

*Electromagnetic Emissions Test Report  
and  
Application for Grant of Equipment Authorization  
pursuant to*

*Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7  
FCC Part 15 Subpart C*

*on the  
S & C Electric Company  
Transmitter  
Model: SpeedNet Radio*

UPN: 5349C-SPEEDNET  
FCC ID: U3DSPEEDNET

GRANTEE: S & C Electric Company  
1135 Atlantic Ave.  
Alameda, CA 94501-1145

TEST SITE: Elliott Laboratories, Inc.  
684 W. Maude Ave  
Sunnyvale, CA 94086

REPORT DATE: January 2, 2008

FINAL TEST DATE: March 29 and March 30, 2007  
December 7 and December 15, 2007

AUTHORIZED SIGNATORY:



Mark E. Hill  
EMC Staff Engineer



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**REVISION HISTORY**

Revision #	Date	Comments	Modified By
1	April 9, 2008	Initial Release	David Guidotti

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## SCOPE

An electromagnetic emissions test has been performed on the S & C Electric Company model SpeedNet Radio pursuant to the following rules:

Industry Canada RSS-Gen Issue 2  
RSS 210 Issue 7 “Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment”  
FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003  
RSS-212 Issue 1 Test Facilities and Test Methods for Radio Equipment

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the S & C Electric Company model SpeedNet Radio and therefore apply only to the tested sample. The sample was selected and prepared by David Munoz of S & C Electric Company.

## **OBJECTIVE**

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

## **STATEMENT OF COMPLIANCE**

The tested sample of S & C Electric Company model SpeedNet Radio complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 2  
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"  
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

**TEST RESULTS SUMMARY****FREQUENCY HOPPING SPREAD SPECTRUM (902 – 928 MHz, 50 channels or more)**

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (c)	20dB Bandwidth	10 kHz	Channel spacing > 20dB bandwidth / 25kHz	Complies
15.247 (a) (1)	RSS 210 A8.1 (b)	Channel Separation	500 kHz		Complies
15.247 (a) (1) (i)	RSS 210 A8.1 (c)	Number of Channels	51	50 or more	Complies
15.247 (a) (1) (i)	RSS 210 A8.1 (c)	Channel Dwell Time	0.266 seconds per 10 seconds	<0.4 second within a 20 second period	Complies
15.247 (a) (1)	RSS 210 A8.1 (a)	Channel Utilization	All channels are used equally - refer to the operational description for full explanation	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (1)	Output Power	27.83 dBm (0.607 Watts) EIRP = 4 W <sup>Note 1</sup>	1Watt, EIRP < 4 Watts	Complies
15.247 (c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 9.28 GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247 (c) 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 9.28 GHz	69.8dBμV/m (3090.3μV/m) @ 2706.5MHz (-4.2dB)	15.207 in restricted bands, all others < -20dBc	Complies
	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies

Note 1: Device is professionally installed and provided with instructions to limit EIRP to not exceed 4 W. This is done by lowering output power depending on antenna used and cable loss.

**GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS**

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	EUT is professionally installed	Unique connector or professionally installed	Complies
15.109	RSS GEN 6 (a) Table 1	Receiver spurious emissions	26.4dB $\mu$ V/m @ 914.800MHz (-19.6dB)		Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	50.0dB $\mu$ V @ 0.538MHz (-6.0dB)	Refer to standard	Complies
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding non-interference	Complies
	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding detachable antenna	Complies

**MEASUREMENT UNCERTAINTIES**

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	$\pm 2.4$
Radiated Emissions	0.015 to 30	$\pm 3.0$
Radiated Emissions	30 to 1000	$\pm 3.6$
Radiated Emissions	1000 to 40000	$\pm 6.0$



## EQUIPMENT UNDER TEST (EUT) DETAILS

### GENERAL

The S & C Electric Company model SpeedNet Radio is a frequency-hopping radio which is designed for commercial/industrial and military applications. The device can operate at two data rates, one using a 207-channel hopping sequence with channel spacing of 125kHz and data rate of 101.5kB/s, the other uses 51 channels with a 500 kHz spacing and a data rate of 406 kb/s.

Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz (via external AC-DC adapter) 10 Watts. In addition, the NovaRoam EH900 will accept DC input power at any voltage between +10 and +18V.

The sample was received on March 29, 2007 and tested on March 29 and March 30, 2007. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
S & C Electric	NovaRoam EH900	Frequency- Hopping Radio		U3DSPEEDNET
Antenex		Yagi Antenna		
Antenex		Omni Antenna		

### ANTENNA SYSTEM

The EUT has a standard TNC antenna connector. It can be used with the following antennas:

- +12.1dBi Yagi
- +5.1dBi omni

The cable lengths supplied with each antenna ensure that their effective gain (actual gain - cable loss) does not exceed 6dBi.

### ENCLOSURE

The EUT enclosure is primarily constructed of extruded aluminum. It measures approximately 13.2 cm wide by 16 cm deep by 3.3 cm high.

### MODIFICATIONS

The EUT did not require modifications during testing in order to comply with emissions specifications.

**SUPPORT EQUIPMENT**

No local support equipment was used during emissions testing.

The following equipment was used as remote support equipment for emissions testing:

Manufacturer	Model	Description	Serial Number	FCC ID
Toshiba	Satellite	Laptop computer		

**EUT INTERFACE PORTS**

The I/O cabling configuration during emissions testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
RJ 45	Laptop	CAT5	Unshielded	30
RS232	NOT CONNECTED	See note below		
Antenna	Antenna	LMR 400	Shielded	See note
DC power	DC Adapter	2-wire	Unshielded	1.5

Note: The Monitor ports was not connected as the manufacturer stated that it is for configuration purpose and therefore would not normally be connected.

During spurious emissions testing, the antenna being tested was connected to the EUT using a 1 meter length of cable. This represented worse case configuration. During actual usage, additional cabling would be used to ensure that the system complies with the 4 W EIRP requirement, as described in the installation guide.

**EUT OPERATION**

Communication was established with the EUT via a ping program running in the remote laptop while the EUT was set to receive on the specified channel.

## **TEST SITE**

### **GENERAL INFORMATION**

Final test measurements were taken on March 29 and March 30, 2007 and December 7 and December 15, 2007 at the Elliott Laboratories Open Area Test Site #1 located at 684 West Maude Avenue, Sunnyvale, California or 41039 Boyce Road, Fremont, California Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission.

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003 and RSS 212.

### **CONDUCTED EMISSIONS CONSIDERATIONS**

Conducted emissions testing is performed in conformance with ANSI C63.4:2003 and RSS 212. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

### **RADIATED EMISSIONS CONSIDERATIONS**

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003 / RSS 212.

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## MEASUREMENT INSTRUMENTATION

### RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

### INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

### LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

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*FILTERS/ATTENUATORS*

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

*ANTENNAS*

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

*ANTENNA MAST AND EQUIPMENT TURNTABLE*

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 and RSS 212 specify that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

*INSTRUMENT CALIBRATION*

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

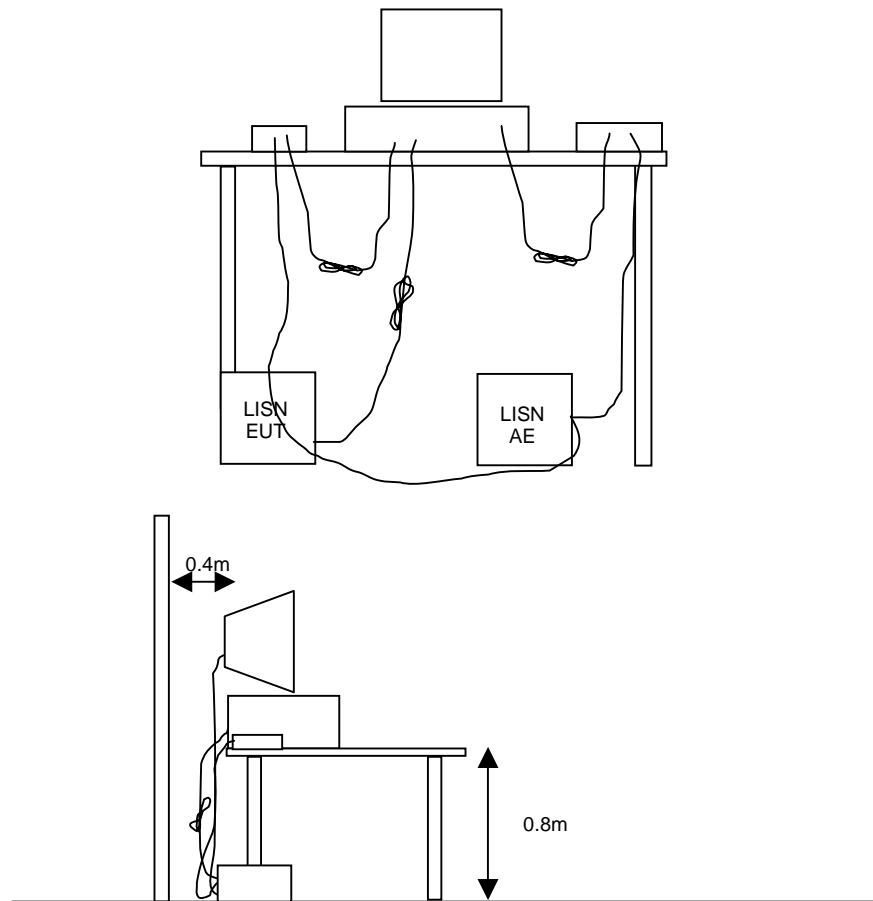
## TEST PROCEDURES

### EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4:2003, and the worst-case orientation is used for final measurements.

### CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.



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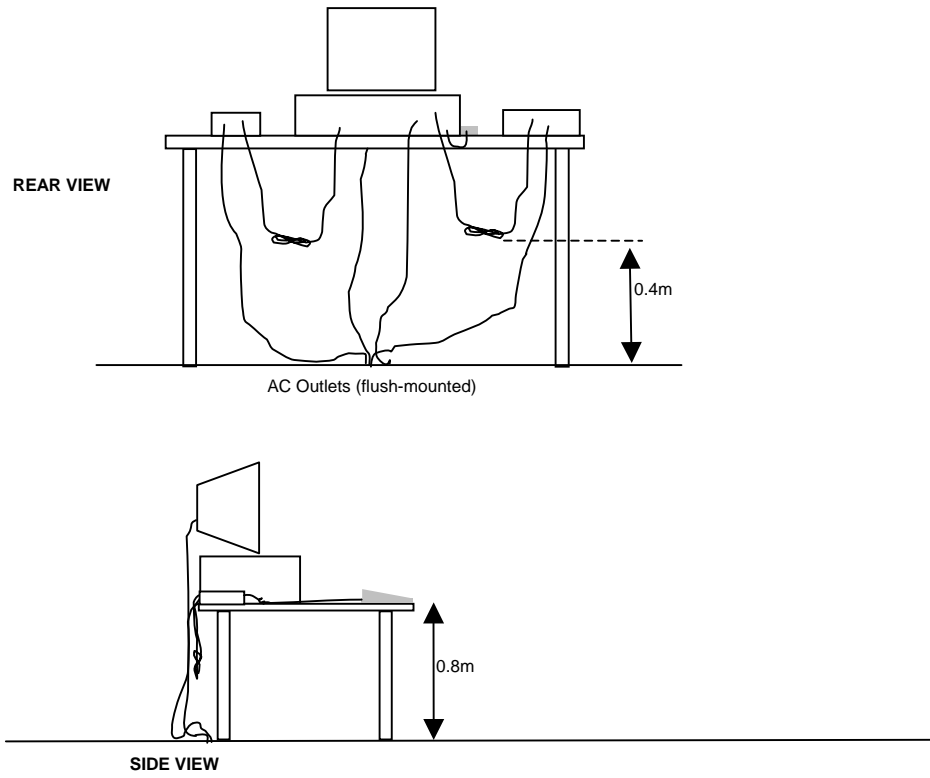
**RADIATED EMISSIONS**

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

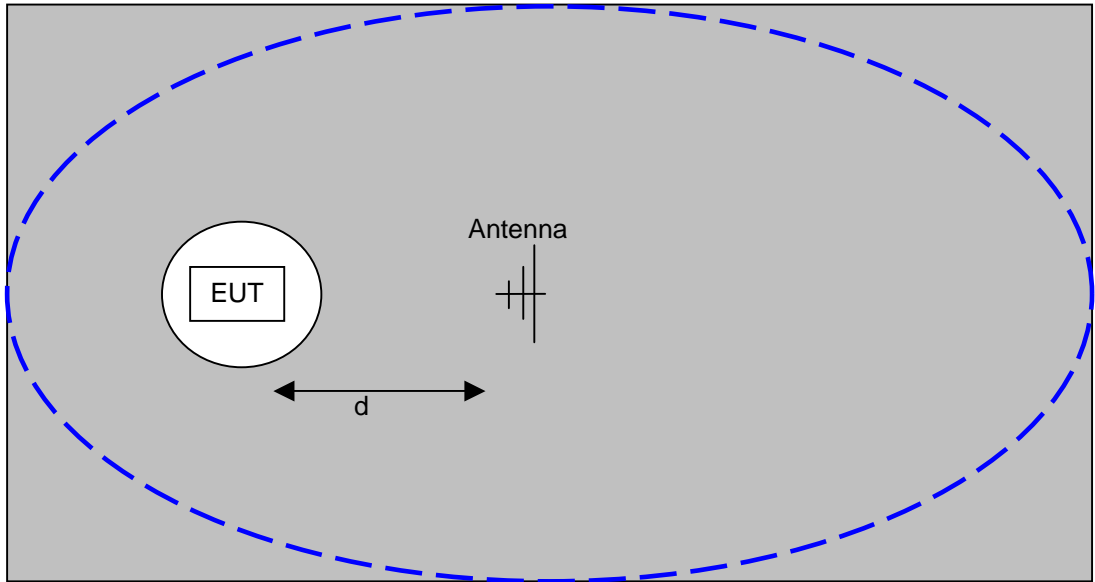
Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

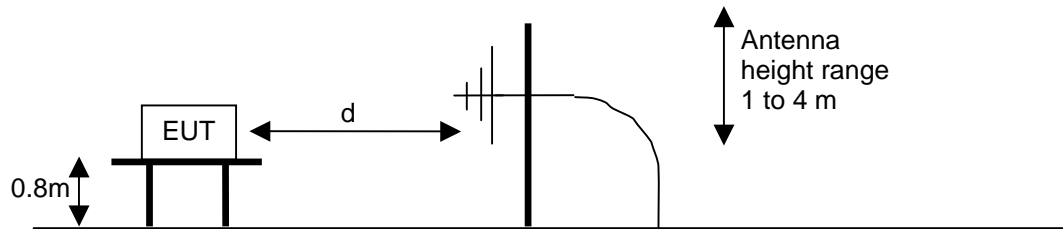


Typical Test Configuration for Radiated Field Strength Measurements





The ground plane extends beyond the ellipse defined in CISPR 16 / CISPR 22 / ANSI C63.4 and is large enough to accommodate test distances (d) of 3m and 10m. Refer to the test data tables for the actual measurement distance.



Test Configuration for Radiated Field Strength Measurements  
OATS- Plan and Side Views

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**BANDWIDTH MEASUREMENTS**

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

**SPECIFICATION LIMITS AND SAMPLE CALCULATIONS**

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

**GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS**

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands<sup>1</sup> (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{\text{KHz}} @ 300\text{m}$	$67.6-20*\log_{10}(F_{\text{KHz}}) @ 300\text{m}$
0.490-1.705	$24000/F_{\text{KHz}} @ 30\text{m}$	$87.6-20*\log_{10}(F_{\text{KHz}}) @ 30\text{m}$
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

**RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS**

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

<sup>1</sup> The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

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**OUTPUT POWER LIMITS – FHSS SYSTEMS**

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	$\geq 50$	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi.

**TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS**

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

**SAMPLE CALCULATIONS - CONDUCTED EMISSIONS**

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

$R_r$  = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

**SAMPLE CALCULATIONS - RADIATED EMISSIONS**

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

$F_d$  = Distance Factor in dB

$D_m$  = Measurement Distance in meters

$D_s$  = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40 * \text{LOG}_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

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The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

$$R_r = \text{Receiver Reading in dBuV/m}$$

$$F_d = \text{Distance Factor in dB}$$

$$R_c = \text{Corrected Reading in dBuV/m}$$

$$L_s = \text{Specification Limit in dBuV/m}$$

$$M = \text{Margin in dB Relative to Spec}$$

#### *SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION*

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

***EXHIBIT 1: Test Equipment Calibration Data***

1 Page

**Conducted Emissions - AC Power Ports, 29-Mar-07****Engineer: Rafael Varelas**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Elliott Laboratories	LISN, FCC / CISPR	LISN-3, OATS	304	30-Jun-07
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	812	05-Feb-08
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	17-Apr-07
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	25-Jul-07

**Radiated Emissions, 30 - 10,000 MHz, 30-Mar-07****Engineer: Rafael Varelas**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	487	24-May-08
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	08-Sep-07
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	15-Nov-07
Hewlett Packard	High Pass filter, 1.5 GHz (Red System)	P/N 84300-80037 (84125C)	1154	09-Jun-07
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	17-Apr-07
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	25-Jul-07
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	03-Jan-08

**Radiated Emissions, 30 - 10,000 MHz, 15-Dec-07****Engineer: Rafael Varelas**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	07-Jun-08
Hewlett Packard	High Pass filter, 1.5 GHz (Red System)	P/N 84300-80037 (84125C)	1154	15-Oct-08
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	21-Sep-08
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	03-Jan-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FMT (SA40) Blue	8564E (84125C)	1393	17-Jan-08
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	06-Nov-08



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***EXHIBIT 2: Test Measurement Data***

35 Pages



## EMC Test Data

Client:	S & C Electric	Job Number:	J67303
Model:	SpeedNet Radio	Test-Log Number:	T67420
		Project Manager:	Sheareen Washington
Contact:	David Munoz		
Emissions Spec:	FCC Part 15.247	Class:	A
Immunity Spec:	-	Environment:	-

# EMC Test Data

For The

**S & C Electric**

Model

**SpeedNet Radio**

Date of Last Test: 12/15/2007



## EMC Test Data

Client:	S & C Electric	Job Number:	J67303
Model:	SpeedNet Radio	Test-Log Number:	T67420
		Project Manager:	Sheareen Washington
Contact:	David Munoz		
Emissions Spec:	FCC Part 15.247	Class:	A
Immunity Spec:	-	Environment:	-

### EUT INFORMATION

*The client agreed provide the following information after the test session(s).*

#### General Description

The EUT is a frequency-hopping radio which is designed for commercial/industrial and military applications. The device can operate at two data rates, one using a 207-channel hopping sequence with channel spacing of 125kHz and data rate of 101.5kb/s, the other uses 51 channels with a 500 kHz spacing and a data rate of 406 kb/s.

Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz (via external AC-DC adapter) 10 Watts. In addition, the NovaRoam EH900 will accept DC input power at any voltage between +10 and +18V.

#### Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
S & C Electric	NovaRoam EH900	Frequency-Hopping Radio	-	U3DSPEEDNET
Antenex		Yagi Antenna	-	
Antenex		Omni Antenna	-	

#### Other EUT Details

The EUT has a standard TNC antenna connector. It can be used with the following antennas:

- +12.1dBi Yagi
- +5.1dBi omni

The cable lengths supplied with each antenna ensure that their effective gain (actual gain - cable loss) does not exceed 6dBi.

#### EUT Enclosure

The EUT enclosure is primarily constructed of extruded aluminum. It measures approximately 13.2 cm wide by 16 cm deep by 3.3 cm high.



## EMC Test Data

Client:	S & C Electric	Job Number:	J67303
Model:	SpeedNet Radio	T-Log Number:	T67420
Contact:	David Munoz	Project Manager:	Sheareen Washington
Emissions Spec:	FCC Part 15.247	Class:	A
Immunity Spec:	-	Environment:	-

### Test Configuration #1

*The client agreed provide the following information after the test session(s).*

#### Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
-	-	-	-	-

#### Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Toshiba	Satellite	Laptop computer		

#### Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
RJ 45	Laptop	CAT5	Unshielded	30
RS232	NOT CONNECTED	See note below		
Antenna	Antenna	LMR 400	Shielded	See note
DC power	DC Adapter	2-wire	Unshielded	1.5

Note: The Monitor ports was not connected as the manufacturer stated that it is for configuration purpose and therefore would not normally be connected.

The Yagi antenna was connected to the EUT via a 130' cable. The Omni antenna was connected via a 60' cable. These cable lengths are the minimum lengths that can be used with respective antennas. The length of cable ensures the maximum EIRP of 4 Watts allowed by RSS 210 and FCC Part 15.247 is not exceeded.

#### EUT Operation During Emissions (Digital Device/Receiver)

Communication was established with the EUT via a ping program running in the remote laptop while the EUT was set to receive on the specified channel.

#### EUT Operation During Emissions (Transmitter)

Radiated spurious emissions measurements were made with the EUT continuously transmitting on a single channel with a duty cycle of ~ 95%. The signal was on for approximately 140ms and off for approximately 10ms.

Direct measurements of hopping parameters were made with the device set to hop across all channels. Bandwidth and power measurements were made with the device on a single channel as detailed for radiated spurious emissions.

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

## FCC 15.247 FHSS - Power, Bandwidth and Spurious Emissions

### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/15/2007 0:00  
 Test Engineer: Rafael Varelas  
 Test Location: SVOATS #1

Config. Used: 1  
 Config Change: None  
 EUT Voltage: 120V/60Hz

### General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections routed in overhead.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

**Ambient Conditions:**            Temperature:        13 °C  
    Rel. Humidity:       62 %

### Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	30 - 10000 MHz - Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	Refer to run
2	20dB Bandwidth	15.247(a)	Pass	10 kHz
2	99% bandwidth	15.247(a)	Pass	10 kHz
3	Output Power	15.247(b)	Pass	27.83 dBm ( 0.606 W)
4	Channel Occupancy	15.247(a)	Pass	Refer to run
4	Number of Channels	15.247(a)	Pass	51

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

**Modifications Made During Testing:**

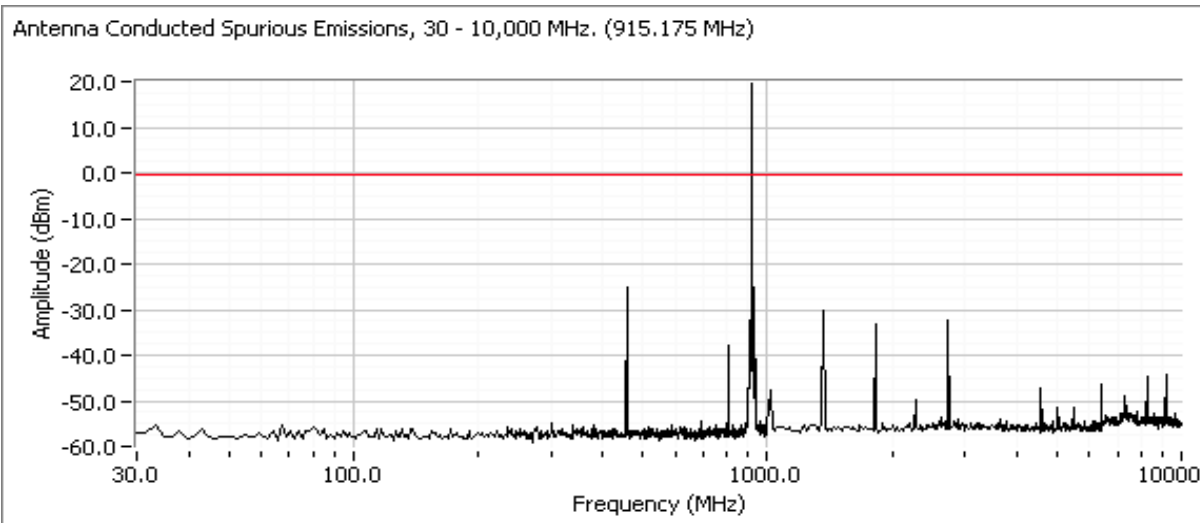
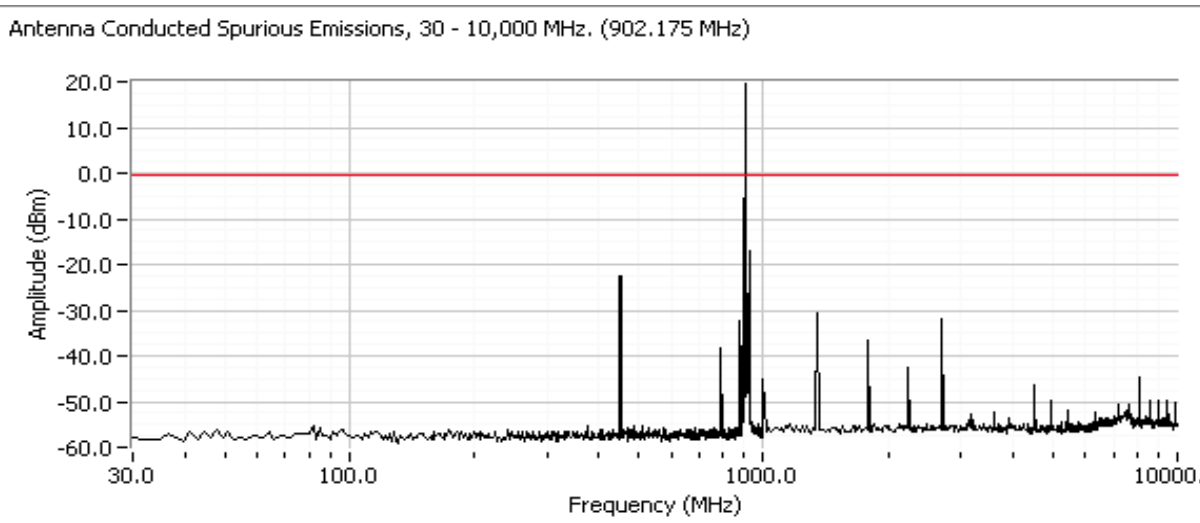
No modifications were made to the EUT during testing

**Deviations From The Standard**

No deviations were made from the requirements of the standard.

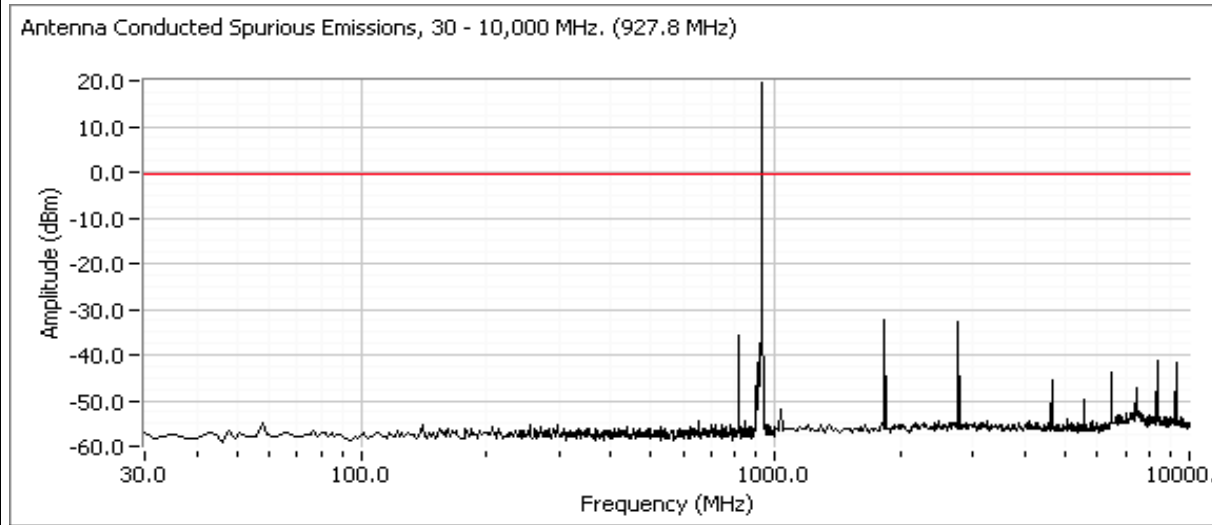
**Run #1: Antenna Conducted Spurious Emissions, 30 - 10,000 MHz.**

Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level.



Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

Run #1: Continued



Run #2: Signal Bandwidth

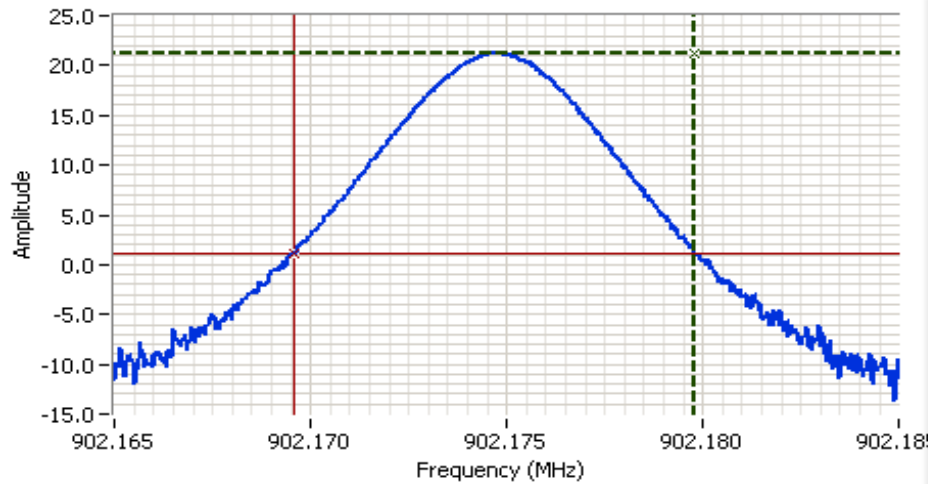
Channel	Frequency (MHz)	Res Bandwidth	20dB Bandwidth (kHz)	Res Bandwidth	99% Bandwidth (kHz)
Low	902.175	3kHz	10	3kHz	10
Mid	915.175	3kHz	10	3kHz	10
High	927.800	3kHz	10	3kHz	10

Note 1: 20dB bandwidth measured using RB = 3kHz, VB = 10kHz (VB > RB)

Note 2: 99% bandwidth measured using RB = 3kHz, VB = 10kHz (VB >=3RB)

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
Contact: David Munoz	Account Manager: Sheareen Washington
Standard: FCC Part 15.247	Class: N/A

Run #2: Continued

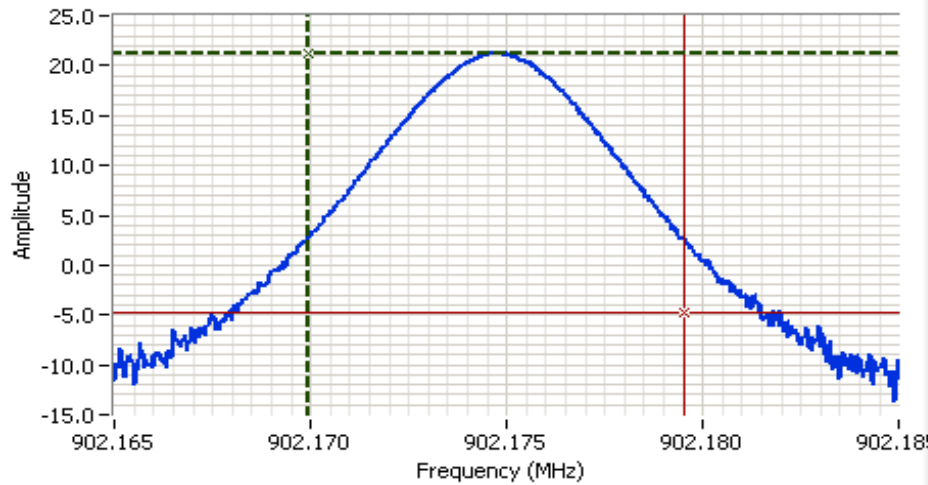


**Analyzer Settings**  
 HP8564E,EMI  
 CF: 902.17 MHz  
 SPAN:20 kHz  
 RB 3 kHz  
 VB 10 kHz  
 Detector Normal  
 Att 20  
 RL Offset 30.00  
 Sweep Time 67.0ms  
 Ref Lvl:40.00DBM

**Comments**  
 High Channel  
 902.175 MHz  
 20dB bandwidth

Cursor 1	902.180	21.17	
Cursor 2	902.170	1.17	

Delta Freq. 10 kHz  
 Delta Amplitude 20.00



**Analyzer Settings**  
 HP8564E,EMI  
 CF: 902.17 MHz  
 SPAN:20 kHz  
 RB 3 kHz  
 VB 10 kHz  
 Detector Normal  
 Att 20  
 RL Offset 30.00  
 Sweep Time 67.0ms  
 Ref Lvl:40.00DBM

**Comments**  
 High Channel  
 902.175 MHz  
 99% power bandwidth:  
 10 kHz

Cursor 1	902.170	21.17	
Cursor 2	902.180	-4.83	

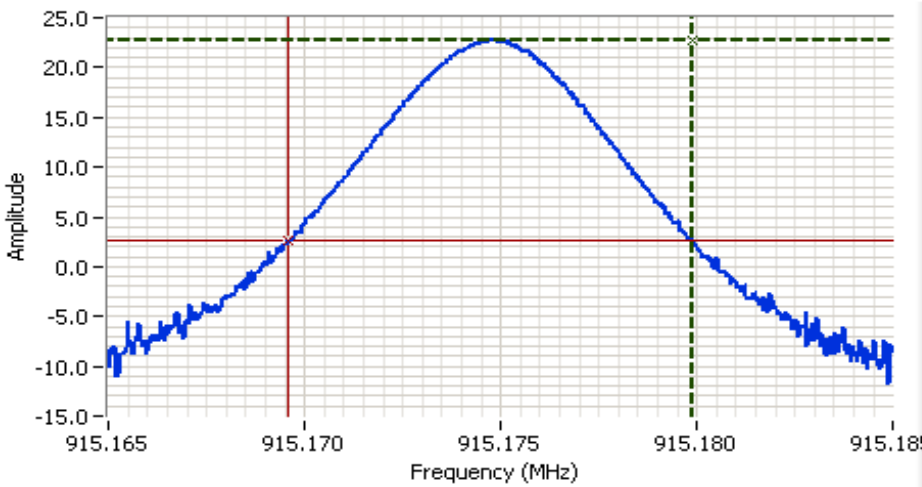
Delta Freq. 10 kHz  
 Delta Amplitude 26.00





Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
Contact: David Munoz	Account Manager: Sheareen Washington
Standard: FCC Part 15.247	Class: N/A

Run #2: Continued



**Analyzer Settings**

HP8564E,EMI  
 CF: 915.17 MHz  
 SPAN:20 kHz  
 RB 3 kHz  
 VB 10 kHz  
 Detector Normal  
 Att 20  
 RL Offset 30.00  
 Sweep Time 67.0ms  
 Ref Lvl:40.00DBM

**Comments**

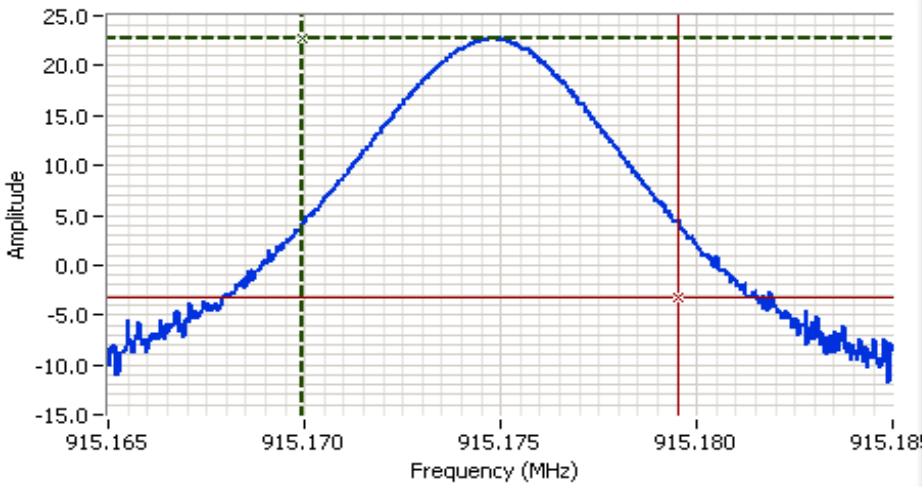
High Channel  
 915.175 MHz  
 20dB bandwidth

Cursor 1 915.180 22.67

Cursor 2 915.170 2.67

Delta Freq. 10 kHz

Delta Amplitude 20.00



**Analyzer Settings**

HP8564E,EMI  
 CF: 915.17 MHz  
 SPAN:20 kHz  
 RB 3 kHz  
 VB 10 kHz  
 Detector Normal  
 Att 20  
 RL Offset 30.00  
 Sweep Time 67.0ms  
 Ref Lvl:40.00DBM

**Comments**

High Channel  
 915.175 MHz  
 99% power bandwidth:  
 10 kHz

Cursor 1 915.170 22.67

Cursor 2 915.180 -3.33

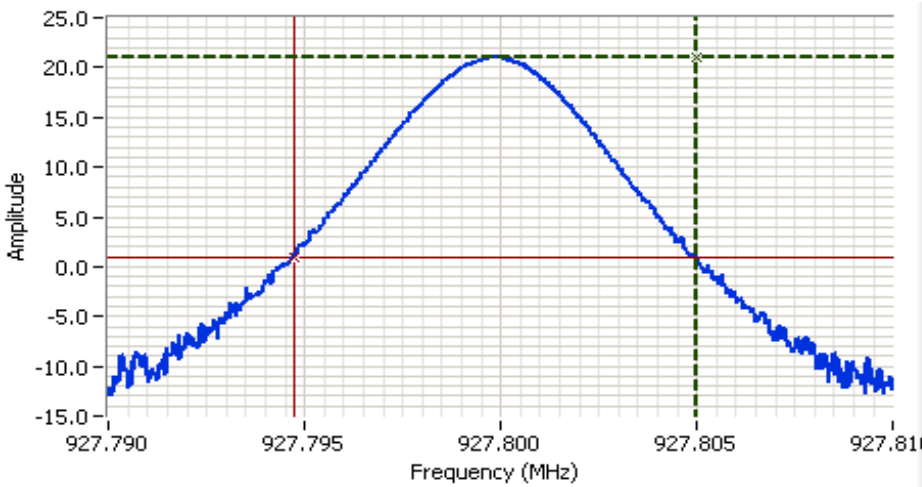
Delta Freq. 10 kHz

Delta Amplitude 26.00



Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
Contact: David Munoz	Account Manager: Sheareen Washington
Standard: FCC Part 15.247	Class: N/A

Run #2: Continued



**Analyzer Settings**

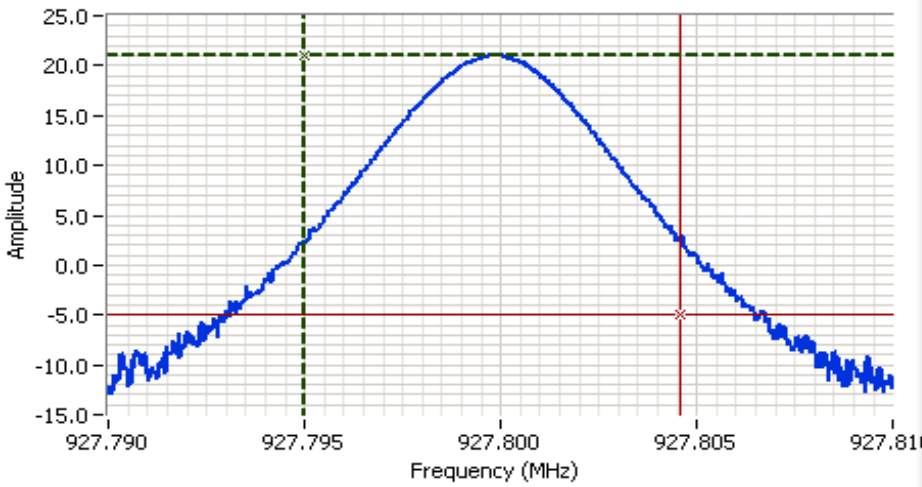
HP8564E,EMI  
 CF: 927.80 MHz  
 SPAN:20 kHz  
 RB 3 kHz  
 VB 10 kHz  
 Detector Normal  
 Att 20  
 RL Offset 30.00  
 Sweep Time 67.0ms  
 Ref Lvl:40.00DBM

**Comments**

High Channel  
 927.8 MHz  
 20dB Bandwidth

Cursor 1	927.805	21.00	⊕ ⊖ ⊞ ⊚
Cursor 2	927.795	1.00	⊕ ⊖ ⊞ ⊚

Delta Freq. 10 kHz  
 Delta Amplitude 20.00



**Analyzer Settings**

HP8564E,EMI  
 CF: 927.80 MHz  
 SPAN:20 kHz  
 RB 3 kHz  
 VB 10 kHz  
 Detector Normal  
 Att 20  
 RL Offset 30.00  
 Sweep Time 67.0ms  
 Ref Lvl:40.00DBM

**Comments**

High Channel  
 927.8 MHz  
 99% power bandwidth:  
 10 kHz

Cursor 1	927.795	21.00	⊕ ⊖ ⊞ ⊚
Cursor 2	927.805	-5.00	⊕ ⊖ ⊞ ⊚

Delta Freq. 10 kHz  
 Delta Amplitude 26.00



Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

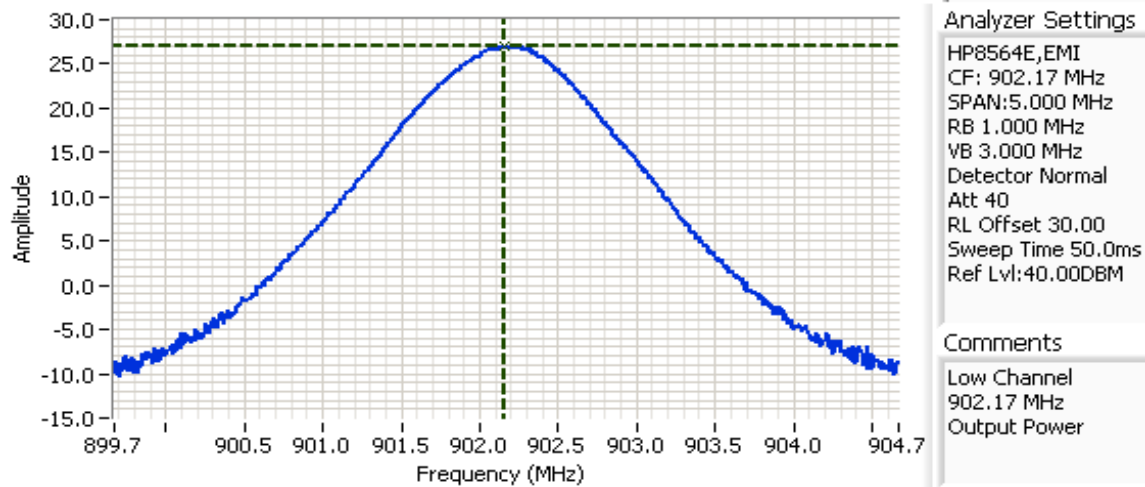
### Run #3: Output Power

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

Maximum antenna gain: 12.1 dBi Yagi Antenna

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	902.175	1MHz	27	0.501187234	-
Mid	915.175	1MHz	27.67	0.584790084	-
High	927.800	1MHz	27.83	0.60673633	-

Note - Power was measured directly at the RF output of the radio at the maximum power setting. The device is provided with instructions to limit the EIRP to under 36dBm (4W).

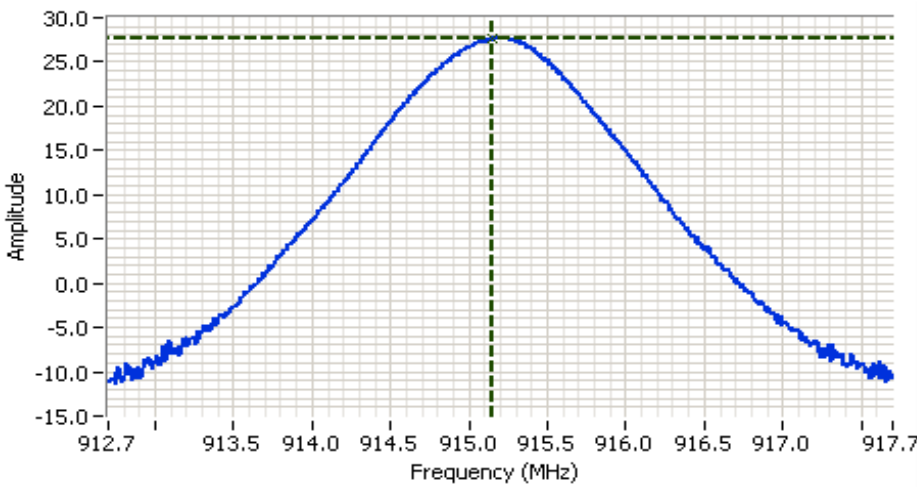


Cursor 1 902.153 27.00

0.000 0.00

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
Contact: David Munoz	Account Manager: Sheareen Washington
Standard: FCC Part 15.247	Class: N/A

Run #3: Continued



Analyzer Settings

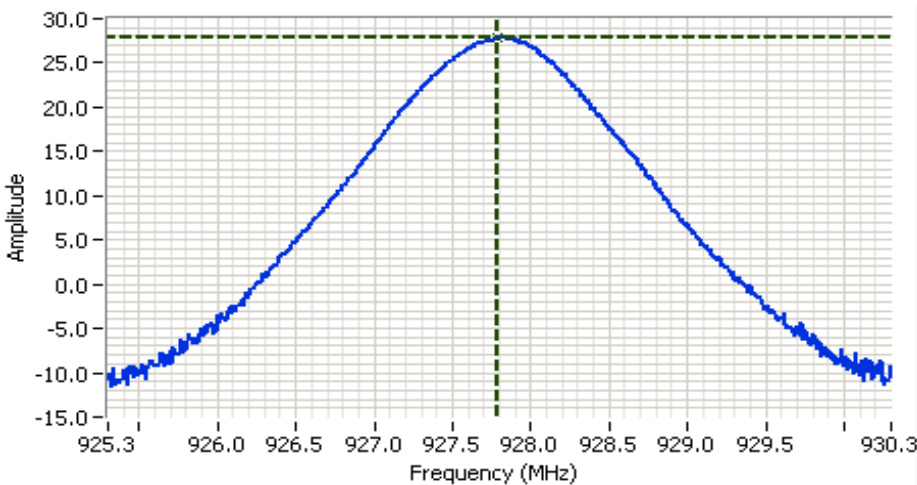
HP8564E,EMI  
 CF: 915.20 MHz  
 SPAN:5.000 MHz  
 RB 1.000 MHz  
 VB 3.000 MHz  
 Detector Normal  
 Att 40  
 RL Offset 30.00  
 Sweep Time 50.0ms  
 Ref Lvl:30.00DBM

Comments

Middle Channel  
 915.175 MHz  
 Output Power

Cursor 1 915.142 27.67

0.000 0.00



Analyzer Settings

HP8564E,EMI  
 CF: 927.80 MHz  
 SPAN:5.000 MHz  
 RB 1.000 MHz  
 VB 3.000 MHz  
 Detector Normal  
 Att 40  
 RL Offset 30.00  
 Sweep Time 50.0ms  
 Ref Lvl:30.00DBM

Comments

High Channel  
 927.8 MHz  
 Output Power

Cursor 1 927.783 27.83

0.000 0.00





## EMC Test Data

Client:	S & C Electric	Job Number:	J67303
Model:	SpeedNet Radio	T-Log Number:	T67420
		Account Manager:	Sheareen Washington
Contact:	David Munoz		
Standard:	FCC Part 15.247	Class:	N/A

### Run #4: Channel Occupancy, Spacing and Number of Channels

For frequency hopping systems operating in the **902-928 MHz** band:

If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

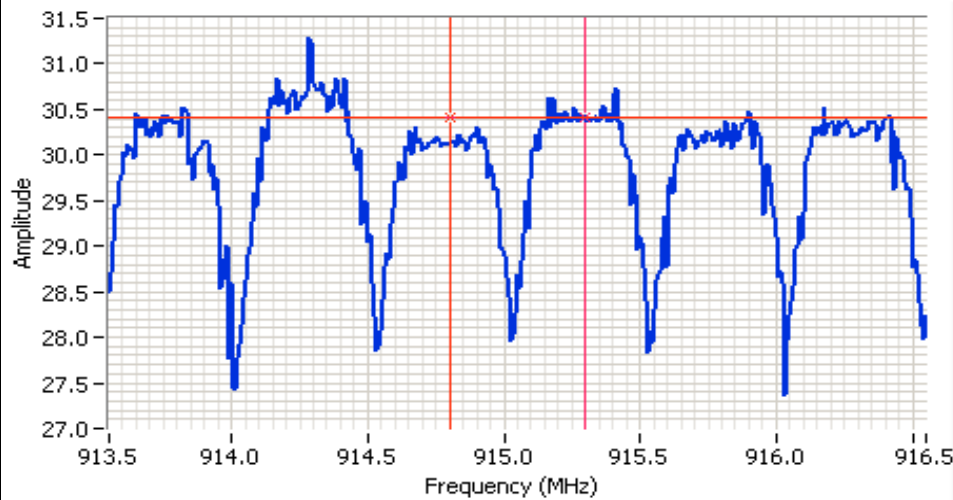
The channel dwell time is calculated from the transmit time on a channel multiplied by the number of times a channel could be used in the 10 second period (i.e. 10s divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 10s in which case the channel dwell time is the transmit time on a channel.

Maximum 20dB bandwidth:	<u>10</u> kHz	Pass
Channel spacing:	<u>500</u> kHz	Pass
Transmission time per hop:	<u>13.3</u> ms	
The time between successive hops on a channel:	<u>510.42</u> ms	
Number of channels (N):	<u>51</u>	Pass
Channel dwell time in 10 seconds:	<u>266</u> ms	Pass

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
Contact: David Munoz	Account Manager: Sheareen Washington
Standard: FCC Part 15.247	Class: N/A

Run #4: Continued

### Channel spacing



#### Analyzer Settings

HP8593EM  
 CF: 915.05 MHz  
 SPAN: 3.000 MHz  
 RB 300 kHz  
 VB 100 kHz  
 Detector POS  
 Att 30  
 RL Offset 21.00  
 Sweep Time 20.0ms  
 Ref Lvl: 35.00DBM

#### Comments

Center channel  
 914.800 MHz  
 Channel Spacing

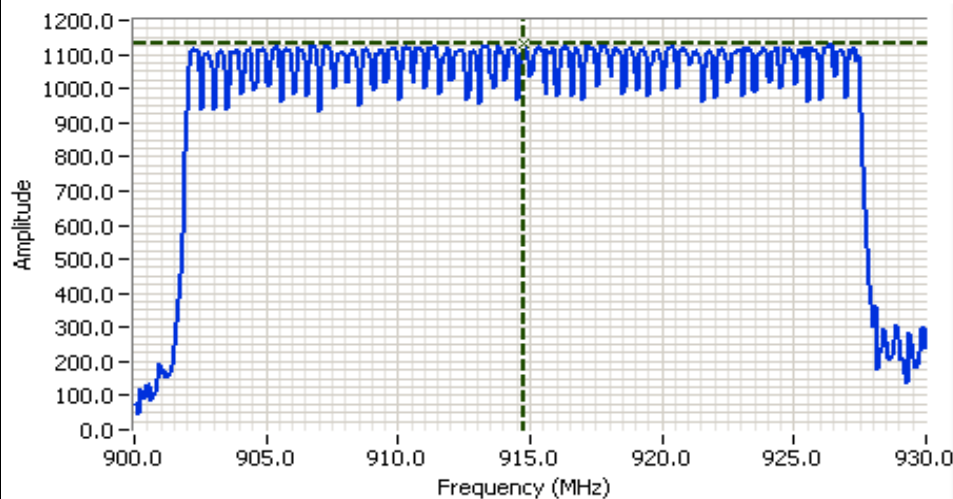
Cursor 1	914.800	30.41	
Cursor 2	915.300	30.41	

Delta Freq. 500 kHz

Delta Amplitude 0.00



### Number of Channel



#### Analyzer Settings

930.00E6  
 CF: 915.00 MHz  
 SPAN: 30.00 MHz  
 RB 100 kHz  
 VB 100 kHz  
 Detector POS  
 Att 30  
 RL Offset 21.00  
 Sweep Time 20.0ms  
 Ref Lvl: 39.00DBM

#### Comments

Center channel  
 914.800 MHz  
 Channel Spacing  
 51 Channels

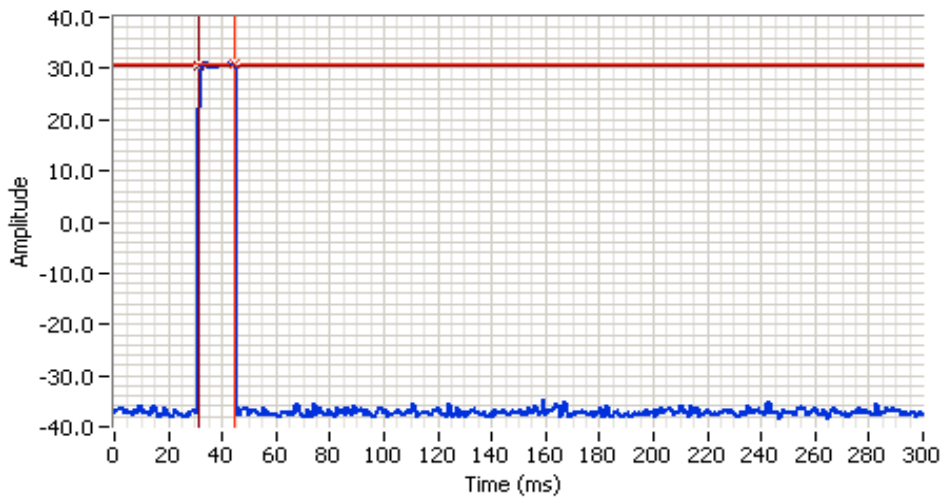
Cursor 1	914.800	1129.50	
	0.000	0.00	



Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
Contact: David Munoz	Account Manager: Sheareen Washington
Standard: FCC Part 15.247	Class: N/A

Run #4: Continued

Dwell Time



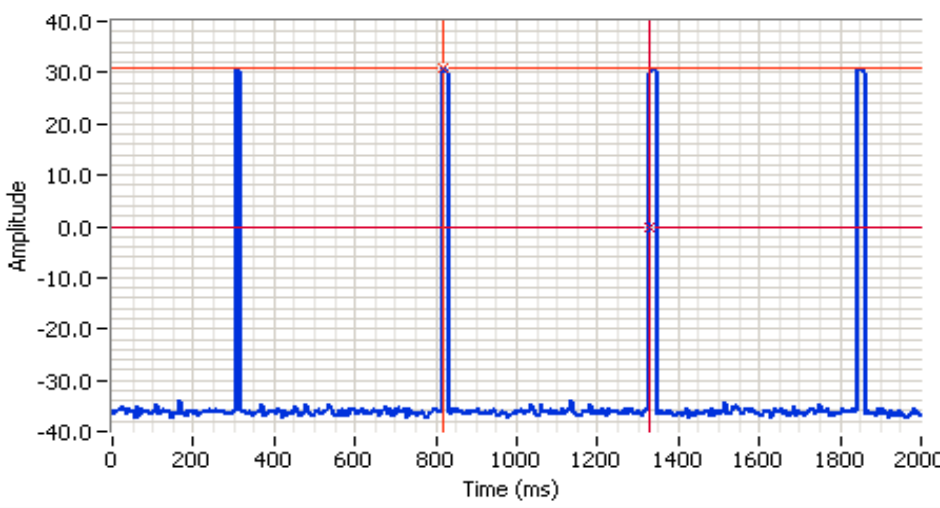
**Analyzer Settings**  
 HP8593EM  
 CF: 914.80 MHz  
 SPAN:0.00 MHz  
 RB 100 kHz  
 VB 100 kHz  
 Detector POS  
 Att 30  
 RL Offset 21.00  
 Sweep Time 300.0ms  
 Ref Lvl:39.00DBM

**Comments**  
 Center channel  
 914.800 MHz  
 Occupancy Channel

Cursor 1	44.531	30.90		Delta Time (ms)	13.28
Cursor 2	31.250	30.52		Delta Amplitude	0.38



Time between successive occupancy of a channel



**Analyzer Settings**  
 HP8593EM  
 CF: 914.80 MHz  
 SPAN:0.00 MHz  
 RB 100 kHz  
 VB 100 kHz  
 Detector POS  
 Att 30  
 RL Offset 21.00  
 Sweep Time 2.0s  
 Ref Lvl:39.00DBM

**Comments**  
 Center channel  
 914.800 MHz  
 Occupancy Channel

Cursor 1	817.187	30.82		Delta Time (ms)	510.42
Cursor 2	1327.60	0.00		Delta Amplitude	30.82



Client:	S & C Electric	Job Number:	J67303
Model:	SpeedNet Radio	T-Log Number:	T67420
		Account Manager:	Sheareen Washington
Contact:	David Munoz		
Standard:	FCC Part 15.247	Class:	N/A

## RSS 210 and FCC 15.247 Radiated Spurious Emissions

### Test Specific Details

Objective: The objective of this test session is to perform engineering evaluation testing of the EUT with respect to the specification listed above.

Date of Test: 12/7/2007	Config. Used: 1
Test Engineer: Rafael Varelas	Config Change: None
Test Location: SVOATS #1	EUT Voltage: 120V/60Hz

### General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections routed in overhead.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

**Ambient Conditions:**

Temperature:	12.4 °C
Rel. Humidity:	71 %

### Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	RE, 30 - 10000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247( c)	Pass	47.9dBµV/m (248.3µV/m) @ 2706.5MHz (-6.1dB)

### Modifications Made During Testing

No modifications were made to the EUT during testing

### Deviations From The Standard

No deviations were made from the requirements of the standard.





# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

Run #1a: Radiated Spurious Emissions, 30 - 10,000 MHz, Tx Mode, Radio # 1  
 Yagi Antenna with 12.1dBi gain, Max Power Setting  
 Low Channel @ 902.175 MHz

**Fundamental Signal Field Strength:** Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.175	119.6	V	-	-	PK	242	1.0	RB = VB = 100kHz, w/o 6dB Pad
902.175	134.1	H	-	-	PK	235	1.0	RB = VB = 100kHz, Measured 132dBuV/m 12/15/07 w/o 6dB Pad

Fundamental emission level @ 3m in 100kHz RBW:	125.3	dB $\mu$ V/m
Limit for emissions outside of restricted bands:	105.3	dB $\mu$ V/m

Limit is -20dBc (Peak power measurement)

Note 1: Calculated by subtracting the marker delta values from the fundamental field strength measurements.

### Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2706.520	47.9	V	54.0	-6.1	AVG	80	1.0	
2706.520	67.9	V	74.0	-6.1	PK	80	1.0	
2706.620	47.7	H	54.0	-6.3	AVG	149	1.2	
2706.620	67.7	H	74.0	-6.3	PK	149	1.2	
6315.130	42.9	H	54.0	-11.1	AVG	114	2.0	Note 3
9021.790	42.5	V	54.0	-11.5	AVG	89	2.0	
9021.810	40.9	H	54.0	-13.1	AVG	118	1.6	
8119.620	40.5	H	54.0	-13.5	AVG	200	1.5	
6315.170	40.2	V	54.0	-13.8	AVG	88	1.3	Note 3
6315.170	60.2	V	74.0	-13.8	PK	88	1.3	
1804.450	39.7	H	54.0	-14.3	AVG	177	1.1	Note 3
8119.600	39.1	V	54.0	-14.9	AVG	124	2.0	
3608.820	38.8	V	54.0	-15.2	AVG	111	1.9	
3608.780	37.9	H	54.0	-16.1	AVG	159	1.8	
1804.350	37.6	V	54.0	-16.4	AVG	237	1.0	Note 3
6315.130	57.0	H	74.0	-17.0	PK	114	2.0	
9021.790	56.3	V	74.0	-17.7	PK	89	2.0	
9021.810	53.8	H	74.0	-20.2	PK	118	1.6	
8119.620	52.9	H	74.0	-21.1	PK	200	1.5	
1804.350	52.3	V	74.0	-21.7	PK	237	1.0	
1804.450	51.4	H	74.0	-22.6	PK	177	1.1	
8119.600	51.3	V	74.0	-22.7	PK	124	2.0	
3608.820	50.5	V	74.0	-23.5	PK	111	1.9	
3608.780	49.4	H	74.0	-24.6	PK	159	1.8	



# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

**Run #1a: Continued**

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	All signals related to the hopping transmission were measured with a peak detector. The average value was then calculated from the peak reading using an average correction factor of 20dB based on a maximum hop time on any one channel of 10ms, with that
Note 3:	Signal is not in a restricted band but the more stringent restricted band limit was used.

**Run #1b: Radiated Spurious Emissions, 30 - 10,000 MHz, Tx Mode, Radio # 1**  
**Yagi Antenna with 12.1dBi gain, Max Power Setting**  
**Center Channel @ 915.175 MHz**

**Fundamental Signal Field Strength:** Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
915.175	133.7	H	-	-	PK	233	1.0	RB = VB = 100kHz, w/o 6dB Pad
915.175	121.5	V	-	-	PK	152	1.8	RB = VB = 100kHz, w/o 6dB Pad

Fundamental emission level @ 3m in 100kHz RBW:	125.7	dB $\mu$ V/m
Limit for emissions outside of restricted bands:	105.7	dB $\mu$ V/m

Limit is -20dBc (Peak power measurement)

Note 1: Calculated by subtracting the marker delta values from the fundamental field strength measurements.

**Other Spurious Emissions**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2745.540	47.0	V	54.0	-7.0	AVG	116	1.2	
2745.540	67.0	V	74.0	-7.0	PK	116	1.2	
2745.570	44.2	H	54.0	-9.8	AVG	85	1.0	
2745.570	64.2	H	74.0	-9.8	PK	85	1.0	
3660.690	42.0	V	54.0	-12.0	AVG	135	1.9	
6406.180	61.4	V	74.0	-12.6	PK	165	1.0	
6406.180	41.4	V	54.0	-12.6	AVG	165	1.0	Note 3
9151.810	41.2	V	54.0	-12.8	AVG	101	1.5	
8236.670	38.9	V	54.0	-15.1	AVG	194	1.4	
1830.470	38.2	V	54.0	-15.8	AVG	245	1.0	Note 3
1830.470	58.2	V	74.0	-15.8	PK	245	1.0	
9151.810	54.9	V	74.0	-19.1	PK	101	1.5	
8236.670	54.3	V	74.0	-19.7	PK	194	1.4	
1830.410	33.7	H	54.0	-20.3	AVG	201	1.0	Note 3
1830.410	53.7	H	74.0	-20.3	PK	201	1.0	
3660.690	52.3	V	74.0	-21.7	PK	135	1.9	

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

**Run #1b: Continued**

Frequency MHz	Level dB $\mu$ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
6406.360	40.8	H	54.0	-13.2	AVG	183	2.0	Note 3
9151.770	40.8	H	54.0	-13.2	AVG	98	1.4	
8236.630	37.9	H	54.0	-16.1	AVG	274	1.4	
9151.770	55.1	H	74.0	-18.9	PK	98	1.4	
3660.700	34.0	H	54.0	-20.0	AVG	191	1.9	
6406.360	53.2	H	74.0	-20.8	PK	183	2.0	
8236.630	52.3	H	74.0	-21.7	PK	274	1.4	
3660.700	47.7	H	74.0	-26.3	PK	191	1.9	

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: All signals related to the hopping transmission were measured with a peak detector. The average value was then calculated from the peak reading using an average correction factor of 20dB based on a maximum hop time on any one channel of 10ms, with that

Note 3: Signal is not in a restricted band but the more stringent restricted band limit was used.

**Run #1c: Radiated Spurious Emissions, 30 - 10,000 MHz, Tx Mode, Radio # 1**  
**Yagi Antenna with 12.1dBi gain, Max Power Setting**  
**High Channel @ 927.8 MHz**

**Fundamental Signal Field Strength:** Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency MHz	Level dB $\mu$ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
927.800	120.3	V	-	-	PK	148	1.8	RB = VB = 100kHz, w/o 6dB Pad
927.800	132.4	H	-	-	PK	225	1.0	RB = VB = 100kHz, w/o 6dB Pad

Fundamental emission level @ 3m in 100kHz RBW:	125.1	
Limit for emissions outside of restricted bands:	105.1 dB $\mu$ V/m	Limit is -20dBc (Peak power measurement)

Note 1: Calculated by subtracting the marker delta values from the fundamental field strength measurements.



# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

Run #1c: Continued

### Other Spurious Emissions

Frequency MHz	Level dBμV/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
2783.360	43.6	V	54.0	-10.4	AVG	138	1.2	
2783.360	63.6	V	74.0	-10.4	PK	138	1.2	
9278.120	41.1	H	54.0	-12.9	AVG	235	1.4	Note 3
9278.120	61.1	H	74.0	-12.9	PK	235	1.4	
960.080	40.0	V	54.0	-14.0	PK	236	1.4	Bandedge
6494.540	59.3	V	74.0	-14.7	PK	177	1.0	
6494.540	39.3	V	54.0	-14.7	AVG	177	1.0	Note 3
1855.610	58.3	V	74.0	-15.7	PK	143	1.1	
1855.610	38.3	V	54.0	-15.7	AVG	143	1.1	Note 3
8350.280	38.2	H	54.0	-15.8	AVG	243	1.3	
9278.130	38.0	V	54.0	-16.0	AVG	243	2.0	Note 3
9278.130	58.0	V	74.0	-16.0	PK	243	2.0	
960.080	37.6	H	54.0	-16.4	PK	318	1.5	Bandedge
6495.460	36.7	H	54.0	-17.3	AVG	149	2.0	Note 3
6495.460	56.7	H	74.0	-17.3	PK	149	2.0	
2783.350	36.0	H	54.0	-18.0	AVG	114	1.0	
2783.350	56.0	H	74.0	-18.0	PK	114	1.0	
8350.190	35.4	V	54.0	-18.6	AVG	198	1.4	
8350.190	55.4	V	74.0	-18.6	PK	198	1.4	
7422.260	35.0	H	54.0	-19.0	AVG	246	1.3	
4639.600	34.9	H	54.0	-19.1	AVG	215	1.2	
3711.260	34.3	H	54.0	-19.7	AVG	229	1.7	
5566.740	32.1	H	54.0	-21.9	AVG	202	1.0	Note 3
8350.280	52.1	H	74.0	-21.9	PK	243	1.3	
1855.500	29.6	H	54.0	-24.4	AVG	216	1.1	Note 3
1855.500	49.6	H	74.0	-24.4	PK	216	1.1	
7422.260	48.4	H	74.0	-25.6	PK	246	1.3	
4639.600	46.0	H	74.0	-28.0	PK	215	1.2	
3711.260	45.0	H	74.0	-29.0	PK	229	1.7	
5566.740	44.6	H	74.0	-29.4	PK	202	1.0	

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: All signals related to the hopping transmission were measured with a peak detector. The average value was then calculated from the peak reading using an average correction factor of 20dB based on a maximum hop time on any one channel of 10ms, with that

Note 3: Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	S & C Electric	Job Number:	J67303
Model:	SpeedNet Radio	T-Log Number:	T67420
		Account Manager:	Sheareen Washington
Contact:	David Munoz		
Standard:	FCC Part 15.247	Class:	N/A

## RSS 210 and FCC 15.247 Radiated Spurious Emissions

### Test Specific Details

Objective: The objective of this test session is to perform engineering evaluation testing of the EUT with respect to the specification listed above.

Date of Test: 12/7/2007	Config. Used: 1
Test Engineer: Suhaila Khushzad	Config Change: None
Test Location: SVOATS #1	EUT Voltage: 120V/60Hz

### General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections routed in overhead.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

<b>Ambient Conditions:</b>	Temperature:	12.4 °C
	Rel. Humidity:	71 %

### Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	RE, 30 - 10000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247( c)	Pass	69.8dBµV/m (3090.3µV/m) @ 2706.5MHz (-4.2dB)

### Modifications Made During Testing

No modifications were made to the EUT during testing

### Deviations From The Standard

No deviations were made from the requirements of the standard.



# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

Run #1a: Radiated Spurious Emissions, 30 - 10,000 MHz, Tx Mode, Radio # 1  
 Omni Antenna with 5.1dBi gain, Max Power Setting  
 Low Channel @ 902.175 MHz

**Fundamental Signal Field Strength:** Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.175	119.0	H	-	-	PK	338	1.0	RB = VB = 100kHz
902.175	132.1	V	-	-	PK	34	1.0	RB = VB = 100kHz

Fundamental emission level @ 3m in 100kHz RBW:		dB $\mu$ V/m
Limit for emissions outside of restricted bands:	-20 dB $\mu$ V/m	Limit is -20dBc (Peak power measurement)

Note 1: Calculated by subtracting the marker delta values from the fundamental field strength measurements.

## Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2706.530	69.8	V	74.0	-4.2	PK	83	1.1	
2706.530	49.8	V	54.0	-4.2	AVG	83	1.1	
2706.550	45.2	H	54.0	-8.8	AVG	126	2.0	
2706.550	45.2	H	74.0	-8.8	PK	126	2.0	
6315.290	41.0	H	54.0	-13.0	AVG	52	2.2	
6315.290	61.0	H	74.0	-13.0	PK	52	2.2	
6315.190	39.1	V	54.0	-14.9	AVG	123	1.0	
6315.190	59.1	V	74.0	-14.9	PK	123	1.0	
4511.000	58.8	V	74.0	-15.2	PK	266	1.0	
4511.000	38.8	V	54.0	-15.2	AVG	266	1.0	
9021.760	35.2	H	54.0	-18.8	AVG	83	1.7	
9021.760	55.2	H	74.0	-18.8	PK	83	1.7	
8119.620	52.8	H	74.0	-21.2	PK	273	1.0	
8119.620	32.8	H	54.0	-21.2	AVG	273	1.0	
3608.770	31.6	V	54.0	-22.4	AVG	86	1.2	
3608.770	51.6	V	74.0	-22.4	PK	86	1.2	
9021.730	31.6	V	54.0	-22.4	AVG	122	1.0	
9021.730	51.6	V	74.0	-22.4	PK	122	1.0	
4510.960	31.1	H	54.0	-22.9	AVG	311	1.0	
4510.960	51.1	H	74.0	-22.9	PK	311	1.0	
7217.400	29.9	V	54.0	-24.1	AVG	138	1.0	
7217.400	49.9	V	74.0	-24.1	PK	138	1.0	
1804.380	29.6	V	54.0	-24.4	AVG	181	1.1	
1804.380	49.6	V	74.0	-24.4	PK	181	1.1	
3608.700	29.0	H	54.0	-25.0	AVG	131	1.4	
3608.700	49.0	H	74.0	-25.0	PK	131	1.4	
7217.310	28.7	H	54.0	-25.3	AVG	77	1.5	

Continued on next page



# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

Continued from previous page

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7217.310	48.7	H	74.0	-25.3	PK	77	1.5	
5413.150	27.9	H	54.0	-26.1	AVG	109	1.0	
5413.150	47.9	H	74.0	-26.1	PK	109	1.0	
1804.430	47.8	H	74.0	-26.2	PK	198	1.0	
1804.430	27.8	H	54.0	-26.2	AVG	198	1.0	
5413.060	26.6	V	54.0	-27.4	AVG	147	1.0	
5413.060	46.6	V	74.0	-27.4	PK	147	1.0	
8119.620	18.9	V	54.0	-35.1	AVG	147	1.3	
8119.620	38.9	V	74.0	-35.1	PK	147	1.3	

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: All signals related to the hopping transmission were measured with a peak detector. The average value was then calculated from the peak reading using an average correction factor of 20dB based on a maximum hop time on any one channel of 10ms, with that channel only being used once every 510ms (51 channels).

Note 3: Signal is not in a restricted band but the more stringent restricted band limit was used.

**Run #1b: Radiated Spurious Emissions, 30 - 10,000 MHz, Tx Mode, Radio # 1**  
**Omni Antenna with 5.1dBi gain, Max Power Setting**  
**Center Channel @ 915.175 MHz**

**Fundamental Signal Field Strength:** Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
915.175	132.9	V	-	-	PK	38	1.0	RB = VB = 100kHz
915.175	120.3	H	-	-	PK	58	1.7	RB = VB = 100kHz

Fundamental emission level @ 3m in 100kHz RBW:	132.9	dB $\mu$ V/m
Limit for emissions outside of restricted bands:	112.9	dB $\mu$ V/m

Limit is -20dBc (Peak power measurement)

Note 1: Calculated by subtracting the marker delta values from the fundamental field strength measurements.



# EMC Test Data

Client:	S & C Electric	Job Number:	J67303
Model:	SpeedNet Radio	T-Log Number:	T67420
		Account Manager:	Sheareen Washington
Contact:	David Munoz		
Standard:	FCC Part 15.247	Class:	N/A

## Other Spurious Emissions

Frequency MHz	Level dB $\mu$ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
2745.140	43.2	V	54.0	-10.8	AVG	189	1.0	
2745.140	63.2	V	74.0	-10.8	PK	189	1.0	
6405.340	62.4	V	74.0	-11.6	PK	148	1.0	
6405.340	42.4	V	54.0	-11.6	AVG	148	1.0	
2745.490	61.9	V	74.0	-12.1	PK	192	1.0	
2745.490	41.9	V	54.0	-12.1	AVG	192	1.0	
2745.680	61.4	H	74.0	-12.6	PK	111	1.1	
2745.680	41.4	H	54.0	-12.6	AVG	111	1.1	
6406.140	38.6	H	54.0	-15.4	AVG	40	2.1	
6406.140	58.6	H	74.0	-15.4	PK	40	2.1	
8236.560	37.5	H	54.0	-16.5	AVG	241	1.1	
8236.560	57.5	H	74.0	-16.5	PK	241	1.1	
8235.440	37.4	V	54.0	-16.6	AVG	180	2.2	
8235.440	57.4	V	74.0	-16.6	PK	180	2.2	
9150.460	35.9	V	54.0	-18.1	AVG	126	1.7	
9150.460	55.9	V	74.0	-18.1	PK	126	1.7	
3660.130	35.2	V	54.0	-18.8	AVG	296	1.4	
3660.130	55.2	V	74.0	-18.8	PK	296	1.4	
4575.140	34.7	V	54.0	-19.3	AVG	309	1.0	
4575.140	54.7	V	74.0	-19.3	PK	309	1.0	
1829.900	33.0	V	54.0	-21.0	AVG	102	1.0	
1829.900	53.0	V	74.0	-21.0	PK	102	1.0	
1830.330	52.3	H	74.0	-21.7	PK	139	1.4	
1830.330	32.3	H	54.0	-21.7	AVG	139	1.4	
7320.540	51.8	V	74.0	-22.2	PK	360	1.5	
7320.540	31.8	V	54.0	-22.2	AVG	360	1.5	
3660.770	31.4	H	54.0	-22.6	AVG	360	2.3	
3660.770	51.4	H	74.0	-22.6	PK	360	2.3	
7321.350	51.3	H	74.0	-22.7	PK	331	2.2	
7321.350	31.3	H	54.0	-22.7	AVG	331	2.2	
5490.230	31.0	V	54.0	-23.0	AVG	176	1.0	
5490.230	51.0	V	74.0	-23.0	PK	176	1.0	
4575.960	30.9	H	54.0	-23.1	AVG	179	1.0	
4575.960	50.9	H	74.0	-23.1	PK	179	1.0	
5491.100	28.9	H	54.0	-25.1	AVG	92	1.6	
5491.100	48.9	H	74.0	-25.1	PK	92	1.6	

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: All signals related to the hopping transmission were measured with a peak detector. The average value was then calculated from the peak reading using an average correction factor of 20dB based on a maximum hop time on any one channel of 10ms, with that channel only being used once every 510ms (51 channels).

Note 3: Signal is not in a restricted band but the more stringent restricted band limit was used.





# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: N/A

Run #1c: Radiated Spurious Emissions, 30 - 10,000 MHz, Tx Mode, Radio # 1  
 Omni Antenna with 5.1dBi gain, Max Power Setting  
 High Channel @ 927.8 MHz

**Fundamental Signal Field Strength:** Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
927.800	118.7	H	-	-	PK	65	1.7	RB = VB = 100kHz
927.800	131.7	V	-	-	PK	158	1.0	RB = VB = 100kHz

Fundamental emission level @ 3m in 100kHz RBW:	131.7	
Limit for emissions outside of restricted bands:	111.7 dB $\mu$ V/m	Limit is -20dBc (Peak power measurement)

Note 1: Calculated by subtracting the marker delta values from the fundamental field strength measurements.

### Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1855.600	46.7	V	54.0	-7.3	AVG	360	1.8	
1855.600	66.7	V	74.0	-7.3	PK	360	1.8	
2783.400	65.6	V	74.0	-8.4	PK	153	1.0	
2783.400	45.6	V	54.0	-8.4	AVG	153	1.0	
960.080	40.0	V	54.0	-14.0	PK	236	1.4	Bandedge
9278.080	39.5	V	54.0	-14.5	AVG	31	1.9	
9278.080	59.5	V	74.0	-14.5	PK	31	1.9	
2783.440	58.8	H	74.0	-15.2	PK	97	1.5	
2783.440	38.8	H	54.0	-15.2	AVG	97	1.5	
960.080	37.6	H	54.0	-16.4	PK	318	1.5	Bandedge
1855.640	37.0	H	54.0	-17.0	AVG	92	1.0	
1855.640	57.0	H	74.0	-17.0	PK	92	1.0	
6494.620	34.5	H	54.0	-19.5	AVG	198	1.0	
6494.620	54.5	H	74.0	-19.5	PK	198	1.0	

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: All signals related to the hopping transmission were measured with a peak detector. The average value was then calculated from the peak reading using an average correction factor of 20dB based on a maximum hop time on any one channel of 10ms, with that channel only being used once every 510ms (51 channels).

Note 3: Signal is not in a restricted band but the more stringent restricted band limit was used.

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

## FCC 15.247 FHSS - Rx Spurious Emissions Omni Antenna

### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 3/30/2007	Config. Used: 1
Test Engineer: Mehran Birgani	Config Change: None
Test Location: SVOATS #1	EUT Voltage: 120V/60Hz

### General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

**Ambient Conditions:**

Temperature:	20 °C
Rel. Humidity:	38 %

### Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1a - 1c	30 - 5000 MHz Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	26.4dBµV/m @ 914.800MHz (-19.6dB)

### Modifications Made During Testing:

No modifications were made to the EUT during testing

### Deviations From The Standard

No deviations were made from the requirements of the standard.



# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

**Run #1a: Radiated Spurious Emissions, 30 - 5000 MHz. Low Channel @ 902.175 MHz (Receive Mode)**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.175	24.5	V	46.0	-21.5	QP	100	1.0	The signal was within noise floor
902.175	24.3	H	46.0	-21.7	QP	180	1.5	The signal was within noise floor
No signal was found above a 1GHz.								

**Run #1b: Radiated Spurious Emissions, 30 - 5000 MHz. Center Channel @ 914.800 MHz (Receive Mode)**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
914.800	26.4	V	46.0	-19.6	QP	0	1.0	The signal was within noise floor
914.800	26.1	H	46.0	-19.9	QP	10	1.8	The signal was within noise floor
No signal was found above a 1GHz.								

**Run #1c: Radiated Spurious Emissions, 30 - 5000 MHz. High Channel @ 927.925 MHz (Receive Mode)**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
927.925	26.1	V	46.0	-19.9	QP	0	1.0	The signal was within noise floor
927.925	25.8	H	46.0	-20.2	QP	360	1.8	The signal was within noise floor
No signal was found above a 1GHz.								

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

**FCC 15.247 FHSS - Rx Spurious Emissions  
Yagi Antenna**

**Test Specific Details**

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 3/30/2007	Config. Used: 1
Test Engineer: Mehran Birgani	Config Change: None
Test Location: SVOATS #1	EUT Voltage: 120V/60Hz

**General Test Configuration**

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

<b>Ambient Conditions:</b>	Temperature:	20 °C
	Rel. Humidity:	38 %

**Summary of Results**

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1a - 1c	30 - 5000 MHz Radiated Spurious Emissions	FCC Part 15.209 / 15.247( c)	Pass	26.4dBµV/m (20.9µV/m) @ 914.800MHz (-19.6dB)

**Modifications Made During Testing:**

No modifications were made to the EUT during testing

**Deviations From The Standard**

No deviations were made from the requirements of the standard.



# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

**Run #1a: Radiated Spurious Emissions, 30 - 5000 MHz. Low Channel @ 902.175 MHz (Receive Mode)**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.175	24.5	V	46.0	-21.5	QP	100	1.0	The signal was within noise floor
902.175	24.3	H	46.0	-21.7	QP	180	1.5	The signal was within noise floor
No signal was found above a 1GHz.								

**Run #1b: Radiated Spurious Emissions, 30 - 5000 MHz. Center Channel @ 914.800 MHz (Receive Mode)**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
914.800	26.4	V	46.0	-19.6	QP	0	1.0	The signal was within noise floor
914.800	26.1	H	46.0	-19.9	QP	10	1.8	The signal was within noise floor
No signal was found above a 1GHz.								

**Run #1c: Radiated Spurious Emissions, 30 - 5000 MHz. High Channel @ 927.925 MHz (Receive Mode)**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
927.925	26.1	V	46.0	-19.9	QP	0	1.0	The signal was within noise floor
927.925	25.8	H	46.0	-20.2	QP	360	1.8	The signal was within noise floor
No signal was found above a 1GHz.								

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

## Radiated Emissions

### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 3/29/2007 18:48	Config. Used: 1
Test Engineer: Rafael Varelas	Config Change: None
Test Location: SVOATS #1	EUT Voltage: 230V/50Hz

### General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing. Remote support equipment was located approximately 30 meters from the test area with all I/O connections routed overhead.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

**Ambient Conditions:**

Temperature:	20 °C
Rel. Humidity:	28 %

### Summary of Results

Run #	Test Performed	Limit	Result	Margin
2	RE, 30 - 1000MHz, Maximized Emissions	EN55022 Class A	Pass	39.6dBµV/m @ 249.988MHz (-7.4dB)

### Modifications Made During Testing:

No modifications were made to the EUT during testing

### Deviations From The Standard

No deviations were made from the requirements of the standard.



# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

## Run #1: Preliminary Radiated Emissions, 30-1000 MHz

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	10	10	0.0

Frequency MHz	Level dB $\mu$ V/m	Pol v/h	EN55022 Class A		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
249.988	39.6	V	47.0	-7.4	QP	245	1.0	
249.988	34.4	H	47.0	-12.6	QP	260	2.0	
649.987	34.2	H	47.0	-12.8	QP	95	1.0	
174.987	24.5	H	40.0	-15.5	QP	170	1.7	Ambient
749.986	31.2	H	47.0	-15.8	QP	265	1.0	
199.987	23.4	V	40.0	-16.6	QP	300	1.0	Signal sub.
874.978	29.7	H	47.0	-17.3	QP	230	1.0	Signal sub.
151.007	22.4	H	40.0	-17.6	QP	75	2.4	
899.975	29.3	V	47.0	-17.7	QP	15	1.0	
34.109	22.1	V	40.0	-17.9	QP	195	1.0	
151.007	22.1	V	40.0	-17.9	QP	295	1.0	
106.753	21.7	V	40.0	-18.3	QP	15	1.0	
499.980	27.8	V	47.0	-19.2	QP	180	1.0	
633.360	26.1	V	47.0	-20.9	QP	15	1.0	Signal sub.
799.989	25.8	V	47.0	-21.2	QP	90	1.0	

## Run #2: Maximized Readings From Run #1

Frequency MHz	Level dB $\mu$ V/m	Pol v/h	EN55022 Class A		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
249.988	39.6	V	47.0	-7.4	QP	245	1.0	
249.988	34.4	H	47.0	-12.6	QP	260	2.0	
649.987	34.2	H	47.0	-12.8	QP	95	1.0	
749.986	31.2	H	47.0	-15.8	QP	265	1.0	
199.987	23.4	V	40.0	-16.6	QP	300	1.0	Signal sub.
874.978	29.7	H	47.0	-17.3	QP	230	1.0	Signal sub.

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

### Conducted Emissions - Power Ports

#### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 3/29/2007 18:48	Config. Used: 1
Test Engineer: Rafael Varelas	Config Change: None
Test Location: SVOATS #1	EUT Voltage: 230V/50Hz

#### General Test Configuration

The EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. Remote support equipment was located approximately 30 meters from the test area. All I/O connections were routed overhead.

**Ambient Conditions:**            Temperature:        20 °C  
    Rel. Humidity:      28 %

#### Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 230V/50Hz	EN55022 Class B	Pass	50.0dBµV @ 0.538MHz (-6.0dB)
2	CE, AC Power, 120V/60Hz	EN55022 Class B	Pass	45.6dBµV @ 0.538MHz (-10.4dB)

#### Modifications Made During Testing:

No modifications were made to the EUT during testing

#### Deviations From The Standard

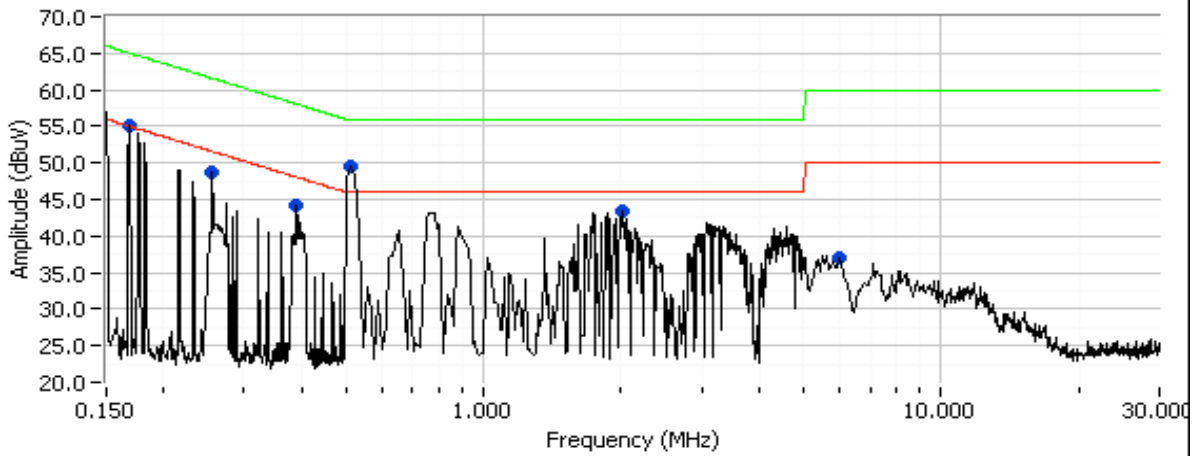
No deviations were made from the requirements of the standard.



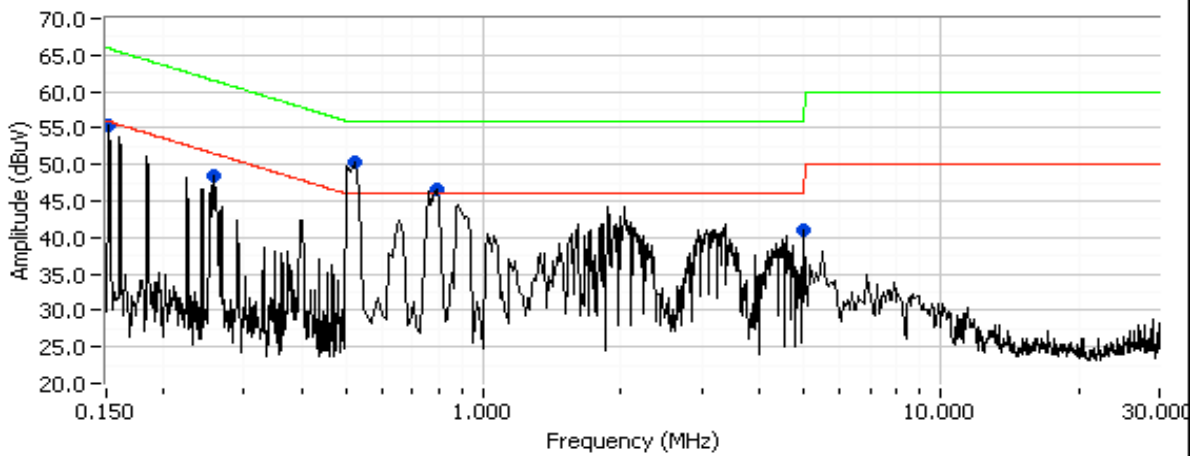
Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
Contact: David Munoz	Account Manager: Sheareen Washington
Standard: FCC Part 15.247	Class: A

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz  
 EUT on Center Channel 914.8 MHz

Run #1: -15 - 30 MHz, 230V/50Hz, Line



Run #1: -15 - 30 MHz, 230V/50Hz, Neutral





# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

**Run #1: Continued**

**Preliminary Readings**

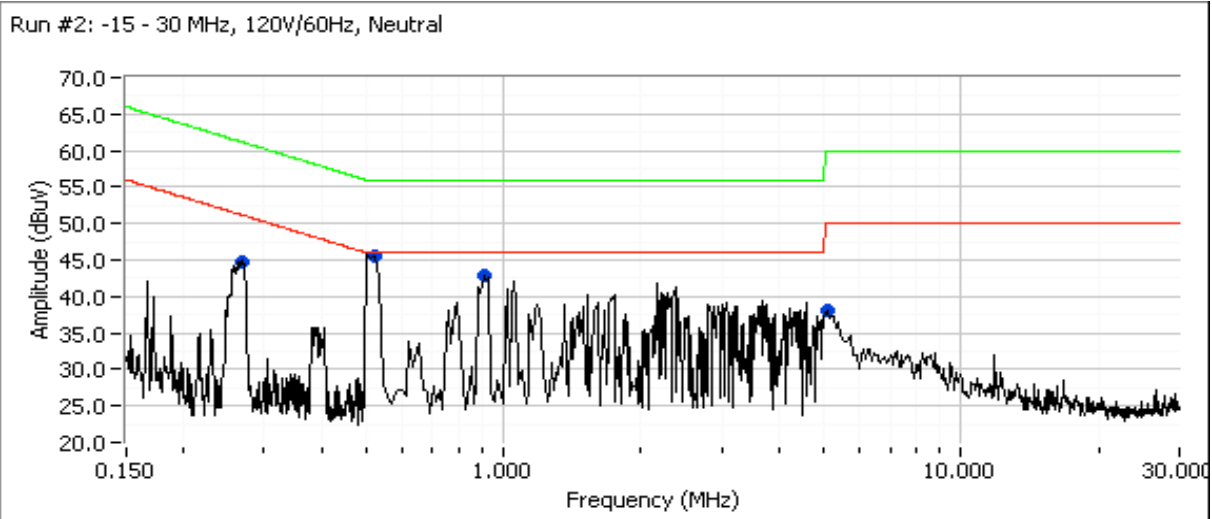
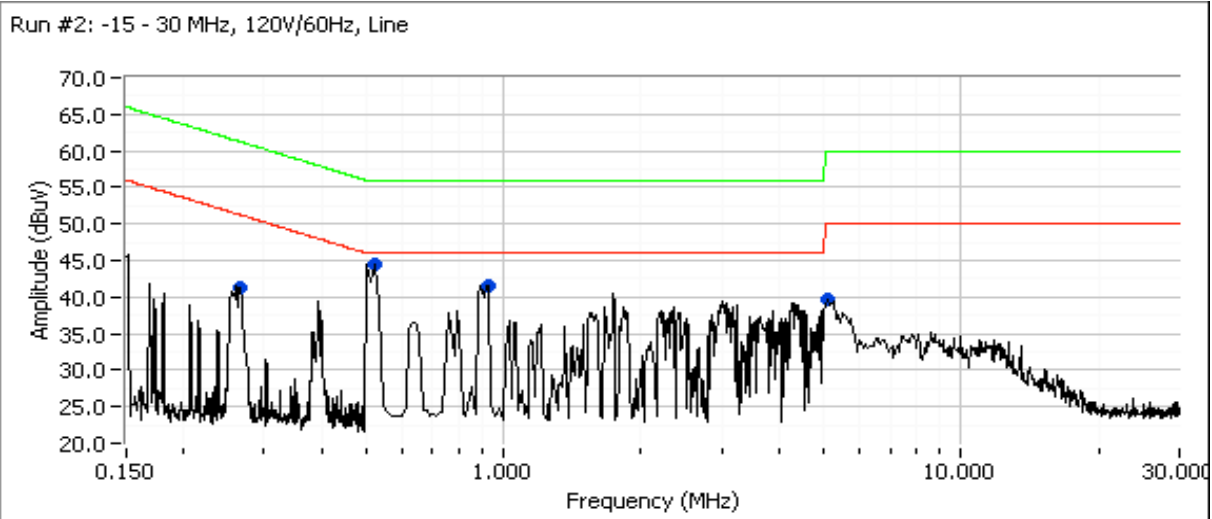
Frequency MHz	Level dB $\mu$ V	AC Line	EN55022 B		Detector QP/Ave	Comments
			Limit	Margin		
0.168	55.2	Line 1	55.0	0.2	Peak	
0.255	48.6	Line 1	51.6	-3.0	Peak	
0.389	44.2	Line 1	48.1	-3.9	Peak	
0.537	49.4	Line 1	46.0	3.4	Peak	
2.020	43.5	Line 1	46.0	-2.5	Peak	
6.000	36.9	Line 1	50.0	-13.1	Peak	
0.152	55.3	Neutral	55.9	-0.6	Peak	
0.257	48.4	Neutral	51.5	-3.1	Peak	
0.538	50.2	Neutral	46.0	4.2	Peak	
0.808	46.6	Neutral	46.0	0.6	Peak	
5.000	41.1	Neutral	46.0	-4.9	Peak	

**Maximized Readings**

Frequency MHz	Level dB $\mu$ V	AC Line	EN55022 B		Detector QP/Ave	Comments
			Limit	Margin		
0.538	50.0	Neutral	56.0	-6.0	QP	
0.524	38.7	Line 1	46.0	-7.3	AVG	
0.524	48.4	Line 1	56.0	-7.6	QP	
0.538	37.2	Neutral	46.0	-8.8	AVG	
0.808	45.4	Neutral	56.0	-10.6	QP	
0.808	34.8	Neutral	46.0	-11.2	AVG	
0.257	40.0	Neutral	51.5	-11.5	AVG	
2.020	41.4	Line 1	56.0	-14.6	QP	
0.257	45.7	Neutral	61.5	-15.8	QP	
0.152	49.7	Neutral	65.9	-16.2	QP	
0.168	48.5	Line 1	65.1	-16.6	QP	
0.255	33.8	Line 1	51.6	-17.8	AVG	
0.255	41.8	Line 1	61.6	-19.8	QP	
2.020	20.9	Line 1	46.0	-25.1	AVG	
0.168	18.3	Line 1	55.1	-36.8	AVG	
0.152	19.1	Neutral	55.9	-36.8	AVG	

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
Contact: David Munoz	Account Manager: Sheareen Washington
Standard: FCC Part 15.247	Class: A

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz  
 EUT on Center Channel 914.8 MHz





# EMC Test Data

Client: S & C Electric	Job Number: J67303
Model: SpeedNet Radio	T-Log Number: T67420
	Account Manager: Sheareen Washington
Contact: David Munoz	
Standard: FCC Part 15.247	Class: A

**Run #2: Continued**

**Preliminary Readings**

Frequency MHz	Level dB $\mu$ V	AC Line	EN55022 B		Detector QP/Ave	Comments
			Limit	Margin		
0.265	41.4	Line	51.3	-9.9	Peak	
0.537	44.5	Line	46.0	-1.5	Peak	
0.942	41.6	Line	46.0	-4.4	Peak	
5.248	39.6	Line	50.0	-10.4	Peak	
0.269	44.8	Neutral	51.1	-6.3	Peak	
0.538	45.6	Neutral	46.0	-0.4	Peak	
0.891	42.8	Neutral	46.0	-3.2	Peak	
5.125	38.2	Neutral	50.0	-11.8	Peak	

**Maximized Readings**

Frequency MHz	Level dB $\mu$ V	AC Line	EN55022 B		Detector QP/Ave	Comments
			Limit	Margin		
0.538	45.6	Neutral	56.0	-10.4	QP	
0.537	44.1	Line	56.0	-11.9	QP	
0.538	32.9	Neutral	46.0	-13.1	AVG	
0.891	42.3	Neutral	56.0	-13.7	QP	
0.537	32.1	Line	46.0	-13.9	AVG	
0.269	36.4	Neutral	51.1	-14.7	AVG	
0.265	35.9	Line	51.3	-15.4	AVG	
0.942	40.5	Line	56.0	-15.5	QP	
0.269	44.8	Neutral	61.1	-16.3	QP	
0.891	26.7	Neutral	46.0	-19.3	AVG	
0.265	40.7	Line	61.3	-20.6	QP	
0.942	24.4	Line	46.0	-21.6	AVG	

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***EXHIBIT 3: Photographs of Test Configurations***

4 Pages

***EXHIBIT 4: Proposed FCC ID Label & Label Location***

*EXHIBIT 5: Detailed Photographs  
of S & C Electric Company Model SpeedNet RadioConstruction*

***EXHIBIT 6: Operator's Manual  
for S & C Electric Company Model SpeedNet Radio***



***EXHIBIT 7: Block Diagram  
of S & C Electric Company Model SpeedNet Radio***

***EXHIBIT 8: Schematic Diagrams  
for S & C Electric Company Model SpeedNet Radio***

***EXHIBIT 9: Theory of Operation  
for S & C Electric Company Model SpeedNet Radio***

***EXHIBIT 10: RF Exposure Information***