

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : RADAR DETECTOR
MODEL/TYPE NO : LRD950 / Proto-type
FCC ID : AMWLRD950
MULTIPLE MODEL : -
BRAND NAME : **Uniden**
APPLICANT : Uniden America Corporation
6225 North State Highway 161, Suite 300,
Irving Texas 75038 United States
Attn.: Renji Inuzuka / Director
MANUFACTURER : ATTOWAVE CO., LTD.
1005, 10F Leader's Tower, 60-15 Gasan-dong,
Gumchun-gu, Seoul, 153-801 Korea
FCC CLASSIFICATION : Class B Personal computers and peripherals
JBP - Part 15 Class B Computing Device Peripheral
RULE PART(S) : FCC Part 15 Subpart B
TEST PROCEDURE : ANSI C63.4-2009
TEST REPORT No. : ETLE141201.1722
DATES OF TEST : December 01, 2014 to December 02, 2014
REPORT ISSUE DATE : December 09, 2014
TEST LABORATORY : ETL Inc. (FCC Designation Number: KR0022)

This RADAR DETECTOR, Model LRD950 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2009 at the ETL Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B:

I attest to the accuracy of data. All measurement herein was performed by me or was made under my supervision and is correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared by: 

Jeong Hwan, Pyo (Test Engineer)

December 09, 2014

Reviewed by: 

Hyung Min, Choi (Chief Engineer)

December 09, 2014

ETL Inc.

Head office: #371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea

Open site: #499-1, Sagot-ri, Seosin-myeon, Hwaseong-si, Gyeonggi-do, 445-882, Korea

Tel: 82-2-858-0786 Fax: 82-2-858-0788

The test report merely corresponds to the test sample(s).

This report shall not be reproduced, in whole or in part without the written approval of ETL Inc.

Table of Contents

FCC Measurement Report

- 1. Introduction**
- 2. Product Information**
- 3. Description of Tests**
- 4. Test Condition**
- 5. Test Results**
 - 5.1 Summary of Test Results**
 - 5.2 Conducted Emissions Measurement**
 - 5.3 Radiated Emissions Measurement**
- 6. Sample Calculation**
- 7. List of test Equipment used for Measurement**

Appendix A. FCC ID Label and Location

Appendix B. Test Setup Photographs

Appendix C. External Photographs

Appendix D. Internal Photographs

Appendix E. Block Diagram

Appendix F. Operating Description

Appendix G. User Manual

FCC MEASUREMENT REPORT

Scope – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

General Information

Applicant Name : Uniden America Corporation

**Address : 6225 North State Highway 161, Suite 300,
Irving Texas 75038 United States**

Attention : Renji Inuzuka / Director

- **EUT Type :** RADAR DETECTOR
- **Model Number :** LRD950
- **FCC ID :** AMWLRD950
- **S/N :** Proto-type
- **Rule Part(s) :** FCC Part 15 Subpart B
- **Test Procedure :** ANSI C63.4-2009
- **FCC Classification :** Class B Personal computers and peripherals
JBP - Part 15 Class B Computing Device Peripheral
- **Dates of Tests :** December 01, 2014 to December 02, 2014
- **Environmental of Tests:** Temperature: (12.5 ± 10.3) °C
Humidity: (35 ± 5) % R.H.
Atmospheric Pressure: (101.8 ± 0.3) kPa
- **Place of Tests :** ETL Inc. Testing Lab. (FCC Designation Number : KR0022)

Radiated Emission test 1;
#499-1, Sagot-ri, Seosin-myeon, Hwaseong-si,
Gyeonggi-do, 445-882, Korea

Radiated Emission test 2 and Conducted Emission test;
#371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No. :** ETLE141201.1722

1. INTRODUCTION

The measurement tests for radiated and conducted emission test were conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.4-2009 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 m and 10 m site configurations. Detailed description of test facility was found to be in compliance with FCC Rules according to the ANSI C63.4-2009 and registered to the Federal Communications Commission (FCC Designation Number : KR0022).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009) was used in determining radiated and conducted emissions from the Uniden America Corporation, Model: LRD950.

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the RADAR DETECTOR (model: LRD950).

The model LRD950 is basic model that was tested.

2.2 General Specification

Receiver Type	
Radar	Double Conversion Super-heterodyne Self-Contained Antenna
Laser	Pulse Laser Signal Receiver
Frequency	
X Band	(10.525 ± 0.050) GHz
K Band	(24.150 ± 0.100) GHz
Ka Band (Super-wide)	(34.700 ± 1.300) GHz
Laser	(950 ± 150) nm
Detector Type	
Radar	Scanning Frequency Discriminator
Laser	Pulse Width Discriminator
Alarm Type	Beep (Detected Band and Signal strength)
Antenna Type	
Radar	Linear Polarized E-vector Vertical
Laser Front	Convex Condenser Lens
Laser Back	Concave Condenser Lens
USB	
USB interface	USB Specification 2.0/1.1
General	
Dimensions	110.0 mm (D) x 69.0 mm (W) x 29.5 mm (H)
Weight	4.1 oz (115 g)
Operating Temperature	(90.5 ± 94.5) °F (Radar/Laser) (32.5 ± 52.5) °C (Radar/Laser)
Storage Temperature	(90.5 ± 112.5) °F (Radar/Laser) (32.5 ± 62.5) °C (Radar/Laser)
Operating Power Source	(13.5 ± 2.5) V DC
High Internal Frequency	MCU Clock → 22 MHz

3. DESCRIPTION OF TESTS

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2009. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω /50 μ H LISN as the input transducer to a Spectrum Analyzer or a Test Receiver. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 9 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1 m x 1.5 m x 0.8 m wooden table which is placed 40 cm away from the vertical wall and 1.5 m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cut power line filters. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN. Non-inductive bundling to a 1 m length shortened all interconnecting cables more than 1 m. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the EMI Test Receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 MHz to 30 MHz. The bandwidth of the spectrum analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup in Appendix B.

3.2 Radiated Emission Measurement

Radiated emission measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2009. The measurements were performed over the frequency range of 30 MHz to 40 GHz (or 5th harmonic of the highest frequency) in using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements below 1 GHz were made with the detector set for "Quasi-peak" within a bandwidth of 120 kHz. The measurements above 1 GHz were made with the detector set for "Peak and Average" within a bandwidth of 1 MHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determined the frequency producing the maximum emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1 000 MHz using Log-Bicon antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site or SVSWR chamber at 3 m. The test equipment was placed on a styrofoam table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high nonmetallic 1 m x 1.5 m table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 m to 4 m and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner and which tends to maximize its emission level in a typical application.

4.2 EUT operation

- The EUT was connected as user's guide. And during the test executed EUT is operating on the following:

Operating Mode
Stand-by mode
X Band: (10.525 ± 0.050) GHz
K Band: (24.150 ± 0.100) GHz
Ka Band (Super-wide band): (34.700 ± 1.300) GHz
Laser: (950 ± 150) nm

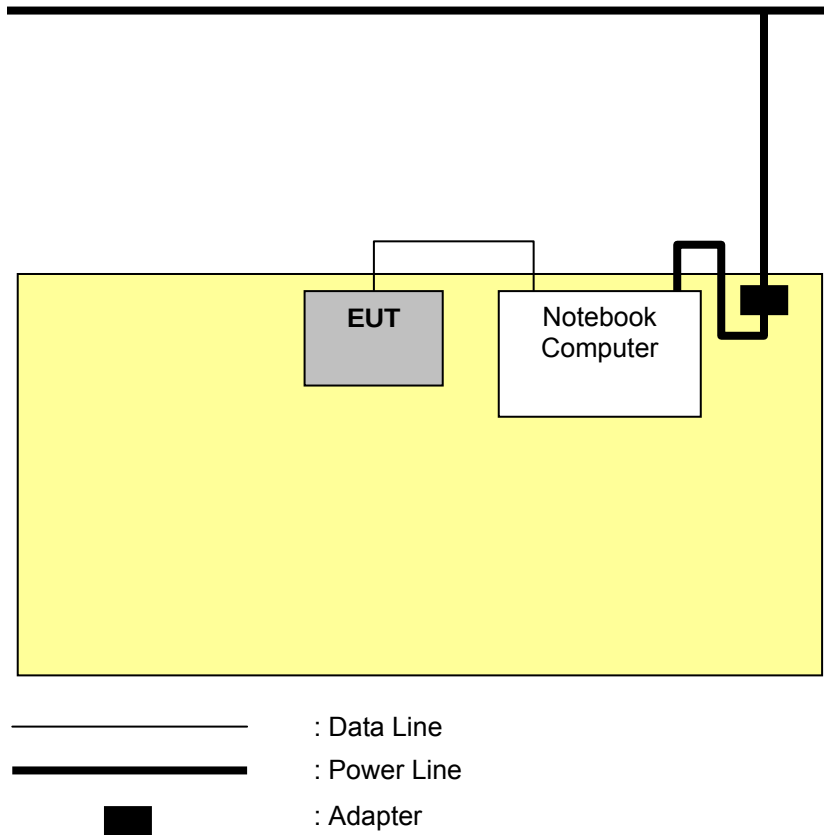
4.3 Support Equipment Used

Description	Model Name	Serial No.	Manufacturer	FCC
Notebook Computer	6550b	CNU1240QRZ	Hewlett-Packard Company	DoC
Adapter (for Notebook Computer)	Series PPP009H	F129211221612 12	Chicony Power Technolgoy (Suzhou) Co., Ltd.	-

4.4 Type of Cables Used

Device from	Device to	Type of I/O port	Length [m]	Type of shield	Used ferrite core
EUT	Notebook Computer	USB	1.0	Shielded	X
Notebook Computer	Adapter	DC Input	1.0	Shielded	O

4.5 The setup drawing(s)



5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule	Measurement Required	Result
15.107(a)	Conducted Emission Measurement	Passed by 6.91 dB
15.109(a)	Radiated Emission Measurement (Below 1 GHz)	Passed by 4.70 dB
15.109(a)	Radiated Emission Measurement (Above 1 GHz)	Passed by 24.70 dB

The data collected shows that the **Uniden America Corporation / RADAR DETECTOR / LRD950** complies with technical requirements of above rules part 15.107(a) and 15.109(a) Class B Limits.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

5.2 Conducted Emissions Measurement

5.2.1 Conducted Emissions Data

EUT	RADAR DETECTOR / LRD950 (S/N: Proto-type)
Limit apply to	FCC Part 15.107(a) Class B
Test Date	December 01, 2014
Environmental of test	(22.7 ± 0.1) °C, (38 ± 1) % R.H., (101.6 ± 0.0) kPa
Operating Condition	Operating on the following Bands (X, K, Ka, Laser bands)
Result	Passed by 6.91 dB

Conducted Emission Test Data

The following data and graph shows the highest levels of conducted emissions on both polarizations of hot and neutral line.

Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 9 kHz)

NOTES:

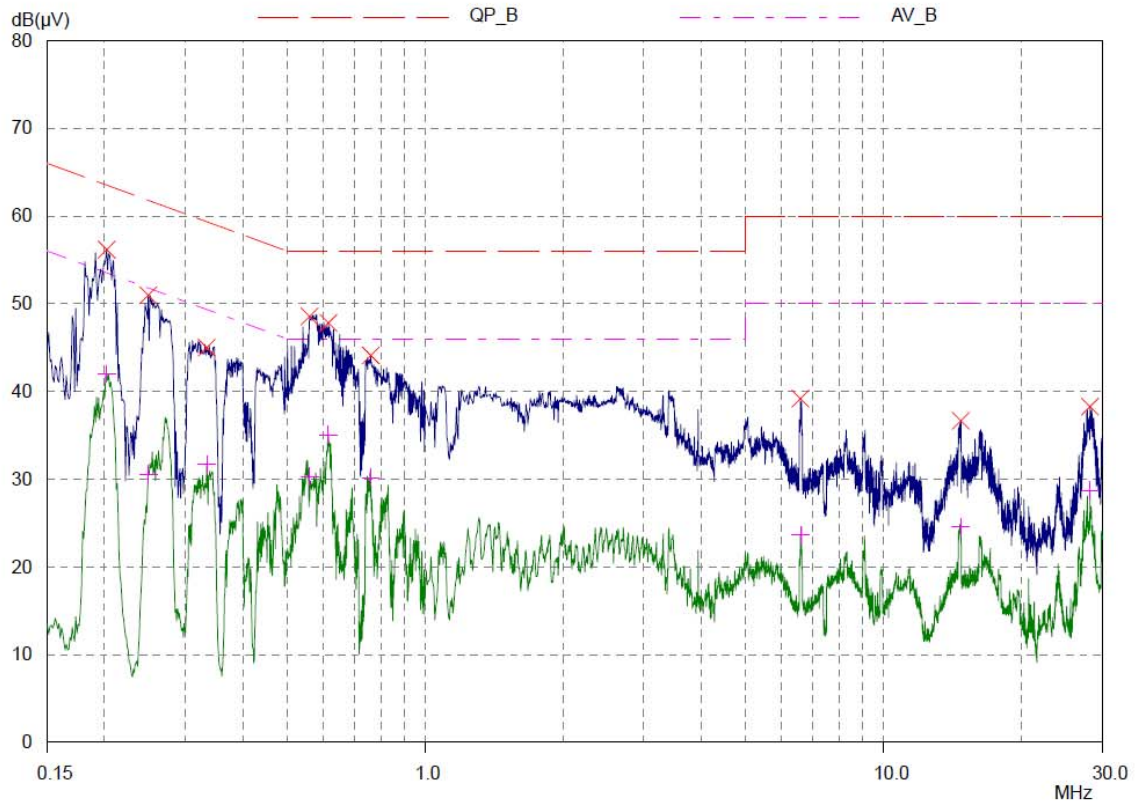
1. Please see the measured data and graph in next page.
2. The Level (Result) value was included the reading, antenna factor and cable loss.
3. Delta (Margin) value = Limit - Level (Result)
4. Measurement were performed at the AC Power Inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC Part 15.107(a) Class B.
5. If the average limit is met when using a Quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

Line: HOT

ETL EMC Laboratory
Conducted Emission Test Result

EUT: ETLE141201.1722
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: HOT

Prescan Measurement:	Detectors:	X PK / + AV
	Meas Time:	see scan settings
	Peaks:	16
	Acc Margin:	10 dB



ETL EMC Laboratory

Conducted Emission Test Result

EUT: ETLE141201.1722

Manuf:

Op Cond:

Operator:

Test Spec:

Comment: HOT

Prescan Measurement: Detectors: X PK / + AV
Meas Time: see scan settings
Peaks: 16
Acc Margin: 10 dB

Peak Search Results

Frequency MHz	PK Level dB(μV)	PK Limit dB(μV)	PK Delta dB
0.202	56.17	63.53	7.36
0.249	50.95	61.79	10.84
0.334	45.00	59.35	14.35
0.56	48.53	56.00	7.47
0.615	47.80	56.00	8.20
0.761	44.10	56.00	11.90
6.585	39.17	60.00	20.83
14.74	36.65	60.00	23.35
28.2	38.26	60.00	21.74

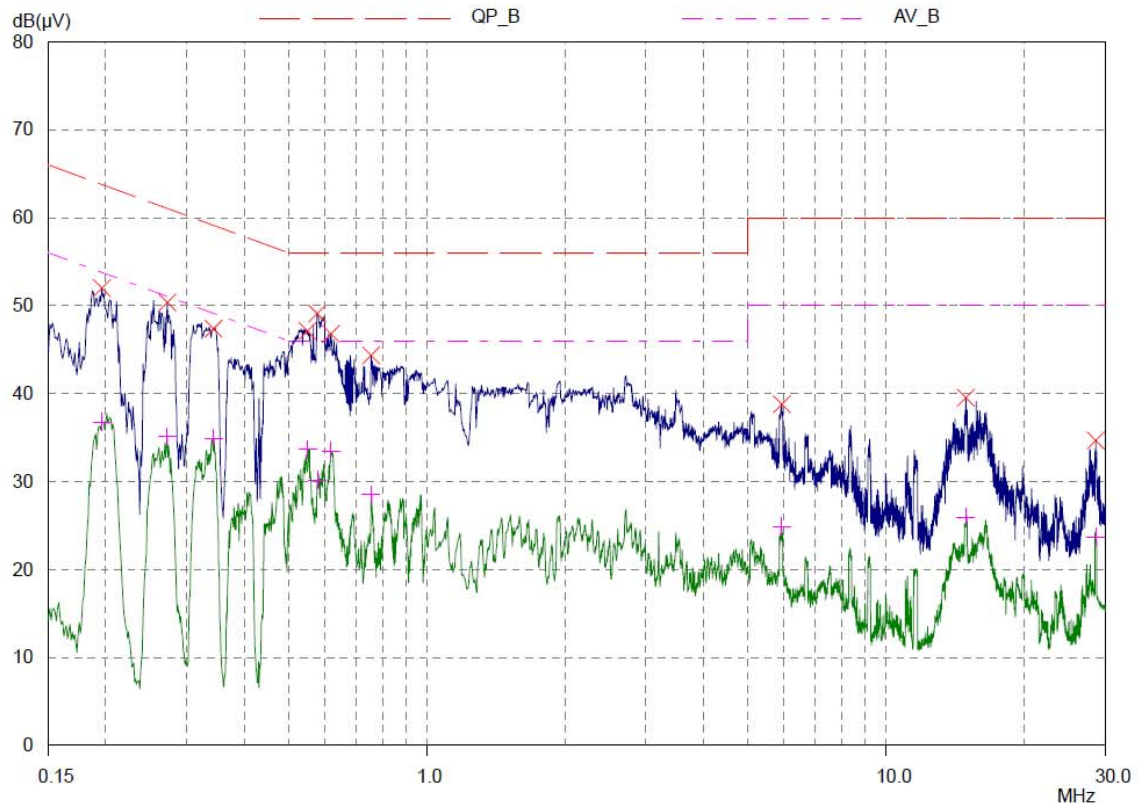
Frequency MHz	AV Level dB(μV)	AV Limit dB(μV)	AV Delta dB
0.202	42.00	53.53	11.53
0.249	30.55	51.79	21.24
0.334	31.70	49.35	17.65
0.56	30.26	46.00	15.74
0.615	35.03	46.00	10.97
0.761	30.18	46.00	15.82
6.585	23.62	50.00	26.38
14.74	24.58	50.00	25.42
28.2	28.71	50.00	21.29

* limit exceeded

Line: Neutral

ETL EMC Laboratory
Conducted Emission Test Result
EUT: ETLE141201.1722
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: NEUTRAL

Prescan Measurement:	Detectors:	X PK / + AV
	Meas Time:	see scan settings
	Peaks:	16
	Acc Margin:	10 dB



ETL EMC Laboratory

Conducted Emission Test Result

EUT: ETLE141201.1722

Manuf:

Op Cond:

Operator:

Test Spec:

Comment: NEUTRAL

Prescan Measurement: Detectors: X PK / + AV
Meas Time: see scan settings
Peaks: 16
Acc Margin: 10 dB

Peak Search Results

Frequency MHz	PK Level dB(μV)	PK Limit dB(μV)	PK Delta dB
0.196	52.00	63.78	11.78
0.272	50.37	61.06	10.69
0.343	47.38	59.13	11.75
0.55	47.11	56.00	8.89
0.577	49.09	56.00	6.91
0.618	46.79	56.00	9.21
0.756	44.34	56.00	11.66
5.925	38.79	60.00	21.21
14.91	39.53	60.00	20.47
28.61	34.66	60.00	25.34

Frequency MHz	AV Level dB(μV)	AV Limit dB(μV)	AV Delta dB
0.196	36.76	53.78	17.02
0.272	35.15	51.06	15.91
0.343	34.94	49.13	14.19
0.55	33.64	46.00	12.36
0.577	30.16	46.00	15.84
0.618	33.44	46.00	12.56
0.756	28.53	46.00	17.47
5.925	24.92	50.00	25.08
14.91	25.93	50.00	24.07
28.61	23.72	50.00	26.28

* limit exceeded

5.3 Radiated Emissions Measurement

5.3.1 Radiated Emissions Data

- Below 1 GHz

EUT	RADAR DETECTOR / LRD950 (S/N: Proto-type)
Limit apply to	FCC Part 15.109(a) Class B
Test Date	December 02, 2014
Environmental of test	(4.2 ± 2.0) °C, (31 ± 1) % R.H., (102.0 ± 0.0) kPa
Operating Condition	Operating on the following Bands (X, K, Ka, Laser bands)
Result	Passed by 4.70 dB

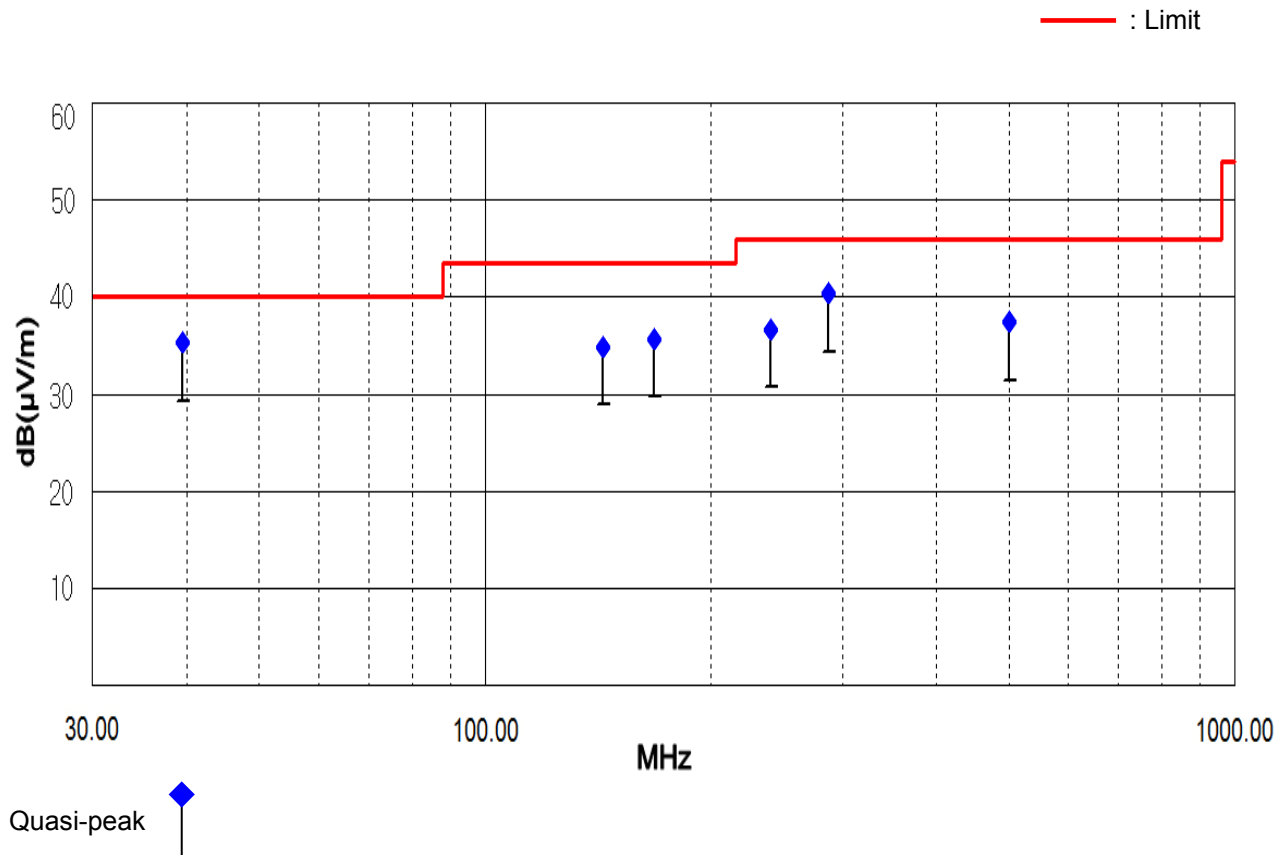
Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 120 kHz)

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB(μV)]	Height [cm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
39.55	23.25	V	11.03	1.02	100	35.30	40.00	4.70
143.85	20.74	V	12.59	1.57	145	34.90	43.50	8.60
168.40	22.10	V	11.91	1.69	140	35.70	43.50	7.80
240.66	23.90	H	10.94	1.86	400	36.70	46.00	9.30
287.70	25.62	H	12.67	2.11	364	40.40	46.00	5.60
500.57	16.05	H	18.35	3.00	142	37.40	46.00	8.60

NOTES:

1. * H : Horizontal polarization , ** V : Vertical polarization
2. Result = Reading + Antenna factor + Cable loss
3. Margin value = Limit - Result
4. The measurement was performed for the frequency range 30 MHz ~ 1 000 MHz according to FCC Part 15.109(a) Class B.



- Above 1 GHz

EUT	RADAR DETECTOR / LRD950 (S/N: Proto-type)
Limit apply to	FCC Part 15.109(a) Class B
Test Date	December 02, 2014
Environmental of test	(21.1 ± 0.4) °C, (36 ± 1) % R.H., (101.5 ± 0.0) kPa
Operating Condition	Operating on the following Bands (X, K, Ka, Laser bands)
Result	Passed by 24.70 dB

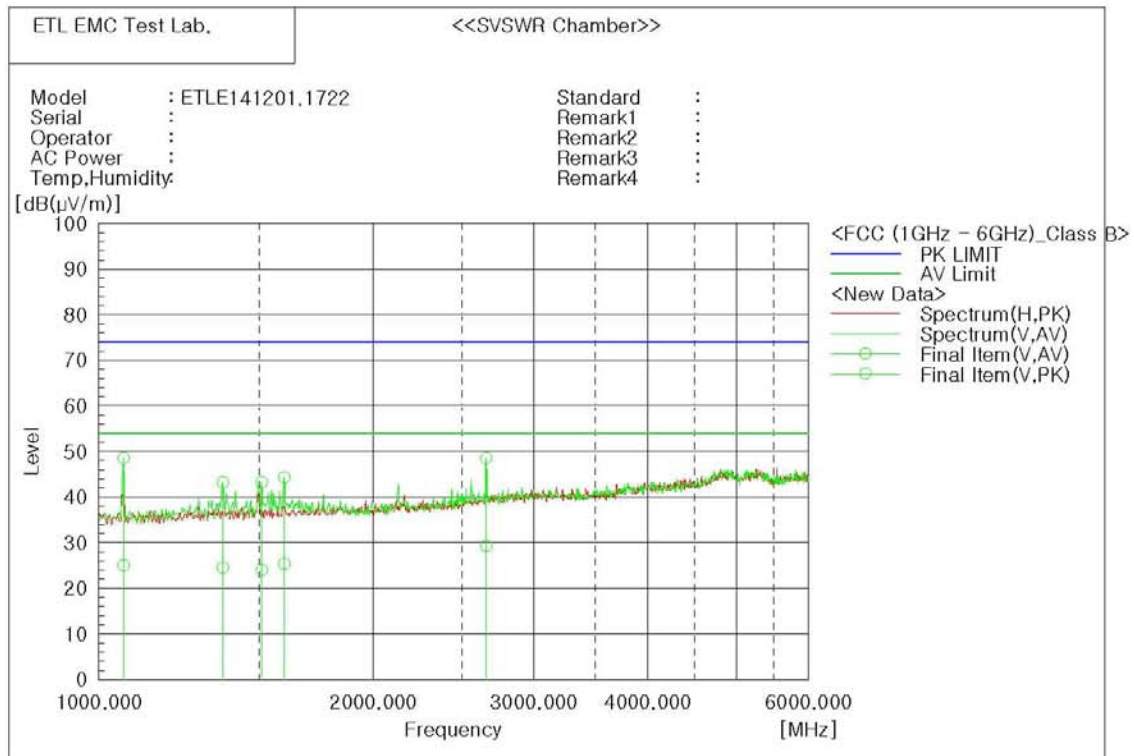
Radiated Emission Test Data

The following data and graph shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Detector mode: CISPR Peak mode, Average mode

NOTES:

1. Please see the measured data and graph in next page.
2. H : Horizontal polarization , V : Vertical polarization
3. The c.f value was included the antenna factor, cable loss and Amp. Gain.
4. Result value = Reading + c.f
5. Margin value = Limit - Result
6. The measurement was performed for the frequency range 1 GHz ~ 6 GHz according to FCC Part 15.109(a) Class B.
7. Upper frequency of measurement range: 5th harmonic of the highest frequency.



Final Result

— Vertical Polarization (AV)—

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
1	1064.640	40.2	-15.1	25.1	54.0	28.9
2	1367.640	38.5	-14.0	24.5	54.0	29.5
3	1509.040	37.6	-13.6	24.0	54.0	30.0
4	1597.920	38.7	-13.3	25.4	54.0	28.6
5	2660.440	38.4	-9.1	29.3	54.0	24.7

— Vertical Polarization (PK)—

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
1	1064.640	63.7	-15.1	48.6	74.0	25.4
2	1367.640	57.3	-14.0	43.3	74.0	30.7
3	1509.040	56.9	-13.6	43.3	74.0	30.7
4	1597.920	57.6	-13.3	44.3	74.0	29.7
5	2660.440	57.7	-9.1	48.6	74.0	25.4

6. SAMPLE CALCULATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.
The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - PA$$

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

PA* = Preamplifier Factor

* PA is only be used for the measuring frequency above 1 GHz.

$$dB(\mu V) = 20 \log_{10} (\mu V) : \text{Equation}$$

$$dB(\mu V) = dBm + 107$$

Example : @ 145.29 MHz

Class B Limit	= 40.00 dB(μ V/m)
Reading	= 23.25 dB(μ V)
Antenna Factor + Cable Loss	= 11.03 + 1.02 = 12.05 dB(μ V/m)
Total	= 35.30 dB(μ V/m)
Margin	= 40.00 – 35.30 = 4.70 dB
	= 4.70 dB below Limit

7. List of test equipments used for measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
☒	EMI Test Receiver	ESVS 10	R&S	835165/001	14.03.18	15.03.18
☒	EMI Test Receiver	ESCS30	R&S	847793/005	14.03.18	15.03.18
☒	EMI Test Receiver	ESCI7	R&S	100851	14.09.03	15.09.03
☒	Two-Line V-Network	ENV216	R&S	958599/106	14.03.18	15.03.18
☒	Horn Antenna	BBHA 9120D	Schwarzbeck	826	14.04.02	16.04.02
☒	Amplifier	TK-PA18	TESTEK.	120020	14.09.04	15.09.04
☒	LogBicon Antenna	VULB9160	Schwarzbeck	3082	13.07.25	15.07.25
☒	Turn-Table	DS1200-S	Innco Systems GmbH	2740311	N/A	N/A
☒	Turn-Table	TT 1.35 SI	SES	-	N/A	N/A
☒	Antenna Master	AM 4.5	SES	-	N/A	N/A