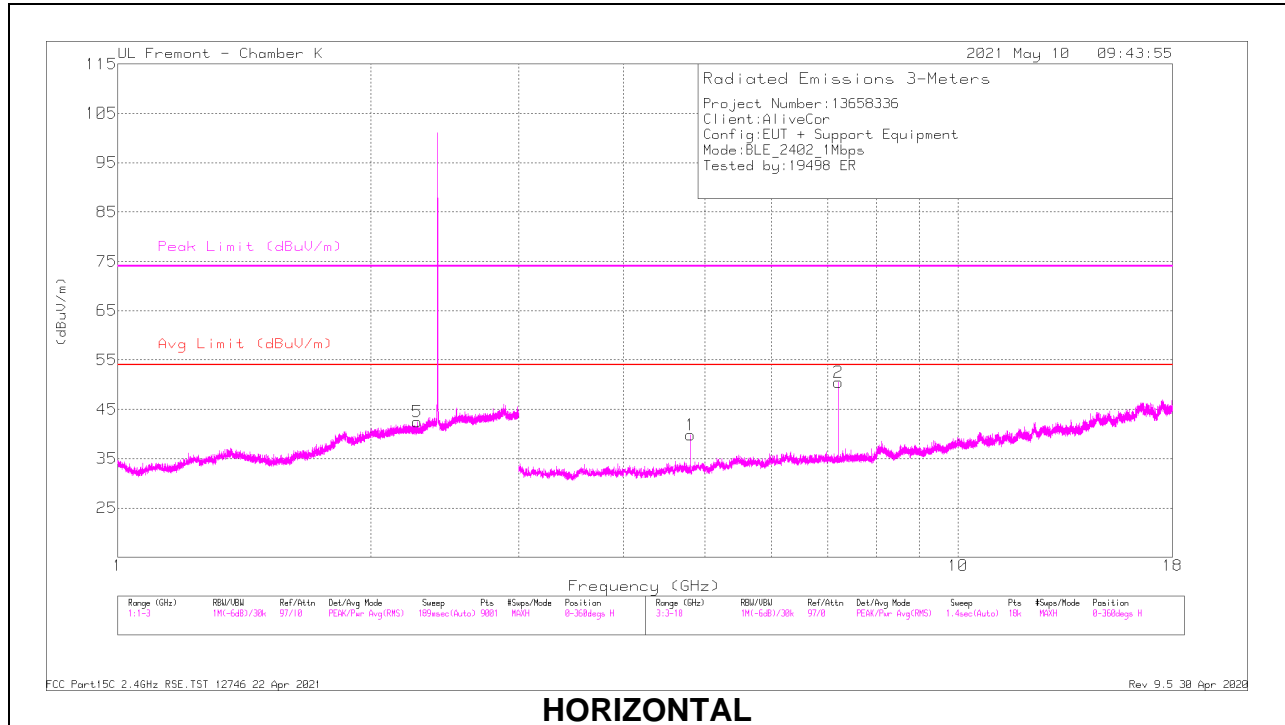


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Chl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	56.43	Pk	32.5	-34	0	54.93	-	-	74	-19.07	186	207	V
2	* 2.48359	57.44	Pk	32.5	-34	0	55.94	-	-	74	-18.06	186	207	V
3	* 2.48351	40.57	RMS	32.5	-34	3.19	42.26	54	-11.74	-	-	186	207	V
4	2.5589	41.16	RMS	32.7	-33.8	3.19	43.25	54	-10.75	-	-	186	207	V

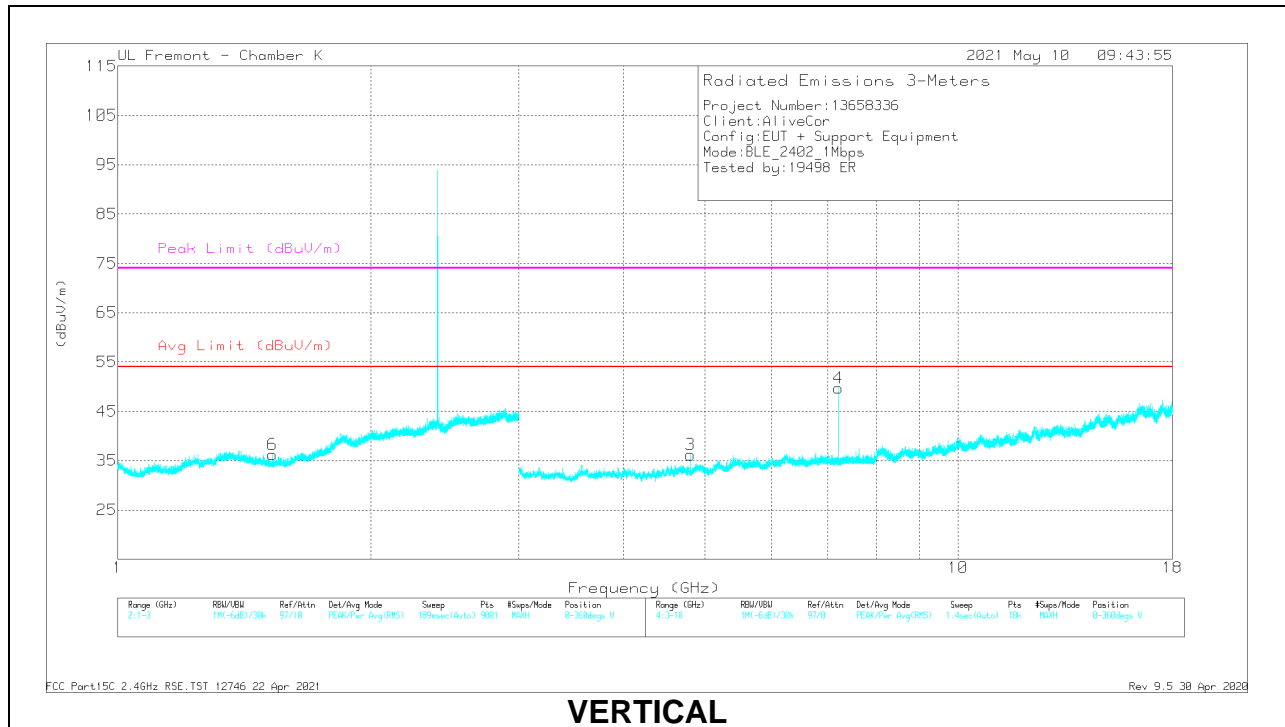
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



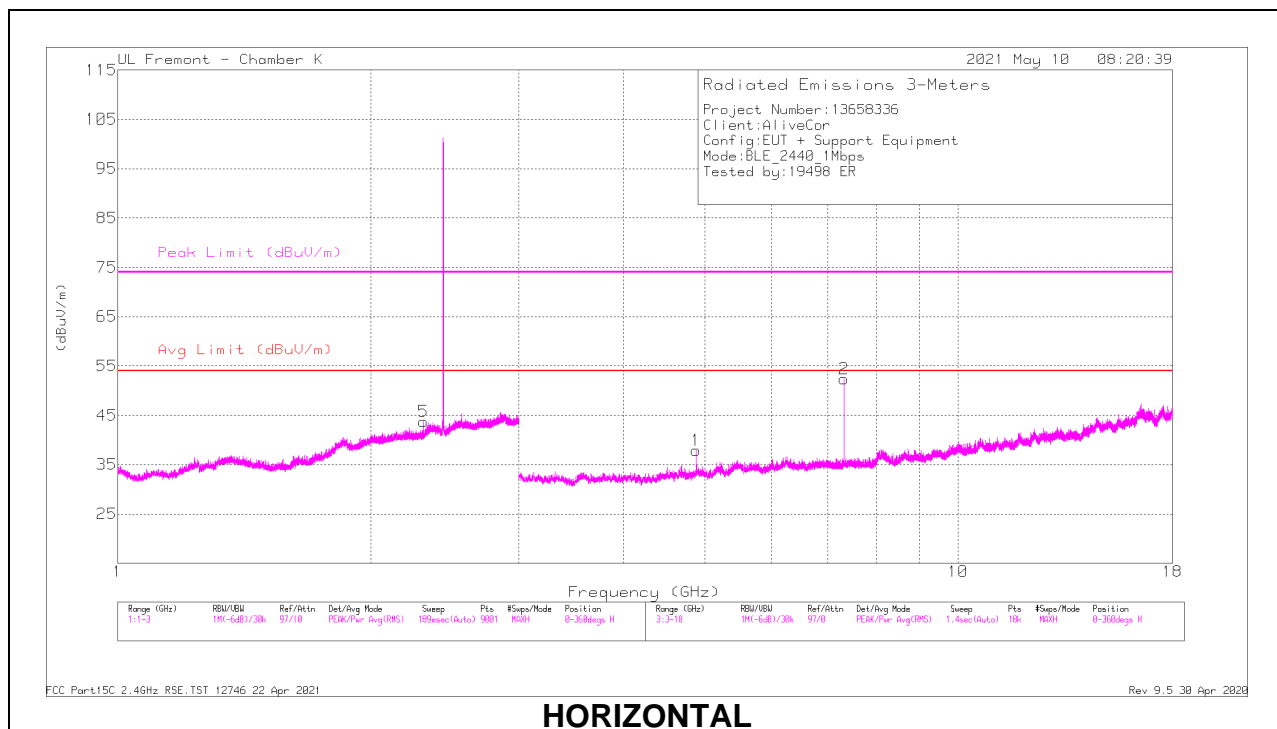
VERTICAL

RADIATED EMISSIONS

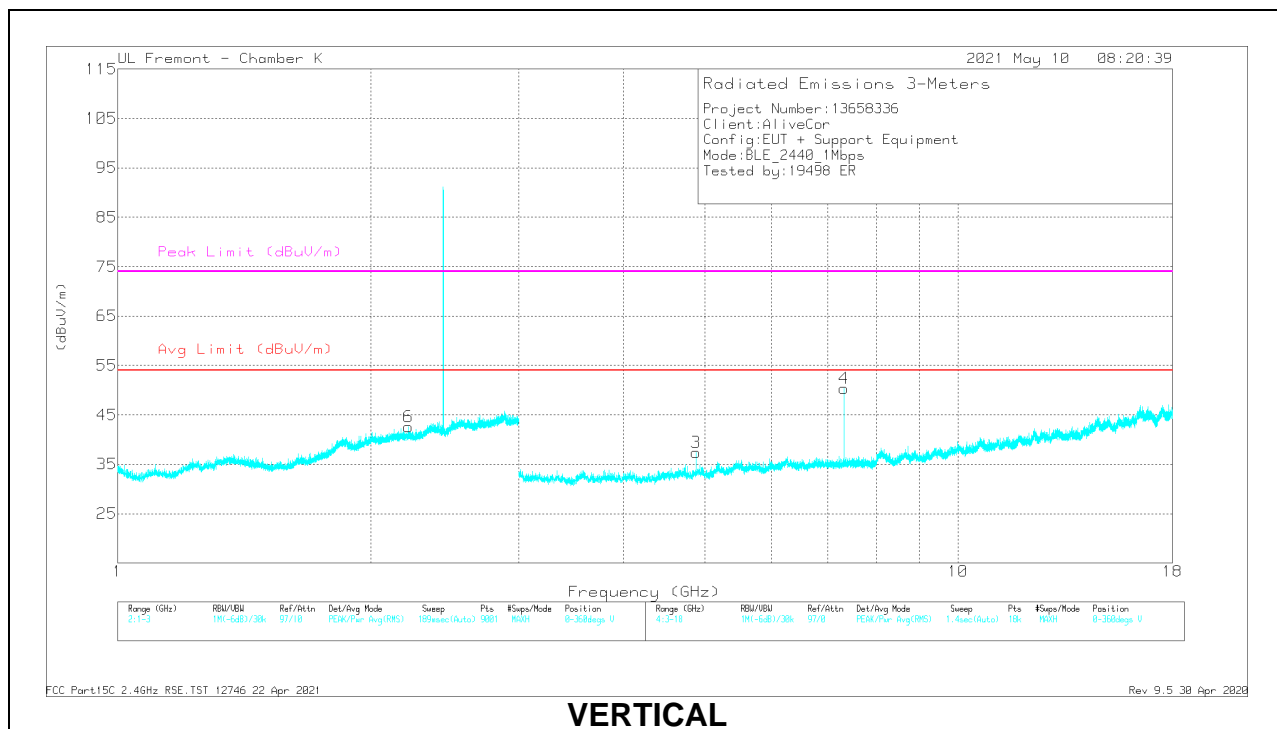
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 2.27437	31.77	PK2	31.6	-11.4	0	51.97	-	-	74	-22.03	39	303	H
	* 2.27375	20.97	MAv1	31.6	-11.4	3.19	44.36	54	-9.64	-	-	39	303	H
6	* 1.52815	28.13	PK2	27.5	-12.8	0	42.83	-	-	74	-31.17	332	381	V
	* 1.52956	17.15	MAv1	27.6	-12.8	3.19	35.14	54	-18.86	-	-	332	381	V
1	* 4.80357	51.18	PK2	34.4	-40	0	45.58	-	-	74	-28.42	106	315	H
	* 4.80393	37.65	MAv1	34.4	-40	3.19	35.24	54	-18.76	-	-	106	315	H
2	7.20536	57.97	PK2	36	-37.8	0	56.17	-	-	-	-	165	112	H
3	* 4.80343	47.87	PK2	34.4	-40	0	42.27	-	-	74	-31.73	183	246	V
	* 4.80261	35.56	MAv1	34.4	-40	3.19	33.15	54	-20.85	-	-	183	246	V
4	7.20675	55.54	PK2	36	-37.8	0	53.74	-	-	-	-	266	120	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

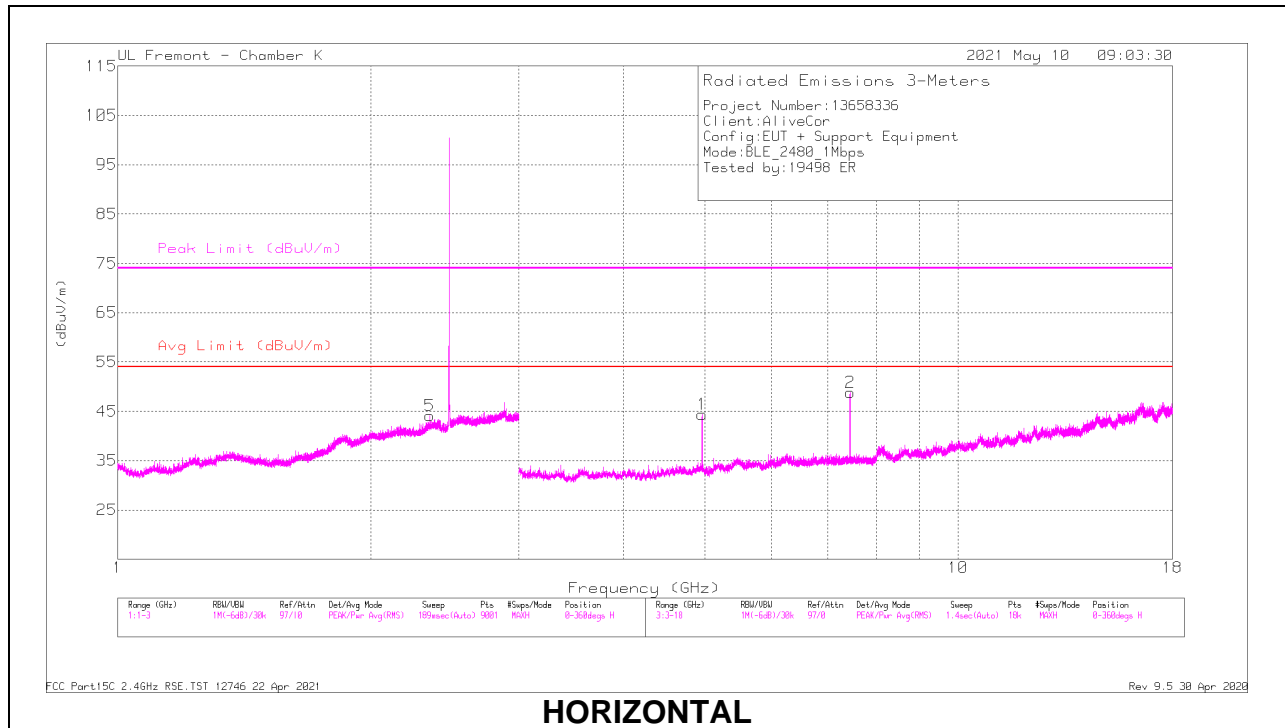
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 2.3122	32.01	PK2	31.9	-11.3	0	52.81	-	-	74	-21.39	201	289	H
	* 2.31196	20.78	MAv1	31.9	-11.3	3.19	44.57	54	-9.43	-	-	201	289	H
6	* 2.21626	28.51	PK2	31.9	-11.4	0	49.01	-	-	74	-24.99	24	100	V
	* 2.21596	18.07	MAv1	31.9	-11.4	3.19	41.76	54	-12.24	-	-	24	100	V
2	* 7.32083	59.75	PK2	36	-37.4	0	58.35	-	-	74	-15.65	162	124	H
	* 7.32051	43.29	MAv1	36	-37.4	3.19	45.08	54	-8.92	-	-	162	124	H
1	* 4.87999	51.24	PK2	34.4	-39.8	0	45.84	-	-	74	-28.16	292	108	H
	* 4.88024	37.41	MAv1	34.4	-39.8	3.19	35.2	54	-18.8	-	-	292	108	H
4	* 7.31931	56.86	PK2	36	-37.4	0	55.46	-	-	74	-18.54	265	96	V
	* 7.32065	42.16	MAv1	36	-37.4	3.19	43.95	54	-10.05	-	-	265	96	V
3	* 4.88008	54.13	PK2	34.4	-39.8	0	48.73	-	-	74	-25.27	299	98	V
	* 4.87997	41.75	MAv1	34.4	-39.8	3.19	39.54	54	-14.46	-	-	299	98	V

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

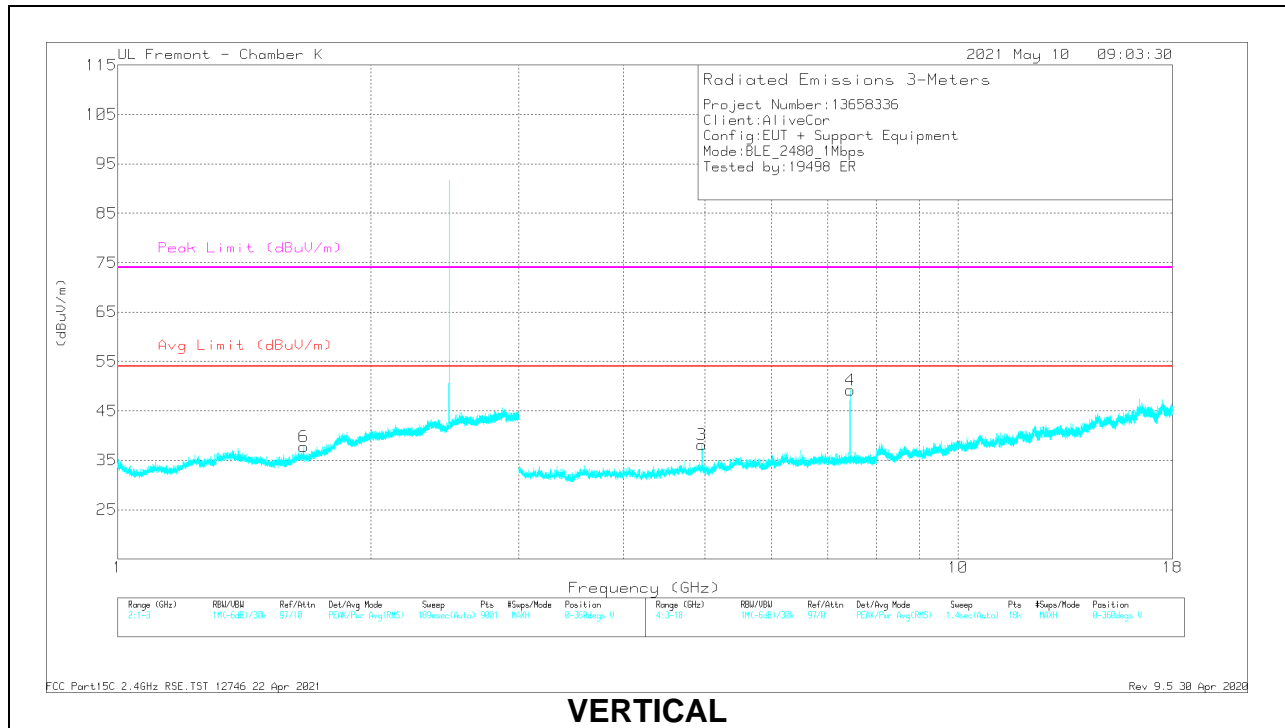
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/ 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
5	* 2.35228	30.96	PK2	32.4	-11.2	0	52.16	-	-	74	-21.84	76	103	H
	* 2.35196	18.9	MAv1	32.4	-11.2	3.19	43.29	54	-10.71	-	-	76	103	H
6	* 1.66506	27.59	PK2	28.9	-12.5	0	43.99	-	-	74	-30.01	346	260	V
	* 1.6672	16.77	MAv1	28.9	-12.5	3.19	36.36	54	-17.64	-	-	346	260	V
1	* 4.96056	52.91	PK2	34.3	-39.9	0	47.31	-	-	74	-26.69	288	104	H
	* 4.96014	39	MAv1	34.3	-39.9	3.19	36.59	54	-17.41	-	-	288	104	H
2	* 7.44082	58.81	PK2	36.1	-37.2	0	57.71	-	-	74	-16.29	164	112	H
	* 7.43955	42.74	MAv1	36.1	-37.2	3.19	44.83	54	-9.17	-	-	164	112	H
3	* 4.96009	55.23	PK2	34.3	-39.9	0	49.63	-	-	74	-24.37	145	354	V
	* 4.9597	44.59	MAv1	34.3	-39.9	3.19	42.18	54	-11.82	-	-	145	354	V
4	* 7.4408	56.3	PK2	36.1	-37.2	0	55.2	-	-	74	-18.8	259	97	V
	* 7.44061	39.29	MAv1	36.1	-37.2	3.19	41.38	54	-12.62	-	-	259	97	V

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

PK2 - KDB558074 Method: Maximum Peak

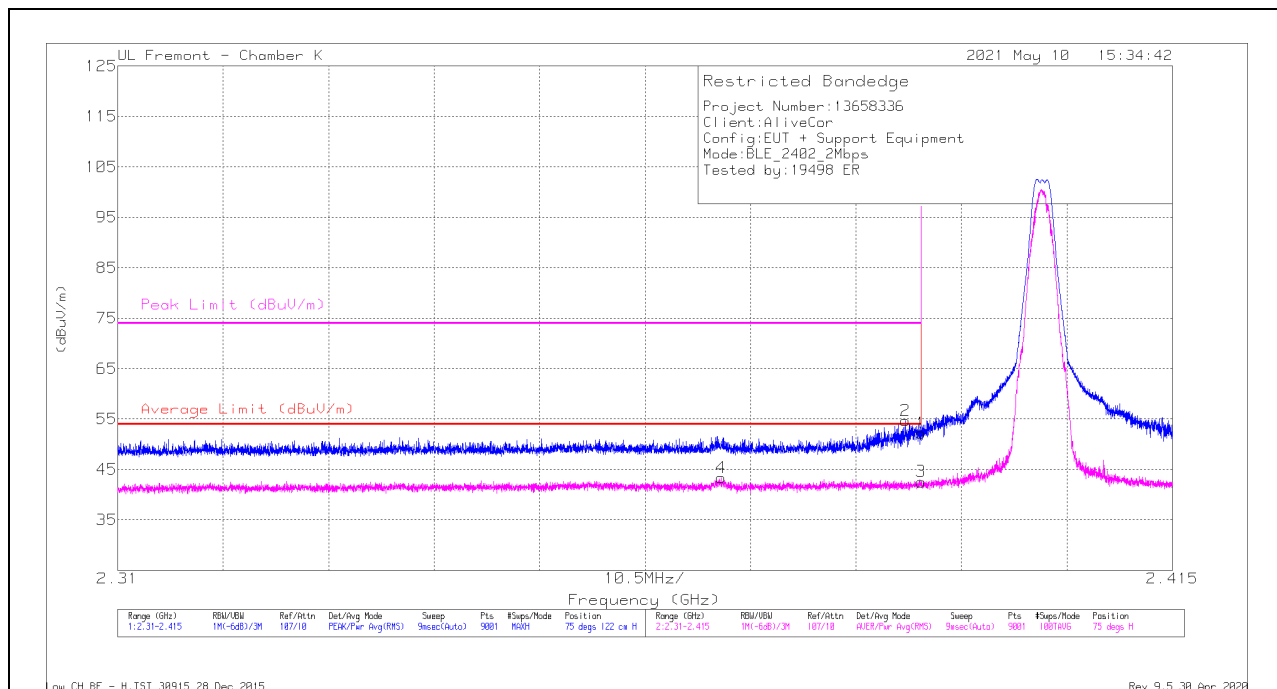
MAv1 - KDB558074 Option 1 Maximum RMS Average

10.2.2. BLE (2Mbps)

Antenna 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



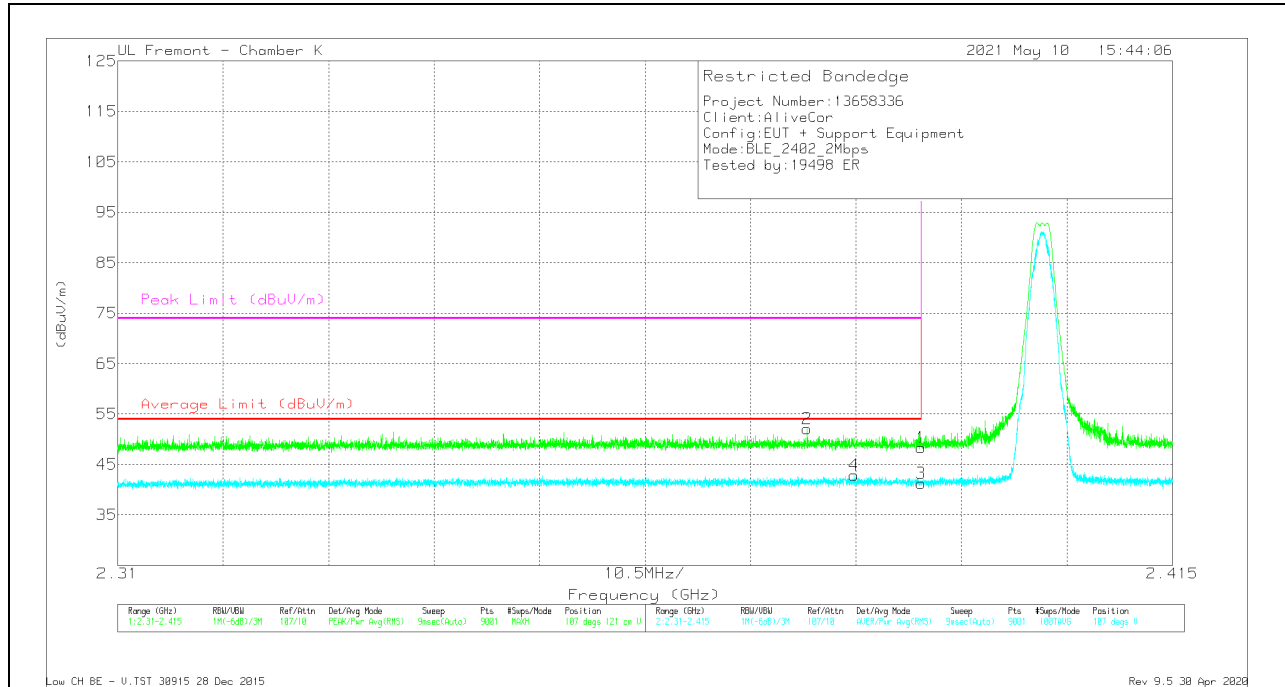
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dBm)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	54.25	Pk	32.4	-34.4	0	52.25	-	-	74	-21.75	75	122	H
2	* 2.38639	56.74	Pk	32.4	-34.4	0	54.74	-	-	74	-19.26	75	122	H
3	* 2.38999	41.49	RMS	32.4	-34.4	3.06	42.55	54	-11.45	-	-	75	122	H
4	* 2.3701	42.36	RMS	32.4	-34.5	3.06	43.32	54	-10.68	-	-	75	122	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT

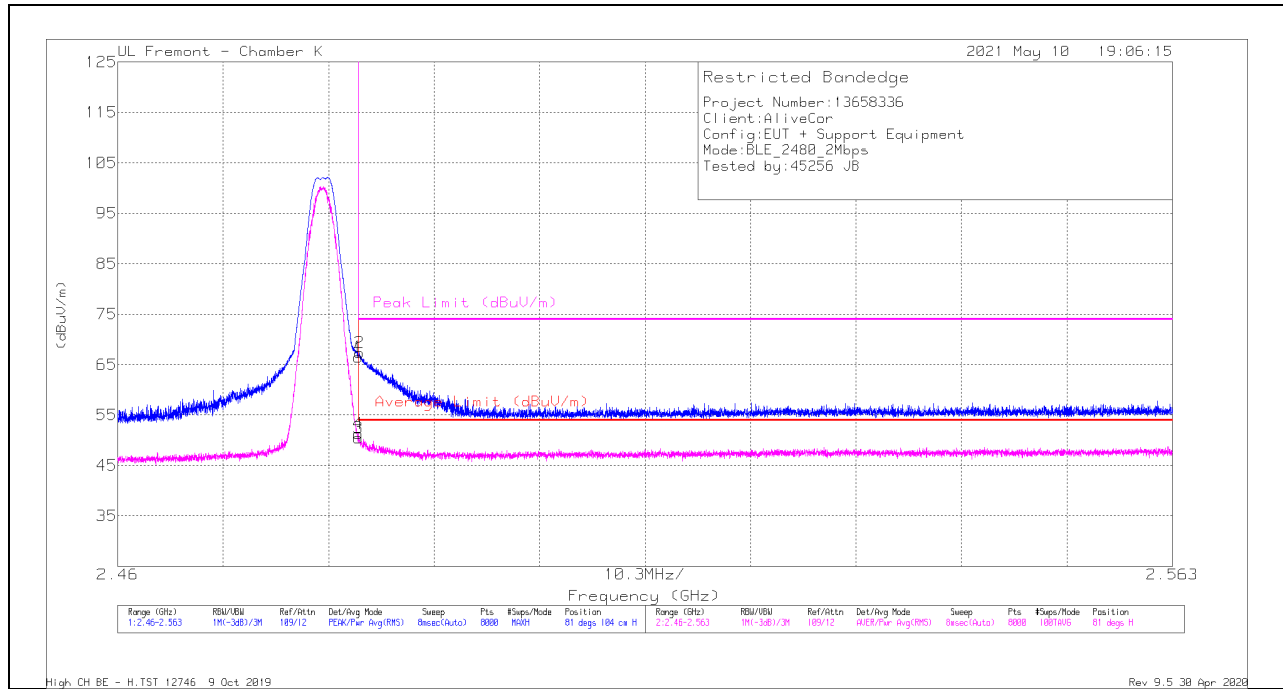


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Chl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	50.31	Pk	32.4	-34.4	0	48.31	-	-	74	-25.69	107	121	V
2	* 2.37864	54.14	Pk	32.4	-34.5	0	52.04	-	-	74	-21.96	107	121	V
3	* 2.38999	40.13	RMS	32.4	-34.4	3.06	41.19	54	-12.81	-	-	107	121	V
4	* 2.3833	41.77	RMS	32.4	-34.4	3.06	42.83	54	-11.17	-	-	107	121	V

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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



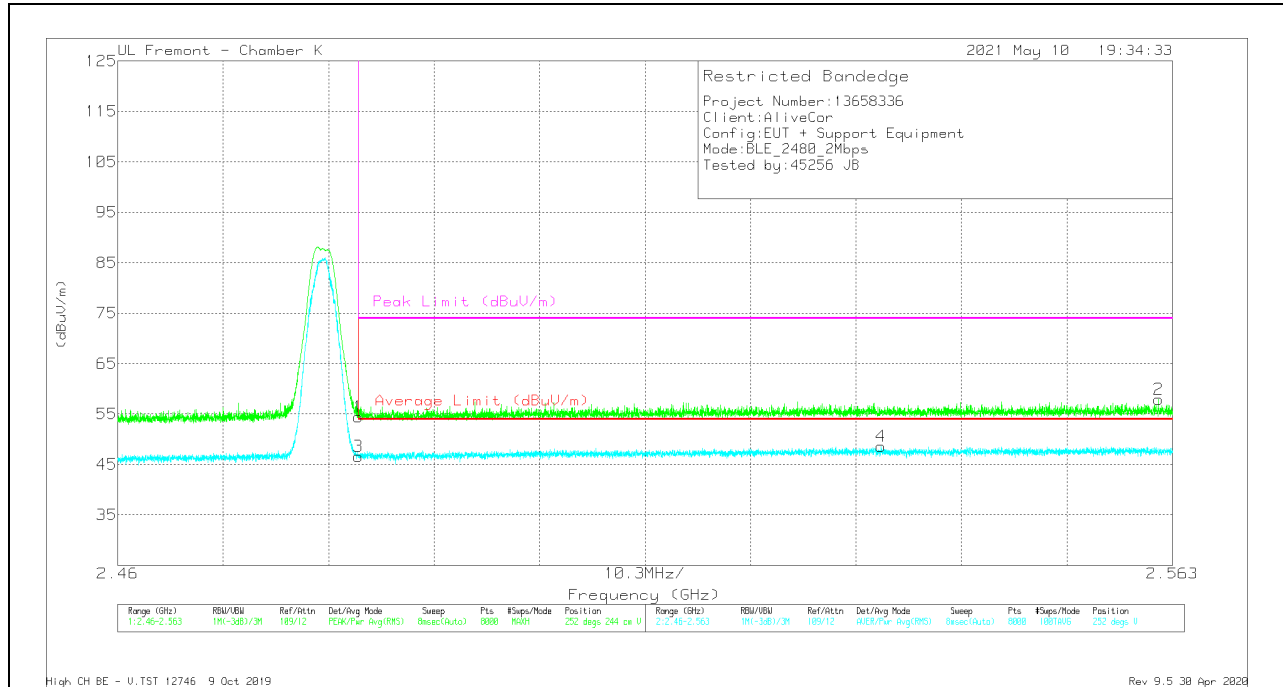
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	44.89	Pk	32.5	-10.9	0	66.49	-	-	74	-7.51	81	104	H
2	* 2.48364	45.78	Pk	32.5	-10.9	0	67.38	-	-	74	-6.62	81	104	H
3	* 2.4835	25.78	RMS	32.5	-10.9	3.06	50.44	54	-3.56	-	-	81	104	H
4	* 2.48351	26.68	RMS	32.5	-10.9	3.06	51.34	54	-2.66	-	-	81	104	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT

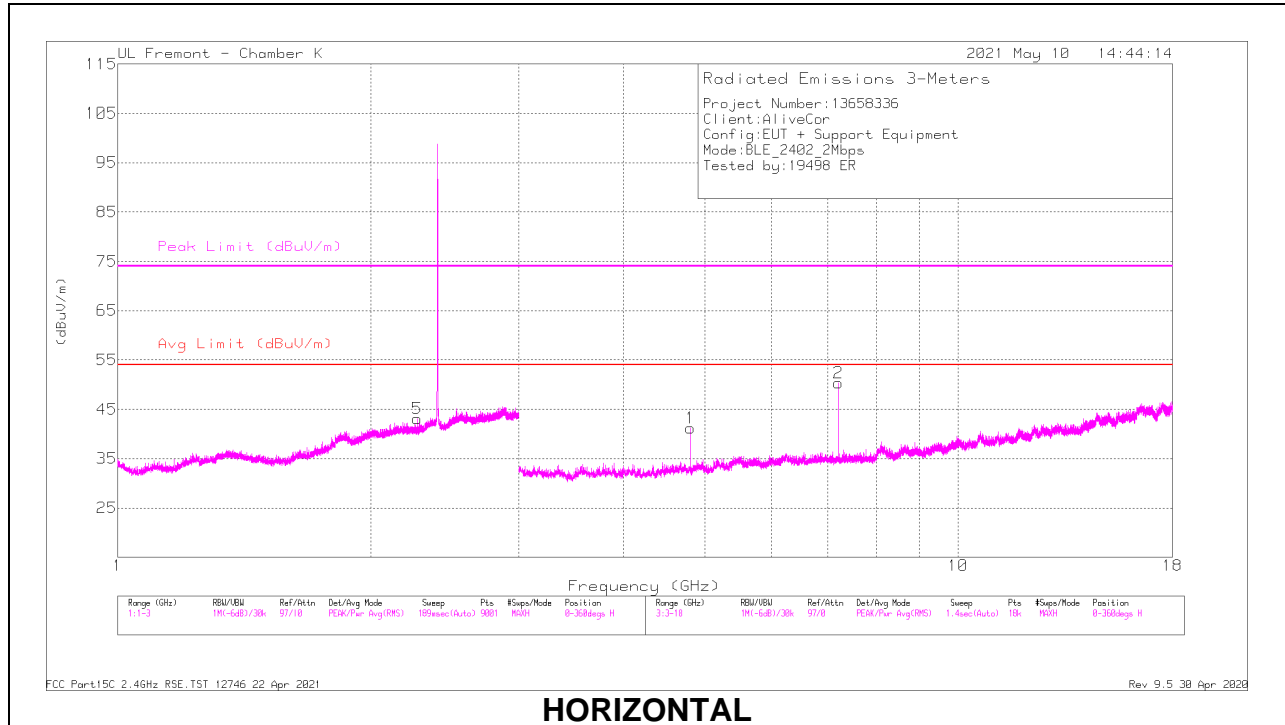


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	32.82	Pk	32.5	-10.9	0	54.42	-	-	74	-19.58	252	244	V
2	2.56165	35.73	Pk	32.7	-10.5	0	57.93	-	-	74	-16.07	252	244	V
3	* 2.4835	21.96	RMS	32.5	-10.9	3.06	46.62	54	-7.38	-	-	252	244	V
4	2.53456	23.53	RMS	32.7	-10.7	3.06	48.59	54	-5.41	-	-	252	244	V

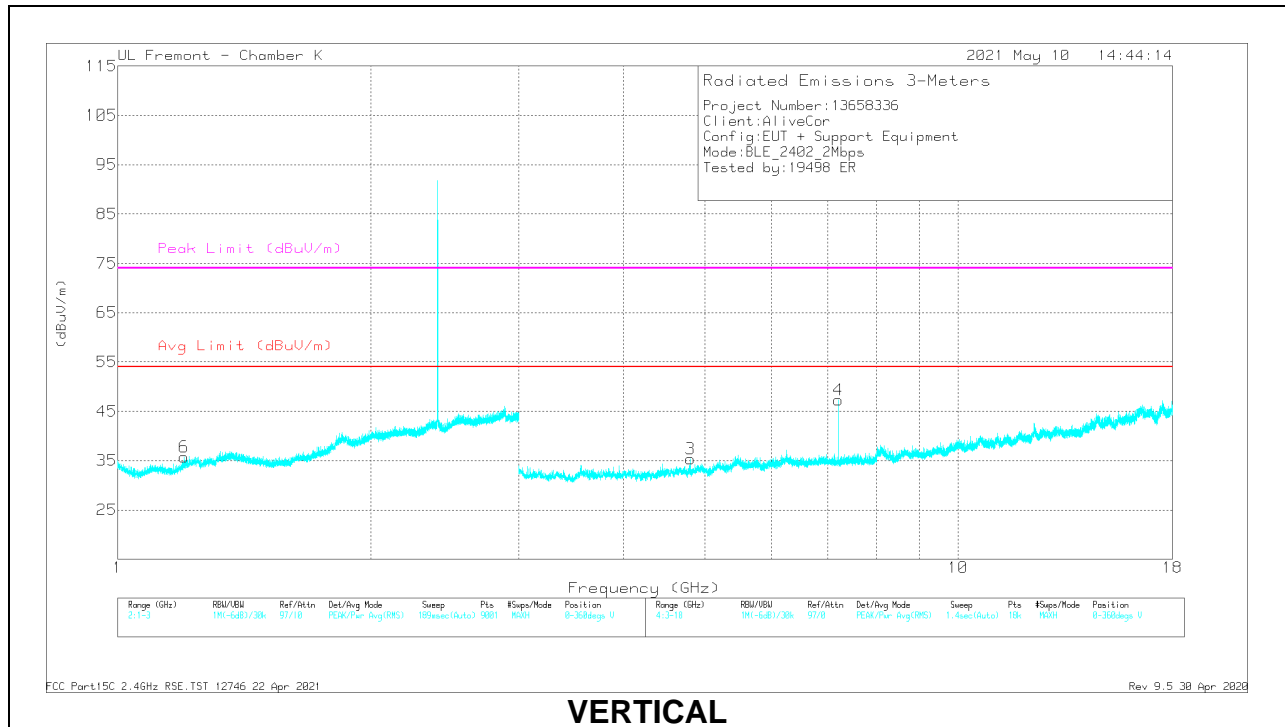
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



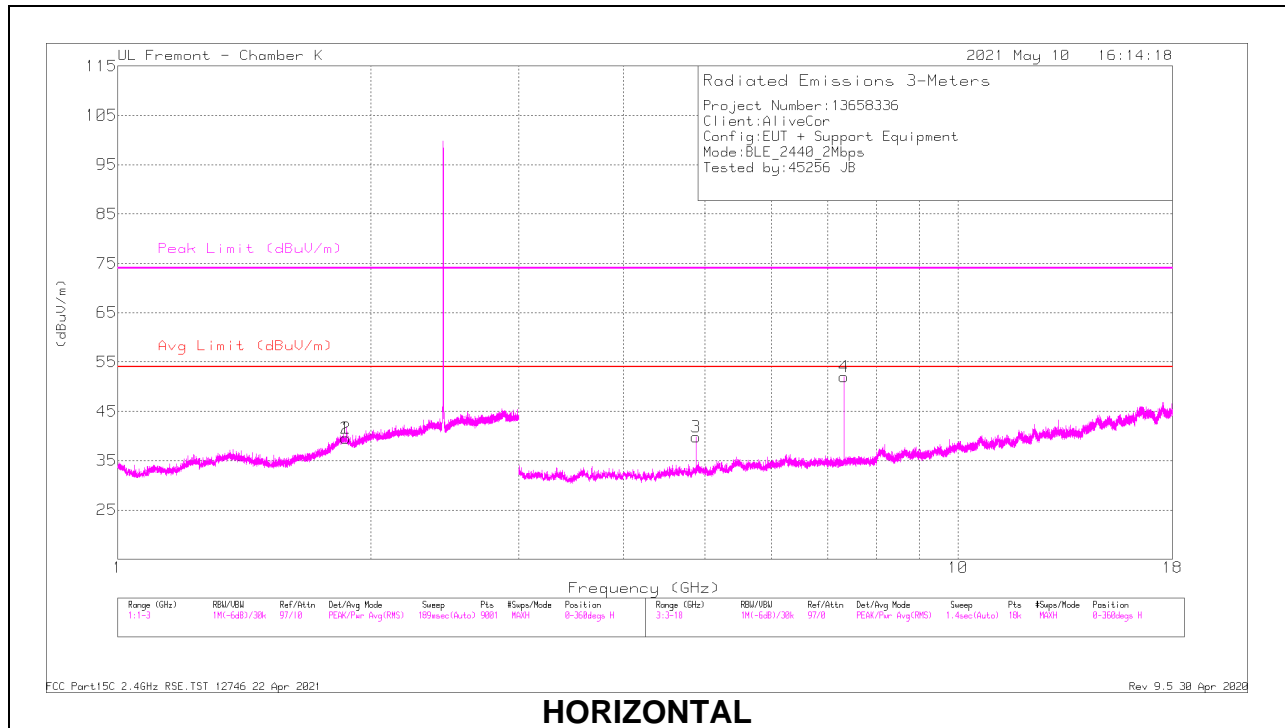
VERTICAL

RADIATED EMISSIONS

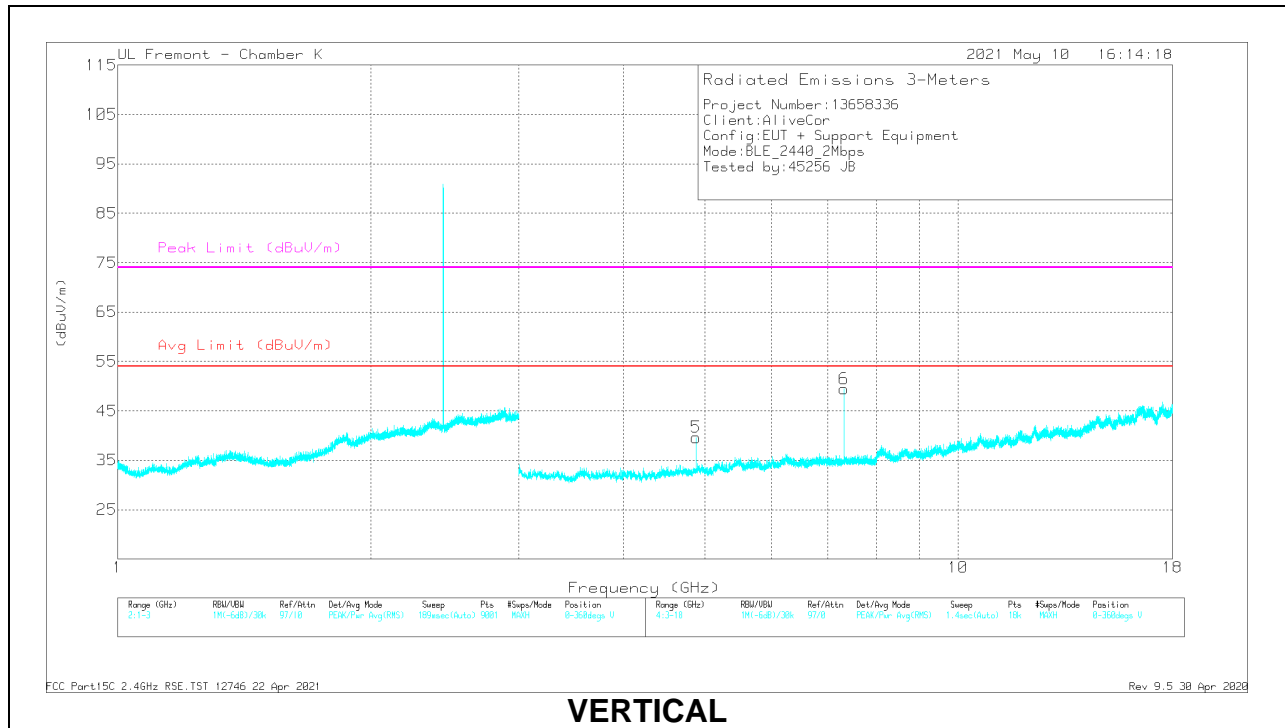
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 2.27382	30.14	PK2	31.6	-11.4	0	50.34	-	-	74	-23.66	203	216	H
	* 2.27371	18.67	MAv1	31.6	-11.4	3.06	41.93	54	-12.07	-	-	203	216	H
6	* 1.20155	27.35	PK2	28.4	-13.6	0	42.15	-	-	74	-31.85	10	176	V
	* 1.20025	16.41	MAv1	28.4	-13.6	3.06	34.27	54	-19.73	-	-	10	176	V
1	* 4.8049	50.91	PK2	34.3	-40	0	45.21	-	-	74	-28.79	105	282	H
	* 4.80427	38.67	MAv1	34.4	-40	3.06	36.13	54	-17.87	-	-	105	282	H
2	7.20754	56.67	PK2	36	-37.8	0	54.87	-	-	-	-	159	147	H
3	* 4.80426	50.72	PK2	34.4	-40	0	45.12	-	-	74	-28.88	174	175	V
	* 4.80403	38.73	MAv1	34.4	-40	3.06	36.19	54	-17.81	-	-	174	175	V
4	7.20463	55.58	PK2	36	-37.8	0	53.78	-	-	-	-	267	104	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

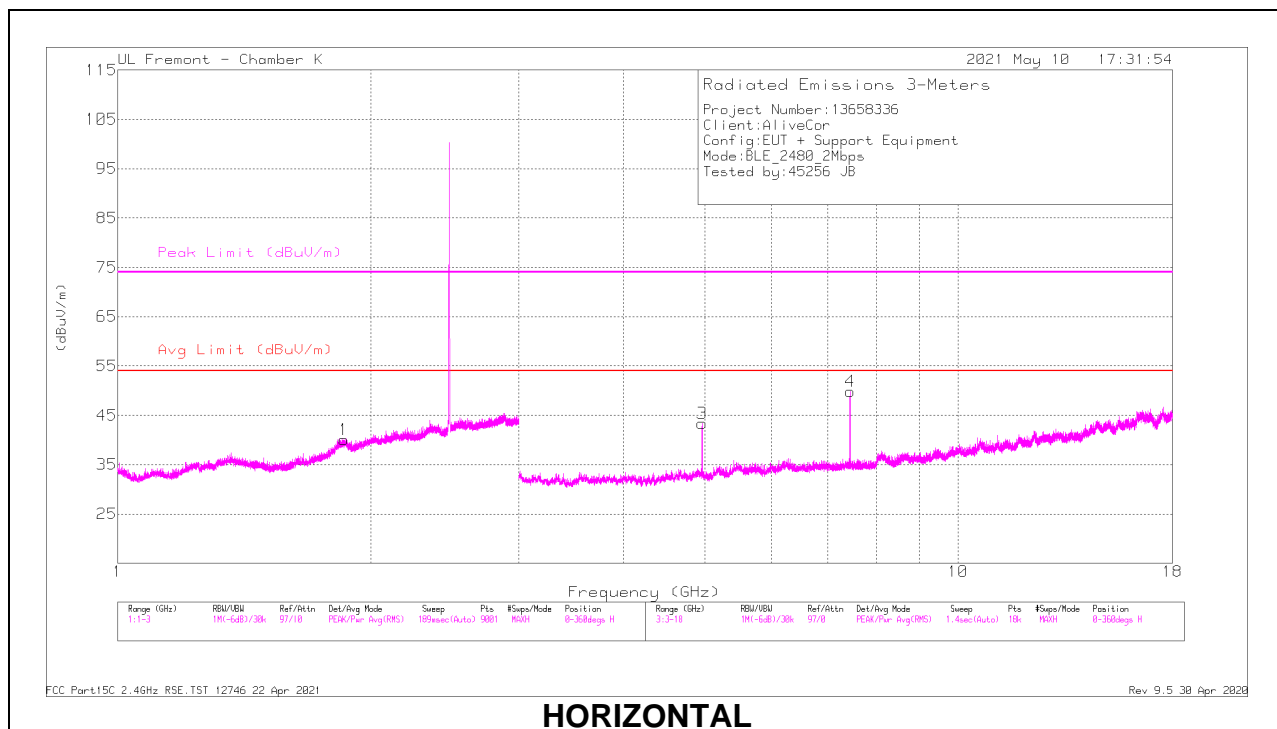
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 4.88104	50.73	PK2	34.3	-39.8	0	45.23	-	-	74	-28.77	293	401	H
	* 4.88064	38.25	MAv1	34.4	-39.8	3.06	35.91	54	-18.09	-	-	293	401	H
4	* 7.31863	59.35	PK2	36	-37.4	0	57.95	-	-	74	-16.05	165	105	H
	* 7.31886	45.37	MAv1	36	-37.4	3.06	47.03	54	-6.97	-	-	165	105	H
5	* 4.8801	48.97	PK2	34.4	-39.8	0	43.57	-	-	74	-30.43	225	374	V
	* 4.87908	36.49	MAv1	34.4	-39.9	3.06	34.05	54	-19.95	-	-	225	374	V
6	* 7.31852	56.28	PK2	36	-37.4	0	54.88	-	-	74	-19.12	266	100	V
	* 7.31895	43.02	MAv1	36	-37.4	3.06	44.68	54	-9.32	-	-	266	100	V

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

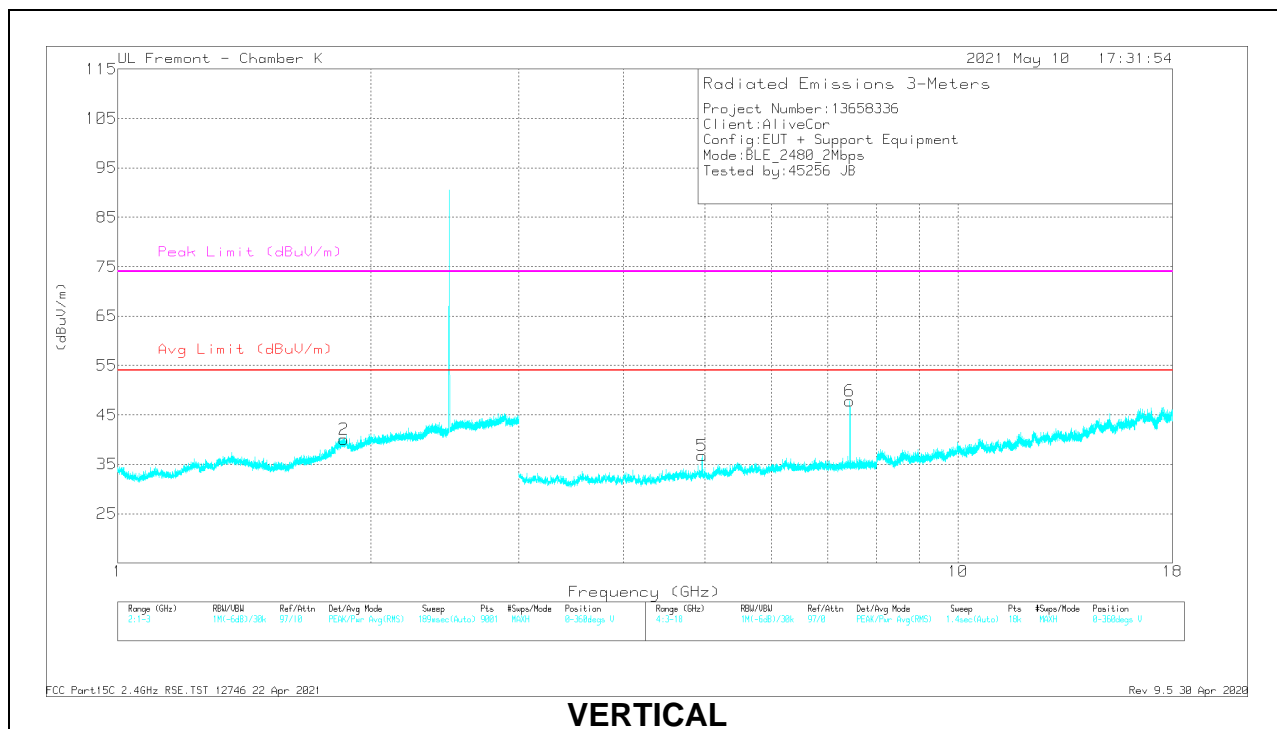
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

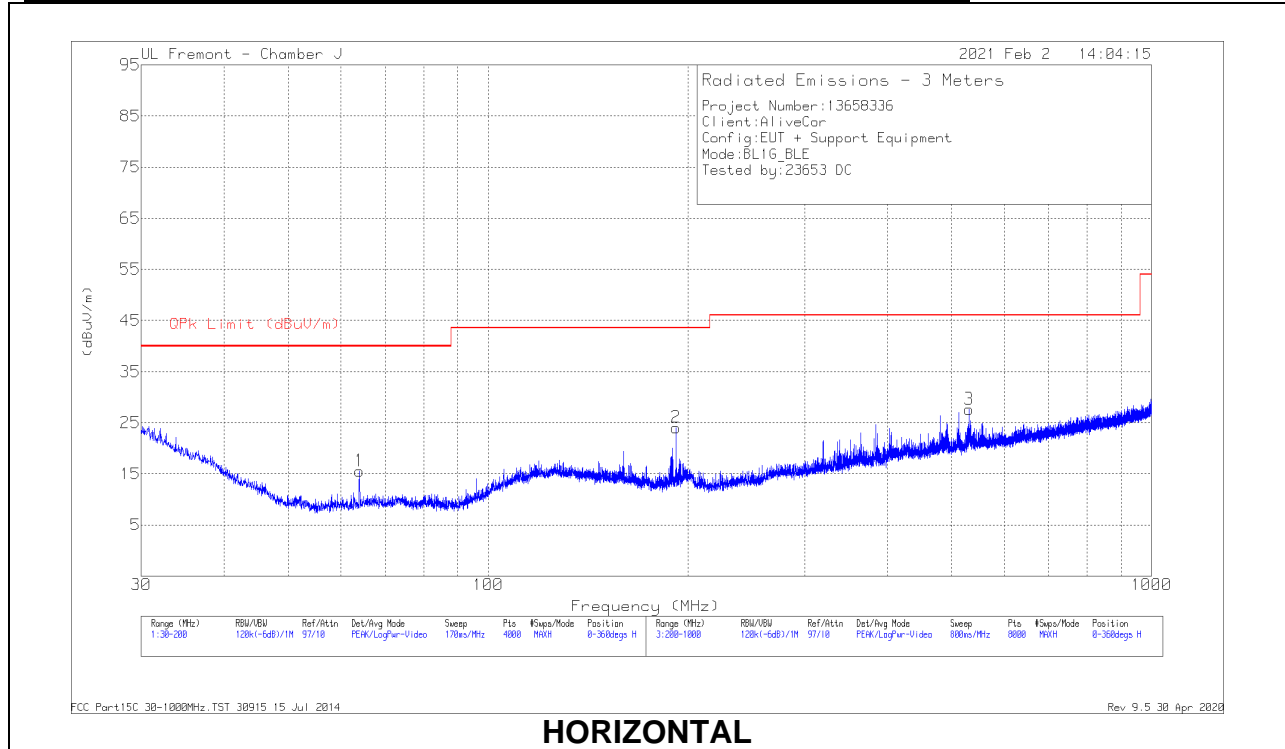
RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/ 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	1.85955	21.36	Pk	30.8	-12.1	0	40.06	-	-	-	-	0-360	200	H
2	1.85978	21.37	Pk	30.8	-12.1	0	40.07	-	-	-	-	0-360	100	V
3	* 4.95988	53	PK2	34.3	-39.9	0	47.4	-	-	74	-26.6	292	96	H
	* 4.96096	39.26	MAv1	34.3	-39.9	3.06	36.72	54	-17.28	-	-	292	96	H
4	* 7.44148	58.55	PK2	36.1	-37.1	0	57.55	-	-	74	-16.45	160	125	H
	* 7.43908	46.47	MAV1	36.1	-37.2	3.06	48.43	54	-5.57	-	-	160	125	H
5	* 4.95914	51.63	PK2	34.3	-39.9	0	46.03	-	-	74	-27.97	297	96	V
	* 4.95978	39.13	MAV1	34.3	-39.9	3.06	36.59	54	-17.41	-	-	297	96	V
6	* 7.4386	52.76	PK2	36.1	-37.2	0	51.66	-	-	74	-22.34	248	213	V
	* 7.43908	39.5	MAV1	36.1	-37.2	3.06	41.46	54	-12.54	-	-	248	213	V

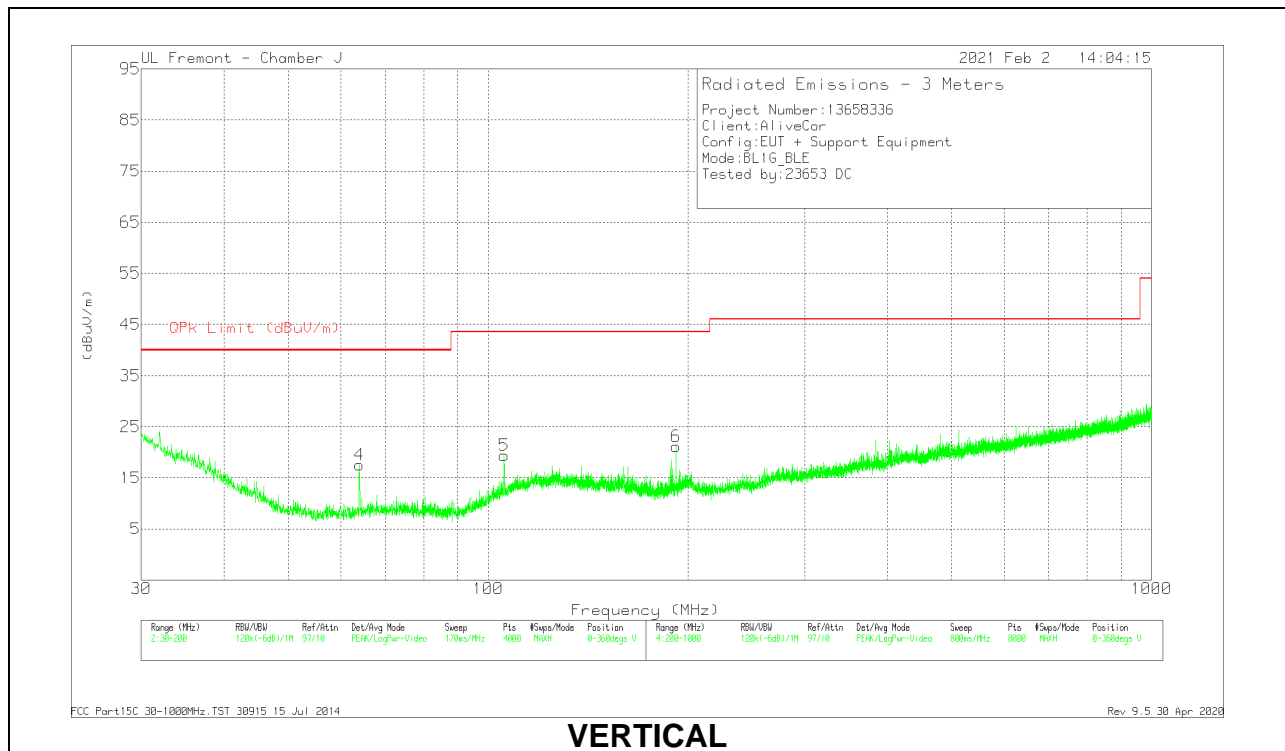
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 MAV1 - KDB558074 Option 1 Maximum RMS Average

10.3. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



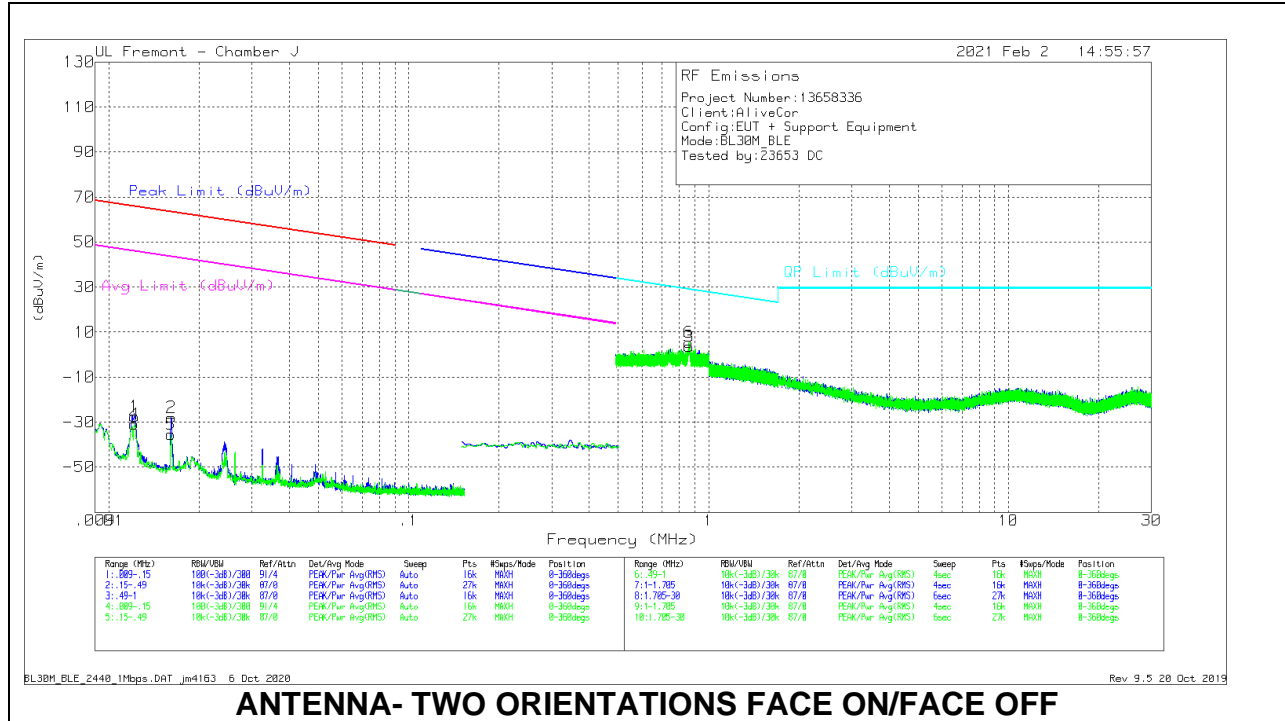
VERTICAL

Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0184052 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	64.0088	32.98	Pk	13.9	-31.3	15.58	40	-24.42	0-360	293	H
2	192.0094	36.87	Pk	17.7	-30.5	24.07	43.52	-19.45	0-360	196	H
4	64.0088	34.91	Pk	13.9	-31.3	17.51	40	-22.49	0-360	100	V
5	105.7546	32.6	Pk	17.7	-30.9	19.4	43.52	-24.12	0-360	100	V
6	192.0094	33.92	Pk	17.7	-30.5	21.12	43.52	-22.4	0-360	100	V
3	531.143	32.72	Pk	24.2	-29.3	27.62	46.02	-18.4	0-360	199	H

10.4. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

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)	Azimuth (Degs)
1	.01218	21.21	Pk	59.8	-28.5	-80	-27.49	65.87	-93.36	45.87	-73.36	0-360
2	.01615	21.29	Pk	59.3	-28.5	-80	-27.91	63.42	-91.33	43.42	-71.33	0-360
4	.01215	17.95	Pk	59.8	-28.5	-80	-30.75	65.89	-96.64	45.89	-76.64	0-360
5	.01613	13.74	Pk	59.3	-28.5	-80	-35.46	63.43	-98.89	43.43	-78.89	0-360

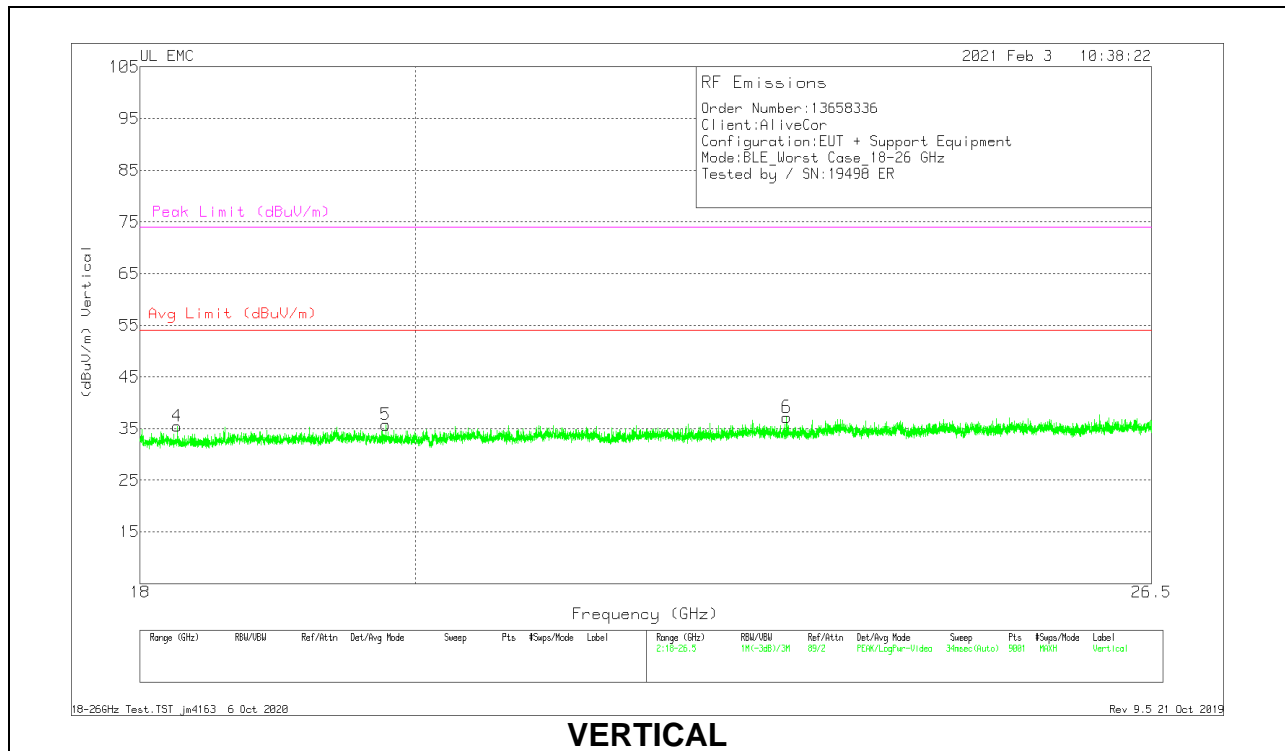
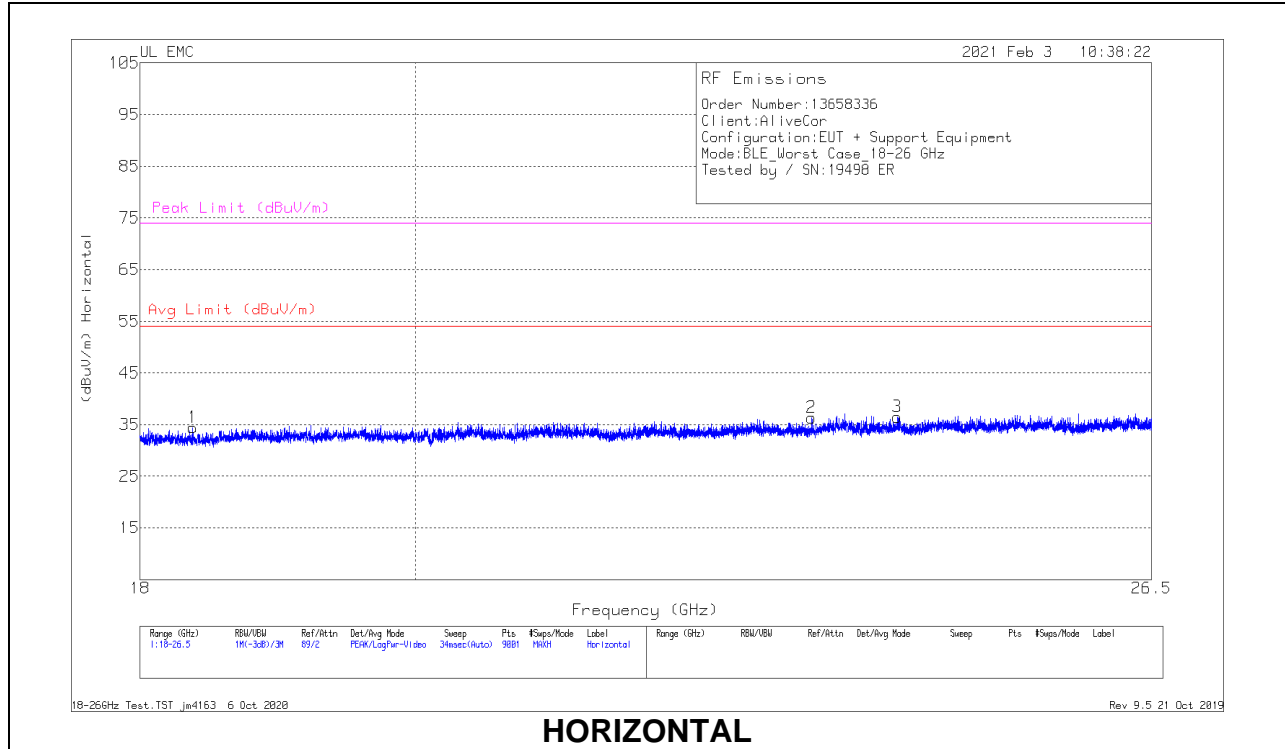
Pk - Peak detector

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	.86051	16.03	Pk	56	-28.4	-40	3.63	28.92	-25.29	0-360
6	.85922	17.8	Pk	56	-28.4	-40	5.4	28.94	-23.54	0-360

Pk - Peak detector

10.5. WORST CASE 18-26 GHZ

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



18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T447 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.3655	70.94	Pk	32.3	-59.3	-9.5	34.44	54	-19.56	74	-39.56
2	23.26905	69.2	Pk	33.8	-57.2	-9.5	36.3	54	-17.7	74	-37.7
3	24.04444	68.18	Pk	34.3	-56.5	-9.5	36.48	54	-17.52	74	-37.52
4	18.25689	72.59	Pk	32.3	-59.9	-9.5	35.49	54	-18.51	74	-38.51
5	19.77367	69.33	Pk	32.8	-56.9	-9.5	35.73	54	-18.27	74	-38.27
6	23.04805	70.29	Pk	33.8	-57.4	-9.5	37.19	54	-16.81	74	-36.81