FCC 47 CFR PART 15 SUBPART C
INDUSTRY (ISED) CANADA RSS-247 ISSUE 1

BLUETOOTH LOW ENERGY CERTIFICATION TEST REPORT

FOR

WIRELESS CAPABLE SECURITY CAMERA

HVIN: R12
PMN: AXIS M1065-LW

FCC ID: PNB-AXISM1065-LW
IC: 3919A-M1065LW

REPORT NUMBER: 11191821-E4

ISSUE DATE: 2016-09-21

Prepared for
AXIS COMMUNICATIONS AB
EMDALAVAGEN 14
LUND
SWEDEN, SE-223 69

Prepared by
UL LLC
12 LABORATORY DR.
RESEARCH TRIANGLE PARK, NC 27709 USA
TEL: (919) 549-1400

NVLAP Lab code: 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2016-07-15	Initial Issue	Brian Kiewra
2	2016-07-21	Added model numbers and more EUT descriptive detail.	Brian Kiewra
3	2016-07-26	Added Line Conducted diagram.	Brian Kiewra
4	2016-08-11	Removed model variants, added HVIN and PMN. Made editorial changes to references throughout.	Brian Kiewra
5	2016-09-08	Lowered BLE power data.	Brian Kiewra
6	2016-09-19	Added clarifying information regarding lowered BLE power data in V5. Included information on samples used for retesting in Section 5.6.	Jeff Moser
7	2016-09-21	Added clarifying information on power setting information and samples used.	Jeff Moser

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Axis Communications AB
Emdalavagen 14
Lund, Sweden, SE-223 69

EUT DESCRIPTION: Wireless Capable Security Camera

HVIN: R12
PMN: AXIS M1065-LW

SERIAL NUMBER: Radiated: ACCC8E23D3A6
Conducted: ACCC8E23D4CF/ACCC8E23D3B2, ACCC8E23D378 (power only).

DATE TESTED: 2016-04-25 to 2016-06-20, 2016-07-13, 2016-08-24

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY (ISED) CANADA RSS-247 Issue 1	Pass
INDUSTRY (ISED) CANADA RSS-GEN Issue 4	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL 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, any agency of the Federal Government, or any agency of any government.

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Approved & Released
For UL LLC By:

Jeffrey Moser
EMC Program Manager
UL – Consumer Technology Division

Prepared By:

Brian Kiewra
WISE Engineer
UL – Consumer Technology Division

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 4, RSS-247 Issue 1.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Suite B, Perimeter Park Drive, Morrisville, NC 27560.

12 Laboratory Dr., RTP, NC 27709
☐ Chamber A
☐ Chamber C

2800 Suite B Perimeter Park Dr., Morrisville, NC 27560
☒ Chamber NORTH
☒ Chamber SOUTH

The onsite chambers are covered under ISED Canada company address code 2180C with site numbers 2180C -1 through 2180C-4, respectively.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at http://www.nist.gov/nvlap/.

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.

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4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Total RF power, conducted	± 0.45 dB
RF power density, conducted	± 1.5 dB
Spurious emissions, conducted	± 2.94 dB
All emissions, radiated up to 40 GHz	± 5.36 dB
Temperature	± 0.07°C
Humidity	± 2.26% RH
DC and low frequency voltages	± 1.27%
Conducted Emissions (0.150-30MHz)	± 2.37dB

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 network surveillance camera that contains an 802.11 a/b/g/n and Bluetooth transceivers, manufactured by AXIS Communications AB, Lund, SWEDEN.

The EUT is provided with an Axis PS-U05 rev. 1 power supply.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	5.17	3.29

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal inverted-f type antenna. The peak antenna gain is +1.3 dBi for 2.4 GHz band.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 6.15_beta52.
Special test firmware used for EMC was 15+snapshot_20160511 (this firmware allows for simultaneously operation for Bluetooth and WLAN in order to reduce test set-ups).

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5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Manufacturer stated that EUT is only intended to operate installed in mounting bracket which is one fixed orientation; therefore, all final radiated testing was performed in stated position.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Lenovo	T440	RTP1014PC015NUR	NA

I/O CABLES

I/O Cable List					
Cable No	**Port**	**# of Identical ports**	**Connector Type**	**Cable Length (m)**	**Remarks**
1	Antenna Port	1	EUT	0.1m	NA
2	AC Mains	1	AC	>1m	NA
3	Ethernet	1	RJ45	>1m	CAT5E

TEST SETUP

Test software exercised the radio card.

SAMPLES USED

Radiated: ACCC8E23D3A6
Conducted: ACCC8E23D4CF/ACCC8E23D3B2, ACCC8E23D378 (power only).

Note – Re-testing was required of the transmitter output power with reduced EUT power settings. All other tests were performed at the higher power settings (considered worst case).

Test	Power Level	Comment
6 dB/99% OBW	Maximum allowed	This was the default setting provided.
Output Power	Reduced	Reduced power setting.
Power Spectral Density	Maximum allowed	This was the default setting provided.
Conducted Emissions	Maximum allowed	This was the default setting provided.
Radiated Emissions	Maximum allowed	This was the default setting provided.
Line Conducted Emissions	Maximum allowed	This was the default setting provided.

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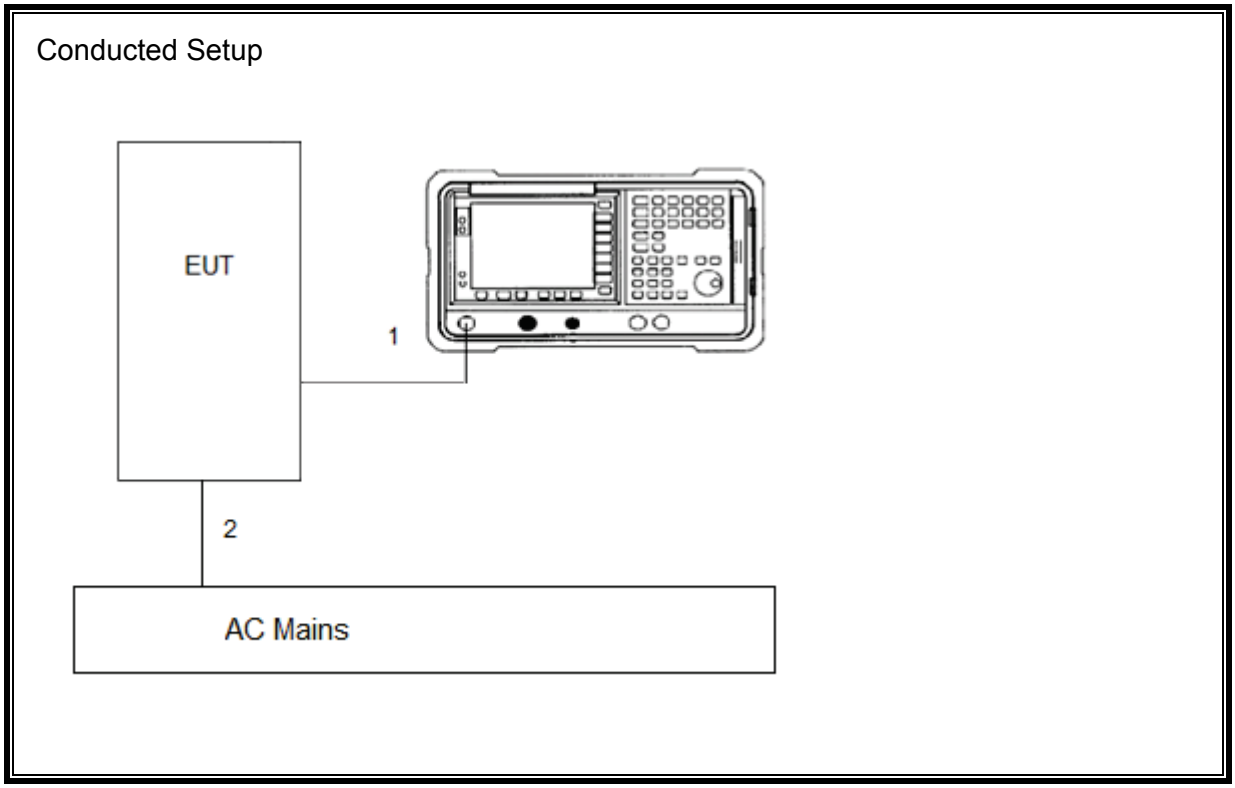
SETUP DIAGRAM FOR TESTS



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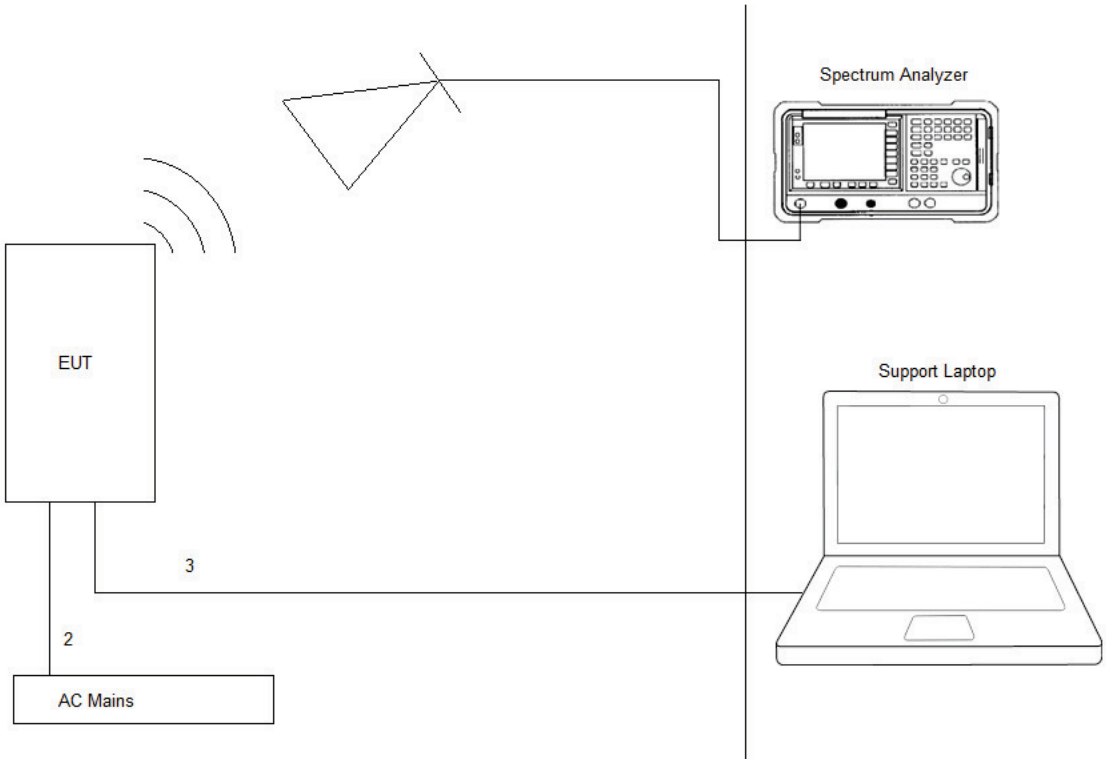
Radiated Setup



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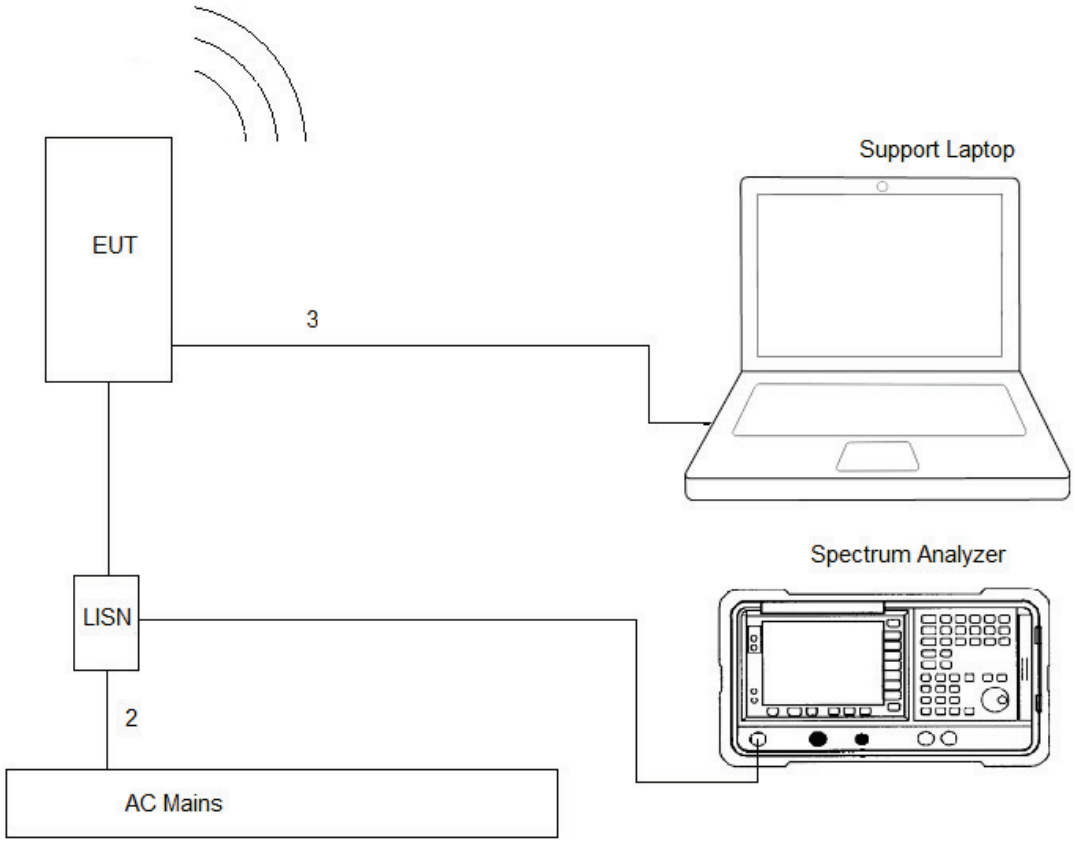
Line Conducted Setup



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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)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2016-06-07	2017-06-30
	18-40 GHz				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2015-08-27	2016-08-31
	Gain-Loss Chains				
N-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2015-06-04	2016-06-30
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2015-09-29	2016-09-30
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2016-04-27	2017-04-30
	Receiver & Software				
SA0026 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2016-02-24	2017-02-28
SA0027	Spectrum Analyzer	Agilent	N9030A	2016-02-08	2017-02-08
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
HI0079	Temp/Humid/Pressure Meter	Springfield Precision	PreciseTemp	2015-07-01	2016-07-31

Note – All testing in this chamber was performed before 2016-06-30.

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

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2016-03-07	2017-03-31
	Gain-Loss Chains				
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2015-08-22	2016-08-31
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2016-03-17	2017-03-31
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
HI0050	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2015-07-01	2016-07-31

Note – All testing in this chamber was performed before 2016-07-31.

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Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 1				
SA0019	Spectrum Analyzer	Agilent Technologies	E4446A	2015-09-02	2016-09-30
PWM004	RF Power Meter	Keysight Technologies	N1911A	2015-06-08, 2016-06-22	2016-06-30, 2017-06-22
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2015-06-05, 2016-06-22	2016-06-30, 2017-06-22
HI0079	Temp/Humid/Pressure Meter	Springfield	PreciseTemp	2015-07-01	2016-07-31
HI0078	Temp/Humid/Pressure Meter	Springfield	PreciseTemp	2016-06-13	2017-06-13
MM0167	True RMS Multimeter	Agilent	U1232A	2015-08-17	2016-08-31
	Conducted Room 2				
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2016-03-22	2017-03-31
PWM003	RF Power Meter	Keysight Technologies	N1911A	2015-06-08, 2016-06-21	2016-06-30, 2017-06-21
PWS003	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2015-06-05, 2016-06-21	2016-06-30, 2017-06-21
HI0080	Temp/Humid/Pressure Meter	Springfield	PreciseTemp	2015-07-01	2016-07-31
HI0078	Temp/Humid/Pressure Meter	Springfield	PreciseTemp	2016-06-13	2017-06-13
MM0168	True RMS Multimeter	Agilent	U1232A	2015-08-17	2016-08-31

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL077	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3476-240	2016-06-15	2017-06-30
HI0079	Temp/Humid/Pressure Meter	Springfield Precision	PreciseTemp	2015-07-01	2016-07-31
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2015-08-24	2016-08-31
LISN008	LISN, 50-ohm/50-uH, 2-conductor, 25A (For support gear only.)	Solar Electronics	8012-50-R-24-BNC	2015-09-03	2016-09-30
MM0167	Multi-meter	Agilent	U1232A	2015-08-17	2016-08-31
PRE0101521 (75141)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2015-08-26	2016-08-31
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2016-06-09	2017-06-30
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Miscellaneous (if needed)				
ATA220	ISN for Unshielded Balanced Pairs	Teseq, Inc.	ISN T8	2015-08-24	2016-08-31
TN0129	ISN for Shielded Balanced Pairs	Teseq, Inc.	ISN ST08	2015-08-24	2016-08-31
TN0145	ISN for Cat-6 Unshielded Balanced Pairs	Teseq, Inc.	ISN T8-Cat6	2015-08-25	2016-08-31
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2016-06-04	2017-06-30

Note – All testing in this area was performed before 2016-07-31.

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7. MEASUREMENT METHODS

Duty Cycle: KDB 558074 D01 v03r05 Section 6.0

6 dB BW: KDB 558074 D01 v03r05, Section 8.1.

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

Output Power: KDB 558074 D01 v03r05, Section 9.1.2

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.1.

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

Line Conducted Emissions: ANSI C63.10:2013 Sections 6.2

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
BLE	0.391	0.624	0.626	62.59%	2.04	2.560

Test Performed: Jeff Cabrera
Test Date: 2016-05-03

Note – This test was performed at the maximum allowed power setting.

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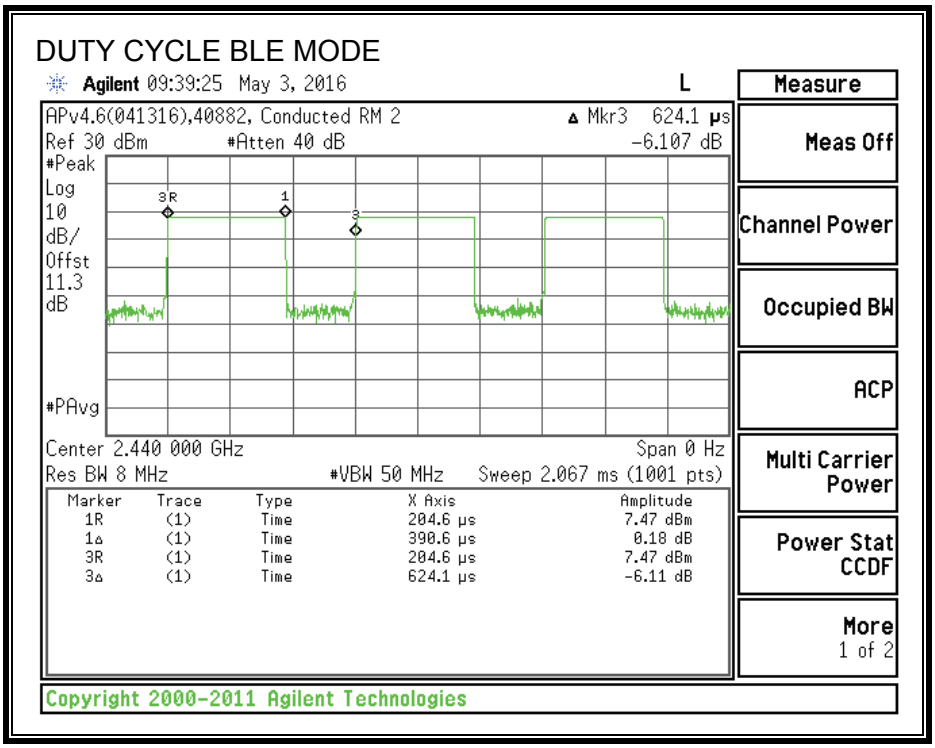
DUTY CYCLE PLOTS



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8.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 5.2 (1)

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7020	0.5
Middle	2440	0.7120	0.5
High	2480	0.7020	0.5

Test Performed: Jeff Cabrera
Test Date: 2016-05-03

Note – This test was performed at the maximum allowed power setting.

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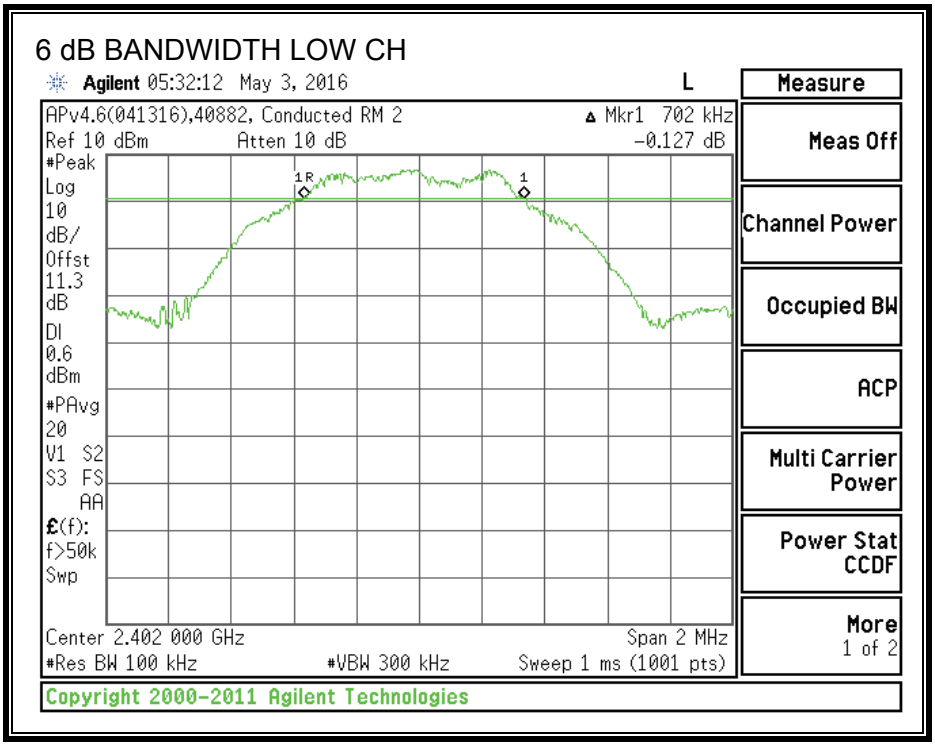
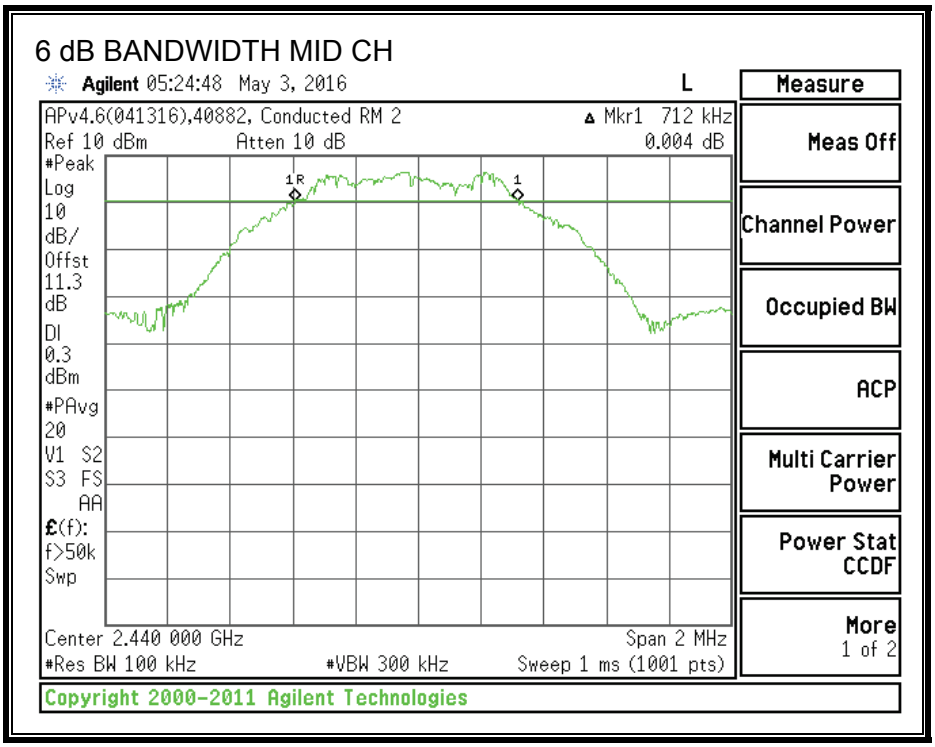
6 dB BANDWIDTH





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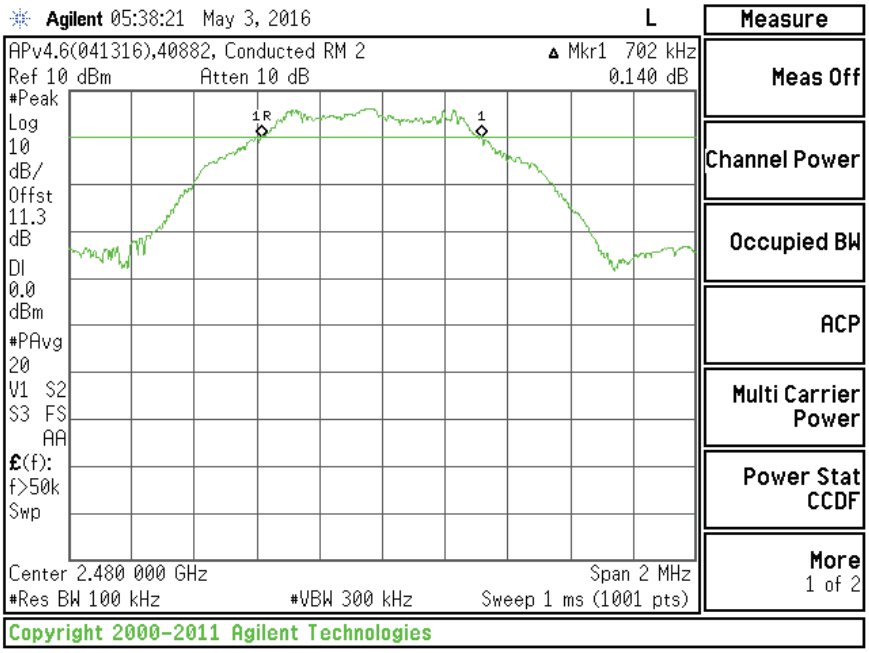
6 dB BANDWIDTH HIGH CH



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8.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only. Testing per RSS-Gen Clause 6.6.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 5% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0516
Middle	2440	1.0551
High	2480	1.0528

Test Performed: Jeff Cabrera
Test Date: 2016-05-03

Note – This test was performed at the maximum allowed power setting.

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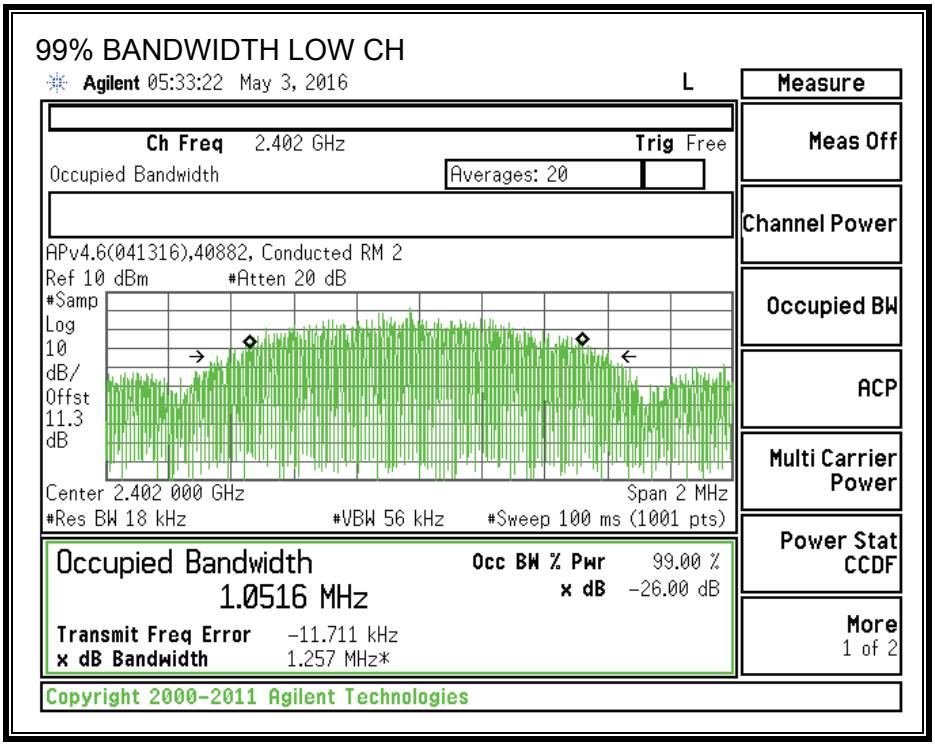
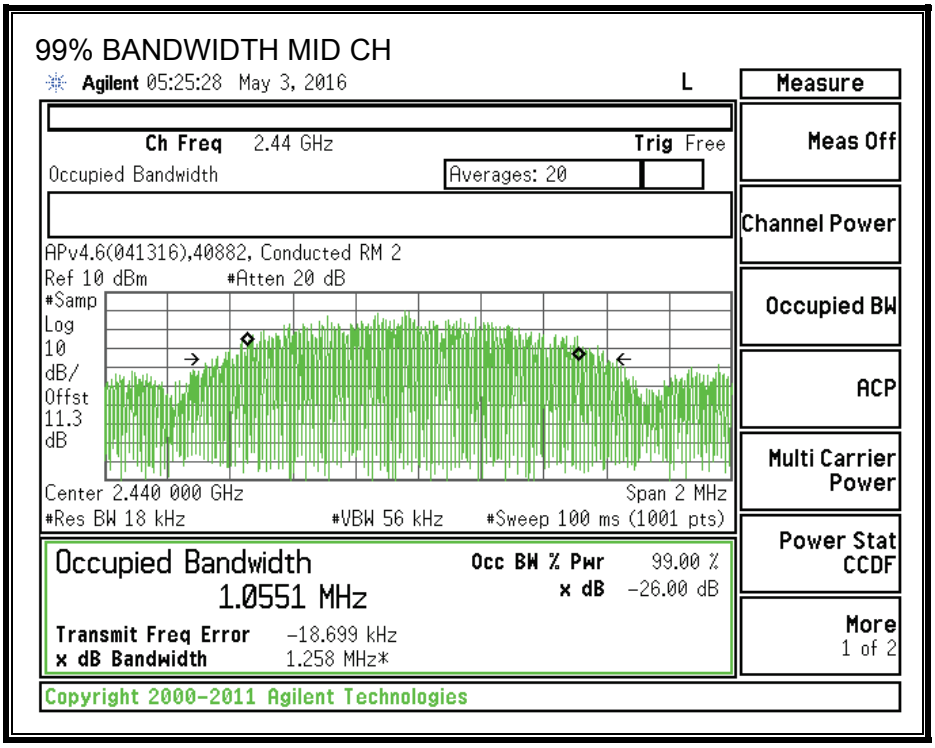
99% BANDWIDTH





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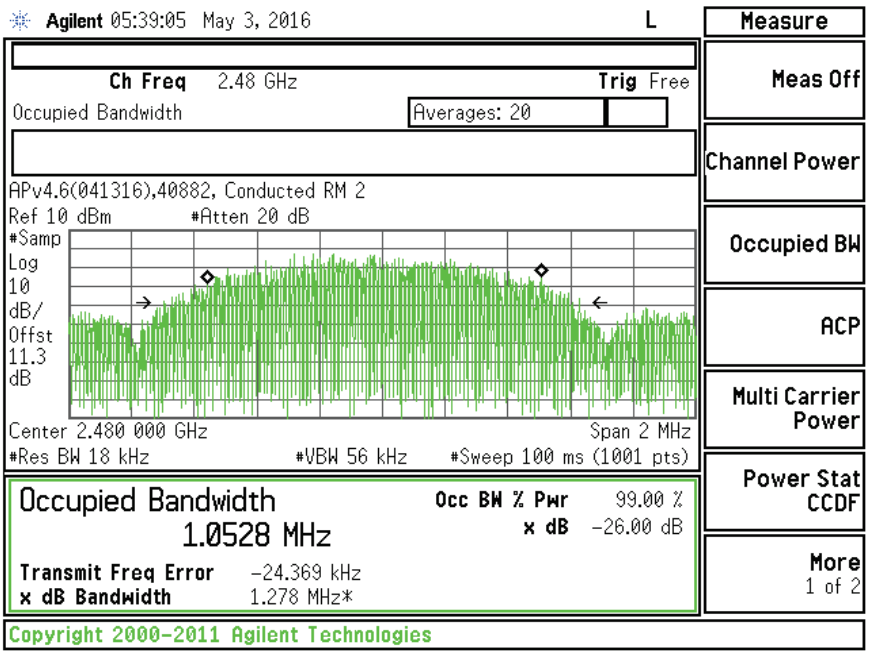
99% BANDWIDTH HIGH CH



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8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

IC RSS-247 5.4 (4)

FCC - For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS - For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

RESULTS

The cable assembly insertion loss of 12.04 dB (including 10 dB pad and 2.04 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.170	30	-24.830
Middle	2440	4.750	30	-25.250
High	2480	4.730	30	-25.270

Test Performed: Niklas Haydon/Jeff Cabrera
Test Date: 2016-08-24

Note – This test was performed at a reduced power setting.

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8.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 12.04 dB (including 10 dB pad and 2.04 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.93
Middle	2440	4.50
High	2480	4.47

Test Performed: Niklas Haydon/Jeff Cabrera
Test Date: 2016-08-24

Note – This test was performed at a reduced power setting.

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8.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 5.2 (2)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz to 100 kHz band during any time interval of continuous transmission.

RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	2.26	8	-5.75
Middle	2440	4.08	8	-3.93
High	2480	4.28	8	-3.72

Test Performed: Jeff Cabrera
Test Date: 2016-05-03

Note – This test was performed at the maximum allowed power setting.

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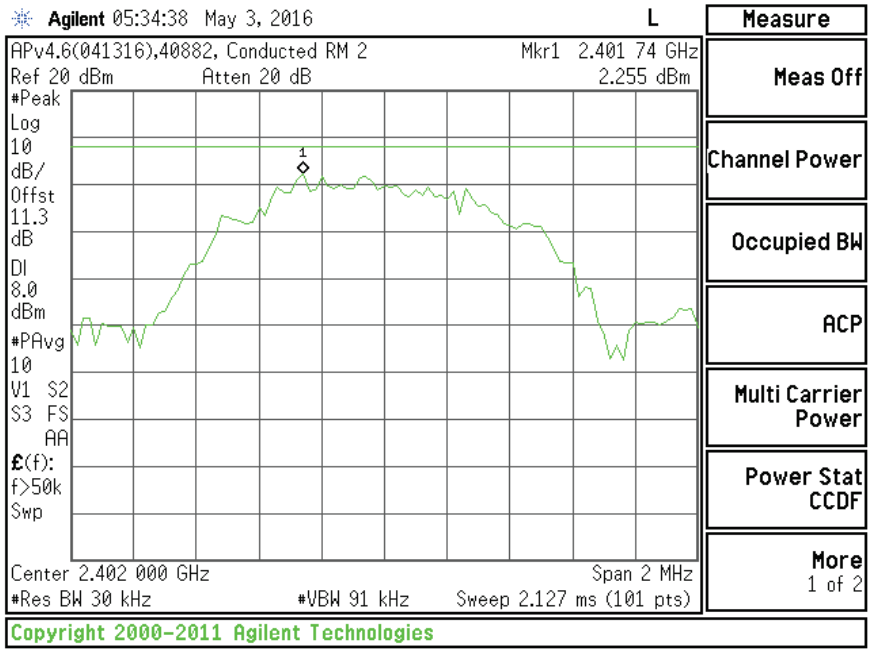
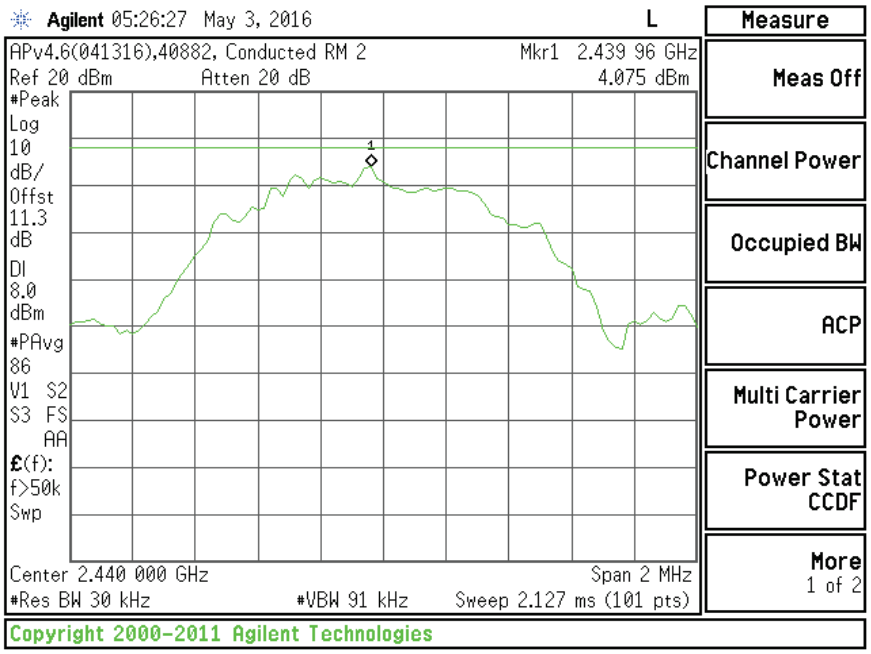
POWER SPECTRAL DENSITY

PSD LOW CH



PSD MID CH



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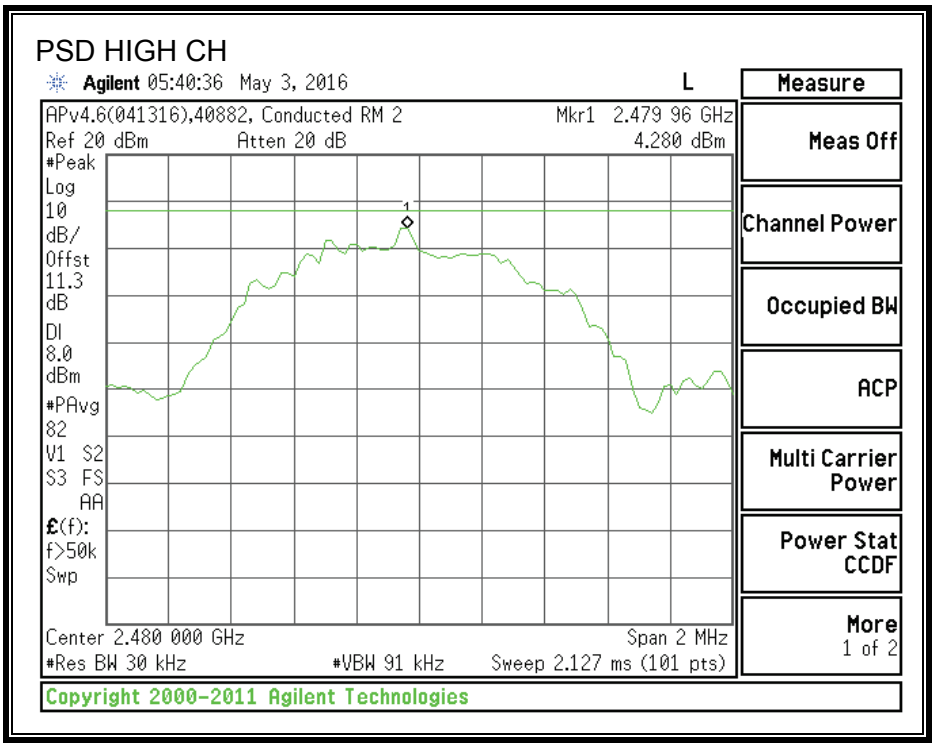
PSD HIGH CH



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8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 5.5

FCC - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RSS - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS

Test Performed: Jeff Cabrera
Test Date: 2016-05-03

Note – This test was performed at the maximum allowed power setting.

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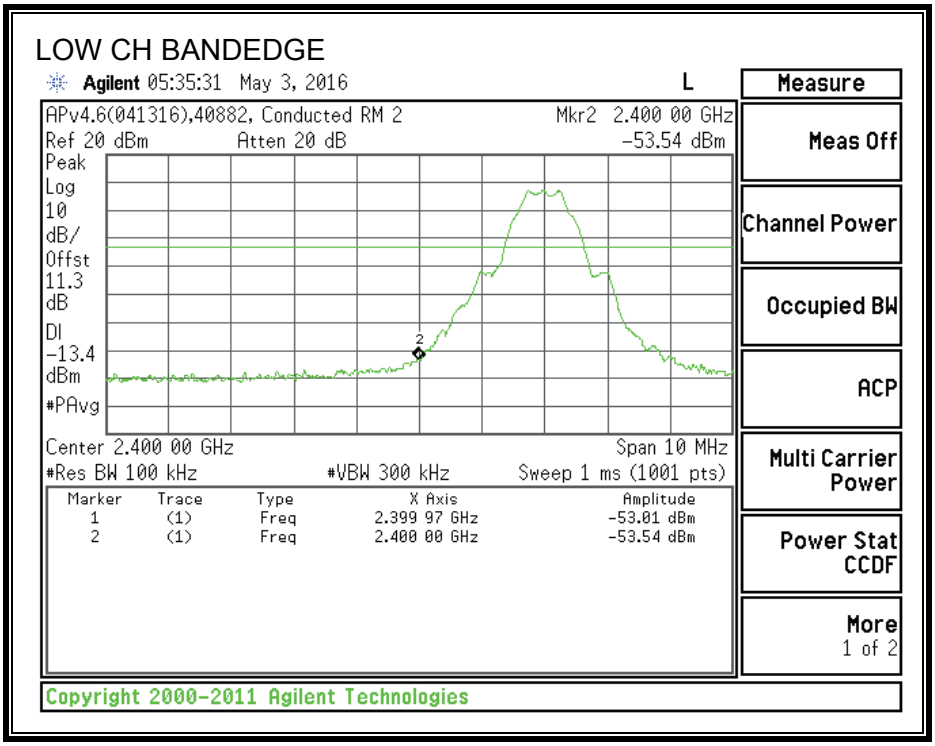
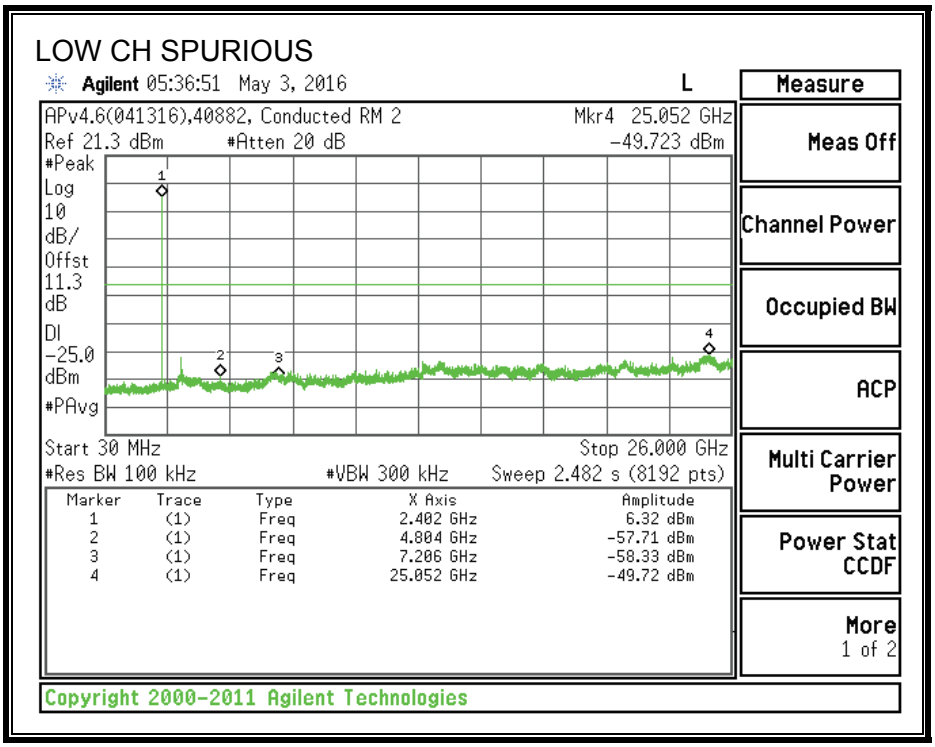
SPURIOUS EMISSIONS, LOW CHANNEL





Note – Limit line should be -13.4 dBm for the Low Channel Spurious plot.

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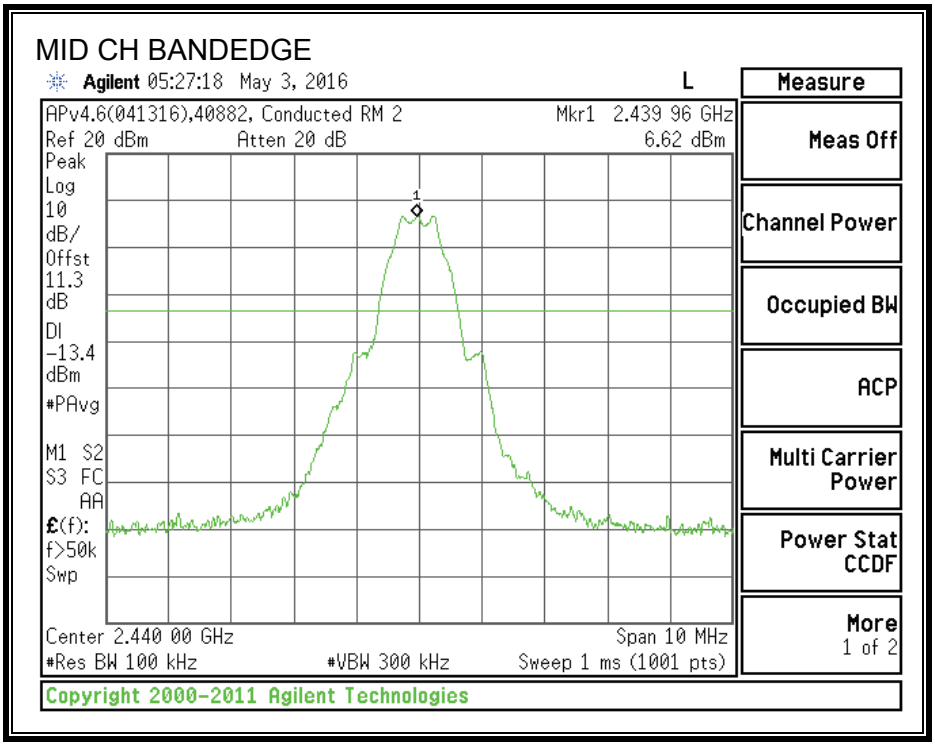
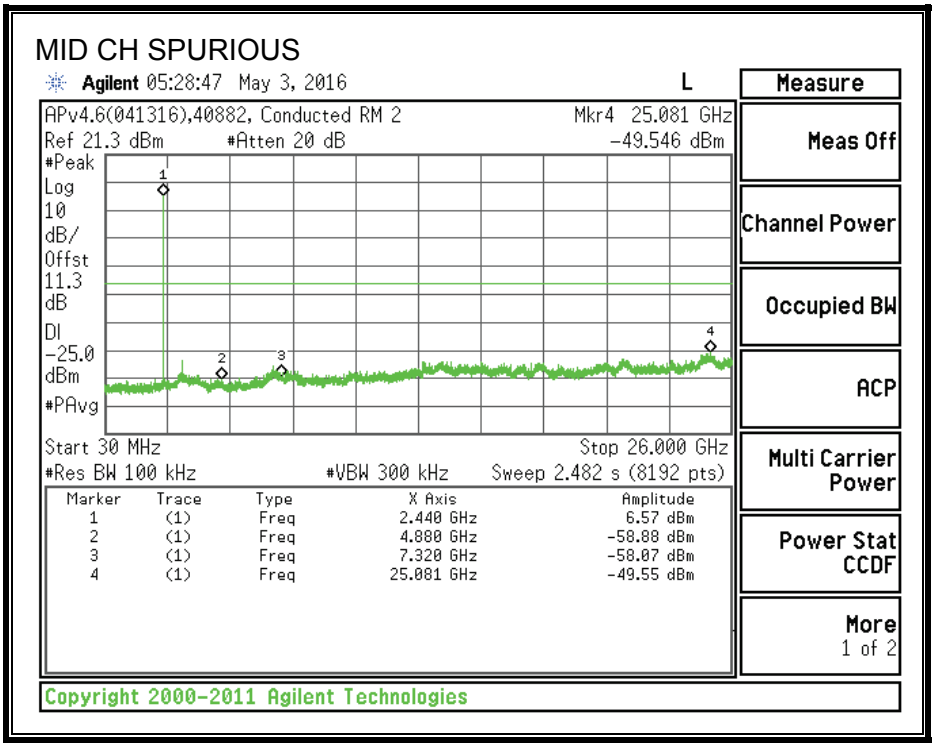
SPURIOUS EMISSIONS, MID CHANNEL





Note – Limit line should be -13.4 dBm for the Mid Channel Spurious plot.

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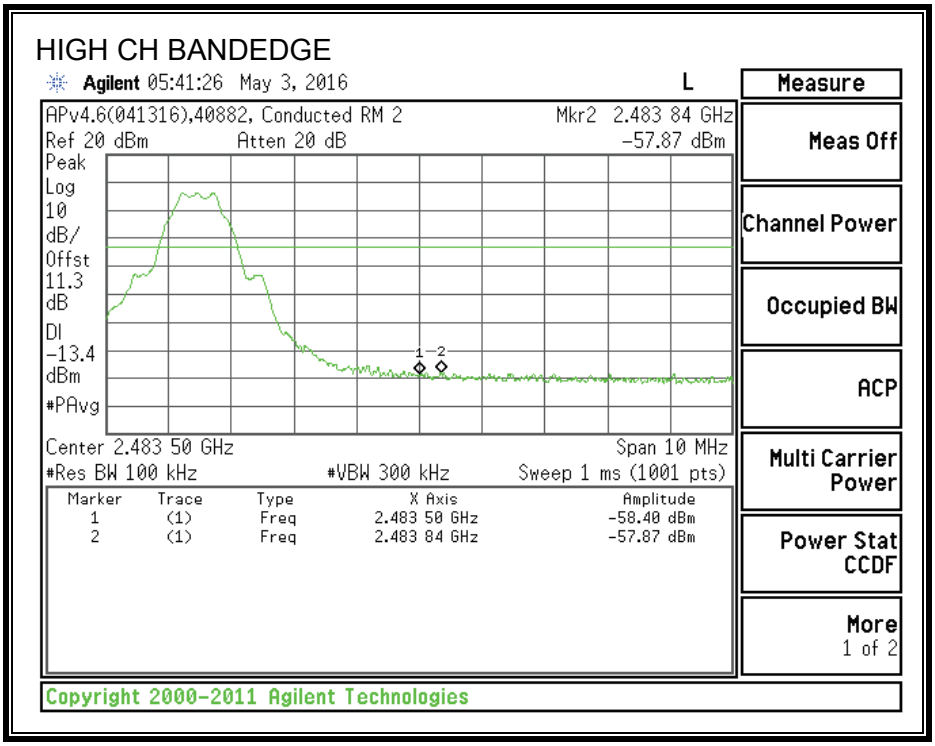
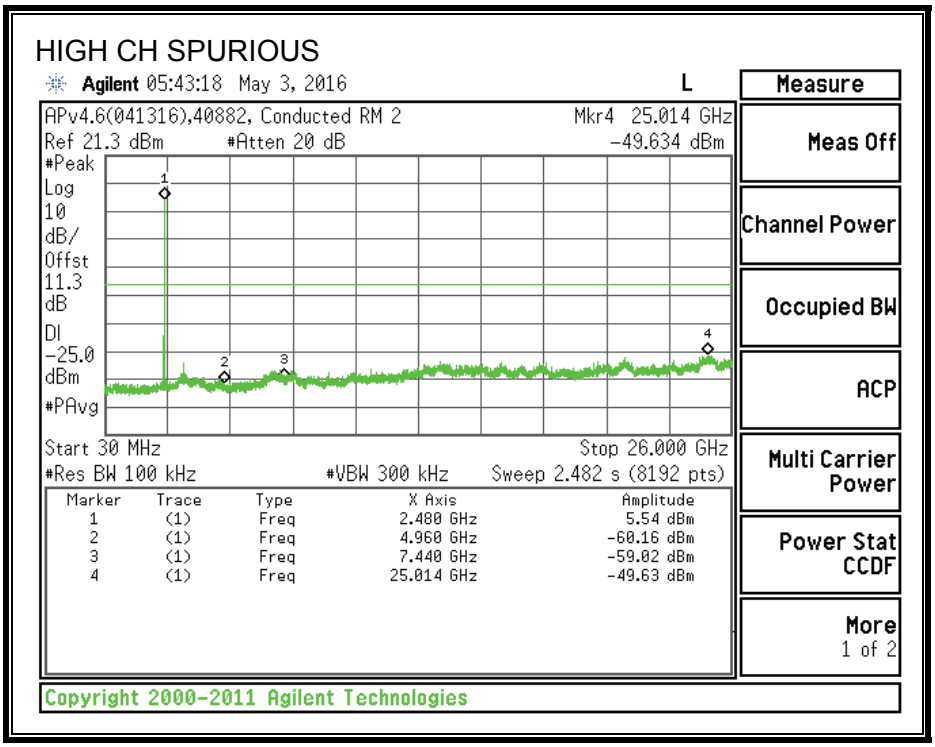
SPURIOUS EMISSIONS, HIGH CHANNEL





Note – Limit line should be -13.4 dBm for the High Channel Spurious plot.

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9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205, §15.209, §15.247 (d)

IC RSS-GEN Clause 8.9 (Transmitter)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz measurements and 1.5 m above the ground plane for above 1GHz measurements. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements for the 30-1000 MHz range, 9 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements for the 0.15-30 MHz range and 200 Hz for peak detection measurements or 200 Hz for quasi-peak detection measurements for the 9 to 150 kHz range. Peak detection is used unless otherwise noted as quasi-peak.

For peak measurements above 1 GHz, the resolution bandwidth is set to 1 MHz and the video bandwidth is set to 3 MHz. For average measurements above 1GHz, the resolution bandwidth and video bandwidth are set as described in ANSI C63.10:2013 for the applicable measurement. For this evaluation, RMS Power Averaging was used and the resolution/video bandwidth settings were 1MHz/3MHz.

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

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.

Note – This test was performed at the maximum allowed power setting.

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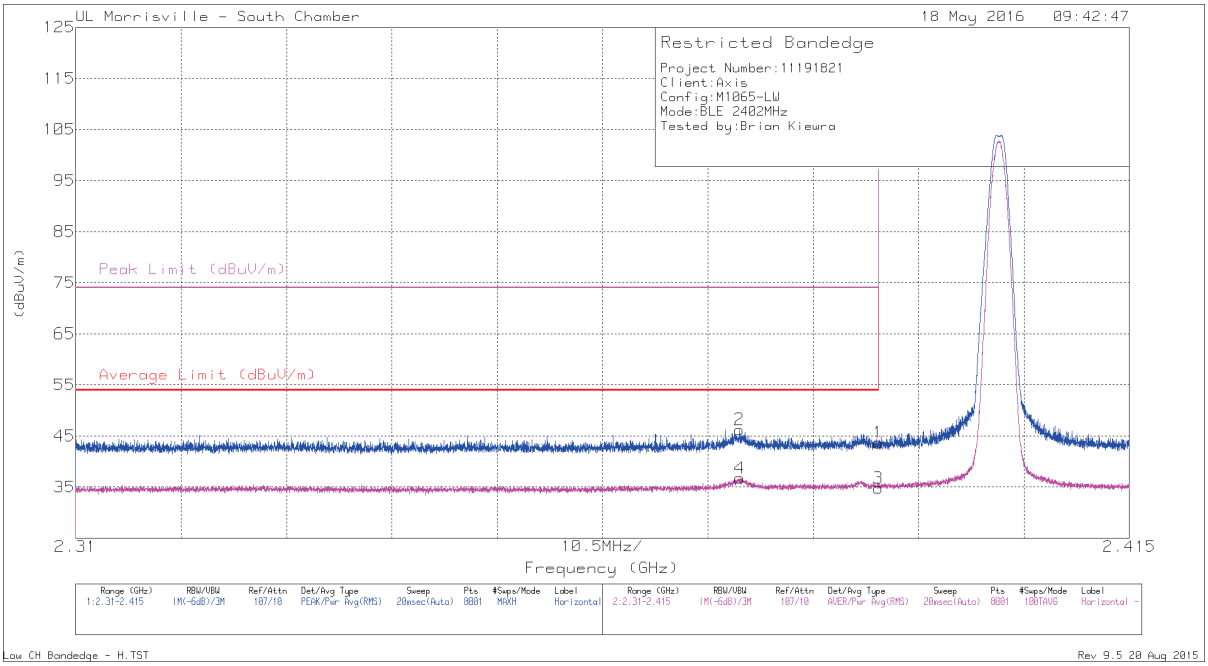
9.2. TRANSMITTER 1-18 GHz

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (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	35.71	Pk	32.2	-24.2	0	43.71	-	-	74	-30.29	46	124	H
2	* 2.376	38.25	Pk	32.1	-24.1	0	46.25	-	-	74	-27.75	46	124	H
3	* 2.39	24.78	RMS	32.2	-24.2	2.04	34.82	54	-19.18	-	-	46	124	H
4	* 2.376	26.71	RMS	32.1	-24.1	2.04	36.75	54	-17.25	-	-	46	124	H

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

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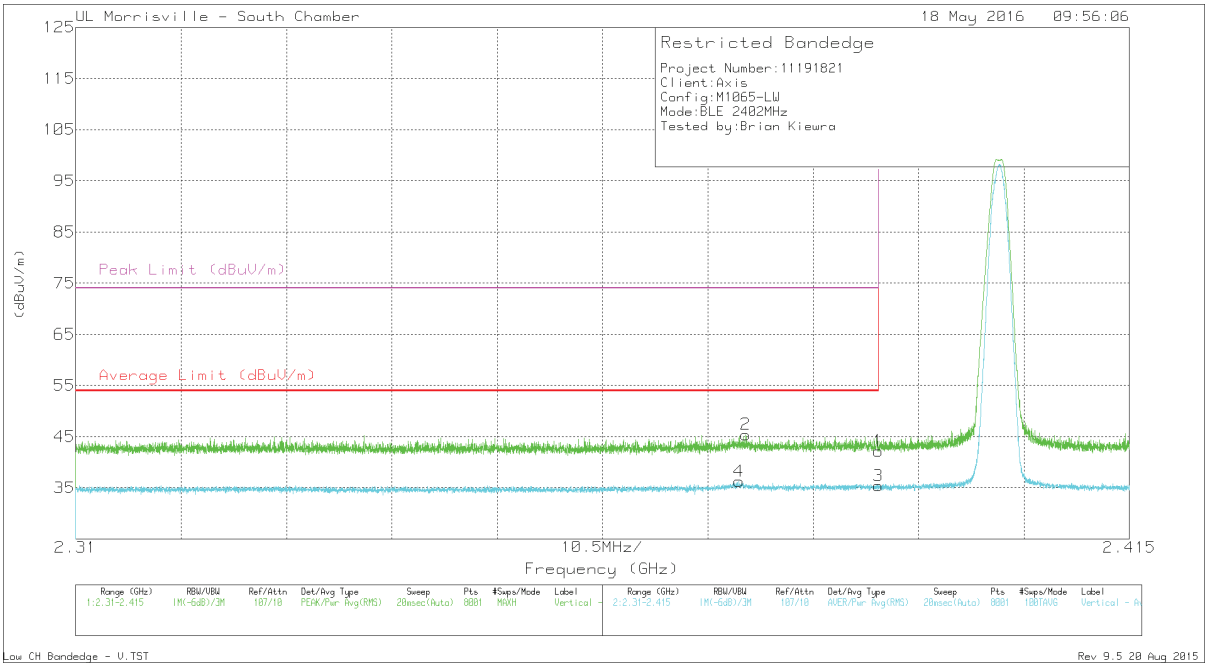
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (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	34.19	Pk	32.2	-24.2	0	42.19	-	-	74	-31.81	360	255	V
2	* 2.377	37.41	Pk	32.1	-24.1	0	45.41	-	-	74	-28.59	360	255	V
3	* 2.39	25.4	RMS	32.2	-24.2	2.04	35.44	54	-18.56	-	-	360	255	V
4	* 2.376	26.22	RMS	32.1	-24.1	2.04	36.26	54	-17.74	-	-	360	255	V

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

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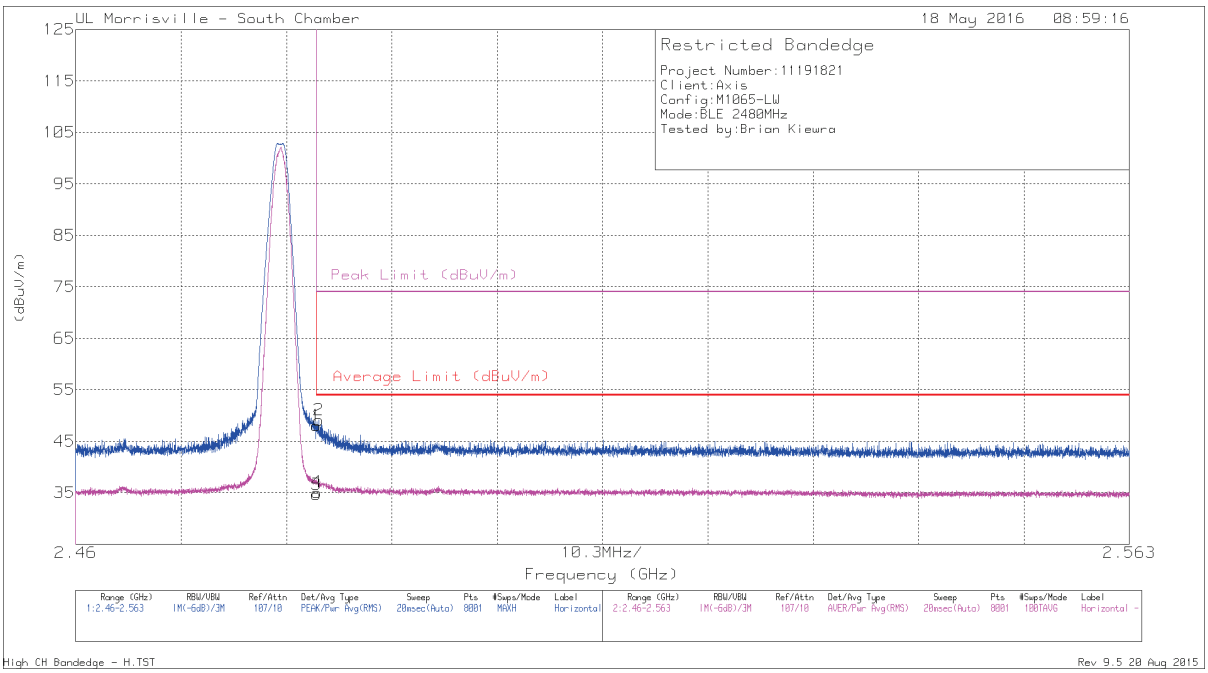
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.32	Pk	32.4	-24.7	0	48.02	-	-	74	-25.98	20	125	H
2	* 2.484	41.41	Pk	32.4	-24.7	0	49.11	-	-	74	-24.89	20	125	H
3	* 2.484	26.96	RMS	32.4	-24.7	2.04	36.70	54	-17.30	-	-	20	125	H
4	* 2.484	27.41	RMS	32.4	-24.7	2.04	37.15	54	-16.85	-	-	20	125	H

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

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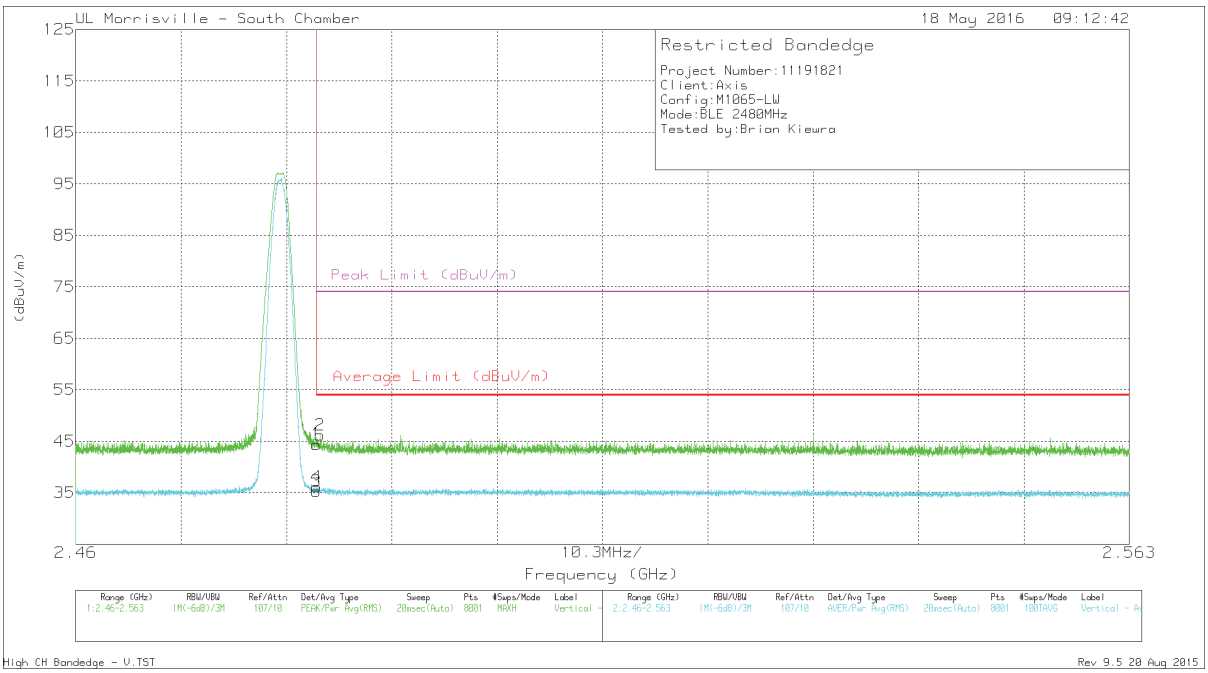
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	36.7	Pk	32.4	-24.7	0	44.4	-	-	74	-29.6	51	133	V
2	* 2.484	38.51	Pk	32.4	-24.7	0	46.21	-	-	74	-27.79	51	133	V
3	* 2.484	25.57	RMS	32.4	-24.7	2.04	35.31	54	-18.69	-	-	51	133	V
4	* 2.484	26.39	RMS	32.4	-24.7	2.04	36.13	54	-17.87	-	-	51	133	V

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

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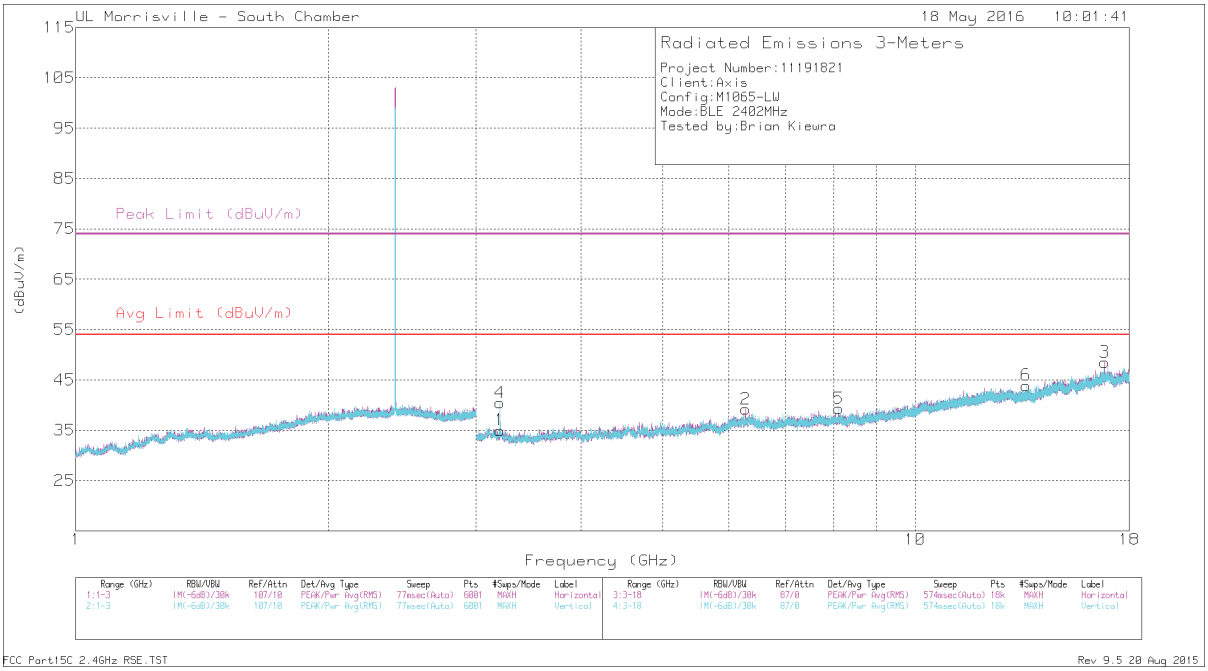
HARMONICS AND SPURIOUS EMISSIONS



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/ fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 8.107	36.3	PK2	35.7	-27.9	0	44.1	-	-	74	-29.9	52	378	V
	* 8.106	24.98	MAv1	35.7	-27.9	2.04	34.82	54	-19.18	-	-	52	378	V
1	3.202	35.01	Pk	33.4	-33.4	0	35.01	-	-	-	-	0-360	200	H
4	3.202	40.49	Pk	33.4	-33.4	0	40.49	-	-	-	-	0-360	102	V
2	6.286	32.68	Pk	35.4	-28.9	0	39.18	-	-	-	-	0-360	200	H
6	13.563	30.51	Pk	38.9	-25.5	0	43.91	-	-	-	-	0-360	102	V
3	16.808	31.14	Pk	41.6	-24.2	0	48.54	-	-	-	-	0-360	101	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
MAv1 - Maximum RMS Average

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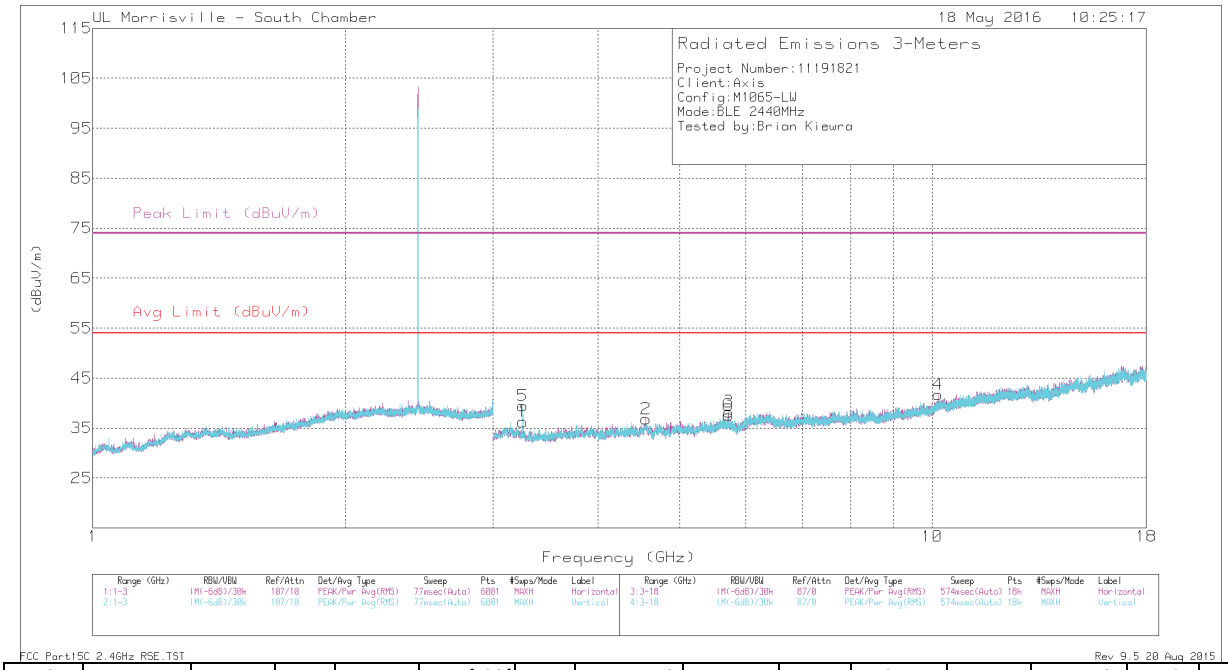

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/ fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.564	40.36	PK2	34	-32.1	0	42.26	-	-	74	-31.74	16	300	H
	* 4.56	28.64	MAv1	34	-32	2.04	32.68	54	-21.32	-	-	16	300	H
1	3.253	36.77	Pk	33.2	-33.7	0	36.27	-	-	-	-	0-360	102	H
5	3.253	39.98	Pk	33.2	-33.7	0	39.48	-	-	-	-	0-360	101	V
6	5.718	33.42	Pk	34.7	-30.5	0	37.62	-	-	-	-	0-360	101	V
3	5.727	34.06	Pk	34.7	-30.5	0	38.26	-	-	-	-	0-360	199	H
4	10.159	30.5	Pk	37.3	-26.1	0	41.7	-	-	-	-	0-360	199	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
MAv1 - Maximum RMS Average

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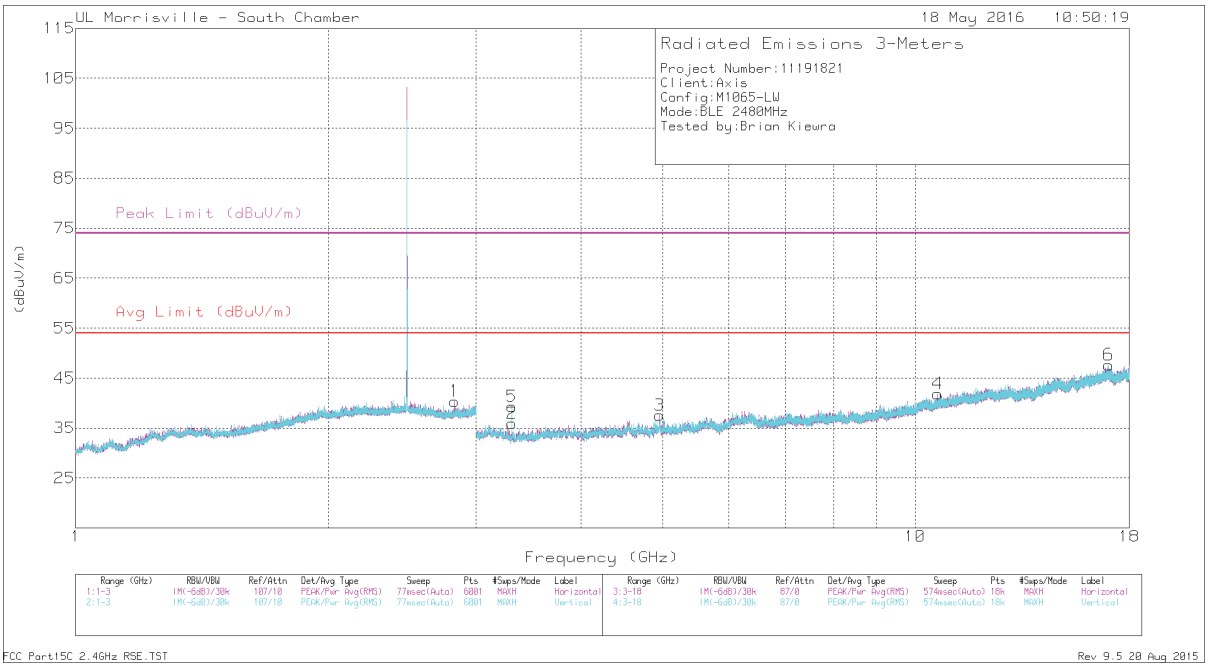

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.829	37.8	PK2	32.7	-26.1	0	44.4	-	-	74	-29.6	309	292	H
	* 2.829	25.83	MAv1	32.7	-26.1	2.04	34.47	54	-19.53	-	-	309	292	H
3	* 4.961	42.17	PK2	34.1	-31.6	0	44.67	-	-	74	-29.33	352	102	H
	* 4.96	31.73	MAv1	34.1	-31.6	2.04	36.27	54	-17.73	-	-	352	102	H
4	* 10.638	34.36	PK2	37.8	-25.3	0	46.86	-	-	74	-27.14	327	121	H
	* 10.639	22.9	MAv1	37.8	-25.3	2.04	37.44	54	-16.56	-	-	327	121	H
2	3.307	36.72	Pk	32.7	-33.5	0	35.92	-	-	-	-	0-360	102	H
5	3.307	40.14	Pk	32.7	-33.5	0	39.34	-	-	-	-	0-360	102	V
6	17.006	30.96	Pk	41.5	-24.8	0	47.66	-	-	-	-	0-360	102	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
MAv1 - Maximum RMS Average

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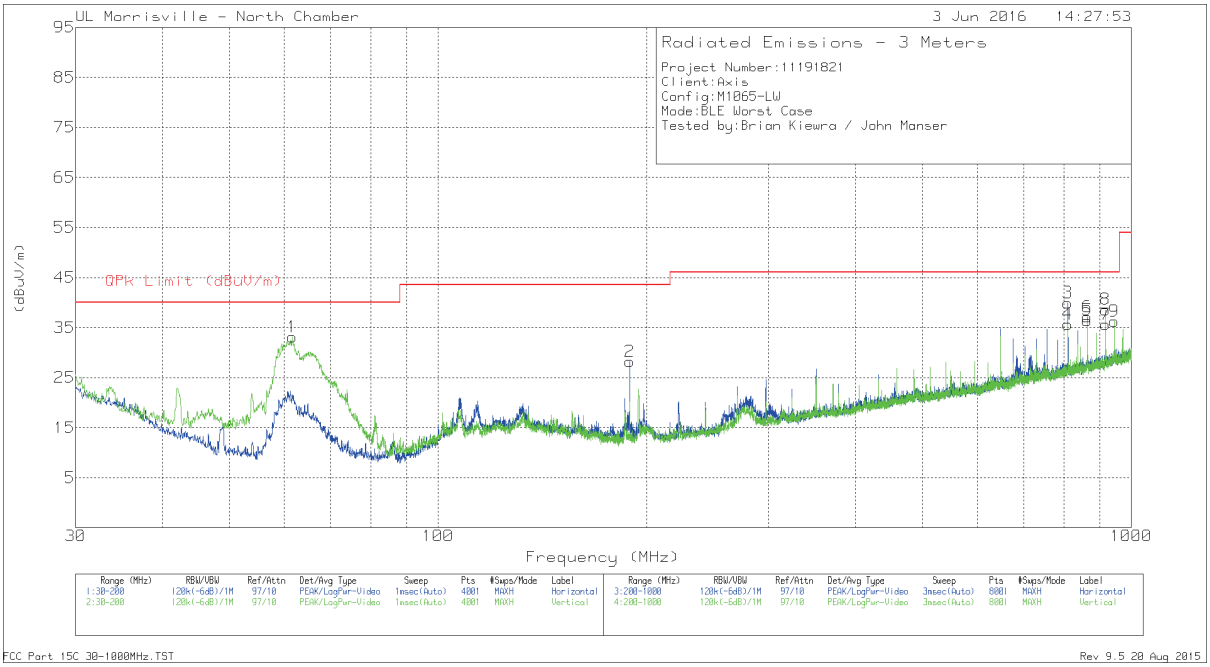
9.3. WORST-CASE BELOW 1 GHz

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



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	61.62	52.31	Pk	12	-31.2	33.11	40	-6.89	0-360	102	V
2	188.9925	42.49	Pk	15.9	-30.2	28.19	43.52	-15.33	0-360	101	H
3	810	41.36	Pk	26.1	-27.5	39.96	46.02	-6.06	0-360	102	H
4	810	37.09	Pk	26.1	-27.5	35.69	46.02	-10.33	0-360	199	V
6	864	37.66	Pk	26.5	-27	37.16	46.02	-8.86	0-360	102	H
5	864	36.95	Pk	26.5	-27	36.45	46.02	-9.57	0-360	102	V
7	918	35.11	Pk	26.9	-26.4	35.61	46.02	-10.41	0-360	102	H
8	918	38.09	Pk	26.9	-26.4	38.59	46.02	-7.43	0-360	102	V
9	945	34.67	Pk	27.6	-26	36.27	46.02	-9.75	0-360	102	V

Pk - Peak detector

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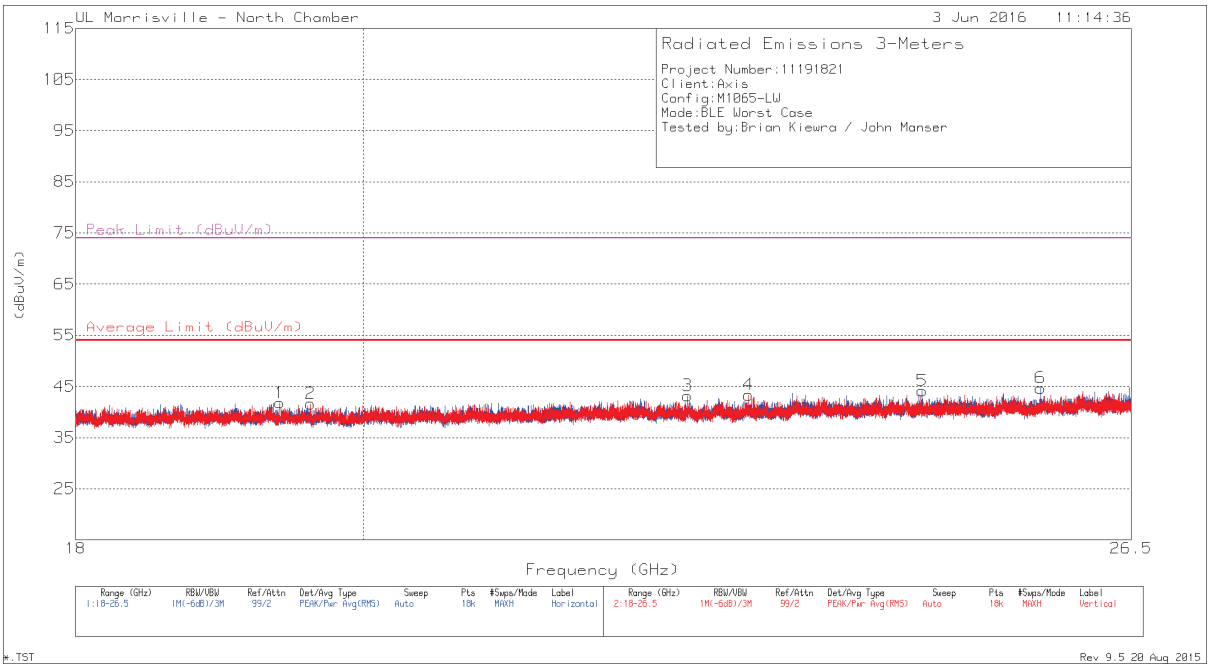
9.4. WORST-CASE 18-16GHz

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



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0076 (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	* 19.396	48.44	PK2	33	-40.7	40.74	54	-13.26	74	-33.26	45	124	H
3	* 22.522	49.14	PK2	33.7	-40.1	42.74	54	-11.26	74	-31.26	150	239	H
2	* 19.621	48.93	PK2	32.9	-40.8	41.03	54	-12.97	74	-32.97	41	178	V
4	* 23.031	49.22	PK2	34.2	-40.1	43.32	54	-10.68	74	-30.68	180	100	V
5	24.546	49.28	Pk	34.5	-39.6	44.18	54	-9.82	74	-29.82	0-360	101	H
6	25.633	48.91	Pk	34.7	-38.9	44.71	54	-9.29	74	-29.29	0-360	199	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
MAv1 - Maximum RMS Average

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10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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 NEUTRAL and HOT lines.

RESULTS

Note – This test was performed at the maximum allowed power setting.

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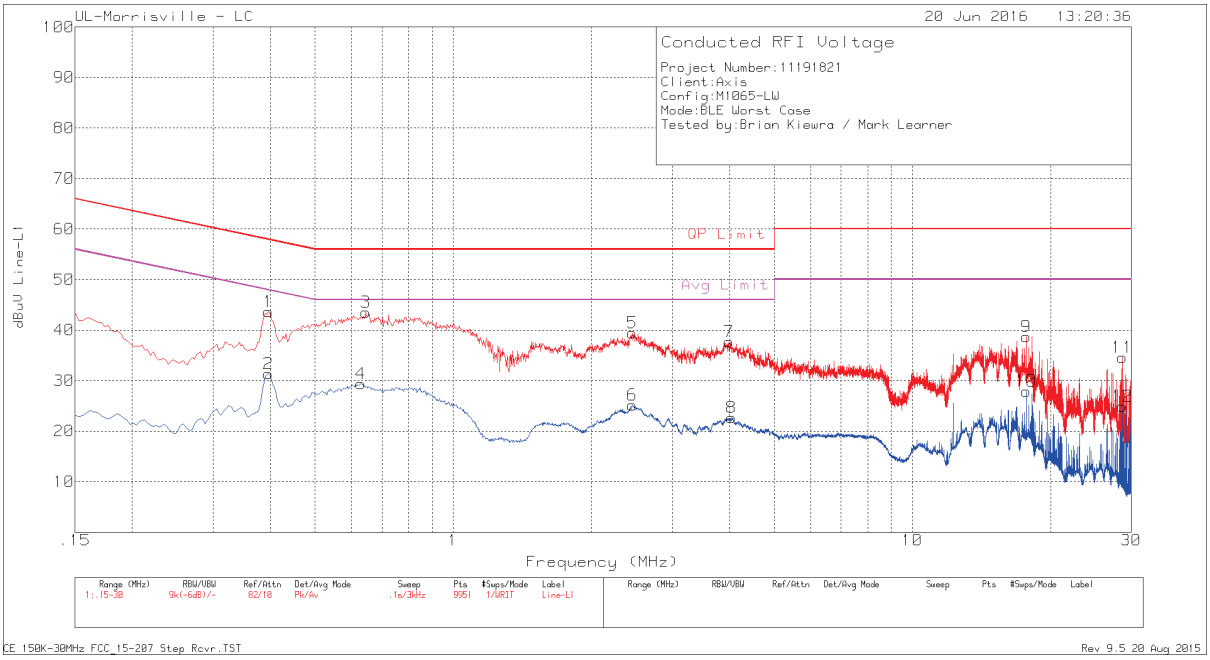
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
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	.396	33.56	Pk	.1	10	43.66	57.94	-14.28	-	-
2	.396	21.22	Av	.1	10	31.32	-	-	47.94	-16.62
3	.645	33.47	Pk	.1	10	43.57	56	-12.43	-	-
4	.63	19.34	Av	.1	10	29.44	-	-	46	-16.56
5	2.454	29.24	Pk	.1	10.1	39.44	56	-16.56	-	-
6	2.457	14.96	Av	.1	10.1	25.16	-	-	46	-20.84
7	3.984	27.46	Pk	.1	10.1	37.66	56	-18.34	-	-
8	4.044	12.48	Av	.1	10.1	22.68	-	-	46	-23.32
9	17.694	27.95	Pk	.2	10.5	38.65	60	-21.35	-	-
10	17.694	17.26	Av	.2	10.5	27.96	-	-	50	-22.04
11	28.686	23.45	Pk	.4	10.7	34.55	60	-25.45	-	-
12	28.686	13.77	Av	.4	10.7	24.87	-	-	50	-25.13

Pk - Peak detector
Av - Average detection

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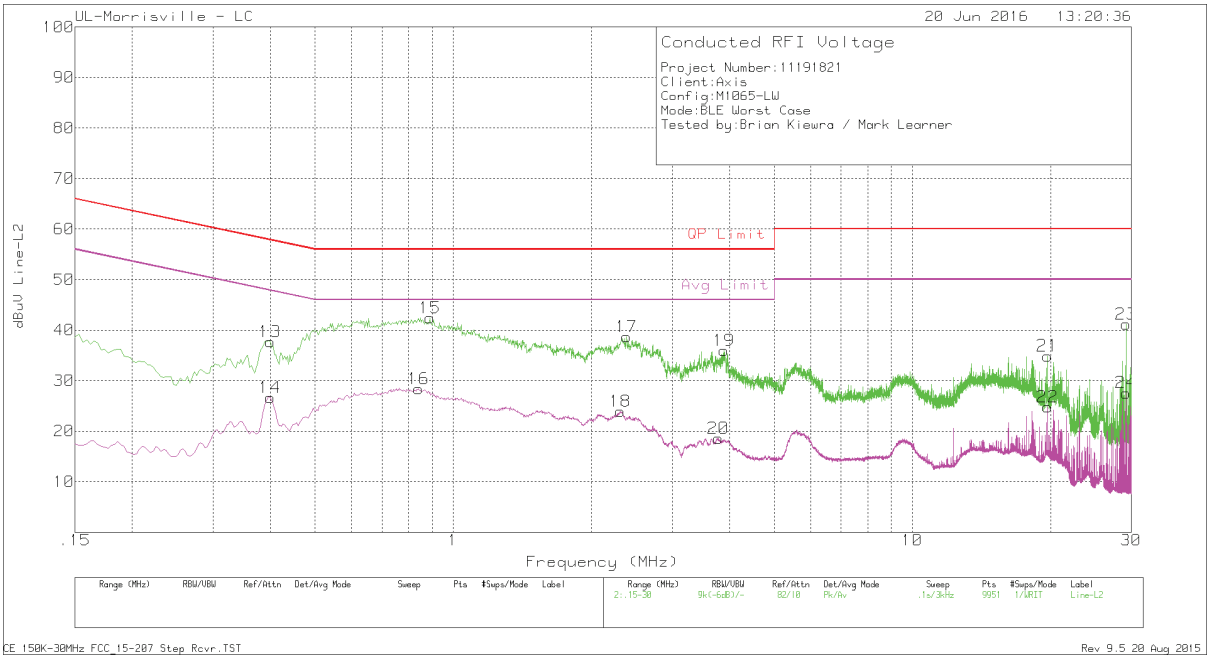
LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF [dB]	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
13	.399	27.6	Pk	.1	10	37.7	57.87	-20.17	-	-
14	.399	16.57	Av	.1	10	26.67	-	-	47.87	-21.2
15	.891	32.44	Pk	0	10	42.44	56	-13.56	-	-
16	.84	18.38	Av	0	10	28.38	-	-	46	-17.62
17	2.388	28.59	Pk	0	10.1	38.69	56	-17.31	-	-
18	2.31	13.78	Av	0	10.1	23.88	-	-	46	-22.12
19	3.894	25.72	Pk	.1	10.1	35.92	56	-20.08	-	-
20	3.786	8.43	Av	.1	10.1	18.63	-	-	46	-27.37
21	19.71	24.21	Pk	.2	10.5	34.91	60	-25.09	-	-
22	19.71	14.09	Av	.2	10.5	24.79	-	-	50	-25.21
23	29.223	30.23	Pk	.3	10.7	41.23	60	-18.77	-	-
24	29.235	16.59	Av	.3	10.7	27.59	-	-	50	-22.41

Pk - Peak detector
Av - Average detection

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