


Electromagnetic Emission
FCC MEASUREMENT REPORT
CERTIFICATION OF COMPLIANCE
FCC Part 15 Certification Measurement


PRODUCT : Iris Recognition Device
MODEL/TYPE NO : iCAM7100 / Proto type
MULTIPLE MODEL : -
BRAND NAME : IrisAccess
FCC ID : ZKE-ICAM7100
APPLICANT : Iris ID, Inc.
Daerung Post Tower 1st 512, 212-8 Guro-dong,
Guro-gu, Seoul 152-790, Korea
Attn.: Jong-Wook Kim / Team Leader
MANUFACTURER : Iris ID, Inc.
Daerung Post Tower 1st 512, 212-8 Guro-dong,
Guro-gu, Seoul 152-790, Korea
FCC CLASSIFICATION : DXX - Part 15 Low Power Communication Device Transmitter
TYPE OF MODULATION : ASK
OPERATING FREQUENCY : 13.56 MHz
ANTENNA TYPE : PCB Pattern Antenna
RULE PART(S) : FCC Part 15 Subpart C
PROCEDURE : ANSI C63.4-2003
TEST REPORT No. : ETLE110408.0278
DATES OF TEST : May 02, 2011 to May 05, 2011
REPORT ISSUE DATE : May 13, 2011
TEST LABORATORY : ETL Inc. (FCC Designation Number : KR0022)

The Iris Recognition Device, Model iCAM7100 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 at the ETL Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart C section 15.225.

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)
May 13, 2011

Reviewed by: 
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May 13, 2011

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*The test report merely corresponds to the test sample(s).
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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 | : Iris ID, Inc. |
| Address | : Daerung Post Tower 1st 512, 212-8 Guro-dong, Guro-gu, Seoul 152-790, Korea |
| Attention | : Jong-Wook Kim / Team Leader |

- **EUT Type** : Iris Recognition Device
- **Model Number** : iCAM7100
- **S/N** : Proto type
- **Type of Modulation** : ASK
- **Operating Frequency** : 13.56 MHz
- **Antenna Type** : PCB Pattern Antenna
- **FCC Rule Part(s)** : FCC Part 15 Subpart C
- **Test Procedure** : ANSI C63.4-2003
- **FCC Classification** : Part 15 Low Power Communication Device Transmitter
- **Dates of Tests** : May 02, 2011 to May 05, 2011
- **Place of Tests** : ETL Inc. Testing Lab.

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

Conducted Emission test;
ETL Inc. Testing Lab.
371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No.** : ETLE110408.0278

1. INTRODUCTION

The measurement test for radiated and conducted emission test was conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.4-2003 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 C63.4-2003 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 C63.4-2003) was used in determining radiated and conducted emissions from the Iris ID, Inc. Model: iCAM7100

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the Iris Recognition Device (model: iCAM7100).

2.2 General Specification

- Main Part

| Item | Specification |
|-----------------------|--|
| Dimension | 178.0 mm x 213.4 mm x 76.7 mm |
| Weight | 1.6 kg |
| CPU | Samsung S3C6410 |
| Memory | 256 MB (m-DDR) |
| Storage | 1 GB (On-board) |
| | 4 GB (Up to 16 GB SD) |
| Iris Sensor | 752 x 480 (B/W WVGA) |
| Face Sensor | 5 M with AF |
| Display | 4.3" LCD |
| Power Input | Allowable Operation Voltage: 12 V DC |
| | During Operation Voltage: 12 V ~ 24 V DC |
| Operation Temperature | -20 °C ~ +55 °C |
| Operating Humidity | 0 % R.H ~ 90 % R.H. |
| Button | Power (Internal) |
| | Motor Tilt (On both sides), 6 Function Keys |
| Connectivity | 10/100 Mbps LAN, USB 2.0, Wiegand, RS232, RS422, Relay |
| Sound In/Out | Mono/external speaker Output, Mono Input |
| RTC | CR2032 (Replaceable) |
| Motor | 12 V DC |

- USB typed RF

| Item | Specification |
|-----------------------|-------------------------|
| Dimension | 26 mm x 94 mm x 15 mm |
| Weight | 17 g |
| Power Supply | Bus Power |
| USB Speed | USB 2.0 Full Speed |
| Standard | ISO7816 |
| Power Consumption | 60 mA |
| MTBF | 500 k Hour |
| LED | Blue |
| Card interface Speed | 420 kbps |
| Card clock Frequency | Up to 8 MHz |
| Supporting Card type | iClass, Mifare, Desfire |
| Operation Temperature | -20 °C ~ +55 °C |
| Operating Humidity | 0 % R.H. ~ 90 % R.H. |
| Type of Modulation | ASK |
| Operating Frequency | 13.56 MHz |
| Antenna Type | PCB Pattern Antenna |

3. DESCRIPTION OF TESTS

3.1 Conducted Emission

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. 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. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2 cm. 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

Radiated emission measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. The measurements were performed over the frequency range of 30 MHz to 1 GHz using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120 kHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determine 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 at 3 m. The test equipment was placed on a wooden turn-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 detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency of type of signal. 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.

3.2.1 Radiated Emission Limits:

(1) According to §15.209 Radiated emission limits, general requirements

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequencies [MHz] | Field Strength [μ V/m] | Measurement Distance [m] |
|-------------------|-----------------------------|--------------------------|
| 0.009 - 0.490 | 2400/F (kHz) | 300 |
| 0.490 - 1.705 | 24000/F (kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100** | 3 |
| 88 - 216 | 150** | 3 |
| 216 - 960 | 200** | 3 |
| Above 960 | 500 | 3 |

** Fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 MHz - 72 MHz, 76 MHz - 88 MHz, 174 MHz - 216 MHz or 470 MHz - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241

3.3 Carrier field strength and field strength outside 13.110 MHz - 14.010 MHz and occupied bandwidth

(1) According to §15.225 Operation within the band 13.110 MHz - 14.010 MHz

- (a) The field strength of any emissions within the band 13.553 MHz - 13.567 MHz shall not exceed 15 848 microvolts/meter at 30 meters
- (b) Within the bands 13.410 MHz - 13.553 MHz and 13.567 MHz - 13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters
- (c) Within the bands 13.110 MHz - 13.410 MHz and 13.710 MHz - 14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters
- (d) The field strength of any emissions appearing outside of the 13.110 MHz - 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209

| Frequency [MHz] | Field Strength Limit [$\mu\text{V}/\text{m}$] @ 30 m | Field Strength Limit [dB($\mu\text{V}/\text{m}$)] @ 30 m | Field Strength Limit [dB($\mu\text{V}/\text{m}$)] @ 3 m |
|-----------------|--|--|---|
| 13.110 - 13.410 | 106 | 40.5 | 80.5 |
| 13.410 - 13.553 | 334 | 50.5 | 90.5 |
| 13.553 - 13.567 | 15 848 | 84.0 | 124.0 |
| 13.567 - 13.710 | 334 | 50.5 | 90.5 |
| 13.710 - 14.010 | 106 | 40.5 | 80.5 |

(2) According to §15.215(c) Occupied bandwidth

(a) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80 % of the permitted band in order to minimize the possibility of out-of-band operation.

3.4 Frequency tolerance

(1) According to §15.225 Operation within the band 13.110 MHz - 14.010 MHz

(e) The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature variation of -20 °C to $+50$ °C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 °C. For battery-operated equipment, the equipment tests shall be performed using a new battery.

3.5 FCC Part 15.205 Restricted Bands of Operations

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

| MHz | MHz | MHz | GHz |
|----------------------------|-------------------------|-------------------|------------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.694 75 - 16.695 25 | 608 - 614 | 5.35 - 5.46 |
| 2.173 5 - 2.190 5 | 16.804 25 - 16.804 75 | 960 - 1 240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1 300 - 1 427 | 8.025 - 8.5 |
| 4.177 25 - 4.177 75 | 37.5 - 38.25 | 1 435 - 1 626.5 | 9.0 - 9.2 |
| 4.207 25 - 4.207 75 | 73 - 74.6 | 1 645.5 - 1 646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1 660 - 1 710 | 10.6 - 12.7 |
| 6.267 75 - 6.268 25 | 108 - 121.94 | 1 718.8 - 1 722.2 | 13.25 - 13.4 |
| 6.311 75 - 6.312 25 | 123 - 138 | 2 200 - 2 300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2 310 - 2 390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.724 75 - 156.725 25 | 2 483.5 - 2 500 | 17.7 - 21.4 |
| 8.376 25 - 8.386 75 | 156.7 - 156.9 | 2 690 - 2 900 | 22.01 - 23.12 |
| 8.414 25 - 8.414 75 | 162.012 5 - 167.17 | 3 260 - 3 267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3 332 - 3 339 | 31.2 - 31.8 |
| 12.519 75 - 12.520 25 | 240 - 285 | 3 345.8 - 3 358 | 36.43 - 36.5 |
| 12.576 75 - 12.577 25 | 322 - 335.4 | 3 600 - 4 400 | (²) |
| 13.36 - 13.41 | | | |

¹ Until February 1, 1999, this restricted band shall be 0.490 MHz - 0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1 000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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

- RF transmitting continuously during the tested.

4.3 Support Equipment Used

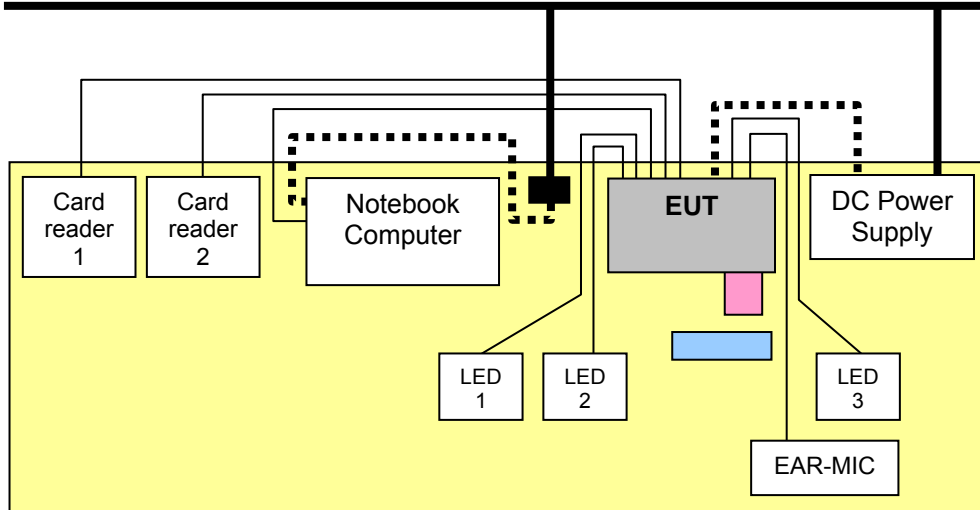
| Description | Model Name | Serial No. | Manufacturer |
|------------------------------------|----------------|--------------------------------|---------------------|
| Notebook Computer | Satellite M200 | 87041323Q | TOSHIBA Corporation |
| Adapter (for Notebook Computer) | SADP-65KBD | 6032B0009901- MMW0729072674 | Delta Electronics |
| USB Drive | NONE | NONE | NONE |
| EAR-MIC | NONE | NONE | NONE |
| Iris test zig | NONE | NONE | NONE |
| LED 1 | NONE | NONE | NONE |
| LED 2 | NONE | NONE | NONE |
| LED 3 | NONE | NONE | NONE |
| Card reader 1 | NONE | 2101-0307 | HID CORPORATION |
| Card reader 2 | NONE | NONE | NONE |
| DC Power Supply | DP30-05A | 0300266 | TOYO TECH |

4.4 Type of Cables Used

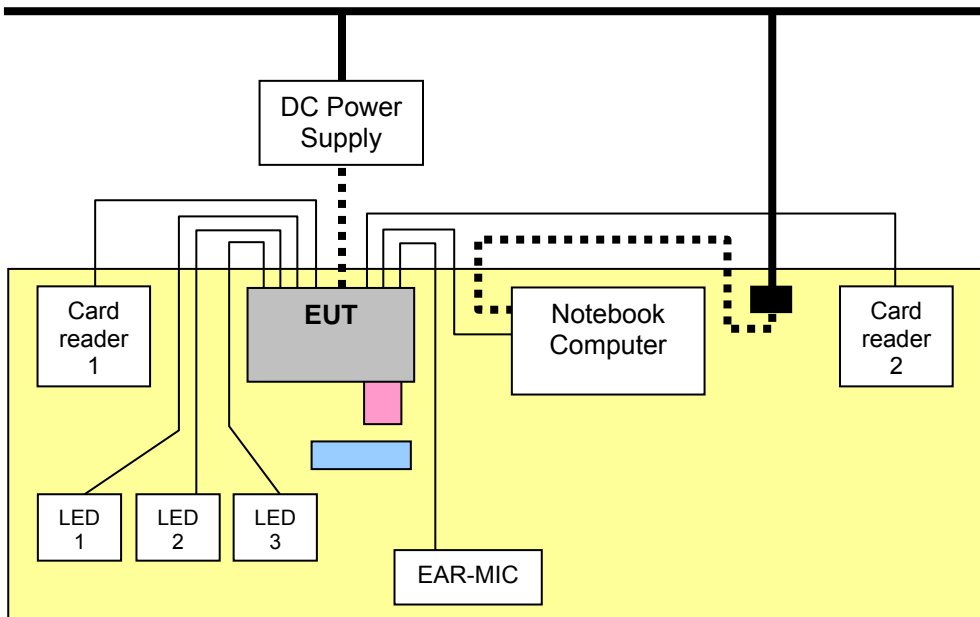
| Device from | Device to | Type of Cable(Port) | Length[m] | Type of shield |
|-------------------|-------------------|-------------------------|-----------|----------------|
| EUT | Notebook Computer | RJ-45 | > 3.0 | Unshielded |
| EUT | USB Drive | USB | - | - |
| EUT | EAR-MIC | Audio Out | 1.2 | Unshielded |
| EUT | LED 1 | Terminal (Weigand) | > 3.0 | Unshielded |
| EUT | LED 2 | Terminal (Relay output) | > 3.0 | Unshielded |
| EUT | LED 3 | Terminal (RS-422) | > 3.0 | Unshielded |
| EUT | Card reader 1 | Terminal | > 3.0 | Unshielded |
| EUT | Card reader 2 | Terminal | > 3.0 | Unshielded |
| EUT | DC Power Supply | DC Input | > 3.0 | Unshielded |
| Notebook Computer | Adapter | DC Input | 1.2 | Shielded |
| DC Power Supply | Power socket | AD Input | 1.2 | Unshielded |


4.5 The setup drawing(s)


- Conducted Emission Measurement




- Radiated Emission Measurement



 : USB Drive

 : Iris test zig

 : Signal line

 : AC Power line

 : DC Power line

 : Adapter

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.

| Test Rule Parts | Measurement Required | Result |
|---------------------|--|-------------|
| 15.207(a)(d) | Conducted emissions | Pass |
| 15.209 15.225(d) | Radiated emissions Field strength outside 13.110 MHz - 14.010 MHz | Pass |
| 15.225(a)(b)(c) | 13.56 MHz carrier field strength within the bands | Pass |
| 15.215 | Occupied Bandwidth | Pass |
| 15.225(e) | Frequency Tolerance | Pass |

The data collected shows that the **Iris ID, Inc. / Iris Recognition Device / iCAM7100** complied with technical requirements of above rules part 15.207, 15.209, 15.215 and 15.225.

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

| | |
|---------------------|--|
| EUT | Iris Recognition Device / iCAM7100 (S/N: Proto type) |
| Limit apply to | FCC Part 15.207(a)(d) |
| Test Date | May 04, 2011 |
| Operating Condition | RF transmitting continuously during the tested |
| Result | Passed by 3.90 dB |

Conducted Emission Test Data

The following table 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)

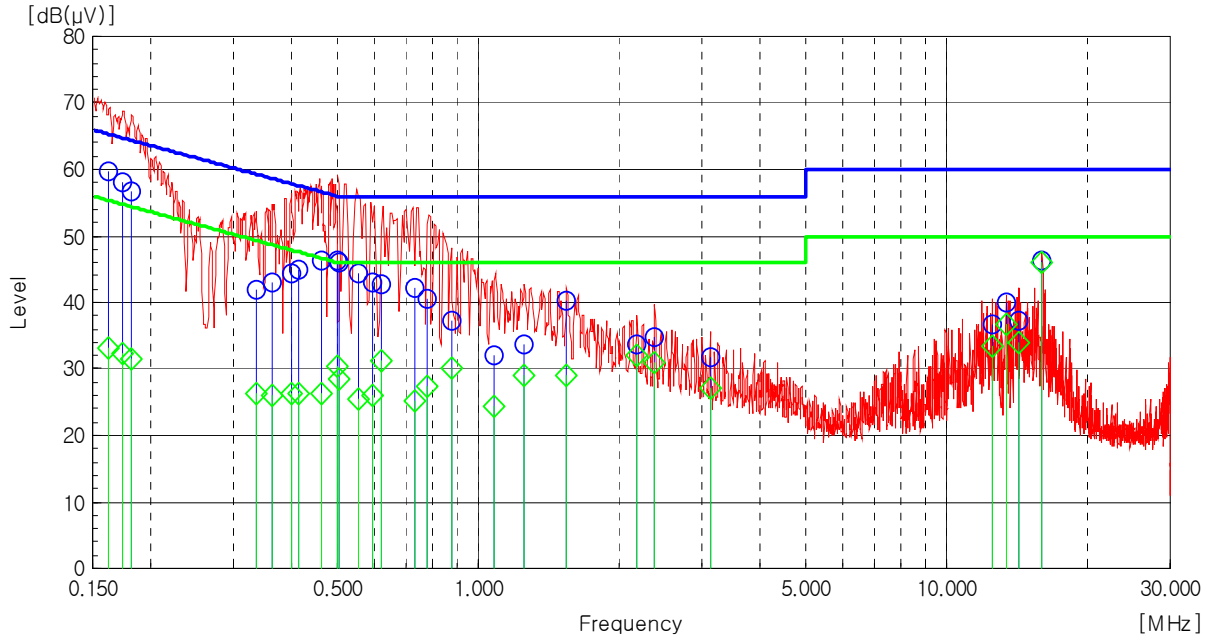
| Frequency [MHz] | Result [dB(μV)] | | Phase (*H/**N) | Limit [dB(μV)] | | Margin [dB] | |
|-----------------|-----------------|---------|----------------|----------------|---------|-------------|---------|
| | Quasi-peak | Average | | Quasi-peak | Average | Quasi-peak | Average |
| 0.151 | 60.90 | 33.80 | N | 65.90 | 55.90 | 5.00 | 22.10 |
| 0.160 | 60.60 | 34.00 | N | 65.40 | 55.40 | 4.80 | 21.40 |
| 0.168 | 60.00 | 33.30 | N | 65.10 | 55.10 | 5.10 | 21.80 |
| 0.463 | 48.70 | 27.20 | N | 56.60 | 46.60 | 7.90 | 19.40 |
| 0.501 | 49.10 | 27.40 | N | 56.00 | 46.00 | 6.90 | 18.60 |
| 0.537 | 48.90 | 27.70 | N | 56.00 | 46.00 | 7.10 | 18.30 |
| 1.246 | 33.80 | 29.10 | H | 56.00 | 46.00 | 22.20 | 16.90 |
| 1.540 | 40.30 | 29.10 | H | 56.00 | 46.00 | 15.70 | 16.90 |
| 2.175 | 33.80 | 32.10 | H | 56.00 | 46.00 | 22.20 | 13.90 |
| 13.418 | 40.10 | 36.80 | H | 60.00 | 50.00 | 19.90 | 13.20 |
| 14.214 | 40.40 | 35.60 | N | 60.00 | 50.00 | 19.60 | 14.40 |
| 16.000 | 46.30 | 46.10 | H | 60.00 | 50.00 | 13.70 | 3.90 |

NOTES:

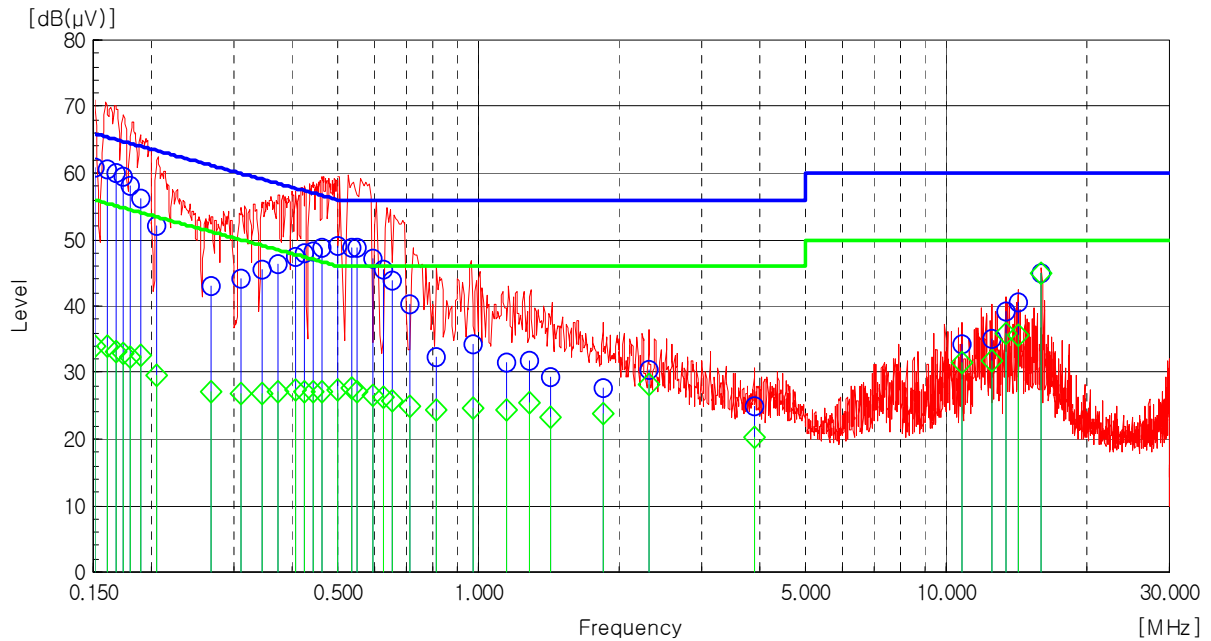
1. * H : HOT Line , **N : Neutral Line
2. The result value was included the antenna factor and cable loss.
3. Margin value = Limit - Result
4. Measurement were performed at the AC Power Inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC Part 15.107(a)(d) Class B.
5. If the average limit 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 Line

Limit : — Quasi-Peak
— Average



Line: Neutral Line



Quasi-peak ○ Average ◇

5.3 Radiated Emissions

| | |
|---------------------|--|
| EUT | Iris Recognition Device / iCAM7100 (S/N: Proto type) |
| Limit apply to | FCC Part 15.209 and 15.225(d) |
| Test Date | May 03, 2011 |
| Operating Condition | RF transmitting continuously during the tested |
| Result | Passed by 3.00 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: 9 KHz, 120 kHz)

- Frequency Range from 9 kHz to 30 MHz Test Data

| Frequency [MHz] | Reading [dB(μV) @ 3 m] | Polarization (*H/**V) | Ant. Factor [dB/m] | Cable Loss [dB] | Result [dB(μV/m) @ 3 m] | Limit [dB(μV/m) @ 3 m] | Margin [dB] |
|-----------------|------------------------|-----------------------|--------------------|-----------------|-------------------------|------------------------|-------------|
| 23.90 | 14.52 | H | 7.88 | 0.80 | 23.20 | 40.00 | 16.80 |

- Frequency Range from 30 MHz to 1 000 MHz Test Data

| Frequency [MHz] | Reading [dB(μV) @ 3 m] | Polarization (*H/**V) | Ant. Factor [dB/m] | Cable Loss [dB] | Result [dB(μV/m) @ 3 m] | Limit [dB(μV/m) @ 3 m] | Margin [dB] |
|-----------------|------------------------|-----------------------|--------------------|-----------------|-------------------------|------------------------|-------------|
| 42.12 | 22.70 | V | 12.00 | 1.50 | 36.20 | 40.00 | 3.80 |
| 54.25 | 21.90 | V | 12.08 | 1.72 | 35.70 | 40.00 | 4.30 |
| 231.27 | 28.40 | H | 10.62 | 3.98 | 43.00 | 46.00 | 3.00 |
| 267.65 | 23.61 | H | 11.85 | 4.24 | 39.70 | 46.00 | 6.30 |
| 308.87 | 25.21 | H | 13.11 | 4.58 | 42.90 | 46.00 | 3.10 |
| 481.05 | 19.27 | H | 17.06 | 5.87 | 42.20 | 46.00 | 3.80 |

NOTES:

- * H : Horizontal polarization , ** V : Vertical polarization
- Result = Reading + Antenna factor + Cable loss
- Margin value = Limit - Result
- The measurement was performed for the frequency range 9 kHz ~ 1 000 MHz according to FCC Part 15.209 and 15.225(d)

5.4 13.56 MHz carrier field strength within bands

| | |
|---------------------|--|
| EUT | Iris Recognition Device / iCAM7100 (S/N: Proto type) |
| Limit apply to | FCC Part 15.225(a)(b)(c) |
| Test Date | May 03, 2011 |
| Operating Condition | RF transmitting continuously during the tested |
| Result | Passed by 55.53 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: 9 kHz)

| Frequency [MHz] | Reading [dB(μV) @ 3 m] | Polarization (*H/**V) | Ant. Factor [dB/m] | Cable Loss [dB] | Result [dB(μV/m) @ 3 m] | Limit [dB(μV/m) @ 3 m] | Margin [dB] |
|-----------------|------------------------|-----------------------|--------------------|-----------------|-------------------------|------------------------|-------------|
| 13.40 | 15.17 | H | 9.10 | 0.70 | 24.97 | 80.50 | 55.53 |
| 13.47 | 10.14 | H | 9.10 | 0.70 | 19.94 | 90.50 | 70.56 |
| 13.56 | 53.00 | H | 9.10 | 0.70 | 62.80 | 124.00 | 61.20 |
| 13.63 | 9.81 | H | 9.10 | 0.70 | 19.61 | 90.50 | 70.89 |
| 13.69 | 10.64 | H | 9.10 | 0.70 | 20.44 | 90.50 | 70.06 |

NOTES:

- * H : Horizontal polarization , ** V : Vertical polarization
- Result = Reading + Antenna factor + Cable loss
- Margin value = Limit - Result
- The measurement was performed for the frequency range 13.56 MHz according to FCC Part 15.225(a)(b)(c)

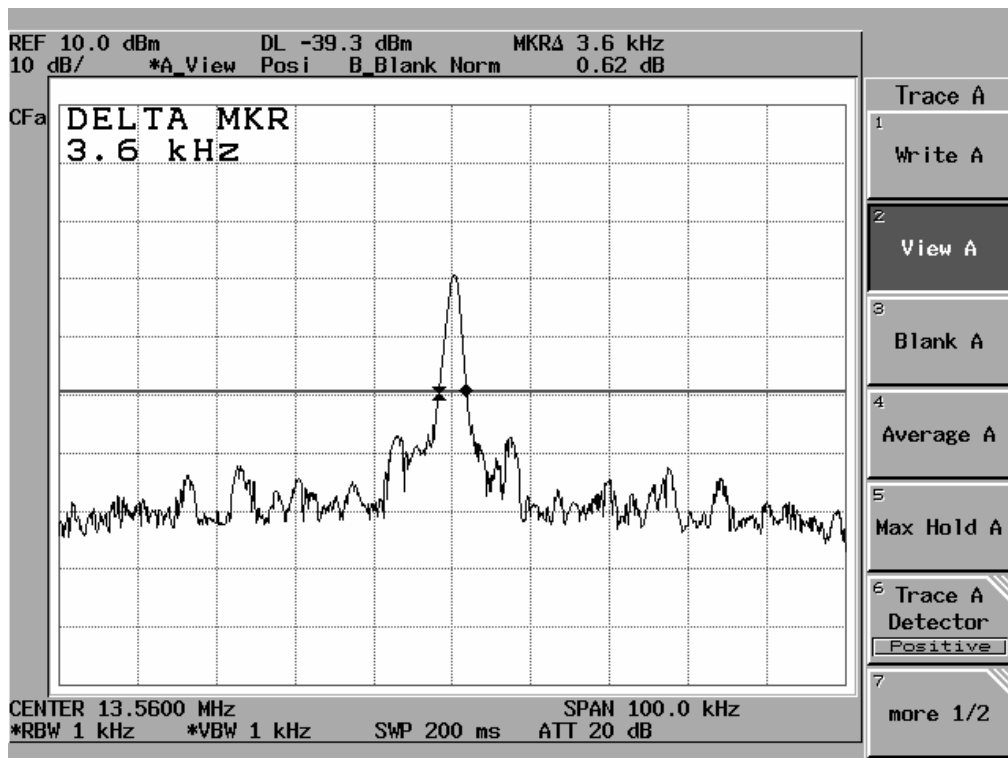
5.5 Occupied Bandwidth

| | |
|---------------------|--|
| EUT | Iris Recognition Device / iCAM7100 (S/N: Proto type) |
| Limit apply to | FCC Part 15.215 |
| Test Date | May 03, 2011 |
| Operating Condition | RF transmitting continuously during the tested |
| Result | Passed |

20 dB Bandwidth Test Data

The spectrum analyzer is set up to as following

- RBW: 1 kHz
- VBW: 1 kHz
- Span: 100 kHz
- Sweep: suitable duration based on the EUT specification



5.6 Frequency Tolerance

| | |
|---------------------|--|
| EUT | Iris Recognition Device / iCAM7100 (S/N: Proto type) |
| Limit apply to | FCC Part 15.215(e) |
| Test Date | May 03, 2011 |
| Operating Condition | RF transmitting continuously during the tested |
| Result | Passed |

Frequency Tolerance Test Data

The Frequency Tolerance of the carrier signal shall be maintained within ± 0.01 % of operating frequency over a temperature variation of -20 °C to $+50$ °C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 °C.

- Operating frequency: 13.56 MHz
- Limit: ± 1 356 Hz
- Within the band: 13.558 644 MHz - 13.561 356 MHz

Frequency Stability Versus Environment Temperature ($+50$ °C ~ -20 °C)

| Reference Frequency: 13.56 MHz | | | | | Limit: ± 1 356 Hz | | | |
|--------------------------------|-------------------------------------|------------|------------|------------|-----------------------|------------|------------|------------|
| Environment Temperature [°C] | Frequency Measure with Time Elapsed | | | | | | | |
| | Start up | | 2 Minute | | 5 Minute | | 10 Minute | |
| | MHz | Deviation | MHz | Deviation | MHz | Deviation | MHz | Deviation |
| 50 | 13.559 800 | -0.000 200 | 13.559 771 | -0.000 229 | 13.559 774 | -0.000 226 | 13.559 773 | -0.000 227 |
| 40 | 13.559 831 | -0.000 169 | 13.559 787 | -0.000 213 | 13.559 781 | -0.000 219 | 13.559 777 | -0.000 223 |
| 30 | 13.559 869 | -0.000 131 | 13.559 817 | -0.000 183 | 13.559 807 | -0.000 193 | 13.559 802 | -0.000 198 |
| 20 | 13.559 926 | -0.000 074 | 13.559 874 | -0.000 126 | 13.559 836 | -0.000 164 | 13.559 833 | -0.000 167 |
| 10 | 13.559 949 | -0.000 051 | 13.559 899 | -0.000 101 | 13.559 887 | -0.000 113 | 13.559 879 | -0.000 121 |
| 0 | 13.559 980 | -0.000 020 | 13.559 970 | -0.000 030 | 13.559 923 | -0.000 077 | 13.559 921 | -0.000 079 |
| -10 | 13.559 995 | -0.000 005 | 13.559 969 | -0.000 031 | 13.559 965 | -0.000 035 | 13.559 962 | -0.000 038 |
| -20 | 13.559 991 | -0.000 009 | 13.559 985 | -0.000 015 | 13.559 985 | -0.000 015 | 13.559 985 | -0.000 015 |

Frequency Stability Versus Input Power (± 15 %): Environment Temperature: 25 °C

| Reference Frequency: 13.56 MHz | | | | | Limit: ± 1 356 Hz | | | |
|--------------------------------|-------------------------------------|------------|------------|------------|-----------------------|------------|------------|------------|
| Power Supplied [Vdc] | Frequency Measure with Time Elapsed | | | | | | | |
| | Start up | | 2 Minute | | 5 Minute | | 10 Minute | |
| | MHz | Deviation | MHz | Deviation | MHz | Deviation | MHz | Deviation |
| 10.80 | 13.559 824 | -0.000 176 | 13.559 816 | -0.000 184 | 13.559 814 | -0.000 186 | 13.559 814 | -0.000 186 |
| 12.00 | 13.559 793 | -0.000 206 | 13.559 790 | -0.000 210 | 13.559 788 | -0.000 212 | 13.559 788 | -0.000 212 |
| 13.20 | 13.559 824 | -0.000 176 | 13.559 807 | -0.000 193 | 13.559 807 | -0.000 193 | 13.559 805 | -0.000 195 |

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

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

$$\text{dB}(\mu\text{V}) = \text{dBm} + 107$$

Example : @ 231.27 MHz

| | |
|-----------------------------|---|
| Class B Limit | = 46.00 dB($\mu\text{V}/\text{m}$) |
| Reading | = 28.40 dB(μV) |
| Antenna Factor + Cable Loss | = 10.62 + 3.98 = 14.60 dB($\mu\text{V}/\text{m}$) |
| Total | = 43.00 dB($\mu\text{V}/\text{m}$) |
| Margin | = 46.00 – 43.00 = 3.00 dB |
| | = 3.00 dB below Limit |

7. List of test equipments used for measurements

| | Test Equipment | Model | Mfg. | Serial No. | Cal. Date | Cal. Due Date |
|-------------------------------------|-------------------------------|----------|-----------------------|------------|-----------|---------------|
| <input checked="" type="checkbox"/> | EMI Test Receiver | ESVS 10 | R&S | 835165/001 | 11.03.22 | 12.03.22 |
| <input checked="" type="checkbox"/> | EMI Test Receiver | ESPI3 | R&S | 100478 | 10.09.17 | 11.09.17 |
| <input checked="" type="checkbox"/> | Two-Line V-Network | ENV216 | R&S | 958599/106 | 11.03.22 | 12.03.22 |
| <input checked="" type="checkbox"/> | LISN | 3816-2 | EMCO | 1002 | 10.09.17 | 11.09.17 |
| <input checked="" type="checkbox"/> | Spectrum Analyzer | R3273 | Advantest | 95090411 | 11.03.23 | 12.03.23 |
| <input checked="" type="checkbox"/> | LogBicon Antenna | VULB9160 | Schwarzbeck | 3082 | 10.02.22 | 12.02.22 |
| <input checked="" type="checkbox"/> | Active Loop Antenna | 6502 | EMCO | 00033743 | 10.10.13 | 12.10.13 |
| <input checked="" type="checkbox"/> | Constant TEMP.&HUMID. Chamber | JYT-500H | Jinyoungtech | N/A | 11.02.14 | 12.02.14 |
| <input checked="" type="checkbox"/> | Attenuator | 33-30-34 | Weinschel | BG9477 | 10.09.16 | 11.09.16 |
| <input checked="" type="checkbox"/> | DC Power Supply | DP30-05A | Toyo Tech | 0300266 | 10.09.17 | 11.09.17 |
| <input checked="" type="checkbox"/> | Turn-Table | MFT-120S | Max-Full Antenna Corp | - | N/A | N/A |
| <input checked="" type="checkbox"/> | Antenna Master | MFA-440E | Max-Full Antenna Corp | - | N/A | N/A |