RADIO TEST REPORT

Test Report No. : 31KE0265-HO-01-A-R1

Applicant	:	**TANITA Corporation**
Type of Equipment	:	**RF module**
Model No.	:	**RA102**
FCC ID	:	**XBXRA102**
Test regulation	:	**FCC Part 15 Subpart C: 2011**
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 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.
6. This report is a revised version of 31KE0265-HO-01-A. 31KE0265-HO-01-A is replaced with this report.

Date of test: October 19, 2011

Representative test engineer:
Tomotaka Sasagawa
Engineer of WiSE Japan,
UL Verification Service

Approved by:
Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

UL Japan, Inc.
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SECTION 1: Customer information

Company Name	:	TANITA Corporation
Address	:	1-14-2 Maeno-cho Itabashi-ku Tokyo, 174-8630 Japan
Telephone Number	:	+81-3-3968-2111
Facsimile Number	:	+81-3-3558-3481
Contact Person	:	Akinori Ochiai

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

2.1 Identification of E.U.T.

Type of Equipment	:	RF module
Model No.	:	RA102
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC2.0V - DC3.3V
Receipt Date of Sample	:	October 19, 2011
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: RA102 (referred to as the EUT in this report) is the RF module.
It is used for data transmission of the measurement machinery.

General Specification

Clock frequency(ies) in the system	:	32.768kHz RFIC:16MHz

Radio Specification

Equipment Type	:	Transceiver
Frequency of Operation	:	2403MHz - 2480MHz
Channel Spacing	:	1MHz
Modulation	:	GFSK
Antenna Type	:	quarter wave meander type (PCB Antenna)
Antenna Gain	:	-2.14dBi
Method of Frequency Generation	:	Crystal

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2011, final revised on July 8, 2011 and effective August 8, 2011
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.249 Operation within the bands 902-928MHz, 2400-2483.5MHz, 5725-5875MHz and 24.0-24.25GHz

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Conducted Emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	[FCC] Section 15.207(a) [IC] RSS-Gen 7.2.4	N/A	**QP** 39.0dB, 4.57777MHz, N **AV** 32.8dB 4.57777MHz, N / 27.92821MHz, L	Complied
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	[FCC] Section 15.249(a)(e) [IC] RSS-210 A2.9	N/A	19.8dB 2403.000MHz, Horizontal, PK	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	[FCC] Section 15.205(a)(b) Section 15.209(a) Section 15.249(a)(d)(e) [IC] RSS-210 2.5 RSS-210 A2.9	N/A	5.8dB 2400.00MHz, Horizontal, PK	Complied
4	20dB Bandwidth	ANSI C63.4:2003	Reference	N/A	N/A	N/A
5	Frequency Tolerance	ANSI C63.4:2003	[FCC] Section 15.249(b) [IC] RSS-210 A2.9	N/A	N/A	N/A *1)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not required since this EUT does not operate with 24.05GHz to 24.25GHz.						

*In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)
This EUT provides stable voltage(DC1.8V) constantly to RF part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement
The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**IC:** RSS-Gen 4.6.1	**IC:** RSS-Gen 4.6.1	N/A	-	Radiated

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 (semi-anechoic chamber)	**Conducted emission (±dB)**
	150kHz-30MHz
No.1	3.5dB
No.2	3.6dB
No.3	3.6dB
No.4	3.6dB

Test room (semi-anechoic chamber)	**Radiated emission**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	5.6dB	5.9dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	5.7dB	5.8dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	5.7dB	5.8dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	5.7dB	5.8dB	5.1dB	4.2dB

*3m/1m/0.5m = 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.

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	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 Data of EMI, Test instruments, and Test set up.

Refer to APPENDIX.

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

4.1 Operating Modes

Transmitting (Tx), 10101010 binary data x 8 bytes

Receiving (Rx)

*Details of Operating Mode(s)

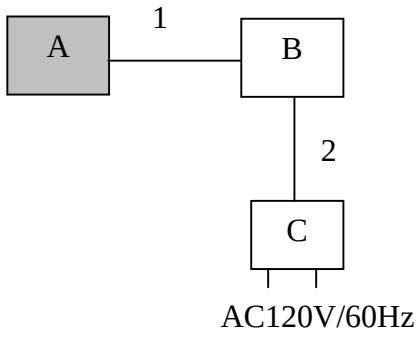
Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission	Transmitting (Tx)	2403MHz 2440MHz 2480MHz
	Receiving (Rx)	2440MHz
20dB Bandwidth 99% Occupied Bandwidth	Transmitting (Tx)	2403MHz 2440MHz 2480MHz
Duty cycle	Transmitting (Tx)	2403MHz

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

*EUT has the power settings by the software as follows;
Power settings: 0dBm
Software: Rs232c, Ver.2.02

*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.

4.2 Configuration and peripherals



*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	RF module	RA102	001	TANITA Corporation	EUT
B	Jig	-	-	TANITA Corporation	-
C	AC Adapter	A20620N	-	SINO-AMERICAN	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.4	Unshielded	Unshielded	-
2	DC Cable	1.9	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, 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.

Detector	**: CISPR quasi-peak and average detector (IF BW 9 kHz)**
Measurement range	**: 0.15-30MHz**
Test data	**: APPENDIX 1**
Test result	**: Pass**

SECTION 6: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane. The EUT was set on the center of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
Photographs of the set up are shown in Appendix 1.

The Radiated Electric Field Strength has been measured on Semi anechoic chamber with a ground plane and at a distance of 3m.
The measuring antenna height was varied between 1 and 4m (frequency 9kHz – 30MHz: loop antenna was fixed height at 1.0m) and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization.
The radiated emission measurements were made with the following detector function of the test receiver/spectrum analyzer.

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	9kHz-150kHz	150kHz–30MHz	30MHz-1GHz	Above 1GHz	
Instrument used	Test Receiver	Test Receiver	Test Receiver	Spectrum Analyzer	
Detector	QP, AV	QP, AV	QP	PK	AV
IF Bandwidth	BW 200Hz	BW 9kHz	BW 120kHz	RBW: 1MHz VBW: 3MHz	*1), *2)
Test Distance	3m	3m	3m	3m (below 10GHz), 1m*2) (above 10GHz),	

*1) For Transmitter Spurious Emission test, emission was pulsed.
Therefore, the Average value was calculated by reducing Duty factor from PK (PK value - Duty factor).
For Duty factor, please refer to Page 21 and 22.
*2) For Receiver Spurious Emission test, Average Detector (RBW: 1MHz, VBW: 10Hz) was used.

- 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.

*The result is rounded off to the second decimal place, so some differences might be observed.

Measurement range : 9kHz-25GHz
Test data : APPENDIX 1
Test result : Pass

SECTION 7: 20dB Bandwidth and Duty Cycle

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	3MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Duty Cycle	zero span	1MHz	3MHz	10msec / 100msec	Peak	Single	Spectrum Analyzer
99% Occupied Bandwidth	3MHz	30kHz	91kHz	Auto	Peak*	Max Hold*	Spectrum Analyzer
*The measurement was performed with Peak detector and Max hold since the duty cycle was not 100%.							

Test data : APPENDIX 1
Test result : Pass

APPENDIX 1: Data of EMI test

Conducted Emission

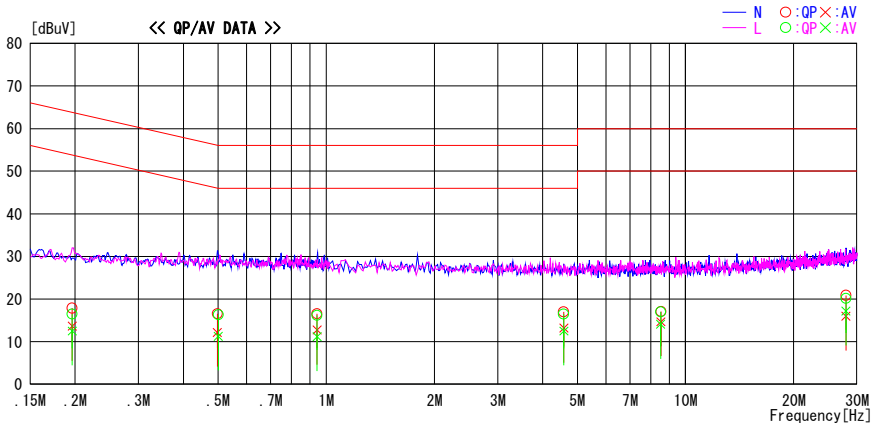
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2011/10/19

Report No. : 31KE0265-HO-01
Power : AC 120V / 60Hz
Temp./Humi. : 24deg.C / 52%RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Tx 2403MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.19640	4.5	0.2	13.4	17.9	13.6	63.8	53.8	45.9	40.2	N	
0.49800	3.2	-1.2	13.4	16.6	12.2	56.0	46.0	39.4	33.8	N	
0.94315	3.1	-0.8	13.5	16.6	12.7	56.0	46.0	39.4	33.3	N	
4.57777	2.8	-1.0	14.2	17.0	13.2	56.0	46.0	39.0	32.8	N	
8.53835	2.2	-0.2	14.9	17.1	14.7	60.0	50.0	42.9	35.3	N	
27.92821	2.7	-2.2	18.2	20.9	16.0	60.0	50.0	39.2	34.0	N	
0.19640	3.1	-0.9	13.4	16.5	12.5	63.8	53.8	47.3	41.3	L	
0.50090	2.9	-2.1	13.4	16.3	11.3	56.0	46.0	39.7	34.7	L	
0.94315	2.7	-2.3	13.5	16.2	11.2	56.0	46.0	39.8	34.8	L	
4.57777	2.3	-1.7	14.2	16.5	12.5	56.0	46.0	39.5	33.5	L	
8.52323	2.1	-0.8	14.9	17.0	14.1	60.0	50.0	43.0	35.9	L	
27.92821	1.9	-1.0	18.2	20.1	17.2	60.0	50.0	39.9	32.8	L	

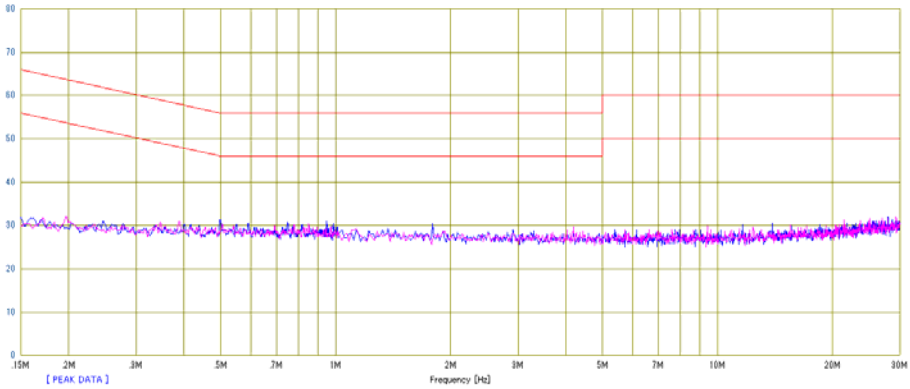
CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

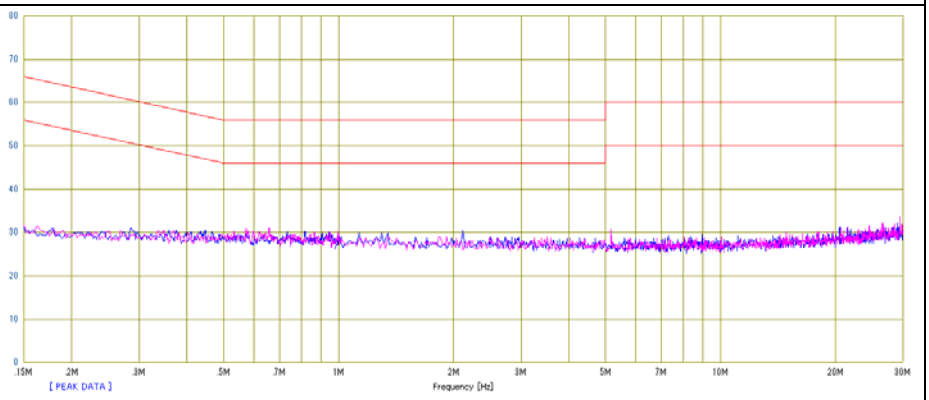
Conducted Emission

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	31KE0265-HO-01
Date	10/19/2011
Temperature/ Humidity	24 deg. C / 52% RH
Engineer	Tomotaka Sasagawa
Mode	Transmitting mode

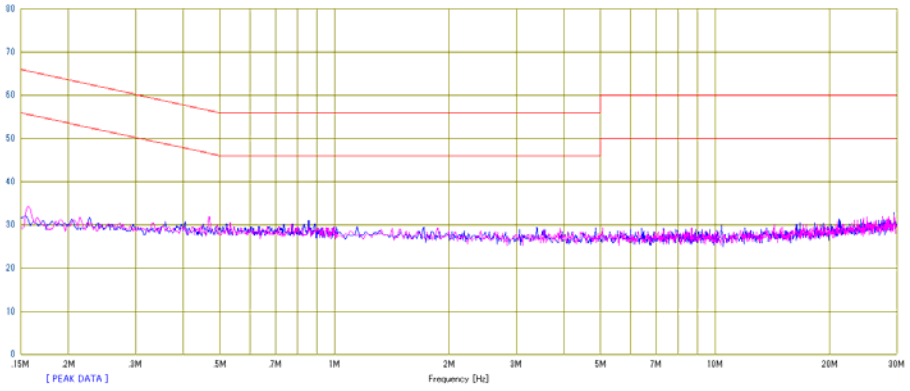
2403MHz



2440MHz



2480MHz



Y scale [dBuV] Chart — N — L

Conducted Emission

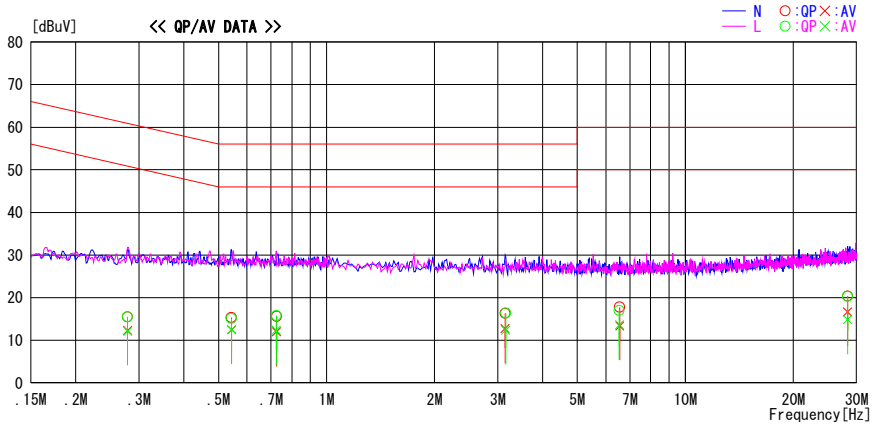
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2011/10/19

Report No. : 31KE0265-HO-01
Power : AC 120V / 60Hz
Temp./Humi. : 24deg.C / 52%RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Rx 2440MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.27905	2.1	-1.1	13.4	15.5	12.3	60.8	50.8	45.3	38.5	N	
0.54295	2.0	-0.9	13.4	15.4	12.5	56.0	46.0	40.6	33.5	N	
0.72565	2.1	-1.5	13.5	15.6	12.0	56.0	46.0	40.4	34.0	N	
3.14169	2.4	-1.2	13.9	16.3	12.7	56.0	46.0	39.7	33.3	N	
6.55806	3.2	-1.2	14.6	17.8	13.4	60.0	50.0	42.2	36.6	N	
28.29579	2.2	-1.5	18.2	20.4	16.7	60.0	50.0	39.6	33.3	N	
0.27905	2.1	-1.2	13.4	15.5	12.2	60.8	50.8	45.3	38.6	L	
0.54295	1.7	-0.9	13.4	15.1	12.5	56.0	46.0	40.9	33.5	L	
0.72420	2.3	-1.1	13.5	15.8	12.4	56.0	46.0	40.2	33.6	L	
3.15680	2.5	-1.5	13.9	16.4	12.4	56.0	46.0	39.6	33.6	L	
6.54294	2.4	-1.0	14.6	17.0	13.6	60.0	50.0	43.0	36.4	L	
28.29579	2.1	-3.4	18.2	20.3	14.8	60.0	50.0	39.7	35.2	L	

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	31KE0265-HO-01
Date	10/19/2011
Temperature/ Humidity	24 deg. C / 52% RH
Engineer	Tomotaka Sasagawa
Mode	Transmitting mode, 2403MHz

QP or PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]	
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver
31.350	QP	23.5	37.0	18.4	7.0	32.2	-	16.7	30.2	40.0	23.3	9.8
41.700	QP	22.9	43.0	14.2	7.2	32.2	-	12.1	32.2	40.0	27.9	7.8
51.600	QP	23.1	29.9	10.7	7.3	32.3	-	8.8	15.6	40.0	31.2	24.4
186.599	QP	22.9	25.1	16.0	8.8	32.0	-	15.7	17.9	43.5	27.8	25.6
710.668	QP	23.1	22.3	22.4	12.2	32.2	-	25.5	24.7	46.0	20.5	21.3
926.505	QP	22.6	23.4	24.8	13.1	31.2	-	29.3	30.1	46.0	16.7	15.9
2390.000	PK	58.0	58.3	28.1	2.5	32.2	-	56.4	56.7	73.9	17.5	17.2
2400.000	PK	69.7	68.8	28.1	2.5	32.2	-	68.1	67.2	73.9	5.8	6.7
2403.000	PK	95.7	94.5	28.1	2.5	32.2	-	94.1	92.9	113.9	19.8	21.0
4806.000	PK	52.6	53.6	31.2	5.3	31.4	-	57.7	58.7	73.9	16.2	15.2
7209.000	PK	43.9	43.5	35.6	6.1	32.4	-	53.2	52.8	73.9	20.7	21.1
9612.000	PK	43.5	42.2	38.3	7.1	33.2	-	55.7	54.4	73.9	18.2	19.5
24030.000	PK	46.8	46.2	38.8	-0.9	31.6	-	53.1	52.5	73.9	20.8	21.4

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

PK with Duty factor

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]	
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver
2390.000	PK	58.0	58.3	28.1	2.5	32.2	-23.6	32.8	33.1	53.9	21.1	20.8
2400.000	PK	69.7	68.8	28.1	2.5	32.2	-23.6	44.5	43.6	53.9	9.4	10.3
2403.000	PK	95.7	94.5	28.1	2.5	32.2	-23.6	70.5	69.3	93.9	23.4	24.6
4806.000	PK	52.6	53.6	31.2	5.3	31.4	-23.6	34.1	35.1	53.9	19.8	18.8
7209.000	PK	43.9	43.5	35.6	6.1	32.4	-23.6	29.6	29.2	53.9	24.3	24.7
9612.000	PK	43.5	42.2	38.3	7.1	33.2	-23.6	32.1	30.8	53.9	21.8	23.1
24030.000	PK	46.8	46.2	38.8	-0.9	31.6	-23.6	29.5	28.9	53.9	24.4	25.0

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier) + Duty factor (Refer to Duty factor data sheet)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
*NS: No Signal

* The test above 1GHz was performed with PK detect. Average emission measurements were calculated with PK detect and duty cycle factor.
* Duty Factor was calculated with the assumption of the worst condition in 100msec.
* The noise measured with PK detect was pulse emission.

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	31KE0265-HO-01
Date	10/19/2011
Temperature/ Humidity	24 deg. C / 52% RH
Engineer	Tomotaka Sasagawa
Mode	Transmitting mode, 2440MHz

QP or PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]	
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver
31.800	QP	22.9	35.7	18.3	7.0	32.2	-	16.0	28.8	40.0	24.0	11.2
42.150	QP	22.4	40.0	14.1	7.2	32.2	-	11.5	29.1	40.0	28.5	10.9
49.938	QP	22.8	29.5	11.3	7.3	32.3	-	9.1	15.8	40.0	30.9	24.2
194.699	QP	23.1	23.3	16.4	8.9	32.0	-	16.4	16.6	43.5	27.1	26.9
746.836	QP	22.9	23.0	22.7	12.4	32.0	-	26.0	26.1	46.0	20.0	19.9
928.839	QP	22.7	23.2	24.9	13.2	31.2	-	29.6	30.1	46.0	16.4	15.9
2440.000	PK	93.0	92.3	28.3	2.5	32.2	-	91.6	90.9	113.9	22.3	23.0
4880.000	PK	48.0	49.2	31.4	5.3	31.4	-	53.3	54.5	73.9	20.6	19.4
7320.000	PK	44.1	44.0	35.7	6.2	32.5	-	53.5	53.4	73.9	20.4	20.5
9760.000	PK	44.3	44.1	38.5	7.3	33.2	-	56.9	56.7	73.9	17.0	17.2
24400.000	PK	46.7	46.5	38.6	-0.9	31.6	-	52.8	52.6	73.9	21.1	21.3

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

PK with Duty factor

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]	
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver
2440.000	PK	93.0	92.3	28.3	2.5	32.2	-23.6	68.0	67.3	93.9	25.9	26.6
4880.000	PK	48.0	49.2	31.4	5.3	31.4	-23.6	29.7	30.9	53.9	24.2	23.0
7320.000	PK	44.1	44.0	35.7	6.2	32.5	-23.6	29.9	29.8	53.9	24.0	24.1
9760.000	PK	44.3	44.1	38.5	7.3	33.2	-23.6	33.3	33.1	53.9	20.6	20.8
24400.000	PK	46.7	46.5	38.6	-0.9	31.6	-23.6	29.2	29.0	53.9	24.7	24.9

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier) + Duty factor (Refer to Duty factor data sheet)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
*NS: No Signal

*The test above 1GHz was performed with PK detect. Average emission measurements were calculated with PK detect and duty cycle factor.
*Duty Factor was calculated with the assumption of the worst condition in 100msec.
*The noise measured with PK detect was pulse emission.

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	31KE0265-HO-01
Date	10/19/2011
Temperature/ Humidity	24 deg. C / 52% RH
Engineer	Tomotaka Sasagawa
Mode	Transmitting mode, 2480MHz

QP or PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]	
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver
30.900	QP	23.4	35.1	18.6	7.0	32.1	-	16.9	28.6	40.0	23.1	11.4
40.800	QP	23.8	32.7	14.5	7.1	32.2	-	13.2	22.1	40.0	26.8	17.9
50.250	QP	24.1	30.9	11.1	7.3	32.3	-	10.2	17.0	40.0	29.8	23.0
214.949	QP	23.1	22.3	16.8	9.1	32.0	-	17.0	16.2	43.5	26.5	27.3
736.241	QP	22.5	22.5	22.6	12.3	32.1	-	25.3	25.3	46.0	20.7	20.7
945.172	QP	22.8	22.6	25.4	13.2	31.1	-	30.3	30.1	46.0	15.7	15.9
2480.000	PK	91.2	90.5	28.5	2.6	32.2	-	90.1	89.4	113.9	23.8	24.5
2483.500	PK	64.1	62.5	28.5	2.6	32.2	-	63.0	61.4	73.9	10.9	12.5
4960.000	PK	50.4	49.7	31.6	5.3	31.4	-	55.9	55.2	73.9	18.0	18.7
7440.000	PK	44.4	44.2	35.8	6.2	32.5	-	53.9	53.7	73.9	20.0	20.2
9920.000	PK	44.1	44.1	38.6	7.4	33.3	-	56.8	56.8	73.9	17.1	17.1
24800.000	PK	47.1	46.9	38.5	-0.9	31.5	-	53.2	53.0	73.9	20.7	20.9

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

PK with Duty factor

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]	
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver
2480.000	PK	91.2	90.5	28.5	2.6	32.2	-23.6	66.5	65.8	93.9	27.4	28.1
2483.500	PK	64.1	62.5	28.5	2.6	32.2	-23.6	39.4	37.8	53.9	14.5	16.1
4960.000	PK	50.4	49.7	31.6	5.3	31.4	-23.6	32.3	31.6	53.9	21.6	22.3
7440.000	PK	44.4	44.2	35.8	6.2	32.5	-23.6	30.3	30.1	53.9	23.6	23.8
9920.000	PK	44.1	44.1	38.6	7.4	33.3	-23.6	33.2	33.2	53.9	20.7	20.7
24800.000	PK	47.1	46.9	38.5	-0.9	31.5	-23.6	29.6	29.4	53.9	24.3	24.5

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier) + Duty factor (Refer to Duty factor data sheet)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
*NS: No Signal

*The test above 1GHz was performed with PK detect. Average emission measurements were calculated with PK detect and Duty cycle factor.
*Duty Factor was calculated with the assumption of the worst condition in 100msec.
*The noise measured with PK detect was pulse emission.

Radiated Emission (Electric Field Strength of Spurious Emission)

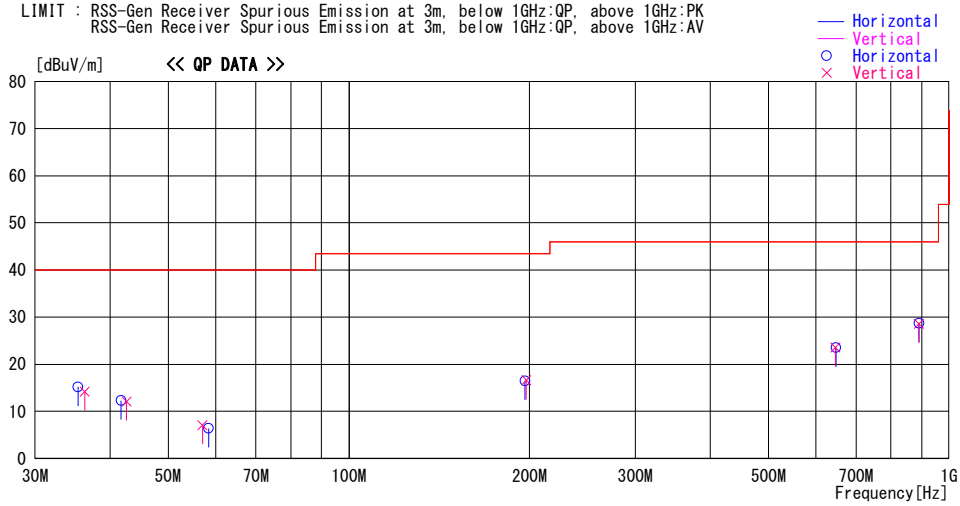
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber

Report No. : 31KE0265-HO-01
Power : AC 120V / 60Hz
Temp./Humi. : 24deg.C / 54% RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Rx 2440MHz / Worst Axis(Hori:Z, Vert:X)

LIMIT : RSS-Gen Receiver Spurious Emission at 3m, below 1GHz:QP, above 1GHz:PK
RSS-Gen Receiver Spurious Emission at 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
35.400	23.4	QP	16.9	-25.1	15.2	348	100	Hori.	40.0	24.8	
36.300	22.9	QP	16.4	-25.1	14.2	292	100	Vert.	40.0	25.8	
41.700	23.1	QP	14.2	-25.0	12.3	356	100	Hori.	40.0	27.7	
42.600	23.2	QP	13.9	-25.0	12.1	1	100	Vert.	40.0	27.9	
57.000	23.0	QP	8.9	-24.8	7.1	312	100	Vert.	40.0	32.9	
58.350	22.8	QP	8.4	-24.8	6.4	350	100	Hori.	40.0	33.6	
196.499	23.1	QP	16.5	-23.1	16.5	2	100	Hori.	43.5	27.0	
197.399	23.2	QP	16.5	-23.1	16.6	301	100	Vert.	43.5	26.9	
646.501	22.9	QP	21.1	-20.4	23.6	53	100	Vert.	46.0	22.4	
647.667	22.8	QP	21.1	-20.4	23.5	300	100	Hori.	46.0	22.5	
890.338	23.1	QP	23.9	-18.3	28.7	277	100	Hori.	46.0	17.3	
890.338	23.0	QP	23.9	-18.3	28.6	51	100	Vert.	46.0	17.4	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

Radiated Emission (Electric Field Strength of Spurious Emission)

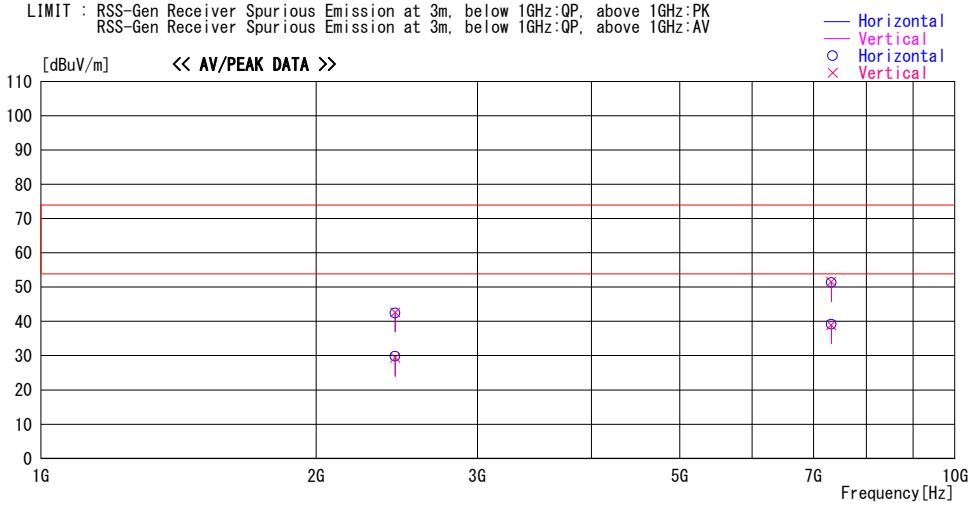
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber

Report No. : 31KE0265-HO-01
Power : AC 120V / 60Hz
Temp./Humi. : 24deg.C / 54% RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Rx 2440MHz / Worst Axis(Hori:Z, Vert:X)

LIMIT : RSS-Gen Receiver Spurious Emission at 3m, below 1GHz:QP, above 1GHz:PK
RSS-Gen Receiver Spurious Emission at 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
2440.000	44.0	PK	28.3	-29.7	42.6	0	100	Vert.	73.9	31.3	
2440.000	43.9	PK	28.3	-29.7	42.5	0	100	Hori.	73.9	31.4	
2440.000	30.8	AV	28.3	-29.7	29.4	0	100	Vert.	53.9	24.5	
2440.000	31.2	AV	28.3	-29.7	29.8	0	100	Hori.	53.9	24.1	
7320.000	43.5	PK	35.7	-27.8	51.4	0	100	Hori.	73.9	22.5	
7320.000	43.6	PK	35.7	-27.8	51.5	0	100	Vert.	73.9	22.4	
7320.000	31.2	AV	35.7	-27.8	39.1	0	100	Hori.	53.9	14.8	
7320.000	31.1	AV	35.7	-27.8	39.0	0	100	Vert.	53.9	14.9	

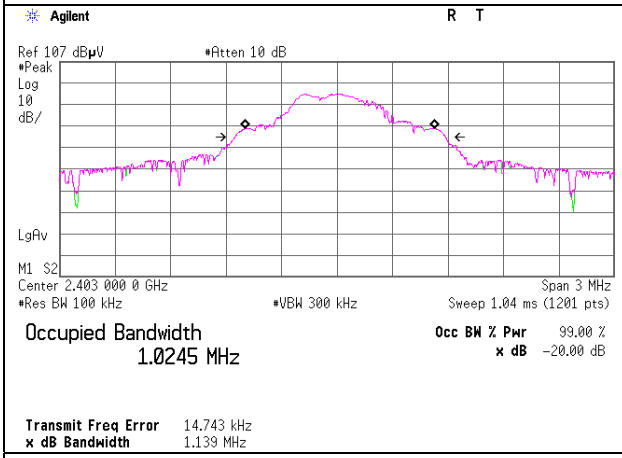
CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

20dB Bandwidth

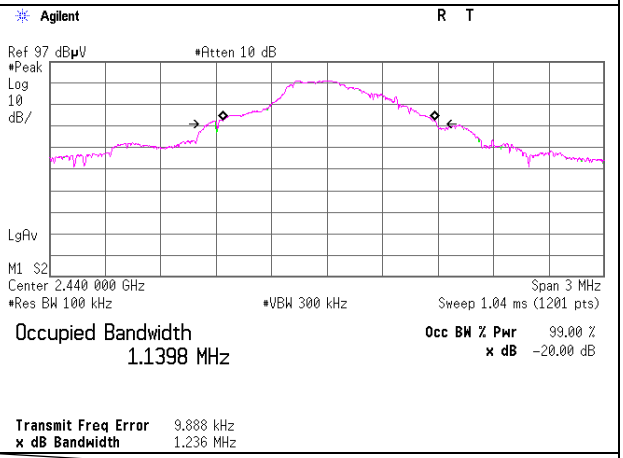
Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	31KE0265-HO-01
Date	10/19/2011
Temperature/ Humidity	24 deg. C / 52% RH
Engineer	Tomotaka Sasagawa
Mode	Transmitting mode

Frequency [MHz]	20dB Bandwidth [MHz]	Limit [kHz]
2403	1.139	-
2440	1.236	-
2480	1.163	-

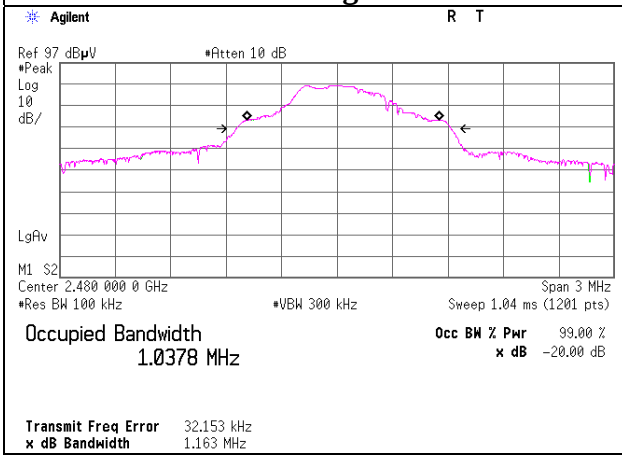
Ch:Low



Ch:Mid



Ch:High



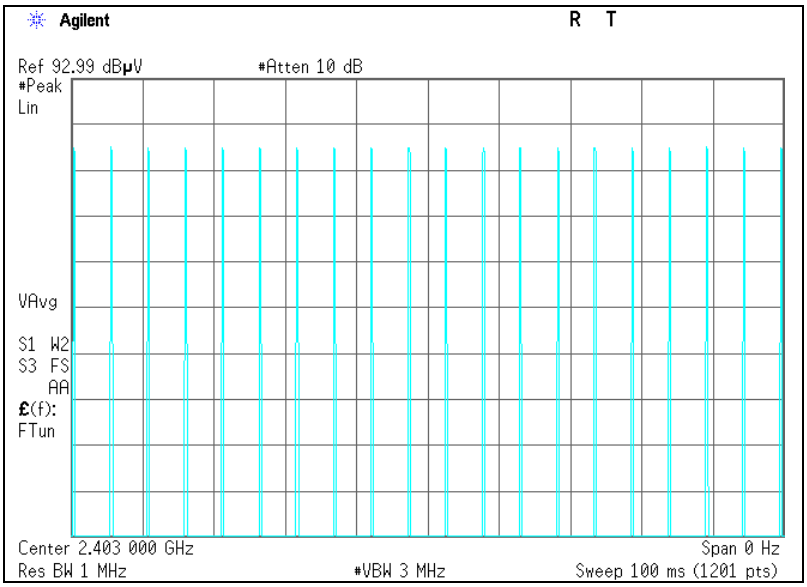
Duty Cycle

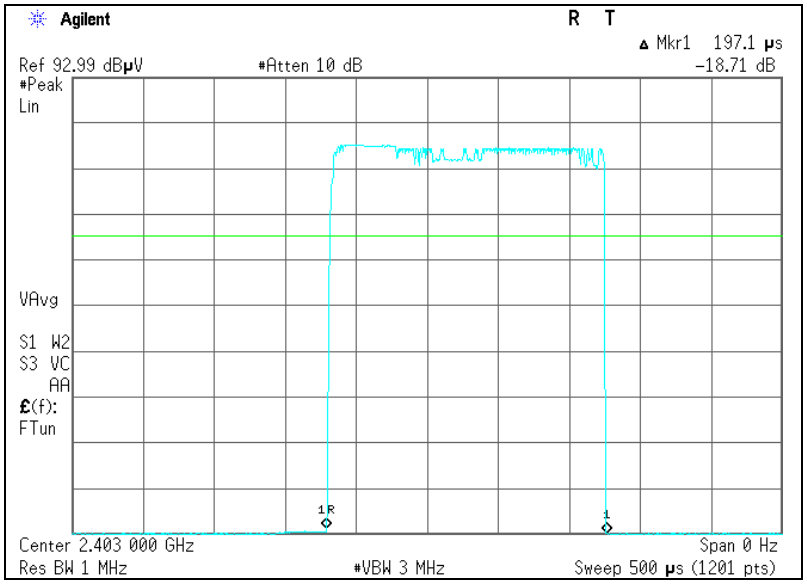
Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	31KE0265-HO-01
Date	10/19/2011
Temperature/ Humidity	24 deg. C / 52% RH
Engineer	Tomotaka Sasagawa
Mode	Transmitting mode

ON time [ms]	Times	ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
0.1971	20	3.9420	100.00	0.0394	28.1 *1)

Duty = $20\log_{10}$(ON time/Cycle)

*1) This is reference data. Please see page 22 for worst duty.



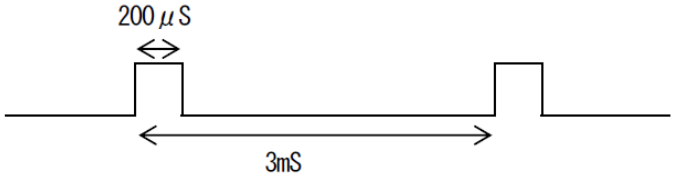


Duty Cycle

ON time [ms]	Times	ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
0.2000	33	6.6000	100.00	0.0660	-23.6

Duty = $20\log_{10}$(ON time/Cycle)

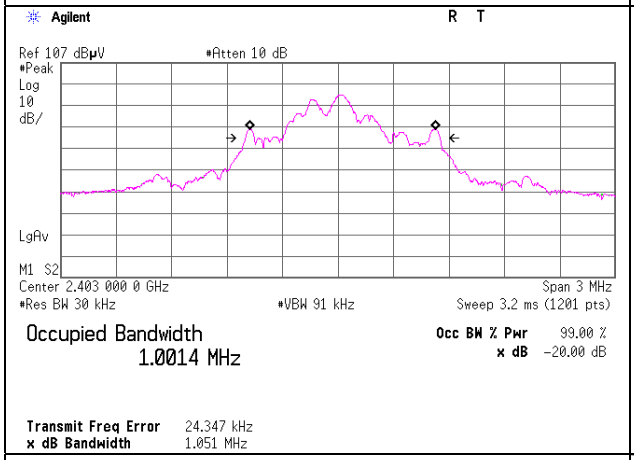
＊ In burst mode, a certain times of packets are transmitted every constant interval of 3 ms.



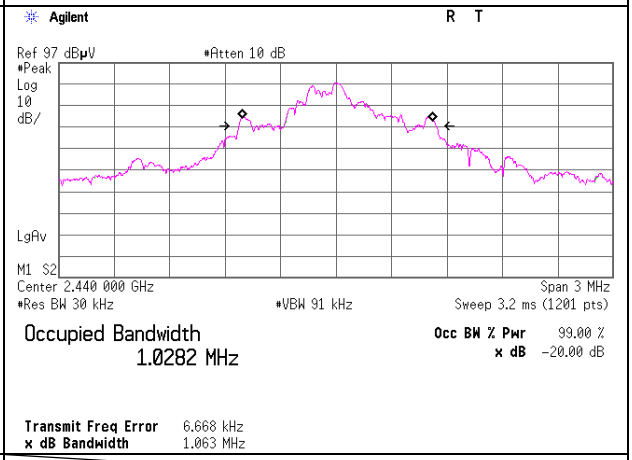
*Although we performed duty cycle testing, we calculated the duty value based on the above information provided by the customer, because it was the worst case.

99% Occuqied Bandwidth

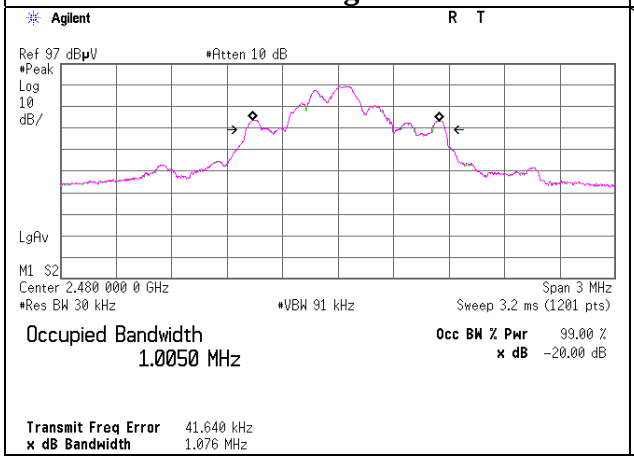
Ch:Low



Ch:Mid



Ch:High



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APPENDIX 2: Test Instruments

EMI test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2011/02/23 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2010/11/18 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2010/10/27 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/08/17 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/08/17 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2011/03/25 * 12
MAT-51	Attenuator(6dB)	Weinschel	2	AS3557	RE	2011/01/14 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2011/07/10 * 12
MOS-01	Digital Humidity Indicator	N.T	NT-1800	MOS01	RE	2011/02/23 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2010/12/07 * 12
MHA-05	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	253	RE	2011/06/19 * 12
MHA-01	Horn Antenna 18-26.5GHz	EMCO	3160-09	1266	RE	2011/06/20 * 12
MCC-134	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336167/4(1m) / 340641(5m)	RE	2011/09/07 * 12
MPA-01	Pre Amplifier	Agilent	8449B	3008A01671	RE	2011/02/24 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2011/02/20 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(AE)	2011/02/22 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2011/01/05 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2011/02/22 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/sucoform141-PE(1m)/RFM-E121(Switcher)	-/04178	CE	2011/07/04 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2011/02/23 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-

EMI test equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2011/04/15 * 12
LP-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	829425/014	RE	2010/12/08 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	RE	2011/02/18 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2011/03/04 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2010/11/05 * 12

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item:
CE: Conducted emission test
RE: Radiated emission, 20dB bandwidth, Automatically deactivate and Duty cycle tests