



CERTIFICATION TEST REPORT

Report Number. : 11836945-E1V2

Applicant : Google LLC.
1600 Amphitheatre Parkway
Mountain View, CA 94043 U.S.A.

Model : H0B

FCC ID : A4R-H0B

IC : 10395A-H0B

EUT Description : Multimedia Device

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED RSS - 247 ISSUE 2

Date Of Issue:
October 25, 2017

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	10/13/17	Initial Release	---
V2	10/25/17	Updated sections 1 and 5.5	C. Susa

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Google LLC.
1600 Amphitheatre Parkway
Mountain View, CA 94043 U.S.A.

EUT DESCRIPTION: Multimedia Device

MODEL: H0B

SERIAL NUMBER: 7904M2Z2N6(radiated), 7904M2Z154(conducted)

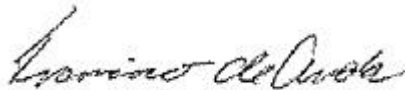
DATE TESTED: September 11th, 2017 - October 10th, 2017

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
ISED RSS-247 Issue 2	Pass
ISED RSS-GEN Issue 4	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 the U.S. government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 2.

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
	☐ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under ISED company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under Industry Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0 except for ISED RSS-247 Issue 2. 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:

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

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	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a multimedia device

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum output power as follows:

Frequency Range (MHz)	Mode	Average		Peak	
		Output Power (dBm)	Output Power (mW)	Output Power (dBm)	Output Power (mW)
2402 - 2480	GFSK	9.17	8.26	9.37	8.65
2402 - 2480	QPSK	5.58	3.61	8.47	7.03
2402 - 2480	8PSK	5.80	3.80	8.63	7.29

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes antenna, with a maximum gain of 4.7dBi

5.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was v1.29.99992

The test utility software used during testing was QRCT v3.0.264.0.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

The fundamental of the EUT was investigated in two orientations Y and Z, it was determined that Y orientation was worst-case orientation. X orientation was not investigated due to the AC and I/O ports in the back of the EUT. Therefore, all final radiated testing was performed with the EUT in Y orientation.

All measurements were performed with the AC plugged into a power source.

Worst-case data rates as provided by the client were:

GFSK mode: DH5
8PSK mode: 3-DH5

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
AC Adapter	HP	HSTNN-LA40	WDUV0B3U8HK1Y
Laptop	HP	11-d001ax	5CD51643JG
USB Ethernet Adapter	Linksys	USB3GIG	15710S05701719
USB Hub	CGC	27402	NSN

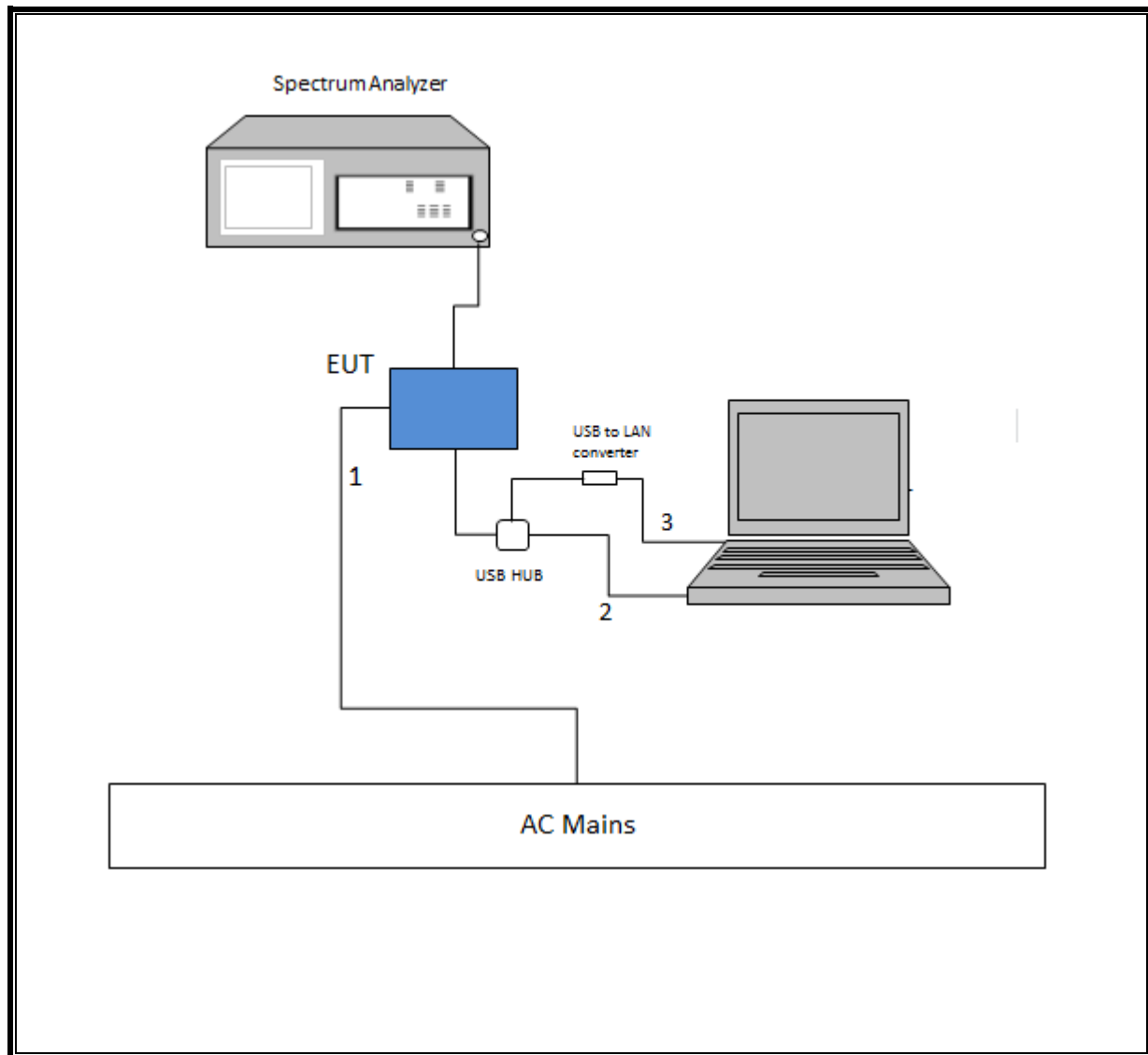
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	2-Prong	unshielded	2	
2	USB	1	USB	unshielded	2.5	USB serial cable
3	Ethernet	1	RJ45	unshielded	1	

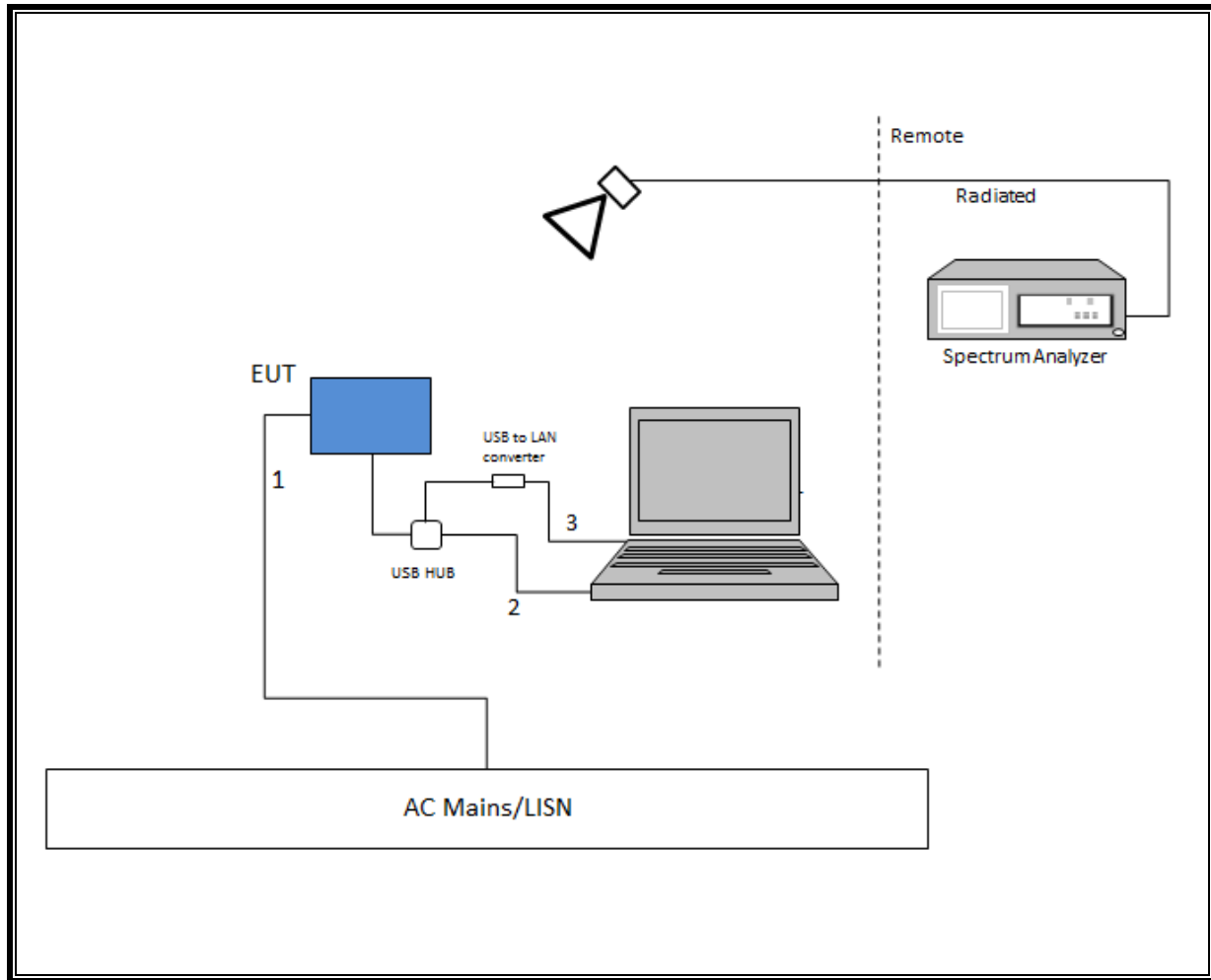
TEST SETUP

The EUT is connected to a test laptop. Test software exercises the radio.

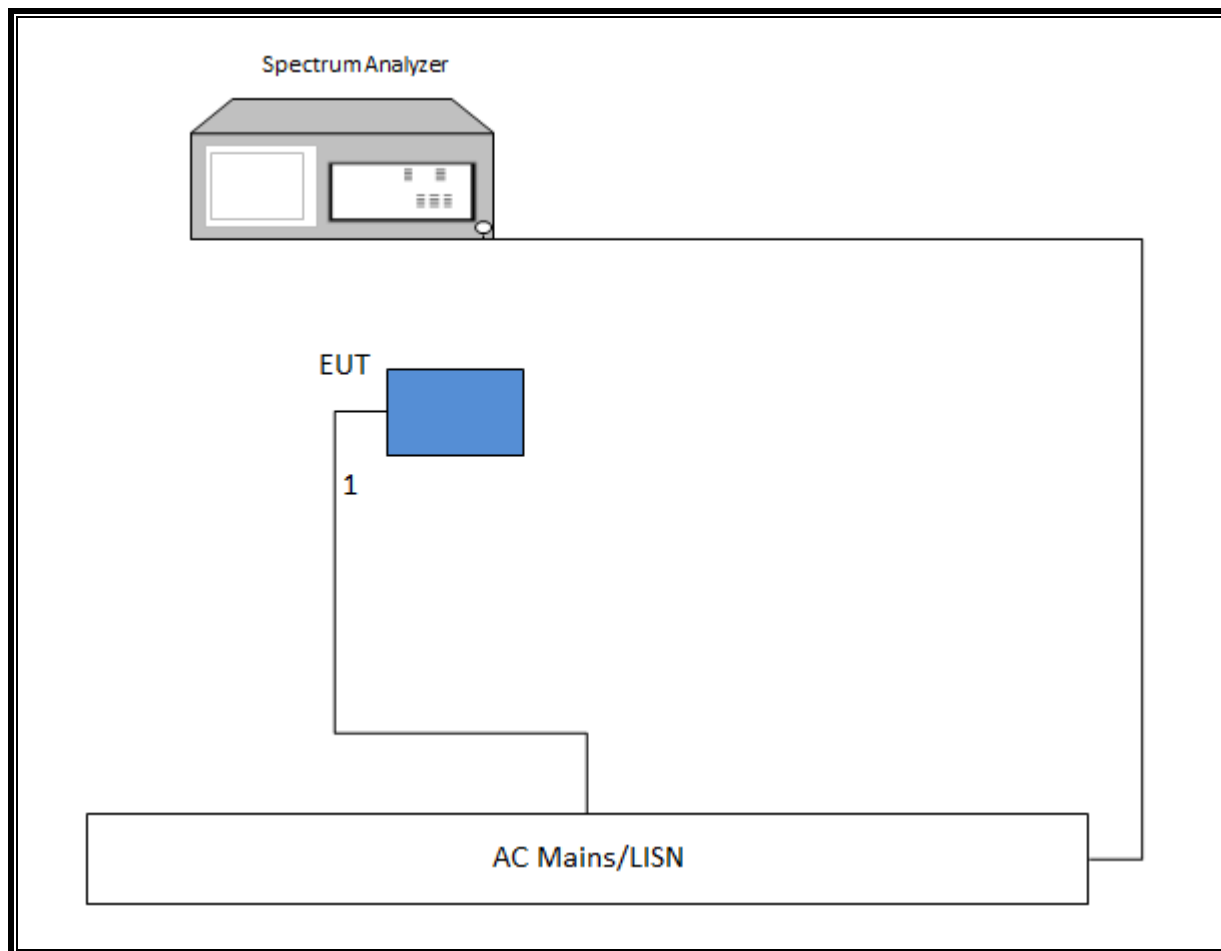
SETUP DIAGRAM FOR ANTENNA PORT CONDUCTED TESTS



SETUP DIAGRAM FOR RADIATED TESTS



SETUP DIAGRAM FOR LINE CONDUCTED TEST



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T711	01/30/18	01/30/17
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T740	11/29/17	11/29/16
High Pass Filter 3GHz	Micro-Tronics	HPM17543	T428	11/29/17	11/29/18
Spectrum Analyzer	Keysight	N9030A	T1210	07/17/18	07/17/17
Power Meter	Keysight	N1911A	T229	08/14/18	08/14/17
Power Sensor	Keysight	N1921A	T1225	03/29/18	03/29/17
EMI Receiver	Rohde & Schwarz	ESR	T1436	01/06/18	01/06/17
LISN	Fischer Custom Communications	FCC-LISN-50/250-25-2-01	T1310	06/15/18	06/15/17
Antenna Horn, 18-26GHz	ARA	MWH-1826	T89	01/04/18	01/04/17
RF Preamplifier, 1-26GHz	Agilent	8449B	T404	07/23/18	07/23/17
Spectrum Analyzer	Keysight	N9030A	T1454	12/15/18	12/15/17
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	10/11/17	10/11/16
Rf Preamplifier, 10kHz – 1GHz	Sonoma	310N	T286	06/02/18	06/02/17
Spectrum Analyzer	Keysight	N9030A	T340	12/14/18	12/14/17

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016
Conducted Emissions Software	UL	UL EMC	Ver 9.5, May 26, 2015

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

LIMITS

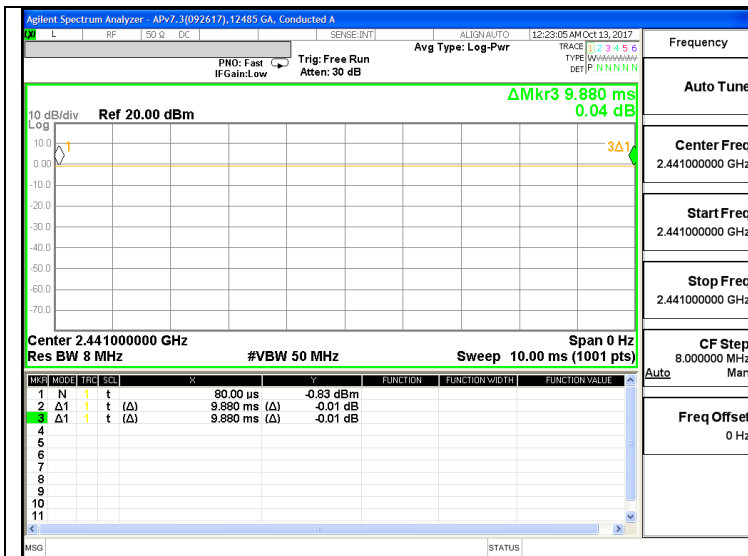
None; for reporting purposes only.

PROCEDURE

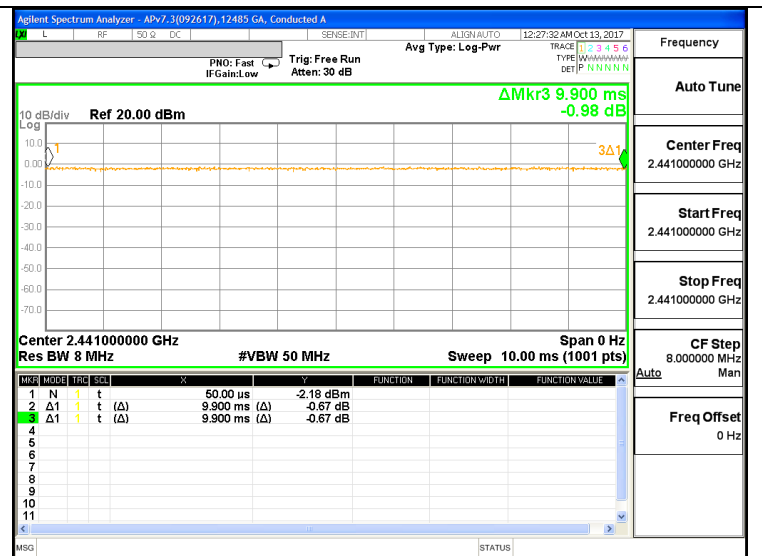
KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
Bluetooth GFSK	9.880	9.880	1.000	100.0%	0.00	0.010
Bluetooth 8PSK	9.900	9.900	1.000	100.0%	0.00	0.010



GFSK



8PSK

7.2. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

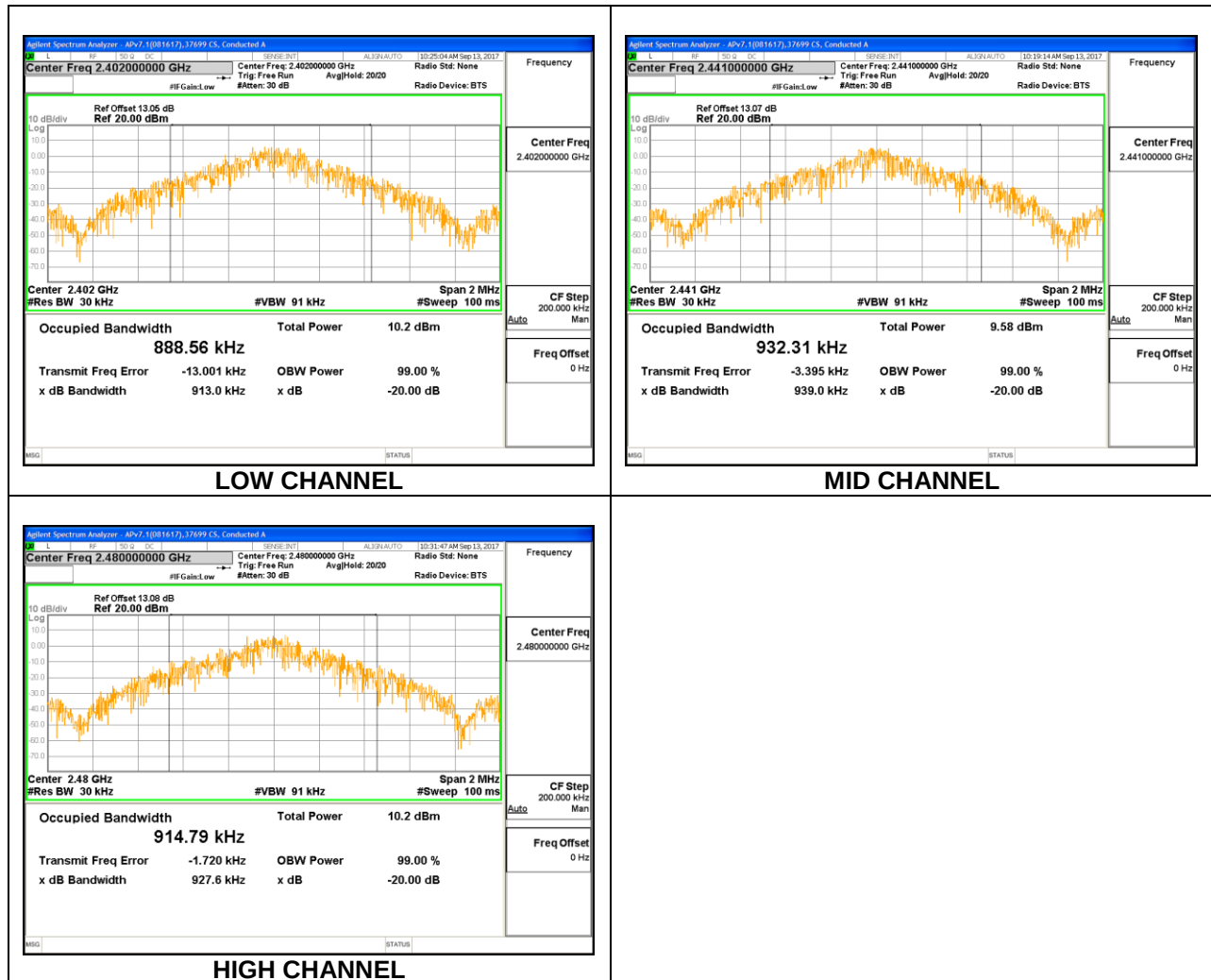
The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to $\geq$ RBW. The sweep time is coupled.

RESULTS

7.2.1. BASIC DATA RATE GFSK MODULATION

20dB and 99% BANDWIDTH

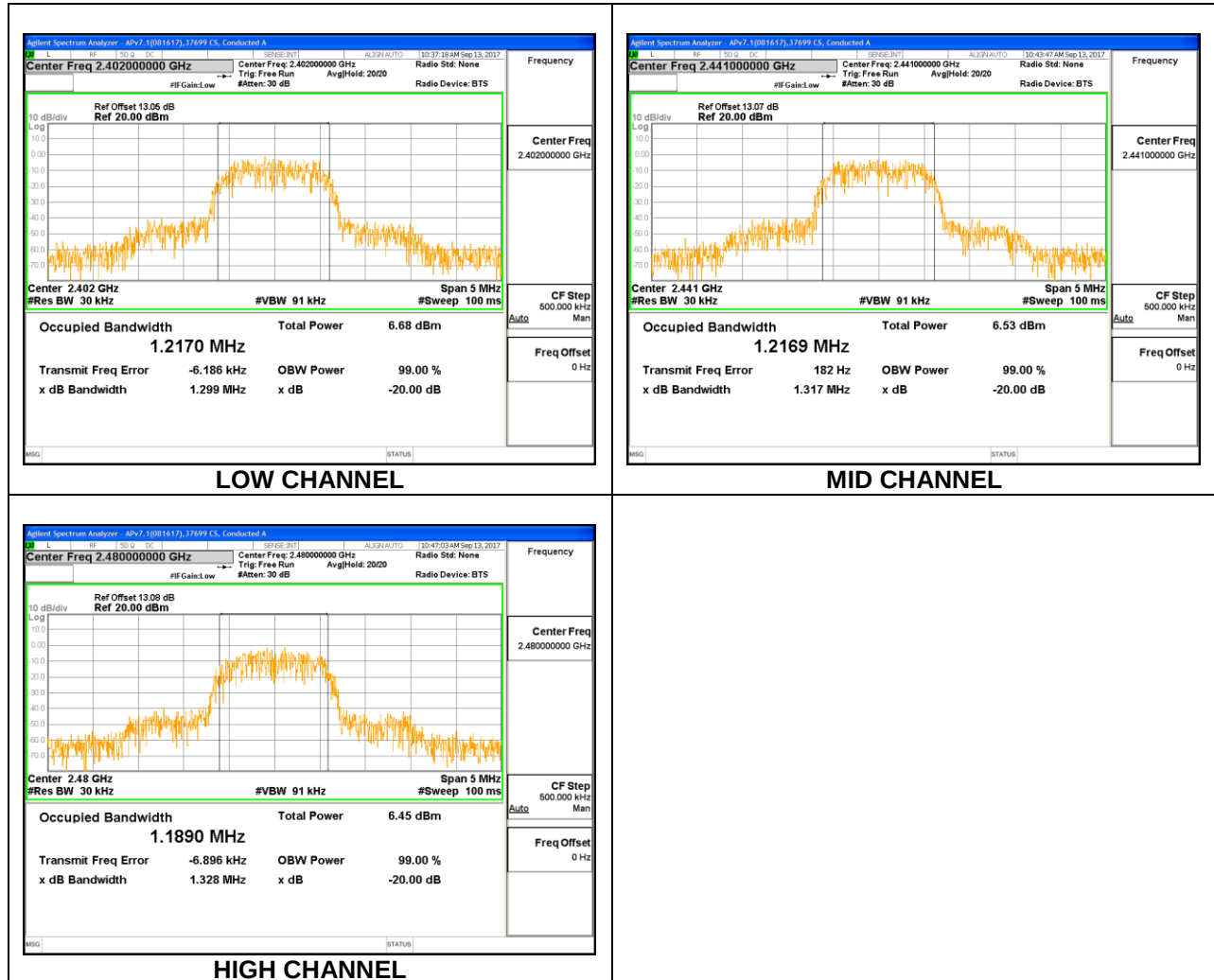
Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2402	913.0	888.56
Mid	2441	939.0	932.31
High	2480	927.6	914.79



7.2.2. ENHANCED DATA RATE 8PSK MODULATION

20dB and 99% BANDWIDTH

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.299	1.217
Mid	2441	1.317	1.2169
High	2480	1.328	1.189



7.3. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

RSS-247 (5.1) (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.

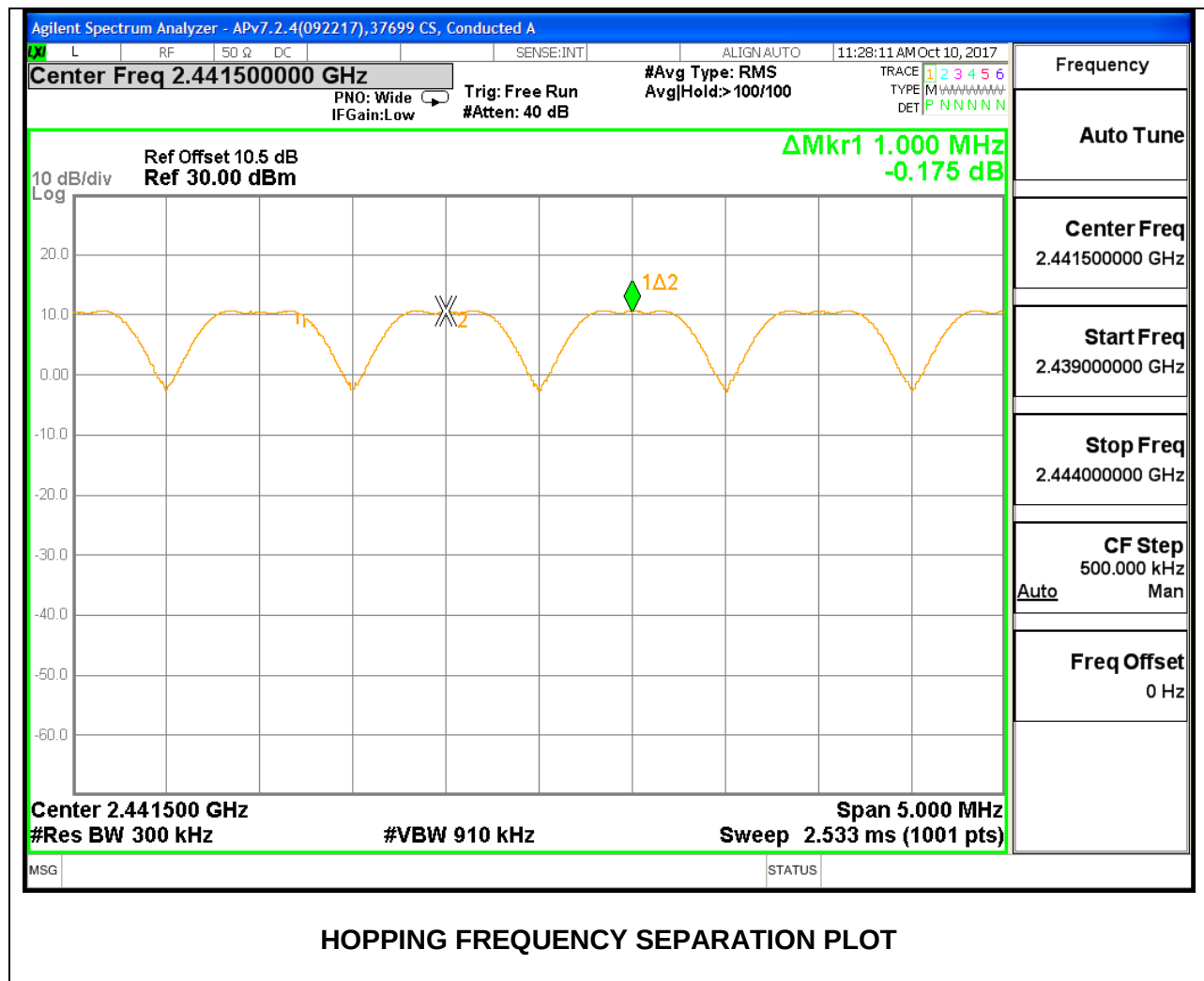
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

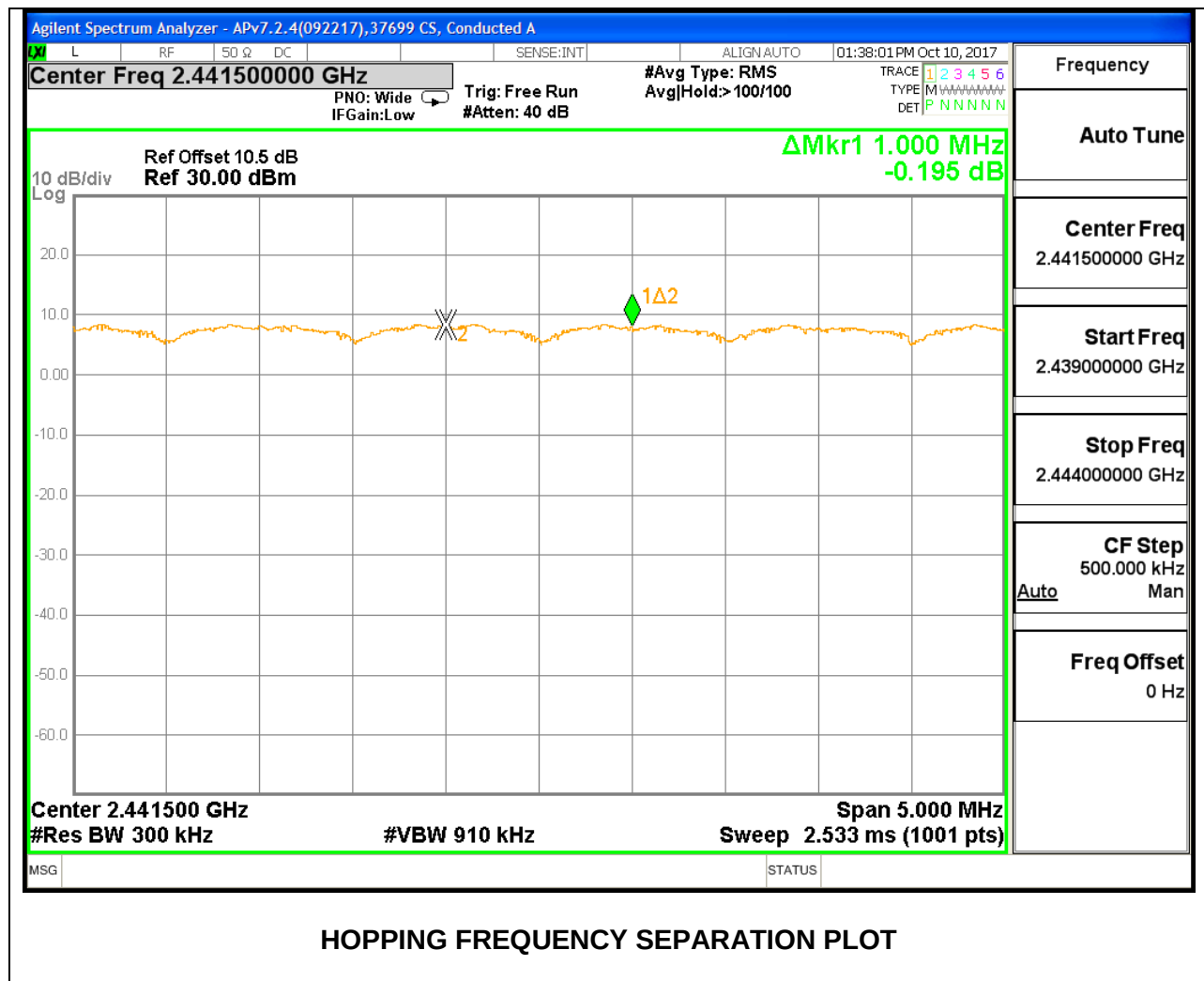
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

RESULTS

7.3.1. BASIC DATA RATE GFSK MODULATION



7.3.2. ENHANCED DATA RATE 8PSK MODULATION



7.4. NUMBER OF HOPPING CHANNELS LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

TEST PROCEDURE

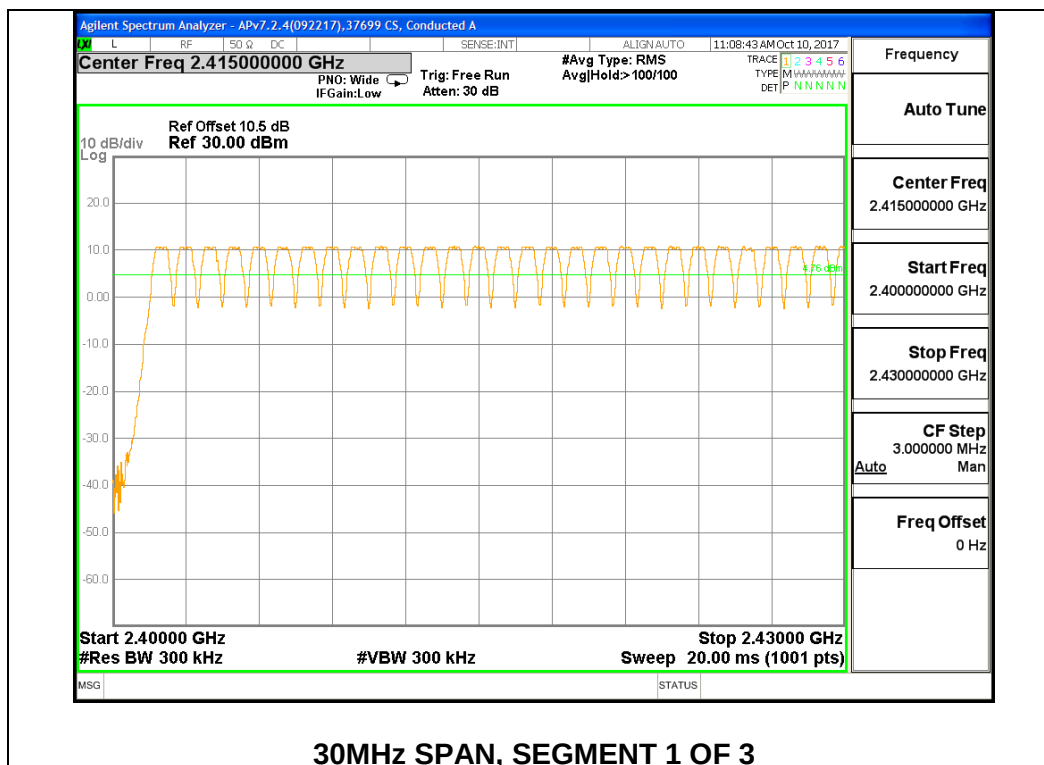
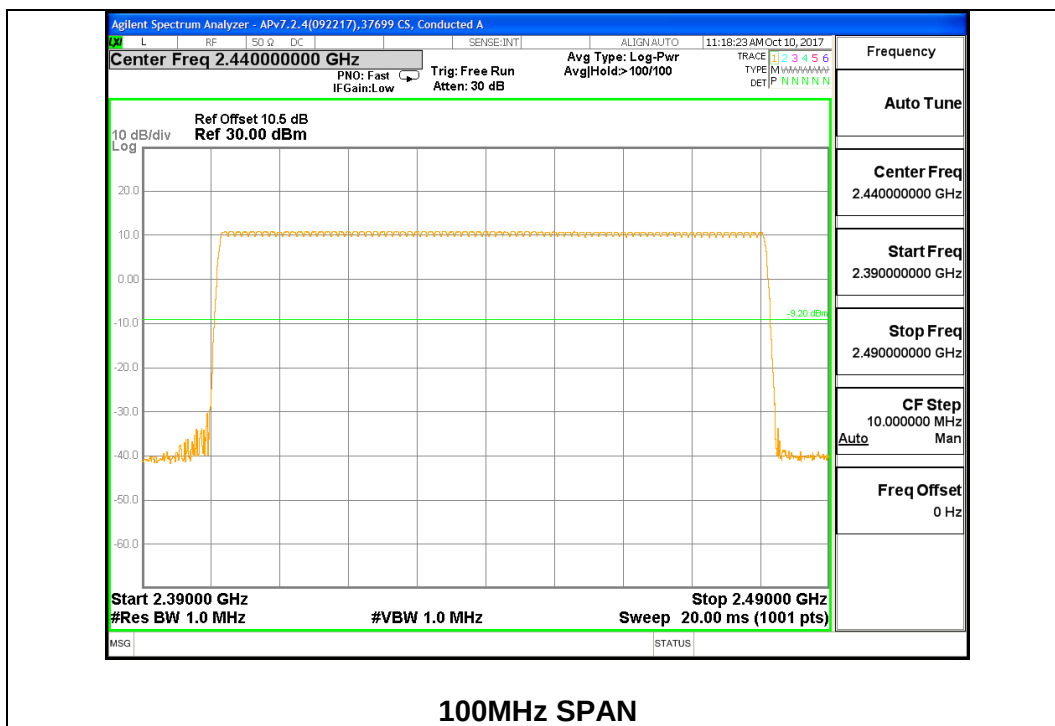
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

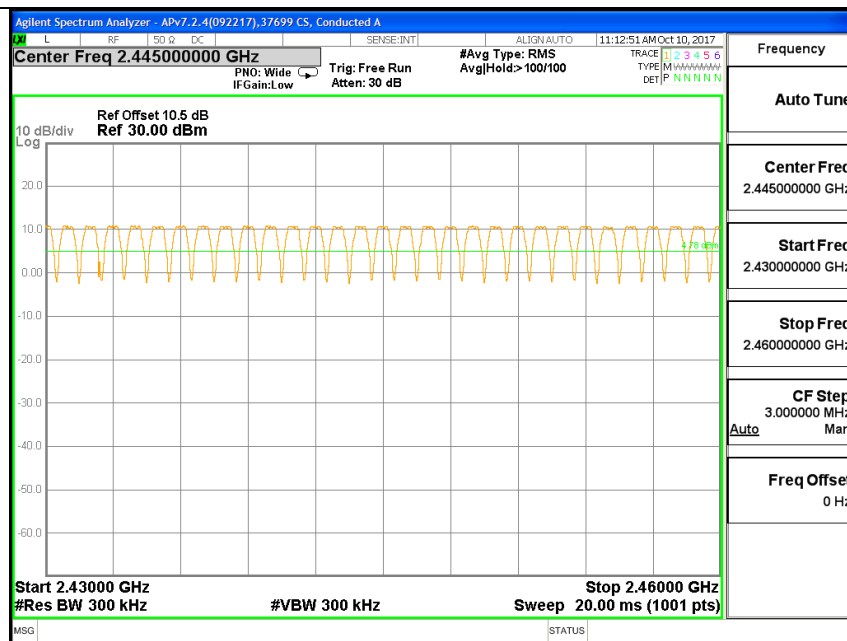
RESULTS

Normal Mode: 79 Channels observed.

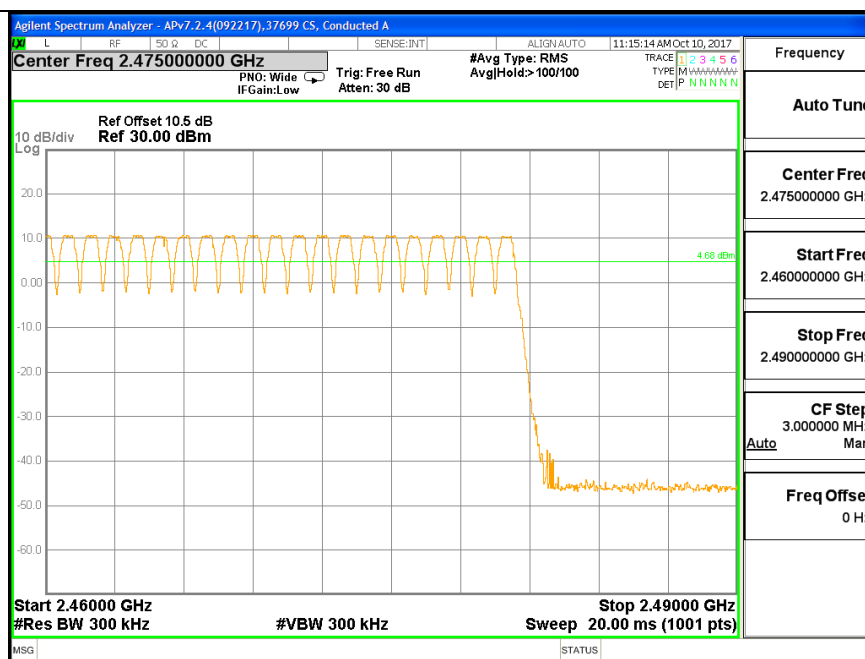
7.4.1. BASIC DATA RATE GFSK MODULATION

NUMBER OF HOPPING CHANNELS





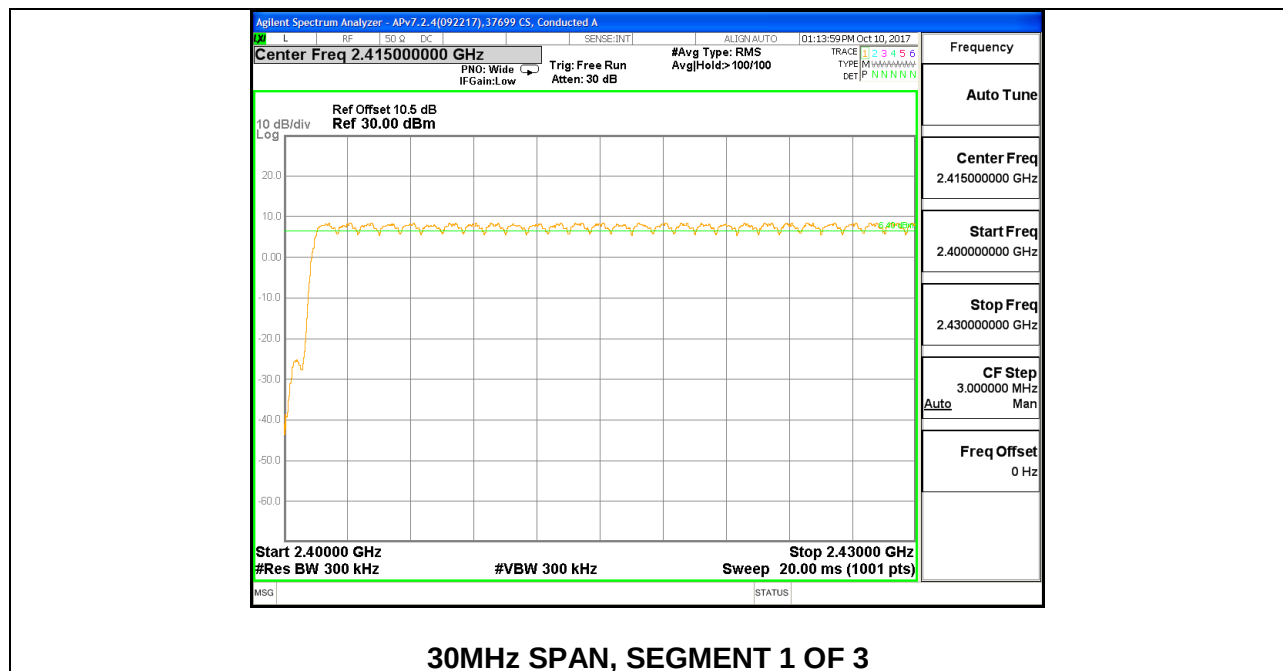
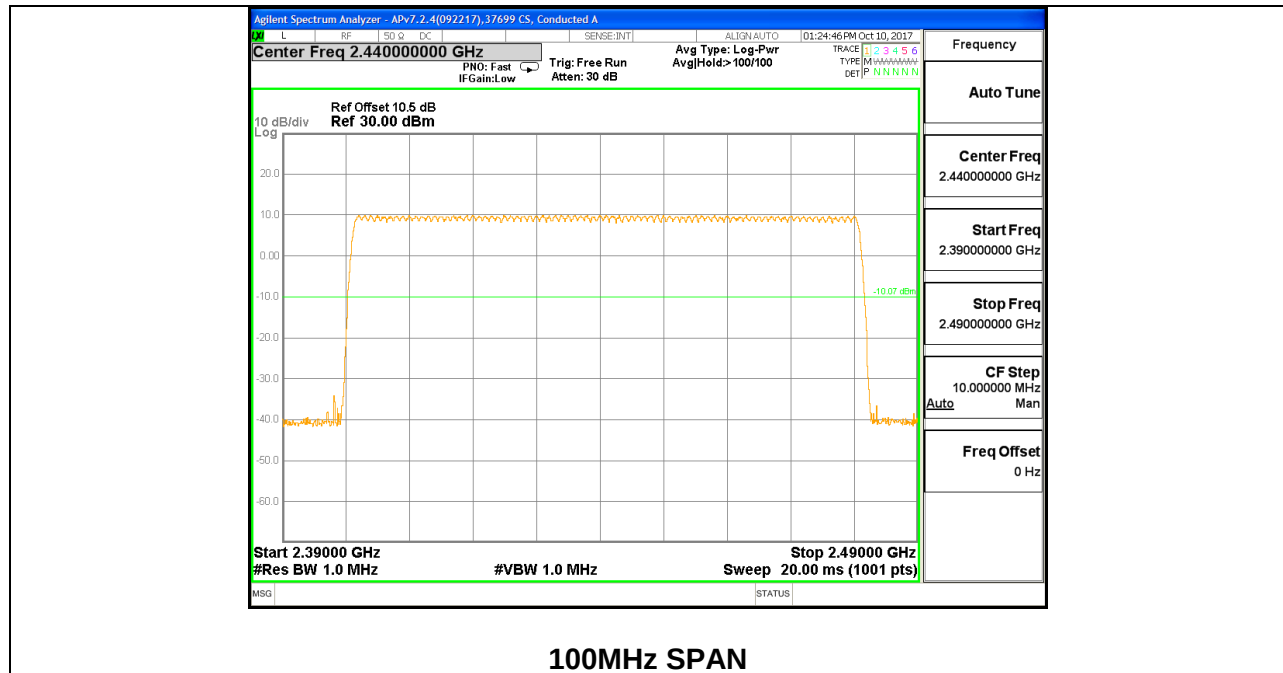
30MHz SPAN, SEGMENT 2 OF 3

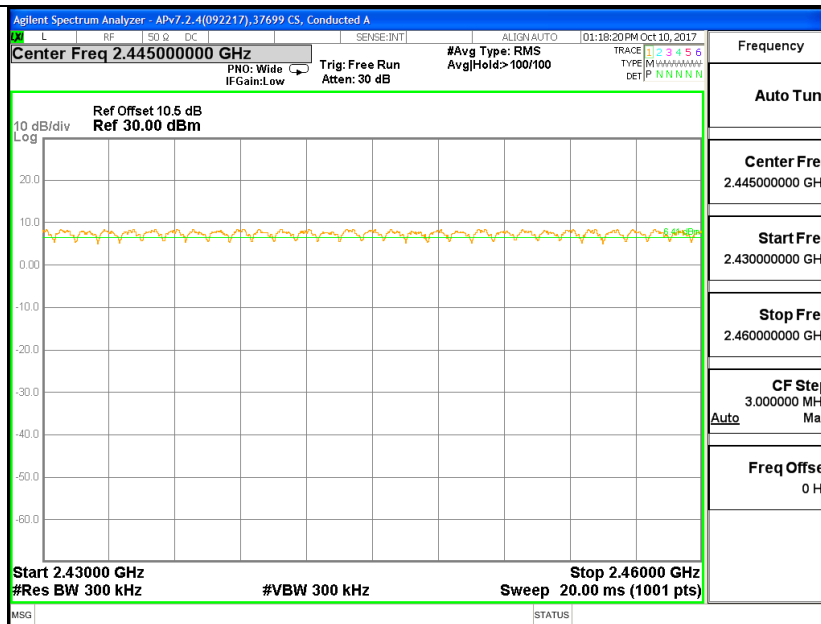


30MHz SPAN, SEGMENT 3 OF 3

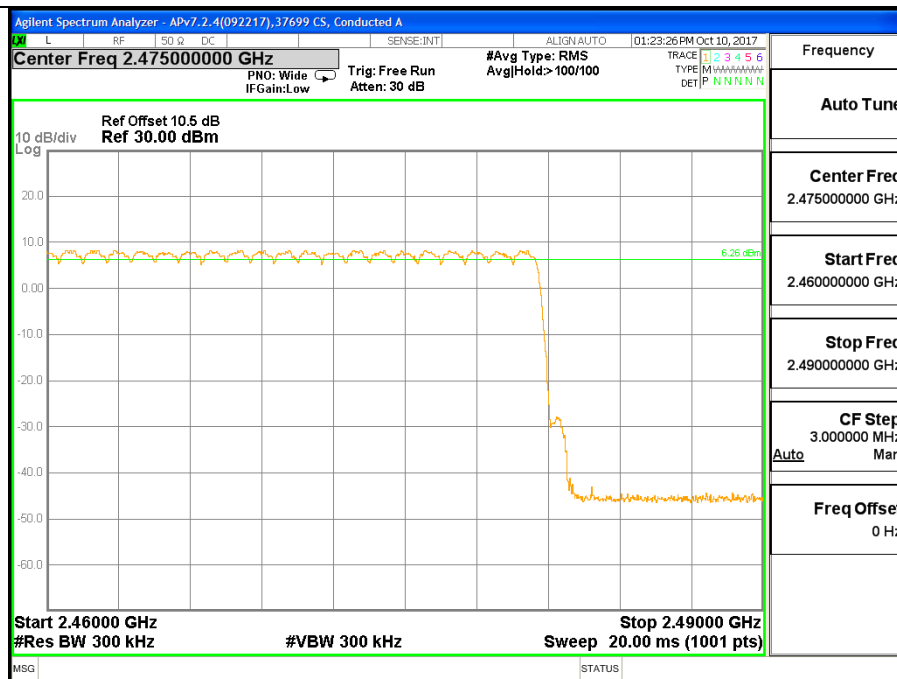
7.4.2. ENHANCED DATA RATE 8PSK MODULATION

NUMBER OF HOPPING CHANNELS





30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

7.5. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (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.

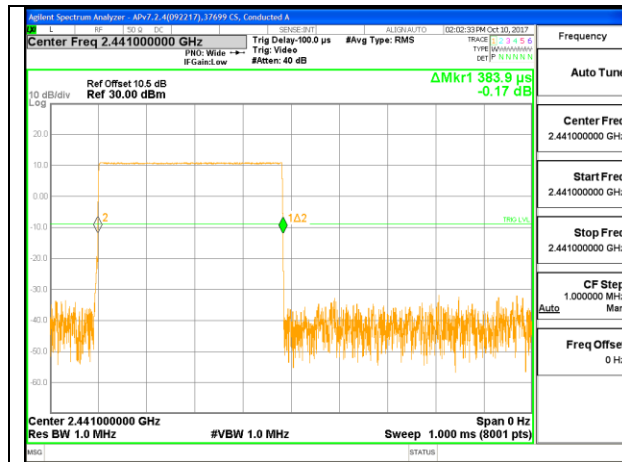
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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

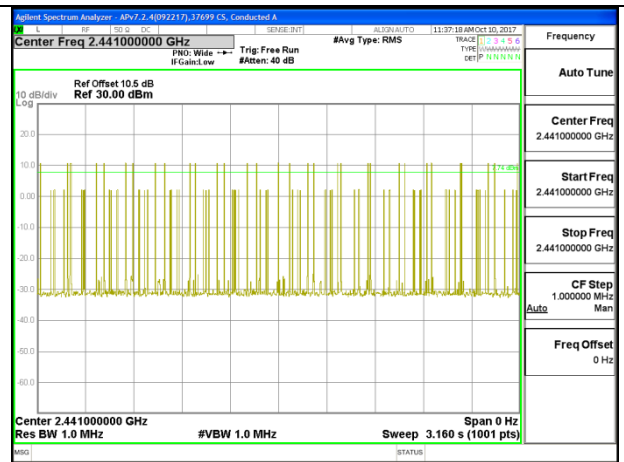
RESULTS

7.5.1. BASIC DATA RATE GFSK MODULATION

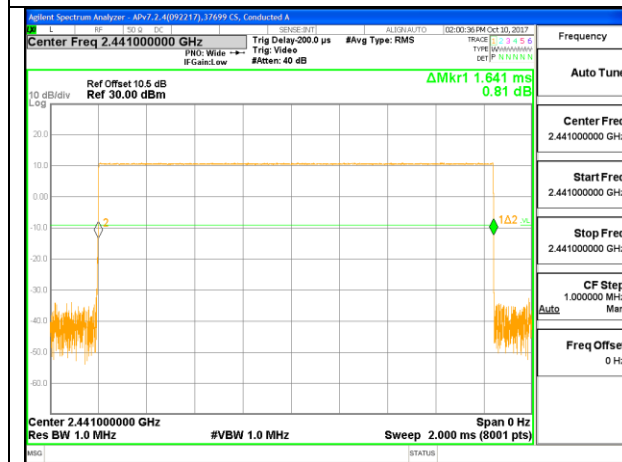
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.3839	32	0.1228	0.4	-0.2772
DH3	1.641	17	0.2790	0.4	-0.1210
DH5	2.889	8	0.2311	0.4	-0.1689
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.3839	8	0.03071	0.4	-0.3693
DH3	1.641	4.25	0.06974	0.4	-0.3303
DH5	2.889	2	0.05778	0.4	-0.3422



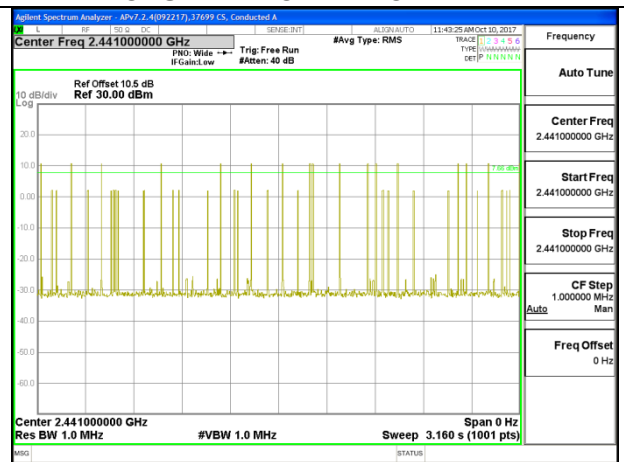
PULSE WIDTH – DH1



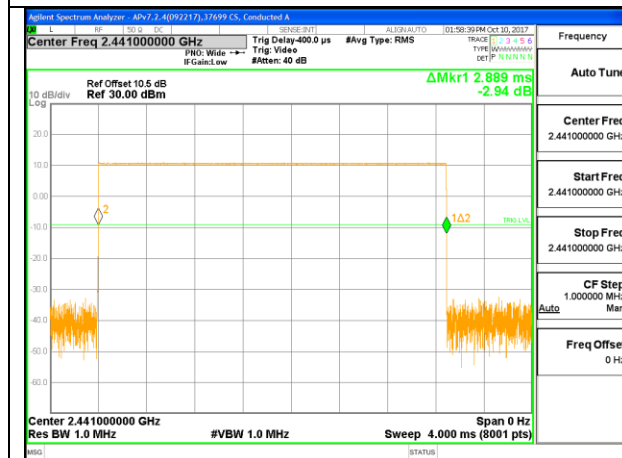
NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH1



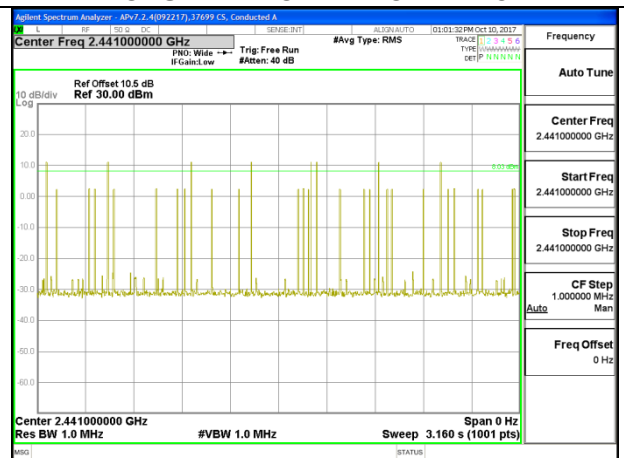
PULSE WIDTH – DH3



NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5

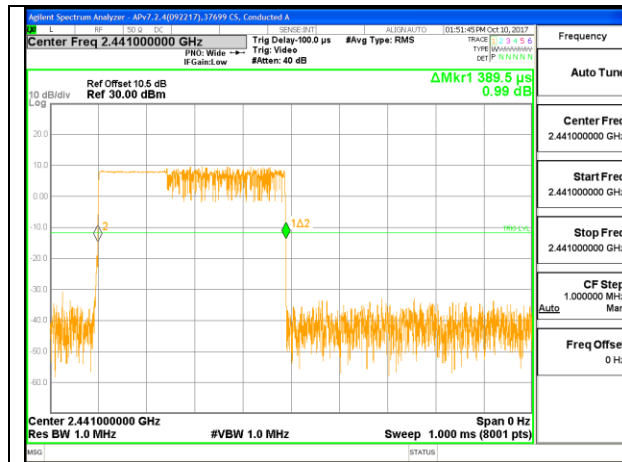


NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH5

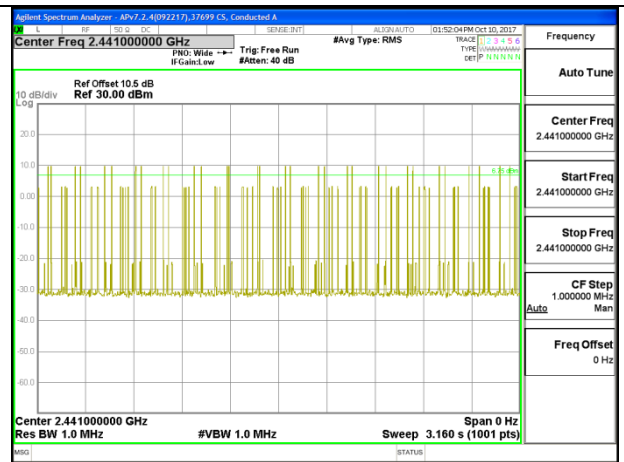
7.5.2. ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
DH1	0.3895	32	0.12464	0.4	-0.27536
DH3	1.641	16	0.26256	0.4	-0.13744
DH5	2.893	11	0.31823	0.4	-0.08177

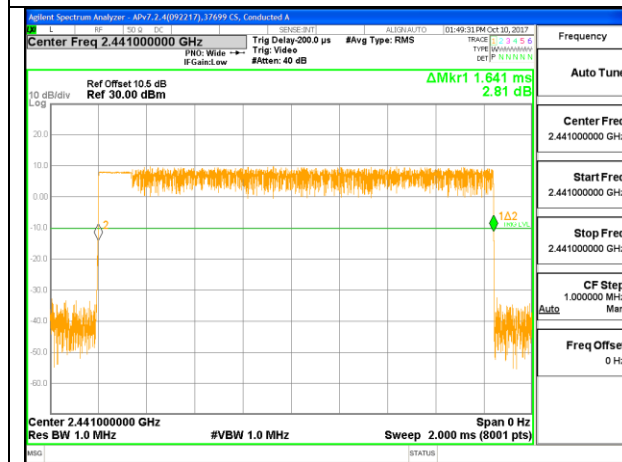
Note: for AFH (8PSK) mode, please refer to the results of AFH (GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate in section 7.5.1 demonstrates compliance with channel occupancy when AFH is employed.



PULSE WIDTH – DH1



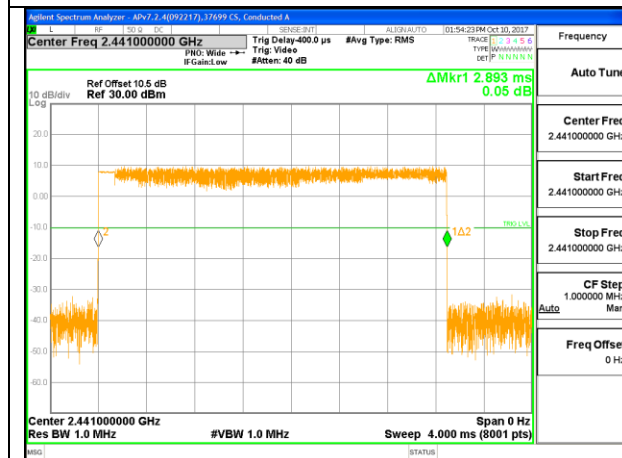
NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH1



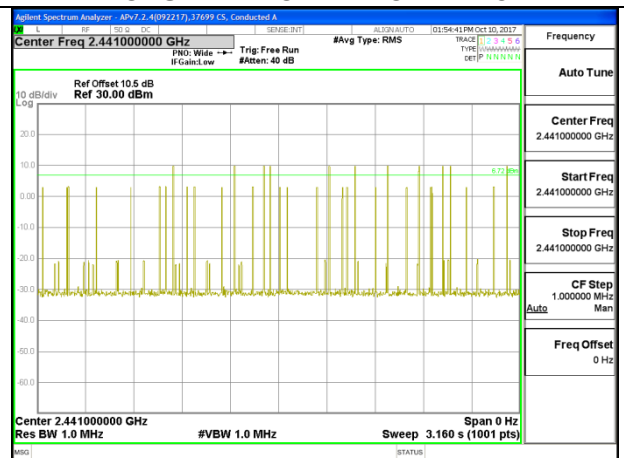
PULSE WIDTH – DH3



NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH5

7.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated peak reading of power.

RESULTS

7.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.16	30	-20.84
Middle	2441	9.36	30	-20.64
High	2480	9.37	30	-20.63

7.6.2. ENHANCED DATA RATE DQPSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.32	30	-21.68
Middle	2441	8.47	30	-21.53
High	2480	8.43	30	-21.57

7.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.63	30	-21.37
Middle	2441	8.41	30	-21.59
High	2480	8.51	30	-21.49

7.7. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

7.7.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.95
Middle	2441	9.17
High	2480	9.17

7.7.2. ENHANCED DATA RATE DQPSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.58
Middle	2441	5.38
High	2480	5.45

7.7.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.6
Middle	2441	5.8
High	2480	5.62

7.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 5.5

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.

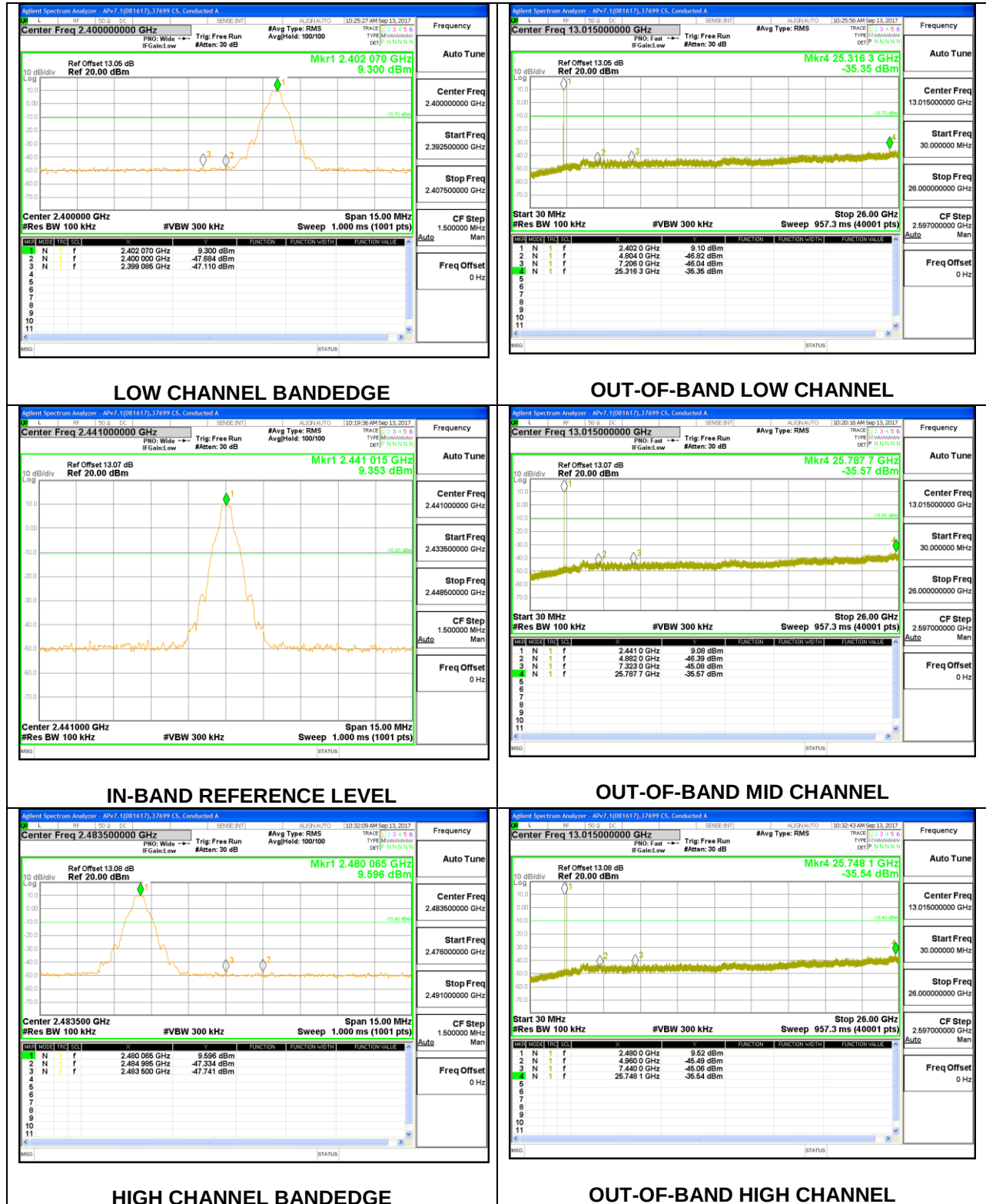
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

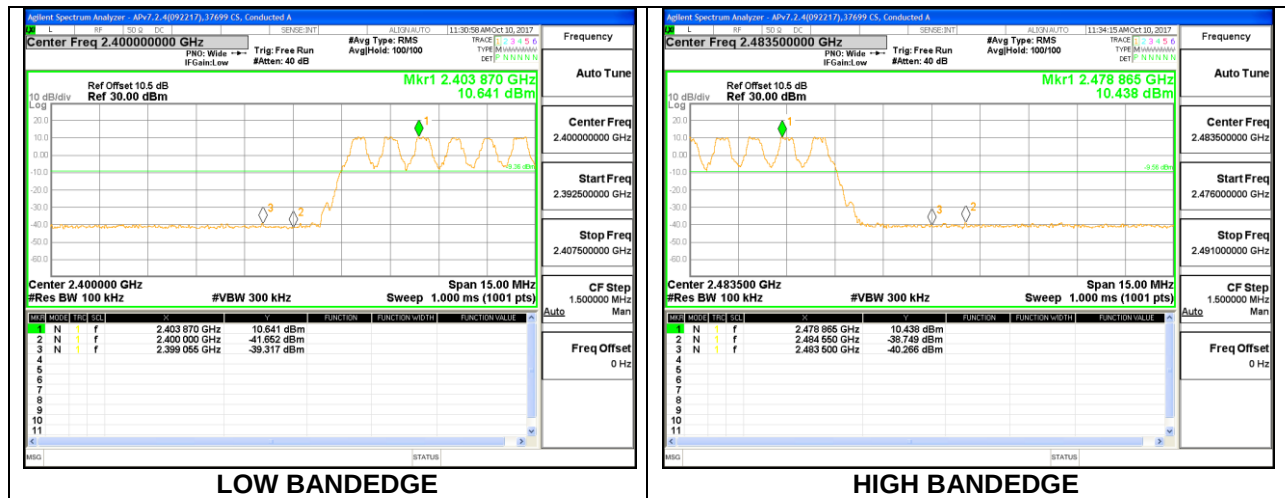
RESULTS

7.8.1. BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, NON HOPPING

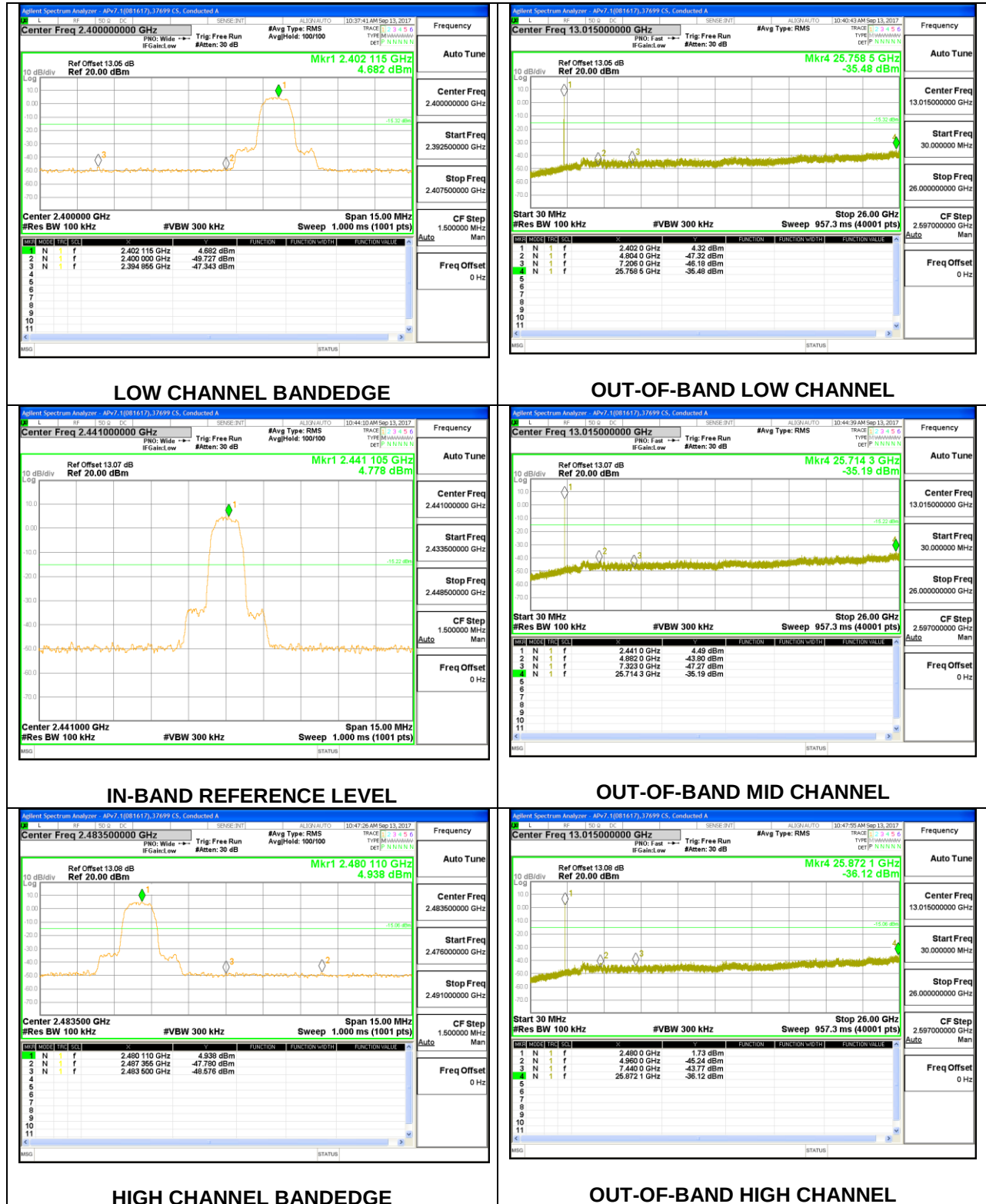


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

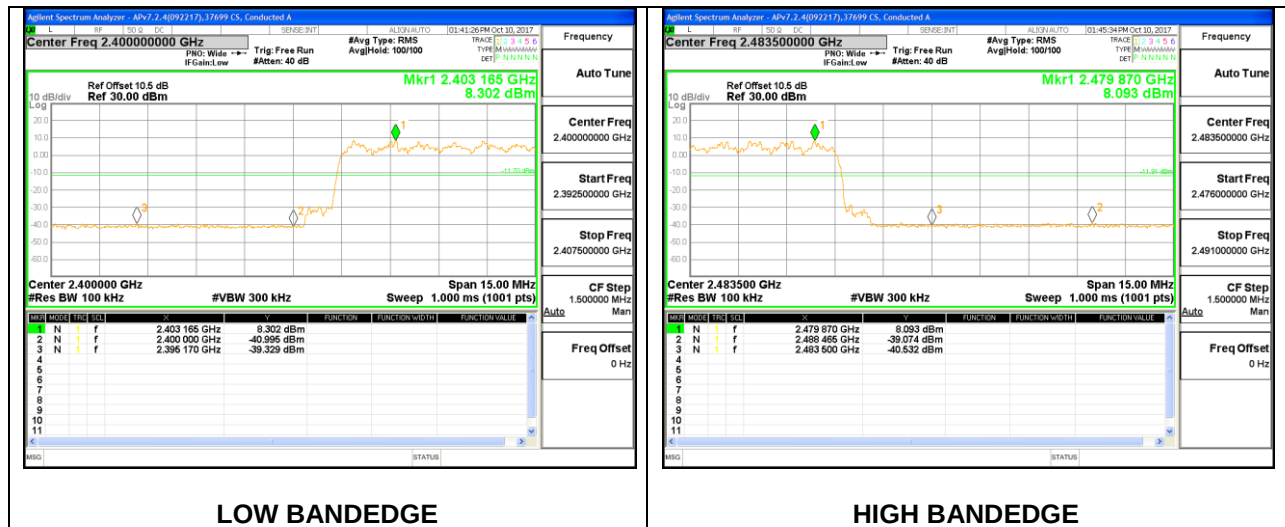


7.8.2. ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, NON HOPPING



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



8. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
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 for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. 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 measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T (10 Hz) video bandwidth with peak detector for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

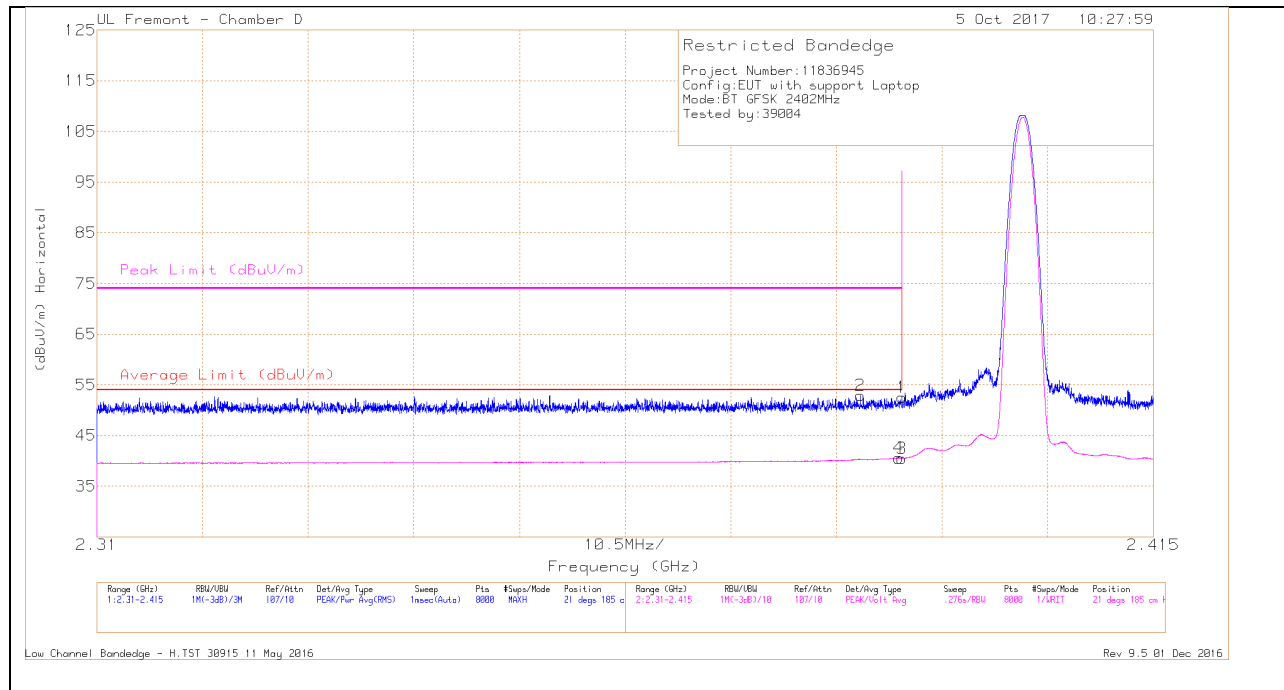
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.1. TRANSMITTER ABOVE 1 GHz

8.1.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULTS



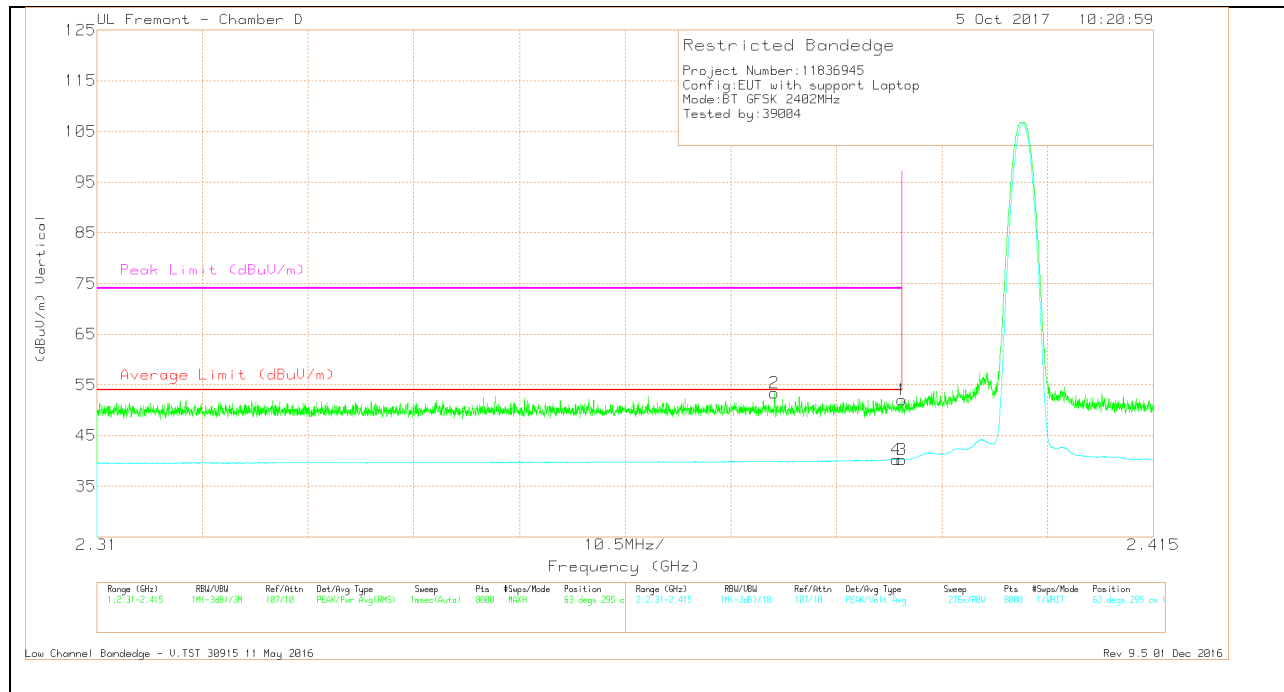
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Ampl/Cbl/Ftr/P ad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.09	Pk	32.1	-20.7	52.49	-	-	74	-21.51	21	185	H
2	* 2.386	41.55	Pk	32.1	-20.8	52.85	-	-	74	-21.15	21	185	H
3	* 2.39	29.12	VA1T	32.1	-20.7	40.52	54	-13.48	-	-	21	185	H
4	* 2.39	29.25	VA1T	32.1	-20.8	40.55	54	-13.45	-	-	21	185	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

VERTICAL RESULTS



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dBm)	Amp/Cbl/Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.39	40.66	Pk	32.1	-20.7	52.06	-	-	74	-21.94	63	295	V
2	* 2.377	42.11	Pk	32.1	-20.8	53.41	-	-	74	-20.59	63	295	V
3	* 2.39	28.81	VA1T	32.1	-20.7	40.21	54	-13.79	-	-	63	295	V
4	* 2.389	28.99	VA1T	32.1	-20.8	40.29	54	-13.71	-	-	63	295	V

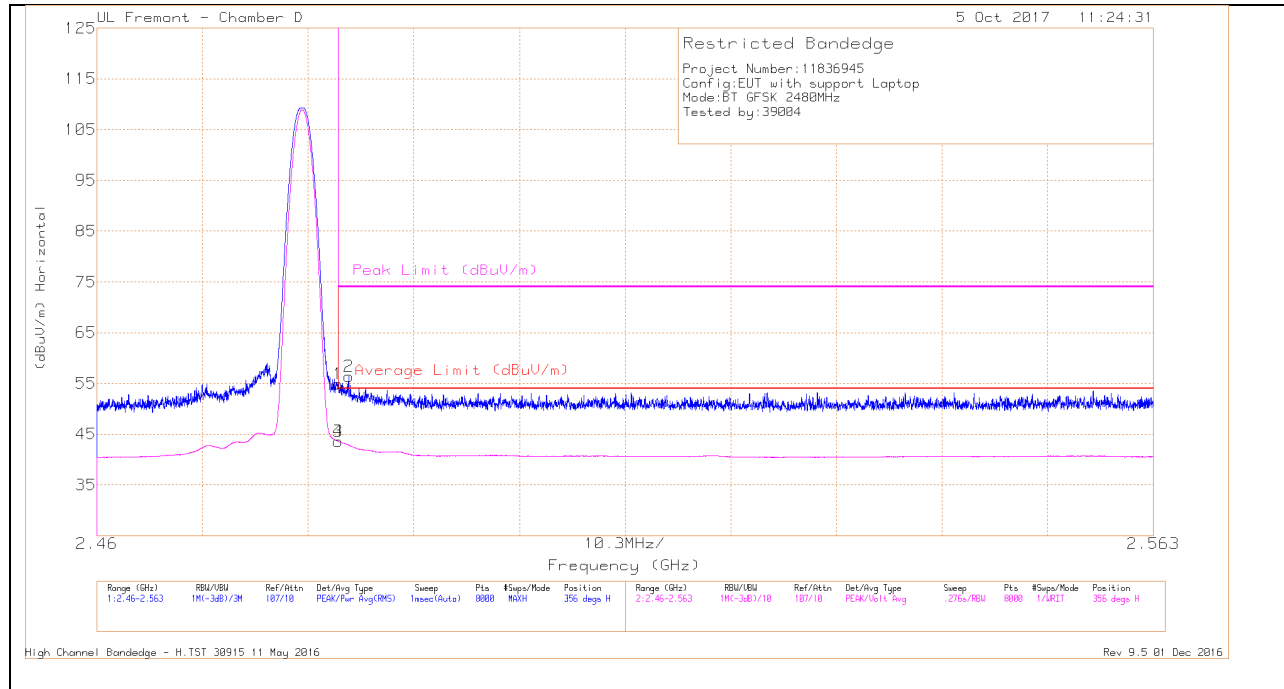
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULTS



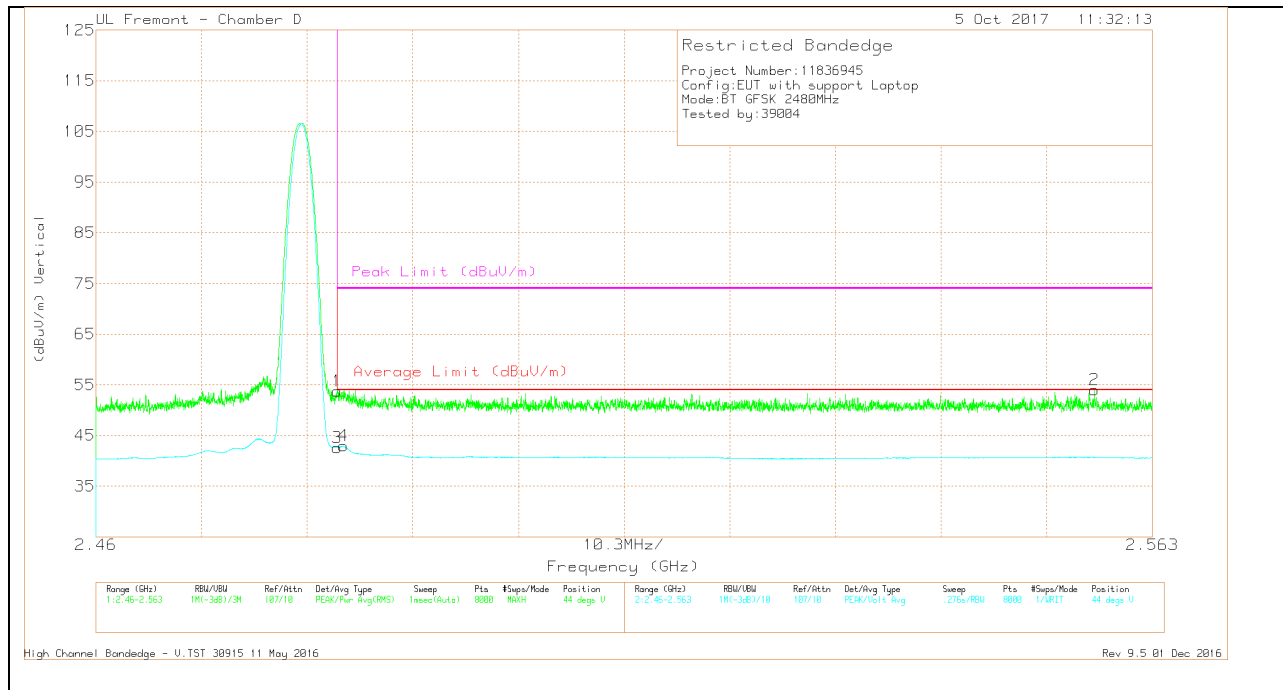
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dBm)	Amp/Cbll/Ftr/P ad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	43.22	Pk	32.5	-20.8	54.92	-	-	74	-19.08	356	337	H
2	* 2.485	44.58	Pk	32.6	-20.8	56.38	-	-	74	-17.62	356	337	H
3	* 2.484	31.89	VA1T	32.5	-20.8	43.59	54	-10.41	-	-	356	337	H
4	* 2.484	31.86	VA1T	32.5	-20.8	43.56	54	-10.44	-	-	356	337	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

VERTICAL RESULTS



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dBm)	Amp/Cbl/Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	42.09	Pk	32.5	-20.8	53.79	-	-	74	-20.21	44	343	V
3	* 2.484	30.91	VA1T	32.5	-20.8	42.61	54	-11.39	-	-	44	343	V
4	* 2.484	31.22	VA1T	32.5	-20.8	42.92	54	-11.08	-	-	44	343	V
2	2.557	42.03	Pk	32.6	-20.6	54.03	-	-	74	-19.97	44	343	V

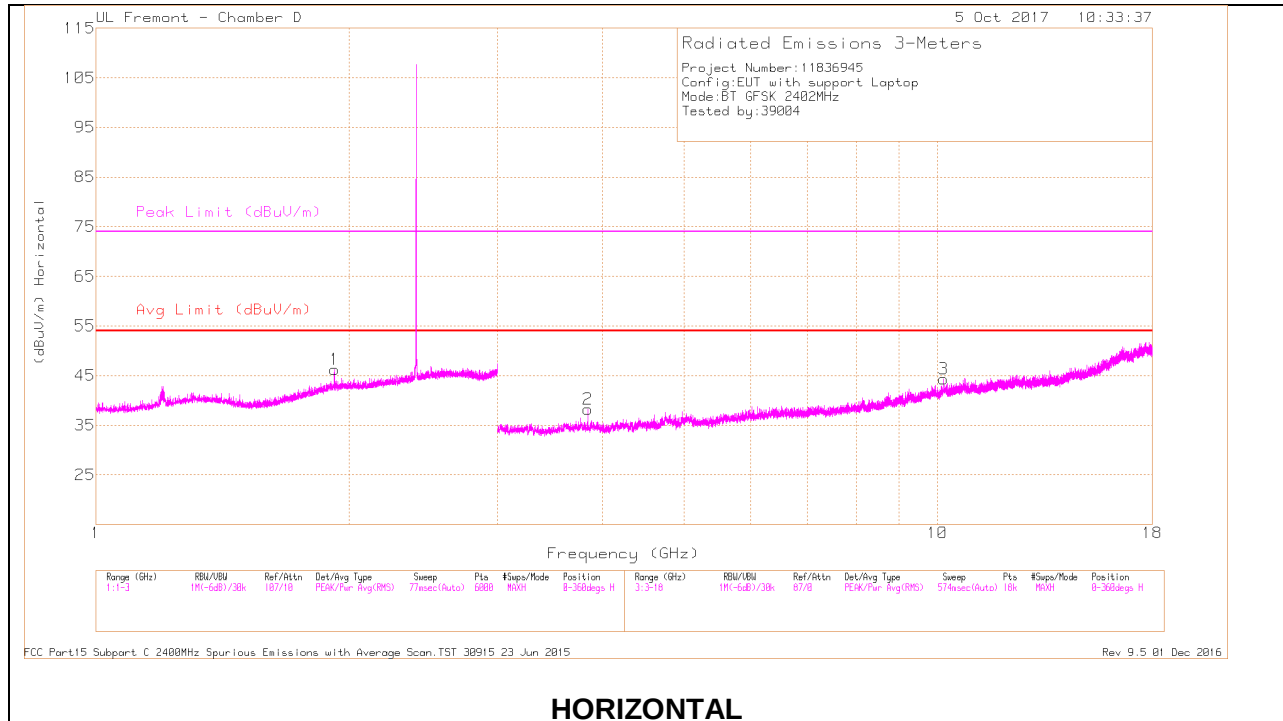
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

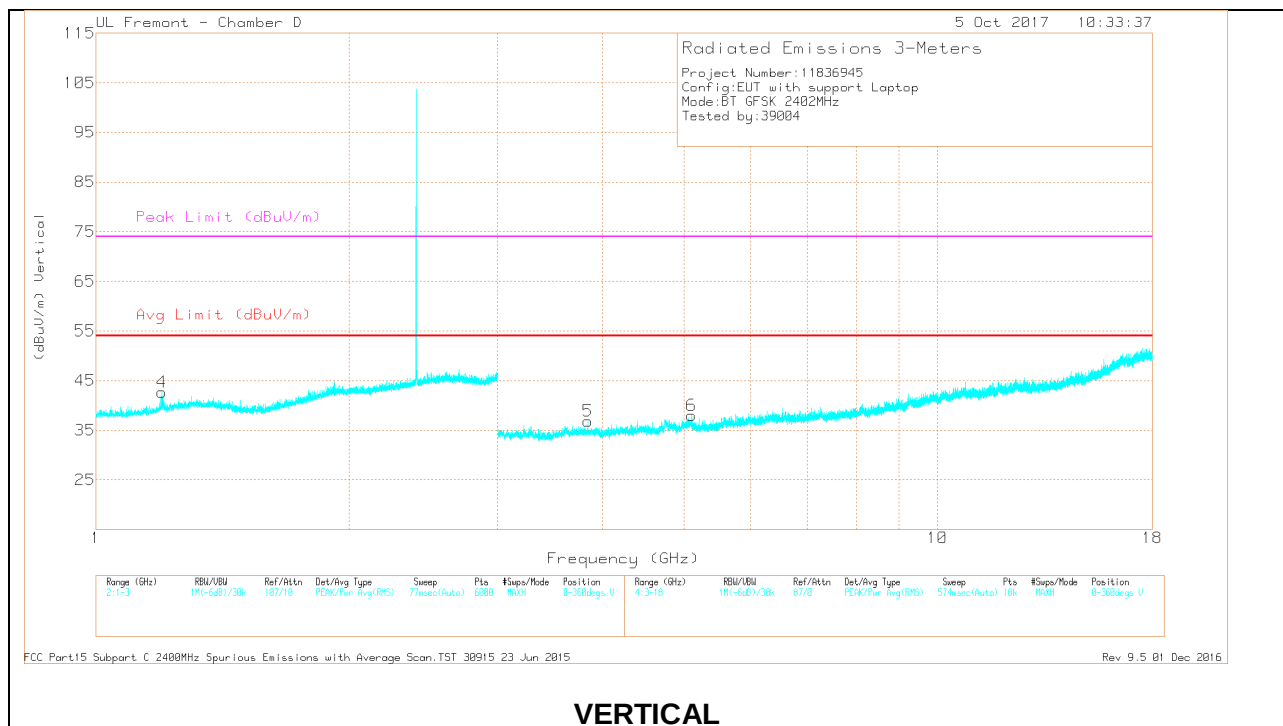
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

LOW CHANNEL DATA

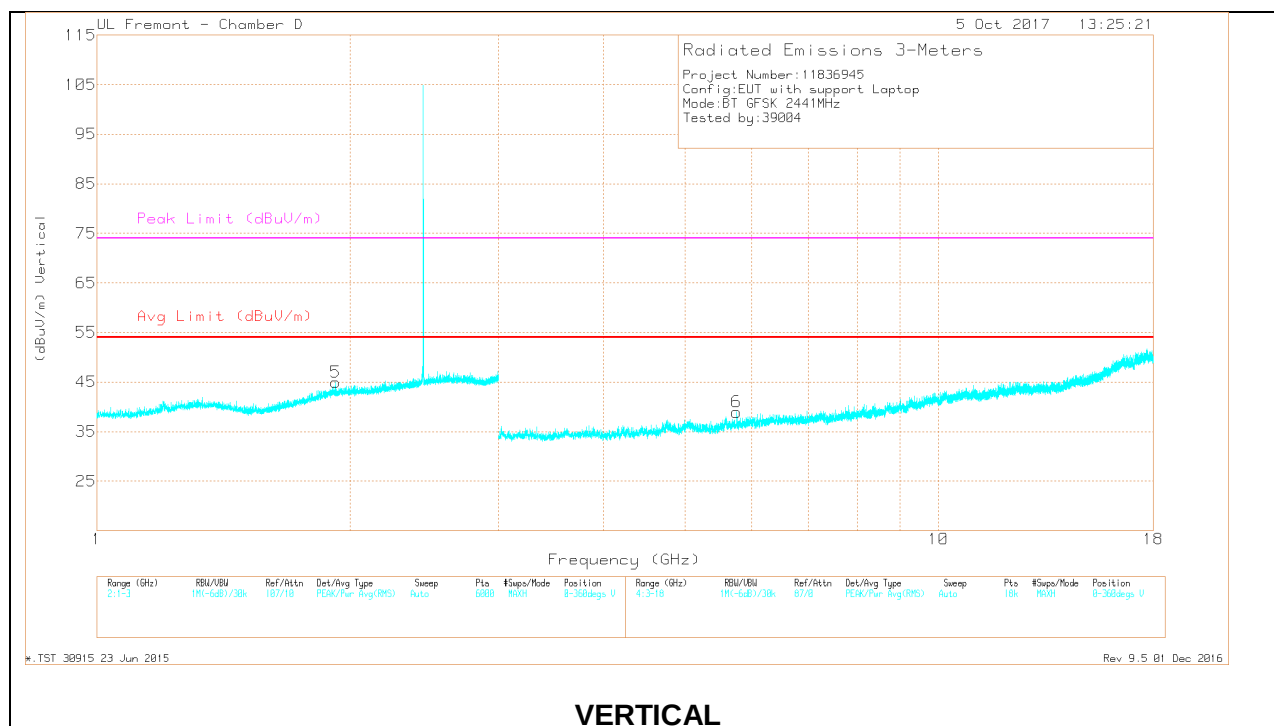
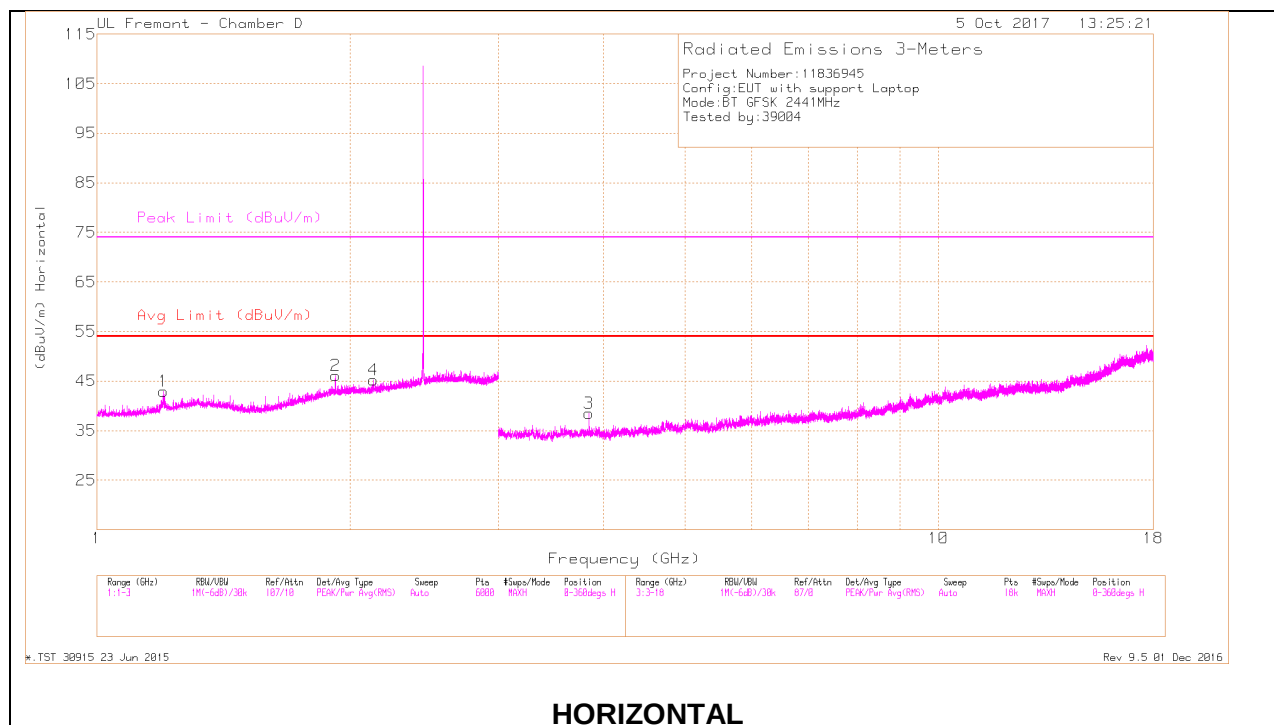
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fitr/ Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 1.198	42.69	PKFH	28.6	-22.4	48.89	-	-	74	-25.11	114	211	V
	* 1.198	28.2	VA1T	28.6	-22.4	34.4	54	-19.6	-	-	114	211	V
2	* 3.84	38.68	PKFH	33.2	-28.6	43.28	-	-	74	-30.72	305	266	H
	* 3.84	29.32	VA1T	33.2	-28.6	33.92	54	-20.08	-	-	305	266	H
5	* 3.839	37.22	PKFH	33.2	-28.6	41.82	-	-	74	-32.18	358	250	V
	* 3.84	27.59	VA1T	33.2	-28.6	32.19	54	-21.81	-	-	358	250	V
6	* 5.101	35.34	PKFH	34.1	-27	42.44	-	-	74	-31.56	275	381	V
	* 5.099	23.55	VA1T	34.1	-27	30.65	54	-23.35	-	-	275	381	V
1	1.92	41.25	PKFH	31.3	-21.4	51.15	-	-	74	-22.85	350	241	H
3	10.176	31.78	PKFH	37.1	-19.9	48.98	-	-	74	-25.02	14	355	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH - FHSS: RB=1MHz VB=3 x RB, Peak

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

MID CHANNEL RESULTS



MID CHANNEL DATA

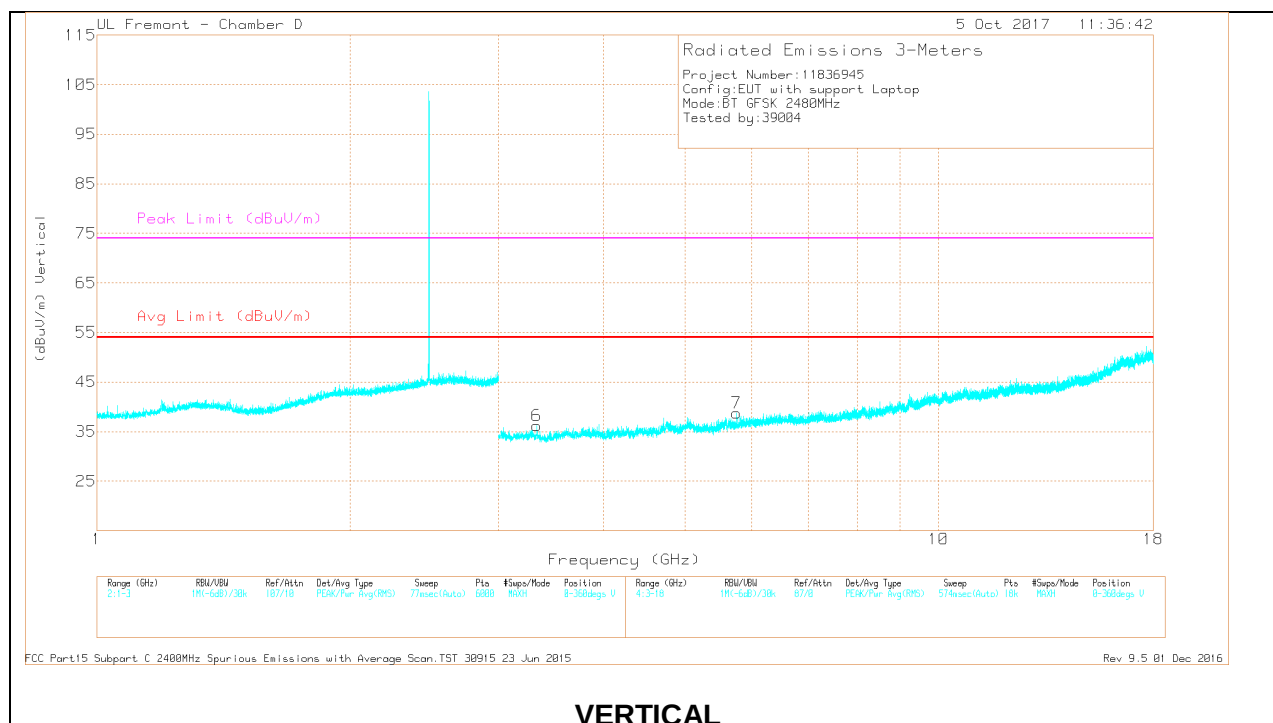
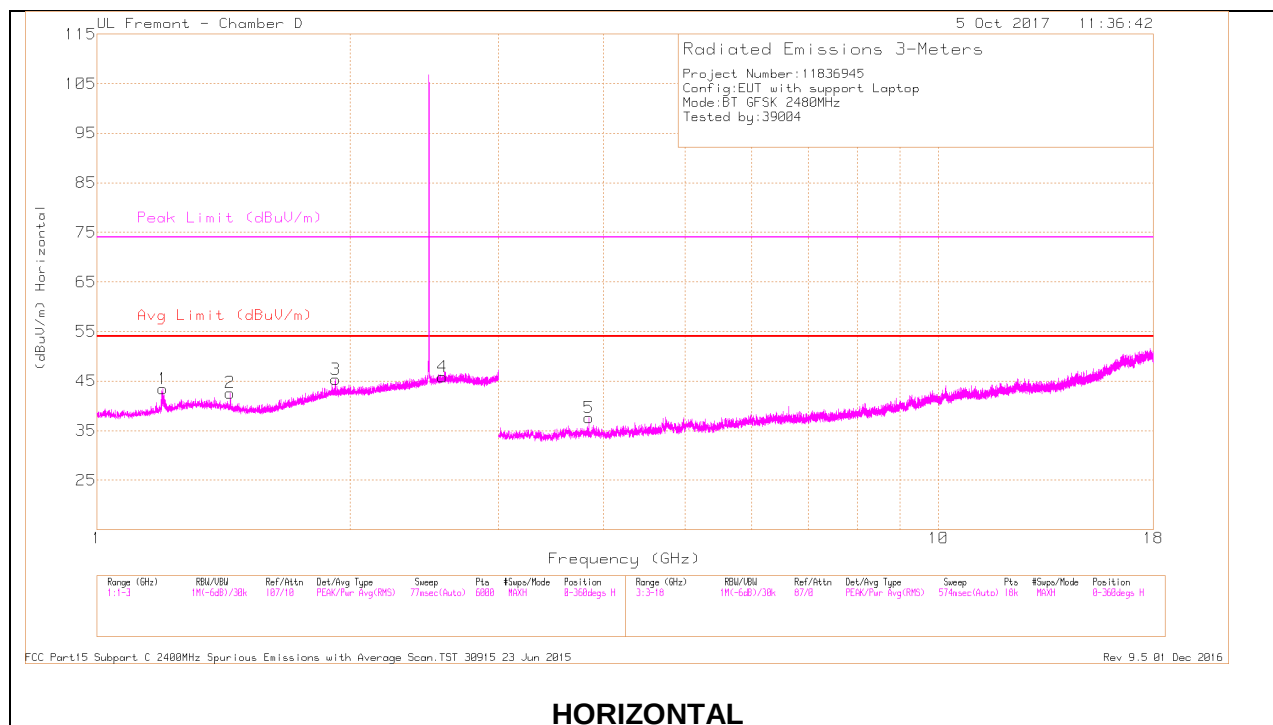
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Ampl/Chl/Ftrr/ Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.2	44.35	PKFH	28.6	-22.4	50.55	-	-	74	-23.45	281	104	H
	* 1.2	36.81	VA1T	28.6	-22.4	43.01	54	-10.99	74	-23.99	282	105	H
3	* 3.84	38.01	PKFH	33.2	-28.7	42.51	-	-	74	-31.49	67	199	H
	* 3.84	30.69	VA1T	33.2	-28.6	35.29	54	-18.71	-	-	67	199	H
2	1.92	40.1	PKFH	31.3	-21.4	50	-	-	74	-24	350	205	H
5	1.92	40.65	PKFH	31.3	-21.4	50.55	-	-	74	-23.45	83	105	V
4	2.132	38.75	PKFH	31.3	-21	49.05	-	-	74	-24.95	55	271	H
6	5.76	36.75	PKFH	34.7	-27.1	44.35	-	-	74	-29.65	113	165	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH - FHSS: RB=1MHz VB=3 x RB, Peak

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

HIGH CHANNEL RESULTS



HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Ampl/Cbl/Filtr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.198	43.52	PKFH	28.6	-22.4	0	49.72	-	-	74	-24.28	322	259	H
	* 1.198	28.58	VA1T	28.6	-22.4	0	34.78	54	-19.22	-	-	322	259	H
2	* 1.44	40.04	PKFH	28.8	-22	0	46.84	-	-	74	-27.16	341	117	H
	* 1.44	30.49	VA1T	28.8	-22	0	37.29	54	-16.71	-	-	341	117	H
5	* 3.84	38.15	PKFH	33.2	-28.6	0	42.75	-	-	74	-31.25	272	239	H
	* 3.84	30.09	VA1T	33.2	-28.6	0	34.69	54	-19.31	-	-	272	239	H
6	* 3.333	36.24	PKFH	32.8	-28.4	0	40.64	-	-	74	-33.36	277	109	V
	* 3.333	25.46	VA1T	32.8	-28.4	0	29.86	54	-24.14	-	-	277	109	V
3	1.92	40.43	PKFH	31.3	-21.4	0	50.33	-	-	74	-23.67	350	246	H
4	2.575	40.02	PKFH	32.6	-20.6	0	52.02	-	-	74	-21.98	181	109	H
7	5.761	36.45	PKFH	34.7	-27.1	0	44.05	-	-	74	-29.95	98	168	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

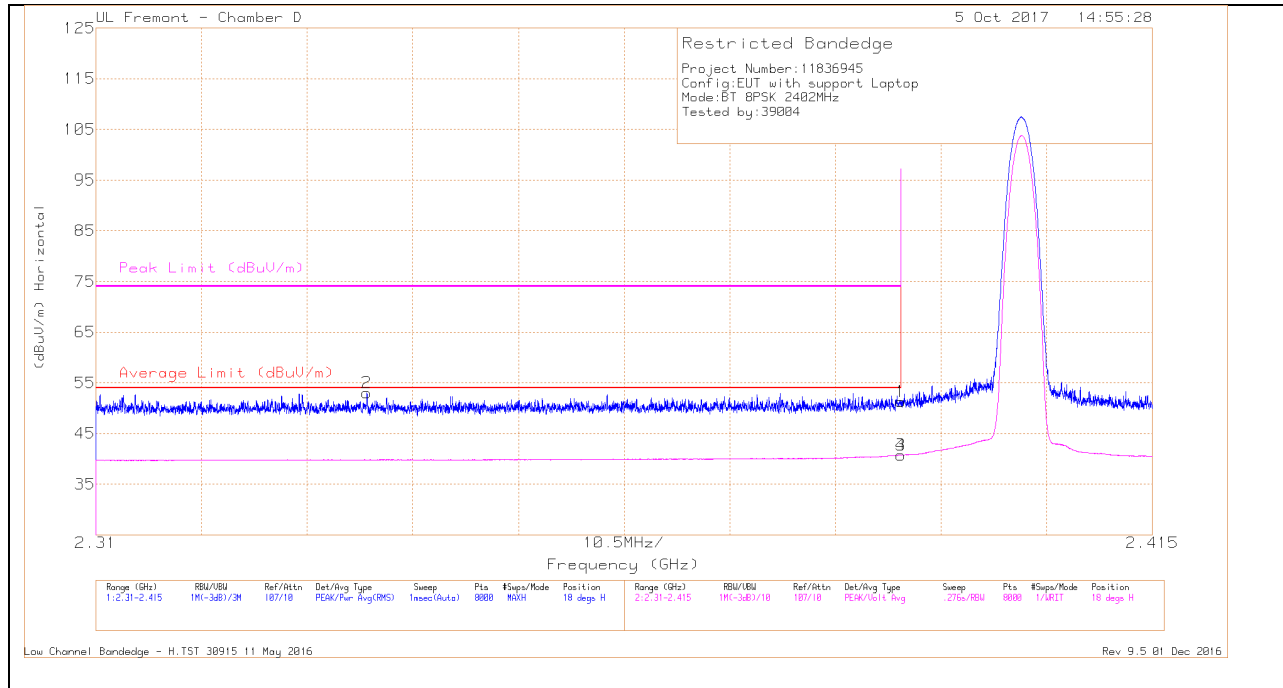
PKFH - FHSS: RB=1MHz VB=3 x RB, Peak

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

8.1.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULTS



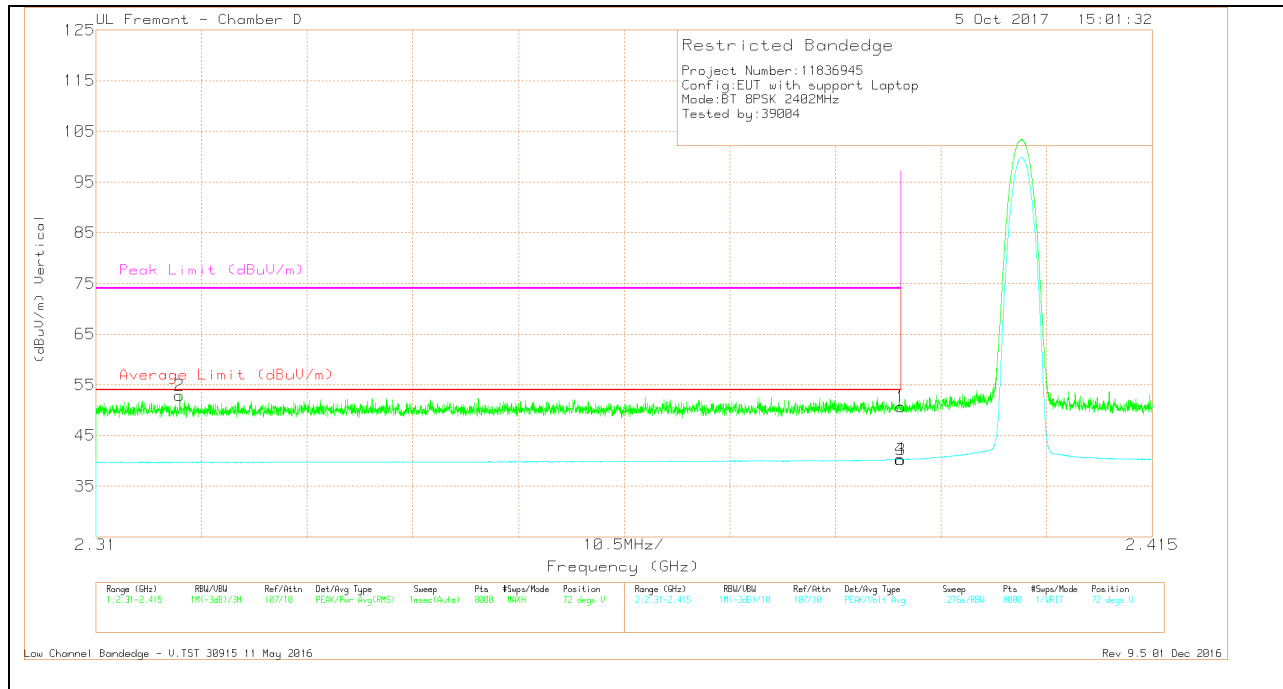
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Ampl/Cbll/Ftr/P ad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.92	Pk	32.1	-20.7	51.32	-	-	74	-22.68	18	194	H
2	* 2.337	41.9	Pk	32	-20.9	53	-	-	74	-21	18	194	H
3	* 2.39	29.35	VA1T	32.1	-20.7	40.75	54	-13.25	-	-	18	194	H
4	* 2.39	29.34	VA1T	32.1	-20.7	40.74	54	-13.26	-	-	18	194	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

VERTICAL RESULTS



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Chl/Filt/P ad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.28	Pk	32.1	-20.7	50.68	-	-	74	-23.32	72	294	V
2	* 2.318	41.84	PK	32	-20.9	52.94	-	-	74	-21.06	72	294	V
3	* 2.39	28.84	VA1T	32.1	-20.7	40.24	54	-13.76	-	-	72	294	V
4	* 2.39	28.9	VA1T	32.1	-20.7	40.3	54	-13.7	-	-	72	294	V

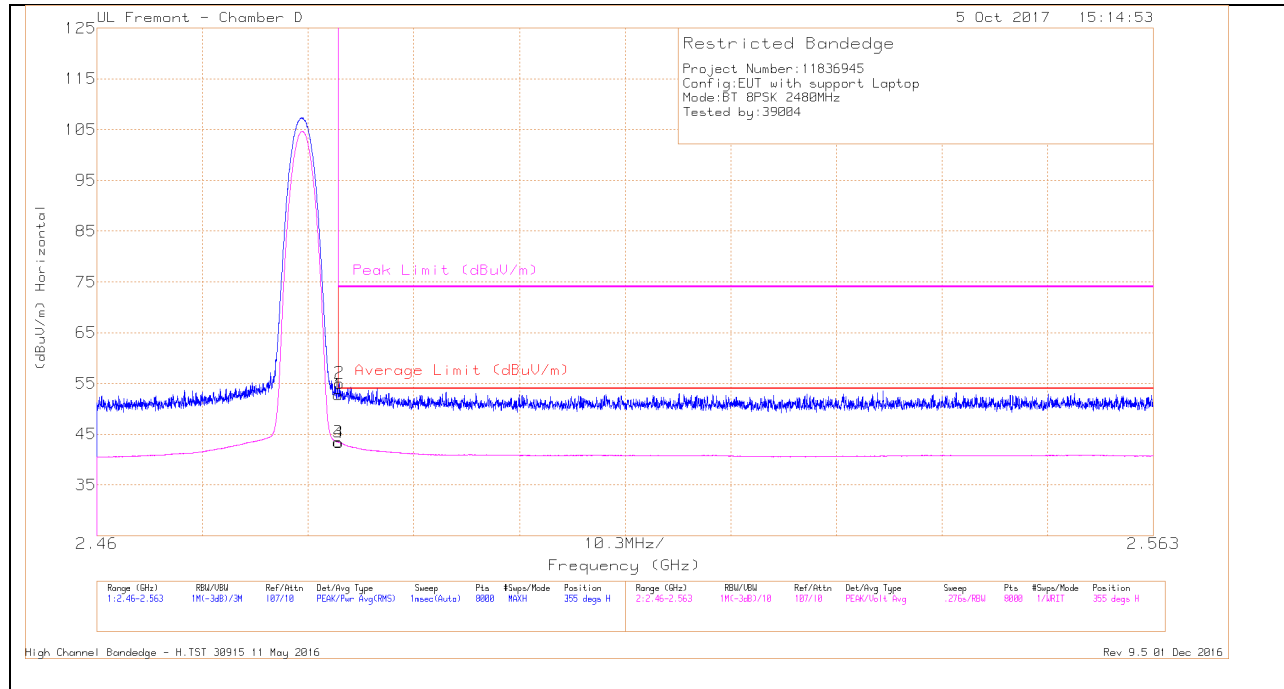
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

AUTHORIZED BANDEGE (HIGH CHANNEL)

HORIZONTAL RESULTS



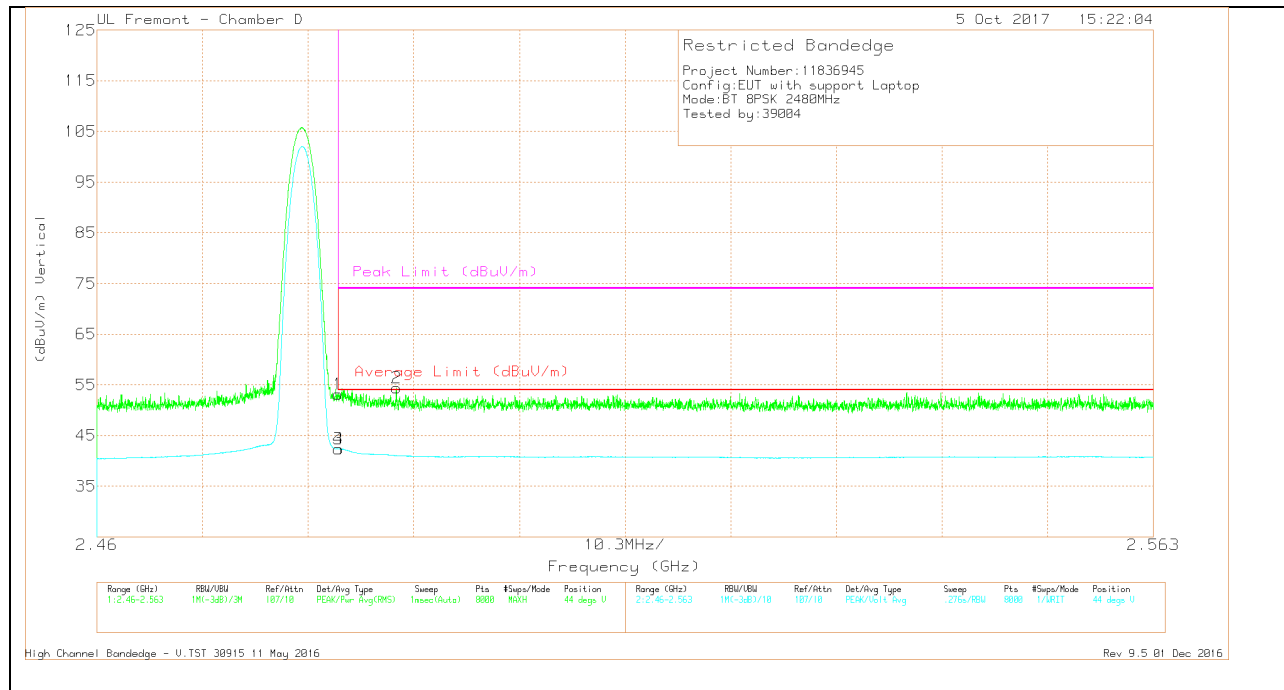
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Ampl/Cbl/Filtr/P ad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.12	Pk	32.5	-20.8	52.82	-	-	74	-21.18	355	337	H
2	* 2.484	43.37	PK	32.5	-20.8	55.07	-	-	74	-18.93	355	337	H
3	* 2.484	31.74	VA1T	32.5	-20.8	43.44	54	-10.56	-	-	355	337	H
4	* 2.484	31.69	VA1T	32.5	-20.8	43.39	54	-10.61	-	-	355	337	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

VERTICAL RESULTS



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Ampl/Cbl/Ftr/P ad (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	41.46	Pk	32.5	-20.8	53.16	-	-	74	-20.84	44	343	V
2	* 2.489	42.54	Pk	32.6	-20.8	54.34	-	-	74	-19.66	44	343	V
3	* 2.484	30.68	VA1T	32.5	-20.8	42.38	54	-11.62	-	-	44	343	V
4	* 2.484	30.68	VA1T	32.5	-20.8	42.38	54	-11.62	-	-	44	343	V

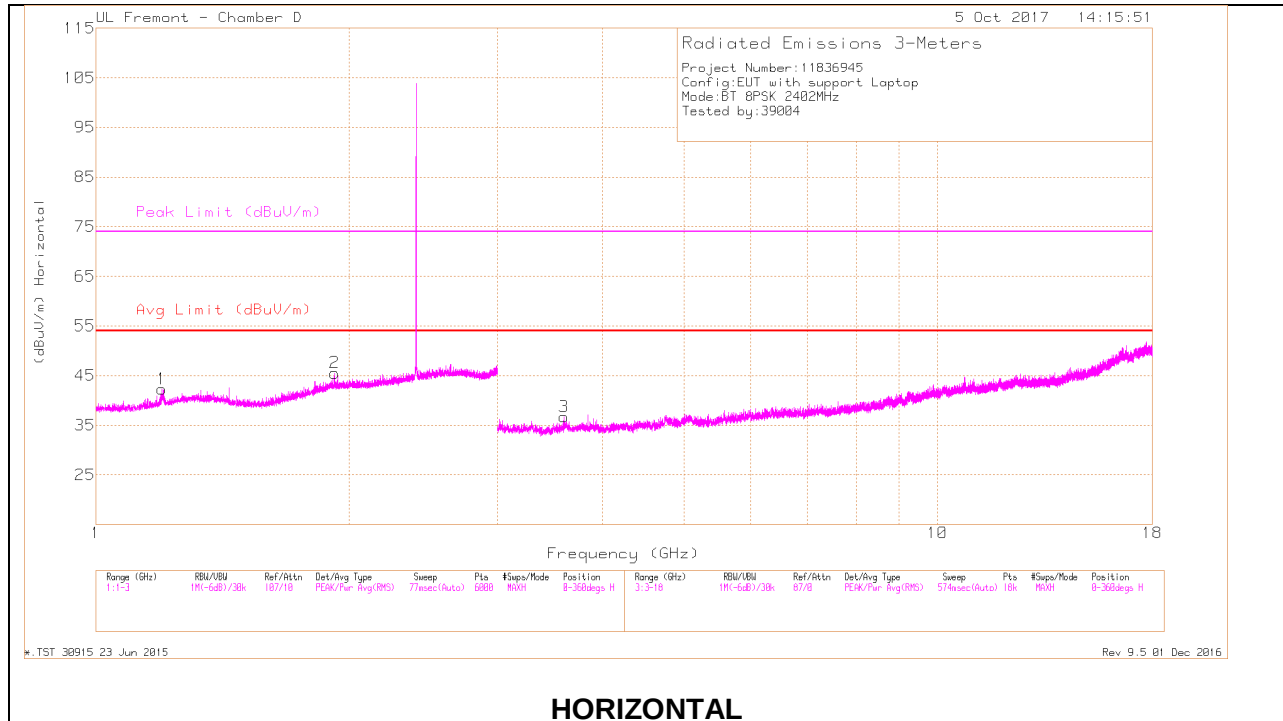
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

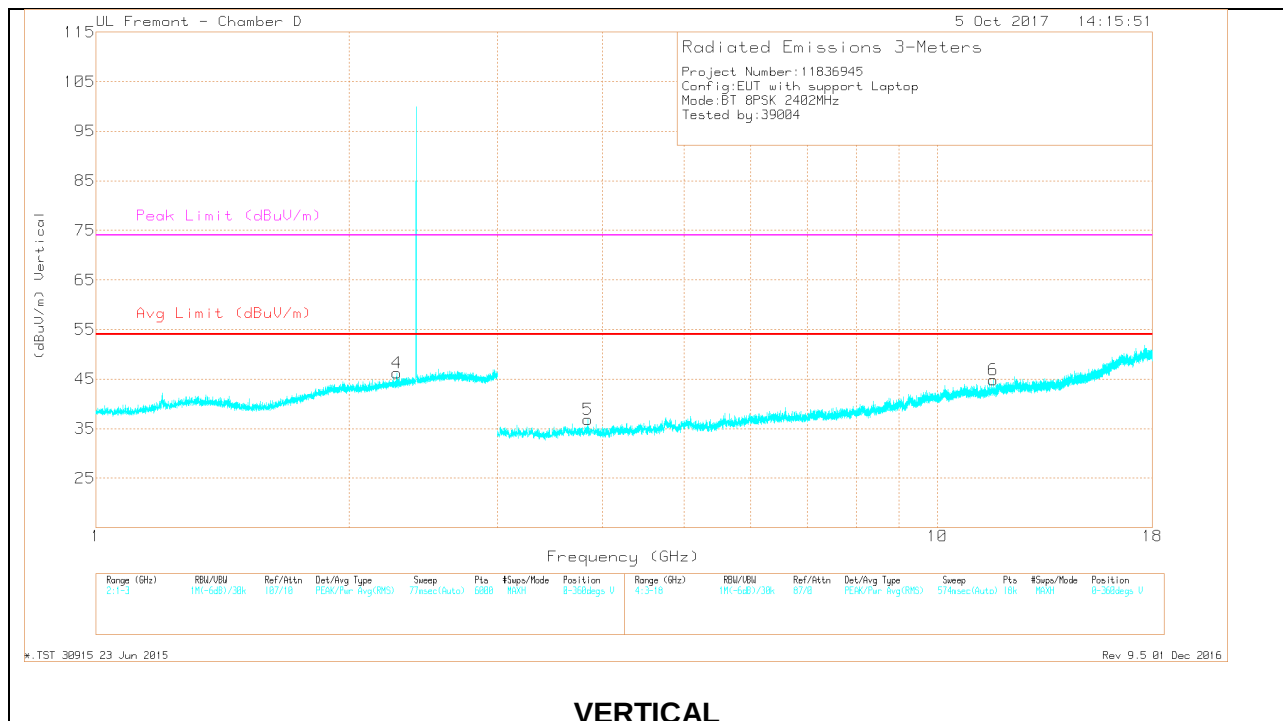
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

LOW CHANNEL DATA

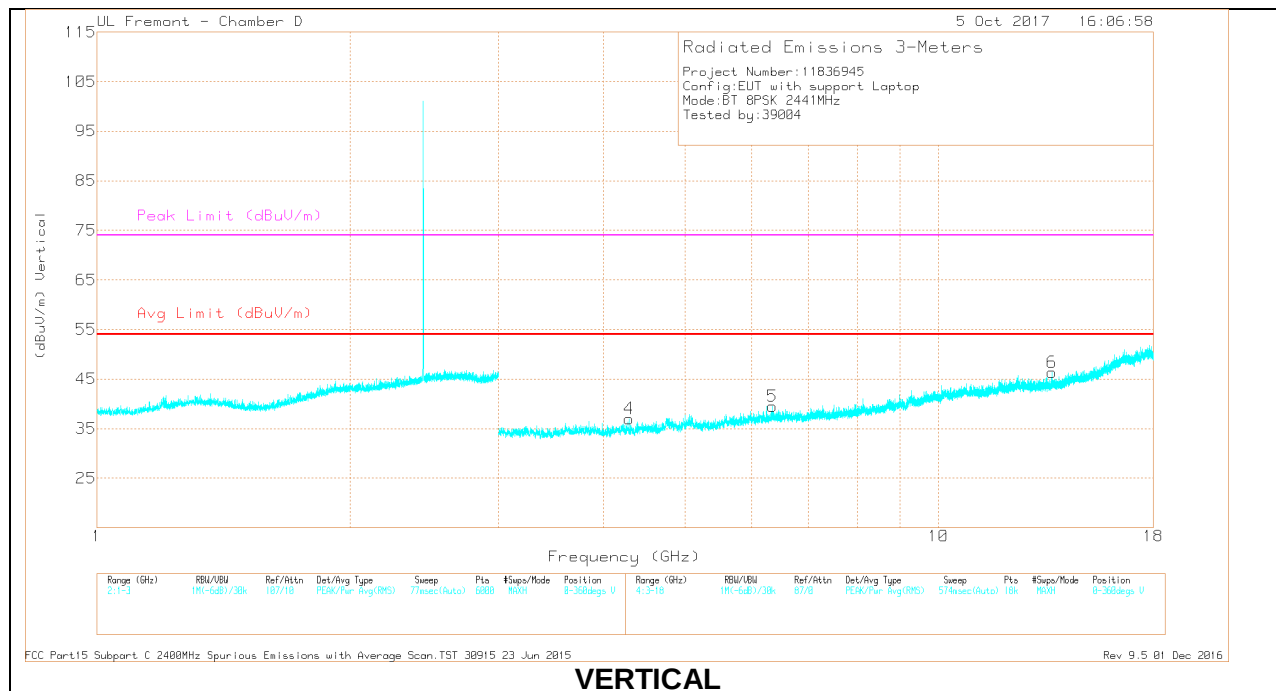
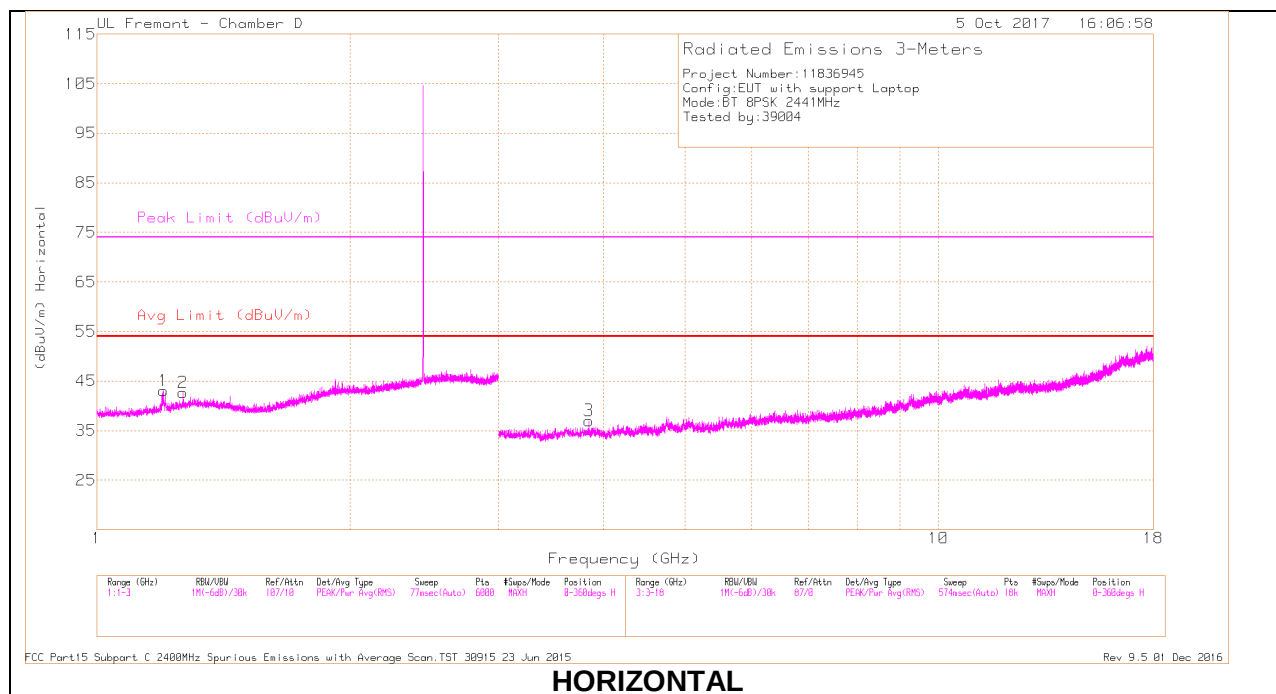
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fitr/ Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.197	43.35	PKFH	28.6	-22.4	49.55	-	-	74	-24.45	324	200	H
	* 1.198	28.33	VA1T	28.6	-22.4	34.53	54	-19.47	-	-	324	200	H
4	* 2.28	38.11	PKFH	31.8	-20.9	49.01	-	-	74	-24.99	319	244	V
	* 2.28	26.89	VA1T	31.8	-20.9	37.79	54	-16.21	-	-	319	244	V
3	* 3.601	35.35	PKFH	33.1	-28.2	40.25	-	-	74	-33.75	142	376	H
	* 3.601	23.66	VA1T	33.1	-28.2	28.56	54	-25.44	-	-	142	376	H
5	* 3.84	37.75	PKFH	33.2	-28.6	42.35	-	-	74	-31.65	356	146	V
	* 3.84	29.12	VA1T	33.2	-28.6	33.72	54	-20.28	-	-	356	146	V
6	* 11.65	33.86	PKFH	38.2	-20.5	51.56	-	-	74	-22.44	137	377	V
	* 11.65	22.44	VA1T	38.2	-20.5	40.14	54	-13.86	-	-	137	377	V
2	1.921	40.17	PKFH	31.3	-21.4	50.07	-	-	74	-23.93	349	106	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH - FHSS: RB=1MHz VB=3 x RB, Peak

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

MID CHANNEL RESULTS



MID CHANNEL DATA

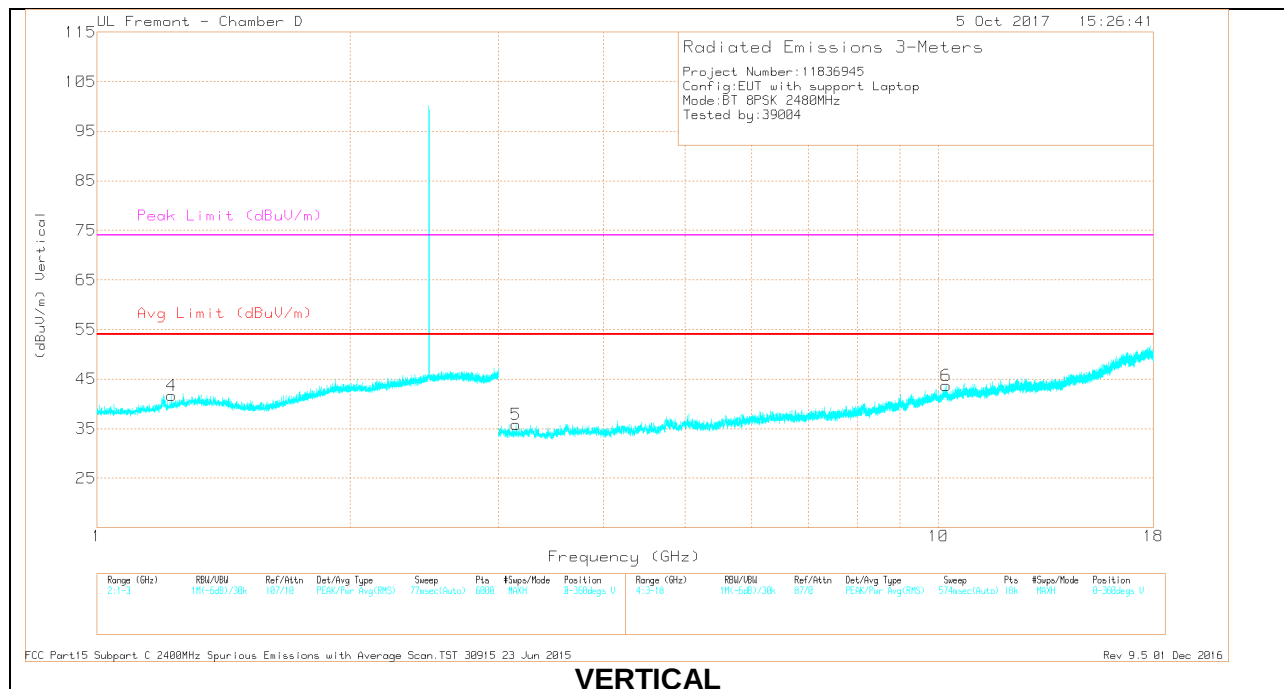
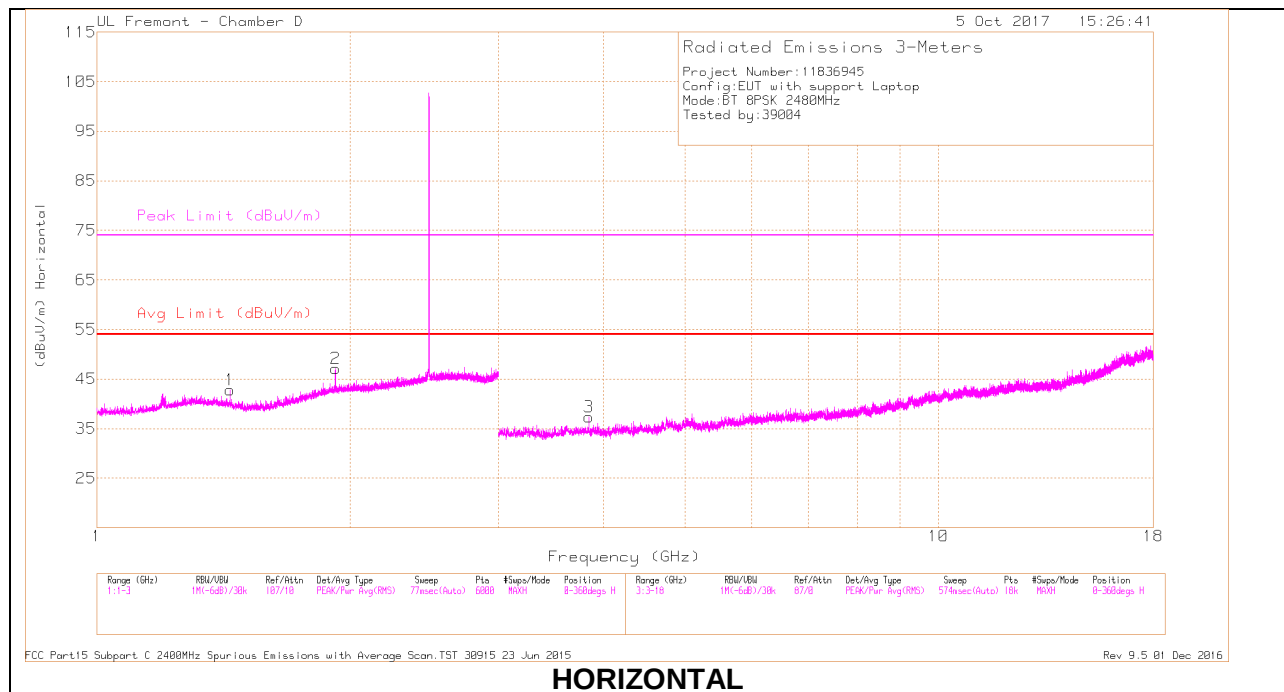
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fitr/ Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.2	42.59	PKFH	28.6	-22.4	48.79	-	-	74	-25.21	320	132	H
	* 1.2	28.35	VA1T	28.6	-22.4	34.55	54	-19.45	-	-	320	132	H
2	* 1.267	39.21	PKFH	29.3	-22.3	46.21	-	-	74	-27.79	185	251	H
	* 1.267	27.32	VA1T	29.2	-22.3	34.22	54	-19.78	-	-	185	251	H
3	* 3.84	38.58	PKFH	33.2	-28.6	43.18	-	-	74	-30.82	83	162	H
	* 3.84	30.41	VA1T	33.2	-28.6	35.01	54	-18.99	-	-	83	162	H
4	* 4.292	35.68	PKFH	33.4	-28.3	40.78	-	-	74	-33.22	52	270	V
	* 4.291	23.49	VA1T	33.4	-28.3	28.59	54	-25.41	-	-	52	270	V
5	6.348	33.82	PKFH	35.4	-26.1	43.12	-	-	74	-30.88	59	285	V
	13.639	33.64	PKFH	38.7	-22.1	50.24	-	-	74	-23.76	122	378	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH - FHSS: RB=1MHz VB=3 x RB, Peak

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

HIGH CHANNEL RESULTS



HIGH CHANNEL DATA

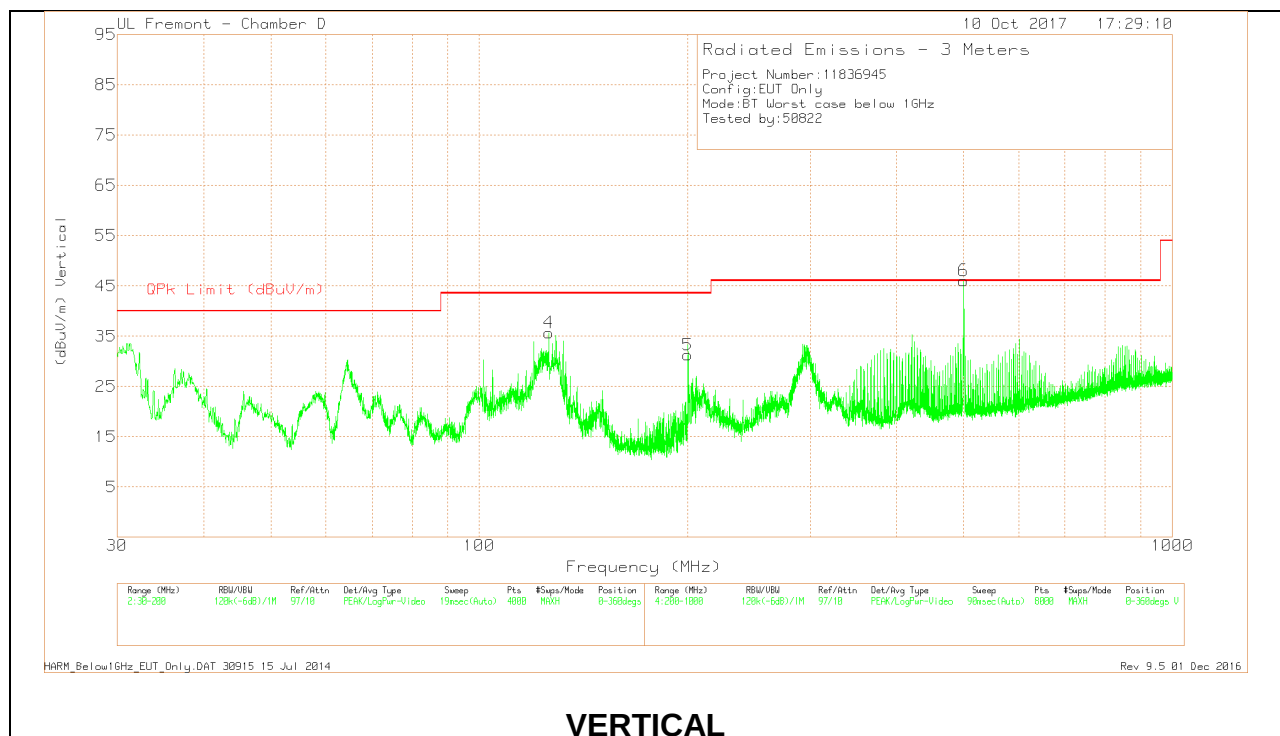
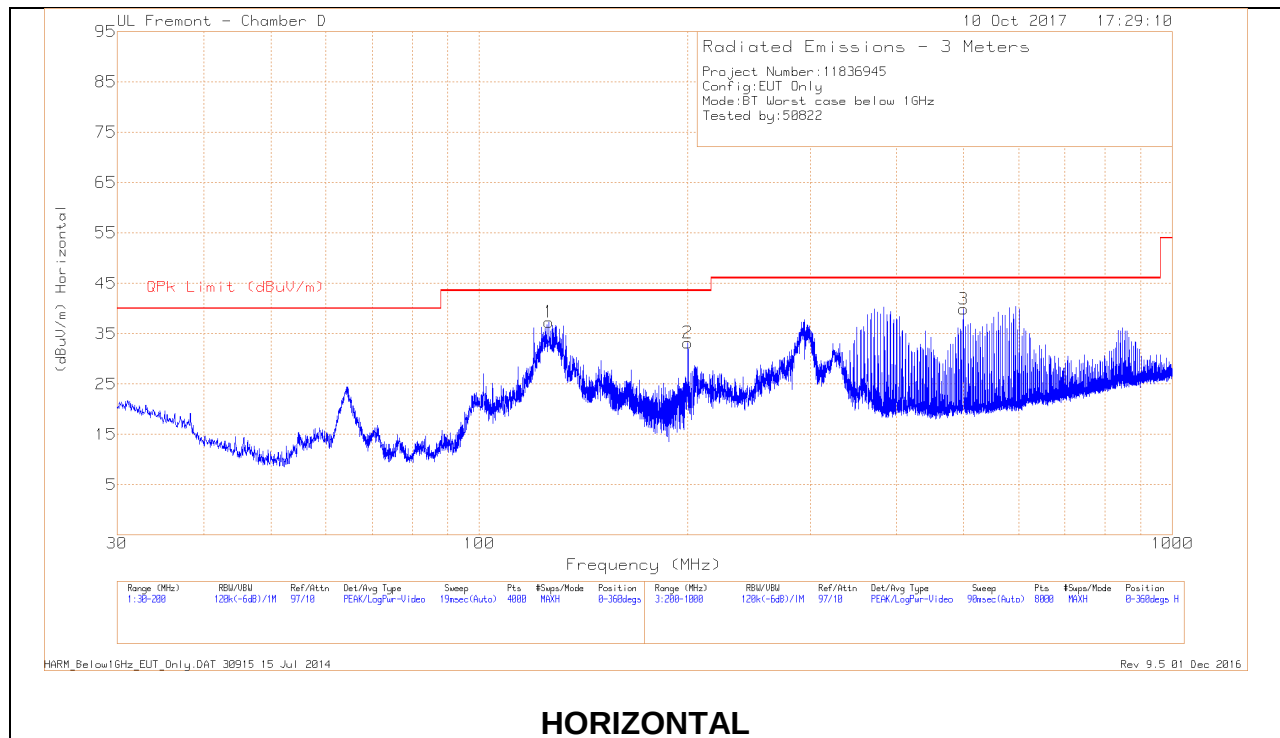
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dBm)	Amp/Cbl/Ftrl Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.44	40.11	PKFH	28.8	-22	46.91	-	-	74	-27.09	1	110	H
	* 1.44	29.82	VA1T	28.8	-22	36.62	54	-17.38	-	-	1	110	H
4	* 1.227	38.46	PKFH	28.9	-22.3	45.06	-	-	74	-28.94	162	307	V
	* 1.225	27.18	VA1T	28.9	-22.4	33.68	54	-20.32	-	-	162	307	V
3	* 3.84	39.13	PKFH	33.2	-28.6	43.73	-	-	74	-30.27	85	170	H
	* 3.84	30.45	VA1T	33.2	-28.6	35.05	54	-18.95	-	-	85	170	H
2	1.92	42.02	PKFH	31.3	-21.4	51.92	-	-	74	-22.08	349	101	H
5	3.15	36.11	PKFH	33	-29.3	39.81	-	-	74	-34.19	320	224	V
6	10.212	30.37	PKFH	37.1	-20	47.47	-	-	74	-26.53	208	328	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH - FHSS: RB=1MHz VB=3 x RB, Peak

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

8.2. WORST-CASE BELOW 1 GHz



Below 1GHz DATA

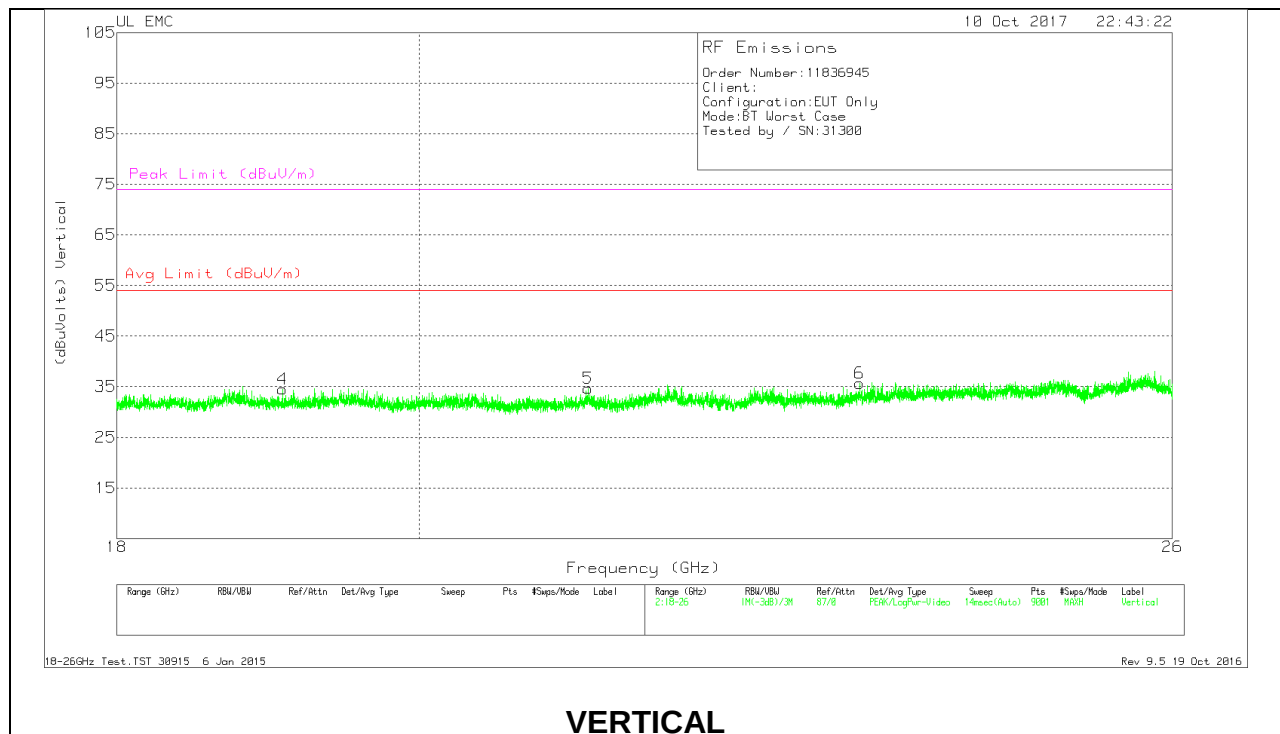
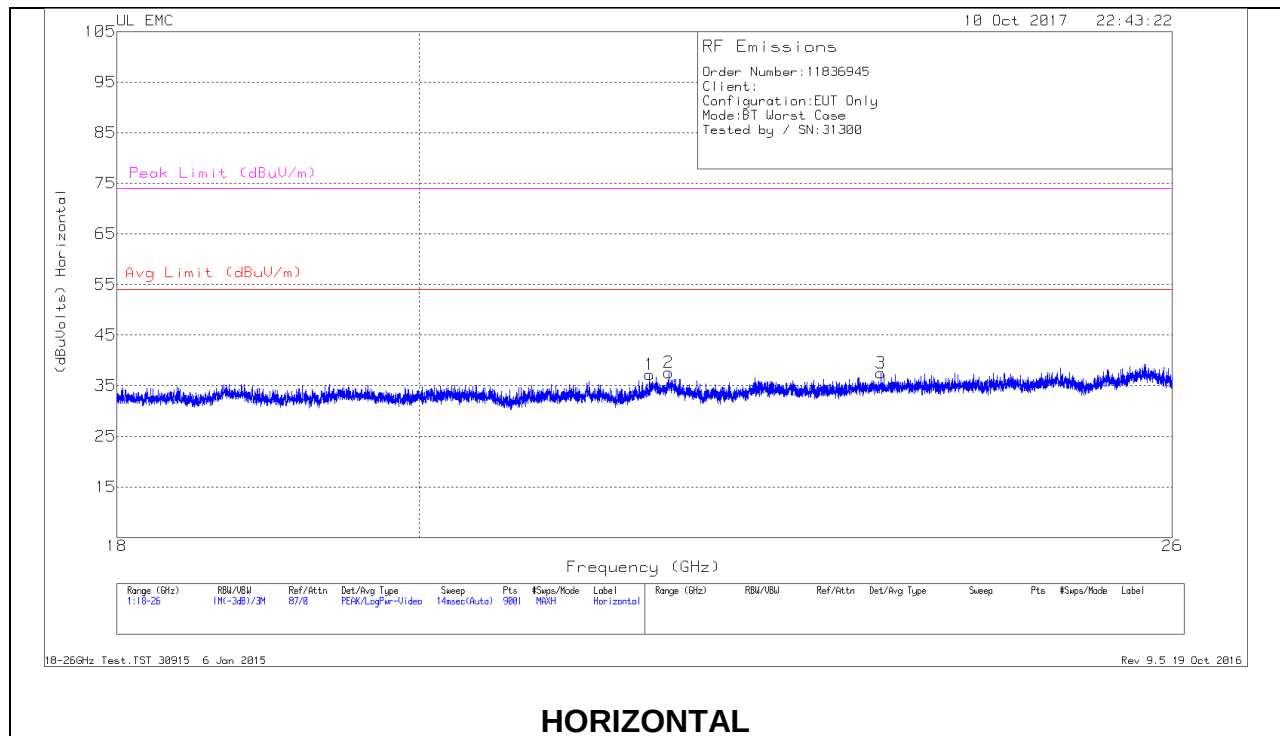
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	500.0007	53.72	Pk	21.7	-29.6	45.82	46.02	-.2	293	102	V
1	* 125.9898	50.41	Pk	18.1	-31.2	37.31	43.52	-6.21	0-360	199	H
4	* 125.9473	48.79	Pk	18.1	-31.2	35.69	43.52	-7.83	0-360	100	V
2	200	47.28	Pk	16.7	-30.8	33.18	43.52	-10.34	0-360	99	H
5	200	45.34	Pk	16.7	-30.8	31.24	43.52	-12.28	0-360	100	V
3	500.039	47.8	Qp	21.7	-29.6	39.9	46.02	-6.12	0-360	199	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Qp - Quasi-Peak detector

Pk - Peak detector

8.3. WORST-CASE 18-26GHz



18-26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	21.672	38.6	Pk	33.2	-25.1	-9.5	37.2	54	-16.8	74	-36.8
2	21.816	38.31	Pk	33.3	-24.5	-9.5	37.61	54	-16.39	74	-36.39
3	23.491	38.22	Pk	33.2	-24.4	-9.5	37.52	54	-16.48	74	-36.48
4	19.07	36.73	Pk	32.2	-24.9	-9.5	34.53	54	-19.47	74	-39.47
5	21.213	35.79	Pk	33.1	-24.7	-9.5	34.69	54	-19.31	74	-39.31
6	23.316	36.35	Pk	33.4	-24.6	-9.5	35.65	54	-18.35	74	-38.35

Pk - Peak detector

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	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

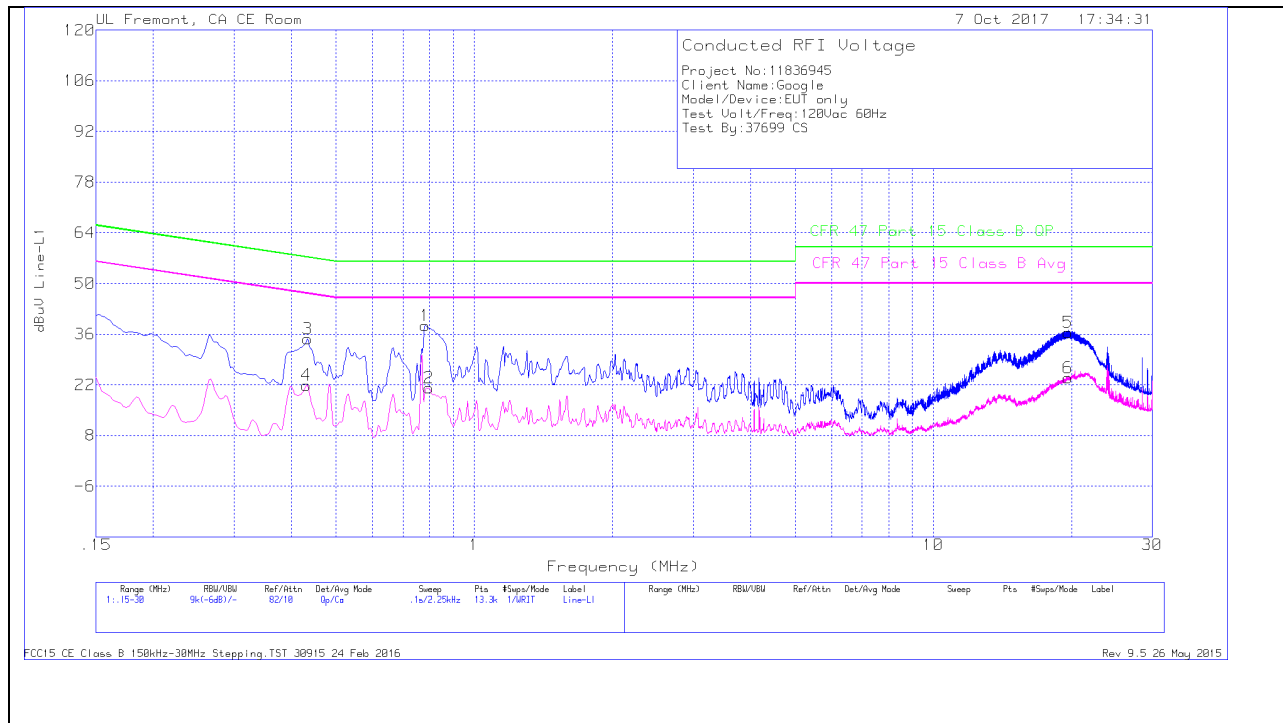
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

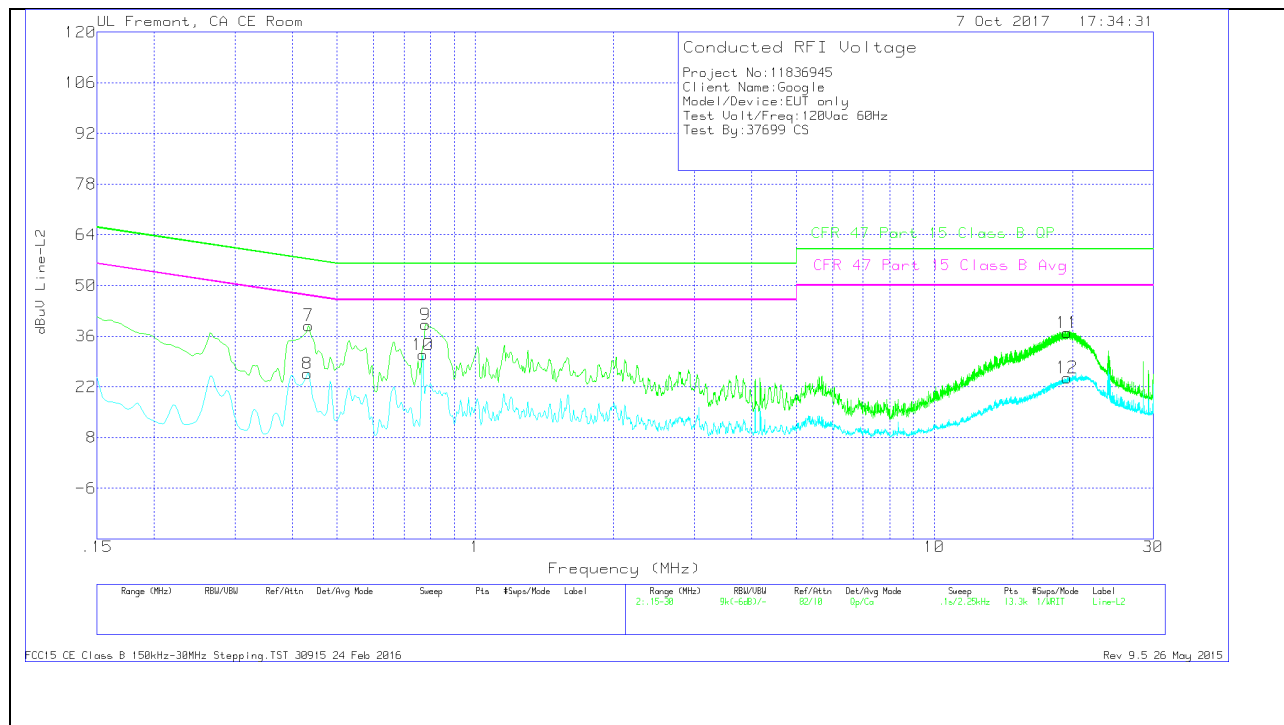
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.78225	28.24	Qp	0	0	10.1	38.34	56	-17.66	-	-
2	.79687	11.03	Ca	0	0	10.1	21.13	-	-	46	-24.87
3	.4335	24.67	Qp	0	0	10.1	34.77	57.19	-22.42	-	-
4	.43125	11.82	Ca	0	0	10.1	21.92	-	-	47.23	-25.31
5	19.6665	25.8	Qp	.1	.3	10.3	36.5	60	-23.5	-	-
6	19.6665	13.2	Ca	.1	.3	10.3	23.9	-	-	50	-26.1

Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
7	.4335	28.86	Qp	0	0	10.1	38.96	57.19	-18.23	-	-
8	.43125	15.62	Ca	0	0	10.1	25.72	-	-	47.23	-21.51
9	.78	29.19	Qp	0	0	10.1	39.29	56	-16.71	-	-
10	.76875	20.81	Ca	0	0	10.1	30.91	-	-	46	-15.09
11	19.47975	26.44	Qp	0	.3	10.3	37.04	60	-22.96	-	-
12	19.4775	13.93	Ca	0	.3	10.3	24.53	-	-	50	-25.47

Qp - Quasi-Peak detector
Ca - CISPR average detection