Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT	:	RADAR DETECTOR
MODEL/TYPE NO	:	DFR9 / Proto-type
FCC ID	:	AMWUA1801
MULTIPLE MODEL	:	DFR8
BRAND NAME	:	Uniden
APPLICANT	:	Uniden America Corporation 3001 Gateway Drive, Suite 130, Irving Texas 75038 United States Attn.: Paul Roby / Manager
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 C63.4-2014
TEST REPORT No.	:	ETLE180504.0437
DATES OF TEST	:	May 15, 2018 to May 17, 2018
REPORT ISSUE DATE	:	July 09, 2018
TEST LABORATORY	:	ETL Inc. (FCC Designation Number: KR0022)

This RADAR DETECTOR, Model DFR9 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2014 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)
July 09, 2018

Reviewed by:
Hyung Min, Choi (Chief Engineer)
July 09, 2018

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

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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 : 3001 Gateway Drive, Suite 130,

Irving Texas 75038 United States

Attention : Paul Roby / Manager

- **EUT Type :** RADAR DETECTOR
- **Model Number :** DFR9
- **FCC ID :** AMWUA1801
- **S/N :** Proto-type
- **Rule Part(s) :** FCC Part 15 Subpart B
- **Test Procedure :** ANSI C63.4-2014
- **FCC Classification :** Class B Personal computers and peripherals
  JBP - Part 15 Class B Computing Device Peripheral
- **Dates of Tests :** May 15, 2018 to May 17, 2018
- **Environmental of Tests:** Temperature: (24.2 ± 1.8) °C
  Humidity: (49 ± 4) % R.H.
  Atmospheric Pressure: (100.7 ± 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. :** ETLE180504.0437

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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 C63.4-2014 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 C63.4-2014 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 C63.4-2014) was used in determining radiated and conducted emissions from the Uniden America Corporation, Model: DFR9.

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2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the RADAR DETECTOR (model: DFR9).

The model DFR9 is basic model that was tested.

The multiple models DFR8 are identical to basic model, except for model designation and GPS module.

The model differences are same with below table;

Model name	GPS module *
DFR9 (Basic model)	O
DFR8	X

* O: Existence, X: Nonexistence

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2.2 General Specification

Receiver Type	
Radar	Double Conversion Superheterodyne Self-Contained Antenna
Laser	Pulsed 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	Voice and Beep (Detected Band and Signal strength)
Antenna Type	
Radar	Linear Polarized E-vector Vertical
Laser Front	Convex Condenser Lens
Laser Back	Concave Condenser Lens
General	
Dimensions	126mm (D) x 79 mm (W) x 36 mm (H)
Weight	6 oz (170g)
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

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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 C63.4-2014. 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 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.

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3.2 Radiated Emission Measurement

Radiated emission measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2014. 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.

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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 equipment under test was operated during the measurement under following conditions:

■ Data update mode (Program: R3 DB Update Program V1.00)

4.3 Support Equipment Used

Description	Model Name	Serial No.	Manufacturer	FCC
Notebook Computer	6550b	CNU1240QRZ	Hewlett-Packard Company	-
Adapter (for Notebook Computer)	Series PPP014H-S	F129411202227 08	Hipro Electronics(Dongguan) 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	Micro USB	1.2	Unshielded	X
Notebook Computer	Adapter	DC Input	1.2	Shielded	O

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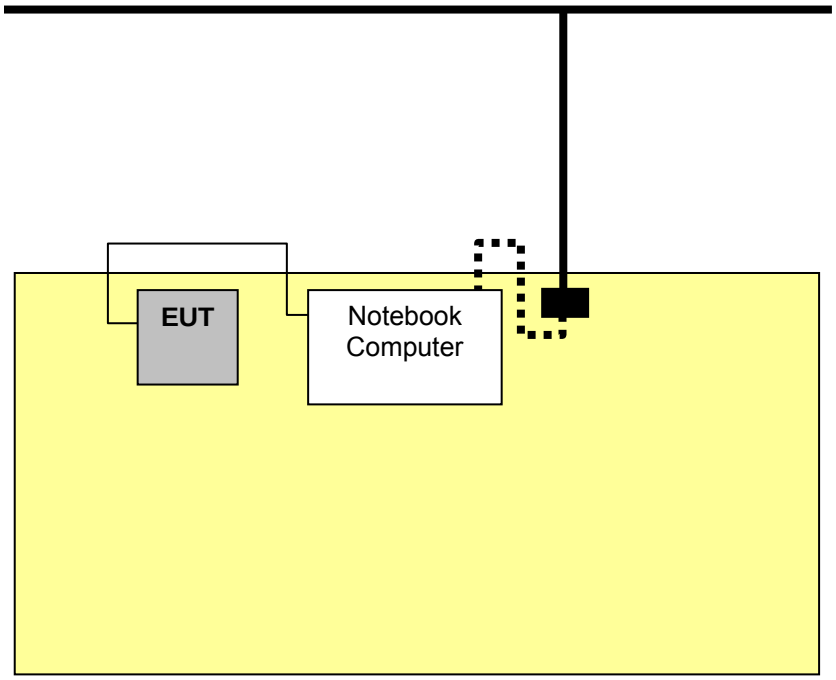
4.5 The setup drawing(s)



: Data Line

: AC Power Line

: DC Power Line

: Adapter

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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),(d)	Conducted Emission Measurement	**Passed by 13.77 dB ***
15.109(a)	Radiated Emission Measurement (Below 1 GHz)	**Passed by 3.26 dB**
15.109(a)	Radiated Emission Measurement (Above 1 GHz)	**Passed by 17.42 dB**

* This test was tested at host computer (EUT was connected USB port of the host computer).

The data collected shows that the **Uniden America Corporation / RADAR DETECTOR / DFR9** complies with technical requirements of above rules part 15.107(a),(d) 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.

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5.2 Conducted Emissions Measurement

5.2.1 Conducted Emissions Data

EUT	RADAR DETECTOR / DFR9 (S/N: Proto-type)
Limit apply to	FCC Part 15.107(a),(d) Class B
Test Date	May 17, 2018
Environmental of test	(22.4 ± 0.0) °C, (45 ± 0) % R.H., (100.4 ± 0.0) kPa
Operating Condition	Data update mode (Program: R3 DB Update Program V1.00)
Result	Passed by 13.77 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, LISN 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),(d) Class B.**
5. **If the Quasi-Peak limit is met when using a Peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the Quasi-Peak detector receiver is unnecessary.**
6. **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.**

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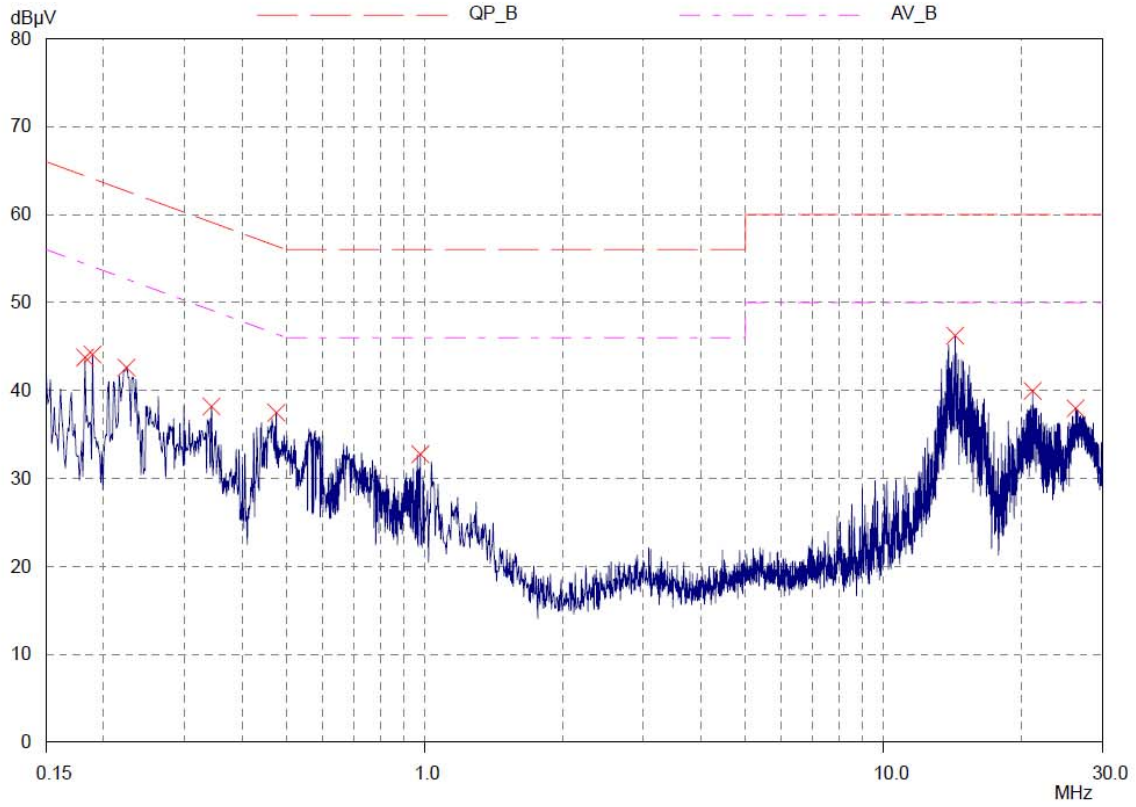
Line: HOT

ETL EMC Laboratory

Conducted Emission Test Result

EUT:	ETLE180504.0437
Manuf:	
Op Cond:	
Operator:	
Test Spec:	
Comment:	HOT

Prescan Measurement:	Detector:	X PK
	Meas Time:	see scan settings
	Peaks:	16
	Acc Margin:	10 dB



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ETL EMC Laboratory

Conducted Emission Test Result

EUT: ETLE180504.0437
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: HOT

Prescan Measurement: Detector: X PK
Meas Time: see scan settings
Peaks: 16
Acc Margin: 10 dB

Peak Search Results

Frequency MHz	PK Level dBµV	PK Limit dBµV	PK Delta dB
0.182	43.74	64.39	20.65
0.189	44.08	64.08	20.00
0.224	42.60	62.67	20.07
0.343	38.17	59.13	20.96
0.475	37.47	56.43	18.96
0.979	32.74	56.00	23.26
14.32	46.23	60.00	13.77
21.12	39.94	60.00	20.06
26.22	37.96	60.00	22.04

* limit exceeded

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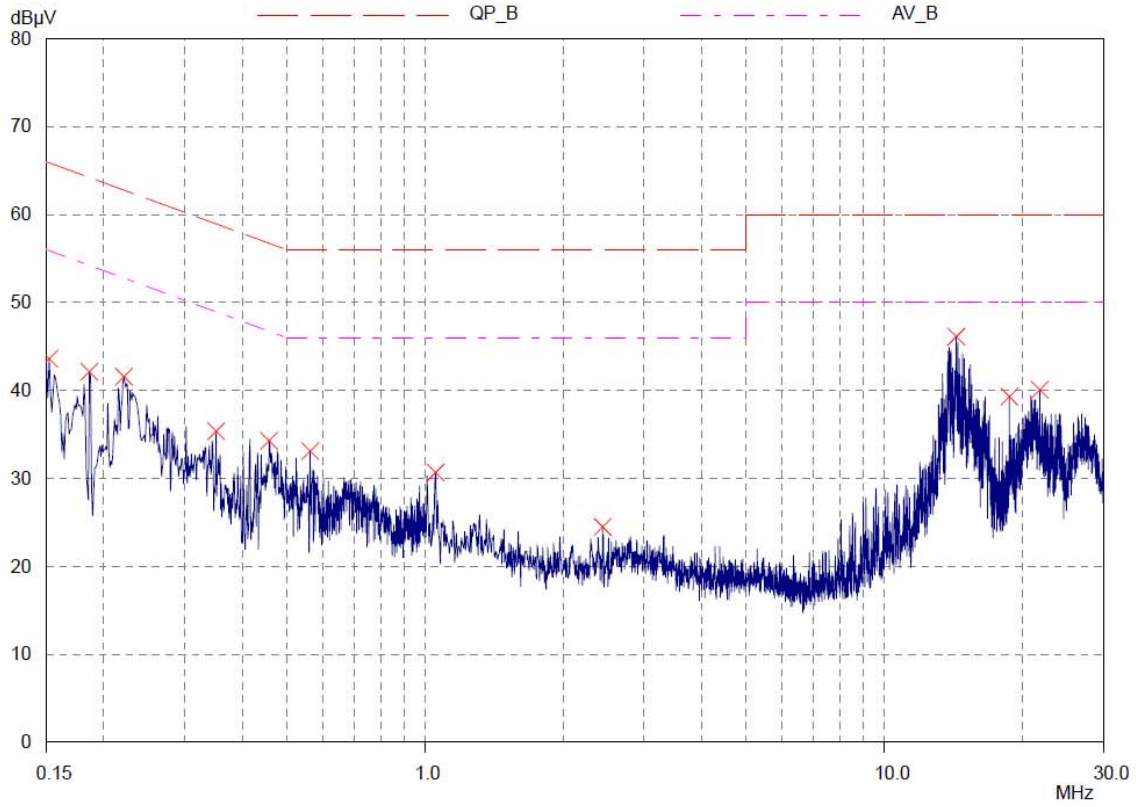
Line: Neutral

ETL EMC Laboratory

Conducted Emission Test Result

EUT: ETLE180504.0437
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: NEUTRAL

Prescan Measurement: Detector: X PK
Meas Time: see scan settings
Peaks: 16
Acc Margin: 10 dB



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ETL EMC Laboratory

Conducted Emission Test Result

EUT: ETLE180504.0437
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: NEUTRAL

Prescan Measurement: Detector: X PK
Meas Time: see scan settings
Peaks: 16
Acc Margin: 10 dB

Peak Search Results

Frequency MHz	PK Level dBµV	PK Limit dBµV	PK Delta dB
0.152	43.61	65.89	22.28
0.186	42.10	64.21	22.11
0.221	41.57	62.78	21.21
0.351	35.37	58.94	23.57
0.458	34.28	56.73	22.45
0.562	33.09	56.00	22.91
1.055	30.65	56.00	25.35
2.435	24.49	56.00	31.51
14.33	46.12	60.00	13.88
18.7	39.29	60.00	20.71
21.77	40.08	60.00	19.92

* limit exceeded

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5.3 Radiated Emissions Measurement

5.3.1 Radiated Emissions Data

- Below 1 GHz

EUT	RADAR DETECTOR / DFR9 (S/N: Proto-type)
Limit apply to	FCC Part 15.109(a) Class B
Test Date	May 15, 2018
Environmental of test	(25.4 ± 0.1) °C, (51 ± 1) % R.H., (101.0 ± 0.0) kPa
Operating Condition	Data update mode (Program: R3 DB Update Program V1.00)
Result	Passed by 3.26 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]
43.54	50.99	V	13.03	-32.44	100	31.58	40.00	8.42
120.01	63.07	V	9.28	-32.11	100	40.24	43.50	3.26
143.85	62.49	V	7.81	-31.89	111	38.41	43.50	5.09
239.99	56.12	H	12.67	-31.81	350	36.98	46.00	9.02
300.00	50.46	H	13.69	-31.68	291	32.47	46.00	13.53
337.19	54.01	H	14.55	-31.57	270	36.99	46.00	9.01
384.84	55.65	H	15.65	-31.43	256	39.87	46.00	6.13

NOTES:

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

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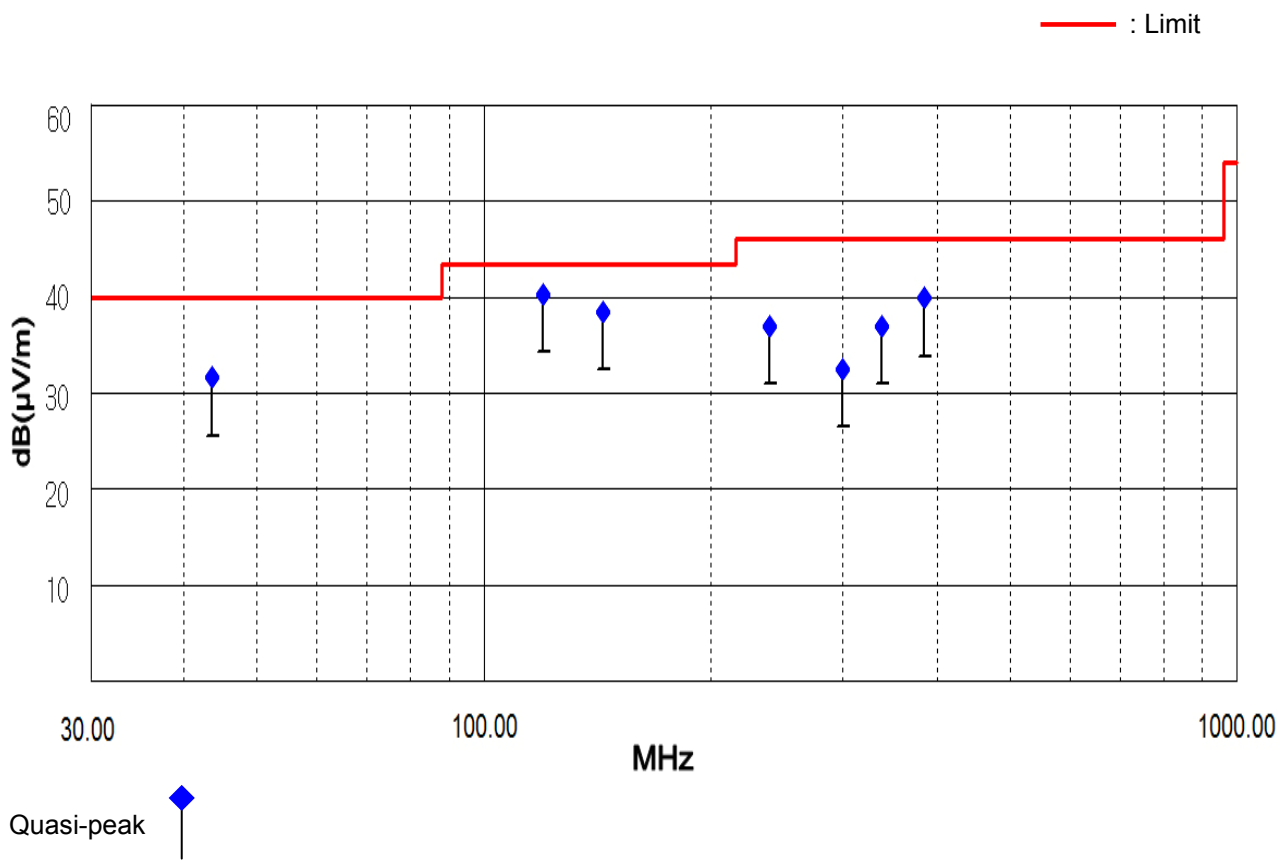

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- Above 1 GHz

EUT	RADAR DETECTOR / DFR9 (S/N: Proto-type)
Limit apply to	FCC Part 15.109(a) Class B
Test Date	May 15, 2018
Environmental of test	(25.9 ± 0.1) °C, (51 ± 1) % R.H., (101.0 ± 0.0) kPa
Operating Condition	Data update mode (Program: R3 DB Update Program V1.00)
Result	Passed by 17.42 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

Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Height [cm]	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average					Peak	Average	Peak	Average	Peak	Average
1 327.36	65.54	42.87	V	100	25.58	-39.76	51.36	28.69	74.00	54.00	22.64	25.31
1 502.00	60.95	50.15	H	100	25.95	-39.52	47.38	36.58	74.00	54.00	26.62	17.42
1 502.00	63.13	47.82	V	100	25.95	-39.52	49.56	34.25	74.00	54.00	24.44	19.75
1 601.00	62.60	43.60	V	100	26.01	-39.36	49.25	30.25	74.00	54.00	24.75	23.75
1 671.54	63.56	41.89	V	100	26.06	-39.26	50.36	28.69	74.00	54.00	23.64	25.31
1 795.63	61.07	40.40	V	100	26.13	-39.06	48.14	27.47	74.00	54.00	25.86	26.53
2 666.84	63.58	39.87	V	100	27.69	-37.58	53.69	29.98	74.00	54.00	20.31	24.02
4 791.56	52.54	37.11	V	100	31.31	-34.65	49.20	33.77	74.00	54.00	24.80	20.23

NOTES:

1. *** H : Horizontal polarization , **V : Vertical polarization**
2. **The cable loss value was included the Amp. Gain.**
3. **Result = Reading + Antenna factor + Cable loss**
4. **Margin value = Limit - Result**
5. **The measurement was performed for the frequency range 1 GHz ~ 6 GHz according to FCC Part 15.109(a) Class B.**
6. **Upper frequency of measurement range: 5th harmonic of the highest frequency.**

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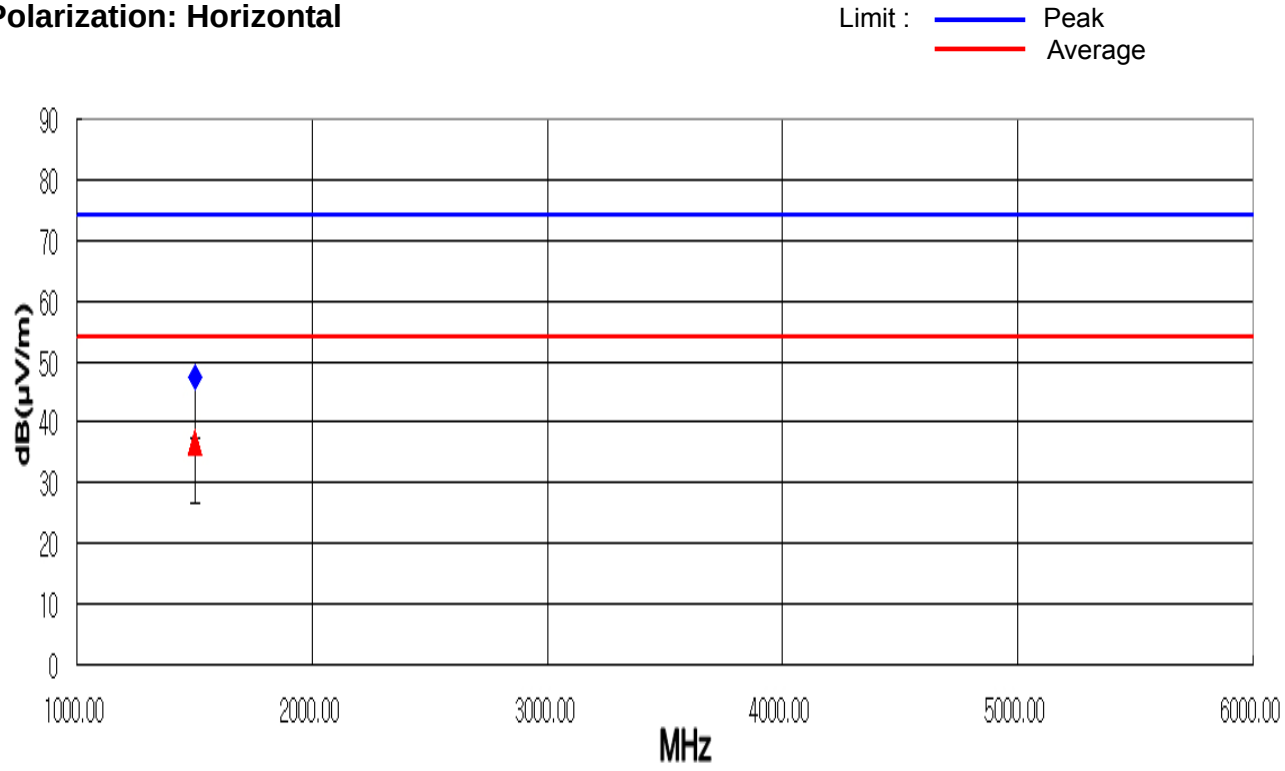
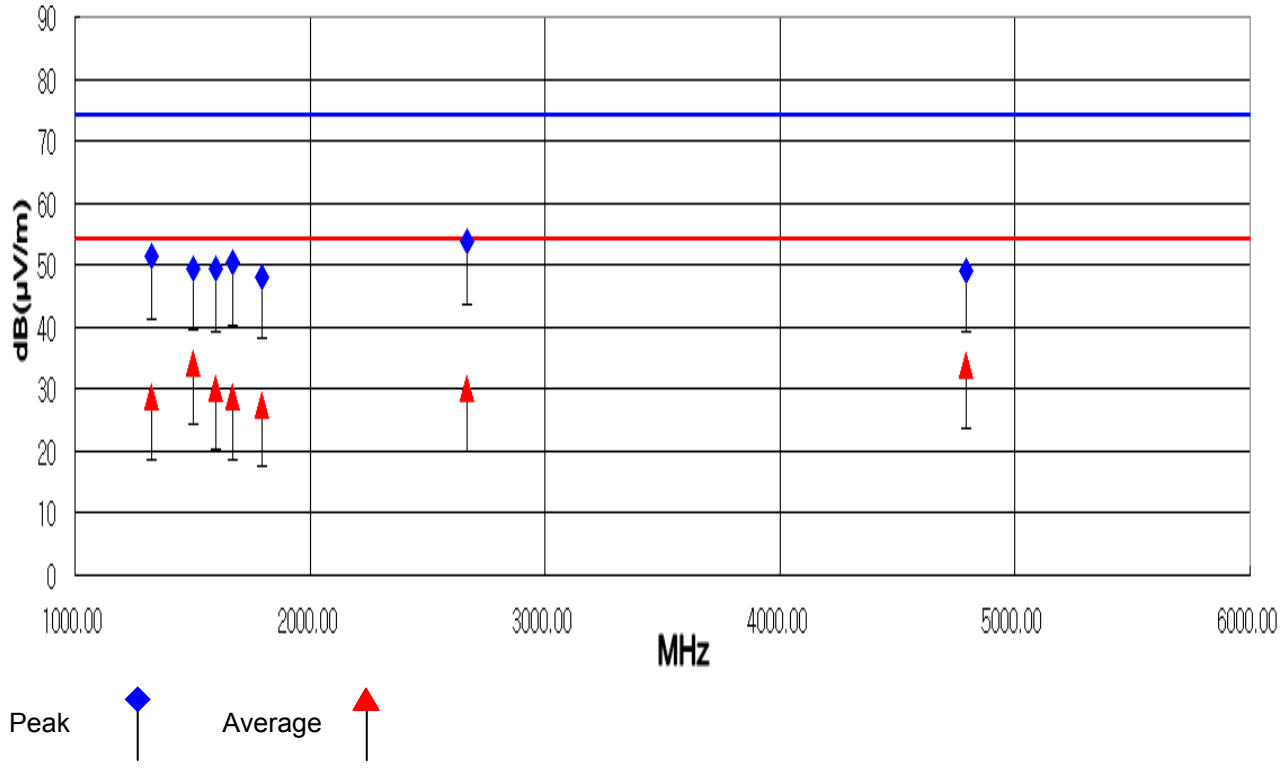
Polarization: Horizontal



Polarization: Vertical



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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

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor - Preamplifier Factor

$dB(\mu V) = 20 \log_{10} (\mu V)$: Equation
dB(μV) = dBm + 107

Example : @ 120.01 MHz

Class B Limit	= 43.50 dB(μV/m)	
Reading	= 63.07 dB(μV)	
Antenna Factor + (Cable Loss - Amp. Gain)		= 9.28 + (-32.11) = -22.83 dB(μV/m)
Total		= 40.24 dB(μV/m)
Margin	= 43.50 – 40.24 = 3.26 dB	
	= 3.26 dB below Limit	

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7. List of test equipments used for measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
☒	EMI Test Receiver	ESPI3	R&S	100478	17.08.31	18.08.31
☒	EMI Test Receiver	ESCS30	R&S	100087	18.03.12	19.03.12
☒	EMI Test Receiver	ESCI7	R&S	100851	17.08.31	18.08.31
☒	Two-Line V-Network	ENV216	R&S	102055	18.03.12	19.03.12
☒	Amplifier	BLWA 0310-1	BONN Elektronik	045672	18.01.31	19.01.31
☒	Horn Antenna	BBHA 9120D	Schwarzbeck	826	18.03.29	20.03.29
☒	Amplifier	TK-PA18	TESTEK.	120020	17.09.01	18.09.01
☒	Bi-Log Antenna	VULB9163	Schwarzbeck	01069	17.02.17	19.02.17
☒	Turn-Table	TT 1.35 SI	SES	-	N/A	N/A
☒	Antenna Master	AM 4.5	SES	-	N/A	N/A

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