



RADIO TEST REPORT


Test Report No. : 10448777H-A

Applicant : DENSO CORPORATION
Type of Equipment : Smart Card Key
Model No. : 14CBF
Test regulation : FCC Part 15 Subpart C: 2014
FCC ID : HYQ14CBF
Test Result : Complied

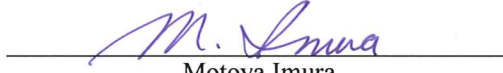
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Date of test: August 19 to September 4, 2014

Representative test
engineer:


Masatoshi Nishiguchi
Engineer
Consumer Technology Division

Approved by:


Motoya Imura
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

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SECTION 1: Customer information

Company Name : DENSO CORPORATION
Address : 1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone Number : +81-566-61-5242
Facsimile Number : +81-566-25-4837
Contact Person : MASAYUKI YAMAMOTO

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

2.1 Identification of E.U.T.

Type of Equipment : Smart Card Key
Model No. : 14CBF
Serial No. : Refer to Clause 4.2
Rating : DC 3.0V
Receipt Date of Sample : August 8, 2014
Country of Mass-production : Japan
Condition of EUT : Engineering 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

Model No: 14CBF (referred to as the EUT in this report) is the Smart Card Key.

General Specification

Clock frequency(ies) in the system : 8 MHz (IC Clock)

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 314.35 MHz / 312.10 MHz *
Modulation : FSK (F1D)
Power Supply (radio part input) : DC 3.0V
Type of Battery : One lithium battery
Antenna type : Built-in type (Fixed)

*These two different frequencies are not emitted simultaneously.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2014, final revised on May 1, 2014 and effective June 2, 2014

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.231 Periodic operation in the band 40.66 - 40.70MHz
and above 70MHz

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 | N/A*1) | - |
| Automatically Deactivate | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: - | FCC: Section 15.231(a)(1) IC: RSS-210 A1.1.1 | N/A | Complied | Radiated |
| Electric Field Strength of Fundamental Emission | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.8 | FCC: Section 15.231(b) IC: RSS-210 A1.1.2 | 12.5dB Horiaontal PK with Duty factor (Tx 312.10MHz) | 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 15.231(b) IC: RSS-210 A1.1.2, 2.5.1 RSS-Gen 7.2.5 | 5.5dB 2808.900MHz Horiaontal PK with Duty factor (Tx 312.10MHz) | Complied | Radiated |
| -20dB Bandwidth | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: - | FCC: Section 15.231(c) IC: Reference data | N/A | 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 does not have AC Mains.

FCC 15.31 (e)

This test was performed with the New Battery (DC 3.0V) and the constant voltage was supplied to the EUT during the tests. Therefore, the 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 | Complied | 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 | 4.0dB | 5.1dB | 5.0dB | 5.1dB | 6.0dB | 4.9dB | 4.3dB |
| No.2 | 3.9dB | 5.2dB | 5.0dB | 4.9dB | 5.9dB | 4.7dB | 4.2dB |
| No.3 | 4.3dB | 5.1dB | 5.2dB | 5.2dB | 6.0dB | 4.8dB | 4.2dB |
| No.4 | 4.6dB | 5.2dB | 5.0dB | 5.2dB | 6.0dB | 5.7dB | 4.2dB |

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

Radiated emission test (3m)

The data listed in this test report has enough margin, more than the site margin.

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3.5 Test Location

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| | 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 | 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 | 2973C-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 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 | 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 | - | 8.8 x 4.6 x 2.8m | 2.4 x 2.4m | - |
| No.11 measurement room | - | 3.1 x 3.4 x 3.0m | 4.8 x 4.6m | - |

* 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.

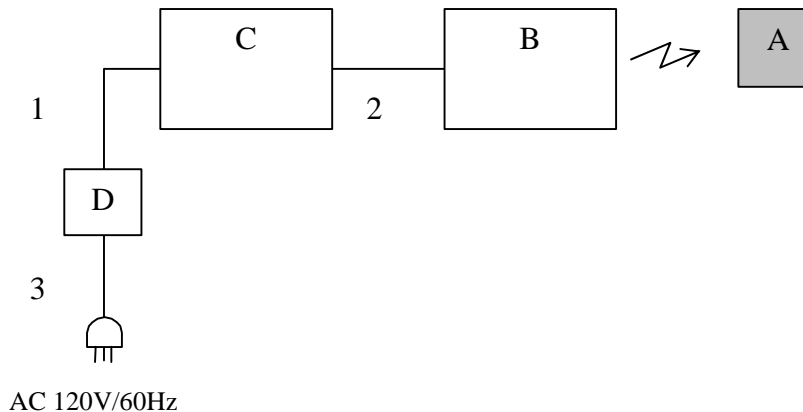
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

| Test Item | Mode |
|--|--|
| Automatically Deactivate | Normal use mode, 314.35 MHz *2) |
| Duty Cycle | Normal use mode, 312.10 MHz *2) |
| Electric Field Strength of Fundamental Emission | Transmitting mode (Tx), 314.35 MHz *1) |
| Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth | Transmitting mode (Tx), 312.10 MHz *1) |

* The system was configured in typical fashion (as a customer would normally use it) for testing.
*1) The software of this mode is the same as one of normal product, except that EUT continues to transmit when transmitter button is being pressed. This button was attached just for testing.(for making continuous transmission)
*2) The EUT transmits only when it receives 134.2kHz radio signal.
End users cannot change the settings of the output power of the product.

4.2 Configuration and peripherals



* Cabling and setup(s) 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 | Smart Card Key | 14CBF | No.2 *1) No.1 *2) | DENSO CORPORATION | EUT |
| B | Door handle unit | - | - | DENSO CORPORATION | *1) |
| C | Test bench | - | - | DENSO CORPORATION | *1) |
| D | AC Adapter | - | - | DENSO CORPORATION | *1) |

*1) Used for Normal use mode only.

*2) Used for Transmitting mode only.

List of cables used

| No. | Name | Length (m) | Shield | | Remark |
|-----|---------------------|------------|------------|------------|--------|
| | | | Cable | Connector | |
| 1 | DC Cable | 1.3 | Unshielded | Unshielded | *1) |
| 2 | DC and Signal Cable | 1.4 | Unshielded | Unshielded | *1) |
| 3 | AC Cable | 1.9 | Unshielded | Unshielded | *1) |

*1) Used for Normal use mode only.

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SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane. The EUT was set on the center of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
Photographs of the set up are shown in Appendix 3.

[Transmitting mode]

(Below 30MHz)

The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

(Above 30MHz)

The Radiated Electric Field Strength has been measured on Semi anechoic chamber with a ground plane and at a distance of 3m.

The measuring antenna height was varied between 1 and 4m 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.

The radiated emission measurements were made with the following detector function of the test receiver/spectrum analyzer.

Test Antennas are used as below;

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

| | From 9kHz to 90kHz and From 110kHz to 150kHz | From 90kHz to 110kHz | From 150kHz to 490kHz | From 490kHz to 30MHz | From 30MHz to 1GHz | Above 1GHz |
|---------------|--|----------------------|-----------------------|----------------------|--------------------------------|--------------------------------|
| Detector Type | Peak | Peak | Peak | Peak | Peak and Peak with Duty factor | Peak and Peak with Duty factor |
| IF Bandwidth | 200Hz | 200Hz | 9.1kHz | 9.1kHz | 120kHz | PK: S/A:RBW 1MHz, VBW 3MHz |

- The carrier level was measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

Noise levels of all the frequencies were measured at the position.

This EUT has two modes which mechanical key is inserted or not. The worst case was confirmed with and without mechanical key, as a result, the test with mechanical key was the worst case. Therefore the test with mechanical key was performed only.

*The result is rounded off to the second decimal place, so some differences might be observed.

Measurement range : 9kHz-3.2GHz

Test data : APPENDIX

Test result : Pass

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SECTION 6: Automatically deactivate

Test Procedure

The measurement was performed with Electric field strength using a spectrum analyzer.

Test data : APPENDIX
Test result : Pass

SECTION 7: -20dB 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 | 300kHz | 3kHz | 9.1kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied Bandwidth | Enough width to display 20dB Bandwidth | 1 % of Span | Three times of RBW | Auto | Peak *1) | Max Hold *1) | Spectrum Analyzer |
| *1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%. | | | | | | | |

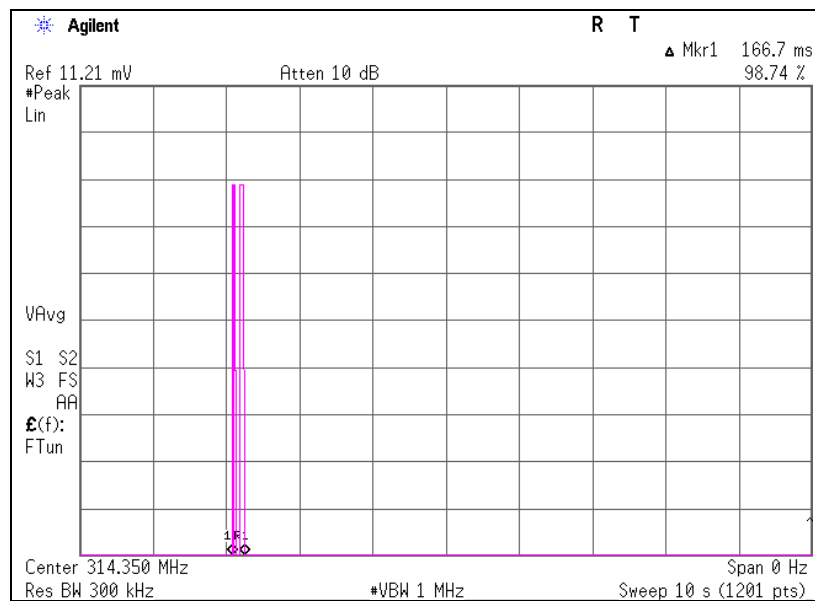
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Automatically deactivate 314.35 MHz

Test place : Ise EMC Lab. No.7 Shielded Room
Report No. : 10448777H
Date : 09/04/2014
Temperature/ Humidity : 23 deg. C / 62% RH
Engineer : Masatoshi Nishiguchi
Mode : Normal use mode 314.35MHz

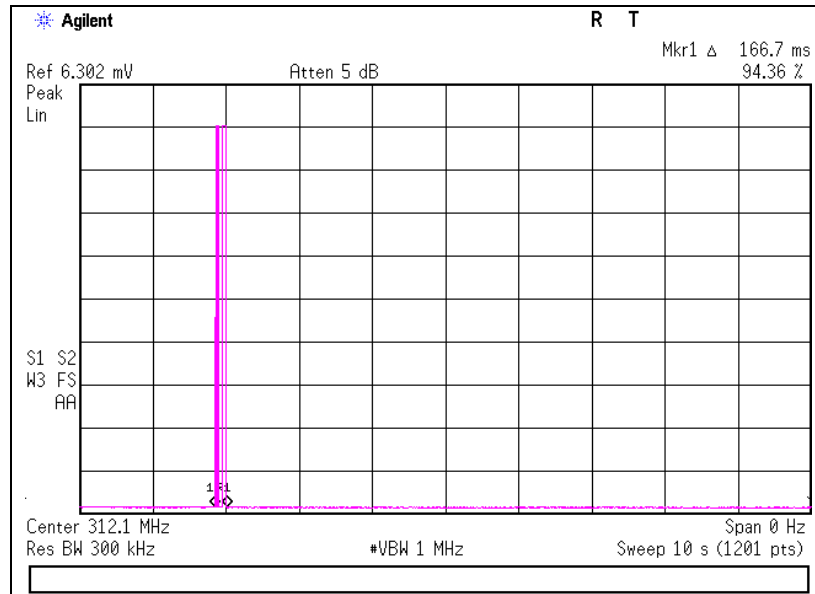
| Time of Transmitting [sec] | Limit [sec] | Result |
|----------------------------------|----------------|--------|
| 0.1667 | 5.00 | Pass |



Automatically deactivate
312.10 MHz

Test place Ise EMC Lab. No.7 Shielded Room
Report No. 10448777H
Date 09/04/2014
Temperature/ Humidity 23 deg. C / 62% RH
Engineer Masatoshi Nishiguchi
Mode Normal use mode 312.10MHz

| Time of Transmitting [sec] | Limit [sec] | Result |
|----------------------------------|----------------|--------|
| 0.1667 | 5.00 | Pass |



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

314.35 MHz

| | | |
|-----------------------|---|--------------------|
| Test place | Ise EMC Lab. No.1 Semi Anechoic Chamber | |
| Report No. | 10448777H | |
| Date | 08/19/2014 | 08/21/2014 |
| Temperature/ Humidity | 23 deg. C / 56% RH | 21 deg. C / 54% RH |
| Engineer | Takumi Shimada | Takumi Shimada |
| | (Below 1GHz) | (Above 1GHz) |
| Mode | Transmitting mode 314.35MHz | |

PK

| Frequency [MHz] | Detector | Reading [dBuV] | | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | | Limit dBuV/m | Margin [dB] | | Remark Inside or Outside of Restricted Bands |
|--------------------|----------|-------------------|------|-------------------------|--------------|--------------|------------------------|--------------------|------|-----------------|----------------|------|--|
| | | Hor | Ver | | | | | Hor | Ver | | Hor | Ver | |
| 314.350 | PK | 78.8 | 76.2 | 14.8 | 10.5 | 38.5 | - | 65.6 | 63.0 | 95.5 | 29.9 | 32.5 | Carrier |
| 628.700 | PK | 33.2 | 37.2 | 19.7 | 12.7 | 38.1 | - | 27.5 | 31.5 | 75.5 | 48.0 | 44.0 | Outside |
| 943.050 | PK | NS | NS | - | - | - | - | - | - | 75.5 | - | - | Outside |
| 1257.400 | PK | 51.9 | 54.4 | 24.7 | 1.9 | 37.0 | - | 41.5 | 44.0 | 75.5 | 34.0 | 31.5 | Outside |
| 1571.750 | PK | 49.2 | 49.4 | 25.1 | 2.1 | 36.8 | - | 39.6 | 39.8 | 73.9 | 34.3 | 34.1 | Inside |
| 1886.100 | PK | 57.7 | 59.5 | 25.9 | 2.2 | 36.7 | - | 49.1 | 50.9 | 75.5 | 26.4 | 24.6 | Outside |
| 2200.450 | PK | 54.2 | 52.9 | 26.4 | 2.4 | 36.6 | - | 46.4 | 45.1 | 73.9 | 27.5 | 28.8 | Inside |
| 2514.800 | PK | 53.9 | 51.3 | 26.9 | 2.6 | 36.7 | - | 46.7 | 44.1 | 75.5 | 28.8 | 31.4 | Outside |
| 2829.150 | PK | 57.5 | 56.6 | 27.4 | 2.7 | 36.8 | - | 50.8 | 49.9 | 73.9 | 23.1 | 24.0 | Inside |
| 3143.500 | PK | 49.1 | 50.2 | 27.7 | 2.9 | 36.8 | - | 42.9 | 44.0 | 75.5 | 32.6 | 31.5 | Outside |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

NS: No signal detected.

PK with Duty factor

| Frequency [MHz] | Detector | Reading [dBuV] | | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | | Limit dBuV/m | Margin [dB] | | Remark |
|--------------------|----------|-------------------|------|-------------------------|--------------|--------------|------------------------|--------------------|------|-----------------|----------------|------|---------|
| | | Hor | Ver | | | | | Hor | Ver | | Hor | Ver | |
| 314.350 | PK | 78.8 | 76.2 | 14.8 | 10.5 | 38.5 | -3.5 | 62.1 | 59.5 | 75.5 | 13.4 | 16.0 | Carrier |
| 628.700 | PK | 33.2 | 37.2 | 19.7 | 12.7 | 38.1 | -3.5 | 24.0 | 28.0 | 55.5 | 31.5 | 27.5 | Outside |
| 943.050 | PK | NS | NS | - | - | - | - | - | - | 55.5 | - | - | Outside |
| 1257.400 | PK | 51.9 | 54.4 | 24.7 | 1.9 | 37.0 | -3.5 | 38.0 | 40.5 | 55.5 | 17.5 | 15.0 | Outside |
| 1571.750 | PK | 49.2 | 49.4 | 25.1 | 2.1 | 36.8 | -3.5 | 36.1 | 36.3 | 53.9 | 17.8 | 17.6 | Inside |
| 1886.100 | PK | 57.7 | 59.5 | 25.9 | 2.2 | 36.7 | -3.5 | 45.6 | 47.4 | 55.5 | 9.9 | 8.1 | Outside |
| 2200.450 | PK | 54.2 | 52.9 | 26.4 | 2.4 | 36.6 | -3.5 | 42.9 | 41.6 | 53.9 | 11.0 | 12.3 | Inside |
| 2514.800 | PK | 53.9 | 51.3 | 26.9 | 2.6 | 36.7 | -3.5 | 43.2 | 40.6 | 55.5 | 12.3 | 14.9 | Outside |
| 2829.150 | PK | 57.5 | 56.6 | 27.4 | 2.7 | 36.8 | -3.5 | 47.3 | 46.4 | 53.9 | 6.6 | 7.5 | Inside |
| 3143.500 | PK | 49.1 | 50.2 | 27.7 | 2.9 | 36.8 | -3.5 | 39.4 | 40.5 | 55.5 | 16.1 | 15.0 | Outside |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier) + Duty factor (Refer to Duty factor data sheet)

NS: No signal detected.

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

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

312.10 MHz

| | | |
|-----------------------|---|--------------------|
| Test place | Ise EMC Lab. No.1 Semi Anechoic Chamber | |
| Report No. | 10448777H | |
| Date | 08/19/2014 | 08/21/2014 |
| Temperature/ Humidity | 23 deg. C / 56% RH | 21 deg. C / 54% RH |
| Engineer | Takumi Shimada | Takumi Shimada |
| | (Below 1GHz) | (Above 1GHz) |
| Mode | Transmitting mode 312.10MHz | |

PK

| Frequency [MHz] | Detector | Reading [dBuV] | | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | | Limit [dBuV/m] | Margin [dB] | | Remark Inside or Outside of Restricted Bands |
|--------------------|----------|-------------------|------|-------------------------|--------------|--------------|------------------------|--------------------|------|-------------------|----------------|------|--|
| | | Hor | Ver | | | | | Hor | Ver | | Hor | Ver | |
| 312.100 | PK | 79.7 | 76.4 | 14.7 | 10.5 | 38.5 | - | 66.4 | 63.1 | 95.4 | 29.0 | 32.3 | Carrier |
| 624.200 | PK | 33.4 | 35.1 | 19.6 | 12.6 | 38.1 | - | 27.5 | 29.2 | 75.4 | 47.9 | 46.2 | Outside |
| 936.300 | PK | NS | NS | - | - | - | - | - | - | 75.4 | - | - | Outside |
| 1248.400 | PK | 50.9 | 57.3 | 24.7 | 1.9 | 37.0 | - | 40.5 | 46.9 | 75.4 | 34.9 | 28.5 | Outside |
| 1560.500 | PK | 50.3 | 49.7 | 25.1 | 2.1 | 36.8 | - | 40.7 | 40.1 | 73.9 | 33.2 | 33.8 | Inside |
| 1872.600 | PK | 58.4 | 60.0 | 25.8 | 2.2 | 36.7 | - | 49.7 | 51.3 | 75.4 | 25.7 | 24.1 | Outside |
| 2184.700 | PK | 54.5 | 53.8 | 26.4 | 2.4 | 36.6 | - | 46.7 | 46.0 | 75.4 | 28.7 | 29.4 | Outside |
| 2496.800 | PK | 55.2 | 50.4 | 26.9 | 2.6 | 36.7 | - | 48.0 | 43.2 | 73.9 | 25.9 | 30.7 | Inside |
| 2808.900 | PK | 58.7 | 57.7 | 27.3 | 2.7 | 36.8 | - | 51.9 | 50.9 | 73.9 | 22.0 | 23.0 | Inside |
| 3121.000 | PK | 50.9 | 48.9 | 27.7 | 2.9 | 36.8 | - | 44.7 | 42.7 | 75.4 | 30.7 | 32.7 | Outside |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

NS: No signal detected.

PK with Duty factor

| Frequency [MHz] | Detector | Reading [dBuV] | | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | | Limit [dBuV/m] | Margin [dB] | | Remark |
|--------------------|----------|-------------------|------|-------------------------|--------------|--------------|------------------------|--------------------|------|-------------------|----------------|------|---------|
| | | Hor | Ver | | | | | Hor | Ver | | Hor | Ver | |
| 312.100 | PK | 79.7 | 76.4 | 14.7 | 10.5 | 38.5 | -3.5 | 62.9 | 59.6 | 75.4 | 12.5 | 15.8 | Carrier |
| 624.200 | PK | 33.4 | 35.1 | 19.6 | 12.6 | 38.1 | -3.5 | 24.0 | 25.7 | 55.4 | 31.4 | 29.7 | Outside |
| 936.300 | PK | NS | NS | - | - | - | - | - | - | 55.4 | - | - | Outside |
| 1248.400 | PK | 50.9 | 57.3 | 24.7 | 1.9 | 37.0 | -3.5 | 37.0 | 43.4 | 55.4 | 18.4 | 12.0 | Outside |
| 1560.500 | PK | 50.3 | 49.7 | 25.1 | 2.1 | 36.8 | -3.5 | 37.2 | 36.6 | 53.9 | 16.7 | 17.3 | Inside |
| 1872.600 | PK | 58.4 | 60.0 | 25.8 | 2.2 | 36.7 | -3.5 | 46.2 | 47.8 | 55.4 | 9.2 | 7.6 | Outside |
| 2184.700 | PK | 54.5 | 53.8 | 26.4 | 2.4 | 36.6 | -3.5 | 43.2 | 42.5 | 55.4 | 12.2 | 12.9 | Outside |
| 2496.800 | PK | 55.2 | 50.4 | 26.9 | 2.6 | 36.7 | -3.5 | 44.5 | 39.7 | 53.9 | 9.4 | 14.2 | Inside |
| 2808.900 | PK | 58.7 | 57.7 | 27.3 | 2.7 | 36.8 | -3.5 | 48.4 | 47.4 | 53.9 | 5.5 | 6.5 | Inside |
| 3121.000 | PK | 50.9 | 48.9 | 27.7 | 2.9 | 36.8 | -3.5 | 41.2 | 39.2 | 55.4 | 14.2 | 16.2 | Outside |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier) + Duty factor (Refer to Duty factor data sheet)

NS: No signal detected.

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

Duty Cycle 314.35 MHz

| | |
|-----------------------|---------------------------------|
| Test place | Ise EMC Lab. No.7 Shielded Room |
| Report No. | 10448777H |
| Date | 09/04/2014 |
| Temperature/ Humidity | 23 deg. C / 62% RH |
| Engineer | Masatoshi Nishiguchi |
| Mode | Normal use mode 314.35MHz |

314.35MHz

(pulse length)

| Type | [ms] |
|--------------------|-------|
| First short pluse | 7.00 |
| Second short pluse | 7.00 |
| long pulse | 52.50 |

(duty)

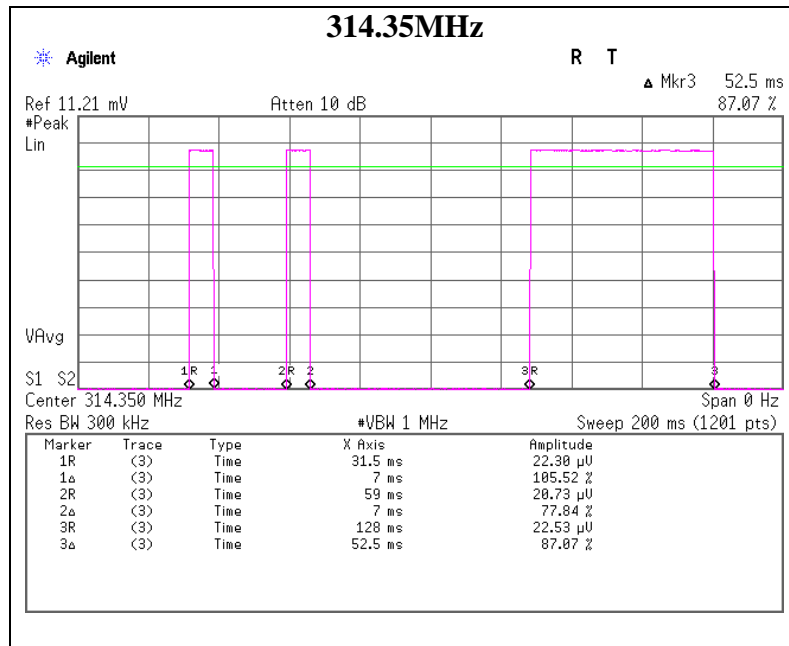
| ON time | Cycle | Duty | Duty |
|---------|--------|-----------------|------|
| [ms] | [ms] | (On time/Cycle) | [dB] |
| 66.50 | 100.00 | 0.67 | -3.5 |

*The sampled 100 msec was the worst case that is included in long pulse transmissions time

+ the first short pulse transmissions time + the second short pulse transmissions of the second try.

Transmission timing is shown in "UHF transmission specification".

*Duty = $20\log_{10}(\text{ON time}/\text{Cycle})$



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Duty Cycle

312.10 MHz

| | |
|-----------------------|---------------------------------|
| Test place | Ise EMC Lab. No.7 Shielded Room |
| Report No. | 10448777H |
| Date | 09/04/2014 |
| Temperature/ Humidity | 23 deg. C / 62% RH |
| Engineer | Masatoshi Nishiguchi |
| Mode | Normal use mode 312.10MHz |

312.10MHz
(pulse length)

| Type | [ms] |
|--------------------|-------|
| First short pluse | 7.00 |
| Second short pluse | 7.00 |
| long pulse | 52.67 |

(duty)

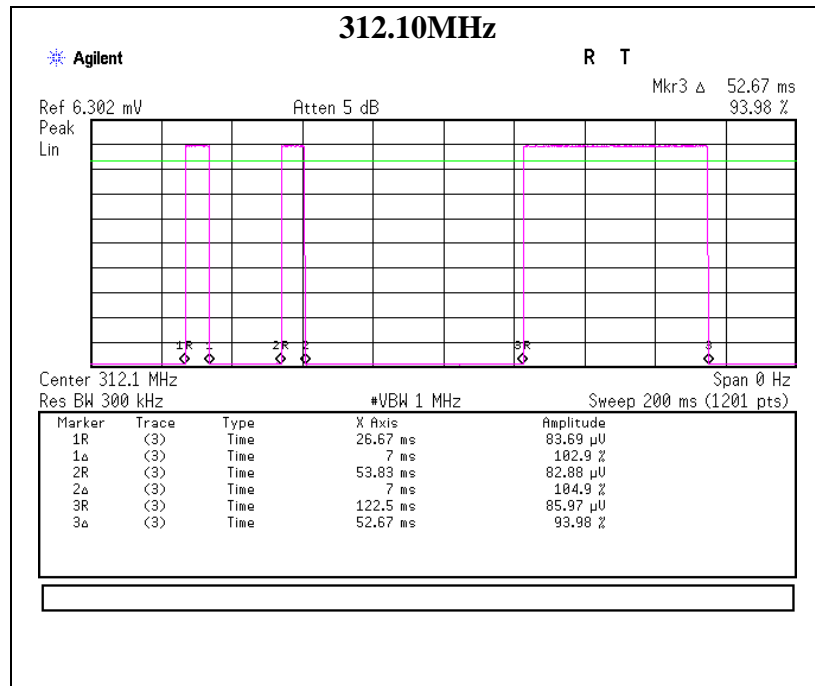
| ON time | Cycle | Duty | Duty |
|---------|--------|-----------------|------|
| [ms] | [ms] | (On time/Cycle) | [dB] |
| 66.67 | 100.00 | 0.67 | -3.5 |

*The sampled 100 msec was the worst case that is included in long pulse transmissions time

+ the first short pulse transmissions time + the second short pulse transmissions of the second try.

Transmission timing is shown in "UHF transmission specification".

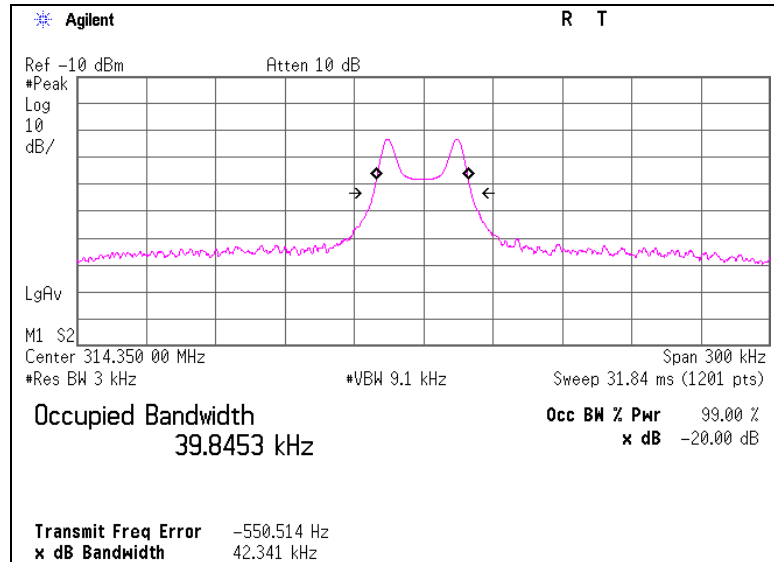
*Duty = 20log₁₀(ON time/Cycle)



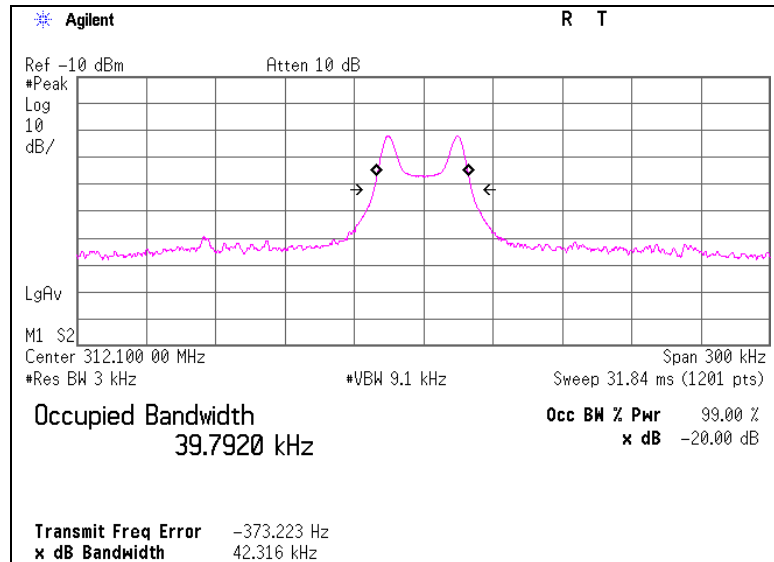
-20dB and 99% Occupied Bandwidth
314.35 MHz / 312.10 MHz

Test place Ise EMC Lab. No.7 Shielded Room
Report No. 10448777H
Date 09/04/2014
Temperature/ Humidity 23 deg. C / 62% RH
Engineer Masatoshi Nishiguchi
Mode Transmitting mode 314.35MHz / 312.10MHz

【314.35MHz】



【312.10MHz】



-20dB and 99% Occupied Bandwidth
314.35 MHz / 312.10 MHz

Test place Ise EMC Lab. No.7 Shielded Room
Report No. 10448777H
Date 09/04/2014
Temperature/ Humidity 23 deg. C / 62% RH
Engineer Masatoshi Nishiguchi
Mode Transmitting mode 314.35MHz / 312.10MHz

Bandwidth Limit : Fundamental Frequency **312.10** MHz x 0.25% = 780.25 kHz

* The above limit was calculated from more stringent nominal frequency.

* Method of KDB 926416 for systems employing non sweeping frequencies was referred.

314.35MHz

| -20dB Bandwidth [kHz] |
|--------------------------|
| 42.34 |

312.10MHz

| -20dB Bandwidth [kHz] |
|--------------------------|
| 42.32 |

| -20dB Bandwidth [kHz] | Bandwidth Limit [kHz] | Result |
|--------------------------|--------------------------|--------|
| 42.34+42.32=84.66 | 780.25 | Pass |

Bandwidth Limit : Fundamental Frequency **314.35** MHz x 0.25% = 785.88 kHz

| 99% Occupied Bandwidth [kHz] | Bandwidth Limit [kHz] | Result |
|---------------------------------|--------------------------|--------|
| 39.85 | 785.88 | Pass |

Bandwidth Limit : Fundamental Frequency **312.10** MHz x 0.25% = 780.25 kHz

| 99% Occupied Bandwidth [kHz] | Bandwidth Limit [kHz] | Result |
|---------------------------------|--------------------------|--------|
| 39.79 | 780.25 | Pass |

APPENDIX 2: Test Instruments

EMI test equipment

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|-------------|----------------------------|--------------------------|---------------------------|--------------------------------|-----------|---------------------------------------|
| MAEC-01 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 10m | DA-06881 | RE | 2014/09/01 * 12 |
| MOS-27 | Thermo-Hygrometer | CUSTOM | CTH-201 | A08Q26 | RE | 2014/02/20 * 12 |
| MJM-21 | Measure | KOMELON | KMC-36 | - | RE | - |
| COTS-MEMI | EMI measurement program | TSJ | TEPTO-DV | - | RE | - |
| MTR-09 | EMI Test Receiver | Rohde & Schwarz | ESU26 | 100412 | RE | 2014/06/06 * 12 |
| KBA-05 | Biconical Antenna | Schwarzbeck | BBA9106 | 2513 | RE | 2013/11/24 * 12 |
| KLA-04 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 361 | RE | 2013/11/24 * 12 |
| MAT-08 | Attenuator(6dB) | Weinschel Corp | 2 | BK7971 | RE | 2013/11/26 * 12 |
| MCC-02 | Coaxial Cable | Suhner/storm/Agilent/TSJ | - | - | RE | 2013/09/12 * 12 |
| MPA-19 | Pre Amplifier | MITEQ | MLA-10K01-B01-35 | 1237616 | RE | 2014/02/17 * 12 |
| MHA-05 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 253 | RE | 2014/05/16 * 12 |
| MPA-01 | Pre Amplifier | Agilent | 8449B | 3008A01671 | RE | 2014/02/05 * 12 |
| MCC-165 | Microwave Cable | Junkosha | MWX221 | 1203S213(1m) / 1311S166(5m) | RE | 2013/11/27 * 12 |
| MOS-34 | Thermo-Hygrometer | Custom | CTH-201 | 3401 | RE | 2014/02/20 * 12 |
| MSA-06 | Spectrum Analyzer | Agilent | E4407B | MY45107638 | RE | 2014/04/02 * 12 |
| MLPA-07 | Loop Antenna | UL Japan | - | - | RE | Pre Check |

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, 99% Occupied Bandwidth, -20dB bandwidth , Automatically deactivate and Duty cycle tests

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