



FCC CFR47 PART 15 SUBPART C

Bluetooth Low Energy

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + Bluetooth/BLE, DTS b/g/n and NFC

MODEL NUMBER : SM-J3109

FCC ID: A3LSMJ3109

REPORT NUMBER: 15K21842-E2

ISSUE DATE: OCT 20, 2015

Prepared for

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129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	10/20/15	Initial issue	Junwhan Lee

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. SAMPLE CALCULATION	6
4.3. MEASUREMENT UNCERTAINTY	7
5. EQUIPMENT UNDER TEST	8
5.1. DESCRIPTION OF EUT	8
5.2. MAXIMUM OUTPUT POWER	8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	8
5.4. WORST-CASE CONFIGURATION AND MODE	8
5.5. DESCRIPTION OF TEST SETUP	9
6. TEST AND MEASUREMENT EQUIPMENT	11
7. MEASUREMENT METHODS	12
8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS	12
8.1. ON TIME AND DUTY CYCLE RESULTS	12
9. SUMMARY TABLE	13
10. ANTENNA PORT TEST RESULTS	14
10.1. 6 dB BANDWIDTH	14
10.2. 99% BANDWIDTH	16
10.3. OUTPUT POWER	18
10.4. AVERAGE POWER	20
10.5. PSD	21
10.6. CONDUCTED SPURIOUS EMISSIONS	23
11. RADIATED TEST RESULTS	27
11.1. LIMITS AND PROCEDURE	27
11.2. TRANSMITTER ABOVE 1 GHz	28
11.3. WORST-CASE BELOW 1 GHz	38
12. AC POWER LINE CONDUCTED EMISSIONS	40

13. SETUP PHOTOS..... 45

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA/LTE Phone + Bluetooth/BLE, DTS b/g/n and NFC
MODEL NUMBER: SM-J3109
SERIAL NUMBER: R28G944MERY, R28G91J6LEV (RADIATED);
R28G84SHPPN (CONDUCTED)
DATE TESTED: SEP 25, 2015 - OCT 20, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:



CY Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 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.

218 Maeyeong-ro
<input type="checkbox"/> Chamber 1
<input checked="" type="checkbox"/> Chamber 2

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

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

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, Below 1GHz	4.14 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + Bluetooth/BLE, DTS b/g/n and NFC. This test report addresses the DTS (BLE) operational mode.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted output power as follows:

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2402 - 2480	BLE	Peak	2.06	1.61
		Average	1.66	1.47

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -5.39 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	ETA0U83CBC	DK1F702HS/A	N/A
Data Cable	SAMSUNG	ECB-DU68WC	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

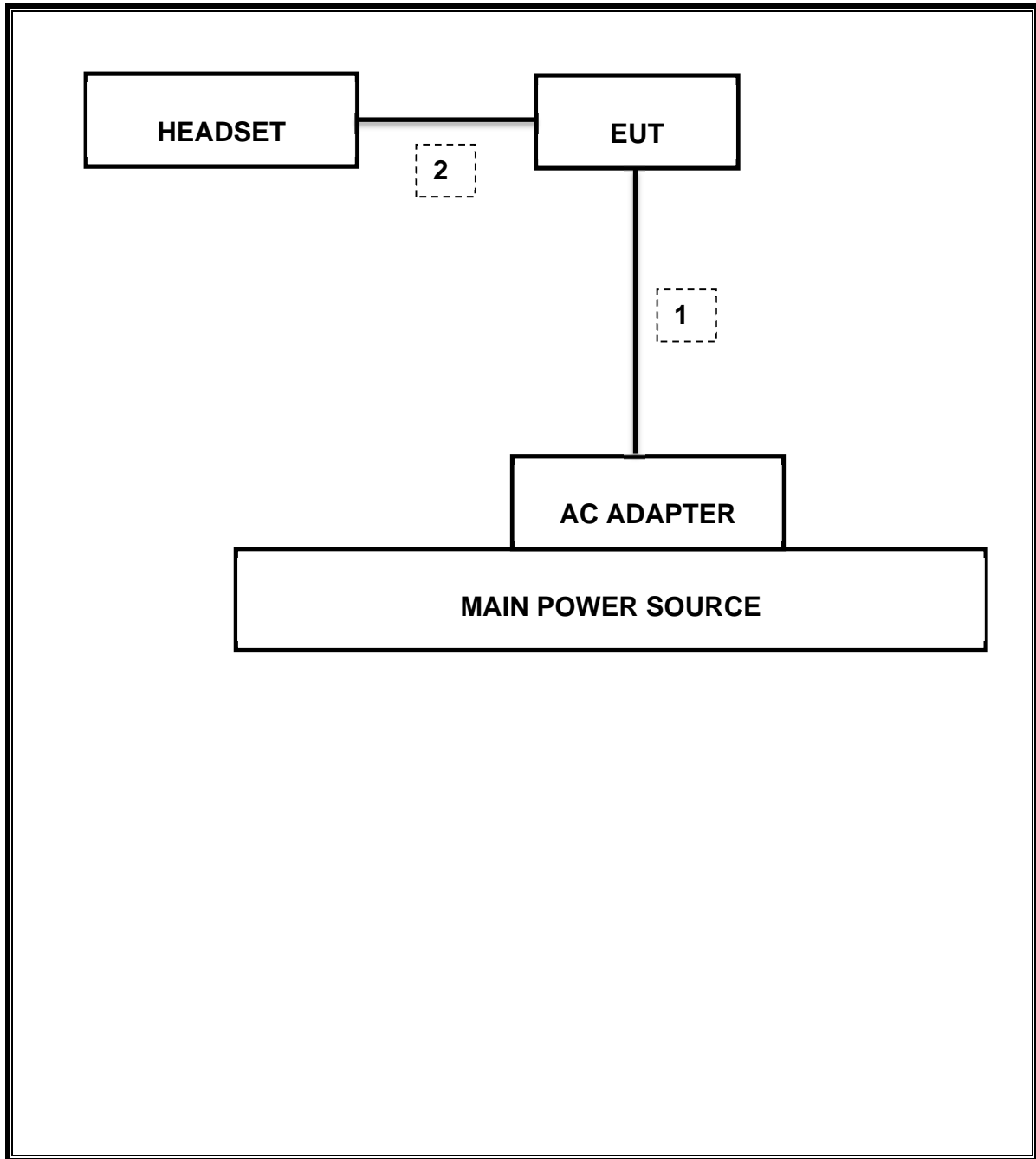
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	0.8m	N/A
1	Audio	1	Mini-Jack	Unshielded	1.0m	N/A

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



6. 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	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	11-17-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-25-16
Antenna, Horn, 18 GHz	ETS	3115	00161451	05-17-16
Antenna, Horn, 18 GHz	ETS	3117	00168724	06-17-16
Antenna, Horn, 18 GHz	ETS	3117	00168717	06-17-16
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-18-16
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-18-16
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-18-16
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-18-16
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-19-16
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-19-16
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-18-16
Average Power Sensor	R&S	NRZ-Z91	102681	08-18-16
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-18-16
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-19-16
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-19-16
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-19-16
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	009	08-18-16
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	015	08-18-16
High Pass Filter 5GHz	Micro-Tronics	HPS17542	009	08-18-16
High Pass Filter 6GHz	Micro-Tronics	HPM17543	010	08-18-16
High Pass Filter 5GHz	Micro-Tronics	HPS17542	016	08-18-16
High Pass Filter 6GHz	Micro-Tronics	HPM17543	015	08-18-16
LISN	R&S	ENV-216	101836	08-19-16
LISN	R&S	ENV-216	101837	08-19-16

7. MEASUREMENT METHODS

KDB 558074 D01 DTS Meas Guidance v03r03: Measurement Procedure §9.1.1 is used for peak power and §10.2 PKPSD is used for power spectral density.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

Band edge emissions within Restricted Bands are measured using RMS with duty cycle factor offset method.

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None: for reporting purposes only.

8.1. 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/T Minimum VBW [kHz]
2400MHz Bands						
BLE	0.390	0.625	0.623	62.3%	2.06	2.567



9. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	Occupied Band width (6dB)	>500KHz	Conducted	Pass	671.1 kHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-46.447 dBm
15.247	TX conducted output power	<30dBm		Pass	2.064 dBm (Peak)
15.247	PSD	<8dBm		Pass	-13.33 dBm (Peak)
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	47.85 dBuV (QP)
15.205, 15.209	Radiated Spurious Emission	< 40dBuV/m	Radiated	Pass	34.52 dBuV/m (QP)

10. ANTENNA PORT TEST RESULTS

10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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



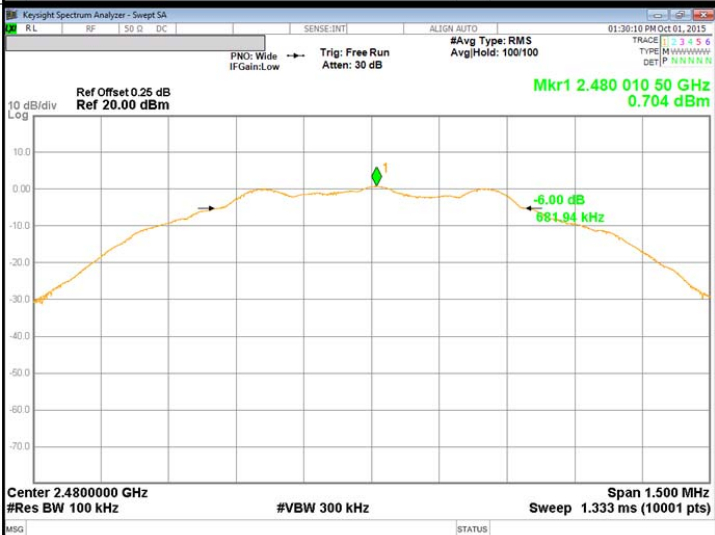
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency [MHz]	6 dB Bandwidth [kHz]	Minimum Limit [kHz]
Low	2402	671.1	500.0
Mid	2440	676.4	500.0
High	2480	681.9	500.0
Worst		671.1	500.0

6 dB BANDWIDTH PLOTS

<p>Low CH</p>	
<p>Middle CH</p>	
<p>High CH</p>	

10.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

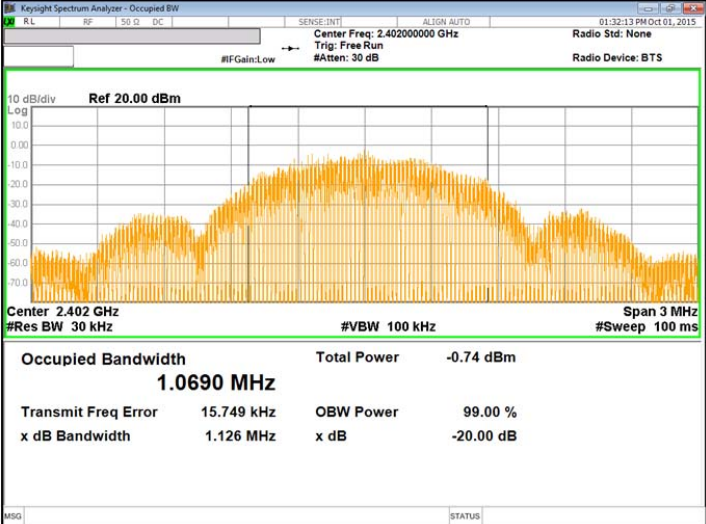
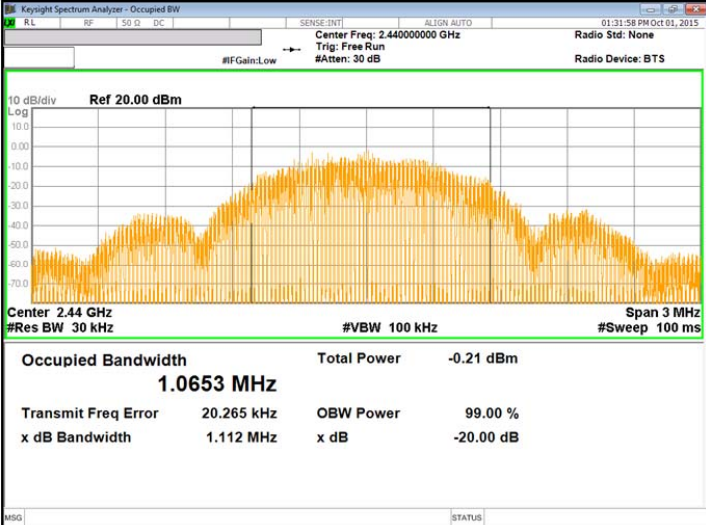
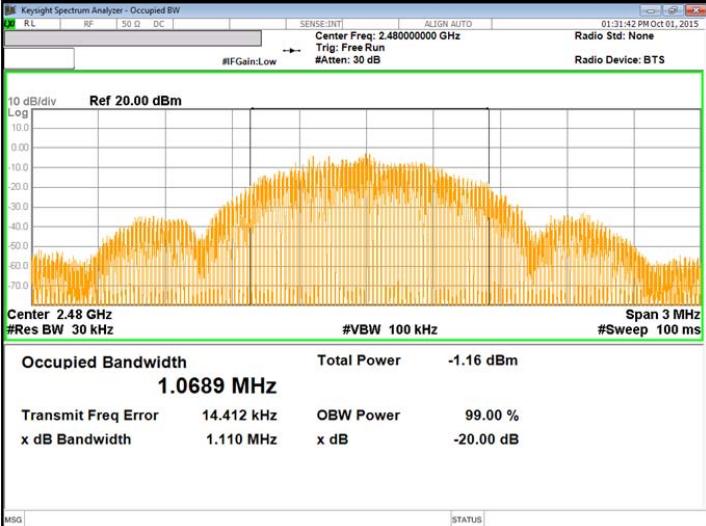
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency [MHz]	99% Bandwidth [MHz]
Low	2402	1.069
Mid	2440	1.065
High	2480	1.069
Worst		1.069

99% BANDWIDTH PLOTS

<p>Low CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.40200000 GHz Trig: Free Run #Atten: 30 dB Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.402 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>-0.74 dBm</td> </tr> <tr> <td>1.0690 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>15.749 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.126 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>-20.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	-0.74 dBm	1.0690 MHz			Transmit Freq Error	15.749 kHz	OBW Power	x dB Bandwidth	1.126 MHz	x dB			-20.00 dB
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Transmit Freq Error	15.749 kHz	OBW Power														
x dB Bandwidth	1.126 MHz	x dB														
		-20.00 dB														
<p>Middle CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.44000000 GHz Trig: Free Run #Atten: 30 dB Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.44 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>-0.21 dBm</td> </tr> <tr> <td>1.0653 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>20.265 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.112 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>-20.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	-0.21 dBm	1.0653 MHz			Transmit Freq Error	20.265 kHz	OBW Power	x dB Bandwidth	1.112 MHz	x dB			-20.00 dB
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x dB Bandwidth	1.112 MHz	x dB														
		-20.00 dB														
<p>High CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.48000000 GHz Trig: Free Run #Atten: 30 dB Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.48 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>-1.16 dBm</td> </tr> <tr> <td>1.0689 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>14.412 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.110 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>-20.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	-1.16 dBm	1.0689 MHz			Transmit Freq Error	14.412 kHz	OBW Power	x dB Bandwidth	1.110 MHz	x dB			-20.00 dB
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1.0689 MHz																
Transmit Freq Error	14.412 kHz	OBW Power														
x dB Bandwidth	1.110 MHz	x dB														
		-20.00 dB														

10.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.


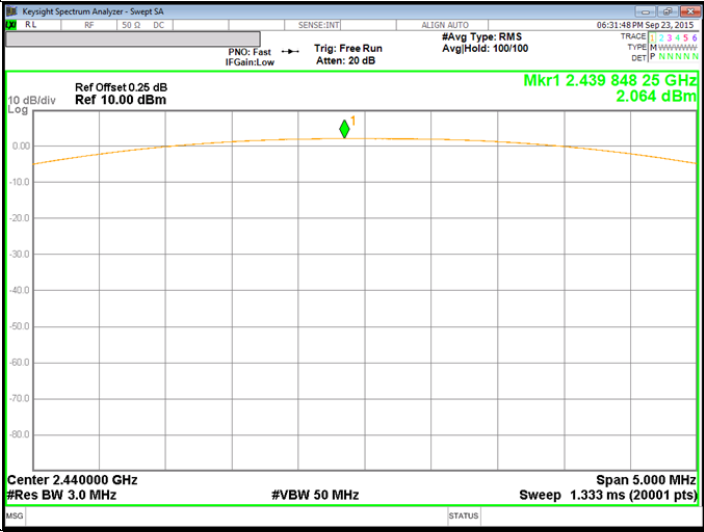

TEST PROCEDURE

Peak power is measured using KDB558074 D01 DTS Meas Guidance v03r03 under section 9.1.1 utilizing spectrum analyzer.

RESULTS

Channel	Frequency [MHz]	Peak Power Reading [dBm]	Limit [dBm]	Margin [dB]
Low	2402	1.584	30.000	-28.416
Mid	2440	2.064	30.000	-27.936
High	2480	1.211	30.000	-28.789
Worst		2.064		-27.936

OUTPUT POWER PLOTS

<p>Low CH</p>	
<p>Middle CH</p>	
<p>High CH</p>	

10.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.1 dB (including 10 dB pad and 0.1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	1.16	1.31
Middle	2440	1.66	1.47
High	2480	0.76	1.19

10.5. PSD

LIMITS

FCC §15.247

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.

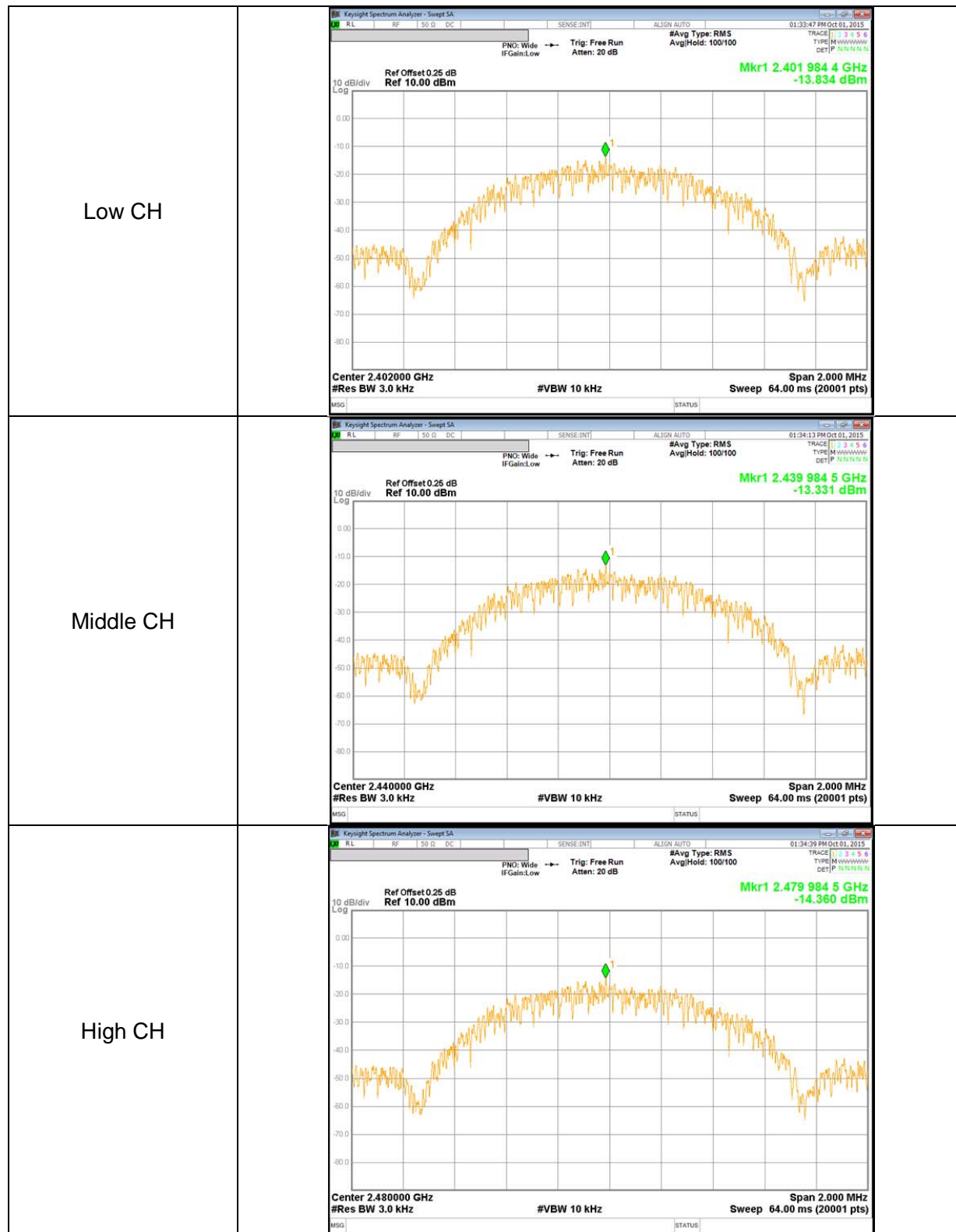
TEST PROCEDURE

Power Spectral Density was performed utilizing the "Method PKPSD (Peak PSD)" under KDB558074 D01 DTS Meas Guidance v03r03

RESULTS

Channel	Frequency [MHz]	PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2402	-13.83	8.00	-21.83
Mid	2440	-13.33	8.00	-21.33
High	2480	-14.36	8.00	-22.36

POWER SPECTRAL DENSITY PLOTS



10.6. 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.

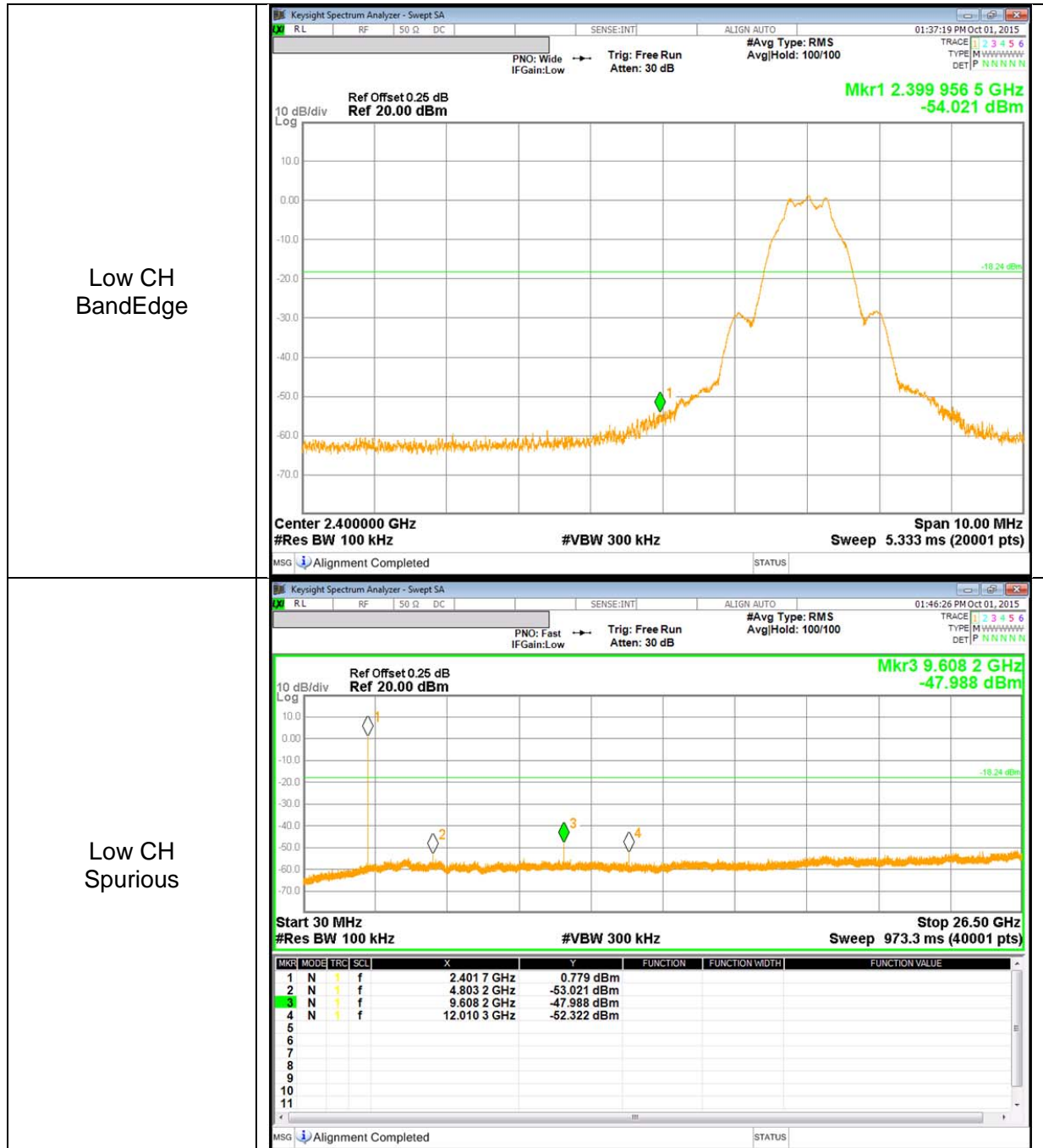
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

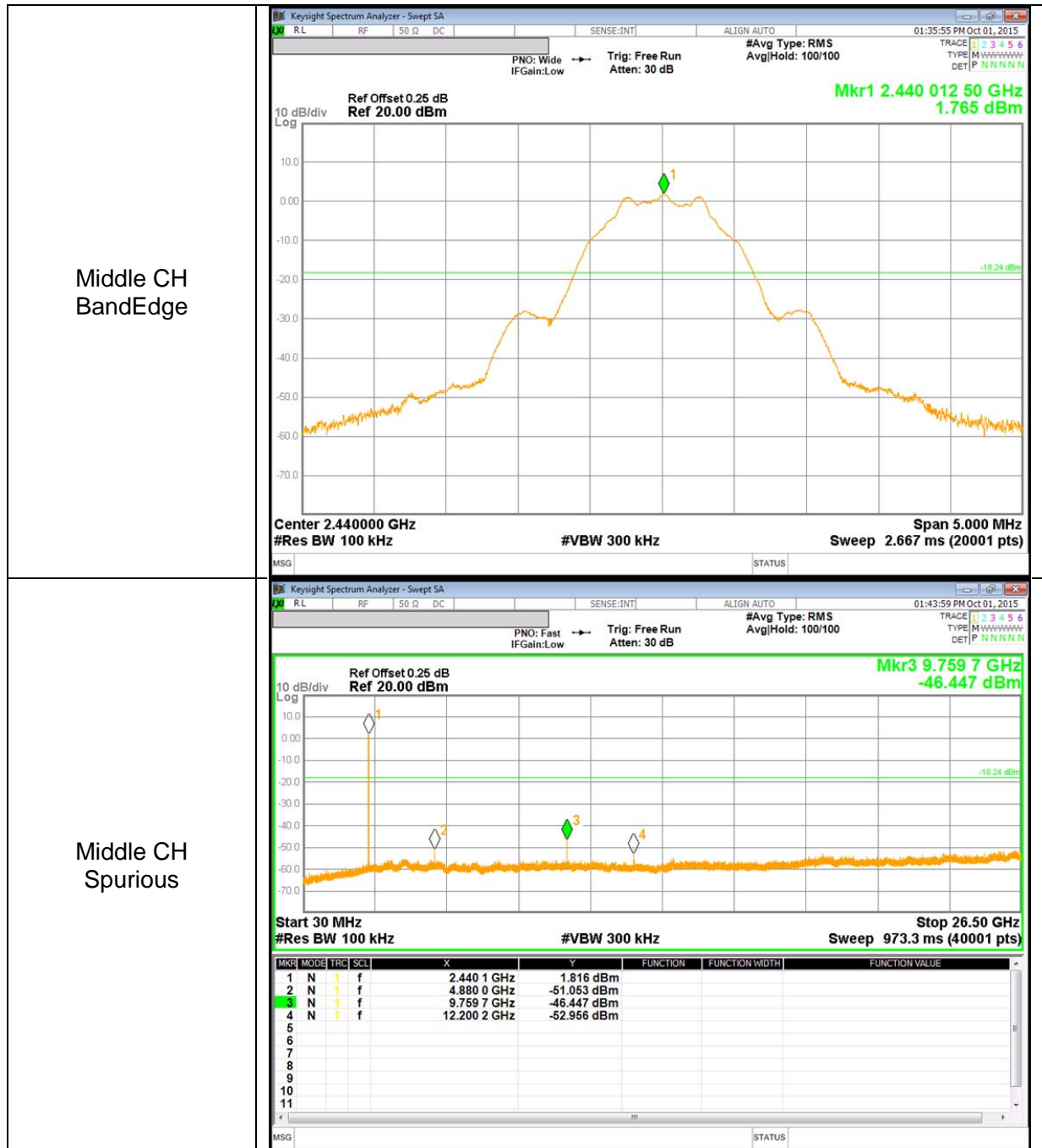
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

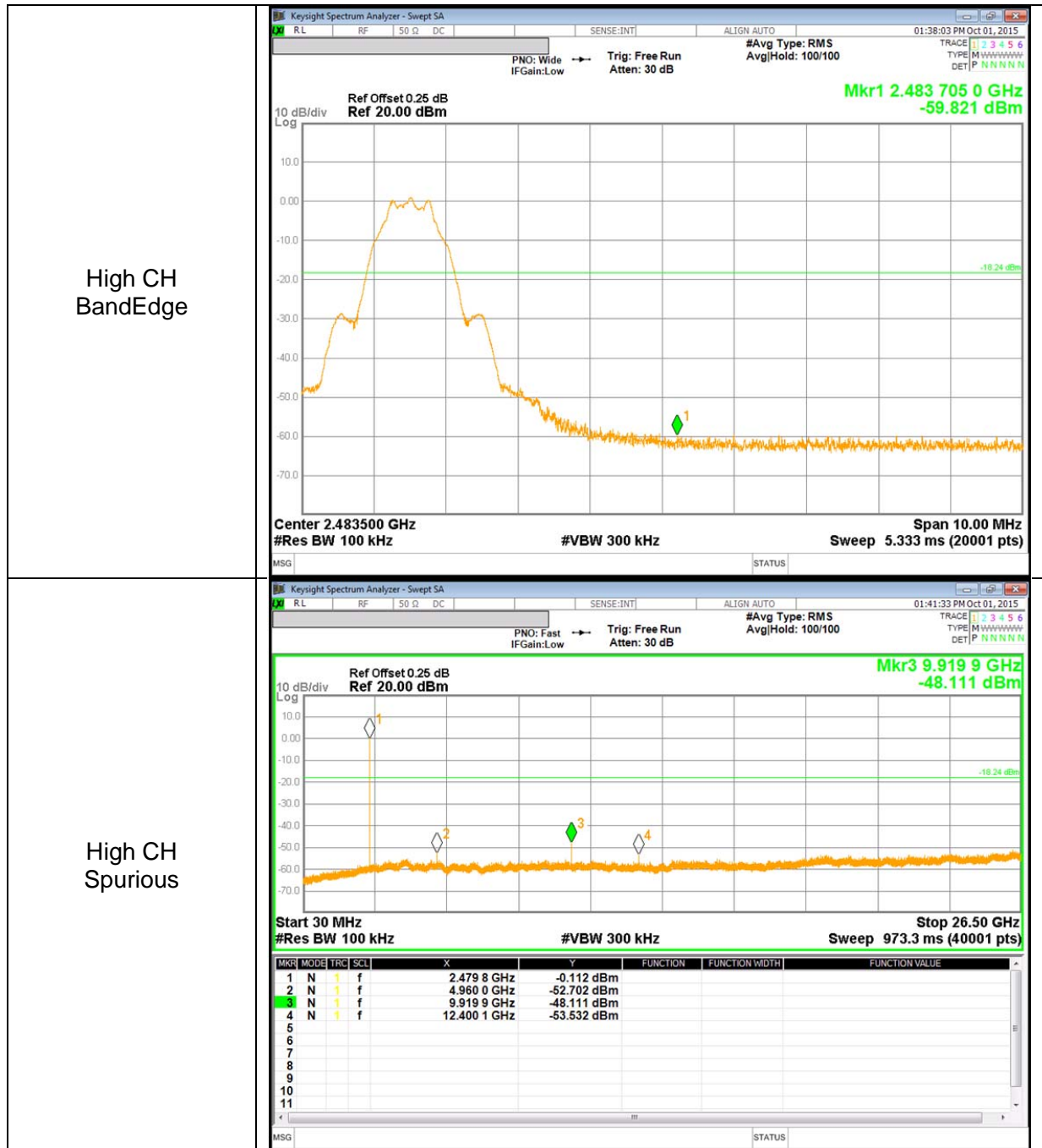
BANDEDGE & SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



11. RADIATED TEST RESULTS

11.1. 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
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. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10 - 2009. 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.

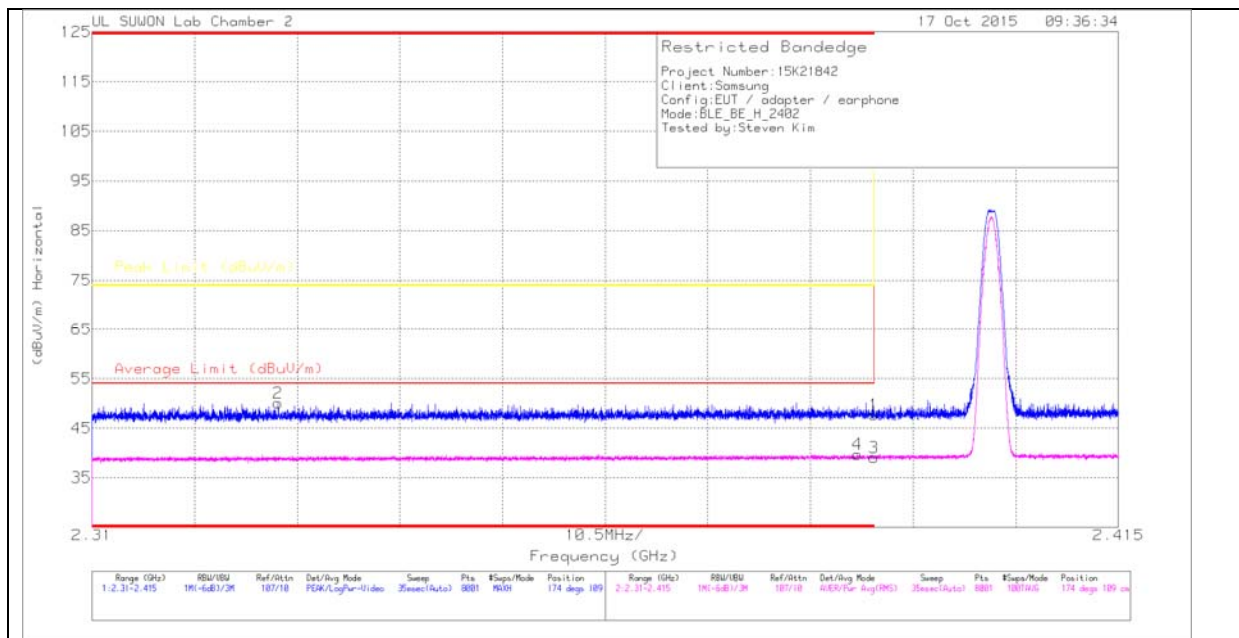
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor = $10 \log(1/x)$. For this sample: $DCF = 10 \log(1/0.623) = 2.06 \text{ dB}$ (Spectrum Analyzer round it up to 2.06dB)

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

11.2. TRANSMITTER ABOVE 1 GHz RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

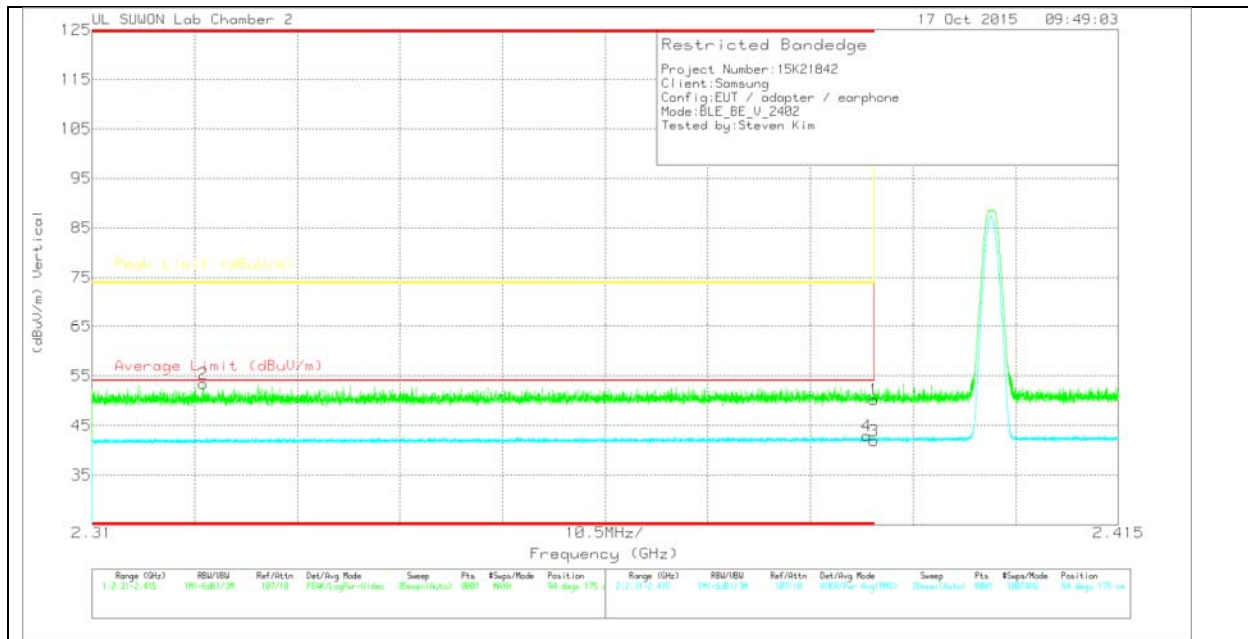
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17_150619)	Path_2_10dB	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.73	Pk	31.8	-22.8	0	47.73	-	-	74	-26.27	174	109	H
2	* 2.329	41.33	Pk	31.7	-22.9	0	50.13	-	-	74	-23.87	174	109	H
3	* 2.39	28.04	RMS	31.8	-22.8	2.05	39.09	54	-14.91	-	-	174	109	H
4	* 2.388	28.7	RMS	31.8	-22.8	2.05	39.75	54	-14.25	-	-	174	109	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 24)_150619	Path_2_10dB	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	38	Pk	31.7	-19.5	0	50.2	-	-	74	-23.8	94	175	V
2	* 2.321	41.51	Pk	31.6	-19.7	0	53.41	-	-	74	-20.59	94	175	V
3	* 2.39	27.71	RMS	31.7	-19.5	2.05	41.96	54	-12.04	-	-	94	175	V
4	* 2.389	28.6	RMS	31.7	-19.5	2.05	42.85	54	-11.15	-	-	94	175	V

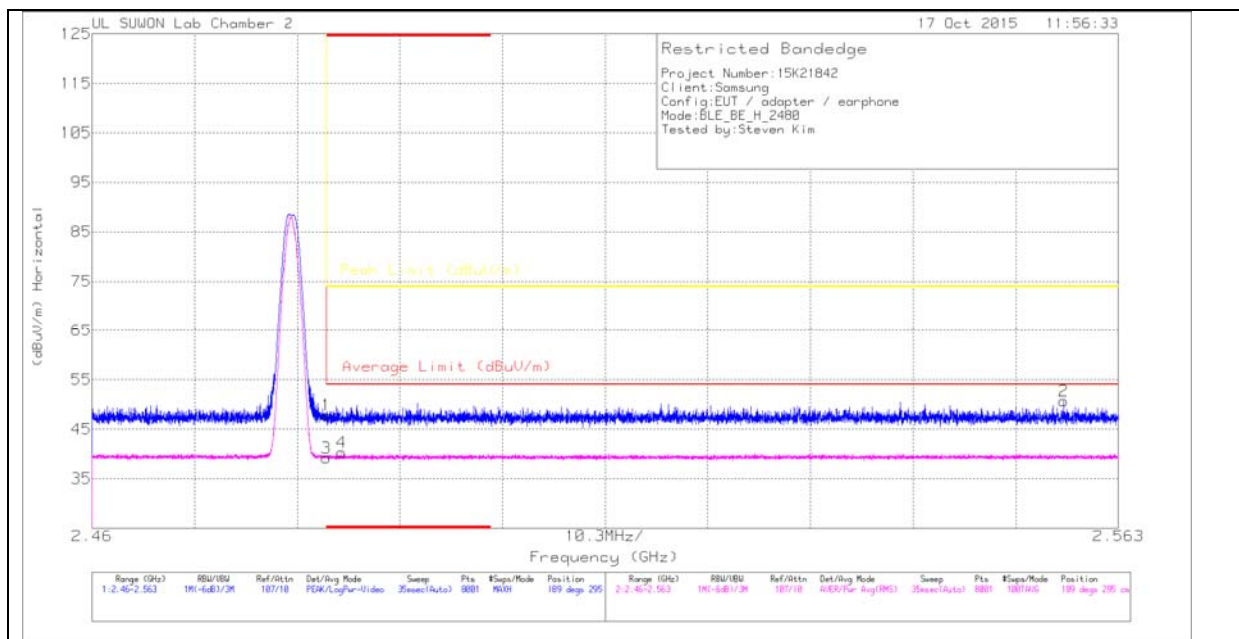
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

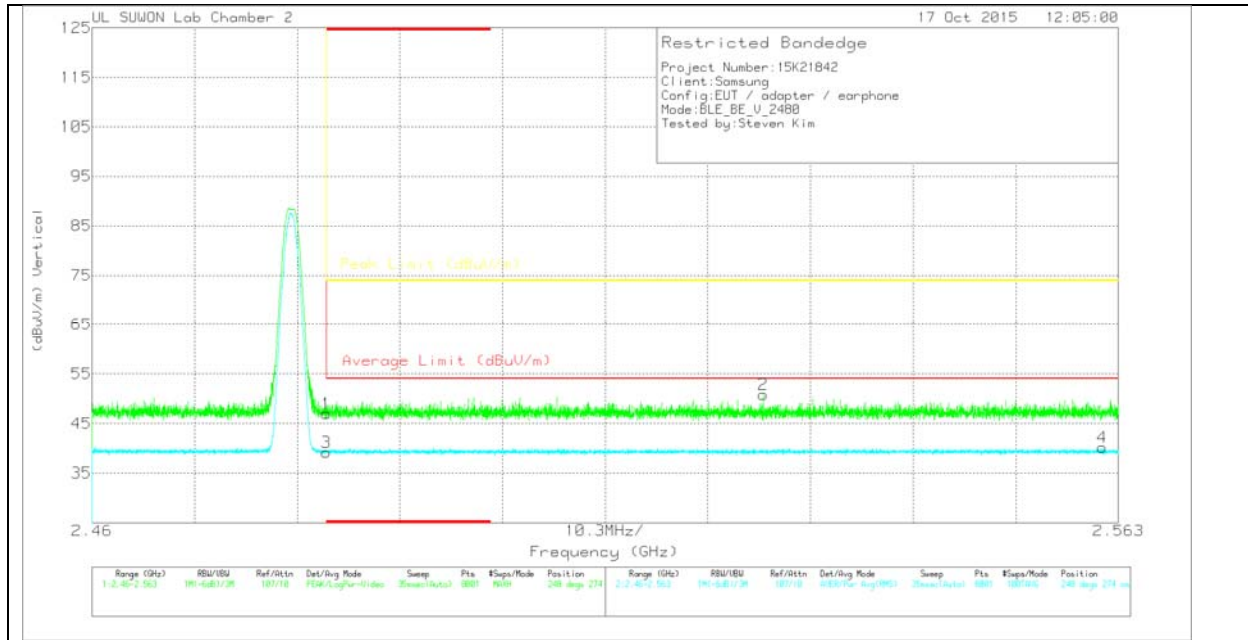
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_2_10dB	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.45	Pk	32	-22.6	0	47.85	-	-	74	-26.15	189	295	H
2	2.557	41.31	Pk	32	-22.6	0	50.71	-	-	74	-23.29	189	295	H
3	* 2.484	27.79	RMS	32	-22.6	2.05	39.24	54	-14.76	-	-	189	295	H
4	* 2.485	28.87	RMS	32	-22.6	2.05	40.32	54	-13.68	-	-	189	295	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_2_10dB	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	37.64	Pk	32	-22.6	0	47.04	-	-	74	-26.96	248	274	V
2	2.527	41.39	Pk	32	-22.6	0	50.79	-	-	74	-23.21	248	274	V
3	* 2.484	27.74	RMS	32	-22.6	2.05	39.19	54	-14.81	-	-	248	274	V
4	2.561	28.68	RMS	32	-22.6	2.05	40.13	54	-13.87	-	-	248	274	V

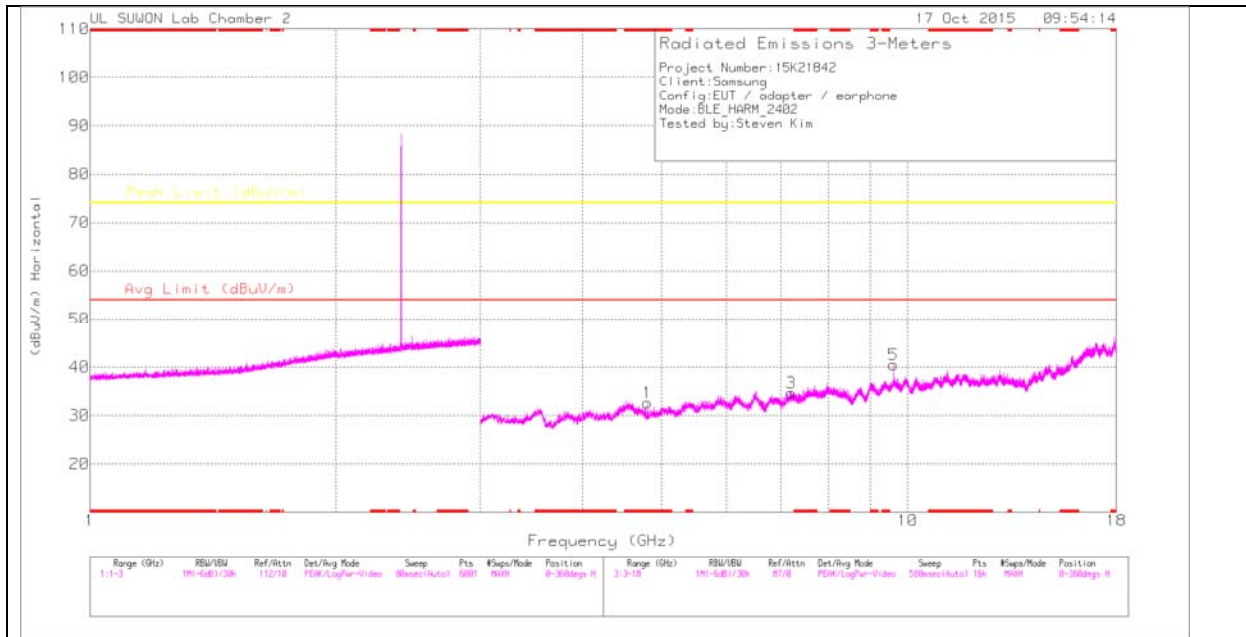
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

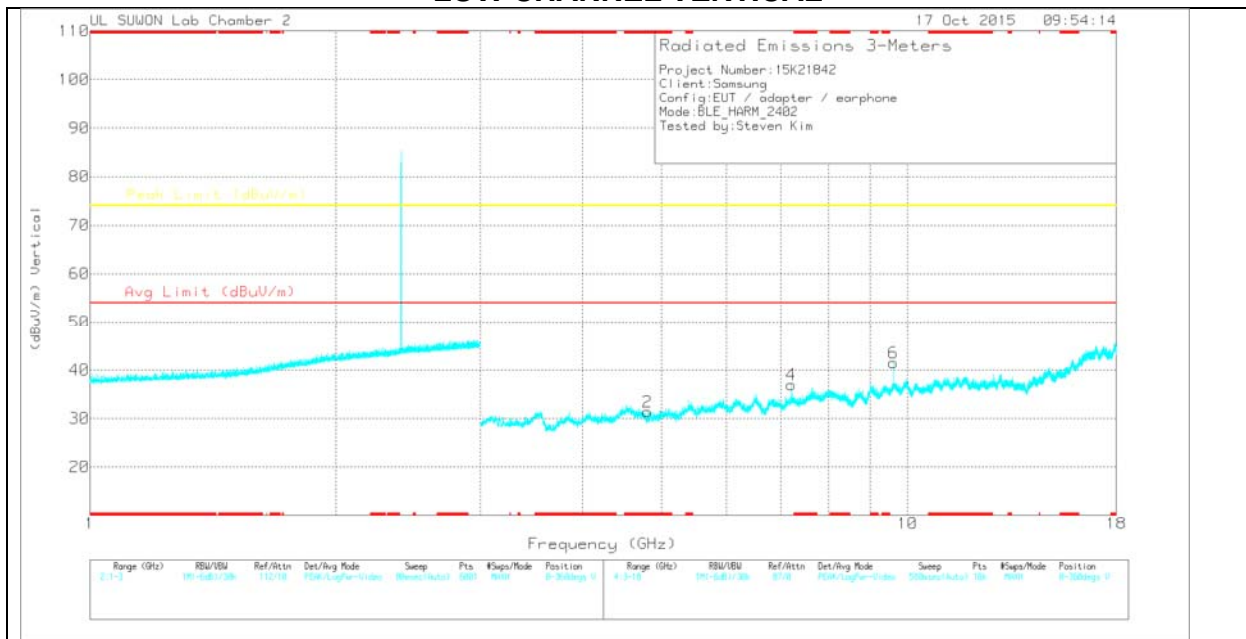
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_3_3GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.804	28.4	PK	34	-29.8	0	32.6	-	-	74	-41.4	0-360	100	H
3	7.205	24.35	PK	35.7	-25.4	0	34.65	-	-	74	-39.35	0-360	200	H
5	9.608	24.52	PK	37	-21	0	40.52	-	-	74	-33.48	0-360	200	H
2	* 4.804	27.23	PK	34	-29.8	0	31.43	-	-	74	-42.57	0-360	200	V
4	7.205	26.71	PK	35.7	-25.4	0	37.01	-	-	74	-36.99	0-360	200	V
6	9.608	25.5	PK	37	-21	0	41.5	-	-	74	-32.5	0-360	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

Radiated Emissions

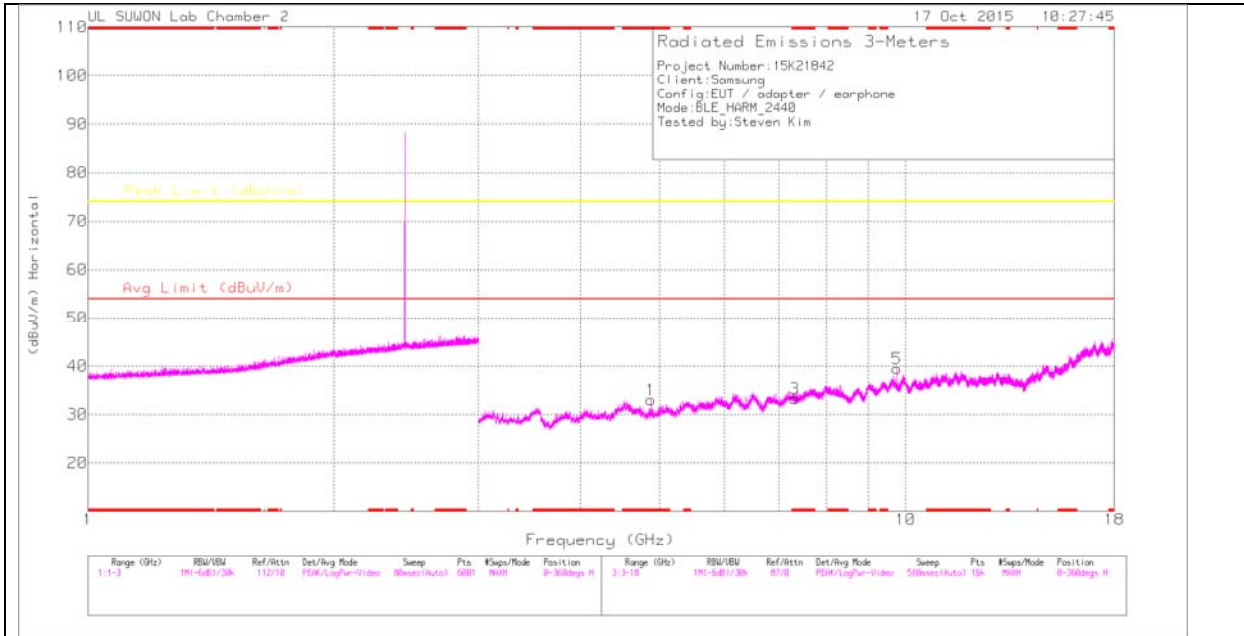
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3 GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	37.46	PK2	34	-29.8	0	41.66	-	-	74	-32.34	315	322	H
* 4.804	25.07	MAv1	34	-29.8	2.05	31.32	54	-22.68	-	-	315	322	H
9.608	32.14	PK2	37	-21	0	48.14	-	-	74	-25.86	4	293	H
7.205	35.75	PK2	35.7	-25.4	0	46.05	-	-	74	-27.95	17	360	V
9.608	33.2	PK2	37	-21	0	49.2	-	-	74	-24.8	308	199	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

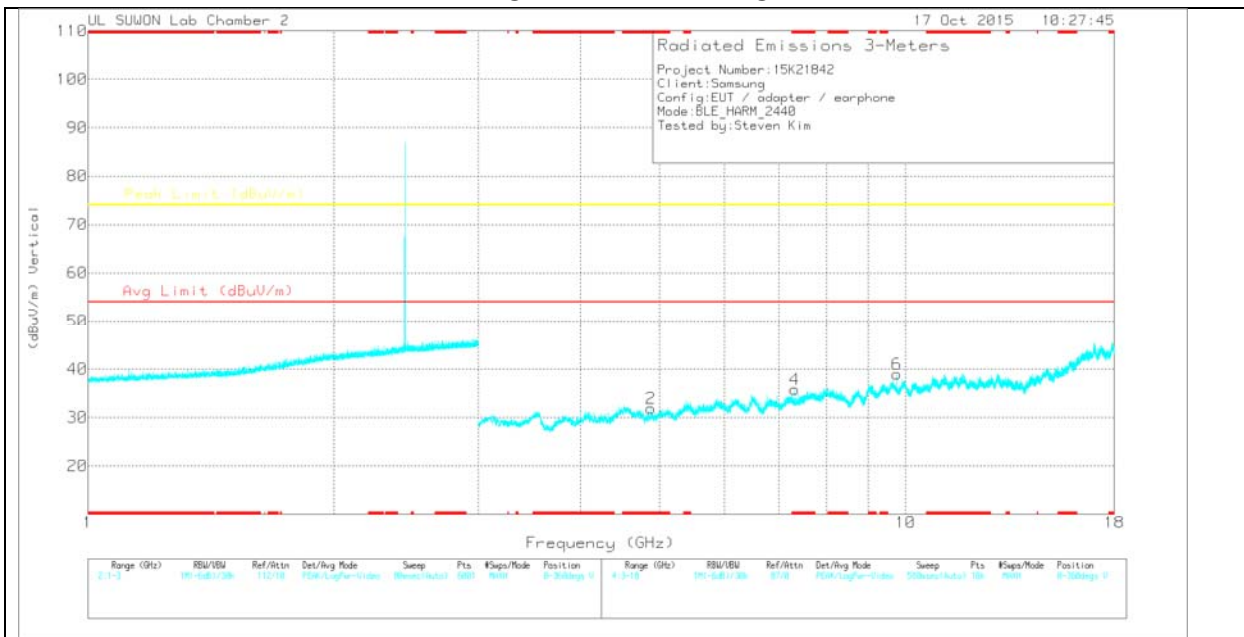
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_3_3GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.88	28.1	PK	34	-29.1	0	33	-	-	74	-41	0-360	100	H
3	* 7.321	23.09	PK	35.8	-25.6	0	33.29	-	-	74	-40.71	0-360	100	H
5	9.76	24.25	PK	37.2	-22	0	39.45	-	-	74	-34.55	0-360	200	H
2	* 4.88	27.01	PK	34	-29.1	0	31.91	-	-	74	-42.09	0-360	200	V
4	* 7.321	25.56	PK	35.8	-25.6	0	35.76	-	-	74	-38.24	0-360	100	V
6	9.76	23.83	PK	37.2	-22	0	39.03	-	-	74	-34.97	0-360	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

Radiated Emissions

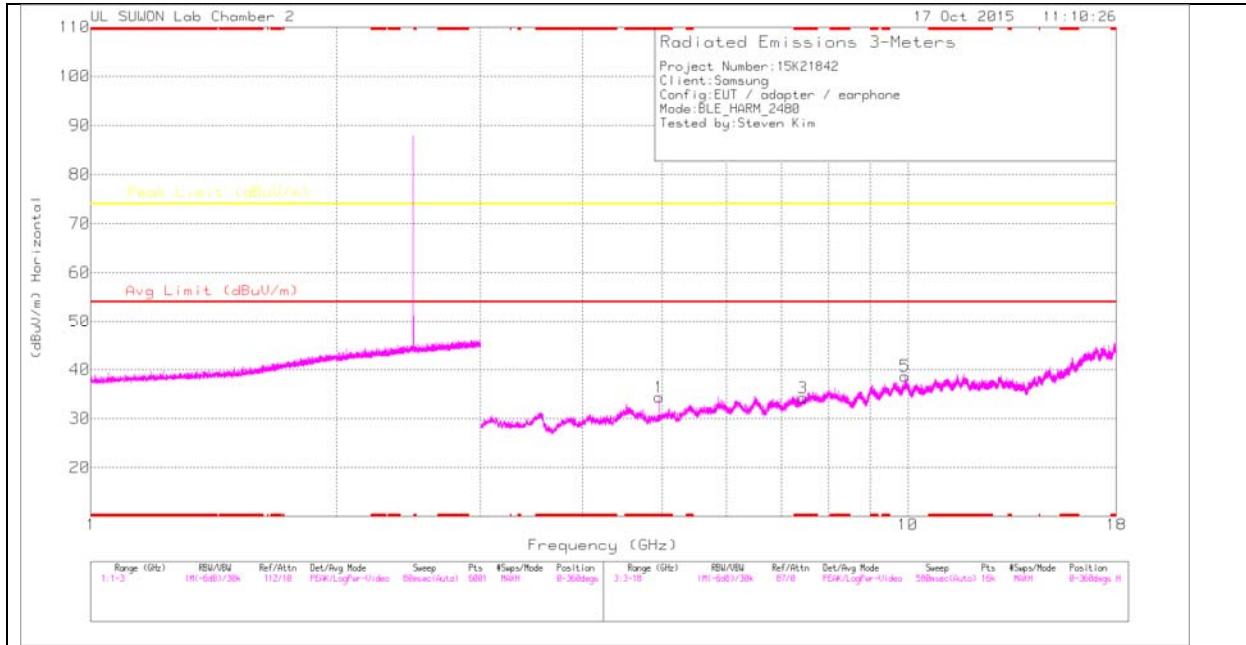
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3 GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88	39.13	PK2	34	-29.1	0	44.03	-	-	74	-29.97	344	260	H
* 4.88	26.57	MAv1	34	-29.1	2.05	33.52	54	-20.48	-	-	344	260	H
9.76	32.35	PK2	37.2	-22	0	47.55	-	-	74	-26.45	356	106	H
* 7.321	36.03	PK2	35.8	-25.6	0	46.23	-	-	74	-27.77	29	256	V
* 7.319	23.28	MAv1	35.8	-25.6	2.05	35.53	54	-18.47	-	-	29	256	V
9.76	32.89	PK2	37.2	-22	0	48.09	-	-	74	-25.91	306	158	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

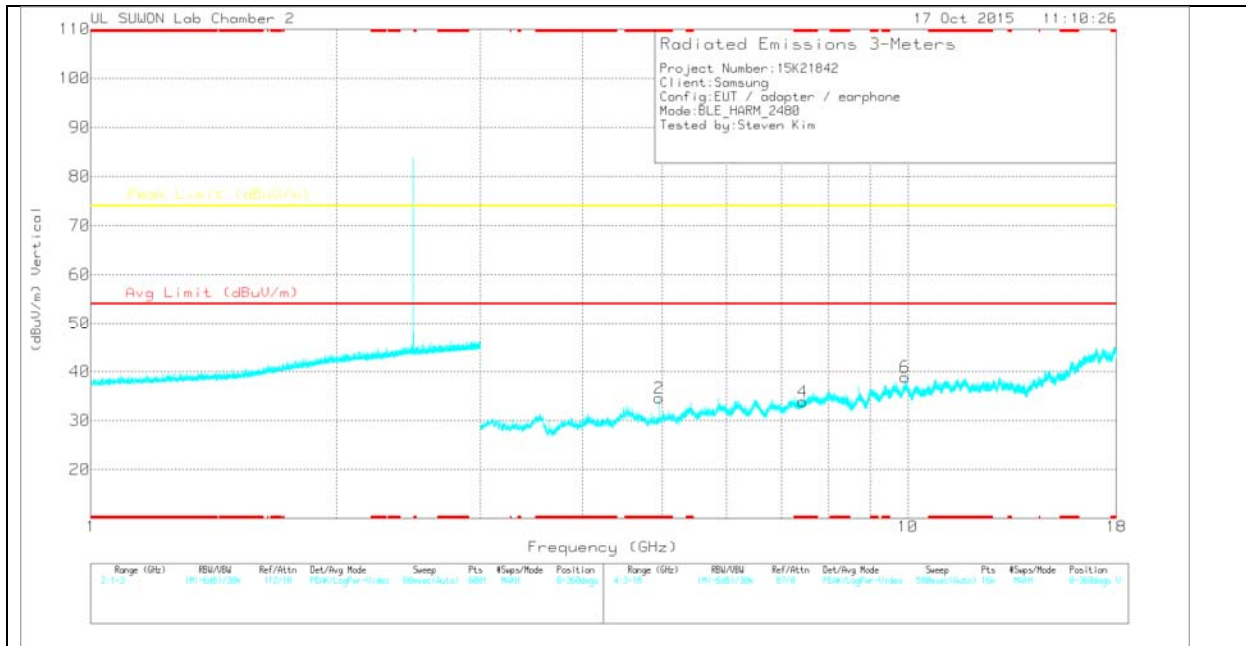
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_3_3GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.959	29.24	PK	34	-28.9	0	34.34	-	-	74	-39.66	0-360	100	H
3	* 7.438	23.23	PK	35.8	-24.8	0	34.23	-	-	74	-39.77	0-360	200	H
5	9.92	21.68	PK	37.4	-20.4	0	38.68	-	-	74	-35.32	0-360	200	H
2	* 4.959	29.54	PK	34	-28.9	0	34.64	-	-	74	-39.36	0-360	100	V
4	* 7.439	22.88	PK	35.8	-24.8	0	33.88	-	-	74	-40.12	0-360	200	V
6	9.92	21.9	PK	37.4	-20.4	0	38.9	-	-	74	-35.1	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3 GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	37.63	PK2	34	-28.9	0	42.73	-	-	74	-31.27	349	311	H
* 4.96	26.62	MAv1	34	-28.9	2.05	33.77	54	-20.23	-	-	349	311	H
9.92	31.65	PK2	37.4	-20.4	0	48.65	-	-	74	-25.35	268	155	H
* 4.96	38.4	PK2	34	-28.9	0	43.5	-	-	74	-30.5	284	299	V
* 4.96	28.09	MAv1	34	-28.9	2.05	35.24	54	-18.76	-	-	284	299	V
9.919	31.01	PK2	37.4	-20.4	0	48.01	-	-	74	-25.99	315	116	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

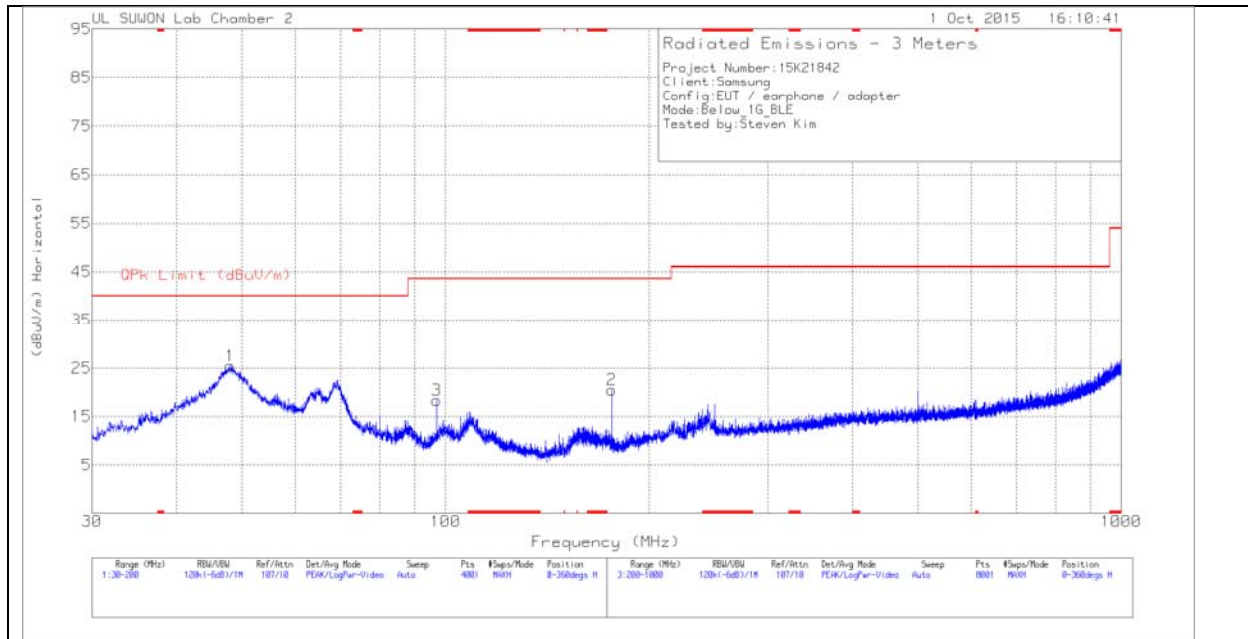
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

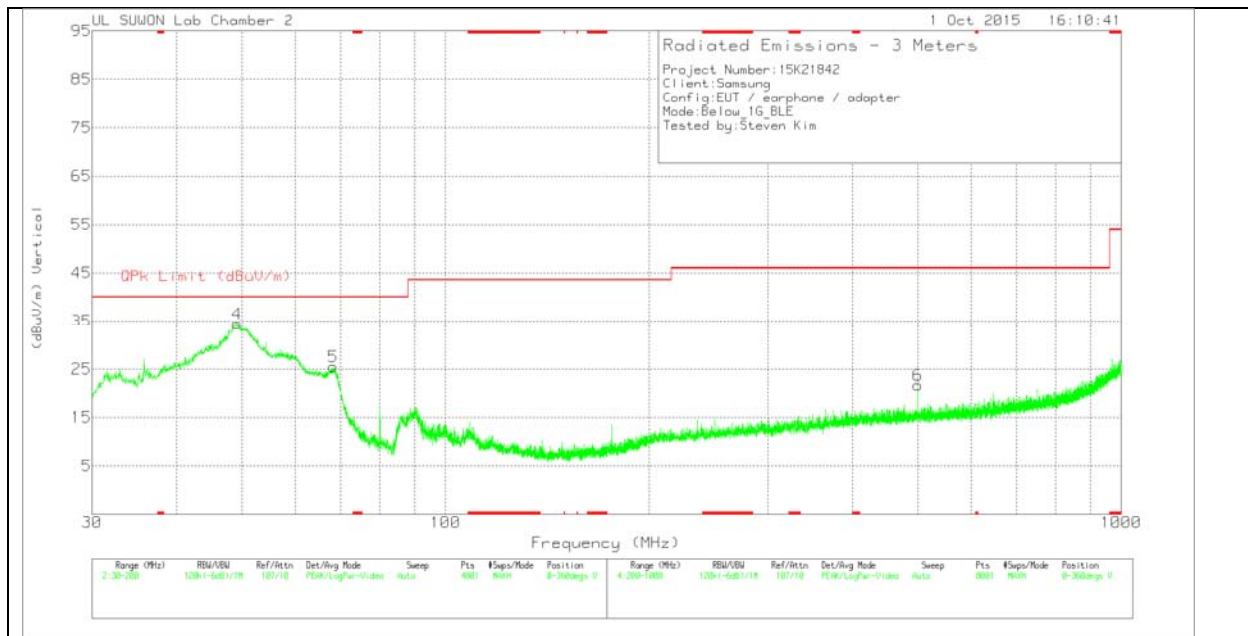
11.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



BELOW 1 GHZ TABLE

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163-749	Below_1G	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	48.105	42.3	Pk	14	-30.8	25.5	40	-14.5	0-360	300	H
2	176.285	41.6	Pk	9.3	-30.4	20.5	43.52	-23.02	0-360	100	H
3	97.065	37.95	Pk	11	-30.6	18.35	43.52	-25.17	0-360	200	H
4	49.21	51.12	Pk	14.1	-30.7	34.52	40	-5.48	0-360	100	V
5	68.165	45.88	Pk	10.2	-30.6	25.48	40	-14.52	0-360	201	V
6	500.4	35.44	Pk	15.8	-29.5	21.74	46.02	-24.28	0-360	100	V

Pk - Peak detector

12. 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.

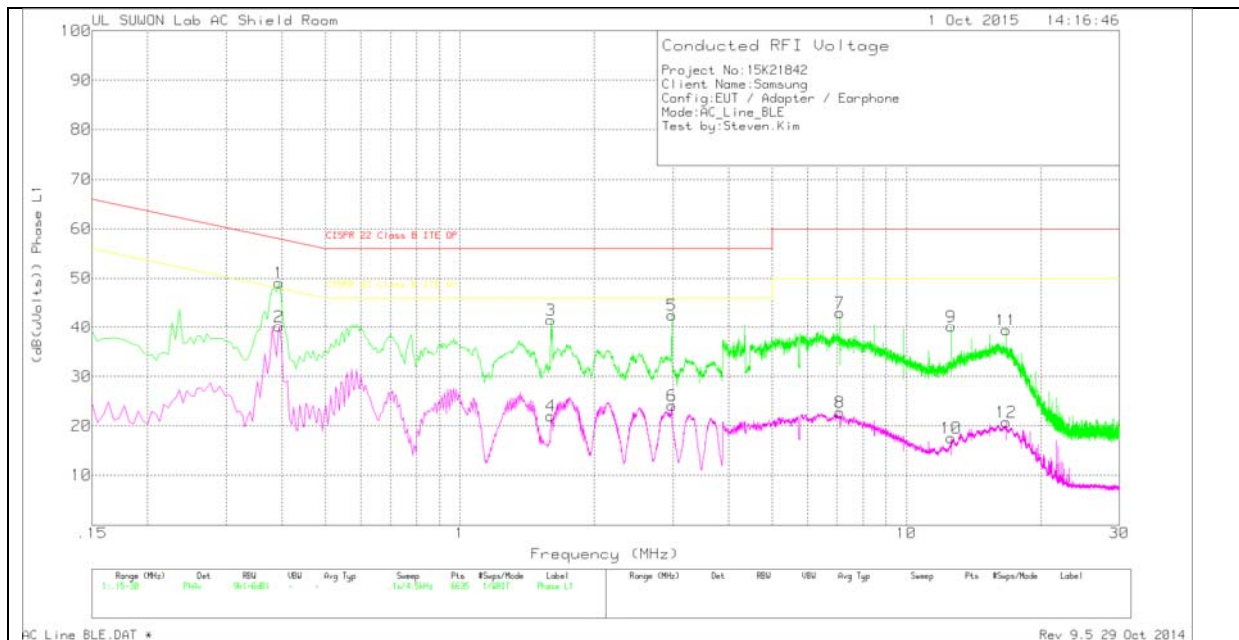
TEST PROCEDURE

ANSI C63.10 - 2009

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_w ith ex- cord_L1	CE Shield Room	Corrected Reading (dB(uVolts))	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
1	.393	39.01	Pk	10.1	0	49.11	58	-8.89	-	-
2	.393	30.1	Av	10.1	0	40.2	-	-	48	-7.8
3	1.599	31.64	Pk	9.8	.1	41.54	56	-14.46	-	-
4	1.599	12.14	Av	9.8	.1	22.04	-	-	46	-23.96
5	2.985	32.59	Pk	9.8	.1	42.49	56	-13.51	-	-
6	2.9805	14.18	Av	9.8	.1	24.08	-	-	46	-21.92
7	7.098	33.07	Pk	9.9	.1	43.07	60	-16.93	-	-
8	7.098	12.73	Av	9.9	.1	22.73	-	-	50	-27.27
9	12.606	29.92	Pk	10.1	.2	40.22	60	-19.78	-	-
10	12.60375	7.26	Av	10.1	.2	17.56	-	-	50	-32.44
11	16.7325	29.08	Pk	10.2	.2	39.48	60	-20.52	-	-
12	16.728	10.33	Av	10.2	.2	20.73	-	-	50	-29.27

Pk - Peak detector

Av - Average detection

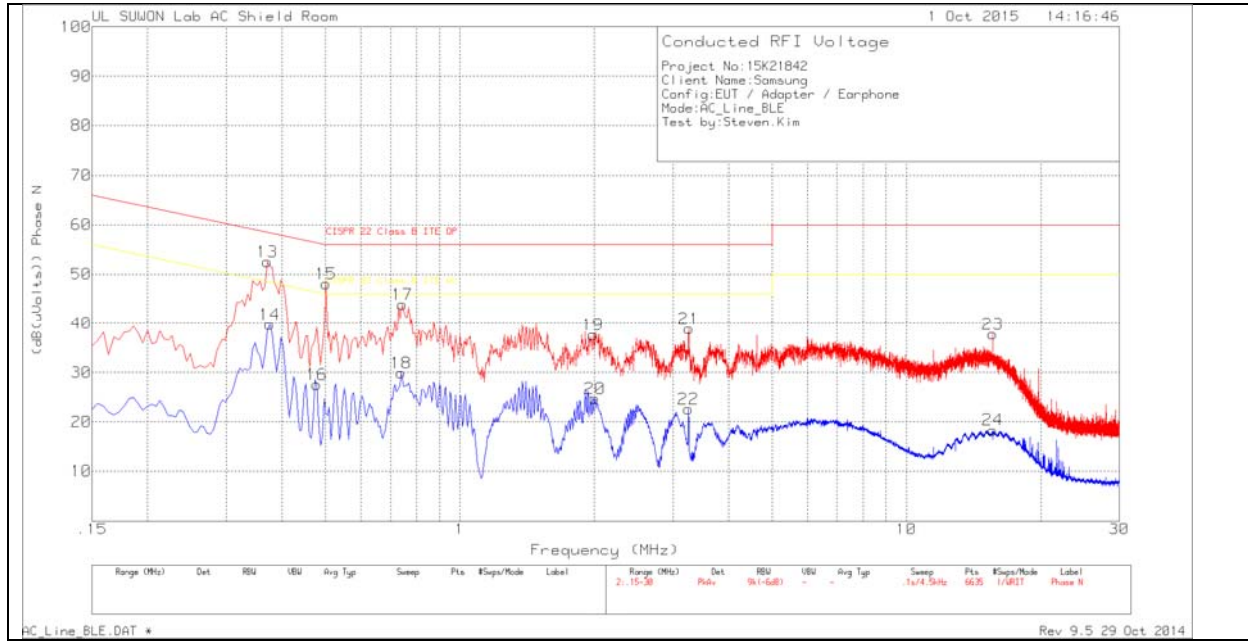
Quasi-Peak Emissions

Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101837_wit h ex-cord_L1	CE Shield Room	Corrected Reading (dB(uVolts))	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
.3912	37.75	Qp	10.1	0	47.85	58.04	-10.19	-	-

Qp - Quasi-Peak detector

LINE 2 PLOT



LINE 2 RESULTS

Trace Markers

Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_w ith ex-cord_N	CE Shield Room	Corrected Reading (dB(uVolts))	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
13	.3705	42.52	Pk	10	0	52.52	58.49	-5.97	-	-
14	.375	29.75	Av	10.1	0	39.85	-	-	48.39	-8.54
15	.501	38	Pk	10.1	0	48.1	56	-7.9	-	-
16	.4785	17.49	Av	10.1	0	27.59	-	-	46.37	-18.78
17	.744	33.85	Pk	10	0	43.85	56	-12.15	-	-
18	.7395	19.92	Av	10	0	29.92	-	-	46	-16.08
19	1.9905	27.83	Pk	9.8	.1	37.73	56	-18.27	-	-
20	2.0085	14.82	Av	9.8	.1	24.72	-	-	46	-21.28
21	3.2595	29.03	Pk	9.8	.1	38.93	56	-17.07	-	-
22	3.2505	12.69	Av	9.8	.1	22.59	-	-	46	-23.41
23	15.63	27.32	Pk	10.3	.2	37.82	60	-22.18	-	-
24	15.63	7.84	Av	10.3	.2	18.34	-	-	50	-31.66

Pk - Peak detector

Av - Average detection

Quasi-Peak Emissions

Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101837_w ith ex-cord_N	CE Shield Room	Corrected Reading (dB(uVolts))	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
.375	33.08	Qp	10.1	0	43.18	58.39	-15.21	-	-
.5055	18.75	Qp	10.1	0	28.85	56	-27.15	-	-

Qp - Quasi-Peak detector