MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

June 30, 2006

Applied Wireless ID
18300 Sutter Blvd.
Morgan Hill, CA 95037

Dear Dennis Bourassa,

Enclosed is the Telecom test report for compliance testing of the Applied Wireless ID, LR911 and 2010 AR as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-03 ed.), Part 15, Subpart B for a Class B Digital Device and Subpart C for Intentional Radiators.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Boonmanus Seelapasay
Documentation Department

Reference: (\Applied Wireless ID\EMCS20216-FCC247)

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33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587-3201 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

Electromagnetic Compatibility Criteria
Test Report

for the

Applied Wireless ID
LR911 and 2010AR

Verified under
the FCC Certification Rules contained in
Title 47 of the CFR, Part 15, Subpart C
for Intentional Radiators

MET Report: EMCS20216-FCC247

Prepared For:

Applied Wireless ID
18300 Sutter Blvd.
Morgan Hill, CA 95037

Prepared By:
MET Laboratories, Inc.
4855 Patrick Henry Drive, Building 6
San Jose, CA 95054

Electromagnetic Compatibility Criteria
Test Report

for the

Applied Wireless ID
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Tested Under

The FCC Certification Rules contained in
Title 47 of the CFR, Part 15, Subpart B
for Intentional Radiators

Shawn McMillen, Project Engineer
Electromagnetic Compatibility Lab

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 15, Section 15.247 of the FCC Rules under normal use and maintenance.

Tony Permsombut,
Manager, Electromagnetic Compatibility Lab

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GR-1089-CORE	***(GR)*** **G**eneral **R**equirement(s) imposed by the NEBS standard, ***(CORE)*** **C**entral **O**ffice **R**ecovery **E**xpress (AT&T), ***(1089)*** specifies various parts of the General Requirements under Bellcore Technical Standard, Requirements for Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**er**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**micro**henry
µF	**micro**farad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation to determine compliance of the Applied Wireless ID LR911 and 2010AR with the requirements of §15.247 Subpart B and C. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the LR911 and 2010AR. Applied Wireless ID should retain a copy of this document which should be kept on file for at least two years after the manufacturing has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with §15.247 Subpart B and C. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	IC Reference	Description	Compliance
47 CFR Part 15.247:2005	RSS-210 Issue 6: 2005	Applicable Standard	Compliant
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.205	RSS-210(A8.5)	Emissions at Restricted Band	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-210(7.2.2)	Conducted Emission Voltage	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-210(A8.1)	Channel Separation Occupied Bandwidth Number of Hopping Channels Time of Occupancy	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	RF Output Power	Compliant
Title 47 of the CFR, Part 15 §15.247(c)	RSS-210(A8.4)	Antenna Gain >6dBi	Compliant
Title 47 of the CFR, Part 15 §15.209, §15.247(d)	RSS-210(A8.5)	Radiated and Conducted Spurious Emissions	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.3)	Power Spectral Density	N/A
Title 47 of the CFR, Part 15 §15.247(f)	RSS-210(A8.3)	Hybrid System Requirements	N/A
Title 47 of the CFR, Part15 15.247(g)	RSS-210(A8.1)	Hopping Capability	Compliant
Title 47 of the CFR, Part 15 §15.247(h)	RSS-210(A8.1)	Hopping Coordination Requirement	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	RSSGen(5.5)	Maximum Permissible Exposure	Compliant
N/A	RSSGen(4.8)	Receiver Spurious Emissions	Compliant

Table 1 Executive Summary of EMC Part 15.247 ComplianceTesting

II. Equipment Configuration

A. Overview

The purpose of this series of tests was to verify compliance of the Applied Wireless ID., LR911 and 2010AR with the limits of CFR 47, §15.247 for Intentional Radiators.

Model(s) Tested:	LR911 and 2010AR	
Model(s) Covered:	LR911 and 2010AR	
EUT Specifications:	Primary Power: 2010AR - 9 VDC LR911 - 12VDC	
	FCC ID: OSGR26EA011	
	Type of Modulations:	FHSS (Frequency Hoping Spread Spectrum)
	Equipment Code:	DSS
	Peak RF Output Power:	29.67dBm (926.8mW) both models
	EUT Frequencies Tested:	Low Channel - 903.14MHz
		Mid Channel - 914.95MHz
		High Cannel - 927.26MHz
	Frequency Range:	903.14-927.26MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Atmospheric Pressure: 860-1060 mbar	
Evaluated by:	Shawn McMillen	
Date(s):	June 30, 2006	

B. References

CFR 47, Part 15, Subpart B	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
CFR 47, Part 15, Subpart C	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ANSI C63.4-2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/NCSL Z540-1-1994	Calibration Laboratories and Measuring and Test Equipment - General Requirements
ANSI/ISO/IEC 17025: 2000	General Requirements for the Competence of Testing and Calibration Laboratories

C. Test Site

All testing was performed at MET Laboratories, Inc., 4855 Patrick Henry Drive, Santa Clara, California 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed semi-anechoic chamber. In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories. In accordance with §2.948(d), MET Laboratories has been accredited by the National Voluntary Laboratory Accreditation Program
(Lab Code: 100273-0).

D. Description of Test Sample

The Applied Wireless LR911 and 2010AR are RFID readers. They utilize a modularly approved M2.6e Module. The module uses frequency hopping technique to satisfy the FCC requirements for spread spectrum operation. With the modulations below and above 250 KHz, 50 frequency channels are selected in a pseudo random manner, with each dwell period at a nominal 300 milliseconds. These channels are separated by 0.5 MHz and extend form 903-927.5 MHz.

By making each dwell period identical and not allowing revisits unit all channels are scanned, it is assured that each hopping channel is utilized equally on average.

Because the receiver utilizes homodyne demodulation, its carrier frequency is automatically identical to that of the transmitter and will hop in synchronous.

The receiver bandwidth is inherently designed to match the modulation of the transponder and since the M2.6e is multi-protocol, the receiver bandwidth is programmed to match the particular transponder used.

In order to avoid simultaneous occupancy of transmitting channels in a multi-transmitter environment, each frequency table is pseudo random and is in no way synchronous with any other. And, although there is always a possibility that 2 or more transmitter can transmit simultaneously in any instant, the probability of any substantial energy buildup is practically zero.

Photograph 1. Photograph of EUT

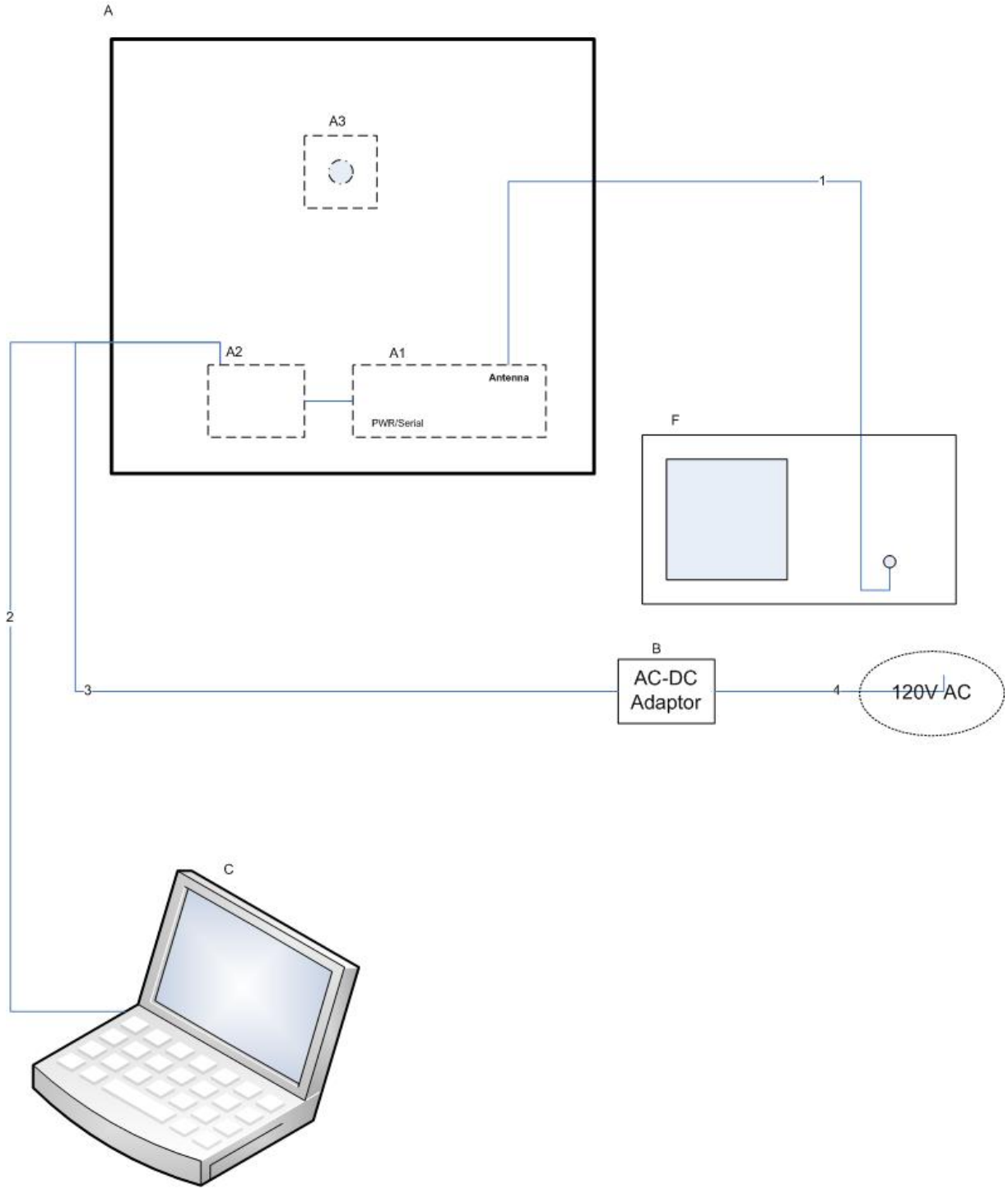


Figure 1. Block Diagram of Test Configuration (Conducted Measurement), LR911

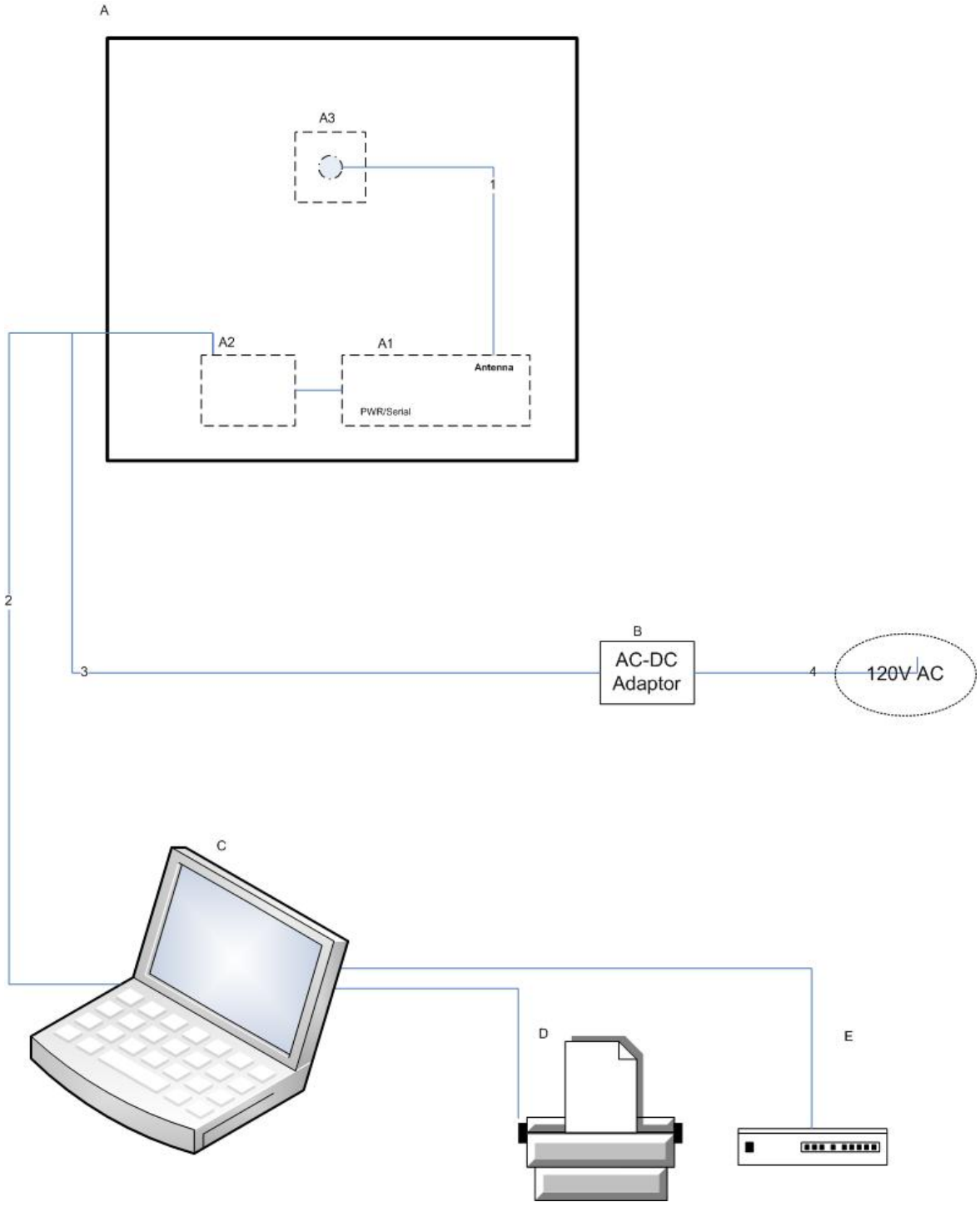


Figure 2. Block Diagram of Test Configuration (15.107, 15.109, 15.207), LR911

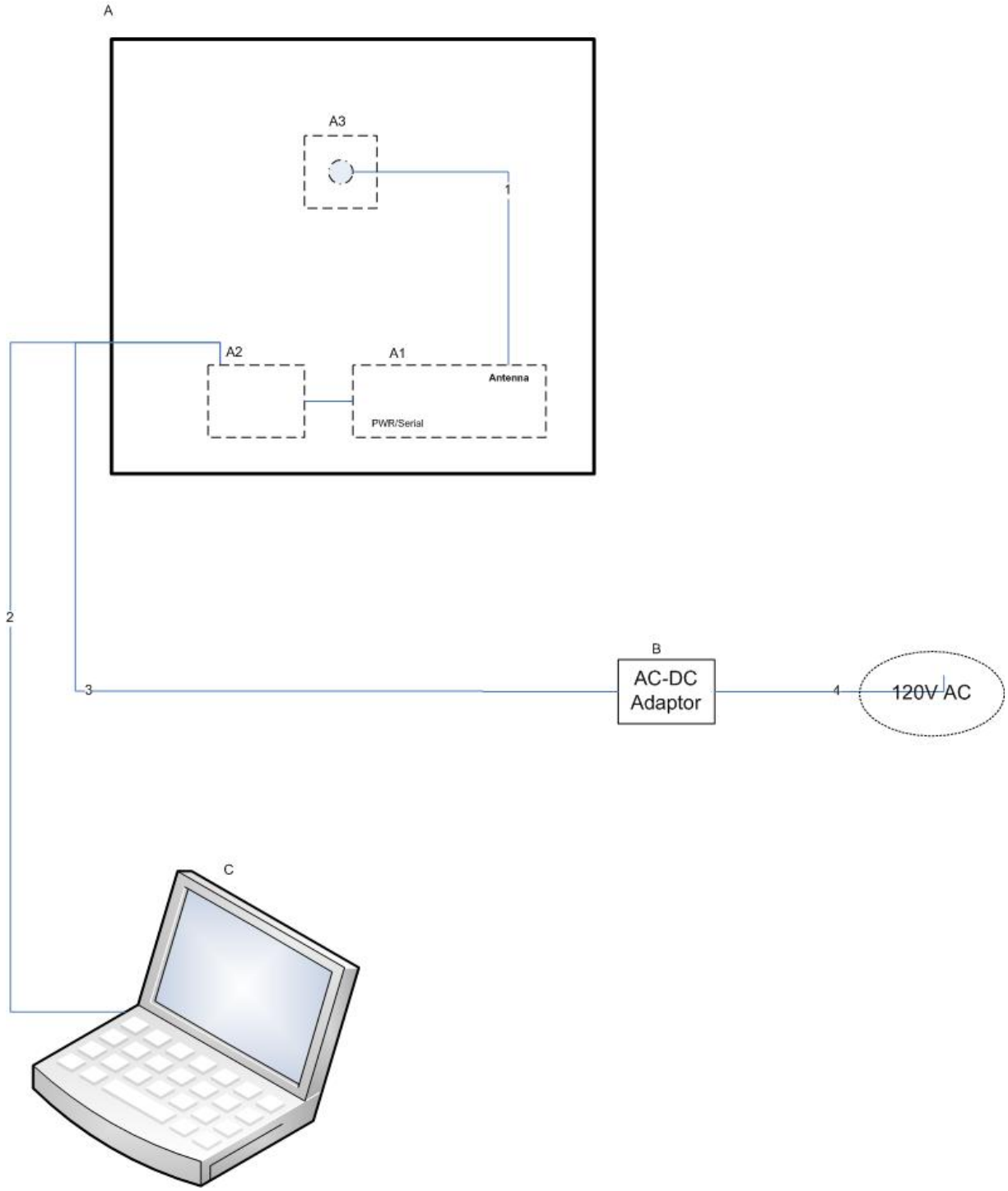


Figure 3. Block Diagram of Test Configuration (Spurious Emissions), LR911

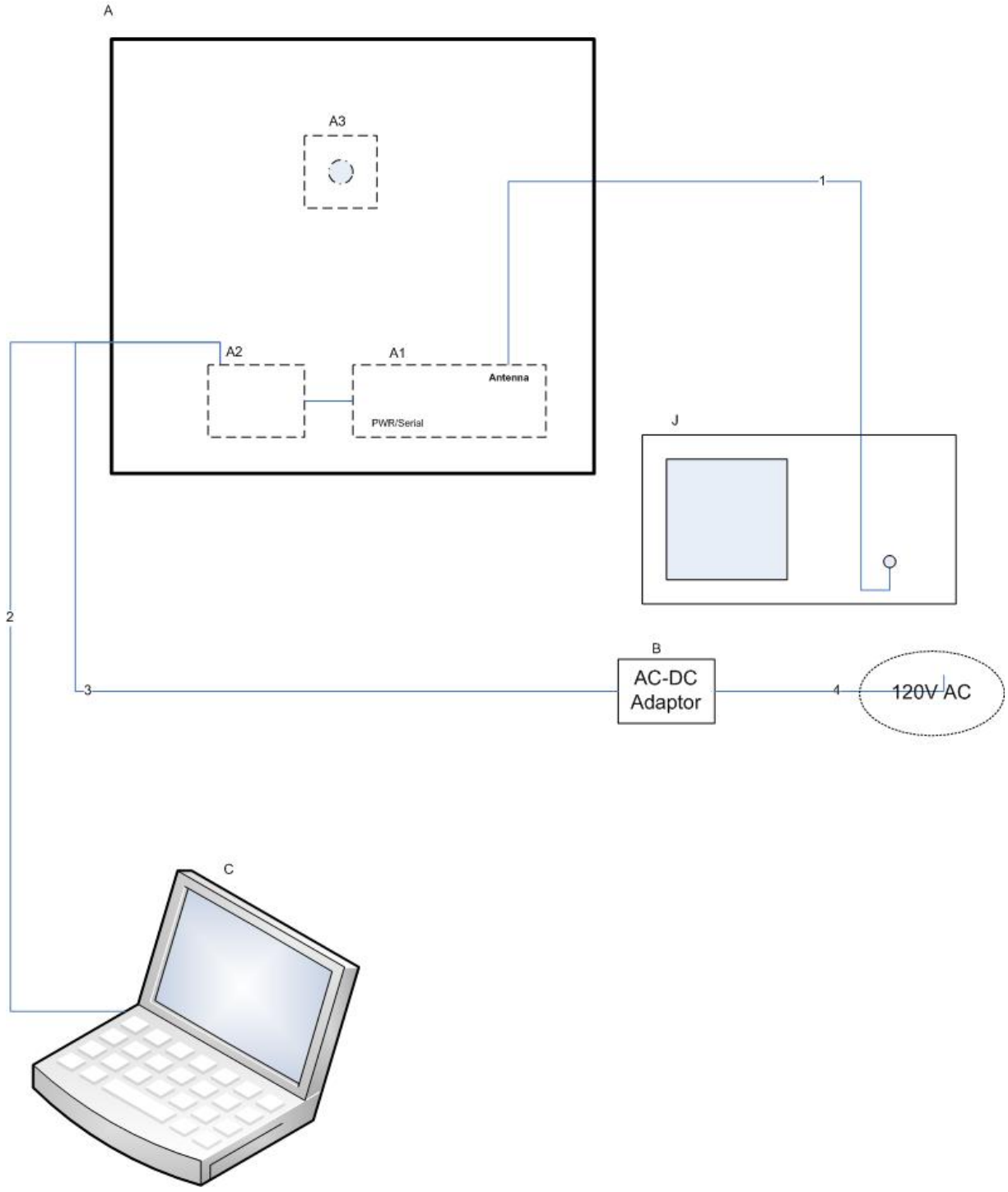


Figure 4. Block Diagram of Test Configuration (Conducted Emissions), 2010AR

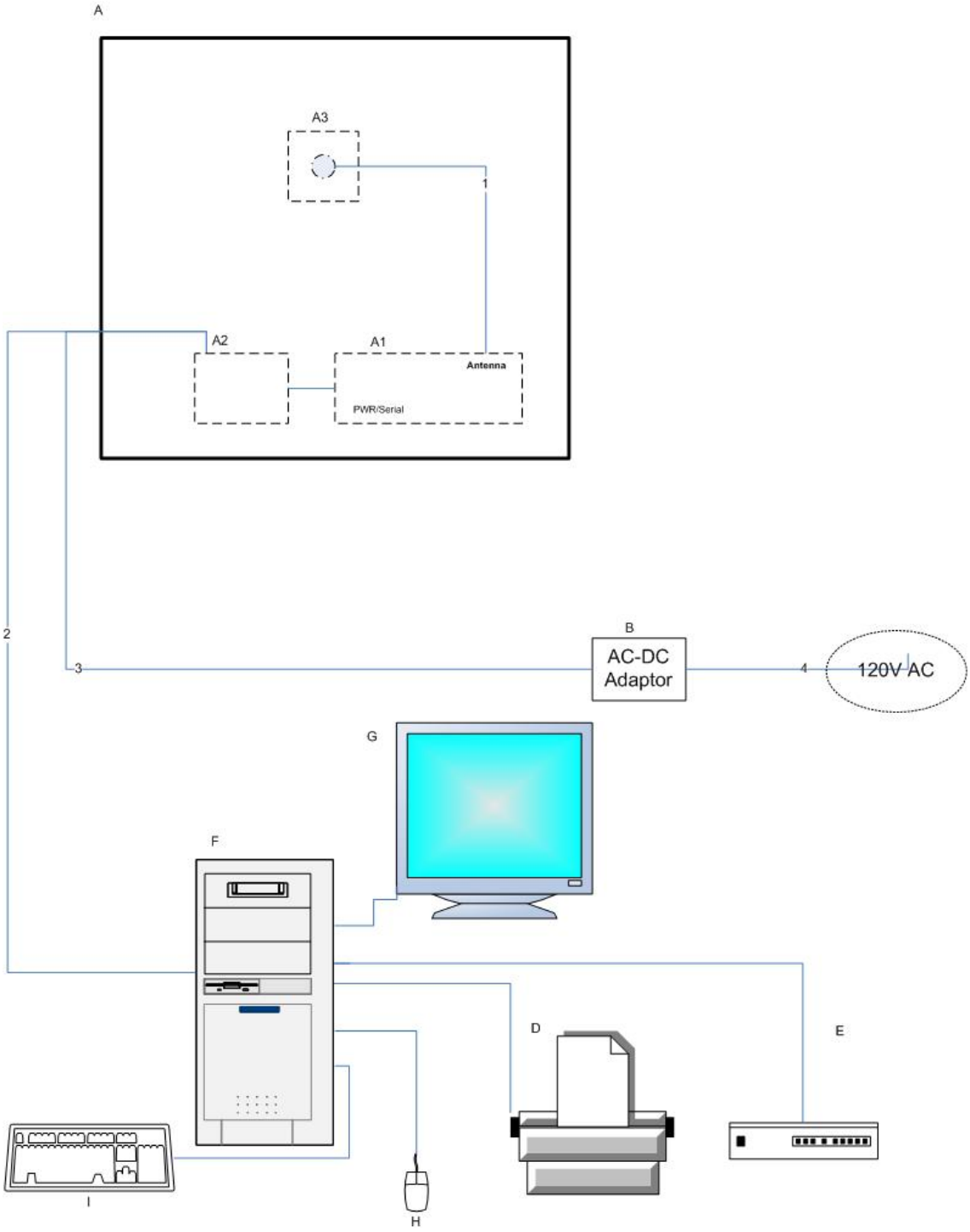


Figure 5. Block Diagram of Test Configuration (15.107, 15.109, 15.207), 2010AR

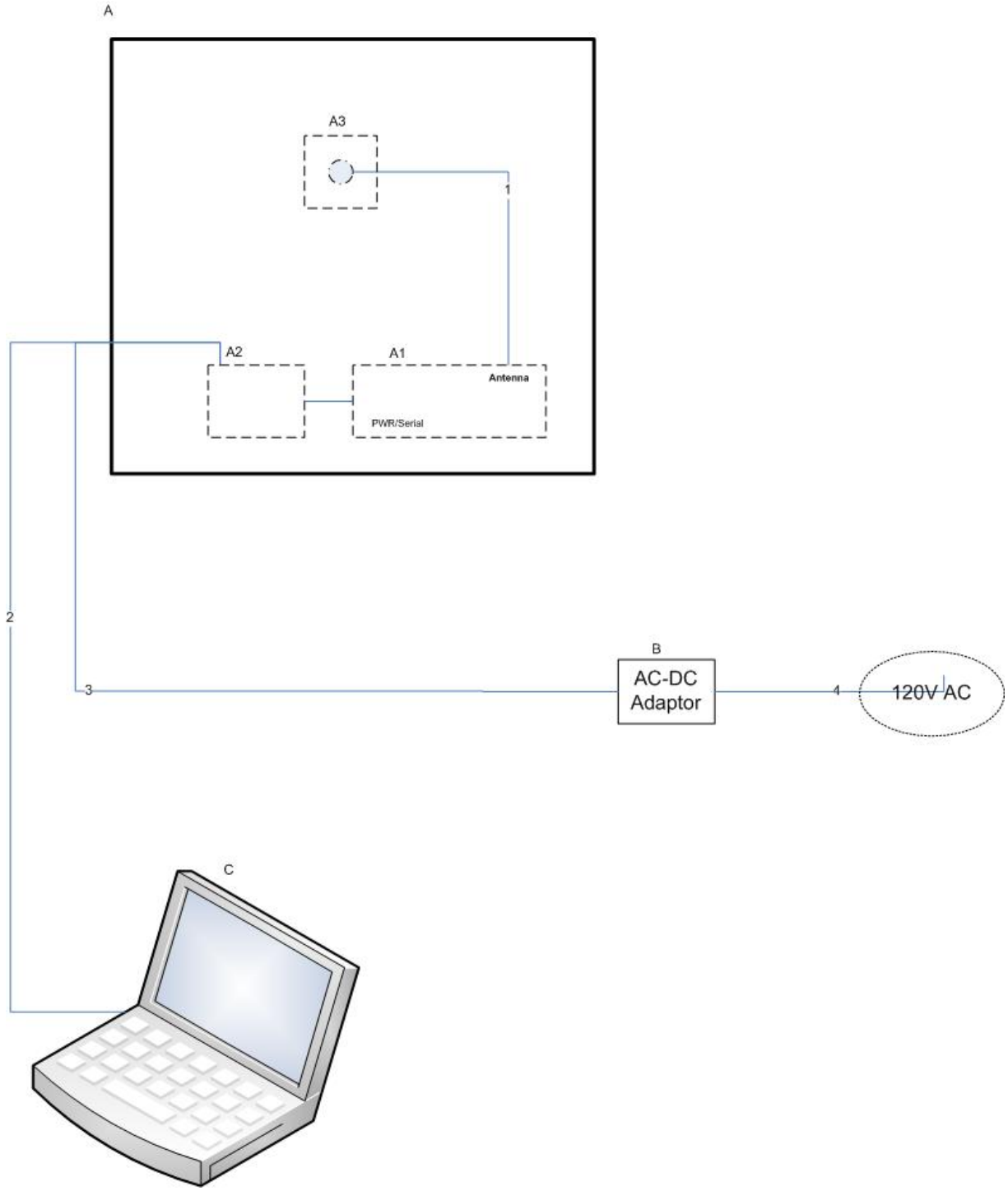


Figure 6. Block Diagram of Test Configuration (Spurious Emissions), 2010AR

E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6 All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Slot	Name / Description	Model Number	Part Number	Serial Number	REV
A	RFID Reader		Sentinel-Prox LR-911	N/A	N/A	N/A
A	1	RF Module	N/A	MPR-1510AE-RM	0553-08-0278	E
A	2	Data Interface Board	N/A	MPR2010-IO	N/A	N/A
A	3	Antenna w interface board	N/A	Hybrid 915MHz	N/A	N/A
B	AC-DC power adaptor (APX Technology)		AP3550W	N/A	N/A	N/A

Table 2. Equipment Configuration for LR911

Ref. ID	Slot	Name / Description	Model Number	Part Number	Serial Number	REV
A	RFID Reader		MPR-2010AR	N/A	N/A	N/A
A	1	RF Module	N/A	MPR-1510AE-RM	0608-08-0108 0553-08-0278	H
A	2	Data Interface Board	N/A	MPR2010-IO	N/A	N/A
A	3	Antenna w interface board	N/A	Hybrid 915MHz	N/A	N/A
B	AC-DC power adaptor (Hon-Kwang)		HK-B118A-09	N/A	50405014	N/A

Table 3. Equipment Configuration for 2010-AR

F. Support Equipment

Applied Wireless supplied support equipment necessary for the operation and testing of the LR911 and-2010 AR**.** All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number
C	Laptop	Dell	Latitude
D	Printer	HP	DeskJet 932C
E	Ethernet Hub	Net Gear	DS 104
F	Spectrum Analyzer	HP	8564E

Table 4. Support Equipment for LR911

Ref. ID	Name / Description	Manufacturer	Model Number
C	Laptop	Dell	Latitude
D	Printer	HP	DeskJet 932C
E	Ethernet Hub	Net Gear	DS 104
F	PC	Dell	OpticPlex GX100
G	Monitor	Dell	E551
H	Mouse	Microsoft	Wheel Mouse 3.0
I	Keyboard	Dell	RT7D5JTW
J	Spectrum Analyzer	HP	8564E

Table 5. Support Equipment for 2010-AR

* The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

G. Ports and Cabling

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded?	Termination Box ID & Port ID
Spurious Emission, 15.107, 15.109, 15.207						
1	A1	Coax	1	0.2	Yes	A3
2	A2	Serial	1	1	No	C, Com 1
3	A2	Serial	1	2	No	B, DC Output
4	B, AC Input	AC Power Cord	1	2	No	120V AC PWR Source
Conducted Measurement						
1	A1	Coax	1	1	Yes	F
2	A2	Serial	1	1	No	C, Com 1
3	A2	Serial	1	2	No	B, DC Output
4	B, AC Input	AC Power Cord	1	2	No	120V AC PWR Source

Table 6. Ports and Cabling for LR911

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded?	Termination Box ID & Port ID
Spurious Emission						
1	A1	Coax	1	0.2	Yes	A3
2	A2	Serial	1	1	No	C, Com 1
3	A2	Serial	1	2	No	B, DC Output
4	B, AC Input	AC Power Cord	1	2	No	120V AC PWR Source
Conducted Measurement						
1	A1	Coax	1	1	Yes	F
2	A2	Serial	1	1	No	C, Com 1
3	A2	Serial	1	2	No	B, DC Output
4	B, AC Input	AC Power Cord	1	2	No	120V AC PWR Source
15.107, 15.109, 15.207						
1	A1	Coax	1	0.2	Yes	A3
2	A2	Serial	1	1	No	F, Com 1
3	A2	Serial	1	2	No	B, DC Output
4	B, AC Input	AC Power Cord	1	2	No	120V AC PWR Source

Table 7. Ports and Cabling for 2010-AR

H. Mode of Operation

RF channel & output power is activated and adjusted by software in laptop.

I. Method of Monitoring EUT Operation

Not applicable.

J. Modifications

a) Modifications to EUT

When performing conducted emission 15.207 on 911LR, 2x Ferrite (Fair-Rite 0443167251) inline near PSA with one loop each.

b) Modifications to Test Standard

No modifications were made to the Test Standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Applied Wireless ID upon completion of testing.

III. Electromagnetic Compatibility Criteria for Unintentional Radiators

Electromagnetic Compatibility Criteria for Unintentional Radiators

§ 15.107 Conducted Emissions Limits

Test Requirement(s): **15.107 (a)** "Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 8. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals."

15.107 (b) "For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 8. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges."

Frequency range (MHz)	15.107(b), Class A Limits (dBµV)		15.107(a), Class B Limits (dBµV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15- 0.5	79	66	66 - 56	56 - 46
0.5 – 5.0	73	60	56	46
5.0 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies.				

Table 8. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Section 15.107(a) (b)

Test Procedures: The EUT was placed on a 0.8m-high wooden table inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were measured using a quasi-peak and/or average detector as appropriate.

Test Results: The EUT was found compliant with the Class A requirement(s) of this section. Measured emissions were below applicable limits.

Test Engineer(s): Elijah Garcia (LR911 - 15.107)
Billy Kwan (2010 AR - 15.107)

Test Date(s): June 12, 2006
June 27, 2006

Conducted Emissions - Voltage, AC Power, Phase Line 120 VAC, 60 Hz, LR911

FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.16	56.83	79	PASS	-22.17	27.86	66	PASS	-38.14
0.21	55.12	79	PASS	-23.88	25.96	66	PASS	-40.04
0.425	50.95	79	PASS	-28.05	22.01	66	PASS	-43.99

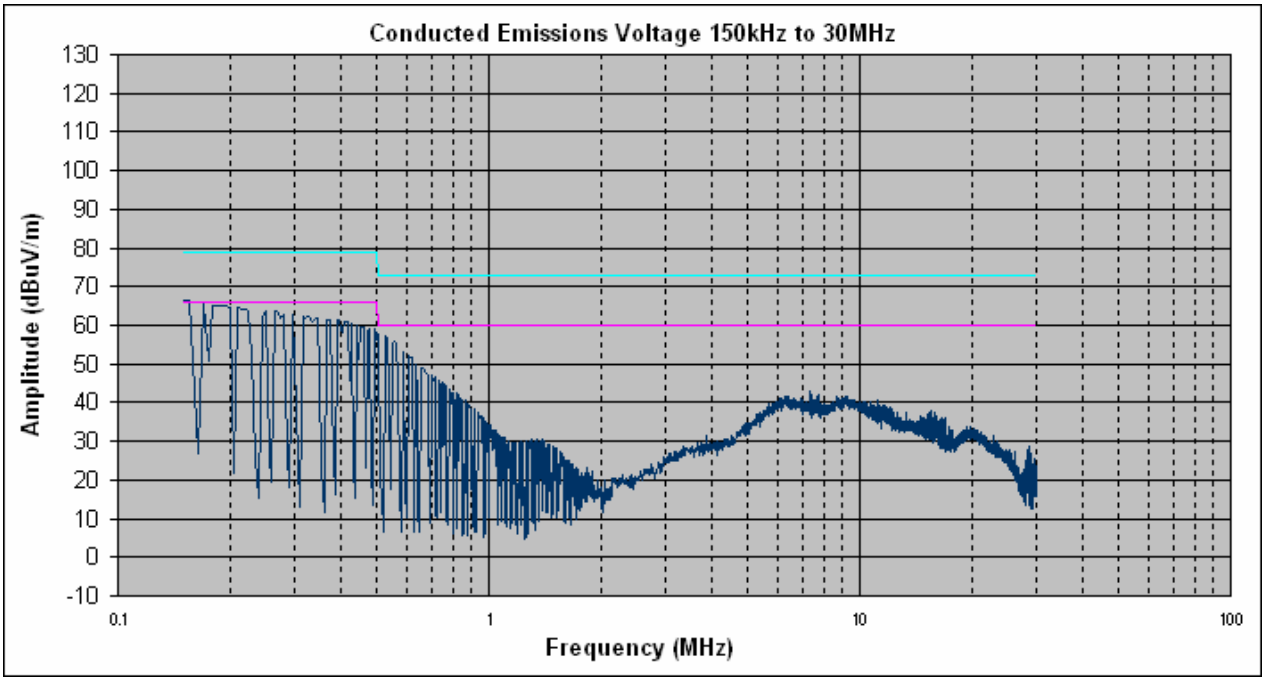
Table 9. Conducted Emissions - Voltage, AC Power, Phase Line 120 VAC, 60 Hz, LR911

Conducted Emissions - Voltage, AC Power, Neutral Line 120 VAC, 60 Hz, LR911

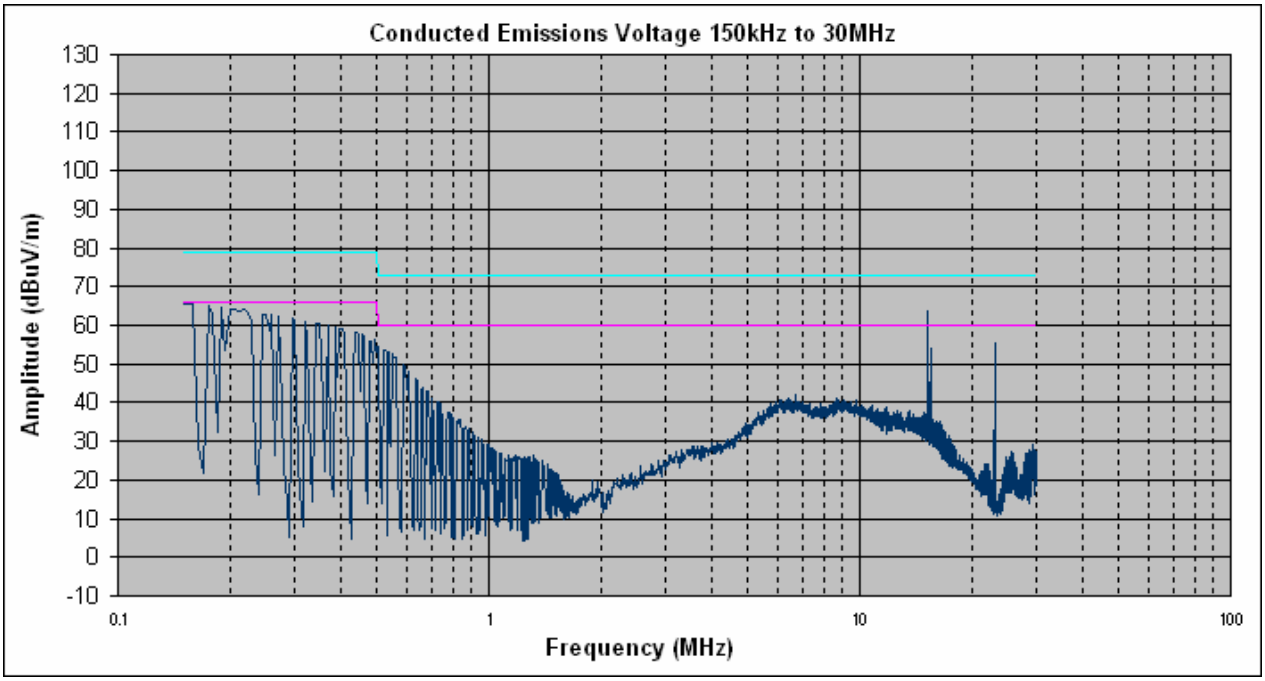
FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.162	58.25	79	PASS	-20.75	28.78	66	PASS	-37.22
0.21	56.36	79	PASS	-22.64	26.86	66	PASS	-39.14
0.422	51.81	79	PASS	-27.19	21.53	66	PASS	-44.47

Table 10. Conducted Emissions - Voltage, AC Power, Neutral Line 120 VAC, 60 Hz, LR911

Conducted Emissions – Voltage, Worst Case Emissions, AC Power, 120 VAC, 60 Hz LR911



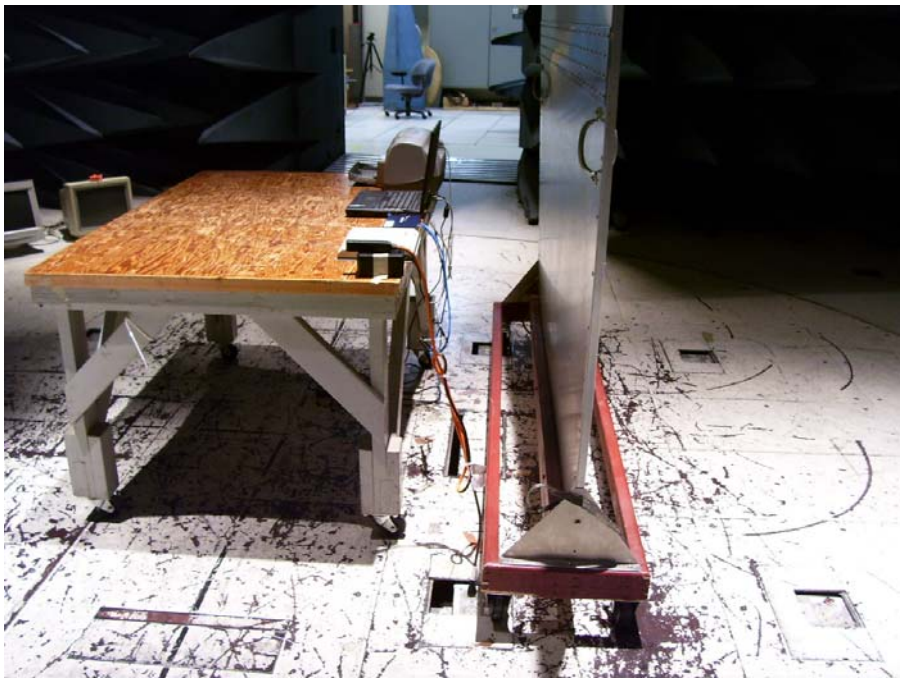
Conducted Emission, Phase Line Plots, LR911



Conducted Emission, Neutral Line Plots, LR911

Conducted Emission Limits Test Setup, LR911

Photograph 2. Conducted Emissions Test Setup (Front), LR911



Photograph 3. Conducted Emissions Test Setup (Back), LR911

Conducted Emissions - Voltage, AC Power, Phase Line 120 VAC, 60 Hz, 2010 AR

FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.626	50.57	73	PASS	-22.43	46.4	60	PASS	-13.6
1.261	48.03	73	PASS	-24.97	42.59	60	PASS	-17.41
1.894	46.52	73	PASS	-26.48	36.21	60	PASS	-23.79

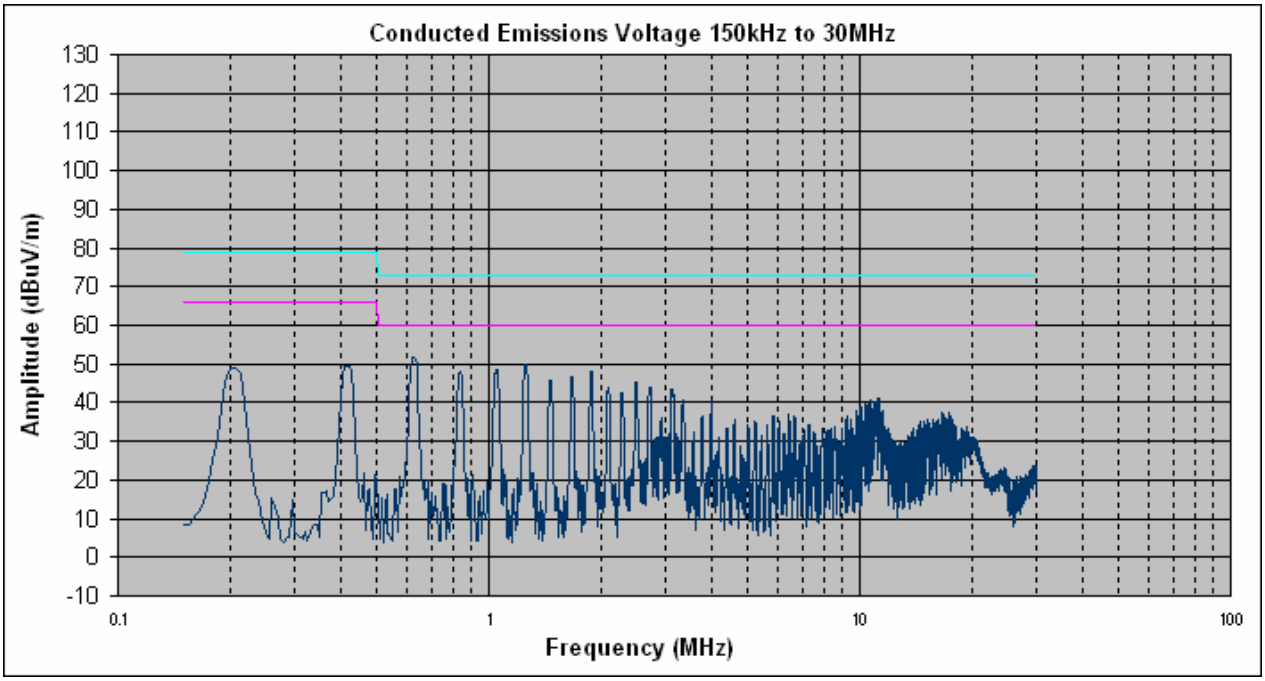
Table 11. Conducted Emissions - Voltage, AC Power, Phase Line 120 VAC, 60 Hz, 2010 AR

Conducted Emissions - Voltage, AC Power, Neutral Line 120 VAC, 60 Hz, 2010 AR

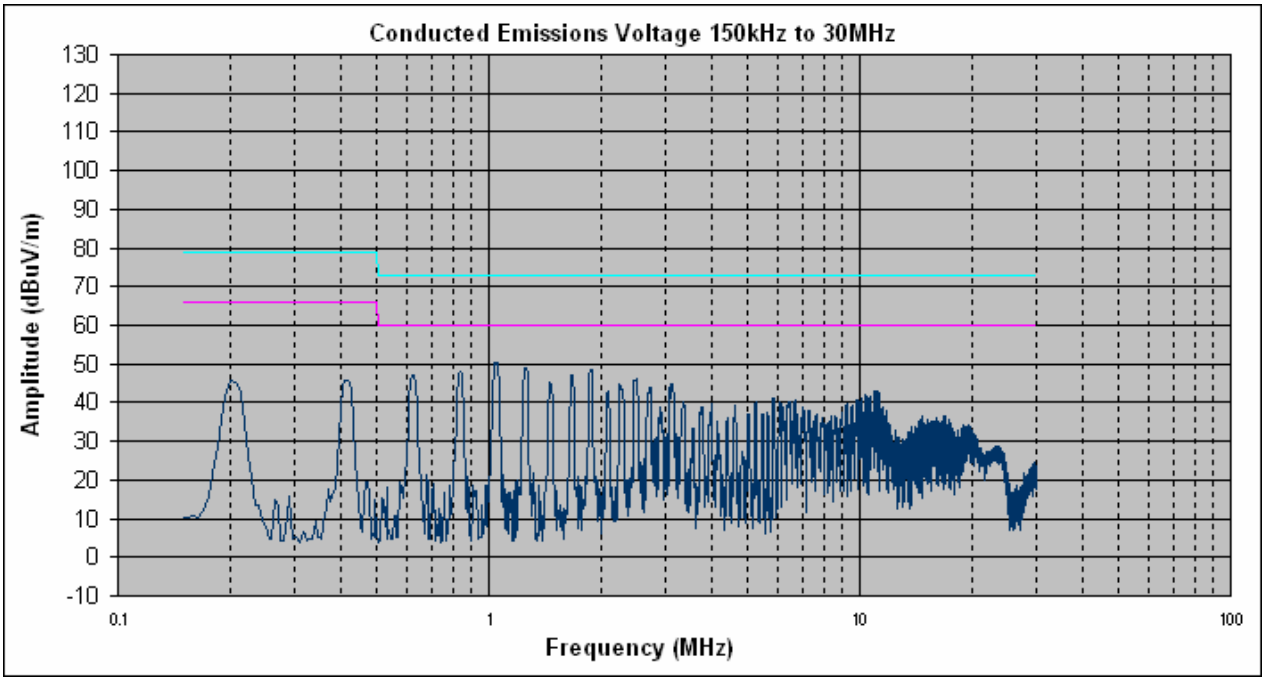
FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
1.044	49.05	73	PASS	-23.95	44.56	60	PASS	-15.44
1.259	47.78	73	PASS	-25.22	43.42	60	PASS	-16.58
1.892	47.32	73	PASS	-25.68	37.66	60	PASS	-22.34

Table 12. Conducted Emissions - Voltage, AC Power, Neutral Line 120 VAC, 60 Hz, 2010 AR

Conducted Emissions - Voltage, Worst Case Emissions, AC Power, 120 VAC, 60 Hz 2010 AR



Conducted Emission, Phase Line Plots, 2010 AR



Conducted Emission, Neutral Line Plots, 2010 AR

Conducted Emission Limits Test Setup, 2010 AR

Photograph 4. Conducted Emissions Test Setup (Front), 2010 AR

Photograph 5. Conducted Emissions Test Setup (Back), 2010 AR

Radiated Emission Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 13.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 13.

Frequency (MHz)	Field Strength (dBµV/m)	
	§15.109 (b), Class A Limit (dBµV) @ 10m	§15.109 (a),Class B Limit (dBµV) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 13. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a 0.8m-high wooden table inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 10 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was found Compliant with the Class A requirement(s) of this section. Measured emissions were below applicable limits

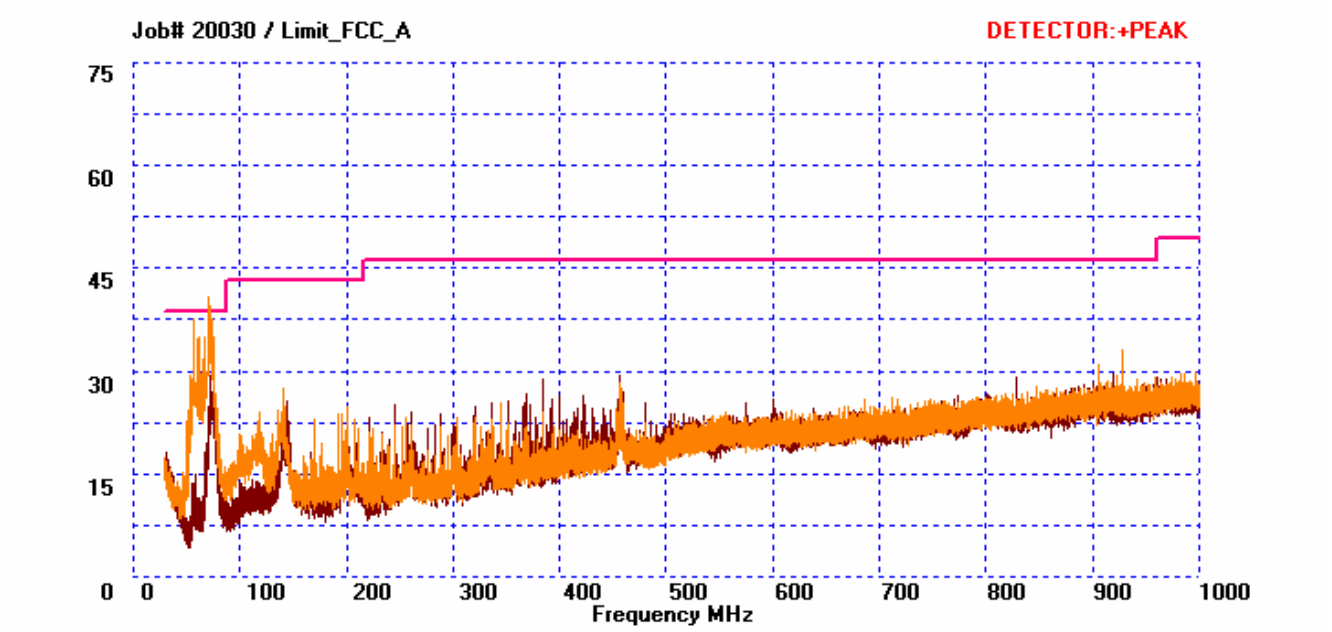
Test Engineer(s): Elijah Garcia (LR911 - 15.109)
Billy Kwan (2010 AR - 15.109)

Test Date(s): June 12, 2006
June 27, 2006

Radiated Emissions Limits Test Results, Class A, LR911

Frequency (MHz)	Antenna Polarity (H/V)	EUT Azimuth (Degrees)	Antenna Height (m)	Uncorrected Amplitude QP Detector (dBuv)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
56.8	V	291	1.43	24.84	6.40	1.24	32.48	39.00	-6.52
71.88	V	261	1	28.72	5.78	1.40	35.90	39.00	-3.11
73.8	H	151	2.17	17.64	6.60	1.42	25.66	39.00	-13.34
140.76	V	291	1	13.50	10.92	2.15	26.57	43.50	-16.93
384	H	101	1.87	10.32	14.96	3.40	28.68	46.40	-17.72
400	H	130	1.3	7.12	15.80	3.50	26.42	46.40	-19.98

Table 14. Radiated Emissions Limits Test Results, 30 MHz – 1 GHz, LR911



Radiated Emissions Limits Test Results, 30 MHz – 1 GHz, Class A, LR911

Radiated Emission Limits Test Setup, LR911

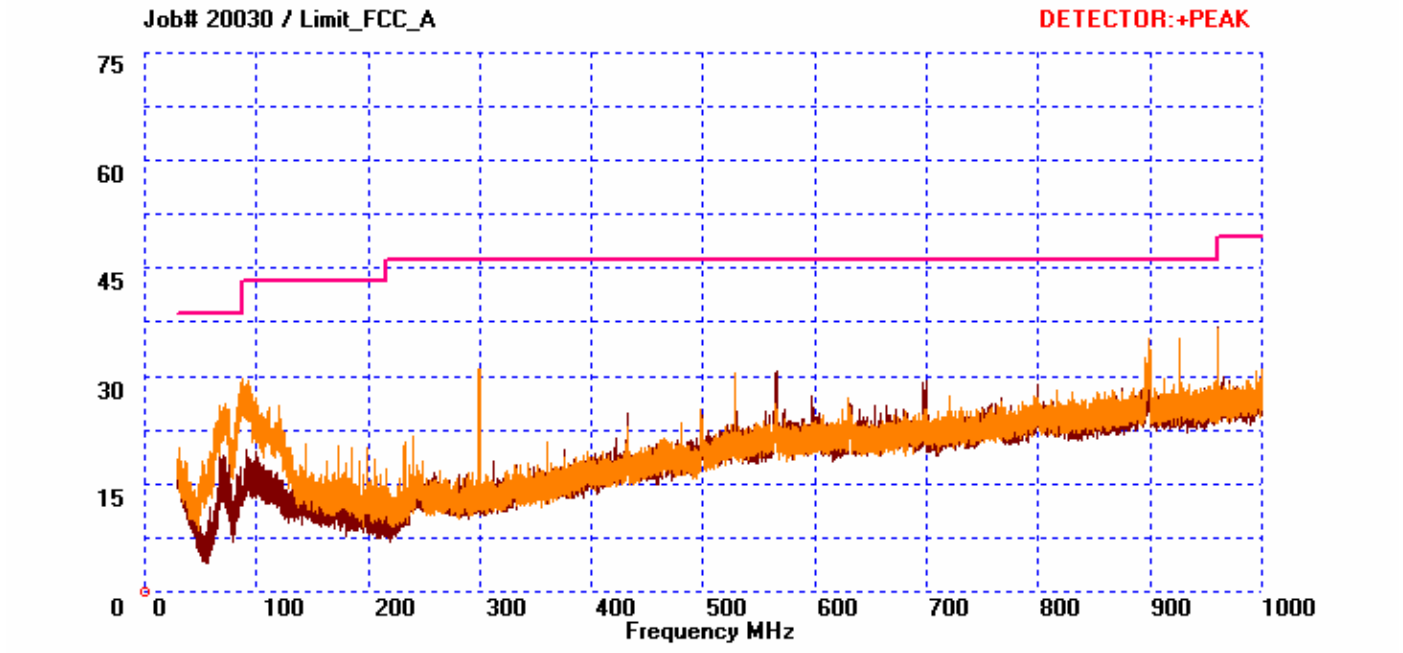
Photograph 6. Radiated Emission Test Setup 30 MHz - 1 GHz, Front View, LR911

Photograph 7. Radiated Emission Test Setup 30 MHz - 1 GHz, Back View, LR911

Radiated Emissions Limits Test Results, Class A, 2010AR

Frequency (MHz)	Antenna Polarity (H/V)	EUT Azimuth (Degrees)	Antenna Height (m)	Uncorrected Amplitude QP Detector (dBuv)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
90.16	V	249	1	16.54	9.33	1.57	27.44	43.50	-16.06
299.76	V	0	1	16.91	13.40	2.93	33.24	46.40	-13.16
566.36	H	215	1.17	6.03	19.02	4.40	29.45	46.40	-16.95
899.36	V	28	1.53	8.89	21.11	5.91	35.90	46.40	-10.50
925.24	V	0	1.29	11.53	21.50	6.03	39.06	46.40	-7.34
960.12	H	155	2.41	9.46	21.30	6.20	36.96	49.50	-12.54

Table 15. Radiated Emissions Limits Test Results, 30 MHz – 1 GHz, 2010AR



Radiated Emissions Limits Test Results, 30 MHz – 1 GHz, Class A, 2010AR

Radiated Emission Limits Test Setup, 2010 AR

Photograph 8. Radiated Emission Test Setup 30 MHz - 1 GHz, Front View 2010-AR

Photograph 9. Radiated Emission Test Setup 30 MHz - 1 GHz, Back View 2010-AR

IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: **§ 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested meets the criteria of this rule by virtue of having a unique MMCX connector and is a PC board mounted antenna and is therefore compliant with §15.203.

Antenna manufacturer - Applied Wireless
Typical Antenna gain - 5.5dBi.
Circular polarization.

Test Engineer(s): Shawn McMillen

Test Date(s): June 27, 2006

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Limits

Test Requirement(s): **§ 15.207 (a):** For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Σ line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15- 0.5	66 – 56*	56 – 46*
0.5 - 0.5	56	46
0.5 - 30	60	50

*Decreases with the logarithm of the frequency

Table 16 Conducted Limits for Intentional Radiators from FCC Part § 15.207(a)

Test Procedure: The transmitter was set to the middle channel and placed on a 0.8 m high wooden table inside in a semi-anechoic chamber (See Photograph 12 and Photograph 13). The EUT was situated such that the back of the EUT was 0.4 m from the vertical conducting plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-1992 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to an EMC/field intensity meter.

Results: Equipment meets the specifications of **Section 15.207 (a)** for Intentional Radiators. Test result details appear on following pages.

Test Engineer(s): Elijah Garcia (LR911 - 15.207)
Billy Kwan (2010 AR - 15.207)

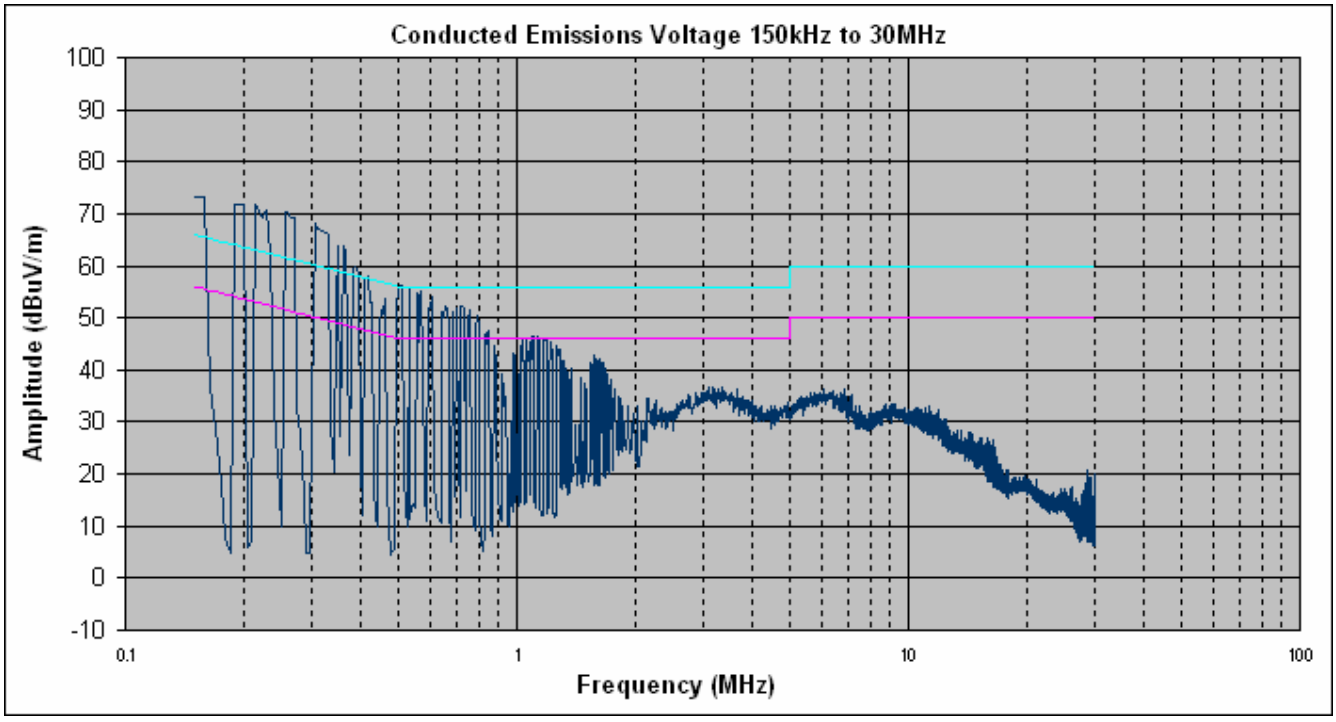
Test Date(s): June 12, 2006
June 27, 2006

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions, LR911

FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.15	63.7	66	3 dB	-2.3	34.46	56	PASS	-21.54
0.18	62.89	64.49	3 dB	-1.6	33.98	54.49	PASS	-20.51
0.2	62.33	63.61	3 dB	-1.28	33.27	53.61	PASS	-20.34
0.245	61.04	61.93	3 dB	-0.89	32.07	51.93	PASS	-19.86
0.3	58.62	60.24	3 dB	-1.62	29.46	50.24	PASS	-20.78
0.325	56.97	59.58	3 dB	-2.61	28.1	49.58	PASS	-21.48
0.525	46.28	56	PASS	-9.72	17.07	46	PASS	-28.93
0.755	40.37	56	PASS	-15.63	13.72	46	PASS	-32.28

Table 17. Conducted Emissions – Voltage, Worst Case Emissions, AC Power, Phase Line 110 VAC, 60 Hz, LR911



Conducted Emission Limits, Phase Line Plot, LR911

Remarks: EUT meets the specifications of **Section 15.207(a)** for Intentional Radiators.

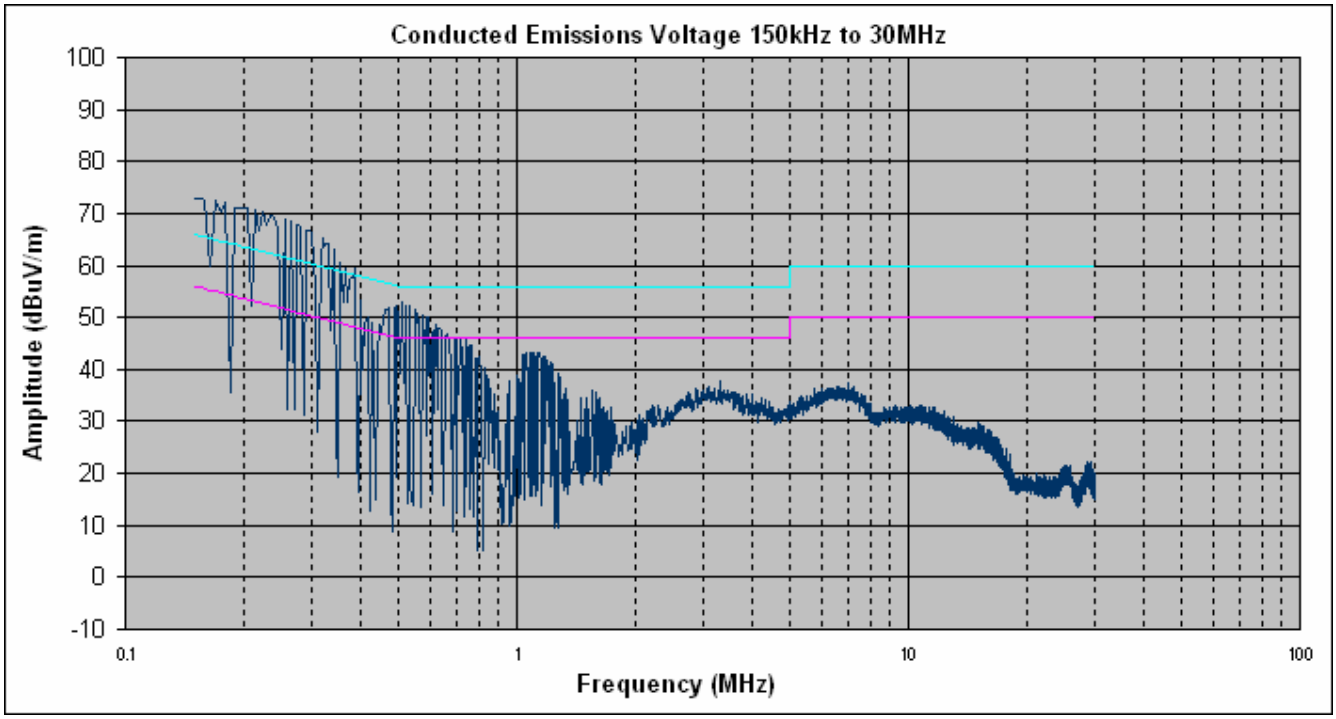
Note: When performing conducted emission 15.207 on 911LR, 2x Ferrite (Fair-Rite 0443167251) inline near PSA with one loop each.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions

FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.15	63.36	66	3 dB	-2.64	34.27	56	PASS	-21.73
0.18	62.69	64.49	3 dB	-1.8	33.27	54.49	PASS	-21.22
0.2	61.79	63.61	3 dB	-1.82	32.84	53.61	PASS	-20.77
0.245	60.12	61.93	3 dB	-1.81	31.11	51.93	PASS	-20.82
0.28	58.38	60.82	3 dB	-2.44	29.33	50.82	PASS	-21.49
0.3	57.88	60.24	3 dB	-2.36	27.82	50.24	PASS	-22.42
0.325	55.21	59.58	PASS	-4.37	25.97	49.58	PASS	-23.61

Table 18. Conducted Emissions – Voltage , Worse Case Emissions, AC Power, Neutral, LR911



Conducted Emission Limits, Neutral Line Plot, LR911

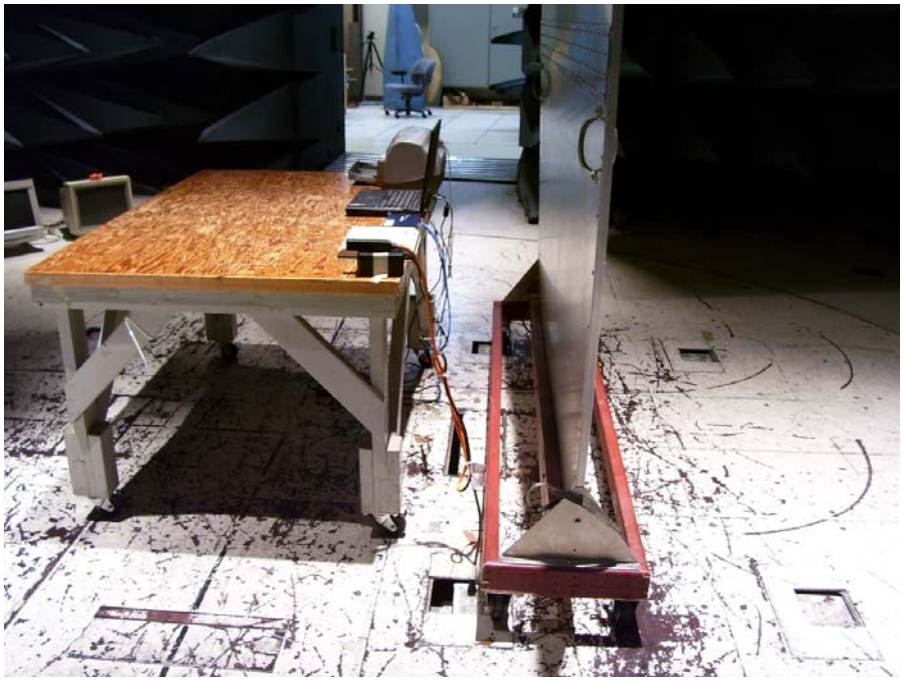
Remarks: EUT meets the specifications of **Section 15.207(a)** for Intentional Radiators.

Note: When performing conducted emission 15.207 on 911LR, 2x Ferrite (Fair-Rite 0443167251) inline near PSA with one loop each.

Electromagnetic Compatibility Criteria for Intentional Radiators, LR911

§ 15.207(a) Conducted Emissions

Photograph 10. Conducted Emissions Test Setup (Front), LR911



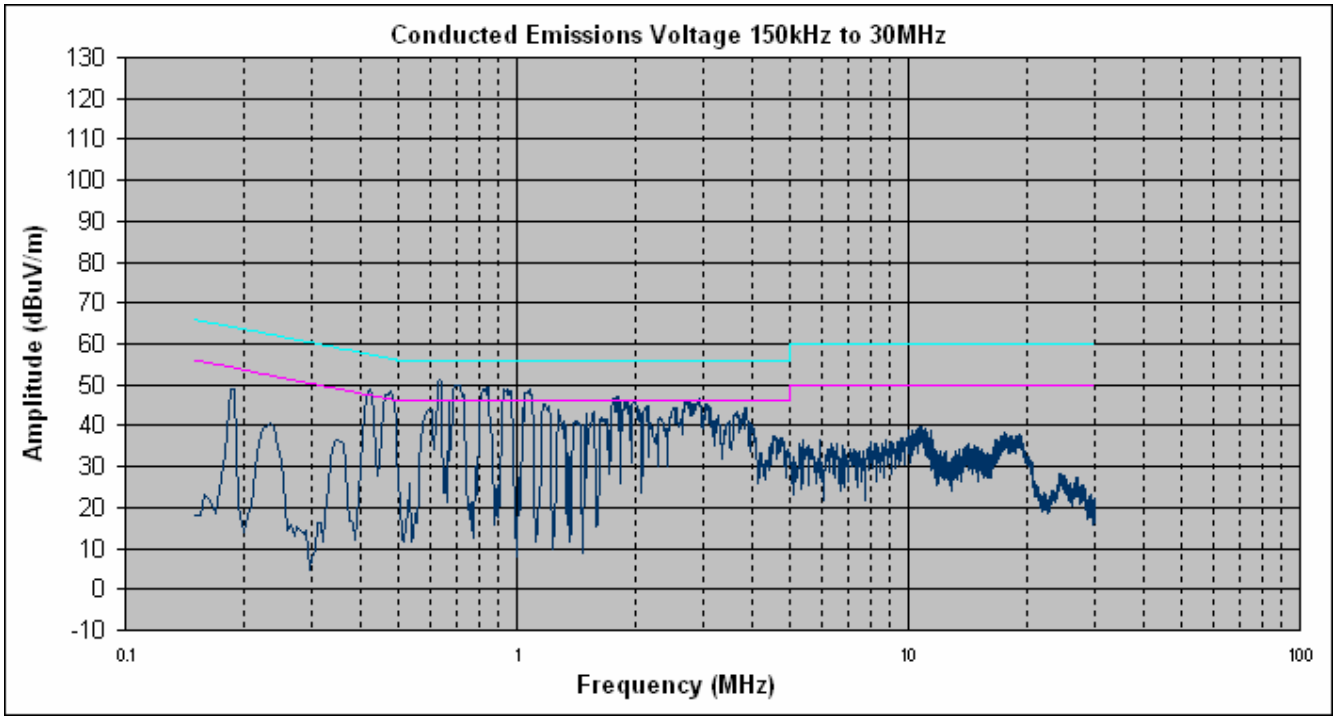
Photograph 11. Conducted Emissions Test Setup (Back), LR911

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions, 2010AR

FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.598	42.16	56	PASS	-13.84	33.36	46	PASS	-12.64
0.705	49.5	56	PASS	-6.5	41.21	46	PASS	-4.79
0.929	48.4	56	PASS	-7.6	33.9	46	PASS	-12.1

Table 19. Conducted Emissions – Voltage, Worst Case Emissions, AC Power, Phase Line 120 VAC, 60 Hz, 2010 AR



Conducted Emission Limits, Phase Line Plot, 2010 AR

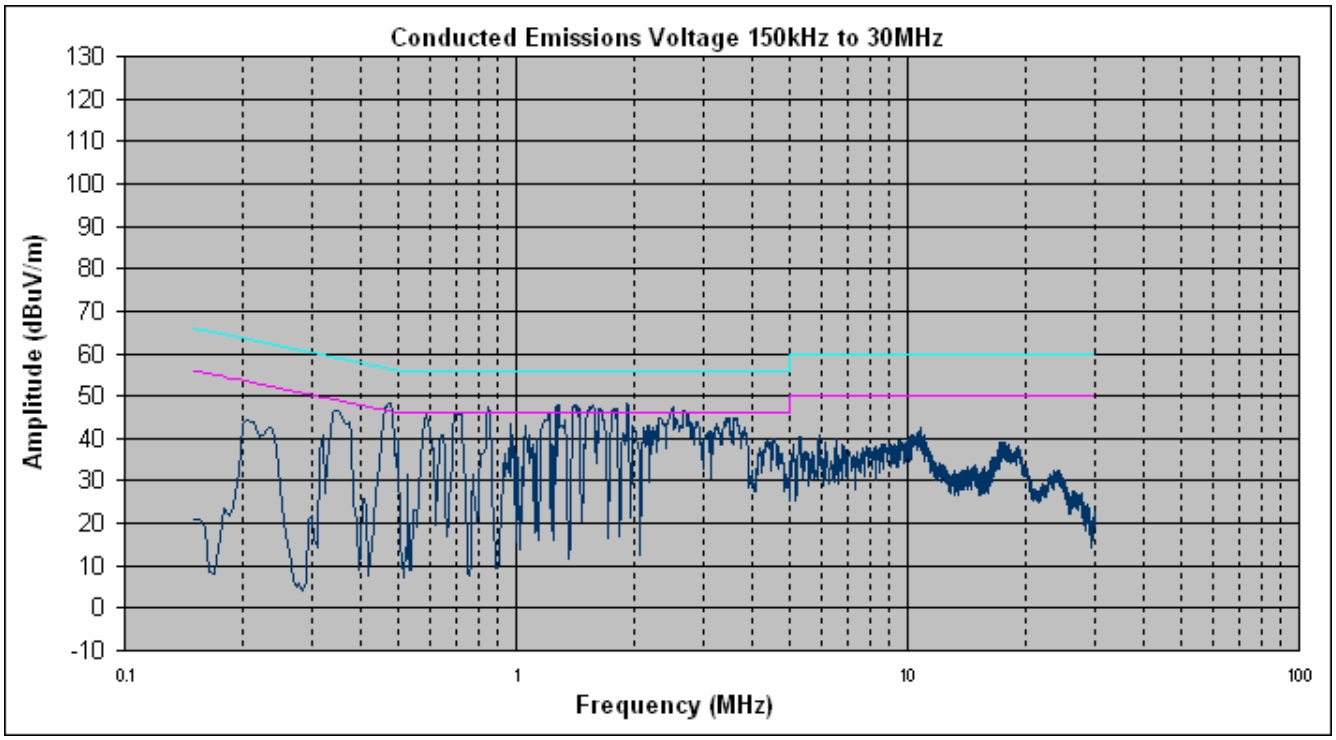
Remarks: EUT meets the specifications of **Section 15.207(a)** for Intentional Radiators.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions

FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
1.324	42.47	56	PASS	-13.53	26.44	46	PASS	-19.56
1.629	46.34	56	PASS	-9.66	29.84	46	PASS	-16.16
1.971	42.61	56	PASS	-13.39	22.94	46	PASS	-23.06

Table 20. Conducted Emissions – Voltage , Worse Case Emissions, AC Power, Neutral Line 120 VAC, 60 Hz, 2010 AR



Conducted Emission Limits, Neutral Line Plot, 2010AR

Remarks: EUT meets the specifications of **Section 15.207(a)** for Intentional Radiators.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions

Photograph 12. Conducted Limits, Test Setup, Front View 2010-AR

Photograph 13. Conducted Limits, Test Setup, Back View 2010-AR

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a) Bandwidth & Channelization Requirements

Test Requirements: **§ 15.247(a):** Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. For DTS, the minimum 6 dB bandwidth shall be at least 500 kHz. For frequency hopping systems, the EUT shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test Procedure: The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth. The 20 dB and 99% bandwidths were measured and recorded.

Test Results: The EUT was found compliant with the Radiated Emission limits of **§15.247(a)** for Intentional Radiators. See following pages for detailed test results.

Note: Refer to modularly approved FCC ID: OGSM26EA for measurement of occupied bandwidth and Channelization Requirements.

Test Engineer: Shawn McMillen

Test Date(s): June 7, 2006

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Output Power and RF Exposure

Test Requirements: **§15.247(b):** The maximum peak output power of the intentional radiator shall not exceed the following:

.

Frequency Hopping Systems Band (MHz)	Output Limit for systems with 25 to <50 Channels (Watts)	Output Limit for systems with ≥ 50 Channels (Watts)
902-928	0.250	1.000
2400–2483.5	0.125	1.000
5725– 5850	1.000	1.000

Table 21. Output Power Requirements from §15.247

Except for: Systems operating in the 2400– 2483.5 MHz band, and

5725– 5850 MHz band that are used exclusively for fixed, point-to-point operations,

if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 21, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400– 2483.5 MHz band may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725– 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Fixed, point-to-point operation excludes the use of point-to-multipoint systems, omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output and RF Exposure

Test Procedure: The transmitter was connected to a calibrated spectrum analyzer utilizing the channel power measurement option. The EUT was measured at the low and high channels of each mode of operation and at a data rate which gave the maximum power level (1Mb/s).

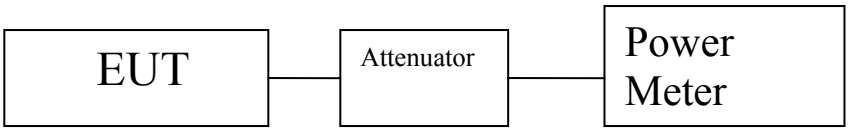
Test Results: The LR911 is intended to be operated using only the ISO-B modulation, while the 2010AR is capable of all modulations listed below. The EUT complies with the Peak Power Output limits of **§ 15.247(b)**.

Peak RF Output Power 2010AR Model		
Carrier Channel	**Modulation**	**Measured Peak Output Power dBm**
Low	EM	29.33
Mid	EM	29.33
High	EM	28.83
Carrier Channel	**Modulation**	**Measured Peak Output Power dBm**
Low	ePC C0	29.67
Mid	ePC C0	29.33
High	ePC C0	29.00
Carrier Channel	**Modulation**	**Measured Peak Output Power dBm**
Low	ePC C1	29.33
Mid	ePC C1	29.33
High	ePC C1	29.00
Carrier Channel	**Modulation**	**Measured Peak Output Power dBm**
Low	ePC V1.19	29.50
Mid	ePC V1.19	29.33
High	ePC V1.19	29.00
Carrier Channel	**Modulation**	**Measured Peak Output Power dBm**
Low	GEN 2	29.50
Mid	GEN 2	29.17
High	GEN 2	28.83
Carrier Channel	**Modulation**	**Measured Peak Output Power dBm**
Low	ISO B	29.33
Mid	ISO B	29.33
High	ISO B	29.00

Peak RF Output Power LR911 Model		
Carrier Channel	**Modulation**	**Measured Peak Output Power dBm**
Low	ISO B	29.33
Mid	ISO B	29.33
High	ISO B	29.00

Test Engineer(s): Shawn McMillen

Test Date(s): June 9, 2006



Block Diagram 1. Peak Power Output Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output and RF Exposure

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit Calculation: EUTs operating frequencies @ 902-928 MHz; highest conducted power = 29.67dBm (peak) therefore, **Limit for Uncontrolled exposure: f/1500 = 0.601 mW/cm^2 or 6.01 W/m^2**

EUT maximum antenna gain = 5.3dBi.

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (926.8 mW)
G = Antenna Gain (3.38 numeric)

$R = (926.8*3.38)/(4*3.14*0.601)^{1/2} = (3132.5/7.55)^{1/2} = 20.3$ cm.

Therefore, in order to comply with the Uncontrolled exposure a 20.3cm separation distance for the radiating structure must be maintained.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(c) Spurious Emissions Requirements – Radiated and RF Conducted

Test Requirements: **§15.247(c)**; **§15.209; §15.205:**

§15.247(c): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110----------	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505----------	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905----------	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128----------	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775----------	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775----------	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218----------	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825----------	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225----------	123–138	2200–2300	14.47–14.5
8.291–8.294----------	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366----------	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675----------	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475----------	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293----------	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025----------	240–285	3345.8–3358 36.	43–36.5
12.57675–12.57725----------	322–335.4	3600–4400	([2])

Table 22. Restricted Bands of Operation from §15.205

[1] Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.
[2] Above 38.6

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(c) Spurious Emissions Requirements – Radiated and RF Conducted

Test Procedure: The EUT was placed onto a 0.8m high wooden table inside in a semi-anechoic chamber. The transmitter was set to the highest operating power level at the low, mid and high channels. The receive antenna was positioned between 1 and 4m while the EUT was rotated about 360 degrees. The maximum field strength was recorded.

For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth. For frequencies above 1 GHz, peak measurements were made with a resolution bandwidth of 1 MHz and a video bandwidth of 1 MHz and average measurements were made with RBW = 1 MHz and VBW = 30 Hz.

For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

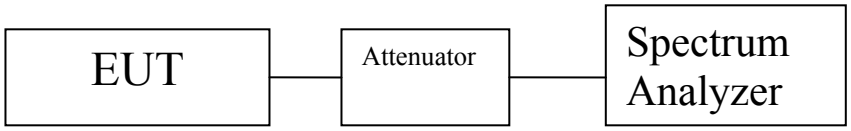
In accordance with §15.35(b) the limit on the radio frequency emissions as measured using instrumentation with a peak detector function shall be 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

For RF Conducted Emissions the transmitter was set to the highest operating power level at the low, mid and high channels. Peak measurements were made with a resolution bandwidth of 1 MHz and a video bandwidth. Spurious emissions were investigated from 30 MHz through to the 10th harmonic of the highest fundamental frequency.

Test Results: **Note:** Refer to modularly approved FCC ID: OGSM26EA for measurement of conducted RF.

Test Engineer: Shawn McMillen

Test Date: June 7, 2006



Block Diagram 2: RF Conducted Measurement Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.209(a) Radiated Emission

Frequency (MHz)	Receive Antenna Polarity	Uncorrected Field strength (dBµV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Corrected Field Strength @ 3m (dBµV)	Limit @ 3m (dBµV)	Measurement Type (dB)
1806.2	H	58.17	35.2	8.8	3.2	34.97	>20dBc	Peak
2709.4	H	49.97	35.3	9.8	3.7	28.17	74	Peak
2709.4	H	39.17	35.3	9.8	3.7	17.37	54	Avg
3612.5	H	50.67	34.5	9.9	4.3	30.37	74	Peak
3612.5	H	44.00	34.5	9.9	4.3	23.70	54	Avg
4515.7	H	53.33	35.1	10.7	5.0	33.93	74	Peak
4515.7	H	49.67	35.1	10.7	5.0	30.27	54	Avg
5418.8	H	56.50	34.9	10.8	5.6	38.00	74	Peak
5418.8	H	53.67	34.9	10.8	5.6	35.17	54	Avg
6321.9	H	52.50	35.1	12.0	6.0	35.40	>20dBc	Peak

Low Channel 903.14 MHz

Frequency (MHz)	Receive Antenna Polarity	Uncorrected Field strength (dBµV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Corrected Field Strength @ 3m (dBµV)	Limit @ 3m (dBµV)	Measurement Type (dB)
1829.9	H	54.90	35.2	8.8	3.2	31.70	>20dBc	Peak
2744.8	H	54.57	35.3	9.8	3.7	32.77	74	Peak
2744.8	H	50.40	35.3	9.8	3.7	28.60	54	Avg
3659.8	H	48.57	34.5	9.9	4.3	28.27	74	Peak
3659.8	H	39.40	34.5	9.9	4.3	19.10	54	Avg
4574.7	H	56.23	35.1	10.7	5.0	36.83	74	Peak
4574.7	H	51.90	35.1	10.7	5.0	32.50	54	Avg
5489.7	H	55.40	34.9	10.8	5.6	36.90	>20dBc	Peak
6404.6	H	55.73	35.1	12.0	6.0	38.63	>20dBc	Peak

Mid Channel 914.95 MHz

Frequency (MHz)	Receive Antenna Polarity	Uncorrected Field strength (dBµV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Corrected Field Strength @ 3m (dBµV)	Limit @ 3m (dBµV)	Measurement Type (dB)
1854.5	H	55.40	35.2	8.8	3.2	32.20	>20dBc	Peak
2781.7	H	49.07	35.3	9.8	3.7	27.27	74	Peak
2781.7	H	42.73	35.3	9.8	3.7	20.93	54	Avg
3709.0	H	48.57	34.5	9.9	4.3	28.27	74	Peak
3709.0	H	42.40	34.5	9.9	4.3	22.10	54	Avg
4636.3	H	57.73	35.1	10.7	5.0	38.33	74	Peak
4636.3	H	55.90	35.1	10.7	5.0	36.50	54	Avg
5563.5	H	54.73	34.9	10.8	5.6	36.23	>20dBc	Peak
6490.8	H	46.90	35.1	12.0	6.0	29.80	>20dBc	Peak

High Channel 927.26 MHz

Note: All other harmonic emissions were measured at the Spectrum Analyzer Noise Floor (SNF)

Remarks: The EUT meets the specifications of **Section 15.209(a)** for Radiated Emissions of Intentional Radiators.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.209(a) Radiated Emission

Photograph 14: Radiated measurements setup, Front View

Photograph 15: Radiated measurements setup, Back View

V. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2421	EMI RECEIVER	ROHDE&SCHWARZ	ESIB 7	2/9/2005	2/9/2007
1S2184	BILOG ANTENNA	CHASE	CBL6112A	1/12/2005	1/12/2007
1S2121	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	10/14/2005	10/14/2006
1S2198	ANTENNA, HORN	EMCO	3115	7/14/2005	7/14/2006
1S2202	ANTENNA, HORN, 1 METER	EMCO	3116	3/23/2005	3/23/2007
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13146	SEE NOTE	
1S2263	CHAMBER, 10 METER	RANTEC	N2-14	8/15/2006	8/15/2007
1S2430	WIDEBAND POWER METER	ANRITSU COMPANY	ML2488A	1/12/2005	1/12/2007
1S2432	WIDEBAND POWER SENSOR	ANRITSU COMPANY	MA2491A	1/12/2005	1/12/2007
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONALCOAXIAL	NARDA	N/A	SEE NOTE	
1S2460	Analyzer, Spectrum 9 kHz-40GHz	Agilent	E4407B	07/06/2005	07/06/2006
1S2430	WIDEBAND POWER METER	ANRITSU COMPANY	ML2488A	1/12/2005	1/12/2007
1S2432	WIDEBAND POWER SENSOR	ANRITSU COMPANY	MA2491A	1/12/2005	1/12/2007
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONALCOAXIAL	NARDA	N/A	SEE NOTE	
1S2128	Harmonic Mixer	Hewlett Packard	11970A	N/A	3/10/2007
1S2129	Harmonic Mixer	Hewlett Packard	11970K	N/A	3/10/2007

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

VI. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

B. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

> Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
>
> – Reorient or relocate the receiving antenna.
>
> – Increase the separation between the equipment and receiver.
>
> – Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
>
> – Consult the dealer or an experienced radio/TV technician for help.

VII. Exhibits

Exhibit A, Hopping Capability Requirements

Exhibit B, Non-Coordination Requirements

End of Report

