

Electromagnetic Compatibility Test Report

Prepared in accordance with

FCC Part 15C, RSS-210 Issue 7 and ANSI C63.10

On

Commercial Lighting Controller

C-IT.04

Artemis Automation, Inc.



148 Rte. 202

Somers, NY 10589

Prepared by:

TUV Rheinland of North America, Inc.

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Client:	Artemis Automation, Inc. 148 Rte. 202 Somers, NY 10589		James S. Bernardo (914) 248-8900 / (404) 591-7955 jbernardo@artemisautomation.com	
Identification:	Commercial Lighting Controller	Serial No.:	0021	
Test item:	C-IT.04	Date tested:	5/6/11	
Testing location:	TUV Rheinland of North America 12 Commerce Road Newtown, CT 06470-1607 U.S.A.		Tel: (203) 426-0888 Fax: (203) 426-4009	
Test specification:	Emissions: FCC Part 15, Subpart C, RSS-210 Issue 7: FCC Parts 15.107(c), 15.207(c) and RSS-GEN 7.2.2 FCC Parts 15.247(d), 15.205, 15.209, 15.215(c) and RSS-210 A8.5 and RSS-GEN 7.2.1 FCC Part 15.247(a)(2) and RSS-210 A1.1.3, FCC Part 15.247 and RSS-210 Annex 8, FCC Part 15.247(b)(3) and RSS-210 A8.4(4), FCC Part 15.247(d) and RSS-210 2.2, FCC Parts 15.109(a) and RSS-210 2.2, 2.6,A8.5, RSS-GEN 7.2.3.2 FCC Parts 15.247(i) and RSS-102, Issue 4,			
Test Result	The above product was found to be Compliant to the above test standard(s)			
tested by: David Hollis		reviewed by: Randy Sorrenti		
4 November 2011		4 November 2011		
<i>Signature</i>		<i>Signature</i>		
Other Aspects:	None			
Abbreviations: OK, Pass, Compliant, Complies = passed Fail, Not Compliant, Does Not Comply = failed N/A = not applicable				
 US5112		 NVLAP CODE 200111-0		Industry Canada 3466D-1

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1 General Information

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Part 15C, RSS-210 Issue 7 and ANSI C63.10 based on the results of testing performed on the Commercial Lighting Controller, Model Number C-IT.04, manufactured by Artemis Automation, Inc. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

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1.3 Summary of Test Results

Applicant	Artemis Automation, Inc. 148 Rte. 202 Somers, NY 10589	Tel	(914) 248-8900	Contact	James S. Bernardo
		Fax	(404) 591-7955	e-mail	jberardo@artemisautomation.com
Description	Commercial Lighting Controller	Model:		C-IT.04	
Serial Number	0021	Test Voltage/Freq.		120/60 240/60	
Test Date Completed:	5/6/11	Test Engineer		David Hollis	
Standards	Description	Severity Level or Limit		Criteria	Test Result
FCC Part 15, Subpart C Standard	Radio Frequency Devices-Subpart C: Intentional Radiators	See specific parts below		See Below	Complies
RSS-210 Issue 7 Standard	Low-Power Licence-exempt Radiocommunication Devices Category I Equipment	See specific parts below		See Below	Complies
FCC Part 15.247 and RSS-210 Annex 8	Operation within the band 2400 to 2483.5 MHz	See specific parts below		Below Limit	Complies
FCC Parts 15.247(d), 15.205, 15.209, 15.215(c) and RSS-210 A8.5 and RSS-GEN 7.2.1	Out-of-Band Spurious and Harmonic Emissions (EUT in Transmit Mode)	Below the applicable limits		Below Limit	Complies
FCC Parts 15.107(c), 15.207(c) and RSS-GEN 7.2.2	Conducted Emissions on AC Mains	Below limit of section 15.207		NA	Complies
FCC Part 15.247(d) and RSS-210 2.2	Band Edge Radiated Emission	Per requirements of the standard		Below Limit	Complies
FCC Part 15.247(b)(3) and RSS-210 A8.4(4)	Conducted Output Power	Shall not exceed 1.0 Watts		Below Limit	Complies
FCC Part 15.247(a)(2) and RSS-210 A1.1.3	Occupied Bandwidth	6 dB \geq 500 kHz 99% BW \leq 0.5% of center freq.		Within Limit	Complies
FCC Part 15.247(e) and RSS-210, Section A8.2(b)	Peak Power Spectral Density	\leq 8 dBm in any 3 kHz		Below Limit	Complies
FCC Part 15.31(e)	Voltage Requirements	Output at 0.85% and 1.15% of Nominal Voltage		Below Limit	Complies
FCC Parts 15.109(a) and RSS-210 2.2, 2.6, A8.5, RSS-GEN 7.2.3.2	Radiated Emissions while EUT in Receive Mode	Below limit of section 15.109(a) Class B		Below Limit	Complies
FCC Parts 15.247(i) and RSS-102, Issue 4	RF Exposure	SAR or MPE Requirements		Below Limit	Complies (without testing)

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2 Laboratory Information

2.1 *Accreditations and Endorsements*

2.1.1 US Federal Communications Commission

TUV Rheinland of North America, located at 12 Commerce Road, Newtown, CT 06470-1607 is accredited by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No US5112). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

This program is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Lab code: 200111-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Industry Canada

Registration No.: 3466D-1. The OATS has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.10-2009.

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2.1.4 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: RAW = Measured level before correction (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V/m}}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dB μ V/m)

$$25 \text{ dB}\mu\text{V/m} + 17.5 \text{ dB} - 20 \text{ dB} + 1.0 \text{ dB} = 23.5 \text{ dB}\mu\text{V/m}$$

2.2 Measurement Uncertainty Emissions

	U_{lab}	U_{cispr}
Radiated Disturbance @ 10m		
30 MHz – 1,000 MHz	3.2 dB	5.2 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	2.4 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.5 dB

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

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2.3 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

2.4 Measurement Equipment Used

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
Power Supply	California Instruments	500iX	57337	04/07/11	04/07/12	All
Receiver	Hewlett Packard	HP 8546A, 85460A	3520A00245, 3448A00212	04/06/11	04/06/12	CE, DP, RE, LAB
Receiver	Hewlett Packard	HP 8546A, 85460A	3448A00304, 3325A00134	12/09/10	12/09/11	CE, DP,RE, OATS
LISN	Schwarzbeck	NSLK 8126A (4 x 25A)	8126278	08/11/09	08/11/11	CE
Antenna	Sunol Sciences	JB3	A022707	02/04/11	02/04/13	RE,RI
Antenna	Chase	CBL6112	22238	05/24/10	05/24/12	RE

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3 Product Information

3.1 Product Description

See Description in the test plan in Appendix A of this report

3.2 Equipment Modifications

No modifications were required to achieve compliance with the standards listed in this test report.

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4 Radiated Emissions

4.1 Spurious Emissions Outside the band – FCC 15.247(d), RSS-210 A8.5

In any 100kHz 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 desired power, based on either RF conducted or radiated measurements. Conducted antenna port measurements are provided below to show that the EUT meets these requirements at the band edges.

4.1.1 Over View of Test

Results	Complies (as tested per this report)				Date	5/5/11	
Standard	FCC Parts 15.205, 15.209, 15.215©, 15.247(d), RSS-210 A8.5, and RSS-GEN 7.2.1						
Product Model	C-IT.04			Serial#	0021		
Test Set-up	Tested on a 3m OATS. See test plans for details.						
EUT Powered By	120/60	Temp	23°C	Humidity	35%	Pressure	1000mbar
Perf. Criteria	(Below Limit)		Perf. Verification		Readings Under Limit		
Mod. To EUT	None		Test Performed By		David Hollis		

4.1.2 Test Procedure

Testing was performed in accordance with 47 CFR Part 15, ANSI C63.10:2009, RSS-GEN Issue 2. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.1.3 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

4.1.4 Final Test

All final radiated spurious emissions measurements were below (in compliance) the limits.

The worst case emissions are shown below. All other emissions are on file at TUV Rheinland.

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4.1.4.1 Emissions Outside the Frequency Band

In any 100kHz 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 desired power, based on either RF conducted or radiated measurements. Conducted antenna port measurements are provided below to show that the EUT meets these requirements at the band edges.

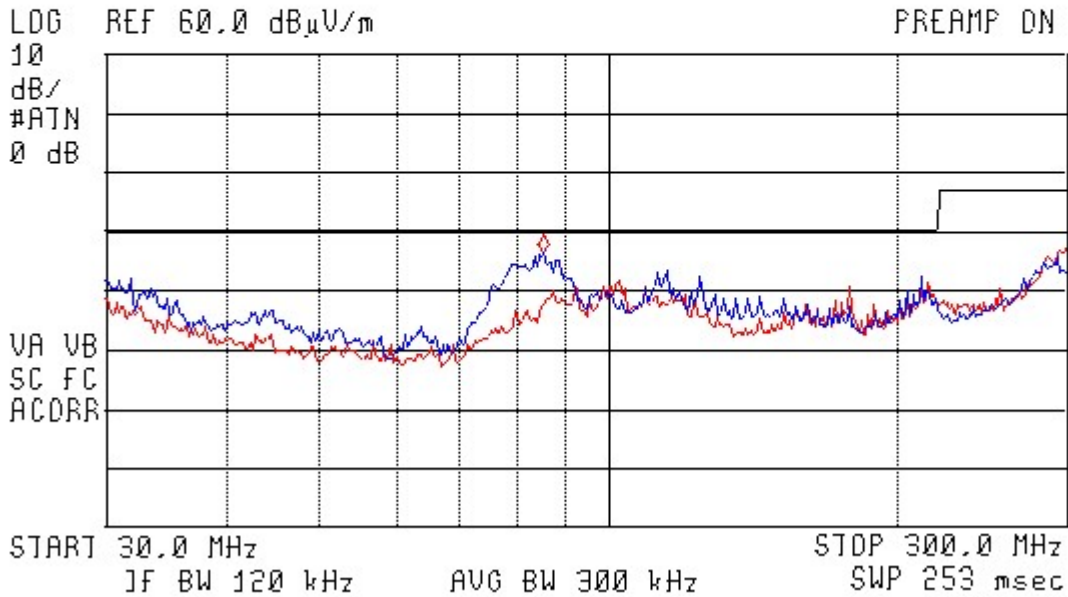
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Radiated Emissions 30MHz to 300MHz

Horizontal/Vertical

09:23:28 MAY 05, 2011
ARTEMIS AUTOMATION MODEL C-11.04

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 87.4 MHz
26.63 dB μ V/m



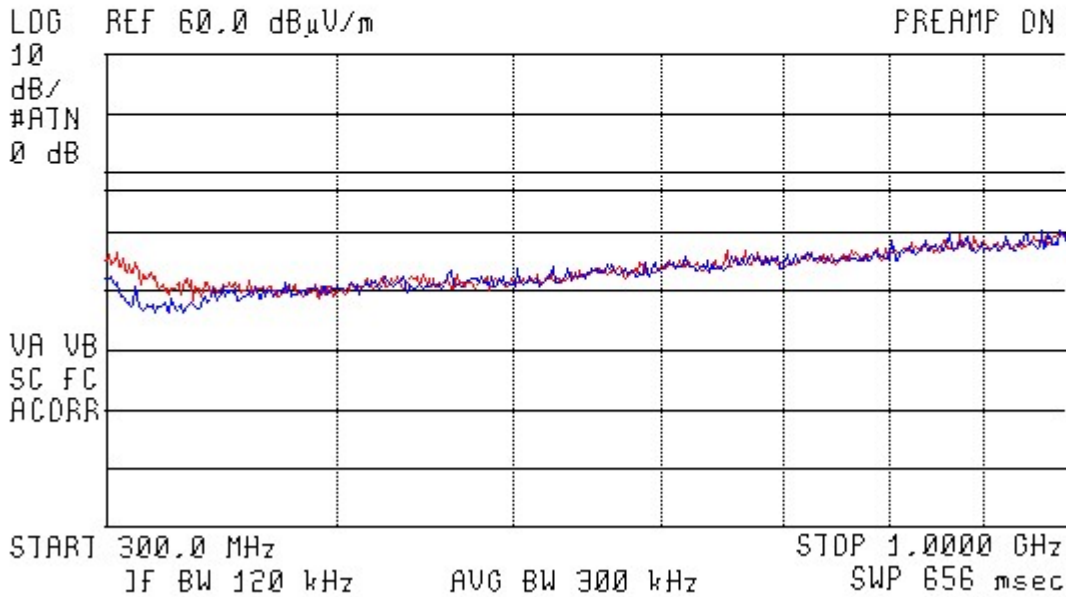
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Radiated Emissions 303MHz to 1000MHz

Horizontal/Vertical

09:26:44 MAY 05, 2011
ARTEMIS AUTOMATION MODEL C-11.04

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



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Final Data

Radiated Emissions Measurements										
Standard:		FCC Part 15.247(d)/FCC Part 15.209/ICES-003 Issue 4				PRESCAN or FINAL:		Final	Date: 5/5/11	
Device Tested:		Artemis Automation Model C-IT.04				Distance:		3m		
Measured Level										
Meas #	Freq (MHz)	Peak	Quasi-Peak	Average	Antenna + Cable Correction Factor (included in measured levels)	Antenna Polarization	Angle (degrees)	Antenna Height (meters)	Comment	
1	32.0580	36.92	25.77	18.37	16.52	Vertical	90	1.50		
2	86.9325	34.38	23.72	16.70	9.34	Vertical	90	1.50		
3	118.1625	30.73	22.80	17.70	12.96	Vertical	90	1.50		
4	127.7595	25.13	15.83	14.51	12.51	Vertical	70	1.30		
5	218.3375	21.46	15.79	11.74	11.14	Vertical	70	1.30		
6	300.7000	22.96	18.41	14.70	14.33	Horizontal	0	2.10		
Tested by: David Hollis										
TUV Rheinland of North America, Inc. 12 Commerce Road Newtown, CT 06470 Tel:(203) 426-0888 Fax: (203) 4										

RE22_B.xlt Revised 21OCT05

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4.2 Band Edge

4.2.1 Test Over View

Results	Complies (as tested per this report)				Date	5/6/11	
Standard	FCC Part 15.247(d), RSS 210 2.2						
Product Model	C-IT.04			Serial#	0021		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	120/60	Temp	23° C	Humidity	35%	Pressure	1000mbar
Perf. Criteria	(Below Limit)		Perf. Verification		Readings Under Limit		
Mod. to EUT	None		Test Performed By		David Hollis		

4.2.2 Test Procedure

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

4.2.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Radiated Emissions test.

4.2.4 Final Test

The EUT met the performance criteria requirement as specified in the standards.

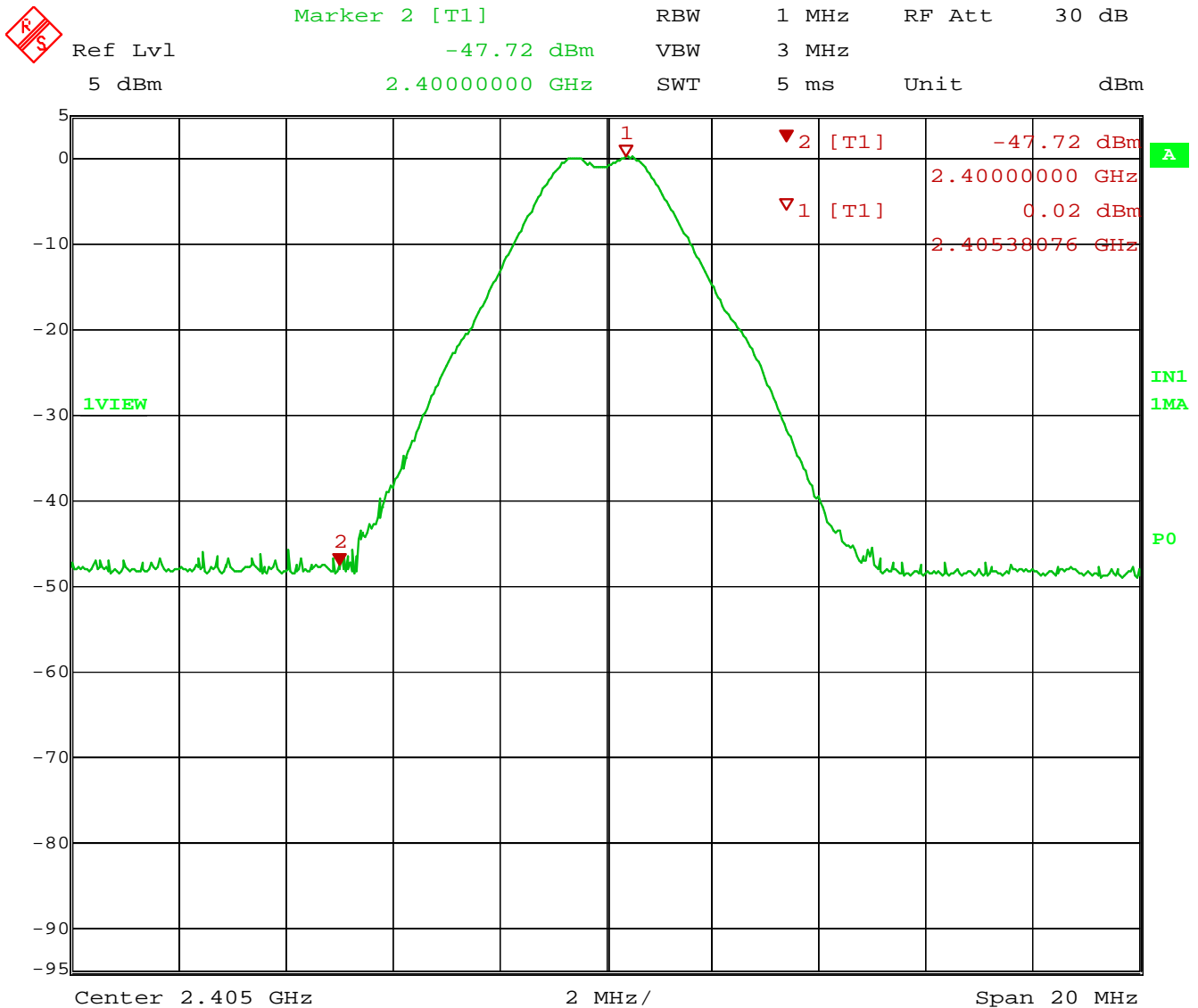
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Notes: Measured using the Peak detector. The band edge marker is at 2.4 GHz (Marker 2).

The nearest restricted band (2390MHz) is 10 MHz below the band edge

The EUT is compliant with the rules.

Figure 1: Lower Band Edge Measurement



Date: 4.MAY.2011 15:54:51

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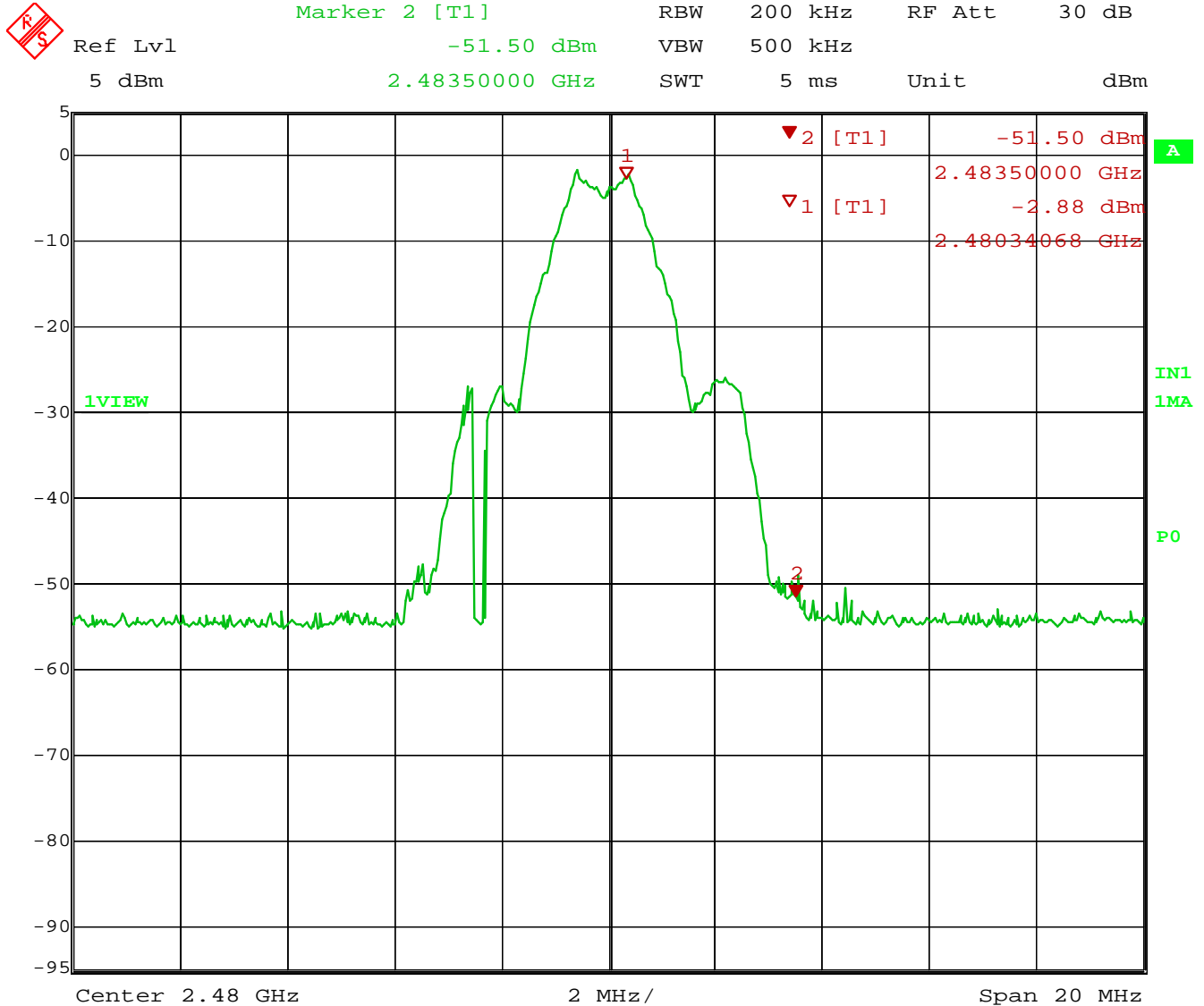
Note: Measured using the peak and average detectors.

Band edge (F1) at 2483.5 MHz is also the start of a restricted band, so the rules of 15.205 apply.

At the band edge of 2483.5 MHz: Peak = 55.5 dBμV/m which is 19.5 dB below the 74 dBμV/m limit.

Average = 40.1 dBμV/m which is 13.9 dB below the 54 dBμV/m limit.

The EUT is compliant with the rules.



Date: 4.MAY.2011 15:11:09

Figure 2: Upper Band Edge Measurement

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4.1 Conducted Emissions on AC Mains

This test measures the electromagnetic levels of spurious signals generated by the EUT on the AC power line that may affect the performance of other near by electronic equipment.

4.1.1 Over View of Test

Results	Complies (as tested per this report)					Date	5/3/11		
Standard	FCC Parts 15.107(c), 15.207(c) and RSS-GEN 7.2.2								
Product Model	C-IT.04				Serial#	0021			
Test Set-up	Tested in shielded room. EUT placed on table, see test plans for details								
EUT Powered By	120/60	240/60	Temp	23° C	Humidity	35%	Pressure	1000mbar	
Frequency Range	150 kHz – 30 MHz								
Perf. Criteria	(Below Limit)			Perf. Verification	Readings Under Limit				
Mod. to EUT	None			Test Performed By	David Hollis				

4.1.2 Test Procedure

Conducted and FCC emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration. Further conducted emission tests were performed per the procedures stated in the other emissions standards listed in this report.

The frequency range from 150kHz – 30MHz was investigated for conducted emissions.

Conducted Emissions measurements were performed in the shielded room using procedures specified in the test plan and standard.

4.1.3 Final Test

All final conducted emissions measurements were below (in compliance) the limits.

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4.1.4 Final Graphs

NOTES:

Conducted Emissions @ 120V/60Hz

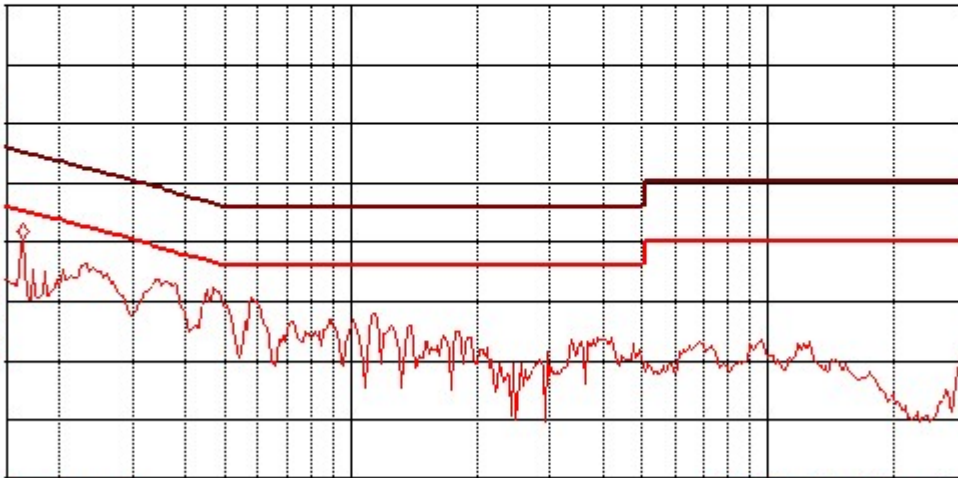
Line

11:38:56 MAY 03 2011
 ARTENIS AUTOMATION MODEL C-1T.04 120/60 LINE
 ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 170 kHz
 50.05 dB μ V/m

LOG REF 90.0 dB μ V/m

10
dB/
ATN
10 dB

VA SB
SC FC
ACORR



START 150 kHz
 L #1F BW 9.0 kHz
 AVG BW 30 kHz
 STOP 30.00 MHz
 SUP 2.49 sec

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NOTES:

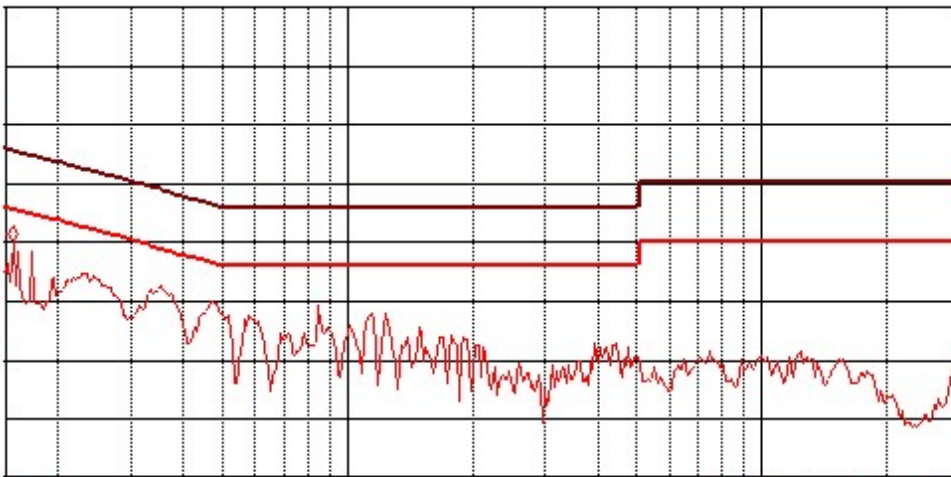
Conducted Emissions @ 120V/60Hz
Neutral

11:49:03 MAY 03 2011
ARTENIS AUTOMATION MODEL C-IT.04 120/60 NEUTRAL
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 160 kHz
49.98 dB μ V/m

LOG REF 90.0 dB μ V/m

10
dB/
ATN
10 dB

VA SB
SC FC
ACORR



START 150 kHz STOP 30.00 MHz
#JF BW 9.0 kHz AVG BW 30 kHz SUP 2.49 sec

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NOTES:

Conducted Emissions @ 240V/60Hz

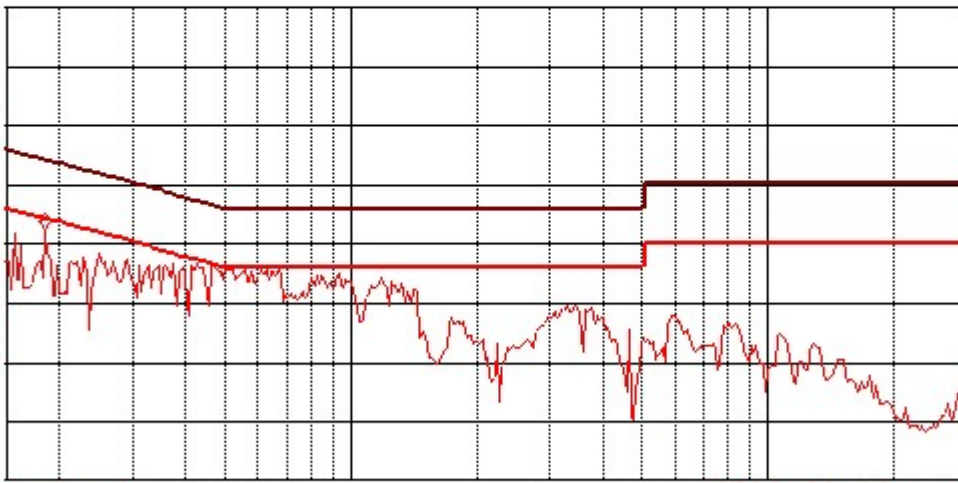
Line

11:06:15 MAY 03 2011
 ARTENIS AUTOMATION MODEL C-1T.04 240/60 LINE
 ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 190 kHz
 52.21 dB μ V/m

LOG REF 90.0 dB μ V/m

10
dB/
ATN
10 dB

VA SB
SC FC
ACORR



START 150 kHz
 #1F BW 9.0 kHz
 AVG BW 30 kHz
 STOP 30.00 MHz
 SUP 2.49 sec

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NOTES:

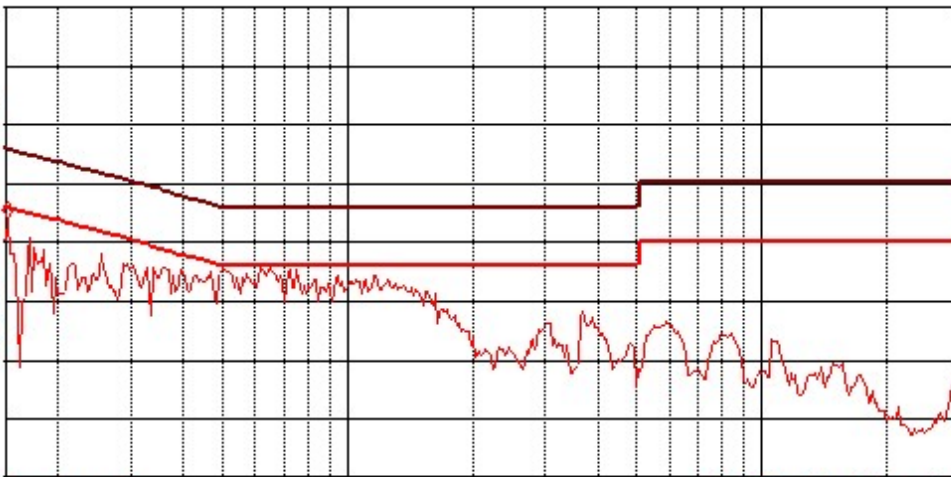
Conducted Emissions @ 240V/60Hz
Neutral

11:19:08 MAY 03 2011
ARTENIS AUTOMATION MODEL C-IT.04 240/60 NEUTRAL
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 150 kHz
54.00 dB μ V/m

LOG REF 90.0 dB μ V/m

10
dB/
ATN
10 dB

VA SB
SC FC
ACORR



START 150 kHz
#JF BW 9.0 kHz
AUG BW 30 kHz
STOP 30.00 MHz
SUP 2.49 sec

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4.1.5 Final Tabulated Data at 120V/60Hz

Conducted Emissions Measurements												
Standard: EN 5522:2006 + A2:2007 Class B/FCC Part 15.107(a)/ICES-003 Issue 4										Date: 5/2/11		
Device Tested: Artemis Automation Model C-IT.04 240/60												
Signal Num	Freq	Peak Amp	QP Amp	Avg Amp	QP Limit	Avg Limit	Conductor	QP Δ	QP Result	Avg Δ	Average Result	Mode
	MHz	dBuV	dBuV	dBuV	dBuV	dBuV		dB		dB		
1	0.1591	54.17	46.64	38.97	65.51	55.51	Line	-18.87	Complied	-16.54	Complied	
2	0.2370	47.51	44.29	40.96	62.20	52.20	Line	-17.91	Complied	-11.24	Complied	
3	0.3536	44.63	42.46	39.11	58.88	48.88	Line	-16.42	Complied	-9.77	Complied	
4	0.4846	43.06	40.70	37.40	56.26	46.26	Line	-15.56	Complied	-8.86	Complied	
5	0.5925	41.09	37.89	34.50	56.00	46.00	Line	-18.11	Complied	-11.50	Complied	
6	1.1395	39.38	37.15	34.50	56.00	46.00	Line	-18.85	Complied	-11.50	Complied	
7	0.1577	58.31	46.47	38.77	65.58	55.58	Neutral	-19.11	Complied	-16.81	Complied	
8	0.1883	47.21	41.42	35.16	64.11	54.11	Neutral	-22.69	Complied	-18.95	Complied	
9	0.2466	46.41	43.09	40.22	61.87	51.87	Neutral	-18.78	Complied	-11.65	Complied	
10	0.3608	43.33	41.33	37.84	58.71	48.71	Neutral	-17.38	Complied	-10.87	Complied	
11	0.4785	41.84	39.64	35.78	56.36	46.36	Neutral	-16.72	Complied	-10.58	Complied	
12	0.9010	38.18	36.18	32.91	56.00	46.00	Neutral	-19.82	Complied	-13.09	Complied	
13	1.2500	38.76	35.92	32.46	56.00	46.00	Neutral	-20.08	Complied	-13.54	Complied	
Tested by: David Hollis												
TUV Rheinland of North America, Inc. 12 Commerce Road Newtown, CT 06470 Tel:(203) 426-0888 Fax: (203) 426-4009												

CE11_1B.xlt Revised 13APR05

4.1.6 Final Tabulated Data at 240V/60Hz

Conducted Emissions Measurements												
Standard: EN 5522:2006 + A2:2007 Class B/FCC Part 15.107(a)/ICES-003 Issue 4										Date: 5/2/11		
Device Tested: Artemis Automation Model C-IT.04 240/60												
Signal Num	Freq	Peak Amp	QP Amp	Avg Amp	QP Limit	Avg Limit	Conductor	QP Δ	QP Result	Avg Δ	Average Result	Mode
	MHz	dBuV	dBuV	dBuV	dBuV	dBuV		dB		dB		
1	0.1542	58.18	49.09	39.41	65.77	55.77	Line	-16.68	Complied	-16.36	Complied	
2	0.1885	53.14	47.43	40.50	64.10	54.10	Line	-16.67	Complied	-13.60	Complied	
3	0.4337	48.10	45.26	40.05	57.18	47.18	Line	-11.92	Complied	-7.13	Complied	
4	0.4757	47.46	44.61	39.20	56.41	46.41	Line	-11.80	Complied	-7.21	Complied	
5	0.5572	46.64	43.82	37.24	56.00	46.00	Line	-12.18	Complied	-8.76	Complied	
6	0.6765	46.78	42.22	35.24	56.00	46.00	Line	-13.78	Complied	-10.76	Complied	
7	0.9411	46.19	41.13	37.95	56.00	46.00	Line	-14.87	Complied	-8.05	Complied	
8	1.1998	45.64	42.35	37.57	56.00	46.00	Line	-13.65	Complied	-8.43	Complied	
9	0.1571	54.17	47.76	37.34	65.61	55.61	Neutral	-17.85	Complied	-18.27	Complied	
10	0.1847	57.72	50.03	43.39	64.27	54.27	Neutral	-14.24	Complied	-10.88	Complied	
11	0.2571	49.69	44.87	42.09	61.52	51.52	Neutral	-16.65	Complied	-9.43	Complied	
12	0.5071	46.78	44.39	38.18	56.00	46.00	Neutral	-11.61	Complied	-7.82	Complied	
13	0.6570	46.64	43.37	37.91	56.00	46.00	Neutral	-12.63	Complied	-8.09	Complied	
14	0.7652	45.96	44.02	38.49	56.00	46.00	Neutral	-11.98	Complied	-7.51	Complied	
15	0.9544	45.05	41.50	35.51	56.00	46.00	Neutral	-14.50	Complied	-10.49	Complied	
16	1.1992	45.83	42.10	37.55	56.00	46.00	Neutral	-13.90	Complied	-8.45	Complied	
Tested by: David Hollis												
TUV Rheinland of North America, Inc. 12 Commerce Road Newtown, CT 06470 Tel:(203) 426-0888 Fax: (203) 426-4009												

CE11_1B.xlt Revised 13APR05

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5 Antenna Port Conducted Emissions

For conducted tests, the emissions were measured at the antenna port.

Testing was performed in accordance with 47 CFR Part 15, ANSI C63.10:2009, RSP-100 Issue 9. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

5.1 Conducted Output Power, FCC 15.247(b)(3) and RSS-210 A8.4(4)

5.1.1 For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

5.1.2 Test Over View

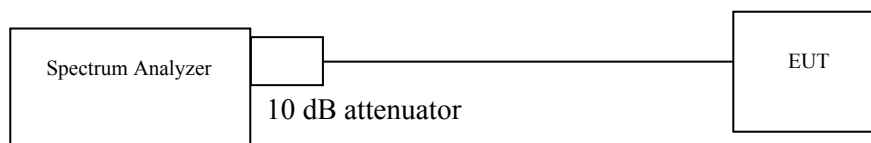
Results	Complies (as tested per this report)				Date	5/4/11	
Standard	FCC Part 15.247(b)(3) and RSS-210 A8.4(4)						
Product Model	C-IT.04			Serial#	0021		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	120/60	Temp	23° C	Humidity	35%	Pressure	1000mbar
Perf. Criteria	(Below Limit)			Perf. Verification	Readings Under Limit		
Mod. to EUT	None			Test Performed By	David Hollis		

5.1.3 Test Procedure

The peak output power was measured at the low, mid and high band frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The cable loss and the attenuator was measured and added in the reference level offset in the spectrum analyzer. The spectrum analyzer's resolution bandwidth was greater than the 20dB bandwidth of the modulated carrier and the video bandwidth was equal to the resolution bandwidth.

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Test Setup:



5.1.4 Deviations

There were no deviations from the test methodology listed in the test plan.

5.1.5 Final Test

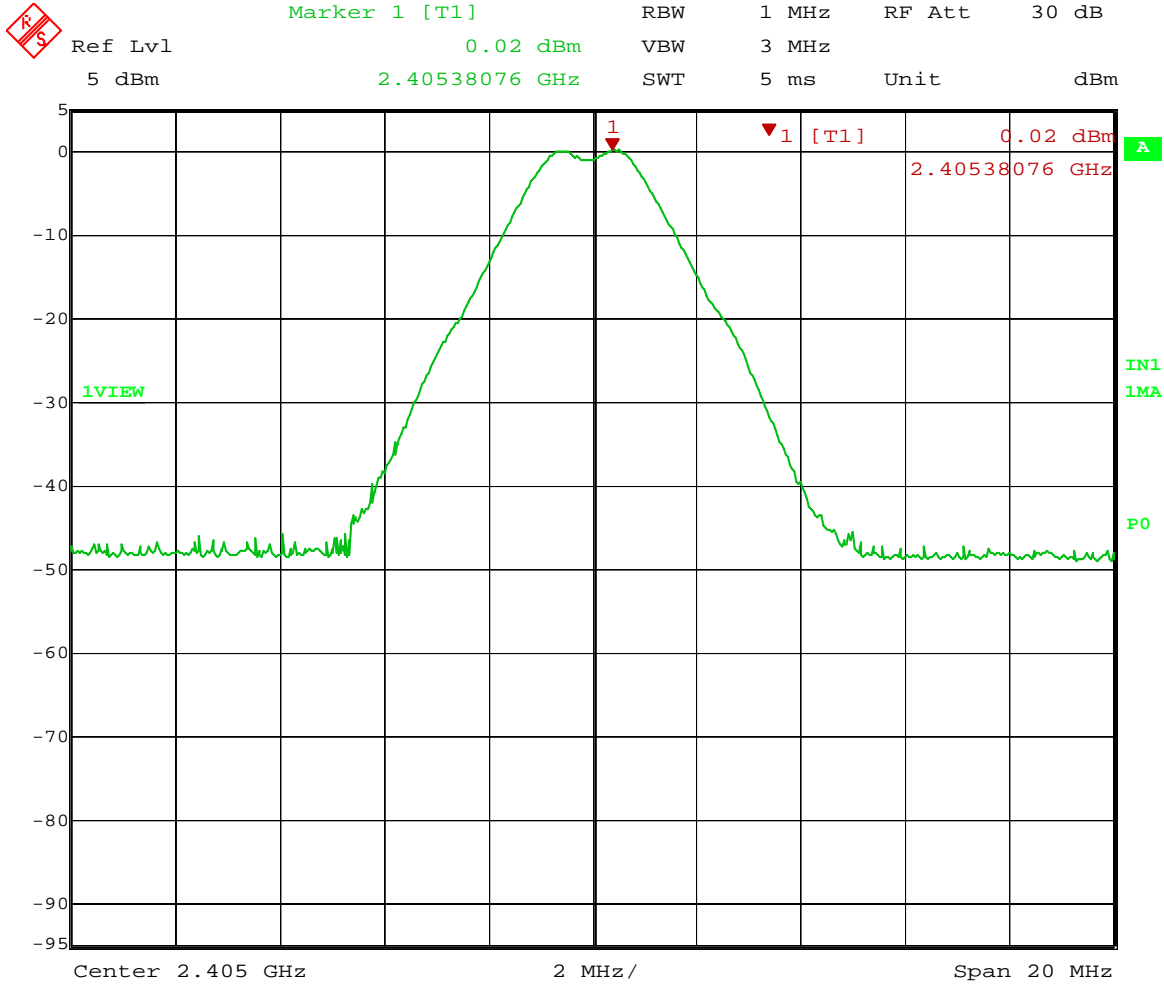
The EUT met the criteria as specified in the test plan of this report and in the standards.

5.1.6 Peak Power Output

Peak Output Conducted Power Measurements

Emission Freq (MHz)	Value (dBm)	Spec Limit (dBm)	Spec Margin (dB)
2405.00 (f_L)	0.02	+30.00	-29.98
2440.00 (f_M)	-0.63	+30.00	-30.63
2480.00 (f_H)	-0.62	+30.00	-30.62

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Date: 4.MAY.2011 15:49:11

Figure 3 – Highest Peak Conducted Power Output for EUT.

Antenna Gain

The Antenna used is below 6dBi gain.

The EUT is also compliant to FCC Part 15.247(b)(4)

Results

As tested, the EUT was found to be compliant to the requirements of the test standard.

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5.2 Peak Power Spectral Density

5.2.1 Test Over View

Results	Complies (as tested per this report)					Date	5/6/11	
Standard	FCC Part 15.247(e) and RSS 210 A8.2(b)							
Product Model	C-IT.04				Serial#	0021		
Test Set-up	Direct Measurement from antenna port							
EUT Powered By	120/60	Temp	23° C	Humidity	35%	Pressure	1000mbar	
Perf. Criteria	Below Limit (10dBm)			Perf. Verification		≤8 dBm in any 3 kHz		
Mod. to EUT	None			Test Performed By		David Hollis		

5.2.2 Test Procedure

Using the methods of ANSI C63.10:1999, section 6.11.2.3 were used.

5.2.3 Deviations

There were no deviations from the test methodology listed in the test plan.

5.2.4 Final Test

The EUT met the criteria as specified in the test plan of this report and in the standards.

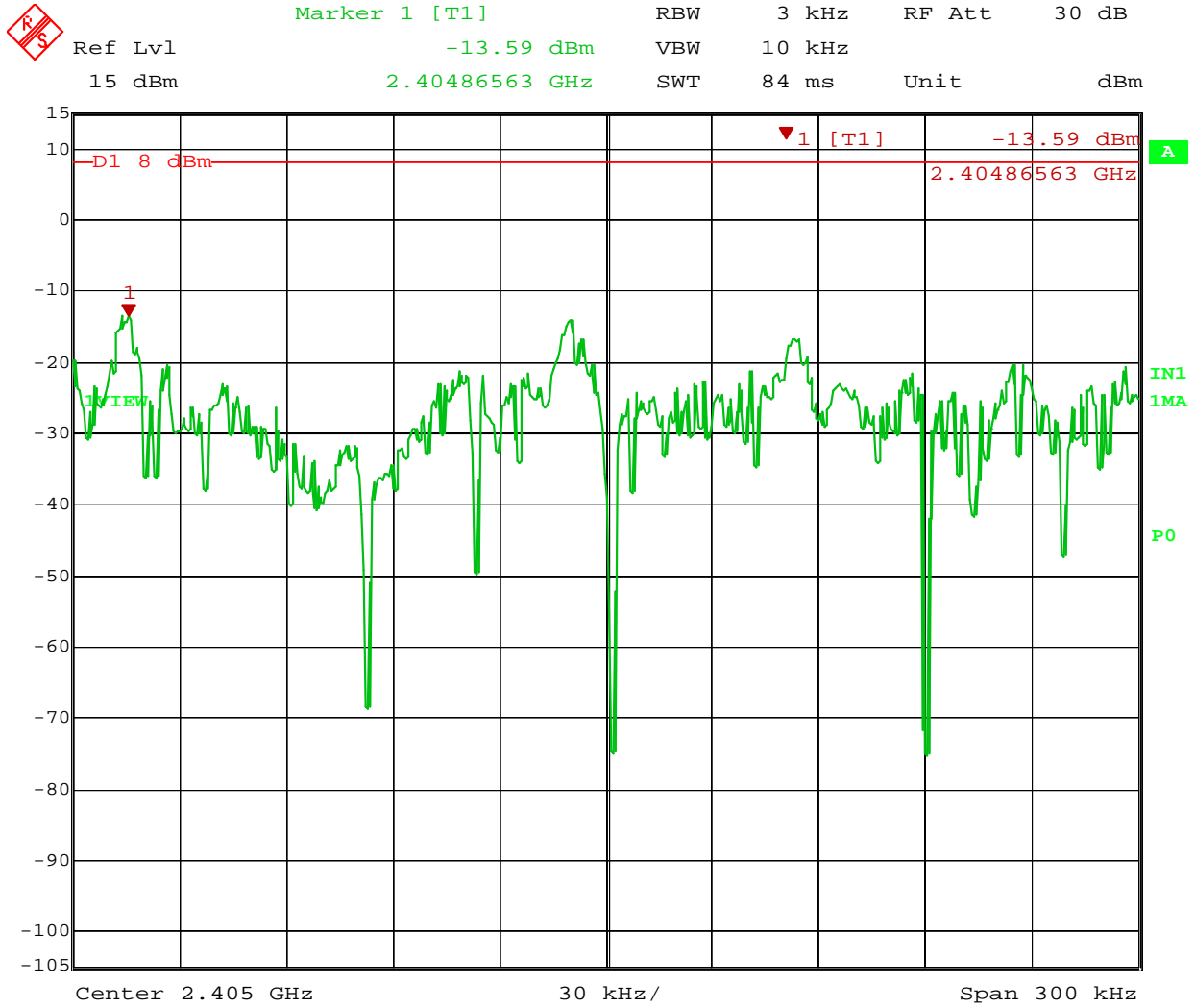
Power Spectral Density Measurements

Emission Freq (MHz)	Corrected Value (dBm)	Spec Limit (dBm)	Spec Margin (dB)
2405.00 (f_L)	-13.6	+8	-21.6
2440.00 (f_M)	-15.1	+8	-23.1
2480.00 (f_H)	-14.6	+8	-22.6

Note: worst Case PSD measurement plots are shown below; the other plots are on file at TUV Rheinland.

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5.2.5 Final Data



Date: 6.MAY.2011 10:06:53

Figure 4: Power Spectral Density measurement

Spectrum Analyzer Parameters:

RBW= 3kHz

Span= 300kHz

VBW= 10kHz

LOG dB/div.= 10dB

Sweep = 100 Seconds

Detector = Sample detector, max hold

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5.3 Occupied Bandwidth

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.3.1 Test Over View

Results	Complies (as tested per this report)				Date	5/4/11	
Standard	FCC Part 15.247(a)(2)						
Product Model	C-IT.04			Serial#	0021		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	120/60	Temp	23° C	Humidity	35%	Pressure	1000mbar
Perf. Criteria	(Below Limit)		Perf. Verification		Readings Under Limit		
Mod. to EUT	None		Test Performed By		David Hollis		

5.3.2 Test Procedure

Minimum allowed 6dB Bandwidth = 500 kHz

5.3.3 Deviations

There were no deviations from the test methodology listed in the test plan.

5.3.4 Final Test

6dB Band width is 2.6 MHz which is > 500 kHz

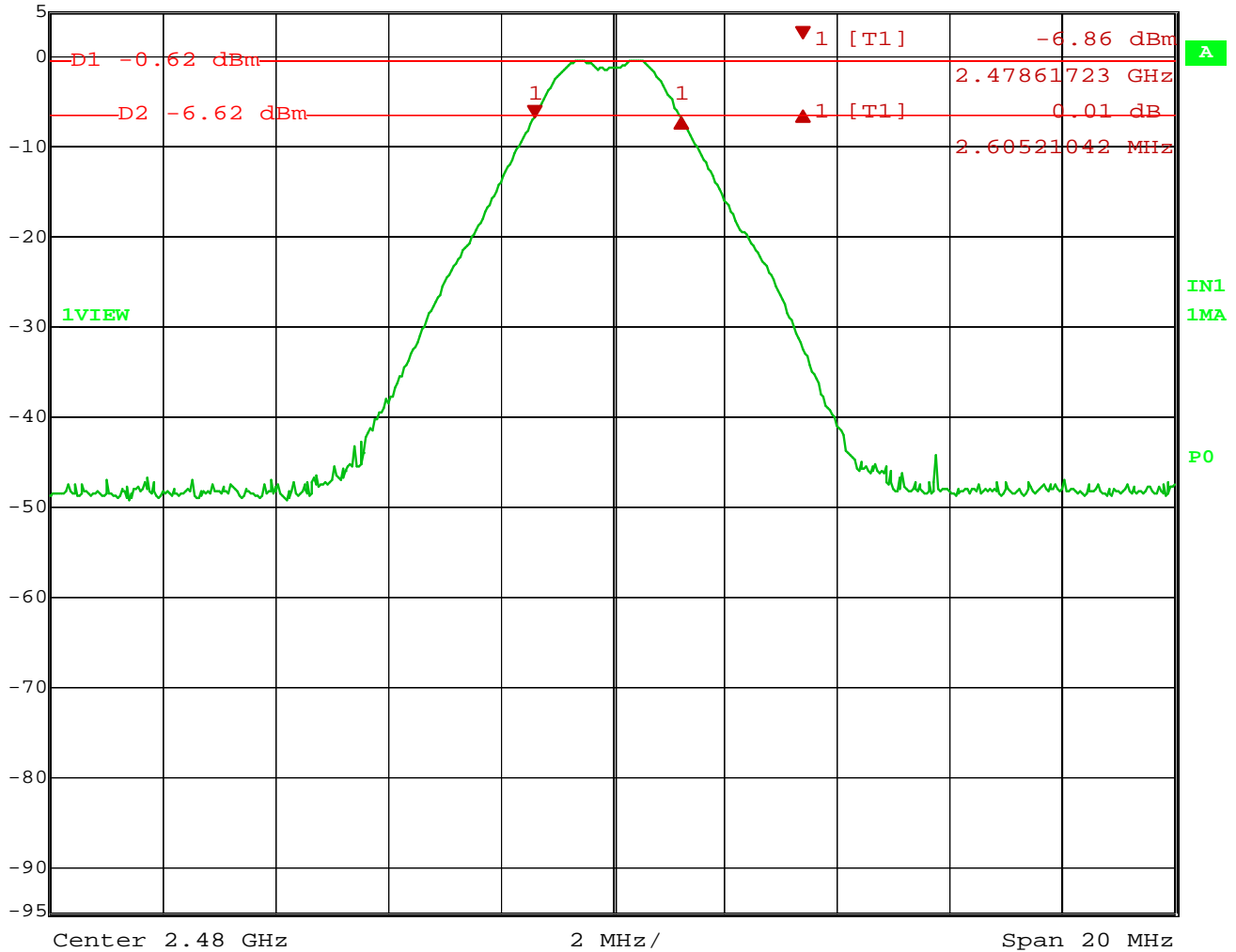
The EUT met the performance criteria requirement as specified in the standards.

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5.3.5 Final Data



Delta 1 [T1]	RBW	1 MHz	RF Att	30 dB
0.01 dB	VBW	3 MHz		
2.60521042 MHz	SWT	5 ms	Unit	dBm
Ref Lvl				
5 dBm				



Date: 4.MAY.2011 14:59:07

Figure 5: 6dB Occupied Bandwidth

Note: The above plot is the worst case.

6dB Band width is 2.6 MHz which is > 500 kHz

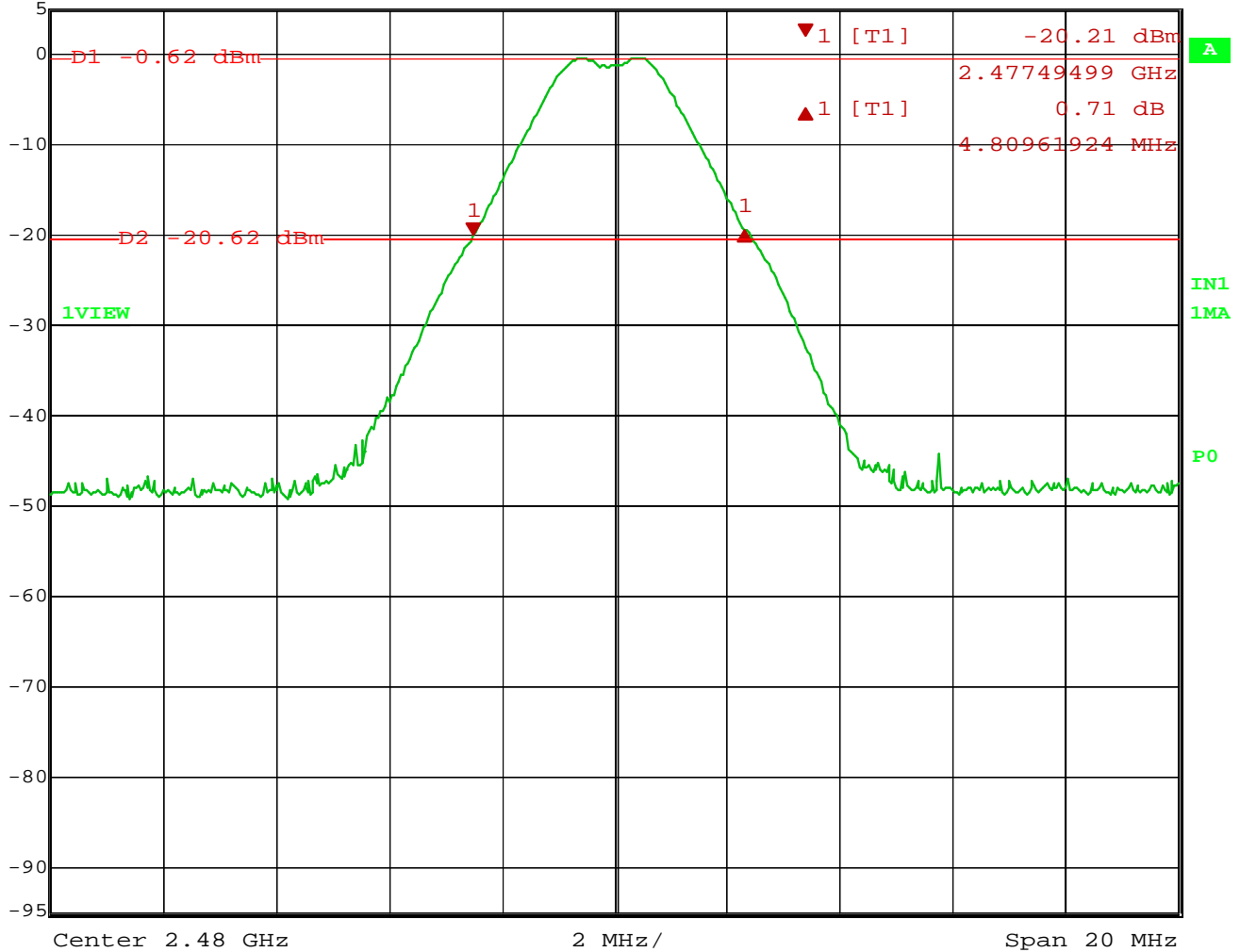
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Report No.:

31150992.002.doc



	Delta 1 [T1]	RBW	1 MHz	RF Att	30 dB
Ref Lvl	0.71 dB	VBW	3 MHz		
5 dBm	4.80961924 MHz	SWT	5 ms	Unit	dBm



Date: 4.MAY.2011 14:57:22

Figure 6: 20 dB Occupied Bandwidth

Note: The above plot is the worst case.

20dB Band width is 4.81 MHz

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5.3.6 99% Power Bandwidth

For the purpose of Section A1.1, the 99% bandwidth shall be no wider than .25% of the center frequency for devices operating between 70-900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

5.3.7 Test Over View

Results	Complies (as tested per this report)				Date	5/4/11	
Standard	RSS-210 Section A1.1.3						
Product Model	C-IT.04			Serial#	0021		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	120/60	Temp	23° C	Humidity	35%	Pressure	1000mbar
Perf. Criteria	(Below Limit)		Perf. Verification		Readings Under Limit		
Mod. to EUT	None		Test Performed By		David Hollis		

5.3.8 Test Procedure

Using the procedures of RSS-GEN section 4.6.1, the 1 kHz resolution bandwidth is 1% of the 1 MHz span. The Video bandwidth is 3 times that of the resolution bandwidth.

The limit of the bandwidth would be 0.5% of 2.4 GHz or 12 MHz.

5.3.9 Deviations

There were no deviations from the test methodology listed in the test plan.

5.3.10 Final Results

The measured 99% bandwidth is 4.21 MHz, which is well below the 12 MHz limit.

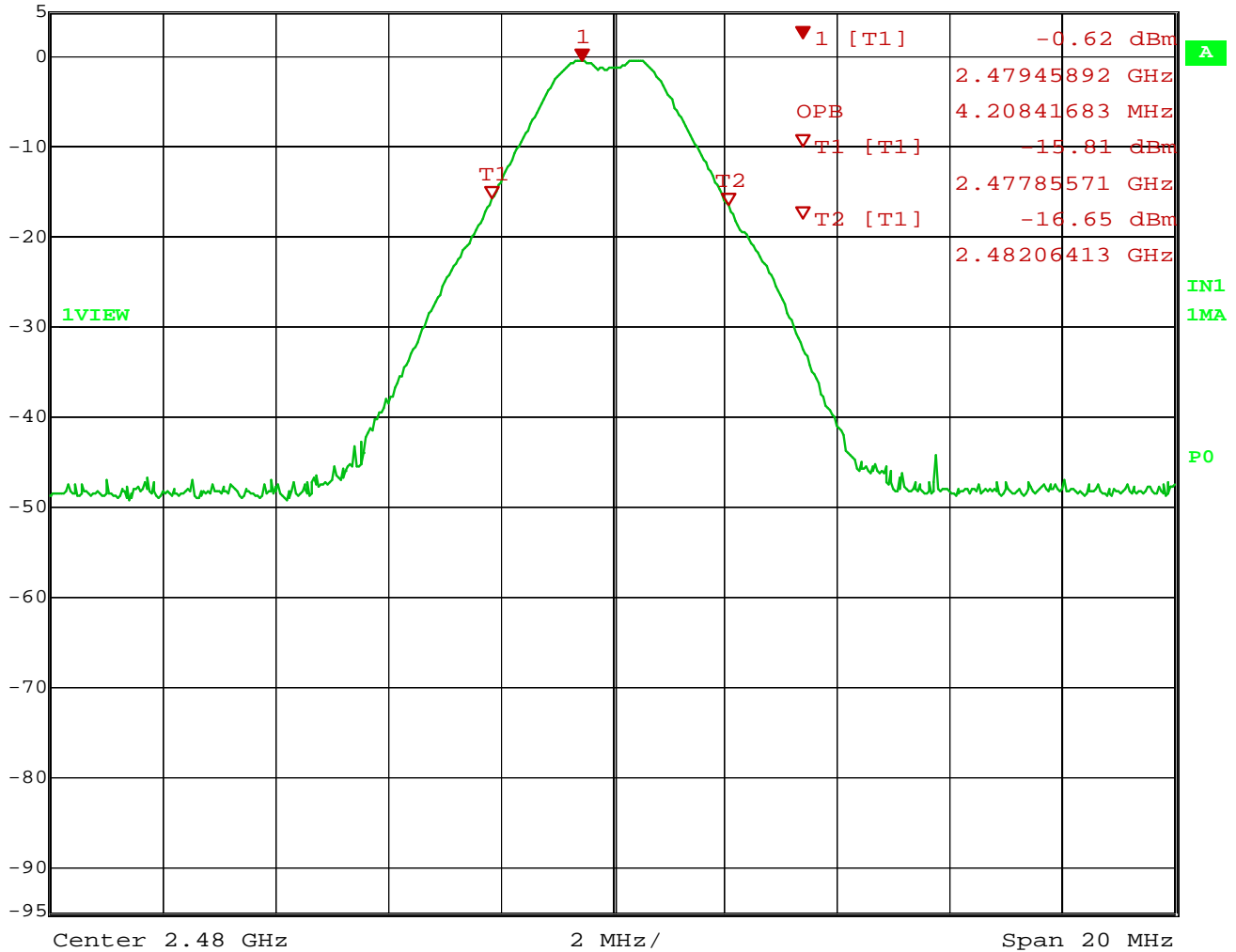
The EUT met the criteria as specified in the test plan of this report and in the standards.

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

5.3.11 Final Data



Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
Ref Lvl	-0.62 dBm	VBW	3 MHz	
5 dBm	2.47945892 GHz	SWT	5 ms	Unit dBm



Date: 4.MAY.2011 15:00:20

Figure 7 – 99% Power Bandwidth = 2.41 MHz

The EUT is compliant to the requirements of RSS-210 A1.1.3

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5.4 Voltage Requirements FCC Part 15.31(e)

FCC Part 15.31 states that for intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4.1 Over View of Test

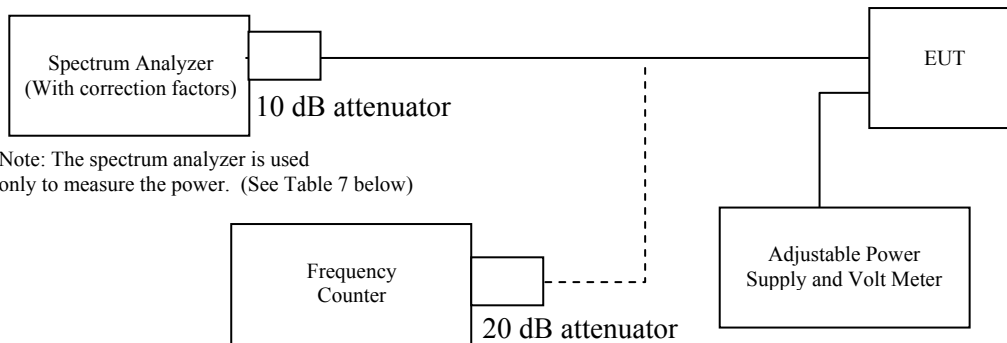
Results	Complies (as tested per this report)	Date	5/4/11
Standard	FCC Part 15.31(e)		
Product Model	C-IT.04	Serial#	0021
Test Set-up	Tested in shielded room. EUT placed on table, see test plans for details		
Mod. to EUT	None	Test Performed By	David Hollis

5.4.2 Test Procedure

Since this module could be used in many different applications, including battery operation, the manufacturer selected that worst-case testing suite to be performed. The power source test was performed using the ±15% of rated voltage

Manufacturer Rated voltage: 4.5VDC, the test will be performed at ±15% of rated voltage.

Test Setup:



Note: The spectrum analyzer is used only to measure the power. (See Table 7 below)

Note: The Frequency Counter is used to measure the frequency.

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Reference at nominal temperature; +20° C

Volts	P(dBm)	Frequency in Hz	Δ to nominal Power (dB)	Δ to nominal Frequency (Hz)
120	0.02	2,405,380,762	0.00	0
138	0.02	2,405,380,987	0.00	225
102	0.01	2,405,379,583	0.01	1179

Note: Reading highlighted in **Yellow** is the reference frequency and power.

Nominal Rated Voltage (V_{Nom}): 120 Volts
 +15% Max Voltage (V_{max}): 138 Volts
 -15% Minimum Voltage (V_{min}): 102 Volts

5.4.3 Final Test

As tested, the EUT was found to be compliant to the requirements of the test standard.

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6 Emissions in Receive Mode.

6.1 Radiated Emissions

This test measures the electromagnetic levels of spurious signals generated by the EUT that radiated from the EUT and may affect the performance of other nearby electronic equipment.

6.1.1 Over View of Test

Results	Complies (as tested per this report)				Date		
Standard	FCC Parts 15.109(a) and RSS-210 2.2, 2.6,A8.5, RSS-GEN 7.2.3.2						
Product Model	C-IT.04	Serial#	0021				
Configuration	See test plan for details						
Test Set-up	Tested at a 10m O.A.T.S. placed on a 1.0m x 1.5m non-conductive table 150cm above the ground plane on a turn-table. See test plans for details						
EUT Powered By	120/60 240/60	Temp	23° C	Humidity	35%	Pressure	1000mbar
Frequency Range	30 MHz to 13 GHz @ 3m						
Perf. Criteria	(Below Limit)		Perf. Verification	Readings Under Limit			
Mod. to EUT	None		Test Performed By	David Hollis			

6.1.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.4:2003 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 30 MHz to 13 GHz was investigated for radiated emissions.

Radiated emission testing was performed at a distance of 3 meters in 10m O.A.T.S.

6.1.3 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

6.1.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

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6.1.5 Final Graphs and Tabulated Data

Radiated Emissions – 30MHz to 300MHz

Horizontal/Vertical

14:15:30 MAR 15, 2011
ARTEMIS AUTOMATION MODEL C-11

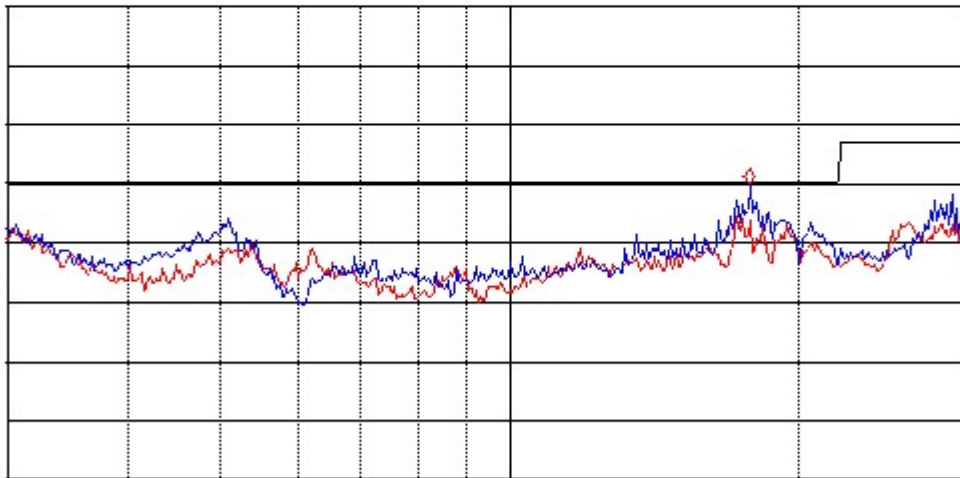
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 179.3 MHz
29.56 dB μ V/m

LOG REF 60.0 dB μ V/m

PREAMP ON

10
dB/
#ATTN
0 dB

VA VB
SC FC
ACDRR



START 30.0 MHz

IF BW 120 kHz

AVG BW 300 kHz

STOP 300.0 MHz

SWP 253 msec

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Radiated Emissions – 300MHz to 1GHz

Horizontal/Vertical

14:21:25 MAR 15, 2011
ARTEMIS AUTOMATION MODEL C-JT

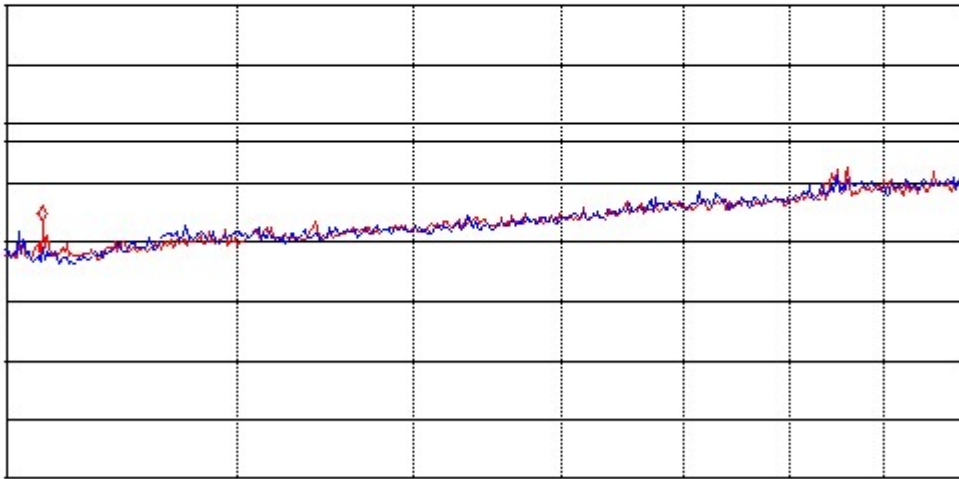
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 318.6 MHz
23.33 dB μ V/m

LDG REF 60.0 dB μ V/m

PREAMP ON

10
dB/
#ATN
0 dB

VA VB
SC FC
ACDRR



START 300.0 MHz STOP 1.0000 GHz
IF BW 120 kHz AVG BW 300 kHz SWP 656 msec

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Radiated Emissions Measurements												
Standard: EN 55022:2006 + A1:2007 Class B/FCC Part 15.109(g)/ICES-003 Issue 4								PRESCAN or FINAL: Prescan		Date: 5/5/11		
Device Tested: Artemis Automation Model C-IT.04								Distance: 3m				
Measured Level												
Meas #	Freq (MHz)	Peak	Quasi-Peak	Average	Quasi-Peak Limit	Quasi-Peak Δ	Antenna + Cable Correction Factor (included in measured levels)	Result	Antenna Polarization	Angle (degrees)	Antenna Height (meters)	Comment
1	32.0625	22.14	16.21	7.00	30.00	-13.79	17.12	Prescan	Vertical	0	1.50	
2	87.1500	28.43	19.65	9.63	30.00	-10.35	10.46	Prescan	Vertical	0	1.50	
3	118.1375	25.22	21.05	17.58	30.00	-8.95	14.21	Prescan	Vertical	0	1.50	Maximum Emissions
4	127.9625	23.95	18.67	14.62	30.00	-11.33	13.79	Prescan	Vertical	0	1.50	
5	218.3625	22.95	18.79	15.58	30.00	-11.21	12.67	Prescan	Vertical	0	1.50	
6	299.9125	27.15	21.32	11.76	37.00	-15.68	16.20	Prescan	Horizontal	0	1.50	
Tested by: David Hollis												
TUV Rheinland of North America, Inc. 12 Commerce Road Newtown, CT 06470 Tel:(203) 426-0888 Fax: (203) 426-4009 RE22_B.xls Revised 21OCT05												

Radiated Emissions Measurements												
Standard: EN55022:2006 + A1:2007/FCC Part 15.109(g)/ICES-003 Issue 4								PRESCAN or FINAL: Final		Date: 5/5/11		
Device Tested: Artemis Automation Model C-IT.04								Distance: 3m				
Measured Level												
Meas #	Freq (MHz)	Peak	Quasi-Peak	Average	Quasi-Peak Limit	Quasi-Peak Δ	Antenna + Cable Correction Factor (included in measured levels)	Result	Antenna Polarization	Angle (degrees)	Antenna Height (meters)	Comment
1	32.0580	36.92	25.77	18.37	30.00	-4.23	16.52	Complied	Vertical	90	1.50	Maximum Emissions
2	86.9325	34.38	23.72	16.70	30.00	-6.28	9.34	Complied	Vertical	90	1.50	
3	118.1625	30.73	22.80	17.70	30.00	-7.20	12.96	Complied	Vertical	90	1.50	
4	127.7595	25.13	15.83	14.51	30.00	-14.17	12.51	Complied	Vertical	70	1.30	
5	218.3375	21.46	15.79	11.74	30.00	-14.21	11.14	Complied	Vertical	70	1.30	
6	300.7000	22.96	18.41	14.70	37.00	-18.59	14.33	Complied	Horizontal	0	2.10	
Tested by: David Hollis												
TUV Rheinland of North America, Inc. 12 Commerce Road Newtown, CT 06470 Tel:(203) 426-0888 Fax: (203) 426-4009 RE22_B.xls Revised 21OCT05												

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7 RF Exposure

7.1 Exposure Requirements – FCC Parts 2.1091, 15.247(d), and RSS-102 Issue 7

FCC Part 15.247(d) states that SAR evaluation is not required if “Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §1.1307(b)(1) of CFR 47.”

RSS-102 section 2.5.1 states that a device is exempt from SAR evaluation if the frequency is “above 2.2 GHz and up to 3 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 20 mW for general public use...”.

7.1.1 Test Procedure

If the antenna is located > 20cm from the user, then an MPE calculation is acceptable.

If the antenna is located < 20cm (portable / mobile / hand-held device) from the user, then SAR evaluation is required.

7.1.2 Evaluation

The EUT is a hand-held portable device where the antenna can be located less than 20cm from the user, therefore SAR evaluation is required.

7.1.2.1 Evaluation for FCC

FCC 447498 D01 Mobile Portable RF Exposure v04, Paragraph 2) section a) i) states:
“A device may be used in portable exposure conditions with no restrictions on host platforms when either the source-based time-averaged output power is $\leq 60/f_{\text{(GHz)}} \text{ mW}$ or all measured 1-g SAR are $< 0.4 \text{ W/kg}$.¹¹”.

The minimum power that requires SAR is $60 / 2.4 \text{ GHz}$ or 25 mW.

The maximum power output plus maximum antenna gain of the EUT is:

$$0.02\text{dBm} + 3\text{dBi (antenna)} = 3.02\text{dBm} = 2.004\text{mW}$$

The EUT is well below the 25mW power.

7.1.2.2 Evaluation for Industry Canada

The maximum power output plus maximum antenna gain of the EUT is:

$$0.02\text{dBm} + 3\text{dBi (antenna)} = 3.02\text{dBm} = 2.004\text{mW}$$

The EUT is well below the 20mW power.

7.1.3 Conclusion

SAR testing is not required for either FCC or Industry Canada.

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Appendix A

Test Plan

This test report is intended to follow this test plan outlined here in unless other wise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

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Test Plan Summary

Table 1: EMC Test Plan Summary FCC& IC

Test	Test Method ANSI C63.10	Test Parameters (from Standard)
Spurious Emission in Received Mode	CFR47 15.109, RSS-GEN Sect.7.2.3	Class B
Spurious Emission in Transmitted Mode	CFR47 15.209, RSS-GEN Sect.7.2.3	Class B
Restricted Bands of Operation	CFR47 15.205, RSS 210 Sect.2.6	Class B
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.7.2.2	Class B
Occupied Bandwidth	CFR47 15.247 (a2), RSS GEN Sect.4.4.1	500kHz minimum
Maximum Transmitted Power	CFR47 15.247 (b3), RSS 210 Sect. A.8.4	30dBm w/ 6dBi antenna
Peak Power Spectral Density	CFR47 15.247 (e), RSS 210 Sect. A.8.2	8dBm/ 3kHz.
Band edge Measurement	CFR47 15.247 (d), RSS 210 Sect. A.8.5	20dBr
RF Exposure	CFR47 15.247 (i), 2.1091	General Population

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