



TEST REPORT

Report Number. : 13171837-E3V2

Applicant : Samsung Electronics Co., Ltd.
129 Samsung-Ro, Yeongtong-Gu,
Suwon-Si, Gyeonggi-Do, 16677, Korea

Model : SM-A515U, SM-A515U1, SM-A515W and SM-S515DL

FCC ID : A3LSMA515U

ISED : 649E-SMA515W

EUT Description : GSM/CDMA/WCDMA/LTE Phablet with BT/BLE,DTS/UNII
a/b/g/n/ac, NFC and ANT+

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

Date Of Issue:
February 28, 2020

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	1/14/2020	Initial Issue	
V2	2/28/2020	Updated Section 2	Steven Tran

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Samsung Electronics Co., Ltd.
129 Samsung-Ro, Yeongtong-Gu,
Suwon-Si, Gyeonggi-Do, 16677, Korea

EUT DESCRIPTION: GSM/CDMA/WCDMA/LTE Phablet with BT/BLE,DTS/UNII
a/b/g/n/ac, NFC and ANT+

MODEL: SM-A515U, SM-A515U1, SM-A515W and SM-S515DL

SERIAL NUMBER: Radiated: R38MB0B5P8X
Conducted: R38MB0B5QVN

DATE TESTED: DECEMBER 30, 2019 – JANUARY 03, 2020

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

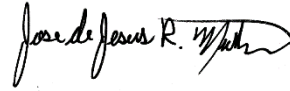
This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This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

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2. 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, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Rd
☐ Chamber A	☐ Chamber D	☐ Chamber I
☐ Chamber B	☐ Chamber E	☒ Chamber J
☐ Chamber C	☐ Chamber F	☒ Chamber K
	☐ Chamber G	☐ Chamber L
	☐ Chamber H	☐ Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code: 2324A.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. 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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

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

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a GSM/CDMA/WCDMA/LTE Phablet with BT/BLE, DTS/UNII a/b/g/n/ac, NFC and ANT+.

The model SM-A515U was used for final testing and is representative of the test results in this report.

5.2. 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	6.93	4.93

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -1.1 dBi.

Note: Antenna 1 = Chain 0.

5.4. SOFTWARE

The test utility software used during testing was A515U.001.

5.5. 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 Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

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

BLE mode: 1Mbps

BLE mode: 2Mbps

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	EP-TA200	R37KBKLF1W1DK3	N/A
Earphone	Samsung	N/A	N/A	N/A

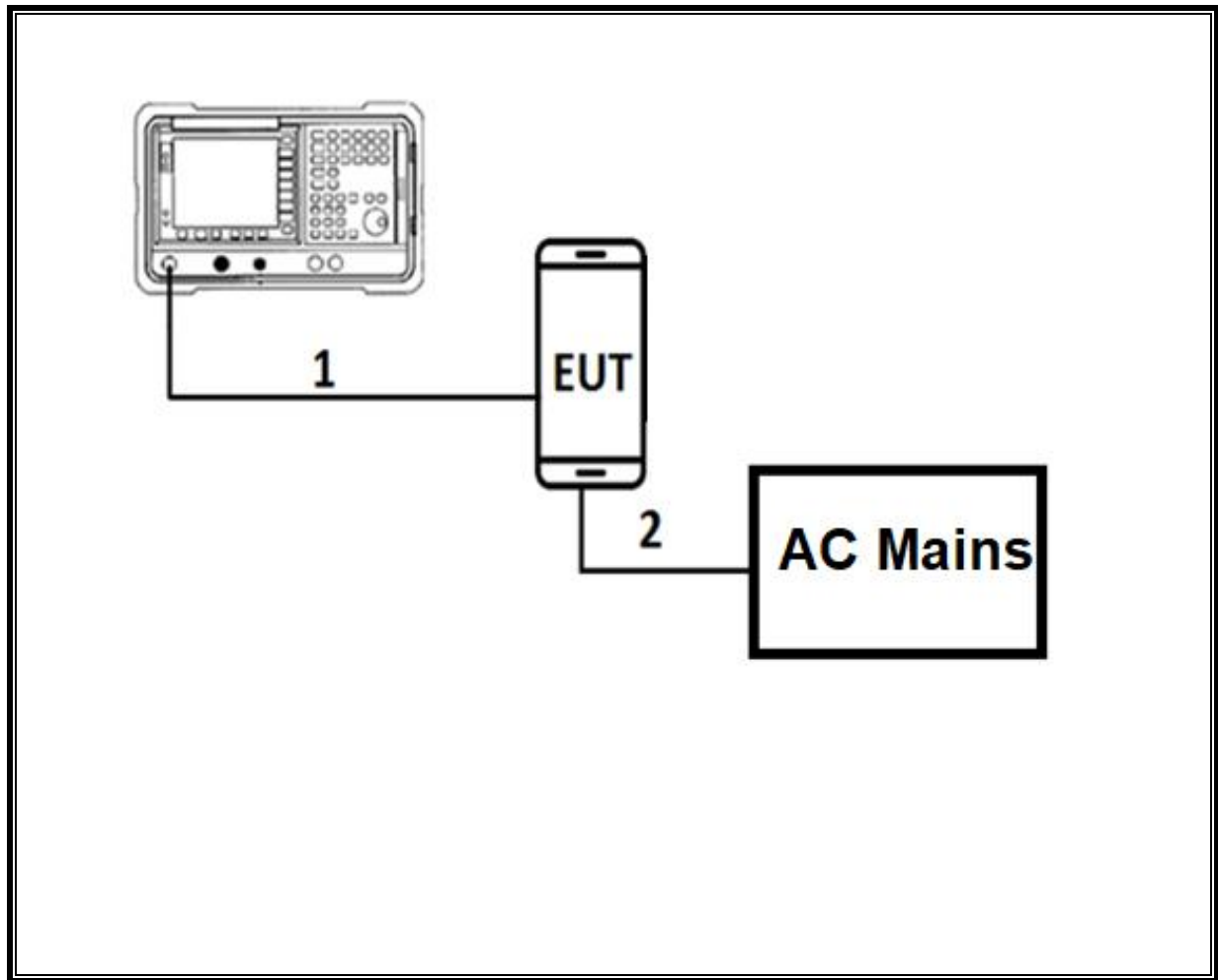
I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	RF	Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Un-shielded	1	EUT to AC Mains

I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	Shielded	1	N/A
2	Earphone	1	3.5mm	Un-shielded	1	N/A

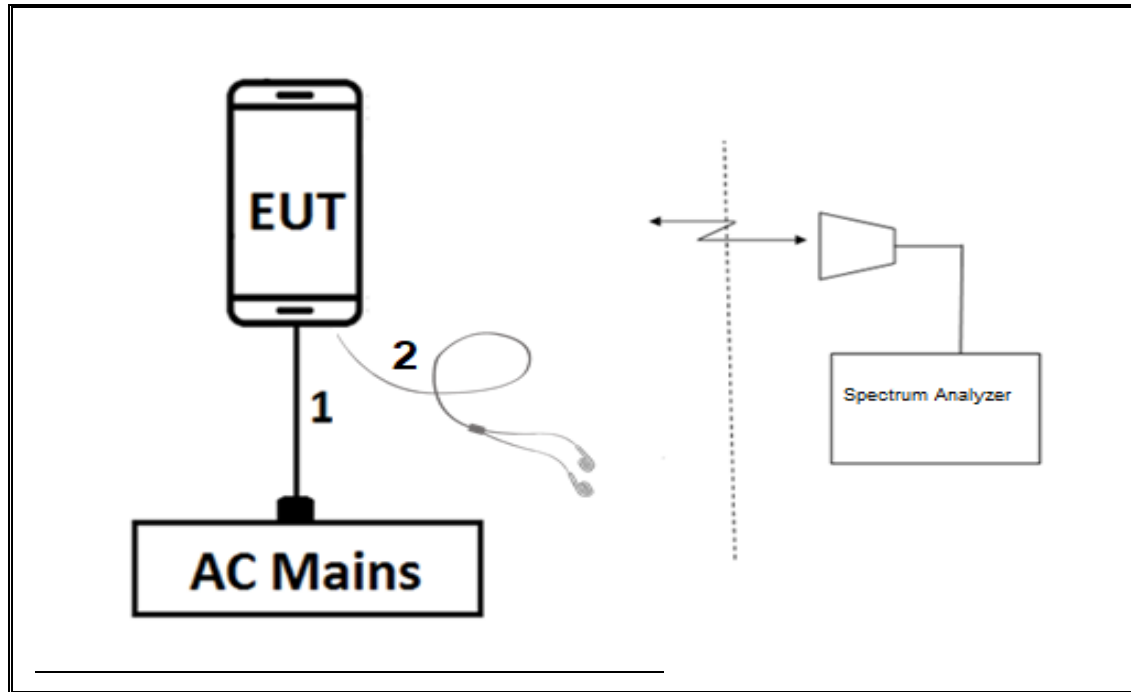
CONDUCTED TEST SETUP DIAGRAM



TEST SETUP

For conducted tests: the EUT was stand alone. The test software exercises the radio.

RADIATED AND AC LINE CONDUCTED EMISSIONS SETUP DIAGRAM



TEST SETUP

For radiated tests: EUT is connected to earphone. The test software exercises the radio.

6. MEASUREMENT METHOD

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

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

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

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

Output Power: ANSI C63.10 Section -11.9.2.3.2 Method 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

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

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

7. 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	Asset	Cal Due
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179367	05/16/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T344	05/07/2020
Amplifier, 1 to 18GHz, 35dB	AMPLICAL	AMP1G18-35	T1571	05/28/2020
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T899	08/23/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0180174	06/01/2020
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179372	02/16/2020
Antenna	ETS-Lindgren	3117	EMC4294	06/14/2020
Amplifier, 1 to 18GHz, 35dB	AMPLICAL	AMP1G18-35	T1569	06/04/2020
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	PRE0179466	05/31/2020
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	PRE0179468	05/31/2020
Antenna Horn, 18 to 26.5GHz	ARA	MWH-1826/B	T447	08/13/2020
Pre-Amp 1-26.5 GHz	AMPLICAL	AMP18G26.5-60	PRE0181238	05/01/2020
Filter, HPF 3.0GHz	MICRO-TRONICS	HPM17543	171901	05/28/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies (Formerly Agilent)	N9030A	T917	01/24/2020
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T229	01/31/2020
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1226	02/06/2020
AC Line Conducted				
EMI Receiver	Rohde & Schwarz	ESR	T1436	02/14/2020
LISN for Conducted Emissions CISPR-16	FCC INC.	FCC LISN 50/250	T1310	01/24/2020
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, Sep 24, 2019	
Antenna Port Software	UL	UL RF	Ver 2019.11.13	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

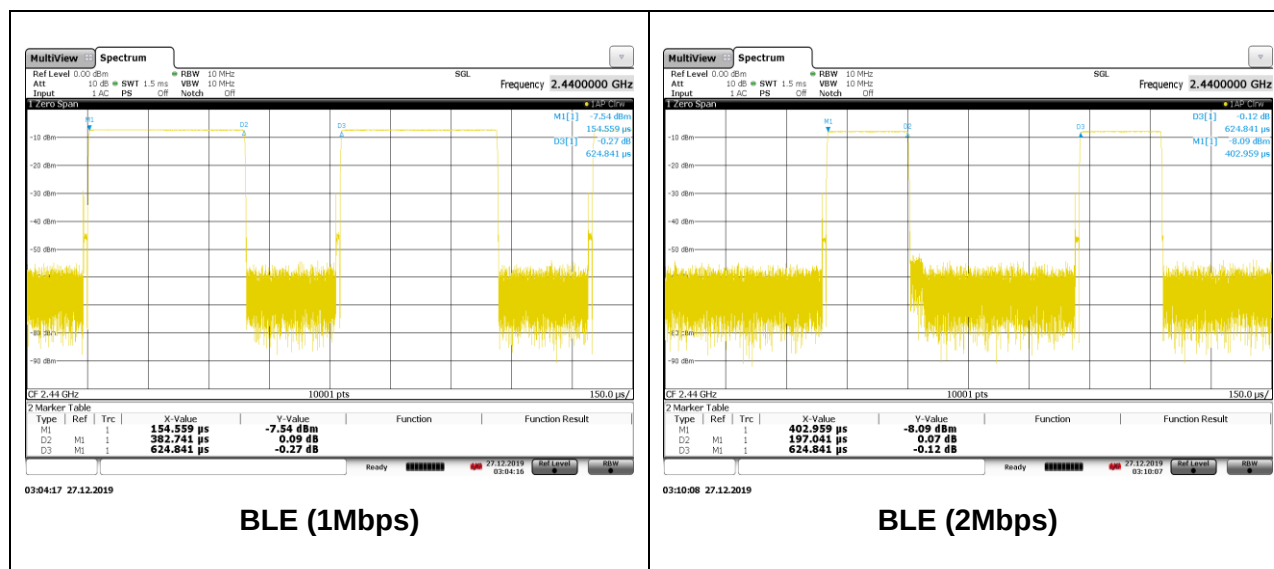
PROCEDURE

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 (1Mbps)	0.383	0.625	0.613	61.25	2.13	2.613
BLE (2Mbps)	0.197	0.625	0.315	31.53	5.01	5.075

DUTY CYCLE PLOTS



8.2. 99% BANDWIDTH

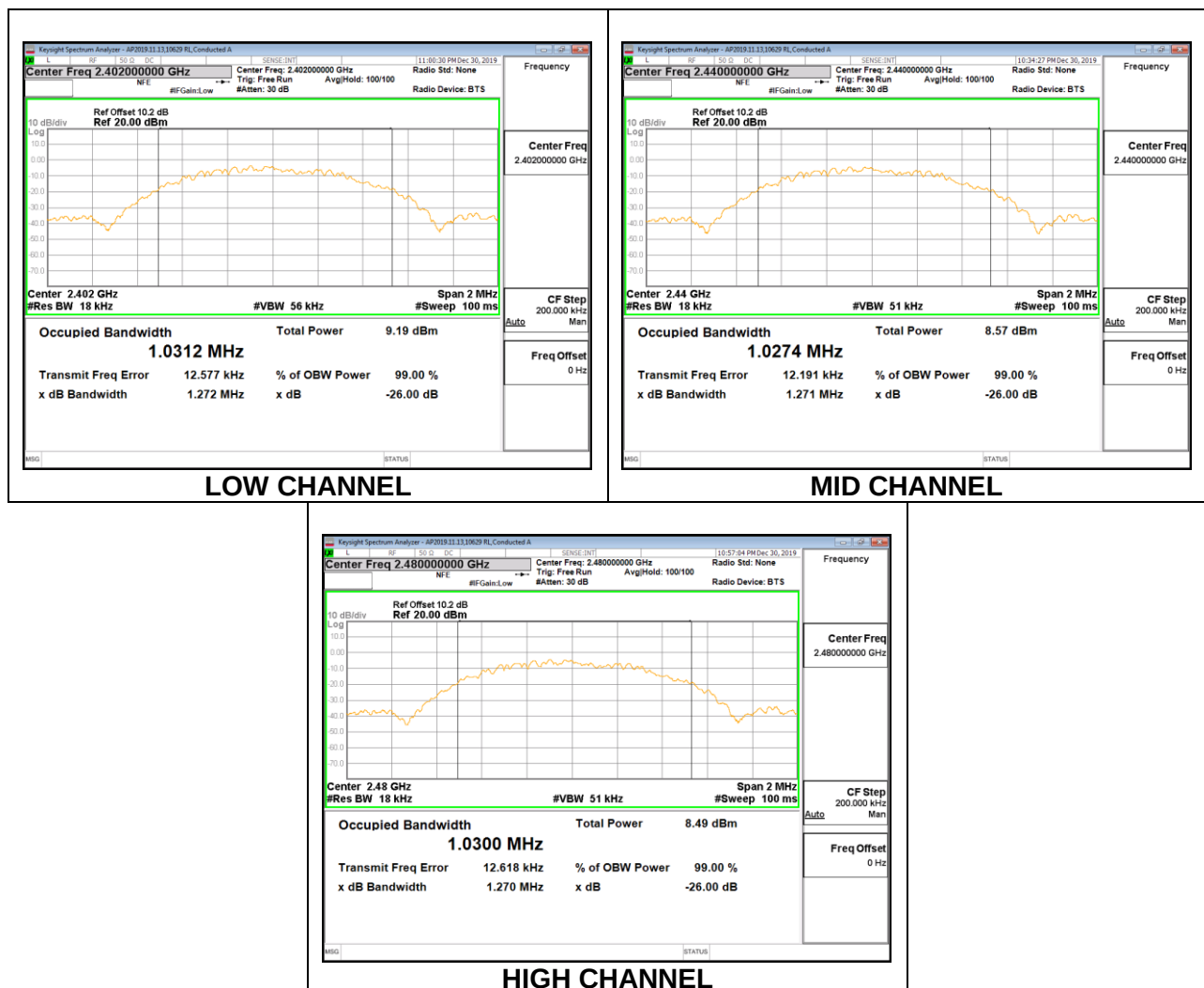
LIMITS

None; for reporting purposes only.

RESULTS

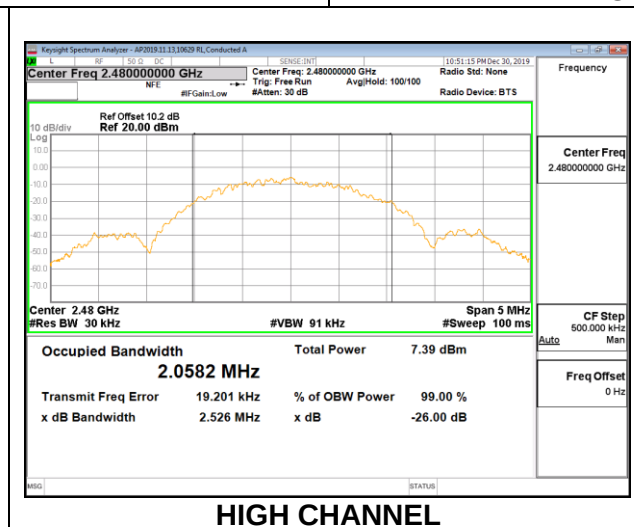
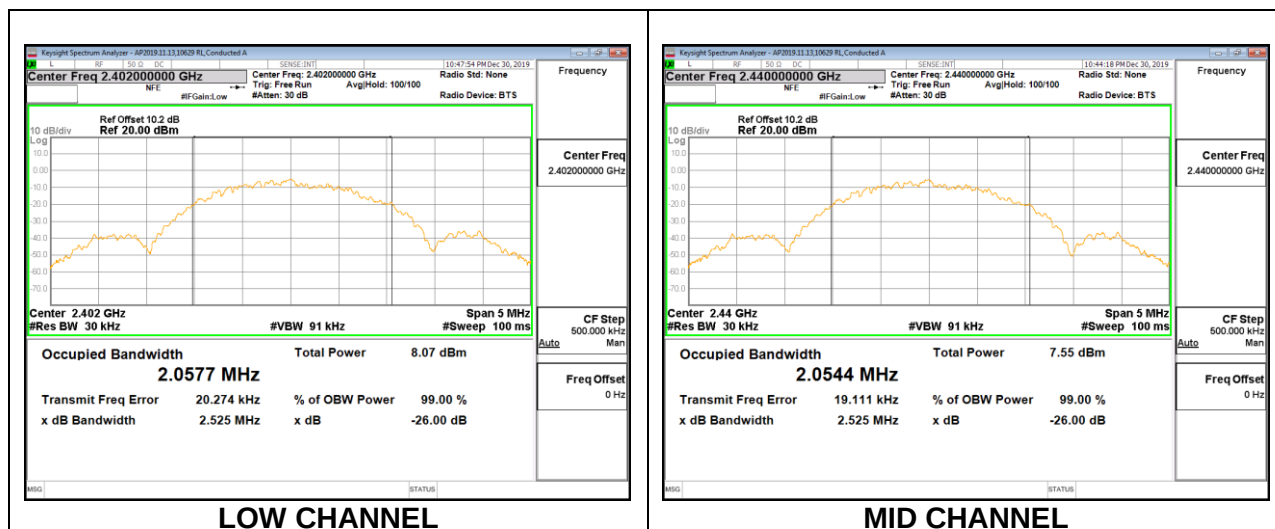
8.2.1. BLE 1Mbps

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0312
Middle	2440	1.0274
High	2480	1.0300



8.2.2. BLE 2Mbps

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	2.0577
Middle	2440	2.0544
High	2480	2.0582



8.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

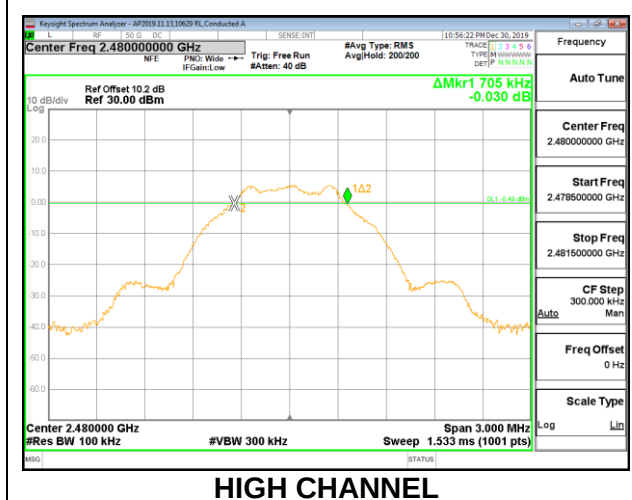
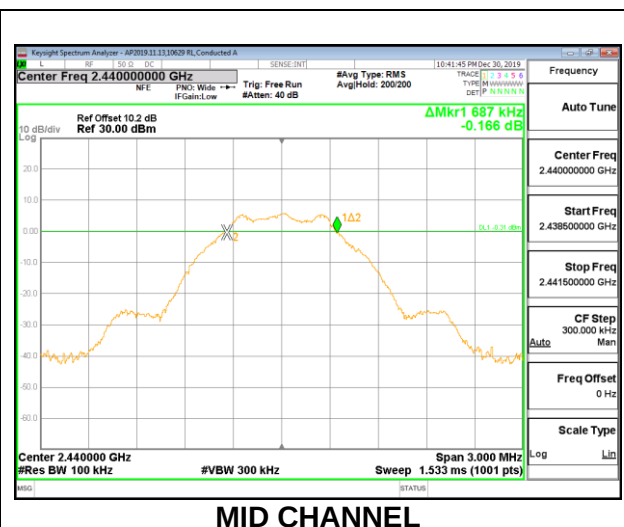
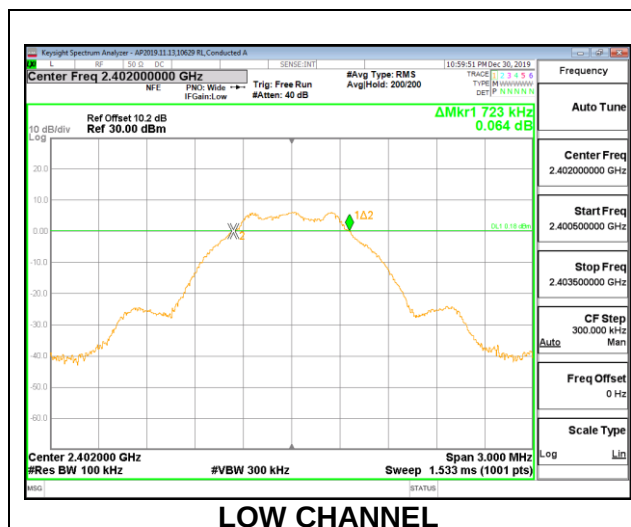
RSS-247 5.2 (a)

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

RESULTS

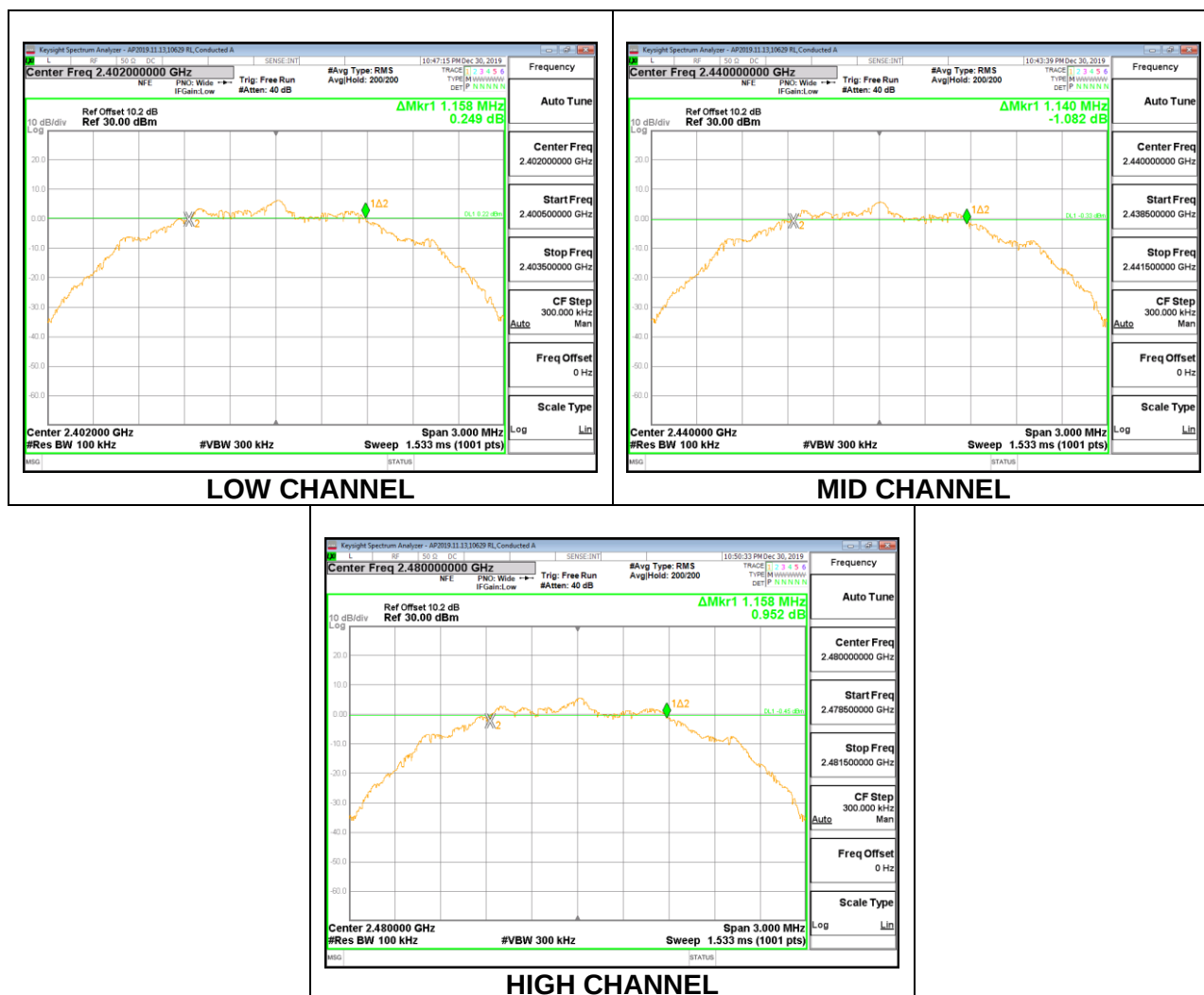
8.3.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.723	0.5
Middle	2440	0.687	0.5
High	2480	0.705	0.5



8.3.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.158	0.5
Middle	2440	1.140	0.5
High	2480	1.158	0.5



8.4. 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 was entered as an offset in the power meter to allow for a gated peak reading of power.

RESULTS

8.4.1. BLE (1Mbps)

Tested By:	16080ZS
Date:	12/30/2019

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	6.90	30	-23.100
Middle	2440	6.15	30	-23.850
High	2480	6.24	30	-23.760

8.4.2. BLE (2Mbps)

Tested By:	16080ZS
Date:	12/30/2019

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	6.93	30	-23.070
Middle	2440	6.20	30	-23.800
High	2480	6.30	30	-23.700

8.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter. The cable assembly insertion loss was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

8.5.1. BLE (1Mbps)

Tested By:	16080ZS
Date:	12/30/2019

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	6.81
Middle	2440	6.07
High	2480	6.16

8.5.2. BLE (2Mbps)

Tested By:	16080ZS
Date:	12/30/2019

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	6.85
Middle	2440	6.11
High	2480	6.19

8.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

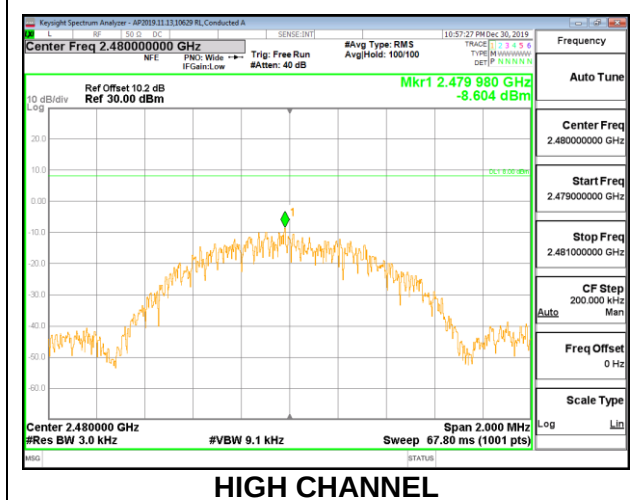
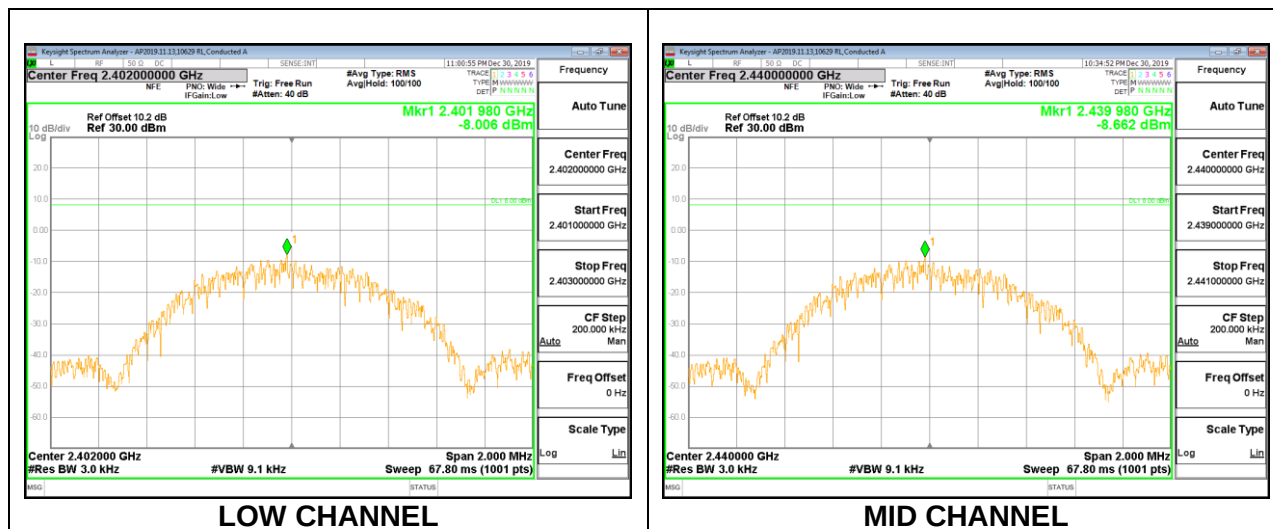
RSS-247 (5.2) (b)

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

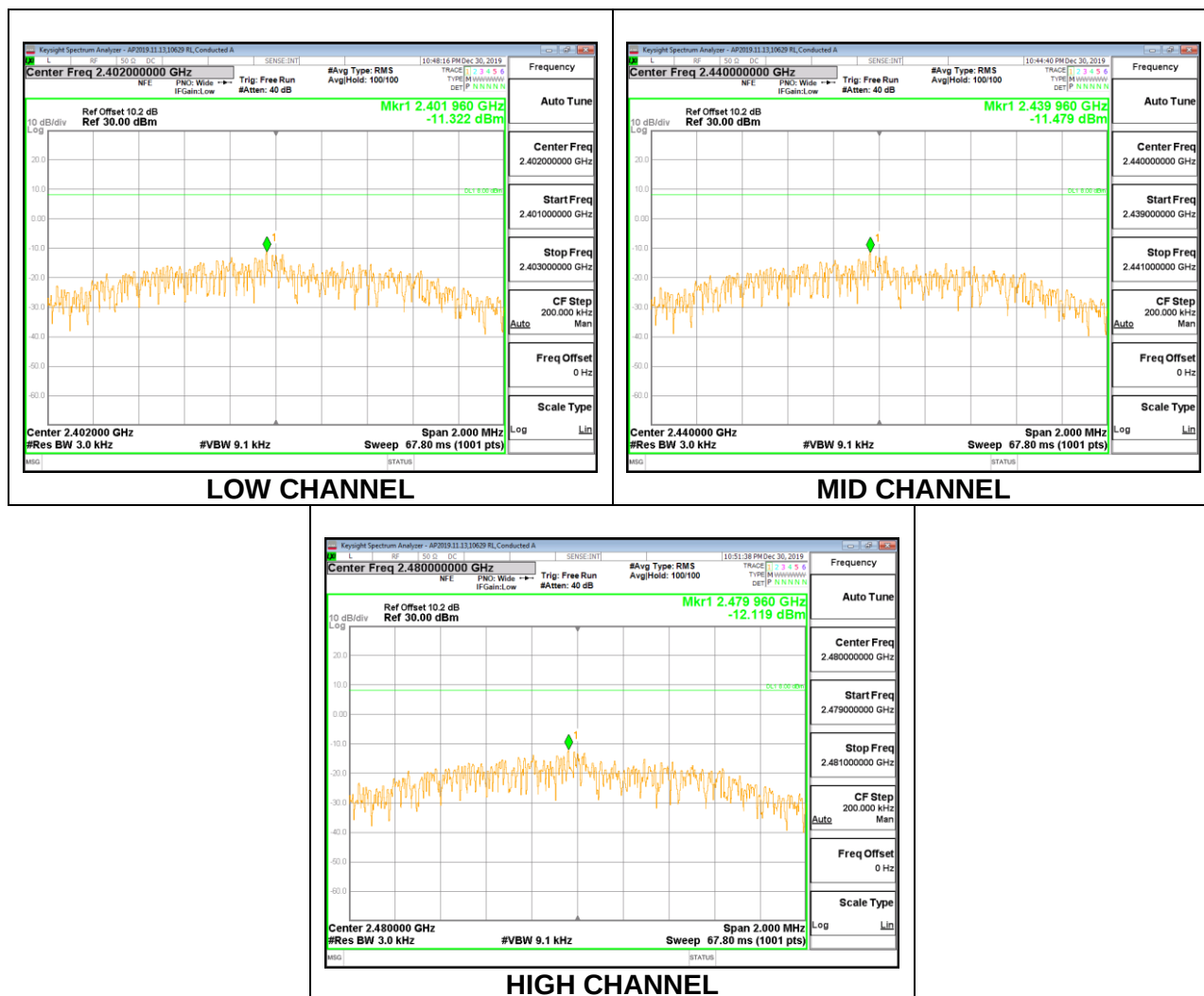
8.6.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-8.01	8	-16.01
Middle	2440	-8.66	8	-16.66
High	2480	-8.60	8	-16.60



8.6.2. BLE (2Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-11.32	8	-19.32
Middle	2440	-11.48	8	-19.48
High	2480	-12.12	8	-20.12



8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

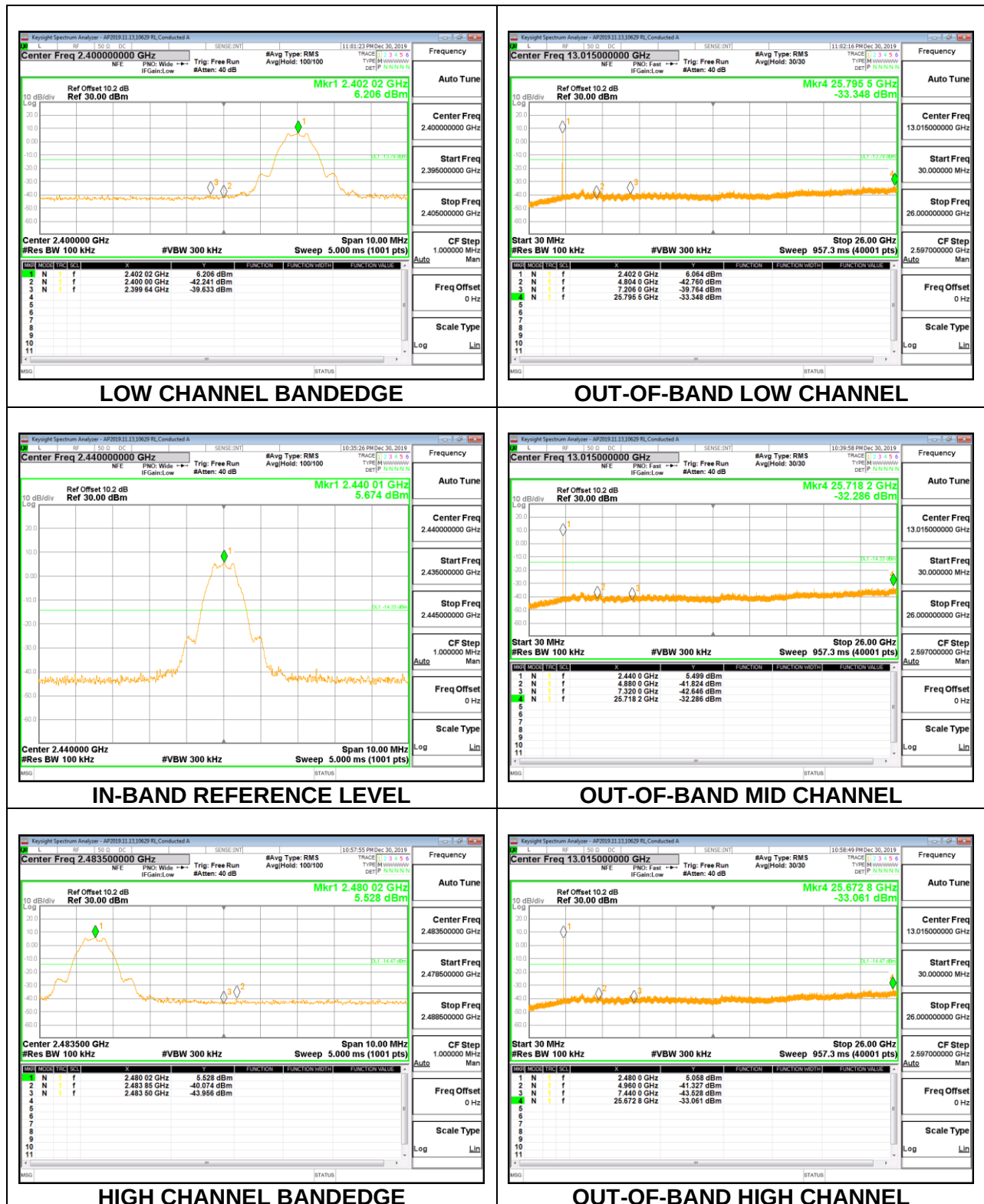
FCC §15.247 (d)

RSS-247 5.5

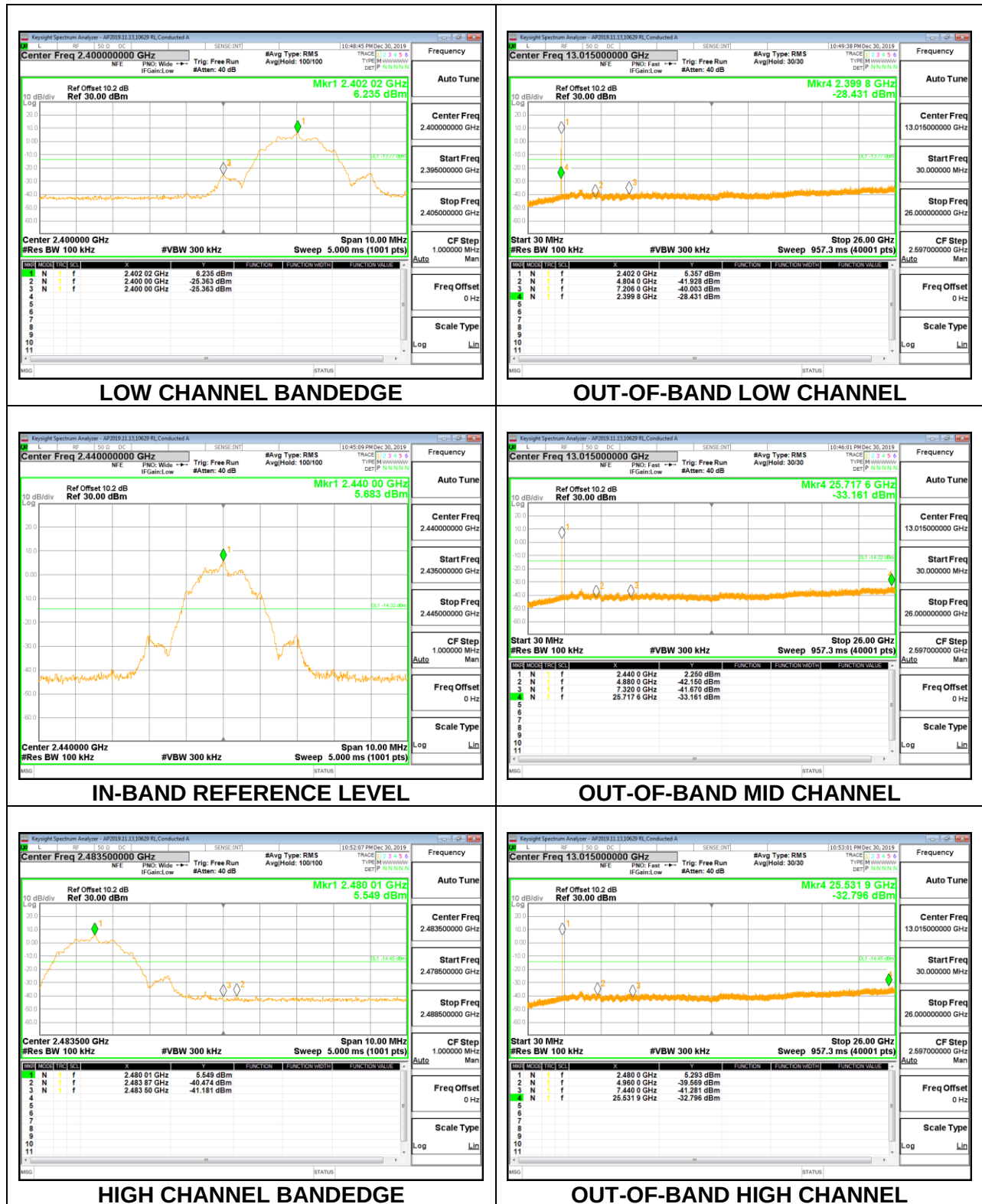
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

8.7.1. BLE (1Mbps)



8.7.2. BLE (2Mbps)



9. RADIATED TEST RESULTS

9.1. 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. Peak detection is used unless otherwise noted as quasi-peak.

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.

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

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.

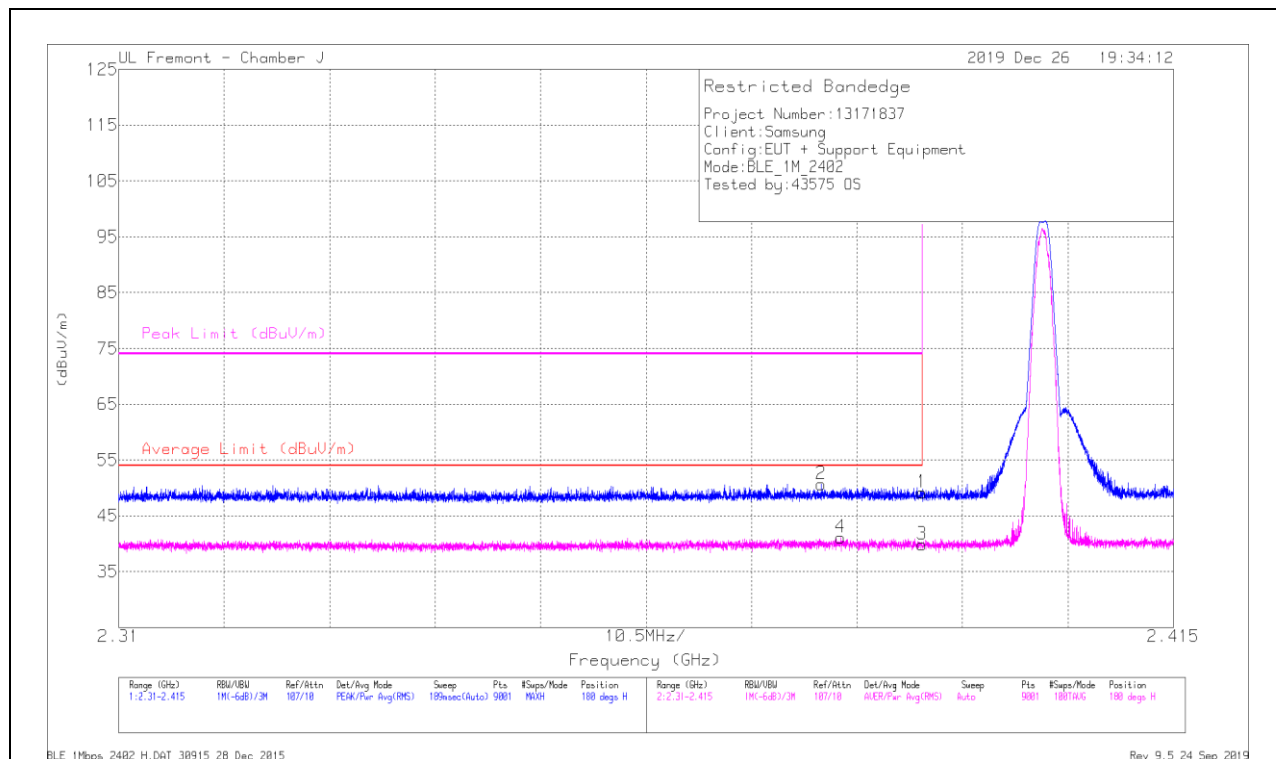
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



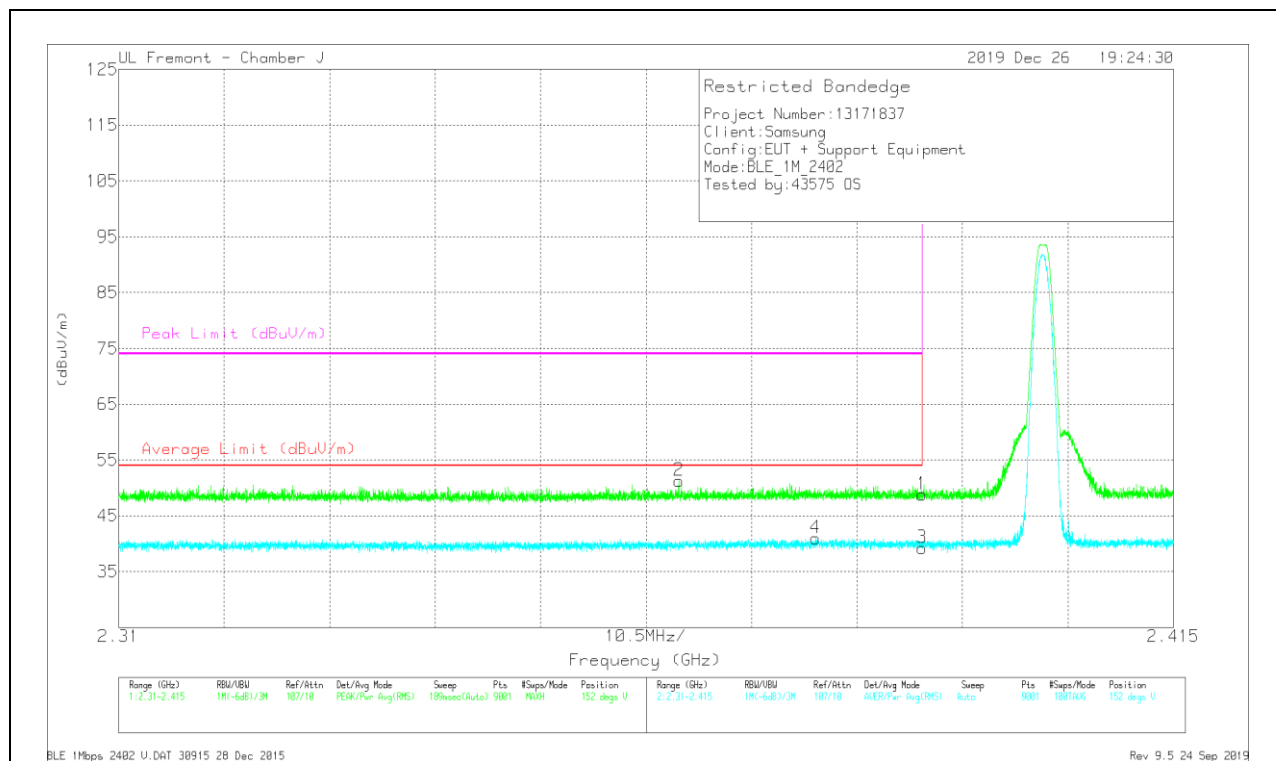
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dBm)	Ampl/Cal/Fit/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.38999	42.78	Pk	31.9	-25.5	0	49.18	-	-	74	-24.82	180	278	H
2	* 2.37994	44.34	Pk	31.8	-25.5	0	50.64	-	-	74	-23.36	180	278	H
3	* 2.38999	31.28	RMS	31.9	-25.5	2.13	39.81	54	-14.19	-	-	180	278	H
4	* 2.38187	32.69	RMS	31.8	-25.5	2.13	41.12	54	-12.88	-	-	180	278	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 T344 (dBm)	Amp(CM/FIR/Pat) (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.38999	42.44	PK	31.9	-25.5	0	43.84	-	-	74	-25.16	152	102	V
2	* 2.36574	45.14	PK	31.7	-25.5	0	51.34	-	-	74	-22.66	152	102	V
3	* 2.38999	30.74	RMS	31.9	-25.5	2.13	39.27	54	-14.73	-	-	152	102	V
4	* 2.3794	32.51	RMS	31.8	-25.5	2.13	40.94	54	-13.06	-	-	152	102	V

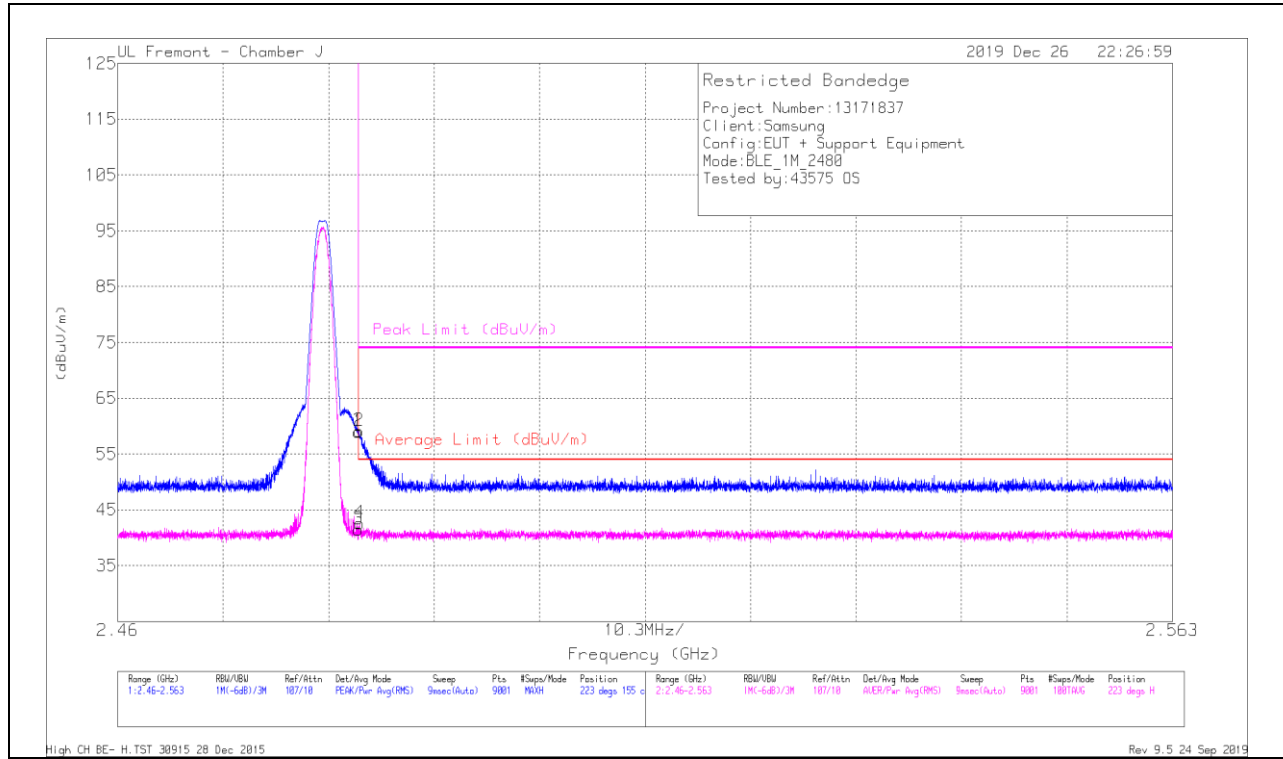
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



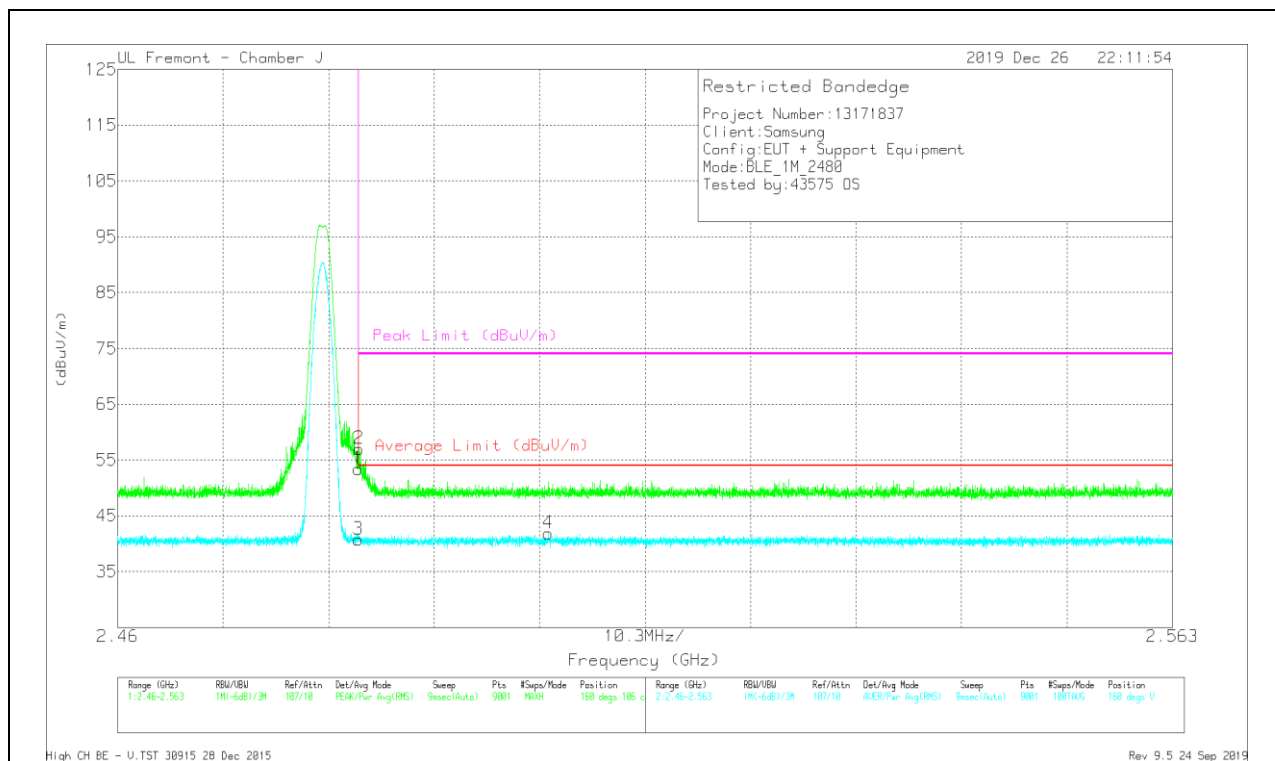
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dBm)	AmpCM/FIR/Pat (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	52.15	Pk	32.3	-25.5	0	58.95	-	-	74	-15.05	223	155	H
2	* 2.48357	52.3	PK	32.3	-25.5	0	59.1	-	-	74	-14.9	223	155	H
3	* 2.48351	32.5	RMS	32.3	-25.5	2.13	41.43	54	-12.57	-	-	223	155	H
4	* 2.48362	33.66	RMS	32.3	-25.5	2.13	42.59	54	-11.41	-	-	223	155	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 T344 (dBm)	Amp CMF/Rtr/Pat (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.48351	46.62	PK	32.3	-25.5	0	53.42	-	-	74	-20.58	160	106	V
2	* 2.48355	50.2	PK	32.3	-25.5	0	57	-	-	74	-17	160	106	V
3	* 2.48351	31.77	RMS	32.3	-25.5	2.13	40.7	54	-13.3	-	-	160	106	V
4	2.50203	32.77	RMS	32.4	-25.5	2.13	41.8	54	-12.2	-	-	160	106	V

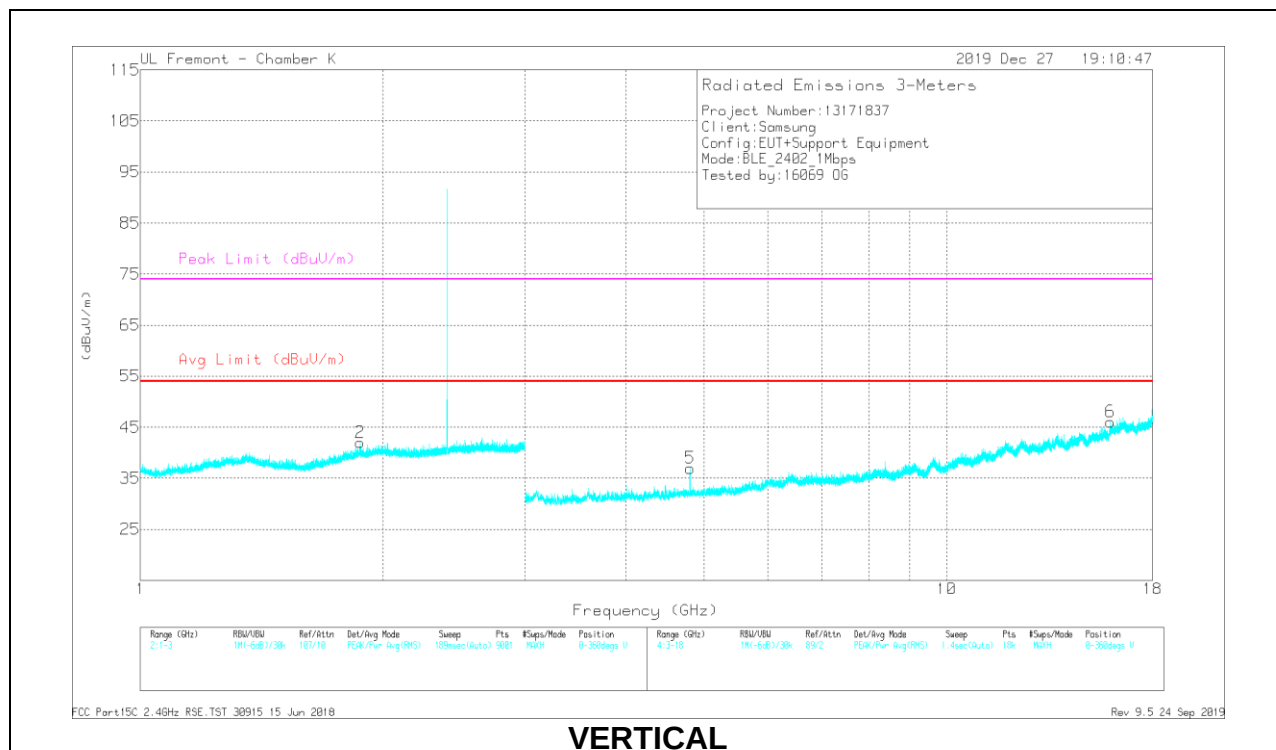
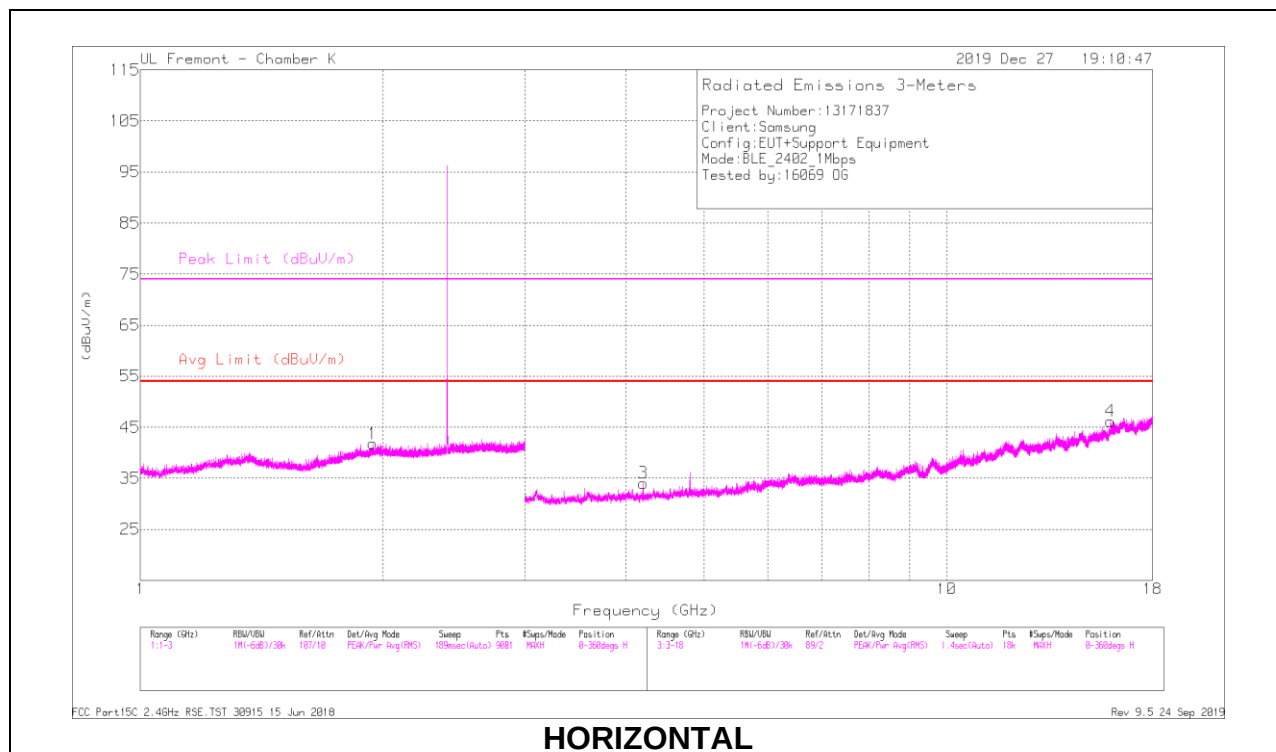
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

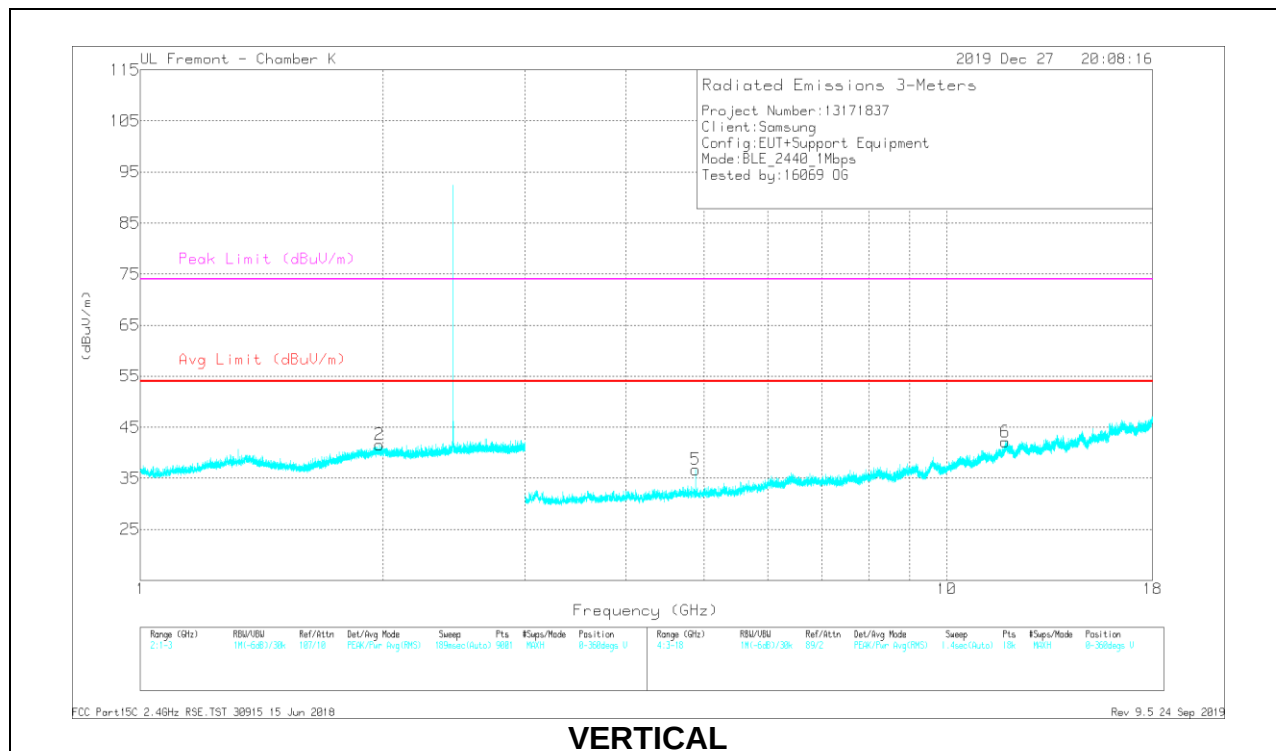
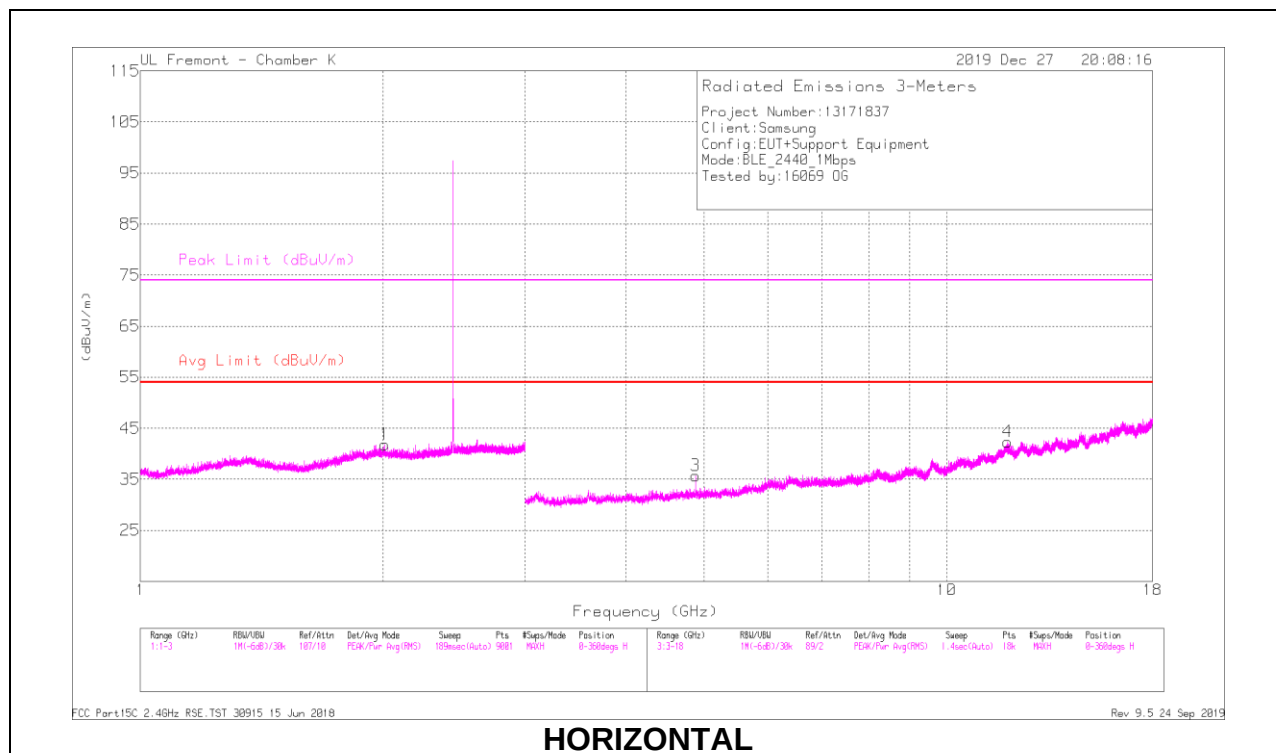
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Ampl/Cbl/Ftr/P ad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.94112	42.19	PK2	31.3	-24.2	0	49.29	-	-	-	-	249	351	H
2	1.87194	41.42	PK2	31.1	-24.1	0	48.42	-	-	-	-	227	166	V
3	* 4.20063	37.49	PK2	33.2	-31	0	39.69	-	-	74	-34.31	295	168	H
3	* 4.20277	26.9	MAV1	33.3	-31.1	2.13	31.23	54	-22.77	-	-	295	168	H
4	* 15.97295	29.39	PK2	40.4	-17.5	0	52.29	-	-	74	-21.71	322	370	H
4	* 15.97282	18.48	MAV1	40.4	-17.5	2.13	43.51	54	-10.49	-	-	322	370	H
5	* 4.80351	39.66	PK2	34.2	-30.3	0	43.56	-	-	74	-30.44	3	96	V
5	* 4.80363	29.99	MAV1	34.2	-30.3	2.13	36.02	54	-17.98	-	-	3	96	V
6	* 15.96579	28.71	PK2	40.4	-17.5	0	51.61	-	-	74	-22.39	43	241	V
6	* 15.96624	18.72	MAV1	40.4	-17.5	2.13	43.75	54	-10.25	-	-	43	241	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



RADIATED EMISSIONS

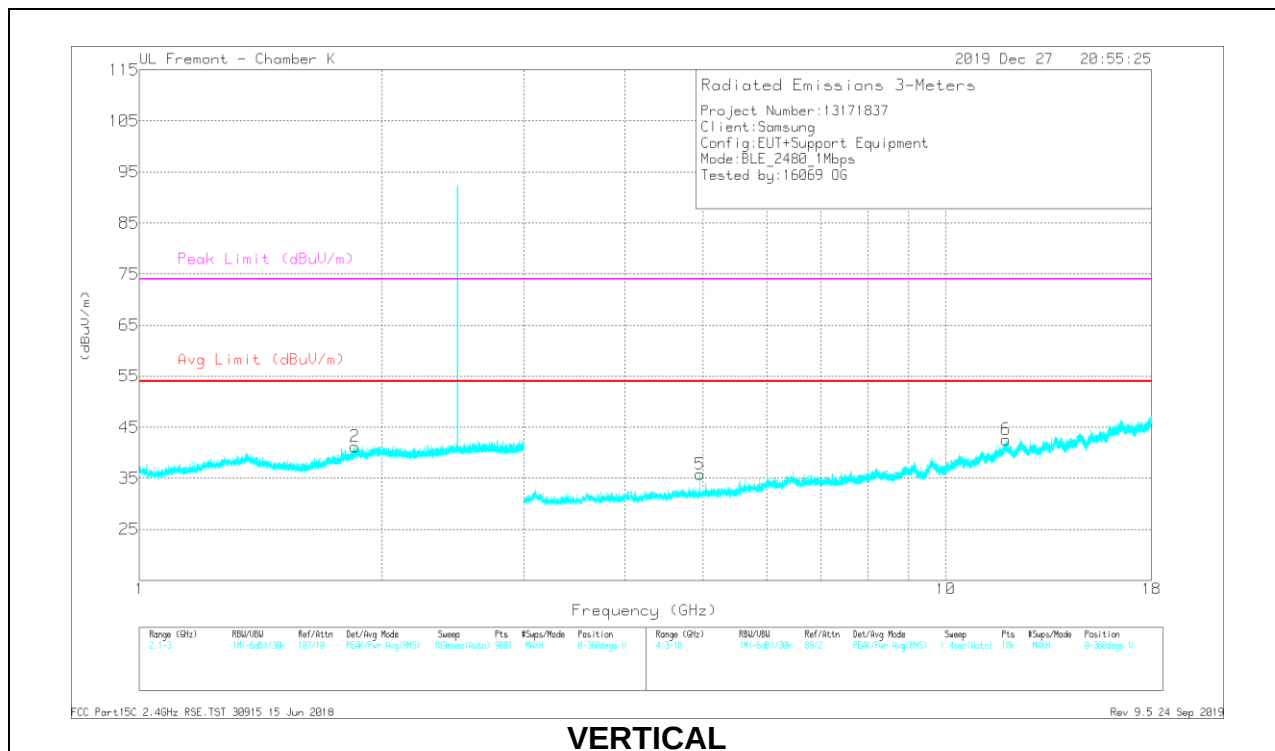
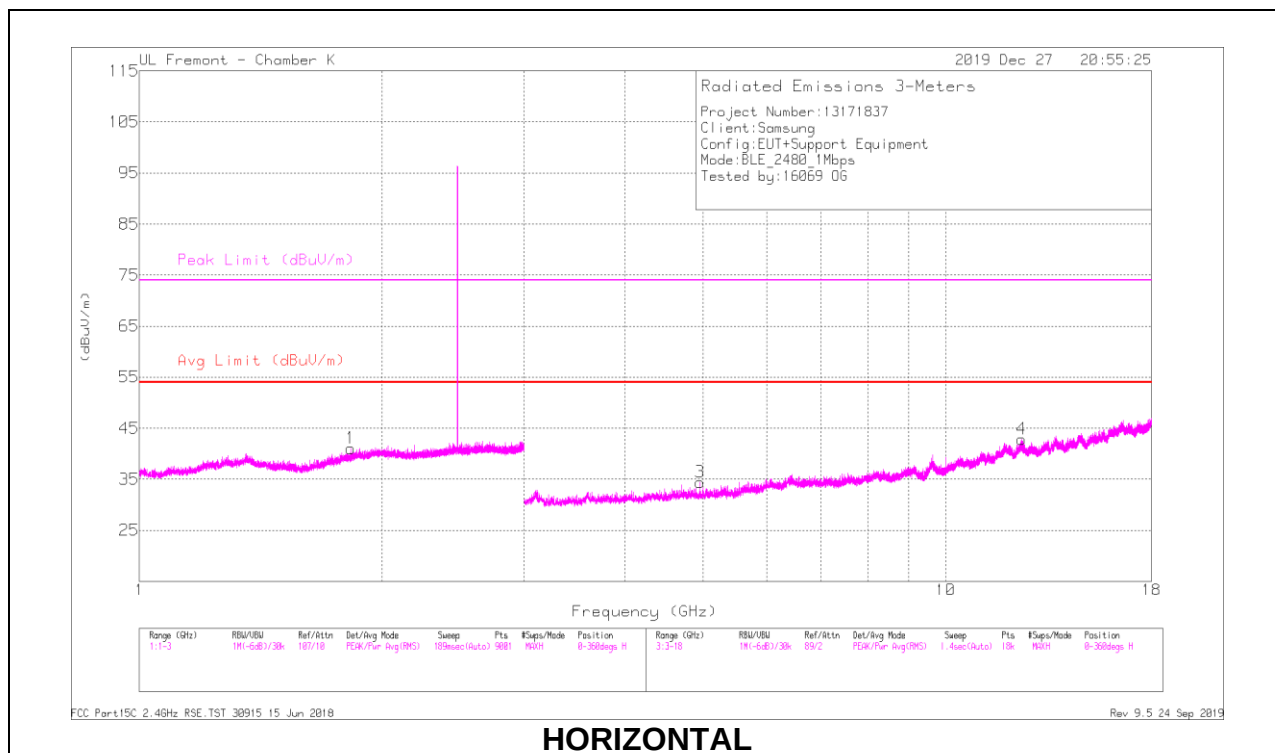
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Ampl/Cbl/Filtr/P ad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.00873	41.72	PK2	31.5	-24.3	0	48.92	-	-	-	-	341	235	H
2	1.98026	40.86	PK2	31.5	-24.4	0	47.96	-	-	-	-	204	296	V
3	* 4.88035	38.89	PK2	34.1	-30.5	0	42.49	-	-	74	-31.51	193	125	H
3	* 4.8797	29.68	MAV1	34.1	-30.5	2.13	35.41	54	-18.59	-	-	193	125	H
4	* 11.90198	30.3	PK2	38.7	-20.2	0	48.8	-	-	74	-25.2	140	396	H
4	* 11.90411	21.14	MAV1	38.7	-20.2	2.13	41.77	54	-12.23	-	-	140	396	H
5	* 4.87985	38.87	PK2	34.1	-30.5	0	42.47	-	-	74	-31.53	357	106	V
5	* 4.87972	30.44	MAV1	34.1	-30.5	2.13	36.17	54	-17.83	-	-	357	106	V
6	* 11.82232	30.18	PK2	38.7	-19.6	0	49.28	-	-	74	-24.72	40	321	V
6	* 11.82033	20.26	MAV1	38.7	-19.6	2.13	41.49	54	-12.51	-	-	40	321	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



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Ampl/Cbl/Ftr/P ad (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	1.82556	42.16	PK2	30.5	-24.2	0	48.46	-	-	-	-	55	163	H
2	1.84883	40.92	PK2	30.8	-24.1	0	47.62	-	-	-	-	86	125	V
3	* 4.96045	37.58	PK2	34.1	-30.6	0	41.08	-	-	74	-32.92	125	225	H
3	* 4.9597	27.59	MAV1	34.1	-30.6	2.13	33.22	54	-20.78	-	-	125	225	H
4	* 12.41577	30.64	PK2	39	-20.1	0	49.54	-	-	74	-24.46	225	247	H
4	* 12.4151	20.96	MAV1	39	-20.1	2.13	41.99	54	-12.01	-	-	225	247	H
5	* 4.95989	40.02	PK2	34.1	-30.6	0	43.52	-	-	74	-30.48	186	108	V
5	* 4.95986	30.83	MAV1	34.1	-30.6	2.13	36.46	54	-17.54	-	-	186	108	V
6	* 11.87342	30.55	PK2	38.7	-19.9	0	49.35	-	-	74	-24.65	308	121	V
6	* 11.87484	20.19	MAV1	38.7	-19.9	2.13	41.12	54	-12.88	-	-	308	121	V

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

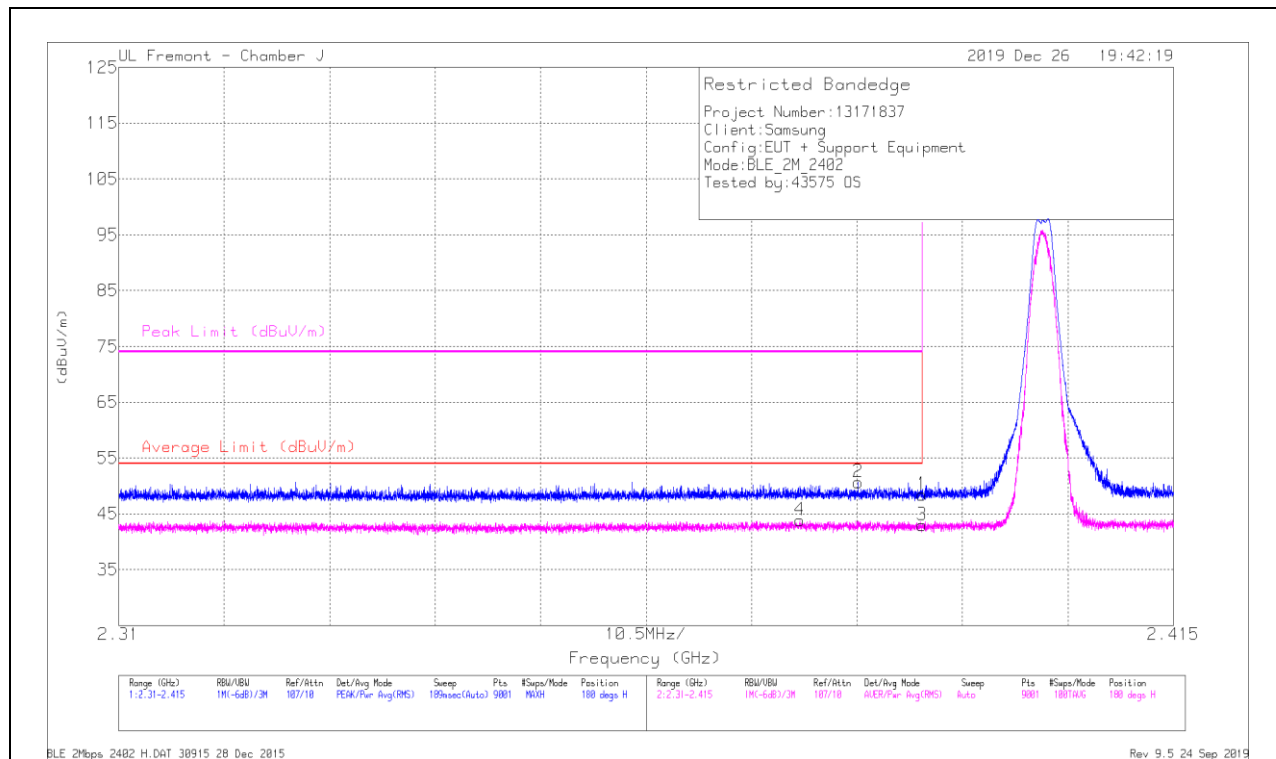
PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

9.2.2. BLE (2Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



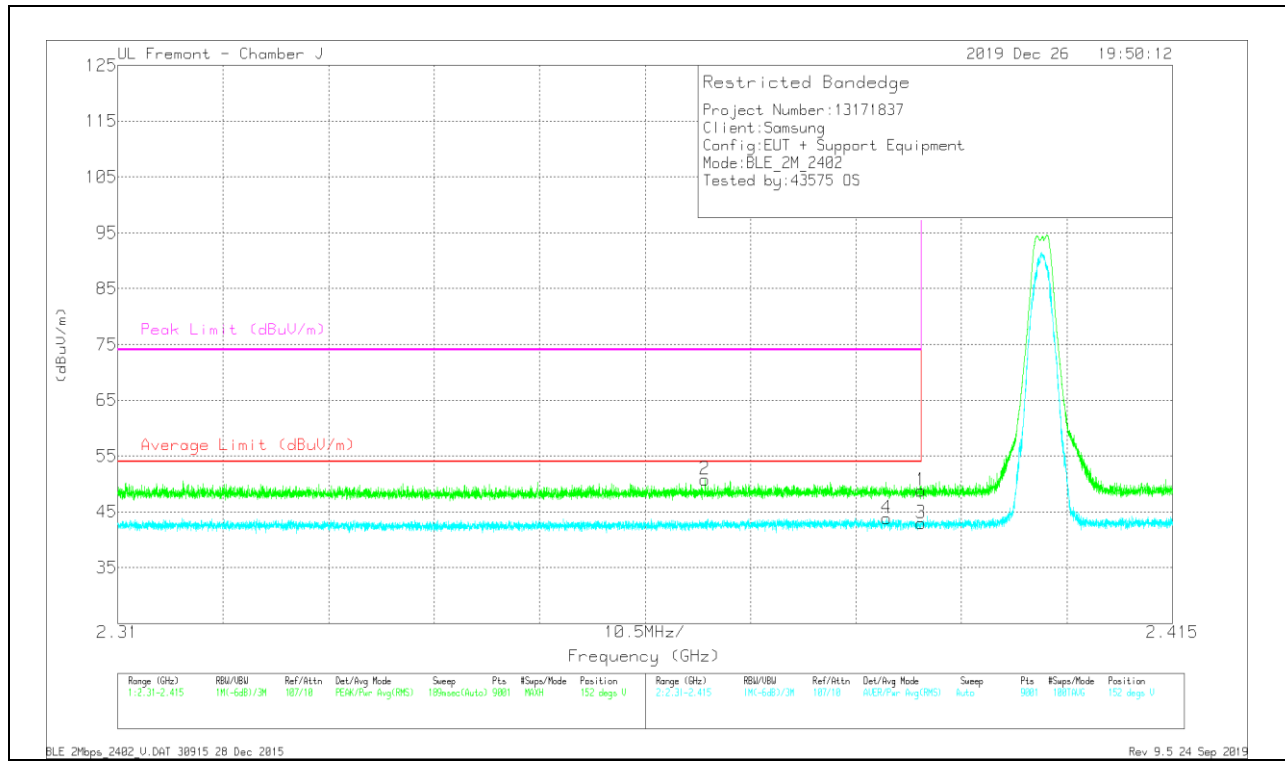
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dBm)	Amp CMF/FIR/Pat (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.38999	42.07	Pk	31.9	-25.5	0	43.47	-	-	74	-25.53	180	278	H
2	* 2.38361	44.4	Pk	31.8	-25.5	0	50.7	-	-	74	-23.3	180	278	H
3	* 2.38999	31.5	RMS	31.9	-25.5	5.01	42.91	54	-11.09	-	-	180	278	H
4	* 2.37779	32.55	RMS	31.8	-25.5	5.01	43.86	54	-10.14	-	-	180	278	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 T344 (dBm)	Amp/CM/FIR/Pat (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.38999	42.36	PK	31.9	-25.5	0	43.78	-	-	74	-25.22	152	102	V
2	* 2.38846	44.48	PK	31.8	-25.5	0	50.78	-	-	74	-23.22	152	102	V
3	* 2.38999	31.51	RMS	31.9	-25.5	5.01	42.92	54	-11.08	-	-	152	102	V
4	* 2.38656	32.57	RMS	31.8	-25.5	5.01	43.88	54	-10.12	-	-	152	102	V

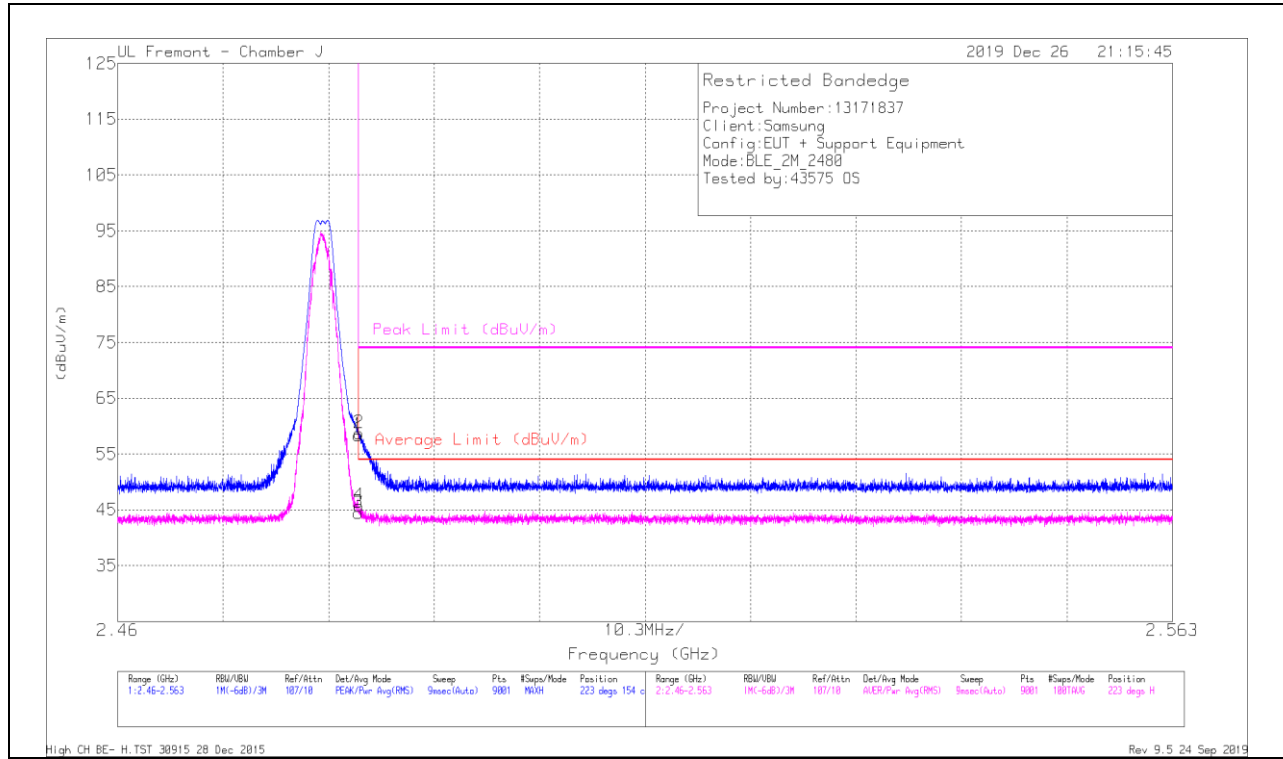
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

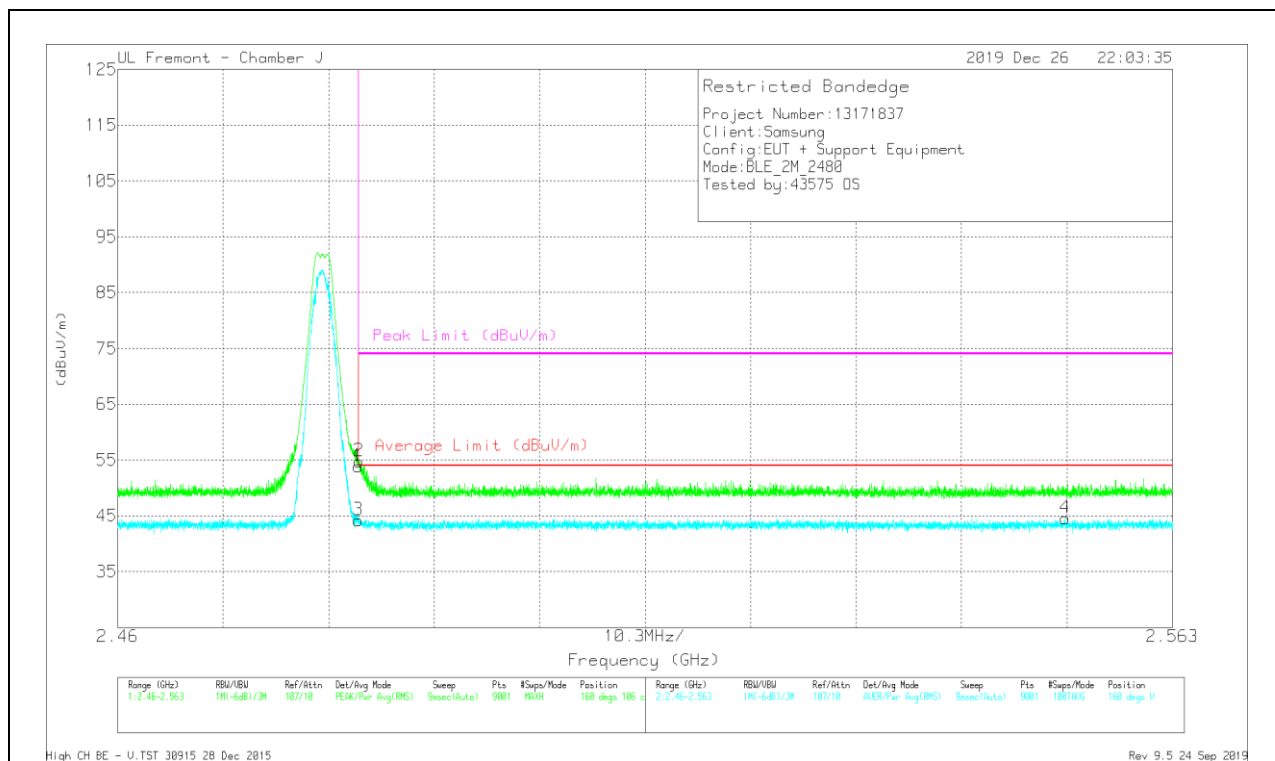
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dBm)	Amp/CM/FIR/Pat (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	51.6	Pk	32.3	-25.5	0	58.4	-	-	74	-15.6	223	154	H
2	* 2.48353	51.97	Pk	32.3	-25.5	0	58.77	-	-	74	-15.23	223	154	H
3	* 2.48351	32.64	RMS	32.3	-25.5	5.01	44.45	54	-9.55	-	-	223	154	H
4	* 2.48354	33.94	RMS	32.3	-25.5	5.01	45.75	54	-8.25	-	-	223	154	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 T344 (dBm)	AmpCMFIR/Pat (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.48351	47.09	PK	32.3	-25.5	0	53.89	-	-	74	-20.11	160	106	V
2	* 2.48357	47.98	PK	32.3	-25.5	0	54.79	-	-	74	-19.21	160	106	V
3	* 2.48351	32.38	RMS	32.3	-25.5	5.01	44.19	54	-9.81	-	-	160	106	V
4	2.55252	32.7	RMS	32.3	-25.4	5.01	44.61	54	-9.39	-	-	160	106	V

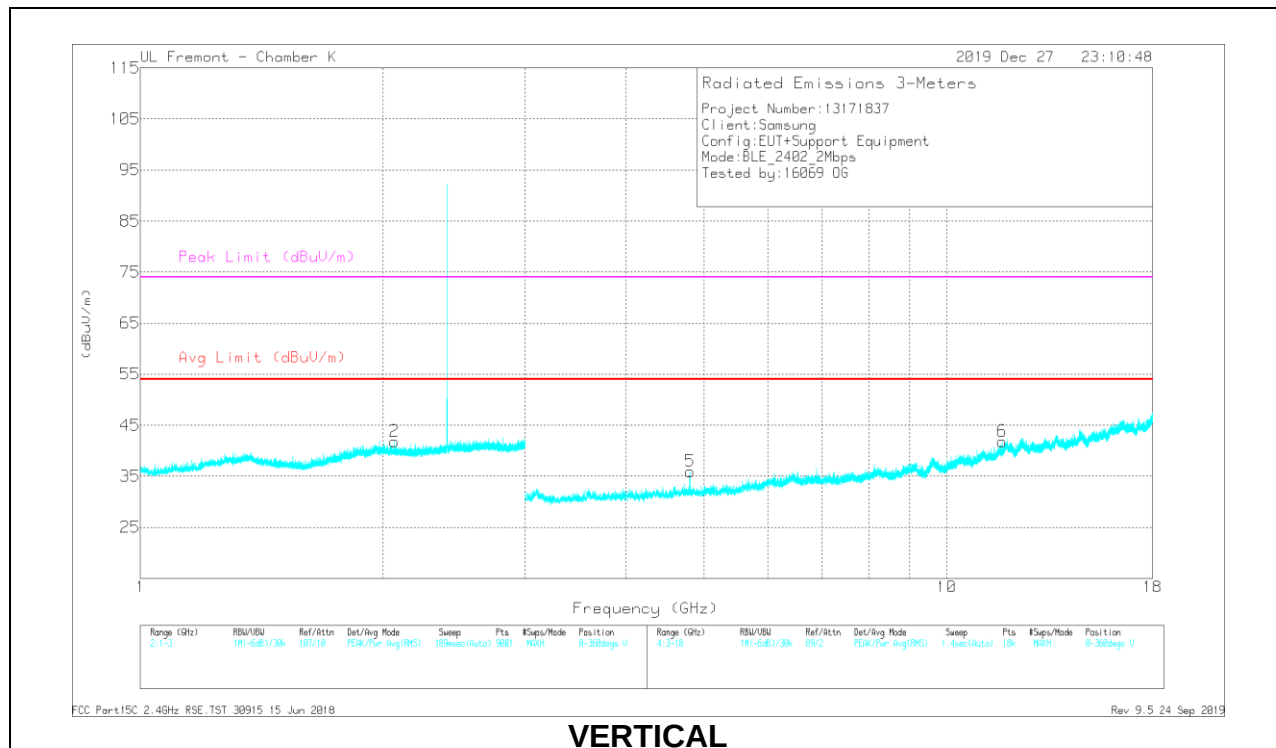
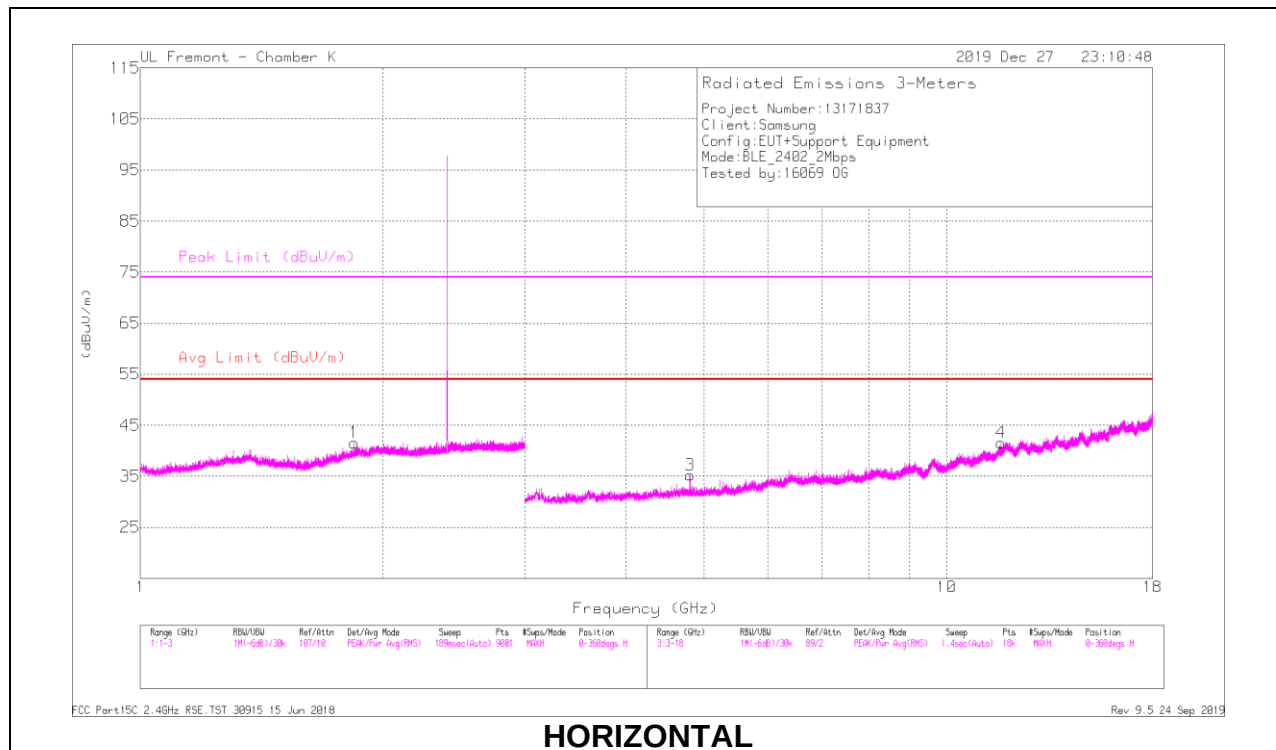
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

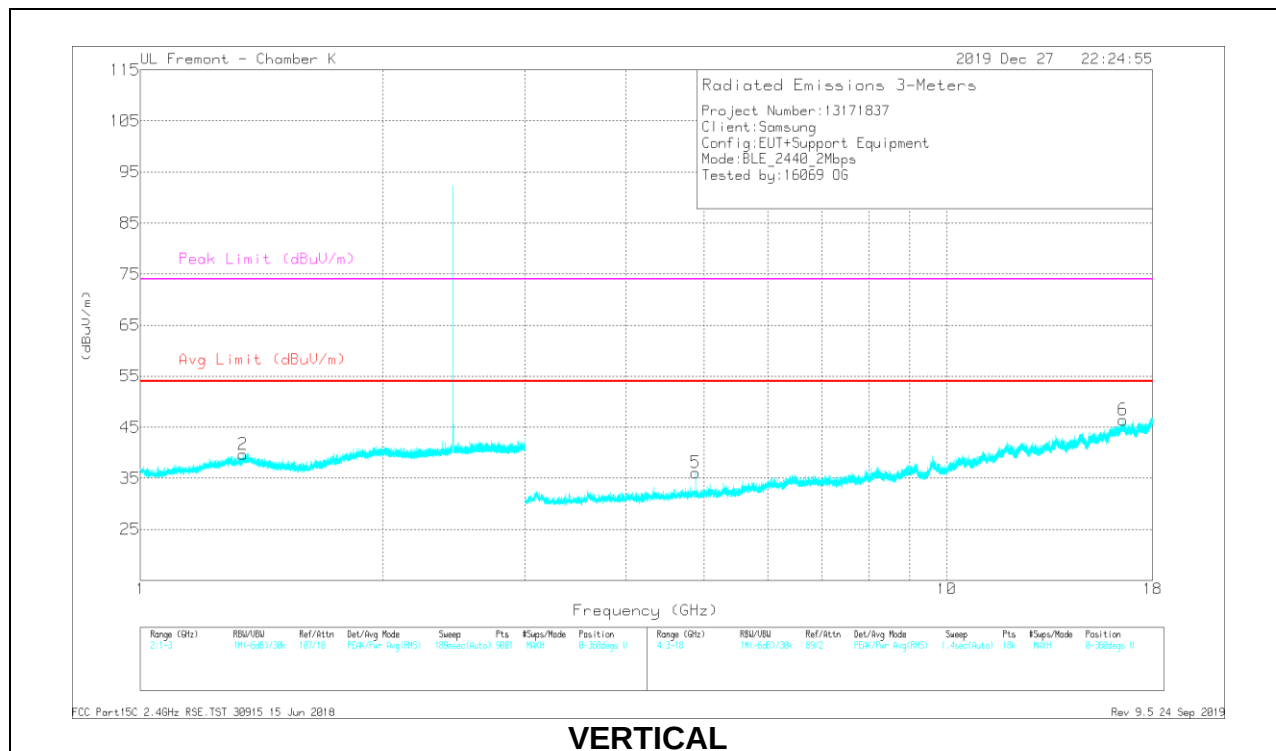
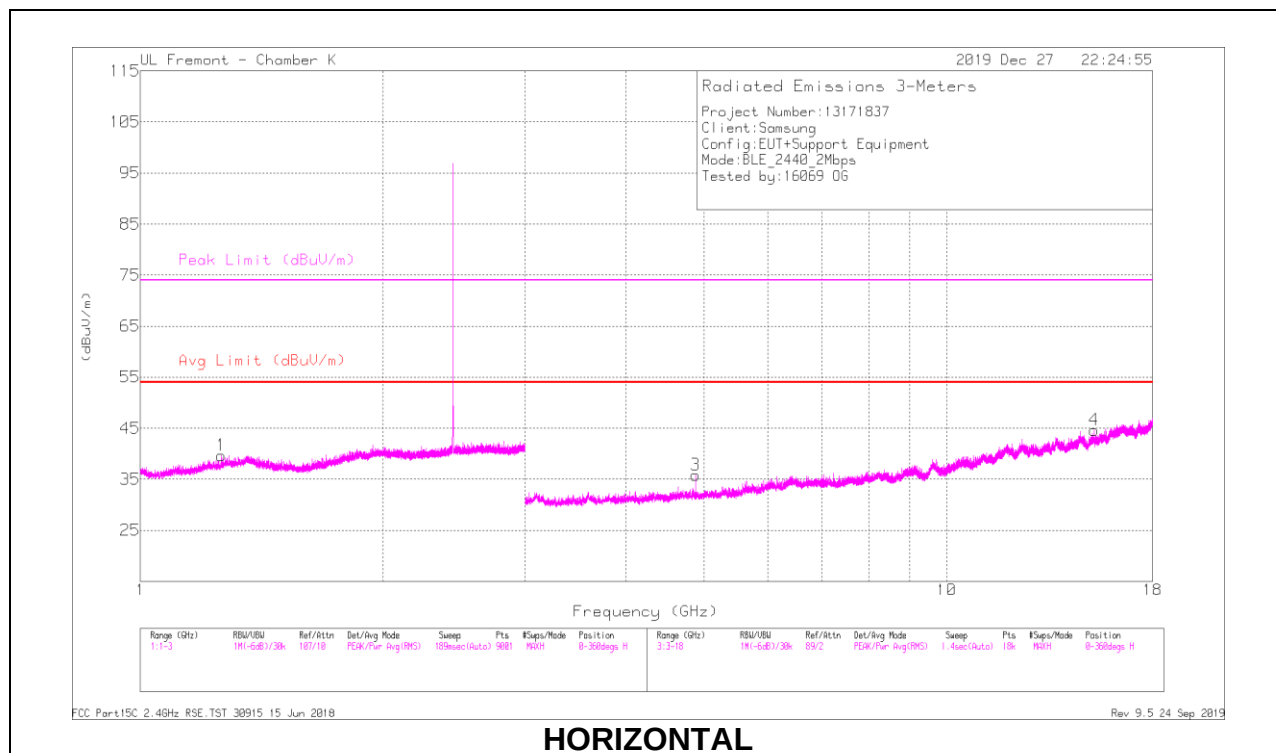
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Ampl/Cbl/Ftr/P ad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.83847	40.94	PK2	30.7	-24.2	0	47.44	-	-	-	-	9	138	H
2	2.06739	42.09	PK2	31.4	-24.5	0	48.99	-	-	-	-	116	221	V
3	* 4.80343	38.52	PK2	34.2	-30.3	0	42.42	-	-	74	-31.58	193	96	H
3	* 4.80372	29.95	MAv1	34.2	-30.3	5.01	38.86	54	-15.14	-	-	193	96	H
4	* 11.68578	30.46	PK2	38.5	-20.3	0	48.66	-	-	74	-25.34	206	153	H
4	* 11.68669	20.15	MAv1	38.5	-20.3	5.01	43.36	54	-10.64	-	-	206	153	H
5	* 4.80445	38.98	PK2	34.2	-30.3	0	42.88	-	-	74	-31.12	347	192	V
5	* 4.80364	28.85	MAv1	34.2	-30.3	5.01	37.76	54	-16.24	-	-	347	192	V
6	* 11.71145	30.1	PK2	38.5	-20.3	0	48.3	-	-	74	-25.7	20	314	V
6	* 11.71332	19.89	MAv1	38.5	-20.3	5.01	43.1	54	-10.9	-	-	20	314	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



RADIATED EMISSIONS

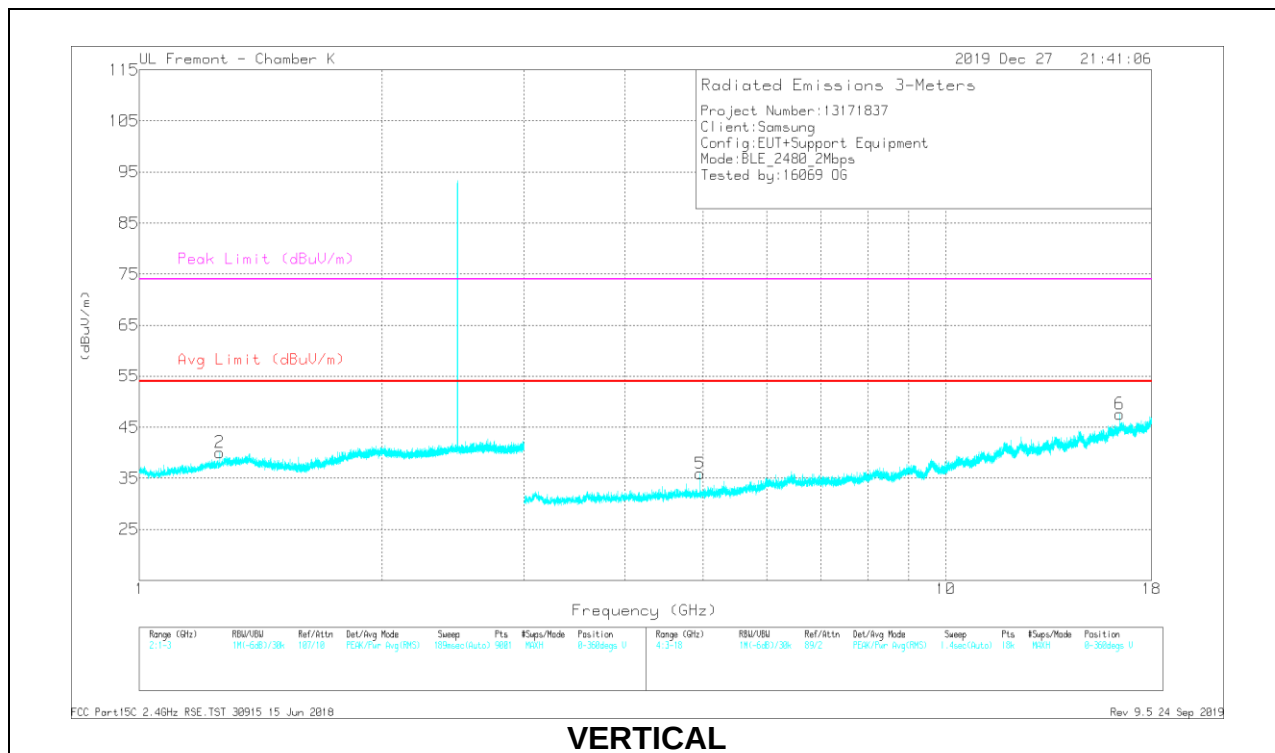
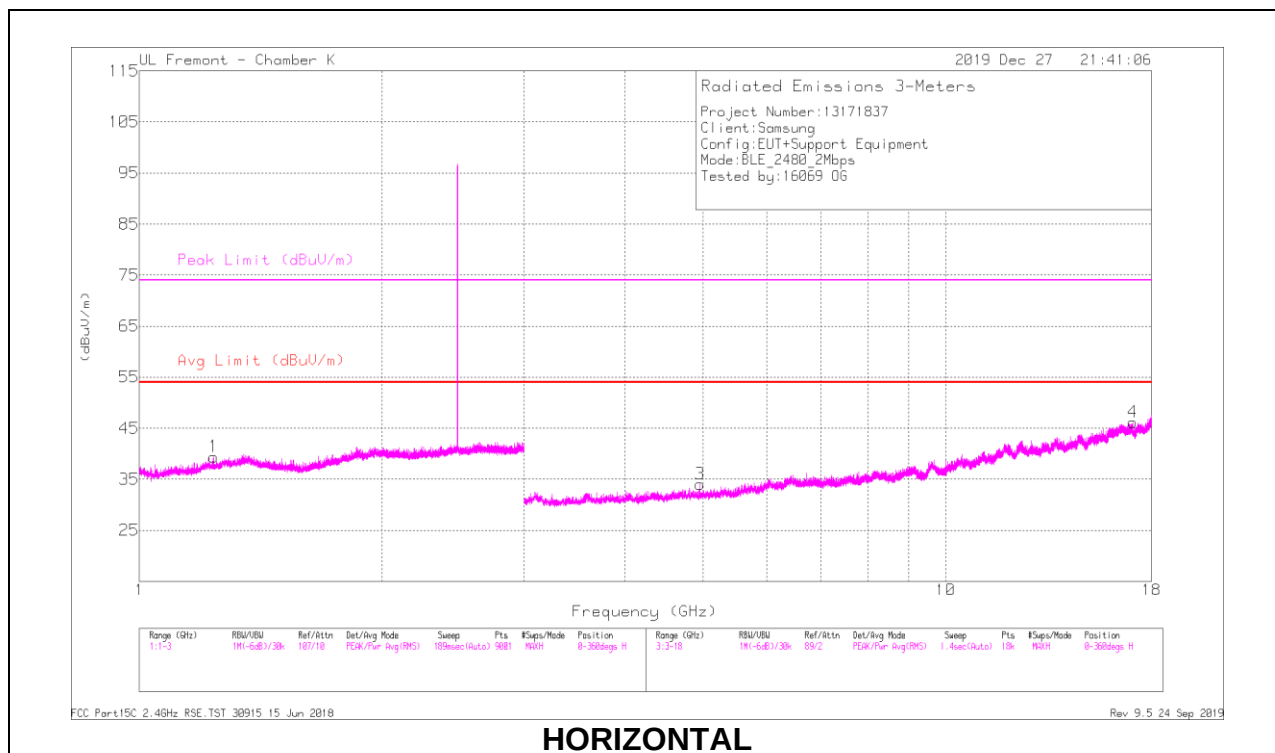
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Amp/Cbl/Ftr/P ad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.25935	41.54	PK2	28.9	-23.9	0	46.54	-	-	74	-27.46	271	310	H
1	* 1.2583	30.89	MAV1	28.9	-23.9	5.01	40.9	54	-13.1	-	-	271	310	H
2	* 1.34195	40.95	PK2	29.4	-23.9	0	46.45	-	-	74	-27.55	301	393	V
2	* 1.34244	31.7	MAV1	29.4	-23.9	5.01	42.21	54	-11.79	-	-	301	393	V
3	* 4.87956	39.58	PK2	34.1	-30.5	0	43.18	-	-	74	-30.82	187	99	H
3	* 4.87966	29.75	MAV1	34.1	-30.5	5.01	38.36	54	-15.64	-	-	187	99	H
4	15.23011	29.33	PK2	39.9	-18.5	0	50.73	-	-	-	-	248	198	H
5	* 4.88004	39.74	PK2	34.1	-30.5	0	43.34	-	-	74	-30.66	348	107	V
5	* 4.8797	30.27	MAV1	34.1	-30.5	5.01	38.88	54	-15.12	-	-	348	107	V
6	16.54701	28.38	PK2	41	-16.6	0	52.78	-	-	-	-	68	228	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



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Amp/Cbl/Filtr/P ad (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	* 1.23519	41.22	PK2	28.7	-23.9	0	46.02	-	-	74	-27.98	239	289	H
1	* 1.23795	32.1	MAV1	28.6	-23.9	5.01	41.81	54	-12.19	-	-	239	289	H
2	* 1.25764	41.02	PK2	28.9	-23.9	0	46.02	-	-	74	-27.98	113	182	V
2	* 1.26	30.7	MAV1	28.9	-23.9	5.01	40.71	54	-13.29	-	-	113	182	V
3	* 4.96008	39.13	PK2	34.1	-30.6	0	42.63	-	-	74	-31.37	192	139	H
3	* 4.95963	27.37	MAV1	34.1	-30.6	5.01	35.88	54	-18.12	-	-	192	139	H
4	17.07403	28.96	PK2	40.4	-16.8	0	52.56	-	-	-	-	34	214	H
5	* 4.96034	39.46	PK2	34.1	-30.6	0	42.96	-	-	74	-31.04	192	282	V
5	* 4.95968	30.49	MAV1	34.1	-30.6	5.01	39	54	-15	-	-	192	282	V
6	16.43942	28.4	PK2	40.8	-17.1	0	52.1	-	-	-	-	253	269	V

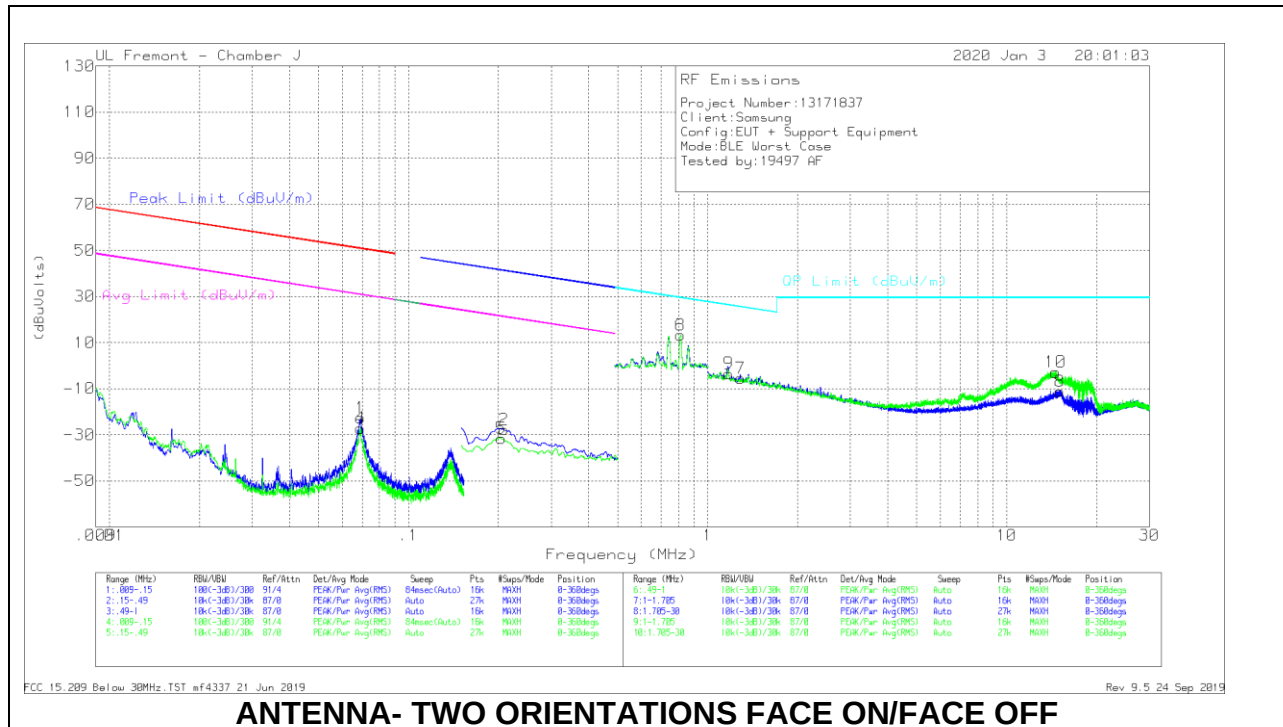
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

9.3. WORST CASE BELOW 30MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Amp/Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	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	.06911	30.23	Pk	55.8	-28.6	-80	-22.57	50.79	-73.36	30.79	-53.36	-	-	-	-	0-360
2	.20806	24.75	Pk	56.1	-28.6	-80	-27.75	-	-	-	-	41.25	-69	21.25	-49	0-360
4	.06898	25.71	Pk	55.8	-28.6	-80	-27.09	50.81	-77.9	30.81	-57.9	-	-	-	-	0-360
5	.2041	21.01	Pk	56.1	-28.6	-80	-31.49	-	-	-	-	41.42	-72.91	21.42	-52.91	0-360

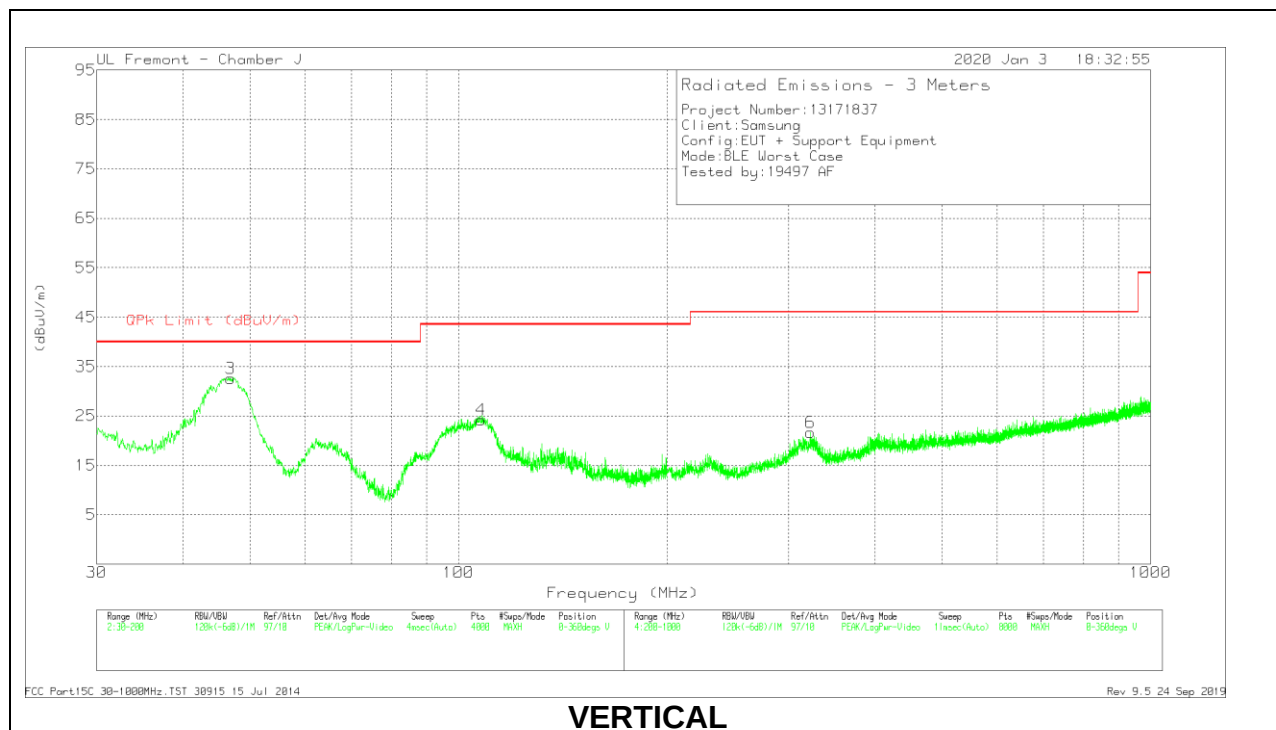
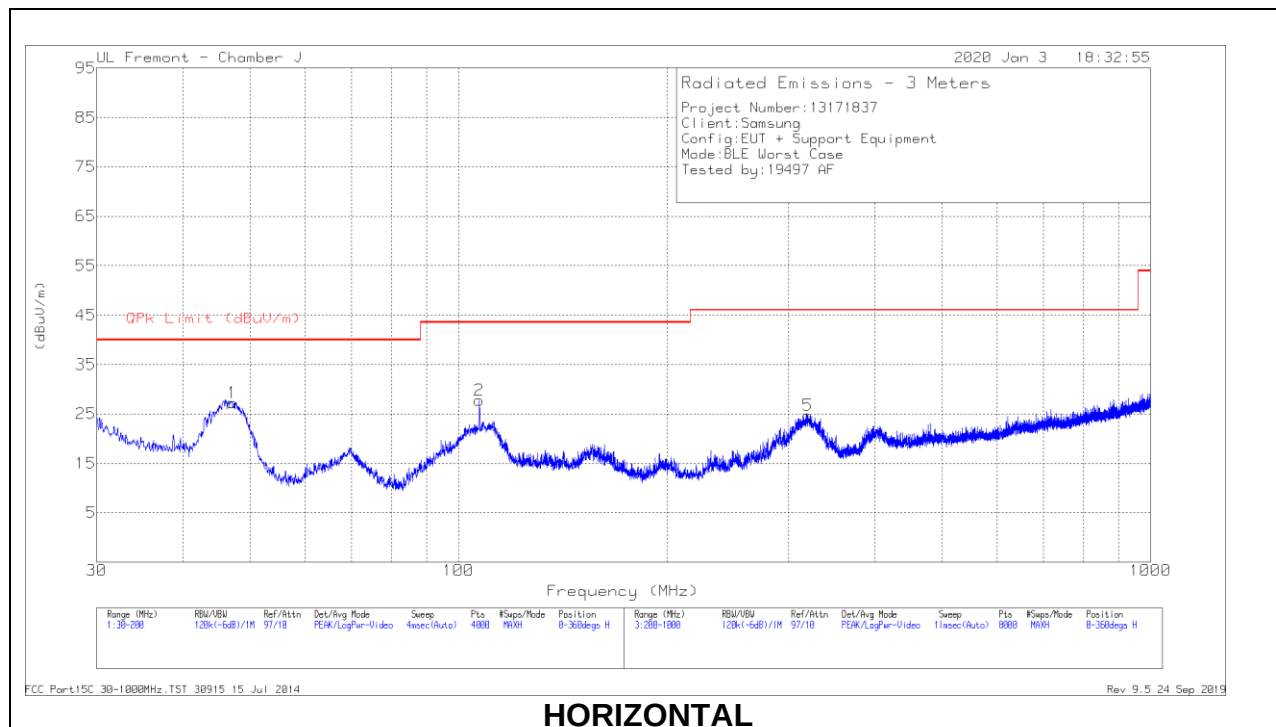
Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Amp/Cbl (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.81158	25.75	Pk	56.1	-28.5	-40	13.35	29.43	-16.08	0-360
6	.81131	25.77	Pk	56.1	-28.5	-40	13.37	29.43	-16.06	0-360
7	1.28802	17.58	Pk	45.3	-28.4	-40	-5.52	25.43	-30.95	0-360
8	15.06176	22.75	Pk	34.1	-27.9	-40	-11.05	29.5	-40.55	0-360
9	1.17525	19.09	Pk	45.9	-28.4	-40	-3.41	26.22	-29.63	0-360
10	14.5713	30.94	Pk	34.1	-27.9	-40	-2.86	29.5	-32.36	0-360

Pk - Peak detector

9.4. WORST CASE BELOW 1 GHz

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



Below 1GHz Data

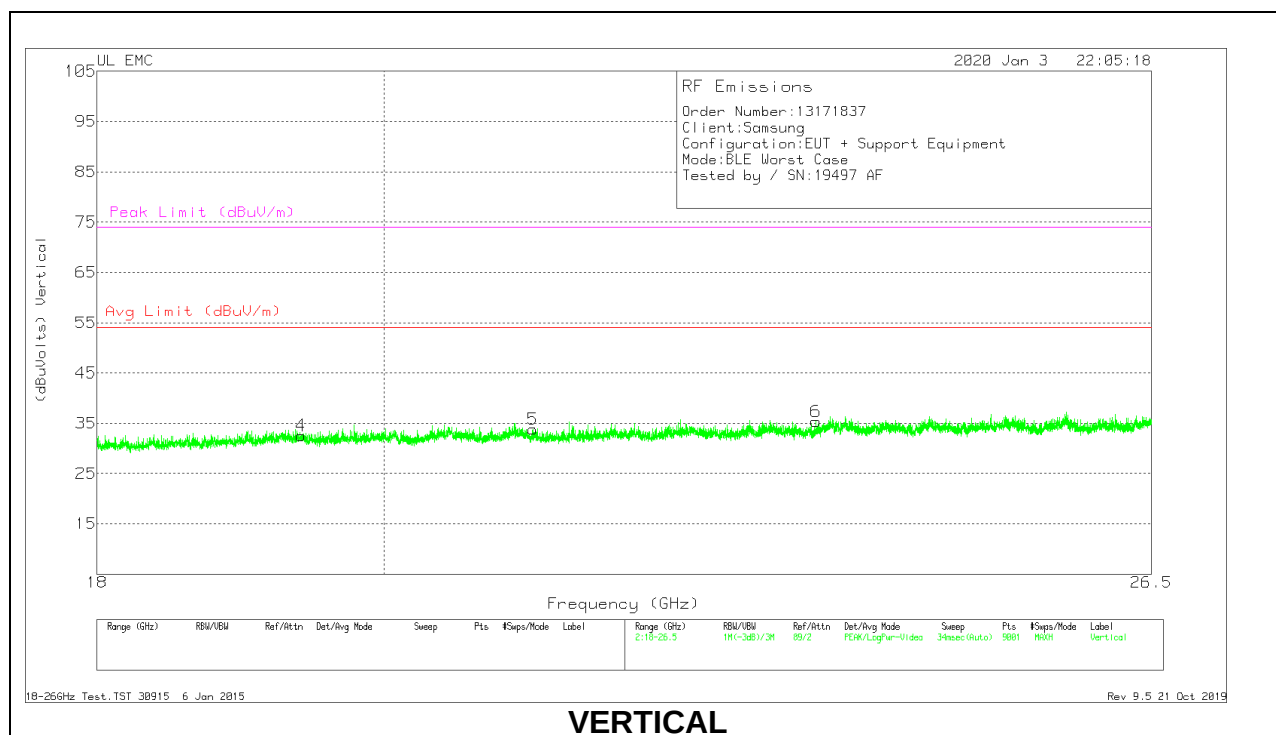
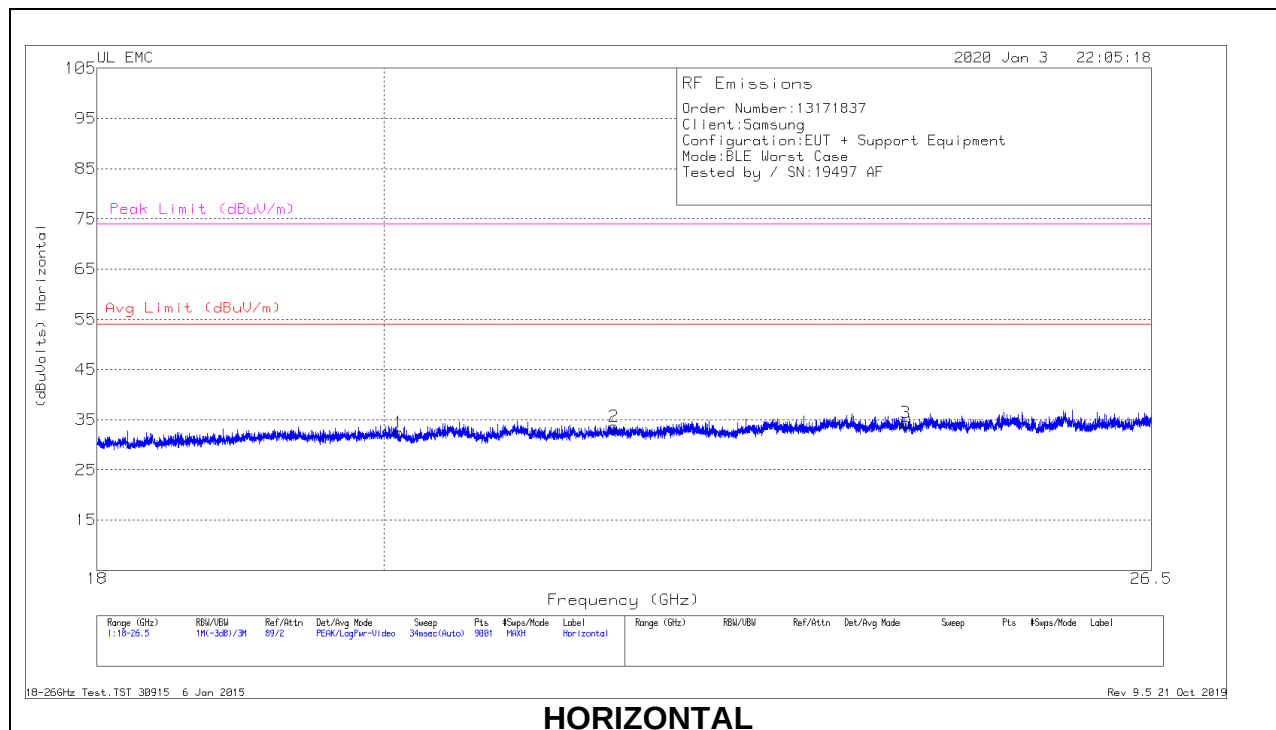
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AFT899 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	47.1319	43.7	Pk	14.9	-31.4	27.2	40	-12.8	0-360	399	H
2	107.1575	40.82	Pk	17.9	-31	27.72	43.52	-15.8	0-360	198	H
3	46.8344	48.93	Pk	15.1	-31.4	32.63	40	-7.37	0-360	101	V
	47.0718	40.6	Qp	15	-31.4	24.2	40	-10.37	327	393	V
4	107.8802	37.12	Pk	18.1	-31	24.22	43.52	-19.3	0-360	101	V
5	320.1156	34.94	Pk	19.8	-30	24.74	46.02	-21.28	0-360	101	H
6	* 322.716	31.87	Pk	19.8	-30	21.67	46.02	-24.35	0-360	101	V

Pk - Peak detector

Qp - Quasi-Peak detector

9.5. 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 (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	20.10894	66.35	Pk	32.9	-57.3	-9.5	32.45	54	-21.55	74	-41.55
2	21.75794	67.35	Pk	33.2	-57.4	-9.5	33.65	54	-20.35	74	-40.35
3	24.21539	66.66	Pk	34.2	-57	-9.5	34.36	54	-19.64	74	-39.64
4	19.39967	66.13	Pk	32.7	-56.8	-9.5	32.53	54	-21.47	74	-41.47
5	21.12044	66.83	Pk	33.2	-56.7	-9.5	33.83	54	-20.17	74	-40.17
6	23.4315	67.97	Pk	34.1	-57.2	-9.5	35.37	54	-18.63	74	-38.63

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

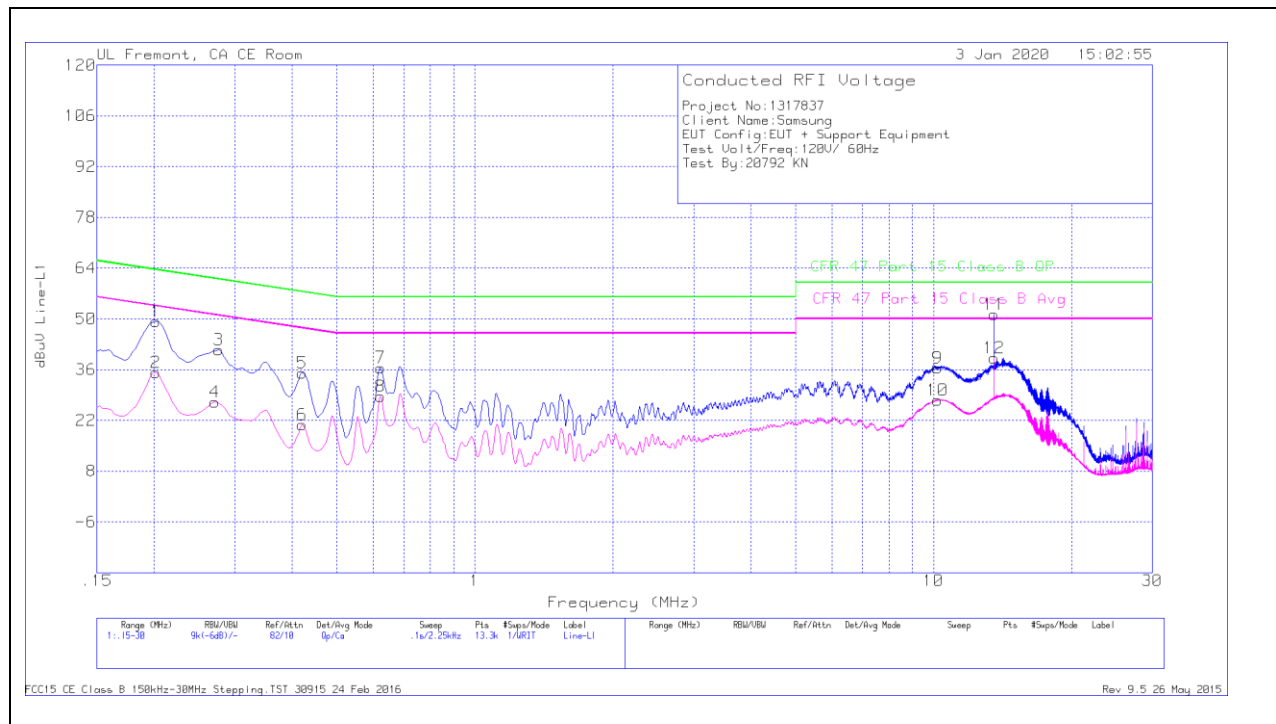
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

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

RESULTS

AC Power Line Norm

LINE 1 RESULTS



Trace Markers

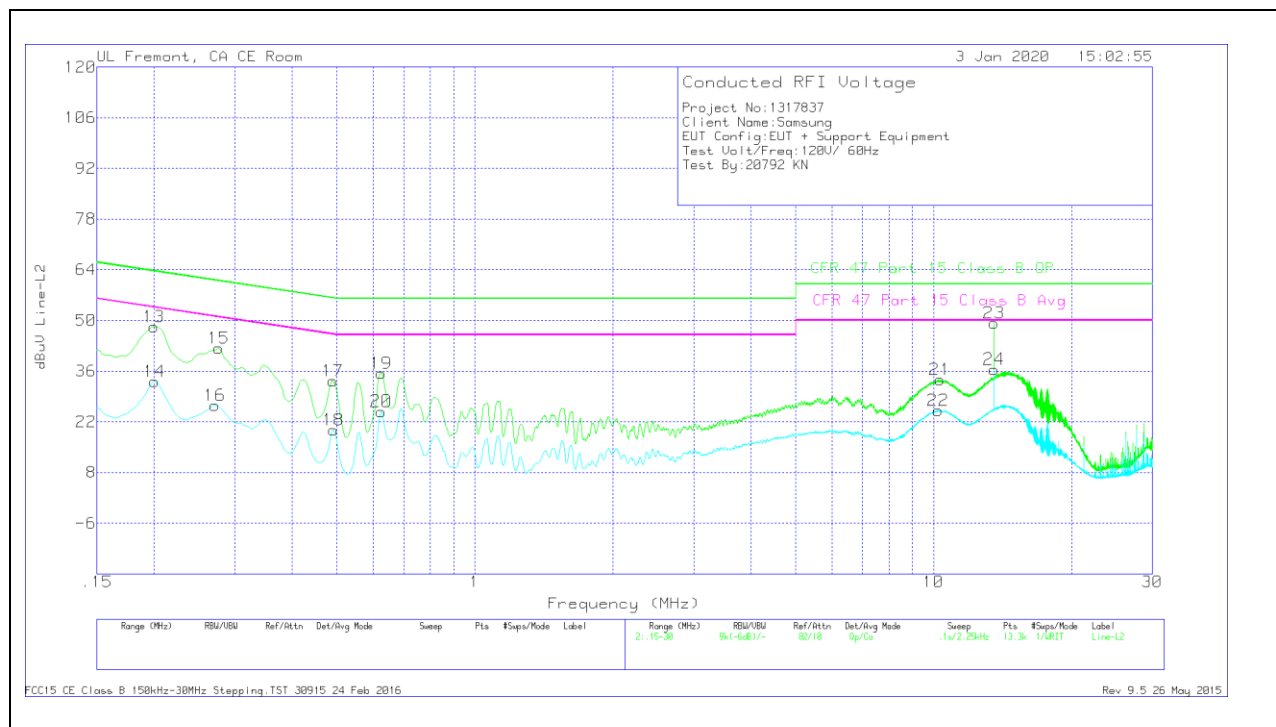
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.20175	39.2	Qp	0	0	10.1	49.3	63.54	-14.24	-	-
2	.20175	25.2	Ca	0	0	10.1	35.3	-	-	53.54	-18.24
3	.276	31.32	Qp	0	0	10.1	41.42	60.94	-19.52	-	-
4	.2715	16.95	Ca	0	0	10.1	27.05	-	-	51.07	-24.02
5	.42	25.02	Qp	0	0	10.1	35.12	57.45	-22.33	-	-
6	.42	10.65	Ca	0	0	10.1	20.75	-	-	47.45	-26.7
7	.6225	26.42	Qp	0	0	10.1	36.52	56	-19.48	-	-
8	.6225	18.46	Ca	0	0	10.1	28.56	-	-	46	-17.44
9	10.21425	26.06	Qp	0	.2	10.2	36.46	60	-23.54	-	-
10	10.20188	17.22	Ca	0	.2	10.2	27.62	-	-	50	-22.38
11	13.56	40.78	Qp	.1	.2	10.2	51.28	60	-8.72	-	-
12	13.56	28.69	Ca	.1	.2	10.2	39.19	-	-	50	-10.81

Qp - Quasi-Peak detector

Ca - CISPR average detection

NOTE: Markers 11 and 12, 13.56MHz is an external NFC signal unrelated to the EUT.

LINE 2 RESULTS



Trace Markers

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.1995	38.17	Qp	0	0	10.1	48.27	63.63	-15.36	-	-
14	.20063	23.09	Ca	0	0	10.1	33.19	-	-	53.58	-20.39
15	.276	32.18	Qp	0	0	10.1	42.28	60.94	-18.66	-	-
16	.2715	16.41	Ca	0	0	10.1	26.51	-	-	51.07	-24.56
17	.48975	23.28	Qp	0	0	10.1	33.38	56.17	-22.79	-	-
18	.492	9.6	Ca	0	0	10.1	19.7	-	-	46.13	-26.43
19	.62475	25.33	Qp	0	0	10.1	35.43	56	-20.57	-	-
20	.62475	14.78	Ca	0	0	10.1	24.88	-	-	46	-21.12
21	10.32225	23.21	Qp	0	.2	10.2	33.61	60	-26.39	-	-
22	10.248	14.8	Ca	0	.2	10.2	25.2	-	-	50	-24.8
23	13.56	38.73	Qp	.1	.2	10.2	49.23	60	-10.77	-	-
24	13.56	26.02	Ca	.1	.2	10.2	36.52	-	-	50	-13.48

Qp - Quasi-Peak detector

Ca - CISPR average detection

NOTE: Markers 23 and 24, 13.56MHz is an external NFC signal unrelated to the EUT.