FCC 47 CFR PART 15 SUBPART C
ISED CANADA RSS-210 ISSUE 9

CERTIFICATION TEST REPORT

FOR

ZWAVE SENSOR ADAPTOR

MODEL NUMBER: FGBS-222

FCC ID: 2AA9MFGBS222
IC: 20430-FGBS222

REPORT NUMBER: R12498130-E2

ISSUE DATE: 2019-03-14

Prepared for
FIBAR GROUP SA
UL. LOTNICZA 1
POZNAN, 60-421
POLAND

Prepared by
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NVLAP TESTING

NVLAP LAB CODE 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2018-12-18	Initial Issue	Brian T. Kiewra
2	2019-01-18	Revised FCC ID on cover page Revised AV power in Section 5.2 Revised mid channel fundamental in Section 8.3.1	Brian T. Kiewra
3	2019-02-19	Replaced “open area test site” with “open field test site” in Section 8.3.4	Brian T. Kiewra
4	2019-03-14	Unit is DC (not battery) powered. Reran radiated using a DC power supply and added AC Mains emissions data.	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: FIBAR GROUP SA
UL. LOTNICZA 1
POZNAN, 60-421, POLAND

EUT DESCRIPTION: ZWave Sensor Adaptor

MODEL: FGBS-222

SERIAL NUMBER: 4B

DATE TESTED: 2018-11-08 to 2019-03-12

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED CANADA RSS-210 Issue 9 Annex B.10	Complies
ISED CANADA 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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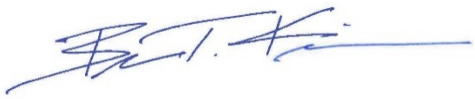
Approved & Released
For UL LLC By:

Jeffrey Moser
Operations Leader
UL – Consumer Technology Division

Prepared By:



Brian T. Kiewra
Project Engineer
UL – Consumer Technology Division

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 5, and RSS-210 Issue 9 Annex B.10.

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., 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 (ISED:2180C-1)	☒ Chamber North (ISED:2180C-3)
☐ Chamber C (ISED:2180C-2)	☐ Chamber South (ISED:2180C-4)

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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
Occupied Channel Bandwidth	2.00%
All emissions, radiated	4.88 dB
Conducted Emissions	3.65 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a ZWave sensor adapter. It allows to enhance the functionality of wired sensors and other devices by adding Z-Wave network communication. One can connect binary sensors, analog sensors, DS18B20 temperature sensors or DHT22 humidity and temperature sensor to report their readings to the Z-Wave controller. It can also control devices by opening/closing output contacts independently of the inputs.

The General Purpose Z-Wave SiP Module is manufactured by Sigma Designs. It operates in the following modes and frequencies:
2FSK (40kbps) (for 908.40MHz)
2FSK (9.6kbps) (for 908.42MHz)
2GFSK (100kbps) (for 916MHz)

5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output peak and average E-field as follows:

Frequency Range (MHz)	Mode	Output PK E-field Strength (dBuV/m)	Output AVE E-field Strength (dBuV/m)
908.4 - 916	2GFSK	96.37	52.63

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna type is quarter-wave monopole. Maximum Peak Antenna Gain is 2dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was custom firmware for tests, rev. 1.0

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. <30MHz radiated testing performed on worst-case channel. 30-1000MHz and 1-10GHz radiated testing performed with EUT transmitting on 908.4MHz, 908.44MHz, and 916MHz.

The EUT was investigated in three orthogonal orientations, X,Y, and Z. It was determined that the Y-axis was worst-case. Therefore all radiated testing performed with the EUT in the Y orientation.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
RF Controller Board	STMicroelectronics	STM8L152 Eval Board	NA	NA
12VDC Battery (x2)	Cell Power	CP1.2-12	NA	NA
Temperature Sensor	MAXIM Integrated	DS18B20	NA	NA
Wiring Harness	Fibar	NA	NA	NA
Input Test Fixture	Fibar	NA	NA	NA
Resistive Load (x4)	Fibar	NA	NA	NA
76021	DC Regulated Power Supply	CircuitSpecialists	CSI3005X5	N/A

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	1	1	Multipin	Multiple Single Conductor	<1m	Provides 12Vdc power to EUT through wiring harness
2	1	1	Barrel	Multiple Single Conductor	<1m	Provides 12Vdc power to resistive load
3	1	1	Multipin	Multiple Single Conductor	<1m	Connects EUT to temp sensor
4	1	1	Multipin	Multiple Single Conductor	<1m	Connects EUT to RF controller
5	1	1	Multipin	Multiple Single Conductor	<1m	Connects WUT to input test fixture through wiring harness
6	1	1	Multipin	Multiple Single Conductor	<1m	Connects EUT to resistive load
7	1	1	Mains	Mains	<3m	Provides AC power to DC power supply.

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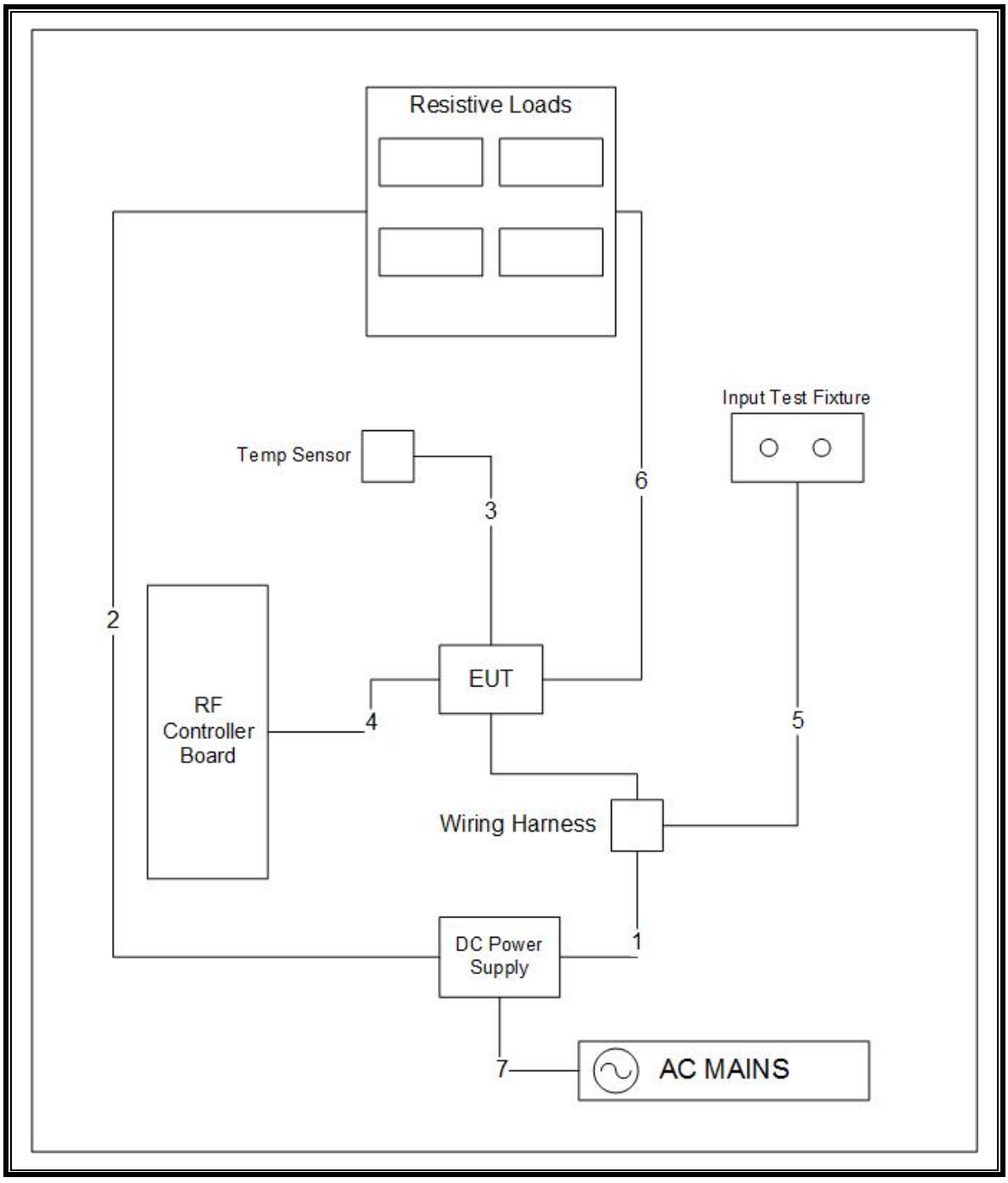
SETUP DIAGRAM FOR TESTS



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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.
0.009-30MHz (Loop Ant.)					
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2019-01-24	2020-01-24
30-1000 MHz					
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2018-08-06	2019-08-06
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-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2018-09-06	2019-09-06
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2018-05-20	2019-05-20
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2018-03-23	2019-03-23
Receiver & Software					
SA0027	Spectrum Analyzer	Agilent	N9030A	2018-04-04	2019-04-04
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
s/n 161024690	Environmental Meter	Fisher Scientific	15-077-963	2016-12-21	2018-12-21
BRF007	902-928 MHz Notch Filter	Micro-Tronics	BRC17691	2018-04-04	2019-04-04
HPF009	1-10 GHz High Pass Filter	Micro-Tronics	HPM17672	2018-03-13	2019-03-13
76021	DC Regulated Power Supply	CircuitSpecialists	CSI3005X5	N/A	N/A

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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	2018-06-19	2019-06-19
s/n 181562858	Environmental Meter	Fisher Scientific	14-650-118	2018-09-04	2020-09-04
75141 (PRE0101521)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2018-08-22	2019-08-22
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2018-06-13	2019-06-13
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
MM0165	Multi-meter	Agilent	U1232A	2018-10-12	2019-10-12

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7. MEASUREMENT METHODS

20 dB BW: ANSI C63.10-2013, Section 6.9.2.

99% Occupied Bandwidth: ANSI C63.10-2013, Section 6.9.3.

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

AC Mains Conducted Emissions: ANSI C63.10:2013 Section 6.2

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8. TEST RESULTS

8.1. DUTY CYCLE (DECLARATION)

Manufacturer has declared worst-case duty cycle to be 0.65%.

4.2 Duty cycle – heavy case

(240 times change state per day + setting all possible frames which can be send by device)

Trigger	How often?	Frame Type	Frames duartion	Duty cycle per hour
Change State: ON/OFF Outputs 1/2	120 times per hour	2x Switch Binary Report	2x 32,5ms = 65ms @R1 2x 7,6ms = 15,2ms @R2 2x 5,5ms = 11ms @R3	0,217%@R1 0,051%@R2 0,037%@R3
External Temperature Report	120 times per hour	1x Sensor Multilevel Report frame	1x 32,5ms = 32,5ms @R1 1x 7,6ms = 7,6ms @R2 1x 5,5ms = 5,5ms @R3	0,108%@R1 0,025%@R2 0,018%@R3
Internal Temperature Report	120 times per hour	1x Sensor Multilevel Report frame	1x 32,5ms = 32,5ms @R1 1x 7,6ms = 7,6ms @R2 1x 5,5ms = 5,5ms @R3	0,108%@R1 0,025%@R2 0,018%@R3
Analog Input 1/2 Report	120 times per hour	2x Sensor Multilevel Report frame	2x 32,5ms = 65ms @R1 2x 7,6ms = 15,2ms @R2 2x 5,5ms = 11ms @R3	0,217%@R1 0,051%@R2 0,037%@R3
				Summary Duty Cycle per hour
			The worst case:	**0,650%@R1 (<1%)** **0,152%@R2 (<1%)** **0,110%@R3 (<1%)**

Change State: triggered 120 times in 1 hour (3,600,000ms). On 65ms each time.
Duty cycle = (65ms * 120)/3600000 = 0.217%

Ext temp: triggered 120 times in 1 hour (3,600,000ms). On 32.5ms each time.
Duty cycle = (32.5ms * 120)/3600000 = 0.108%

Int temp: triggered 120 times in 1 hour (3,600,000ms). On 32.5ms each time.
Duty cycle = (32.5ms * 120)/3600000 = 0.108%

Analog Input 1/2: triggered 120 times in 1 hour (3,600,000ms). On 65ms each time.
Duty cycle = (65ms * 120)/3600000 = 0.217%

Worst-Case duty cycle = 0.217% + 0.108% + 0.108% + 0.217% = 0.65%

Refer to document “FGBS-222 Duty Cycle_1.1.pdf” provided by manufacturer for duty cycle measurements and calculations.

Duty cycle correction factor base on worst-case duty cycle of .65% is 20log(.0065) = -43.74.

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8.2. 99% AND 20dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

20 dB EBW and 99% OBW - The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 5% of the 99 % and 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized. This was performed over the air.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)	20dB Bandwidth (MHz)
Low	908.4	0.087	0.085
Middle	908.44	0.064	0.066
High	916	0.112	0.126

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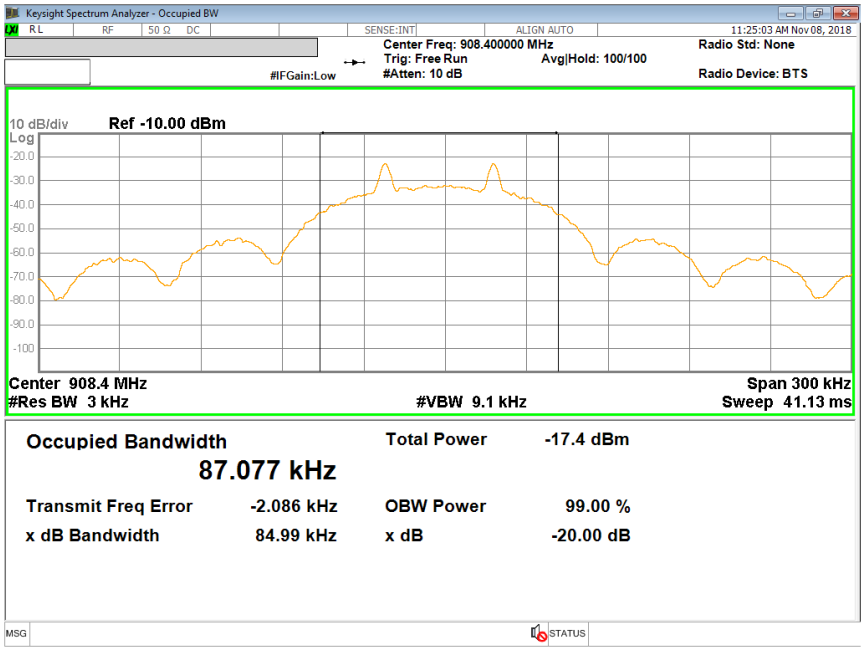
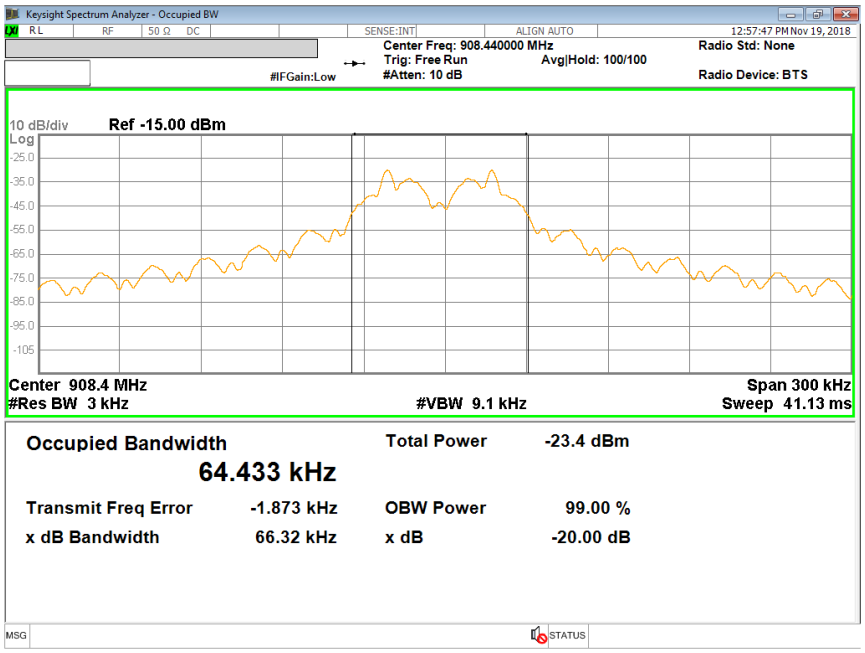
99% AND 20 dB BANDWIDTH

99% AND 20 dB BANDWIDTH LOW CH



99% AND 20 dB BANDWIDTH MID CH



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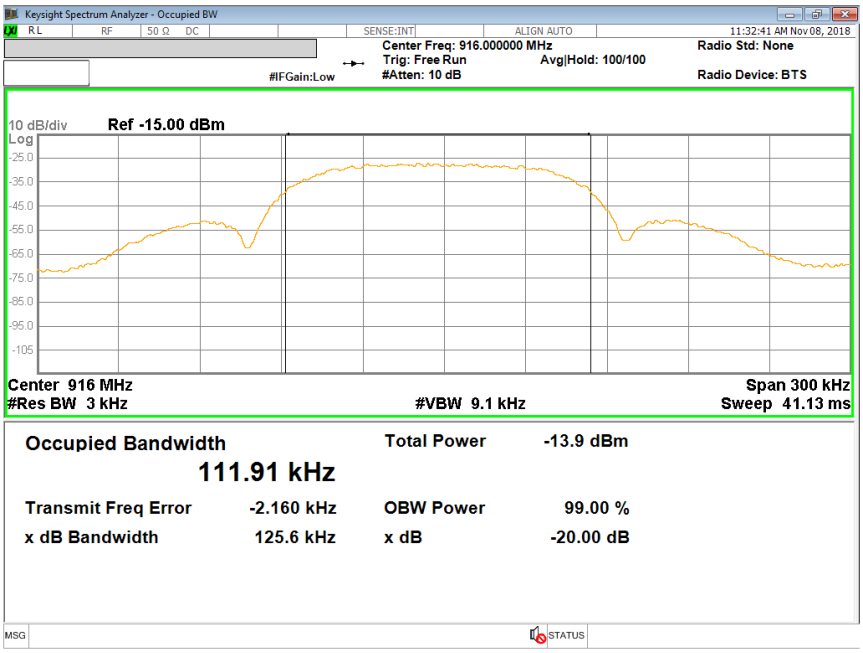
99% AND 20 dB BANDWIDTH HIGH CH



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8.3. RADIATED EMISSIONS LIMITS

FCC 15.205(a), 15.209 (a), FCC 15.249 (a)(d)(e)
IC RSS-210, B.10
IC RSS-GEN Clause 8.9 (Transmitter)

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following @ 3 meter:

Fundamental frequency	Field strength of fundamental at 3 m		Field strength of harmonics at 3 m	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	107.95	2500	67.95

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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) @ 300m	-
0.490-1.705	24000/F(kHz) @ 30m	-
1.705-30.0	30 @ 30m	-
30 - 88	100**	40**
88 - 216	150**	43.5**
216 - 960	200**	46**
Above 960	500**	54**

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permltted under other sections of this part, e.g., §§15.231 and 15.241.

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TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

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

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

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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RESULTS

8.3.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION

Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	Duty Cycle Correction Factor (dB)	Corrected Reading (dBuV/m)	Pk Limit (dBuV/m)	Margin (dB)	Av Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity	Notes
908.375	89.62	Pk	28.9	-26.2	-	92.32	114	-21.68	-	-	122	156	H	1
908.375	89.62	Pk	28.9	-26.2	-43.74	48.58	-	-	94	-45.42	122	156	H	1
908.368	83.35	Pk	28.9	-26.2	-	86.05	114	-27.95	-	-	49	152	V	1
908.368	83.35	Pk	28.9	-26.2	-43.74	42.31	-	-	94	-51.69	49	152	V	1
908.409	89.79	Pk	28.9	-26.2	-	92.49	114	-21.51	-	-	128	155	H	2
908.409	89.79	Pk	28.9	-26.2	-43.74	48.75	-	-	94	-45.25	128	155	H	2
908.425	83.37	Pk	28.9	-26.2	-	86.07	114	-27.93	-	-	53	152	V	2
908.425	83.37	Pk	28.9	-26.2	-43.74	42.33	-	-	94	-51.67	53	152	V	2
916.026	93.67	Pk	28.9	-26.2	-	96.37	114	-17.63	-	-	132	154	H	3
916.026	93.67	Pk	28.9	-26.2	-43.74	52.63	-	-	94	-41.37	132	154	H	3
916.026	87.16	Pk	28.9	-26.2	-	89.86	114	-24.14	-	-	57	149	V	3
916.026	87.16	Pk	28.9	-26.2	-43.74	46.12	-	-	94	-47.88	57	149	V	3

Pk - Peak detector
Av - Average detection (Duty cycle corrected based on manufacturer's declared of 0.65% as worst-case).

Notes: 1 - Fundamental_908.4 MHz
2 - Fundamental_908.42 MHz
3 - Fundamental_916 MHz

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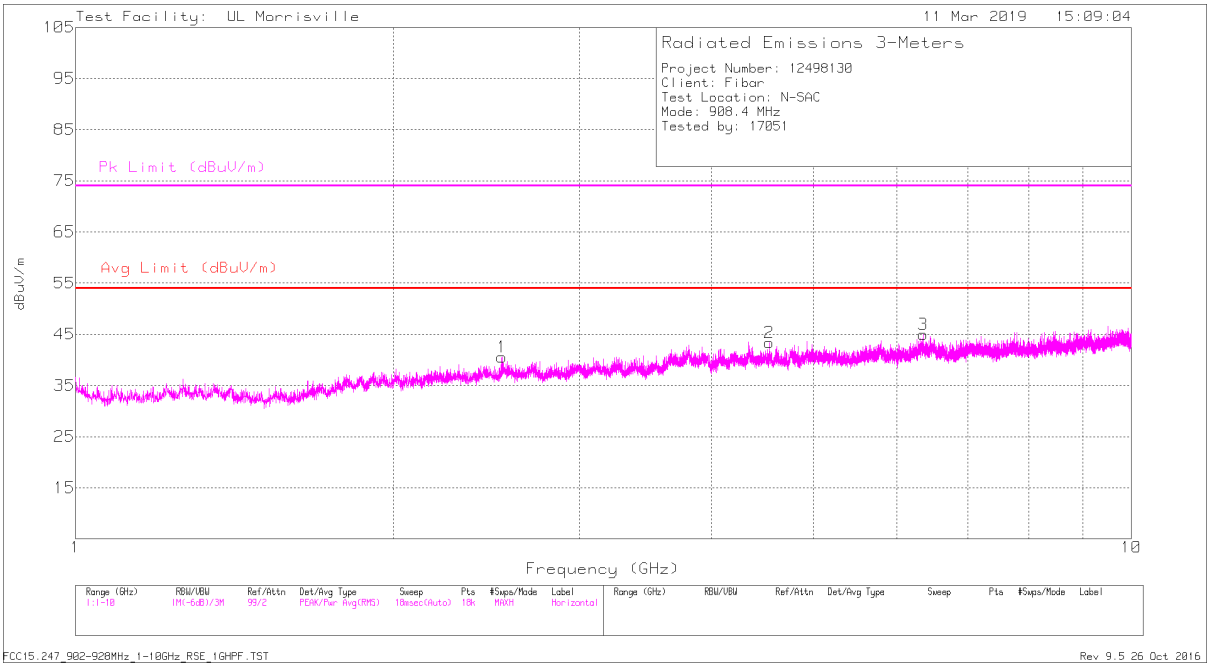
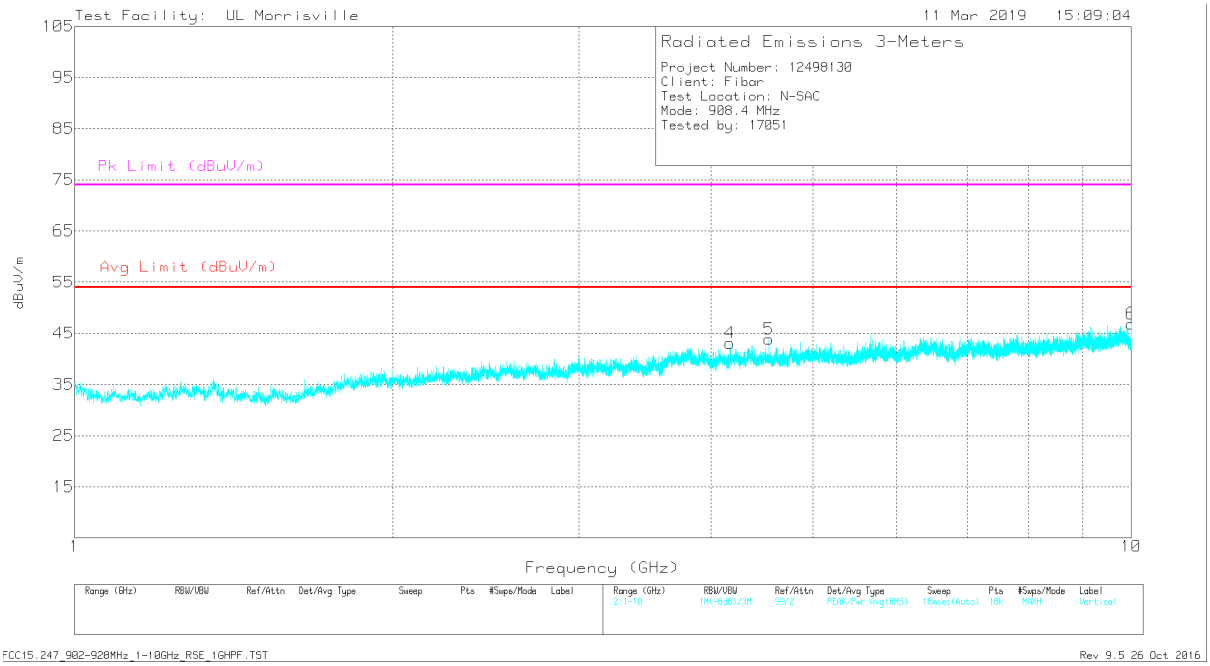
8.3.2. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1 GHz

908.4 MHz SPURIOUS EMISSIONS 1 TO 10 GHz (HORIZONTAL)



908.4 MHz SPURIOUS EMISSIONS 1 TO 10 GHz (VERTICAL)



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908.4 MHz SPURIOUS EMISSIONS 1 TO 10 GHz TABULAR DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.534	42.16	Pk	32.4	-34.4	.4	40.56	54	-13.44	74	-33.44	0-360	199	H
2	4.542	45.37	Pk	34	-33.2	.4	46.57	-	-	74	-27.43	126	102	H
	4.542	38.39	Av	34	-33.2	.4	39.59	54	-14.41	-	-	126	102	H
3	6.349	40.79	Pk	35.5	-31.6	.3	44.99	54	-9.01	74	-29.01	0-360	102	H
4	4.172	41.97	Pk	33.5	-32.9	.5	43.07	54	-10.93	74	-30.93	0-360	102	V
5	4.542	45.81	Pk	34	-33.2	.4	47.01	-	-	74	-26.99	10	226	V
	4.542	38.44	Av	34	-33.2	.4	39.64	54	-14.36	-	-	10	226	V
6	9.992	39.8	Pk	37	-28	.4	49.2	-	-	74	-24.8	41	100	V
	9.992	30.55	Av	37	-28	.4	39.95	54	-14.05	-	-	41	100	V

Pk - Peak detector
Av - Average detection

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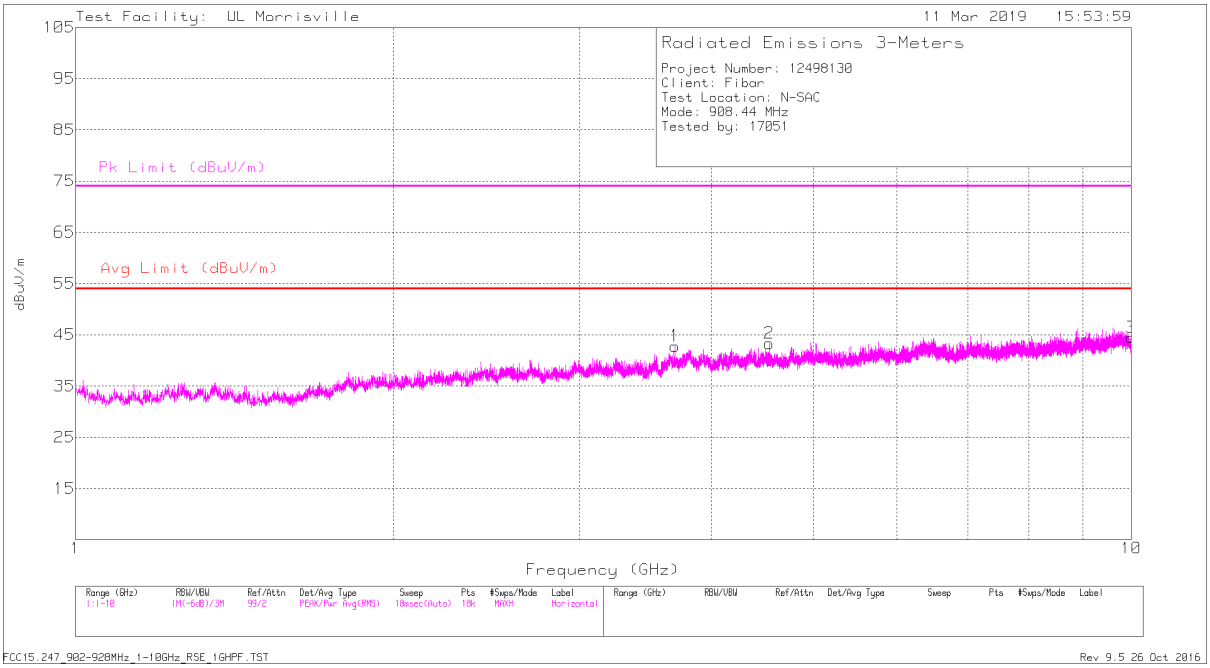
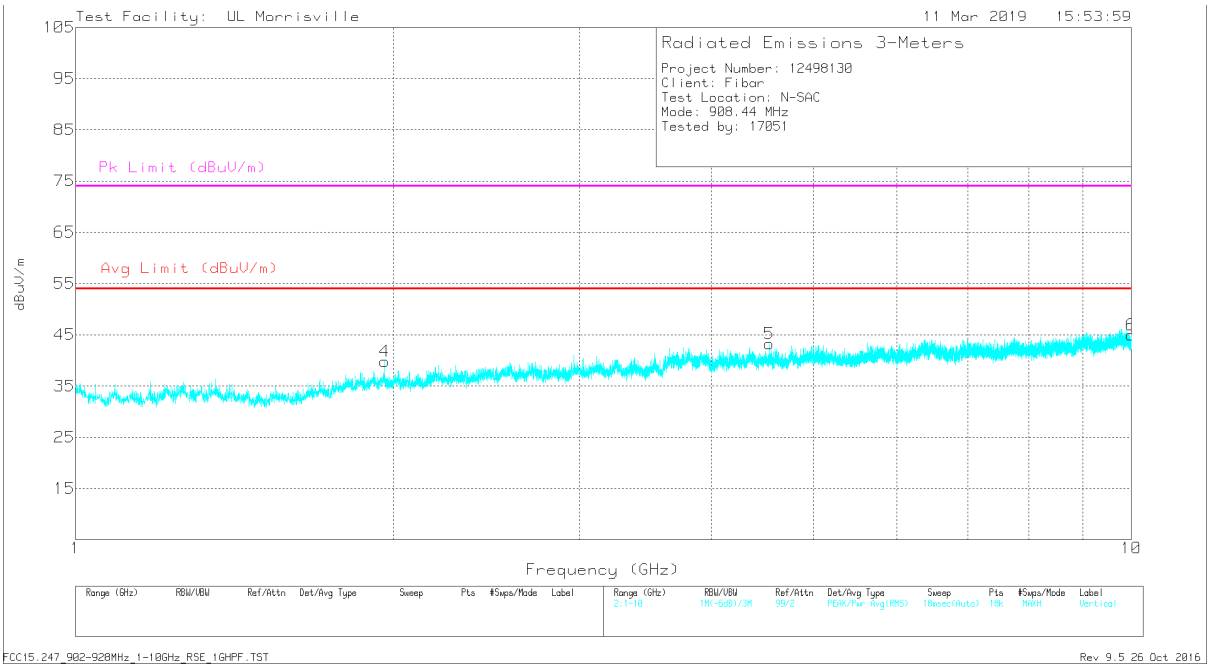
908.44 MHz SPURIOUS EMISSIONS 1 TO 10 GHz (HORIZONTAL)



908.44 MHz SPURIOUS EMISSIONS 1 TO 10 GHz (VERTICAL)



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908.44 MHz SPURIOUS EMISSIONS 1 TO 10 GHz TABULAR DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.696	42.31	Pk	33.2	-33.2	.5	42.81	54	-11.19	74	-31.19	0-360	299	H
2	4.542	46.36	Pk	34	-33.2	.4	47.56	-	-	74	-26.44	123	100	H
	4.542	39.12	Av	34	-33.2	.4	40.32	54	-13.68	-	-	123	100	H
3	9.993	39.61	Pk	37	-28	.4	49.01	-	-	74	-24.99	40	101	H
	9.993	30.66	Av	37	-28	.4	40.06	54	-13.94	-	-	40	101	H
4	1.961	43.57	Pk	31.2	-35.4	.4	39.77	54	-14.23	74	-34.23	0-360	301	V
5	4.542	45.55	Pk	34	-33.2	.4	46.75	-	-	74	-27.25	8	225	V
	4.542	38.8	Av	34	-33.2	.4	40	54	-14	-	-	8	225	V
6	9.993	40.11	Pk	37	-28	.4	49.51	-	-	74	-24.49	38	101	V
	9.993	30.9	Av	37	-28	.4	40.3	54	-13.7	-	-	38	101	V

Pk - Peak detector
Av - Average detection

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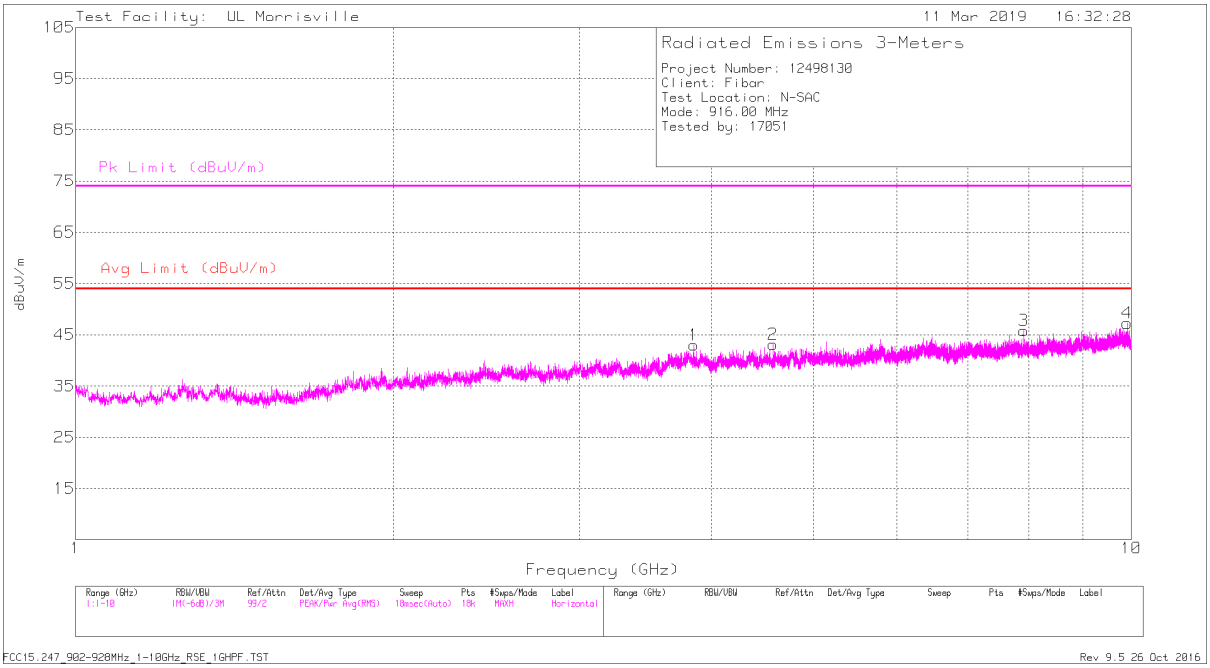
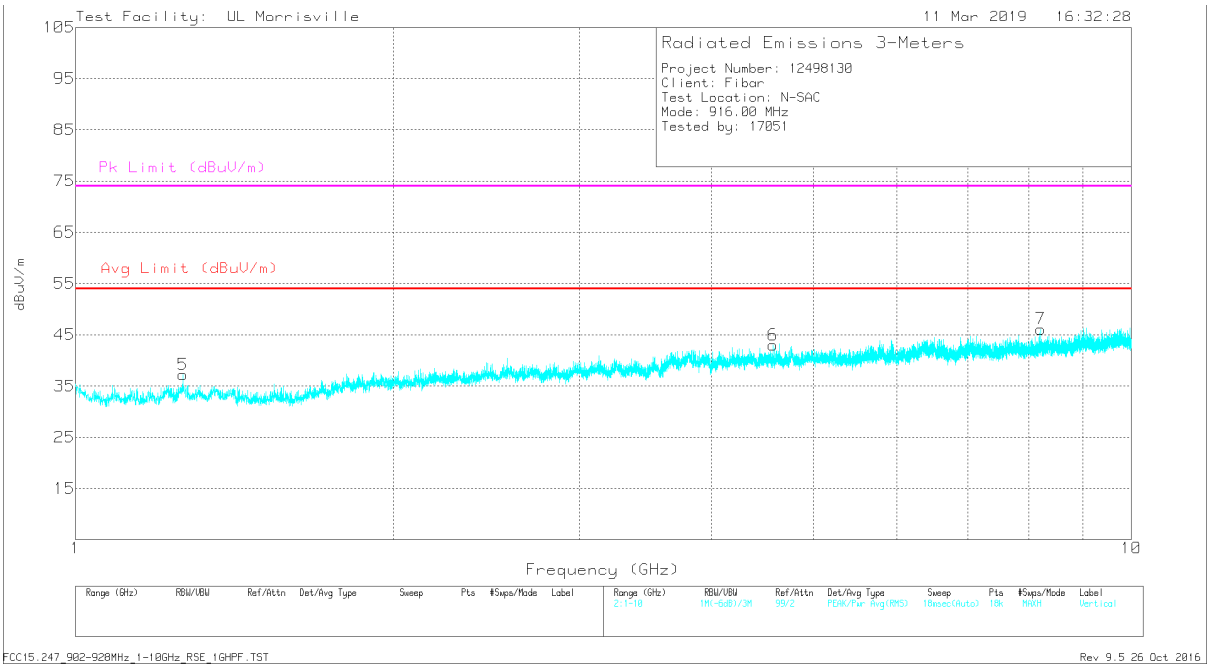
916 MHz SPURIOUS EMISSIONS 1 TO 10 GHz (HORIZONTAL)



916 MHz SPURIOUS EMISSIONS 1 TO 10 GHz (VERTICAL)



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916 MHz SPURIOUS EMISSIONS 1 TO 10 GHz TABULAR DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.849	42.37	Pk	33.5	-33.3	.4	42.97	54	-11.03	74	-31.03	0-360	101	H
2	4.58	45.78	Pk	34.1	-33.3	.3	46.88	-	-	74	-27.12	124	100	H
	4.58	38.79	Av	34.1	-33.3	.3	39.89	54	-14.11	-	-	124	100	H
3	7.906	39.23	Pk	35.8	-29.5	.3	45.83	54	-8.17	74	-28.17	0-360	199	H
4	9.91	37.3	Pk	37.1	-28.2	.4	46.6	-	-	74	-27.4	226	300	H
	9.91	24.63	Av	37.1	-28.2	.4	33.93	54	-20.07	-	-	226	300	H
5	1.263	44.54	Pk	29.1	-36.9	.5	37.24	54	-16.76	74	-36.76	0-360	201	V
6	4.58	44.63	Pk	34.1	-33.3	.3	45.73	-	-	74	-28.27	6	226	V
	4.58	36.76	Av	34.1	-33.3	.3	37.86	54	-16.14	-	-	6	226	V
7	8.205	38.73	Pk	35.8	-29	.3	45.83	-	-	74	-28.17	57	300	V
	8.205	25.56	Av	35.8	-29	.3	32.66	54	-21.34	-	-	57	300	V

Pk - Peak detector
Av - Average detection

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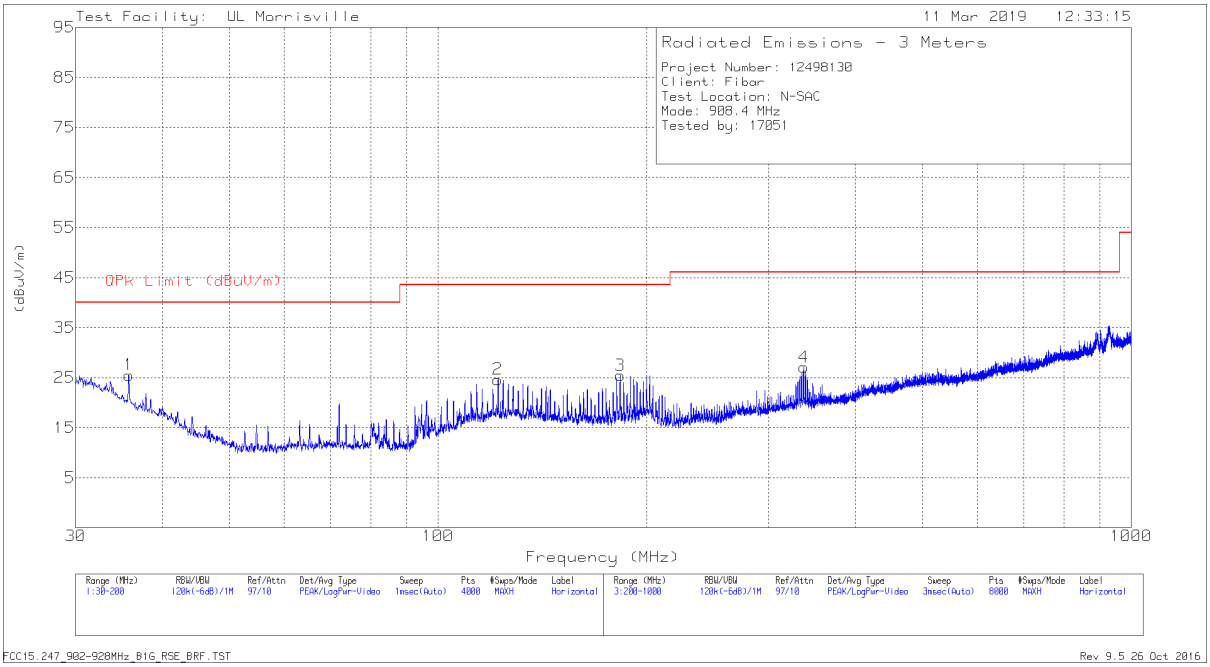
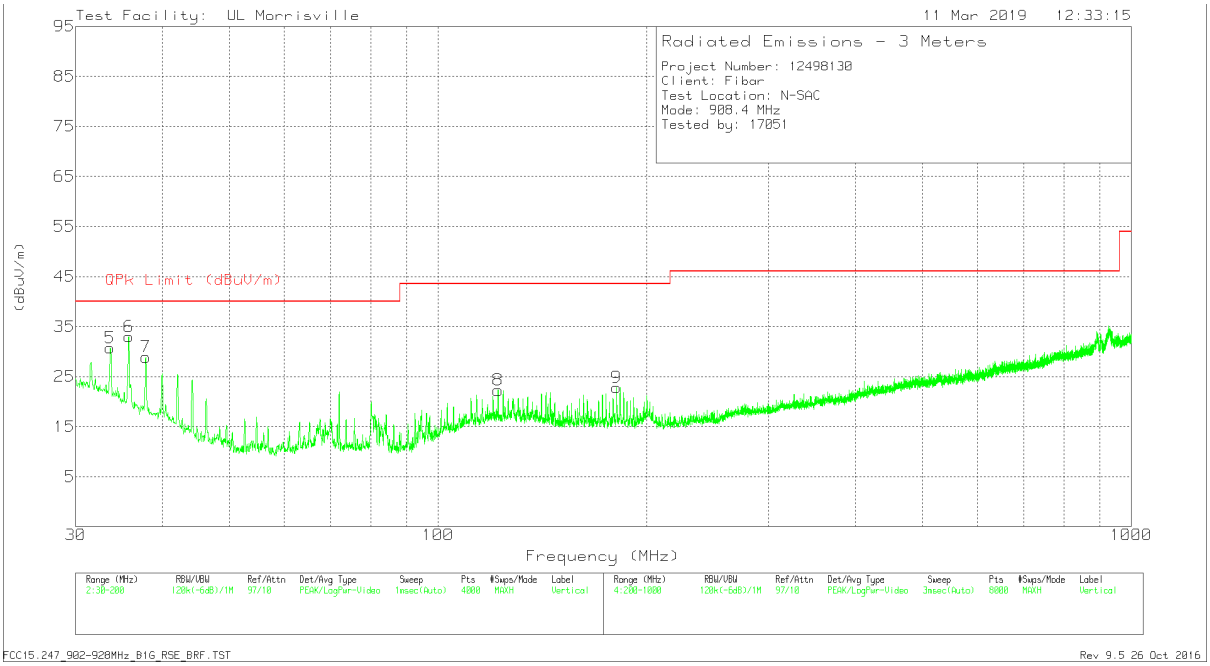
8.3.3. HARMONICS AND SPURIOUS EMISSIONS BELOW 1 GHz

908.4 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



908.4 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



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908.4 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz TABULAR DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	BRF (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	35.7815	33.42	Pk	23.7	-31.7	.1	25.52	40	-14.48	0-360	299	H
2	122.0363	34.94	Pk	20.1	-30.7	.3	24.64	43.52	-18.88	0-360	199	H
3	183.0396	37.72	Pk	17.6	-30.2	.3	25.42	43.52	-18.1	0-360	101	H
4	336.7178	35.29	Pk	20.7	-29.2	.3	27.09	46.02	-18.93	0-360	102	H
5	33.6559	37.14	Pk	25.2	-31.7	.1	30.74	40	-9.26	0-360	101	V
6	35.7705	40.56	Qp	23.7	-31.7	.1	32.66	40	-7.34	32	100	V
7	37.8645	38.42	Pk	22.1	-31.7	.1	28.92	40	-11.08	0-360	101	V
8	122.0576	32.57	Pk	20.1	-30.7	.3	22.27	43.52	-21.25	0-360	101	V
9	180.9991	35.15	Pk	17.6	-30.2	.3	22.85	43.52	-20.67	0-360	101	V

Pk - Peak detector
Qp - Quasi-Peak detector

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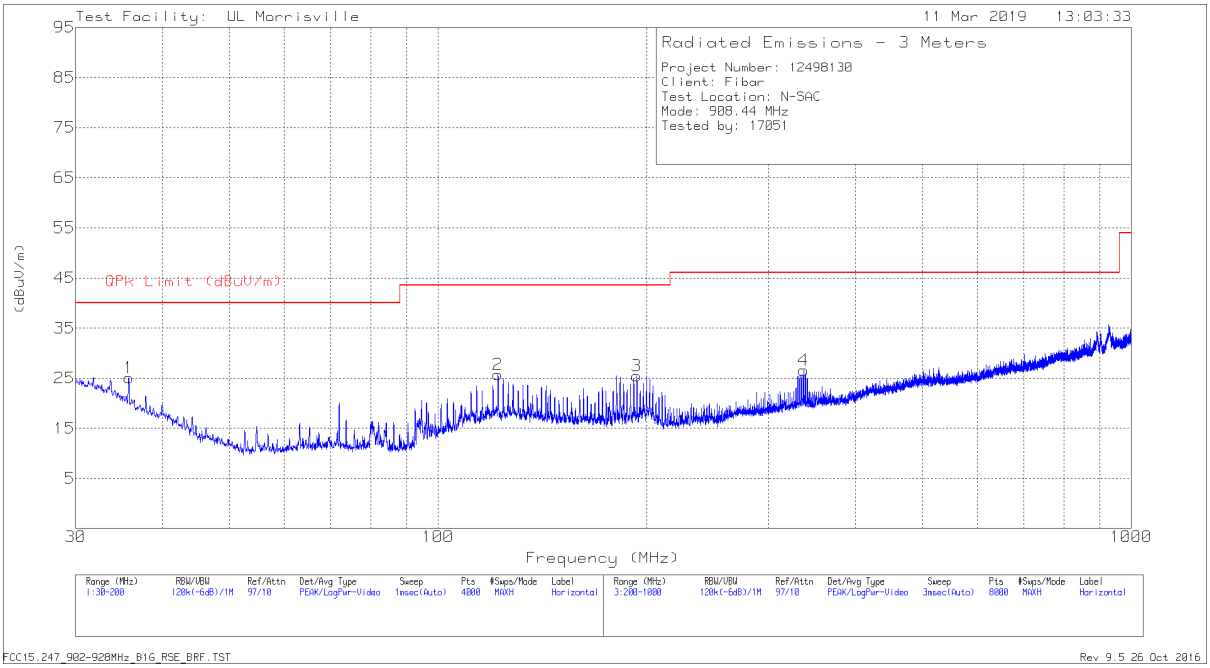
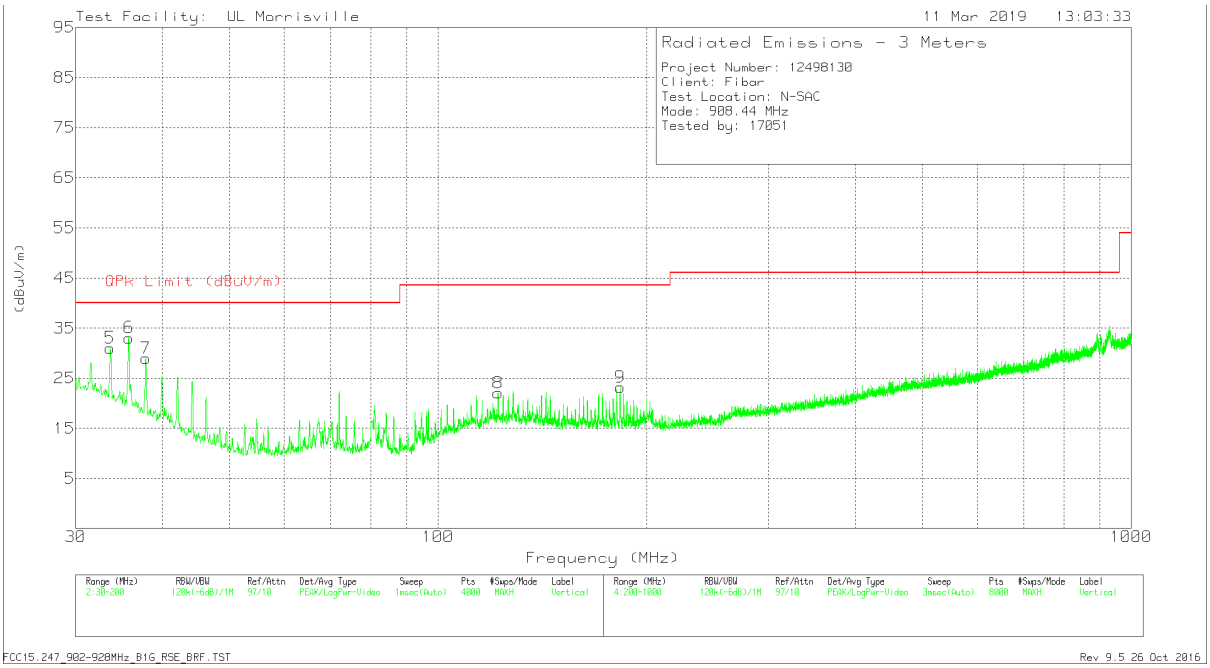
908.44 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



908.44 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



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908.44 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz TABULAR DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	BRF (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	35.7815	32.94	Pk	23.7	-31.7	.1	25.04	40	-14.96	0-360	399	H
2	122.0363	35.97	Pk	20.1	-30.7	.3	25.67	43.52	-17.85	0-360	199	H
3	193.5398	37.07	Pk	18.2	-30.1	.3	25.47	43.52	-18.05	0-360	100	H
4	336.6178	34.76	Pk	20.7	-29.2	.3	26.56	46.02	-19.46	0-360	102	H
5	33.6559	37.42	Pk	25.2	-31.7	.1	31.02	40	-8.98	0-360	102	V
6	35.772	40.42	Qp	23.7	-31.7	.1	32.52	40	-7.48	46	100	V
7	37.8645	38.49	Pk	22.1	-31.7	.1	28.99	40	-11.01	0-360	102	V
8	122.0788	32.38	Pk	20.1	-30.7	.3	22.08	43.52	-21.44	0-360	102	V
9	183.0821	35.48	Pk	17.6	-30.2	.3	23.18	43.52	-20.34	0-360	102	V

Pk - Peak detector
Qp - Quasi-Peak detector

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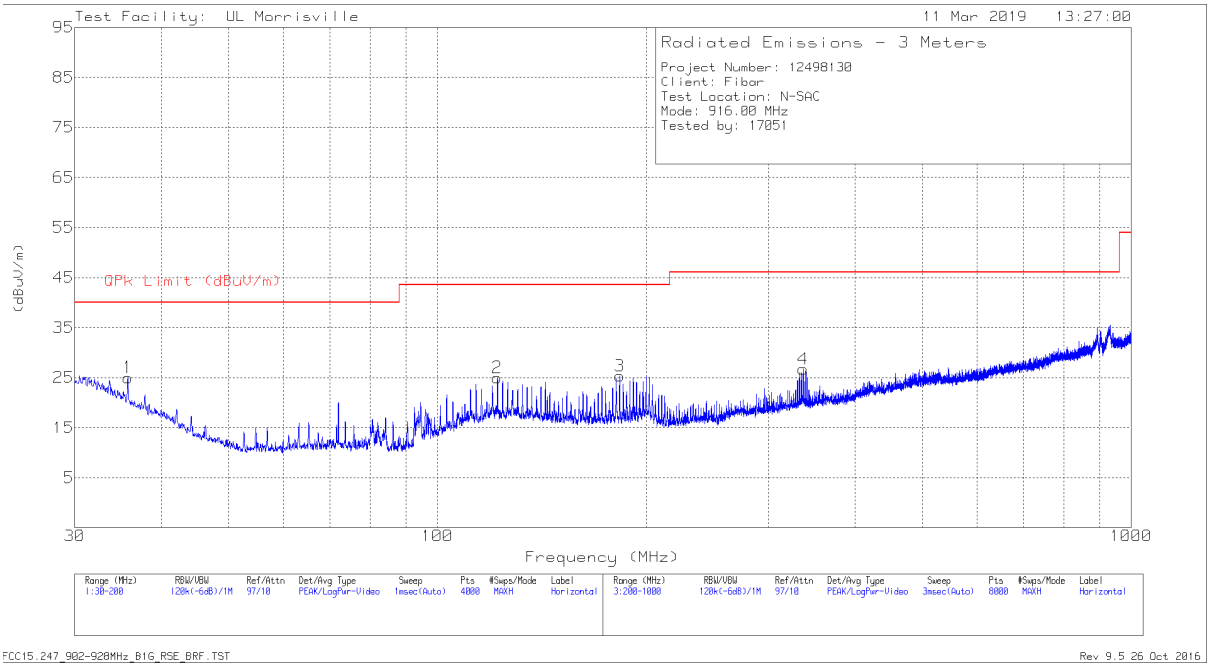
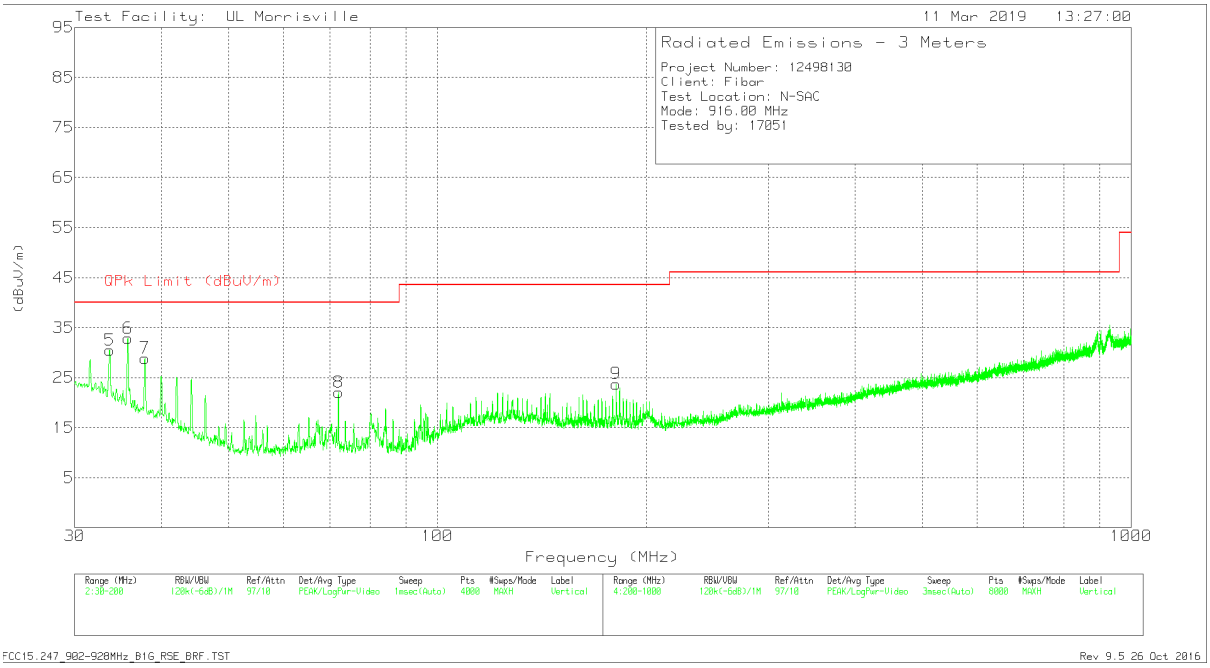
916 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



916 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



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916 MHz SPURIOUS EMISSIONS 30 TO 1000 MHz TABULAR DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	BRF (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	35.7815	32.91	Pk	23.7	-31.7	.1	25.01	40	-14.99	0-360	399	H
2	122.0363	35.29	Pk	20.1	-30.7	.3	24.99	43.52	-18.53	0-360	199	H
3	183.0396	37.66	Pk	17.6	-30.2	.3	25.36	43.52	-18.16	0-360	98	H
4	336.6178	34.89	Pk	20.7	-29.2	.3	26.69	46.02	-19.33	0-360	102	H
5	33.6772	36.9	Pk	25.2	-31.7	.1	30.5	40	-9.5	0-360	101	V
6	35.7744	40.52	Qp	23.7	-31.7	.1	32.62	40	-7.38	34	100	V
7	37.8645	38.41	Pk	22.1	-31.7	.1	28.91	40	-11.09	0-360	101	V
8	72.0009	38.75	Pk	14.3	-31.2	.2	22.05	40	-17.95	0-360	101	V
9	180.9566	36.06	Pk	17.6	-30.2	.3	23.76	43.52	-19.76	0-360	101	V

Pk - Peak detector
Qp - Quasi-Peak detector

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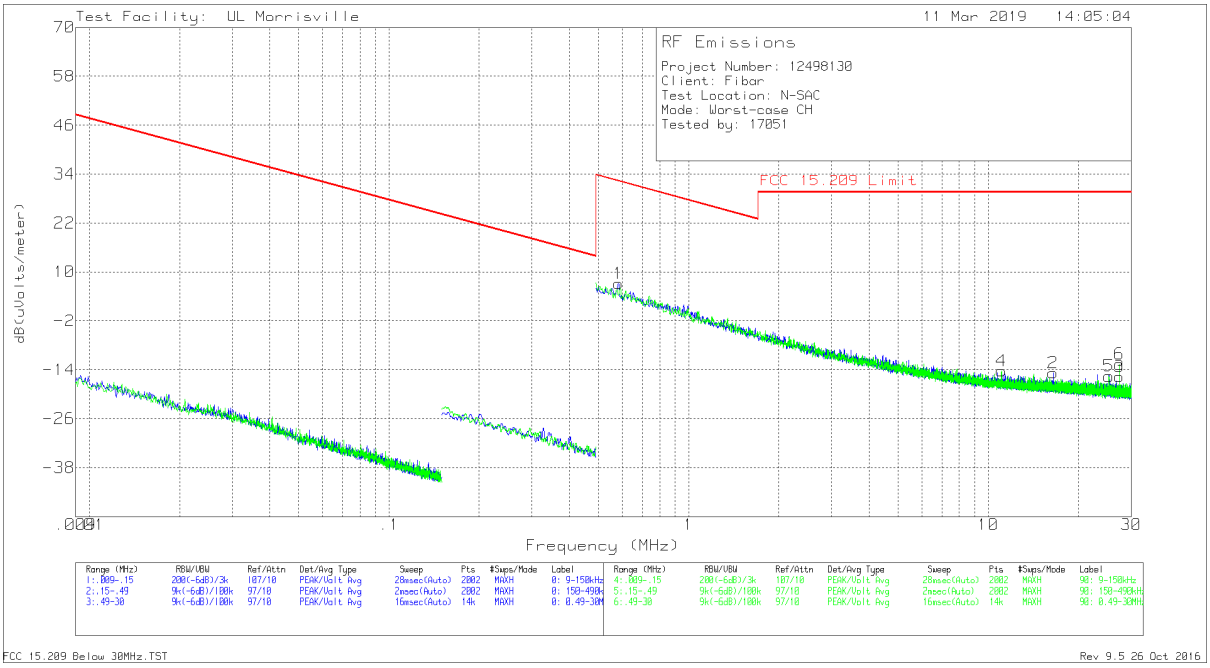
8.3.4. WORST CASE EMISSIONS BELOW 30 MHz

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).



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	FCC 15.209 AV Limit	FCC 15.209 PK Limit	Worst-Case Margin (dB)	Azimuth (Degs)
1	.58275	36.27	Pk	10.8	.1	-40	7.17	32.29	-	-	-25.12	0-360
2	16.44124	14.28	Pk	10.3	.7	-40	-14.72	29.54	-	-	-44.26	0-360
3	27.35751	14.96	Pk	8.5	.9	-40	-15.64	29.54	-	-	-45.18	0-360
4	11.06162	14.59	Pk	10.5	.6	-40	-14.31	29.54	-	-	-43.85	0-360
5	25.25373	14.52	Pk	9	.9	-40	-15.58	29.54	-	-	-45.12	0-360
6	27.35857	17.95	Pk	8.5	.9	-40	-12.65	29.54	-	-	-42.19	0-360

Pk - Peak detector

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

Line conducted data is recorded for both lines.

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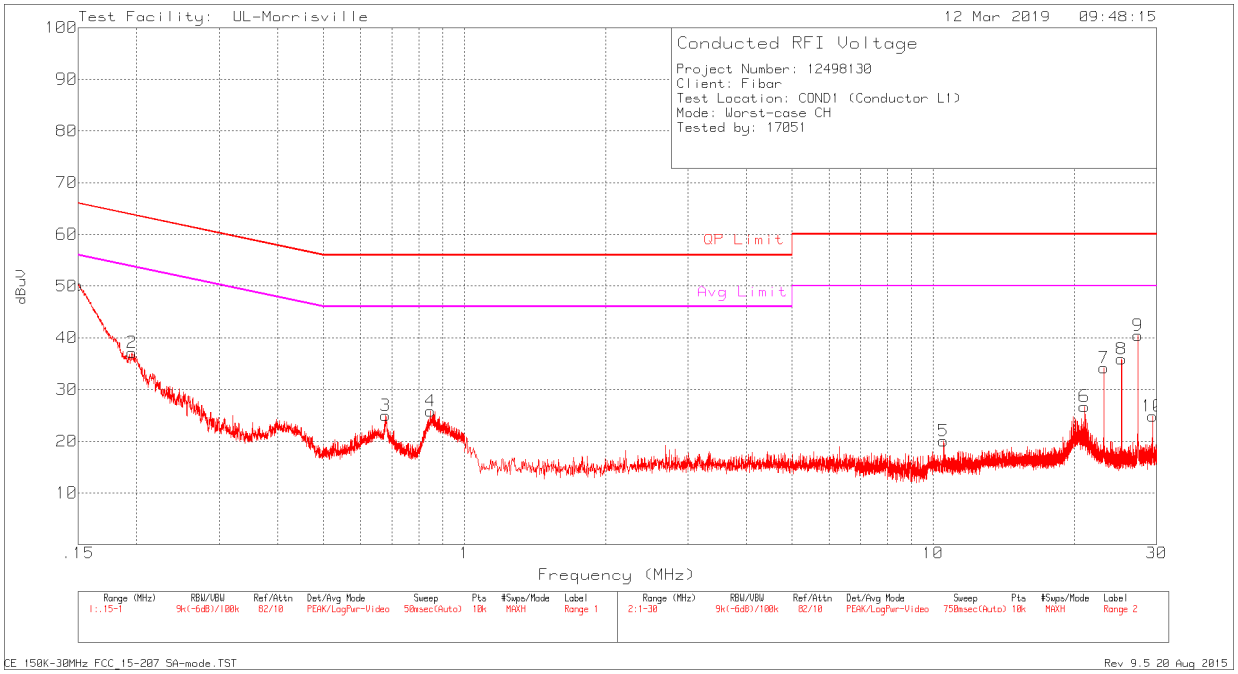
LINE 1 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
1	.15	31.68	Qp	.2	10	41.88	66	-24.12	-	-
	.15	6.04	Ca	.2	10	16.24	-	-	56	-39.76
2	.19522	26.92	Pk	.2	10	37.12	63.81	-26.69	53.81	-16.69
3	.67896	14.94	Pk	0	10	24.94	56	-31.06	46	-21.06
4	.84726	15.81	Pk	0	10	25.81	56	-30.19	46	-20.19
5	10.51954	9.67	Pk	.1	10.3	20.07	60	-39.93	50	-29.93
6	21.03565	15.93	Pk	.2	10.6	26.73	60	-33.27	50	-23.27
7	23.14177	23.39	Pk	.2	10.6	34.19	60	-25.81	50	-15.81
8	25.24644	25.13	Pk	.2	10.6	35.93	60	-24.07	50	-14.07
9	27.34822	29.57	Pk	.2	10.7	40.47	60	-19.53	50	-9.53
10	29.45144	13.87	Pk	.3	10.7	24.87	60	-35.13	50	-25.13

Pk - Peak detector
Qp - Quasi-Peak detector
Ca - CISPR average detection

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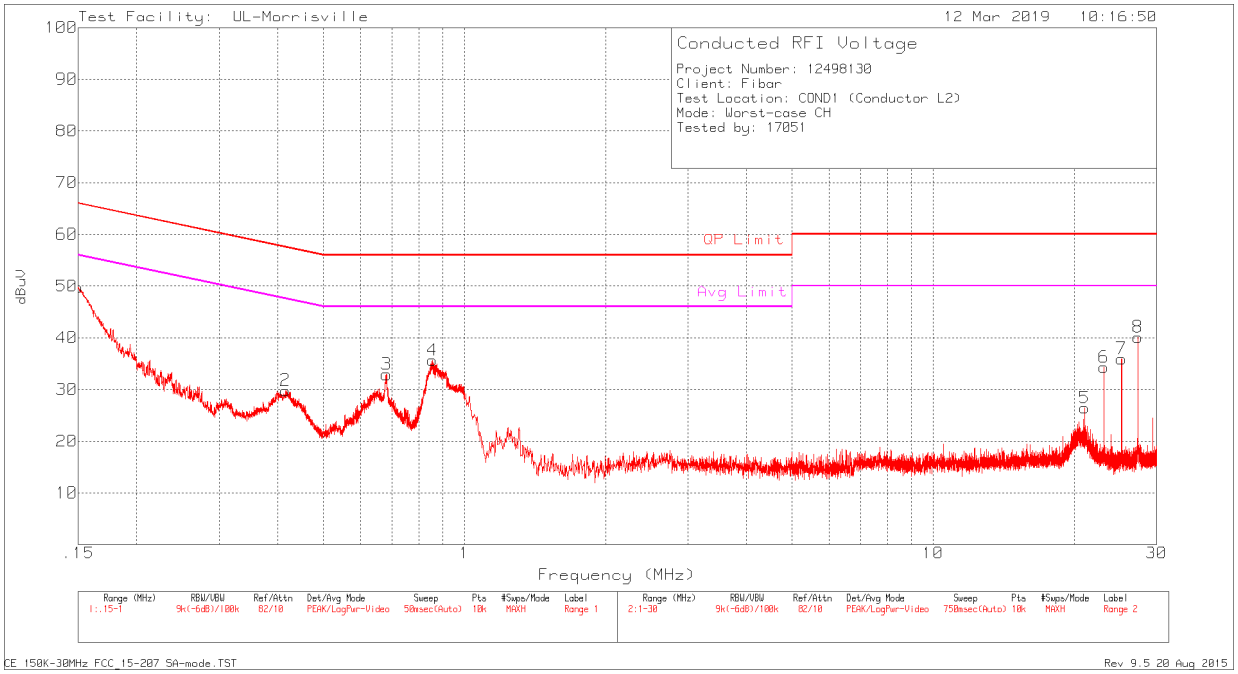
LINE 2 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
1	.15	31.23	Qp	.2	10	41.43	66	-24.57	-	-
	.15	8.21	Ca	.2	10	18.41	-	-	56	-37.59
2	.41503	19.72	Pk	.1	10	29.82	57.55	-27.73	47.55	-17.73
3	.68219	22.91	Pk	0	10	32.91	56	-23.09	46	-13.09
4	.85414	25.67	Pk	0	10	35.67	56	-20.33	46	-10.33
5	21.04145	15.64	Pk	.2	10.6	26.44	60	-33.56	50	-23.56
6	23.14467	23.53	Pk	.2	10.6	34.33	60	-25.67	50	-15.67
7	25.25079	25.16	Pk	.2	10.6	35.96	60	-24.04	50	-14.04
8	27.35401	29.23	Pk	.2	10.7	40.13	60	-19.87	50	-9.87

Pk - Peak detector
Qp - Quasi-Peak detector
Ca - CISPR average detection

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