Emissions Test Report

EUT Name: Reader

EUT Model: R22-1012

FCC ID: URGR221012

CFR Title 47, FCC Part 15, Subpart C

Prepared for:

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Report/Issue Date: 7 February 2009
Report Number: 30862910.003 Revision A

Statement of Compliance

Manufacturer:	RadarFind Corporation 2100 Gateway Centre Blvd., Suite 150 Morrisville, NC 27560 919 228-2170
Requester / Applicant:	Stephen Snell
Name of Equipment:	Reader
Operation Frequency Range	902.4 MHz to 927.6 MHz
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR Title 47, FCC Part 15, Subpart C
Test Dates:	05 January, 2009 to 08 January, 2009

Guidance Documents:

Emissions: FCC 47 CFR Part 15C

Test Methods:

Emissions: ANSI C63.4:2003

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

Mark Ryan

7 February 2009

NVLAP Signatory — Date

NVLAP 200094-0

FC 90552 and 100881

Industry Canada IC3755

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1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR Title 47, FCC Part 15, Subpart C based on the results of testing performed on *05 January*, 2009 through *08 January, 2009* on the *Reader* Model No. *R22-1012* manufactured by RadarFind Corporation. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

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

1.3 Summary of Test Results

Table 1 - Summary of Test Results

Test	Test Method(s)	Test Parameters	Measurement	Result
Peak Output Power	FCC Part 15.249(a)	50 mV/m (94 dBµV/m)	10.3 mV/m (80.25 dBµV/m) @ 3 meters (peak)	**compliant**
Radiated and Spurious Emissions	FCC Parts 15.209(a), 15.249(d), and 15.249(e)	500µV /m (54 dBµV/m)	123.5 µV /m (41.83 dBµV /m) @ 3 meters Peak	**compliant**
Conducted Emissions	FCC Part 15.207(a)	Table FCC Part 15.207(a) (57.25 dBµV/m QP at 430 kHz)	50.86 dBµV QP (worst case)	**compliant**

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

No modifications were found to be necessary in order to achieve compliance.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

TUV Rheinland is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 25 and ISO 9002 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

Registration No. IC3755

2.1.4 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174 and C-1236).

2.1.5 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2005, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2005, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7m x 3.7m x 3.175mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6m x 0.8m x 0.8m high non-conductive table with a 3.175mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50cm x 50cm x 3.175mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 7.3m x 3.7m x 3.2m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9m x 3.7m x 3.175mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The conducted test system has a combined standard uncertainty of ± 1.2 dB. The radiated test system has a combined standard uncertainty of ± 1.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 25.

2.5 Configuration

Two special "FCC Test" software loads will be created for the Reader, which will cause it to transmit maximum traffic, even though it is not installed in a working system environment. One software version will perform the Part 15.249 signaling, and the other will perform Part 15.247 signaling. This software will speed up all RF measurements. Since the EUT is powered by 120 VAC, the transmitters can run indefinitely without battery limitations. The transmitters will operate at their maximum power output of +8dBm (in the Part 15.247 mode) and will be connected to the devices integrated horizontal and vertical antennas. The transceivers will also spend some of their time in receive mode, to allow detection of possible out of band emissions. This Test report will be concerned only with the Part 15.249 mode.

A representative from the OEM will be on hand to assist testing. Spare samples will also be on hand. We propose the following measurement sequence:

- The transmitter fundamental is <1 GHz, thus no measurements are required above 10 GHz
- Use 1.2 GHz high-pass filter for measurements above 1GHz (filter avoids SA front-end overload when measuring harmonics/spurs)
- Radiated power/spurious (X, Y, Z axes from 30MHz to 10GHz)
- Band edge - a plot showing that the left edge of the lowest frequency is above 902 MHz, and that the right edge of the high frequency is less than 928 MHz. Mark the -20 dBc point from the peak closest to the band edge

2.5.1 RadarFind Deliverables for FCC Part 15.249 Evaluation

RadarFind will supply a Part 15.249 version of the Reader test sample. It will be loaded with special software which will continuously exercise the two transmitters in the following manner:

- Continuous loop of: 340 ms vertical transmission on 918.000; 340 ms horizontal transmission on 918.000, 50 ms receive 915 MHz on both radios, repeat (one Micrel sleeps while the other is transmitting)
- Transmit power below -12dBm, so as not to exceed the 50 mV/m field strength with the Moxon antenna (this may have to be field adjustable, so as we can maximize radiated field strength while staying just below the Part 15.249 limit of 50mV/m @3m)
- Transmitter bit rate of 111,111 bits per second modulated FSK, deviation is approximately 320 kHz.

The serial number of the EUT submitted for testing in "Chirp Mode" is Not Serialized.

3 Radiated RF Emissions – in "Chirp" mode

Testing was performed in accordance with 47 CFR Part 15, ANSI C63.4:2003. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. The EUT will not transmit on both antennas at the same time.

3.1 Peak Output Power FCC Part 15.249(a)

The EUT is not a fixed, point-to-point device therefore FCC part 15.249(b) is not applicable to this apparatus.

The field strength of emissions from intentional radiators operated within these frequency bands (901 – 928 MHz) shall comply with the following limits:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500

Note: 50 mV/m is equivalent to 94 dBµV/m

500 µV/m is equivalent to 54 dBµV/m

Peak Power Output:

Vertical Antenna: 909.0 MHz = 92.07 dBµV/m = 40.1 mV/m (1.9 dB margin to the limit)

Horizontal Antenna: 918.0 MHz = 89.34 dBµV/m = 29.3 mV/m (4.66 dB margin to the limit)

Note: Measurements were made using a CISPR 16 compliant EMC Receiver.

Per FCC Part 15.249(c), all field strengths were measured at a distance of 3m.

As originally tested, the EUT was found to be **compliant** to the requirements of the test standard(s).

SOP 1 Radiated Emissions

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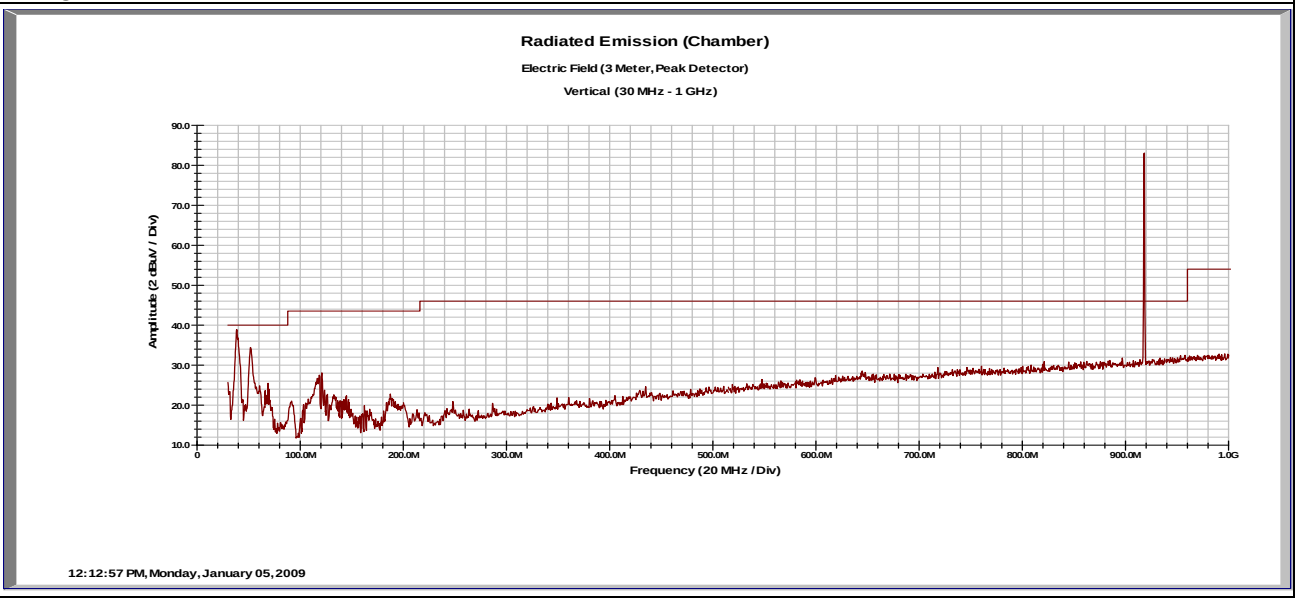
EUT Name	Reader	**Date**	05 January, 1009
EUT Model	R22-1012	**Temp / Hum in**	72º F / 43% rH
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15C	**Voltage / Freq.**	120VAC / 60Hz
Deg/sweep	12	**RBW / VBW**	120 kHz / 300 kHz
Dist/Ant Used	3m / 6140	**Performed by**	Mark Ryan
Configuration	Constant modulated transmit, Vertical antenna active on 909.00 MHz		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
909.00	H	1	321	52.35	0.00	3.42	22.66	78.43	94.00	-15.57
909.00	V	1.3	4	66.29	0.00	3.42	22.36	92.07	94.00	-1.93

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Orientation 1 is worst case (see test setup photos)
The limit for the fundamental frequency is 50mV which is equivalent to 94 dBµV.
All other emissions including harmonics and spurs must be under the limits of FCC part 15.209

SOP 1 Radiated Emissions

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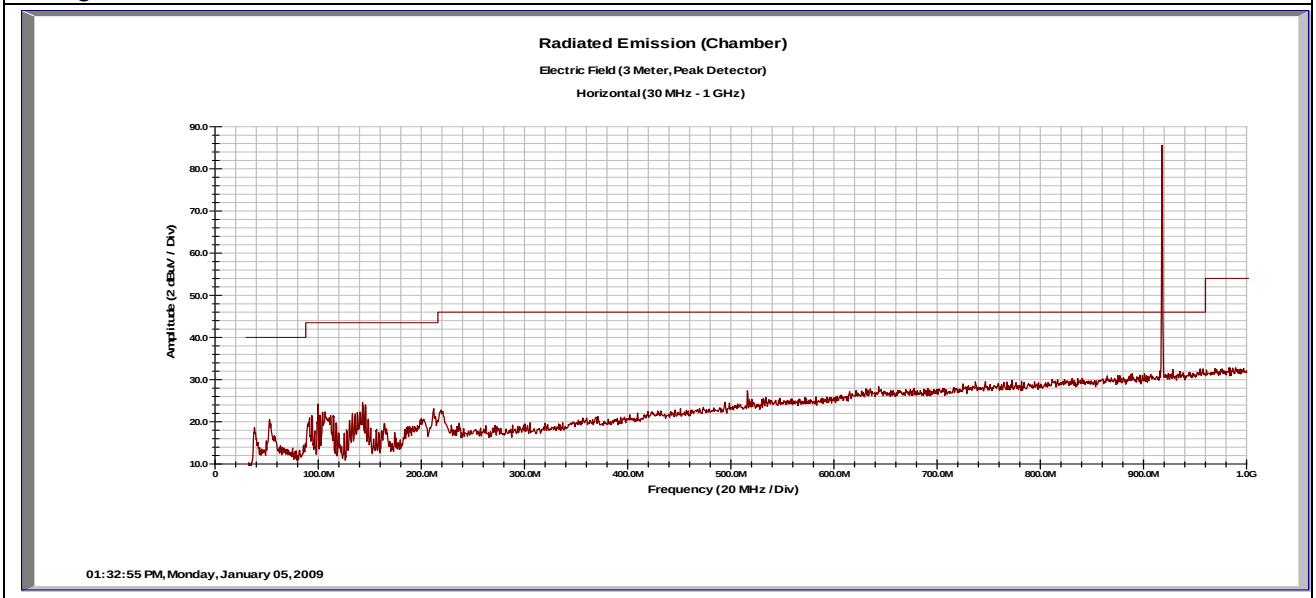
EUT Name	Reader	**Date**	05 January, 1009
EUT Model	R22-1012	**Temp / Hum in**	72º F / 43% rH
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15C	**Voltage / Freq.**	120VAC / 60Hz
Deg/sweep	12	**RBW / VBW**	120 kHz / 300 kHz
Dist/Ant Used	3m / 6140	**Performed by**	Mark Ryan
Configuration	Constant modulated transmit, Horizontal antenna active on 918.00MHz		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	Pk E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
918.00	H	1.6	333	63.26	0.00	3.42	22.66	89.34	94.00	-4.66
918.00	V	1	274	55.68	0.00	3.42	22.36	81.46	94.00	-12.54

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Orientation 1 is worst case (see test setup photos)
The limit for the fundamental frequency is 50mV which is equivalent to 94 dBµV.
All other emissions including harmonics and must be under the limits of FCC part 15.209

4 Spurious Emissions – in "Chirp" Mode

4.1 Spurious Emissions FCC Part 15.249(d) and 15.249(e)

4.1.1 Test Methodology

4.1.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 300 kHz and provide a reading at each frequency for each 6° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

4.1.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

4.1.1.3 Deviations

There were no deviations from this test methodology.

4.1.2 Test Results

As originally tested, the EUT was found to be **compliant** to the requirements of the test standard(s).

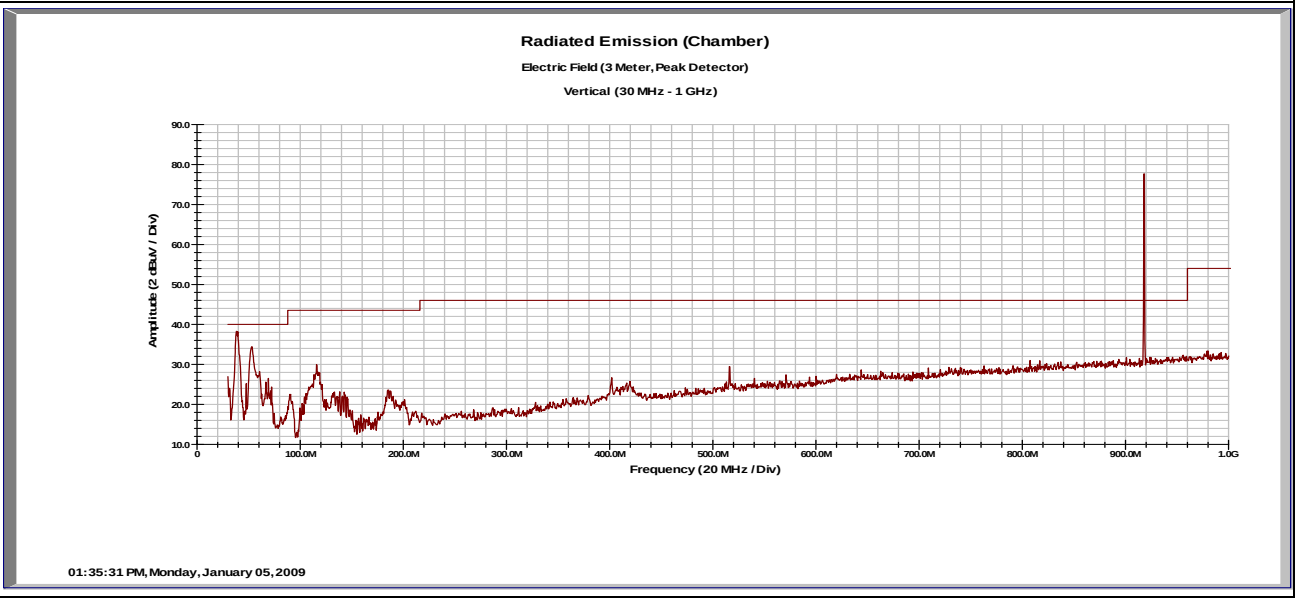
4.1.2.1 Emissions Outside the Frequency Band

Per FCC part 15.249(d): Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Sec. 15.209, whichever is the lesser attenuation.

Per FCC part 15.249(e): As shown in Sec. 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section is based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

SOP 1 Radiated Emissions — Tracking # 30862910.003 Page 1 of 3

EUT Name	Reader	**Date**	05 January, 1009
EUT Model	R22-1012	**Temp / Hum in**	72º F / 43% rH
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15C	**Voltage / Freq.**	120VAC / 60Hz
Deg/sweep	12	**RBW / VBW**	120 kHz / 300 kHz
Dist/Ant Used	3m / 6140	**Performed by**	Mark Ryan
Configuration	EUT in "Chirp" Mode using the internal Horizontal Antenna.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
38.64	V	1.1	0	24.65	0.00	0.65	8.32	33.62	40.00	-6.38
54.12	V	1	0	20.39	0.00	0.80	9.48	30.67	40.00	-9.33

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Orientation 1 is worst case (see test setup photos). Other plots are on file at TUV Rheinland
The limit for all emissions outside the band including harmonics must be under the limits of FCC part 15.209

SOP 1 Radiated Emissions

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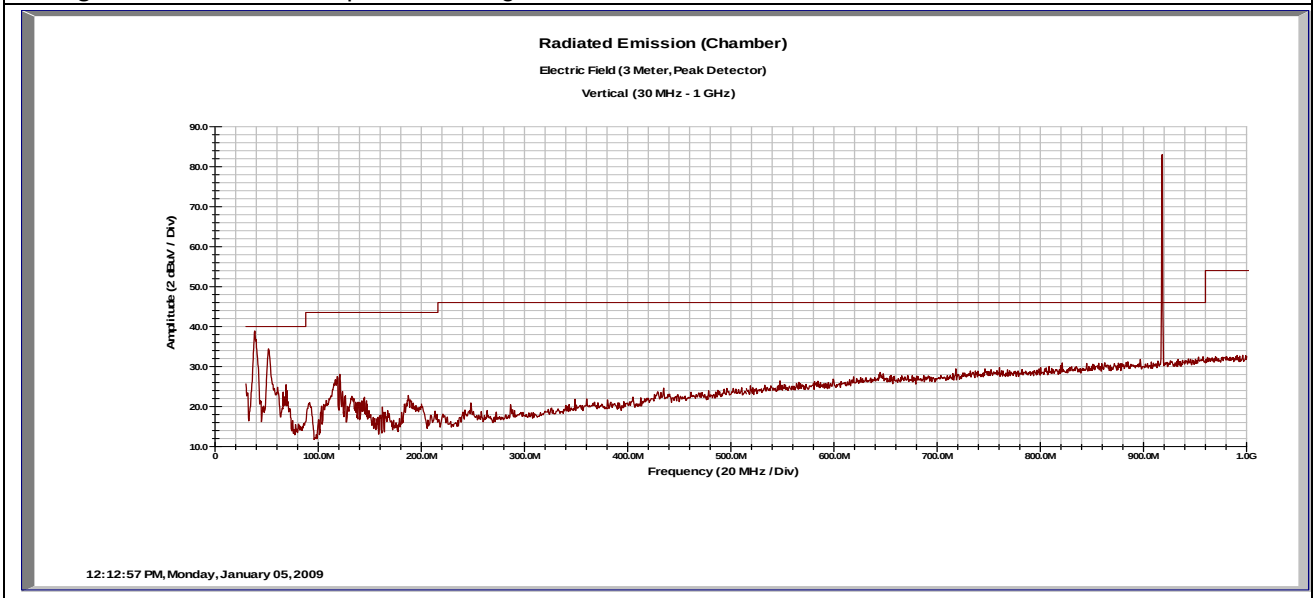
EUT Name	Reader	**Date**	05 January, 1009
EUT Model	R22-1012	**Temp / Hum in**	72º F / 43% rH
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15C	**Voltage / Freq.**	120VAC / 60Hz
Deg/sweep	12	**RBW / VBW**	120 kHz / 300 kHz
Dist/Ant Used	3m / 6140	**Performed by**	Mark Ryan
Configuration	EUT in "Chirp" Mode using the internal Vertical Antenna.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
38.64	V	1.1	0	24.56	0.00	0.65	8.32	33.53	40.00	-6.47
54.12	V	1	0	19.45	0.00	0.80	9.48	29.73	40.00	-10.27

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Orientation 1 is worst case shown (see test setup photos) Other plots are on file at TUV Rheinland
The limit for all emissions outside the band including harmonics must be under the limits of FCC part 15.209.

SOP 1 Radiated Emissions — Tracking # 30862910.003 Page 3 of 3

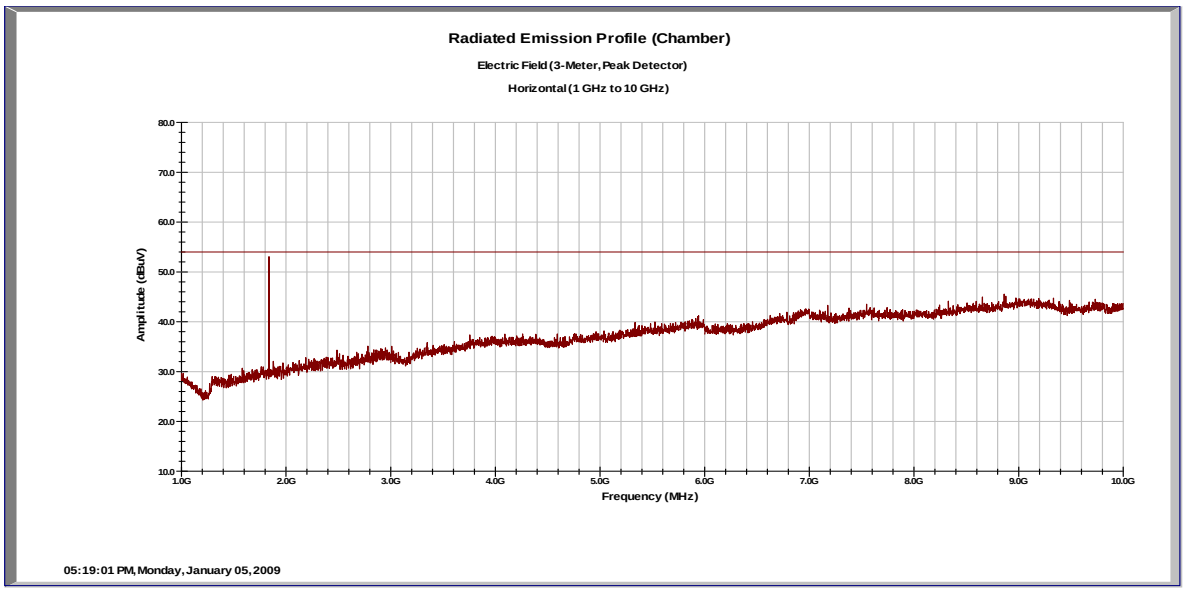
EUT Name	Reader	**Date**	05 January, 1009
EUT Model	R22-1012	**Temp / Hum in**	72º F / 43% rH
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15C	**Voltage / Freq.**	120VAC / 60Hz
Deg/sweep	6	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3 meters / 3115	**Performed by**	Mark Ryan
Configuration	EUT in "Chirp" Mode		

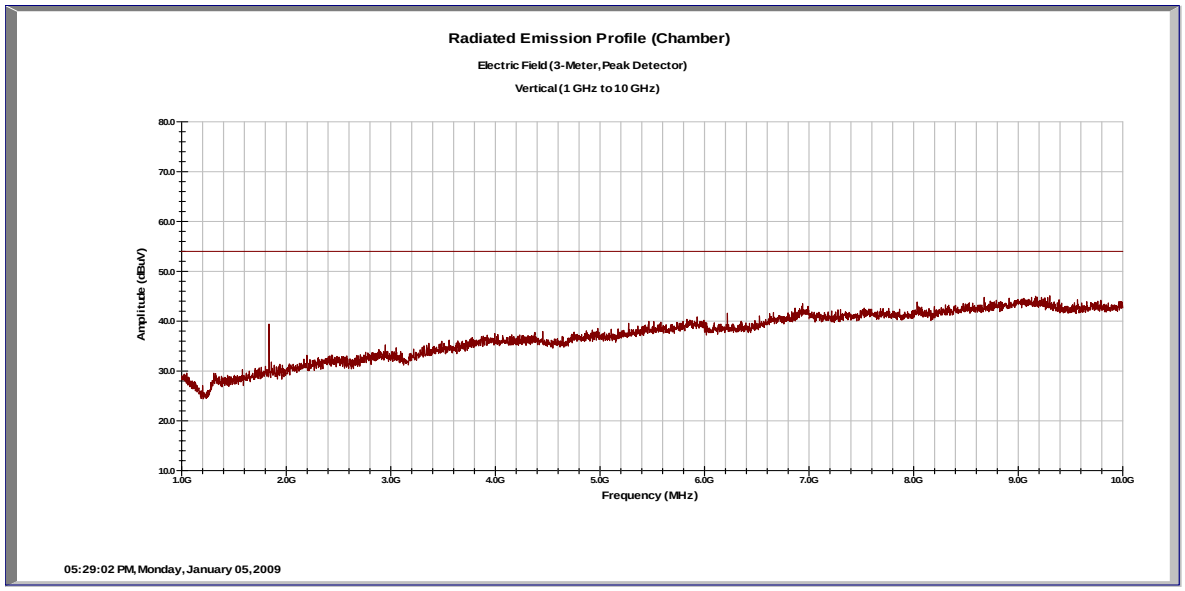
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dBuV/m)
EUT: Horiz Ant										
Peak										
1836.00	H	1	349	55.91	36.16	6.34	26.95	53.03	74.00	-20.97
1836.00	V	1	164	46.08	36.16	6.34	26.68	42.94	74.00	-31.06
Average										
1836.00	H	1	349	50.17	36.16	6.34	26.95	47.29	54.00	-6.71
1836.00	V	1	164	36.28	36.16	6.34	26.68	33.14	54.00	-20.86
EUT: Vert Ant										
Peak										
1836.00	H	1.4	31	50.01	36.16	6.34	26.95	47.13	74.00	-26.87
1836.00	V	1.1	32	56.92	36.16	6.34	26.68	53.78	74.00	-20.22
Average										
1836.00	H	1.4	31	42.39	36.16	6.34	26.95	39.51	54.00	-14.49
1836.00	V	1.1	32	51.21	36.16	6.34	26.68	48.07	54.00	-5.93

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

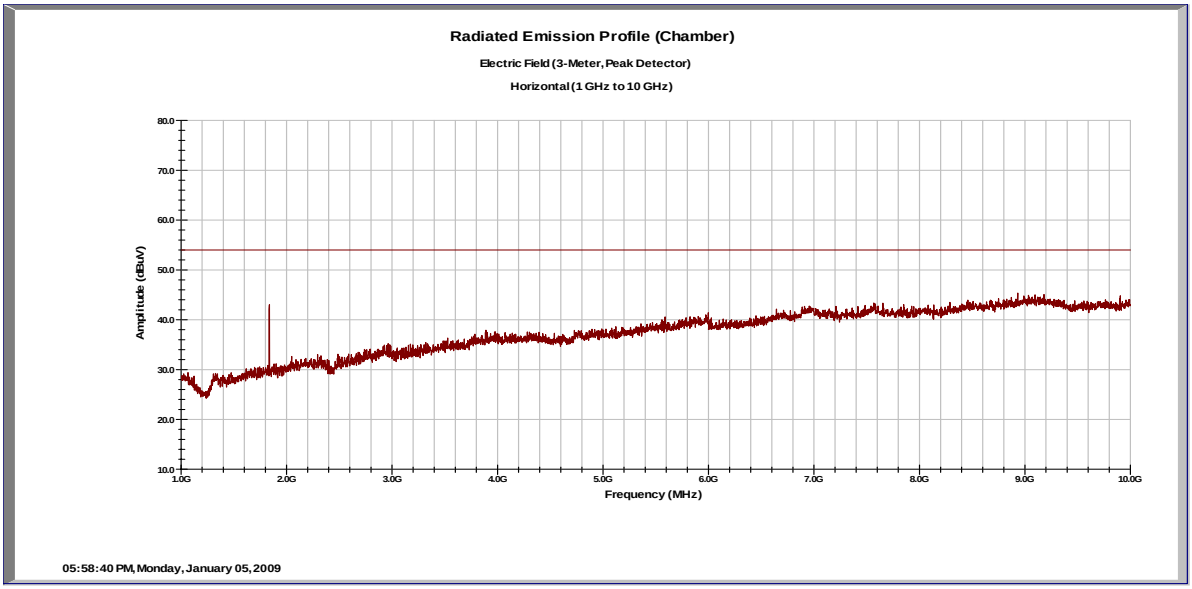
Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

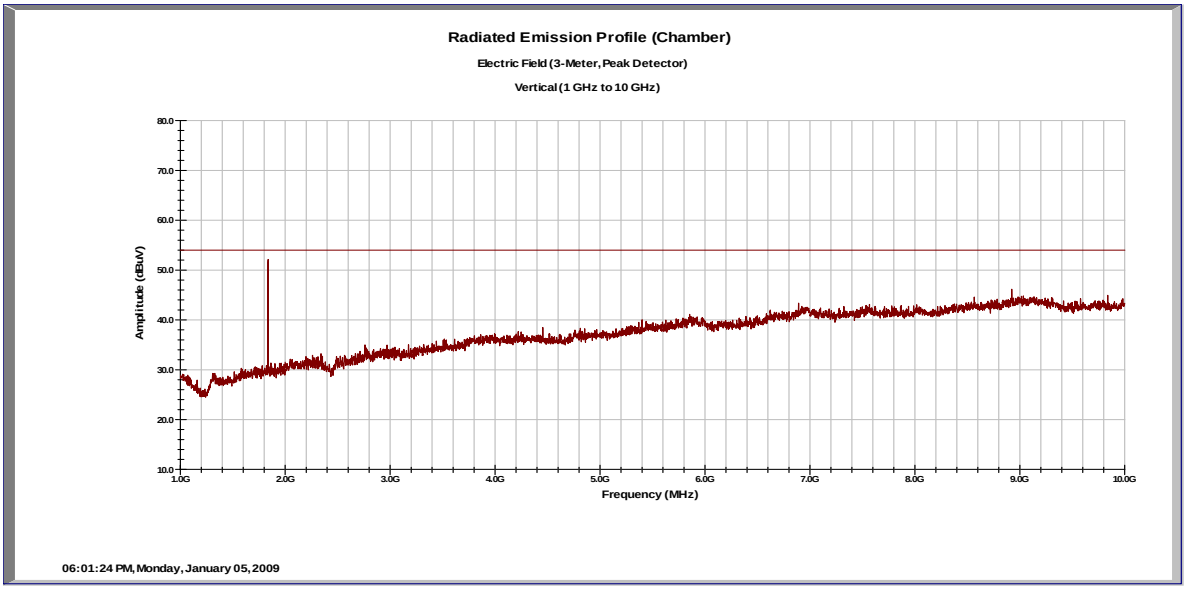
Notes: The frequency of the apparatus is 918MHz.
The limit for the harmonics is 500 µV which is equivalent to 54 dBµV for the Average Detector, the Peak limit is 20 dB above the Average Limit or 74 dBµV.
Only the 2nd harmonic was visible, all other harmonics and spurs were indistinguishable from the EMC receiver's noise floor.





1 – 10 GHz Plots of Harmonics and spurs with transmitters in Chirp mode - Horizontal





1 – 10 GHz Plots of Harmonics and spurs with transmitters in Chirp mode - Vertical

5 Conducted Power Line Emissions

5.1 Conducted Emissions FCC part 15.207 In "Chirp" Mode

Testing was performed in accordance with FCC Part 15.207(a). These test methods are listed under the laboratory's NVLAP Scope of Accreditation.

This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

5.1.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. For each frequency sub-range, each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50μH / 50Ω LISNs.

Testing is either performed in the anechoic chamber or on PLC Site 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the anechoic chamber is a 2m x 2m wooden frame that is covered with ¼ inch hardware cloth and is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN. Floor-standing equipment is placed directly on the ground plane.

5.1.1.1 Deviations

There were no deviations from this test methodology.

5.1.2 Test Results

Section 5.1.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Plots of the EUT's AC Line Conducted emissions are contained in the following sections. The plots show peak and/or average emissions and the corresponding peak and/or average limits. If the peak emissions are below the average limit, then the EUT is considered to pass and no average measurements are made. If the peak emissions are below the quasi-peak limit and the average emissions are below the average limit, then the EUT is considered to pass and no further measurements are made. Otherwise, individual frequencies are measured and compared to the corresponding limit for the detector used (quasi-peak or average).

5.1.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

SOP 2 Conducted Emissions

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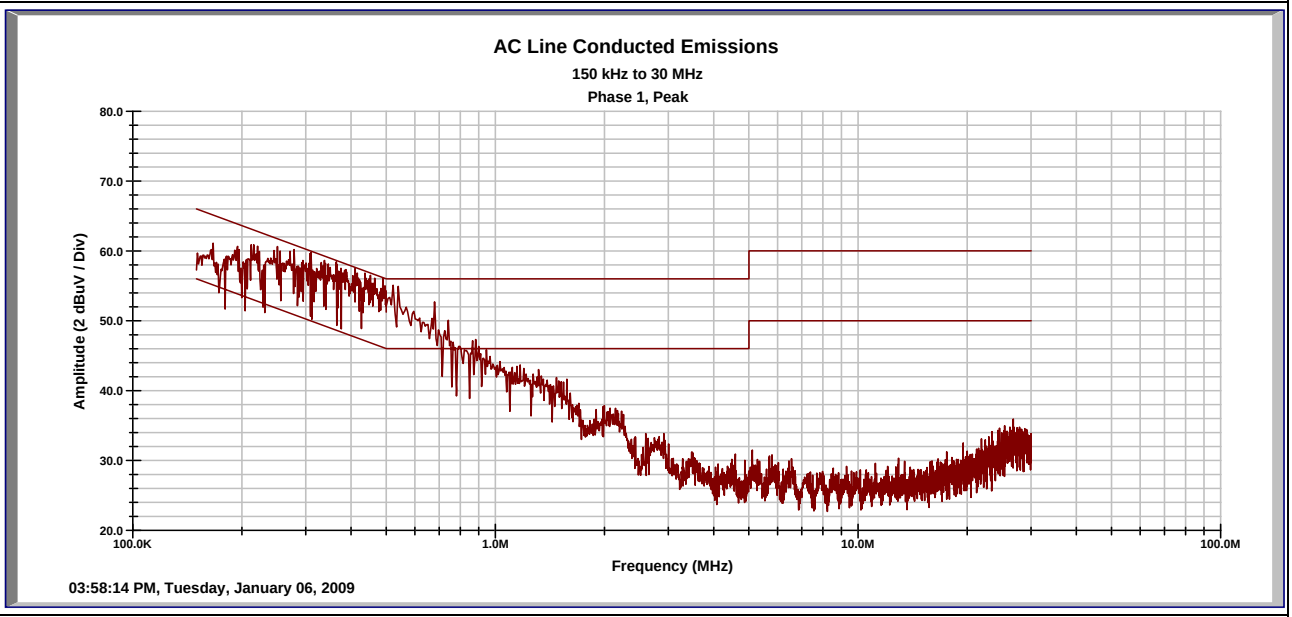
EUT Name	Reader	**Date**	6 January 2009
EUT Model	R22-1012	**Temperature**	70° F
EUT Serial	Not Serialized	**Humidity**	42% rH
Standard	FCC 47 CFR Part 15C	**Line AC /Freq**	120VAC / 60Hz
LISNs Used	16	**Performed by**	Mark Ryan
Configuration:	EUT in “Chirp” mode - Line		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.15	1	41.88	15.29	0.04	10.17	66.00	56.00	-13.92	-30.51
0.40	1	39.16	14.76	0.09	10.17	57.85	47.85	-8.44	-22.84
0.50	1	36.00	12.63	0.07	10.18	56.00	46.00	-9.76	-23.13
0.76	1	31.55	9.22	0.13	10.20	56.00	46.00	-14.13	-26.46
2.19	1	18.86	4.93	0.12	10.24	56.00	46.00	-26.78	-30.71
27.02	1	12.23	1.80	0.19	11.39	60.00	50.00	-36.19	-36.62

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

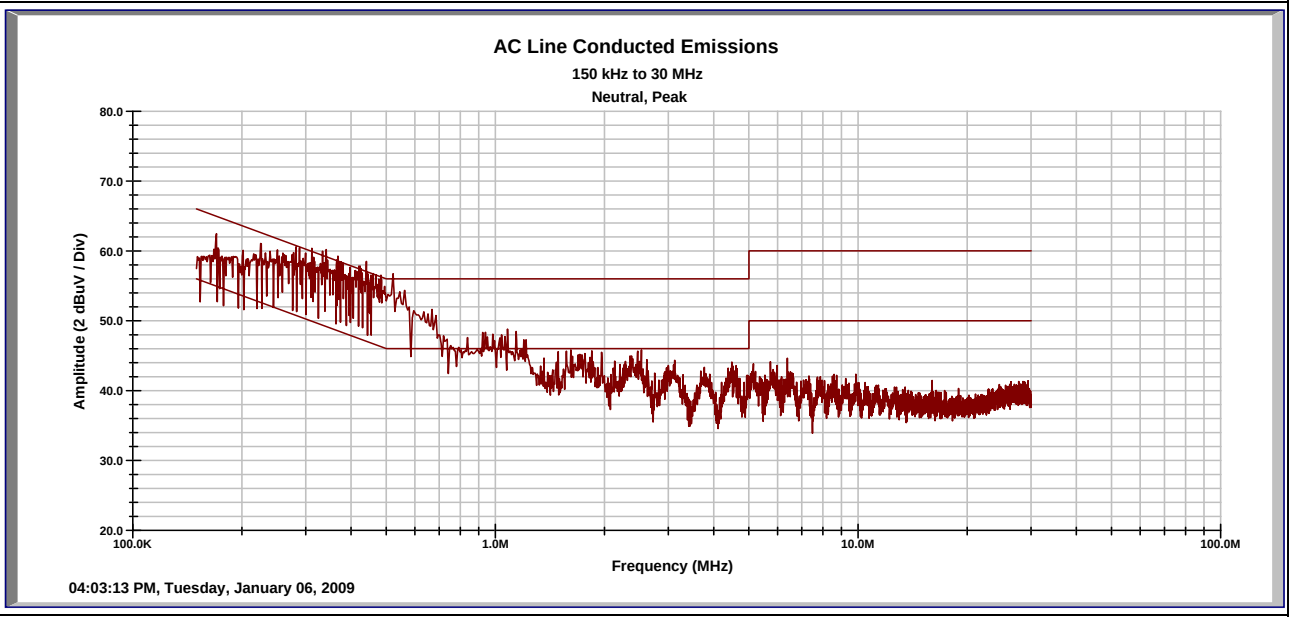
Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

Tracking # 30862910.003 Page 1 of 2

EUT Name	Reader	**Date**	6 January 2009
EUT Model	R22-1012	**Temperature**	70° F
EUT Serial	Not Serialized	**Humidity**	42% rH
Standard	FCC 47 CFR Part 15C	**Line AC /Freq**	120VAC / 60Hz
LISNs Used	15	**Performed by**	Mark Ryan
Configuration:	EUT in “Chirp” mode - Neutral		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.15	N	44.08	21.85	0.04	10.14	66.00	56.00	-11.74	-23.97
0.43	N	40.63	23.08	0.09	10.14	57.25	47.25	-6.39	-13.94
0.50	N	37.19	19.35	0.07	10.18	56.00	46.00	-8.56	-16.40
0.84	N	29.50	18.40	0.13	10.31	56.00	46.00	-16.05	-17.15
2.35	N	27.52	19.74	0.10	10.28	56.00	46.00	-18.11	-15.89
27.81	N	21.11	12.66	0.20	13.61	60.00	50.00	-25.08	-23.53

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

5.1.3 Sample Calculation

The signal strength is calculated by adding the LISN Correction Factor and Cable Loss to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM + CBL + LCF

Where: FIM = Field Intensity Meter (dBμV)
CBL = Cable Loss (dB)
LCF = LISN Loss (dB)

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

As originally tested, the EUT was found to be **compliant** to the requirements of the test standard(s).

6 Test Equipment Use List

6.1 Test Equipment use list

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
SOP 1 - Radiated Emissions (5 Meter Chamber)					
Amplifier, preamp	Agilent Technologies	8449B	3008A01480	30-Jan-08	30-Jan-09
Antenna Horn 1-18GHz	EMCO	3115	5770	16-Jun-08	16-Jun-10
Ant. BiconiLog	Chase	CBL6140A	1108	13-Jun-08	13-Jun-10
Receiver, EMI	Rohde & Schwarz	ESIB40	100043	9-Jun-08	9-Jun-09
Cable, Coax	Andrew	FSJ1-50A	003	25-Jan-08	25-Jan-09
Cable, Coax	Andrew	FSJ1-50A	030	30-Jan-08	30-Jan-09
Cable, Coax	Andrew	FSJ1-50A	045	30-Jan-08	30-Jan-09
SOP 2 - Conducted Emissions (AC/DC)					
LISN 15-18 (NSLK 8126)	Schwarzbeck Mess-Electronik	NSLK 8126	003885	11-Jan-08	11-Jan-09
Spectrum Analyzer[1]	Agilent Tec.	E7405A	US39440161	7-Aug-08	7-Aug-09
Cable, Coax	Belden	RG-213	004	25-Jan-08	25-Jan-09