



CERTIFICATION TEST REPORT

Report Number. : 12810732-E3V1

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

Model : SM-G398FN/DS and SM-G398FN

FCC ID : A3LSMG398FN

EUT Description : GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac and
NFC

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

Date Of Issue:
May 14, 2019

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	5/14/2019	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 Phone with BT, DTS/UNII a/b/g/n/ac and NFC

MODEL: SM-G398FN/DS and SM-G398FN

SERIAL NUMBER: Radiated: R38M4044FGF, R38M4044QSK
Conducted: R38M4044PNW

DATE TESTED: APRIL 23 – MAY 06, 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, and KDB 558074 D01 15.247 Meas Guidance v05r02.

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

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 Phone with BT, DTS/UNII a/b/g/n/ac and NFC.

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)	6.95	4.95
2403 - 2480	BLE (2Mbps)	7.02	5.04

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -1.13 dBi.

5.4. 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.

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	EP-TA200	R37M14P3GY1SE3	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

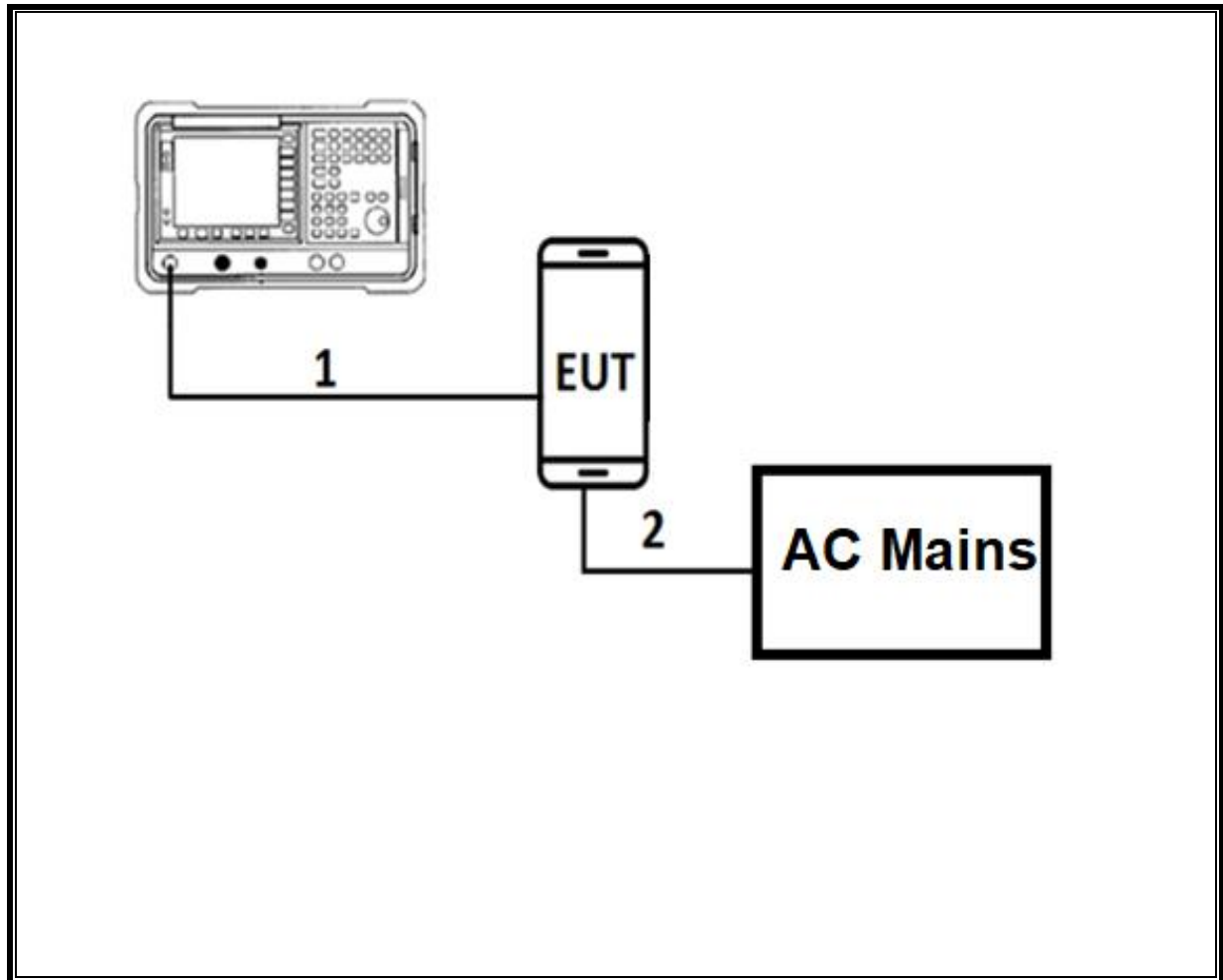
I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

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

TEST SETUP

The EUT is a stand alone unit. Test software exercised the radio card.

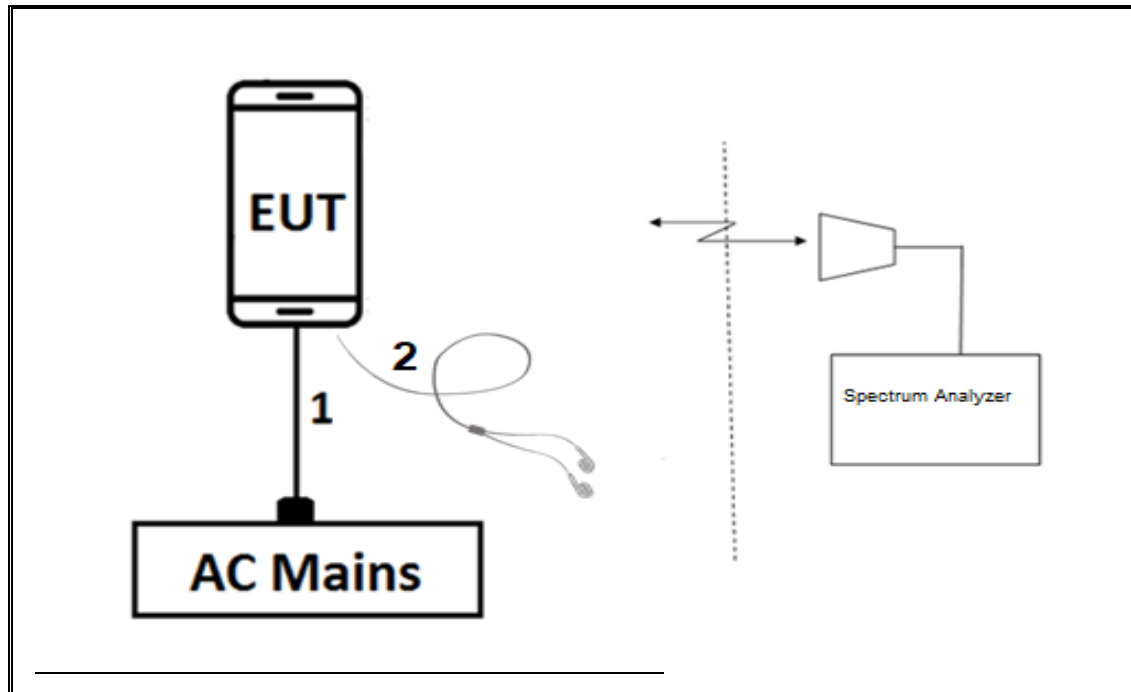
CONDUCTED TEST SETUP DIAGRAM



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, the EUT is stand alone unit and 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

Output Power: ANSI C63.10 Section 11.9.1.3 PKPM1 Peak power meter method

Average 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)

Band-edge: ANSI C63.10 Section 11.13.3.4 Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction factor

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

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

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

Conducted emissions in restricted frequency bands: ANSI C63.10 Section 11.12.

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

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	ID Num	Cal Due	Last Cal
6 port rf switch, 1-18GHz	Pasternack	PE7159	171455	08/01/2019	08/01/2018
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1271	07/26/2019	07/26/2018
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1224	10/09/2019	10/09/2018
Antenna, Passive Loop 30Hz – 1MHz	Electro-Metrics	EM-6871	PRE0179465	05/22/2019	05/22/2018
Antenna, Passive Loop 100kHz – 30MHz	Electro-Metrics	EM-6872	PRE0179467	05/23/2019	05/23/2018
Antenna, Horn 1-18GHz	AR	AMPL-ATH1G18	PRE0189055	04/20/2020	04/20/2019
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	06/21/2019	06/21/2018
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179372	02/26/2020	02/26/2019
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179377	02/15/2020	02/15/2019
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179376	02/14/2020	02/14/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T908	01/23/2020	01/23/2019
Amplifier, 1-18GHz, 35 dB	AMPLICAL	AMP1G18-35	T1571	07/30/2019	07/30/2018
Amplifier, 1-18GHz, 35 dB	AMPLICAL	AMP1G18-35	T1569	07/30/2019	07/30/2018
Amplifier, 100kHz to 1GHz, 32 dB	Sonoma Instrument	310	PRE0180175	07/09/2019	07/09/2018
Hybrid Antenna, 30MHz to 3GHz	SunAR rf motion	JB3	PRE0181571	11/13/2019	11/13/2018
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	PRE0182188	08/29/2019	08/29/2018
Pre-Amp, 18-26.5GHz	AMPLICAL	AMP18G26.5-60	PRE0181238	05/01/2020	05/01/2019
AC Line Conducted					
EMI Receiver	Rohde & Schwarz	ESR	T1436	02/14/2020	02/14/2019
LISN for Conducted Emissions CISPR-16	FCC INC.	FCC LISN 50/250	T1310	06/15/2019	06/15/2018
Test Software List					
Radiated Software	UL	UL EMC	Ver 9.5, June 22, 2018		
Antenna Port Software	UL	UL RF	Ver 9.6, April 18, 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.

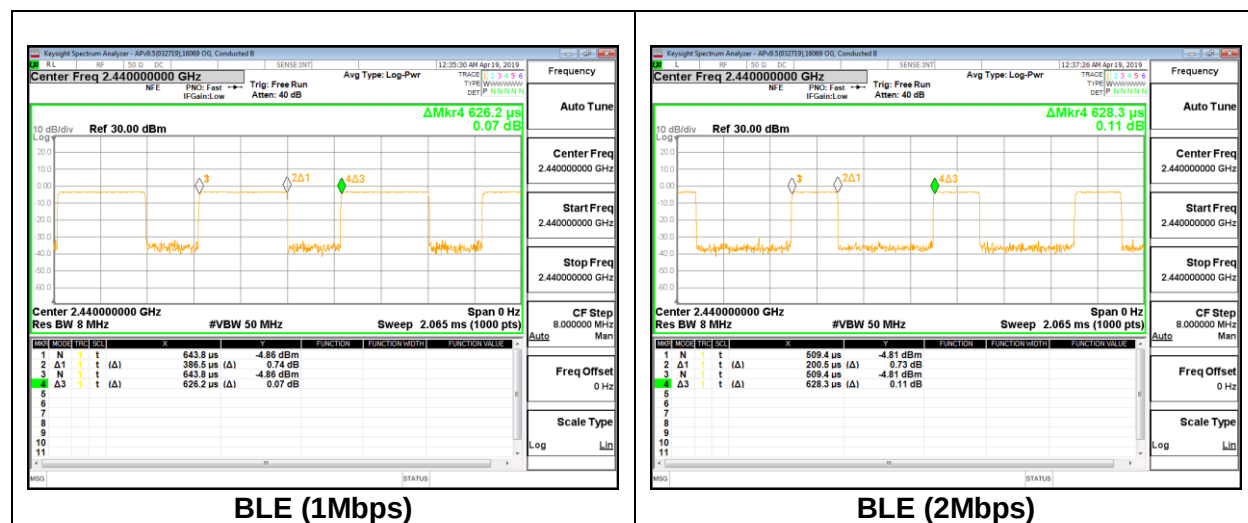
PROCEDURE

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)	0.3865	0.6262	0.617	61.72%	2.10	2.587
BLE (2Mbps)	0.2005	0.6283	0.319	31.91%	4.96	4.988

DUTY CYCLE PLOTS



8.2. 6 dB BANDWIDTH

LIMITS

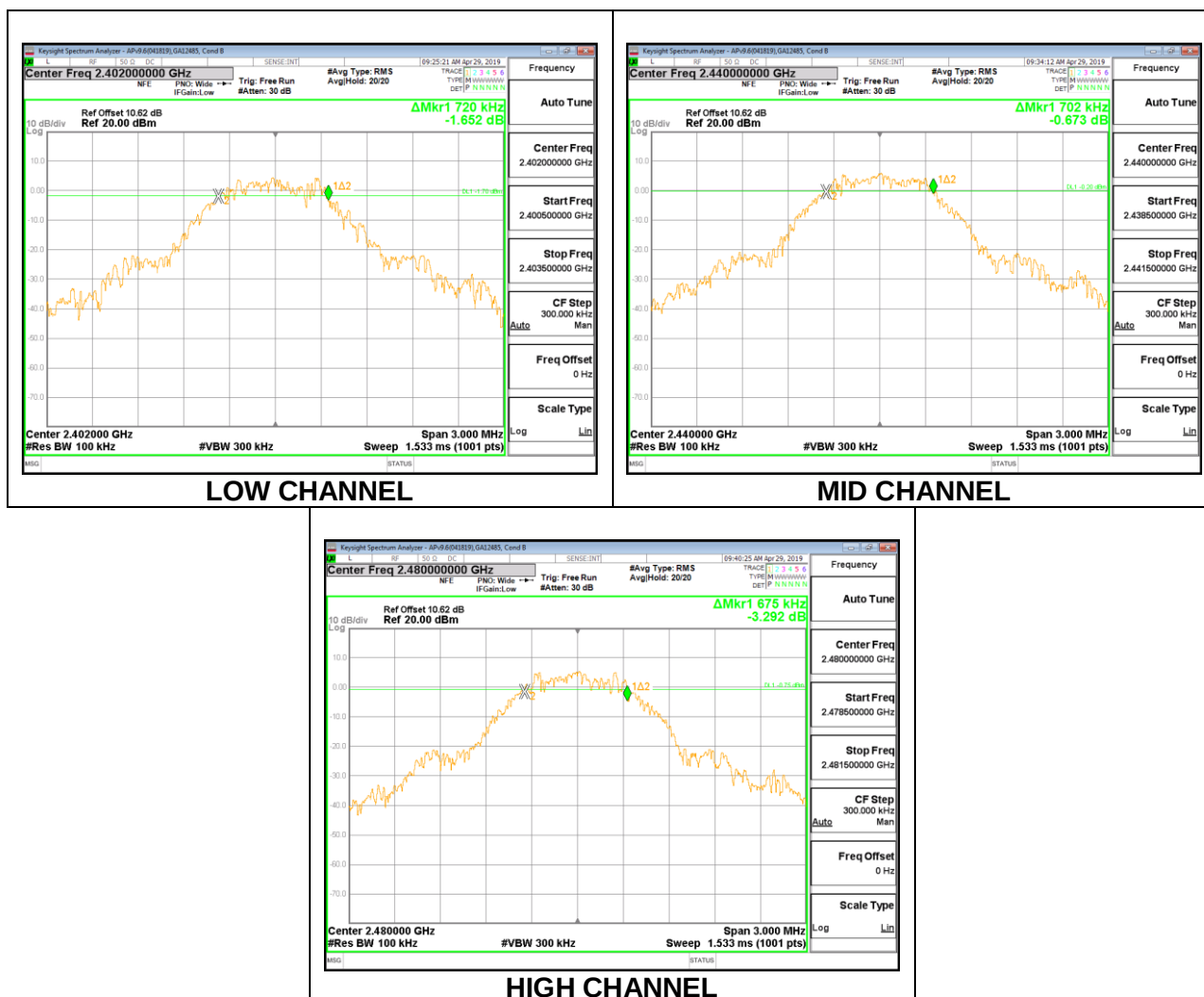
FCC §15.247 (a) (2)

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

RESULTS

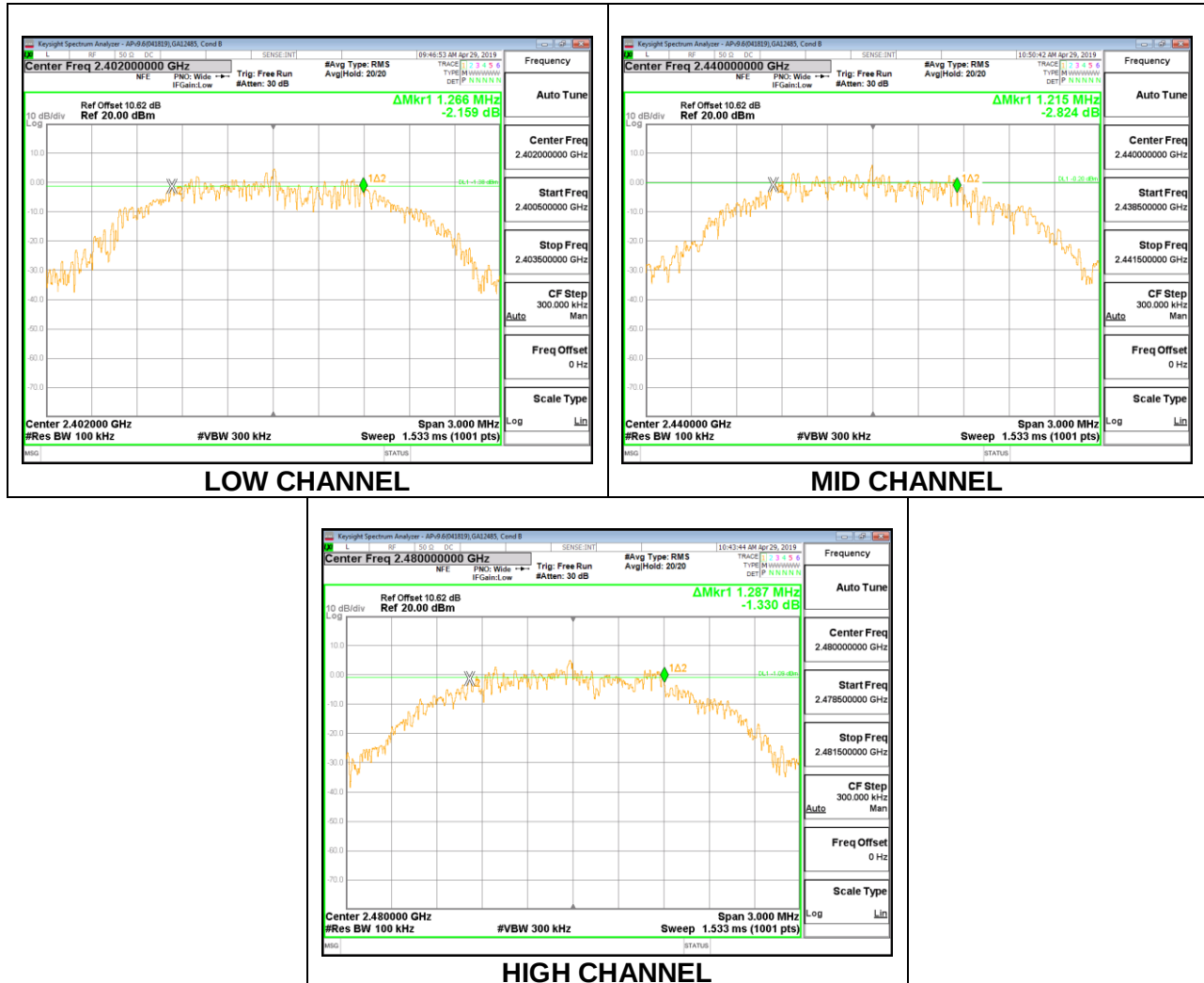
8.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.720	0.5
Middle	2440	0.702	0.5
High	2480	0.675	0.5



8.2.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.266	0.5
Middle	2440	1.215	0.5
High	2480	1.287	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 gated peak reading of power.

RESULTS

8.3.1. BLE (1Mbps)

Tested By:	GA 12485
Date:	4/29/2019

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.69	30	-24.310
Middle	2440	6.95	30	-23.050
High	2480	6.40	30	-23.600

8.3.2. BLE (2Mbps)

Tested By:	GA 12485
Date:	4/29/2019

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.75	30	-24.250
Middle	2440	7.02	30	-22.980
High	2480	6.48	30	-23.520

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:	GA 12485
Date:	4/29/2019

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.94
Middle	2440	6.21
High	2480	5.72

8.4.2. BLE (2Mbps)

Tested By:	GA 12485
Date:	4/29/2019

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.94
Middle	2440	6.22
High	2480	5.72

8.5. POWER SPECTRAL DENSITY

LIMITS

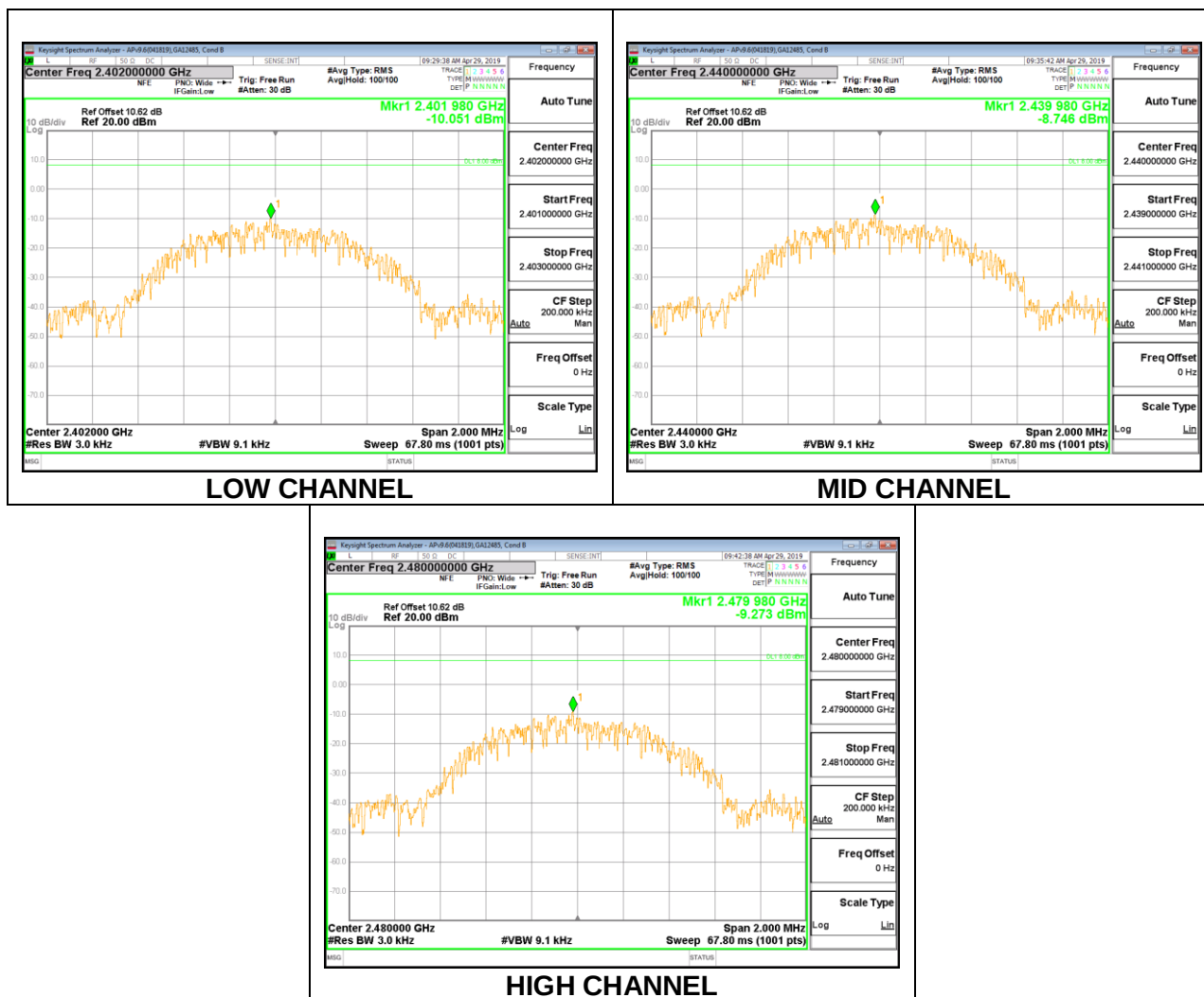
FCC §15.247 (e)

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

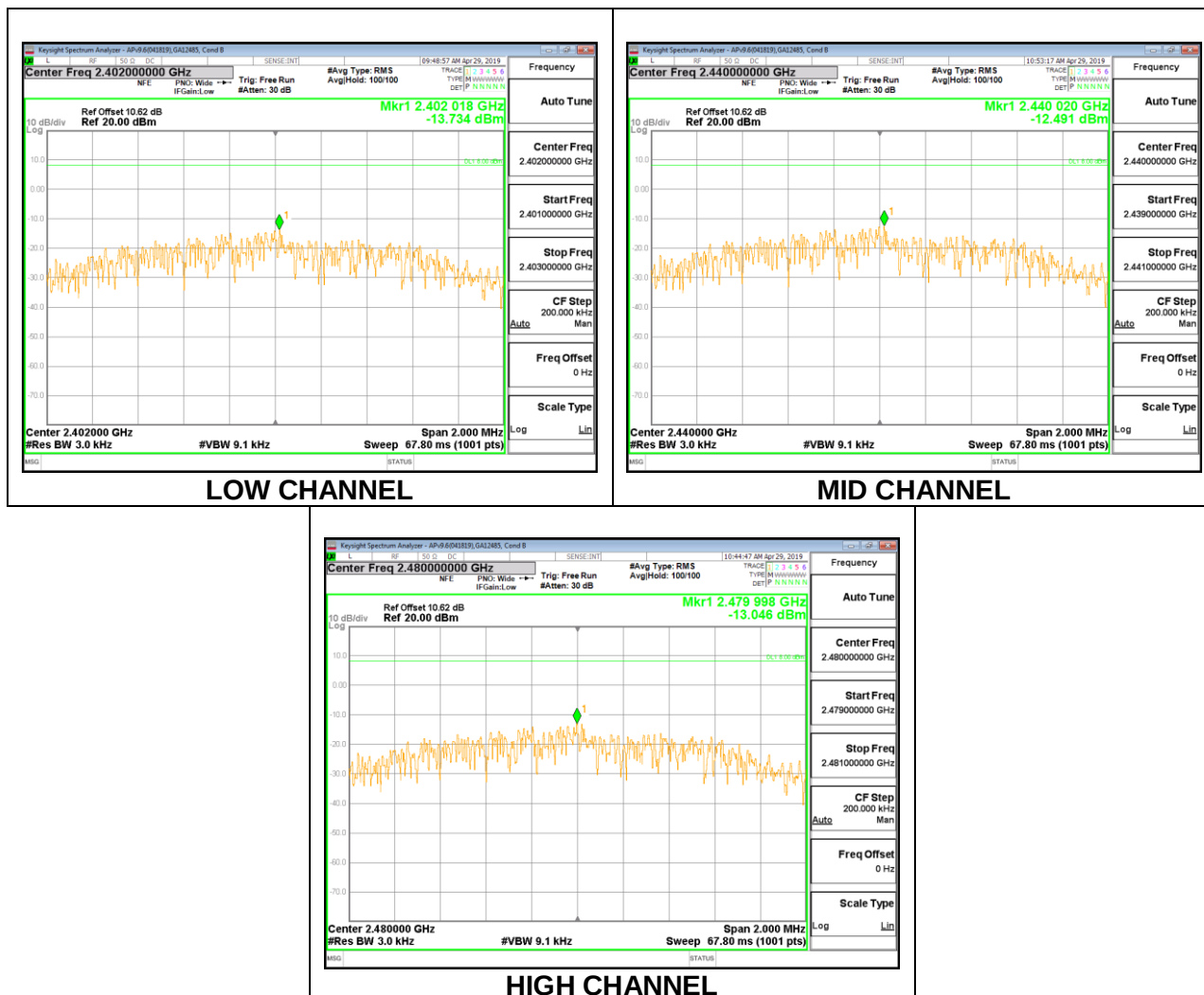
8.5.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-10.05	8	-18.05
Middle	2440	-8.75	8	-16.75
High	2480	-9.27	8	-17.27



8.5.2. BLE (2Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-13.73	8	-21.73
Middle	2440	-12.49	8	-20.49
High	2480	-13.05	8	-21.05



8.6. CONDUCTED SPURIOUS EMISSIONS

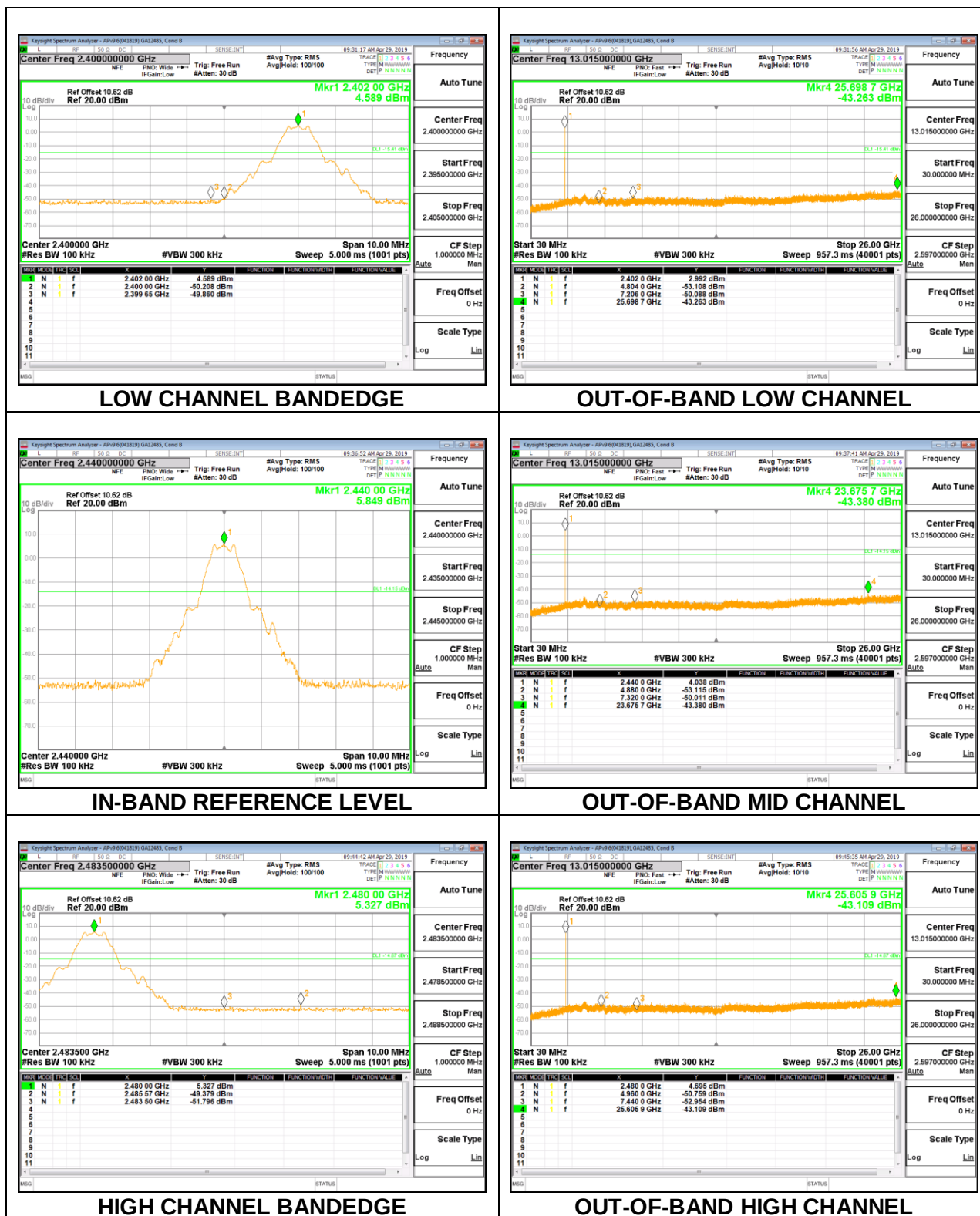
LIMITS

FCC §15.247 (d)

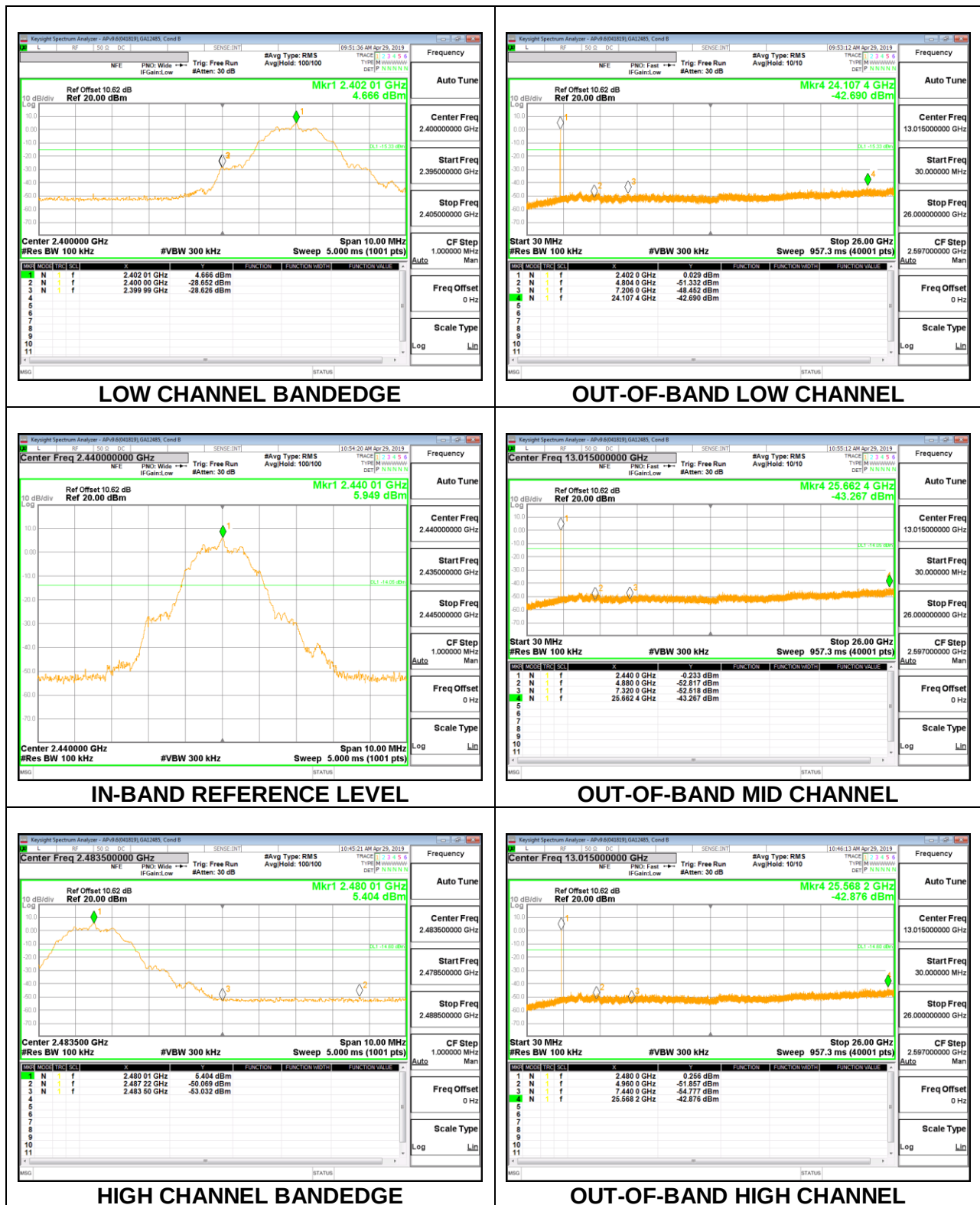
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

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.

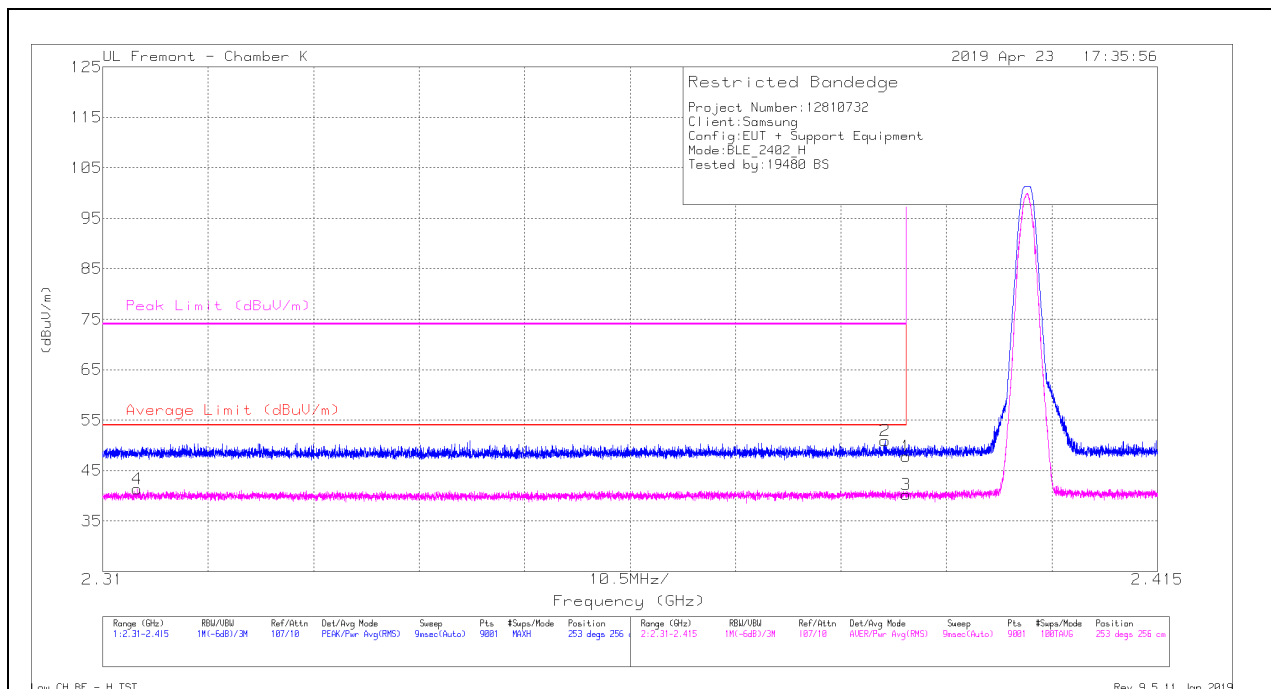
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

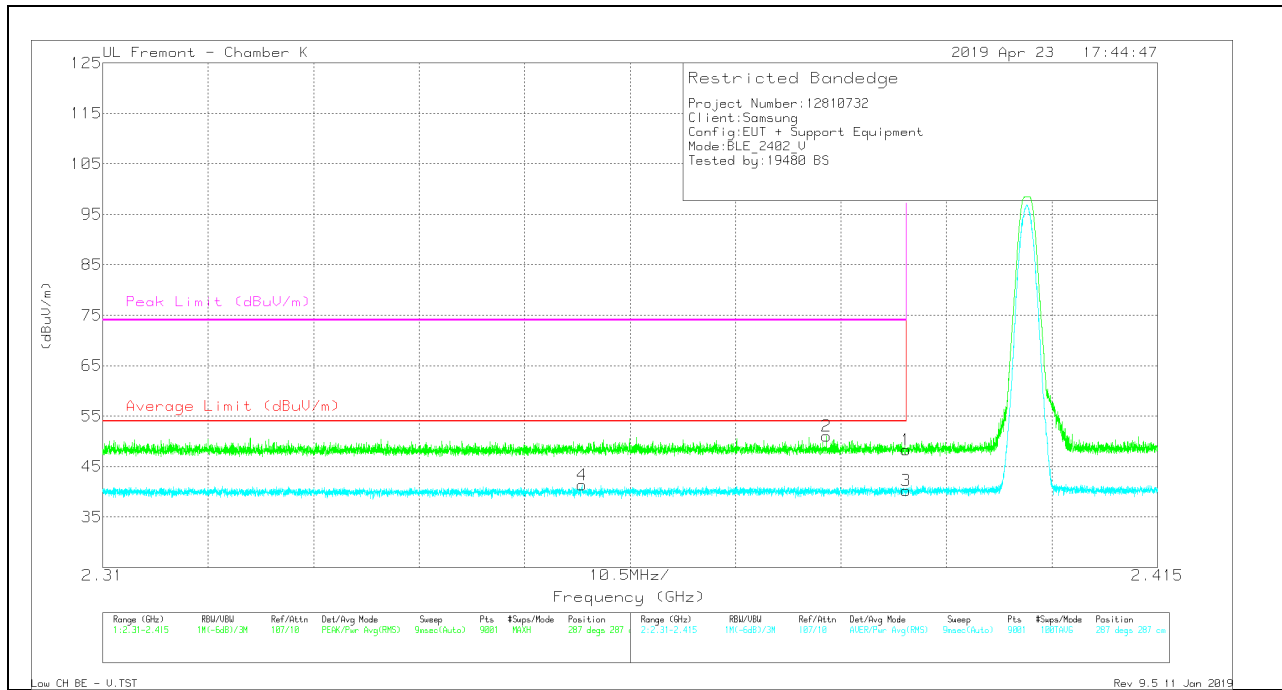
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/CbI/Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.56	Pk	31.9	-24.7	0	47.76	-	-	74	-26.24	253	256	H
2	* 2.388	43.63	Pk	31.9	-24.6	0	50.93	-	-	74	-23.07	253	256	H
3	* 2.39	30.92	RMS	31.9	-24.7	2.1	40.22	54	-13.78	-	-	253	256	H
4	* 2.313	32.27	RMS	31.7	-24.7	2.1	41.37	54	-12.63	-	-	253	256	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 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	* 2.39	41.1	Pk	31.9	-24.7	0	48.3	-	-	74	-25.7	287	287	V
2	* 2.382	43.86	Pk	31.9	-24.7	0	51.06	-	-	74	-22.94	287	287	V
3	* 2.39	30.95	RMS	31.9	-24.7	2.1	40.25	54	-13.75	-	-	287	287	V
4	* 2.358	32.14	RMS	31.7	-24.6	2.1	41.34	54	-12.66	-	-	287	287	V

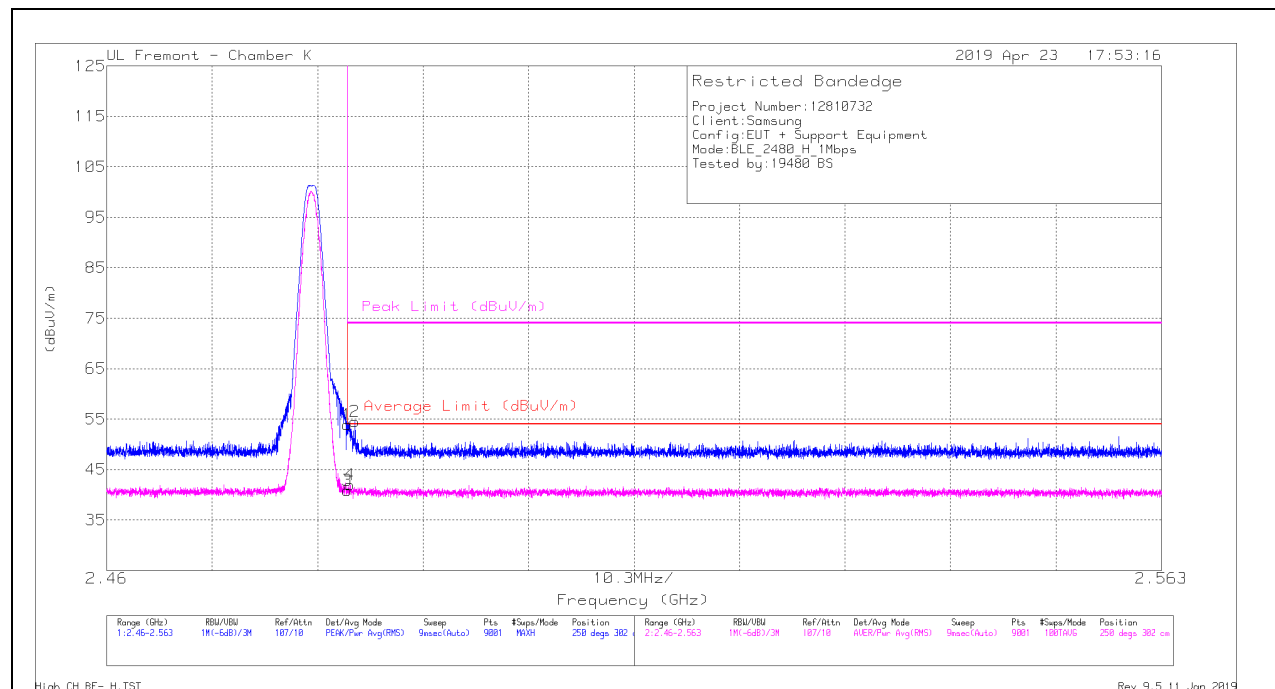
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

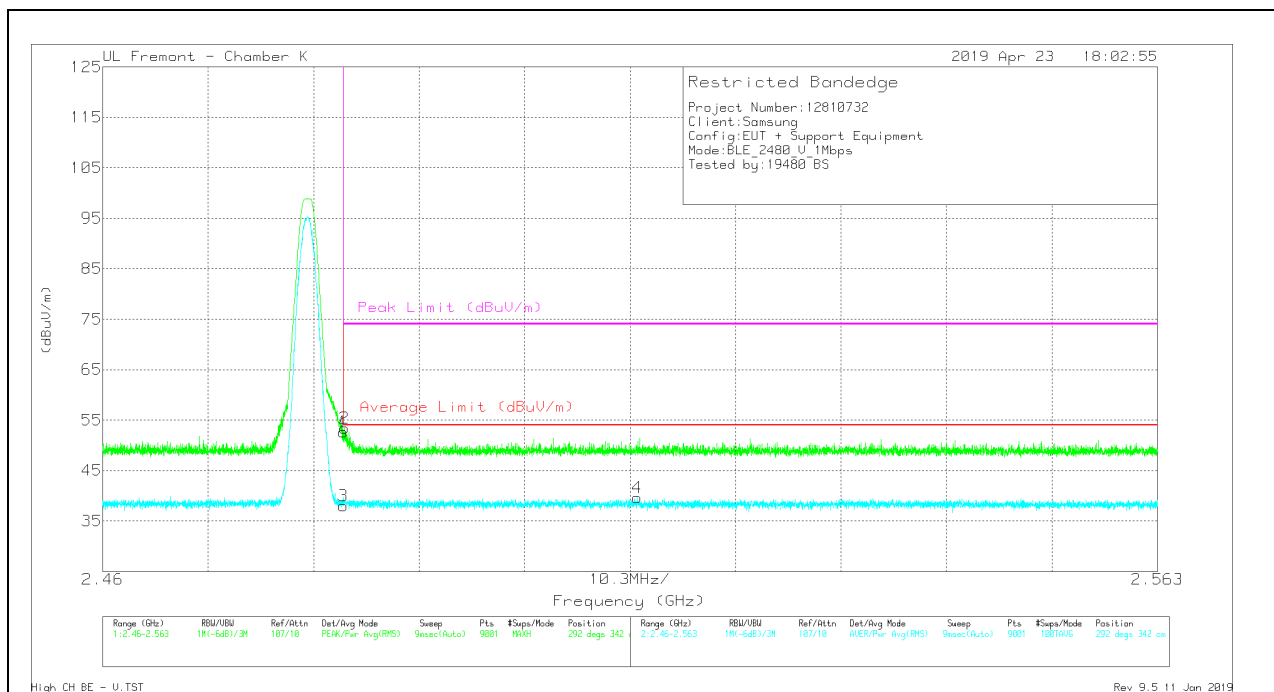
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	46.44	Pk	32.3	-24.8	0	53.94	-	-	74	-20.06	250	302	H
2	* 2.484	47.04	Pk	32.3	-24.8	0	54.54	-	-	74	-19.46	250	302	H
3	* 2.484	31.29	RMS	32.3	-24.8	2.1	40.89	54	-13.11	-	-	250	302	H
4	* 2.484	32.32	RMS	32.3	-24.8	2.1	41.92	54	-12.08	-	-	250	302	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 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	* 2.484	45.16	Pk	32.3	-24.8	0	52.66	-	-	74	-21.34	292	342	V
2	* 2.484	45.9	Pk	32.3	-24.8	0	53.4	-	-	74	-20.6	292	342	V
3	* 2.484	30.51	RMS	32.3	-24.8	2.1	40.11	54	-13.89	-	-	292	342	V
4	2.512	31.96	RMS	32.3	-24.7	2.1	41.66	54	-12.34	-	-	292	342	V

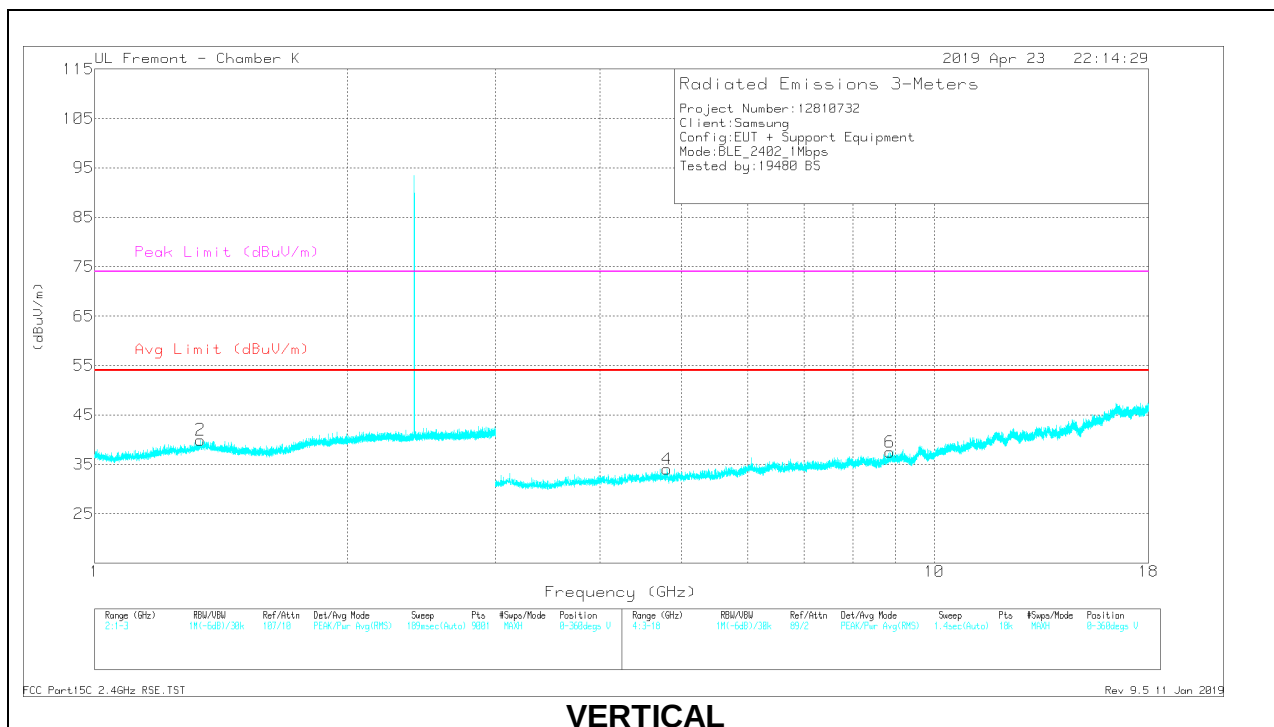
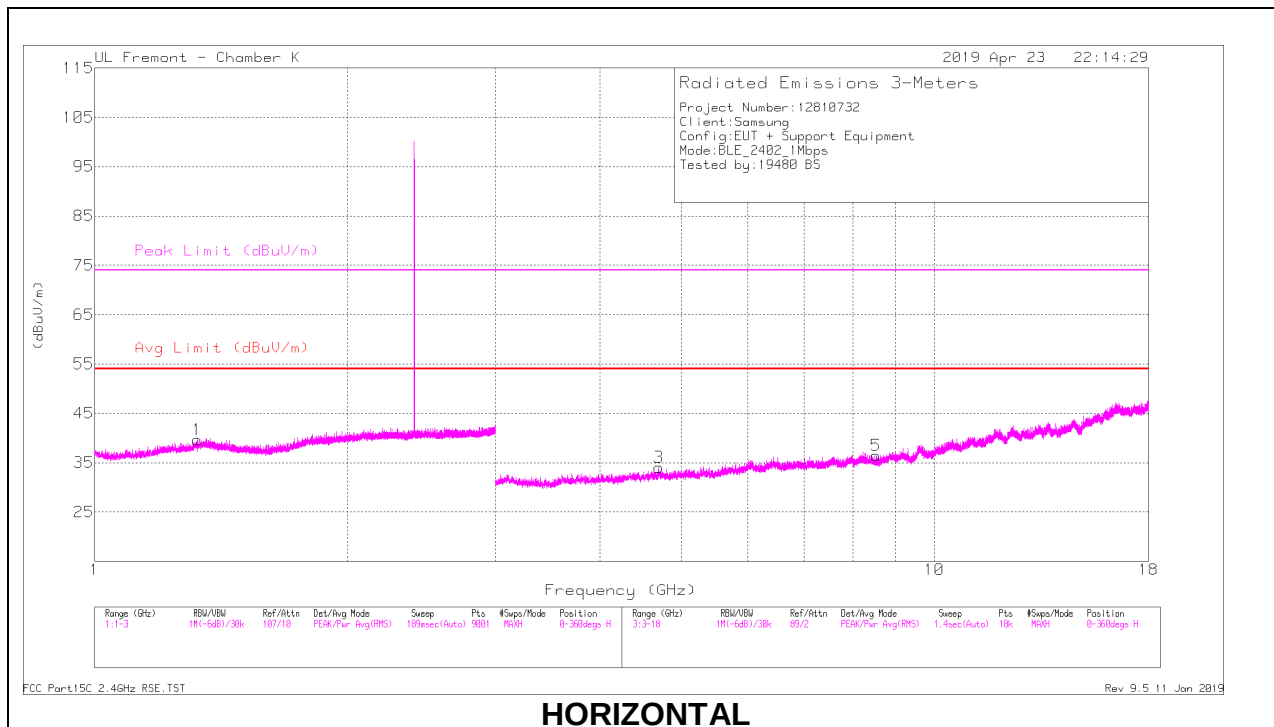
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

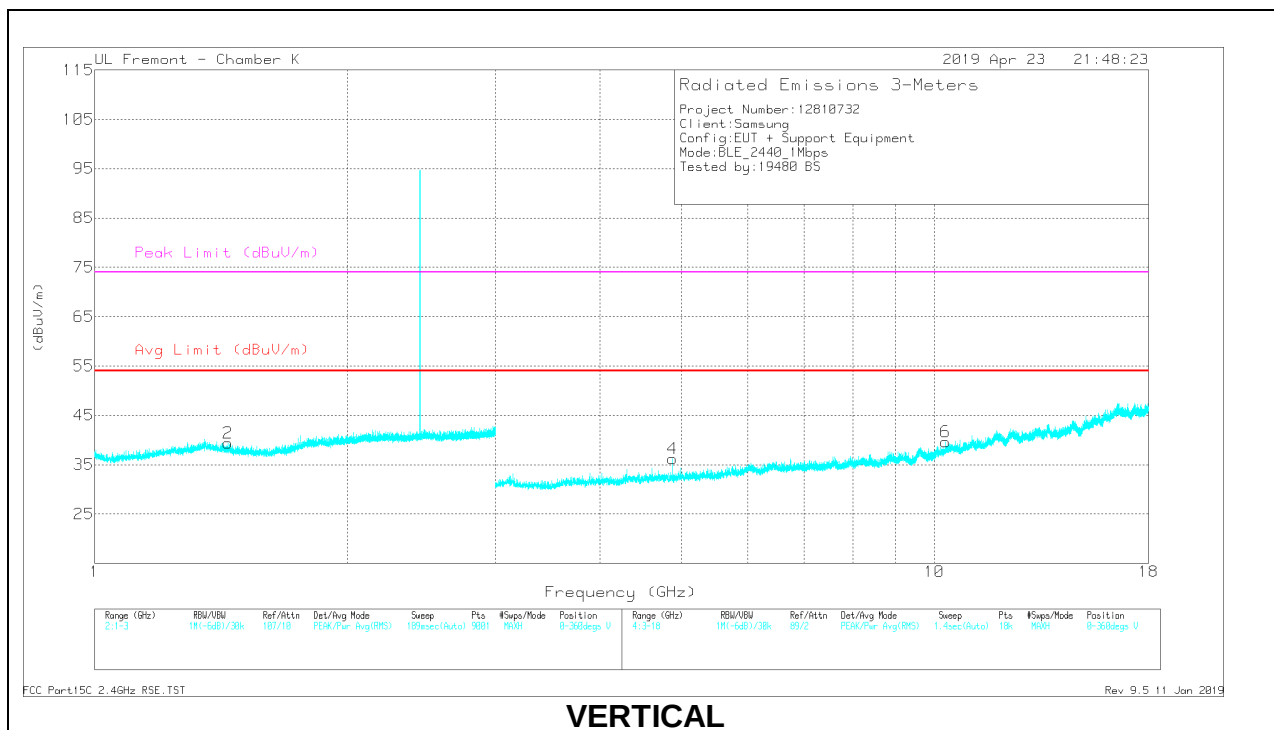
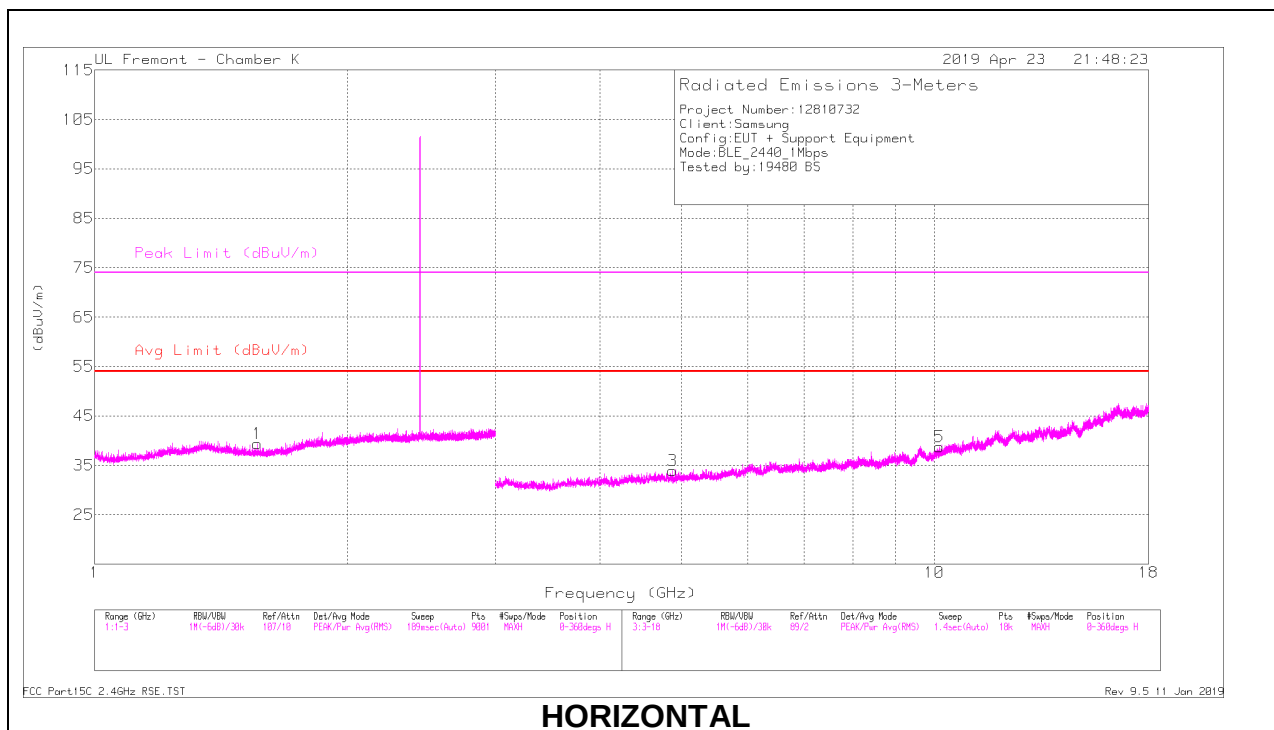
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.324	41.45	PK2	29.1	-23.9	0	46.65	-	-	74	-27.35	305	323	H
	* 1.324	31.46	MAv1	29.1	-23.9	2.1	38.76	54	-15.24	-	-	305	323	H
2	* 1.336	41.62	PK2	29.3	-23.9	0	47.02	-	-	74	-26.98	218	318	V
	* 1.338	31.65	MAv1	29.3	-24	2.1	39.05	54	-14.95	-	-	218	318	V
3	* 4.696	36.78	PK2	34.1	-30.5	0	40.38	-	-	74	-33.62	107	279	H
	* 4.696	27.34	MAv1	34.1	-30.5	2.1	33.04	54	-20.96	-	-	107	279	H
5	8.525	32.79	PK2	35.7	-24.8	0	43.69	-	-	-	-	36	366	H
4	* 4.804	37.15	PK2	34.2	-30.3	0	41.05	-	-	74	-32.95	158	356	V
	* 4.804	27.49	MAv1	34.2	-30.3	2.1	33.49	54	-20.51	-	-	158	356	V
6	8.861	31.88	PK2	36.1	-23.9	0	44.08	-	-	-	-	215	141	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

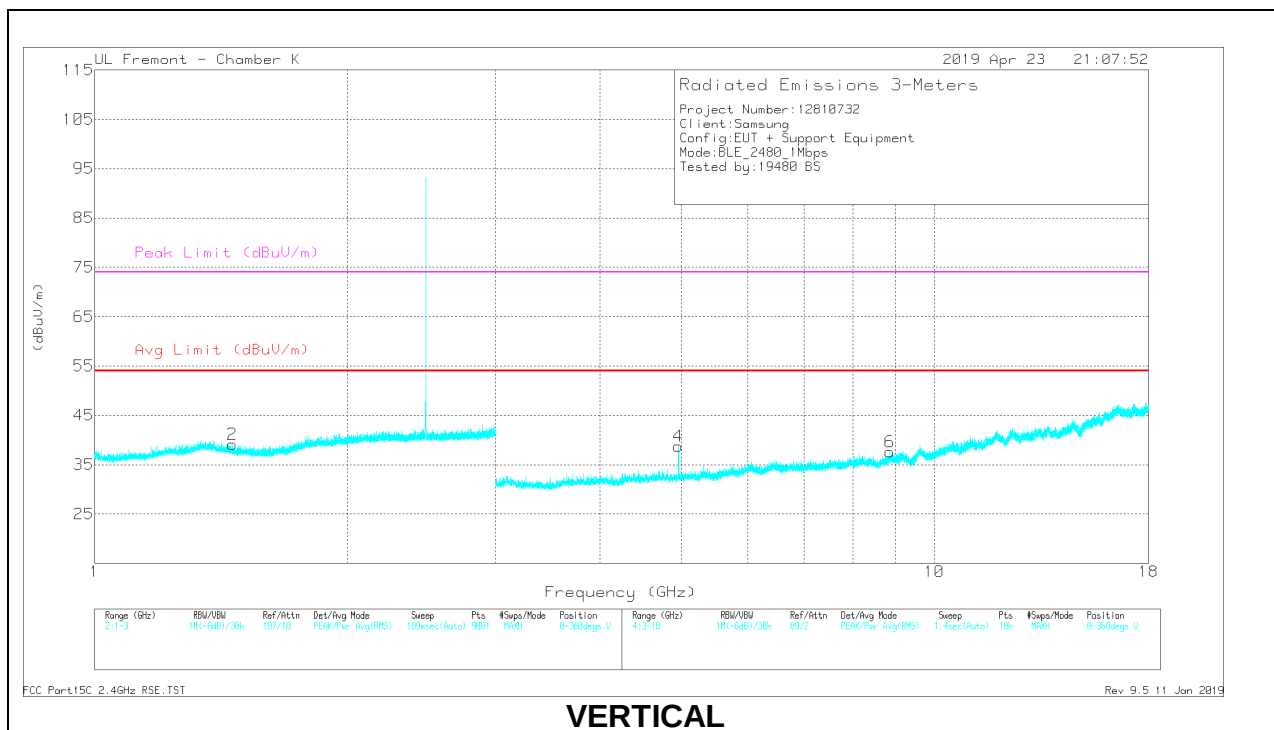
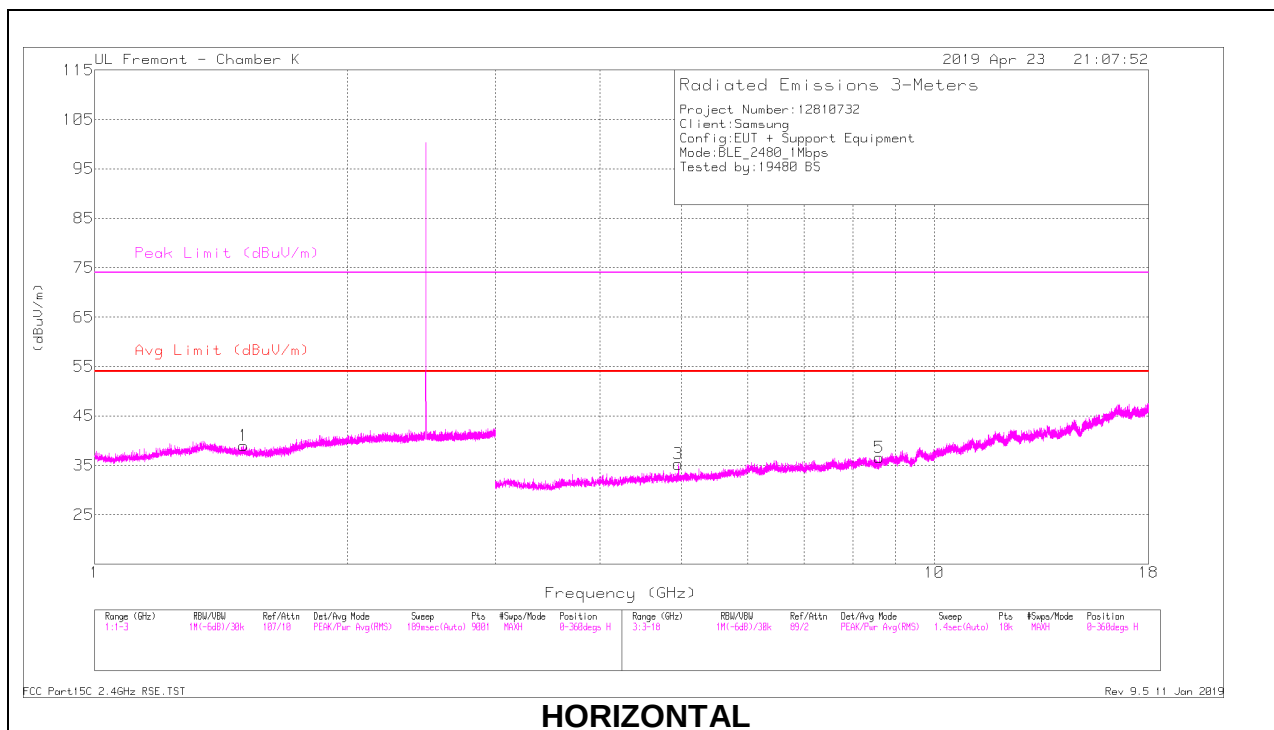
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.56	40.86	PK2	28.1	-23.9	0	45.06	-	-	74	-28.94	142	192	H
	* 1.564	31.69	MAv1	28.1	-23.9	2.1	37.99	54	-16.01	-	-	142	192	H
2	* 1.44	41.71	PK2	28.5	-23.8	0	46.41	-	-	74	-27.59	166	394	V
	* 1.442	31.95	MAv1	28.5	-23.7	2.1	38.85	54	-15.15	-	-	166	394	V
3	* 4.88	37.72	PK2	34.1	-30.5	0	41.32	-	-	74	-32.68	148	128	H
	* 4.88	27.39	MAv1	34.1	-30.5	2.1	33.09	54	-20.91	-	-	148	128	H
5	10.14	31.28	PK2	37.2	-23	0	45.48	-	-	-	-	293	360	H
4	* 4.88	39.05	PK2	34.1	-30.5	0	42.65	-	-	74	-31.35	146	104	V
	* 4.88	30.19	MAv1	34.1	-30.5	2.1	35.89	54	-18.11	-	-	146	104	V
6	10.311	30.75	PK2	37.3	-22.7	0	45.35	-	-	-	-	234	352	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 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	* 1.503	41.38	PK2	28.1	-23.8	0	45.68	-	-	74	-28.32	211	274	H
	* 1.506	31.43	MAv1	28.1	-23.8	2.1	37.83	54	-16.17	-	-	211	274	H
2	* 1.46	41.08	PK2	28.4	-23.9	0	45.58	-	-	74	-28.42	110	343	V
	* 1.46	31.71	MAv1	28.4	-23.9	2.1	38.31	54	-15.69	-	-	110	343	V
3	* 4.96	38.56	PK2	34.2	-30.6	0	42.16	-	-	74	-31.84	187	102	H
	* 4.96	30.16	MAv1	34.2	-30.6	2.1	35.86	54	-18.14	-	-	187	102	H
5	8.905	31.07	PK2	35.8	-24.6	0	42.27	-	-	-	-	161	280	H
4	* 4.96	39.93	PK2	34.2	-30.6	0	43.53	-	-	74	-30.47	204	102	V
	* 4.96	33.49	MAv1	34.2	-30.6	2.1	39.19	54	-14.81	-	-	204	102	V
6	8.859	32.18	PK2	36.1	-23.8	0	44.48	-	-	-	-	41	386	V

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

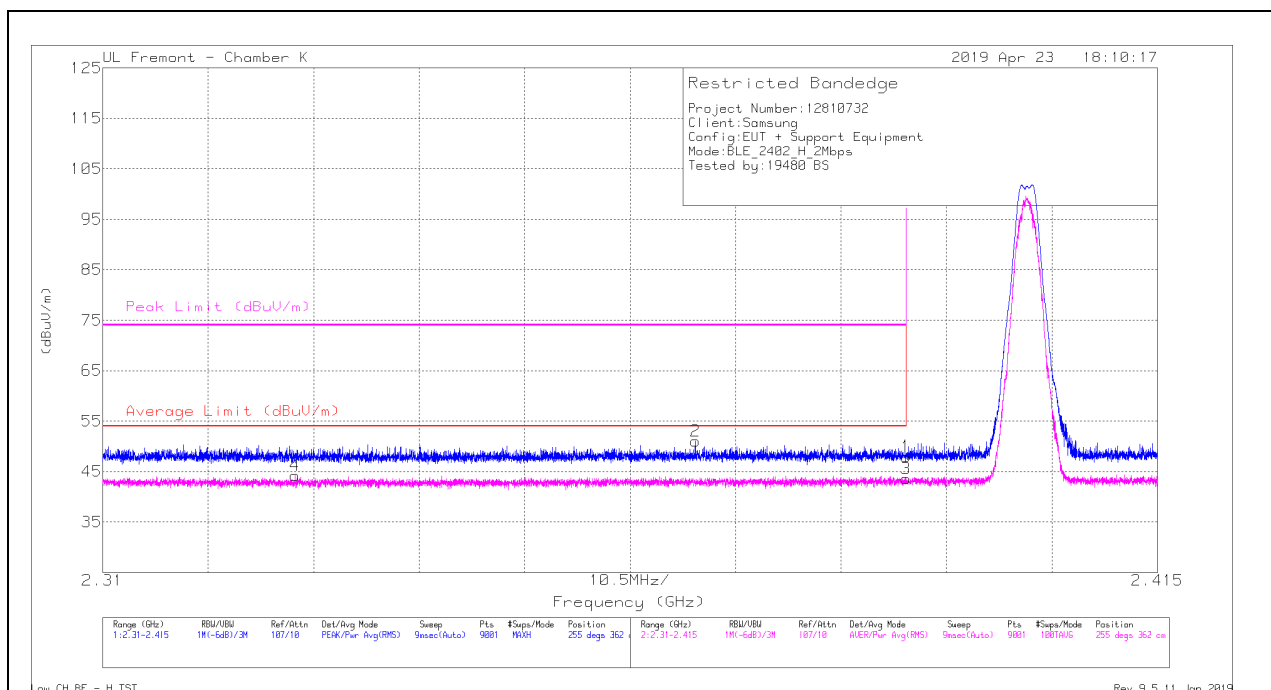
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

9.2.2. BLE (2Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

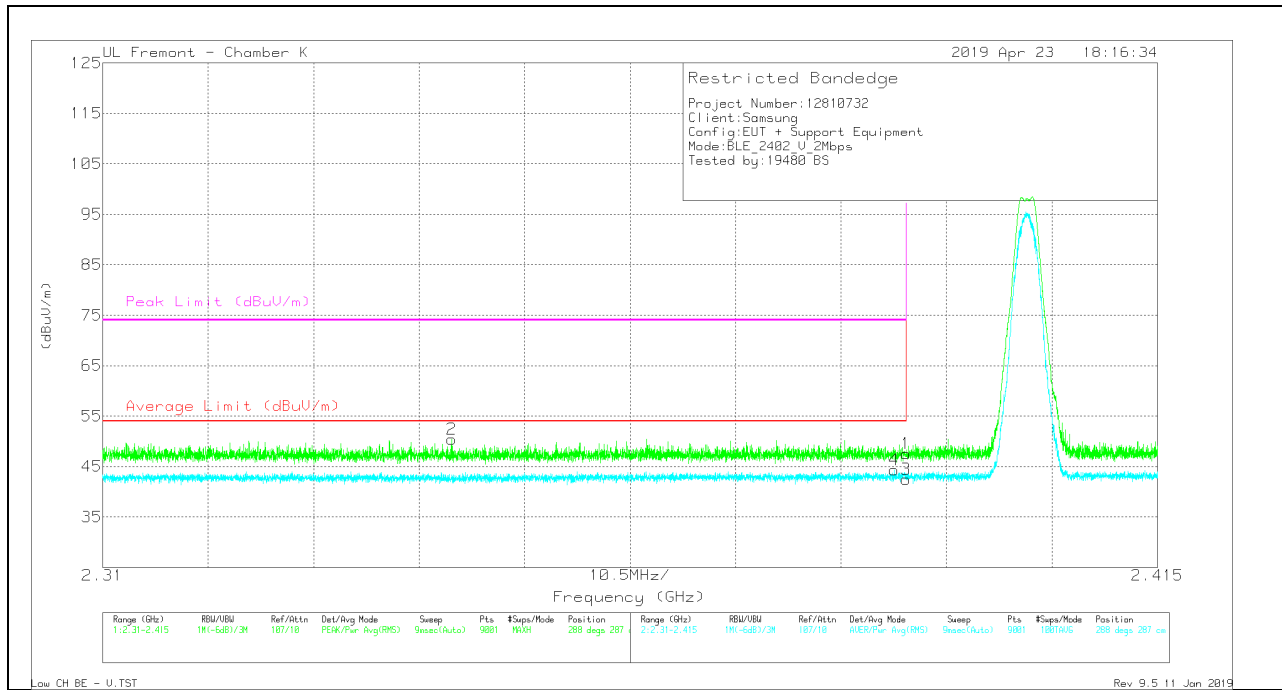
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.79	PK	31.9	-24.7	0	47.99	-	-	74	-26.01	255	362	H
2	* 2.369	43.81	PK	31.8	-24.6	0	51.01	-	-	74	-22.99	255	362	H
3	* 2.39	31.46	RMS	31.9	-24.7	4.96	43.62	54	-10.38	-	-	255	362	H
4	* 2.329	32.16	RMS	31.7	-24.6	4.96	44.22	54	-9.78	-	-	255	362	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 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	* 2.39	40.36	Pk	31.9	-24.7	0	47.56	-	-	74	-26.44	288	287	V
2	* 2.345	43.34	Pk	31.7	-24.6	0	50.44	-	-	74	-23.56	288	287	V
3	* 2.39	30.36	RMS	31.9	-24.7	4.96	42.52	54	-11.48	-	-	288	287	V
4	* 2.389	32.13	RMS	31.9	-24.7	4.96	44.29	54	-9.71	-	-	288	287	V

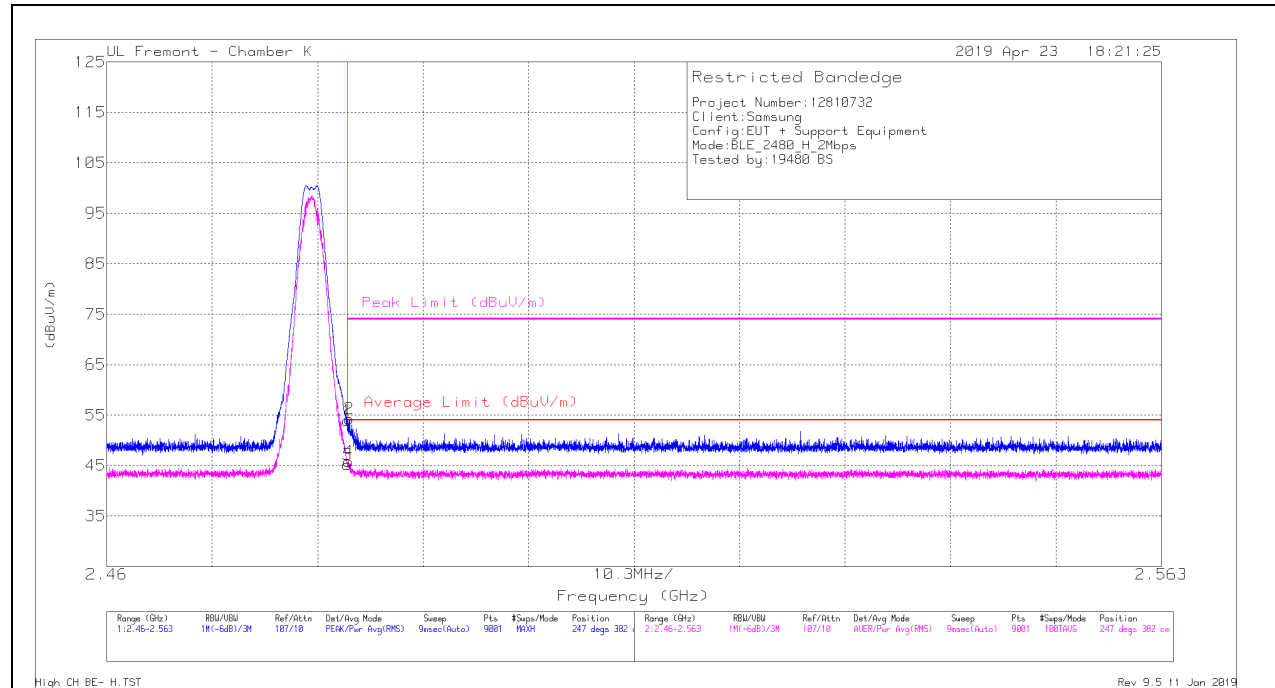
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

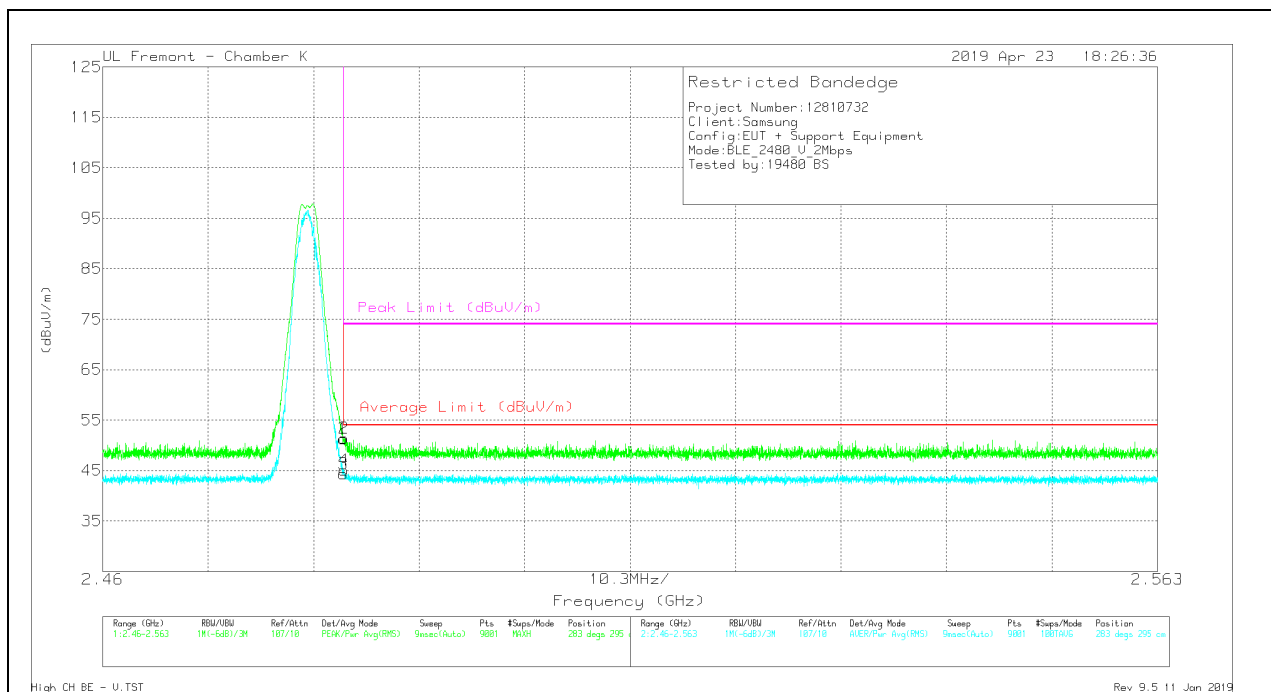
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1	* 2.484	46.44	Pk	32.3	-24.8	0	53.94	-	-	74	-20.06	247	382	H
2	* 2.484	46.79	Pk	32.3	-24.8	0	54.29	-	-	74	-19.71	247	382	H
3	* 2.484	32.79	RMS	32.3	-24.8	4.96	45.25	54	-8.75	-	-	247	382	H
4	* 2.484	33.35	RMS	32.3	-24.8	4.96	45.81	54	-8.19	-	-	247	382	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 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	* 2.484	43.81	Pk	32.3	-24.8	0	51.31	-	-	74	-22.69	283	295	V
2	* 2.484	43.86	Pk	32.3	-24.8	0	51.36	-	-	74	-22.64	283	295	V
3	* 2.484	31.86	RMS	32.3	-24.8	4.96	44.32	54	-9.68	-	-	283	295	V
4	* 2.484	32.6	RMS	32.3	-24.8	4.96	45.06	54	-8.94	-	-	283	295	V

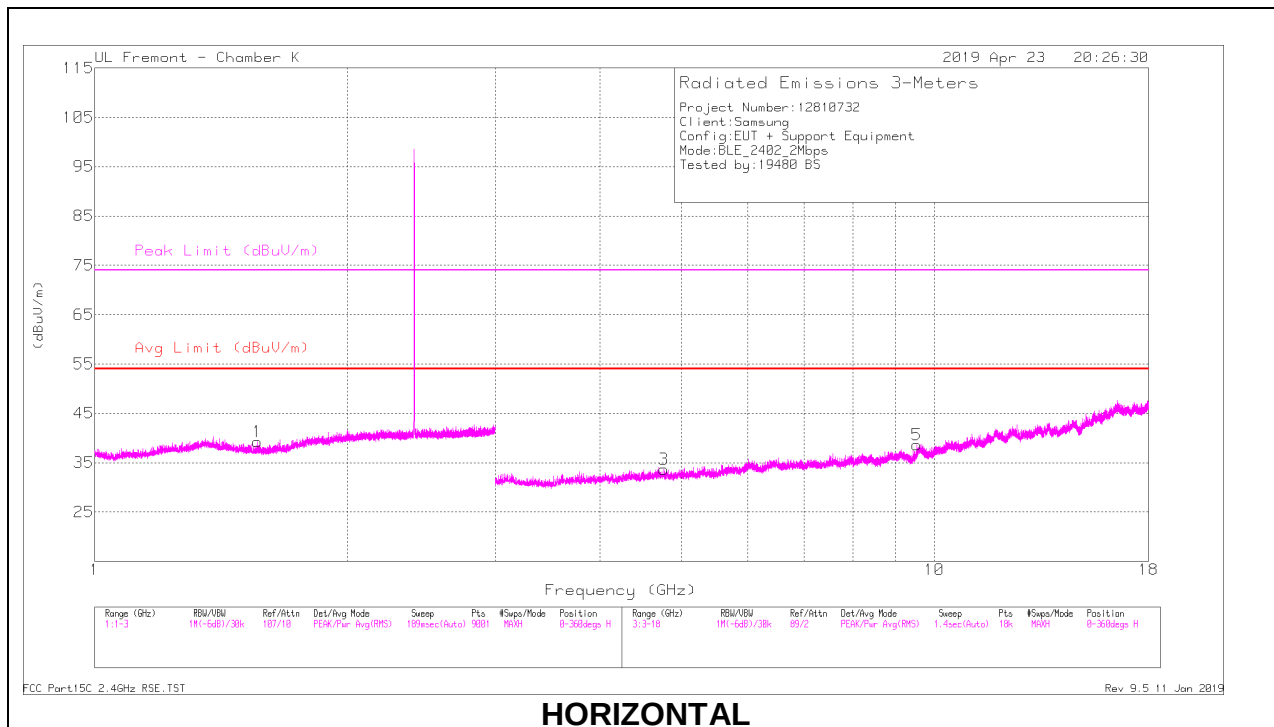
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

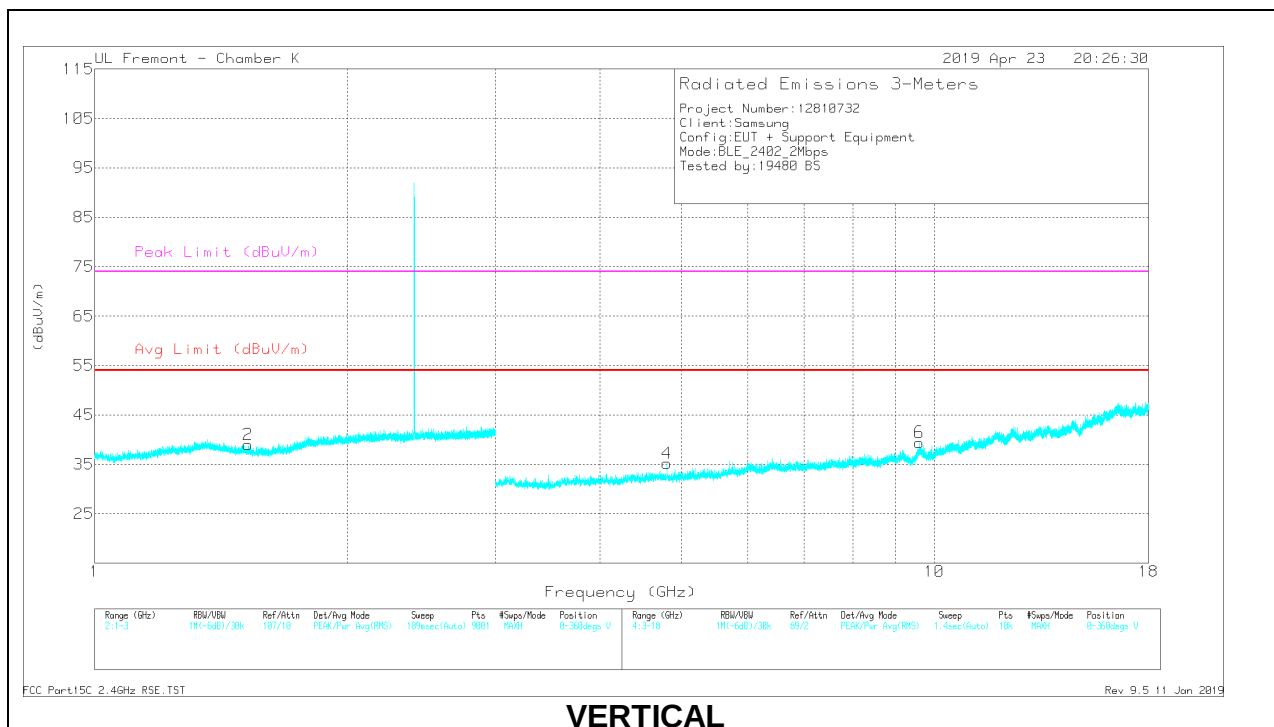
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

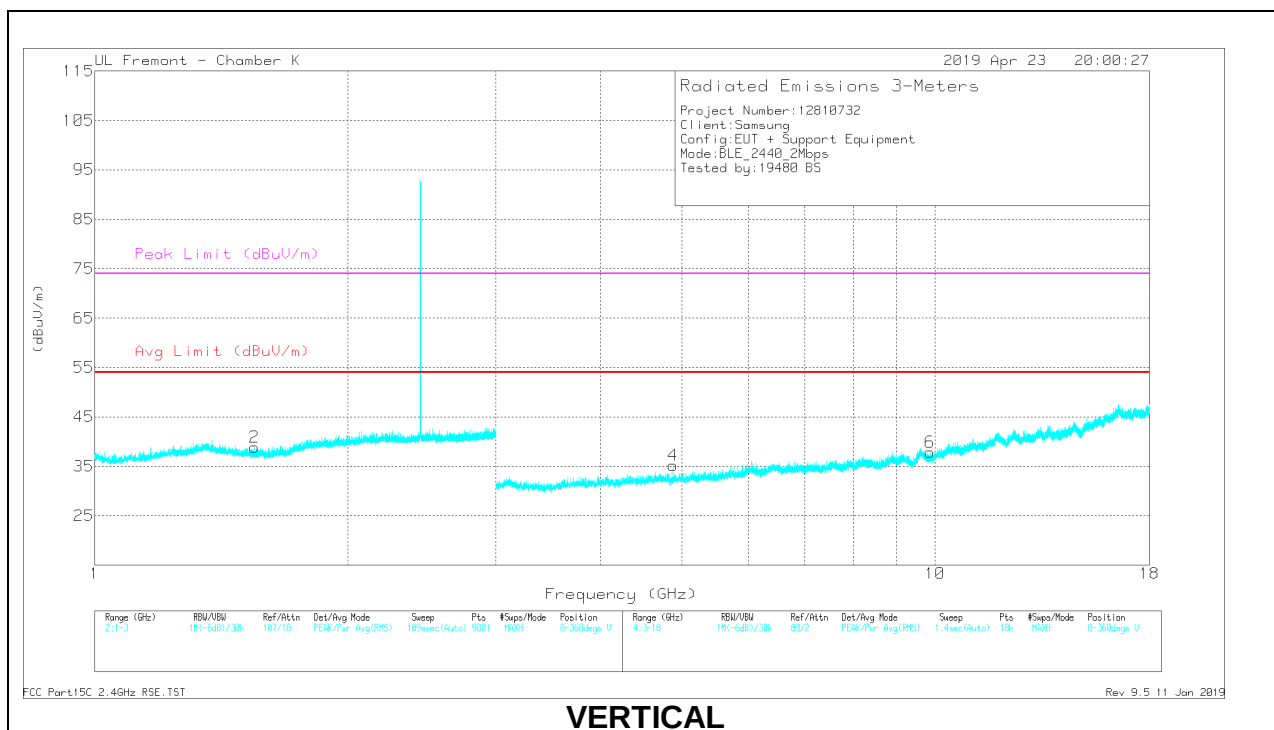
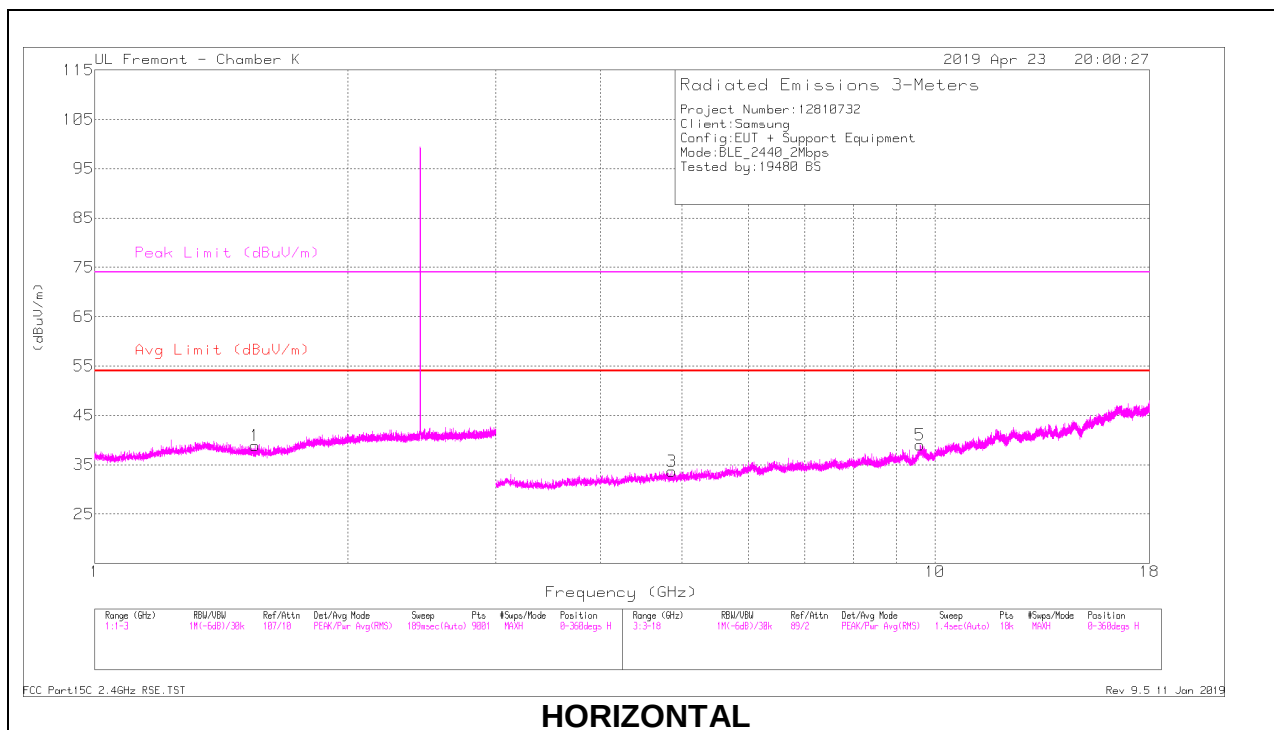
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.562	43.21	PK2	28.1	-23.9	0	47.41	-	-	74	-26.59	170	366	H
	* 1.564	31.31	MAv1	28.1	-23.9	4.96	40.47	54	-13.53	-	-	170	366	H
2	* 1.523	42.12	PK2	28.1	-23.8	0	46.42	-	-	74	-27.58	76	393	V
	* 1.522	31.44	MAv1	28.1	-23.8	4.96	40.7	54	-13.3	-	-	76	393	V
3	* 4.765	36.36	PK2	34.1	-30.2	0	40.26	-	-	74	-33.74	78	138	H
	* 4.765	26.92	MAv1	34.1	-30.2	4.96	35.78	54	-18.22	-	-	78	138	H
5	9.537	32.14	PK2	36.7	-23.1	0	45.74	-	-	-	-	322	202	H
4	* 4.804	37.65	PK2	34.2	-30.3	0	41.55	-	-	74	-32.45	140	110	V
	* 4.804	28.77	MAv1	34.2	-30.3	4.96	37.63	54	-16.37	-	-	140	110	V
6	9.607	31.53	PK2	36.8	-22.9	0	45.43	-	-	-	-	218	178	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

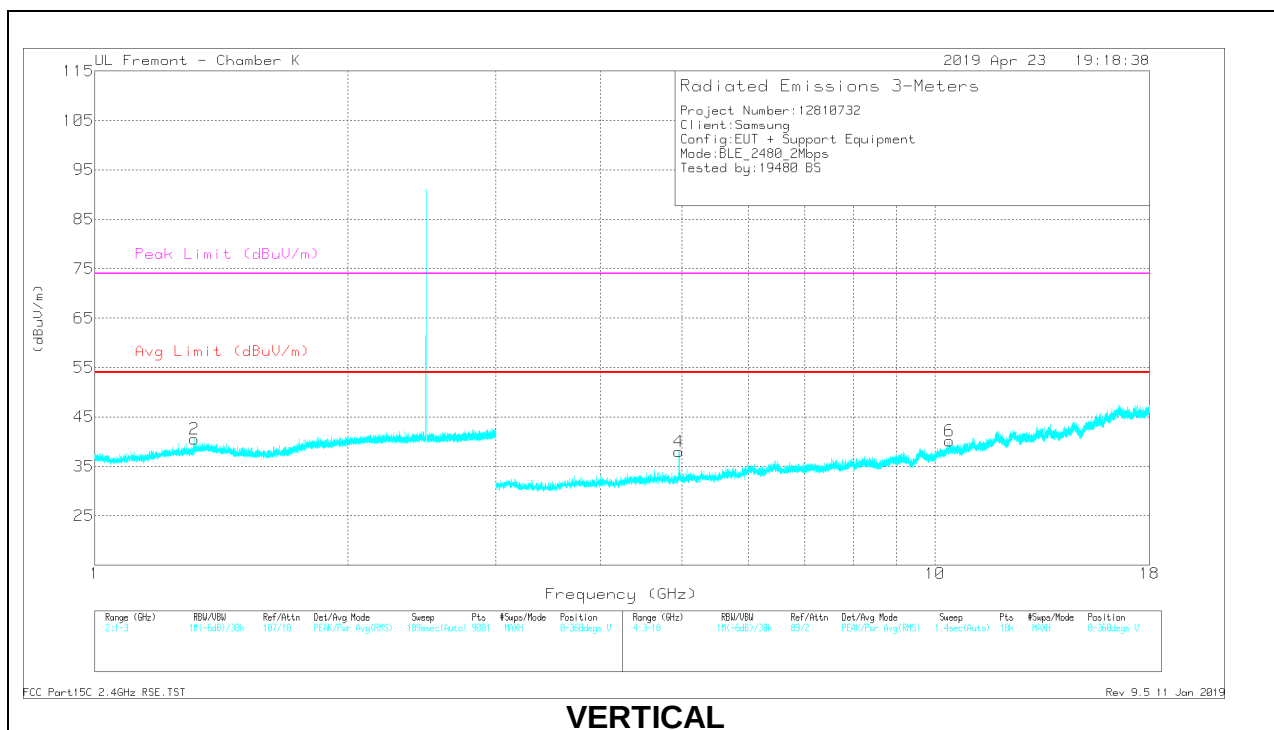
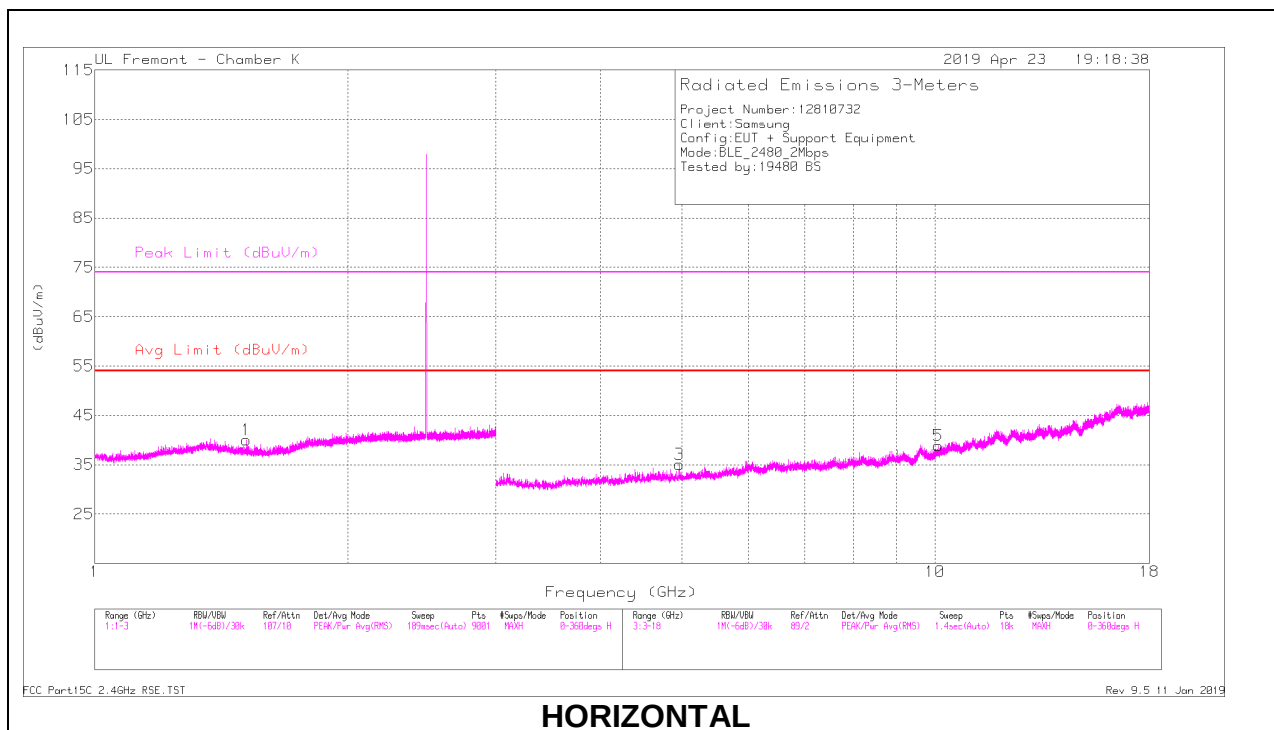
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.551	41.51	PK2	28.1	-23.9	0	45.71	-	-	74	-28.29	354	247	H
	* 1.552	31.5	MAv1	28.1	-23.9	4.96	40.66	54	-13.34	-	-	354	247	H
2	* 1.552	41.26	PK2	28.1	-23.9	0	45.46	-	-	74	-28.54	355	204	V
	* 1.552	31.71	MAv1	28.1	-23.9	4.96	40.87	54	-13.13	-	-	355	204	V
3	* 4.863	36.66	PK2	34.1	-30.5	0	40.26	-	-	74	-33.74	156	195	H
	* 4.862	27.61	MAv1	34.1	-30.5	4.96	36.17	54	-17.83	-	-	156	195	H
5	9.605	31.43	PK2	36.8	-22.9	0	45.33	-	-	-	-	360	237	H
4	* 4.88	37.8	PK2	34.1	-30.5	0	41.4	-	-	74	-32.6	198	116	V
	* 4.88	30.28	MAv1	34.1	-30.5	4.96	38.84	54	-15.16	-	-	198	116	V
6	9.865	30.98	PK2	37	-23	0	44.98	-	-	-	-	302	135	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 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	* 1.515	41.74	PK2	28.1	-23.8	0	46.04	-	-	74	-27.96	274	374	H
	* 1.516	31.19	MAv1	28.1	-23.8	4.96	40.45	54	-13.55	-	-	274	374	H
2	* 1.311	41.17	PK2	28.9	-23.9	0	46.17	-	-	74	-27.83	293	354	V
	* 1.312	31.24	MAv1	28.9	-23.9	4.96	41.2	54	-12.8	-	-	293	354	V
3	* 4.96	37.84	PK2	34.2	-30.6	0	41.44	-	-	74	-32.56	228	267	H
	* 4.96	29.56	MAv1	34.2	-30.6	4.96	38.12	54	-15.88	-	-	228	267	H
5	10.092	30.87	PK2	37.2	-23.1	0	44.97	-	-	-	-	270	383	H
4	* 4.96	39.94	PK2	34.2	-30.6	0	43.54	-	-	74	-30.46	199	107	V
	* 4.96	33.15	MAv1	34.2	-30.6	4.96	41.71	54	-12.29	-	-	199	107	V
6	10.404	31.44	PK2	37.4	-22.9	0	45.94	-	-	-	-	189	156	V

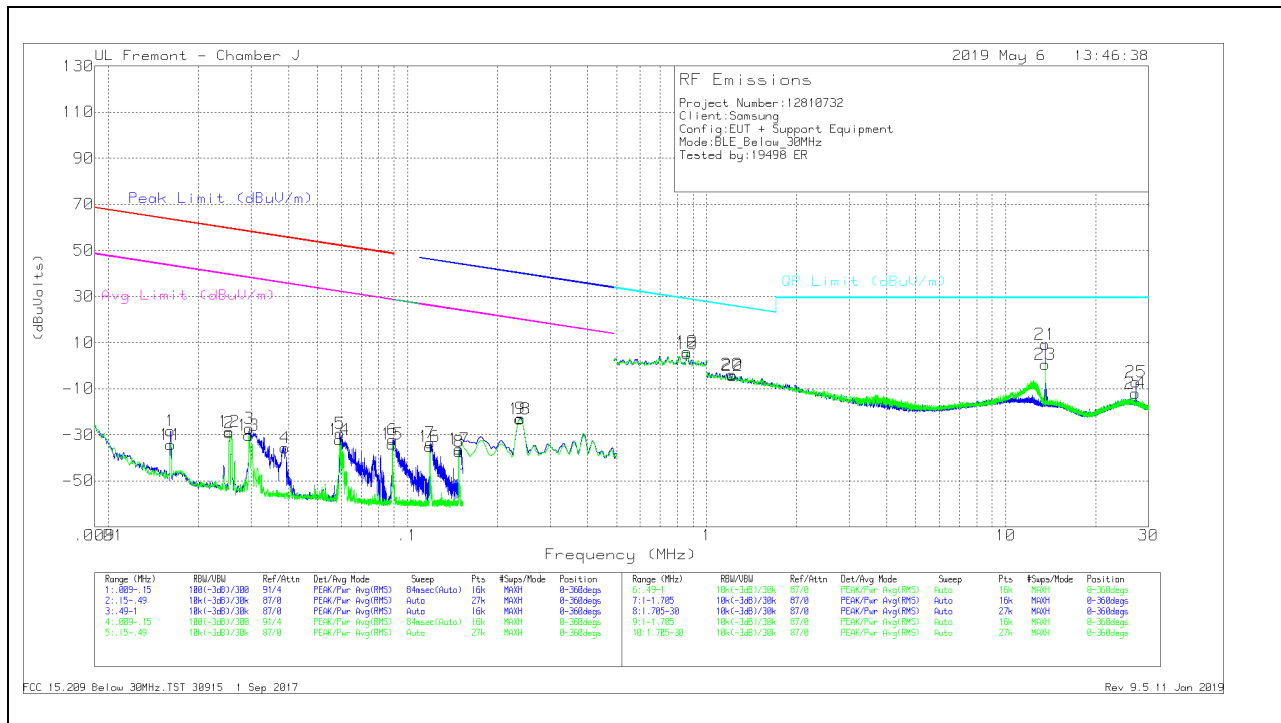
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

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	.01615	20.67	Pk	59.5	-28.5	-80	-28.33	63.42	-91.75	43.42	-71.75	-	-	-	-	0-360
2	.02536	21.01	Pk	58.4	-28.5	-80	-29.09	59.5	-88.59	39.5	-68.59	-	-	-	-	0-360
3	.02956	23.28	Pk	57.9	-28.5	-80	-27.32	58.17	-85.49	38.17	-65.49	-	-	-	-	0-360
4	.03888	15.5	Pk	57.3	-28.5	-80	-35.7	55.79	-91.49	35.79	-71.49	-	-	-	-	0-360
5	.05938	23.02	Pk	56.3	-28.6	-80	-29.28	52.11	-81.39	32.11	-61.39	-	-	-	-	0-360
6	.08911	20.68	Pk	55.8	-28.6	-80	-32.12	48.59	-80.71	28.59	-60.71	-	-	-	-	0-360
7	.11887	19.41	Pk	55.7	-28.5	-80	-33.39	-	-	-	-	46.13	-79.62	26.13	-59.62	0-360
8	.14887	15.43	Pk	55.9	-28.6	-80	-37.27	-	-	-	-	44.17	-81.44	24.17	-61.44	0-360
9	.23837	29.34	Pk	56.3	-28.5	-80	-22.86	-	-	-	-	40.07	-62.93	20.07	-42.93	0-360
11	.01616	14.79	Pk	59.5	-28.5	-80	-34.21	63.42	-97.63	43.42	-77.63	-	-	-	-	0-360
12	.02536	21.54	Pk	58.4	-28.5	-80	-28.56	59.5	-88.06	39.5	-68.06	-	-	-	-	0-360
13	.02949	20.34	Pk	58	-28.5	-80	-30.16	58.19	-88.35	38.19	-68.35	-	-	-	-	0-360
14	.05928	20.09	Pk	56.3	-28.6	-80	-32.21	52.13	-84.34	32.13	-64.34	-	-	-	-	0-360
15	.089	18.8	Pk	55.8	-28.6	-80	-34	48.6	-82.6	28.6	-62.6	-	-	-	-	0-360
16	.11873	17.73	Pk	55.7	-28.5	-80	-35.07	-	-	-	-	46.14	-81.21	26.14	-61.21	0-360
17	.14838	16.57	Pk	55.9	-28.6	-80	-36.13	-	-	-	-	44.2	-80.33	24.2	-60.33	0-360
18	.23789	28.96	Pk	56.3	-28.5	-80	-23.24	-	-	-	-	40.09	-63.33	20.09	-43.33	0-360

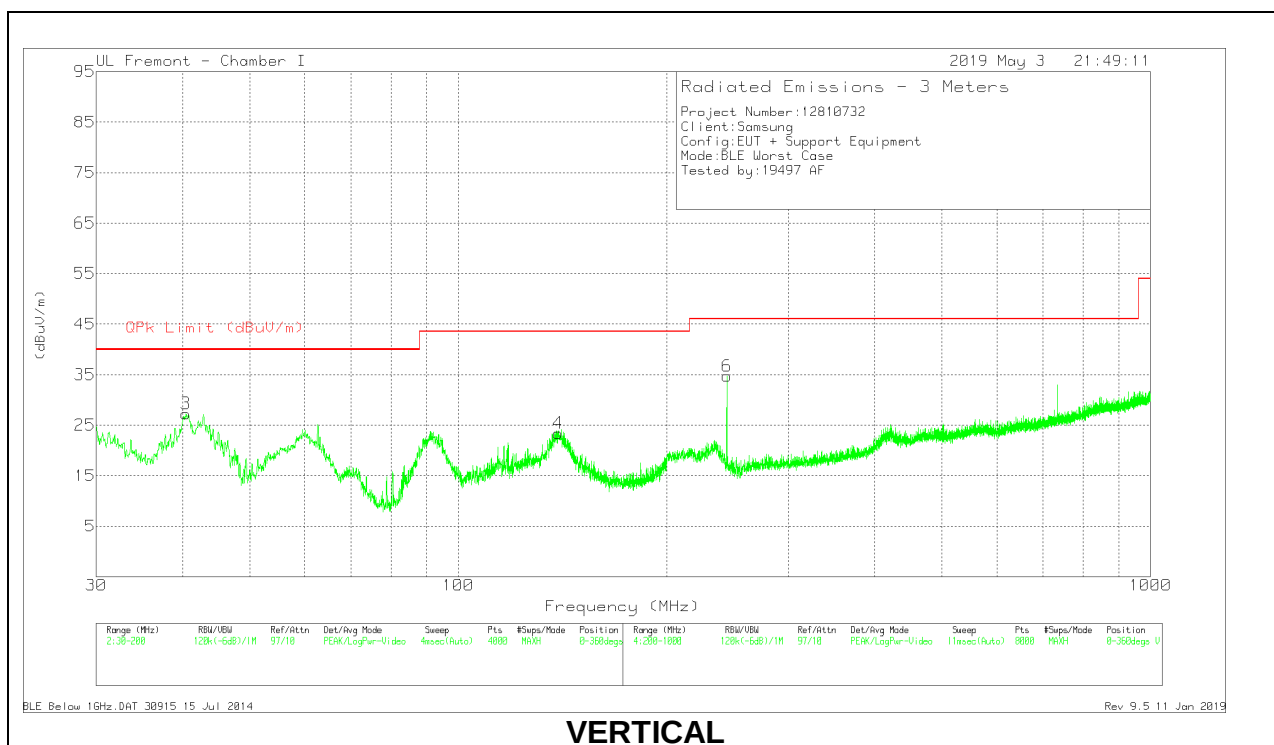
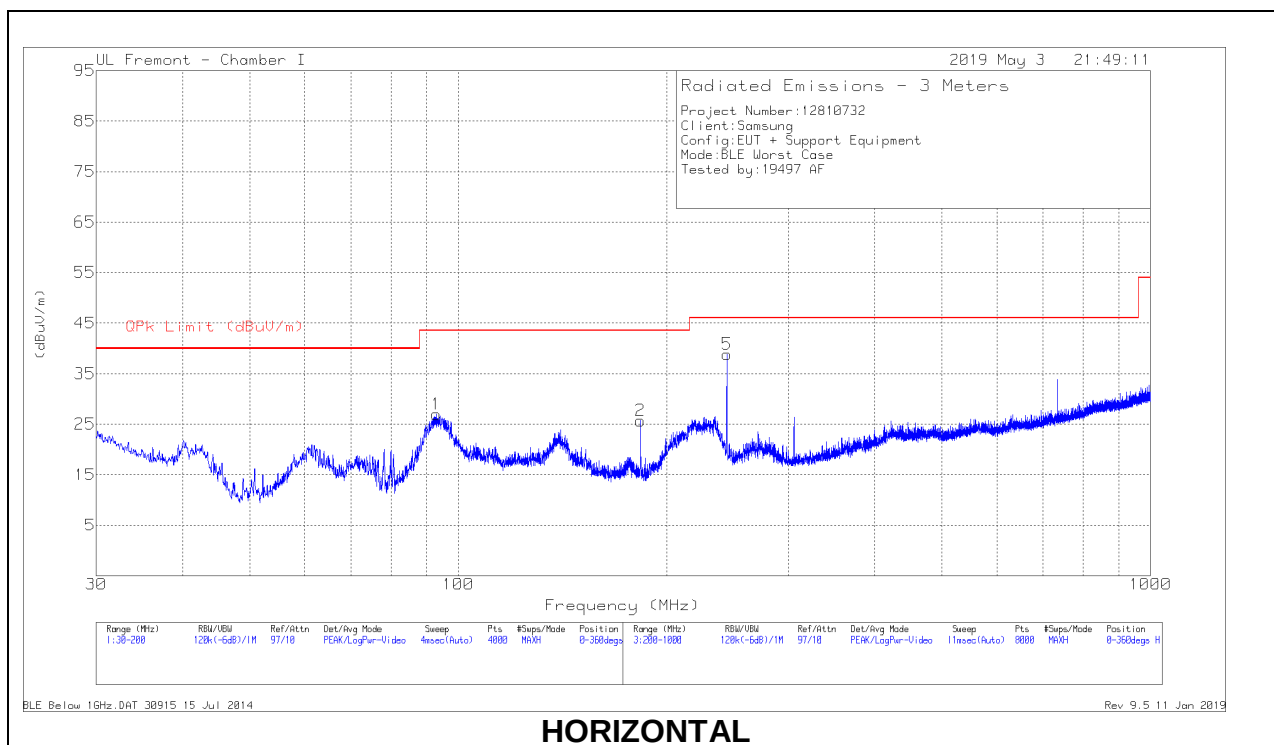
Pk - Peak detector

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)
10	.86096	17.25	Pk	56.3	-28.4	-40	5.15	28.92	-23.77	0-360
19	.86141	17.98	Pk	56.3	-28.4	-40	5.88	28.91	-23.03	0-360
20	1.21681	19.22	Pk	45.3	-28.4	-40	-3.88	25.92	-29.8	0-360
21	13.55998	42.75	Pk	34.3	-27.9	-40	9.15	29.5	-20.35	0-360
25	27.27515	27.2	Pk	33.3	-27.7	-40	-7.2	29.5	-36.7	0-360
22	1.21938	18.68	Pk	45.3	-28.4	-40	-4.42	25.9	-30.32	0-360
23	13.55998	34.13	Pk	34.3	-27.9	-40	.53	29.5	-28.97	0-360
24	27.12005	22.36	Pk	33.3	-27.7	-40	-12.04	29.5	-41.54	0-360

Pk - Peak detector

9.4. WORST CASE BELOW 1 GHz

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



Below 1GHz Data

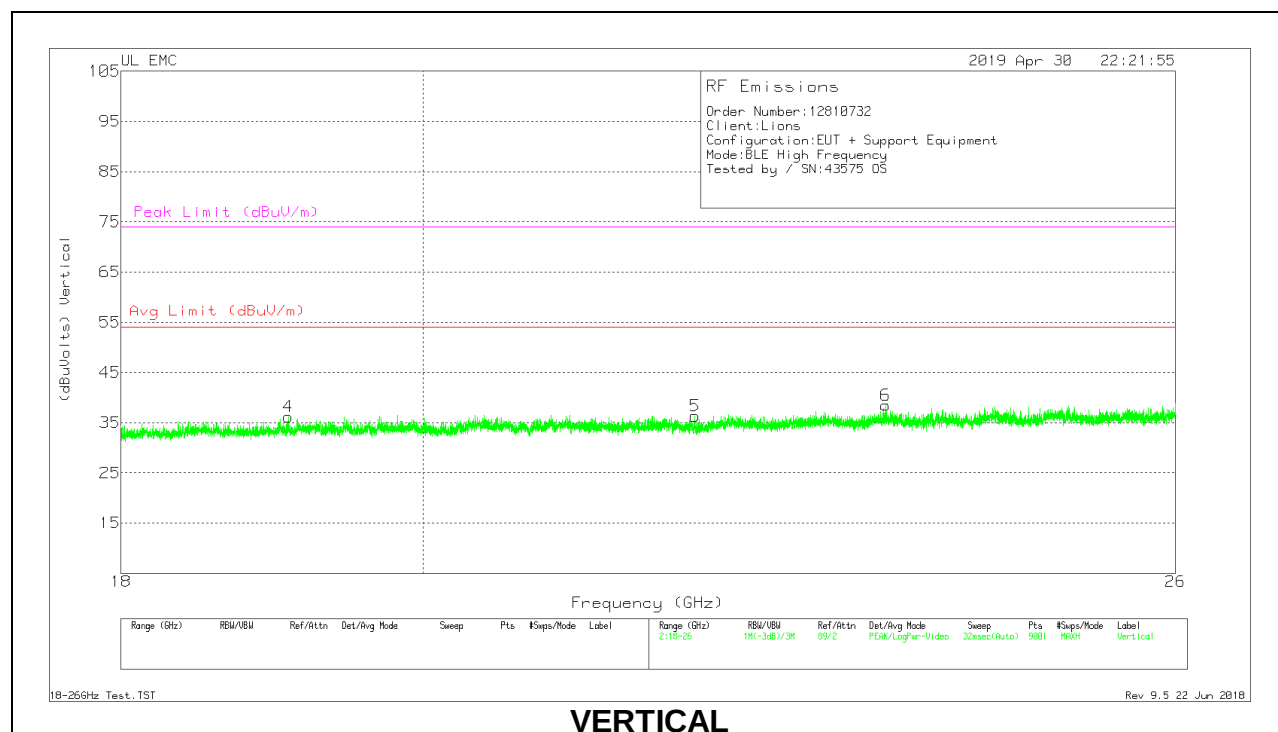
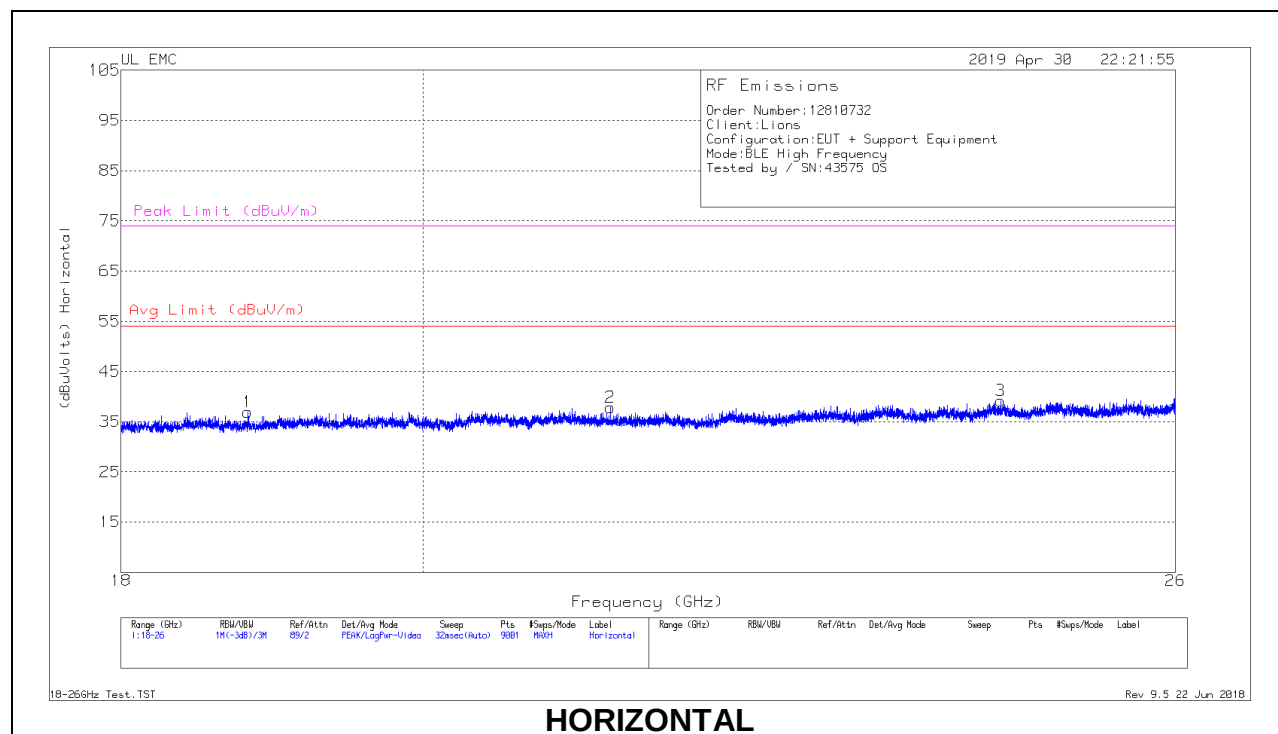
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0184971 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	93.0013	43.56	Pk	14.2	-30.8	26.96	43.52	-16.56	0-360	200	H
2	183.4222	39.1	Pk	16.9	-30.3	25.7	43.52	-17.82	0-360	200	H
3	40.4577	39.17	Pk	19.3	-31.2	27.27	40	-12.73	0-360	101	V
4	139.4233	35.01	Pk	18.9	-30.5	23.41	43.52	-20.11	0-360	101	V
5	244.5528	51.89	Pk	17.6	-30	39.49	46.02	-6.53	180	102	H
	244.5528	51.17	Qp	17.6	-30	38.77	46.02	-7.25	180	102	H
6	244.5058	47.1	Pk	17.6	-30	34.7	46.02	-11.32	0-360	199	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	AF PRE0182188 (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	18.814	71.5	Pk	33.2	-58.3	-9.5	36.9	54	-17.1	74	-37.1
2	21.35	71.11	Pk	33.6	-57.4	-9.5	37.81	54	-16.19	74	-36.19
3	24.461	70.57	Pk	34.6	-56.5	-9.5	39.17	54	-14.83	74	-34.83
4	19.08	70.05	Pk	33.1	-57.5	-9.5	36.15	54	-17.85	74	-37.85
5	21.988	69.5	Pk	34.1	-57.8	-9.5	36.3	54	-17.7	74	-37.7
6	23.501	70.26	Pk	34.6	-56.9	-9.5	38.46	54	-15.54	74	-35.54

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

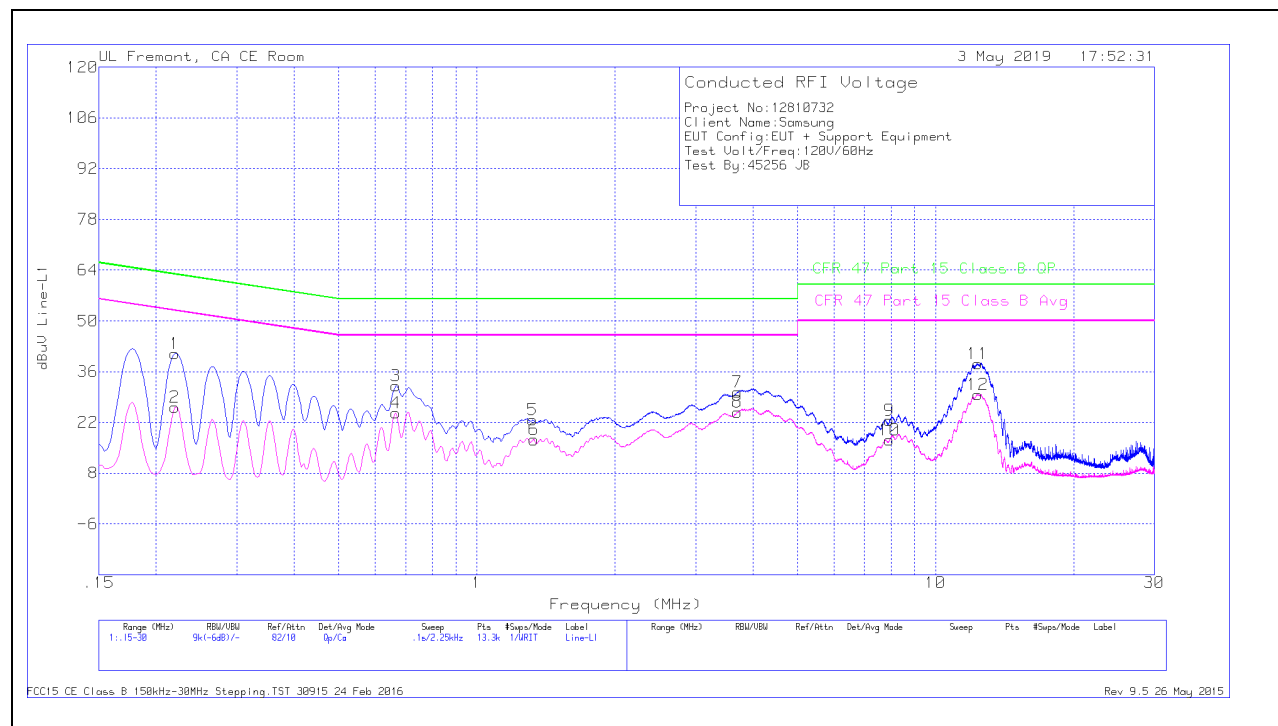
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

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

RESULTS

AC Power Line Norm

LINE 1 RESULTS



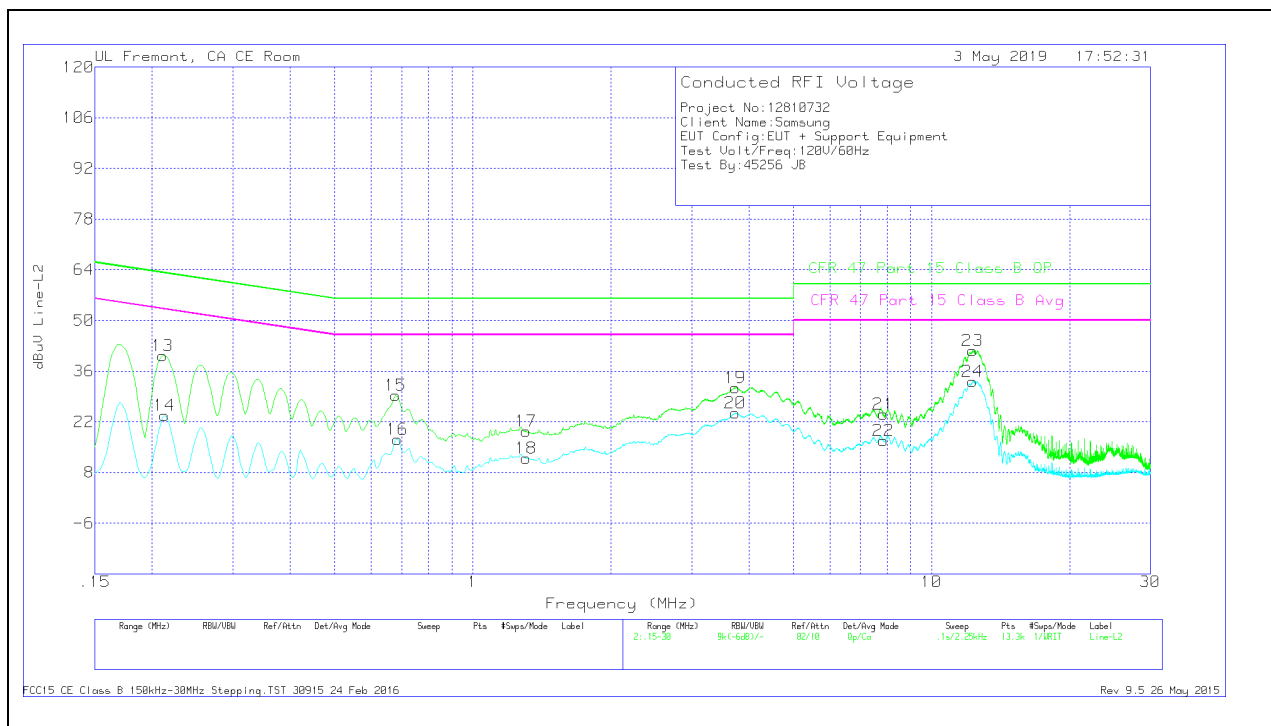
Trace Markers

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	.21975	30.88	Qp	0	0	10.1	40.98	62.83	-21.85	-	-
2	.21975	16.12	Ca	0	0	10.1	26.22	-	-	52.83	-26.61
3	.66637	22.02	Qp	0	0	10.1	32.12	56	-23.88	-	-
4	.66525	14.45	Ca	0	0	10.1	24.55	-	-	46	-21.45
5	1.32225	12.46	Qp	0	.1	10.1	22.66	56	-33.34	-	-
6	1.3335	7.04	Ca	0	.1	10.1	17.24	-	-	46	-28.76
7	3.7005	20.23	Qp	0	.1	10.1	30.43	56	-25.57	-	-
8	3.70275	14.68	Ca	0	.1	10.1	24.88	-	-	46	-21.12
9	7.9395	12.06	Qp	0	.2	10.2	22.46	60	-37.54	-	-
10	7.94063	6.8	Ca	0	.2	10.2	17.2	-	-	50	-32.8
11	12.3675	27.67	Qp	.1	.2	10.2	38.17	60	-21.83	-	-
12	12.3675	19.2	Ca	.1	.2	10.2	29.7	-	-	50	-20.3

Qp - Quasi-Peak detector

Ca - CISPR average detection

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	.21075	30.15	Qp	0	0	10.1	40.25	63.18	-22.93	-	-
14	.213	13.64	Ca	0	0	10.1	23.74	-	-	53.09	-29.35
15	.67875	19.19	Qp	0	0	10.1	29.29	56	-26.71	-	-
16	.6855	7.09	Ca	0	0	10.1	17.19	-	-	46	-28.81
17	1.30875	9.15	Qp	0	.1	10.1	19.35	56	-36.65	-	-
18	1.30875	1.79	Ca	0	.1	10.1	11.99	-	-	46	-34.01
19	3.73875	21.21	Qp	0	.1	10.1	31.41	56	-24.59	-	-
20	3.73425	14.17	Ca	0	.1	10.1	24.37	-	-	46	-21.63
21	7.84725	13.72	Qp	0	.2	10.2	24.12	60	-35.88	-	-
22	7.845	6.42	Ca	0	.2	10.2	16.82	-	-	50	-33.18
23	12.3	31.18	Qp	.1	.2	10.2	41.68	60	-18.32	-	-
24	12.3	22.64	Ca	.1	.2	10.2	33.14	-	-	50	-16.86

Qp - Quasi-Peak detector

Ca - CISPR average detection