



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1**

Bluetooth Low Energy

CERTIFICATION TEST REPORT

FOR

Wi-Fi/BT Transceiver

MODEL NUMBER : WCM730Q

FCC ID: A3LWCM730Q

IC ID : 649E-WCM730Q

REPORT NUMBER: 4787630783-E2V1

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Prepared for

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	10/31/16	Initial issue	Junwhan Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: Wi-Fi/BT Transceiver
MODEL NUMBER: WCM730Q
EUT WLAN MAC ADDRESS: B8BBAFC457EA, B8BBAFC457E9
B8BBAFC45874, B8BBAFC458A6 (RADIATED)
B8BBAFC45850, B8BBAFC45844 (CONDUCTED)
DATE TESTED: OCT 10, 2016 - OCT 28, 2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass
INDUSTRY CANADA RSS-GEN Issue 4	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 FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 558074 D01 v03r05, ANSI C63.10-2013 for FCC and ANSI C63.10-2013, RSS-GEN Issue 4, RSS-247 Issue 1 for IC.

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 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 Wi-Fi/BT Transceiver.
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	4.150	2.60
		Average	3.774	2.38

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an Metal Inverted F antenna, with a maximum gain of -0.1 dBi

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

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

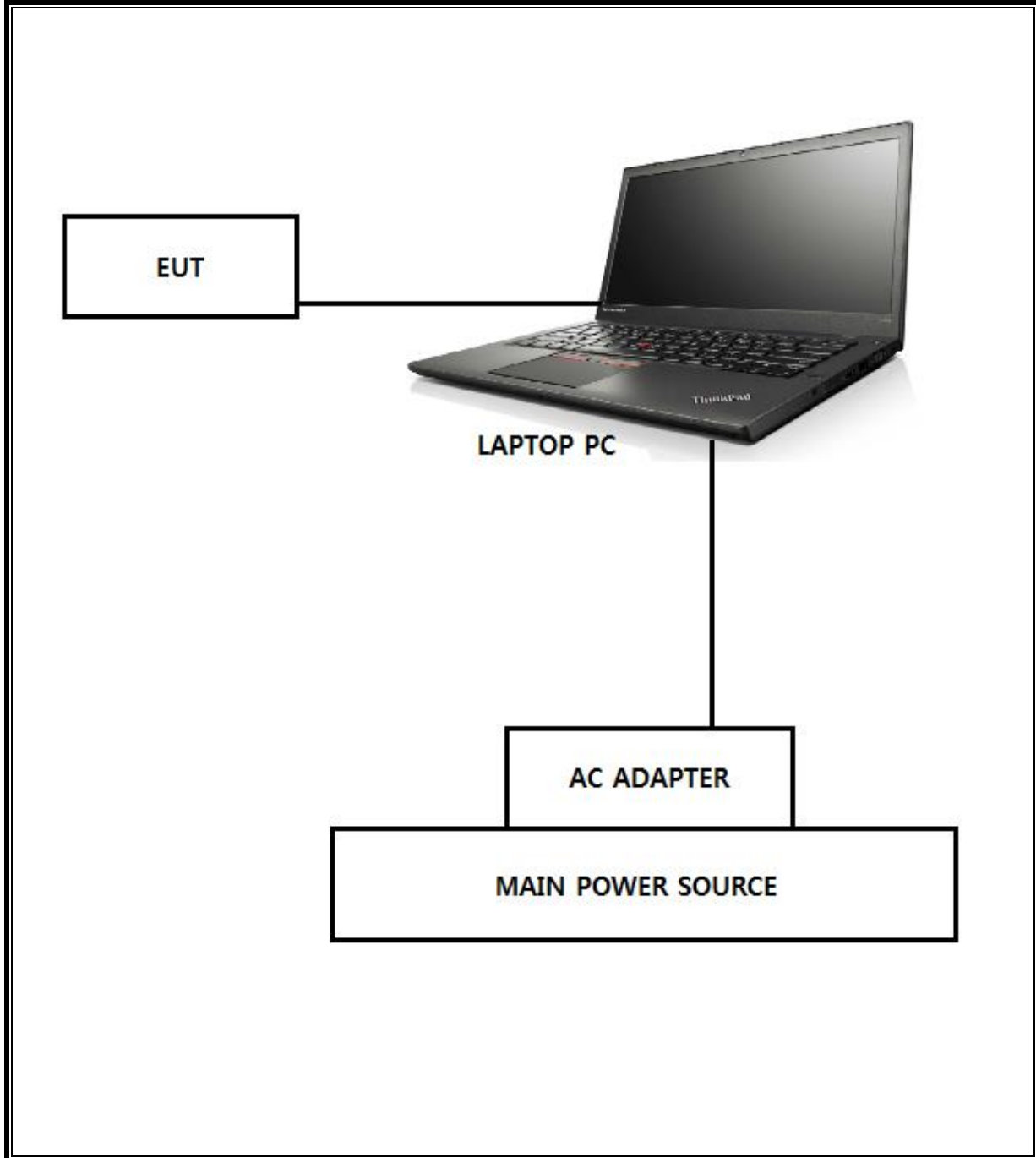
SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
USB Cable	SAMSUNG	USB Cable	N/A	N/A
LAPTOP PC	LENOVO	T450	PC-07B394	N/A
ADAPTER	LENOVO	ADLX65NDC3A	N/A	N/A

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



5.6. MANUFACTURER and FACTORY INFORMATION

5.6.1. Manufacturer

1. Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea, 16677

5.6.2. Factory

1. WISOL CO., LTD.
531-7 Gajang-ro, Osan-si, Gyeonggi-do, Korea
2. WISOL HANOI Co., Ltd.
26, ROAD 05, VSIP, PHU CHAN COMMUNE, TU SON DISTRICT,
BAC NINH PROVINCE, VIETNAM
3. ShenZhen Zowee Technology Co., Ltd
Block 5, Science&Technology Industrial Park of Privately Owned
Enterprises, Pingshan, Xili Nanshan District Shenzhen Guangdong
518055, China
4. ShenZhen Zowee Technology Co., Ltd
BaoAn Subcompany Zowee Factory Tongfuyu Industrial Zone
Songgang, Baoan District Shenzhen Guangdong 518105, China
ShenZhen Zowda Precision Mold Co., Ltd
5. Block 2&Block 3(Floor 1&2) Zowee Factory Tongfuyu Industrial Zone
Songgang, Baoan District Shenzhen Guangdong 518055, China
6. TianJin Zowda Science and Technology Develop Co., Ltd
Between Xinye 1 Street and Xinhuan South Street West Zone,
Economic Development Area Tianjin 300457, China
7. Chengdu Xuguang Technology Co., Ltd.
No.86 2nd Section, Park Road, Longquanyi District, Chengdu City, Sichuan Province,
P.R.China

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	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	08-17-17
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-16-17
Preamplifier	ETS	3115-PA	00167475	08-17-17
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-16-17
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-17-17
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-16-17
Average Power Sensor	R&S	NRZ-Z91	102681	08-16-17
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-17-17
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-17-17
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-16-17
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-16-17
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-17-17
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-16-17
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-17-17
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-16-17
High Pass Filter 6GHz	Micro-Tronics	HPM17542	009	08-17-17
High Pass Filter 6GHz	Micro-Tronics	HPM17542	016	08-16-17
LISN	R&S	ENV-216	101836	08-16-17
LISN	R&S	ENV-216	101837	08-16-17
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	11-25-17
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-16-17

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.

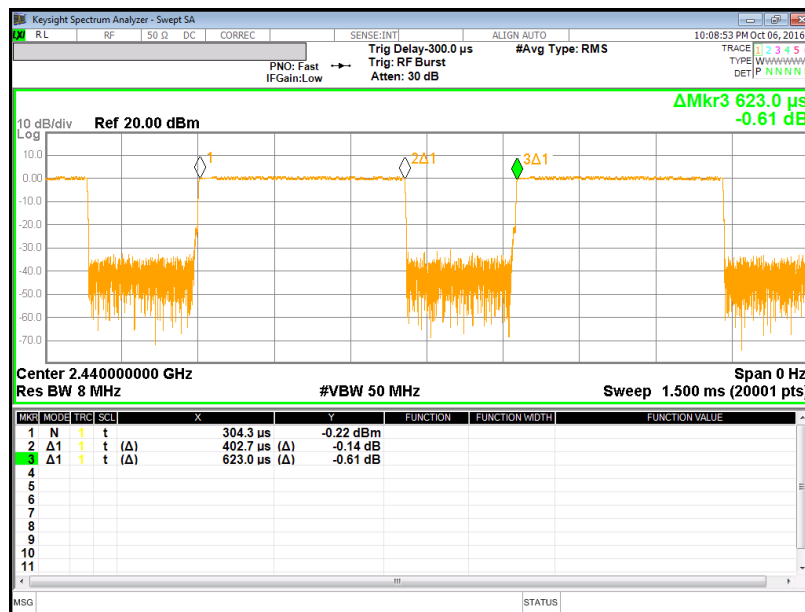
8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

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	0.403	0.623	0.646	64.6%	1.90	2.483



9. SUMMARY TABLE

FCC Part Section	IC Section	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	RSS-247 5.2(1)	Occupied Band width (6dB)	>500KHz	Conducted	Pass	659.2 kHz
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-22.926 dBm
15.247	RSS-247 5.4(4)	TX conducted output power	<30dBm		Pass	4.15 dBm (Peak)
15.247	RSS-247 5.2(2)	PSD	<8dBm		Pass	-11.091 dBm (Peak)
15.205, 15.209	RSS-GEN Clause 7 & 8.9	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	48.24 dBuV/m (Av)
15.207 (a)	RSS-GEN Clause 8.8	AC Power Line conducted emissions	Section 12	Power Line conducted	Pass	52.91 dBuV (Qp)

10. ANTENNA PORT TEST RESULTS

10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)
IC RSS-247 §5.2 (1)

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

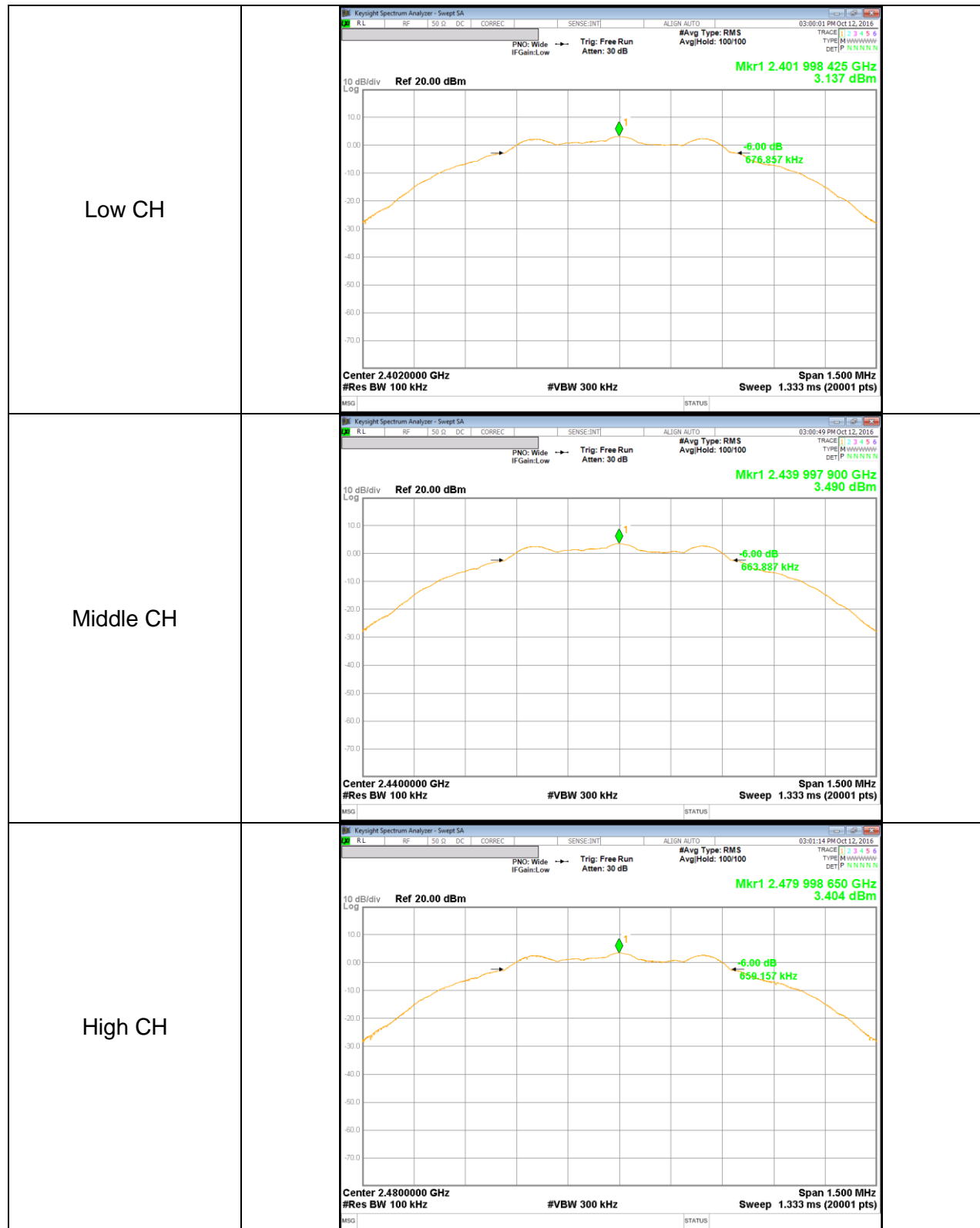
TEST PROCEDURE

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	676.9	500.0
Mid	2440	663.9	500.0
High	2480	659.2	500.0
Worst		659.2	500.0

6 dB BANDWIDTH PLOTS



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	1.068
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 300 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>1.21 dBm</td> </tr> <tr> <td>1.0663 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>9.158 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.226 MHz</td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	1.21 dBm	1.0663 MHz			Transmit Freq Error	OBW Power	99.00 %	9.158 kHz	x dB	-26.00 dB	x dB Bandwidth	1.226 MHz	
Occupied Bandwidth	Total Power	1.21 dBm														
1.0663 MHz																
Transmit Freq Error	OBW Power	99.00 %														
9.158 kHz	x dB	-26.00 dB														
x dB Bandwidth	1.226 MHz															
<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 300 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>1.58 dBm</td> </tr> <tr> <td>1.0675 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>7.480 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.226 MHz</td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	1.58 dBm	1.0675 MHz			Transmit Freq Error	OBW Power	99.00 %	7.480 kHz	x dB	-26.00 dB	x dB Bandwidth	1.226 MHz	
Occupied Bandwidth	Total Power	1.58 dBm														
1.0675 MHz																
Transmit Freq Error	OBW Power	99.00 %														
7.480 kHz	x dB	-26.00 dB														
x dB Bandwidth	1.226 MHz															
<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 300 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>1.50 dBm</td> </tr> <tr> <td>1.0686 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>6.764 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.226 MHz</td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	1.50 dBm	1.0686 MHz			Transmit Freq Error	OBW Power	99.00 %	6.764 kHz	x dB	-26.00 dB	x dB Bandwidth	1.226 MHz	
Occupied Bandwidth	Total Power	1.50 dBm														
1.0686 MHz																
Transmit Freq Error	OBW Power	99.00 %														
6.764 kHz	x dB	-26.00 dB														
x dB Bandwidth	1.226 MHz															

10.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)
IC RSS-247 §5.4 (4)

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

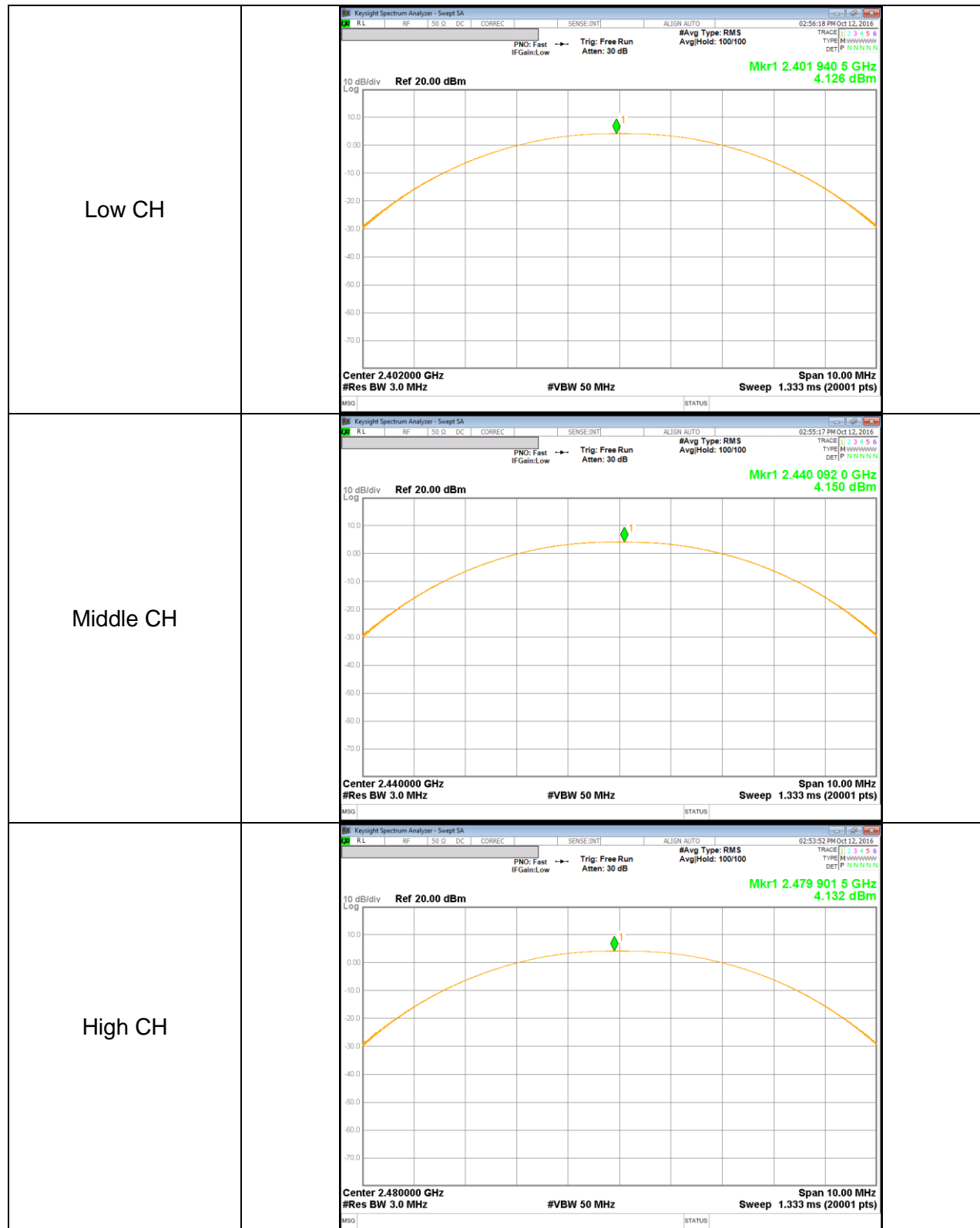
TEST PROCEDURE

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	4.126	30.000	-25.874
Mid	2440	4.150	30.000	-25.850
High	2480	4.132	30.000	-25.868
Worst		4.150		-25.850

OUTPUT POWER PLOTS



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	3.720	2.36
Middle	2440	3.774	2.38
High	2480	3.714	2.35

10.5. PSD

LIMITS

FCC §15.247
IC RSS-247 §5.2 (2)

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.

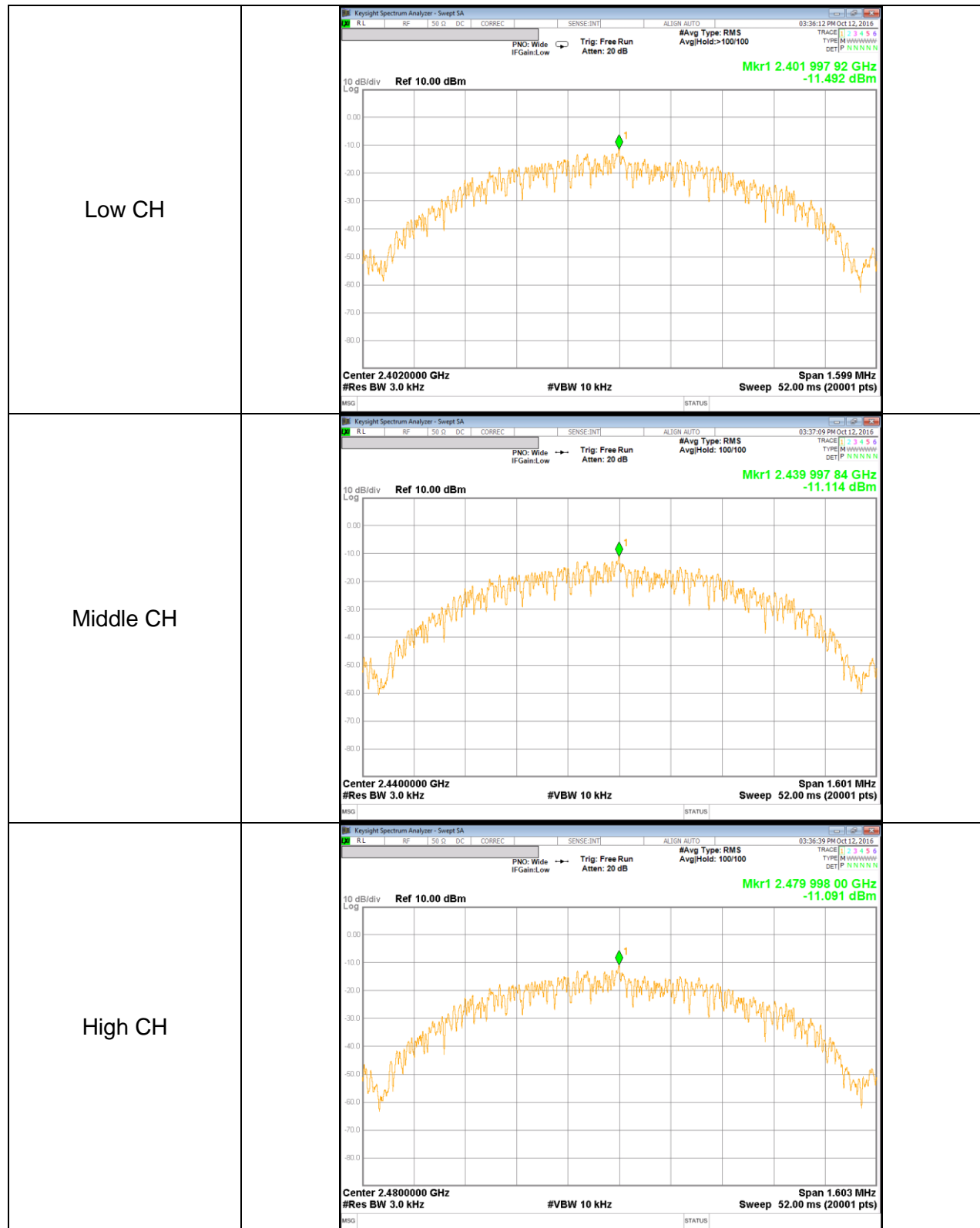
TEST PROCEDURE

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	-11.492	8.00	-19.49
Mid	2440	-11.114	8.00	-19.11
High	2480	-11.091	8.00	-19.09

POWER SPECTRAL DENSITY PLOTS



10.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)
IC RSS-247 §5.5

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

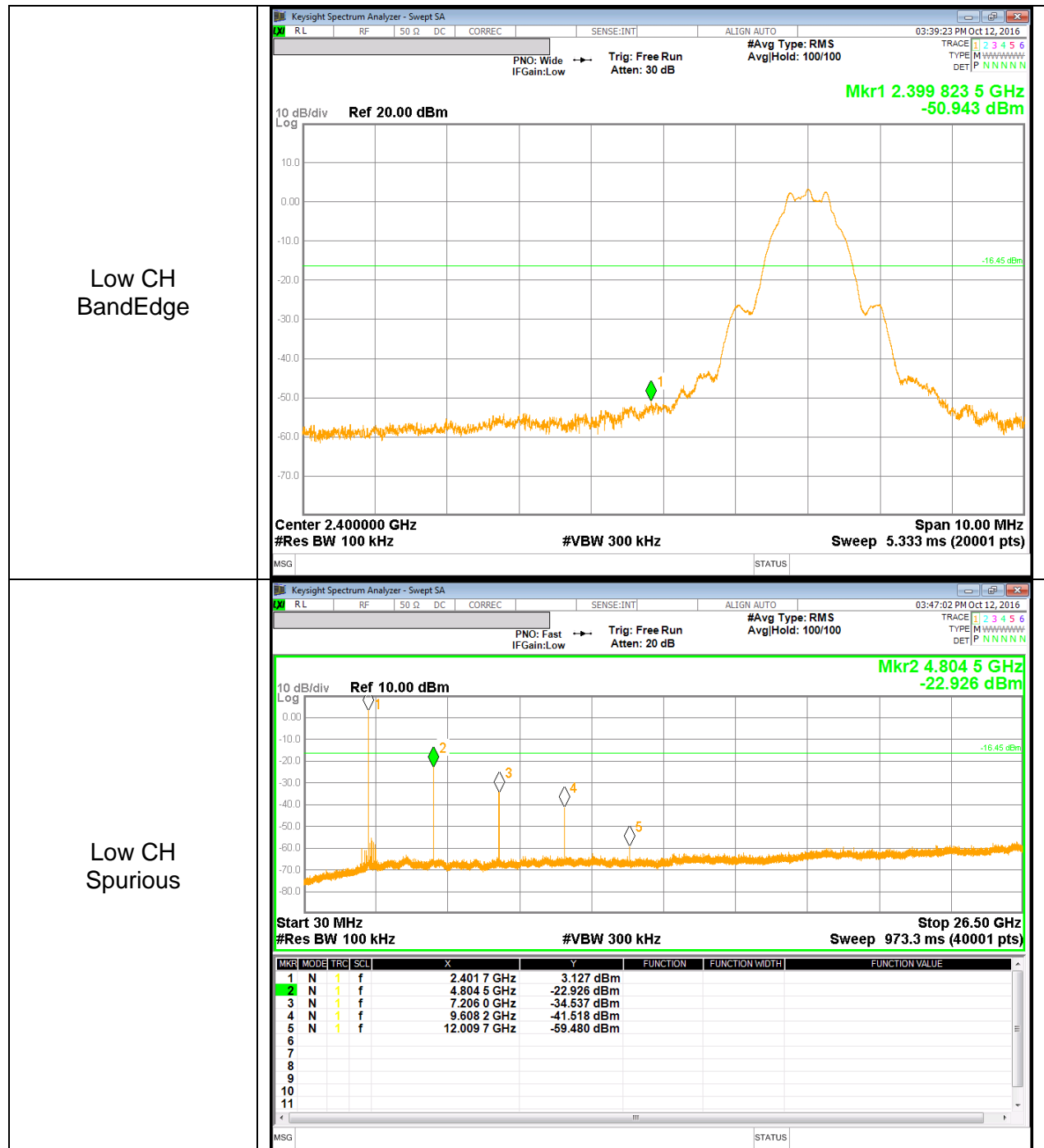
TEST PROCEDURE

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.

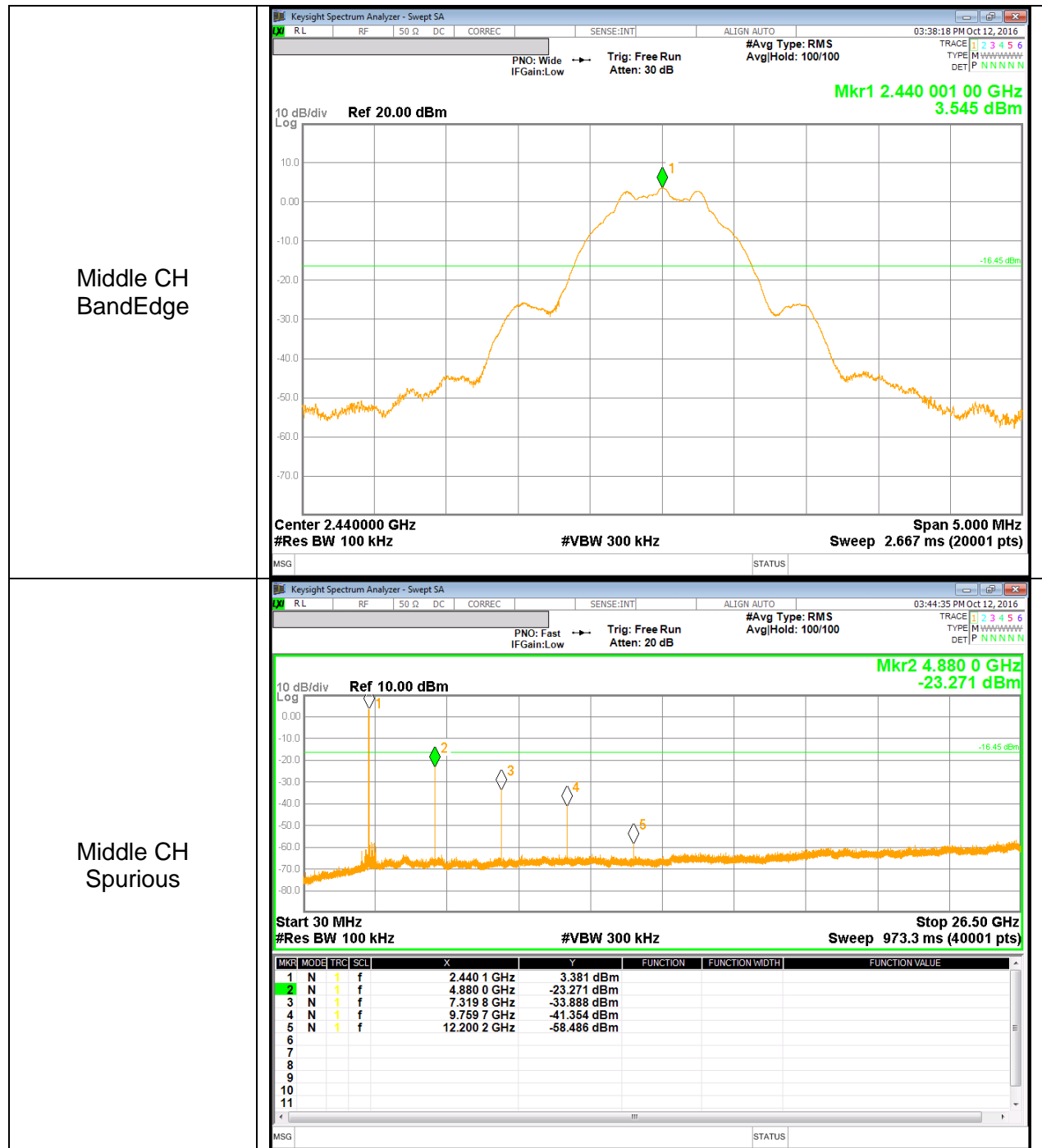
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

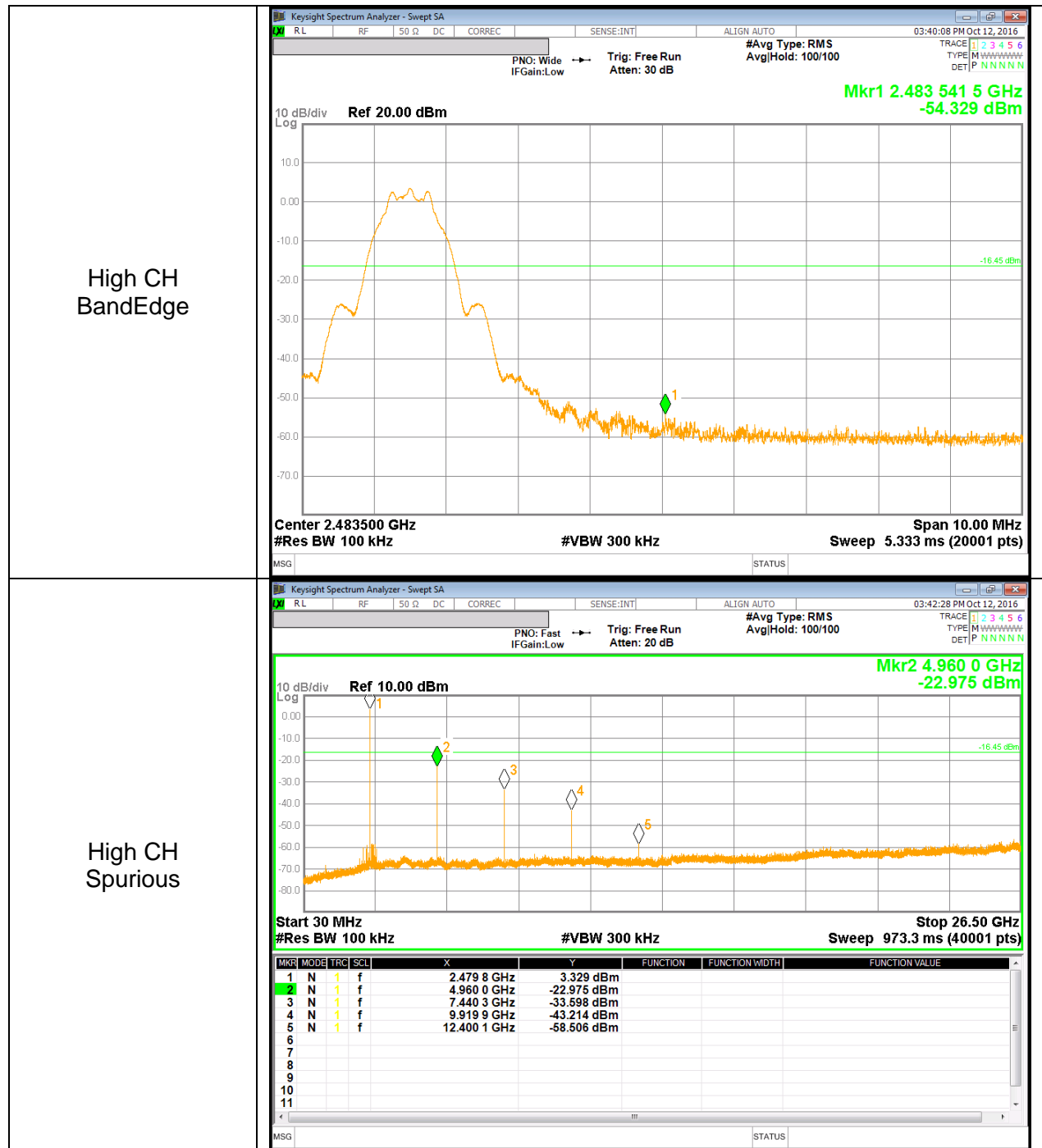
BANDEDGE & SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



11. RADIATED TEST RESULTS

11.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209
IC RSS-GEN Clause 8.9 (Transmitter)
IC RSS-GEN Clause 7 (Receiver)

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits ($\mu\text{V/m}$)	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. (Restricted bandedge, Final detection of spurious harmonic emissions)
Duty cycle factor = $10 \log(1/x)$. For this sample: $DCF = 10\log(1/0.646)=1.90\text{dB}$
(Spectrum Analyzer round it up to 1.90dB)

Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

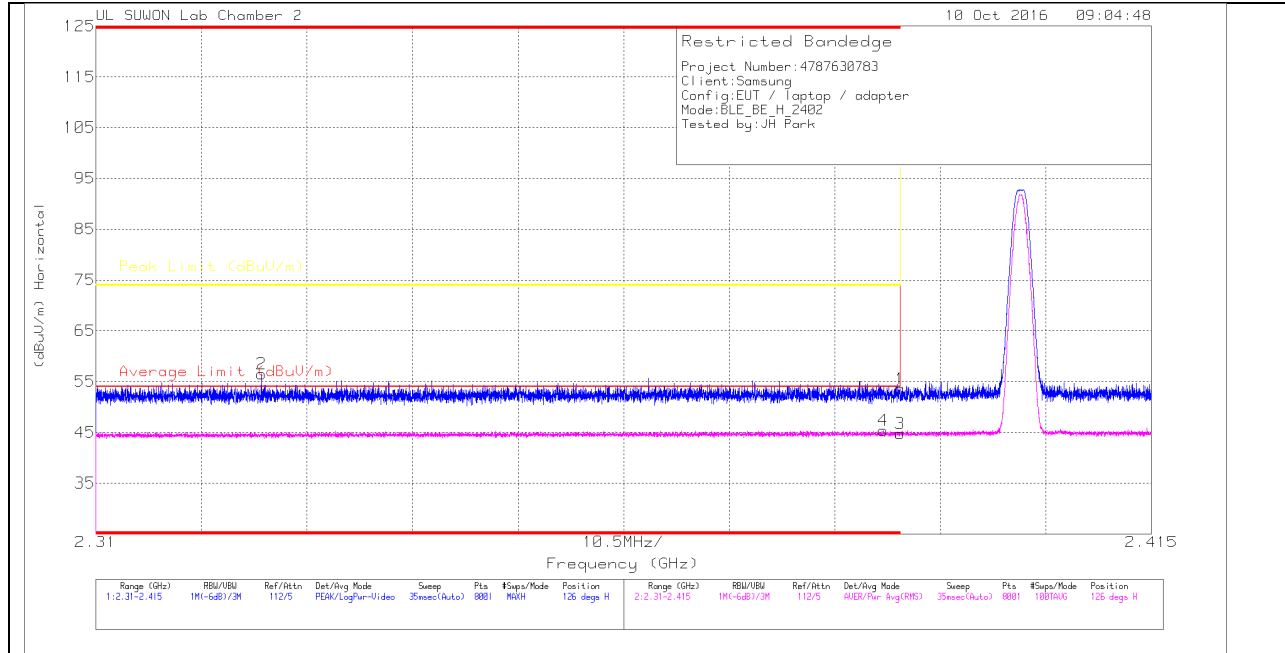
The spectrum from 1 GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

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 : Spurious emissions from 5.95GHz to 6GHz were generated by laptop PC.
Refer to the section 11.3, test result of stand alone condition of laptop PC.

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

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

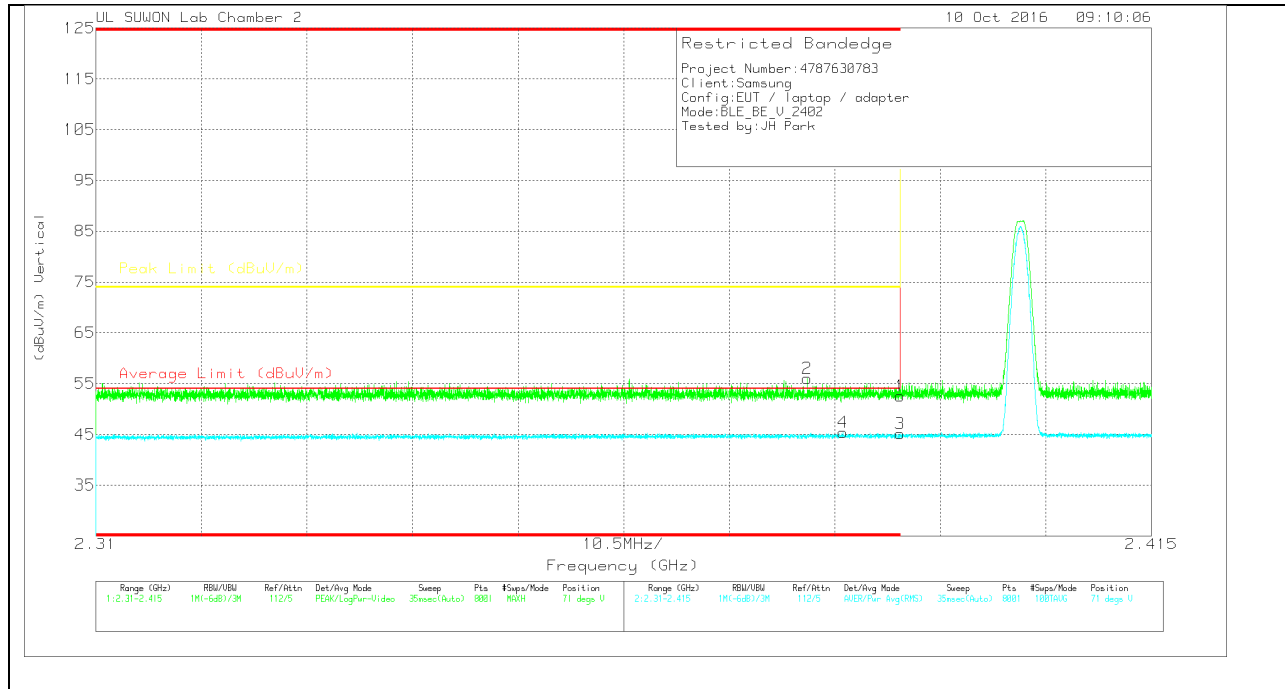
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 24)_150619	Path_2_10dB	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.39	Pk	31.7	-19.5	0	53.59	-	-	74	-20.41	126	123	H
2	* 2.326	44.58	Pk	31.6	-19.7	0	56.48	-	-	74	-17.52	126	123	H
3	* 2.39	30.61	RMS	31.7	-19.5	1.9	44.71	54	-9.29	-	-	126	123	H
4	* 2.388	31.23	RMS	31.7	-19.5	1.9	45.33	54	-8.67	-	-	126	123	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	40.31	Pk	31.7	-19.5	0	52.51	-	-	74	-21.49	71	326	V
2	* 2.381	43.86	Pk	31.7	-19.5	0	56.06	-	-	74	-17.94	71	326	V
3	* 2.39	31.02	RMS	31.7	-19.5	1.9	45.12	54	-8.88	-	-	71	326	V
4	* 2.384	31.29	RMS	31.7	-19.5	1.9	45.39	54	-8.61	-	-	71	326	V

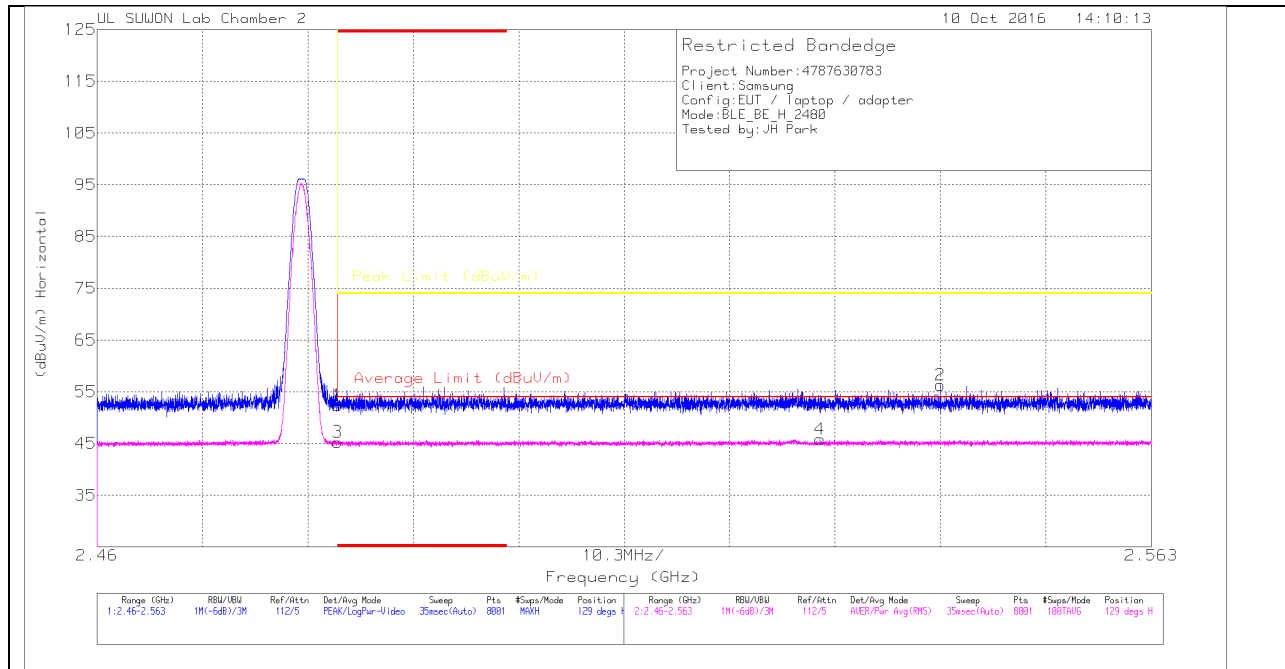
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

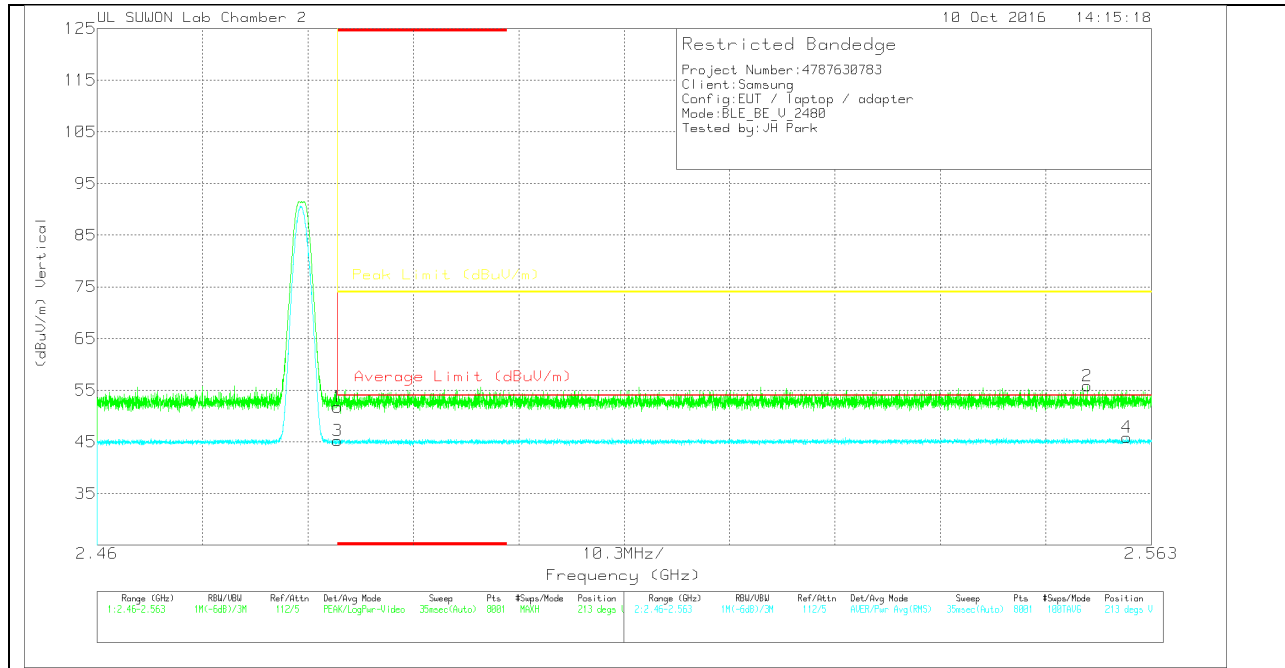
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 24)_150619	Path_2_10dB	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.95	Pk	31.8	-19.4	0	52.35	-	-	74	-21.65	129	100	H
2	2.542	43.69	Pk	31.9	-19.3	0	56.29	-	-	74	-17.71	129	100	H
3	* 2.484	30.98	RMS	31.8	-19.4	1.9	45.28	54	-8.72	-	-	129	100	H
4	2.531	31.37	RMS	31.9	-19.3	1.9	45.87	54	-8.13	-	-	129	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 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	* 2.484	39.37	Pk	31.8	-19.4	0	51.77	-	-	74	-22.23	213	400	V
2	2.557	43.25	Pk	31.9	-19.3	0	55.85	-	-	74	-18.15	213	400	V
3	* 2.484	30.92	RMS	31.8	-19.4	1.9	45.22	54	-8.78	-	-	213	400	V
4	2.561	31.39	RMS	31.9	-19.3	1.9	45.89	54	-8.11	-	-	213	400	V

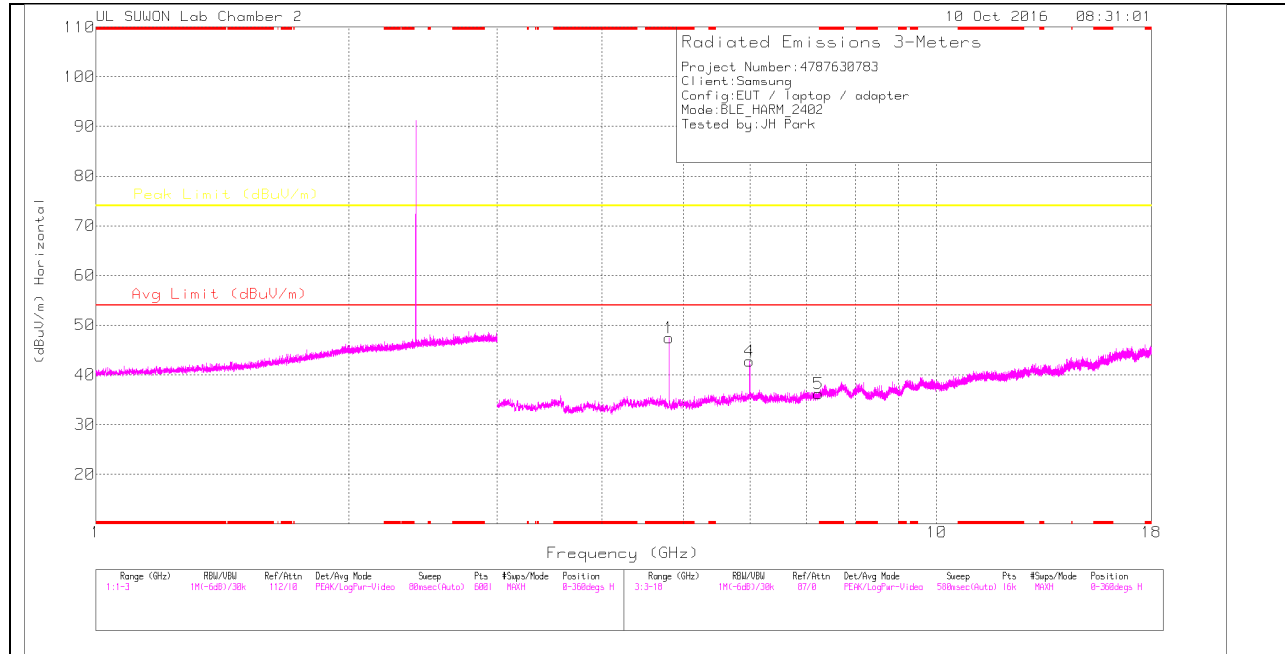
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

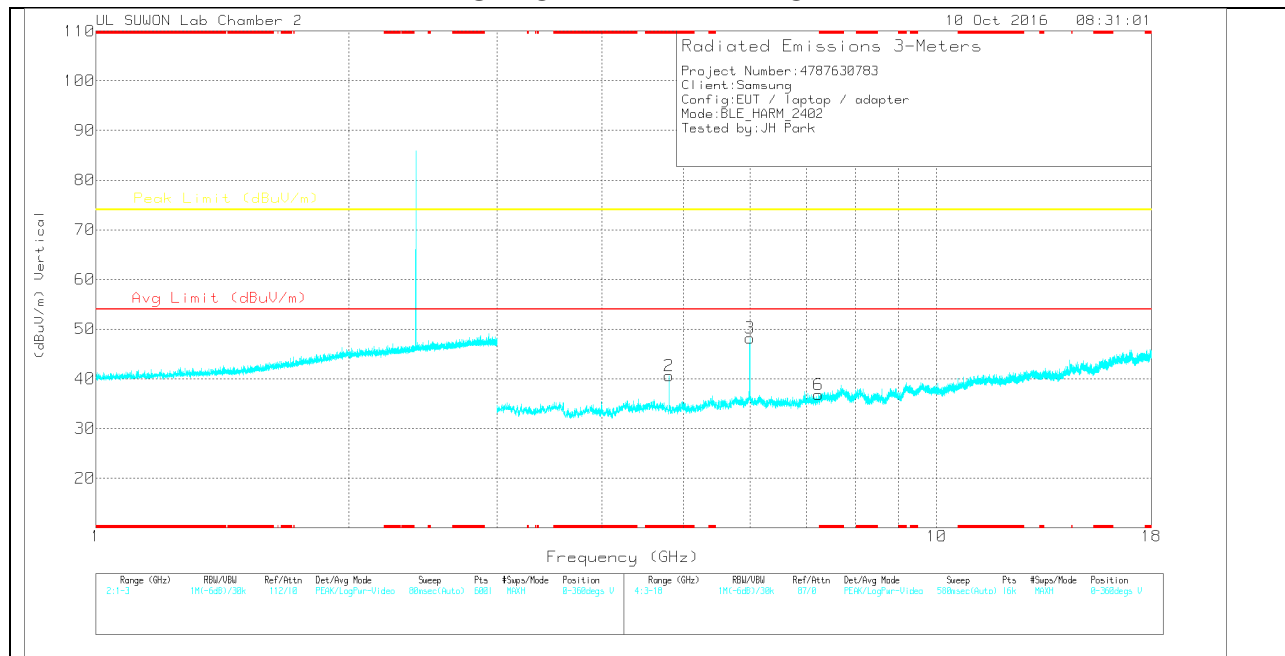
RMS - RMS detection

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(0016872 4)_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	38.83	PK	33.9	-25.3	0	47.43	-	-	74	-26.57	0-360	250	H
4	5.988	31.71	PK	34.8	-23.8	0	42.71	-	-	74	-31.29	0-360	250	H
5	7.238	23.39	PK	35.8	-23	0	36.19	-	-	74	-37.81	0-360	250	H
2	* 4.804	32.02	PK	33.9	-25.3	0	40.62	-	-	74	-33.38	0-360	250	V
3	5.998	37.26	PK	34.8	-23.8	0	48.26	-	-	74	-25.74	0-360	250	V
6	7.233	24.06	PK	35.8	-23	0	36.86	-	-	74	-37.14	0-360	250	V

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

PK – Peak Detector

Radiated Emissions

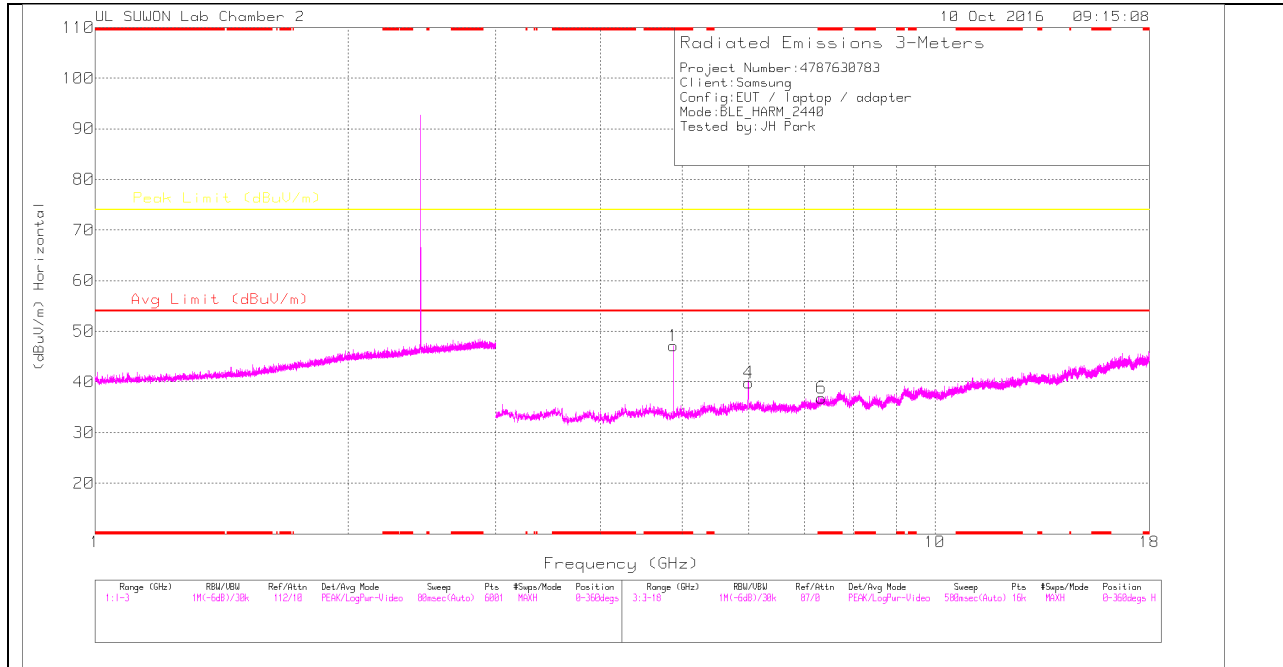
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8724)_150 619	Path_3	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.803	44.64	PK2	33.9	-25.3	0	53.24	-	-	74	-20.76	48	100	H
* 4.804	37.74	MAv1	33.9	-25.3	1.9	48.24	54	-5.76	-	-	48	100	H
* 4.804	39.78	PK2	33.9	-25.3	0	48.38	-	-	74	-25.62	175	364	V
* 4.804	29.65	MAv1	33.9	-25.3	1.9	40.15	54	-13.85	-	-	175	364	V
5.988	43.05	PK2	34.8	-23.8	0	54.05	-	-	74	-19.95	4	347	V
5.99	39.76	PK2	34.8	-23.8	0	50.76	-	-	74	-23.24	168	113	H

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

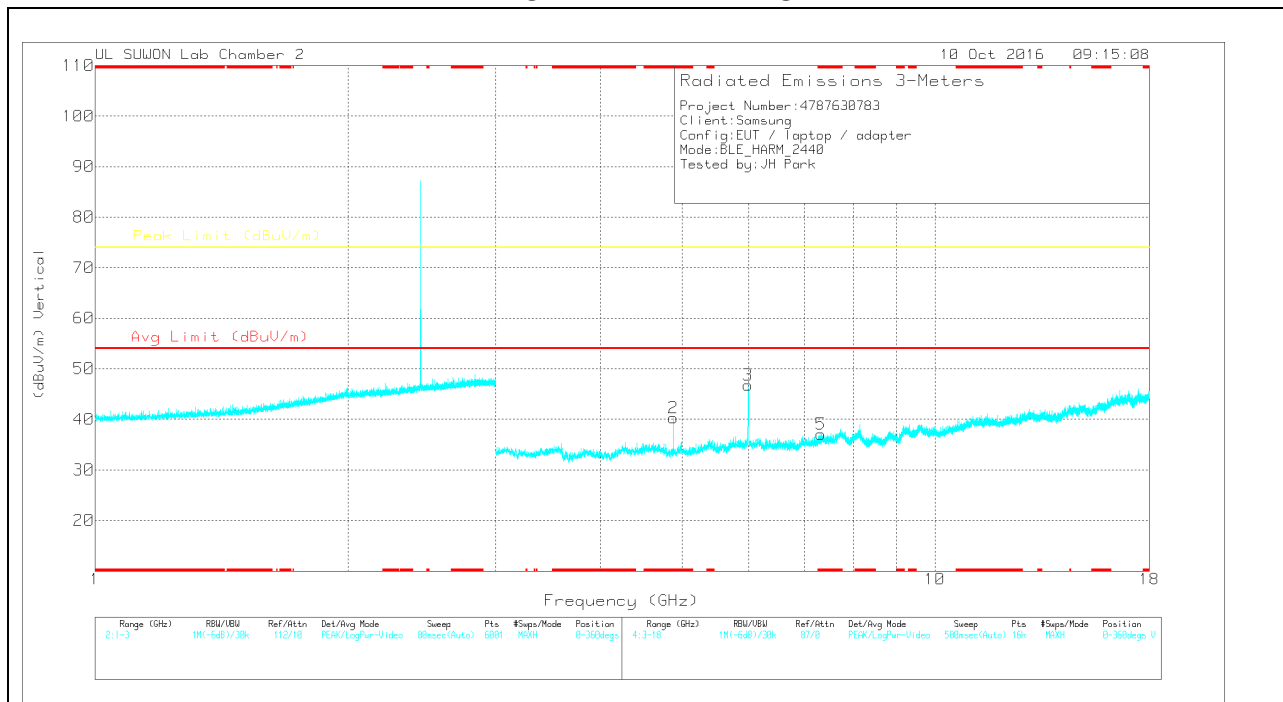
PK2 - KDB558074 Method: Maximum Peak

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(0016872 4)_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	38.42	PK	33.9	-25.2	0	47.12	-	-	74	-26.88	0-360	150	H
4	5.998	28.83	PK	34.8	-23.8	0	39.83	-	-	74	-34.17	0-360	150	H
6	* 7.328	23.45	PK	35.9	-22.5	0	36.85	-	-	74	-37.15	0-360	150	H
2	* 4.88	31.58	PK	33.9	-25.2	0	40.28	-	-	74	-33.72	0-360	250	V
3	5.989	35.76	PK	34.8	-23.8	0	46.76	-	-	74	-27.24	0-360	250	V
5	* 7.319	23.75	PK	35.9	-22.6	0	37.05	-	-	74	-36.95	0-360	150	V

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

PK – Peak Detector

Radiated Emissions

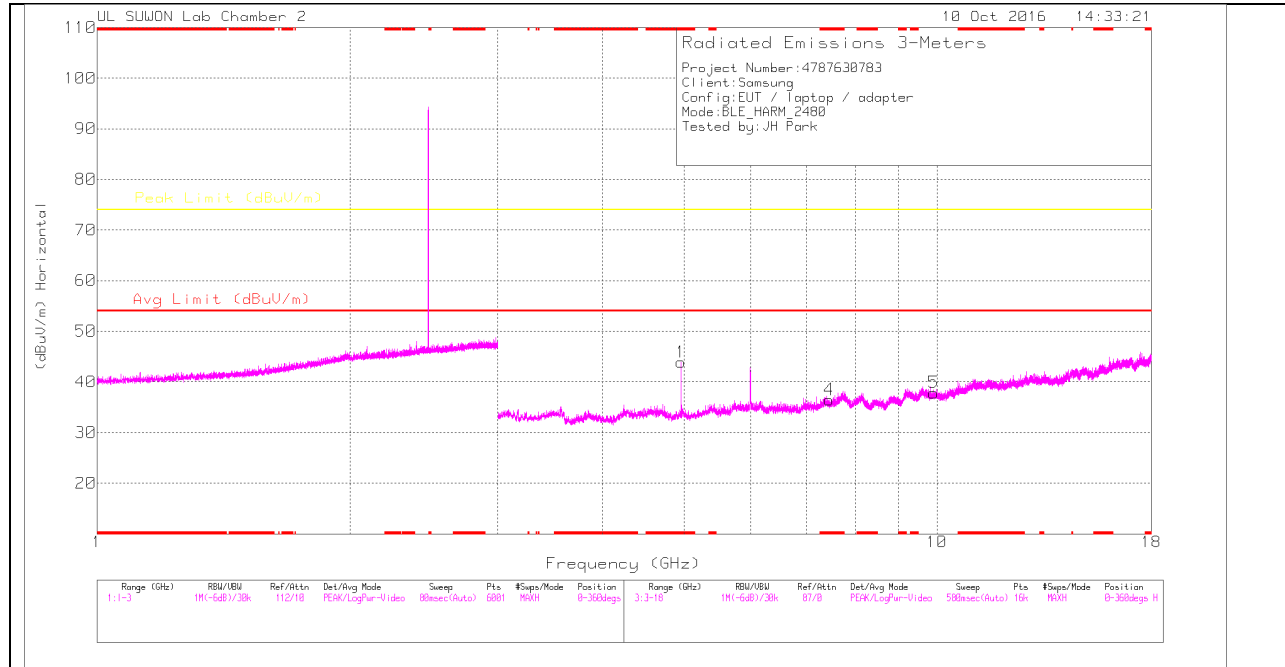
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8724)_150 619	Path_3	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88	43.88	PK2	33.9	-25.2	0	52.58	-	-	74	-21.42	42	103	H
* 4.88	36.03	MAv1	33.9	-25.2	1.9	46.63	54	-7.37	-	-	42	103	H
* 4.88	39.99	PK2	33.9	-25.2	0	48.69	-	-	74	-25.31	194	395	V
* 4.879	33.35	MAv1	33.9	-25.2	1.9	43.95	54	-10.05	-	-	194	395	V
5.999	37.58	PK2	34.8	-23.8	0	48.58	-	-	74	-25.42	168	287	H
5.988	41.26	PK2	34.8	-23.8	0	52.26	-	-	74	-21.74	4	347	V

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

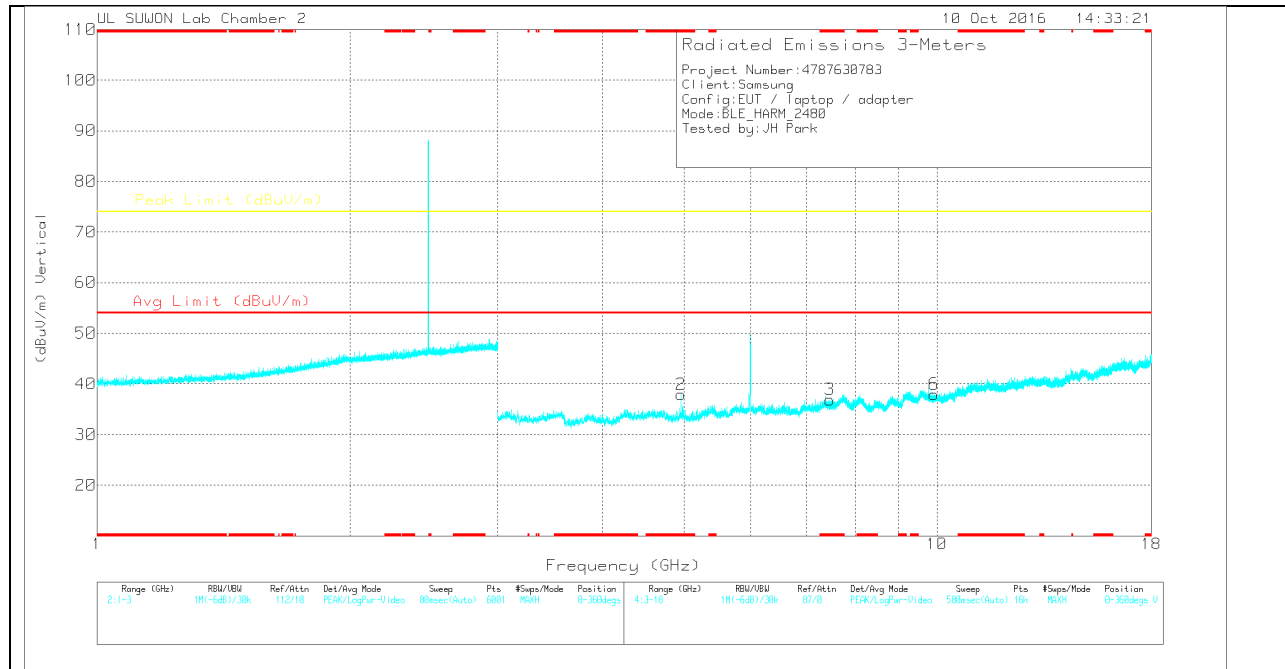
PK2 - KDB558074 Method: Maximum Peak

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(0016872 4)_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	35.01	PK	33.9	-25	0	43.91	-	-	74	-30.09	0-360	150	H
4	* 7.438	22.57	PK	36	-22.1	0	36.47	-	-	74	-37.53	0-360	150	H
5	9.914	19.86	PK	37.1	-19.1	0	37.86	-	-	74	-36.14	0-360	250	H
2	* 4.959	29.01	PK	33.9	-25	0	37.91	-	-	74	-36.09	0-360	250	V
3	* 7.452	22.98	PK	36	-22.1	0	36.88	-	-	74	-37.12	0-360	250	V
6	9.92	19.87	PK	37.1	-19	0	37.97	-	-	74	-36.03	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(0016 8724)_150 619	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
* 4.959	41.49	PK2	33.9	-25	0	50.39	-	-	74	-23.61	35	134	H
* 4.96	34.36	MAV1	33.9	-25	1.9	45.16	54	-8.84	-	-	35	134	H
* 4.959	37.76	PK2	33.9	-25	0	46.66	-	-	74	-27.34	24	355	V
* 4.96	28.15	MAV1	33.9	-25	1.9	38.95	54	-15.05	-	-	24	355	V

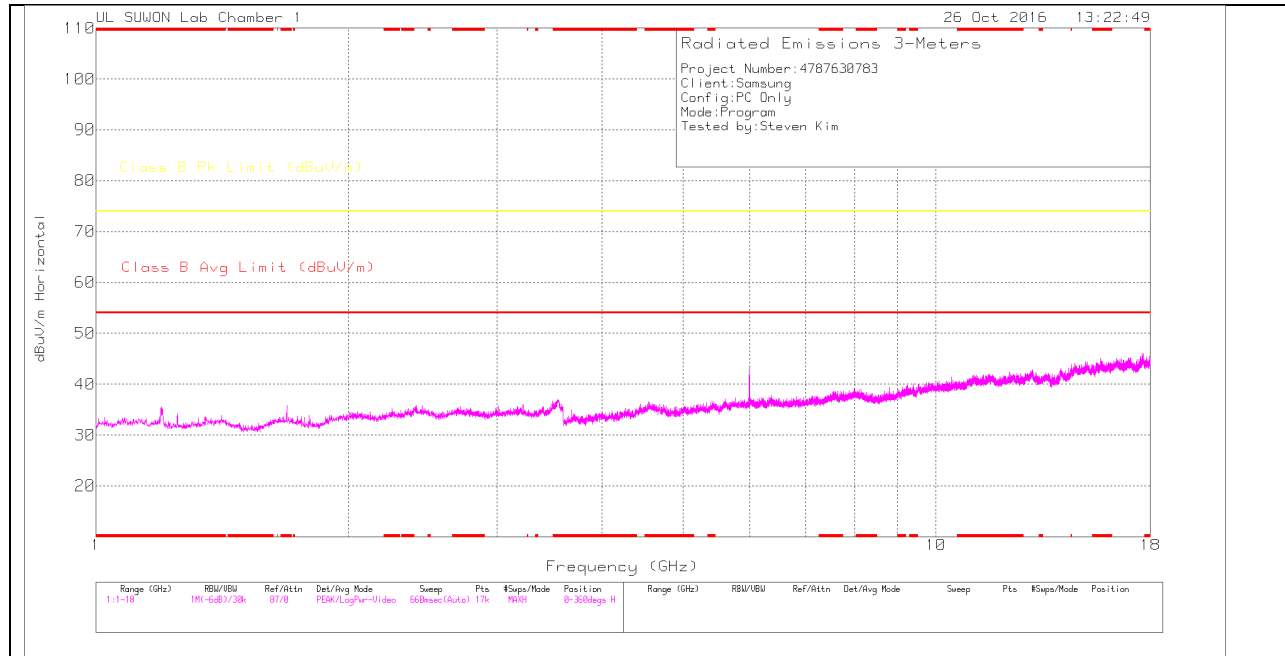
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

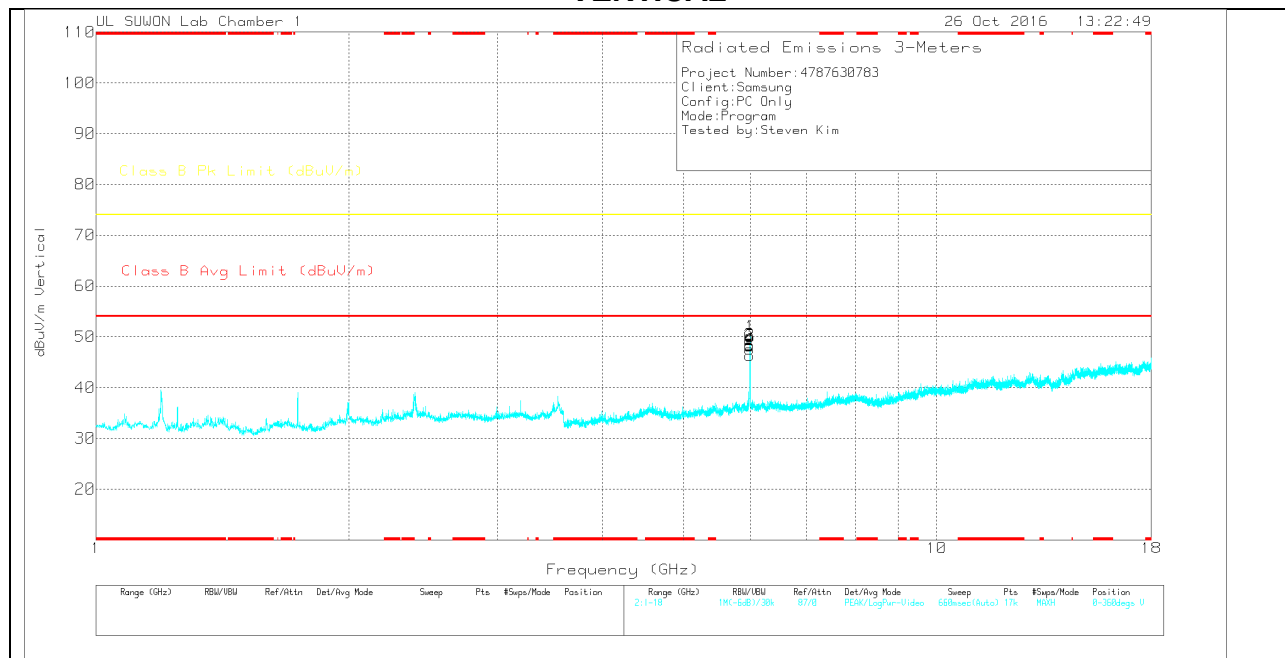
MAV1 - KDB558074 Option 1 Maximum RMS Average

11.3. TEST RESULT OF LAPTOP STAND ALONE CONDITION

HORIZONTAL



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.

DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	1- 18GHz[dB]	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.998	47.3	PK	34.9	-32.1	50.1	-	-	74	-23.9	0-360	100	V
2	5.988	45.61	PK	34.9	-32.2	48.31	-	-	74	-25.69	0-360	200	V
3	5.99	45.79	PK	34.9	-32.2	48.49	-	-	74	-25.51	0-360	100	V
4	5.991	44.83	PK	34.9	-32.2	47.53	-	-	74	-26.47	0-360	100	V
5	5.994	43.55	PK	34.9	-32.1	46.35	-	-	74	-27.65	0-360	100	V
6	5.996	45.36	PK	34.9	-32.1	48.16	-	-	74	-25.84	0-360	100	V

PK – Peak Detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	1- 18GHz[dB]	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5.994	56.43	Pk	34.9	-32.1	59.23	-	-	74	-14.77	272	108	V
5.994	38.64	Av	34.9	-32.1	41.44	54	-12.56	-	-	272	108	V

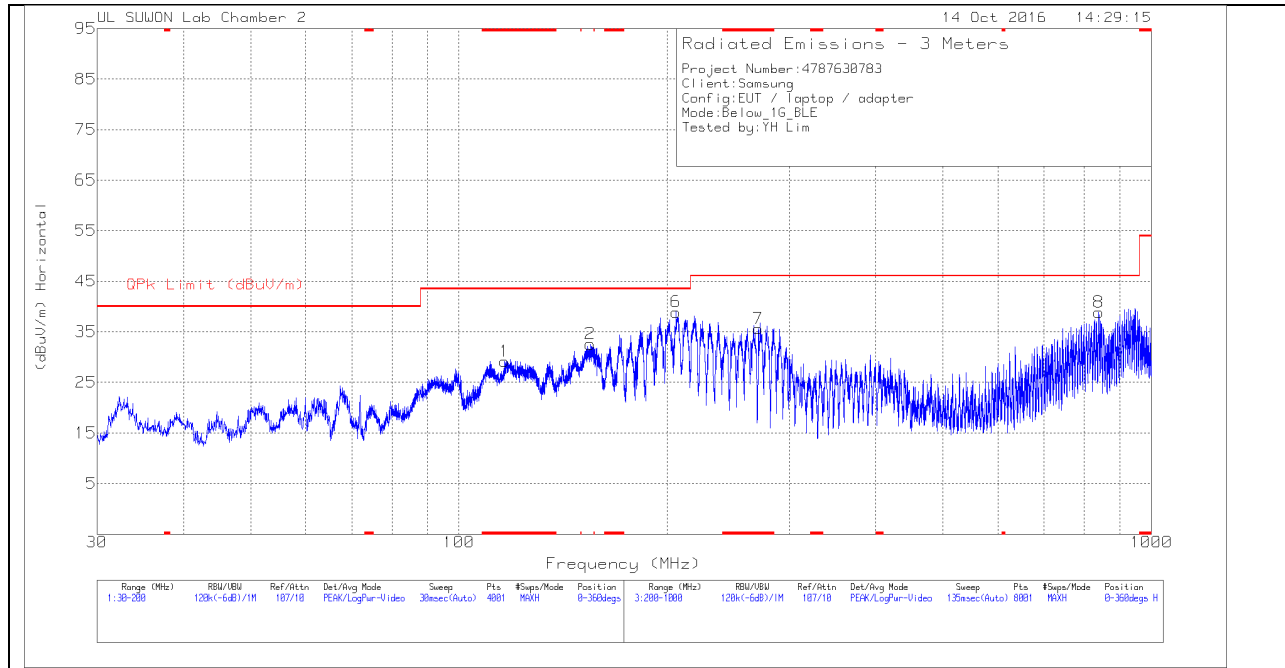
Pk - Peak detector

Av - Average detection

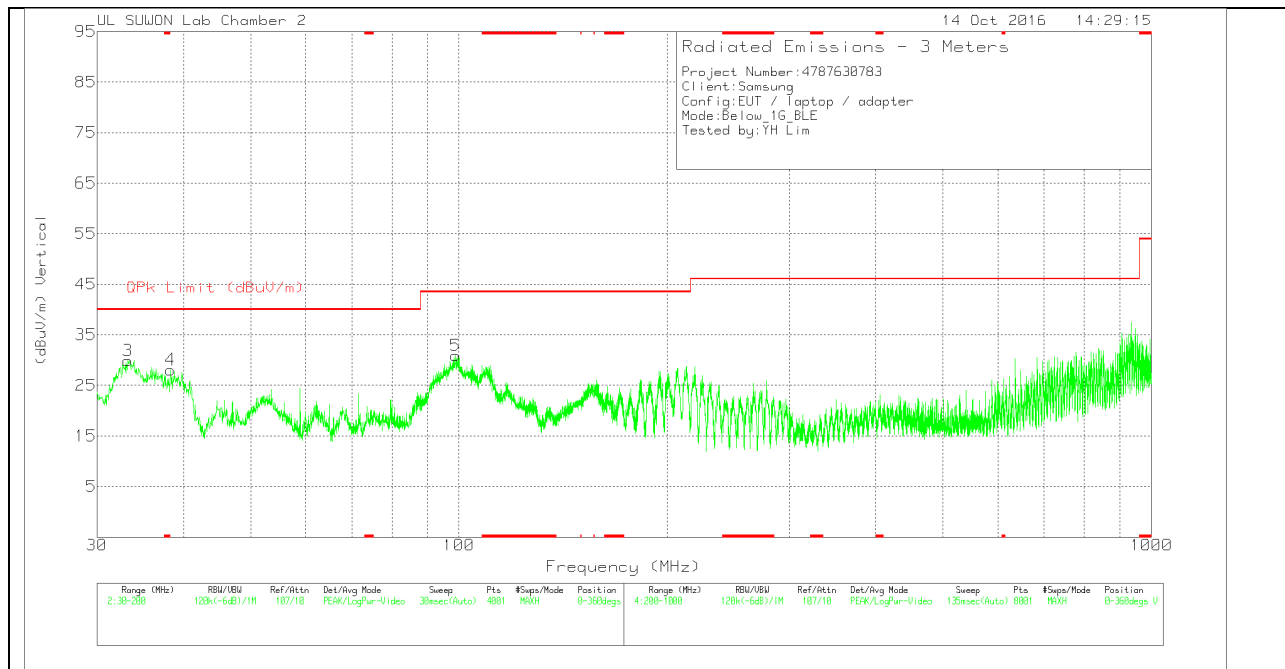
11.4. WORST-CASE BELOW 1 GHz

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	* 116.445	49.43	Pk	10.2	-30.5	29.13	43.52	-14.39	0-360	300	H
2	154.7375	54.58	Pk	8.4	-30.4	32.58	43.52	-10.94	0-360	200	H
3	33.23	50.07	Pk	10.6	-30.8	29.87	40	-10.13	0-360	100	V
4	38.33	46.76	Pk	12.1	-30.8	28.06	40	-11.94	0-360	100	V
5	98.8925	50	Pk	11.4	-30.5	30.9	43.52	-12.62	0-360	100	V
6	205.7	57.72	Pk	11.5	-30.3	38.92	43.52	-4.6	0-360	100	H
7	* 270.7	52.92	Pk	12.8	-30.1	35.62	46.02	-10.4	0-360	100	H
8	839.7	48.77	Pk	18.5	-28.4	38.87	46.02	-7.15	0-360	100	H

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

Pk - Peak detector

Radiated Emissions

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
203.7988	49.06	Qp	11.5	-30.3	30.26	43.52	-13.26	345	126	H

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

Qp - Quasi-Peak detector

12. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)
IC RSS-GEN Clause 8.8

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.

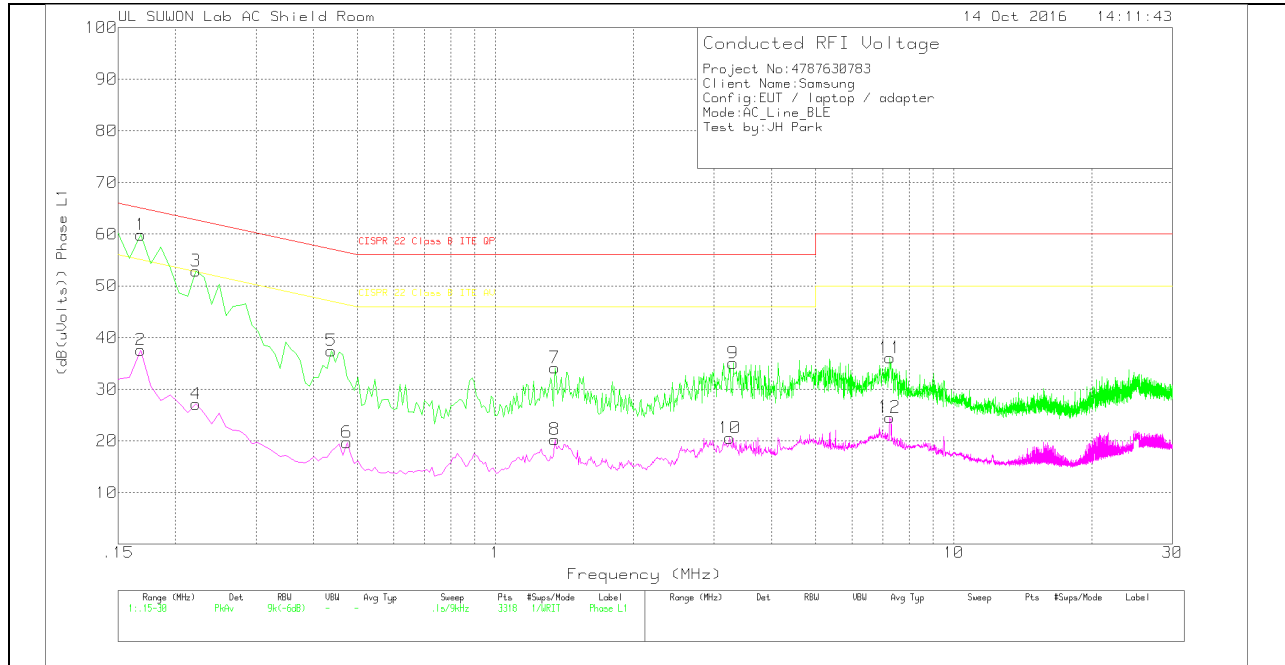
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

Phase L1 .15 - 30MHz

Marker	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)
1	.168	49.68	Pk	10.2	0	59.88	65.06	-5.18	-	-
2	.168	27.4	Av	10.2	0	37.6	-	-	55.06	-17.46
3	.222	42.99	Pk	9.9	0	52.89	62.74	-9.85	-	-
4	.222	17.25	Av	9.9	0	27.15	-	-	52.74	-25.59
5	.438	27.37	Pk	10.1	0	37.47	57.1	-19.63	-	-
6	.474	9.51	Av	10.2	0	19.71	-	-	46.44	-26.73
7	1.347	24.16	Pk	9.9	.1	34.16	56	-21.84	-	-
8	1.347	10.28	Av	9.9	.1	20.28	-	-	46	-25.72
9	3.3	25.15	Pk	9.8	.1	35.05	56	-20.95	-	-
10	3.246	10.67	Av	9.8	.1	20.57	-	-	46	-25.43
11	7.26	26.09	Pk	9.9	.1	36.09	60	-23.91	-	-
12	7.242	14.56	Av	9.9	.1	24.56	-	-	50	-25.44

Pk - Peak detector

Av - Average detection

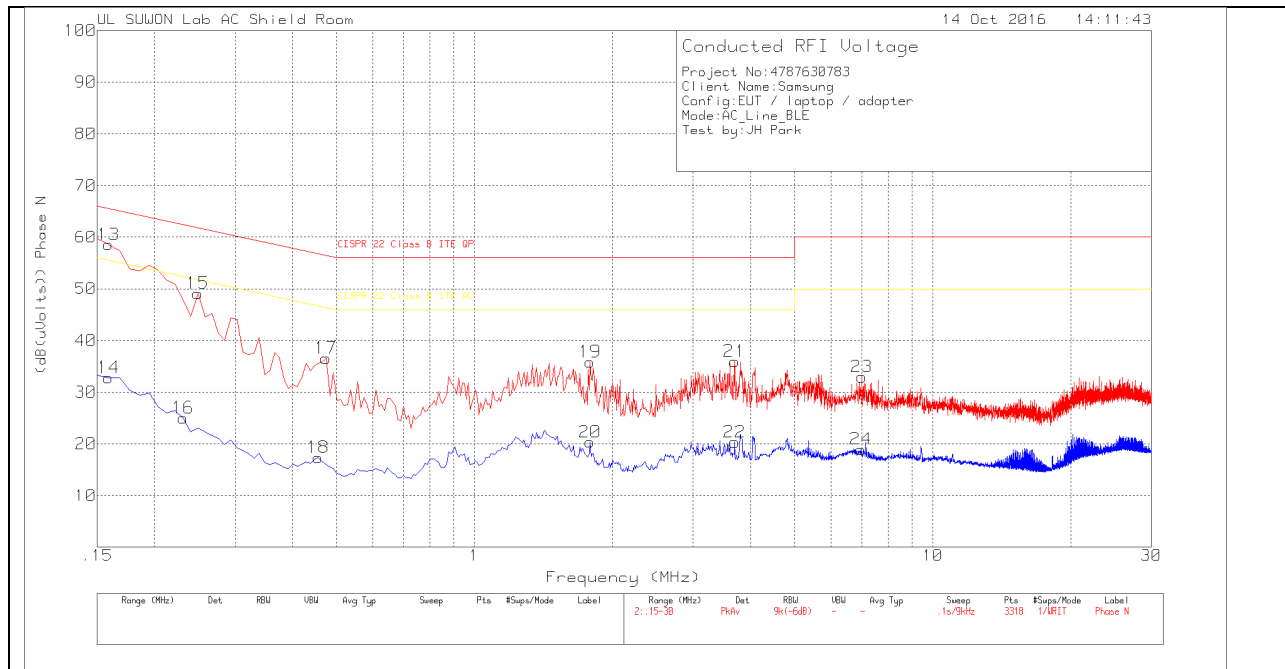
Quasi-Peak Emissions

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)
.168	42.71	Qp	10.2	0	52.91	65.06	-12.15	-	-
.2229	36.27	Qp	9.8	0	46.07	62.71	-16.64	-	-

Qp - Quasi-Peak detector

LINE 2 PLOT



LINE 2 RESULTS

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	.159	48.57	Pk	10	0	58.57	65.52	-6.95	-	-
14	.159	22.81	Av	10	0	32.81	-	-	55.52	-22.71
15	.249	39.44	Pk	9.7	0	49.14	61.79	-12.65	-	-
16	.231	15.22	Av	9.8	0	25.02	-	-	52.41	-27.39
17	.474	26.49	Pk	10.1	0	36.59	56.44	-19.85	-	-
18	.456	7.28	Av	10.1	0	17.38	-	-	46.77	-29.39
19	1.788	25.97	Pk	9.8	.1	35.87	56	-20.13	-	-
20	1.788	10.46	Av	9.8	.1	20.36	-	-	46	-25.64
21	3.696	26.07	Pk	9.8	.1	35.97	56	-20.03	-	-
22	3.696	10.42	Av	9.8	.1	20.32	-	-	46	-25.68
23	6.999	22.98	Pk	9.9	.1	32.98	60	-27.02	-	-
24	6.972	8.97	Av	9.9	.1	18.97	-	-	50	-31.03

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)
.1635	42.96	Qp	10.1	0	53.06	65.28	-12.22	-	-
.2445	32.26	Qp	9.7	0	41.96	61.94	-19.98	-	-
.231	36.13	Qp	9.8	0	45.93	62.41	-16.48	-	-

Qp - Quasi-Peak detector