



RADIO TEST REPORT

Test Report No.: 31IE0111-SH-01-A
Original test report: 30FE0016-SH-01-A

Applicant : CANON INC.
Type of Equipment : Wireless LAN Module
Model No. : K30326
FCC ID : AZDK30326
Test regulation : FCC Part15 Subpart C: 2010 (Class II change)
Test result : Complied

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Date of test: April 11, 12, 18 and 19, 2011

Representative test engineer:

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SECTION 1: Customer information

Company Name : CANON INC.
 Address : 30-2, Shimomaruko 3-chome, Ohta-Ku, Tokyo, Japan
 Telephone Number : +81-3-3758-2111
 Contact Person : Takahito Kamiya

SECTION 2: Equipment under test (E.U.T.)**2.1 Identification of E.U.T.**

Type of Equipment : Wireless LAN Module
 Model Number : K30326
 Serial Number : 11-02
 Rating : DC3.465V
 Country of Mass-production : Thailand, Vietnam
 Condition of EUT : Production prototype
 (Not for Sale: This sample is equivalent to mass-produced items.)
 Receipt Date of Sample : April 11, 2011
 Modification of EUT : No modification by the test lab.

2.2 Product description

Model: K30326 (referred to as the EUT in this report) is a Wireless LAN Module.

Equipment type : Transceiver
 Frequency of operation : 11b, 11g and 11n-20 : 2412-2462MHz
 11n-40 : 2422-2452MHz
 Clock frequency : 40MHz
 Bandwidth & channel spacing : 11b, 11g, and 11n-20
 Bandwidth : 20MHz, Channel spacing : 5MHz
 11n-40
 Bandwidth : 40MHz, Channel spacing : 5MHz
 Type of modulation : 11b: DSSS
 11g, 11n: OFDM
 Antenna type : Pattern antenna (meander)
 Antenna gain with cable loss : 0.4dBi
 Antenna connector type : -
 ITU code : D1D, G1D
 Operation temperature range : -5 to +55 deg.C.

Original test report: 30FE0016-SH-01-A

Changed part from the original model:

- IC
- Capacitor

FCC Part15.31 (e)

The Wireless LAN Module is provided with stable power supply (DC 3.1 V), therefore the equipment complies with power supply regulation.

FCC Part15.203 Antenna requirement

The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2010, final revised on December 6, 2010 and effective January 5, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A	17.0dB (0.20669MHz, QP, 11b Tx 2437MHz)	Complied
6dB bandwidth	"Guidance on Measurement for Digital Transmission Systems Section 15.247" & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.247 (a)(2) & 15.209	-	*1)	-	N/A
Maximum peak output power	"Guidance on Measurement for Digital Transmission Systems Section 15.247" & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.247 (b)(3) & 15.209	-	*1)	-	N/A
Out of band emission & Restricted band edges	"Guidance on Measurement for Digital Transmission Systems Section 15.247" & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.109, 15.247 (d) & 15.209	Radiated	N/A	1.1dB (4924.000MHz, Horizontal, AV, 11b Tx 2462MHz) *2)	Complied
Power density	"Guidance on Measurement for Digital Transmission Systems Section 15.247" & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.247 (e)	-	*1)	-	N/A

*1) Refer to the original report 30FE0016-SH-01-A.

*2) No spurious noise was detected at the frequency range of 9kHz to 30MHz.

3.3 Addition to standard

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

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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 (±)
Conducted emission (AC Mains) AMN/LISN	150kHz-30MHz	3.0 dB	2.6 dB	3.1 dB
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.4 dB	2.7 dB	3.4 dB
	30MHz-300MHz	4.6 dB	4.5 dB	4.9 dB
	300MHz-1GHz	4.5 dB	4.6 dB	5.1 dB
	1GHz-13GHz	3.9 dB	3.9 dB	4.0 dB
Radiated emission (Measurement distance: 1m)	13GHz-18GHz	4.8 dB	4.8 dB	4.8 dB
	18GHz-40GHz	4.2 dB	4.2 dB	4.2 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 report meets the limits unless the uncertainty is taken into consideration.

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 type="checkbox"/> No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input checked="" 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 type="checkbox"/> No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-

3.6 Test setup, Test data & Test instruments

Refer to Appendix 1 to 3.

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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.

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN9, Power setting 13dBm
IEEE 802.11g (11g)	9Mbps, PN9, Power setting 12dBm
IEEE 802.11n-20: 2.4G Band	MCS 0, PN9, Power setting 12dBm
IEEE 802.11n-40: 2.4G Band	MCS 0, PN9, Power setting 12dBm
*The worst condition was determined based on the test result of Maximum peak output power (Low Channel) Refer to the original report 30FE0016-SH-01-A.	

The data setting for the test mode was set the burst rate.

Test Item	Operating Mode	Tested frequency
Conducted emission Out of band emission	11b Tx	2412MHz
	11g Tx	2437MHz
	11n-20 Tx	2462MHz
	11n-40 Tx	2422MHz
		2437MHz
		2452MHz

Software & power setting:

Software : DutApiClient_USB.exe (ver. 1.0.1.12)
 Power settings : 11b: 13dBm
 11g, 11n-20, 11n-40: 12dBm

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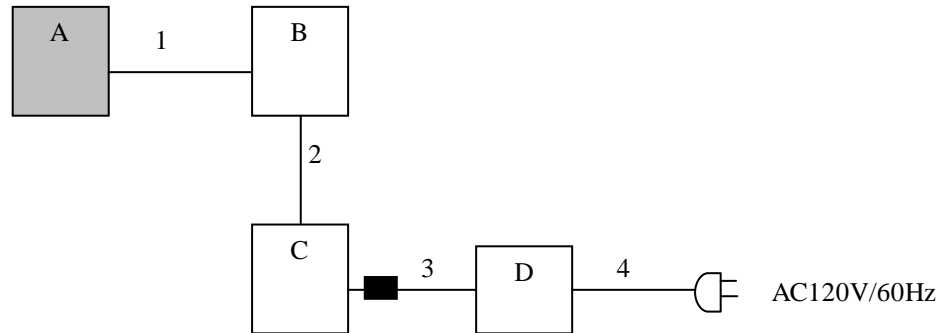
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4.2 Configuration of tested system



■ : Standard Ferrite Core

* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless LAN Module	K30326	11-02	CANON INC.	EUT
B	INTERFACE BOARD	WLAN JOINT	0002	CANON INC.	-
C	Laptop Computer	ThinkPad T42	L3-64H12	IBM	-
D	AC adapter	08K8208	11S08K8208Z1Z9M A5AB0U2	IBM	-

List of cables used

No.	Name	Length (m)	Shield	
			Cable	Connector
1	Ribbon	0.15	Unshielded	Unshielded
2	USB	1.4	Shielded	Shielded
3	DC	1.8	Unshielded	Unshielded
4	AC	0.8	Unshielded	Unshielded

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SECTION 5: Conducted emission

5.1 Operating environment

The test was carried out in No.3 shielded room.

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. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.

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 Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN).

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 detection of the test receiver.

Detection Type : Quasi-Peak/ Average

IF Bandwidth : 9kHz

5.5 Results

Summary of the test results : Pass

Refer to APPENDIX 2

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SECTION 6: Out of band emission

6.1 Operating environment

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

6.2 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. Photographs of the set up are shown in Appendix 1.

6.3 Test conditions

Frequency range : 9kHz - 26GHz
Test distance : 3m (below 13GHz) / 1m (above 13GHz)
EUT position : Table top

6.4 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) (Refer to Figure 1).

Frequency: From 9kHz to 30MHz at distance 3m

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

The measurements were performed for vertical polarization (antenna angle: 0deg., 45deg., 90deg., and 135 deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 1.

Frequency: From 30MHz to 26GHz 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 quasi-peak, peak and average detector.

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

<9kHz to 30MHz>

	9kHz to 90kHz & 110kHz to 150kHz	90kHz to 110kHz	150kHz to 490kHz	490kHz to 30MHz
Detector Type	PK/AV	QP	PK/AV	QP
IF Bandwidth	200Hz	200Hz	10kHz	9kHz
Measuring antenna	Loop antenna			

* FCC 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])

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<30MHz to 26GHz>

Frequency	30MHz to 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer *1)
Detector IF bandwidth	QP: BW 120kHz	PK: RBW: 1MHz VBW: 3MHz, AV RBW: 1MHz VBW: *2) (Pulse noise) 10Hz (No pulse noise)

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

*2) Used for the band edge of the harmonics that can be measured. The VBW is based on the inverse of the duty cycle (Refer to the data).

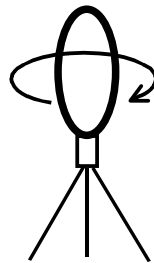
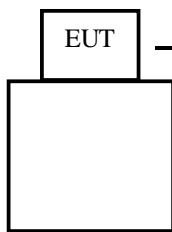
The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Frequency	Antenna: Horizontal	Antenna: Vertical
Below 1GHz	Y	Y
Above 1GHz (below 18GHz)	X	Z
Above 1GHz (above 18GHz)	Y	X

Figure 1. Antenna angle

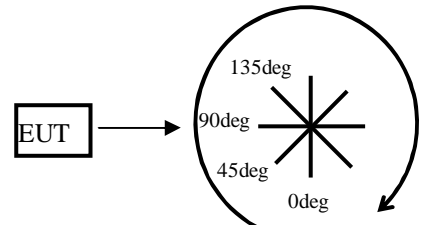
Direction of the Loop Antenna

Side View (Vertical)



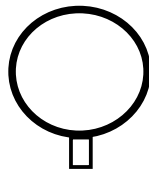
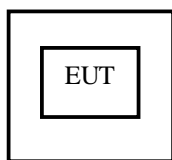
Front side: 0 deg.
Forward direction: clockwise

Top View (Vertical)

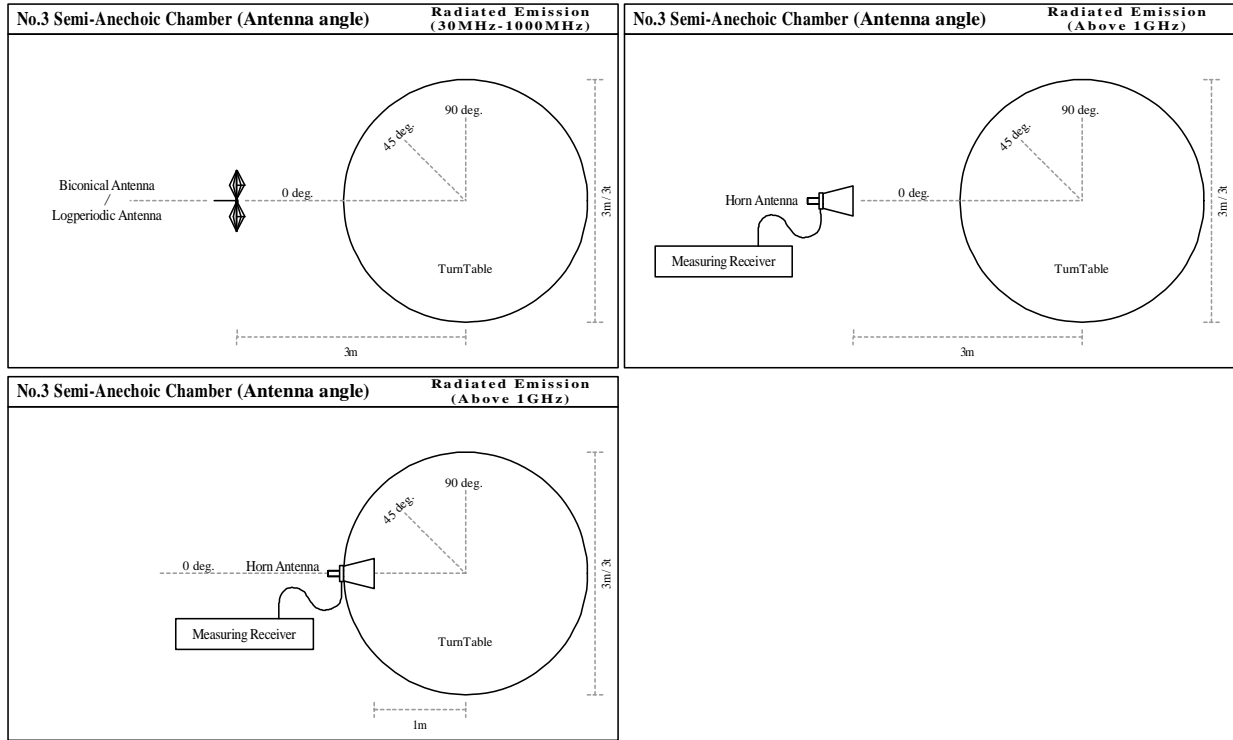


Front side: 0 deg.
Forward direction: clockwise

Top View (Horizontal)



Antenna was not rotated.



6.5 Band edge

Band edge level at 2400MHz is less than 20dB of peak point of the carrier. Refer to the data (Antenna Port Conducted).
 Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209. Refer to the data (Radiated).

6.6 Results

Summary of the test results : Pass
 Refer to APPENDIX 2

Contents of appendixes

APPENDIX 1: Photographs of test setup

Conducted emission
Out of band emission
Pre-check of worst position

APPENDIX 2: Test data

Conducted emission
Out of band emission

APPENDIX 3: Test instruments

Test instruments