



# RADIO TEST REPORT

**Test Report No.: 31CE0052-HO-01-K**

**Applicant** : CANON INC.  
**Type of Equipment** : Wireless Module  
**Model No.** : CH9-1225  
**FCC ID** : AZD214  
**Test regulation** : FCC Part15 Subpart E: 2011  
**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 limits of the above regulation.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

**Date of test:** May 19 to June 25, 2011

**Representative test engineer:**



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**Approved by :**



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13-EM-F0429

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## **SECTION 1: Customer information**

Company Name : Canon Inc.  
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Telephone Number : +81 3 3757 6798  
Facsimile Number : +81 3 3757 8431  
Contact Person : Kiyoshi Sahoyama

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

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

Type of Equipment : Wireless Module  
Model No. : CH9-1225  
Serial No. : Refer to 4.2 in this report.  
Rating : DC3.3V  
Receipt Date of Sample : May 9, 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.

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## 2.2 Product description

Model: CH9-1225 (referred to as the EUT in this report) is a Wireless Module.

### General specification

Clock frequency(ies) in the system : 38.4MHz, 32.768kHz

### Radio specification

Equipment type : Transceiver  
Antenna type : Planar Inverted F Antenna  
Antenna connector type : U.FL  
Operation temperature range : -20 to +70 deg.C.

### Bluetooth\*1)

Frequency of operation : 2402-2480MHz  
Bandwidth / Channel spacing : 79MHz & 1MHz  
Type of modulation : FHSS  
Antenna gain with cable loss : 1.95dBi  
ITU code : F1D, G1D

\*1) Refer to the test report 31CE0052-HO-01-I for this function.

### Wireless LAN

Frequency of operation \*2) : 2412-2462MHz (IEEE 802.11b, 11g, 11n-HT20)  
2422-2452MHz (IEEE 802.11n-HT40)  
5180-5320MHz (IEEE 802.11a, 11n-HT20)  
5190-5310MHz (IEEE 802.11n-HT40)  
5745-5825MHz (IEEE 802.11a, 11n-HT20)  
5755-5795MHz (IEEE 802.11n-HT40)

Bandwidth & channel spacing : Bandwidth :  
20MHz (IEEE 802.11b, 11g, 11a, 11n-HT20), 40MHz (IEEE 802.11n-HT40)  
Channel spacing :  
5MHz (2.4GHz), 20MHz (5GHz)

Type of modulation : DSSS (IEEE 802.11b)  
OFDM (IEEE 802.11a/g/n)

Antenna gain with cable loss : +1.95 dBi (2400/2450/2500MHz)  
-1.32 dBi (5160/5250/5340MHz)  
-0.43 dBi (5725/5785/5845MHz)

ITU code : D1D, G1D

\*2) Refer to the test report 31CE0052-HO-01-J for FCC 15.247.

### FCC Part15.31 (e)

The Wireless Module is provided with stable power supply DC 3.3V from the host device and has power supply regulator which provides DC 2.85V and DC 1.8V, therefore, the equipment complies power supply regulation.

### FCC Part15.203

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

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

#### **3.1 Test specification**

Test specification : FCC Part 15 Subpart E: 2011, final revised on July 8, 2011  
and effective August 8, 2011  
Title : FCC 47CFR Part15 Radio Frequency Device  
Subpart E Unlicensed National Information Infrastructure Devices  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements  
: Section 15.407 General technical requirements

\*The revision on July 8, 2011 does not affect the test specification applied to the EUT.

The EUT has been tested for compliance with FCC Part 15 Subpart B: 2011. Refer to the test report 31CE0052-SH-03-B.

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**3.2 Procedures & Results**

Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC 15.407 (b)(6) & 15.207	-	N/A	21.0dB Freq.: 0.46040MHz Phase: N Detection: Quasi-Peak Mode: Tx 5190MHz IEEE 802.11n-40	Complied
26dB emission bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.407(a)(1)(2)	Conducted	N/A	See data	-
Maximum peak output power	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.407 (a)(1)(2)	Conducted	N/A		Complied
Peak power spectral density	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.407 (a)(1)(2)	Conducted	N/A		Complied
Peak excursion ratio	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.407 (a)(6)	Conducted	N/A		Complied
Spurious emission & Restricted band edges	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.109, 15.407 (b)(1)(2)(4)(5)(6)(7), 15.205 & 15.209	Conducted / Radiated	N/A	9.2dB Freq.: 10640.000MHz Polarization: Vertical Detection: Average Mode: Tx 5320MHz IEEE 802.11a ----- 9.2dB Freq.: 10640.000MHz Polarization: Vertical Detection: Average Mode: Tx 5320MHz IEEE 802.11n-20 ----- 9.2dB Freq.: 10620.000MHz Polarization: Vertical Detection: Average Mode: Tx 5310MHz IEEE 802.11n-40	Complied
Dynamic frequency selection	FCC 06-96 APPENDIX	FCC 15.407 (h)(2)	Conducted	*2)	N/A	N/A

\*1) These tests were also referred to FCC Public Notice DA02-2138 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands".

\*2) Refer to the test report 31CE0052-HO-01-L.

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

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### 3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2003 13. Measurement of intentional radiators, RSS-Gen 4.6.1	RSS-Gen 4.6.1	Conducted	-	-

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

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

### 3.4 Uncertainty

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

Item	Frequency range	No.1 SAC*1/SR*2 (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
<b>Conducted emission (AC Mains) AMN/LISN</b>	150kHz-30MHz	3.6 dB	3.6 dB	3.6 dB
<b>Radiated emission (Measurement distance: 3m)</b>	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.9 dB	5.1 dB	5.0 dB
	300MHz-1GHz	5.0 dB	5.2 dB	5.0 dB
	1GHz-13GHz	4.8 dB	4.8 dB	4.9 dB
<b>Radiated emission (Measurement distance: 1m)</b>	13GHz-18GHz	5.6 dB	5.6 dB	5.6 dB
	18GHz-40GHz	4.8 dB	4.3 dB	4.4 dB

\*1: SAC=Semi-Anechoic Chamber

\*2: SR= Shielded Room is applied besides radiated emission

#### Conducted emission test

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

#### Radiated emission test

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

#### Antenna port conducted test

Power Measurement uncertainty above 1GHz for this test was: (±) 1.9dB

Spurious emission (Conducted), Power density Measurement (below 1GHz) uncertainty for this test was: (±) 1.8dB

Spurious emission (Conducted), Power density Measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB

Spurious emission (Conducted), Power density Measurement (3G-18GHz) uncertainty for this test was: (±) 3.6dB

Spurious emission (Conducted), Power density Measurement (18G-26.5GHz) uncertainty for this test was: (±) 4.0dB

Bandwidth Measurement uncertainty for this test was: (±) 5.4%

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### 3.5 Test location

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JAB Accreditation No. : RTL02610

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
<input type="checkbox"/> No.1 Semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input checked="" type="checkbox"/> No.3 Semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
<input type="checkbox"/> No.4 Full-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input type="checkbox"/> No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input checked="" type="checkbox"/> No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input checked="" type="checkbox"/> No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input checked="" type="checkbox"/> No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-

### 3.6 Test setup, Data of test & Test instruments

Refer to Appendix 1 to 3.



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

### 4.1 Operating mode

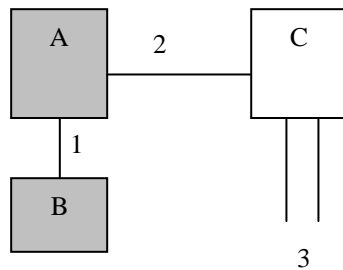
The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Mode	Tested frequency	Power setting *1)	Worst data rate *2)
All items	Transmitting IEEE 802.11a	5180MHz, 5200MHz, 5240MHz	13dBm	6Mbps, PN9
		5260MHz, 5280MHz, 5320MHz	13dBm	6Mbps, PN9
	Transmitting IEEE 802.11n-20	5180MHz, 5200MHz, 5240MHz	13dBm	MCS2, PN9
		5260MHz, 5280MHz, 5320MHz	13dBm	MCS2, PN9
	Transmitting IEEE 802.11n-40	5190MHz, 5230MHz	13dBm	MCS2, PN9
		5270MHz, 5310MHz	13dBm	MCS2, PN9

\*1) Software: Tera Term v4.69  
\*2) The worst condition was determined based on the test result of Maximum Peak Output Power (Low Channel)

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

### 4.2 Configuration and peripherals



\* Test data was taken under worse case conditions.

#### Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Module	CH9-1225	*1)	CANON	EUT
B	Antenna	Dual Band WLAN Antenna Cable Assembly 2011	001	Tyco Electronics	EUT
C	Extender	TSS-T6	-	CANON	-

\*1) ES4101: Conducted emission and Radiated emission, ES4006: Other test

#### List of cables used

No.	Name	Length (m)	Shield (Cable)	Shield (Connector)	Remarks
1	Antenna	0.025	Unshielded	Unshielded	-
2	Jig	0.04	Unshielded	Unshielded	-
3	DC	1.5	Unshielded	Unshielded	+3.3V, G

## **SECTION 5: Conducted emission**

### **5.1 Operating environment**

The test was carried out in No.2 shielded room.

Temperature : Refer to test data (APPENDIX 2)  
Humidity : Refer to test data (APPENDIX 2)

### **5.2 Test configuration**

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT was aligned and was 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 and excess AC cable was bundled in center. Photographs of the set up are shown in Appendix 1.

### **5.3 Test conditions**

Frequency range : 0.15 - 30MHz  
EUT position : Table top

### **5.4 Test procedure**

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a screened room. The EUT was connected to a Line Impedance Stabilization Network (LISN) via DC power supply. An overview sweep with peak detection has been performed. The measurements had been performed with a quasi-peak detector and if required, an average detector. The conducted emission measurements were made with the following detector of the test receiver.

Detector Type : Quasi-Peak/ Average  
IF Bandwidth : 9kHz

### **5.5 Results**

Summary of the test results : Pass

## **SECTION 6: 26dB bandwidth & Occupied bandwidth (99%)**

### **Test procedure**

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

Summary of the test results: Pass  
Refer to APPENDIX 2

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## **SECTION 7: Maximum peak output power**

### **Test procedure**

The Maximum Peak Output Power was measured with a spectrum analyzer connected to the antenna port. The test was made with the spectrum analyzer that has a function of channel-power measurement. We followed the method 1 specified in DA-02-2138A1.

Summary of the test results: Pass  
Refer to APPENDIX 2

## **SECTION 8: Peak power density**

### **Test procedure**

The peak power spectral density was measured with a spectrum analyzer connected to the antenna port. We followed the method 2 specified in DA-02-2138A1.

Summary of the test results: Pass  
Refer to APPENDIX 2

## **SECTION 9: Peak excursion ratio**

### **Test Procedure**

The Peak Excursion Ratio was measured with a spectrum analyzer connected to the antenna port. The second sweep was measured based on method 1 specified in DA-02-2138A1

Summary of the test results: Pass  
Refer to APPENDIX 2

## **SECTION 10: Spurious emission (Antenna port conducted)**

### **Test procedure**

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

Summary of the test results: Pass  
Refer to APPENDIX 2

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## **SECTION 11: Radiated emission**

### **11.1 Operating environment**

The test was carried out in No.3 Semi-Anechoic Chamber.

Temperature : Refer to test data (APPENDIX 2)  
Humidity : Refer to test data (APPENDIX 2)

### **11.2 Test configuration**

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of 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 1.

### **11.3 Test conditions**

Frequency range : 30MHz to 40GHz  
EUT position : Table top

### **11.4 Test procedure**

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m (below 13GHz) / 1m (above 13GHz). Measurements were performed with quasi-peak, peak and average detector. 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.

The radiated emission measurements were made with the following detection of the test receiver and Spectrum Analyzer.

Frequency	:	30-1000MHz	1000-40000MHz	
Detection Type	:	Quasi-Peak	Peak	* Average
IF Bandwidth	:	120kHz	RBW:1MHz/VBW:3MHz	RBW:1MHz/VBW: 10Hz RBW:1MHz/VBW: 3MHz(RMS)*1

\* When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

\*1) RMS detector was used for the outside of the restricted band.

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT and its antenna to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Worst position:

	Test Antenna	Frequency	Carrier	Spurious				
				30M-1GHz	1-13GHz	13-18GHz	18-26.5GHz	26.5-40GHz
EUT Antenna	Horizontal		Z	X	Z	X	X	X
	Vertical		Y	X	Y	X	X	X
Module	Horizontal		Y	X	Y	X	Y	Y
	Vertical		Z	X	Z	X	X	X

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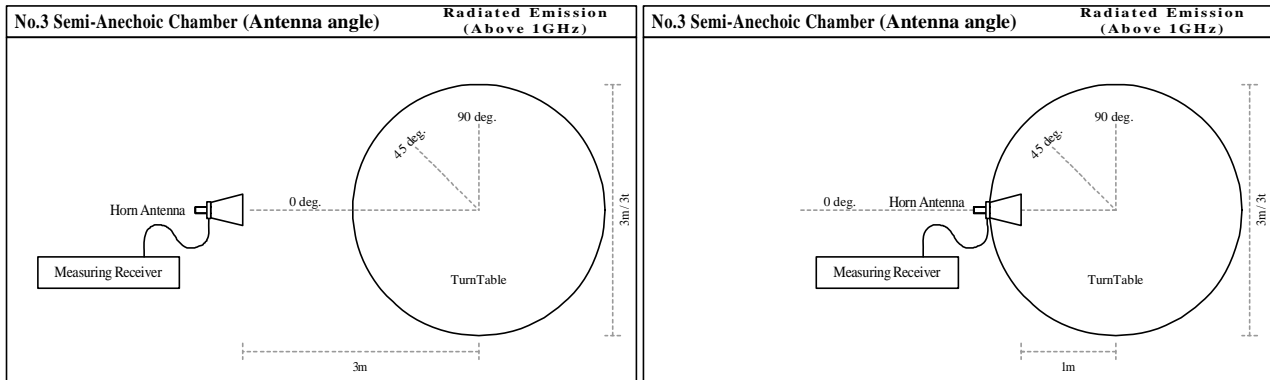
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**Figure 1. Antenna angle**



**11.5 Band edge**

Band edge level at 5150MHz and 5350MHz is below the limits of FCC 15.209. Refer to the data.

**11.6 Results**

Summary of the test results : Pass \*No noise was detected above the 5th order harmonics.  
Refer to APPENDIX 2

## **Contents of appendixes**

### **APPENDIX 1: Photographs of test setup**

Conducted emission  
Radiated emission  
Pre-check of the worst position

### **APPENDIX 2: Test data**

Conducted emission  
26dB bandwidth  
99% Occupied bandwidth  
Maximum peak output power  
Radiated emission  
Spurious emission (Antenna port conducted)  
Peak power density  
Peak excursion ratio

### **APPENDIX 3: Test instruments**

Test instruments

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