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Lab Number:	10LB048
Project Number:	10RT02887-1
File Number:	MC15465
Date:	July 22, 2010
Models:	Reader Model R22-1012 (AC) FCC ID: URGR221012

Electromagnetic Compatibility Test Report

For

RadarFind Corp.

Raleigh, NC

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Project Number: 10RT02887 File Number: MC15465
Model Number: Reader Model R22-1012
Client Name: RadarFind Corp.

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FCC ID: URGR221012

Test Report Details

Tests Performed By: **Underwriters Laboratories Inc.
12 Laboratory Dr.
Research Triangle Park, NC 27709**

Tests Performed For: **RadarFind Corporation
A TeleTracking Technologies Company
2100 Gateway Centre Blvd., Suite 150
Morrisville, NC 27560**

Applicant Contact: **Mr. Steve Snell**
Title: **Director, Hardware Engineering**
Phone: **(919) 228-2170**
E-mail: **ssnell@radarfind.com**

Test Report Date: **July 15, 2010**

Product Type: **Low-Powered Transmitter**

Product standards: **FCC Part 15, Subpart C, 15.249**

Model Number: **Reader Models R22-1012 (AC)**

Sample Serial Number: **Unserialized production samples**

EUT Category: **Frequency Hopping Spread Spectrum Transmitter**

Testing Start Date: **July 6, 2010**

Date Testing Complete: **July 12, 2010**

Overall Results: Compliant

Underwriters Laboratories Inc. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. Underwriters Laboratories Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Underwriters Laboratories Inc. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the US government.

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Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
8-19-2010	Model Number Corrected	J. Marley	M. Nolting

1.0 G E N E R A L - Product Description

1.1 Equipment Description

This equipment functions as a device tracking system consisting of readers and tags operating in the 902-928 MHz ISM band under FCC Part 15.249.

1.2 Equipment Marking Plate

Documented in Original FCC Submission.

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1.3 Device Configuration During Test

1.3.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Reader	RadarFind Corp.	R22-1012	AC Powered Reader
Note: EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, or SIM - Simulator (Not Subjected to Test)				

1.3.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
1	Mains	AC	N	N	For Reader Only.
2	Antenna	N/E	—	—	
Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

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1.3.3 EUT Internal Operating Frequencies:

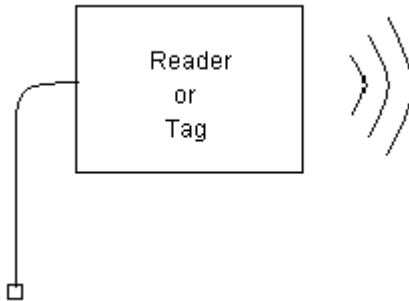
Frequency (MHz)	Description
902-928	Operating Frequency Band.

1.3.4 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	120Vac	-	-	60Hz	Single Phase	Reader

1.4 Block Diagram:

The diagram below illustrates the configuration of the equipment above.



1.5 Description of X and Y Axis Product Orientations



X-Orientation (upright) Y-Orientation (on side)

EUT is measured with Horizontal and Vertical antenna position in each orientation to cover the typical installations and directions of maximum antenna gain. From the original testing the upright orientation was worst case for the reader.

1.6 EUT Configurations

Mode #	Description
1	Reader (AC) standalone.

1.7 EUT Operation Modes

Mode #	Description			
1	Readers are set to continuously operate at maximum power level moving between the following six operating frequencies/modes for the purposes of test.			
TX Antenna	Frequency	Baud Rate	Deviation	Length
Vertical	909 MHz	200,000 bit/s	± 297 kHz	400 ms TX
Horizontal	909 MHz	200,000 bit/s	± 297 kHz	400 ms TX
Vertical	905 MHz	200,000 bit/s	± 297 kHz	0.3 ms TX, 3 ms idle (10% duty cycle)
Horizontal	905 MHz	200,000 bit/s	± 297 kHz	0.3 ms TX, 3 ms idle (10% duty cycle)
Vertical	918 MHz	200,000 bit/s	± 297 kHz	400 ms TX
Horizontal	918 MHz	200,000 bit/s	± 297 kHz	400 ms TX

Mode #	Description
2	Tags are set to continuously operate at maximum power level moving between the following six operating frequencies/modes for the purposes of test. <ul style="list-style-type: none">• 905 MHz • 909 MHz • 912 MHz• 915 MHz • 918 MHz • 927 MHz.

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

None

2.2 Device Modifications Necessary for Compliance

None

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
FCC Part 15, Subpart C, 15.249	Code of Federal Regulations, Part 15, Radio Frequency Devices	2009

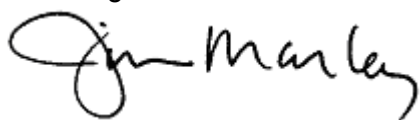
2.4 Results Summary

Requirement – Test	Result (Compliant / Non-Compliant)*
Radiated Power / Radiated Spurious Emissions	Compliant
Conducted Emissions – AC	Compliant

2.5 Test Scope

These tests are performed in support of a Class III Permissive Change. Other test items from previous certification are considered to remain valid.

Test Engineer:



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Reviewer:



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Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

----- United States -----

Code of Federal Regulations Title 47	Part 15, Subpart C, Radio Frequency Devices
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Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150
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Sample Calculations

Radiated Field Strength and Conducted Emissions data contained within this report are calculated as follows:

Radiated Field Strength

Field Strength (dBuV/m) = Meter Reading (dBuV) + Antenna Factor (dB/m) - Amp Gain (dB) + Cable Loss (dB)

Conducted Emissions

Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable/Attenuator Loss (dB) + LISN Voltage Correction Factor (dB)

4.1 Test Conditions and Results – RADIATED POWER / RADIATED SPURIOUS EMISSIONS

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable, and with EUT oriented in each of three orthogonal axes as noted.	
Basic Standard	FCC Part 15, Subpart C, 15.249 (Restricted Bands, FCC Part 15.209 General Limits Apply)	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 9.30 GHz	(3 meter measurement distance)

Limits – FCC Part 15.249(a) (EIRP Limit, not Point-to-Point operation)

Frequency (MHz)	Limit (dBµV/m)		
	Fundamental	Harmonics	
	Peak or Quasi-Peak	Peak	Average
902 – 928	94.0	74.0	54.0

Limits – FCC Part 15.249(c) Spurious Other than Harmonics

Frequency (MHz)	Limit (dBµV/m)
30 – 10 th harmonic	50 dB below fundamental (or 15.209 limit, whichever is higher)

Limits – FCC Part 15.209 (General Limits)

Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Average
30 - 88	40.0	NA
88 - 216	43.5	NA
216 - 960	46.0	NA
960 - 1000	54.0	NA
1000 - EUT 10 th harmonic	NA	54.0 (peak limit 74.0)
Supplementary information: None		

Table 1 Radiated Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	(D) 4 (Reader – AC Powered)	1
Supplementary information: None		

Table 2 Radiated Emissions Test Equipment

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	30-1000 MHz Range				
AT0021	Biconical Antenna, 30 to 200 MHz	Schaffner, EMC	VBA6106A	12/23/09	12/31/10
AT0022	Log-periodic Antenna, 200 MHz to 1000 MHz	Chase	UPA6109	12/22/09	12/31/10
	1-10 GHz				
AT0032	Horn Antenna 1 to 10 GHz	EMC Test Syst.	3115	9/25/09	9/30/10
	Gain-Loss Chains				
SAC_C (Biconical 3m location)	(1) ATA084: Attenuator (2) ATA124: Amplifier (3) ATA167: Cable (4) ATA132: Cable (5) ATA229: DC Bias Tee (6) ATA199: Cable	(1) Pasternack (2) Miteq (3) Eupen (4) UL (5) Miteq (6) Micro-Coax	(1) PE7002-6 (2) AM-3A-000110-N (3) CMS/RG 214 (4) UFA210A-0-6000-50U-50U (5) BT2000-C (6) UFB293C-0-0720-5GU50U)	06/03/10	08/31/10
SAC_D (Log-Periodic 3m location)	(1) ATA085: Attenuator (2) ATA125: Amplifier (3) ATA225: Cable (4) ATA189: Cable (5) ATA115: DC Bias Tee (6) ATA198: Cable	(1) Pasternack (2) Miteq (3) EUPEN (4) EUPE (5) Miteq (6) Micro-Coax	(1) PE7002-6 (2) AM-3A-000110-N (3) CMS/RG 214 (4) CMS/RG 214 (5) AM-1523-7687 (6) UFB293C-0-0720-5GU50U	02/17/10	08/31/10
SAC_E_HORN (Horn 3m location)	(1) ATA144: Amplifier (2) ATA207: Cable (3) ATA096: Cable (4) ATA199: Cable	(1) Miteq (2) Micro-Coax (3) Micro-Coax (4) Micro-Coax	(1) AFS42-00101800-25-N-42MF (2) UFB293C-1-3360-50U50U (3) UTIFLEX (4) UFB293C-0-0720-5GU50U	08/24/09	08/31/10
	Receiver & Software				
SA0123	Spectrum Analyzer / Receiver	HP	8566B	05/27/10	05/31/11
AMP005	Pre-amplifier	HP	8449B Opt H02 (calibrated with ATA091 6dB atten)	05/27/10	05/31/11
SAR003	Spectrum Analyzer / Receiver	Rohde & Schwarz	1088.7490K40	1/18/10	1/31/11
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA

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Model Number: Reader Model R22-1012

Client Name: RadarFind Corp.

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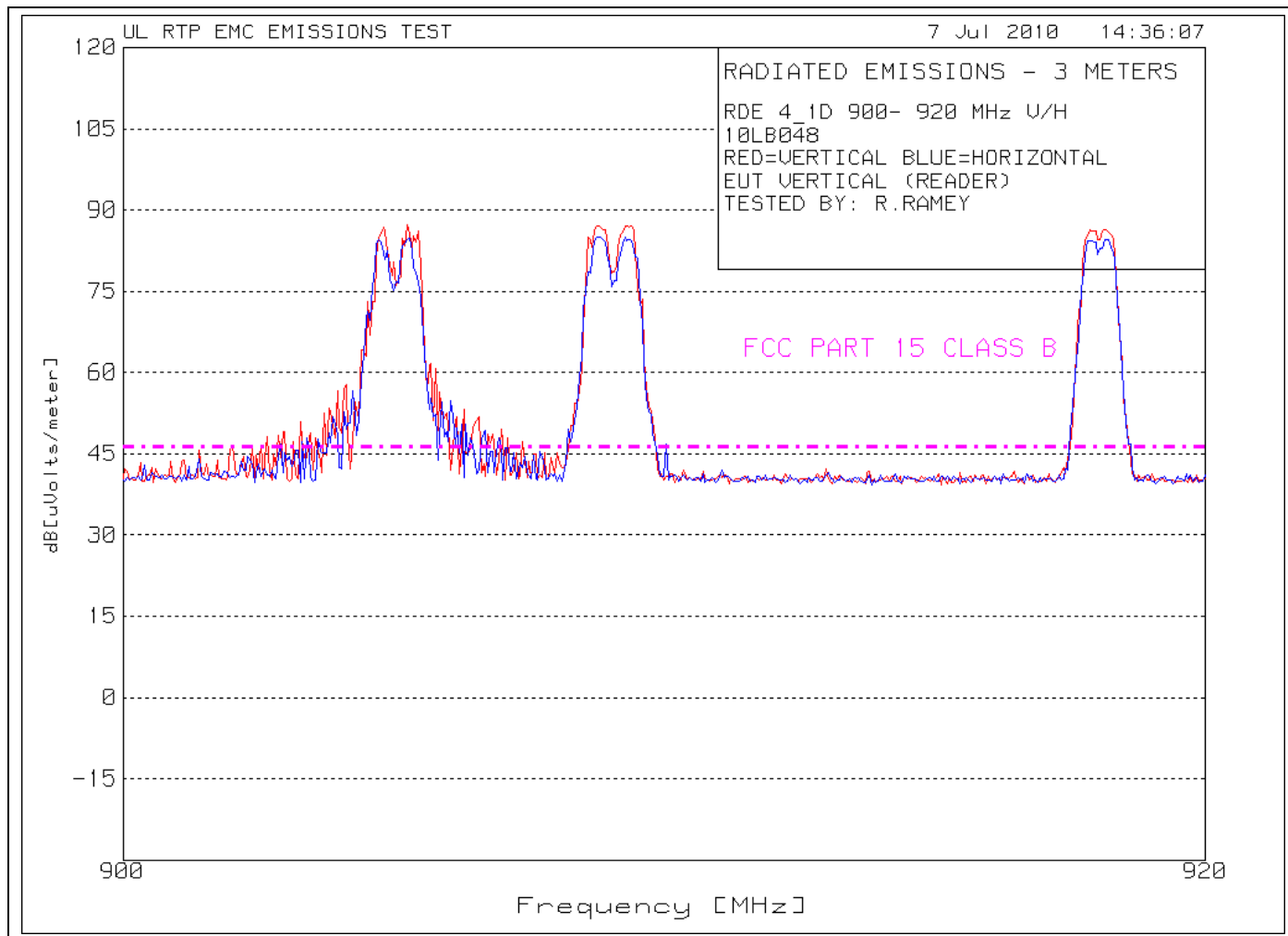
Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Additional Equipment used				
HI0034	Environmental meter (T/H/P)	Control Company	99760-00	10/19/09	10/31/10
MG1180	Tape Measure	Lufkin	HI-VIZ	8/8/08	8/31/11

4.1.1 Radiated Spurious Emissions – Reader – AC Powered

Figure 1 Test setup photo for Radiated Emissions (Reader, X-Y Orientation)



Figure 2 Radiated Emissions Graph 902-920 MHz (Reader, X-Orientation)



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Table 3 Radiated Emissions Data Points (Reader, X-Orientation)

RDE 4 1D 900- 920 MHz V/H
 10LB048
 RED=VERTICAL BLUE=HORIZONTAL
 EUT VERTICAL (READER)
 TESTED BY: R.RAMEY

Marker Number	Test Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	15.249 Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol. [V/H]
Vertical 900 - 920MHz										
1	904.7695	51.67	pk	12	23.1	86.77	94	-7.23	100	Vert
2	909.3387	52.16	pk	12	23	87.16	94	-6.84	100	Vert
3	918.1162	51.6	pk	12	22.8	86.4	94	-7.60	100	Vert

Horizontal 900 - 920MHz										
4	905.2505	49.56	pk	12	23.1	84.66	94	-9.34	199	Horz
5	908.6974	50.05	pk	12	23	85.05	94	-8.95	199	Horz
6	918.1563	49.7	pk	12	22.8	84.5	94	-9.5	199	Horz

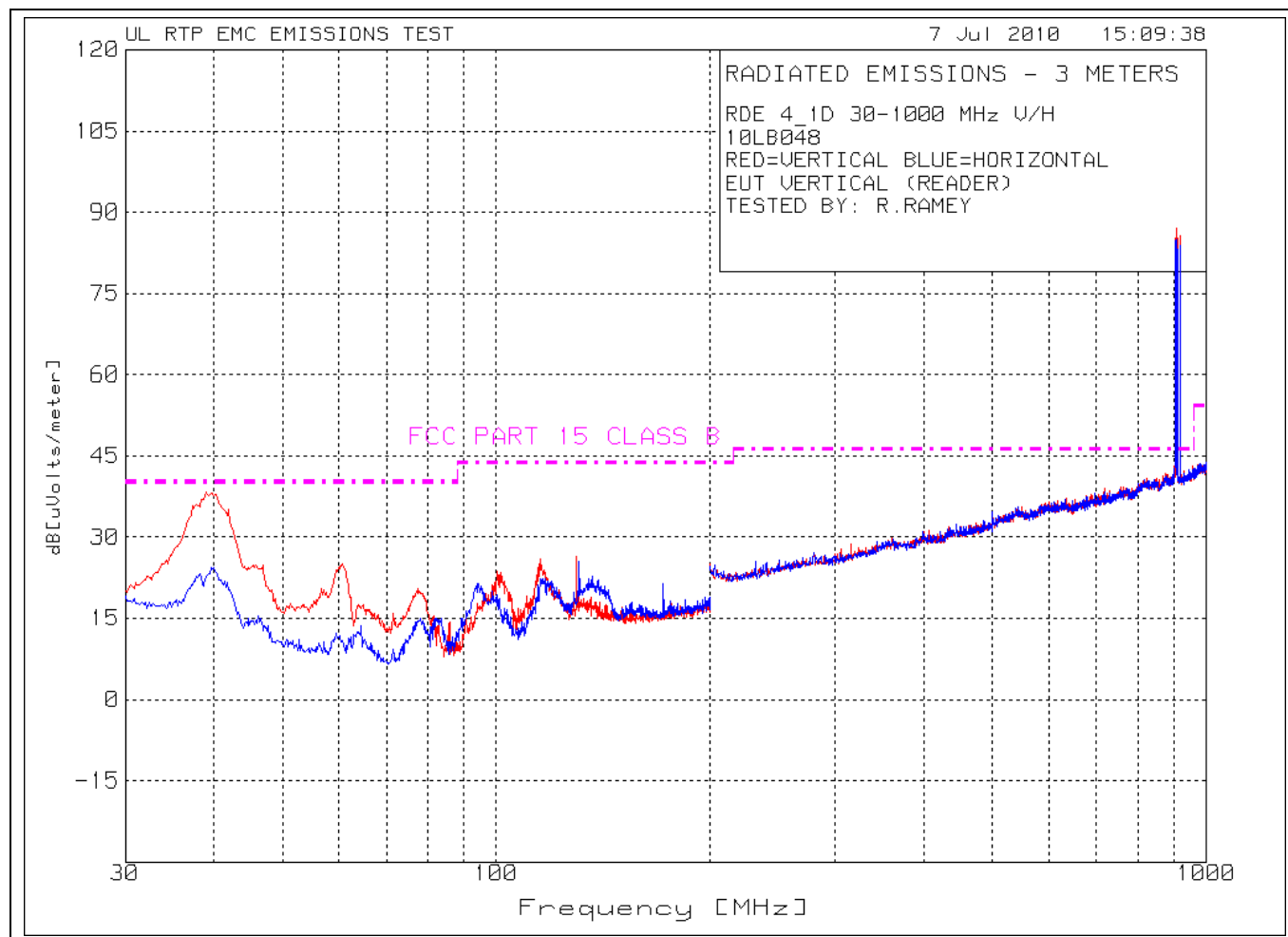
Test Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	15.209 Limit [dBuV/m]	Margin [dB]	Azim [deg]	Height [cm]	Pol. [V/H]
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Vertical 900 - 920MHz										
905.2756	47.23	qp	12	23.1	82.33	94	-11.67	358	106	Vert
909.2054	50.02	qp	12	23	85.02	94	-8.98	30	110	Vert
917.8372	49.54	qp	12	22.8	84.34	94	-9.66	360	100	Vert

Horizontal 900 - 920MHz										
904.6969	46.16	qp	12	23.1	81.26	94	-12.74	0	148	Horz
908.7395	48.57	qp	12	23	83.57	94	-10.43	360	138	Horz
917.8722	48.21	qp	12	22.8	83.01	94	-10.99	64	131	Horz

pk - Peak detector
 qp - Quasi-Peak detector

Figure 3 Radiated Emissions Graph 30-1000 MHz (Reader, X-Orientation)



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Table 4 Radiated Emissions Data Points (Reader, X-Orientation)

RDE 4_1D 30-1000 MHz V/H
 10LB048
 RED=VERTICAL BLUE=HORIZONTAL
 EUT VERTICAL (READER)
 TESTED BY: R.RAMEY

Marker Test Number Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	FCC-B Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol. [V/H]	

Vertical 30 - 200MHz										
1	39.019	50.36	pk	-26.8	14.7	38.26	40	-1.74	100	Vert
2	46.8468	40.04	pk	-26.7	11.6	24.94	40	-15.06	100	Vert
3	60.6306	45.01	pk	-26.7	6.7	25.01	40	-14.99	100	Vert
4	77.6476	39.93	pk	-26.4	6.9	20.43	40	-19.57	100	Vert
5	115.0851	39.31	pk	-26.4	13	25.91	43.5	-17.59	100	Vert
6	129.5496	38.74	pk	-26.3	14	26.44	43.5	-17.06	100	Vert
Pk - Peak detector										
Test Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	15.209 Limit [dBuV/m]	Margin [dB]	Azim [deg]	Height [cm]	Pol. [V/H]

Vertical 30 - 200MHz										
39.8798	46.68	qp	-26.6	14.2	34.28	40	-5.72	360	100	Vert

Figure 4 Radiated Emissions Graph 1-10 GHz (Reader, X-Orientation)

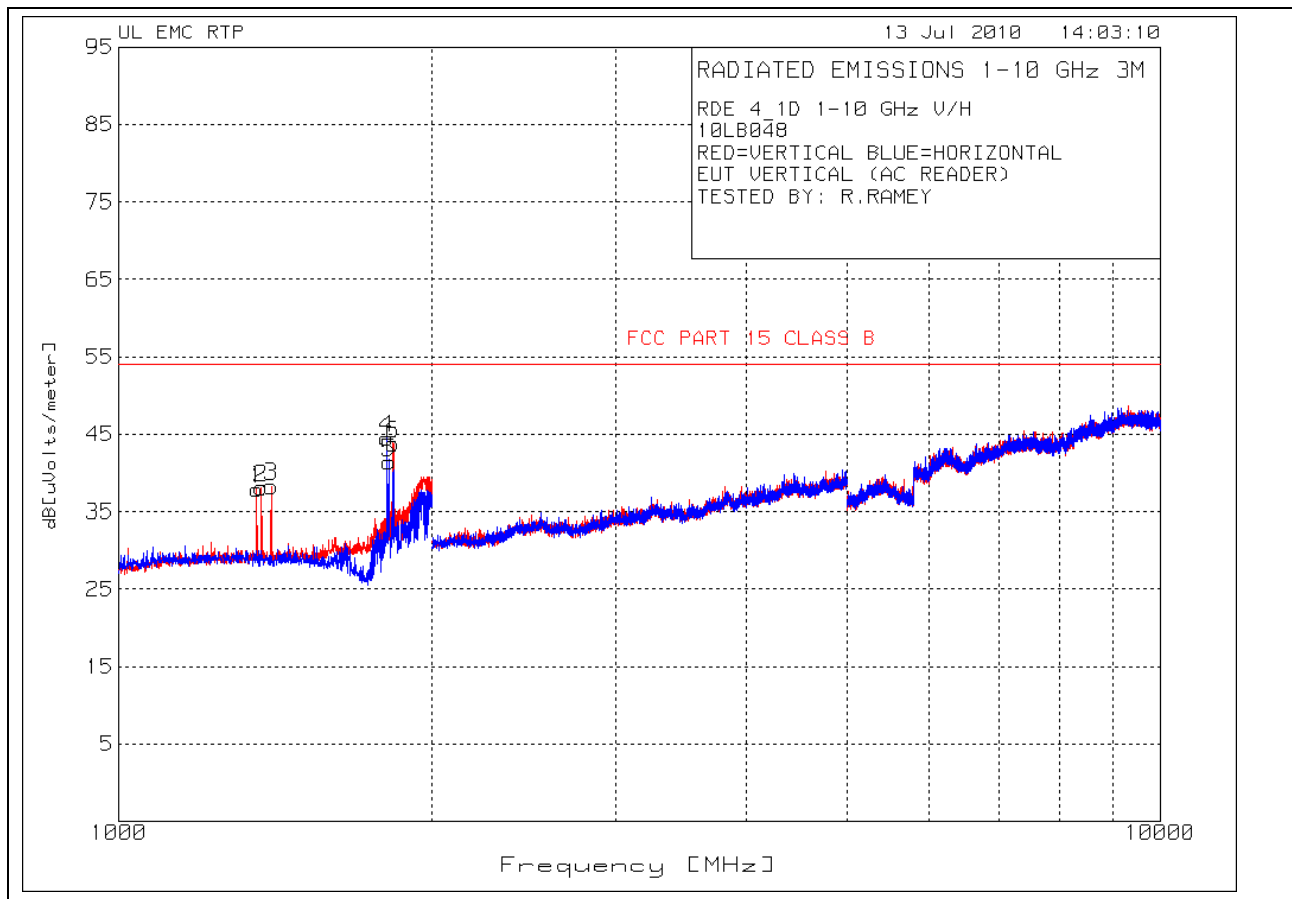


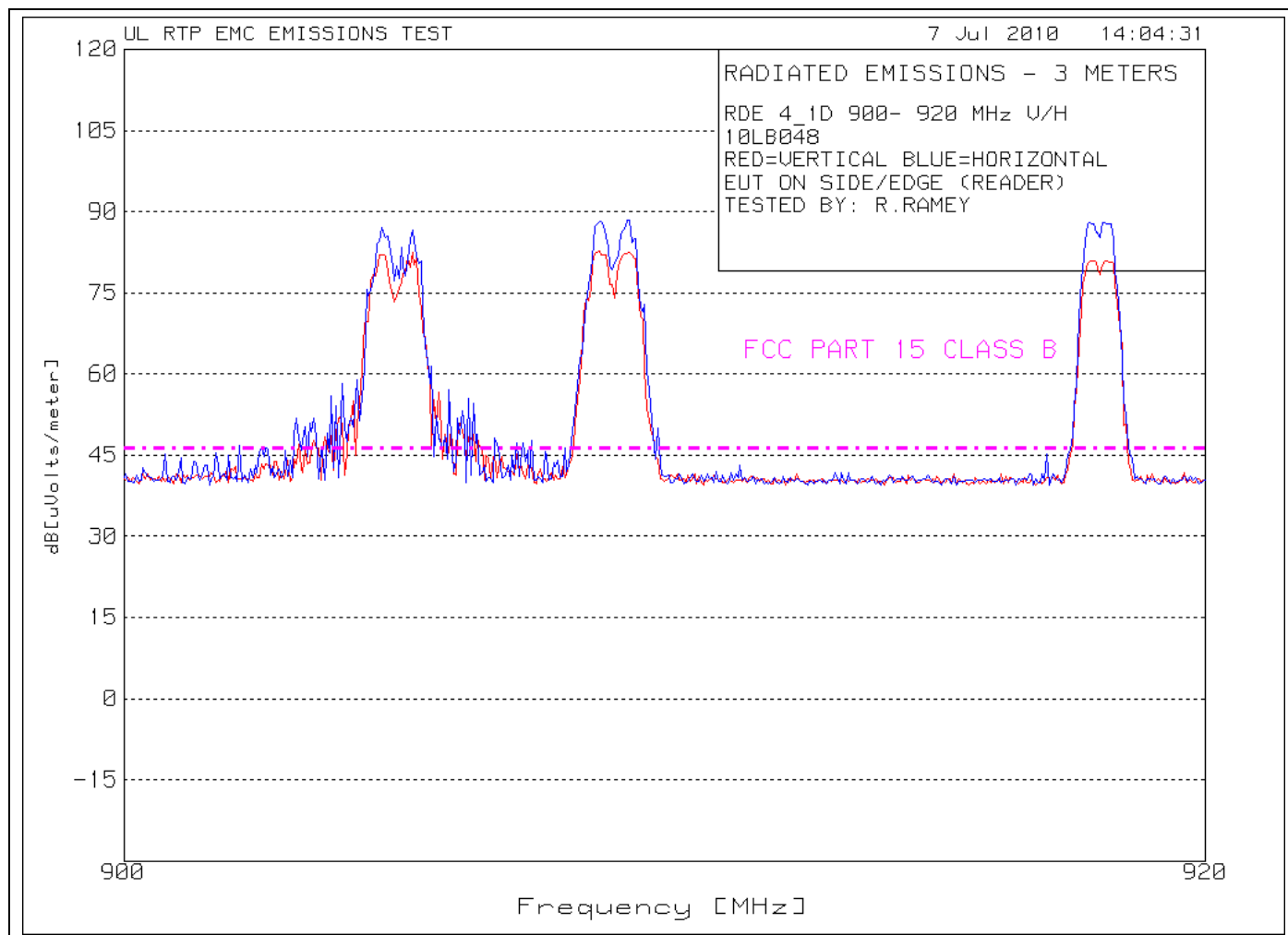
Table 5 Radiated Emissions Data Points (Reader, X-Orientation)

RDE 4_1D 1-10 GHz V/H
10LB048
RED=VERTICAL BLUE=HORIZONTAL
EUT VERTICAL (AC READER)
TESTED BY: R.RAMEY

Marker Number	Test Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	15.209 Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol. [V/H]
Vertical 1000 - 2000MHz -----										
1	1357	76	pk	-63.4	25.3	37.9	54	-16.1	150	Vert
2	1371	76.1	pk	-63.3	25.3	38.1	54	-15.9	150	Vert
3	1402	76.3	pk	-63.3	25.3	38.3	54	-15.7	150	Vert
6	1835	79.6	pk	-62.8	27	43.8	54	-10.2	150	Vert
Horizontal 1000 - 2000MHz -----										
4	1810	80.5	pk	-62.9	26.9	44.5	54	-9.5	150	Horz
5	1817	77.4	pk	-62.9	26.9	41.4	54	-12.6	150	Horz

pk - Peak detector

Figure 5 Radiated Emissions Graph 902-920 MHz (Reader, Y-Orientation)



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Table 6 Radiated Emissions Data Points (Reader, Y-Orientation)

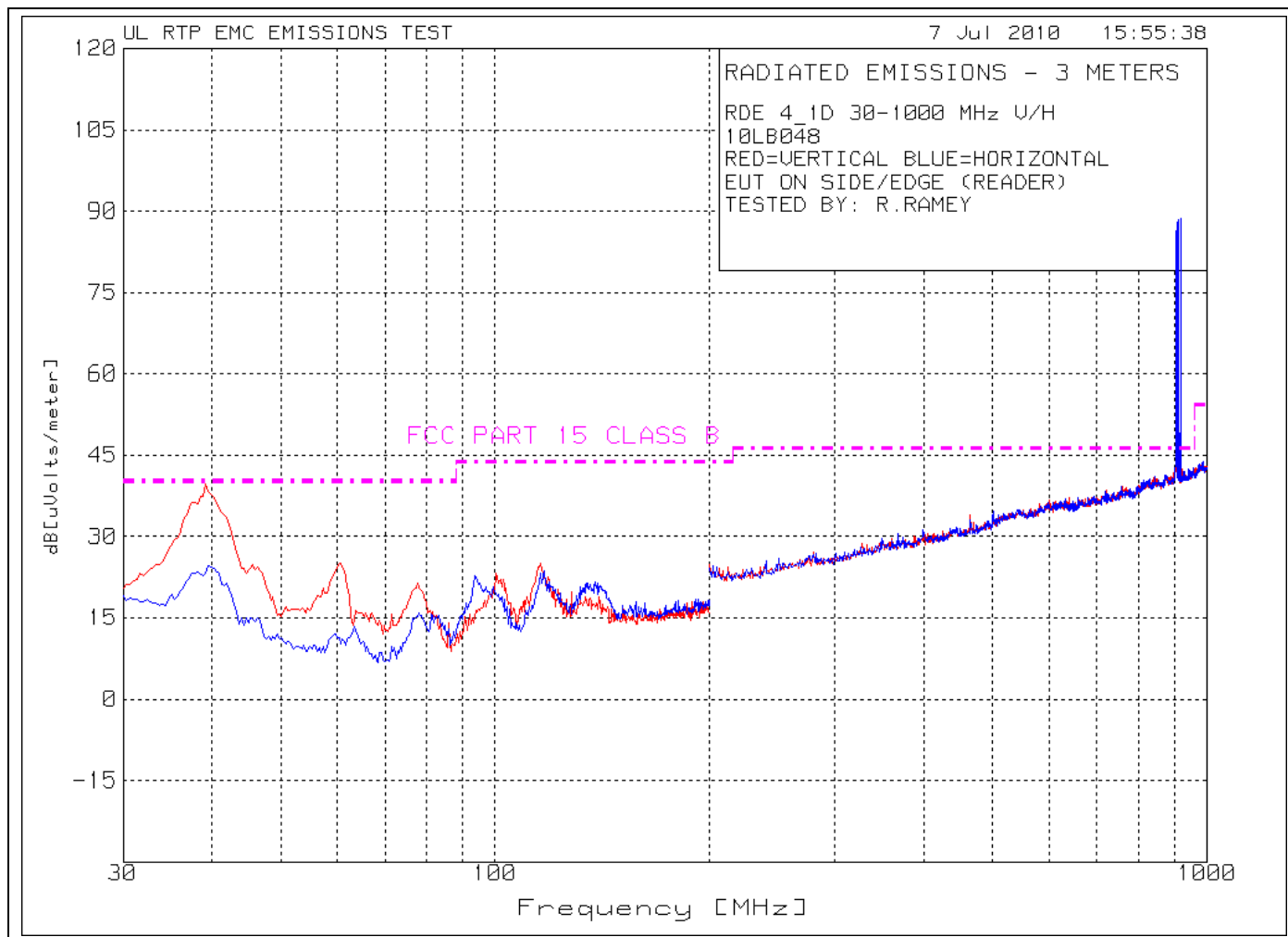
RDE 4_1D 900- 920 MHz V/H
 10LB048
 RED=VERTICAL BLUE=HORIZONTAL
 EUT ON SIDE/EDGE (READER)
 TESTED BY: R.RAMEY

Marker Test Number Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	15.249 Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol. [V/H]
Vertical 900 - 920MHz									
1 904.7295	46.94	pk	12	23.1	82.04	94	-11.96	199	Vert
2 908.7375	47.62	pk	12	23	82.62	94	-11.38	100	Vert
3 917.8758	46.12	pk	12	22.8	80.92	94	-13.08	199	Vert
Horizontal 900 - 920MHz									
4 904.7295	51.95	pk	12	23.1	87.05	94	-6.95	100	Horz
5 909.2986	53.36	pk	12	23	88.36	94	-5.64	100	Horz
6 918.1162	53.17	pk	12	22.8	87.97	94	-6.03	100	Horz

Test Freq. [MHz]	Meter Reading	Det. Type [dBuV]	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	15.249 Limit [dBuV/m]	Margin [dB]	Azim [deg]	Height [cm]	Pol. [V/H]
Vertical 900 - 920MHz										
905.2054	46.38	qp	12	23.1	81.48	94	-12.52	360	135	Vert
908.8517	46.71	qp	12	23	81.71	94	-12.29	0	114	Vert
917.8672	47.33	qp	12	22.8	82.13	94	-11.87	360	114	Vert
Horizontal 900 - 920MHz										
909.2385	49.38	qp	12	23	84.38	94	-9.62	52	248	Horz
905.1954	47.36	qp	12	23.1	82.46	94	-11.54	360	100	Horz
918.1628	49.87	qp	12	22.8	84.67	94	-9.33	0	146	Horz

pk - Peak detector
 qp - Quasi-Peak detector

Figure 6 Radiated Emissions Graph 30-1000 MHz (Reader, Y-Orientation)



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Table 7 Radiated Emissions Data Points (Reader, Y-Orientation)

RDE 4_1D 30-1000 MHz V/H
 10LB048
 RED=VERTICAL BLUE=HORIZONTAL
 EUT ON SIDE/EDGE (READER)
 TESTED BY: R.RAMEY

Marker Test Number Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	FCC-B Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol. [V/H]

Vertical 30 - 200MHz									
1 39.1984	51.94	pk	-26.8	14.6	39.74	40	-.26	100	Vert
2 60.3206	45	pk	-26.7	6.8	25.1	40	-14.9	100	Vert
3 77.6954	40.9	pk	-26.4	6.9	21.4	40	-18.6	100	Vert
5 100.1804	39.05	pk	-26.6	10.8	23.25	43.5	-20.25	100	Vert
6 115.8517	38.46	pk	-26.5	13	24.96	43.5	-18.54	100	Vert

Horizontal 30 - 200MHz									
4 93.7074	39.53	pk	-26.5	9.8	22.83	43.5	-20.67	100	Vert

Test Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	15.209 Limit [dBuV/m]	Margin [dB]	Azim [deg]	Height [cm]	Pol. [V/H]

Vertical 30 - 200MHz										
39.7495	47.42	qp	-26.6	14.3	35.12	40	-4.88	154	100	Vert

pk - Peak detector
 qp - Quasi-Peak detector

Figure 7 Radiated Emissions Graph 1-10 GHz (Reader, Y-Orientation)

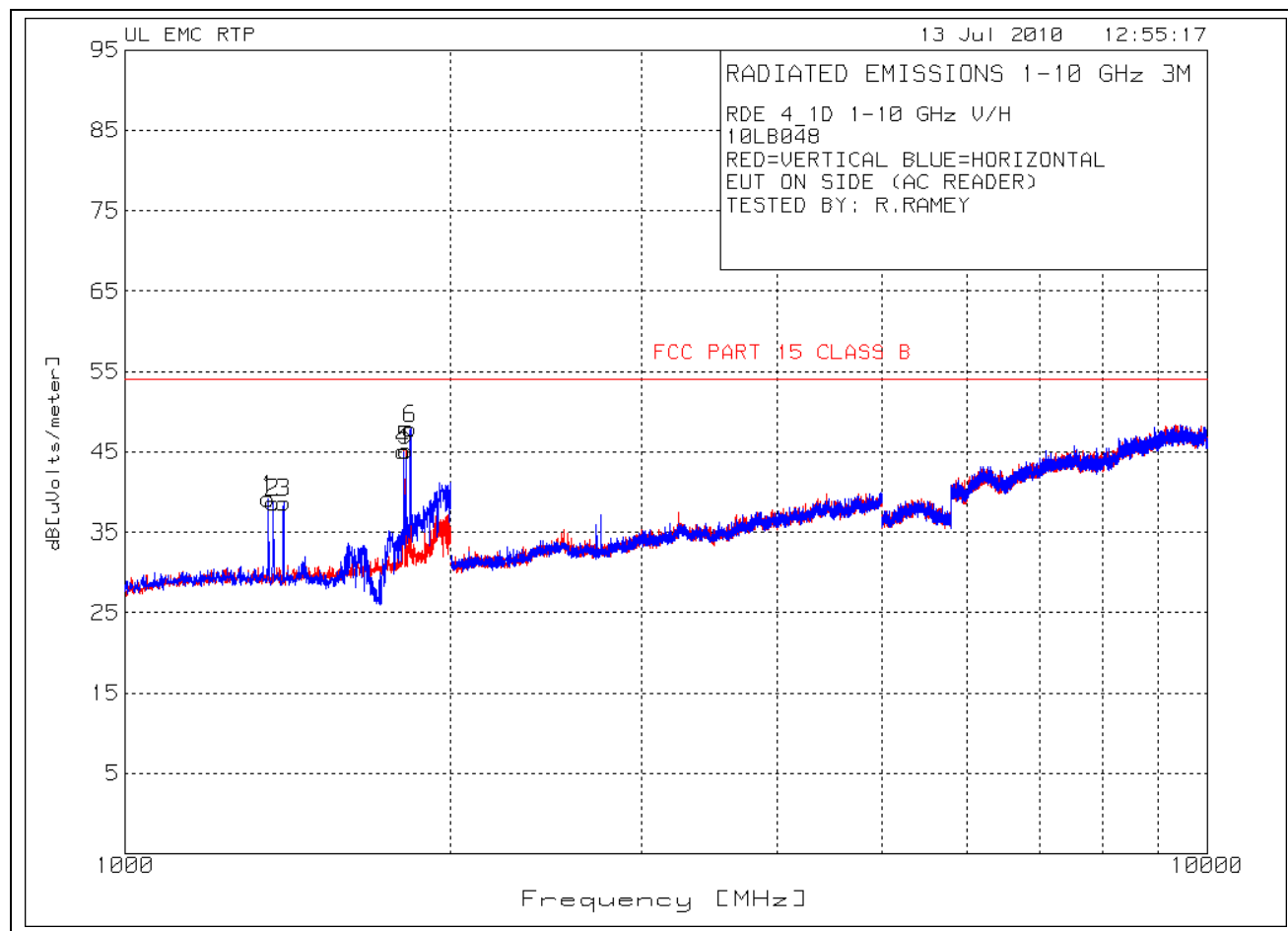


Table 8 Radiated Emissions Data Points (Reader, Y-Orientation)

RDE 4_1D 1-10 GHz V/H
10LB048
RED=VERTICAL BLUE=HORIZONTAL
EUT ON SIDE (AC READER)

Marker Number	Test Freq. [MHz]	Meter Reading [dBuV]	Det. Type	Cbl/Amp Factor [dB]	Ant. Factor [dB]	Field Strength [dBuV/m]	15.209 Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol. [V/H]
Vertical 1000 - 2000MHz -----										
4	1808	81.1	pk	-62.9	26.9	45.1	54	-8.9	150	Vert
5	1818	81.2	pk	-62.9	26.9	45.2	54	-8.8	150	Vert
Horizontal 1000 - 2000MHz -----										
1	1356	77.3	pk	-63.4	25.3	39.2	54	-14.8	150	Horz
2	1371	76.7	pk	-63.3	25.3	38.7	54	-15.3	150	Horz
3	1402	76.7	pk	-63.3	25.3	38.7	54	-15.3	150	Horz
6	1835	83.7	pk	-62.8	27	47.9	54	-6.1	150	Horz

pk - Peak detector

4.2 Test Conditions and Results – MAINS TERMINAL – CONDUCTED EMISSIONS

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.	
Basic Standard	FCC Part 15, Subpart B/ 15.207	
UL LPG	80-EM-S0026	
	Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range	150kHz to 30MHz	Mains
Limits – 15.107 / 15.207		
Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50
Supplementary information: None		

Table 9 Conducted Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	5 (AC Reader)	1
Supplementary information: None		

Project Number: 10RT02887 File Number: MC15465
 Model Number: Reader Model R22-1012
 Client Name: RadarFind Corp.

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FCC ID: URGR221012

Table 10 Conducted Emissions Test Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SAR003	Spectrum Analyzer / Receiver	Rohde & Schwarz	1088.7490K40	1/18/10	1/31/11
ATA013, ATA509	Coaxial Cables	-	-	3/1/10	3/31/11
HI0034	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	10/19/09	10/31/10
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Transient Limiter				
ATA001	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM-7600	3/1/10	3/31/11
	LISNs				
ATA066	LISN, 50-ohm/50-uH, 24A	Solar Electronics	9629-50-TS-24-BNC	3/1/10	3/31/11
ATA067	LISN, 50-ohm/50-uH, 24A	Solar Electronics	9629-50-TS-24-BNC	3/1/10	3/31/11

Figure 8 Test Setup for Conducted Emissions – AC Reader



Figure 9 Conducted Emissions Graph – AC Reader - Line

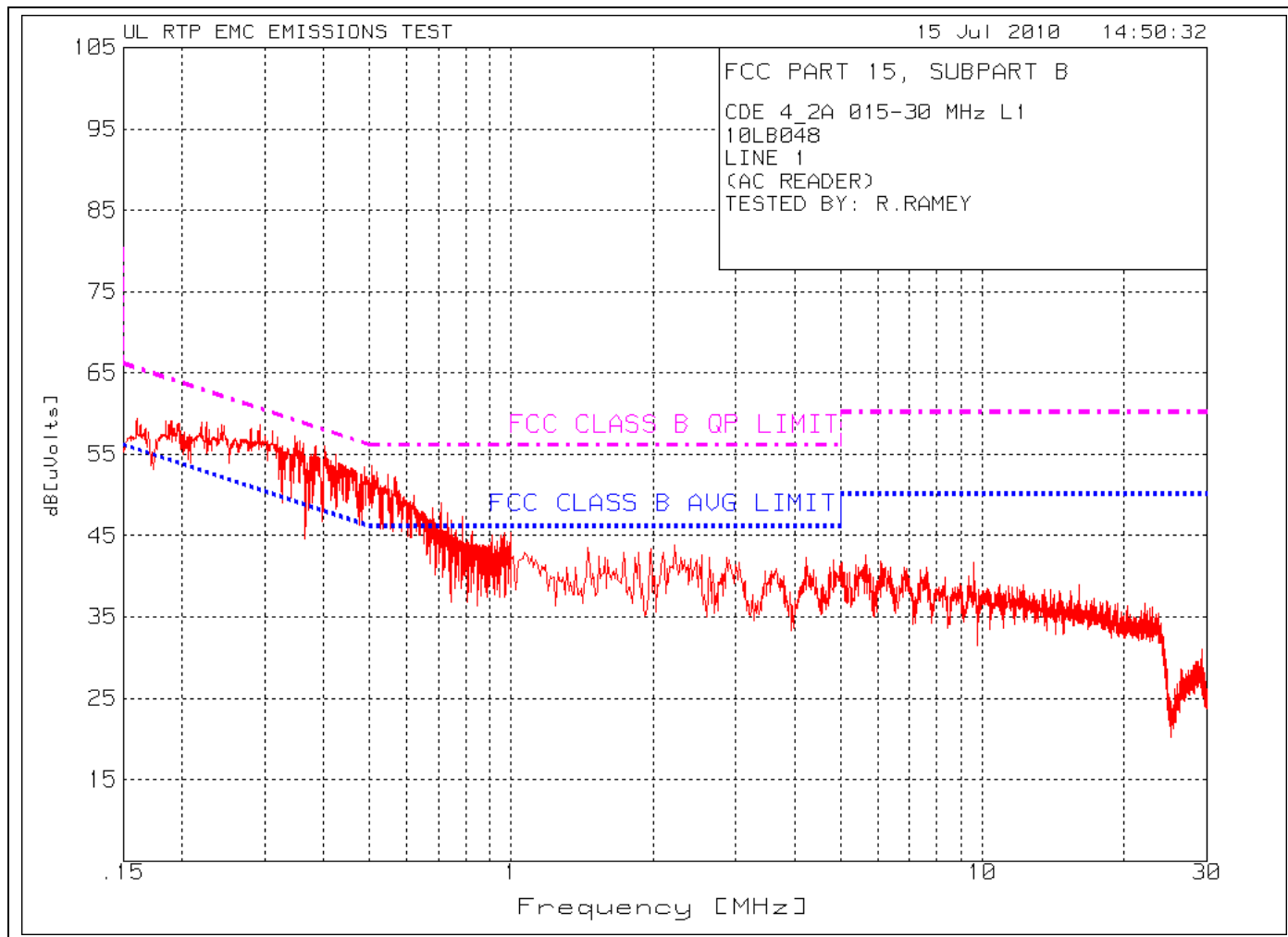


Table 11 Conducted Emissions Data Points – AC Reader – Line

CDE 4_2A 015-30 MHz L1
10LB048
LINE 1
(AC READER)
TESTED BY: R.RAMEY

Marker No.	Test Freq. [MHz]	Meter Reading [dB (uV)]	Det. Type	Gain/Loss Factor [dB]	LISN Factor [dB]	Corr'd Voltage [dBuV]	FCC-B QuasiPk Limit [dBuV]	FCC-B QuasiPk Margin [dB]	FCC-B Average Limit [dBuV]	FCC-B Average Margin [dB]
Range: 1 .15 - 1MHz										
1	.16054	48.43	pk	10.8	.1	59.33	65.4	-6.07	-	-
2	.1898	48.24	pk	10.8	.1	59.14	64	-4.86	-	-
3	.22517	48.05	pk	10.9	0	58.95	62.6	-3.65	-	-
4	.24252	47.72	pk	10.9	0	58.62	62	-3.38	-	-
5	.2932	47.73	pk	10.9	0	58.63	60.4	-1.77	-	-
6	.34796	46.33	pk	10.9	0	57.23	59	-1.77	-	-
7	.38401	45.09	pk	10.9	0	55.99	58.2	-2.21	-	-

8	.42449	44.06	pk	10.9	0	54.96	57.4	-2.44	-	-
9	.46122	42.24	pk	10.9	0	53.14	56.7	-3.56	-	-
10	.49864	41.15	pk	10.9	0	52.05	56	-3.95	-	-
11	.56633	41.31	pk	10.9	0	52.21	56	-3.79	-	-
12	.61633	38.07	pk	10.9	0	48.97	56	-7.03	-	-
13	.70952	38.14	pk	10.9	0	49.04	56	-6.96	-	-
14	.78605	36.28	pk	11.0	0	47.28	56	-8.72	-	-
15	.84184	33	pk	11.0	0	44	56	-12	-	-
16	.96531	34.39	pk	11.0	0	45.39	56	-10.61	-	-

Range: 2 1 - 30MHz

17	1.45258	32.61	pk	11.0	0	43.61	56	-12.39	46	-2.39
18	1.85874	31.89	pk	11.1	0	42.99	56	-13.01	46	-3.01
19	2.21849	32.66	pk	11.2	0	43.86	56	-12.14	46	-2.14
20	2.86835	31.06	pk	11.2	0	42.26	56	-13.74	46	-3.74
21	4.22609	31.05	pk	11.2	0	42.25	56	-13.75	46	-3.75
22	4.84114	30.81	pk	11.2	0	42.01	56	-13.99	46	-3.99

Test Freq.	Meter Reading	Det. Type	Gain/Loss Factor	LISN Factor	Corr'd Voltage	FCC-B QuasiPk Limit	FCC-B QuasiPk Margin	FCC-B Average Limit	FCC-B Average Margin
[MHz]	[dB (uV)]		[dB]	[dB]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dB]

Range: 1 .15 - 1MHz

.173	17.3	av	10.8	.1	28.2	-	-	54.8	-26.6
.18952	20.83	av	10.8	.1	31.73	-	-	54.1	-22.37
.23154	18.72	av	10.9	0	29.62	-	-	52.4	-22.78
.25025	19.97	av	10.9	0	30.87	-	-	51.7	-20.83
.29318	21.18	av	10.9	0	32.08	-	-	50.4	-18.32
.34113	20.05	av	10.9	0	30.95	-	-	49.2	-18.25
.38009	20.8	av	10.9	0	31.7	-	-	48.3	-16.6
.41604	19.42	av	10.9	0	30.32	-	-	47.5	-17.18
.45706	19.59	av	10.9	0	30.49	-	-	46.7	-16.21
.48612	19.1	av	10.9	0	30	-	-	46.2	-16.2
.55628	14.31	av	10.9	0	25.21	-	-	46	-20.79
.61037	11.51	av	10.9	0	22.41	-	-	46	-23.59
.7169	12.2	av	10.9	0	23.1	-	-	46	-22.9
.79942	16.5	av	11	0	27.5	-	-	46	-18.5
.84013	15.84	av	11	0	26.84	-	-	46	-19.16
.95788	18.56	av	11	0	29.56	-	-	46	-16.44

Range: 2 1 - 30MHz

1.4598	14.59	av	11	0	25.59	-	-	46	-20.41
1.84857	12.33	av	11.1	0	23.43	-	-	46	-22.57
2.21961	17.68	av	11.2	0	28.88	-	-	46	-17.12
2.87199	16.99	av	11.2	0	28.19	-	-	46	-17.81
4.22025	16.8	av	11.2	0	28	-	-	46	-18.0
4.84868	16.58	av	11.2	0	27.78	-	-	46	-18.22

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector

Figure 10 Conducted Emissions Graph – AC Reader - Neutral

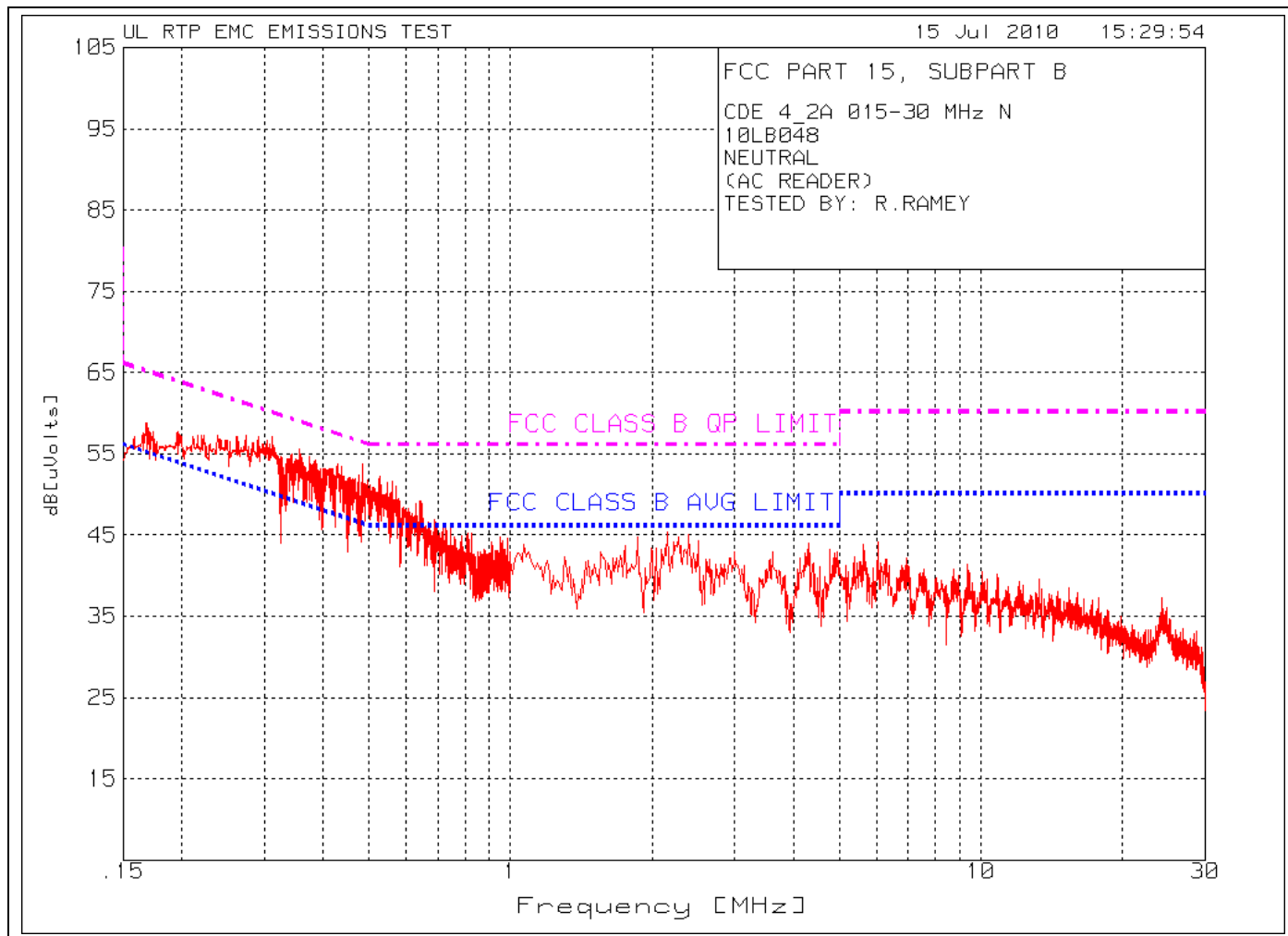


Table 12 Conducted Emissions Data Points – AC Reader – Neutral

CDE 4_2A 015-30 MHz N
10LB048
NEUTRAL
(AC READER)
TESTED BY: R.RAMEY

Marker No.	Test Freq. [MHz]	Meter Reading [dB (uV)]	Det. Type	Gain/Loss Factor [dB]	LISN Factor [dB]	Corr'd 1 Voltage [dBuV]	FCC-B		FCC-B	
							QuasiPk Limit [dBuV]	QuasiPk Margin [dB]	Average Limit [dBuV]	Average Margin [dB]

Range: 1 .15 - 1MHz										
1	.16803	47.95	pk	10.8	.1	58.85	65.1	-6.25	-	-
2	.19592	46.69	pk	10.9	.1	57.69	63.8	-6.11	-	-
3	.24184	45.94	pk	10.9	0	56.84	62	-5.16	-	-
4	.3034	45.71	pk	10.9	0	56.61	60.1	-3.49	-	-
5	.3568	44.52	pk	10.9	0	55.42	58.8	-3.38	-	-
6	.42653	42.51	pk	10.9	0	53.41	57.3	-3.89	-	-
7	.48401	42.92	pk	10.9	0	53.82	56.3	-2.48	-	-
8	.54422	39.15	pk	10.9	0	50.05	56	-5.95	-	-

9	.6432	38.35	pk	10.9	0	49.25	56	-6.75	-	-
10	.70612	34.29	pk	10.9	0	45.19	56	-10.81	-	-
11	.82517	34.33	pk	10.9	0	45.23	56	-10.77	-	-
12	.93708	32.09	pk	11	0	43.09	56	-12.91	-	-

Range: 2 1 - 30MHz

13	1.06963	32.85	pk	11	0	43.85	56	-12.15	-	-
14	1.85874	33.65	pk	11.1	0	44.75	56	-11.25	-	-
15	2.16046	34.29	pk	11.1	0	45.39	56	-10.61	-	-
16	2.39256	33.92	pk	11.1	0	45.02	56	-10.98	-	-
17	2.996	31.8	pk	11.2	0	43	56	-13	-	-
18	3.59944	31.7	pk	11.2	0	42.9	56	-13.1	-	-
19	4.30732	32.75	pk	11.2	0	43.95	56	-12.05	-	-
20	4.77151	32.01	pk	11.2	0	43.21	56	-12.79	-	-

Test Freq. [MHz]	Meter Reading [dB (uV)]	Det. Type	Gain/Loss Factor [dB]	LISN Factor [dB]	Corr'd Voltage [dBuV]	FCC-B QuasiPk Limit [dBuV]	FCC-B QuasiPk Margin [dB]	FCC-B Average Limit [dBuV]	FCC-B Average Margin [dB]
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Range: 1 .15 - 1MHz

.17071	39.0	qp	10.9	0	49.9	65.0	-15.1	-	-
.1893	38.93	qp	10.9	0	49.83	64.1	-14.27	-	-
.23746	37.86	qp	10.9	0	48.76	62.2	-13.44	-	-
.29583	36.51	qp	10.9	0	47.41	60.4	-12.99	-	-
.35127	34.97	qp	10.9	0	45.87	58.9	-13.03	-	-
.42812	33.85	qp	10.9	0	44.75	57.3	-12.55	-	-

Test Freq. [MHz]	Meter Reading [dB (uV)]	Det. Type	Gain/Loss Factor [dB]	LISN Factor [dB]	Corr'd Voltage [dBuV]	FCC-B QuasiPk Limit [dBuV]	FCC-B QuasiPk Margin [dB]	FCC-B Average Limit [dBuV]	FCC-B Average Margin [dB]
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Range: 1 .15 - 1MHz

.17374	17.7	av	10.8	.1	28.6	-	-	54.8	-26.2
.20499	18.44	av	10.9	.1	29.44	-	-	53.4	-23.96
.23821	21.53	av	10.9	0	32.43	-	-	52.2	-19.77
.30413	21.04	av	10.9	0	31.94	-	-	50.1	-18.16
.3614	20.9	av	10.9	0	31.8	-	-	48.7	-16.9
.42624	19.74	av	10.9	0	30.64	-	-	47.3	-16.66
.48304	19.55	av	10.9	0	30.45	-	-	46.3	-15.85
.5404	17.94	av	10.9	0	28.84	-	-	46	-17.16
.64028	10.56	av	10.9	0	21.46	-	-	46	-24.54
.71764	12.96	av	10.9	0	23.86	-	-	46	-22.14
.82894	18.65	av	10.9	0	29.55	-	-	46	-16.45
.9262	19.21	av	11	0	30.21	-	-	46	-15.79

Range: 2 1 - 30MHz

1.0644	18.55	av	11	0	29.55	-	-	46	-16.45
1.85427	13.06	av	11.1	0	24.16	-	-	46	-21.84
2.16866	18.27	av	11.2	0	29.47	-	-	46	-16.53
2.38934	17.5	av	11.1	0	28.6	-	-	46	-17.4
2.99408	18.12	av	11.2	0	29.32	-	-	46	-16.68
3.5958	17.97	av	11.2	0	29.17	-	-	46	-16.83
4.29926	17.09	av	11.2	0	28.29	-	-	46	-17.71
4.77381	17.04	av	11.2	0	28.24	-	-	46	-17.76

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

Appendix A

Accreditations and Authorizations



NVLAP Lab code: 200246-0

NVLAP: The National Institute of Standards and Technology (NIST) administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP is comprised of laboratory accreditation programs (LAPs) which are established on the basis of requests and demonstrated need. Each LAP includes specific calibration and/or test standards and related methods and protocols assembled to satisfy the unique needs for accreditation in a field of testing or calibration. NVLAP accredits public and private laboratories based on evaluation of their technical qualifications and competence to carry out specific calibrations or tests. Accreditation criteria are established in accordance with the U.S. Code of Federal Regulations (CFR, Title 15, Part 285), NVLAP Procedures and General Requirements, and encompass the requirements of ISO/IEC 17025. For a full scope listing see <http://ts.nist.gov/ts/htdocs/210/214/scopes/2002460.htm>



FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91039).



Industry Canada Industrie Canada

Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: 2180C



VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.:

- Test Station 5 (Location A) C-2427, R-722
- Test Station 4 (Location E) C-743, T-236

- Test Station 1 (Location D) C-742, T-235
- Test Station 6 (Location C) C-744, T-237



ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).



NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 2004/108/EC, Annex III (2-3). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.

NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).

NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6.