



Test report No. : 32EE0108-HO-01-R2
Page : 1 of 16
Issued date : January 24, 2012
Revised date : February 14, 2012
FCC ID : A7HYOS-3807

RADIO TEST REPORT

Test Report No. : 32EE0108-HO-01-R2

Applicant : YOKOWO CO.,LTD.

Type of Equipment : Short Range Radar

Model No. : YOS-3807

FCC ID : A7HYOS-3807

Test regulation : FCC Part 15 Subpart C: 2012

Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 32EE0108-HO-01-R1. 32EE0108-HO-01-R1 is replaced with this report.

Date of test: December 23 and 25, 2011

Representative test engineer:

Hironobu Ohnishi
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

13-EM-F0429

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SECTION 1: Customer information

Company Name : YOKOWO CO.,LTD.
Address : No.5-11 Takinogawa 7-chome, Kita-ku, Tokyo 114-8515, Japan
Telephone Number : +81-3-3916-3111
Facsimile Number : +81-3-3916-3184
Contact Person : Yui Koda

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Short Range Radar
Model No. : YOS-3807
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC12V
Receipt Date of Sample : December 22, 2011
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Feature of EUT

Short Range Radar is mounted on the vehicle.

General Specification

Clock frequency(ies) in the system : 20MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 24.085GHz - 24.165GHz
Modulation : ASK
Power Supply (radio part input) : DC5.0V, DC-0.4V
Antenna type : PCB Antenna
Antenna Gain : 16dBi

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

| | | |
|--------------------|---|---|
| Test Specification | : | FCC Part 15 Subpart C: 2012, final revised on February 1, 2012 |
| Title | : | FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.245 Operation within the bands 902 – 928MHz, 2435 – 2465MHz, 5785 – 5815MHz, 10500 – 10550MHz, and 24075 – 24175MHz. |

*The revision on February 1, 2012 does not affect the test specification applied to the EUT.

3.2 Procedures and results

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|--|---|-----------------------------------|----------|----------|
| Conducted Emission | FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements IC: RSS-Gen 7.2.4 | FCC: Section 15.207 IC: RSS-Gen 7.2.4 | N/A *1) | N/A | N/A |
| Electric Field Strength of Fundamental Emission | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.8 | FCC: Section15.245(b) IC: RSS-210 A7.1 RSS-Gen 7.2.3 | 26.6dB 24151.550MHz, AV, Hori. | Complied | Radiated |
| Electric Field Strength of Spurious Emission | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.9 | FCC: Section 15.205 Section 15.209 Section 15.245(b) IC: RSS-210 A7.1, A7.2 RSS-Gen 7.2.5 | 2.2dB 24175.000MHz, PK, Hori. | Complied | Radiated |
| -20dB Bandwidth | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: - | FCC: Section15.215(c) IC: Reference data | See Data | Complied | Radiated |

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

This EUT provides stable voltage (DC5.0V, DC-0.4V) constantly to RF Part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|------------------------|-------------------|-------------------|--------------|---------|----------|
| 99% Occupied Bandwidth | IC: RSS-Gen 4.6.1 | IC: RSS-Gen 4.6.1 | N/A | - | Radiated |

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

| Test room (semi-anechoic chamber) | Radiated emission | | | | | | |
|--------------------------------------|-------------------|-----------------|----------------|-----------------|-------------------|-------------------|-------|
| | (3m*)(+dB) | | | (1m*)(+dB) | | (0.5m*)(+dB) | |
| 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz | 1GHz -10GHz | 10GHz -18GHz | 18GHz -26.5GHz | 26.5GHz -40GHz | |
| No.1 | 4.2dB | 5.0dB | 5.1dB | 5.6dB | 5.9dB | 4.4dB | 4.3dB |
| No.2 | 4.1dB | 5.2dB | 5.1dB | 5.7dB | 5.8dB | 4.3dB | 4.2dB |
| No.3 | 4.5dB | 5.0dB | 5.2dB | 5.7dB | 5.8dB | 4.5dB | 4.2dB |
| No.4 | 4.7dB | 5.2dB | 5.2dB | 5.7dB | 5.8dB | 5.1dB | 4.2dB |

*3m/1m/0.5m = Measurement distance

| Radiated emission (+dB) | |
|-------------------------|-------|
| 40GHz-50GHz | 3.9dB |
| 50GHz-75GHz | 5.1dB |
| 75GHz-110GHz | 5.4dB |

Radiated emission test(3m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

| | FCC Registration Number | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms |
|----------------------------|-------------------------|------------------------|----------------------------|--|------------------------|
| No.1 semi-anechoic chamber | 313583 | 2973C-1 | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | No.1 Power source room |
| No.2 semi-anechoic chamber | 655103 | 2973C-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 148738 | 2973C-3 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.3 Preparation room |
| No.3 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.4 semi-anechoic chamber | 134570 | 2973C-4 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.4 Preparation room |
| No.4 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.5 semi-anechoic chamber | - | - | 6.0 x 6.0 x 3.9m | 6.0 x 6.0m | - |
| No.6 shielded room | - | - | 4.0 x 4.5 x 2.7m | 4.75 x 5.4 m | - |
| No.6 measurement room | - | - | 4.75 x 5.4 x 3.0m | 4.75 x 4.15 m | - |
| No.7 shielded room | - | - | 4.7 x 7.5 x 2.7m | 4.7 x 7.5m | - |
| No.8 measurement room | - | - | 3.1 x 5.0 x 2.7m | N/A | - |
| No.9 measurement room | - | - | 8.0 x 4.5 x 2.8m | 2.0 x 2.0m | - |
| No.10 measurement room | - | - | 2.6 x 2.8 x 2.5m | 2.4 x 2.4m | - |
| No.11 measurement room | - | - | 3.1 x 3.4 x 3.0m | 2.4 x 3.4m | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up.

Refer to APPENDIX.

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

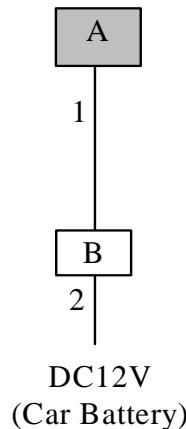
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode: 1) Side looking mode
2) Rear looking mode

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|-----|-------------------|--------------|---------------|-----------------|---------|
| A | Short Range Radar | YOS-3807 | 1 | YOKOWO CO.,LTD. | EUT |
| B | Jig | - | - | YOKOWO CO.,LTD. | - |

List of cables used

| No. | Name | Length (m) | Shield | | Remark |
|-----|---------------------|------------|------------|------------|--------|
| | | | Cable | Connector | |
| 1 | DC and Signal Cable | 7.9 | Unshielded | Unshielded | - |
| 2 | DC Cable | 0.7 | Unshielded | Unshielded | - |

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m (40GHz – 100GHz: 0.5m by 0.5m), raised 0.8m (40GHz – 100GHz: 1.5m) above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane. The height of the measuring antenna varied between 1 and 4m (frequency 9kHz – 30MHz: loop antenna was fixed height at 1.0m) and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength. The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table. When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

| Frequency | Below 30MHz | 30MHz to 300MHz | 300MHz to 1GHz | Above 1GHz |
|--------------|-------------|-----------------|----------------|------------|
| Antenna Type | Loop | Biconical | Logperiodic | Horn |

| Frequency | 9kHz-150kHz | 150kHz-30MHz | 30MHz-1GHz | 1GHz-100GHz |
|-----------------|---------------|---------------|---------------|--|
| Instrument used | Test Receiver | Test Receiver | Test Receiver | Spectrum Analyzer |
| Detector | QP, AV | QP, AV | QP | Peak Average |
| IF Bandwidth | BW 200Hz | BW 9kHz | BW 120kHz | RBW: 1MHz VBW: 3MHz |
| Test Distance | 3m | 3m | 3m | 3m (below 10GHz), 1m*1) (10GHz – 40GHz), 0.5m*2) (40GHz – 50GHz), 0.3m*3) (above 50GHz) |

*1) Distance Factor: $20 \times \log (3.0m/1.0m) = 9.5dB$

*2) Distance Factor: $20 \times \log (3.0m/0.5m) = 15.6dB$

*3) Distance Factor: $20 \times \log (3.0m/0.3m) = 20.0dB$

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[About the carrier measurement]

The carrier levels were confirmed at maximum direction of transmission. The maximum direction was searched under carefully since beam-widths are extremely narrow.

The carrier levels were measured in the far field. The distance of the fair field was calculated from follow equation.

$$r = \frac{2D^2}{\lambda}$$

where

r is the distance from the radiating element of the EUT to the edge of the far field, in m

D is the largest dimension of both the radiating element and the test antenna (horn), in m

Lambda is the wavelength of the emission under investigation [300/f (MHz)], in m

| Frequency [GHz] | Lambda [mm] | Maximum Dimention D [m] | Far Field Boundary r [m] |
|--------------------|----------------|-------------------------------|--------------------------------|
| 24.2 | 12.4 | 0.073 | 0.900 |

The test was made on EUT at the normal use position.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 9kHz-100GHz
Test data : APPENDIX
Test result : Pass

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SECTION 6: 20dB Bandwidth and 99% Occupied bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

| Test | Span | RBW | VBW | Sweep | Detector | Trace | Instrument used |
|------------------------|-------|--------|--------|-------|----------|----------|-------------------|
| 20dB Bandwidth | 10MHz | 100kHz | 300kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied bandwidth | 10MHz | 100kHz | 300kHz | Auto | Sample | Single | Spectrum Analyzer |

Test data : APPENDIX 1
Test result : Pass

APPENDIX 1: Data of EMI test

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

| | | | | | | | |
|-----------------------|---|--|--|--|--------------------|--|--|
| Test place | Head Office EMC Lab. No.3 Semi Anechoic Chamber | | | | | | |
| Report No. | 32EE0108-HO-01 | | | | | | |
| Date | 12/23/2011 | | | | 12/25/2011 | | |
| Temperature/ Humidity | 20 deg. C / 30% RH | | | | 22 deg. C / 33% RH | | |
| Engineer | Hironobu Ohnishi | | | | | | |
| | 1GHz – 100GHz | | | | 9kHz – 1GHz | | |
| Mode | Side looking mode | | | | | | |

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|------------------------|-----------------------|
| Hori | 37.459 | QP | 24.7 | 15.9 | 7.2 | 32.2 | 15.6 | 40.0 | 24.4 | |
| Hori | 40.796 | QP | 24.2 | 14.6 | 7.3 | 32.2 | 13.9 | 40.0 | 26.1 | |
| Hori | 184.690 | QP | 31.3 | 16.4 | 9.0 | 32.0 | 24.7 | 43.5 | 18.8 | |
| Hori | 12075.390 | PK | 45.2 | 37.6 | -4.0 | 32.8 | 46.0 | 73.9 | 27.9 | |
| Hori | 24075.000 | PK | 65.6 | 38.6 | -1.7 | 31.6 | 70.9 | 73.9 | 3.0 * 1) | |
| Hori | 24151.550 | PK | 105.8 | 38.6 | -1.7 | 31.5 | 111.2 | 147.9 | 36.7 * 1), Fundamental | |
| Hori | 24175.000 | PK | 66.3 | 38.6 | -1.7 | 31.5 | 71.7 | 73.9 | 2.2 * 1) | |
| Hori | 48301.580 | PK | 71.9 | 40.4 | -3.2 | 22.9 | 86.2 | 107.9 | 21.7 * 1) | |
| Hori | 60377.210 | PK | 15.9 | 41.6 | 24.3 | 26.6 | 55.2 | 73.9 | 18.7 | |
| Hori | 72452.630 | PK | 23.6 | 41.7 | 28.0 | 5.0 | 88.3 | 107.9 | 19.6 * 1) | |
| Hori | 96603.580 | PK | 33.4 | 45.6 | 26.5 | 28.7 | 76.8 | 97.5 | 20.7 * 1) | |
| Hori | 12075.390 | AV | 38.7 | 37.6 | -4.0 | 32.8 | 39.5 | 53.9 | 14.4 | VBW=10Hz |
| Hori | 24075.000 | AV | 42.5 | 38.6 | -1.7 | 31.6 | 47.8 | 53.9 | 6.1 | VBW=10Hz |
| Hori | 24151.550 | AV | 95.7 | 38.6 | -1.7 | 31.5 | 101.1 | 127.9 | 26.8 | VBW=10Hz, Fundamental |
| Hori | 24175.000 | AV | 43.2 | 38.6 | -1.7 | 31.5 | 48.6 | 53.9 | 5.3 | VBW=10Hz |
| Hori | 48301.580 | AV | 60.8 | 40.4 | -3.2 | 22.9 | 75.1 | 87.9 | 12.8 | VBW=10Hz |
| Hori | 60377.210 | AV | 9.8 | 41.6 | 24.3 | 26.6 | 49.1 | 53.9 | 4.8 | VBW=10Hz |
| Hori | 72452.630 | AV | 3.6 | 41.7 | 28.0 | 5.0 | 68.3 | 87.9 | 19.6 | VBW=10Hz |
| Hori | 96603.580 | AV | 20.3 | 45.6 | 26.5 | 28.7 | 63.7 | 77.5 | 13.8 | VBW=10Hz |
| Vert | 37.459 | QP | 32.8 | 15.9 | 7.2 | 32.2 | 23.7 | 40.0 | 16.3 | |
| Vert | 40.796 | QP | 32.8 | 14.6 | 7.3 | 32.2 | 22.5 | 40.0 | 17.5 | |
| Vert | 184.690 | QP | 25.0 | 16.4 | 9.0 | 32.0 | 18.4 | 43.5 | 25.1 | |
| Vert | 12075.390 | PK | 49.1 | 37.6 | -4.0 | 32.8 | 49.9 | 73.9 | 24.0 | |
| Vert | 24075.000 | PK | 58.6 | 38.6 | -1.7 | 31.6 | 63.9 | 73.9 | 10.0 * 1) | |
| Vert | 24151.550 | PK | 92.1 | 38.6 | -1.7 | 31.5 | 97.5 | 147.9 | 50.4 * 1), Fundamental | |
| Vert | 24175.000 | PK | 58.8 | 38.6 | -1.7 | 31.5 | 64.2 | 73.9 | 9.7 * 1) | |
| Vert | 48301.580 | PK | 67.1 | 40.4 | -3.2 | 22.9 | 81.4 | 107.9 | 26.5 * 1) | |
| Vert | 60377.210 | PK | 14.5 | 41.6 | 24.3 | 26.6 | 53.8 | 73.9 | 20.1 | |
| Vert | 72452.630 | PK | 22.1 | 41.7 | 28.0 | 5.0 | 86.8 | 107.9 | 21.1 * 1), No signal. | |
| Vert | 96603.580 | PK | 29.9 | 45.6 | 26.5 | 28.7 | 73.3 | 97.5 | 24.2 * 1) | |
| Vert | 12075.390 | AV | 44.3 | 37.6 | -4.0 | 32.8 | 45.1 | 53.9 | 8.8 | VBW=10Hz |
| Vert | 24075.000 | AV | 35.3 | 38.6 | -1.7 | 31.6 | 40.6 | 53.9 | 13.3 | VBW=10Hz |
| Vert | 24151.550 | AV | 82.0 | 38.6 | -1.7 | 31.5 | 87.4 | 127.9 | 40.5 | VBW=10Hz, Fundamental |
| Vert | 24175.000 | AV | 35.5 | 38.6 | -1.7 | 31.5 | 40.9 | 53.9 | 13.0 | VBW=10Hz |
| Vert | 48301.580 | AV | 55.1 | 40.4 | -3.2 | 22.9 | 69.4 | 87.9 | 18.5 | VBW=10Hz |
| Vert | 60377.210 | AV | 6.0 | 41.6 | 24.3 | 26.6 | 45.3 | 53.9 | 8.6 | VBW=10Hz |
| Vert | 72452.630 | AV | 0.6 | 41.7 | 28.0 | 5.0 | 65.3 | 87.9 | 22.6 | No signal. |
| Vert | 96603.580 | AV | 15.0 | 45.6 | 26.5 | 28.7 | 58.4 | 77.5 | 19.1 | VBW=10Hz |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Distance factor: 10GHz-40GHz $20\log(3.0m/1.0m) = 9.5dB$

40GHz-50GHz $20\log(3.0m/0.5m) = 15.6dB$

50GHz-100GHz $20\log(3.0m/0.3m) = 20.0dB$

*4th harmonics exceeded the limit of § 15.209, but as its operation is limited to specific activities of limited duration, the limit of Spurious emission complied based on §15.245(b)(i)(iii)

*1) 10 dB was added to the reading value, since the spectrum analyzer might not accurately measure the peak emission.

More details are shown on page 14.

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

| | | | | | | | |
|-----------------------|---|--|--|--------------------|--|--|--|
| Test place | Head Office EMC Lab. No.3 Semi Anechoic Chamber | | | | | | |
| Report No. | 32EE0108-HO-01 | | | | | | |
| Date | 12/23/2011 | | | 12/25/2011 | | | |
| Temperature/ Humidity | 20 deg. C / 30% RH | | | 22 deg. C / 33% RH | | | |
| Engineer | Hironobu Ohnishi | | | Hironobu Ohnishi | | | |
| | 1GHz – 100GHz | | | 9kHz – 1GHz | | | |
| Mode | Rear looking mode | | | | | | |

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|------------------------|-----------------------|
| Hori | 37.528 | QP | 25.1 | 15.8 | 7.2 | 32.2 | 15.9 | 40.0 | 24.1 | |
| Hori | 41.328 | QP | 24.1 | 14.4 | 7.3 | 32.2 | 13.6 | 40.0 | 26.4 | |
| Hori | 184.946 | QP | 31.1 | 16.4 | 9.0 | 32.0 | 24.5 | 43.5 | 19.0 | |
| Hori | 12075.390 | PK | 44.8 | 37.6 | -4.0 | 32.8 | 45.6 | 73.9 | 28.3 | |
| Hori | 24075.000 | PK | 65.6 | 38.6 | -1.7 | 31.6 | 70.9 | 73.9 | 3.0 * 1) | |
| Hori | 24151.550 | PK | 105.9 | 38.6 | -1.7 | 31.5 | 111.3 | 147.9 | 36.6 * 1), Fundamental | |
| Hori | 24175.000 | PK | 65.9 | 38.6 | -1.7 | 31.5 | 71.3 | 73.9 | 2.6 * 1) | |
| Hori | 48301.610 | PK | 72.0 | 40.4 | -3.2 | 22.9 | 86.3 | 107.9 | 21.6 * 1) | |
| Hori | 60376.990 | PK | 16.2 | 41.6 | 24.3 | 26.6 | 55.5 | 73.9 | 18.4 | |
| Hori | 72452.370 | PK | 23.2 | 41.7 | 28.0 | 5.0 | 87.9 | 107.9 | 20.0 * 1) | |
| Hori | 96603.580 | PK | 33.0 | 45.6 | 26.5 | 28.7 | 76.4 | 97.5 | 21.1 * 1) | |
| Hori | 12075.390 | AV | 38.9 | 37.6 | -4.0 | 32.8 | 39.7 | 53.9 | 14.2 | VBW=10Hz |
| Hori | 24075.000 | AV | 42.8 | 38.6 | -1.7 | 31.6 | 48.1 | 53.9 | 5.8 | VBW=10Hz |
| Hori | 24151.550 | AV | 95.9 | 38.6 | -1.7 | 31.5 | 101.3 | 127.9 | 26.6 | VBW=10Hz, Fundamental |
| Hori | 24175.000 | AV | 43.1 | 38.6 | -1.7 | 31.5 | 48.5 | 53.9 | 5.4 | VBW=10Hz |
| Hori | 48301.610 | AV | 60.7 | 40.4 | -3.2 | 22.9 | 75.0 | 87.9 | 12.9 | VBW=10Hz |
| Hori | 60376.990 | AV | 10.2 | 41.6 | 24.3 | 26.6 | 49.5 | 53.9 | 4.4 | VBW=10Hz |
| Hori | 72452.370 | AV | 4.1 | 41.7 | 28.0 | 5.0 | 68.8 | 87.9 | 19.1 | VBW=10Hz |
| Hori | 96603.580 | AV | 20.0 | 45.6 | 26.5 | 28.7 | 63.4 | 77.5 | 14.1 | VBW=10Hz |
| Vert | 37.528 | QP | 34.0 | 15.8 | 7.2 | 32.2 | 24.8 | 40.0 | 15.2 | |
| Vert | 41.328 | QP | 32.6 | 14.4 | 7.3 | 32.2 | 22.1 | 40.0 | 17.9 | |
| Vert | 184.946 | QP | 25.3 | 16.4 | 9.0 | 32.0 | 18.7 | 43.5 | 24.8 | |
| Vert | 12075.390 | PK | 48.7 | 37.6 | -4.0 | 32.8 | 49.5 | 73.9 | 24.4 | |
| Vert | 24075.000 | PK | 58.7 | 38.6 | -1.7 | 31.6 | 64.0 | 73.9 | 9.9 * 1) | |
| Vert | 24151.550 | PK | 91.5 | 38.6 | -1.7 | 31.5 | 96.9 | 147.9 | 51.0 * 1), Fundamental | |
| Vert | 24175.000 | PK | 57.9 | 38.6 | -1.7 | 31.5 | 63.3 | 73.9 | 10.6 * 1) | |
| Vert | 48301.610 | PK | 67.6 | 40.4 | -3.2 | 22.9 | 81.9 | 107.9 | 26.0 * 1) | |
| Vert | 60376.990 | PK | 14.3 | 41.6 | 24.3 | 26.6 | 53.6 | 73.9 | 20.3 | |
| Vert | 72452.370 | PK | 21.8 | 41.7 | 28.0 | 5.0 | 86.5 | 107.9 | 21.4 * 1), No signal. | |
| Vert | 96603.580 | PK | 30.5 | 45.6 | 26.5 | 28.7 | 73.9 | 97.5 | 23.6 * 1) | |
| Vert | 12075.390 | AV | 44.8 | 37.6 | -4.0 | 32.8 | 45.6 | 53.9 | 8.3 | VBW=10Hz |
| Vert | 24075.000 | AV | 34.8 | 38.6 | -1.7 | 31.6 | 40.1 | 53.9 | 13.8 | VBW=10Hz |
| Vert | 24151.550 | AV | 81.3 | 38.6 | -1.7 | 31.5 | 86.7 | 127.9 | 41.2 | VBW=10Hz, Fundamental |
| Vert | 24175.000 | AV | 35.3 | 38.6 | -1.7 | 31.5 | 40.7 | 53.9 | 13.2 | VBW=10Hz |
| Vert | 48301.610 | AV | 55.1 | 40.4 | -3.2 | 22.9 | 69.4 | 87.9 | 18.5 | VBW=10Hz |
| Vert | 60376.990 | AV | 6.5 | 41.6 | 24.3 | 26.6 | 45.8 | 53.9 | 8.1 | VBW=10Hz |
| Vert | 72452.370 | AV | 0.6 | 41.7 | 28.0 | 5.0 | 65.3 | 87.9 | 22.6 | No signal. |
| Vert | 96603.580 | AV | 15.3 | 45.6 | 26.5 | 28.7 | 58.7 | 77.5 | 18.8 | VBW=10Hz |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Distance factor: 10GHz-40GHz $20\log(3.0m/1.0m) = 9.5dB$
 40GHz-50GHz $20\log(3.0m/0.5m) = 15.6dB$
 50GHz-100GHz $20\log(3.0m/0.3m) = 20.0dB$

*4th harmonics exceeded the limit of § 15.209, but as its operation is limited to specific activities of limited duration, the limit of Spurious emission complied based on §15.245(b)(i)(iii)

*1) 10 dB was added to the reading value, since the spectrum analyzer might not accurately measure the peak emission.

More details are shown on page 14.

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

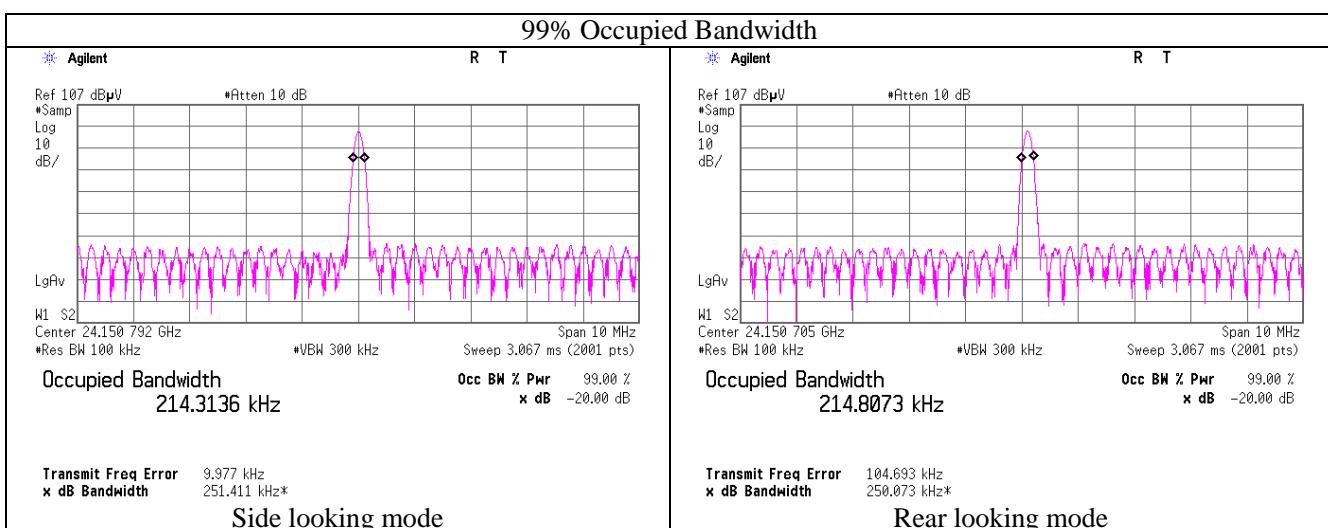
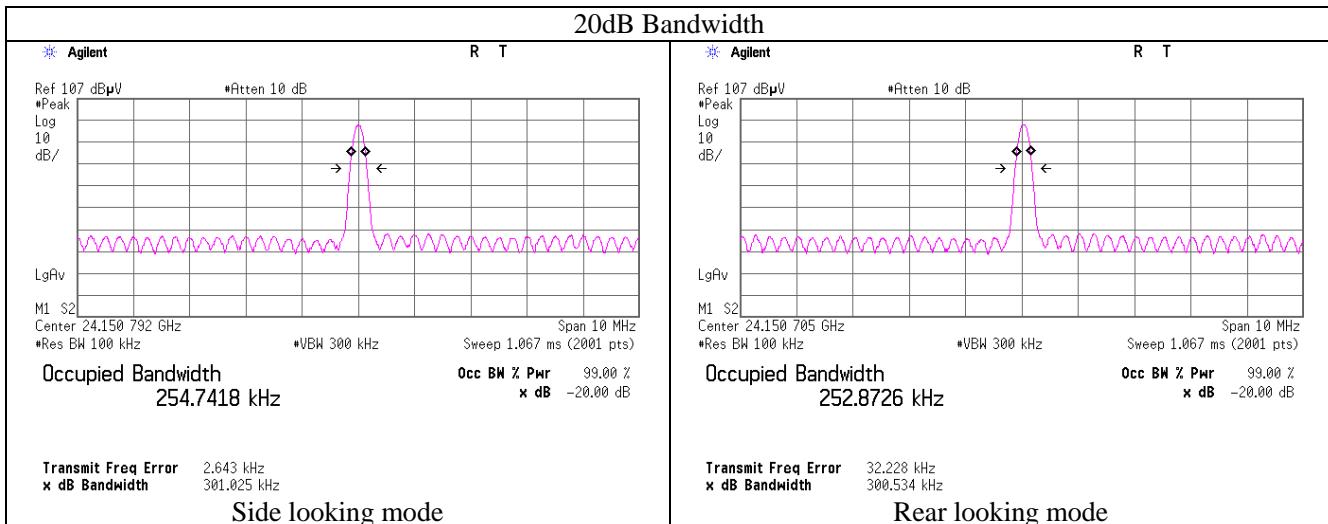
Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

-20dB and 99% Occupied Bandwidth

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
 Report No. 32EE0108-HO
 Date 12/23/2011
 Temperature/ Humidity 20 deg. C / 30% RH
 Engineer Hironobu Ohnishi
 Mode Side / Rear looking mode

| Mode | 20dB Bandwidth [kHz] | 99% Occupied Bandwidth [kHz] |
|-------------------|-------------------------|---------------------------------|
| Side looking mode | 301.025 | 214.314 |
| Rear looking mode | 300.534 | 214.807 |



UL Japan, Inc.

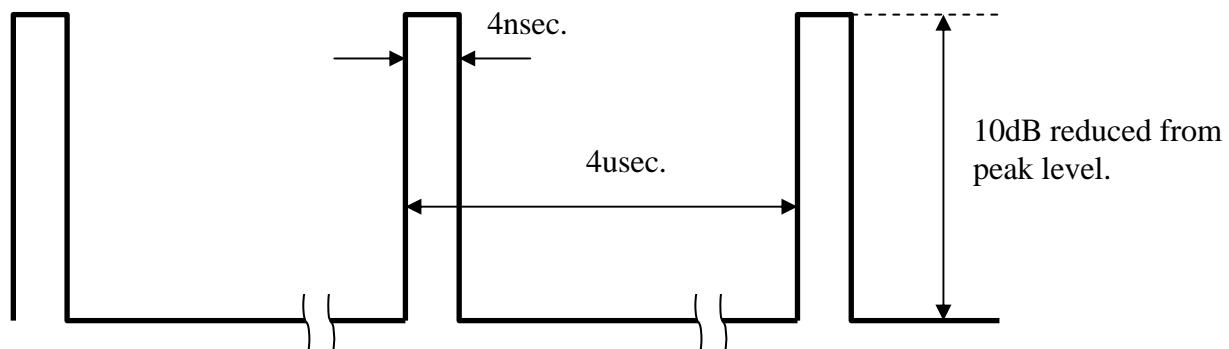
Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

Duty Cycle



The duty cycle was declared by the manufacturer.

The EUT always transmits continuously and has 10dB difference in level except "while both BSI and CTA are not working." means the speed of vehicle is less than 10km/h, and the gear of vehicle is not put into the back.

The transmitting time of peak level is extremely short. Therefore the spectrum analyzer might not accurately measure the peak emission.

However, there is enough margin to the result of fundamental emissions level added 10 dB.

APPENDIX 2: Test Instruments

EMI test equipment

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|-------------|----------------------------------|---------------------|---|---------------------------|-----------|---------------------------------------|
| MAEC-03 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-10005 | RE | 2011/02/22 * 12 |
| MOS-13 | Thermo-Hygrometer | Custom | CTH-180 | - | RE | 2011/02/23 * 12 |
| MJM-06 | Measure | PROMART | SEN1955 | - | RE | |
| COTS-MEMI | EMI measurement program | TSJ | TEPTO-DV | - | RE | - |
| MSA-04 | Spectrum Analyzer | Agilent | E4448A | US44300523 | RE | 2011/04/08 * 12 |
| MHA-20 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 258 | RE | 2011/05/23 * 12 |
| MCC-133 | Microwave Cable | HUBER+SUHNER | SUCOFLEX104 | 336164/4(1m) / 340640(5m) | RE | 2011/09/07 * 12 |
| MPA-11 | MicroWave System Amplifier | Agilent | 83017A | MY39500779 | RE | 2011/03/10 * 12 |
| MHA-16 | Horn Antenna 15-40GHz | Schwarzbeck | BBHA9170 | BBHA9170306 | RE | 2011/05/23 * 12 |
| MCC-05 | Microwave Cable 1G-40GHz 2m | Storm | 421-011 (90-1394-079) | 01-12-002 | RE | 2011/01/20 * 12 |
| MPA-03 | Microwave System Power Amplifier | Agilent | 83050A | 3950M00205 | RE | 2011/06/15 * 12 |
| MHA-07 | Horn Antenna | Custom | HO22R | 10766-01 | RE | 2011/10/31 * 12 |
| MHA-09 | Horn Antenna | WiseWave | ARH1523-02 | 10766-01 | RE | 2011/10/31 * 12 |
| MPA-08 | Pre Amplifier | WiseWave | ALN-61226028-51 | 11576-01-071 | RE | 2011/08/27 * 12 |
| MMX-01 | Preselected Millimeter Mixer | Agilent | 11974V-E01 | 3001A00412 | RE | 2011/06/13 * 12 |
| MHA-11 | Horn Antenna | WiseWave | ARH1023-02 | 10766-01 | RE | 2011/10/31 * 12 |
| MPA-18 | Pre Amplifier | AmTechs Corporation | LNA-7511025 | 9601 | RE | 2011/08/27 * 12 |
| MMX-02 | Harmonic Mixer | Agilent | 11970W | 2521 A01909 | RE | 2011/06/14 * 12 |
| MCC-66 | Microwave Cable 1G-40GHz | Suhner | SUCOFLEX102 | 28636/2 | RE | 2011/04/22 * 12 |
| MCC-67 | Microwave Cable 1G-40GHz | Suhner | SUCOFLEX102 | 28635/2 | RE | 2011/04/22 * 12 |
| MTR-08 | Test Receiver | Rohde & Schwarz | ESCI | 100767 | RE | 2011/08/11 * 12 |
| MLPA-01 | Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100017 | RE | 2011/10/19 * 12 |
| MCC-112 | Coaxial cable | Fujikura/Suhner/TSJ | 5D-2W(10m)/SFM141(3m)/sucuform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher) | -/00640 | RE | 2011/07/15 * 12 |
| MCC-31 | Coaxial cable | UL Japan | - | - | RE | 2011/07/28 * 12 |
| MPA-13 | Pre Amplifier | SONOMA INSTRUMENT | 310 | 260834 | RE | 2011/03/04 * 12 |
| MAT-09 | Attenuator(6dB) | Weinschel Corp | 2 | BK7973 | RE | 2011/11/02 * 12 |
| MBA-03 | Biconical Antenna | Schwarzbeck | BBA9106 | 1915 | RE | 2011/10/15 * 12 |
| MLA-03 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 174 | RE | 2011/10/15 * 12 |
| MCC-51 | Coaxial cable | UL Japan | - | - | RE | 2011/07/15 * 12 |

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: RE: Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission),
-20dB and 99% Occupied Bandwidth

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124