



# RADIO TEST REPORT

**Test Report No. : 29KE0214-HO-01-G**

**Applicant** : Canon Inc.  
**Type of Equipment** : WLAN Module  
**Model No.** : CH9-1161  
**FCC ID** : AZD162  
**Test regulation** : FCC Part 15 Subpart E: 2009  
Section 15.407  
**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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

**Date of test:** March 26 to May 2, 2009

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NVLAP LAB CODE: 200572-0

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

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MF060b (06.08.09)

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## **SECTION 1: Customer information**

Company Name : Canon Inc.  
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Contact Person : Kiyoshi Sahoyama

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

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

Type of Equipment : WLAN Module  
Model No. : CH9-1161  
Serial No. : ES7004, ES7005, ES7006  
Rating : DC3.3V  
Receipt Date of Sample : March 18, 2009  
Country of Mass-production : Japan  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model No: CH9-1161 (referred to as the EUT in this report) is the WLAN Module.

Equipment Type : Transceiver  
Clock frequency : 38.4MHz  
Method of Frequency Generation : Crystal  
Operating voltage (inner) : DC1.8V, DC2.85V  
Operating temperature range : -10 to +60 deg. C.

	<b>IEEE802.11b</b>	<b>IEEE802.11g</b>	<b>IEEE802.11a</b>
Frequency of operation	2412-2462MHz	2412-2462MHz	5180-5240MHz (W52) 5260-5320MHz (W53) 5500-5700MHz (W56) *1) 5745-5825MHz (W58)
Type of modulation	DSSS	OFDM	OFDM
Channel spacing	5MHz	5MHz	20MHz
ITU Code	G1D	D1D	D1D
Antenna type	Planar Inverted F antenna	Planar Inverted F antenna	Planar Inverted F antenna
Antenna Gain	-2.18dBi	-2.18dBi	1.85dBi (W52/W53) 2.62dBi (W56) 1.50dBi (W58)

\*1) Frequency range of 5580-5660MHz is not used in Canada.

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

### **3.1 Test Specification**

Test Specification : FCC Part15 Subpart E: 2009, final revised on December 2, 2009  
Title : FCC 47CFR Part15 Radio Frequency Device  
Subpart E Unlicensed National Information Infrastructure Devices  
Section 15.407 General technical requirements

\* The revision on December 2, 2009 does not influence the test specification applied to the EUT.

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

The RF Module has own regulator.

The RF Module is constantly provided voltage (DC1.8 / 2.85V) through own regulator regardless of input voltage.  
Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203/212 Antenna requirement**

The EUT has a unique coupling/antenna connector (UFL). Therefore the equipment complies with the requirement of 15.203/212.

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### 3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	FCC :ANSI C63.4:2003	FCC: 15.407(b)(6) / 15.207	Conducted	N/A	[QP] 17.5dB, 0.20291MHz, L [AV] 14.7dB, 0.53885MHz, L	Complied
		IC: RSS-Gen 7.2.2	IC: RSS-Gen 7.2.2				
2	26dB Emission Bandwidth	FCC :ANSI C63.4:2003	FCC : 15.407(a)(1)(2)	Conducted	N/A	N/A	N/A
		IC: -	IC: RSS-210 A9.2 (1)(2)				
3	Maximum Peak Output Power	FCC :ANSI C63.4:2003, FCC Public Notice DA 02-2138A1	FCC : 15.407(a) (1)(2)	Conducted	N/A	See data	Complied
		IC: -	IC: RSS-210 A9.2 (1)(2)				
4	Peak Power Spectral Density	FCC :ANSI C63.4:2003, FCC Public Notice DA 02-2138A1	FCC : 15.407(a) (1)(2)	Conducted	N/A	See data	Complied
		IC: -	IC: RSS-210 A9.2 (1)(2)				
5	Peak Excursion Ratio	FCC :ANSI C63.4:2003, FCC Public Notice DA 02-2138A1	FCC : 15.407(a)(6)	Conducted	N/A	See data	Complied
		IC: -	IC: -				
6	Spurious Emission	FCC: ANSI C63.4:2003	FCC : 15.407(b) (1)(2)(3), 15.205and15.209	Conducted / Radiated	N/A	[Tx] 9.0dB, 5725.00MHz, Horizontal, PK [Rx] 9.0dB, 11120.00MHz, Horizontal, AV	Complied
		IC: -	IC: RSS-210 A.9.3 (1)(2)(3)				
7	Band Edge Compliance	FCC :ANSI C63.4:2003	FCC : 15.407(b) (1)(2)(3) (5), 15.205and15.209	Conducted / Radiated	N/A	See data	Complied
		IC: -	IC: RSS-210 A.9.3 (1)(2)(3)				

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.

\*These tests were also referred to FCC Public Notice DA 02-2138A1 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands".

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### 3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Conducted	N/A	N/A	N/A

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	Conducted emission	Radiated emission (10m*)			Radiated emission (3m*)			Radiated emission (3m*)	
		150kHz-30MHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz
No.1 semi-anechoic Chamber (±)	3.7dB	3.1dB	4.4dB	4.2dB	3.2dB	3.8dB	3.9dB	5.9dB	6.1dB
No.2 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.4dB	4.0dB	5.9dB	6.1dB
No.3 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.6dB	4.0dB	5.9dB	6.1dB
No.4 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	3.9dB	3.9dB	5.9dB	6.1dB

\*10m/3m = Measurement distance

#### Conducted emission test

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

#### Radiated emission test(3m)

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

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

The measurement uncertainty for this test is ±3.0dB.

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### 3.5 Test Location

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

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

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

Refer to APPENDIX 1 to 3.

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

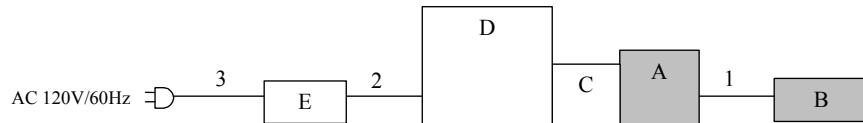
### **4.1 Operating Modes**

<b>Test Item</b>	<b>Test mode</b>	<b>Test frequency</b>	<b>Channel</b>	
Conducted Emission Spurious Emission	-IEEE802.11a Transmitting (Tx), 24Mbps, Payload: PN9	5180MHz(L)	36	
		5220MHz(M)	44	
		5240MHz(H)	48	
		5260MHz(L)	52	
		5300MHz(M)	60	
	-IEEE802.11a Receiving (Rx)	5320MHz(H)	64	
		5500MHz(L)	100	
		5600MHz(M)	120	
		5700MHz(H)	140	
		5220MHz(M)	44	
26dB Emission Bandwidth Maximum Peak Output Power Peak Power Spectral Density Peak Excursion Ratio 99% Occupied Bandwidth	-IEEE802.11a Transmitting (Tx), 24Mbps, Payload: PN9	5300MHz(M)	60	
		5600MHz(M)	120	
		5180MHz(L)	36	
		5220MHz(M)	44	
		5240MHz(H)	48	
		5260MHz(L)	52	
		5300MHz(M)	60	
		5320MHz(H)	64	
5500MHz(L)		100		
		5600MHz(M)		
		5700MHz(H)		

As a result of preliminary test, the formal test was performed with the above modes, which had the maximum power. Transmitting duty was 100% on all the tests.

#### 4.2 Configuration and peripherals

[Conducted emission and Antenna Terminal Conducted tests]



\* 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	WLAN Module	CH9-1161	ES7004* ES7005*	Canon Inc.	EUT
B	Antenna	TE 2069856-1	01	Canon Inc.	EUT
C	Jig Board	-	-	Canon Inc.	-
D	Note PC	PORTE6ER500 Series	88091989H	TOSHIBA	-
E	AC Adapter	PA3241U-2ACA	G71C00062310	TOSHIBA	-

\* Please refer to Appendix 2: Data of EMI test.

#### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.15	Shielded	Shielded	-
2	DC Cable	1.8	Unshielded	Unshielded	-
3	AC Cable	1.8	Unshielded	Unshielded	-

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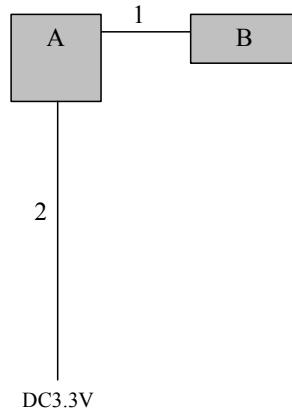
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[Radiated emission test]



\* 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	WLAN Module	CH9-1161	ES7004* ES7006*	Canon Inc.	EUT
B	Antenna	TE 2069856-1	01	Canon Inc.	EUT

\* Please refer to Appendix 2: Data of EMI test.

**List of cables used**

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.15	Shielded	Shielded	-
2	DC Cable	3.0	Unshielded	Unshielded	-

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## **SECTION 5: Conducted Emission**

### **Test Procedure**

EUT was placed on a urethane platform of nominal size, 1.0m by 0.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals 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 a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center .

#### **For the tests on EUT with other peripherals (as a whole system)**

I/O cable and AC 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. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber or a Measurement Room.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

<b>Detector</b>	<b>: quasi-peak and average detector (IF BW 9 kHz)</b>
<b>Measurement range</b>	<b>: 0.15-30MHz</b>
<b>Test data</b>	<b>: APPENDIX 2</b>
<b>Test result</b>	<b>: Pass</b>

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## **SECTION 6: Spurious Emission and Band Edge Compliance**

### **[Conducted]**

#### **Test Procedure**

The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port.

**Test data** : APPENDIX 2  
**Test result** : Pass

### **[Radiated]**

#### **Test Procedure**

EUT was placed on a urethane platform of nominal size, 1.0m by 0.5m, raised 0.8m above the conducting ground plane. The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz) , 1m(10-26.5GHz, Distance Factor :  $20\log(3[m]/1[m])$ ) and 0.5m( Upper 26.5GHz, Distance Factor :  $20\log(3[m]/0.5[m])$  ).

The height of the measuring 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 with the Test Receiver or the Spectrum Analyzer.

#### **Below 1GHz**

The result also satisfied with the general limits specified in section 15.209(a).

#### **Above 1GHz**

Inside of the restricted bands (Section 15.205): Apply to limit in the Section 15.209(a)

Outside of the restricted bands (Section 15.407): Limit -27dBm EIRP

Frequency	Below 1GHz	Above 1GHz (Inside of the restricted bands)	Above 1GHz (Outside of the restricted bands)
Instrument use	Test Receiver	Spectrum Analyzer	Spectrum Analyzer
Detector IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 1MHz AV *1): RBW:1MHz/VBW: 10Hz	RBW:1MHz/VBW: 1MHz

\*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

**Test data** : APPENDIX 2  
**Test result** : Pass

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

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## **SECTION 7: Bandwidth**

### **26dB Bandwidth**

#### **Test Procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.  
The following spectrum analyzer setting was used:

- Span: Enough width to display Bandwidth
- RBW: as close to 1% of EBW
- VBW: Three times of RBW
- Sweep: Auto
- Detector: Peak
- Trace: Clear Write

**Test data : APPENDIX 2**  
**Test result : Pass**

### **99% Occupied Bandwidth**

#### **Test Procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.  
The following spectrum analyzer setting was used:

- Span: Enough width to display Bandwidth
- RBW: as close to 1% of the Span as is possible without being below 1%
- VBW: Three times of RBW
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

**Test data : APPENDIX 2**  
**Test result : Pass**

## **SECTION 8: Maximum Peak Output Power**

#### **Test Procedure**

The Peak Transmit 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.

**Test data : APPENDIX 2**  
**Test result : Pass**

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## **SECTION 9: Peak Power Spectral 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.

Test data : APPENDIX 2  
Test result : Pass

## **SECTION 10: 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 (Maximum Peak Output Power) specified in DA-02-2138A1.

Test data : APPENDIX 2  
Test result : Pass

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