TEST REPORT

Report Number. : R13548896-E2

Applicant	:	Samsung Electronics Co., Ltd. 129 Samsung-Ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 16677, Korea
Model	:	SM-M127F and SM-M127F/DS
FCC ID	:	A3LSMM127F
EUT Description	:	GSM/WCDMA/LTE Phablet with BT/BLE and DTS b/g/n
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
2020-12-08

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400

NVLAP TESTING
NVLAP Lab code: 200246-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2020-11-30	Initial Issue	Cristian Melara
V2	2020-12-08	Updated test methodology, average & peak measurements, average & peak test procedure, and 11.1.1 header.	Cristian Melara

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Samsung Electronics Co, Ltd.
129 Samsung-Ro, Yeongtong-Gu
Suwon-Si, Gyeonggi-Do, 16677, Korea

EUT DESCRIPTION: GSM/WCDMA/LTE Phablet with BT/BLE and DTS b/g/n

MODEL: SM-M127F and SM-M127F/DS

SERIAL NUMBER: Radiated: TJG0333H
Conducted: TJF2546

SAMPLE RECEIPT DATE: 2020-10-23

DATE TESTED: 2020-10-29 to 2020-12-08

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	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.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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, or any agency of the U.S. government.

Approved & Released For
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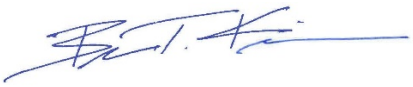
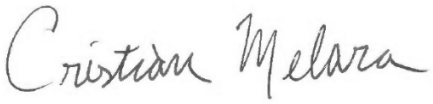


Brian Kiewra
Project Engineer
Consumer Technology Division
UL LLC

Prepared By:



Cristian Melara
Engineer
Consumer Technology Division
UL LLC

2. TEST RESULTS SUMMARY

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 11.6.
See Comment	20dB BW/99% OBW	Reporting purposes only	ANSI C63.10 Sections 6.9.2 and 6.9.3
15.247 (a)(1)	Hopping Frequency Separation	Compliant	None.
15.247 (a)(1)(iii)	Number of Hopping Channels	Compliant	None.
15.247 (a)(1)(iii)	Average Time of Occupancy	Compliant	None.
15.247 (b)(1)	Output Power	Compliant	None.
See Comment	Average Power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (d)	Conducted Spurious Emissions	Compliant	None.
15.209, 15.205	Radiated Emissions	Compliant	None.
15.207	AC Mains Conducted Emissions	Compliant	None.

3. 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, KDB 414788 D01 Radiated Test Site v01r01.

4. 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 Perimeter Park Dr. Suite B, 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 Perimeter Park Dr.
☐ Chamber A RTP	☒ North Chamber
☐ Chamber C RTP	☐ South Chamber

The above test sites and facilities are covered under FCC Test Firm Registration # 703469.

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

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. 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	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 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%.

5.4. 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

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE phablet with BT/BLE and DTS b/g/n. There are two models, SM-M127F and SM-M127F/DS. The SM-M127F/DS was tested in this report.

The models are electronically equivalent with the only difference being that the SM-M127F/DS has dual sim capability.

This report covers BT testing only.

6.2. 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	8.83	7.64
2402 - 2480	Enhanced DQPSK	8.99	7.93
2402 - 2480	Enhanced 8PSK	9.32	8.55

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

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an antenna with a maximum gain of -0.8 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was HW: REV. 0.1.
The test utility software used during testing was SW [vendor.ril.sw_ver]: [M127FXXU0FCC_test]

6.5. WORST-CASE CONFIGURATION AND MODE

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

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

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

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 also.

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

GFSK mode: DH1
DQPSK mode: 2-DH1
8PSK mode: 3-DH1

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charging Adapter	Samsung	EP-TA200	R37M3FV0M01DK3	NA
Earbuds	NA	NS	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB-C	1	USB-C	USB	<3m	Goes to power supply
2	Auxiliary	1	Auxiliary	Auxiliary	<3m	Connects to earbuds

TEST SETUP

Test software exercised the radio.

SETUP DIAGRAMS

Please refer to R13548896-EP1 for setup diagrams

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7. 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.
	0.009-30MHz	**(Loop Ant.)**			
AT0079 (In @ 0800 09/02/2020)	Active Loop Antenna	ETS-Lindgren	6502	2020-08-20	2021-08-20
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-07-27	2021-07-27
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-04-27	2021-04-27
	18-40 GHz				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2019-11-07	2020-11-07
	Gain-Loss Chains				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-29	2021-07-29
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-07-29	2021-07-29
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-28	2021-07-28
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-31	2021-07-31
	Receiver & Software				
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
SOFTEMI	EMI Software	UL	Version 9.5 (2019-08-18)	NA	NA
	Additional Equipment used				
s/n 200037610	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22
1153.9000.35	Bluetooth Tester	Rohde and Schwartz	CBT	NA	NA

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2020-03-26	2021-03-26
HI0091	Environmental Meter	Fisher Scientific	14-650-118	2020-06-26	2021-06-26
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2020-08-18	2021-08-18
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2020-08-18	2021-08-18
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2020-03-26	2021-03-26
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (2015-08-20)	NA	NA
	Miscellaneous (if needed)				
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2020-08-08	2021-08-08
80579 (T374)	Wideband Radio Communications Tester	Rohde and Schwartz	CMW500 (SN 132911)	2020-08-07	2021-08-07

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Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
SA027	Spectrum Analyzer	Keysight Technologies	N9030A	2020-06-10	2021-06-10
PWM001 (PRE0136343)	RF Power Meter	Keysight Technologies	N1912A	2020-07-17	2021-07-17
PWS002 (PRE0137348)	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2020-09-10	2021-09-10
HI0090 (PRE0191271)	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
SOFTEMI	EMC Software	UL	Version 2020.10.14 and Version 2020.10.22	NA	NA
	Additional Equipment used				
80579 (T374)	Wideband Radio Communications Tester	Rohde and Schwartz	CMW500 (SN 132911)	2020-08-07	2021-08-07

8. 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

Band-Edge: ANSI C63.10-2013 Section 7.8.6, 6.10.4 and 6.10.5

General Radiated Emissions: ANSI C63.10-2013 Section 6.3-6.6

AC Line Conducted Emissions: ANSI C63.10-2013 Section 6.2

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9. ANTENNA PORT TEST RESULTS

9.1. 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	0.375	1.249	0.300	30.0%	5.23	2.667
Bluetooth DQPSK	0.388	1.251	0.310	31.0%	5.09	2.580
Bluetooth 8PSK	0.388	1.251	0.310	31.0%	5.09	2.580

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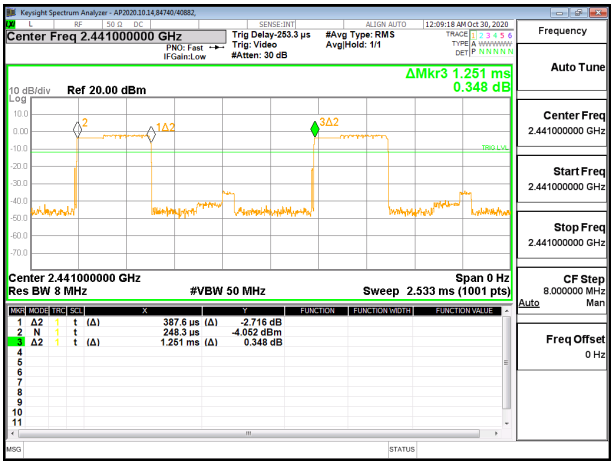
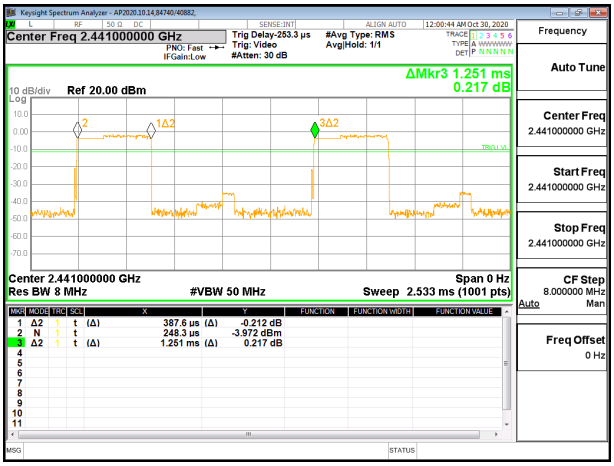
DUTY CYCLE PLOTS

HIGH POWER GFSK



HIGH POWER QPSK



LOW POWER 8PSK

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9.2. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

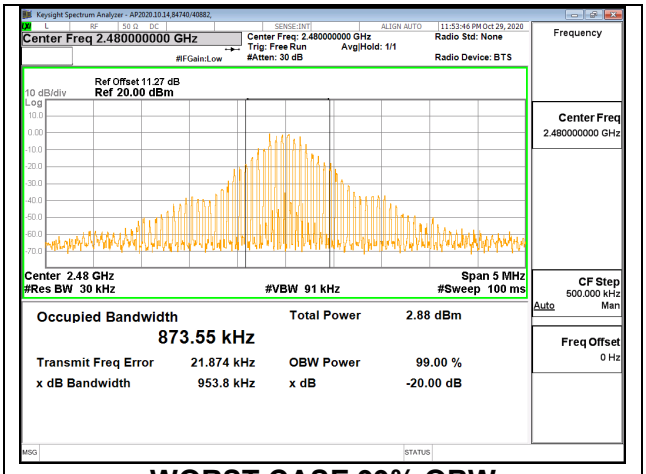
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1-5% of the 20 dB bandwidth and the 99% Occupied Bandwidth. The VBW is set to ≥ 3x RBW. The sweep time is coupled.

RESULTS

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.056	0.894
Mid	2441	0.966	0.876
High	2480	0.896	0.874

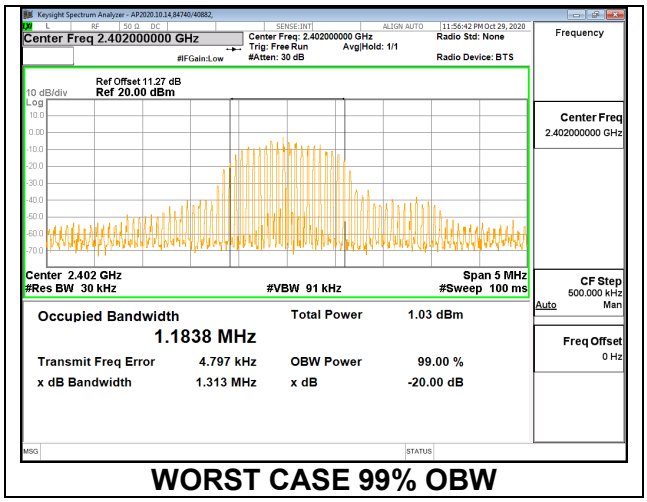


WORST CASE 99% OBW

WORST CASE 20 dB EBW

9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.302	1.184
Mid	2441	1.102	1.185
High	2480	1.286	1.184



WORST CASE 99% OBW

WORST CASE 20 dB EBW

9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

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 channel spacing) and the VBW is set to VBW >= RBW. The sweep time is coupled.

RESULTS

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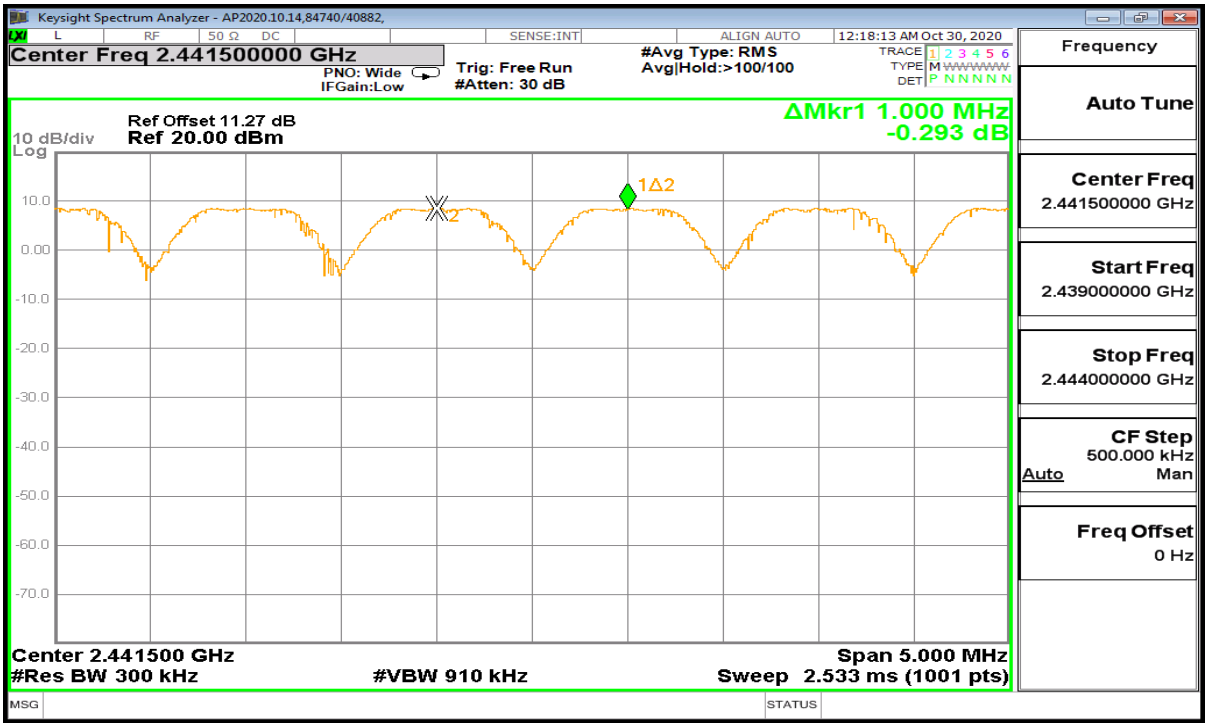
9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

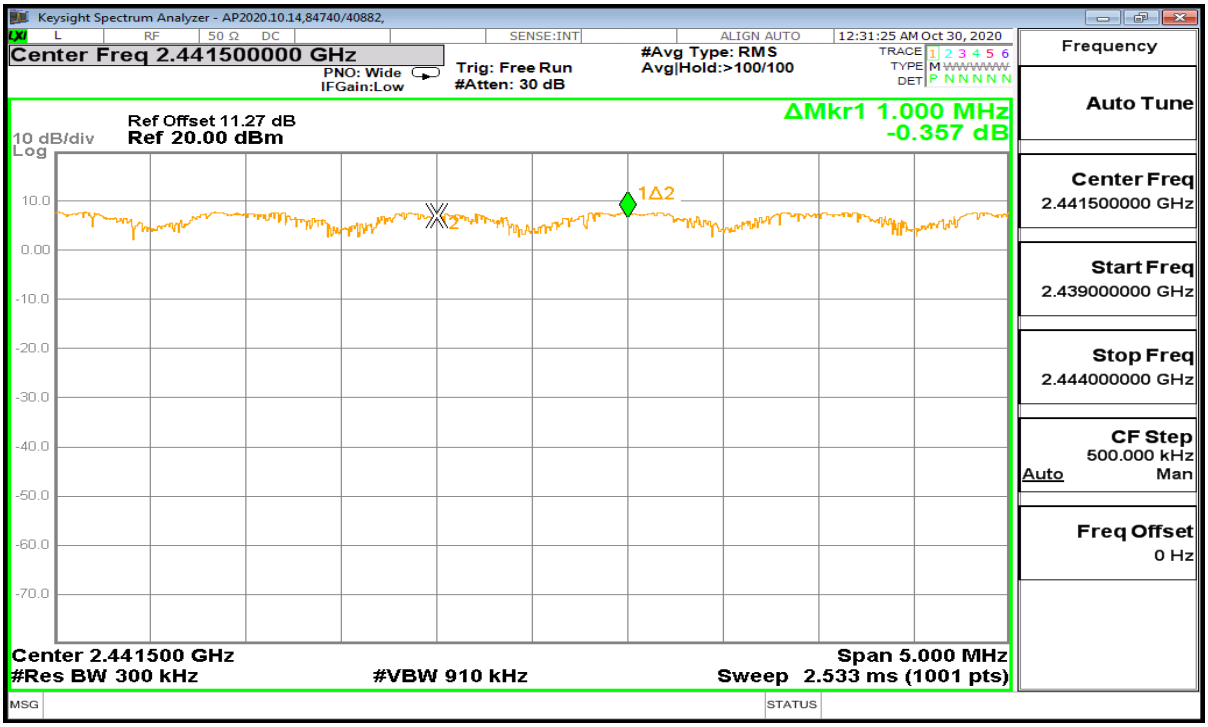


HOPPING FREQUENCY SEPARATION PLOT

Note – The channel hopping separation of 1MHz is less than the 20 dB bandwidth (approx. 1.056 MHz). However, the output power is less than 125 mW and the channel separation is greater than 2/3 the 20 dB bandwidth (approx. 704 kHz).

Ch. A (MHz)	Ch. B (MHz)	Ch. 1 to Ch. 2 Sep. (MHz)	Max. 20 dB BW (MHz)	2/3 20 dB BW (MHz)	Margin (MHz)
2441	2442	1.000	1.056	0.704	-0.296

9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

Note – The channel hopping separation of 1MHz is less than the 20 dB bandwidth (approx. 1.302 MHz). However, the output power is less than 125 mW and the channel separation is greater than 2/3 the 20 dB bandwidth (approx. 868 kHz).

Ch. A (MHz)	Ch. B (MHz)	Ch. 1 to Ch. 2 Sep. (MHz)	Max. 20 dB BW (MHz)	2/3 20 dB BW (MHz)	Margin (MHz)
2441	2442	1.000	1.302	0.868	-0.132

9.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

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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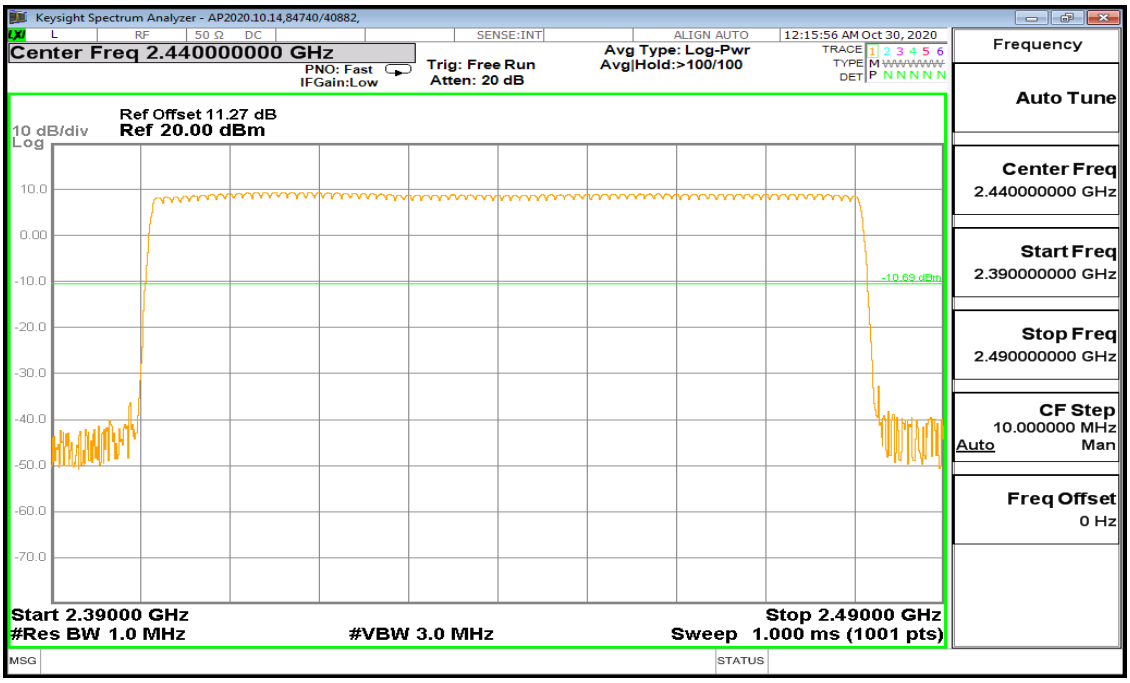
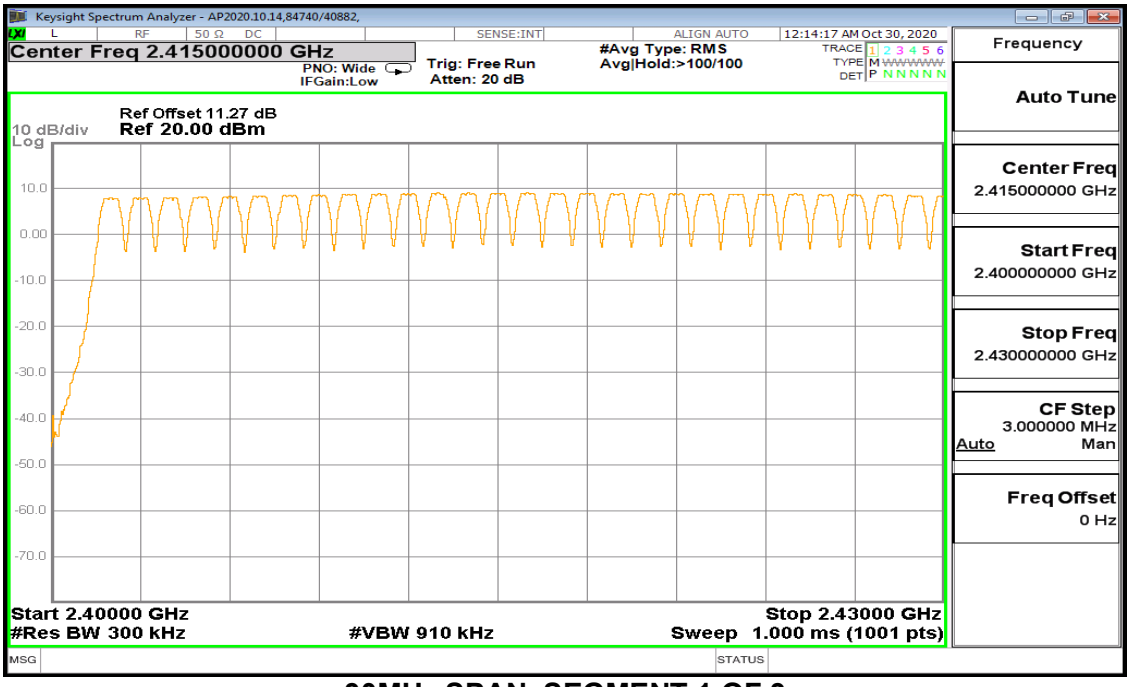
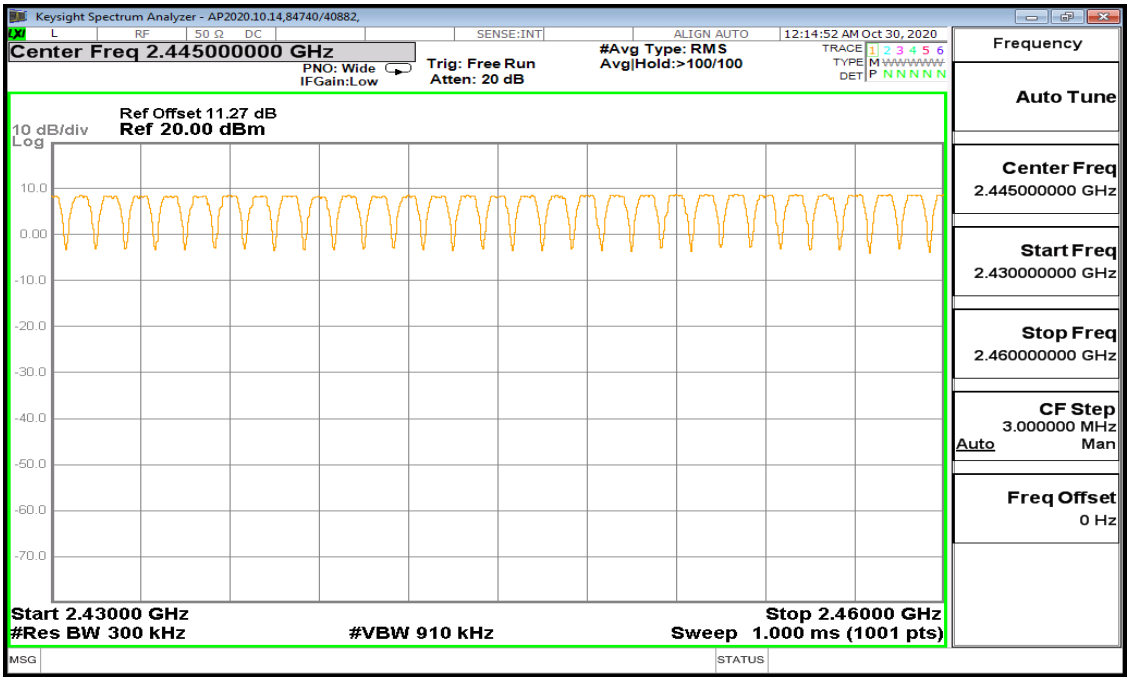
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



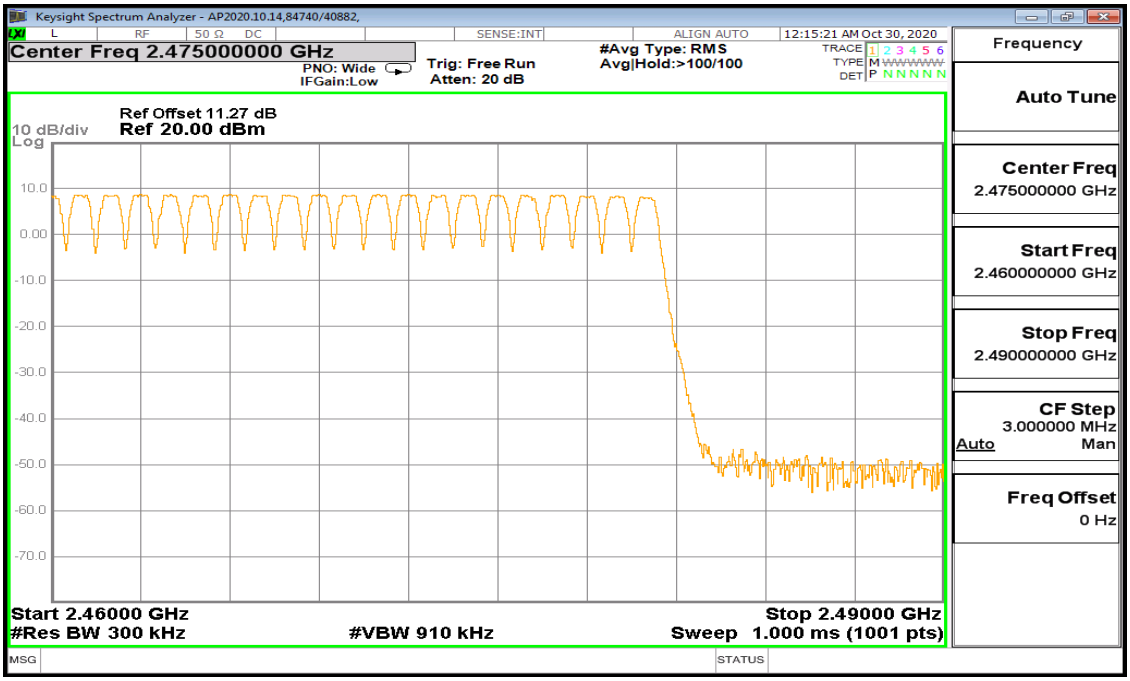
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

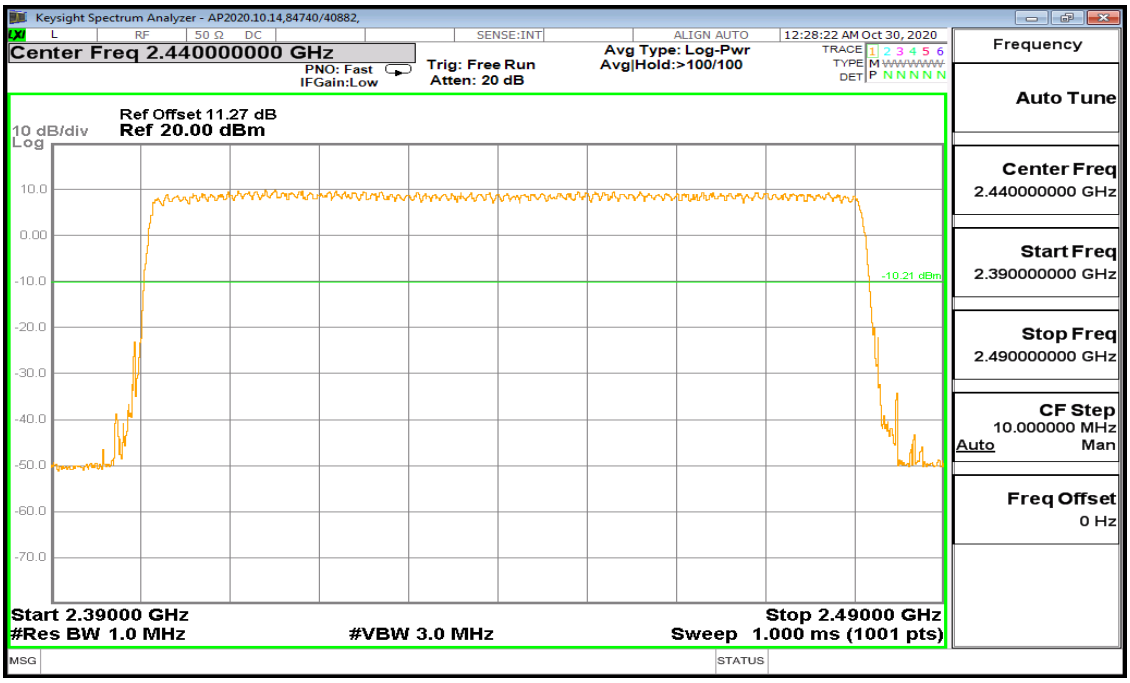


30MHz SPAN, SEGMENT 2 OF 3

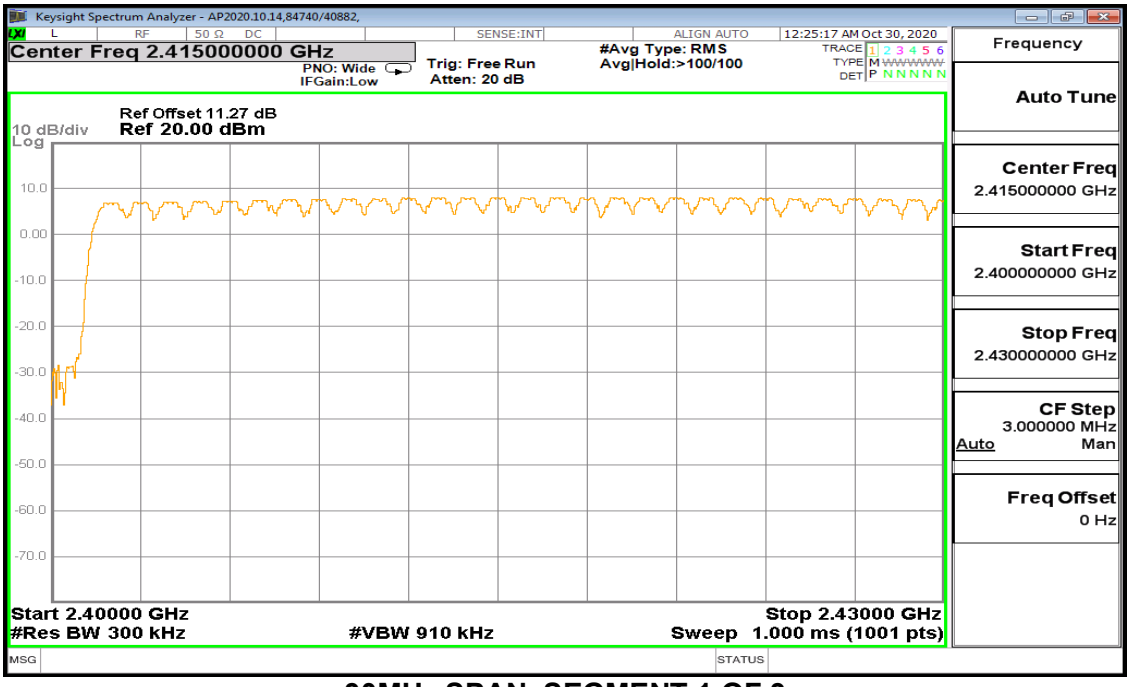


30MHz SPAN, SEGMENT 3 OF 3

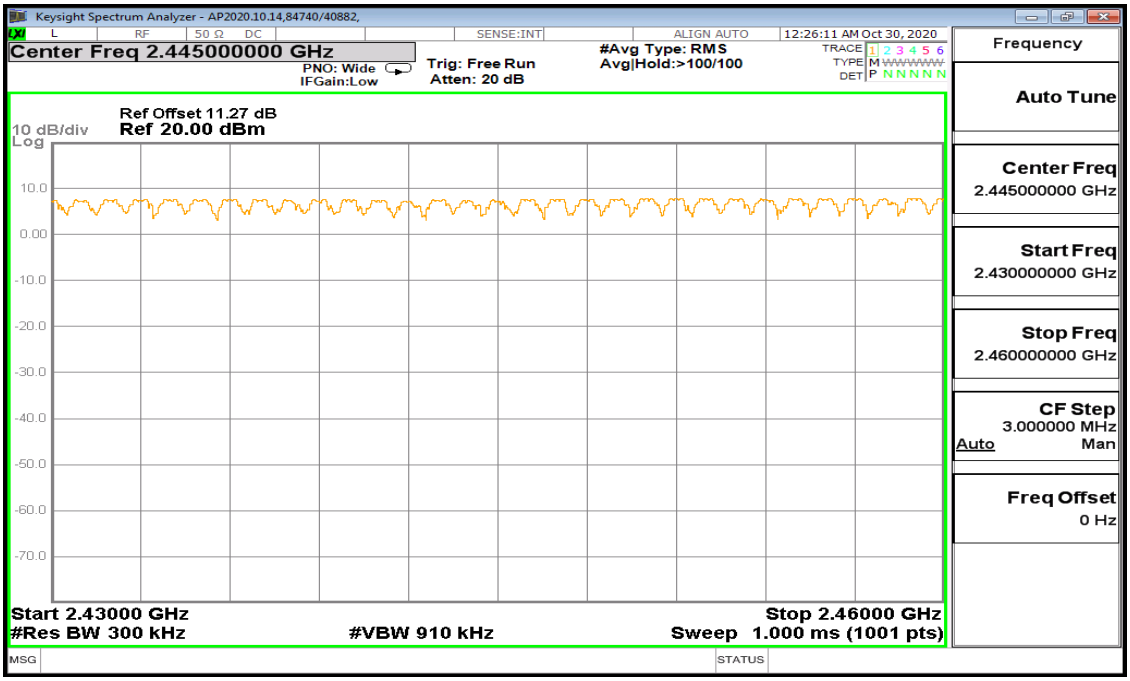
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



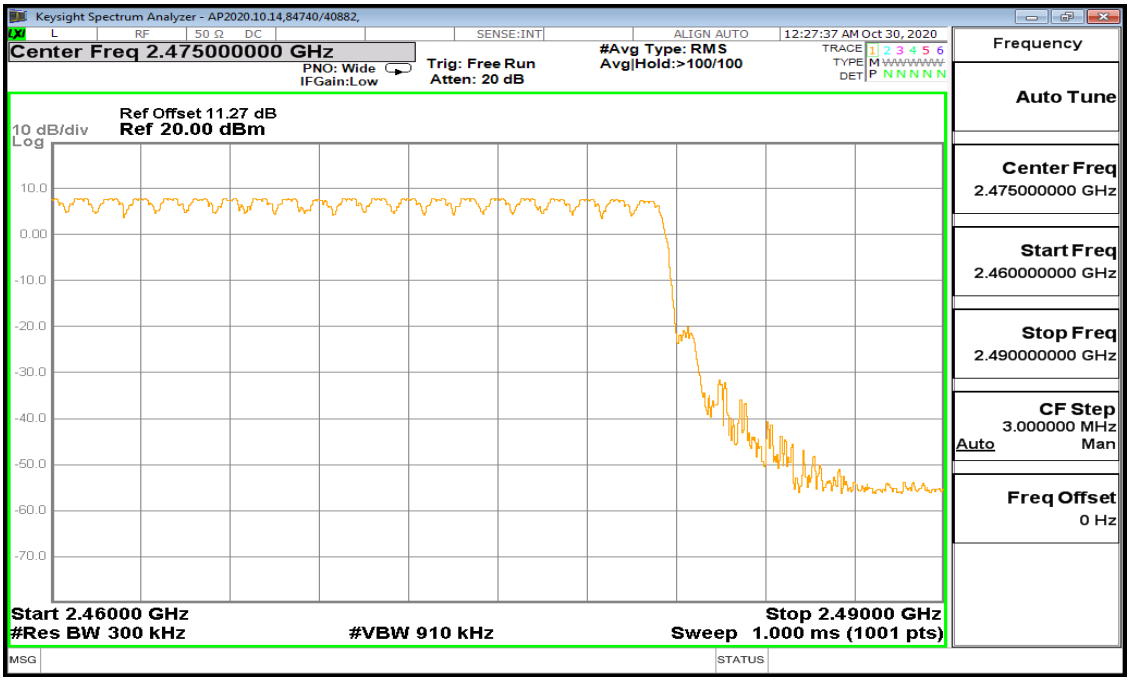
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

9.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

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.

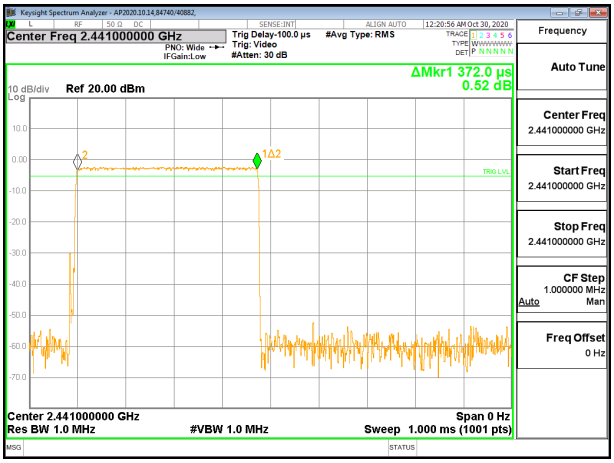
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

RESULTS

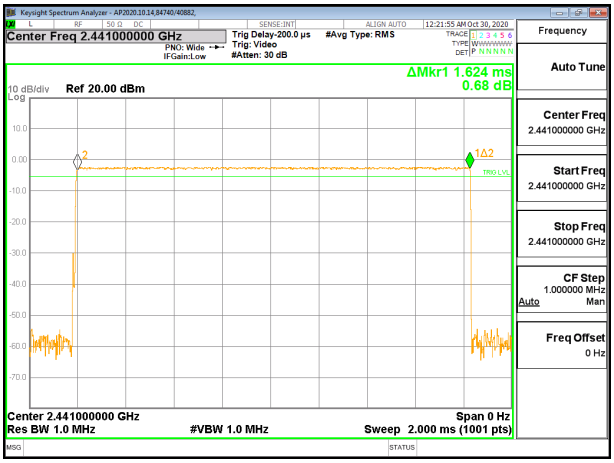
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

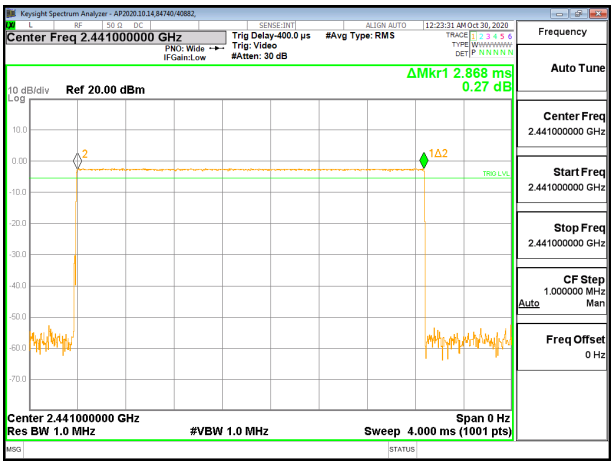
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.372	31	0.1153	0.4	-0.2847
DH3	1.624	18	0.2923	0.4	-0.1077
DH5	2.868	11	0.3155	0.4	-0.0845
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.372	7.75	0.02883	0.4	-0.3712
DH3	1.624	4.5	0.07308	0.4	-0.3269
DH5	2.868	2.75	0.07887	0.4	-0.3211



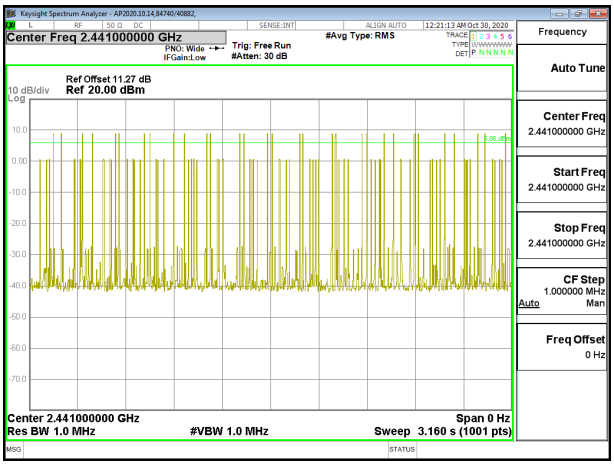
PULSE WIDTH – DH1



PULSE WIDTH – DH3



PULSE WIDTH – DH5



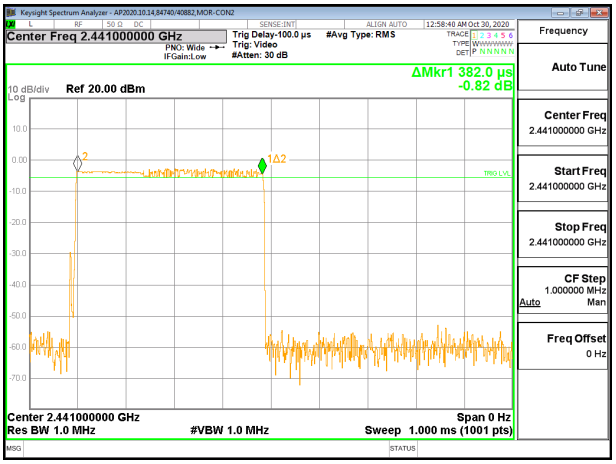
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3

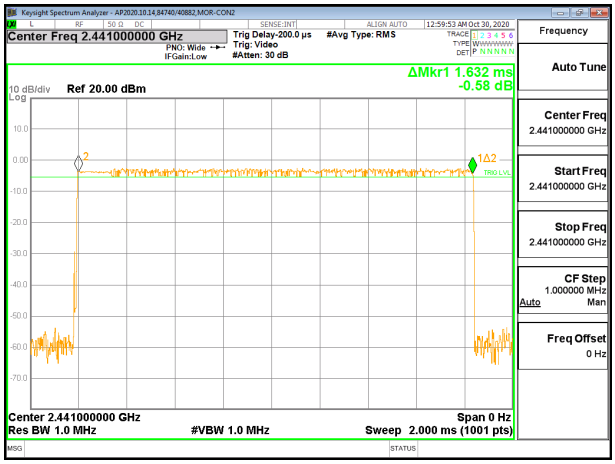
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

9.5.2. BLUETOOTH BASIC DATA RATE DQPSK MODULATION

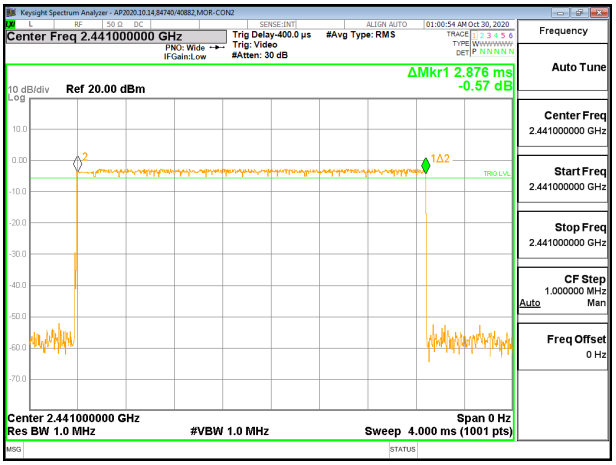
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DQPSK Normal					
3DH1	0.382	32	0.12224	0.4	-0.27776
3DH3	1.632	18	0.29376	0.4	-0.10624
3DH5	2.876	9	0.25884	0.4	-0.14116



PULSE WIDTH – 3DH1

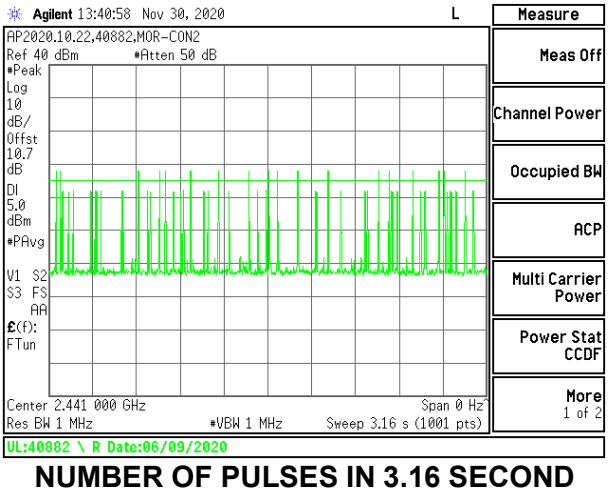


PULSE WIDTH – 3DH3

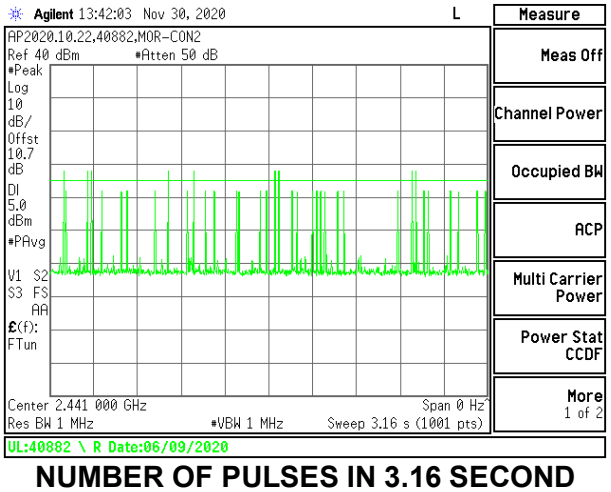


PULSE WIDTH – 3DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3

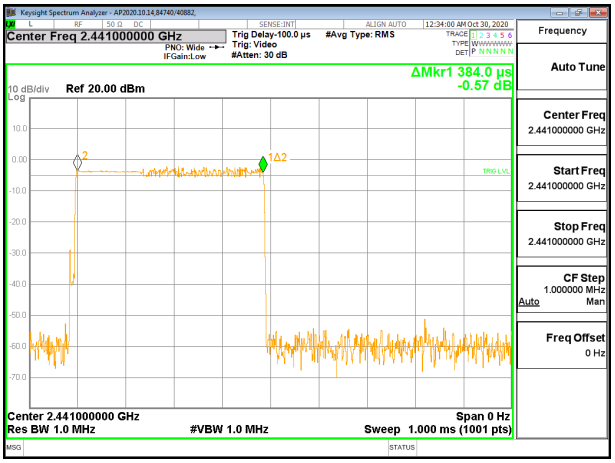


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

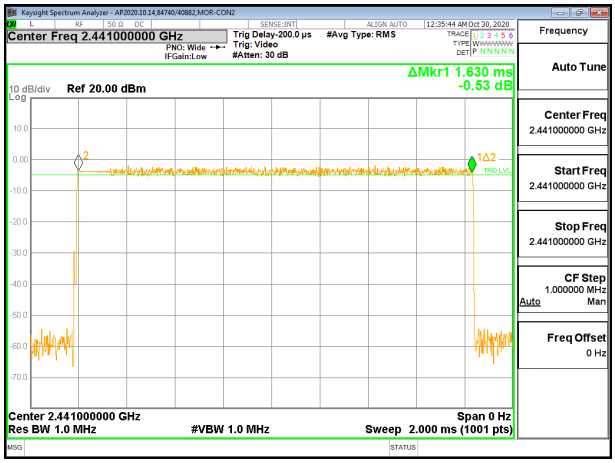
9.5.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

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	0.384	31	0.11904	0.4	-0.281
3DH3	1.63	18	0.2934	0.4	-0.1066
3DH5	2.872	12	0.34464	0.4	-0.0554

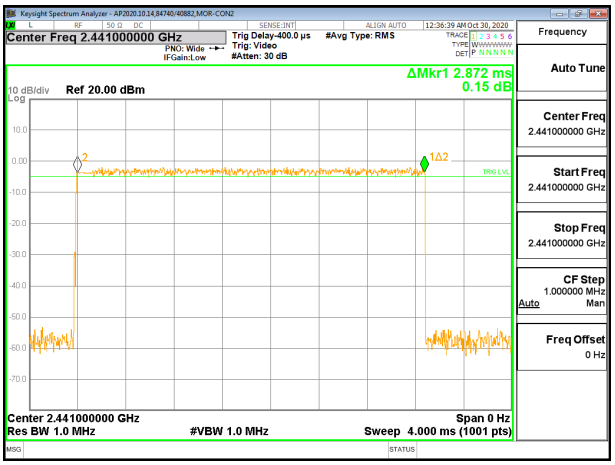
Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



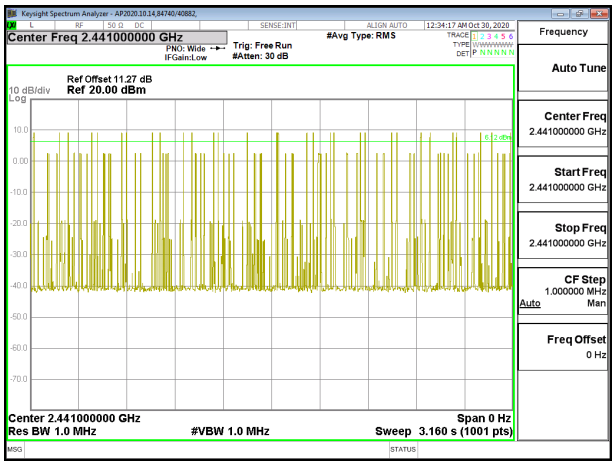
PULSE WIDTH – 3DH1



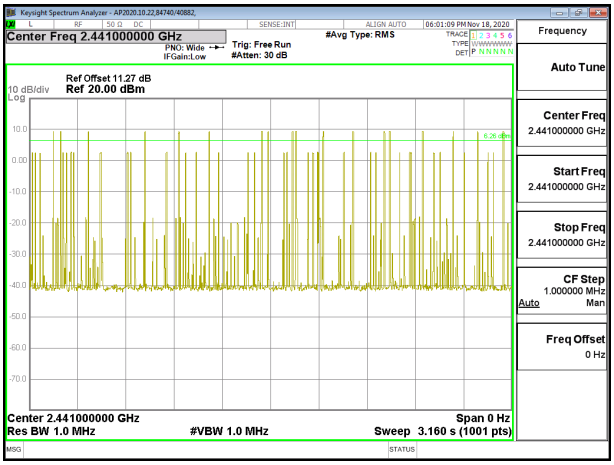
PULSE WIDTH – 3DH3



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

9.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

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 peak power sensor and power meter for a peak power measurement.

The cable assembly insertion loss of 11.27 dB (including 10.88 dB pad and 0.39 dB cable) was entered as an offset in the power meter.

RESULTS

UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

9.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	84740/40882
Date:	2020-10-29

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.40	21	-12.6
Middle	2441	8.83	21	-12.17
High	2480	8.70	21	-12.3

9.6.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	84740/40882
Date:	2020-10-29 and 2020-12-08

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.69	21	-12.31
Middle	2441	8.99	21	-12.01
High	2480	8.91	21	-12.09

9.6.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	84740/40882
Date:	2020-10-29 and 2020-12-08

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.17	21	-11.83
Middle	2441	9.32	21	-11.68
High	2480	9.19	21	-11.81

9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband average power sensor and power meter for a gated average power measurement.

The cable assembly insertion loss of 11.27 dB (including 10.88 dB pad and 0.39 dB cable) was entered as an offset in the power meter.

RESULTS

9.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	84740/40882
Date	2020-10-29

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.86
Middle	2441	8.33
High	2480	8.19

9.7.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	84740/40882
Date	2020-10-29 and 2020-12-08

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6.76
Middle	2441	6.93
High	2480	6.94

9.7.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	84740/40882
Date	2020-10-29 and 2020-12-08

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6.73
Middle	2441	6.99
High	2480	6.97

9.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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.

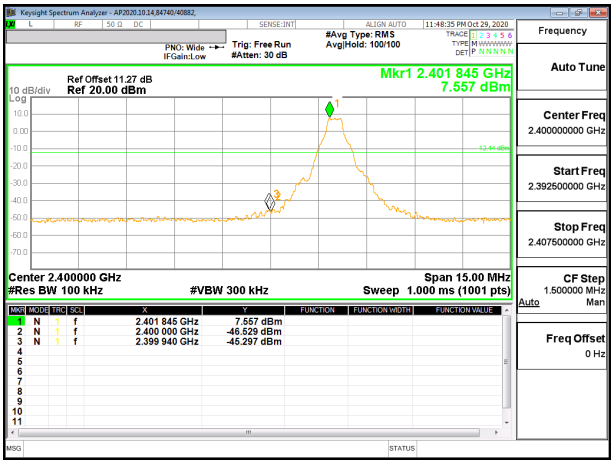
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

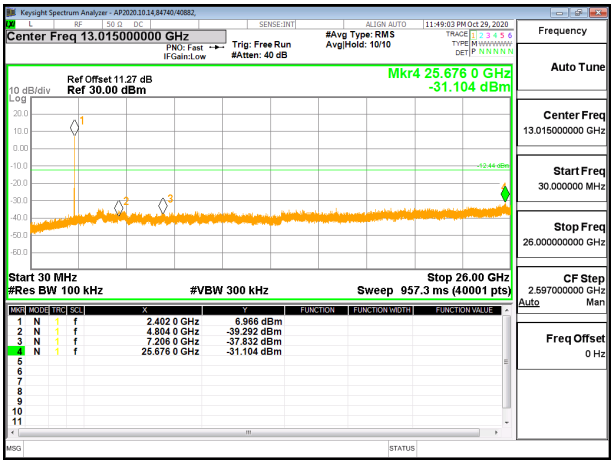
RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

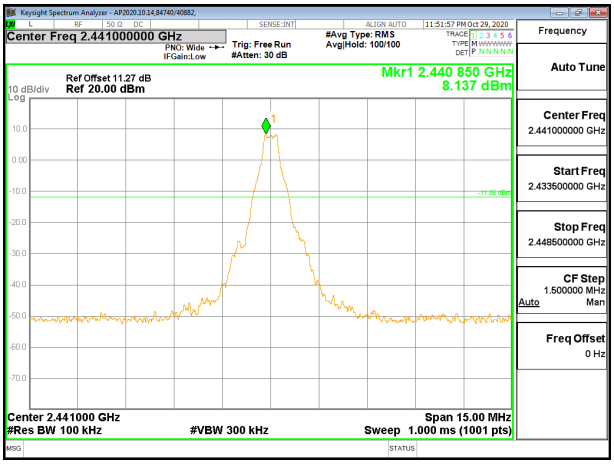
Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



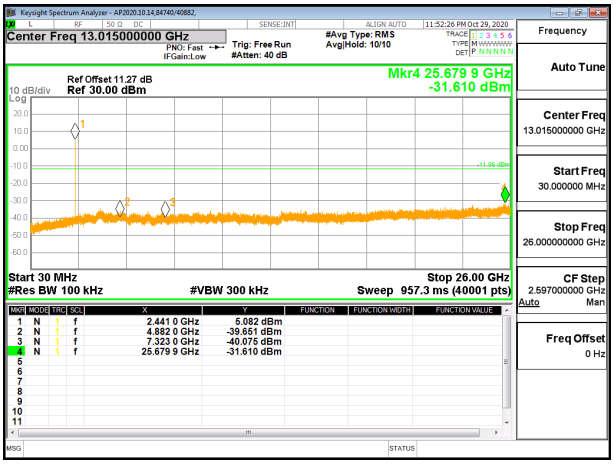
LOW CHANNEL BANDEDGE



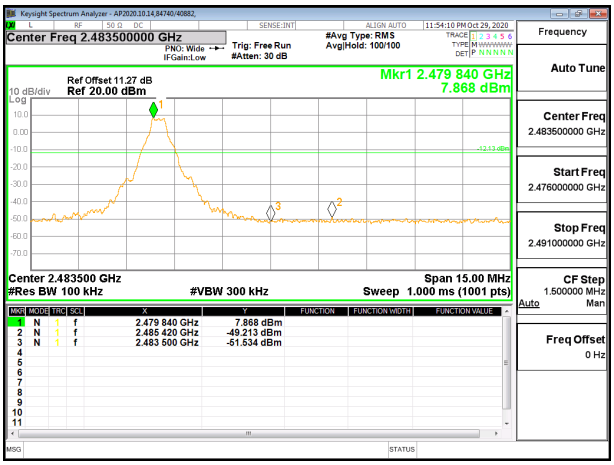
OUT-OF-BAND LOW CHANNEL



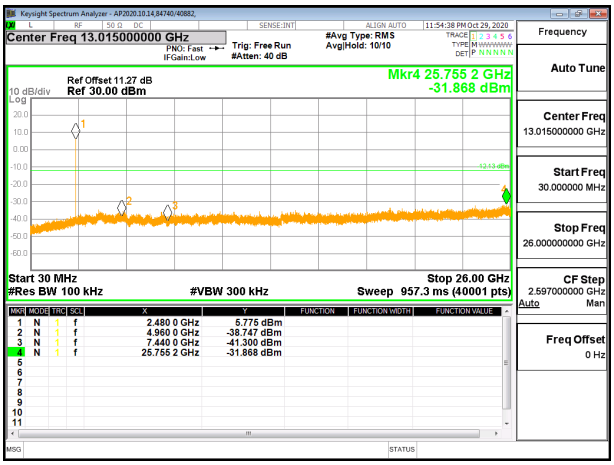
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

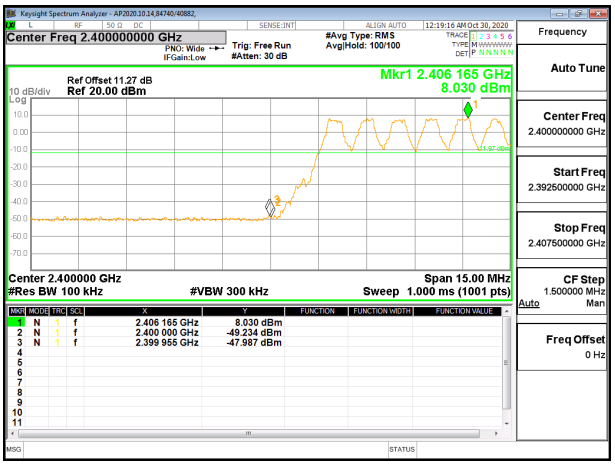


HIGH CHANNEL BANDEDGE

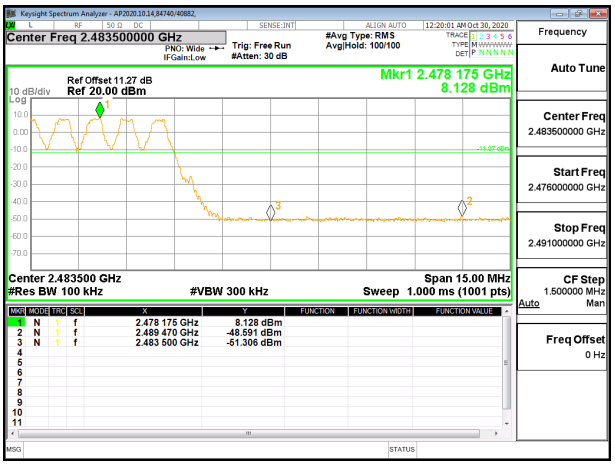


OUT-OF-BAND HIGH CHANNEL

Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



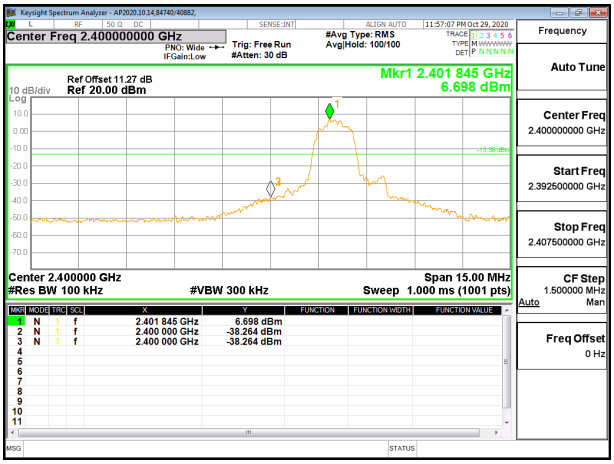
LOW BANDEDGE



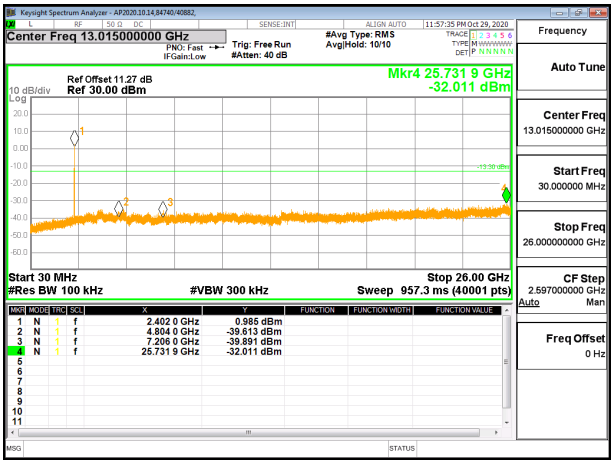
HIGH BANDEDGE

9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

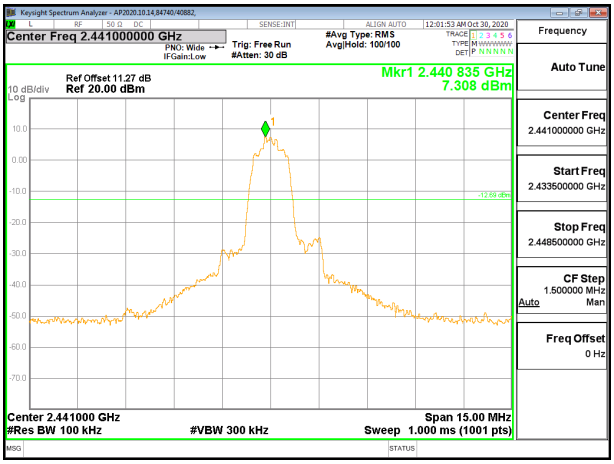
Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



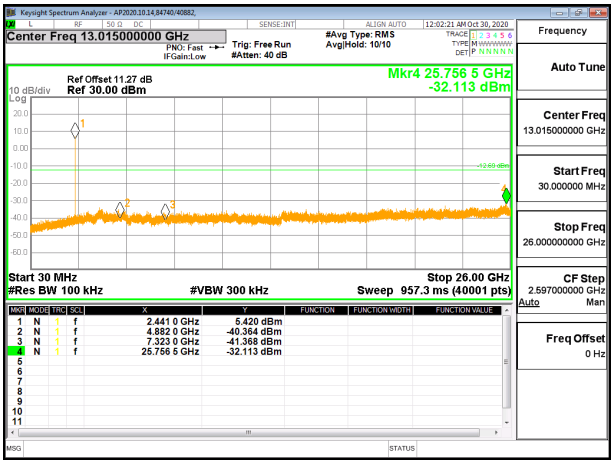
LOW CHANNEL BANDEDGE



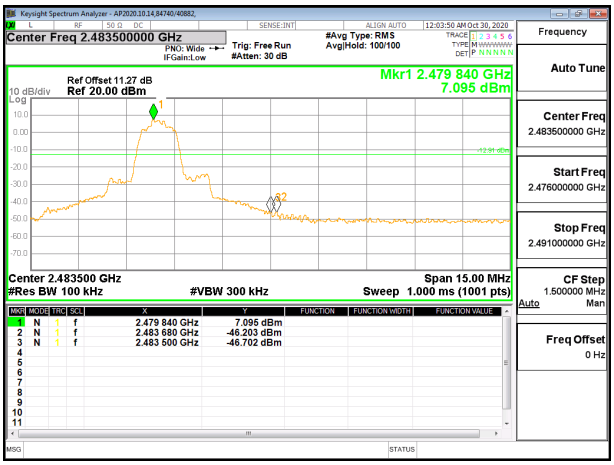
OUT-OF-BAND LOW CHANNEL



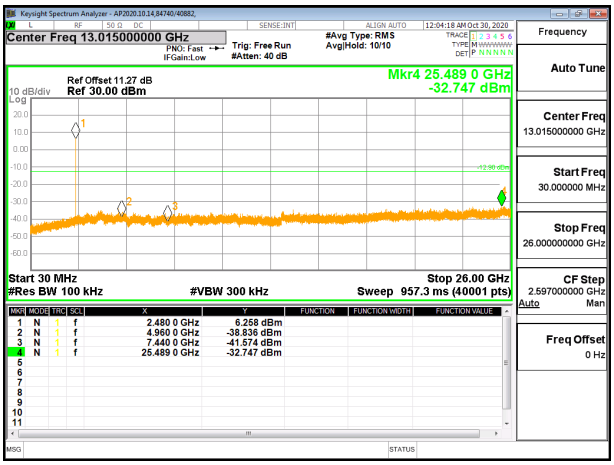
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

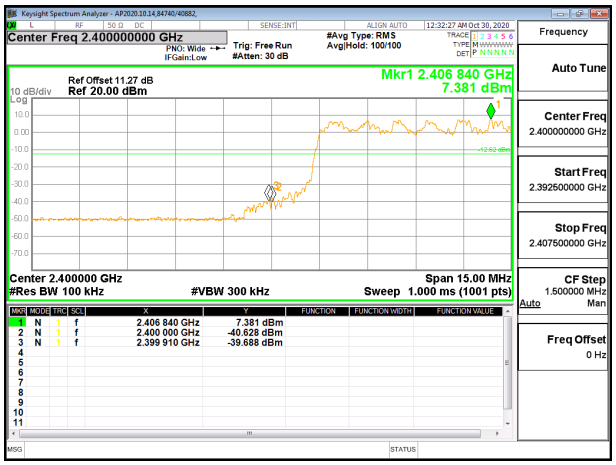


HIGH CHANNEL BANDEDGE

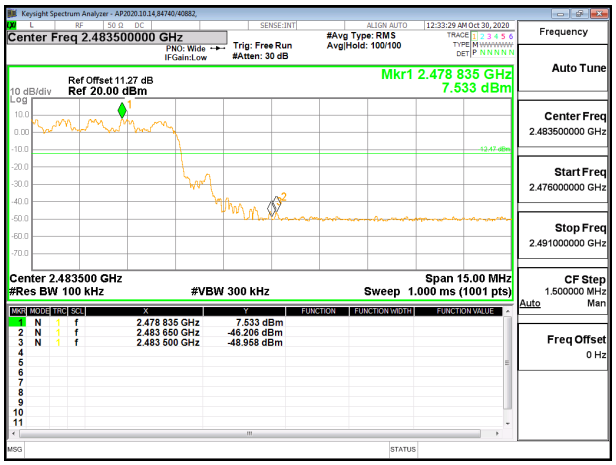


OUT-OF-BAND HIGH CHANNEL

Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

10. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

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 in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

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 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.

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

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.

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

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

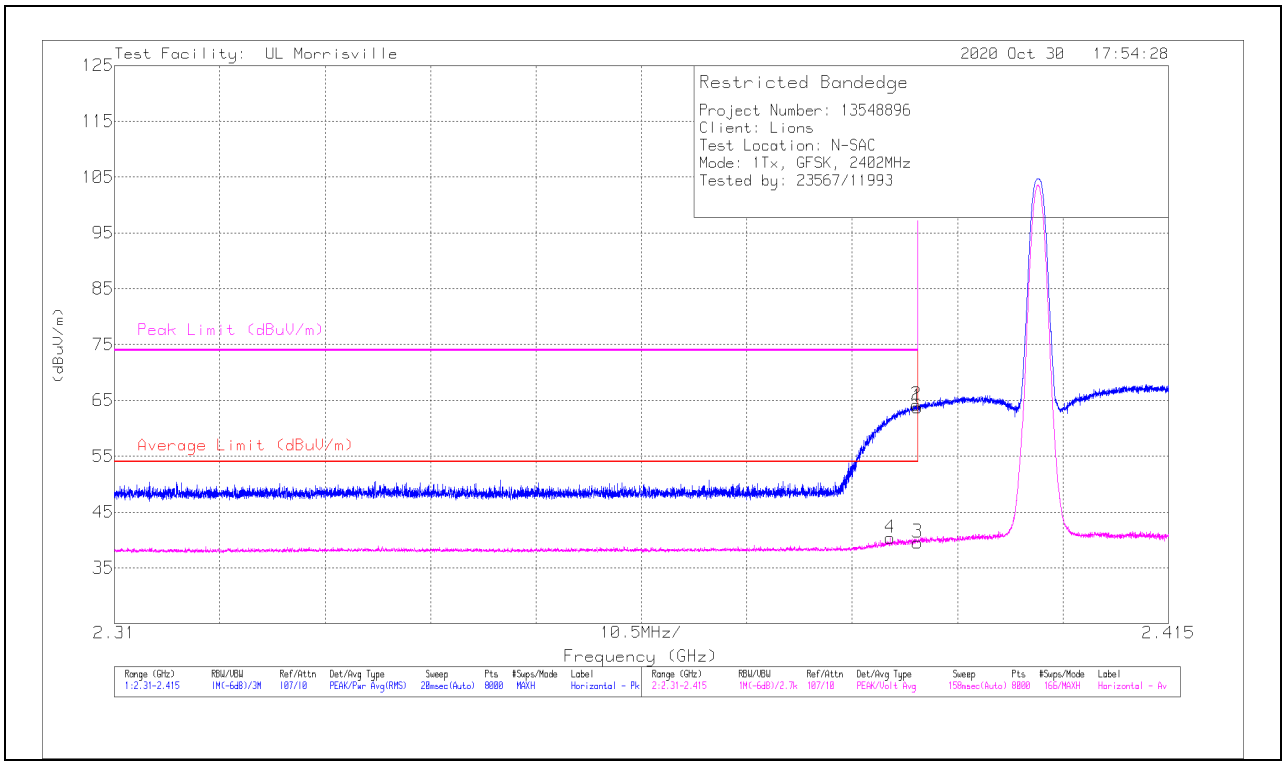
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

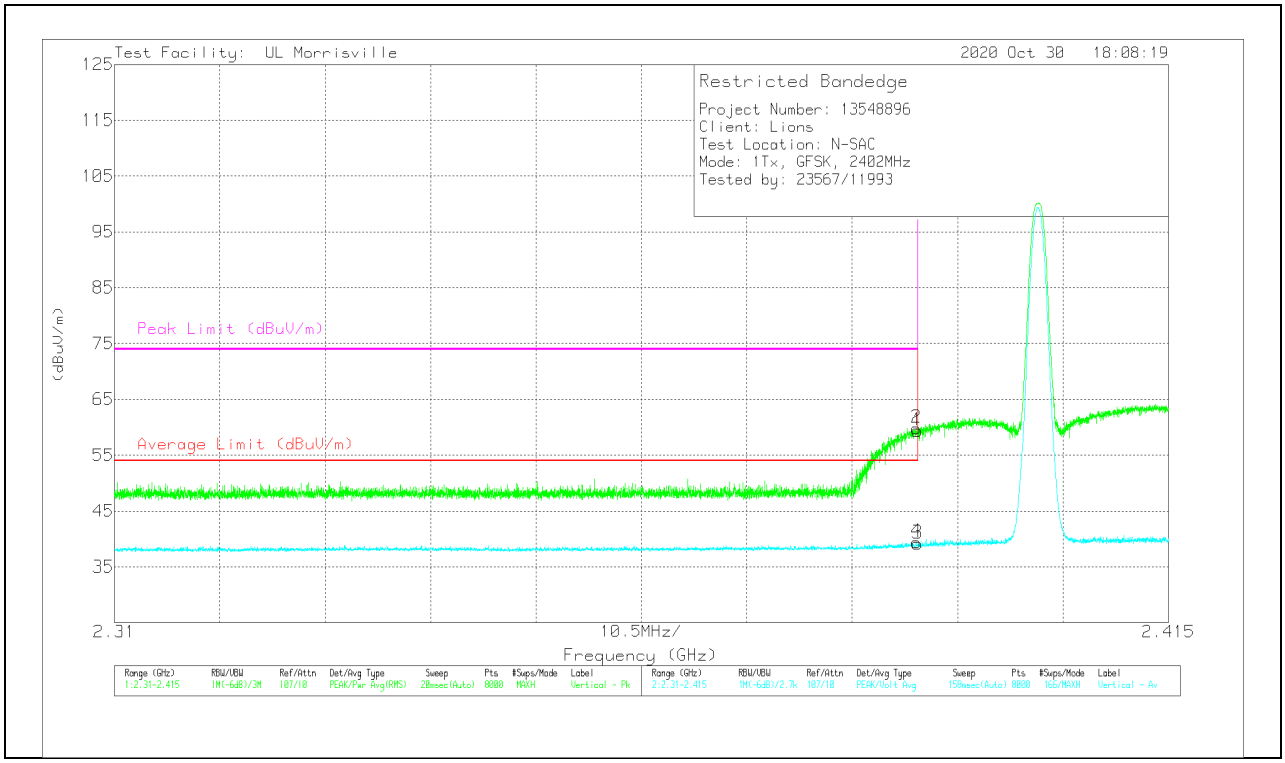
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	56.39	Pk	31.8	-24.4	63.79	-	-	74	-10.21	138	293	H
2	* ** 2.38992	56.81	Pk	31.8	-24.4	64.21	-	-	74	-9.79	138	293	H
3	* ** 2.39	32.17	V1TV	31.8	-24.4	39.57	54	-14.43	-	-	138	293	H
4	* ** 2.38728	32.95	V1TV	31.8	-24.4	40.35	54	-13.65	-	-	138	293	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	51.99	Pk	31.8	-24.4	59.39	-	-	74	-14.61	159	287	V
2	* ** 2.3899	52.47	Pk	31.8	-24.4	59.87	-	-	74	-14.13	159	287	V
3	* ** 2.39	31.81	V1TV	31.8	-24.4	39.21	54	-14.79	-	-	159	287	V
4	* ** 2.38992	32.06	V1TV	31.8	-24.4	39.46	54	-14.54	-	-	159	287	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

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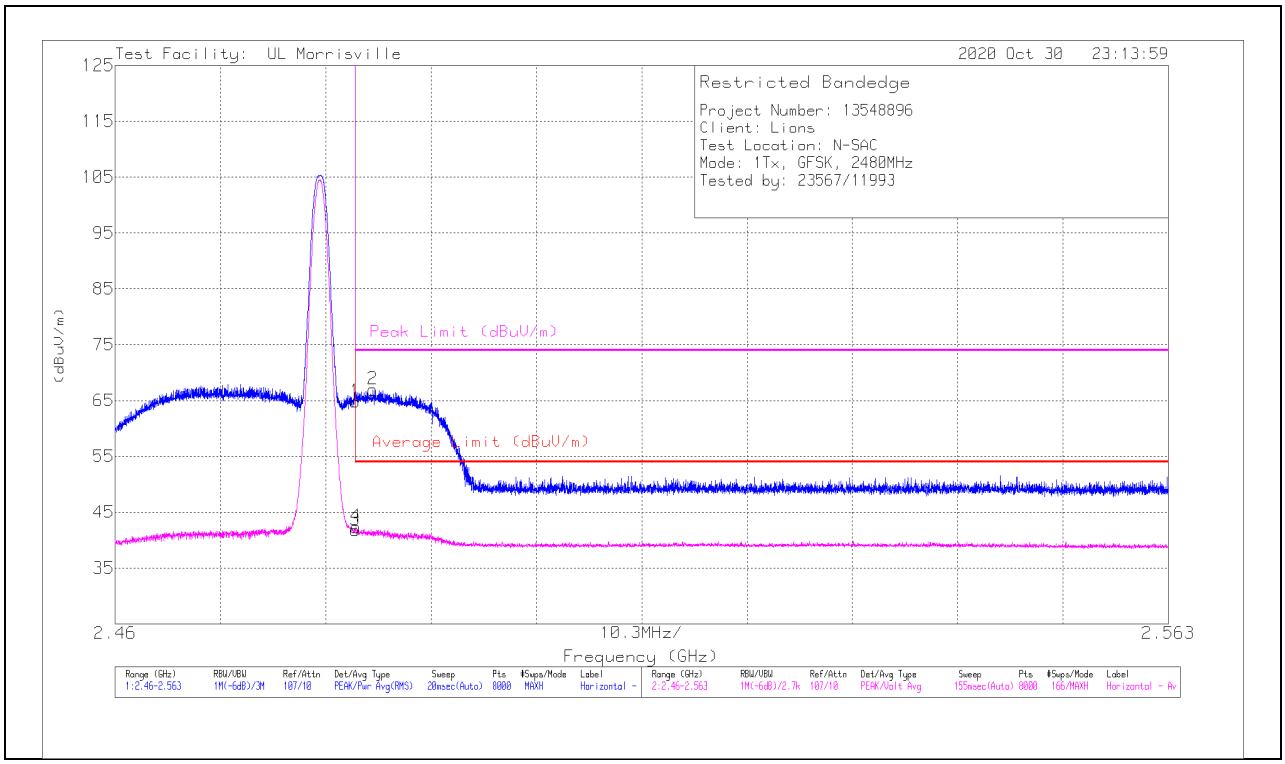
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

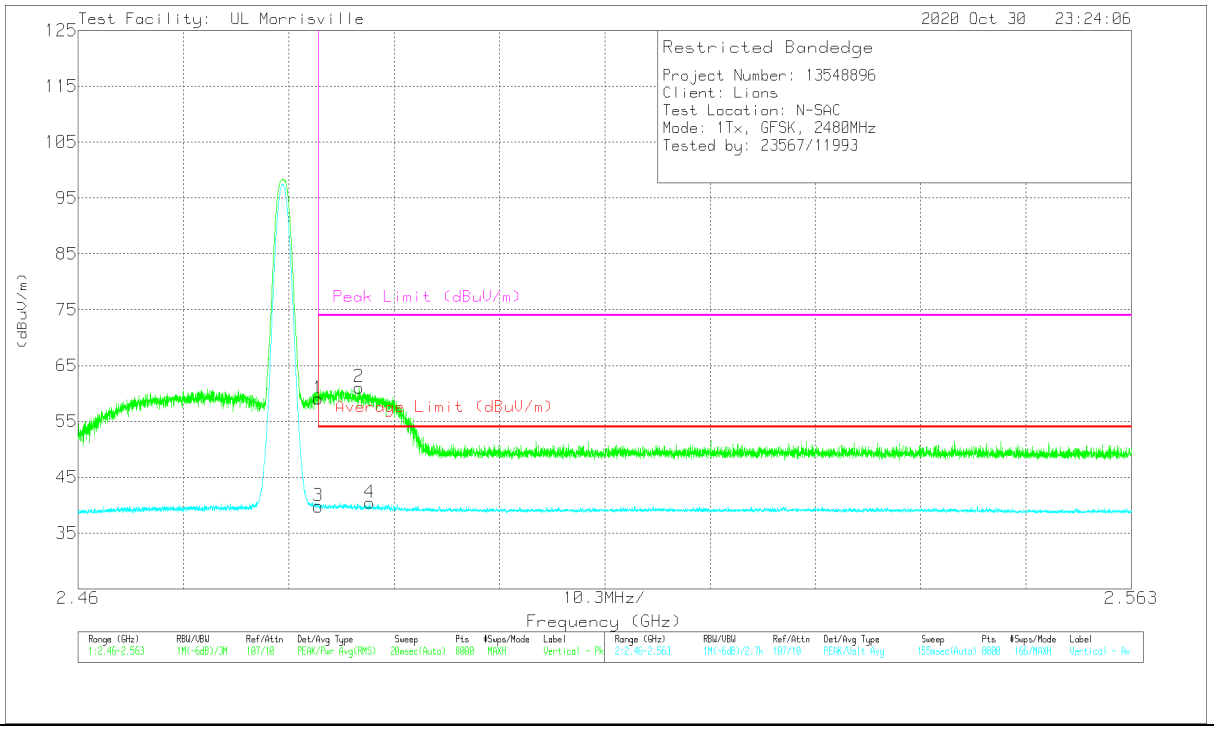


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	56.61	Pk	32.4	-24.2	64.81	-	-	74	-9.19	130	172	H
2	* ** 2.4852	58.65	Pk	32.5	-24.2	66.95	-	-	74	-7.05	130	172	H
3	* ** 2.4835	33.58	V1TV	32.4	-24.2	41.78	54	-12.22	-	-	130	172	H
4	* ** 2.48354	34.16	V1TV	32.4	-24.2	42.36	54	-11.64	-	-	130	172	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 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	* ** 2.4835	50.87	Pk	32.4	-24.2	59.07	-	-	74	-14.93	38	182	V
2	* ** 2.48749	52.8	Pk	32.5	-24.2	61.1	-	-	74	-12.9	38	182	V
3	* ** 2.4835	31.59	V1TV	32.4	-24.2	39.79	54	-14.21	-	-	38	182	V
4	* ** 2.48851	32.13	V1TV	32.5	-24.2	40.43	54	-13.57	-	-	38	182	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

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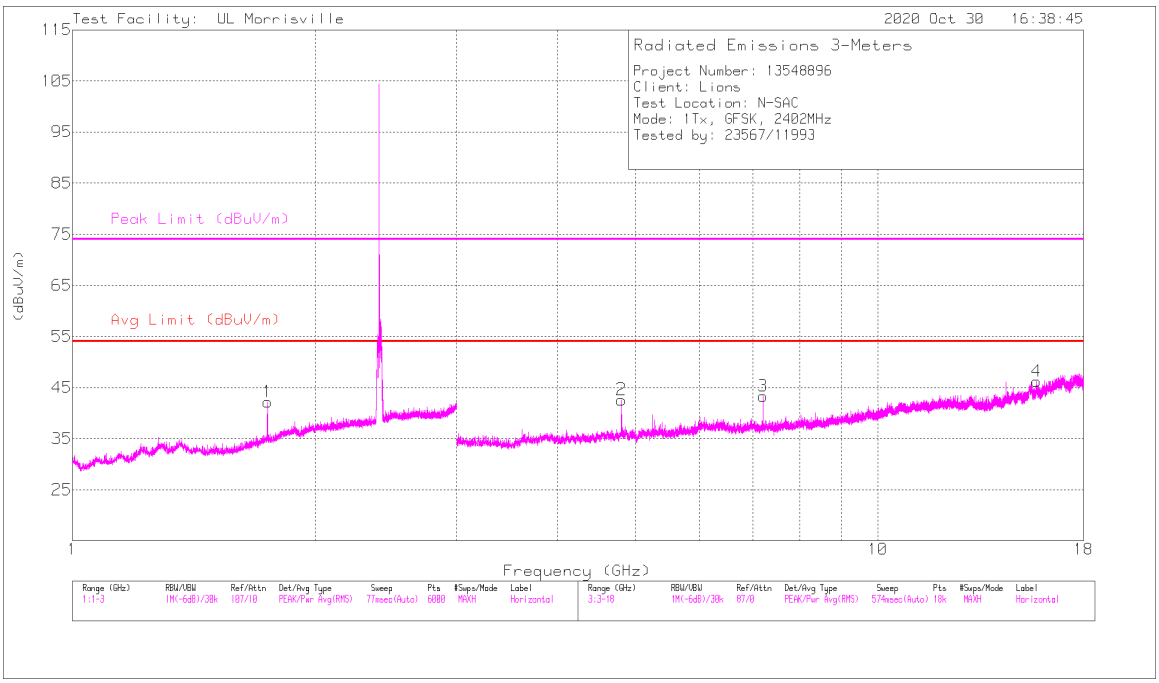
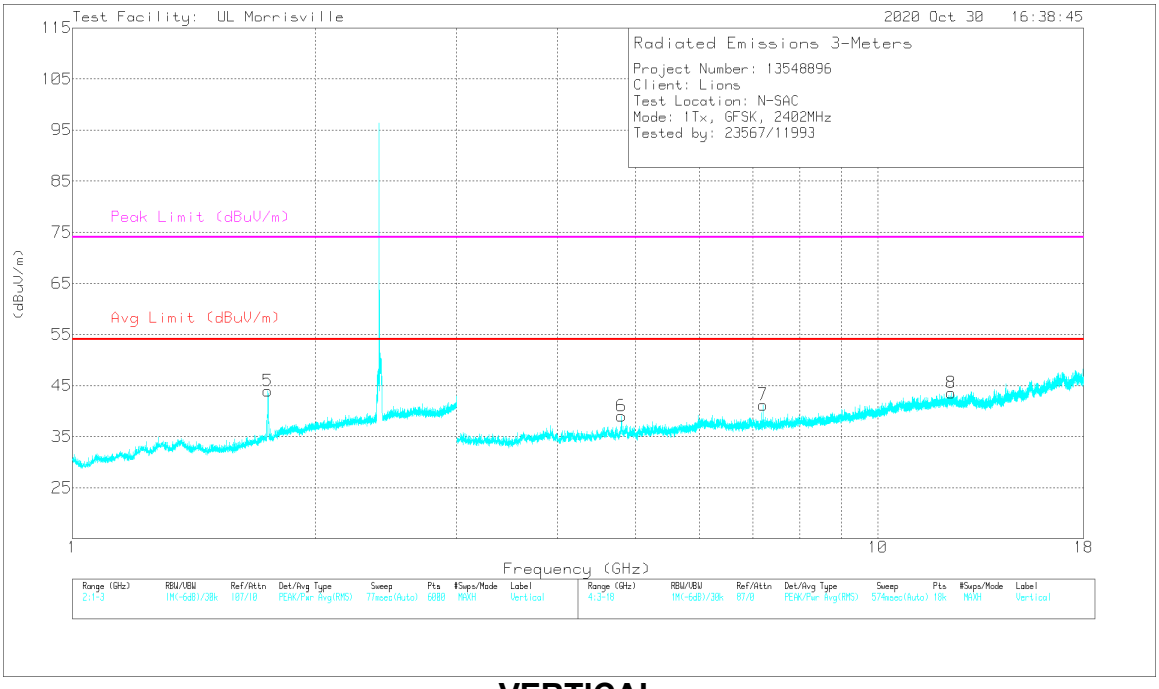
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



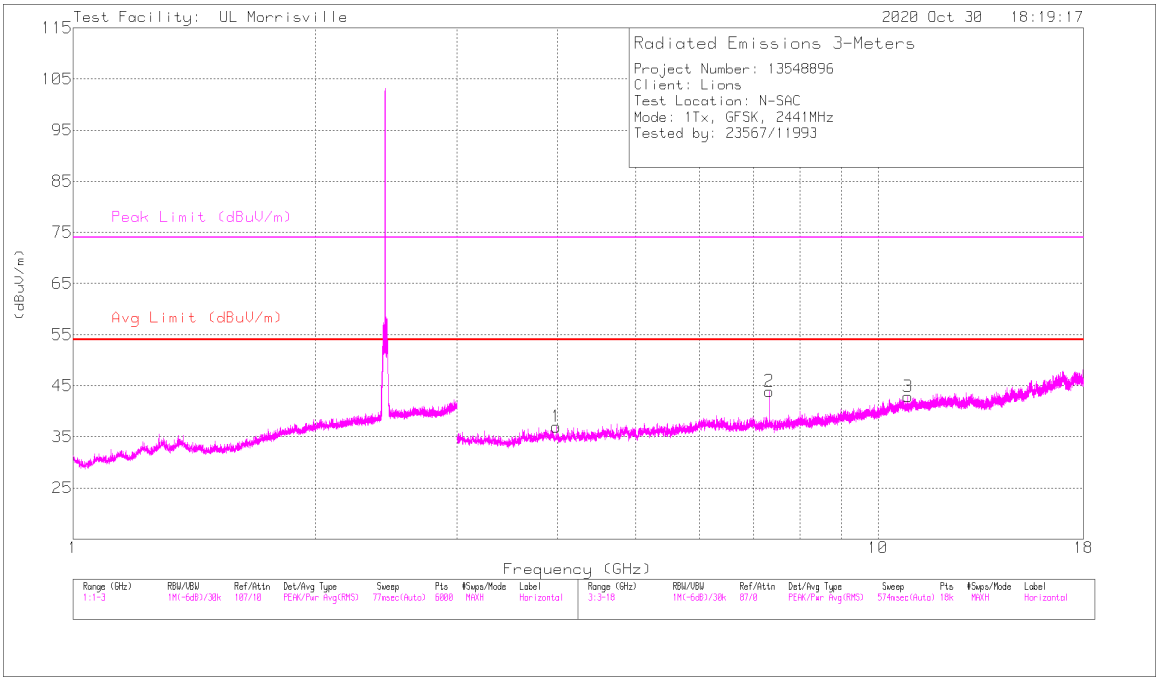
VERTICAL

RADIATED EMISSIONS

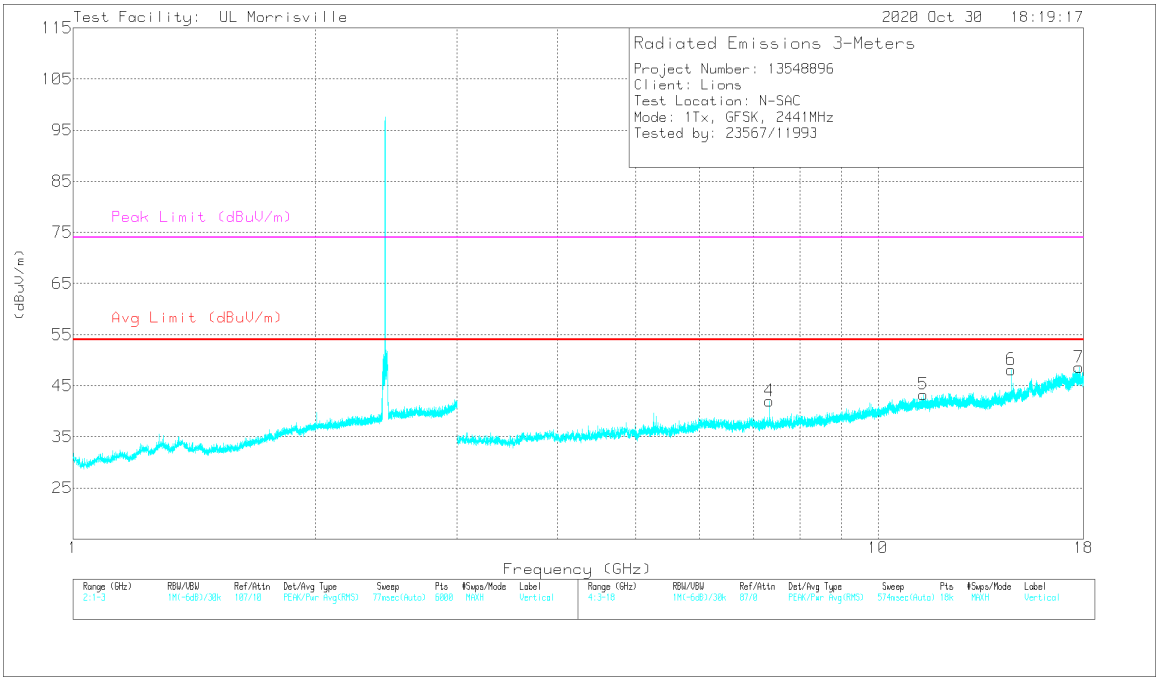
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 1.7468	38.37	PK2	29.6	-24.3	43.67	-	-	74	-30.33	353	256	H
	** 1.74721	32.53	V1TV	29.6	-24.3	37.83	54	-16.17	-	-	353	256	H
5	** 1.74964	36.41	PK2	29.6	-24.3	41.71	-	-	74	-32.29	71	392	V
	** 1.74812	38.02	V1TV	29.6	-24.3	43.32	54	-10.68	-	-	71	392	V
2	* ** 4.80371	40.6	PK2	34.3	-31.5	43.4	-	-	74	-30.6	111	111	H
	* ** 4.80381	29.06	V1TV	34.3	-31.5	31.86	54	-22.14	-	-	111	111	H
4	* ** 15.74172	36.85	PK2	40.1	-24.3	52.65	-	-	74	-21.35	276	249	H
	* ** 15.73986	25.04	V1TV	40.1	-24.4	40.74	54	-13.26	-	-	276	249	H
6	* ** 4.80398	44.32	PK2	34.3	-31.5	47.12	-	-	74	-26.88	316	239	V
	* ** 4.80362	29.33	V1TV	34.3	-31.5	32.13	54	-21.87	-	-	316	239	V
8	* ** 12.32826	36.51	PK2	38.9	-26.1	49.31	-	-	74	-24.69	40	208	V
	* ** 12.32978	24.98	V1TV	38.9	-26.1	37.78	54	-16.22	-	-	40	208	V
3	7.20607	37.63	Pk	35.6	-29.9	43.33	-	-	-	-	0-360	101	H
7	7.20607	35.54	Pk	35.6	-29.9	41.24	-	-	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration
Pk - Peak detector

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 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	* ** 3.98128	41.32	PK2	33.6	-32	42.92	-	-	74	-31.08	38	162	H
	* ** 3.98145	29.44	V1TV	33.6	-32	31.04	54	-22.96	-	-	38	162	H
2	* ** 7.32312	43.26	PK2	35.7	-29.2	49.76	-	-	74	-24.24	331	104	H
	* ** 7.32278	34.34	V1TV	35.7	-29.2	40.84	54	-13.16	-	-	331	104	H
3	* ** 10.89438	36.57	PK2	37.9	-25.8	48.67	-	-	74	-25.33	153	101	H
	* ** 10.89437	24.88	V1TV	37.9	-25.8	36.98	54	-17.02	-	-	153	101	H
4	* ** 7.32283	42.2	PK2	35.7	-29.2	48.7	-	-	74	-25.3	303	108	V
	* ** 7.32285	33.04	V1TV	35.7	-29.2	39.54	54	-14.46	-	-	303	108	V
5	* ** 11.38525	37.28	PK2	38.1	-25.1	50.28	-	-	74	-23.72	168	134	V
	* ** 11.38434	24.43	V1TV	38.1	-25.1	37.43	54	-16.57	-	-	168	134	V
7	* ** 17.76922	36.21	PK2	41.7	-23.3	54.61	-	-	74	-19.39	51	229	V
	* ** 17.76878	24.52	V1TV	41.7	-23.3	42.92	54	-11.08	-	-	51	229	V
6	14.64482	35.15	Pk	39.7	-26.7	48.15	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration
Pk - Peak detector

UL LLC
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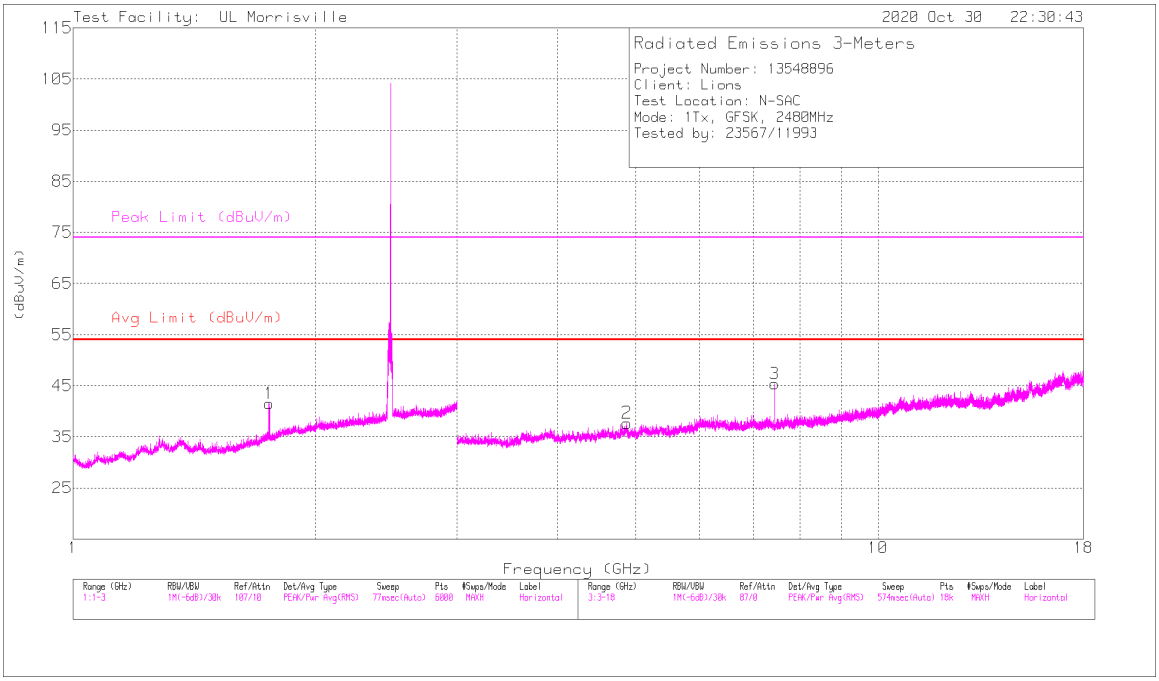
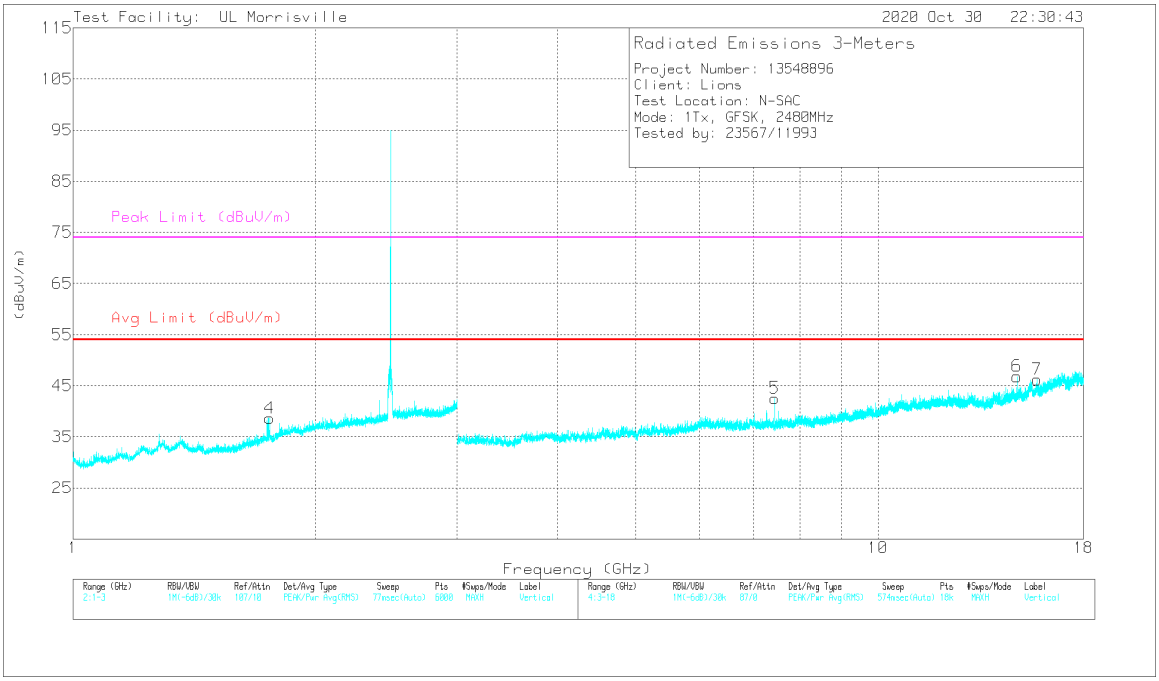
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 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	** 1.75171	37.56	PK2	29.7	-24.4	42.86	-	-	74	-31.14	7	237	H
	** 1.75124	25.1	V1TV	29.7	-24.4	30.4	54	-23.6	-	-	7	237	H
4	** 1.75297	38.19	PK2	29.6	-24.4	43.39	-	-	74	-30.61	20	257	V
	** 1.75353	25.81	V1TV	29.6	-24.4	31.01	54	-22.99	-	-	20	257	V
2	* ** 4.87784	41.65	PK2	34.1	-31.4	44.35	-	-	74	-29.65	355	332	H
	* ** 4.87737	29.56	V1TV	34.1	-31.4	32.26	54	-21.74	-	-	355	332	H
3	* ** 7.43972	43.26	PK2	35.7	-29.3	49.66	-	-	74	-24.34	3	111	H
	* ** 7.43988	35.5	V1TV	35.7	-29.3	41.9	54	-12.1	-	-	3	111	H
5	* ** 7.43974	42.07	PK2	35.7	-29.3	48.47	-	-	74	-25.53	155	198	V
	* ** 7.43982	33.99	V1TV	35.7	-29.3	40.39	54	-13.61	-	-	155	198	V
7	* ** 15.75796	36.52	PK2	40	-24.4	52.12	-	-	74	-21.88	48	170	V
	* ** 15.75822	25.1	V1TV	40	-24.4	40.7	54	-13.3	-	-	48	170	V
6	14.879	34.41	Pk	39.5	-27.1	46.81	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration
Pk - Peak detector

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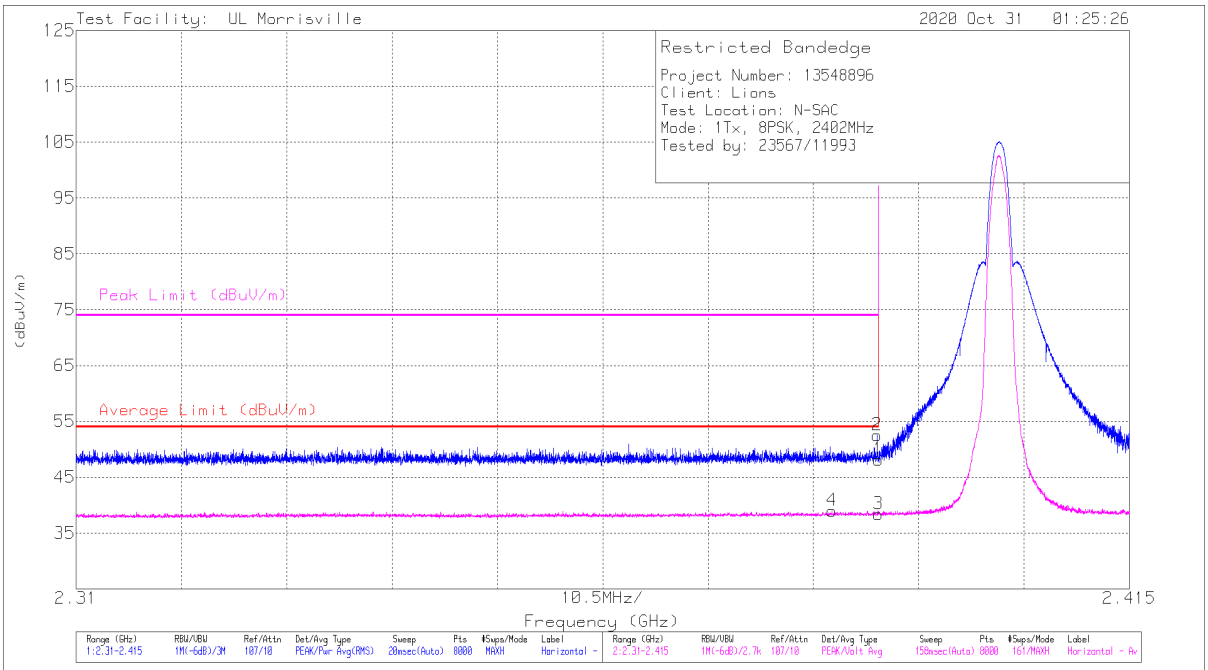
10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

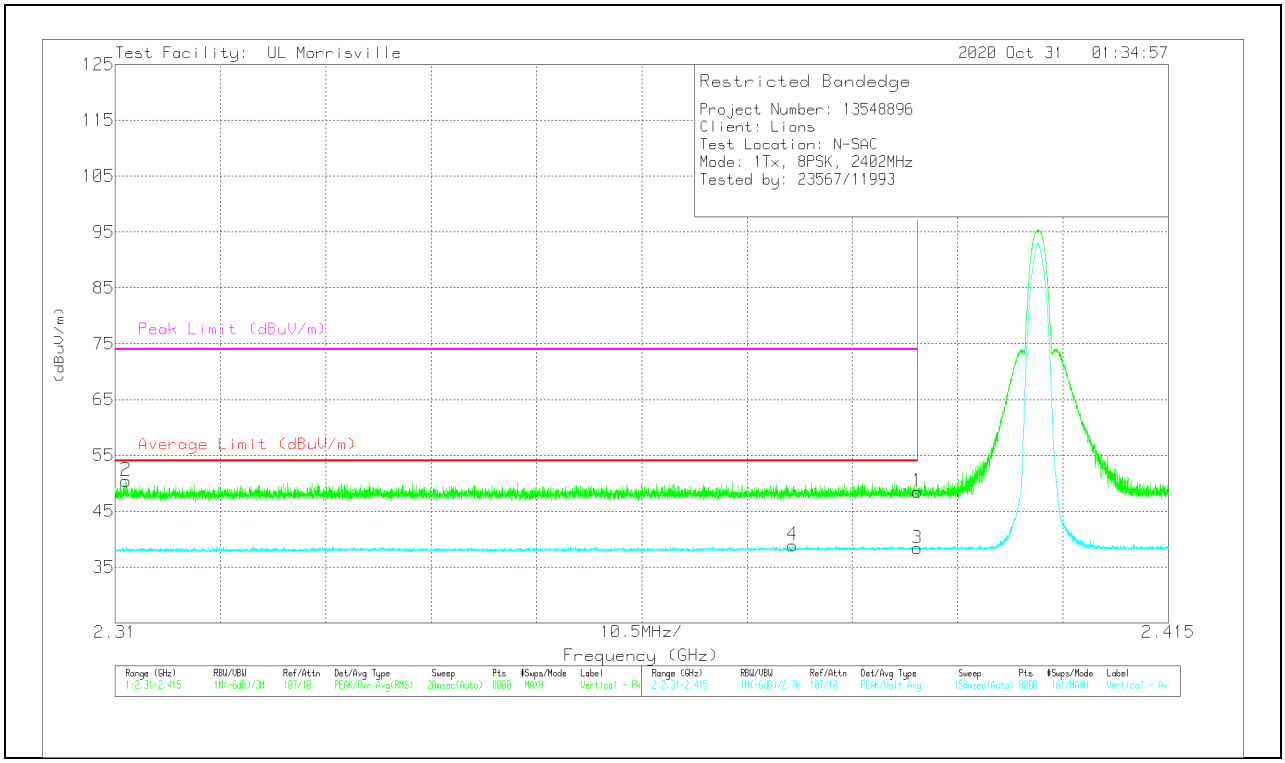
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	40.72	Pk	31.8	-24.4	48.12	-	-	74	-25.88	132	175	H
2	* ** 2.38985	45.11	Pk	31.8	-24.4	52.51	-	-	74	-21.49	132	175	H
3	* ** 2.39	30.97	V1TV	31.8	-24.4	38.37	54	-15.63	-	-	132	175	H
4	* ** 2.38536	31.56	V1TV	31.8	-24.4	38.96	54	-15.04	-	-	132	175	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	41.12	Pk	31.8	-24.4	48.52	-	-	74	-25.48	29	181	V
2	* ** 2.31108	43.38	Pk	31.7	-24.6	50.48	-	-	74	-23.52	29	181	V
3	* ** 2.39	30.98	V1TV	31.8	-24.4	38.38	54	-15.62	-	-	29	181	V
4	* ** 2.37754	31.61	V1TV	31.7	-24.4	38.91	54	-15.09	-	-	29	181	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

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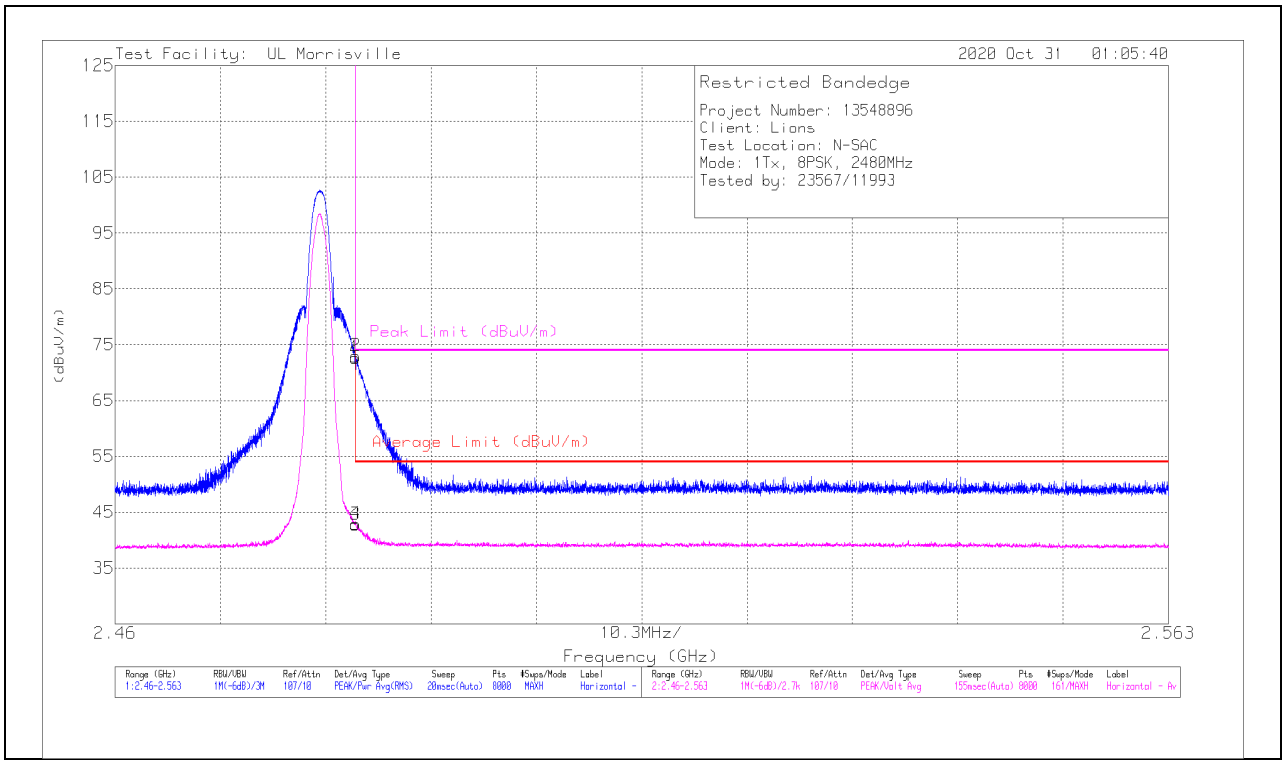
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 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	* ** 2.4835	64.42	Pk	32.4	-24.2	72.62	-	-	74	-1.38	144	324	H
2	* ** 2.48351	64.72	Pk	32.4	-24.2	72.92	-	-	74	-1.08	144	324	H
3	* ** 2.4835	34.57	V1TV	32.4	-24.2	42.77	54	-11.23	-	-	144	324	H
4	* ** 2.48351	34.66	V1TV	32.4	-24.2	42.86	54	-11.14	-	-	144	324	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

UL LLC
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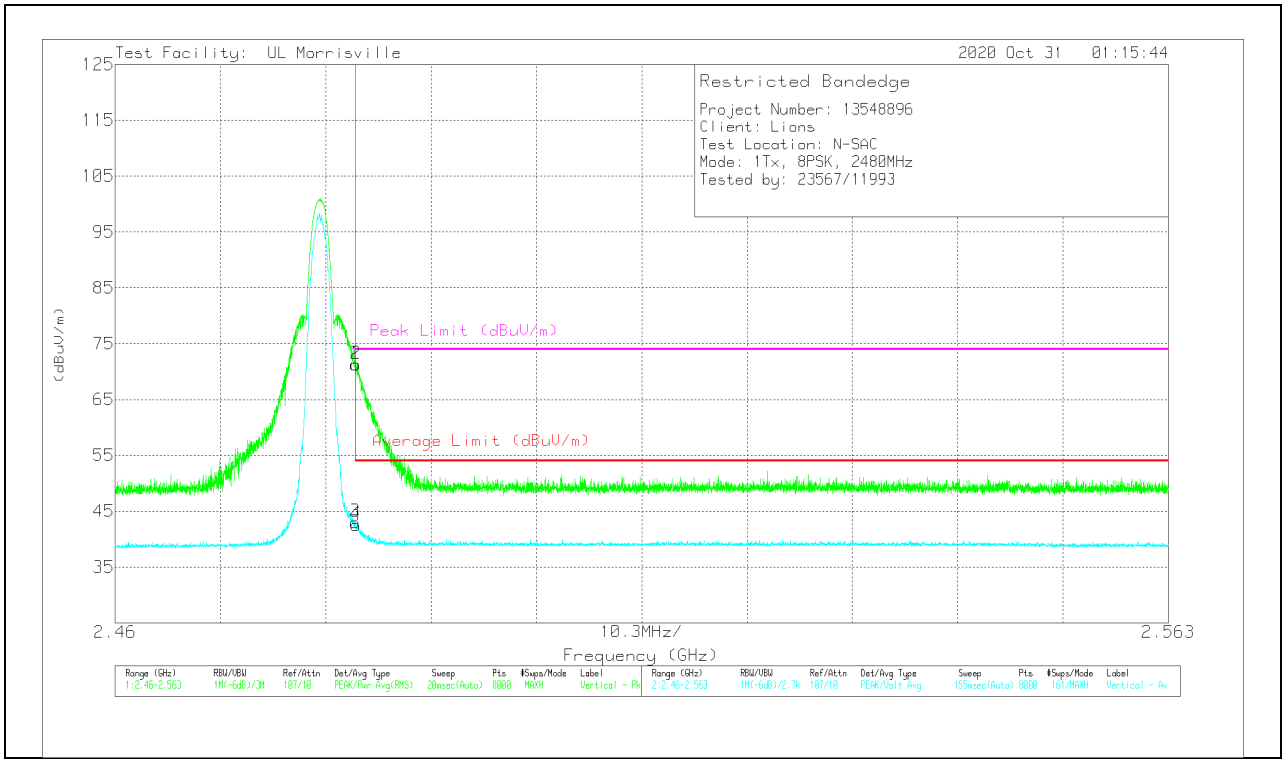
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 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	* ** 2.4835	63.12	Pk	32.4	-24.2	71.32	-	-	74	-2.68	188	392	V
2	* ** 2.48354	63.13	Pk	32.4	-24.2	71.33	-	-	74	-2.67	188	392	V
3	* ** 2.4835	34.87	V1TV	32.4	-24.2	43.07	54	-10.93	-	-	188	392	V
4	* ** 2.48356	34.36	V1TV	32.4	-24.2	42.56	54	-11.44	-	-	188	392	V

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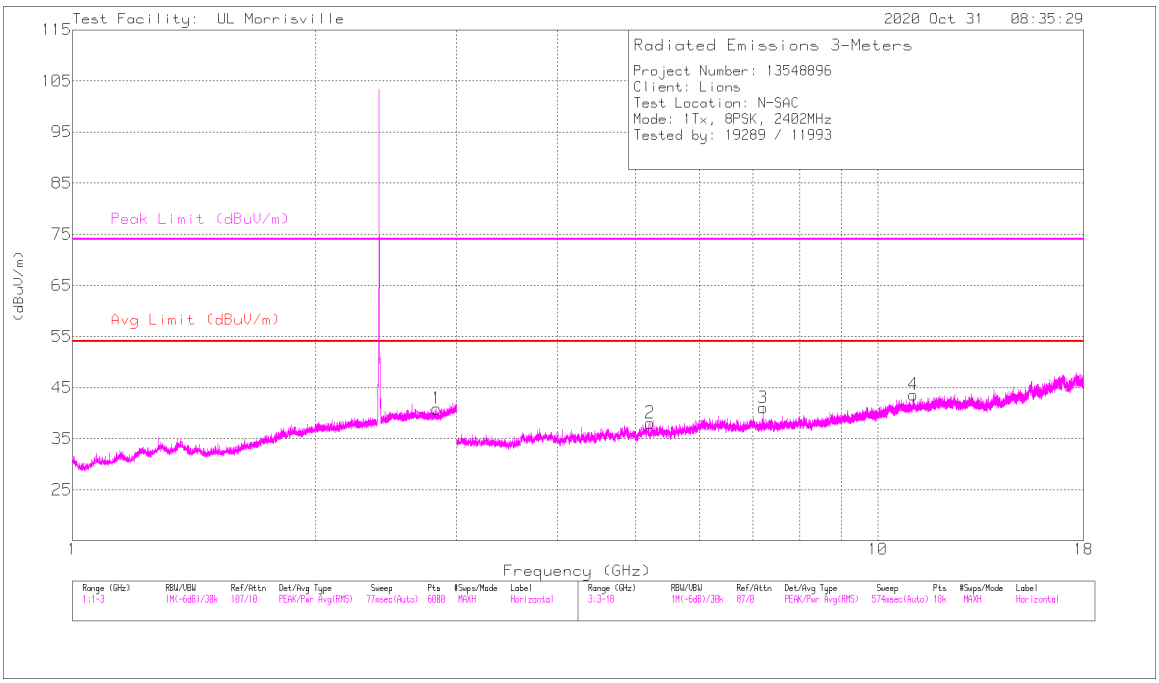
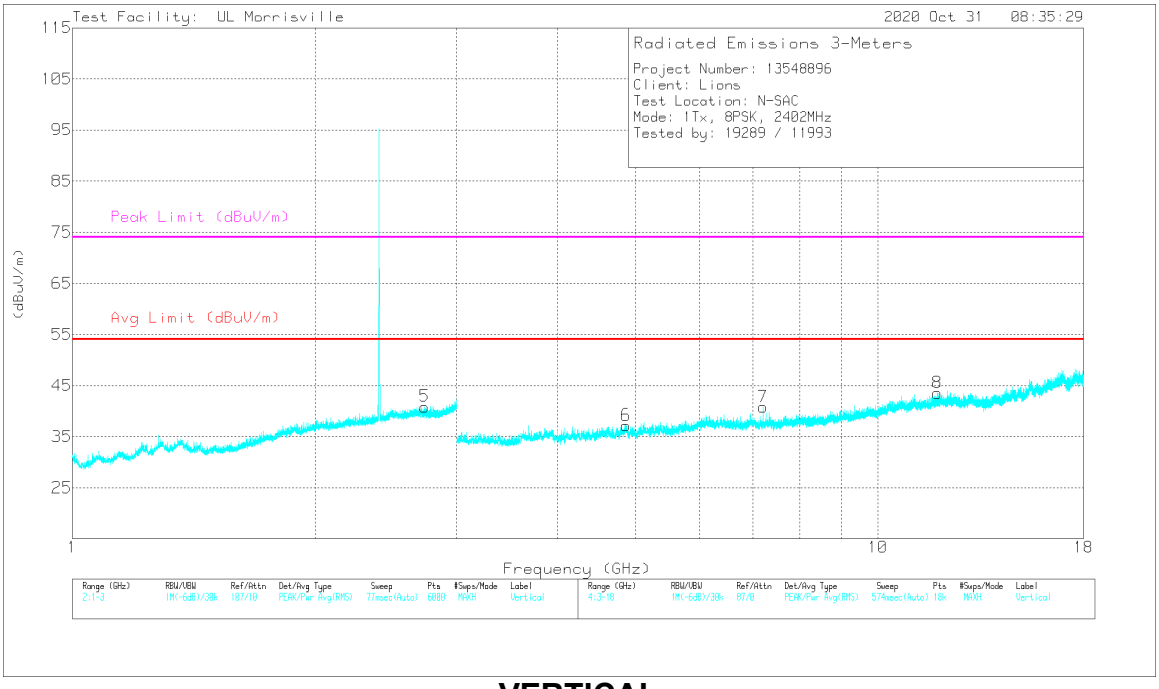
Pk - Peak detector
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



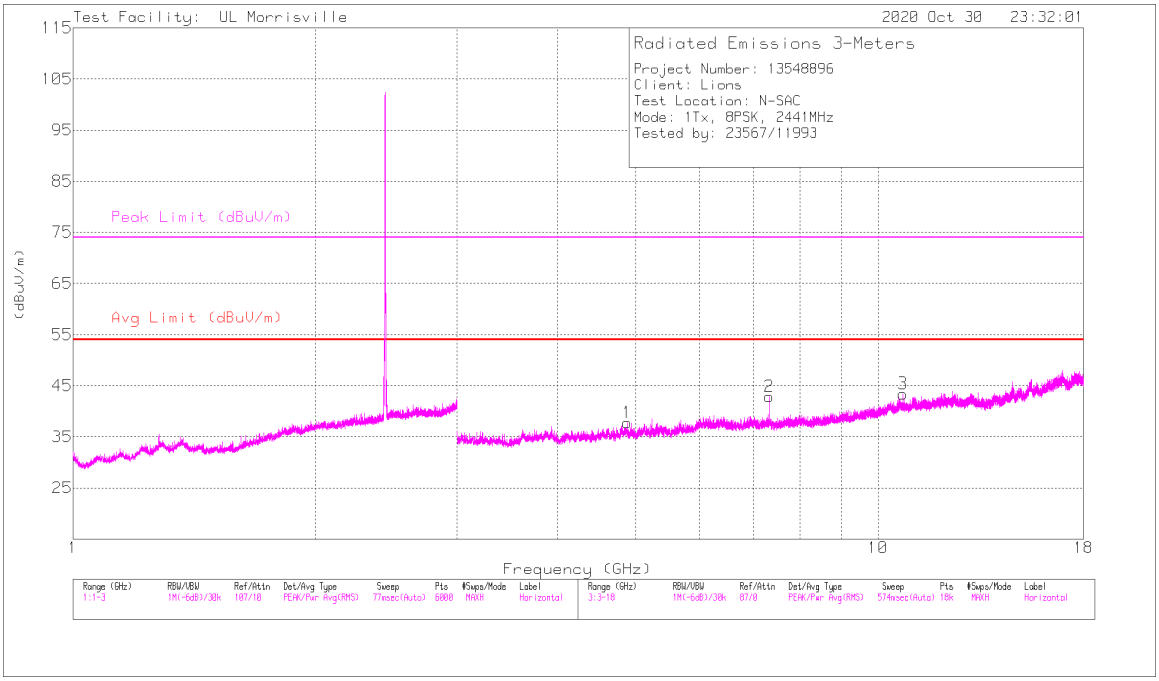
VERTICAL

RADIATED EMISSIONS

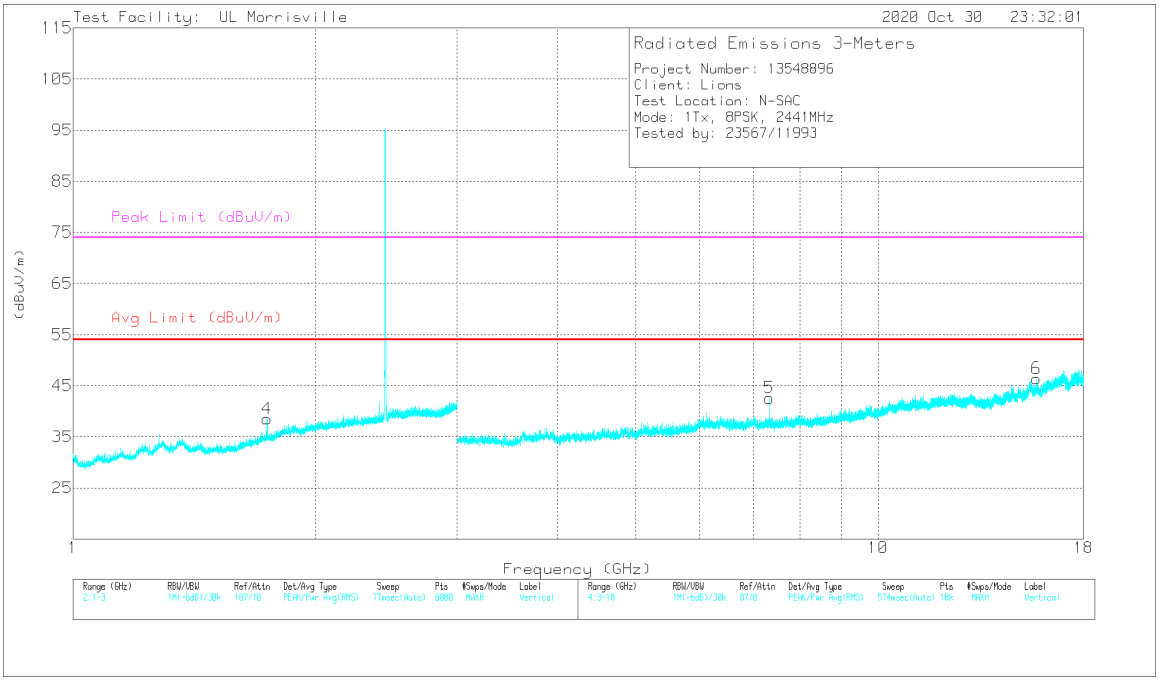
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.83264	37.19	PK2	32.1	-23.6	45.69	-	-	74	-28.31	200	194	H
	* ** 2.83278	25.87	V1TV	32.1	-23.6	34.37	54	-19.63	-	-	200	194	H
5	* ** 2.73761	37.35	PK2	32.3	-23.9	45.75	-	-	74	-28.25	314	195	V
	* ** 2.73767	25.92	V1TV	32.3	-23.9	34.32	54	-19.68	-	-	314	195	V
2	** 5.21442	41.19	PK2	34.3	-32.4	43.09	-	-	74	-30.91	114	125	H
	** 5.21531	29.66	V1TV	34.3	-32.4	31.56	54	-22.44	-	-	114	125	H
4	* ** 11.0744	36.6	PK2	37.9	-25.3	49.2	-	-	74	-24.8	354	202	H
	* ** 11.07451	24.99	V1TV	37.9	-25.3	37.59	54	-16.41	-	-	354	202	H
6	* ** 4.86748	41.25	PK2	34	-31.3	43.95	-	-	74	-30.05	49	191	V
	* ** 4.86721	29.5	V1TV	34	-31.3	32.2	54	-21.8	-	-	49	191	V
8	* ** 11.86043	36.58	PK2	38.5	-25.8	49.28	-	-	74	-24.72	192	120	V
	* ** 11.86033	25.05	V1TV	38.5	-25.8	37.75	54	-16.25	-	-	192	120	V
3	7.20524	35.33	Pk	35.6	-29.9	41.03	-	-	-	-	0-360	200	H
7	7.20524	35.07	Pk	35.6	-29.9	40.77	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration
Pk - Peak detector

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 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
4	** 1.74336	42.56	PK2	29.5	-24.3	47.76	-	-	74	-26.24	355	321	V
	** 1.74499	31.53	V1TV	29.5	-24.3	36.73	54	-17.27	-	-	355	321	V
1	* ** 4.88311	41.41	PK2	34	-31.4	44.01	-	-	74	-29.99	242	125	H
	* ** 4.88188	33.87	V1TV	34.1	-31.4	36.57	54	-17.43	-	-	242	125	H
2	* ** 7.32312	42.2	PK2	35.7	-29.2	48.7	-	-	74	-25.3	355	132	H
	* ** 7.32257	32.99	V1TV	35.6	-29.2	39.39	54	-14.61	-	-	355	132	H
3	* ** 10.73245	36.79	PK2	37.8	-25.5	49.09	-	-	74	-24.91	39	199	H
	* ** 10.7323	24.66	V1TV	37.8	-25.5	36.96	54	-17.04	-	-	39	199	H
5	* ** 7.32237	41.76	PK2	35.6	-29.2	48.16	-	-	74	-25.84	167	152	V
	* ** 7.32255	32.18	V1TV	35.6	-29.2	38.58	54	-15.42	-	-	167	152	V
6	* ** 15.73378	37.32	PK2	40.2	-24.6	52.92	-	-	74	-21.08	251	321	V
	* ** 15.73307	25.21	V1TV	40.1	-24.6	40.71	54	-13.29	-	-	251	321	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

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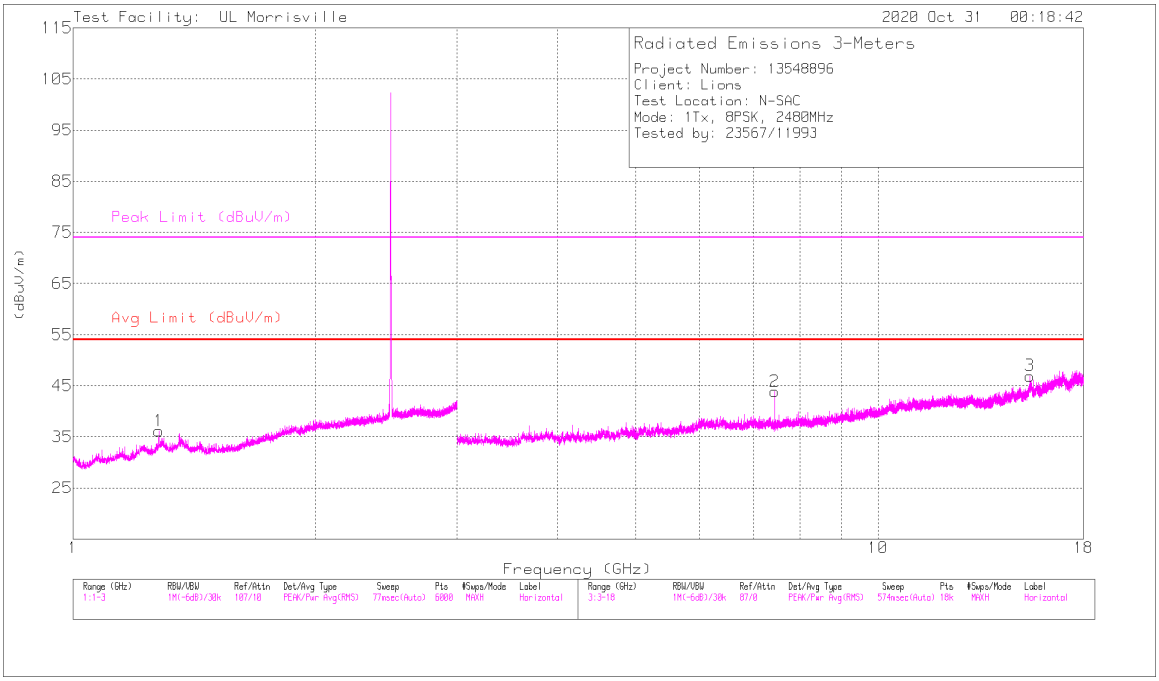
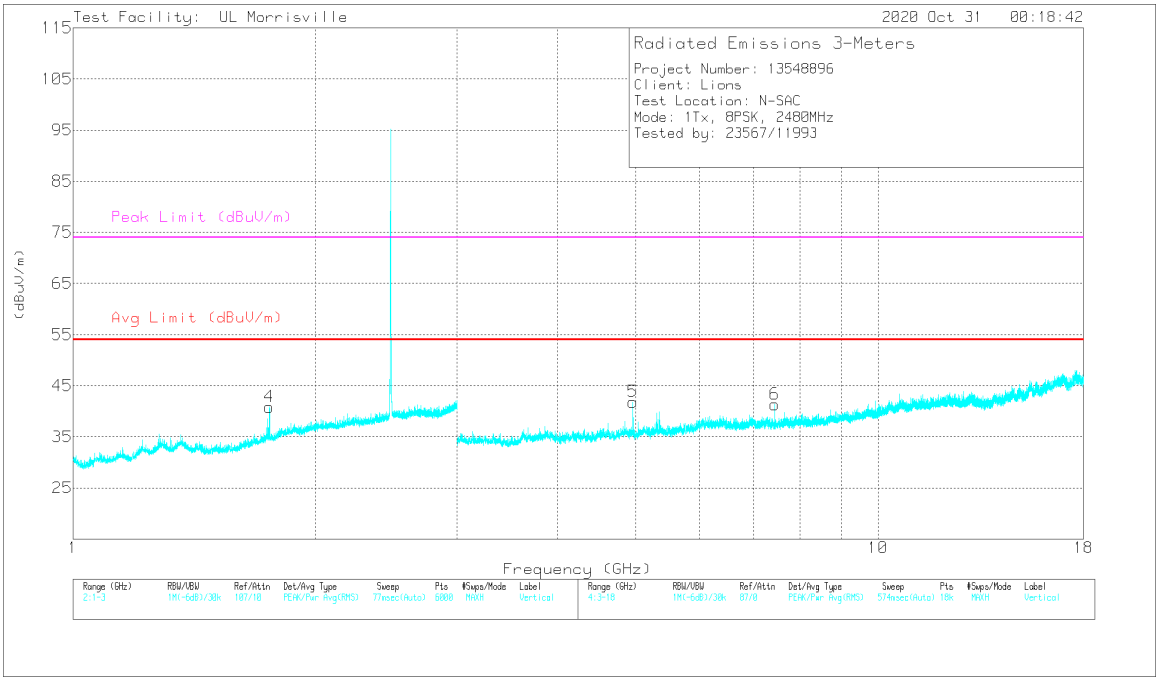
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

UL LLC
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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 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	* 1.27993	36.43	PK2	29.5	-25.7	40.23	-	-	74	-33.77	179	236	H
	* 1.27798	25.13	V1TV	29.6	-25.7	29.03	54	-24.97	-	-	179	236	H
4	** 1.75223	36.83	PK2	29.6	-24.4	42.03	-	-	74	-31.97	0	331	V
	** 1.75011	29.92	V1TV	29.6	-24.3	35.22	54	-18.78	-	-	0	331	V
2	* ** 7.44032	42.45	PK2	35.7	-29.3	48.85	-	-	74	-25.15	2	108	H
	* ** 7.43967	34.61	V1TV	35.7	-29.3	41.01	54	-12.99	-	-	2	108	H
3	* ** 15.44283	36.63	PK2	40.1	-24.6	52.13	-	-	74	-21.87	64	143	H
	* ** 15.44248	25.16	V1TV	40.2	-24.6	40.76	54	-13.24	-	-	64	143	H
5	* ** 4.95919	41.56	PK2	34.1	-32.3	43.36	-	-	74	-30.64	309	320	V
	* ** 4.96008	29.83	V1TV	34.1	-32.4	31.53	54	-22.47	-	-	309	320	V
6	* ** 7.43989	40.35	PK2	35.7	-29.3	46.75	-	-	74	-27.25	298	325	V
	* ** 7.43972	30.1	V1TV	35.7	-29.3	36.5	54	-17.5	-	-	298	325	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

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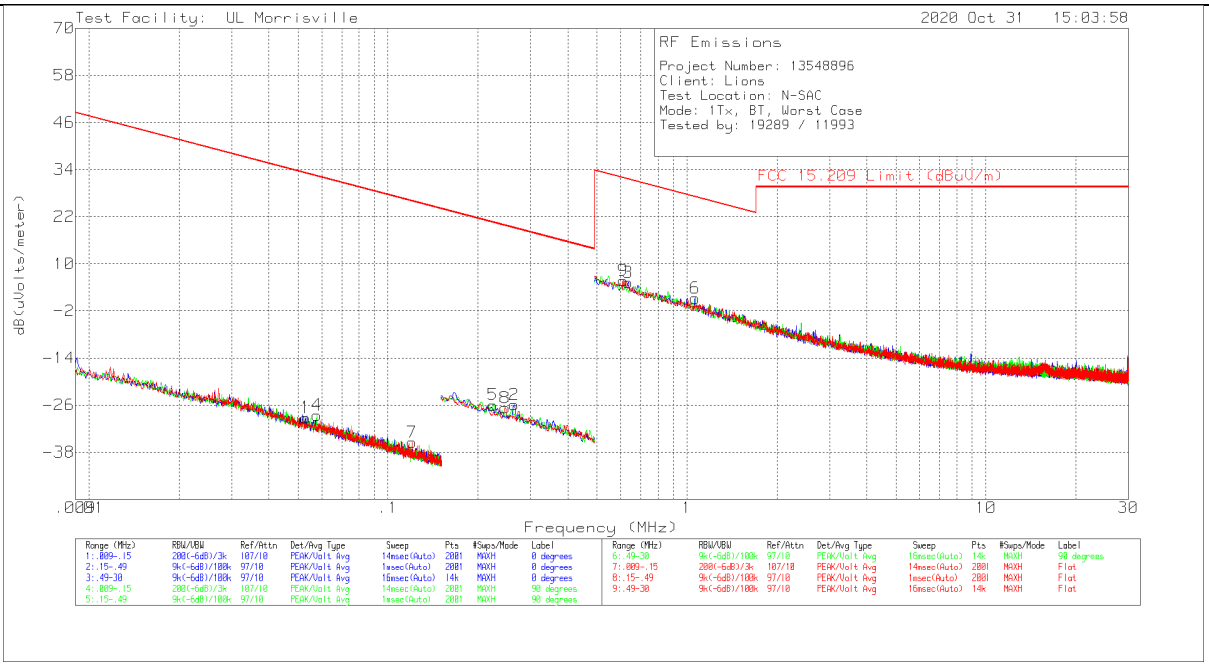
10.2. WORST CASE BELOW 30MHZ

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

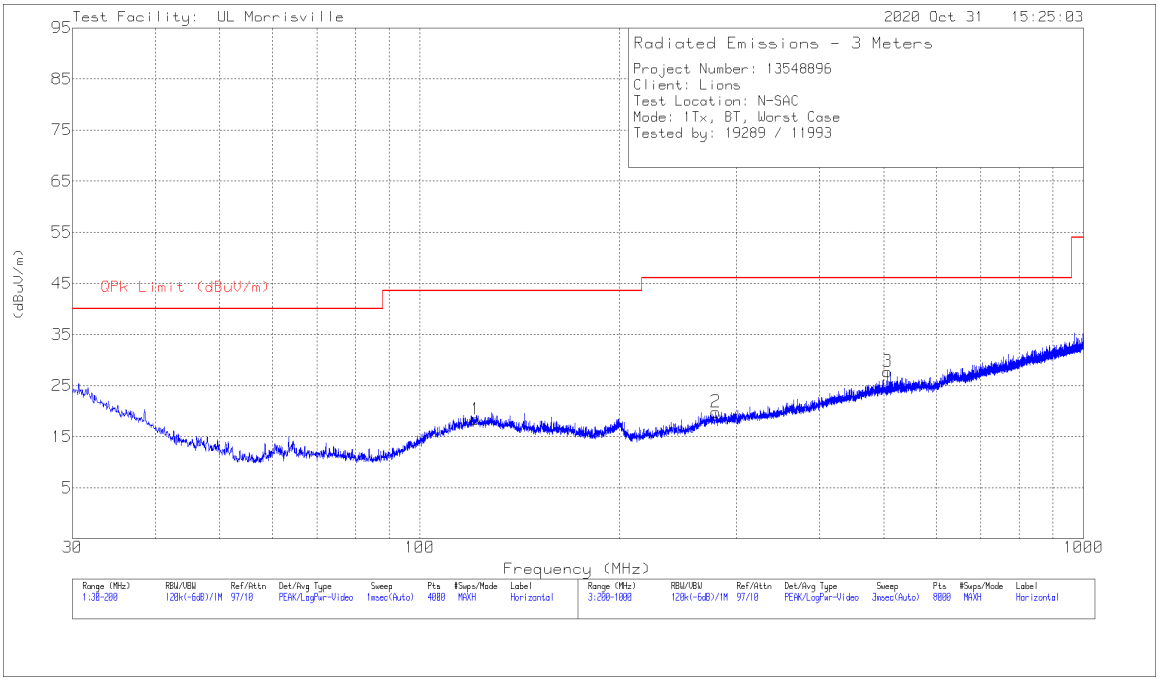
Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 QP/AV Limit (dBuV/m	FCC 15.209 PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.05295	39.21	Pk	11.5	.1	-80	-29.19	33.13	53.13	-62.32	0-360
4	.05778	39.84	Pk	11.5	.1	-80	-28.56	32.37	52.37	-60.93	0-360
7	.12026	33.51	Pk	10.9	.1	-80	-35.49	26	46	-61.49	0-360
5	.22463	43.12	Pk	10.8	.1	-80	-25.98	20.57	40.57	-46.55	0-360
8	.24648	42.41	Pk	10.8	.1	-80	-26.69	19.77	39.77	-46.46	0-360
2	.26416	43.27	Pk	10.7	.1	-80	-25.93	19.17	39.17	-45.1	0-360
9	.61226	34.76	Pk	10.8	.2	-40	5.76	31.87	-	-26.11	0-360
3	.63651	34.22	Pk	10.8	.2	-40	5.22	31.53	-	-26.31	0-360
6	1.06759	29.99	Pk	11	.2	-40	1.19	27.04	-	-25.85	0-360

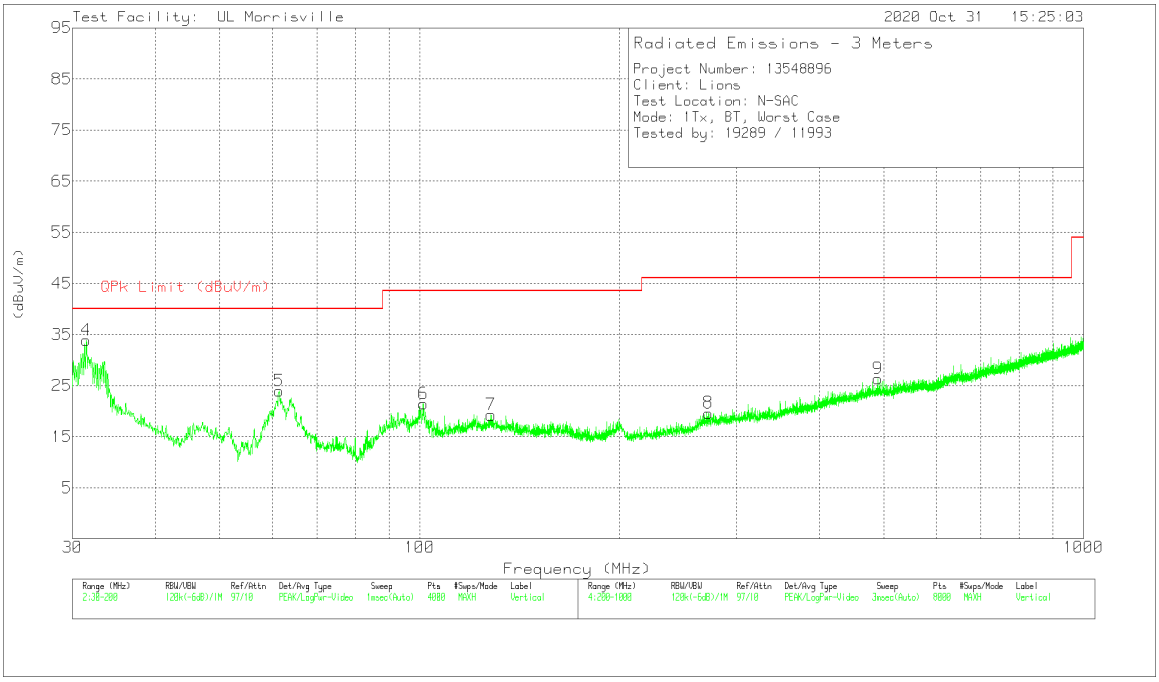
Pk - Peak detector

10.3. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 121.5687	28.64	Pk	20	-30.2	18.44	43.52	-25.08	0-360	99	H
7	* ** 128.1154	29.35	Pk	20	-30.1	19.25	43.52	-24.27	0-360	100	V
2	* ** 279.4103	29.26	Pk	19.4	-28.8	19.86	46.02	-26.16	0-360	99	H
3	** 507.1399	31.37	Pk	23.7	-27.3	27.77	46.02	-18.25	0-360	200	H
8	* ** 272.4094	29.11	Pk	19.3	-28.8	19.61	46.02	-26.41	0-360	98	V
9	** 489.7377	29.73	Pk	23.8	-27.2	26.33	46.02	-19.69	0-360	300	V
4	31.4879	39.4	Pk	25.9	-31.4	33.9	-	-	0-360	100	V
5	61.4156	41.31	Pk	13.6	-31	23.91	-	-	0-360	100	V
6	101.2484	35.15	Pk	16.7	-30.4	21.45	-	-	0-360	100	V

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

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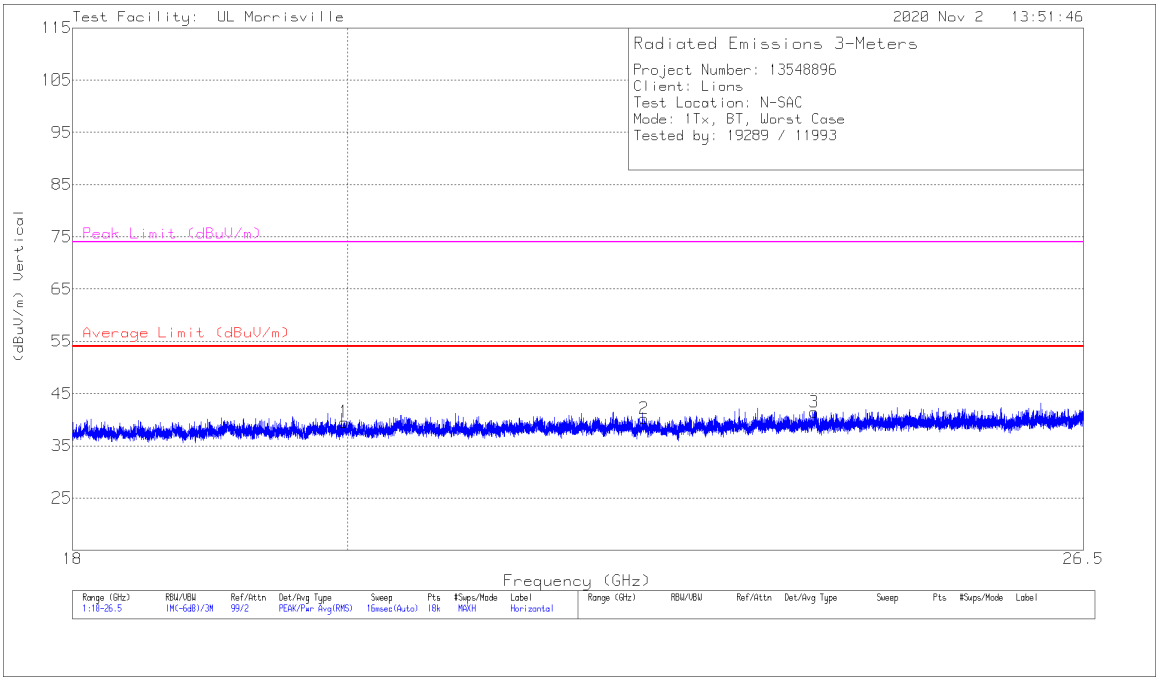
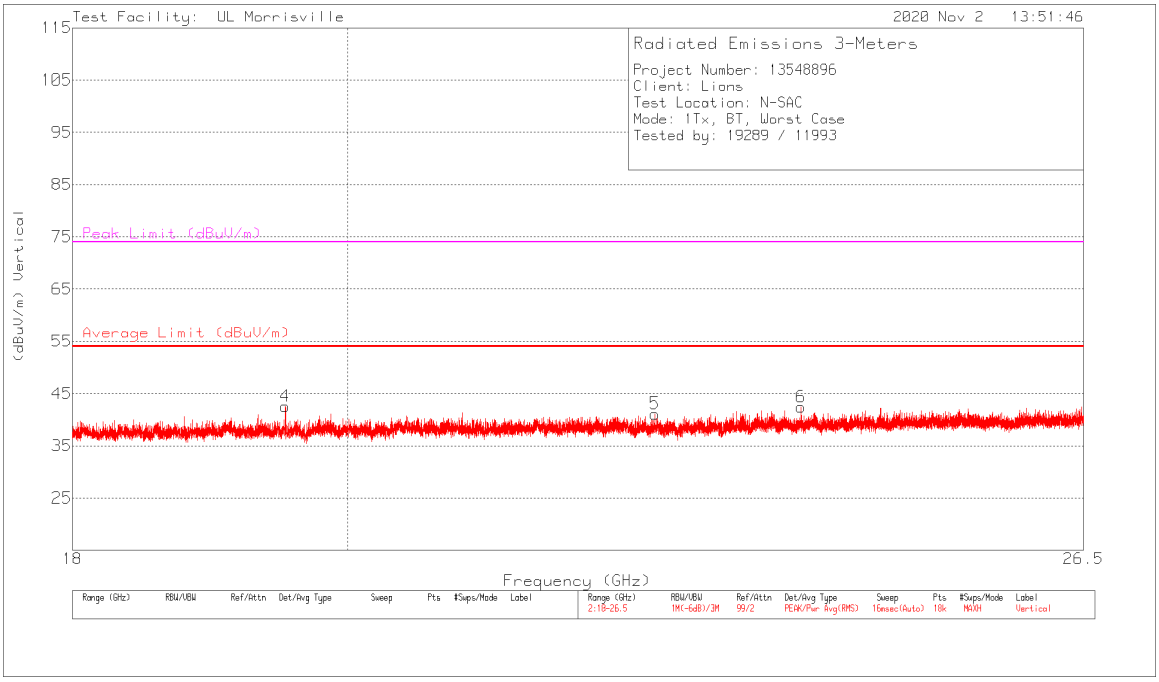
10.4. WORST CASE 18-26 GHZ

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



HORIZONTAL



VERTICAL

18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (dB/m)	Amp/CBL (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 19.96975	47.22	Pk	32.9	-40.6	39.52	54	-14.48	74	-34.48	0-360	101	H
2	* ** 22.39899	47.62	Pk	33.6	-41	40.22	54	-13.78	74	-33.78	0-360	150	H
3	* ** 23.90404	47.72	Pk	34.1	-40.4	41.42	54	-12.58	74	-32.58	0-360	200	H
4	* ** 19.52772	50.47	Pk	32.8	-40.7	42.57	54	-11.43	74	-31.43	0-360	101	V
5	* ** 22.49344	48.62	Pk	33.6	-41.1	41.12	54	-12.88	74	-32.88	0-360	300	V
6	* ** 23.78645	48.94	Pk	34	-40.5	42.44	54	-11.56	74	-31.56	0-360	300	V

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

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11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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.

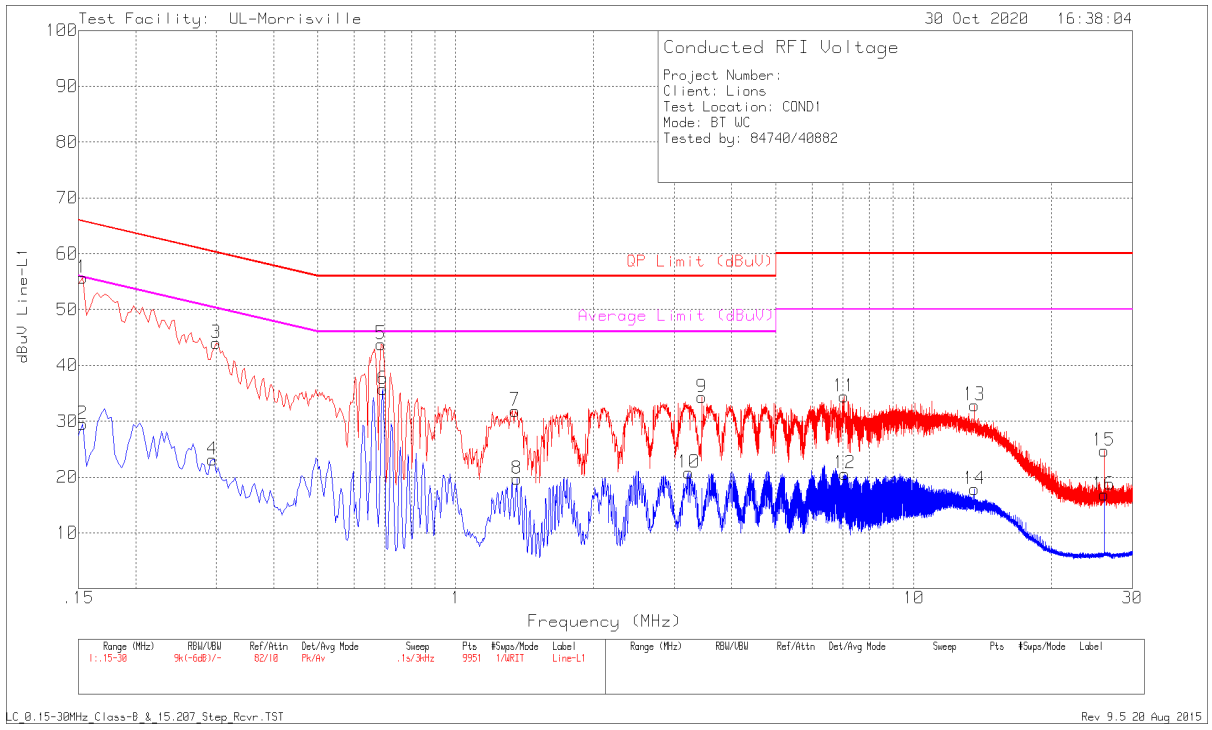
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

11.1.1. AC Power Line

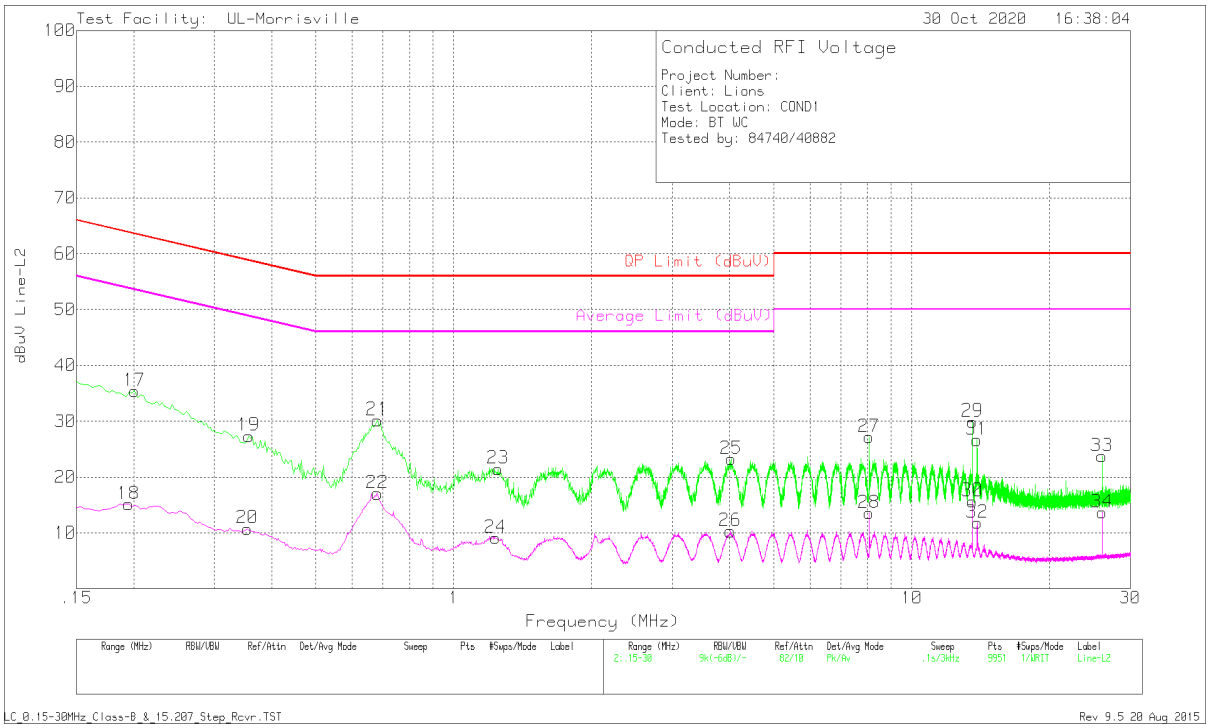
LINE 1 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.153	45.78	Pk	.2	9.7	55.68	65.84	-10.16	-	-
2	.153	19.65	Av	.2	9.7	29.55	-	-	55.84	-26.29
3	.3	34.25	Pk	.1	9.7	44.05	60.24	-16.19	-	-
4	.294	13.33	Av	.1	9.7	23.13	-	-	50.41	-27.28
5	.687	34.01	Pk	0	9.8	43.81	56	-12.19	-	-
6	.693	25.95	Av	0	9.8	35.75	-	-	46	-10.25
7	1.347	22.1	Pk	0	9.8	31.9	56	-24.1	-	-
8	1.359	9.87	Av	0	9.8	19.67	-	-	46	-26.33
9	3.447	24.5	Pk	0	9.8	34.3	56	-21.7	-	-
10	3.228	10.99	Av	0	9.8	20.79	-	-	46	-25.21
11	7.041	24.46	Pk	.1	9.9	34.46	60	-25.54	-	-
12	7.071	10.61	Av	.1	9.9	20.61	-	-	50	-29.39
13	13.56	22.78	Pk	.1	10	32.88	60	-27.12	-	-
14	13.563	7.74	Av	.1	10	17.84	-	-	50	-32.16
15	26.001	14.22	Pk	.3	10.2	24.72	60	-35.28	-	-
16	26.001	6.35	Av	.3	10.2	16.85	-	-	50	-33.15

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
17	.201	25.49	Pk	.2	9.7	35.39	63.57	-28.18	-	-
18	.195	5.22	Av	.2	9.7	15.12	-	-	53.82	-38.7
19	.357	17.57	Pk	.1	9.7	27.37	58.8	-31.43	-	-
20	.354	.98	Av	.1	9.7	10.78	-	-	48.87	-38.09
21	.681	20.39	Pk	0	9.8	30.19	56	-25.81	-	-
22	.681	7.26	Av	0	9.8	17.06	-	-	46	-28.94
23	1.248	11.67	Pk	0	9.8	21.47	56	-34.53	-	-
24	1.233	-.72	Av	0	9.8	9.08	-	-	46	-36.92
25	4.029	13.28	Pk	.1	9.9	23.28	56	-32.72	-	-
26	4.014	.3	Av	.1	9.9	10.3	-	-	46	-35.7
27	8.064	17.08	Pk	.1	10	27.18	60	-32.82	-	-
28	8.064	3.47	Av	.1	10	13.57	-	-	50	-36.43
29	13.56	19.83	Pk	.1	10	29.93	60	-30.07	-	-
30	13.56	5.57	Av	.1	10	15.67	-	-	50	-34.33
31	13.881	16.55	Pk	.1	10	26.65	60	-33.35	-	-
32	13.89	1.7	Av	.1	10	11.8	-	-	50	-38.2
33	25.998	13.31	Pk	.2	10.2	23.71	60	-36.29	-	-
34	26.001	3.23	Av	.2	10.2	13.63	-	-	50	-36.37

Pk - Peak detector
Av - Average detection

12. SETUP PHOTOS

Please refer to R13548896-EP1 for setup photos

END OF TEST REPORT

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