



849 NW State Road 45
Newberry, FL 32669 USA
Ph: 888.472.2424 or 352.472.5500
Fax: 352.472.2030
Email: info@timcoengr.com
Website: www.timcoengr.com

FCC PART 15.247 TEST REPORT

DIGITAL SPREAD SPECTRUM

Applicant	CENTRALITE SYSTEMS, INC.
Address	6420 WALL STREET MOBILE ALABAMA 36695 USA
FCC ID	T3LTS001
Model Number	TS001
Product Description	2.4 GHz Thermostat (Zigbee)
Date Sample Received	3/31/2010
Date Tested	4/13/2010
Tested By	Nam Nguyen
Approved By	Mario de Aranzeta
Report Number	747AUT10TestReport.PDF
Test Results	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Testing Certificate # 0955-01

TABLE OF CONTENT

GENERAL REMARKS	3
DUT SPECIFICATION.....	4
TEST ENVIRONMENT	4
TEST SUPPORTING EQUIPMENT	4
EMC EQUIPMENT LIST.....	5
TEST PROCEDURES.....	6
RADIATION INTERFERENCE	7
OCCUPIED BANDWIDTH.....	9
POWER OUTPUT.....	10
SPURIOUS EMISSIONS AT ANTENNA TERMINALS	11
RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND	12
POWER SPECTRAL DENSITY	16
POWER LINE CONDUCTED INTERFERENCE.....	18

GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:

- fulfill the general approval requirements as identified in this test report
- not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.



Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, Fl 32669



Authorized Signatory Name:

Mario de Aranzeta C.E.T.
Compliance Engineer/ Lab. Supervisor

Date: April 15, 2010

DUT SPECIFICATION

Applicable Standard	Part 15.247		
DUT Description	2.4 GHz Thermostat (Zigbee)		
FCC ID	T3LTS001		
Operating Frequency	2,405 – 2,480 MHz		
Number of channels	16		
DUT Power Source	<input checked="" type="checkbox"/> 110–120Vac/50– 60Hz		
	<input type="checkbox"/> DC Power		
	<input type="checkbox"/> Battery Operated Exclusively		
Test Item	<input type="checkbox"/> Prototype	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed	<input type="checkbox"/> Mobile	<input type="checkbox"/> Portable
Antenna Connector	None		
Antenna	Chip antenna		

TEST ENVIRONMENT

Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.
Test Conditions	Temperature: 26°C Relative humidity: 50%
Test Exercise	The DUT was placed in continuous transmit mode of operation.

TEST SUPPORTING EQUIPMENT

Supporting Device	Manufacturer	Model / FCC ID	Serial Number
N/A			

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/20/10	3/19/13
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/09	1/10/12
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/11/07	5/10/10
Analyzer Silver Tower Quasi-Peak Adapter	HP	85650A	3303A01844	CAL 10/30/08	10/30/10
Analyzer Silver Tower RF Preselector	HP	85685A	2620A00294	CAL 3/6/09	3/6/11
Analyzer Silver Tower Spectrum Analyzer	HP	8566B Opt 462	3552A22064 3638A08608	CAL 10/30/08	10/30/10
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/09	12/8/11
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/09	12/8/11
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/09	12/7/11
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/09	12/7/11
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/09	12/12/11
Antenna: Biconnical	Eaton	94455-1	1096	CAL 10/11/08	10/11/10
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	CAL 12/1/08	12/1/10

TEST PROCEDURES

Radiation Interference: ANSI C63.4-2003 using a spectrum analyzer, a preselector, a quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3 MHz above 1 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

Formula Of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBμV) to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+ CL = FS
33	20 dBμV	+ 10.36 dB	+ 0.5 = 30.86 dBμV/m @ 3m

Power Line Conducted Interference: The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

Bandwidth 6.0dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=1 MHz and the video bandwidth (VBW) =3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Antenna Conducted Emissions: The RBW=100 kHz, VBW=300 kHz and the span set to 10 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

ANSI C63.4-2003 10.1 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The DUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. Emissions attenuated more than 20 dB below the permissible value are not reported.

RADIATION INTERFERENCE

Rules Part No.: 15.247, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V}/\text{m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V}/\text{m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V}/\text{m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V}/\text{m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Part 15.247	
Fundamental 902 – 928 MHz	127.37 dB $\mu\text{V}/\text{m}$ @ 3 meters
Fundamental 2.4 – 2.4835 MHz	127.37 dB $\mu\text{V}/\text{m}$ @ 3 meters
Harmonics	54.0 dB $\mu\text{V}/\text{m}$ @ 3 meters

Any emissions that fall in the restricted bands (15.205) must be less than or equal to 54 dB $\mu\text{V}/\text{m}$. Spurious emissions not in a restricted band must be 20 dBc. Harmonics were checked through the 10th harmonic.

Test Data: All values are peak unless noted. Where a peak and an average value is listed for an emission then the peak limit become 74 dB $\mu\text{V}/\text{m}$.

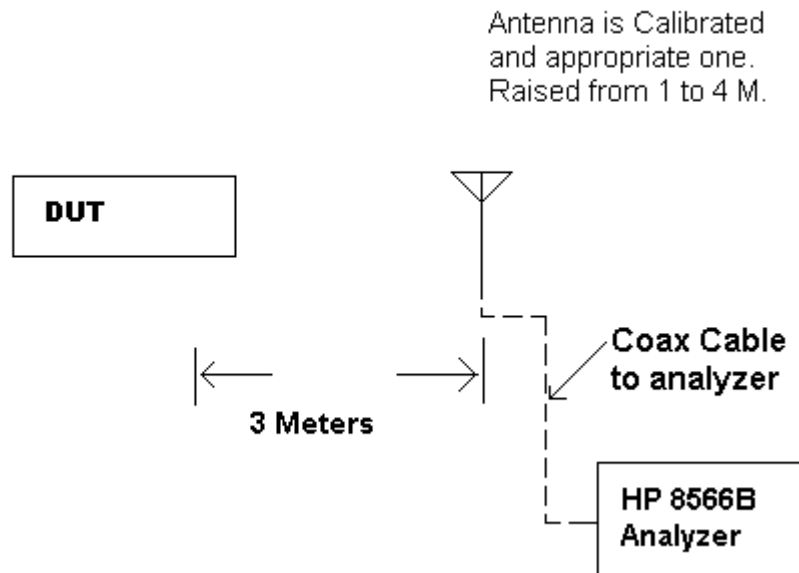
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μV	Ant. Polarity V/H	Detector	Coax Loss dB	Correction Factor dB/m	Field Strength dB $\mu\text{V}/\text{m}$	Margin dB
2,405.00	2,405.00	61.2	H	Peak	3.18	32.25	96.63	30.75
2,405.00	2,405.00	61.9	V	Peak	3.18	32.25	97.33	30.05
2,405.00	4,810.00	9.2	V	Peak	4.91	34.1	48.21	5.8
2,405.00	4,810.00	17.8	H	Peak	4.91	34.1	56.81	17.19
2,405.00	4,810.00	9.9	H	Avg	4.91	34.1	48.91	5.1
2,440.00	2,440.00	61.2	H	Peak	3.21	32.34	96.75	30.63
2,440.00	2,440.00	63.4	V	Peak	3.21	32.34	98.95	28.43
2,440.00	4,880.00	11.4	H	Peak	4.94	34.1	50.44	3.56
2,440.00	4,880.00	20.4	H	Peak	4.94	34.1	59.44	14.56
2,440.00	4,880.00	12.3	V	Avg	4.94	34.1	51.34	2.66
2,480.00	2,480.00	61.9	H	Peak	3.24	32.45	97.59	29.79
2,480.00	2,480.00	65.1	V	Peak	3.24	32.45	100.79	26.59
2,480.00	4,960.00	10.3	H	Peak	4.98	34.1	49.38	4.62
2,480.00	4,960.00	16.8	H	Peak	4.98	34.1	55.88	18.12
2,480.00	4,960.00	12.7	V	Avg	4.98	34.1	51.78	2.22

APPLICANT: CENTRALITE SYSTEMS, INC.

FCC ID: T3LTS001

REPORT: C\CENTRALITE\747AUT10\747AUT10TestReport.doc

Method of Measuring Radiated Spurious Emissions



Harmonics were checked through the 10th harmonic

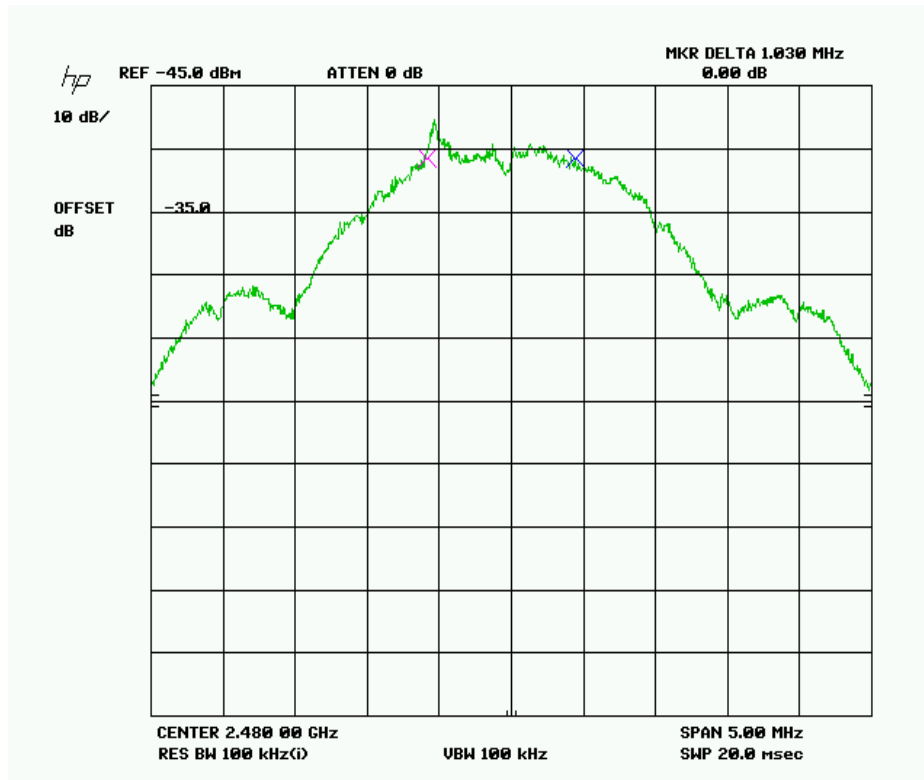
METHOD OF MEASUREMENT: The procedure used was ANSI standard C63.4-2003 & the FCC/OET Guidance on Measurements for Spread Spectrum Systems – Public Notice DA 00-705 dated March 30th, 2000.

OCCUPIED BANDWIDTH

Rules Part No.: 15.247(a) (2)

Requirements: The 6 dB bandwidth must be greater than 500 kHz.

Test Data: 1.03 MHz
The 20 dB BW is 2.5 MHz



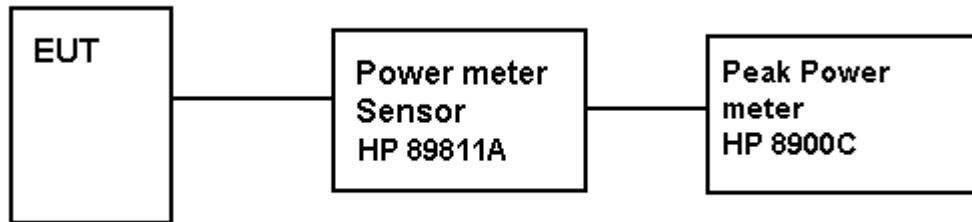
Three places in the band were measured and the worst case reported.

POWER OUTPUT

Rules Part #:15.247(b) the limits are: 1 Watt conducted, 4W radiated ERP

Measurement:

TEST SET UP:



Test Results: 5 mW or 0.005 Watts

Frequency MHz	Po dBm
2405.00	6.48
2400.00	6.48
2480.00	6.70

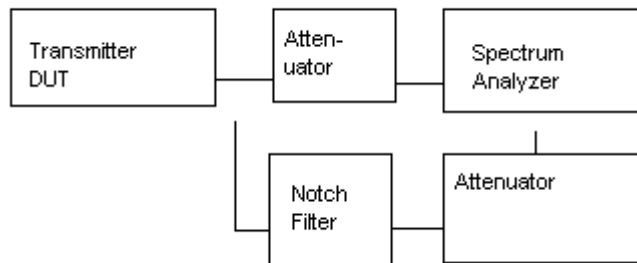
SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Requirements: Emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

Test Data: N/A,

Device has a permanently attached antenna and no antenna connector.

15.247(c) Method of Measuring RF Conducted Spurious Emissions

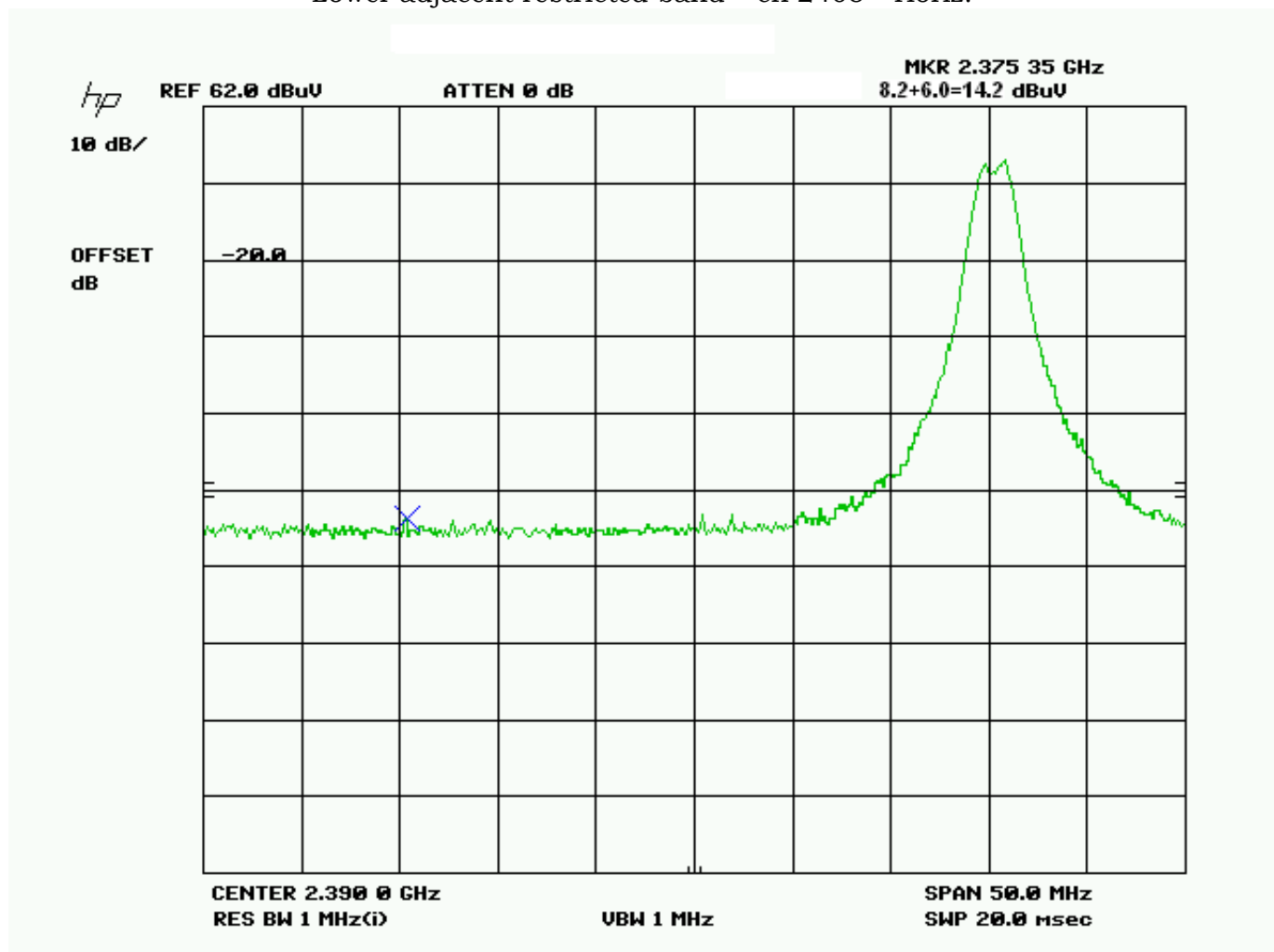


RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

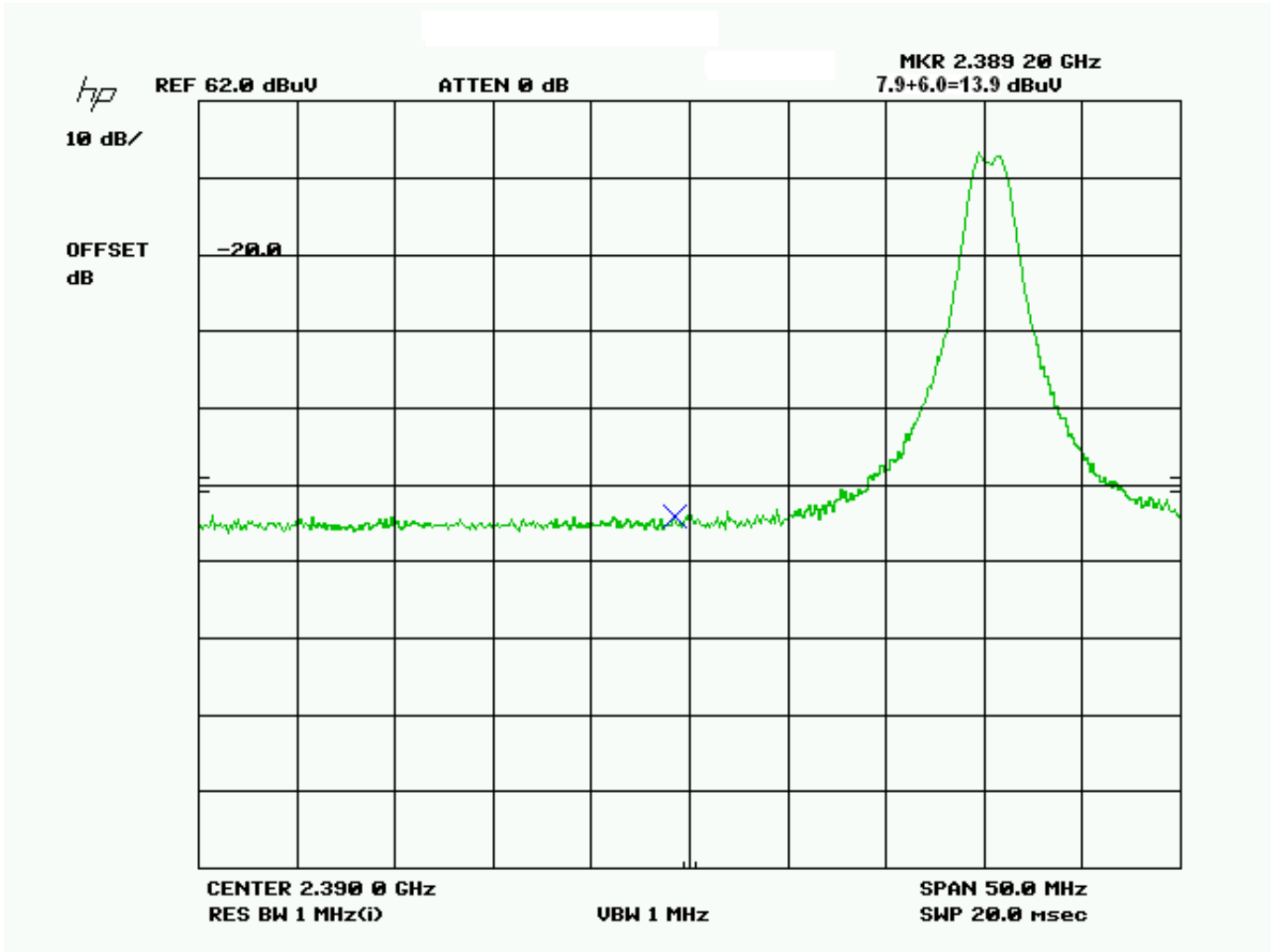
Requirements: Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 $\mu\text{V}/\text{m}$ (54 $\text{dB}\mu\text{V}/\text{m}$).

Test Procedure: An in band field strength measurement of the fundamental Emission using the RBW and detector function required by C63.4-2000 and FCC Rules. The procedure was repeated with an average detector and a plot made. The calculated field strength in the adjacent restricted band is presented below.

Lower adjacent restricted band – ch 2405 - Horiz.

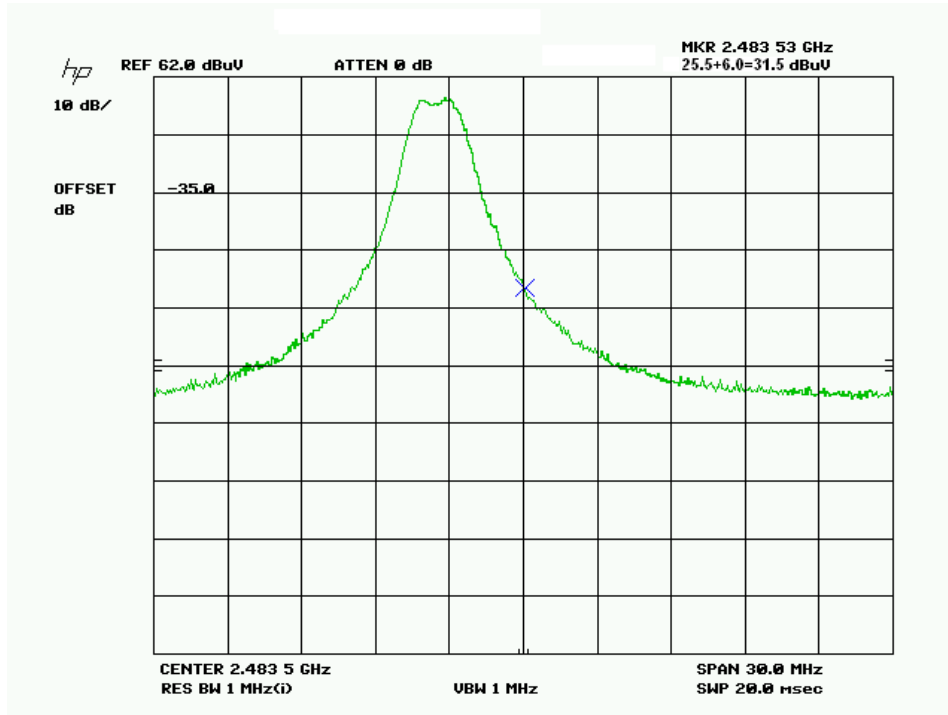


Lower adjacent restricted band – ch 2405 – Vert.

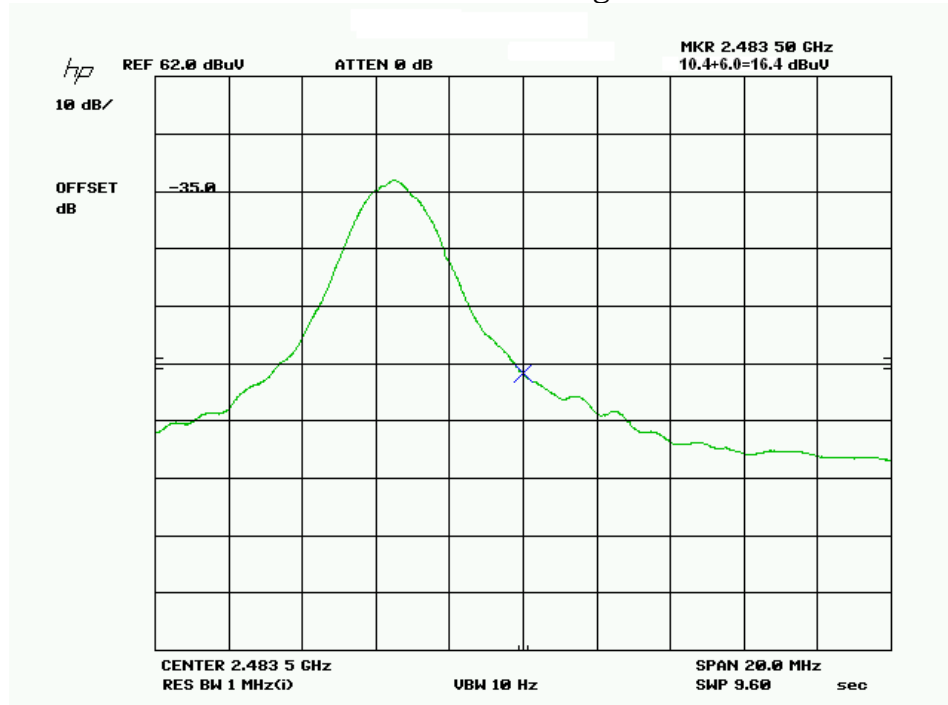


Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Pol. V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Margin dB
2,405.00	2,375.35	14.2	H	3.17	32.21	49.58	4.42
2,405.00	2,389.20	13.9	V	3.17	32.19	49.26	4.74

Upper adjacent restricted band – ch 2480 - Horiz.



Upper adjacent restricted band – ch 2480 - Horiz. – Avg



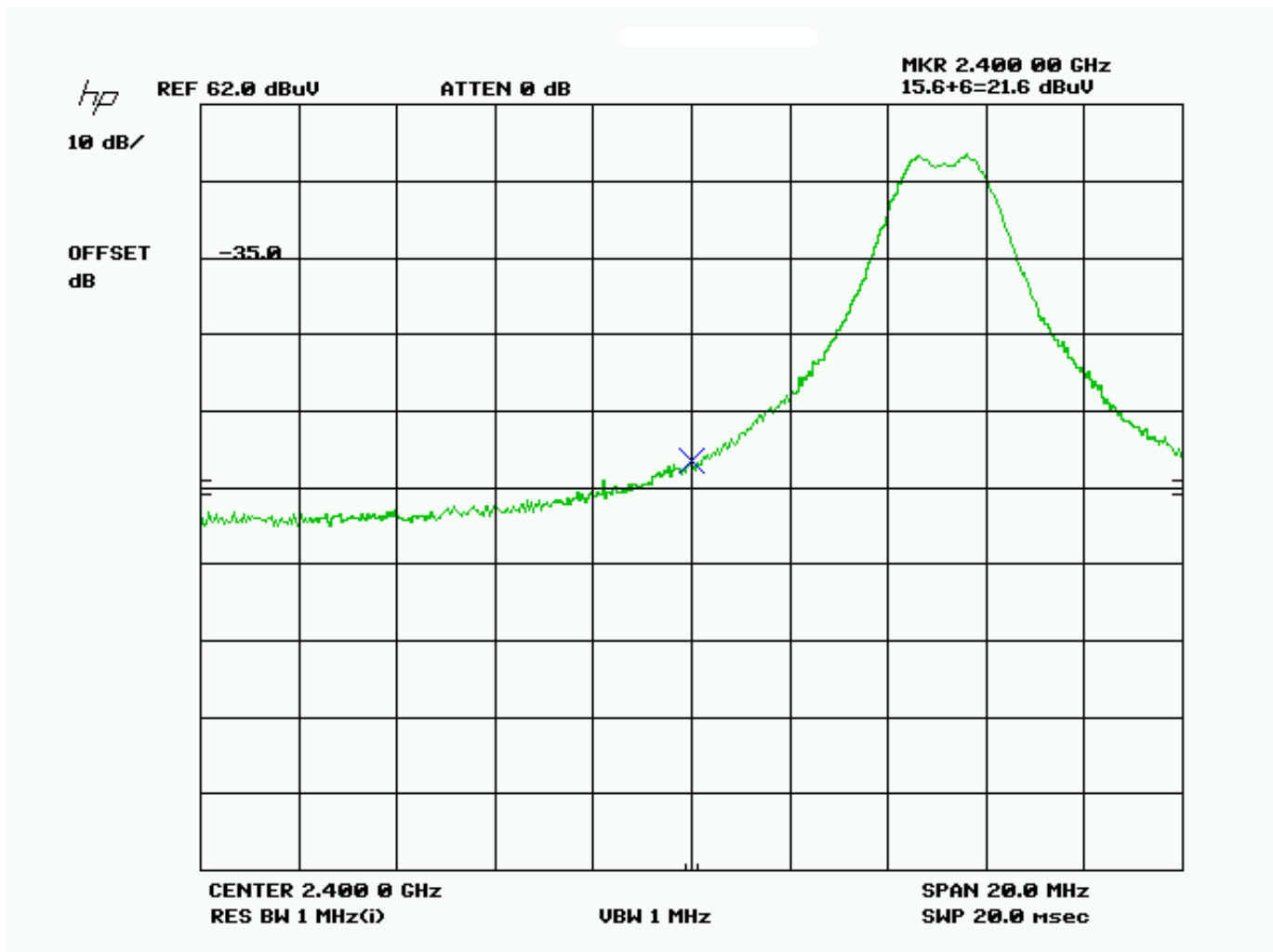
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Polarity V/H	Detector	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Margin dB
2,480.00	2,483.53	31.5	H	Peak	3.24	32.46	67.2	-13.2
2,480.00	2,483.50	16.4	H	Avg	3.24	32.46	52.1	1.9

APPLICANT: CENTRALITE SYSTEMS, INC.

FCC ID: T3LTS001

REPORT: C:\CENTRALITE\747AUT10\747AUT10TestReport.doc

Lower bandedge plots



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μ V	Ant. Polarity	Detector	Coax Loss dB	Correction Factor dB/m	Field Strength dB μ V/m
2,405.00	2,405.00	61.9	V	Pk	3.18	32.25	97.33
2,405.00	2,400.00	21.6	V	Pk	3.18	32.25	57.03

Emission meets 20 dBc requirement.

POWER SPECTRAL DENSITY

Rules Part No.: 15.247(d)

Requirements: The peak level measured must be less than +8.0 dBm.

Test Data: SEE THE FOLLOWING PLOTS

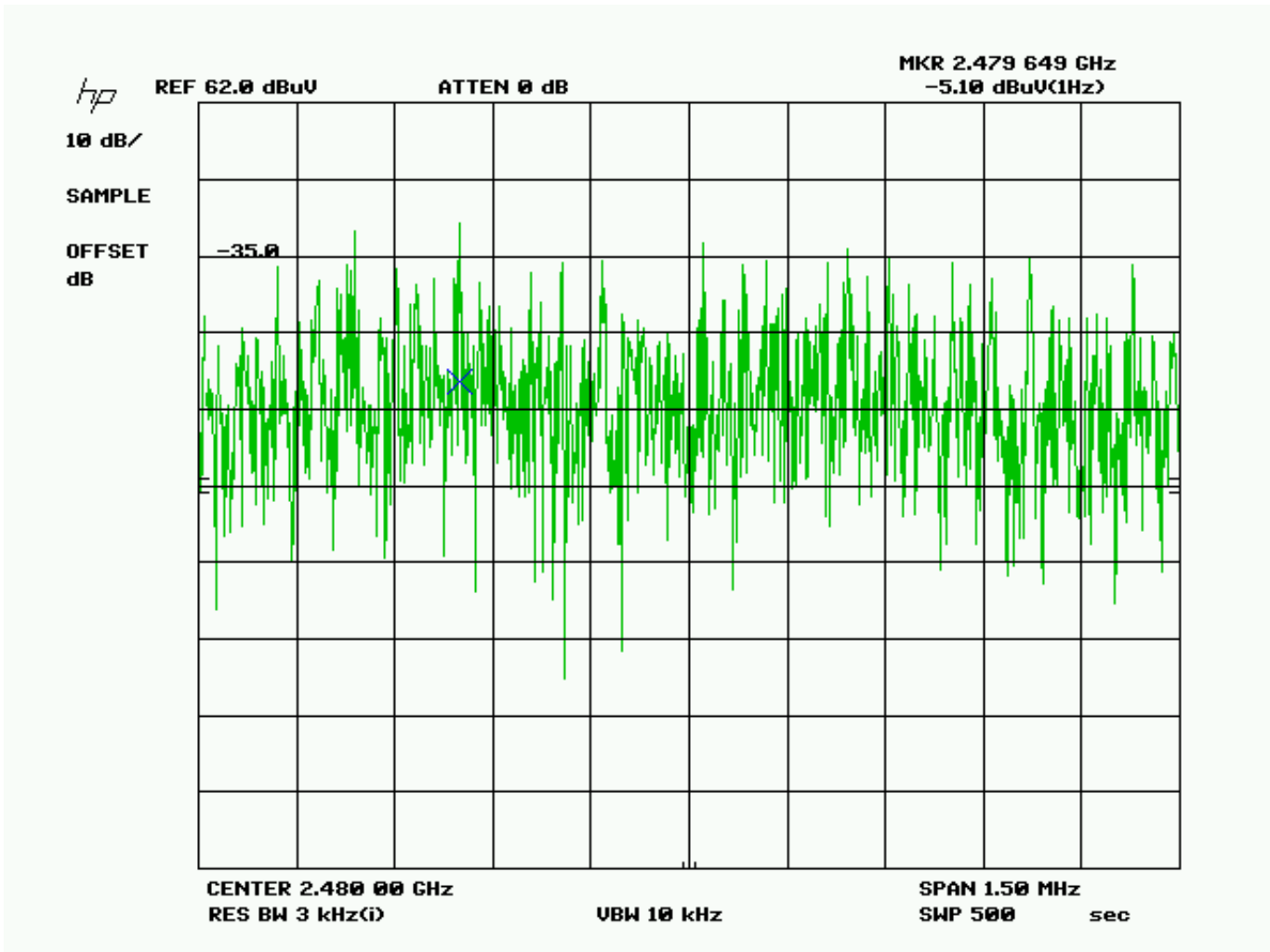
802.11b

Three places in the band were measured and the worst case reported.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Pol. V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m
2,480.00	2,479.65	-5.1	V	3.24	32.45	30.59
2,480.00	2,480.12	-9.3	H	3.24	32.45	26.39

30.59 dBµV/m
+35 dB CF for 1 Hz to 3 kHz RBW
 65.59 dBµV/m

-29.6 dBm converted from an EIRP value then to conducted in dBm



Power Spectral Density _ Vertical

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Part 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dB μ V)	Average Limits (dB μ V)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50

* Decrease with logarithm of frequency

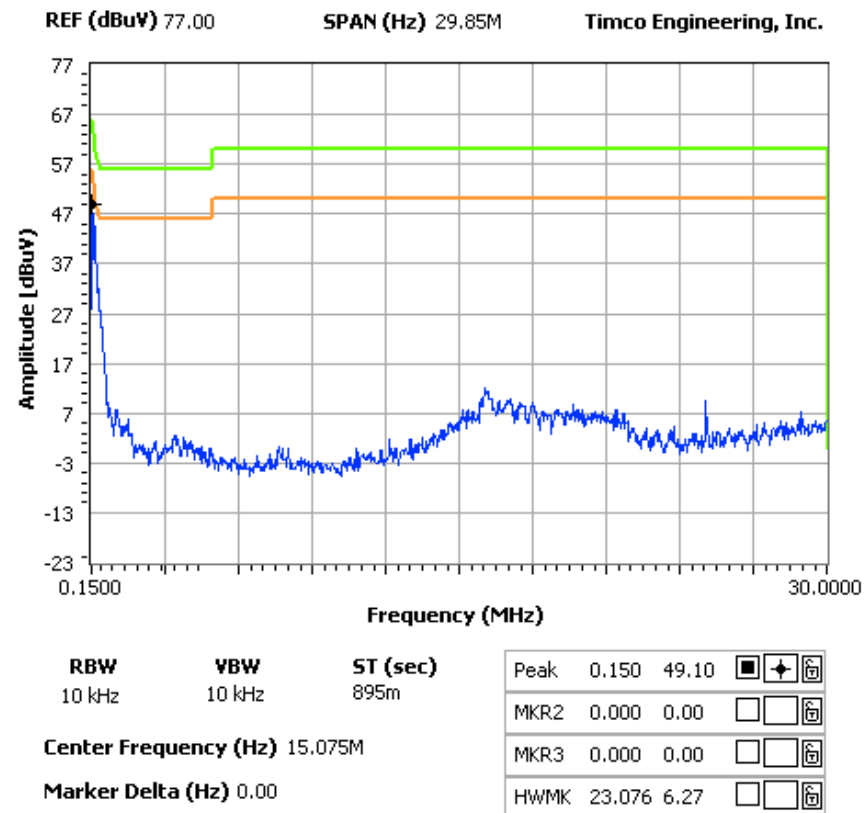
Test Data: The following plots represent the emissions read for power line conducted. Both lines were observed.

POWERLINE CONDUCTED PLOT – LINE 1

NOTES:

CENTRALITE SYSTEMS, INC. - FCC ID: T3LTS001
POWER LINE CONDUCTED PLOT - LINE 1

FCC 15.107 Mask Class B



POWERLINE CONDUCTED PLOT – LINE 2

NOTES:

CENTRALITE SYSTEMS, INC. - FCC ID: T3LTS001
 POWER LINE CONDUCTED PLOT - LINE 2

FCC 15.107 Mask Class B

