



FCC CFR47 PART 15 SUBPART C

**BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT**

FOR

GSM/WCDMA/LTE Phone + Bluetooth, WLAN DTS/UNII a/b/g/n, ANT+ and NFC

MODEL NUMBER: SM-A500G/DS, SM-A500G

FCC ID: A3LSMA500G

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NVLAP LAB CODE 200065-0

Revision History

Issue			
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--	9/22/14	Initial issue	P. Zhang
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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	7
4.1. MEASURING INSTRUMENT CALIBRATION	7
4.2. SAMPLE CALCULATION	7
4.3. MEASUREMENT UNCERTAINTY	7
5. EQUIPMENT UNDER TEST	8
5.1. DESCRIPTION OF EUT	8
5.2. MAXIMUM OUTPUT POWER	8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	8
5.4. WORST-CASE CONFIGURATION AND MODE	9
5.5. DESCRIPTION OF TEST SETUP	10
6. TEST AND MEASUREMENT EQUIPMENT	12
7. SUMMARY TABLE	13
8. ANTENNA PORT TEST RESULTS	14
8.1. 20 dB AND 99% BANDWIDTH	14
8.1.1. BASIC DATA RATE GFSK MODULATION	14
8.1.2. ENHANCED DATA RATE 8PSK MODULATION	14
20 dB AND 99% BANDWIDTH PLOTS	15
8.2. HOPPING FREQUENCY SEPARATION	27
8.3. NUMBER OF HOPPING CHANNELS	29
8.4. AVERAGE TIME OF OCCUPANCY	34
8.5. OUTPUT POWER	42
8.5.1. BASIC DATA RATE GFSK MODULATION	42
8.5.2. ENHANCED DATA RATE 8PSK MODULATION	43
8.5.3. OUTPUT POWER PLOTS	44
8.6. AVERAGE POWER	50
8.6.1. BASIC DATA RATE GFSK MODULATION	50
8.6.2. DATA RATE PI/4-DQPSK MODULATION	51
8.6.3. ENHANCED DATA RATE 8PSK MODULATION	51

8.7.	CONDUCTED SPURIOUS EMISSIONS.....	52
8.7.1.	BASIC DATA RATE GFSK MODULATION.....	53
	ENHANCED DATA RATE 8PSK MODULATION	61
9.	RADIATED TEST RESULTS.....	69
9.1.	LIMITS AND PROCEDURE	69
9.2.	TRANSMITTER ABOVE 1 GHz	71
9.2.1.	BASIC DATA RATE GFSK MODULATION.....	71
9.2.2.	ENHANCED DATA RATE 8PSK MODULATION	84
9.3.	WORST-CASE BELOW 1 GHz.....	97
10.	AC POWER LINE CONDUCTED EMISSIONS	100
11.	SETUP PHOTOS	104

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n, ANT+ and NFC
MODEL: SM-A500G/DS, SM-A500G
SERIAL NUMBER: 1962761 (Conducted), 1962762 (Radiated)
DATE TESTED: SEPTEMBER 22-25, 2014

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, 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 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 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.

47173 Benicia Street	47266 Benicia Street
☒ Chamber A	☐ Chamber D
☒ Chamber B	☐ Chamber E
☒ Chamber C	☐ Chamber F
	☒ Chamber G

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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	3.52 dB
Radiated Disturbance, 30 to 26000 MHz	4.94 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/LTE Phone + Bluetooth, DTS/UNII a/b/g/n, ANT+ and NFC.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	13.62	23.01
2402 - 2480	Enhanced 8PSK	13.63	23.07

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 -5.49 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,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
AC Adapter	SAMSUNG	ETA0U83EWE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

I/O CABLES

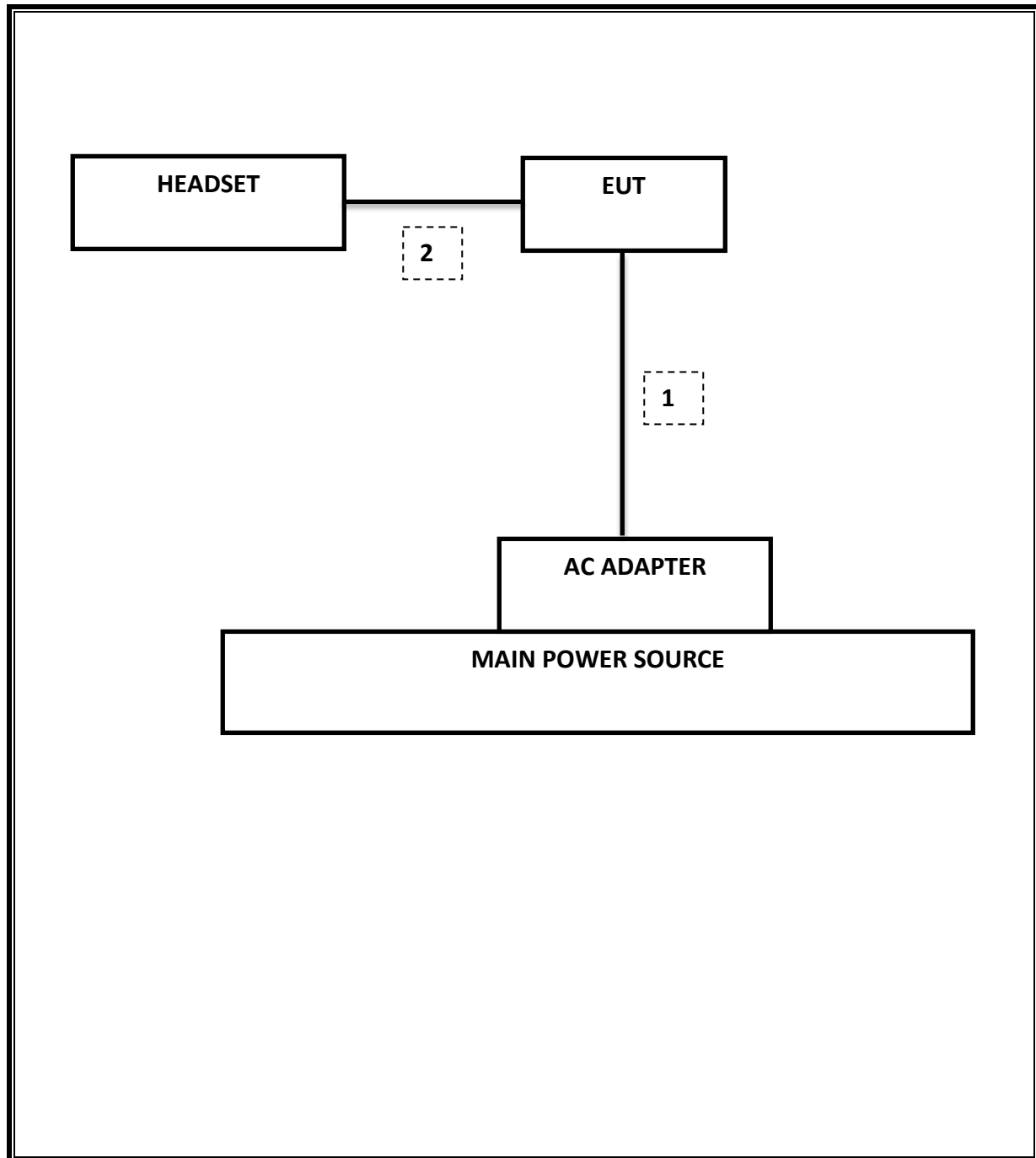
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

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	Asset	Cal Due
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/14
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
CBT Bluetooth Tester	R & S	CBT	None	07/12/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14

7. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	RSS-GEN 4.6	Occupied Band width (99%)	N/A	Conducted	Pass	1.195MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-45.36dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	13.63dBm
15.247 (a)(1)	RSS-210 A8.1(b)	Hopping frequency separation	> 25KHz		Pass	1MHz
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Number of Hopping channels	More than 15 non-overlapping channels		Pass	79
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Avg Time of Occupancy	< 0.4sec		Pass	0.3157s
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	29.02dBuV
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	47.49dBuV/m

8. ANTENNA PORT TEST RESULTS

8.1. 20 dB AND 99% BANDWIDTH

LIMIT

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	0.96	0.90
Middle	2441	0.95	0.93
High	2480	0.97	0.99
Worst		0.90	0.90

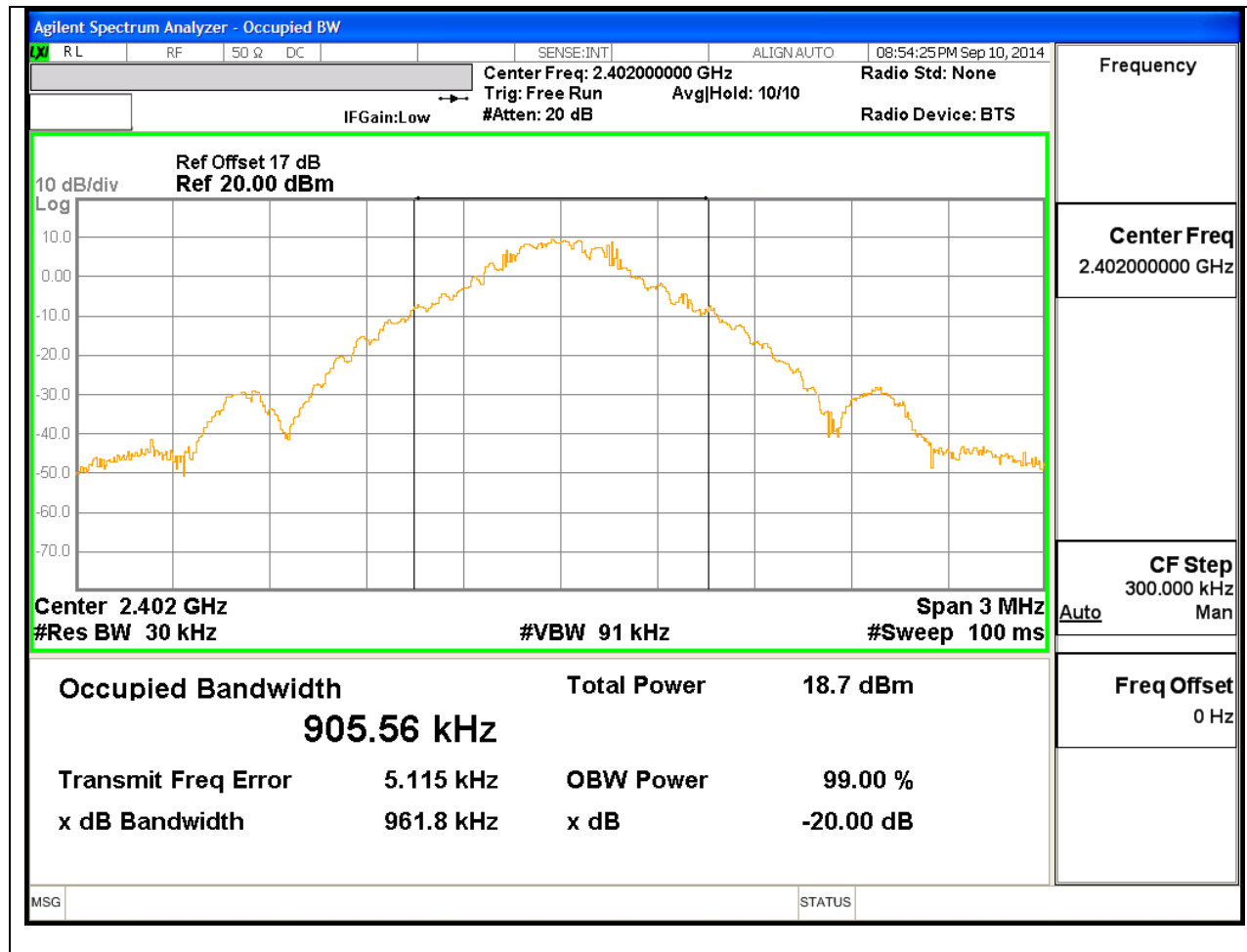
8.1.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.284	1.195
Middle	2441	1.294	1.153
High	2480	1.265	1.175
Worst		1.18	1.15

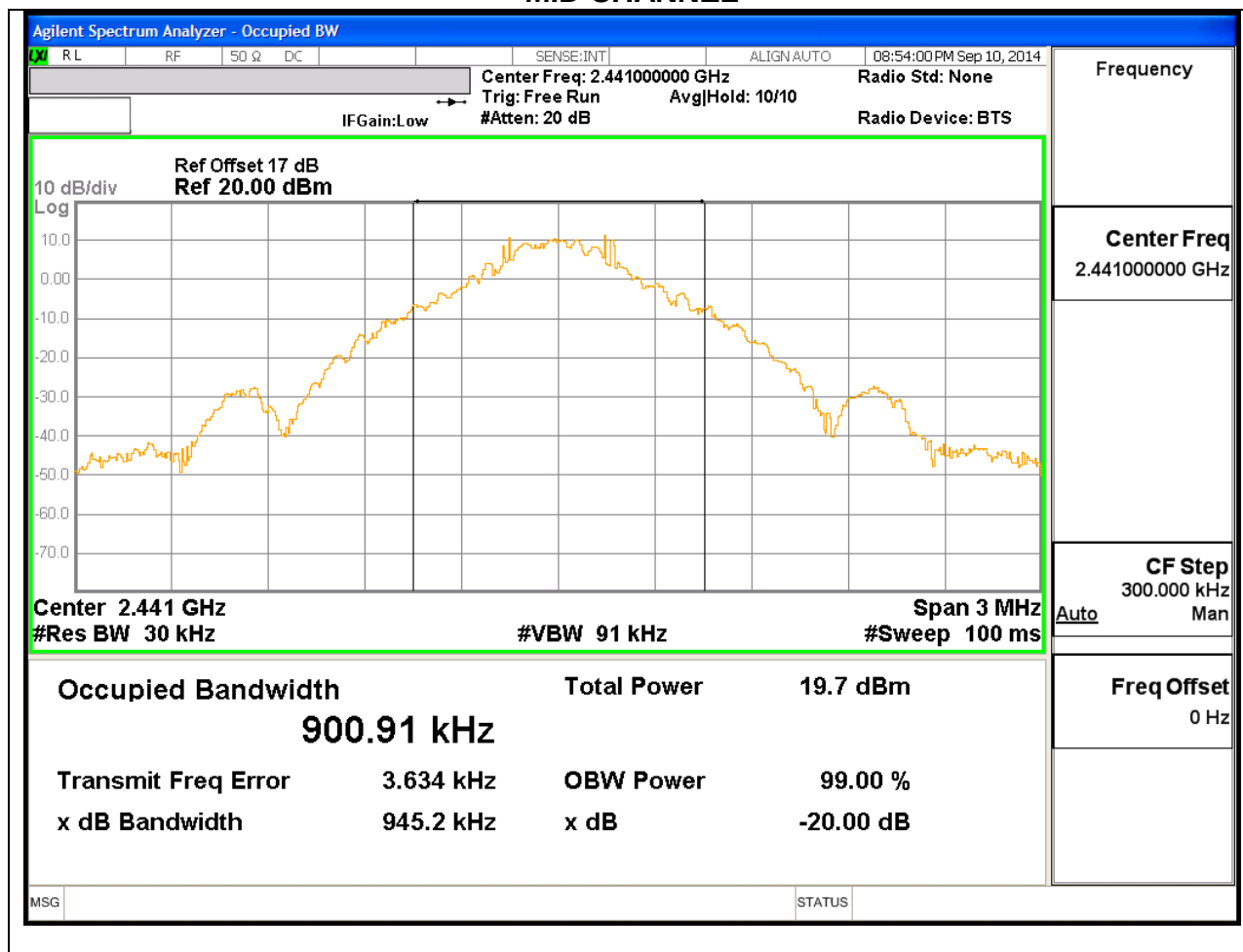
20 dB AND 99% BANDWIDTH PLOTS

GFSK 20 dB BANDWIDTH

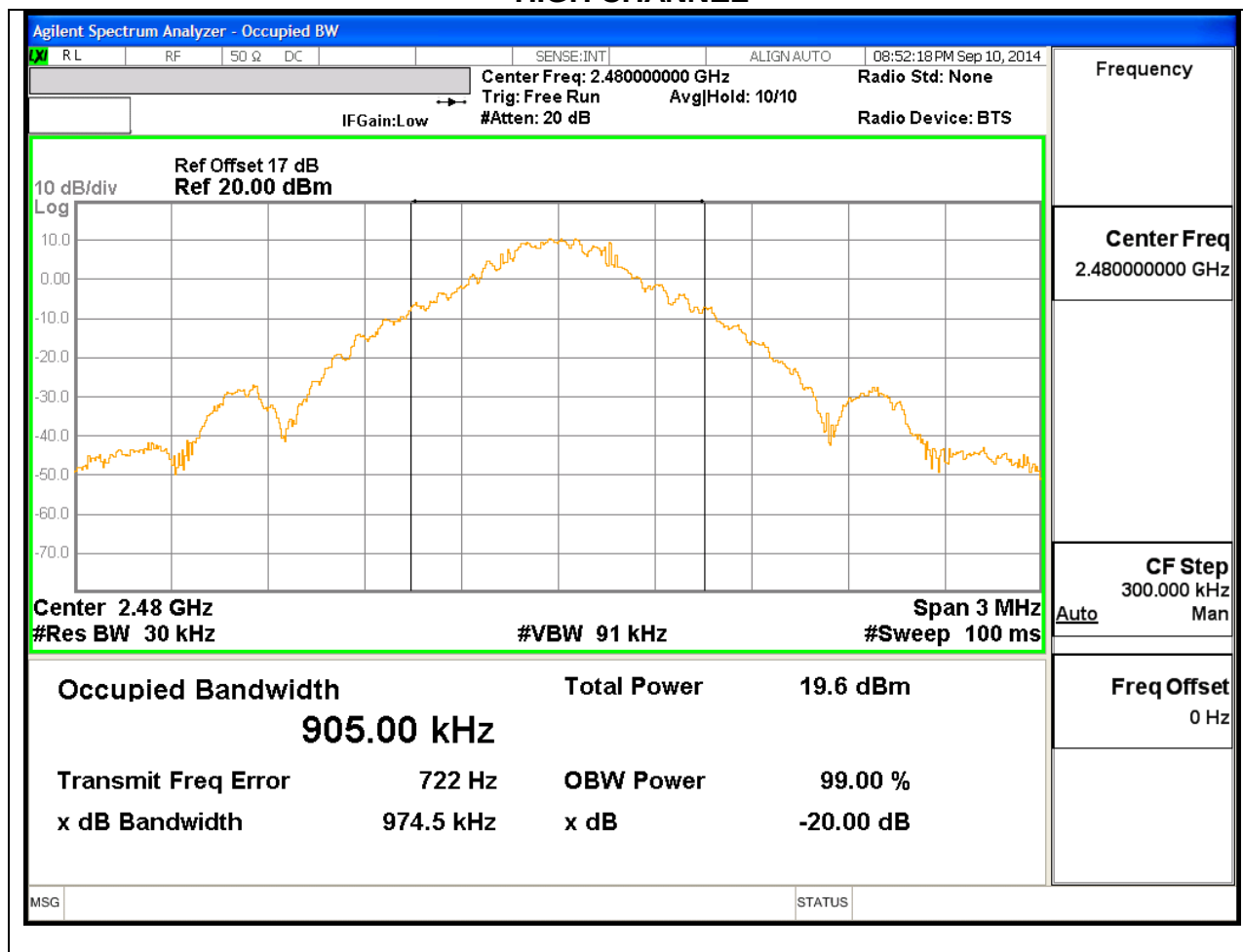
LOW CHANNEL



MID CHANNEL

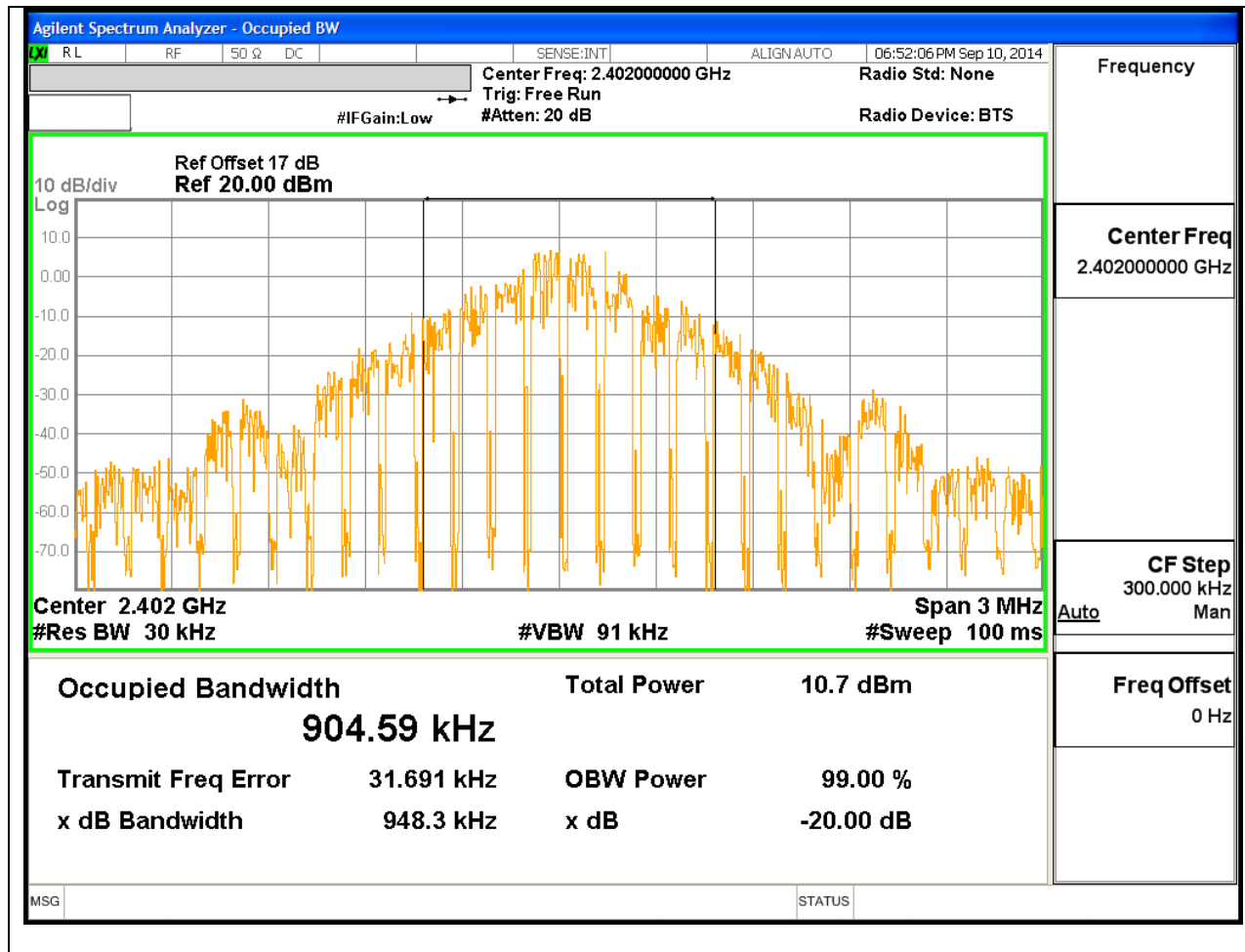


HIGH CHANNEL

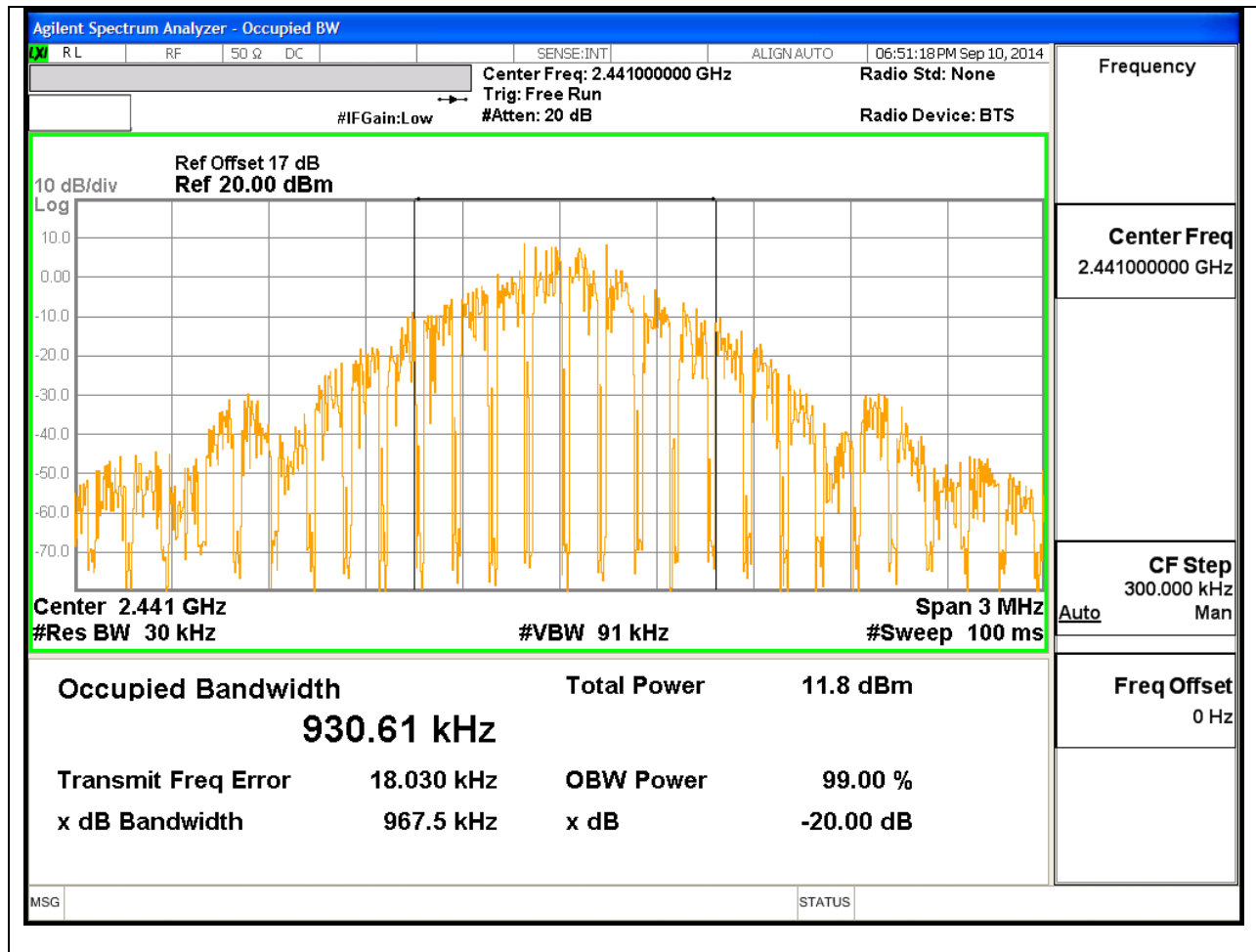


GFSK 99% BANDWIDTH

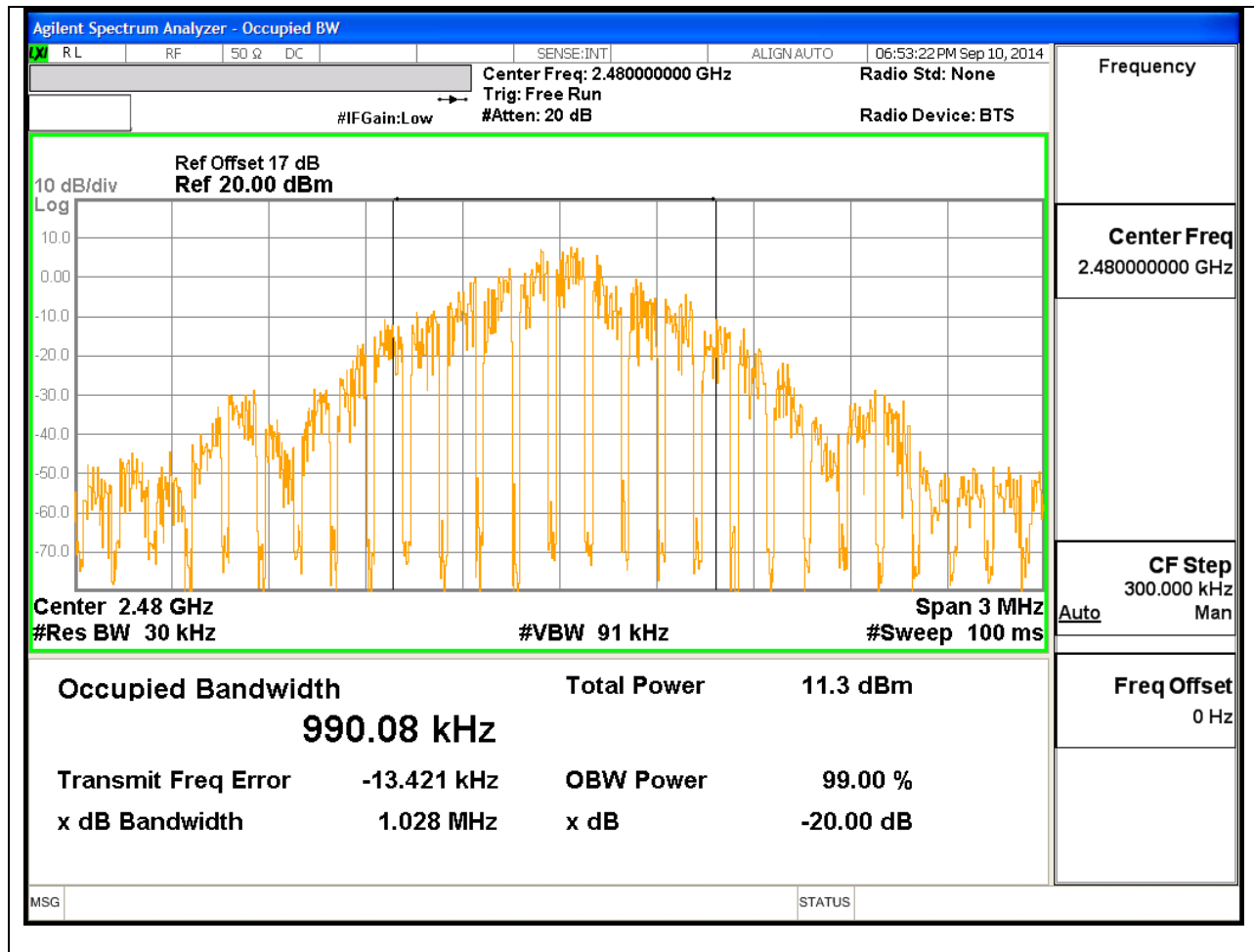
LOW CHANNEL



MID CHANNEL

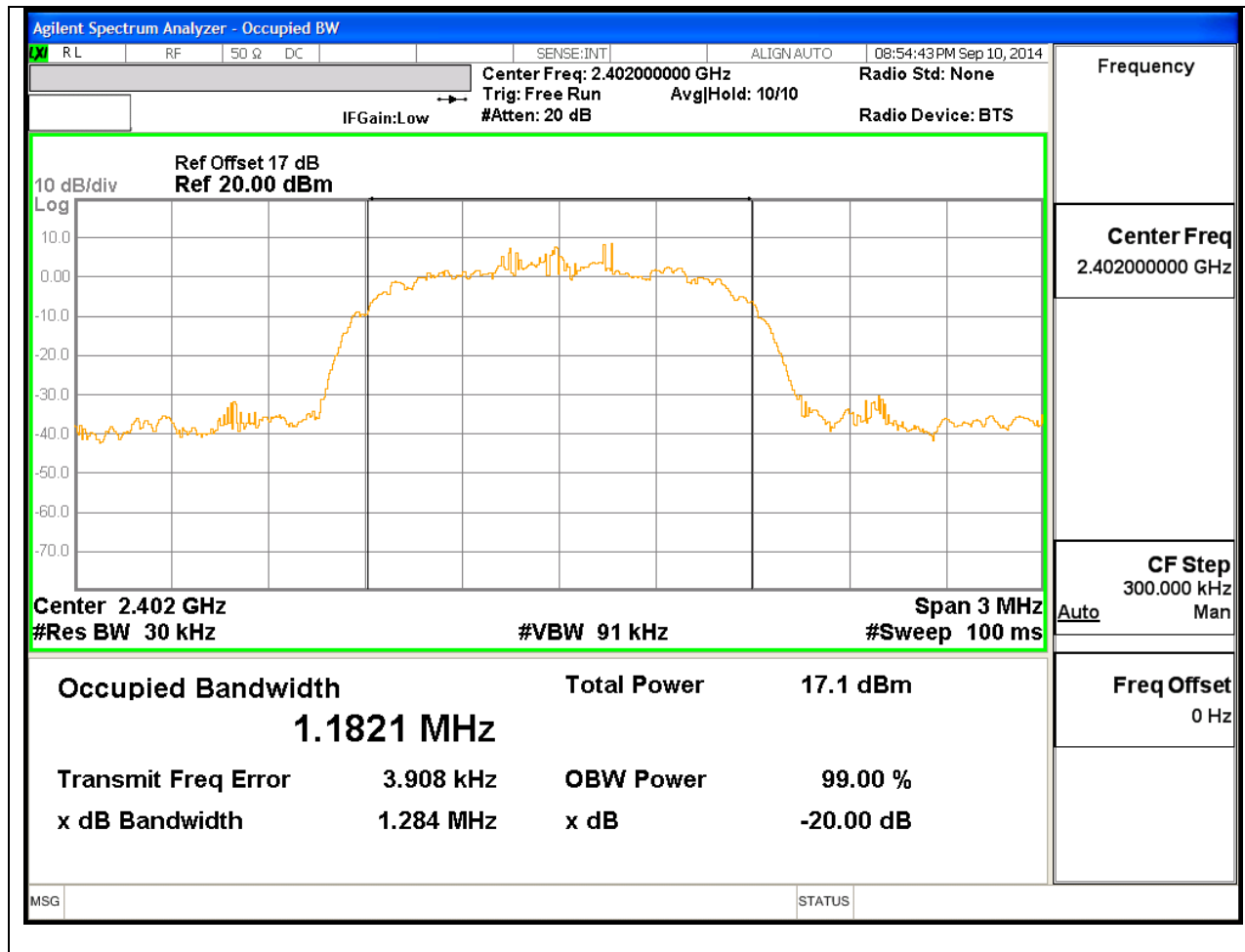


HIGH CHANNEL

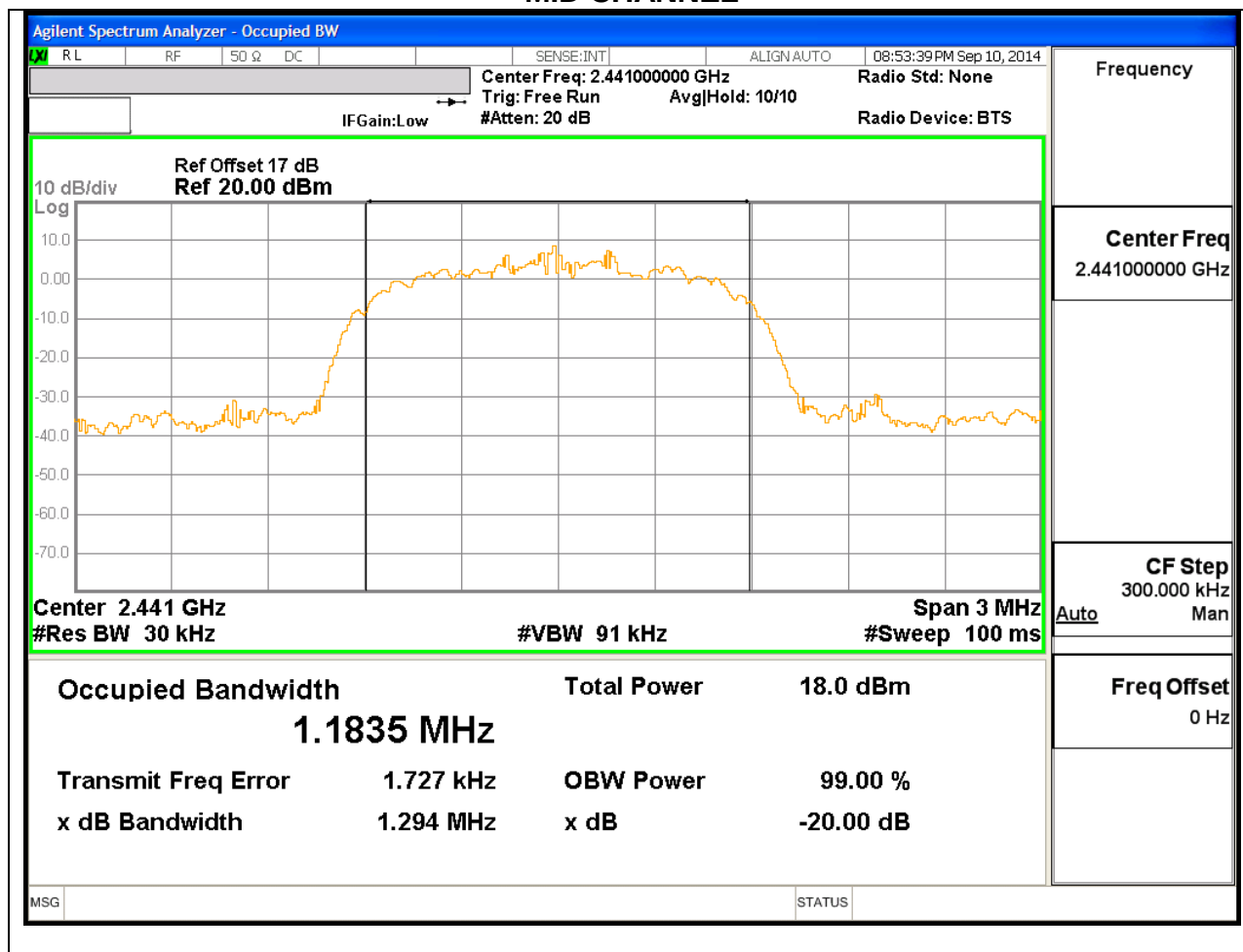


8PSK 20 dB BANDWIDTH

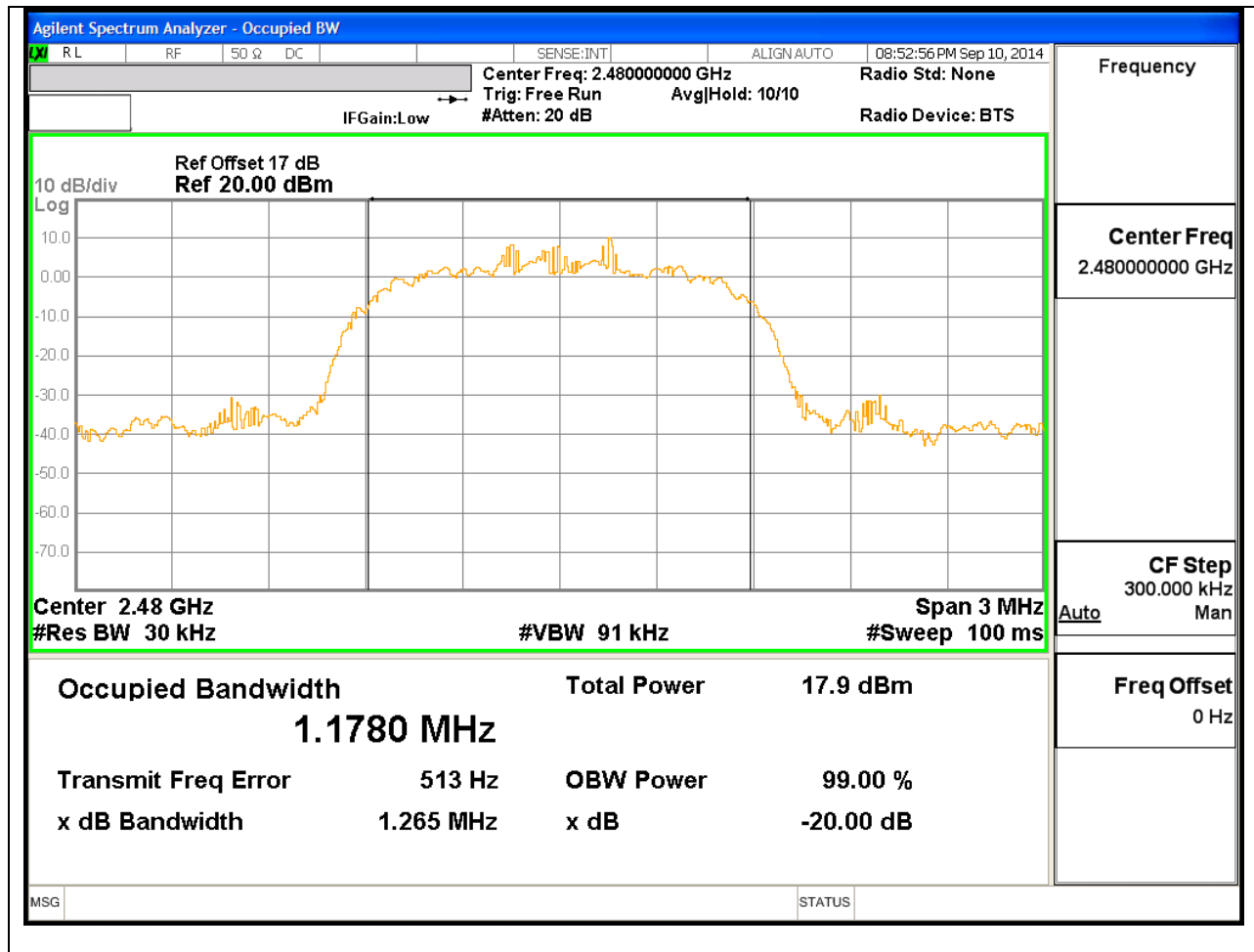
LOW CHANNEL



MID CHANNEL

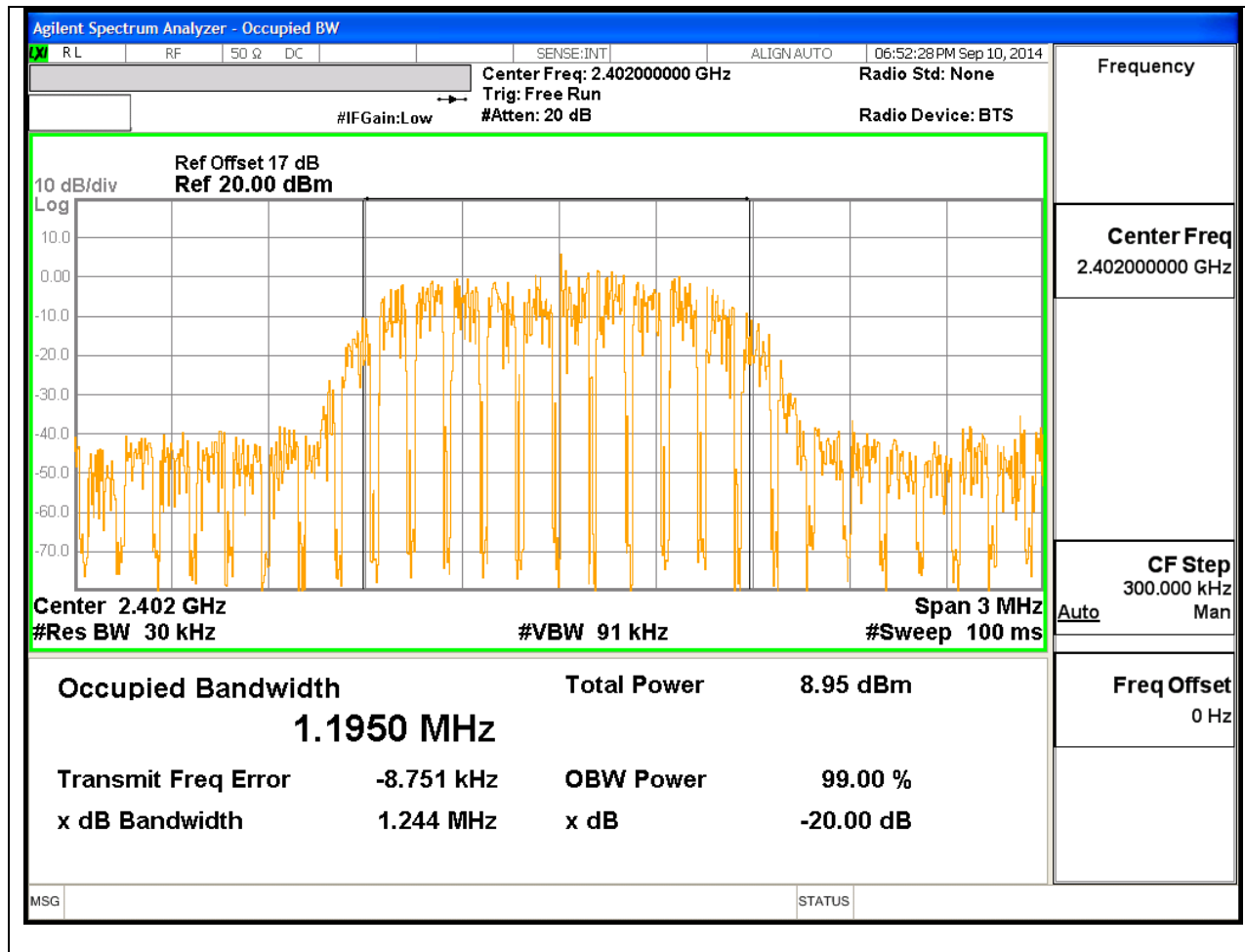


HIGH CHANNEL

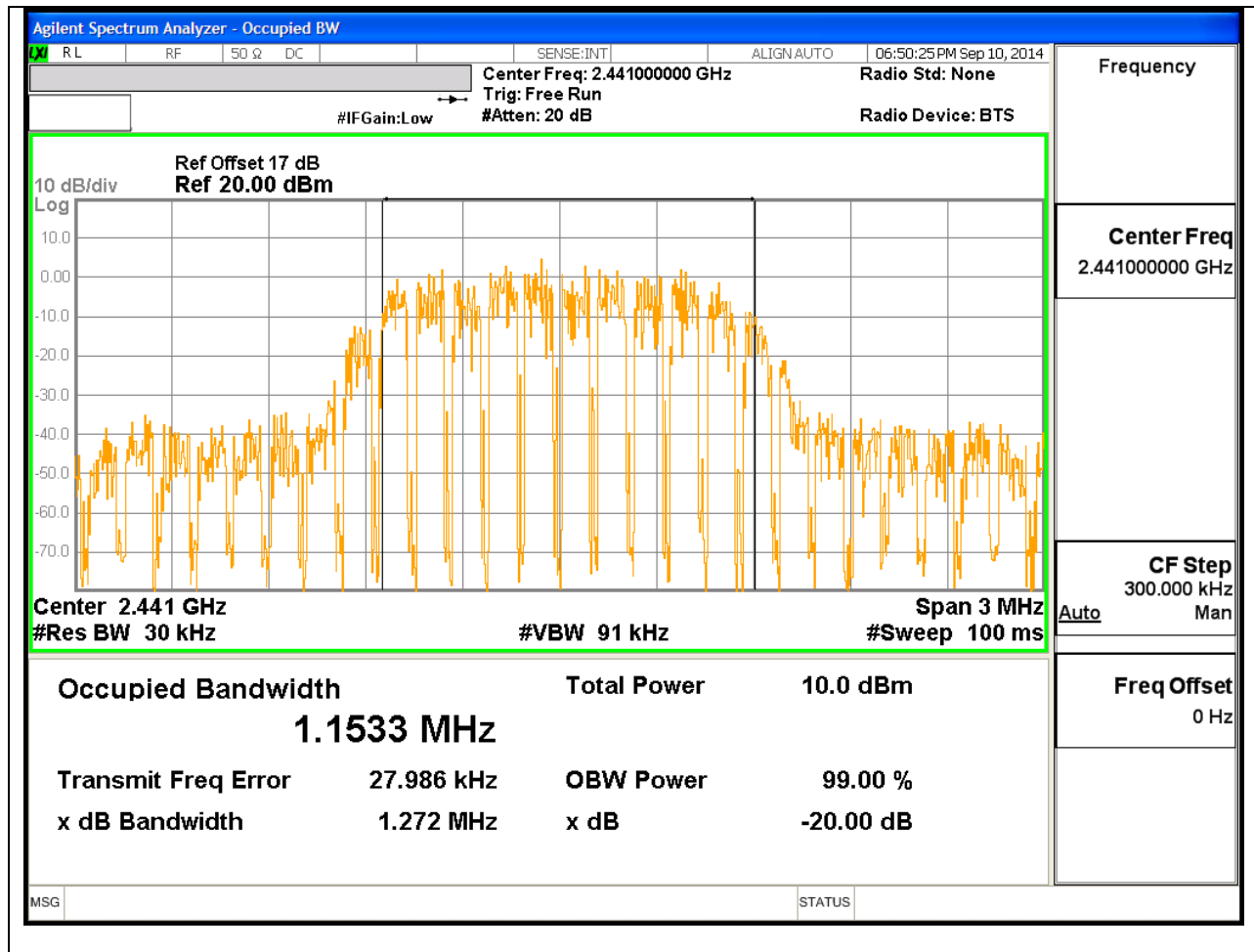


8PSK 99% BANDWIDTH

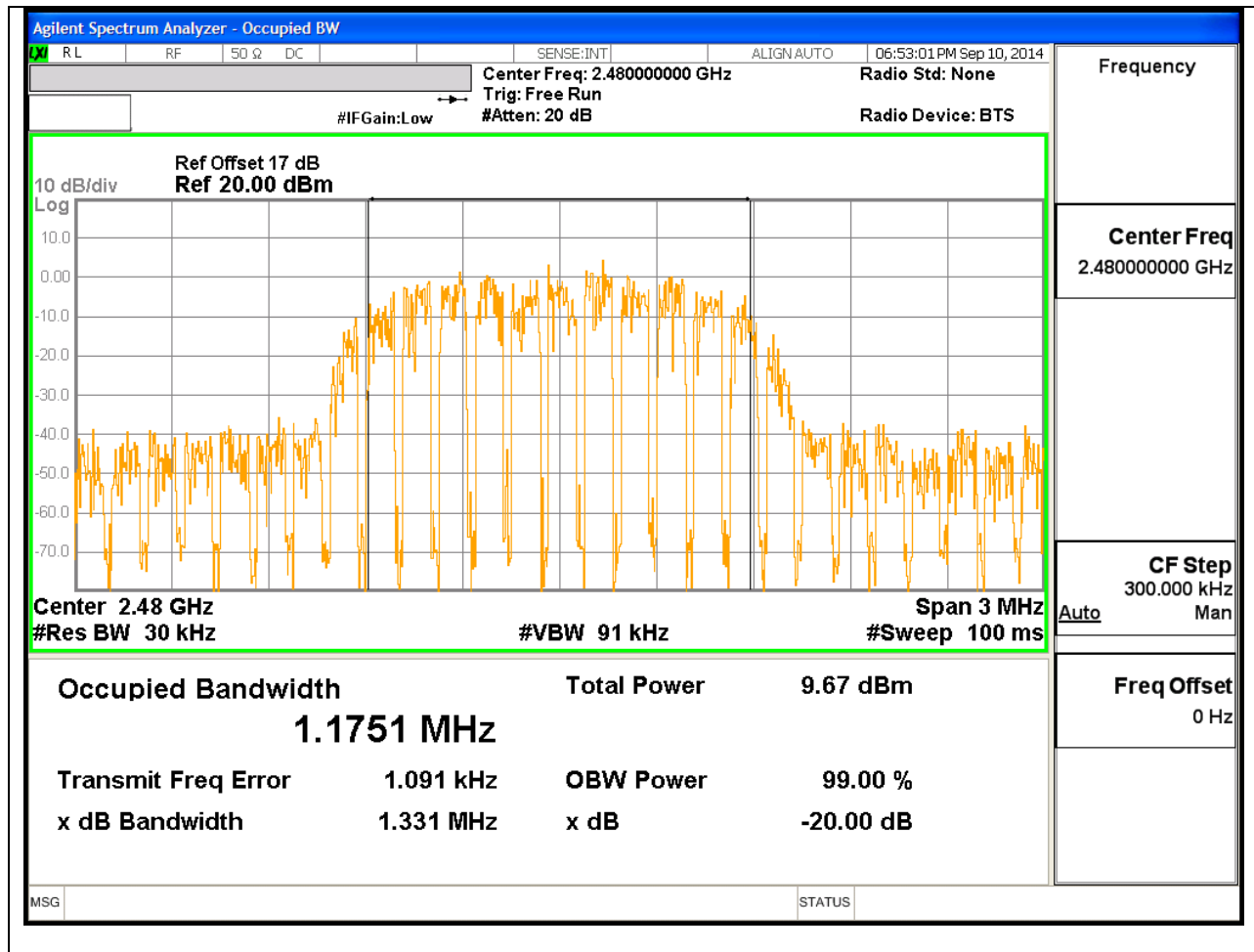
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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

8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

TEST PROCEDURE

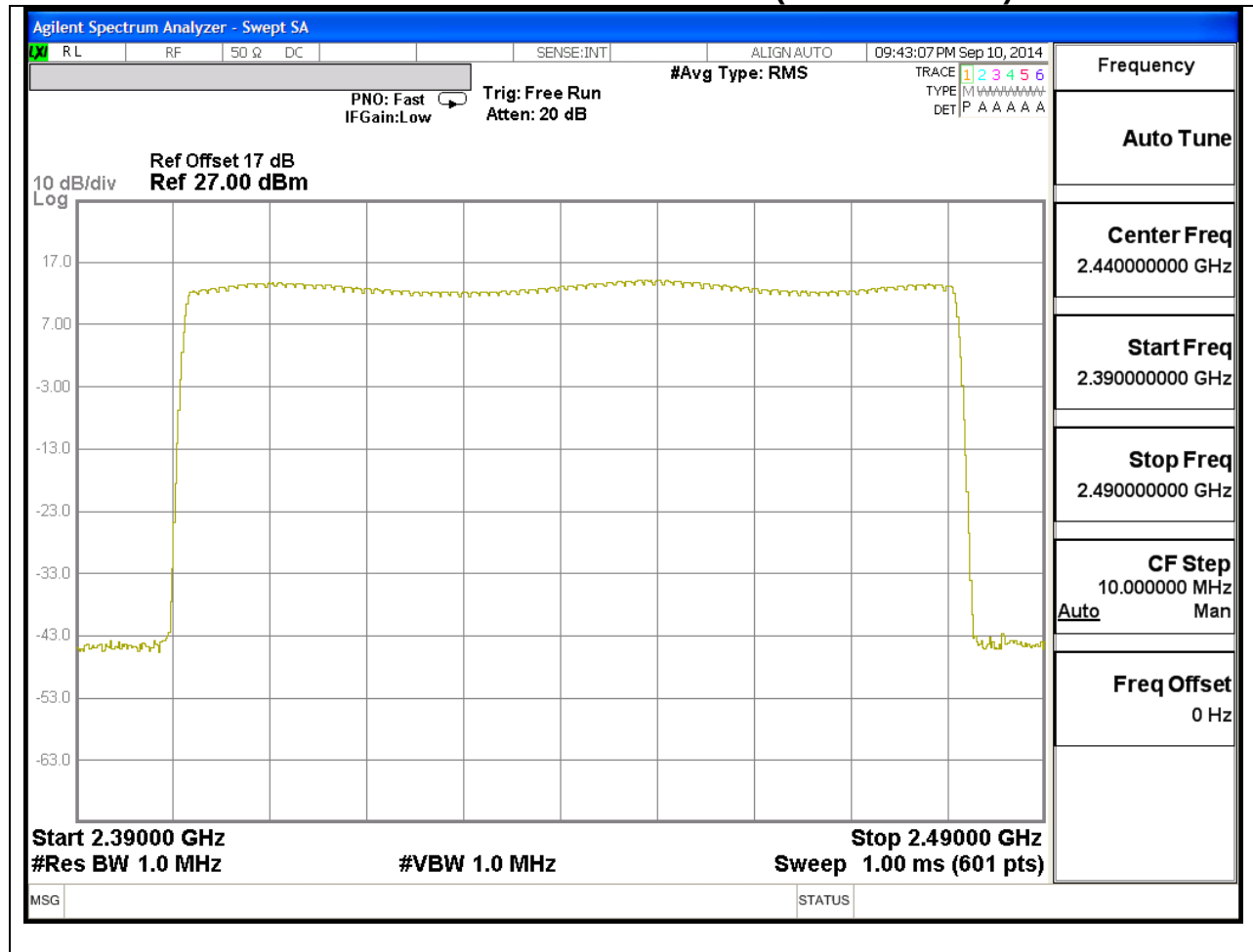
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

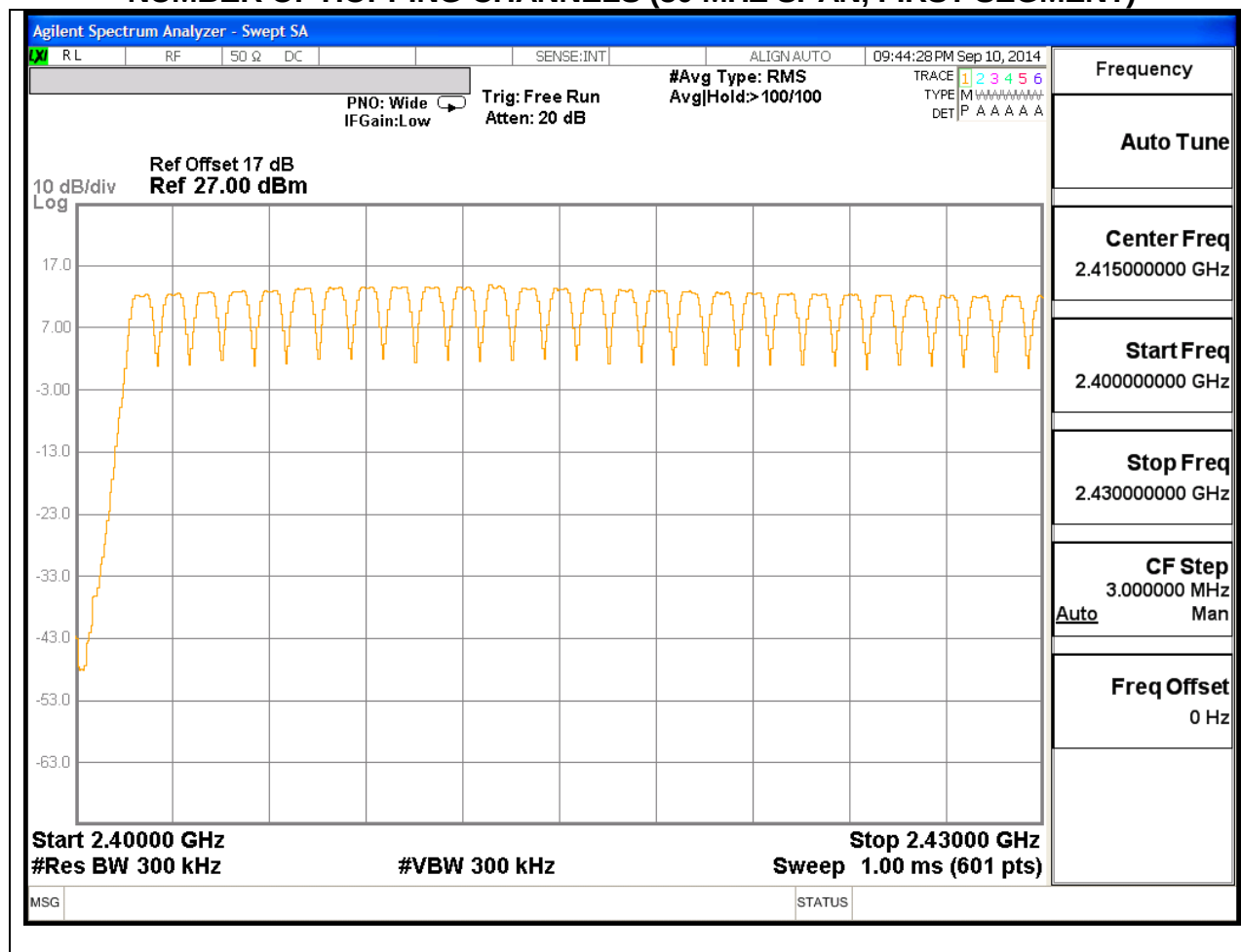
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS PLOTS

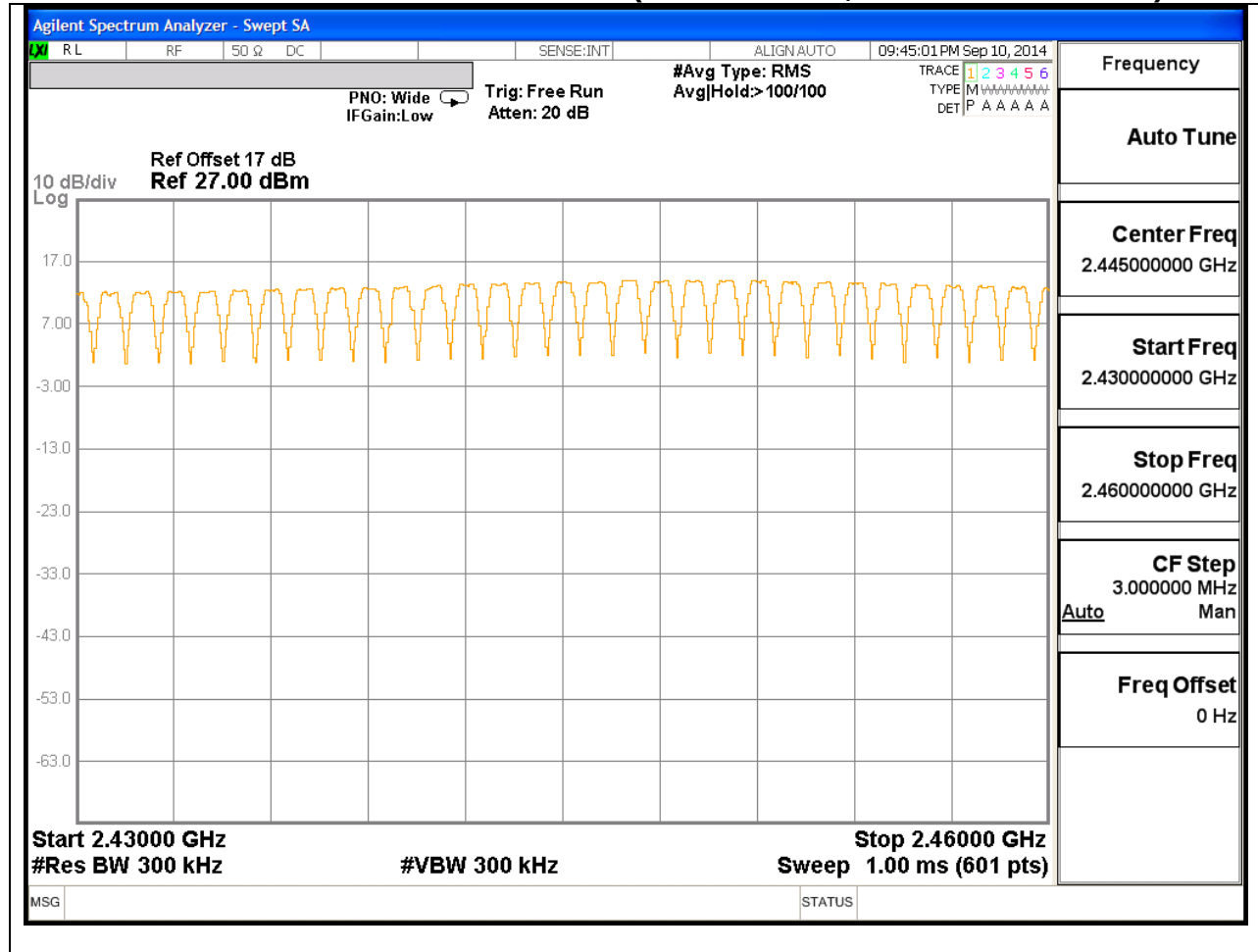
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



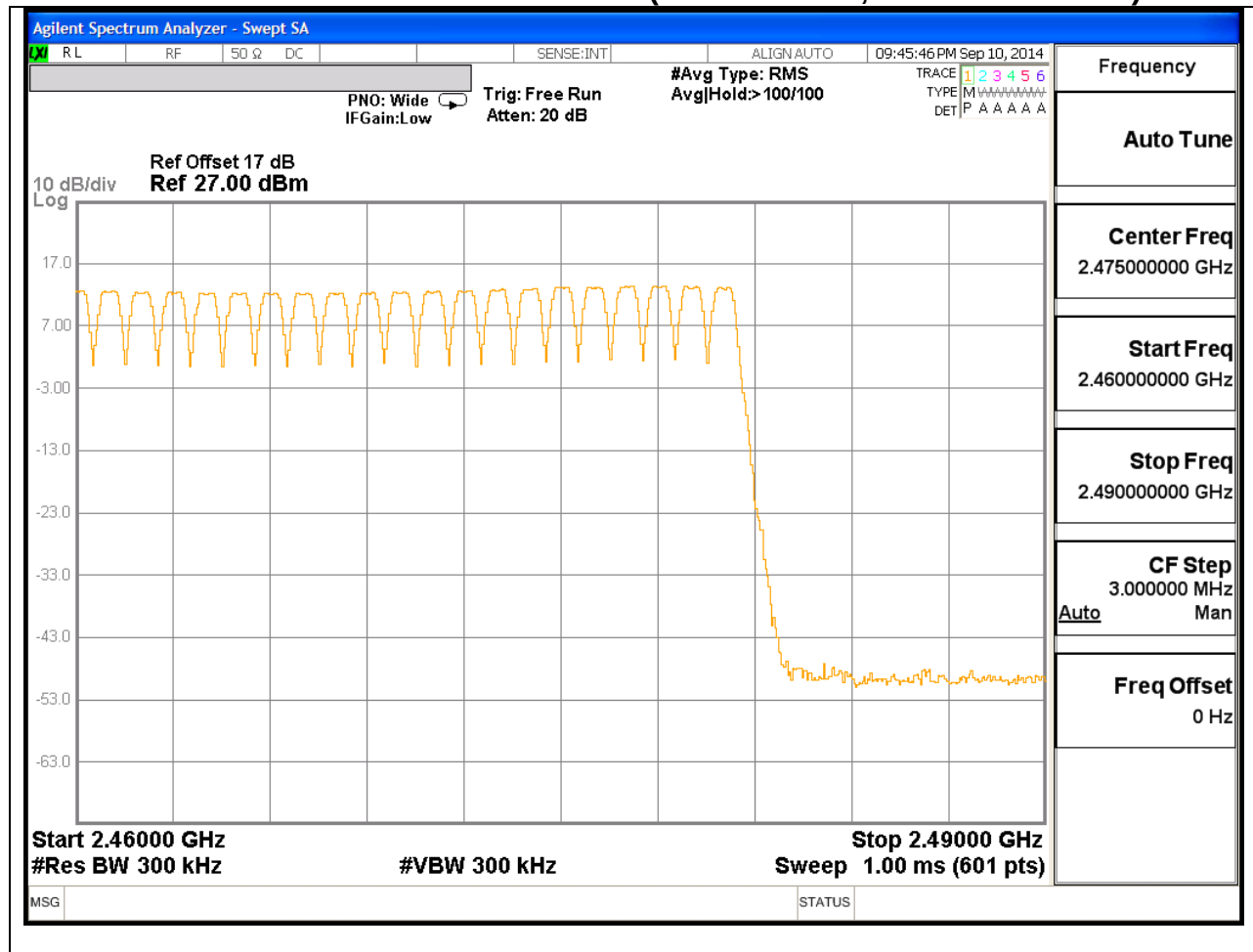
NUMBER OF HOPPING CHANNELS (30 MHz SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHz SPAN, THIRD SEGMENT)



8.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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.

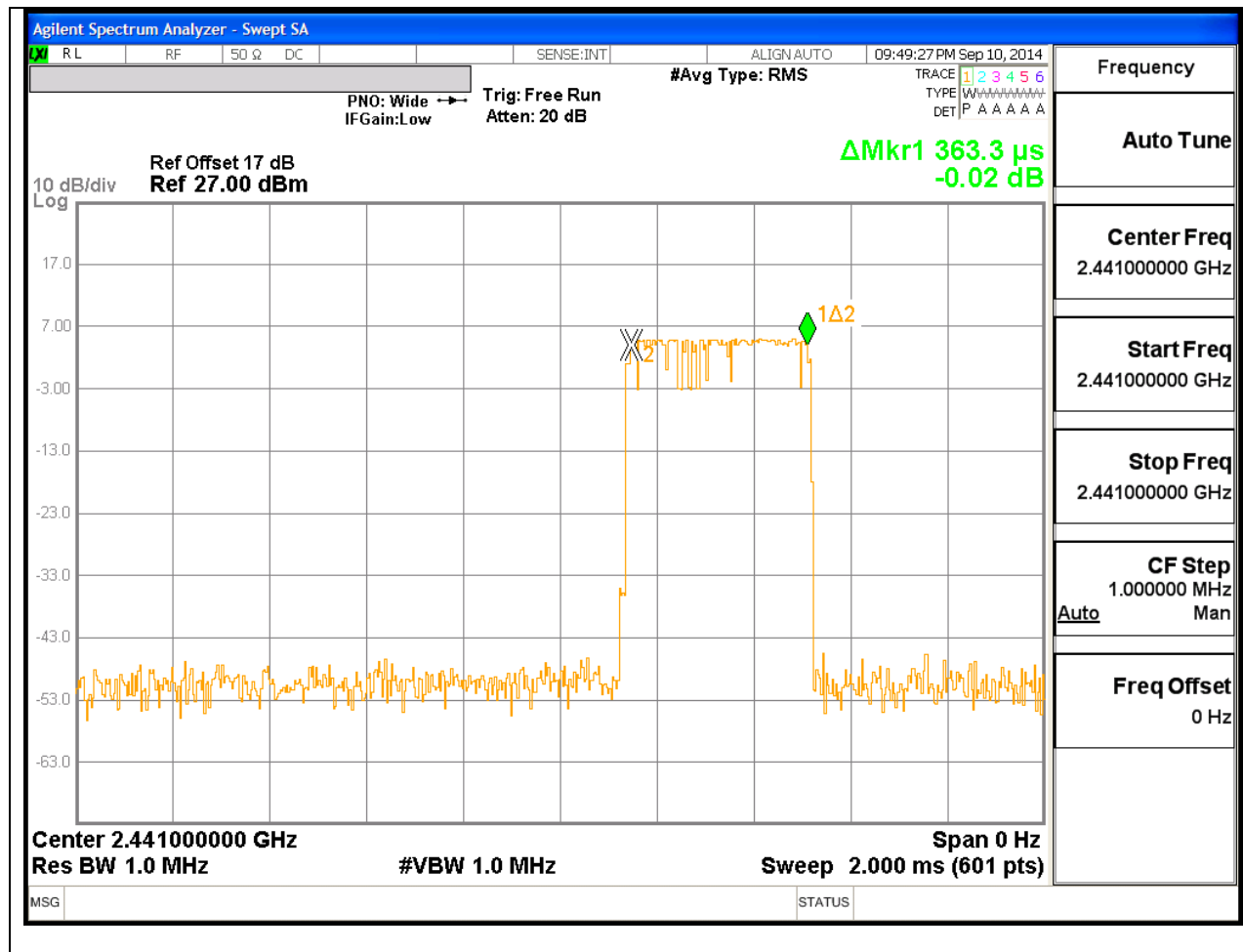
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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

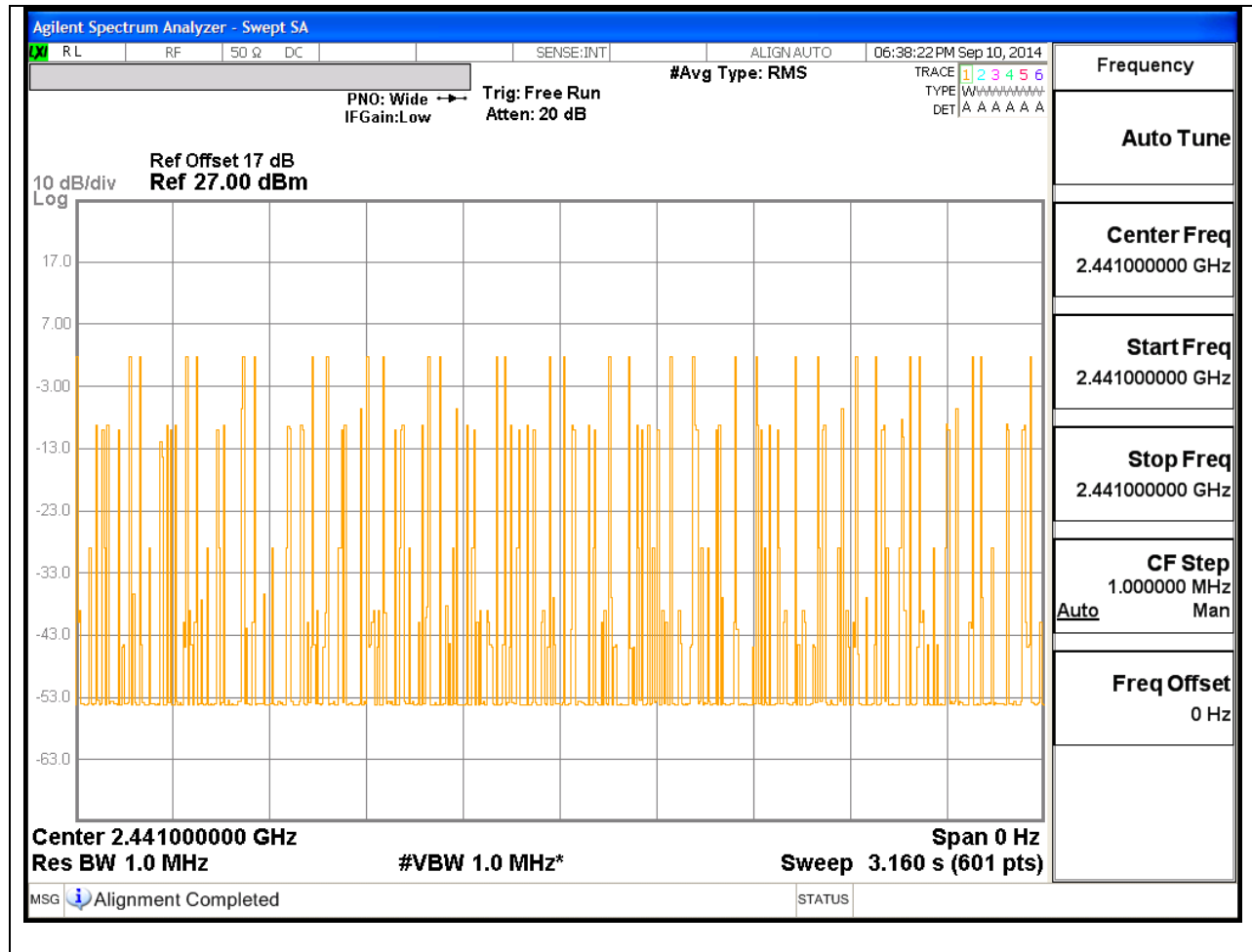
RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.363	33	0.11979	0.4	-0.28021
DH3	1.633	14	0.22862	0.4	-0.17138
DH5	2.87	11	0.3157	0.4	-0.0843
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.363	8.25	0.0299475	0.4	-0.37005
DH3	1.633	3.5	0.057155	0.4	-0.34285
DH5	2.87	2.75	0.078925	0.4	-0.32108

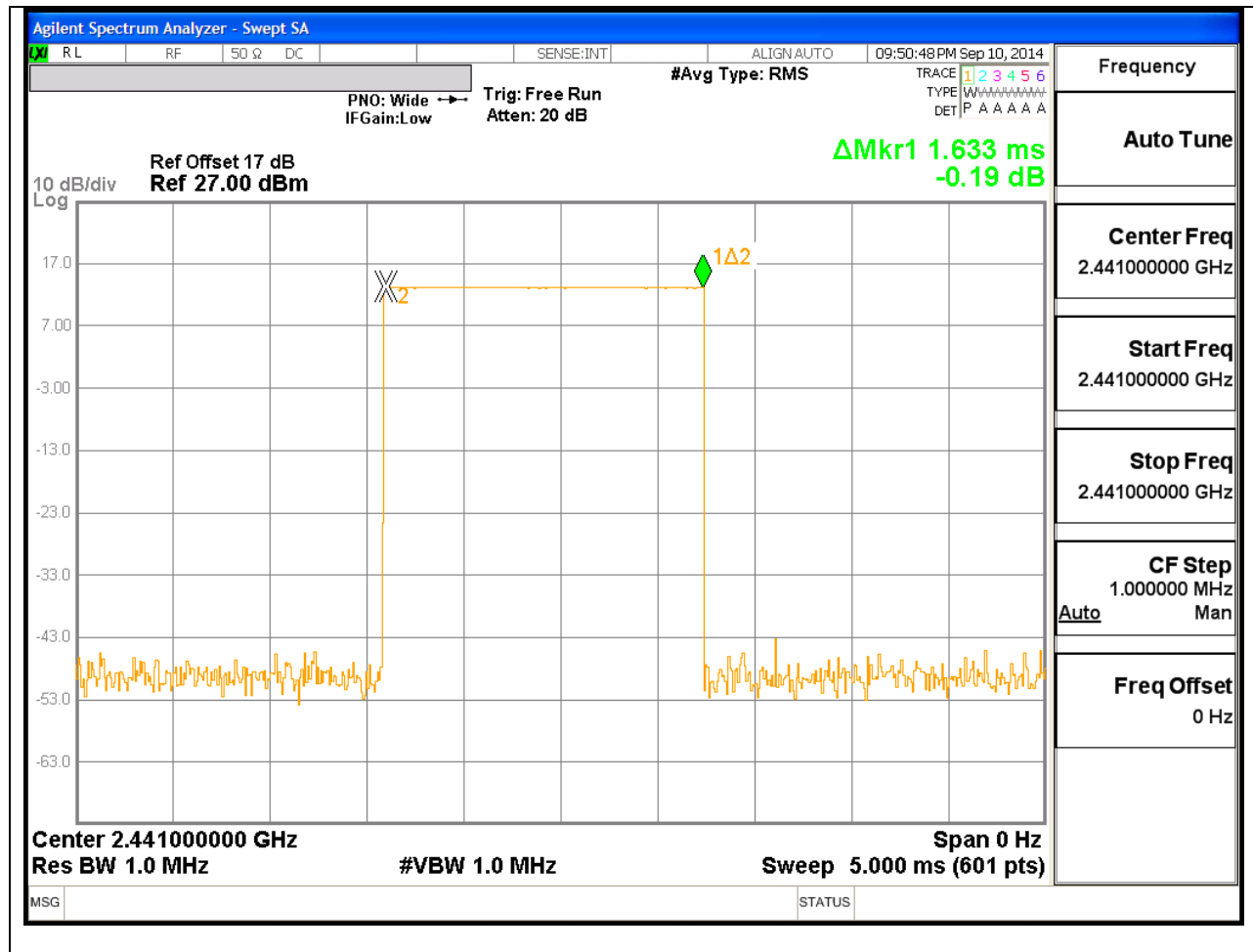
PULSE WIDTH - DH1



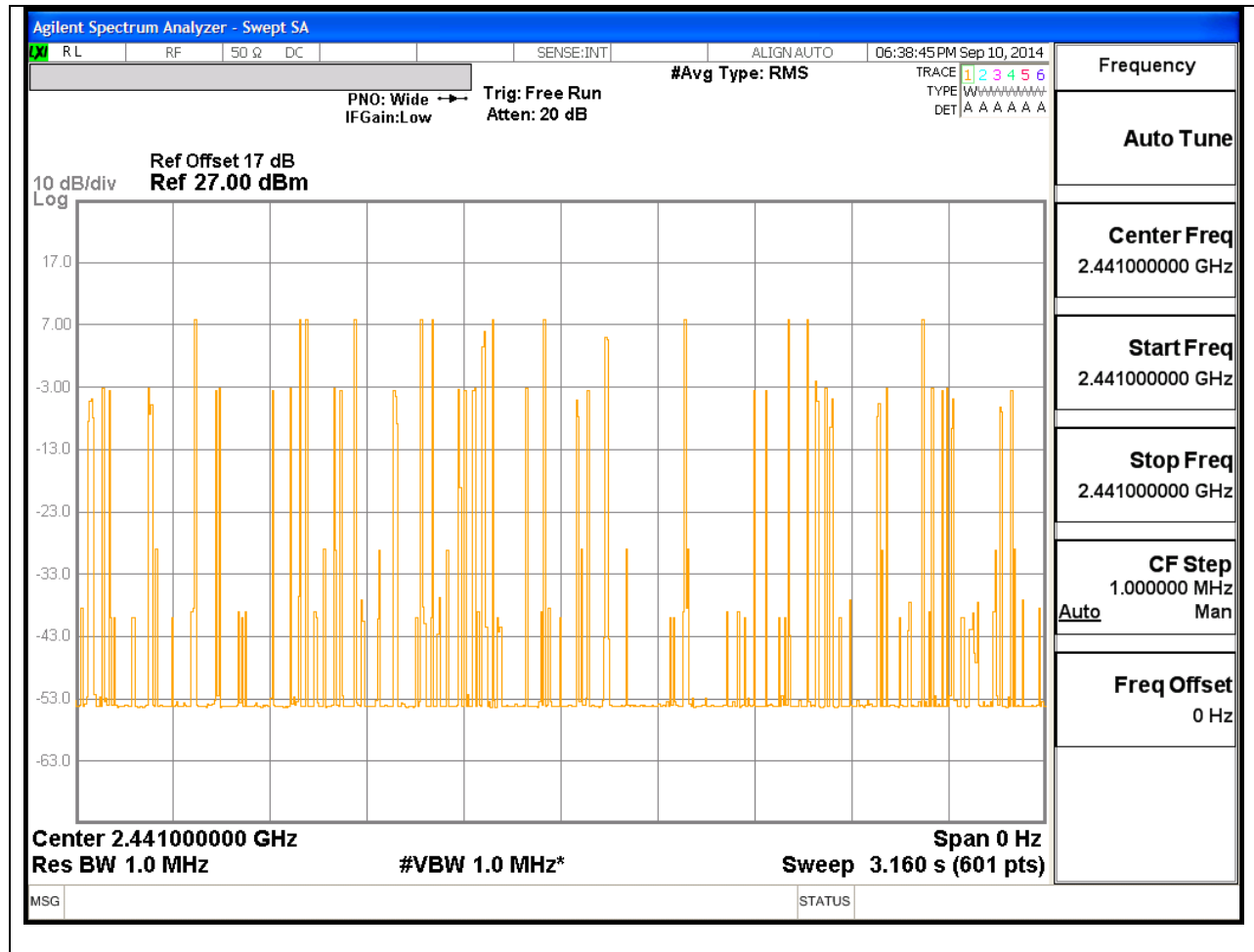
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



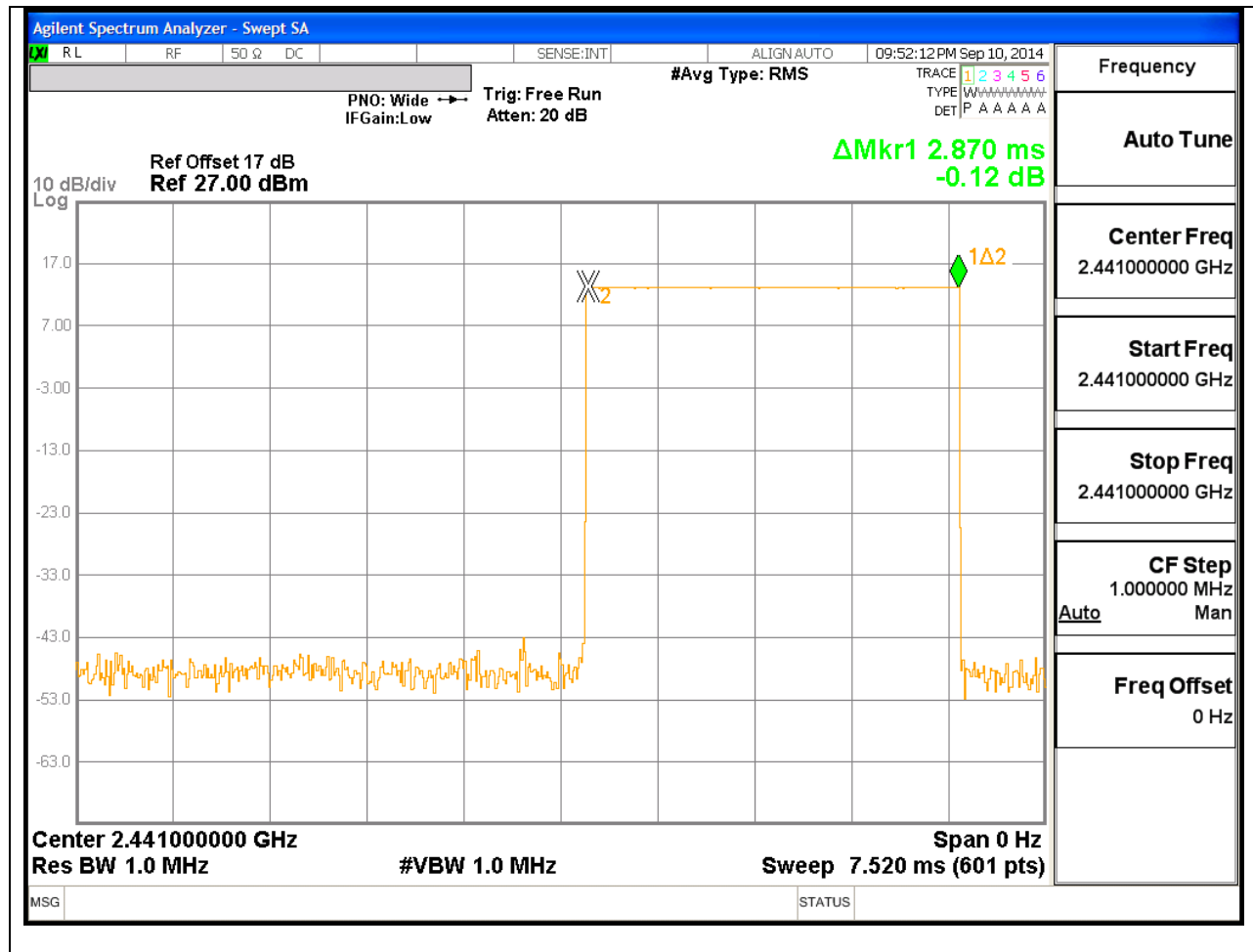
PULSE WIDTH - DH3



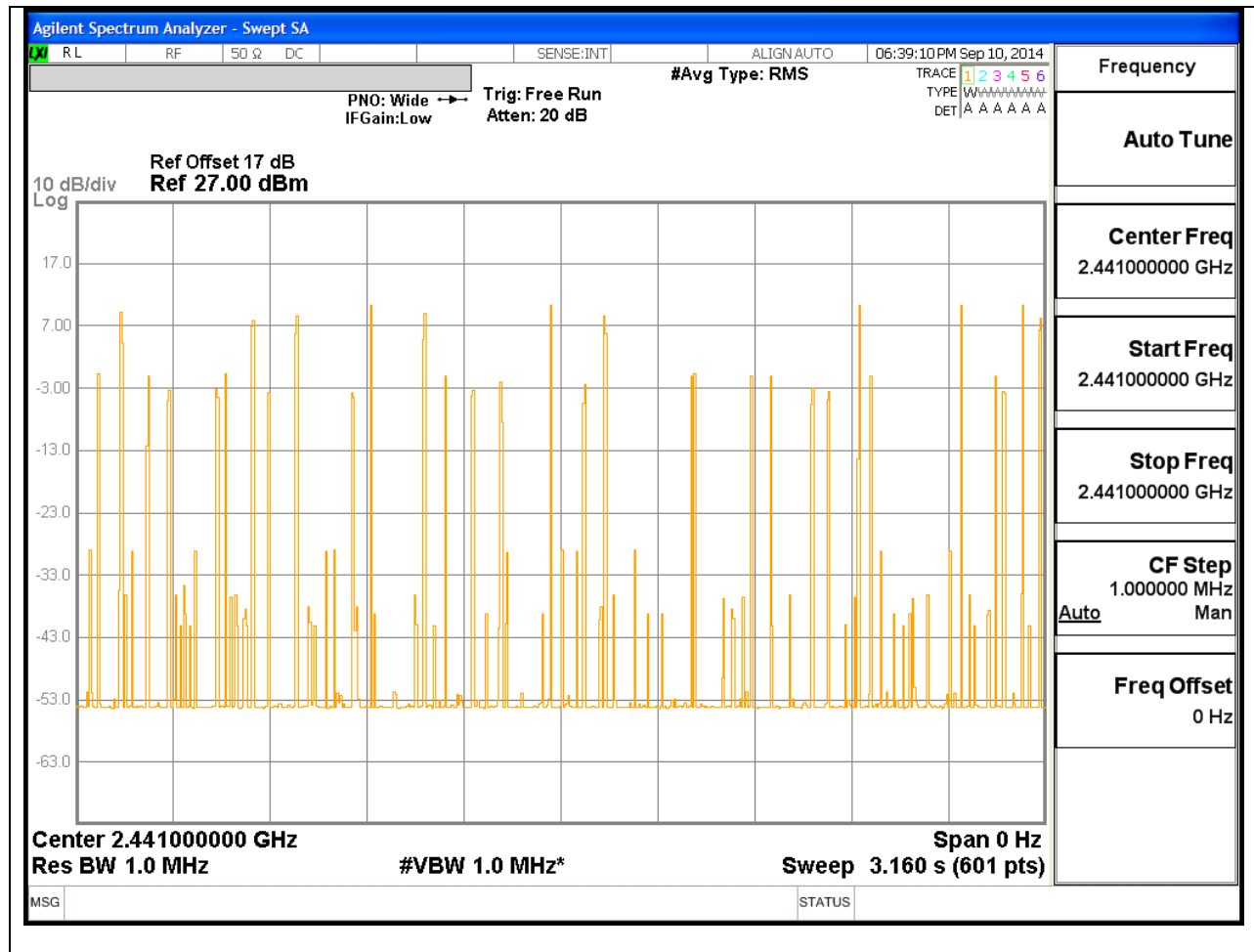
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



PULSE WIDTH - DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

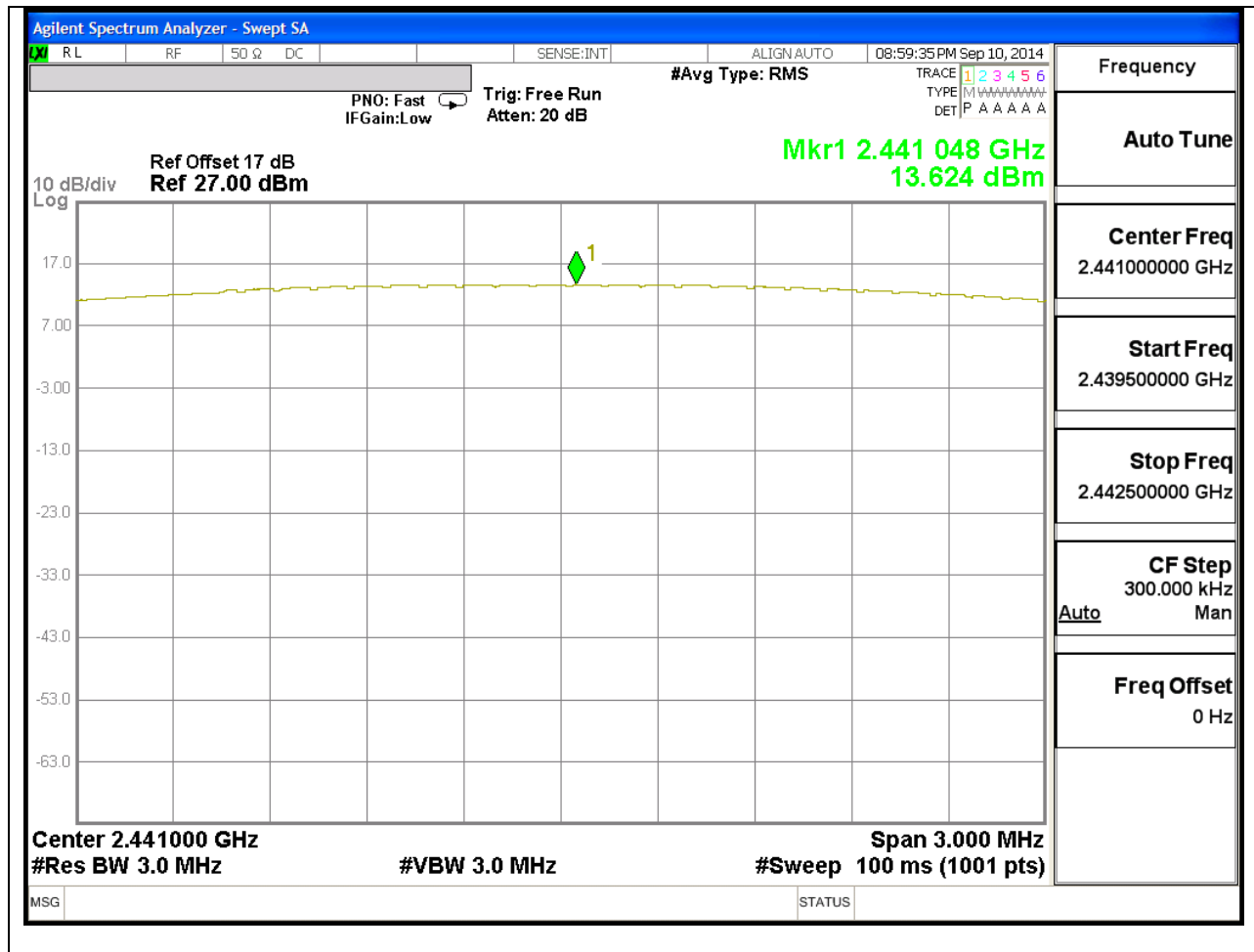
8.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.42	21	-8.58
Middle	2441	13.62	21	-7.38
High	2480	13.28	21	-7.72
Worst		13.65		-7.38

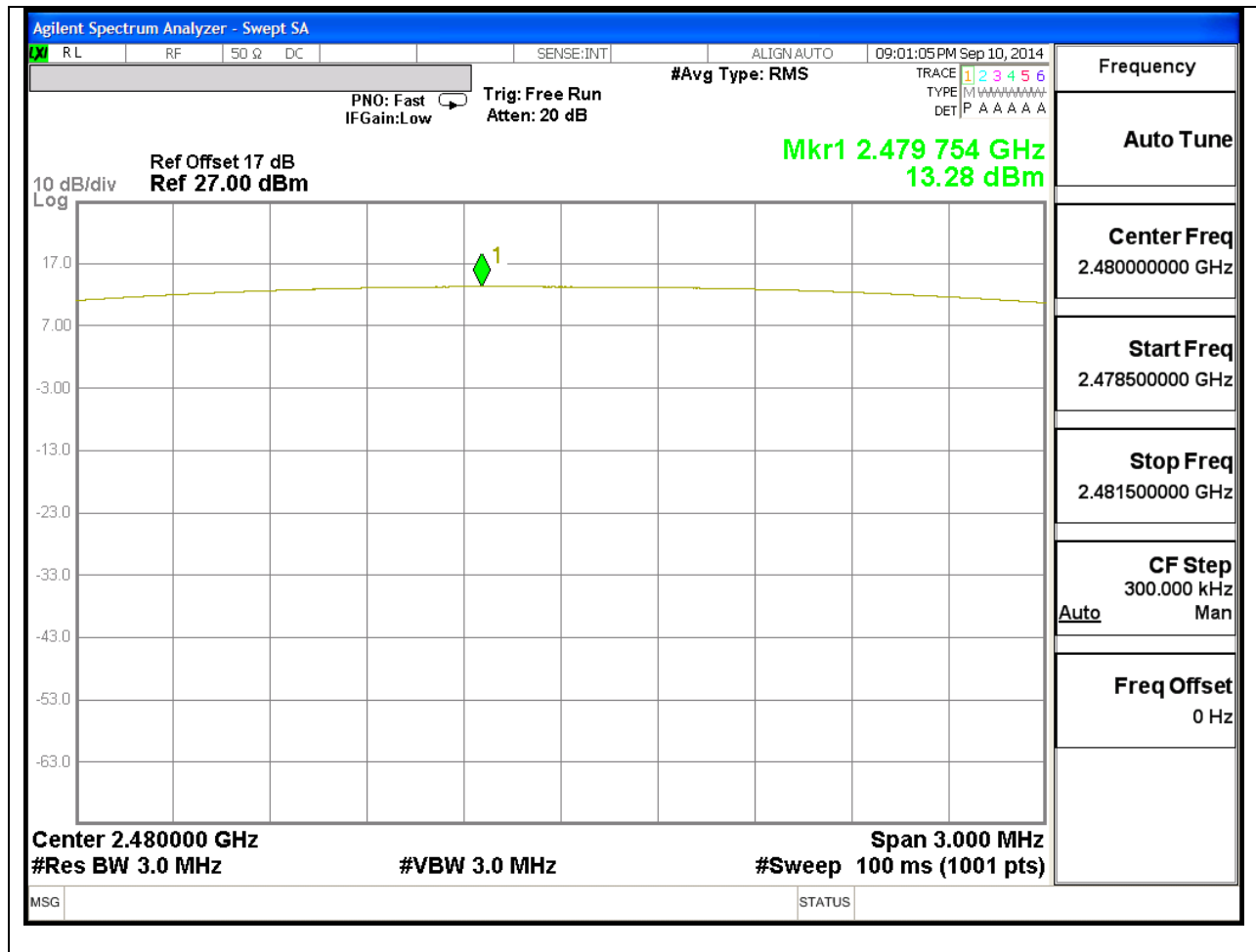
8.5.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	13.08	21	-7.92
Middle	2441	13.59	21	-7.41
High	2480	13.63	21	-7.37
Worst		13.63		-7.37

MID CHANNEL



HIGH CHANNEL



Agilent Spectrum Analyzer - Swept SA

RL RF 50 Ω DC SENSE:INT ALIGN AUTO 09:00:00 PM Sep 10, 2014

#Avg Type: RMS

PNO: Fast IFGain:Low Trig: Free Run Atten: 20 dB

TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P A A A A A

Ref Offset 17 dB
Ref 27.00 dBm

Mkr1 2.440 931 GHz
13.59 dBm

Frequency	
Auto Tune	
Center Freq	2.441000000 GHz
Start Freq	2.439500000 GHz
Stop Freq	2.442500000 GHz
CF Step	300.000 kHz
Auto Man	
Freq Offset	0 Hz

Center 2.441000 GHz Span 3.000 MHz
#Res BW 3.0 MHz #VBW 3.0 MHz #Sweep 100 ms (1001 pts)

MSG STATUS

Agilent Spectrum Analyzer - Swept SA

RL RF 50 Ω DC SENSE:INT ALIGN AUTO 09:00:35 PM Sep 10, 2014

#Avg Type: RMS

TRAC 1 2 3 4 5 6
TYPE M W W W W W W W
DET P A A A A A

PNO: Fast IF Gain: Low Trig: Free Run Atten: 20 dB

Ref Offset 17 dB
Ref 27.00 dBm

Mkr1 2.479 985 GHz
13.625 dBm

10 dB/div
Log

Center 2.480000 GHz
#Res BW 3.0 MHz

#VBW 3.0 MHz

Span 3.000 MHz
#Sweep 100 ms (1001 pts)

MSG STATUS

Frequency

Auto Tune

Center Freq
2.480000000 GHz

Start Freq
2.478500000 GHz

Stop Freq
2.481500000 GHz

CF Step
300.000 kHz
Auto Man

Freq Offset
0 Hz

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 10.7 dB (including 10 dB pad and 0.7 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)	Average Power (dBm)
Low	2402	12
Middle	2441	12.4
High	2480	12.5
Worst		12.5

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.80
Middle	2441	10.10
High	2480	10.30
Worst		10.30

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.8
Middle	2441	10.2
High	2480	10.3
Worst		10.3

8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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.

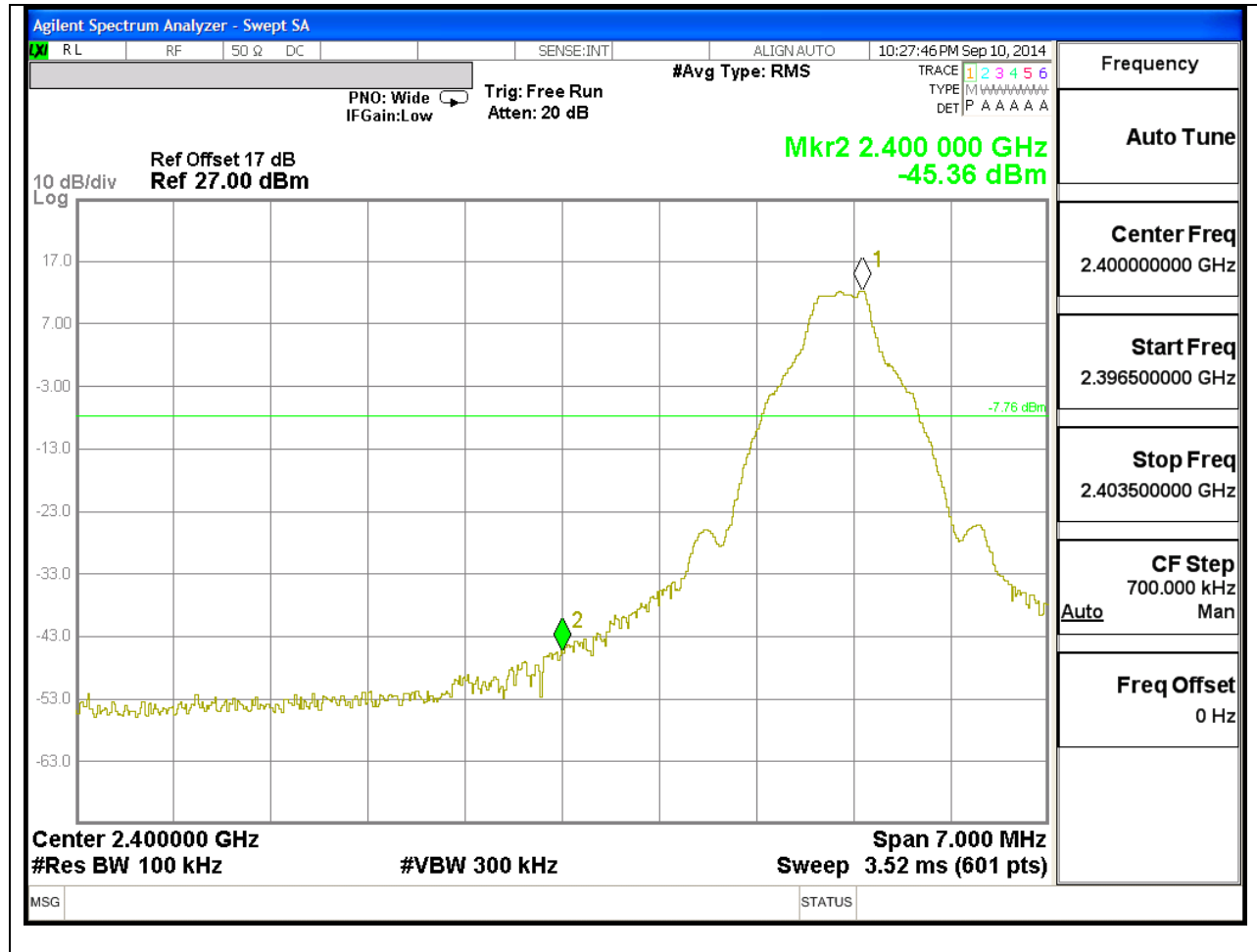
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

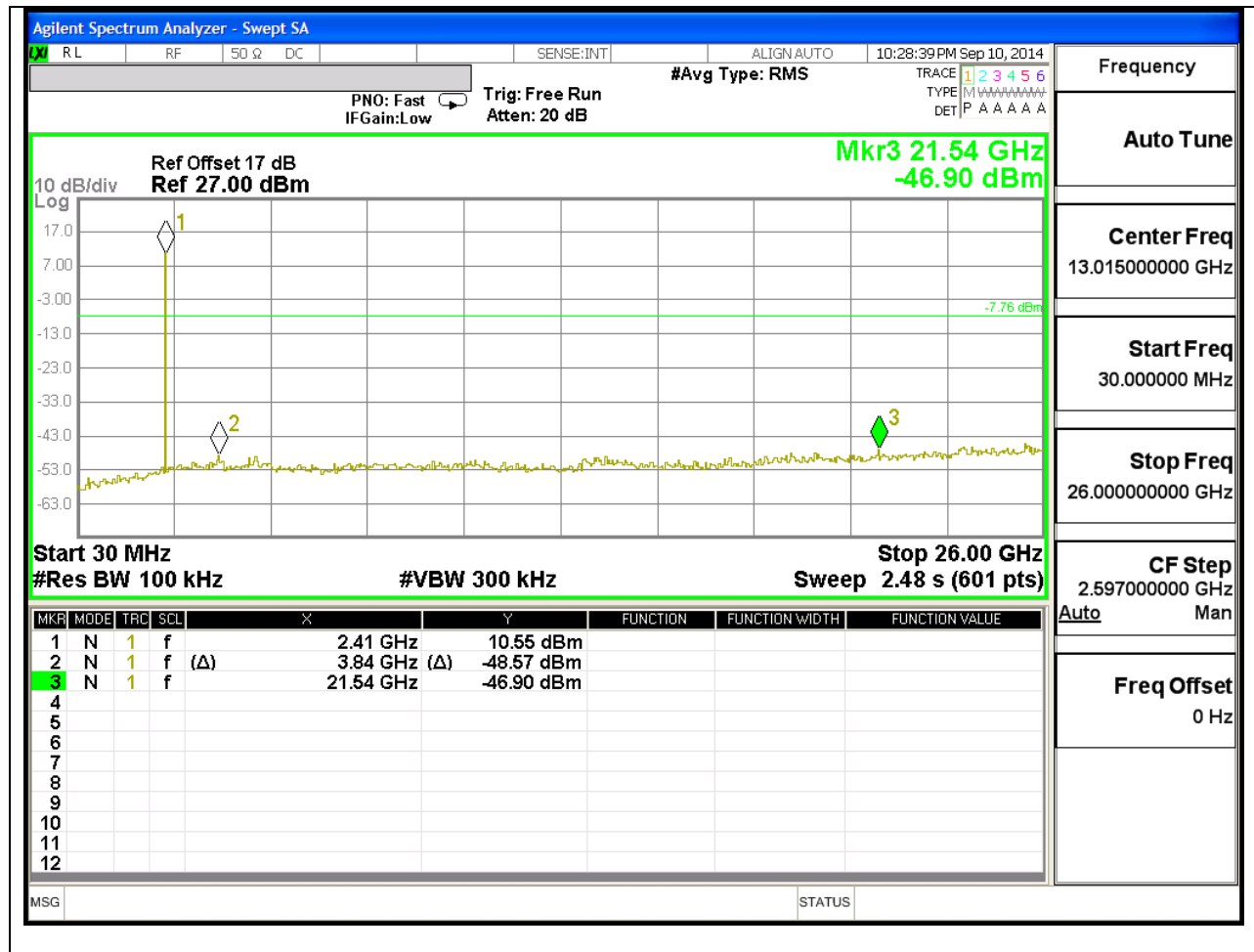
8.7.1. BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL

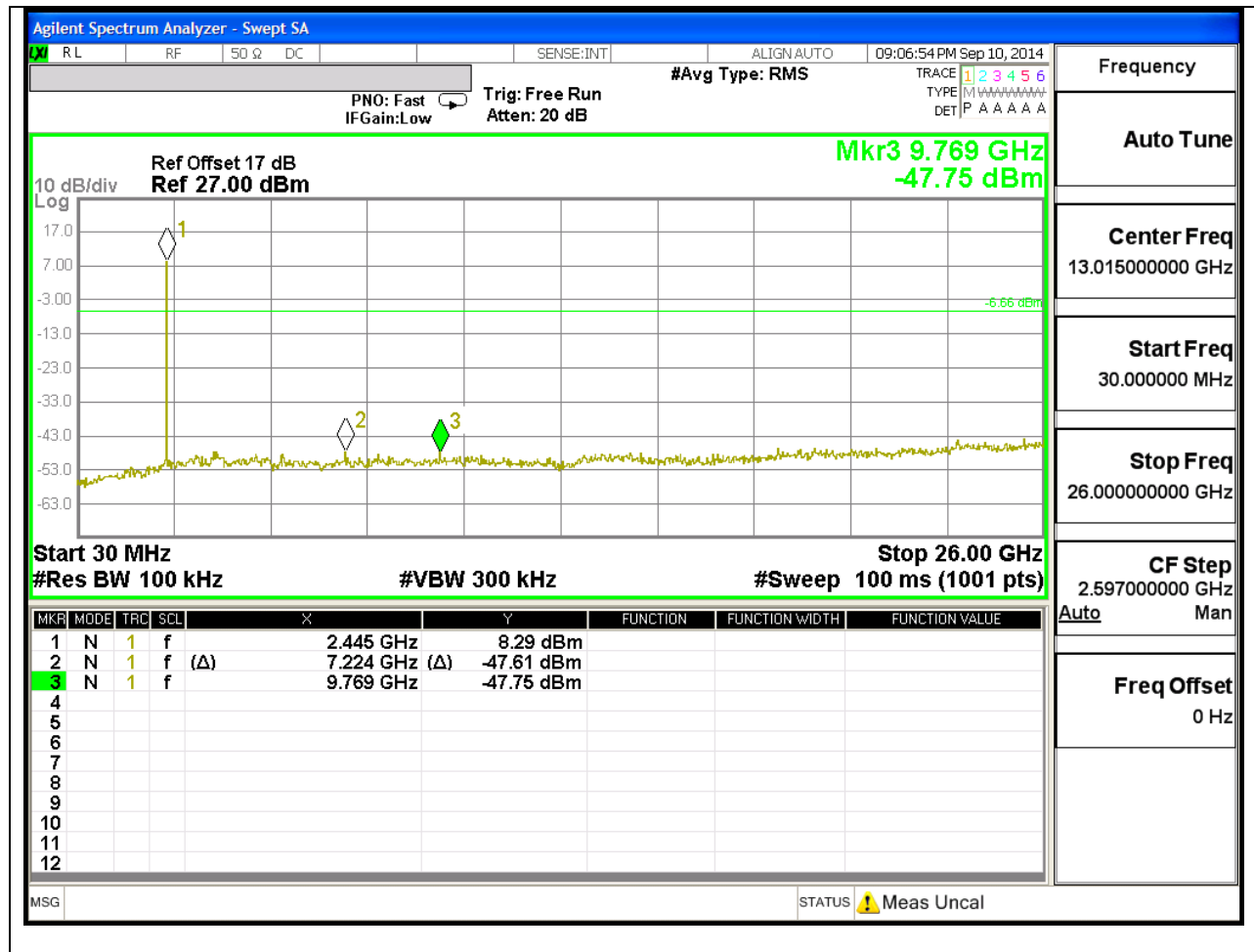
LOW CHANNEL BANDEDGE



LOW CHANNEL SPURIOUS

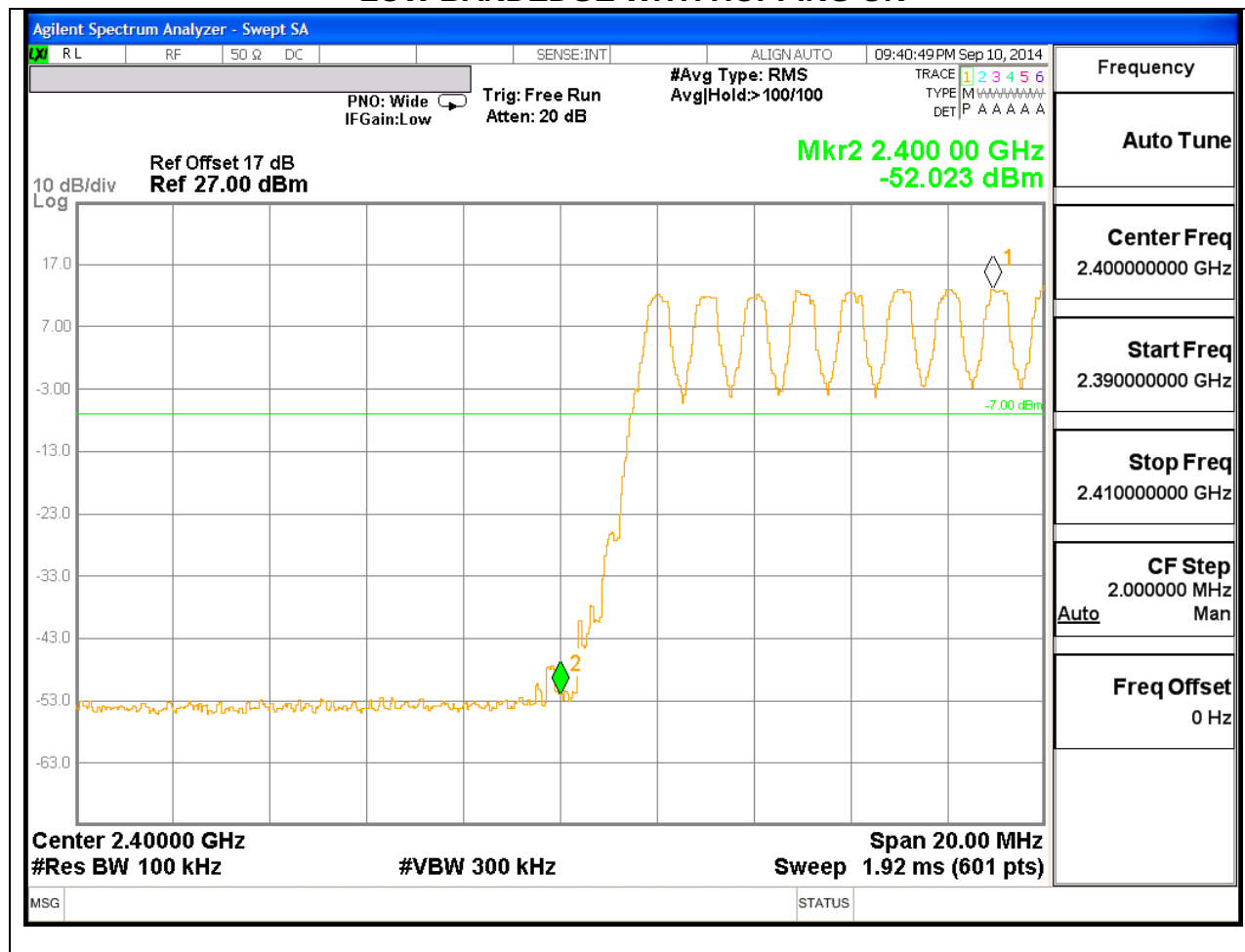


MID CHANNEL SPURIOUS

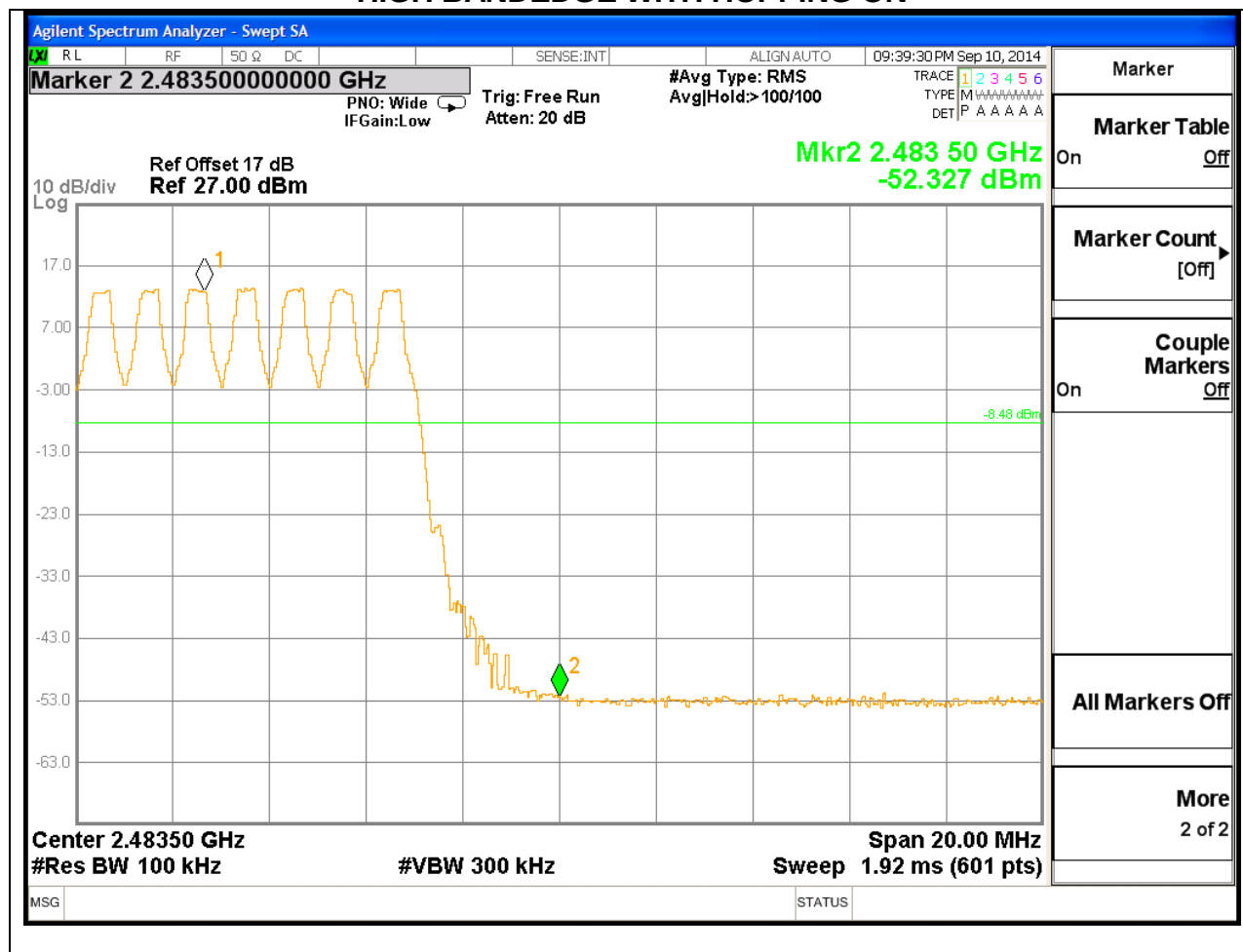


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



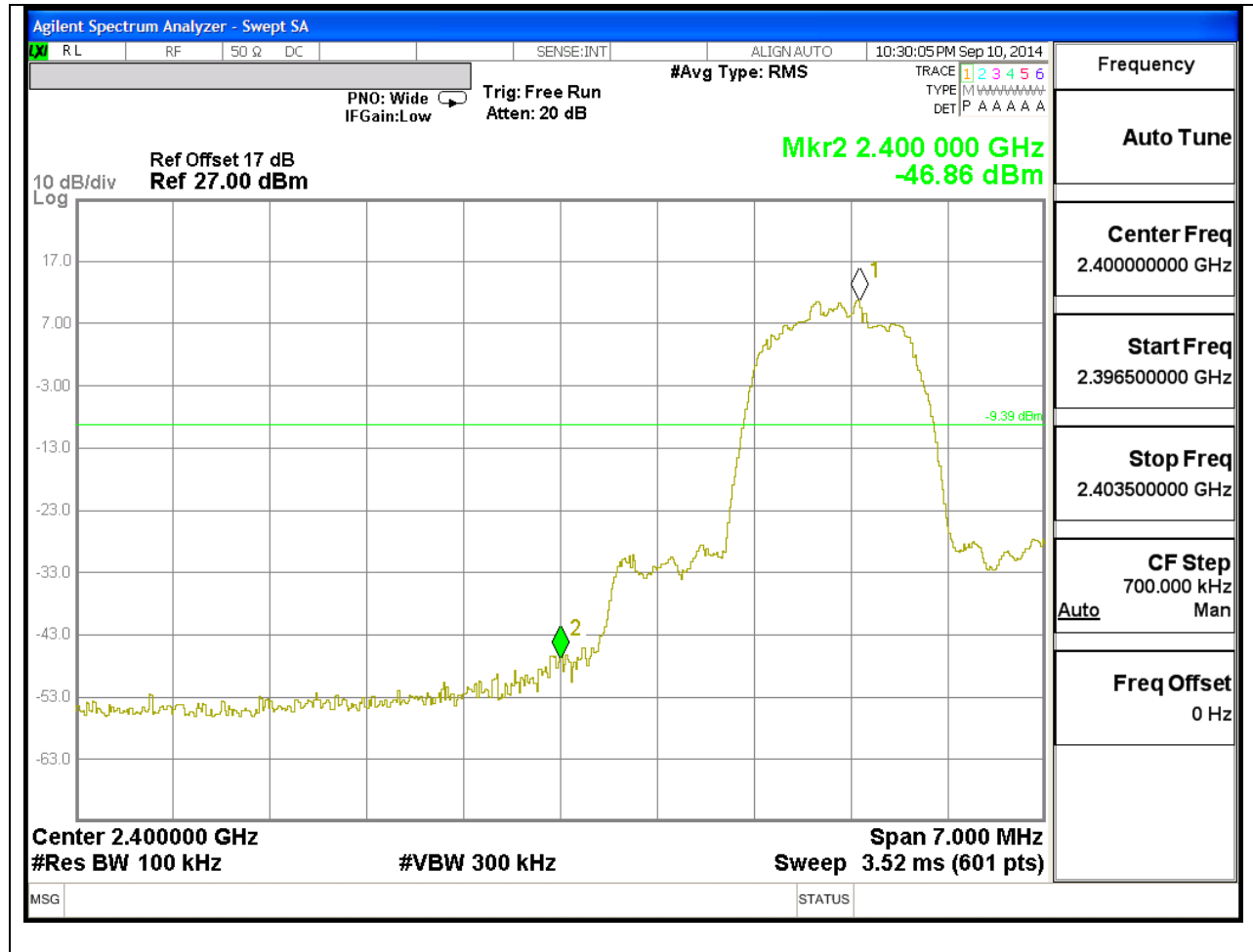
HIGH BANDEDGE WITH HOPPING ON



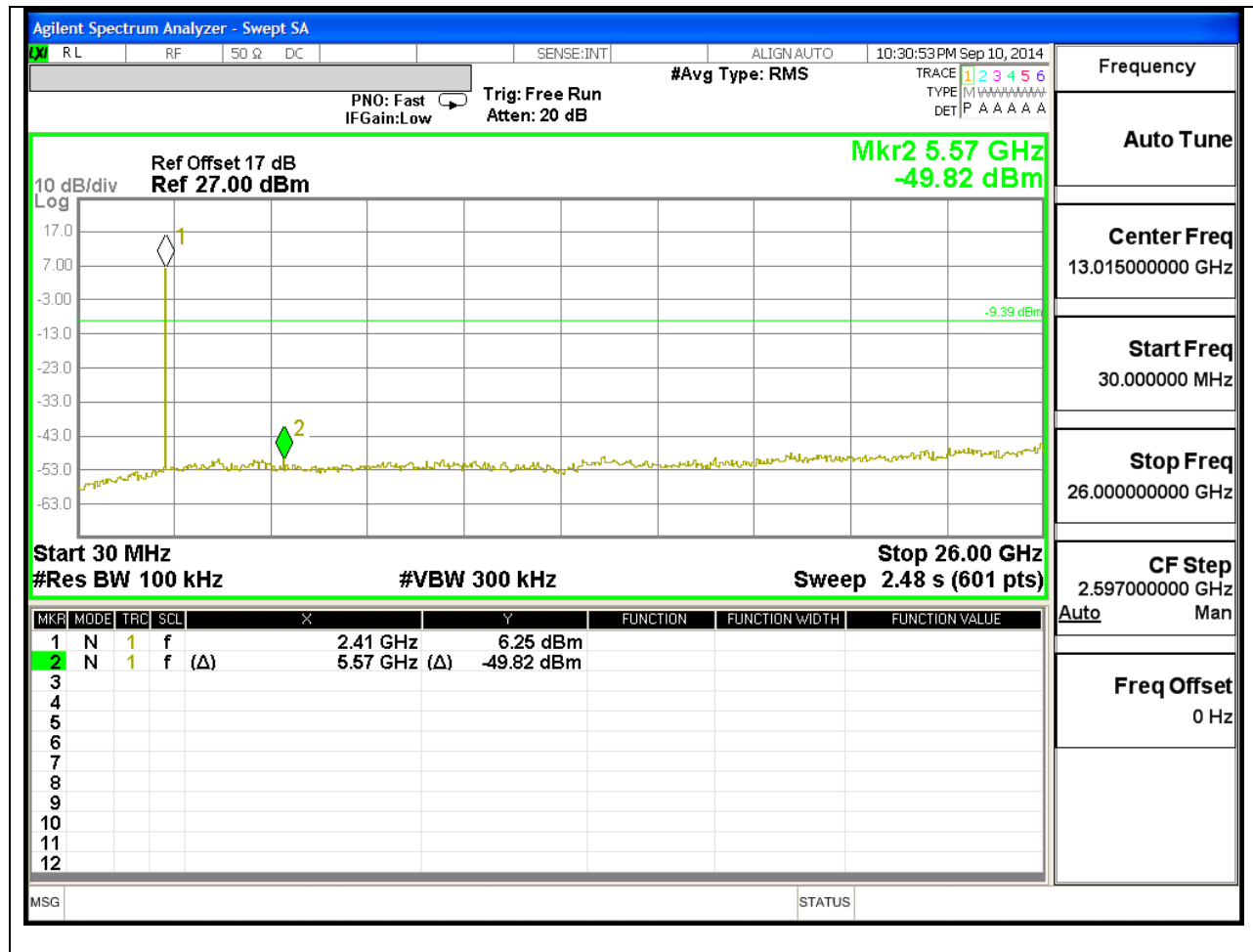
ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

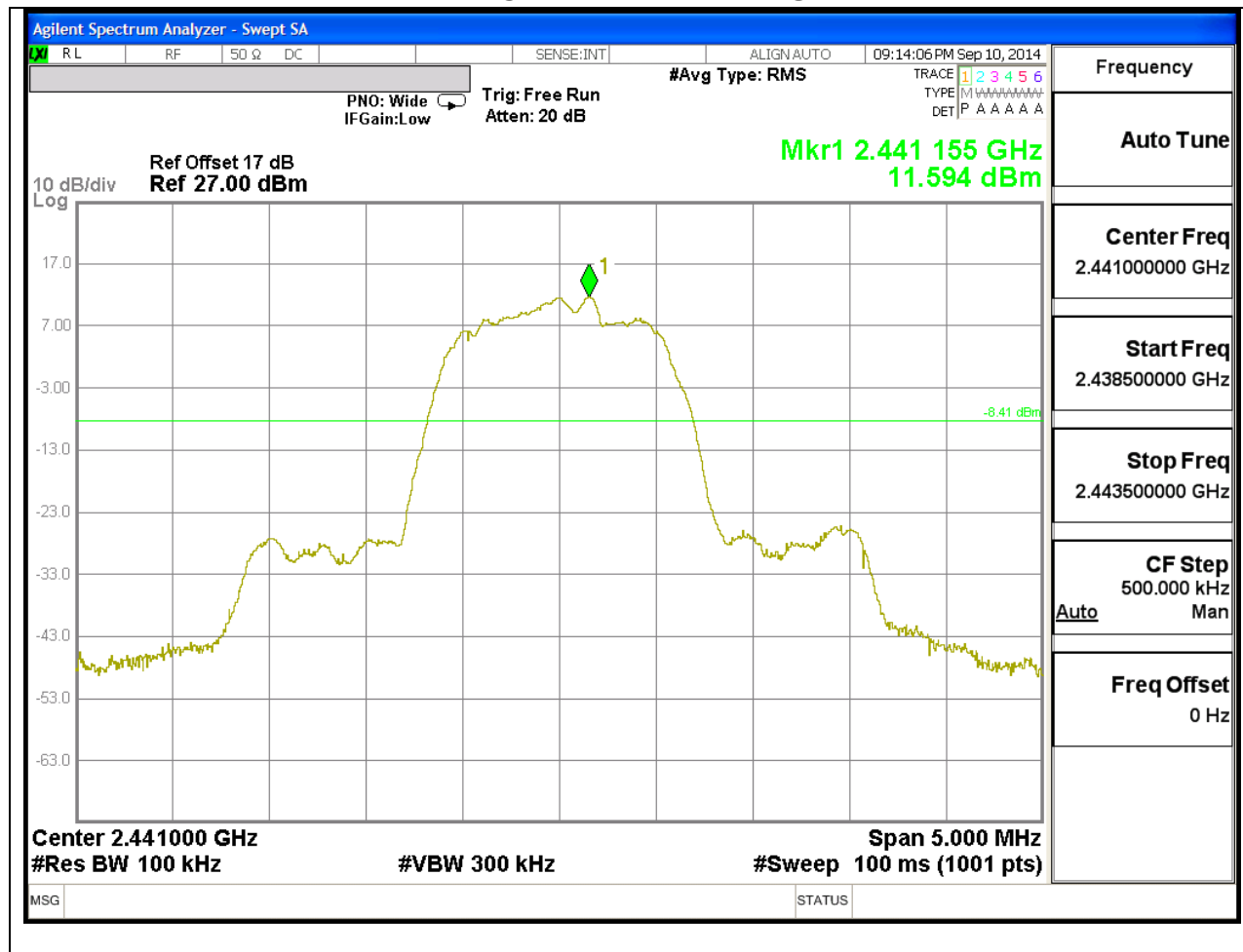


LOW CHANNEL SPURIOUS

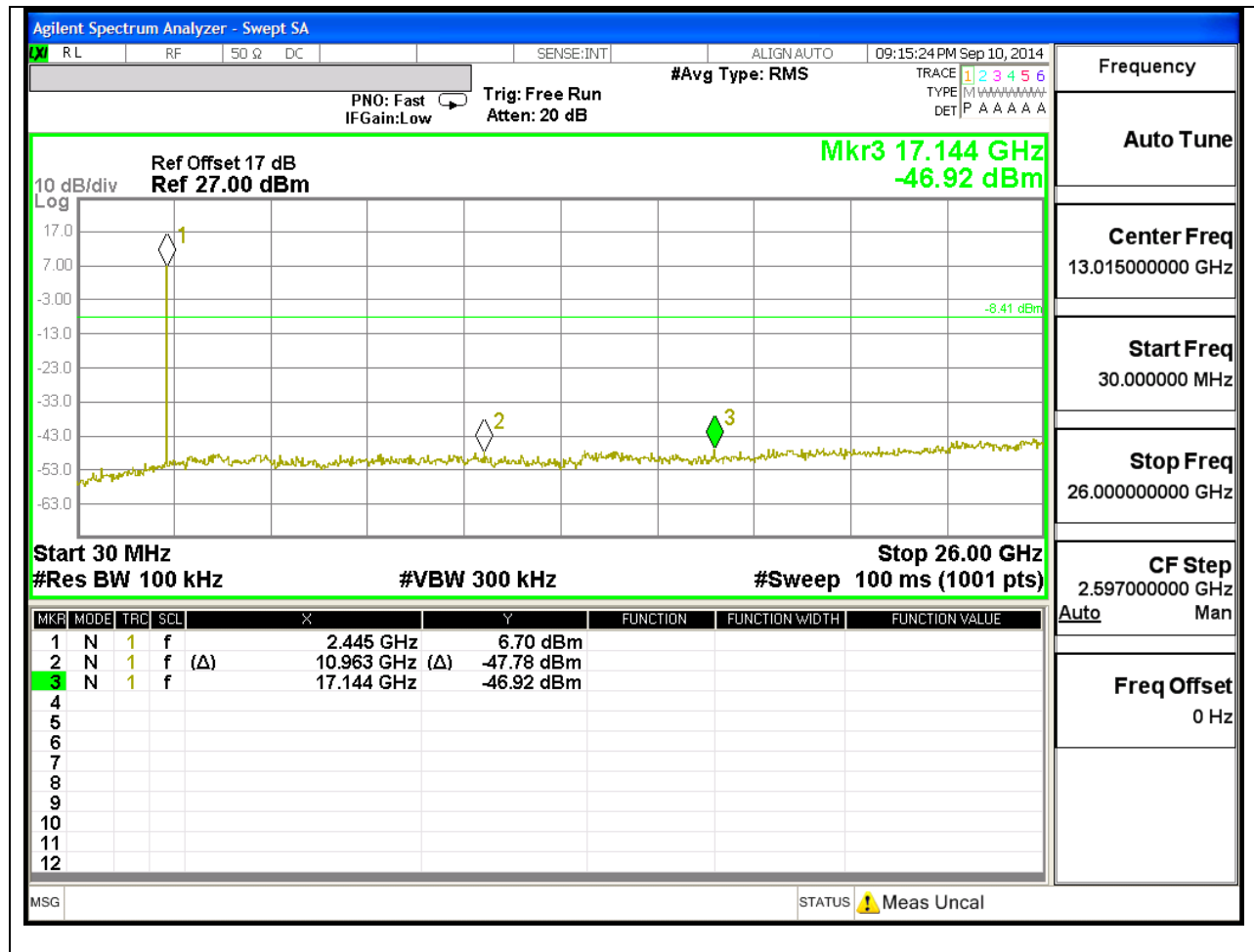


SPURIOUS EMISSIONS, MID CHANNEL

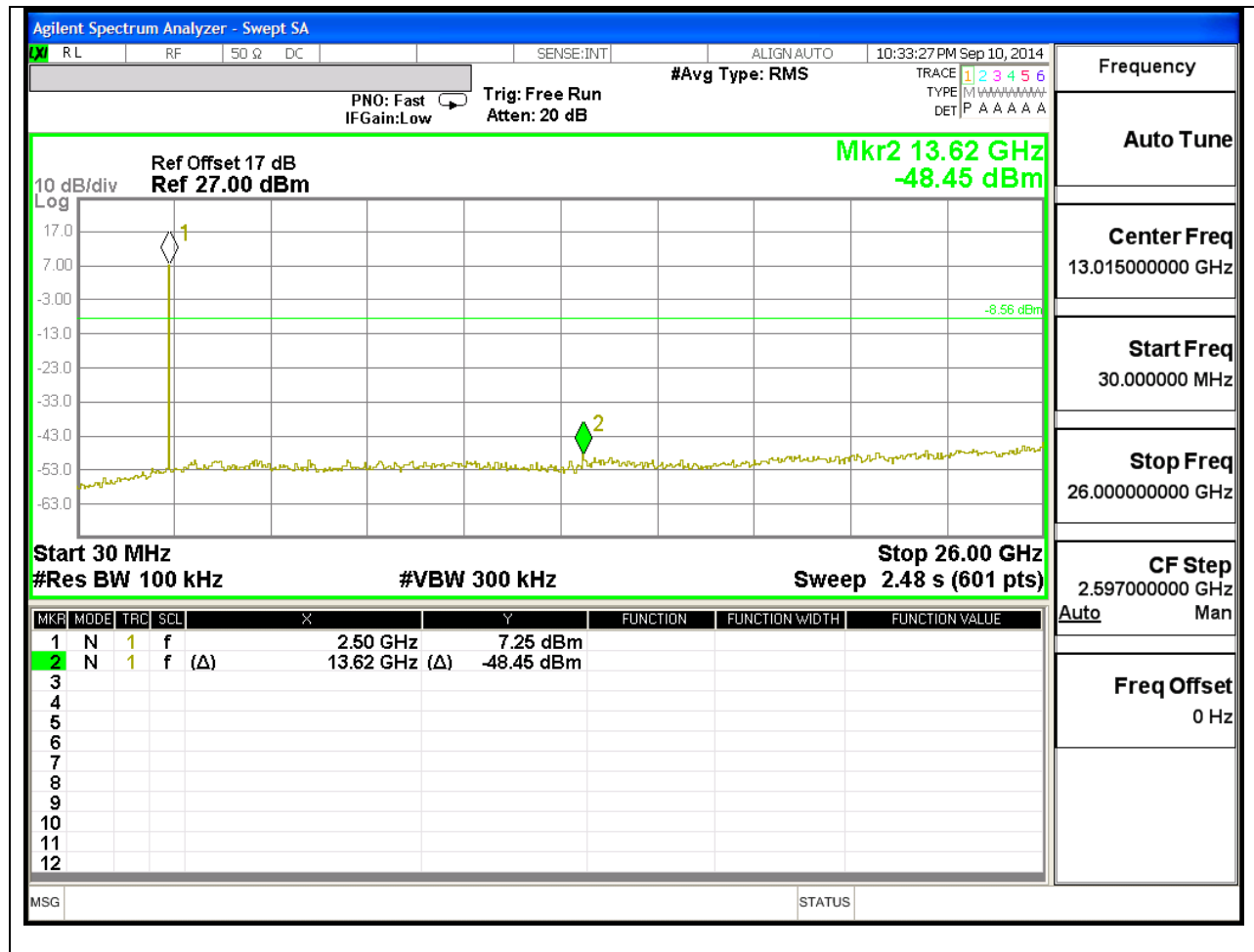
MID CHANNEL BANDEDGE



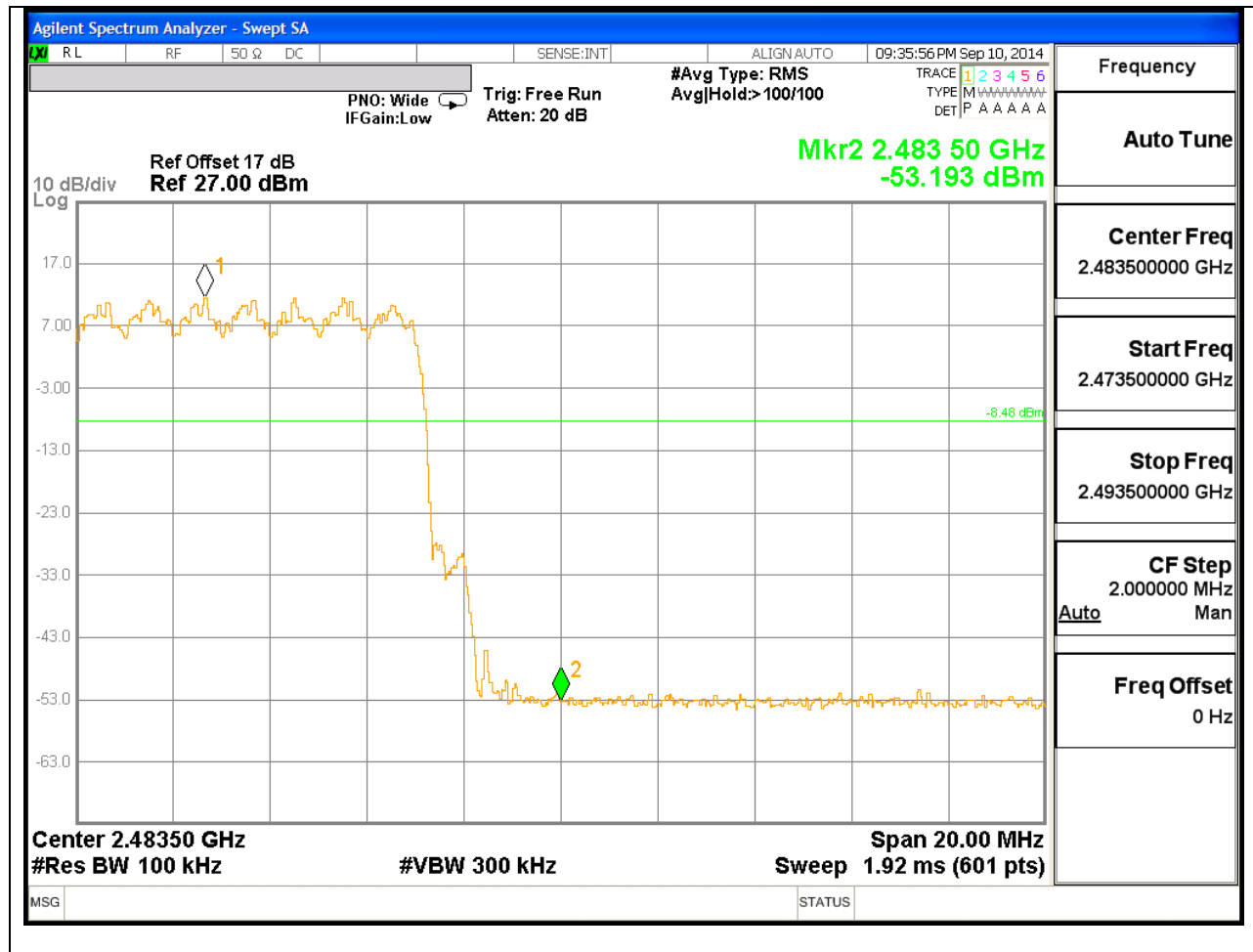
MID CHANNEL SPURIOUS



HIGH CHANNEL SPURIOUS



HIGH BANDEDGE WITH HOPPING ON



9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit ($\mu\text{V}/\text{m}$) at 3 m	Field Strength Limit (dB $\mu\text{V}/\text{m}$) 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 C63.4. 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.

$$\text{GFSK} = 1/T = 1 / 0.0028\text{S} = 360\text{Hz}.$$

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.

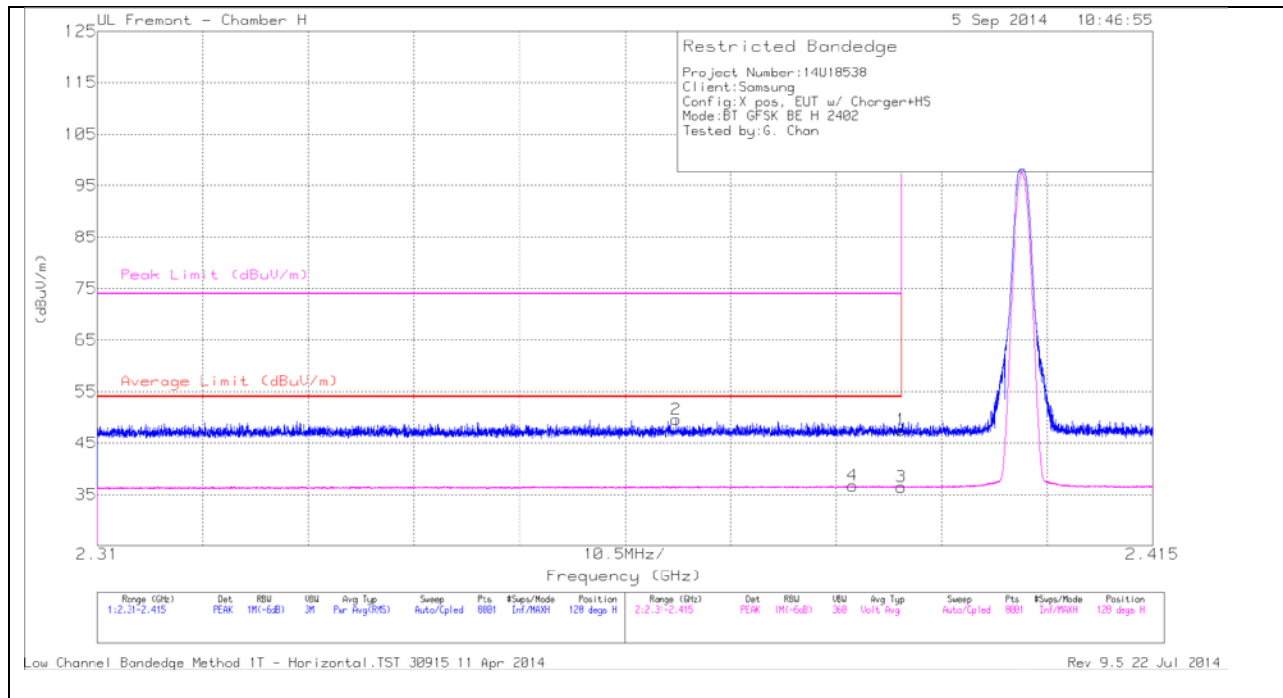
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

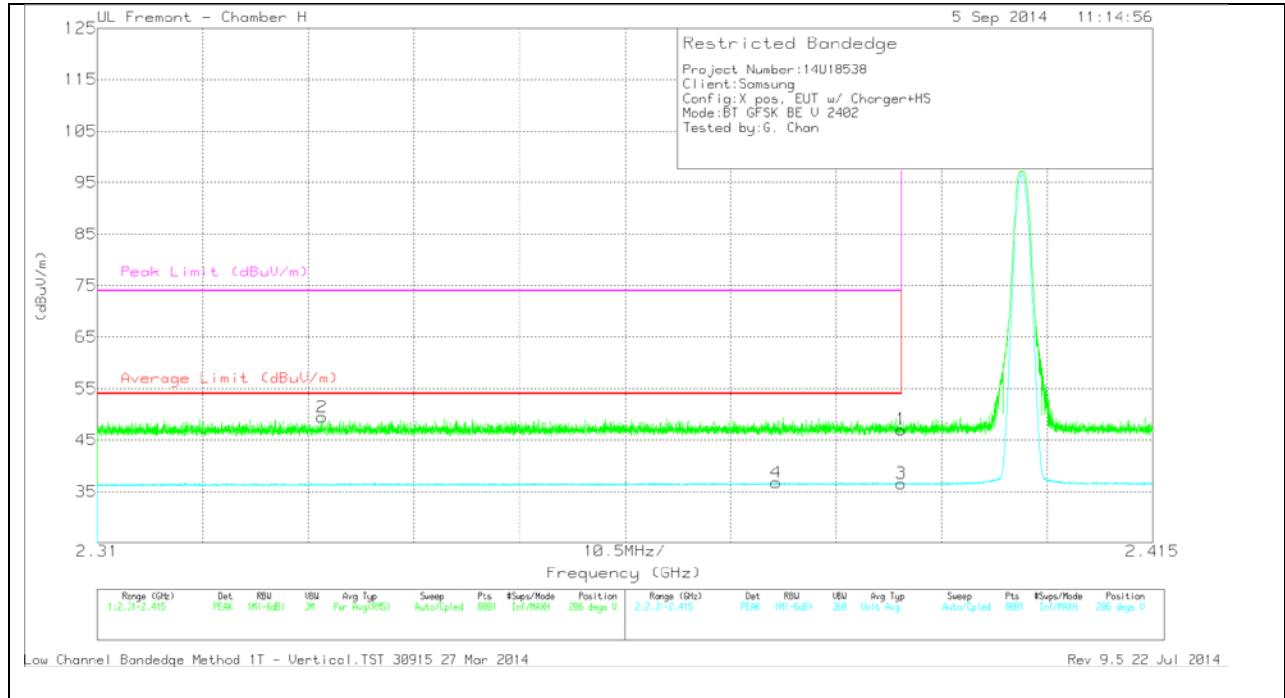
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cb/ Filt/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.368	42.29	PK	31.9	-24.6	49.59	-	-	74	-24.41	128	284	H
4	* 2.385	29.31	VB1T	32	-24.6	36.71	54	-17.29	-	-	128	284	H
1	* 2.39	40.13	PK	32	-24.6	47.53	-	-	74	-26.47	128	284	H
3	* 2.39	29.07	VB1T	32	-24.6	36.47	54	-17.53	-	-	128	284	H

VERTICAL PEAK AND AVERAGE PLOT

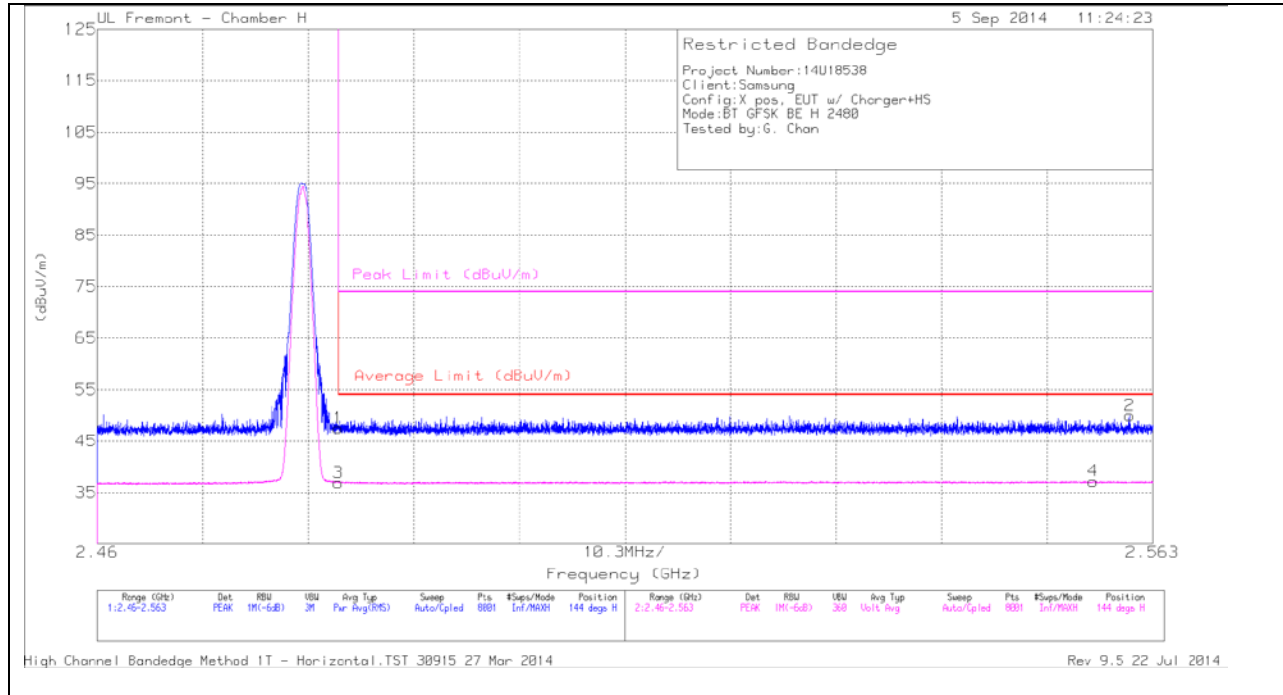


VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.332	42.14	PK	31.9	-24.6	49.44	-	-	74	-24.56	206	297	V
4	* 2.378	29.37	VB1T	32	-24.6	36.77	54	-17.23	-	-	206	297	V
1	* 2.39	39.66	PK	32	-24.6	47.06	-	-	74	-26.94	206	297	V
3	* 2.39	29.17	VB1T	32	-24.6	36.57	54	-17.43	-	-	206	297	V

AUTHORIZED BANDEDGE (HIGH CHANNEL)

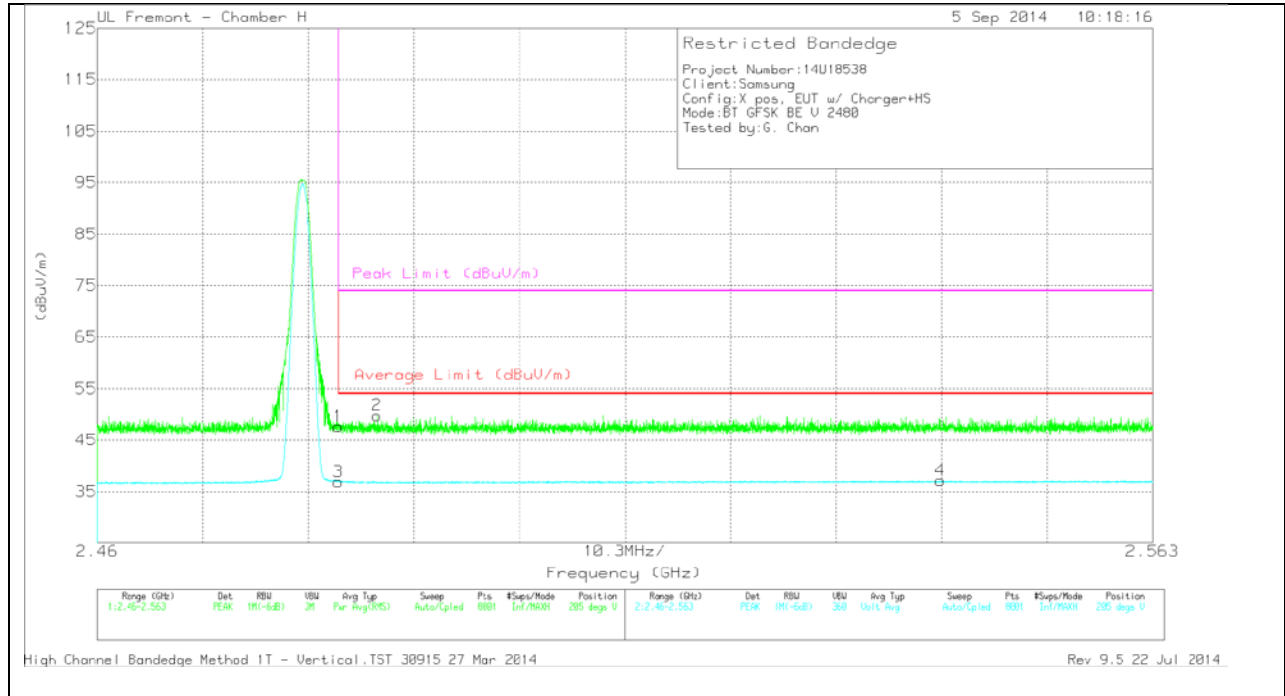
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Filt/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.79	PK	32.2	-24.5	47.49	-	-	74	-26.51	144	183	H
3	* 2.484	29.18	VB1T	32.2	-24.5	36.88	54	-17.12	-	-	144	183	H
4	2.557	29.29	VB1T	32.2	-24.3	37.19	54	-16.81	-	-	144	183	H
2	2.561	42.04	PK	32.2	-24.3	49.94	-	-	74	-24.06	144	183	H

VERTICAL PEAK AND AVERAGE PLOT

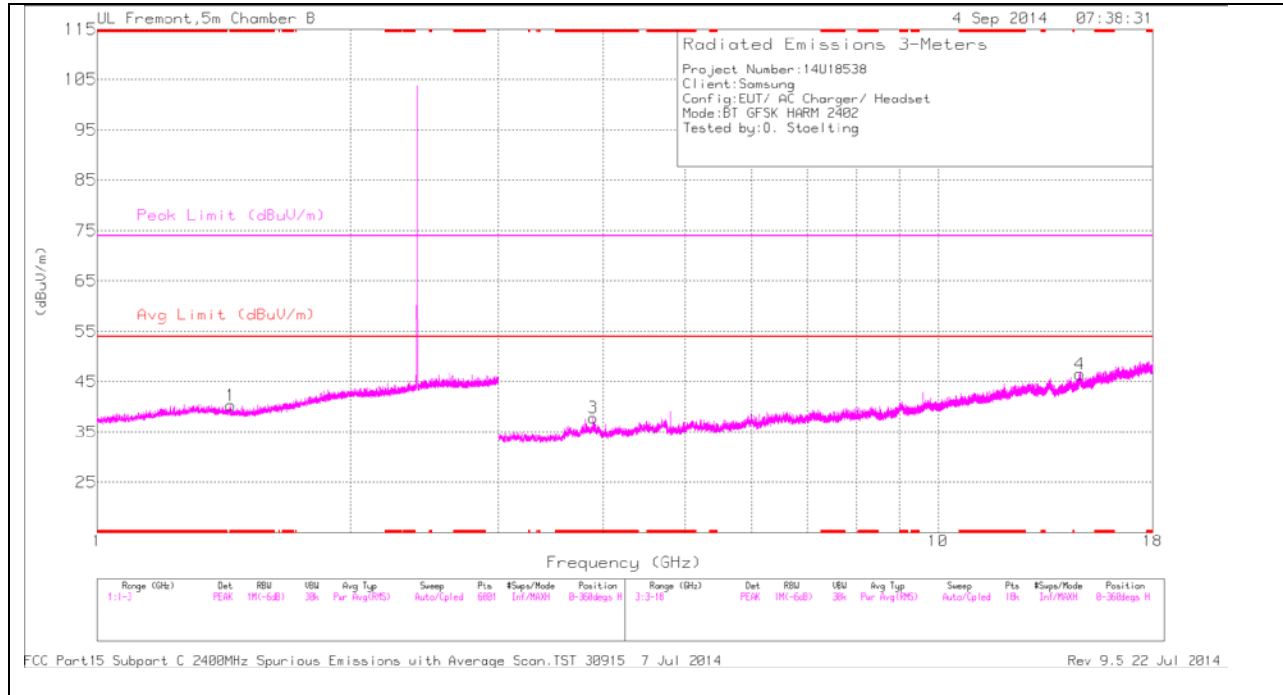


VERTICAL DATA

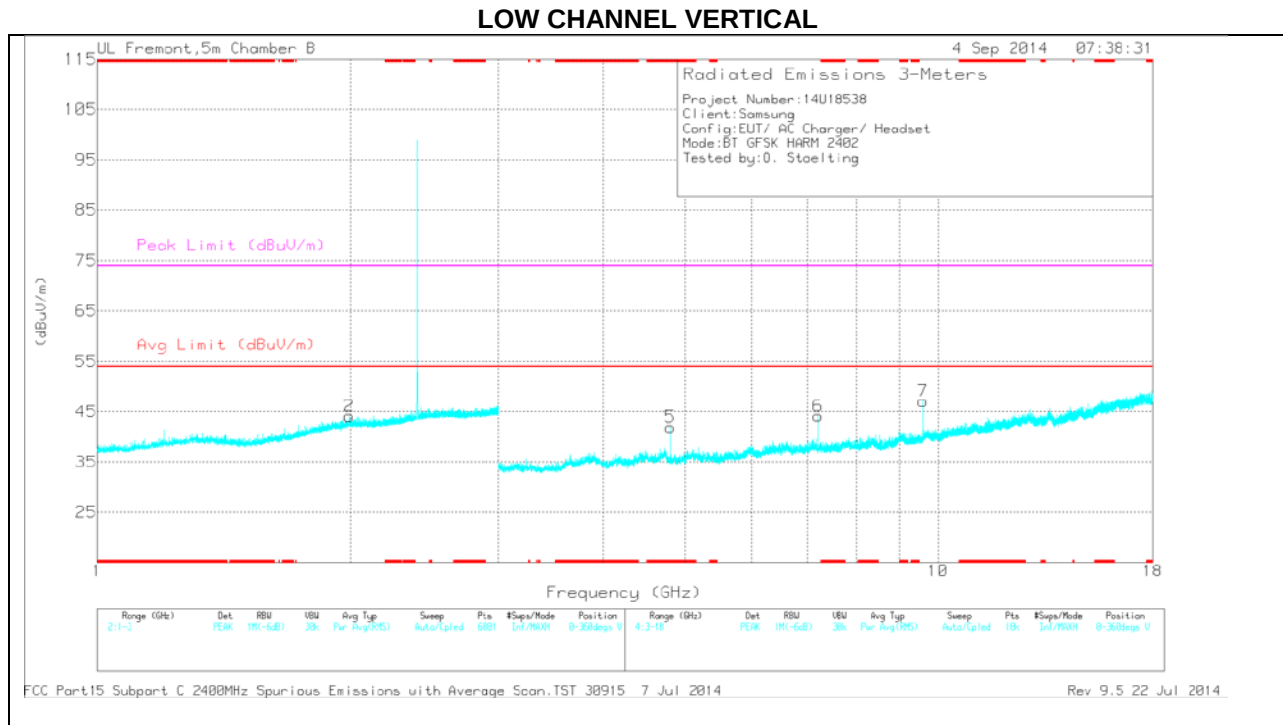
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.95	PK	32.2	-24.5	47.65	-	-	74	-26.35	205	343	V
3	* 2.484	29.19	VB1T	32.2	-24.5	36.89	54	-17.11	-	-	205	343	V
2	* 2.487	42.08	PK	32.2	-24.5	49.78	-	-	74	-24.22	205	343	V
4	2.542	29.34	VB1T	32.2	-24.4	37.14	54	-16.86	-	-	205	343	V

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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



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	AF T345 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.441	36.06	PK	28.3	-24.1	40.26	-	-	74	-33.74	0-360	101	H
3	* 3.89	34.33	PK	33.8	-30.3	37.83	-	-	74	-36.17	0-360	101	H
5	* 4.804	37.34	PK	34.2	-29.6	41.94	-	-	74	-32.06	0-360	101	V
2	1.996	36.1	PK	31.3	-23.3	44.1	-	-	-	-	0-360	101	V
6	7.206	35.94	PK	35.5	-27.3	44.14	-	-	-	-	0-360	200	V
7	9.607	34.8	PK	36.8	-24.5	47.1	-	-	-	-	0-360	200	V
4	14.739	26.88	PK	39.4	-19.8	46.48	-	-	-	-	0-360	200	H

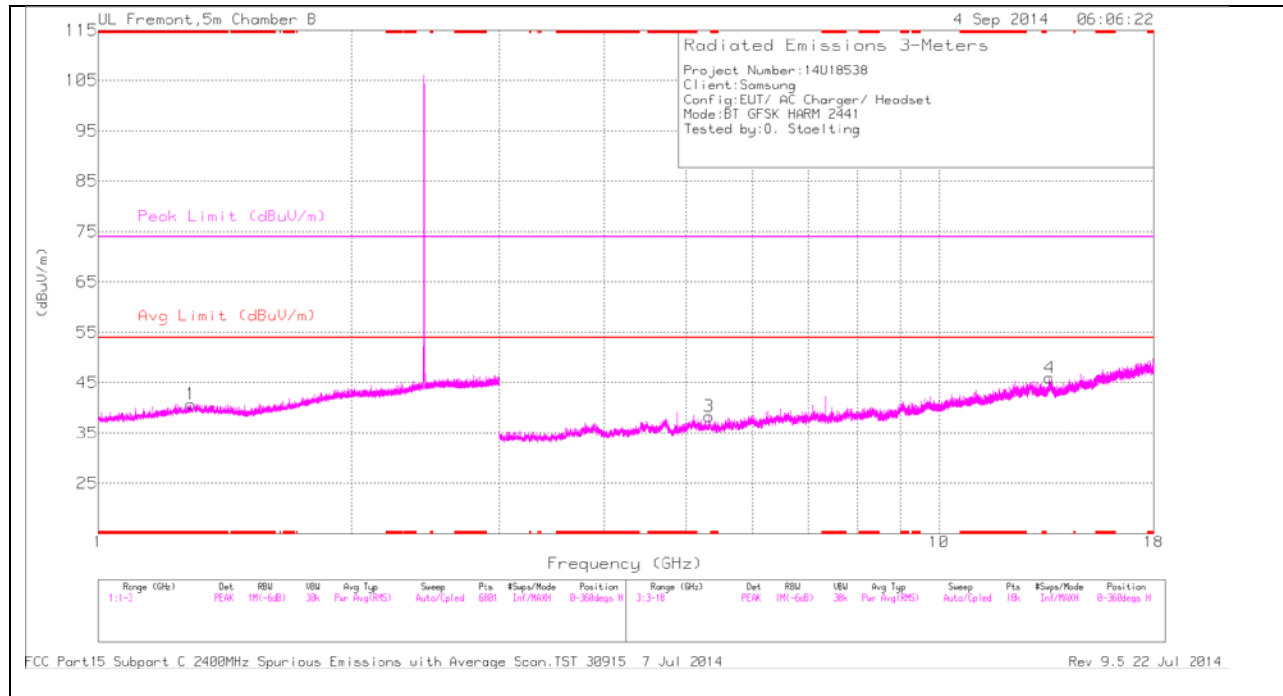
PK - Peak detector

RADIATED EMISSIONS

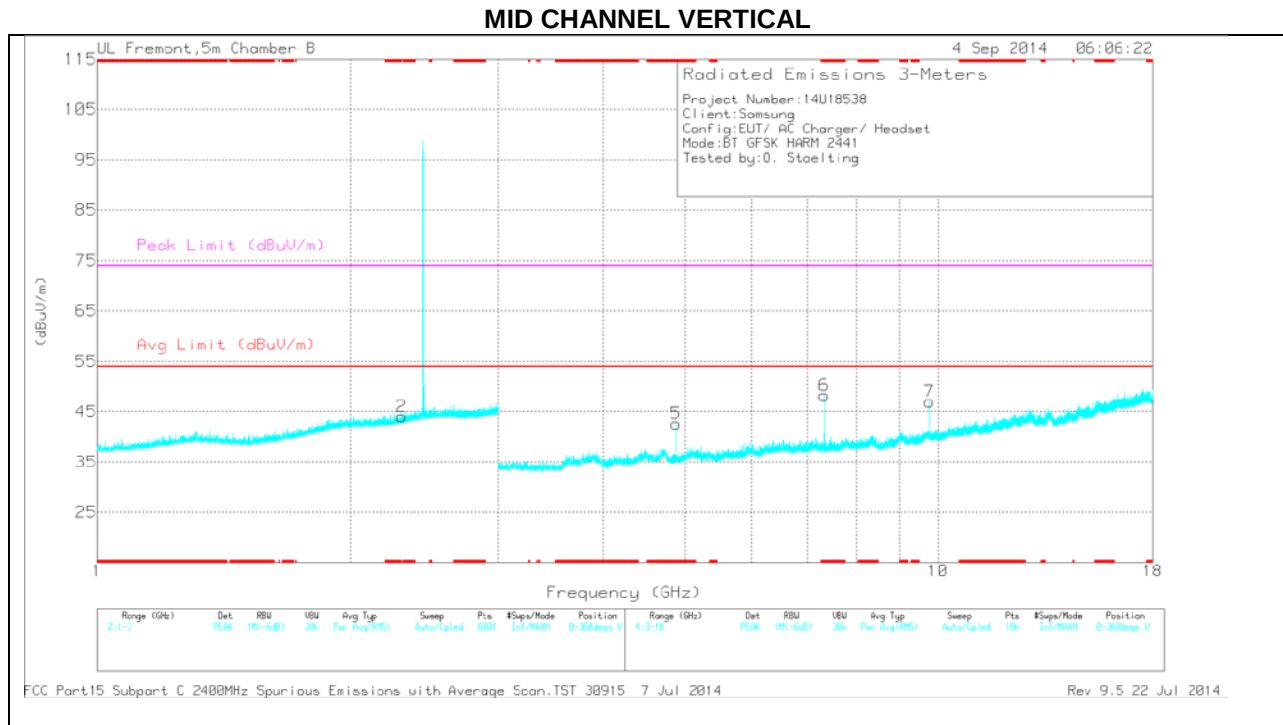
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	43.47	PK3	34.2	-29.6	48.07	-	-	74	-25.93	265	228	V
* 4.804	34.51	VB1T	34.2	-29.6	39.11	54	-14.89	-	-	265	228	V
7.205	42.16	PK3	35.5	-27.3	50.36	-	-	-	-	136	248	V
7.206	33.6	VB1T	35.5	-27.3	41.8	-	-	-	-	136	248	V
9.608	40.63	PK3	36.8	-24.5	52.93	-	-	-	-	156	219	V
9.608	33.35	VB1T	36.8	-24.5	45.65	-	-	-	-	156	219	V

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

MID CHANNEL HORIZONTAL



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



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	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.288	36.29	PK	28.8	-24.3	40.79	-	-	74	-33.21	0-360	101	H
5	* 4.882	39.11	PK	34.2	-30.7	42.61	-	-	74	-31.39	0-360	200	V
6	* 7.323	41.03	PK	35.6	-28.4	48.23	-	-	74	-25.77	0-360	200	V
2	2.301	35.32	PK	31.6	-22.9	44.02	-	-	-	-	0-360	199	V
3	5.331	33.01	PK	34.5	-29.2	38.31	-	-	-	-	0-360	200	H
7	9.764	34.37	PK	36.9	-24.3	46.97	-	-	-	-	0-360	200	V
4	13.534	27.75	PK	38.9	-20.7	45.95	-	-	-	-	0-360	200	H

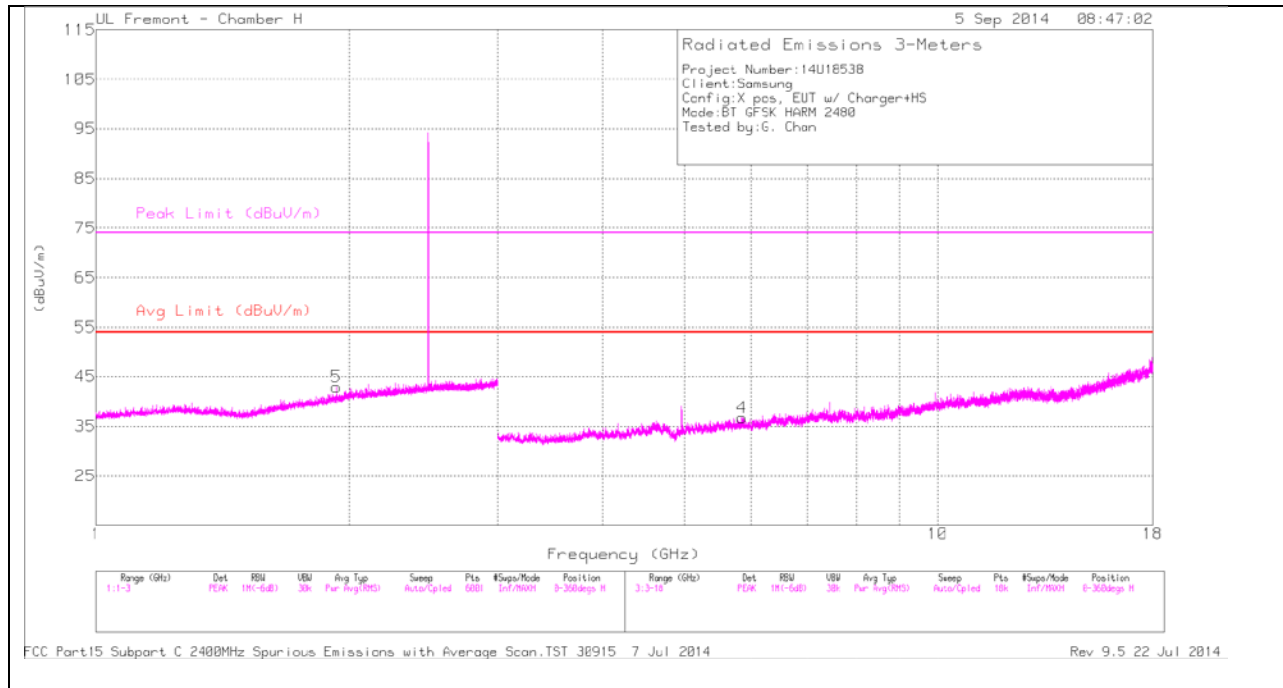
PK - Peak detector

RADIATED EMISSIONS

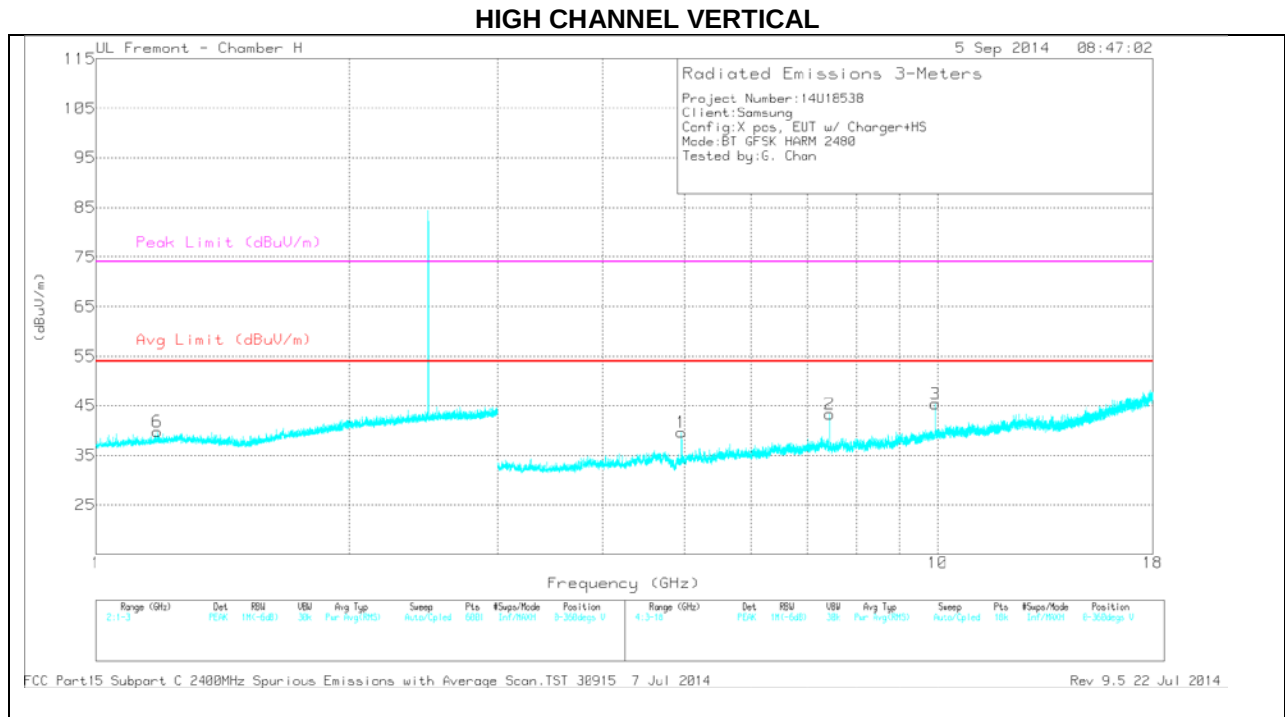
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.882	45.88	PK3	34.2	-30.7	49.38	-	-	74	-24.62	225	289	V
* 4.882	37.43	VB1T	34.2	-30.7	40.93	54	-13.07	-	-	225	289	V
* 7.323	46.51	PK3	35.6	-28.4	53.71	-	-	74	-20.29	197	174	V
* 7.323	40.29	VB1T	35.6	-28.4	47.49	54	-6.51	-	-	197	174	V
9.764	38.91	PK3	36.9	-24.3	51.51	-	-	-	-	154	212	V
9.764	30.88	VB1T	36.9	-24.3	43.48	-	-	-	-	154	212	V

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

HIGH CHANNEL HORIZONTAL



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



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	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	* 1.182	37.02	PK	28.6	-25.9	39.72	-	-	74	-34.28	0-360	100	V
1	* 4.96	37.08	PK	34.3	-31.8	39.58	-	-	74	-34.42	0-360	201	V
2	* 7.44	36.57	PK	36.1	-29.3	43.37	-	-	74	-30.63	0-360	100	V
5	1.928	37.2	PK	30.8	-25.1	42.9	-	-	-	-	0-360	100	H
4	5.852	32.89	PK	35.1	-31.3	36.69	-	-	-	-	0-360	201	H
3	9.92	34.03	PK	37.2	-25.9	45.33	-	-	-	-	0-360	201	V

PK - Peak detector

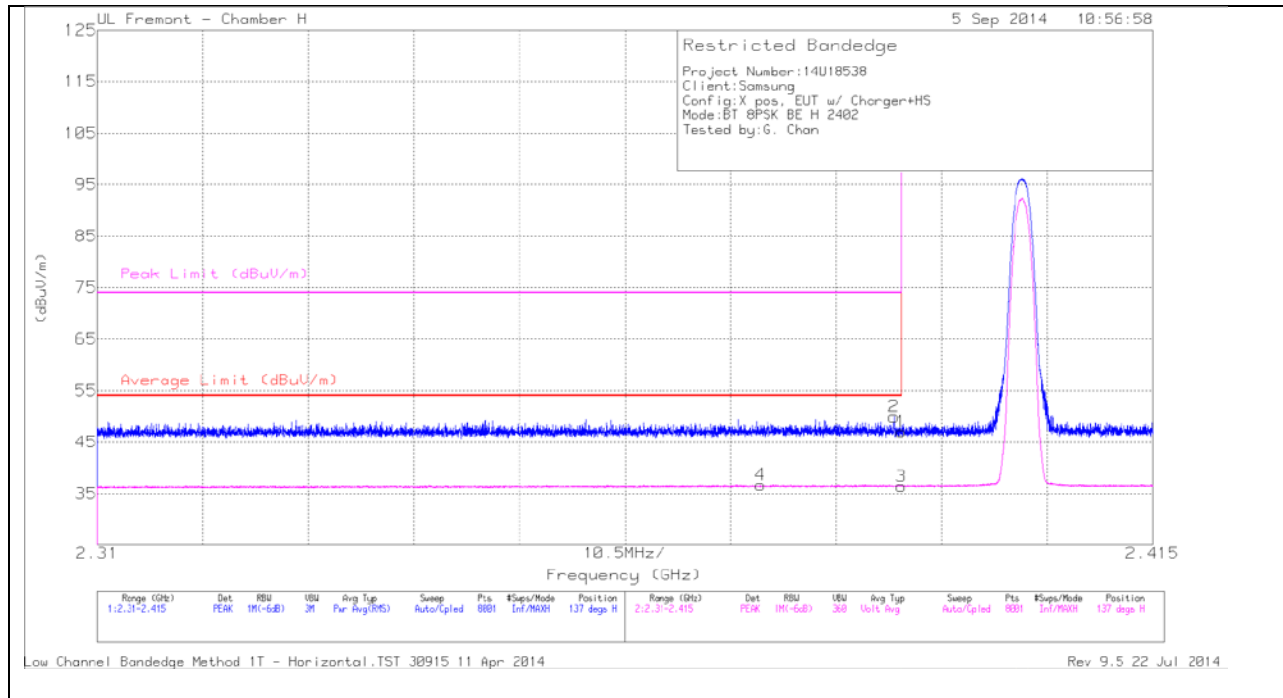
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	45.14	PK3	34.3	-31.8	47.64	-	-	74	-26.36	59	264	V
* 4.96	37.33	VB1T	34.3	-31.8	39.83	54	-14.17	-	-	59	264	V
* 7.44	45.34	PK3	36.1	-29.3	52.14	-	-	74	-21.86	104	315	V
* 7.44	38.83	VB1T	36.1	-29.3	45.63	54	-8.37	-	-	104	315	V
9.92	40.95	PK3	37.2	-25.9	52.25	-	-	-	-	206	274	V
9.92	34.6	VB1T	37.2	-25.9	45.9	-	-	-	-	206	274	V

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

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

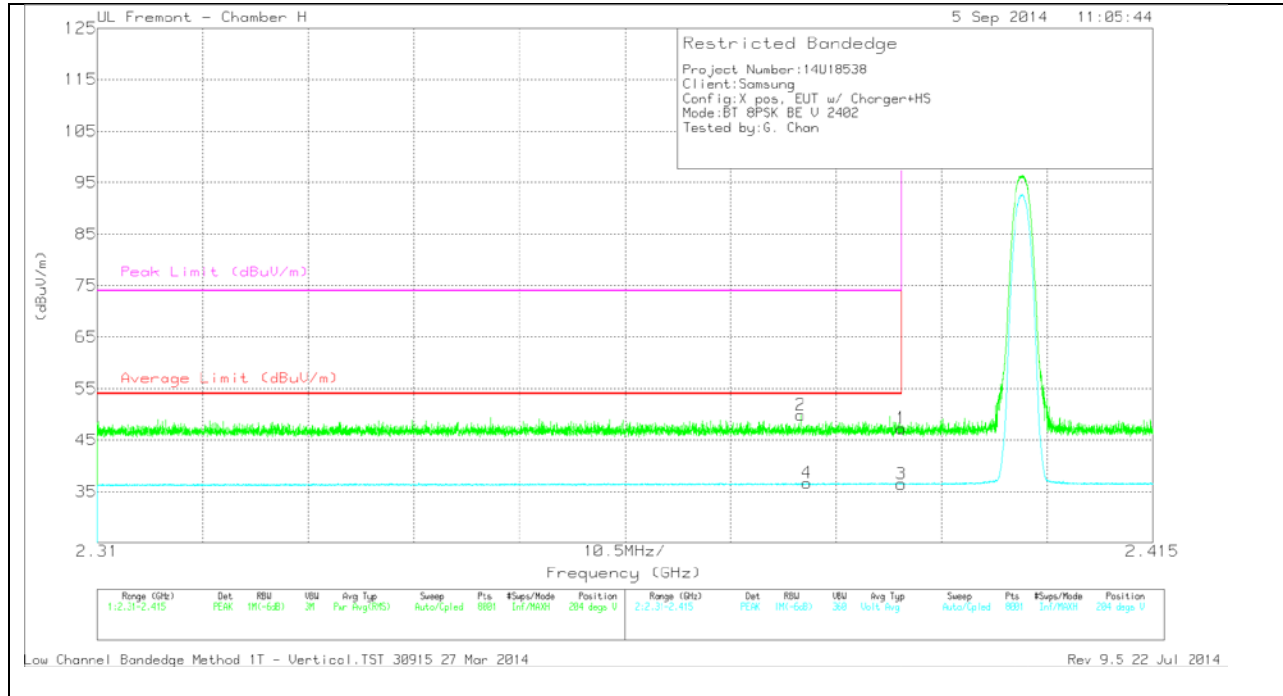
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 2.376	29.27	VB1T	32	-24.6	36.67	54	-17.33	-	-	137	285	H
2	* 2.389	42.51	PK	32	-24.6	49.91	-	-	74	-24.09	137	285	H
1	* 2.39	39.64	PK	32	-24.6	47.04	-	-	74	-26.96	137	285	H
3	* 2.39	28.99	VB1T	32	-24.6	36.39	54	-17.61	-	-	137	285	H

VERTICAL PEAK AND AVERAGE PLOT

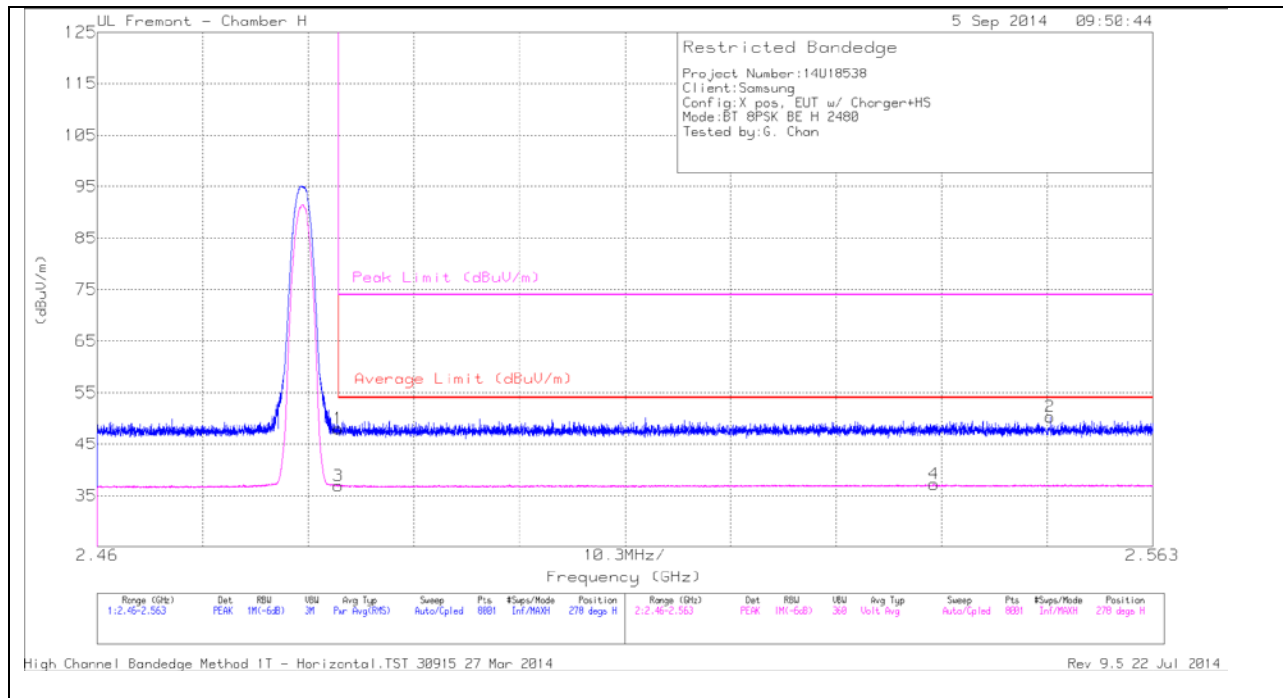


VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Filt/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.38	42.46	PK	32	-24.6	49.86	-	-	74	-24.14	204	295	V
4	* 2.381	29.27	VB1T	32	-24.6	36.67	54	-17.33	-	-	204	295	V
1	* 2.39	39.89	PK	32	-24.6	47.29	-	-	74	-26.71	204	295	V
3	* 2.39	29.08	VB1T	32	-24.6	36.48	54	-17.52	-	-	204	295	V

AUTHORIZED BANDEDGE (HIGH CHANNEL)

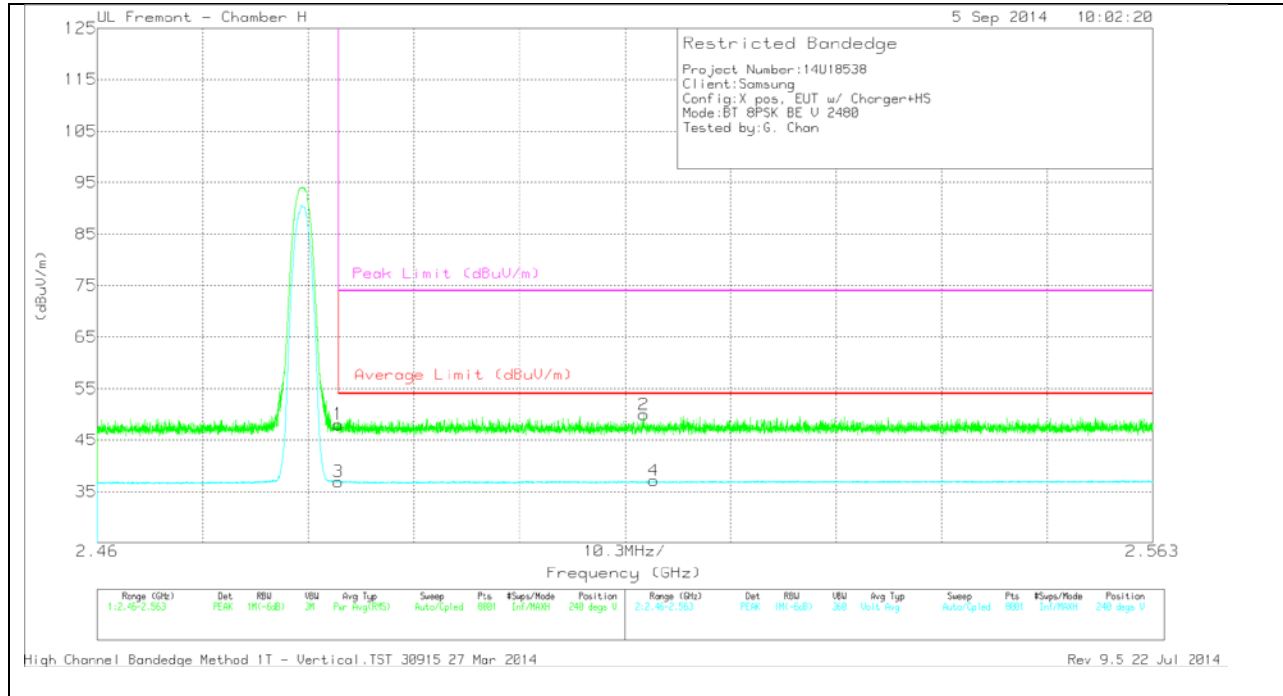
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Filt/Pad (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	40.31	PK	32.2	-24.5	48.01	-	-	74	-25.99	278	279	H
3	* 2.484	29.19	VB1T	32.2	-24.5	36.89	54	-17.11	-	-	278	279	H
4	2.542	29.41	VB1T	32.2	-24.4	37.21	54	-16.79	-	-	278	279	H
2	2.553	42.37	PK	32.2	-24.3	50.27	-	-	74	-23.73	278	279	H

VERTICAL PEAK AND AVERAGE PLOT

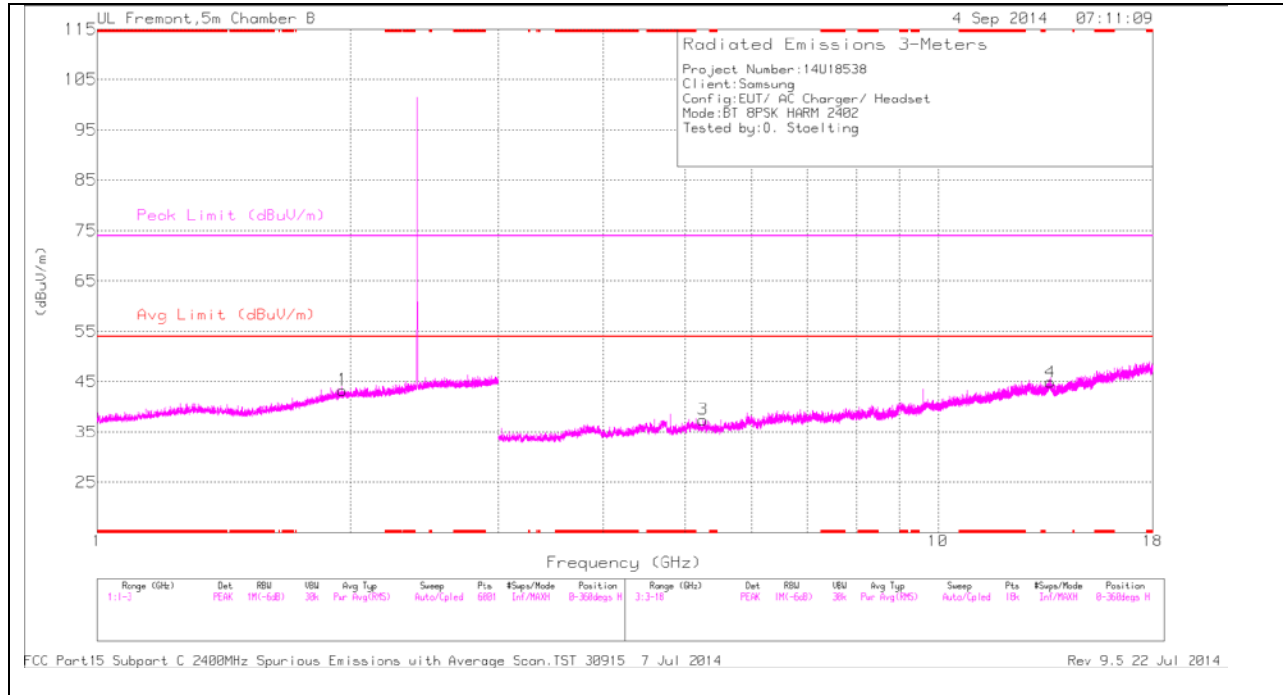


VERTICAL DATA

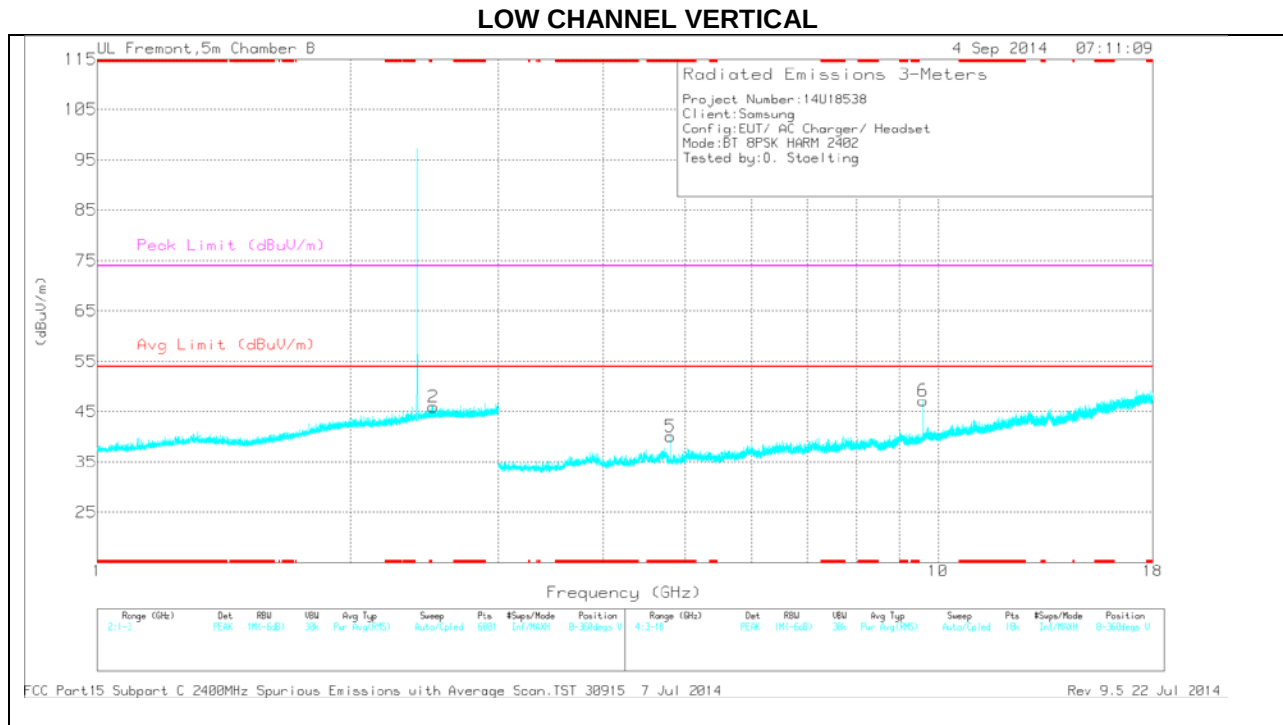
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.33	PK	32.2	-24.5	48.03	-	-	74	-25.97	240	342	V
3	* 2.484	29.21	VB1T	32.2	-24.5	36.91	54	-17.09	-	-	240	342	V
2	2.513	42.15	PK	32.2	-24.4	49.95	-	-	74	-24.05	240	342	V
4	2.514	29.33	VB1T	32.2	-24.4	37.13	54	-16.87	-	-	240	342	V

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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



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	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 4.804	35.48	PK	34.2	-29.6	40.08	-	-	74	-33.92	0-360	200	V
1	1.956	35.53	PK	31.2	-23.4	43.33	-	-	-	-	0-360	101	H
2	2.51	36.14	PK	32.4	-22.6	45.94	-	-	-	-	0-360	199	V
3	5.259	33.27	PK	34.4	-30.2	37.47	-	-	-	-	0-360	101	H
6	9.608	34.87	PK	36.8	-24.5	47.17	-	-	-	-	0-360	200	V
4	13.605	27.21	PK	38.8	-21.1	44.91	-	-	-	-	0-360	200	H

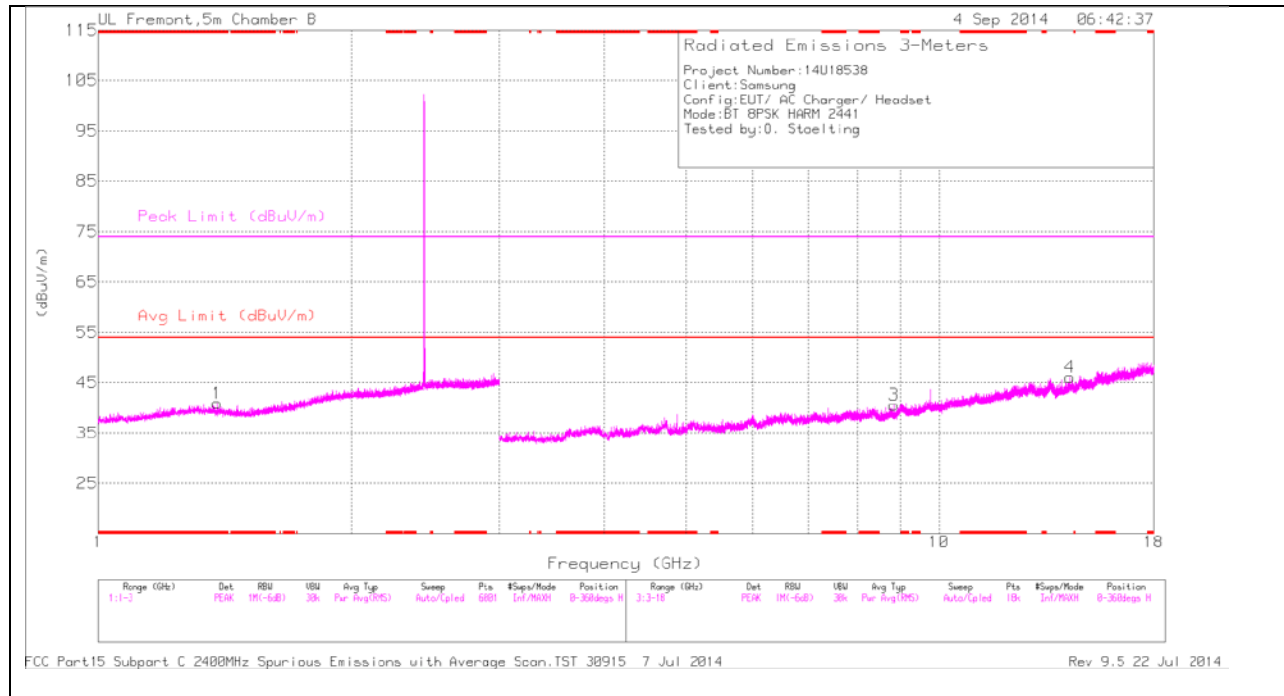
PK - Peak detector

RADIATED EMISSIONS

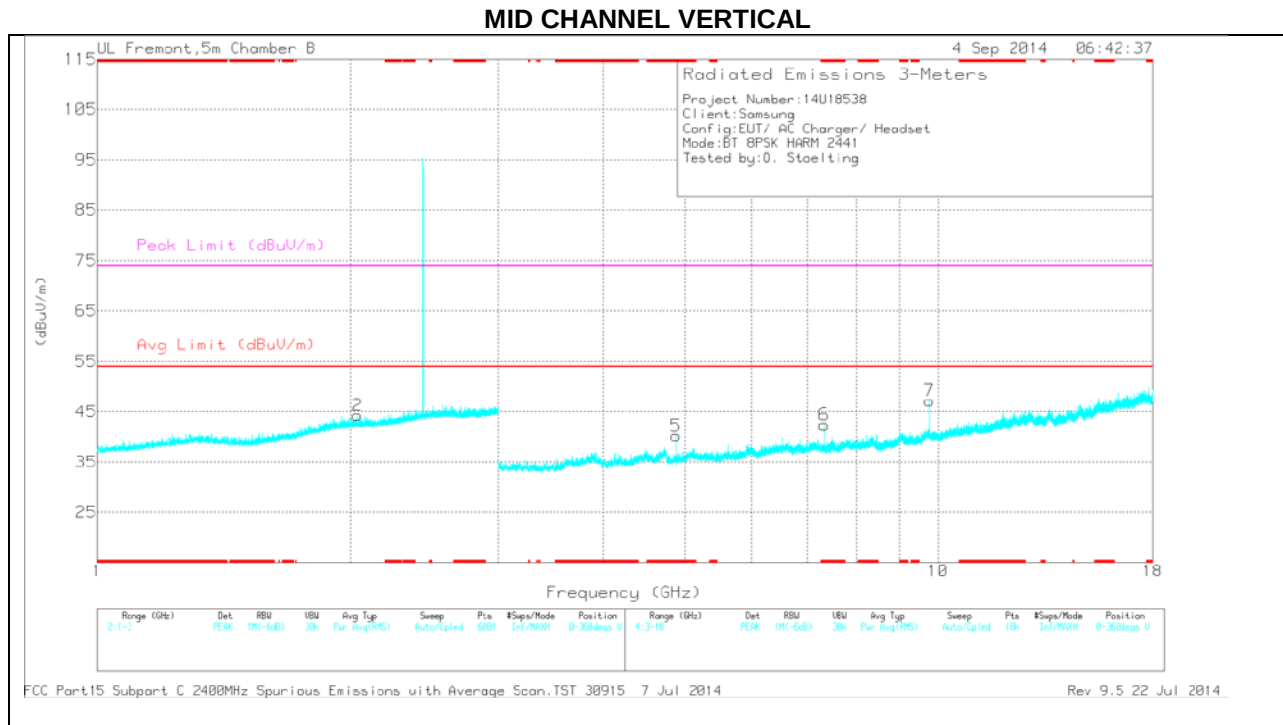
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	42.64	PK3	34.2	-29.6	47.24	-	-	74	-26.76	228	223	V
* 4.804	32.49	VB1T	34.2	-29.6	37.09	54	-16.91	-	-	228	223	V
9.608	40.49	PK3	36.8	-24.5	52.79	-	-	-	-	154	231	V
9.608	34.6	VB1T	36.8	-24.5	46.9	-	-	-	-	154	231	V

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

MID CHANNEL HORIZONTAL



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



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	AF T345 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.386	36.48	PK	28.6	-24.2	40.88	-	-	74	-33.12	0-360	200	H
5	* 4.882	36.69	PK	34.2	-30.7	40.19	-	-	74	-33.81	0-360	200	V
6	* 7.323	35.23	PK	35.6	-28.4	42.43	-	-	74	-31.57	0-360	200	V
2	2.041	36.29	PK	31.3	-23.3	44.29	-	-	-	-	0-360	200	V
3	8.846	30.58	PK	36	-26	40.58	-	-	-	-	0-360	200	H
7	9.764	34.6	PK	36.9	-24.3	47.2	-	-	-	-	0-360	200	V
4	14.316	27.67	PK	39	-20.6	46.07	-	-	-	-	0-360	101	H

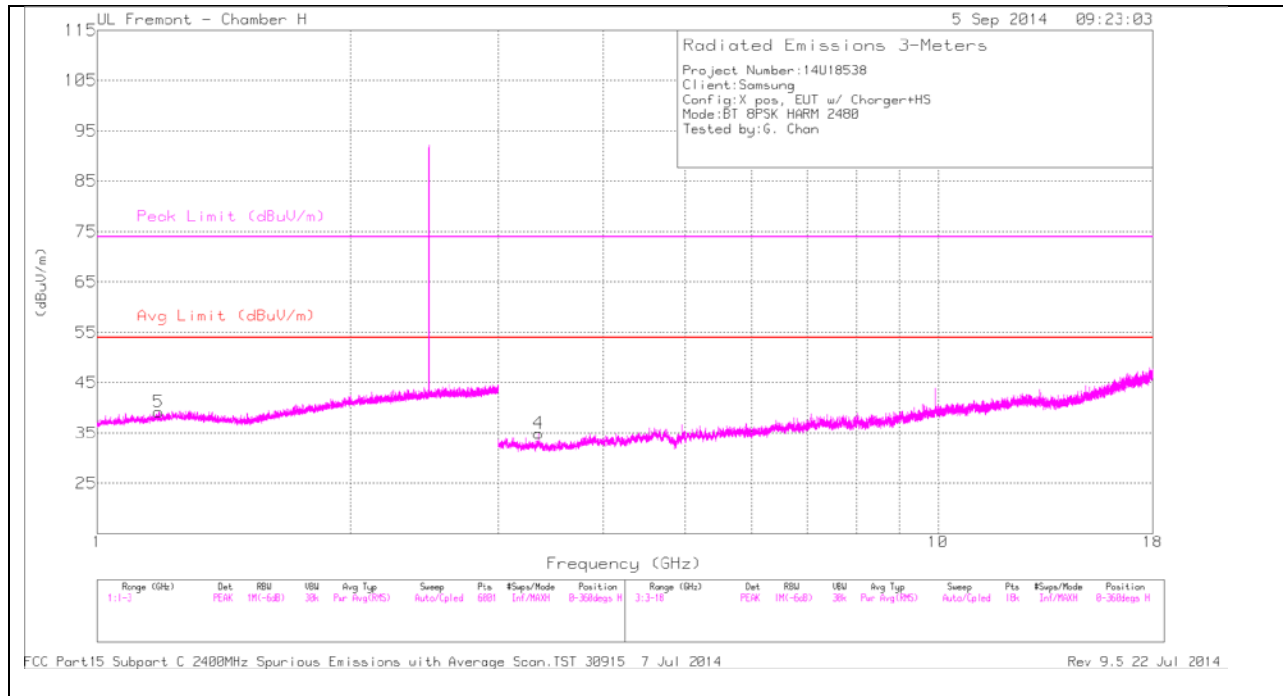
PK - Peak detector

RADIATED EMISSIONS

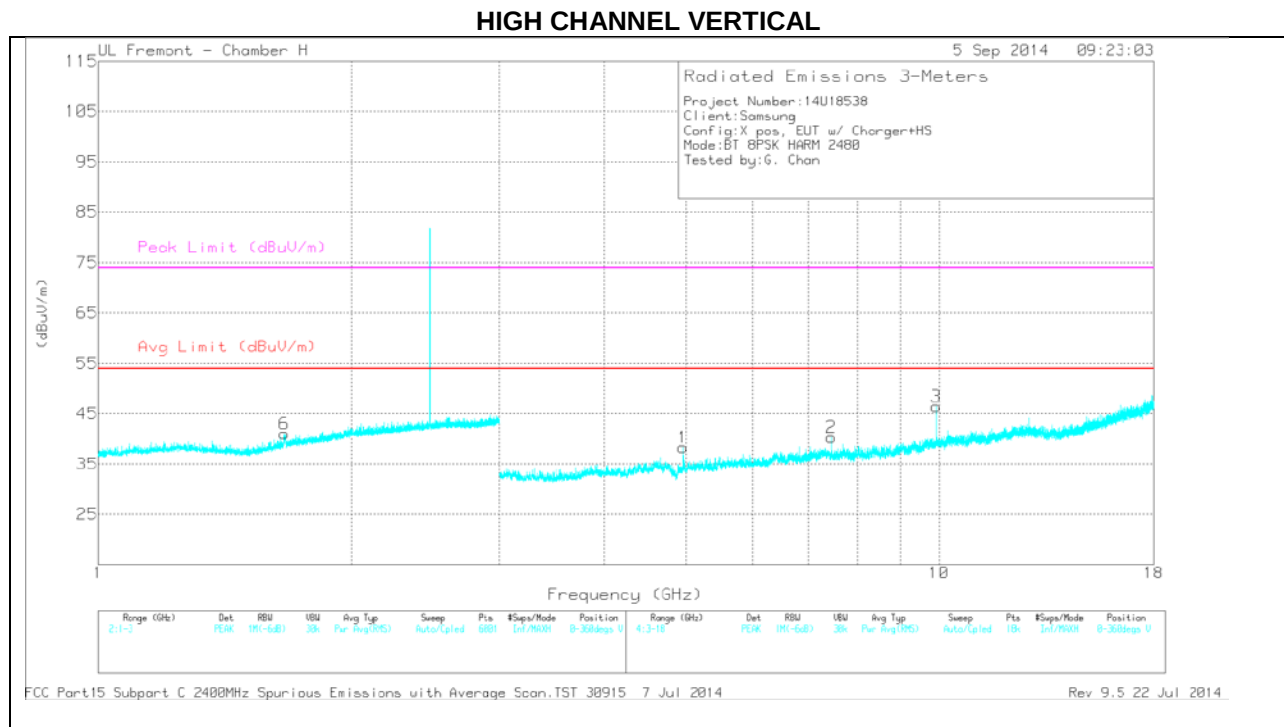
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.882	43.41	PK3	34.2	-30.7	46.91	-	-	74	-27.09	4	120	V
* 4.882	34.22	VB1T	34.2	-30.7	37.72	54	-16.28	-	-	4	120	V
* 7.323	45.34	PK3	35.6	-28.4	52.54	-	-	74	-21.46	201	203	V
* 7.323	33.05	VB1T	35.6	-28.4	40.25	54	-13.75	-	-	201	203	V
9.764	40.02	PK3	36.9	-24.3	52.62	-	-	-	-	138	209	V
9.764	33.51	VB1T	36.9	-24.3	46.11	-	-	-	-	138	209	V

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

HIGH CHANNEL HORIZONTAL



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



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	AF T863 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 1.183	36.49	PK	28.6	-25.9	39.19	-	-	74	-34.81	0-360	201	H
6	* 1.664	37.03	PK	29	-25	41.03	-	-	74	-32.97	0-360	201	V
4	* 3.349	34.36	PK	32.9	-32.3	34.96	-	-	74	-39.04	0-360	100	H
1	* 4.96	35.76	PK	34.3	-31.8	38.26	-	-	74	-35.74	0-360	201	V
2	* 7.44	33.5	PK	36.1	-29.3	40.3	-	-	74	-33.7	0-360	100	V
3	9.92	35.12	PK	37.2	-25.9	46.42	-	-	-	-	0-360	201	V

PK - Peak detector

RADIATED EMISSIONS

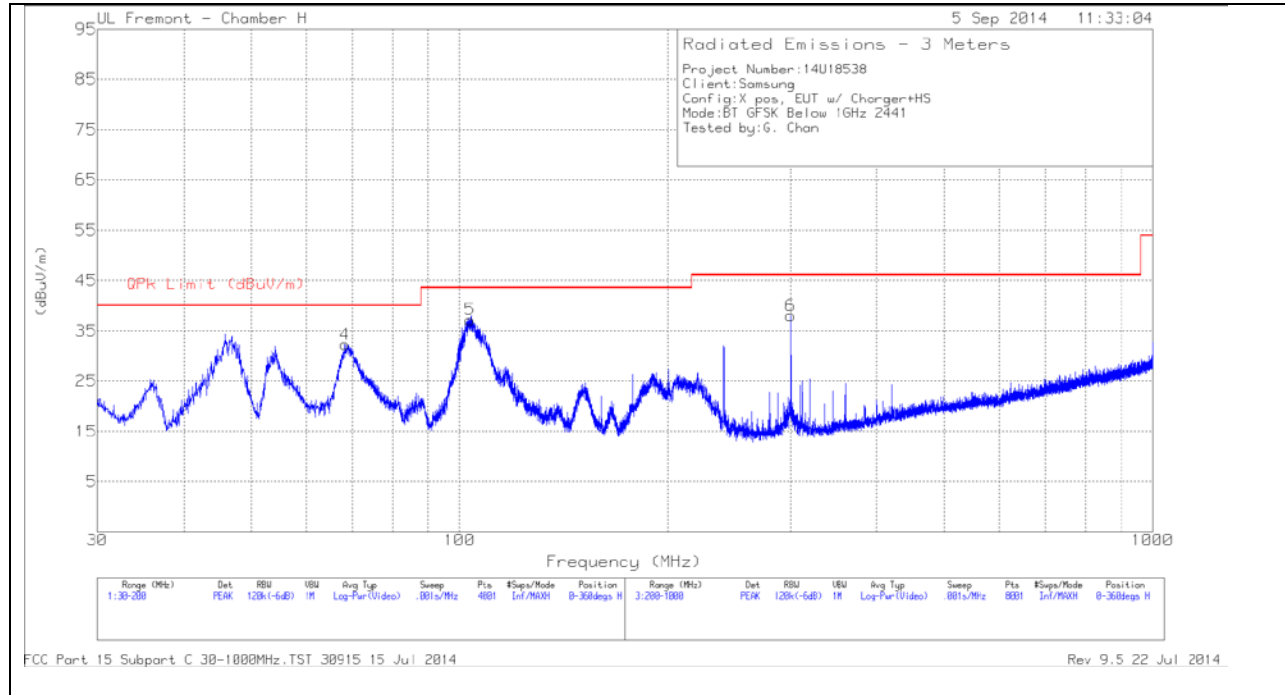
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96	42.44	PK3	34.3	-31.8	44.94	-	-	74	-29.06	267	194	V
* 4.96	33.2	VB1T	34.3	-31.8	35.7	54	-18.3	-	-	267	194	V
* 7.44	43.42	PK3	36.1	-29.3	50.22	-	-	74	-23.78	97	314	V
* 7.44	32.47	VB1T	36.1	-29.3	39.27	54	-14.73	-	-	97	314	V
9.92	41.65	PK3	37.2	-25.9	52.95	-	-	-	-	206	275	V
9.92	36.14	VB1T	37.2	-25.9	47.44	-	-	-	-	206	275	V

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

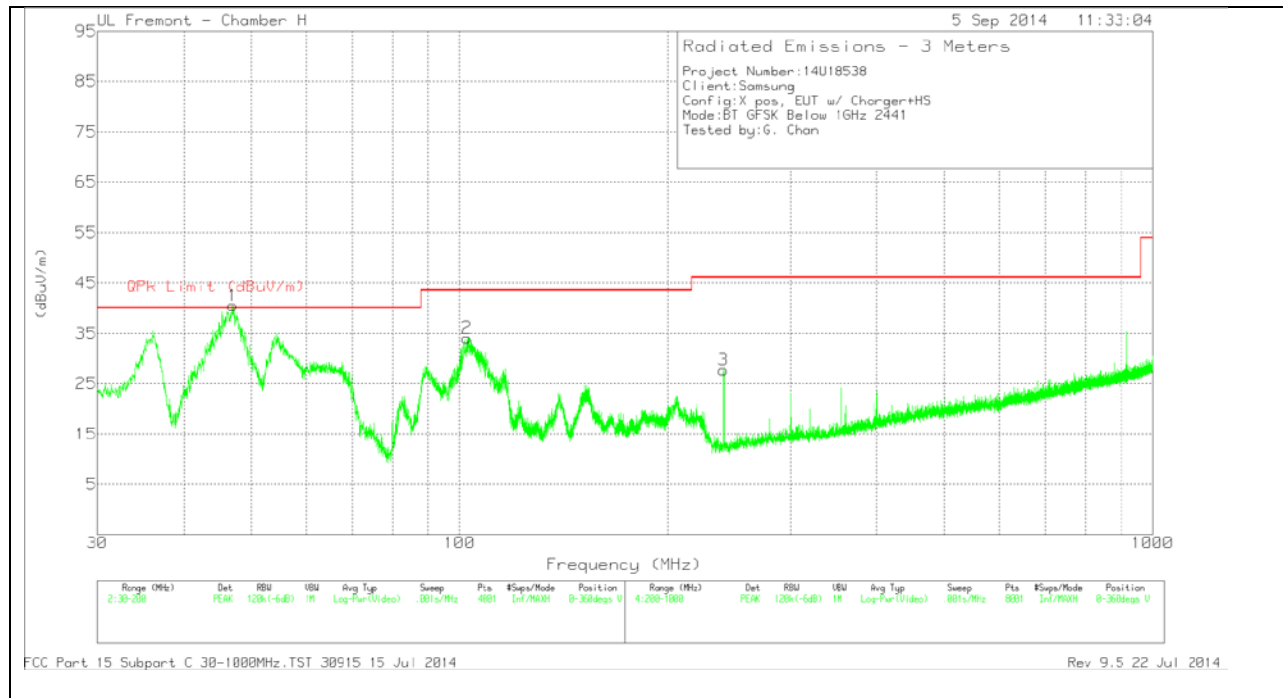
9.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



BELOW 1 GHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	SS JB3 SN A051314-1	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 240.3	42.32	PK	14.4	-29	27.72	46.02	-18.3	0-360	100	V
1	47	58.01	PK	12.3	-30.8	39.51	40	-0.49	0-360	100	V
4	68.3775	51.47	PK	11.3	-30.5	32.27	40	-7.73	0-360	301	H
2	102.3775	50.77	PK	13.4	-30.1	34.07	43.52	-9.45	0-360	100	V
5	103.4825	53.5	PK	13.8	-30.1	37.2	43.52	-6.32	0-360	201	H
6	300.4	50.13	PK	16.5	-28.6	38.03	46.02	-7.99	0-360	100	H

PK - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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 C63.4.

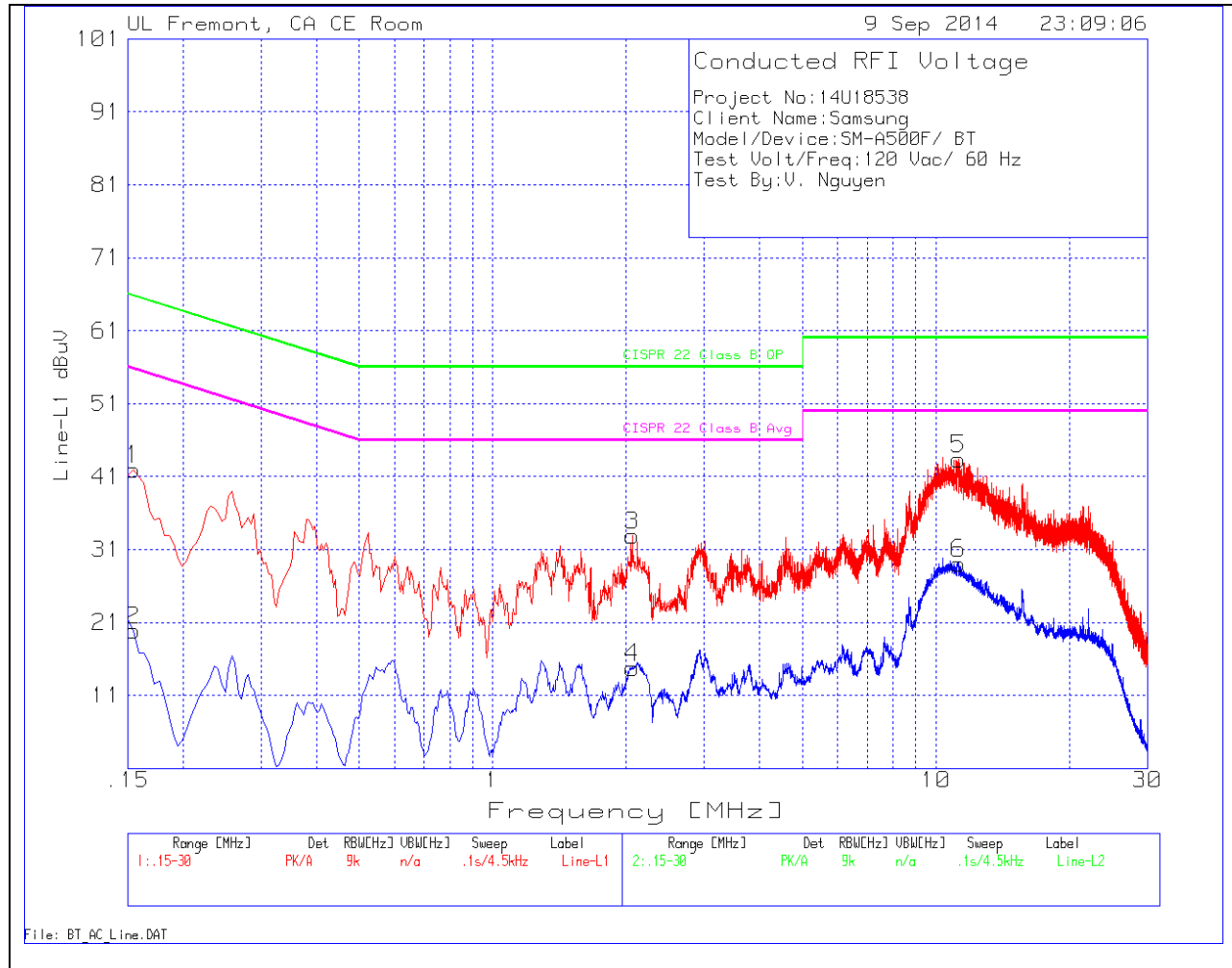
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT

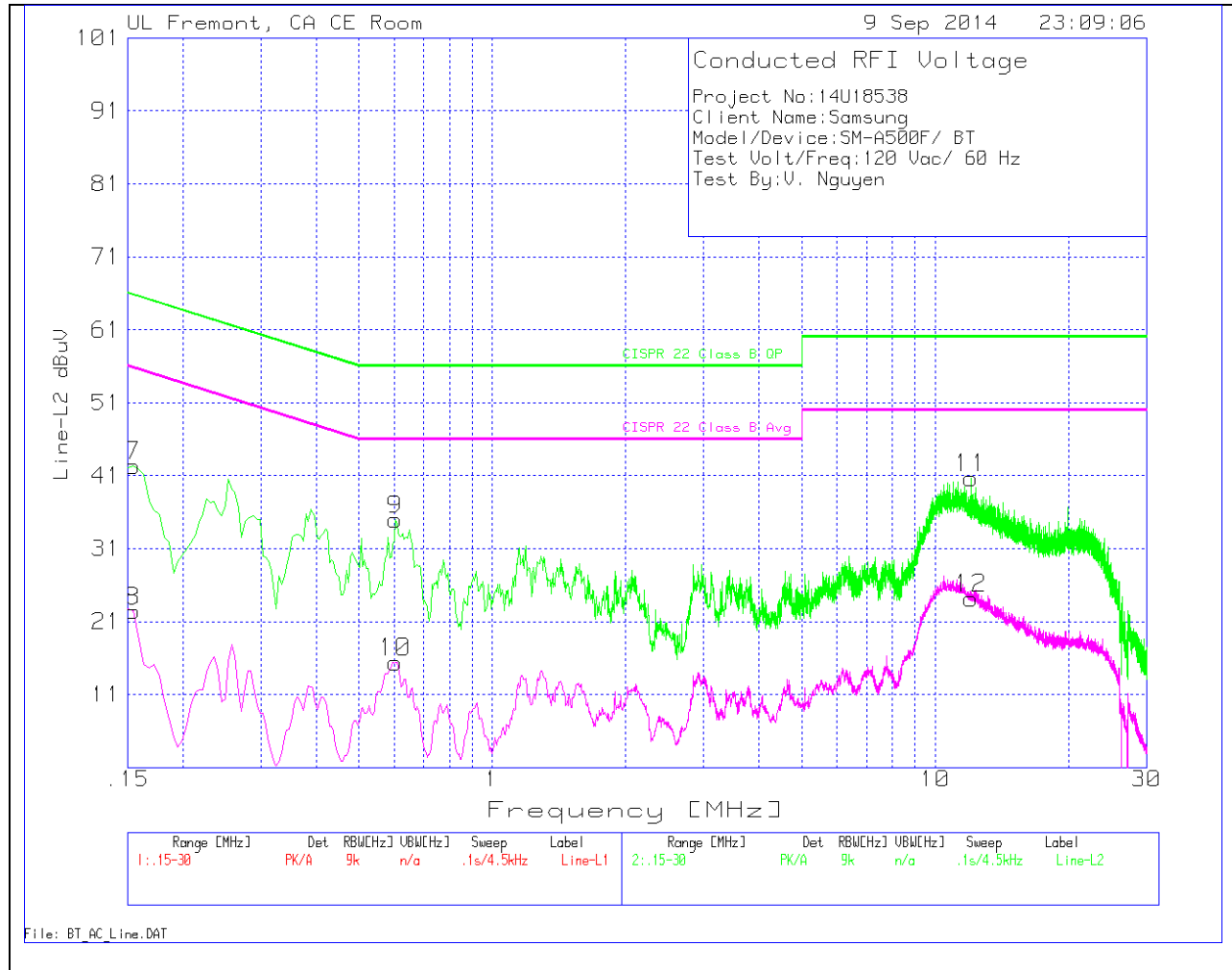


LINE 1 RESULTS

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.1545	40.63	PK	1.3	0	41.93	65.8	-23.87	-	-
2	.1545	18.55	Av	1.3	0	19.85	-	-	55.8	-35.95
3	2.0625	32.57	PK	.2	.1	32.87	56	-23.13	-	-
4	2.0625	14.48	Av	.2	.1	14.78	-	-	46	-31.22
5	11.2245	42.93	PK	.2	.2	43.33	60	-16.67	-	-
6	11.2245	28.62	Av	.2	.2	29.02	-	-	50	-20.98

LINE 2 PLOT



LINE 2 RESULTS

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
7	.1545	40.93	PK	1.4	0	42.33	65.8	-23.47	-	-
8	.1545	21.02	Av	1.4	0	22.42	-	-	55.8	-33.38

9	.6045	34.63	PK	.3	0	34.93	56	-21.07	-	-
10	.6045	15.1	Av	.3	0	15.4	-	-	46	-30.6
11	12.0345	40.25	PK	.2	.2	40.65	60	-19.35	-	-
12	12.0345	23.78	Av	.2	.2	24.18	-	-	50	-25.82
