CERTIFICATION TEST REPORT

Report Number. : 11981280-18V2

Applicant	:	FITBIT INC. 199 FREMONT ST, 14TH FLOOR SAN FRANCISCO, CA 94105, U.S.A
Model	:	FB505
FCC ID	:	XRAFB505
IC	:	8542A-FB505
EUT Description	:	SMART WATCH
Test Standard(s)	:	LP0002: 2018

Date Of Issue:
February 13, 2018

Prepared by:
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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	1/31/2018	Initial Review	--
V2	2/13/2018	Revised standard version to LP0002: 2018 and updated limit on page 36 and 49.	Tina Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: FITBIT INC.
199 FREMONT ST, 14TH FLOOR
SAN FRANCISCO,
CA 94105, U.S.A

EUT DESCRIPTION: SMART WATCH

MODEL: FB505

SERIAL NUMBER: B2-H1-213, B2-H1-047 (RADIATED)
B2-A1-1367P (CONDUCTED)

DATE TESTED: DECEMBER 21, 2017 – JANUARY 27, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
LP0002: 2018	Complies

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 NCC LP0002: 2018, 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 (IC:2324B-1)	☐ Chamber D (IC:22541-1)
☒ Chamber B (IC:2324B-2)	☐ Chamber E (IC:22541-2)
☒ Chamber C (IC:2324B-3)	☐ Chamber F (IC:22541-3)
	☐ Chamber G (IC:22541-4)
	☐ Chamber H (IC:22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

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.

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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
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB
Occupied Channel Bandwidth	±0.39 %
Time	±0.02 %

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The equipment under test is a Smart Watch.

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	10.21	10.50
	DQPSK	9.38	8.67
	Enhanced 8PSK	11.85	15.31

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Peak Gain (dBi)
2.4	-11.30

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Tera Term Ver 4.93.
The firmware installed in the EUT during testing was Version 32.3.125.8.

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5.5. WORST-CASE CONFIGURATION AND MODE

EUT has 1 type of plastic wristband and 3 types of metallic bands: Mesh, Link and Tri-Link. The worst-case configuration was investigated with wristbands with and without a charger and it was determined that EUT with plastic wristband and with a charger was the worst-case; therefore, all final radiated testing was performed with this configuration.

Radiated bandedge, harmonics, and spurious emissions from 1 GHz to 18GHz were performed with EUT set to transmit at the Low/Middle/High channels.

Radiated emission 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.

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

Worst-case data rates were:

GFSK mode: DH5
8PSK mode: 3-DH5

DQPSK mode has been verified to have the lowest power.

BT and Wifi bands do not transmit simultaneously.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC Adapter	Lenovo	ADLX45DLCC2A	11S36200283ZZ10051KU2U	NA
Laptop	Lenovo	ThinkPad X1 Carbon	R9-0G4NPM 15/06	NA
AC/DC Adapter	Homespot	S005AYU0500100	N/A	NA

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Unshielded	1	AC Mains to AC/DC Adapter
2	DC	1	DC	Unshielded	1.5	AC/DC Adapter to Laptop
3	USB	1	USB	Unshielded	1	Laptop to EUT
4	Antenna	1	SMA	Unshielded	0.2	To spectrum analyzer

I/O CABLES (AC POWER CONDUCTED TEST AND RADIATED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	Unshielded	1	Charger to AC/DC adapter

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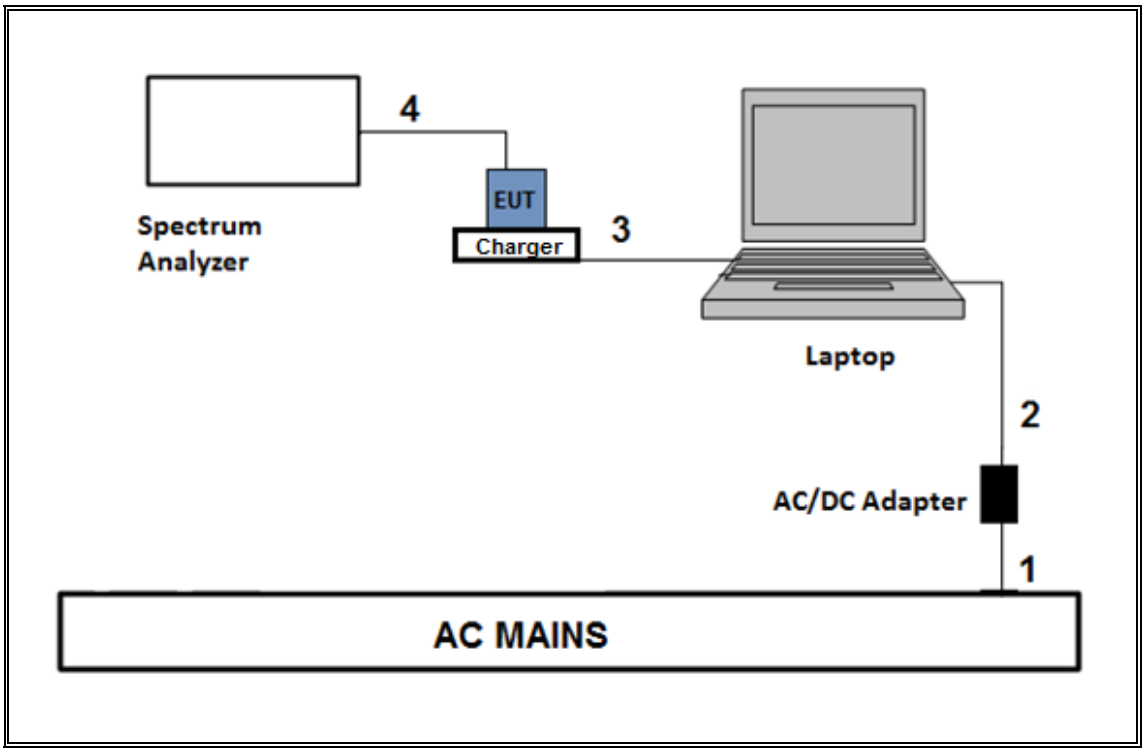
TEST SETUP-CONDUCTED TEST

The EUT was placed in charger and powered by host laptop. Test software exercised the EUT.

SETUP DIAGRAM



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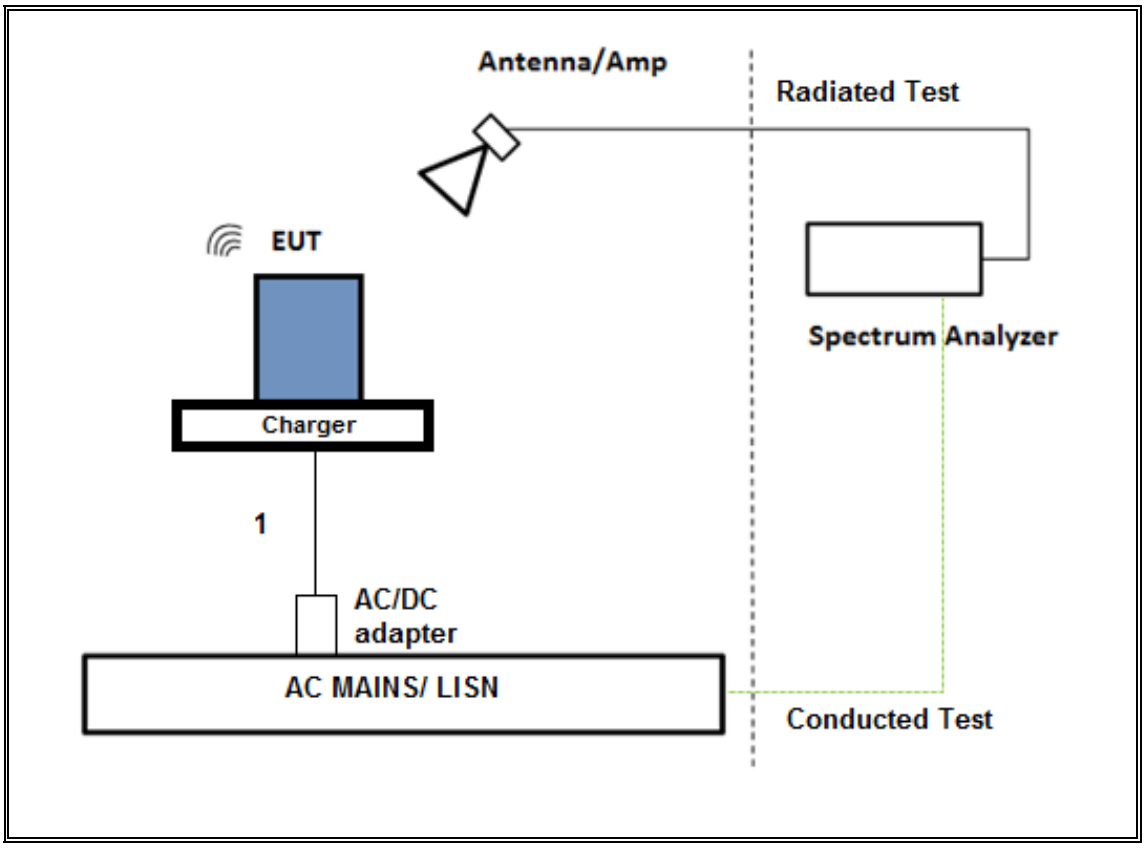
TEST SETUP- AC LINE CONDUCTED TEST AND RADIATED TEST

The EUT was placed in charger and powered by an AC/DC adapter. Test software exercised the EUT.

SETUP DIAGRAM



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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, Horn 1-18GHz	ETS Lindgren	3117	T862	06/09/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T1165	11/25/2018
Antenna, Active Loop 9KHz to 30MHz	EMCO	6502	T35	3/09/2018
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	T300	12/11/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1466	04/11/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	06/09/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T493	12/16/2018
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T899	06/15/2018
Amplifier, 10KHz to 1GHz, 32dB	Keysight	8447D	T10	02/15/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T907	01/23/2018
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	T243	11/02/2018
Amplifier, 30kHz-1000MHz	Keysight	8447D	T15	08/14/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T905	1/11/2018
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	E4446A	T146	07/18/2018
Antenna Horn, 18 to 26GHz	ARA	MWH-1826	T89	01/04/2018
Amplifier, 1 to 26.5GHz 23.5dB gain Minimum	Keysight	8449B	T404	07/23/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A-544	T1113	12/21/2018
Power Meter, P-series single channel	Keysight	N1912A	T1245	05/12/2018
Power Sensor	Keysight	N1921A	T413	06/22/2018
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1124	11/07/2018
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/15/2018
Power Cable, Line Conducted Emissions	UL	PG1	T861	08/31/2018
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016	
Conducted Software	UL	UL EMC	Ver 7.7, Dec 14, 2017	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

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7. MEASUREMENT METHODS

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6

Occupied BW (20dB): ANSI C63.10-2013 Section 6.9.2

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Carrier Frequency Separation: ANSI C63.10-2013 Section 7.8.2

Number of Hopping Frequencies: ANSI C63.10-2013 Section 7.8.3

Time of Occupancy (Dwell Time): ANSI C63.10-2013 Section 7.8.4

Peak Output Power: ANSI C63.10-2013 Section 7.8.5

Conducted Spurious Emissions: ANSI C63.10-2013 Section 7.8.8

Conducted Band-Edge: ANSI C63.10-2013 Section 6.10.4

Radiated Spurious Emissions 30-1000MHz: ANSI C63.10-2013 Section 6.3 and 6.5

Radiated Spurious Emissions above 1GHz: ANSI C63.10-2013 Section 6.3 and 6.6

Radiated Band-edge: ANSI C63.10-2013 Section 6.10.5

AC Power-line conducted emissions: ANSI C63.10-2013, Section 6.2.

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

ANSI C63.10, Section 11.6 : 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/B Minimum VBW (khz)
GFSK	2.890	3.750	0.771	77.07%	1.13	3.460
8PSK	2.890	3.750	0.771	77.07%	1.13	3.460

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DUTY CYCLE PLOTS

HOPPING OFF

DUTY CYCLE GFSK MODE

DUTY CYCLE 8PSK MODE

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8.2. DATA RATE GFSK MODULATION

8.2.1. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2402	933.021	898.064
Middle	2441	909.656	897.096
High	2480	881.083	889.527

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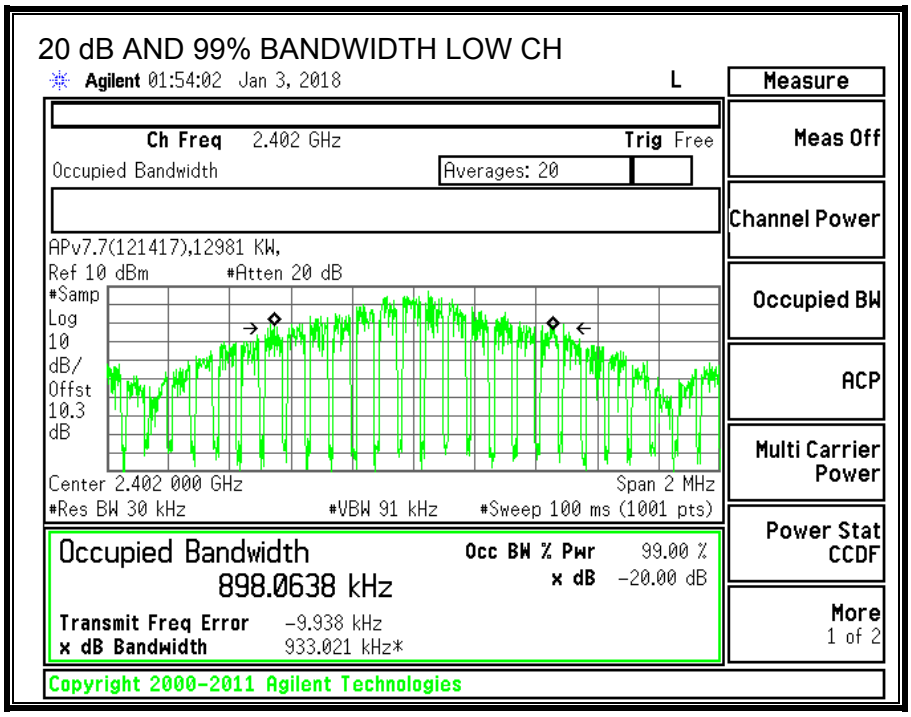
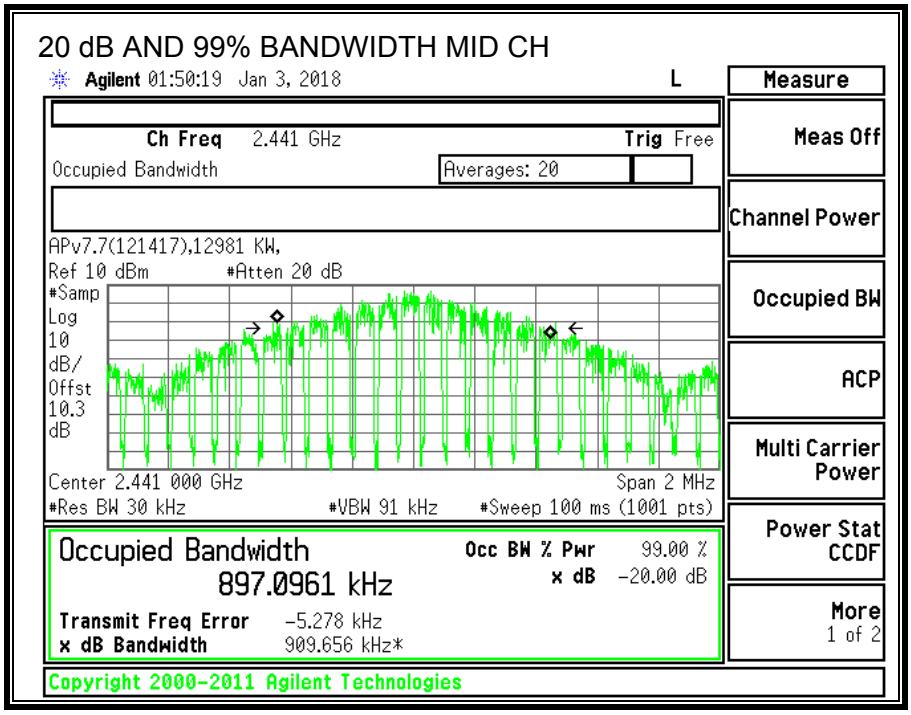
20 dB AND 99% BANDWIDTH LOW CH



20 dB AND 99% BANDWIDTH MID CH



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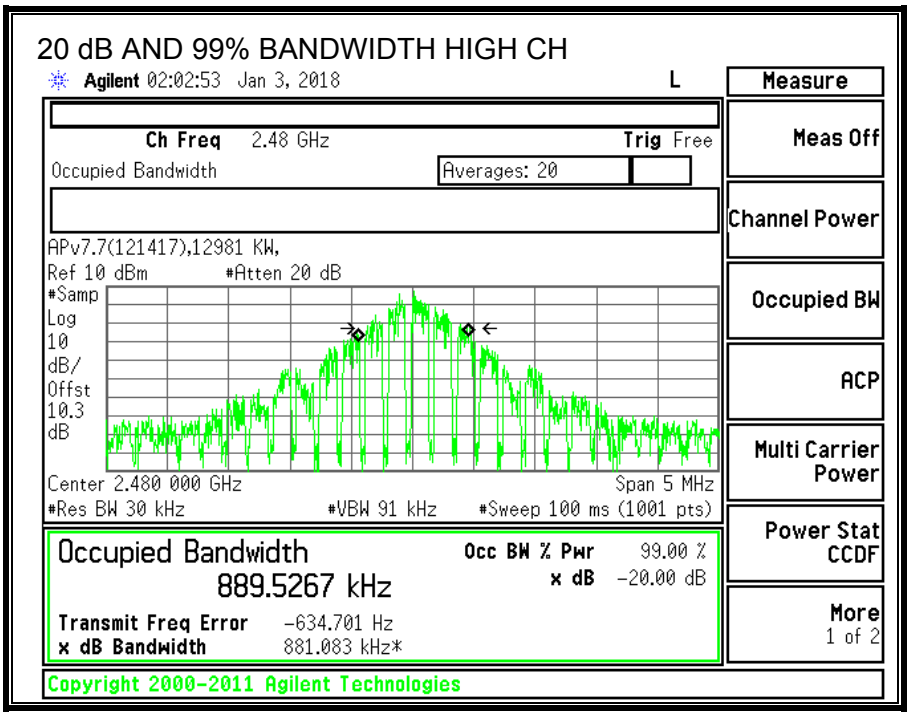
20 dB AND 99% BANDWIDTH HIGH CH



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8.2.2. HOPPING FREQUENCY SEPARATION

LIMITS

NCC LP0002 § 3.10.1.6(1)(A)

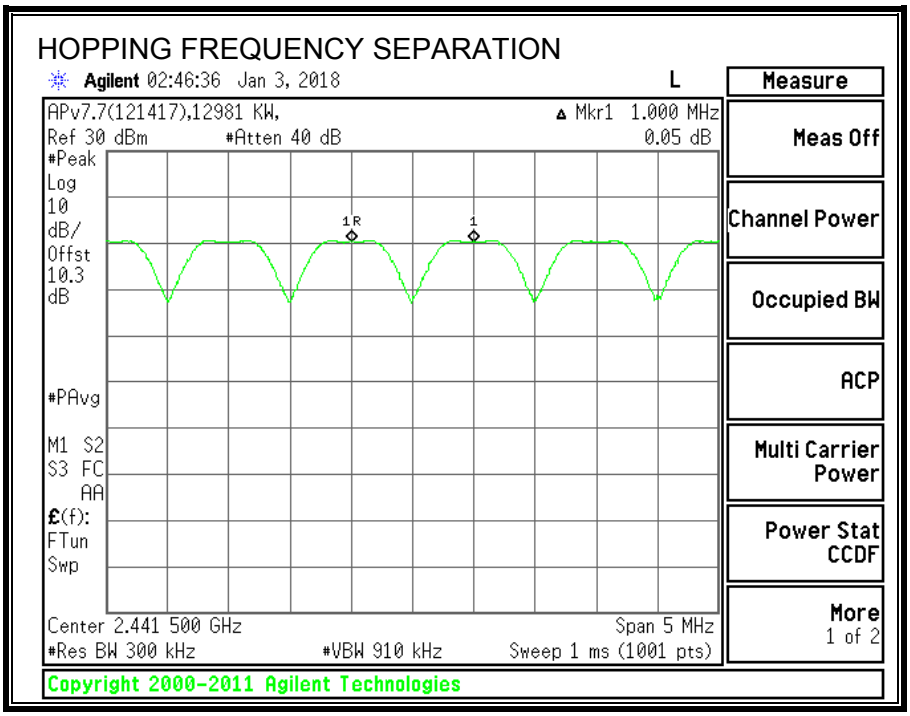
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

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



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8.2.3. NUMBER OF HOPPING CHANNELS

LIMITS

NCC LP0002 3.10.1.6(1)(A)(a)

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

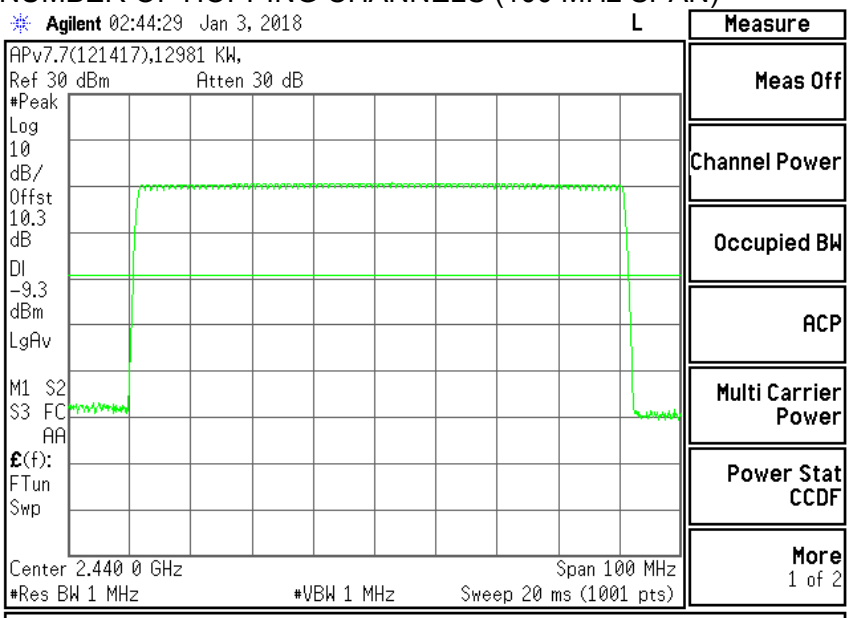
TEST PROCEDURE

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.

NUMBER OF HOPPING CHANNELS (100 MHz SPAN)



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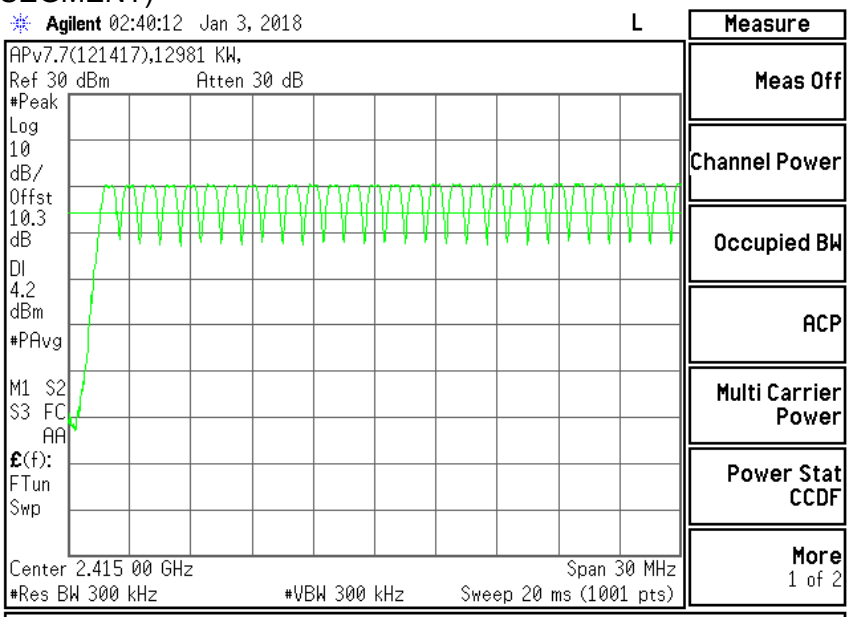
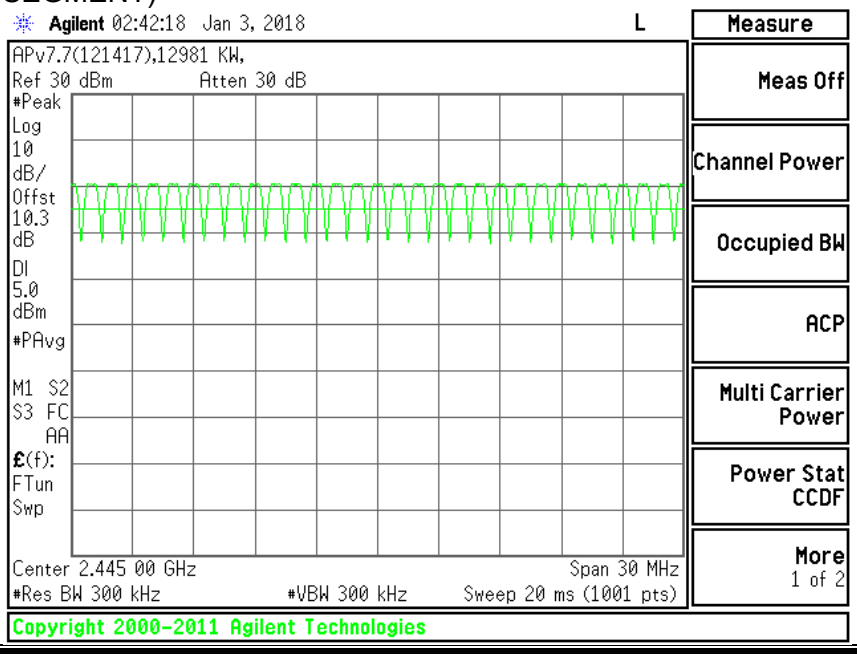
NUMBER OF HOPPING CHANNELS (30 MHz SPAN, FIRST SEGMENT)



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



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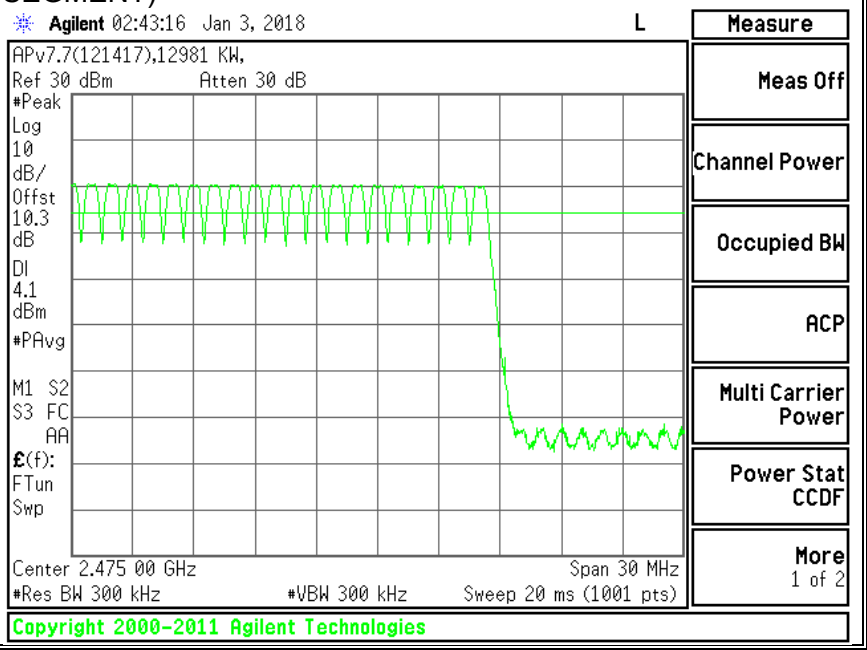
NUMBER OF HOPPING CHANNELS (30 MHz SPAN, THIRD SEGMENT)



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8.2.4. AVERAGE TIME OF OCCUPANCY

LIMITS

NCC LP0002 3.10.1.6(1)(A)(a)

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 * (# of pulses in 3.16 s) * 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 * (# of pulses in 0.8 s) * 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	0.3839	32	0.123	0.4	-0.277
DH3	1.64	16	0.262	0.4	-0.138
DH5	2.88	12	0.346	0.4	-0.054
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	0.3839	8	0.031	0.4	-0.369
DH3	1.64	4	0.066	0.4	-0.334
DH5	2.88	3	0.086	0.4	-0.314

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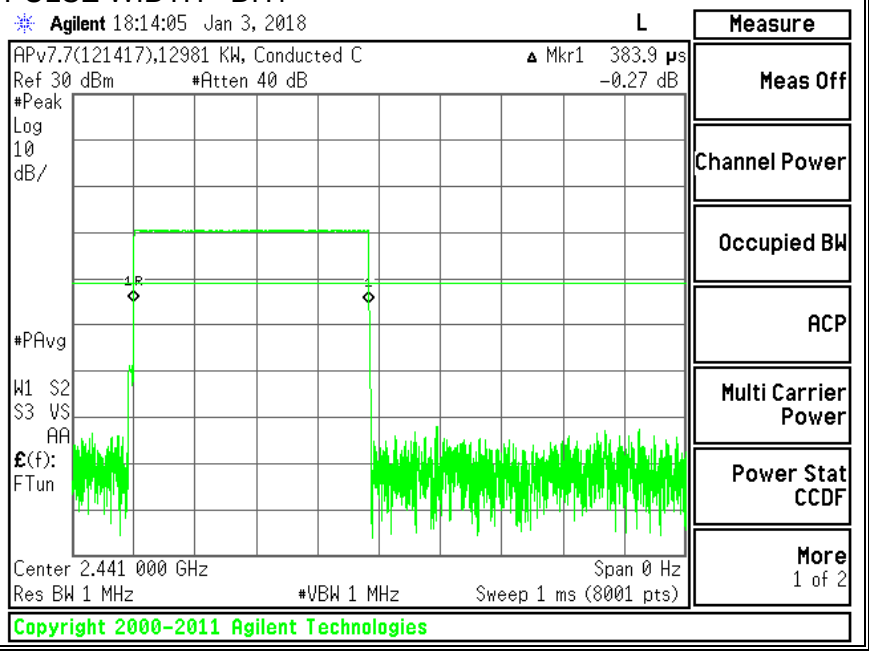
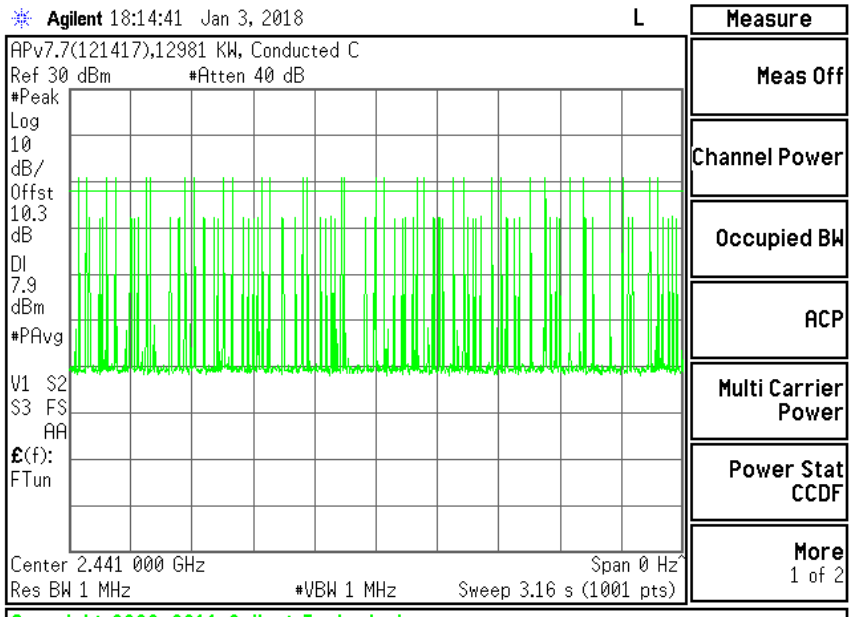
PULSE WIDTH - DH1



NUMBER OF PULSES - DH1



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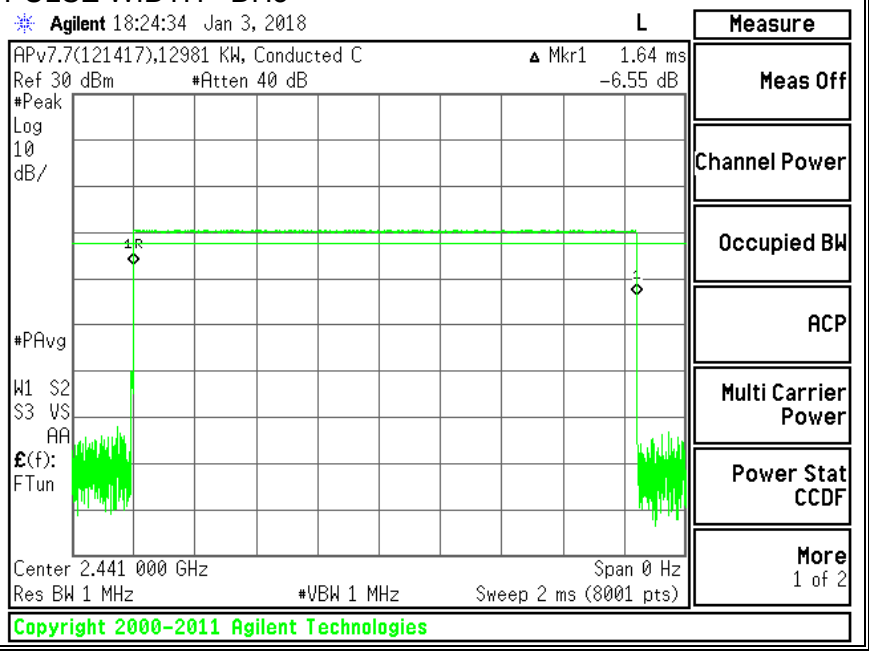
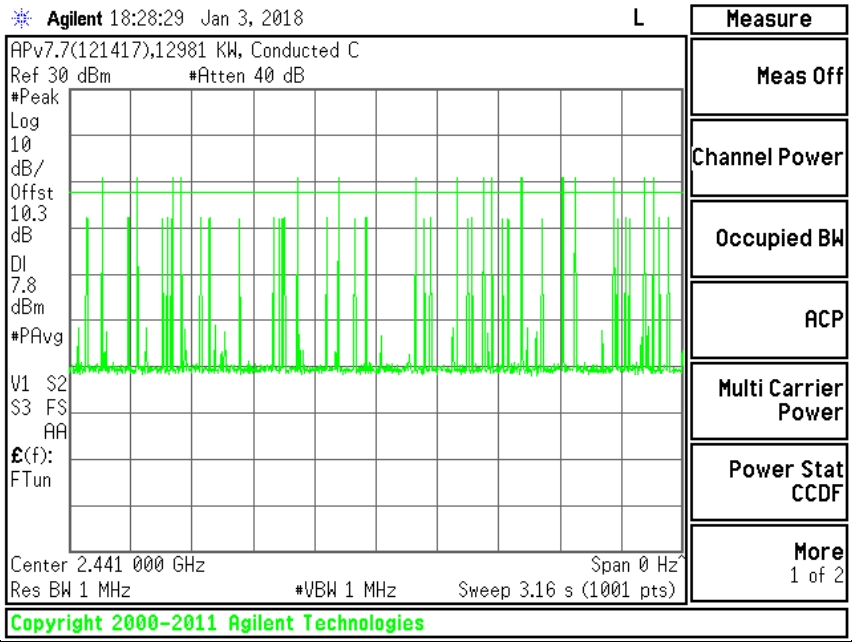
PULSE WIDTH - DH3



NUMBER OF PULSES - DH3



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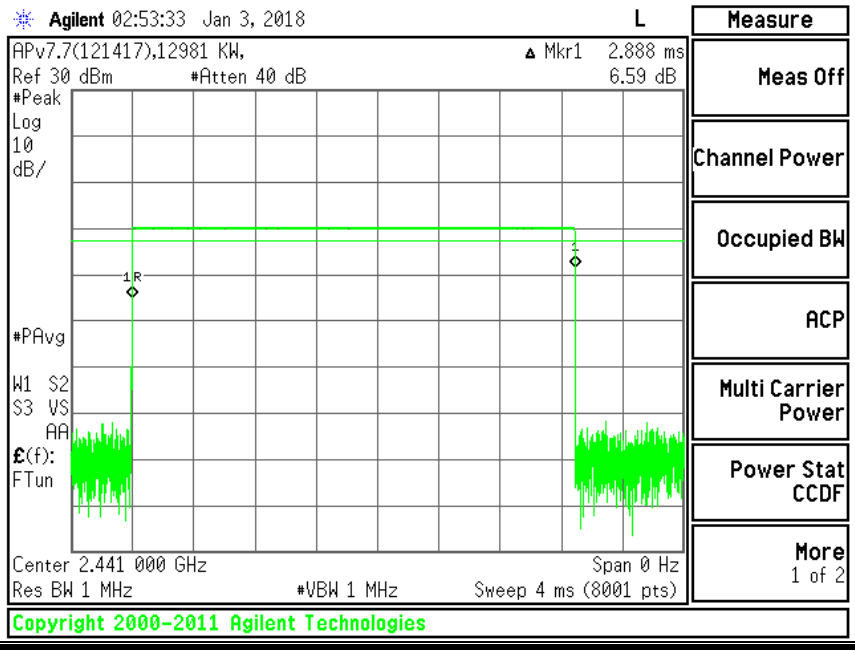
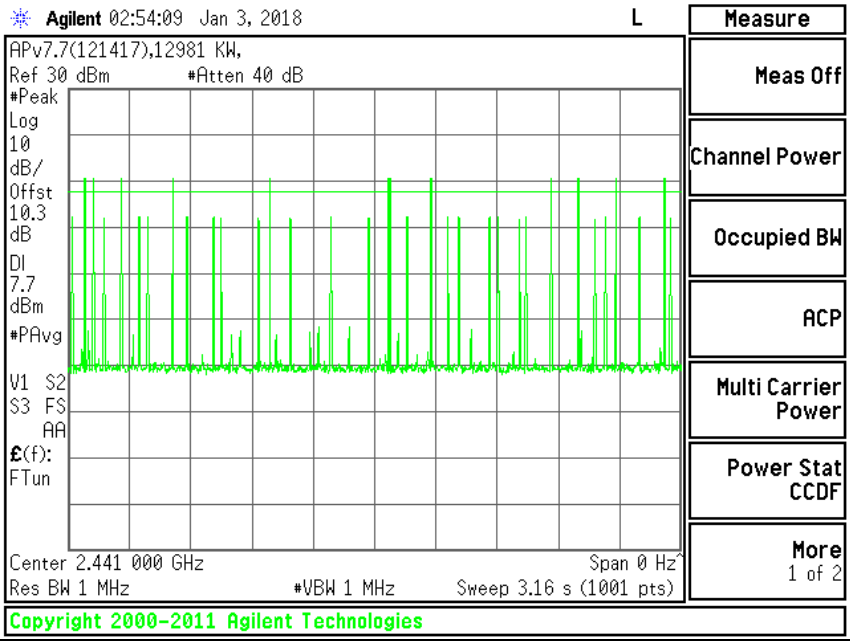
PULSE WIDTH - DH5



NUMBER OF PULSES - DH5



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8.2.5. OUTPUT POWER

LIMITS

NCC LP0002 3.10.1.2(1)(A)

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

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	12981	Date:	12/28/2017

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.05	30	-19.95
Middle	2441	10.21	30	-19.79
High	2480	9.77	30	-20.23

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8.2.6. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	12981	Date:	12/28/2017

The cable assembly insertion loss of 10.3 dB (including 10 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.88
Middle	2441	10.03
High	2480	9.60

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8.2.7. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

LIMITS

NCC LP0002 3.10.1.5(1)

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

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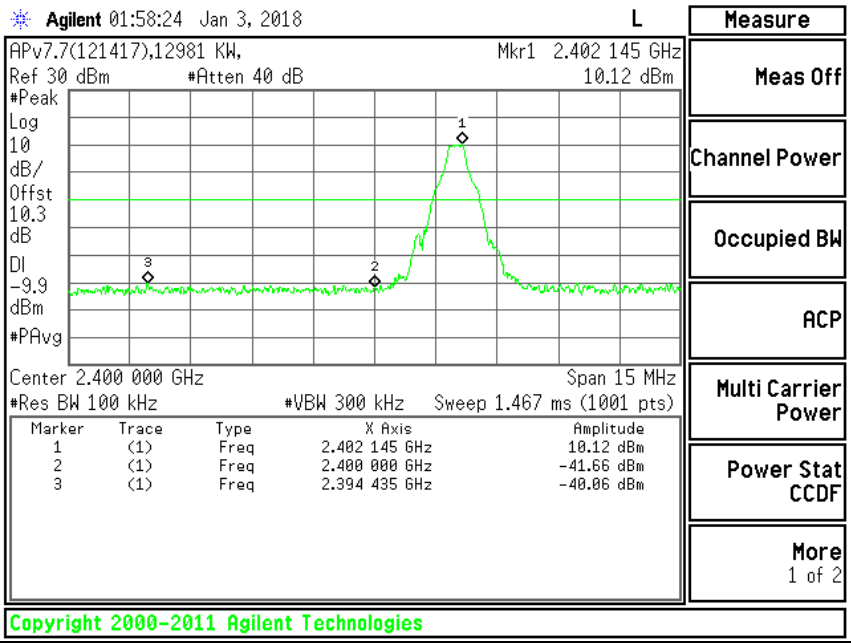
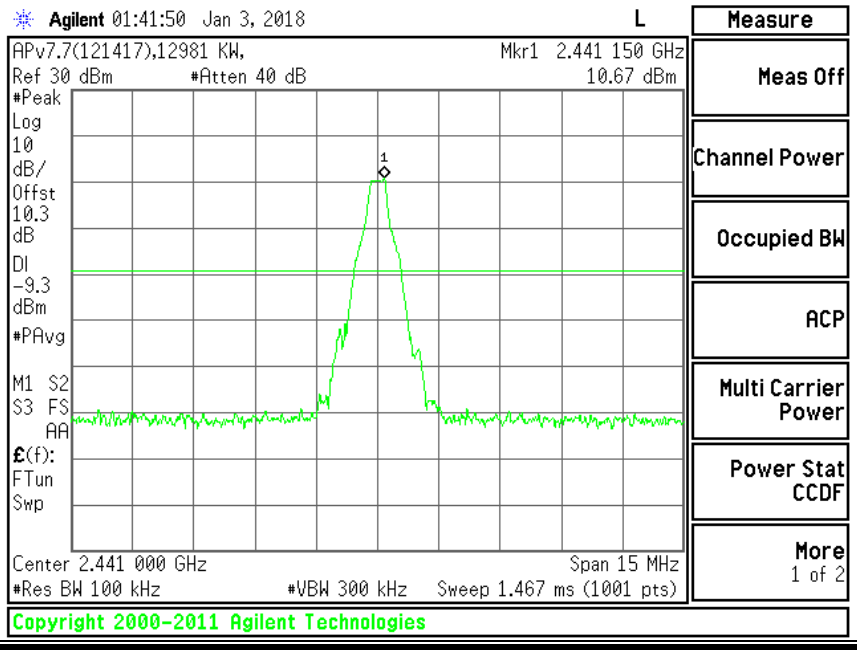
CONDUCTED BANDEDGE LOW CH



CONDUCTED BANDEDGE MID CH



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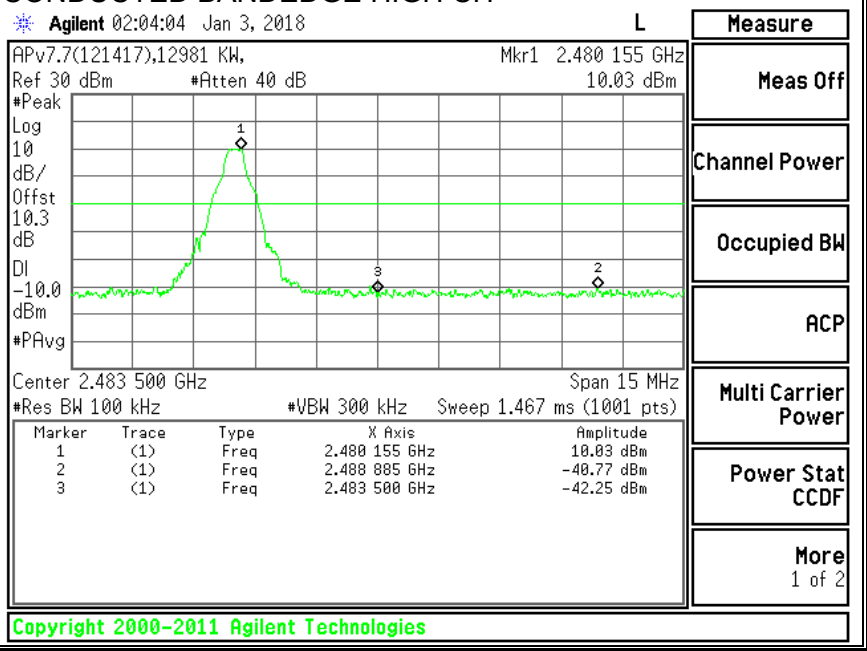
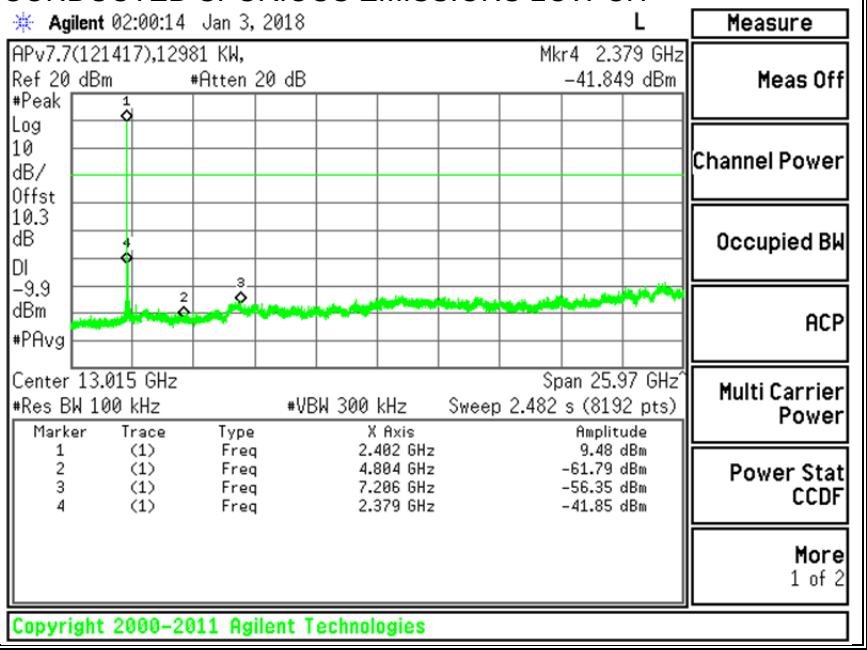
CONDUCTED BANDEDGE HIGH CH



CONDUCTED SPURIOUS EMISSIONS LOW CH



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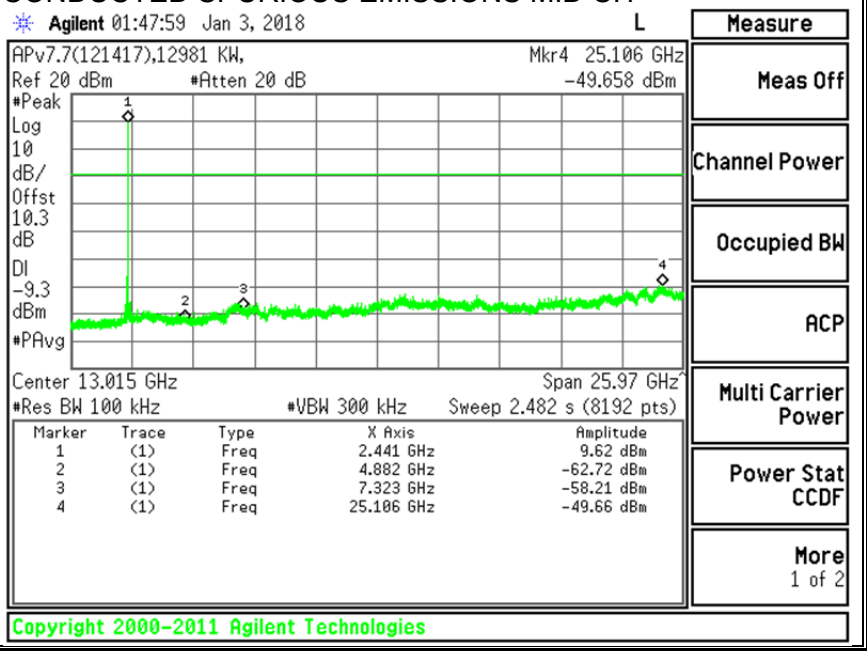
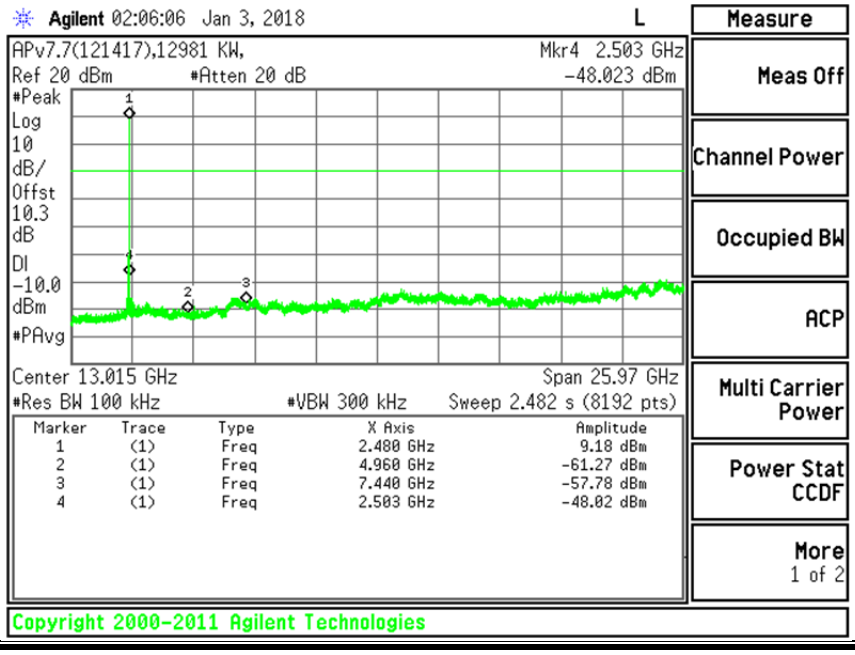
CONDUCTED SPURIOUS EMISSIONS MID CH



CONDUCTED SPURIOUS EMISSIONS HIGH CH



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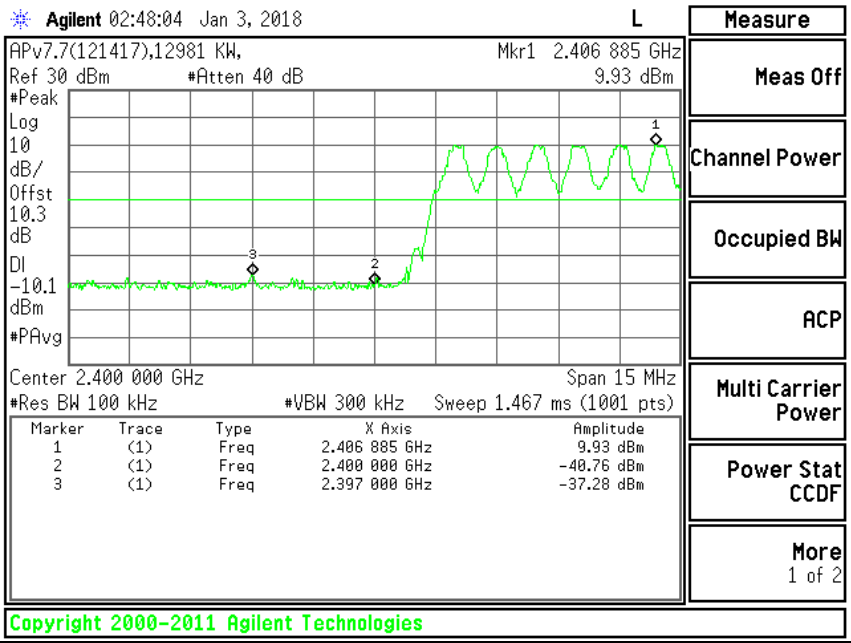
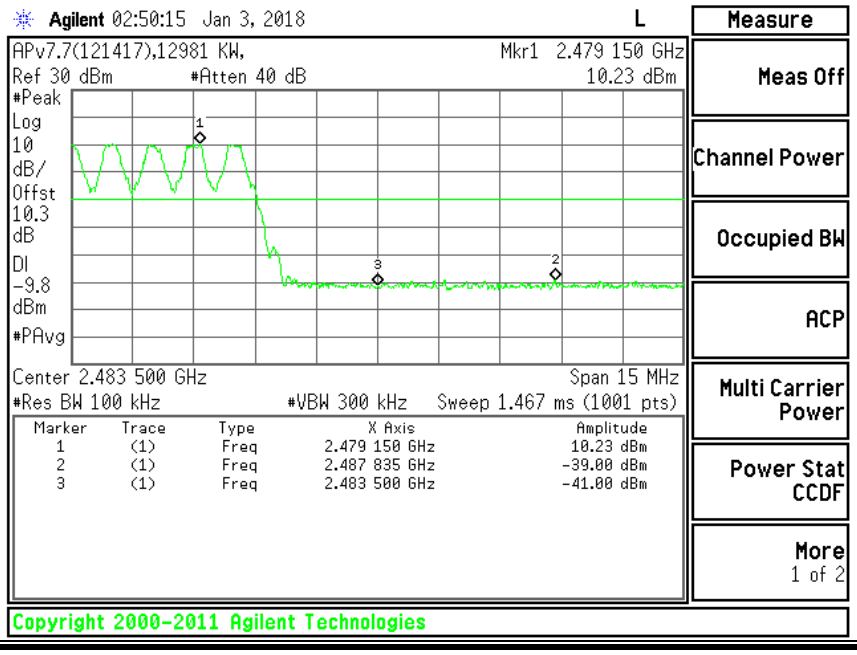
LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



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8.3. ENHANCED DATA RATE DQPSK MODULATION

8.3.1. OUTPUT POWER

LIMITS

NCC LP0002 3.10.1.2(1)(B)

Except (A), according to 3.10.1.6 (1) (A) (a), the maximum antenna gain is less than 6 dBi, the limit is 21 dBm (125mW).

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	12981	Date:	12/28/2017

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.94	21	-12.06
Middle	2441	9.38	21	-11.62
High	2480	8.82	21	-12.18

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8.3.2. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	12981	Date:	12/28/2017

The cable assembly insertion loss of 10.3 dB (including 10 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.69
Middle	2441	9.12
High	2480	8.55

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8.4. ENHANCED DATA RATE 8PSK MODULATION

8.4.1. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2402	1317	1224.8
Middle	2441	1307	1210.2
High	2480	1313	1213.5

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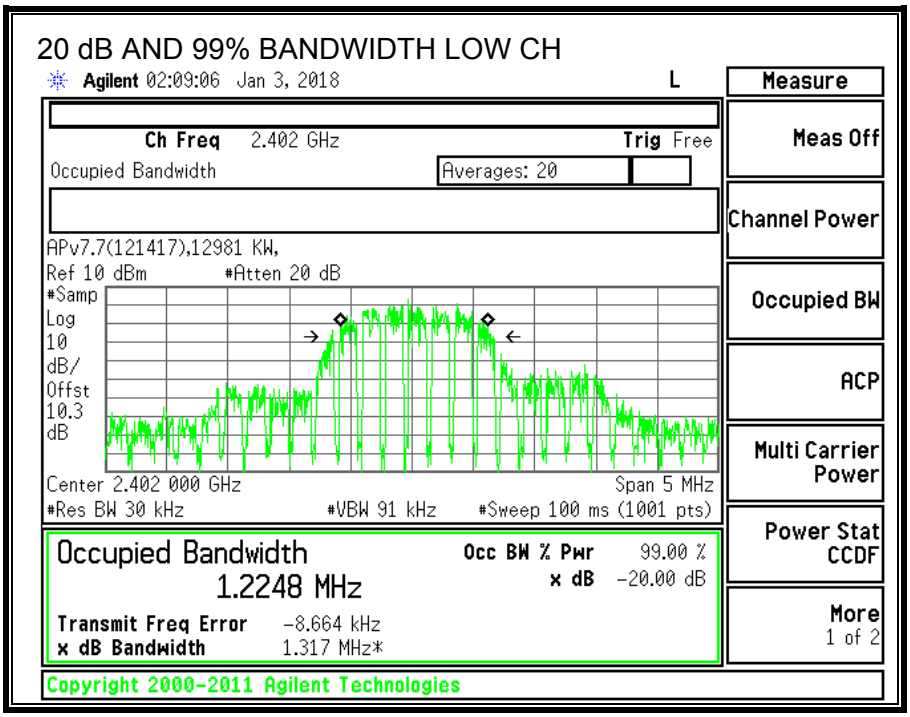
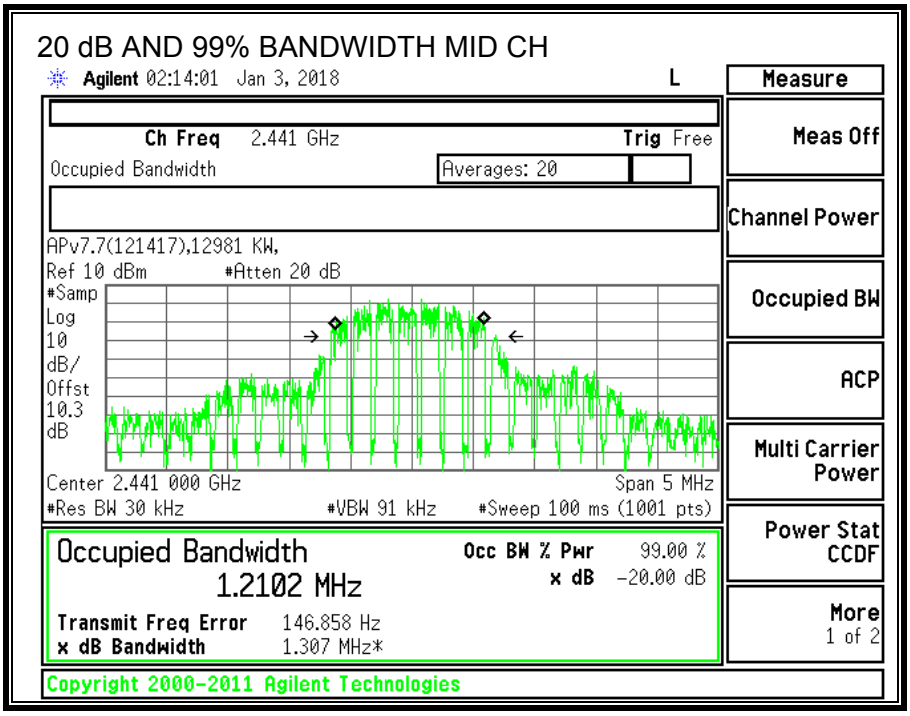
20 dB AND 99% BANDWIDTH LOW CH



20 dB AND 99% BANDWIDTH MID CH



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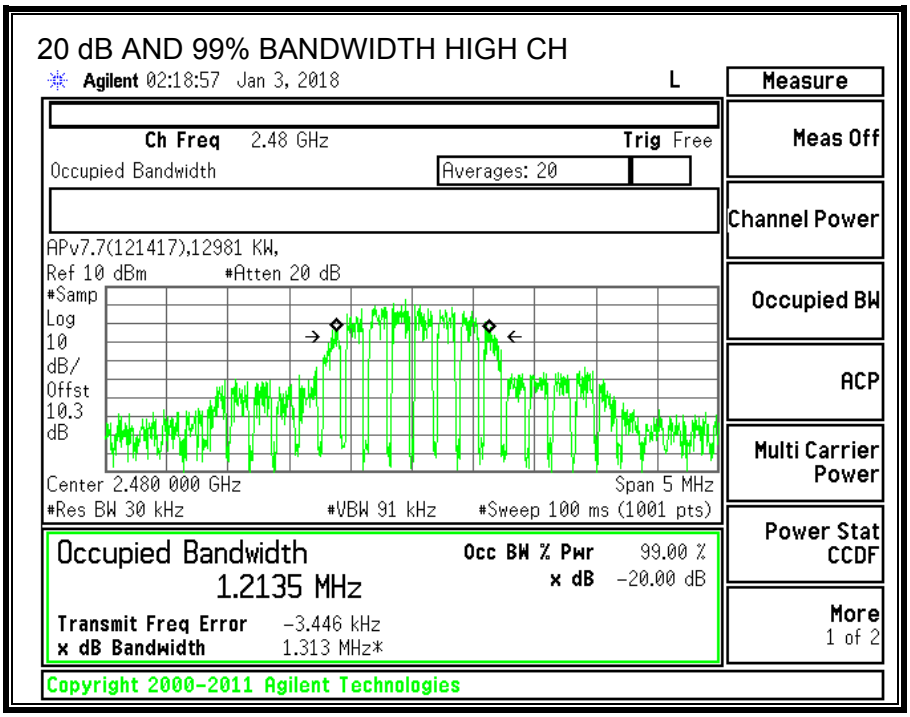
20 dB AND 99% BANDWIDTH HIGH CH



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8.4.2. HOPPING FREQUENCY SEPARATION

LIMITS

NCC LP0002 § 3.10.1.6(1)(A)

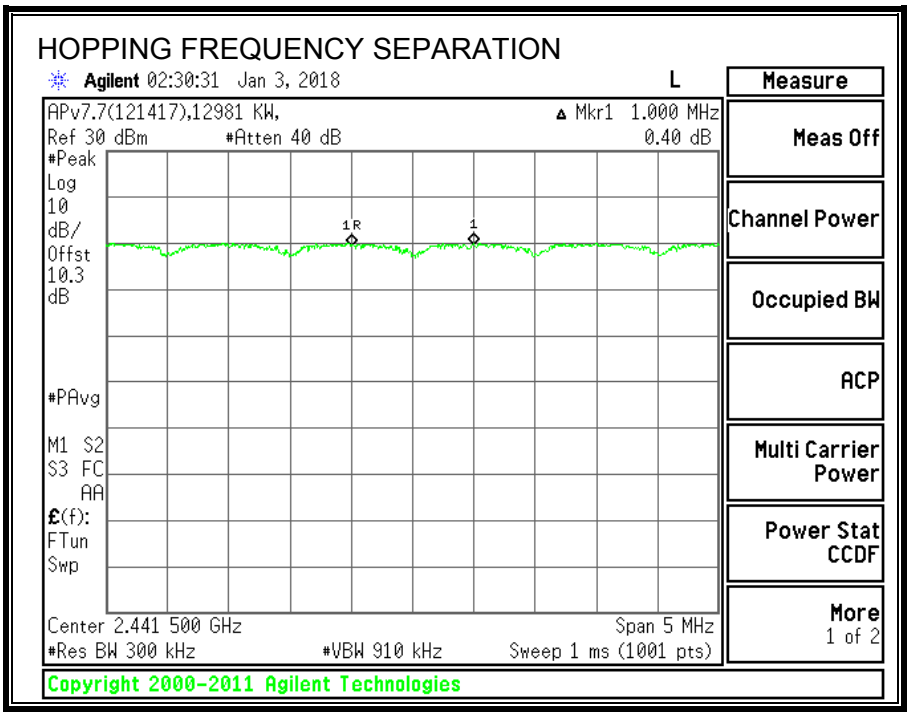
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

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



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8.4.3. NUMBER OF HOPPING CHANNELS

LIMITS

NCC LP0002 3.10.1.6(1)(A)(a)

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

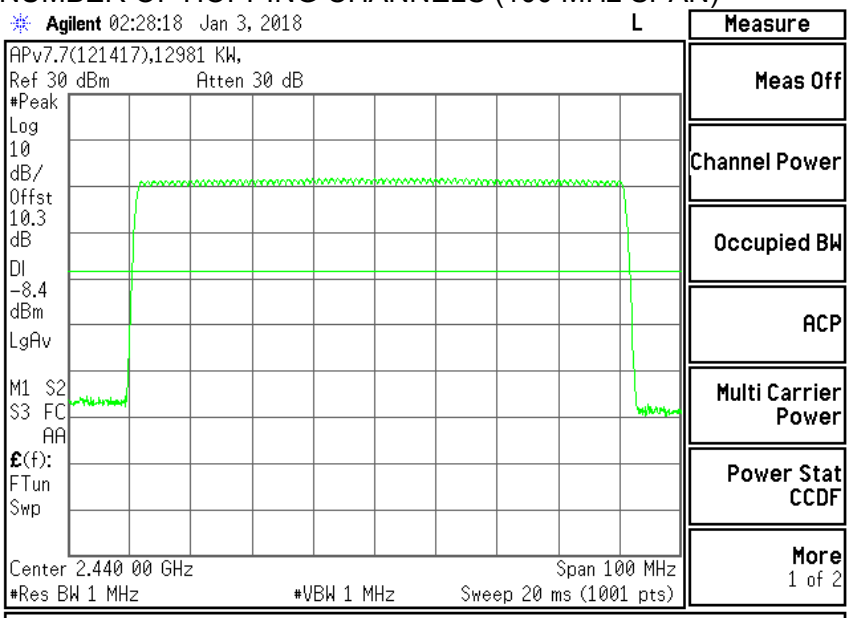
TEST PROCEDURE

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.

NUMBER OF HOPPING CHANNELS (100 MHz SPAN)



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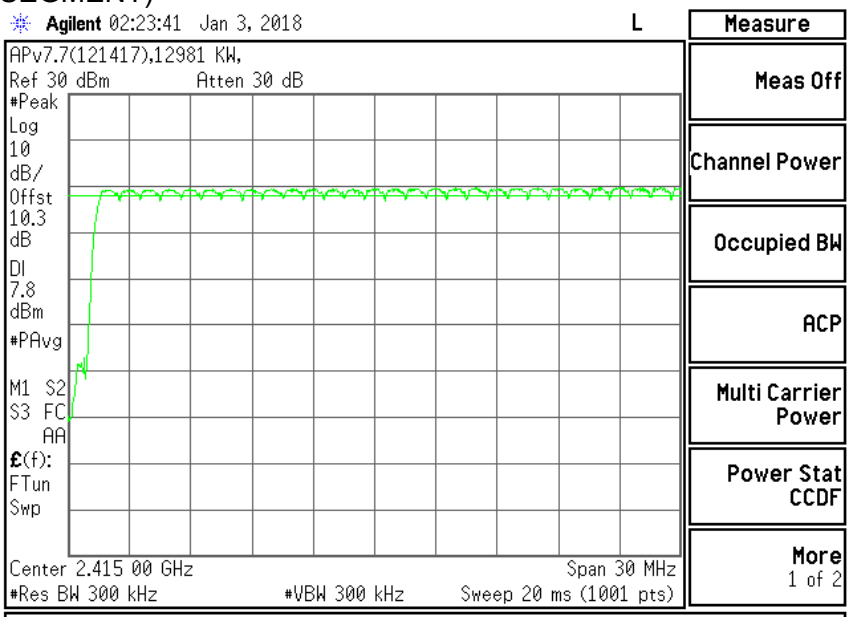
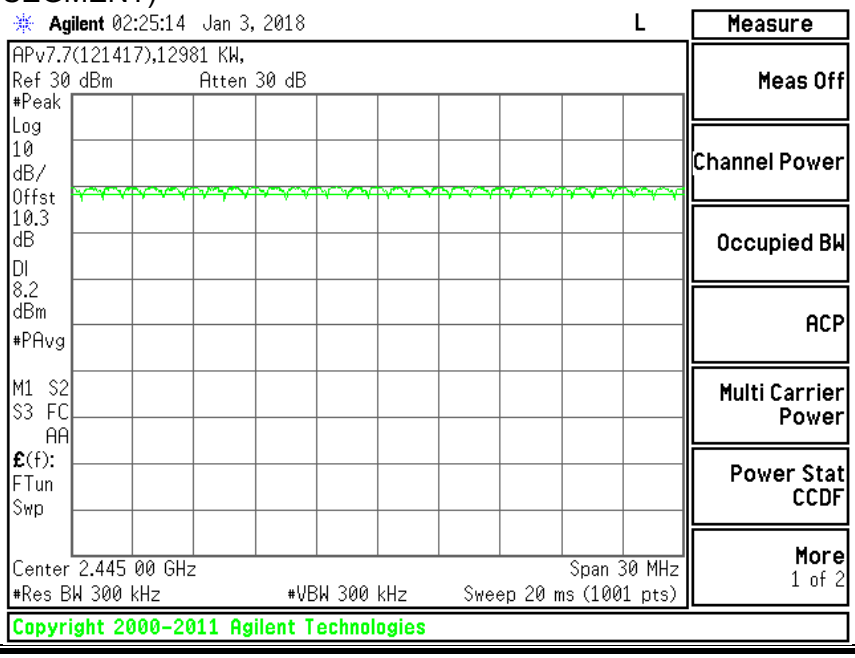
NUMBER OF HOPPING CHANNELS (30 MHz SPAN, FIRST SEGMENT)



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



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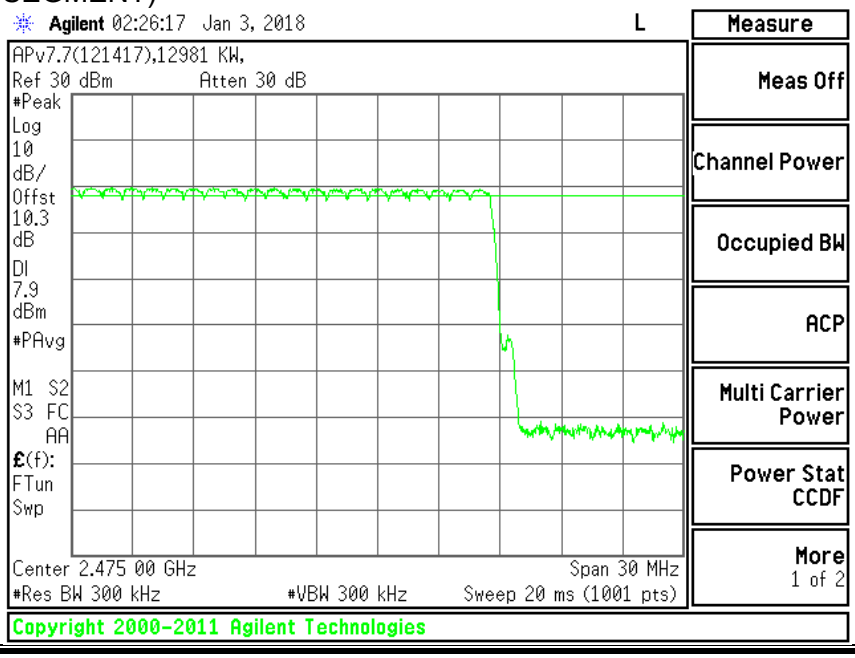
NUMBER OF HOPPING CHANNELS (30 MHz SPAN, THIRD SEGMENT)



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8.4.4. AVERAGE TIME OF OCCUPANCY

LIMITS

NCC LP0002 3.10.1 §6.1

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 * (# of pulses in 3.16 s) * 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 * (# of pulses in 0.8 s) * pulse width.

RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK (EDR) Mode					
3DH1	0.3899	32	0.125	0.4	-0.275
3DH3	1.641	16	0.263	0.4	-0.137
3DH5	2.892	11	0.318	0.4	-0.082

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 8.2.4 demonstrates compliance with channel occupancy when AFH is employed.

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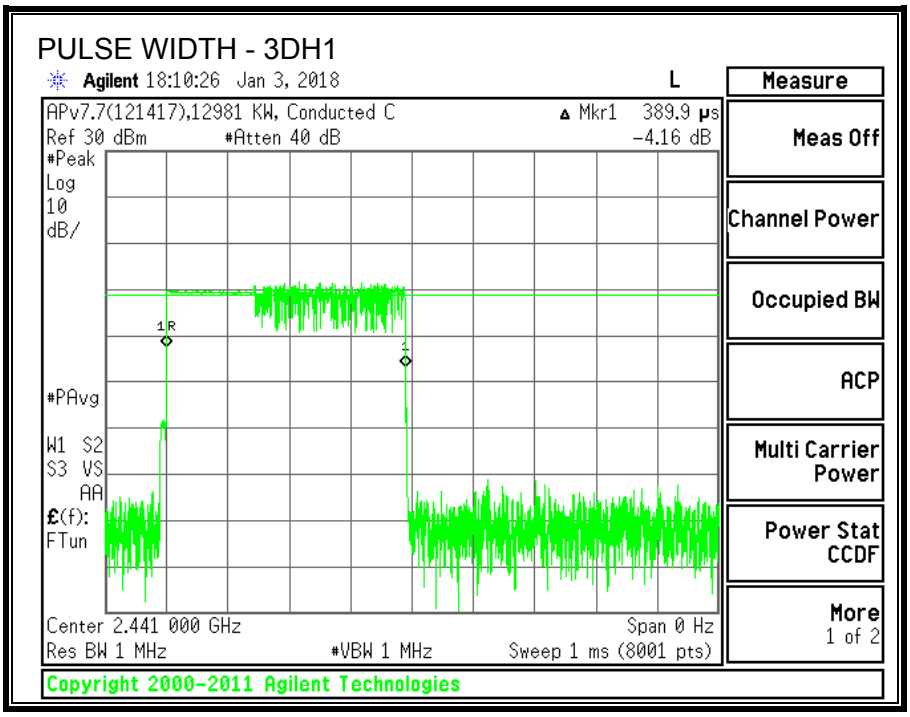
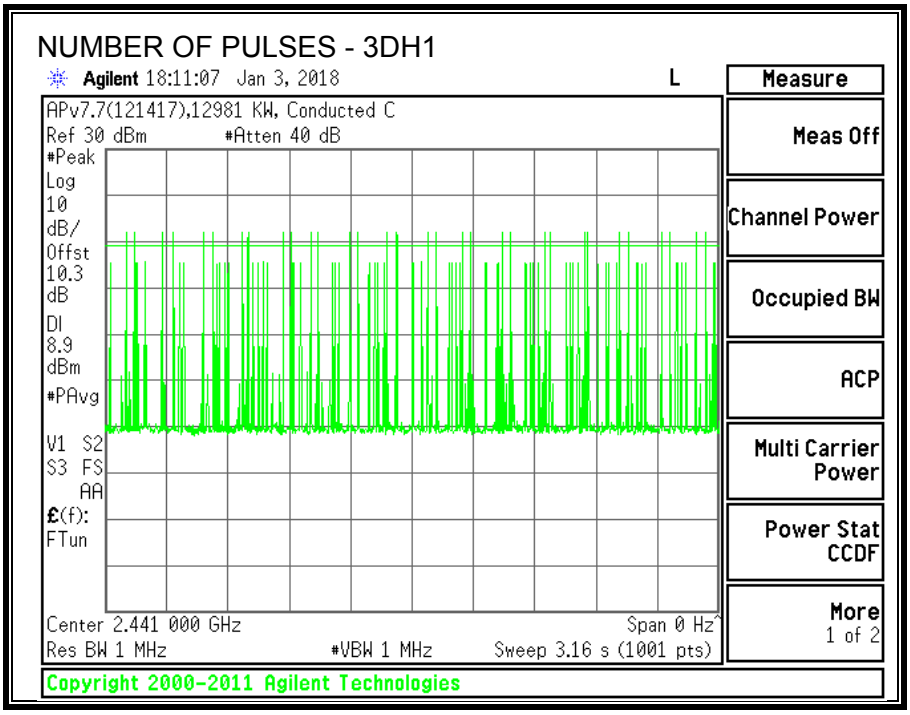
PULSE WIDTH - 3DH1



NUMBER OF PULSES - 3DH1



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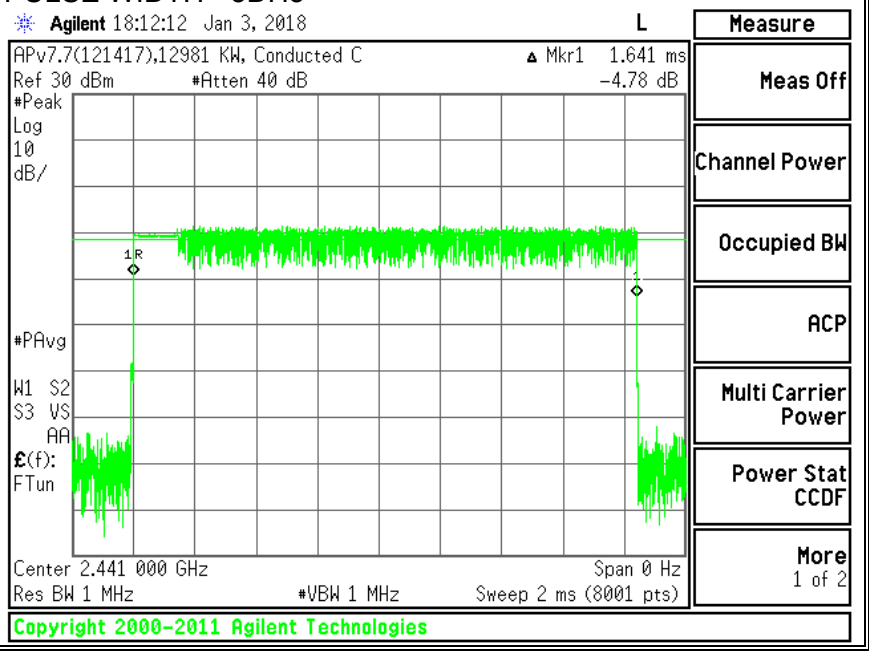
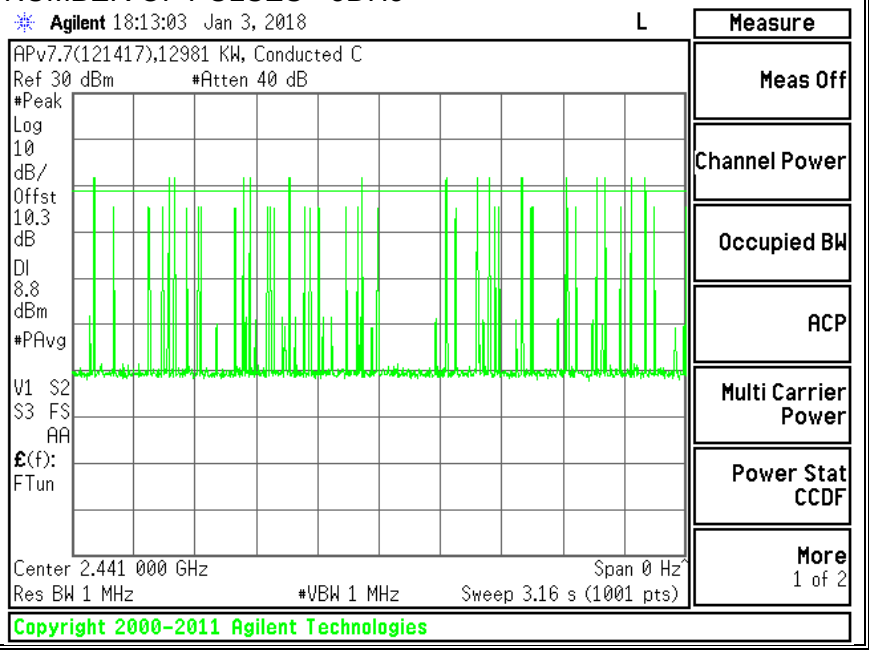
PULSE WIDTH - 3DH3



NUMBER OF PULSES - 3DH3



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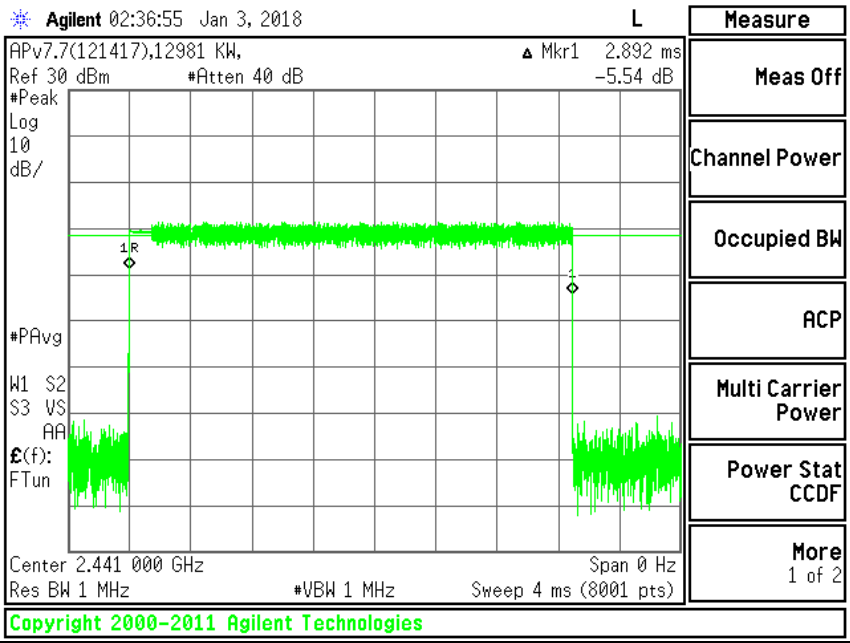
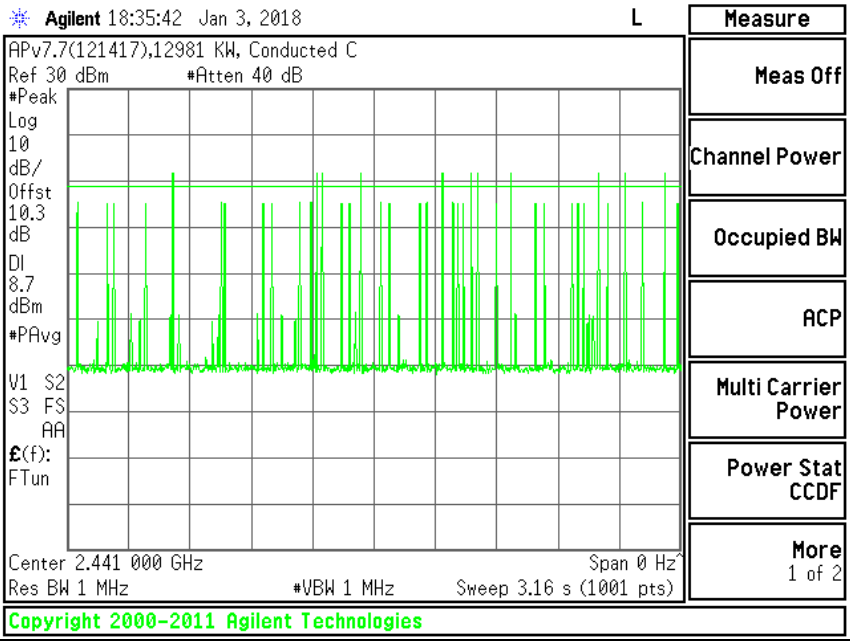
PULSE WIDTH - 3DH5



NUMBER OF PULSES - 3DH5



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8.4.5. OUTPUT POWER

LIMITS

NCC LP0002 3.10.1.2(1)(B)

Except (A), according to 3.10.1.6 (1) (A) (a), the maximum antenna gain is less than 6 dBi, the limit is 21 dBm (125mW).

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	12981	Date:	12/28/2017

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.62	21	-9.38
Middle	2441	11.85	21	-9.15
High	2480	11.04	21	-9.96

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8.4.6. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	12981	Date:	12/28/2017

The cable assembly insertion loss of 10.3 dB (including 10 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.82
Middle	2441	9.15
High	2480	8.64

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8.4.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

NCC LP0002 3.10.1.5(1)

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

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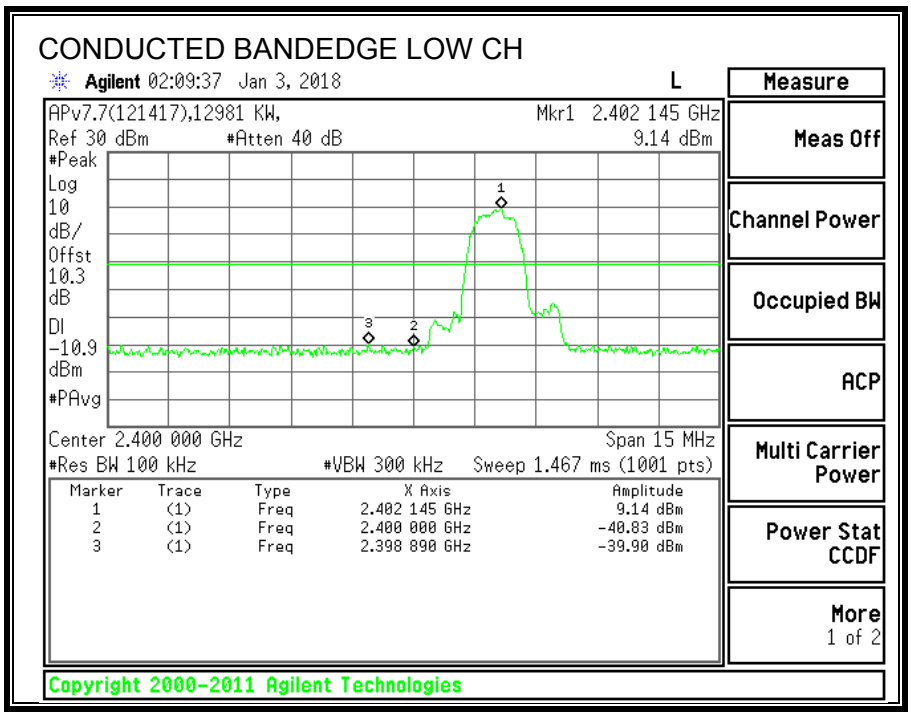
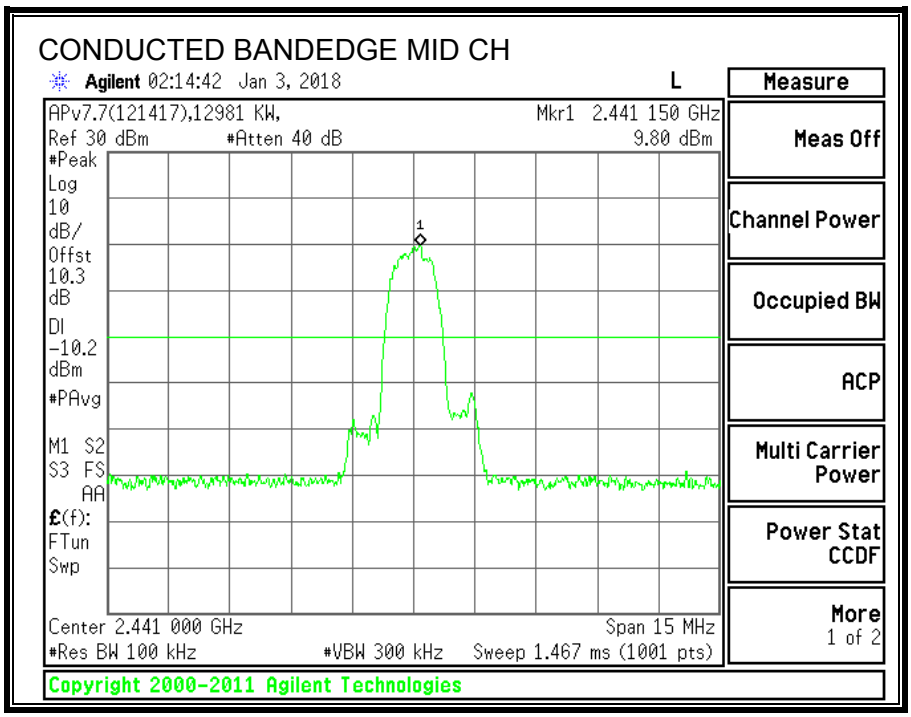
CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS





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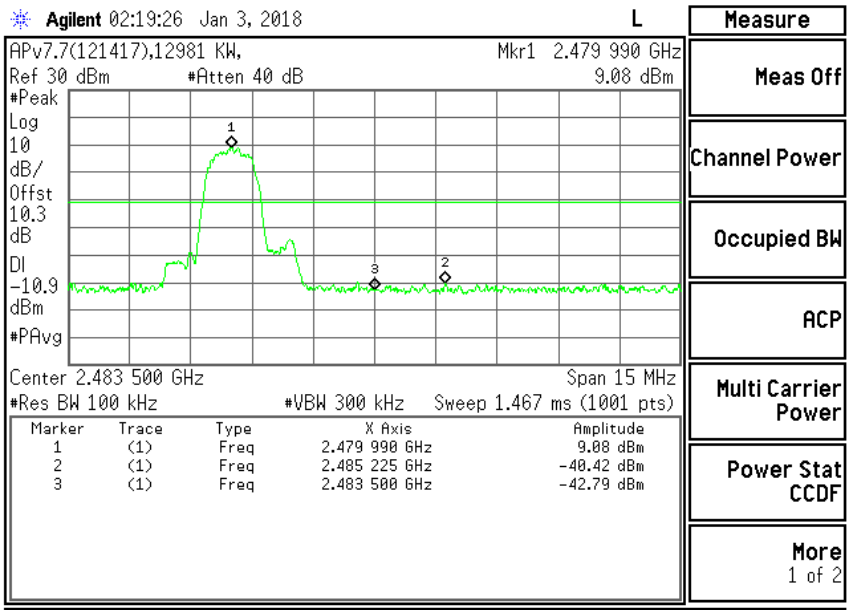
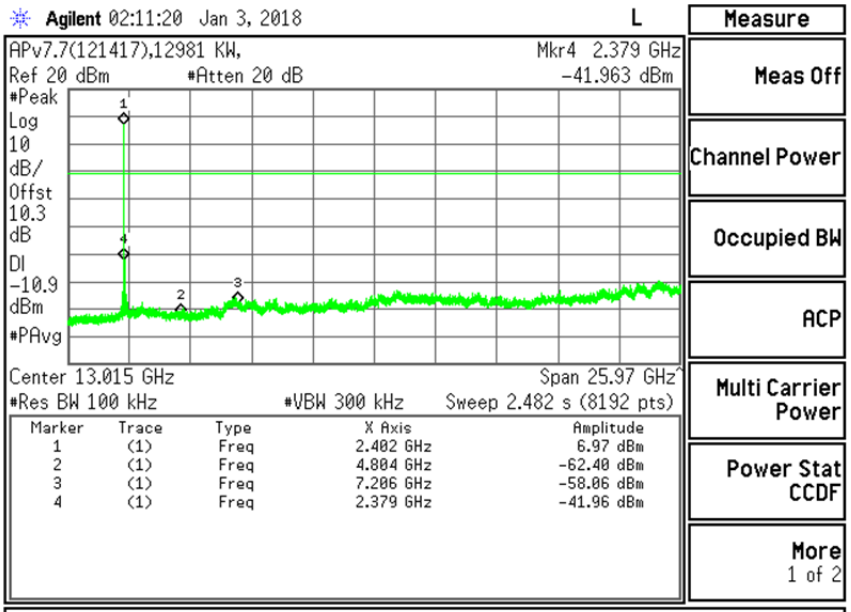
CONDUCTED BANDEDGE HIGH CH



CONDUCTED SPURIOUS EMISSIONS LOW CH



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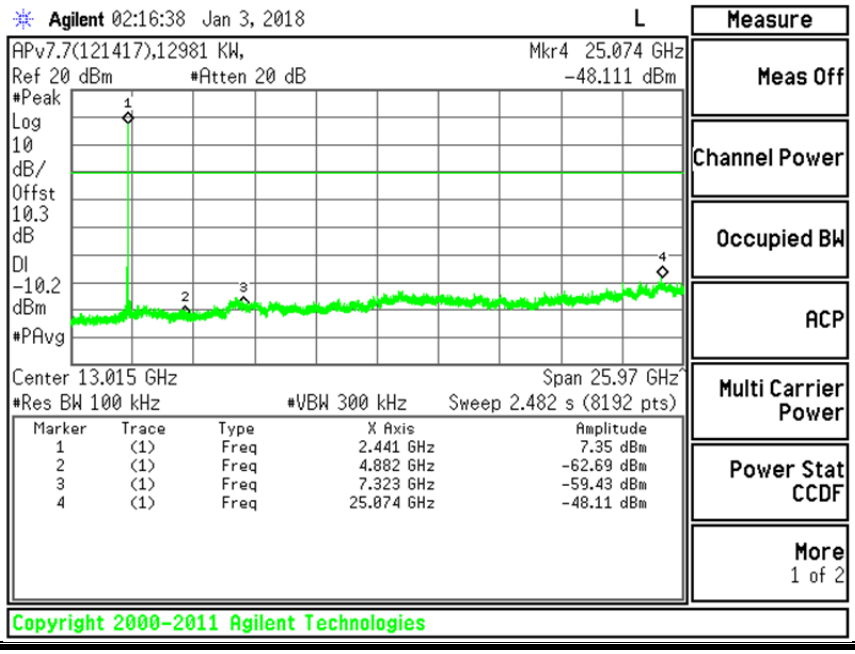
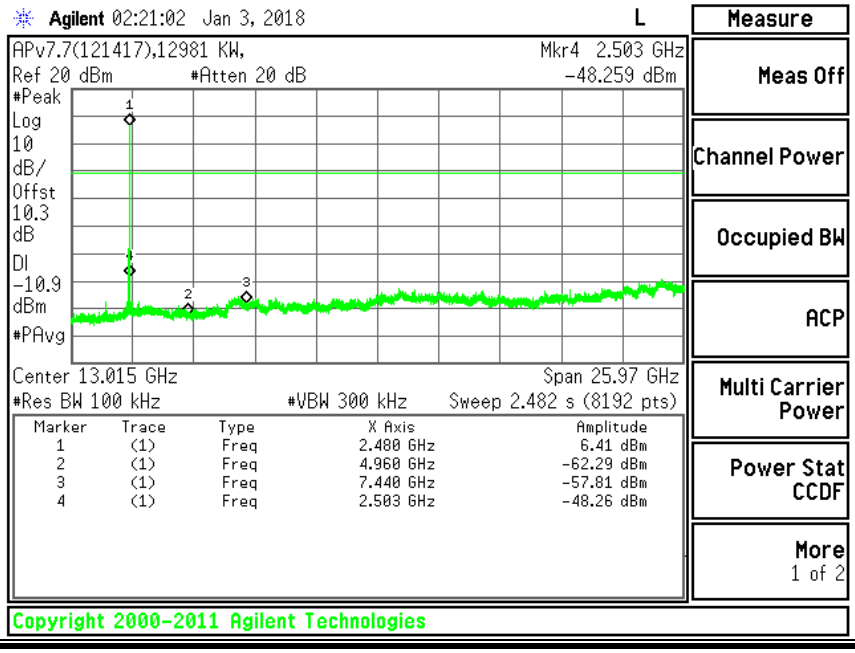
CONDUCTED SPURIOUS EMISSIONS MID CH



CONDUCTED SPURIOUS EMISSIONS HIGH CH



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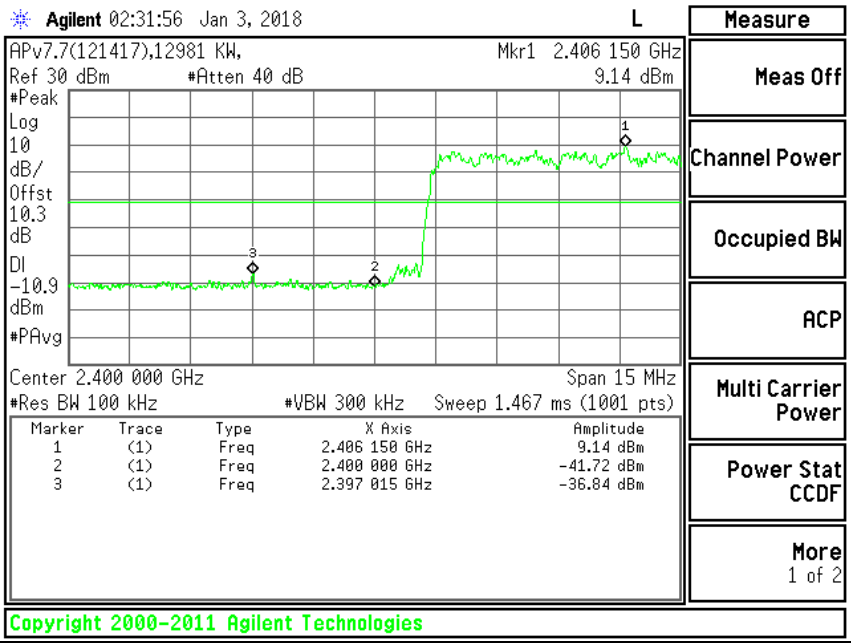
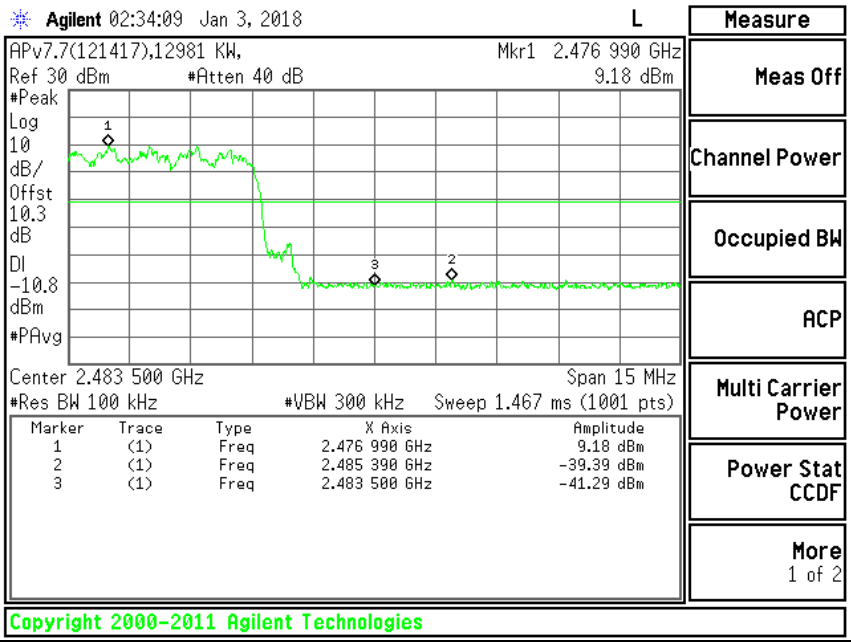
LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



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9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

NCC LP0002 §2.7 and §2.8

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 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 pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final scans 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.

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak→ this is a note from Radiated automation software. When the frequency is below 1G, software is using RB=100kHz; when the frequency is above 1G, software is using RB=1MHz.

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.

RESULTS

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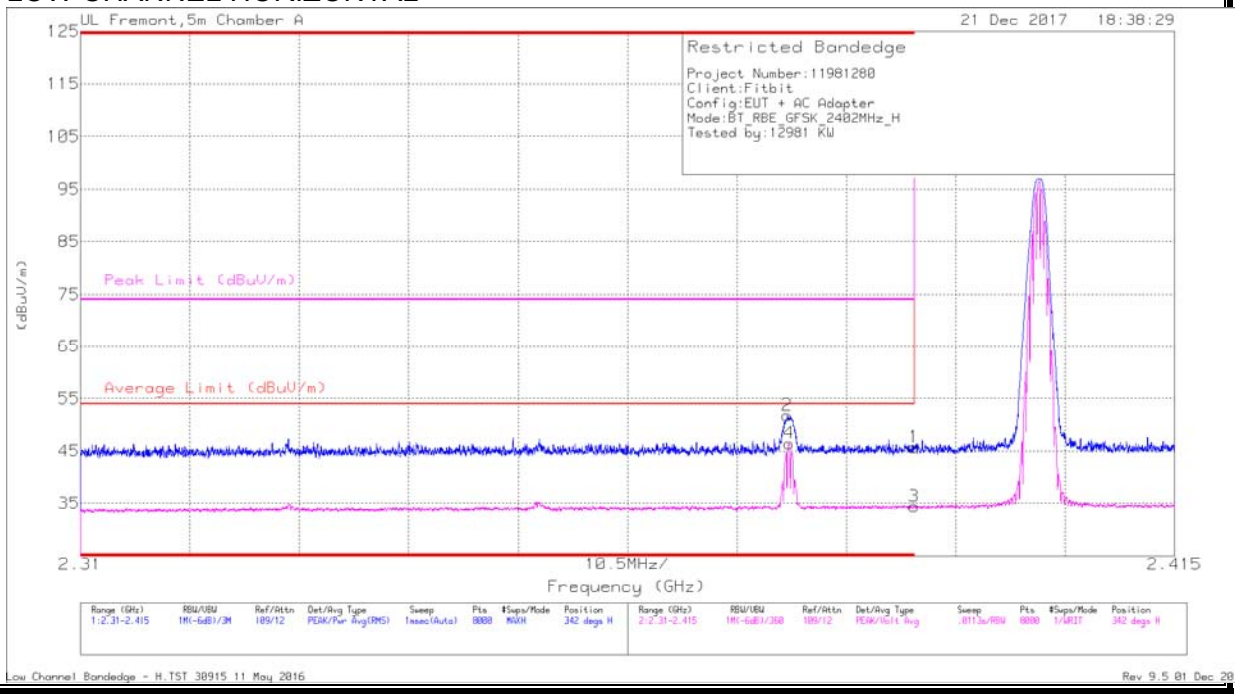
9.2. TRANSMITTER ABOVE 1GHZ

9.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/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	* 2.39	37.21	Pk	31.8	-23.3	45.71	-	-	74	-28.29	342	163	H
2	* 2.378	43.47	Pk	31.7	-23.4	51.77	-	-	74	-22.23	342	163	H
3	* 2.39	25.92	VA1T	31.8	-23.3	34.42	54	-19.58	-	-	342	163	H
4	* 2.378	38.11	VA1T	31.7	-23.4	46.41	54	-7.59	-	-	342	163	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

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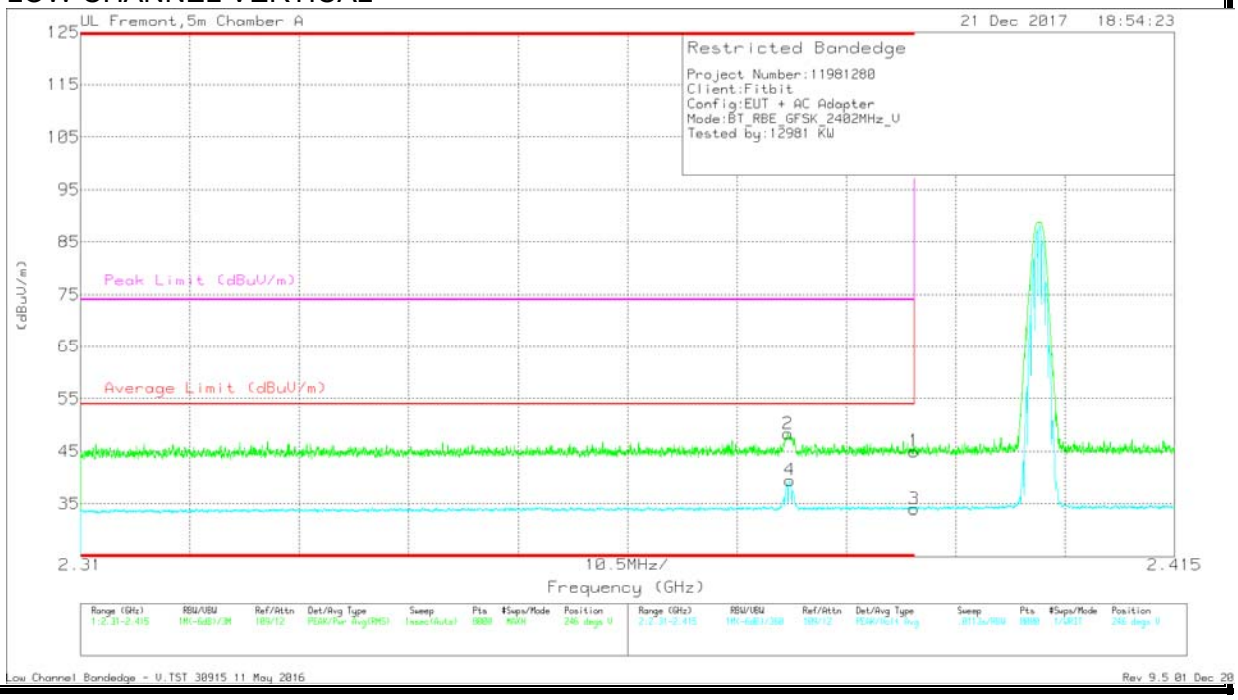
LOW CHANNEL VERTICAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/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	* 2.378	40.01	Pk	31.7	-23.4	48.31	-	-	74	-25.69	246	166	V
4	* 2.378	31.14	VA1T	31.7	-23.4	39.44	54	-14.56	-	-	246	166	V
1	* 2.39	36.51	Pk	31.8	-23.3	45.01	-	-	74	-28.99	246	166	V
3	* 2.39	25.49	VA1T	31.8	-23.3	33.99	54	-20.01	-	-	246	166	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

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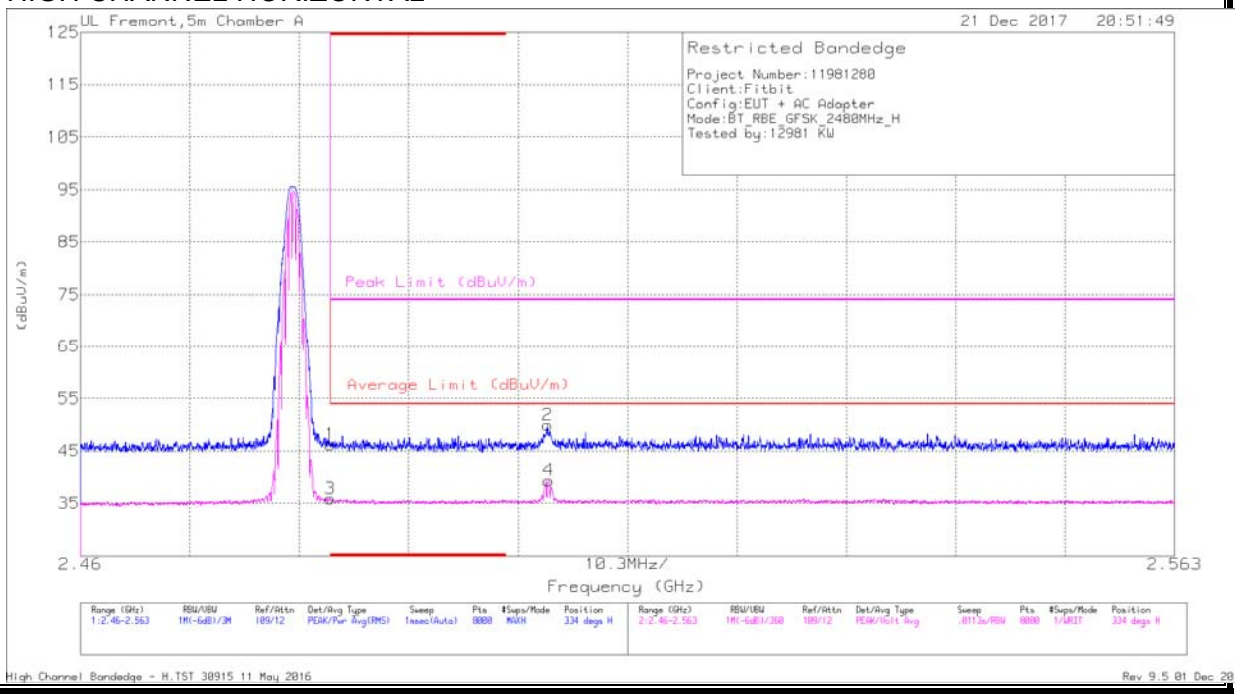
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/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	37.12	Pk	32.3	-23.2	46.22	-	-	74	-27.78	334	149	H
3	* 2.484	26.74	VA1T	32.3	-23.2	35.84	54	-18.16	-	-	334	149	H
2	2.504	40.76	Pk	32.4	-23.2	49.96	-	-	74	-24.04	334	149	H
4	2.504	30.18	VA1T	32.4	-23.2	39.38	54	-14.62	-	-	334	149	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

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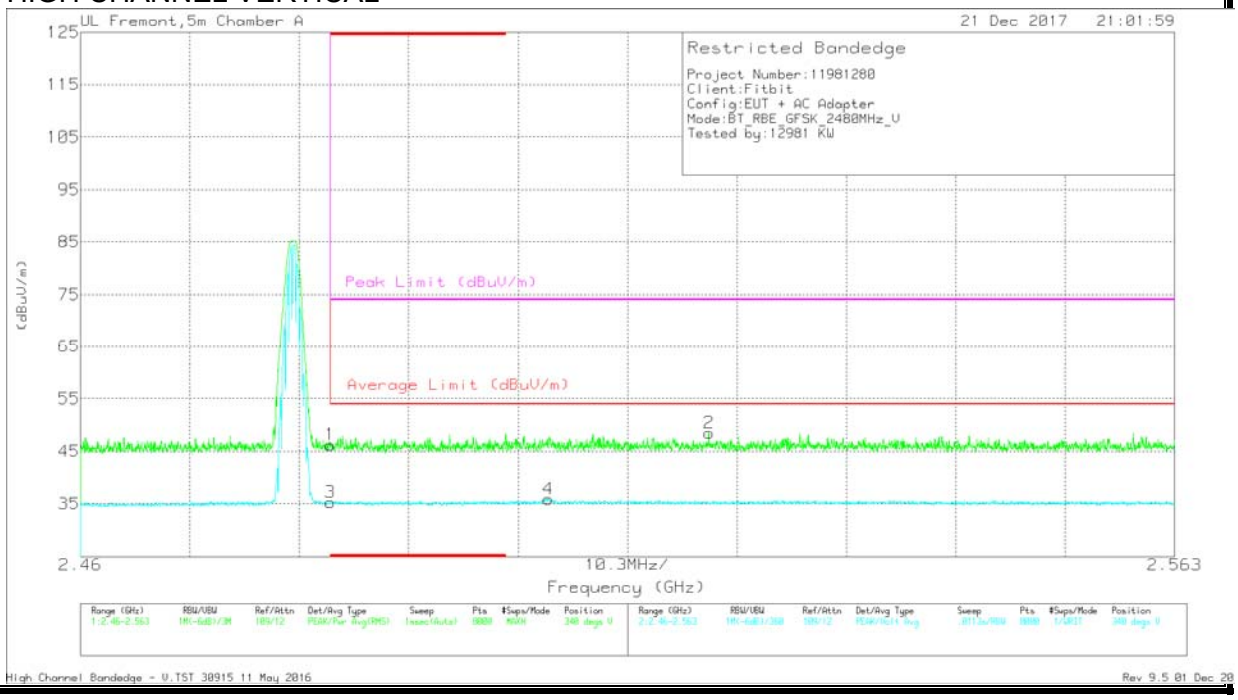
HIGH CHANNEL VERTICAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/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	37.06	Pk	32.3	-23.2	46.16	-	-	74	-27.84	340	167	V
3	* 2.484	26.22	VA1T	32.3	-23.2	35.32	54	-18.68	-	-	340	167	V
4	2.504	26.74	VA1T	32.4	-23.2	35.94	54	-18.06	-	-	340	167	V
2	2.519	39.25	Pk	32.4	-23.2	48.45	-	-	74	-25.55	340	167	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

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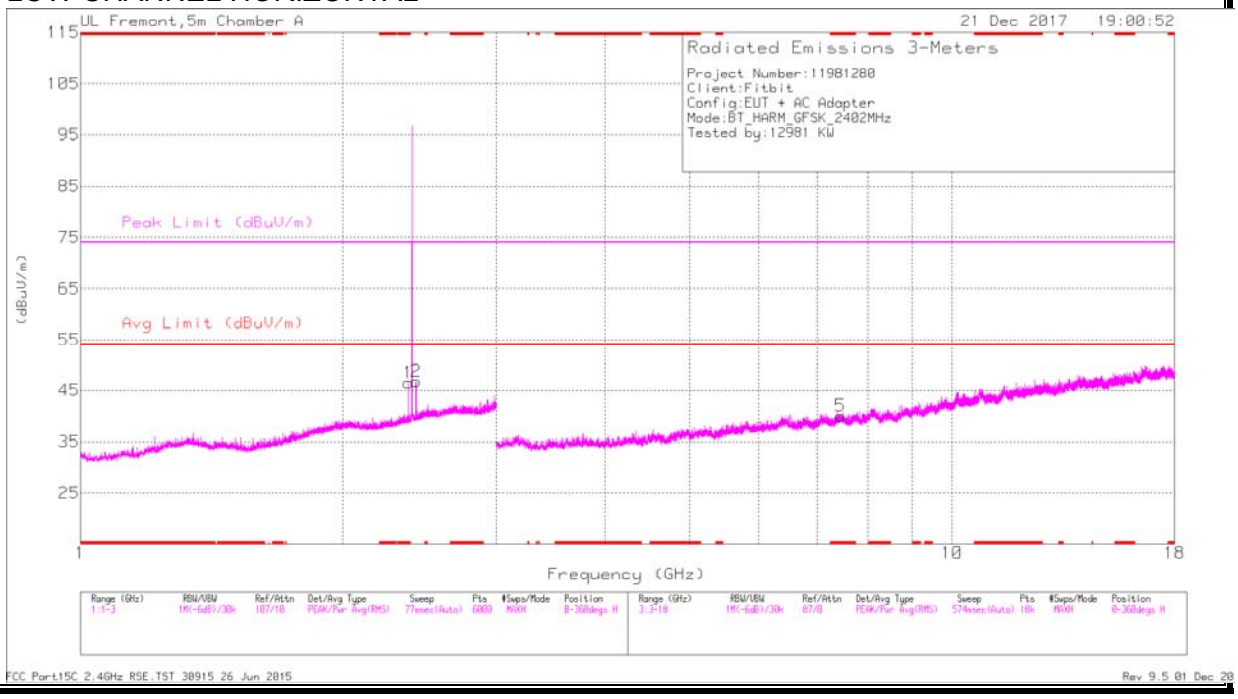
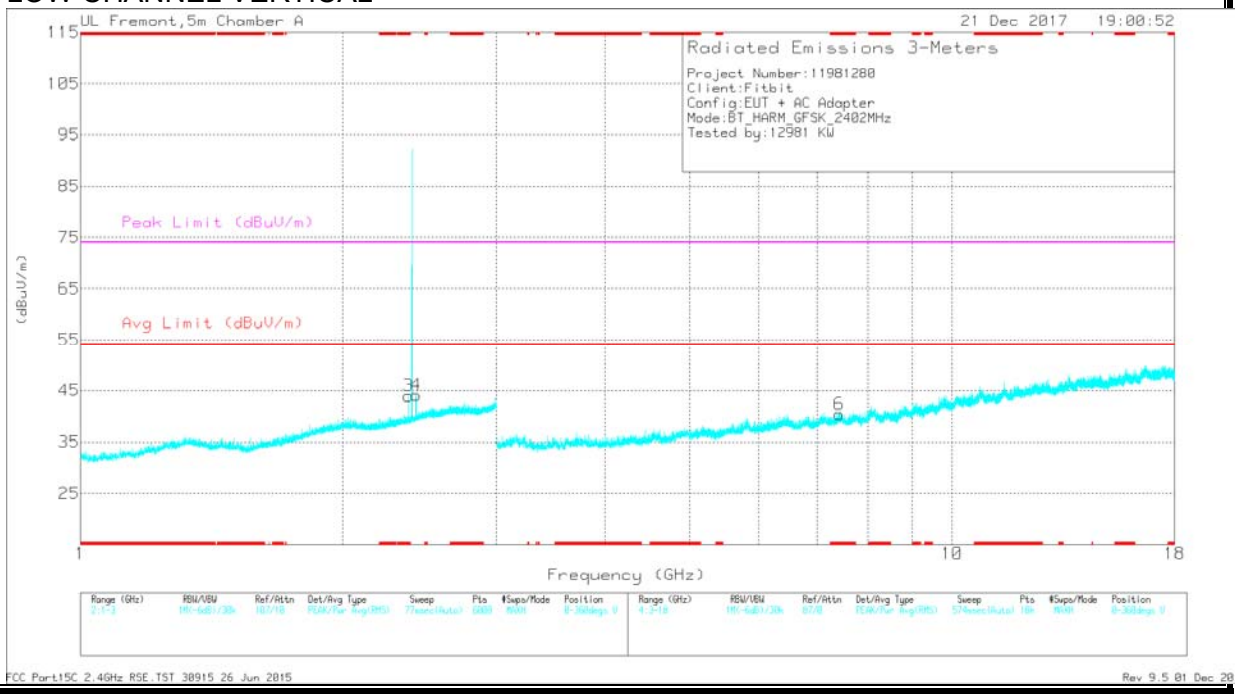
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



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Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.378	41.66	PKFH	31.7	-23.4	49.96	-	-	74	-24.04	344	162	H
* 2.378	37.69	VA1T	31.7	-23.4	45.99	54	-8.01	-	-	344	162	H
* 2.378	38.38	PKFH	31.7	-23.4	46.68	-	-	74	-27.32	329	102	V
* 2.378	32.74	VA1T	31.7	-23.4	41.04	54	-12.96	-	-	329	102	V
* 7.455	30.83	PKFH	35.6	-21.6	44.83	-	-	74	-29.17	293	150	H
* 7.453	20.05	VA1T	35.6	-21.6	34.05	54	-19.95	-	-	293	150	H
* 7.417	30.86	PKFH	35.6	-21.9	44.56	-	-	74	-29.44	270	119	V
* 7.418	20.18	VA1T	35.6	-21.9	33.88	54	-20.12	-	-	270	119	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

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

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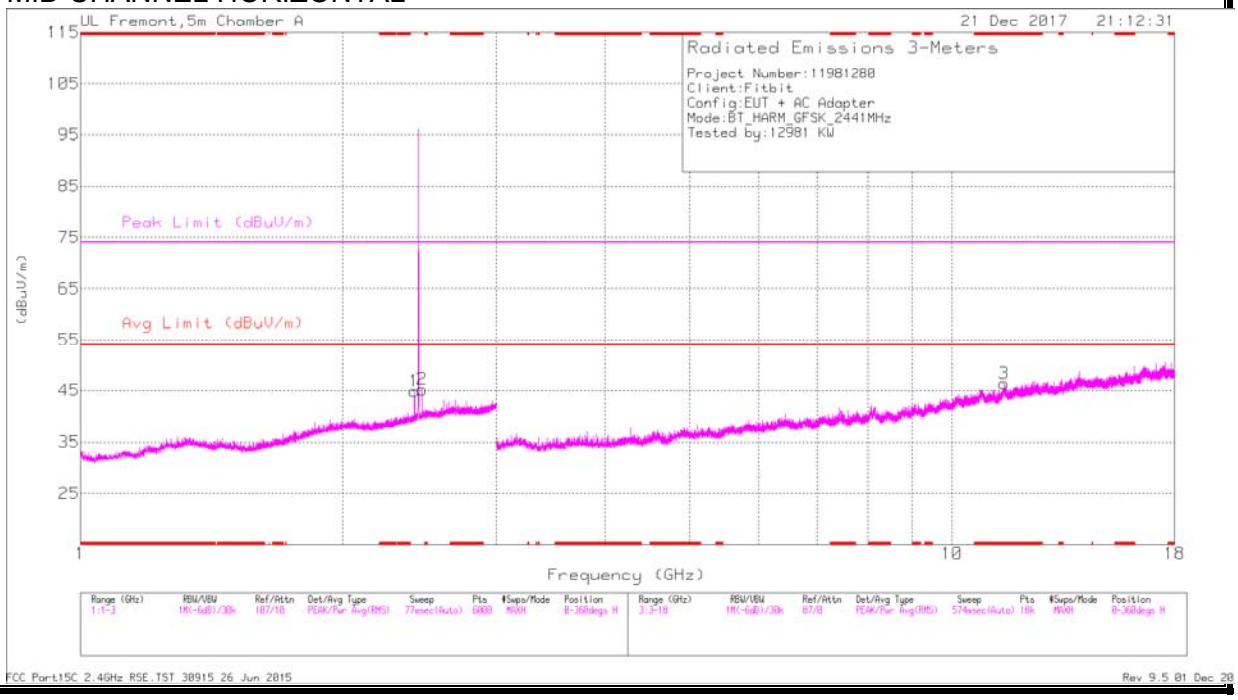
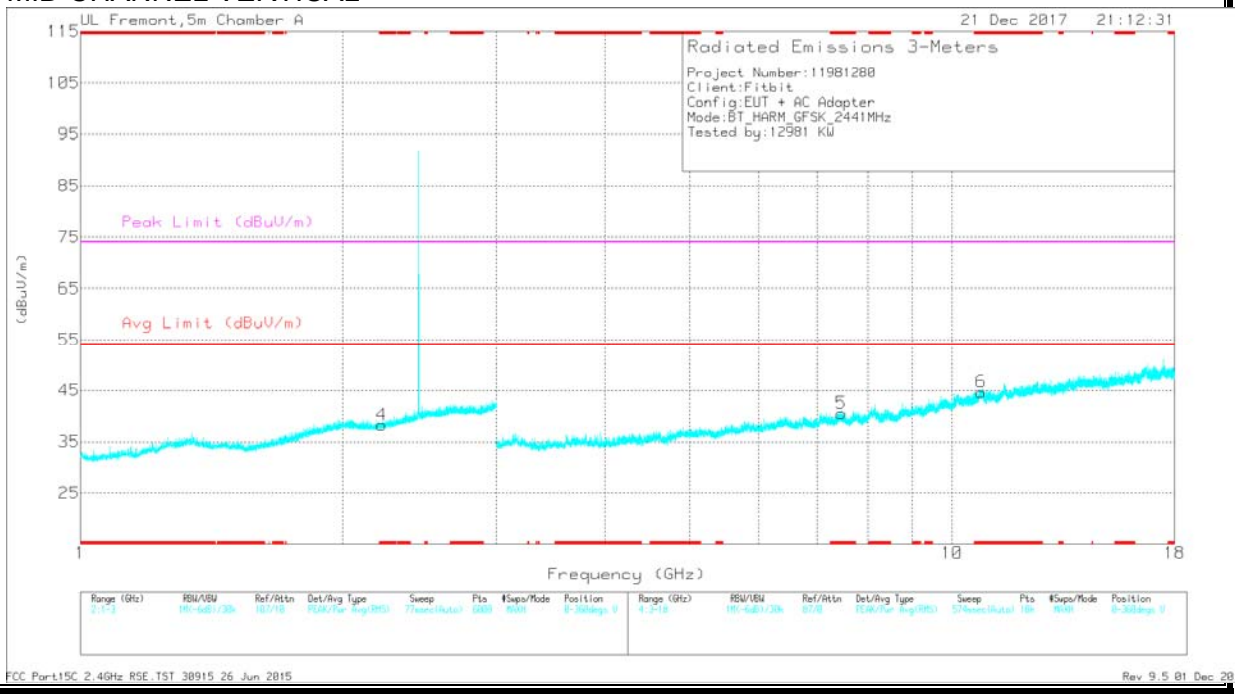
MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



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Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.215	34.95	PKFH	31.2	-23.6	42.55	-	-	74	-31.45	320	152	V
* 2.213	24.19	VA1T	31.2	-23.6	31.79	54	-22.21	-	-	320	152	V
* 11.47	30.17	PKFH	38.3	-18.1	50.37	-	-	74	-23.63	65	166	H
* 11.474	19.33	VA1T	38.3	-18	39.63	54	-14.37	-	-	65	166	H
* 7.46	31.32	PKFH	35.6	-21.6	45.32	-	-	74	-28.68	123	154	V
* 7.458	20.23	VA1T	35.6	-21.6	34.23	54	-19.77	-	-	123	154	V
* 10.801	30.51	PKFH	37.8	-18.7	49.61	-	-	74	-24.39	190	139	V
* 10.802	19.33	VA1T	37.8	-18.7	38.43	54	-15.57	-	-	190	139	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

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

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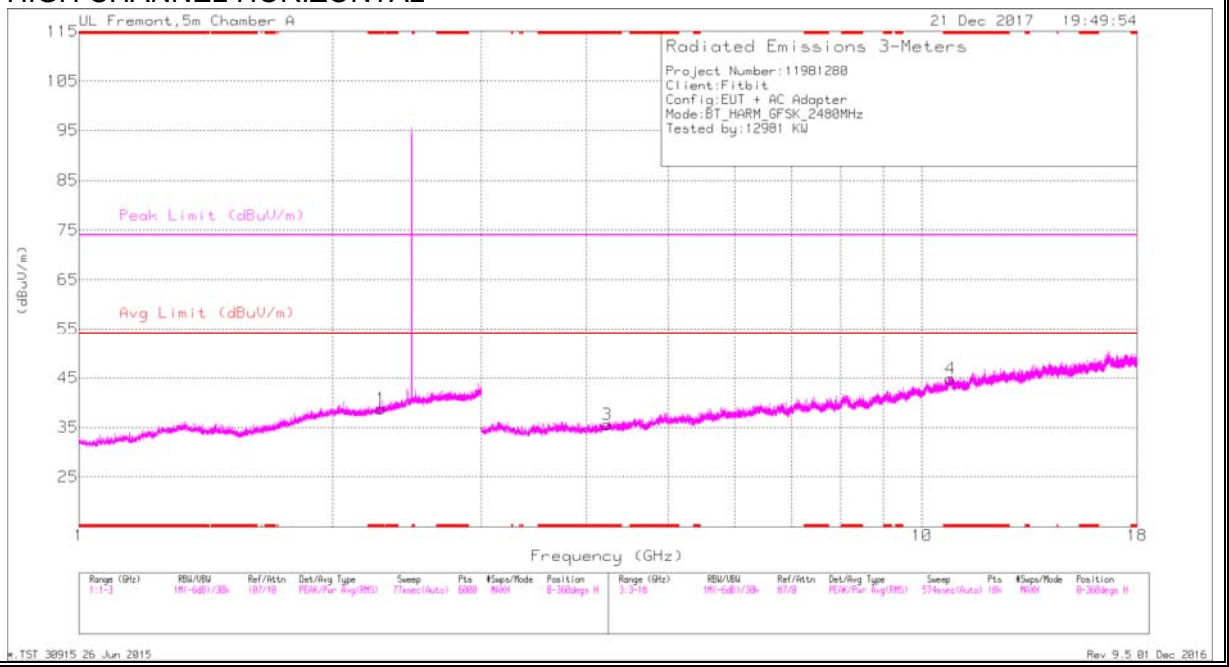
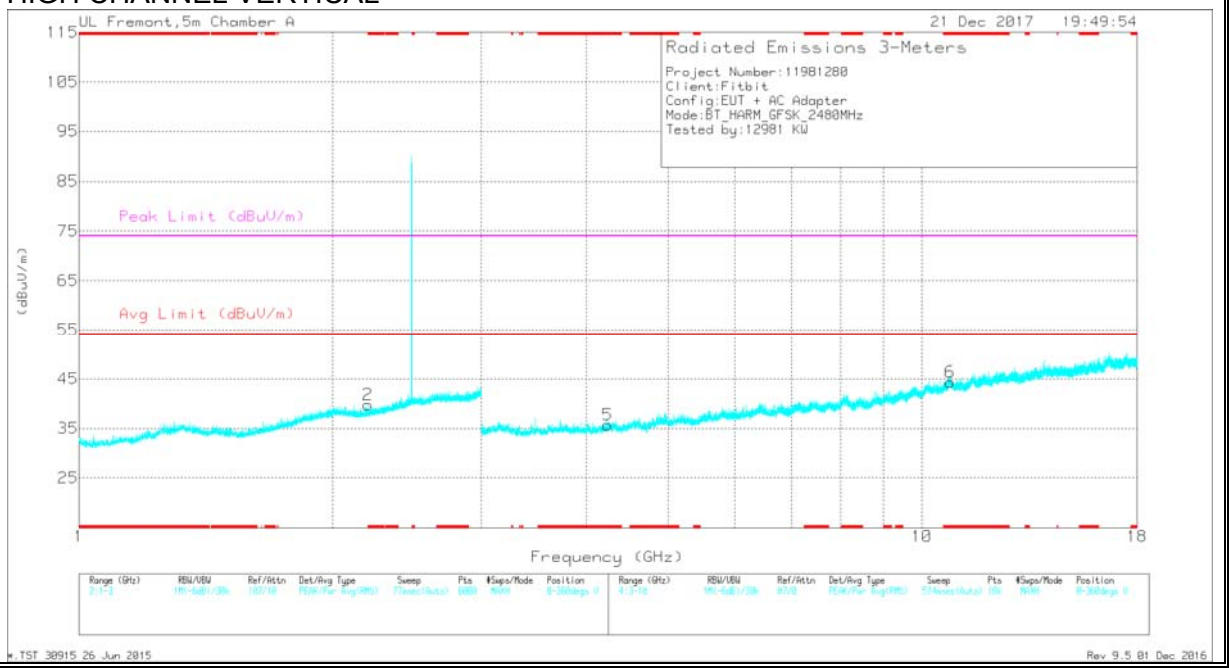
HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



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Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.282	35.39	PKFH	31.5	-23.5	43.39	-	-	74	-30.61	190	171	H
* 2.285	24.2	VA1T	31.5	-23.5	32.2	54	-21.8	-	-	190	171	H
* 2.208	36.64	PKFH	31.2	-23.6	44.24	-	-	74	-29.76	110	183	V
* 2.294	24.44	VA1T	31.5	-23.5	32.44	54	-21.56	-	-	110	183	V
* 4.233	35.13	PKFH	33.4	-27.2	41.33	-	-	74	-32.67	321	201	H
* 4.233	23.88	VA1T	33.4	-27.3	29.98	54	-24.02	-	-	321	201	H
* 10.814	29.84	PKFH	37.8	-18.5	49.14	-	-	74	-24.86	258	192	H
* 10.814	19.28	VA1T	37.8	-18.5	38.58	54	-15.42	-	-	258	192	H
* 4.239	34.69	PKFH	33.5	-27.3	40.89	-	-	74	-33.11	65	153	V
* 4.241	24.14	VA1T	33.5	-27.4	30.24	54	-23.76	-	-	65	153	V
* 10.796	31.15	PKFH	37.8	-18.7	50.25	-	-	74	-23.75	79	141	V
* 10.798	19.3	VA1T	37.8	-18.7	38.4	54	-15.6	-	-	79	141	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

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

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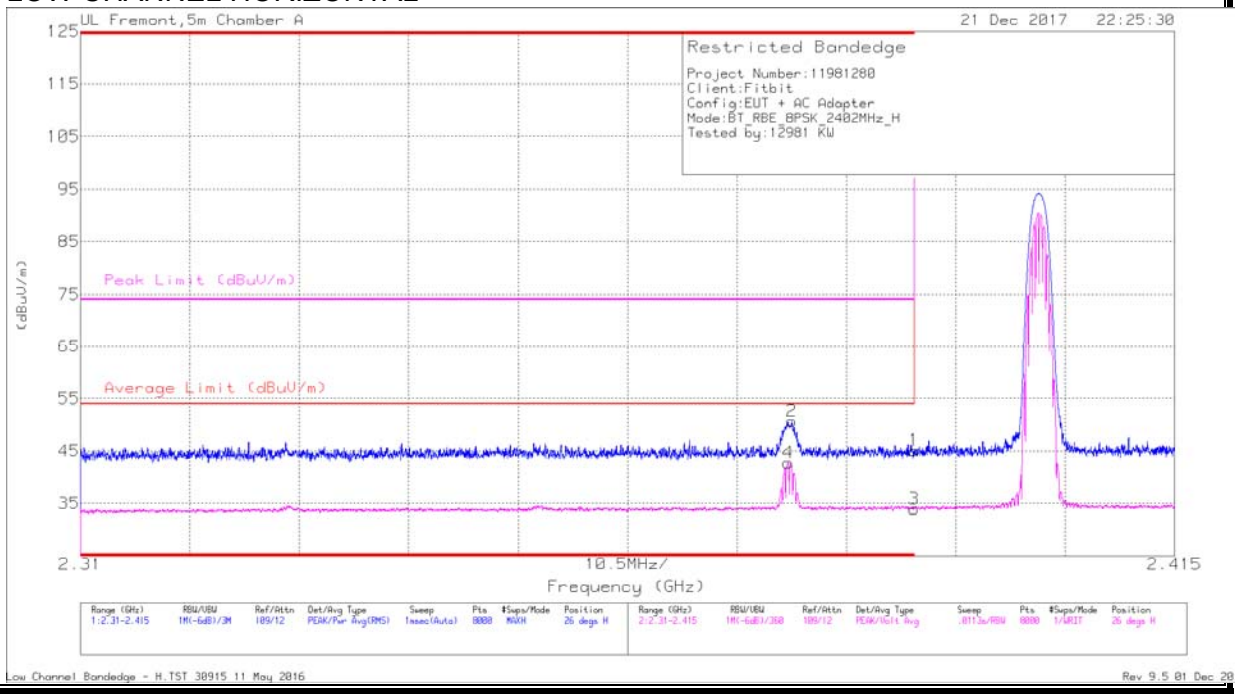
9.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/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	* 2.39	36.62	Pk	31.8	-23.3	45.12	-	-	74	-28.88	26	158	H
2	* 2.378	42.39	Pk	31.7	-23.4	50.69	-	-	74	-23.31	26	158	H
3	* 2.39	25.44	VA1T	31.8	-23.3	33.94	54	-20.06	-	-	26	158	H
4	* 2.378	34.46	VA1T	31.7	-23.4	42.76	54	-11.24	-	-	26	158	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

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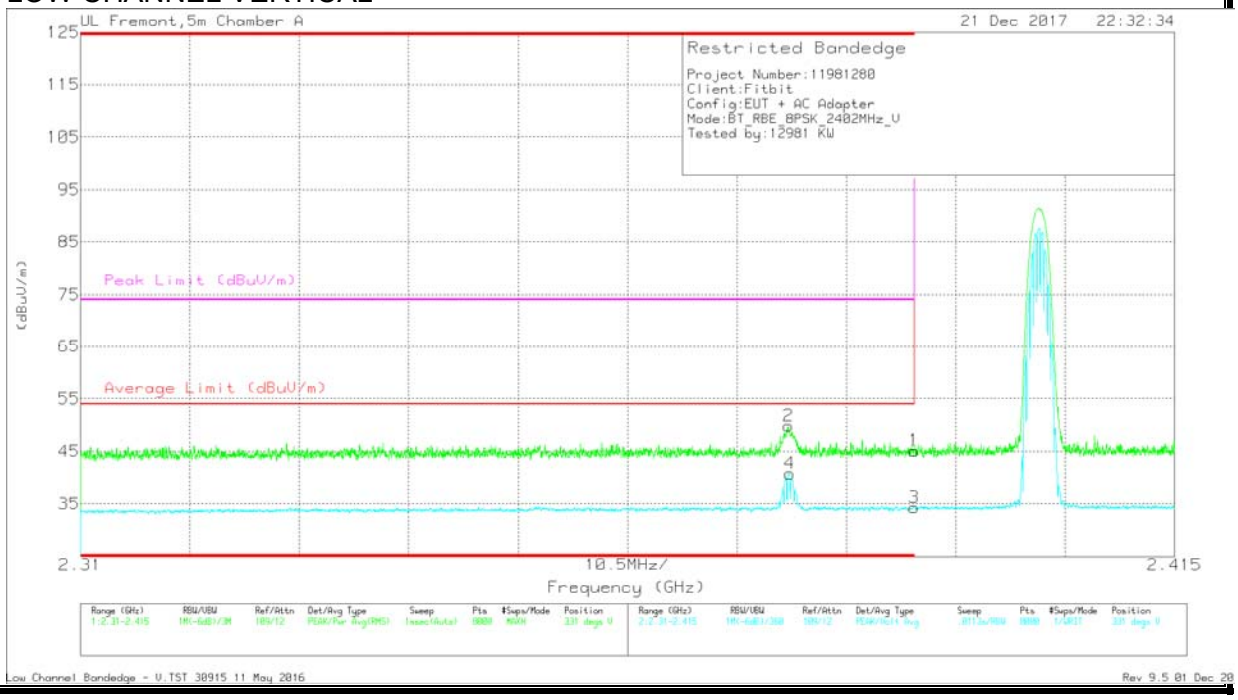
LOW CHANNEL VERTICAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/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	* 2.378	41.52	Pk	31.7	-23.4	49.82	-	-	74	-24.18	331	141	V
4	* 2.378	32.45	VA1T	31.7	-23.4	40.75	54	-13.25	-	-	331	140	V
1	* 2.39	36.57	Pk	31.8	-23.3	45.07	-	-	74	-28.93	331	141	V
3	* 2.39	25.8	VA1T	31.8	-23.3	34.3	54	-19.7	-	-	331	140	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

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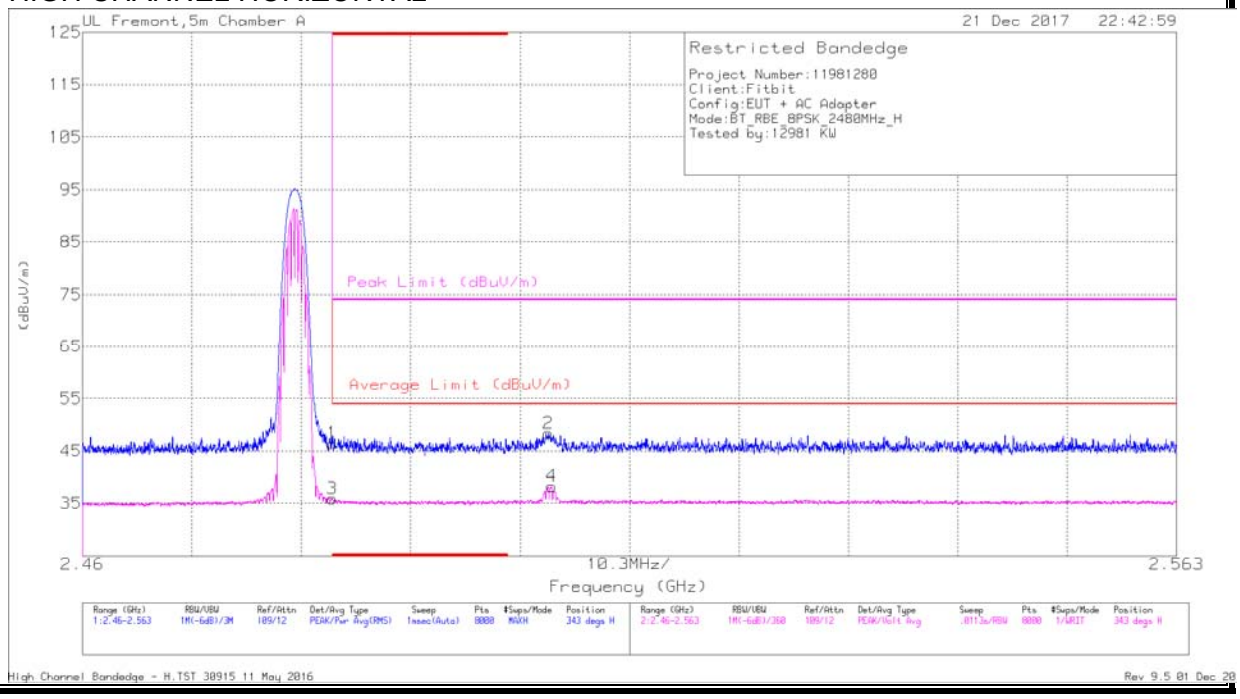
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/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	37.34	Pk	32.3	-23.2	46.44	-	-	74	-27.56	343	237	H
3	* 2.484	26.79	VA1T	32.3	-23.2	35.89	54	-18.11	-	-	343	237	H
2	2.504	39.1	Pk	32.4	-23.2	48.3	-	-	74	-25.7	343	237	H
4	2.504	29.05	VA1T	32.4	-23.2	38.25	54	-15.75	-	-	343	237	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

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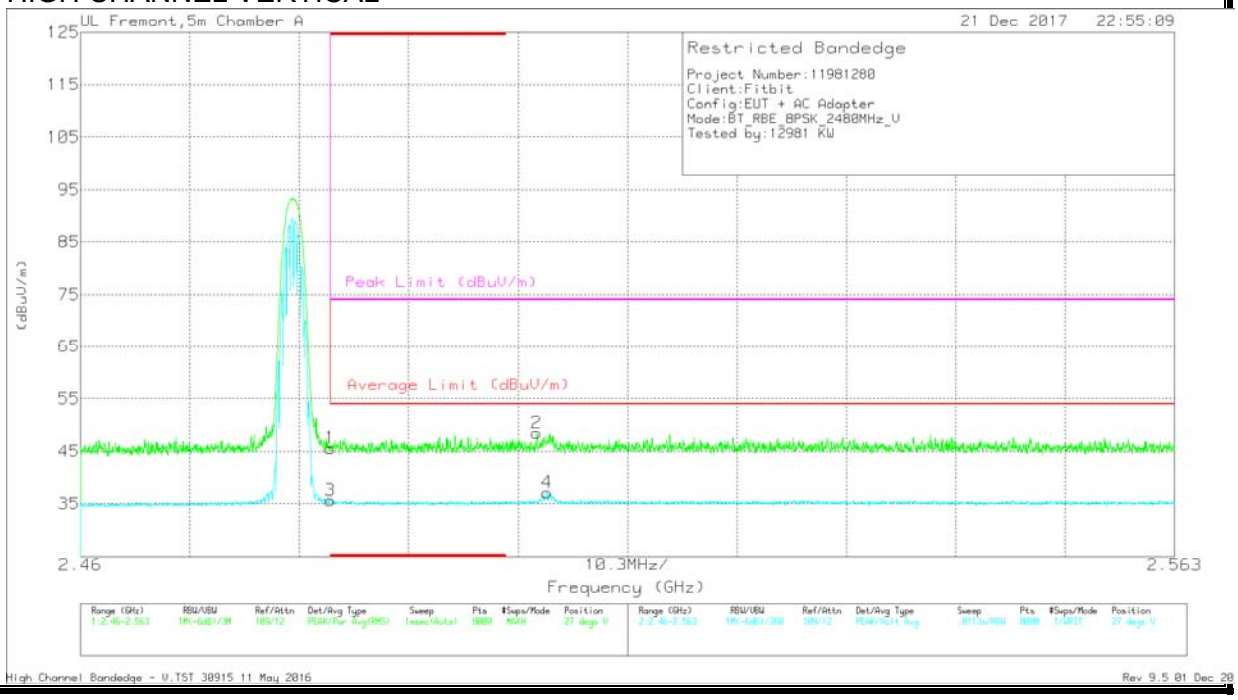
HIGH CHANNEL VERTICAL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/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	36.45	Pk	32.3	-23.2	45.55	-	-	74	-28.45	27	139	V
3	* 2.484	26.49	VA1T	32.3	-23.2	35.59	54	-18.41	-	-	27	139	V
2	2.503	39.18	Pk	32.4	-23.2	48.38	-	-	74	-25.62	27	139	V
4	2.504	27.88	VA1T	32.4	-23.2	37.08	54	-16.92	-	-	27	139	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

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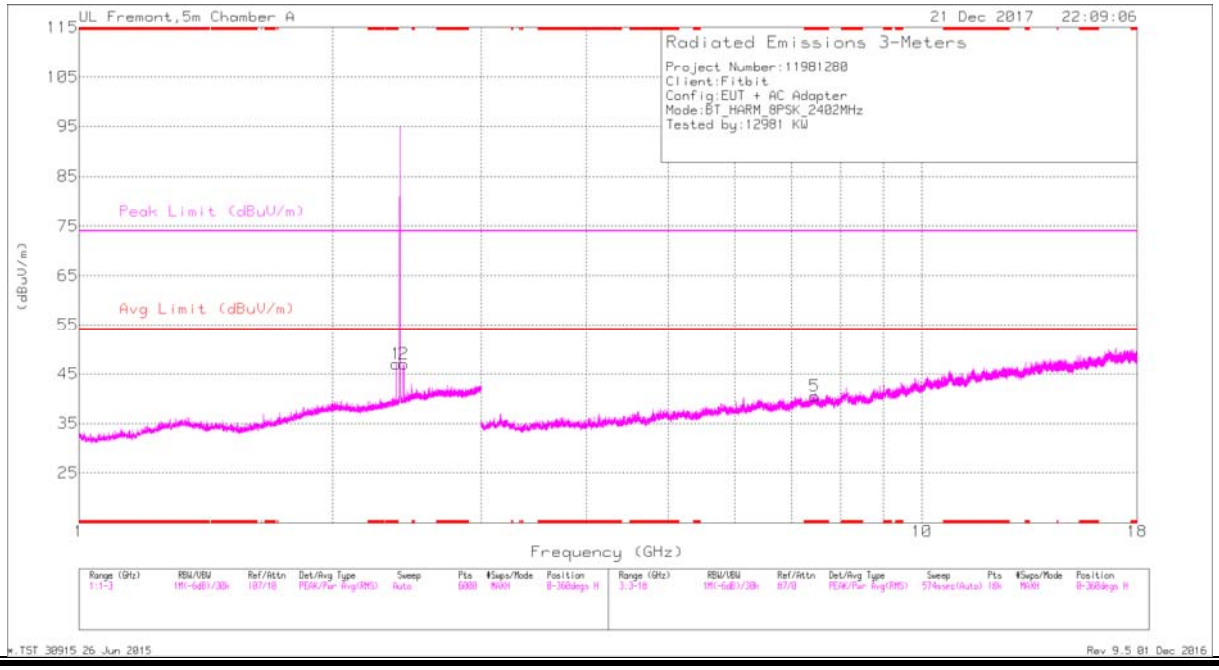
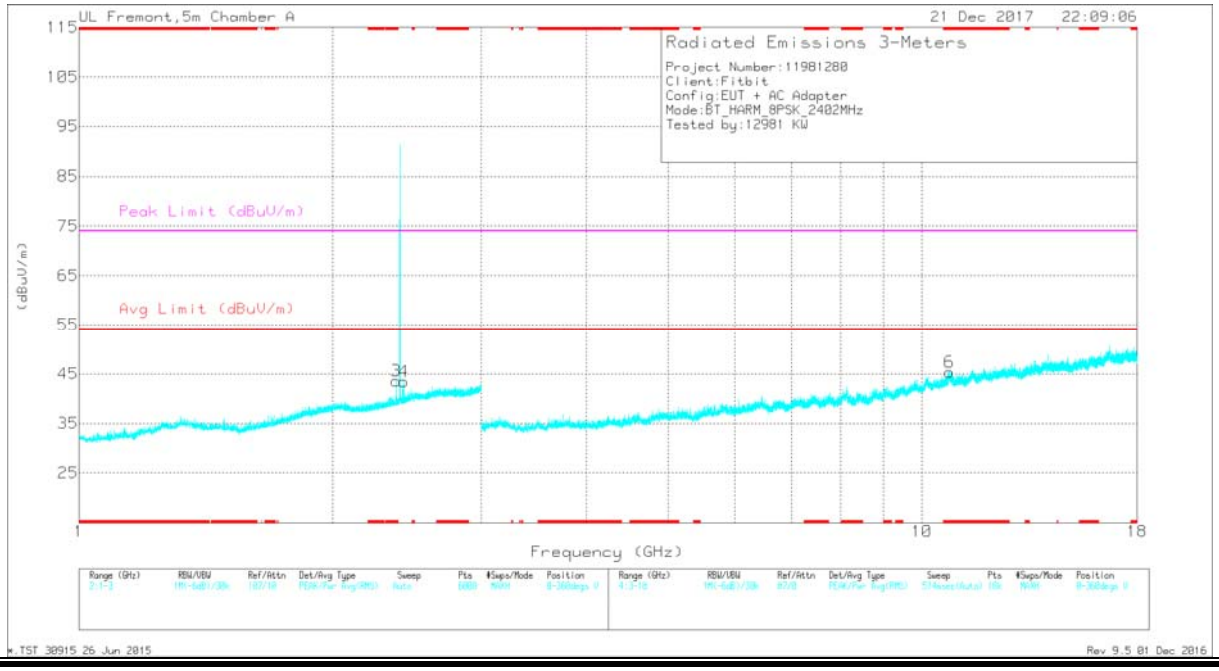
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



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Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.378	41.17	PKFH	31.7	-23.4	49.47	-	-	74	-24.53	112	121	H
* 2.378	34.52	VA1T	31.7	-23.4	42.82	54	-11.18	-	-	112	121	H
* 2.378	37.23	PKFH	31.7	-23.4	45.53	-	-	74	-28.47	92	156	V
* 2.378	28.98	VA1T	31.7	-23.4	37.28	54	-16.72	-	-	92	156	V
* 7.468	32.05	PKFH	35.7	-21.7	46.05	-	-	74	-27.95	250	215	H
* 7.468	20.02	VA1T	35.7	-21.7	34.02	54	-19.98	-	-	250	215	H
* 10.774	30.58	PKFH	37.8	-18.3	50.08	-	-	74	-23.92	152	256	V
* 10.775	19.35	VA1T	37.8	-18.2	38.95	54	-15.05	-	-	152	256	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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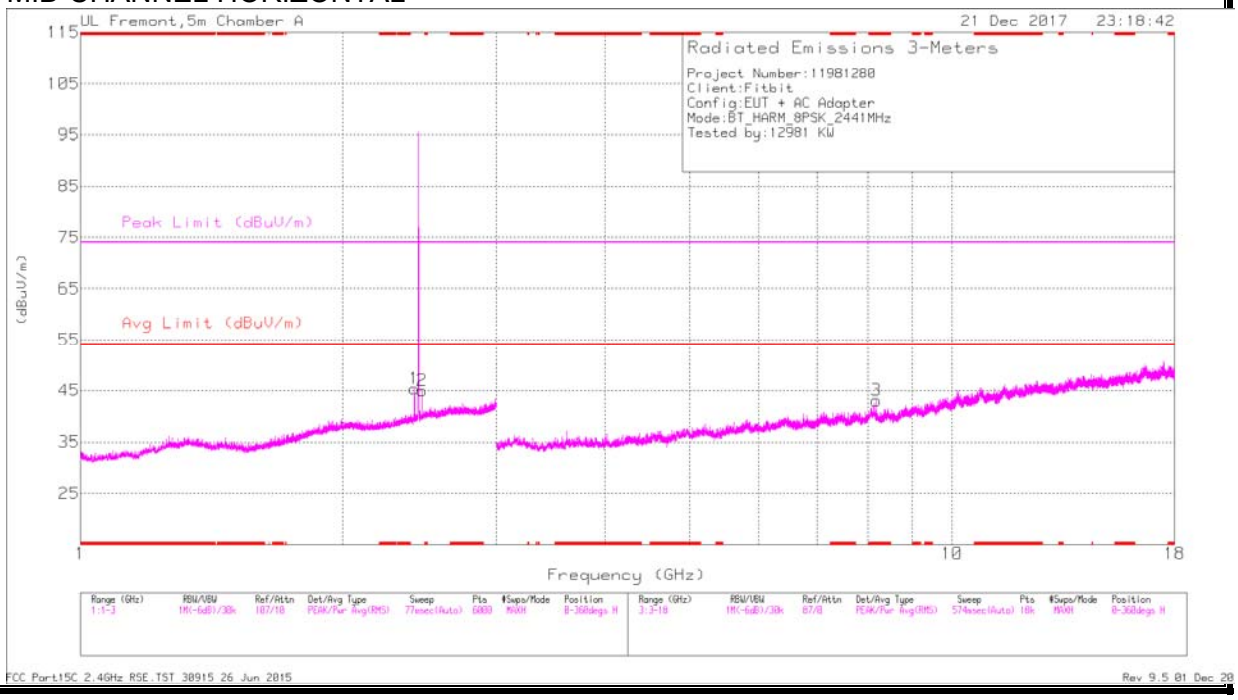
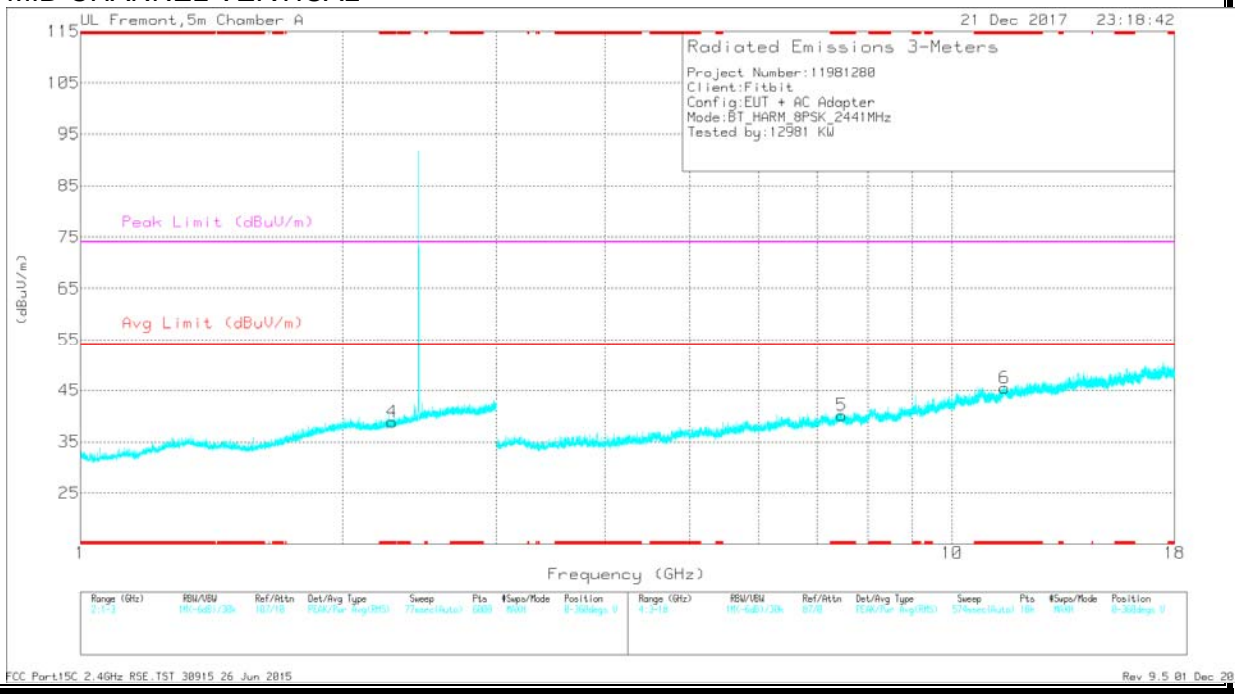
MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



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Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.279	36.91	PKFH	31.5	-23.5	44.91	-	-	74	-29.09	119	132	V
* 2.276	24.41	VA1T	31.5	-23.5	32.41	54	-21.59	-	-	119	132	V
* 8.19	31.05	PKFH	35.8	-21.9	44.95	-	-	74	-29.05	310	148	H
* 8.191	20.45	VA1T	35.8	-21.9	34.35	54	-19.65	-	-	310	148	H
* 7.476	31.54	PKFH	35.7	-21.8	45.44	-	-	74	-28.56	18	139	V
* 7.476	20.24	VA1T	35.7	-21.8	34.14	54	-19.86	-	-	18	139	V
* 11.488	30.7	PKFH	38.3	-18.1	50.9	-	-	74	-23.1	231	189	V
* 11.49	19.44	VA1T	38.3	-18.2	39.54	54	-14.46	-	-	231	189	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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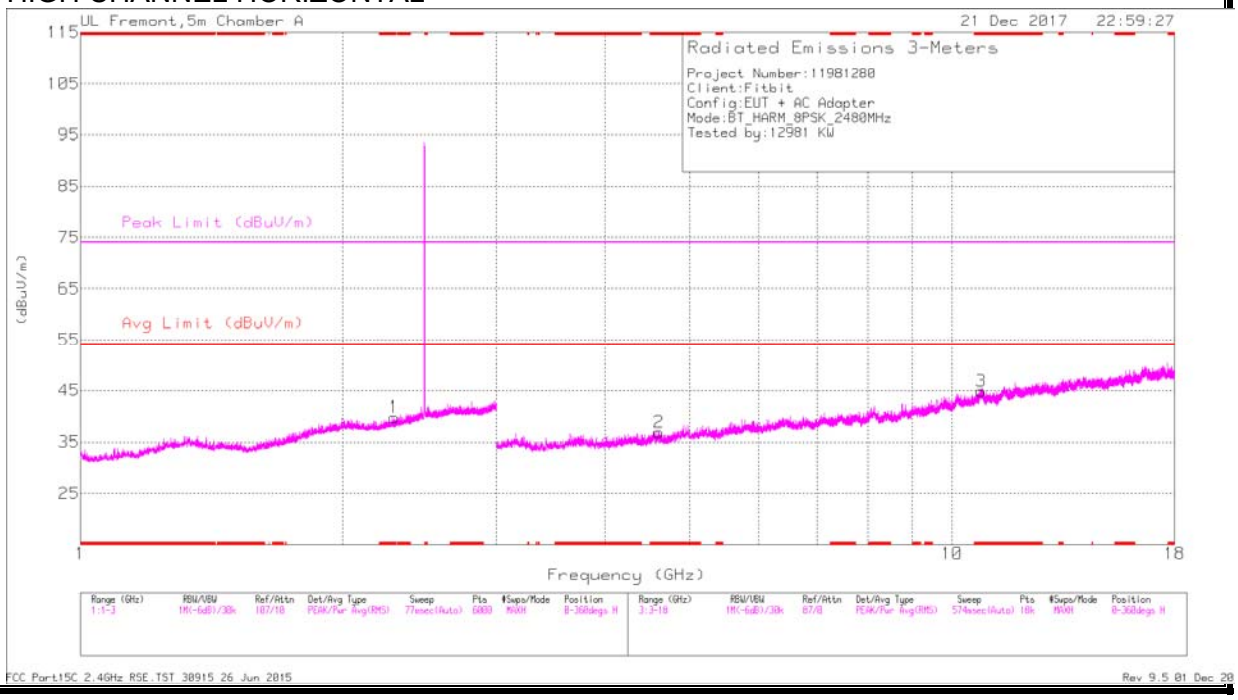
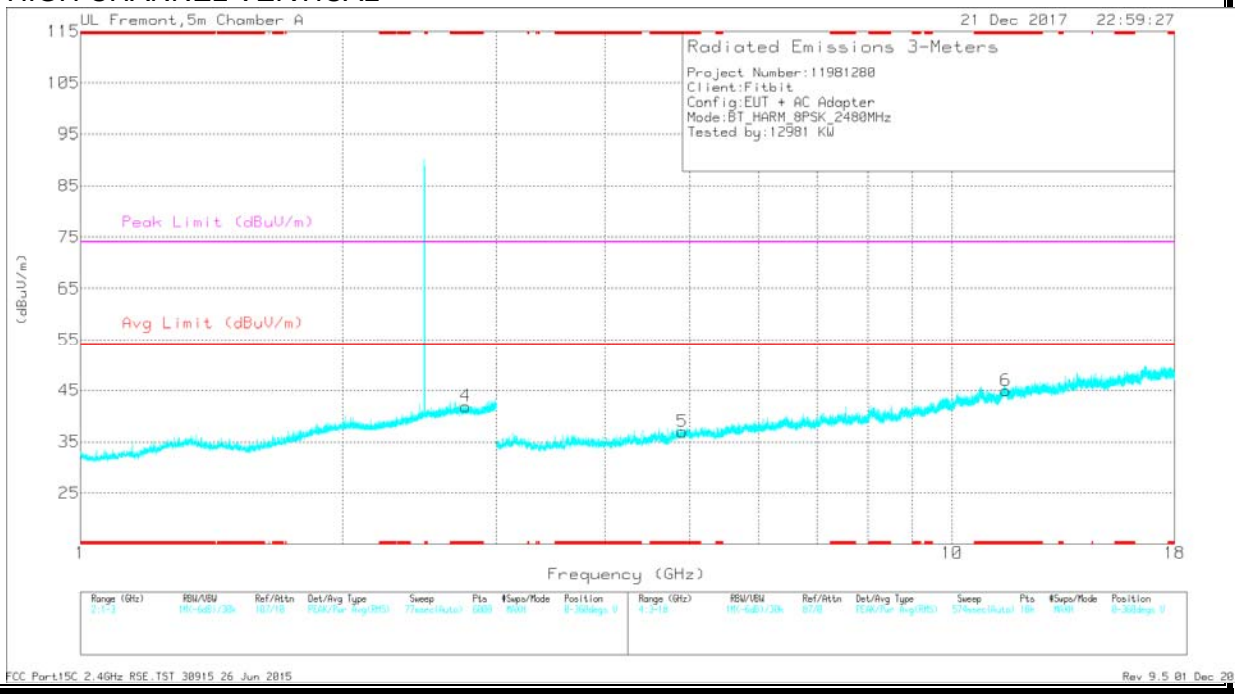
HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



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Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.29	35.84	PKFH	31.5	-23.5	43.84	-	-	74	-30.16	95	160	H
* 2.289	23.95	VA1T	31.5	-23.5	31.95	54	-22.05	-	-	95	160	H
* 2.767	37.59	PKFH	32.3	-22.4	47.49	-	-	74	-26.51	231	129	V
* 2.769	24.48	VA1T	32.3	-22.4	34.38	54	-19.62	-	-	231	129	V
* 4.615	34.63	PKFH	34.1	-27.3	41.43	-	-	74	-32.57	305	205	H
* 4.614	23.82	VA1T	34.1	-27.3	30.62	54	-23.38	-	-	305	205	H
* 10.799	30.88	PKFH	37.8	-18.7	49.98	-	-	74	-24.02	70	139	H
* 10.797	19.26	VA1T	37.8	-18.7	38.36	54	-15.64	-	-	70	139	H
* 4.91	33.54	PKFH	34.1	-26.4	41.24	-	-	74	-32.76	82	181	V
* 4.908	22.82	VA1T	34.1	-26.4	30.52	54	-23.48	-	-	82	181	V
* 11.53	30.55	PKFH	38.4	-18.8	50.15	-	-	74	-23.85	132	208	V
* 11.53	19.27	VA1T	38.4	-18.8	38.87	54	-15.13	-	-	132	208	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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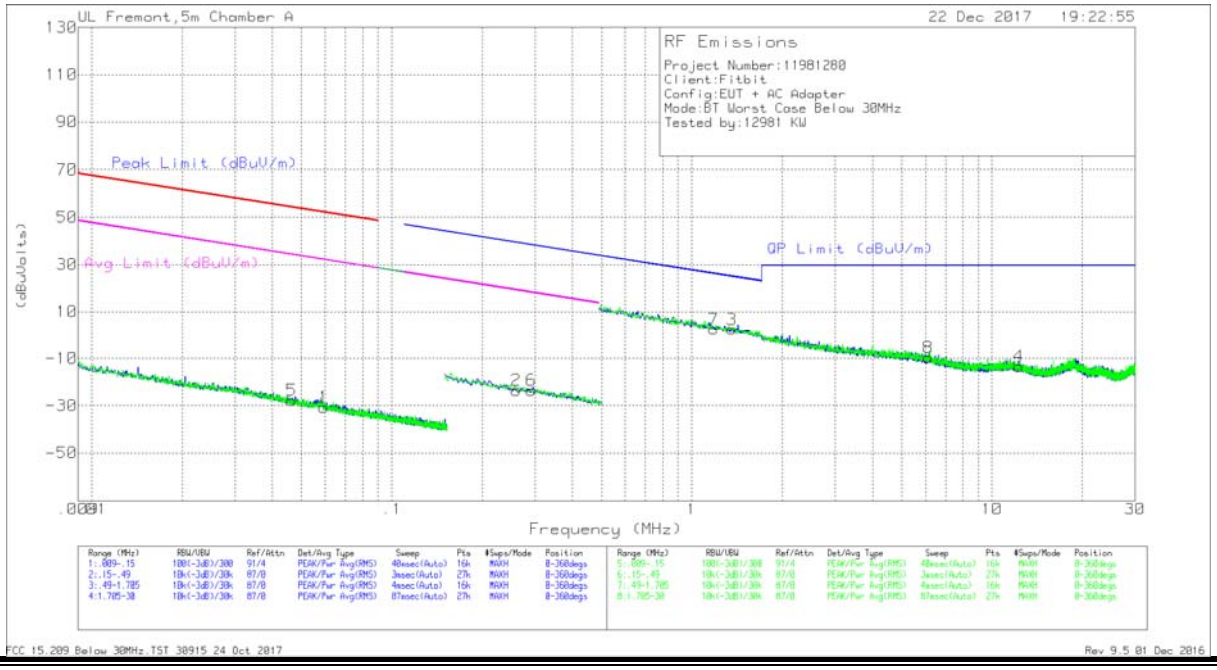
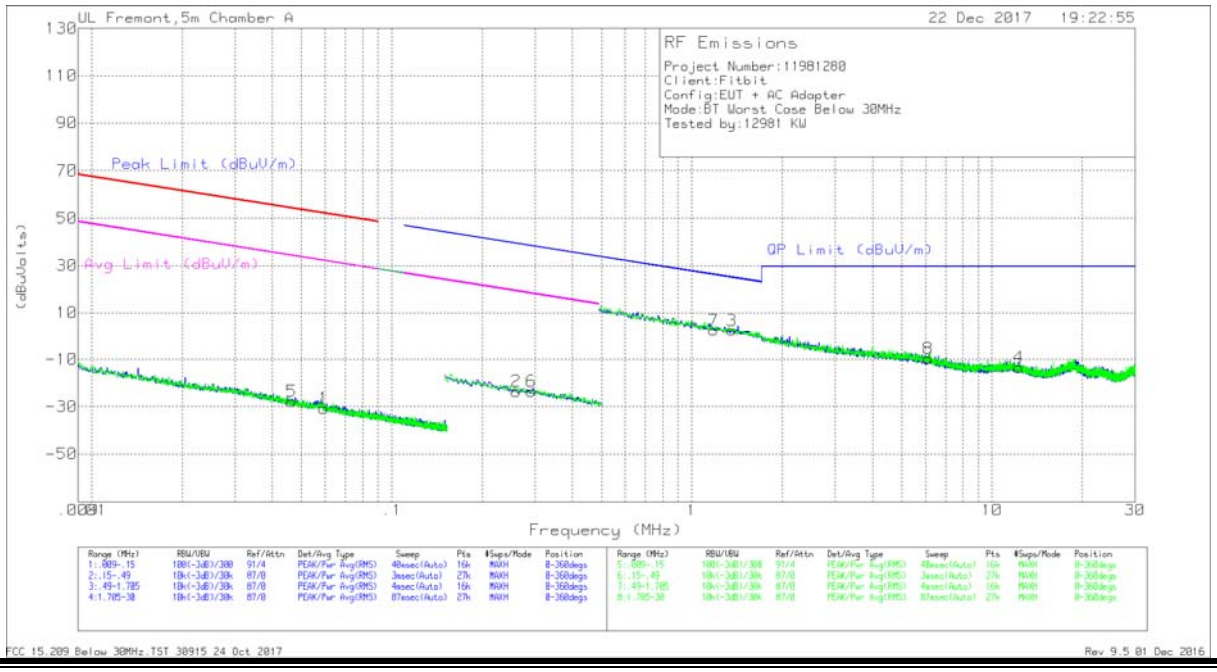
9.3. TRANSMITTER WORST-CASE BELOW 30MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL PLOT



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DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	.04644	37.54	Pk	14.5	.1	-80	-27.86	54.25	-82.11	34.25	-62.11	-	-	-	-	0-360
1	.0594	34.78	Pk	14.5	.1	-80	-30.62	52.11	-82.73	32.11	-62.73	-	-	-	-	0-360
2	.25978	42.45	Pk	13.8	.1	-80	-23.65	-	-	-	-	39.32	-62.97	19.32	-42.97	0-360
6	.29169	42.45	Pk	13.8	.1	-80	-23.65	-	-	-	-	38.31	-61.96	18.31	-41.96	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
7	1.18194	28.1	Pk	14.3	.2	-40	2.6	26.17	-23.57	0-360
3	1.35952	27.92	Pk	14.3	.2	-40	2.42	24.96	-22.54	0-360
8	6.12599	15.59	Pk	14.4	.4	-40	-9.61	29.5	-39.11	0-360
4	12.27565	11.24	Pk	14.7	.5	-40	-13.56	29.5	-43.06	0-360

Pk - Peak detector

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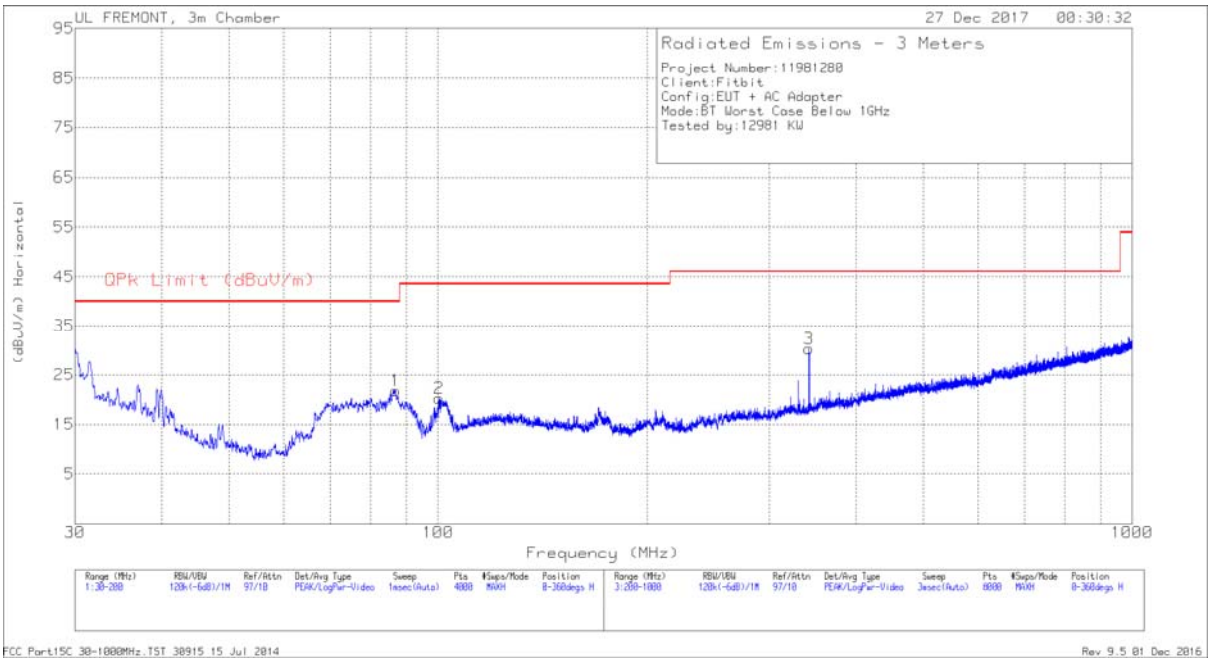
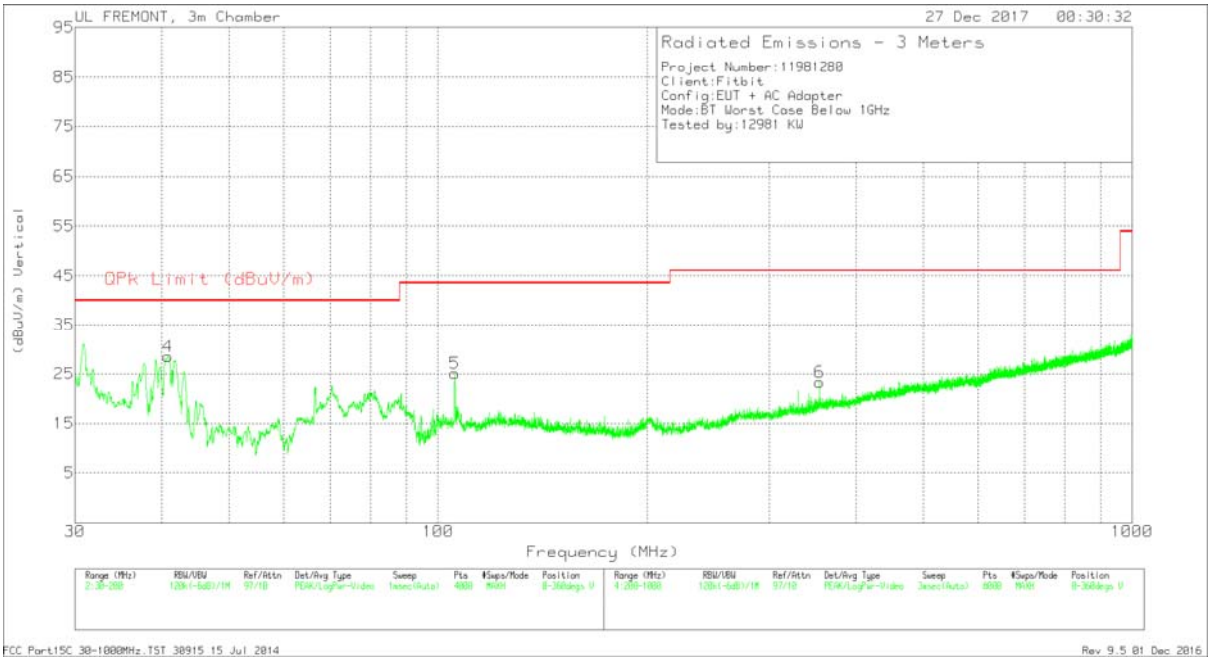
9.4. TRANSMITTER WORST-CASE 30MHz TO 1GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



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DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	40.8403	42.17	Pk	17.3	-30.9	28.57	40	-11.43	0-360	100	V
1	86.8372	40.82	Pk	11.4	-30.4	21.82	40	-18.18	0-360	200	H
2	100.2919	36.16	Pk	14.4	-30.3	20.26	43.52	-23.26	0-360	200	H
5	105.6696	39.49	Pk	15.8	-30.2	25.09	43.52	-18.43	0-360	100	V
3	342.4185	40.69	Pk	18	-28.4	30.29	46.02	-15.73	0-360	300	H
6	354.4201	33.23	Pk	18.5	-28.4	23.33	46.02	-22.69	0-360	200	V

Pk - Peak detector

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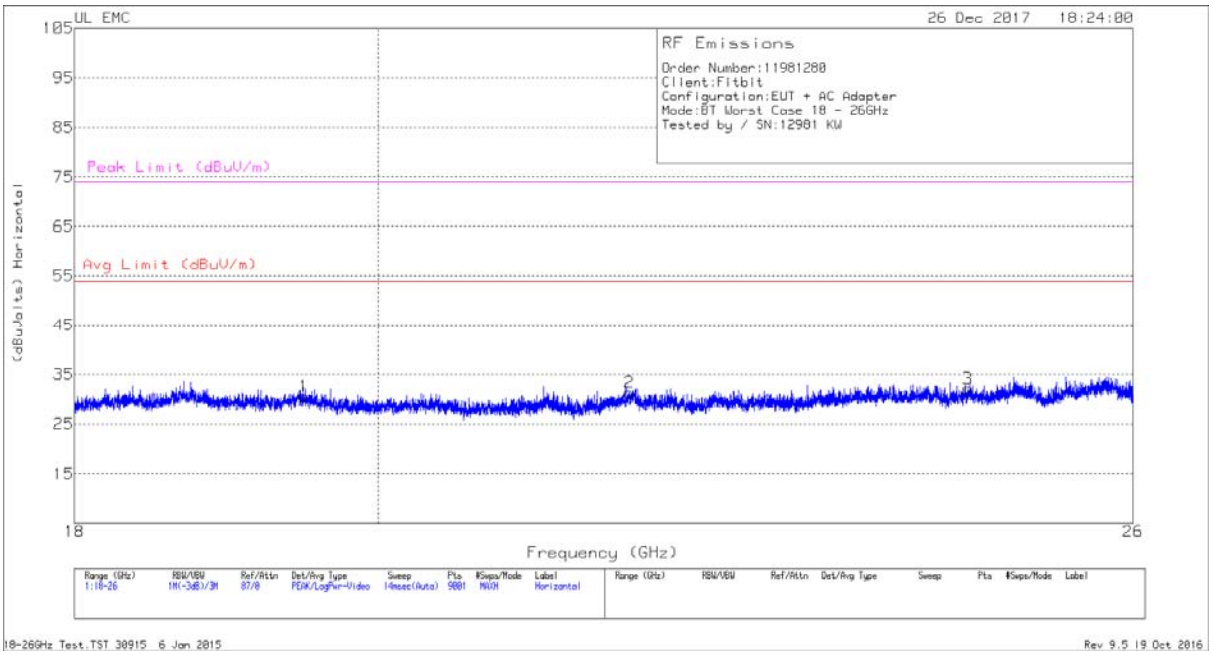
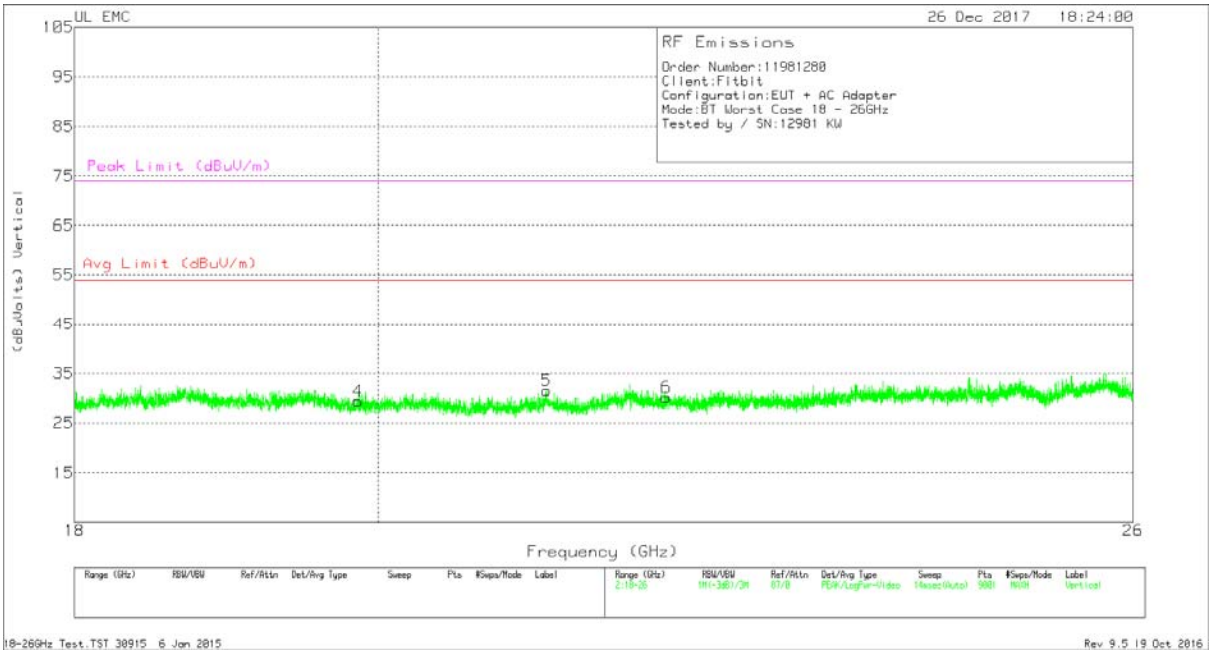
9.5. TRANSMITTER WORST-CASE ABOVE 18GHz

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL PLOT



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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	19.493	32.74	Pk	32.5	-25.1	-9.5	30.64	54	-23.36	74	-43.36
2	21.824	32.16	Pk	33.3	-24.6	-9.5	31.36	54	-22.64	74	-42.64
3	24.548	31.7	Pk	34	-24.1	-9.5	32.1	54	-21.9	74	-41.9
4	19.862	30.97	Pk	32.8	-24.9	-9.5	29.37	54	-24.63	74	-44.63
5	21.208	32.66	Pk	33.1	-24.7	-9.5	31.56	54	-22.44	74	-42.44
6	22.108	31.5	Pk	33	-24.8	-9.5	30.2	54	-23.8	74	-43.8

Pk - Peak detector

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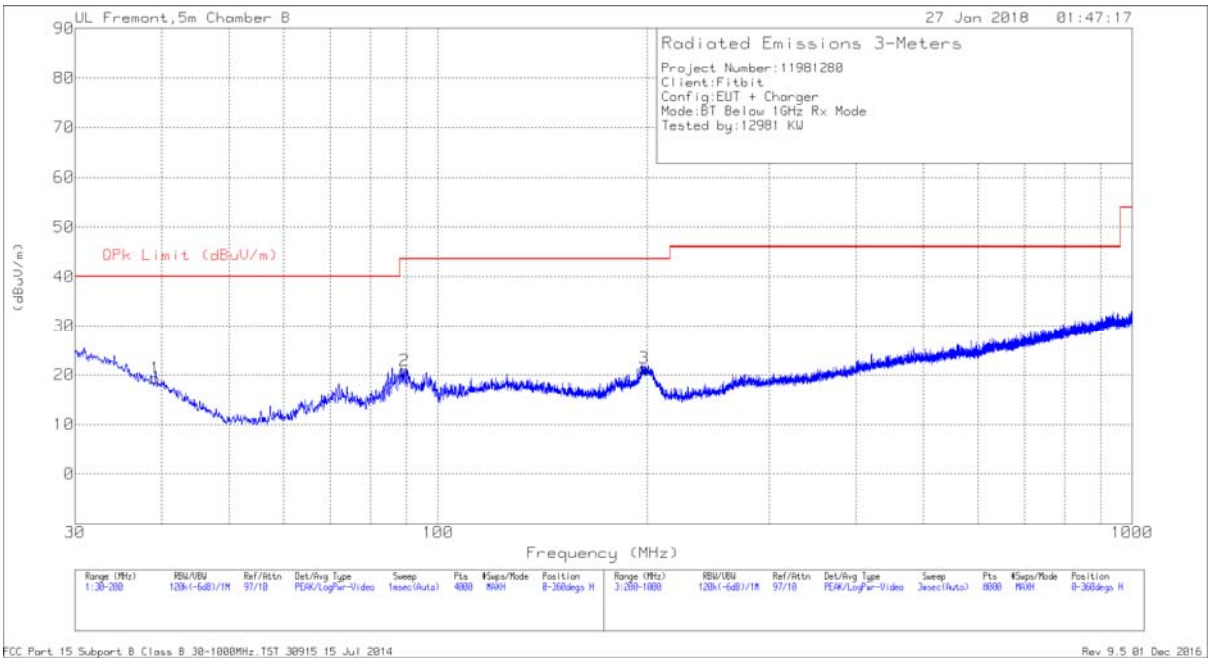
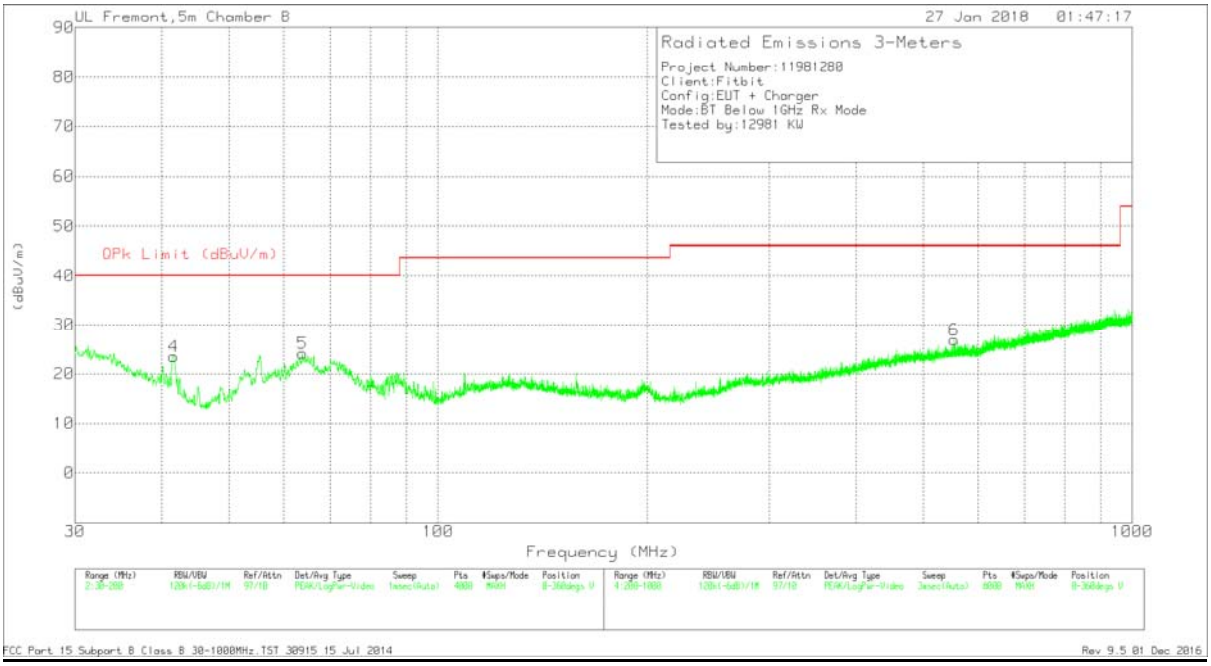
9.6. RECEIVER WORST-CASE BELOW 1GHz

3 m RADIATED EMISSIONS 30 TO 1000 MHz

HORIZONTAL PLOT



VERTICAL PLOT



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DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T899 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	39.1399	29.12	Pk	18.9	-28.7	19.32	40	-20.68	0-360	100	H
4	41.648	35.29	Pk	16.9	-28.7	23.49	40	-16.51	0-360	100	V
5	63.7962	40.46	Pk	12.1	-28.4	24.16	40	-15.84	0-360	100	V
2	89.3879	37.49	Pk	11.5	-28.1	20.89	43.52	-22.63	0-360	100	H
3	197.9185	31.8	Pk	16.4	-26.9	21.3	43.52	-22.22	0-360	100	H
6	553.546	30.42	Pk	22.3	-25.8	26.92	46.02	-19.1	0-360	100	V

Pk - Peak detector

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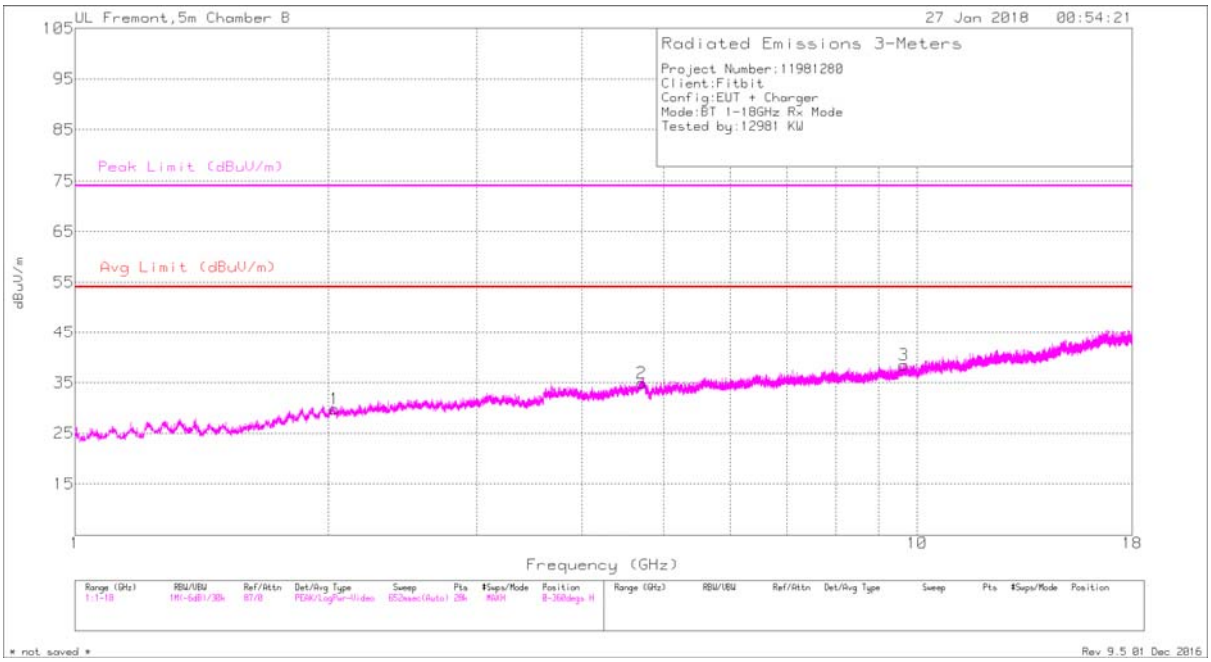
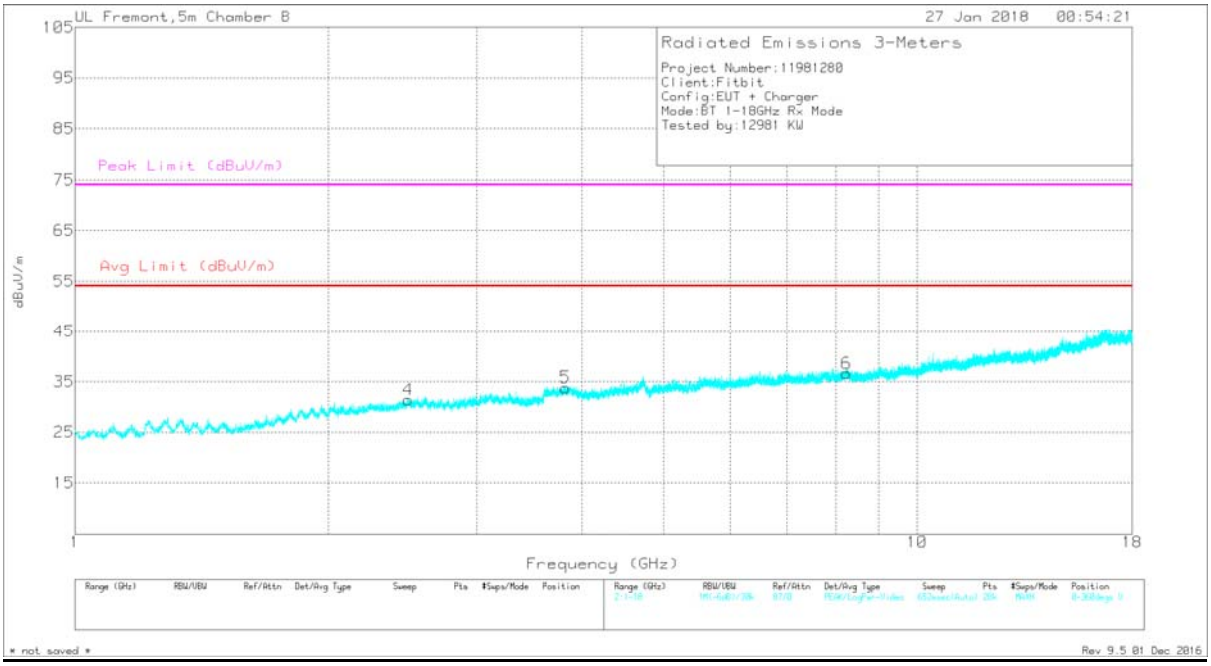
9.7. RECEIVER WORST-CASE ABOVE 1GHz

3 m RADIATED EMISSIONS 1000 TO 18,000 MHz

HORIZONTAL PLOT



VERTICAL PLOT



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DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.032	40.55	Pk	31.4	-33.3	38.65	-	-	74	-35.35	179	168	H
2.032	27.61	Av	31.4	-33.3	25.71	54	-28.29	-	-	179	168	H
2.488	39.78	Pk	32.5	-33	39.28	-	-	74	-34.72	256	112	V
2.488	27.48	Av	32.5	-33	26.98	54	-27.02	-	-	256	112	V
3.824	39.66	Pk	33.5	-31.6	41.56	-	-	74	-32.44	91	150	V
3.824	27.36	Av	33.5	-31.6	29.26	54	-24.74	-	-	91	150	V
4.706	40.43	Pk	34.2	-31.3	43.33	-	-	74	-30.67	55	260	H
4.706	27.63	Av	34.2	-31.3	30.53	54	-23.47	-	-	55	260	H
8.246	36.46	Pk	36.1	-27.9	44.66	-	-	74	-29.34	135	182	V
8.246	24.08	Av	36.1	-27.9	32.28	54	-21.72	-	-	135	182	V
9.636	34.47	Pk	36.8	-25.7	45.57	-	-	74	-28.43	165	108	H
9.636	22.52	Av	36.8	-25.7	33.62	54	-20.38	-	-	165	108	H

Pk - Peak detector
Av - Average detection

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10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

NCC LP0002 §2.3

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

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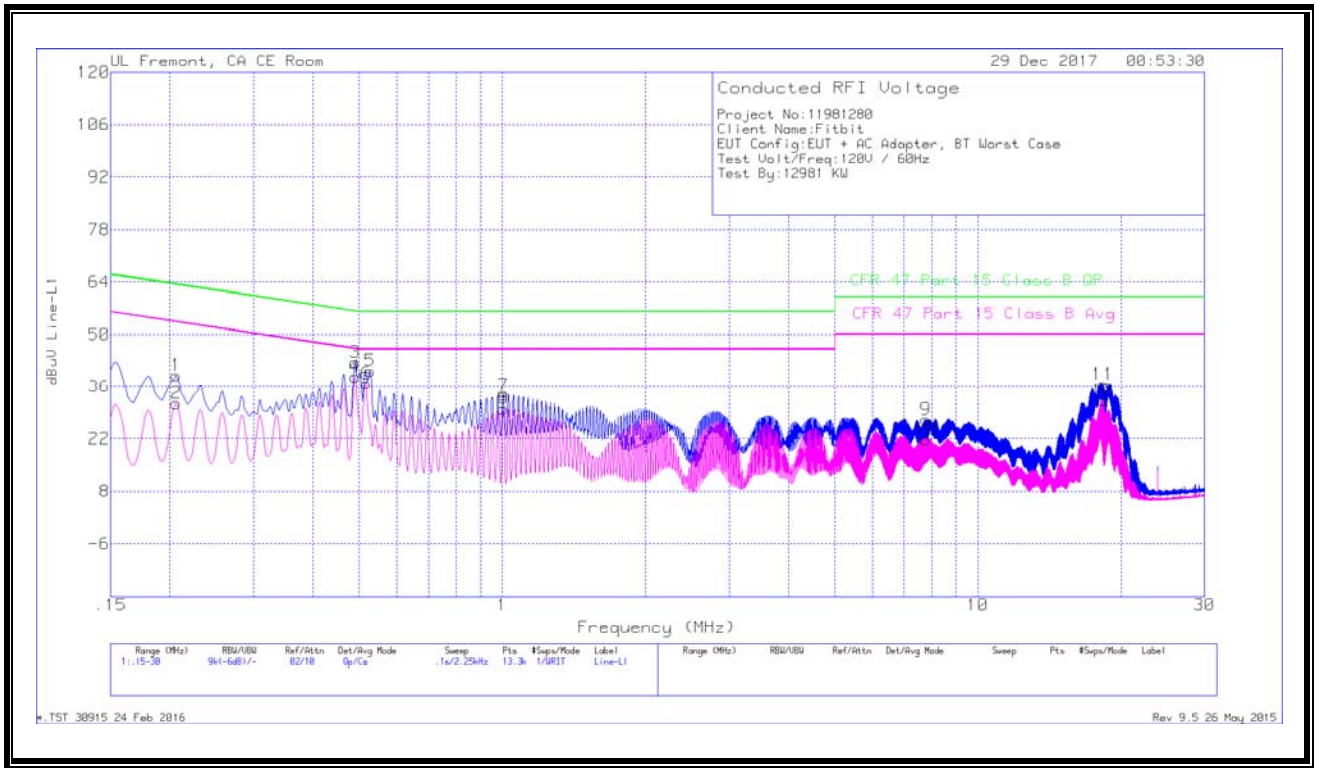
10.1. EUT POWERED BY AC/DC ADAPTER VIA USB CABLE

LINE 1 RESULTS



WORST EMISSIONS

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	.20625	28.97	Qp	0	0	10.1	39.07	63.35	-24.28	-	-
2	.20625	21.25	Ca	0	0	10.1	31.35	-	-	53.35	-22
3	.48975	32.48	Qp	0	0	10.1	42.58	56.17	-13.59	-	-
4	.48975	28.55	Ca	0	0	10.1	38.65	-	-	46.17	-7.52
5	.528	30.21	Qp	0	0	10.1	40.31	56	-15.69	-	-
6	.51675	26.61	Ca	0	0	10.1	36.71	-	-	46	-9.29
7	1.005	23.39	Qp	0	.1	10.1	33.59	56	-22.41	-	-
8	1.005	19.73	Ca	0	.1	10.1	29.93	-	-	46	-16.07
9	7.78425	16.72	Qp	0	.2	10.2	27.12	60	-32.88	-	-
10	7.78425	11.4	Ca	0	.2	10.2	21.8	-	-	50	-28.2
11	18.32775	25.97	Qp	0	.3	10.3	36.57	60	-23.43	-	-
12	18.32775	21.59	Ca	0	.3	10.3	32.19	-	-	50	-17.81

Qp - Quasi-Peak detector

Ca - CISPR average detection

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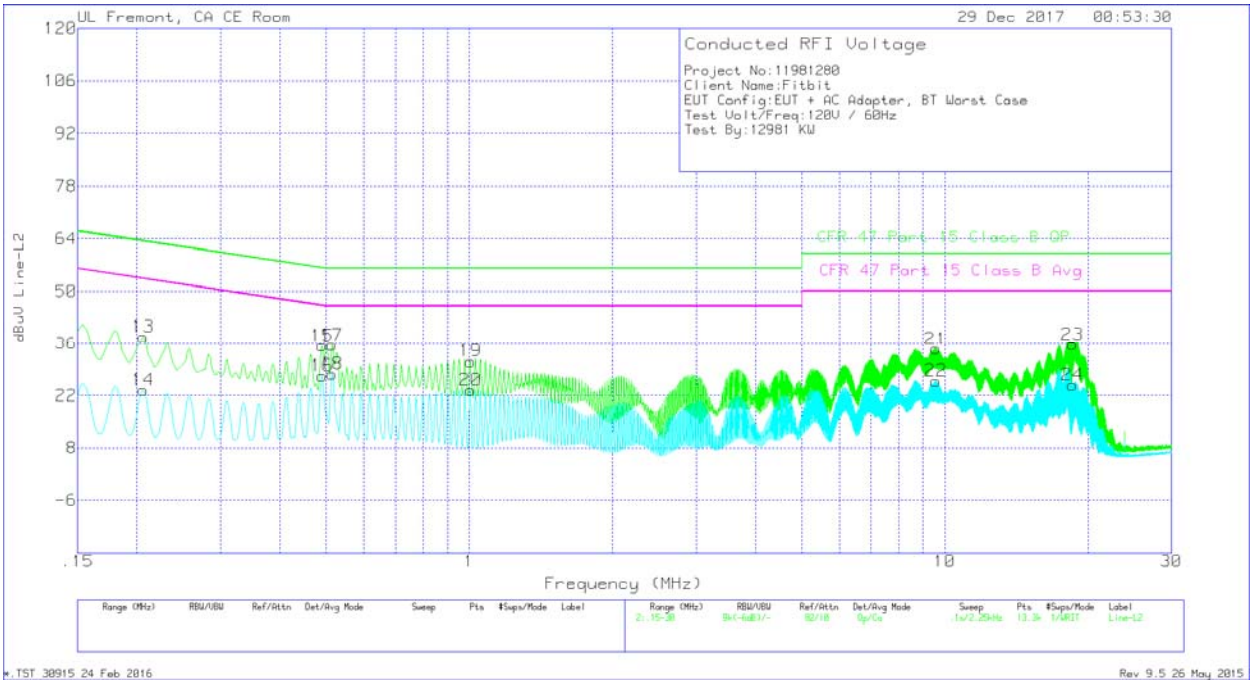
LINE 2 RESULTS



WORST EMISSIONS

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)
13	.20625	27.76	Qp	0	0	10.1	37.86	63.35	-25.49	-	-
14	.20625	13.36	Ca	0	0	10.1	23.46	-	-	53.35	-29.89
15	.48975	25.31	Qp	0	0	10.1	35.41	56.17	-20.76	-	-
16	.48975	17.05	Ca	0	0	10.1	27.15	-	-	46.17	-19.02
17	.5145	25.46	Qp	0	0	10.1	35.56	56	-20.44	-	-
18	.5145	17.6	Ca	0	0	10.1	27.7	-	-	46	-18.3
19	1.005	20.94	Qp	0	.1	10.1	31.14	56	-24.86	-	-
20	1.005	13.26	Ca	0	.1	10.1	23.46	-	-	46	-22.54
21	9.5775	24.12	Qp	0	.2	10.2	34.52	60	-25.48	-	-
22	9.5775	15.52	Ca	0	.2	10.2	25.92	-	-	50	-24.08
23	18.5595	25.17	Qp	0	.3	10.3	35.77	60	-24.23	-	-
24	18.5595	14.23	Ca	0	.3	10.3	24.83	-	-	50	-25.17

Qp - Quasi-Peak detector

Ca - CISPR average detection

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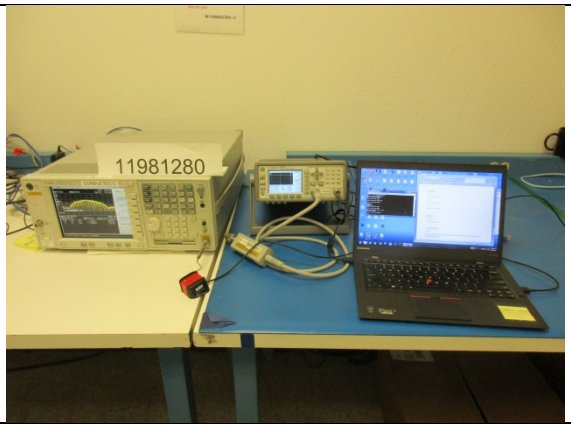
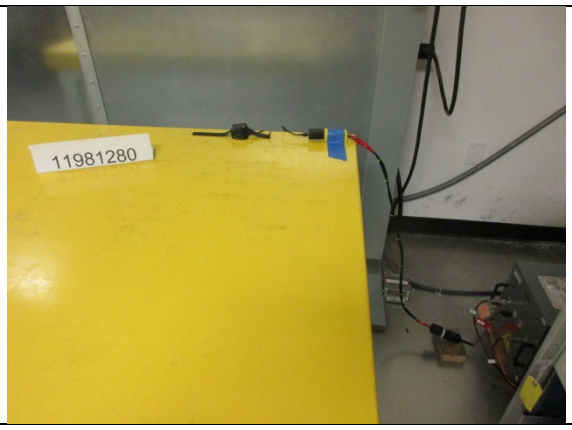
11. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

FRONT PHOTO

AC MAINS LINE CONDUCTED EMISSIONS	
	
FRONT PHOTO (AC/DC ADAPTER)	BACK PHOTO (AC/DC ADAPTER)

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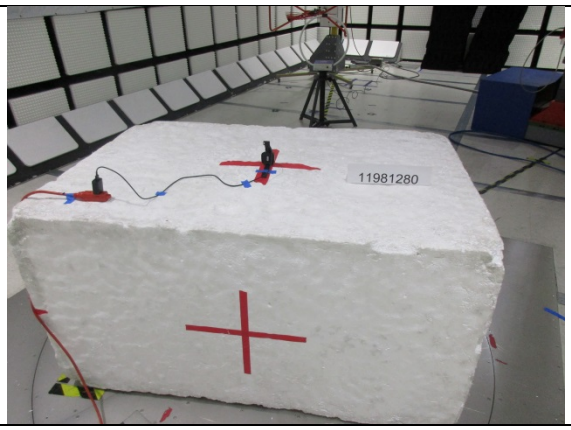
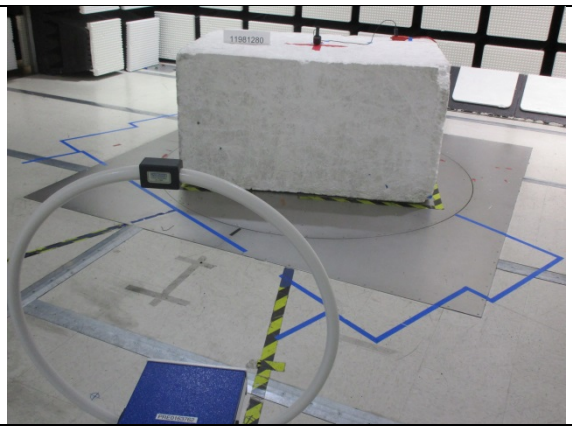
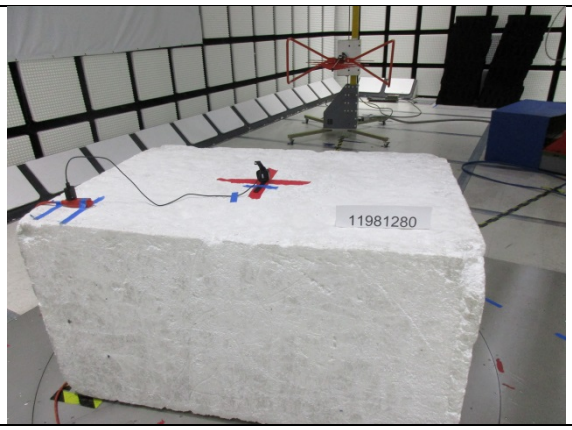
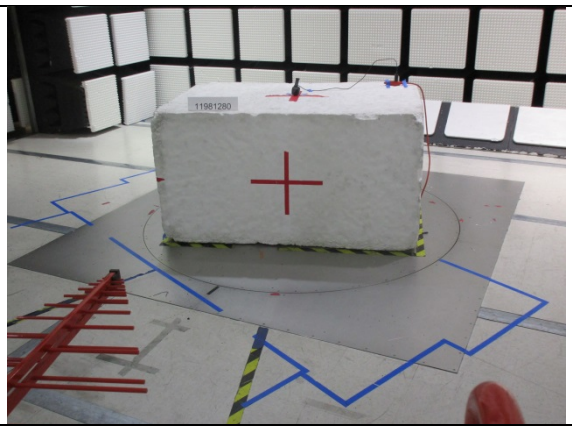
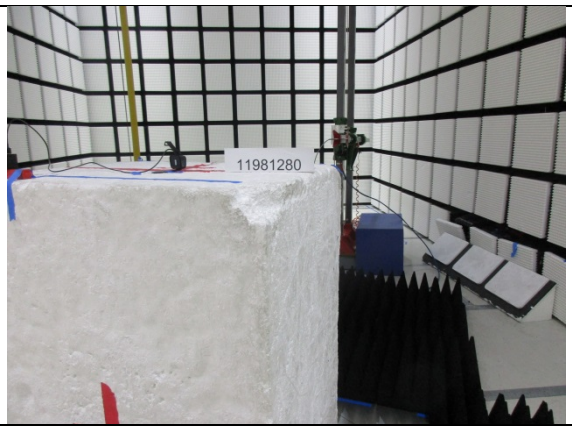
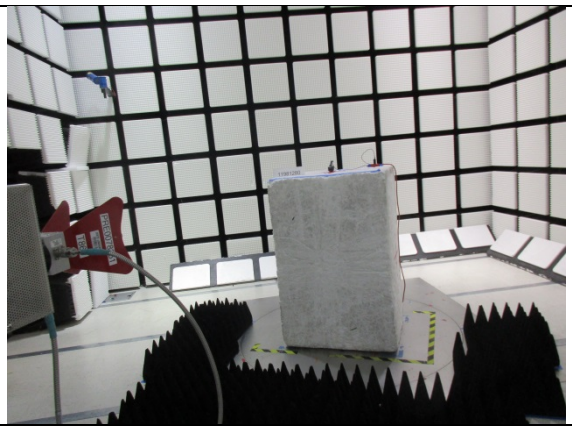
3 METER RADIATED SPURIOUS EMISSIONS BELOW 30MHz	
	
FRONT PHOTO	BACK PHOTO
3 METER RADIATED SPURIOUS EMISSIONS 30MHZ TO 1GHZ	
	
FRONT PHOTO	BACK PHOTO
3 METER RADIATED SPURIOUS EMISSIONS 1GHZ TO 18GHZ	
	
FRONT PHOTO	BACK PHOTO

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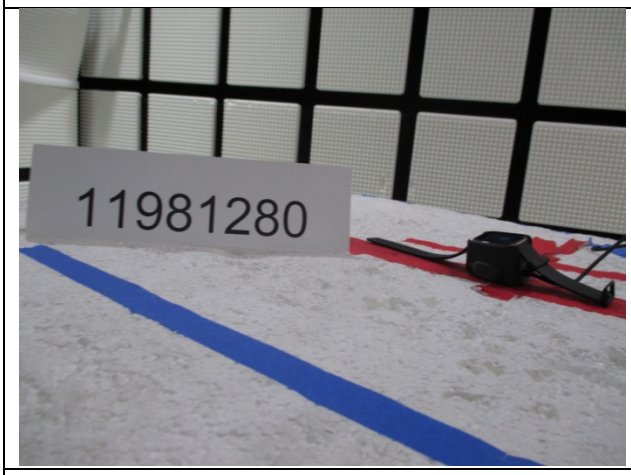
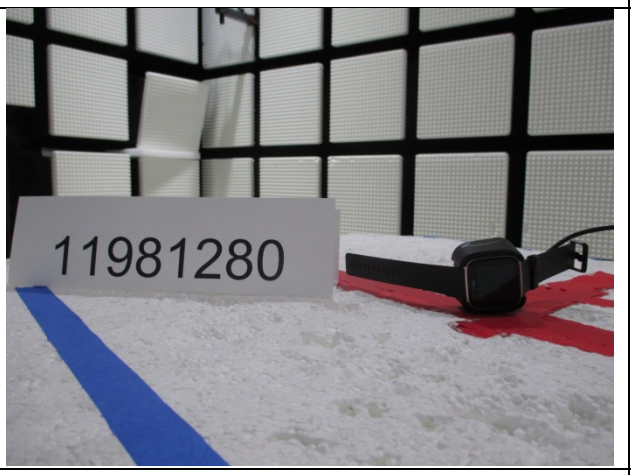
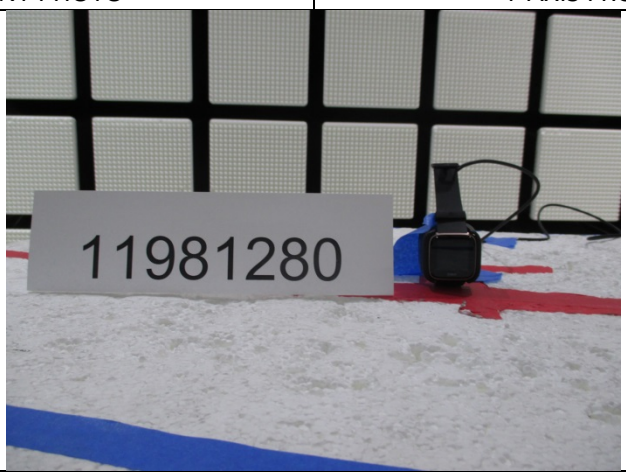
RADIATED RF MEASUREMENT FOR PORTABLE CONFIGURATION



X-AXIS FRONT PHOTO



Y-AXIS FRONT PHOTO



Z-AXIS FRONT PHOTO

END OF REPORT

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