CERTIFICATION TEST REPORT

Report Number. : R12663957R-E9

Applicant	:	Bose Corporation 100 The Mountain Framingham, MA 01701, USA
Model	:	BL2R
FCC ID	:	A94BL2R
IC	:	3232A-BL2R
EUT Description	:	Wireless Headset
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5

Date Of Issue:
2019-04-17

Prepared by:
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NVLAP Lab code: 200246-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2019-04-10	Initial Issue	Niklas Haydon
V2	2019-04-17	Adjusted duty cycle correction for radiated emissions	Niklas Haydon

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Bose Corporation
100 The Mountain
Framingham, MA 01701, USA

EUT DESCRIPTION: Wireless Headset

MODEL: BL2R

SERIAL NUMBER: R-2, R-4, R-5, R-7

DATE TESTED: 2019-03-06 to 2019-04-03

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 LLC 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.

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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.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, North Carolina, USA and 2800 Suite Perimeter Park Dr., Morrisville, North Carolina, USA. 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.

12 Laboratory Dr.	2800 Suite Perimeter Park Dr.
☐ Chamber A (ISED:2180C-1)	☒ Chamber North (ISED:2180C-3)
☐ Chamber C (ISED:2180C-2)	☒ Chamber South (ISED:2180C-4)

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0

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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
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	2.00%
RF output power, conducted	1.3 dB (PK), 0.45 dB (AV)
RF output power, radiated (SAC)	4.52 dB
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	2.50 dB
All emissions, radiated	4.88 dB
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

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 right earbud of a wireless headset with a BT/BLE transceiver.

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	9.09	8.11
2402 - 2480	Enhanced DQPSK	8.58	7.21
2402 - 2480	Enhanced 8PSK	8.57	7.19

Note: GFSK, DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are equivalent or the worst case. Testing is based on these modes to showing compliance.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an LDS antenna, with a maximum gain of 0 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was:

BT firmware version 13944.
Audio firmware version 5360.
Apps0 firmware version 1213.
Apps1 firmware version 1547165335.

The EUT driver software installed in the host equipment during testing was 97.0.0.0

The test utility software, BlueTest3, used during testing was 3.1.4

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5.5. WORST-CASE CONFIGURATION AND MODE

The EUT only transmits while battery powered therefore powerline conducted emissions were not performed.

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

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

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

All testing performed in GFSK and 8PSK modes. 8PSK mode represents DQPSK and is considered equivalent or worst-case. Note – Power and Average Time of Occupancy were performed in DQPSK mode.

Worst-case data rates/packet sizes were:

GFSK mode: DH5
DQPSK mode: 2-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**
Laptop	Lenovo	T450	A2UQS	NA
Debugger	Qualcomm	TRBI 200	N171219	NA

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	I/O	1	Hardwired	Single strand	<1m	For testing purposes only. Connects to laptop through debugger for configuration.
2	DC	1	hardwired	Single strand	<3m	For testing purposes only. Provides DC power.

SETUP DIAGRAMS

Please refer to R12663957R-EP9 for setup diagrams

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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 Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
1-18 GHz					
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2018-04-30	2019-04-30
Gain-Loss Chains					
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2019-03-15	2020-03-15
Receiver & Software					
SA0027	Spectrum Analyzer	Agilent	N9030A	2018-04-04	2019-04-04
SA0026	Spectrum Analyzer	Agilent	N9030A	2019-03-19	2020-03-19
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
SN 181562858	Environmental Meter	Fisher Scientific	14-650-118	2018-09-04	2020-09-04

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Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz (Loop Ant.)					
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2019-01-24	2020-01-31
30-1000 MHz					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2018-07-24	2019-07-24
1-18 GHz					
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2018-04-30	2019-04-30
18-40 GHz					
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2018-11-08	2019-11-08
Gain-Loss Chains					
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2018-09-06	2019-09-06
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2018-05-20	2019-05-20
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2019-03-13	2020-03-13
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2018-09-30	2019-09-30
Receiver & Software					
SA0025	Spectrum Analyzer	Agilent	N9030A	2019-02-28	2020-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27

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Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
81018	Spectrum Analyzer	Agilent Technologies	E4446A	2018-04-12	2019-04-12
SN 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A
76022	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A
72822 (1100504)	Spectrum Analyzer	Agilent Technologies	E4446A	2018-11-19	2019-11-19
PWM005	RF Power Meter	Keysight Technologies	N1912A	2018-04-25	2019-04-25
PWS005	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2018-04-26	2019-04-26
MM0165	True RMS Multimeter	Agilent	U1232A	2018-10-12	2019-10-31

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7. MEASUREMENT METHODS

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

Emissions 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

Out-of-Band Emissions in non-restricted band: ANSI C63.10-2013 Section 7.8.6, 7.8.8. & 6.10.4

Out-of-band emissions in restricted bands: ANSI C63.10-2013 Section 6.3-6.5 & 6.10.5

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

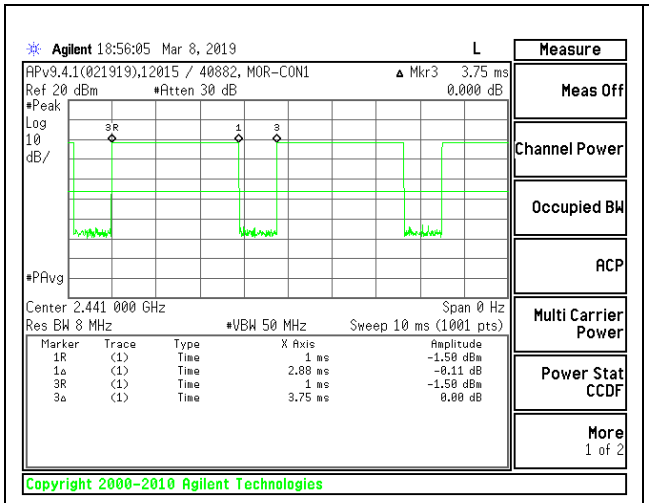
PROCEDURE

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

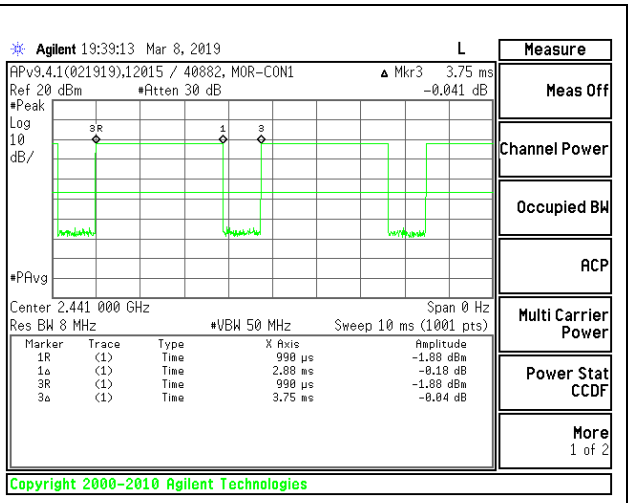
ON TIME AND DUTY CYCLE RESULTS

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	76.800	1.15	0.347
Bluetooth 8PSK	2.88	3.75	0.768	76.800	1.15	0.347

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 ≥ 1-5% of the 20 dB bandwidth and 99% Occupied Bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

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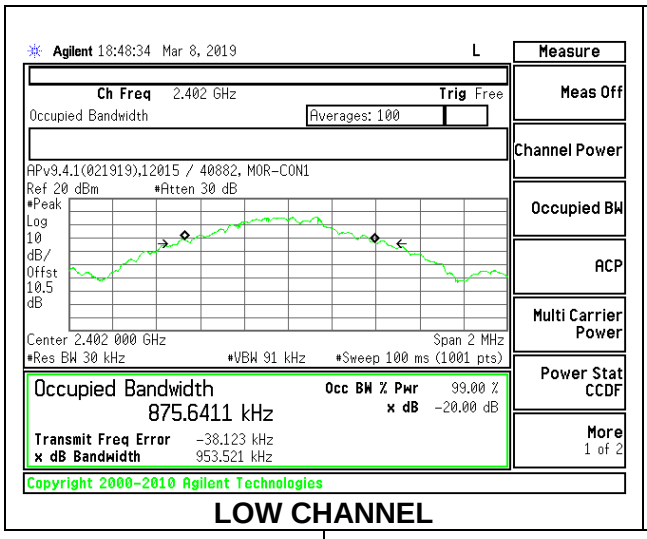
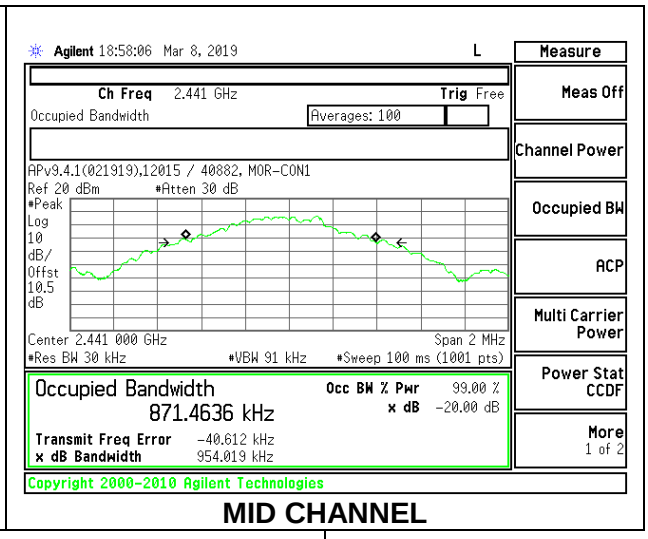
8.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

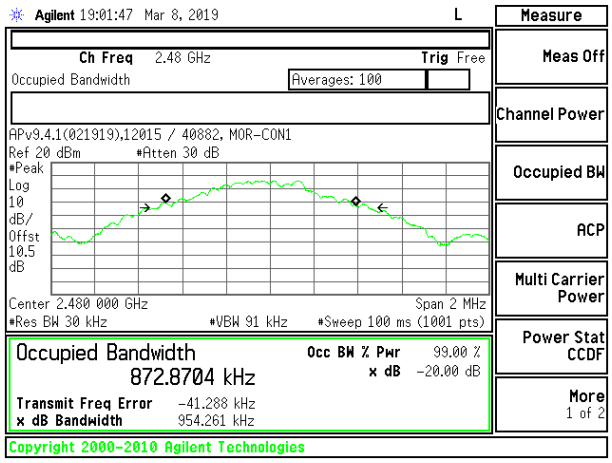
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.954	0.876
Mid	2441	0.954	0.872
High	2480	0.954	0.873



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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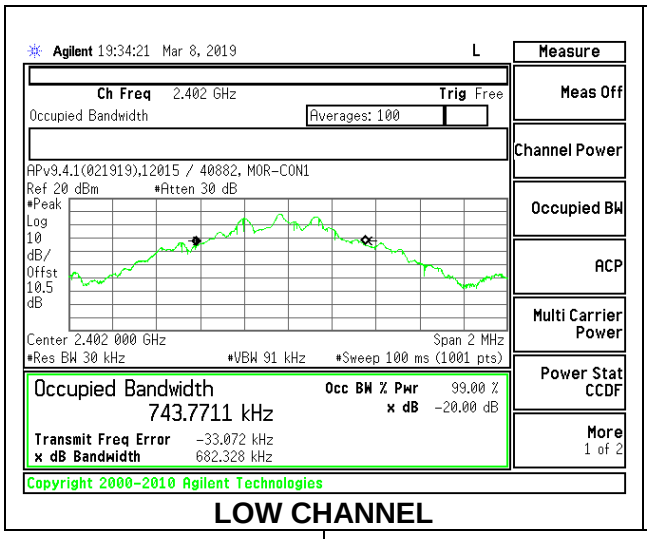
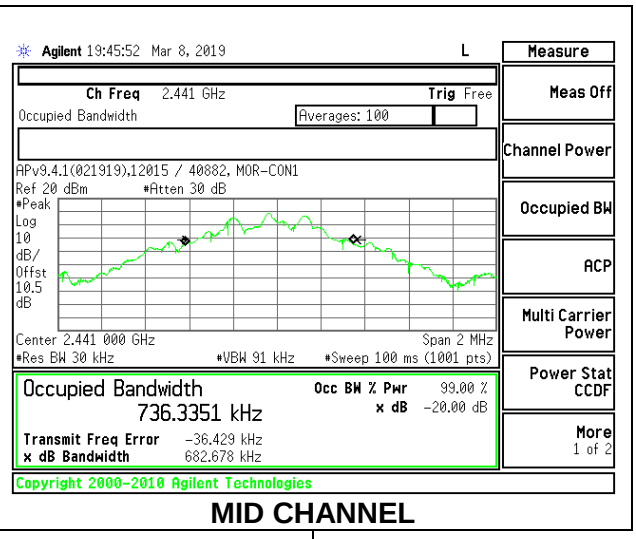
8.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

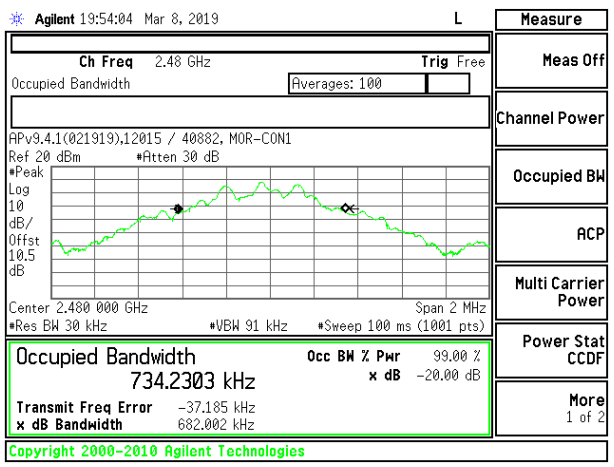
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.682	0.744
Mid	2441	0.683	0.736
High	2480	0.682	0.734



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 (approx. 30% of the channel spacing) and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

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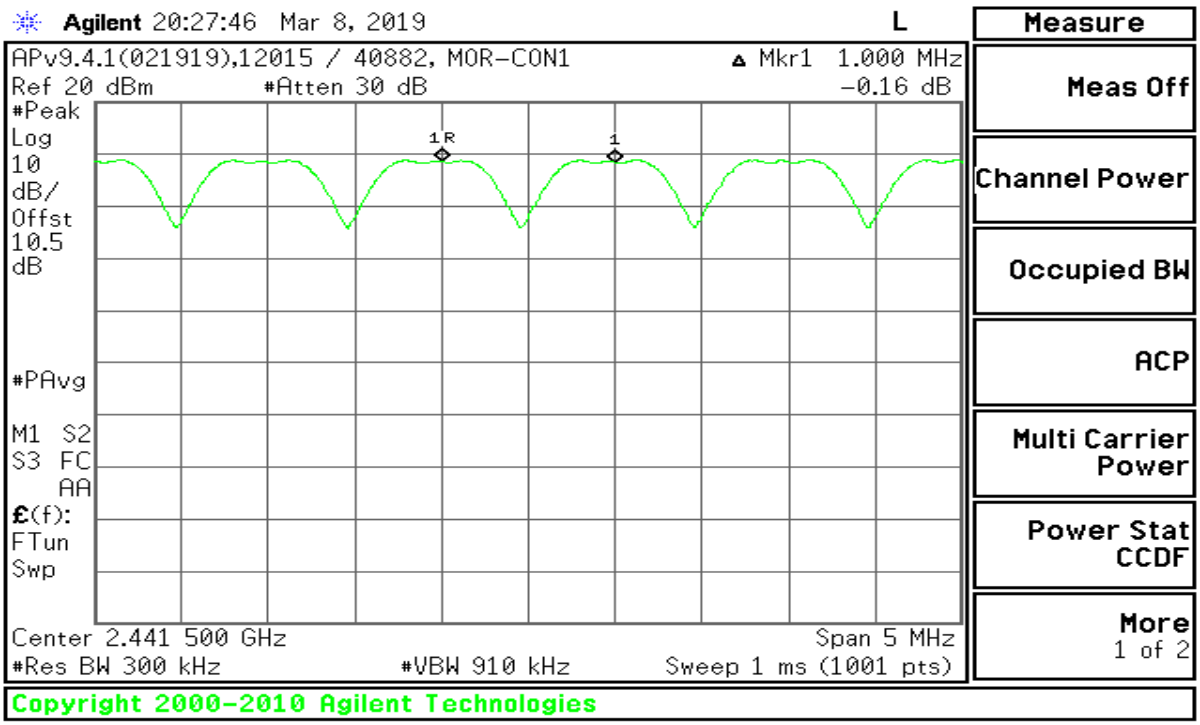
8.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

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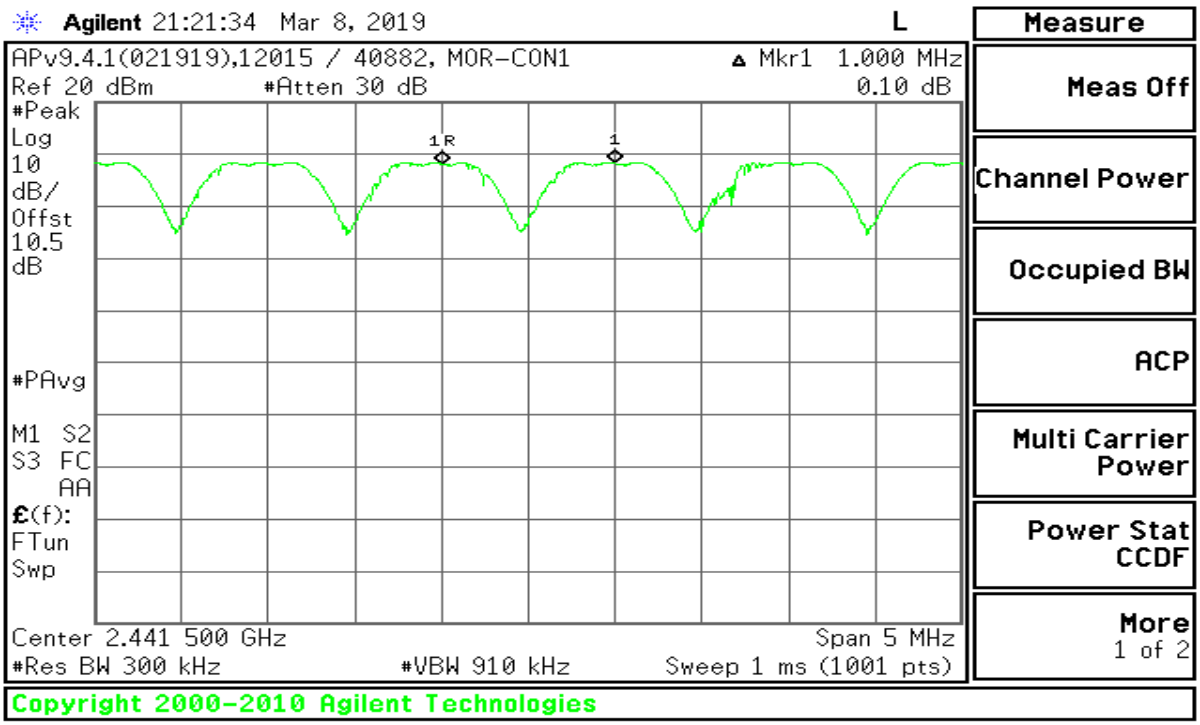
8.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



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 for visibility of the entire span. Then, smaller spans are set to more clearly identify the channels. The RBW is set to 30% of the channel spacing (approx. 300kHz). The analyzer is set to Max Hold.

RESULTS

Normal Mode: All Channels Observed

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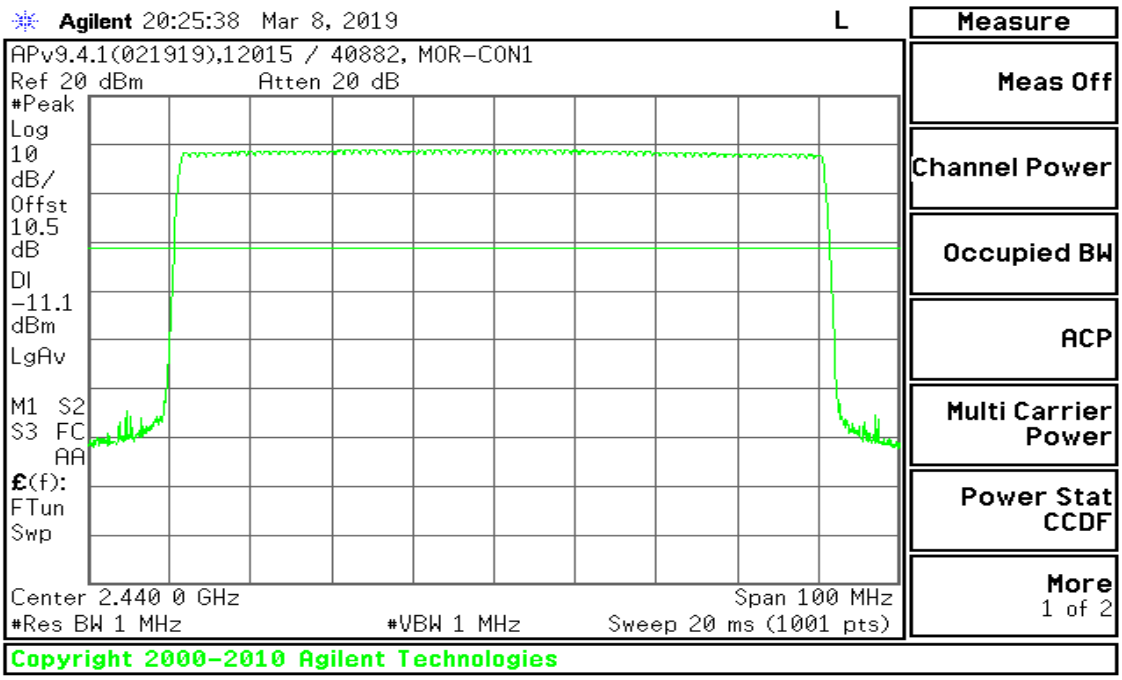
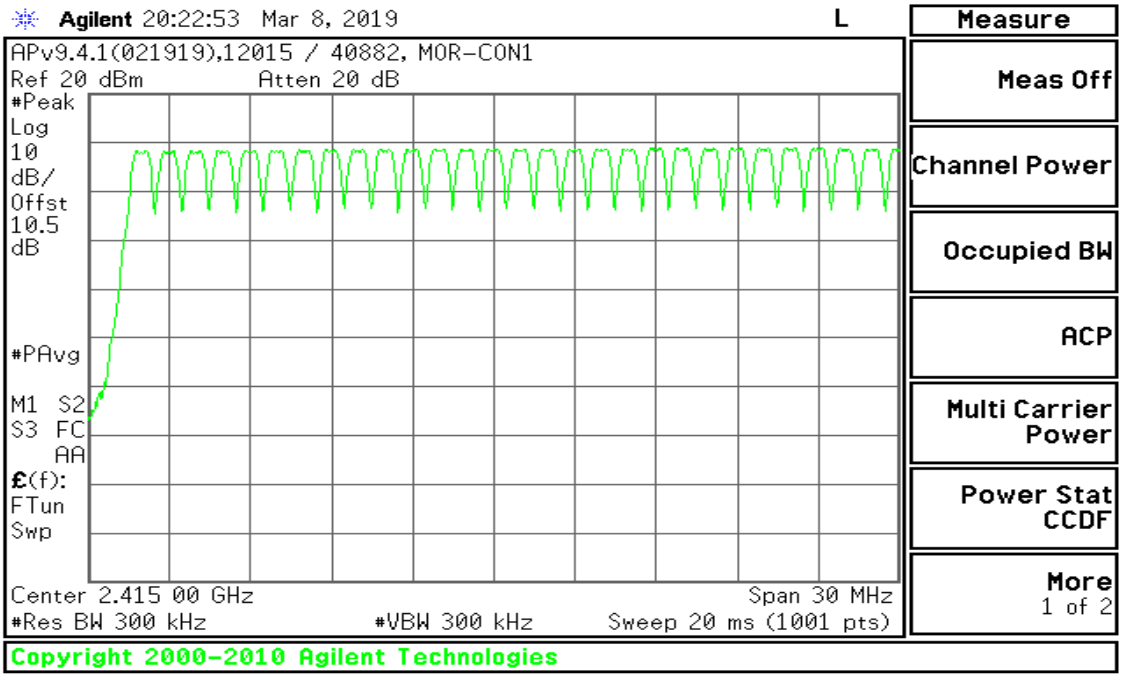
8.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

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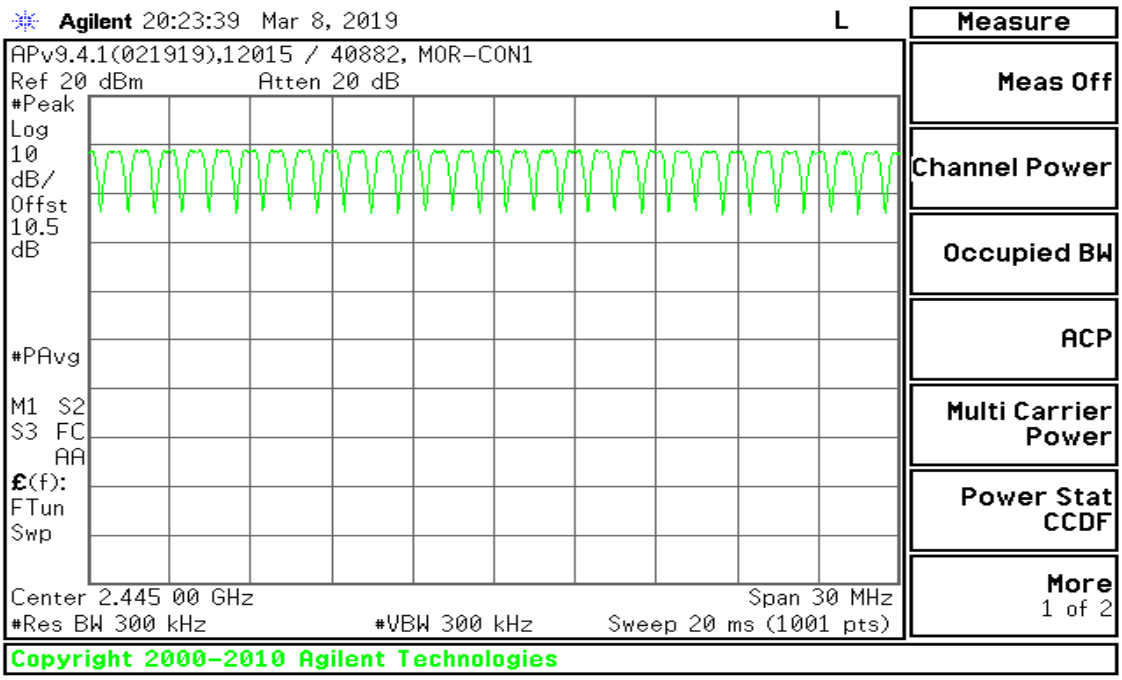
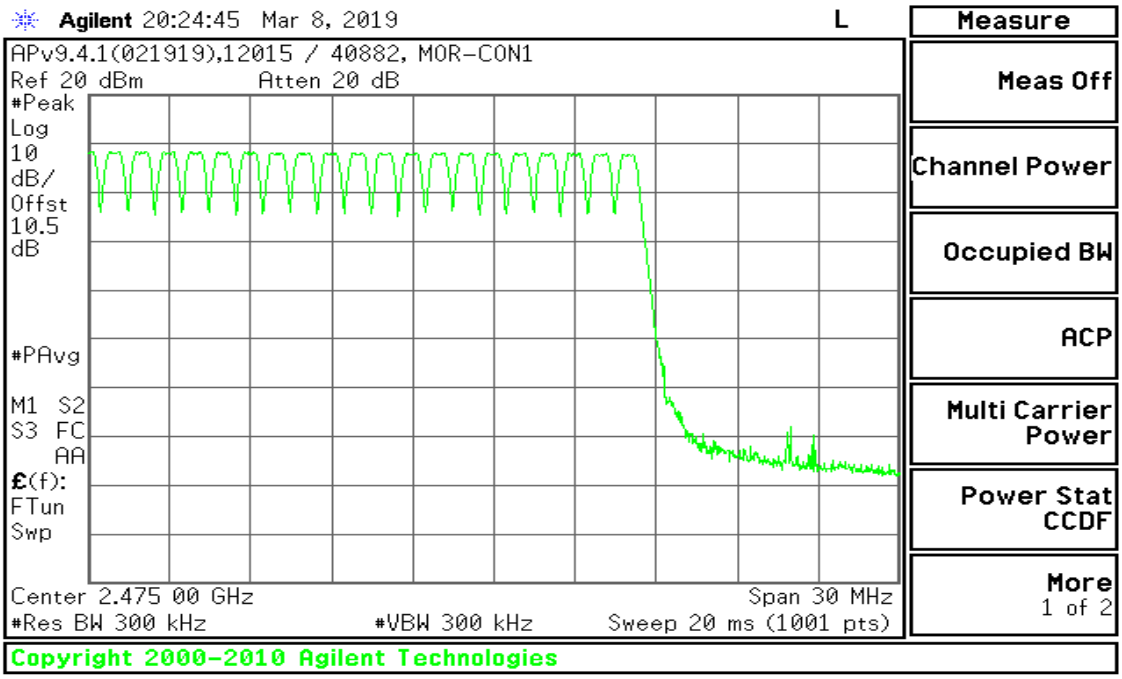


30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

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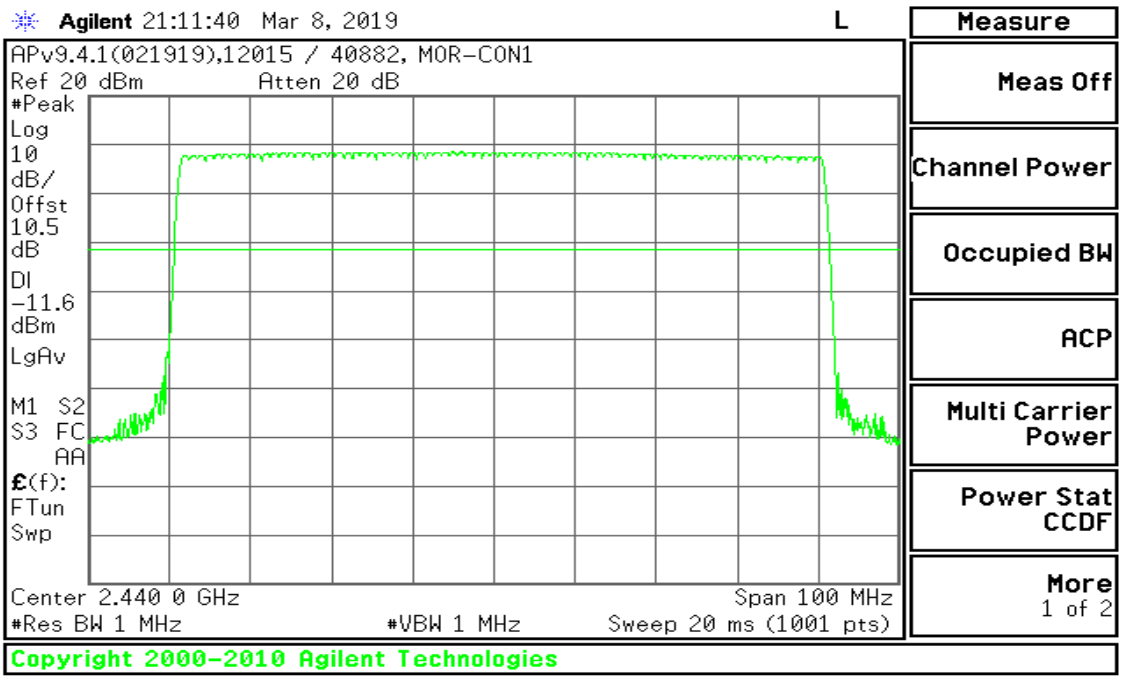
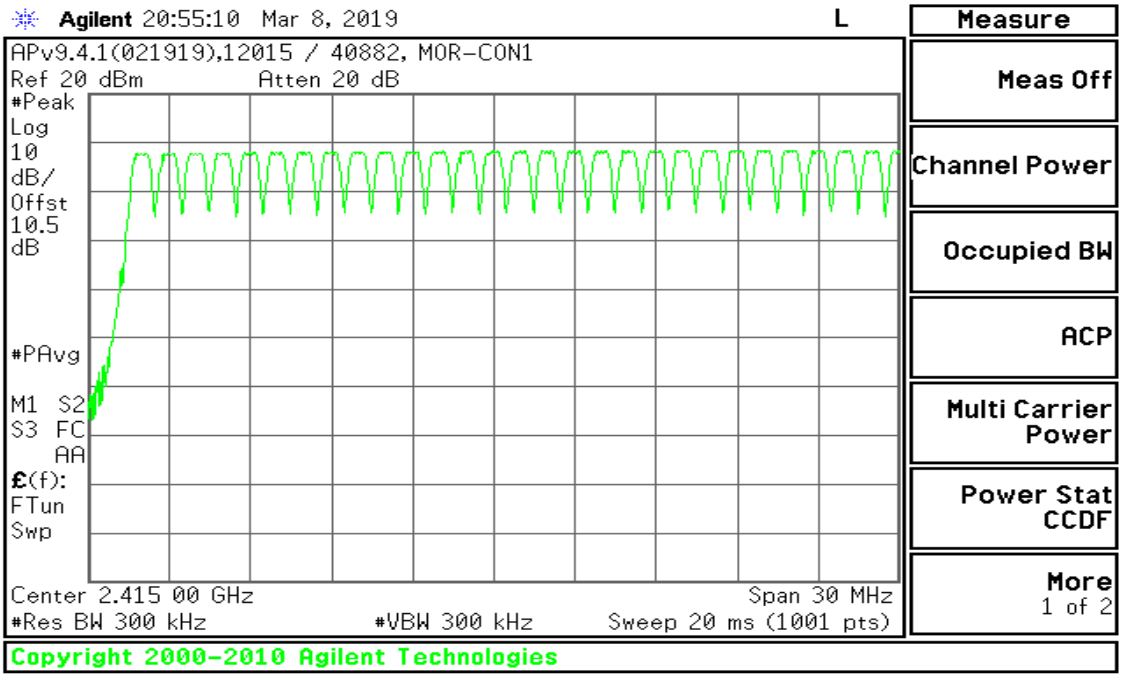
8.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

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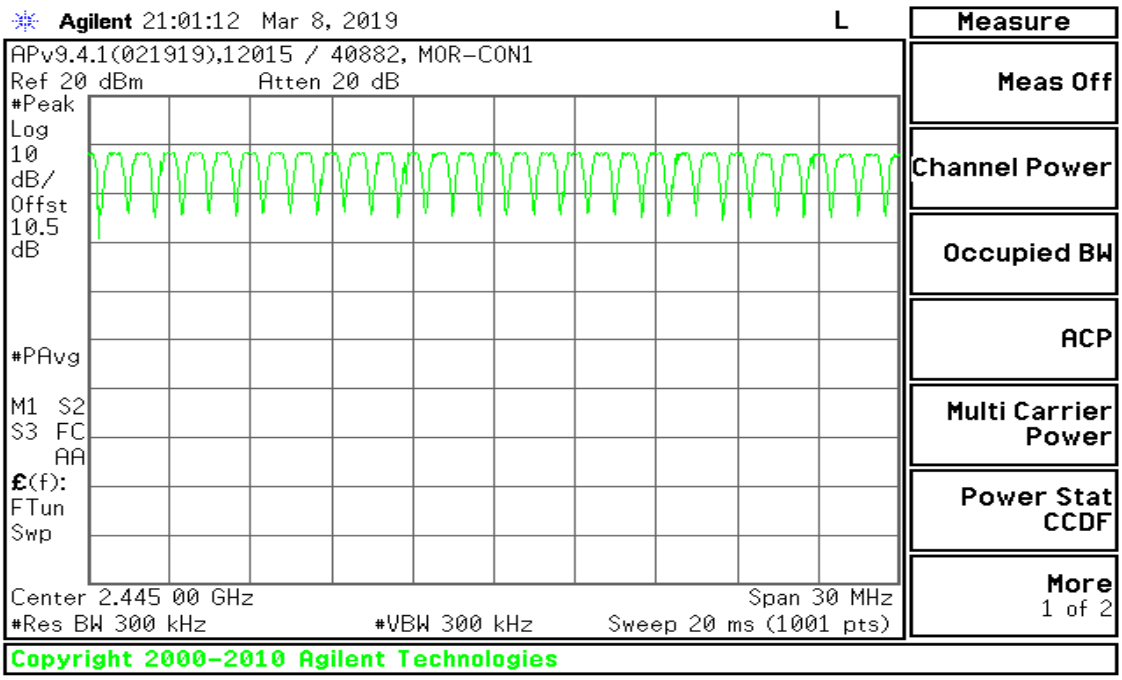
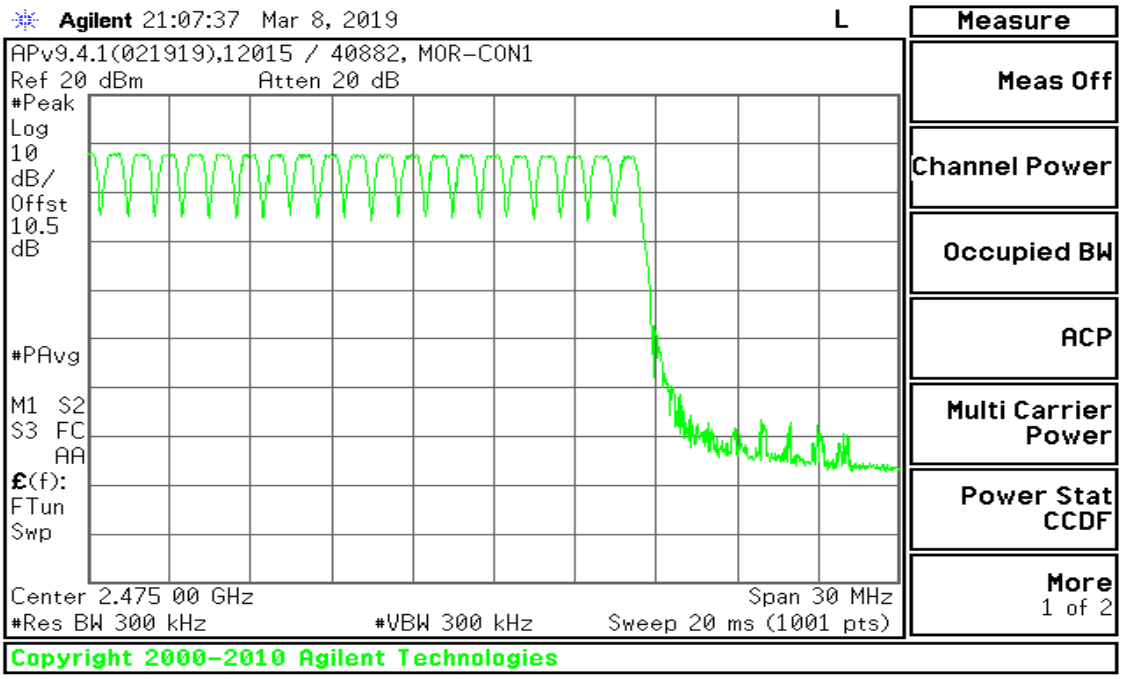


30MHz SPAN, SEGMENT 2 OF 3



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	0.373	32	0.1194	0.4	-0.2806
DH3	1.63	16	0.2608	0.4	-0.1392
DH5	2.871	11	0.3158	0.4	-0.0842
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	0.373	8	0.02984	0.4	-0.3702
DH3	1.63	4	0.06520	0.4	-0.3348
DH5	2.871	2.75	0.07895	0.4	-0.3210

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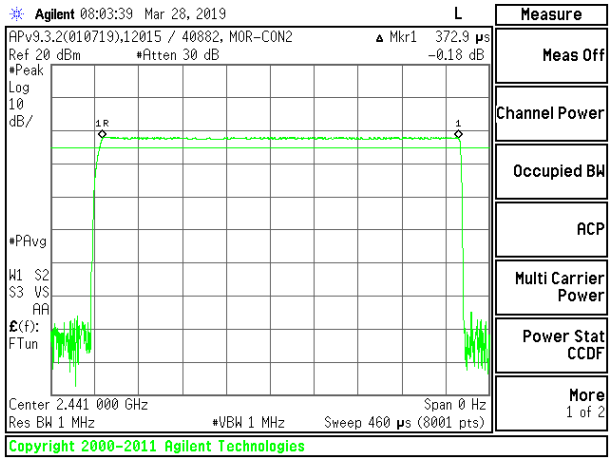
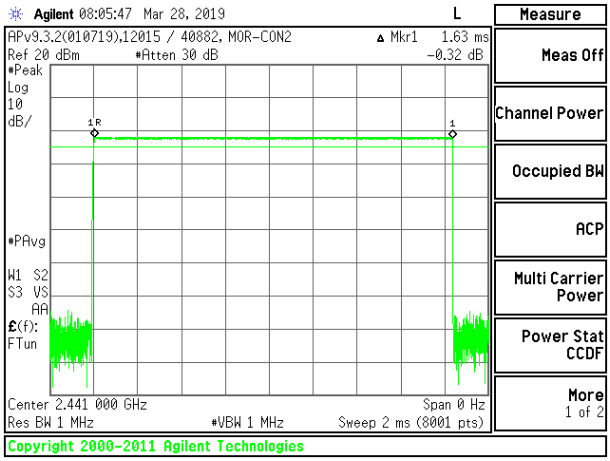
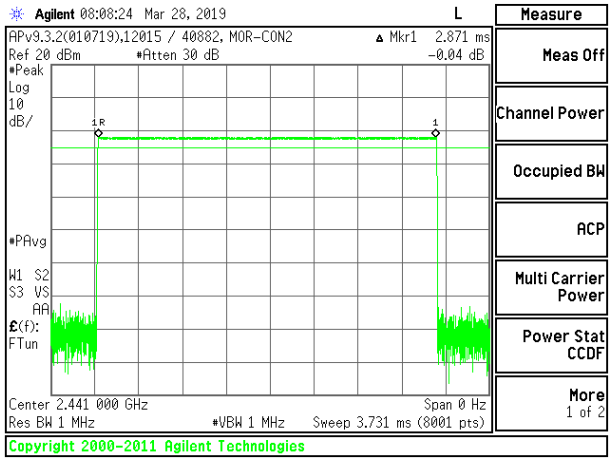


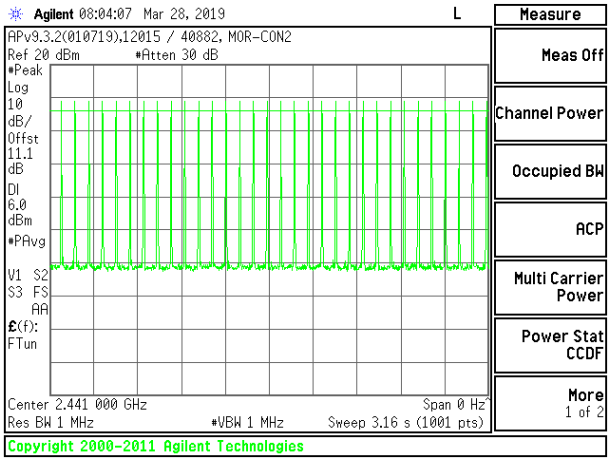
PULSE WIDTH – 1DH1



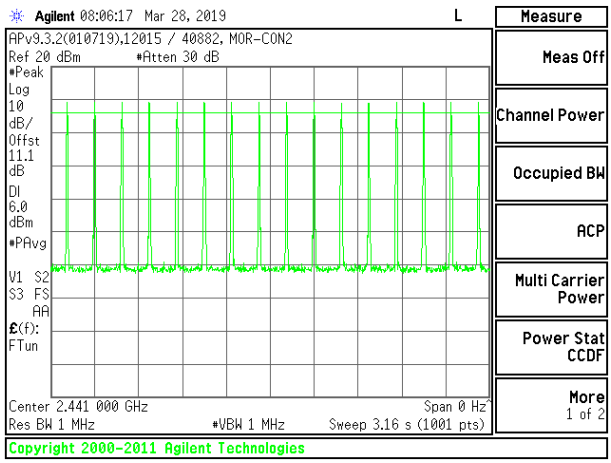
PULSE WIDTH – 1DH3



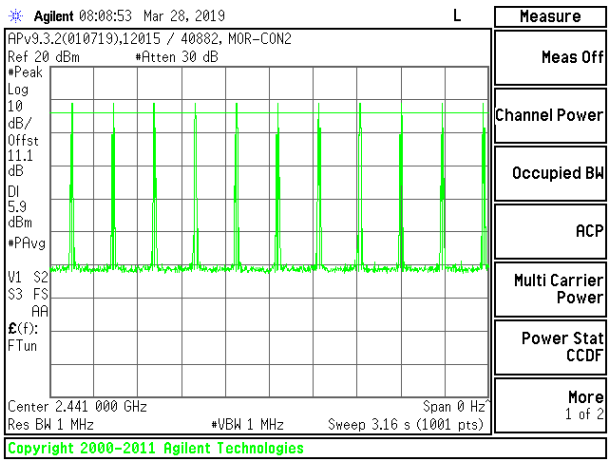
PULSE WIDTH – 1DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 1DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 1DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 1DH5

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8.5.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DQPSK Normal Mode					
2DH1	0.374	32	0.11968	0.4	-0.28032
2DH3	1.627	16	0.26032	0.4	-0.13968
2DH5	2.874	11	0.31614	0.4	-0.08386

Note: for AFH(DQPSK) 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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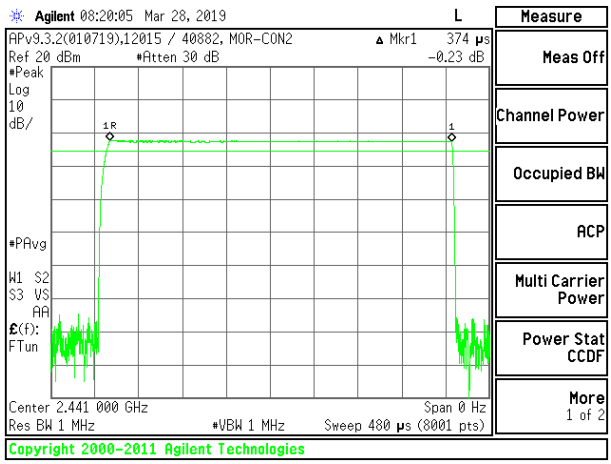
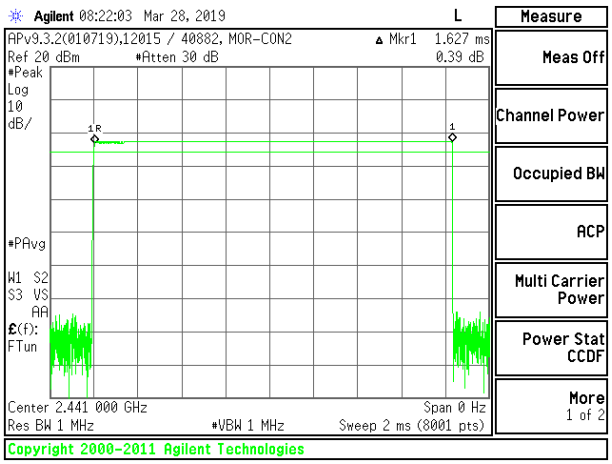
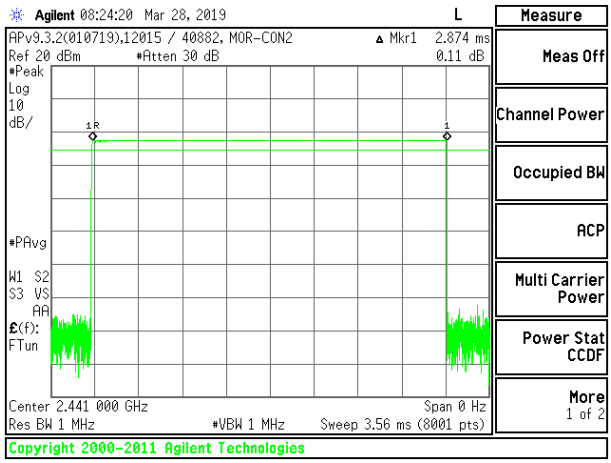


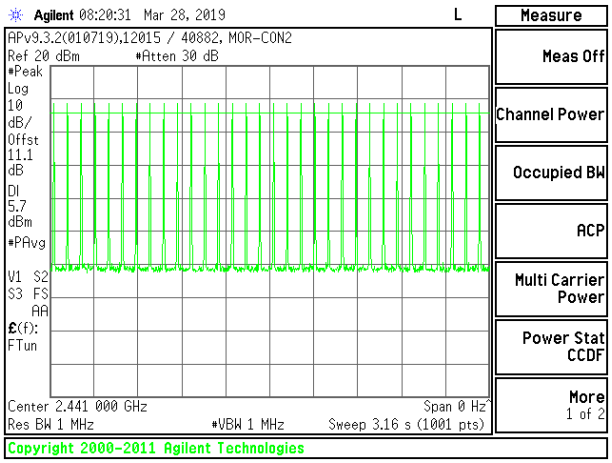
PULSE WIDTH – 2DH1



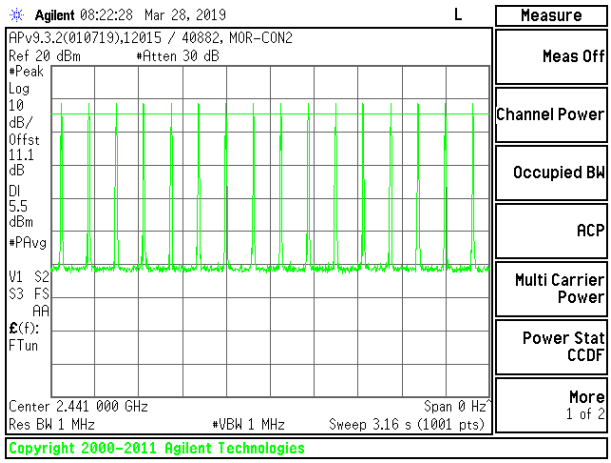
PULSE WIDTH – 2DH3



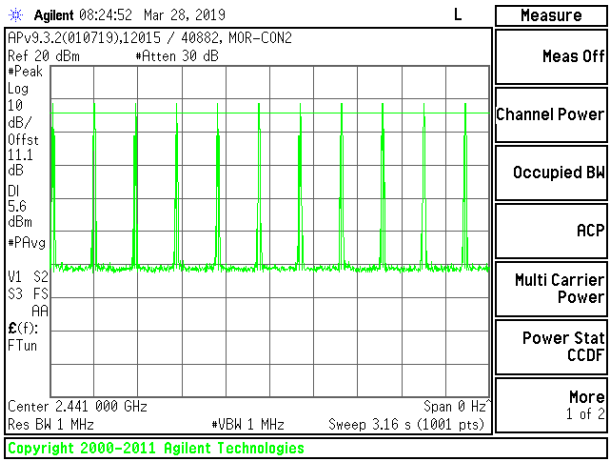
PULSE WIDTH – 2DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 2DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 2DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 2DH5

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8.5.3. 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	0.376	32	0.12032	0.4	-0.2797
3DH3	1.626	16	0.26016	0.4	-0.1398
3DH5	2.873	11	0.31603	0.4	-0.084

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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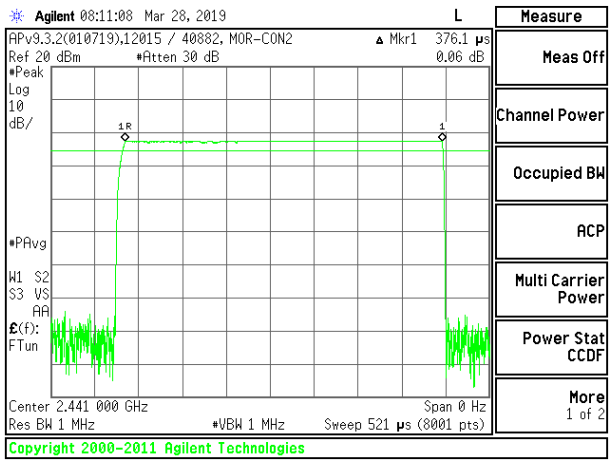
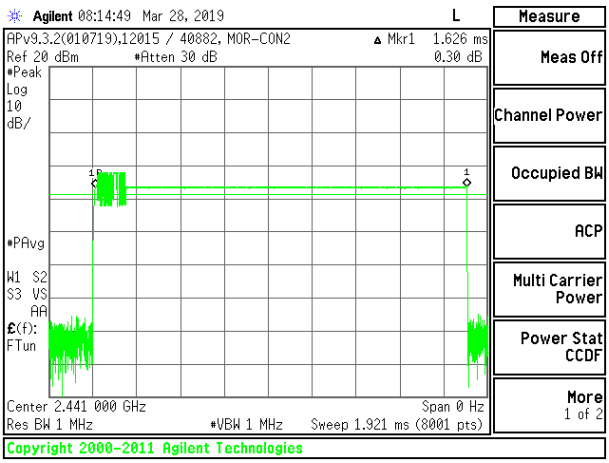
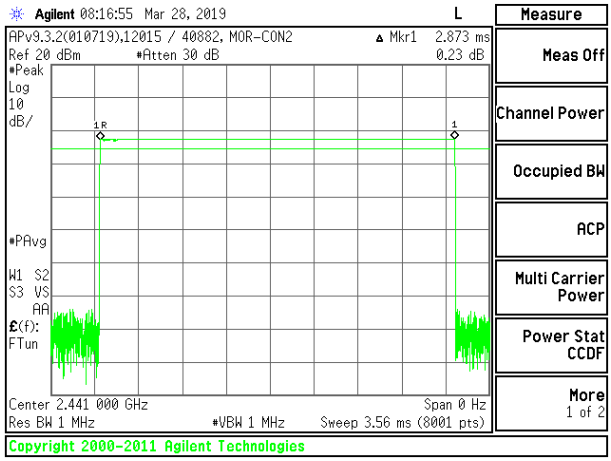


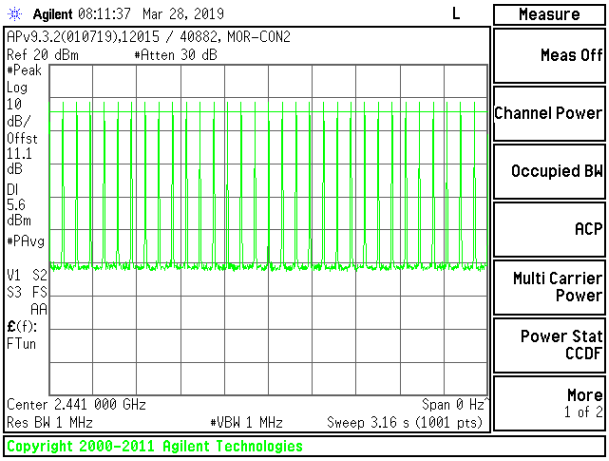
PULSE WIDTH – 3DH1



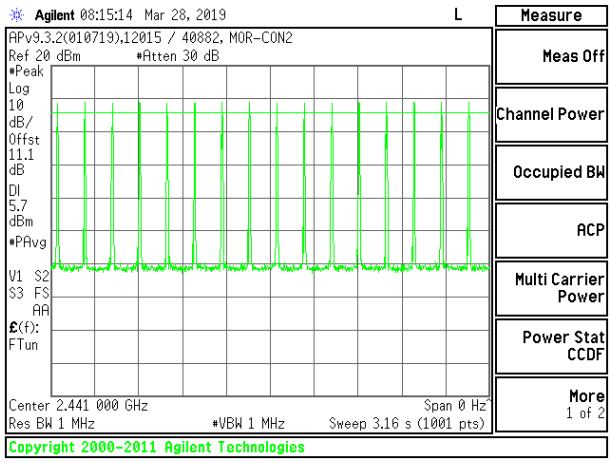
PULSE WIDTH – 3DH3



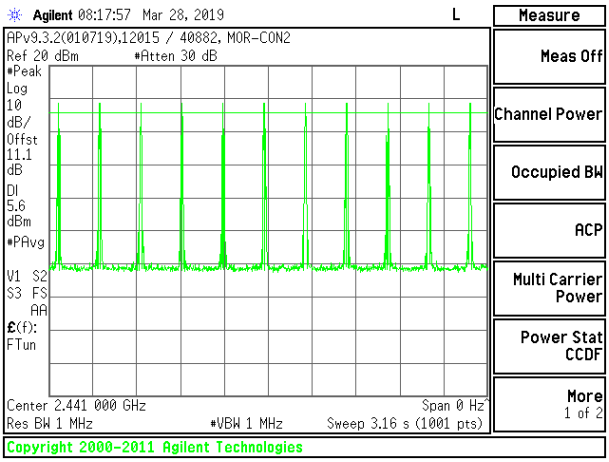
PULSE WIDTH – 3DH5



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.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

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

RESULTS

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8.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	12015/40882
Date:	2019-03-06

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.50	30	-21.5
Middle	2441	9.09	30	-20.91
High	2480	8.32	30	-21.68

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8.6.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	12015/40882
Date:	2019-03-06

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8	30	-22
Middle	2441	8.58	30	-21.42
High	2480	7.69	30	-22.31

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8.6.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	12015/40882
Date:	2019-03-06

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.90	30	-22.1
Middle	2441	8.57	30	-21.43
High	2480	7.66	30	-22.34

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

RESULTS

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8.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	12015/40882
Date	2019-03-06

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.42
Middle	2441	8.92
High	2480	8.23

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8.7.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	12015/40882
Date	2019-03-06

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.83
Middle	2441	8.46
High	2480	7.47

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8.7.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	12015/40882
Date	2019-03-06

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.77
Middle	2441	8.43
High	2480	7.49

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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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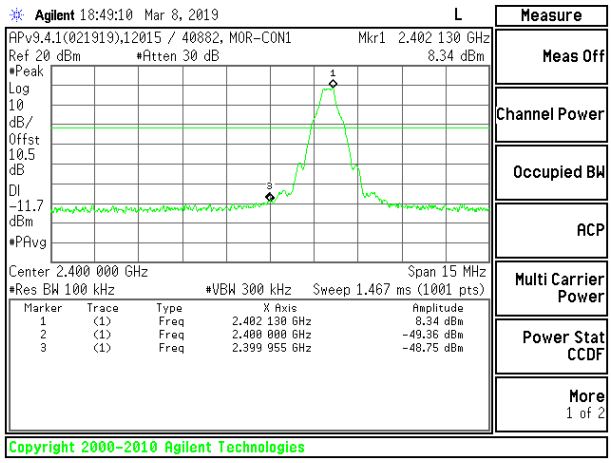
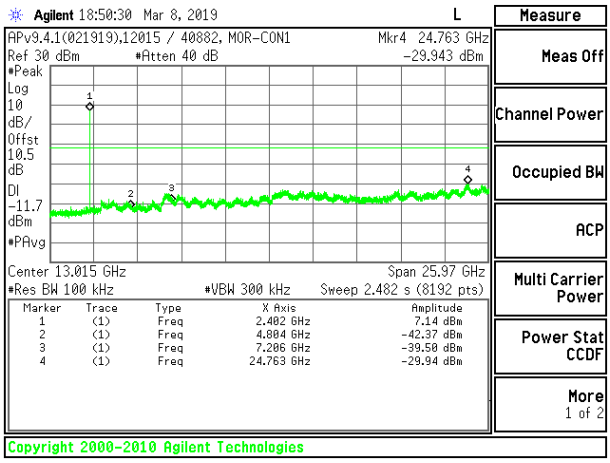
8.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

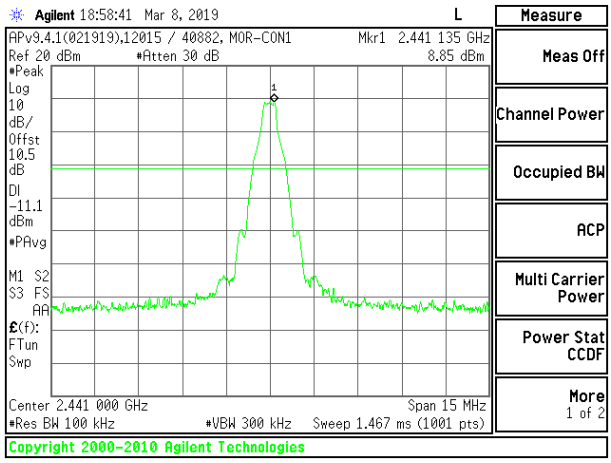
Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



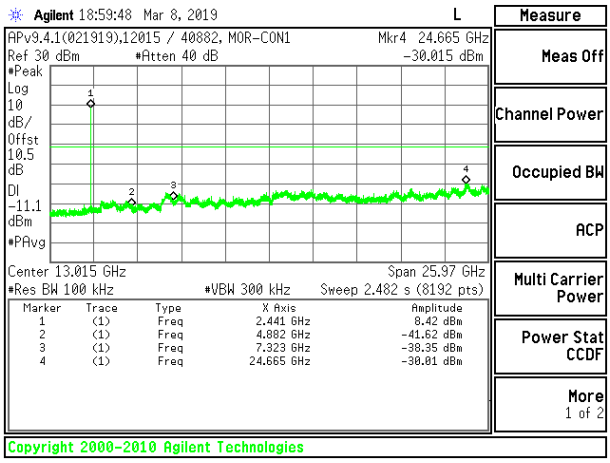
LOW CHANNEL BANDEDGE



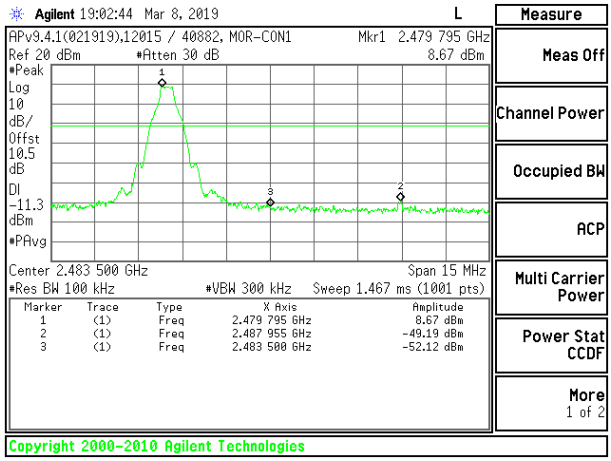
OUT-OF-BAND LOW CHANNEL



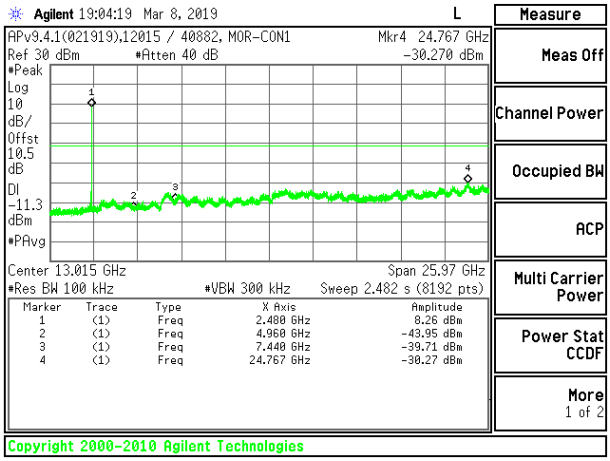
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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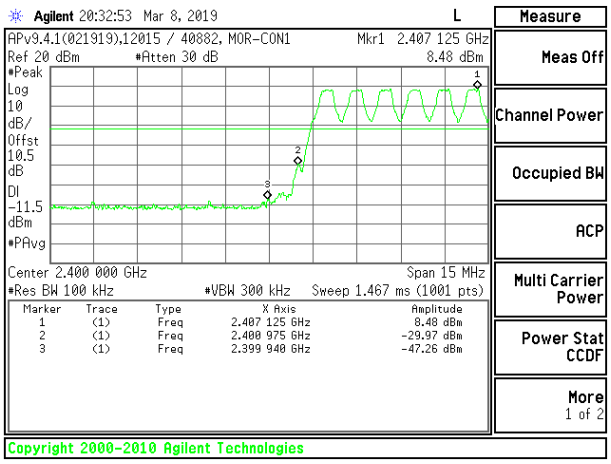
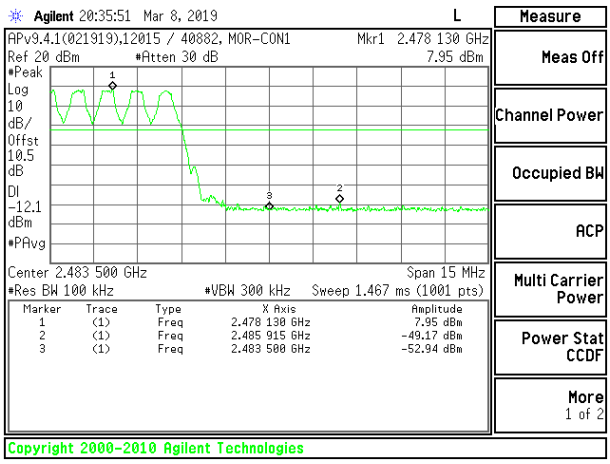
Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

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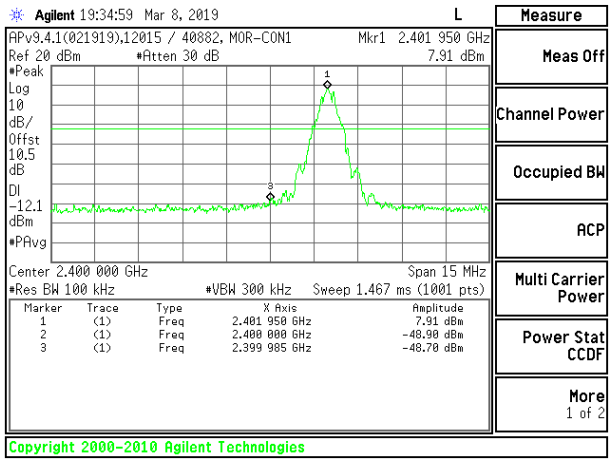
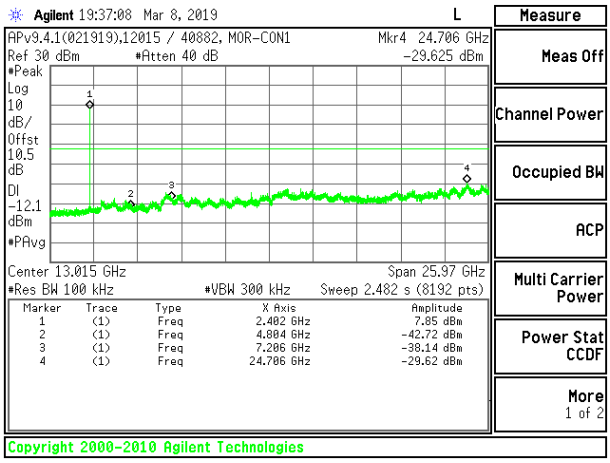
8.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

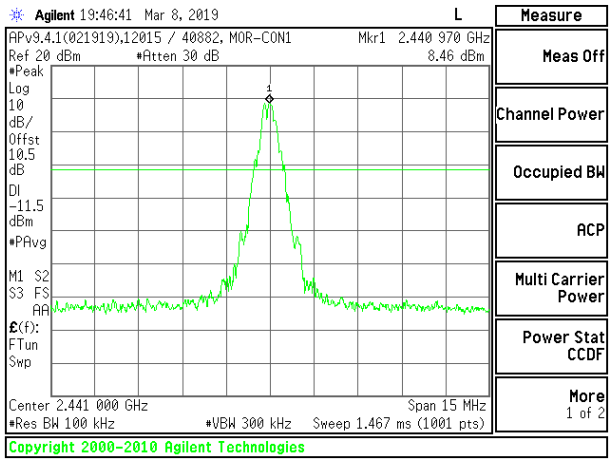
Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



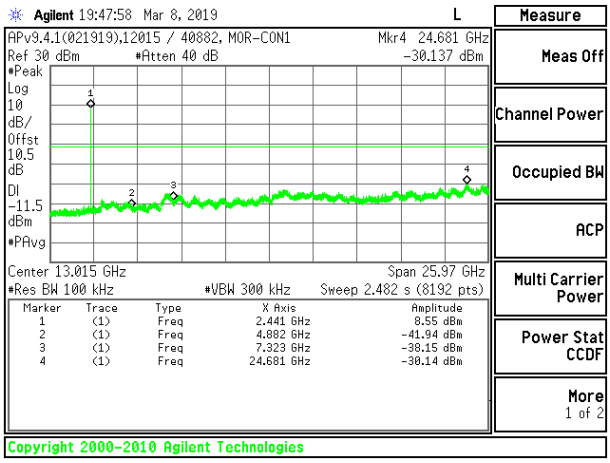
LOW CHANNEL BANDEDGE



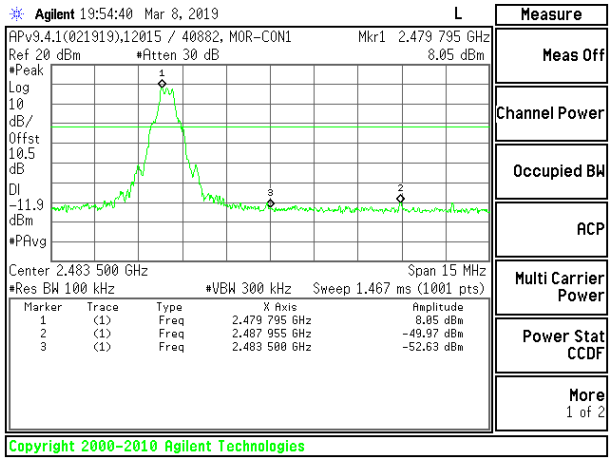
OUT-OF-BAND LOW CHANNEL



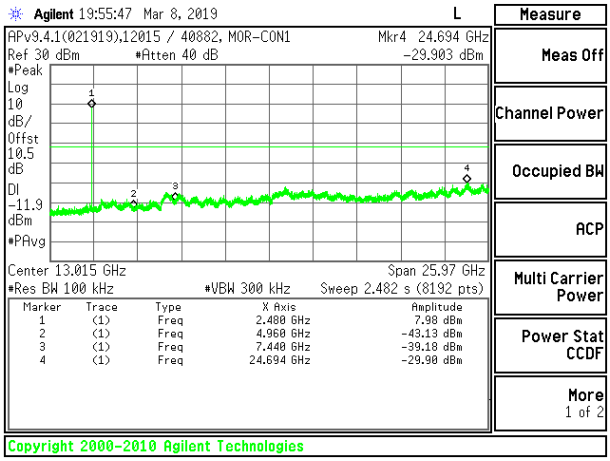
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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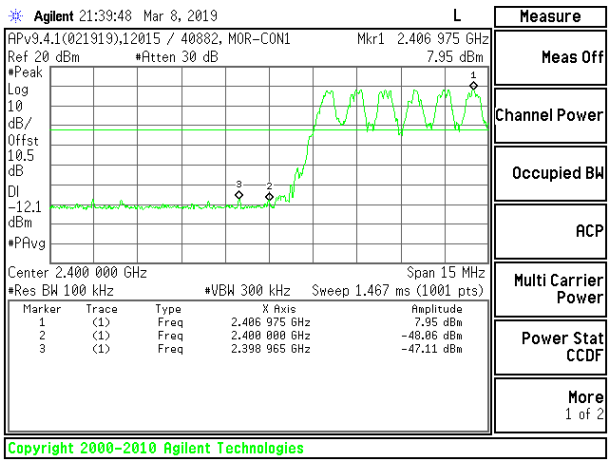
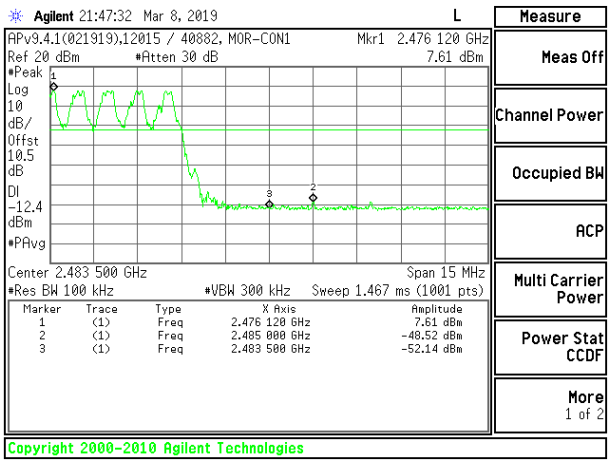
Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



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 200 Hz for measurements from 9kHz to 150kHz, 9kHz for measurements from 150kHz to 30 MHz and 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements from 30-1000 MHz. Peak detection is used unless otherwise noted as quasi-peak.

For pre-scans from 1-18 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements from 1-18 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements. For average measurements, a duty cycle correction was subtracted from the Peak value to obtain the final average value. Refer to the KDB 558074 D01 15.247 Meas Guidance v05r02 section below for further explanation.

For scans above 18 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz.

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

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

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3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

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.

Note – For this test program, Peak detection was used. The DCCF was then subtracted from the peak value. The DCCF was calculated based on the worst case on-time when the device transmits DH5 packets and operates on 20 channels (5/1600 s per hop = 3.125 ms per channel). In this mode, the device will have a maximum of 2 hops on a channel in 100ms or 2x 3.125 ms = 6.25 ms on any channel. Therefore, 20log (6.25 / 100) = - 24dB.

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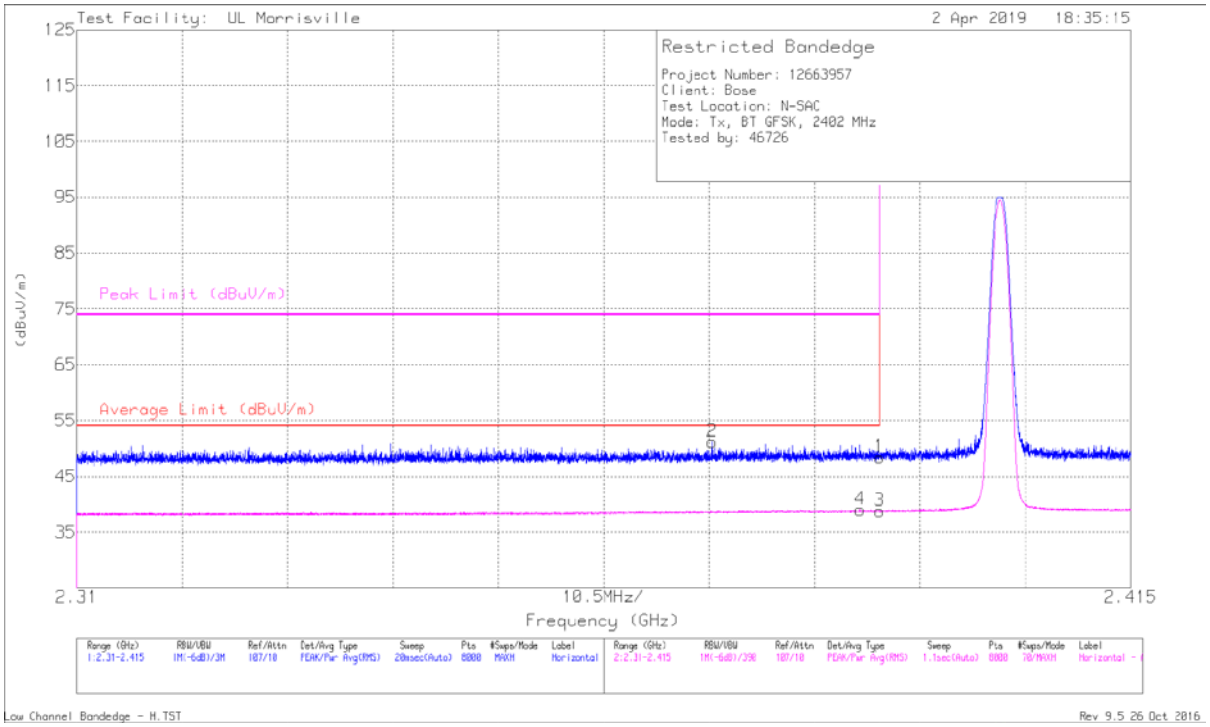
9.1. TRANSMITTER ABOVE 1 GHz

9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.93	Pk	32	-24.5	0	48.43	-	-	74	-25.57	46	109	H
	* 2.39	40.93	Pk	32	-24.5	-24	24.43	54	-29.57	-	-	46	109	H
2	* 2.373	43.92	Pk	31.9	-24.6	0	51.22	-	-	74	-22.78	46	109	H
	* 2.373	43.92	Pk	31.9	-24.6	-24	27.22	54	-26.78	-	-	46	109	H

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

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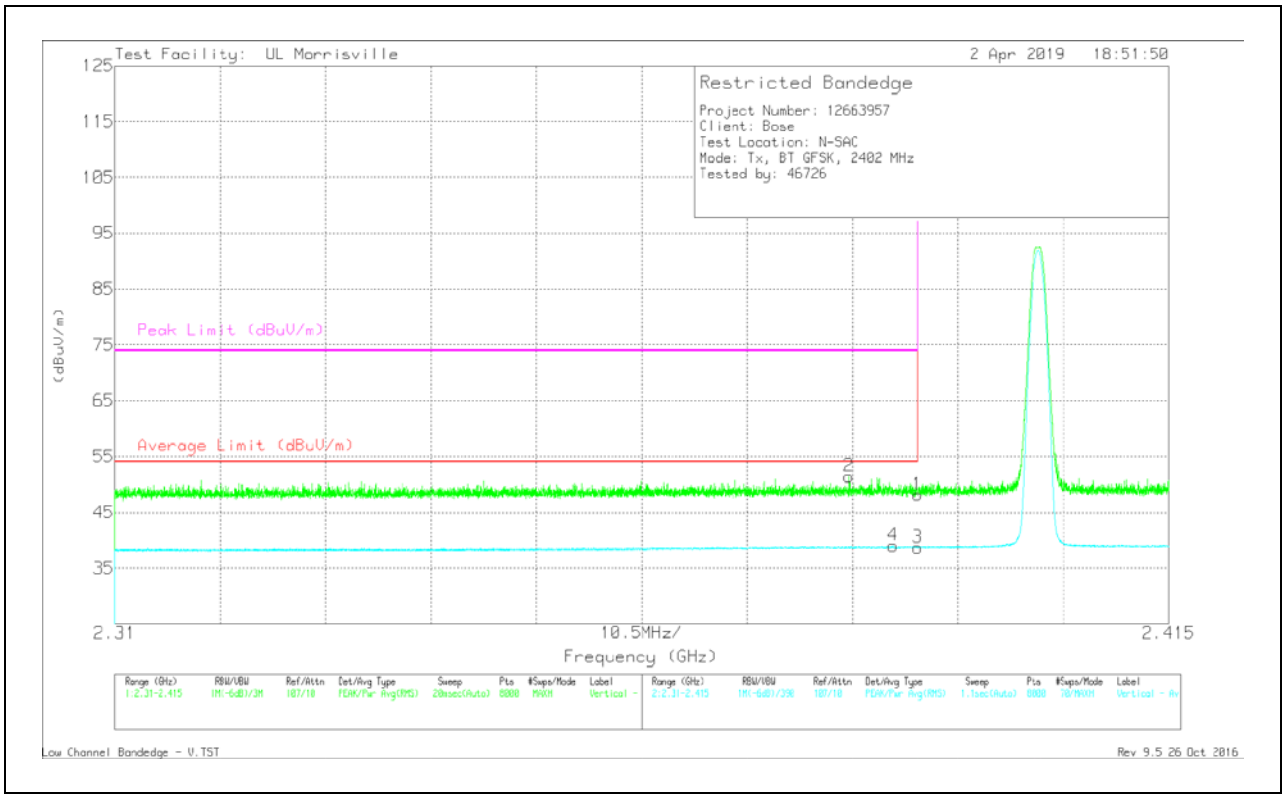
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.61	Pk	32	-24.5	0	48.11	-	-	74	-25.89	303	111	V
	* 2.39	40.61	Pk	32	-24.5	-24	24.11	54	-29.89	-	-	303	111	V
2	* 2.383	43.93	Pk	32	-24.5	0	51.43	-	-	74	-22.57	303	111	V
	* 2.383	43.93	Pk	32	-24.5	-24	27.43	54	-26.57	-	-	303	111	V

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

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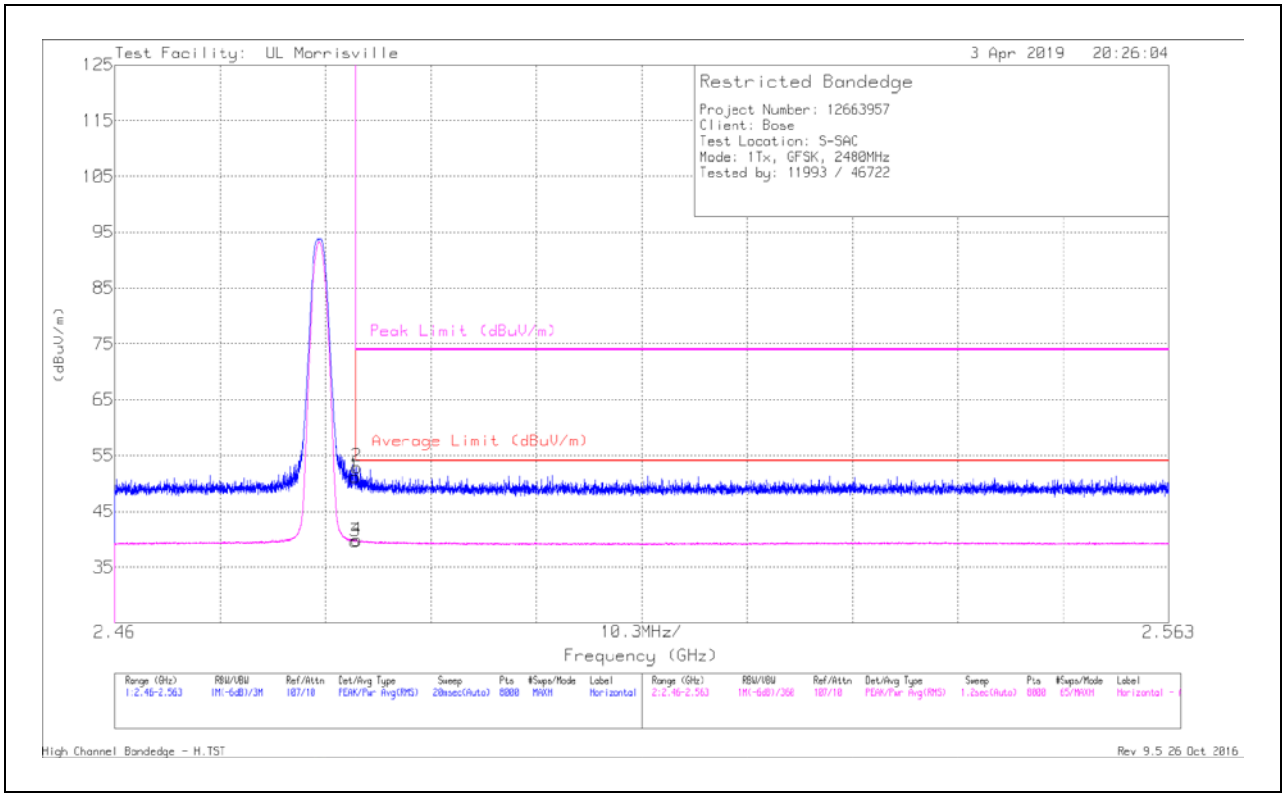
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	42.8	Pk	32.4	-24	0	51.2	-	-	74	-22.8	141	104	H
	* 2.484	42.8	Pk	32.4	-24	-24	27.2	54	-26.8	-	-	141	104	H
2	* 2.484	44.59	Pk	32.4	-24	0	52.99	-	-	74	-21.01	141	104	H
	* 2.484	44.59	Pk	32.4	-24	-24	28.99	54	-25.01	-	-	141	104	H

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

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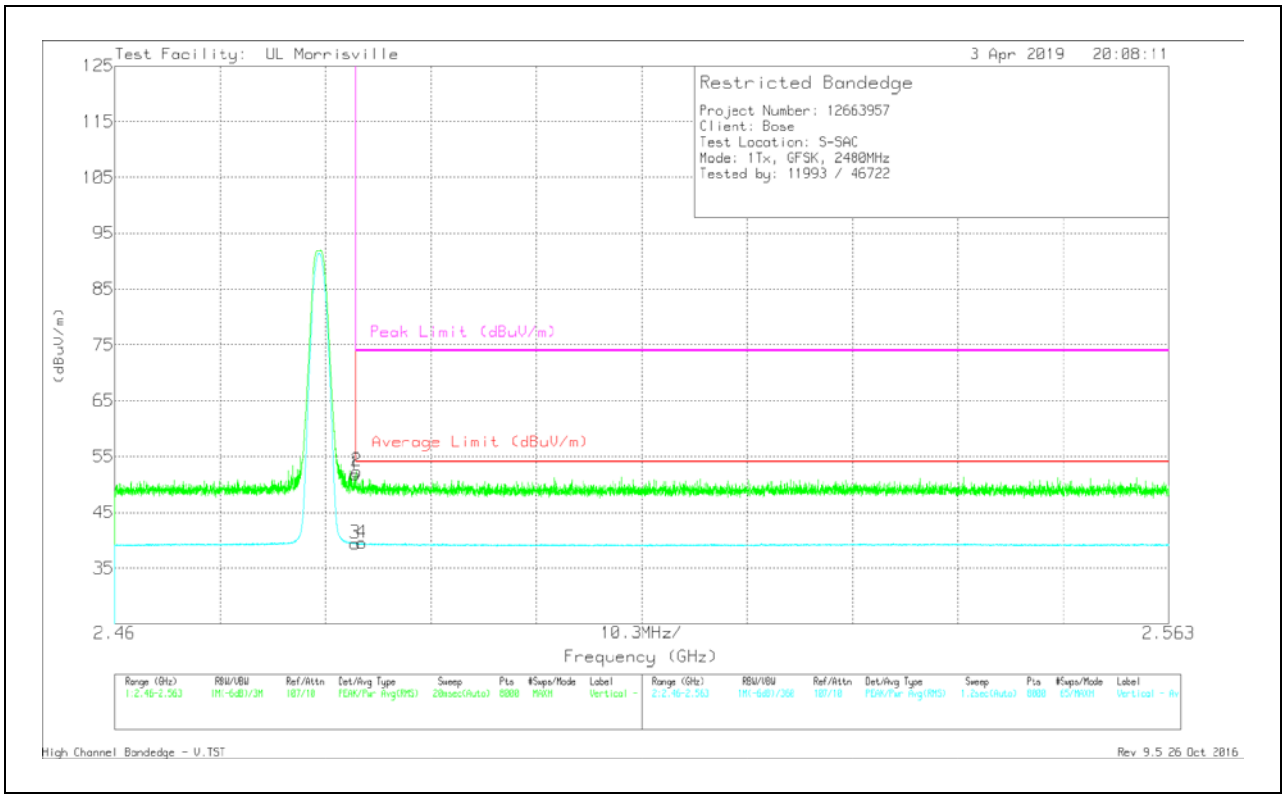
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	43.46	Pk	32.4	-24	0	51.86	-	-	74	-22.14	336	107	V
	* 2.484	43.46	Pk	32.4	-24	-24	27.86	54	-26.14	-	-	336	107	V
2	* 2.484	43.97	Pk	32.4	-24	0	52.37	-	-	74	-21.63	336	107	V
	* 2.484	43.97	Pk	32.4	-24	-24	28.37	54	-25.63	-	-	336	107	V

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

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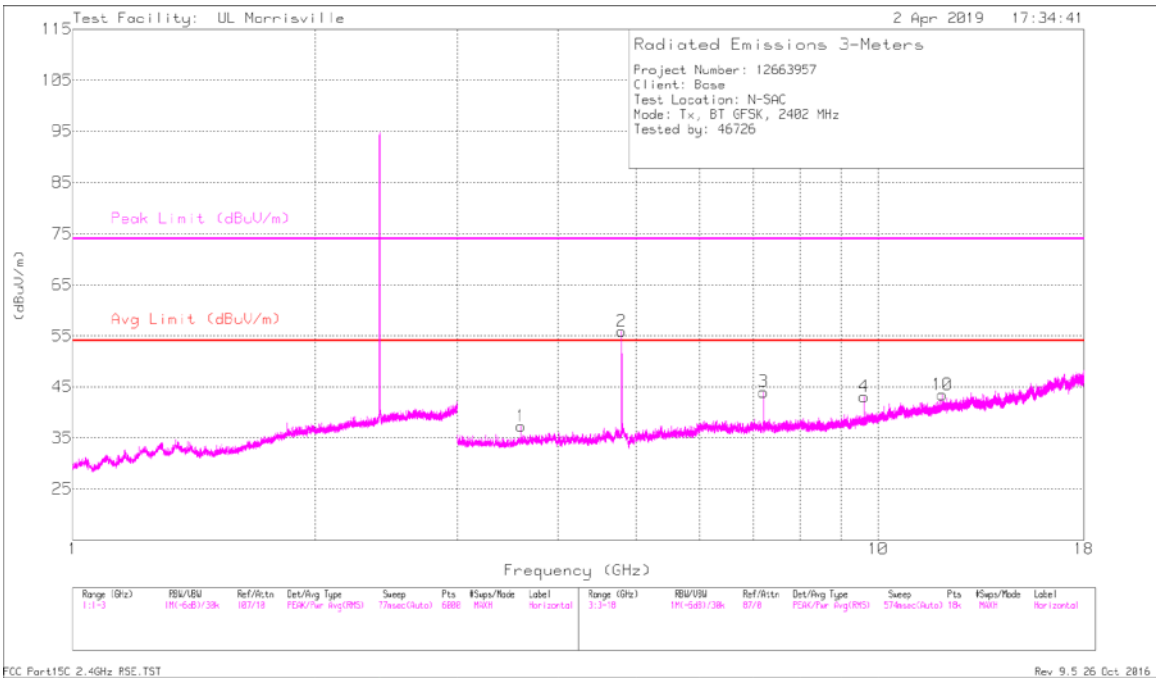
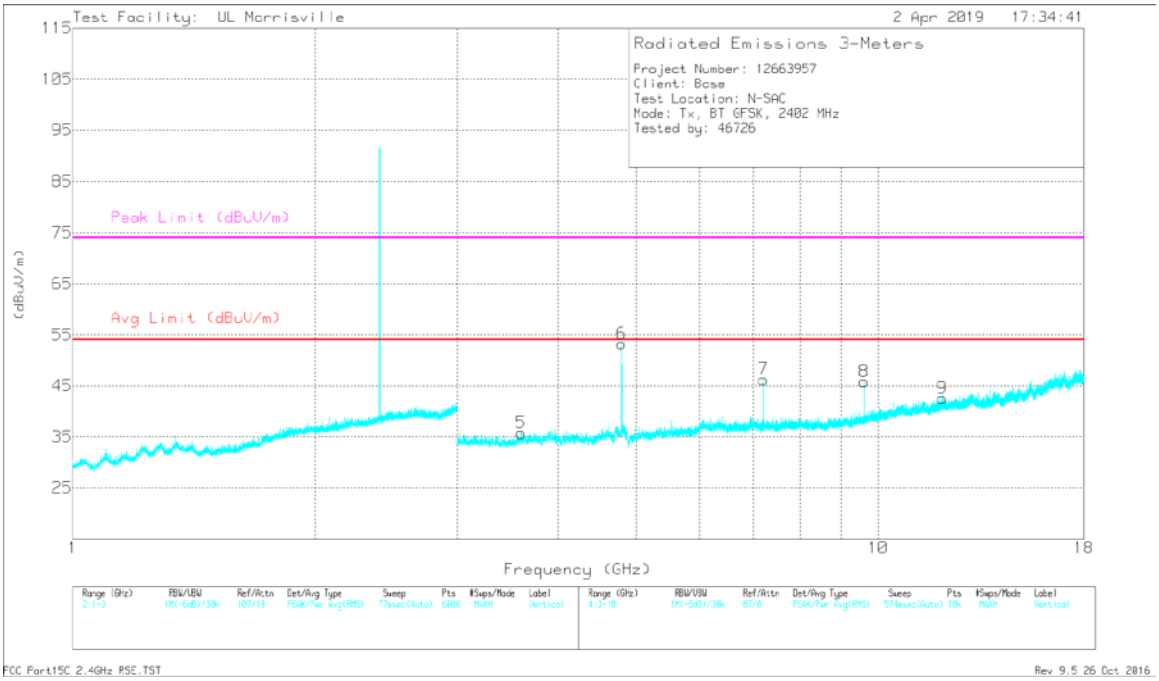
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 3.603	42.51	PK-U	32.9	-31.4	0	44.01	-	-	74	-29.99	118	109	H
	* ** 3.603	42.51	PK-U	32.9	-31.4	-24	20.01	54	-33.99	-	-	118	109	H
2	* ** 4.804	55.41	PK-U	34.1	-31.6	0	57.91	-	-	74	-16.09	86	109	H
	* ** 4.804	55.41	PK-U	34.1	-31.6	-24	33.91	54	-20.09	-	-	86	109	H
10	* ** 12.011	38.28	PK-U	38.7	-25.6	0	51.38	-	-	74	-22.62	130	113	H
	* ** 12.011	38.28	PK-U	38.7	-25.6	-24	27.38	54	-26.62	-	-	130	113	H
5	* ** 3.603	41.31	PK-U	32.9	-31.4	0	42.81	-	-	74	-31.19	79	260	V
	* ** 3.603	41.31	PK-U	32.9	-31.4	-24	18.61	54	-35.39	-	-	79	260	V
6	* ** 4.804	53.84	PK-U	34.1	-31.6	0	56.34	-	-	74	-17.66	281	307	V
	* ** 4.804	53.84	PK-U	34.1	-31.6	-24	32.34	54	-21.66	-	-	281	307	V
9	* ** 12.011	37.5	PK-U	38.7	-25.6	0	50.6	-	-	74	-23.4	297	103	V
	* ** 12.011	37.5	PK-U	38.7	-25.6	-24	26.6	54	-27.4	-	-	297	103	V
3	7.206	38.41	Pk	35.6	-30	0	44.01	-	-	-	-	0-360	102	H
7	7.206	40.68	Pk	35.6	-30	0	46.28	-	-	-	-	0-360	101	V
4	9.606	34.14	Pk	36.9	-28	0	43.04	-	-	-	-	0-360	102	H
8	9.608	36.96	Pk	36.9	-28	0	45.86	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - Maximum Peak
Pk - Peak detector

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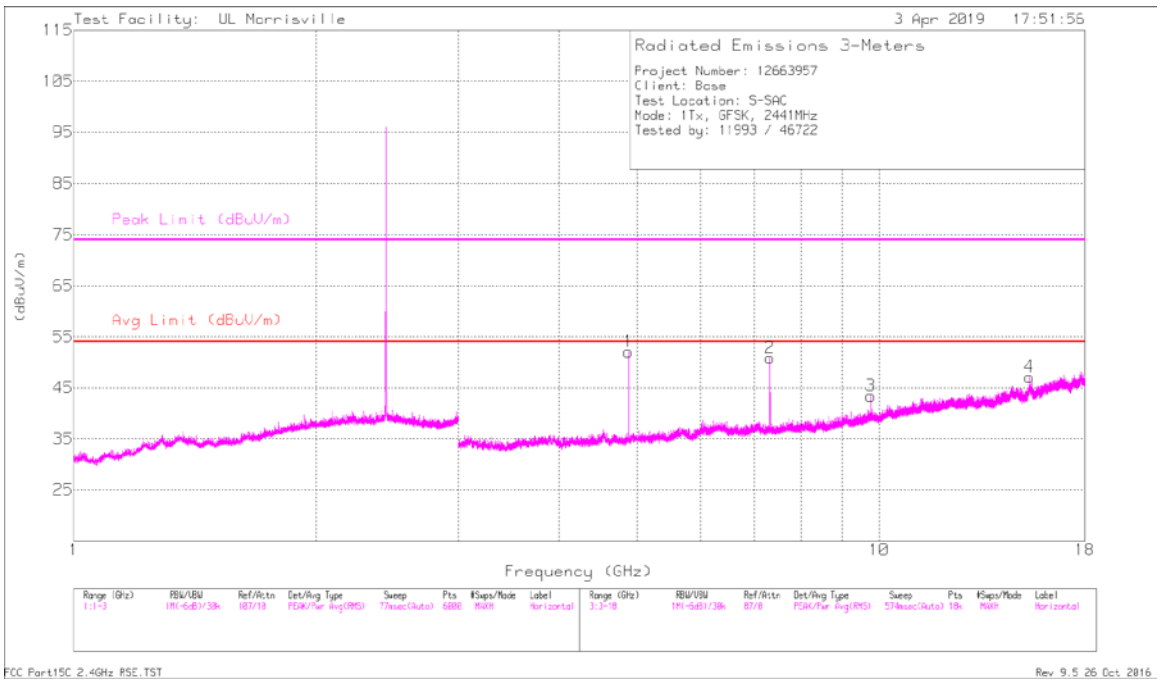
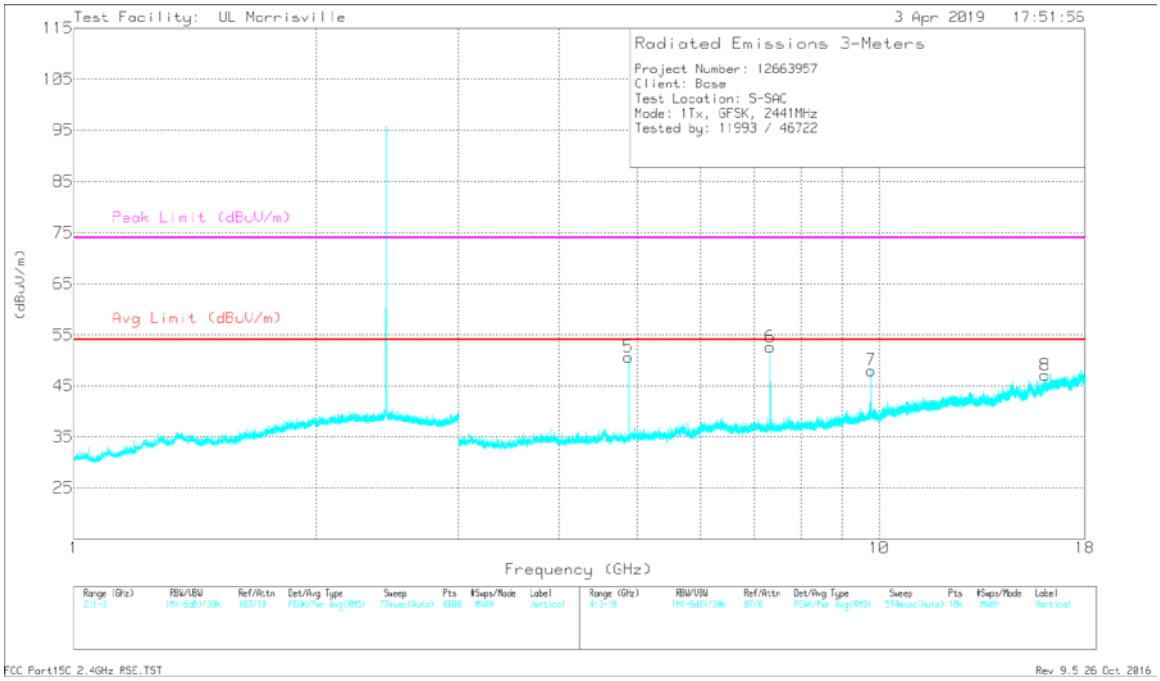
MID CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.882	50.64	PK-U	34	-30.6	0	54.04	-	-	74	-19.96	166	108	H
	* ** 4.882	50.64	PK-U	34	-30.6	-24	30.04	54	-23.96	-	-	166	108	H
2	* ** 7.322	44.76	PK-U	35.5	-27.5	0	52.76	-	-	74	-21.24	52	128	H
	* ** 7.322	44.76	PK-U	35.5	-27.5	-24	28.76	54	-25.24	-	-	52	128	H
4	* ** 15.355	34.23	PK-U	39.9	-22.3	0	51.83	-	-	74	-22.17	145	361	H
	* ** 15.355	34.23	PK-U	39.9	-22.3	-24	27.83	54	-26.17	-	-	145	361	H
5	* ** 4.882	49.64	PK-U	34	-30.6	0	53.04	-	-	74	-20.96	145	282	V
	* ** 4.882	49.64	PK-U	34	-30.6	-24	29.04	54	-24.96	-	-	145	282	V
6	* ** 7.323	47.03	PK-U	35.5	-27.5	0	55.03	-	-	74	-18.97	126	102	V
	* ** 7.323	47.03	PK-U	35.5	-27.5	-24	31.03	54	-22.97	-	-	126	102	V
8	* ** 16.076	35.39	PK-U	40.6	-23.7	0	52.29	-	-	74	-21.71	55	328	V
	* ** 16.076	35.39	PK-U	40.6	-23.7	-24	28.29	54	-25.71	-	-	55	328	V
3	9.763	32	Pk	37	-25.6	0	43.4	-	-	-	-	0-360	102	H
7	9.764	36.62	Pk	37	-25.6	0	48.02	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - Maximum Peak

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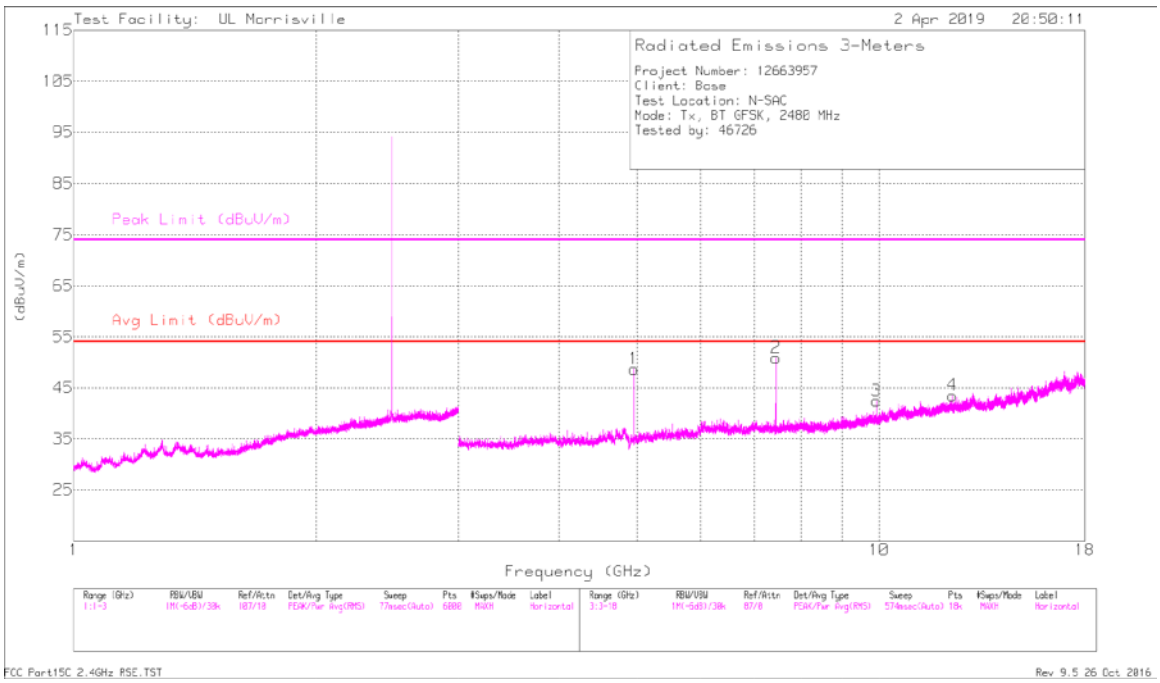
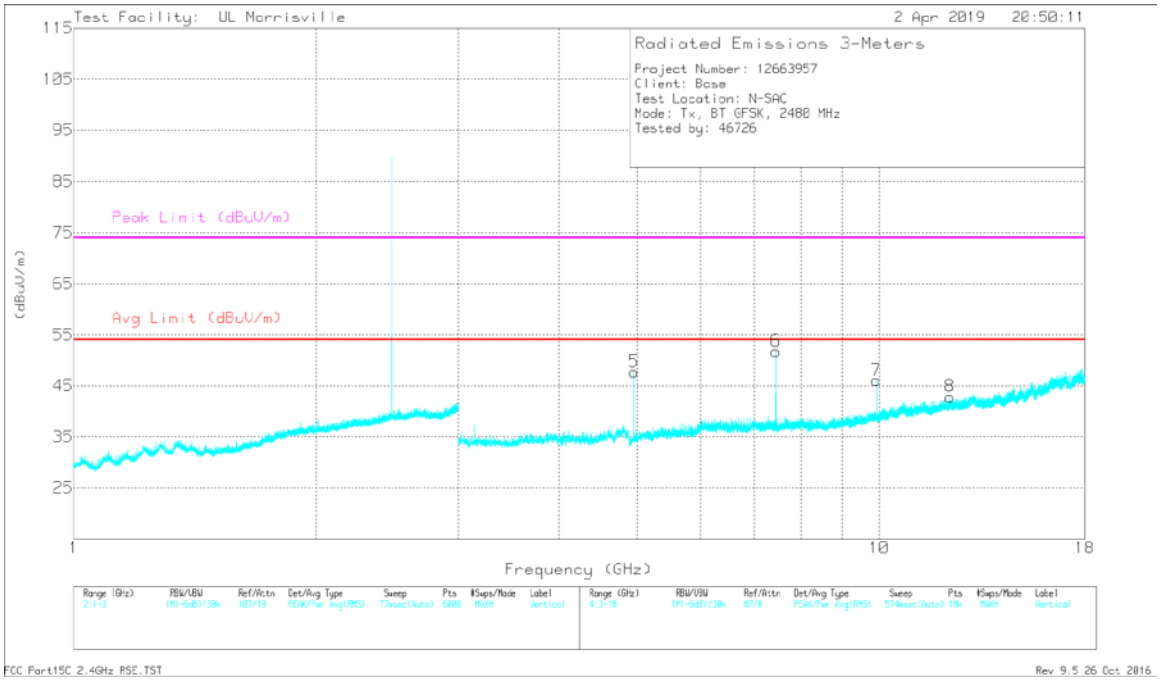
HIGH CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.96	49.65	PK-U	34.1	-32.3	0	51.45	-	-	74	-22.55	188	118	H
	* ** 4.96	49.65	PK-U	34.1	-32.3	-24	27.45	54	-26.55	-	-	188	118	H
2	* ** 7.439	47.34	PK-U	35.6	-29.2	0	53.74	-	-	74	-20.26	336	113	H
	* ** 7.439	47.34	PK-U	35.6	-29.2	-24	29.74	54	-24.26	-	-	336	113	H
4	* ** 12.319	35.98	PK-U	38.9	-25.7	0	49.18	-	-	74	-24.82	62	389	H
	* ** 12.319	35.98	PK-U	38.9	-25.7	-24	25.18	54	-28.82	-	-	62	389	H
5	* ** 4.96	49.22	PK-U	34.1	-32.3	0	51.02	-	-	74	-22.98	161	111	V
	* ** 4.96	49.22	PK-U	34.1	-32.3	-24	27.02	54	-26.98	-	-	161	111	V
6	* ** 7.44	48.92	PK-U	35.6	-29.2	0	55.32	-	-	74	-18.68	161	108	V
	* ** 7.44	48.92	PK-U	35.6	-29.2	-24	31.32	54	-22.68	-	-	161	108	V
8	* ** 12.247	35.76	PK-U	38.9	-25.8	0	48.86	-	-	74	-25.14	143	284	V
	* ** 12.247	35.76	PK-U	38.9	-25.8	-24	24.86	54	-29.14	-	-	143	284	V
3	9.92	33.02	Pk	37.1	-27.7	0	42.42	-	-	-	-	0-360	102	H
7	9.92	36.68	Pk	37.1	-27.7	0	46.08	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - Maximum Peak
Pk - Peak detector

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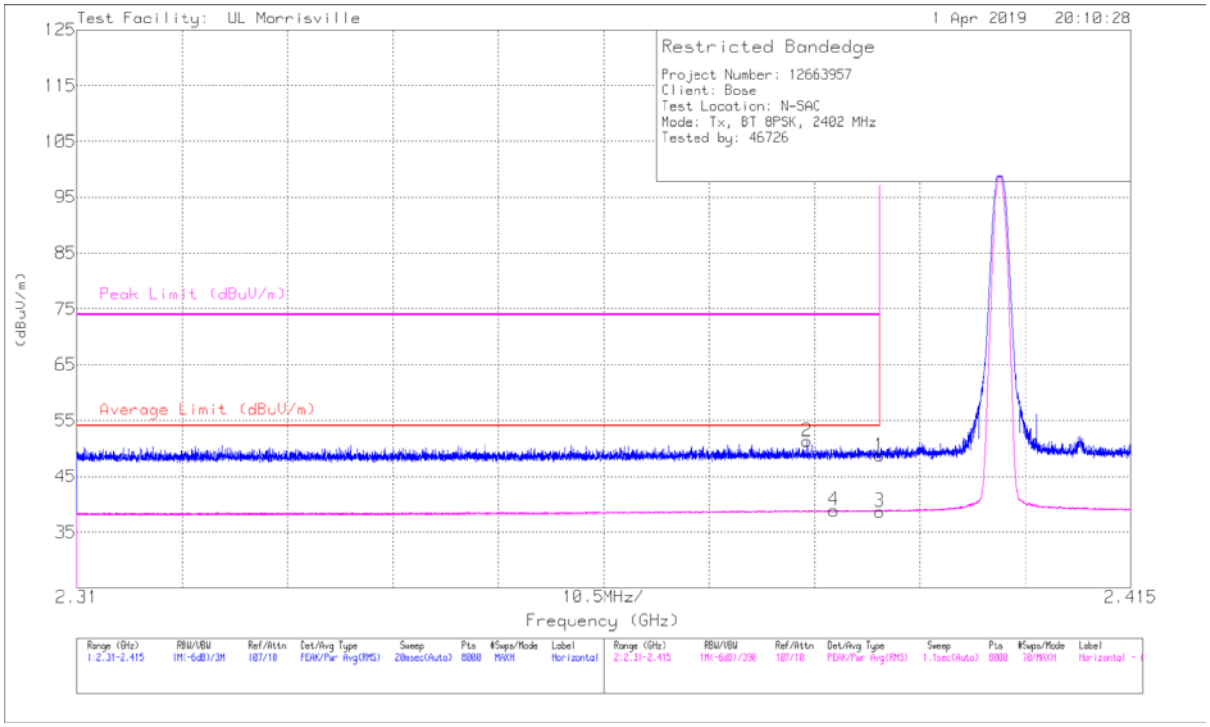
9.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.25	Pk	32	-24.5	0	48.75	-	-	74	-25.25	189	118	H
	* 2.39	41.25	Pk	32	-24.5	-24	24.75	54	-29.25	-	-	189	118	H
2	* 2.383	43.85	Pk	32	-24.5	0	51.35	-	-	74	-22.65	189	118	H
	* 2.383	43.85	Pk	32	-24.5	-24	27.35	54	-26.65	-	-	189	118	H

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

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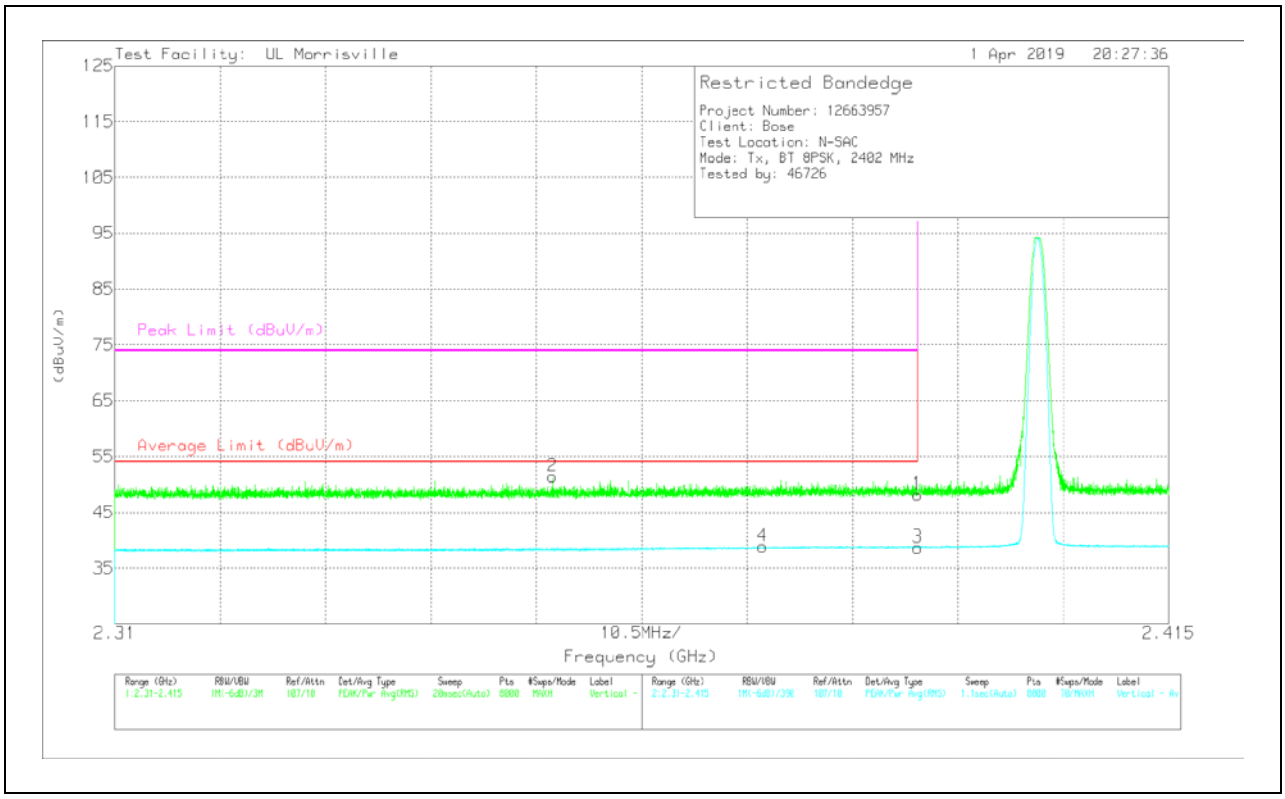
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.67	Pk	32	-24.5	0	48.17	-	-	74	-25.83	13	370	V
	* 2.39	40.67	Pk	32	-24.5	-24	24.17	54	-29.83	-	-	13	370	V
2	* 2.354	44.35	Pk	31.7	-24.6	0	51.45	-	-	74	-22.55	13	370	V
	* 2.354	44.35	Pk	31.7	-24.6	-24	27.45	54	-26.55	-	-	13	370	V

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

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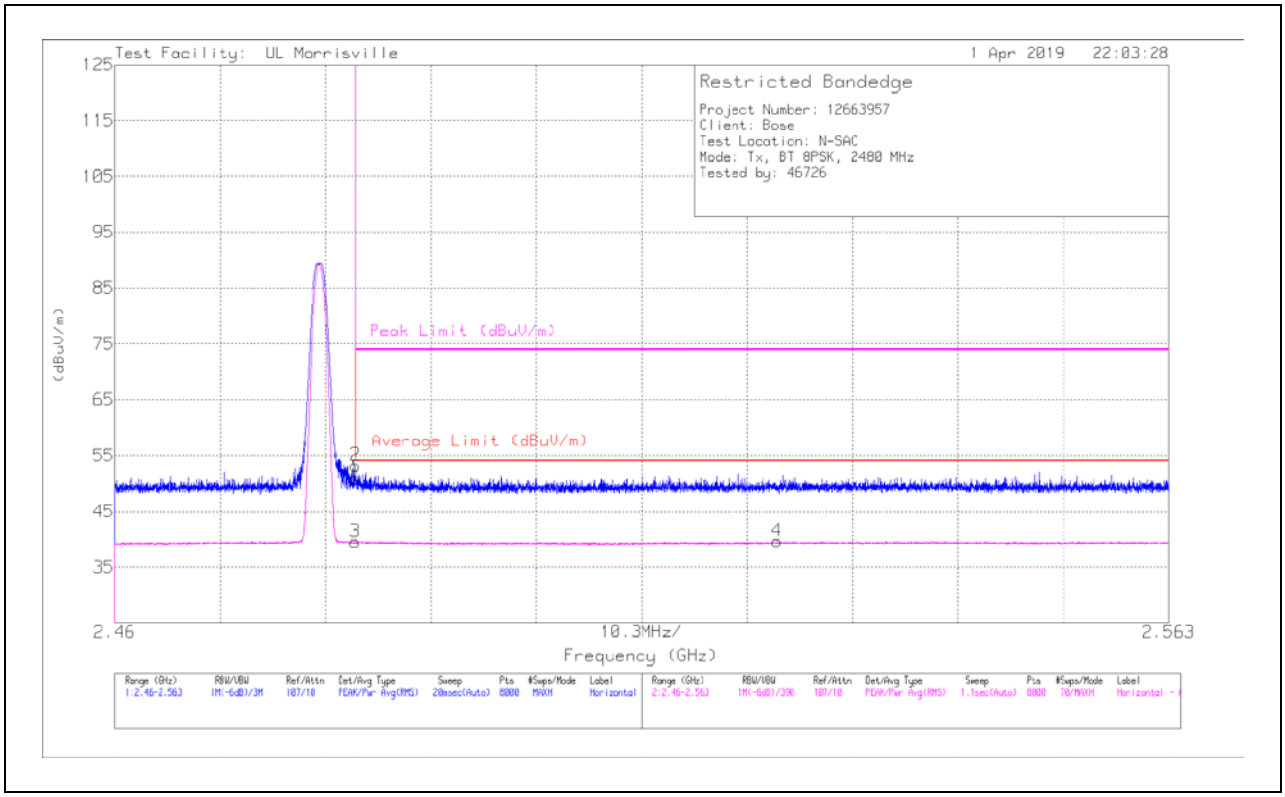
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	42.85	Pk	32.4	-24.3	0	50.95	-	-	74	-23.05	101	116	H
	* 2.484	42.85	Pk	32.4	-24.3	-24	26.95	54	-27.05	-	-	101	116	H
2	* 2.484	45.11	Pk	32.4	-24.3	0	53.21	-	-	74	-20.79	101	116	H
	* 2.484	45.11	Pk	32.4	-24.3	-24	29.21	54	-24.79	-	-	101	116	H

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

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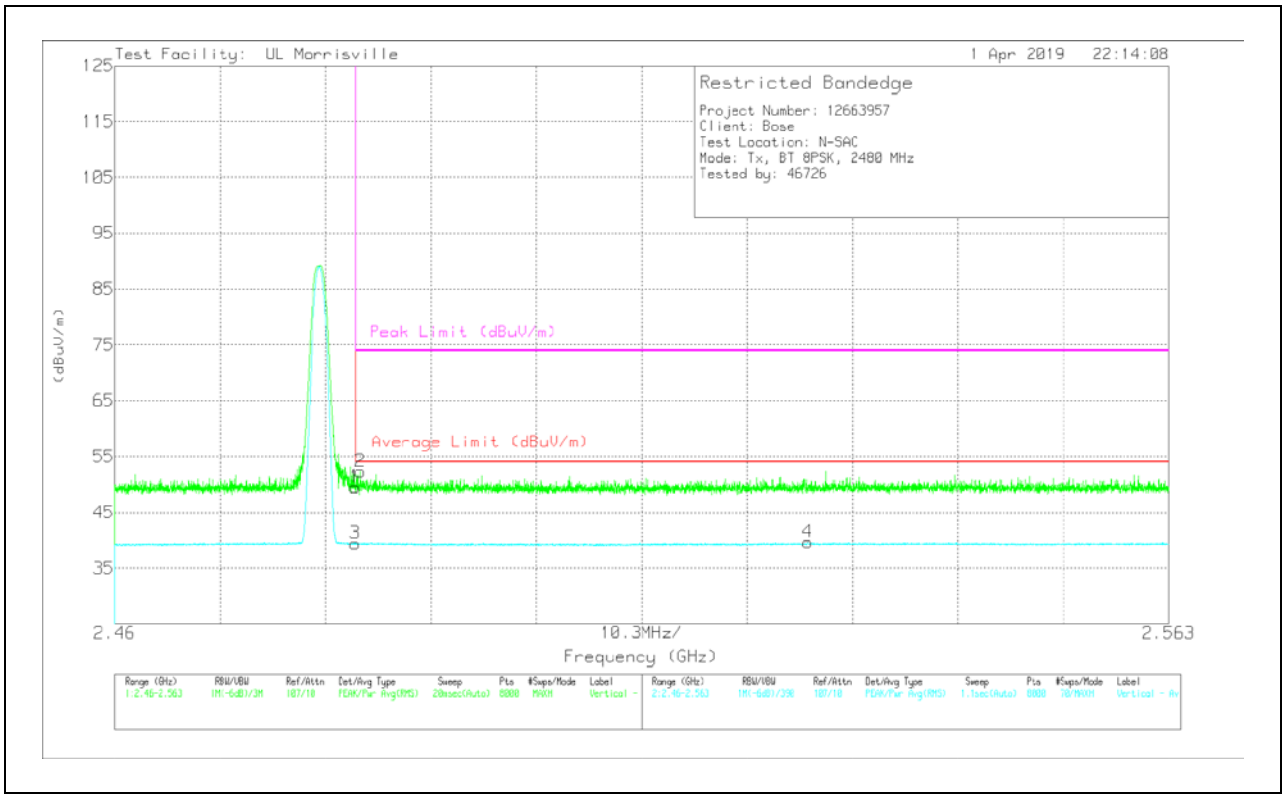
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.36	Pk	32.4	-24.3	0	49.46	-	-	74	-24.54	208	131	V
	* 2.484	41.36	Pk	32.4	-24.3	-24	25.46	54	-28.54	-	-	208	131	V
2	* 2.484	44.23	Pk	32.4	-24.3	0	52.33	-	-	74	-21.67	208	131	V
	* 2.484	44.23	Pk	32.4	-24.3	-24	28.33	54	-25.67	-	-	208	131	V

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

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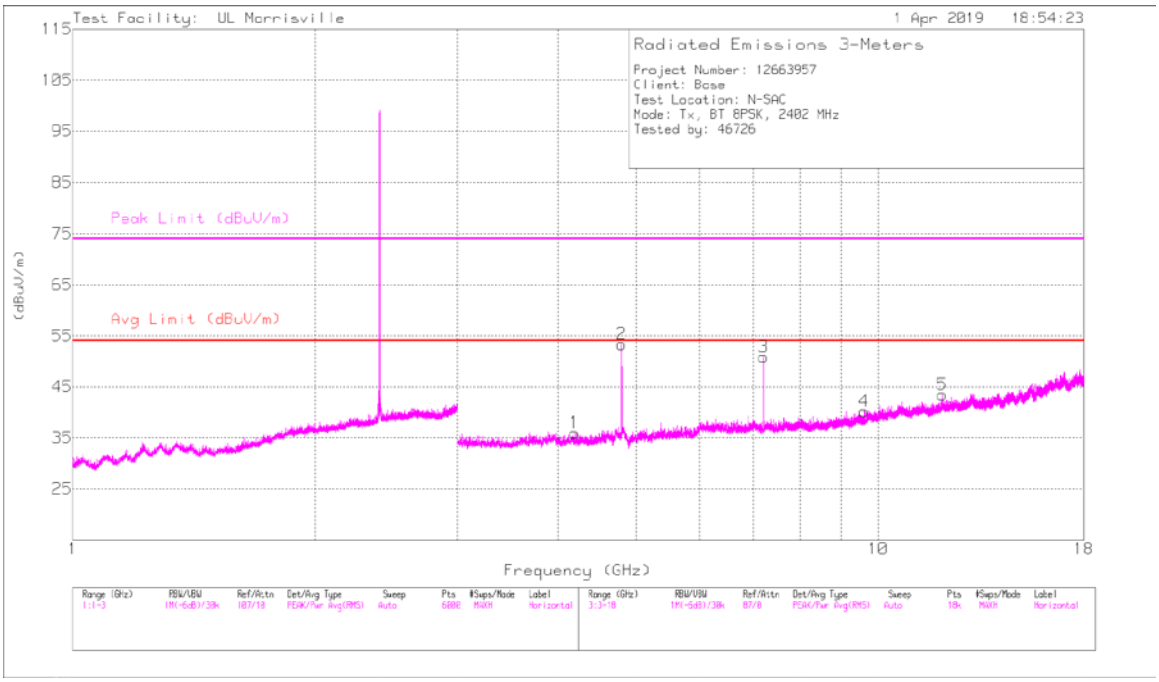
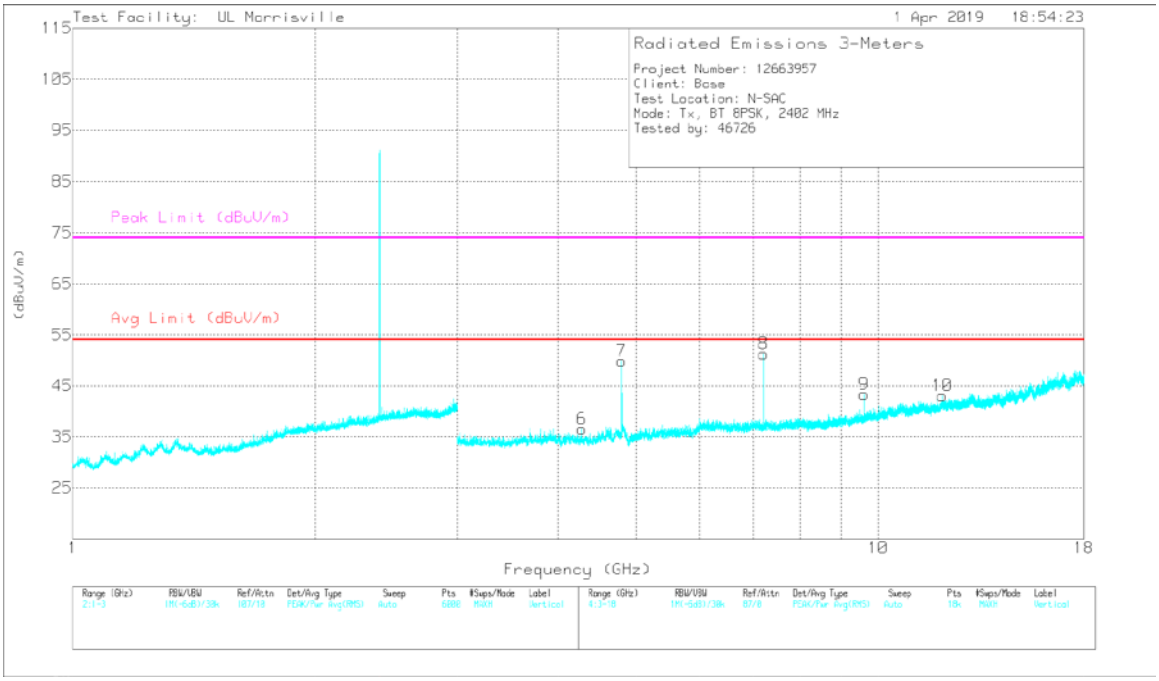
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.198	40.16	PK-U	33.4	-31.3	0	42.26	-	-	74	-31.74	11	106	H
	* 4.198	40.16	PK-U	33.4	-31.3	-24	18.26	54	-35.74	-	-	11	106	H
2	* 4.804	53.34	PK-U	34.1	-31.6	0	55.84	-	-	74	-18.16	284	113	H
	* 4.804	53.34	PK-U	34.1	-31.6	-24	31.84	54	-22.16	-	-	284	113	H
5	* 12.01	37.6	PK-U	38.7	-25.6	0	50.7	-	-	74	-23.3	185	102	H
	* 12.01	37.6	PK-U	38.7	-25.6	-24	26.7	54	-27.3	-	-	185	102	H
6	* 4.287	40.19	PK-U	33.5	-31.8	0	41.89	-	-	74	-32.11	97	303	V
	* 4.287	40.19	PK-U	33.5	-31.8	-24	17.89	54	-36.11	-	-	97	303	V
7	* 4.804	50.87	PK-U	34.1	-31.6	0	53.37	-	-	74	-20.63	201	110	V
	* 4.804	50.87	PK-U	34.1	-31.6	-24	29.37	54	-24.63	-	-	201	110	V
10	* 12.01	37.67	PK-U	38.7	-25.6	0	50.77	-	-	74	-23.23	23	103	V
	* 12.01	37.67	PK-U	38.7	-25.6	-24	26.77	54	-27.23	-	-	23	103	V
3	7.205	45.27	Pk	35.6	-30	0	50.87	-	-	-	-	0-360	102	H
8	7.205	45.68	Pk	35.6	-30	0	51.28	-	-	-	-	0-360	199	V
4	9.607	31.29	Pk	36.9	-28	0	40.19	-	-	-	-	0-360	199	H
9	9.607	34.41	Pk	36.9	-28	0	43.31	-	-	-	-	0-360	102	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK-U - Maximum Peak
Pk - Peak detector

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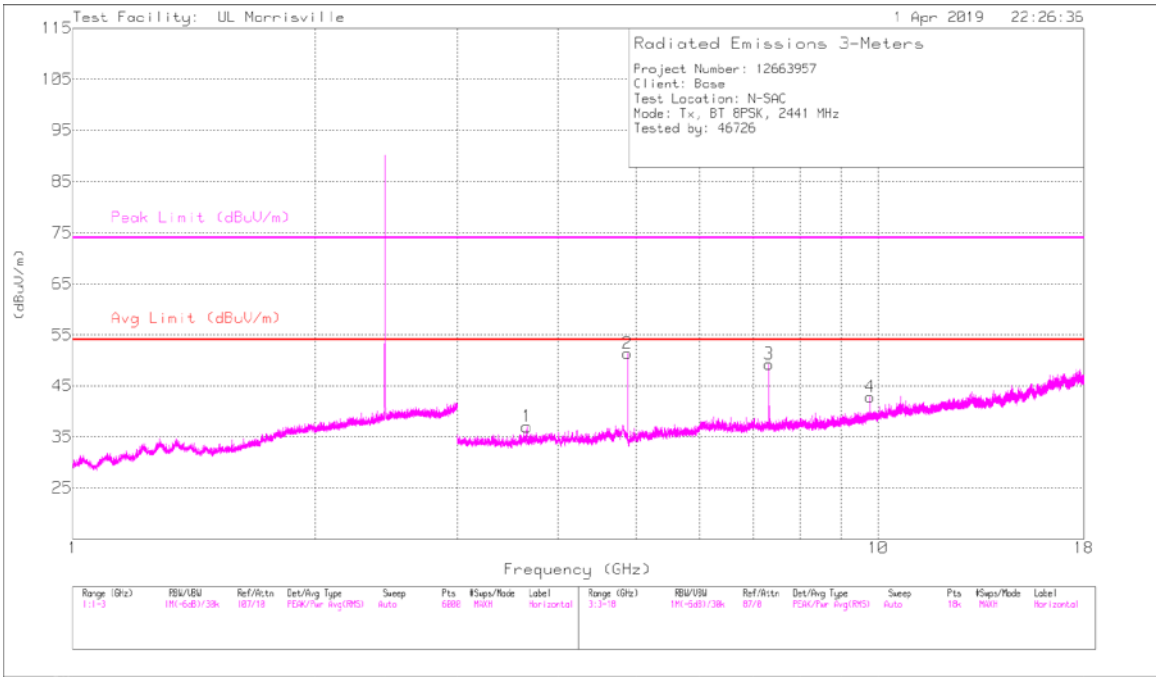
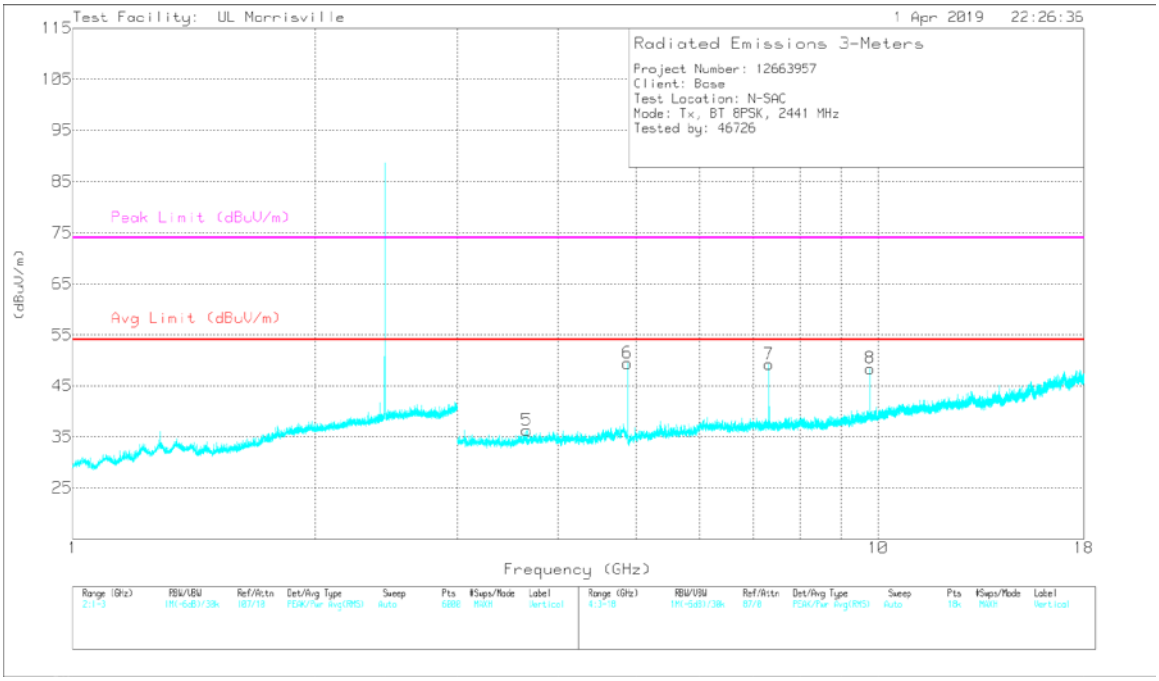
MID CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 3.661	42.09	PK-U	33	-31.5	0	43.59	-	-	74	-30.41	351	170	H
	* ** 3.661	42.09	PK-U	33	-31.5	-24	19.59	54	-34.41	-	-	351	170	H
2	* ** 4.882	50.33	PK-U	34.1	-31.3	0	53.13	-	-	74	-20.87	320	103	H
	* ** 4.882	50.33	PK-U	34.1	-31.3	-24	29.13	54	-24.87	-	-	320	103	H
3	* ** 7.323	46.09	PK-U	35.6	-29.2	0	52.49	-	-	74	-21.51	332	105	H
	* ** 7.323	46.09	PK-U	35.6	-29.2	-24	28.49	54	-25.51	-	-	332	105	H
5	* ** 3.661	41.87	PK-U	33	-31.5	0	43.37	-	-	74	-30.63	125	201	V
	* ** 3.661	41.87	PK-U	33	-31.5	-24	19.37	54	-34.63	-	-	125	201	V
6	* ** 4.882	50.25	PK-U	34.1	-31.3	0	53.05	-	-	74	-20.95	182	102	V
	* ** 4.882	50.25	PK-U	34.1	-31.3	-24	29.05	54	-24.95	-	-	182	102	V
7	* ** 7.323	46.12	PK-U	35.6	-29.2	0	52.52	-	-	74	-21.48	134	109	V
	* ** 7.323	46.12	PK-U	35.6	-29.2	-24	28.52	54	-25.48	-	-	134	109	V
4	9.764	33.04	Pk	37	-27.2	0	42.84	-	-	-	-	0-360	102	H
8	9.764	38.61	Pk	37	-27.2	0	48.41	-	-	-	-	0-360	102	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - Maximum Peak
Pk - Peak detector

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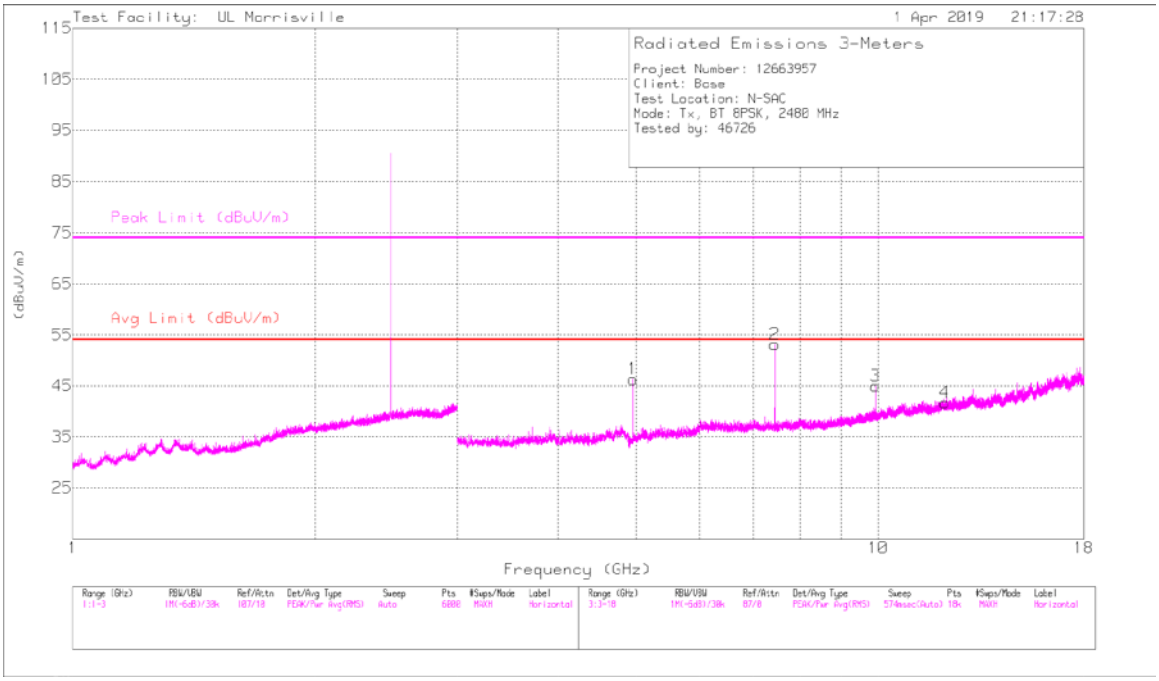
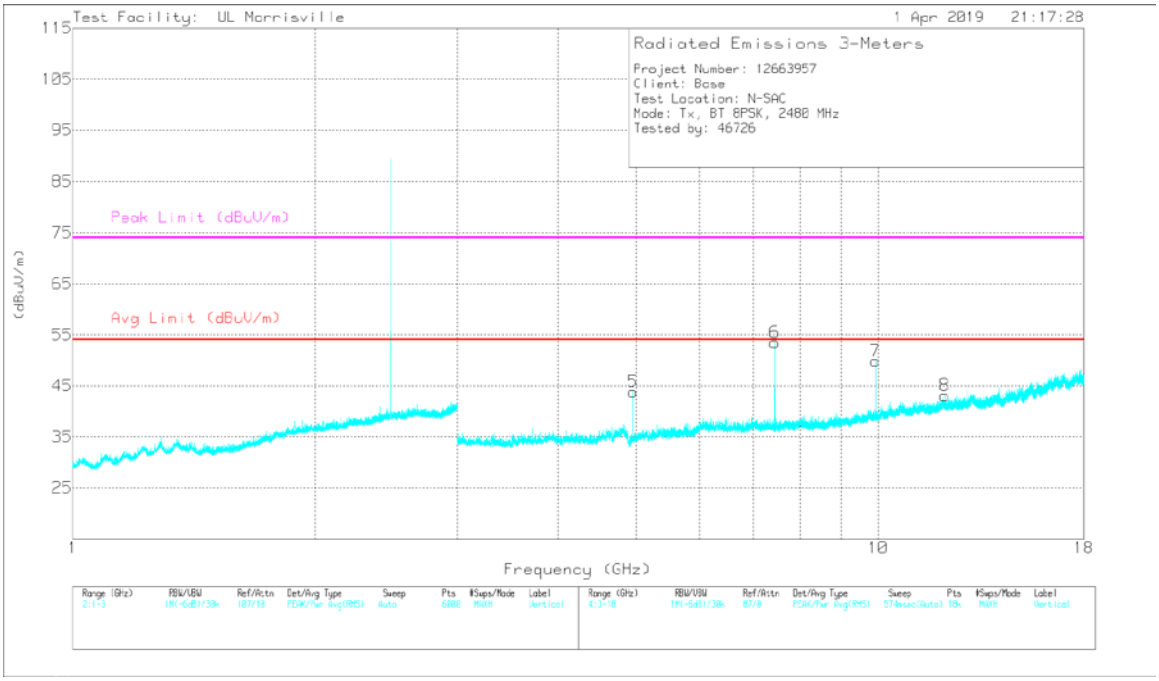
HIGH CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.96	47.05	PK-U	34.1	-32.3	0	48.85	-	-	74	-25.15	138	103	H
	* ** 4.96	47.05	PK-U	34.1	-32.3	-24	24.85	54	-29.15	-	-	138	103	H
2	* ** 7.44	48.9	PK-U	35.6	-29.2	0	55.3	-	-	74	-18.7	150	106	H
	* ** 7.44	48.9	PK-U	35.6	-29.2	-24	31.3	54	-22.7	-	-	150	106	H
4	* ** 12.095	35.41	PK-U	38.8	-25.7	0	48.51	-	-	74	-25.49	0	398	H
	* ** 12.095	35.41	PK-U	38.8	-25.7	-24	24.51	54	-29.49	-	-	0	398	H
5	* ** 4.96	45.34	PK-U	34.1	-32.3	0	47.14	-	-	74	-26.86	17	103	V
	* ** 4.96	45.34	PK-U	34.1	-32.3	-24	23.14	54	-30.86	-	-	17	103	V
6	* ** 7.44	49.36	PK-U	35.6	-29.2	0	55.76	-	-	74	-18.24	334	103	V
	* ** 7.44	49.36	PK-U	35.6	-29.2	-24	31.76	54	-22.24	-	-	334	103	V
8	* ** 12.101	35.83	PK-U	38.7	-25.7	0	48.83	-	-	74	-25.17	340	331	V
	* ** 12.101	35.83	PK-U	38.7	-25.7	-24	24.4	54	-29.6	-	-	340	331	V
3	9.92	35.58	Pk	37.1	-27.7	0	44.98	-	-	-	-	0-360	102	H
7	9.92	40.45	Pk	37.1	-27.7	0	49.85	-	-	-	-	0-360	102	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - Maximum Peak
Pk - Peak detector

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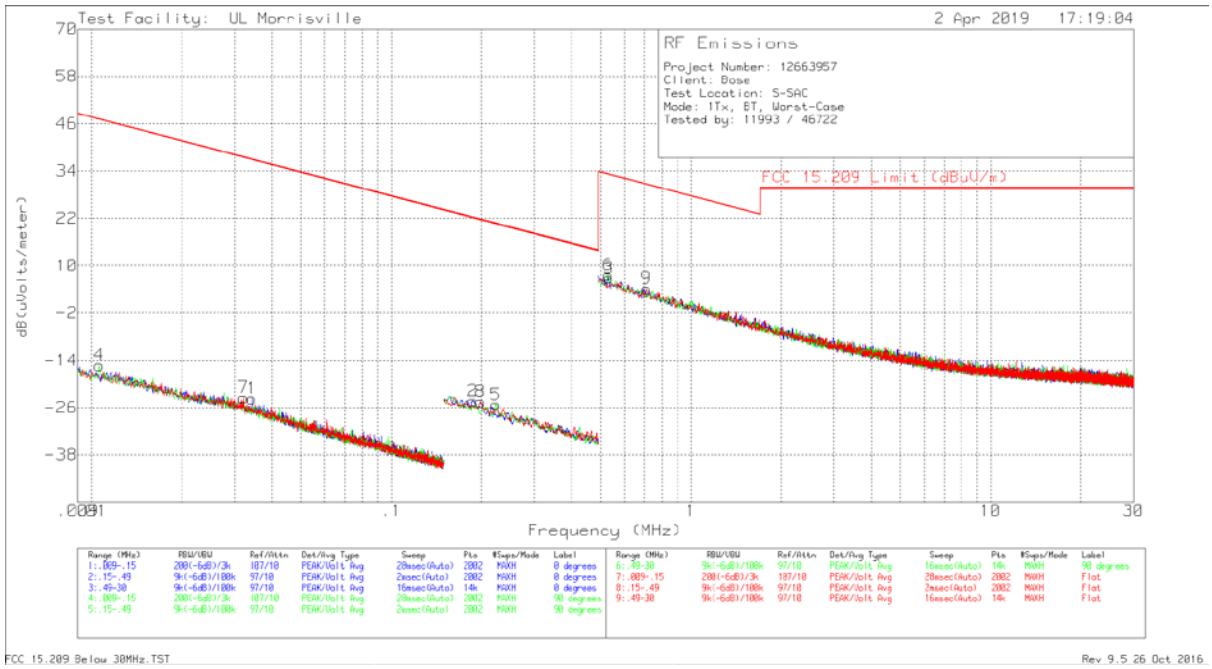
9.2. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (test distance / specification distance).



ANTENNA- THREE ORIENTATIONS

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uV/m)	FCC 15.209 QP Limit (dBuV/m)	FCC 15.209 AV Limit (dBuV/m)	FCC 15.209 PK Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)	Antenna Face
4	.01061	46.63	Pk	18	.1	-80	-15.27	-	47.09	67.09	-62.36	0-360	Off
7	.0321	43.17	Pk	13.3	.1	-80	-23.43	-	37.47	57.47	-60.9	0-360	Flat
1	.03427	43.17	Pk	13	.1	-80	-23.73	-	36.91	56.91	-60.64	0-360	On
2	.18749	44.93	Pk	10.7	.1	-80	-24.27	-	22.14	42.14	-46.41	0-360	On
8	.19888	44.67	Pk	10.7	.1	-80	-24.53	-	21.63	41.63	-46.16	0-360	Flat
5	.22276	43.91	Pk	10.7	.1	-80	-25.29	-	20.65	40.65	-45.94	0-360	Off
6	.529	36.77	Pk	10.8	.1	-40	7.67	33.13	-	-	-25.46	0-360	Off
3	.53216	36	Pk	10.8	.1	-40	6.9	33.08	-	-	-26.18	0-360	On
9	.71134	33.3	Pk	10.8	.1	-40	4.2	30.56	-	-	-26.36	0-360	Flat

Pk - Peak detector

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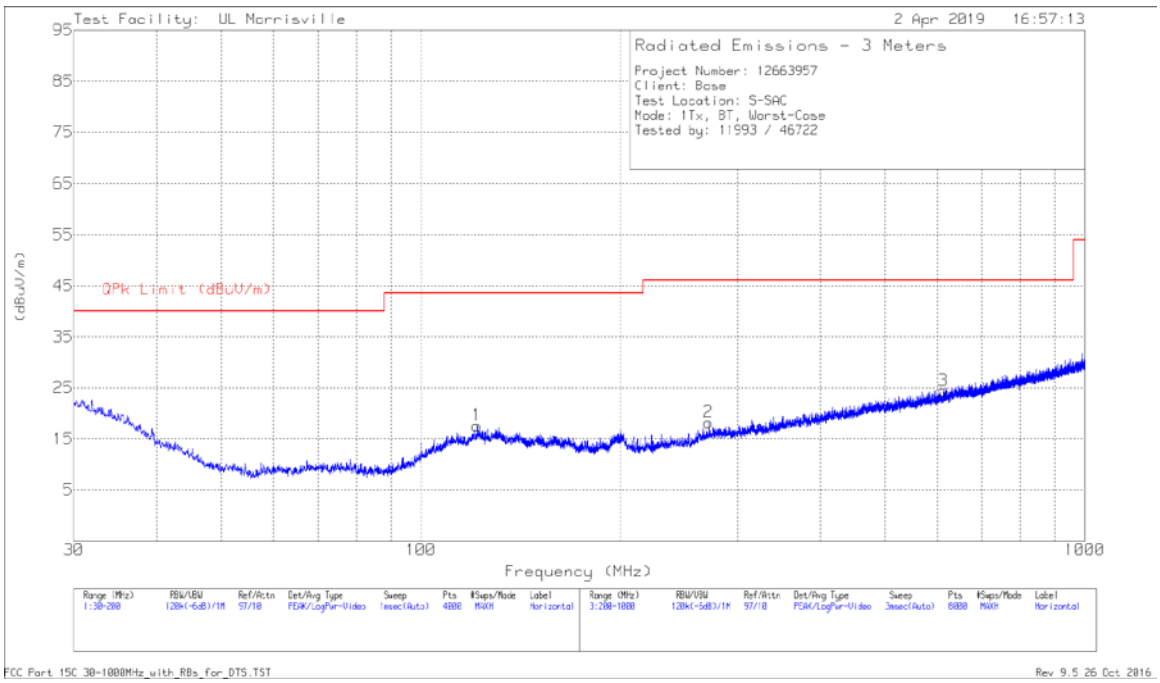
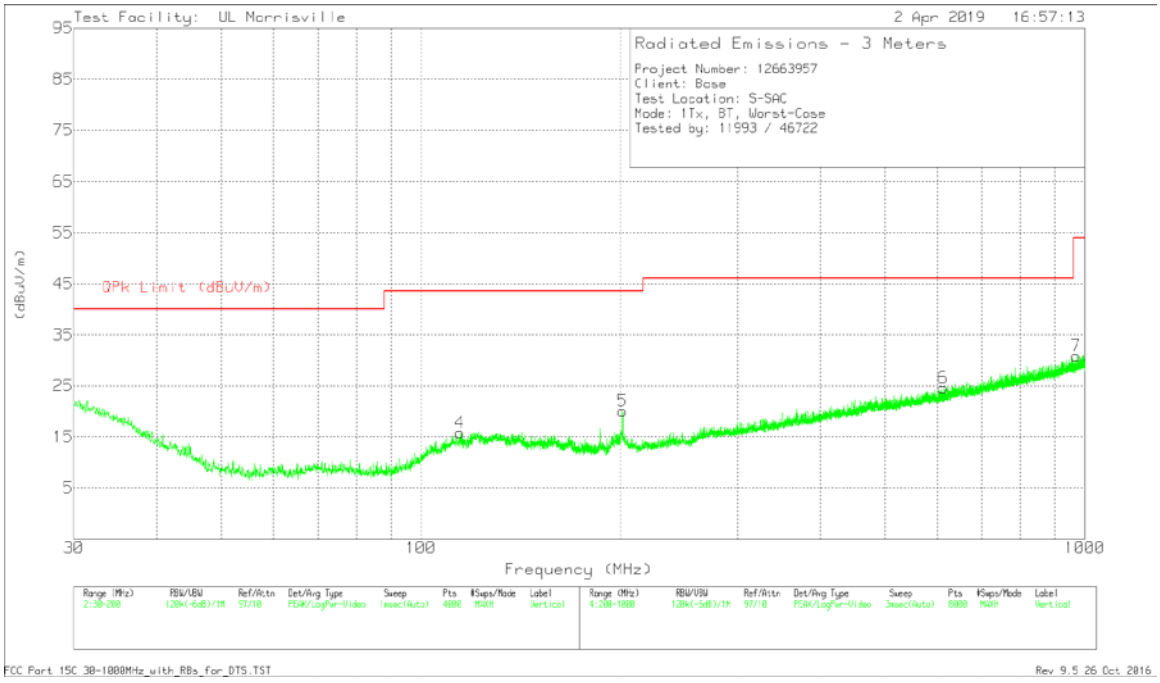
9.3. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

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Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 121.5262	30.21	Pk	18.2	-30.8	17.61	43.52	-25.91	0-360	399	H
4	* 114.5119	29.01	Pk	17.6	-30.8	15.81	43.52	-27.71	0-360	101	V
2	* 271.3093	30.13	Pk	17.8	-29.7	18.23	46.02	-27.79	0-360	199	H
3	* 612.0536	29.41	Pk	23.7	-28.7	24.41	46.02	-21.61	0-360	399	H
6	* 611.8535	29.59	Pk	23.7	-28.7	24.59	46.02	-21.43	0-360	102	V
7	* 970.8002	29.07	Pk	27.8	-26	30.87	53.97	-23.1	0-360	102	V
5	201.3002	32.85	Pk	17.4	-30.2	20.05	43.52	-23.47	0-360	102	V

Pk - Peak detector

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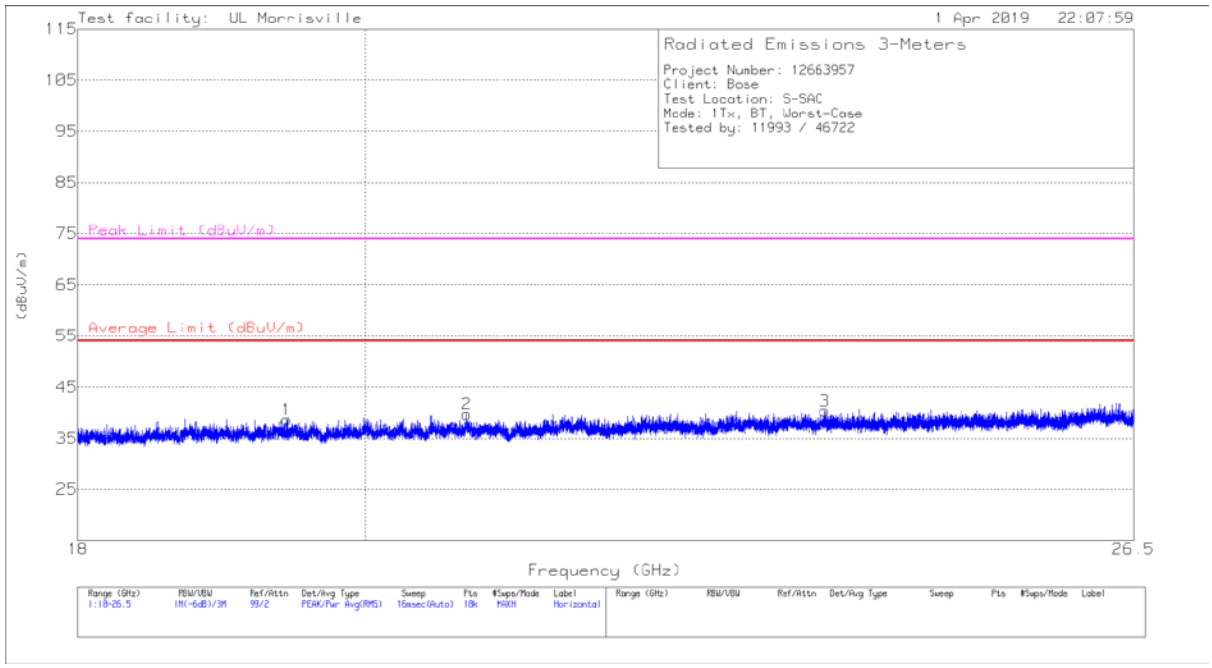
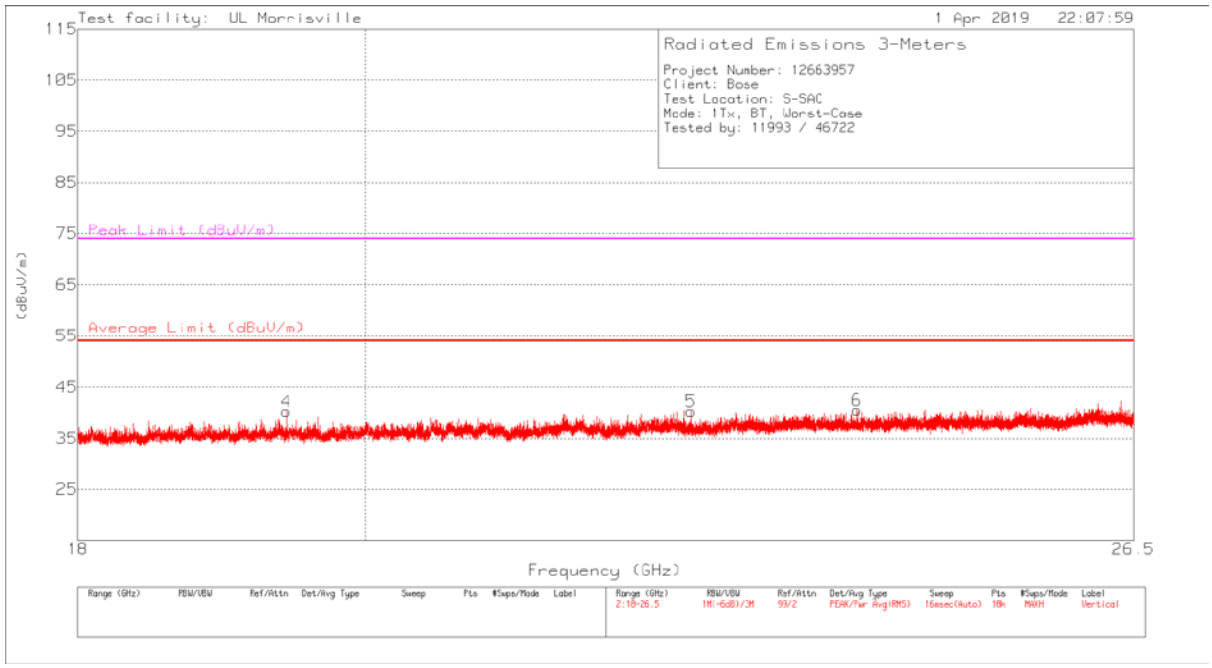
9.4. WORST CASE 18-26 GHZ

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



HORIZONTAL



VERTICAL

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18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (dB/m)	Cbl/Amp (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 19.431	44.73	Pk	32.7	-38.8	38.63	54	-15.37	74	-35.37	0-360	199	H
2	* 20.757	44.78	Pk	33	-38.1	39.68	54	-14.32	74	-34.32	0-360	149	H
3	* 23.666	43.76	Pk	34	-37.4	40.36	54	-13.64	74	-33.64	0-360	299	H
4	* 19.43	46.34	Pk	32.7	-38.8	40.24	54	-13.76	74	-33.76	0-360	101	V
5	* 22.533	44.66	Pk	33.5	-37.9	40.26	54	-13.74	74	-33.74	0-360	101	V
6	* 23.948	43.7	Pk	34	-37.2	40.5	54	-13.5	74	-33.5	0-360	201	V

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

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10. SETUP PHOTOS

Please refer to R12663957R-EP1 for setup photos

END OF TEST REPORT

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