



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SC-01H

FCC ID: A3LSC01H

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Prepared for

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	09/02/15	Initial issue	Junwhan Lee
A	09/22/15	Revised section 6	Junwhan Lee
B	09/23/15	Removed note about KDB558074 on section 9.2	Junwhan Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA Phone + Bluetooth/BLE, DTS b/g/n and NFC
MODEL NUMBER: SC-01H
SERIAL NUMBER: R38G70DOR6V (RADIATED); 74d6c83c (CONDUCTED)
DATE TESTED: AUG 10, 2015 - AUG 17, 2015

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
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UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-823, 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 GSM/WCDMA Phone + Bluetooth/BLE, DTS b/g/n and NFC.
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	10.75	11.89
		Peak	11.07	12.78
	Enhanced Pi/4-DPSK	Average	8.59	7.23
		Peak	10.98	12.52
	Enhanced 8PSK	Average	8.66	7.35
		Peak	11.55	14.30

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 -0.23 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA20EWE	R37FC2100M1SE3	N/A
Data Cable	SAMSUNG	ECB-DU4EWE	N/A	N/A
Earphone	SAMSUNG	EG920BW	N/A	N/A

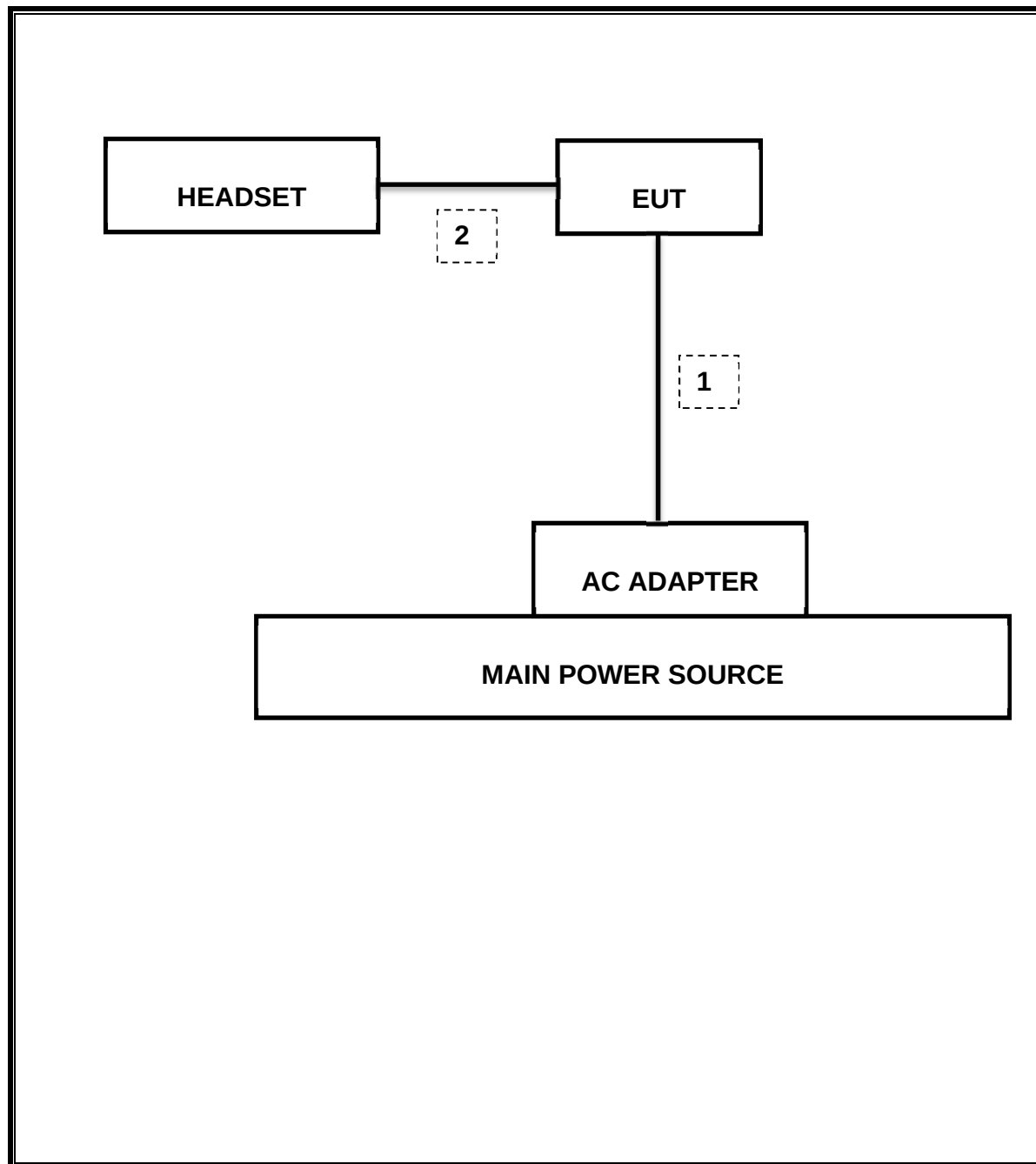
I/O CABLES

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	0016145	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	11-17-15
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	11-18-15
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	09-23-15
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	11-17-15
Average Power Sensor	R&S	NRZ-Z91	102681	11-17-15
Average Power Sensor	Agilent / HP	U2000	MY54270007	09-23-15
EMI Test Receive, 40 GHz	R&S	ESU40	100439	11-17-15
EMI Test Receive, 3 GHz	R&S	ESR3	101832	11-17-15
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	009	11-17-15
High Pass Filter 5GHz	Micro-Tronics	HPS17542	009	11-17-15
High Pass Filter 6GHz	Micro-Tronics	HPM17543	010	11-17-15
LISN	R&S	ENV-216	101836	04-09-16
LISN	R&S	ENV-216	101837	04-09-16
Combiner	WEINSCHEL	1575	2153	11-17-15

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	1.198 MHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-37.32 dBm
15.247 (b)(1)	TX conducted output power	<21dBm		Pass	11.554 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	0.375 sec
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	44.14 dBuV (QP)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	47.91 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 [MHz]
Low	2402	0.900	0.929
Mid	2441	0.944	0.901
High	2480	0.818	0.891
Worst		0.944	0.929

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

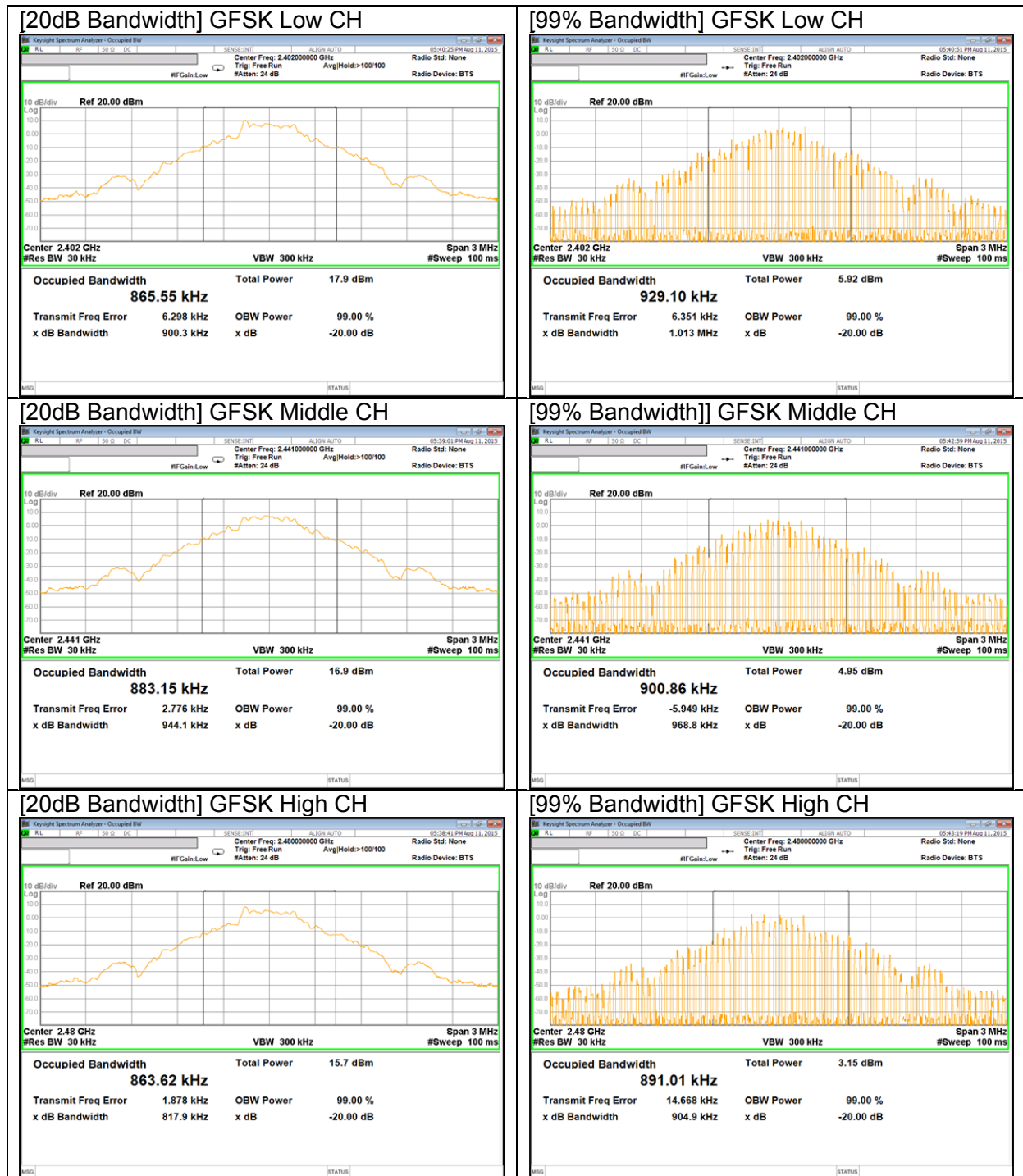
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.238	1.194
Mid	2441	1.240	1.161
High	2480	1.239	1.197
Worst		1.240	1.197

8.1.3. ENHANCED DATA RATE 8PSK MODULATION

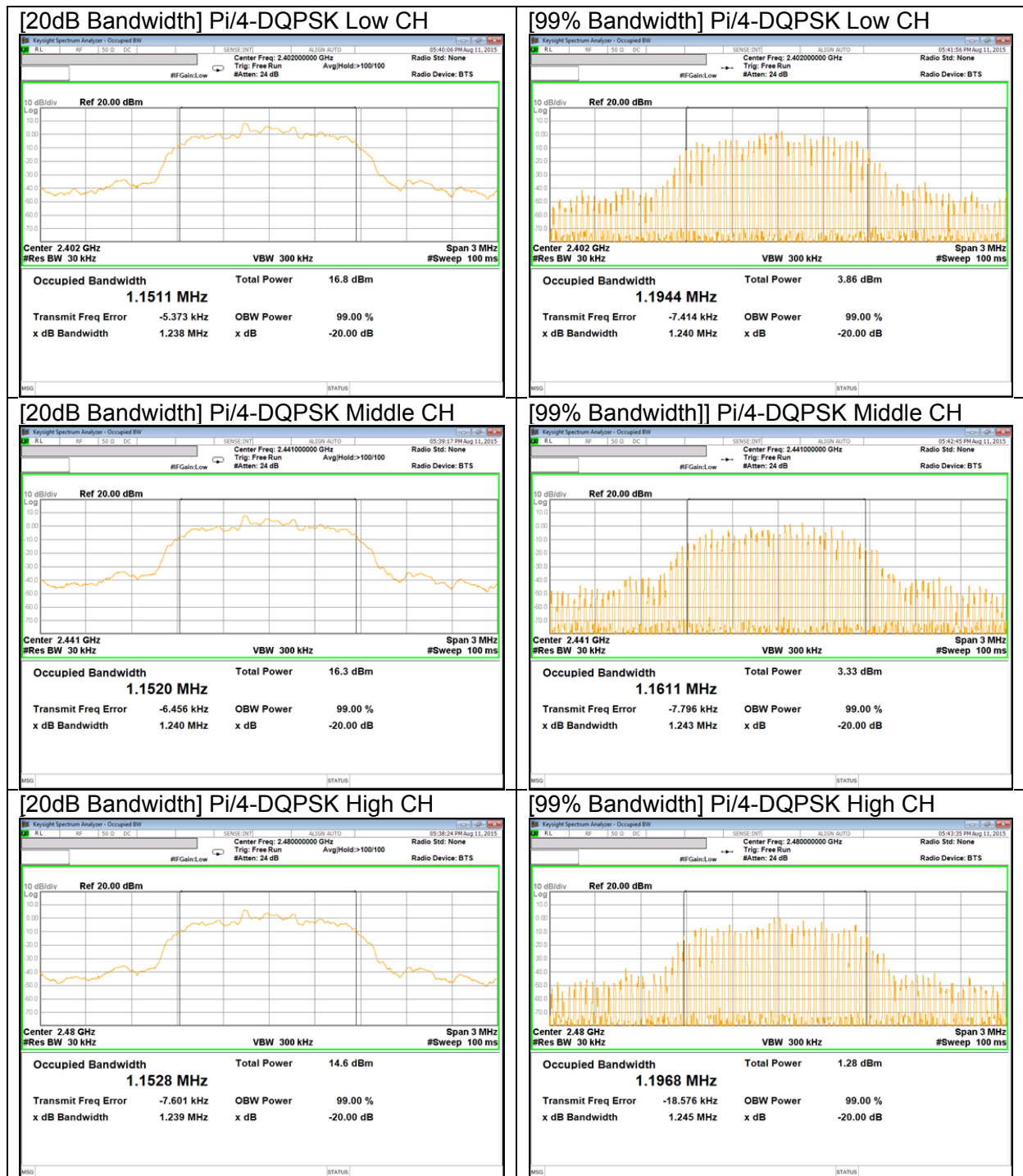
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.263	1.161
Mid	2441	1.265	1.166
High	2480	1.267	1.198
Worst		1.267	1.198

8.1.4. 20 dB AND 99% BANDWIDTH PLOTS

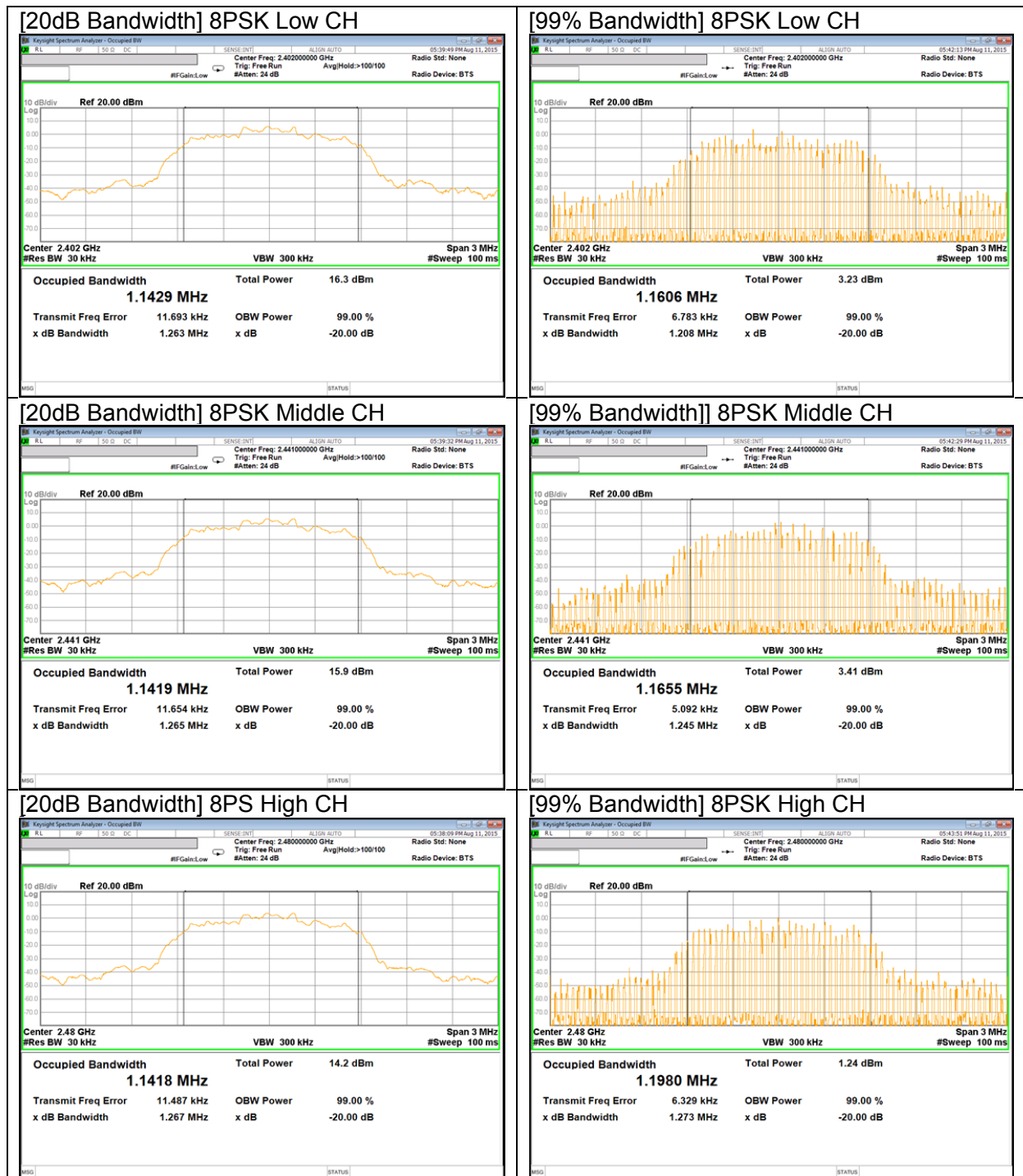
GFSK BANDWIDTH



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.

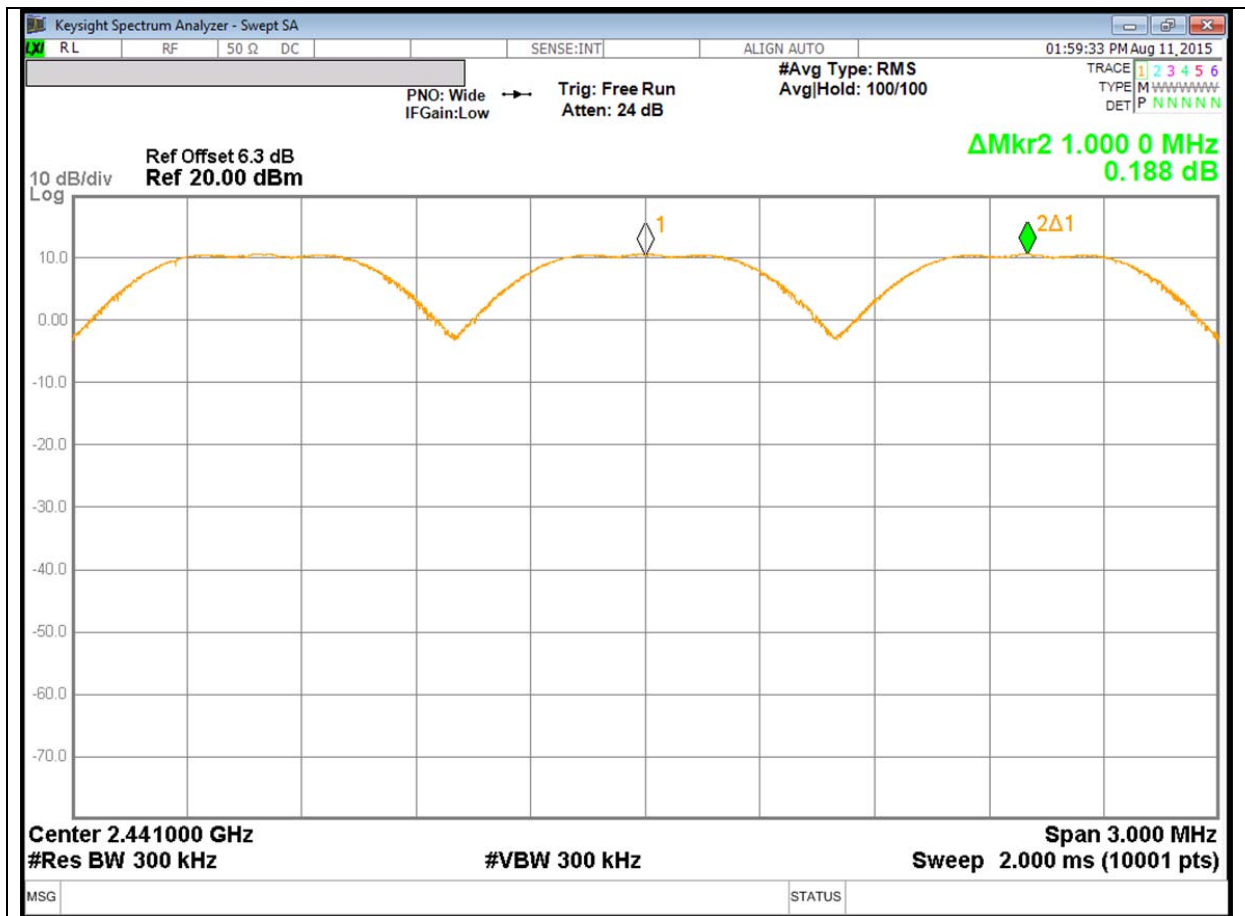
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

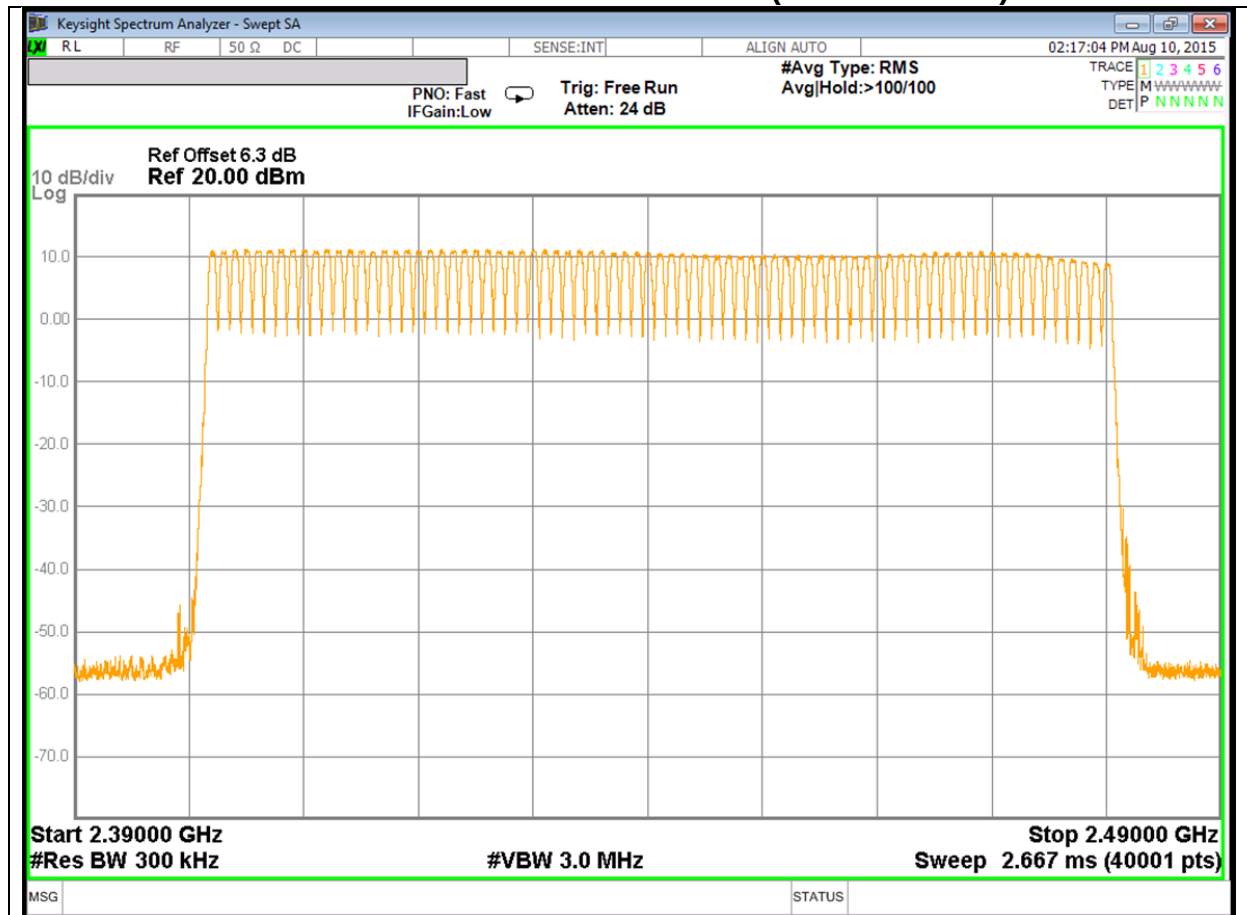
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

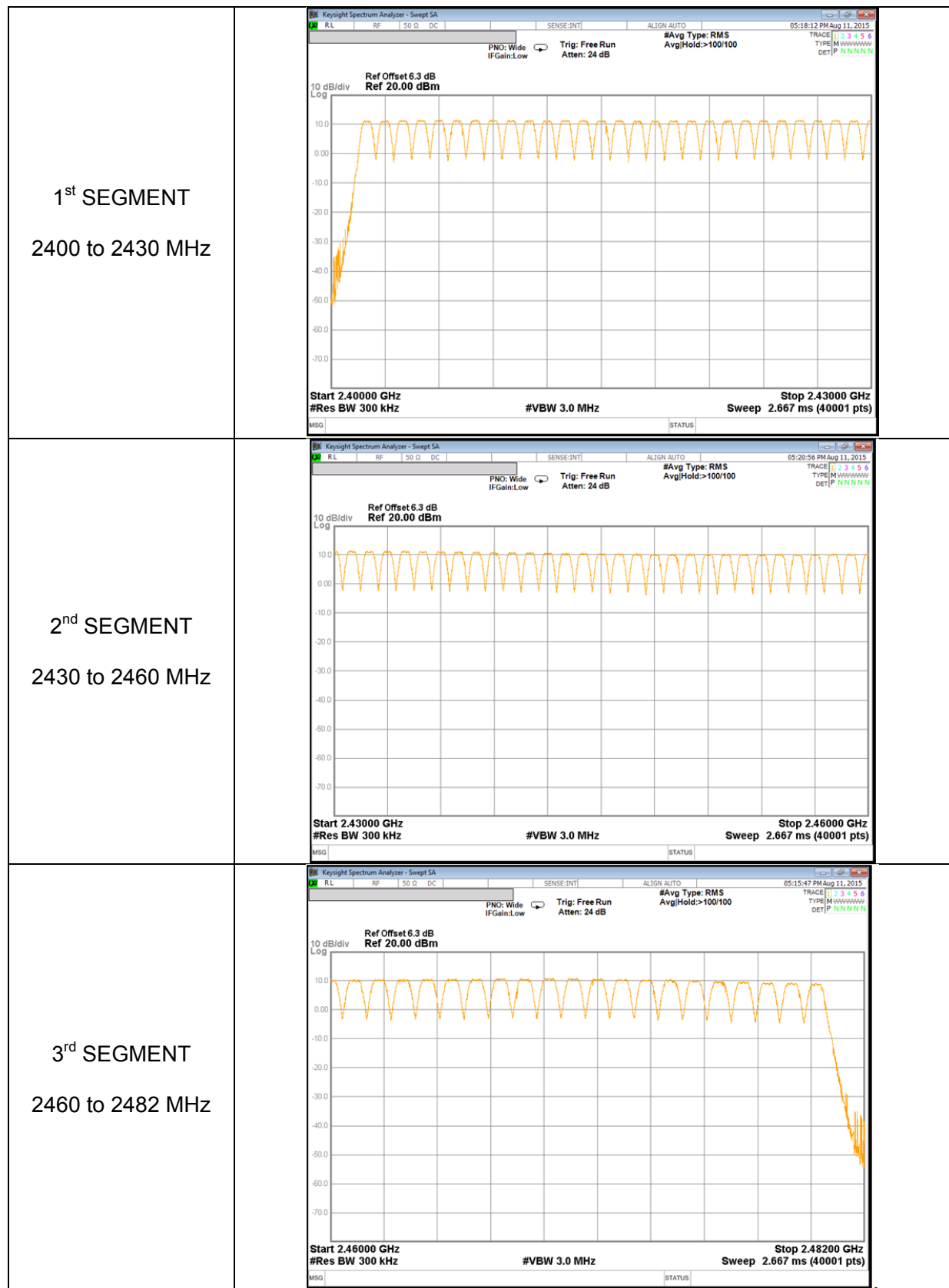
RESULTS

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.

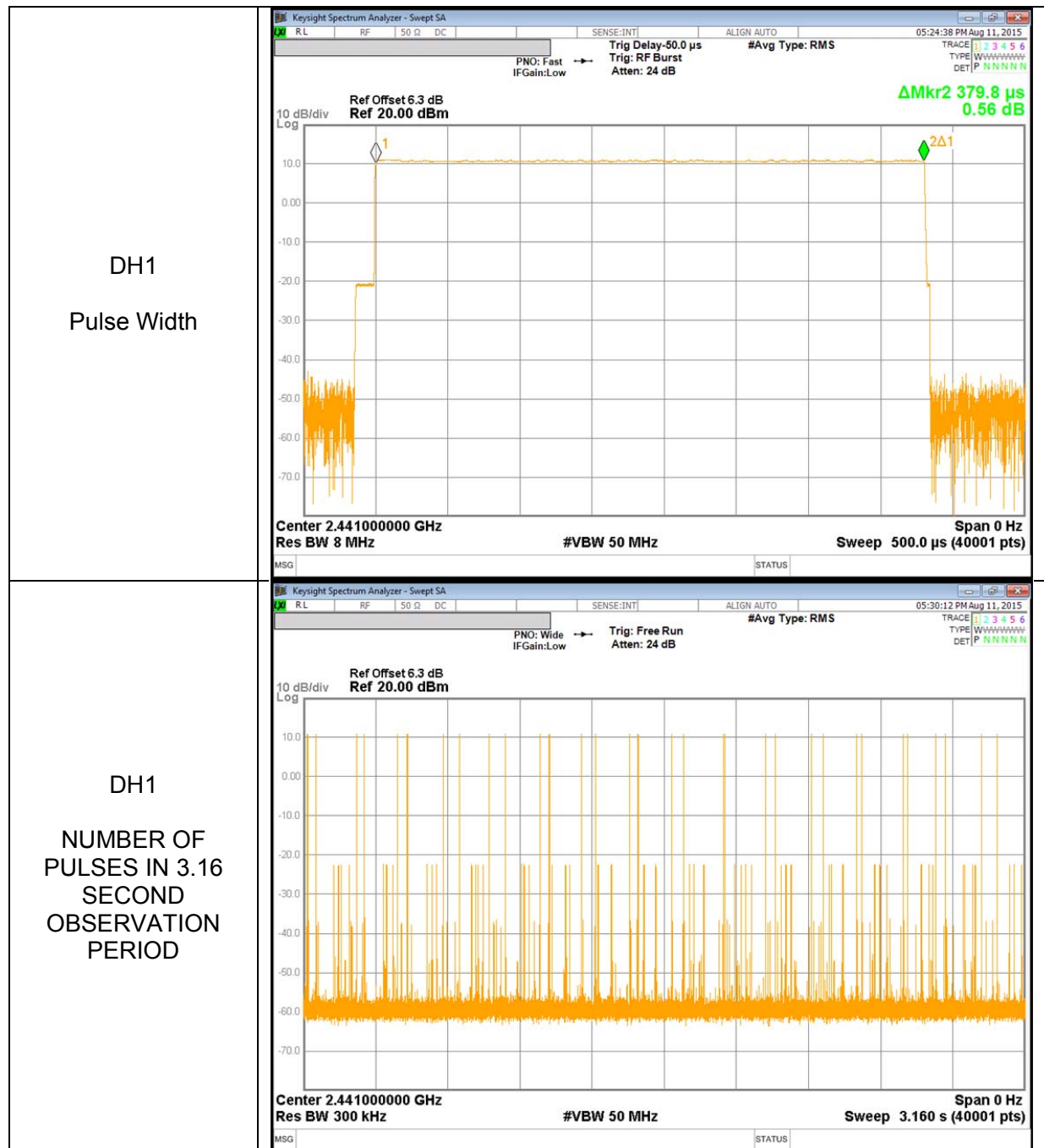
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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	0.380	32	0.121536	0.4	-0.2785
DH3	1.635	16	0.261600	0.4	-0.1384
DH5	2.882	13	0.374660	0.4	-0.0253
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.380	8	0.030384	0.4	-0.36962
DH3	1.635	4	0.065400	0.4	-0.3346
DH5	2.882	3.25	0.093665	0.4	-0.30634

DH1



DH3

KeySight Spectrum Analyzer - Swept SA

RL RF 50 Ω DC SENSE:INT ALIGN AUTO 05:25:51 PM Aug 11, 2015

PNO: Fast IF Gain: Low Trig Delay: 200.0 μ s #Avg Type: RMS
Trig: RF Burst Atten: 24 dB

Ref Offset 6.3 dB Ref 20.00 dBm

10 dB/div Log

1 2 Δ 1

Center 2.441000000 GHz Res BW 8 MHz #VBW 50 MHz Span 0 Hz Sweep 2.000 ms (40001 pts)

MSG Alignment Completed STATUS

KeySight Spectrum Analyzer - Swept SA

RL RF 50 Ω DC SENSE:INT ALIGN AUTO 05:28:45 PM Aug 11, 2015

PNO: Wide IF Gain: Low Trig: Free Run #Avg Type: RMS
Trig: Free Run Atten: 24 dB

Ref Offset 6.3 dB Ref 20.00 dBm

10 dB/div Log

Center 2.441000000 GHz Res BW 300 kHz #VBW 50 MHz Span 0 Hz Sweep 3.160 s (40001 pts)

MSG STATUS

DH3

Pulse Width

DH3

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

The figure consists of two screenshots of a Keysight Spectrum Analyzer interface. The top screenshot shows a pulse width measurement. The display is set to a center frequency of 2.441000000 GHz, a resolution bandwidth (Res BW) of 8 MHz, and a video bandwidth (#VBW) of 50 MHz. The sweep time is 2.000 ms. The trace shows a flat baseline with two sharp, narrow pulses. The first pulse is marked with a '1' and the second with a '2'. The pulse width is indicated as 0.14 dB. The bottom screenshot shows a pulse count measurement. The display is set to the same center frequency, but with a resolution bandwidth (Res BW) of 300 kHz. The sweep time is 3.160 s. The trace shows a continuous stream of narrow pulses. The pulse count is indicated as 1.635 ms.

DH5

DH5

Pulse Width

Ref Offset 6.3 dB
Ref 20.00 dBm

10 dB/div
Log

Center 2.441000000 GHz
Res BW 8 MHz

#VBW 50 MHz

Sweep 3.500 ms (40001 pts)

Span 0 Hz

Trig Delay-200.0 μ s
Trig: RF Burst
Atten: 24 dB

#Avg Type: RMS

05:26:37 PM Aug 11, 2015

Trig: Free Run
Atten: 24 dB

Ref Offset 6.3 dB
Ref 20.00 dBm

10 dB/div
Log

Center 2.441000000 GHz
Res BW 300 kHz

#VBW 50 MHz

Sweep 3.160 s (40001 pts)

Span 0 Hz

Trig: Free Run
Atten: 24 dB

#Avg Type: RMS

05:28:22 PM Aug 11, 2015

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	11.065	21	-9.935
Middle	2441	10.732	21	-10.268
High	2480	9.153	21	-11.847
Worst		11.065	21	-9.935

8.5.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	10.977	21	-10.023
Middle	2441	10.624	21	-10.376
High	2480	9.018	21	-11.982
Worst		10.977	21	-10.023

8.5.3. ENHANCED DATA RATE 8PSK MODULATION

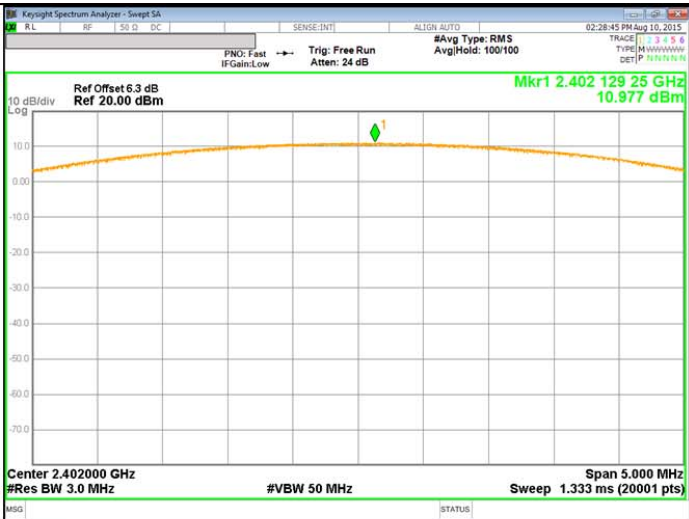
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	11.554	21	-9.446
Middle	2441	11.206	21	-9.794
High	2480	9.620	21	-11.380
Worst		11.554	21	-9.446

8.5.4. OUTPUT POWER PLOTS

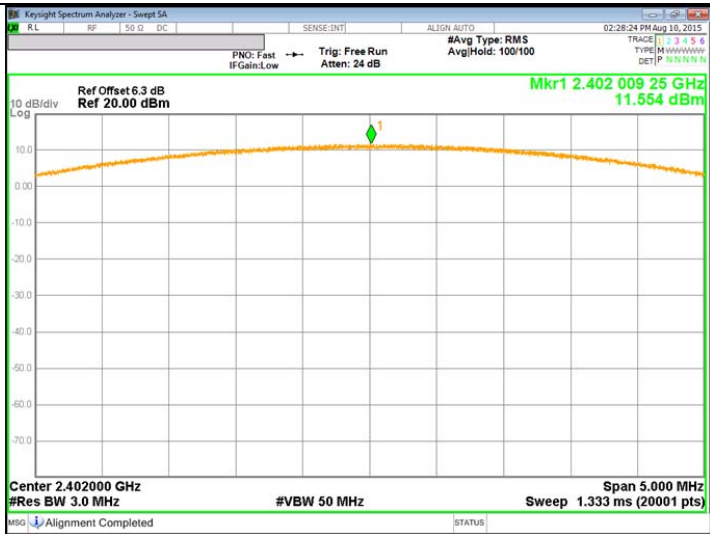
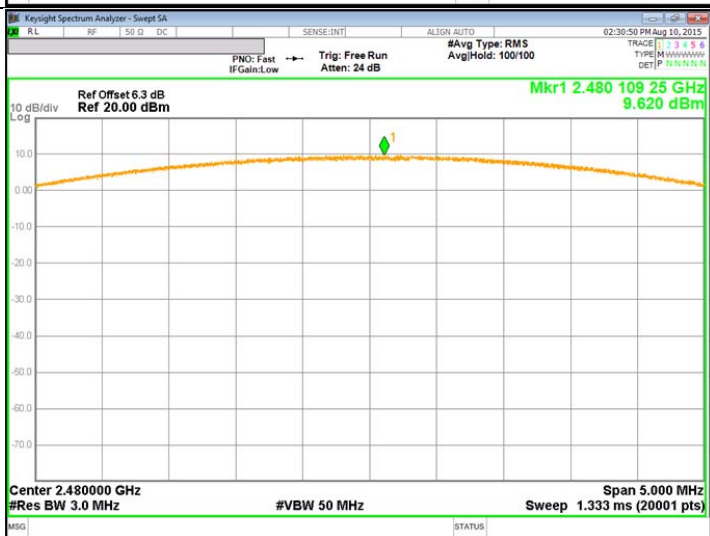
GFSK OUTPUT POWER

GFSK Low CH	 Key: Keysight Spectrum Analyzer - Sweep SA RL RF 50 Ω DC SENSE:INT1 ALIGN: AUTO 02:29:22 PM Aug 10, 2015 PNO: Fast IF Gain: Low Trig: Free Run #Avg Type: RMS Avg/Hold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.402 031 75 GHz 11.065 dBm 10 dB/div Log Center 2.402000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts)
GFSK Middle CH	 Key: Keysight Spectrum Analyzer - Sweep SA RL RF 50 Ω DC SENSE:INT1 ALIGN: AUTO 02:29:45 PM Aug 10, 2015 PNO: Fast IF Gain: Low Trig: Free Run #Avg Type: RMS Avg/Hold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.440 954 25 GHz 10.732 dBm 10 dB/div Log Center 2.441000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts)
GFSK High CH	 Key: Keysight Spectrum Analyzer - Sweep SA RL RF 50 Ω DC SENSE:INT1 ALIGN: AUTO 02:31:27 PM Aug 10, 2015 PNO: Fast IF Gain: Low Trig: Free Run #Avg Type: RMS Avg/Hold: 100/100 Ref Offset 6.3 dB Ref 20.00 dBm Mkr1 2.480 049 00 GHz 9.153 dBm 10 dB/div Log Center 2.480000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 5.000 MHz Sweep 1.333 ms (20001 pts)

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	10.75	11.89
Middle	2441	10.40	10.95
High	2480	8.82	7.62

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	8.59	7.23
Middle	2441	8.25	6.68
High	2480	6.66	4.63

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	7.35	5.43
Middle	2441	6.80	4.79
High	2480	4.72	2.96

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.

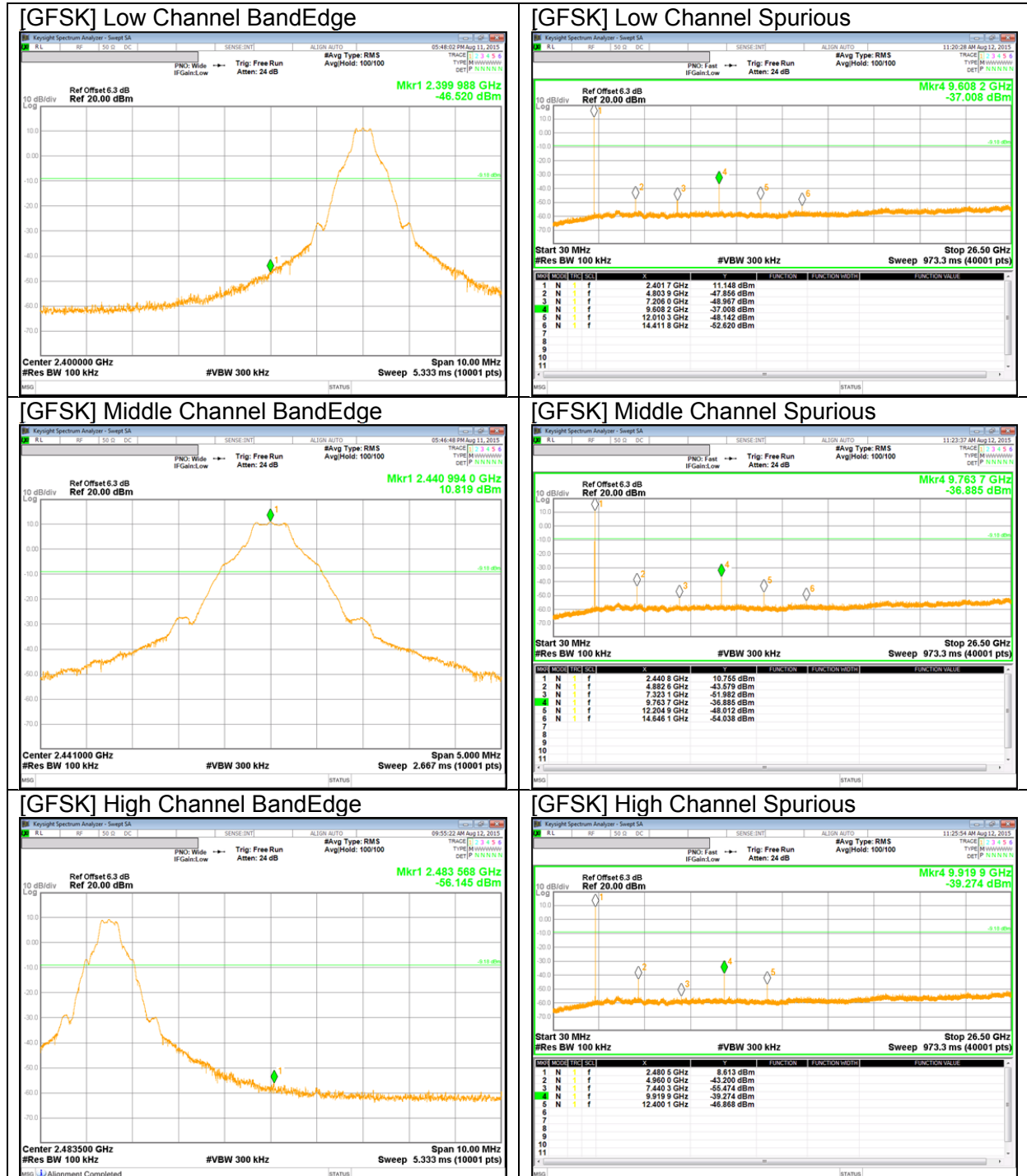
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

RESULTS

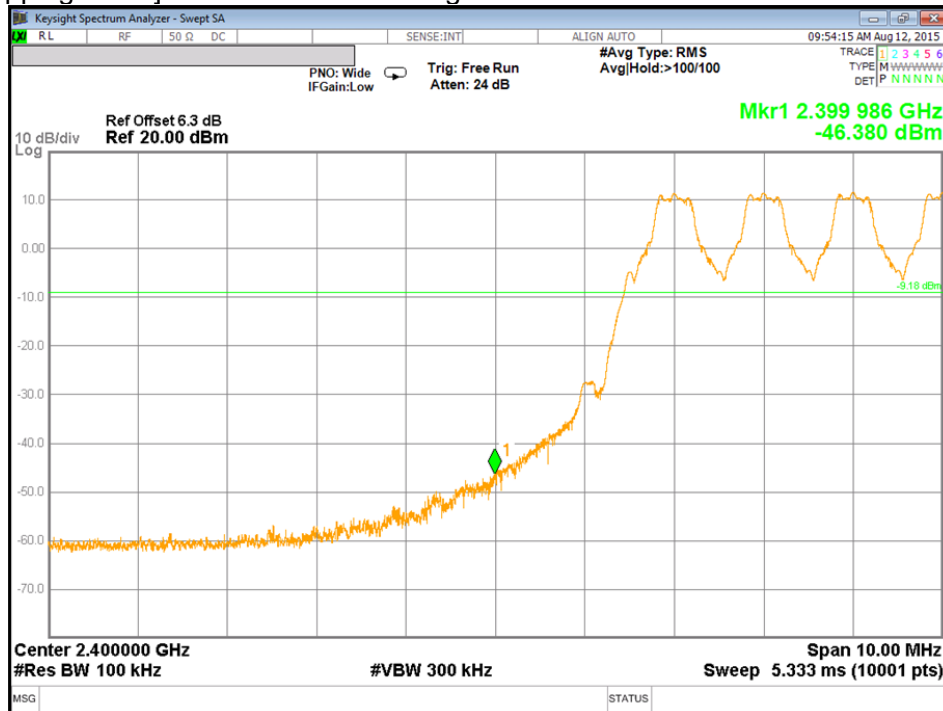
8.7.1. BASIC DATA RATE GFSK MODULATION

GFSK Mode

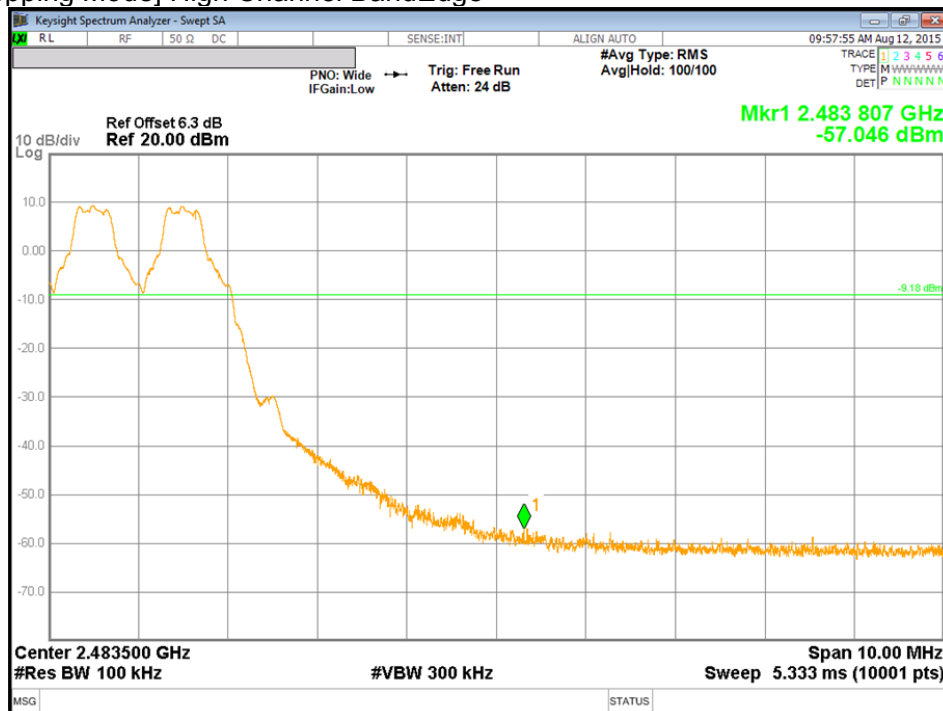


BandEdge Emission at GFSK Hopping Mode

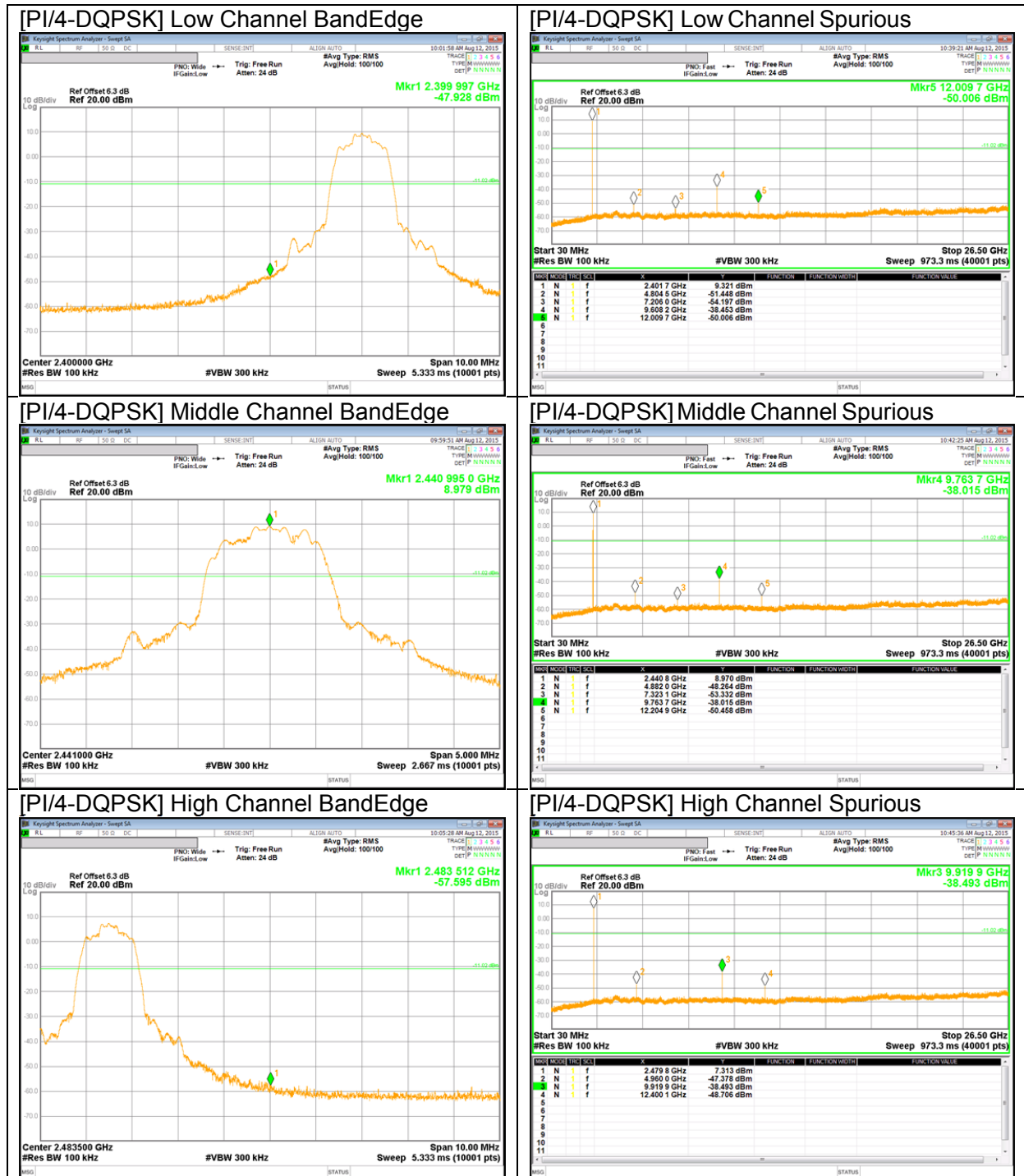
[GFSK Hopping Mode] Low Channel BandEdge



[GFSK Hopping Mode] High Channel BandEdge

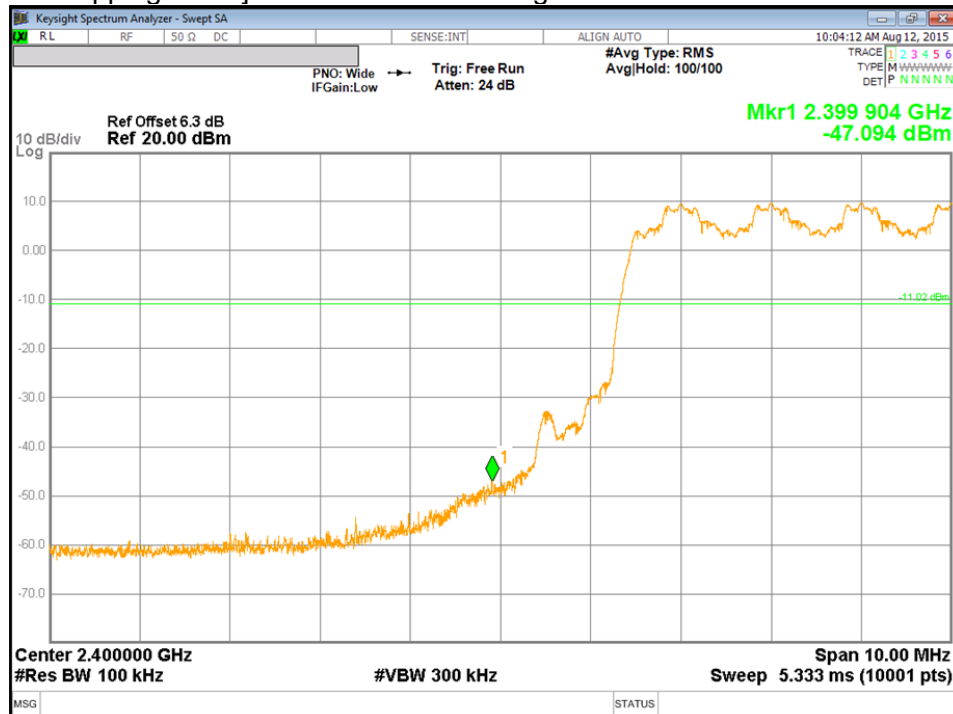


PI/4-DQPSK Mode

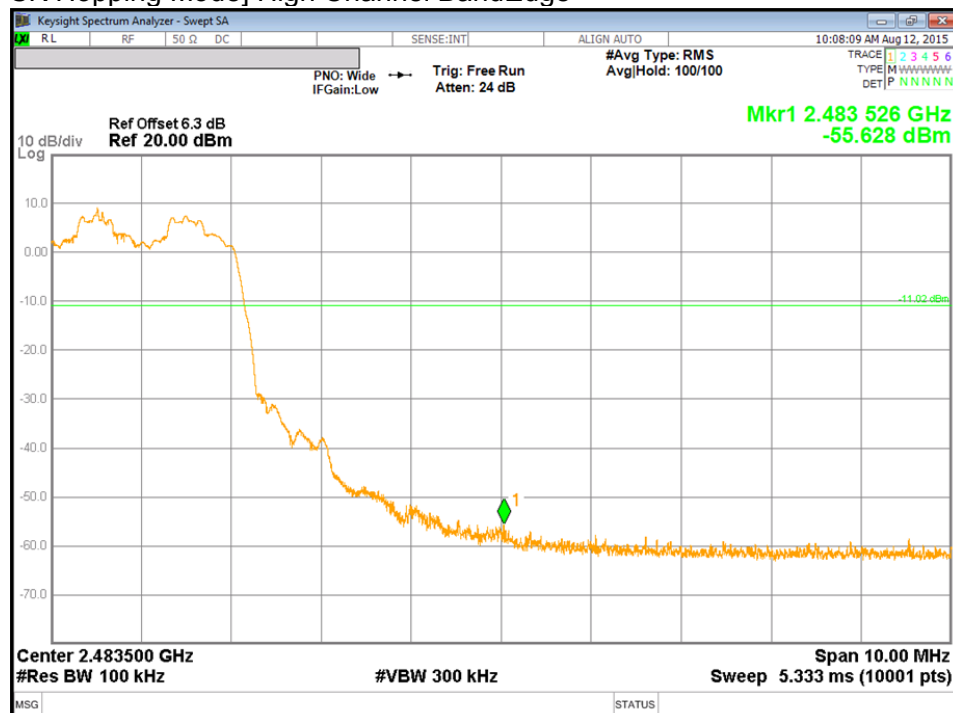


BandEdge Emission at PI/4-DQPSK Hopping Mode

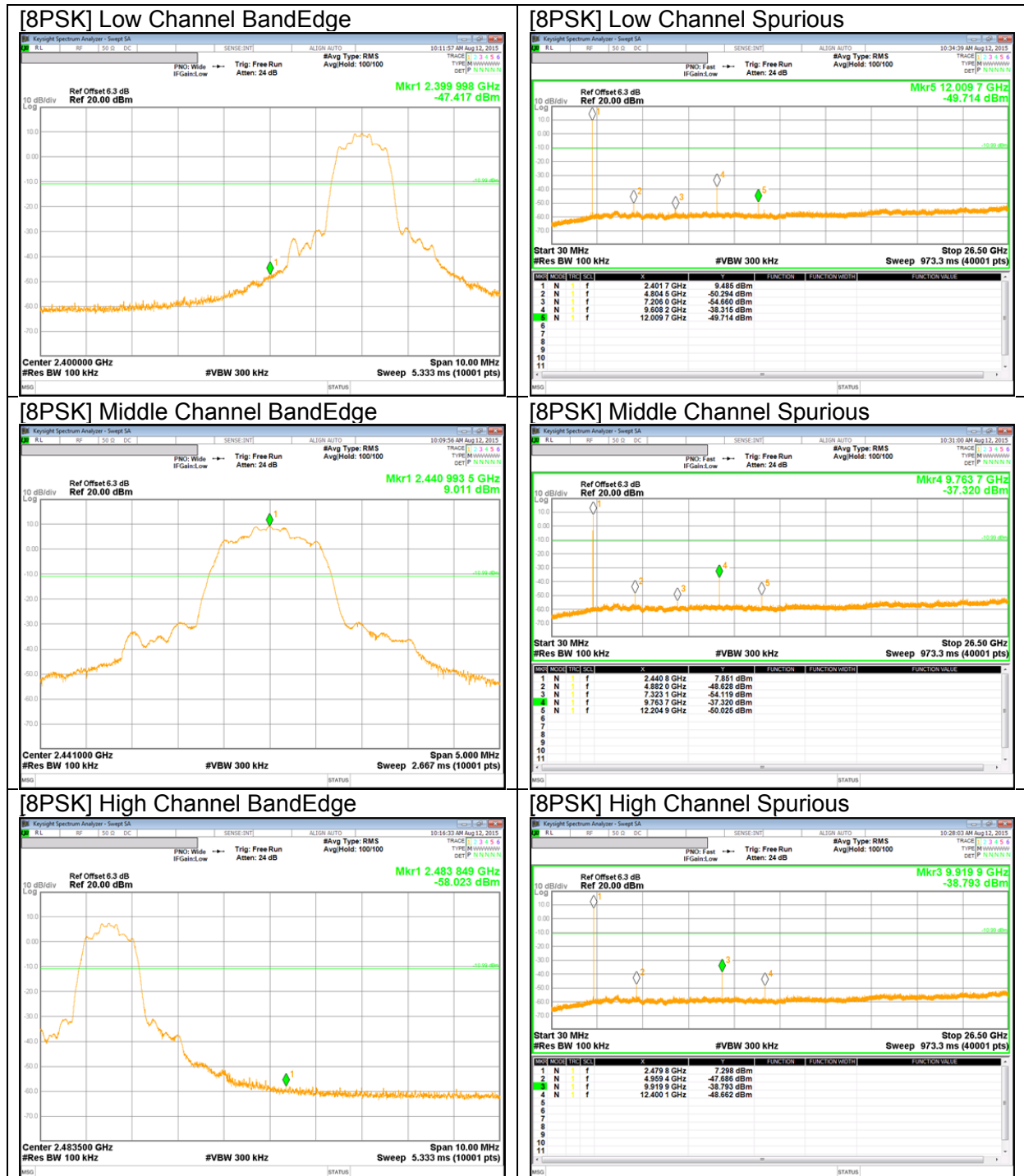
[PI/4-DQPSK Hopping Mode] Low Channel BandEdge



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

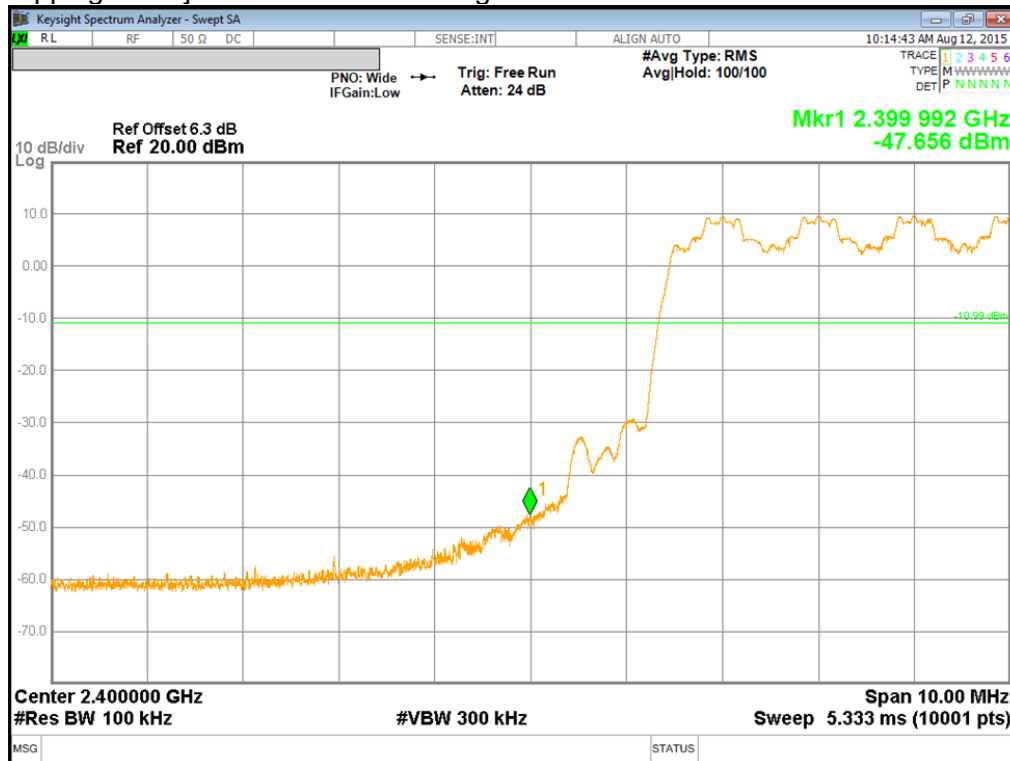


8PSK Mode

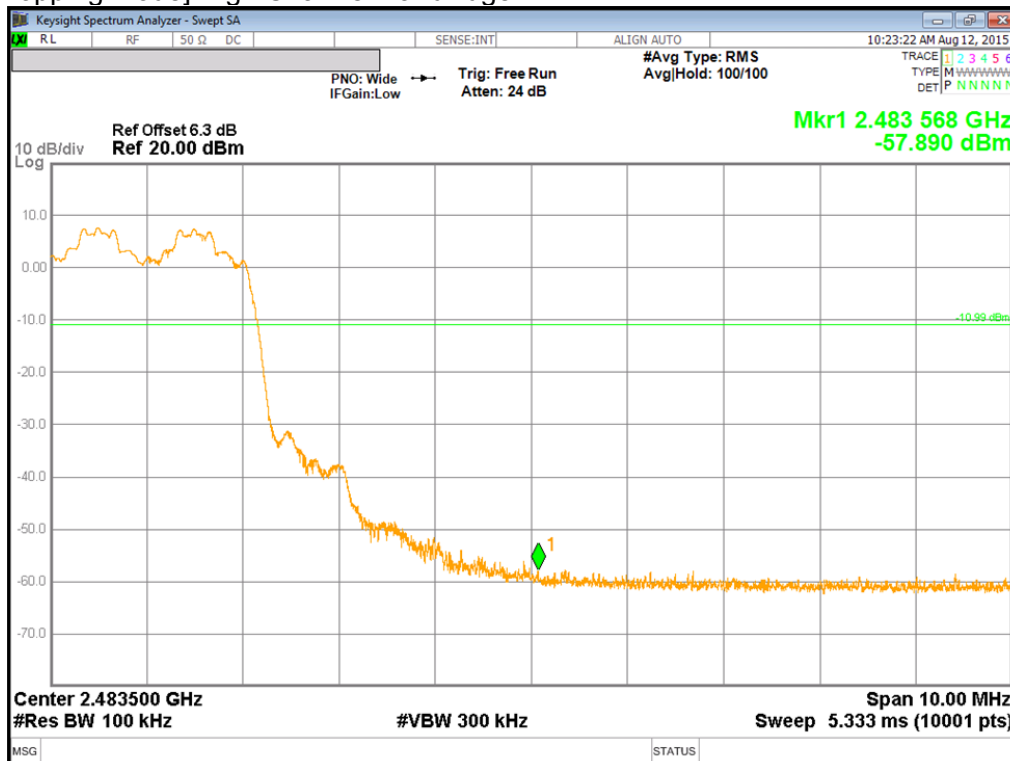


BandEdge Emission at 8PSK Hopping Mode

[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

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.

$GFSK = 1/T = 1 / 0.0029S = 350Hz$.

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.

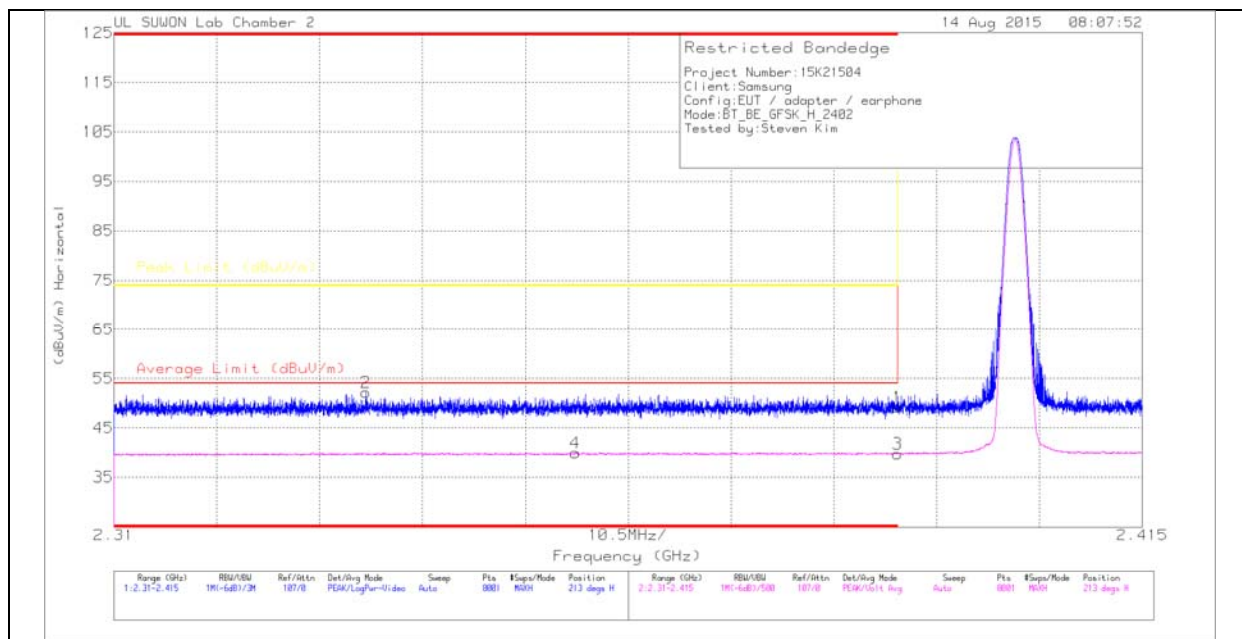
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

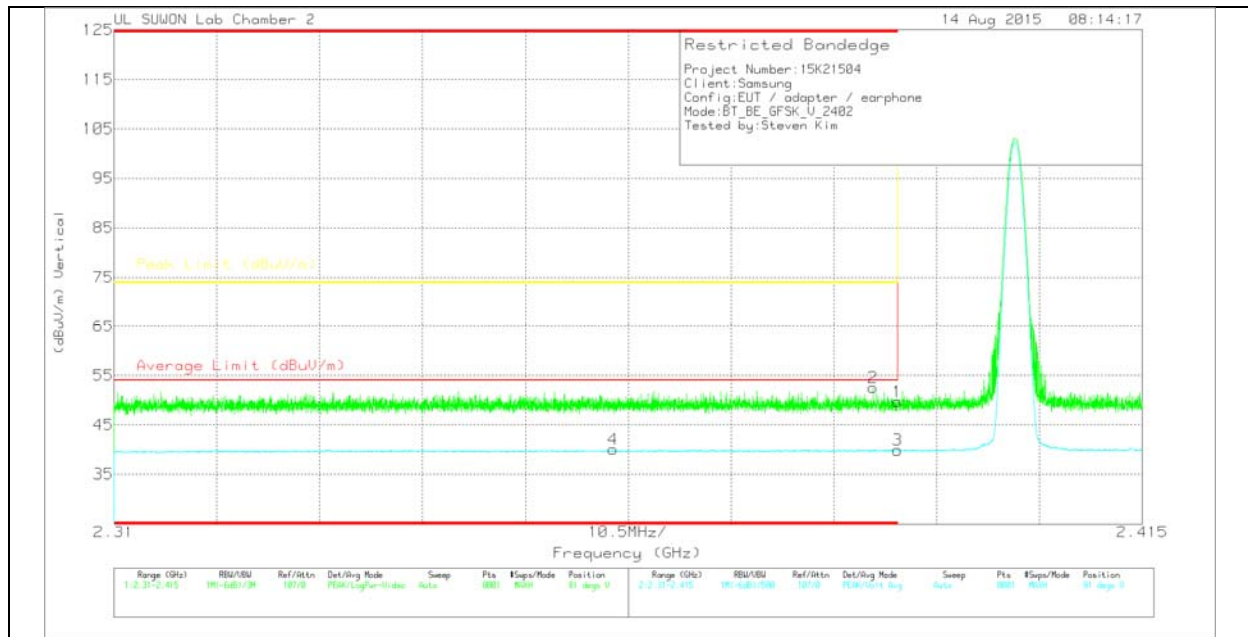
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8724)_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	37.04	Pk		-19.5	49.24	-	-	74	-24.76	213	138	H
2	* 2.336	40.14	Pk		-19.6	52.14	-	-	74	-21.86	213	138	H
3	* 2.39	27.55	V1TV		-19.5	39.75	54	-14.25	-	-	213	138	H
4	* 2.357	27.89	V1TV		-19.6	39.99	54	-14.01	-	-	213	138	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

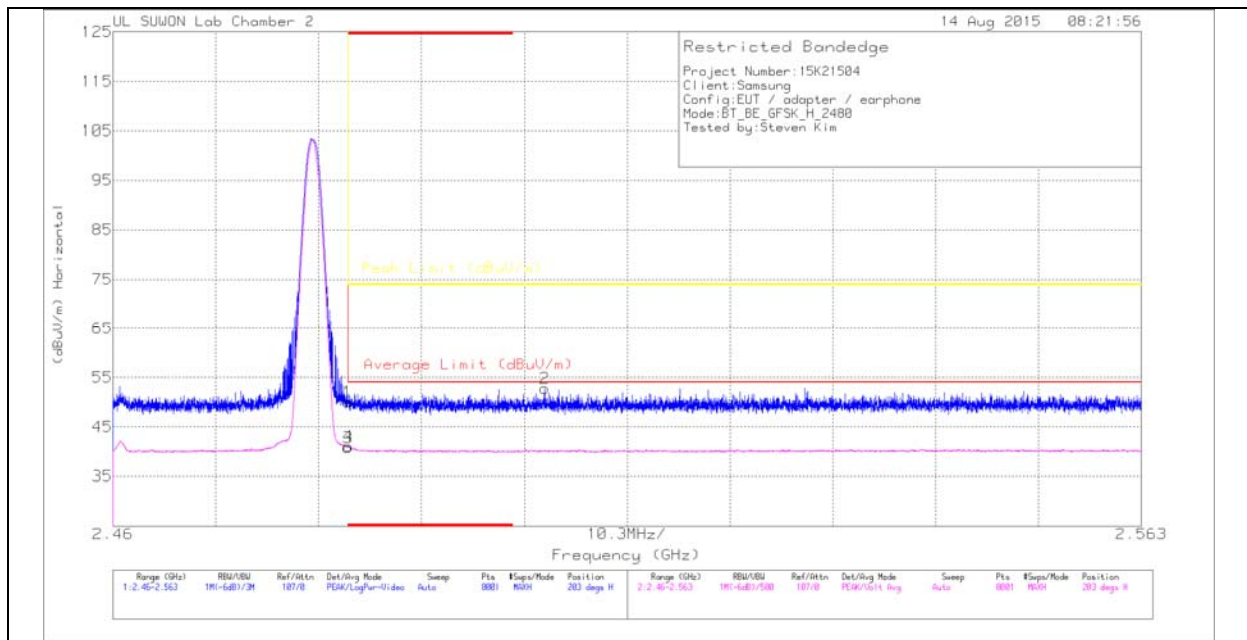
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8724)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	37.55	Pk	31.7	-19.5	49.75	-	-	74	-24.25	81	166	V
2	* 2.388	40.4	Pk	31.7	-19.5	52.6	-	-	74	-21.4	81	166	V
3	* 2.39	27.68	V1TV	31.7	-19.5	39.88	54	-14.12	-	-	81	166	V
4	* 2.361	27.93	V1TV	31.7	-19.6	40.03	54	-13.97	-	-	81	166	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

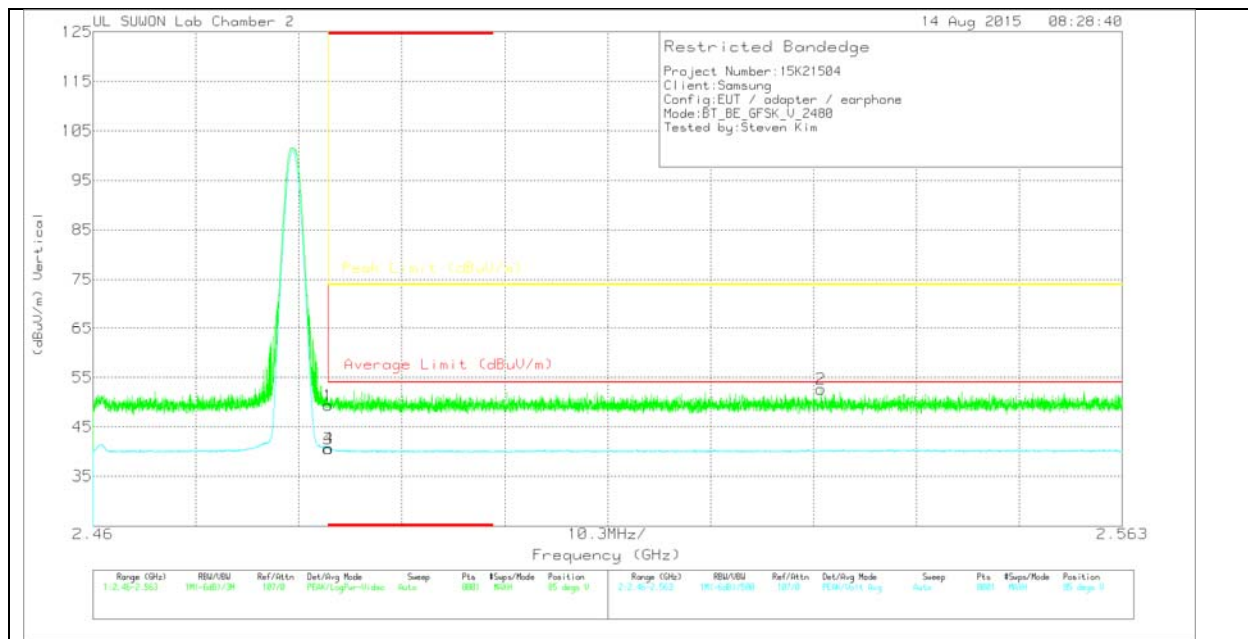
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8724)_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	37.73	Pk	31.8	-19.4	50.13	-	-	74	-23.87	203	342	H
2	2.503	40.24	Pk	31.9	-19.3	52.84	-	-	74	-21.16	203	342	H
3	* 2.484	28.41	V1TV	31.8	-19.4	40.81	54	-13.19	-	-	203	342	H
4	* 2.484	28.6	V1TV	31.8	-19.4	41	54	-13	-	-	203	342	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

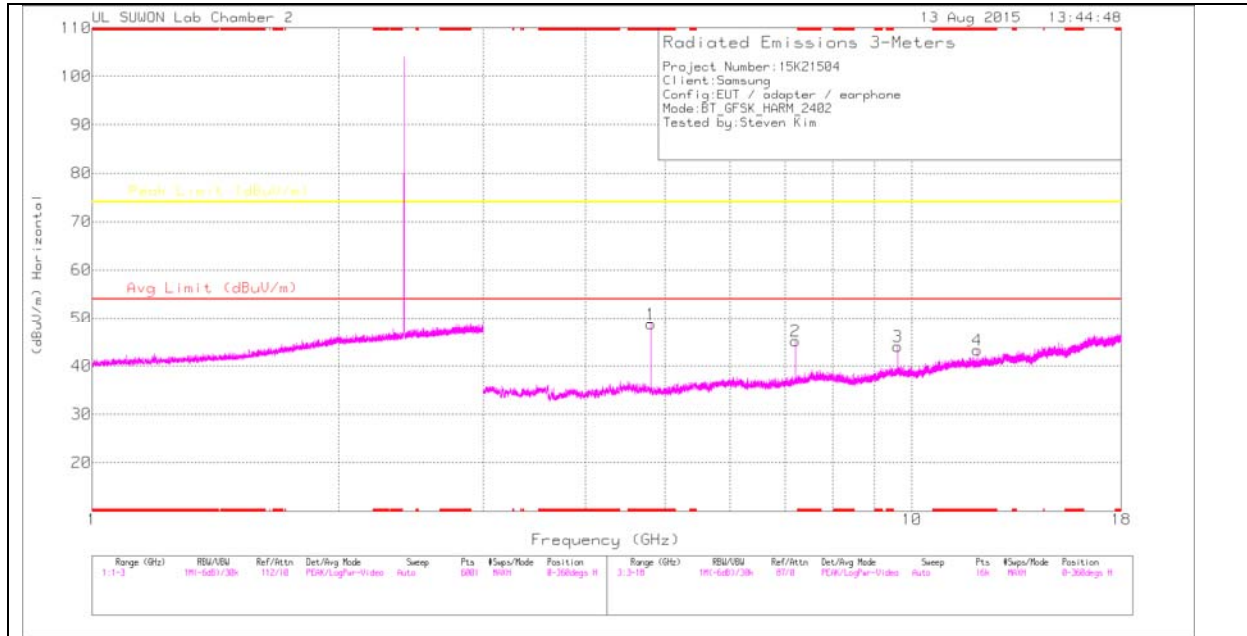
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8724)_150 619	Path_2_10 dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	36.97	Pk		-19.4	49.37	-	-	74	-24.63	85	170	V
2	2.533	40.02	Pk		-19.3	52.62	-	-	74	-21.38	85	170	V
3	* 2.484	28.16	V1TV		-19.4	40.56	54	-13.44	-	-	85	170	V
4	* 2.484	28.22	V1TV		-19.4	40.62	54	-13.38	-	-	85	170	V

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

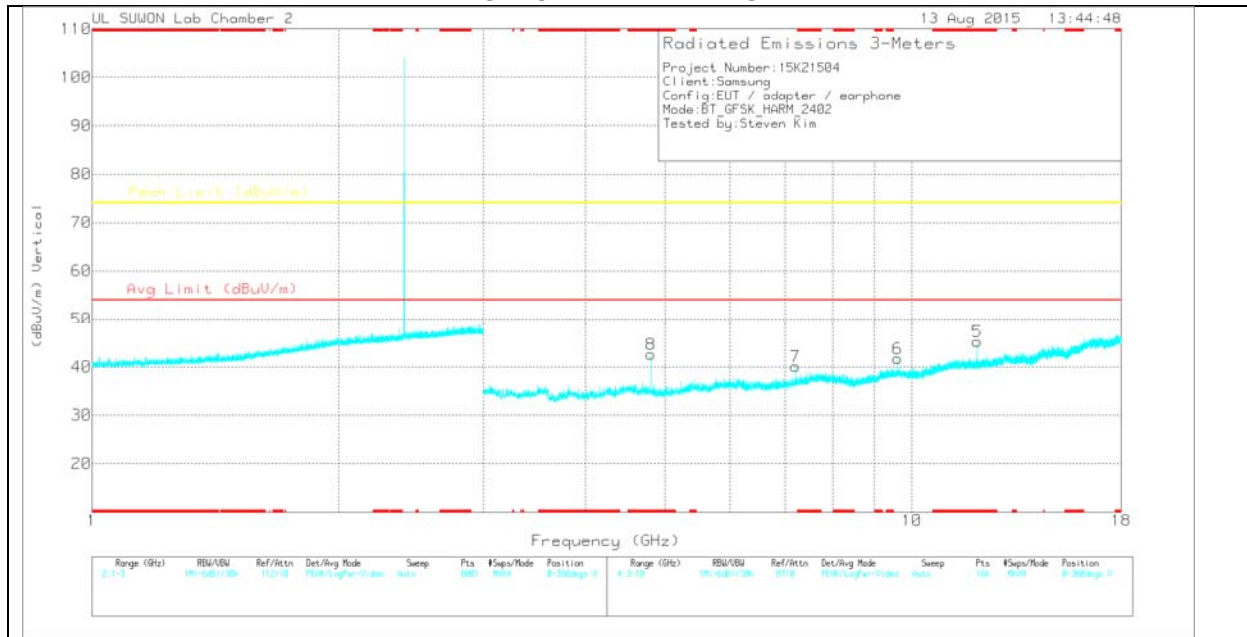
Pk - Peak detector

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(00168 724)_15061 9	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.804	40.17	PK	33.9	-25.3	48.77	-	-	74	-25.23	0-360	200	H
2	7.206	32.38	PK	35.8	-23	45.18	-	-	74	-28.82	0-360	200	H
3	9.608	26.26	PK	36.9	-19.1	44.06	-	-	74	-29.94	0-360	200	H
4	* 12.01	22.1	PK	38.7	-17.5	43.3	-	-	74	-30.7	0-360	200	H
5	* 12.011	24.07	PK	38.7	-17.5	45.27	-	-	74	-28.73	0-360	200	V
6	9.608	24.01	PK	36.9	-19.1	41.81	-	-	74	-32.19	0-360	200	V
7	7.205	27.26	PK	35.8	-22.9	40.16	-	-	74	-33.84	0-360	200	V
8	* 4.804	34.02	PK	33.9	-25.3	42.62	-	-	74	-31.38	0-360	200	V

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

PK – Peak detector

Radiated Emissions

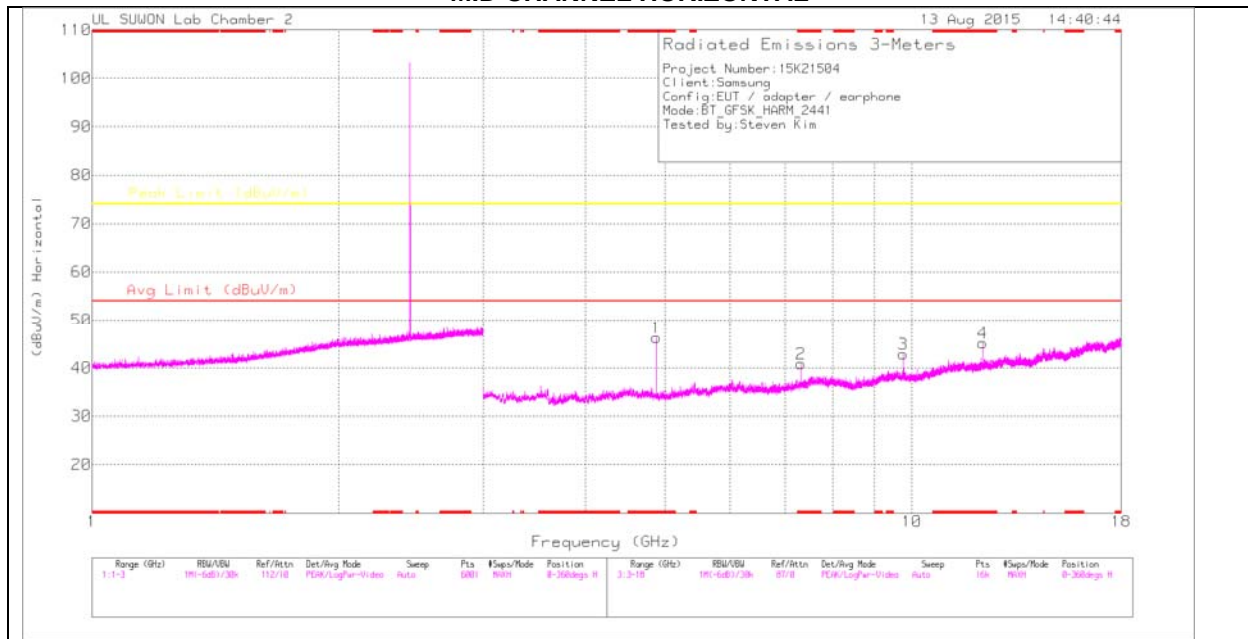
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 724)_15061 9	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	45.55	PK2	33.9	-25.3	54.15	-	-	74	-19.85	209	219	H
* 4.804	39.31	VA1T	33.9	-25.3	47.91	54	-6.09	-	-	209	219	H
* 4.804	40.63	PK2	33.9	-25.3	49.23	-	-	74	-24.77	207	346	V
* 4.804	31.38	VA1T	33.9	-25.3	39.98	54	-14.02	-	-	207	346	V
7.206	39.6	PK2	35.8	-22.9	52.5	-	-	74	-21.5	229	328	H
7.206	31.24	VA1T	35.8	-22.9	44.14	-	-	-	-	229	328	H
7.206	36.48	PK2	35.8	-22.9	49.38	-	-	74	-24.62	69	146	V
7.206	23.93	VA1T	35.8	-22.9	36.83	-	-	-	-	69	146	V
9.609	31.5	PK2	36.9	-19.1	49.3	-	-	74	-24.7	134	305	H
9.608	17.53	VA1T	36.9	-19.1	35.33	-	-	-	-	134	305	H
9.603	31.77	PK2	36.9	-19.1	49.57	-	-	74	-24.43	323	319	V
9.608	17.47	VA1T	36.9	-19.1	35.27	-	-	-	-	323	319	V
* 12.01	30.34	PK2	38.7	-17.5	51.54	-	-	74	-22.46	266	154	H
* 12.01	19.05	VA1T	38.7	-17.5	40.25	54	-13.75	-	-	266	154	H
* 12.01	31.81	PK2	38.7	-17.5	53.01	-	-	74	-20.99	156	268	V
* 12.01	21.57	VA1T	38.7	-17.5	42.77	54	-11.23	-	-	156	268	V

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

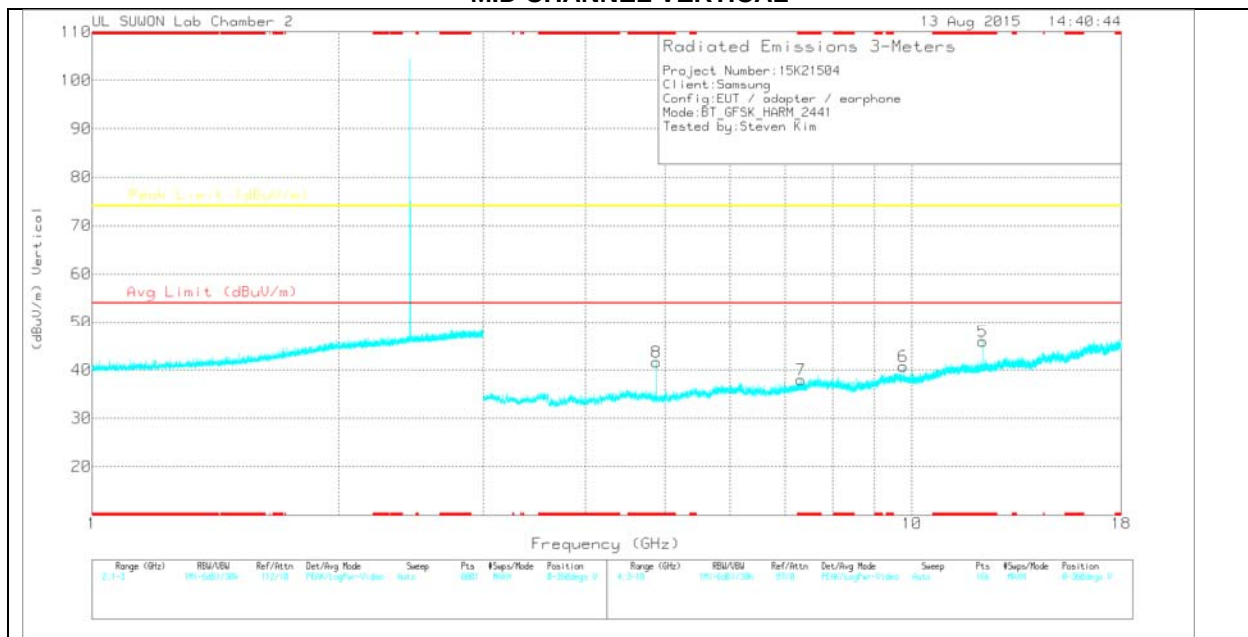
PK2 - Maximum Peak

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

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(00168 724)_15061 9	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	37.63	PK	33.9	-25.2	46.33	-	-	74	-27.67	0-360	100	H
2	* 7.323	27.52	PK	35.9	-22.5	40.92	-	-	74	-33.08	0-360	100	H
3	9.764	25.25	PK	37	-19.3	42.95	-	-	74	-31.05	0-360	200	H
4	* 12.205	23.6	PK	38.8	-17.2	45.2	-	-	74	-28.8	0-360	200	H
5	* 12.205	24.34	PK	38.8	-17.2	45.94	-	-	74	-28.06	0-360	200	V
6	9.764	23.02	PK	37	-19.3	40.72	-	-	74	-33.28	0-360	200	V
7	* 7.323	24.6	PK	35.9	-22.5	38	-	-	74	-36	0-360	100	V
8	* 4.881	32.88	PK	33.9	-25.2	41.58	-	-	74	-32.42	0-360	200	V

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

PK – Peak detector

Radiated Emissions

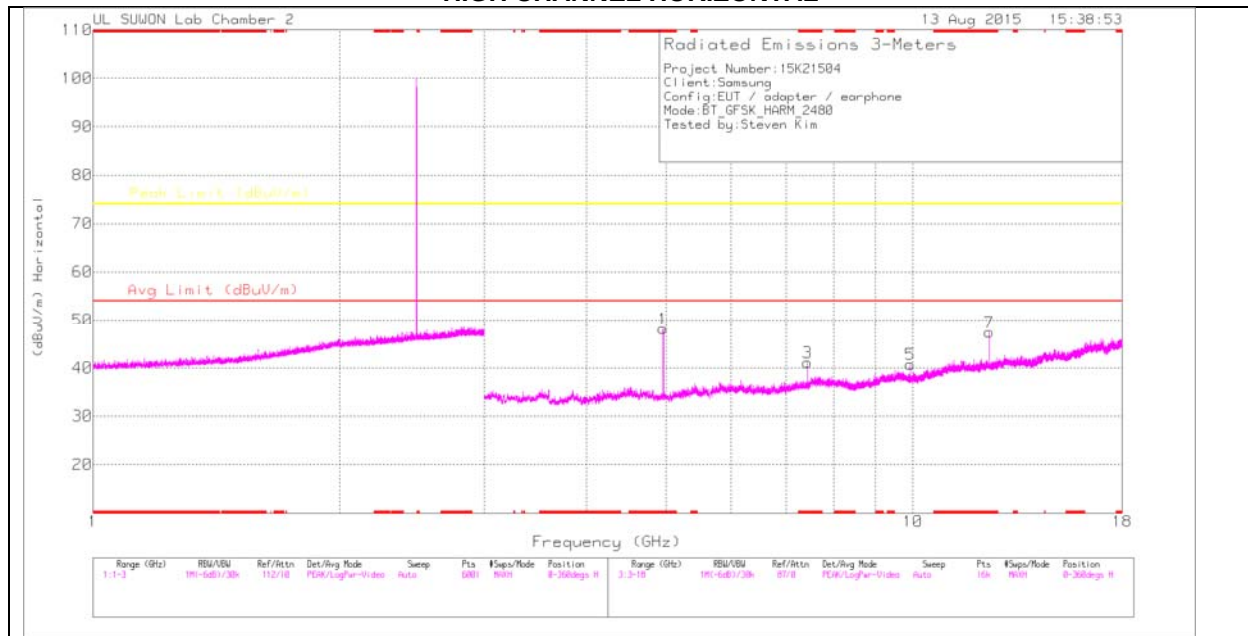
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 724)_15061 9	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.882	44.14	PK2	33.9	-25.2	52.84	-	-	74	-21.16	204	262	H
* 4.882	38.67	VA1T	33.9	-25.2	47.37	54	-6.63	-	-	204	262	H
* 4.882	39.43	PK2	33.9	-25.2	48.13	-	-	74	-25.87	190	270	V
* 4.882	31.79	VA1T	33.9	-25.2	40.49	54	-13.51	-	-	190	270	V
* 7.323	38.1	PK2	35.9	-22.5	51.5	-	-	74	-22.5	94	135	H
* 7.323	28.28	VA1T	35.9	-22.5	41.68	54	-12.32	-	-	94	135	H
* 7.323	37.38	PK2	35.9	-22.5	50.78	-	-	74	-23.22	207	266	V
* 7.323	26.33	VA1T	35.9	-22.5	39.73	54	-14.27	-	-	207	266	V
9.764	33.2	PK2	37	-19.3	50.9	-	-	74	-23.1	159	221	H
9.764	22.5	VA1T	37	-19.3	40.2	-	-	-	-	159	221	H
9.761	31.44	PK2	37	-19.3	49.14	-	-	74	-24.86	219	395	V
9.764	17.45	VA1T	37	-19.3	35.15	-	-	-	-	219	395	V
* 12.205	29.87	PK2	38.8	-17.2	51.47	-	-	74	-22.53	260	103	H
* 12.205	17.78	VA1T	38.8	-17.2	39.38	54	-14.62	-	-	260	103	H
* 12.203	30	PK2	38.8	-17.2	51.6	-	-	74	-22.4	14	359	V
* 12.212	15.36	VA1T	38.8	-17.1	37.06	54	-16.94	-	-	14	359	V

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

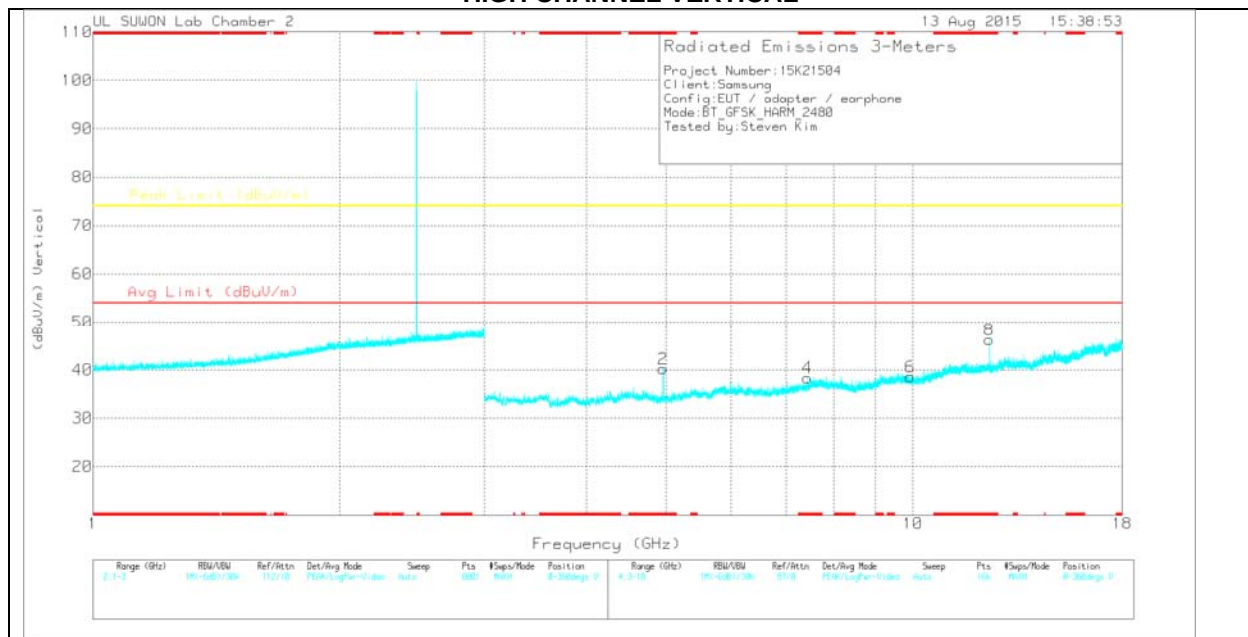
PK2 - Maximum Peak

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

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(00168 724)_15061 9	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.959	39.35	PK	33.9	-25	48.25	-	-	74	-25.75	0-360	200	H
3	* 7.44	27.28	PK	36	-22.1	41.18	-	-	74	-32.82	0-360	200	H
5	9.92	22.7	PK	37.1	-19	40.8	-	-	74	-33.2	0-360	200	H
7	* 12.4	25.93	PK	38.8	-17.3	47.43	-	-	74	-26.57	0-360	200	H
2	* 4.959	31.35	PK	33.9	-25	40.25	-	-	74	-33.75	0-360	100	V
4	* 7.441	24.5	PK	36	-22.1	38.4	-	-	74	-35.6	0-360	100	V
6	9.92	20.5	PK	37.1	-19	38.6	-	-	74	-35.4	0-360	200	V
8	* 12.4	24.82	PK	38.8	-17.3	46.32	-	-	74	-27.68	0-360	200	V

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

PK – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 724)_15061 9	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	41.78	PK2	33.9	-25	50.68	-	-	74	-23.32	215	251	H
* 4.96	34.94	VA1T	33.9	-25	43.84	54	-10.16	-	-	215	251	H
* 4.96	39.49	PK2	33.9	-25	48.39	-	-	74	-25.61	210	272	V
* 4.96	31.56	VA1T	33.9	-25	40.46	54	-13.54	-	-	210	272	V
* 7.44	37.15	PK2	36	-22.1	51.05	-	-	74	-22.95	95	140	H
* 7.44	26.67	VA1T	36	-22.1	40.57	54	-13.43	-	-	95	140	H
* 7.44	35.57	PK2	36	-22.1	49.47	-	-	74	-24.53	182	140	V
* 7.44	21.92	VA1T	36	-22.1	35.82	54	-18.18	-	-	182	140	V
9.92	33.01	PK2	37.1	-19	51.11	-	-	74	-22.89	157	154	H
9.92	22.73	VA1T	37.1	-19	40.83	-	-	-	-	157	154	H
9.92	32.06	PK2	37.1	-19	50.16	-	-	74	-23.84	140	280	V
9.92	18.48	VA1T	37.1	-19	36.58	-	-	-	-	140	280	V
* 12.4	32.83	PK2	38.8	-17.3	54.33	-	-	74	-19.67	215	122	H
* 12.4	23.85	VA1T	38.8	-17.3	45.35	54	-8.65	-	-	215	122	H
* 12.4	33.84	PK2	38.8	-17.3	55.34	-	-	74	-18.66	203	130	V
* 12.4	25.56	VA1T	38.8	-17.3	47.06	54	-6.94	-	-	203	130	V

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

PK2 - Method: Maximum Peak

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