



Test report No. : 10182580S-C
Page : 1 of 25
Issued date : February 14, 2014
Revised date : February 20, 2014
FCC ID : H5P-WLAN528

RADIO TEST REPORT

Test Report No.: 10182580S-C

Applicant : TOPCON CORPORATION
Type of Equipment : WLAN UNIT
Model No. : WLAN528
FCC ID : H5P-WLAN528
Test regulation : FCC Part15 Subpart C: 2013 (Class II Change)
Test Item : Conducted emission, Radiated emission
Test result : Complied

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Date of test: January 28 to 30, 2014

Tested by:

Tatsuya Arai
Engineer of WiSE Japan,
UL Verification Service

Approved by :

Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service

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13-EM-F0429

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SECTION 1: Customer information

Company Name : TOPCON CORPORATION
Brand Name : TOPCON
Address : 75-1, Hasunuma-Cho, Itabashi-Ku, Tokyo, 174-8580 Japan
Telephone Number : +81-3-3558-2579
Facsimile Number : +81-3-3966-0038
Contact Person : Hiroshi Inaba

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

2.1 Identification of E.U.T.

Type of Equipment : WLAN UNIT
Model Number : WLAN528
Serial Number : Refer to Section 4.2
Rating : DC 3.3V
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : January 9, 2014
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: WLAN528 (referred to as the EUT in this report) is a WLAN UNIT.

Clock frequency(ies) in the system : 16MHz(Max)

<Radio part>

Equipment type : Transceiver
Frequency of operation : 2412-2462MHz
Bandwidth : 20MHz
Channel spacing : 5MHz
Type of modulation : DSSS, OFDM
ITU code : D1D, G1D
Operation temperature range : -15 to +55 deg.C
Antenna type : Monopole Antenna
Antenna gain : 3.5dBi
Antenna connector type : U.FL

FCC 15.31 (e) / 212

The RF Module has its own regulator.

The RF Module is constantly provided voltage (DC1.8V) through the regulator. Therefore, this EUT complies with the requirement.

FCC 15.203 / 212

The EUT has a unique coupling/antenna connector (U.FL connector). 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 C: 2013,
final revised on September 30, 2013 and effective October 30, 2013
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 *1)	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2009	FCC 15.207	-	N/A	21.4dB Freq.: 0.35528MHz Detector: Quasi-Peak Phase: N Mode: Tx 11g 2412MHz	Complied
6dB bandwidth	ANSI C63.10:2009	FCC 15.247 (a)(2)	Conducted	N/A *2)	-	N/A
Maximum peak conducted output power	ANSI C63.10:2009	FCC 15.247 (b)(3)	Conducted	N/A *2)	-	N/A
Out of band emission & Restricted band edges	ANSI C63.10:2009	FCC 15.109, 15.247 (d) & 15.209	Conducted / Radiated	N/A	6.1 dB Freq.: 2483.500 MHz Polarization: Horizontal Detection: Average Mode: Tx 2462MHz, Tx, IEEE802.11g, PN9	Complied
Power density	ANSI C63.10:2009	FCC 15.247 (e)	Conducted	N/A *2)	-	N/A
Note: UL Japan's EMI Work Procedures No.13-EM-W0420 and 13-EM-W0422. *1) These tests were also referred to KDB 558074 v03 r01 (FCC), "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247". *2) This item has not been tested since the module has been certificated. The test is for additional antenna.						

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) LISN	150kHz-30MHz	3.6 dB	3.6 dB	3.5 dB
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.8 dB	5.0 dB	4.8 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB
	1GHz-15GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.7 dB	5.6 dB	5.6 dB
	18GHz-40GHz	5.2 dB	4.3 dB	4.3 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 the site margin.

Radiated emission test

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

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
☒ No.1 semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 semi-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☒ No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☐ No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ 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.

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

4.1 Operating mode

Test item	Mode	Tested frequency	Power setting *1)	Worst data rate *2)
Conducted emission	Transmitting IEEE 802.11g	2412MHz	10dBm	54Mbps, PN9
Radiated emission *3)	Transmitting IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	10dBm	11Mbps, PN9
	Transmitting IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	10dBm	54Mbps, PN9

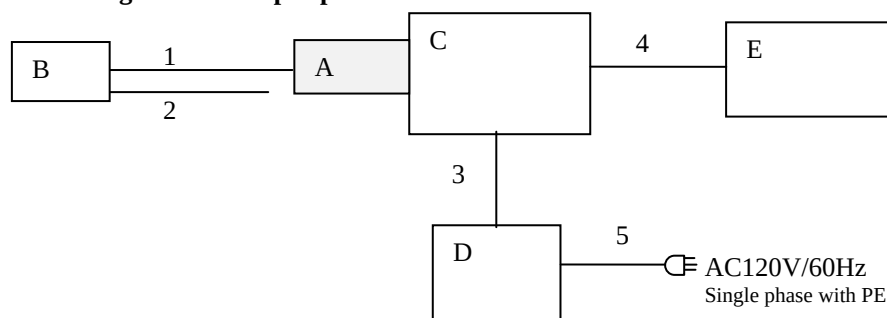
*1) Software used for the test: Labtool Ver 1.2.11 This power setting is average value and maximum except tolerance, and any user cannot set over this value.

*2) The worst condition was determined based on the test result of Maximum Peak Conducted Output Power (refer to original test report).

*3) Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals -" of TCB Council Workshop October 2009.

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

4.2 Configuration and peripherals



* Cabling and setup 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 UNIT	WLAN528	-	Topcon	EUT
B	Antenna	ANTB18-194A0	-	SANSEI ELECTRIC	-
C	Jig	-	-	-	-
D	Power Supply(DC)	PAN35-10A	ML002085	Kikusui	-
E	NJT-528 ADDAPTER	-	-	-	-

List of cables used

No.	Cable Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna (Upper)	0.15	Shielded	Shielded	-
2	Antenna (Lower)	0.15	Shielded	Shielded	-
3	DC	0.7	Unshielded	Unshielded	-
4	Signal	0.65	Unshielded	Unshielded	-
5	AC	1.8	Unshielded	Unshielded	-

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SECTION 5: Conducted emission

5.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 0.8m 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, including peripherals 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. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. Photographs of the set up are shown in APPENDIX 3.

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, a CISPR average detector. The conducted emission measurements were made with the following detection of the test receiver.

Detection Type : Quasi-Peak/ CISPR Average
IF Bandwidth : 9kHz

5.5 Results

Summary of the test results : Pass
Refer to APPENDIX 1.

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SECTION 6: Radiated emission

6.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

6.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5m by 0.5m, raised 0.8m (below 15GHz) / 1m (above 15GHz) above the conducting ground plane. Photographs of the set up are shown in APPENDIX 3.

6.3 Test conditions

Frequency range : 30MHz to 25GHz
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 15GHz) / 1m (above 15GHz) (Refer to Figure 1). 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.

Frequency	30-1000MHz	1-25GHz		20dBc
Detection type	Quasi-Peak	Peak	Average *1)	Peak
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 3MHz Detector: RMS	RBW: 100kHz VBW: 300kHz

*1) Average Power Measurement was measured based on 12.2.5 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

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.

Worst case:

Subject	Rx Antenna polarization	Carrier (Band edge)	Spurious	
			Below 1GHz	Above 1GHz
Module	Horizontal	X	Z	X
	Vertical	Z	Z	X
Antenna	Horizontal	X	Y	X
	Vertical	Y	Y	Y

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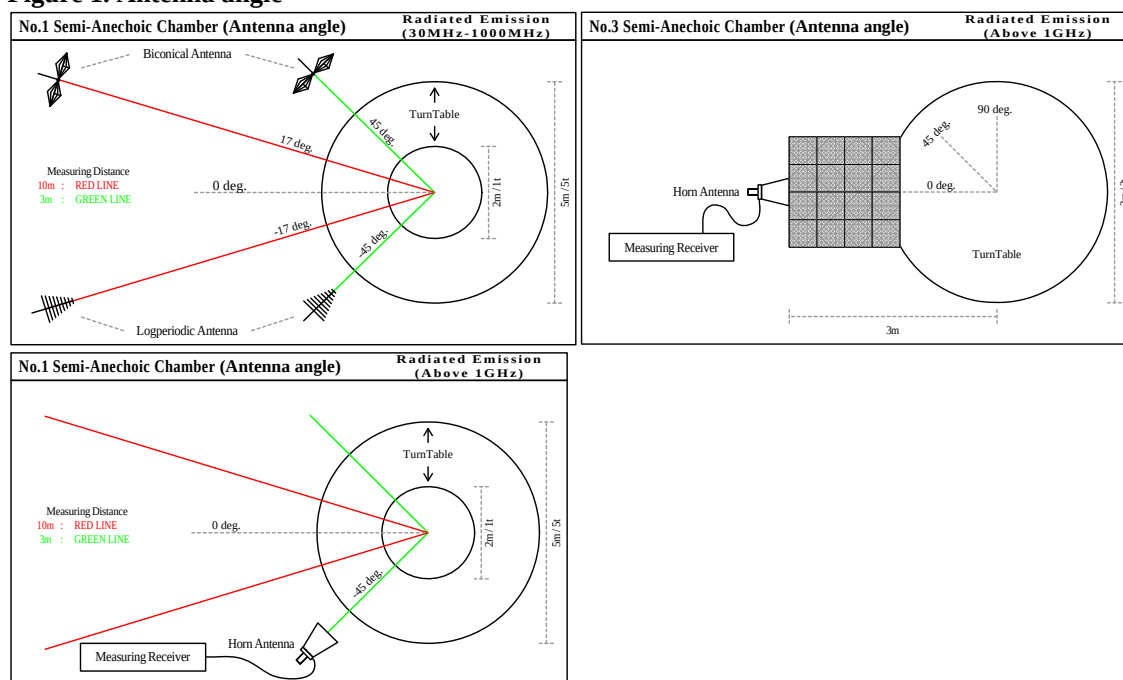
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Figure 1. Antenna angle



6.5 Band edge

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

6.6 Results

Summary of the test results : Pass
* No noise was detected above the 5th order harmonics.

Refer to APPENDIX 1.

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Conducted emission
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Test instruments

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Pre-check of the worst position

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DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2014/01/30

Company : TOPCON CORPORATION

Kind of EUT : WLAN UNIT

Model No. : WLAN528

Serial No. : 00 0b 6c c7 e7 b1

Remarks : -

Mode : Tx 11g 2412MHz

Report No. : 10182580S

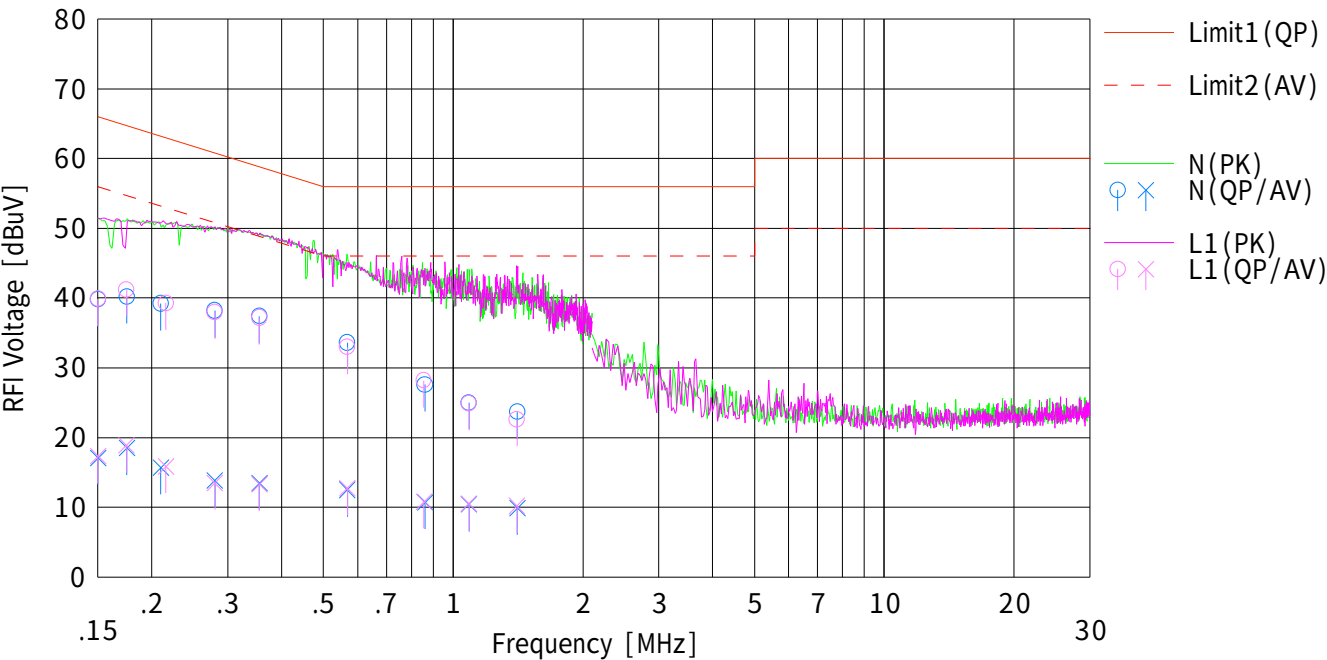
Power : DC 3.4V

Temp./Humi. : 21deg.C. / 30%RH

Limit1 : FCC 15C(15.207) QP

Limit2 : FCC 15C(15.207) AV

Engineer : Tatsuya Arai



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	27.1	4.4	12.7	39.8	17.1	65.9	55.9	26.1	38.8	N	
2	0.17500	27.5	5.8	12.7	40.2	18.5	64.7	54.7	24.5	36.2	N	
3	0.21000	26.5	3.0	12.7	39.2	15.7	63.2	53.2	24.0	37.5	N	
4	0.28012	25.5	1.1	12.7	38.2	13.8	60.8	50.8	22.6	37.0	N	
5	0.35528	24.7	0.8	12.7	37.4	13.5	58.8	48.8	21.4	35.3	N	
6	0.56800	20.9	-0.2	12.7	33.6	12.5	56.0	46.0	22.4	33.5	N	
7	0.86095	14.9	-2.0	12.7	27.6	10.7	56.0	46.0	28.4	35.3	N	
8	1.08890	12.3	-2.3	12.7	25.0	10.4	56.0	46.0	31.0	35.6	N	
9	1.41070	11.0	-2.8	12.7	23.7	9.9	56.0	46.0	32.3	36.1	N	
10	0.15000	27.2	4.6	12.7	39.9	17.3	65.9	55.9	26.0	38.6	L1	
11	0.17473	28.5	6.2	12.7	41.2	18.9	64.7	54.7	23.5	35.8	L1	
12	0.21550	26.6	3.2	12.7	39.3	15.9	62.9	52.9	23.6	37.0	L1	
13	0.28028	25.3	0.8	12.7	38.0	13.5	60.8	50.8	22.8	37.3	L1	
14	0.35521	24.5	0.6	12.7	37.2	13.3	58.8	48.8	21.6	35.5	L1	
15	0.56800	20.3	0.0	12.7	33.0	12.7	56.0	46.0	23.0	33.3	L1	
16	0.85471	15.5	-1.9	12.7	28.2	10.8	56.0	46.0	27.8	35.2	L1	
17	1.08844	12.2	-2.2	12.7	24.9	10.5	56.0	46.0	31.1	35.5	L1	
18	1.40742	9.9	-2.5	12.7	22.6	10.2	56.0	46.0	33.4	35.8	L1	

Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.3 Semi Anechoic Chamber
Date	January 26, 2014	January 28, 2014
Temperature / Humidity	22 deg.C, 39 %RH	24 deg.C, 32 %RH
Engineer	Takahiro Suzuki	Makoto Hosaka
Mode	Tx, 2412 MHz	
	Tx, IEEE802.11b, PN9	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	44.0	26.8	14.7	35.1	50.4	73.9	23.5	100	218	
Hori.	4824.000	PK	47.7	31.1	7.4	34.7	51.5	73.9	22.4	100	99	
Hori.	7236.000	PK	42.2	37.1	8.8	35.1	53.0	73.9	20.9	100	0	
Hori.	9648.000	PK	44.0	38.6	10.0	35.3	57.3	73.9	16.6	100	0	
Hori.	12060.000	PK	44.6	39.6	10.9	35.3	59.8	73.9	14.1	100	0	
Hori.	2390.000	AV	31.8	26.8	14.7	35.1	38.2	53.9	15.7	100	218	
Hori.	4824.000	AV	34.3	31.1	7.4	34.7	38.1	53.9	15.8	100	99	
Hori.	7236.000	AV	30.6	37.1	8.8	35.1	41.4	53.9	12.5	100	0	
Hori.	9648.000	AV	31.2	38.6	10.0	35.3	44.5	53.9	9.4	100	0	
Hori.	12060.000	AV	32.0	39.6	10.9	35.3	47.2	53.9	6.7	100	0	
Vert.	2390.000	PK	44.0	26.8	14.7	35.1	50.4	73.9	23.5	100	299	
Vert.	4824.000	PK	47.6	31.1	7.4	34.7	51.4	73.9	22.5	100	155	
Vert.	7236.000	PK	42.3	37.1	8.8	35.1	53.1	73.9	20.8	100	0	
Vert.	9648.000	PK	42.3	38.6	10.0	35.3	55.6	73.9	18.3	100	0	
Vert.	12060.000	PK	43.2	39.6	10.9	35.3	58.4	73.9	15.5	100	0	
Vert.	2390.000	AV	31.6	26.8	14.7	35.1	38.0	53.9	15.9	100	299	
Vert.	4824.000	AV	33.6	31.1	7.4	34.7	37.4	53.9	16.5	100	155	
Vert.	7236.000	AV	30.5	37.1	8.8	35.1	41.3	53.9	12.6	100	0	
Vert.	9648.000	AV	30.8	38.6	10.0	35.3	44.1	53.9	9.8	100	0	
Vert.	12060.000	AV	31.6	39.6	10.9	35.3	46.8	53.9	7.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.7	26.8	14.7	35.1	96.1	-	-	
Hori.	2398.590	PK	44.3	26.8	14.7	35.1	50.7	76.1	25.4	
Hori.	2400.000	PK	41.8	26.8	14.7	35.1	48.2	76.1	27.9	
Vert.	2412.000	PK	89.0	26.8	14.7	35.1	95.4	-	-	
Vert.	2398.590	PK	43.3	26.8	14.7	35.1	49.7	75.4	25.7	
Vert.	2400.000	PK	41.4	26.8	14.7	35.1	47.8	75.4	27.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.3 Semi Anechoic Chamber
Date	January 26, 2014	January 28, 2014
Temperature / Humidity	22 deg.C, 39 %RH	24 deg.C, 32 %RH
Engineer	Takahiro Suzuki	Makoto Hosaka
Mode	Tx, 2437 MHz	
	Tx, IEEE802.11b, PN9	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	43.7	31.3	7.4	34.8	47.6	73.9	26.3	100	101	
Hori.	7311.000	PK	42.7	37.2	8.8	35.2	53.5	73.9	20.4	100	0	
Hori.	9748.000	PK	42.9	38.7	10.0	35.4	56.2	73.9	17.7	100	0	
Hori.	12185.000	PK	42.8	39.6	10.9	35.1	58.2	73.9	15.7	100	0	
Hori.	4874.000	AV	31.2	31.3	7.4	34.8	35.1	53.9	18.8	100	101	
Hori.	7311.000	AV	30.3	37.2	8.8	35.2	41.1	53.9	12.8	100	0	
Hori.	9748.000	AV	30.8	38.7	10.0	35.4	44.1	53.9	9.8	100	0	
Hori.	12185.000	AV	31.1	39.6	10.9	35.1	46.5	53.9	7.4	100	0	
Vert.	4874.000	PK	44.1	31.3	7.4	34.8	48.0	73.9	25.9	100	320	
Vert.	7311.000	PK	42.4	37.2	8.8	35.2	53.2	73.9	20.7	100	0	
Vert.	9748.000	PK	43.4	38.7	10.0	35.4	56.7	73.9	17.2	100	0	
Vert.	12185.000	PK	43.2	39.6	10.9	35.1	58.6	73.9	15.3	100	0	
Vert.	4874.000	AV	30.7	31.3	7.4	34.8	34.6	53.9	19.3	100	320	
Vert.	7311.000	AV	30.3	37.2	8.8	35.2	41.1	53.9	12.8	100	0	
Vert.	9748.000	AV	30.9	38.7	10.0	35.4	44.2	53.9	9.7	100	0	
Vert.	12185.000	AV	31.1	39.6	10.9	35.1	46.5	53.9	7.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.3 Semi Anechoic Chamber
Date	January 26, 2014	January 28, 2014
Temperature / Humidity	22 deg.C, 39 %RH	24 deg.C, 32 %RH
Engineer	Takahiro Suzuki	Makoto Hosaka
Mode	Tx, 2462 MHz	
	Tx, IEEE802.11b, PN9	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	45.8	26.9	14.8	35.0	52.5	73.9	21.4	100	218	
Hori.	4924.000	PK	43.3	31.6	7.4	34.8	47.5	73.9	26.4	100	100	
Hori.	7386.000	PK	42.9	37.3	8.9	35.3	53.8	73.9	20.1	100	0	
Hori.	9848.000	PK	44.5	38.9	10.0	35.5	57.9	73.9	16.0	100	0	
Hori.	12310.000	PK	42.8	39.6	10.9	35.0	58.3	73.9	15.6	100	0	
Hori.	2483.500	AV	33.5	26.9	14.8	35.0	40.2	53.9	13.7	100	218	
Hori.	4924.000	AV	30.2	31.6	7.4	34.8	34.4	53.9	19.5	100	100	
Hori.	7386.000	AV	30.1	37.3	8.9	35.3	41.0	53.9	12.9	100	0	
Hori.	9848.000	AV	30.9	38.9	10.0	35.5	44.3	53.9	9.6	100	0	
Hori.	12310.000	AV	30.6	39.6	10.9	35.0	46.1	53.9	7.8	100	0	
Vert.	2483.500	PK	45.2	26.9	14.8	35.0	51.9	73.9	22.0	100	279	
Vert.	4924.000	PK	42.8	31.6	7.4	34.8	47.0	73.9	26.9	100	349	
Vert.	7386.000	PK	42.8	37.3	8.9	35.3	53.7	73.9	20.2	100	0	
Vert.	9848.000	PK	43.1	38.9	10.0	35.5	56.5	73.9	17.4	100	0	
Vert.	12310.000	PK	42.7	39.6	10.9	35.0	58.2	73.9	15.7	100	0	
Vert.	2483.500	AV	32.8	26.9	14.8	35.0	39.5	53.9	14.4	100	279	
Vert.	4924.000	AV	31.0	31.6	7.4	34.8	35.2	53.9	18.7	100	349	
Vert.	7386.000	AV	30.1	37.3	8.9	35.3	41.0	53.9	12.9	100	0	
Vert.	9848.000	AV	30.8	38.9	10.0	35.5	44.2	53.9	9.7	100	0	
Vert.	12310.000	AV	30.5	39.6	10.9	35.0	46.0	53.9	7.9	100	0	

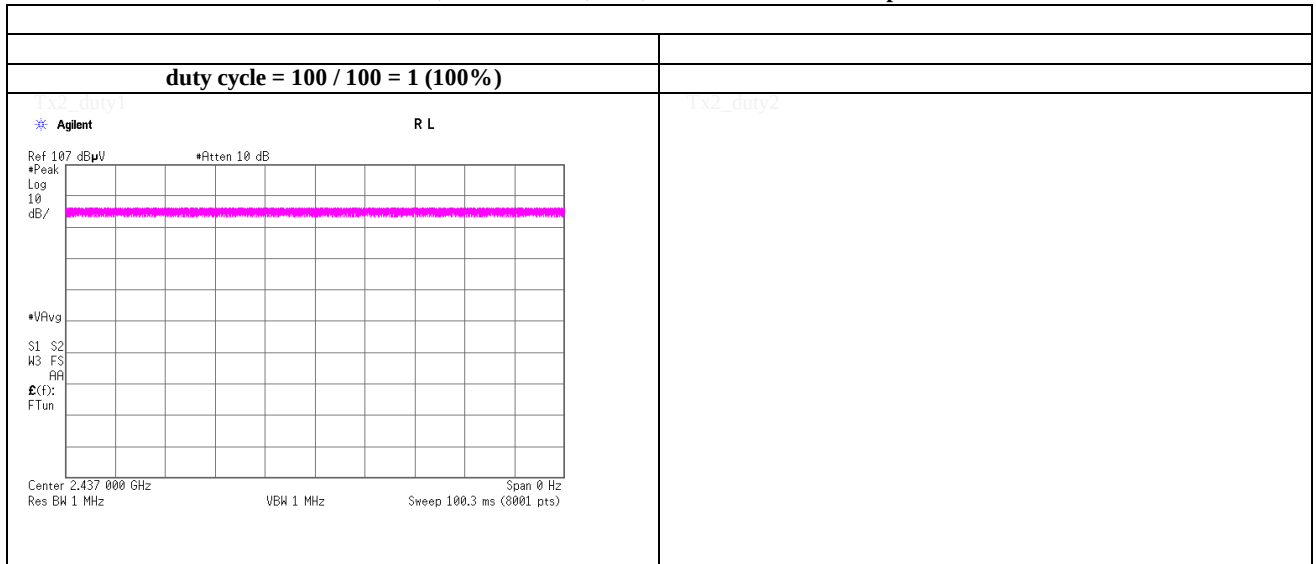
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	January 26, 2014	
Temperature / Humidity	22deg.C , 39%RH	
Engineer	Takahiro Suzuki	

Burst rate confirmation

Tx, IEEE802.11b, PN9, worst data mode 11Mbps



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Shonan EMC Lab.

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Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.3 Semi Anechoic Chamber
Date	January 26, 2014	January 28, 2014
Temperature / Humidity	22 deg.C, 39 %RH	24 deg.C, 32 %RH
Engineer	Takahiro Suzuki	Makoto Hosaka
Mode	Tx, 2412 MHz	
	Tx, IEEE802.11g, PN9	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	48.9	26.8	14.7	35.1	55.3	73.9	18.6	100	91	
Hori.	2651.996	PK	50.0	27.3	15.1	35.0	57.4	73.9	16.5	100	214	
Hori.	4824.000	PK	45.6	31.1	7.4	34.7	49.4	73.9	24.5	100	98	
Hori.	7236.000	PK	43.7	37.1	8.8	35.1	54.5	73.9	19.4	100	0	
Hori.	9648.000	PK	43.2	38.6	10.0	35.3	56.5	73.9	17.4	100	0	
Hori.	12060.000	PK	44.1	39.6	10.9	35.3	59.3	73.9	14.6	100	0	
Hori.	2390.000	AV	35.7	26.8	14.7	35.1	42.1	53.9	11.8	100	91	
Hori.	2651.996	AV	37.3	27.3	15.1	35.0	44.7	53.9	9.2	100	214	
Hori.	4824.000	AV	33.3	31.1	7.4	34.7	37.1	53.9	16.8	100	98	
Hori.	7236.000	AV	30.6	37.1	8.8	35.1	41.4	53.9	12.5	100	0	
Hori.	9648.000	AV	31.0	38.6	10.0	35.3	44.3	53.9	9.6	100	0	
Hori.	12060.000	AV	31.9	39.6	10.9	35.3	47.1	53.9	6.8	100	0	
Vert.	88.000	QP	32.2	7.8	8.4	31.8	16.6	40.0	23.4	100	45	
Vert.	2390.000	PK	48.4	26.8	14.7	35.1	54.8	73.9	19.1	100	170	
Vert.	2651.996	PK	47.8	27.3	15.1	35.0	55.2	73.9	18.7	100	243	
Vert.	4824.000	PK	45.6	31.1	7.4	34.7	49.4	73.9	24.5	100	216	
Vert.	7236.000	PK	43.0	37.1	8.8	35.1	53.8	73.9	20.1	100	0	
Vert.	9648.000	PK	43.2	38.6	10.0	35.3	56.5	73.9	17.4	100	0	
Vert.	12060.000	PK	43.7	39.6	10.9	35.3	58.9	73.9	15.0	100	0	
Vert.	2390.000	AV	35.1	26.8	14.7	35.1	41.5	53.9	12.4	100	170	
Vert.	2651.996	AV	35.7	27.3	15.1	35.0	43.1	53.9	10.8	100	243	
Vert.	4824.000	AV	33.2	31.1	7.4	34.7	37.0	53.9	16.9	100	216	
Vert.	7236.000	AV	30.6	37.1	8.8	35.1	41.4	53.9	12.5	100	0	
Vert.	9648.000	AV	31.1	38.6	10.0	35.3	44.4	53.9	9.5	100	0	
Vert.	12060.000	AV	31.9	39.6	10.9	35.3	47.1	53.9	6.8	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	85.6	26.8	14.7	35.1	92.0	-	-	
Hori.	2400.000	PK	52.3	26.8	14.7	35.1	58.7	72.0	13.3	
Vert.	2412.000	PK	84.7	26.8	14.7	35.1	91.1	-	-	
Vert.	2400.000	PK	50.3	26.8	14.7	35.1	56.7	71.1	14.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.3 Semi Anechoic Chamber
Date	January 26, 2014	January 28, 2014
Temperature / Humidity	22 deg.C, 39 %RH	24 deg.C, 32 %RH
Engineer	Takahiro Suzuki	Makoto Hosaka
Mode	Tx, 2437 MHz	
	Tx, IEEE802.11g, PN9	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2661.690	PK	49.0	27.3	15.1	35.0	56.4	73.9	17.5	100	208	
Hori.	4874.000	PK	43.5	31.3	7.4	34.8	47.4	73.9	26.5	100	102	
Hori.	7311.000	PK	42.3	37.2	8.8	35.2	53.1	73.9	20.8	100	0	
Hori.	9748.000	PK	42.6	38.7	10.0	35.4	55.9	73.9	18.0	100	0	
Hori.	12185.000	PK	42.9	39.6	10.9	35.1	58.3	73.9	15.6	100	0	
Hori.	2661.690	AV	36.6	27.3	15.1	35.0	44.0	53.9	9.9	100	208	
Hori.	4874.000	AV	31.4	31.3	7.4	34.8	35.3	53.9	18.6	100	102	
Hori.	7311.000	AV	30.2	37.2	8.8	35.2	41.0	53.9	12.9	100	0	
Hori.	9748.000	AV	30.9	38.7	10.0	35.4	44.2	53.9	9.7	100	0	
Hori.	12185.000	AV	31.1	39.6	10.9	35.1	46.5	53.9	7.4	100	0	
Vert.	2661.690	PK	47.5	27.3	15.1	35.0	54.9	73.9	19.0	100	260	
Vert.	4874.000	PK	43.2	31.3	7.4	34.8	47.1	73.9	26.8	100	269	
Vert.	7311.000	PK	42.4	37.2	8.8	35.2	53.2	73.9	20.7	100	0	
Vert.	9748.000	PK	43.2	38.7	10.0	35.4	56.5	73.9	17.4	100	0	
Vert.	12185.000	PK	43.2	39.6	10.9	35.1	58.6	73.9	15.3	100	0	
Vert.	2661.690	AV	35.4	27.3	15.1	35.0	42.8	53.9	11.1	100	260	
Vert.	4874.000	AV	31.3	31.3	7.4	34.8	35.2	53.9	18.7	100	269	
Vert.	7311.000	AV	30.3	37.2	8.8	35.2	41.1	53.9	12.8	100	0	
Vert.	9748.000	AV	30.9	38.7	10.0	35.4	44.2	53.9	9.7	100	0	
Vert.	12185.000	AV	31.1	39.6	10.9	35.1	46.5	53.9	7.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.3 Semi Anechoic Chamber
Date	January 26, 2014	January 28, 2014
Temperature / Humidity	22 deg.C, 39 %RH	24 deg.C, 32 %RH
Engineer	Takahiro Suzuki	Makoto Hosaka
Mode	Tx, 2462 MHz	
	Tx, IEEE802.11g, PN9	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	57.2	26.9	14.8	35.0	63.9	73.9	10.0	100	134	
Hori.	2639.757	PK	49.5	27.2	15.0	35.0	56.7	73.9	17.2	100	211	
Hori.	4924.000	PK	42.5	31.6	7.4	34.8	46.7	73.9	27.2	100	107	
Hori.	7386.000	PK	41.8	37.3	8.9	35.3	52.7	73.9	21.2	100	0	
Hori.	9848.000	PK	42.3	38.9	10.0	35.5	55.7	73.9	18.2	100	0	
Hori.	12310.000	PK	43.3	39.6	10.9	35.0	58.8	73.9	15.1	100	0	
Hori.	2483.500	AV	41.1	26.9	14.8	35.0	47.8	53.9	6.1	100	134	
Hori.	2639.757	AV	36.5	27.2	15.0	35.0	43.7	53.9	10.2	100	211	
Hori.	4924.000	AV	30.5	31.6	7.4	34.8	34.7	53.9	19.2	100	107	
Hori.	7386.000	AV	30.1	37.3	8.9	35.3	41.0	53.9	12.9	100	0	
Hori.	9848.000	AV	30.9	38.9	10.0	35.5	44.3	53.9	9.6	100	0	
Hori.	12310.000	AV	30.6	39.6	10.9	35.0	46.1	53.9	7.8	100	0	
Vert.	2483.500	PK	54.6	26.9	14.8	35.0	61.3	73.9	12.6	100	1	
Vert.	2639.757	PK	47.0	27.2	15.0	35.0	54.2	73.9	19.7	100	336	
Vert.	4924.000	PK	43.5	31.6	7.4	34.8	47.7	73.9	26.2	100	352	
Vert.	7386.000	PK	41.9	37.3	8.9	35.3	52.8	73.9	21.1	100	0	
Vert.	9848.000	PK	43.7	38.9	10.0	35.5	57.1	73.9	16.8	100	0	
Vert.	12310.000	PK	43.2	39.6	10.9	35.0	58.7	73.9	15.2	100	0	
Vert.	2483.500	AV	39.1	26.9	14.8	35.0	45.8	53.9	8.1	100	1	
Vert.	2639.757	AV	35.3	27.2	15.0	35.0	42.5	53.9	11.4	100	336	
Vert.	4924.000	AV	30.3	31.6	7.4	34.8	34.5	53.9	19.4	100	352	
Vert.	7386.000	AV	30.1	37.3	8.9	35.3	41.0	53.9	12.9	100	0	
Vert.	9848.000	AV	30.9	38.9	10.0	35.5	44.3	53.9	9.6	100	0	
Vert.	12310.000	AV	30.6	39.6	10.9	35.0	46.1	53.9	7.8	100	0	

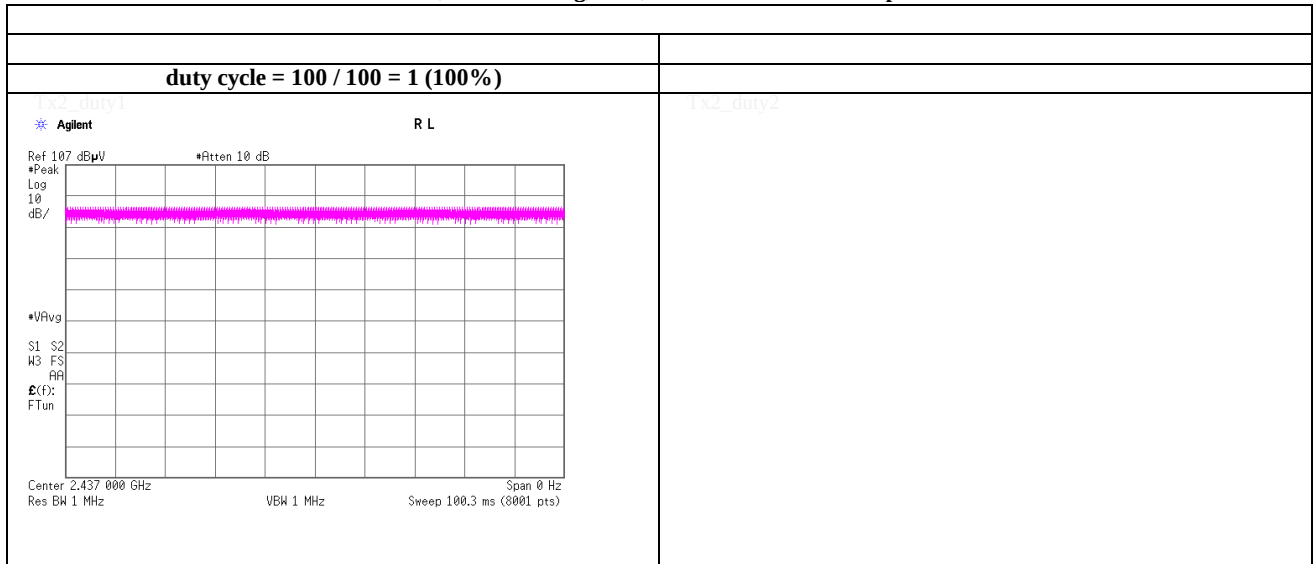
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter))(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	January 26, 2014	
Temperature / Humidity	22deg.C , 39%RH	
Engineer	Takahiro Suzuki	

Burst rate confirmation

Tx, IEEE802.11g, PN9, worst data mode 54Mbps



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APPENDIX 3 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2013/02/12 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2013/12/26 * 12
KAT3-09	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2013/08/23 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2013/10/13 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2013/04/04 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2013/04/04 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2013/10/26 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2013/02/27 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2013/11/20 * 12
SJM-08	Measure	PROMART	SEN1935	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2013/07/03 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF, MF)	-	RE,CE	-
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2013/03/19 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2013/04/09 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2013/05/22 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2013/08/12 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2013/03/19 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2013/03/14 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2013/03/16 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2013/03/28 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2013/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2013/11/22 * 12
KAF-04	Pre Amplifier	Agilent	8449B	3008A01600	RE	2013/04/03 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE,CE	-
SCC-C9/C10/SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271(RF Selector)	CE	2013/04/03 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2013/02/25 * 12
SAT3-05	Attenuator	JFW	50HF-003N	-	CE	2013/02/12 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2013/03/07 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	CE	2013/02/27 * 12

The expiration date of the calibration is the end of the expired month .
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .

Test Item : CE: Conducted emission , RE: Radiated emission ,
End of Report

UL Japan, Inc.

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