FCC CFR47 PART 15 SUBPART C

Bluetooth Low Energy

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-G610F/DD, SM-G610F/DS

FCC ID: A3LSMG610F

REPORT NUMBER: 16K23775-E2V1

ISSUE DATE: AUG 08, 2016

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

Prepared by
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218 Maeyeong-ro, Yeongtong-gu,
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ACCREDITED
TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	08/08/16	Initial issue	Junwhan Lee

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1. ATTESTATION OF TEST RESULTS

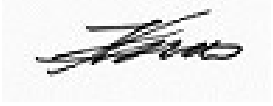
COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone + Bluetooth/BLE, DTS b/g/n and ANT+
MODEL NUMBER:	SM-G610F/DD, SM-G610F/DS
SERIAL NUMBER:	5203a883e8304309, R38H70DHYVE (SM-G610F/DD, RADIATED); R38H60EJB6X (SM-G610F/DS, RADIATED); R38H60EJBGD (SM-G610F/DD, CONDUCTED)
DATE TESTED:	JUL 18, 2016 - AUG 05, 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
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Tested By:

Junwhan Lee
Suwon Lab Engineer
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, 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
☒ Chamber 1
☒ 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:

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

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%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

SM-G610F/DD and SM-G610F/DS are same hardware.
But travel charger and data cable of these two model were different.

In accordance with difference of travel charger and data cable, AC power line conducted test and radiated emmisions test below 1GHz were conducted by each model.

SM-G610F/DD was used for the other tests.

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	9.15	8.22
		Average	8.42	6.95

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -2.1 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 X orientation.

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5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

■ SM-G610F/DD

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA50IWE	DK2H418VS/A-E	N/A
Data Cable	SAMSUNG	EP-DG915UWE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

■ SM-G610F/DS

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA50EWE	DK4H426VS/A-E	N/A
Data Cable	SAMSUNG	ECB-DU68WE	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
2	Audio	1	Mini-Jack	Unshielded	1.0m	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.

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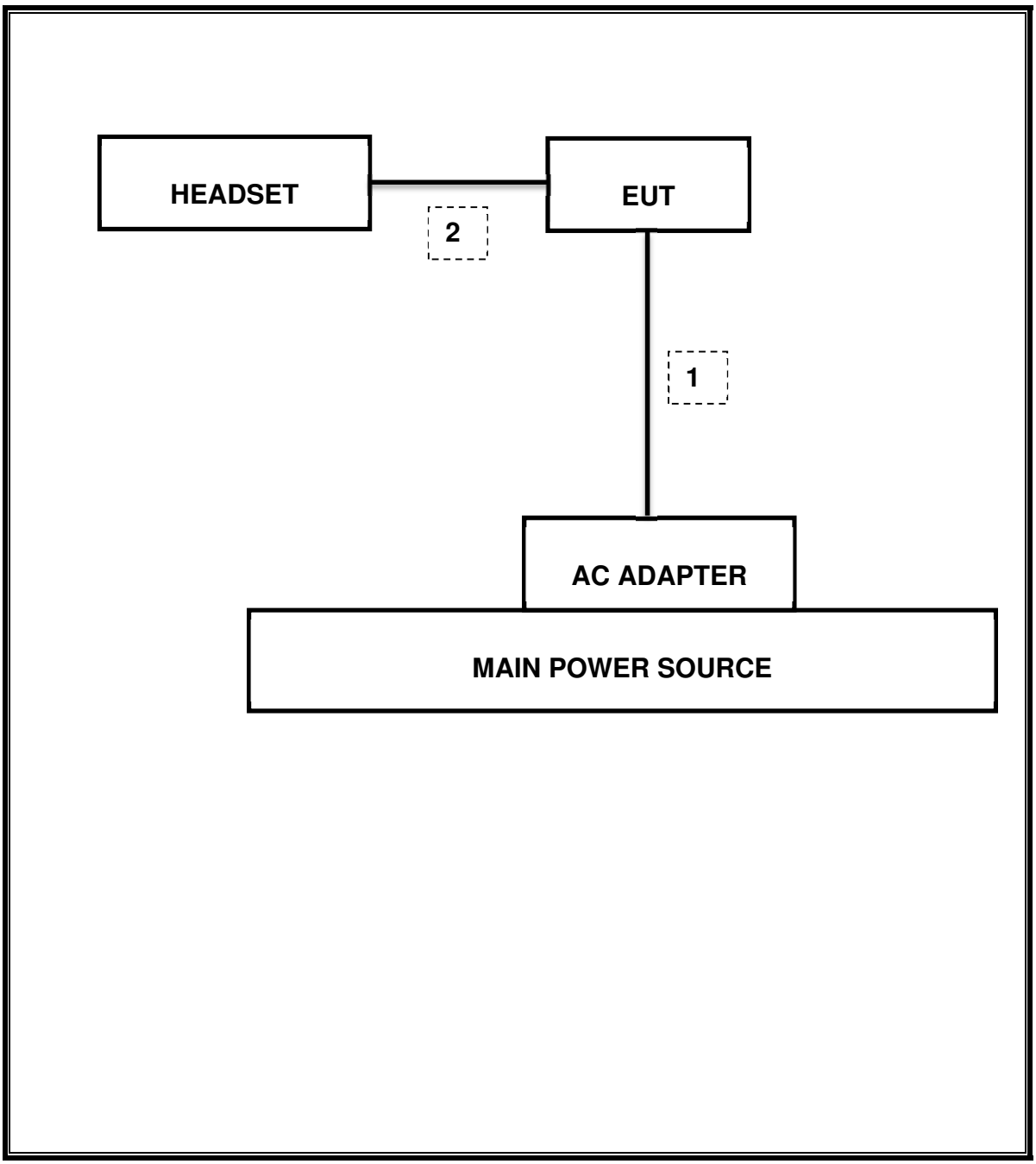
SETUP DIAGRAM FOR TESTS



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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	11-30-17
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	12-15-17
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 5GHz	Micro-Tronics	LPS17541	009	08-18-16
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-18-16
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-18-16
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-18-16
High Pass Filter 6GHz	Micro-Tronics	HPM17542	009	08-18-16
High Pass Filter 6GHz	Micro-Tronics	HPM17542	016	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 v03r05: 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.

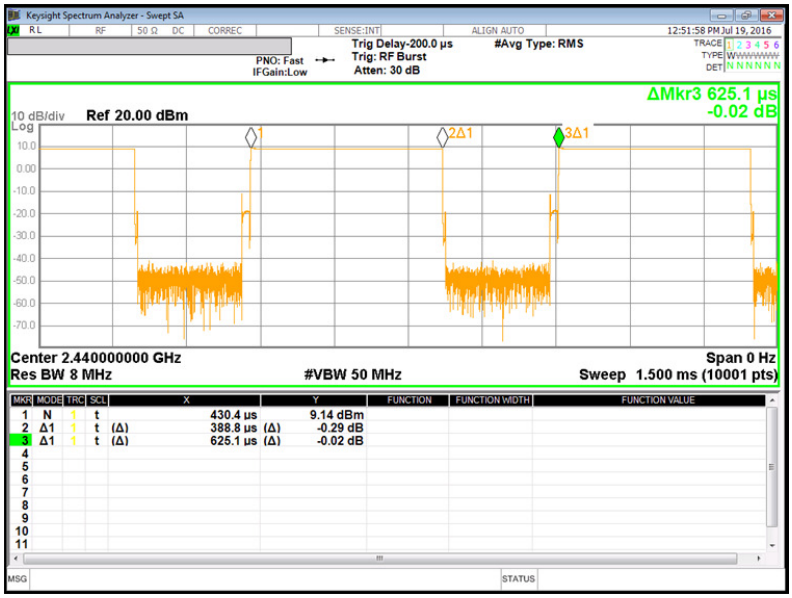
8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

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	0.622	62.2%	2.06	2.572



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	686.6 kHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-42.044 dBm
15.247	TX conducted output power	<30dBm		Pass	9.15 dBm (Peak)
15.247	PSD	<8dBm		Pass	-5.62 dBm (Peak)
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	51.76 dBuV (Qp)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	40.3 dBuV/m (Av)

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	691.2	500.0
Mid	2440	695.2	500.0
High	2480	686.6	500.0
Worst		686.6	500.0

6 dB BANDWIDTH PLOTS

Low CH			
Middle CH			
High CH			

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	1.059
Mid	2440	1.059
High	2480	1.064
Worst		1.064

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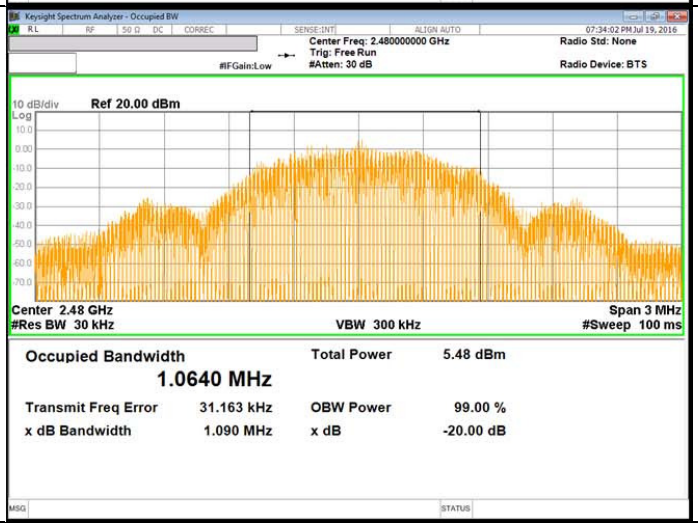
99% BANDWIDTH PLOTS

Low CH			
Middle CH			
High CH			

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 v03r05 under section 9.1.1 utilizing spectrum analyzer.

RESULTS

Channel	Frequency [MHz]	Peak Power Reading [dBm]	Limit [dBm]	Margin [dB]
Low	2402	8.374	30.000	-21.626
Mid	2440	9.150	30.000	-20.850
High	2480	8.071	30.000	-21.929
Worst		9.150		-20.850

OUTPUT POWER PLOTS

Low CH			
Middle CH			
High CH			

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	8.19	6.60
Middle	2440	8.42	6.95
High	2480	7.29	5.36

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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 v03r05

RESULTS

Channel	Frequency [MHz]	PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2402	-5.62	8.00	-13.62
Mid	2440	-6.01	8.00	-14.01
High	2480	-6.40	8.00	-14.40

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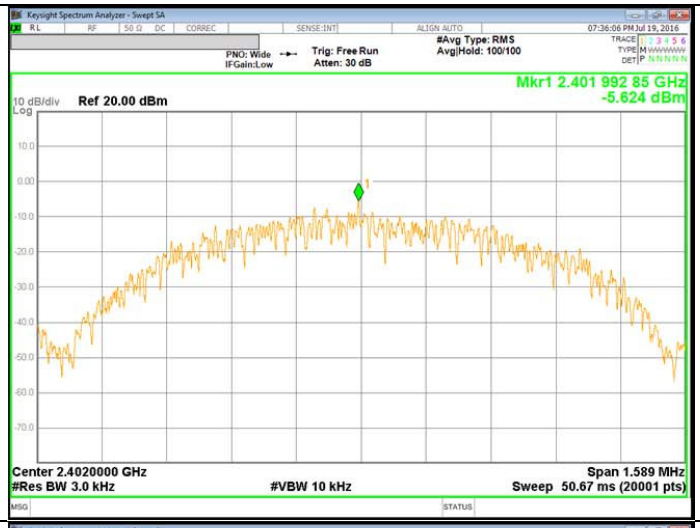
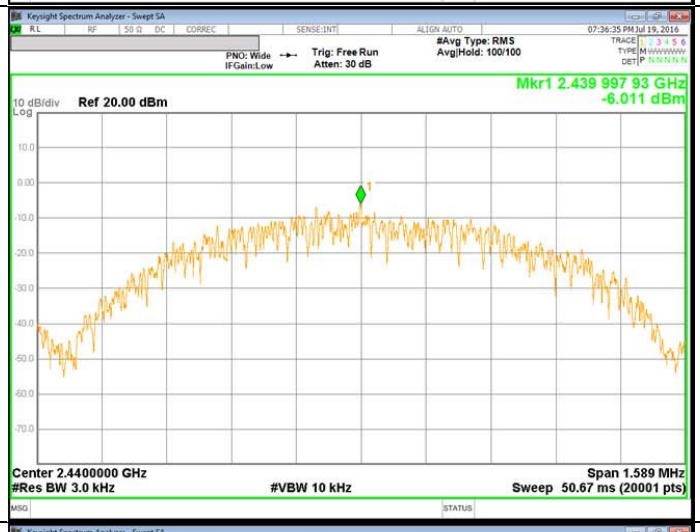
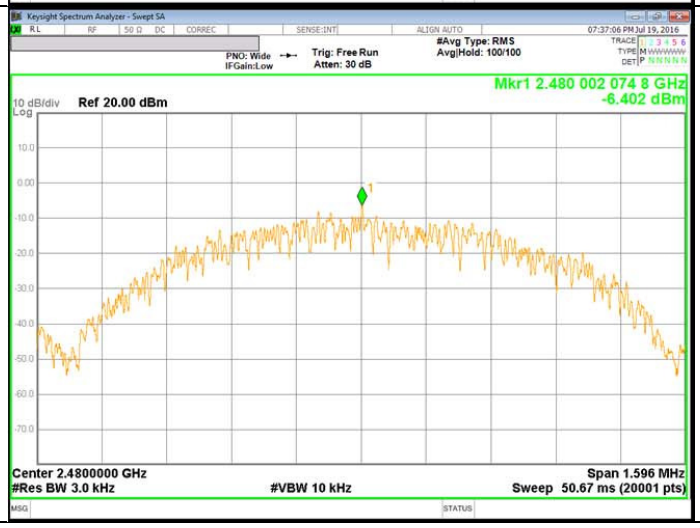
POWER SPECTRAL DENSITY PLOTS

Low CH		
Middle CH		
High CH		

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.

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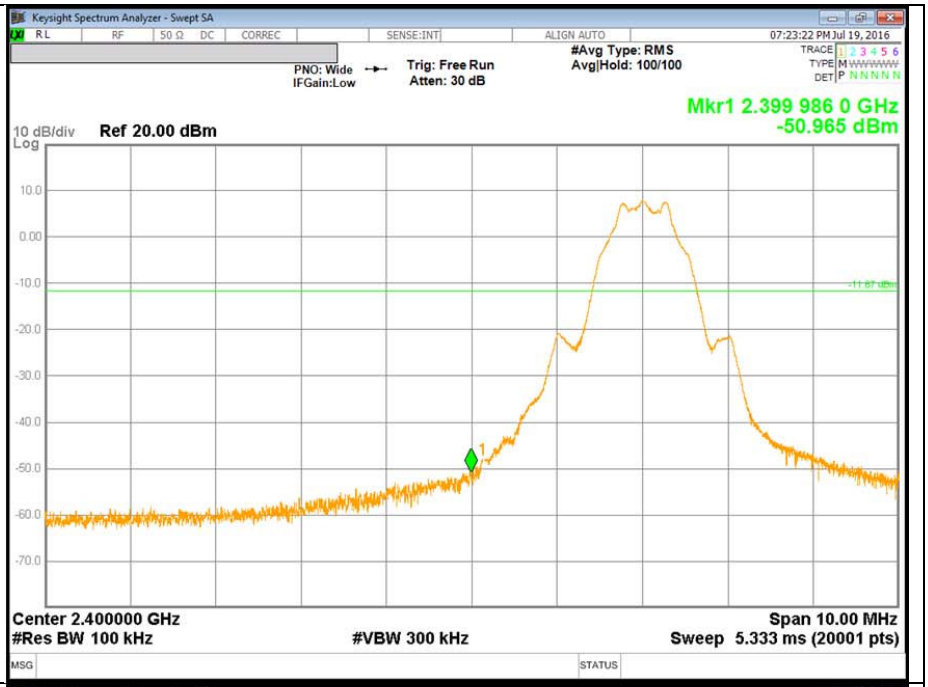
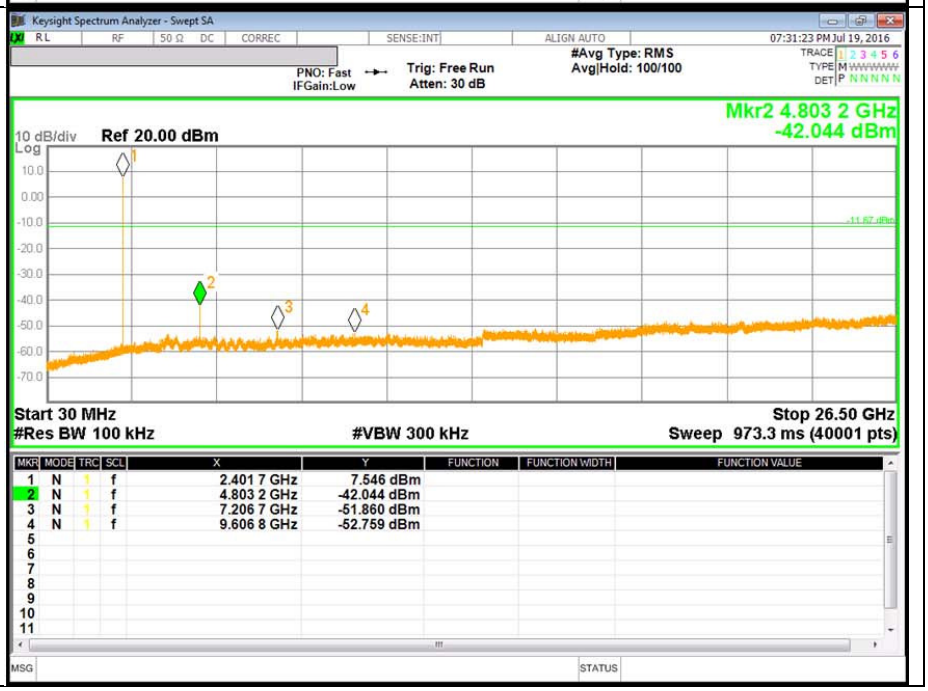
RESULTS

BANDEDGE & SPURIOUS EMISSIONS, LOW CHANNEL

Low CH BandEdge	
Low CH Spurious	

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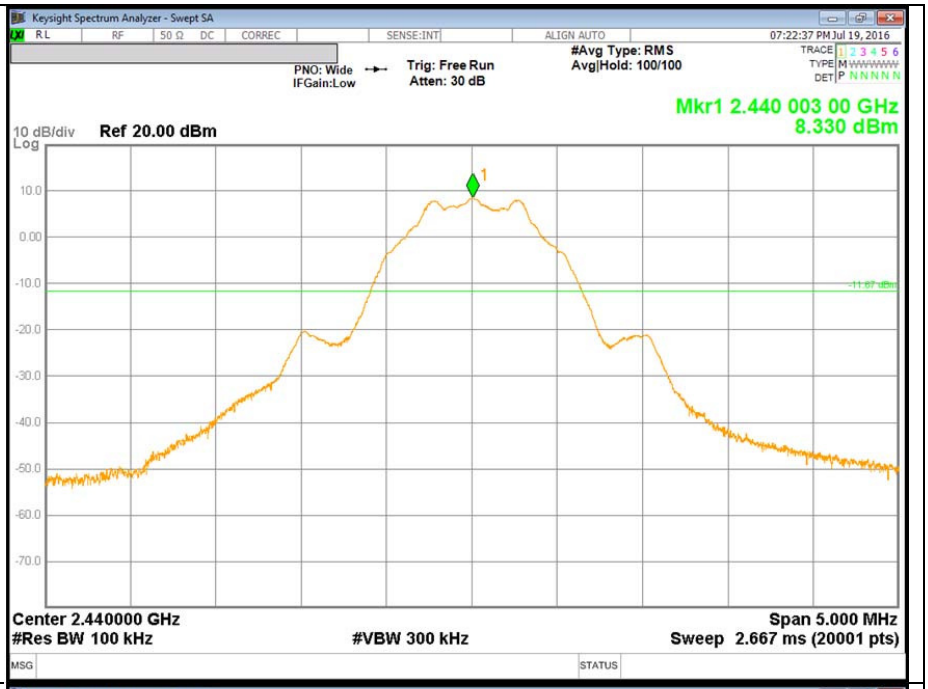
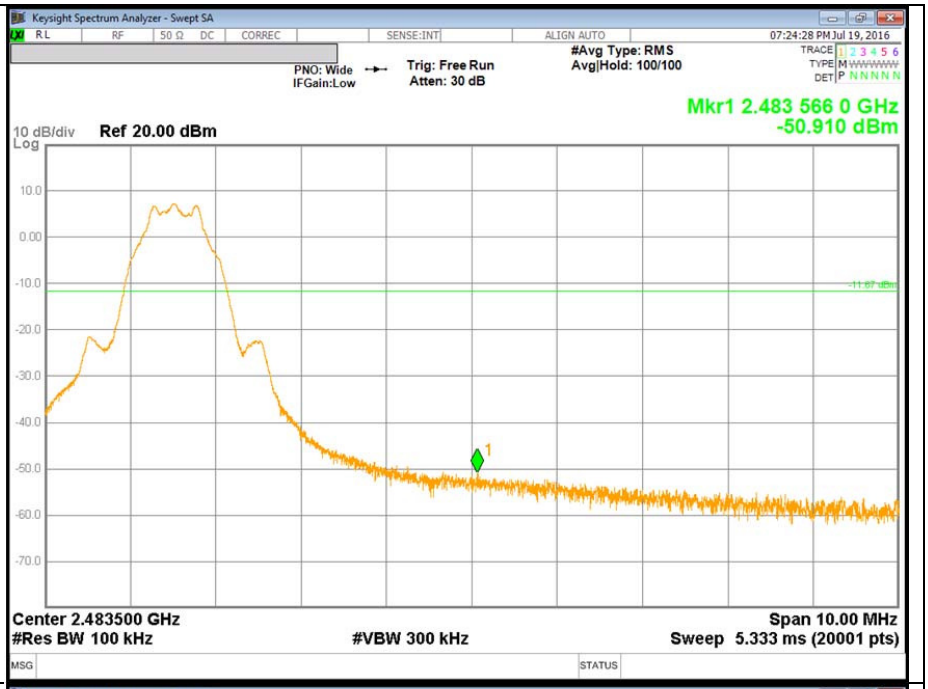
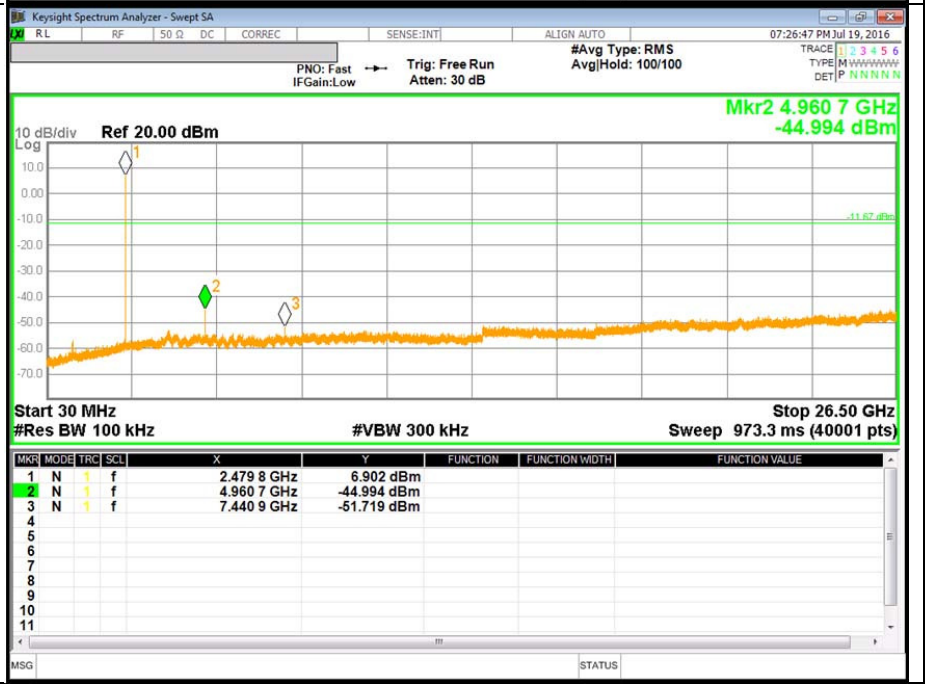
SPURIOUS EMISSIONS, MID CHANNEL

Middle CH BandEdge	
Middle CH Spurious	

SPURIOUS EMISSIONS, HIGH CHANNEL

High CH BandEdge	
High CH Spurious	

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11. RADIATED TEST RESULTS

11.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for 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 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 = 10log(1/0.622)=2.06dB (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.

Note : Emission was pre-scanned from 9KHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).
Per FCC part 15.31(o), test results were not reported.

Formula for converting the filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

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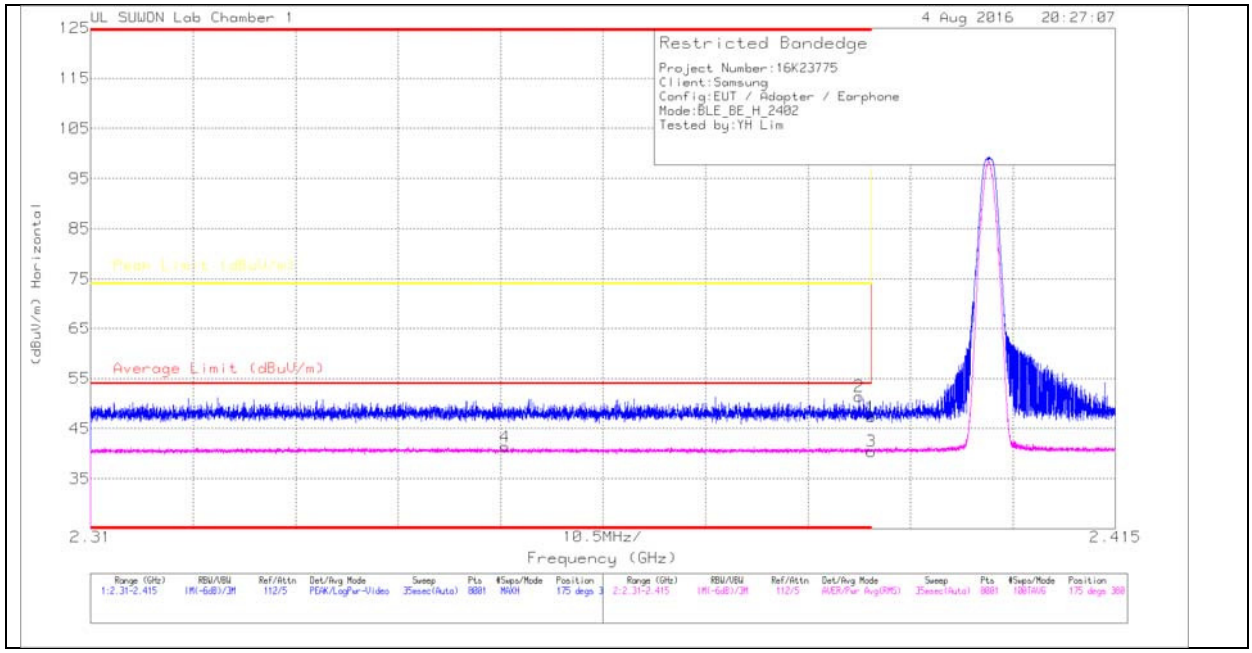
11.2. TRANSMITTER ABOVE 1 GHz
RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

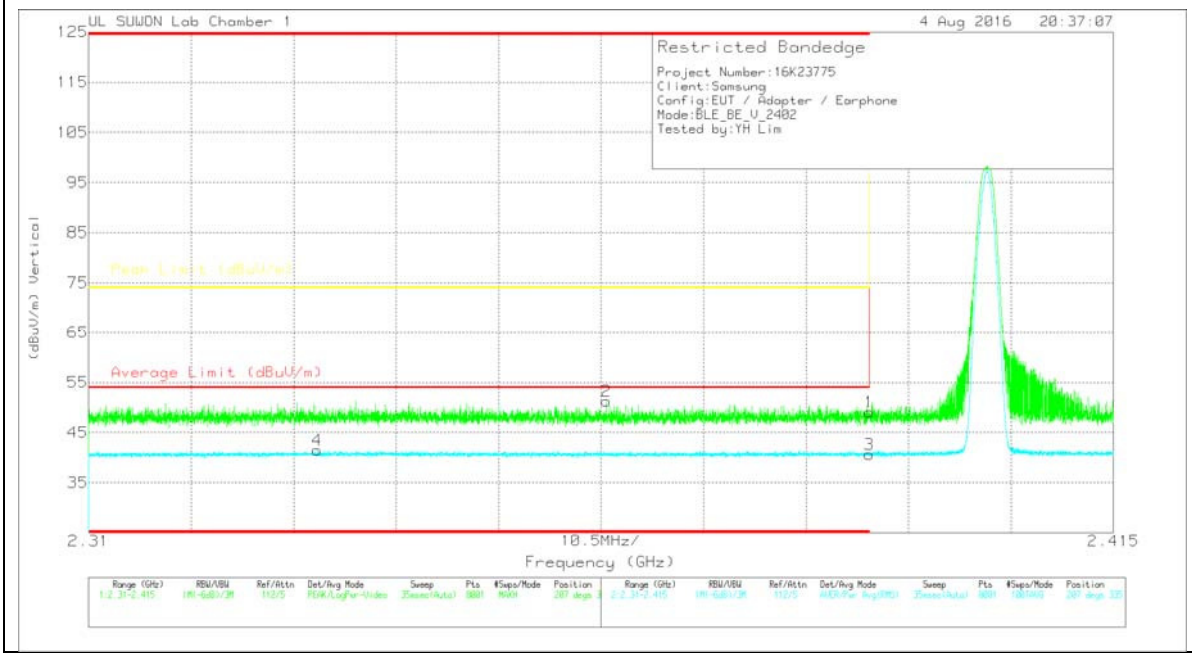
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168717)_150619	Path_2	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	44.57	Pk	31.8	-29	0	47.37	-	-	74	-26.63	175	380	H
2	* 2.389	48.62	Pk	31.8	-29	0	51.42	-	-	74	-22.58	175	380	H
3	* 2.39	35.59	RMS	31.8	-29	2.06	40.45	54	-13.55	-	-	175	380	H
4	* 2.352	36.61	RMS	31.7	-29	2.06	41.37	54	-12.63	-	-	175	380	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(00168717)_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	46.24	Pk	31.8	-29	0	49.04	-	-	74	-24.96	207	335	V
2	* 2.363	48.49	Pk	31.8	-29	0	51.29	-	-	74	-22.71	207	335	V
3	* 2.39	35.76	RMS	31.8	-29	2.06	40.62	54	-13.38	-	-	207	335	V
4	* 2.333	36.72	RMS	31.7	-29	2.06	41.48	54	-12.52	-	-	207	335	V

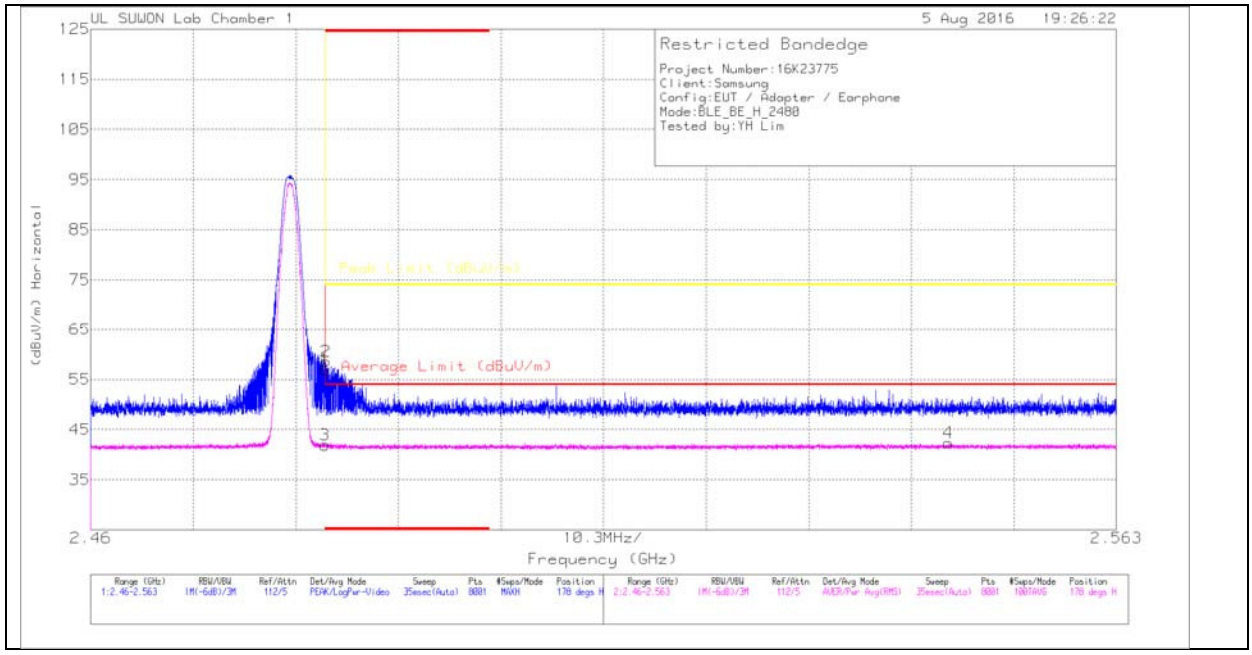
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

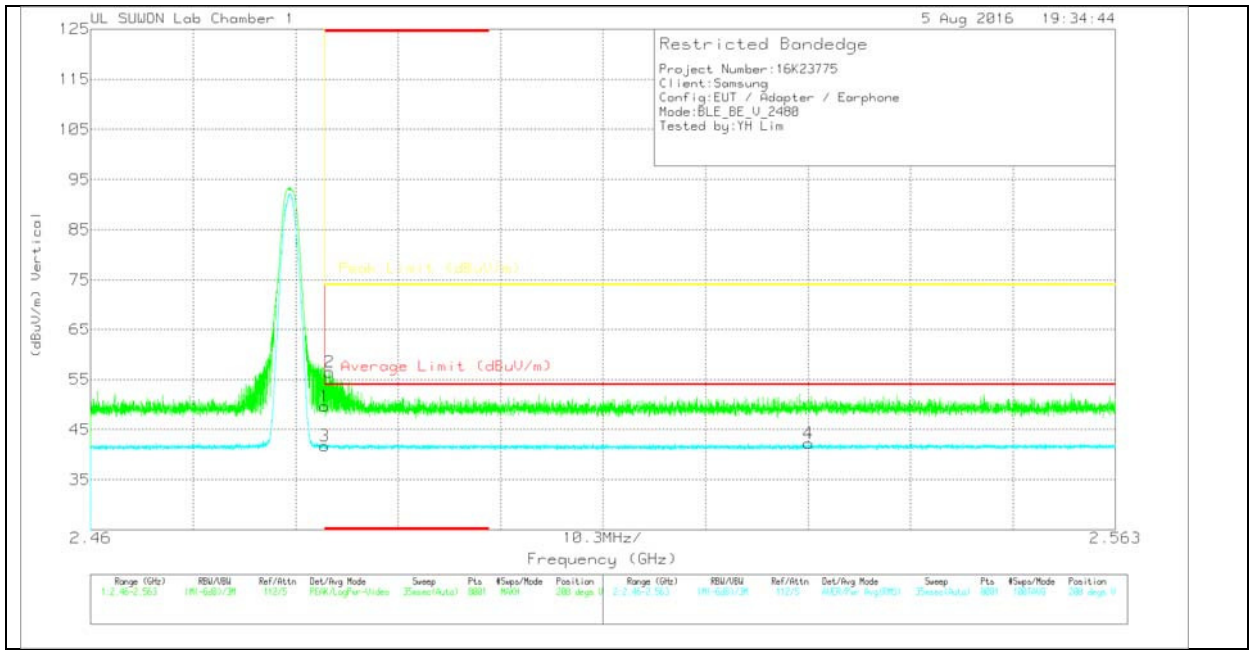
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168717)_150619	Path_2	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	53.32	Pk	32	-28.3	0	57.02	-	-	74	-16.98	178	400	H
2	* 2.484	54.92	Pk	32	-28.3	0	58.62	-	-	74	-15.38	178	400	H
3	* 2.484	36.18	RMS	32	-28.3	2.06	41.94	54	-12.06	-	-	178	400	H
4	2.546	36.53	RMS	32	-28.2	2.06	42.39	54	-11.61	-	-	178	400	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(00168717)_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	Pk	32	-28.3	0	49.7	-	-	74	-24.3	208	358	V
2	* 2.484	52.77	Pk	32	-28.3	0	56.47	-	-	74	-17.53	208	358	V
3	* 2.484	36.01	RMS	32	-28.3	2.06	41.77	54	-12.23	-	-	208	358	V
4	2.532	36.5	RMS	32	-28.3	2.06	42.26	54	-11.74	-	-	208	358	V

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

Pk - Peak detector

RMS - RMS detection

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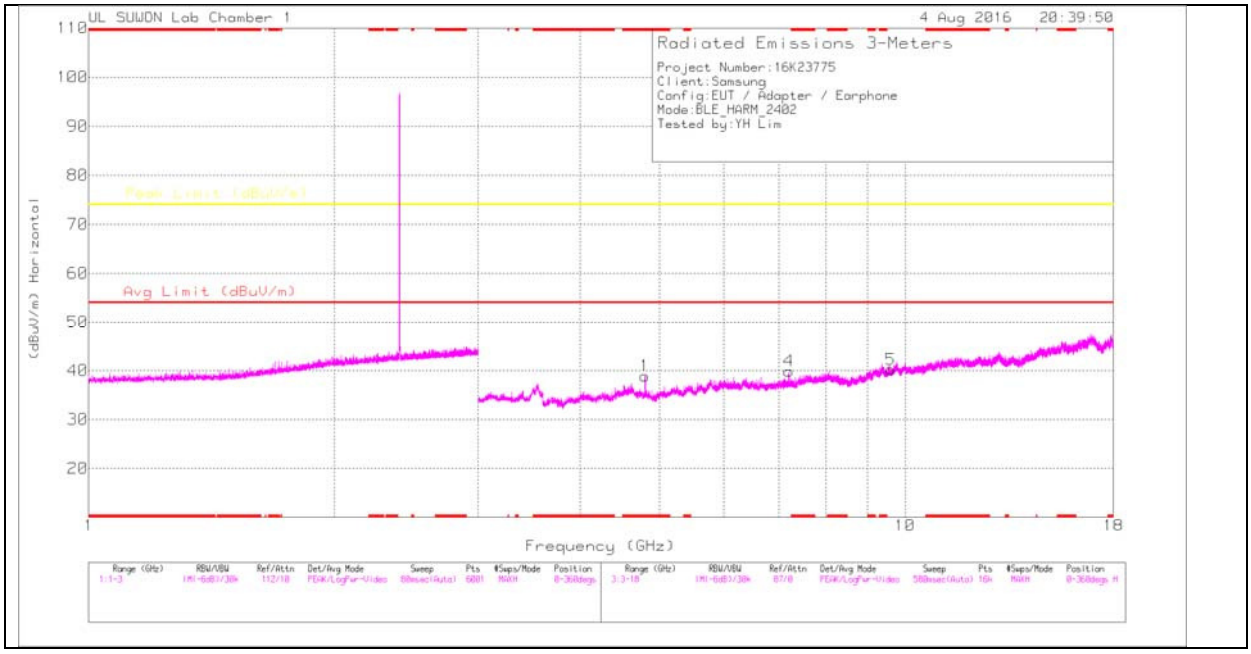
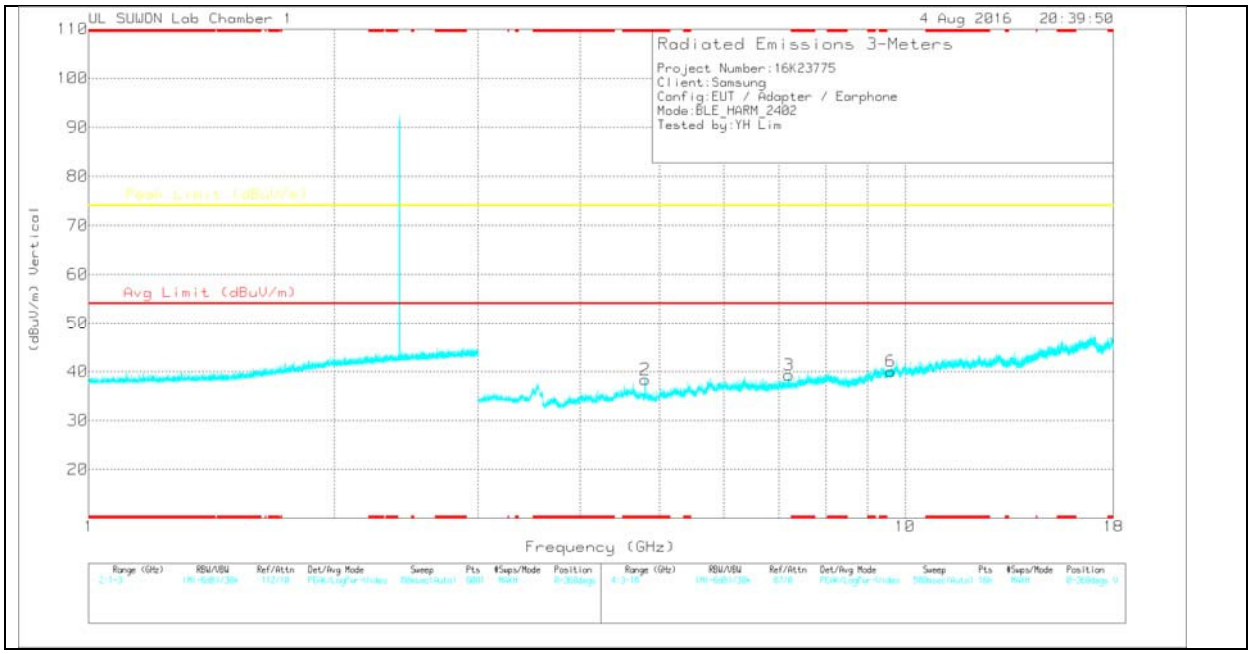
HARMONICS AND SPURIOUS EMISSIONS

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(00168717)_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	* 4.804	38.74	Pk	34	-33.8	0	38.94	-	-	74	-35.06	0-360	150	H
4	7.206	35.03	Pk	35.7	-30.8	0	39.93	-	-	74	-34.07	0-360	150	H
5	9.608	30.56	Pk	37	-27.3	0	40.26	-	-	74	-33.74	0-360	250	H
2	* 4.805	38.21	Pk	34	-33.8	0	38.41	-	-	74	-35.59	0-360	250	V
3	7.205	34.43	Pk	35.7	-30.8	0	39.33	-	-	74	-34.67	0-360	150	V
6	9.608	30.36	Pk	37	-27.3	0	40.06	-	-	74	-33.94	0-360	150	V

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

Pk – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168717)_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
* 4.804	49.37	PK2	34	-33.8	0	49.57	-	-	74	-24.43	360	130	H
* 4.804	29.51	MAv1	34	-33.8	2.06	31.77	54	-22.23	-	-	360	130	H
* 4.805	48.05	PK2	34	-33.8	0	48.25	-	-	74	-25.75	360	120	V
* 4.804	36.81	MAv1	34	-33.8	2.06	39.07	54	-14.93	-	-	360	120	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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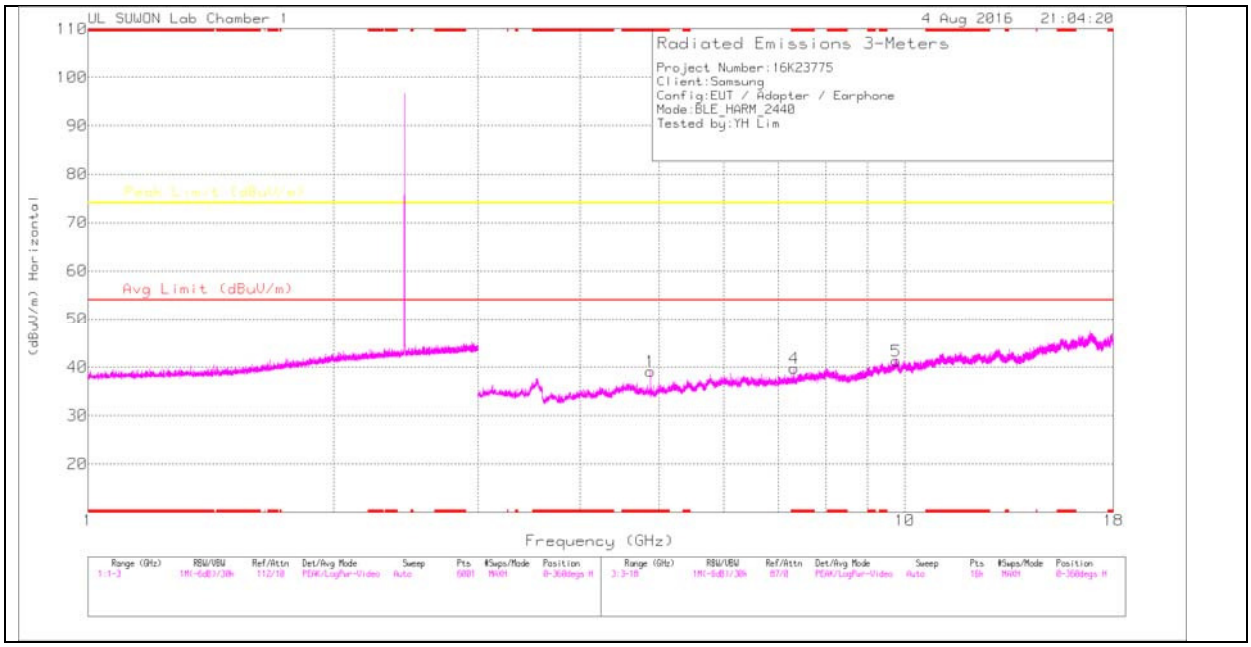
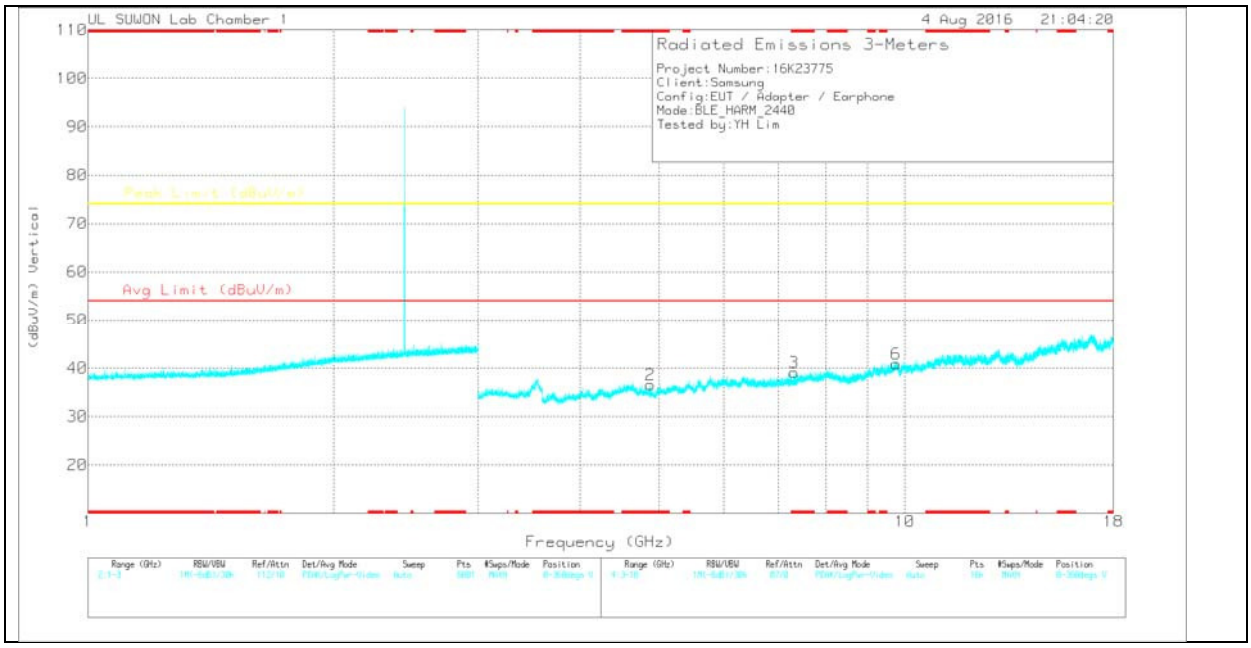
MID CHANNEL HORIZONTAL



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.

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MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168717)_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	* 4.88	39.14	Pk	34	-34	0	39.14	-	-	74	-34.86	0-360	150	H
4	* 7.32	34.81	Pk	35.8	-30.9	0	39.71	-	-	74	-34.29	0-360	250	H
5	9.758	30.75	Pk	37.2	-26.7	0	41.25	-	-	74	-32.75	0-360	250	H
2	* 4.88	36.57	Pk	34	-34	0	36.57	-	-	74	-37.43	0-360	250	V
3	* 7.321	34.18	Pk	35.8	-30.9	0	39.08	-	-	74	-34.92	0-360	250	V
6	9.752	30.32	Pk	37.2	-26.7	0	40.82	-	-	74	-33.18	0-360	150	V

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

Pk – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168717)_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
* 4.88	48.56	PK2	34	-34	0	48.56	-	-	74	-25.44	270	120	H
* 4.88	35.38	MAv1	34	-34	2.06	37.44	54	-16.56	-	-	270	120	H
* 4.88	47.28	PK2	34	-34	0	47.28	-	-	74	-26.72	151	100	V
* 4.88	34.85	MAv1	34	-34	2.06	36.91	54	-17.09	-	-	151	100	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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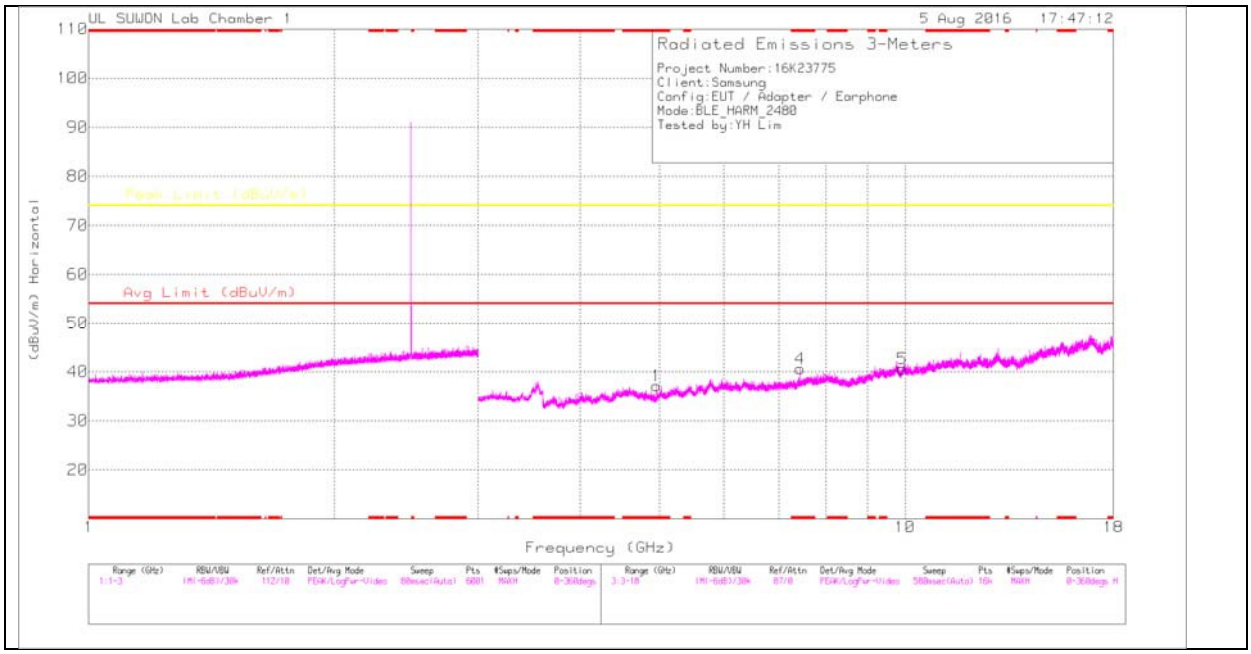
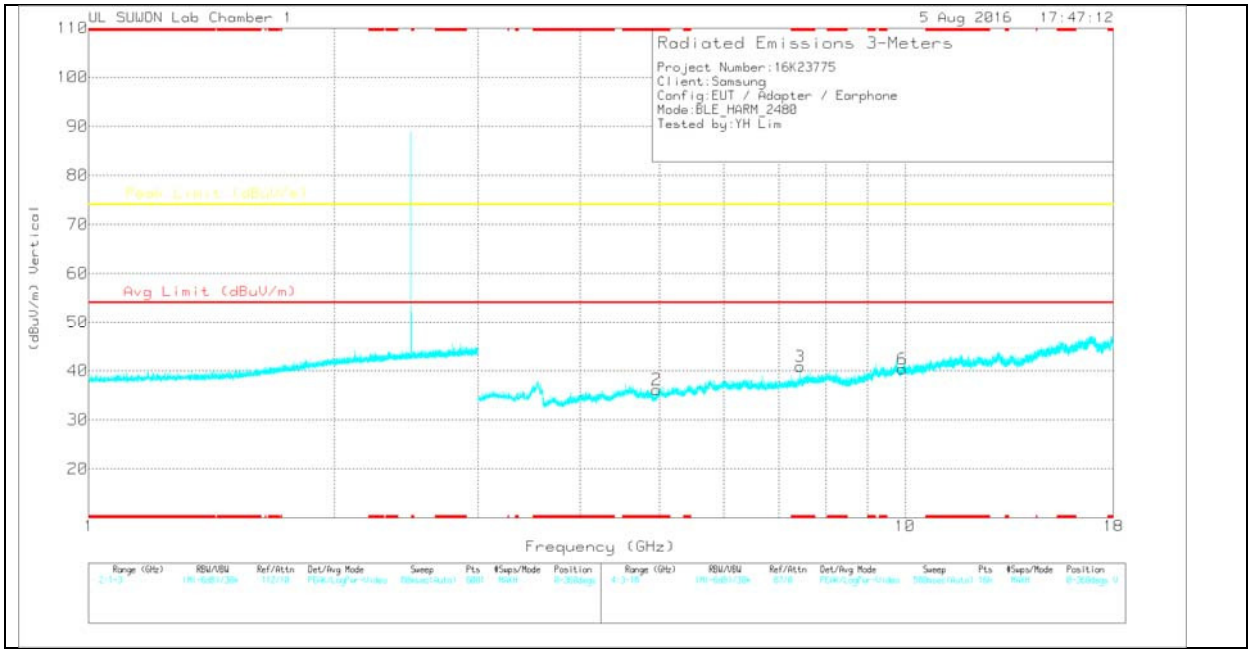
HIGH CHANNEL HORIZONTAL



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(00168717)_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	* 4.959	37.09	PK	34	-34	0	37.09	-	-	74	-36.91	0-360	250	H
4	* 7.439	35.54	PK	35.8	-30.7	0	40.64	-	-	74	-33.36	0-360	250	H
5	9.921	30.37	PK	37.4	-27.2	0	40.57	-	-	74	-33.43	0-360	150	H
2	* 4.959	36.17	PK	34	-34	0	36.17	-	-	74	-37.83	0-360	250	V
3	* 7.441	35.78	PK	35.8	-30.7	0	40.88	-	-	74	-33.12	0-360	250	V
6	9.923	30.05	PK	37.4	-27.1	0	40.35	-	-	74	-33.65	0-360	150	V

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

PK – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168717)_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
* 7.44	45.46	PK2	35.8	-30.7	0	50.56	-	-	74	-23.44	283	370	H
* 7.439	33.14	MAv1	35.8	-30.7	2.06	40.3	54	-13.7	-	-	283	370	H
* 7.435	44.78	PK2	35.8	-30.7	0	49.88	-	-	74	-24.12	360	299	H
* 7.447	29.74	MAv1	35.8	-30.6	2.06	37	54	-17	-	-	360	299	H

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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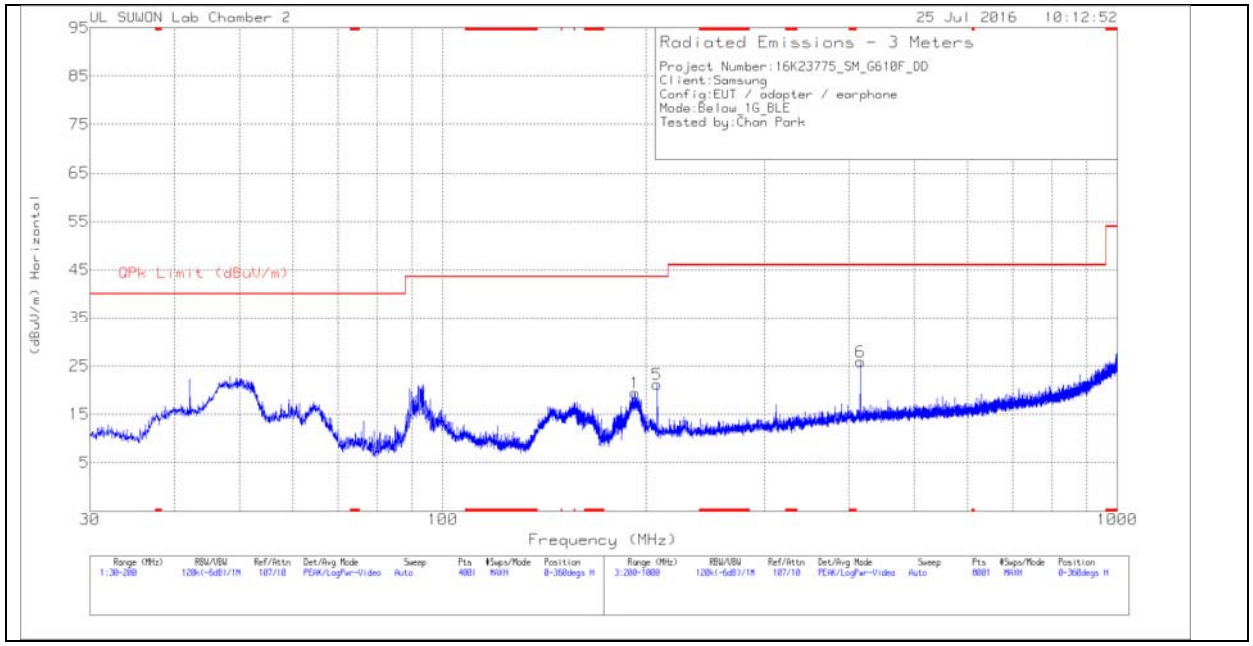
11.3. WORST-CASE BELOW 1 GHz

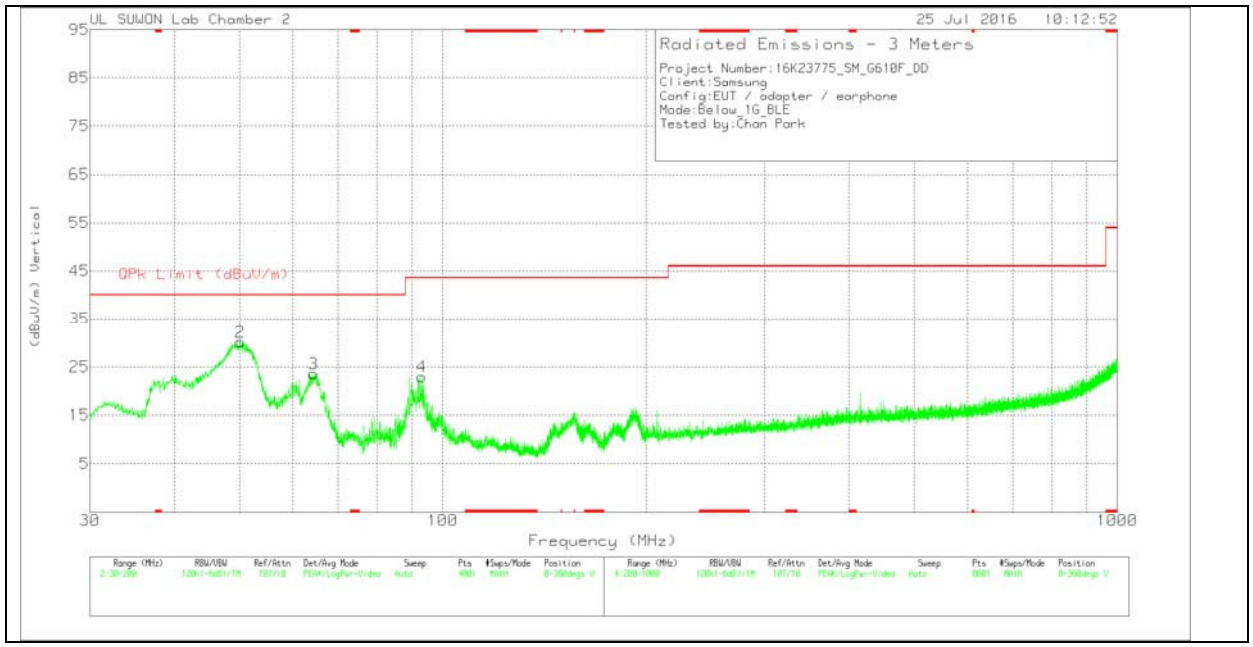
11.3.1. SM-G610F/DD

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	192.8175	39.08	Pk	10.7	-30.4	19.38	43.52	-24.14	0-360	100	H
2	50.145	46.78	Pk	14.1	-30.7	30.18	40	-9.82	0-360	100	V
3	64.3825	42.93	Pk	11.4	-30.7	23.63	40	-16.37	0-360	100	V
4	93.1125	43.35	Pk	10.2	-30.6	22.95	43.52	-20.57	0-360	100	V
5	208	39.84	Pk	11.6	-30.3	21.14	43.52	-22.38	0-360	200	H
6	416	40.21	Pk	15.4	-29.7	25.91	46.02	-20.11	0-360	100	H

Pk - Peak detector

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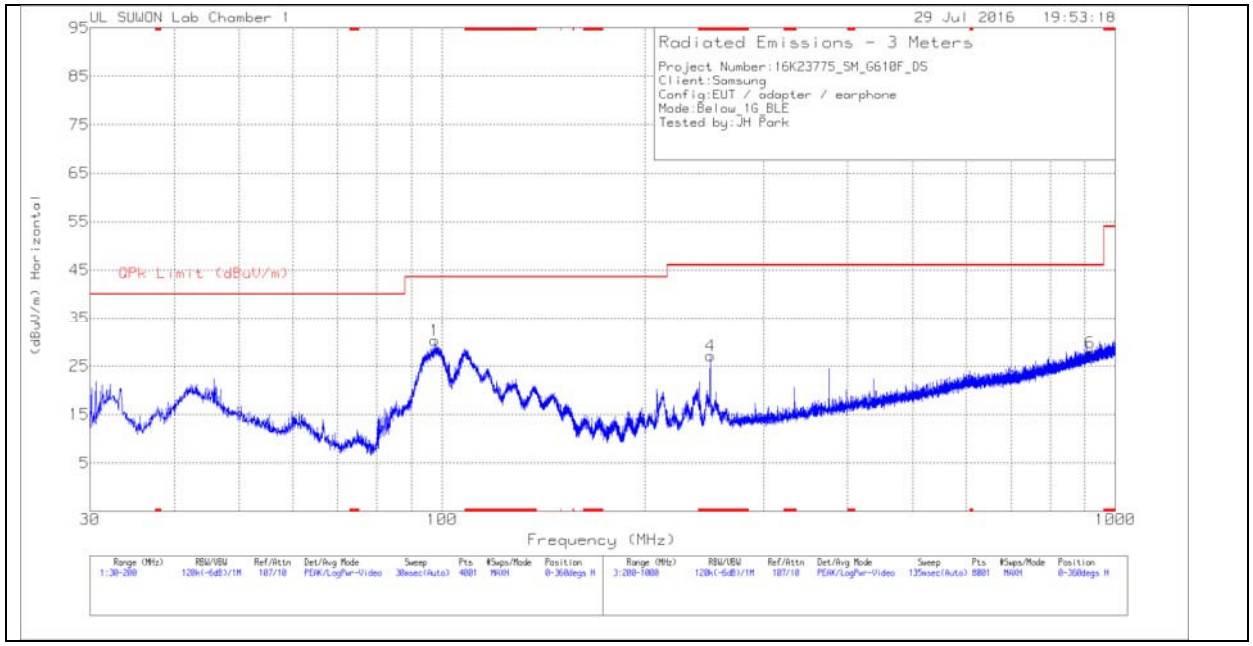
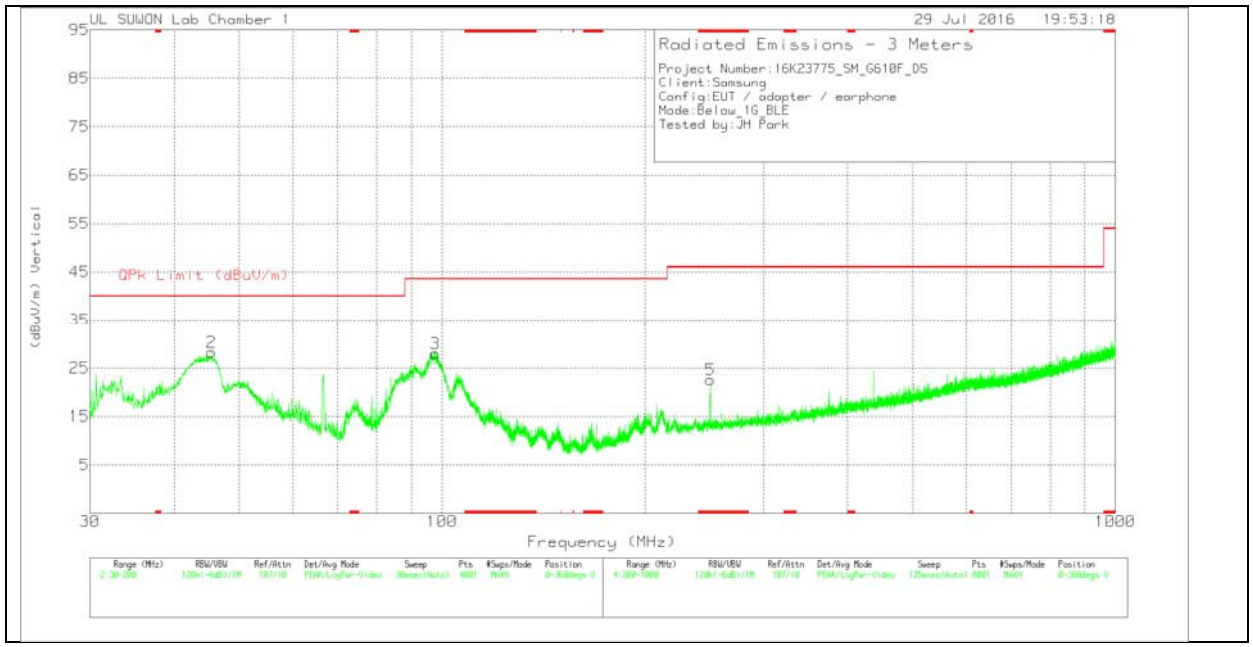
11.3.2. SM-G610F/DS

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	97.4475	48.65	Pk	11	-29.3	30.35	43.52	-13.17	0-360	300	H
2	45.47	44.87	Pk	13.6	-30.2	28.27	40	-11.73	0-360	100	V
3	97.745	46.19	Pk	11.1	-29.3	27.99	43.52	-15.53	0-360	100	V
4	* 250.2	42.77	Pk	12.3	-27.9	27.17	46.02	-18.85	0-360	100	H
6	917.1	29.16	Pk	22.1	-23.5	27.76	46.02	-18.26	0-360	100	H
5	* 250.2	38.19	Pk	12.3	-27.9	22.59	46.02	-23.43	0-360	200	V

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

Pk - Peak detector

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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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

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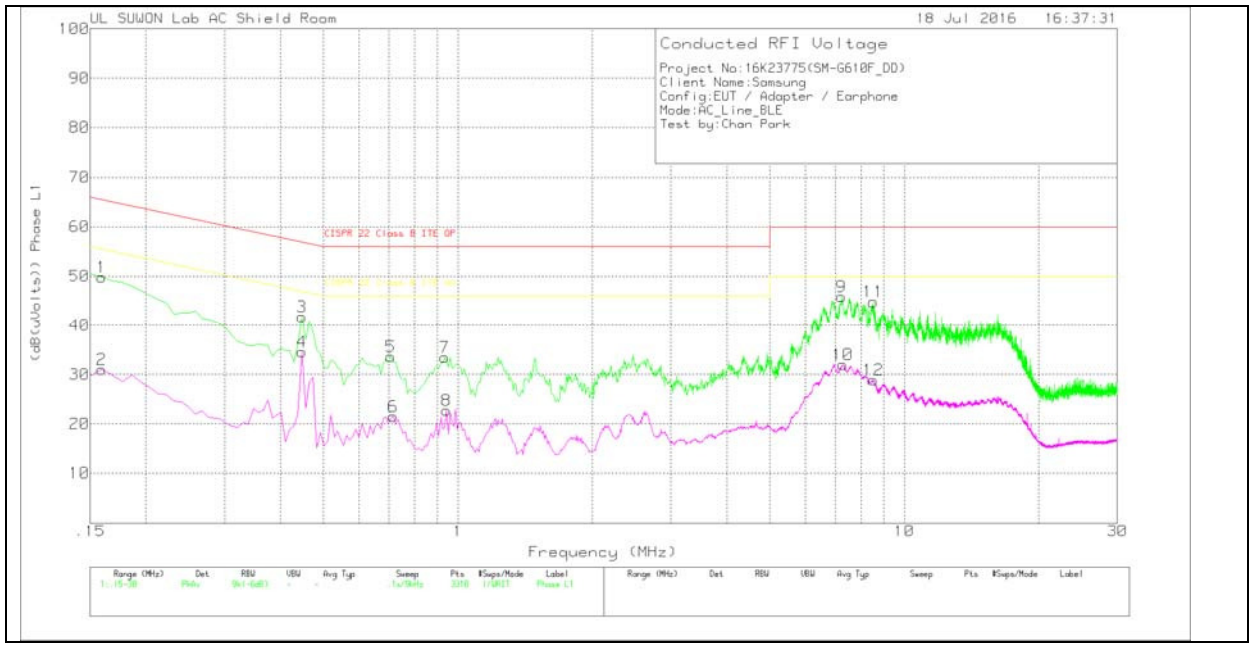
12.1. SM-G610F/DD

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_with 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	.159	39.77	Pk	10	0	49.77	65.52	-15.75	-	-
2	.159	21.02	Av	10	0	31.02	-	-	55.52	-24.5
3	.447	31.65	Pk	10.1	0	41.75	56.93	-15.18	-	-
4	.447	24.54	Av	10.1	0	34.64	-	-	46.93	-12.29
5	.708	23.64	Pk	10	0	33.64	56	-22.36	-	-
6	.717	11.45	Av	10	0	21.45	-	-	46	-24.55
7	.933	23.6	Pk	9.9	0	33.5	56	-22.5	-	-
8	.942	12.83	Av	9.9	0	22.73	-	-	46	-23.27
9	7.242	35.88	Pk	9.9	.1	45.88	60	-14.12	-	-
10	7.269	22.06	Av	9.9	.1	32.06	-	-	50	-17.94
11	8.529	34.81	Pk	9.9	.1	44.81	60	-15.19	-	-
12	8.511	18.92	Av	9.9	.1	28.92	-	-	50	-21.08

Pk - Peak detector

Av - Average detection

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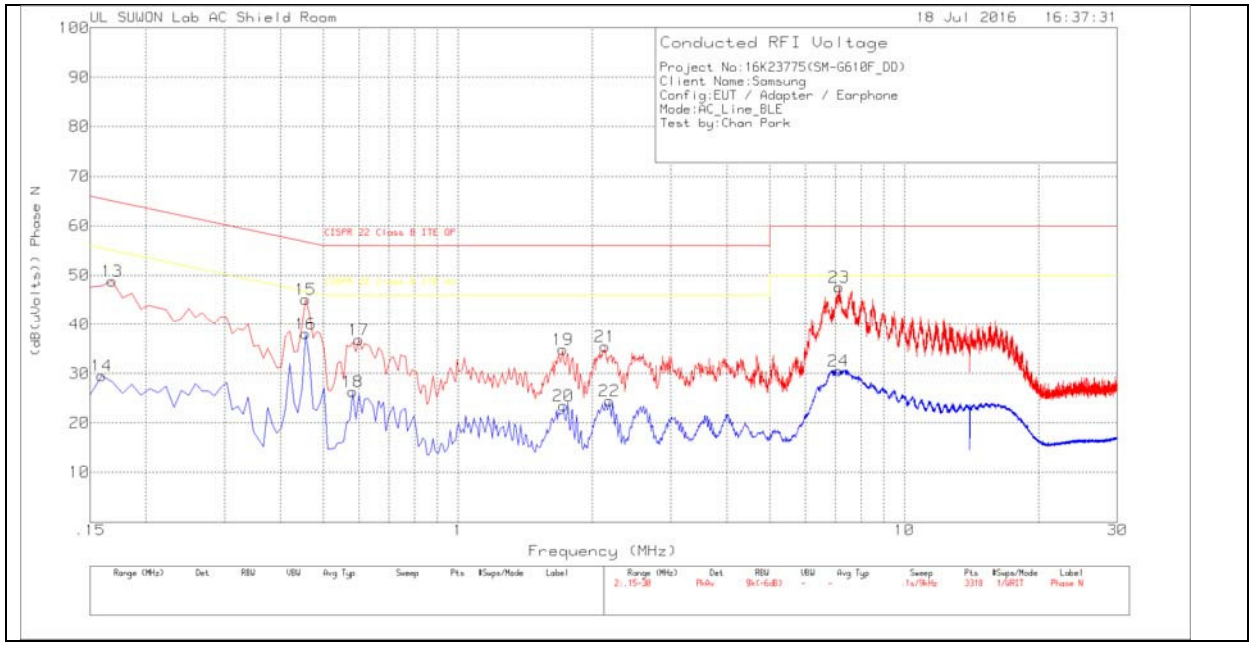
LINE 2 PLOT



LINE 2 RESULTS

Trace Markers

Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_with 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	.168	38.6	Pk	10.2	0	48.8	65.06	-16.26	-	-
14	.159	19.48	Av	10	0	29.48	-	-	55.52	-26.04
15	.456	35.04	Pk	10.1	0	45.14	56.77	-11.63	-	-
16	.456	27.91	Av	10.1	0	38.01	-	-	46.77	-8.76
17	.6	26.77	Pk	10.1	0	36.87	56	-19.13	-	-
18	.582	16.19	Av	10.1	0	26.29	-	-	46	-19.71
19	1.716	24.9	Pk	9.8	.1	34.8	56	-21.2	-	-
20	1.725	13.54	Av	9.8	.1	23.44	-	-	46	-22.56
21	2.139	25.56	Pk	9.8	.1	35.46	56	-20.54	-	-
22	2.184	14.58	Av	9.8	.1	24.48	-	-	46	-21.52
23	7.143	37.54	Pk	9.9	.1	47.54	60	-12.46	-	-
24	7.116	20.54	Av	9.9	.1	30.54	-	-	50	-19.46

Pk - Peak detector

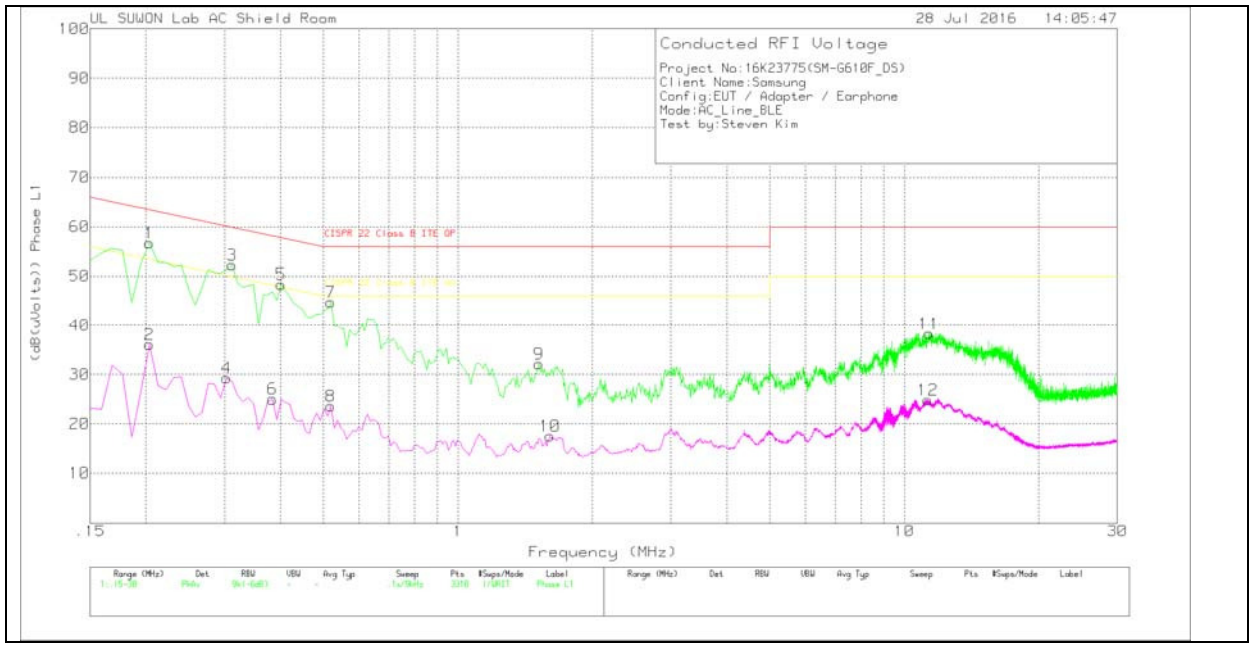
Av - Average detection

12.2. SM-G610F/DS

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_with 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	.204	46.8	Pk	9.9	0	56.7	63.45	-6.75	-	-
2	.204	26.18	Av	9.9	0	36.08	-	-	53.45	-17.37
3	.312	42.38	Pk	9.9	0	52.28	59.92	-7.64	-	-
4	.303	19.38	Av	9.9	0	29.28	-	-	50.16	-20.88
5	.402	38.29	Pk	10.1	0	48.39	57.81	-9.42	-	-
6	.384	14.92	Av	10.1	0	25.02	-	-	48.19	-23.17
7	.519	34.49	Pk	10.2	0	44.69	56	-11.31	-	-
8	.519	13.38	Av	10.2	0	23.58	-	-	46	-22.42
9	1.518	22.21	Pk	9.8	.1	32.11	56	-23.89	-	-
10	1.608	7.6	Av	9.8	.1	17.5	-	-	46	-28.5
11	11.364	28.12	Pk	10	.2	38.32	60	-21.68	-	-
12	11.292	14.63	Av	10	.2	24.83	-	-	50	-25.17

Pk - Peak detector

Av - Average detection

Quasi-Peak Emissions

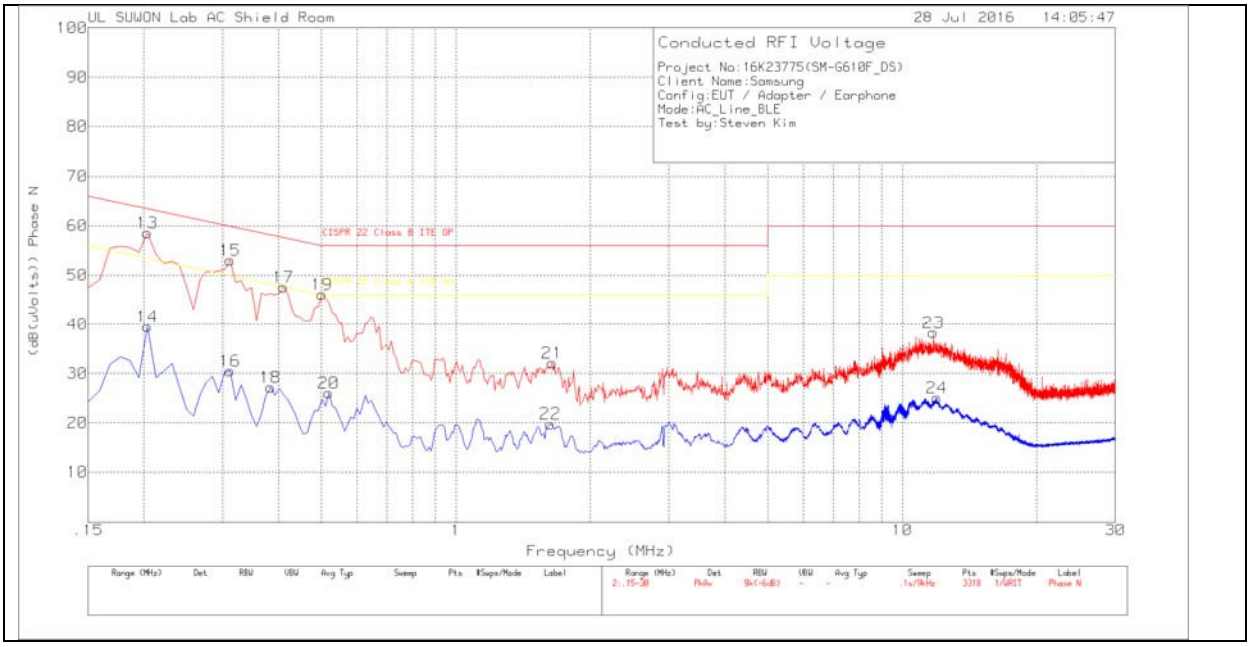
Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101837_with 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)
.1707	42.46	Qp	10.2	0	52.66	64.93	-12.27	-	-
.1995	41.76	Qp	10	0	51.76	63.63	-11.87	-	-
.2085	41.04	Qp	9.9	0	50.94	63.26	-12.32	-	-
.3696	30.97	Qp	10.1	0	41.07	58.51	-17.44	-	-

Qp – Quasi-Peak detector

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

LINE 2 PLOT



LINE 2 RESULTS

Trace Markers

Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_with 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	.204	48.71	Pk	9.9	0	58.61	63.45	-4.84	-	-
14	.204	29.66	Av	9.9	0	39.56	-	-	53.45	-13.89
15	.312	43.08	Pk	9.9	0	52.98	59.92	-6.94	-	-
16	.312	20.61	Av	9.9	0	30.51	-	-	49.92	-19.41
17	.411	37.5	Pk	10.1	0	47.6	57.63	-10.03	-	-
18	.384	17.03	Av	10.1	0	27.13	-	-	48.19	-21.06
19	.501	36.01	Pk	10.1	0	46.11	56	-9.89	-	-
20	.519	15.95	Av	10.1	0	26.05	-	-	46	-19.95
21	1.644	22.26	Pk	9.8	.1	32.16	56	-23.84	-	-
22	1.626	9.92	Av	9.8	.1	19.82	-	-	46	-26.18
23	11.742	27.86	Pk	10.2	.2	38.26	60	-21.74	-	-
24	11.949	14.62	Av	10.2	.2	25.02	-	-	50	-24.98

Pk - Peak detector

Av - Average detection

Quasi-Peak Emissions

Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101837_with 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)
.1707	42	Qp	10.2	0	52.2	64.93	-12.73	-	-
.2085	40.95	Qp	9.9	0	50.85	63.26	-12.41	-	-
.3687	30.77	Qp	10.1	0	40.87	58.53	-17.66	-	-

Qp – Quasi-Peak detector