



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

Bluetooth

CERTIFICATION TEST REPORT

FOR

Bluetooth/BLE, DTS/UNII a/b/g/n/ac and ANT+ Tablet

MODEL NUMBER : SM-T670

FCC ID: A3LSMT670

IC ID: 649E-SMT670

REPORT NUMBER: 15K21654-E3

ISSUE DATE: SEP 14, 2015

Prepared for

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

Prepared by

**UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea**

TEL: (031) 337-9902

FAX: (031) 213-5433



Revision History

Rev.	Issue Date	Revisions	Revised By
--	09/08/15	Initial issue	Junwhan Lee
--	09/14/15	Revised power table of page 7	Junwhan Lee

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. SAMPLE CALCULATION	6
4.3. MEASUREMENT UNCERTAINTY	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT	7
5.2. MAXIMUM OUTPUT POWER.....	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	7
5.4. WORST-CASE CONFIGURATION AND MODE.....	7
5.5. DESCRIPTION OF TEST SETUP.....	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. SUMMARY TABLE	11
8. ANTENNA PORT TEST RESULTS.....	12
8.1. 20 dB AND 99% BANDWIDTH	12
8.1.1. BASIC DATA RATE GFSK MODULATION.....	12
8.1.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION.....	12
8.1.3. ENHANCED DATA RATE 8PSK MODULATION	12
8.1.4. 20 dB AND 99% BANDWIDTH PLOTS.....	13
8.2. HOPPING FREQUENCY SEPARATION	16
8.3. NUMBER OF HOPPING CHANNELS.....	18
8.4. AVERAGE TIME OF OCCUPANCY.....	21
8.5. OUTPUT POWER.....	25
8.5.1. BASIC DATA RATE GFSK MODULATION.....	25
8.5.2. ENHANCED DATA RATE PI/4-DPSK MODULATION	25
8.5.3. ENHANCED DATA RATE 8PSK MODULATION	25
8.5.4. OUTPUT POWER PLOTS.....	26
8.6. AVERAGE POWER.....	29
8.6.1. BASIC DATA RATE GFSK MODULATION.....	29
8.6.2. DATA RATE PI/4-DQPSK MODULATION	29
8.6.3. ENHANCED DATA RATE 8PSK MODULATION	29
8.7. CONDUCTED SPURIOUS EMISSIONS.....	30
8.7.1. BASIC DATA RATE GFSK MODULATION.....	31

9. RADIATED TEST RESULTS.....	37
9.1. LIMITS AND PROCEDURE	37
9.2. TRANSMITTER ABOVE 1 GHz	38
9.2.1. BASIC DATA RATE GFSK MODULATION	38
9.2.2. ENHANCED DATA RATE 8PSK MODULATION	48
9.3. WORST-CASE BELOW 1 GHz.....	58
10. AC POWER LINE CONDUCTED EMISSIONS	60
11. SETUP PHOTOS	65

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: Bluetooth/BLE, DTS/UNII a/b/g/n/ac and ANT+ Tablet
MODEL NUMBER: SM-T670
SERIAL NUMBER: R32G8008T9F (RADIATED); R32G800900V (CONDUCTED)
DATE TESTED: AUG 21, 2015 - SEP 07, 2015

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, and KDB 558074 D01 v03r03, ANSI C63.10-2009 for FCC and ANSI C63.10-2013 for IC, RSS-GEN Issue 4, and RSS-247 Issue 1.

ANSI C63.10-2009 Deviation

Radiated spurious emission above 1GHz EUT height is 1.5m not 0.8m.

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:

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

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 Bluetooth/BLE, DTS/UNII a/b/g/n/ac and ANT+ Tablet.
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	8.50	7.07
		Peak	8.56	7.18
	Enhanced Pi/4-DPSK	Average	4.31	2.70
		Peak	6.57	4.54
	Enhanced 8PSK	Average	4.35	2.72
		Peak	7.08	5.11

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.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 2.94dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	KSAS0501900200HU	R37G819A01R0KT3	N/A
Data Cable	SAMSUNG	EP-DG925UWE	N/A	N/A
Earphone	SAMSUNG	GH59-13967A	N/A	N/A

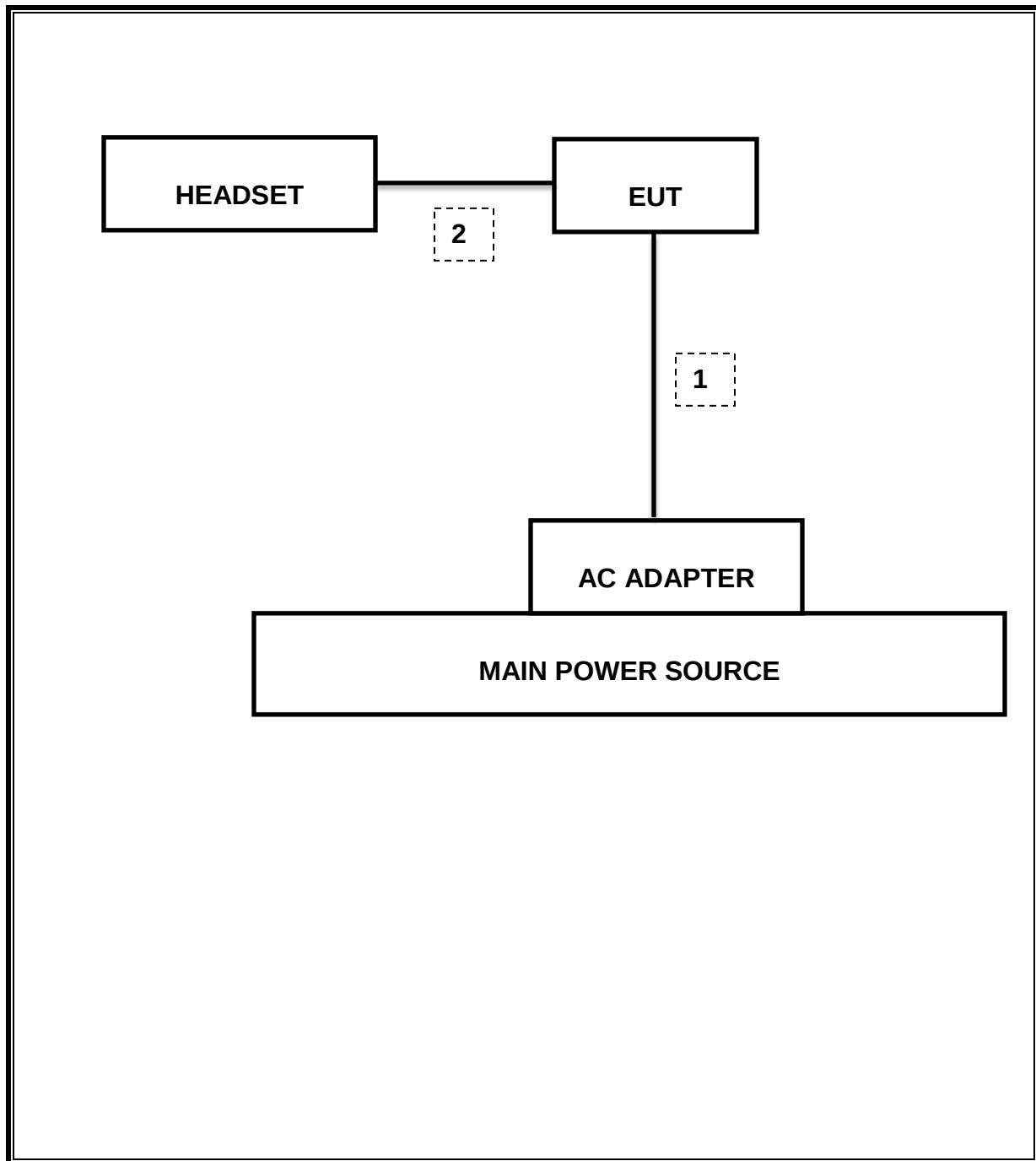
I/O CABLES

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 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	750	11-17-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-25-16
Antenna, Horn, 18 GHz	ETS	3115	00167211	09-20-15
Antenna, Horn, 18 GHz	ETS	3115	00161451	05-17-16
Antenna, Horn, 18 GHz	ETS	3117	00168724	06-17-16
Antenna, Horn, 18 GHz	ETS	3117	00168717	06-17-16
Antenna, Horn, 40 GHz	ETS	3116C	00166255	09-23-15
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	09-29-15
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-18-16
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-18-16
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-18-16
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-18-16
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-19-16
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-19-16
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-18-16
Average Power Sensor	R&S	NRZ-Z91	102681	08-18-16
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-18-16
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-19-16
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-19-16
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-19-16
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	009	08-18-16
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	015	08-18-16
High Pass Filter 5GHz	Micro-Tronics	HPS17542	009	08-18-16
High Pass Filter 6GHz	Micro-Tronics	HPM17543	010	08-18-16
High Pass Filter 5GHz	Micro-Tronics	HPS17542	016	08-18-16
High Pass Filter 6GHz	Micro-Tronics	HPM17543	015	08-18-16
LISN	R&S	ENV-216	101836	08-19-16
LISN	R&S	ENV-216	101837	08-19-16
Combiner	WEINSCHEL	1575	2153	08-20-16

7. SUMMARY TABLE

FCC Part Section	RSS Section	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	RSS-GEN 4.6	Occupied Band width (99%)	N/A	Conducted	Pass	1.366 MHz
2.1051, 15.247 (d)	RSS-247 5.1(2)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-51.036 dBm
15.247 (b)(1)	RSS-247 5.1(2)	TX conducted output power	<21dBm		Pass	8.564 dBm (Peak)
15.247 (a)(1)	RSS-247 5.1(2)	Hopping frequency separation	> 25KHz		Pass	1 MHz
15.247 (a)(1)(iii)	RSS-247 5.1(4)	Number of Hopping channels	More than 15 non-overlapping channels		Pass	79
15.247 (a)(1)(iii)	RSS-247 5.1(4)	Avg Time of Occupancy	< 0.4sec		Pass	0.346 sec
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	52.7 dBuV (QP)
15.205, 15.209	RSS-GEN Clause 7 & 8.9	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	34.11 dBuV/m (QP)

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 [MHz]
Low	2402	0.938	932.270
Mid	2441	0.937	903.120
High	2480	0.937	903.060
Worst		0.938	932.270

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

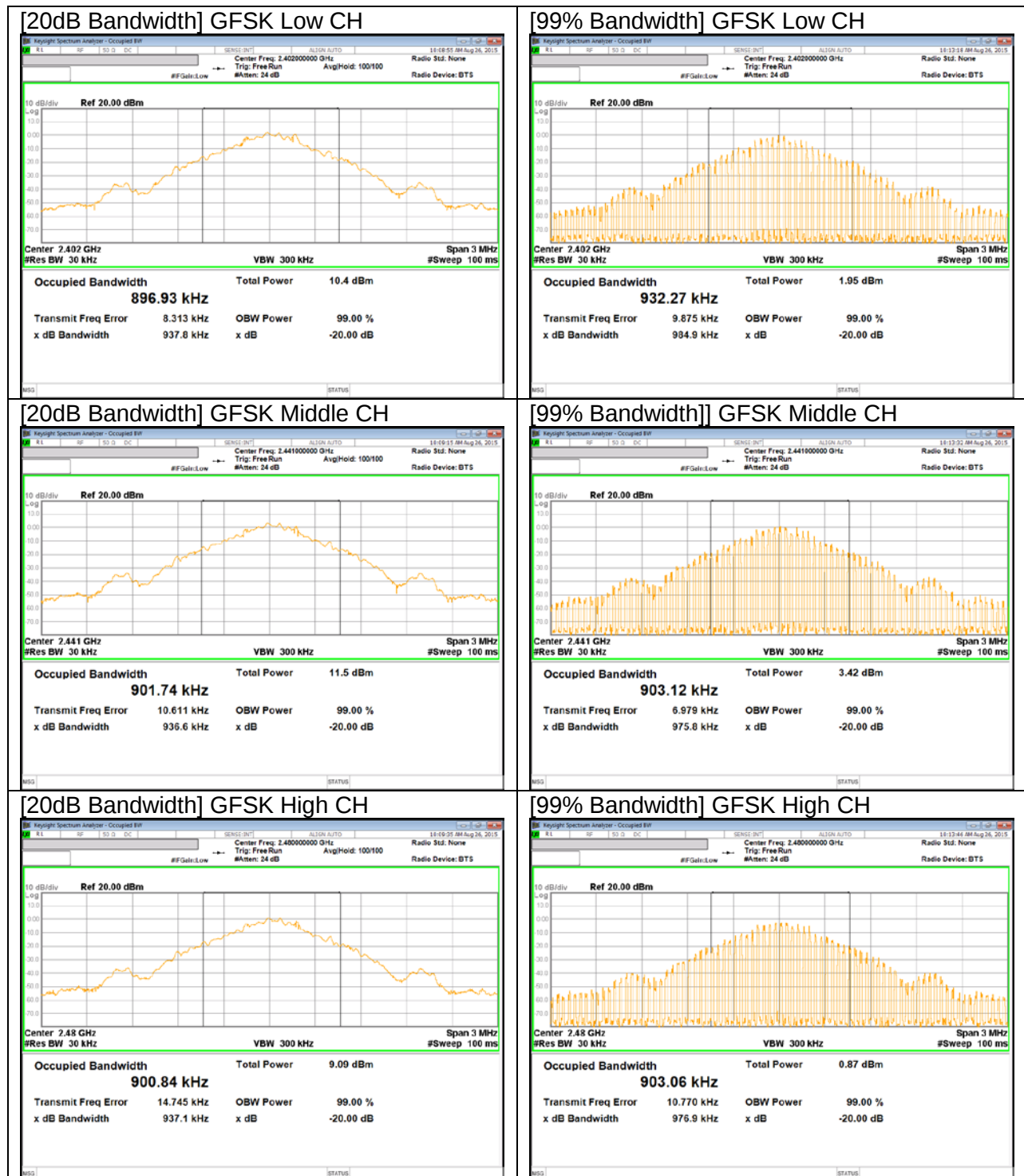
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.354	1.166
Mid	2441	1.353	1.199
High	2480	1.346	1.196
Worst		1.354	1.199

8.1.3. ENHANCED DATA RATE 8PSK MODULATION

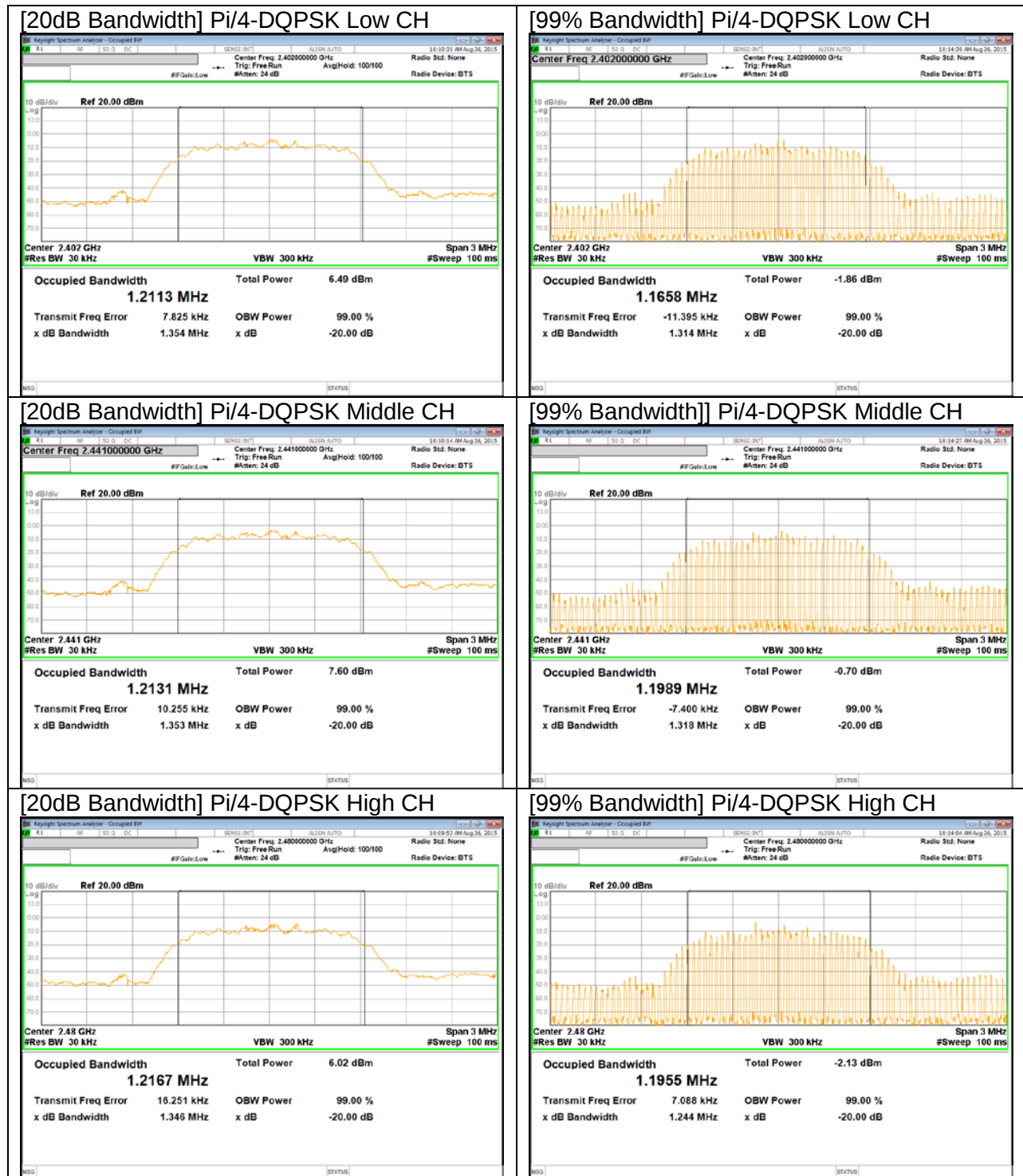
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.352	1.195
Mid	2441	1.362	1.170
High	2480	1.366	1.195
Worst		1.366	1.195

8.1.4. 20 dB AND 99% BANDWIDTH PLOTS

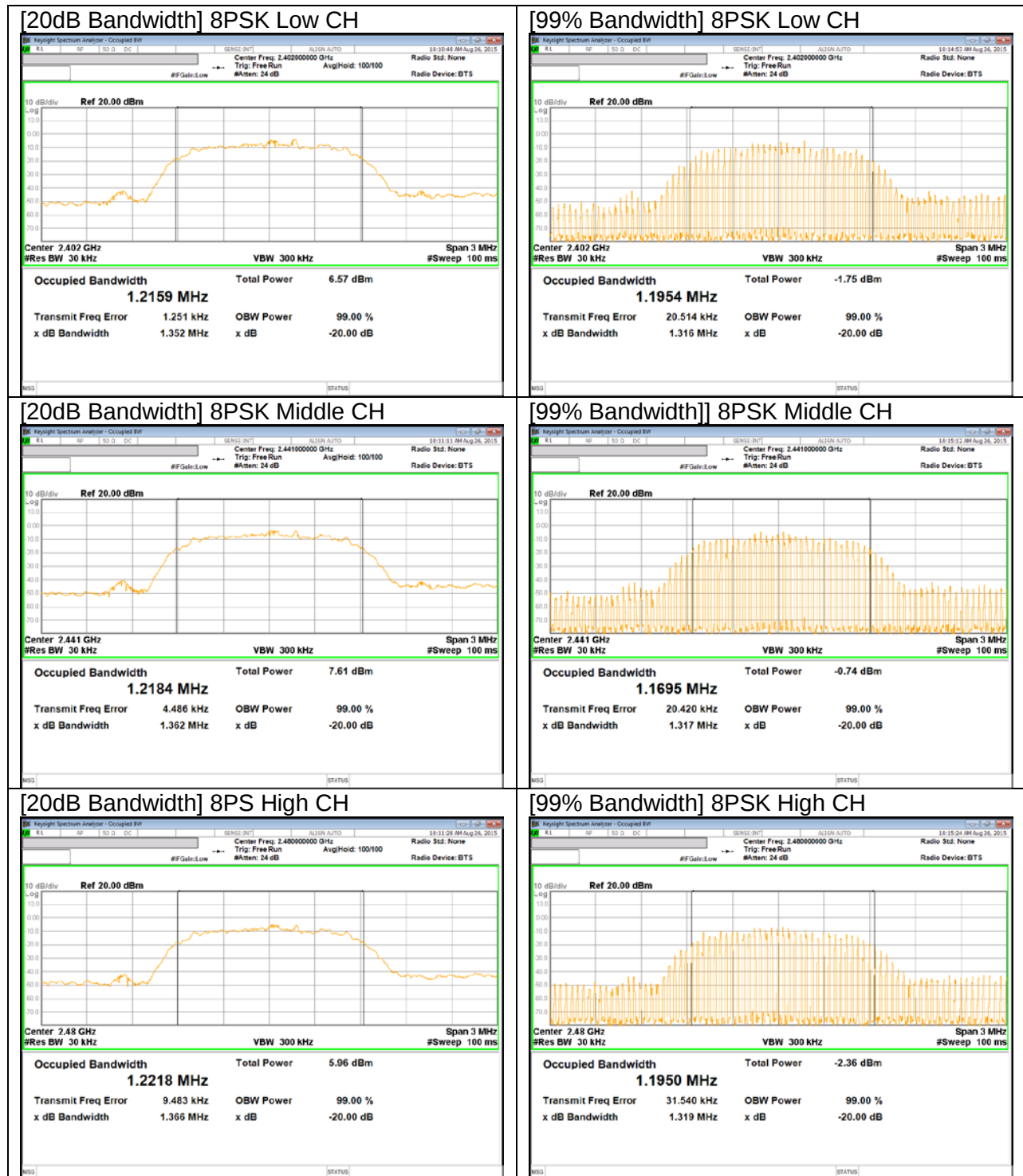
GFSK BANDWIDTH



Pi/4-DQPSK BANDWIDTH



8PSK BANDWIDTH



8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)
IC RSS-247 §5.1 (2)

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.

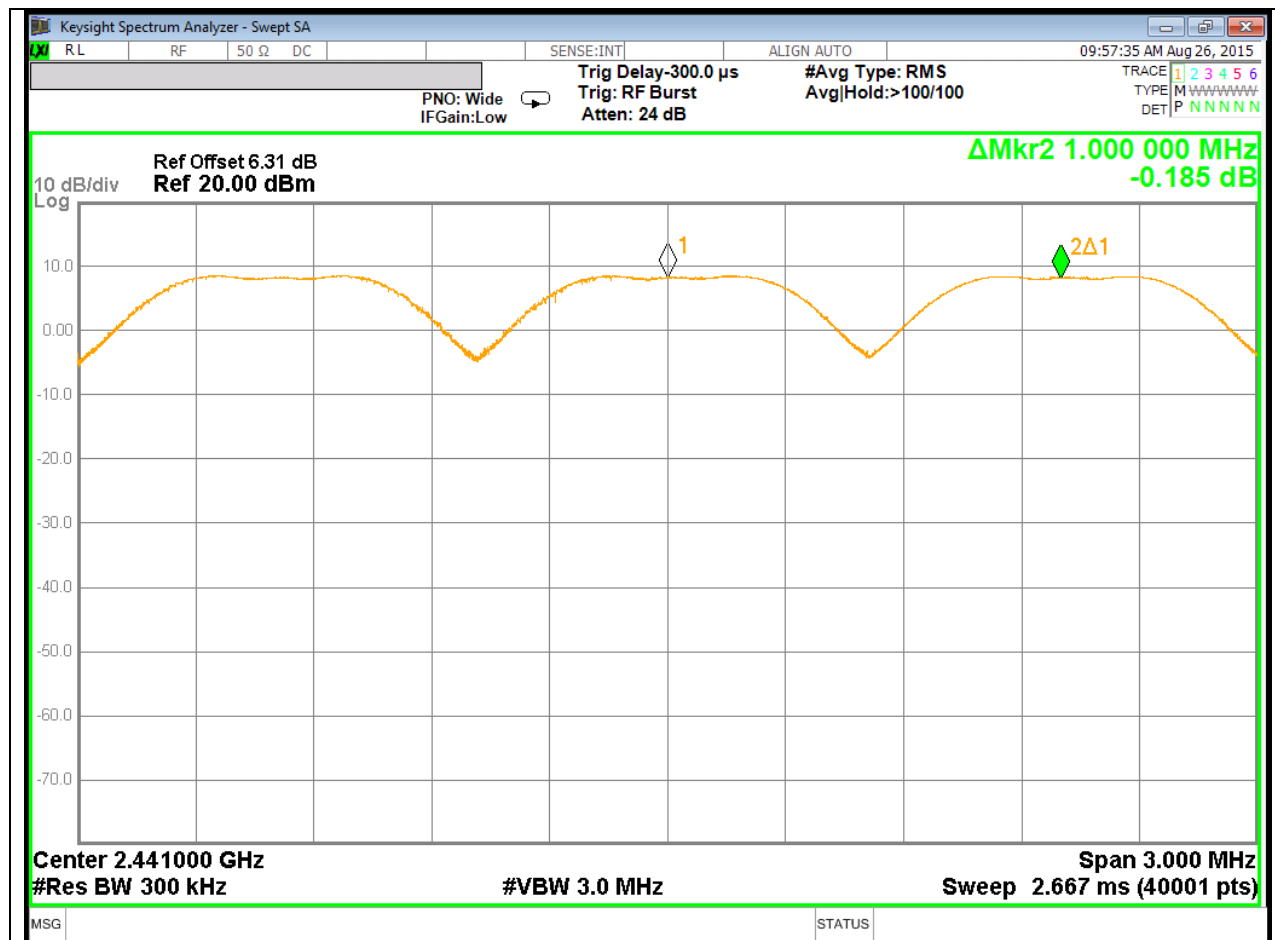
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 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)
IC RSS-247 §5.1 (4)

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

TEST PROCEDURE

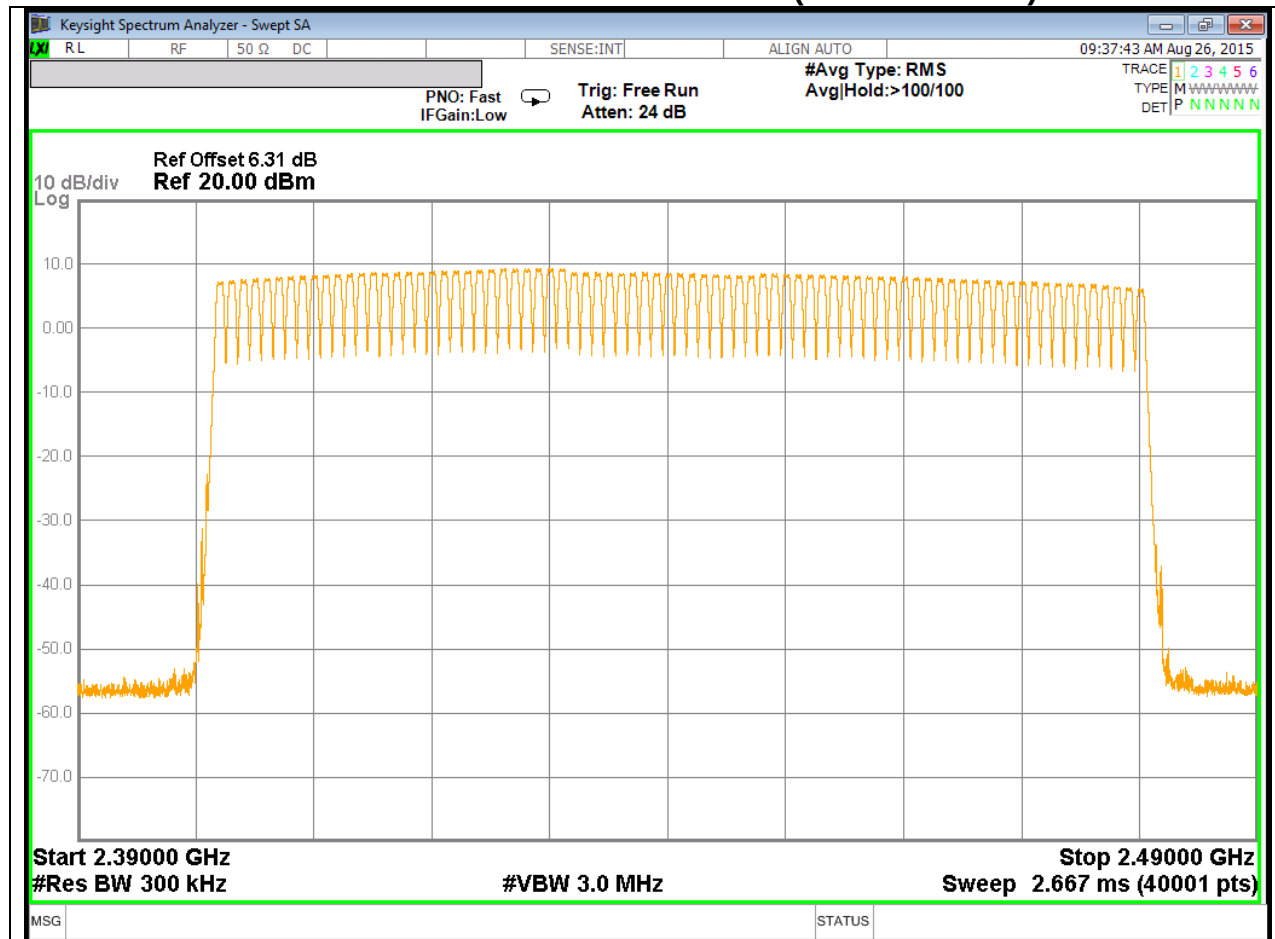
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

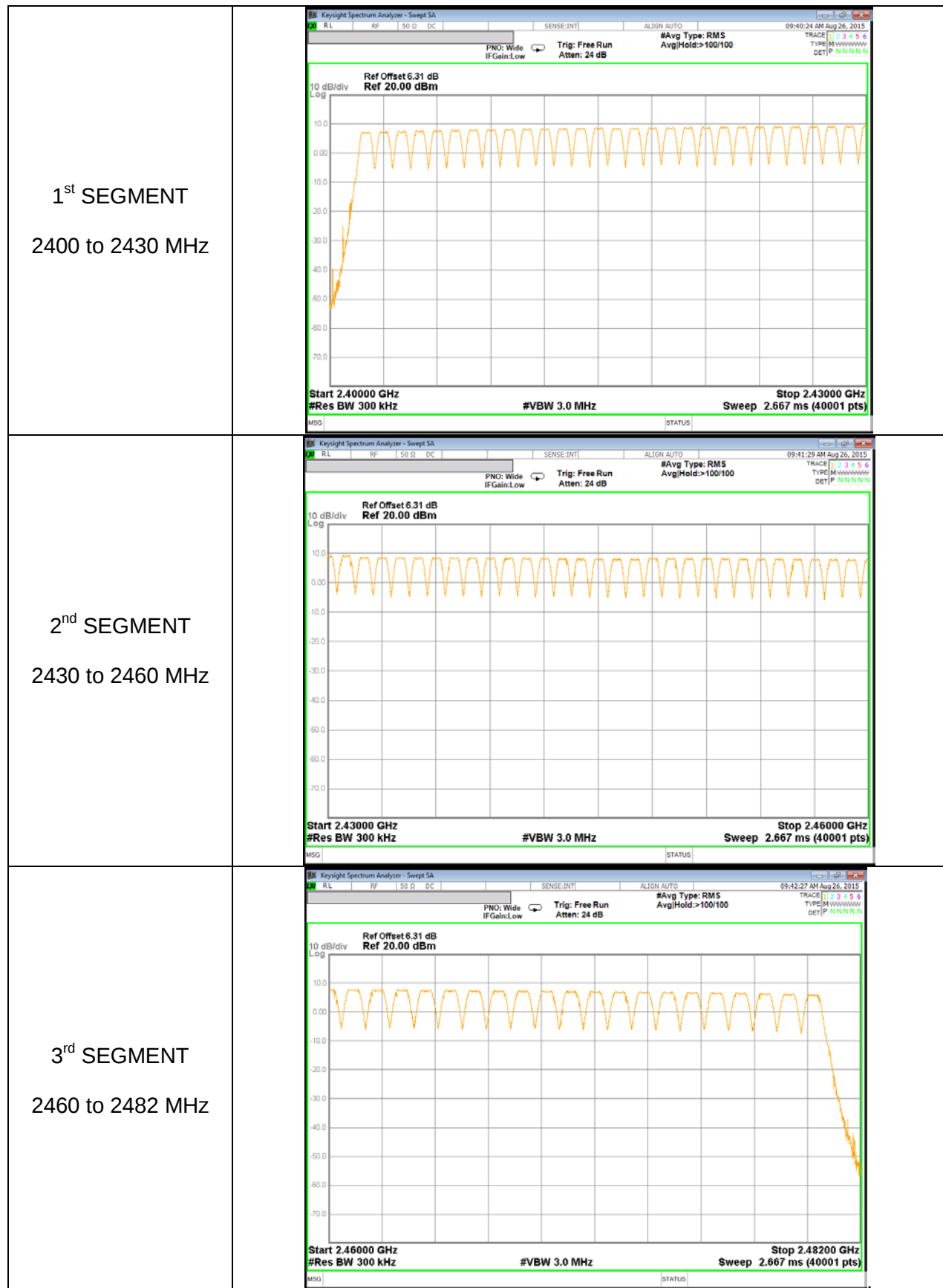
RESULTS

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)
IC RSS-247 §5.1 (4)

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.

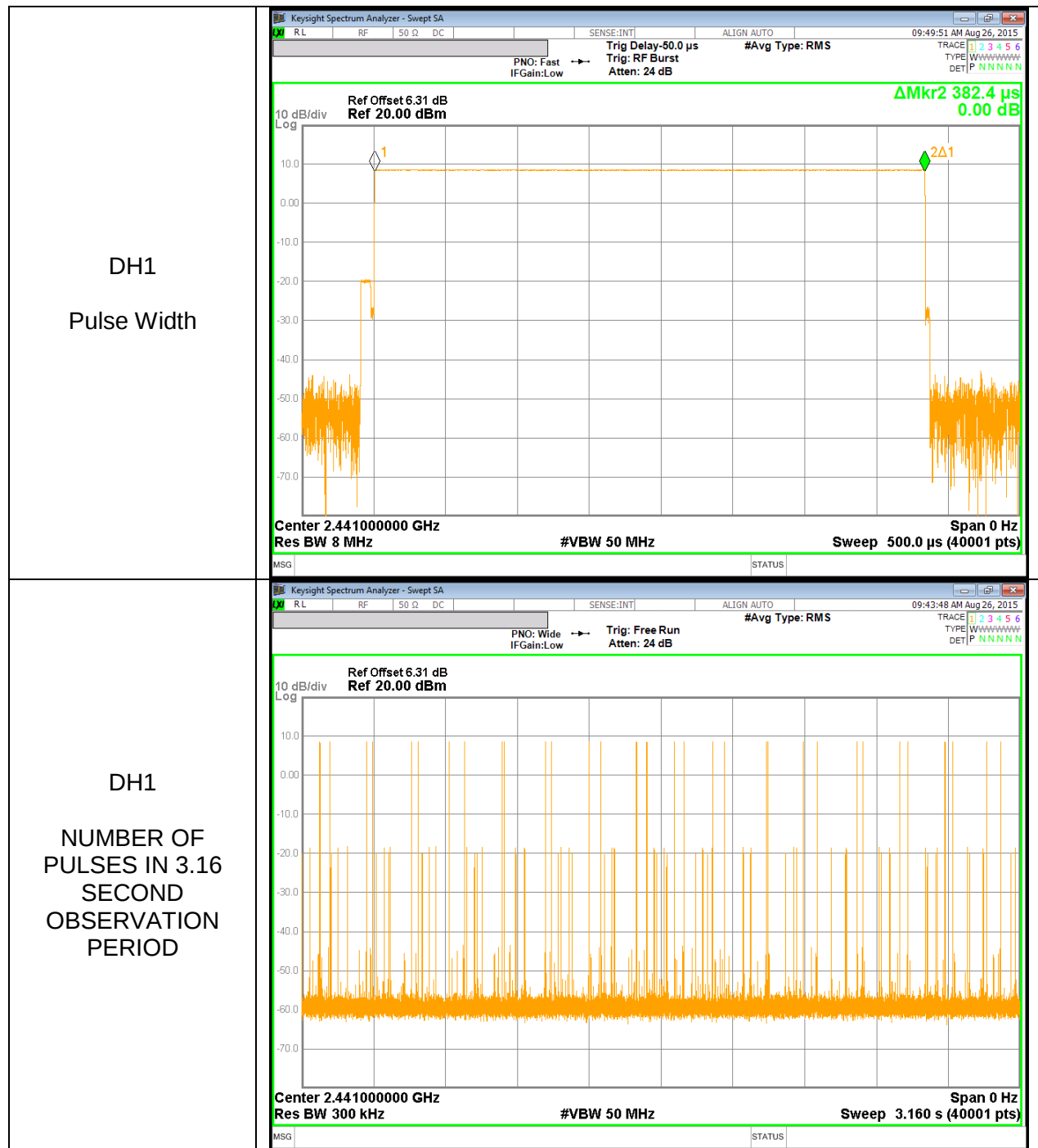
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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

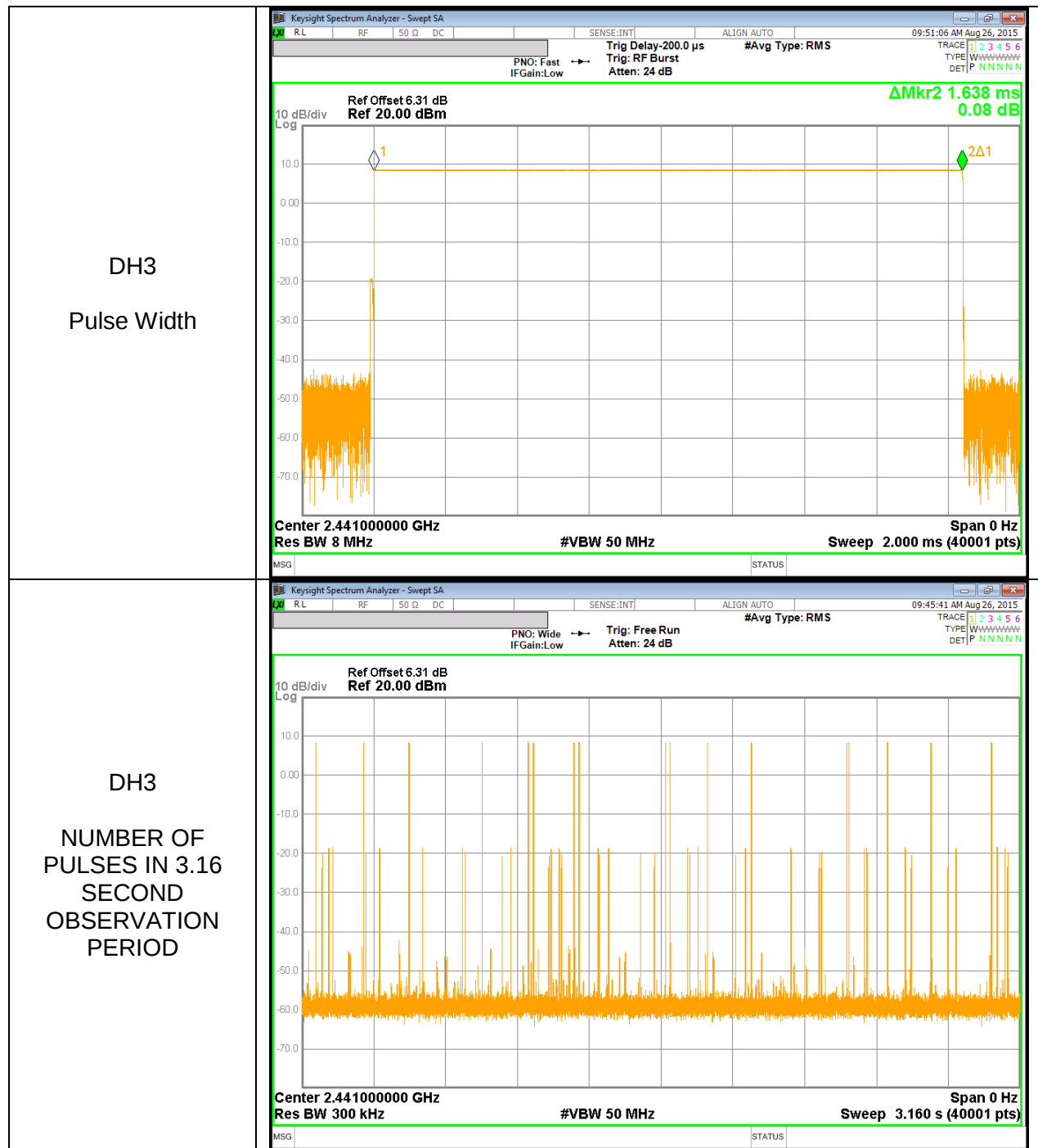
RESULTS

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	0.122368	0.4	-0.2776
DH3	1.638	17	0.278460	0.4	-0.1215
DH5	2.886	12	0.346320	0.4	-0.0537
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	0.030592	0.4	-0.36941
DH3	1.638	4.25	0.069615	0.4	-0.33039
DH5	2.886	3	0.086580	0.4	-0.31342

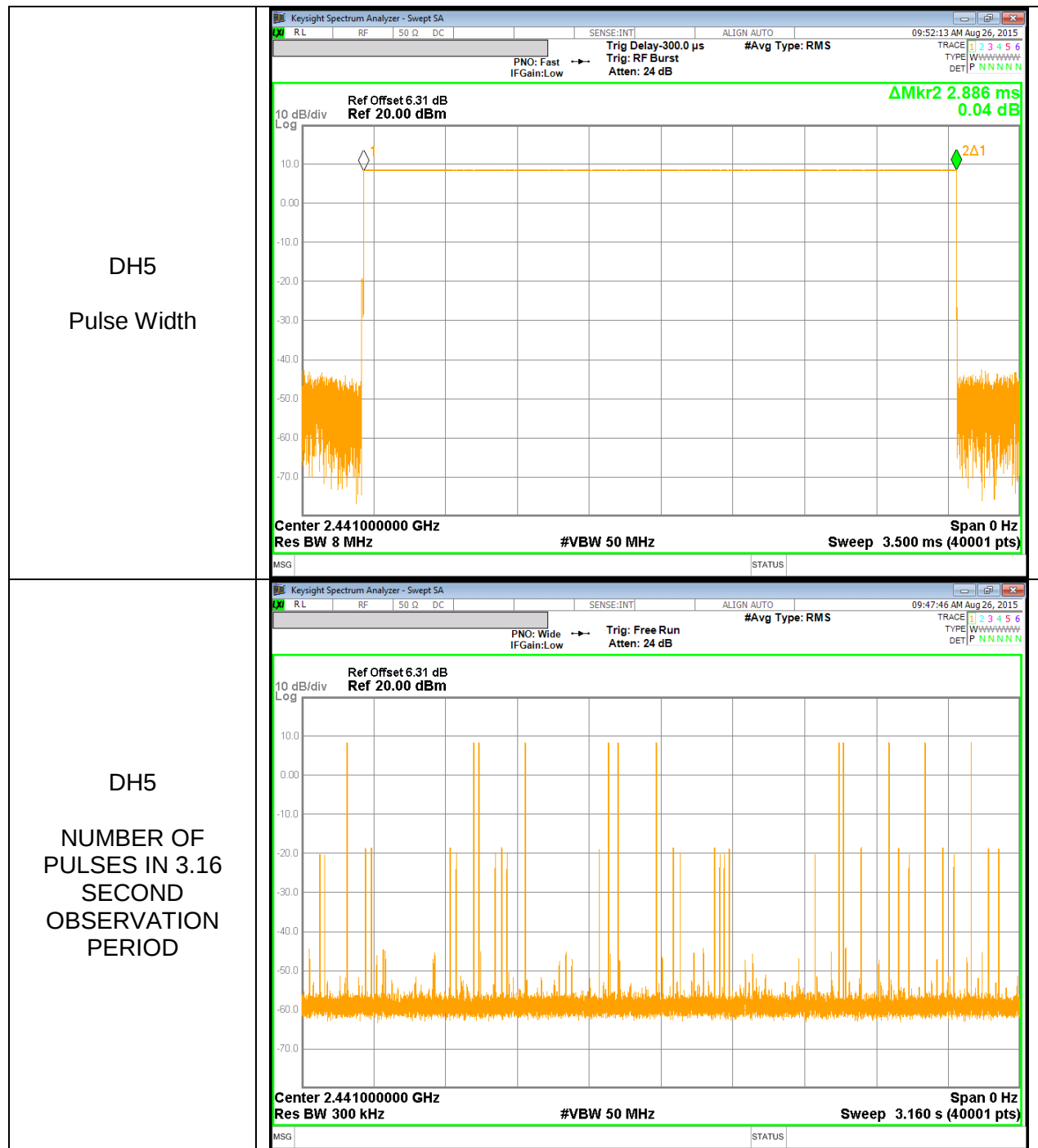
DH1



DH3



DH5



8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)
IC RSS-247 §5.1 (2)

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	7.327	21	-13.673
Middle	2441	8.564	21	-12.436
High	2480	6.162	21	-14.838
Worst		8.564	21	-12.436

8.5.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	5.537	21	-15.463
Middle	2441	6.574	21	-14.426
High	2480	4.810	21	-16.190
Worst		6.574	21	-14.426

8.5.3. ENHANCED DATA RATE 8PSK MODULATION

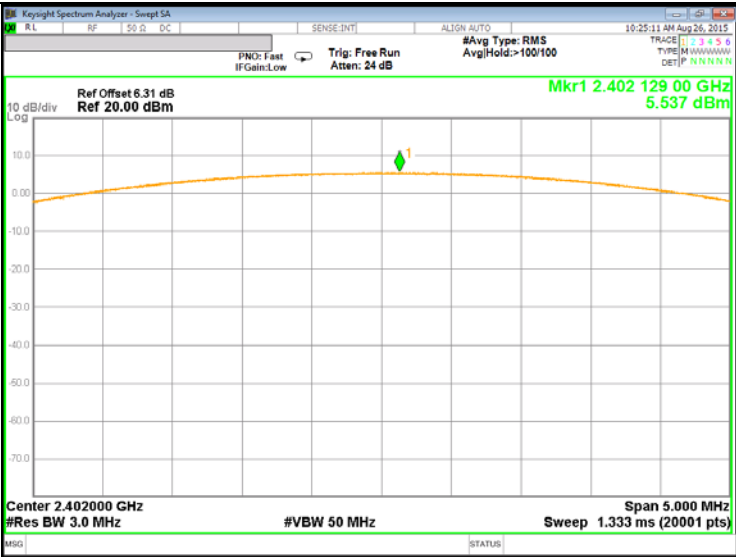
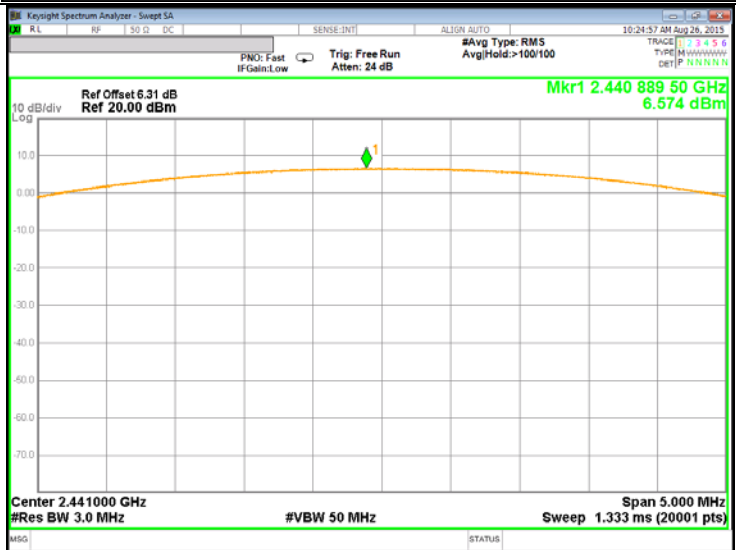
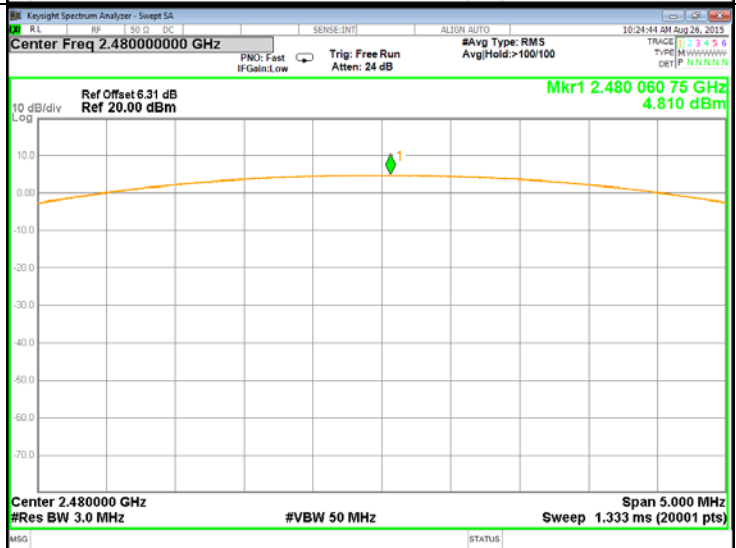
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	5.855	21	-15.145
Middle	2441	7.080	21	-13.920
High	2480	5.254	21	-15.746
Worst		7.080	21	-13.920

8.5.4. OUTPUT POWER PLOTS

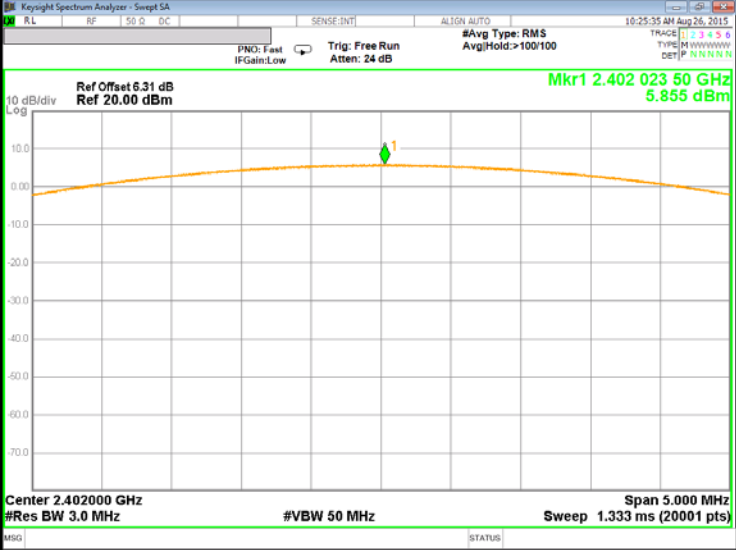
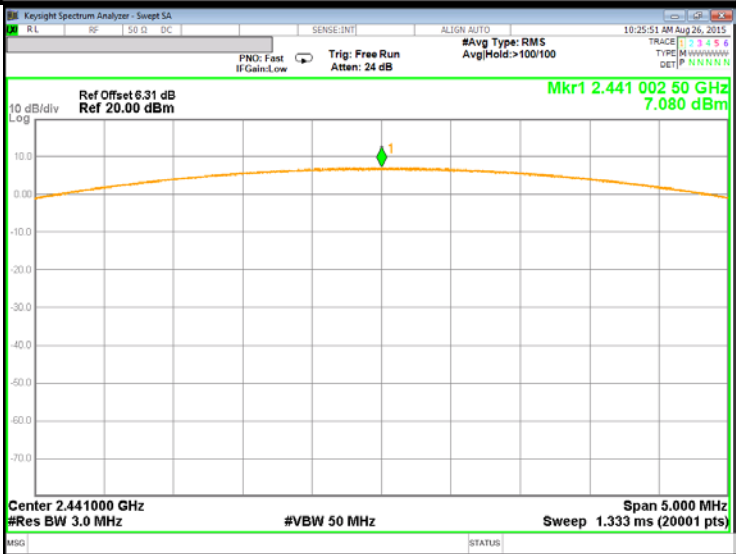
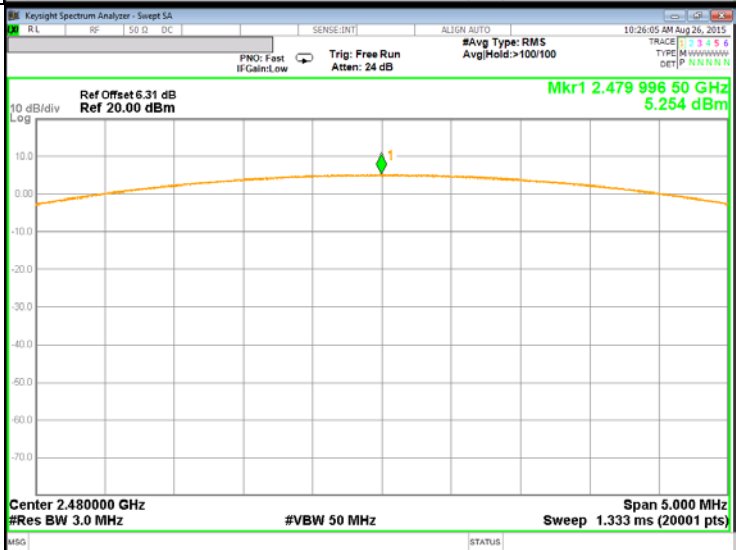
GFSK OUTPUT POWER



Pi/4-DPSK OUTPUT POWER

Pi/4-DPSK Low CH	
Pi/4-DPSK Middle CH	
Pi/4-DPSK High CH	

8PSK OUTPUT POWER

8PSK Low CH	
8PSK Middle CH	
8PSK High CH	

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	7.23	5.28
Middle	2441	8.50	7.07
High	2480	6.08	4.05

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	3.12	2.05
Middle	2441	4.31	2.70
High	2480	2.71	1.86

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	3.17	2.08
Middle	2441	4.35	2.72
High	2480	2.74	1.88

8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)
IC RSS-247 §5.1 (2)

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.

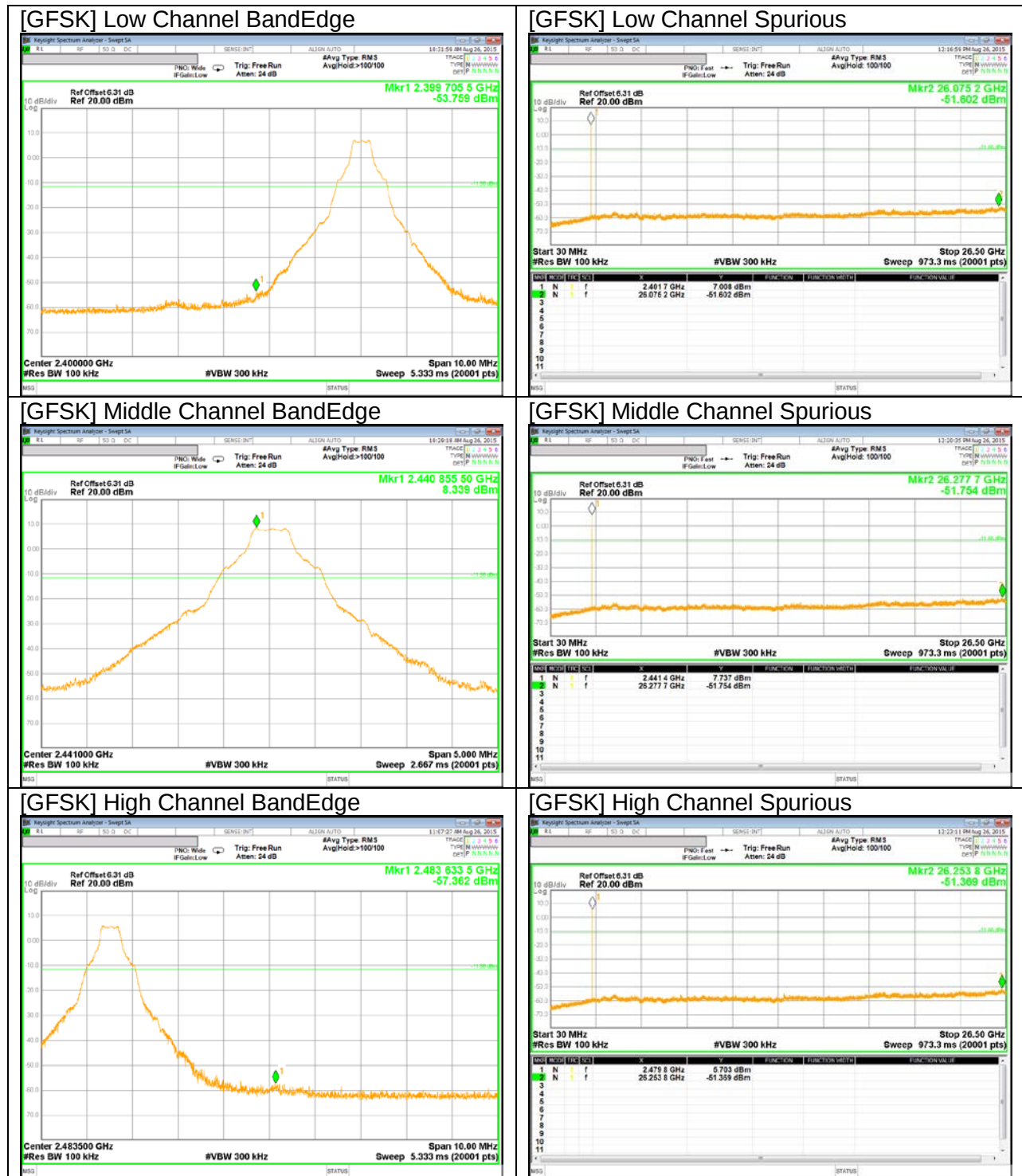
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

RESULTS

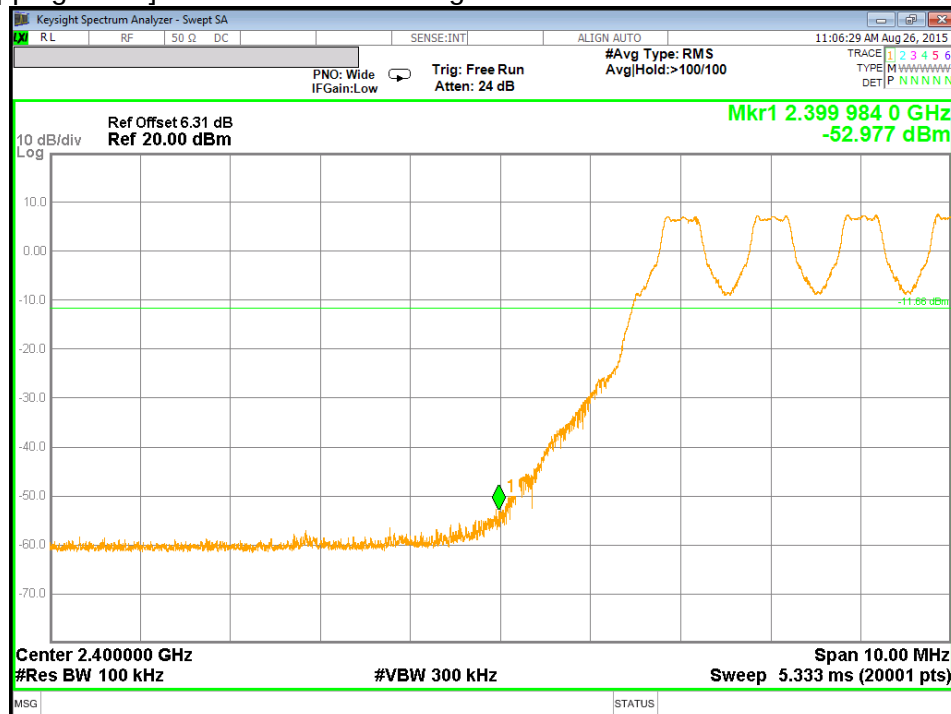
8.7.1. BASIC DATA RATE GFSK MODULATION

GFSK Mode

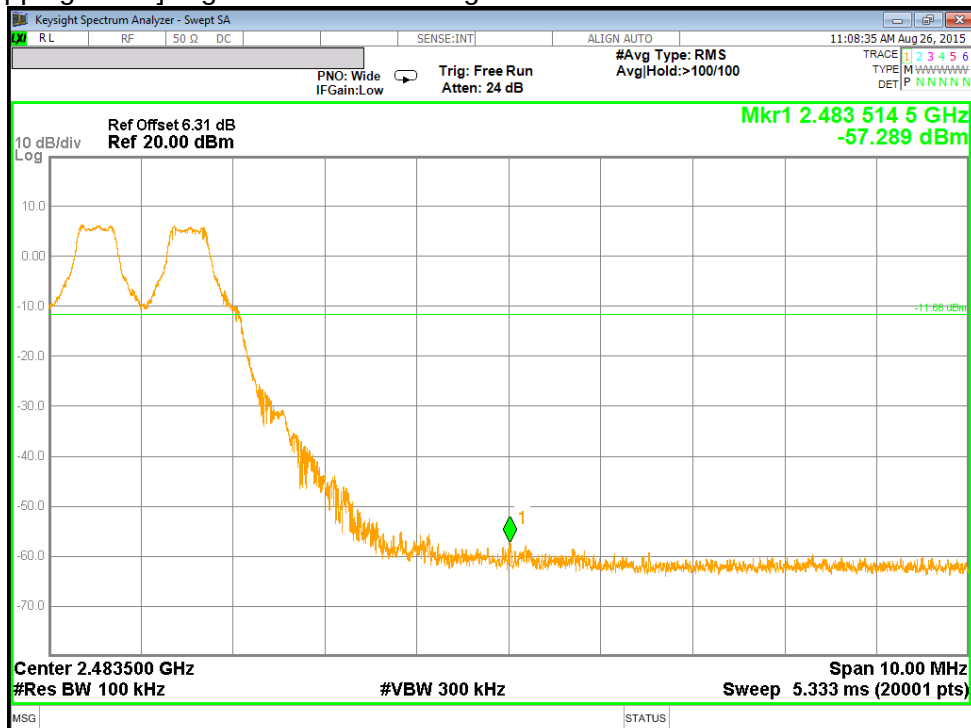


BandEdge Emission at GFSK Hopping Mode

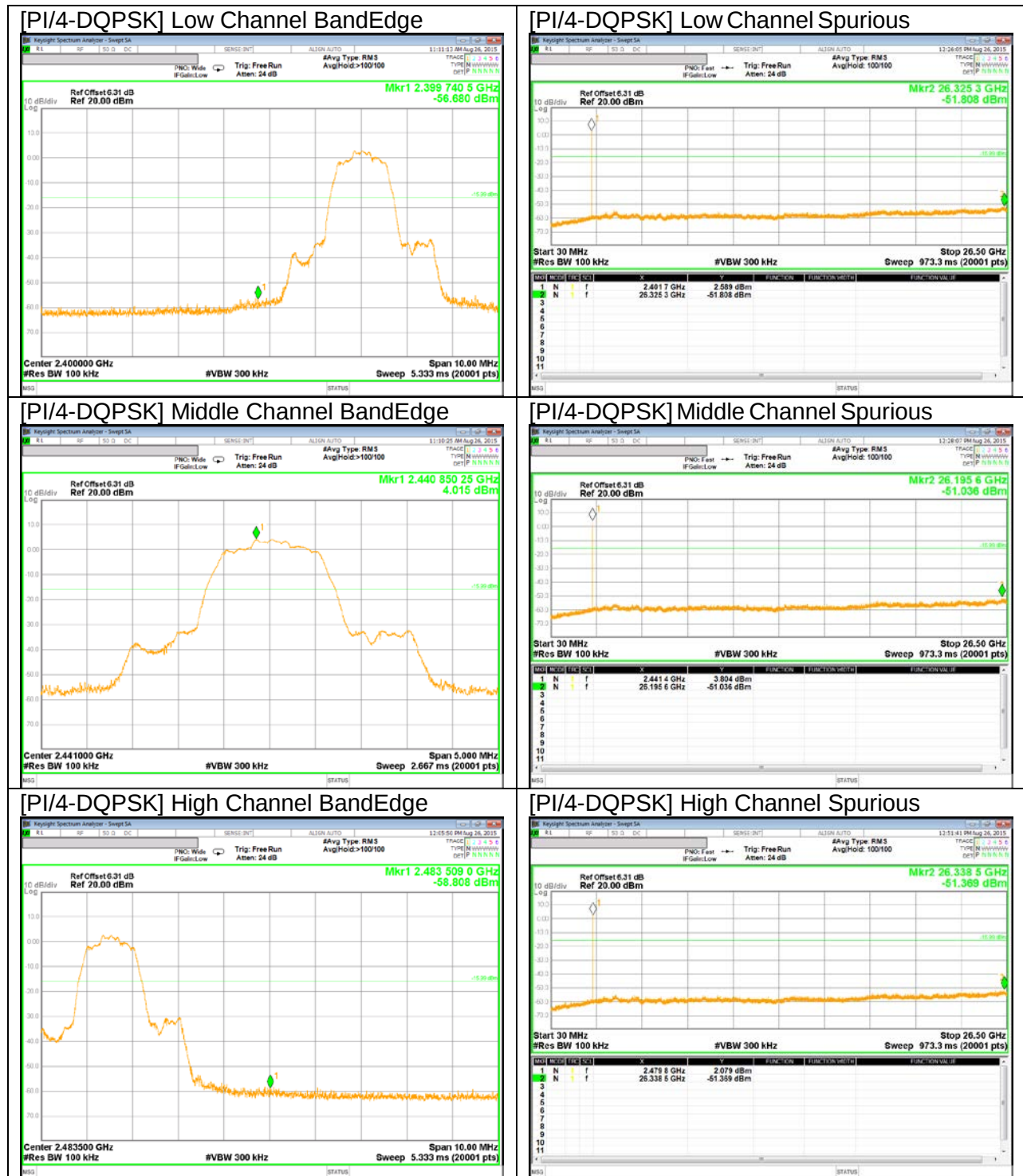
[GFSK Hopping Mode] Low Channel BandEdge



[GFSK Hopping Mode] High Channel BandEdge

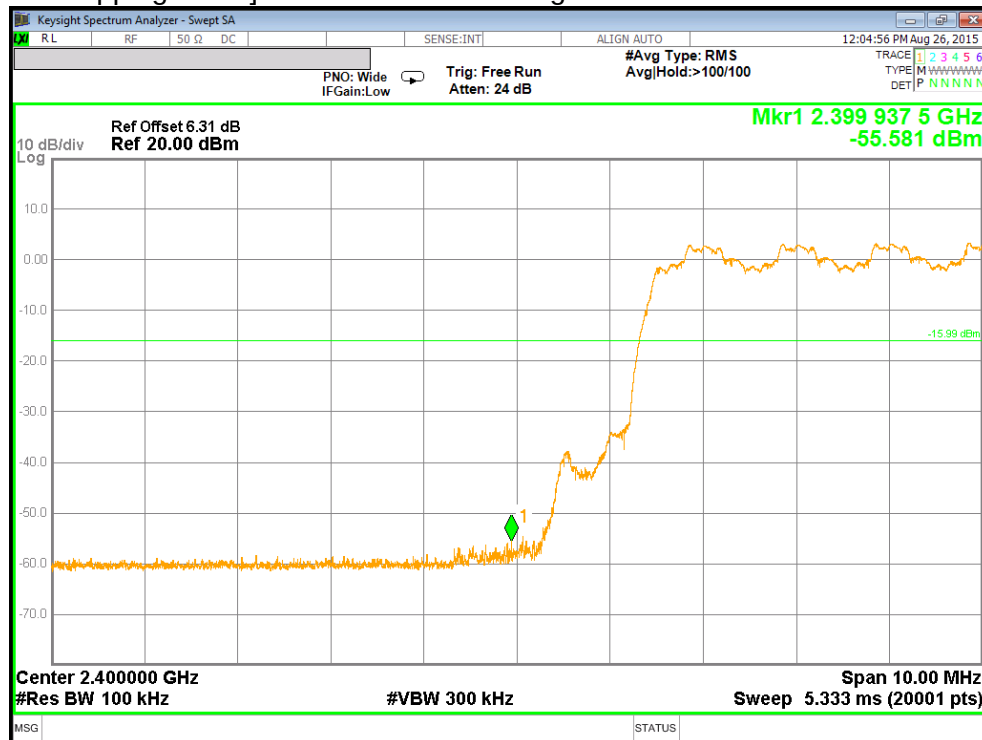


PI/4-DQPSK Mode

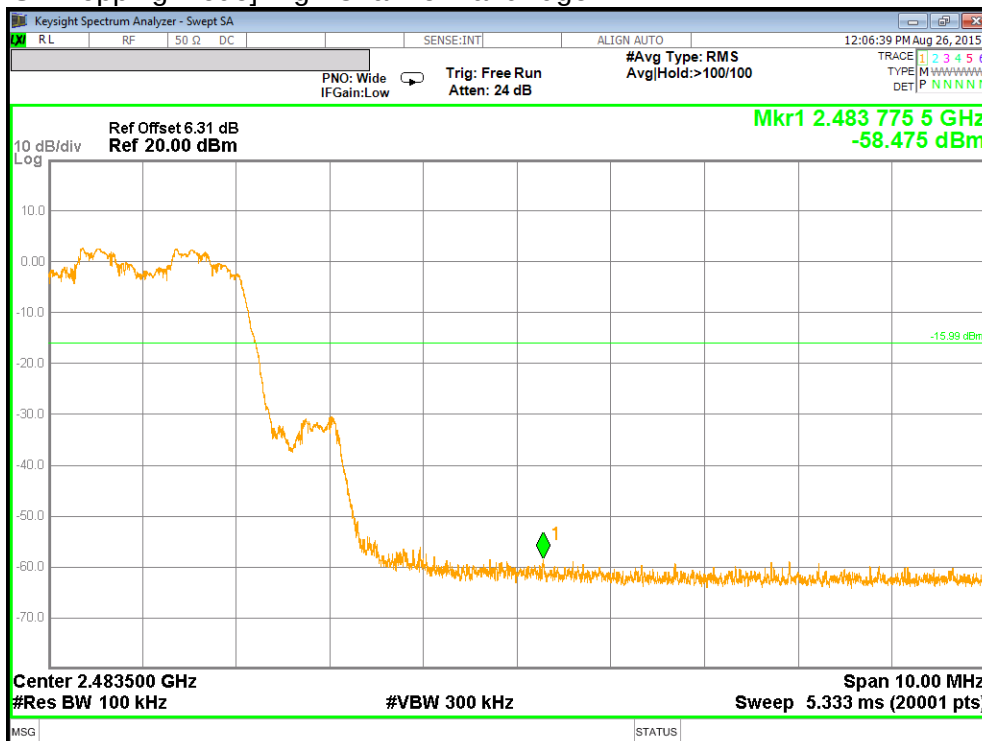


BandEdge Emission at PI/4-DQPSK Hopping Mode

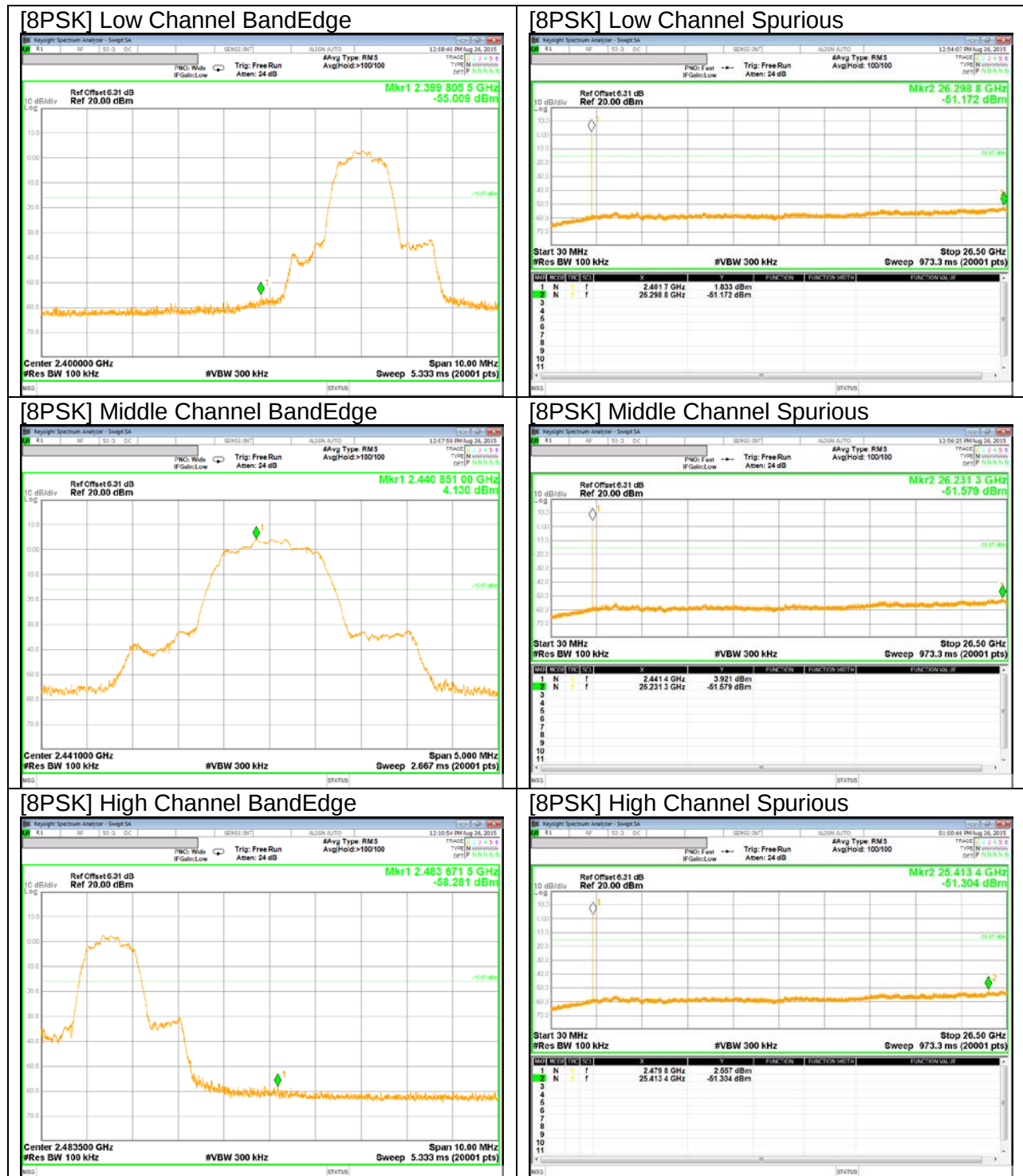
[PI/4-DQPSK Hopping Mode] Low Channel BandEdge



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

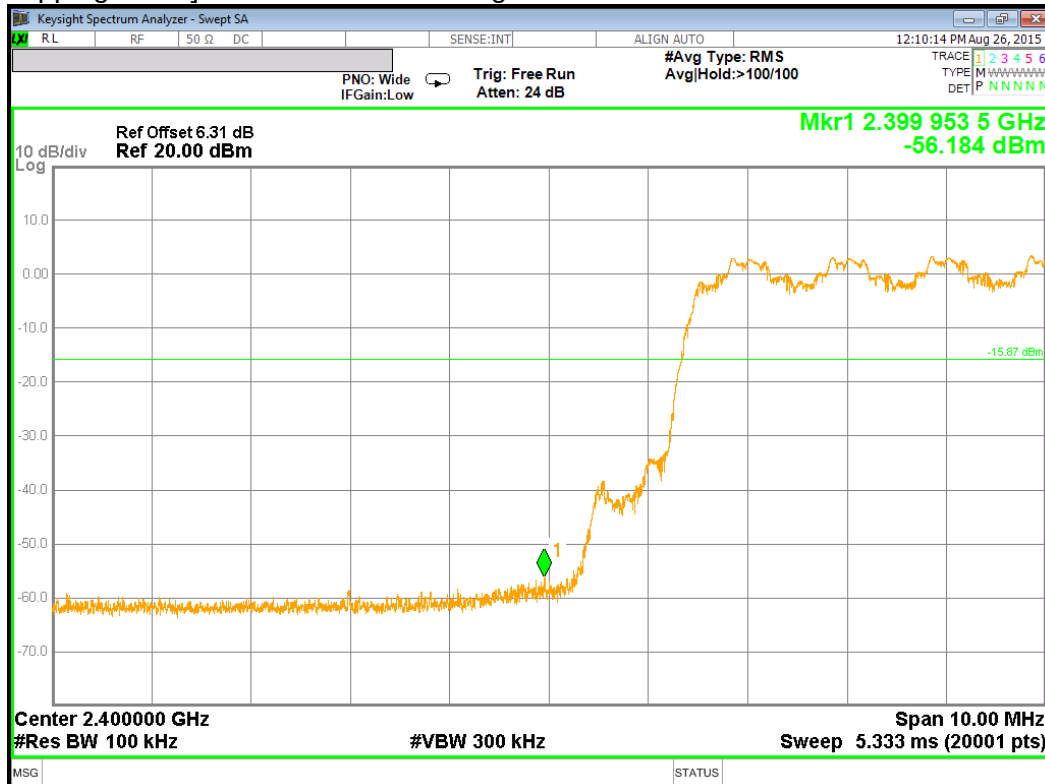


8PSK Mode

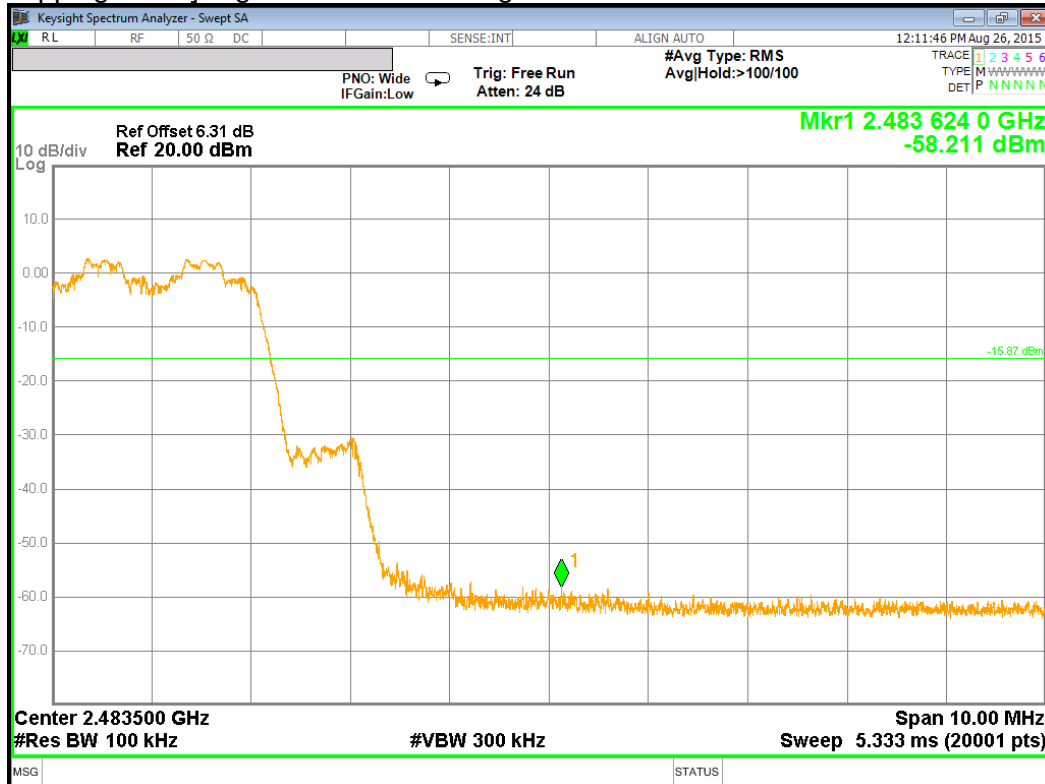


BandEdge Emission at 8PSK Hopping Mode

[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
IC RSS-GEN Clause 8.9 (Transmitter)
IC RSS-GEN Clause 7 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. 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 band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 1/T (on time) for average measurement.

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

The spectrum from 1GHzHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

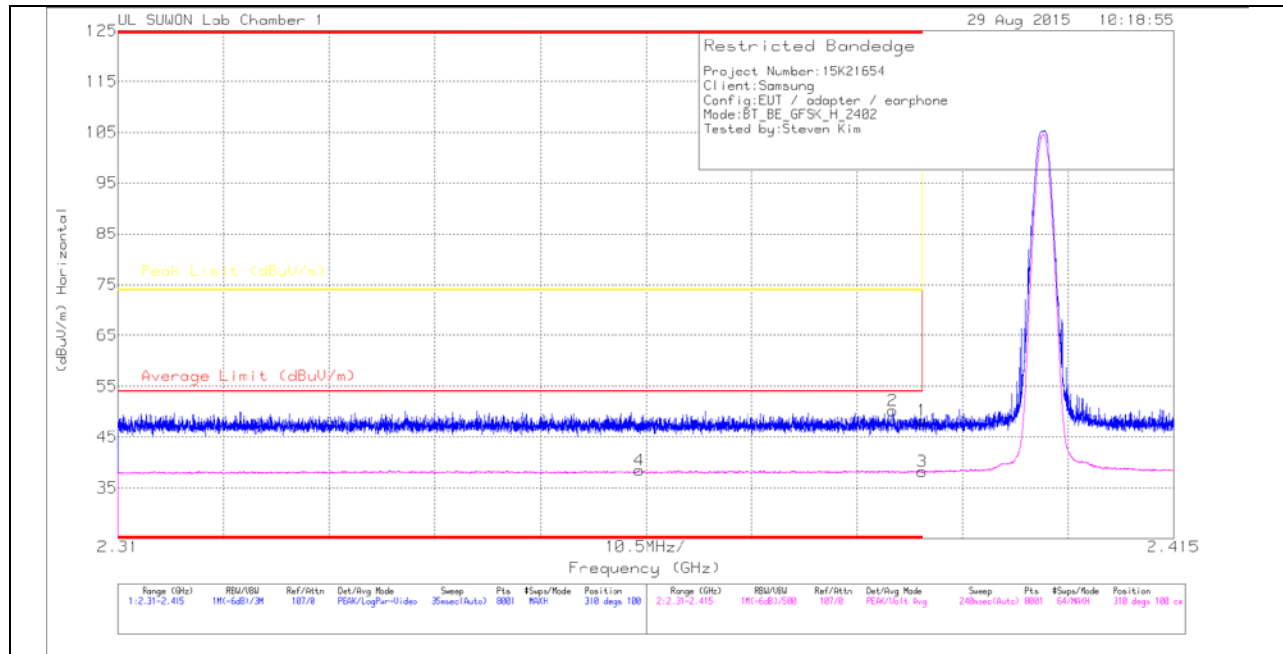
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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

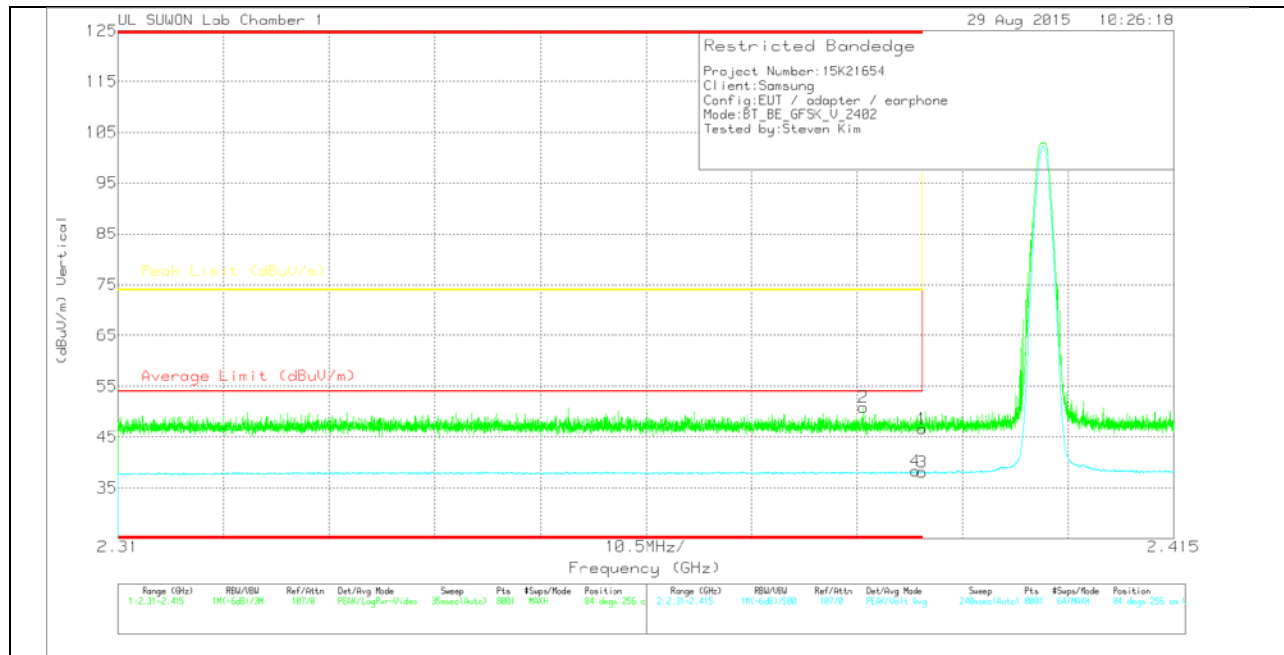
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 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	39.24	Pk	31.8	-22.8	48.24	-	-	74	-25.76	310	100	H
2	* 2.387	41.2	Pk	31.8	-22.8	50.2	-	-	74	-23.8	310	100	H
3	* 2.39	29.15	V1TV	31.8	-22.8	38.15	54	-15.85	-	-	310	100	H
4	* 2.362	29.52	V1TV	31.7	-22.8	38.42	54	-15.58	-	-	310	100	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

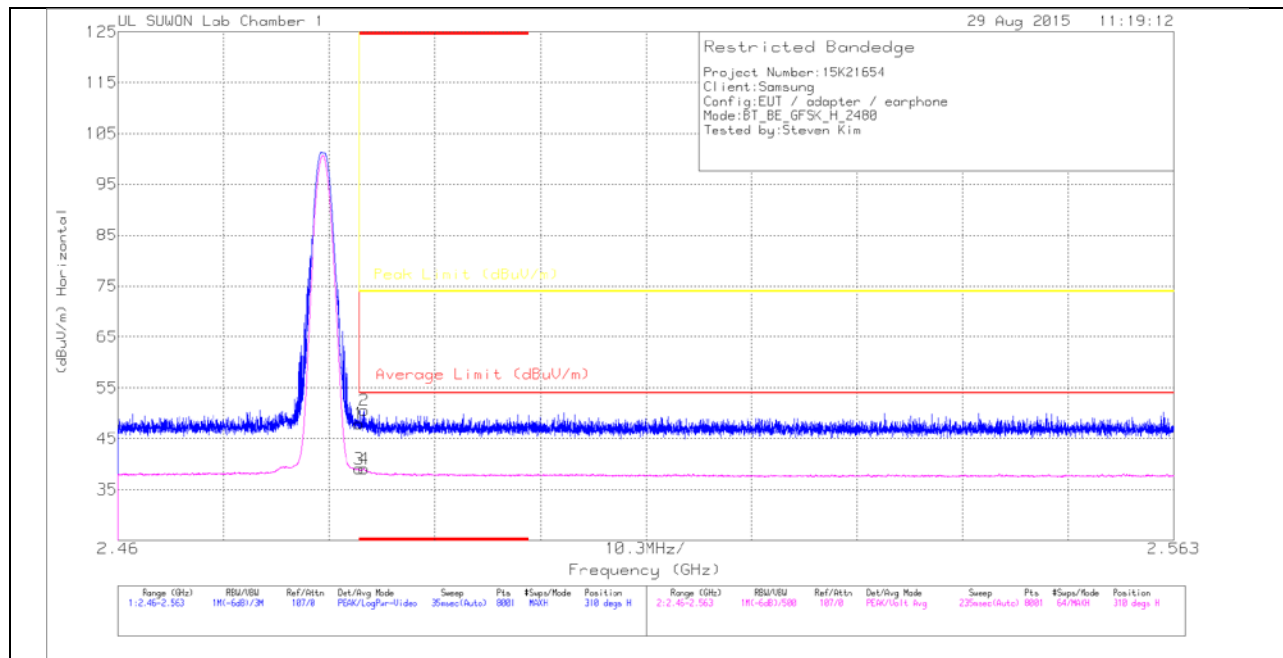
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	37.65	Pk	31.8	-22.8	46.65	-	-	74	-27.35	84	256	V
2	* 2.384	41.88	Pk	31.8	-22.8	50.88	-	-	74	-23.12	84	256	V
3	* 2.39	29.09	V1TV	31.8	-22.8	38.09	54	-15.91	-	-	84	256	V
4	* 2.389	29.28	V1TV	31.8	-22.8	38.28	54	-15.72	-	-	84	256	V

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

Pk - Peak detector

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

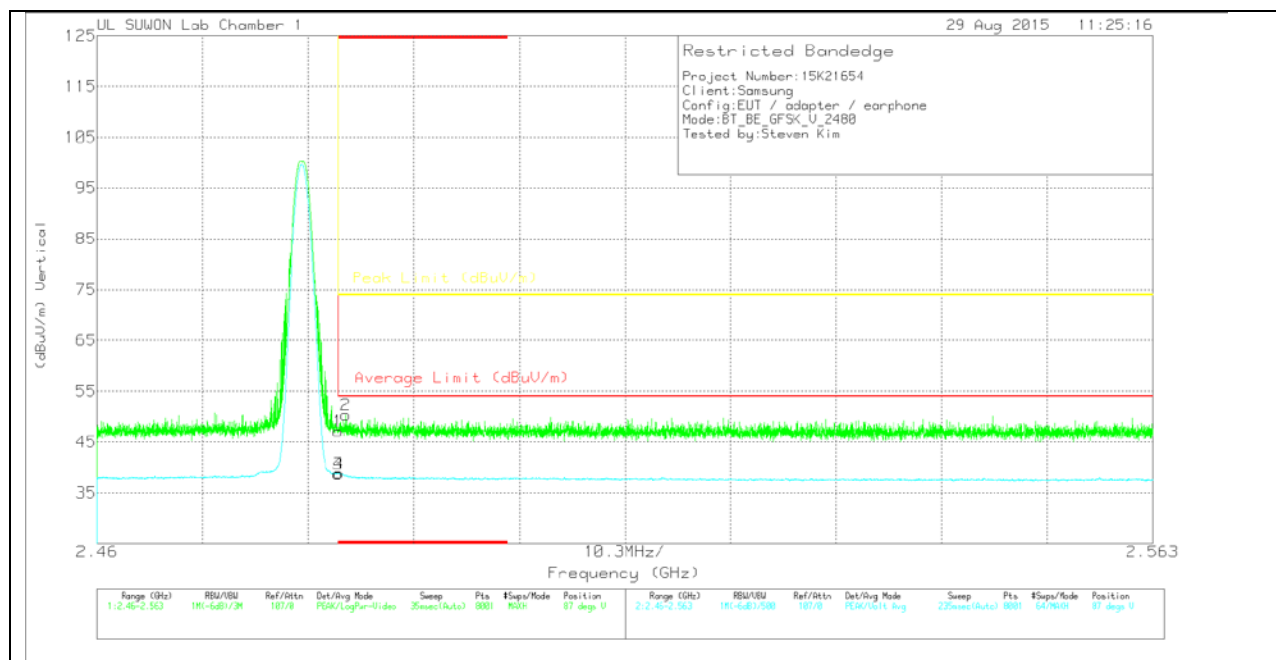
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.57	Pk	32	-22.6	47.97	-	-	74	-26.03	310	100	H
2	* 2.484	41.2	Pk	32	-22.6	50.6	-	-	74	-23.4	310	100	H
3	* 2.484	29.63	V1TV	32	-22.6	39.03	54	-14.97	-	-	310	100	H
4	* 2.484	29.66	V1TV	32	-22.6	39.06	54	-14.94	-	-	310	100	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

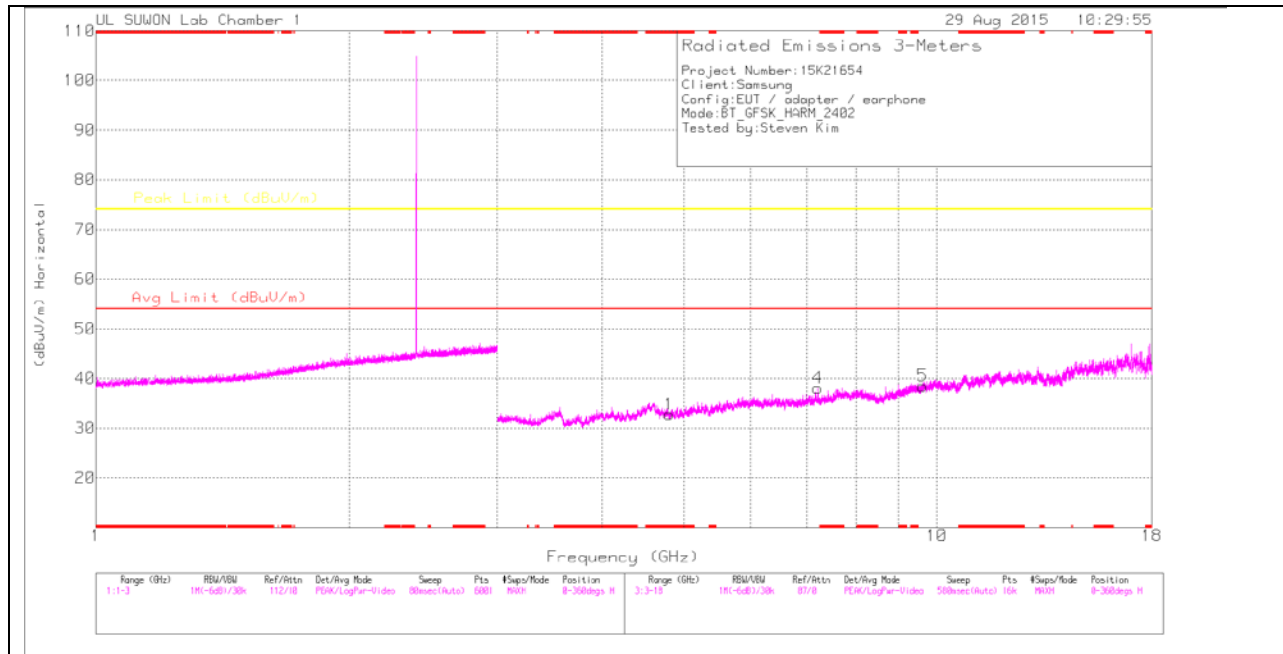
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.66	Pk	32	-22.6	47.06	-	-	74	-26.94	87	196	V
2	* 2.484	40.97	Pk	32	-22.6	50.37	-	-	74	-23.63	87	196	V
3	* 2.484	29.35	V1TV	32	-22.6	38.75	54	-15.25	-	-	87	196	V
4	* 2.484	29.43	V1TV	32	-22.6	38.83	54	-15.17	-	-	87	196	V

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

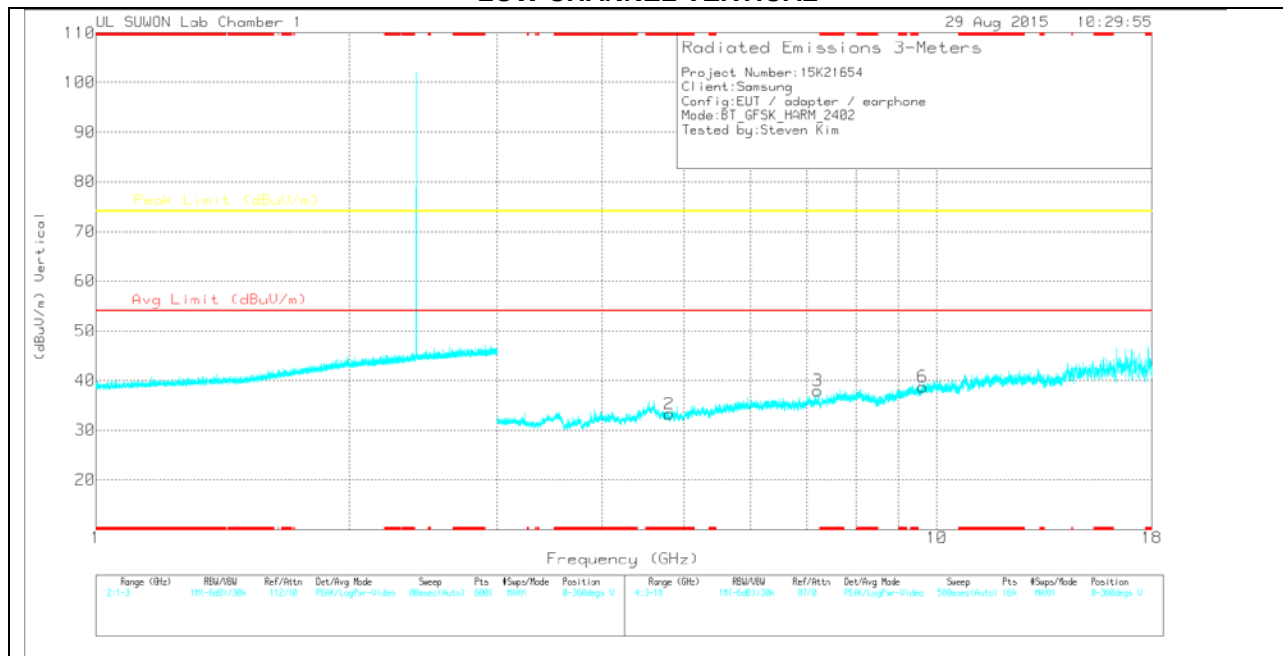
Pk - Peak detector

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

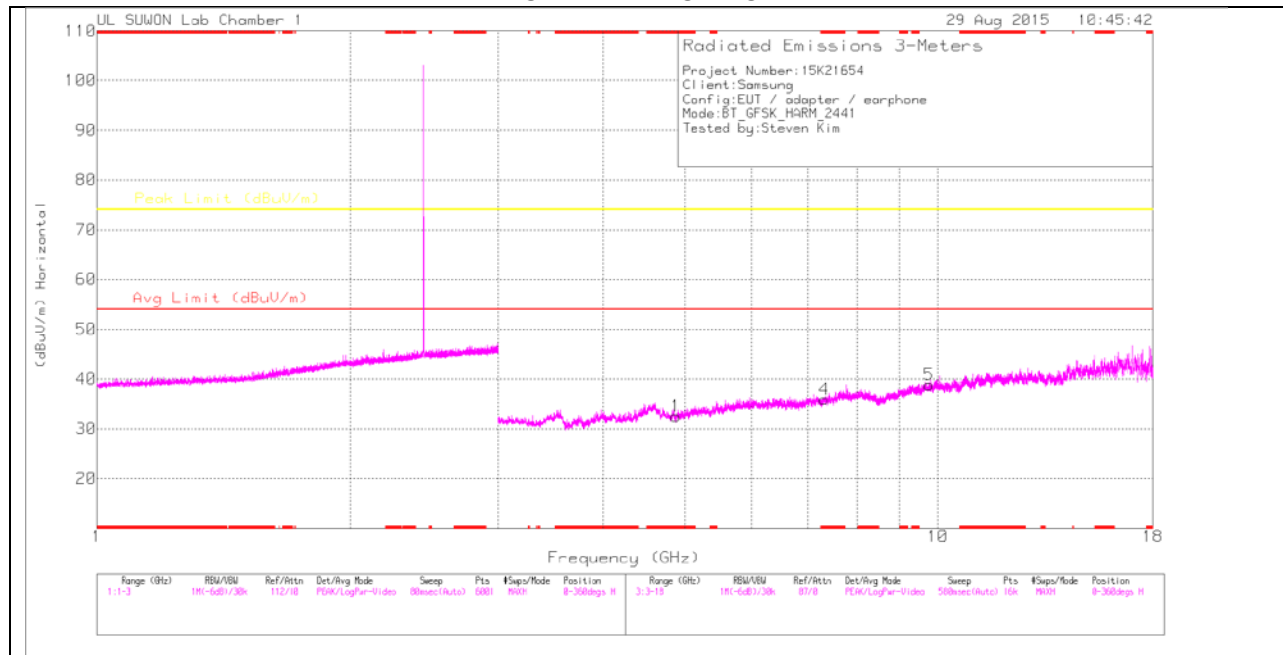
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3G HP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.803	28.53	PK	34	-29.8	32.73	-	-	74	-41.27	0-360	100	H
4	7.205	27.78	PK	35.7	-25.4	38.08	-	-	74	-35.92	0-360	200	H
5	9.608	22.53	PK	37	-21	38.53	-	-	74	-35.47	0-360	100	H
2	* 4.806	29.13	PK	34	-29.8	33.33	-	-	74	-40.67	0-360	200	V
3	7.206	27.69	PK	35.7	-25.4	37.99	-	-	74	-36.01	0-360	200	V
6	9.606	22.68	PK	37	-21	38.68	-	-	74	-35.32	0-360	100	V

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

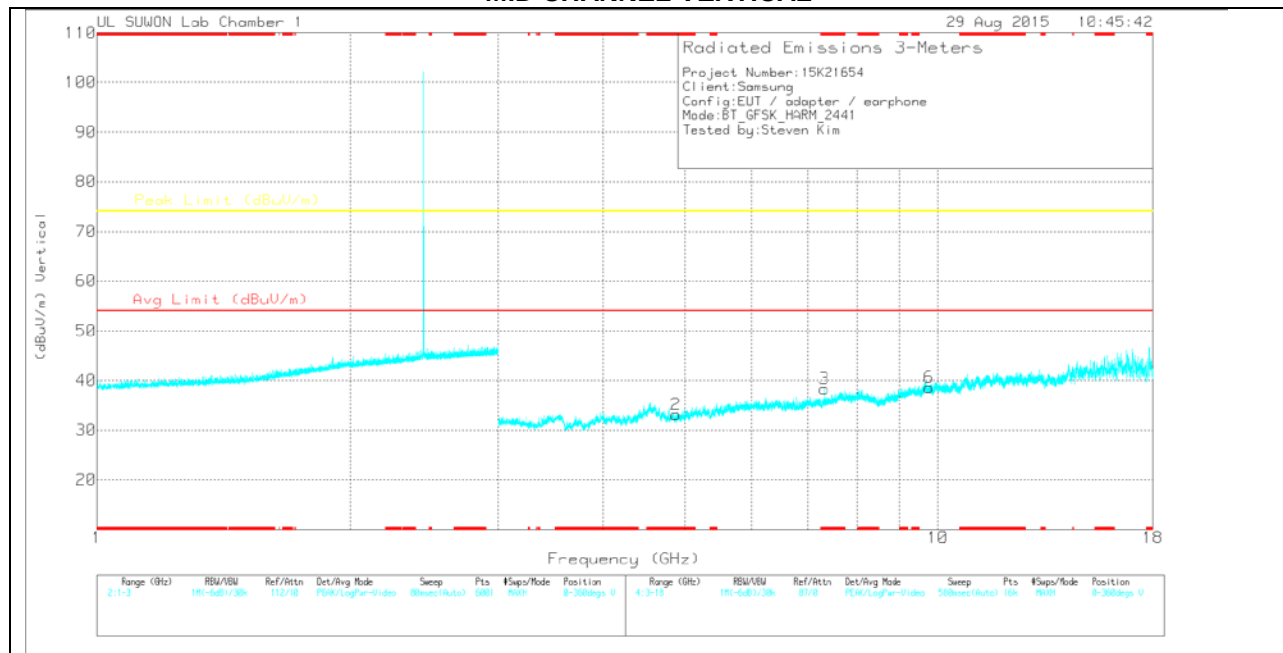
PK – Peak detector

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

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

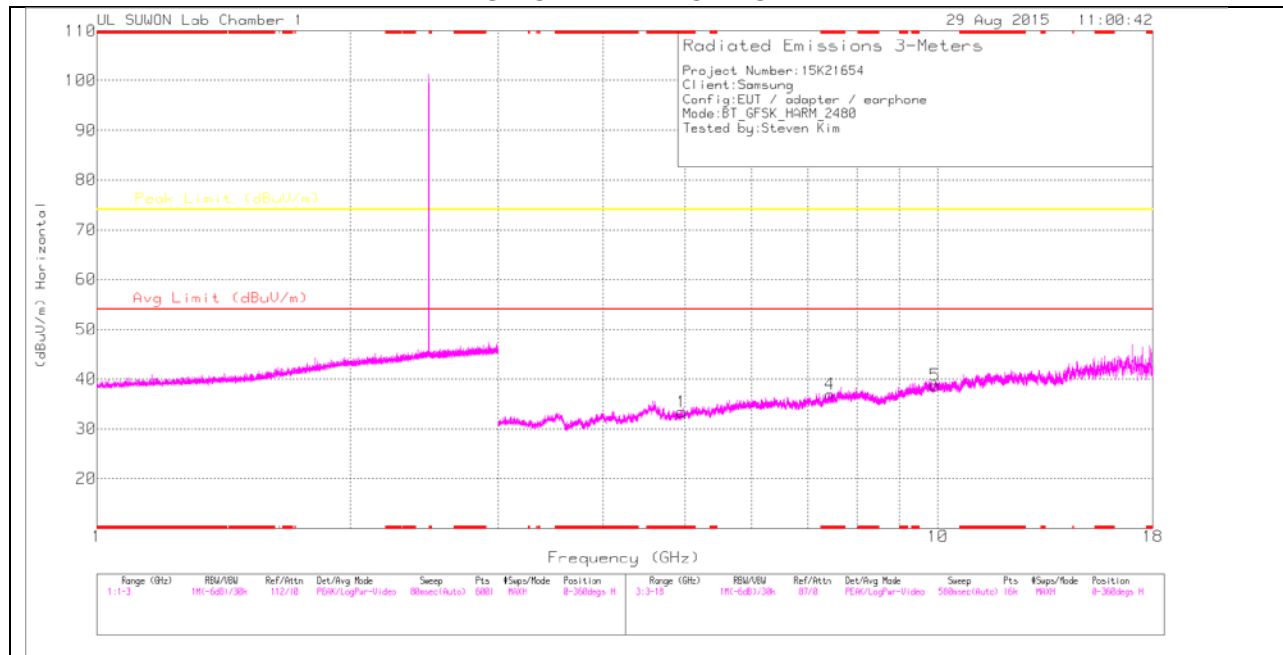
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3G HP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	27.61	PK	34	-29.1	32.51	-	-	74	-41.49	0-360	200	H
4	* 7.323	25.78	PK	35.8	-25.6	35.98	-	-	74	-38.02	0-360	200	H
5	9.764	23.68	PK	37.2	-22	38.88	-	-	74	-35.12	0-360	200	H
2	* 4.881	28.24	PK	34	-29.1	33.14	-	-	74	-40.86	0-360	100	V
3	* 7.323	28.11	PK	35.8	-25.6	38.31	-	-	74	-35.69	0-360	100	V
6	9.764	23.38	PK	37.2	-22	38.58	-	-	74	-35.42	0-360	200	V

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

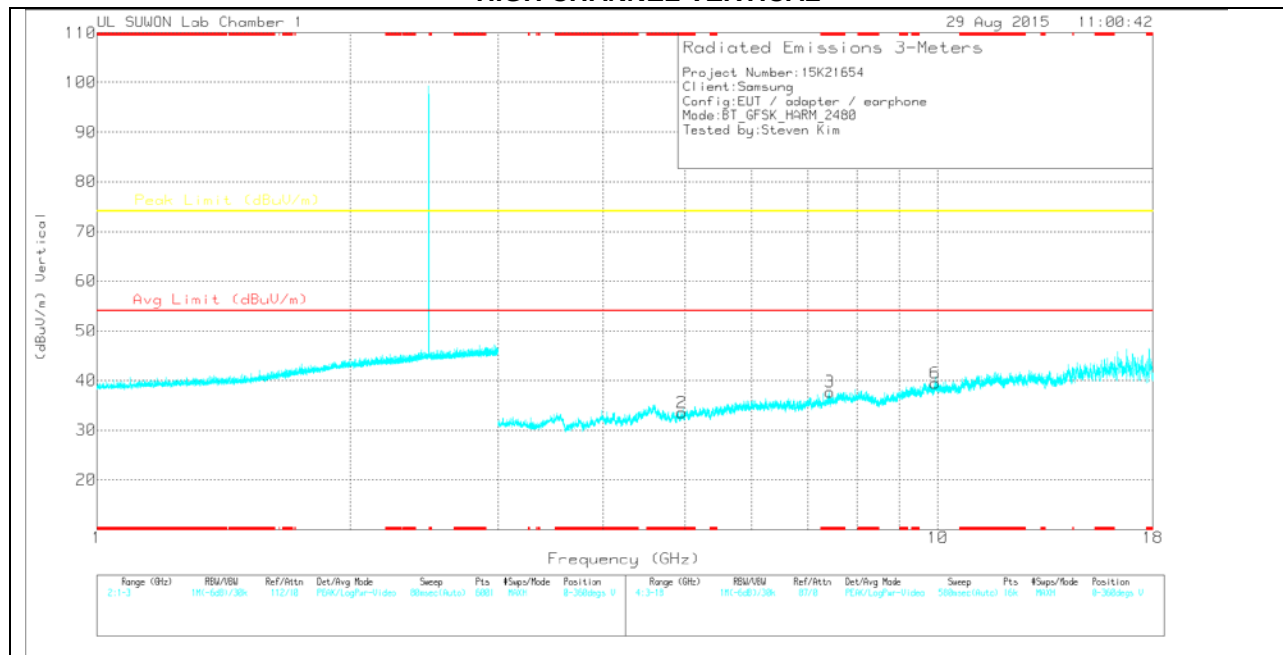
PK – Peak detector

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

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

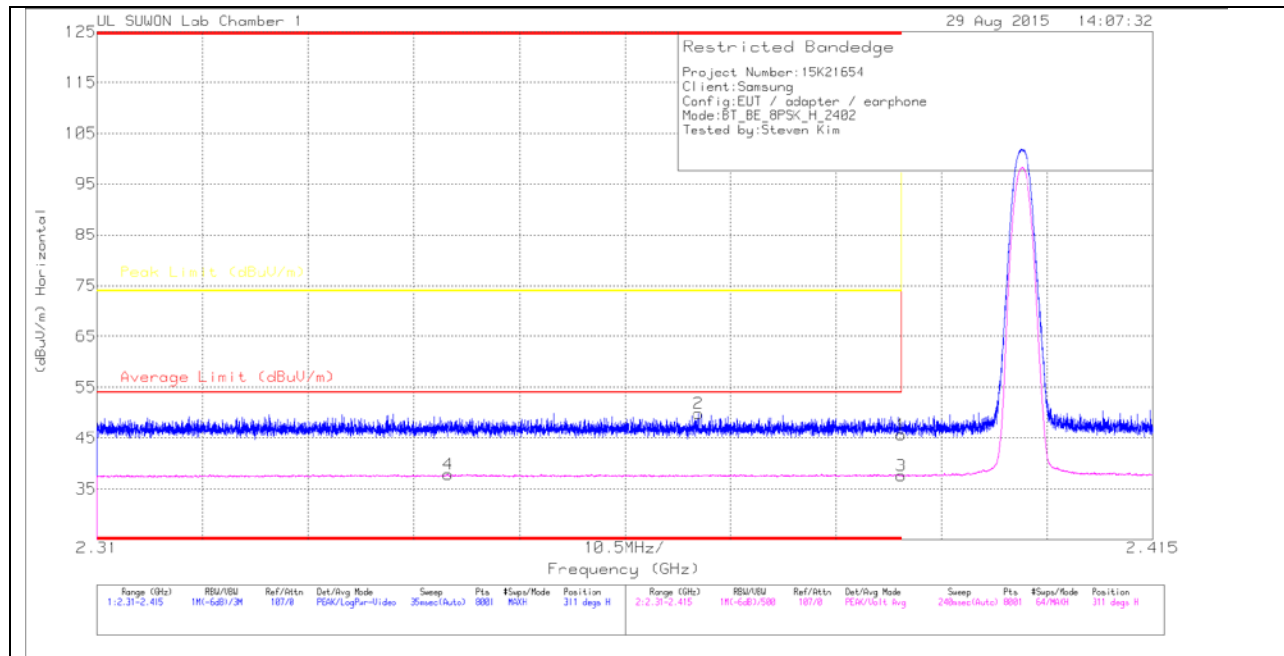
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3G HP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.958	28.36	PK	34	-28.9	33.46	-	-	74	-40.54	0-360	200	H
4	* 7.438	25.99	PK	35.8	-24.8	36.99	-	-	74	-37.01	0-360	100	H
5	9.918	21.69	PK	37.4	-20.4	38.69	-	-	74	-35.31	0-360	100	H
2	* 4.959	28.43	PK	34	-28.9	33.53	-	-	74	-40.47	0-360	200	V
3	* 7.44	26.73	PK	35.8	-24.8	37.73	-	-	74	-36.27	0-360	100	V
6	9.922	22.44	PK	37.4	-20.4	39.44	-	-	74	-34.56	0-360	100	V

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

PK – Peak detector

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

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



HORIZONTAL DATA

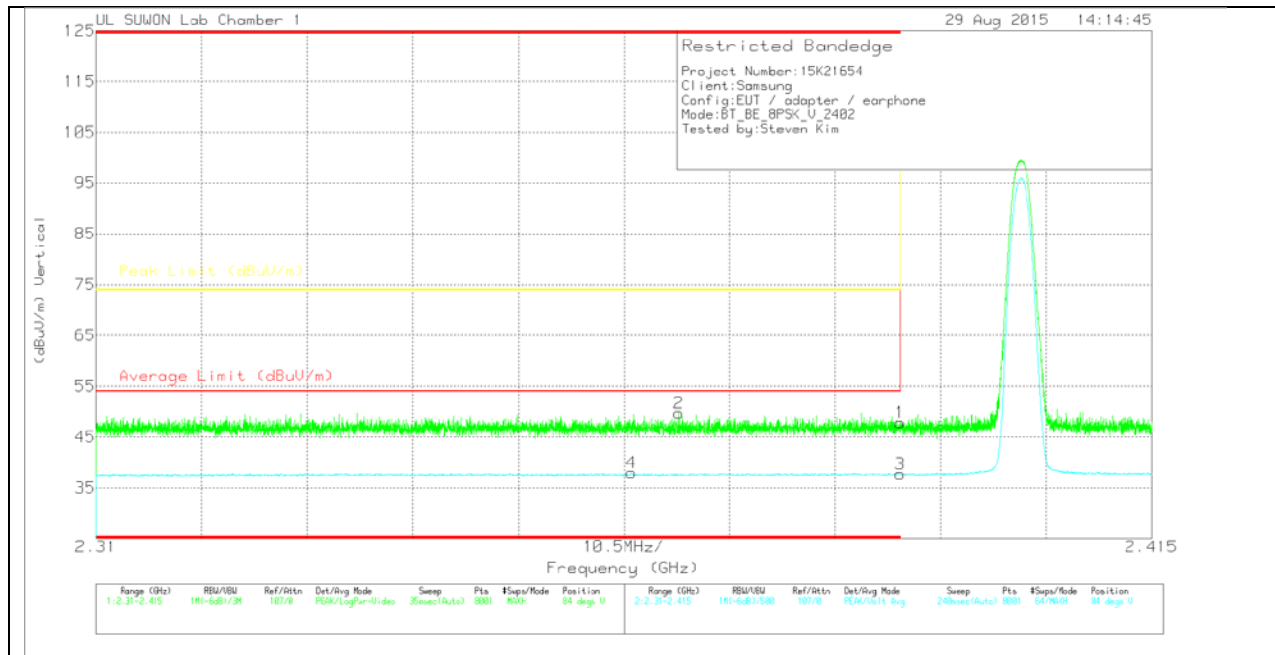
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 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	36.61	Pk	31.8	-22.8	45.61	-	-	74	-28.39	311	100	H
2	* 2.37	40.86	Pk	31.8	-22.8	49.86	-	-	74	-24.14	311	100	H
3	* 2.39	28.56	V1TV	31.8	-22.8	37.56	54	-16.44	-	-	311	100	H
4	* 2.345	29.03	V1TV	31.7	-22.9	37.83	54	-16.17	-	-	311	100	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

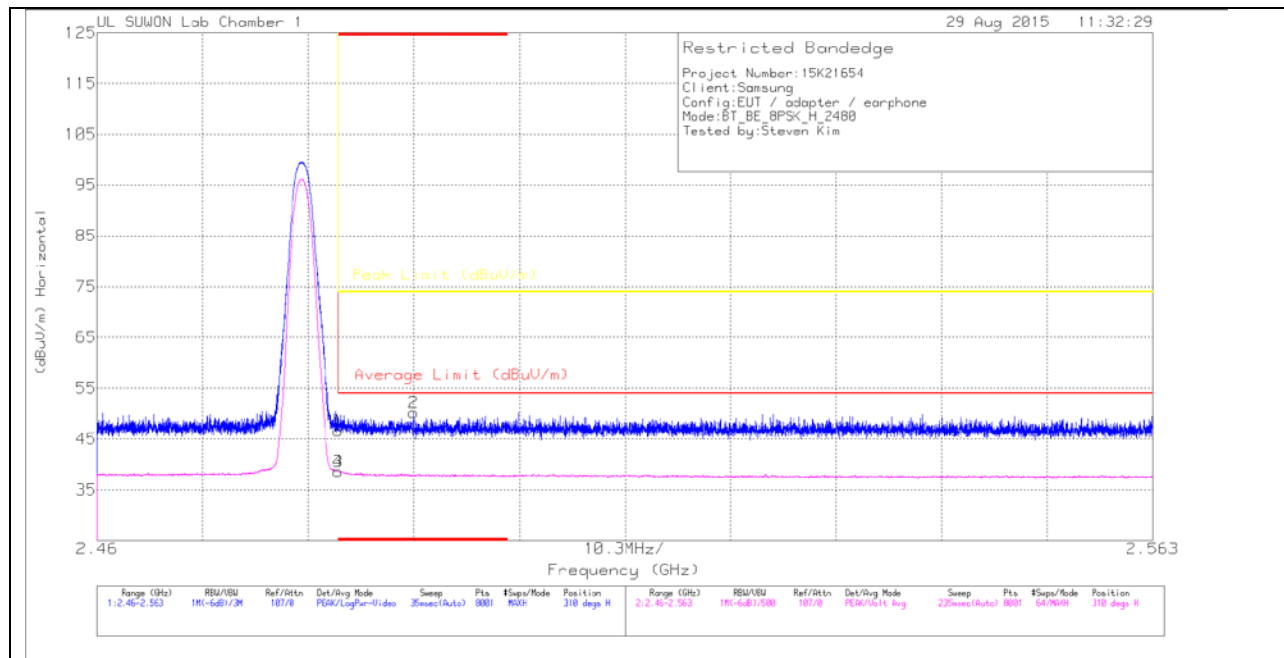
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.8	Pk	31.8	-22.8	47.8	-	-	74	-26.2	84	252	V
2	* 2.368	40.76	Pk	31.8	-22.8	49.76	-	-	74	-24.24	84	252	V
3	* 2.39	28.67	V1TV	31.8	-22.8	37.67	54	-16.33	-	-	84	252	V
4	* 2.363	28.94	V1TV	31.8	-22.8	37.94	54	-16.06	-	-	84	252	V

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

Pk - Peak detector

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

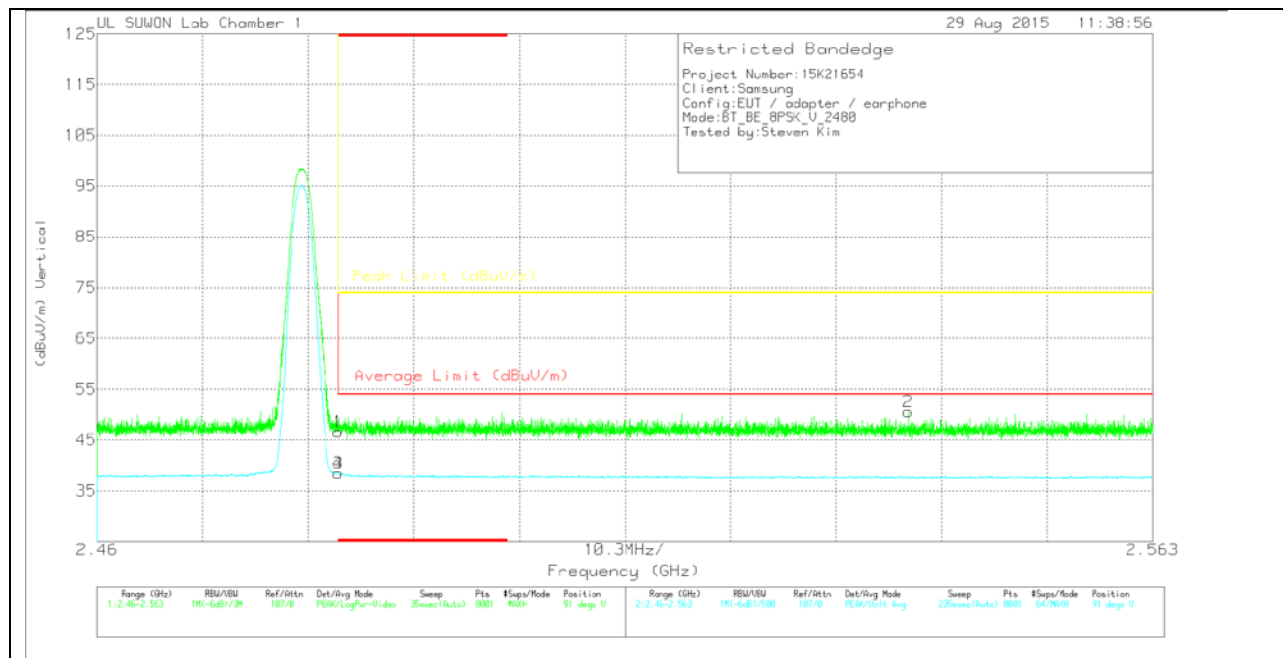
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.25	Pk	32	-22.6	46.65	-	-	74	-27.35	310	102	H
2	* 2.491	40.83	Pk	32	-22.6	50.23	-	-	74	-23.77	310	102	H
3	* 2.484	29.17	V1TV	32	-22.6	38.57	54	-15.43	-	-	310	102	H
4	* 2.484	29.13	V1TV	32	-22.6	38.53	54	-15.47	-	-	310	102	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

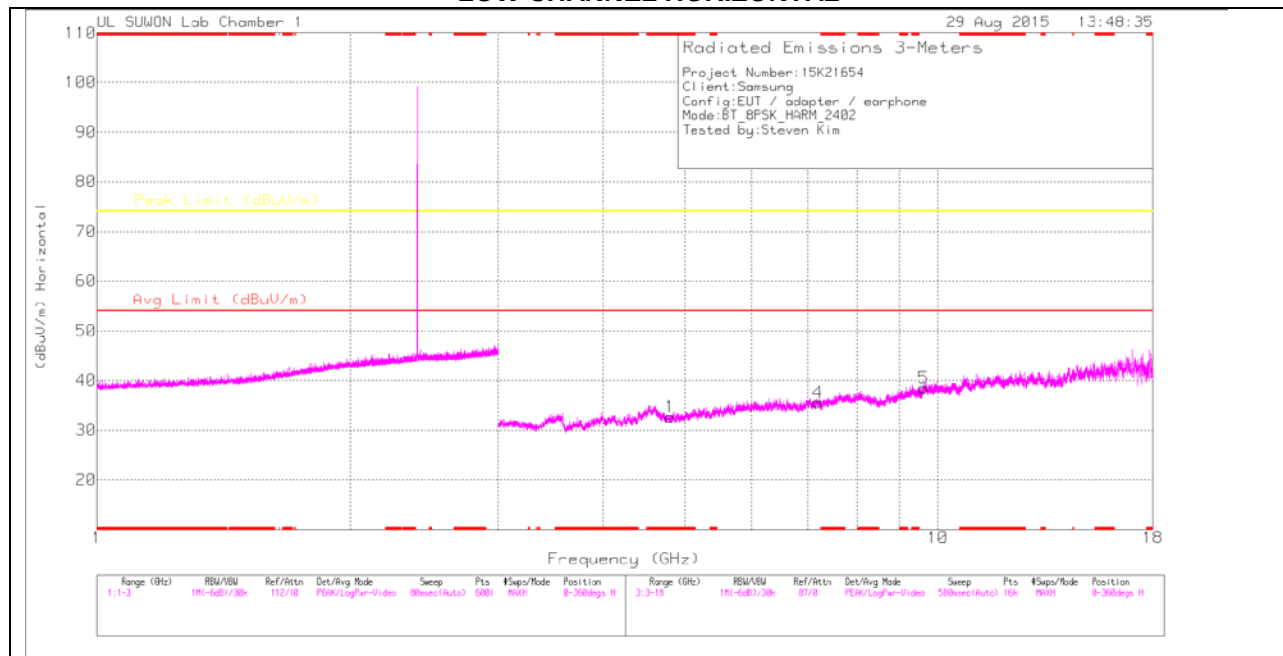
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.21	Pk	32	-22.6	46.61	-	-	74	-27.39	91	196	V
2	2.539	41.2	Pk	32	-22.6	50.6	-	-	74	-23.4	91	196	V
3	* 2.484	29.05	V1TV	32	-22.6	38.45	54	-15.55	-	-	91	196	V
4	* 2.484	29.04	V1TV	32	-22.6	38.44	54	-15.56	-	-	91	196	V

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

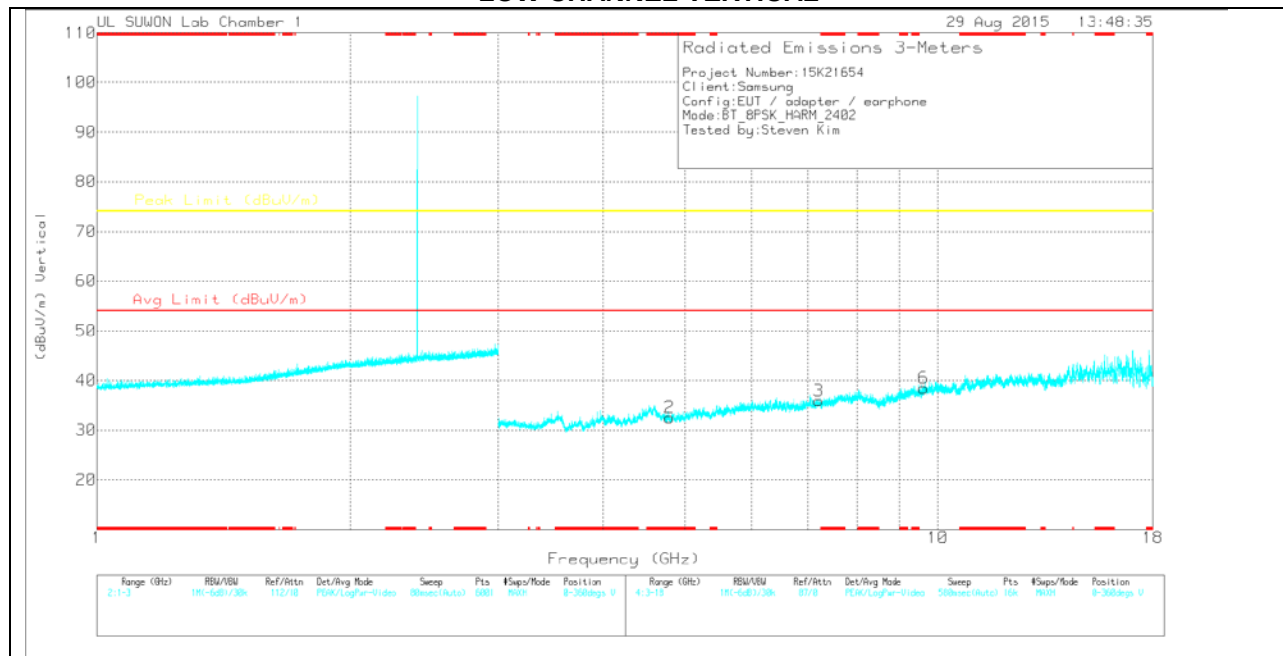
Pk - Peak detector

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

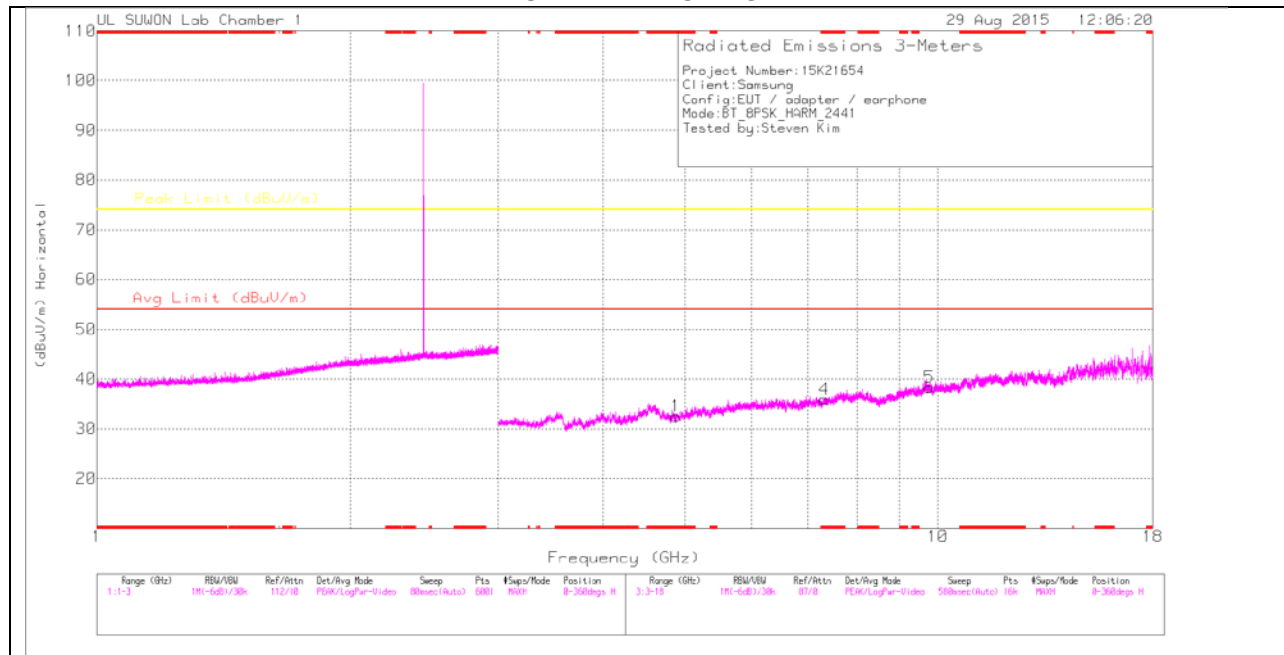
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3G HP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.803	28.47	PK	34	-29.8	32.67	-	-	74	-41.33	0-360	200	H
4	7.203	25.29	PK	35.7	-25.4	35.59	-	-	74	-38.41	0-360	200	H
5	9.61	22.46	PK	37	-21	38.46	-	-	74	-35.54	0-360	100	H
2	* 4.799	28.4	PK	34	-29.9	32.5	-	-	74	-41.5	0-360	100	V
3	7.205	25.64	PK	35.7	-25.4	35.94	-	-	74	-38.06	0-360	100	V
6	9.608	22.44	PK	37	-21	38.44	-	-	74	-35.56	0-360	100	V

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

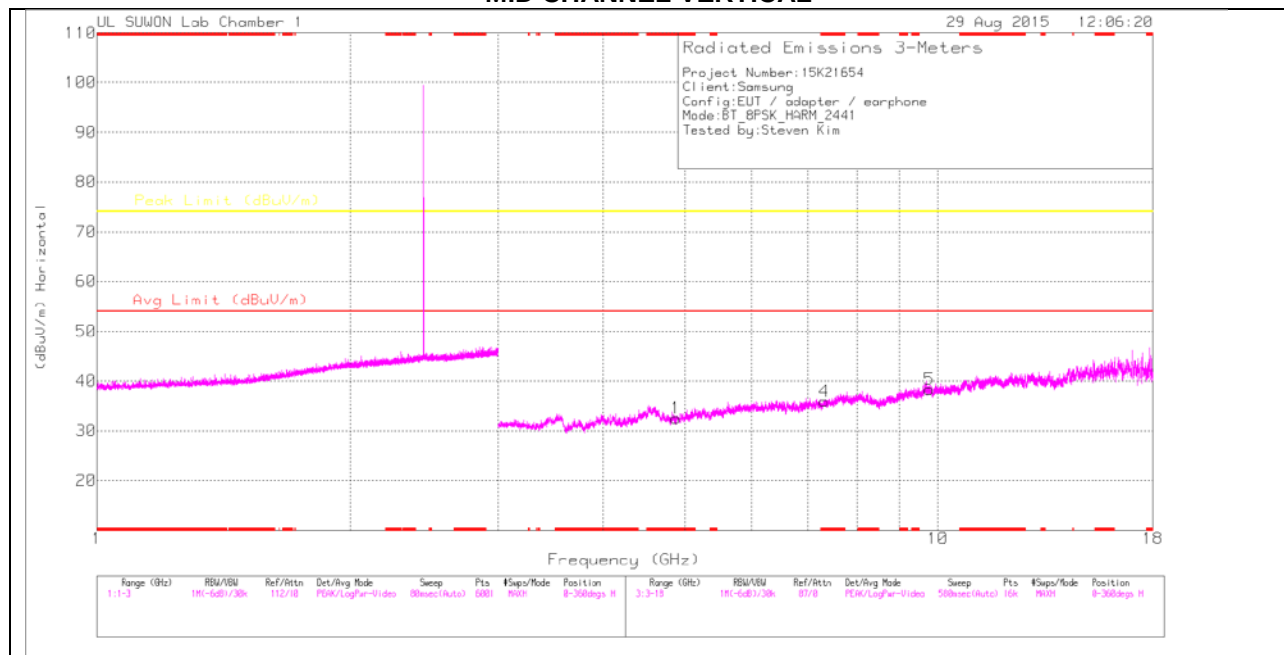
PK – Peak detector

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

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

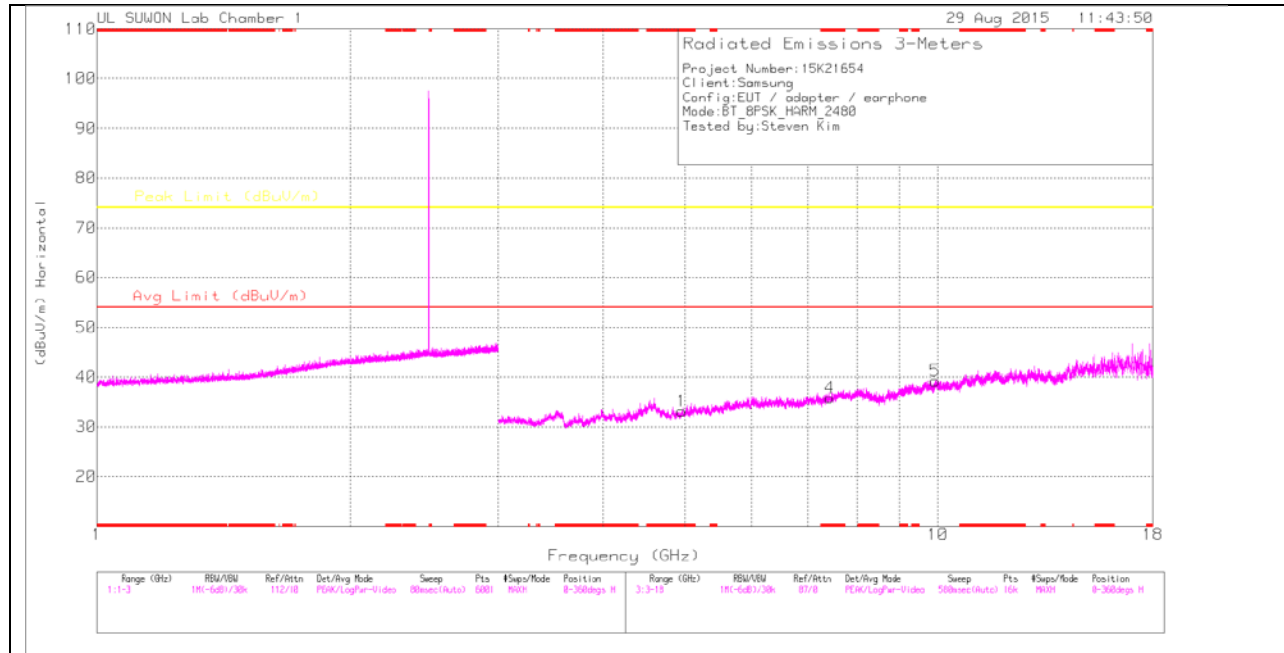
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3G HP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	27.62	PK	34	-29.1	32.52	-	-	74	-41.48	0-360	200	H
4	* 7.319	25.76	PK	35.8	-25.6	35.96	-	-	74	-38.04	0-360	200	H
5	9.766	23.21	PK	37.2	-22.1	38.31	-	-	74	-35.69	0-360	200	H
2	* 4.887	27.85	PK	34	-29.1	32.75	-	-	74	-41.25	0-360	200	V
3	* 7.319	26.05	PK	35.8	-25.6	36.25	-	-	74	-37.75	0-360	200	V
6	9.766	23.8	PK	37.2	-22.1	38.9	-	-	74	-35.1	0-360	100	V

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

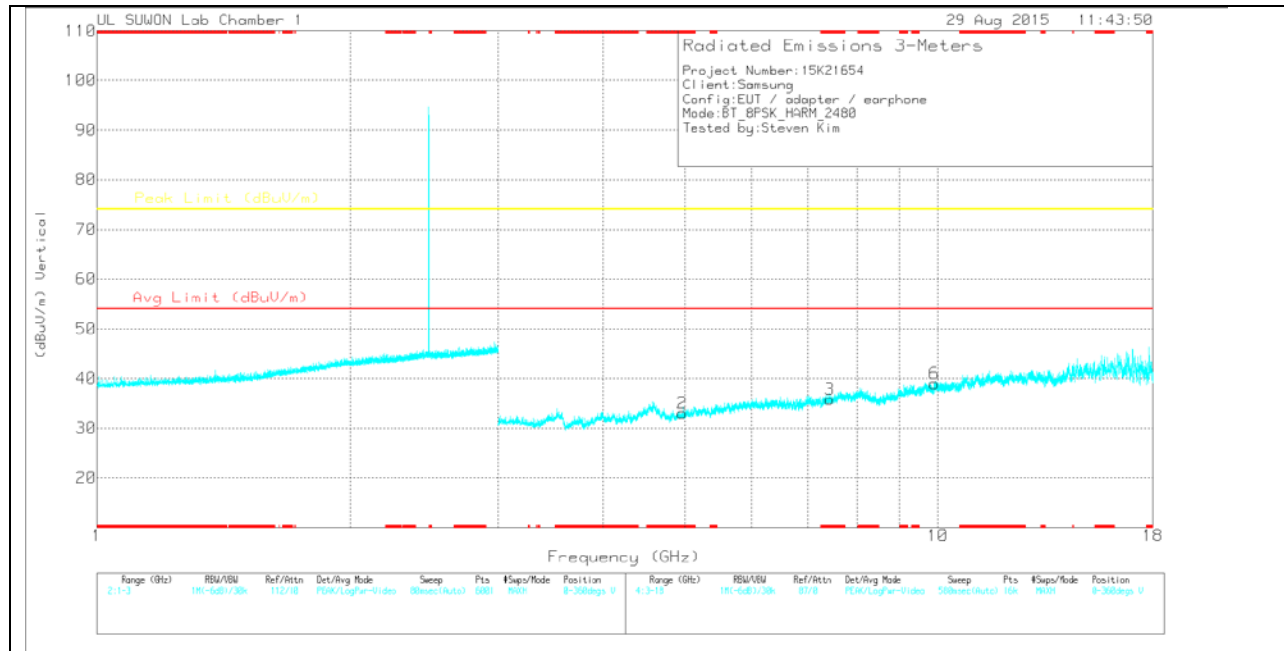
PK – Peak detector

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

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



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

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3_3G HP	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.957	28.03	PK	34	-28.9	33.13	-	-	74	-40.87	0-360	100	H
4	* 7.442	24.8	PK	35.8	-24.8	35.8	-	-	74	-38.2	0-360	200	H
5	9.921	22.21	PK	37.4	-20.4	39.21	-	-	74	-34.79	0-360	100	H
2	* 4.965	27.85	PK	34.1	-28.9	33.05	-	-	74	-40.95	0-360	200	V
3	* 7.44	24.86	PK	35.8	-24.8	35.86	-	-	74	-38.14	0-360	200	V
6	9.916	22.09	PK	37.4	-20.5	38.99	-	-	74	-35.01	0-360	100	V

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

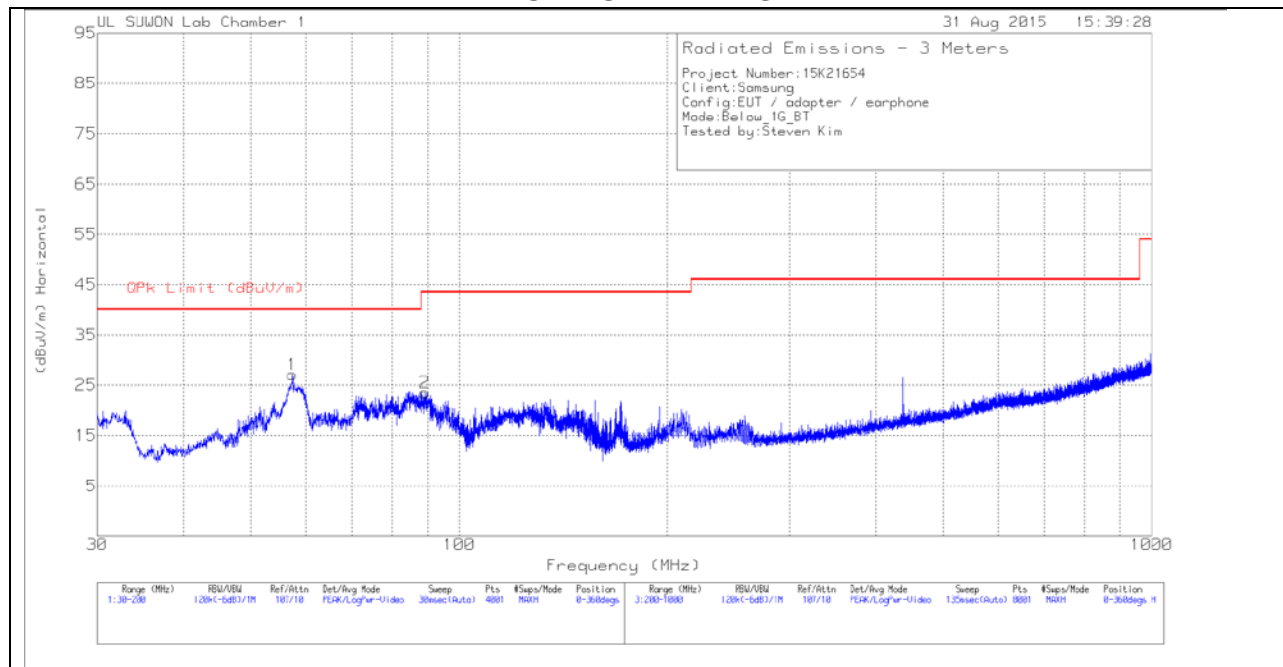
PK – Peak detector

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

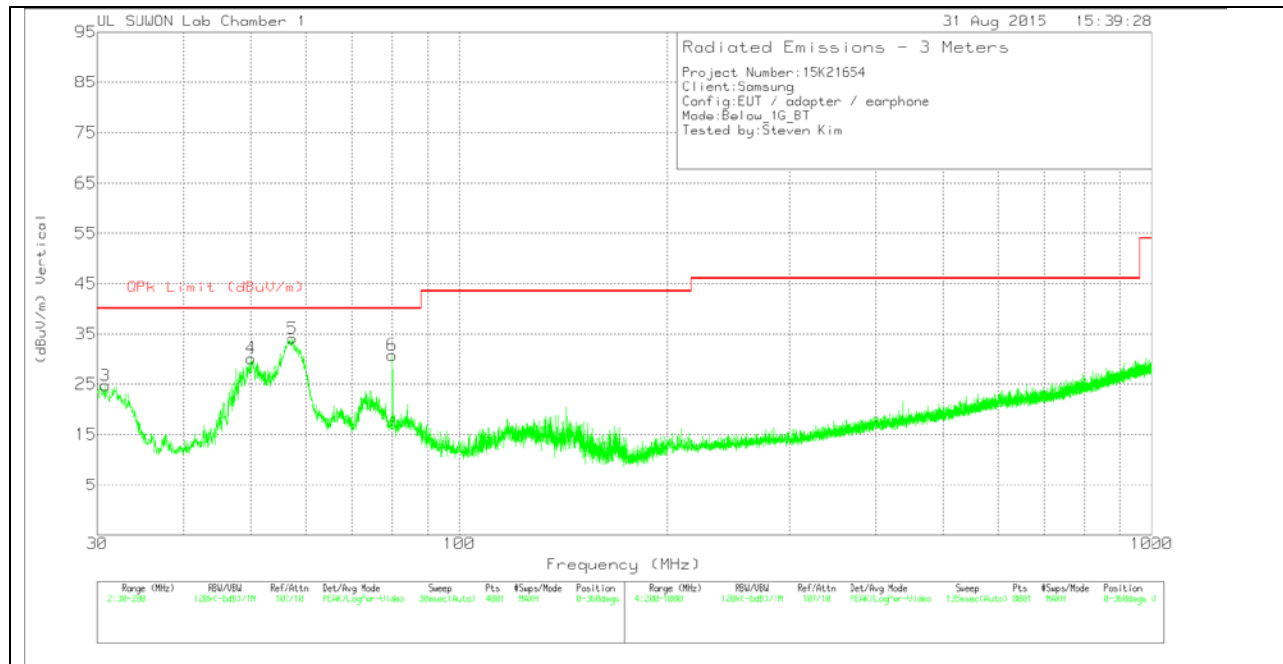
9.3. WORST-CASE BELOW 1 GHz

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	VULB9163-750	Bi-Log	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	57.4975	44.12	Pk	13	-30	27.12	40	-12.88	0-360	400	H
2	89.16	43.63	Pk	9.3	-29.4	23.53	43.52	-19.99	0-360	200	H
3	30.85	44.94	Pk	10.3	-30.5	24.74	40	-15.26	0-360	100	V
4	50.06	46.35	Pk	13.9	-30.1	30.15	40	-9.85	0-360	100	V
5	57.4975	51.11	Pk	13	-30	34.11	40	-5.89	0-360	100	V
6	79.98	53.48	Pk	6.9	-29.6	30.78	40	-9.22	0-360	100	V

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)
RSS-Gen §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.

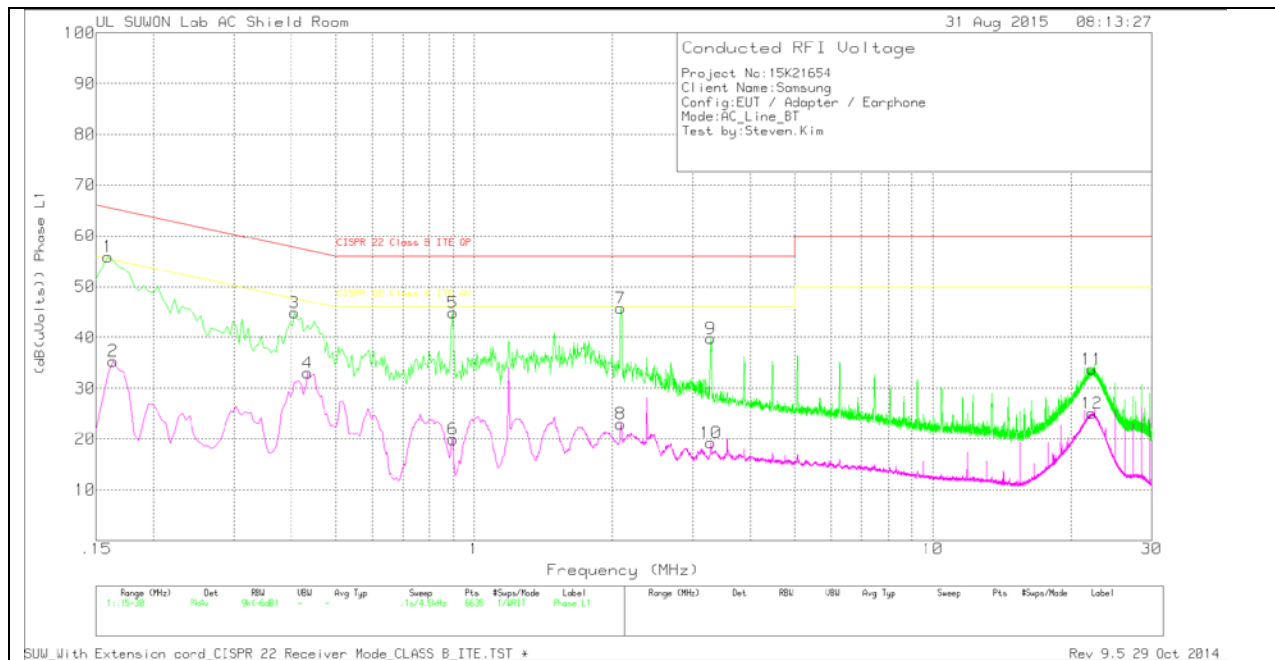
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_w ith ex- cord_L1	CE Shield Room	Corrected Reading (dBuV)	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
1	.159	45.83	Pk	10	0	55.83	65.52	-9.69	-	-
2	.1635	25.3	Av	10.1	0	35.4	-	-	55.28	-19.88
3	.4065	34.72	Pk	10.1	0	44.82	57.72	-12.9	-	-
4	.4335	22.84	Av	10.1	0	32.94	-	-	47.19	-14.25
5	.897	34.93	Pk	9.9	0	44.83	56	-11.17	-	-
6	.897	10.05	Av	9.9	0	19.95	-	-	46	-26.05
7	2.085	35.81	Pk	9.8	.1	45.71	56	-10.29	-	-
8	2.085	13.1	Av	9.8	.1	23	-	-	46	-23
9	3.282	29.91	Pk	9.8	.1	39.81	56	-16.19	-	-
10	3.282	9.38	Av	9.8	.1	19.28	-	-	46	-26.72
11	22.2405	23.04	Pk	10.5	.2	33.74	60	-26.26	-	-
12	22.2135	14.52	Av	10.4	.2	25.12	-	-	50	-24.88

Pk - Peak detector

Av - Average detection

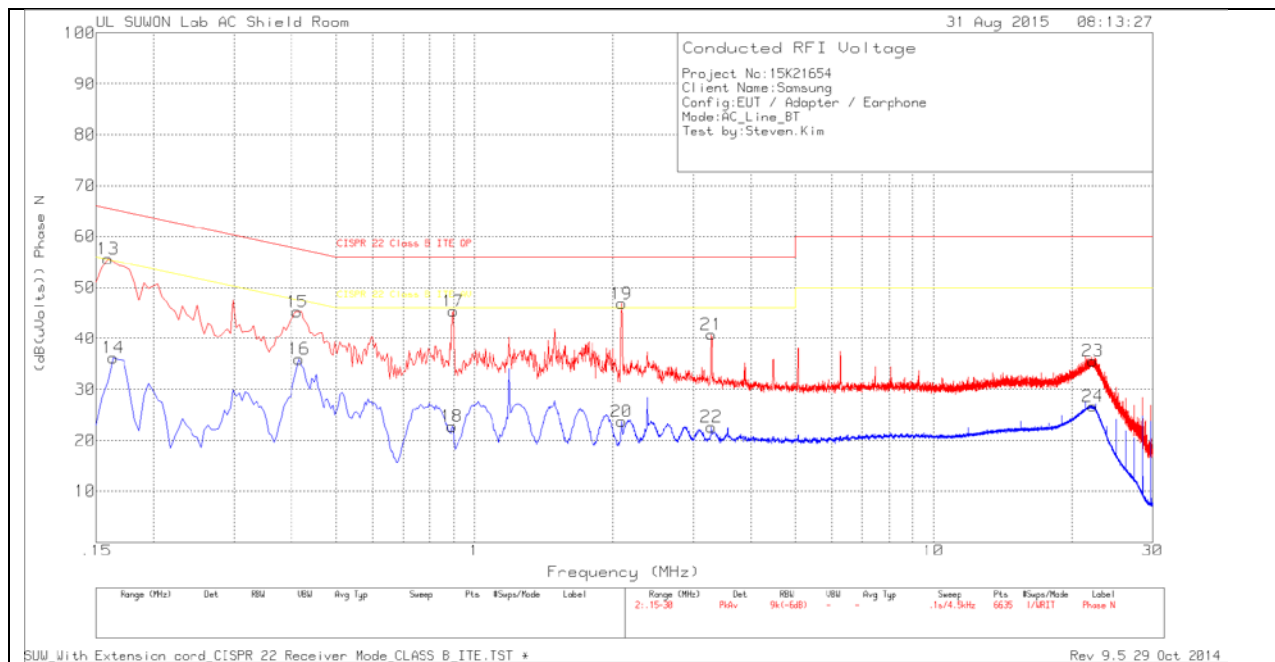
Quasi-Peak Emissions

Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101837_wit h ex-cord_L1	CE Shield Room	Corrected Reading (dBuV)	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
.1599	42.7	Qp	10	0	52.7	65.47	-12.77	-	-
2.0895	32.15	Qp	9.8	.1	42.05	56	-13.95	-	-

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 (dBuV)	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
13	.159	45.65	Pk	10	0	55.65	65.52	-9.87	-	-
14	.1635	26.16	Av	10.1	0	36.26	-	-	55.28	-19.02
15	.411	35.19	Pk	10.1	0	45.29	57.63	-12.34	-	-
16	.4155	25.86	Av	10.1	0	35.96	-	-	47.54	-11.58
17	.897	35.44	Pk	9.9	0	45.34	56	-10.66	-	-
18	.8925	12.79	Av	9.9	0	22.69	-	-	46	-23.31
19	2.0895	36.98	Pk	9.8	.1	46.88	56	-9.12	-	-
20	2.0895	13.8	Av	9.8	.1	23.7	-	-	46	-22.3
21	3.282	30.87	Pk	9.8	.1	40.77	56	-15.23	-	-
22	3.282	12.71	Av	9.8	.1	22.61	-	-	46	-23.39
23	22.227	24.66	Pk	10.7	.2	35.56	60	-24.44	-	-
24	22.2315	15.81	Av	10.7	.2	26.71	-	-	50	-23.29

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 (dBuV)	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
.159	42.31	Qp	10	0	52.31	65.52	-13.21	-	-
2.0895	32.22	Qp	9.8	.1	42.12	56	-13.88	-	-

Qp – Quasi-Peak detector