



RADIO TEST REPORT cover sheet

Applicant : **Clarion Co., Ltd.**

Model No. : **QY-5120, PH-3782**

FCC ID : **AX2QY5120**

The difference between 3 models (QY-5111, QY-5120 and PH-3782) doesn't affect the radio characteristics.

The electrical characteristics among those models are identical to each other.

Therefore, we use test report No. 10705692S-K and 10705692S-L.

Date

July 9, 2015

Toyokazu Imamura

Leader

Consumer Technology Division

UL Japan, Inc.

Shonan EMC Lab.

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RADIO TEST REPORT

Test Report No.: 10705692S-K

(Original test report: 10399701S-F)

Applicant : Clarion Co., Ltd.
Type of Equipment : Navigation Unit
Model No. : QY-5111
FCC ID : AX2QY5092
Test regulation : FCC Part15 Subpart C: 2015
Test item : Radiated Spurious emission
Test result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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.
4. The test results in this test 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 any agency of the Federal Government.
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: March 12 to 15, 2015

Representative test engineer:

T. Arai

Tatsuya Arai
Engineer
Consumer Technology Division

Approved by :

T. Amamura

Toyokazu Imamura
Leader
Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Clarion Co., Ltd.
Address : 7-2 Shintoshin, Chuo-ku, Saitama-shi, Saitama, 330-0081 Japan
Telephone Number : +81-48-601-3602
Facsimile Number : +81-48-601-3802
Contact Person : Matsuhiko Hirano

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

2.1 Identification of E.U.T.

Type of Equipment : Navigation Unit
Model Number : QY-5111
Serial Number : Refer to Section 4.2
Rating : DC10-16V
Country of Mass-production : Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : March 11, 2015
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: QY-5111 (referred to as the EUT in this report) is a Navigation Unit.

Clock frequency(ies) in the system : 5.6448 MHz, 6.144 MHz, 8.192 MHz, 16.92 MHz, 12.8 MHz,
24.576 MHz, 26 MHz, 27 MHz, 28.224 MHz, 33.231 MHz, 41.6 MHz,
48 MHz

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<Bluetooth part>

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth & channel spacing : 79MHz & 1MHz
Type of modulation : GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna type : Film
Antenna gain : 3.0dBi
Antenna connector type : U.FL
Operation temperature range : -30 to +70 deg.C.
ITU code : F1D, G1D

<Wireless LAN part>

Equipment type : Transceiver
Frequency of operation : 2412-2462MHz
Bandwidth & channel spacing : 20MHz & 5MHz
Type of modulation : CCK, OFDM
Antenna type : Film
Antenna gain : 3.0dBi
Antenna connector type : U.FL
Operation temperature range : -30 to +70 deg.C.
ITU code : G1D, D1D

* For Wireless LAN part, refer to the test report: 10705692S-L.

FCC 15.31 (e)

The EUT provides stable voltage (DC3.3V) constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC 15.203

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2015, final revised on June 12, 2015
and effective July 13, 2015
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

* The revision on June 12, 2015 does not affect the test specification applied to the EUT.

The EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 10705692S-E.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009	FCC 15.207	-	N/A *1)	-	-
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4:2009	FCC 15.247 (a)(1)	Conducted	*2)		-
20dB bandwidth	FCC Public Notice DA 00-705 & ANSI C63.4:2009	FCC 15.247 (a)(1)	Conducted	*2)		-
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4:2009	FCC 15.247 (a)(1)(iii)	Conducted	*2)		-
Dwell time	FCC Public Notice DA 00-705 & ANSI C63.4:2009	FCC 15.247 (a)(1)(iii)	Conducted	*2)		-
Maximum peak output power	FCC Public Notice DA 00-705 & ANSI C63.4:2009	FCC 15.247 (b)(1)	Conducted	*2)		-
Band edge compliance & Spurious emission	FCC Public Notice DA 00-705 & ANSI C63.4:2009	FCC 15.247 (d) 15.209	Radiated	N/A	4.3 dB Freq.: 663.013MHz Detection: Quasi-Peak Polarization: Vertical Mode: Tx 2441MHz, 3-DH5	Complied
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422 *1) The test is not applicable since the EUT has no AC mains. *2) Refer to the test report: 10399701S-F (Tested model: QY-5092)						

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 (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.5 dB	3.5 dB
	30MHz-300MHz	4.9 dB	4.9 dB	4.7 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	5.7 dB	5.7 dB
	18GHz-40GHz	4.5 dB	4.3 dB	4.3 dB

*1: SAC=Semi-Anechoic Chamber

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

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

	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	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.2 semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.3 semi-anechoic chamber	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	-
☐ No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

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	Operating mode	Tested frequency
Band edge compliance & Spurious emission	Transmitting (DH5 / 3-DH5), Payload: PRBS9-Hopping OFF	2402MHz, 2441MHz, 2480MHz

*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload.

We removed 2-DH mode (2 Mb/s EDR: pi/4DQPSK) except power measurement by using 3-DH mode (3 Mb/s EDR: 8DPSK) as a representative.

EUT has the power settings by the software as follows;

Power settings	Fixed
Software	Tera Term ver. 4.66

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

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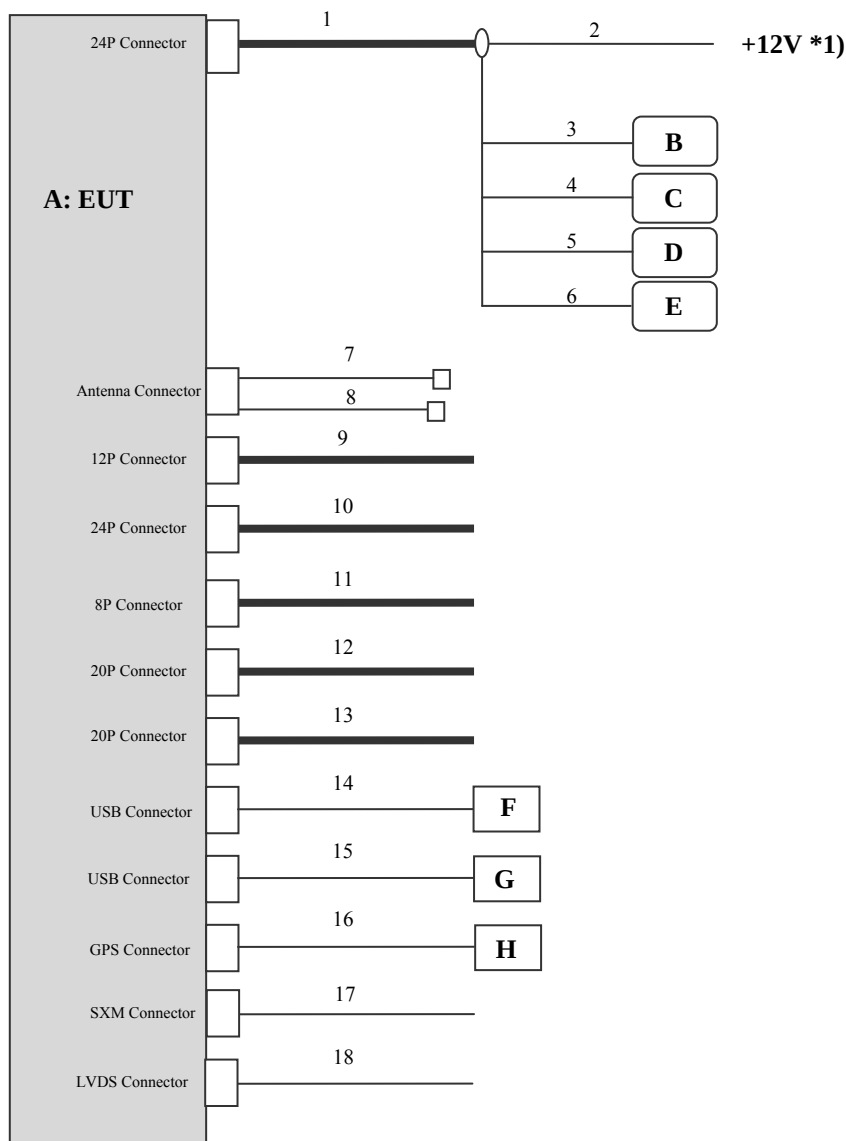
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4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

*1) DC power supply (Model No.: PAN35-10A) was used for DC 12V input.

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Description of EUT and Auxiliary equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Navigation Unit	QY-5111	CL****540000032	Clarion	EUT
B	Speaker	KFC-RS160	-	KENWOOD	-
C	Speaker	KFC-RS160	-	KENWOOD	-
D	Speaker	KFC-RS160	-	KENWOOD	-
E	Speaker	KFC-RS160	-	KENWOOD	-
F	USB Memory	MF-RSU204GPN	BR00004173	ELECOM	-
G	USB Memory	HUD-128PJ	-	HAGIWARA SYS-COM	-
H	GPS Antenna	-	0960138000763	-	-

List of cables used

No.	Item	Length(m)	Shield (Cable)	Shield (Connector)	Remarks
1	24P Connector (Gray)	2.0	Unshielded	Unshielded	-
2	+B, ACC, GND	1.2	Unshielded	Unshielded	-
3	Speaker Front Left	1.8	Unshielded	Unshielded	-
4	Speaker Front Right	1.8	Unshielded	Unshielded	-
5	Speaker Rear Left	1.8	Unshielded	Unshielded	-
6	Speaker Rear Right	1.8	Unshielded	Unshielded	-
7	Main antenna	0.2+3.0	Shielded	Shielded	-
8	Sub antenna	0.2	Shielded	Shielded	-
9	12P Connector (Gray)	2.2	Unshielded	Unshielded	-
10	24P Connector (Gray)	2.2	Unshielded	Unshielded	-
11	8P Connector (Gray)	2.5	Unshielded	Unshielded	-
12	20P Connector (Gray)	2.2	Unshielded	Unshielded	-
13	28P Connector (Gray)	2.2	Unshielded	Unshielded	-
14	USB connector	0.5	Shielded	Shielded	-
15	USB connector	0.5	Shielded	Shielded	-
16	GPS connector	2.5	Shielded	Shielded	-
17	SXM connector	2.0	Shielded	Shielded	-
18	LVDS connector	2.0	Shielded	Shielded	-

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SECTION 5: Radiated emission

5.1 Operating environment

Test room : 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, 1.0m 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 EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. 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 3.

5.3 Test conditions

Frequency range : 30MHz - 25GHz
EUT position : Table top

5.4 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	Peak
IF Bandwidth	: 120kHz	RBW:1MHz VBW:3MHz	RBW:1MHz VBW:10Hz	RBW: 100kHz VBW: 300kHz

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

Although 00-705 accepts VBW=10Hz for AV measurements, confirmed that superfluous smoothing was not performed.

** Since the duty cycle is the same as shown in the original report: 10399701S-F, the same duty factor is used.

The EUT was set at 38 degree as normal position according to the EUT's specification.

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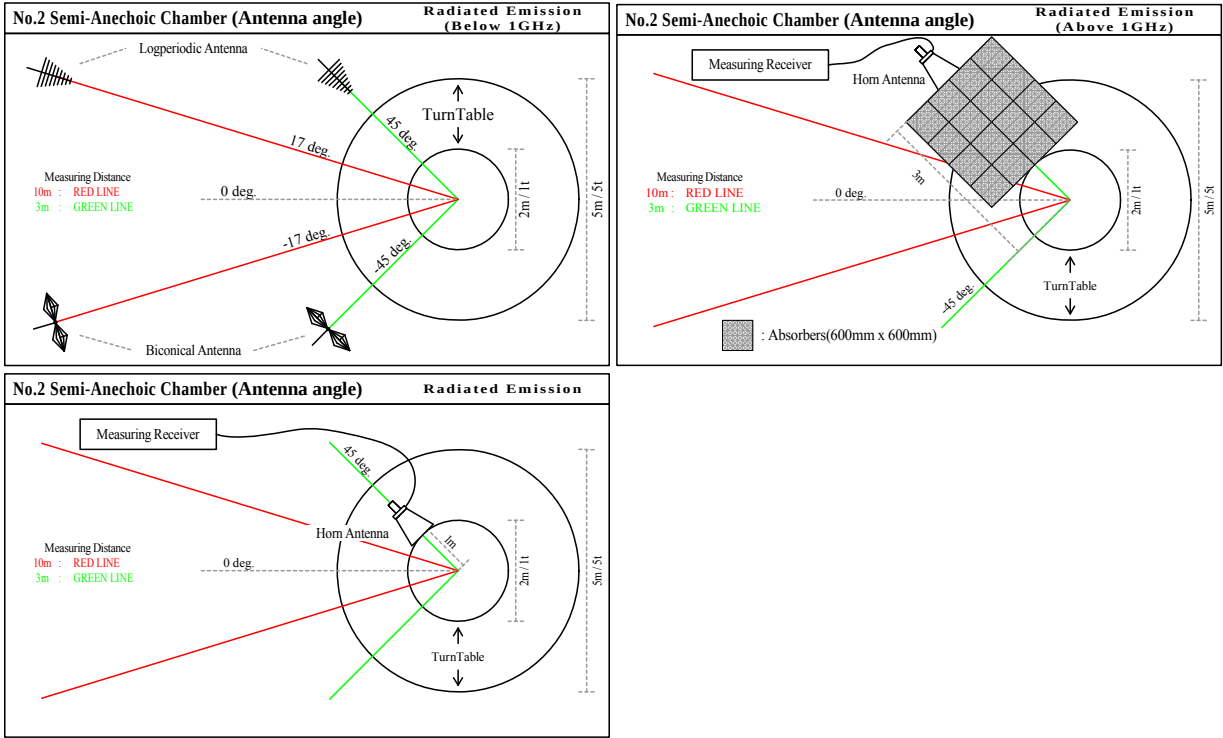
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Figure 1. Antenna angle



5.5 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.

5.6 Results

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

Refer to APPENDIX 1.

Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

Radiated emission

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission

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APPENDIX 1: Data of radio tests**Radiated Emission**

Test place	No.2 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 12, 2015	March 15, 2015
Temperature / Humidity	23 deg.C, 26 %RH	16 deg.C, 25 %RH
Engineer	Kenichi Adachi	Tatsuya Arai
Mode	Tx, 2402 MHz	
	Tx, Bluetooth, BDR, PRBS9,	

(* 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.	135.201	QP	40.7	14.0	8.2	31.8	31.1	43.5	12.4	143	102	
Hori.	480.036	QP	41.6	17.2	7.5	31.6	34.7	46.0	11.3	100	317	
Hori.	487.499	QP	46.3	17.3	7.6	31.6	39.6	46.0	6.4	205	120	
Hori.	960.065	QP	38.6	22.6	9.7	30.4	40.5	53.9	13.4	100	191	
Hori.	2390.000	PK	43.3	25.9	14.5	38.1	45.6	73.9	28.3	100	34	
Hori.	2937.557	PK	51.2	26.9	6.7	38.1	46.7	73.9	27.2	100	211	
Hori.	4804.000	PK	45.5	30.4	7.5	36.8	46.6	73.9	27.3	152	64	
Hori.	7206.000	PK	45.3	36.3	9.0	39.1	51.5	73.9	22.4	100	0	
Hori.	9608.000	PK	42.8	38.3	9.8	36.9	54.0	73.9	19.9	100	0	
Hori.	12010.000	PK	44.3	39.3	11.2	38.1	56.7	73.9	17.2	100	0	
Hori.	2390.000	AV	31.0	25.9	14.5	38.1	33.3	53.9	20.6	100	34	
Hori.	2937.557	AV	45.4	26.9	6.7	38.1	40.9	53.9	13.0	100	211	
Hori.	4804.000	AV	34.0	30.4	7.5	36.8	35.1	53.9	18.8	152	64	
Hori.	7206.000	AV	32.2	36.3	9.0	39.1	38.4	53.9	15.5	100	0	
Hori.	9608.000	AV	30.0	38.3	9.8	36.9	41.2	53.9	12.7	100	0	
Hori.	12010.000	AV	31.4	39.3	11.2	38.1	43.8	53.9	10.1	100	0	
Vert.	135.195	QP	40.2	14.0	8.2	31.8	30.6	43.5	12.9	100	74	
Vert.	487.494	QP	41.2	17.3	7.6	31.6	34.5	46.0	11.5	100	211	
Vert.	682.496	QP	39.3	20.1	8.5	31.5	36.4	46.0	9.6	100	61	
Vert.	960.065	QP	34.2	22.6	9.7	30.4	36.1	53.9	17.8	100	254	
Vert.	2390.000	PK	43.4	25.9	14.5	38.1	45.7	73.9	28.2	143	141	
Vert.	3001.578	PK	52.8	27.0	6.5	38.1	48.2	73.9	25.7	100	213	
Vert.	4804.000	PK	45.0	30.4	7.5	36.8	46.1	73.9	27.8	142	359	
Vert.	7206.000	PK	45.2	36.3	9.0	39.1	51.4	73.9	22.5	100	0	
Vert.	9608.000	PK	42.9	38.3	9.8	36.9	54.1	73.9	19.8	100	0	
Vert.	12010.000	PK	44.4	39.3	11.2	38.1	56.8	73.9	17.1	100	0	
Vert.	2390.000	AV	31.1	25.9	14.5	38.1	33.4	53.9	20.5	143	141	
Vert.	3001.578	AV	46.9	27.0	6.5	38.1	42.3	53.9	11.6	100	213	
Vert.	4804.000	AV	32.5	30.4	7.5	36.8	33.6	53.9	20.3	142	359	
Vert.	7206.000	AV	32.1	36.3	9.0	39.1	38.3	53.9	15.6	100	0	
Vert.	9608.000	AV	30.1	38.3	9.8	36.9	41.3	53.9	12.6	100	0	
Vert.	12010.000	AV	31.5	39.3	11.2	38.1	43.9	53.9	10.0	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.	2402.000	PK	87.4	25.9	14.5	38.1	89.7	-	-	Carrier
Hori.	2400.000	PK	39.7	25.9	14.5	38.1	42.0	69.7	27.7	
Vert.	2402.000	PK	79.6	25.9	14.5	38.1	81.9	-	-	Carrier
Vert.	2400.000	PK	35.5	25.9	14.5	38.1	37.8	61.9	24.1	

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

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Radiated Emission

Test place	No.2 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 12, 2015	March 15, 2015
Temperature / Humidity	23 deg.C, 26 %RH	16 deg.C, 25 %RH
Engineer	Kenichi Adachi	Tatsuya Arai
Mode	Tx, 2441 MHz	
	Tx, Bluetooth, BDR, PRBS9,	

(* 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.	135.198	QP	40.2	14.0	8.2	31.8	30.6	43.5	12.9	230	104	
Hori.	480.034	QP	41.4	17.2	7.5	31.6	34.5	46.0	11.5	100	316	
Hori.	487.498	QP	45.8	17.3	7.6	31.6	39.1	46.0	6.9	215	117	
Hori.	960.066	QP	38.6	22.6	9.7	30.4	40.5	53.9	13.4	100	191	
Hori.	2937.556	PK	51.0	26.9	6.7	38.1	46.5	73.9	27.4	100	214	
Hori.	4882.000	PK	45.1	30.7	7.6	36.8	46.6	73.9	27.3	147	62	
Hori.	7323.000	PK	44.9	36.4	8.9	39.1	51.1	73.9	22.8	100	0	
Hori.	9764.000	PK	44.7	38.3	9.9	37.0	55.9	73.9	18.0	100	0	
Hori.	12205.000	PK	45.3	39.2	11.2	38.0	57.7	73.9	16.2	100	0	
Hori.	2937.556	AV	45.1	26.9	6.7	38.1	40.6	53.9	13.3	100	214	
Hori.	4882.000	AV	32.7	30.7	7.6	36.8	34.2	53.9	19.7	147	62	
Hori.	7323.000	AV	31.7	36.4	8.9	39.1	37.9	53.9	16.0	100	0	
Hori.	9764.000	AV	29.9	38.3	9.9	37.0	41.1	53.9	12.8	100	0	
Hori.	12205.000	AV	31.1	39.2	11.2	38.0	43.5	53.9	10.4	100	0	
Vert.	135.199	QP	40.4	14.0	8.2	31.8	30.8	43.5	12.7	100	74	
Vert.	487.502	QP	44.9	17.3	7.6	31.6	38.2	46.0	7.8	100	227	
Vert.	682.493	QP	40.4	20.1	8.5	31.5	37.5	46.0	8.5	100	63	
Vert.	3001.577	PK	53.0	27.0	6.5	38.1	48.4	73.9	25.5	100	212	
Vert.	4882.000	PK	44.8	30.7	7.6	36.8	46.3	73.9	27.6	143	0	
Vert.	7323.000	PK	45.0	36.4	8.9	39.1	51.2	73.9	22.7	100	0	
Vert.	9764.000	PK	44.8	38.3	9.9	37.0	56.0	73.9	17.9	100	0	
Vert.	12205.000	PK	45.4	39.2	11.2	38.0	57.8	73.9	16.1	100	0	
Vert.	3001.577	AV	47.0	27.0	6.5	38.1	42.4	53.9	11.5	100	212	
Vert.	4882.000	AV	32.3	30.7	7.6	36.8	33.8	53.9	20.1	143	0	
Vert.	7323.000	AV	31.8	36.4	8.9	39.1	38.0	53.9	15.9	100	0	
Vert.	9764.000	AV	29.8	38.3	9.9	37.0	41.0	53.9	12.9	100	0	
Vert.	12205.000	AV	31.0	39.2	11.2	38.0	43.4	53.9	10.5	100	0	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **UL Japan, Inc.****Shonan EMC Lab.**

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Radiated Emission

Test place	No.2 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 12, 2015	March 15, 2015
Temperature / Humidity	23 deg.C, 26 %RH	16 deg.C, 25 %RH
Engineer	Kenichi Adachi	Tatsuya Arai
Mode	Tx, 2480 MHz	
	Tx, Bluetooth, BDR, PRBS9,	

(* 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.	135.199	QP	40.2	14.0	8.2	31.8	30.6	43.5	12.9	132	102	
Hori.	480.029	QP	41.7	17.2	7.5	31.6	34.8	46.0	11.2	100	316	
Hori.	487.502	QP	46.4	17.3	7.6	31.6	39.7	46.0	6.3	204	120	
Hori.	960.061	QP	32.0	22.6	9.7	30.4	33.9	53.9	20.0	100	280	
Hori.	2483.500	PK	44.8	25.9	14.6	38.0	47.3	73.9	26.6	100	36	
Hori.	2937.566	PK	51.5	26.9	6.7	38.1	47.0	73.9	26.9	100	214	
Hori.	4960.000	PK	44.9	31.0	7.7	36.7	46.9	73.9	27.0	147	61	
Hori.	7440.000	PK	45.2	36.5	9.0	39.2	51.5	73.9	22.4	100	0	
Hori.	9920.000	PK	42.9	38.4	9.8	37.1	54.0	73.9	19.9	100	0	
Hori.	12400.000	PK	44.0	39.1	11.4	37.9	56.6	73.9	17.3	100	0	
Hori.	2483.500	AV	32.0	25.9	14.6	38.0	34.5	53.9	19.4	100	36	
Hori.	2937.566	AV	45.4	26.9	6.7	38.1	40.9	53.9	13.0	100	214	
Hori.	4960.000	AV	32.4	31.0	7.7	36.7	34.4	53.9	19.5	147	61	
Hori.	7440.000	AV	32.4	36.5	9.0	39.2	38.7	53.9	15.2	100	0	
Hori.	9920.000	AV	29.9	38.4	9.8	37.1	41.0	53.9	12.9	100	0	
Hori.	12400.000	AV	31.6	39.1	11.4	37.9	44.2	53.9	9.7	100	0	
Vert.	135.196	QP	39.9	14.0	8.2	31.8	30.3	43.5	13.2	100	61	
Vert.	487.503	QP	44.9	17.3	7.6	31.6	38.2	46.0	7.8	100	223	
Vert.	682.498	QP	40.4	20.1	8.5	31.5	37.5	46.0	8.5	100	63	
Vert.	960.065	QP	34.3	22.6	9.7	30.4	36.2	53.9	17.7	100	247	
Vert.	2483.500	PK	44.7	25.9	14.6	38.0	47.2	73.9	26.7	144	140	
Vert.	3001.573	PK	52.6	27.0	6.5	38.1	48.0	73.9	25.9	100	217	
Vert.	4960.000	PK	43.8	31.0	7.7	36.7	45.8	73.9	28.1	141	359	
Vert.	7440.000	PK	45.1	36.5	9.0	39.2	51.4	73.9	22.5	100	0	
Vert.	9920.000	PK	43.0	38.4	9.8	37.1	54.1	73.9	19.8	100	0	
Vert.	12400.000	PK	43.9	39.1	11.4	37.9	56.5	73.9	17.4	100	0	
Vert.	2483.500	AV	31.9	25.9	14.6	38.0	34.4	53.9	19.5	144	140	
Vert.	3001.573	AV	46.6	27.0	6.5	38.1	42.0	53.9	11.9	100	217	
Vert.	4960.000	AV	32.0	31.0	7.7	36.7	34.0	53.9	19.9	141	359	
Vert.	7440.000	AV	32.3	36.5	9.0	39.2	38.6	53.9	15.3	100	0	
Vert.	9920.000	AV	30.0	38.4	9.8	37.1	41.1	53.9	12.8	100	0	
Vert.	12400.000	AV	31.5	39.1	11.4	37.9	44.1	53.9	9.8	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

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Radiated Emission

Test place	No.2 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 12, 2015	March 15, 2015
Temperature / Humidity	24 deg.C, 27 %RH	16 deg.C, 25 %RH
Engineer	Kenichi Adachi	Tatsuya Arai
Mode	Tx, 2402 MHz	
	Tx, Bluetooth, EDR, PRBS9,	

(* 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.	135.198	QP	39.9	14.0	8.2	31.8	30.3	43.5	13.2	227	101	
Hori.	480.032	QP	41.6	17.2	7.5	31.6	34.7	46.0	11.3	100	317	
Hori.	487.500	QP	46.5	17.3	7.6	31.6	39.8	46.0	6.2	210	120	
Hori.	682.495	QP	36.5	20.1	8.5	31.5	33.6	46.0	12.4	100	92	
Hori.	2390.000	PK	42.8	25.9	14.5	38.1	45.1	73.9	28.8	100	359	
Hori.	2905.584	PK	44.2	26.8	6.7	38.1	39.6	73.9	34.3	100	359	
Hori.	4804.000	PK	43.0	30.4	7.5	36.8	44.1	73.9	29.8	100	213	
Hori.	7206.000	PK	44.5	36.3	9.0	39.1	50.7	73.9	23.2	100	0	
Hori.	9608.000	PK	42.9	38.3	9.8	36.9	54.1	73.9	19.8	100	0	
Hori.	12010.000	PK	43.3	39.3	11.2	38.1	55.7	73.9	18.2	100	0	
Hori.	2390.000	AV	29.0	25.9	14.5	38.1	31.3	53.9	22.6	100	359	
Hori.	2905.584	AV	30.6	26.8	6.7	38.1	26.0	53.9	27.9	100	359	
Hori.	4804.000	AV	31.1	30.4	7.5	36.8	32.2	53.9	21.7	100	213	
Hori.	7206.000	AV	33.0	36.3	9.0	39.1	39.2	53.9	14.7	100	0	
Hori.	9608.000	AV	31.2	38.3	9.8	36.9	42.4	53.9	11.5	100	0	
Hori.	12010.000	AV	32.9	39.3	11.2	38.1	45.3	53.9	8.6	100	0	
Vert.	135.198	QP	40.6	14.0	8.2	31.8	31.0	43.5	12.5	100	67	
Vert.	487.501	QP	44.7	17.3	7.6	31.6	38.0	46.0	8.0	100	230	
Vert.	662.982	QP	44.6	19.8	8.4	31.5	41.3	46.0	4.7	100	58	
Vert.	682.498	QP	40.4	20.1	8.5	31.5	37.5	46.0	8.5	100	64	
Vert.	2390.000	PK	42.4	25.9	14.5	38.1	44.7	73.9	29.2	100	259	
Vert.	3174.399	PK	45.6	27.3	6.5	38.0	41.4	73.9	32.5	100	0	
Vert.	4804.000	PK	42.4	30.4	7.5	36.8	43.5	73.9	30.4	100	52	
Vert.	7206.000	PK	44.5	36.3	9.0	39.1	50.7	73.9	23.2	100	0	
Vert.	9608.000	PK	42.4	38.3	9.8	36.9	53.6	73.9	20.3	100	0	
Vert.	12010.000	PK	42.7	39.3	11.2	38.1	55.1	73.9	18.8	100	0	
Vert.	2390.000	AV	29.1	25.9	14.5	38.1	31.4	53.9	22.5	100	259	
Vert.	3174.399	AV	34.0	27.3	6.5	38.0	29.8	53.9	24.1	100	0	
Vert.	4804.000	AV	31.1	30.4	7.5	36.8	32.2	53.9	21.7	100	52	
Vert.	7206.000	AV	32.8	36.3	9.0	39.1	39.0	53.9	14.9	100	0	
Vert.	9608.000	AV	31.2	38.3	9.8	36.9	42.4	53.9	11.5	100	0	
Vert.	12010.000	AV	32.8	39.3	11.2	38.1	45.2	53.9	8.7	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.	2402.000	PK	82.2	25.9	14.5	38.1	84.5	-	-	Carrier
Hori.	2400.000	PK	36.8	25.9	14.5	38.1	39.1	64.5	25.4	
Vert.	2402.000	PK	77.0	25.9	14.5	38.1	79.3	-	-	Carrier
Vert.	2400.000	PK	33.8	25.9	14.5	38.1	36.1	59.3	23.2	

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

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Radiated Emission

Test place	No.2 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 12, 2015	March 15, 2015
Temperature / Humidity	24 deg.C, 27 %RH	16 deg.C, 25 %RH
Engineer	Kenichi Adachi	Tatsuya Arai
Mode	Tx, 2441 MHz	
	Tx, Bluetooth, EDR, PRBS9,	

(* 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.	135.199	QP	39.7	14.0	8.2	31.8	30.1	43.5	13.4	234	98	
Hori.	480.033	QP	41.4	17.2	7.5	31.6	34.5	46.0	11.5	100	319	
Hori.	487.499	QP	45.0	17.3	7.6	31.6	38.3	46.0	7.7	206	111	
Hori.	960.062	QP	39.4	22.6	9.7	30.4	41.3	53.9	12.6	100	191	
Hori.	2822.486	PK	41.0	26.6	7.0	38.1	36.5	73.9	37.4	100	359	
Hori.	4882.000	PK	43.1	30.7	7.6	36.8	44.6	73.9	29.3	139	85	
Hori.	7323.000	PK	43.1	36.4	8.9	39.1	49.3	73.9	24.6	100	0	
Hori.	9764.000	PK	41.4	38.3	9.9	37.0	52.6	73.9	21.3	100	0	
Hori.	12205.000	PK	43.3	39.2	11.2	38.0	55.7	73.9	18.2	100	0	
Hori.	2822.486	AV	30.4	26.6	7.0	38.1	25.9	53.9	28.0	100	359	
Hori.	4882.000	AV	31.8	30.7	7.6	36.8	33.3	53.9	20.6	139	85	
Hori.	7323.000	AV	32.9	36.4	8.9	39.1	39.1	53.9	14.8	100	0	
Hori.	9764.000	AV	31.0	38.3	9.9	37.0	42.2	53.9	11.7	100	0	
Hori.	12205.000	AV	32.3	39.2	11.2	38.0	44.7	53.9	9.2	100	0	
Vert.	135.198	QP	40.6	14.0	8.2	31.8	31.0	43.5	12.5	100	64	
Vert.	487.497	QP	44.7	17.3	7.6	31.6	38.0	46.0	8.0	100	228	
Vert.	663.013	QP	45.0	19.8	8.4	31.5	41.7	46.0	4.3	100	63	
Vert.	682.498	QP	40.2	20.1	8.5	31.5	37.3	46.0	8.7	100	61	
Vert.	2931.038	PK	43.9	26.9	6.7	38.1	39.4	73.9	34.5	100	359	
Vert.	4882.000	PK	42.4	30.7	7.6	36.8	43.9	73.9	30.0	100	60	
Vert.	7323.000	PK	44.2	36.4	8.9	39.1	50.4	73.9	23.5	100	0	
Vert.	9764.000	PK	41.6	38.3	9.9	37.0	52.8	73.9	21.1	100	0	
Vert.	12205.000	PK	42.9	39.2	11.2	38.0	55.3	73.9	18.6	100	0	
Vert.	2931.038	AV	32.3	26.9	6.7	38.1	27.8	53.9	26.1	100	359	
Vert.	4882.000	AV	31.3	30.7	7.6	36.8	32.8	53.9	21.1	100	60	
Vert.	7323.000	AV	32.9	36.4	8.9	39.1	39.1	53.9	14.8	100	0	
Vert.	9764.000	AV	30.9	38.3	9.9	37.0	42.1	53.9	11.8	100	0	
Vert.	12205.000	AV	32.2	39.2	11.2	38.0	44.6	53.9	9.3	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

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Radiated Emission

Test place	No.2 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 12, 2015	March 15, 2015
Temperature / Humidity	24 deg.C, 27 %RH	16 deg.C, 25 %RH
Engineer	Kenichi Adachi	Tatsuya Arai
Mode	Tx, 2480 MHz	
	Tx, Bluetooth, EDR, PRBS9,	

(* 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.	135.197	QP	39.9	14.0	8.2	31.8	30.3	43.5	13.2	235	99	
Hori.	480.034	QP	41.2	17.2	7.5	31.6	34.3	46.0	11.7	100	315	
Hori.	487.502	QP	46.4	17.3	7.6	31.6	39.7	46.0	6.3	202	120	
Hori.	960.067	QP	39.9	22.6	9.7	30.4	41.8	53.9	12.1	100	191	
Hori.	2483.500	PK	43.8	25.9	14.6	38.0	46.3	73.9	27.6	259	45	
Hori.	2937.589	PK	41.0	26.9	6.7	38.1	36.5	73.9	37.4	100	359	
Hori.	4960.000	PK	43.1	31.0	7.7	36.7	45.1	73.9	28.8	154	82	
Hori.	7440.000	PK	44.3	36.5	9.0	39.2	50.6	73.9	23.3	100	0	
Hori.	9920.000	PK	41.6	38.4	9.8	37.1	52.7	73.9	21.2	100	0	
Hori.	12400.000	PK	42.0	39.1	11.4	37.9	54.6	73.9	19.3	100	0	
Hori.	2483.500	AV	31.2	25.9	14.6	38.0	33.7	53.9	20.2	259	45	
Hori.	2937.589	AV	37.4	26.9	6.7	38.1	32.9	53.9	21.0	100	359	
Hori.	4960.000	AV	31.9	31.0	7.7	36.7	33.9	53.9	20.0	154	82	
Hori.	7440.000	AV	32.5	36.5	9.0	39.2	38.8	53.9	15.1	100	0	
Hori.	9920.000	AV	30.2	38.4	9.8	37.1	41.3	53.9	12.6	100	0	
Hori.	12400.000	AV	31.4	39.1	11.4	37.9	44.0	53.9	9.9	100	0	
Vert.	135.196	QP	40.5	14.0	8.2	31.8	30.9	43.5	12.6	100	52	
Vert.	487.500	QP	44.8	17.3	7.6	31.6	38.1	46.0	7.9	100	221	
Vert.	663.009	QP	44.8	19.8	8.4	31.5	41.5	46.0	4.5	100	67	
Vert.	682.499	QP	40.8	20.1	8.5	31.5	37.9	46.0	8.1	100	64	
Vert.	2483.500	PK	42.8	25.9	14.6	38.0	45.3	73.9	28.6	113	331	
Vert.	2937.285	PK	43.9	26.9	6.7	38.1	39.4	73.9	34.5	100	359	
Vert.	4960.000	PK	41.7	31.0	7.7	36.7	43.7	73.9	30.2	100	313	
Vert.	7440.000	PK	43.9	36.5	9.0	39.2	50.2	73.9	23.7	100	0	
Vert.	9920.000	PK	40.8	38.4	9.8	37.1	51.9	73.9	22.0	100	0	
Vert.	12400.000	PK	42.6	39.1	11.4	37.9	55.2	73.9	18.7	100	0	
Vert.	2483.500	AV	30.4	25.9	14.6	38.0	32.9	53.9	21.0	113	331	
Vert.	2937.285	AV	30.8	26.9	6.7	38.1	26.3	53.9	27.6	100	359	
Vert.	4960.000	AV	31.0	31.0	7.7	36.7	33.0	53.9	20.9	100	313	
Vert.	7440.000	AV	32.6	36.5	9.0	39.2	38.9	53.9	15.0	100	0	
Vert.	9920.000	AV	30.3	38.4	9.8	37.1	41.4	53.9	12.5	100	0	
Vert.	12400.000	AV	31.6	39.1	11.4	37.9	44.2	53.9	9.7	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

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APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2014/07/08 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2014/08/12 * 12
SCC-G02	Coaxial Cable	Suhner	SUCOFLEX 104A	46498/4A	RE	2014/04/22 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2014/11/21 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2014/11/21 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2014/11/21 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2014/05/15 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2014/09/03 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2014/10/30 * 12
SJM-14	Measure	ASKUL	-	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFLMF)	-	RE	-
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2014/11/21 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2014/03/17 * 12
SFL-01	Highpass Filter	MICRO-TRONICS	HPM50115	001	RE	2014/11/21 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2015/03/11 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2014/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2014/03/14 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2015/02/18 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2015/02/18 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2014/08/27 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2014/11/22 * 12
SCC-B1/B3/B5 /B7/B8/B13/S RSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-270(RF Selector)	RE	2014/04/25 * 12
SCC-B2/B4/B6 /B7/B8/B13/S RSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-270(RF Selector)	RE	2014/04/25 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2014/11/22 * 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 :

RE: Radiated emission ,