



**FCC 47 CFR PART 15 SUBPART C
ISED CANADA RSS-247 ISSUE 2**

**CLASS 2 PERMISSIVE CHANGE REPORT
FOR**

WAFERSENSE AUTO MULTI-SENSOR

MODEL NUMBER: AMS-300C, AMS-200C, AMS-150C

**FCC ID: SPD003
IC: 6210A-003**

REPORT NUMBER: R11616692-E1C

ISSUE DATE: 2017-10-27

**Prepared for
CYBEROPTICS CORPORATION
5900 GOLDEN HILLS DRIVE
MINNEAPOLIS, MINNESOTA 55416, USA**

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



NVLAP LAB CODE 200246-0

Revision History

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1. DATA REUSE

1.1. INTRODUCTION

This testing is to support a Class II Permissive Change for the addition of a new antenna configuration. The manufacture is changing the chip antenna to a trace antenna. No other changes have been made to the radio. The EUT contains a Mitsumi Bluetooth Transceiver, Model WML-40, which has been certified under FCC IDs: POOWML-C40 and SPD003.

The AMS300C, AMS200C, and AMS150C use a carbon fiber composite housing and differ only in diameter.

CyberOptics Corporation takes full responsibility that previous data referenced under FCC IDs: POOWML-C40 and SPD003 represent compliance.

1.2. TESTING PERFORMED

Radiated Spurious Emissions testing will be performed to demonstrate the new antenna configuration is compliant to FCC 15.247. All other testing is covered under previous test reports for FCC IDs: P00WML-C40 and SPD003

1.3. REFERENCE DETAIL SECTION

Equipment Class	Reference FCC ID	Type Grant	Grant Date	Report Number
FHSS	FCC ID: POOWML-C40	New	2006-05-01	EF/2006/10010
FHSS	FCC ID: SPD003	C2PC	2008-03-19	CYBR0077.1

2. ATTESTATION OF TEST RESULTS

COMPANY NAME: CyberOptics Corporation
5900 Golden Hills Drive
Minneapolis, Minnesota 55416, USA

EUT DESCRIPTION: WaferSense Auto Multi-Sensor

MODEL: AMS-300C, AMS-200C, AMS-150C

SERIAL NUMBER: AM000583

DATE TESTED: 2017-08-22 to 2017-08-23

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
ISED CANADA RSS-247 Issue 2	Pass
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, or any agency of the U.S. Government.

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

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, RSS-GEN Issue 4, RSS-247 Issue 2.

4. 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 Perimeter Park Dr., Suite B, Morrisville, NC 27560, USA.

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 Industry 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/>.

5. CALIBRATION AND UNCERTAINTY

5.1. 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.

5.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

5.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY	Required by standard
Occupied Channel Bandwidth	2.00%	±5 %
RF output power, conducted	1.3 dB	±1,5 dB
Power Spectral Density, conducted	2.47 dB	±3 dB
Unwanted Emissions, conducted	2.94 dB	±3 dB
All emissions, radiated	5.36 dB	±6 dB
Temperature	2.26 °C	±3 °C
Supply voltages	2.40%	±3 %
Time	3.39%	±5 %

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

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a Bluetooth transceiver used for measuring real-time Leveling, vibration and humidity within a Semiconductor Process. The AMS300C, AMS200C, and AMS150C use a carbon fiber composite housing and differ only in diameter.

6.2. MAXIMUM OUTPUT POWER

Power not measured, covered in report CYBR0077.1. A default power setting was used as dictated by Cyberoptics. This power setting was for a target power of 11-12dBm.

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an inverted-F (IFA) PCB trace antenna, with a maximum gain of -0.4 dBi.

6.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was BC4 v26.4279

The test utility software used during testing was BlueTest3 v1.24.

6.5. WORST-CASE CONFIGURATION AND MODE

An XYZ investigation was performed on all models (AMS-150C, 200C, 300C). The AMS-300C was found to be worst-case unit.

Radiated emissions 1-18GHz were performed with the EUT set to transmit on low, mid, and high channels. Radiated emissions 0.009 – 1000MHz and 18-26GHz were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

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

Unless noted in the test report, all tests were performed with the DH5 packet size as this was considered worst-case.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT & PERIPHERALS

SUPPORT EQUIPMENT & PERIPHERALS LIST			
Description	Manufacturer	Model	Serial Number
Laptop	Dell	PP18L	27L7KC1
WaferSense Sensor (Carbon)	CyberOptics	8023729	HXC01706
WaferSense Sensor (Quartz)	CyberOptics	8023729	HXC01709

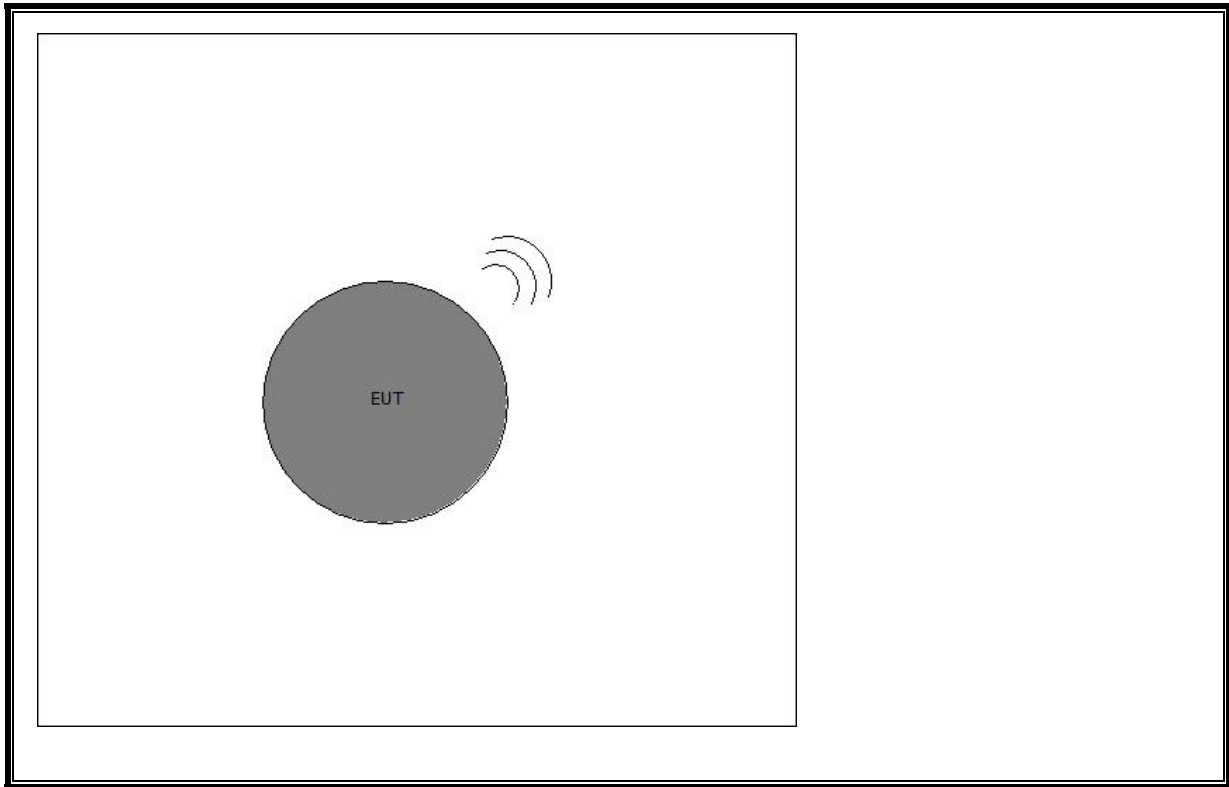
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length m	Remarks
1	AC	1	AC	AC Mains	>3m	None

TEST SETUP

The EUT was installed in a typical configuration. The customer provided test software to exercise the EUTs during test. Refer to the following diagram.

SETUP DIAGRAM FOR TESTS



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)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2016-12-28	2017-12-31
30-1000 MHz					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2017-06-15	2018-06-15
1-18 GHz					
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2017-04-05	2018-04-05
18-40 GHz					
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2016-09-06	2017-09-06
Gain-Loss Chains					
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2016-10-04	2017-10-04
N-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2017-06-11	2018-06-11
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2017-08-18	2018-08-18
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2017-03-03	2018-03-03
Receiver & Software					
SA0027	Spectrum Analyzer	Agilent	N9030A	2017-03-16	2018-03-16
SA0026 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2017-02-17	2018-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
s/n 161024690	Environmental Meter	Fisher Scientific	15-077-963	2016-12-21	2018-12-21

8. MEASUREMENT METHODS

Duty Cycle: KDB 558074 Zero-Span Spectrum Analyzer Method

Out-of-band emissions in restricted bands: ANSI C63.10:2013 Sections 6.3-6.6

KDB 558074 Zero-Span Spectrum Analyzer Method.

	B (msec)	(msec)	x (linear)	Cycle (%)	Correction Factor (dB)	Minimum VBW (kHz)
2.4 GHz band (Hopping OFF)						
Bluetooth GFSK	2.896	3.749	0.772	77.25%	1.12	0.345

DUTY CYCLE GFSK MODE

Keysight Spectrum Analyzer - Swept SA
RL RF 50 Ω DC SENSE:INT ALIGN AUTO 01:51:56 AM Aug 22, 2017

PNO: Fast IF Gain: Low Trig: Free Run #Atten: 10 dB #Avg Type: Voltage

TRACE 1 2 3 4 5 6 TYPE W W W W W W W DET P P P P P P

10 dB/div Ref 106.99 dBμV **ΔMkr3 3.749 ms -0.09 dB**

Log

Center 2.441000000 GHz Res BW 8 MHz #VBW 50 MHz Sweep 15.20 ms (6000 pts) Span 0 Hz

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	t	t	4.488 ms	69.46 dBμV			
2	Δ1	t	(Δ)	2.896 ms (Δ)	0.18 dB			
3	Δ1	t	(Δ)	3.749 ms (Δ)	-0.09 dB			

MSG STATUS

Date: 2017-08-22
Project: 11616692
Tester: Haydon Niklas

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE LIMITS

FCC §15.205 and §15.209
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
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 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. The particular averaging method used for this test program was by measuring using a Peak detector with the resolution bandwidth set to 1MHz and a reduced video bandwidth, based on $1/T_{on}$ where T_{on} is the transmit on time.

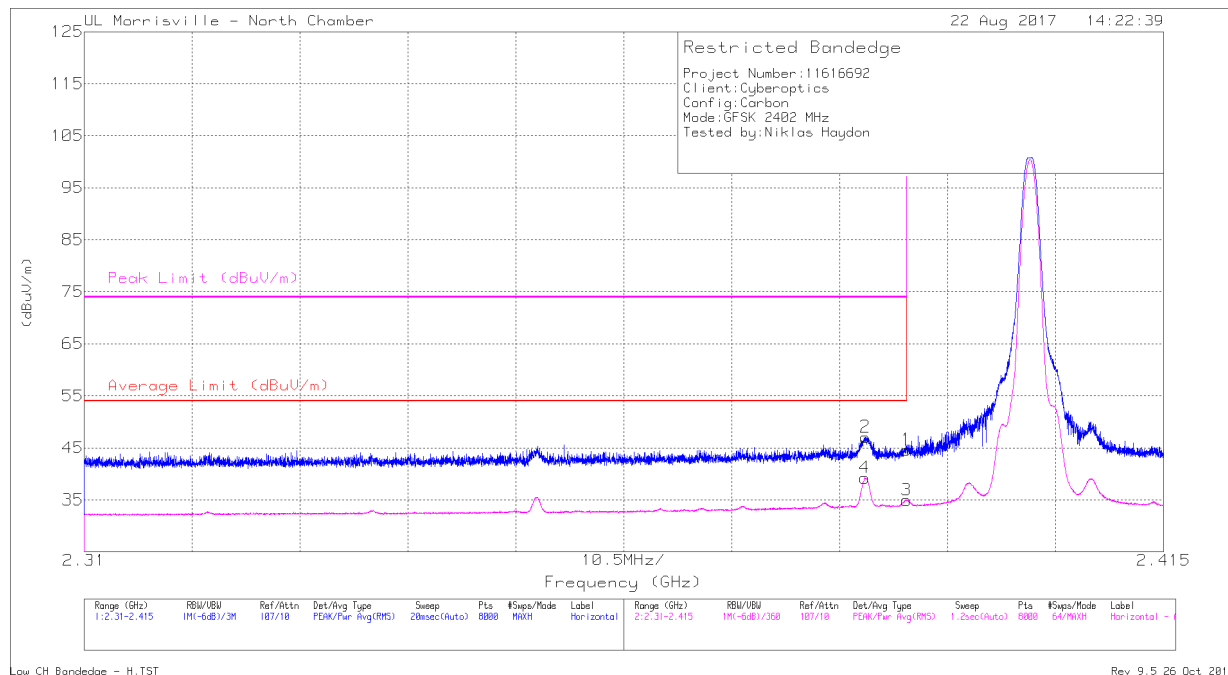
The spectrum from 1 to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. For 9kHz to 1000 MHz and 18 to 26 GHz investigation, the worst-case channel was selected.

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.

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



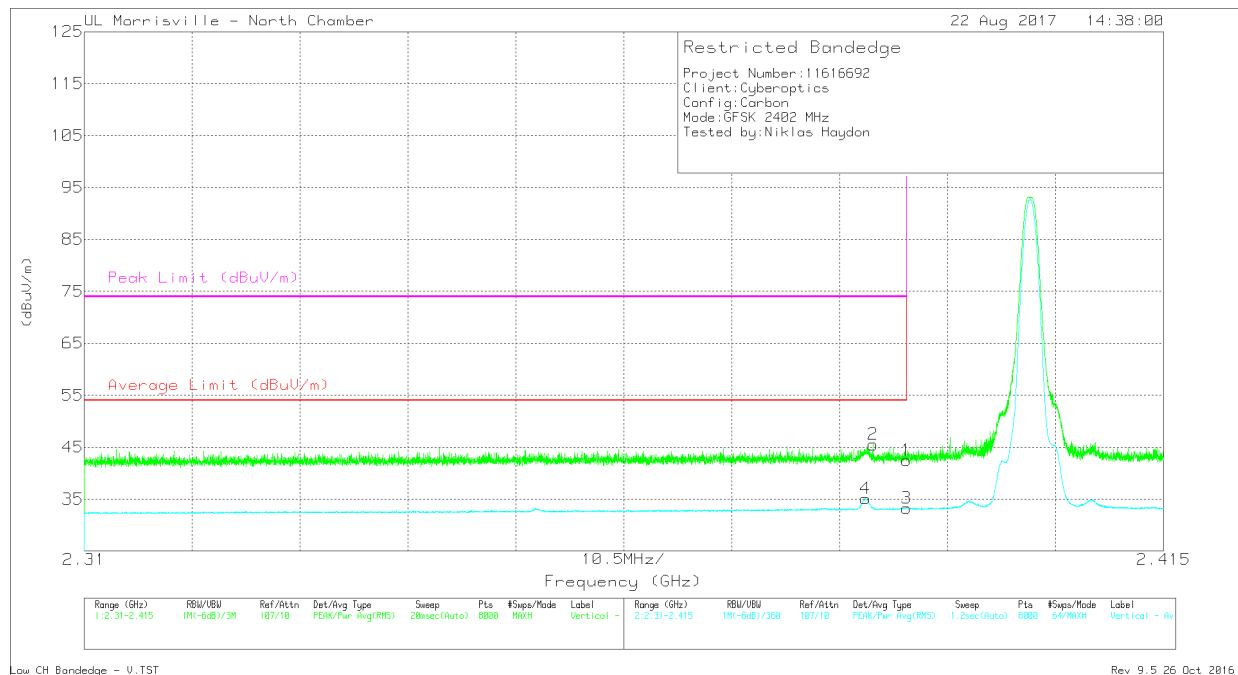
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	36.72	Pk	31.8	-23.9	44.62	-	-	74	-29.38	109	102	H
2	* 2.386	39.17	Pk	31.8	-23.9	47.07	-	-	74	-26.93	109	102	H
3	* 2.39	27.03	V1TR	31.8	-23.9	34.93	54	-19.07	-	-	109	102	H
4	* 2.386	31.33	V1TR	31.8	-23.9	39.23	54	-14.77	-	-	109	102	H

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

Pk - Peak detector

V1TR: VB=1/Ton, AVG where: Ton is packet duration

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



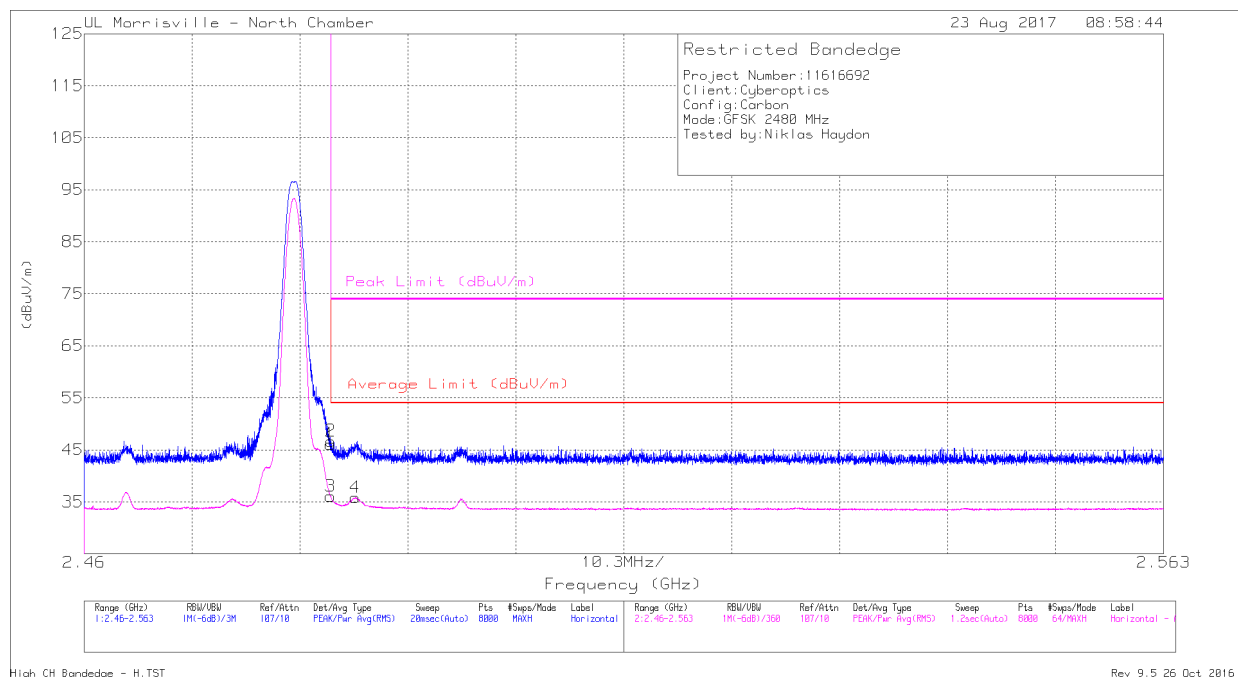
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	34.56	Pk	31.8	-23.9	42.46	-	-	74	-31.54	38	253	V
2	* 2.387	37.6	Pk	31.8	-23.9	45.5	-	-	74	-28.5	38	253	V
3	* 2.39	25.38	V1TR	31.8	-23.9	33.28	54	-20.72	-	-	38	253	V
4	* 2.386	27.21	V1TR	31.8	-23.9	35.11	54	-18.89	-	-	38	253	V

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Pk - Peak detector

V1TR: VB=1/Ton, AVG where: Ton is packet duration

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



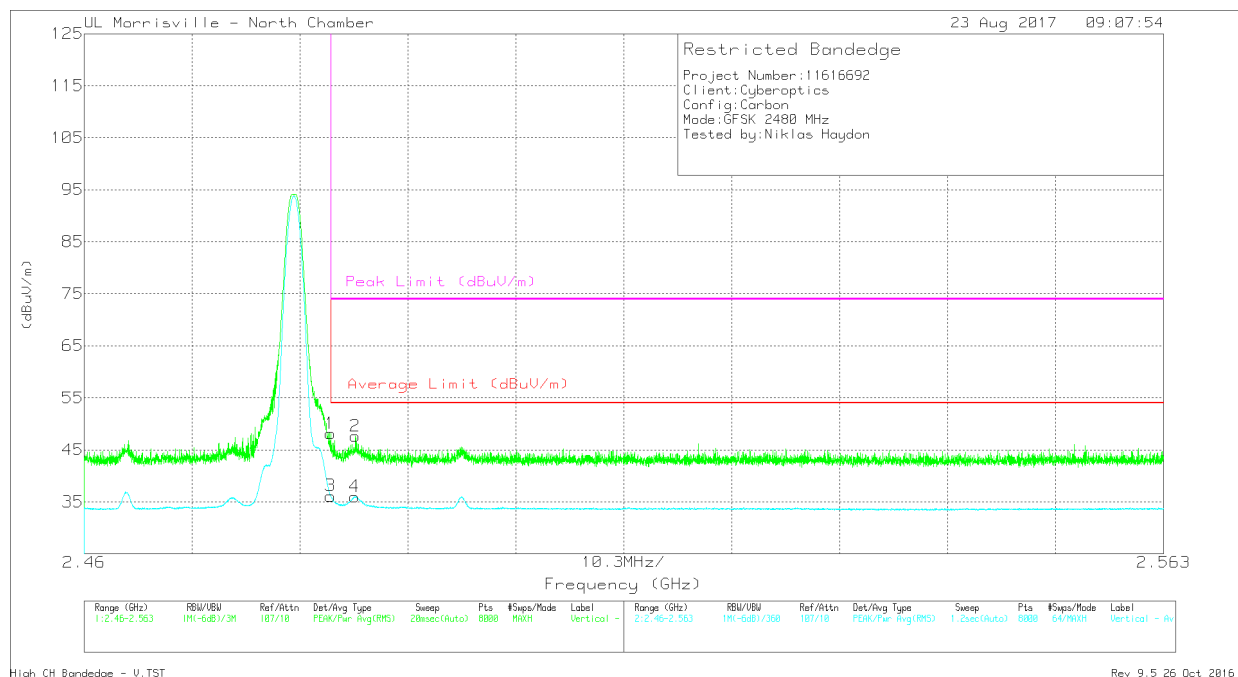
Marker	Frequency (GHz)	Meter Reading (dBUV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBUV/m)	Average Limit (dBUV/m)	Margin (dB)	Peak Limit (dBUV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.59	Pk	32.3	-23.8	46.09	-	-	74	-27.91	32	198	H
2	* 2.484	38.19	Pk	32.3	-23.8	46.69	-	-	74	-27.31	32	198	H
3	* 2.484	27.55	V1TR	32.3	-23.8	36.05	54	-17.95	-	-	32	198	H
4	* 2.486	27.35	V1TR	32.3	-23.8	35.85	54	-18.15	-	-	32	198	H

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

Pk - Peak detector

V1TR: VB=1/Ton, AVG where: Ton is packet duration

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



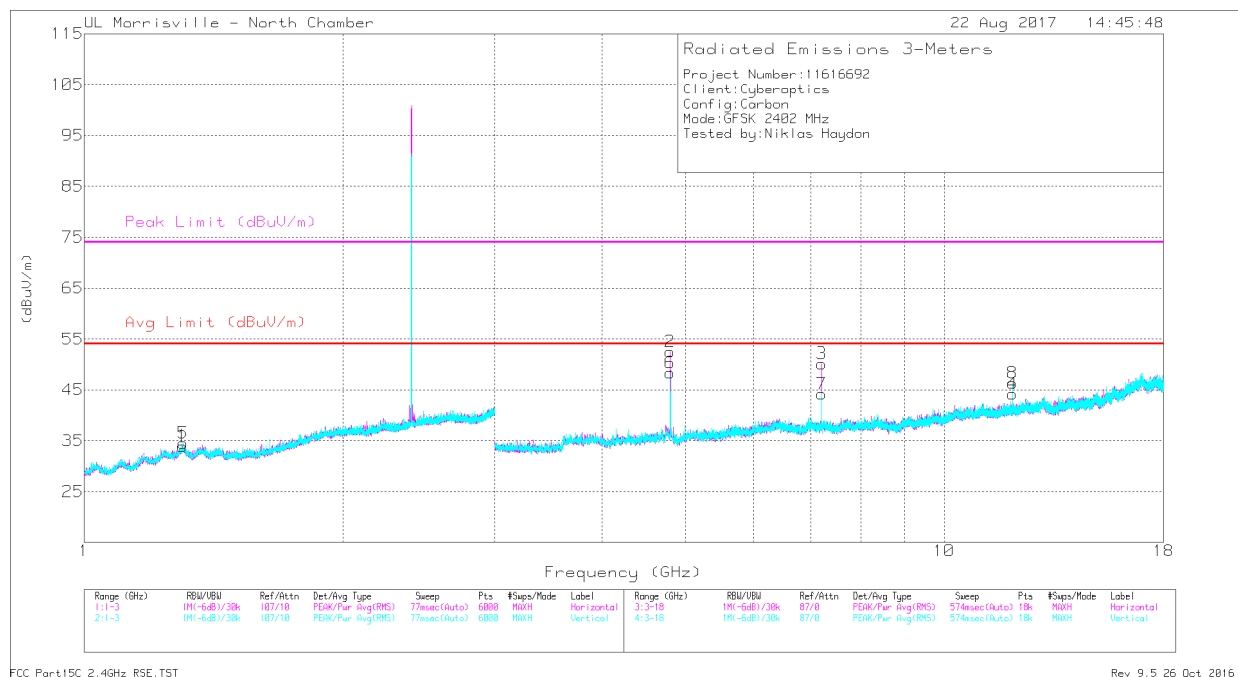
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.64	Pk	32.3	-23.8	48.14	-	-	74	-25.86	31	217	V
2	* 2.486	39.12	Pk	32.3	-23.8	47.62	-	-	74	-26.38	31	217	V
3	* 2.484	27.65	V1TR	32.3	-23.8	36.15	54	-17.85	-	-	31	217	V
4	* 2.486	27.5	V1TR	32.3	-23.8	36	54	-18	-	-	31	217	V

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

Pk - Peak detector

V1TR: VB=1/Ton, AVG where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS



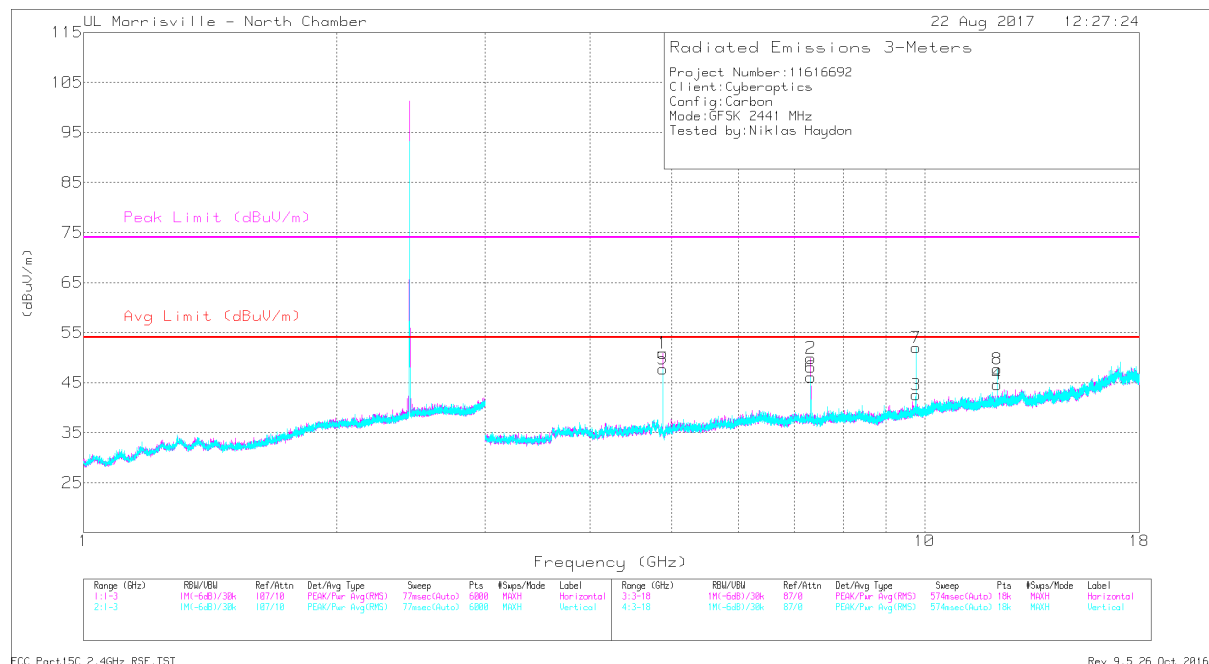
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.301	37.09	PK-U	29.3	-25.2	41.19	-	-	74	-32.81	331	235	H
	* 1.301	24.91	V1TR	29.3	-25.2	29.01	54	-24.99	-	-	331	235	H
2	* 4.804	52.48	PK-U	34.1	-31.1	55.48	-	-	74	-18.52	6	111	H
	* 4.804	49.11	V1TR	34.1	-31.1	52.11	54	-1.89	-	-	6	111	H
4	* 12.009	37.06	PK-U	38.7	-25.5	50.26	-	-	74	-23.74	338	159	H
	* 12.011	27.35	V1TR	38.7	-25.5	40.55	54	-13.45	-	-	338	159	H
5	* 1.302	36.45	PK-U	29.3	-25.1	40.65	-	-	74	-33.35	71	280	V
	* 1.301	24.81	V1TR	29.3	-25.2	28.91	54	-25.09	-	-	71	280	V
6	* 4.804	48.25	PK-U	34.1	-31.1	51.25	-	-	74	-22.75	11	246	V
	* 4.804	43.65	V1TR	34.1	-31.1	46.65	54	-7.35	-	-	11	246	V
8	* 12.011	39.64	PK-U	38.7	-25.5	52.84	-	-	74	-21.16	55	127	V
	* 12.011	31.38	V1TR	38.7	-25.5	44.58	54	-9.42	-	-	55	127	V
3	7.206	43.94	Pk	35.6	-29.4	50.14	-	-	-	-	0-360	199	H
7	7.206	37.98	Pk	35.6	-29.4	44.18	-	-	-	-	0-360	102	V

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

Pk - Peak detector

PK-U: Maximum Peak

V1TR: VB=1/Ton, AVG where: Ton is packet duration



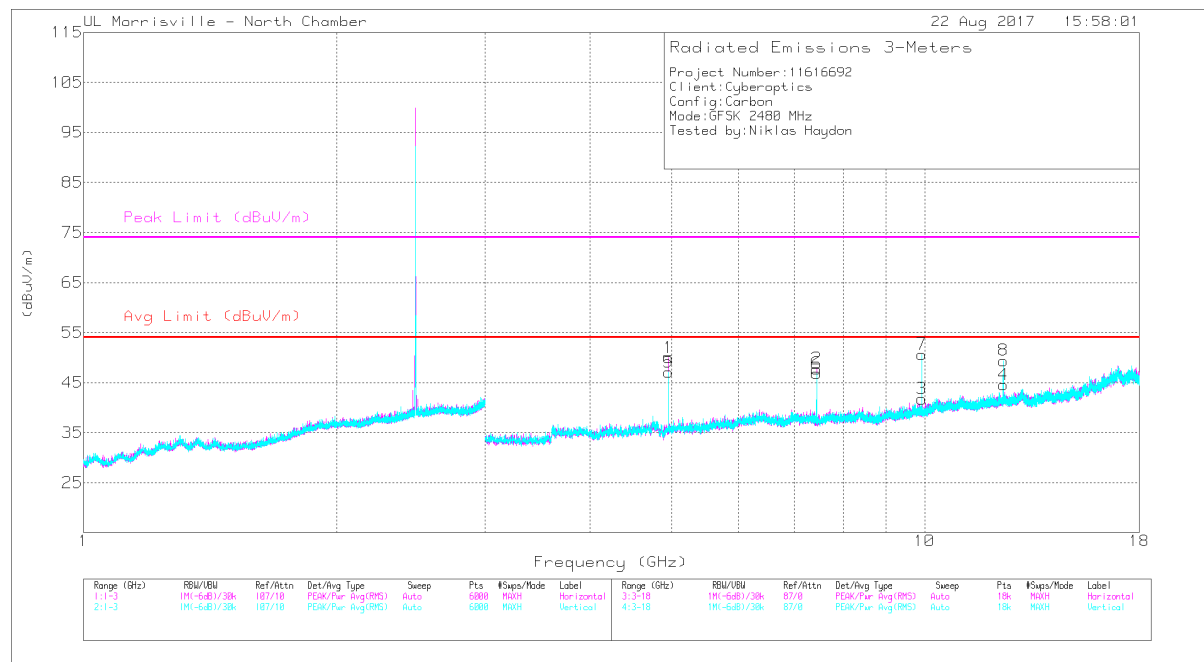
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.882	49.76	PK-U	34	-31	52.76	-	-	74	-21.24	7	106	H
	* 4.882	46.58	V1TR	34	-31	49.58	54	-4.42	-	-	7	106	H
2	* 7.322	46.34	PK-U	35.6	-28.6	53.34	-	-	74	-20.66	4	382	H
	* 7.323	40.83	V1TR	35.6	-28.6	47.83	54	-6.17	-	-	4	382	H
4	* 12.204	38.51	PK-U	38.9	-26.4	51.01	-	-	74	-22.99	352	191	H
	* 12.206	29.05	V1TR	38.9	-26.4	41.55	54	-12.45	-	-	352	191	H
5	* 4.882	46.62	PK-U	34	-31	49.62	-	-	74	-24.38	0	194	V
	* 4.882	42.01	V1TR	34	-31	45.01	54	-8.99	-	-	0	194	V
6	* 7.324	46.37	PK-U	35.6	-28.6	53.37	-	-	74	-20.63	44	318	V
	* 7.323	40.45	V1TR	35.6	-28.6	47.45	54	-6.55	-	-	44	318	V
8	* 12.206	40.82	PK-U	38.9	-26.4	53.32	-	-	74	-20.68	42	159	V
	* 12.206	33.12	V1TR	38.9	-26.4	45.62	54	-8.38	-	-	42	159	V
3	9.765	32.78	Pk	36.8	-27	42.58	-	-	-	-	0-360	103	H
7	9.765	42.16	Pk	36.8	-27	51.96	-	-	-	-	0-360	199	V

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

Pk - Peak detector

PK-U: Maximum Peak

V1TR: VB=1/Ton, AVG where: Ton is packet duration



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/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	* 4.96	51.89	PK-U	34.1	-31.8	54.19	-	-	74	-19.81	4	275	H
	* 4.96	48.48	V1TR	34.1	-31.8	50.78	54	-3.22	-	-	4	275	H
2	* 7.439	44.32	PK-U	35.6	-28.5	51.42	-	-	74	-22.58	24	178	H
	* 7.44	38.1	V1TR	35.6	-28.6	45.1	54	-8.9	-	-	24	178	H
4	* 12.401	37.47	PK-U	38.9	-26.2	50.17	-	-	74	-23.83	348	217	H
	* 12.401	28.11	V1TR	38.9	-26.2	40.81	54	-13.19	-	-	348	217	H
5	* 4.96	47.24	PK-U	34.1	-31.8	49.54	-	-	74	-24.46	7	198	V
	* 4.96	42.68	V1TR	34.1	-31.8	44.98	54	-9.02	-	-	7	198	V
6	* 7.44	44.41	PK-U	35.6	-28.5	51.51	-	-	74	-22.49	41	336	V
	* 7.44	38.31	V1TR	35.6	-28.6	45.31	54	-8.69	-	-	41	336	V
8	* 12.399	40.83	PK-U	38.9	-26.2	53.53	-	-	74	-20.47	69	110	V
	* 12.401	32.65	V1TR	38.9	-26.2	45.35	54	-8.65	-	-	69	110	V
3	9.92	32.26	Pk	37	-27.5	41.76	-	-	-	-	0-360	102	H
7	9.919	41.16	Pk	37	-27.5	50.66	-	-	-	-	0-360	102	V

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

Pk - Peak detector

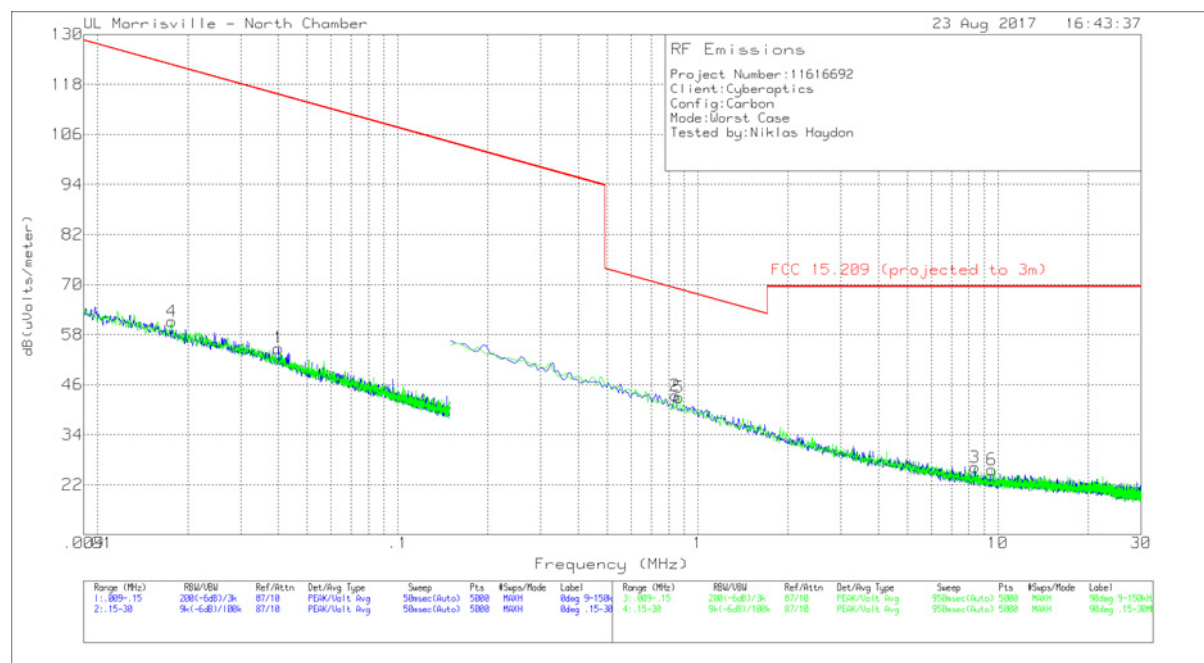
PK-U: Maximum Peak

V1TR: VB=1/Ton, AVG where: Ton is packet duration

10.3. WORST-CASE BELOW 1 GHz SPURIOUS EMISSIONS 9 kHz TO 30 MHz (WORST-CASE CONFIGURATION)

Note: All measurements were made at a test distance of 3 m. The limits in the plots and tabular data are the FCC/IC limits extrapolated from the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to the measurement distance 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 $40 \cdot \log$ (specification distance / test distance).

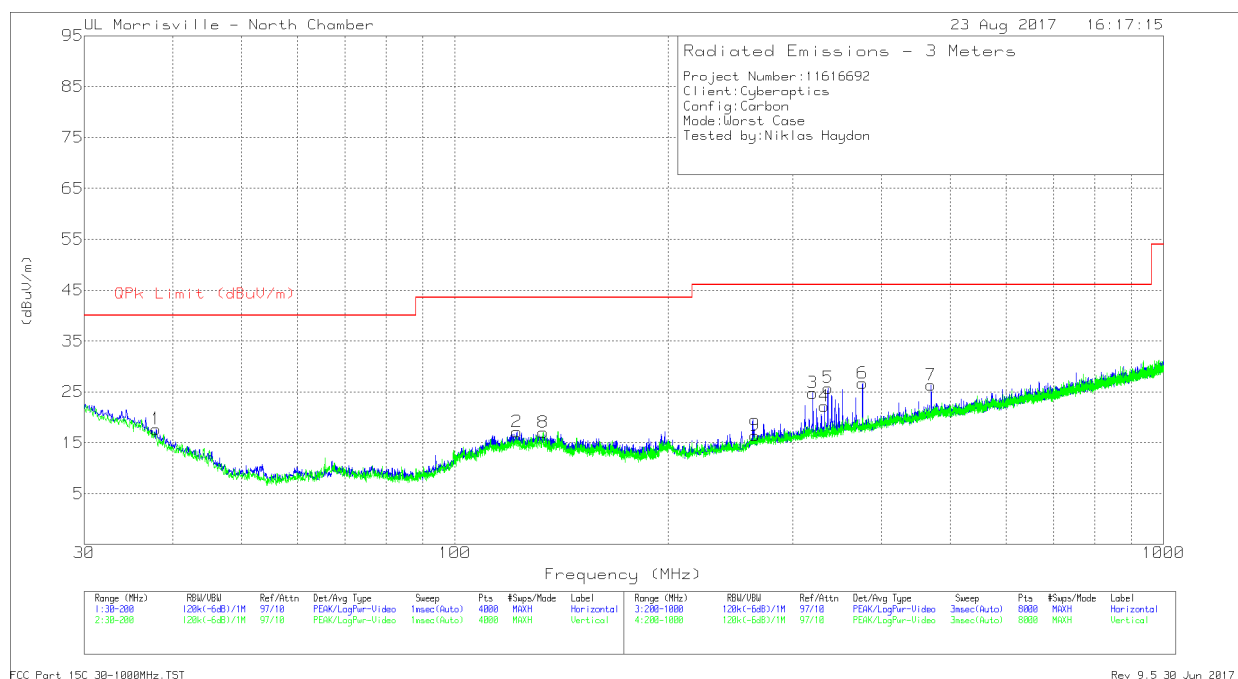
Although these tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against an open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 (projected to 3m)	Margin (dB)	Azimuth (Degs)
4	.01768	46.07	Pk	15	.1	61.17	122.66	-61.49	0-360
1	.04008	42.27	Pk	12.4	.1	54.77	115.55	-60.78	0-360
2	.84264	32.62	Pk	10.7	.1	43.42	69.09	-25.67	0-360
5	.86652	32	Pk	10.8	.1	42.9	68.85	-25.95	0-360
3	8.39595	15.13	Pk	10.6	.5	26.23	69.54	-43.31	0-360
6	9.54835	14.64	Pk	10.5	.5	25.64	69.54	-43.9	0-360

Pk - Peak detector

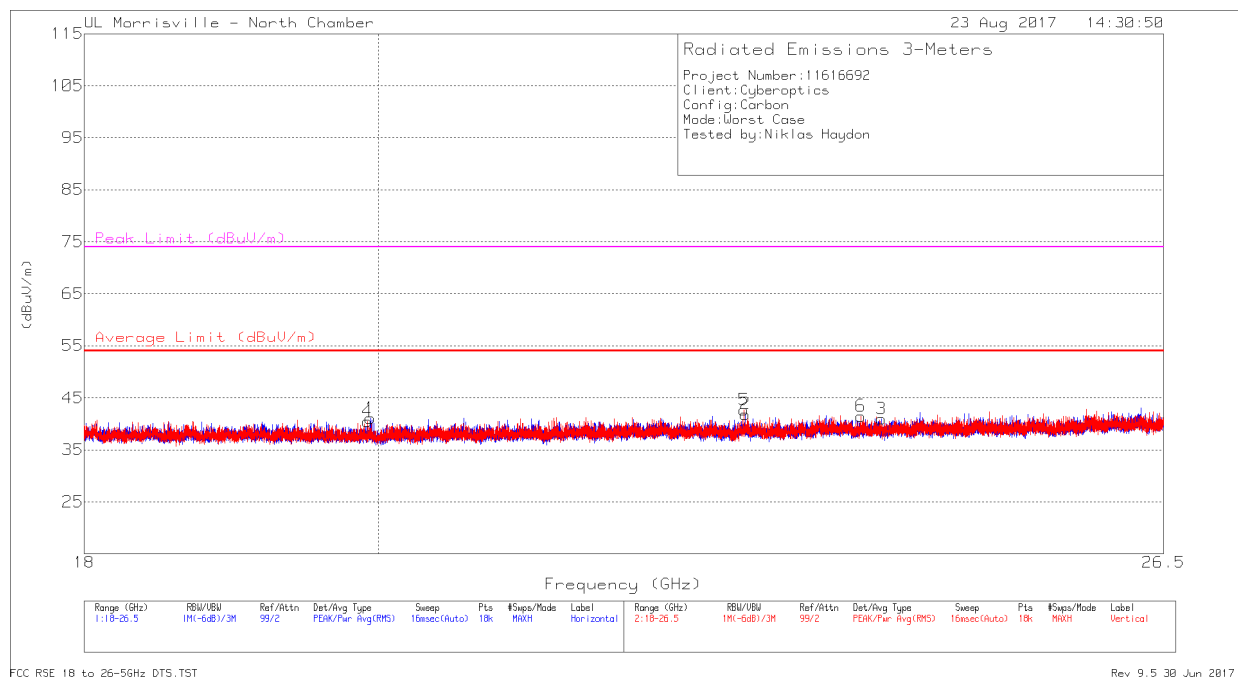
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 37.907	29.3	Pk	20.1	-31.7	17.7	40	-22.3	0-360	299	H
2	* 122.3339	29.69	Pk	18.2	-30.7	17.19	43.52	-26.33	0-360	199	H
8	* 133.2592	29.62	Pk	18.1	-30.7	17.02	43.52	-26.5	0-360	102	V
4	* 331.9171	32.8	Pk	18.7	-29.3	22.2	46.02	-23.82	0-360	102	H
9	* 265.1085	28.66	Pk	17.5	-29.7	16.46	46.02	-29.56	0-360	302	V
3	319.9156	35.48	Pk	18.7	-29.4	24.78	46.02	-21.24	0-360	102	H
5	336.0177	36.07	Pk	18.9	-29.2	25.77	46.02	-20.25	0-360	102	H
6	376.0229	35.88	Pk	19.8	-29	26.68	46.02	-19.34	0-360	199	H
7	469.9351	33.16	Pk	21.8	-28.6	26.36	46.02	-19.66	0-360	199	H

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

SPURIOUS EMISSIONS 18 TO 26 GHz (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	* 19.943	49.35	Pk	33	-41.3	41.05	54	-12.95	74	-32.95	0-360	251	H
2	* 22.812	49.08	Pk	33.7	-40.9	41.88	54	-12.12	74	-32.12	0-360	251	H
3	* 23.951	47.58	Pk	33.9	-40.5	40.98	54	-13.02	74	-33.02	0-360	102	H
4	* 19.922	48.75	Pk	33	-41.3	40.45	54	-13.55	74	-33.55	0-360	103	V
5	* 22.799	49.87	Pk	33.7	-40.9	42.67	54	-11.33	74	-31.33	0-360	148	V
6	* 23.774	47.89	Pk	34	-40.4	41.49	54	-12.51	74	-32.51	0-360	103	V

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