



FCC CFR47 PART 15 SUBPART C

Bluetooth

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-R775S

FCC ID: A3LSMR775S

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	11/07/16	Initial issue	Junwhan Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: LTE Watch + Bluetooth/BLE and DTS b/g/n
MODEL NUMBER: SM-R775S
SERIAL NUMBER: R3AH800PHH, R3AHA006PM (RADIATED);
R3AHA006PH(CONDUCTED)
DATE TESTED: OCT 26, 2016 - NOV 03, 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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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:

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

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 LTE Watch + Bluetooth/BLE and DTS b/g/n.
This test report addresses the DSS (BT) operational mode.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2402 - 2480	Basic GFSK	Average	14.459	27.919
		Peak	14.707	29.560
	Enhanced Pi/4-DPSK	Average	8.489	7.062
		Peak	11.391	13.775
	Enhanced 8PSK	Average	8.557	7.173
		Peak	11.926	15.581

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -4.5 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 Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance. For average power data please refer to section 8.6.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Adapter	SAMSUNG	EP-TA60KBK	R73H58A0B72DK3	N/A
Wireless Charger	SAMSUNG	EP-YO760	N/A	A3LEPYO760

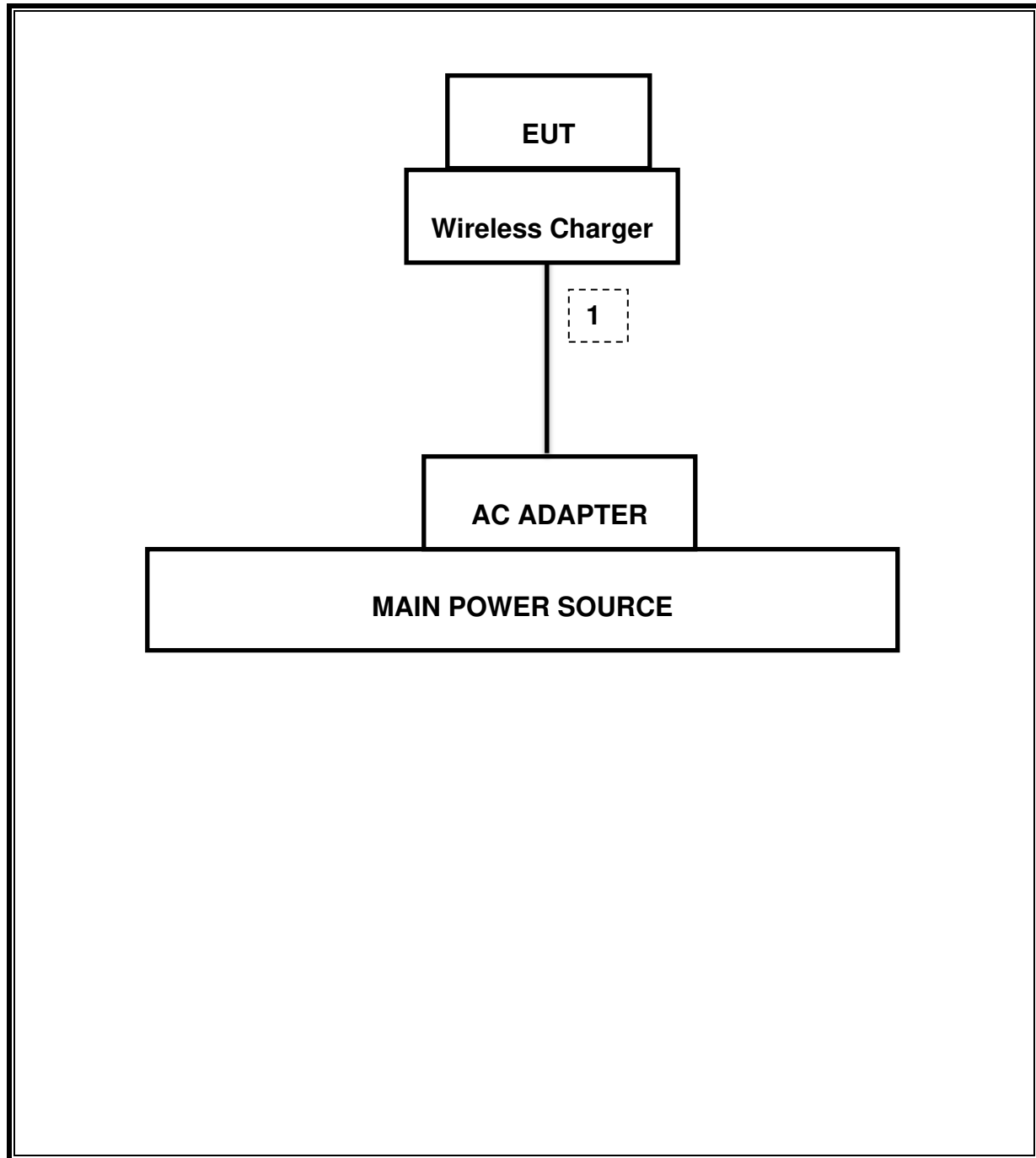
I/O CABLES

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 continuously communicating to the Bluetooth tester during the tests.
EUT was set in the Hidden menu mode to enable BT communications.

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	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
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-18-17
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
Attenuator	PASTERNAK	PE7087-10	A009	08-16-17
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	11-25-17

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass	1.315 MHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-37.508 dBm
15.247 (b)(1)	TX conducted output power	<21dBm		Pass	14.709 dBm (Peak)
15.247 (a)(1)	Hopping frequency separation	> 25KHz		Pass	1 MHz
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non-overlapping channels		Pass	79
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 0.4sec		Pass	0.34572 sec
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	54.43 dBuV (Pk)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	40.91 dBuV/m (Av)

8. ANTENNA PORT TEST RESULTS

8.1. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq$ 1% of the 20 dB bandwidth. The VBW is set to $\geq$ RBW. The sweep time is coupled.

RESULTS

8.1.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [KHz]
Low	2402	1.048	1.013
Mid	2441	1.047	1.013
High	2480	1.047	1.013
Worst		1.048	1.013

8.1.2. ENHANCED DATA RATE $\pi/4$ -DQPSK MODULATION

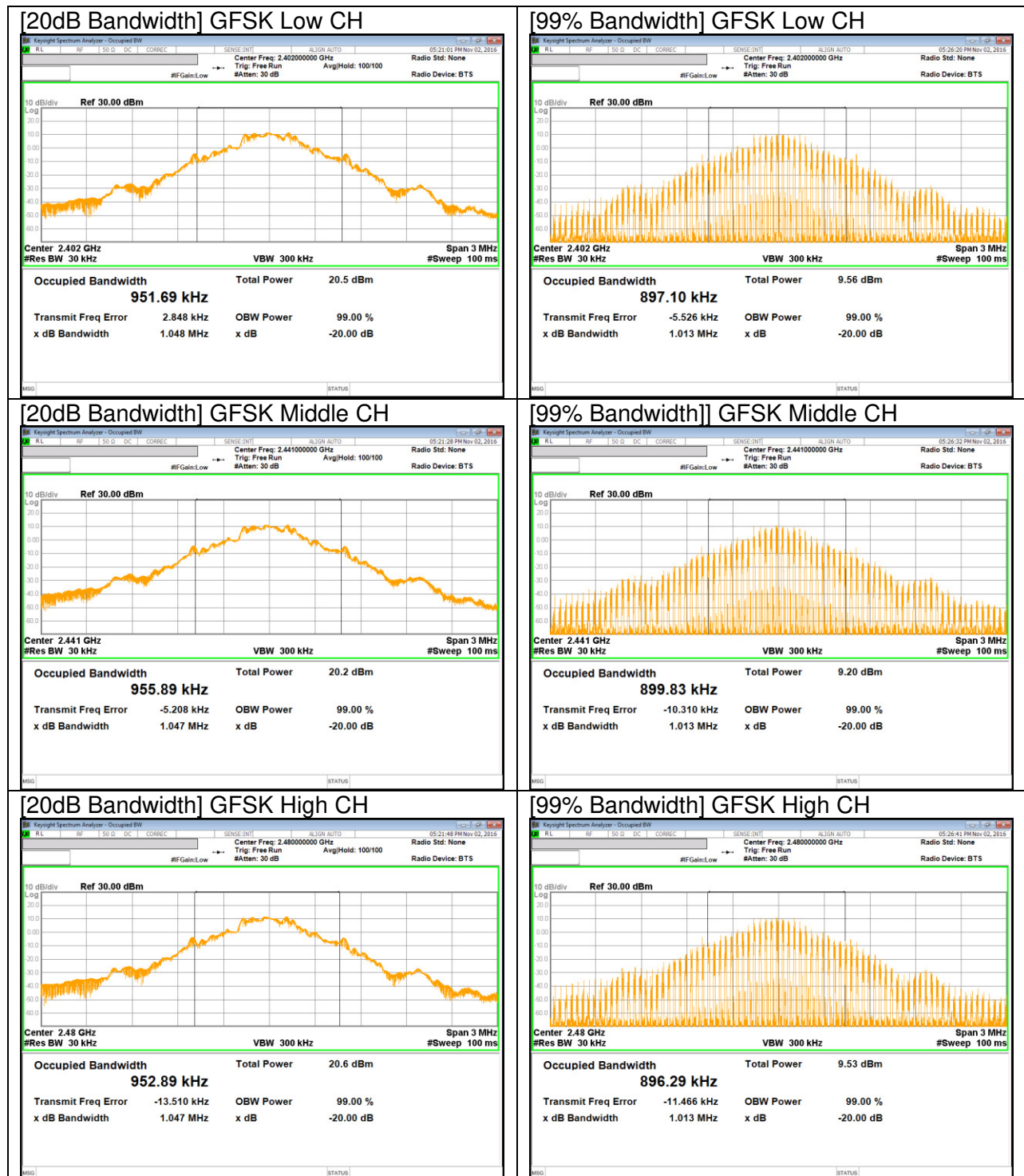
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.303	1.315
Mid	2441	1.347	1.313
High	2480	1.344	1.315
Worst		1.347	1.315

8.1.3. ENHANCED DATA RATE 8PSK MODULATION

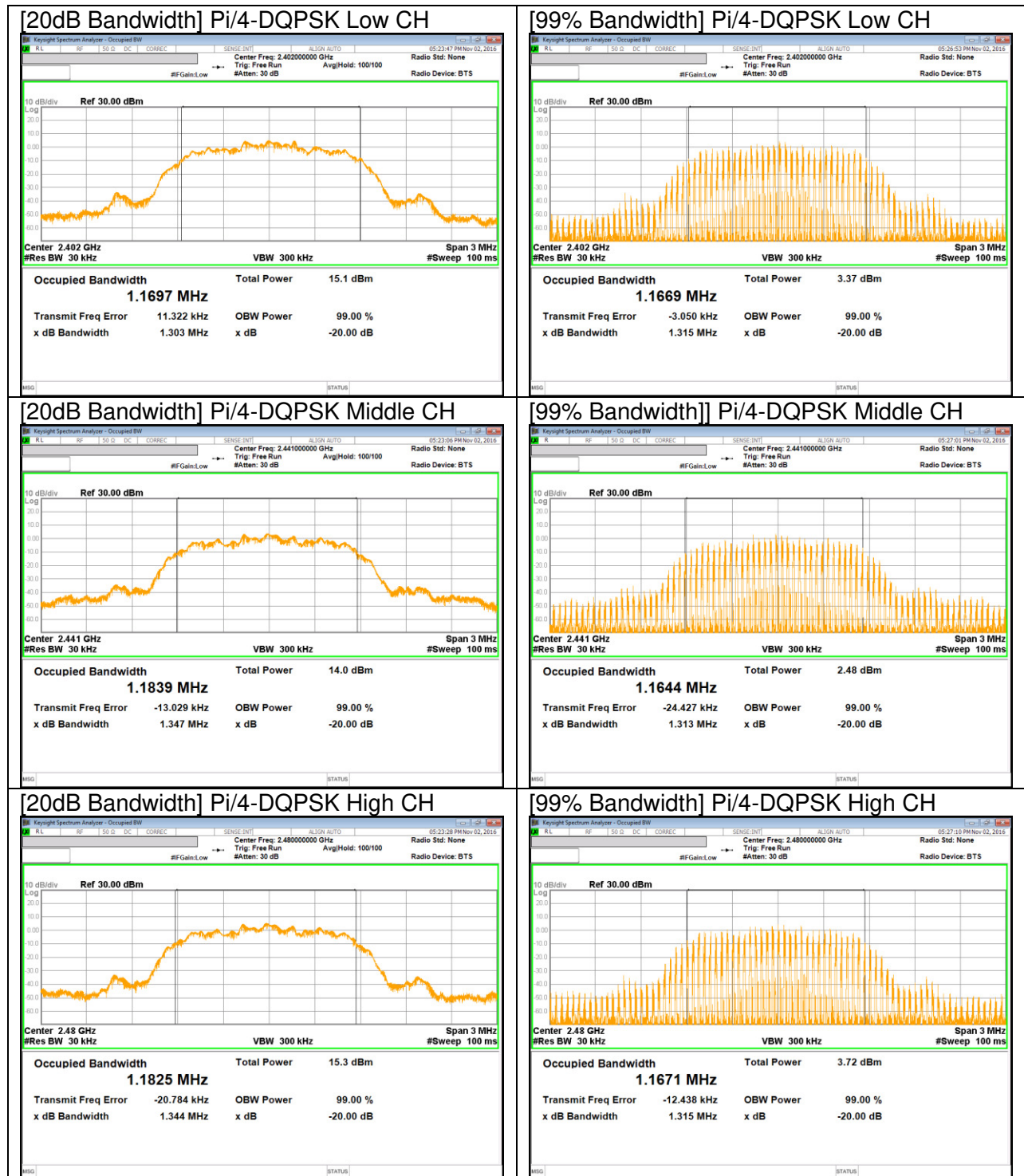
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.305	1.162
Mid	2441	1.310	1.164
High	2480	1.307	1.164
Worst		1.310	1.164

8.1.4. 20 dB AND 99% BANDWIDTH PLOTS

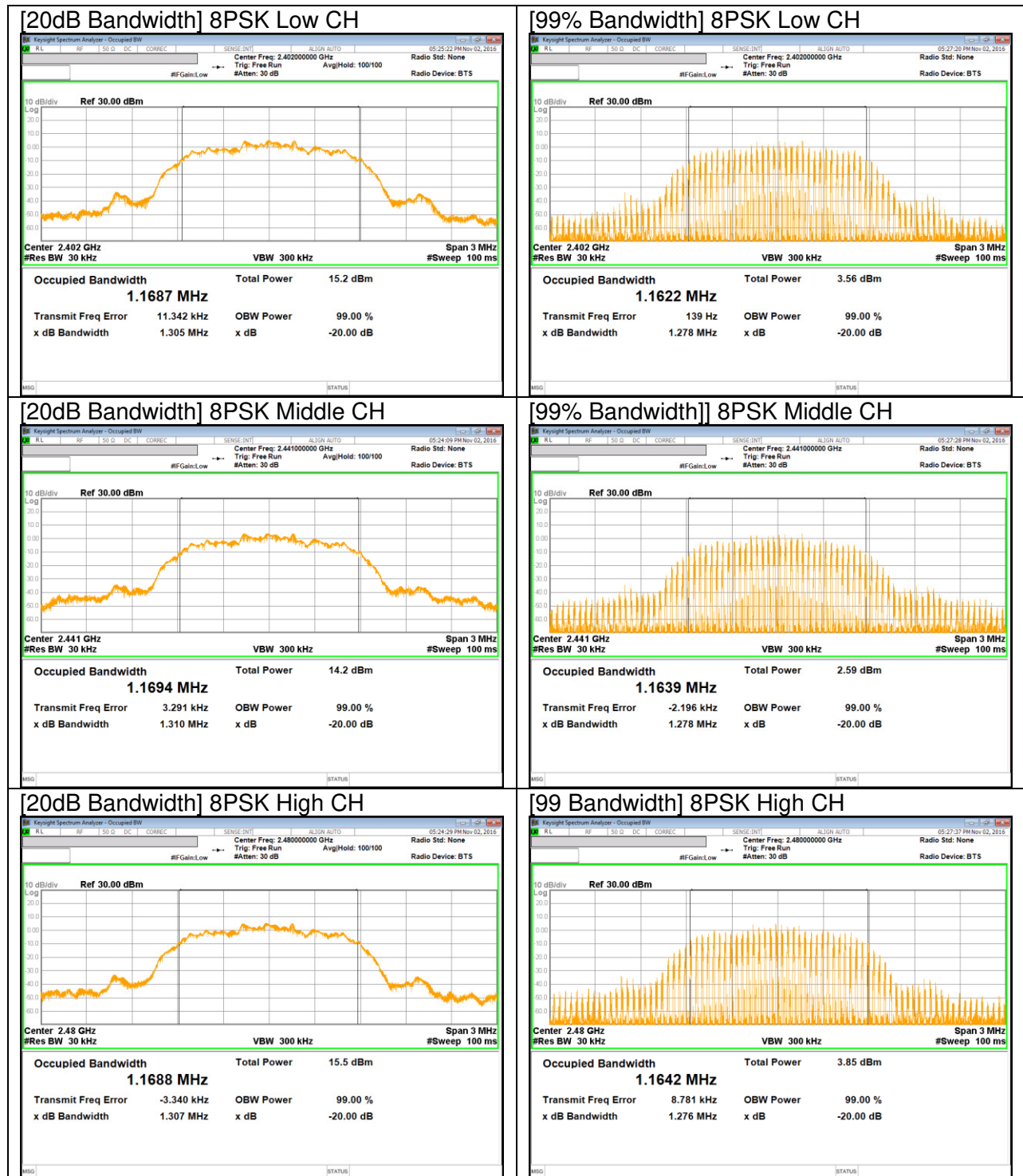
GFSK BANDWIDTH



Pi/4-DQPSK BANDWIDTH



8PSK BANDWIDTH



8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION PLOT



8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

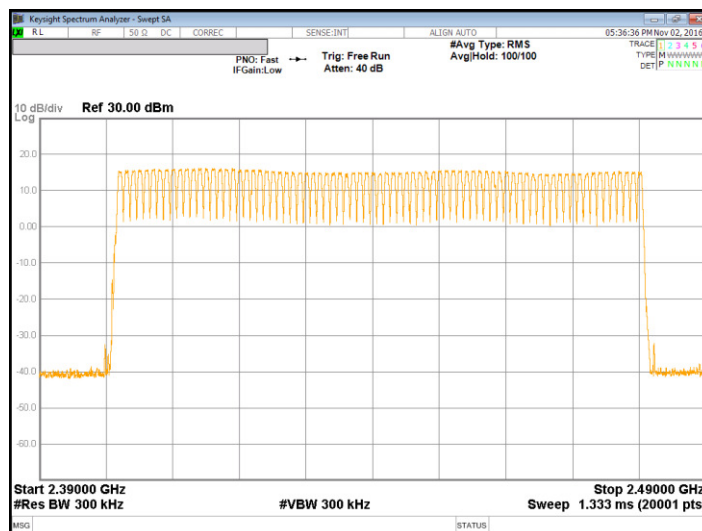
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS PLOTS

NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)





8.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

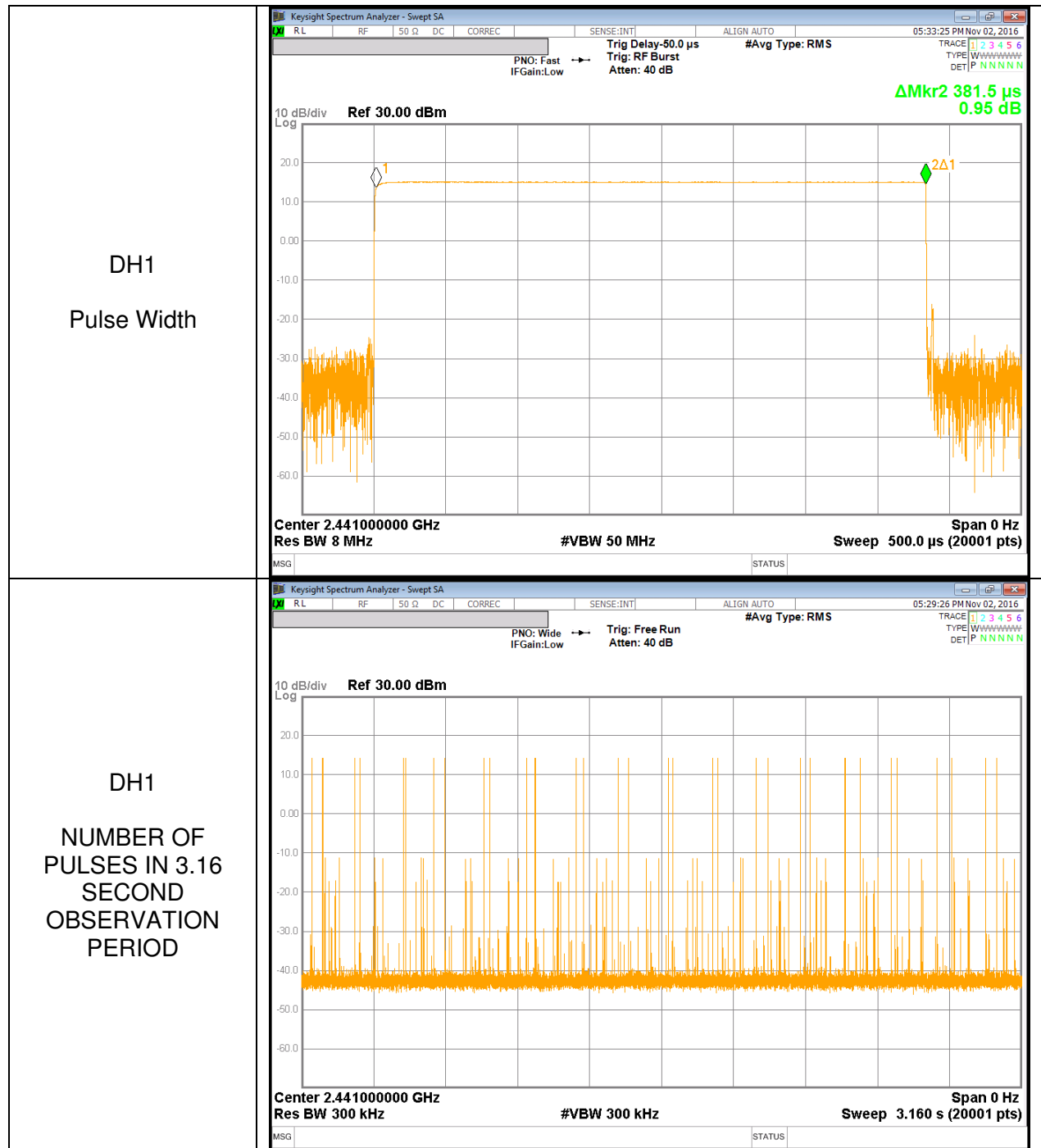
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$.

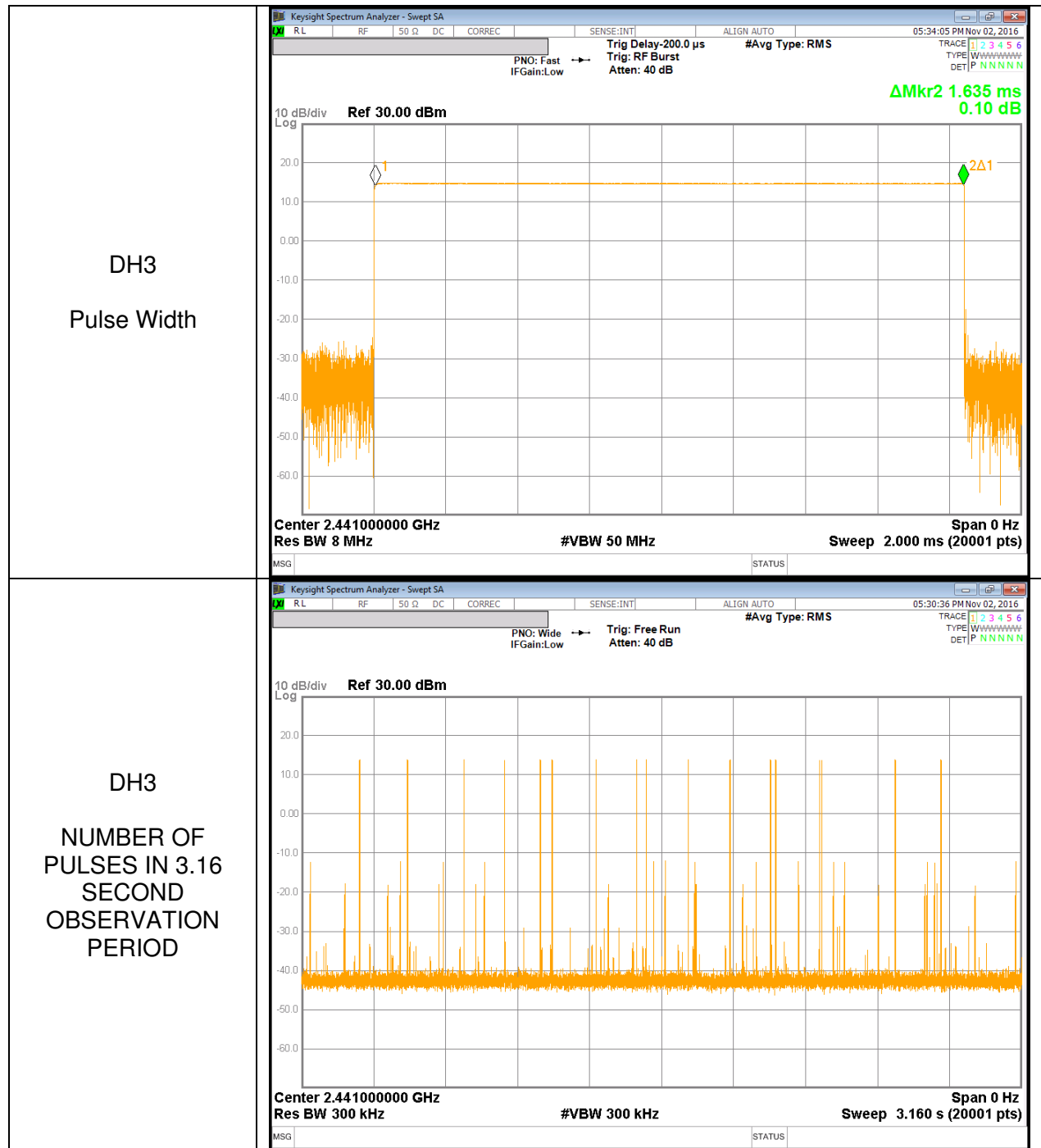
RESULTS

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.382	32	0.122080	0.4	-0.2779
DH3	1.635	17	0.277950	0.4	-0.1221
DH5	2.881	12	0.345720	0.4	-0.0543
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.382	8	0.030520	0.4	-0.36948
DH3	1.635	4.25	0.069488	0.4	-0.33051
DH5	2.881	3	0.086430	0.4	-0.31357

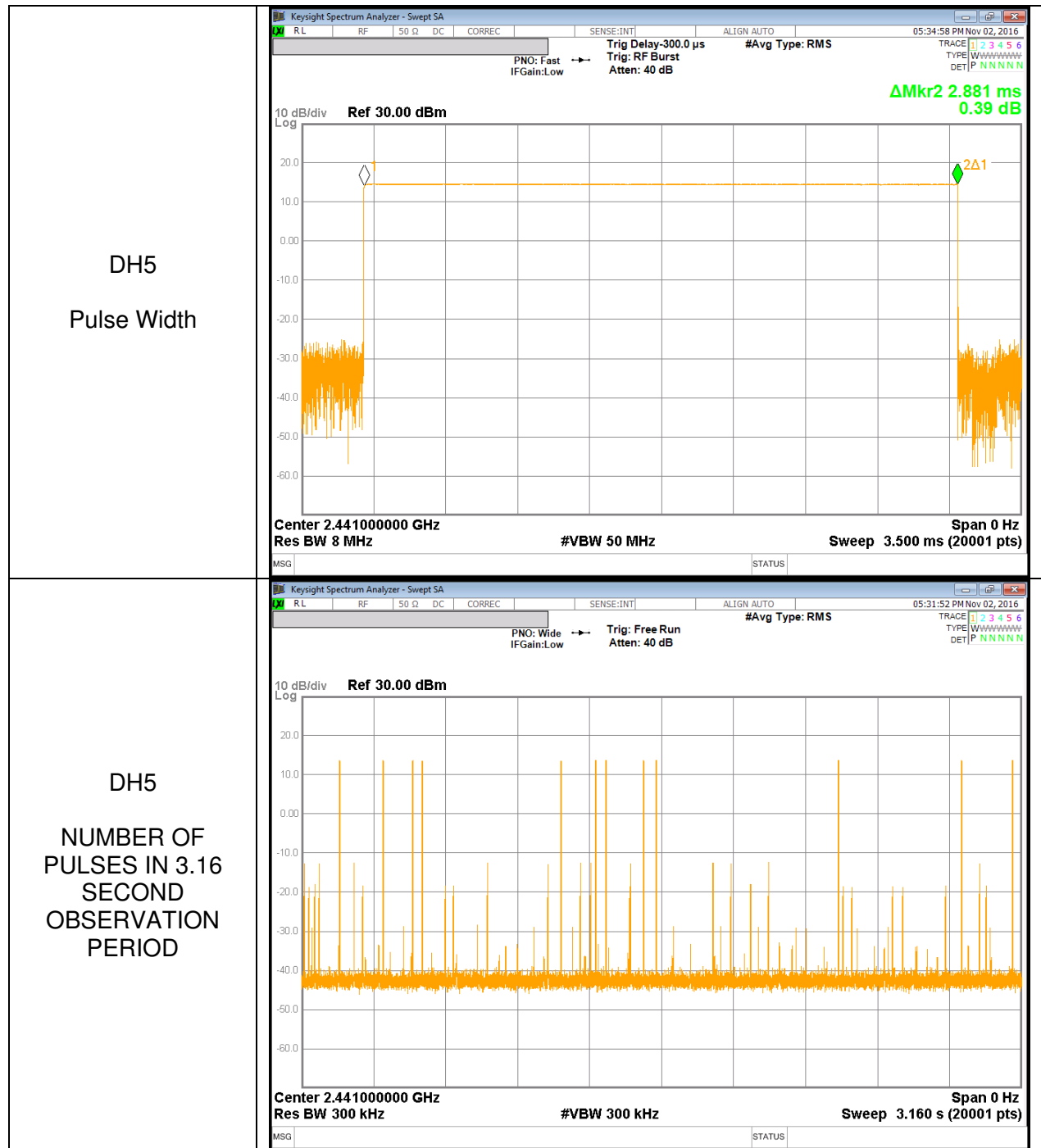
DH1



DH3



DH5



8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

8.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	14.707	21	-6.293
Middle	2441	14.323	21	-6.677
High	2480	14.659	21	-6.341
Worst		14.707	21	-6.293

8.5.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

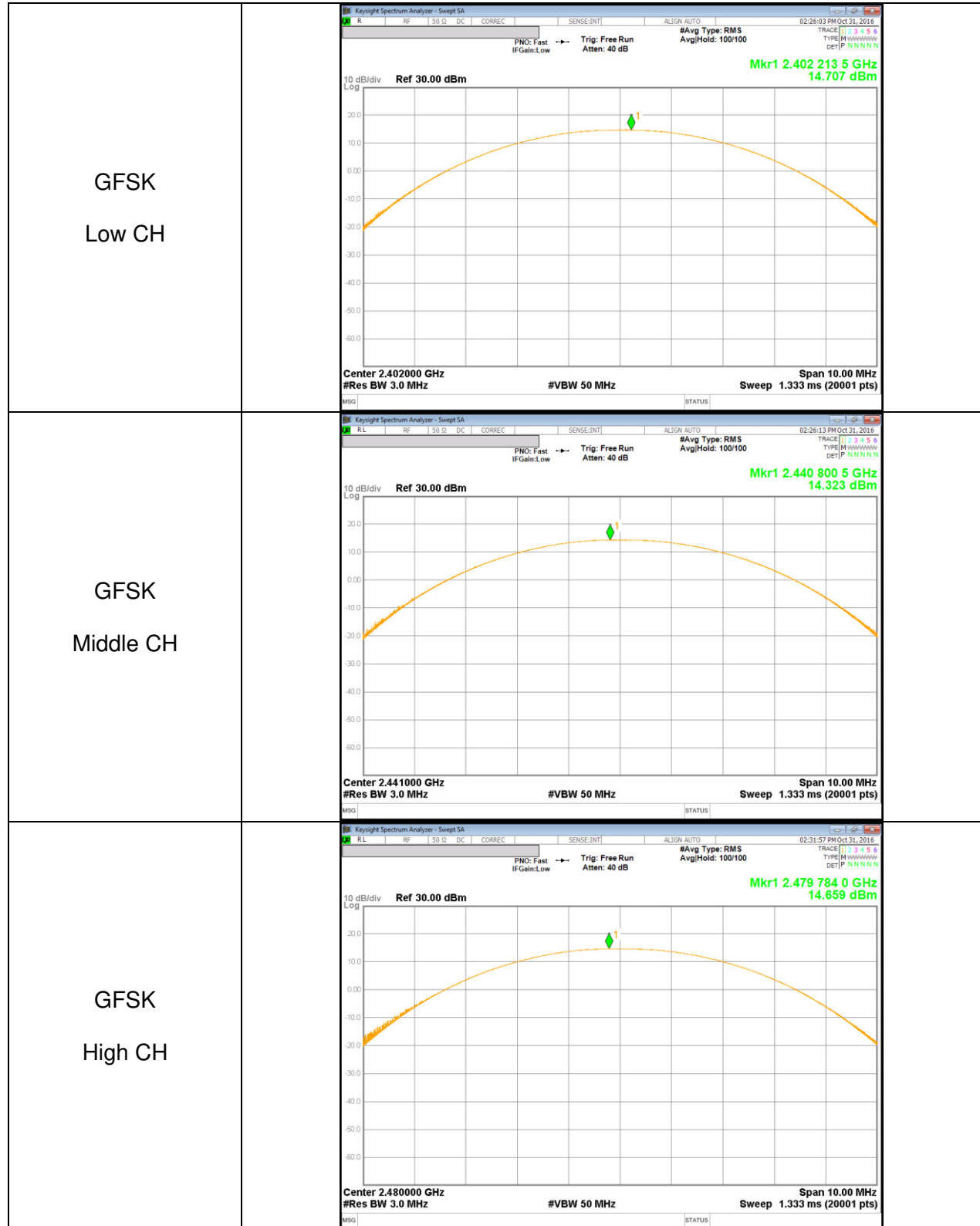
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	11.012	21	-9.988
Middle	2441	10.106	21	-10.894
High	2480	11.391	21	-9.609
Worst		11.391	21	-9.609

8.5.3. ENHANCED DATA RATE 8PSK MODULATION

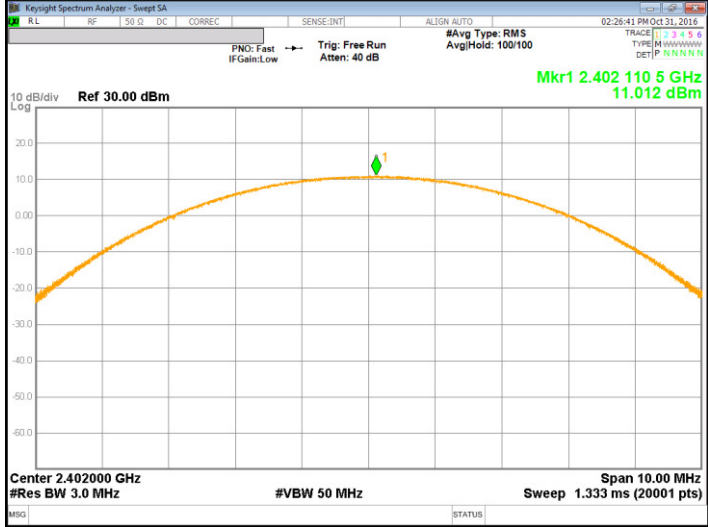
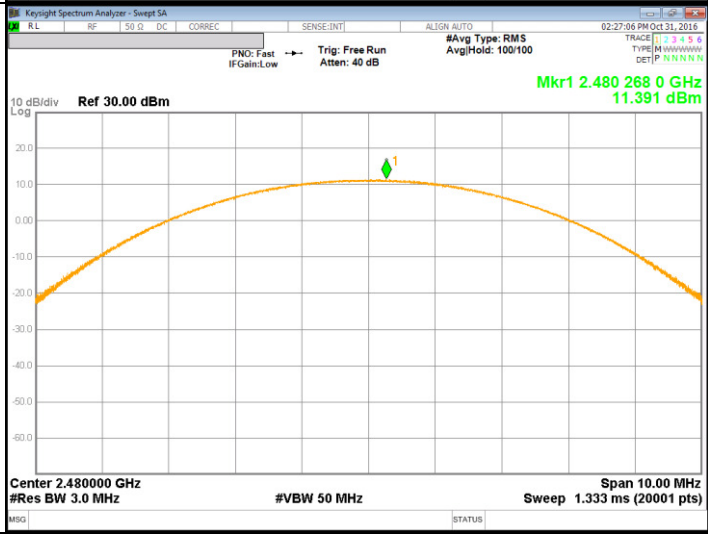
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	11.676	21	-9.324
Middle	2441	10.691	21	-10.309
High	2480	11.926	21	-9.074
Worst		11.926	21	-9.074

8.5.4. OUTPUT POWER PLOTS

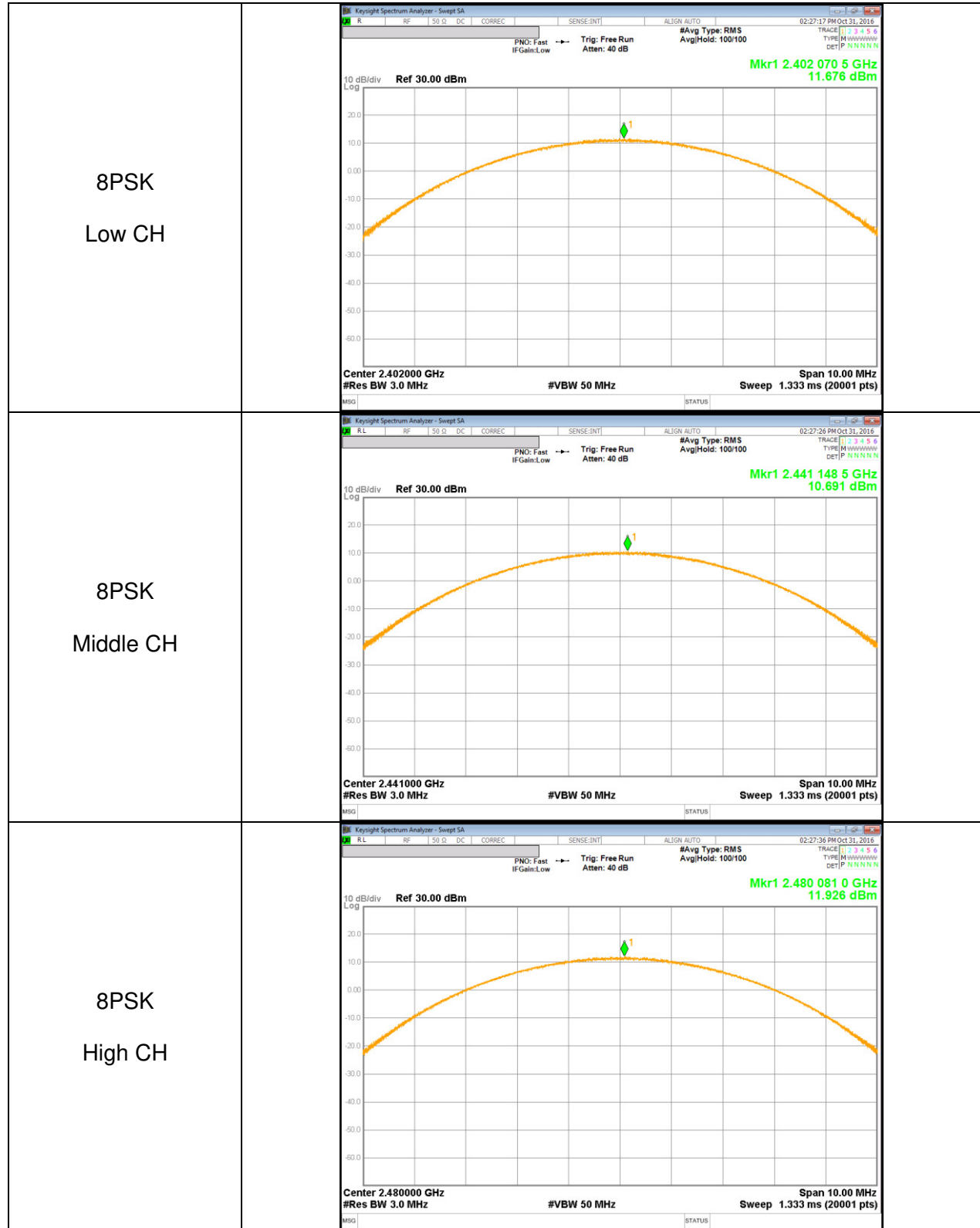
GFSK OUTPUT POWER



Pi/4-DPSK OUTPUT POWER

Pi/4-DPSK Low CH	 KeySight Spectrum Analyzer - Swept SA #Avg Type: RMS AvgHold: 100/100 Trig: Free Run Atten: 40 dB PNO: Fast IF Gain: Low Ref 30.00 dBm Mkr1 2.402100 GHz 11.012 dBm Center 2.402100 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 10.00 MHz Sweep 1.333 ms (20001 pts)
Pi/4-DPSK Middle CH	 KeySight Spectrum Analyzer - Swept SA #Avg Type: RMS AvgHold: 100/100 Trig: Free Run Atten: 40 dB PNO: Fast IF Gain: Low Ref 30.00 dBm Mkr1 2.440924 GHz 10.106 dBm Center 2.441000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 10.00 MHz Sweep 1.333 ms (20001 pts)
Pi/4-DPSK High CH	 KeySight Spectrum Analyzer - Swept SA #Avg Type: RMS AvgHold: 100/100 Trig: Free Run Atten: 40 dB PNO: Fast IF Gain: Low Ref 30.00 dBm Mkr1 2.480268 GHz 11.391 dBm Center 2.480000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 10.00 MHz Sweep 1.333 ms (20001 pts)

8PSK OUTPUT POWER



8.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

DA 00-705: 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.

8.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	14.459	27.92
Middle	2441	14.004	25.14
High	2480	14.425	27.70

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	8.247	6.68
Middle	2441	7.188	5.23
High	2480	8.489	7.06

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	8.329	6.81
Middle	2441	7.261	5.32
High	2480	8.557	7.17

8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

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.

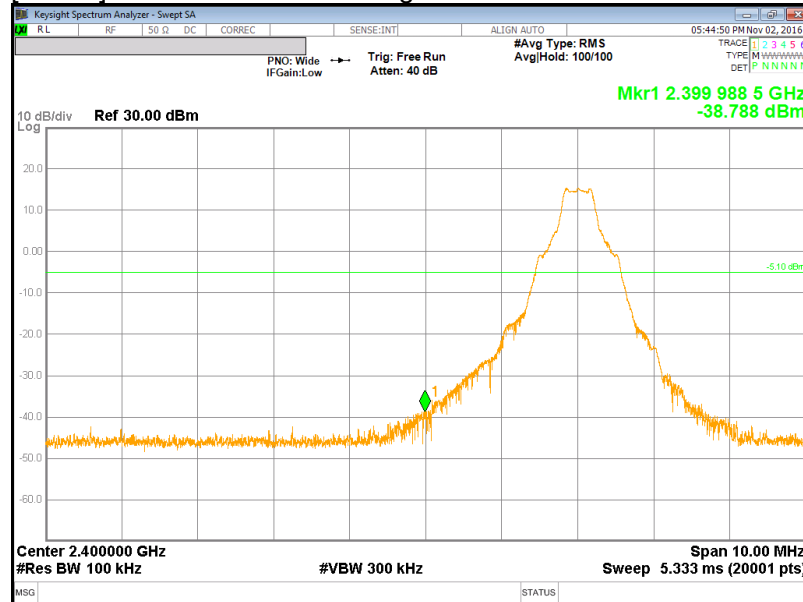
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

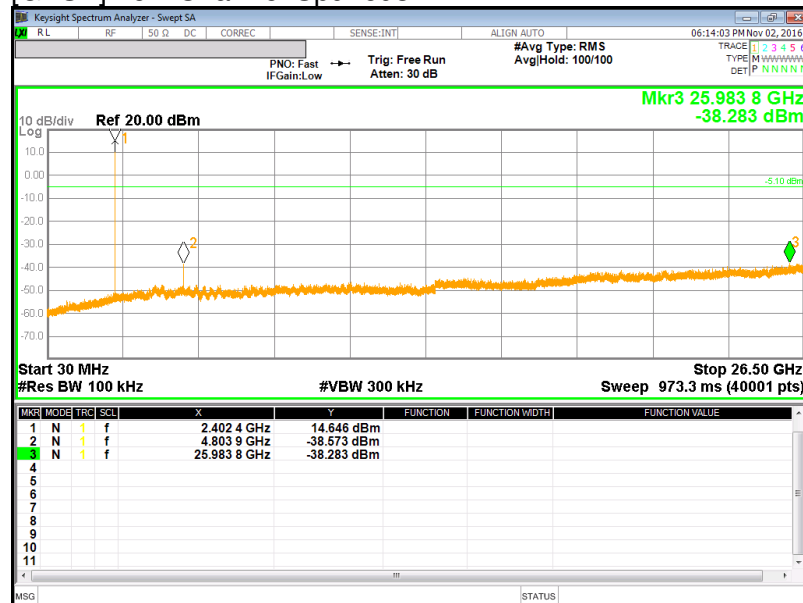
8.7.1. BASIC DATA RATE GFSK MODULATION

GFSK Mode

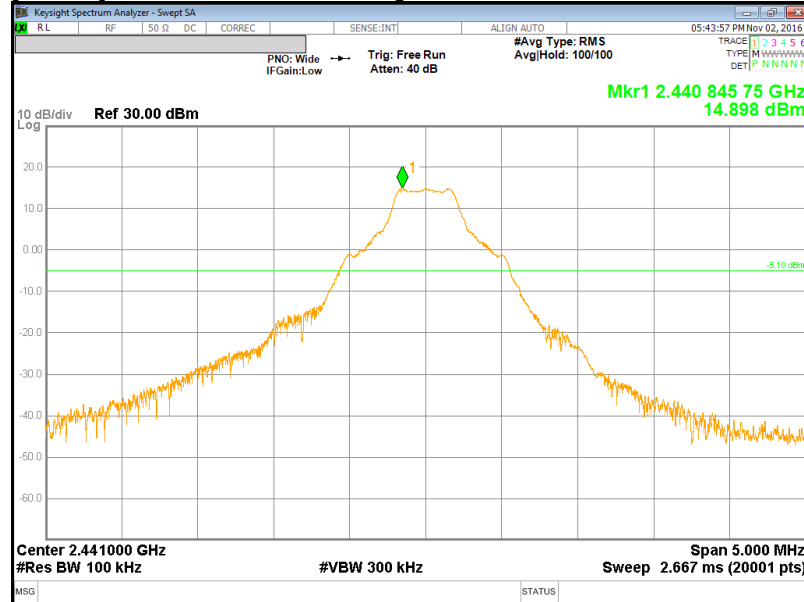
[GFSK] Low Channel BandEdge



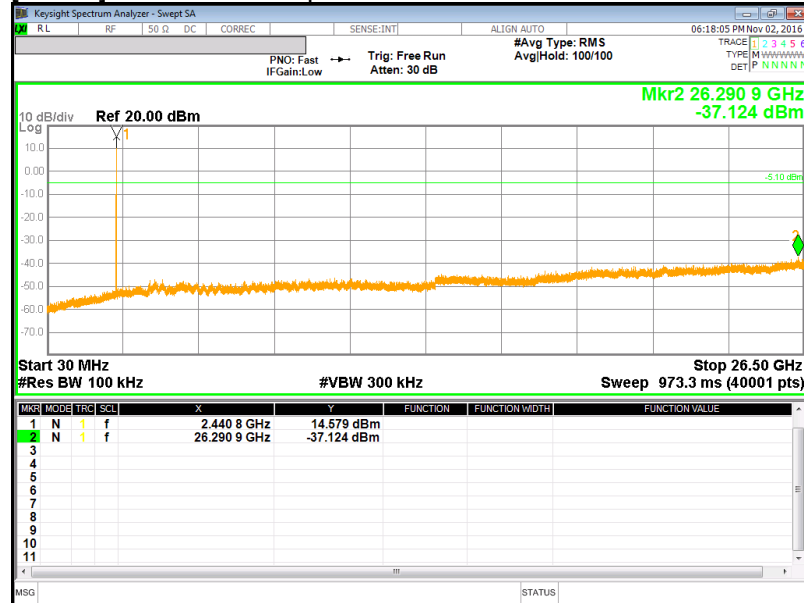
[GFSK] Low Channel Spurious



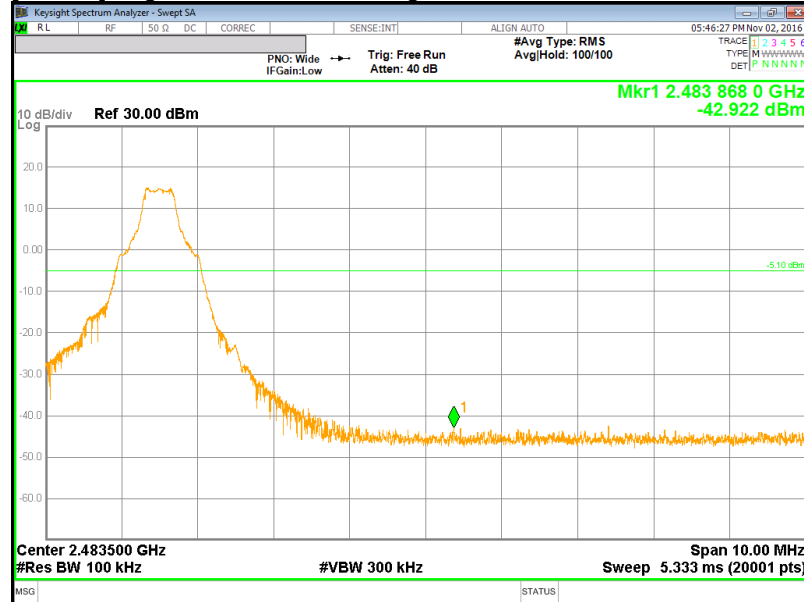
[GFSK] Mid Channel BandEdge



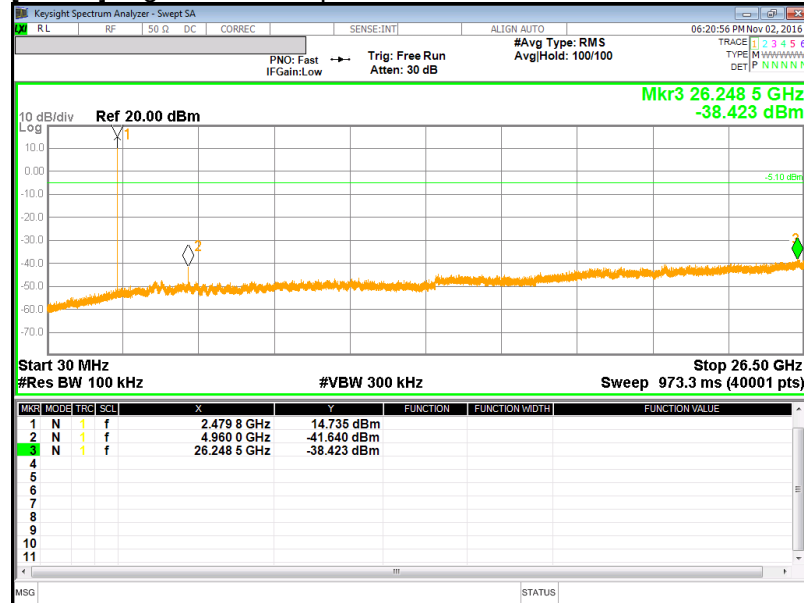
[GFSK] Mid Channel Spurious



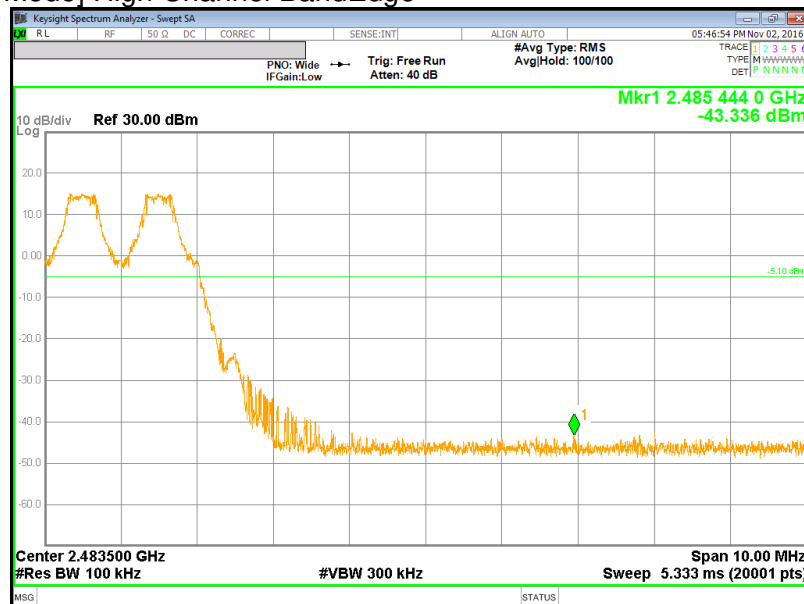
[GFSK] High Channel BandEdge



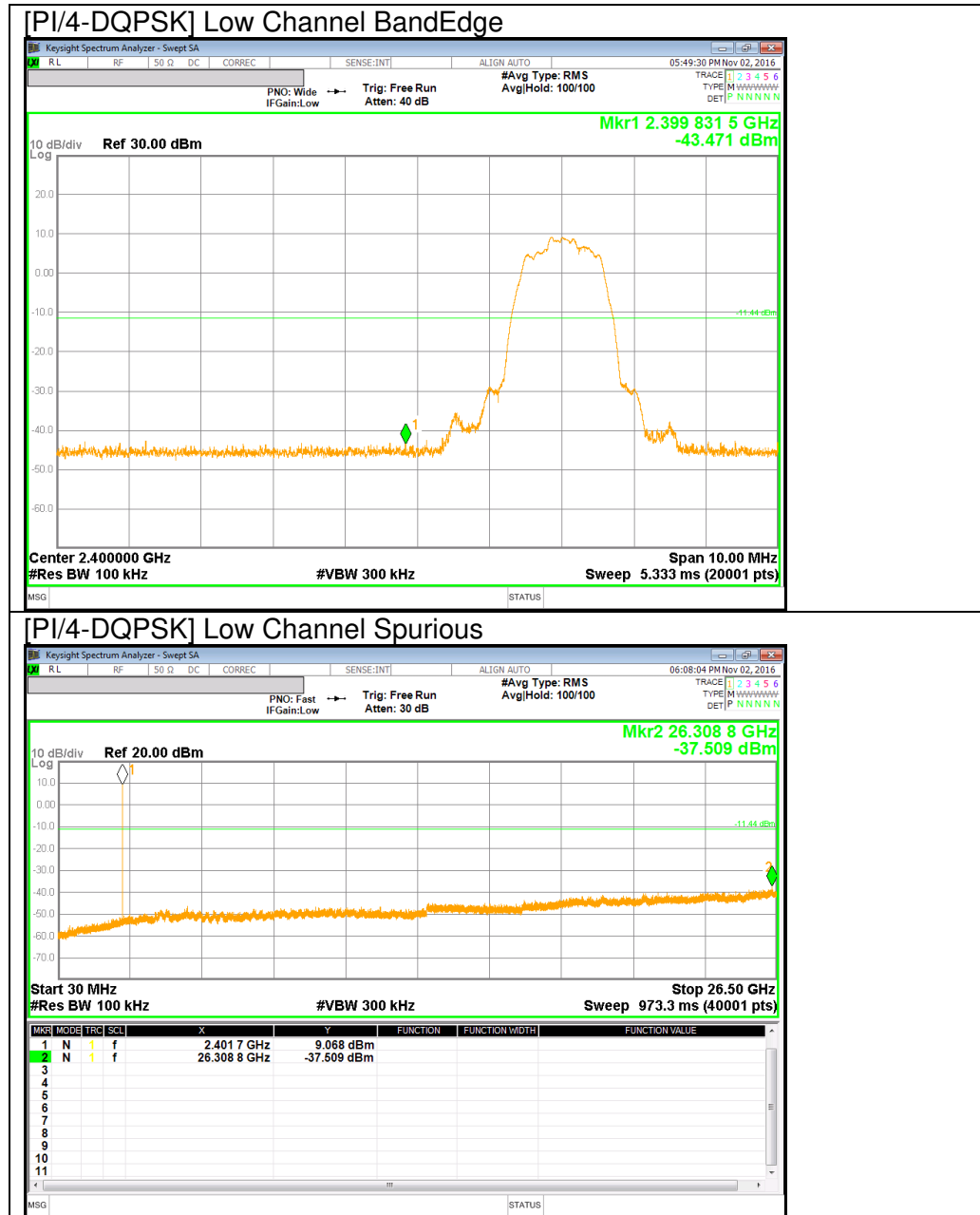
[GFSK] High Channel Spurious



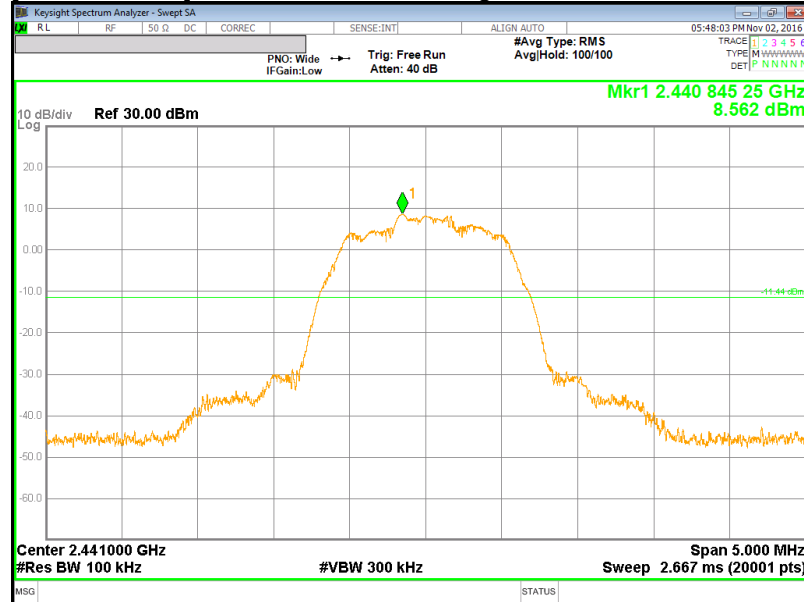
[GFSK Hopping Mode] Low Channel BandEdge



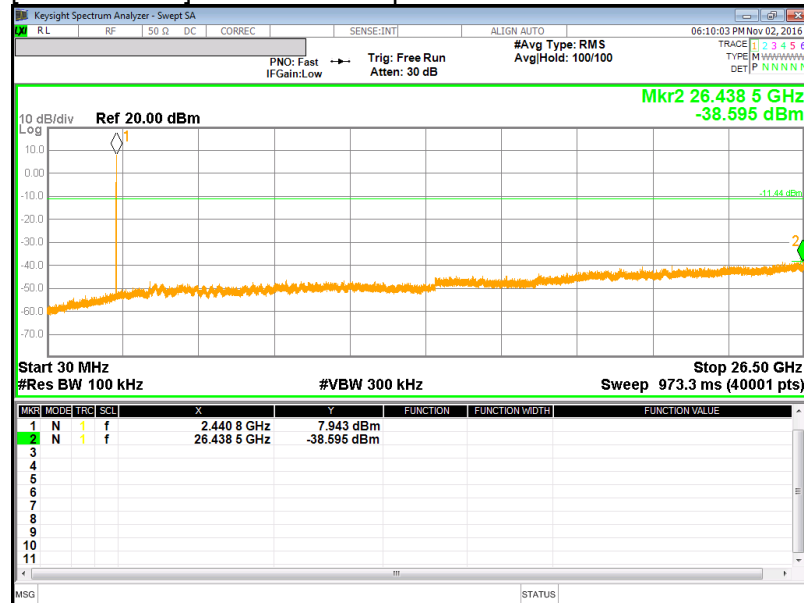
PI/4-DQPSK Mode



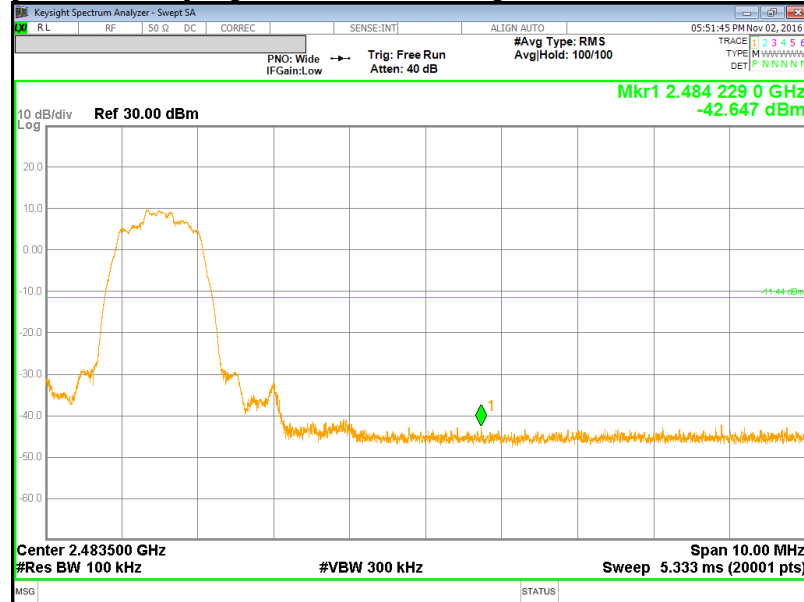
[PI/4-DQPSK] Mid Channel BandEdge



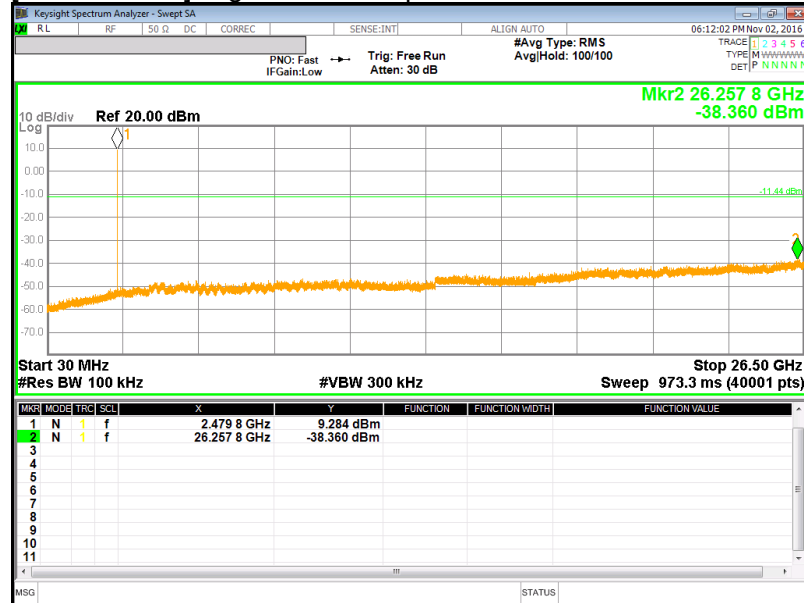
[PI/4-DQPSK] Mid Channel Spurious



[PI/4-DQPSK] High Channel BandEdge

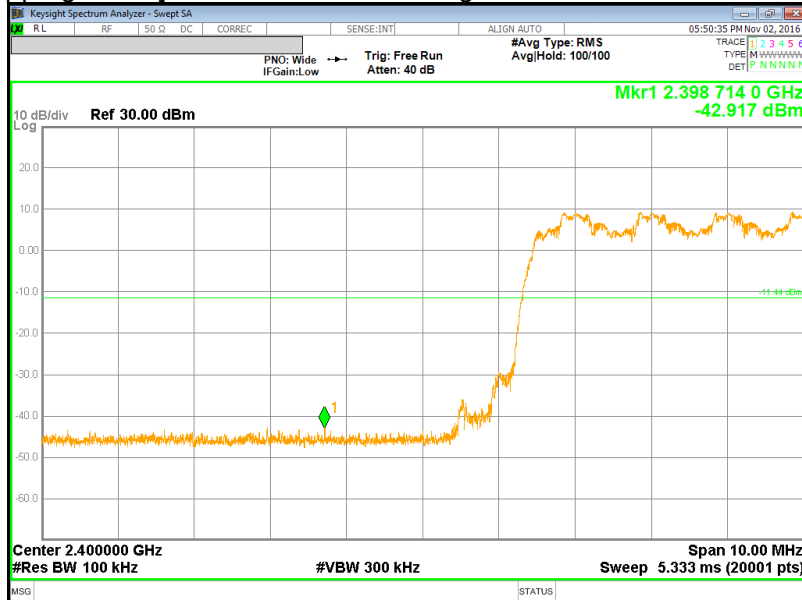


[PI/4-DQPSK] High Channel Spurious

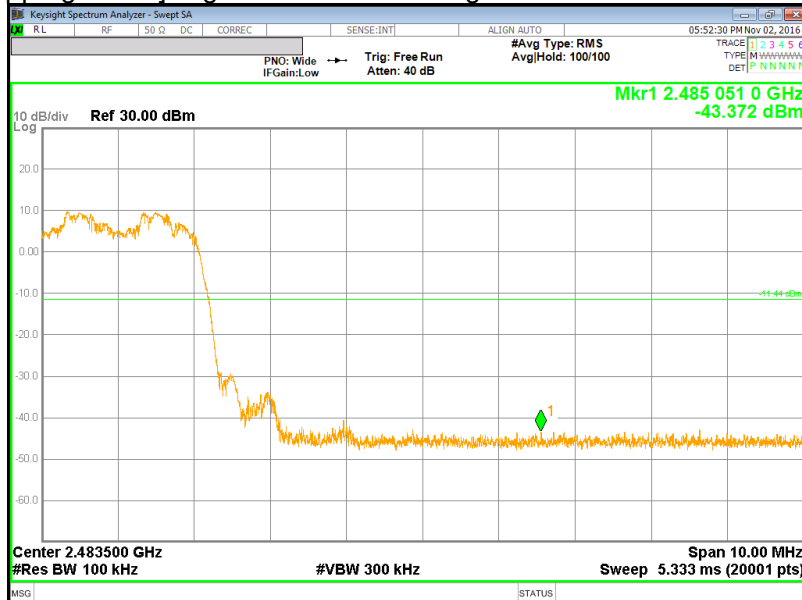


BandEdge Emission at PI/4-DQPSK Hopping Mode

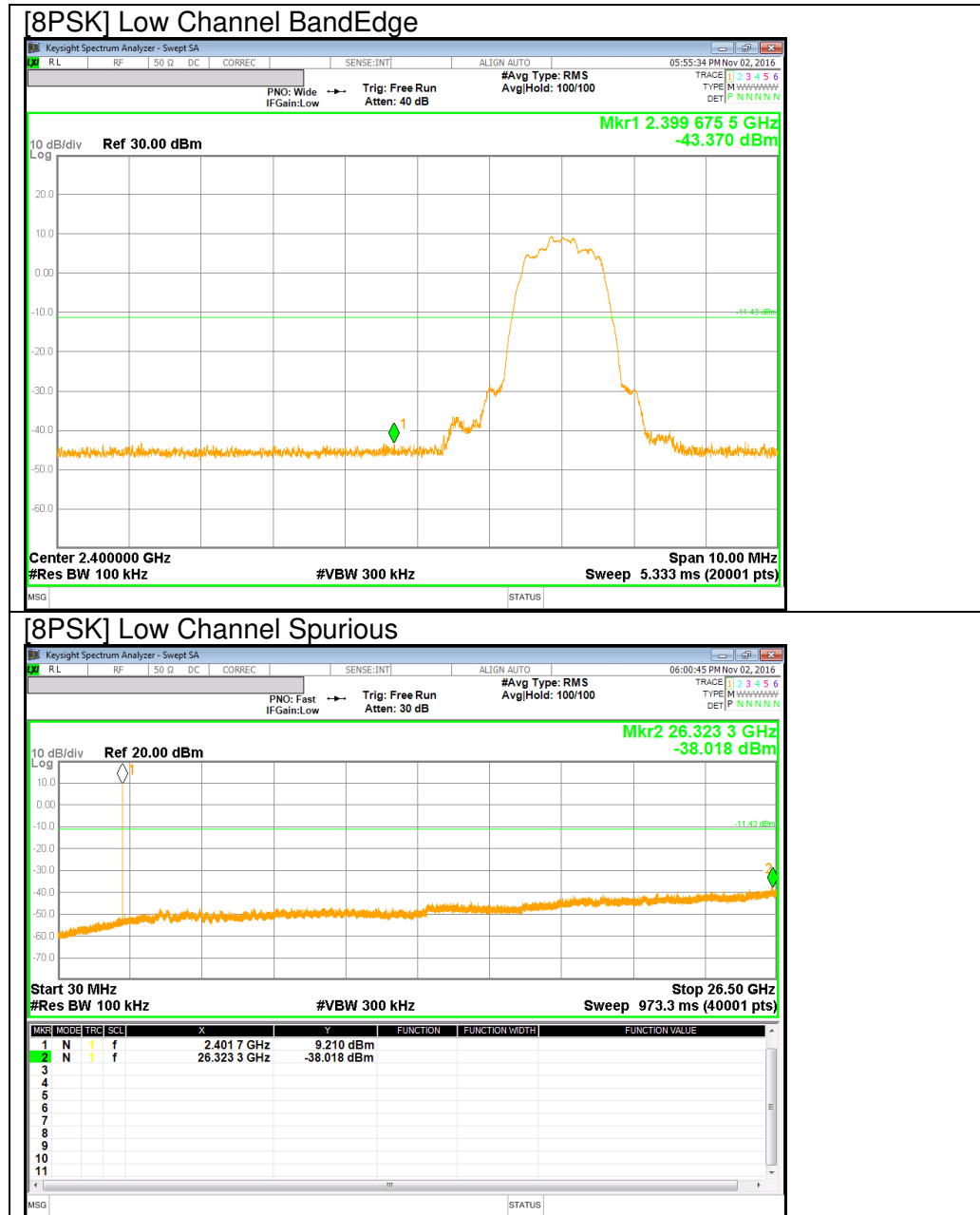
[PI/4-DQPSK Hopping Mode] Low Channel BandEdge



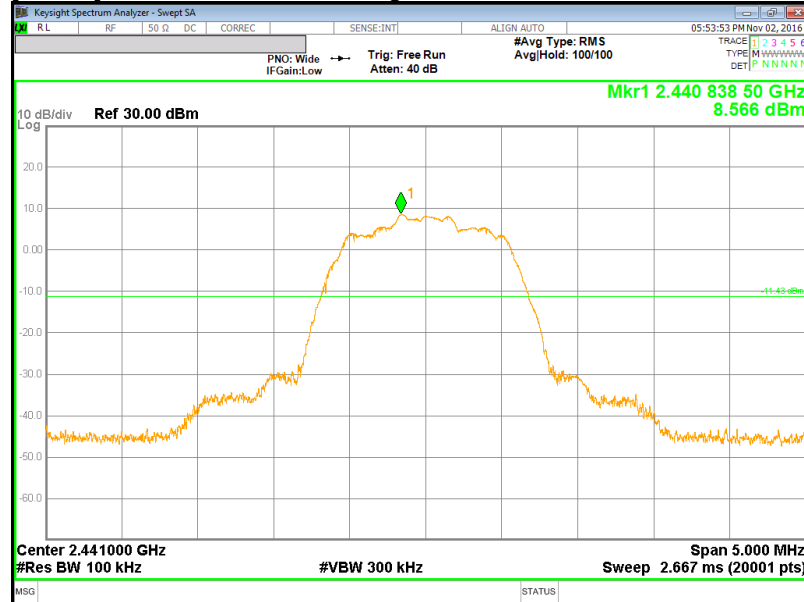
[PI/4-DQPSK Hopping Mode] High Channel BandEdge



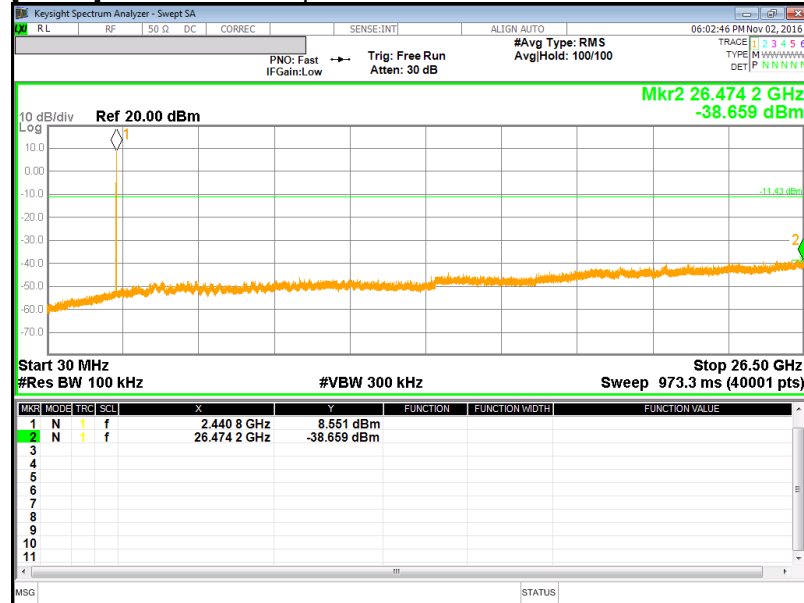
8PSK Mode



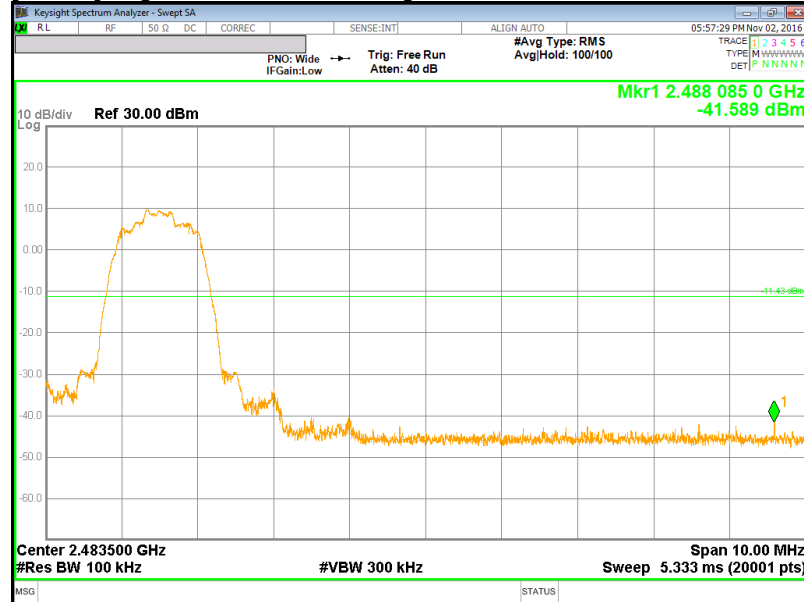
[8PSK] Mid Channel BandEdge



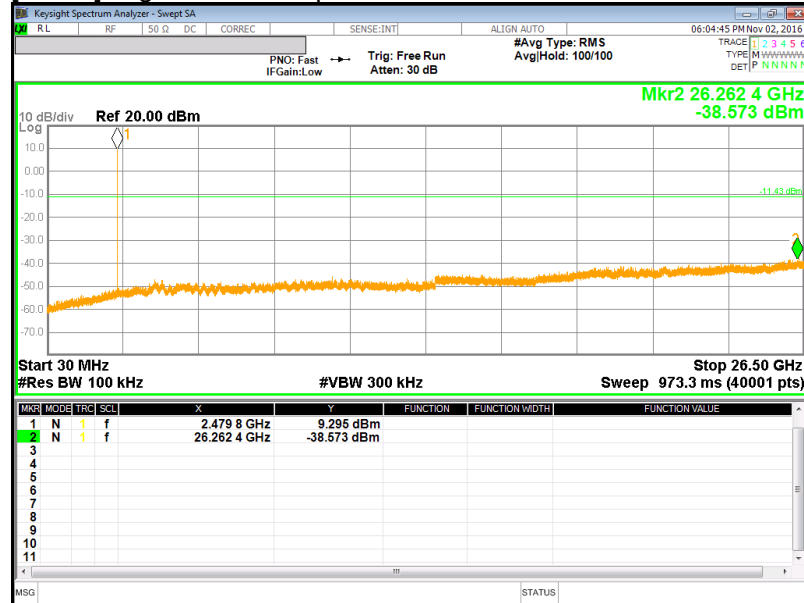
[8PSK] Mid Channel Spurious



[8PSK] High Channel BandEdge

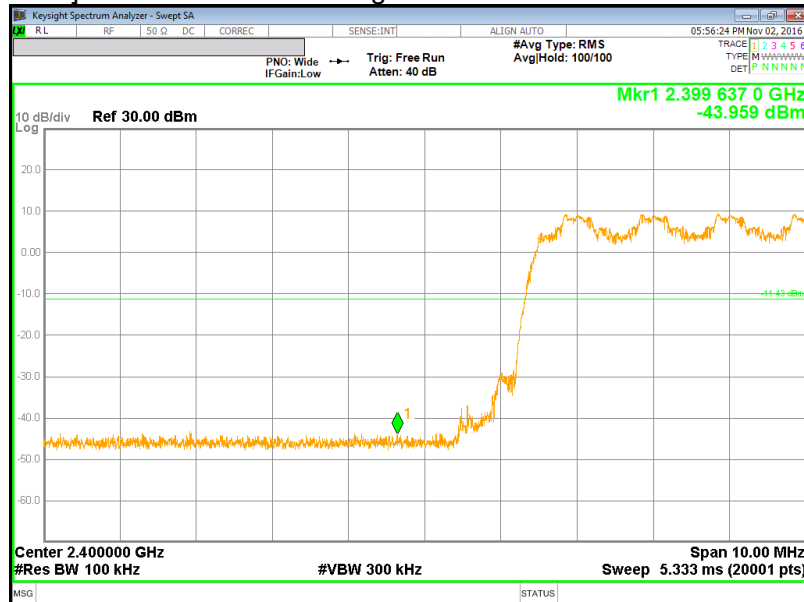


[8PSK] High Channel Spurious

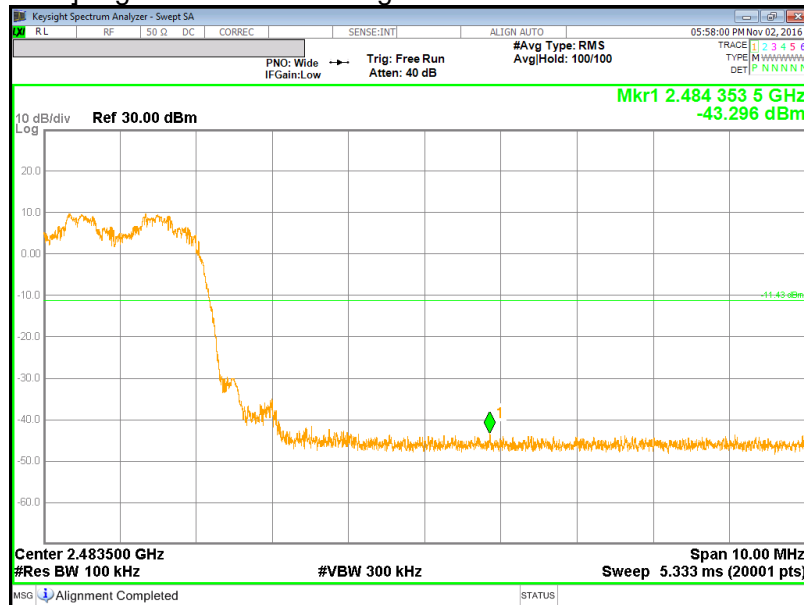


BandEdge Emission at 8PSK Hopping Mode

[8PSK Hopping Mode] Low Channel BandEdge



[8PSK Hopping Mode] High Channel BandEdge



9. RADIATED TEST RESULTS

9.1. 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 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; the video bandwidth is set to 3 MHz for peak measurements.(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.)

For band edge 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 1/T (on time) for average measurement.

$$\text{GFSK} = 1/T = 1 / 0.0029\text{S} = 350\text{Hz}.$$

The minimum VBW was 350Hz, but test receiver(ESU40) couldn't set value 350Hz. Due to this reason, testing VBW was set to 500Hz(Worst cases).

The spectrum from 1GHz 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 : 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.

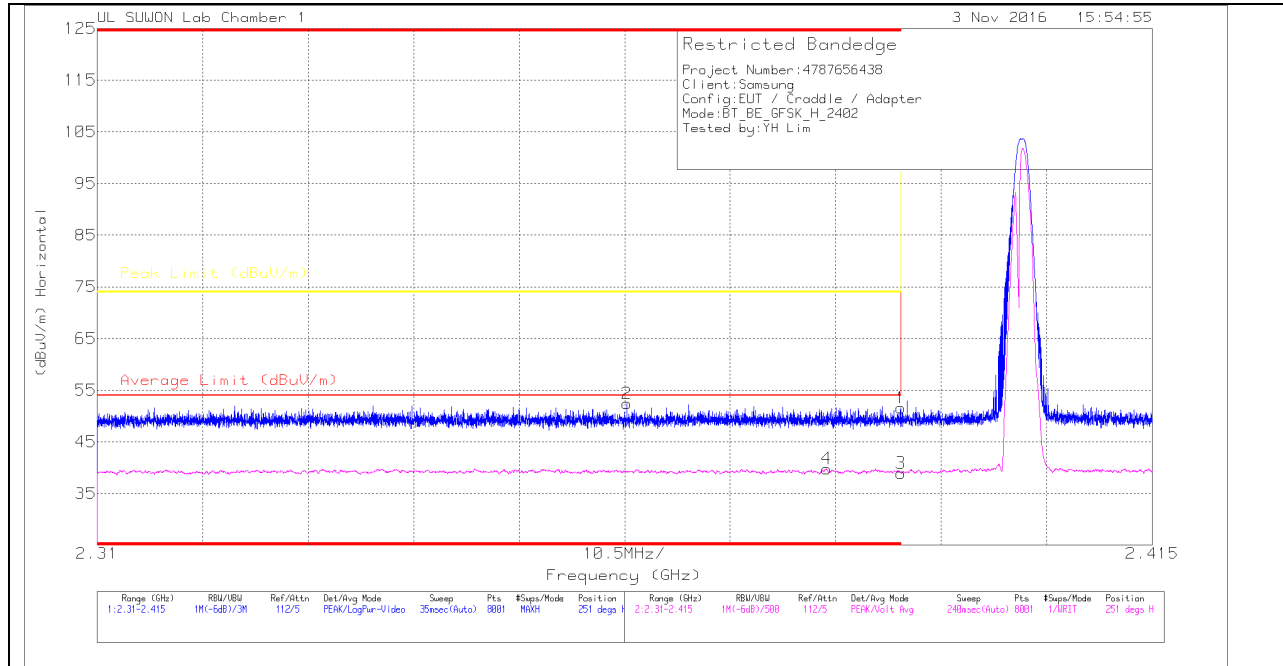
Formula for converting the filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

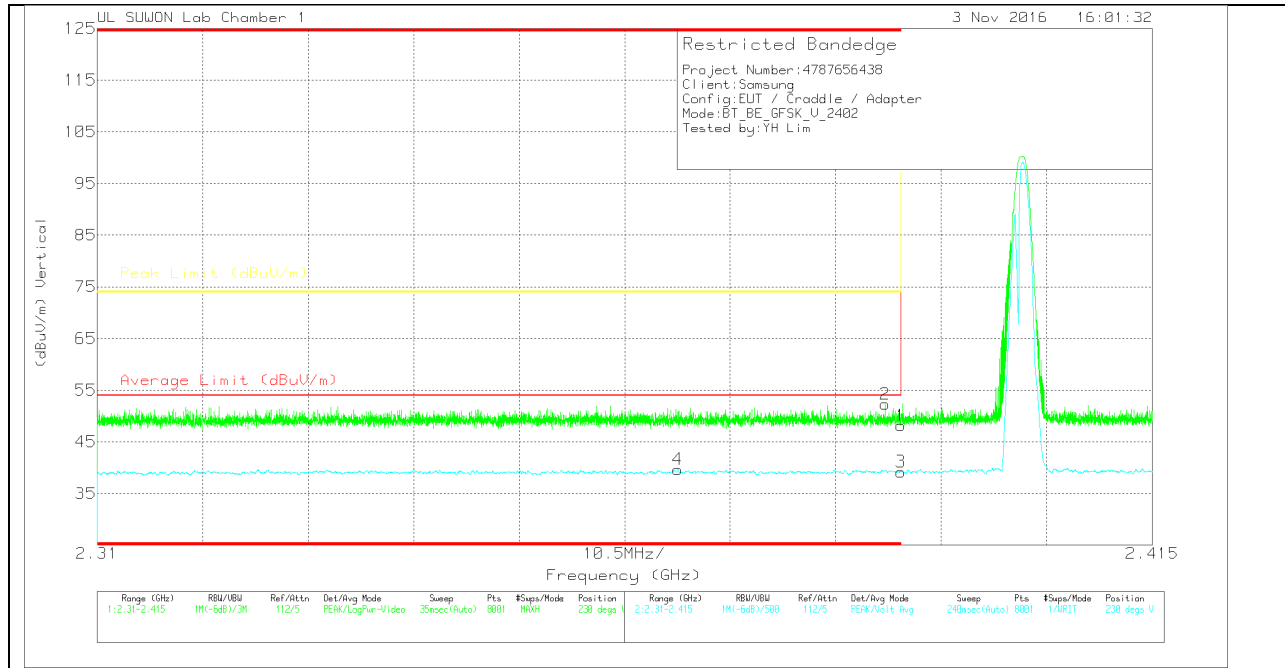
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	10dB[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	48.17	Pk	31.8	-28.4	51.57	-	-	74	-22.43	251	108	H
2	* 2.363	49.02	Pk	31.8	-28.4	52.42	-	-	74	-21.58	251	108	H
3	* 2.39	35.55	VA1T	31.8	-28.4	38.95	54	-15.05	-	-	251	108	H
4	* 2.383	36.52	VA1T	31.8	-28.5	39.82	54	-14.18	-	-	251	108	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	10dB[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	44.78	Pk		31.8	-28.4	48.18	-	74	-25.82	230	377	V
2	* 2.388	48.92	Pk		31.8	-28.4	52.32	-	74	-21.68	230	377	V
3	* 2.39	35.81	VA1T		31.8	-28.4	39.21	54	-14.79	-	230	377	V
4	* 2.368	36.28	VA1T		31.8	-28.4	39.68	54	-14.32	-	230	377	V

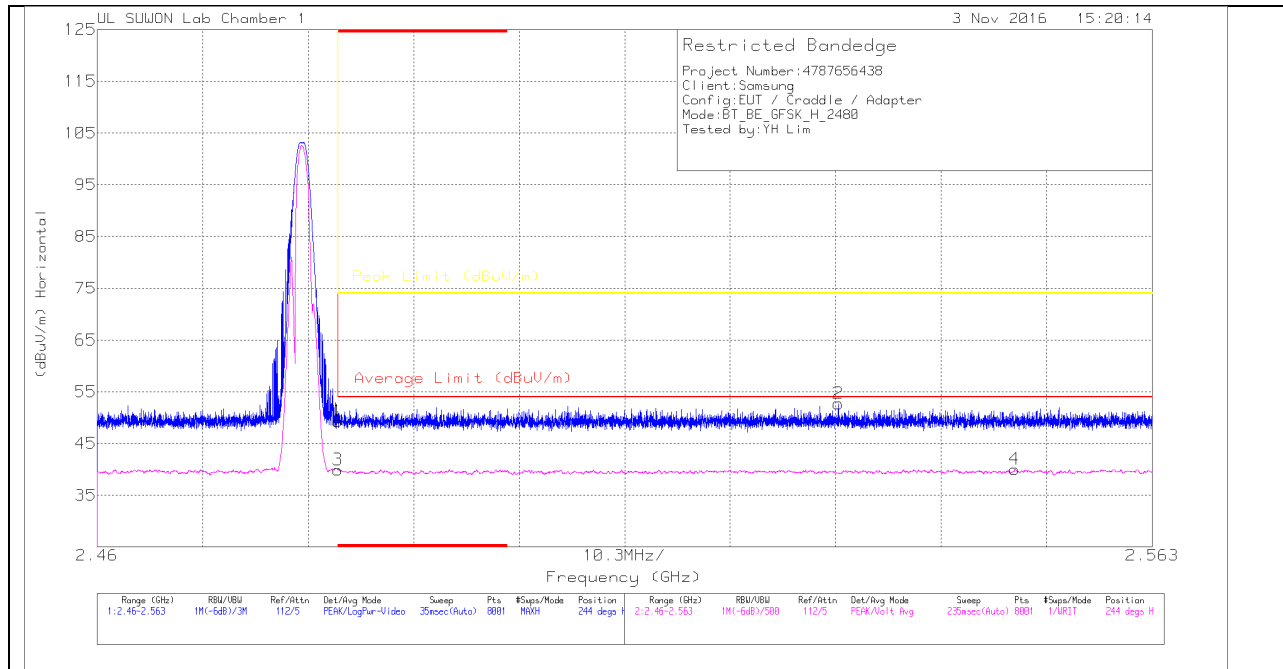
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

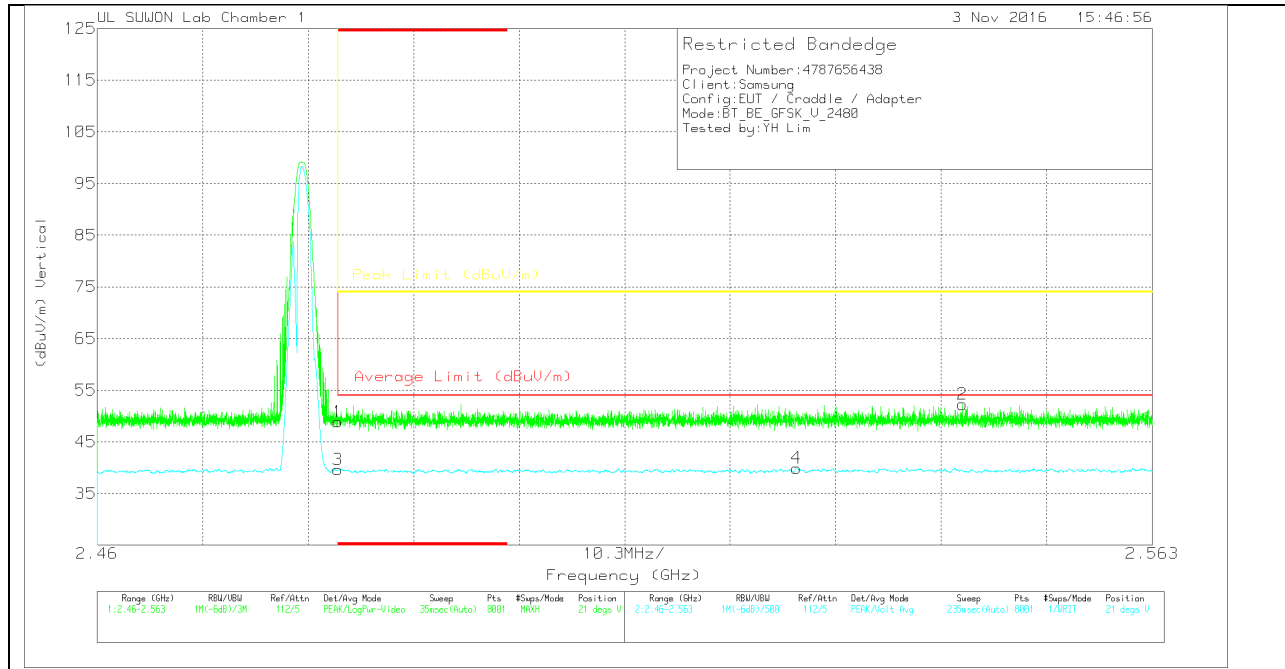
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	10dB[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	45.59	Pk	32	-28.3	49.29	-	-	74	-24.71	244	207	H
2	2.532	49.04	Pk	32	-28.3	52.74	-	-	74	-21.26	244	207	H
3	* 2.484	36.23	VA1T	32	-28.3	39.93	54	-14.07	-	-	244	207	H
4	2.55	36.36	VA1T	32	-28.3	40.06	54	-13.94	-	-	244	207	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	10dB[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	45.2	Pk	32	-28.3	48.9	-	-	74	-25.1	21	127	V
2	2.544	48.57	Pk	32	-28.3	52.27	-	-	74	-21.73	21	127	V
3	* 2.484	35.94	VA1T	32	-28.3	39.64	54	-14.36	-	-	21	127	V
4	2.528	36.24	VA1T	32	-28.3	39.94	54	-14.06	-	-	21	127	V

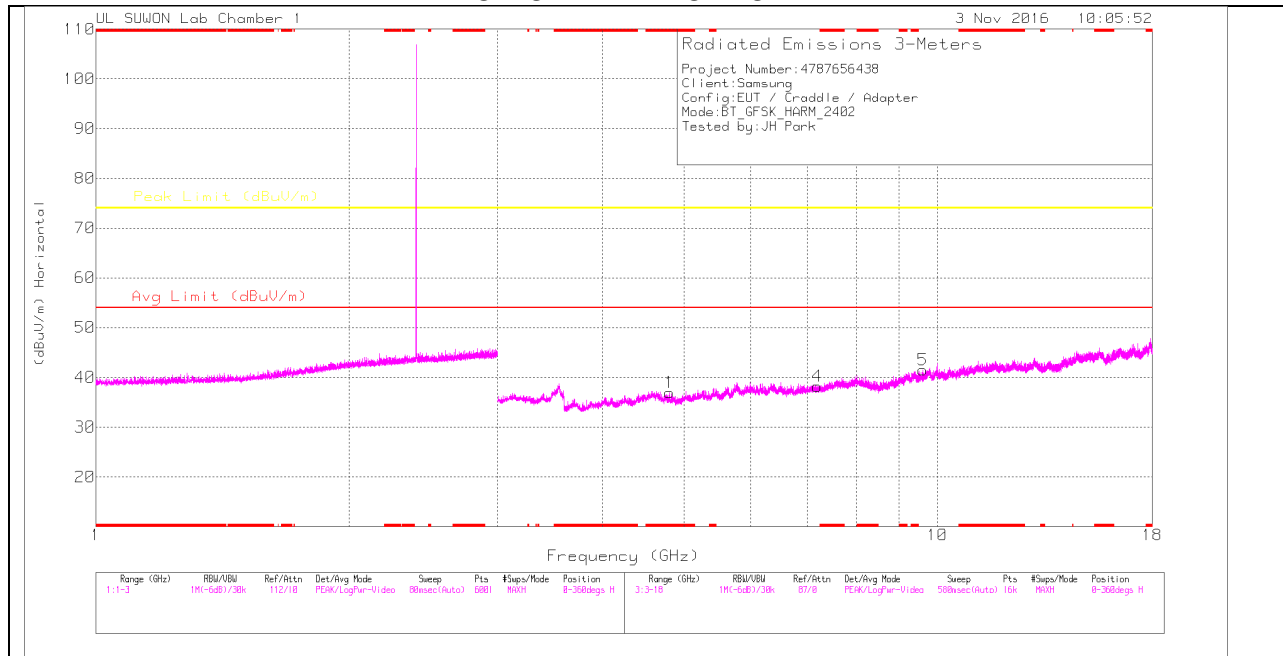
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

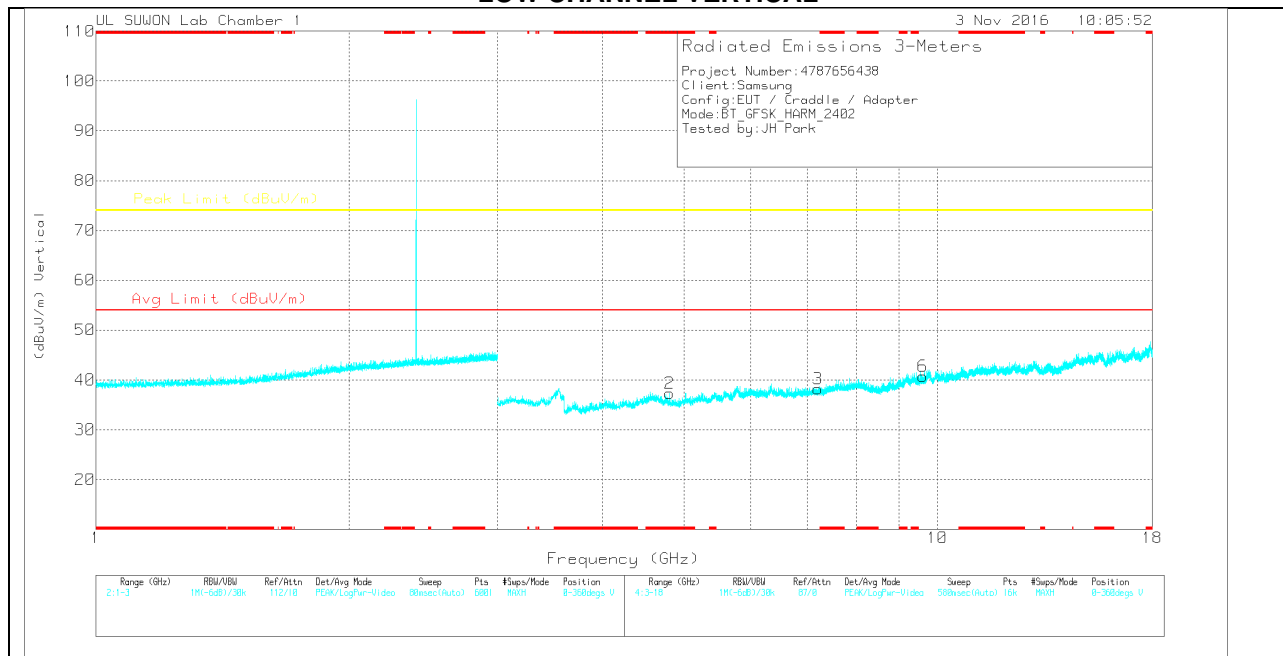
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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

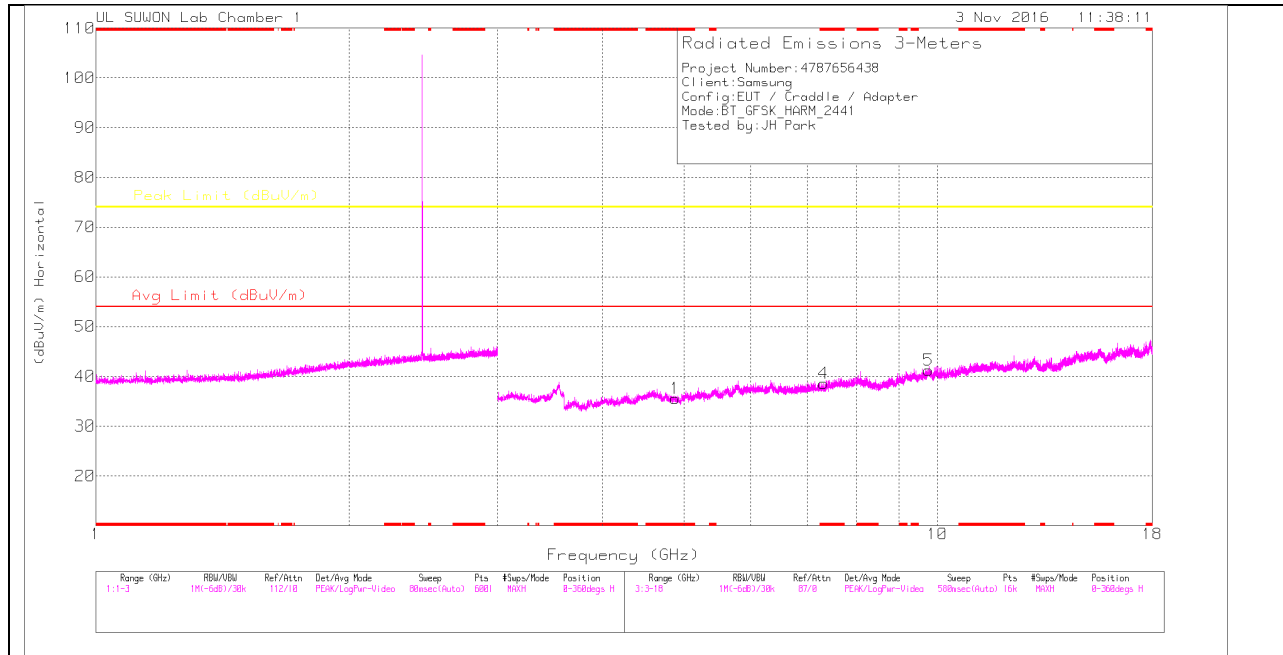
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	3GHz_HP[d B]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.804	36.43	PK	34	-33.5	36.93	-	-	74	-37.07	0-360	250	H
4	7.198	33.12	PK	35.7	-30.6	38.22	-	-	74	-35.78	0-360	250	H
5	9.611	31.85	PK	37	-27.4	41.45	-	-	74	-32.55	0-360	150	H
2	* 4.804	36.79	PK	34	-33.5	37.29	-	-	74	-36.71	0-360	250	V
3	7.206	33.11	PK	35.7	-30.6	38.21	-	-	74	-35.79	0-360	150	V
6	9.615	31.14	PK	37	-27.4	40.74	-	-	74	-33.26	0-360	250	V

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

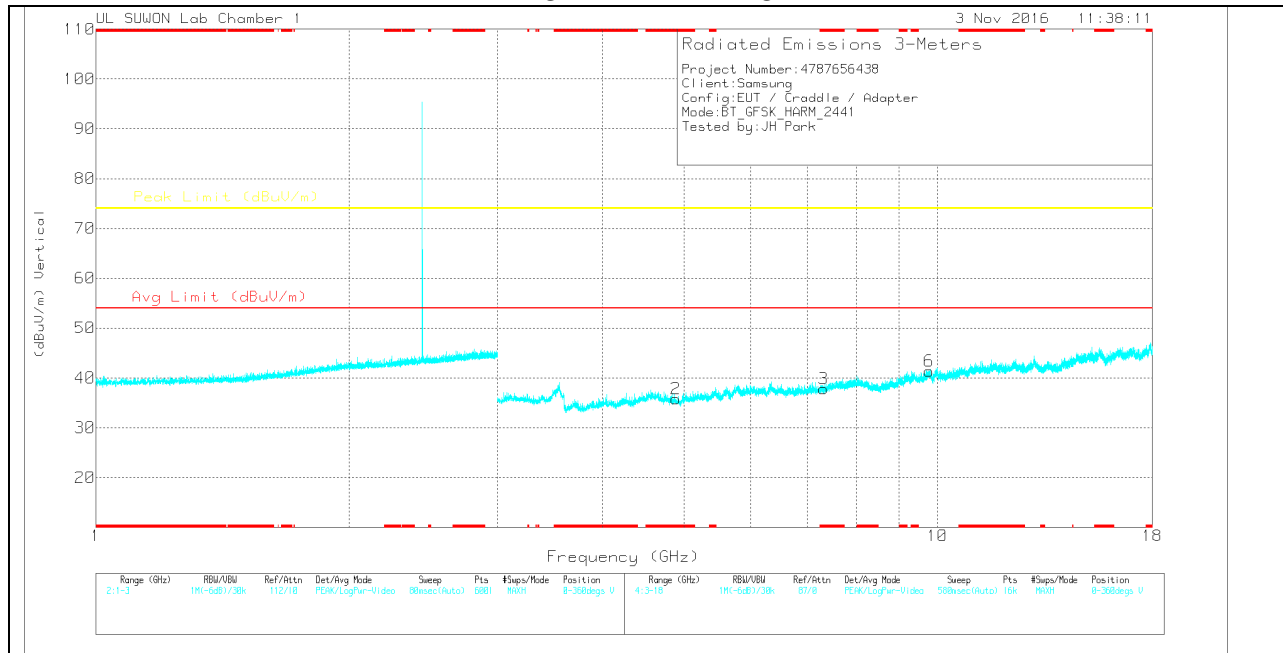
PK – Peak Detector

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

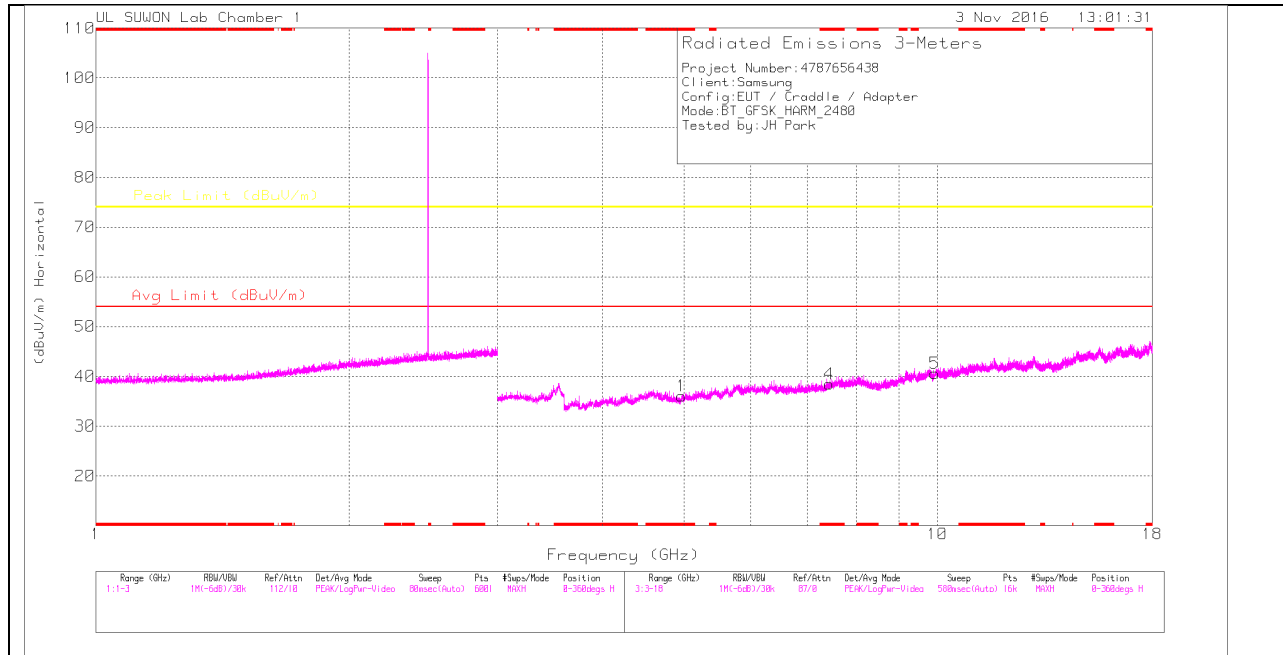
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	3GHz_HP[d B]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	35.1	PK	34	-33.5	35.6	-	-	74	-38.4	0-360	150	H
4	* 7.326	33.35	PK	35.8	-30.6	38.55	-	-	74	-35.45	0-360	250	H
5	9.761	30.61	PK	37.2	-26.6	41.21	-	-	74	-32.79	0-360	250	H
2	* 4.885	35.33	PK	34	-33.5	35.83	-	-	74	-38.17	0-360	150	V
3	* 7.322	32.66	PK	35.8	-30.6	37.86	-	-	74	-36.14	0-360	250	V
6	9.768	30.7	PK	37.2	-26.5	41.4	-	-	74	-32.6	0-360	250	V

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

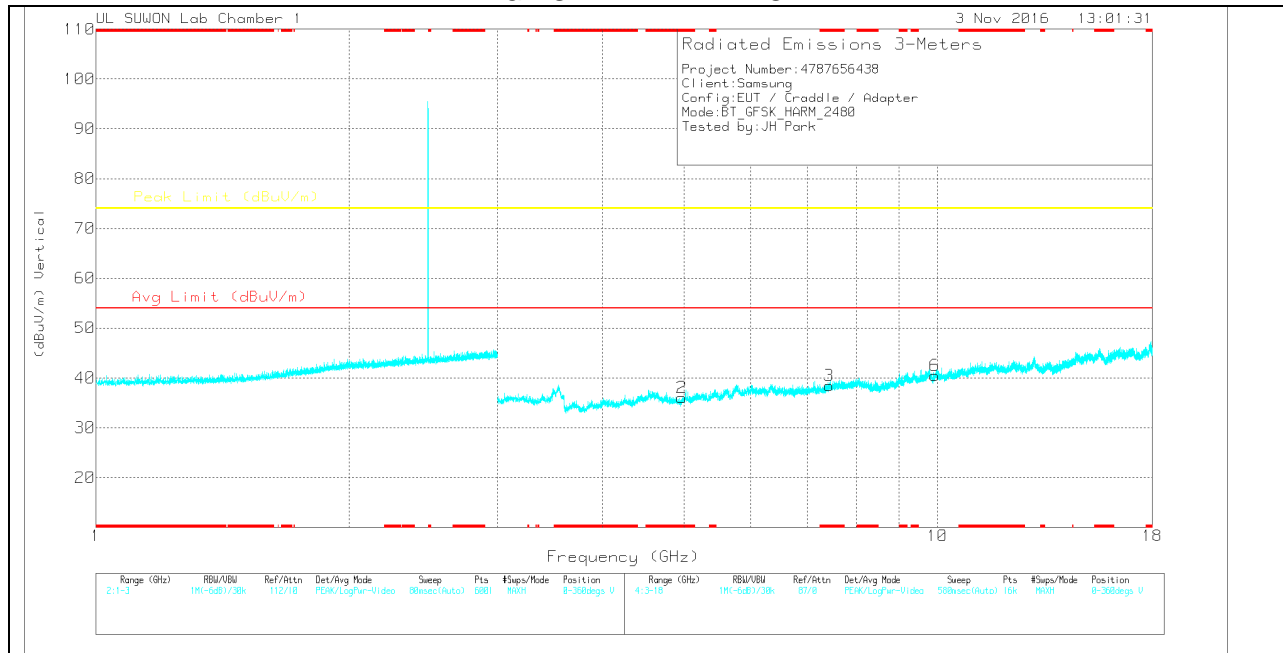
PK – Peak Detector

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(0016 8717)_150 619	3GHz_HP[d B]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.964	35.68	PK	34	-33.6	36.08	-	-	74	-37.92	0-360	150	H
4	* 7.44	33.09	PK	35.8	-30.4	38.49	-	-	74	-35.51	0-360	250	H
5	9.92	30.29	PK	37.4	-27.1	40.59	-	-	74	-33.41	0-360	250	H
2	* 4.969	35.61	PK	34.1	-33.6	36.11	-	-	74	-37.89	0-360	150	V
3	* 7.44	33.06	PK	35.8	-30.4	38.46	-	-	74	-35.54	0-360	250	V
6	9.927	30.01	PK	37.4	-26.9	40.51	-	-	74	-33.49	0-360	250	V

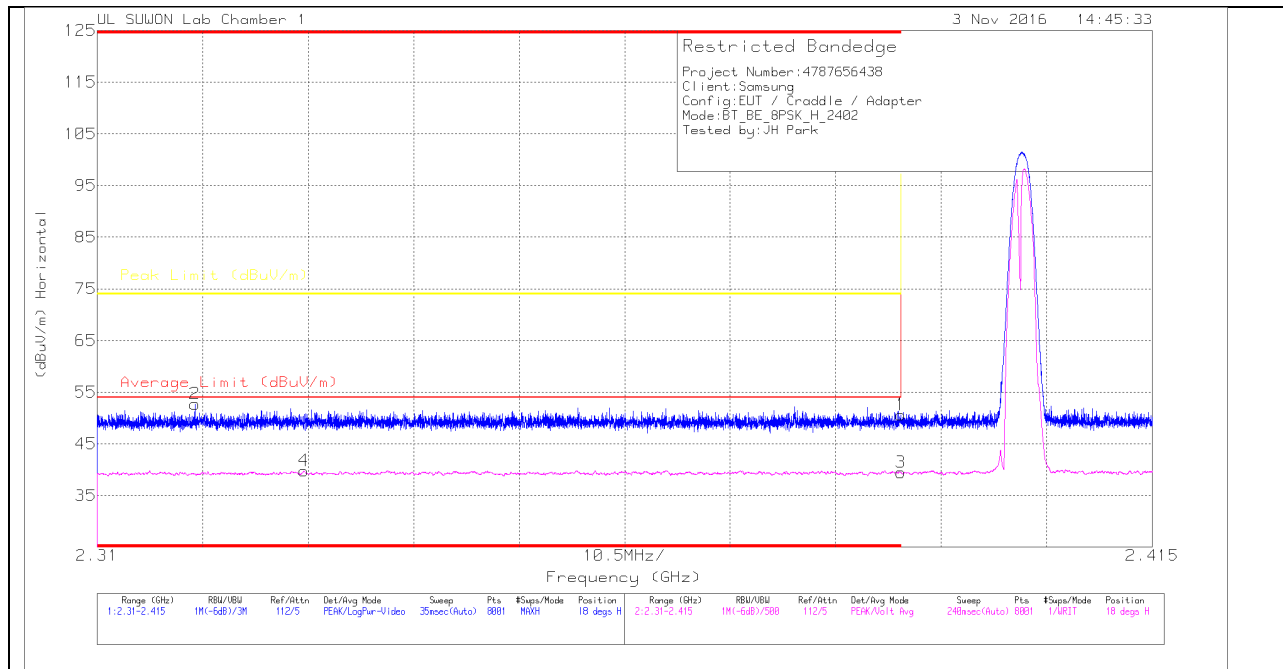
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

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

9.2.2. ENHANCED DATA RATE 8PSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

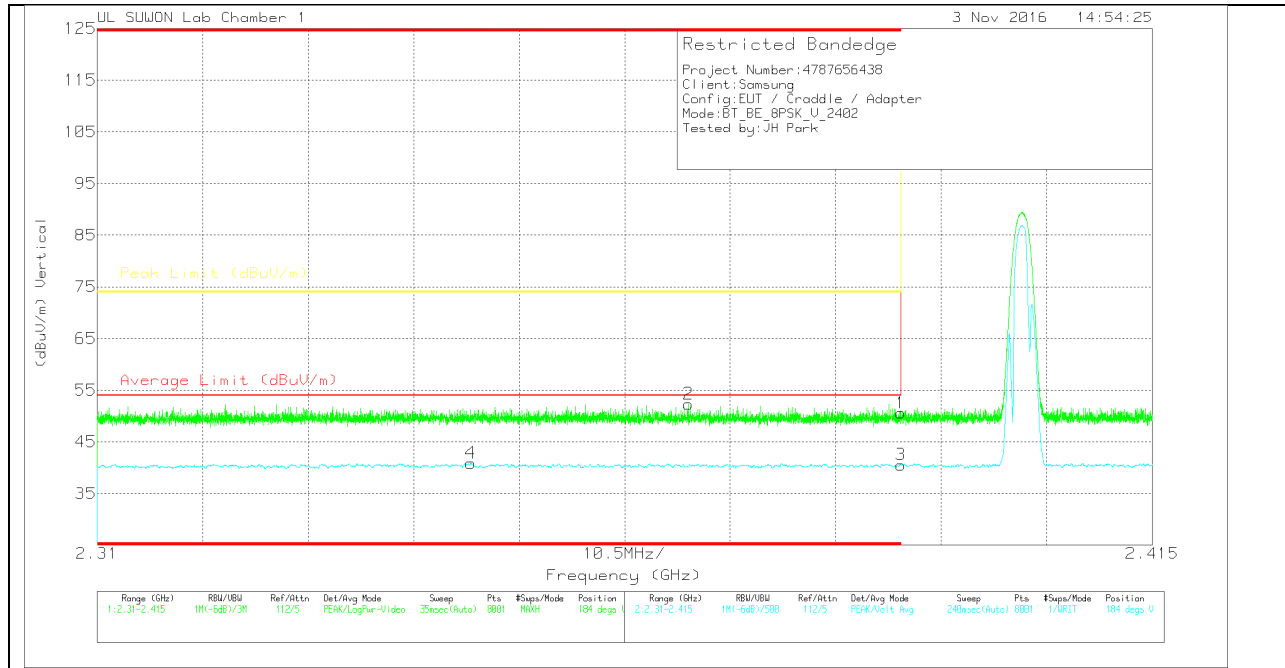
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	10dB[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	47.24	Pk		-28.4	50.64	-	-	74	-23.36	18	144	H
2	* 2.32	49.54	Pk		-28.5	52.74	-	-	74	-21.26	18	144	H
3	* 2.39	36.09	VA1T		-28.4	39.49	54	-14.51	-	-	18	144	H
4	* 2.331	36.62	VA1T		-28.5	39.82	54	-14.18	-	-	18	144	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117/00168 717_15061 9	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	47.18	Pk		-28.4	0	50.58	-	-	74	-23.42	184	101	V
2	* 2.369	48.93	Pk		-28.4	0	52.33	-	-	74	-21.67	184	101	V
3	* 2.39	36.02	VA1T		-28.4	1.14	40.56	54	-13.44	-	-	184	101	V
4	* 2.347	36.57	VA1T		-28.5	1.14	40.91	54	-13.09	-	-	184	101	V

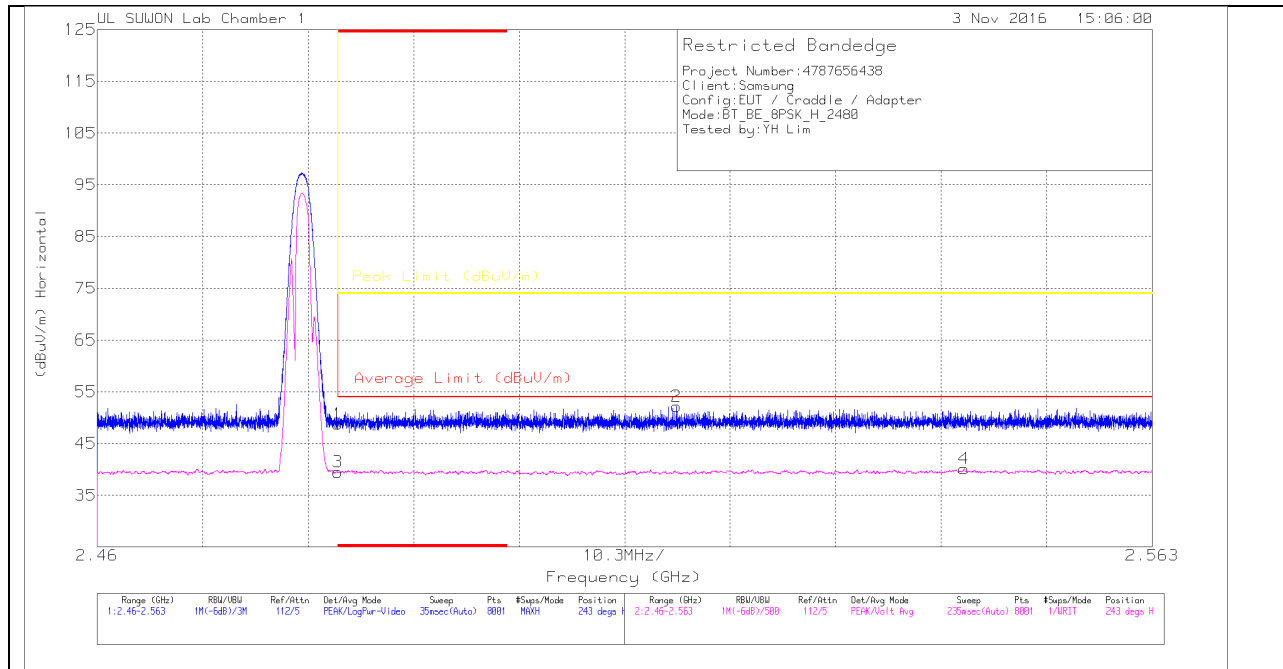
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

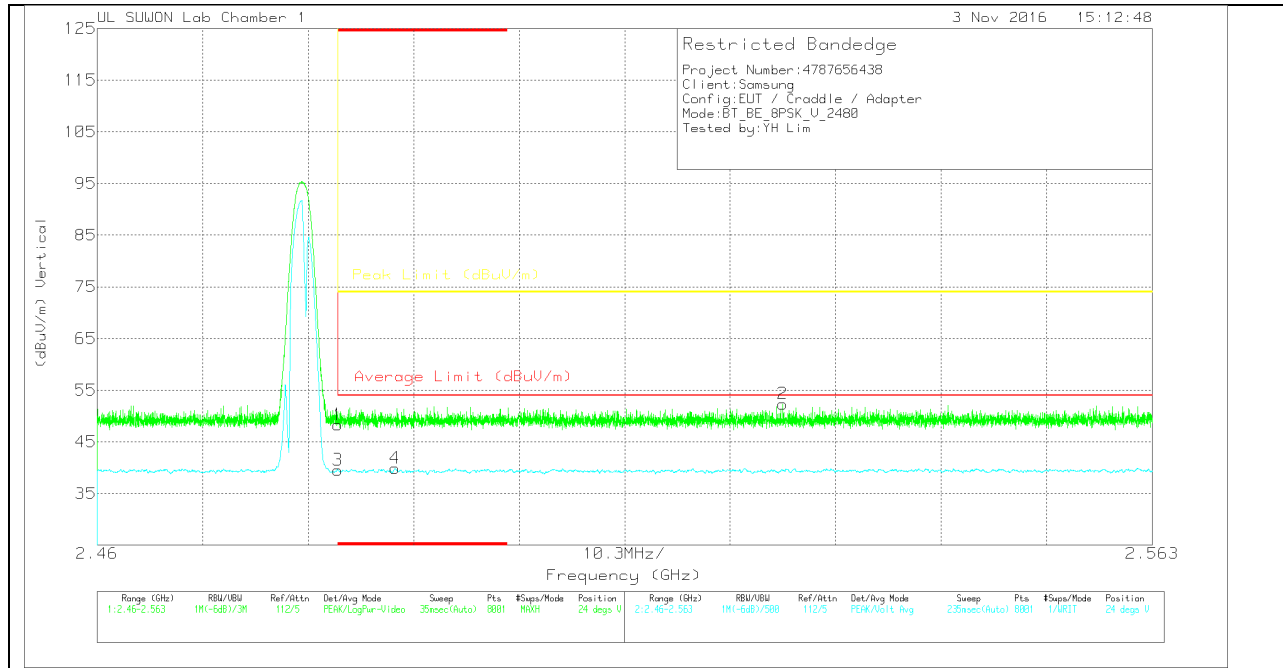
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	10dB[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	45.08	Pk		-28.3	48.78	-	-	74	-25.22	243	162	H
2	2.517	48.46	Pk		-28.3	52.16	-	-	74	-21.84	243	162	H
3	* 2.484	35.79	VA1T		-28.3	39.49	54	-14.51	-	-	243	162	H
4	2.545	36.41	VA1T		-28.3	40.11	54	-13.89	-	-	243	162	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	10dB[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	44.61	Pk	32	-28.3	48.31	-	-	74	-25.69	24	125	V
2	2.527	48.67	Pk	32	-28.3	52.37	-	-	74	-21.63	24	125	V
3	* 2.484	35.85	VA1T	32	-28.3	39.55	54	-14.45	-	-	24	125	V
4	* 2.489	36.21	VA1T	32	-28.3	39.91	54	-14.09	-	-	24	125	V

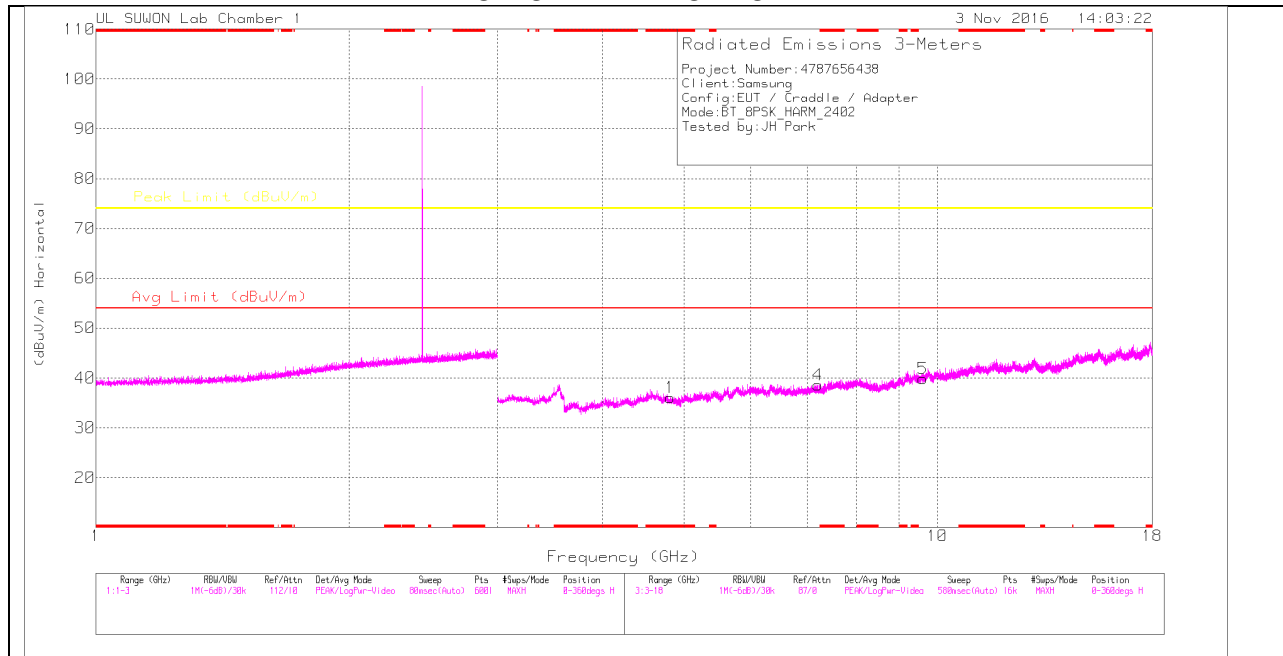
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

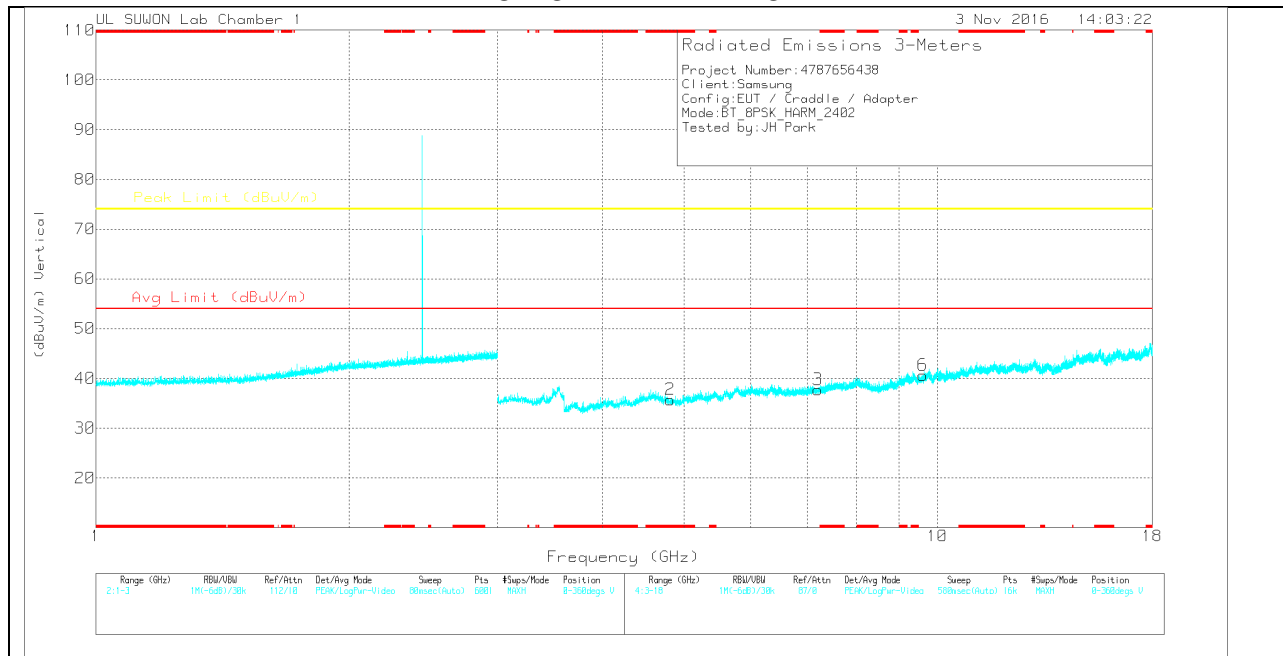
VA1T - FHSS: Linear Voltage Average $V_B = 1/T_{on}$ where: T_{on} is transmit duration

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

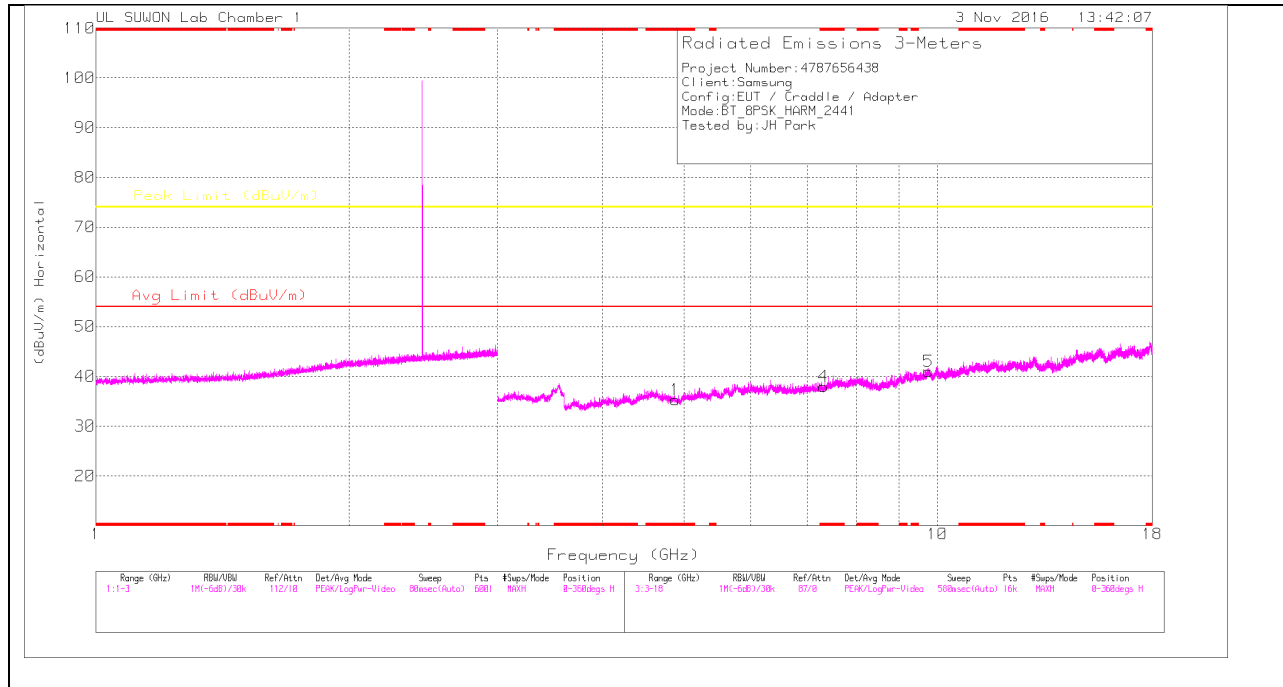
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	3GHz_HP[d B]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.81	35.57	PK	34	-33.5	36.07	-	-	74	-37.93	0-360	250	H
4	7.21	33.61	PK	35.7	-30.7	38.61	-	-	74	-35.39	0-360	250	H
5	9.604	30.18	PK	37	-27.3	39.88	-	-	74	-34.12	0-360	150	H
2	* 4.812	35.25	PK	34	-33.5	35.75	-	-	74	-38.25	0-360	150	V
3	7.21	32.77	PK	35.7	-30.7	37.77	-	-	74	-36.23	0-360	250	V
6	9.6	30.98	PK	37	-27.3	40.68	-	-	74	-33.32	0-360	150	V

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

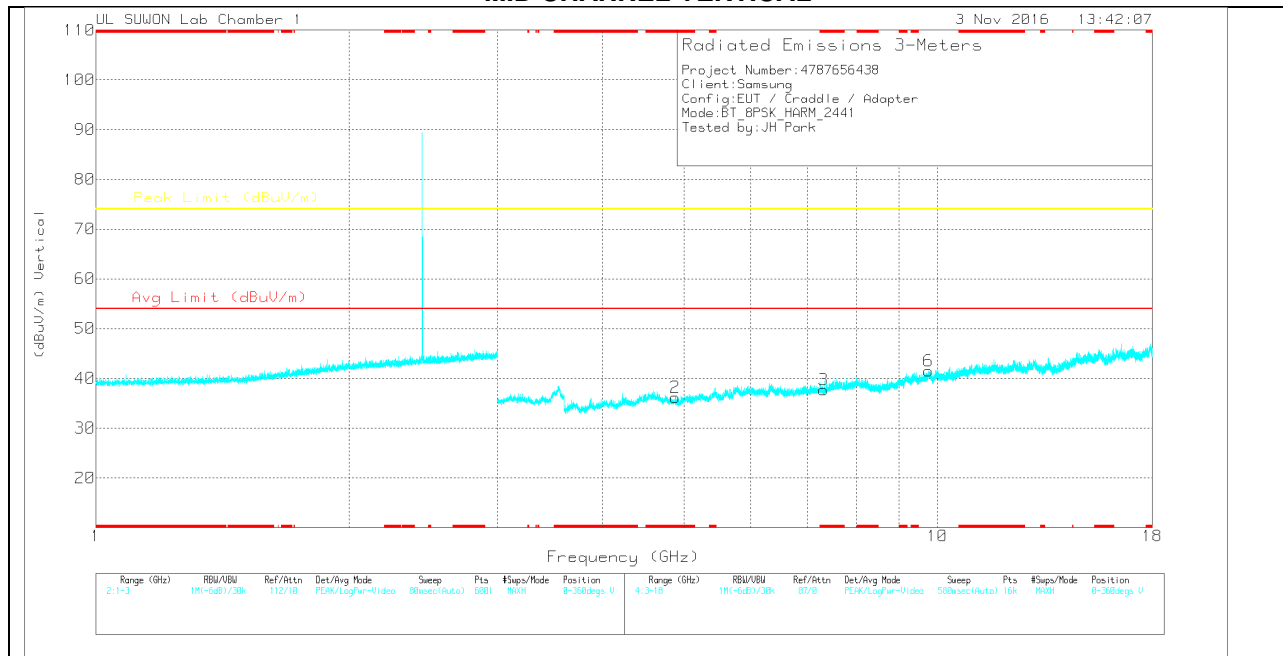
PK – Peak Detector

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

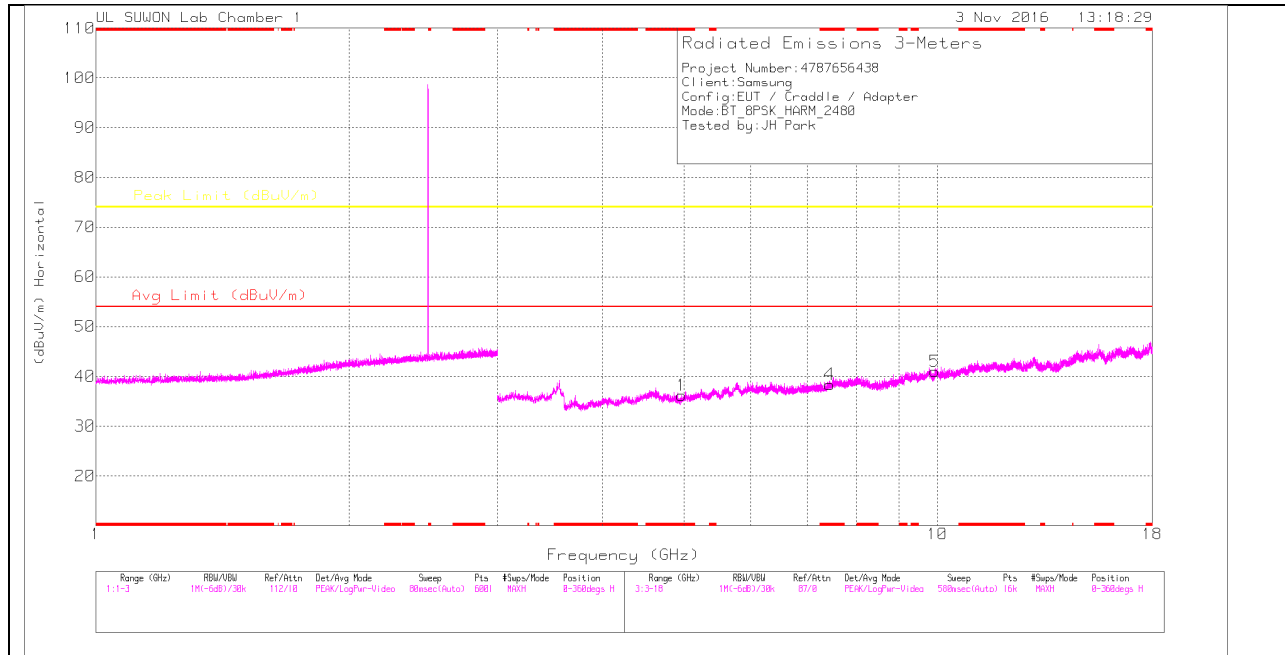
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	3GHz_HP[d B]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.883	34.84	PK	34	-33.5	35.34	-	-	74	-38.66	0-360	250	H
4	* 7.324	32.79	PK	35.8	-30.6	37.99	-	-	74	-36.01	0-360	150	H
5	9.763	30.42	PK	37.2	-26.6	41.02	-	-	74	-32.98	0-360	150	H
2	* 4.883	35.71	PK	34	-33.5	36.21	-	-	74	-37.79	0-360	250	V
3	* 7.322	32.52	PK	35.8	-30.6	37.72	-	-	74	-36.28	0-360	250	V
6	9.763	30.92	PK	37.2	-26.6	41.52	-	-	74	-32.48	0-360	150	V

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

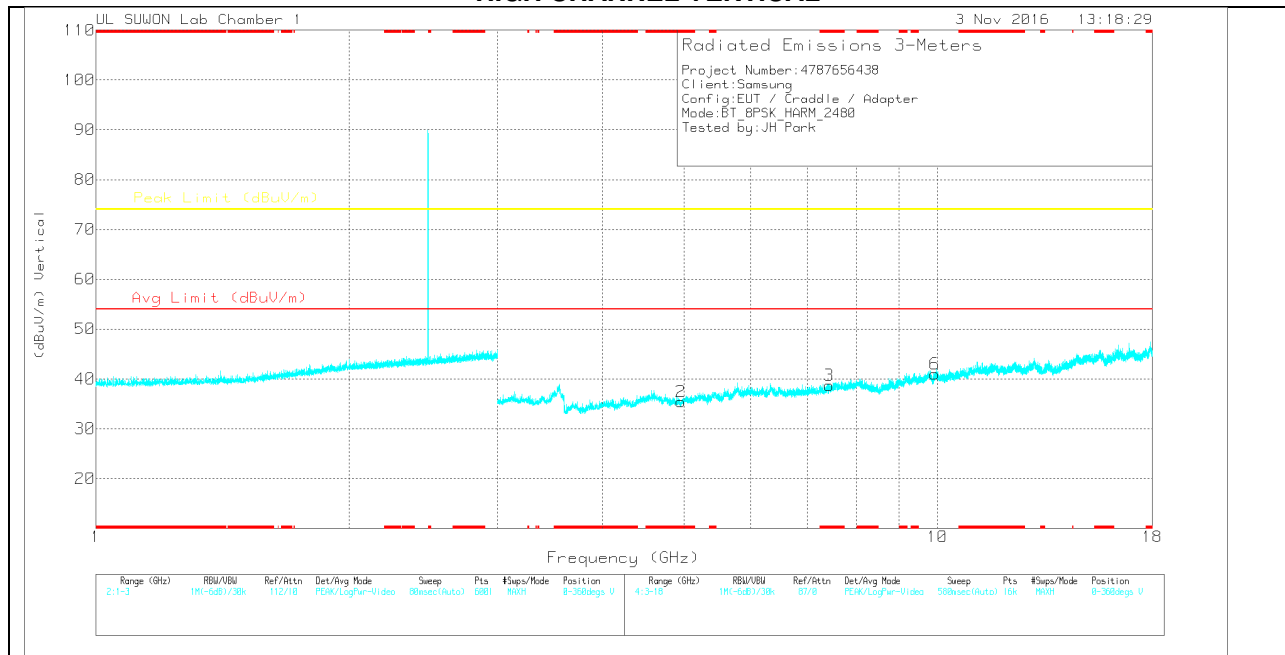
PK – Peak Detector

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(0016 8717)_150 619	3GHz_HP[d B]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.963	35.74	PK	34	-33.6	36.14	-	-	74	-37.86	0-360	150	H
4	* 7.443	33	PK	35.8	-30.4	38.4	-	-	74	-35.6	0-360	250	H
5	9.919	30.75	PK	37.4	-27.1	41.05	-	-	74	-32.95	0-360	250	H
2	* 4.958	35	PK	34	-33.6	35.4	-	-	74	-38.6	0-360	150	V
3	* 7.44	33.35	PK	35.8	-30.4	38.75	-	-	74	-35.25	0-360	250	V
6	9.92	30.64	PK	37.4	-27.1	40.94	-	-	74	-33.06	0-360	150	V

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

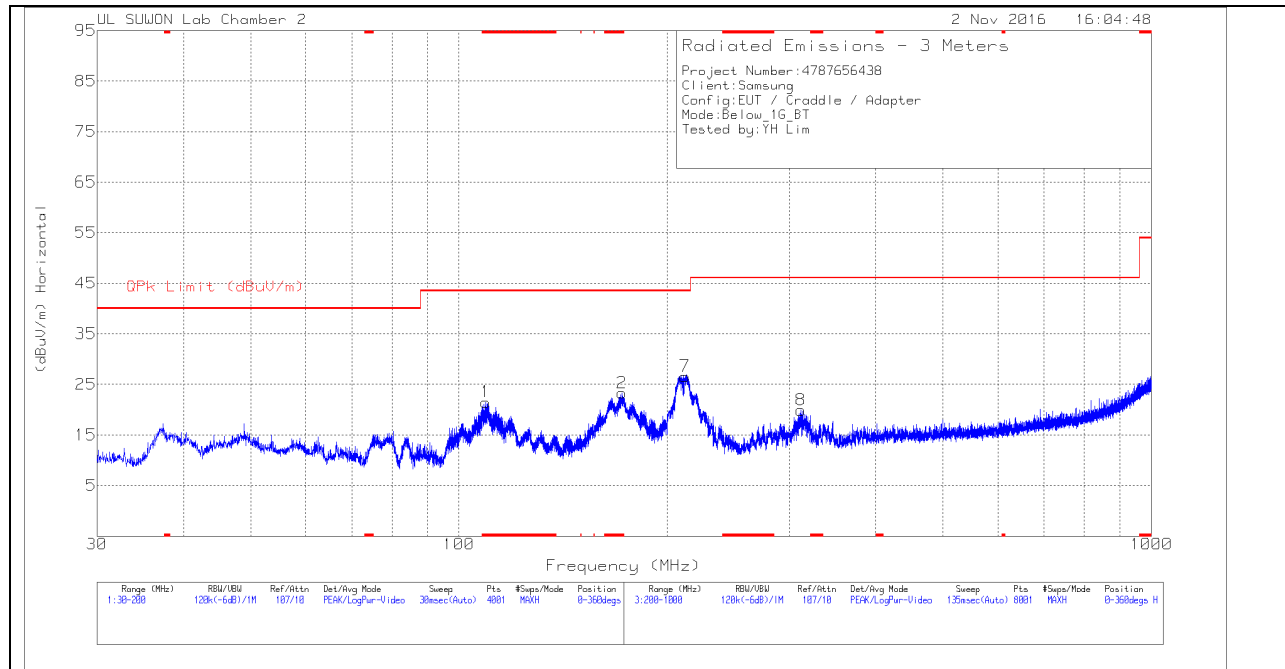
PK – Peak Detector

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

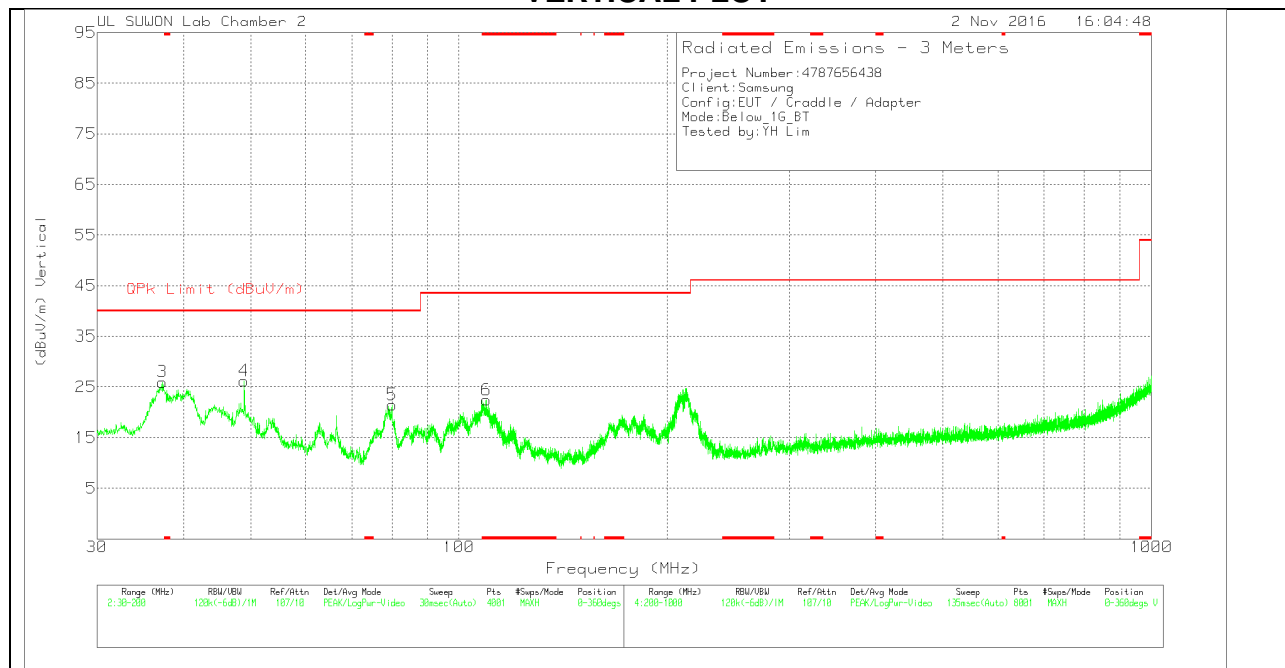
9.3. WORST-CASE BELOW 1 GHz

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

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	* 109.3475	41.2	Pk	10.8	-30.5	21.5	43.52	-22.02	0-360	300	H
2	* 172.0775	44.47	Pk	9.1	-30.3	23.27	43.52	-20.25	0-360	200	H
3	37.31	45.08	Pk	11.7	-30.8	25.98	40	-14.02	0-360	100	V
4	48.955	42.78	Pk	14.1	-30.7	26.18	40	-13.82	0-360	100	V
5	80.0225	44.95	Pk	7.1	-30.6	21.45	40	-18.55	0-360	100	V
6	* 109.56	42.1	Pk	10.8	-30.5	22.4	43.52	-21.12	0-360	100	V
7	212.1	45.16	Pk	11.6	-30.2	26.56	43.52	-16.96	0-360	100	H
8	311.7	36.19	Pk	13.6	-29.9	19.89	46.02	-26.13	0-360	100	H

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

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

* Decreases with the logarithm of the frequency.

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.

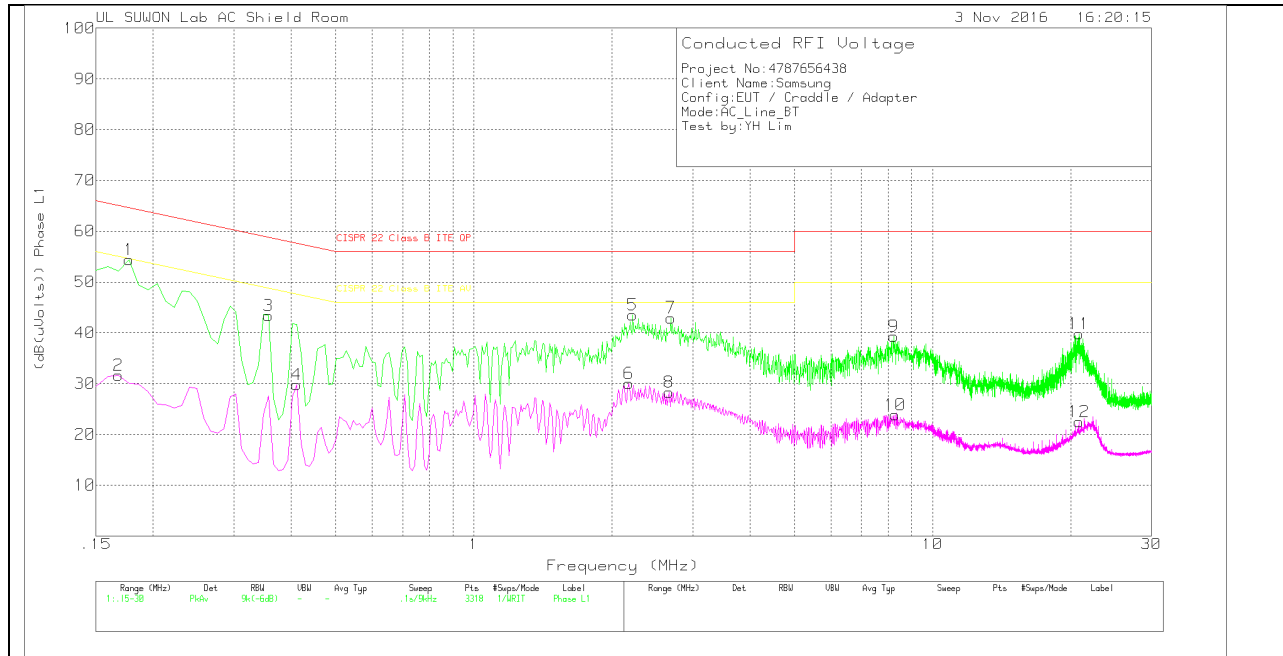
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

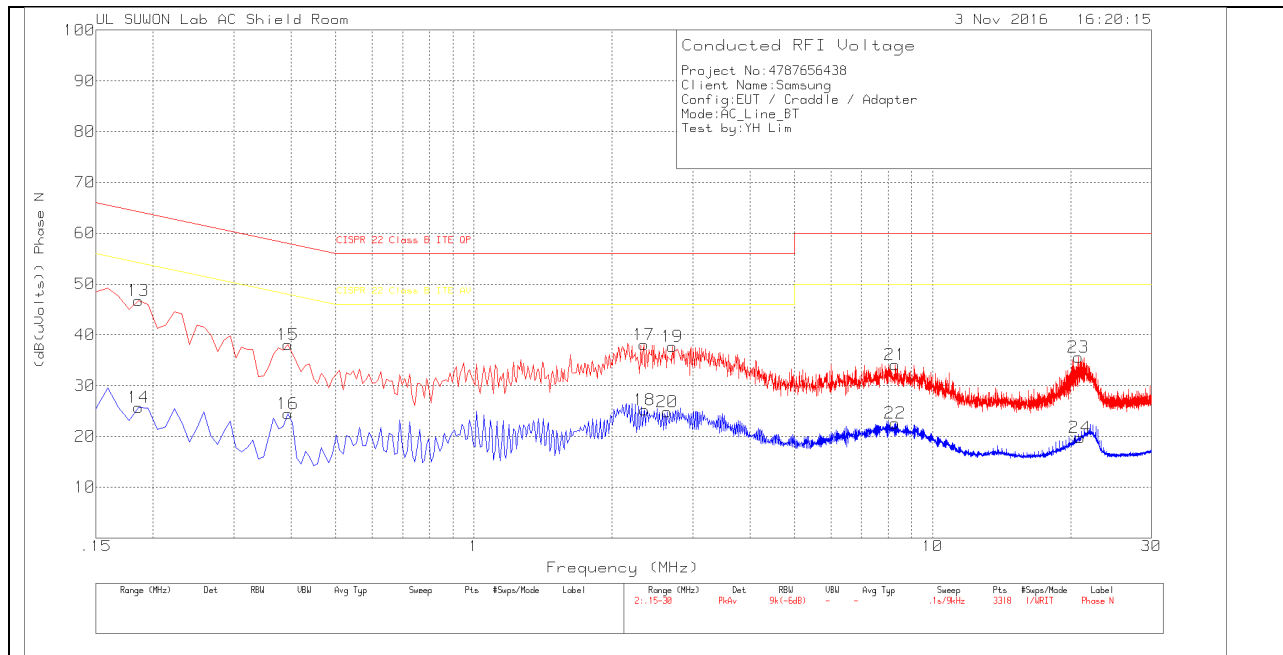
Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_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	.177	44.43	Pk	10	0	54.43	64.63	-10.2	-	-
2	.168	21.66	Av	10	0	31.66	-	-	55.06	-23.4
3	.357	33.54	Pk	9.8	0	43.34	58.8	-15.46	-	-
4	.411	19.85	Av	9.9	0	29.75	-	-	47.63	-17.88
5	2.22	33.69	Pk	9.7	.1	43.49	56	-12.51	-	-
6	2.175	20.27	Av	9.7	.1	30.07	-	-	46	-15.93
7	2.688	33.15	Pk	9.7	.1	42.95	56	-13.05	-	-
8	2.661	18.49	Av	9.7	.1	28.29	-	-	46	-17.71
9	8.223	29.32	Pk	9.9	.1	39.32	60	-20.68	-	-
10	8.286	13.86	Av	9.9	.1	23.86	-	-	50	-26.14
11	20.877	29.23	Pk	10.4	.2	39.83	60	-20.17	-	-
12	20.841	11.85	Av	10.4	.2	22.45	-	-	50	-27.55

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	.186	36.79	Pk	9.9	0	46.69	64.21	-17.52	-	-
14	.186	15.75	Av	9.9	0	25.65	-	-	54.21	-28.56
15	.393	28.17	Pk	9.9	0	38.07	58	-19.93	-	-
16	.393	14.58	Av	9.9	0	24.48	-	-	48	-23.52
17	2.346	28.26	Pk	9.7	.1	38.06	56	-17.94	-	-
18	2.355	15.43	Av	9.7	.1	25.23	-	-	46	-20.77
19	2.706	27.93	Pk	9.7	.1	37.73	56	-18.27	-	-
20	2.643	15.01	Av	9.7	.1	24.81	-	-	46	-21.19
21	8.286	24	Pk	10	.1	34.1	60	-25.9	-	-
22	8.286	12.45	Av	10	.1	22.55	-	-	50	-27.45
23	20.805	24.7	Pk	10.7	.2	35.6	60	-24.4	-	-
24	20.967	8.91	Av	10.7	.2	19.81	-	-	50	-30.19

Pk - Peak detector

Av - Average detection