



FCC CFR47 PART 15 SUBPART C

Bluetooth Low Energy

CERTIFICATION TEST REPORT

FOR

CDMA Watch + Bluetooth/BLE and DTS b/g/n

MODEL NUMBER : SM-R735V

FCC ID: A3LSMR735C

REPORT NUMBER: 16K22865-E2V3

ISSUE DATE: FEB 29, 2016

Prepared for
SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Prepared by
UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433



Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	02/22/16	Initial issue	Junwhan Lee
V2	02/26/16	Revised radiated test result of below 1GHz	Junwhan Lee
V3	02/29/16	Revised test setup photo (portable)	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. <i>MEASURING INSTRUMENT CALIBRATION</i>	6
4.2. <i>SAMPLE CALCULATION</i>	6
4.3. <i>MEASUREMENT UNCERTAINTY</i>	7
5. EQUIPMENT UNDER TEST	8
5.1. <i>DESCRIPTION OF EUT</i>	8
5.2. <i>MAXIMUM OUTPUT POWER</i>	8
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	8
5.4. <i>WORST-CASE CONFIGURATION AND MODE</i>	8
5.5. <i>DESCRIPTION OF TEST SETUP</i>	9
6. TEST AND MEASUREMENT EQUIPMENT	11
7. MEASUREMENT METHODS	12
8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS	12
8.1. <i>ON TIME AND DUTY CYCLE RESULTS</i>	12
9. SUMMARY TABLE	13
10. ANTENNA PORT TEST RESULTS	14
10.1. <i>6 dB BANDWIDTH</i>	14
10.2. <i>99% BANDWIDTH</i>	16
10.3. <i>OUTPUT POWER</i>	18
10.4. <i>AVERAGE POWER</i>	20
10.5. <i>PSD</i>	21
10.6. <i>CONDUCTED SPURIOUS EMISSIONS</i>	23
11. RADIATED TEST RESULTS	27
11.1. <i>LIMITS AND PROCEDURE</i>	27
11.2. <i>TRANSMITTER ABOVE 1 GHz</i>	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: CDMA Watch + Bluetooth/BLE and DTS b/g/n
MODEL NUMBER: SM-R735C
SERIAL NUMBER: A0000047485158, A0000047485152 (RADIATED);
A000004748515A (CONDUCTED)
DATE TESTED: FEB 15, 2016 - FEB 26, 2016

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 checked="" type="checkbox"/> Chamber 1
<input 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 CDMA Watch + Bluetooth/BLE and DTS b/g/n.
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	3.48	2.23
		Average	3.04	2.01

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -6.8dBi

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 X orientation.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Adapter	SAMSUNG	EP-TA20JWE	R37GB7Q0FK2SE3	N/A
Data Cable	SAMSUNG	EP-DG925UWZ	N/A	N/A
Wireless Charger	SAMSUNG	EP-OR720	RF7G91V4JKJTYS	A3LEPOR720

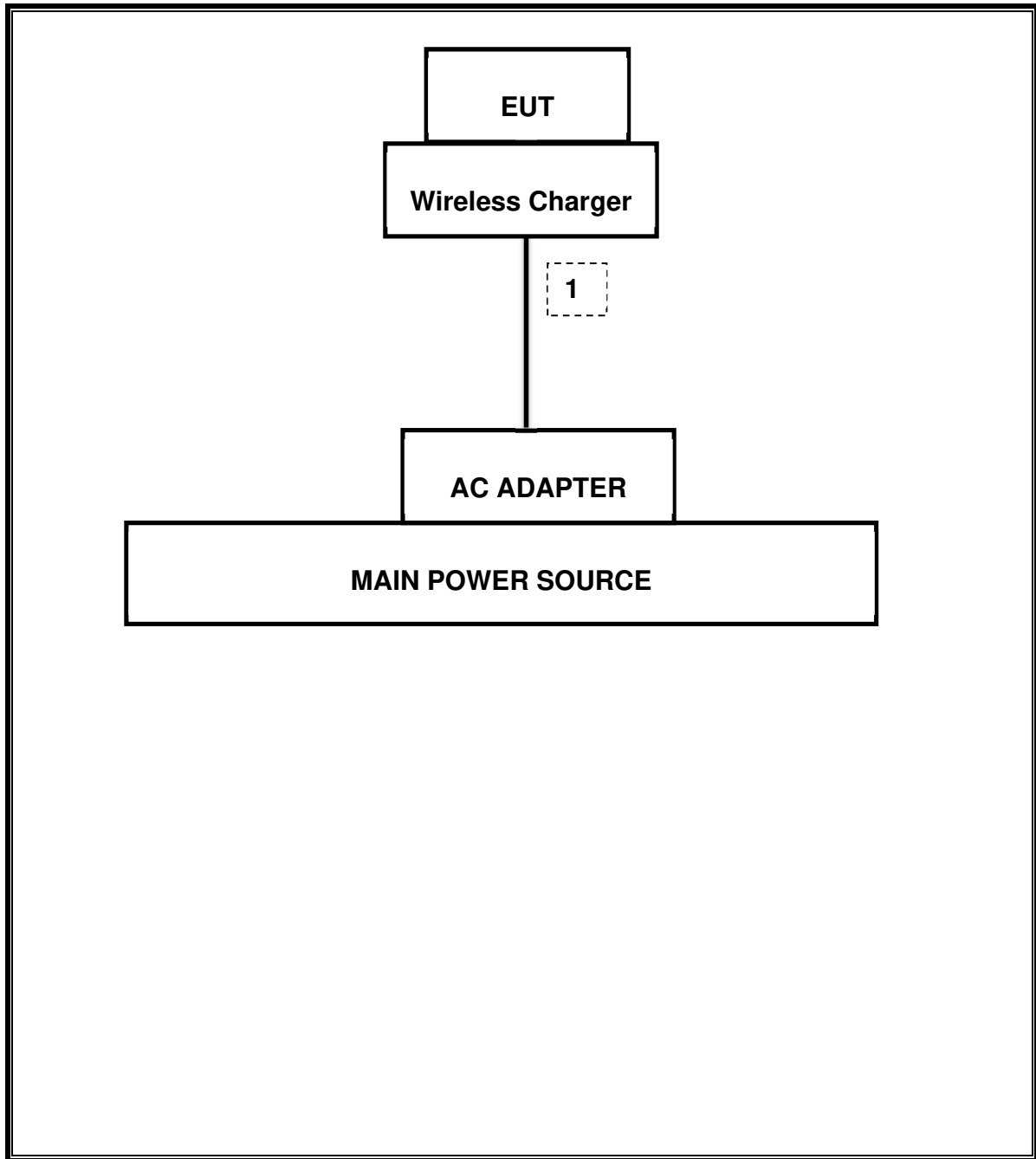
I/O CABLES

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

TEST SETUP

The EUT is a stand-alone unit during the tests.
 Test software in hidden menu exercised the EUT to enable BLE mode.

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	11-17-16
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-25-17
Antenna, Horn, 18 GHz	ETS	3115	00167211	09-20-16
Antenna, Horn, 18 GHz	ETS	3115	00161451	05-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168724	06-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168717	06-17-17
Antenna, Horn, 40 GHz	ETS	3116C	00166155	09-23-16
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	08-24-17
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 v03r04: 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.

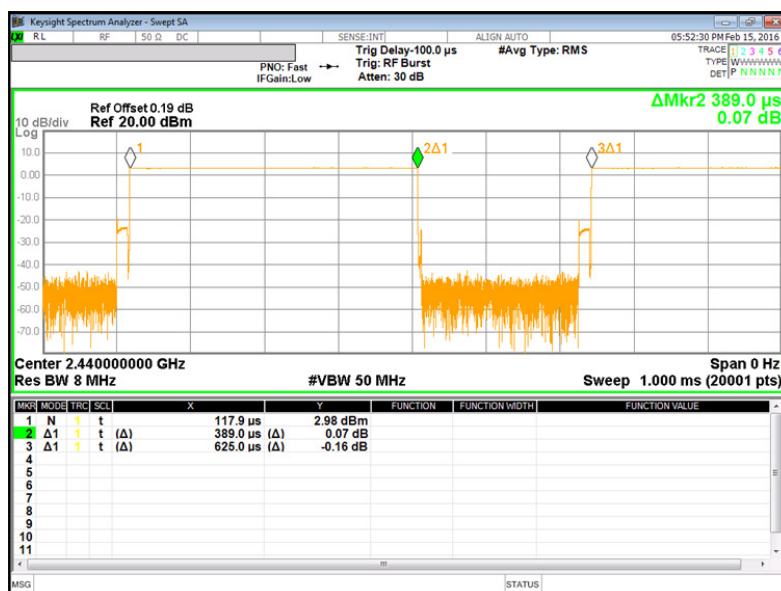
8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

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	0.389	0.625	0.623	62.3%	2.06	2.569



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	698.9 kHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-54.984 dBm
15.247	TX conducted output power	<30dBm		Pass	3.483 dBm (Peak)
15.247	PSD	<8dBm		Pass	-10.39 dBm (Peak)
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	39.84 dBuV (QP)
15.205, 15.209	Radiated Spurious Emission	Section 11	Radiated	Pass	34.66 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	711.5	500.0
Mid	2440	698.9	500.0
High	2480	701.4	500.0
Worst		698.9	500.0

6 dB BANDWIDTH PLOTS

<p>Low CH</p>	<p>Keyight Spectrum Analyzer - Sweep SA Ref Offset 0.26 dB Ref 20.00 dBm Mkr1 2.401 976 975 GHz 2.689 dBm -6.00 dB 741.488 kHz Center 2.4020000 GHz #Res BW 100 kHz #VBW 300 kHz Span 1.500 MHz Sweep 1.333 ms (20001 pts)</p>
<p>Middle CH</p>	<p>Keyight Spectrum Analyzer - Sweep SA Ref Offset 0.26 dB Ref 20.00 dBm Mkr1 2.439 985 150 GHz 2.989 dBm -6.00 dB 698.876 kHz Center 2.4400000 GHz #Res BW 100 kHz #VBW 300 kHz Span 1.500 MHz Sweep 1.333 ms (20001 pts)</p>
<p>High CH</p>	<p>Keyight Spectrum Analyzer - Sweep SA Ref Offset 0.26 dB Ref 20.00 dBm Mkr1 2.479 986 950 GHz 2.289 dBm -6.00 dB 701.440 kHz Center 2.4800000 GHz #Res BW 100 kHz #VBW 300 kHz Span 1.500 MHz Sweep 1.333 ms (20001 pts)</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	1.066
Mid	2440	1.067
High	2480	1.060
Worst		1.067

99% BANDWIDTH PLOTS

<p>Low CH</p>	<p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.40200000 GHz Trig: Free Run #Atten: 30 dB</p> <p>Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.402 GHz #Res BW 30 kHz #VBW 91 kHz Span 3 MHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>1.58 dBm</td> </tr> <tr> <td>1.0662 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-14.172 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td></td> <td></td> </tr> <tr> <td>1.229 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	1.58 dBm	1.0662 MHz			Transmit Freq Error	OBW Power	99.00 %	-14.172 kHz	x dB	-26.00 dB	x dB Bandwidth			1.229 MHz		
Occupied Bandwidth	Total Power	1.58 dBm																	
1.0662 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-14.172 kHz	x dB	-26.00 dB																	
x dB Bandwidth																			
1.229 MHz																			
<p>Middle CH</p>	<p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.44000000 GHz Trig: Free Run #Atten: 30 dB</p> <p>Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.44 GHz #Res BW 30 kHz #VBW 91 kHz Span 3 MHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>1.65 dBm</td> </tr> <tr> <td>1.0672 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-10.019 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td></td> <td></td> </tr> <tr> <td>1.229 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	1.65 dBm	1.0672 MHz			Transmit Freq Error	OBW Power	99.00 %	-10.019 kHz	x dB	-26.00 dB	x dB Bandwidth			1.229 MHz		
Occupied Bandwidth	Total Power	1.65 dBm																	
1.0672 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-10.019 kHz	x dB	-26.00 dB																	
x dB Bandwidth																			
1.229 MHz																			
<p>High CH</p>	<p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.48000000 GHz Trig: Free Run #Atten: 30 dB</p> <p>Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.48 GHz #Res BW 30 kHz #VBW 91 kHz Span 3 MHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>1.12 dBm</td> </tr> <tr> <td>1.0599 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-2.672 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td></td> <td></td> </tr> <tr> <td>1.229 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	1.12 dBm	1.0599 MHz			Transmit Freq Error	OBW Power	99.00 %	-2.672 kHz	x dB	-26.00 dB	x dB Bandwidth			1.229 MHz		
Occupied Bandwidth	Total Power	1.12 dBm																	
1.0599 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-2.672 kHz	x dB	-26.00 dB																	
x dB Bandwidth																			
1.229 MHz																			

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 v03r04 under section 9.1.1 utilizing spectrum analyzer.

RESULTS

Channel	Frequency [MHz]	Peak Power Reading [dBm]	Limit [dBm]	Margin [dB]
Low	2402	3.453	30.000	-26.547
Mid	2440	3.483	30.000	-26.517
High	2480	2.931	30.000	-27.069
Worst		3.483		-26.517

OUTPUT POWER PLOTS

<p>Low CH</p>	<p>KeySight Spectrum Analyzer - Sweep SA 06:31:28 PM Feb 15, 2016 #Avg Type: RMS AvgHold: 100/100 PNO: Fast IF Gain: Low Trig: Free Run Atten: 30 dB Ref Offset 0.19 dB Ref 20.00 dBm Mkr1 2.401 767 00 GHz 3.453 dBm 10 dB/div Log Center 2.402000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts)</p>
<p>Middle CH</p>	<p>KeySight Spectrum Analyzer - Sweep SA 06:31:42 PM Feb 15, 2016 #Avg Type: RMS AvgHold: 100/100 PNO: Fast IF Gain: Low Trig: Free Run Atten: 30 dB Ref Offset 0.19 dB Ref 20.00 dBm Mkr1 2.439 748 50 GHz 3.483 dBm 10 dB/div Log Center 2.440000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts)</p>
<p>High CH</p>	<p>KeySight Spectrum Analyzer - Sweep SA 06:29:32 PM Feb 15, 2016 #Avg Type: RMS AvgHold: 100/100 PNO: Fast IF Gain: Low Trig: Free Run Atten: 30 dB Ref Offset 0.19 dB Ref 20.00 dBm Mkr1 2.479 796 00 GHz 2.931 dBm 10 dB/div Log Center 2.480000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts)</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	3.02	2.00
Middle	2440	3.04	2.01
High	2480	2.43	1.75

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.

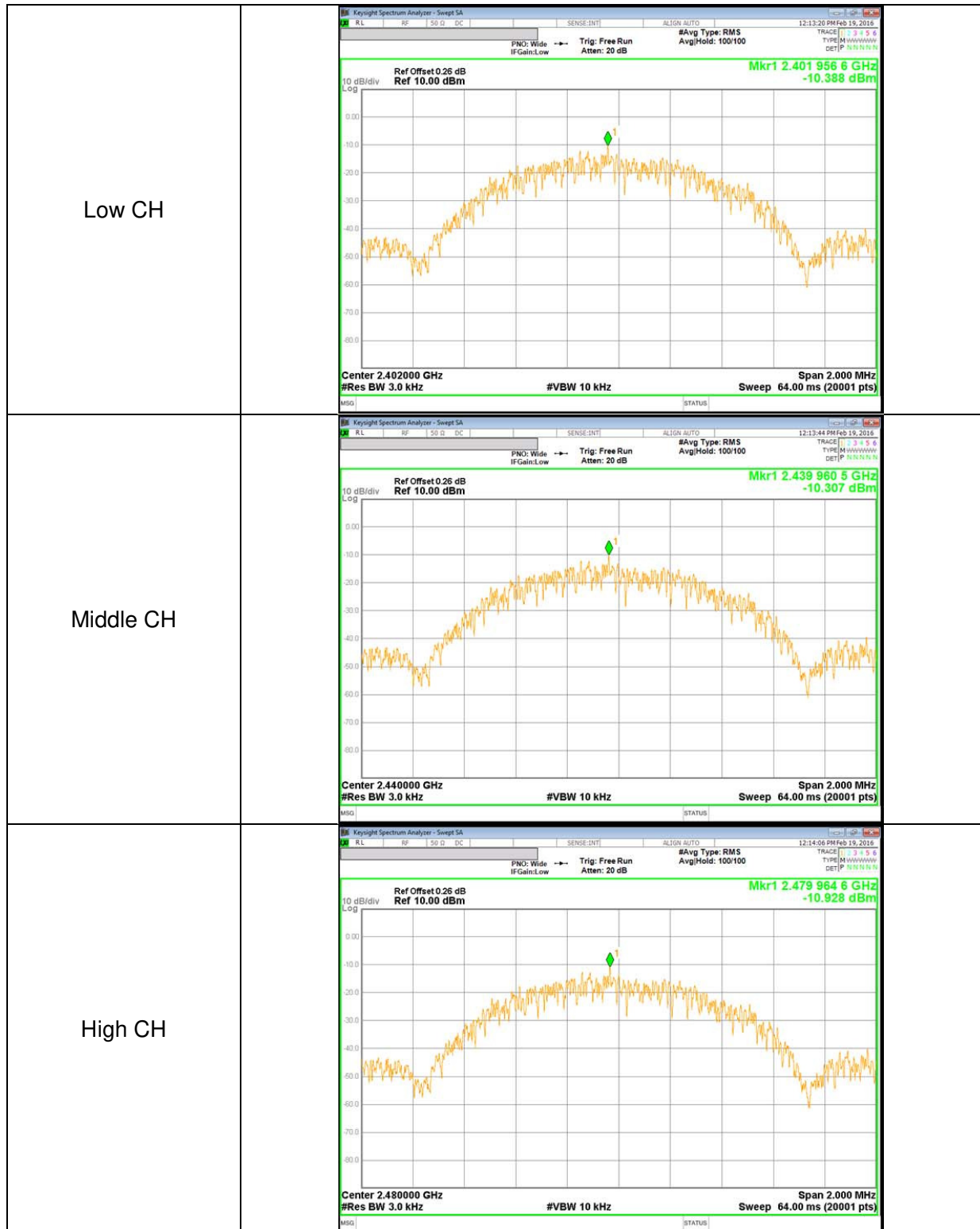
TEST PROCEDURE

Power Spectral Density was performed utilizing the "Method PKPSD (Peak PSD)" under KDB558074 D01 DTS Meas Guidance v03r04

RESULTS

Channel	Frequency [MHz]	PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2402	-10.39	8.00	-18.39
Mid	2440	-11.66	8.00	-19.66
High	2480	-10.93	8.00	-18.93

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.

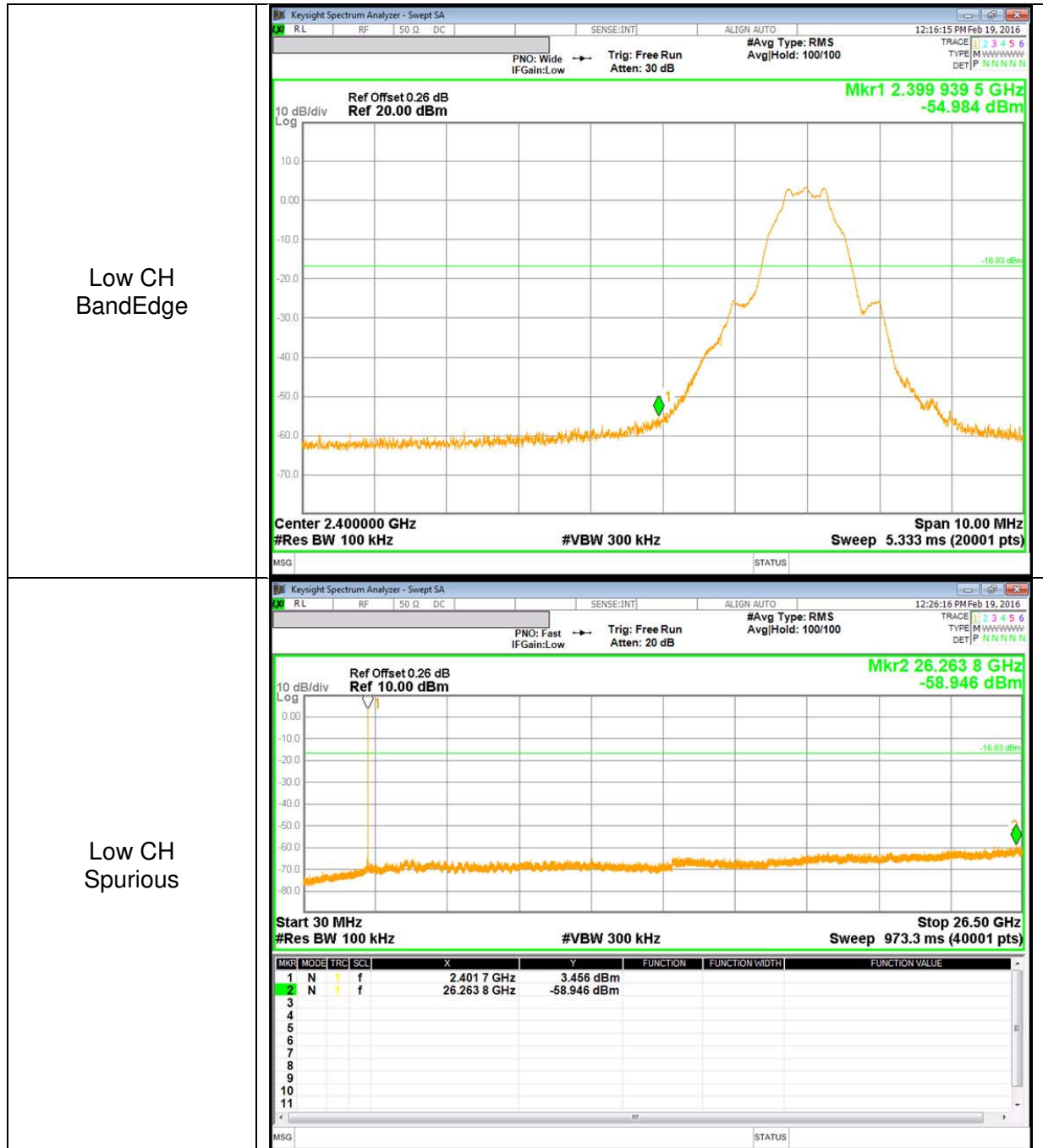
TEST PROCEDURE

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.

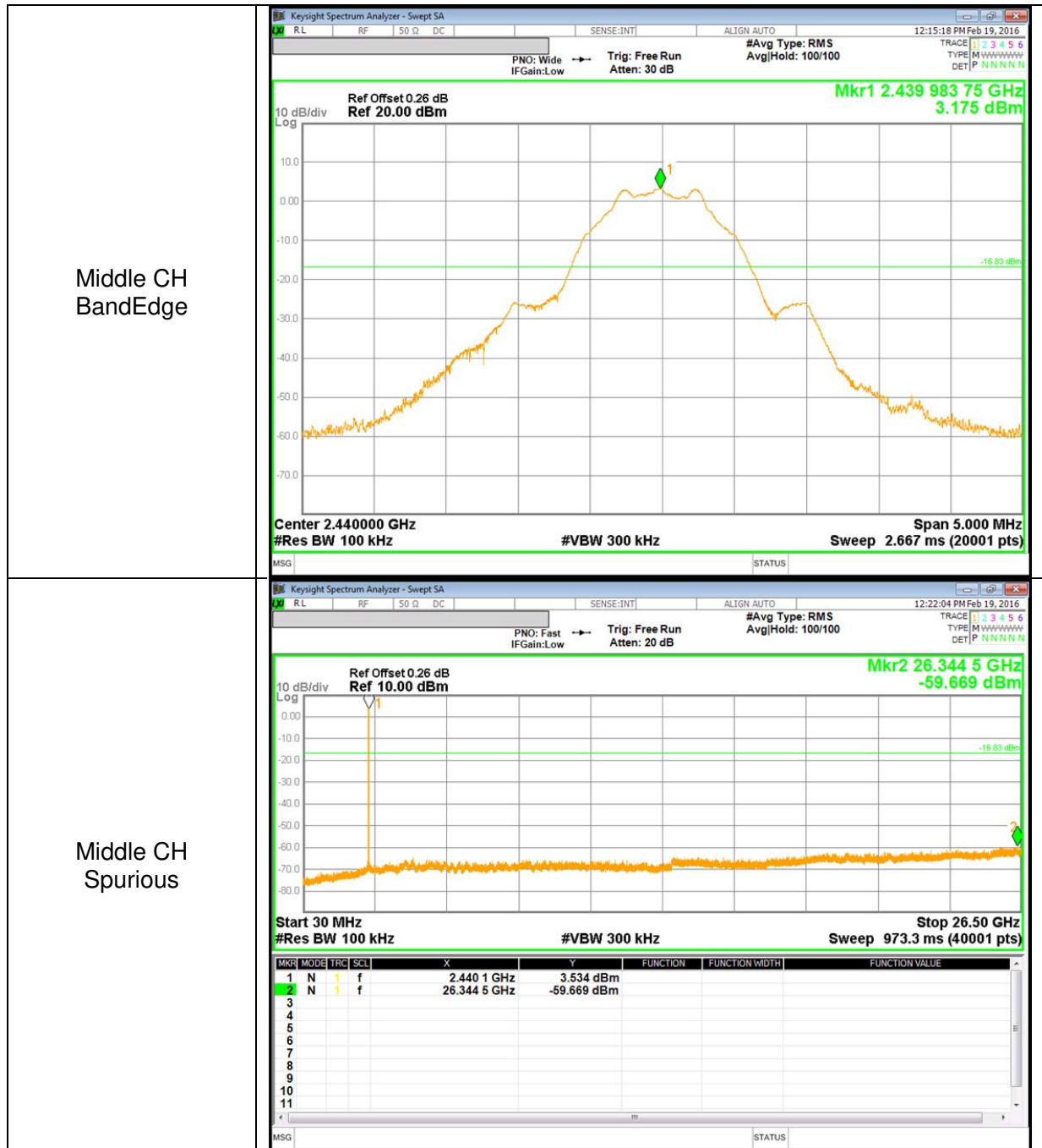
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

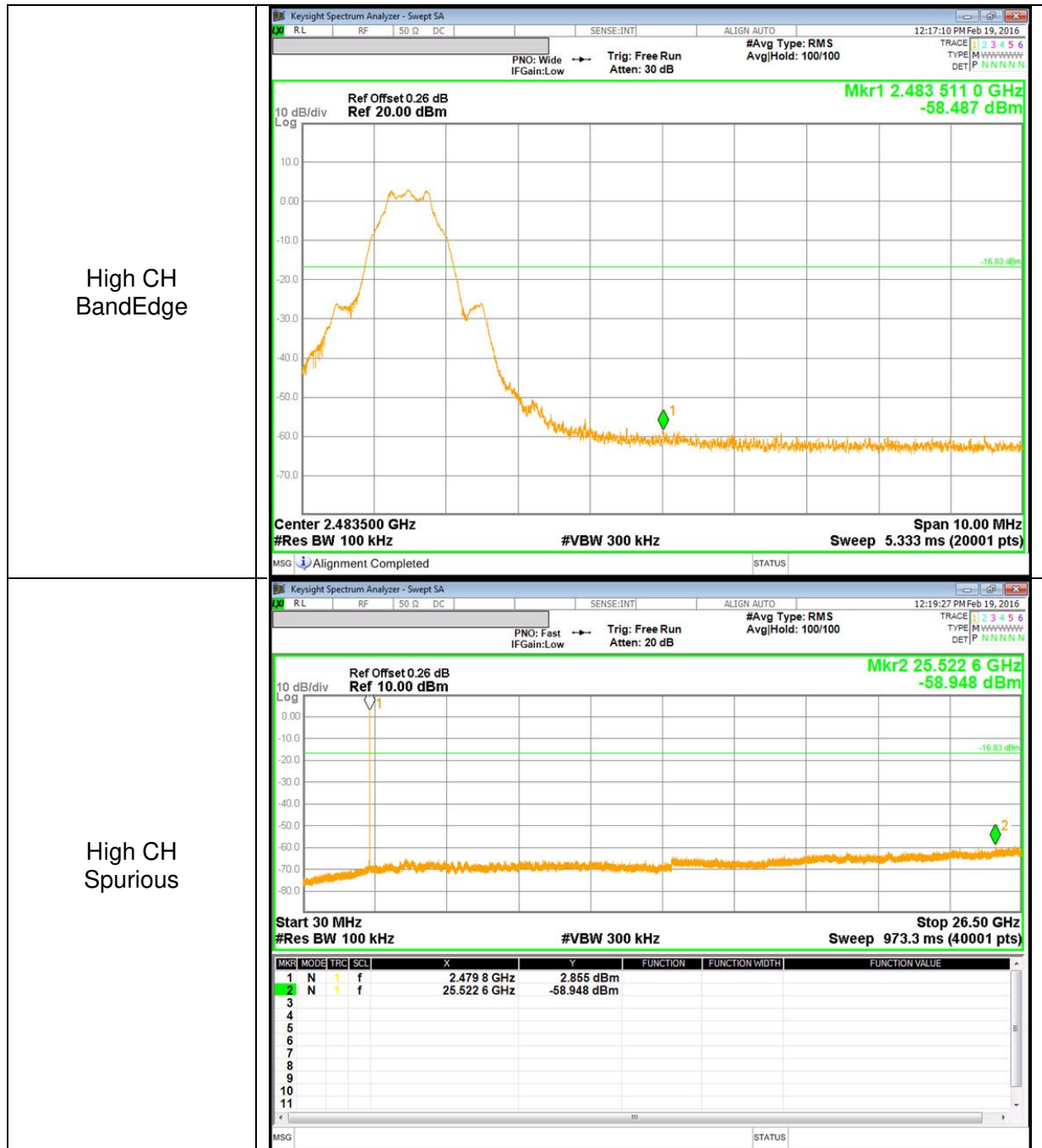
BANDEDGE & SPURIOUS EMISSIONS, LOW CHANNEL



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.

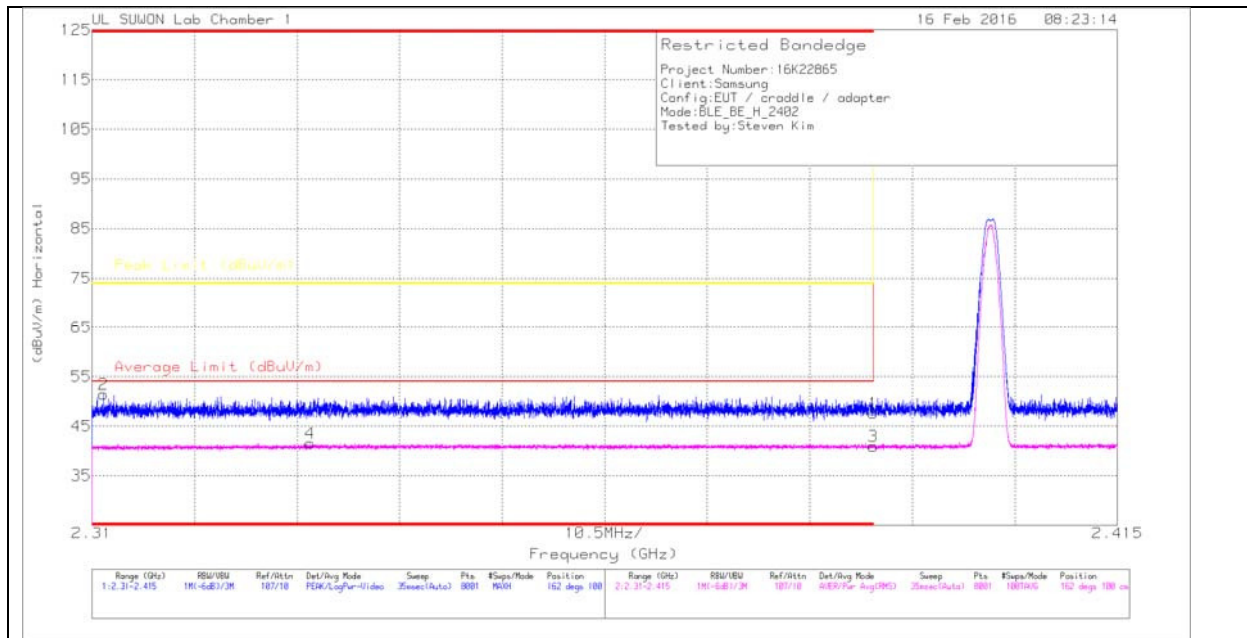
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor = $10 \log(1/x)$. For this sample: DCF = $10 \log(1/0.623) = 2.06 \text{ dB}$ (Spectrum Analyzer 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

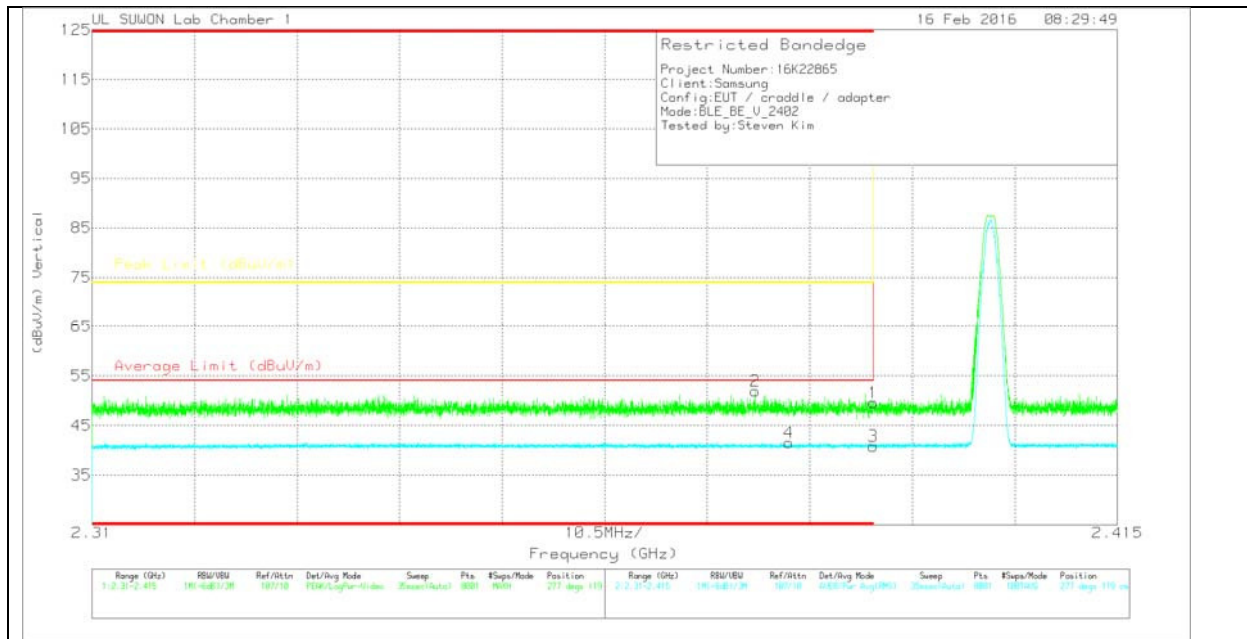
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_2	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	44.75	Pk	31.8	-29	0	47.55	-	-	74	-26.45	162	100	H
2	* 2.311	48.82	PK	31.7	-29.1	0	51.42	-	-	74	-22.58	162	100	H
3	* 2.39	36.06	RMS	31.8	-29	2.06	40.92	54	-13.08	-	-	162	100	H
4	* 2.332	36.81	RMS	31.7	-29	2.06	41.57	54	-12.43	-	-	162	100	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	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	46.73	PK	31.8	-29	0	49.53	-	-	74	-24.47	277	119	V
2	* 2.378	49.18	PK	31.8	-29	0	51.98	-	-	74	-22.02	277	119	V
3	* 2.39	36	RMS	31.8	-29	2.06	40.86	54	-13.14	-	-	277	119	V
4	* 2.381	36.73	RMS	31.8	-29	2.06	41.59	54	-12.41	-	-	277	119	V

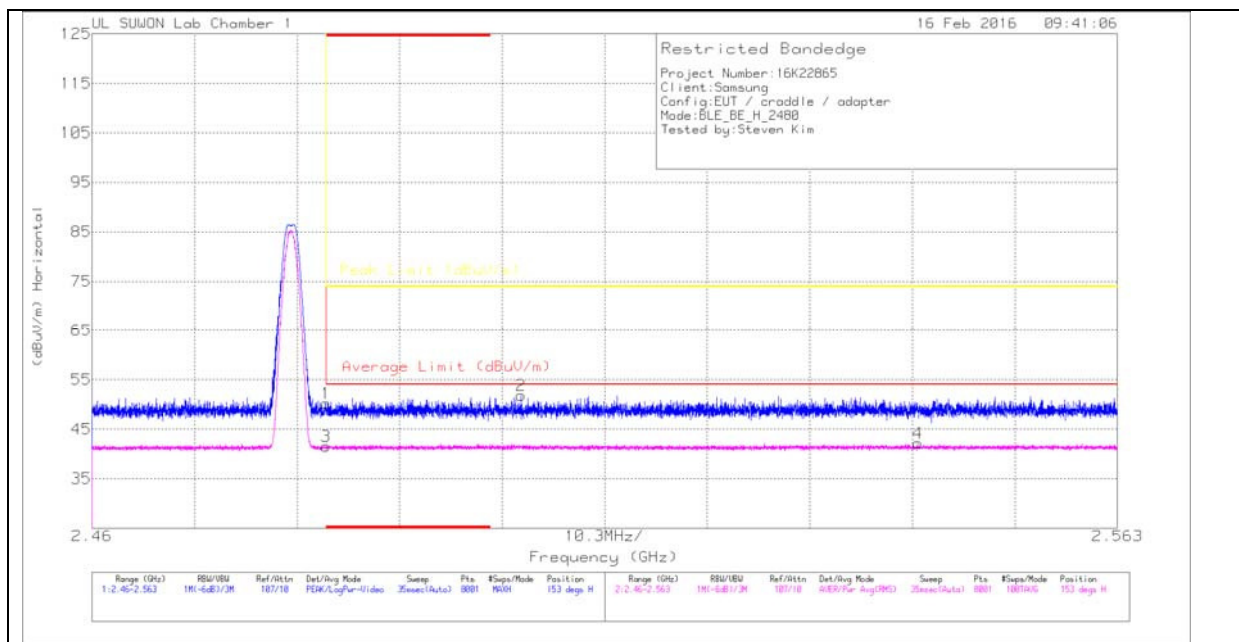
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

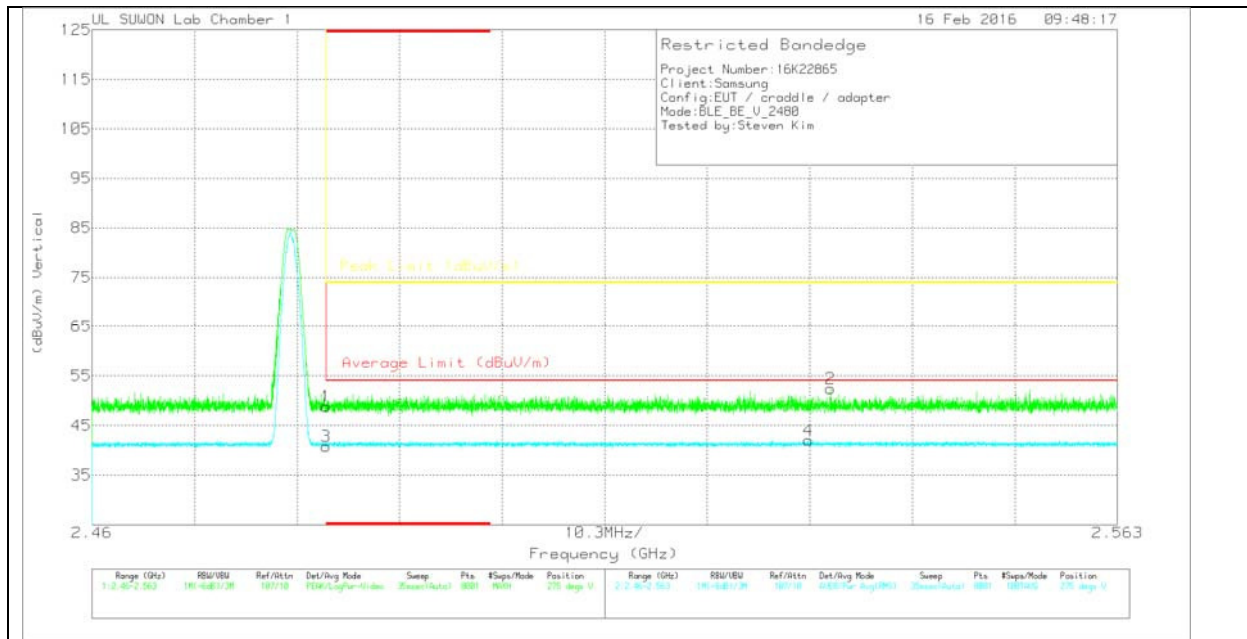
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_2	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	46.45	Pk	32	-28.3	0	50.15	-	-	74	-23.85	153	284	H
2	2.503	48.07	Pk	32	-28.3	0	51.77	-	-	74	-22.23	153	284	H
3	* 2.484	35.81	RMS	32	-28.3	2.06	41.57	54	-12.43	-	-	153	284	H
4	2.543	36.27	RMS	32	-28.2	2.06	42.13	54	-11.87	-	-	153	284	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	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	45.11	PK	32	-28.3	0	48.81	-	-	74	-25.19	275	102	V
2	2.534	48.71	PK	32	-28.3	0	52.41	-	-	74	-21.59	275	102	V
3	* 2.484	35.02	RMS	32	-28.3	2.06	40.78	54	-13.22	-	-	275	102	V
4	2.532	36.32	RMS	32	-28.3	2.06	42.08	54	-11.92	-	-	275	102	V

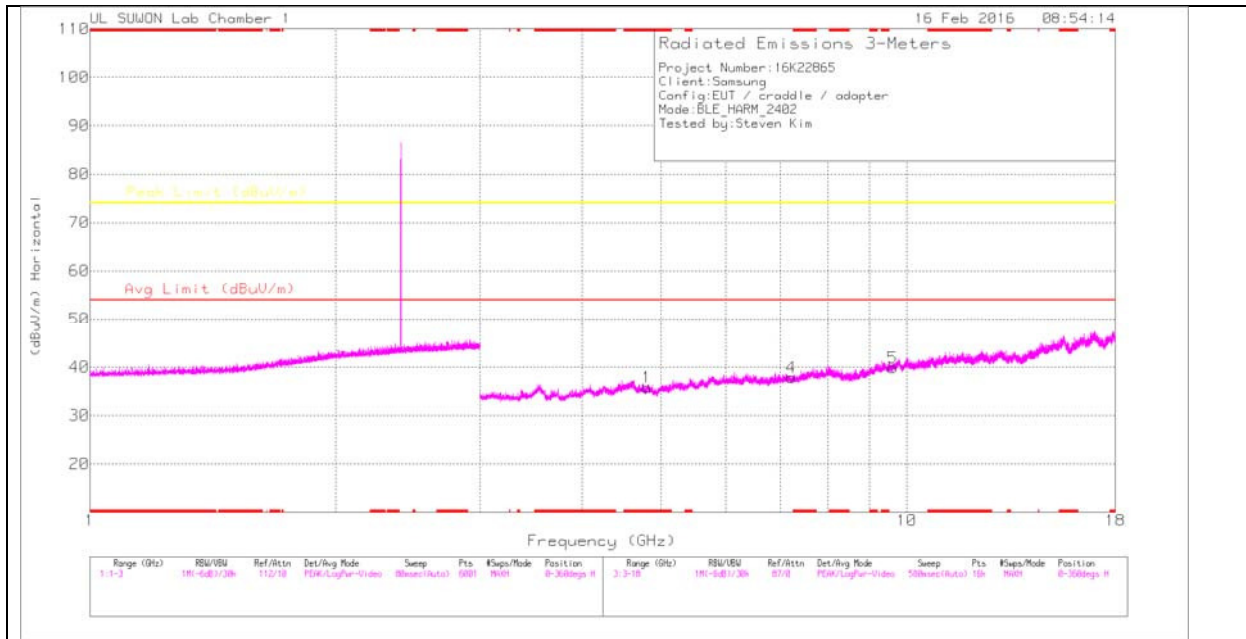
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

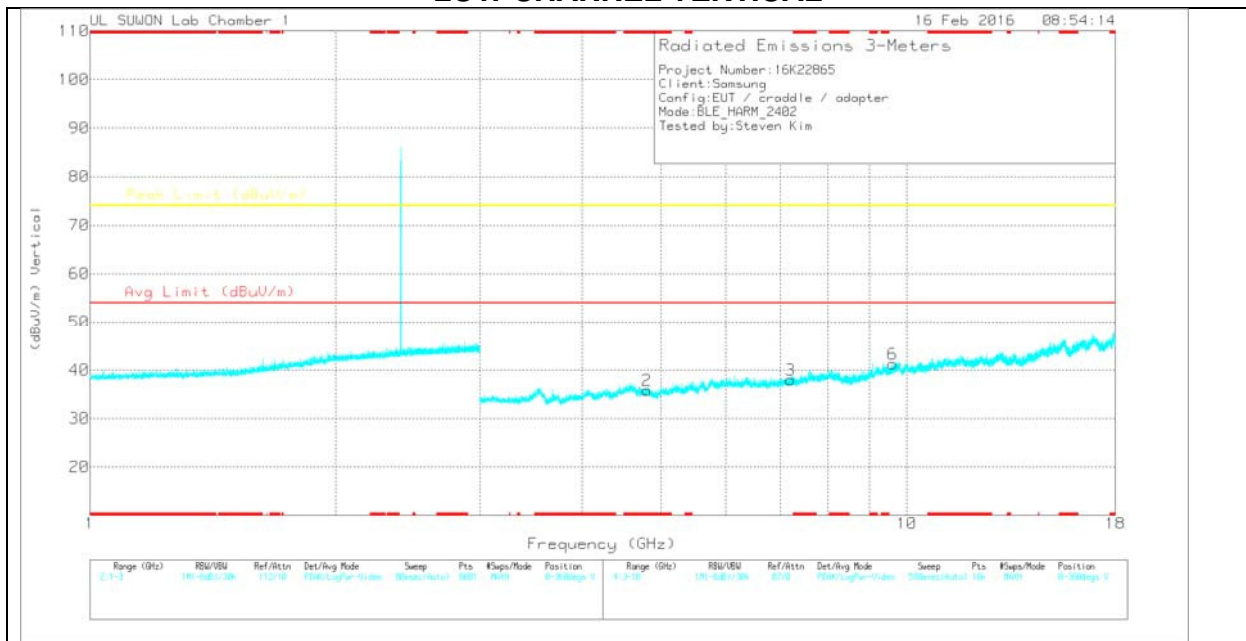
RMS - RMS detection

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

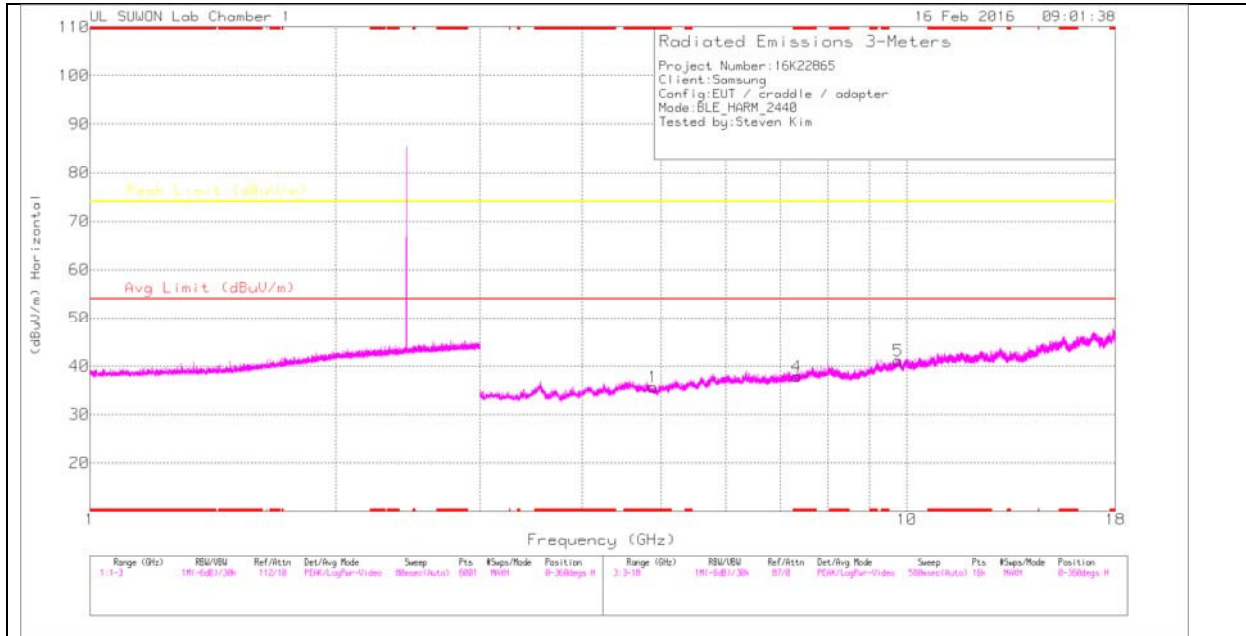
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_3	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.803	35.66	PK	34	-33.8	0	35.86	-	-	74	-38.14	0-360	100	H
4	7.214	32.99	PK	35.7	-30.9	0	37.79	-	-	74	-36.21	0-360	200	H
5	9.608	30.11	PK	37	-27.3	0	39.81	-	-	74	-34.19	0-360	100	H
2	* 4.805	35.6	PK	34	-33.8	0	35.8	-	-	74	-38.2	0-360	100	V
3	7.208	33.03	PK	35.7	-30.8	0	37.93	-	-	74	-36.07	0-360	200	V
6	9.604	31.52	PK	37	-27.3	0	41.22	-	-	74	-32.78	0-360	200	V

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

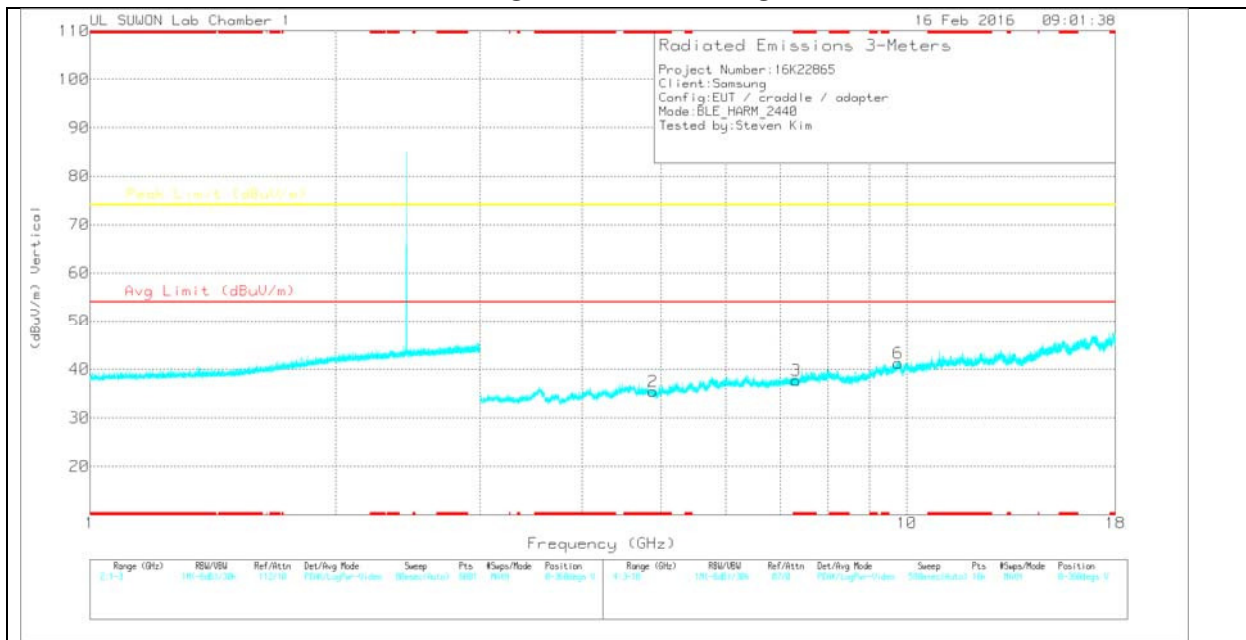
PK – Peak detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

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

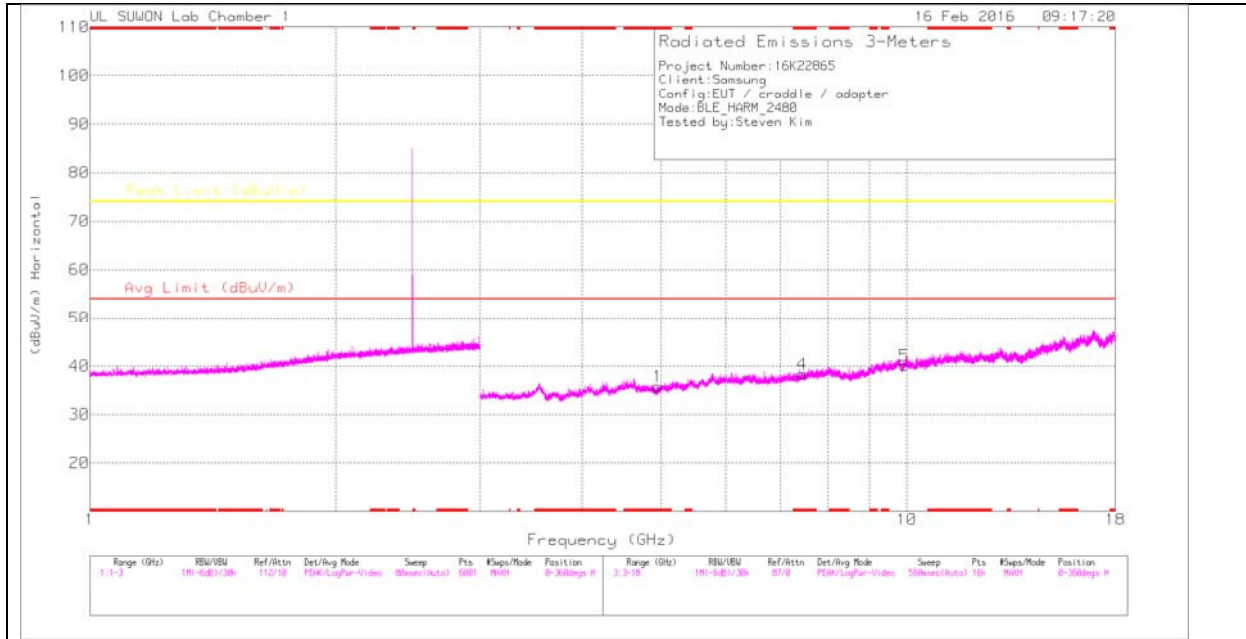
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_3	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.892	35.74	PK	34	-34	0	35.74	-	-	74	-38.26	0-360	200	H
4	* 7.325	32.88	PK	35.8	-30.8	0	37.88	-	-	74	-36.12	0-360	100	H
5	9.755	30.57	PK	37.2	-26.7	0	41.07	-	-	74	-32.93	0-360	200	H
2	* 4.886	35.46	PK	34	-34	0	35.46	-	-	74	-38.54	0-360	100	V
3	* 7.323	32.79	PK	35.8	-30.9	0	37.69	-	-	74	-36.31	0-360	100	V
6	9.753	30.78	PK	37.2	-26.7	0	41.28	-	-	74	-32.72	0-360	100	V

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

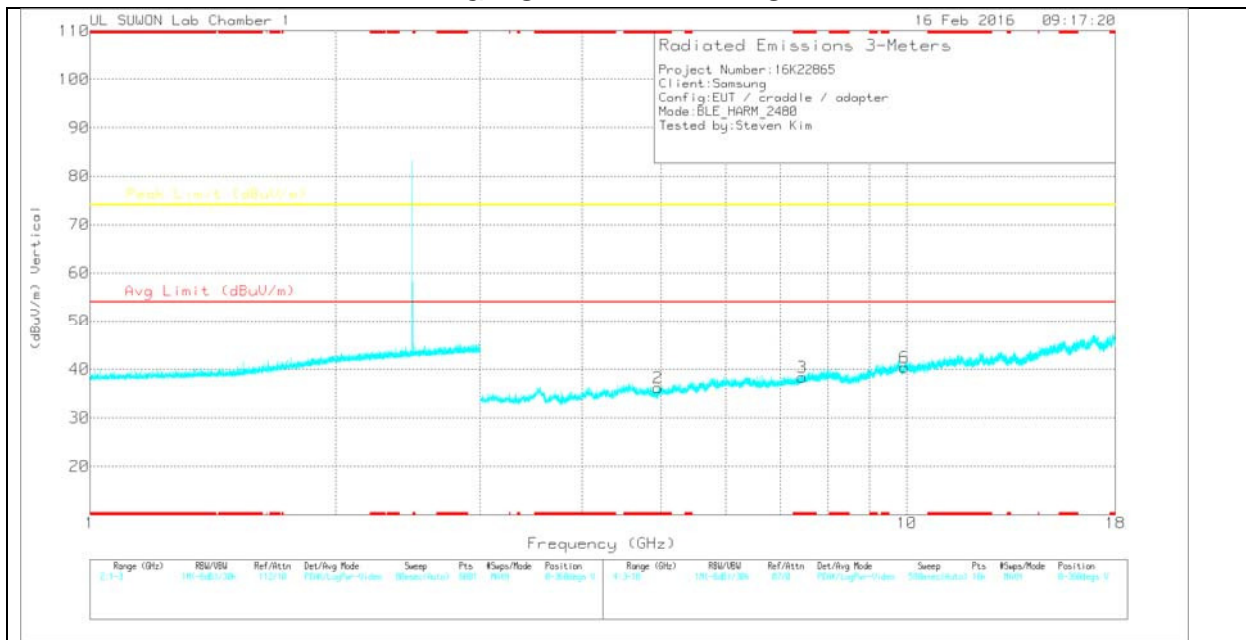
PK – Peak detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

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	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	* 4.956	35.79	PK	34	-34	0	35.79	-	-	74	-38.21	0-360	100	H
4	* 7.44	33.24	PK	35.8	-30.7	0	38.34	-	-	74	-35.66	0-360	200	H
5	9.919	29.89	PK	37.4	-27.2	0	40.09	-	-	74	-33.91	0-360	100	H
2	* 4.96	36.2	PK	34	-34	0	36.2	-	-	74	-37.8	0-360	100	V
3	* 7.439	33.25	PK	35.8	-30.7	0	38.35	-	-	74	-35.65	0-360	200	V
6	9.923	30.03	PK	37.4	-27.1	0	40.33	-	-	74	-33.67	0-360	200	V

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

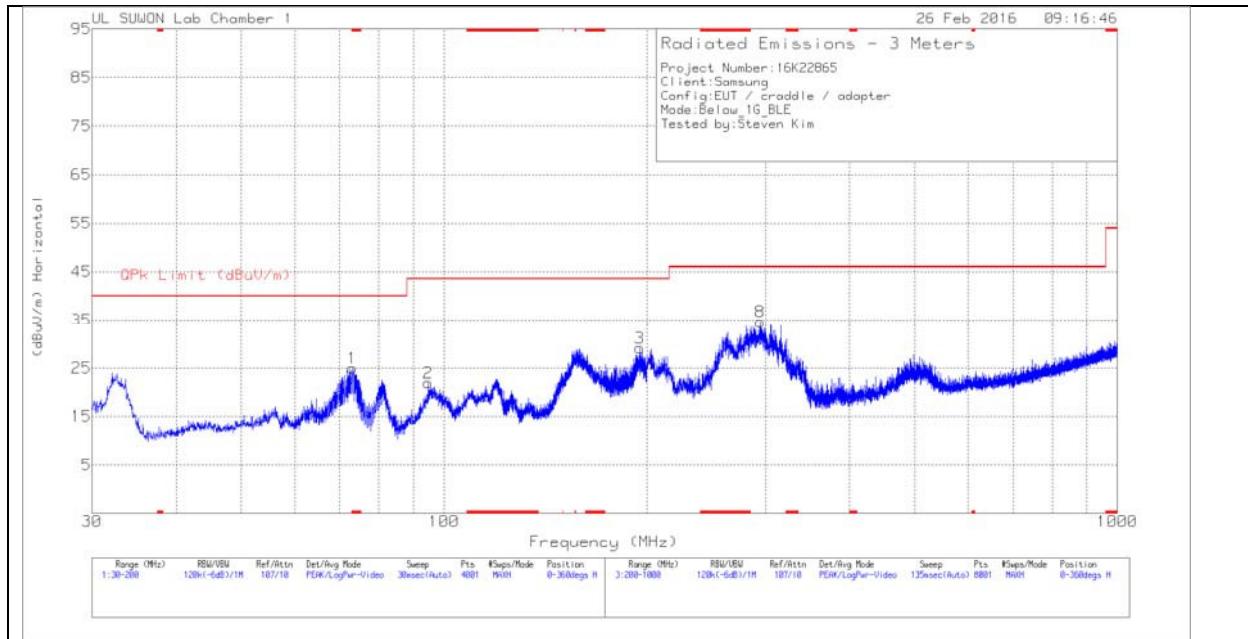
PK – Peak detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

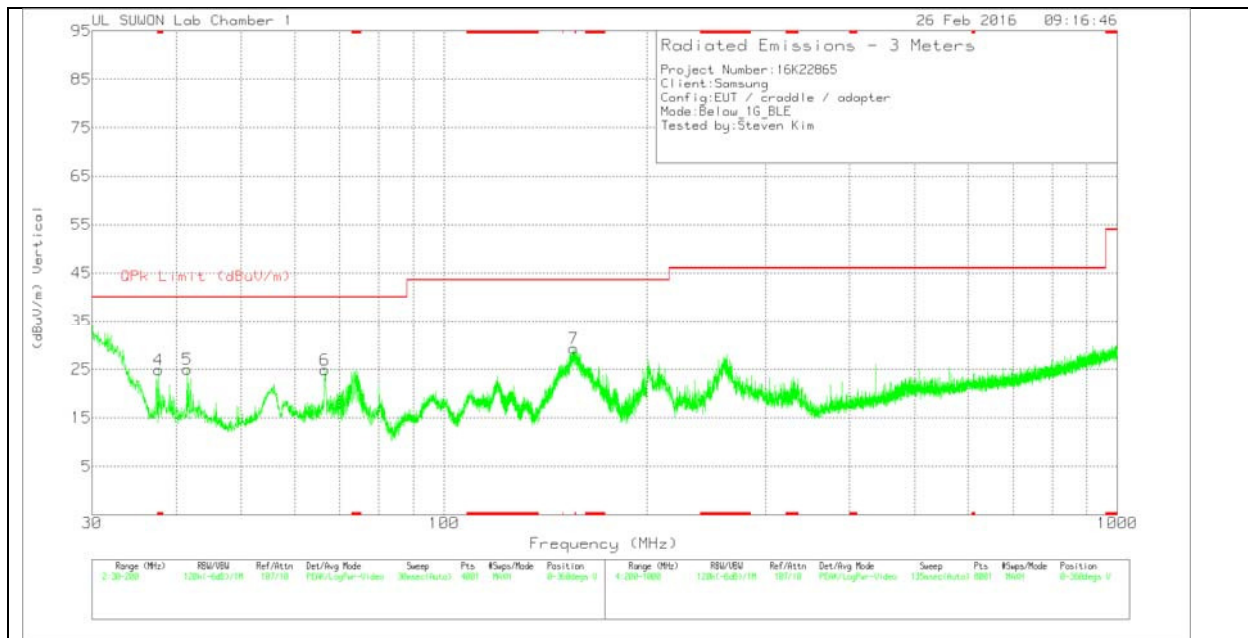
11.3. WORST-CASE BELOW 1 GHz

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	VULB9163-750	Bi-Log	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 73.095	45.88	Pk	8.8	-29.7	24.98	40	-15.02	0-360	300	H
2	94.77	40.74	Pk	10.5	-29.3	21.94	43.52	-21.58	0-360	300	H
3	195.155	46.4	Pk	10.9	-28.2	29.1	43.52	-14.42	0-360	100	H
4	* 37.6925	43.81	Pk	11.5	-30.4	24.91	40	-15.09	0-360	100	V
5	41.5175	42.53	Pk	12.8	-30.3	25.03	40	-14.97	0-360	100	V
6	66.5075	43.94	Pk	10.7	-29.8	24.84	40	-15.16	0-360	100	V
7	155.6725	49.53	Pk	8.3	-28.6	29.23	43.52	-14.29	0-360	100	V
8	294.9	48.96	Pk	13.2	-27.5	34.66	46.02	-11.36	0-360	100	H

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

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.

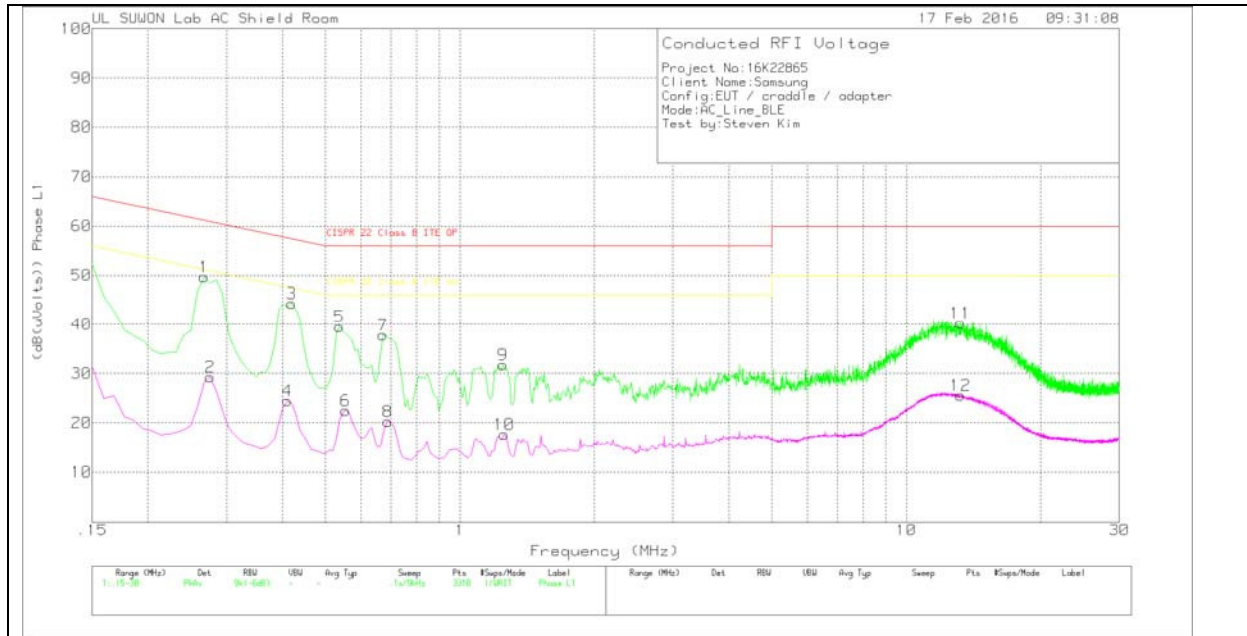
TEST PROCEDURE

ANSI C63.10 - 2009

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

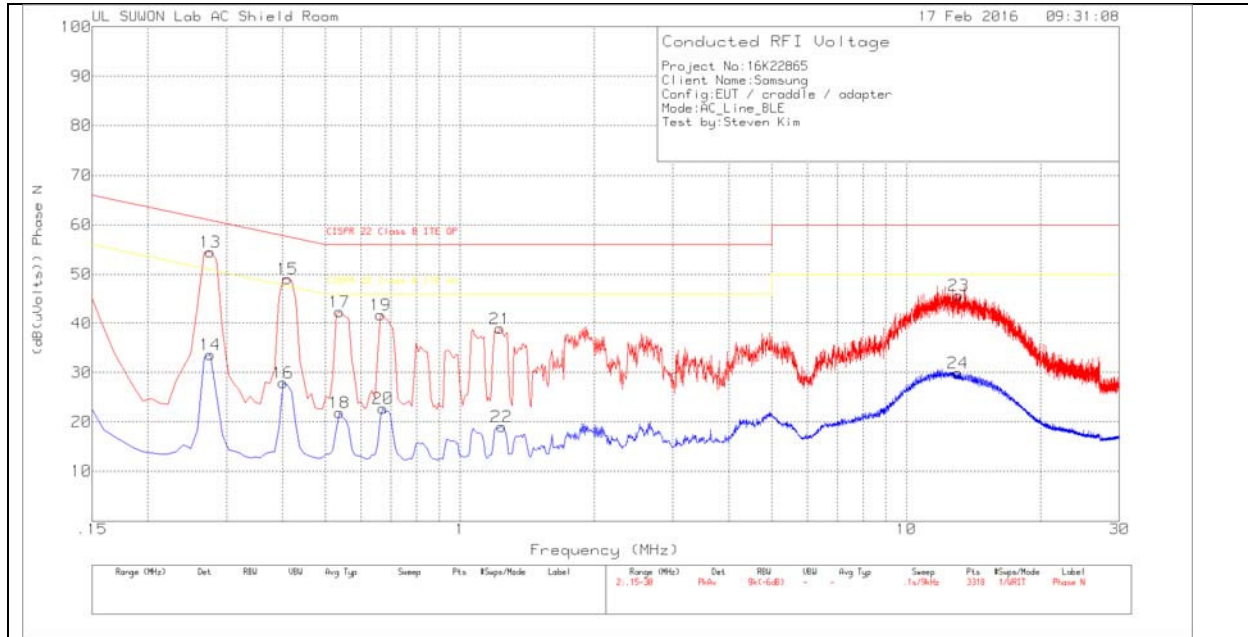
Phase L1 .15 - 30MHz

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	.267	39.9	Pk	9.8	0	49.7	61.21	-11.51	-	-
2	.276	19.46	Av	9.8	0	29.26	-	-	50.94	-21.68
3	.42	34.21	Pk	10.1	0	44.31	57.45	-13.14	-	-
4	.411	14.38	Av	10.1	0	24.48	-	-	47.63	-23.15
5	.537	29.46	Pk	10.1	0	39.56	56	-16.44	-	-
6	.555	12.38	Av	10.1	0	22.48	-	-	46	-23.52
7	.672	27.74	Pk	10.1	0	37.84	56	-18.16	-	-
8	.69	10.21	Av	10.1	0	20.31	-	-	46	-25.69
9	1.248	21.81	Pk	9.9	.1	31.81	56	-24.19	-	-
10	1.257	7.61	Av	9.9	.1	17.61	-	-	46	-28.39
11	13.236	30.01	Pk	10.1	.2	40.31	60	-19.69	-	-
12	13.227	15.23	Av	10.1	.2	25.53	-	-	50	-24.47

Pk - Peak detector

Av - Average detection

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	.276	44.69	Pk	9.8	0	54.49	60.94	-6.45	-	-
14	.276	23.82	Av	9.8	0	33.62	-	-	50.94	-17.32
15	.411	39.03	Pk	10.1	0	49.13	57.63	-8.5	-	-
16	.402	17.8	Av	10.1	0	27.9	-	-	47.81	-19.91
17	.537	32.27	Pk	10.1	0	42.37	56	-13.63	-	-
18	.537	11.74	Av	10.1	0	21.84	-	-	46	-24.16
19	.663	31.73	Pk	10	0	41.73	56	-14.27	-	-
20	.672	12.75	Av	10	0	22.75	-	-	46	-23.25
21	1.23	29.01	Pk	9.8	.1	38.91	56	-17.09	-	-
22	1.239	9.09	Av	9.8	.1	18.99	-	-	46	-27.01
23	13.083	35.35	Pk	10.2	.2	45.75	60	-14.25	-	-
24	13.047	19.49	Av	10.2	.2	29.89	-	-	50	-20.11

Pk - Peak detector

Av - Average detection

Quasi-Peak Emissions

Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101837_wit h 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)
.2715	30.04	Qp	9.8	0	39.84	61.07	-21.23	-	-
.4065	24.11	Qp	10.1	0	34.21	57.72	-23.51	-	-
.4029	24.45	Qp	10.1	0	34.55	57.79	-23.24	-	-
13.0875	22.24	Qp	10.2	.2	32.64	60	-27.36	-	-
13.047	22.67	Qp	10.2	.2	33.07	60	-26.93	-	-

Qp – Quasi-Peak detector