



FCC CFR47 PART 15 SUBPART C

Bluetooth

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Tablet + BT/BLE and DTS b/g/n

MODEL NUMBER : SM-T285YD

FCC ID: A3LSMT285YD

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA/LTE Tablet + BT/BLE and DTS b/g/n
MODEL NUMBER: SM-T285YD
SERIAL NUMBER: R32H40036RF, R32H40037AW, R32H40036PB(RADIATED);
R32H40035XH (CONDUCTED)
DATE TESTED: APR 25, 2016 - MAY 23, 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
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CY Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Junwhan Lee
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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, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
<input checked="" type="checkbox"/>	Chamber 1
<input type="checkbox"/>	Chamber 2

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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 GSM/WCDMA/LTE Tablet + BT/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	8.47	7.04
		Peak	8.99	7.93
	Enhanced Pi/4-DPSK	Average	7.90	6.16
		Peak	10.36	10.86
	Enhanced 8PSK	Average	7.90	6.17
		Peak	10.74	11.85

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 -1.01 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	ETA0U84IWE	R37H2AD7L11RC3	N/A
Data Cable	SAMSUNG	ECB-DU68WE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

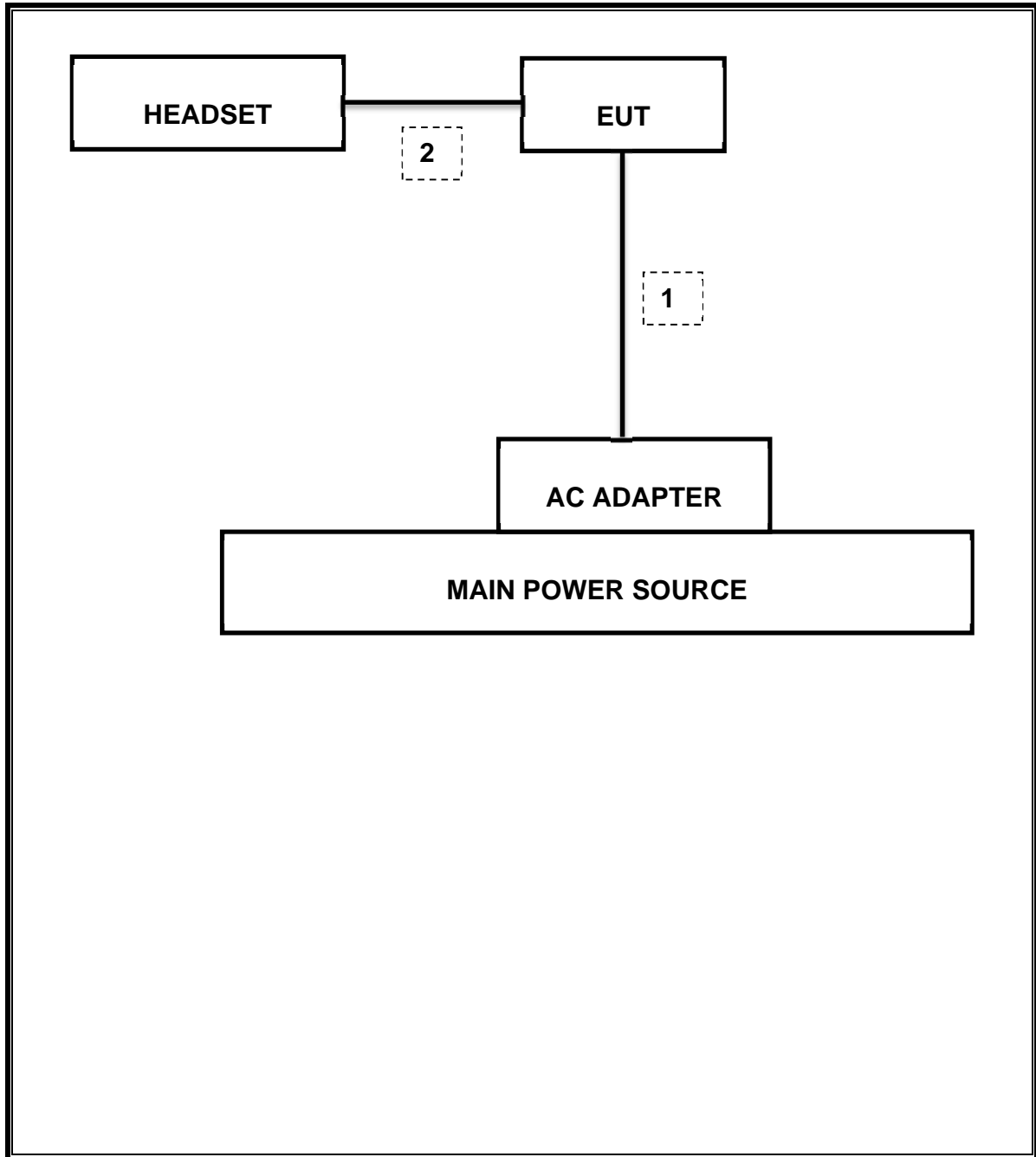
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	0.8m	N/A
1	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	11-17-16
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-25-17
Antenna, Horn, 18 GHz	ETS	3115	00167211	09-20-16
Antenna, Horn, 18 GHz	ETS	3115	00161451	05-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168724	06-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168717	06-17-17
Antenna, Horn, 40 GHz	ETS	3116C	00166155	11-30-17
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	12-15-17
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-18-16
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-18-16
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-18-16
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-18-16
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-19-16
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-19-16
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-18-16
Average Power Sensor	R&S	NRZ-Z91	102681	08-18-16
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-18-16
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-19-16
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-19-16
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-19-16
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Low Pass Filter 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	2152	08-20-16

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	1.191 MHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-38.889 dBm
15.247 (b)(1)	TX conducted output power	<21dBm		Pass	10.739 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	0.3498 sec
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	37.5 dBuV (QP)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	53.93 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	894.700	826.770
Mid	2441	867.800	826.590
High	2480	834.600	825.690
Worst		894.700	826.770

8.1.2. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

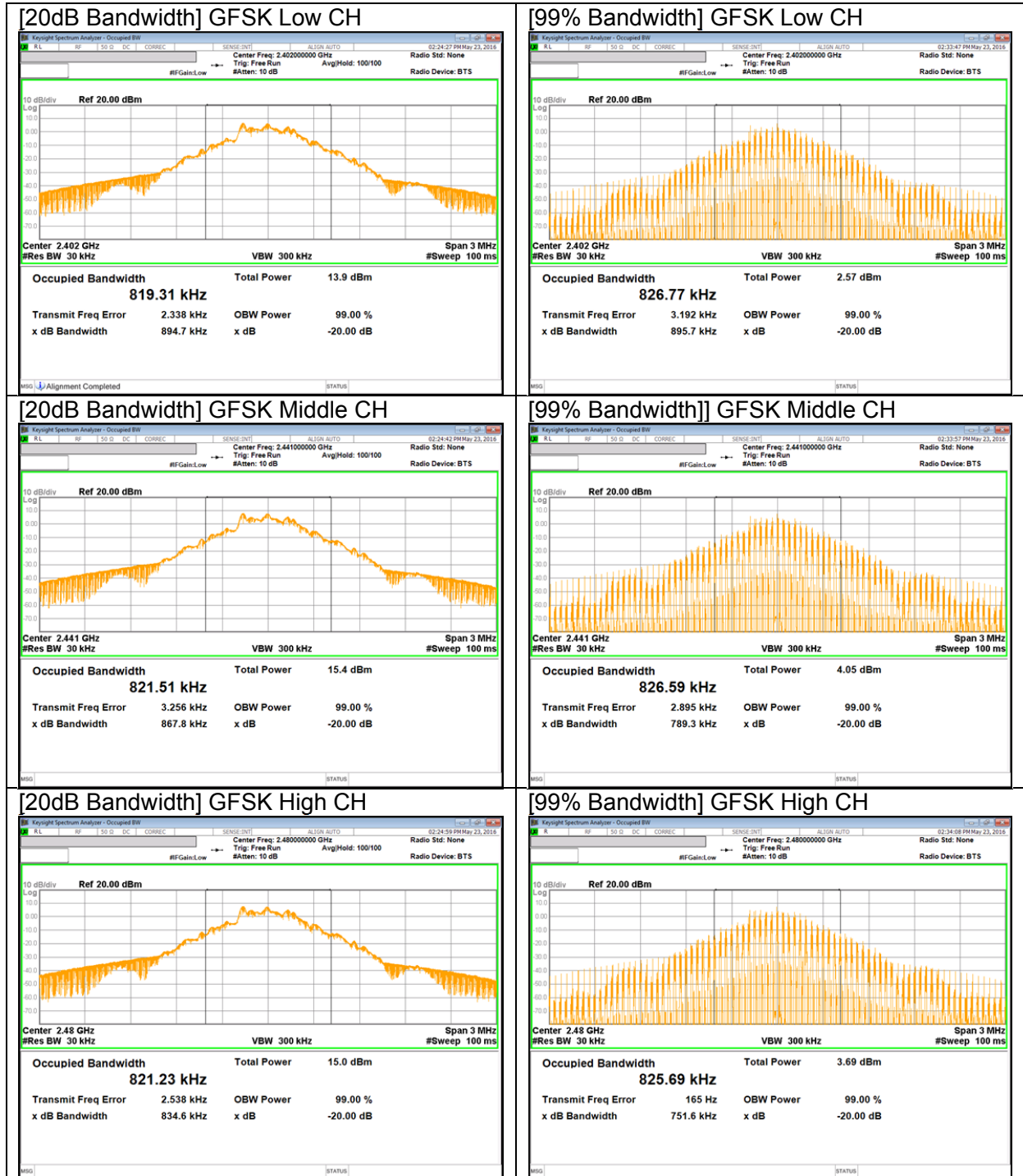
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.252	1.163
Mid	2441	1.255	1.131
High	2480	1.254	1.163
Worst		1.255	1.163

8.1.3. ENHANCED DATA RATE 8PSK MODULATION

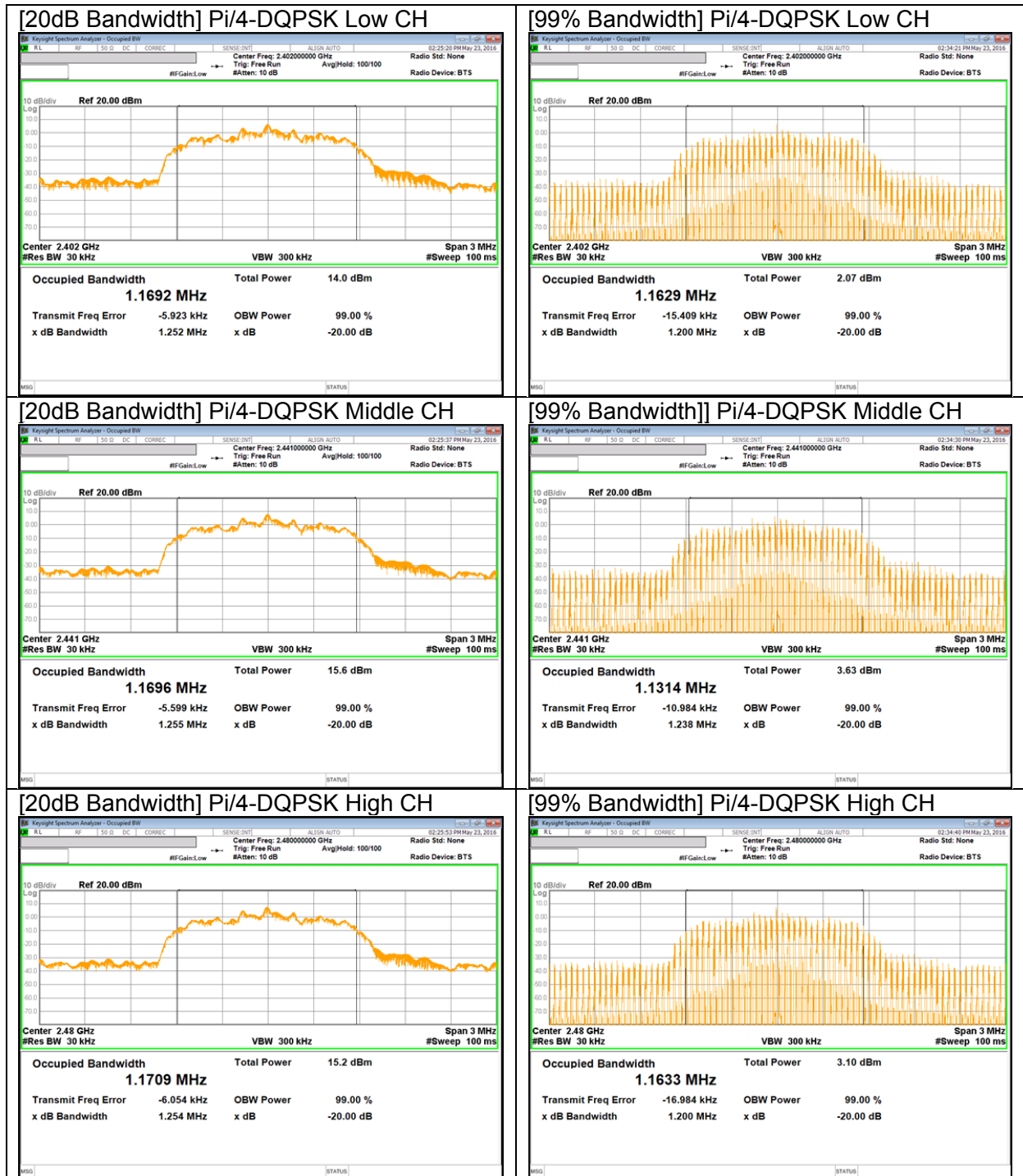
Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99% Bandwidth [MHz]
Low	2402	1.221	1.167
Mid	2441	1.237	1.164
High	2480	1.222	1.191
Worst		1.237	1.191

8.1.4. 20 dB AND 99% BANDWIDTH PLOTS

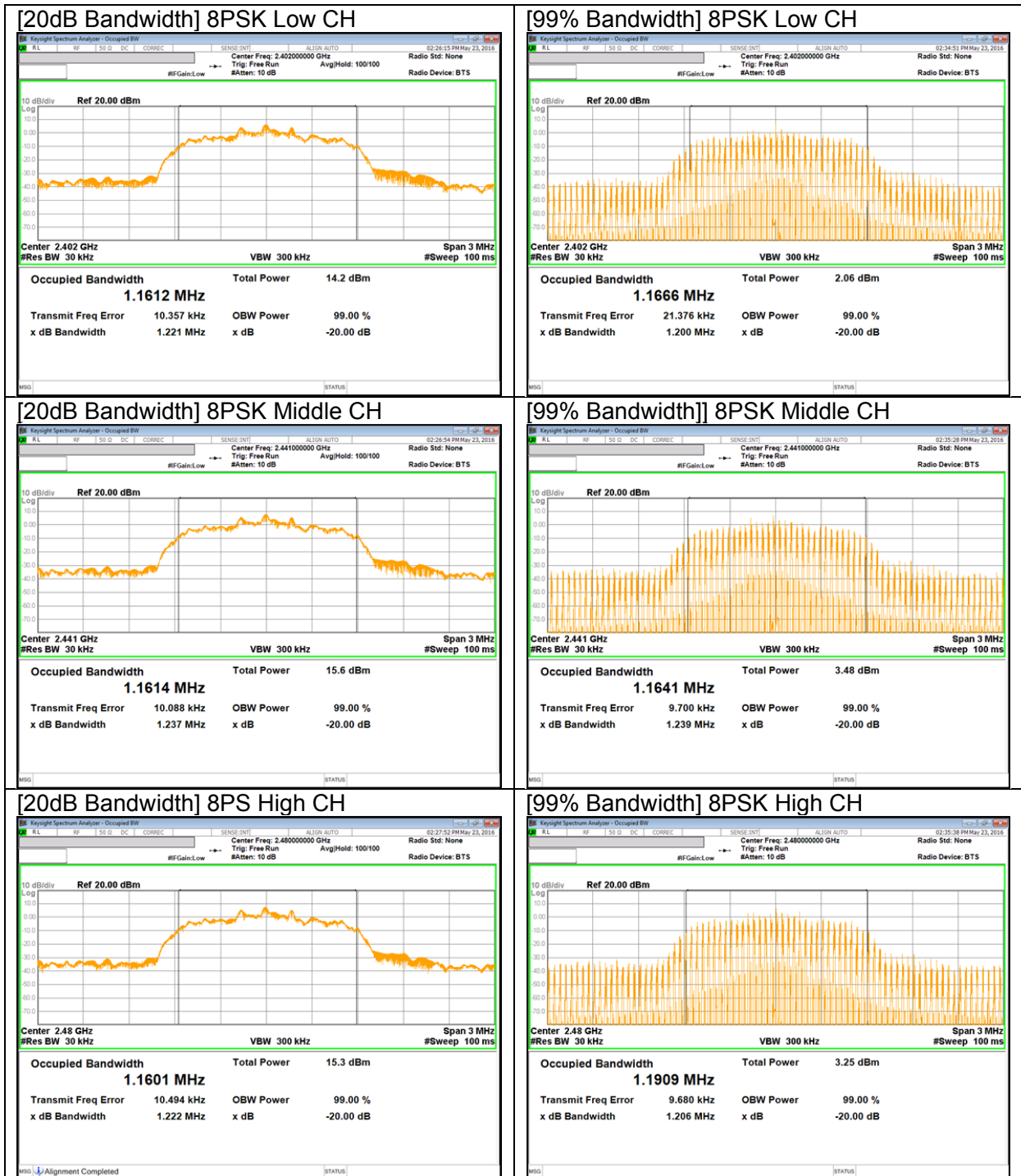
GFSK BANDWIDTH



Pi/4-DQPSK BANDWIDTH



8PSK BANDWIDTH



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

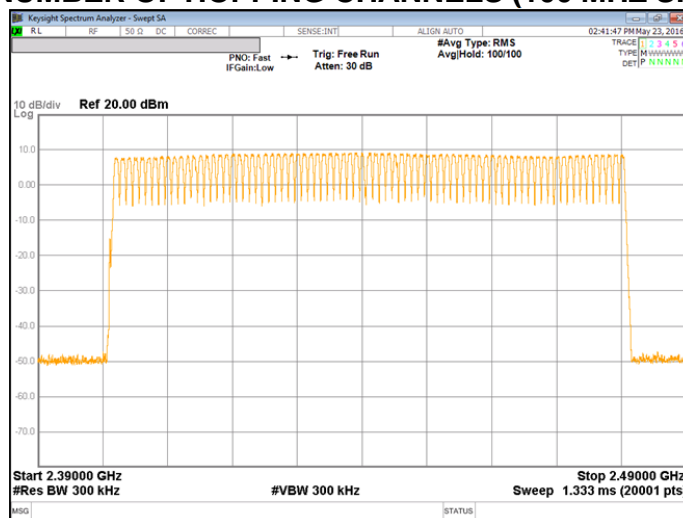
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

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.

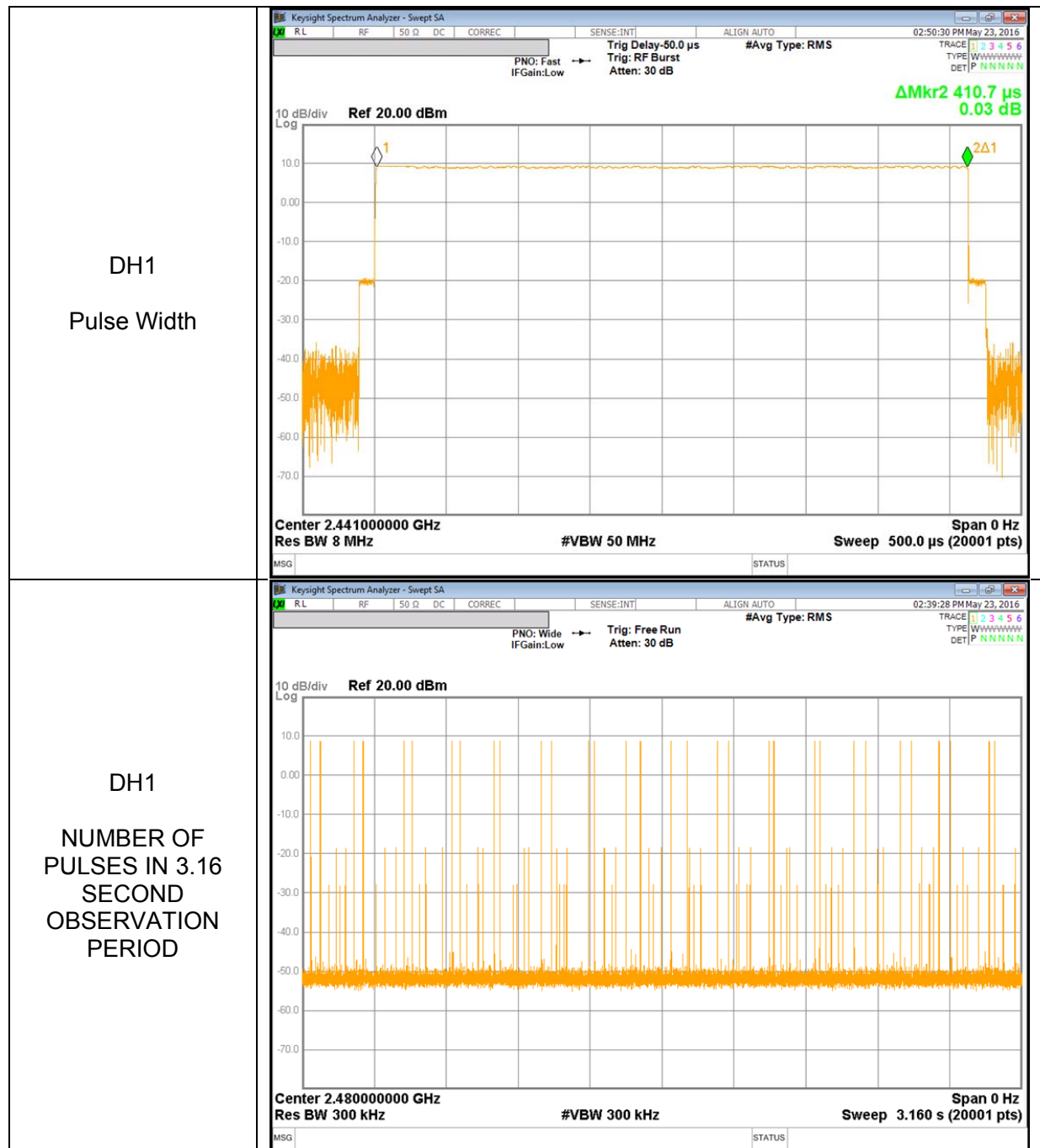
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$.

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

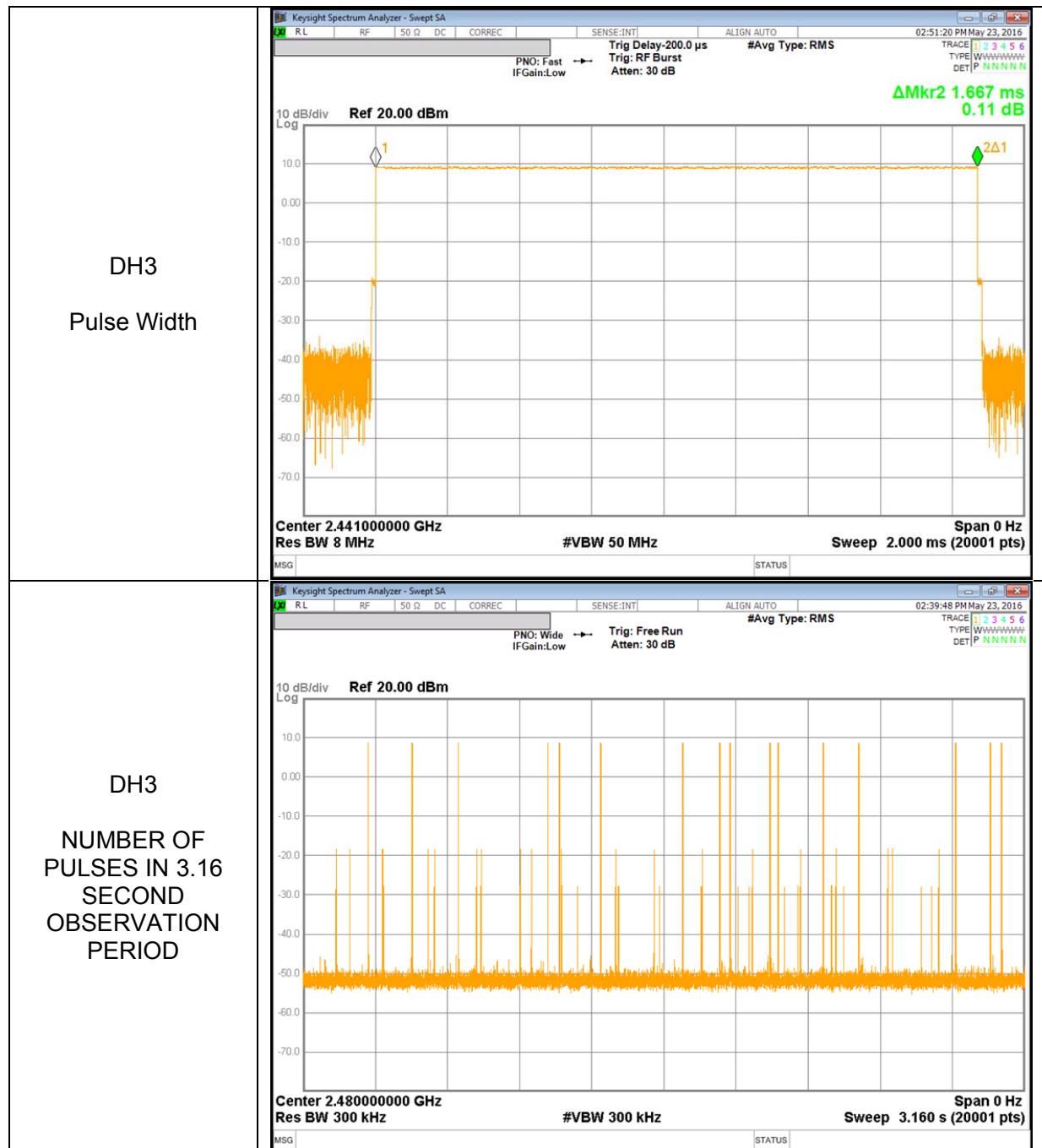
RESULTS

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.411	32	0.131424	0.4	-0.2686
DH3	1.667	16	0.266720	0.4	-0.1333
DH5	2.915	12	0.349800	0.4	-0.0502
GFSK AFH					
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.411	8	0.032856	0.4	-0.36714
DH3	1.667	4	0.066680	0.4	-0.33332
DH5	2.915	3	0.087450	0.4	-0.31255

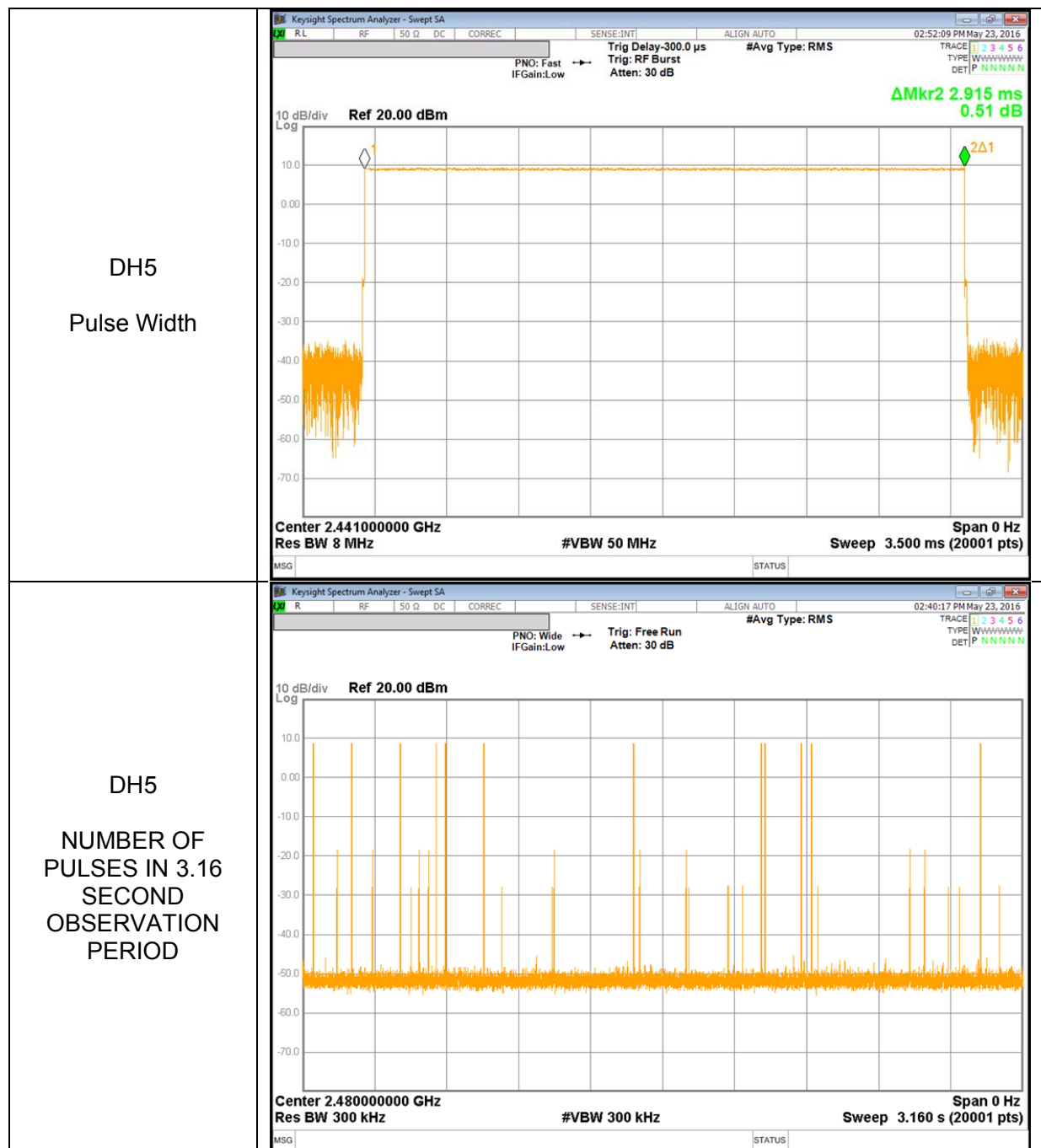
DH1



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	7.670	21	-13.33
Middle	2441	8.990	21	-12.01
High	2480	8.649	21	-12.351
Worst		8.990	21	-12.01

8.5.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

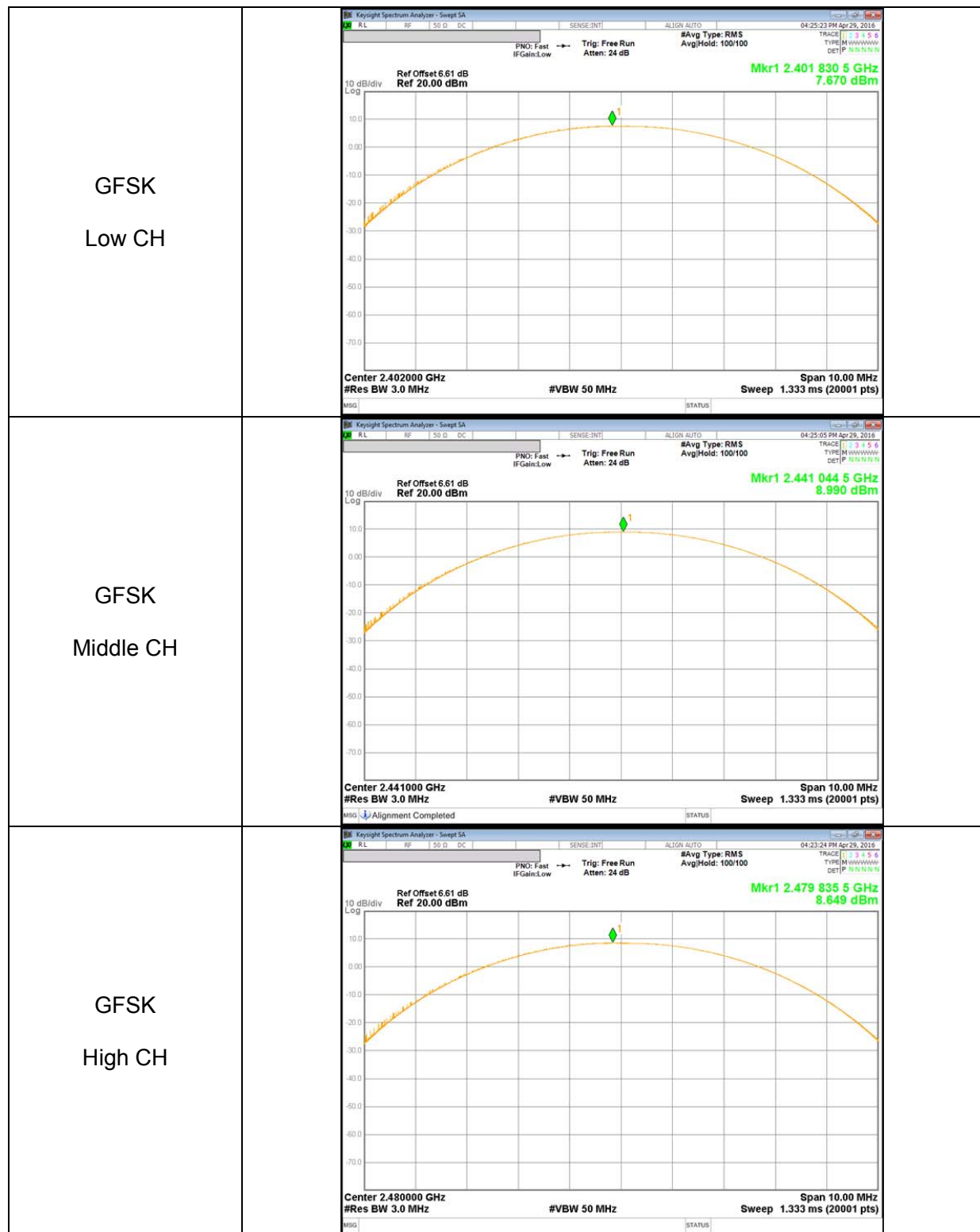
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	8.940	21	-12.060
Middle	2441	10.360	21	-10.640
High	2480	9.801	21	-11.199
Worst		10.360	21	-10.640

8.5.3. ENHANCED DATA RATE 8PSK MODULATION

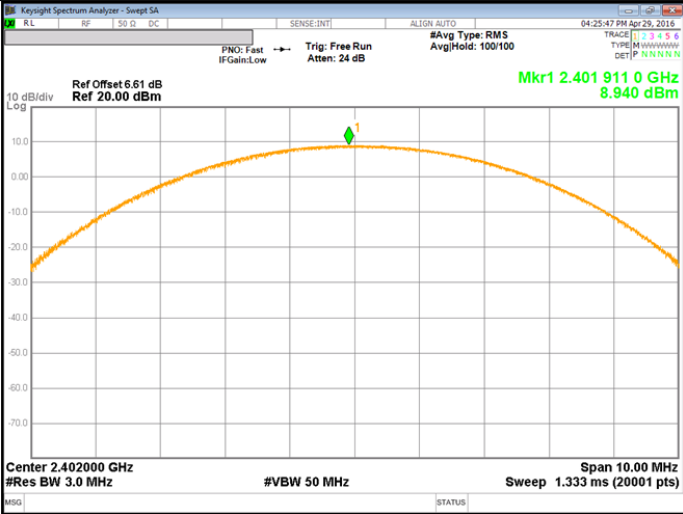
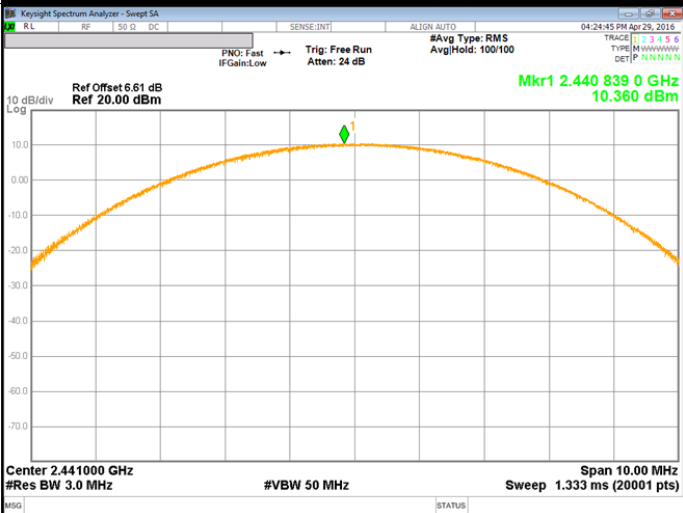
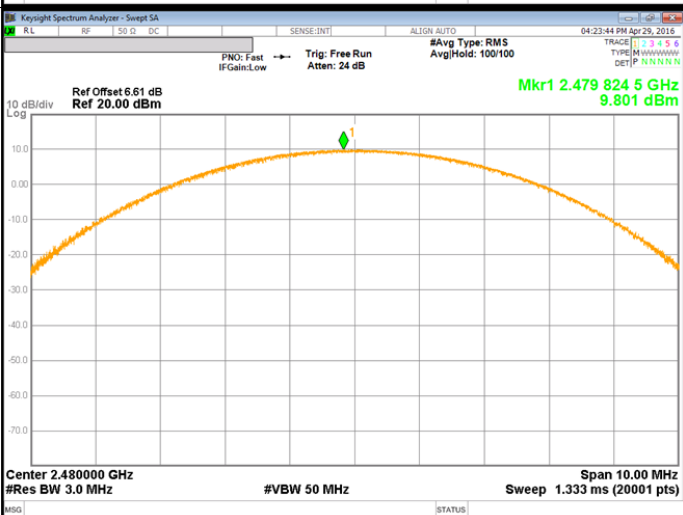
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	9.288	21	-11.712
Middle	2441	10.739	21	-10.261
High	2480	10.128	21	-10.872
Worst		10.739	21	-10.261

8.5.4. OUTPUT POWER PLOTS

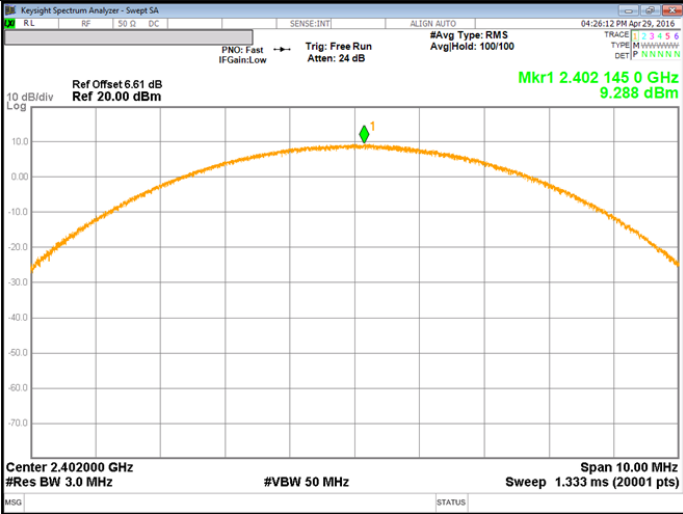
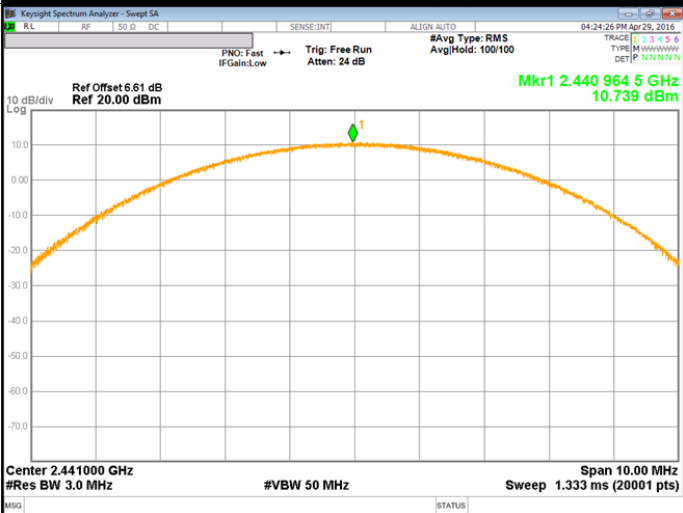
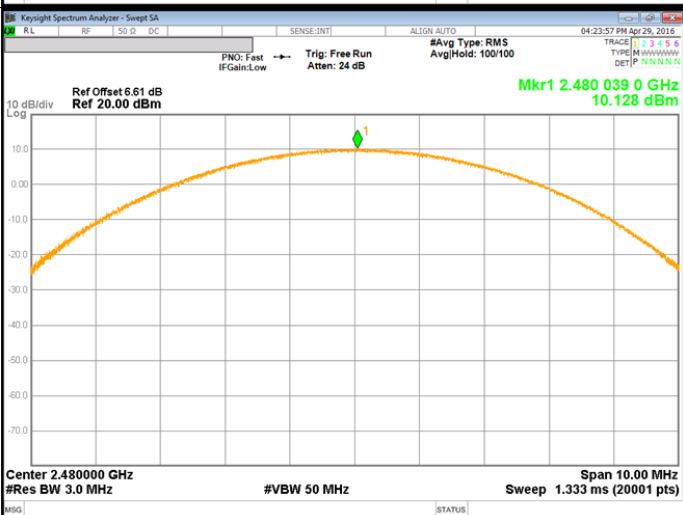
GFSK OUTPUT POWER



Pi/4-DPSK OUTPUT POWER

<p>Pi/4-DPSK Low CH</p>	 <p>KeySight Spectrum Analyzer - Swept SA PNO: Fast IFGain:Low Trig: Free Run Atten: 24 dB #Avg Type: RMS AvgHold: 100/100 Ref Offset 6.61 dB Ref 20.00 dBm Mkr1 2.401 911 0 GHz 8.940 dBm Center 2.402000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 10.00 MHz Sweep 1.333 ms (20001 pts)</p>
<p>Pi/4-DPSK Middle CH</p>	 <p>KeySight Spectrum Analyzer - Swept SA PNO: Fast IFGain:Low Trig: Free Run Atten: 24 dB #Avg Type: RMS AvgHold: 100/100 Ref Offset 6.61 dB Ref 20.00 dBm Mkr1 2.440 839 0 GHz 10.360 dBm Center 2.441000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 10.00 MHz Sweep 1.333 ms (20001 pts)</p>
<p>Pi/4-DPSK High CH</p>	 <p>KeySight Spectrum Analyzer - Swept SA PNO: Fast IFGain:Low Trig: Free Run Atten: 24 dB #Avg Type: RMS AvgHold: 100/100 Ref Offset 6.61 dB Ref 20.00 dBm Mkr1 2.479 824 5 GHz 9.801 dBm Center 2.480000 GHz #Res BW 3.0 MHz #VBW 50 MHz Span 10.00 MHz Sweep 1.333 ms (20001 pts)</p>

8PSK OUTPUT POWER

<p>8PSK Low CH</p>	
<p>8PSK Middle CH</p>	
<p>8PSK High CH</p>	

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	6.993	5.00
Middle	2441	8.474	7.04
High	2480	8.033	6.36

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	6.399	4.36
Middle	2441	7.898	6.16
High	2480	7.380	5.47

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	6.402	4.37
Middle	2441	7.904	6.17
High	2480	7.423	5.52

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.

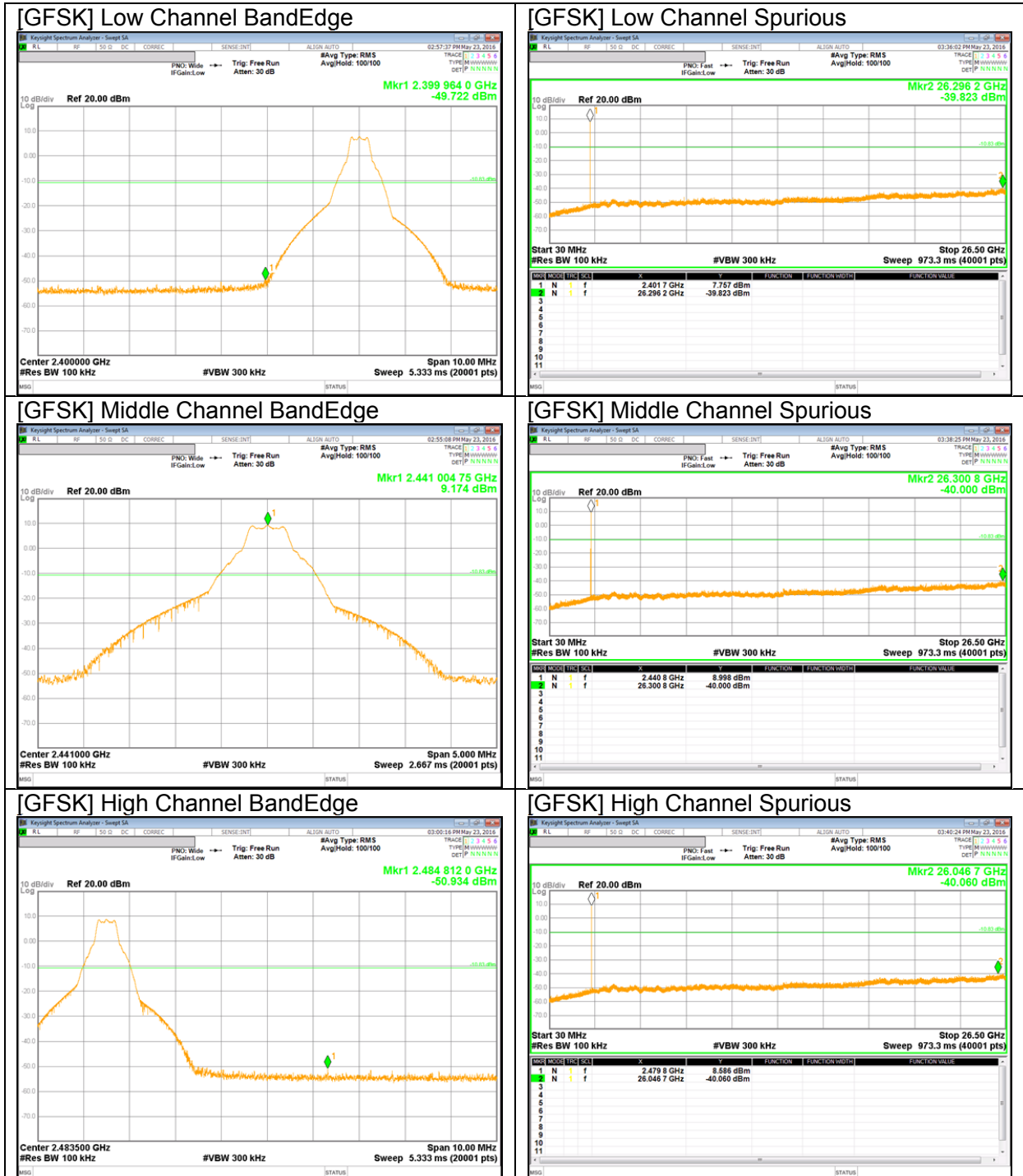
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

RESULTS

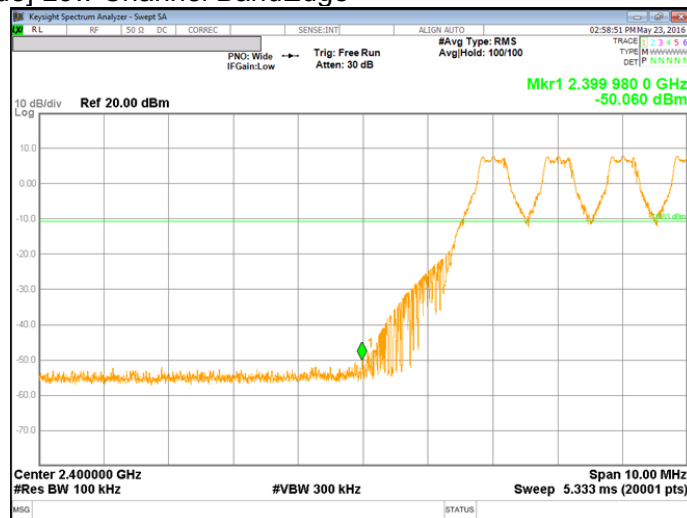
8.7.1. BASIC DATA RATE GFSK MODULATION

GFSK Mode

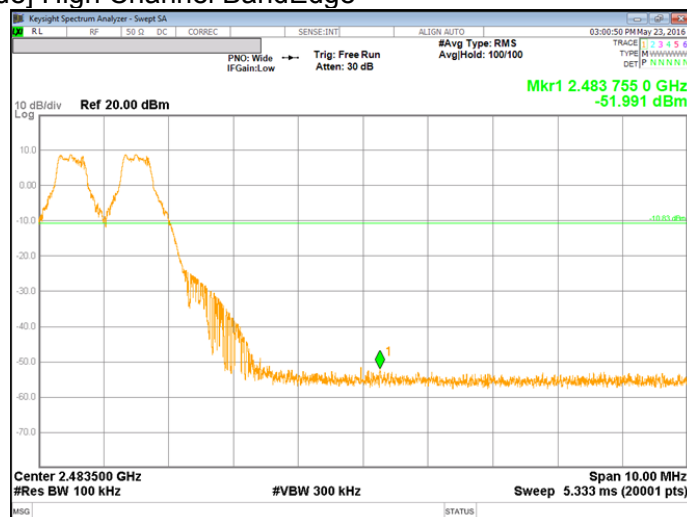


BandEdge Emission at GFSK Hopping Mode

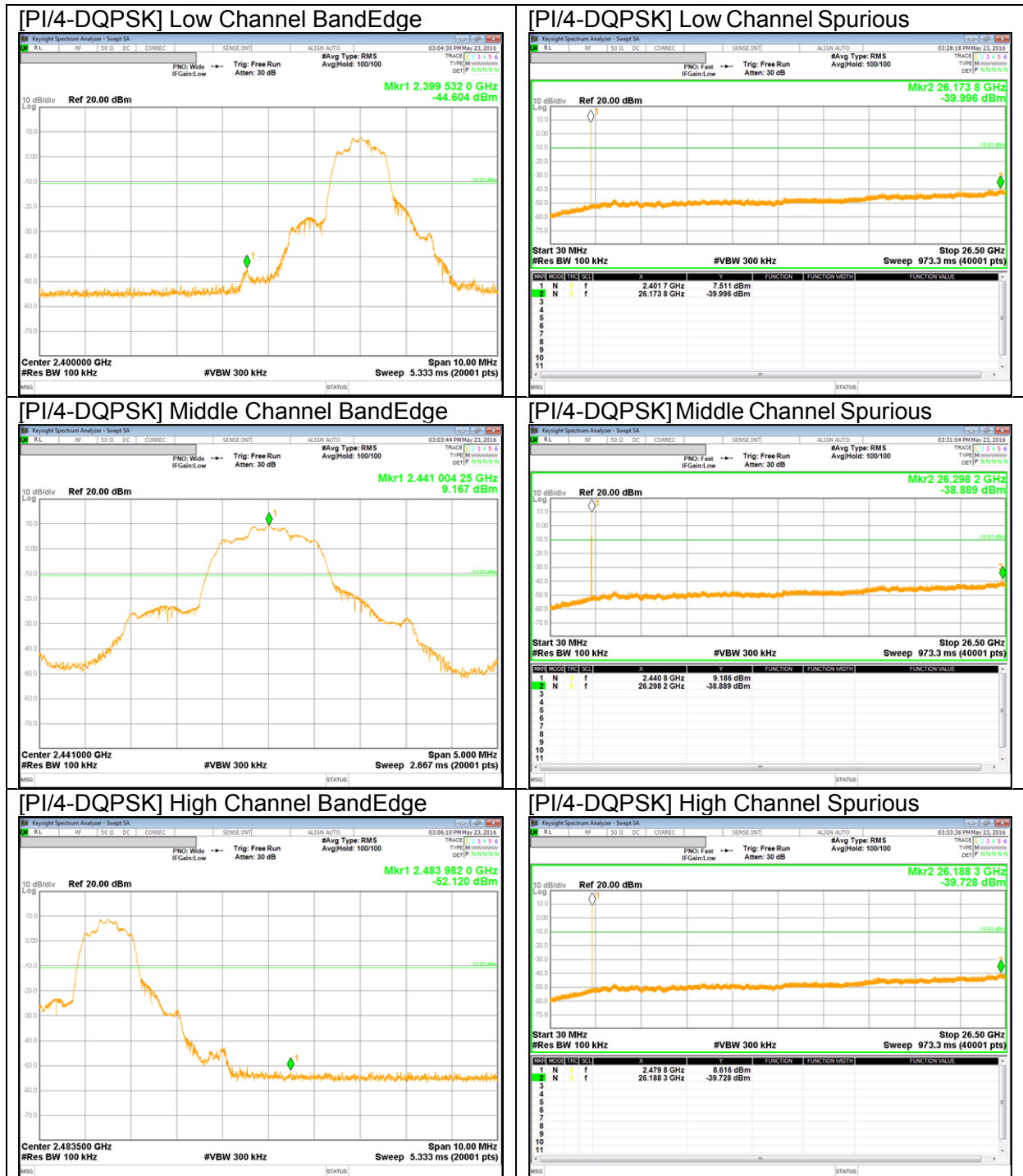
[GFSK Hopping Mode] Low Channel BandEdge



[GFSK Hopping Mode] High Channel BandEdge



PI/4-DQPSK Mode

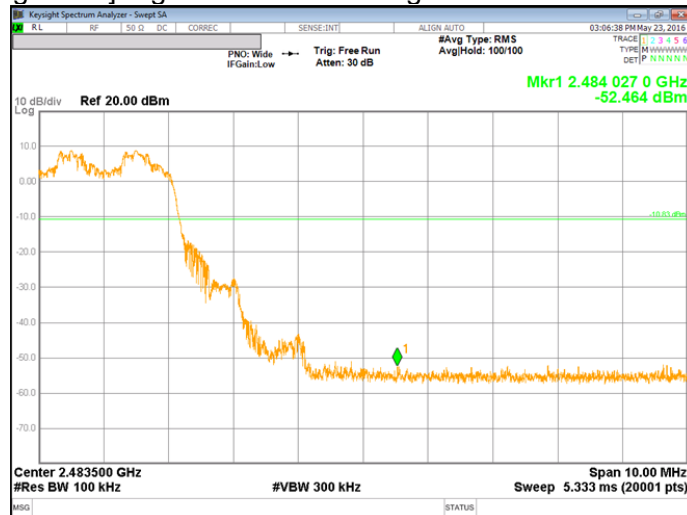


BandEdge Emission at PI/4-DQPSK Hopping Mode

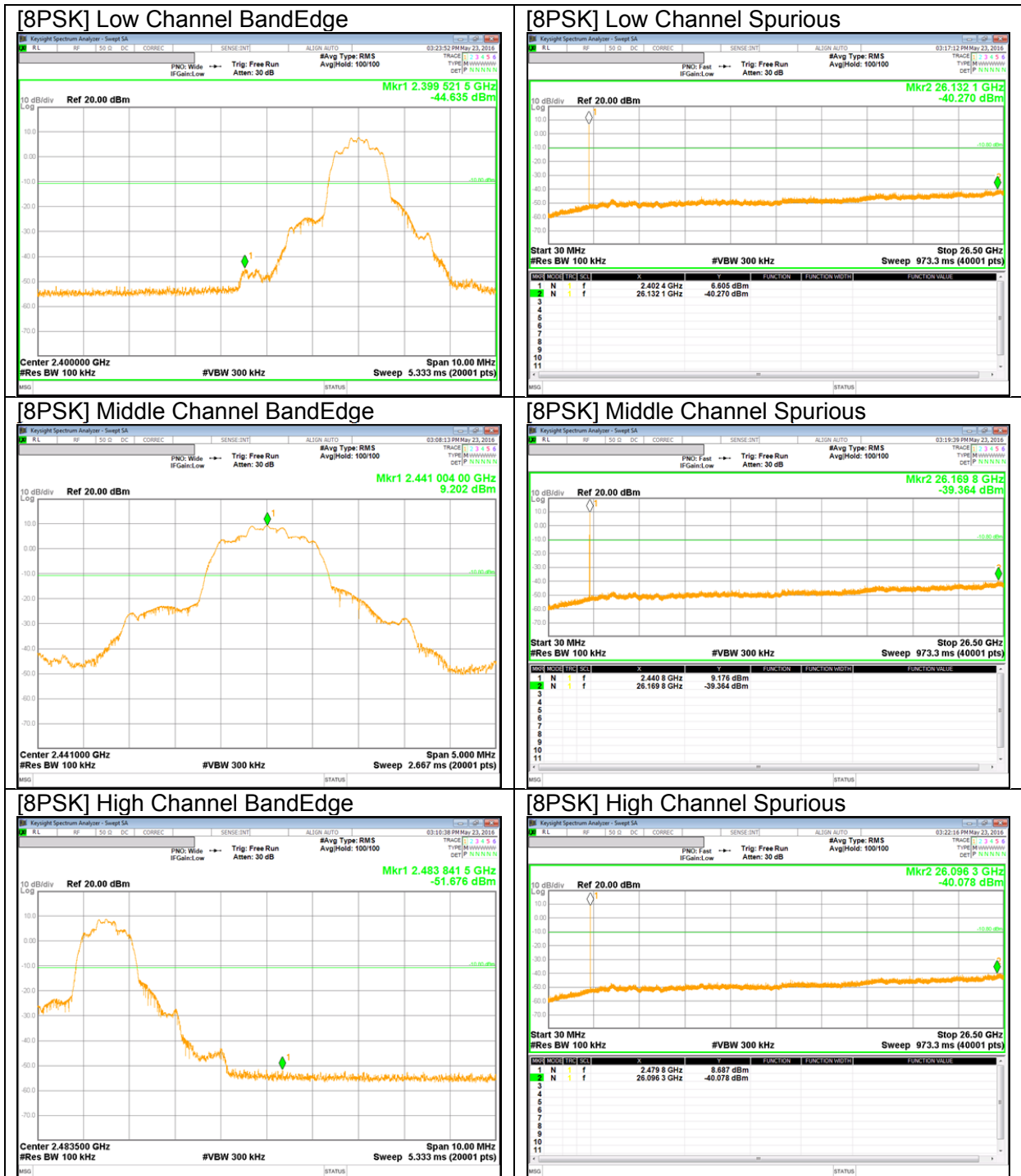
[PI/4-DQPSK Hopping Mode] Low Channel BandEdge



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

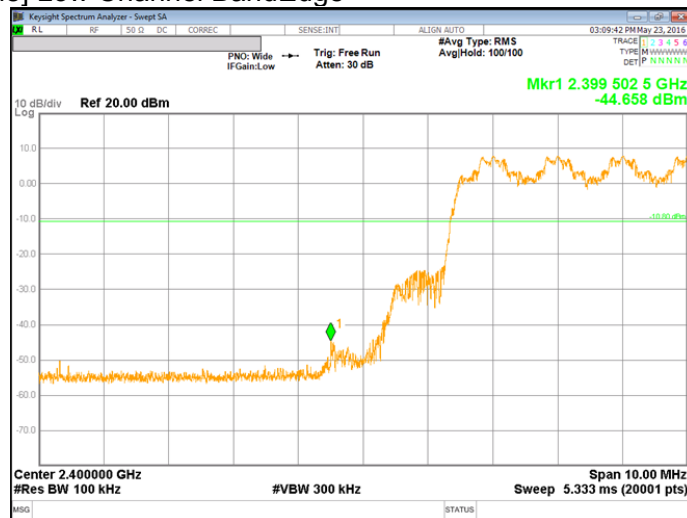


8PSK Mode



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.

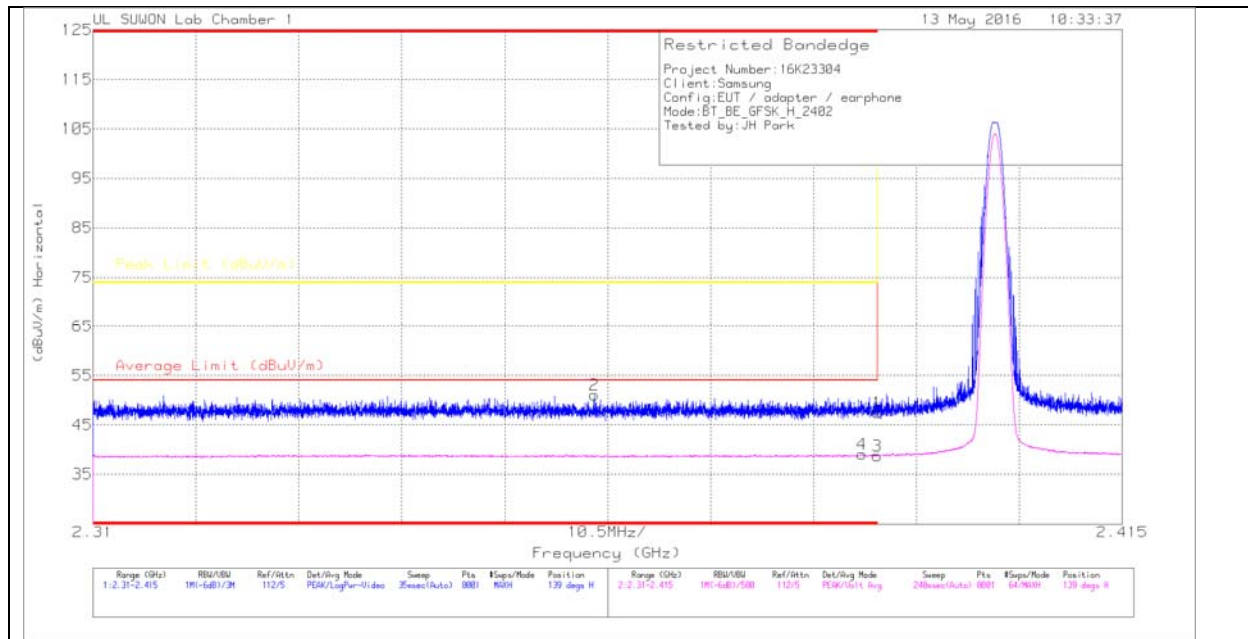
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

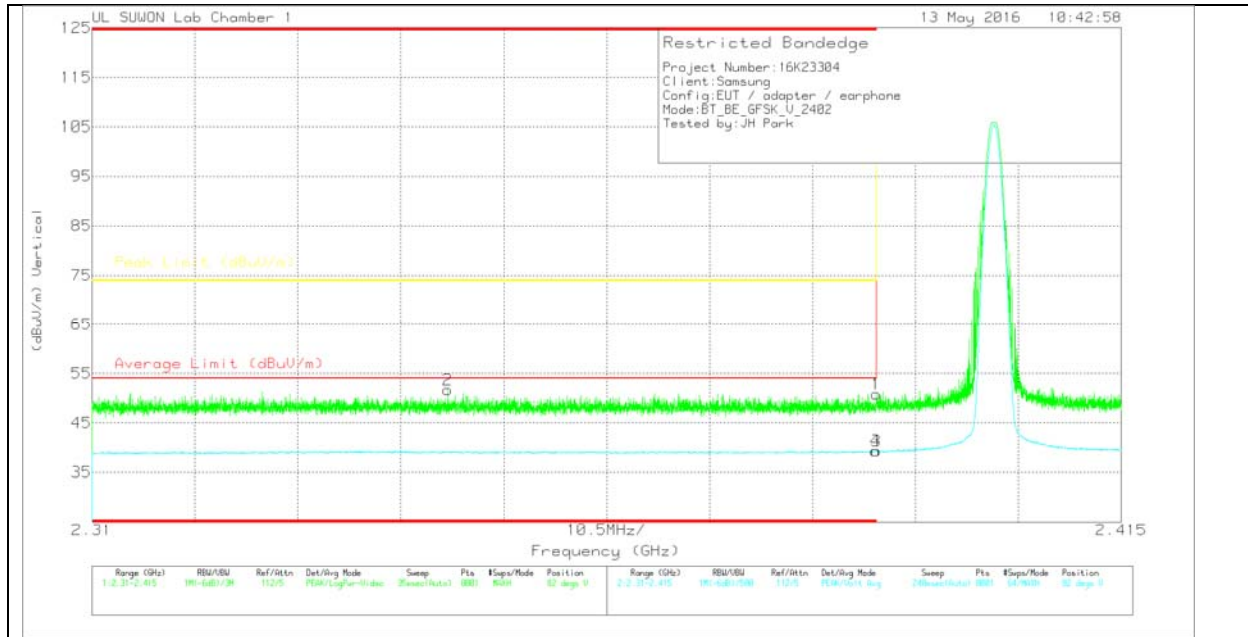
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2	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	44.63	Pk		-29	47.43	-	-	74	-26.57	139	175	H
2	* 2.361	48.34	Pk		-29	51.04	-	-	74	-22.96	139	175	H
3	* 2.39	35.94	V1TV		-29	38.74	54	-15.26	-	-	139	175	H
4	* 2.388	36.27	V1TV		-29	39.07	54	-14.93	-	-	139	175	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

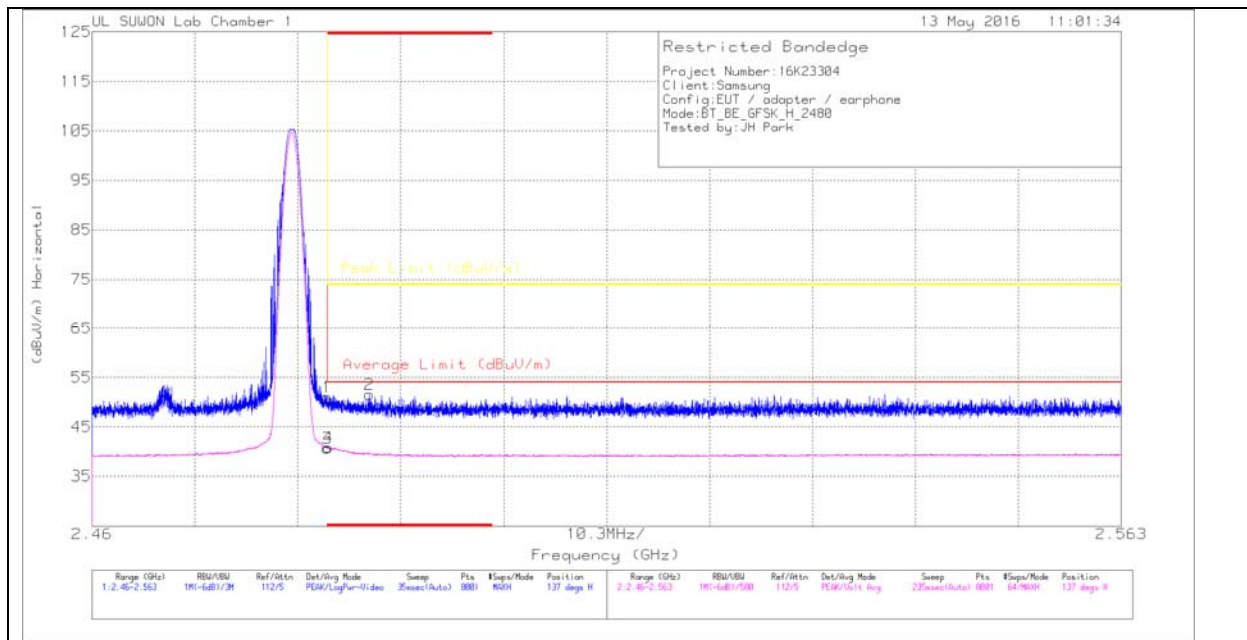
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	48.07	Pk	31.8	-29	50.87	-	-	74	-23.13	82	400	V
2	* 2.346	48.95	Pk	31.7	-29	51.65	-	-	74	-22.35	82	400	V
3	* 2.39	36.52	V1TV	31.8	-29	39.32	54	-14.68	-	-	82	400	V
4	* 2.39	36.52	V1TV	31.8	-29	39.32	54	-14.68	-	-	82	400	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

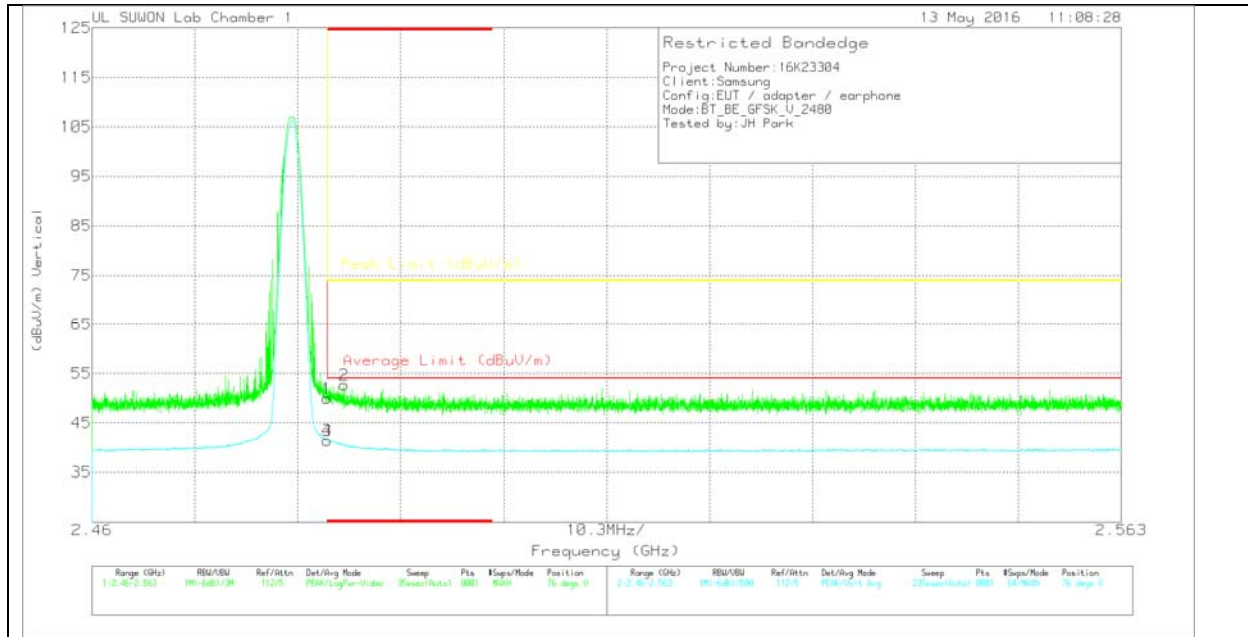
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2	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	47.91	Pk	32	-28.9	51.01	-	-	74	-22.99	137	165	H
2	* 2.488	48.47	Pk	32	-28.9	51.57	-	-	74	-22.43	137	165	H
3	* 2.484	37.61	V1TV	32	-28.9	40.71	54	-13.29	-	-	137	165	H
4	* 2.484	37.71	V1TV	32	-28.9	40.81	54	-13.19	-	-	137	165	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

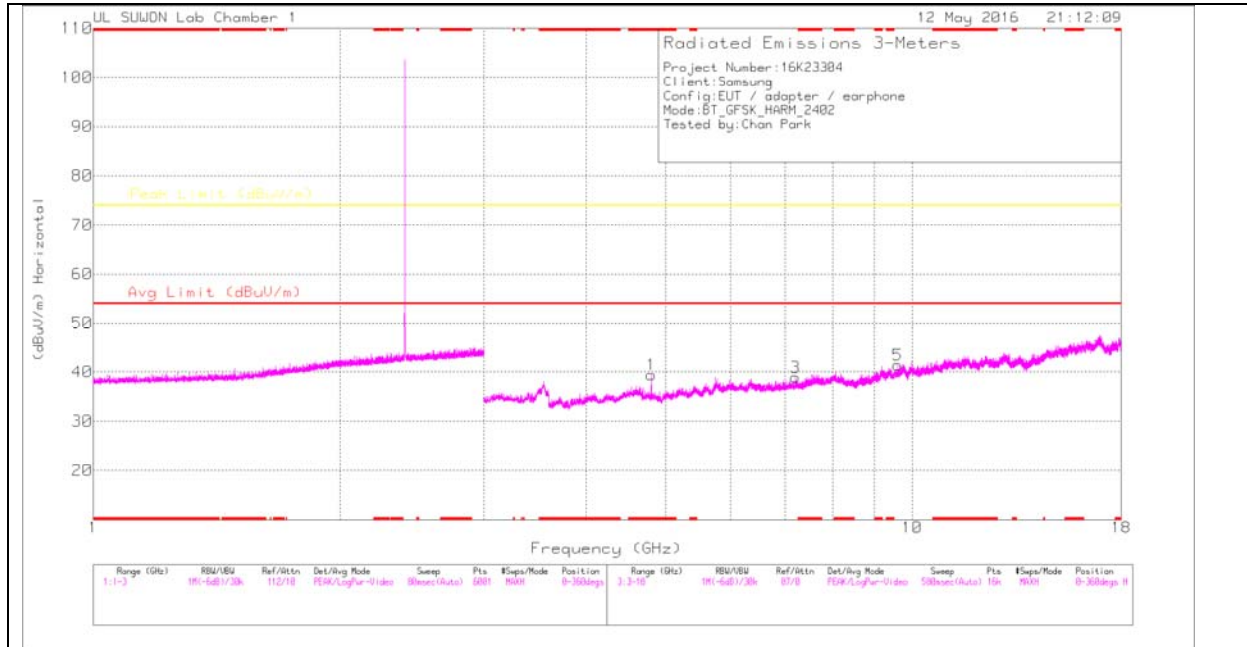
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	46.84	Pk	32	-28.9	49.94	-	-	74	-24.06	76	371	V
2	* 2.485	49.54	Pk	32	-28.9	52.64	-	-	74	-21.36	76	371	V
3	* 2.484	38.27	V1TV	32	-28.9	41.37	54	-12.63	-	-	76	371	V
4	* 2.484	38.33	V1TV	32	-28.9	41.43	54	-12.57	-	-	76	371	V

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

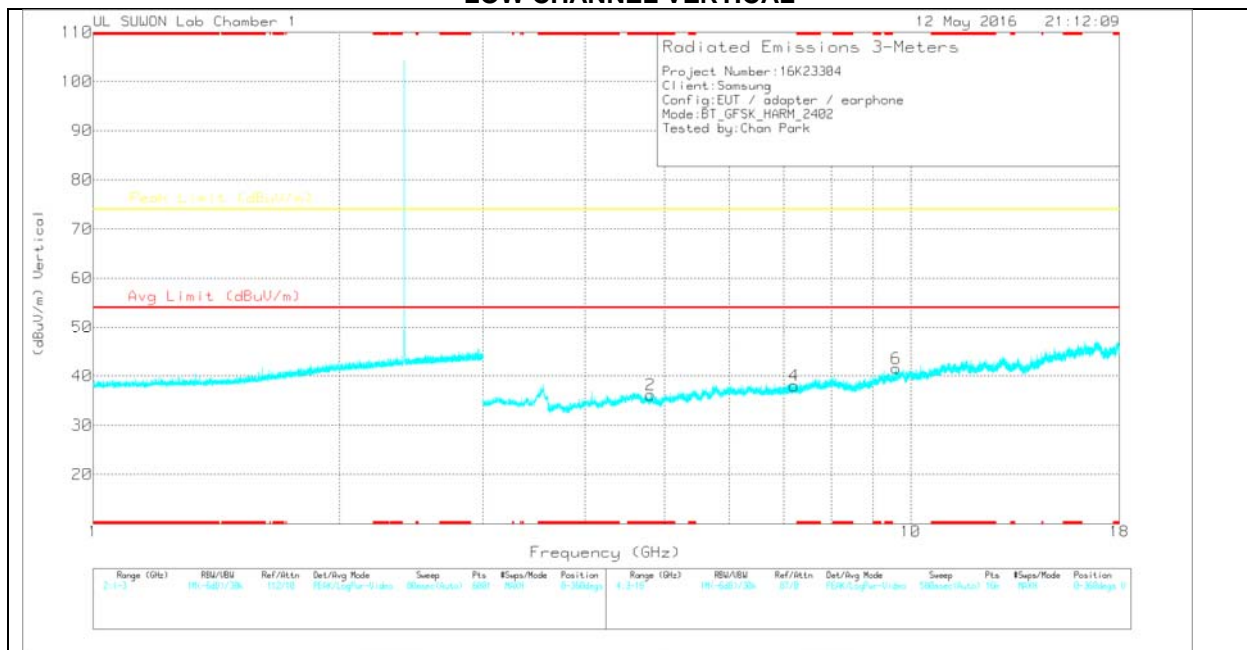
Pk - Peak detector

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	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.803	39.21	PK	34	-33.8	39.41	-	-	74	-34.59	0-360	100	H
3	7.205	34.03	PK	35.7	-30.8	38.93	-	-	74	-35.07	0-360	100	H
5	9.607	31.68	PK	37	-27.3	41.38	-	-	74	-32.62	0-360	200	H
2	* 4.806	35.95	PK	34	-33.8	36.15	-	-	74	-37.85	0-360	200	V
4	7.199	33.01	PK	35.7	-30.7	38.01	-	-	74	-35.99	0-360	200	V
6	9.607	31.81	PK	37	-27.3	41.51	-	-	74	-32.49	0-360	100	V

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

PK – Peak detector

Radiated Emissions

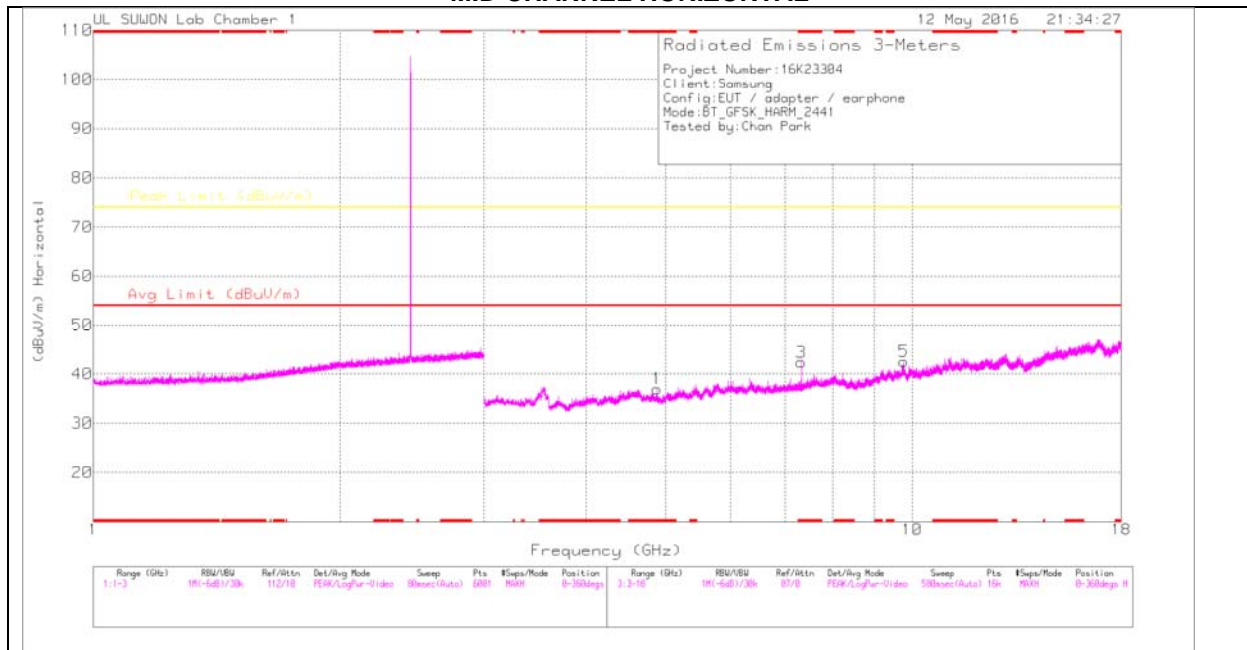
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	47.82	PK2	34	-33.8	48.02	-	-	74	-25.98	126	104	H
* 4.804	37.02	VA1T	34	-33.8	37.22	54	-16.78	-	-	126	104	H

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

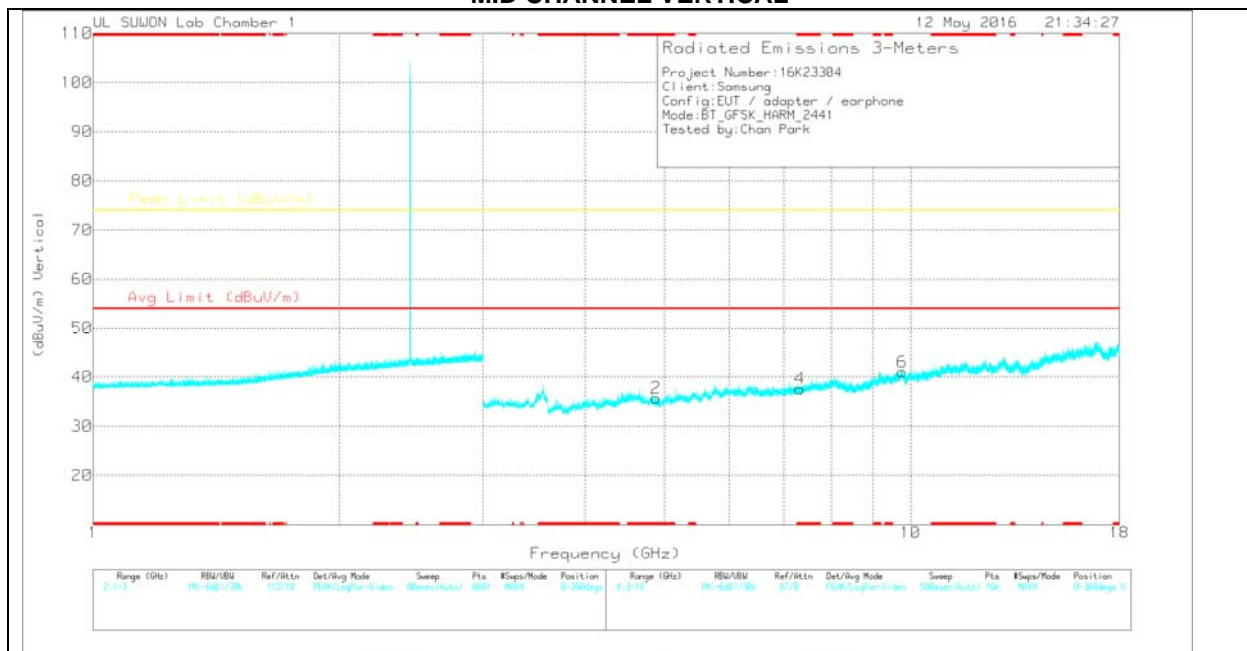
PK2 - KDB558074 Method: Maximum Peak

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(0016 8717)_150 619	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	PK	34	-34	37	-	-	74	-37	0-360	200	H
3	* 7.323	37.48	PK	35.8	-30.9	42.38	-	-	74	-31.62	0-360	200	H
5	9.764	31.98	PK	37.2	-26.6	42.58	-	-	74	-31.42	0-360	200	H
2	* 4.882	35.71	PK	34	-34	35.71	-	-	74	-38.29	0-360	200	V
4	* 7.323	32.71	PK	35.8	-30.9	37.61	-	-	74	-36.39	0-360	200	V
6	9.764	30.44	PK	37.2	-26.6	41.04	-	-	74	-32.96	0-360	200	V

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

PK – Peak detector

Radiated Emissions

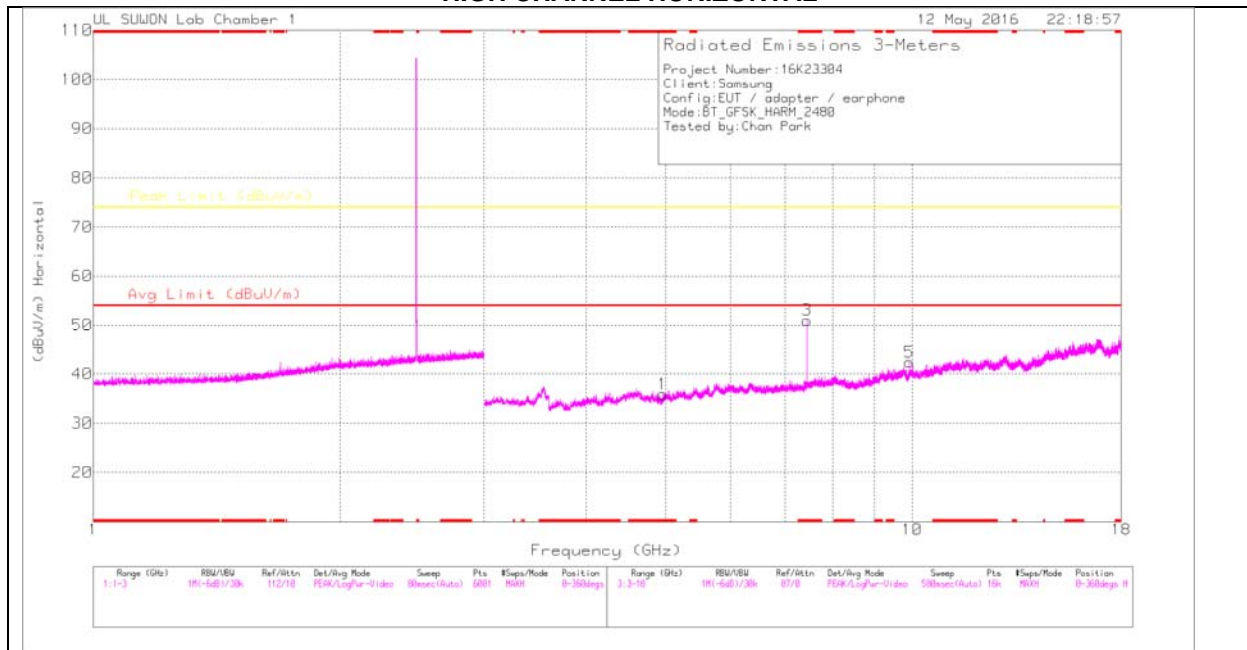
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.323	46.96	PK2	35.8	-30.9	51.86	-	-	74	-22.14	247	190	H
* 7.323	39.18	VA1T	35.8	-30.9	44.08	54	-9.92	-	-	247	190	H

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

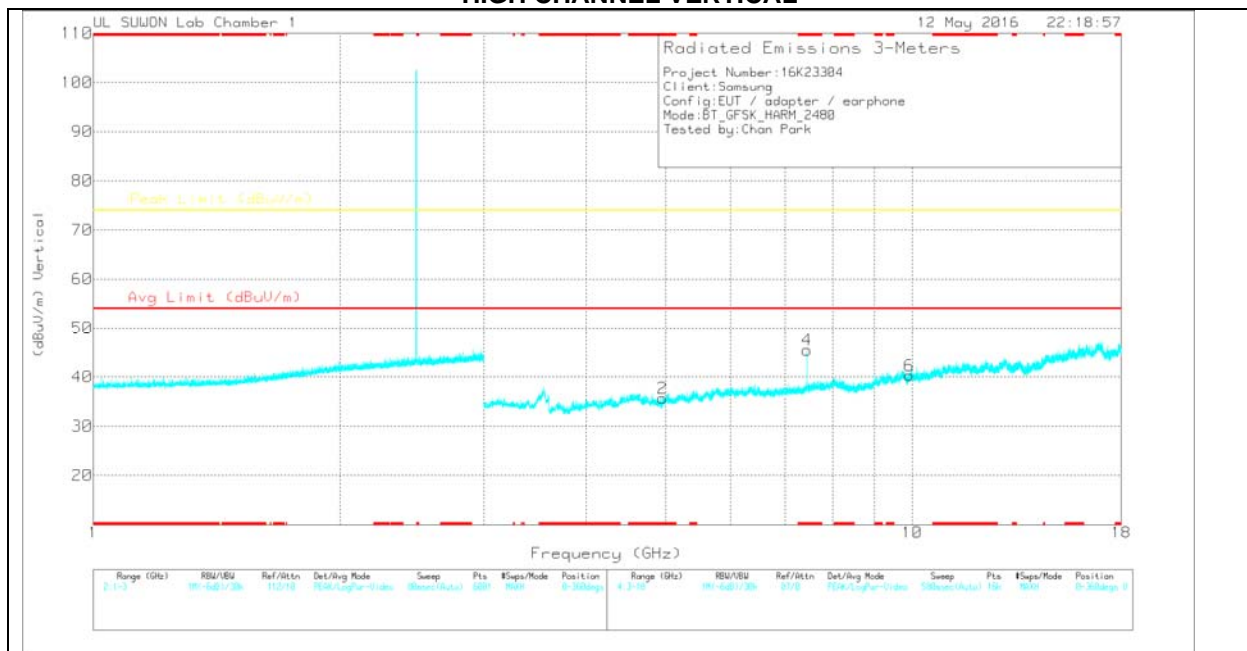
PK2 - KDB558074 Method: Maximum Peak

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(0016 8717)_150 619	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	35.89	PK	34	-34	35.89	-	-	74	-38.11	0-360	100	H
3	* 7.44	45.95	PK	35.8	-30.7	51.05	-	-	74	-22.95	0-360	100	H
5	9.919	32.19	PK	37.4	-27.2	42.39	-	-	74	-31.61	0-360	200	H
2	* 4.956	35.68	PK	34	-34	35.68	-	-	74	-38.32	0-360	200	V
4	* 7.44	40.37	PK	35.8	-30.7	45.47	-	-	74	-28.53	0-360	200	V
6	9.919	30.1	PK	37.4	-27.2	40.3	-	-	74	-33.7	0-360	100	V

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

PK – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.439	52.33	PK2	35.8	-30.7	57.43	-	-	74	-16.57	238	146	H
* 7.439	48.83	VA1T	35.8	-30.7	53.93	54	-0.07	-	-	238	146	H
* 7.439	47.27	PK2	35.8	-30.7	52.37	-	-	74	-21.63	240	144	V
* 7.44	40.6	VA1T	35.8	-30.7	45.7	54	-8.3	-	-	240	144	V

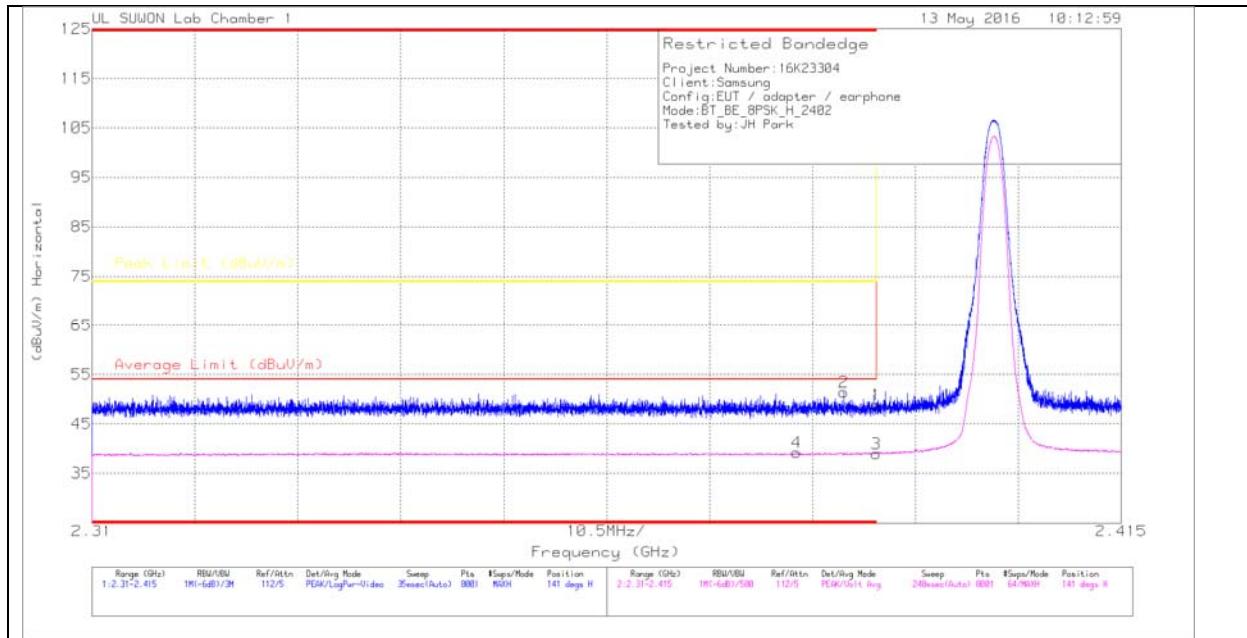
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

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

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

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

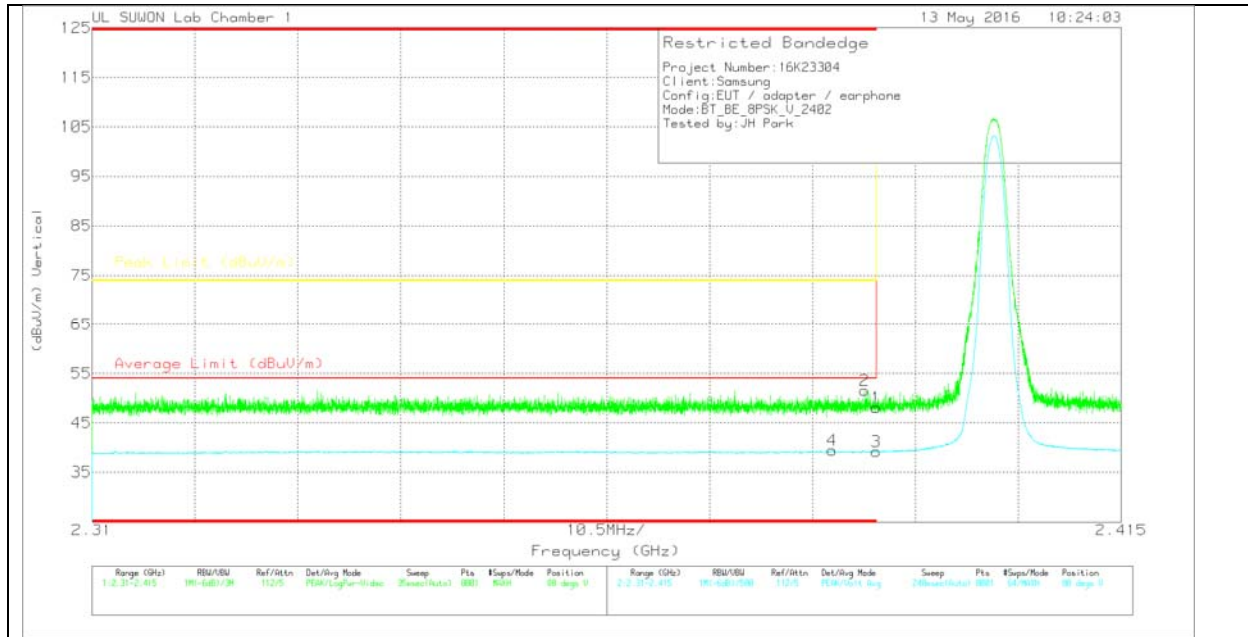
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	46.03	Pk		-29	48.83	-	-	74	-25.17	141	174	H
2	* 2.387	48.62	Pk		-29	51.42	-	-	74	-22.58	141	174	H
3	* 2.39	36.14	V1TV		-29	38.94	54	-15.06	-	-	141	174	H
4	* 2.382	36.37	V1TV		-29	39.17	54	-14.83	-	-	141	174	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

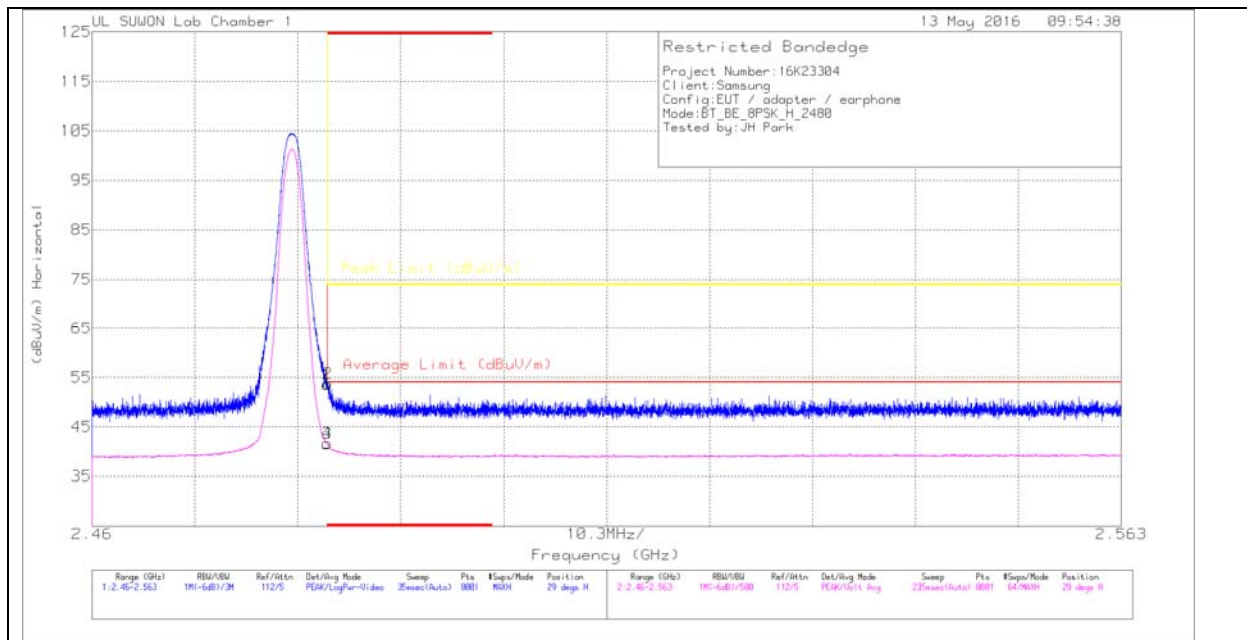
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	45.34	Pk	31.8	-29	48.14	-	-	74	-25.86	88	187	V
2	* 2.389	48.78	Pk	31.8	-29	51.58	-	-	74	-22.42	88	187	V
3	* 2.39	36.35	V1TV	31.8	-29	39.15	54	-14.85	-	-	88	187	V
4	* 2.386	36.61	V1TV	31.8	-29	39.41	54	-14.59	-	-	88	187	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

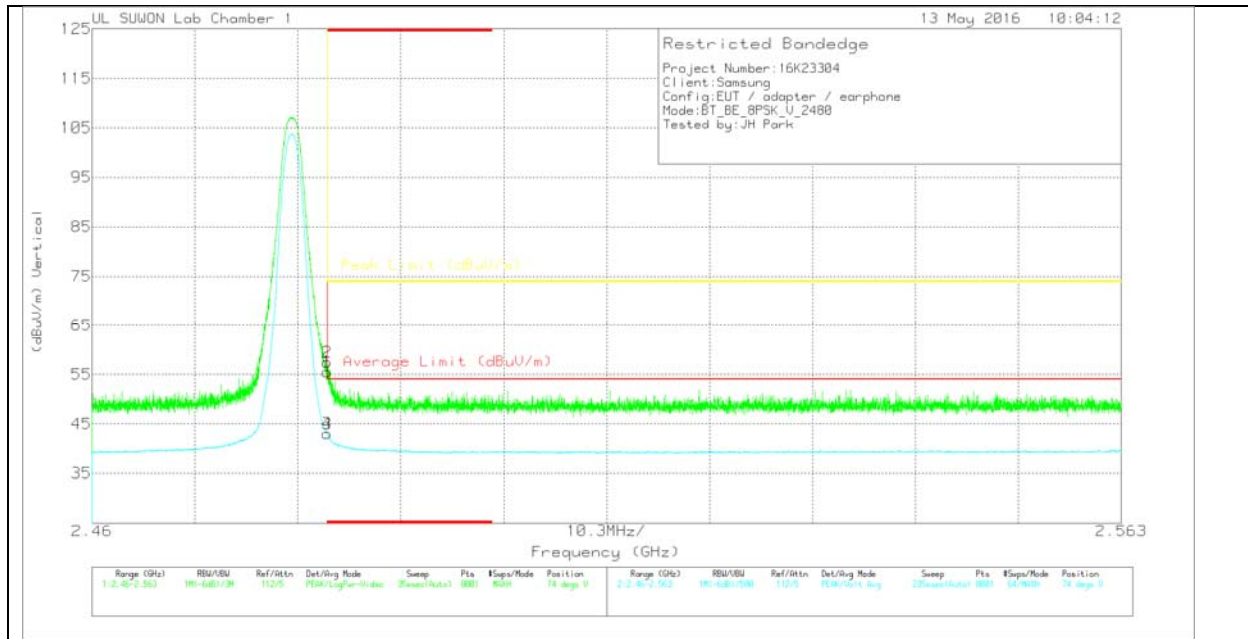
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2	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	50.42	Pk	32	-28.9	53.52	-	-	74	-20.48	29	298	H
2	* 2.484	50.67	Pk	32	-28.9	53.77	-	-	74	-20.23	29	298	H
3	* 2.484	38.51	V1TV	32	-28.9	41.61	54	-12.39	-	-	29	298	H
4	* 2.484	38.52	V1TV	32	-28.9	41.62	54	-12.38	-	-	29	298	H

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

Pk - Peak detector

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

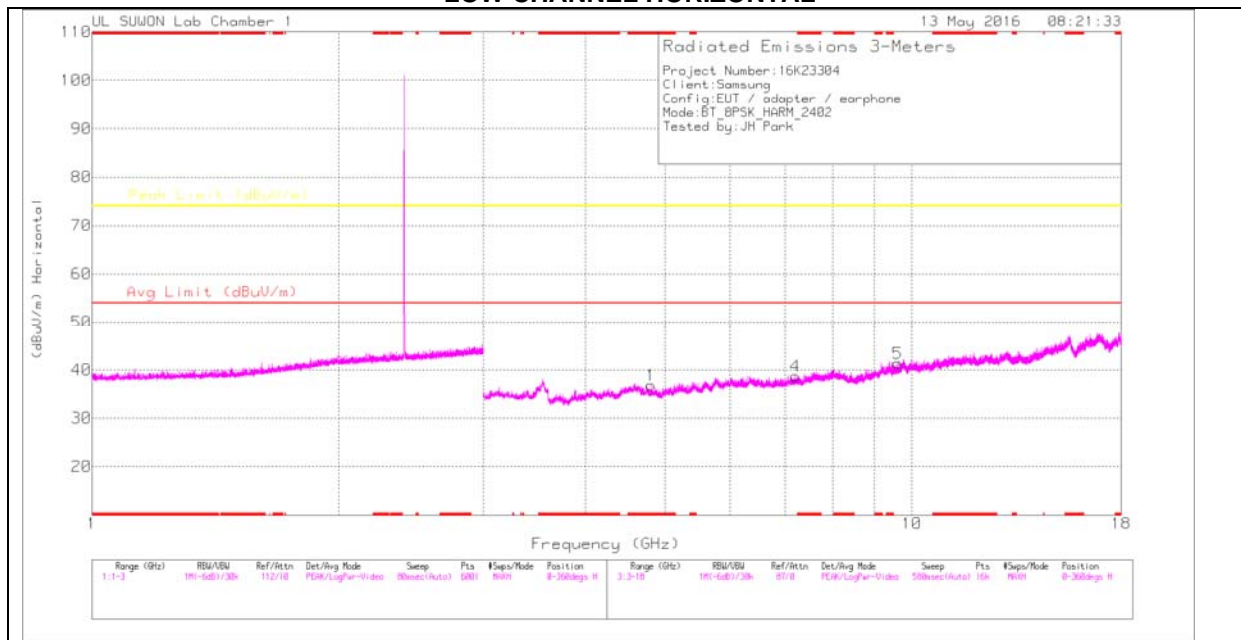
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_2	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	52.48	Pk	32	-28.9	55.58	-	-	74	-18.42	74	370	V
2	* 2.484	54.44	Pk	32	-28.9	57.54	-	-	74	-16.46	74	370	V
3	* 2.484	39.96	V1TV	32	-28.9	43.06	54	-10.94	-	-	74	370	V
4	* 2.484	39.94	V1TV	32	-28.9	43.04	54	-10.96	-	-	74	370	V

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

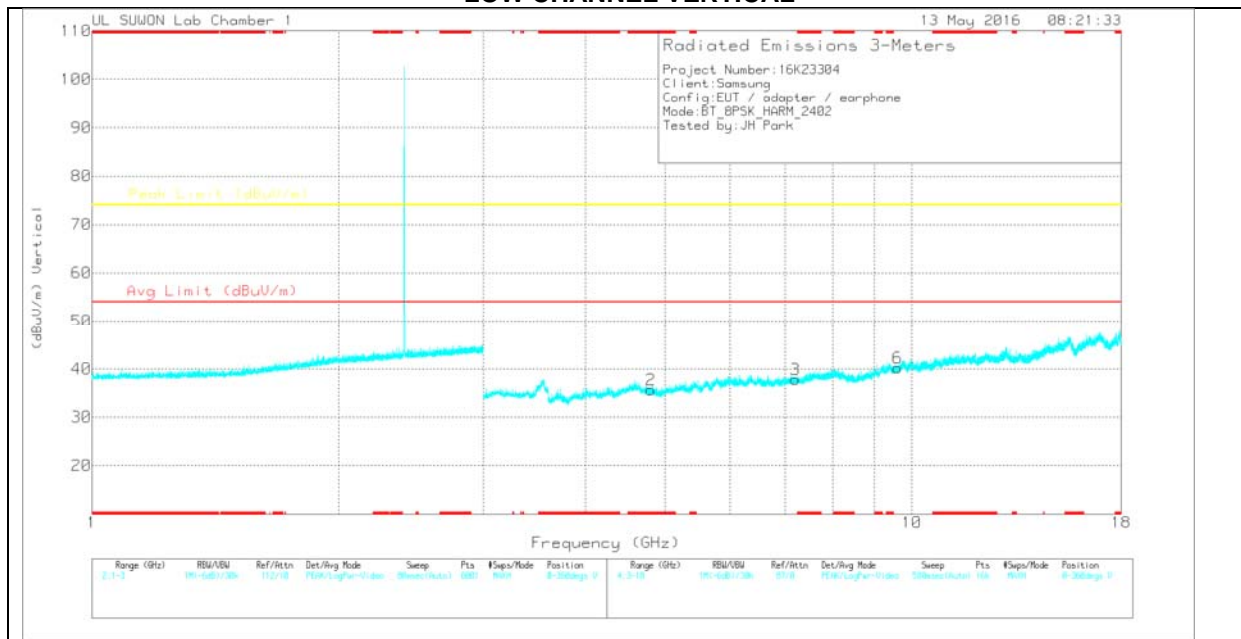
Pk - Peak detector

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

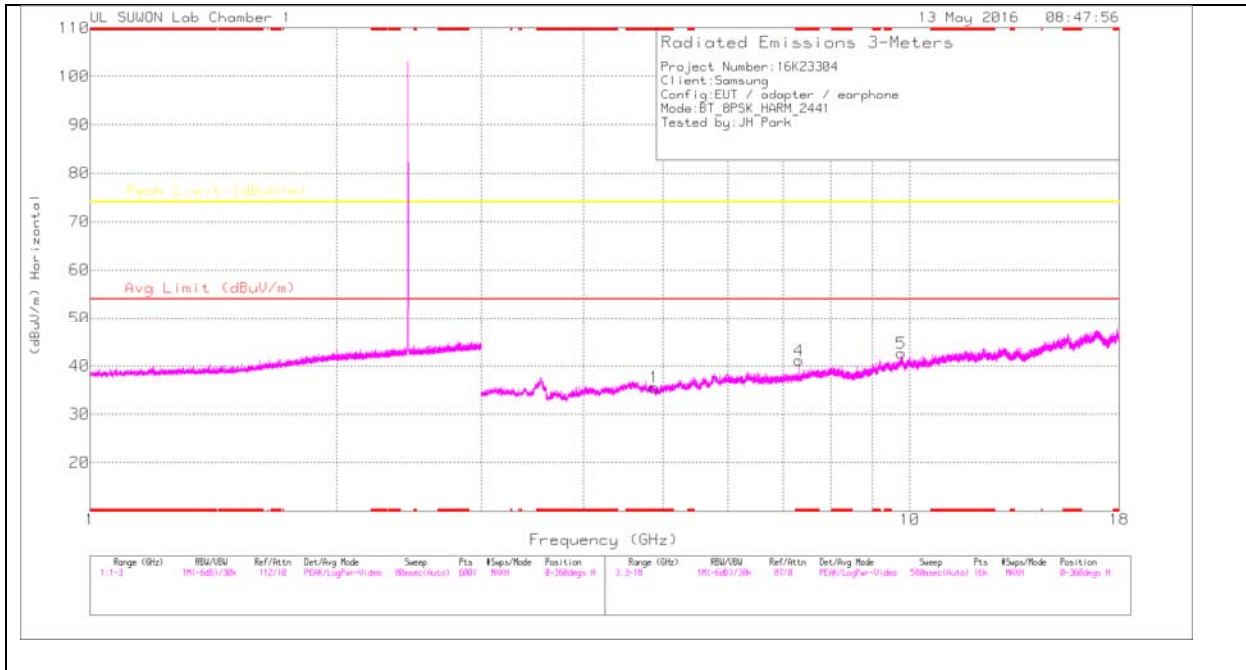
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.804	36.65	PK	34	-33.8	36.85	-	-	74	-37.15	0-360	100	H
4	7.206	33.81	PK	35.7	-30.8	38.71	-	-	74	-35.29	0-360	200	H
5	9.609	31.69	PK	37	-27.3	41.39	-	-	74	-32.61	0-360	200	H
2	* 4.807	35.48	PK	34	-33.8	35.68	-	-	74	-38.32	0-360	100	V
3	7.207	32.94	PK	35.7	-30.8	37.84	-	-	74	-36.16	0-360	200	V
6	9.603	30.49	PK	37	-27.3	40.19	-	-	74	-33.81	0-360	200	V

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

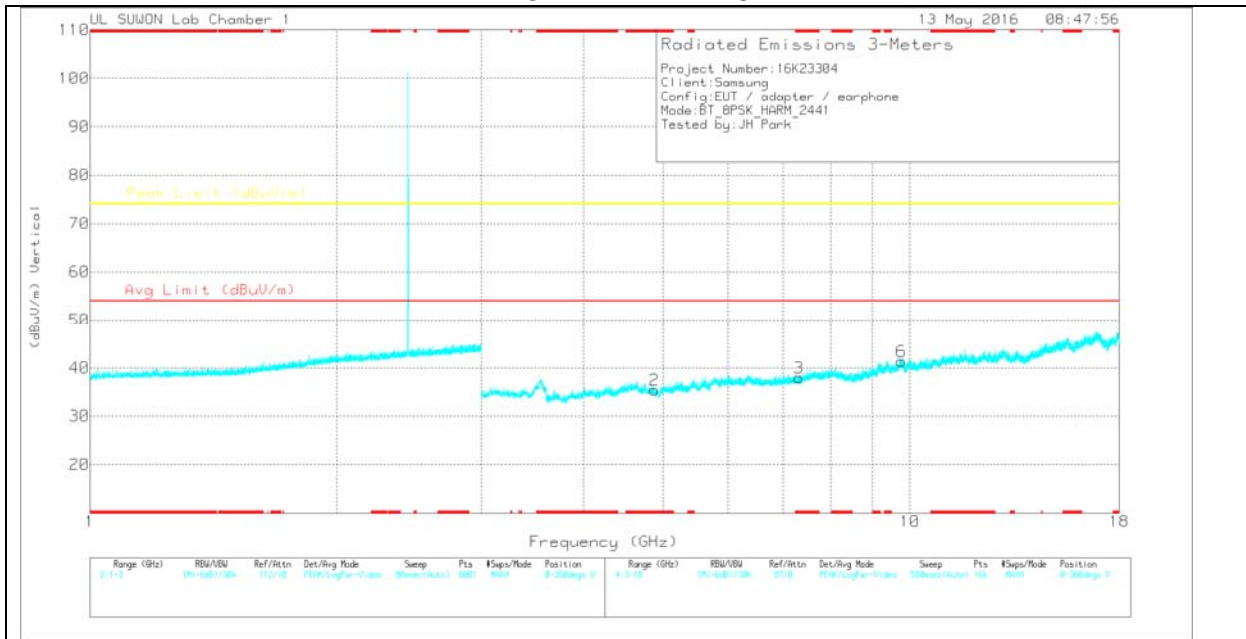
PK – Peak Detector

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

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	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	35.5	PK	34	-34	35.5	-	-	74	-38.5	0-360	100	H
4	* 7.323	36.24	PK	35.8	-30.9	41.14	-	-	74	-32.86	0-360	200	H
5	9.764	31.99	PK	37.2	-26.6	42.59	-	-	74	-31.41	0-360	200	H
2	* 4.881	35.43	PK	34	-34	35.43	-	-	74	-38.57	0-360	200	V
3	* 7.321	33.02	PK	35.8	-30.9	37.92	-	-	74	-36.08	0-360	100	V
6	9.766	30.74	PK	37.2	-26.6	41.34	-	-	74	-32.66	0-360	200	V

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

PK – Peak Detector

Radiated Emissions

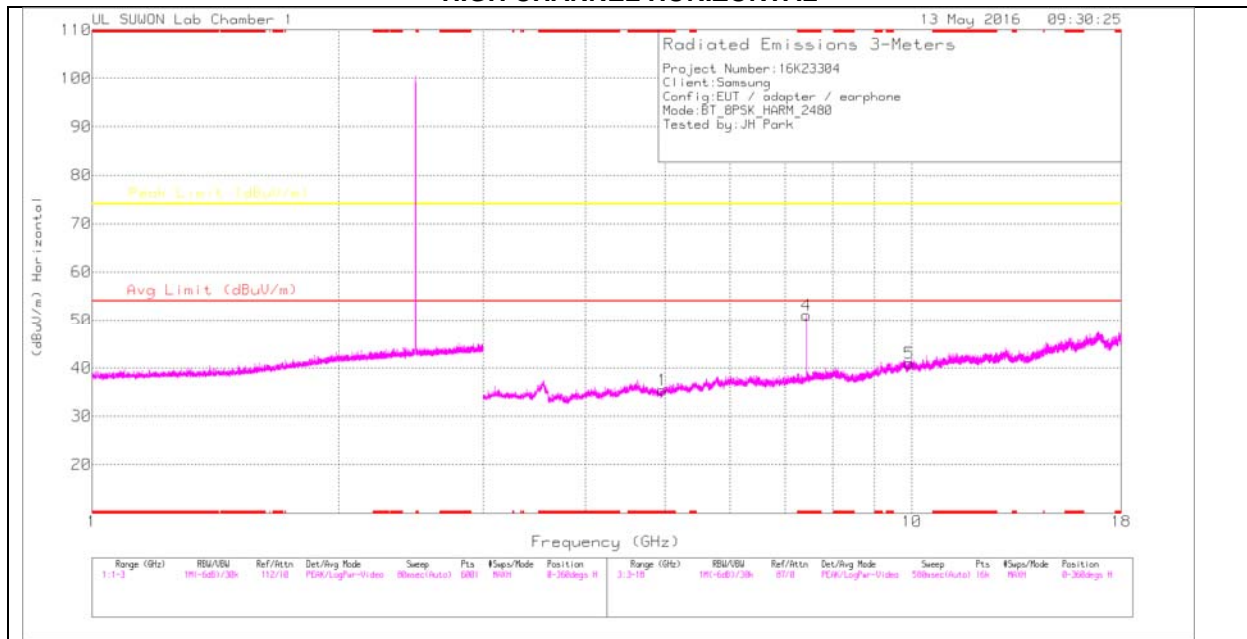
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.323	46.12	PK2	35.8	-30.9	51.02	-	-	74	-22.98	238	182	H
* 7.323	33.07	VA1T	35.8	-30.9	37.97	54	-16.03	-	-	238	182	H

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

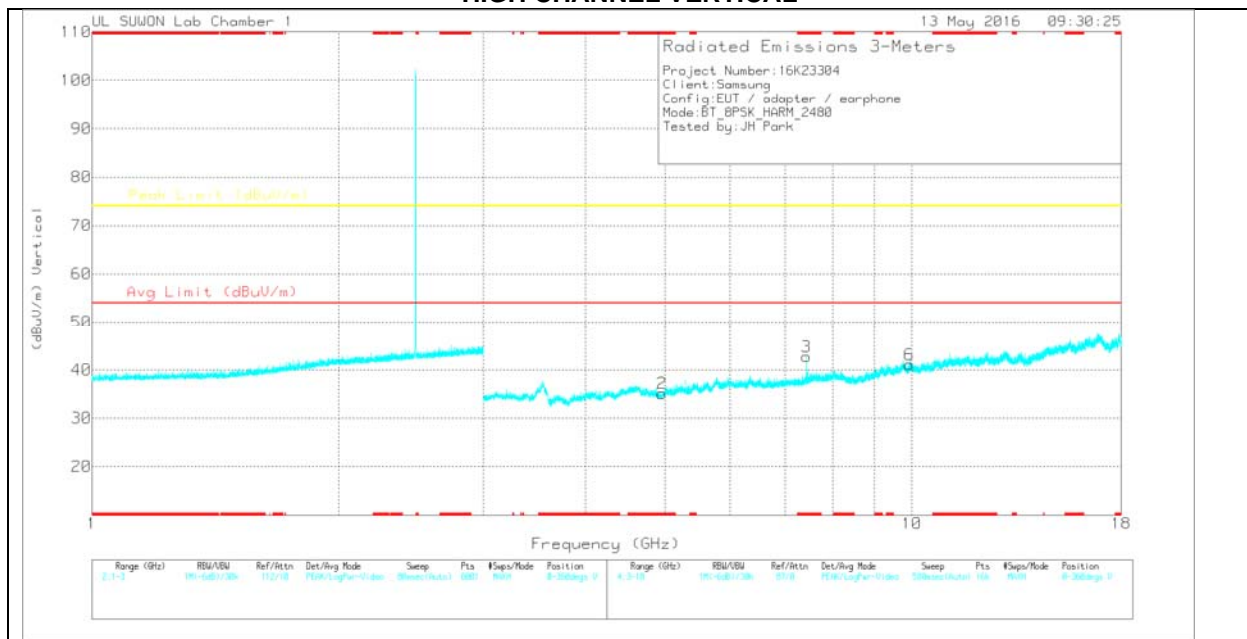
PK2 - KDB558074 Method: Maximum Peak

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(0016 8717)_150 619	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.96	35.4	PK	34	-34	35.4	-	-	74	-38.6	0-360	200	H
4	* 7.44	46.01	PK	35.8	-30.7	51.11	-	-	74	-22.89	0-360	200	H
5	9.92	30.74	PK	37.4	-27.2	40.94	-	-	74	-33.06	0-360	200	H
2	* 4.958	35.12	PK	34	-34	35.12	-	-	74	-38.88	0-360	200	V
3	* 7.44	37.71	PK	35.8	-30.7	42.81	-	-	74	-31.19	0-360	200	V
6	9.92	30.92	PK	37.4	-27.2	41.12	-	-	74	-32.88	0-360	100	V

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

PK – Peak Detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	Path_3	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.44	55.03	PK2	35.8	-30.7	60.13	-	-	74	-13.87	248	190	H
* 7.44	44.27	VA1T	35.8	-30.7	49.37	54	-4.63	-	-	248	190	H
* 7.44	48.52	PK2	35.8	-30.7	53.62	-	-	74	-20.38	239	149	V
* 7.44	36.4	VA1T	35.8	-30.7	41.5	54	-12.5	-	-	239	149	V

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

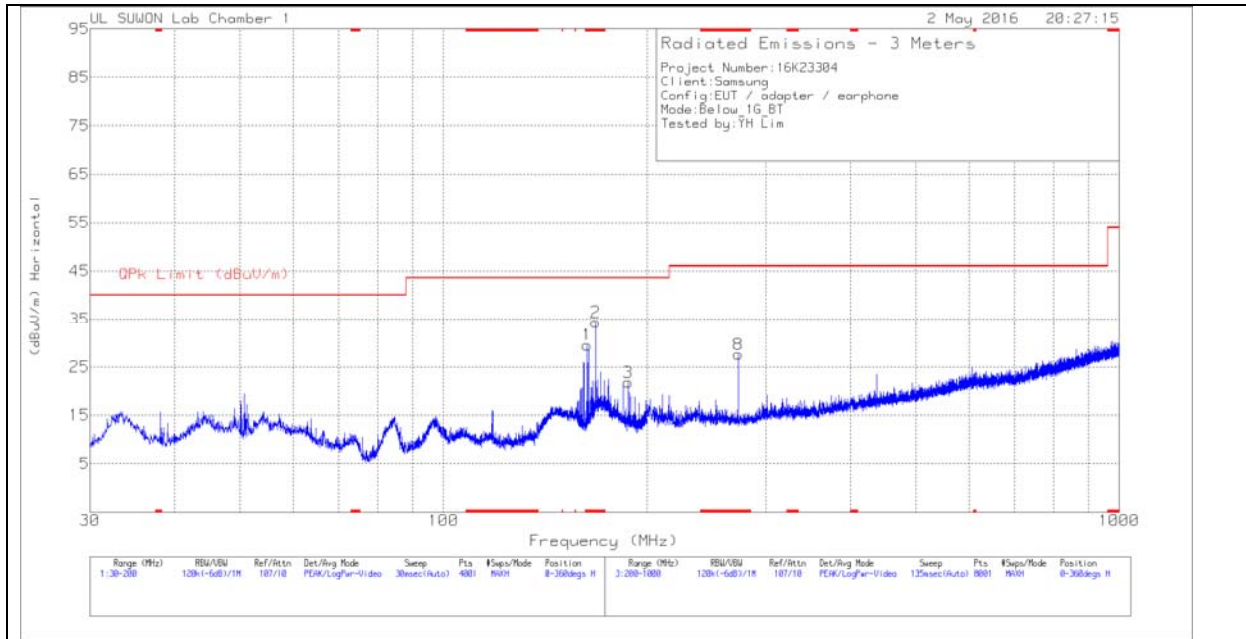
PK2 - Maximum Peak

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

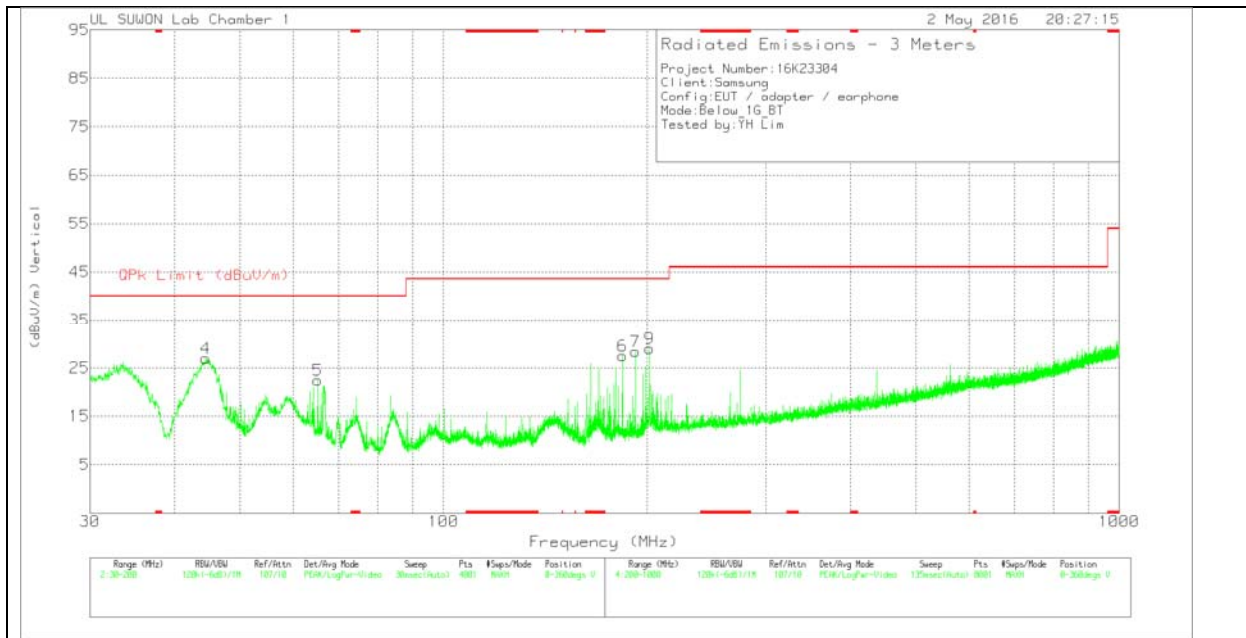
9.3. WORST-CASE BELOW 1 GHz

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	* 163.3225	49.5	Pk	8.6	-28.5	29.6	43.52	-13.92	0-360	100	H
2	* 167.955	54	Pk	8.9	-28.5	34.4	43.52	-9.12	0-360	100	H
3	187.505	40.06	Pk	10.1	-28.3	21.86	43.52	-21.66	0-360	100	H
4	44.4925	43.67	Pk	13.5	-30.2	26.97	40	-13.03	0-360	100	V
5	65.105	41.21	Pk	11.1	-29.9	22.41	40	-17.59	0-360	100	V
6	183.9775	46.05	Pk	9.8	-28.3	27.55	43.52	-15.97	0-360	100	V
7	192.35	46.03	Pk	10.6	-28.2	28.43	43.52	-15.09	0-360	100	V
8	* 273.1	42.46	Pk	12.8	-27.6	27.66	46.02	-18.36	0-360	200	H
9	202	45.78	Pk	11.4	-28.2	28.98	43.52	-14.54	0-360	100	V

* - 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.

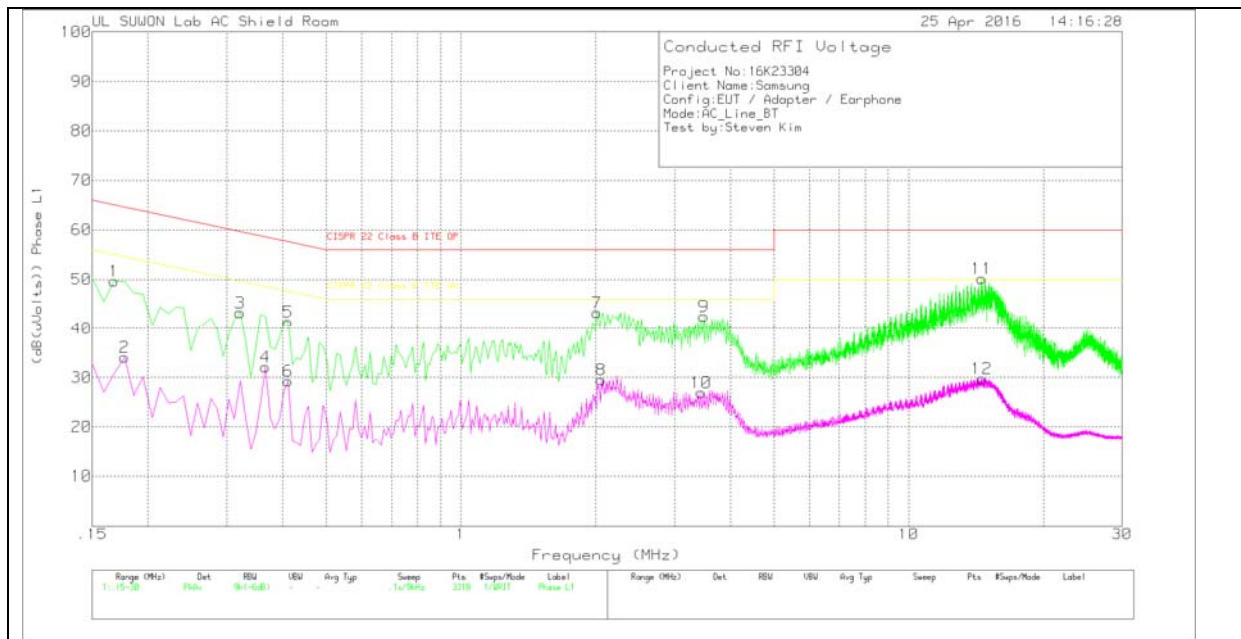
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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	.168	39.45	Pk	10.2	0	49.65	65.06	-15.41	-	-
2	.177	23.9	Av	10.2	0	34.1	-	-	54.63	-20.53
3	.321	33.29	Pk	10	0	43.29	59.68	-16.39	-	-
4	.366	22.05	Av	10.1	0	32.15	-	-	48.59	-16.44
5	.411	31.33	Pk	10.1	0	41.43	57.63	-16.2	-	-
6	.411	19.23	Av	10.1	0	29.33	-	-	47.63	-18.3
7	2.013	33.31	Pk	9.8	.1	43.21	56	-12.79	-	-
8	2.058	19.64	Av	9.8	.1	29.54	-	-	46	-16.46
9	3.489	32.62	Pk	9.8	.1	42.52	56	-13.48	-	-
10	3.444	17.09	Av	9.8	.1	26.99	-	-	46	-19.01
11	14.586	39.93	Pk	10.1	.2	50.23	60	-9.77	-	-
12	14.586	19.53	Av	10.1	.2	29.83	-	-	50	-20.17

Pk - Peak detector

Av - Average detection

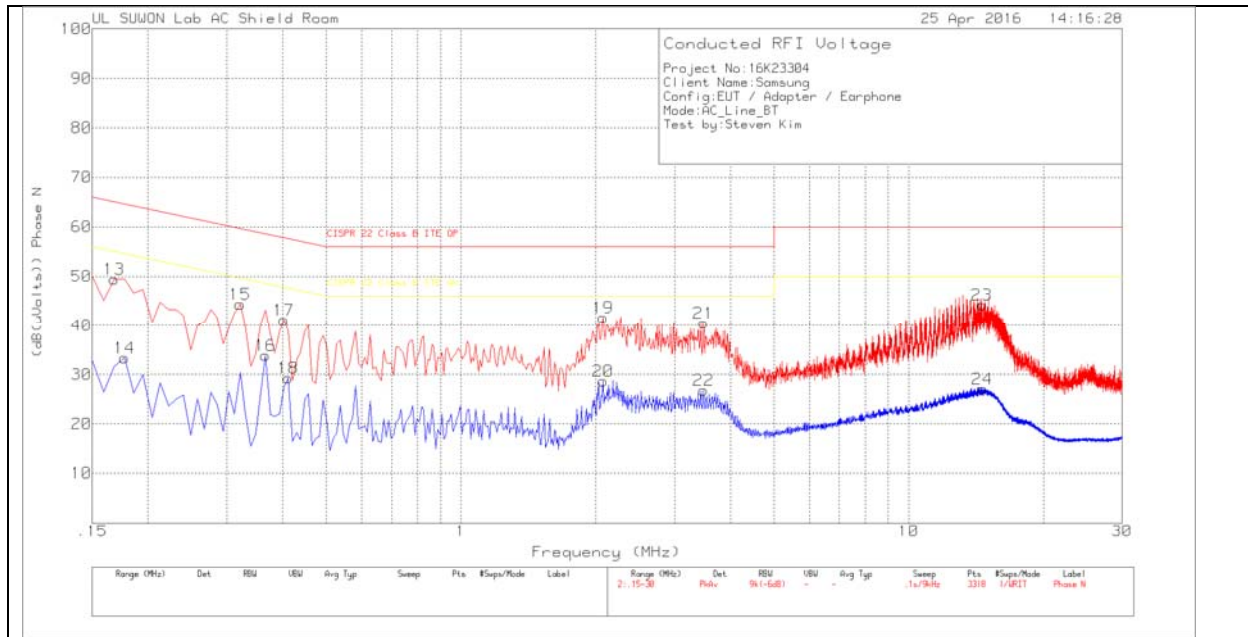
Quasi-Peak Emissions

Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101837_wit h ex-cord_L1	CE Shield Room	Corrected Reading (dB(uVolts))	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
2.1435	27.6	Qp	9.8	.1	37.5	56	-18.5	-	-
14.7615	28.13	Qp	10.2	.2	38.53	60	-21.47	-	-

Qp - Quasi-Peak detector

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	.168	39.28	Pk	10.2	0	49.48	65.06	-15.58	-	-
14	.177	23.26	Av	10.1	0	33.36	-	-	54.63	-21.27
15	.321	34.51	Pk	9.9	0	44.41	59.68	-15.27	-	-
16	.366	23.72	Av	10.1	0	33.82	-	-	48.59	-14.77
17	.402	31	Pk	10.1	0	41.1	57.81	-16.71	-	-
18	.411	19.13	Av	10.1	0	29.23	-	-	47.63	-18.4
19	2.076	31.71	Pk	9.8	.1	41.61	56	-14.39	-	-
20	2.076	18.71	Av	9.8	.1	28.61	-	-	46	-17.39
21	3.48	30.68	Pk	9.8	.1	40.58	56	-15.42	-	-
22	3.48	16.89	Av	9.8	.1	26.79	-	-	46	-19.21
23	14.577	33.76	Pk	10.3	.2	44.26	60	-15.74	-	-
24	14.631	16.6	Av	10.3	.2	27.1	-	-	50	-22.9

Pk - Peak detector

Av - Average detection

Quasi-Peak Emissions

Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101837_wit h ex-cord_N	CE Shield Room	Corrected Reading (dB(uVolts))	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
2.1813	25.59	Qp	9.8	.1	35.49	56	-20.51	-	-
15.0054	22.7	Qp	10.3	.2	33.2	60	-26.8	-	-

Qp - Quasi-Peak detector