

TEST REPORT

Report Number: 3184846ATL-001

July 31, 2009

Product Designation: SHC-G

Standard: 47 CFR Part 15, Subpart C (15.231e - Periodic operation in the band 40.66-40.70 MHz and above 70 MHz, Reduced limits)
RSS-210, Issue 7, 2007

Tested by:

Intertek Testing Services NA Inc.
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Duluth, GA 30096

Client:

Sequentric Energy Systems LLC
2840 South College Road
Suite 210
Wilmington, NC 28412
Contact: Daniel Flohr
Phone: 910.233.8690

Tests performed by:



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Report reviewed by:



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1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)		
5.0	Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)	07/17/2009	
6.0	Restrictions (FCC 15C - 15.231(a))	07/17/2009	
7.0	Duty Cycle Determination (FCC 15A - 15.35(c))	04/29/2009	PASS
8.0	Radiated Emissions (FCC 15C - 15.231(b))	07/16/2009	PASS
9.0	Conducted emissions on AC power lines (Conducted Emissions)	04/29/2009	PASS
10.0	Bandwidth Requirements (FCC 15C - 15.231(c))	07/29/2009	PASS
11.0	Revision History (Revision History)		

3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Gateway Control Unit	Sequentric Energy Systems, LLC	SHC-G	256-68125

EUT receive date:	04/27/2009; 07/15/2009
EUT receive condition:	Good

Description of EUT provided by Client:

Sequentric RF System comprising of:

- Gateway Control Unit (Gateway)
- 6 VAC Input

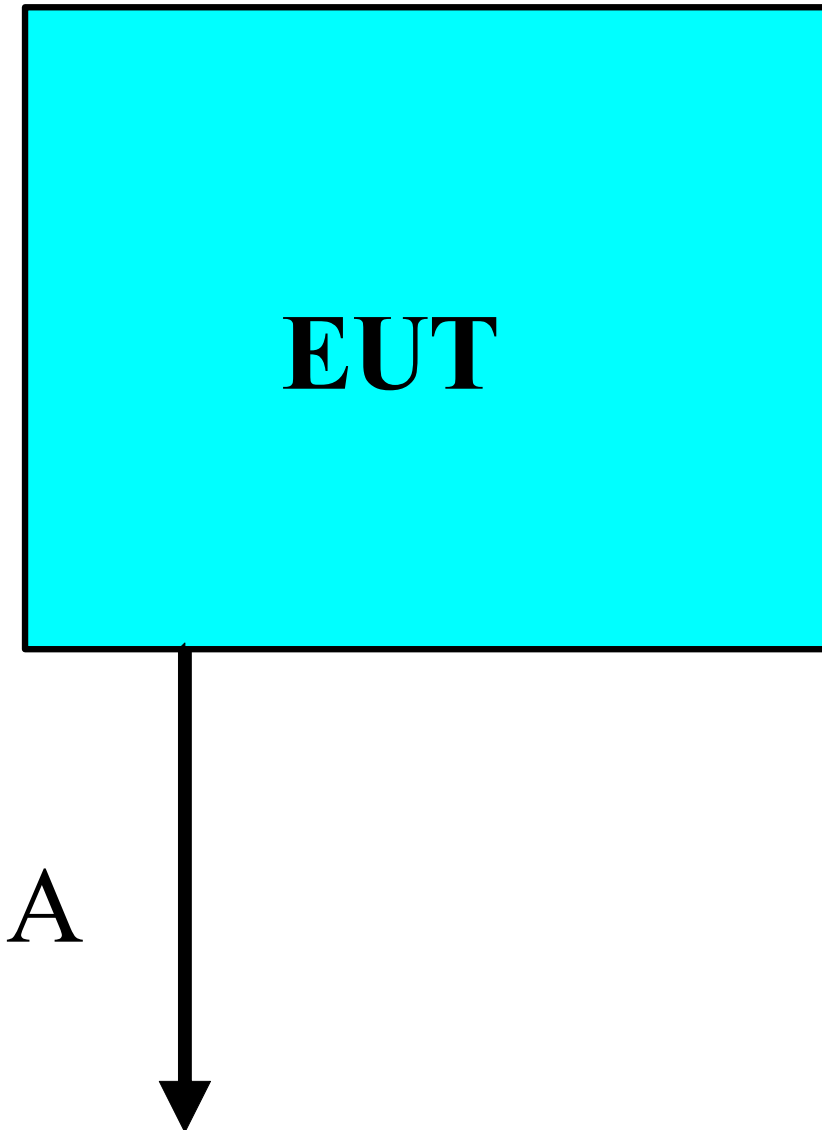
Description of EUT exercising:

The EUT was placed in a continuous transmit state with normal modulation.

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Method:

Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

Drawing:

Block diagram

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Data:

EUT Cabling						
ID	Description	Length	Shielding	Ferrites	Connection	
					From	To
A	DC Power	1.8M	No	No	EUT	AC/DC Adapter

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

5.0 Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)**Method:**

Complete the overview spreadsheet.

Related Submittal(s) Grants: This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.

Data:

Applicant	Sequentric Energy Systems LLC
	2840 South College Road
	Wilmington NC 28412
Trade Name & Model No.	SQR Energy Management System (SHC-G)
FCC Identifier	WPV-SEQR09001A
Frequency Range (MHz)	434
Antenna Type (15.203)	Detachable Antenna, Reverse SMA (Antenna Factor, P/N: ANT-433-CW-HWR-RPS)
Manufacturer name & address	Sequentric Energy Systems LLC
	2840 South College Road
	Wilmington NC 28412

Related Submittals and Grants:	This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.
Additions, deviations and exclusions from standards	None

6.0 Restrictions (FCC 15C - 15.231(a))

Method:

15.231(a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

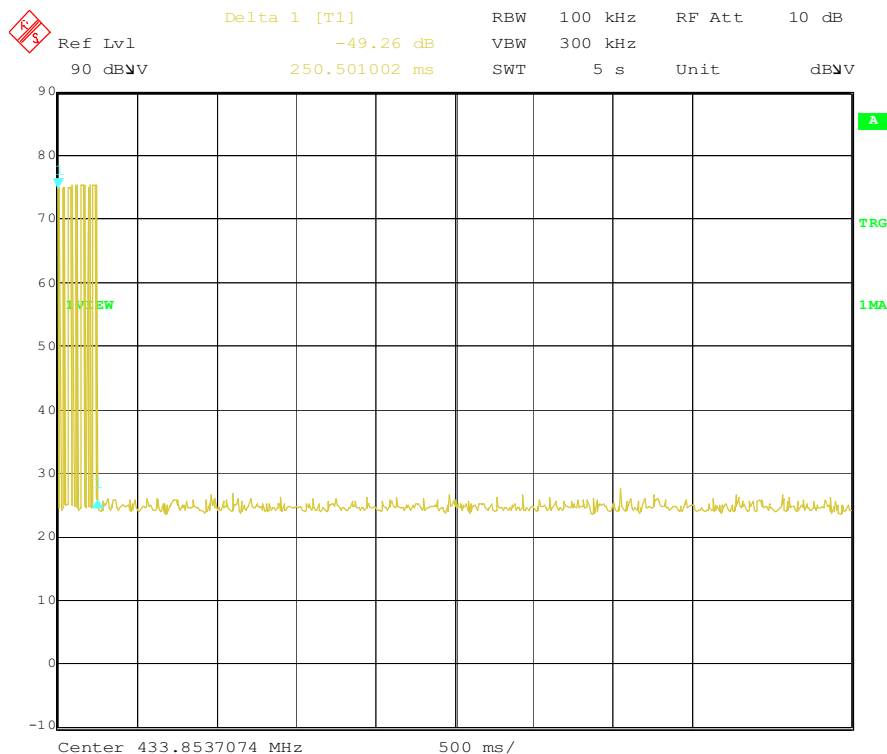
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

Plot:



Date: 29.MAY.2009 17:18:41

5 Second Shutoff

6.0 Restrictions (FCC 15C - 15.231(a))

Data:

15.231(a)	Response	Requirement
Frequency Range (Mhz, max)	434	40.66-40.70 MHz and > 70MHz
Frequency Range (MHz, min)	434	40.66-40.70 MHz and > 70MHz
Transmit only control signal?	Yes	Only control signal allowed
Continuous transmission?	No	No
Voice transmission?	No	No
Video transmission?	No	No
Radio control of toy?	No	No

15.231(a)(1)		
Manually operated?	No	
Deactivates within 5 seconds?	N/A	Yes
Show plot (10 second sweep)	N/A	

15.231(a)(2)		
Automatically operated?	Yes	
Deactivates within 5 seconds?	Yes	Yes
Show plot (10 second sweep)	Yes	

15.231(a)(3)		
Periodically transmits at predetermined intervals?	Yes	No
Polling signals?	Yes	Allowed, with restrictions
Polling rate and timing	Yes, 1.633ms pulse every 10 seconds	< 2 seconds per hour

15.231(a)(4)		
For Emergency Use?	No	Allowed

15.231(a)(5)		
Exceed 15.231(a)(1) or (a)(2) requirements?	No	Allowed for professional install

7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

Method:

(c) Unless otherwise specified, e.g. §15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Determine the period of the pulse train, T, in mSec and record the results. T is defined as the time from the beginning of one pulse train to the beginning of the next pulse train.

Count the number of different types of pulses, N and record the results.

For each of the different types of pulses, count the number of occurrences within one pulse train.

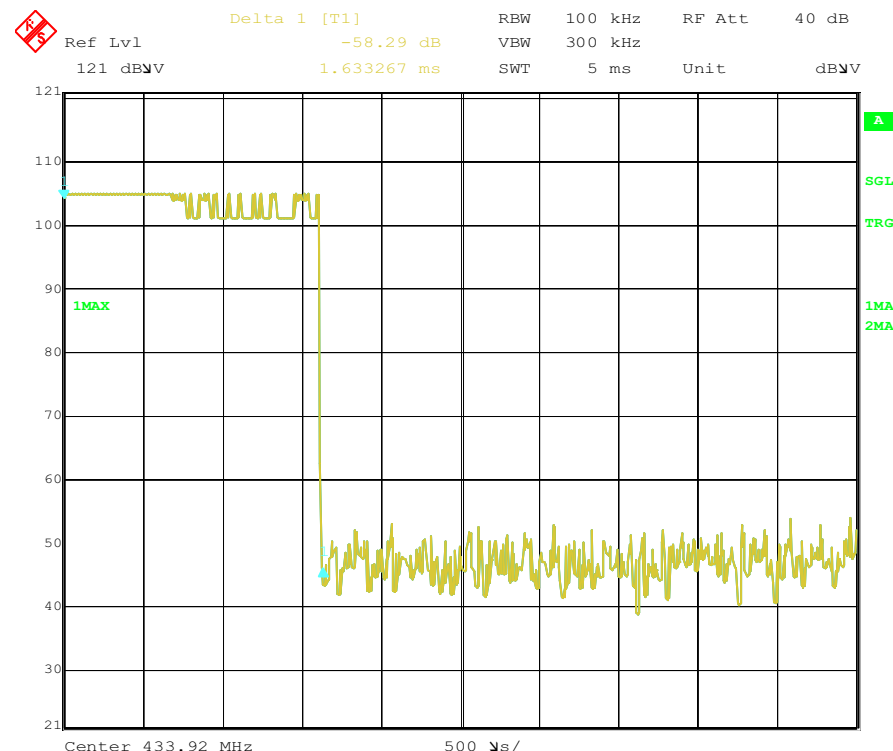
Use the Duty Cycle Correction Factor, DCCF, from the results table and use it to adjust the field strength measurements recorded for radiated emissions.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/10/2008	10/10/2009

Results: The sample tested was found to Comply.

Plot:

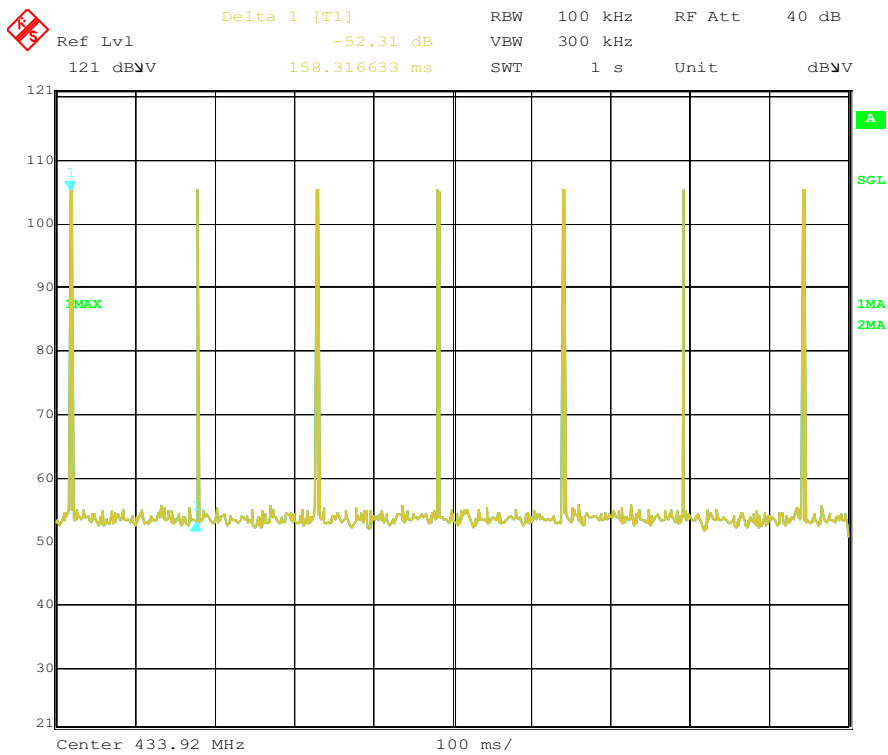


Date: 29.APR.2009 16:56:47

Single Pulse Train

7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

Plot:



Date: 29.APR.2009 16:52:23

Complete Pulse Train

7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

Data:

Duration of Pulse Train, T (mSec):	158.317
Averaging Interval, A_I (mSec):	100
Number of different Pulses, N:	1

	Number (# P_x)	Pulse Width, mSec (PW_x)	Product (# P_x)*(PW_x)
Pulse Width 1	1	1.633	1.633
Pulse Width 2			
Pulse Width 3			
Pulse Width 4			
Pulse Width 5			
Pulse Width 6			
Pulse Width 7			
Pulse Width 8			
Pulse Width 9			
Pulse Width 10			

Duty Cycle:	0.01633
Duty Cycle Correction Factor, dB:	-35.7

$$T_{on} = (PW_1 * \#P_1) + (PW_2 * \#P_2) + \dots + (PW_n * \#P_n)$$

$$DutyCycle = T_{on} \div A_I$$

$$DCCF = 20 * \log_{10}(DutyCycle)$$

8.0 Radiated Emissions (FCC 15C - 15.231(b))

Method:

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the limits specified in FCC Part 15.231(b).

Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

For radiated emission measurements, the EUT is attached to a styro-foam block and placed on a non-conductive table whose top is 80cm above the ground plane. If the EUT is handheld, the signal shall be aximized through rotation and placement in the three orthogonal axes.

During the test the EUT is rotated and the antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 3 meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent 3-meter reading using inverse scaling with distance.

Radiated emission measurements were performed from 30 MHz to 10 times the highest frequency generated in the EUT. When provided, emissions plots are taken with a peak detector unless otherwise indicated.

Analyzer resolution is:

100 kHz or greater for frequencies 1000 MHz and below,
1 MHz for frequencies above 1000 MHz.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4:2003.

The Peak value of the Field Strength was measured. The Average value was obtained from the Peak by subtracting the Duty Cycle Correction Factor or by using an average detector.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, BiLog, 20-2000MHz	Chase	CBL6112B	211386	09/26/2008	09/26/2009
Antenna, Horn, <18 GHz	EMCO	3115	BOX-HORN1	08/08/2008	08/08/2009
Cable E01, <18GHz	Pasternack	RG214/U	E01	05/04/2009	05/04/2010
Cable E201, 18 GHz, N, 3m	Megaphase	TM18 NKNK 118	E201	01/29/2009	01/29/2010
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/04/2009	05/04/2010
Cable ST1, 7m, N-N, 18 GHz	Storm Products Co.	PR90-206-7MTR	ST1	01/23/2009	01/23/2010
EMI Receiver	Hewlett Packard	8546A	211505	01/12/2009	01/12/2010
EMI Receiver, Preselector section	Hewlett Packard	85460A	015762	01/12/2009	01/12/2010
Excel spreadsheet for radiated emissions	Software	Excel - RE Worksh	SW004	12/08/2008	12/08/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	04/07/2009	04/07/2010
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/10/2008	10/10/2009
Tile - software profile for radiated and conducted emissions testing.	Software	Tile - Emissions	SW006	12/08/2008	12/08/2009

Results: The sample tested was found to Comply.

8.0 Radiated Emissions (FCC 15C - 15.231(b))**Photo:**

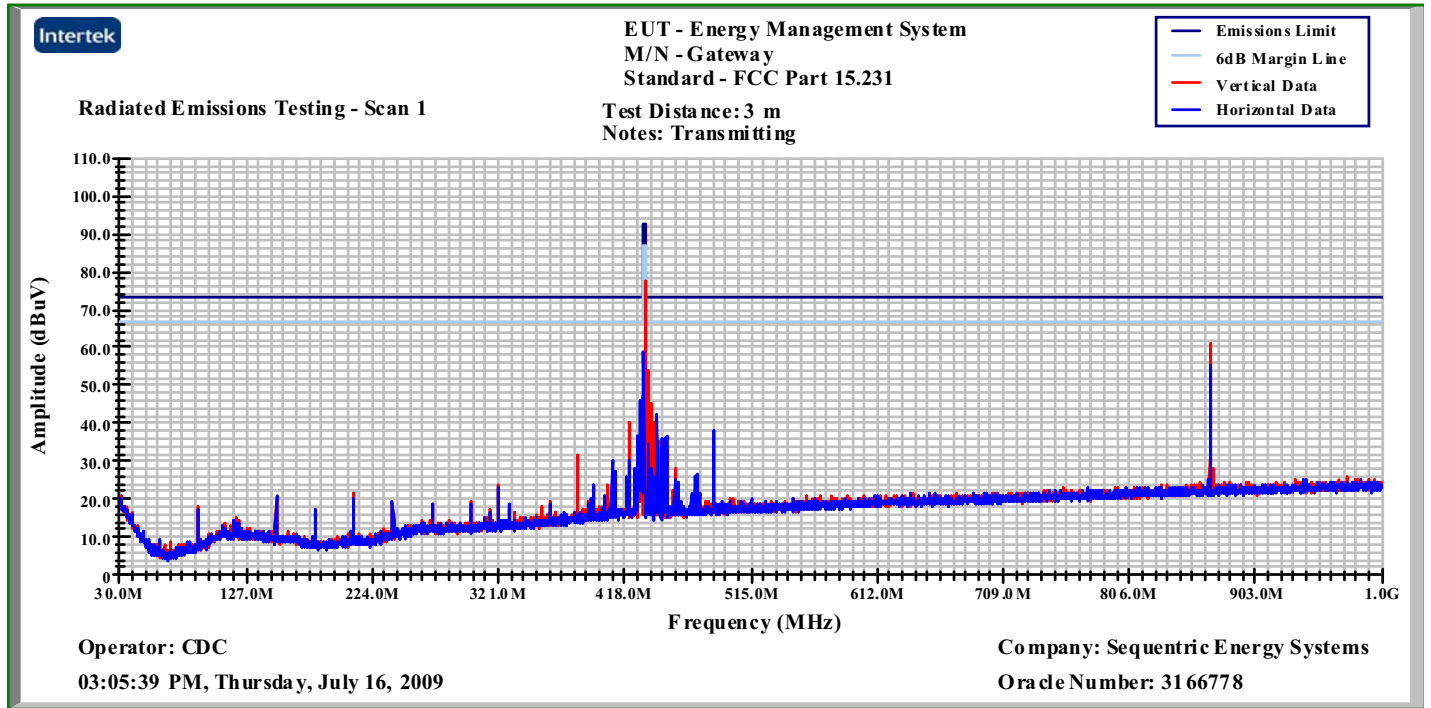
Test Setup

8.0 Radiated Emissions (FCC 15C - 15.231(b))**Photo:**

Test Setup

8.0 Radiated Emissions (FCC 15C - 15.231(b))

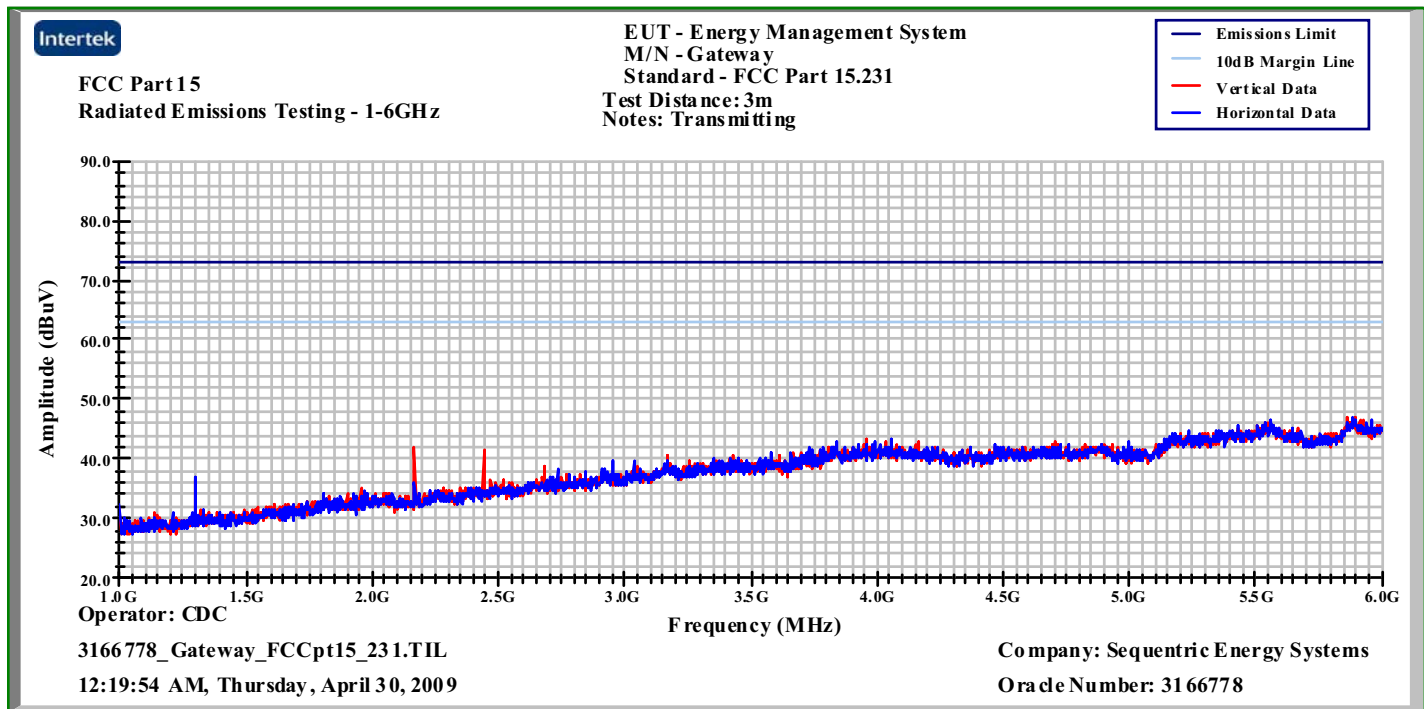
Plot:



Peak Plot - 15.231e Limits

8.0 Radiated Emissions (FCC 15C - 15.231(b))

Plot:



Peak Plot - 15.231e Limits

8.0 Radiated Emissions (FCC 15C - 15.231(b))

Data:

Date: 7/16/2009

Test Distance (m): 3

Frequency Range (MHz): 30-1000

Limit: 15.231e

Input power: 120VAC, 60Hz

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Duty Cycle Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
v	433.966	69.1	17.3	3.8	0.0	90.2	92.9	-2.7	P/100k/300k
v	433.966	69.1	17.3	3.8	35.7	54.5	72.9	-18.4	P/100k/300k
h	433.859	68.0	18.2	3.8	0.0	90.0	92.9	-2.9	P/100k/300k
h	433.859	68.0	18.2	3.8	35.7	54.3	72.9	-18.6	P/100k/300k
v	867.883	29.2	21.4	5.5	0.0	56.0	72.9	-16.8	P/100k/300k
v	867.883	29.2	21.4	5.5	35.7	20.3	52.9	-32.6	P/100k/300k
h	867.969	30.0	21.8	5.5	0.0	57.2	72.9	-15.6	P/100k/300k
h	867.969	30.0	21.8	5.5	35.7	21.5	52.9	-31.4	P/100k/300k
Calculations		G=C+D+E-F		I=G-H					

Note: Output power reduced since last assessment on April 29, 2009

9.0 Conducted emissions on AC power lines (Conducted Emissions)

Method:

Equipment setup for conducted disturbance tests shall follow the guidelines of ANSI C63.4:2003, EN 55022:1998 +A1:2000 +A2:2003, AS/NZS CISPR22: 2002 and VCCI V-3 / 2007.04.

Measurements in the frequency range of 150kHz to 30 MHz shall be performed with a quasi-peak or average detector instrument that meets the requirements of Section One of CISPR 16. An AMN shall be used to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN defined in CISPR 16 shall be used.

In the frequency range of 150 kHz to 30 MHz, a resolution/video bandwidth of 9kHz/30kHz or greater shall be used.

The EUT shall be located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

If a flexible mains cord is provided by the manufacturer that is in excess of 1m, the excess cable shall be folded back and forth as far as possible to form a bundle not exceeding 0.4m in length.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance shall be measured between each current carrying conductor and the reference ground. Each measured values shall be reported.

If EUT is intended for tabletop use, the EUT shall be placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is be placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the floor standing EUT shall be placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material. The metal ground plane shall extend at least 0.5m beyond the boundaries of the EUT and had minimum dimensions of 2m by 2m.

TEST SITE

The test site for conducted emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. The VCCI Registration Number for this site is C-2818.

MEASUREMENT UNCERTAINTY

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

150 kHz to 30 MHz: +/- 2.8 dB

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Cable TT1, 6ft, N(Male) to N(Male)	Mini-Circuits	CBL-6FT-NMNM	TT1	05/04/2009	05/04/2010
Cable TT5	Andrews	Cable TT5	TT5 211405	05/04/2009	05/04/2010
EMI Receiver	Hewlett Packard	8546A	211505	01/12/2009	01/12/2010
EMI Receiver, Preselector section	Hewlett Packard	85460A	015762	01/12/2009	01/12/2010
Excel spreadsheet for conducted emissions tests	Software	Excel - CE Worksh	SW002	12/08/2008	12/08/2009
LISN (TT5)	Fischer Custom Comm	FCC-LISN-50-50-M	211407	08/25/2008	08/25/2009
Tile - software profile for radiated and conducted emissions testing.	Software	Tile - Emissions	SW006	12/08/2008	12/08/2009

Results: The sample tested was found to Comply.

9.0 Conducted emissions on AC power lines (Conducted Emissions)

Photo:



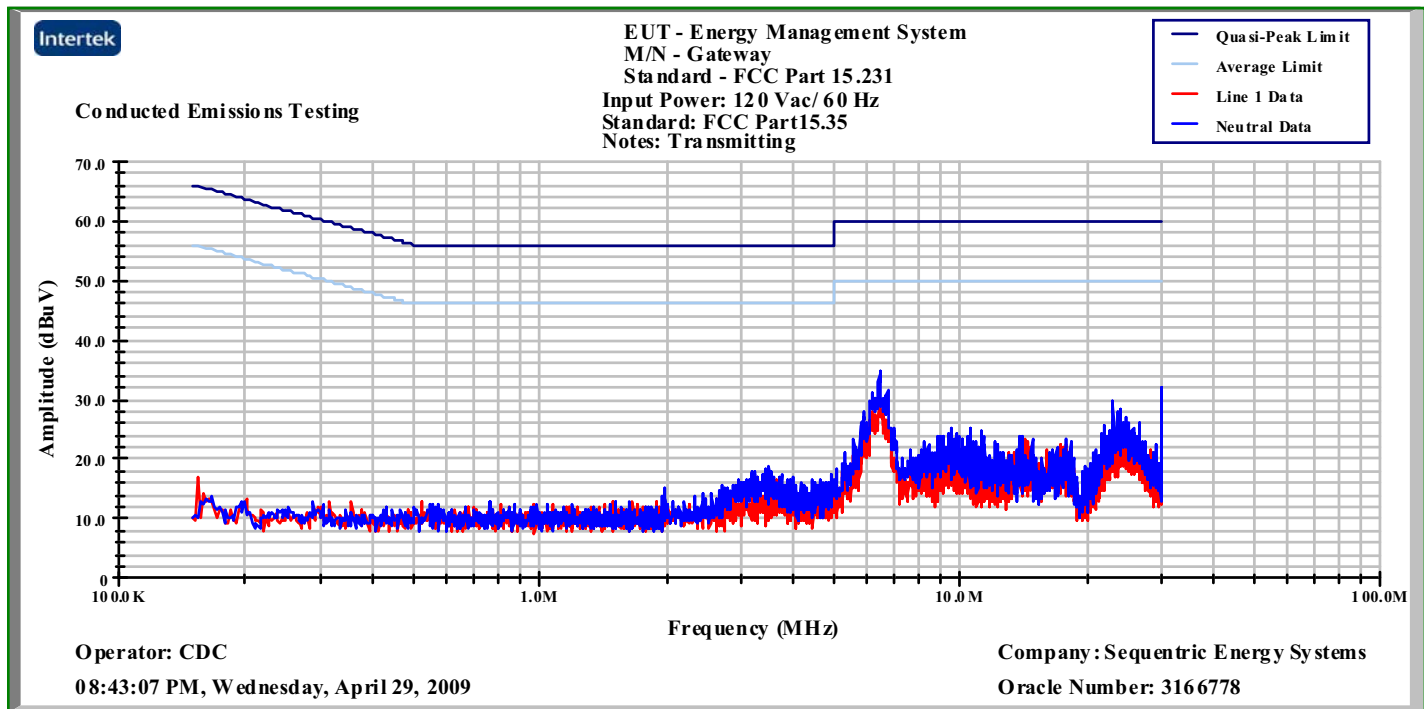
Test Setup

9.0 Conducted emissions on AC power lines (Conducted Emissions)**Photo:**

Test Setup

9.0 Conducted emissions on AC power lines (Conducted Emissions)

Plot:



Peak Plot

9.0 Conducted emissions on AC power lines (Conducted Emissions)**Data:**

Conducted Emissions Summary			
Rule Part	Limit	Input Voltage	Result
FCC Part 15.107	CISPR Class B	120 Vac / 60 Hz	Pass

Peak data was more than 10dB below the average limit.

10.0 Bandwidth Requirements (FCC 15C - 15.231(c))

Method:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

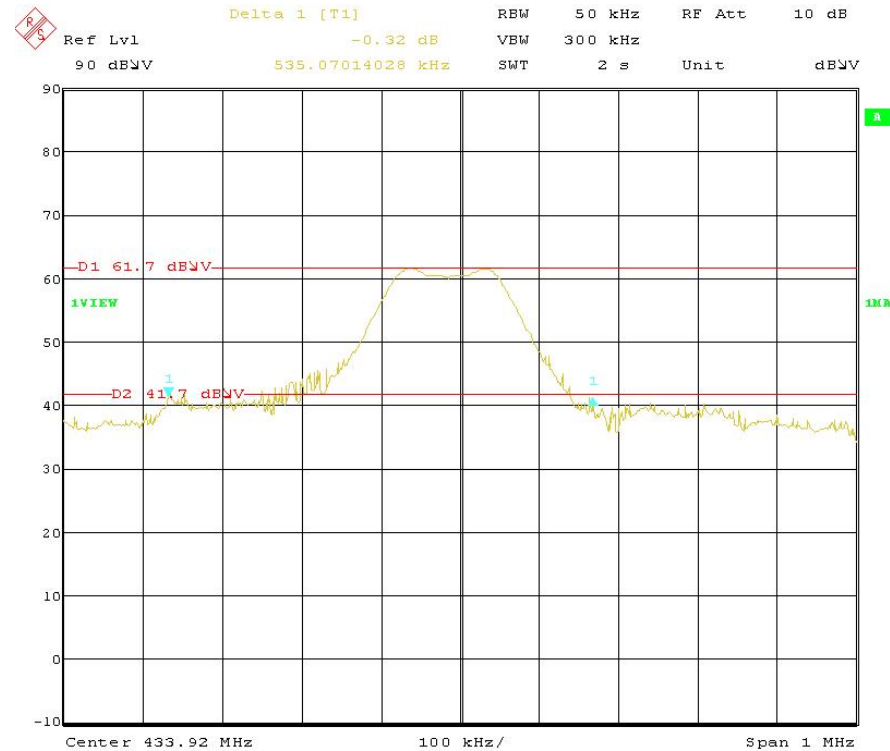
- Center Frequency is set to the fundamental of transmitter.
- Resolution Bandwidth is set to approximately 1% of the emission bandwidth.
- Video Bandwidth is set greater than or equal to the Resolution Bandwidth.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/10/2008	10/10/2009

Results: The sample tested was found to Comply.

Plot:



Date: 29.JUL.2009 16:11:10

Bandwidth Plot

10.0 Bandwidth Requirements (FCC 15C - 15.231(c))**Data:**

Fundamental Frequency MHz	Measured Bandwidth MHz	Bandwidth Limit MHz
433.9	0.535	1.08475

Suggested Instrument Settings	
RBW (kHz):	54
VBW (kHz):	163
Span (MHz):	1.085
Sweep time (s):	>1

11.0 Revision History (Revision History)**Method:**

Document the history of the report.

Data:

Revision Level	Date	Report Number	Notes
Original issue	July 27, 2009	3184846ATL-001	--
1	July 28, 2009	3184846ATL-001	- Corrected company designation in Section 5.0.
2	July 31, 2009	3184846ATL-001	- Corrected bandwidth plot. - Added average data to radiated emissions table