



# RADIO TEST REPORT

Test Report No. : 26KE0261-HO-A

Applicant : OMRON Corporation  
Type of Equipment : Long-Range RFID Reader/Writer Antenna  
Model No. : Reader/Writer : V720S-BC5D4A-US  
Antenna: V720-HS04  
Test standard : FCC Part 15 Subpart C : 2006  
Section 15.207 and 15.225  
FCC ID : OZGV720SBC5D4A-US  
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.

Date of test:

July 19 to August 1, 2006

Tested by:

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EMC Services

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Approved by :

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Group Leader of  
EMC Services



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.

\*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://ulapex.jp/emc/nvlap.htm>

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## **SECTION 1: Client information**

|                  |   |                                                           |
|------------------|---|-----------------------------------------------------------|
| Company Name     | : | OMRON Corporation                                         |
| Address          | : | 2-2-1 Nishikusatsu Kusatsu-shi, Shiga-ken, 525-0035 Japan |
| Telephone Number | : | +81-77-565-5202                                           |
| Facsimile Number | : | +81-77-565-5553                                           |
| Contact Person   | : | YUKIO OGAWA                                               |

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

### **2.1 Identification of E.U.T.**

|                        |   |                                                                                           |
|------------------------|---|-------------------------------------------------------------------------------------------|
| Type of Equipment      | : | Long-Range RFID Reader/Writer<br>Antenna                                                  |
| Model No.              | : | Reader/Writer: V720S-BC5D4A-US<br>Antenna: V720-HS04                                      |
| Serial No.             | : | Reader/Writer: SR060501<br>Antenna: SA060501                                              |
| Country of Manufacture | : | Japan                                                                                     |
| Receipt Date of Sample | : | July 6, 2006                                                                              |
| Condition of EUT       | : | Production prototype<br>(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: V720S-BC5D4A-US is the Long-Range RFID Reader/Writer.  
V720-HS04 is the Antenna.  
The clock frequency of EUT is 16MHz, 1.8432MHz and 13.56MHz.

|                                |   |                                                                                        |
|--------------------------------|---|----------------------------------------------------------------------------------------|
| Equipment Type                 | : | Transceiver                                                                            |
| Frequency of operation         | : | 13.56MHz                                                                               |
| Frequency band                 | : | 13.553 – 13.567MHz                                                                     |
| Type of modulation             | : | ASK                                                                                    |
| Bandwidth                      | : | 188kHz                                                                                 |
| Antenna Type                   | : | Loop Antenna                                                                           |
| Antenna Connector Type         | : | Reverse BNC                                                                            |
| Method of Frequency Generation | : | Crystal                                                                                |
| Operating voltage (inner)      | : | DC24V +/-10%, DC18V, 15V, 5V (RF module)                                               |
| Operating Temperature          | : | -10 deg. C. to +50 deg. C. (V720S-BC5D4A-US)<br>-10 deg. C. to +55 deg. C. (V720-HS04) |

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### **SECTION 3: Test specification, procedures & results**

#### **3.1 Test Specification**

Test Specification : FCC Part15 Subpart C : 2006

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.225 : Operation within the band 13.110-14.010MHz

#### **FCC 15.31 (e)**

This EUT provides stable voltage(DC18V, 15V, 5V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

The EUT has a unique coupling/antenna connector (Reverse BNC). Therefore the equipment complies with requirement of 15.203.

#### **3.2 Procedures and results**

| No. | Item                                            | Test Procedure                                                     | Specification                        | Remarks   | Deviation | Worst margin                          | Results  |
|-----|-------------------------------------------------|--------------------------------------------------------------------|--------------------------------------|-----------|-----------|---------------------------------------|----------|
| 1   | Conducted emission                              | ANSI C63.4:2003<br>7. AC powerline conducted emission measurements | Section 15.207                       | -         | N/A       | 2.8dB<br>13.55985MHz<br>AV, L         | Complied |
| 2   | Electric Field Strength of Fundamental Emission | ANSI C63.4:2003<br>13. Measurement of intentional radiators        | Section 15.225(a)                    | Radiated  | N/A       | 15.3dB<br>13.55993MHz<br>90deg, QP    | Complied |
| 3   | Spectrum Mask                                   | ANSI C63.4:2003<br>13. Measurement of intentional radiators        | Section 15.225(b)(c)                 | Radiated  | N/A       | 20.0dB<br>13.41000MHz<br>90deg, PK    | Complied |
| 4   | -20dB Bandwidth                                 | ANSI C63.4:2003<br>13. Measurement of intentional radiators        | Section15.215(c)                     | Conducted | N/A       | See data                              | Complied |
| 5   | Electric Field Strength of Spurious Emission    | ANSI C63.4:2003<br>13. Measurement of intentional radiators        | Section15.209,<br>Section 15.225 (d) | Radiated  | N/A       | 1.0dB<br>298.319MHz<br>Horizontal, QP | Complied |
| 6   | Frequency Tolerance                             | ANSI C63.4:2003<br>13. Measurement of intentional radiators        | Section15.225(e)                     | Conducted | N/A       | See data                              | Complied |

Note: UL Apex's EMI Work Procedures No.QPM05 and QPM15

\*These tests were performed without any deviations from test procedure except for additions or exclusions.

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### 3.3 Addition to standards

| No. | Item                    | Test Procedure | Specification | Remarks  | Deviation | Worst margin | Results  |
|-----|-------------------------|----------------|---------------|----------|-----------|--------------|----------|
| 1   | 99% Occupied Band Width | RSS-Gen 4.4.1  | RSS-Gen 4.4.1 | Radiated | N/A       | N/A          | Complied |

### 3.4 Uncertainty

#### Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test is  $\pm 2.6\text{dB}$ .

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

#### Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Loop antenna is  $\pm 4.41\text{dB}(3\text{m}) / \pm 4.39\text{dB}(10\text{m})$ .

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is  $\pm 4.59\text{dB}(3\text{m}) / \pm 4.58\text{dB}(10\text{m})$ .

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is  $\pm 4.62\text{dB}(3\text{m}) / \pm 4.60\text{dB}(10\text{m})$ .

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is  $\pm 5.27\text{dB}$ .

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

#### Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test is  $\pm 3.0\text{dB}$ .

### 3.5 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications  
FCC Part 15 Subpart C: 2006 Section 15.225.

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### 3.6 Test Location

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|                               | FCC<br>Registration<br>Number | IC Registration<br>Number | Width x Depth x<br>Height (m) | Size of<br>reference ground plane (m) /<br>horizontal conducting plane | Other<br>rooms      |
|-------------------------------|-------------------------------|---------------------------|-------------------------------|------------------------------------------------------------------------|---------------------|
| No.1 semi-anechoic<br>chamber | 313583                        | IC4247A                   | 19.2 x 11.2 x 7.7m            | 7.0 x 6.0m                                                             | Preparation<br>room |
| No.2 semi-anechoic<br>chamber | 655103                        | IC4247A-2                 | 7.5 x 5.8 x 5.2m              | 4.0 x 4.0m                                                             | -                   |
| No.3 semi-anechoic<br>chamber | 148738                        | IC4247A-3                 | 12.0 x 8.5 x 5.9m             | 6.8 x 5.75m                                                            |                     |
| No.3 shielded room            | -                             | -                         | 4.0 x 6.0 x 2.7m              | N/A                                                                    | -                   |
| No.4 semi-anechoic<br>chamber | 134570                        | IC4247A-4                 | 12.0 x 8.5 x 5.9m             | 6.8 x 5.75m                                                            | -                   |
| No.4 shielded room            | -                             | -                         | 4.0 x 6.0 x 2.7m              | N/A                                                                    | -                   |
| No.5 semi-anechoic<br>chamber | -                             | -                         | 6.0 x 6.0 x 3.9m              | N/A                                                                    | -                   |
| No.6 shielded<br>room         | -                             | -                         | 4.0 x 4.5 x 2.7m              | 2.0 x 2.0 m                                                            | -                   |
| No.6 measurement<br>room      | -                             | -                         | 4.75 x 5.4 x 3.0m             | 4.75 x 5.4 m                                                           | -                   |
| No.7 shielded room            | -                             | -                         | 4.7 x 7.5 x 2.7m              | 4.7 x 7.5m                                                             | -                   |
| No.8 measurement<br>room      | -                             | -                         | 3.1 x 5.0 x 2.7m              | N/A                                                                    | -                   |

\* 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.7 shielded room.

### 3.7 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

### **4.1 Operating Modes**

The EUT was operated in a manner similar to typical use during the tests.

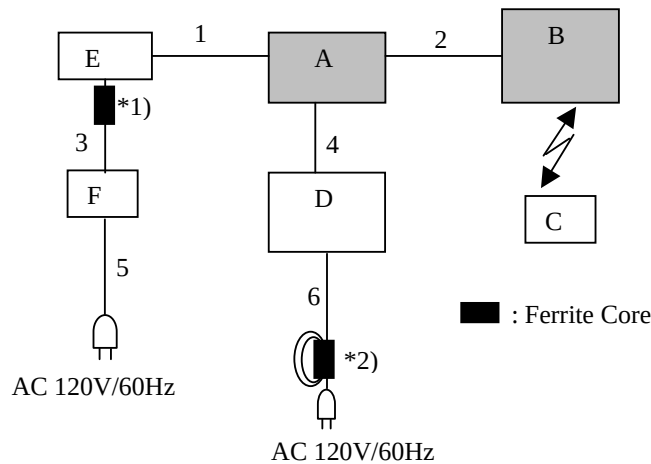
The mode is used : 13.56MHz Transmitting mode with Tag.

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

Frequency Tolerance:

Temperature for the extreme tests : -20 deg.C.(minimum) to + 50deg.C.(maximum)  
Voltage for the extreme tests : AC102V, AC120V, AC138V

### **4.2 Configuration and peripherals**



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

\*1) Standard attachment of E. PC

\*2) The ferrite core (model:ZCAT3035-1330, manufacturer:TDK) is attached to the cable of DC power supply (at the side of AC Mains) recommended by the manufacturer, OMRON Corporation.

The ferrite core is included in the same package of EUT when it is placed on the market.

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**Description of EUT and Support equipment**

| No. | Item                           | Model number | Serial number | Manufacturer | Remark |
|-----|--------------------------------|--------------|---------------|--------------|--------|
| A   | Long- Range RFID Reader/Writer | V720S-BC5D4A | SR060501      | OMRON        | EUT    |
| B   | Antenna                        | V720-HS04    | SA060501      | OMRON        | EUT    |
| C   | Tag                            | V720S-D13P01 | -             | OMRON        | -      |
| D   | DC Power Supply                | S82K-05024   | 17Z2P2        | OMRON        | -      |
| E   | PC                             | 2640-40J     | 97-0938D      | IBM          | -      |
| F   | AC Adapter                     | 85G6706      | 1M9DA014404   | IBM          | -      |

**List of cables used**

| No. | Name          | Length (m) | Shield     |            |
|-----|---------------|------------|------------|------------|
|     |               |            | Cable      | Connector  |
| 1   | RS-232C Cable | 3.0        | Shielded   | Shielded   |
| 2   | Antenna Cable | 3.35       | Shielded   | Shielded   |
| 3   | DC Cable      | 1.8        | Unshielded | Unshielded |
| 4   | DC Cable      | 3.0        | Unshielded | Unshielded |
| 5   | AC Cable      | 1.1        | Unshielded | Unshielded |
| 6   | AC Cable      | 1.4        | Unshielded | Unshielded |

## **SECTION 5: Conducted emission**

### **5.1 Operating environment**

Test place : No.1 semi anechoic chamber.  
Temperature : See data  
Humidity : See data

### **5.2 Test configuration**

EUT was placed on a urethane platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN/AMN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50ohm connectors of the LISN/ AMN were resistively terminated in 50ohm when not connected to the measuring equipment. The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a horizontal conducting plane 4.0 x 4.0m and a vertical conducting plane 2.0 x 2.0m in a semi Anechoic Chamber. A drawing of the set up is shown in the photos of APPENDIX 1.

### **5.3 Test conditions**

Frequency range : 0.15MHz – 30MHz  
EUT position : Table top  
EUT operation mode : See Clause 4.1

### **5.4 Test procedure**

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in the semi Anechoic Chamber. The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains Network (AMN). An overview sweep with peak detection has been performed. The measurements had been performed with a quasi-peak detector and if required, with an average detector. The conducted emission measurements were made with the following detector function of the test receiver.  
Detector Type : QP and AV  
IF Bandwidth : 9kHz

### **5.5 Test result**

Summary of the test results : Pass

## **SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask )**

### **6.1 Operating environment**

The test was carried out in a No.1 semi Anechoic Chamber

Temperature : See data  
Humidity : See data

### **6.2 Test Procedure**

The Radiated Electric Field Strength intensity has been measured in a semi anechoic chamber with a ground plane and at the distance of 10 and 3m.

Frequency : From 9kHz to 30MHz at distance 10m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for each antenna angle 0deg. , 45deg. and 90deg.

Frequency : From 30MHz to 1GHz at distance 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 intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector.

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

|               | From 9kHz to 90kHz<br>and<br>From 110kHz to<br>150kHz | From<br>90kHz to<br>110kHz | From<br>150kHz<br>to 490kHz | From<br>490kHz to<br>30MHz | From<br>30MHz to<br>1GHz |
|---------------|-------------------------------------------------------|----------------------------|-----------------------------|----------------------------|--------------------------|
| Detector Type | PK/AV                                                 | QP                         | PK/AV                       | QP                         | QP                       |
| IF Bandwidth  | 200Hz                                                 | 200Hz                      | 9kHz                        | 9kHz                       | 120kHz                   |

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

\* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

9kHz – 490kHz [Limit at 3m]=[Limit at 300m]-40log (3[m]/300[m])

490kHz – 30MHz[Limit at 3m]=[Limit at 30m]-40log (3[m]/30[m])

### **6.3 Test result**

Summary of the test results : Pass

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## **SECTION 7: -20dB Bandwidth**

### **Test Procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

|             |              |
|-------------|--------------|
| Test data   | : APPENDIX 2 |
| Test result | : Pass       |

## **SECTION 8: 99% Occupied Bandwidth**

### **Test Procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

|             |              |
|-------------|--------------|
| Test data   | : APPENDIX 2 |
| Test result | : Pass       |

## **SECTION 9: Frequency Tolerance**

### **Test Procedure**

The Frequency Tolerance was measured with a spectrum analyzer connected to the antenna port.

|             |              |
|-------------|--------------|
| Test data   | : APPENDIX 2 |
| Test result | : Pass       |