CERTIFICATION TEST REPORT

Report Number. : 12857633-E2V2

Applicant	:	Microsoft Corporation One Microsoft Way Redmond, WA 98052-6399 USA
Model	:	1873
FCC ID	:	C3K1873
IC	:	3048A-1873
EUT Description	:	Portable Computing Device
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5

Date Of Issue:
September 16, 2019

Prepared by:
UL Verification Services Inc.
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NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	9/3/2019	Initial Issue	---
V2	9/16/2019	Section 9: Revision updated	Henry Lau

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399
USA

EUT DESCRIPTION: Portable Computing Device

MODEL: 1873

SERIAL NUMBER: 009075792757 (Conducted)
009060692757 (Radiated)
009059592757 (Radiated)

DATE TESTED: July 30, 2019 – August 09, 2019

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

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, KDB 558074 D01 15.247 Meas Guidance v05r02, RSS-GEN Issue 5, and RSS-247 Issue 2, DA 00 -705.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, 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	47658 Kato Road
☒ Chamber A	☐ Chamber D	☒ Chamber I
☐ Chamber B	☐ Chamber E	☐ Chamber J
☐ Chamber C	☐ Chamber F	☐ Chamber K
	☐ Chamber G	☐ Chamber L
	☐ Chamber H	☐ Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code: 2324A.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

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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

RADIATED EMISSIONS
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

MAINS CONDUCTED EMISSIONS
Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

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	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

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

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a Portable Computing Device.

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	3.70	2.34
2402 - 2480	Enhanced DQPSK	5.42	3.48
2402 - 2480	Enhanced 8PSK	5.80	3.80

Note: GFSK, DQPSK, 8PSK average Power are all investigated. See section 8.7

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of -2.2 dBi.

5.4. SOFTWARE AND FIRMWARE

The operating system installed on the EUT is Windows 10 Pro build 18362.19h1_release.190318-1202.

The Driver installed on the EUT is version 12.0.0.835.

The test utility software used during testing was QRCT v4.0.00125

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 30MHz, 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 EUT has one intended orientations, X; therefore, all final radiated testing was performed with the EUT in X orientation.

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

GFSK mode: DH5
8PSK mode: 3-DH5

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC DC Adapter	Microsoft	1706	0CI30J0IZ9396	DoC
AC DC Adapter	Lenovo	ADLX45NDC2A	11S45N0291Z1ZS925 3E2N9	DoC
Laptop	Lenovo	E555	6449237	TX2-RTL8723BE
Mouse	Logitech	B100	1451HS05PX68	DoC
USB 3.0 Gigabit Ethernet Adapter	Linksys	1113	X821908-002	DoC
USB Type C to Audio Jack	SONY	A1-0231	N/A	DoC

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	Un-Shielded	1	to AC/DC Adaptor
2	DC	1	DC	Shielded	1.2	to Laptop, to EUT
3	Antenna	1	SMA	Un-Shielded	0.2	to Analyzer
4	USB	1	TYPE A	Shielded	0.2	USB-A to RJ45 converter
5	Ethernet	1	RJ45	Un-Shielded	0.5	Support Laptop to Ethernet Adapter
6	AC	1	AC	Un-Shielded	1	to AC/DC Adaptor
7	DC	1	DC	Shielded	1.2	to Support Equipment

I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	AC	Un-shielded	1	to AC/DC Adapter
2	DC	1	DC	Shielded	1.2	to EUT
3	USB	1	TYPE A	Shielded	1.5	EUT to Mouse
4	USB	1	Type C	Shielded	0.1	USB-C to Audio Jack converter
5	Earphone	2	3.5mm	Un-shielded	1	EUT to earphone

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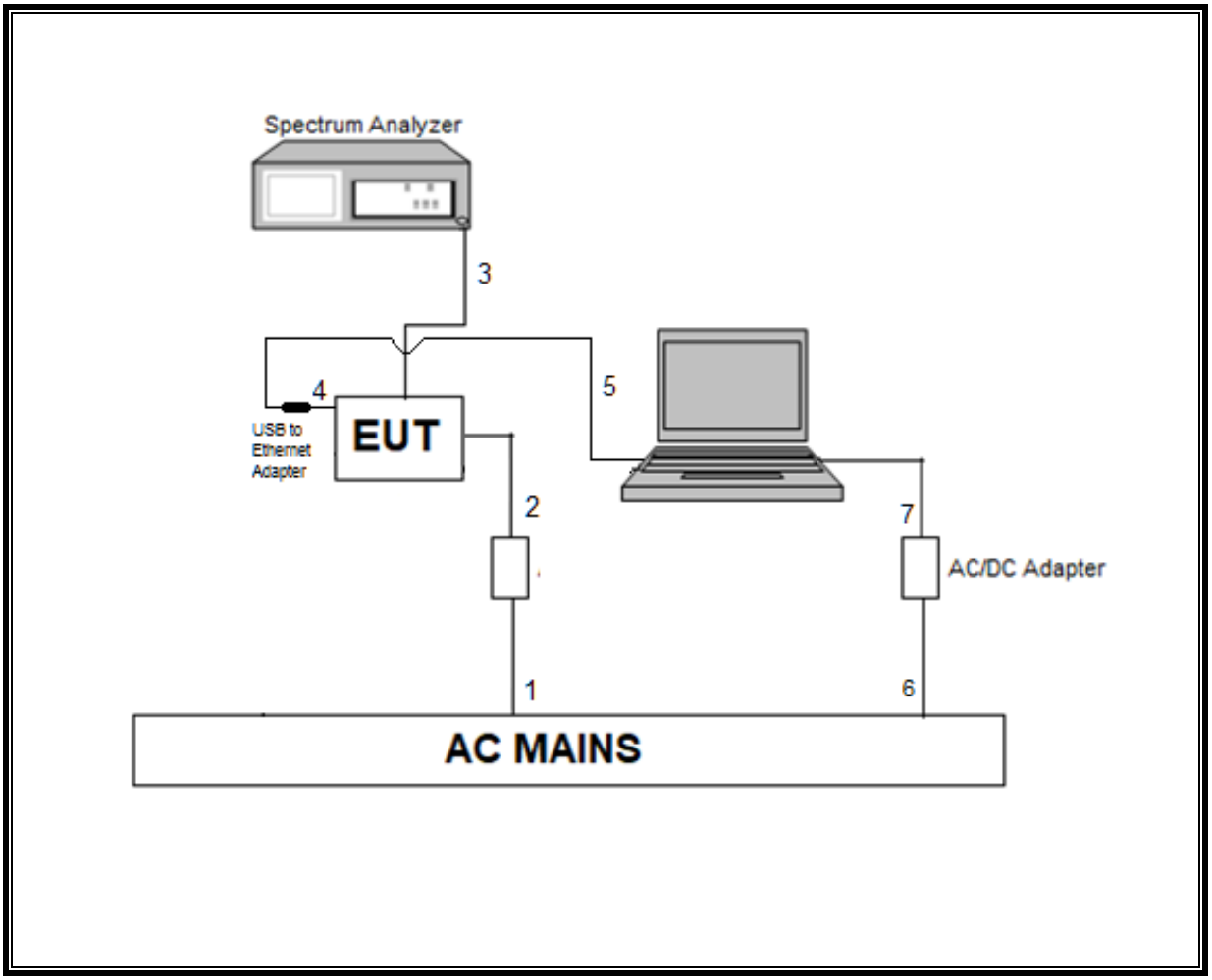
TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card.

CONDUCTED TEST SETUP DIAGRAM



TEST SETUP

For conducted tests, the EUT was connected to a laptop. The test software exercises the radio.

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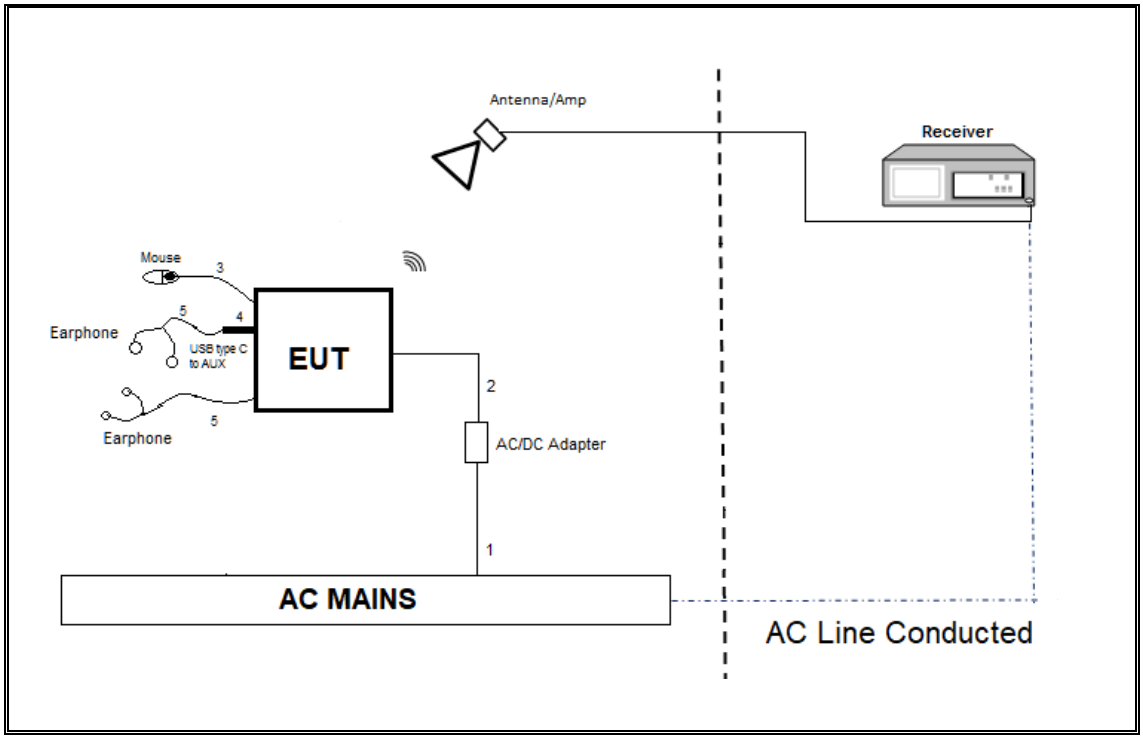
RADIATED AND AC LINE CONDUCTED EMISSIONS SETUP DIAGRAM



TEST SETUP

For radiated tests and AC line conducted tests: EUT is connected to all support equipment. The test software exercises the radio. Support laptop was removed after EUT was configured.

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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**	**ID Num**	**Cal Due**	**Last Cal**
Antenna, Passive Loop 30Hz to 1MHz	ELETRO METRICS	EM-6871	PRE0179465	05/31/2020	05/31/2019
Antenna, Passive Loop 100kHz to 30MHz	ELETRO METRICS	EM-6872	PRE0179467	05/31/2020	05/31/2019
Horn Antenna 1-18GHz	ETS-Lindgren	3117	T862	06/05/2020	06/05/2019
Amplifier, 1 to18GHz	MITEQ	AFS42-00101800-25-S-42	PRE0181078	08/31/2019	08/01/2018
Amplifier, 1 to18GHz	MITEQ	AFS42-00101800-25-S-42	PRE0181078	08/24/2020	08/24/2019
Horn Antenna 1-18GHz	ETS-Lindgren	3117	T346	05/14/2020	05/14/2019
Amplifier, 1 to18GHz	MITEQ	AFS42-00101800-25-S-42	T1165	05/24/2020	05/24/2019
Antenna, Broadband Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	PRE0184971	11/13/2019	11/13/2018
Amplifier, 9kHz to 1GHz, 32 dB	Sonoma Instrument	310	PRE0180175	06/29/2020	06/29/2019
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	PRE0182188	08/29/2019	08/29/2018
Rf Amplifier, 18-26.5GHz, 60dB gain	Amplical	AMP18G26.5-60	PRE0181238	05/01/2020	05/01/2019
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1265	01/29/2020	01/29/2019
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1227	02/05/2020	02/05/2019
BRF 2400-2500 MHz	Micro-Tronics	BRM50702-02	T1784	07/19/2020	07/19/2019
BRF 5470-5725 MHz	Micro-Tronics	BRM50704	T1780	06/24/2020	06/24/2019
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179376	02/14/2020	02/14/2019
Spectrum Analyzer, PSA, 3Hz to 26.5GHz	Agilent (Keysight) Technologies	E4440A	T200	01/28/2020	01/28/2019
AC Line Conducted					
EMI Receiver	Rohde & Schwarz	ESR	T1436	02/14/2020	02/14/2019
LISN for Conducted Emissions CISPR-16	FCC INC.	FCC LISN 50/250	T1310	01/24/2020	01/24/2019
Test Software List					
Radiated Software	UL	UL EMC		Ver 9.5, June 15, 2019	
Antenna Port Software	UL	UL RF		Ver 10.0.1, July 23, 2019	
AC Line Conducted Software	UL	UL EMC		Ver 9.5, May 26, 2015	

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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 Below 30MHz: ANSI C63.10-2013 Section 6.4

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.

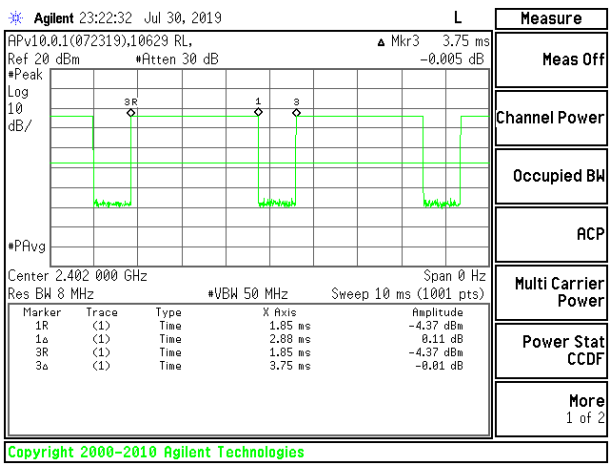
PROCEDURE

ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

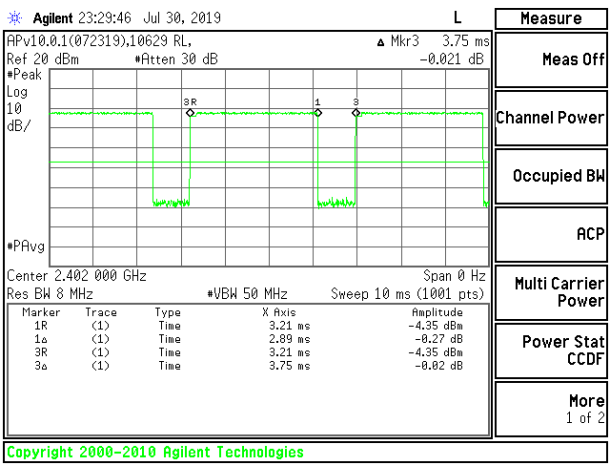
ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
Bluetooth GFSK	2.88	3.75	0.768	76.8%	1.15	0.347
Bluetooth 8PSK	2.89	3.75	0.771	77.1%	1.13	0.346

DUTY CYCLE PLOTS



BLUETOOTH GFSK



BLUETOOTH 8PSK

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8.2. 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

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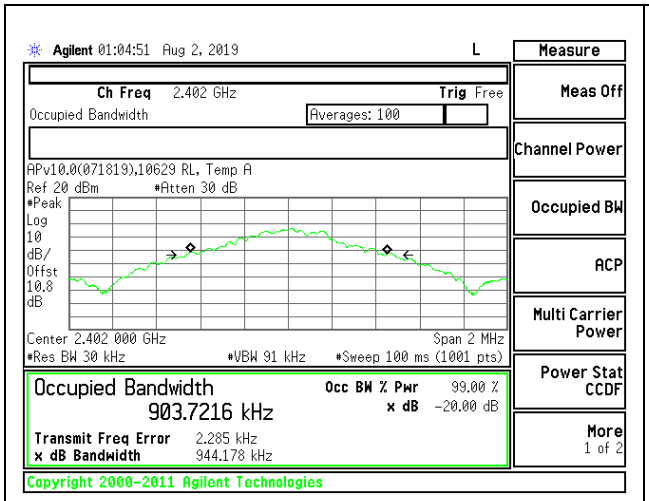
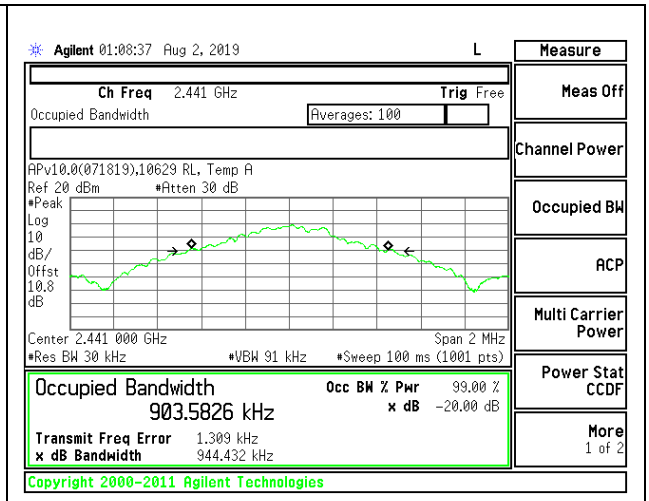
8.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

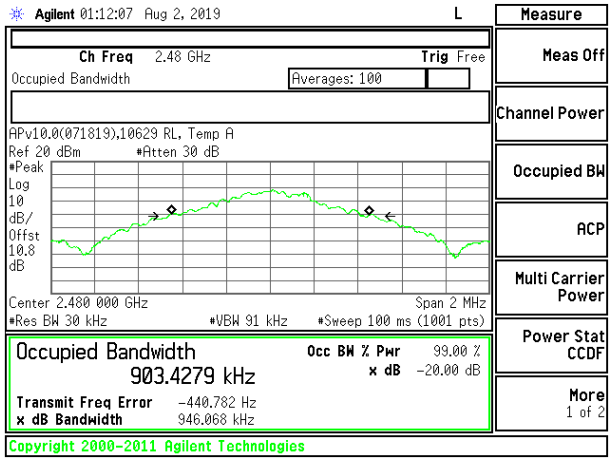
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.944	0.904
Mid	2441	0.944	0.904
High	2480	0.946	0.903



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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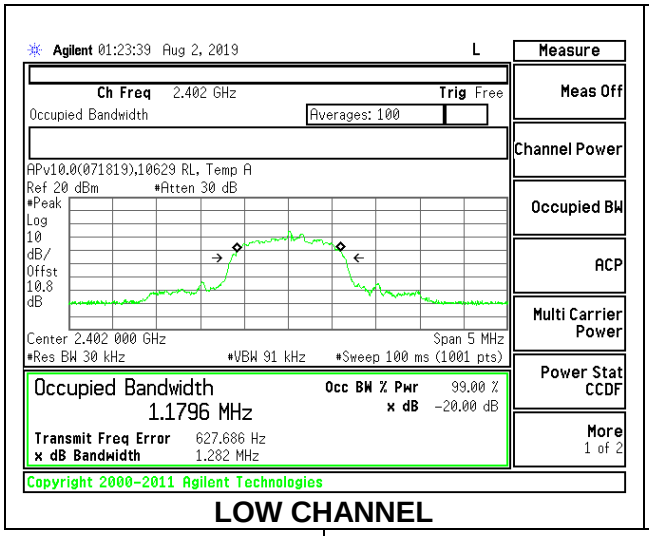
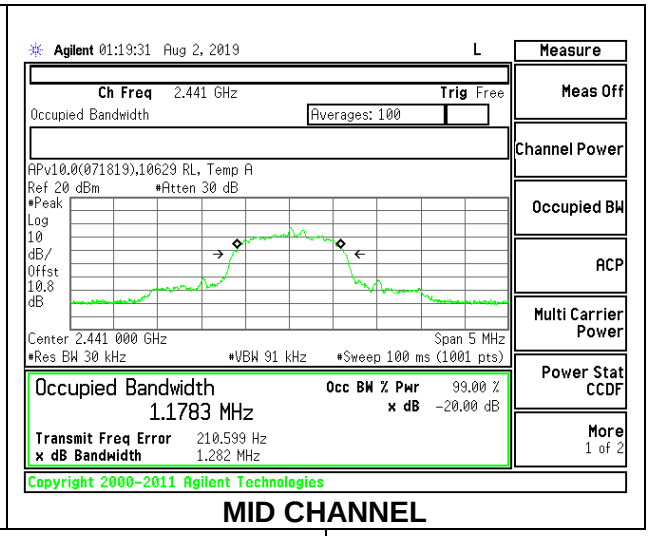
8.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

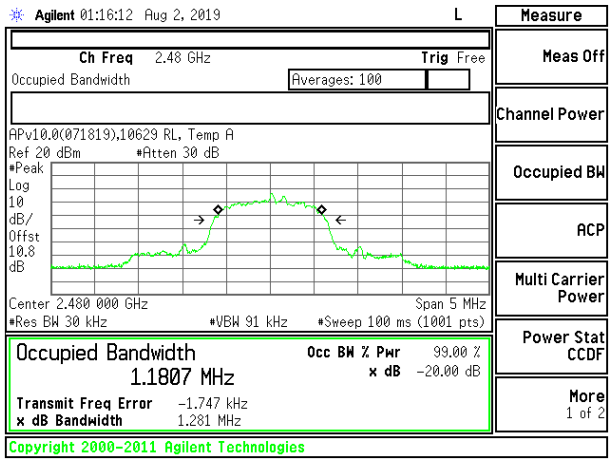
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.282	1.180
Mid	2441	1.282	1.178
High	2480	1.281	1.181



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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8.3. HOPPING FREQUENCY SEPARATION

LIMITS

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 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 VBW >= RBW. The sweep time is coupled.

RESULTS

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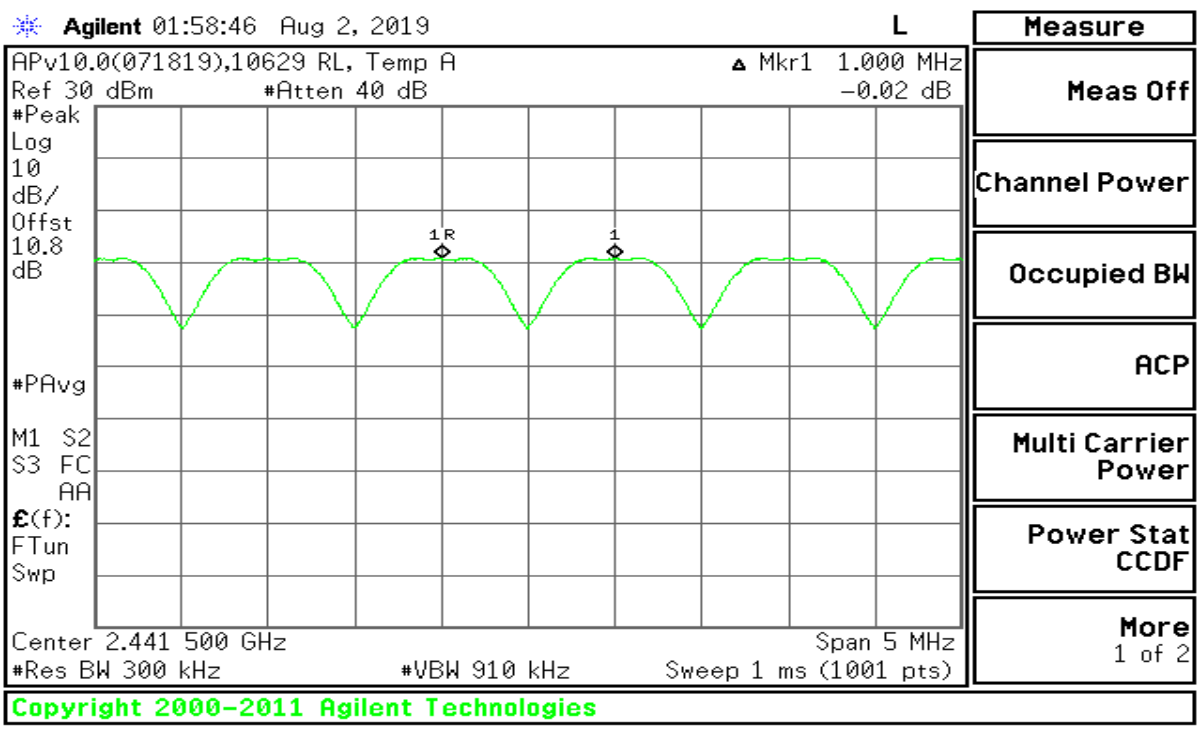
8.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

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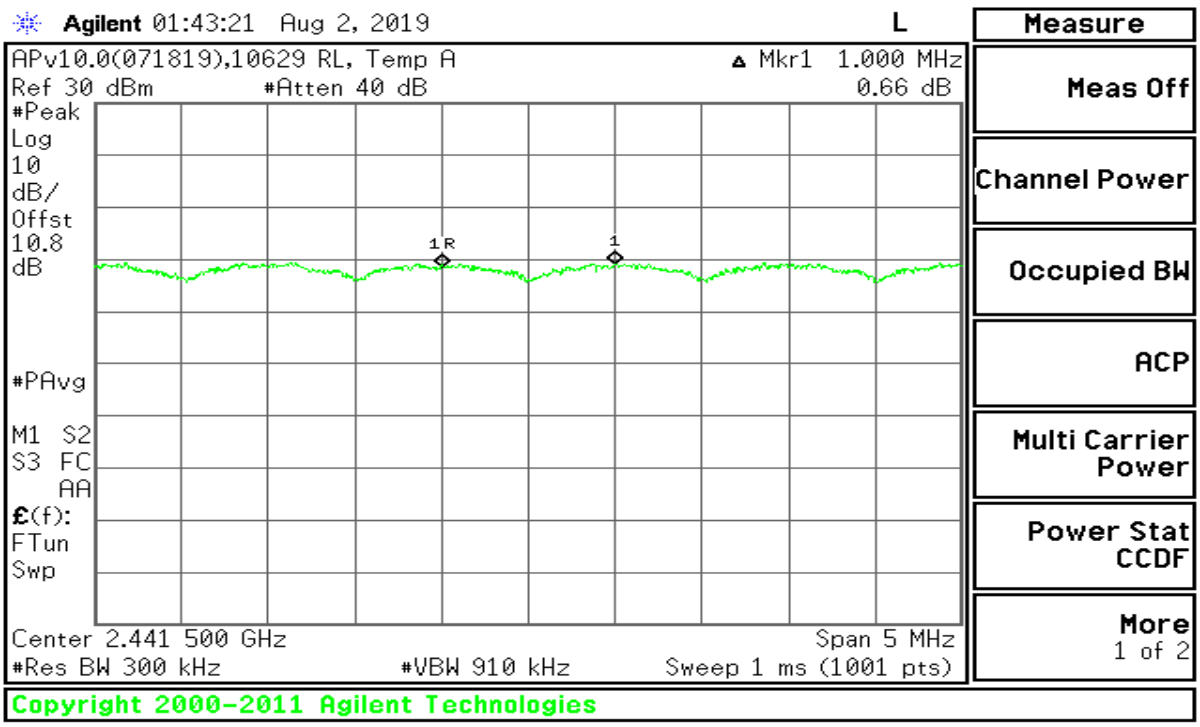
8.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

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8.4. 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

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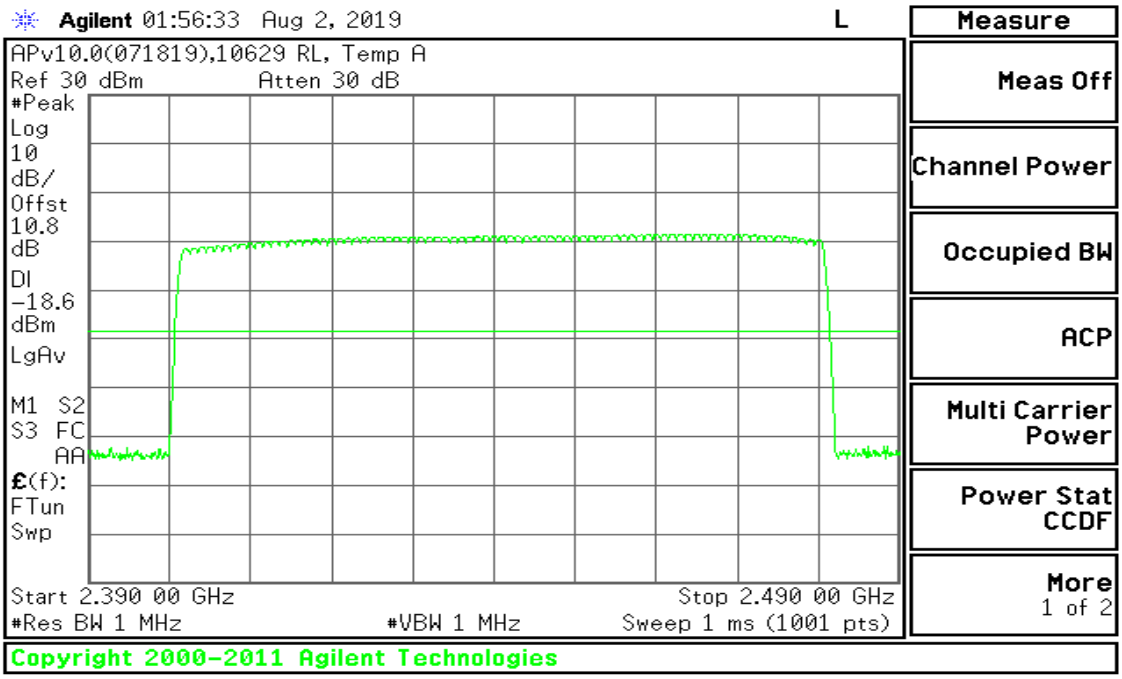
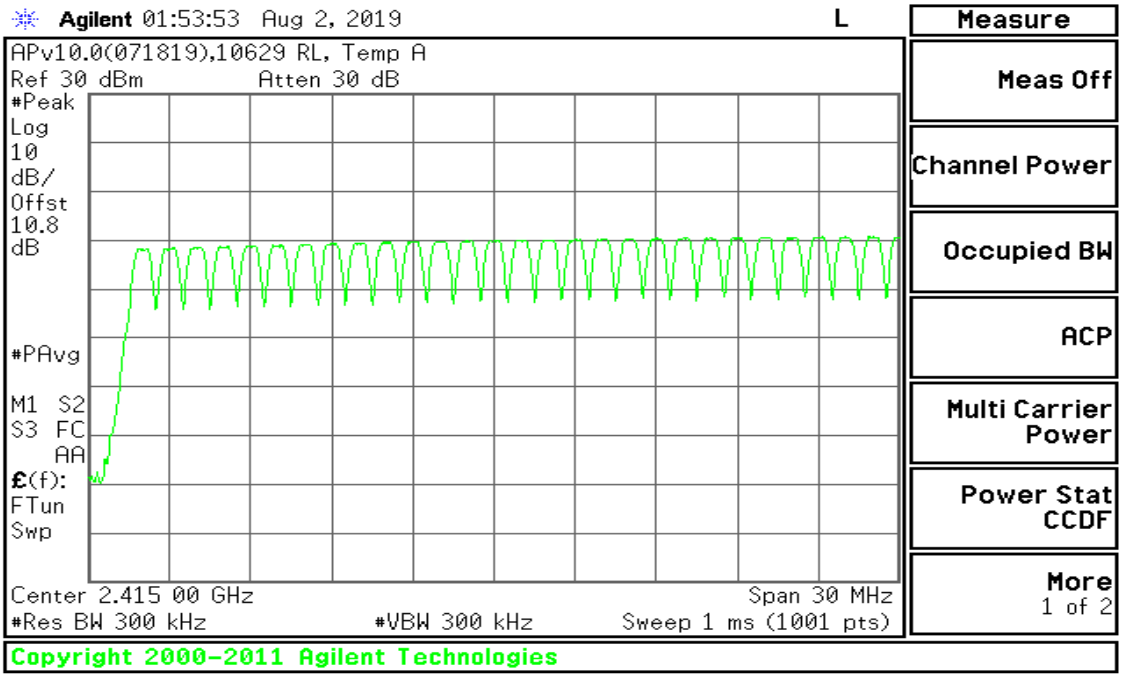
8.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

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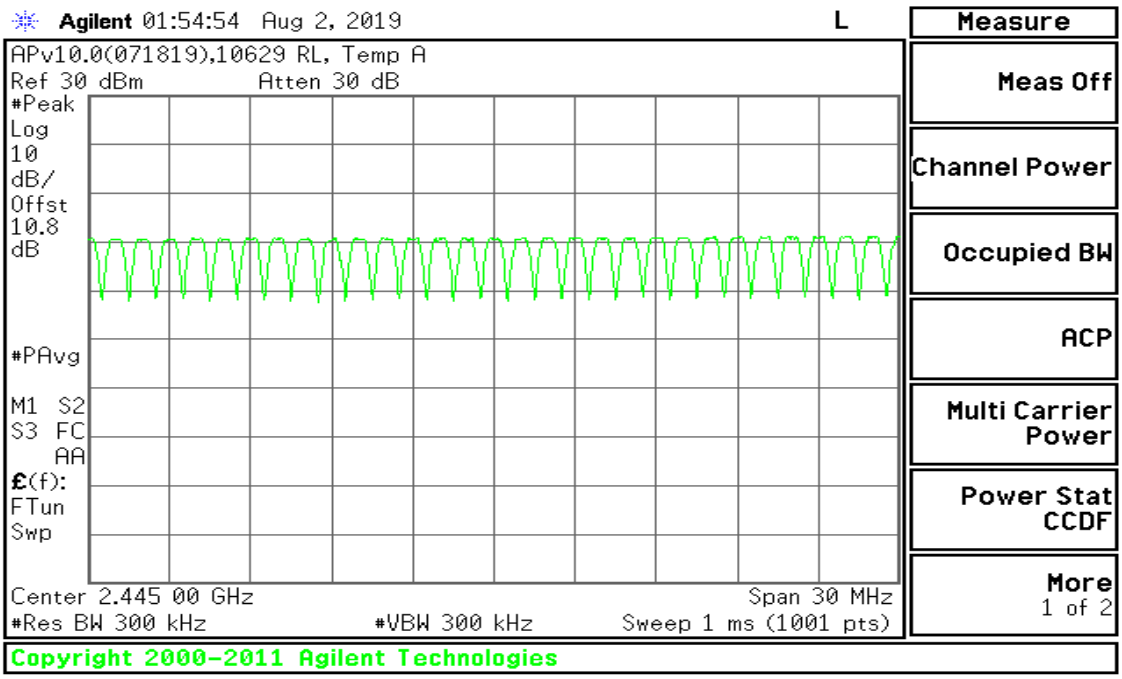
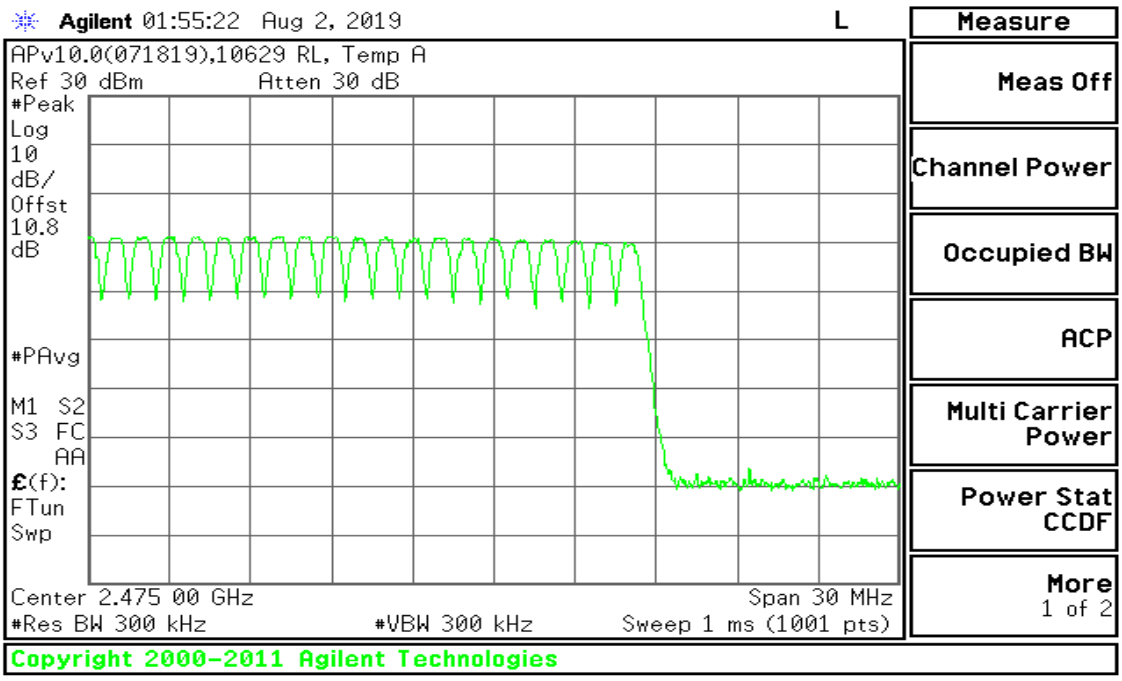


30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

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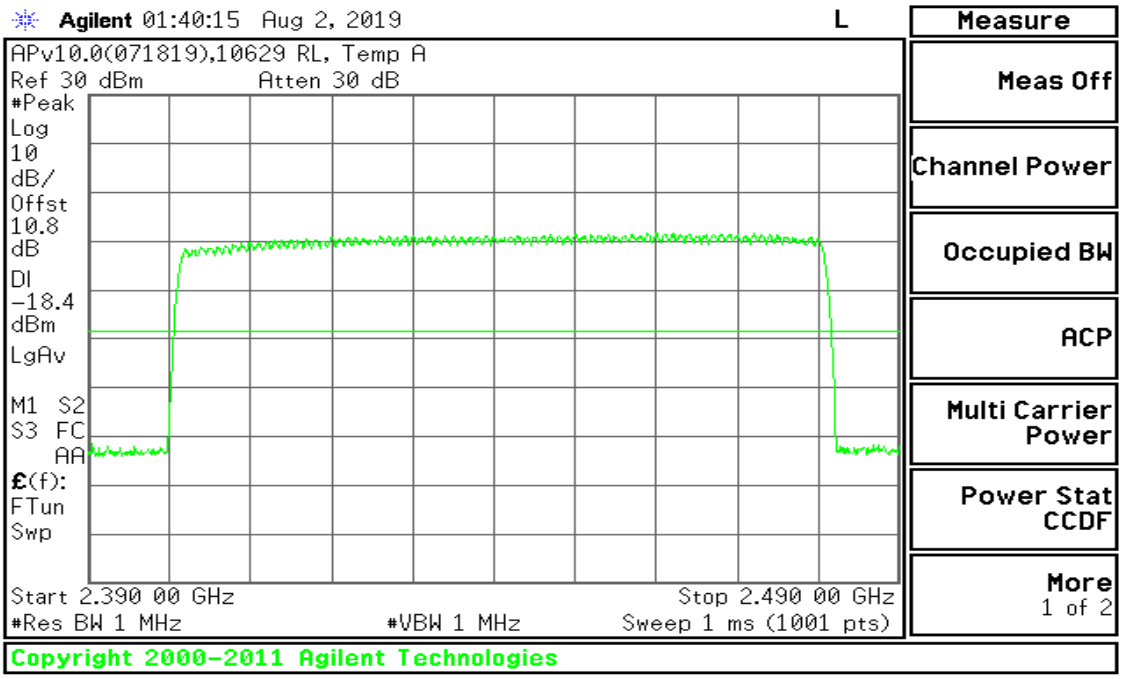
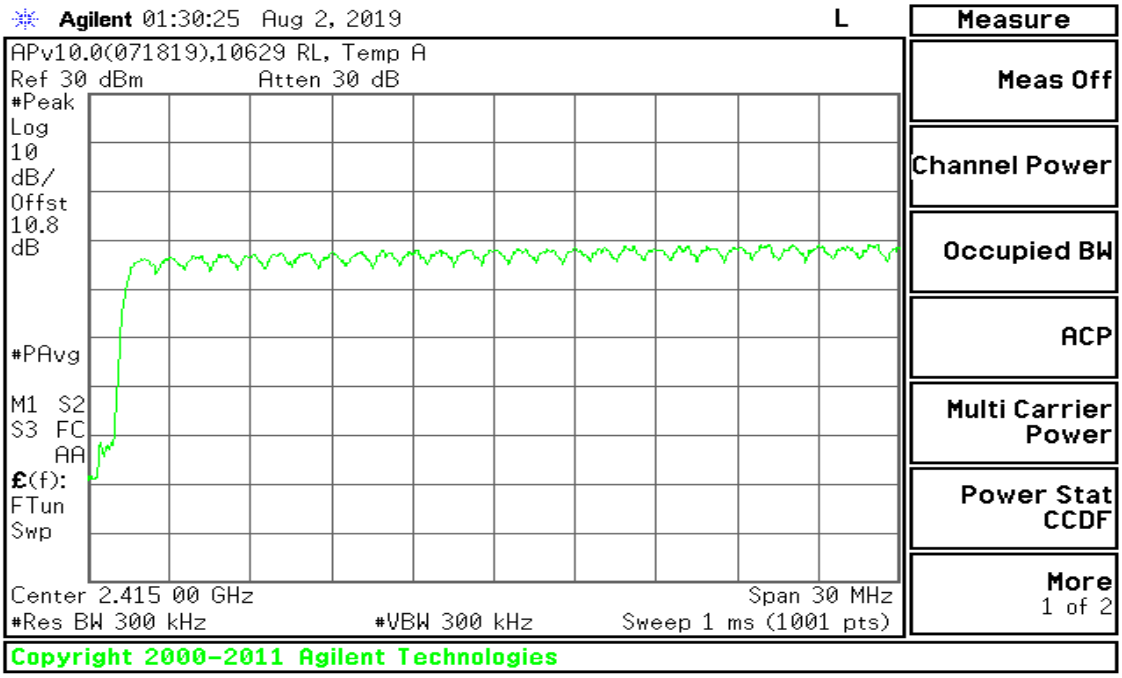
8.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

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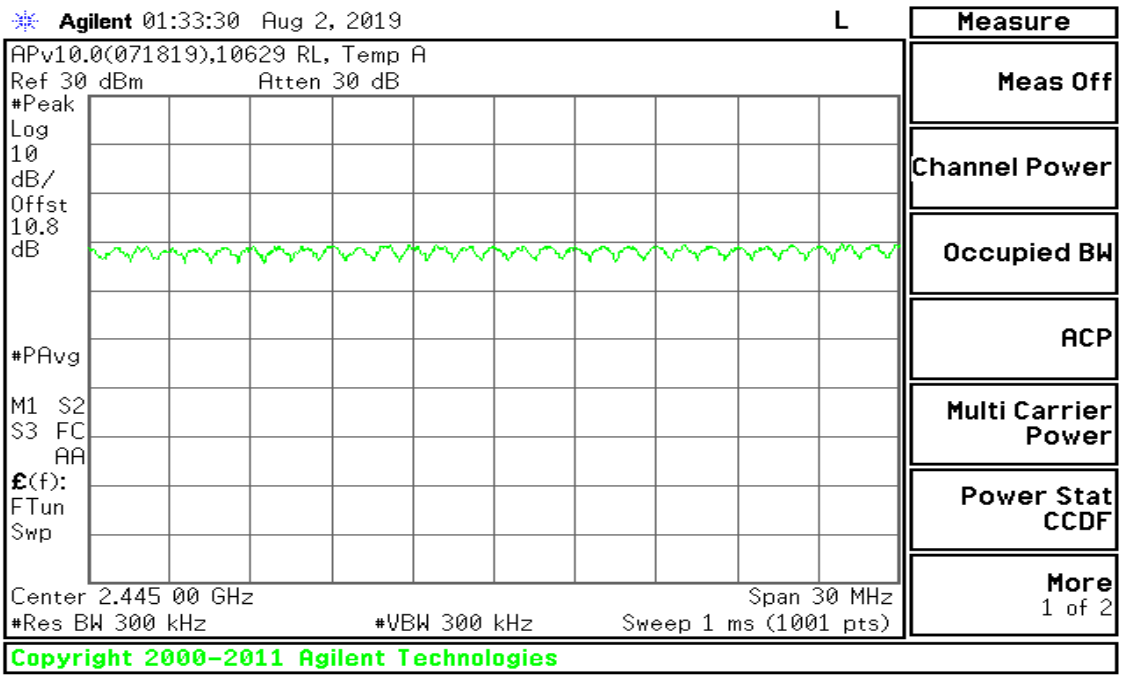
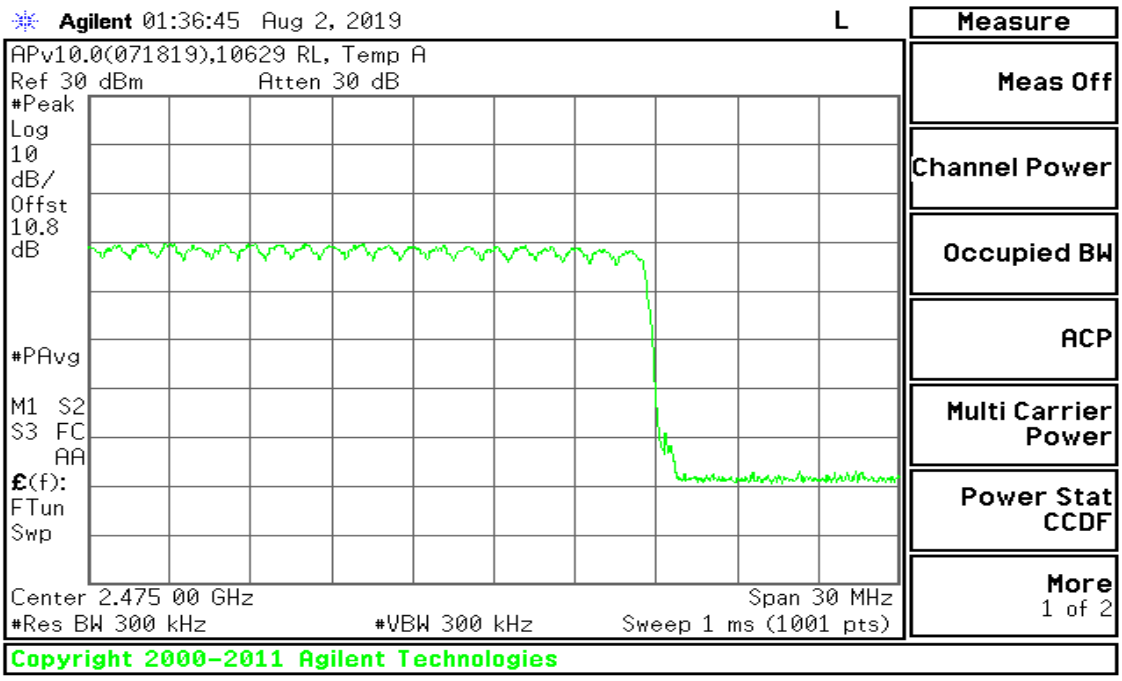


30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

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8.5. AVERAGE TIME OF OCCUPANCY

LIMITS

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 3.16 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

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8.5.1. BLUETOOTH 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	0.381	32	0.1219	0.4	-0.2781
DH3	1.636	15	0.2454	0.4	-0.1546
DH5	2.884	9	0.2596	0.4	-0.1404
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	0.381	8	0.03048	0.4	-0.3695
DH3	1.636	3.75	0.06135	0.4	-0.3387
DH5	2.884	2.25	0.06489	0.4	-0.3351

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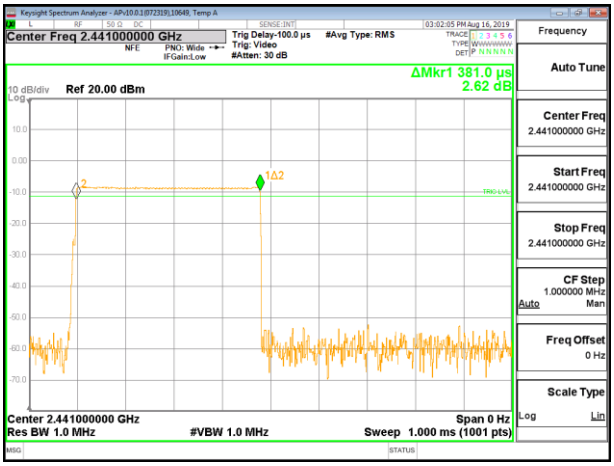
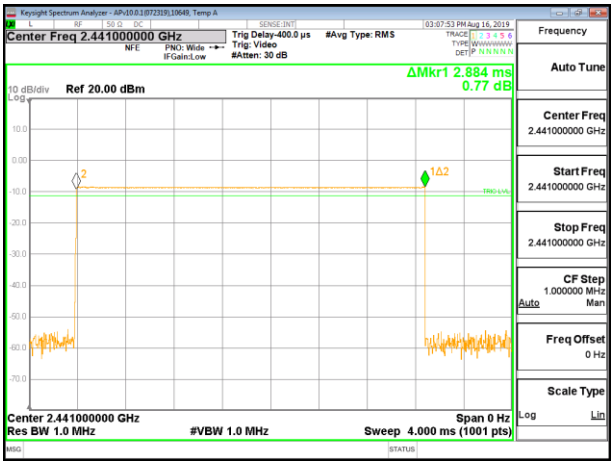
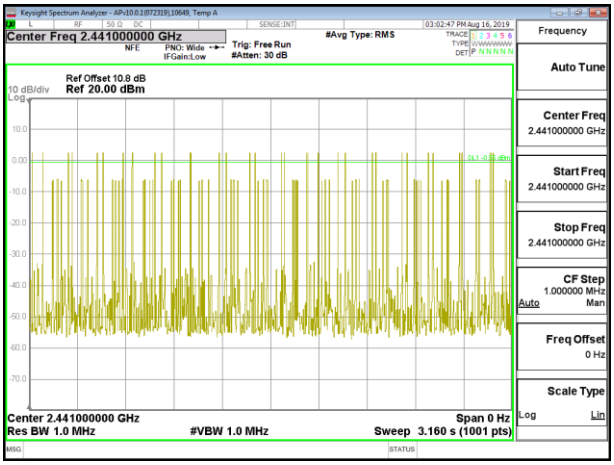


PULSE WIDTH – DH1

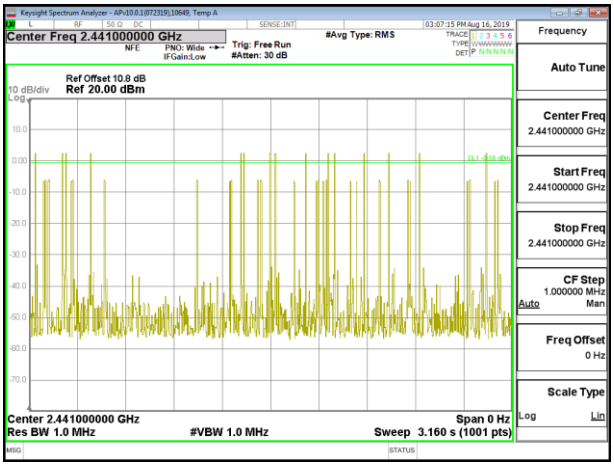
PULSE WIDTH – DH3



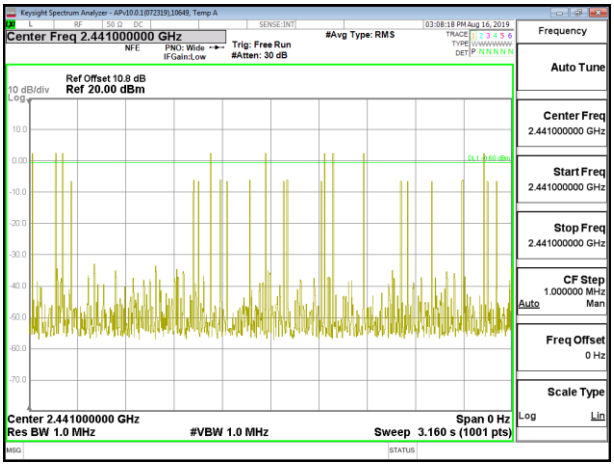
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

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8.5.2. BLUETOOTH 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					
3DH1	0.386	31	0.11966	0.4	-0.28034
3DH3	1.145	14	0.1603	0.4	-0.2397
3DH5	2.888	7	0.20216	0.4	-0.19784

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 demonstrates compliance with channel occupancy when AFH is employed.

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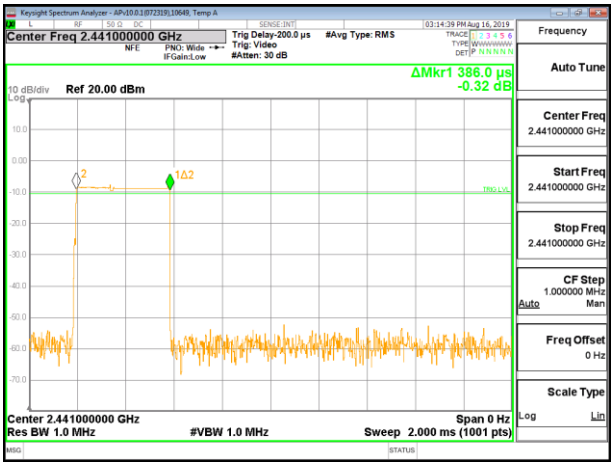
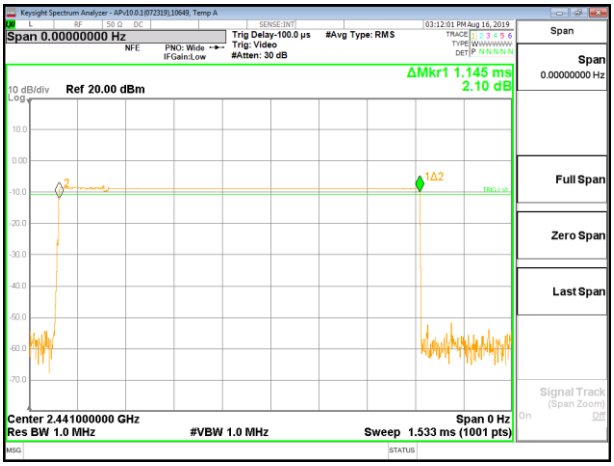
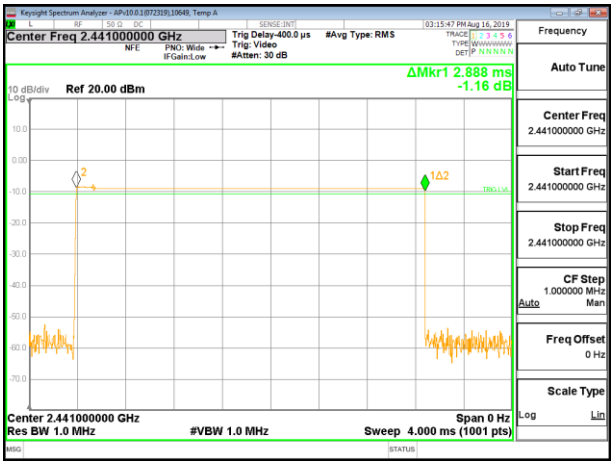


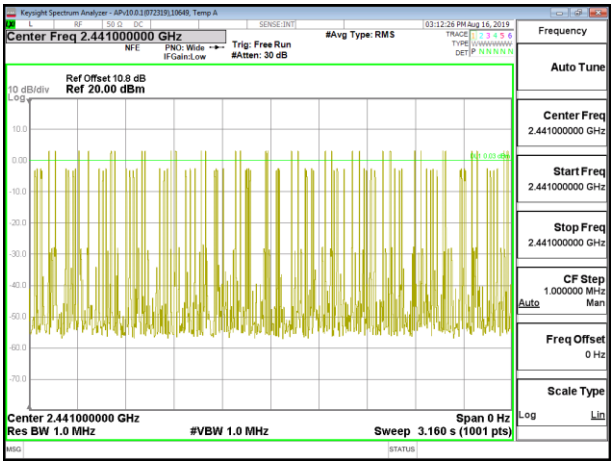
PULSE WIDTH – 3DH1



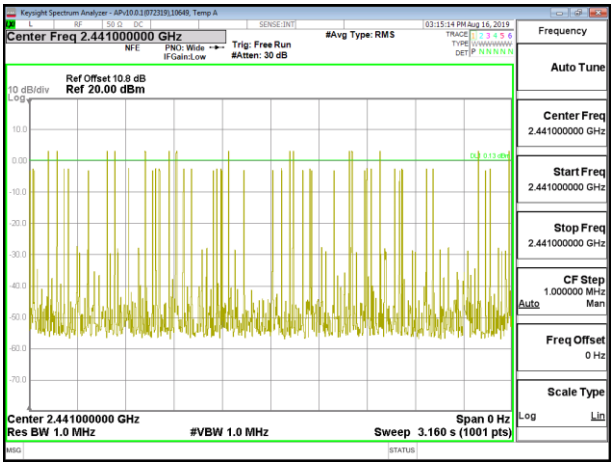
PULSE WIDTH – 3DH3



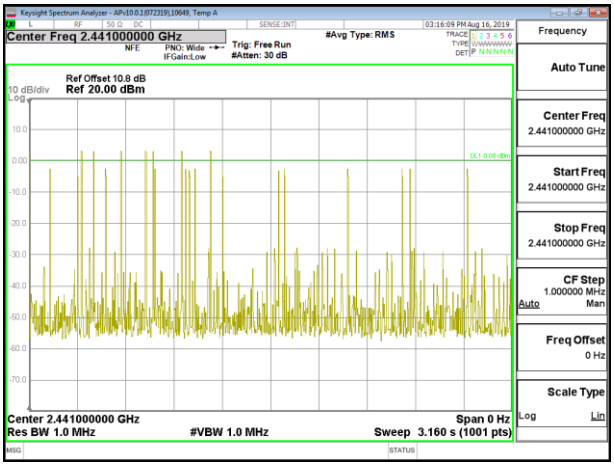
PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

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8.6. 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. 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.

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

The cable assembly insertion loss of was entered as an offset in the power meter to allow for a peak reading of power.

RESULTS

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8.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	10629 RL
Date:	8/2/2019

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	1.37	21	-19.63
Middle	2441	3.70	21	-17.3
High	2480	2.57	21	-18.43

8.6.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	10629 RL
Date:	8/2/2019

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.51	21	-17.49
Middle	2441	5.80	21	-15.2
High	2480	4.60	21	-16.4

8.6.3. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	10629 RL
Date:	8/2/2019

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.11	21	-17.89
Middle	2441	5.42	21	-15.58
High	2480	4.27	21	-16.73

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8.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

The cable assembly insertion loss of was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

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8.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	10629 RL
Date	8/2/2019

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	0.93
Middle	2441	3.36
High	2480	2.23

8.7.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	10629 RL
Date	8/2/2019

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	0.44
Middle	2441	2.90
High	2480	1.77

8.7.3. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	10629 RL
Date	8/2/2019

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	0.44
Middle	2441	2.90
High	2480	1.73

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8.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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

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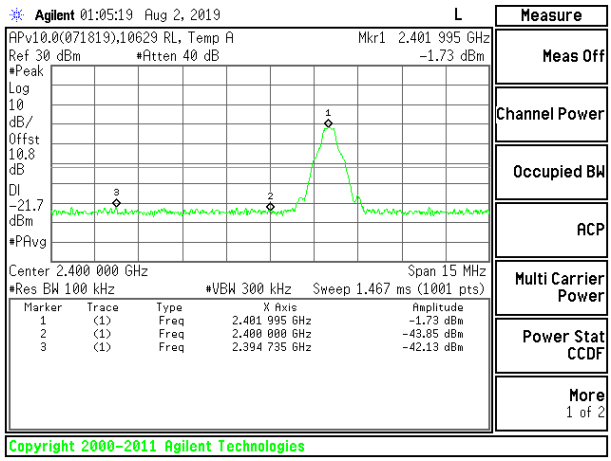
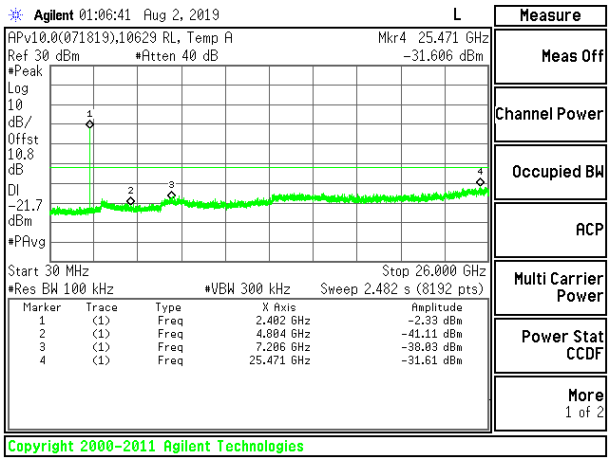
8.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

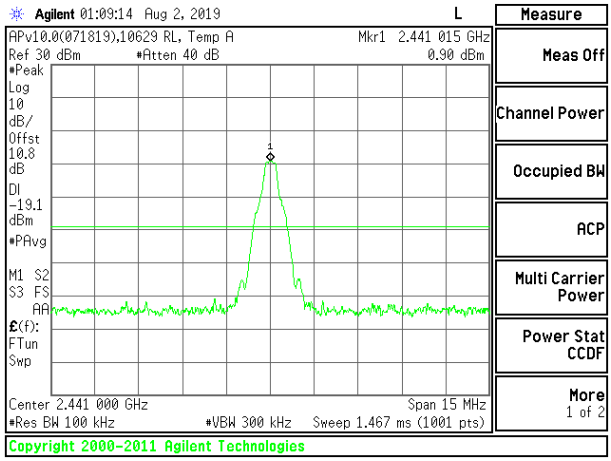
Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



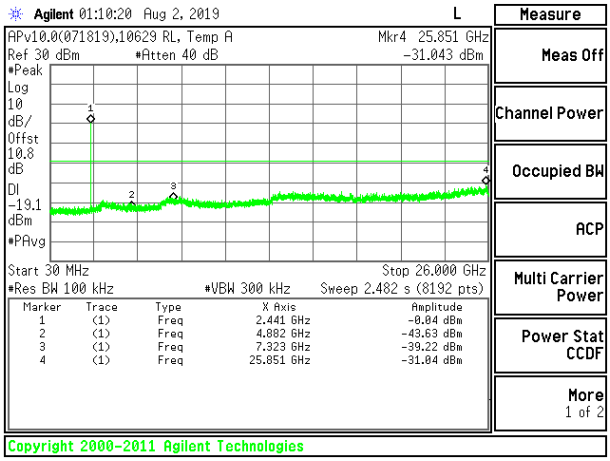
LOW CHANNEL BANDEDGE



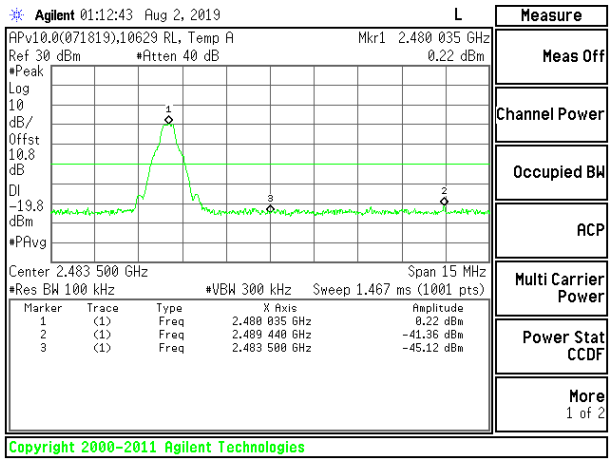
OUT-OF-BAND LOW CHANNEL



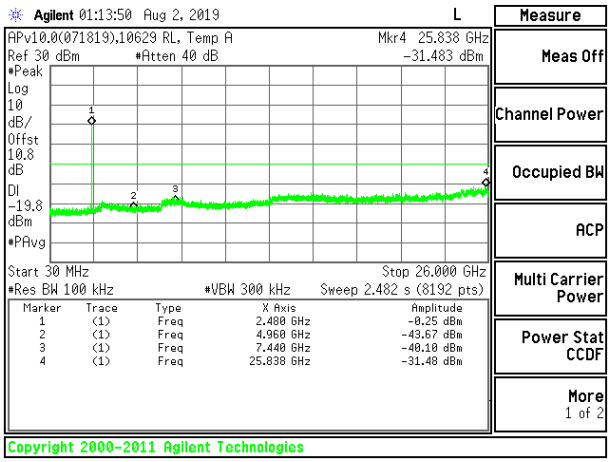
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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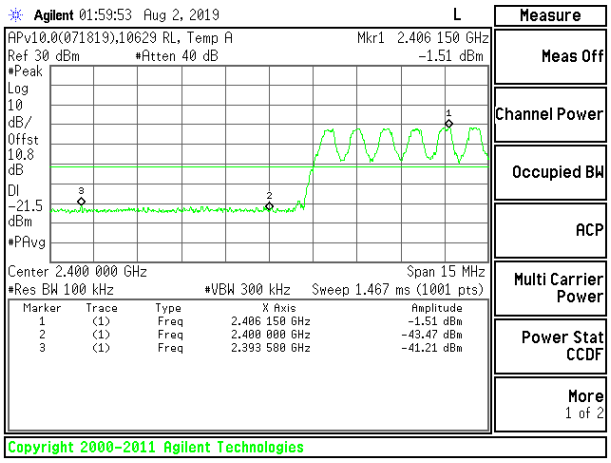
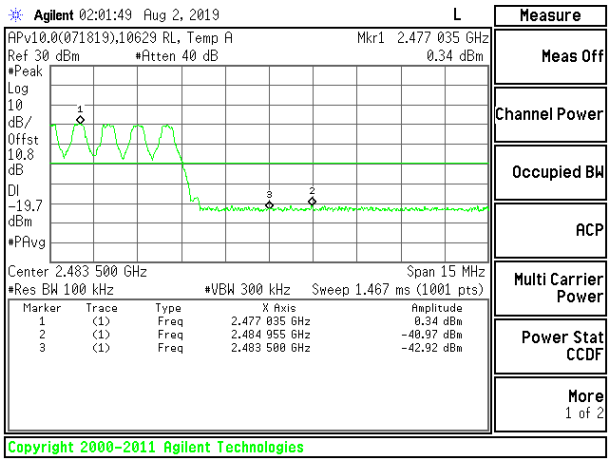
Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

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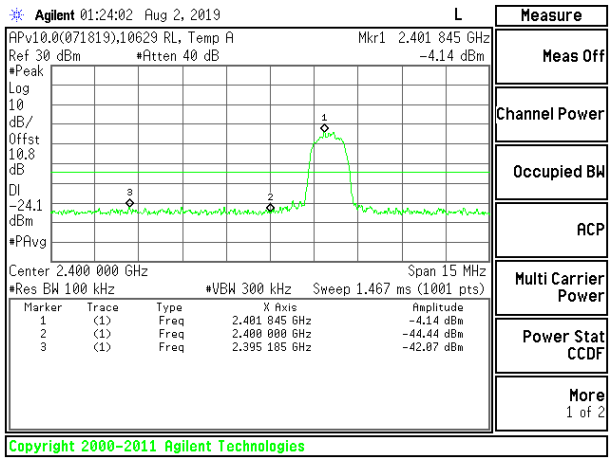
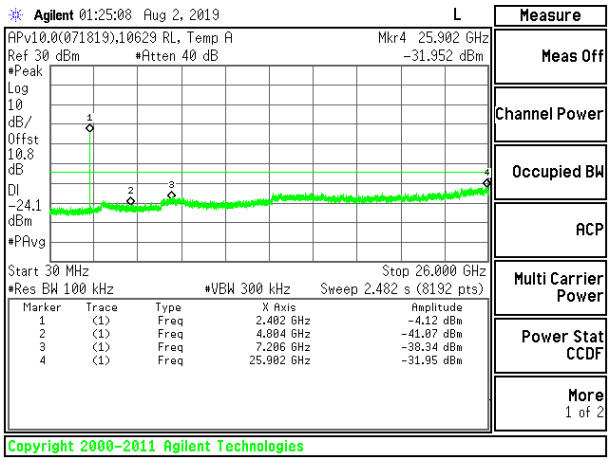
8.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

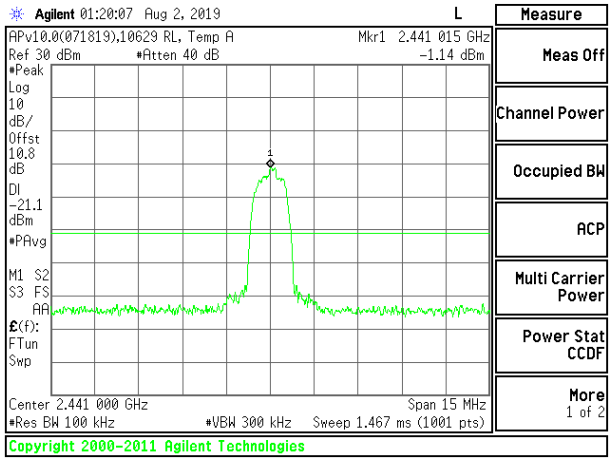
Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



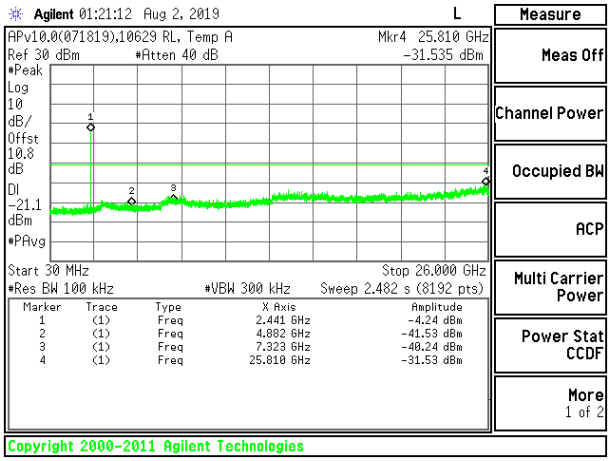
LOW CHANNEL BANDEDGE



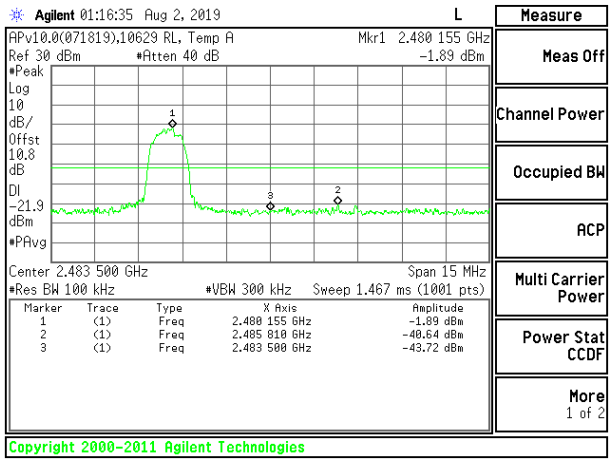
OUT-OF-BAND LOW CHANNEL



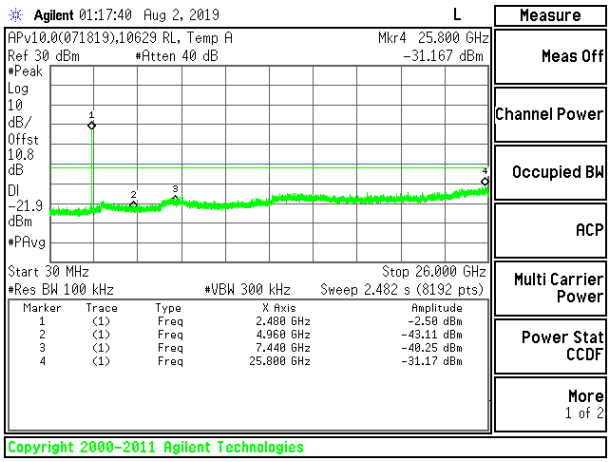
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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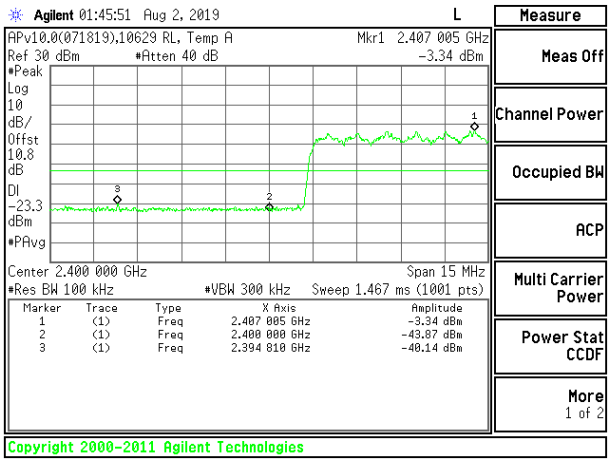
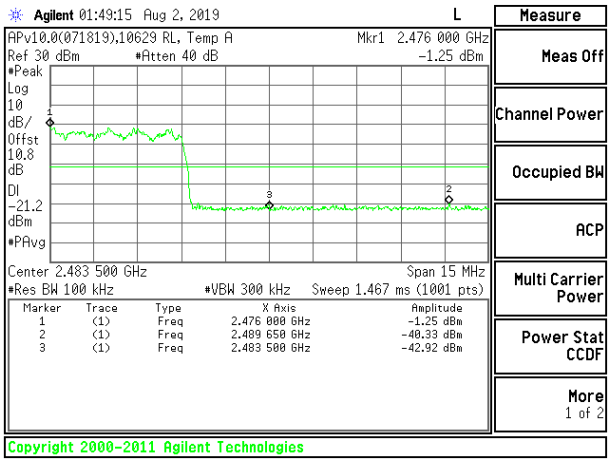
Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

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9. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

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 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 measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T 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 30MHz, 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.

2D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.

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KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

KDB 558074 D01 15.247 Meas Guidance v05r02

Use of a duty cycle correction factor (DCCF) is permitted for calculating average radiated field strength emission levels for an FHSS device in 15.247. This DCCF can be applied when the field strength limit (e.g., within a Government Restricted band) and the conditions specified in Section 15.35(c) can be satisfied. The average radiated field strength is calculated by subtracting the DCCF from the maximum radiated field strength level as determined through measurement. The maximum radiated field strength level represents the worst-case (maximum amplitude) RMS measurement of the emission(s) during continuous transmission (i.e., not including any time intervals during which the transmitter is off or is transmitting at a reduced power level). It is also acceptable to apply the DCCF to a measurement performed with a peak detector instead of the specified RMS power averaging detector. Note that Section 15.35(c) specifies that the DCCF shall represent the worst-case (greatest duty cycle) over any 100 msec transmission period.

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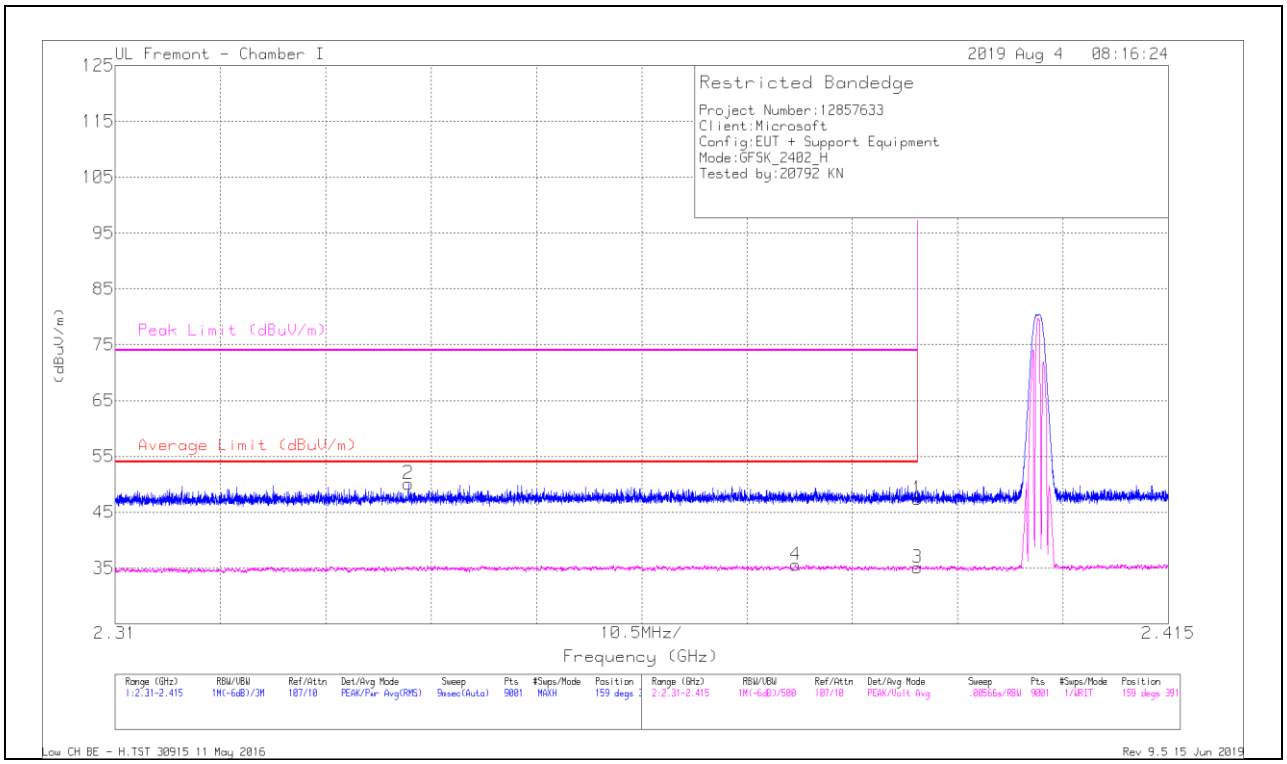
9.1. TRANSMITTER ABOVE 1 GHz

9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Flt r/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	2.38999	37.1	Pk	31.9	-21.6	47.4	-	-	74	-26.6	159	391	H
2	2.33923	39.99	Pk	31.6	-21.5	50.09	-	-	74	-23.91	159	391	H
3	2.38999	24.77	VA1T	31.9	-21.6	35.07	54	-18.93	-	-	159	391	H
4	2.37783	25.17	VA1T	31.9	-21.5	35.57	54	-18.43	-	-	159	391	H

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

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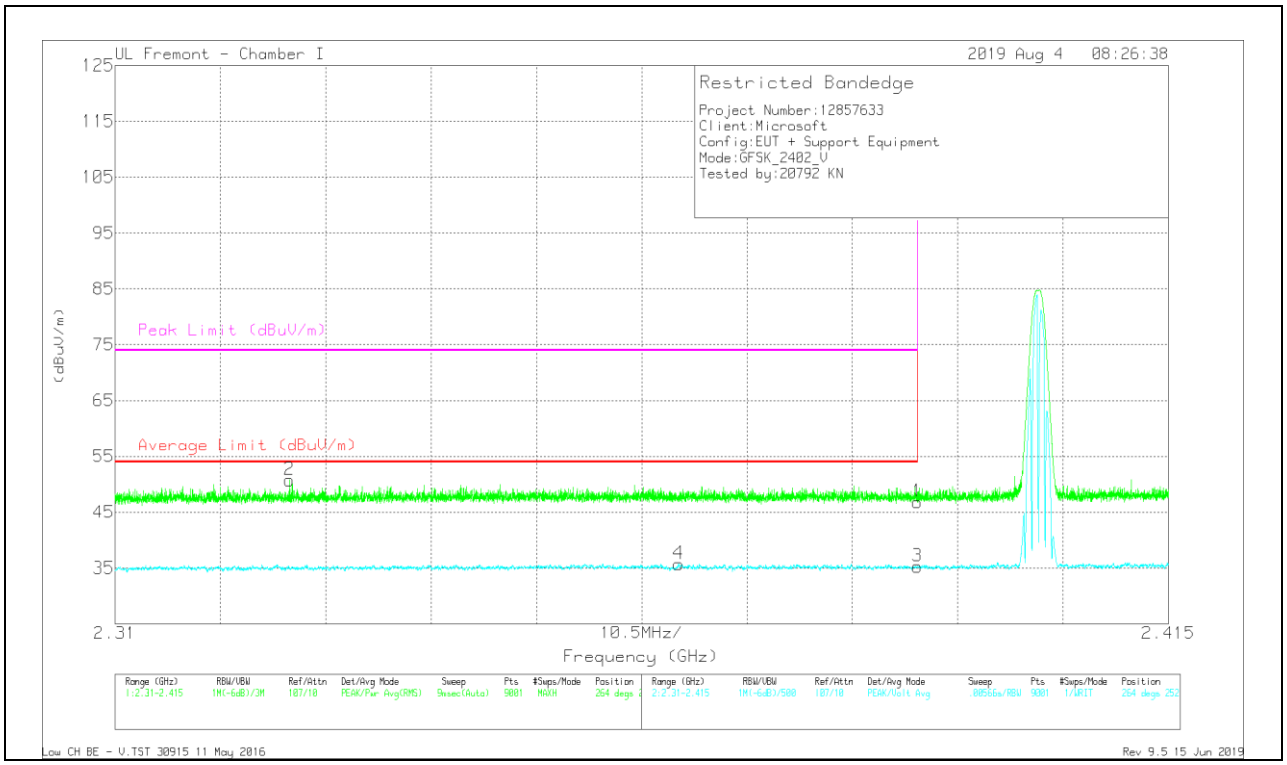
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Flt r/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	2.38999	36.55	Pk	31.9	-21.6	46.85	-	-	74	-27.15	264	252	V
2	2.32738	40.77	Pk	31.5	-21.5	50.77	-	-	74	-23.23	264	252	V
3	2.38999	24.98	VA1T	31.9	-21.6	35.28	54	-18.72	-	-	264	252	V
4	2.36618	25.45	VA1T	31.8	-21.5	35.75	54	-18.25	-	-	264	252	V

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

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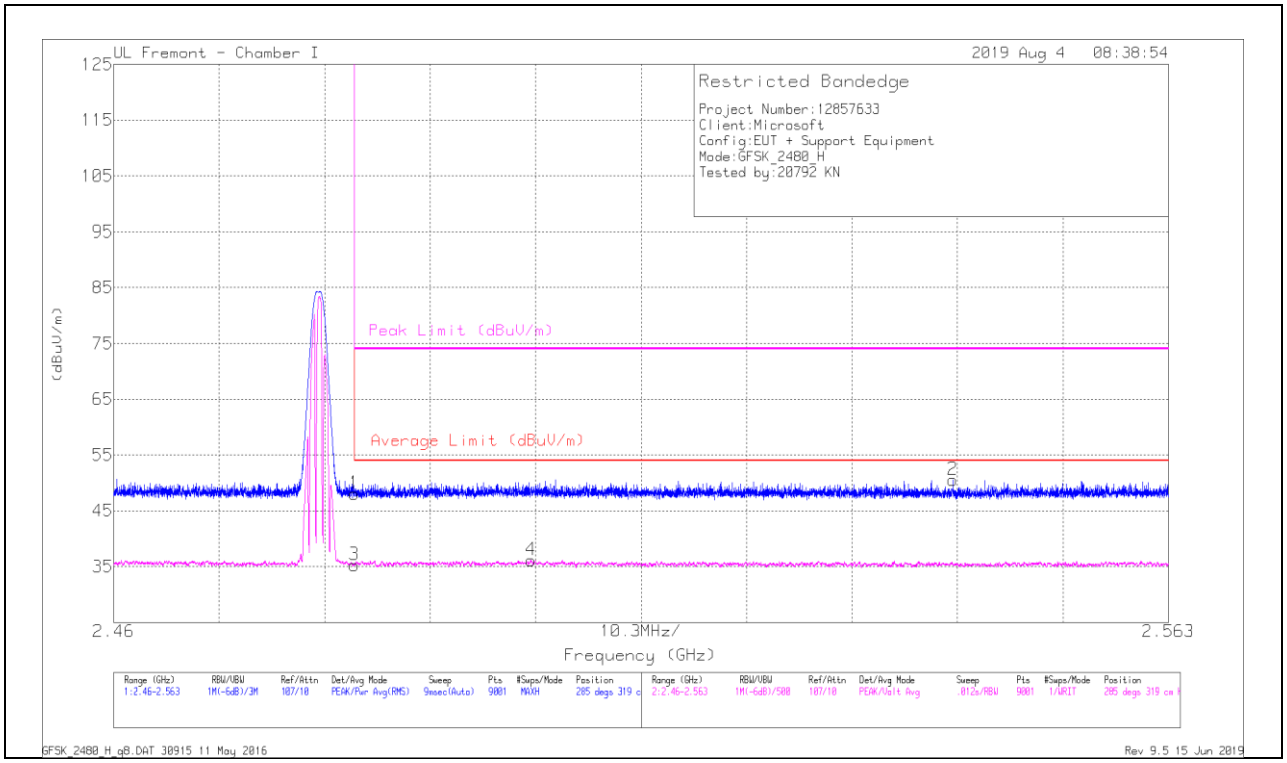
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



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	2.48351	37.36	Pk	32.4	-21.7	48.06	-	-	74	-25.94	285	319	H
2	2.54196	40.15	Pk	32.2	-21.8	50.55	-	-	74	-23.45	285	319	H
3	2.48351	24.55	VA1T	32.4	-21.7	35.25	54	-18.75	-	-	285	319	H
4	2.50073	25.54	VA1T	32.3	-21.7	36.14	54	-17.86	-	-	285	319	H

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

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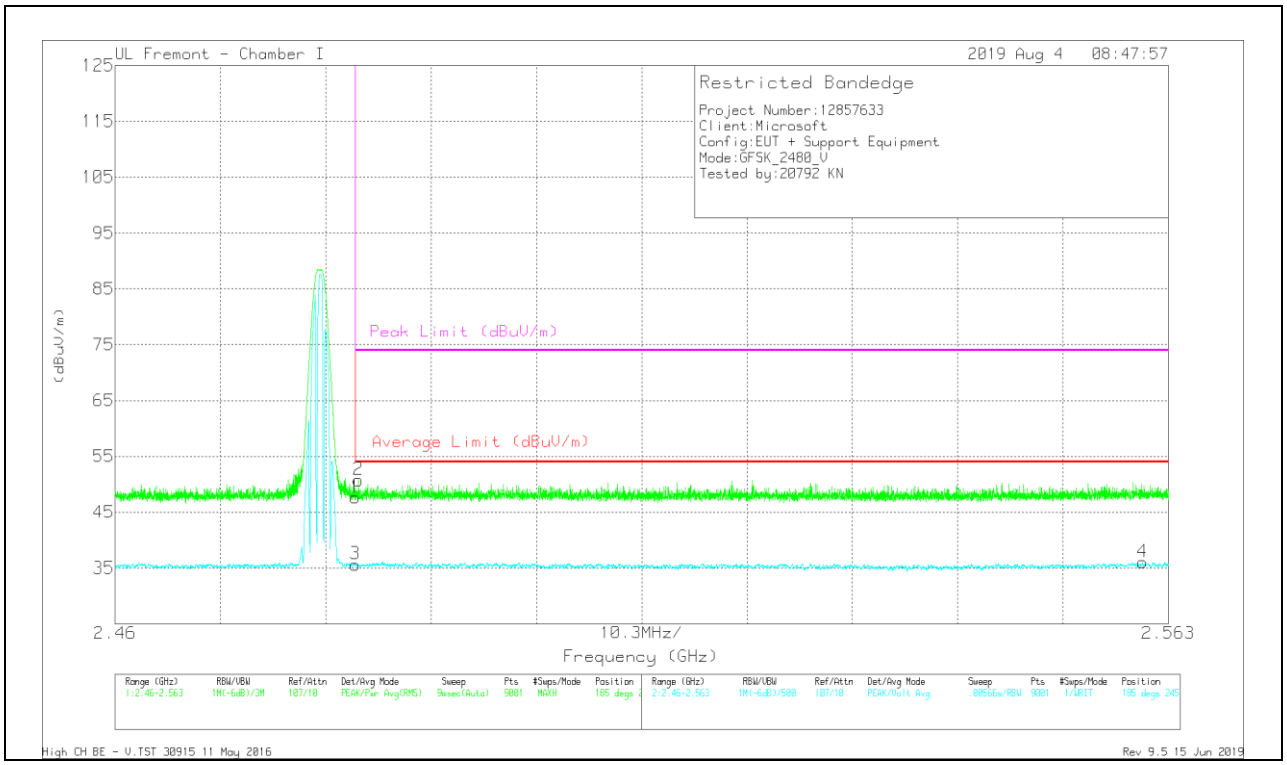
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Flt r/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	2.48351	36.94	Pk	32.4	-21.7	47.64	-	-	74	-26.36	185	245	V
2	2.48379	40.06	Pk	32.4	-21.7	50.76	-	-	74	-23.24	185	245	V
3	2.48351	24.93	VA1T	32.4	-21.7	35.63	54	-18.37	-	-	185	245	V
4	2.56047	25.37	VA1T	32.3	-21.6	36.07	54	-17.93	-	-	185	245	V

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

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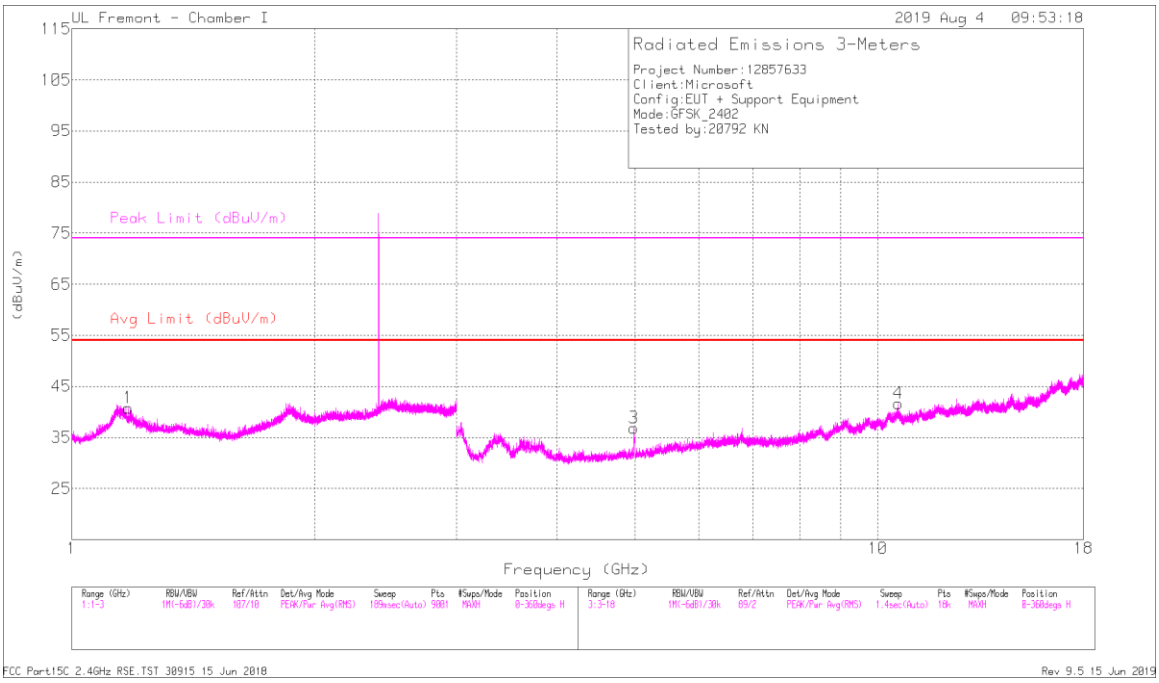
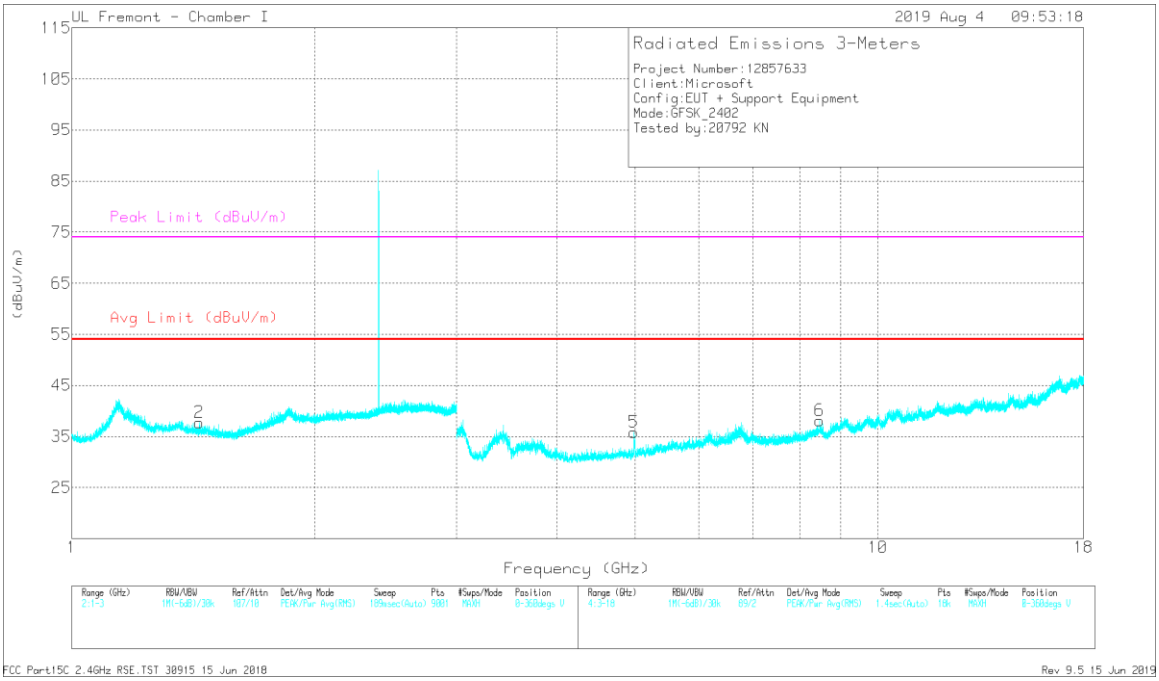
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	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
1	* 1.17666	45.96	PKFH	27.8	-23.2	50.56	-	-	74	-23.44	352	146	H
	* 1.17287	33.11	VA1T	27.7	-23.2	37.61	54	-16.39	-	-	352	146	H
2	* 1.439	39.54	PKFH	28.4	-23.4	44.54	-	-	74	-29.46	204	239	V
	* 1.43754	26.97	VA1T	28.4	-23.4	31.97	54	-22.03	-	-	204	239	V
3	* 4.97994	44.56	PKFH	34.1	-29.1	49.56	-	-	74	-24.44	122	165	H
	* 4.98226	24.32	VA1T	34.1	-29.1	29.32	54	-24.68	-	-	122	165	H
4	* 10.60908	30.35	PKFH	37.9	-20.1	48.15	-	-	74	-25.85	260	259	H
	* 10.60643	17.17	VA1T	37.9	-20.1	34.97	54	-19.03	-	-	260	259	H
5	* 4.97994	43.79	PKFH	34.1	-29.1	48.79	-	-	74	-25.21	297	178	V
	* 4.98353	23.98	VA1T	34.2	-29.1	29.08	54	-24.92	-	-	297	178	V
6	* 8.47295	31.84	PKFH	35.8	-23.2	44.44	-	-	74	-29.56	167	307	V
	* 8.47129	18.92	VA1T	35.8	-23.2	31.52	54	-22.48	-	-	167	307	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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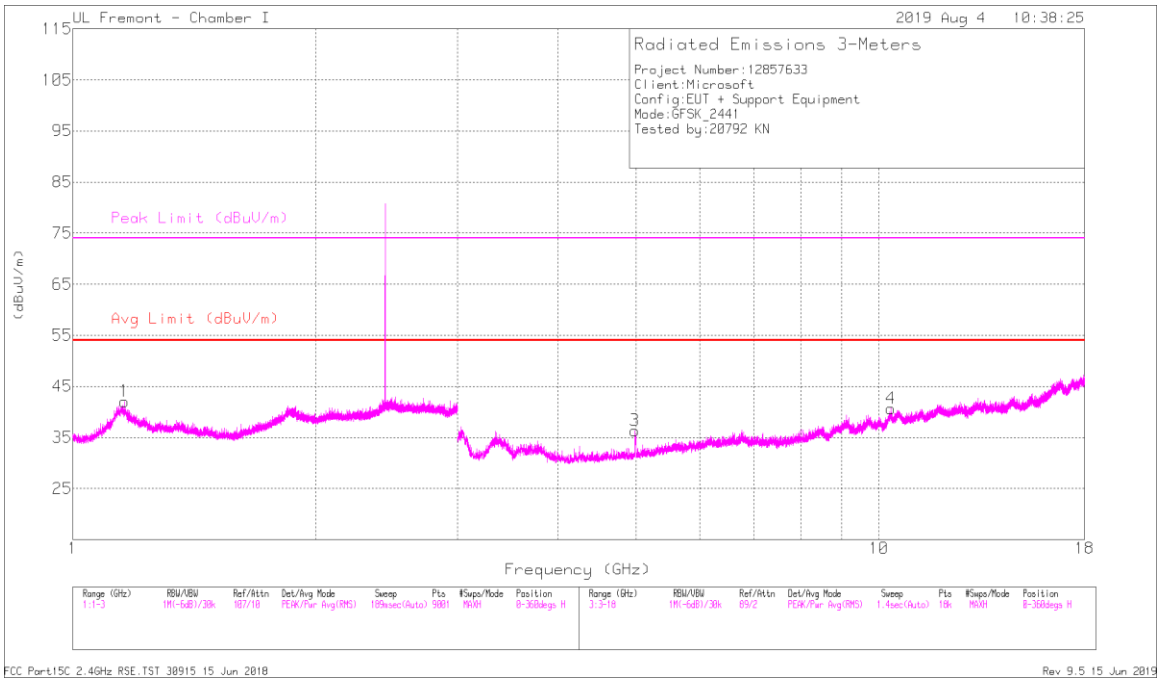
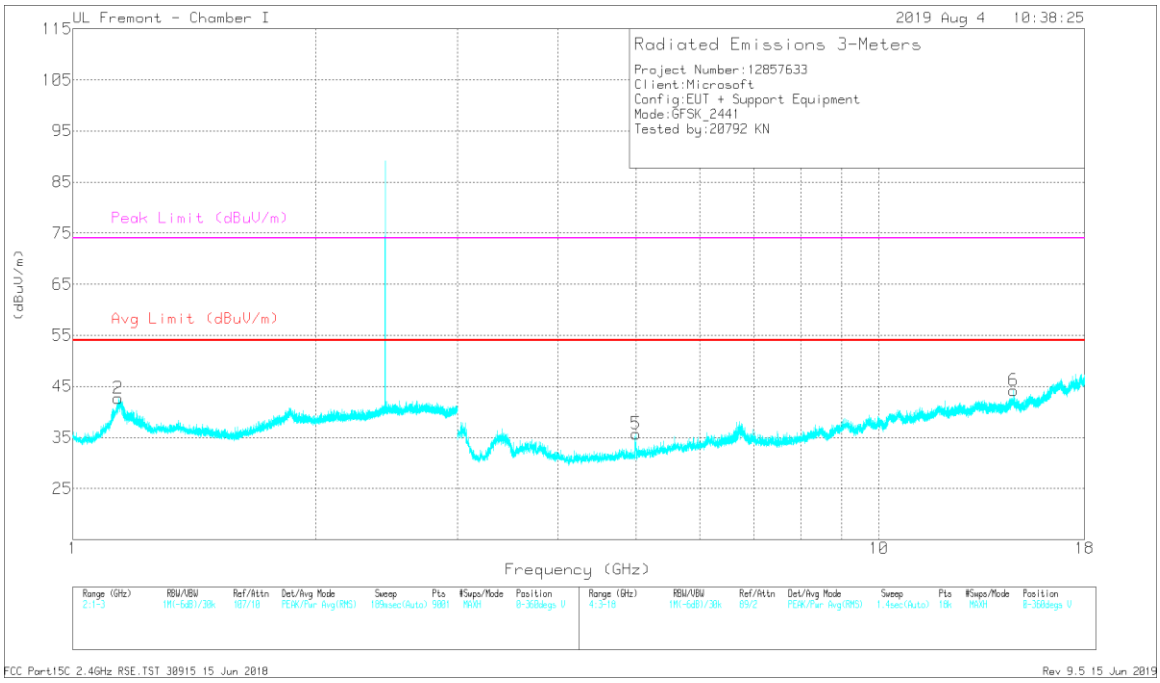
MID CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	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
1	* 1.15743	41.97	PKFH	27.6	-23.3	46.27	-	-	74	-27.73	268	234	H
	* 1.15901	29.58	VA1T	27.6	-23.3	33.88	54	-20.12	-	-	268	234	H
2	* 1.13853	48.46	PKFH	27.7	-23.4	52.76	-	-	74	-21.24	262	270	V
	* 1.13876	35.86	VA1T	27.7	-23.4	40.16	54	-13.84	-	-	262	270	V
3	* 4.9799	46.05	PKFH	34.1	-29.1	51.05	-	-	74	-22.95	113	144	H
	* 4.98068	24.21	VA1T	34.1	-29.1	29.21	54	-24.79	-	-	113	144	H
4	10.35231	30.44	PKFH	37.4	-20.5	47.34	-	-	-	-	40	116	H
5	* 4.99624	42.88	PKFH	34.2	-29.1	47.98	-	-	74	-26.02	301	201	V
	* 4.99666	23.56	VA1T	34.2	-29.1	28.66	54	-25.34	-	-	301	201	V
6	14.69611	31.73	PKFH	40	-21.4	50.33	-	-	-	-	181	130	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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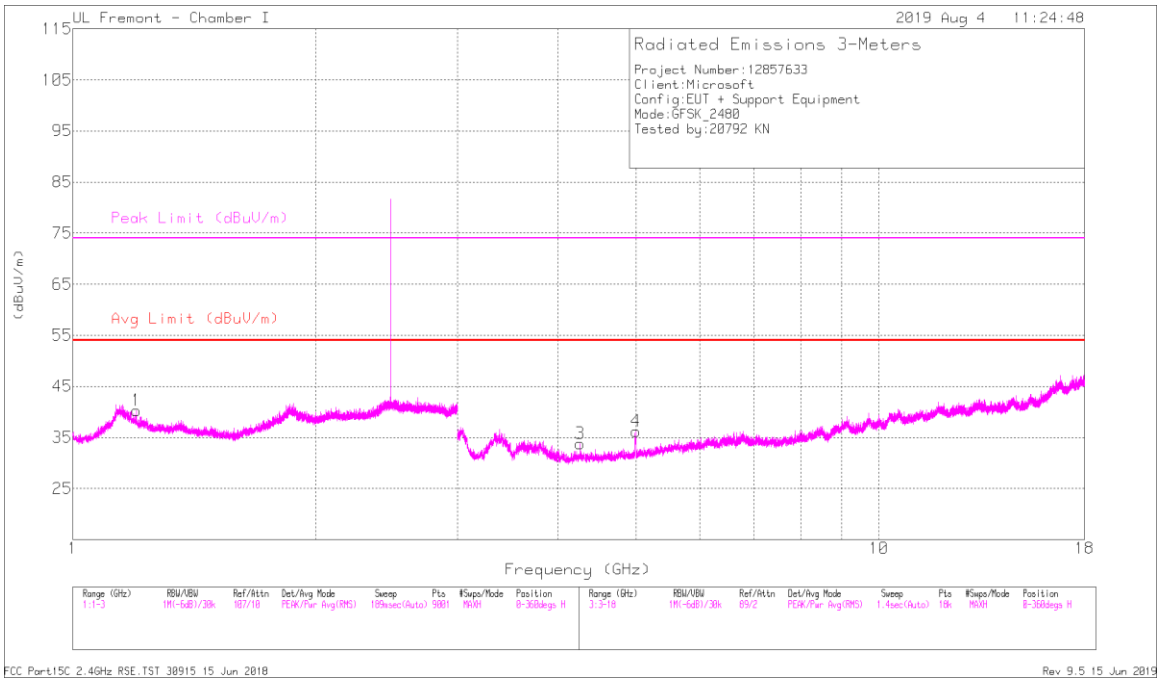
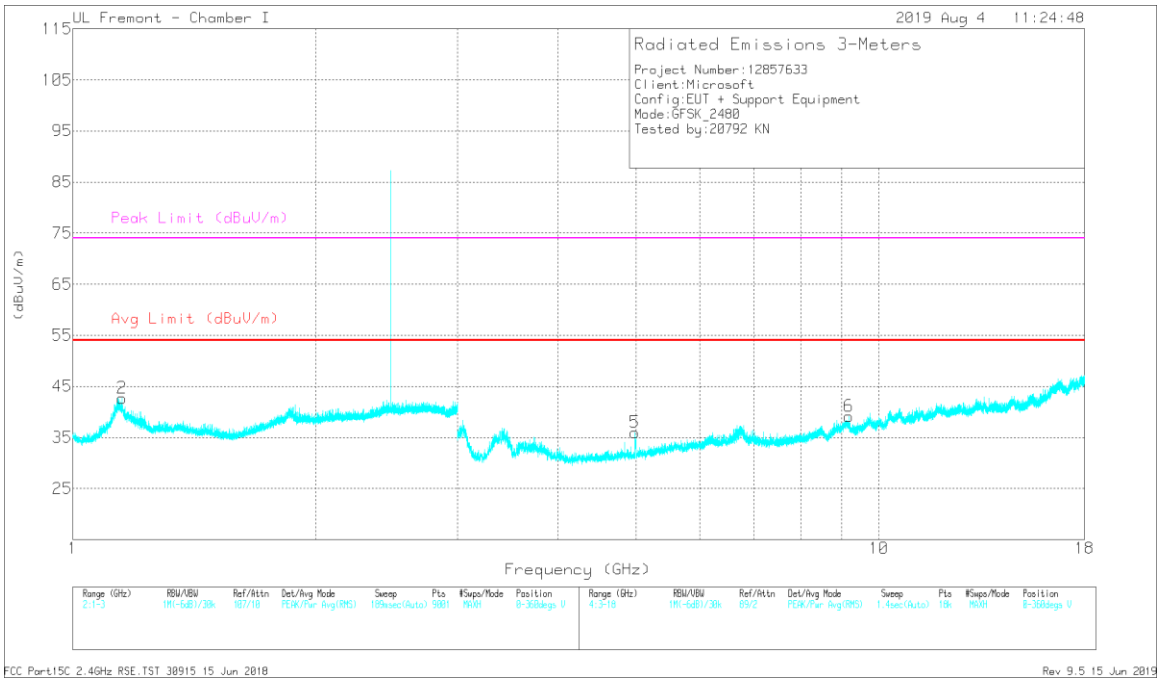
HIGH CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	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
1	* 1.19776	42.61	PKFH	28.4	-23	48.01	-	-	74	-25.99	203	179	H
	* 1.19825	28.65	VA1T	28.4	-23	34.05	54	-19.95	-	-	203	179	H
2	* 1.15125	41.95	PKFH	27.6	-23.3	46.25	-	-	74	-27.75	216	166	V
	* 1.15154	28.78	VA1T	27.6	-23.3	33.08	54	-20.92	-	-	216	166	V
3	* 4.26239	35.31	PKFH	33.5	-29	39.81	-	-	74	-34.19	21	156	H
	* 4.26149	22.86	VA1T	33.5	-29.1	27.26	54	-26.74	-	-	21	156	H
4	* 4.99961	44.55	PKFH	34.3	-29	49.85	-	-	74	-24.15	97	102	H
	* 4.99808	23.98	VA1T	34.3	-29	29.28	54	-24.72	-	-	97	102	H
5	* 4.98311	42.44	PKFH	34.2	-29.1	47.54	-	-	74	-26.46	298	180	V
	* 4.98172	23.79	VA1T	34.1	-29.1	28.79	54	-25.21	-	-	298	180	V
6	* 9.18622	31.19	PKFH	36.4	-21.6	45.99	-	-	74	-28.01	64	209	V
	* 9.18839	18.11	VA1T	36.4	-21.7	32.81	54	-21.19	-	-	64	209	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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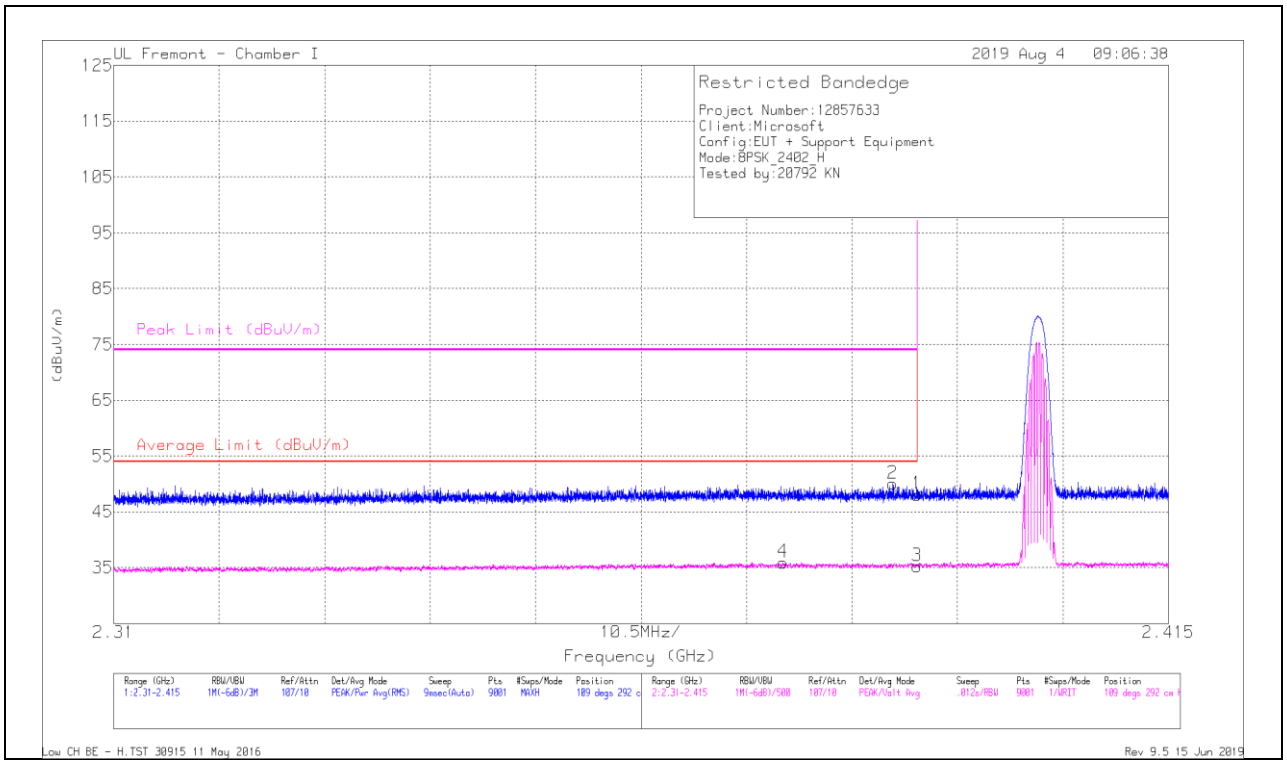
9.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Flt r/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	2.38999	37.82	Pk	31.9	-21.6	48.12	-	-	74	-25.88	109	292	H
2	2.38757	39.74	Pk	31.9	-21.6	50.04	-	-	74	-23.96	109	292	H
3	2.38999	24.94	VA1T	31.9	-21.6	35.24	54	-18.76	-	-	109	292	H
4	2.37662	25.55	VA1T	31.9	-21.5	35.95	54	-18.05	-	-	109	292	H

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

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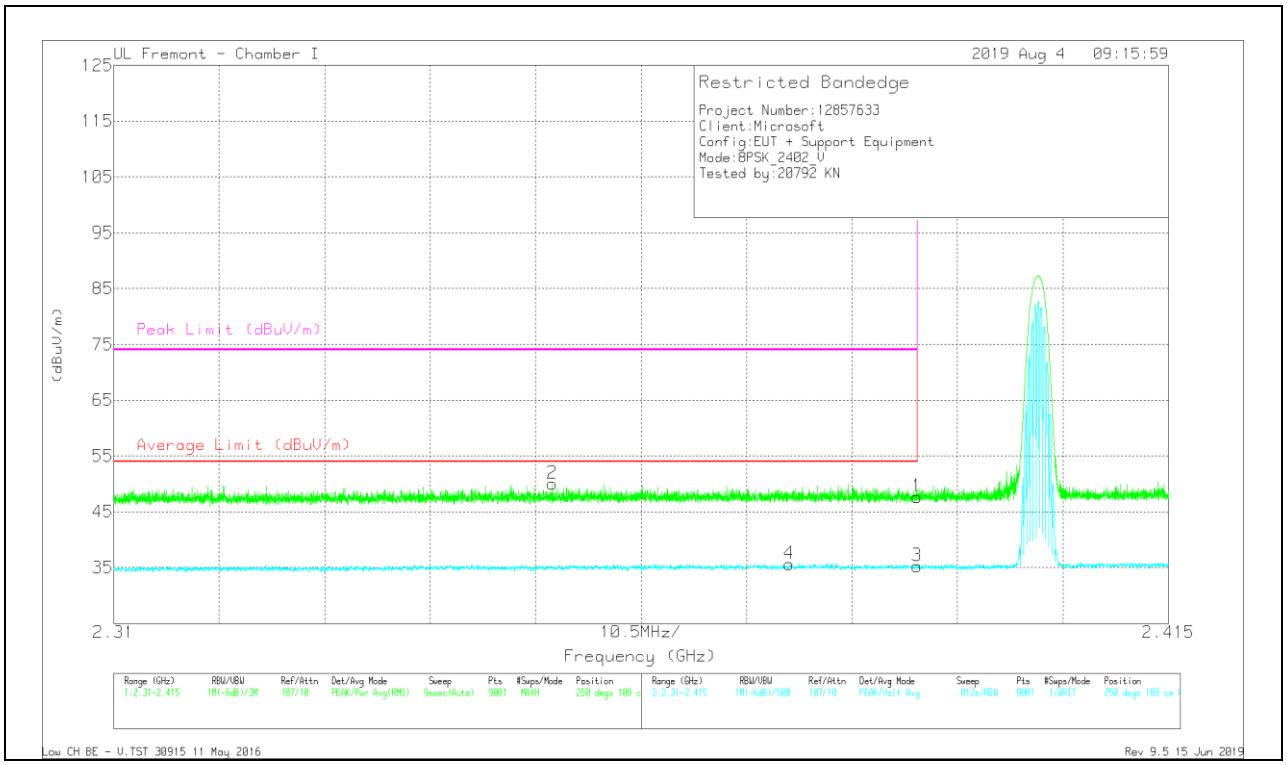
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Flt r/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	2.38999	37.33	Pk	31.9	-21.6	47.63	-	-	74	-26.37	250	188	V
2	2.35368	39.86	Pk	31.7	-21.5	50.06	-	-	74	-23.94	250	188	V
3	2.38999	24.95	VA1T	31.9	-21.6	35.25	54	-18.75	-	-	250	188	V
4	2.37726	25.27	VA1T	31.9	-21.5	35.67	54	-18.33	-	-	250	188	V

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

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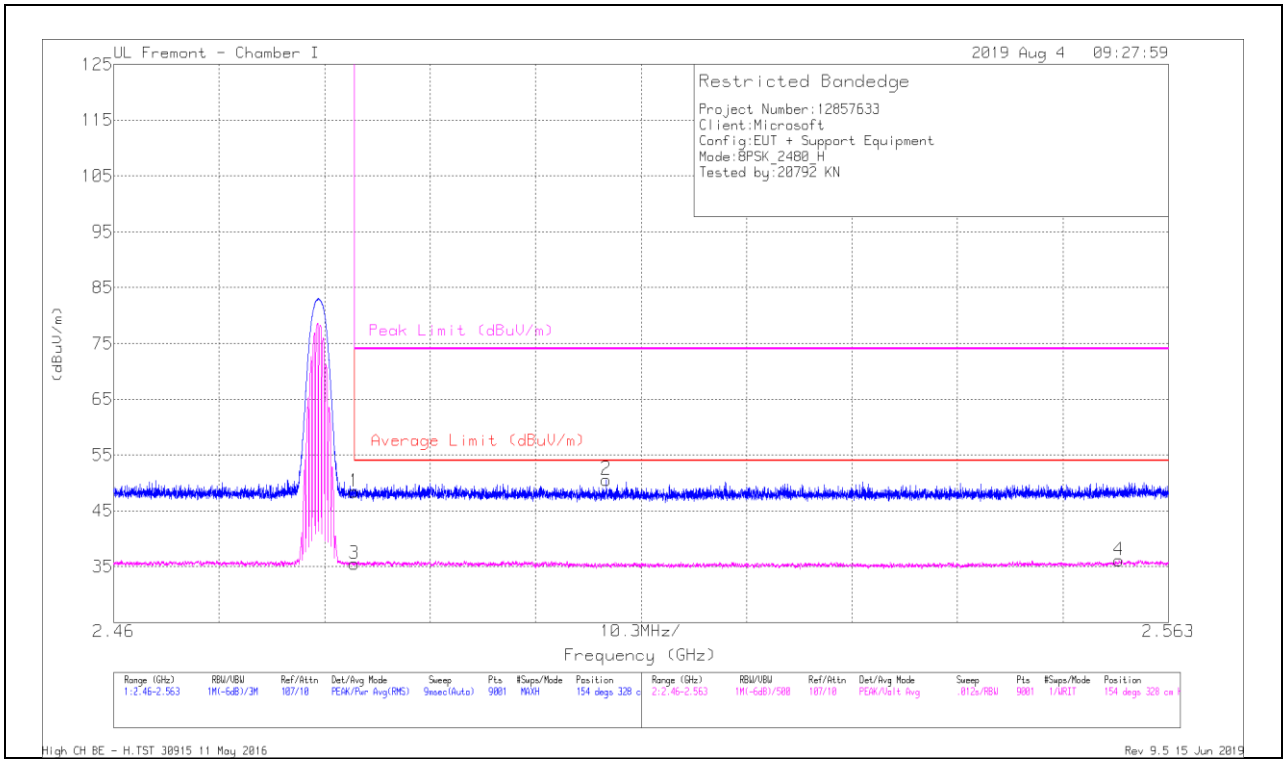
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Flt r/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	2.48351	37.73	Pk	32.4	-21.7	48.43	-	-	74	-25.57	154	328	H
2	2.50812	40.1	Pk	32.3	-21.8	50.6	-	-	74	-23.4	154	328	H
3	2.48351	24.77	VA1T	32.4	-21.7	35.47	54	-18.53	-	-	154	328	H
4	2.55818	25.45	VA1T	32.3	-21.6	36.15	54	-17.85	-	-	154	328	H

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

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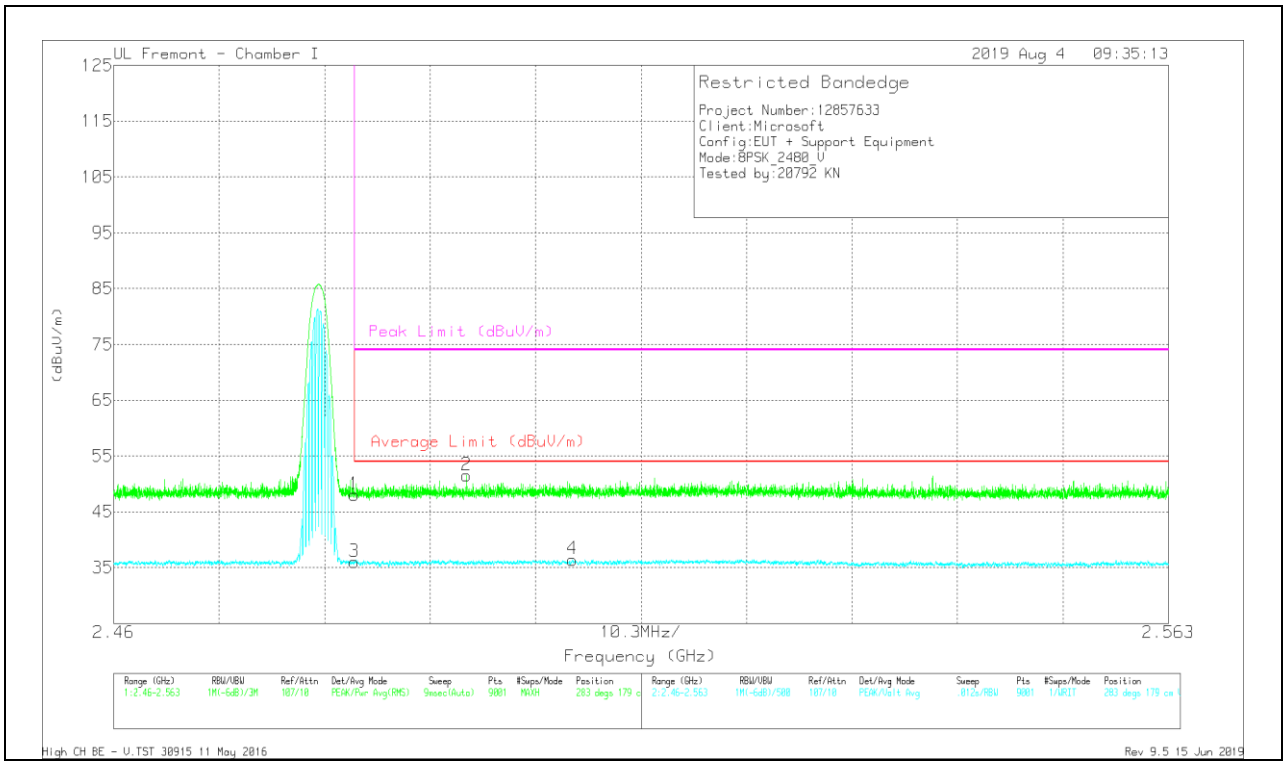
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Flt r/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	2.48351	37.31	Pk	32.4	-21.7	48.01	-	-	74	-25.99	283	179	V
2	2.49446	41.07	Pk	32.3	-21.8	51.57	-	-	74	-22.43	283	179	V
3	2.48351	25.3	VA1T	32.4	-21.7	36	54	-18	-	-	283	179	V
4	2.5048	25.95	VA1T	32.3	-21.8	36.45	54	-17.55	-	-	283	179	V

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

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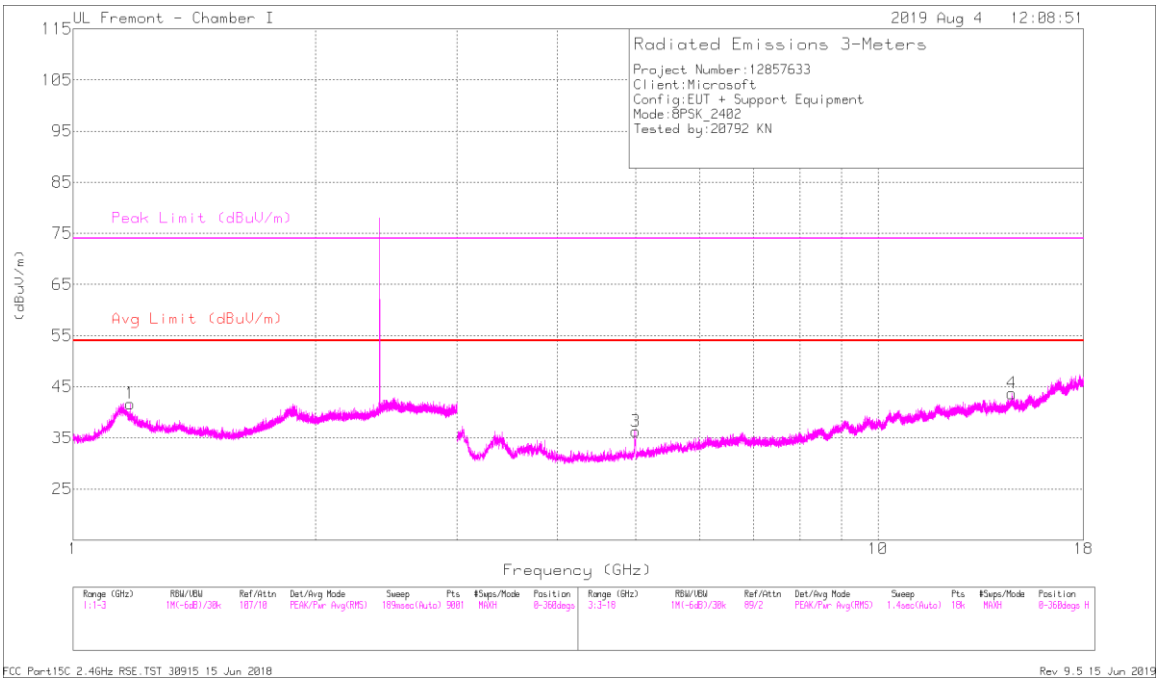
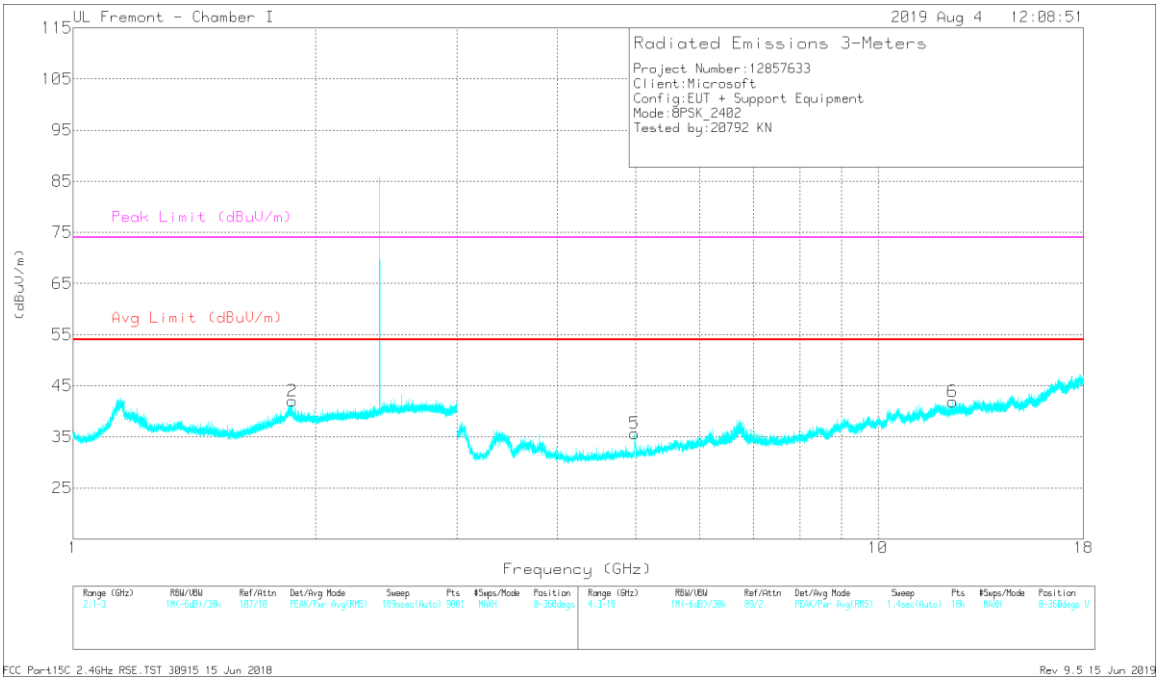
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	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
1	* 1.17788	45.75	PKFH	27.9	-23.2	50.45	-	-	74	-23.55	347	139	H
	* 1.17559	32.13	VA1T	27.8	-23.2	36.73	54	-17.27	-	-	347	139	H
2	1.87206	41.99	PKFH	30.9	-22.3	50.59	-	-	-	-	293	226	V
3	* 4.9967	43.64	PKFH	34.2	-29.1	48.74	-	-	74	-25.26	97	154	H
	* 4.99579	24.06	VA1T	34.2	-29.1	29.16	54	-24.84	-	-	97	154	H
4	14.65668	31.62	PKFH	40	-21.3	50.32	-	-	-	-	37	141	H
5	* 4.98159	43.73	PKFH	34.1	-29.1	48.73	-	-	74	-25.27	298	225	V
	* 4.98283	23.99	VA1T	34.1	-29.1	28.99	54	-25.01	-	-	298	225	V
6	* 12.37802	30.27	PKFH	39	-21.1	48.17	-	-	74	-25.83	343	198	V
	* 12.37619	18.06	VA1T	39	-21.1	35.96	54	-18.04	-	-	343	198	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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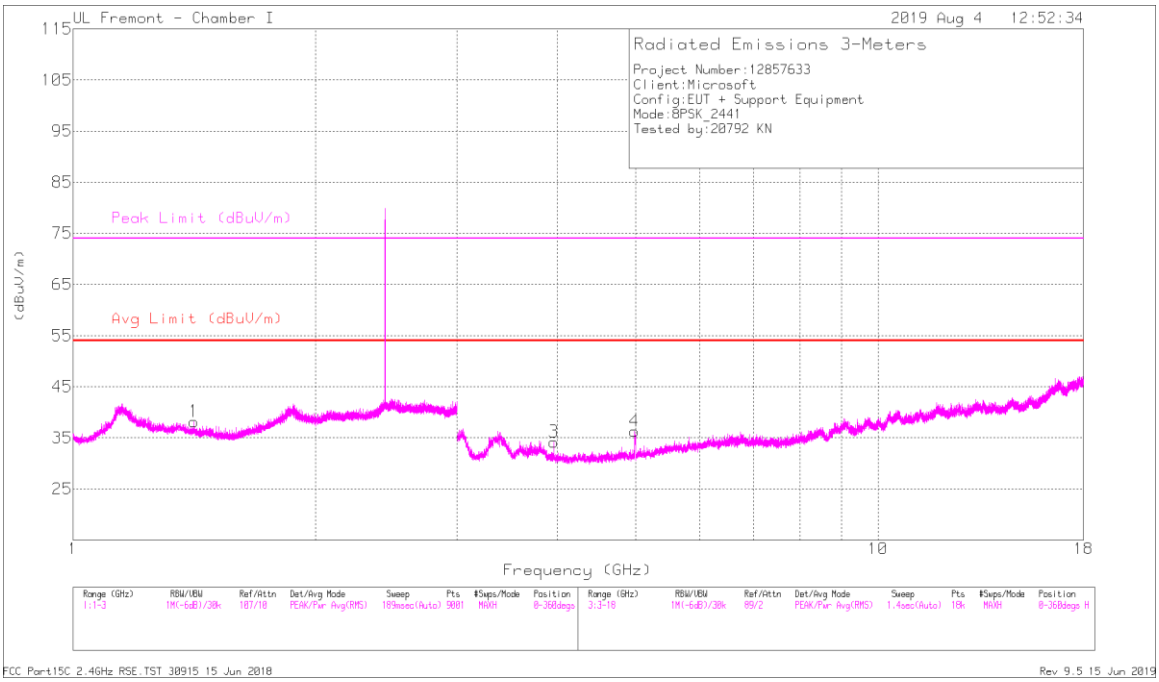
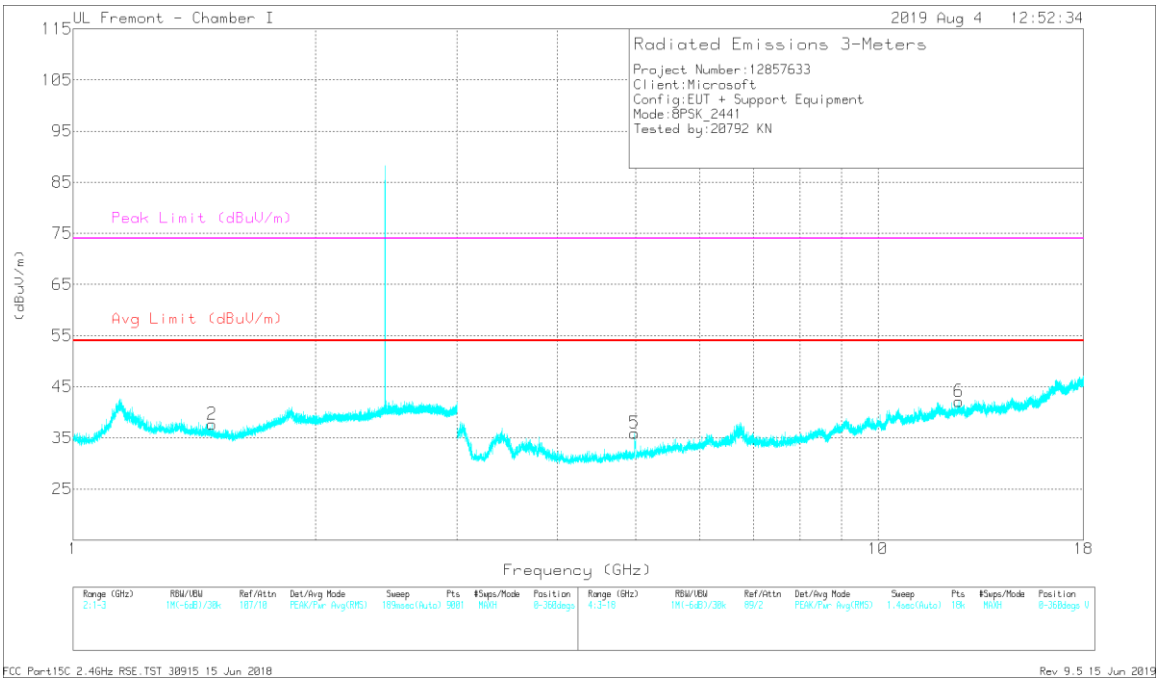
MID CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	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
1	* 1.40939	39.56	PKFH	28.8	-23.3	45.06	-	-	74	-28.94	200	202	H
	* 1.41844	26.54	VA1T	28.7	-23.3	31.94	54	-22.06	-	-	200	202	H
2	* 1.49284	40.34	PKFH	28	-23.4	44.94	-	-	74	-29.06	156	230	V
	* 1.48512	27.22	VA1T	28.2	-23.5	31.92	54	-22.08	-	-	156	230	V
3	* 3.95545	36.83	PKFH	33.3	-29.9	40.23	-	-	74	-33.77	84	138	H
	* 3.95265	24.21	VA1T	33.3	-30	27.51	54	-26.49	-	-	84	138	H
4	* 4.98014	45.22	PKFH	34.1	-29.1	50.22	-	-	74	-23.78	108	143	H
	* 4.98135	24.27	VA1T	34.1	-29.1	29.27	54	-24.73	-	-	108	143	H
5	* 4.97988	43.68	PKFH	34.1	-29.1	48.68	-	-	74	-25.32	294	199	V
	* 4.9825	24.22	VA1T	34.1	-29.1	29.22	54	-24.78	-	-	294	199	V
6	* 12.5925	30.61	PKFH	39	-21.2	48.41	-	-	74	-25.59	281	160	V
	* 12.5948	18.27	VA1T	39.1	-21.2	36.17	54	-17.83	-	-	281	160	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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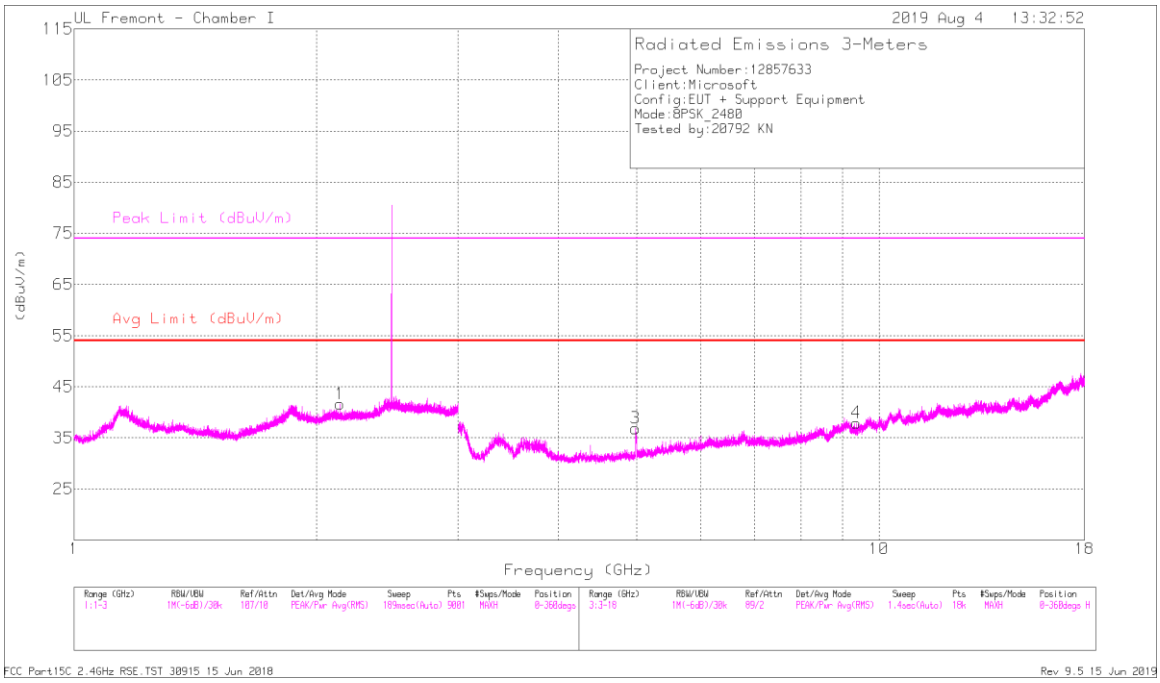
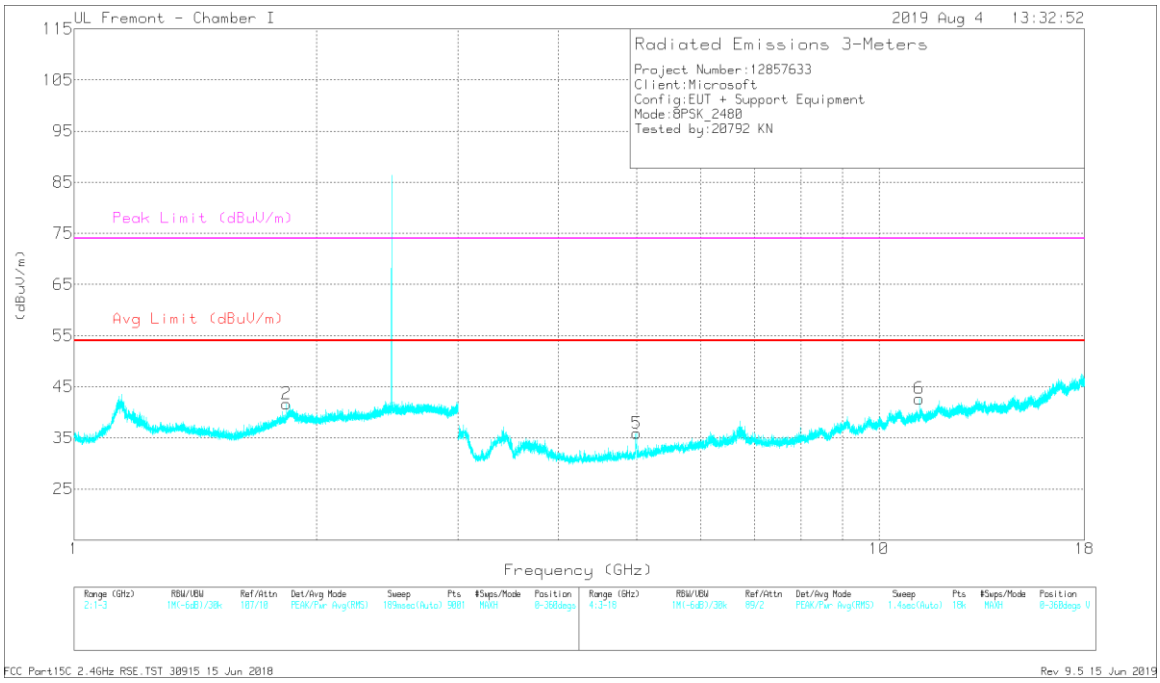
HIGH CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	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
1	2.13927	40.05	PKFH	31.1	-22.1	49.05	-	-	-	-	338	163	H
2	1.83476	38.15	PKFH	30.7	-22.2	46.65	-	-	-	-	105	206	V
3	* 4.97997	45.78	PKFH	34.1	-29.1	50.78	-	-	74	-23.22	98	124	H
	* 4.98342	24.47	VA1T	34.2	-29.1	29.57	54	-24.43	-	-	98	124	H
4	* 9.36842	30.81	PKFH	36.4	-22.1	45.11	-	-	74	-28.89	167	215	H
	* 9.36797	17.47	VA1T	36.4	-22.1	31.77	54	-22.23	-	-	167	215	H
5	* 4.99581	42.76	PKFH	34.2	-29.1	47.86	-	-	74	-26.14	291	196	V
	* 4.99594	23.79	VA1T	34.2	-29.1	28.89	54	-25.11	-	-	291	196	V
6	* 11.22016	32.44	PKFH	38	-20.5	49.94	-	-	74	-24.06	213	211	V
	* 11.21993	24.25	VA1T	38	-20.5	41.75	54	-12.25	-	-	213	211	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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9.2. SPURIOUS EMISSIONS FOR COLLOCATION

TEST-CASE CONDITIONS

Test Case #	Antenna	Mode	Frequency (MHz)
1	Antenna 1	BT, 8PSK & WLAN 5GHz, 11n HT20	2441 & 5500
2	Antenna 1	BT, 8PSK	2441
	Antenna 2	WLAN 2.4GHz, 11g	2437
3	Antenna 1	BT, 8PSK	2441
	Antenna 2	WLAN 5GHz, 11n HT20	5500

For simultaneous transmission of any BT 8PSK (2.4GHz) and WLAN (2.4 GHz) bands, and BT 8PSK (2.4GHz) and WLAN (5GHz) bands on different antennas, investigation has been performed and no noticeable new emission was found.

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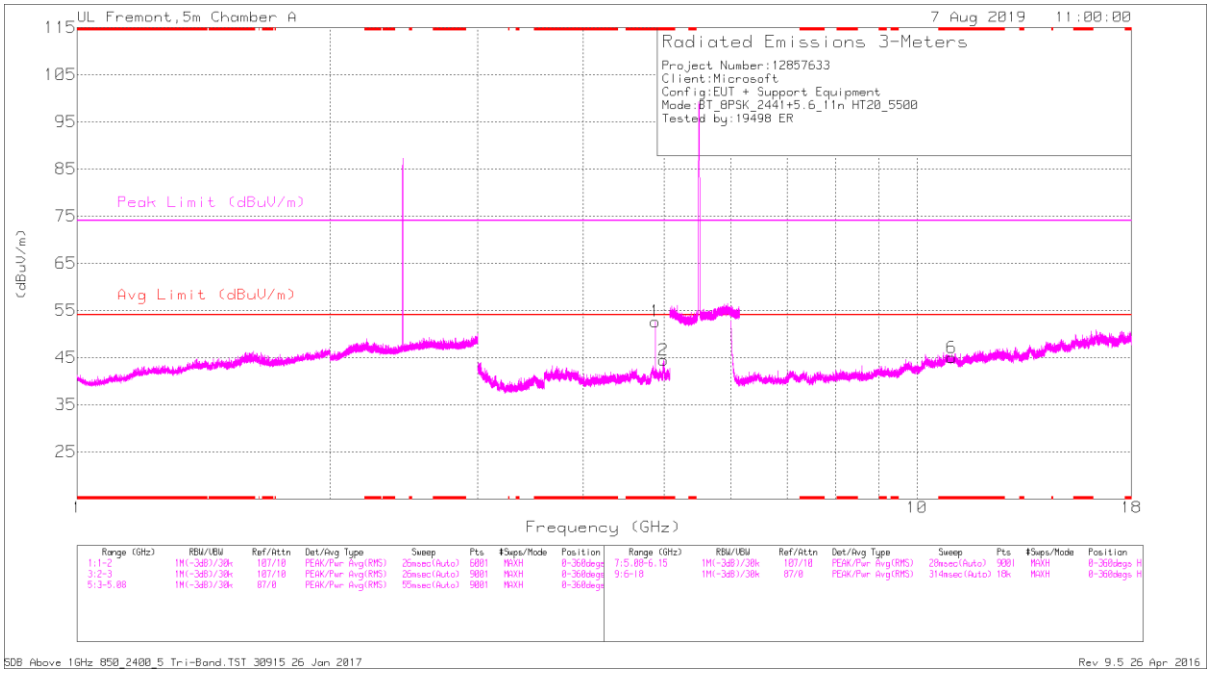
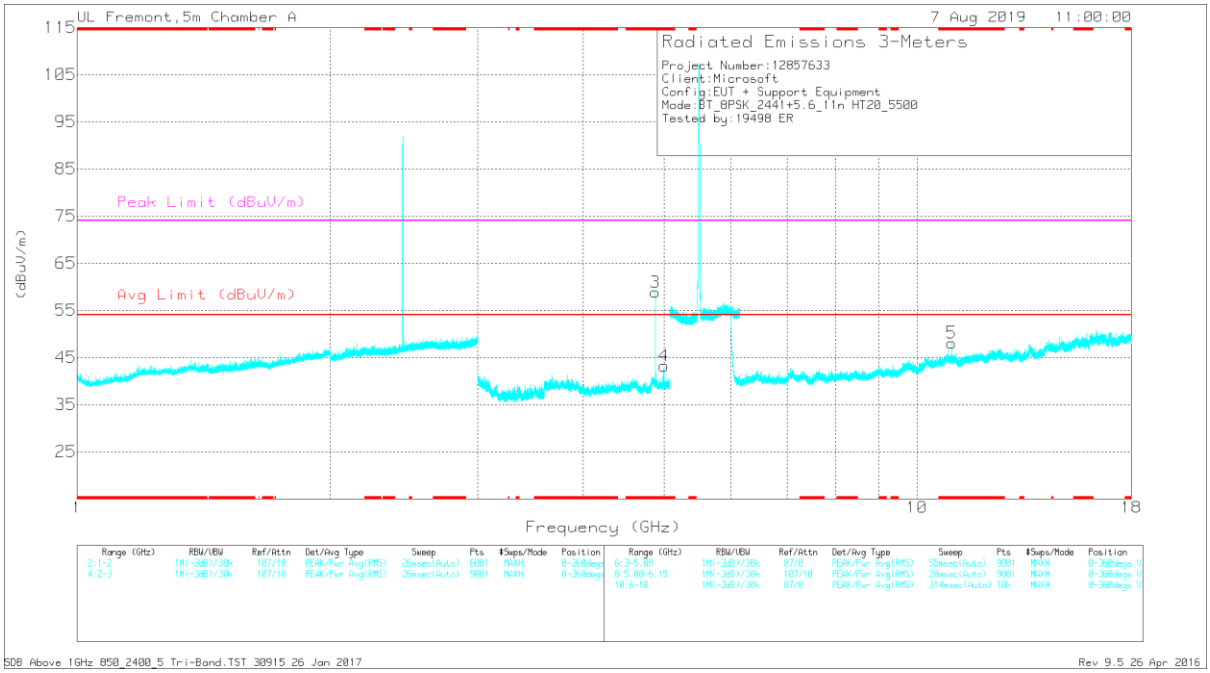
9.2.1. TEST CASE 1

Antenna 1 BT 8PSK 2441 + Antenna 1 WLAN 5GHz 802.11n HT20 5500MHz



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.882	48.51	PKFH	34.1	-26.2	3	59.41	-	-	74	-14.59	262	391	H
2	* 4.995	40.27	PKFH	34.3	-27.7	3	49.87	-	-	74	-24.13	0	142	H
3	* 4.882	52.05	PKFH	34.1	-26.2	1	60.95	-	-	74	-13.05	170	391	V
4	* 4.991	39.88	PKFH	34.3	-27.7	1	47.48	-	-	74	-26.52	22	130	V
5	* 10.996	33.87	PKFH	37.9	-19.6	0	52.17	-	-	74	-21.83	73	278	H
6	* 11.004	34.38	PKFH	37.9	-19.7	0	52.58	-	-	74	-21.42	247	290	V

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

PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

Note: No average measurement required according to FCC document: DA 00 -705.

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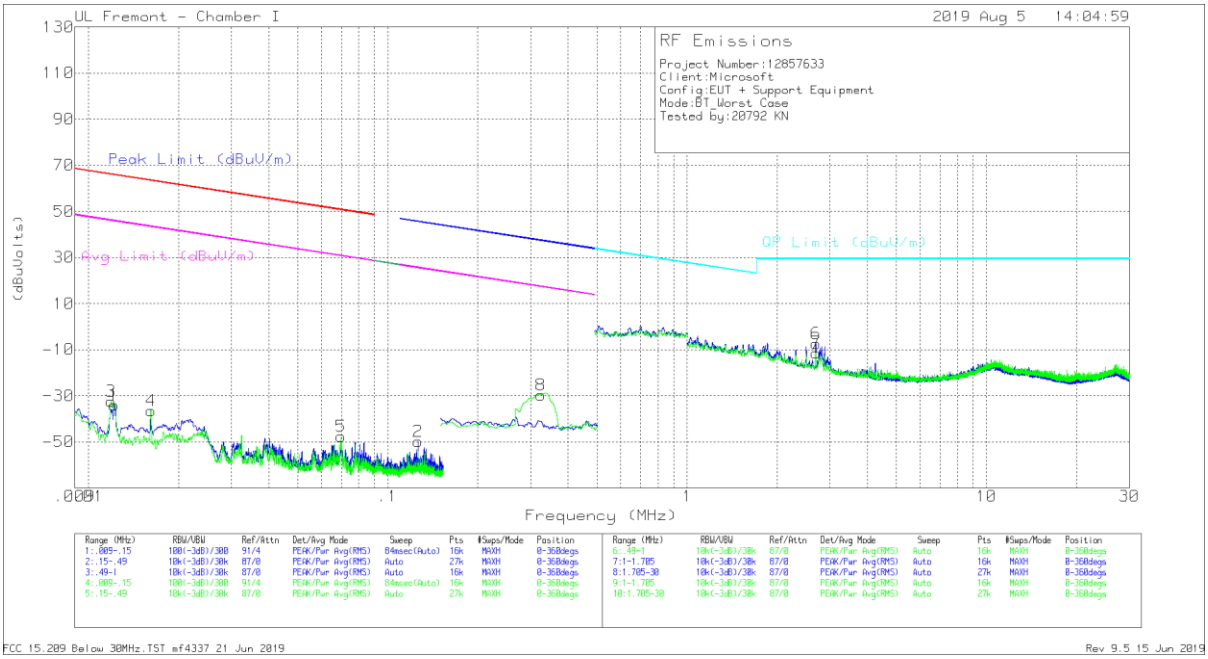
9.3. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

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Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Cables w/ PRE0180175 (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)
1	.0122	18.53	Pk	59.9	-32.4	-80	-33.97	65.85	-99.82	45.85	-79.82	-	-	-	-	0-360
2	.12617	6.39	Pk	55.6	-31.9	-80	-49.91	-	-	-	-	45.61	-95.52	25.61	-75.52	0-360
3	.01192	19.99	Pk	59.9	-32.4	-80	-32.51	66.06	-98.57	46.06	-78.57	-	-	-	-	0-360
4	.01617	16.6	Pk	59.3	-32.4	-80	-36.5	63.41	-99.91	43.41	-79.91	-	-	-	-	0-360
5	.06982	8.45	Pk	55.8	-32	-80	-47.75	50.71	-98.46	30.71	-78.46	-	-	-	-	0-360
8	.32436	26.25	Pk	56.1	-31.9	-80	-29.55	-	-	-	-	37.39	-66.94	17.39	-46.94	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Cables w/ PRE0180175 (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
6	2.68907	24.58	Pk	39.7	-31.7	-40	-7.42	29.5	-36.92	0-360
7	2.68802	20.69	Pk	39.7	-31.7	-40	-11.31	29.5	-40.81	0-360

Pk - Peak detector

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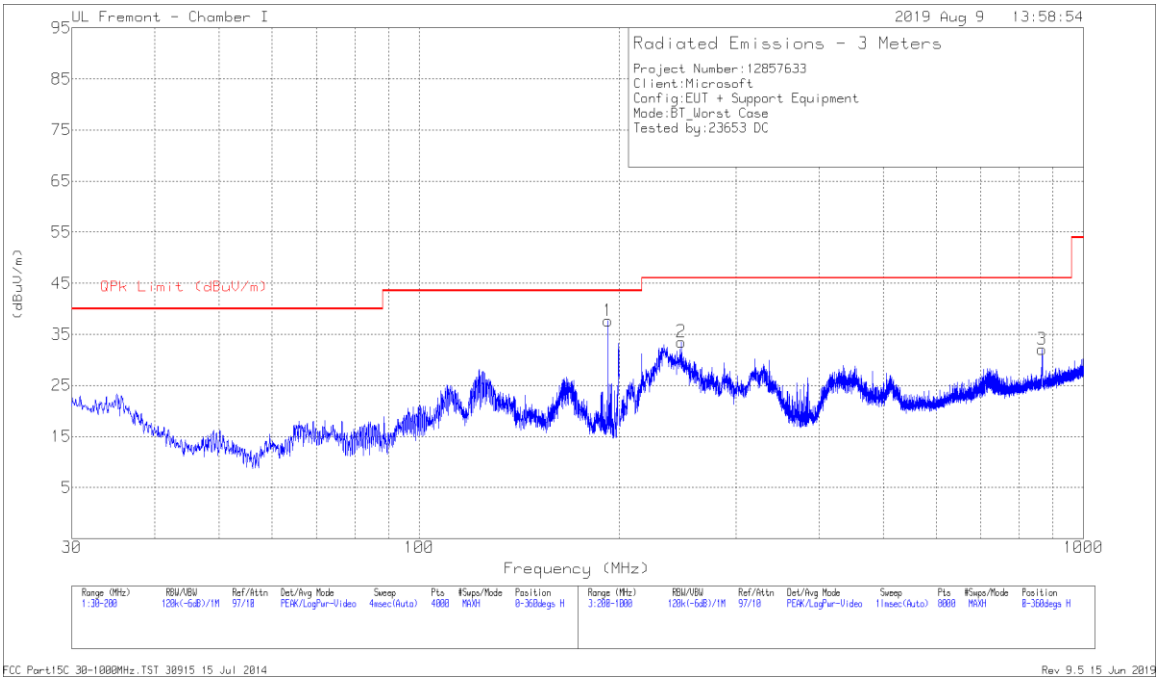
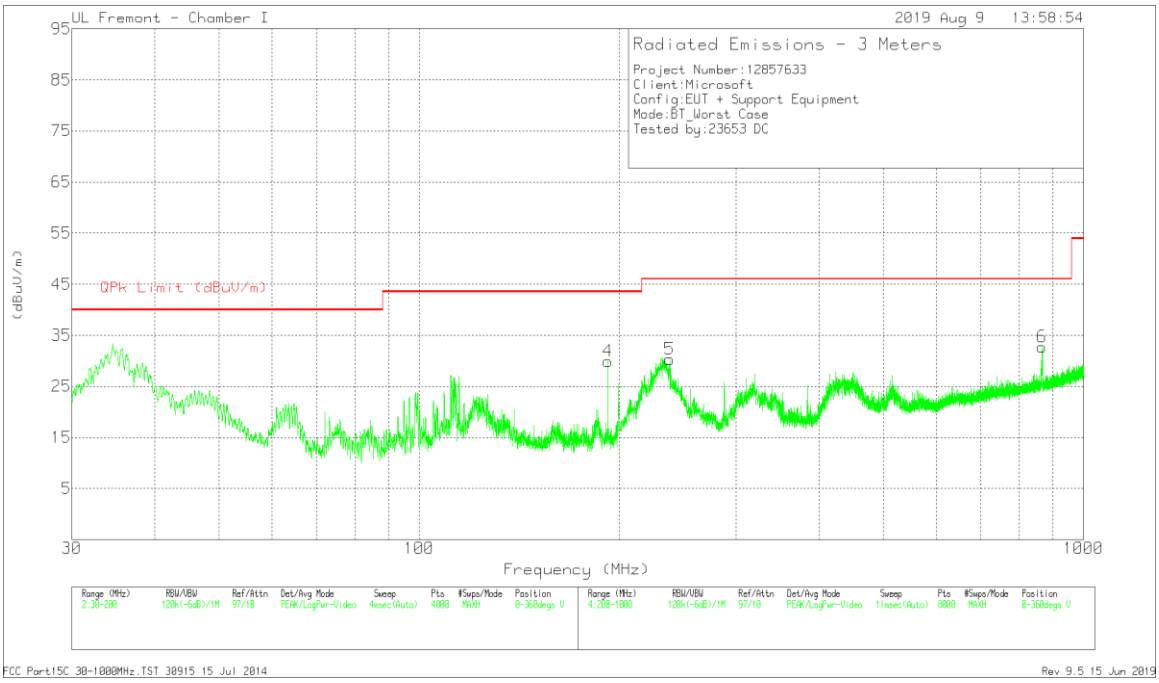
9.4. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



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Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0184971 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	192.3495	50.83	Pk	17.1	-30.3	37.63	43.52	-5.89	0-360	102	H
	192.3572	50.96	Qp	17.1	-30.3	37.76	43.52	-5.76	188	115	H
4	192.3495	43.13	Pk	17.1	-30.3	29.93	43.52	-13.59	0-360	101	V
2	* 248.1063	46.03	Pk	17.5	-30	33.53	46.02	-12.49	0-360	101	H
3	866.3866	31.87	Pk	27.7	-27.5	32.07	46.02	-13.95	0-360	200	H
5	238.205	42.85	Pk	17.5	-30.1	30.25	46.02	-15.77	0-360	199	V
6	865.8866	32.5	Pk	27.7	-27.5	32.7	46.02	-13.32	0-360	199	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
Qp - Quasi-Peak detector

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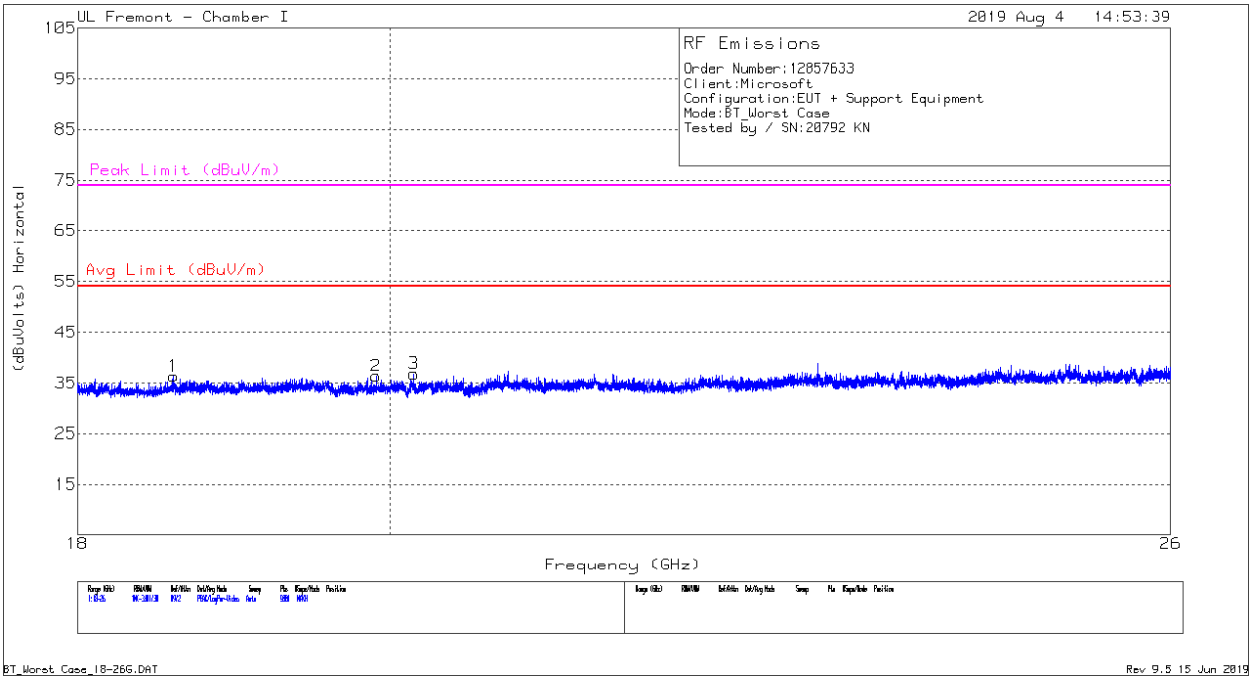
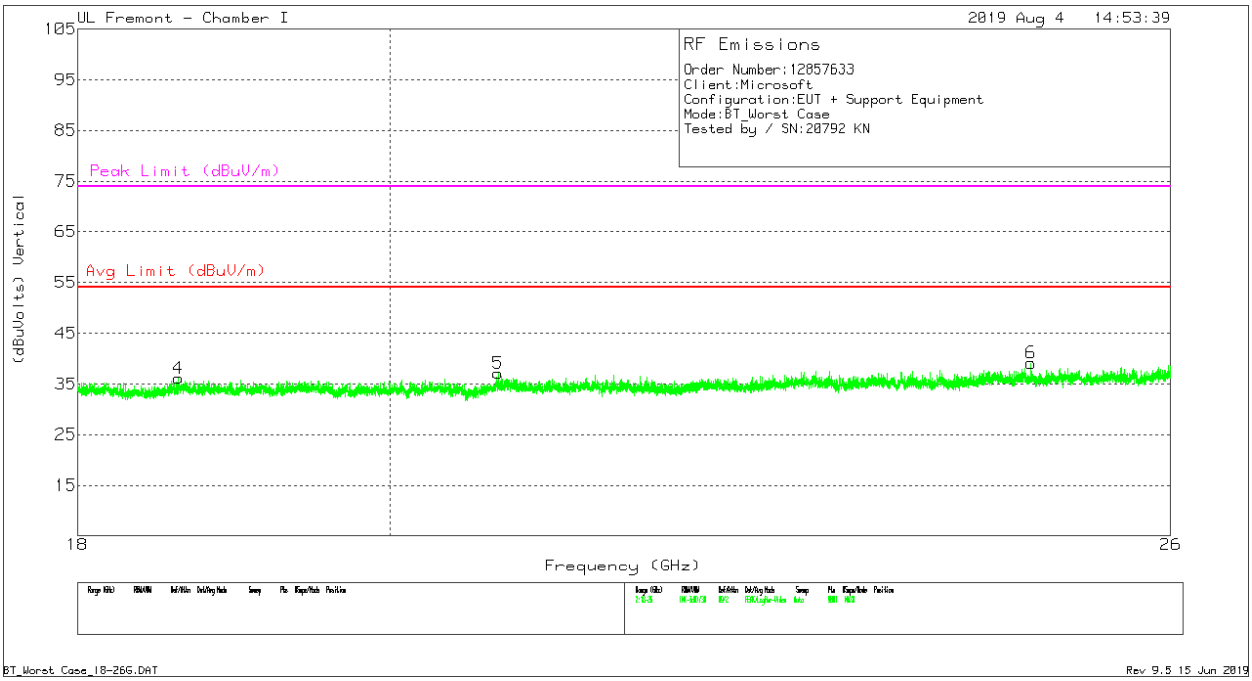
9.5. WORST CASE 18-26 GHZ

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



HORIZONTAL



VERTICAL

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18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0182188 (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	18.59111	71.84	Pk	33	-59	-9.5	36.34	54	-17.66	74	-37.66
2	19.904	69.66	Pk	33.4	-57.2	-9.5	36.36	54	-17.64	74	-37.64
3	20.15822	69.87	Pk	33.4	-57	-9.5	36.77	54	-17.23	74	-37.23
4	18.62222	71.52	Pk	32.9	-58.8	-9.5	36.12	54	-17.88	74	-37.88
5	20.73689	69.98	Pk	33.4	-56.8	-9.5	37.08	54	-16.92	74	-36.92
6	24.80622	69.18	Pk	34.9	-55.5	-9.5	39.08	54	-14.92	74	-34.92

Pk - Peak detector

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10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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

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

RESULTS

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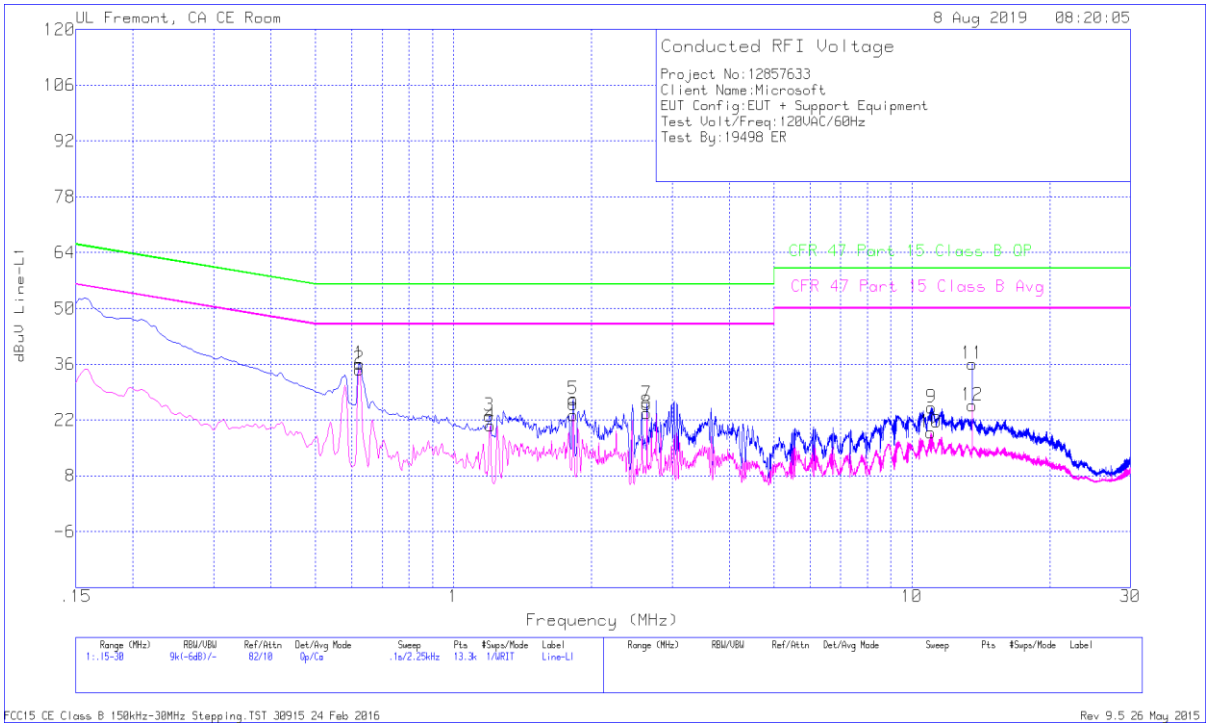
10.1.1. AC Power Line Norm

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	.6225	26.03	Qp	0	0	10.1	36.13	56	-19.87	-	-
2	.6225	24.69	Ca	0	0	10.1	34.79	-	-	46	-11.21
3	1.1985	12.81	Qp	0	.1	10.1	23.01	56	-32.99	-	-
4	1.203	10.45	Ca	0	.1	10.1	20.65	-	-	46	-25.35
5	1.824	17.1	Qp	0	.1	10.1	27.3	56	-28.7	-	-
6	1.82625	13.08	Ca	0	.1	10.1	23.28	-	-	46	-22.72
7	2.643	15.76	Qp	0	.1	10.1	25.96	56	-30.04	-	-
8	2.643	13.61	Ca	0	.1	10.1	23.81	-	-	46	-22.19
9	11.0557	14.65	Qp	.1	.2	10.2	25.15	60	-34.85	-	-
10	11.004	8.4	Ca	.1	.2	10.2	18.9	-	-	50	-31.1
11	13.56	25.58	Qp	.1	.2	10.2	36.08	60	-23.92	-	-
12	13.56	15.2	Ca	.1	.2	10.2	25.7	-	-	50	-24.3

Qp - Quasi-Peak detector
Ca - CISPR average detection
NOTE: Markers 11 and 12, 13.56MHz is an external NFC signal unrelated to the EUT.

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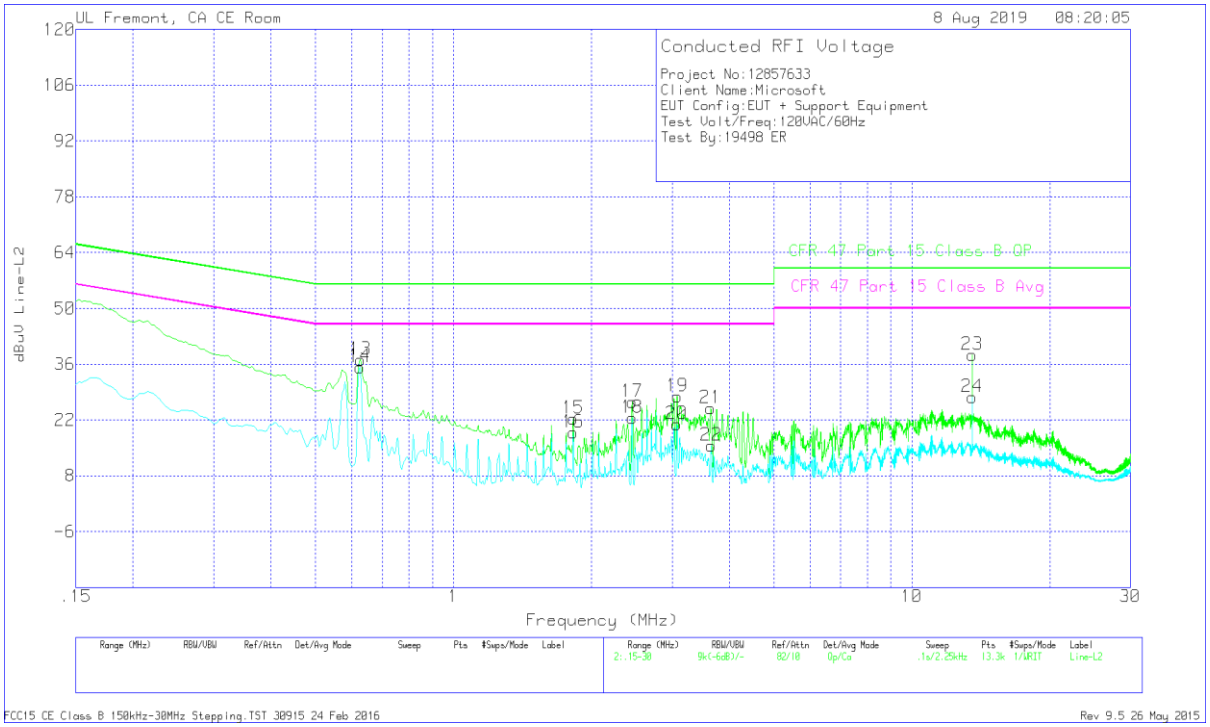
LINE 2 RESULTS



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)
13	.627	27.11	Qp	0	0	10.1	37.21	56	-18.79	-	-
14	.62475	25.21	Ca	0	0	10.1	35.31	-	-	46	-10.69
15	1.824	12.09	Qp	0	.1	10.1	22.29	56	-33.71	-	-
16	1.824	8.61	Ca	0	.1	10.1	18.81	-	-	46	-27.19
17	2.45175	16.35	Qp	0	.1	10.1	26.55	56	-29.45	-	-
18	2.45175	12.38	Ca	0	.1	10.1	22.58	-	-	46	-23.42
19	3.07725	17.69	Qp	0	.1	10.1	27.89	56	-28.11	-	-
20	3.075	10.81	Ca	0	.1	10.1	21.01	-	-	46	-24.99
21	3.63975	14.84	Qp	0	.1	10.1	25.04	56	-30.96	-	-
22	3.651	5.46	Ca	0	.1	10.1	15.66	-	-	46	-30.34
23	13.56	27.82	Qp	.1	.2	10.2	38.32	60	-21.68	-	-
24	13.56	17.31	Ca	.1	.2	10.2	27.81	-	-	50	-22.19

Qp - Quasi-Peak detector
Ca - CISPR average detection
NOTE: Markers 23 and 24, 13.56MHz is an external NFC signal unrelated to the EUT.

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