



TEST REPORT

Report Number. : 13096868-E3V1

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

Model : SM-A715F and SM-A715F/DS

FCC ID : A3LSMA715F

EUT Description : GSM/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

Date Of Issue:
December 09, 2019

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	12/9/2019	Initial Issue	

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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/WCDMA/LTE Phablet with BT/BLE, DTS/UNII
a/b/g/n/ac, NFC and ANT+

MODEL: SM-A715F and SM-A715F/DS

SERIAL NUMBER: Conducted: R38M60J9VBM
Radiated: R38M808E5AH

DATE TESTED: NOVEMBER 11 – DECEMBER 2, 2019

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 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, and KDB 414788 D01 Radiated Test Site v01r01.

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	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 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/WCDMA/LTE Phablet with BT/BLE, DTS/UNII a/b/g/n/ac, NFC and ANT+. The model SM-A715F 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 (1Mbps)	7.64	5.81
2402 - 2480	BLE (2Mbps)	7.91	6.18

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal antenna, with a maximum peak gain of -7.52 dBi.

5.4. SOFTWARE

The test utility software used during testing was A715F.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 Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

Worst-case data rates as provided by the client were 1Mbps and 2Mbps.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	EP-TA800	R37M8PH3JN2SE3	N/A
Earphone	Samsung	N/A	N/A	N/A

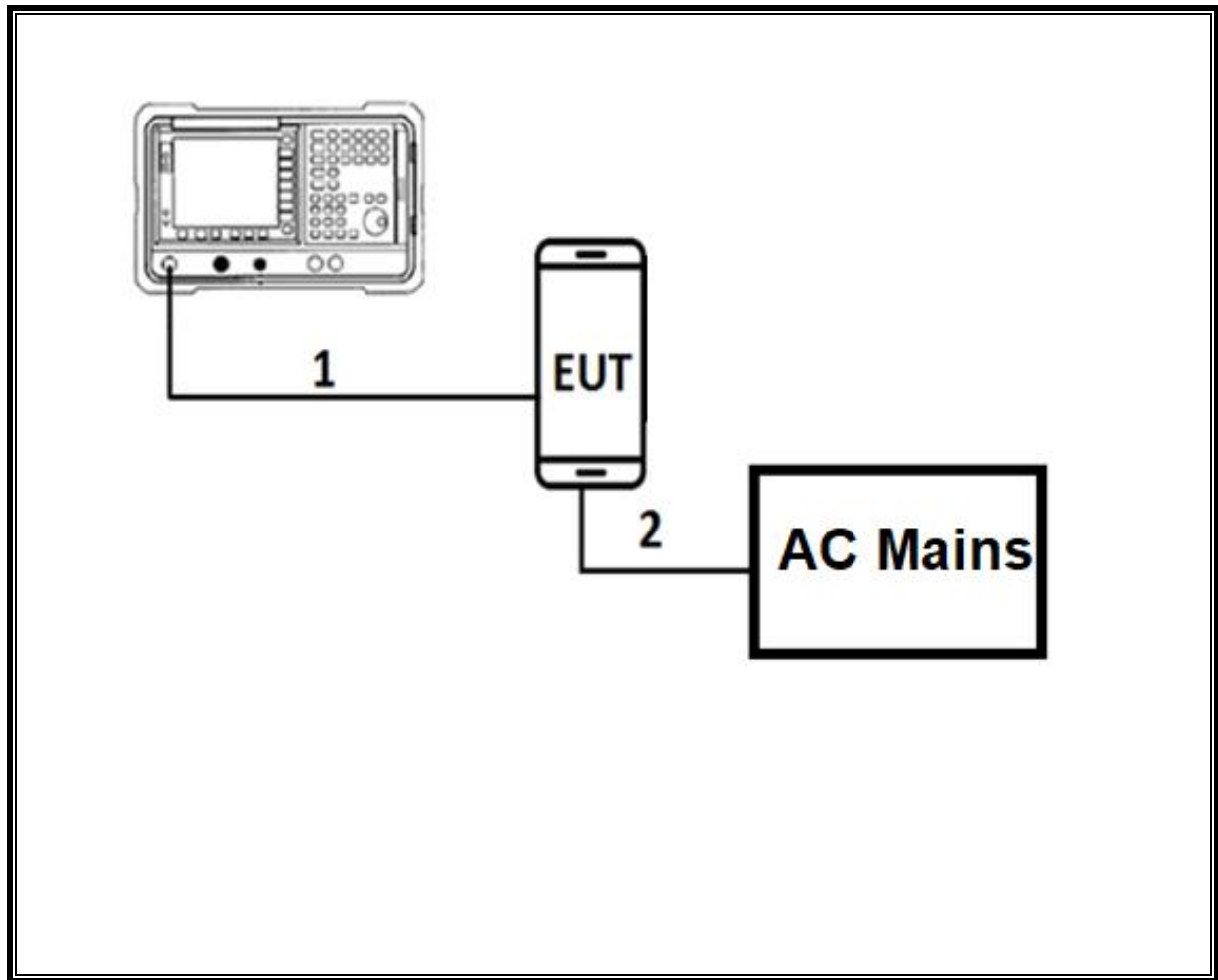
I/O CABLES (CONDUCTED TEST)

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

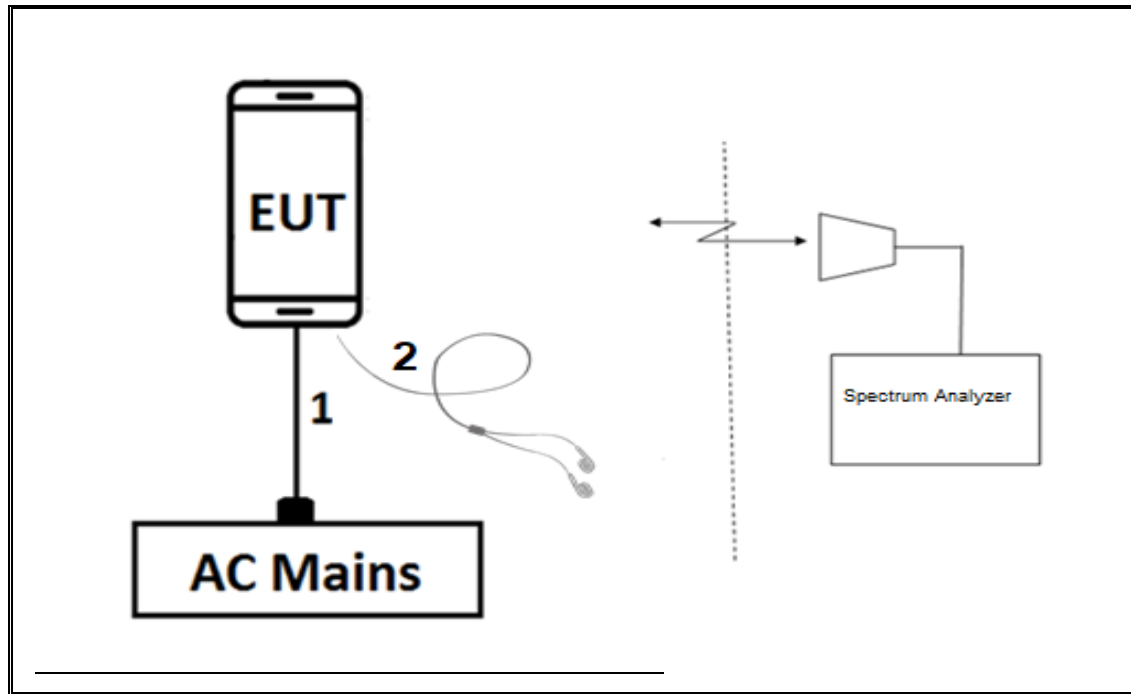
CONDUCTED TEST SETUP DIAGRAM



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
Antenna, Passive Loop 30Hz to 1MHz	ELETRO METRICS	EM-6871	PRE0179466	05/31/2020
Antenna, Passive Loop 100KHz to 30MHz	ELETRO METRICS	EM-6872	PRE0179468	05/31/2020
Antenna, Horn 1-18GHz	ETS Lindgren	3117	EMC4249 / PRE0100034	06/14/2020
Antenna, Horn 700MHz-18GHz	A.H. Systems, Inc.	SAS-571	PRE0194893	05/16/2021
Amplifier, 1 to 18GHz	Amplical	AMP1G18-35	T1569	05/04/2020
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T931	05/11/2020
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T899	08/23/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0190174	06/01/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE175953	12/13/2019
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	E4446A	T146	01/28/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T917	01/24/2020
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
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179372	02/16/2020
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179367	05/16/2020
Filter, HPF 3.0GHz	MICRO-TRONICS	HPM17543	T897	05/04/2020
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, June 15, 2019	
Antenna Port Software	UL	UL RF	Ver 11.13, Nov 13, 2019	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

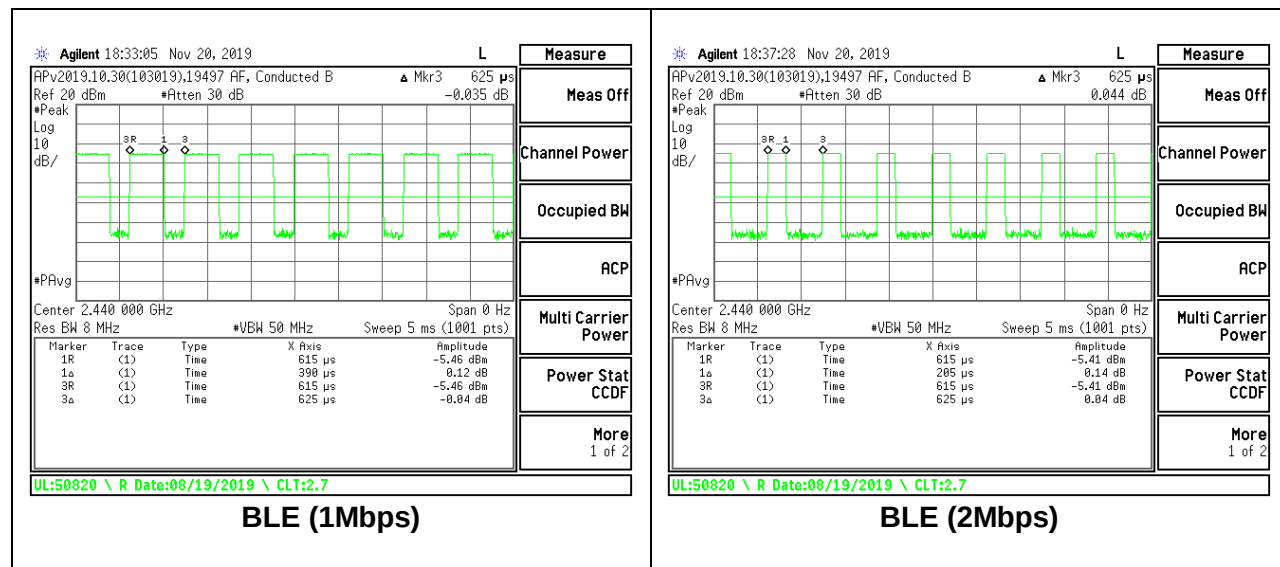
PROCEDURE

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)	0.390	0.625	0.624	62.4	2.05	2.564
BLE (2Mbps)	0.205	0.625	0.328	32.8	4.84	4.878

DUTY CYCLE PLOTS



8.2. 6 dB BANDWIDTH

LIMITS

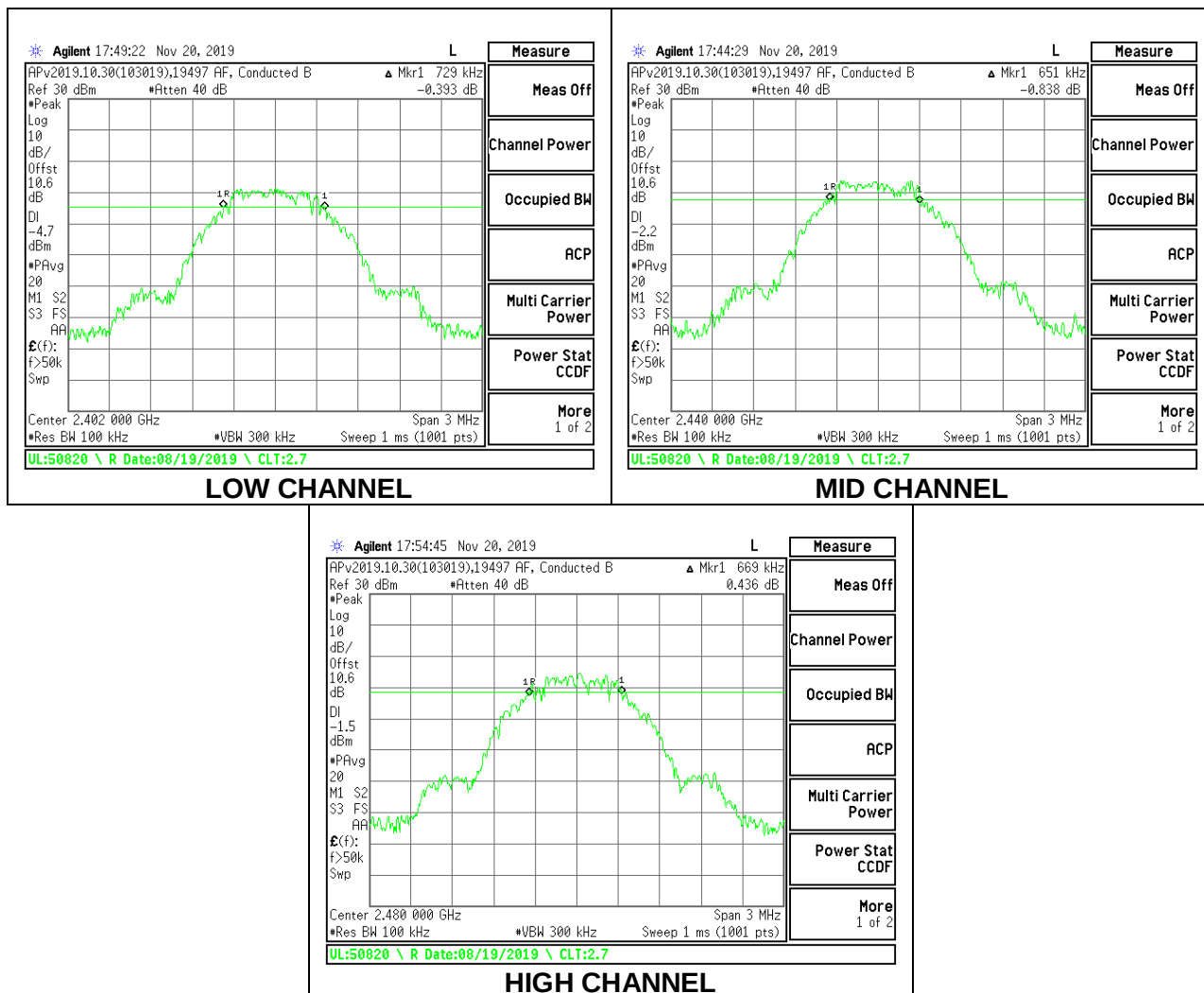
FCC §15.247 (a) (2)

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

RESULTS

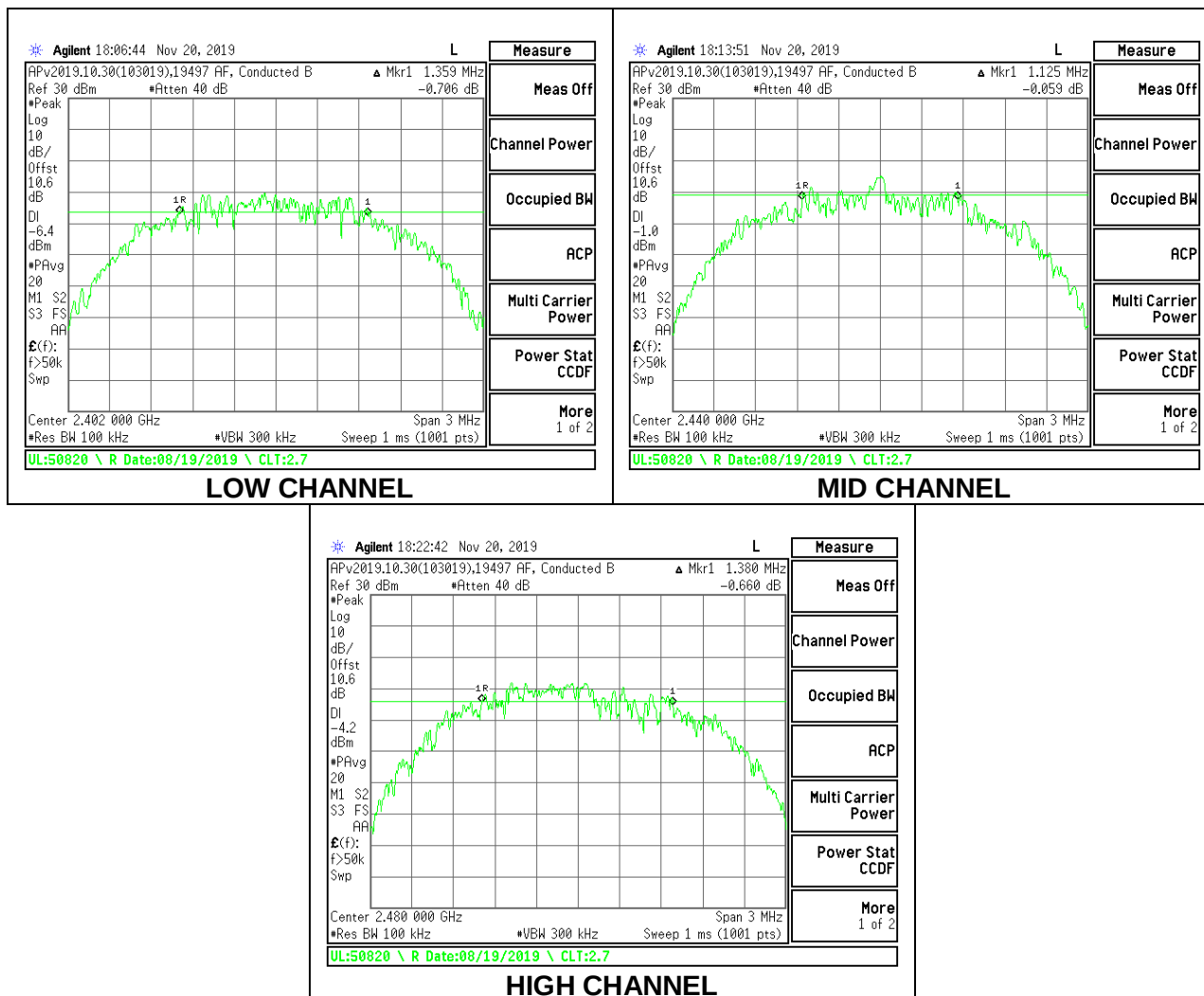
8.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.729	0.5
Middle	2440	0.651	0.5
High	2480	0.669	0.5



8.2.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.359	0.5
Middle	2440	1.125	0.5
High	2480	1.380	0.5



8.3. 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 cable assembly insertion loss was entered as an offset in the power meter to allow for a peak reading of power.

RESULTS

8.3.1. BLE (1Mbps)

Tested By:	16080 ZS
Date:	11/21/2019

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.02	30	-24.980
Middle	2440	7.35	30	-22.650
High	2480	7.64	30	-22.360

8.3.2. BLE (2Mbps)

Tested By:	16080ZS
Date:	11/21/2019

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.23	30	-24.770
Middle	2440	7.65	30	-22.350
High	2480	7.91	30	-22.090

8.4. 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

8.4.1. BLE (1Mbps)

Tested By:	16080ZS
Date:	11/21/2019

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.75
Middle	2440	7.07
High	2480	7.38

8.4.2. BLE (2Mbps)

Tested By:	16080ZS
Date:	11/21/2019

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.70
Middle	2440	7.09
High	2480	7.41

8.5. POWER SPECTRAL DENSITY

LIMITS

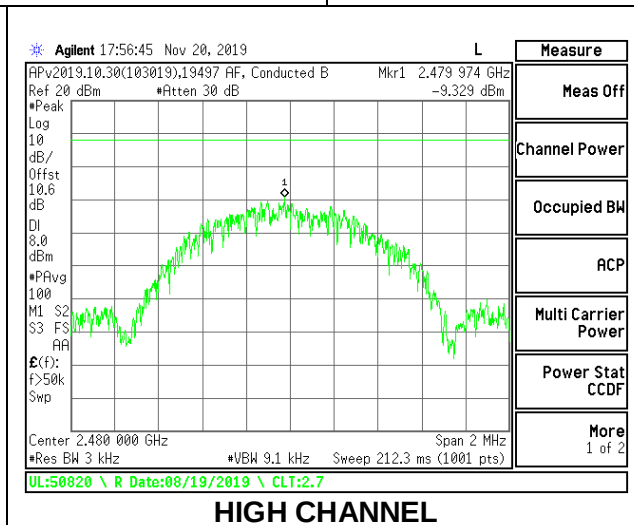
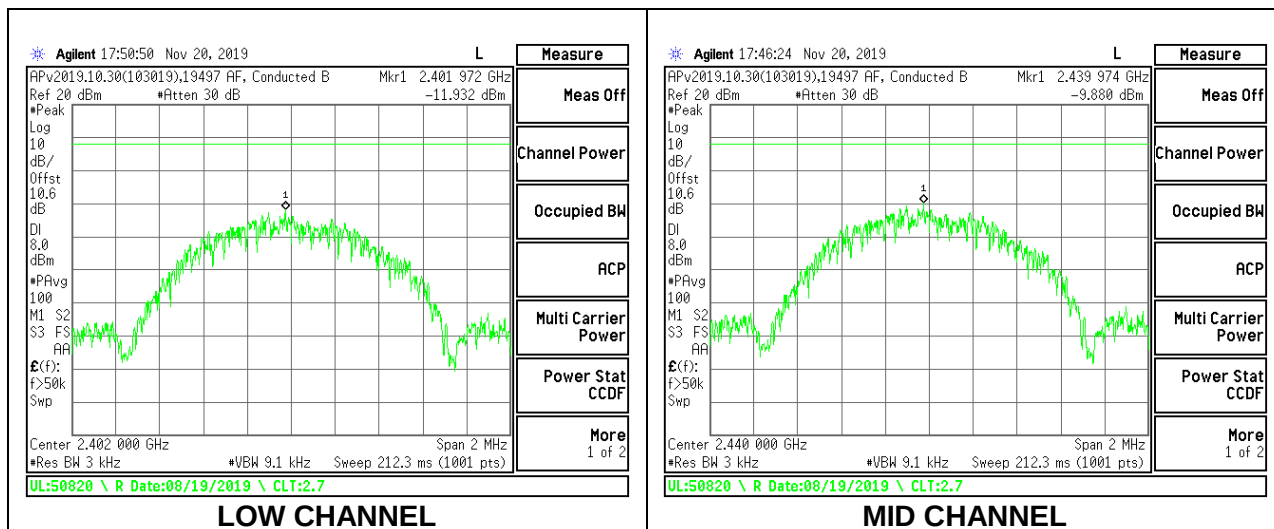
FCC §15.247 (e)

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

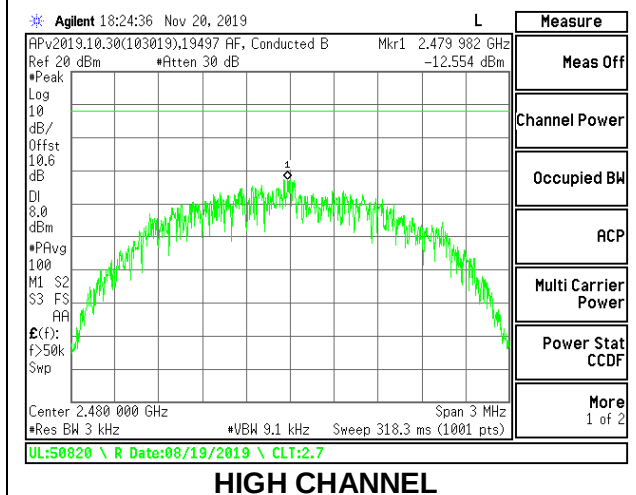
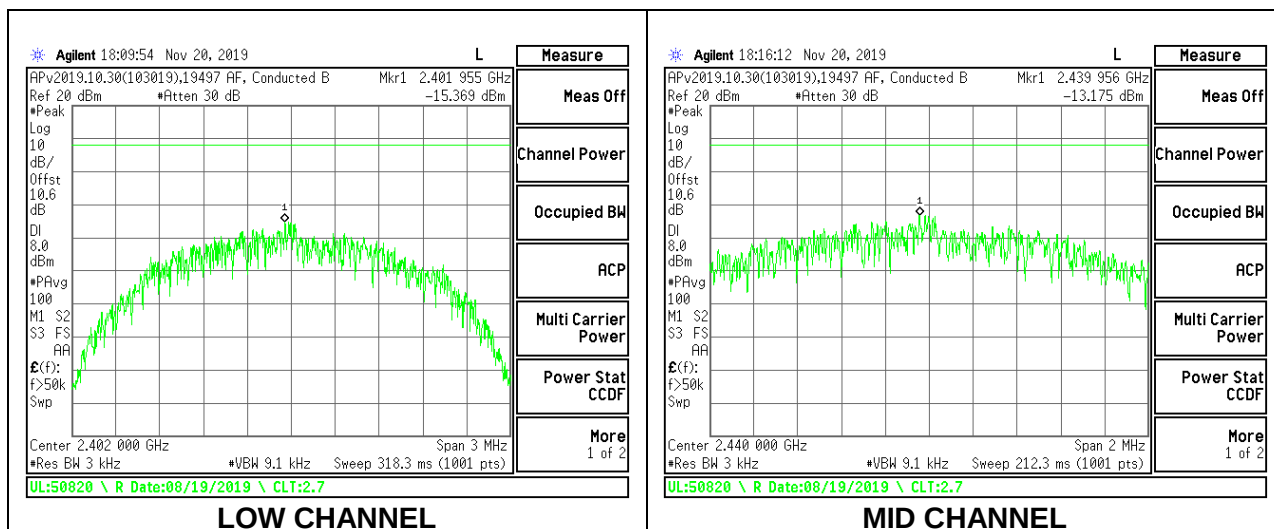
8.5.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-11.930	8	-19.93
Middle	2440	-9.880	8	-17.88
High	2480	-9.329	8	-17.33



8.5.2. BLE (2Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-15.369	8	-23.37
Middle	2440	-13.175	8	-21.18
High	2480	-12.554	8	-20.55



8.6. CONDUCTED SPURIOUS EMISSIONS

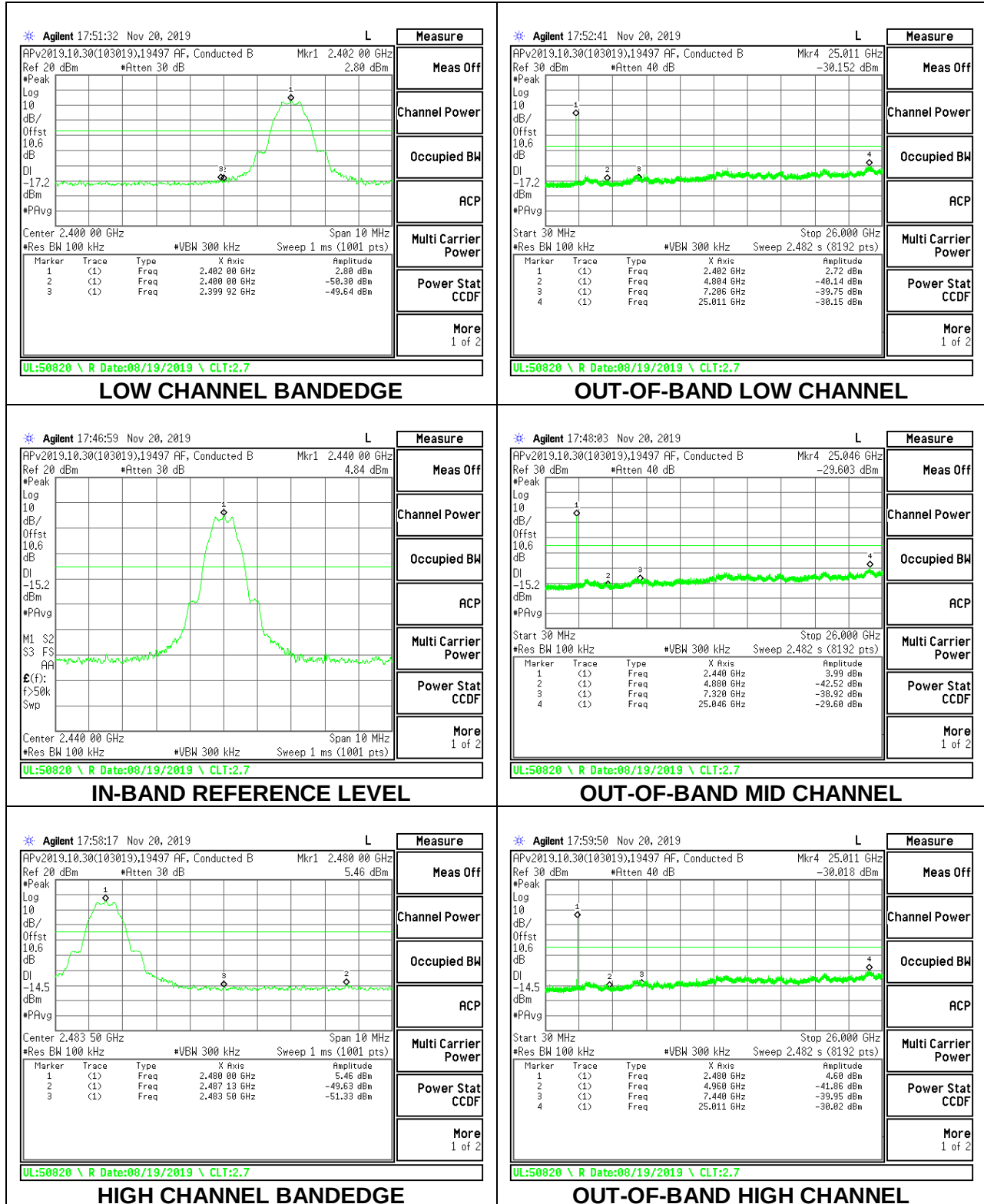
LIMITS

FCC §15.247 (d)

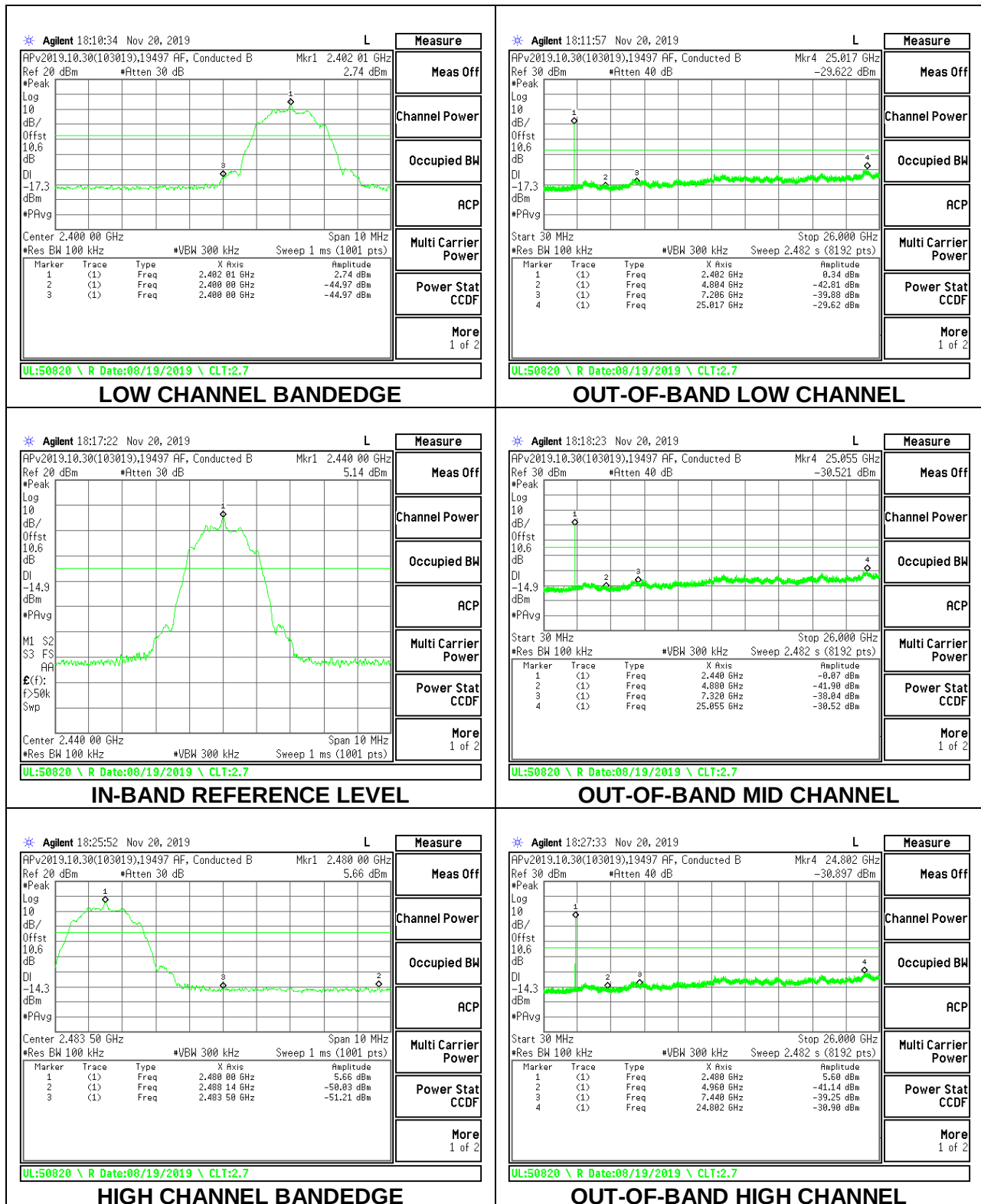
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

8.6.1. BLE (1Mbps)



8.6.2. BLE (2Mbps)



9. RADIATED TEST RESULTS

9.1. 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. 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.

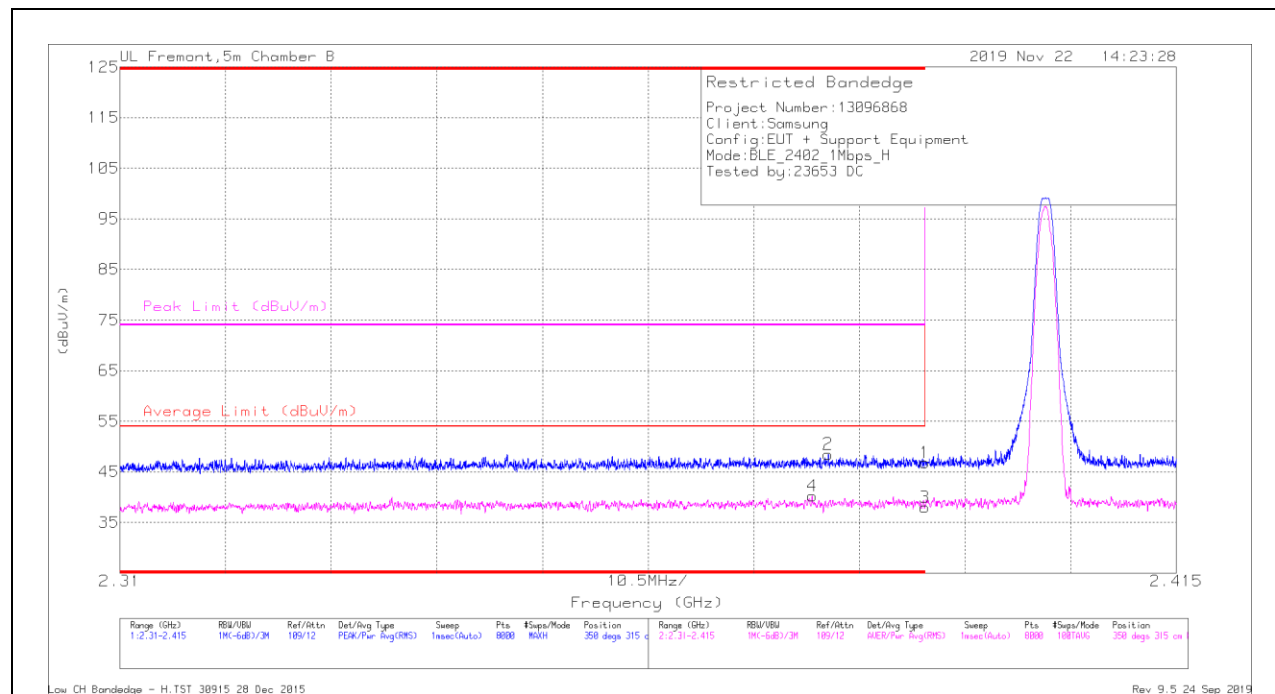
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

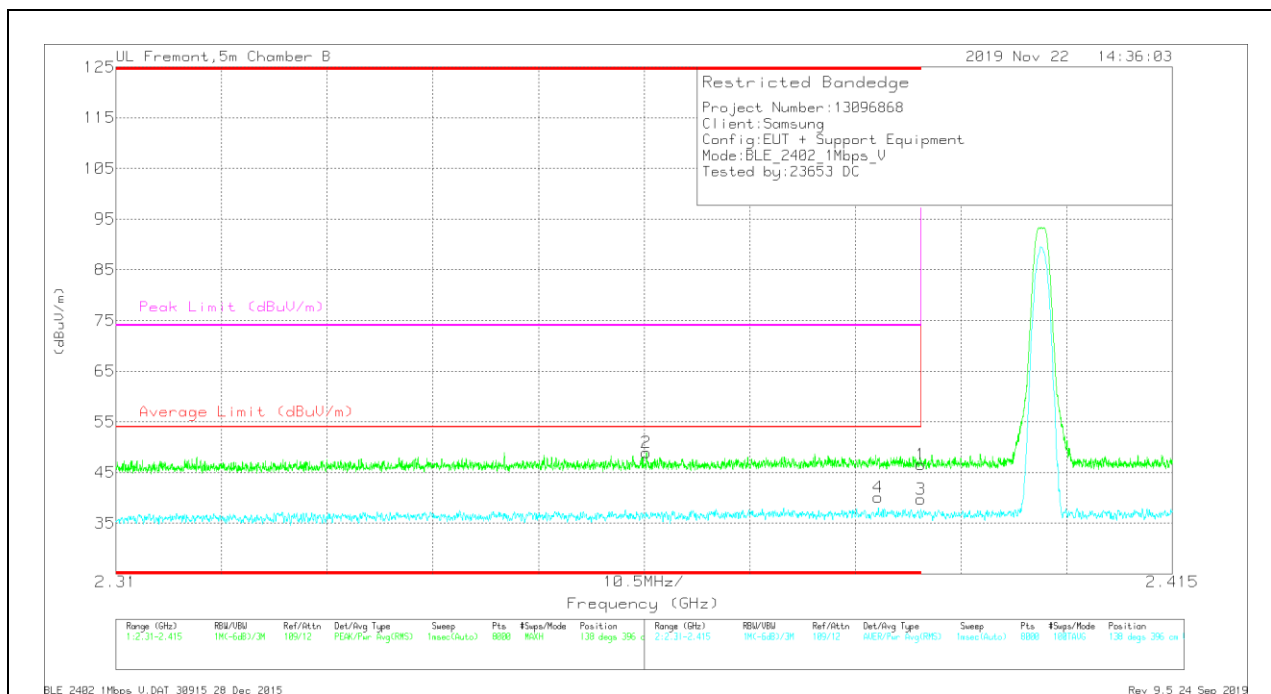
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (dB/m)	Amp/Cb/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	35.41	PK	30.3	-18.9	0	46.81	-	-	74	-27.19	350	315	H
2	* 2.38041	37.09	PK	30.2	-18.8	0	48.49	-	-	74	-25.51	350	315	H
3	* 2.39	24.58	RMS	30.3	-18.9	2.05	38.03	54	-15.97	-	-	350	315	H
4	* 2.3788	26.73	RMS	30.2	-18.8	2.05	40.18	54	-13.82	-	-	350	315	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (dB/m)	Amp/CbI/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	* 2.39	35.19	Pk	30.3	-18.9	0	46.59	-	-	74	-27.41	138	396	V
2	* 2.36273	37.86	Pk	30.1	-19	0	48.96	-	-	74	-25.04	138	396	V
3	* 2.39	26.32	RMS	30.3	-18.9	2.05	39.77	54	-14.23	-	-	138	396	V
4	* 2.38578	26.76	RMS	30.2	-18.9	2.05	40.11	54	-13.89	-	-	138	396	V

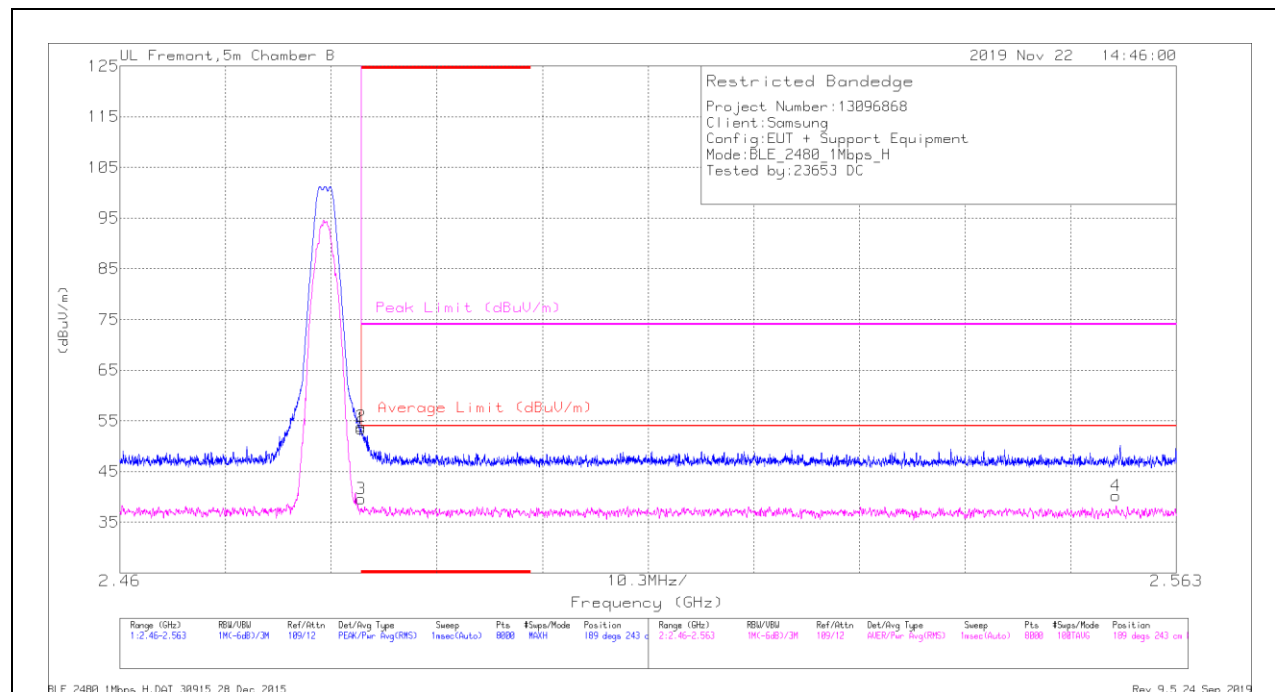
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

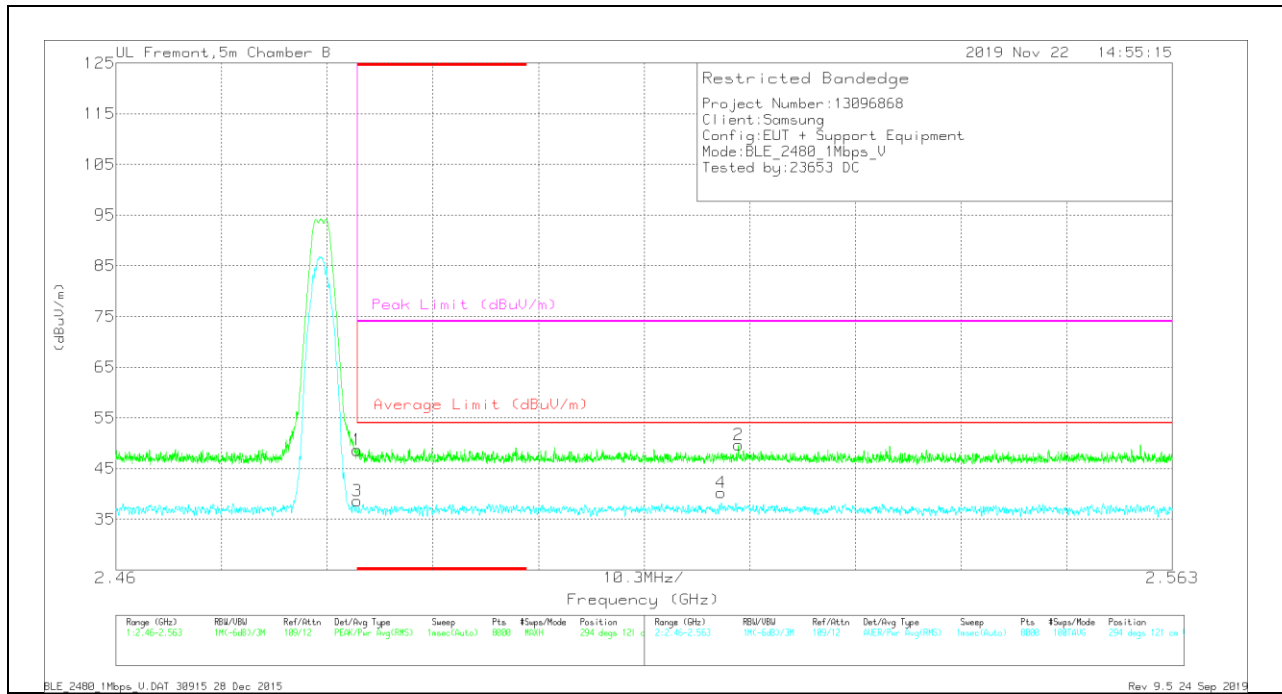
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (dB/m)	Amp/Cb/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	42.16	Pk	30.2	-18.9	0	53.46	-	-	74	-20.54	189	243	H
2	* 2.48351	42.63	Pk	30.2	-18.9	0	53.93	-	-	74	-20.07	189	243	H
3	* 2.4835	26.31	RMS	30.2	-18.9	2.05	39.66	54	-14.34	-	-	189	243	H
4	2.55713	26.99	RMS	30.1	-18.9	2.05	40.24	54	-13.76	-	-	189	243	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (dB/m)	Amp/CbI/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	37.32	PK	30.2	-18.9	0	48.62	-	-	74	-25.38	294	121	V
3	* 2.4835	25.26	RMS	30.2	-18.9	2.05	38.61	54	-15.39	-	-	294	121	V
4	2.51902	26.97	RMS	30.1	-18.9	2.05	40.22	54	-13.78	-	-	294	121	V
2	2.5207	38.37	PK	30.1	-18.8	0	49.67	-	-	74	-24.33	294	121	V

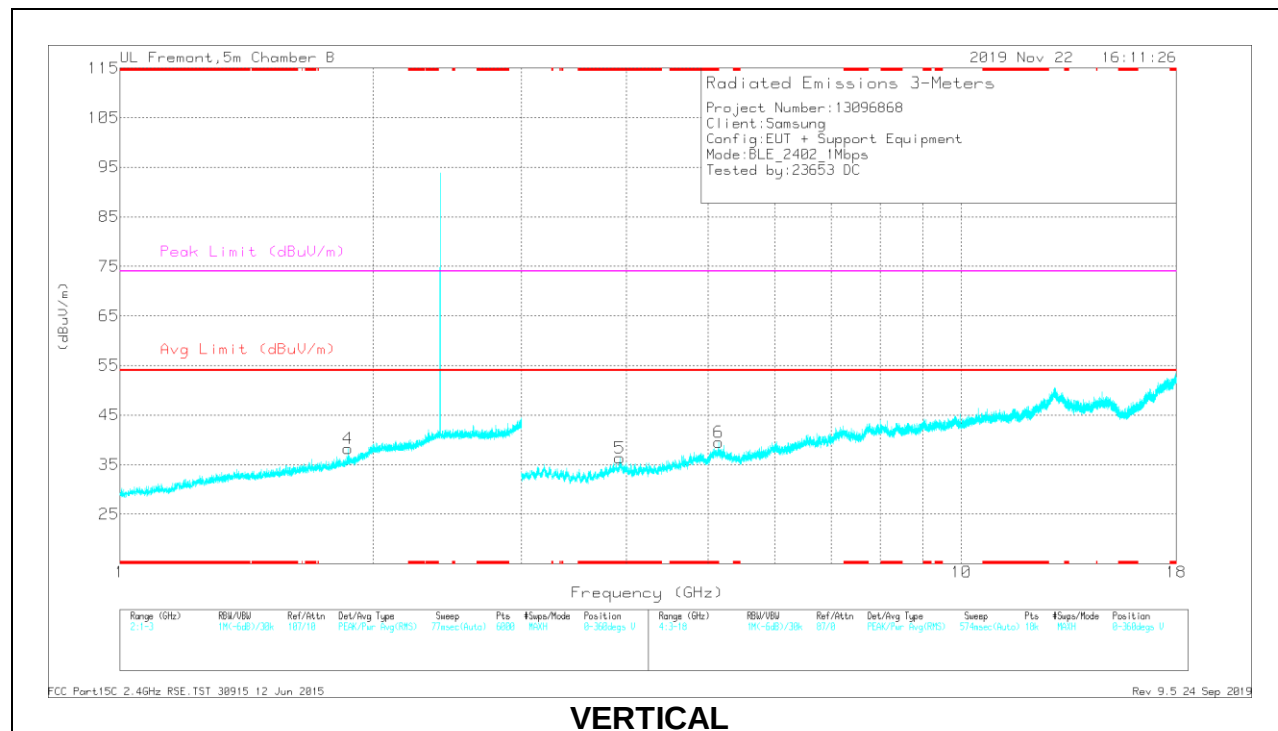
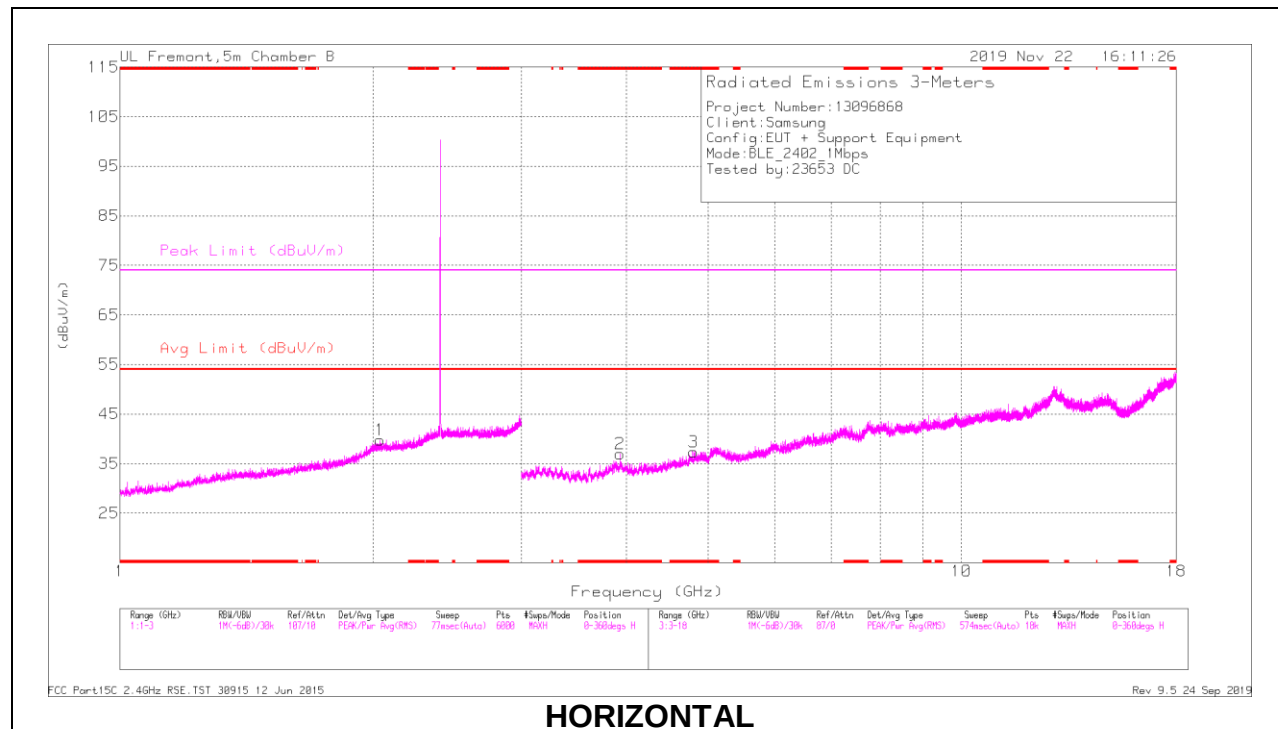
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

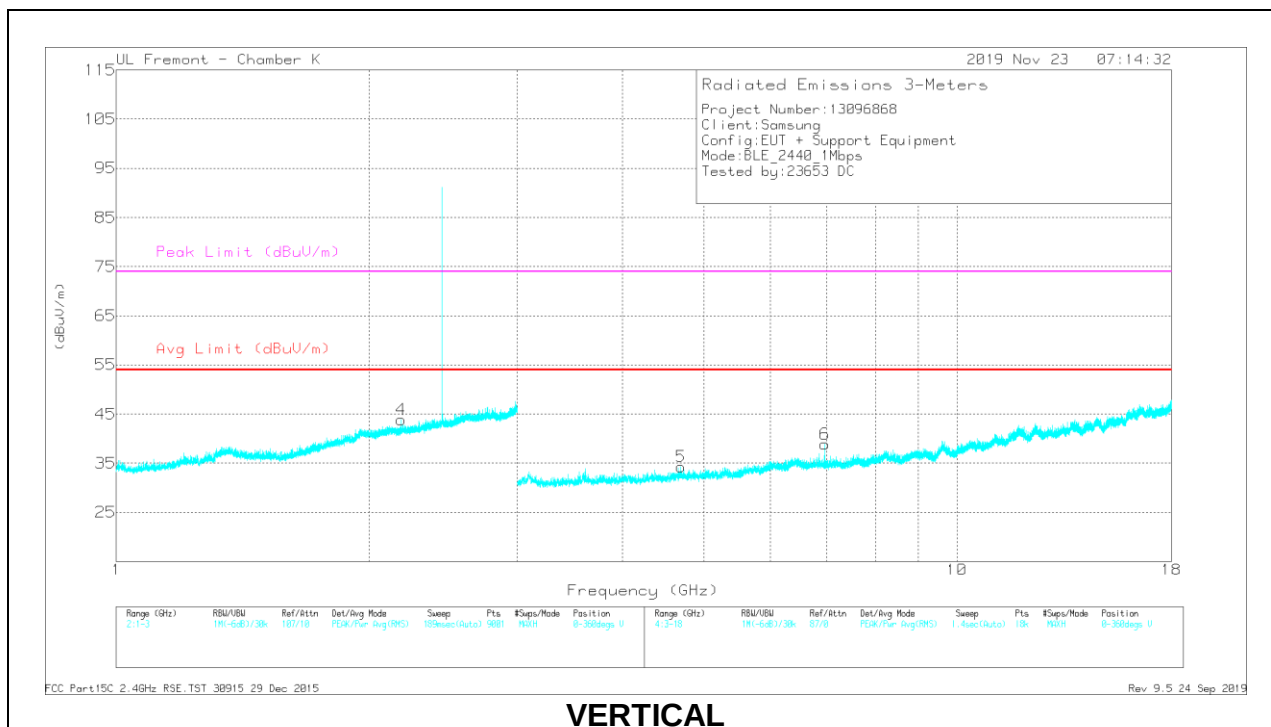
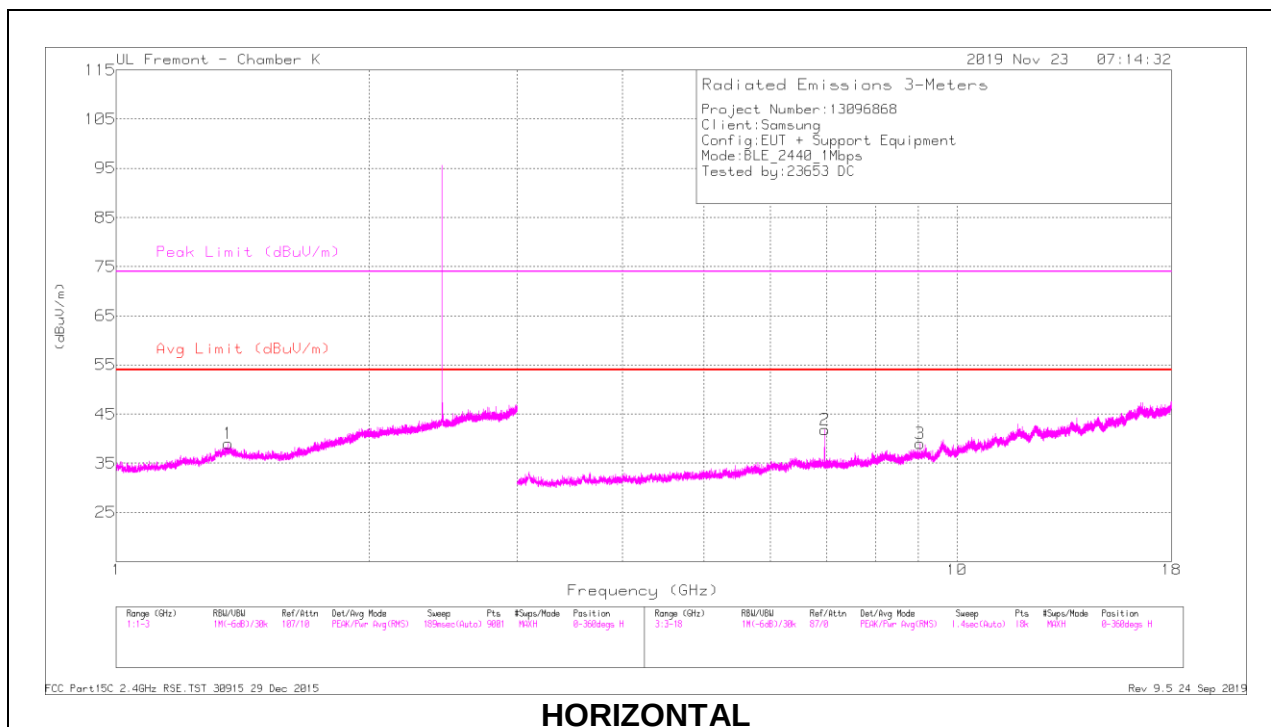
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 3.92841	37.91	PK2	31.7	-25.7	0	43.91	-	-	74	-30.09	109	189	H
	* 3.92938	24.09	MAv1	31.7	-25.7	2.05	32.14	54	-21.86	-	-	109	189	H
3	* 4.80618	35.16	PK2	33	-24.4	0	43.76	-	-	74	-30.24	58	120	H
	* 4.80855	23.12	MAv1	33	-24.3	2.05	33.87	54	-20.13	-	-	58	120	H
5	* 3.92517	35.38	PK2	31.7	-25.6	0	41.48	-	-	74	-32.52	161	141	V
	* 3.92787	24.06	MAv1	31.7	-25.7	2.05	32.11	54	-21.89	-	-	161	141	V
6	* 5.14307	35.28	PK2	34	-23.9	0	45.38	-	-	74	-28.62	147	155	V
	* 5.14382	22.96	MAv1	34	-23.9	2.05	35.11	54	-18.89	-	-	147	155	V
4	1.8685	35.05	PK2	26.7	-19	0	42.75	-	-	74	-31.25	178	293	V
1	2.03732	35.36	PK2	28.6	-19.1	0	44.86	-	-	74	-29.14	31	342	H

* - 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

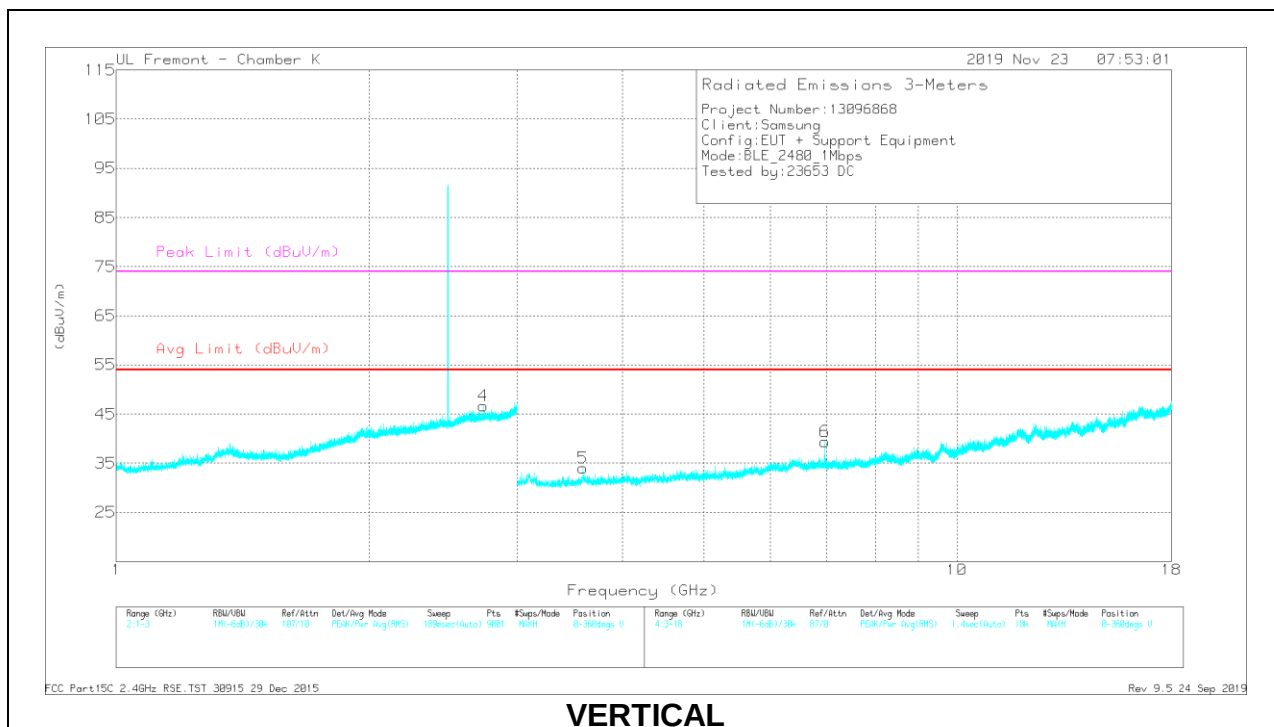
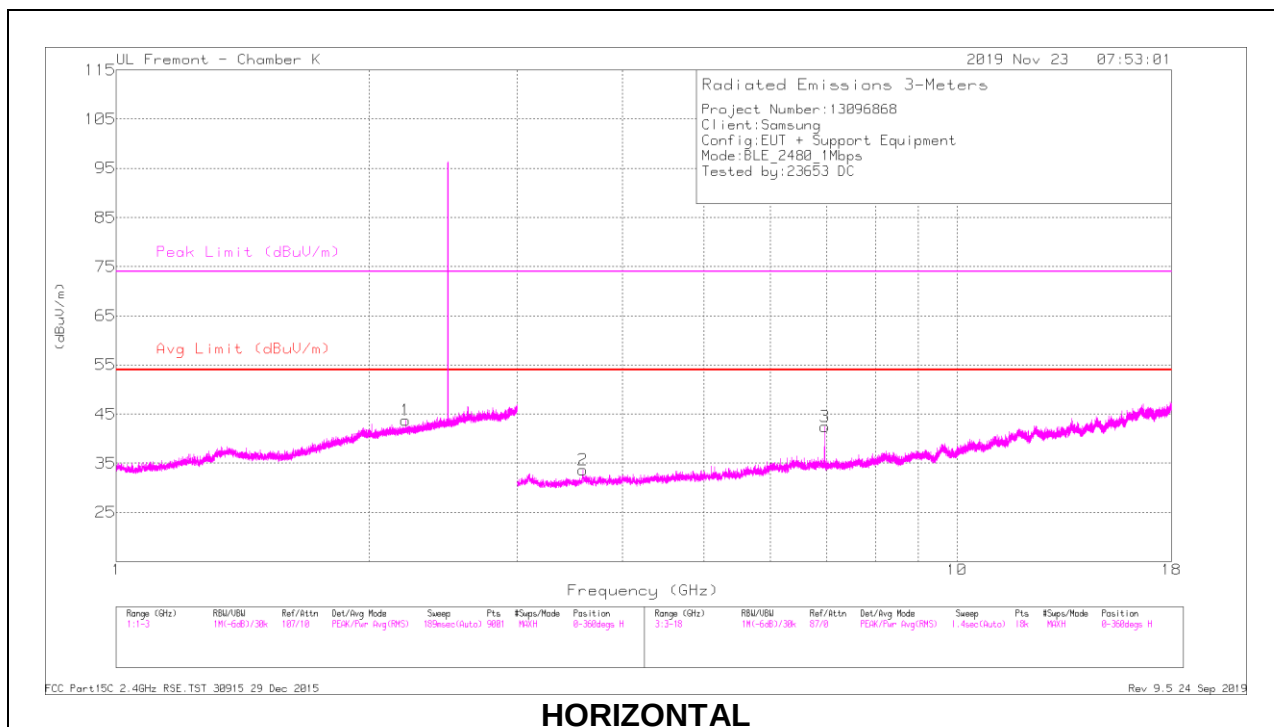
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.35776	33	PK2	29.6	-16.9	0	45.7	-	-	74	-28.3	162	230	H
	* 1.36089	22.36	MAv1	29.5	-16.8	2.05	37.11	54	-16.89	-	-	162	230	H
4	2.18294	34.17	PK2	31.3	-14.7	0	50.77	-	-	-	-	159	226	V
2	6.95996	36.99	PK2	35.7	-26.8	0	45.89	-	-	-	-	320	175	H
3	* 9.03923	33.72	PK2	36.3	-23.8	0	46.22	-	-	74	-27.78	162	231	H
	* 9.03914	22.09	MAv1	36.3	-23.8	2.05	36.64	54	-17.36	-	-	162	231	H
6	6.96011	36.5	PK2	35.7	-26.8	0	45.4	-	-	-	-	15	99	V
5	* 4.69687	36.77	PK2	34	-30.5	0	40.27	-	-	74	-33.73	162	230	V
	* 4.69843	27.59	MAv1	34	-30.5	2.05	33.14	54	-20.86	-	-	162	230	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/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	* 2.21115	33.01	PK2	31.3	-14.7	0	49.61	-	-	74	-24.39	158	230	H
	* 2.20841	22.66	MAv1	31.3	-14.6	2.05	41.41	54	-12.59	-	-	158	230	H
4	* 2.73397	33.5	PK2	32.7	-13.4	0	52.8	-	-	74	-21.2	158	230	V
	* 2.73312	23.16	MAv1	32.6	-13.4	2.05	44.41	54	-9.59	-	-	158	230	V
3	6.95996	37.54	PK2	35.7	-26.8	0	46.44	-	-	-	-	349	117	H
2	* 3.58785	37.83	PK2	34.2	-32.3	0	39.73	-	-	74	-34.27	158	230	H
	* 3.58846	28.64	MAv1	34.2	-32.3	2.05	32.59	54	-21.41	-	-	158	230	H
6	6.95995	36.1	PK2	35.7	-26.8	0	45	-	-	-	-	17	101	V
5	* 3.59065	38.04	PK2	34.2	-32.3	0	39.94	-	-	74	-34.06	158	231	V
	* 3.5927	28.77	MAv1	34.1	-32.3	2.05	32.62	54	-21.38	-	-	158	231	V

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

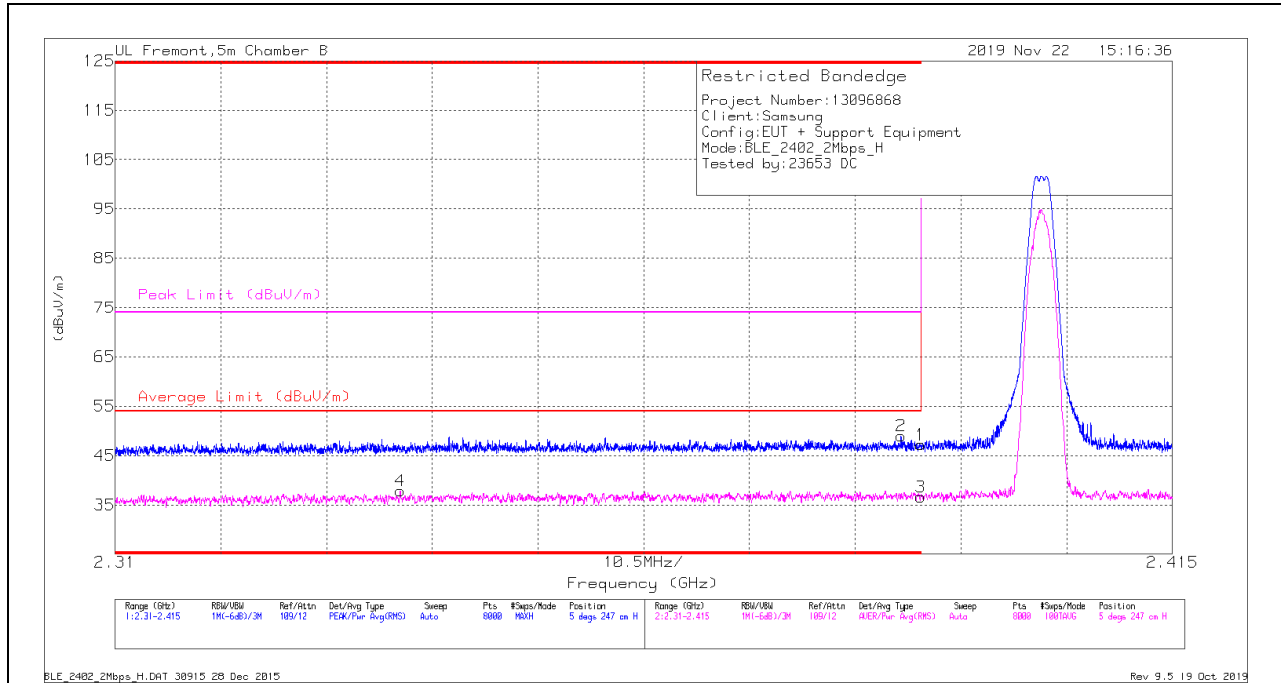
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

9.2.2. BLE (2Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

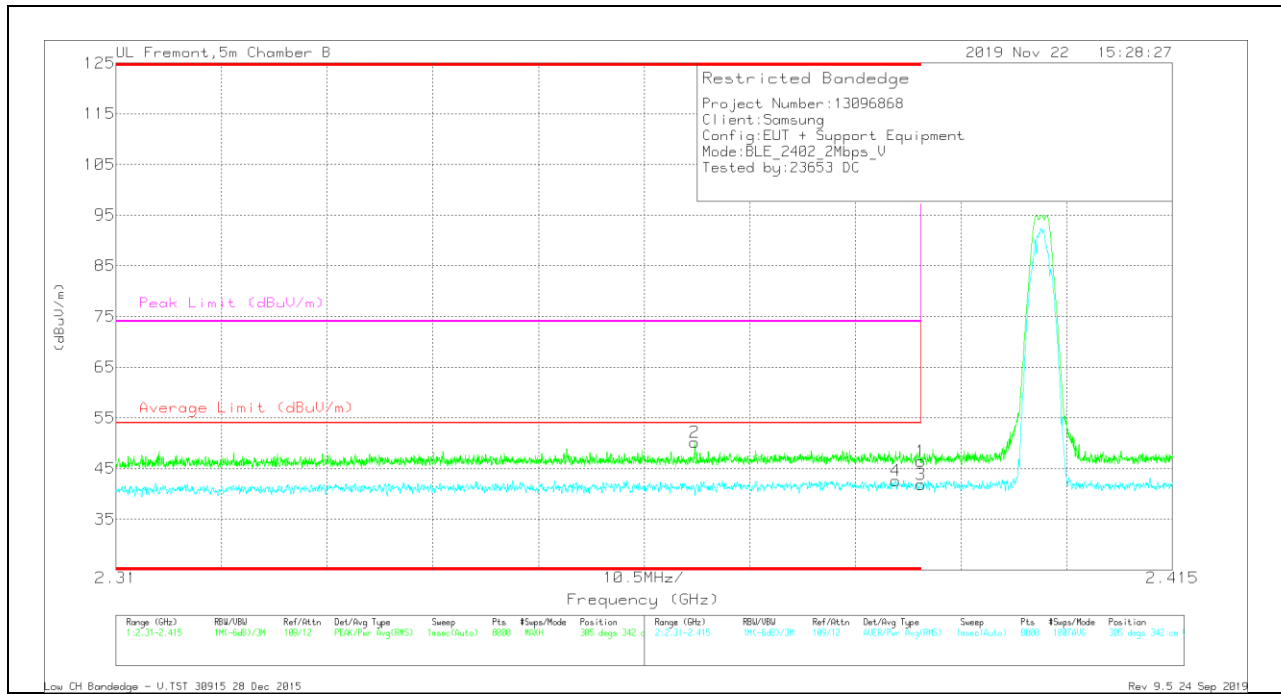
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (dB/m)	Amp/CbI/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	35.78	Pk	30.3	-18.9	0	47.18	-	-	74	-26.82	5	247	H
2	* 2.38804	37.61	Pk	30.3	-18.9	0	49.01	-	-	74	-24.99	5	247	H
3	* 2.39	20.41	RMS	30.3	-18.9	4.84	36.65	54	-17.35	-	-	5	247	H
4	* 2.33831	22.04	RMS	29.9	-18.9	4.84	37.88	54	-16.12	-	-	5	247	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (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
2	* 2.36754	39.02	PK	30.1	-19	0	50.12	-	-	74	-23.88	305	342	V
4	* 2.38749	26.38	RMS	30.3	-18.9	4.84	42.62	54	-11.38	-	-	305	342	V
1	* 2.39	35.09	PK	30.3	-18.9	0	46.49	-	-	74	-27.51	305	342	V
3	* 2.39	25.65	RMS	30.3	-18.9	4.84	41.89	54	-12.11	-	-	305	342	V

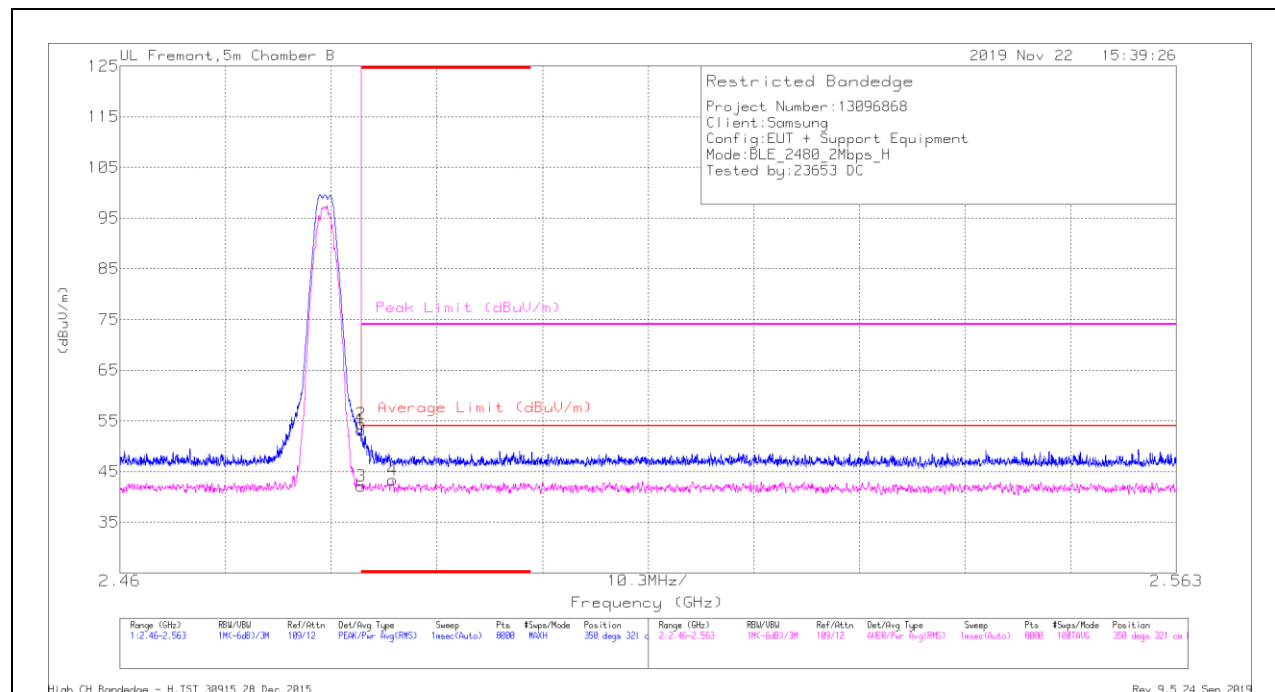
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

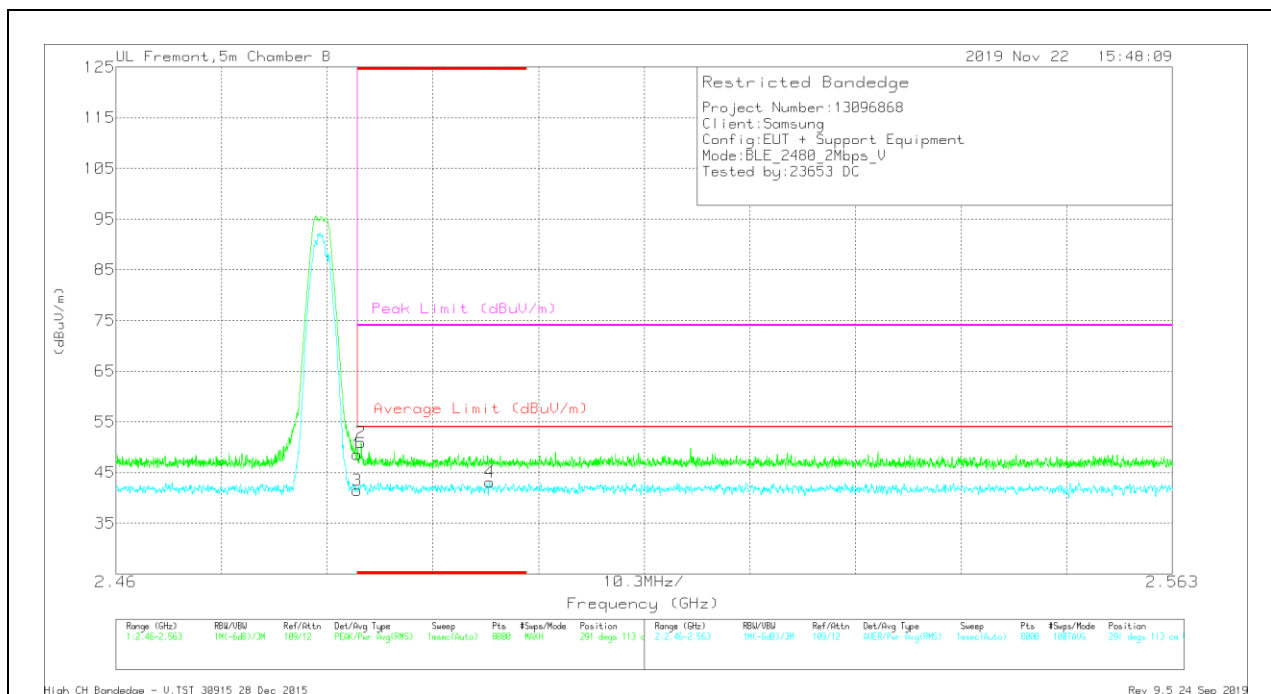
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (dB/m)	Amp/Cbl/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	41.8	Pk	30.2	-18.9	0	53.1	-	-	74	-20.9	350	321	H
3	* 2.4835	25.93	RMS	30.2	-18.9	4.84	42.07	54	-11.93	-	-	350	321	H
2	* 2.48353	43.07	Pk	30.2	-18.9	0	54.37	-	-	74	-19.63	350	321	H
4	* 2.48659	27.15	RMS	30.2	-18.9	4.84	43.29	54	-10.71	-	-	350	321	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0194893 (dB/m)	Amp/CbI/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	37.24	PK	30.2	-18.9	0	48.54	-	-	74	-25.46	291	113	V
3	* 2.4835	25.34	RMS	30.2	-18.9	4.84	41.48	54	-12.52	-	-	291	113	V
2	* 2.48391	39.57	PK	30.2	-18.9	0	50.87	-	-	74	-23.13	291	113	V
4	* 2.49643	27.08	RMS	30.1	-18.9	4.84	43.12	54	-10.88	-	-	291	113	V

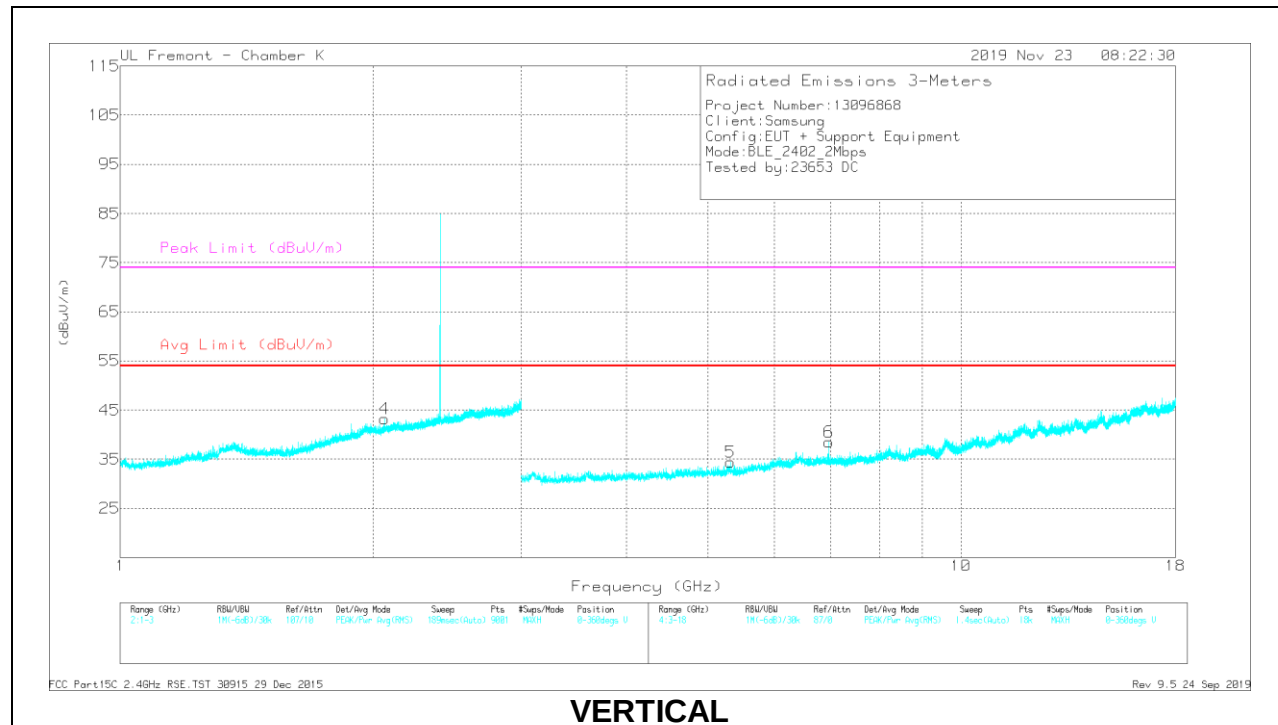
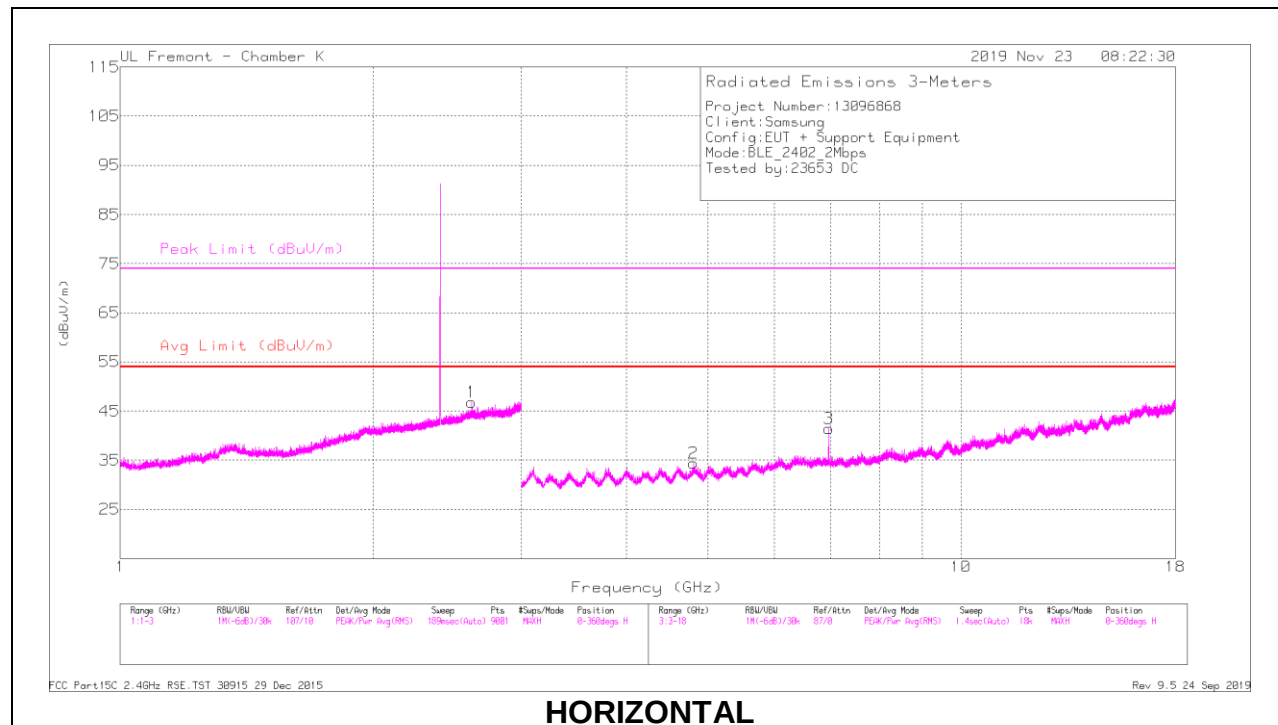
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

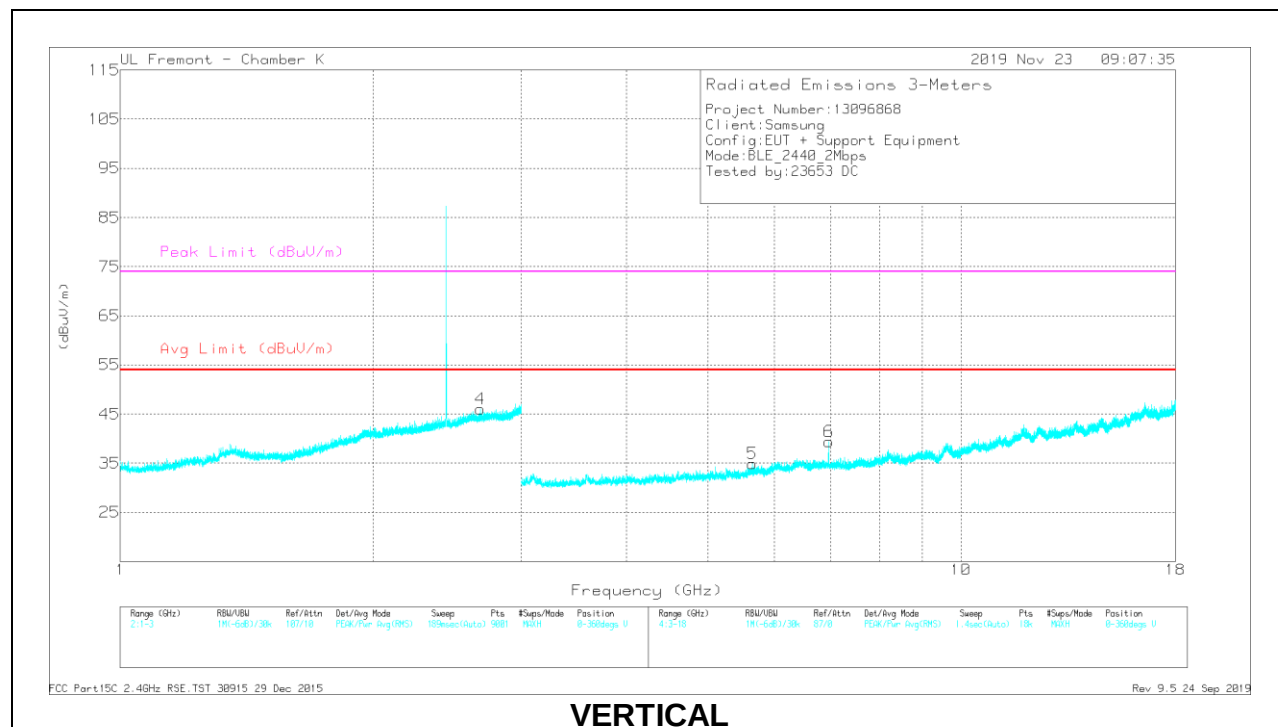
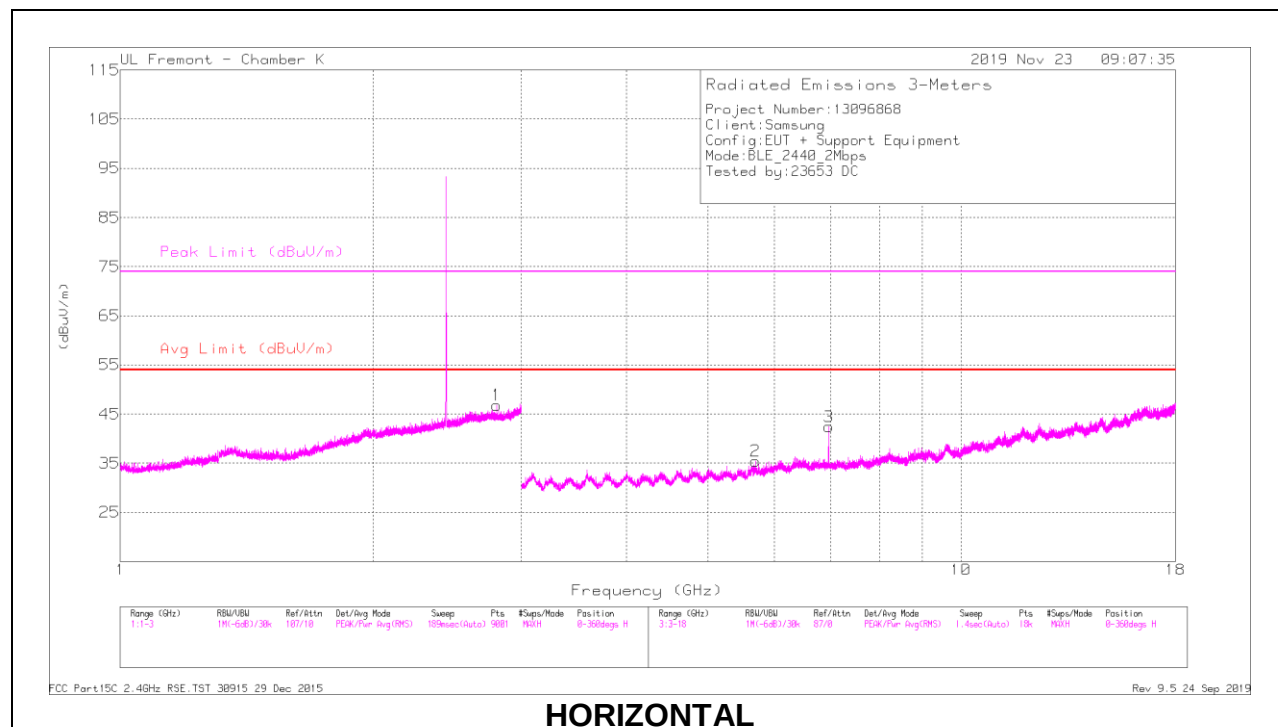
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.61765	32.97	PK2	32.7	-13.7	0	51.97	-	-	-	-	160	230	H
4	2.05905	32.36	PK2	31.4	-15.1	0	48.66	-	-	-	-	160	230	V
3	6.95996	37.3	PK2	35.7	-26.8	0	46.2	-	-	-	-	352	139	H
2	* 4.80867	36.76	PK2	34.2	-30.2	0	40.76	-	-	74	-33.24	160	230	H
	* 4.80762	26.8	MAv1	34.2	-30.2	4.84	35.64	54	-18.36	-	-	160	230	H
5	5.31443	35.91	PK2	34.3	-29.4	0	40.81	-	-	-	-	158	230	V
6	6.95987	36.64	PK2	35.7	-26.8	0	45.54	-	-	-	-	15	316	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

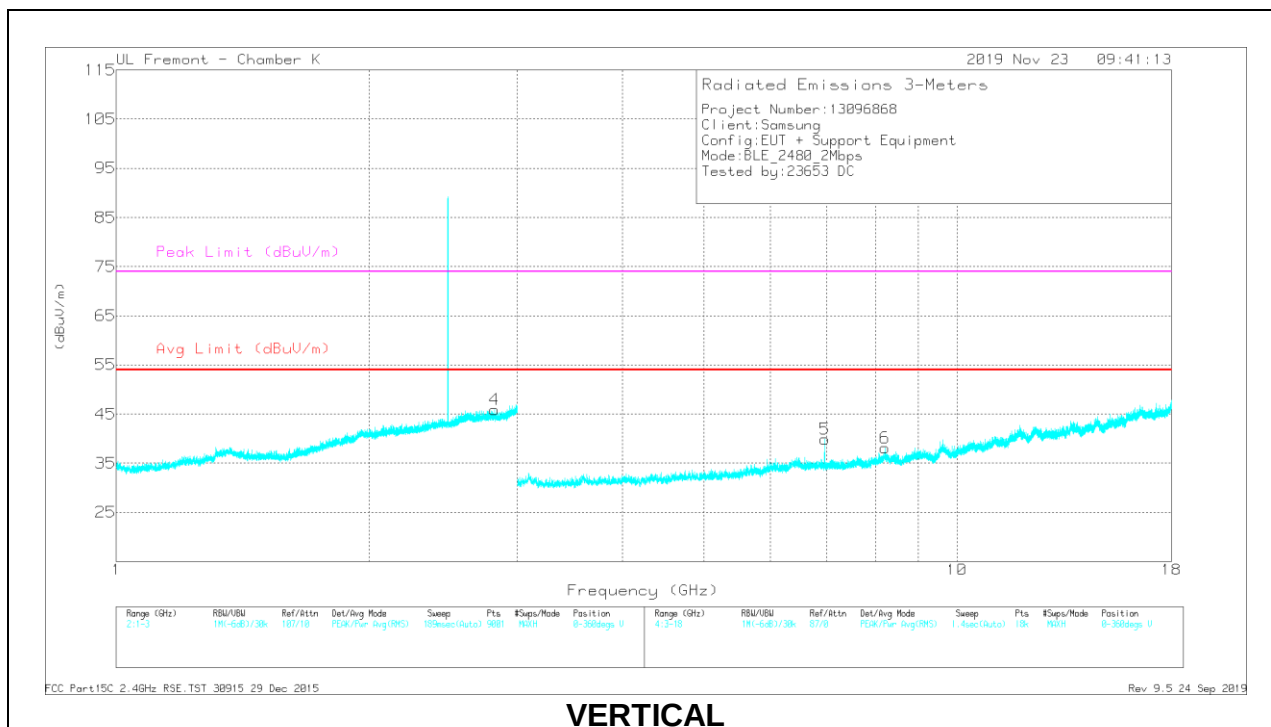
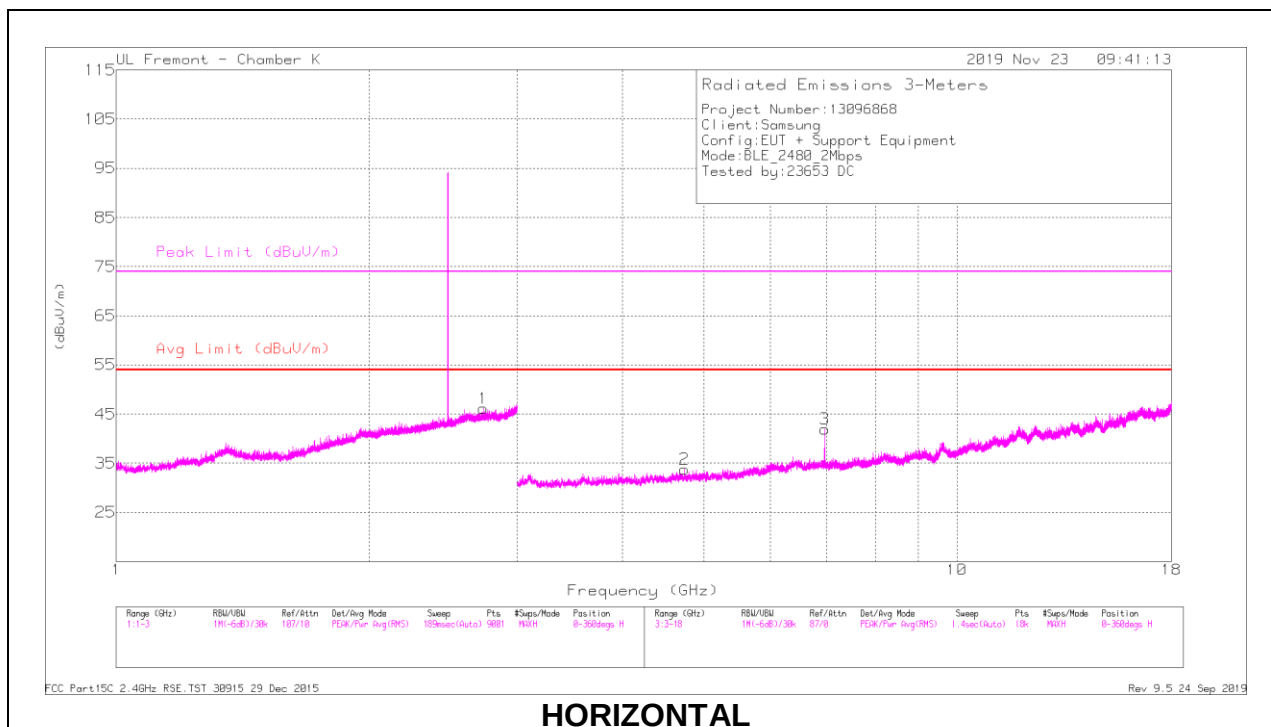
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF EMC4294 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.80472	33.2	PK2	32.4	-13.1	0	52.5	-	-	74	-21.5	158	230	H
	* 2.80375	23.08	MAv1	32.4	-13.1	4.84	47.22	54	-6.78	-	-	158	230	H
4	* 2.68254	32.33	PK2	32.6	-13.6	0	51.33	-	-	74	-22.67	158	231	V
	* 2.68489	22.9	MAv1	32.6	-13.6	4.84	46.74	54	-7.26	-	-	158	231	V
2	5.69512	34.78	PK2	34.8	-28.4	0	41.18	-	-	-	-	164	230	H
3	6.95994	37.19	PK2	35.7	-26.8	0	46.09	-	-	-	-	322	313	H
5	5.64834	35.61	PK2	34.8	-28.7	0	41.71	-	-	-	-	156	230	V
6	6.96007	36.73	PK2	35.7	-26.8	0	45.63	-	-	-	-	18	305	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/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	* 2.736	32.65	PK2	32.7	-13.4	0	51.95	-	-	74	-22.05	160	230	H
	* 2.73273	23.33	MAv1	32.6	-13.4	4.84	47.37	54	-6.63	-	-	160	230	H
4	* 2.81906	34.24	PK2	32.3	-13.1	0	53.44	-	-	74	-20.56	160	230	V
	* 2.81822	23.04	MAv1	32.3	-13.1	4.84	47.08	54	-6.92	-	-	160	230	V
3	6.96003	38.13	PK2	35.7	-26.8	0	47.03	-	-	-	-	0	138	H
2	* 4.74404	36.15	PK2	34	-30.3	0	39.85	-	-	74	-34.15	160	230	H
	* 4.74551	26.77	MAv1	34	-30.3	4.84	35.31	54	-18.69	-	-	160	230	H
5	6.95994	36.77	PK2	35.7	-26.8	0	45.67	-	-	-	-	18	100	V
6	* 8.21523	33.33	PK2	35.9	-24.9	0	44.33	-	-	74	-29.67	160	230	V
	* 8.21462	23.78	MAv1	35.9	-24.9	4.84	39.62	54	-14.38	-	-	160	230	V

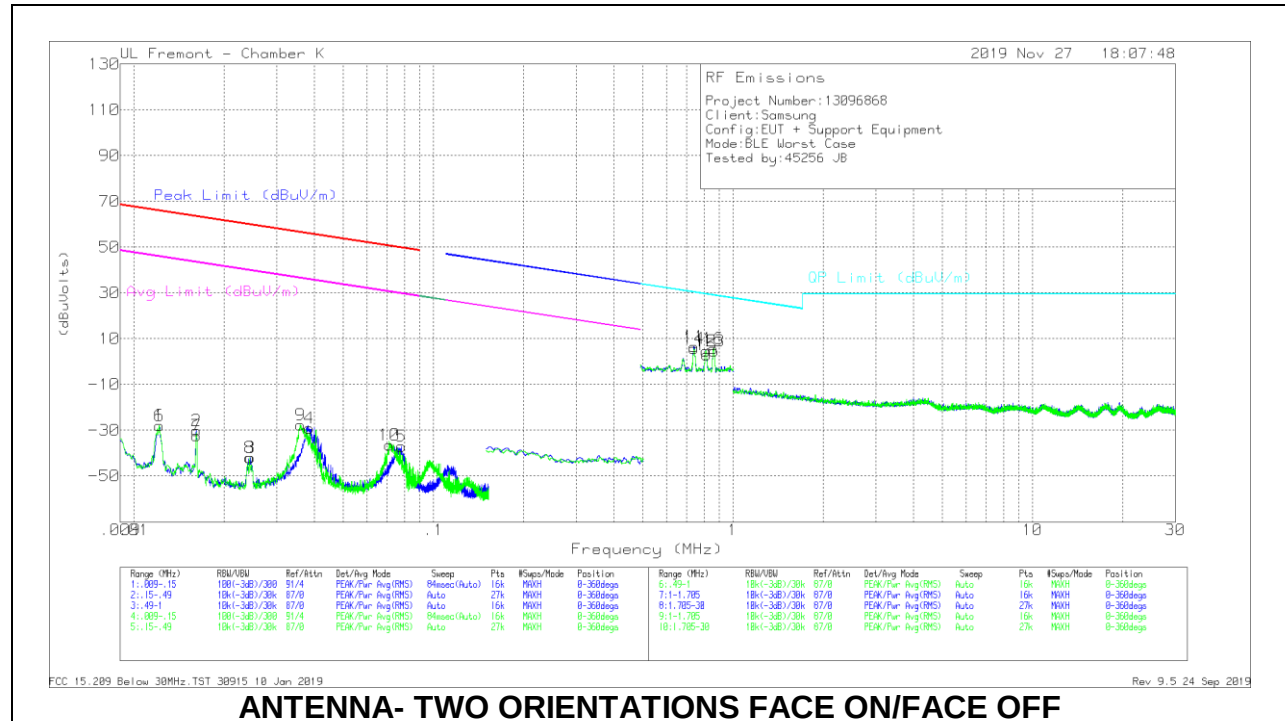
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

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)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Cables w/ PRE0186650	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.01216	24	Pk	59.9	-31.8	-80	-27.9	65.89	-93.79	45.89	-73.79	0-360
2	.01615	22.52	Pk	59.3	-31.9	-80	-30.08	63.42	-93.5	43.42	-73.5	0-360
3	.02449	11.88	Pk	58.3	-32.1	-80	-41.92	59.81	-101.73	39.81	-81.73	0-360
4	.0384	26.12	Pk	57.1	-32.2	-80	-28.98	55.9	-84.88	35.9	-64.88	0-360
5	.07805	19.55	Pk	55.6	-32.2	-80	-37.05	49.74	-86.79	29.74	-66.79	0-360
6	.01214	23.92	Pk	59.9	-31.8	-80	-27.98	65.9	-93.88	45.9	-73.88	0-360
7	.01619	20.25	Pk	59.3	-31.9	-80	-32.35	63.4	-95.75	43.4	-75.75	0-360
8	.02432	11.86	Pk	58.3	-32.1	-80	-41.94	59.87	-101.81	39.87	-81.81	0-360
9	.03602	27.27	Pk	57.3	-32.2	-80	-27.63	56.45	-84.08	36.45	-64.08	0-360
10	.0714	19.99	Pk	55.8	-32.2	-80	-36.41	50.51	-86.92	30.51	-66.92	0-360

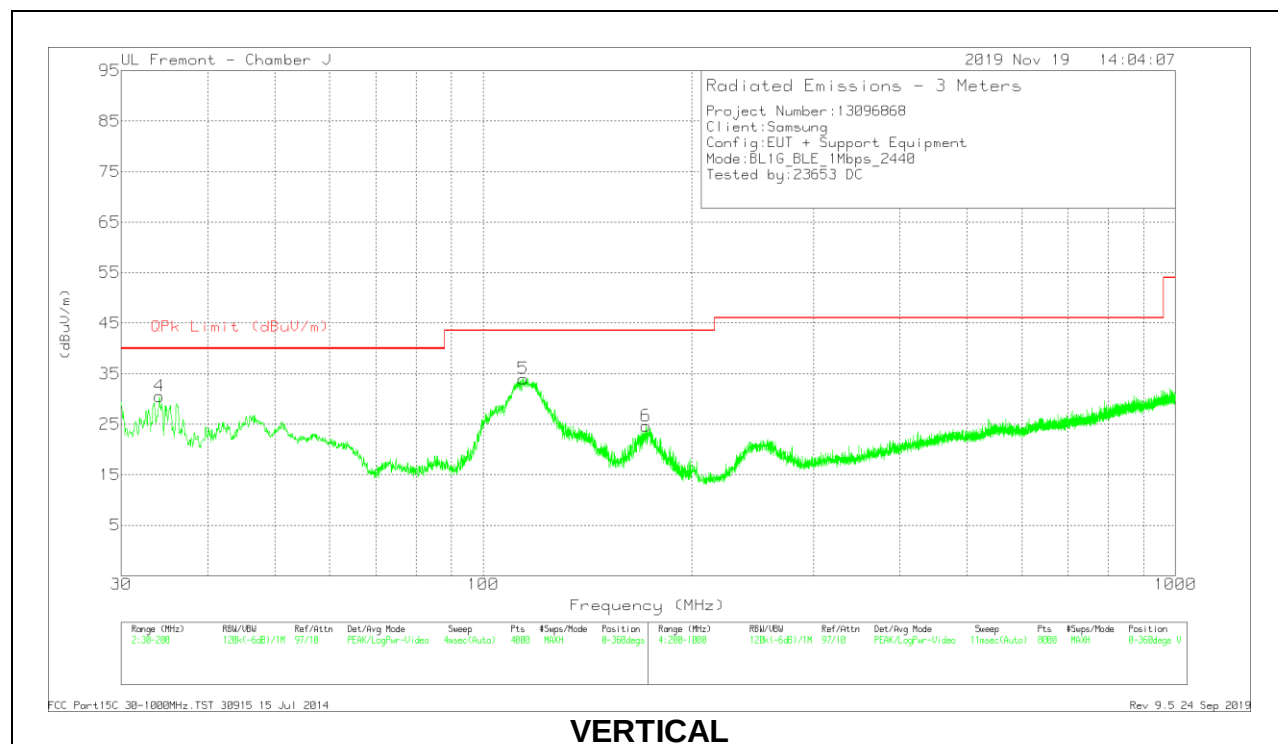
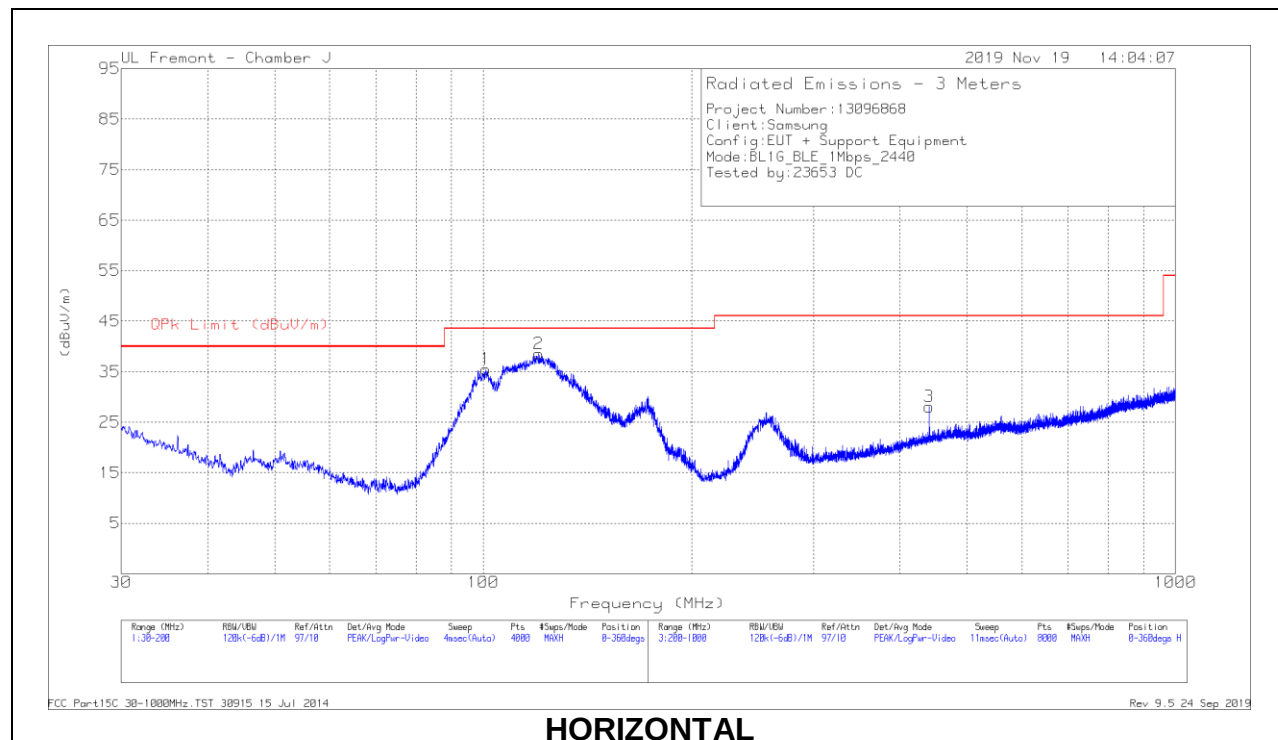
Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Cables w/ PRE0186650	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
11	.74102	22.63	Pk	56.1	-32.1	-40	6.63	30.22	-23.59	0-360
12	.81195	20.74	Pk	56.1	-32.1	-40	4.74	29.43	-24.69	0-360
13	.86446	20.66	Pk	56.1	-32.1	-40	4.66	28.88	-24.22	0-360
14	.74141	21.61	Pk	56.1	-32.1	-40	5.61	30.21	-24.6	0-360
15	.81589	18.97	Pk	56.1	-32.1	-40	2.97	29.38	-26.41	0-360
16	.86125	21.75	Pk	56.1	-32.1	-40	5.75	28.92	-23.17	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	AF T899 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	100.9509	49.99	Pk	16.5	-31	35.49	43.52	-8.03	0-360	299	H
2	* 120.3571	49.97	Pk	19.5	-30.9	38.57	43.52	-4.95	254	164	H
	* 120.7397	46.43	Qp	19.5	-30.9	35.03	43.52	-8.49	254	164	H
4	34.0385	37.55	Pk	24.6	-31.6	30.55	40	-9.45	0-360	101	V
5	* 114.2993	45.92	Pk	19	-30.9	34.02	43.52	-9.5	0-360	101	V
6	* 171.9867	37.57	Pk	17.7	-30.6	24.67	43.52	-18.85	0-360	101	V
3	441.1313	35.27	Pk	22.5	-29.7	28.07	46.02	-17.95	0-360	101	H

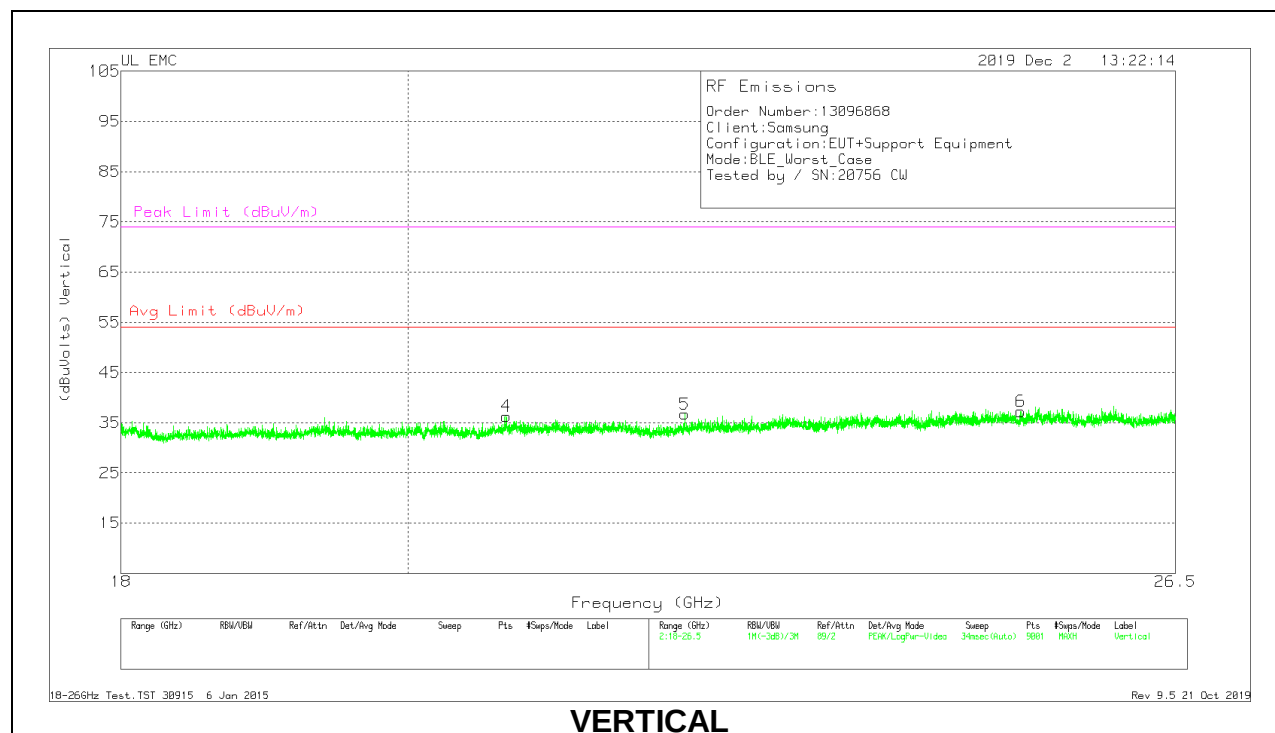
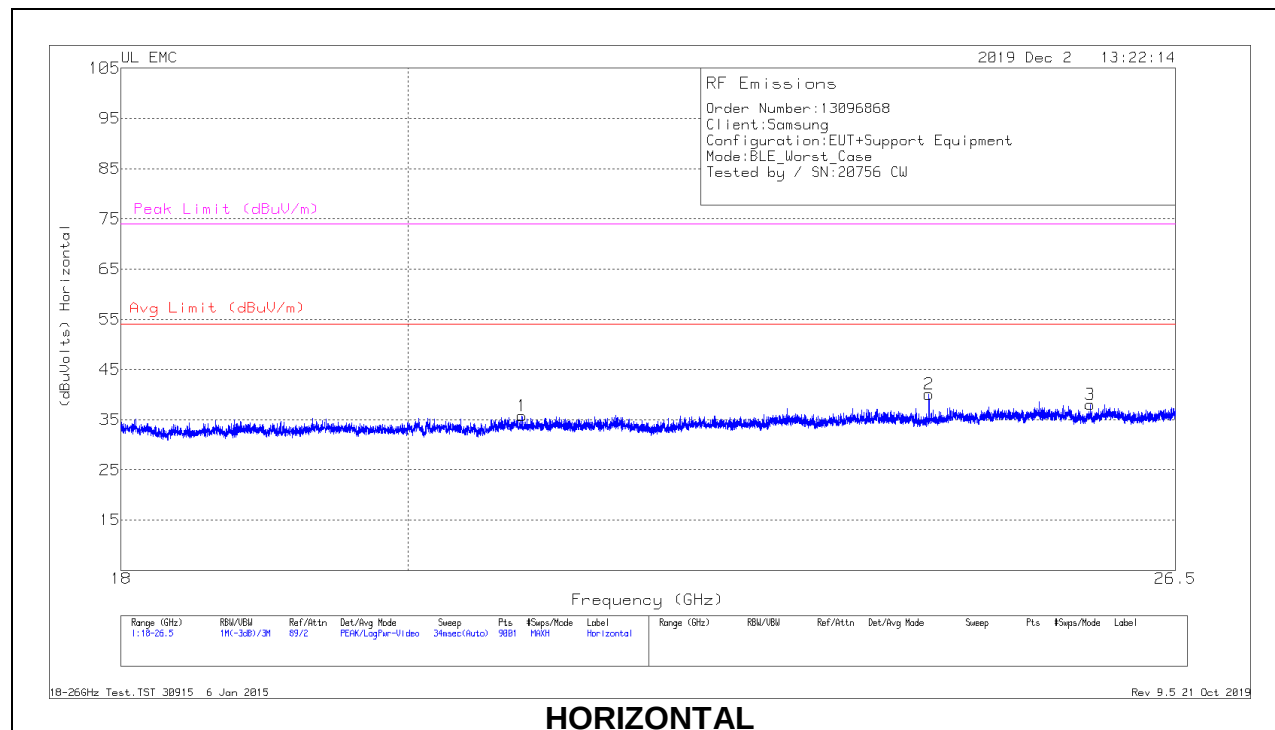
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

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	20.85128	69.16	Pk	33.1	-57	-9.5	35.76	54	-18.24	74	-38.24
2	24.20877	72.39	Pk	34.2	-57	-9.5	40.09	54	-13.91	74	-33.91
3	25.68494	68.02	Pk	34.4	-54.9	-9.5	38.02	54	-15.98	74	-35.98
4	20.73133	69.49	Pk	33.1	-56.8	-9.5	36.29	54	-17.71	74	-37.71
5	22.13289	70.31	Pk	33.5	-57.6	-9.5	36.71	54	-17.29	74	-37.29
6	25.03705	67.35	Pk	34.6	-55.2	-9.5	37.25	54	-16.75	74	-36.75

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

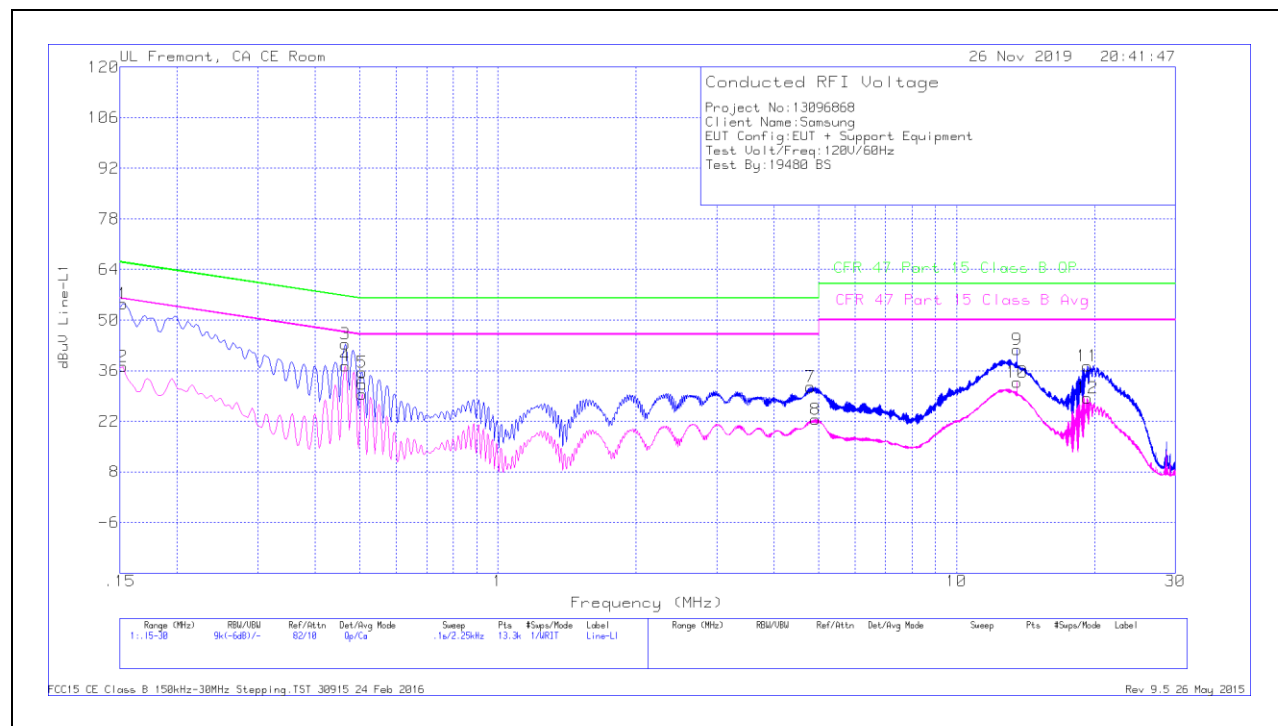
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

RESULTS

AC Power Line Norm

LINE 1 RESULTS



Trace Markers

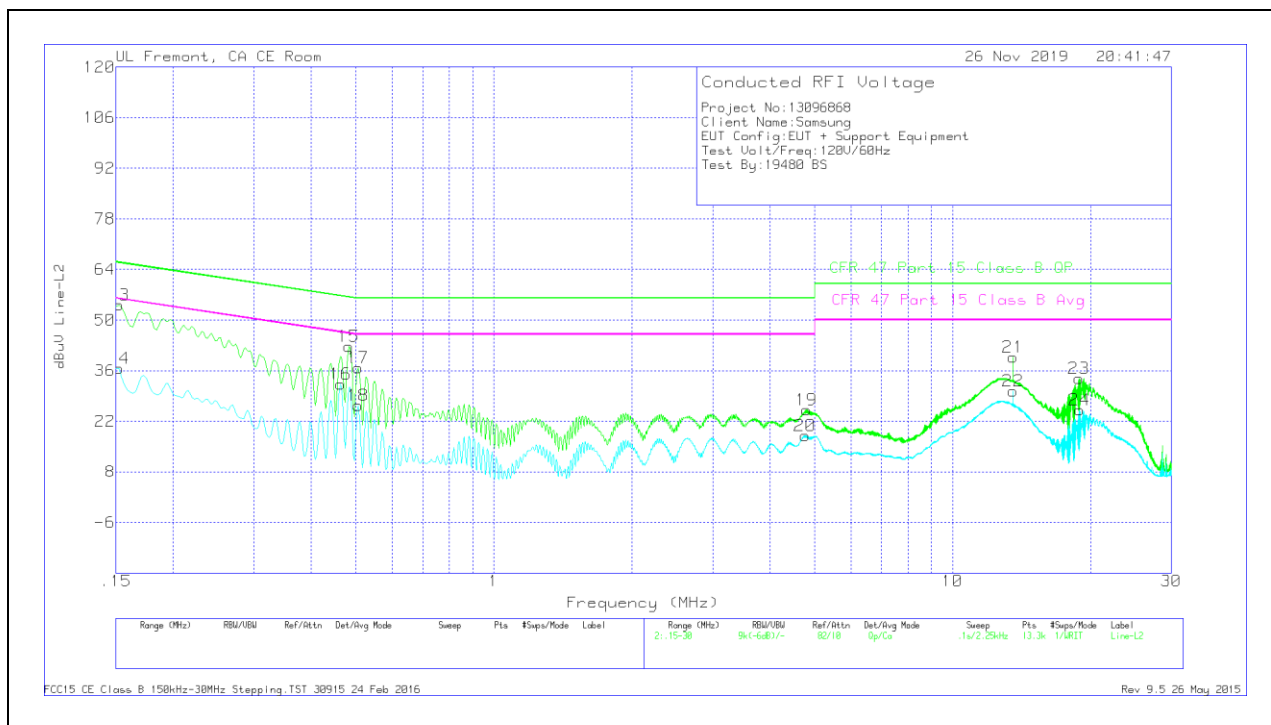
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.15225	44.27	Qp	.1	0	10.1	54.47	65.88	-11.41	-	-
2	.15225	26.98	Ca	.1	0	10.1	37.18	-	-	55.88	-18.7
3	.465	33.27	Qp	0	0	10.1	43.37	56.6	-13.23	-	-
4	.465	27.21	Ca	0	0	10.1	37.31	-	-	46.6	-9.29
5	.5055	25.52	Qp	0	0	10.1	35.62	56	-20.38	-	-
6	.5055	19.4	Ca	0	0	10.1	29.5	-	-	46	-16.5
7	4.80075	21.29	Qp	0	.1	10.1	31.49	56	-24.51	-	-
8	4.9335	12.33	Ca	0	.1	10.1	22.53	-	-	46	-23.47
9	13.56	31.31	Qp	.1	.2	10.2	41.81	60	-18.19	-	-
10	13.56	22.26	Ca	.1	.2	10.2	32.76	-	-	50	-17.24
11	19.3065	26.68	Qp	.1	.3	10.3	37.38	60	-22.62	-	-
12	19.28625	17.74	Ca	.1	.3	10.3	28.44	-	-	50	-21.56

Qp - Quasi-Peak detector

Ca - CISPR average detection

NOTE: Markers 9 and 10, 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	.15225	43.96	Qp	.1	0	10.1	54.16	65.88	-11.72	-	-
14	.15225	26.4	Ca	.1	0	10.1	36.6	-	-	55.88	-19.28
15	.483	32.52	Qp	0	0	10.1	42.62	56.29	-13.67	-	-
16	.46275	22.16	Ca	0	0	10.1	32.26	-	-	46.64	-14.38
17	.5055	26.62	Qp	0	0	10.1	36.72	56	-19.28	-	-
18	.5055	16.24	Ca	0	0	10.1	26.34	-	-	46	-19.66
19	4.80975	14.99	Qp	0	.1	10.1	25.19	56	-30.81	-	-
20	4.767	7.88	Ca	0	.1	10.1	18.08	-	-	46	-27.92
21	13.56	29.22	Qp	.1	.2	10.2	39.72	60	-20.28	-	-
22	13.56	19.88	Ca	.1	.2	10.2	30.38	-	-	50	-19.62
23	18.843	23.13	Qp	.1	.3	10.3	33.83	60	-26.17	-	-
24	18.9285	14.52	Ca	.1	.3	10.3	25.22	-	-	50	-24.78

Qp - Quasi-Peak detector

Ca - CISPR average detection

NOTE: Markers 21 and 22, 13.56MHz is an external NFC signal unrelated to the EUT.