RADIO TEST REPORT

Test Report No. : 10058679H-R2

Applicant	:	**SUMITOMO PRECISION PRODUCTS CO., LTD.**
Type of Equipment	:	**920MHz/20mW TRANSCEIVER MODULE**
Model No.	:	**WM-Z3001**
FCC ID	:	**WWGZ3001**
Test regulation	:	**FCC Part 15 Subpart C: 2013**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with 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 10058679H-R1. 10058679H-R1 is replaced with this report.

Date of test: September 27 to October 3, 2013

Representative test engineer:
Masatoshi Nishiguchi
Engineer of WiSE Japan,
UL Verification Service

Approved by:
Masanori Nishiyama
Manager 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.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

REVISION HISTORY

Original Test Report No.: 10058679H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10058679H	October 15, 2013	-	-
1	10058679H-R1	October 22, 2013	P4	Correction of Antenna List
1	10058769H-R1	October 22, 2013	P8	Correction of Power supply voltage (Conducted emission).
1	10058769H-R1	October 22, 2013	P12	Addition of Detector information (Maximum Peak Output Power)
1	10058679H-R1	October 22, 2013	P13, 15	Correction of Power supply voltage
1	10058769H-R1	October 22, 2013	P21, 22	Addition of Detector information.
2	10058679H-R2	October 28, 2013	P4	Correction of Antenna List
2	10058679H-R2	October 28, 2013	P6	Correction of sentence : FCC 15.31 (e)

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

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SECTION 1: Customer information

Company Name	:	SUMITOMO PRECISION PRODUCTS CO., LTD.
Address	:	1-10 FUSO-CHO, AMAGASAKI, HYOGO, 660-0891, JAPAN
Telephone Number	:	+81-6-6489-8264
Facsimile Number	:	+81-6-6489-5910
Contact Person	:	Junya Tada

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

2.1 Identification of E.U.T.

Type of Equipment	:	920MHz/20mW TRANSCEIVER MODULE
Model No.	:	WM-Z3001
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.3V nominal
Receipt Date of Sample	:	September 27, 1013
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

General Specification

Clock frequency(ies) in the system	:	Transceiver: 36 MHz System : 24 MHz, 32.768kHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	918.1-927.7MHz
Modulation	:	2-FSK
Power Supply (radio part input)	:	DC 2.7 to 3.6V
Antenna type	:	PCB Trace antenna (Inverted F type): Antenna 1 Dipole antenna Option (External type): Antenna 2

Antenna Information

	PCB Antenna (PCB trace antenna)	External Antenna
Model No.	-	AHSL-SAB-00100
Frequency Range	915 - 930MHz	915 - 930MHz
Impedance	50Ω	50Ω
Connector Type	-	R.SMA-P
Type of Antenna	Inverted F	1/2λ sleeve
Antenna Gain	-4.1.dBi	2.14dBi
Size	24.0mm x 10.5mm	Ø13mm x 195mm
Maker	-	HOKO ELECTRONICS
Note		with Cable [XD-W030AE900]

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2013, final revised on June 11, 2013 and effective July 11, 2013
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.4:2003 7. AC powerline conducted emission measurements	**FCC:** Section 15.207	**QP** 15.7dB 4.91294MHz, N, Pattern Antenna/ 4.91343MHz, L, Pattern Antenna **AV** 10.5dB 12.98540MHz, N, Pattern Antenna	Complied	-
Carrier Frequency Separation	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)	See data.	Complied	Conducted
20dB Bandwidth	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)		Complied	Conducted
Number of Hopping Frequency	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)(i)		Complied	Conducted
Dwell time	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)(i)		Complied	Conducted
Maximum Peak Output Power	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(b)(2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(d)	3.2dB 2754.300MHz, AV, Vert., Antenna 1	Complied	Conducted/ Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					

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

FCC 15.31 (e)
The provides stable voltage (DC 1.5V and 2.0V) is constantly provided to the EUT regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement
For Antenna 1:
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.
For Antenna 2:
The EUT has a unique coupling/antenna connector (U.FL).

Therefore, the equipment complies with the antenna requirement of Section 15.203/212.

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	-	Conducted

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

3.4 Uncertainty

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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	4.2dB

*3m/1m/0.5m = Measurement distance

Power meter (±dB)	
Below 1GHz	Above 1GHz
0.7dB	1.5dB

Antenna terminal conducted emission and Power density (±dB)			Antenna terminal conducted emission (±dB)		Channel power (±dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.5dB	1.7dB	2.8dB	2.8dB	2.9dB	2.6dB

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 report meets the limits unless the uncertainty is taken into consideration.

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 8999 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	4.0 x 4.5 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 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 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

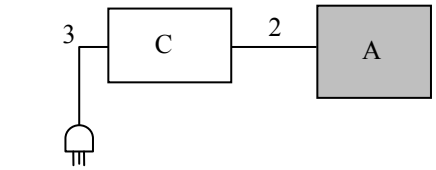
4.1 Operating Mode(s)

Mode	Tested Frequency
Transmitting mode (Tx mode)	918.1MHz 922.9MHz 927.7MHz
*Power of the EUT was set by the software as follows; Power settings: 20mW Software: WM-Z3000 Test Evaluation Ver. S027 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

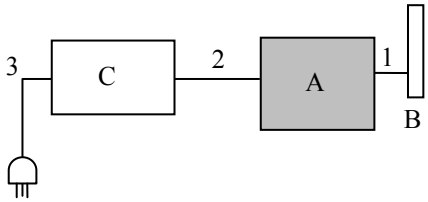
4.2 Configuration and peripherals

Conducted emission

[Antenna 1]

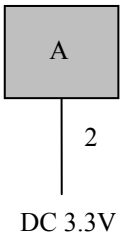


[Antenna 2]

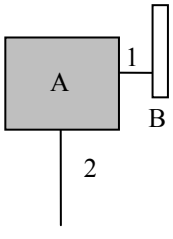


Radiated emission

[Antenna 1]



[Antenna 2]



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	920MHz/20mW TRANSCEIVER MODULE	WM-Z3001	1304590002	SUMITOMO PRECISION PRODUCTS	EUT
B	External Antenna	AHSL-SAB-00100	1	HOKO	EUT
C	DC Power Supply	PMC35-2A	13010501	KIKUSUI	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna	0.06	Shielded	Shielded	-
2	DC Cable	0.4 for CE * 1.9 for other tests	Unshielded	Unshielded	-
3	AC Cable	1.8	Unshielded	Unshielded	-

* CE: Conducted emission

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.
The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)
I/O 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 .
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector	**: QP and CISPR AV**
Measurement range	**: 0.15-30MHz**
Test data	**: APPENDIX**
Test result	**: Pass**

SECTION 6: Radiated Spurious Emission

Test Procedure
EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.
The height of the measuring antenna varied between 1 and 4m 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 with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5 (IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz *1)	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz)		3m (below 10GHz)

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

- 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 test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30M-10GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	1MHz	10kHz	30kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	1.25MHz	10kHz	30kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	12MHz	120kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100kHz	300kHz	As necessary capture the entire dwell time per hopping channel	Peak	Max Hold	Spectrum Analyzer
Conducted Spurious Emission *2)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
	30MHz to 10GHz (Less or equal to 5GHz)	100kHz	300kHz				
Conducted Spurious Emission Band Edge compliance	Low 19MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
	High 10MHz						

*1) The measurement was performed with Max Hold since the duty cycle was not 100%.
*2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)
*3) Reference data

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Conducted Emission

Antenna 1

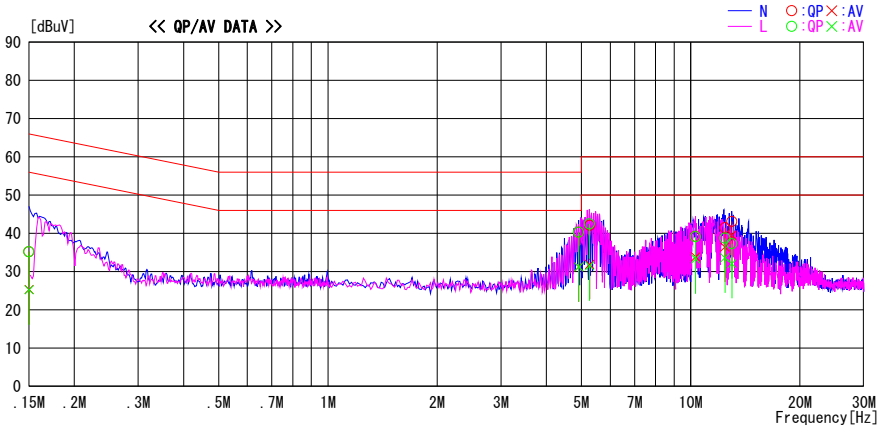
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. : 10058679H
Power : AC 120V/60Hz
Temp./Humi. : 23deg. C / 54% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 918.1MHz, Antenna 1

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]		
0.15000	22.0	12.1	13.2	35.2	25.3	66.0	56.0	30.8	30.7	N	
4.91294	26.3	17.2	14.0	40.3	31.2	56.0	46.0	15.7	14.8	N	
5.26446	28.1	17.9	14.0	42.1	31.9	60.0	50.0	17.9	18.1	N	
10.31668	24.8	19.5	14.4	39.2	33.9	60.0	50.0	20.8	16.1	N	
12.42163	26.9	21.8	14.6	41.5	36.4	60.0	50.0	18.5	13.6	N	
12.98540	28.5	24.9	14.6	43.1	39.5	60.0	50.0	16.9	10.5	N	
0.15000	22.0	12.0	13.2	35.2	25.2	66.0	56.0	30.8	30.8	L	
4.91343	26.3	17.2	14.0	40.3	31.2	56.0	46.0	15.7	14.8	L	
5.26384	28.5	17.5	14.0	42.5	31.5	60.0	50.0	17.5	18.5	L	
10.31687	24.7	18.9	14.4	39.1	33.3	60.0	50.0	20.9	16.7	L	
12.42333	24.1	19.0	14.6	38.7	33.6	60.0	50.0	21.3	16.4	L	
12.98615	22.7	17.5	14.6	37.3	32.1	60.0	50.0	22.7	17.9	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.

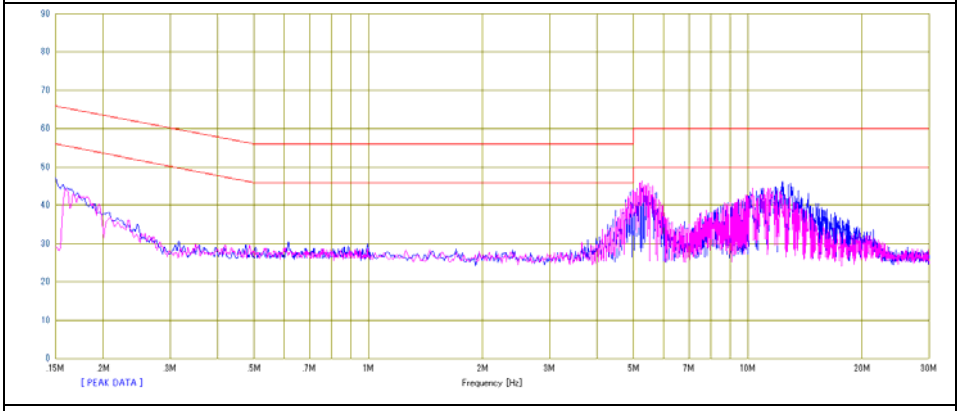
*The limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.

Conducted Emission

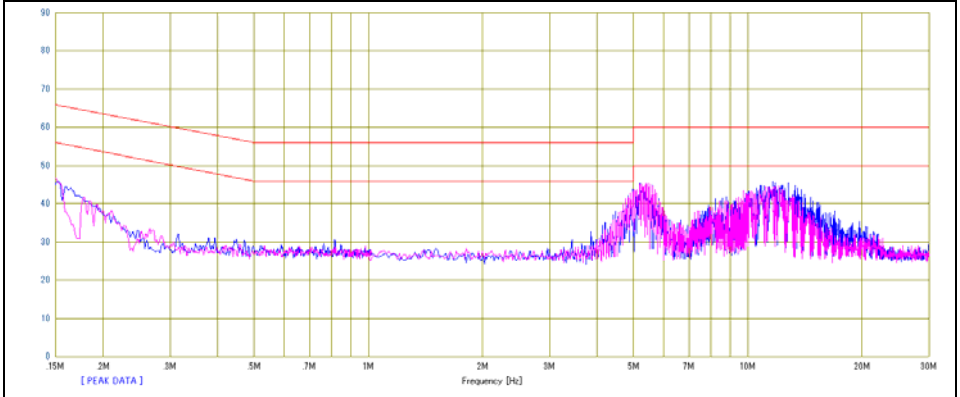
Antenna 1

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10058679H
Date	10/02/2013
Temperature/ Humidity	23 deg.C/ 54% RH
Engineer	Satofumi Matsuyama
Mode	Tx, Pattern Antenna

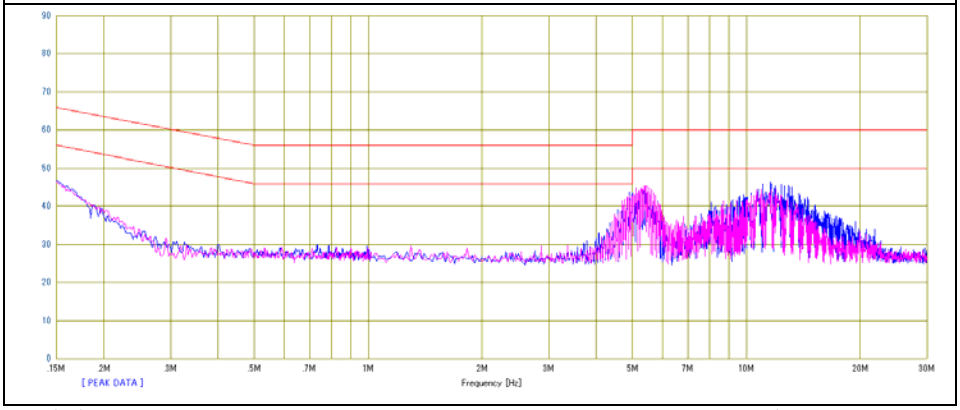
918.1MHz



922.9MHz



927.7MHz



Y scale [dBuV] Chart — N — L

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Conducted Emission

Antenna 2

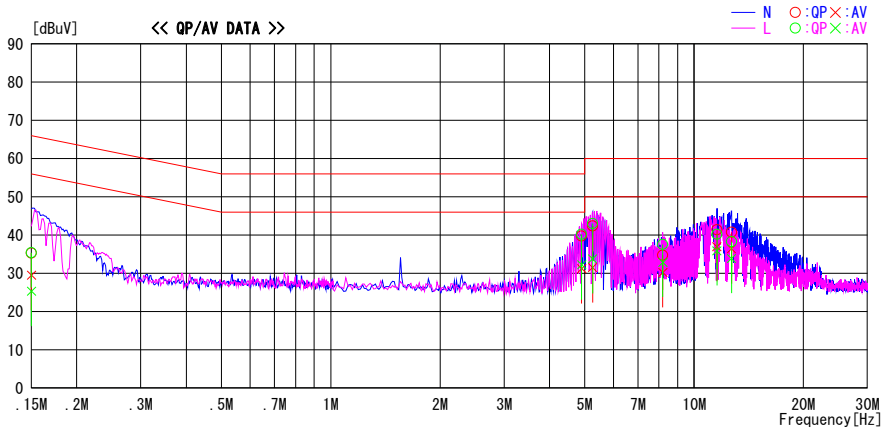
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. : 10058679H
Power : AC 120V/60Hz
Temp./Humi. : 23deg. C / 54% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 918.1MHz, Antenna 2

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]		
0.15000	22.1	16.3	13.2	35.3	29.5	66.0	56.0	30.7	26.5	N	
0.15000	22.2	12.1	13.2	35.4	25.3	66.0	56.0	30.6	30.7	L	
4.90263	26.2	18.2	14.0	40.2	32.2	56.0	46.0	15.8	13.8	L	
4.90332	25.7	17.2	14.0	39.7	31.2	56.0	46.0	16.3	14.8	N	
5.25331	29.0	19.8	14.0	43.0	33.8	60.0	50.0	17.0	16.2	L	
5.25398	28.4	17.5	14.0	42.4	31.5	60.0	50.0	17.6	18.5	N	
8.19466	23.4	18.7	14.2	37.6	32.9	60.0	50.0	22.4	17.1	L	
8.19381	20.5	16.0	14.2	34.7	30.2	60.0	50.0	25.3	19.8	N	
11.55740	25.6	21.3	14.6	40.2	35.9	60.0	50.0	19.8	14.1	L	
11.55582	26.8	22.4	14.6	41.4	37.0	60.0	50.0	18.6	13.0	N	
12.67787	26.1	21.8	14.6	40.7	36.4	60.0	50.0	19.3	13.6	N	
12.67777	23.7	19.3	14.6	38.3	33.9	60.0	50.0	21.7	16.1	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.

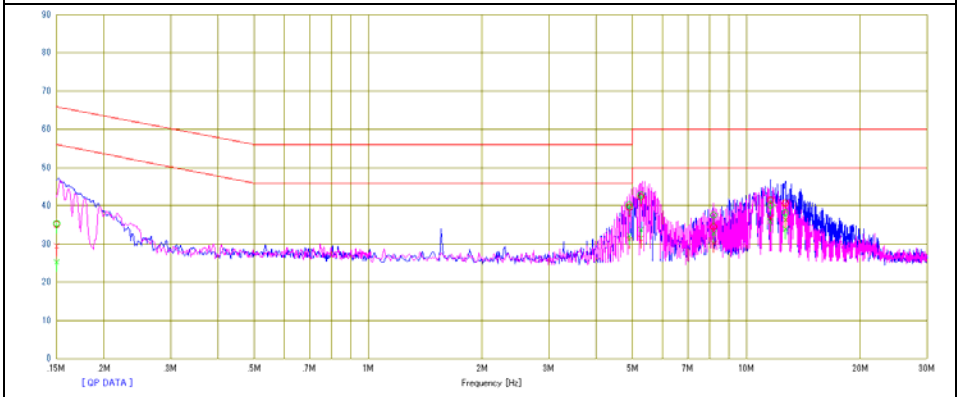
*The limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.

Conducted Emission

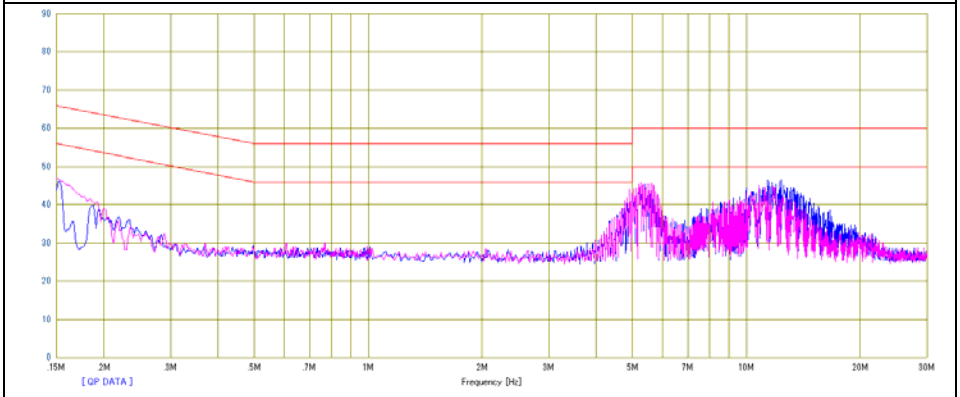
Antenna 2

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10058679H
Date	10/02/2013
Temperature/ Humidity	23 deg.C/ 54% RH
Engineer	Satofumi Matsuyama
Mode	Tx, External Antenna

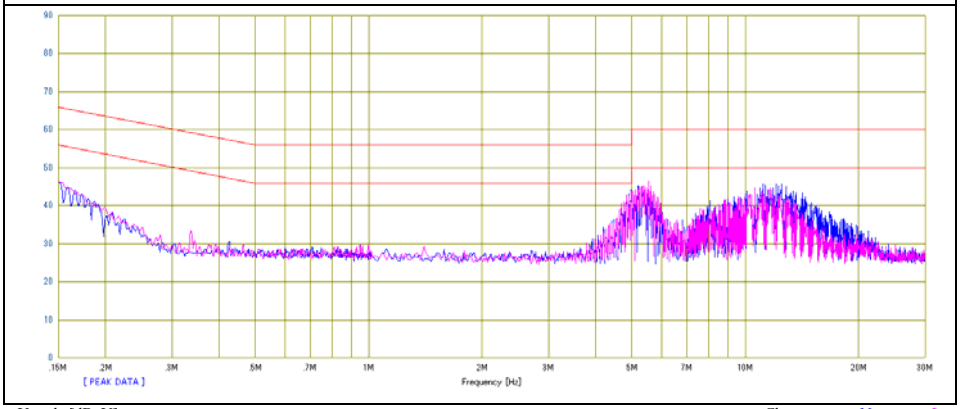
918.1MHz



922.9MHz



927.7MHz



Y scale [dBuV] Chart — N — L

20dB Bandwidth and Carrier Frequency Separation

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10058679H
Date	09/27/2013
Temperature/ Humidity	25 deg.C/ 45% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx (Hopping on)

Freq. [MHz]	20dB Bandwidth [MHz]	Limit for 20dB Bandwidth [MHz]
918.1	0.267	<=0.5
922.9	0.266	<=0.5
927.7	0.266	<=0.5

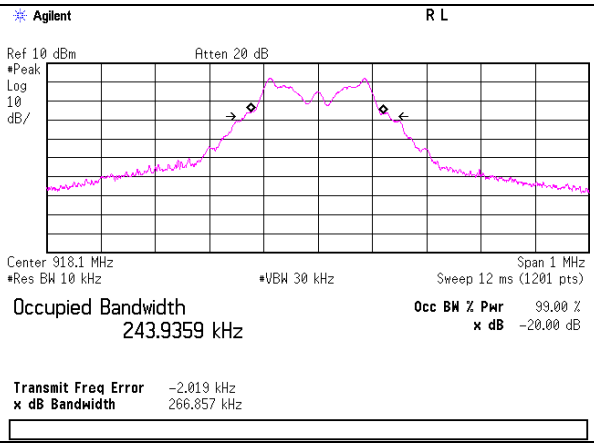
Freq. [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
918.1	0.400	>= 0.267
922.9	0.400	>= 0.266
927.7	0.400	>= 0.266

Limit: 20dB Bandwidth or 25kHz (whichever is greater).

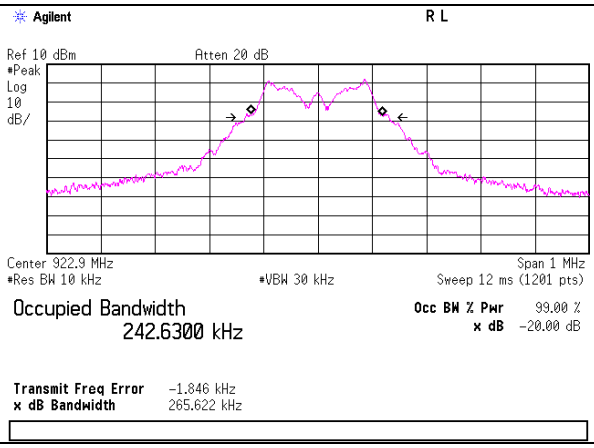
Tx

20dB Bandwidth

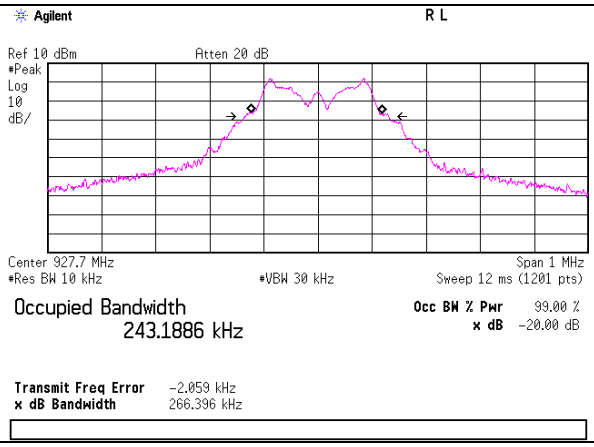
918.1MHz



922.9MHz

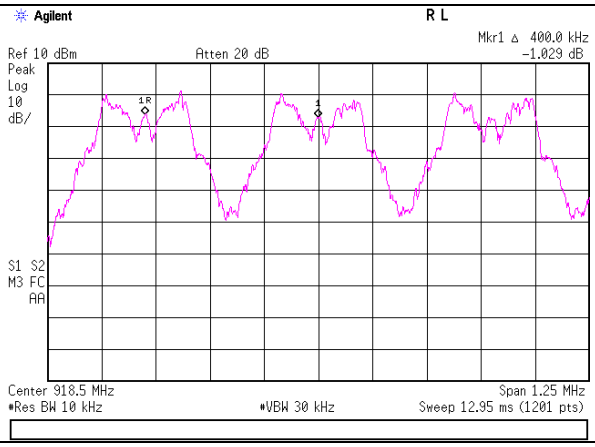


927.7MHz

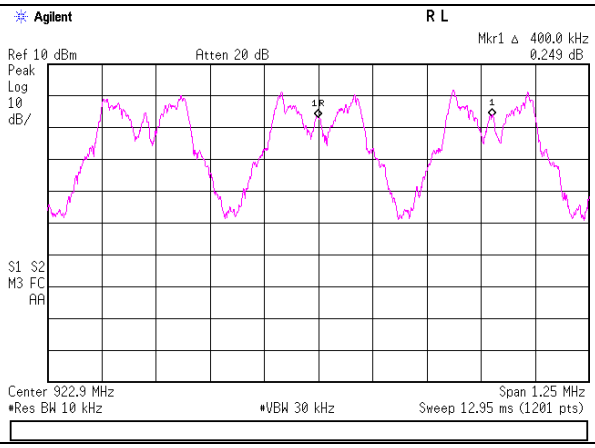


Carrier Frequency Separation

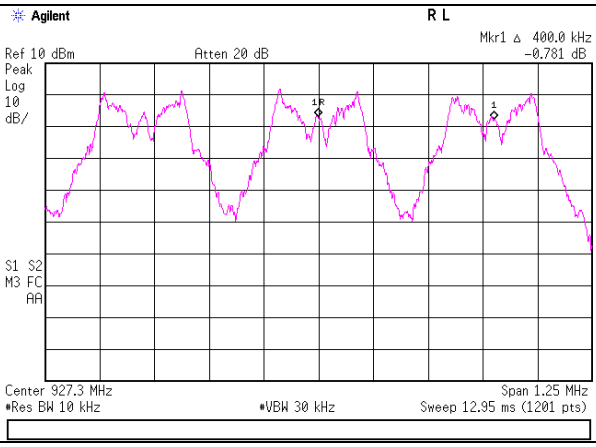
918.1MHz



922.9MHz



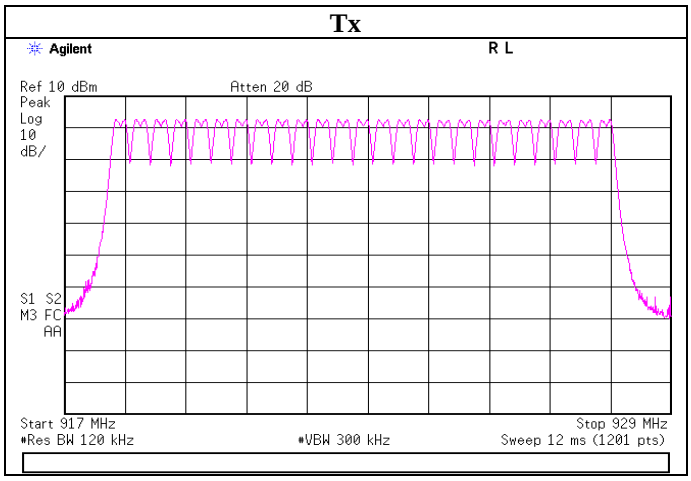
927.7MHz



Number of Hopping Frequency

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10058679H
Date	09/27/2013
Temperature/ Humidity	25 deg.C/ 45% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx (Hopping on)

Mode	Number of channel [times]	Limit [times]
Tx	25	>= 25



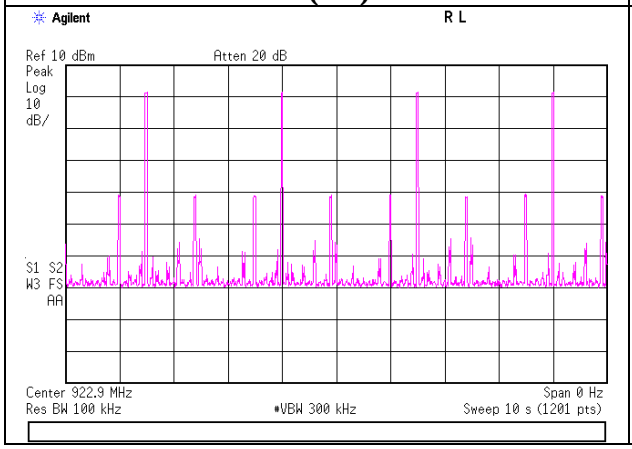
Dwell time

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10058679H
Date	09/27/2013
Temperature/ Humidity	25 deg.C/ 45% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx (Hopping on)

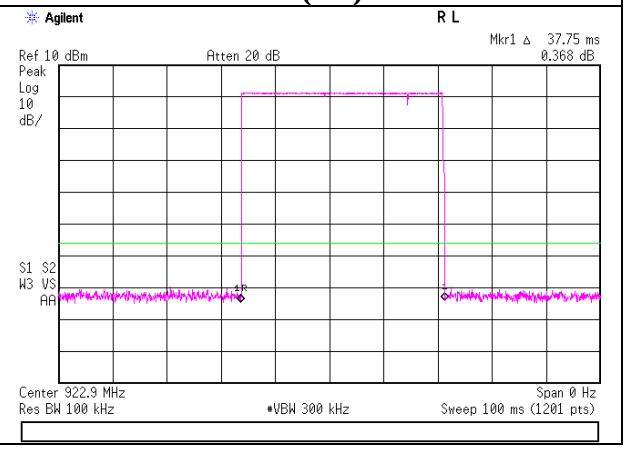
Mode	Number of transmission in 10sec [times]	Length of transmission time [msec]	Result [msec]	Limit [msec]
Tx	4	37.8	151.0	400

Result [ms] = Number of transmission in 10sec [times] * Length of transmission time [msec]

Tx (1/2)



Tx (2/2)



Maximum Peak Output Power

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10058679H
Date	09/27/2013
Temperature/ Humidity	25 deg.C/ 45% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx (Hopping off)

[PK]

Freq.	Reading	Cable Loss	Atten.	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
918.1	2.64	0.39	9.90	12.94	19.66	23.97	250	11.03
922.9	2.60	0.39	9.90	12.90	19.48	23.97	250	11.07
927.7	2.52	0.39	9.90	12.82	19.12	23.97	250	11.15

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

Average Output Power
(Reference data for SAR testing)

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10058679H
Date	09/27/2013
Temperature/ Humidity	25 deg.C/ 45% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx (Hopping off)

[AV]

Freq. [MHz]	Detector	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]
918.1	AV	2.58	0.39	9.90	12.88	19.39
922.9	AV	2.51	0.39	9.90	12.81	19.08
927.7	AV	2.45	0.39	9.90	12.75	18.82

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

Radiated Spurious Emission

Antenna 1

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10058679H	
Date	10/02/2013	10/02/2013
Temperature/ Humidity	21 deg.C/ 52% RH	23 deg.C/ 54% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(30-1000MHz)
Mode	Tx 918.1MHz, Antenna 1	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	34.728	QP	23.1	16.5	6.8	28.6	17.8	40.0	22.2	
Hori	68.825	QP	24.5	6.7	7.2	28.6	9.8	40.0	30.2	
Hori	72.783	QP	23.4	6.5	7.2	28.6	8.5	40.0	31.5	
Hori	78.612	QP	29.3	6.4	7.3	28.6	14.4	40.0	25.6	
Hori	98.373	QP	24.5	9.8	7.4	28.5	13.2	43.5	30.3	
Hori	846.099	QP	27.6	22.1	11.1	28.1	32.7	46.0	13.3	
Hori	1836.200	PK	60.3	26.4	3.1	35.9	53.9	73.9	20.0	
Hori	2754.300	PK	54.0	27.2	3.3	35.4	49.1	73.9	24.8	
Hori	3672.400	PK	48.0	28.4	4.2	34.7	45.9	73.9	28.0	
Hori	4590.500	PK	49.2	30.0	5.5	34.8	49.9	73.9	24.0	
Hori	5508.600	PK	44.3	31.4	5.1	34.6	46.2	73.9	27.7	
Hori	6426.700	PK	49.0	33.8	5.5	34.7	53.6	73.9	20.3	
Hori	7344.800	PK	46.7	35.8	5.7	34.9	53.3	73.9	20.6	
Hori	8262.900	PK	NS	-	-	-	-	73.9	-	
Hori	9181.000	PK	NS	-	-	-	-	73.9	-	
Hori	2754.300	AV	49.8	27.2	3.3	35.4	44.9	53.9	9.0	
Hori	3672.400	AV	38.3	28.4	4.2	34.7	36.2	53.9	17.7	
Hori	4590.500	AV	42.0	30.0	5.5	34.8	42.7	53.9	11.2	
Hori	5508.600	AV	33.0	31.4	5.1	34.6	34.9	53.9	19.0	
Hori	6426.700	AV	39.3	33.8	5.5	34.7	43.9	53.9	10.0	
Hori	7344.800	AV	37.0	35.8	5.7	34.9	43.6	53.9	10.3	
Hori	8262.900	AV	NS	-	-	-	-	53.9	-	
Hori	9181.000	AV	NS	-	-	-	-	53.9	-	
Vert	34.728	QP	24.9	16.5	6.8	28.6	19.6	40.0	20.4	
Vert	68.825	QP	28.7	6.7	7.2	28.6	14.0	40.0	26.0	
Vert	72.783	QP	31.1	6.5	7.2	28.6	16.2	40.0	23.8	
Vert	78.612	QP	34.1	6.4	7.3	28.6	19.2	40.0	20.8	
Vert	98.373	QP	30.9	9.8	7.4	28.5	19.6	43.5	23.9	
Vert	846.099	QP	26.9	22.1	11.1	28.1	32.0	46.0	14.0	
Vert	1836.200	PK	60.0	26.4	3.1	35.9	53.6	73.9	20.3	
Vert	2754.300	PK	58.8	27.2	3.3	35.4	53.9	73.9	20.0	
Vert	3672.400	PK	50.0	28.4	4.2	34.7	47.9	73.9	26.0	
Vert	4590.500	PK	48.1	30.0	5.5	34.8	48.8	73.9	25.1	
Vert	5508.600	PK	45.8	31.4	5.1	34.6	47.7	73.9	26.2	
Vert	6426.700	PK	47.6	33.8	5.5	34.7	52.2	73.9	21.7	
Vert	7344.800	PK	48.0	35.8	5.7	34.9	54.6	73.9	19.3	
Vert	8262.900	PK	NS	-	-	-	-	73.9	-	
Vert	9181.000	PK	NS	-	-	-	-	73.9	-	
Vert	2754.300	AV	55.6	27.2	3.3	35.4	50.7	53.9	3.2	
Vert	3672.400	AV	44.3	28.4	4.2	34.7	42.2	53.9	11.7	
Vert	4590.500	AV	41.0	30.0	5.5	34.8	41.7	53.9	12.2	
Vert	5508.600	AV	33.0	31.4	5.1	34.6	34.9	53.9	19.0	
Vert	6426.700	AV	38.5	33.8	5.5	34.7	43.1	53.9	10.8	
Vert	7344.800	AV	37.0	35.8	5.7	34.9	43.6	53.9	10.3	
Vert	8262.900	AV	NS	-	-	-	-	53.9	-	
Vert	9181.000	AV	NS	-	-	-	-	53.9	-	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Ampl

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Radiated Spurious Emission

Antenna 1

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10058679H	
Date	10/02/2013	10/02/2013
Temperature/ Humidity	21 deg.C/ 52% RH	23 deg.C/ 54% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(30-1000MHz)
Mode	Tx 918.1MHz, Antenna 1	

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	918.100	PK	100.7	22.5	11.4	27.8	106.8	-	-	Carrier
Hori	902.000	PK	28.5	22.3	11.3	27.9	34.2	86.8	52.6	
Hori	1836.200	PK	59.2	26.4	3.1	35.9	52.8	86.8	34.0	
Vert	918.100	PK	98.4	22.5	11.4	27.8	104.5	-	-	Carrier
Vert	902.000	PK	28.9	22.3	11.3	27.9	34.6	84.5	49.9	
Vert	1836.200	PK	59.2	26.4	3.1	35.9	52.8	84.5	31.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	1836.200	AV	59.0	26.4	3.1	35.9	-8.5	44.1	53.9	9.8	
Vert	1836.200	AV	59.0	26.4	3.1	35.9	-8.5	44.1	53.9	9.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))
- Gain(Amprifier) + Dwell time factor (Refer to dwell time data sheet)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Radiated Spurious Emission

Antenna 1

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10058679H	
Date	10/02/2013	10/02/2013
Temperature/ Humidity	21 deg.C/ 52% RH	23 deg.C/ 54% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(30-1000MHz)
Mode	Tx 922.9MHz, Antenna 1	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	35.873	QP	23.3	16.1	6.8	28.6	17.6	40.0	22.4	
Hori	68.821	QP	24.4	6.7	7.2	28.6	9.7	40.0	30.3	
Hori	72.728	QP	23.5	6.5	7.2	28.6	8.6	40.0	31.4	
Hori	78.614	QP	29.4	6.4	7.3	28.6	14.5	40.0	25.5	
Hori	95.684	QP	26.5	9.3	7.4	28.5	14.7	43.5	28.8	
Hori	850.898	QP	28.1	22.1	11.1	28.0	33.3	46.0	12.7	
Hori	1845.800	PK	58.0	26.4	3.1	35.8	51.7	73.9	22.2	
Hori	2768.700	PK	60.6	27.2	3.4	35.4	55.8	73.9	18.1	
Hori	3691.600	PK	49.8	28.5	4.2	34.7	47.8	73.9	26.1	
Hori	4614.500	PK	47.8	30.0	5.5	34.8	48.5	73.9	25.4	
Hori	5537.400	PK	43.2	31.5	5.1	34.6	45.2	73.9	28.7	
Hori	6460.300	PK	46.2	34.0	5.5	34.7	51.0	73.9	22.9	
Hori	7383.200	PK	46.1	35.8	5.7	34.9	52.7	73.9	21.2	
Hori	8306.100	PK	NS	-	-	-	-	73.9	-	
Hori	9229.000	PK	NS	-	-	-	-	73.9	-	
Hori	1845.800	AV	56.0	26.4	3.1	35.8	49.7	53.9	4.2	
Hori	3691.600	AV	43.4	28.5	4.2	34.7	41.4	53.9	12.5	
Hori	4614.500	AV	38.3	30.0	5.5	34.8	39.0	53.9	14.9	
Hori	5537.400	AV	31.5	31.5	5.1	34.6	33.5	53.9	20.4	
Hori	6460.300	AV	36.9	34.0	5.5	34.7	41.7	53.9	12.2	
Hori	7383.200	AV	33.6	35.8	5.7	34.9	40.2	53.9	13.7	
Hori	8306.100	AV	NS	-	-	-	-	53.9	-	
Hori	9229.000	AV	NS	-	-	-	-	53.9	-	
Vert	35.873	QP	24.6	16.1	6.8	28.6	18.9	40.0	21.1	
Vert	68.821	QP	28.8	6.7	7.2	28.6	14.1	40.0	25.9	
Vert	72.728	QP	31.4	6.5	7.2	28.6	16.5	40.0	23.5	
Vert	78.614	QP	34.0	6.4	7.3	28.6	19.1	40.0	20.9	
Vert	98.327	QP	30.8	9.8	7.4	28.5	19.5	43.5	24.0	
Vert	850.898	QP	27.0	22.1	11.1	28.0	32.2	46.0	13.8	
Vert	1845.800	PK	59.0	26.4	3.1	35.8	52.7	73.9	21.2	
Vert	2768.700	PK	58.2	27.2	3.4	35.4	53.4	73.9	20.5	
Vert	3691.600	PK	50.3	28.5	4.2	34.7	48.3	73.9	25.6	
Vert	4614.500	PK	49.3	30.0	5.5	34.8	50.0	73.9	23.9	
Vert	5537.400	PK	43.0	31.5	5.1	34.6	45.0	73.9	28.9	
Vert	6460.300	PK	45.5	34.0	5.5	34.7	50.3	73.9	23.6	
Vert	7383.200	PK	48.1	35.8	5.7	34.9	54.7	73.9	19.2	
Vert	8306.100	PK	NS	-	-	-	-	73.9	-	
Vert	9229.000	PK	NS	-	-	-	-	73.9	-	
Vert	1845.800	AV	56.9	26.4	3.1	35.8	50.6	53.9	3.3	
Vert	2768.700	AV	54.9	27.2	3.4	35.4	50.1	53.9	3.8	
Vert	3691.600	AV	44.4	28.5	4.2	34.7	42.4	53.9	11.5	
Vert	4614.500	AV	40.6	30.0	5.5	34.8	41.3	53.9	12.6	
Vert	5537.400	AV	32.0	31.5	5.1	34.6	34.0	53.9	19.9	
Vert	6460.300	AV	35.0	34.0	5.5	34.7	39.8	53.9	14.1	
Vert	7383.200	AV	36.5	35.8	5.7	34.9	43.1	53.9	10.8	
Vert	8306.100	AV	NS	-	-	-	-	53.9	-	
Vert	9229.000	AV	NS	-	-	-	-	53.9	-	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Ampl

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Radiated Spurious Emission

Antenna 1

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10058679H	
Date	10/02/2013	10/02/2013
Temperature/ Humidity	21 deg.C/ 52% RH	23 deg.C/ 54% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(30-1000MHz)
Mode	Tx 922.9MHz, Antenna 1	

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	922.900	PK	100.3	22.5	11.4	27.8	106.4	-	-	Carrier
Hori	1845.800	PK	56.9	26.4	3.1	35.8	50.6	86.4	35.8	
Vert	922.900	PK	97.4	22.5	11.4	27.8	103.5	-	-	Carrier
Vert	1845.800	PK	57.9	26.4	3.1	35.8	51.6	83.5	31.9	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2768.700	AV	58.4	27.2	3.4	35.4	-8.5	45.1	53.9	8.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))
- Gain(Amprifier) + Dwell time factor (Refer to dwell time data sheet)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Radiated Spurious Emission

Antenna 1

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10058679H	
Date	10/02/2013	10/02/2013
Temperature/ Humidity	21 deg.C/ 52% RH	23 deg.C/ 54% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(30-1000MHz)
Mode	Tx 927.7MHz, Antenna 1	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	36.124	QP	23.0	16.0	6.8	28.6	17.2	40.0	22.8	
Hori	68.852	QP	24.2	6.7	7.2	28.6	9.5	40.0	30.5	
Hori	72.783	QP	23.3	6.5	7.2	28.6	8.4	40.0	31.6	
Hori	78.621	QP	29.5	6.4	7.3	28.6	14.6	40.0	25.4	
Hori	95.685	QP	26.3	9.3	7.4	28.5	14.5	43.5	29.0	
Hori	855.699	QP	25.8	22.1	11.1	28.0	31.0	46.0	15.0	
Hori	1855.400	PK	58.0	26.5	3.1	35.8	51.8	73.9	22.1	
Hori	2783.100	PK	56.9	27.2	3.4	35.4	52.1	73.9	21.8	
Hori	3710.800	PK	47.6	28.5	4.3	34.7	45.7	73.9	28.2	
Hori	4638.500	PK	48.1	30.1	5.6	34.8	49.0	73.9	24.9	
Hori	5566.200	PK	43.0	31.5	5.1	34.6	45.0	73.9	28.9	
Hori	6493.900	PK	45.4	34.1	5.5	34.7	50.3	73.9	23.6	
Hori	7421.600	PK	45.7	35.9	5.7	34.9	52.4	73.9	21.5	
Hori	8349.300	PK	NS	-	-	-	-	73.9	-	
Hori	9277.000	PK	NS	-	-	-	-	73.9	-	
Hori	1855.400	AV	55.8	26.5	3.1	35.8	49.6	53.9	4.3	
Hori	2783.100	AV	53.7	27.2	3.4	35.4	48.9	53.9	5.0	
Hori	3710.800	AV	39.6	28.5	4.3	34.7	37.7	53.9	16.2	
Hori	4638.500	AV	39.0	30.1	5.6	34.8	39.9	53.9	14.0	
Hori	5566.200	AV	31.0	31.5	5.1	34.6	33.0	53.9	20.9	
Hori	6493.900	AV	35.0	34.1	5.5	34.7	39.9	53.9	14.0	
Hori	7421.600	AV	34.2	35.9	5.7	34.9	40.9	53.9	13.0	
Hori	8349.300	AV	NS	-	-	-	-	53.9	-	
Hori	9277.000	AV	NS	-	-	-	-	53.9	-	
Vert	36.124	QP	24.5	16.0	6.8	28.6	18.7	40.0	21.3	
Vert	68.852	QP	28.7	6.7	7.2	28.6	14.0	40.0	26.0	
Vert	72.783	QP	31.1	6.5	7.2	28.6	16.2	40.0	23.8	
Vert	78.621	QP	34.3	6.4	7.3	28.6	19.4	40.0	20.6	
Vert	98.353	QP	30.9	9.8	7.4	28.5	19.6	43.5	23.9	
Vert	855.699	QP	24.7	22.1	11.1	28.0	29.9	46.0	16.1	
Vert	1855.400	PK	58.1	26.5	3.1	35.8	51.9	73.9	22.0	
Vert	2783.100	PK	55.0	27.2	3.4	35.4	50.2	73.9	23.7	
Vert	3710.800	PK	50.5	28.5	4.3	34.7	48.6	73.9	25.3	
Vert	4638.500	PK	49.5	30.1	5.6	34.8	50.4	73.9	23.5	
Vert	5566.200	PK	43.9	31.5	5.1	34.6	45.9	73.9	28.0	
Vert	6493.900	PK	45.4	34.1	5.5	34.7	50.3	73.9	23.6	
Vert	7421.600	PK	47.2	35.9	5.7	34.9	53.9	73.9	20.0	
Vert	8349.300	PK	NS	-	-	-	-	73.9	-	
Vert	9277.000	PK	NS	-	-	-	-	73.9	-	
Vert	1855.400	AV	55.9	26.5	3.1	35.8	49.7	53.9	4.2	
Vert	2783.100	AV	51.5	27.2	3.4	35.4	46.7	53.9	7.2	
Vert	3710.800	AV	43.8	28.5	4.3	34.7	41.9	53.9	12.0	
Vert	4638.500	AV	41.9	30.1	5.6	34.8	42.8	53.9	11.1	
Vert	5566.200	AV	31.8	31.5	5.1	34.6	33.8	53.9	20.1	
Vert	6493.900	AV	34.5	34.1	5.5	34.7	39.4	53.9	14.5	
Vert	7421.600	AV	36.5	35.9	5.7	34.9	43.2	53.9	10.7	
Vert	8349.300	AV	NS	-	-	-	-	53.9	-	
Vert	9277.000	AV	NS	-	-	-	-	53.9	-	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Ampr
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

Radiated Spurious Emission

Antenna 1

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10058679H	
Date	10/02/2013	10/02/2013
Temperature/ Humidity	21 deg.C/ 52% RH	23 deg.C/ 54% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(30-1000MHz)
Mode	Tx 927.7MHz, Antenna 1	

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	927.700	PK	99.1	22.5	11.4	27.8	105.2	-	-	Carrier
Hori	928.000	PK	62.2	22.6	11.4	27.7	68.5	85.2	16.7	
Hori	1855.400	PK	56.5	26.5	3.1	35.8	50.3	85.2	34.9	
Vert	927.700	PK	96.8	22.5	11.4	27.8	102.9	-	-	Carrier
Vert	928.000	PK	59.7	22.6	11.4	27.7	66.0	82.9	16.9	
Vert	1855.400	PK	56.9	26.5	3.1	35.8	50.7	82.9	32.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

Radiated Spurious Emission

Antenna 2

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10058679H	
Date	10/02/2013	10/02/2013
Temperature/ Humidity	21 deg.C/ 52% RH	23 deg.C/ 54% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(30-1000MHz)
Mode	Tx 918.1MHz, Antenna 2	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	33.276	QP	23.2	16.7	6.8	28.6	18.1	40.0	21.9	
Hori	68.847	QP	24.6	6.7	7.2	28.6	9.9	40.0	30.1	
Hori	72.725	QP	23.3	6.5	7.2	28.6	8.4	40.0	31.6	
Hori	78.624	QP	29.1	6.4	7.3	28.6	14.2	40.0	25.8	
Hori	98.331	QP	24.7	9.8	7.4	28.5	13.4	43.5	30.1	
Hori	846.098	QP	26.2	22.1	11.1	28.1	31.3	46.0	14.7	
Hori	1836.200	PK	52.1	26.4	3.1	35.9	45.7	73.9	28.2	
Hori	2754.300	PK	50.8	27.2	3.3	35.4	45.9	73.9	28.0	
Hori	3672.400	PK	46.0	28.4	4.2	34.7	43.9	73.9	30.0	
Hori	4590.500	PK	43.9	30.0	5.5	34.8	44.6	73.9	29.3	
Hori	5508.600	PK	44.1	31.4	5.1	34.6	46.0	73.9	27.9	
Hori	6426.700	PK	43.3	33.8	5.5	34.7	47.9	73.9	26.0	
Hori	7344.800	PK	44.2	35.8	5.7	34.9	50.8	73.9	23.1	
Hori	8262.900	PK	NS	-	-	-	-	73.9	-	
Hori	9181.000	PK	NS	-	-	-	-	73.9	-	
Hori	1836.200	AV	48.9	26.4	3.1	35.9	42.5	53.9	11.4	
Hori	2754.300	AV	45.8	27.2	3.3	35.4	40.9	53.9	13.0	
Hori	3672.400	AV	34.1	28.4	4.2	34.7	32.0	53.9	21.9	
Hori	4590.500	AV	32.8	30.0	5.5	34.8	33.5	53.9	20.4	
Hori	5508.600	AV	31.7	31.4	5.1	34.6	33.6	53.9	20.3	
Hori	6426.700	AV	33.1	33.8	5.5	34.7	37.7	53.9	16.2	
Hori	7344.800	AV	33.4	35.8	5.7	34.9	40.0	53.9	13.9	
Hori	8262.900	AV	NS	-	-	-	-	53.9	-	
Hori	9181.000	AV	NS	-	-	-	-	53.9	-	
Vert	33.276	QP	25.4	16.7	6.8	28.6	20.3	40.0	19.7	
Vert	68.847	QP	28.5	6.7	7.2	28.6	13.8	40.0	26.2	
Vert	72.725	QP	30.9	6.5	7.2	28.6	16.0	40.0	24.0	
Vert	78.624	QP	34.0	6.4	7.3	28.6	19.1	40.0	20.9	
Vert	98.331	QP	31.0	9.8	7.4	28.5	19.7	43.5	23.8	
Vert	846.098	QP	25.2	22.1	11.1	28.1	30.3	46.0	15.7	
Vert	1836.200	PK	50.3	26.4	3.1	35.9	43.9	73.9	30.0	
Vert	2754.300	PK	52.1	27.2	3.3	35.4	47.2	73.9	26.7	
Vert	3672.400	PK	45.6	28.4	4.2	34.7	43.5	73.9	30.4	
Vert	4590.500	PK	44.5	30.0	5.5	34.8	45.2	73.9	28.7	
Vert	5508.600	PK	43.4	31.4	5.1	34.6	45.3	73.9	28.6	
Vert	6426.700	PK	44.0	33.8	5.5	34.7	48.6	73.9	25.3	
Vert	7344.800	PK	44.2	35.8	5.7	34.9	50.8	73.9	23.1	
Vert	8262.900	PK	NS	-	-	-	-	73.9	-	
Vert	9181.000	PK	NS	-	-	-	-	73.9	-	
Vert	1836.200	AV	46.4	26.4	3.1	35.9	40.0	53.9	13.9	
Vert	2754.300	AV	48.0	27.2	3.3	35.4	43.1	53.9	10.8	
Vert	3672.400	AV	35.0	28.4	4.2	34.7	32.9	53.9	21.0	
Vert	4590.500	AV	34.2	30.0	5.5	34.8	34.9	53.9	19.0	
Vert	5508.600	AV	31.3	31.4	5.1	34.6	33.2	53.9	20.7	
Vert	6426.700	AV	31.3	33.8	5.5	34.7	35.9	53.9	18.0	
Vert	7344.800	AV	33.2	35.8	5.7	34.9	39.8	53.9	14.1	
Vert	8262.900	AV	NS	-	-	-	-	53.9	-	
Vert	9181.000	AV	NS	-	-	-	-	53.9	-	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Ampl

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Radiated Spurious Emission

Antenna 2

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10058679H	
Date	10/02/2013	10/02/2013
Temperature/ Humidity	21 deg.C/ 52% RH	23 deg.C/ 54% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(30-1000MHz)
Mode	Tx 918.1MHz, Antenna 2	

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	918.100	PK	107.6	22.5	11.4	27.8	113.7	-	-	Carrier
Hori	902.000	PK	30.1	22.3	11.3	27.9	35.8	93.7	57.9	
Hori	1836.200	PK	49.9	26.4	3.1	35.9	43.5	93.7	50.2	
Vert	918.100	PK	107.2	22.5	11.4	27.8	113.3	-	-	Carrier
Vert	902.000	PK	30.1	22.3	11.3	27.9	35.8	93.3	57.5	
Vert	1836.200	PK	48.0	26.4	3.1	35.9	41.6	93.3	51.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

Radiated Spurious Emission

Antenna 2

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10058679H
Date 10/02/2013
Temperature/ Humidity 23 deg.C/ 54% RH
Engineer Satofumi Matsuyama

Mode Tx 922.9MHz, Antenna 2

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	33.264	QP	23.3	16.7	6.8	28.6	18.2	40.0	21.8	
Hori	68.811	QP	24.5	6.7	7.2	28.6	9.8	40.0	30.2	
Hori	72.751	QP	23.4	6.5	7.2	28.6	8.5	40.0	31.5	
Hori	78.643	QP	29.0	6.4	7.3	28.6	14.1	40.0	25.9	
Hori	98.314	QP	24.8	9.8	7.4	28.5	13.5	43.5	30.0	
Hori	850.899	QP	26.6	22.1	11.1	28.0	31.8	46.0	14.2	
Hori	1845.800	PK	51.9	26.4	3.1	35.8	45.6	73.9	28.3	
Hori	2768.700	PK	53.9	27.2	3.4	35.4	49.1	73.9	24.8	
Hori	3691.600	PK	45.0	28.5	4.2	34.7	43.0	73.9	30.9	
Hori	4614.500	PK	44.6	30.0	5.5	34.8	45.3	73.9	28.6	
Hori	5537.400	PK	NS	-	-	-	-	73.9	-	
Hori	6460.300	PK	43.3	34.0	5.5	34.7	48.1	73.9	25.8	
Hori	7383.200	PK	45.6	35.8	5.7	34.9	52.2	73.9	21.7	
Hori	8306.100	PK	NS	-	-	-	-	73.9	-	
Hori	9229.000	PK	NS	-	-	-	-	73.9	-	
Hori	1845.800	AV	47.2	26.4	3.1	35.8	40.9	53.9	13.0	
Hori	2768.700	AV	48.7	27.2	3.4	35.4	43.9	53.9	10.0	
Hori	3691.600	AV	34.2	28.5	4.2	34.7	32.2	53.9	21.7	
Hori	4614.500	AV	32.6	30.0	5.5	34.8	33.3	53.9	20.6	
Hori	5537.400	AV	NS	-	-	-	-	53.9	-	
Hori	6460.300	AV	31.4	34.0	5.5	34.7	36.2	53.9	17.7	
Hori	7383.200	AV	33.2	35.8	5.7	34.9	39.8	53.9	14.1	
Hori	8306.100	AV	NS	-	-	-	-	53.9	-	
Hori	9229.000	AV	NS	-	-	-	-	53.9	-	
Vert	33.264	QP	25.5	16.7	6.8	28.6	20.4	40.0	19.6	
Vert	68.811	QP	28.7	6.7	7.2	28.6	14.0	40.0	26.0	
Vert	72.751	QP	30.8	6.5	7.2	28.6	15.9	40.0	24.1	
Vert	78.643	QP	34.1	6.4	7.3	28.6	19.2	40.0	20.8	
Vert	98.314	QP	31.2	9.8	7.4	28.5	19.9	43.5	23.6	
Vert	850.899	QP	27.5	22.1	11.1	28.0	32.7	46.0	13.3	
Vert	1845.800	PK	53.1	26.4	3.1	35.8	46.8	73.9	27.1	
Vert	2768.700	PK	50.5	27.2	3.4	35.4	45.7	73.9	28.2	
Vert	3691.600	PK	44.9	28.5	4.2	34.7	42.9	73.9	31.0	
Vert	4614.500	PK	44.6	30.0	5.5	34.8	45.3	73.9	28.6	
Vert	5537.400	PK	NS	-	-	-	-	73.9	-	
Vert	6460.300	PK	NS	-	-	-	-	73.9	-	
Vert	7383.200	PK	45.2	35.8	5.7	34.9	51.8	73.9	22.1	
Vert	8306.100	PK	NS	-	-	-	-	73.9	-	
Vert	9229.000	PK	NS	-	-	-	-	73.9	-	
Vert	1845.800	AV	48.3	26.4	3.1	35.8	42.0	53.9	11.9	
Vert	2768.700	AV	45.7	27.2	3.4	35.4	40.9	53.9	13.0	
Vert	3691.600	AV	34.4	28.5	4.2	34.7	32.4	53.9	21.5	
Vert	4614.500	AV	32.7	30.0	5.5	34.8	33.4	53.9	20.5	
Vert	5537.400	AV	NS	-	-	-	-	53.9	-	
Vert	6460.300	AV	NS	-	-	-	-	53.9	-	
Vert	7383.200	AV	33.4	35.8	5.7	34.9	40.0	53.9	13.9	
Vert	8306.100	AV	NS	-	-	-	-	53.9	-	
Vert	9229.000	AV	NS	-	-	-	-	53.9	-	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Ampl

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

Radiated Spurious Emission

Antenna 2

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10058679H
Date 10/02/2013
Temperature/ Humidity 23 deg.C/ 54% RH
Engineer Satofumi Matsuyama

Mode Tx 927.7MHz, Antenna 2

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	35.933	QP	22.4	16.0	6.8	28.6	16.6	40.0	23.4	
Hori	68.813	QP	24.5	6.7	7.2	28.6	9.8	40.0	30.2	
Hori	72.753	QP	23.6	6.5	7.2	28.6	8.7	40.0	31.3	
Hori	78.632	QP	29.1	6.4	7.3	28.6	14.2	40.0	25.8	
Hori	98.312	QP	25.0	9.7	7.4	28.5	13.6	43.5	29.9	
Hori	855.699	QP	28.3	22.1	11.1	28.0	33.5	46.0	12.5	
Hori	1855.400	PK	52.8	26.5	3.1	35.8	46.6	73.9	27.3	
Hori	2783.100	PK	53.4	27.2	3.4	35.4	48.6	73.9	25.3	
Hori	3710.800	PK	45.4	28.5	4.3	34.7	43.5	73.9	30.4	
Hori	4638.500	PK	45.3	30.1	5.6	34.8	46.2	73.9	27.7	
Hori	5566.200	PK	NS	-	-	-	-	73.9	-	
Hori	6493.900	PK	44.1	34.1	5.5	34.7	49.0	73.9	24.9	
Hori	7421.600	PK	46.0	35.9	5.7	34.9	52.7	73.9	21.2	
Hori	8349.300	PK	NS	-	-	-	-	73.9	-	
Hori	9277.000	PK	NS	-	-	-	-	73.9	-	
Hori	1855.400	AV	48.8	26.5	3.1	35.8	42.6	53.9	11.3	
Hori	2783.100	AV	48.4	27.2	3.4	35.4	43.6	53.9	10.3	
Hori	3710.800	AV	34.6	28.5	4.3	34.7	32.7	53.9	21.2	
Hori	4638.500	AV	32.9	30.1	5.6	34.8	33.8	53.9	20.1	
Hori	5566.200	AV	NS	-	-	-	-	53.9	-	
Hori	6493.900	AV	31.6	34.1	5.5	34.7	36.5	53.9	17.4	
Hori	7421.600	AV	33.5	35.9	5.7	34.9	40.2	53.9	13.7	
Hori	8349.300	AV	NS	-	-	-	-	53.9	-	
Hori	9277.000	AV	NS	-	-	-	-	53.9	-	
Vert	35.933	QP	25.4	16.0	6.8	28.6	19.6	40.0	20.4	
Vert	68.813	QP	28.9	6.7	7.2	28.6	14.2	40.0	25.8	
Vert	72.753	QP	30.9	6.5	7.2	28.6	16.0	40.0	24.0	
Vert	78.632	QP	34.0	6.4	7.3	28.6	19.1	40.0	20.9	
Vert	98.312	QP	31.4	9.7	7.4	28.5	20.0	43.5	23.5	
Vert	855.699	QP	27.9	22.1	11.1	28.0	33.1	46.0	12.9	
Vert	1855.400	PK	51.8	26.5	3.1	35.8	45.6	73.9	28.3	
Vert	2783.100	PK	50.5	27.2	3.4	35.4	45.7	73.9	28.2	
Vert	3710.800	PK	45.1	28.5	4.3	34.7	43.2	73.9	30.7	
Vert	4638.500	PK	43.6	30.1	5.6	34.8	44.5	73.9	29.4	
Vert	5566.200	PK	NS	-	-	-	-	73.9	-	
Vert	6493.900	PK	NS	-	-	-	-	73.9	-	
Vert	7421.600	PK	45.2	35.9	5.7	34.9	51.9	73.9	22.0	
Vert	8349.300	PK	NS	-	-	-	-	73.9	-	
Vert	9277.000	PK	NS	-	-	-	-	73.9	-	
Vert	1855.400	AV	47.6	26.5	3.1	35.8	41.4	53.9	12.5	
Vert	2783.100	AV	45.1	27.2	3.4	35.4	40.3	53.9	13.6	
Vert	3710.800	AV	32.5	28.5	4.3	34.7	30.6	53.9	23.3	
Vert	4638.500	AV	32.0	30.1	5.6	34.8	32.9	53.9	21.0	
Vert	5566.200	AV	NS	-	-	-	-	53.9	-	
Vert	6493.900	AV	NS	-	-	-	-	53.9	-	
Vert	7421.600	AV	33.6	35.9	5.7	34.9	40.3	53.9	13.6	
Vert	8349.300	AV	NS	-	-	-	-	53.9	-	
Vert	9277.000	AV	NS	-	-	-	-	53.9	-	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Ampli
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

Radiated Spurious Emission

Antenna 2

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10058679H
Date 10/02/2013
Temperature/ Humidity 23 deg.C/ 54% RH
Engineer Satofumi Matsuyama

Mode Tx 927.7MHz, Antenna 2

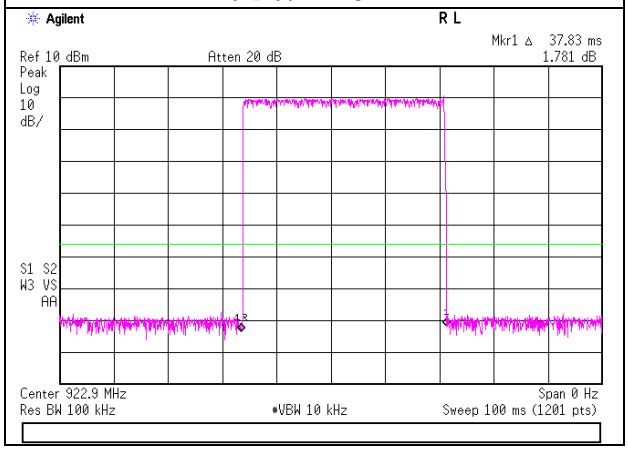
20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	927.700	PK	106.8	22.5	11.4	27.8	112.9	-	-	Carrier
Hori	928.000	PK	70.9	22.6	11.4	27.7	77.2	92.9	15.7	
Vert	927.700	PK	106.3	22.5	11.4	27.8	112.4	-	-	Carrier
Vert	928.000	PK	71.5	22.6	11.4	27.7	77.8	92.4	14.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

VBW (AV) Calculation

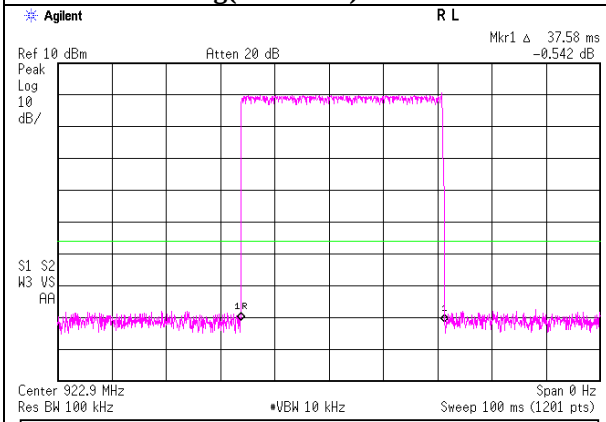
VBW = 10Hz



Dwell time factor

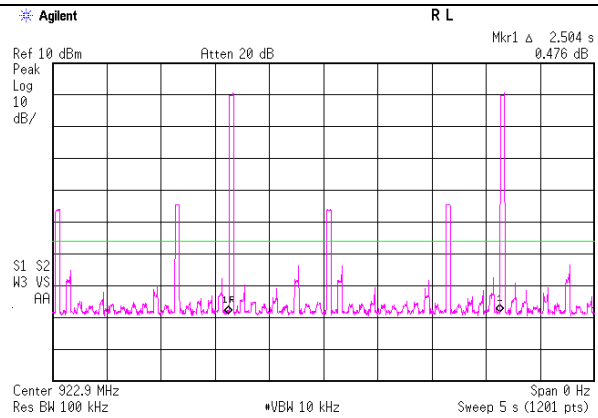
Worst 100ms

Dwell time factor =
20log(37.58/100) = -8.5dB



1cycle time

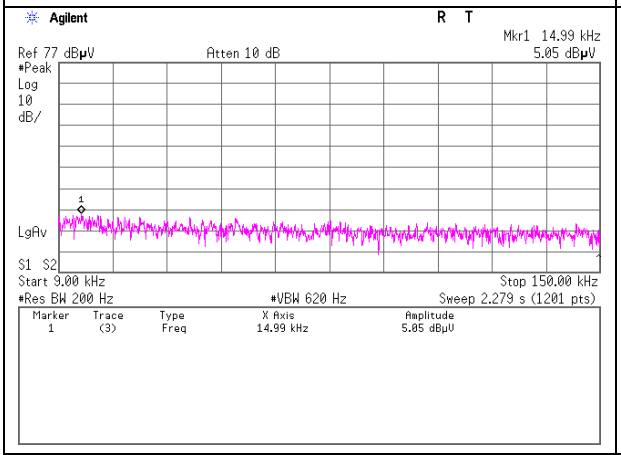
2.5s



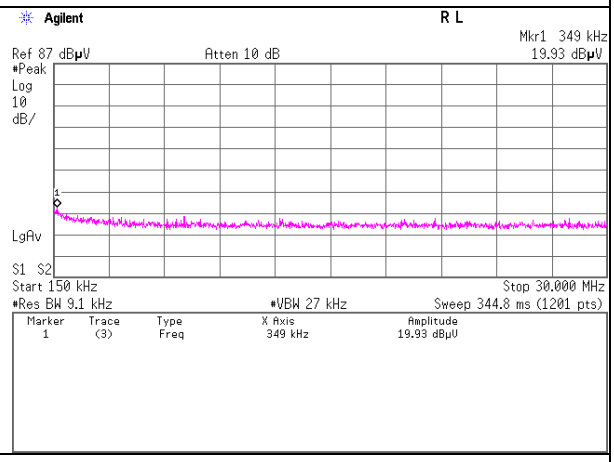
Conducted Spurious Emission

Tx 918.1MHz

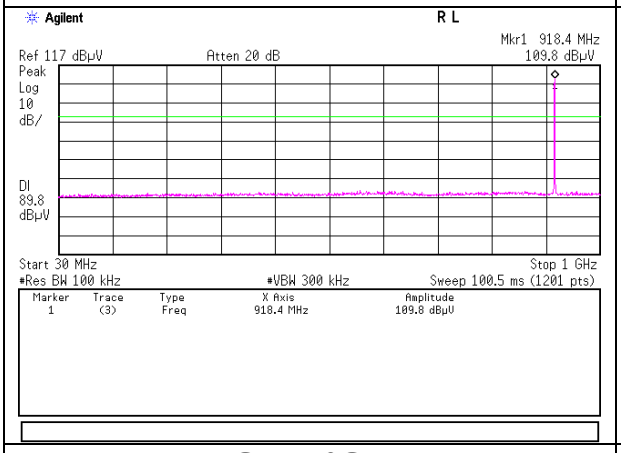
9kHz-150kHz



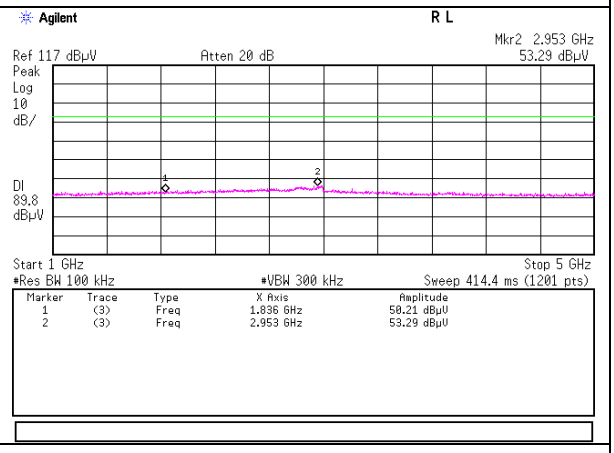
150kHz-30MHz



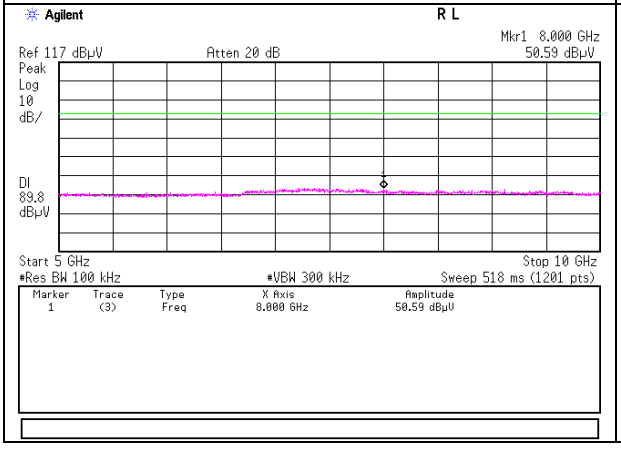
30MHz-1GHz



1GHz-5GHz



5GHz-10GHz

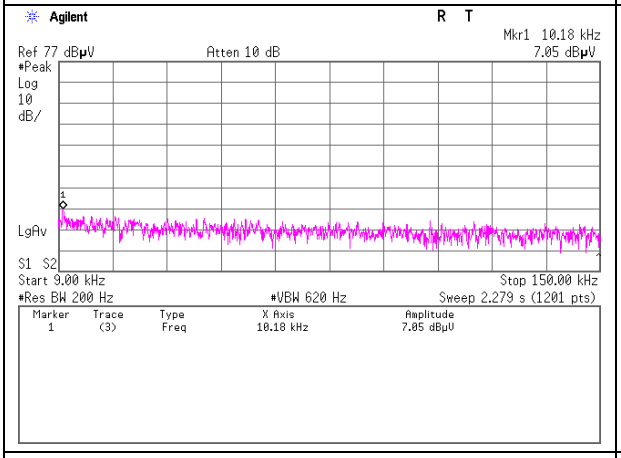


UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

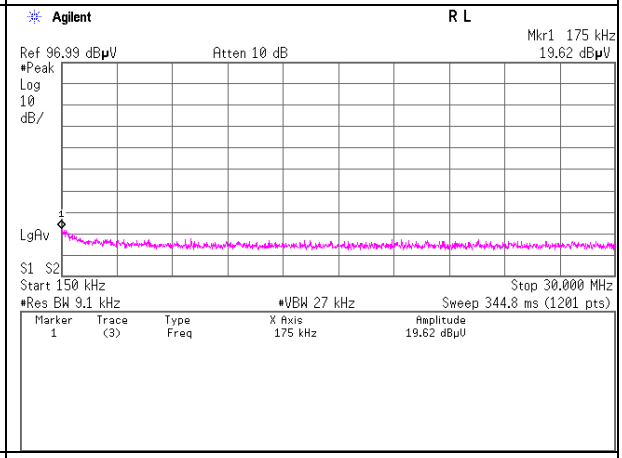
Conducted Spurious Emission

Tx 922.9MHz

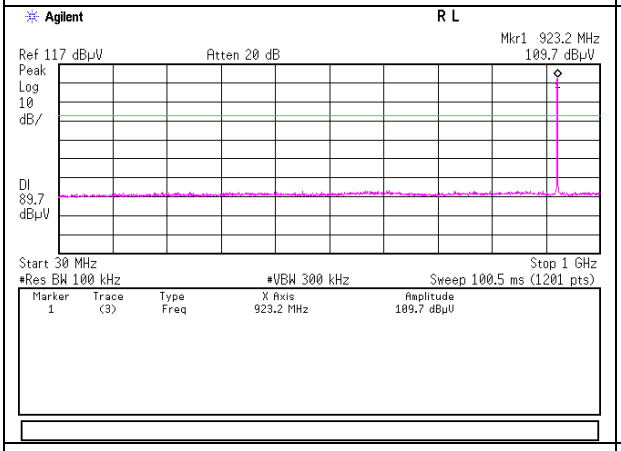
9kHz-150kHz



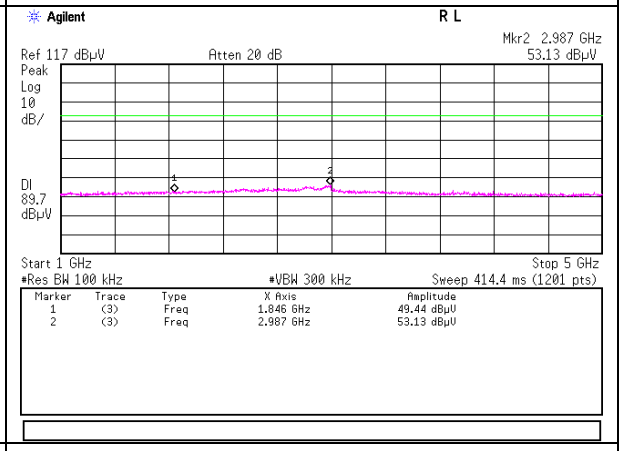
150kHz-30MHz



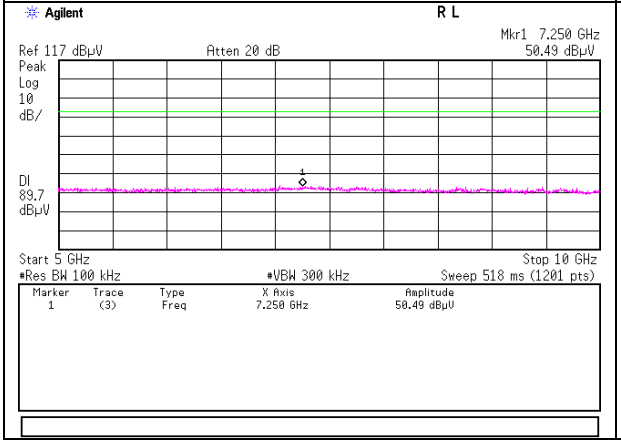
30MHz-1GHz



1GHz-5GHz



5GHz-10GHz



UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
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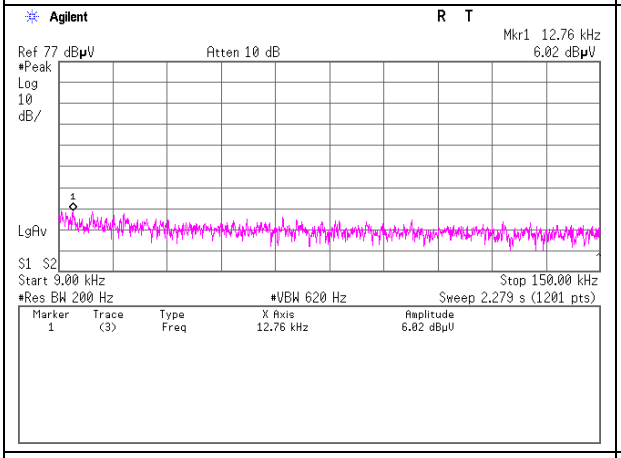
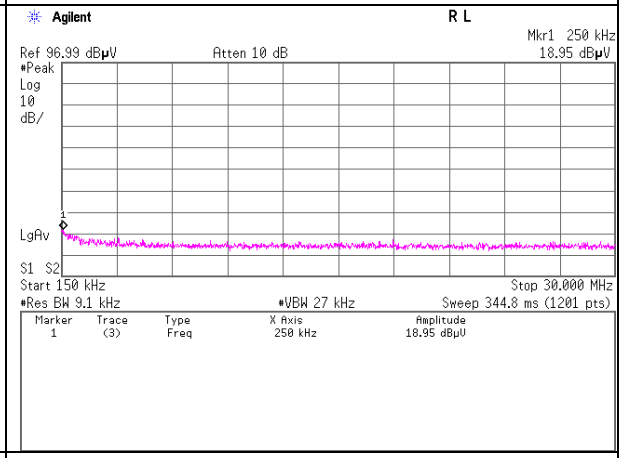
Conducted Spurious Emission

Tx 927.7MHz

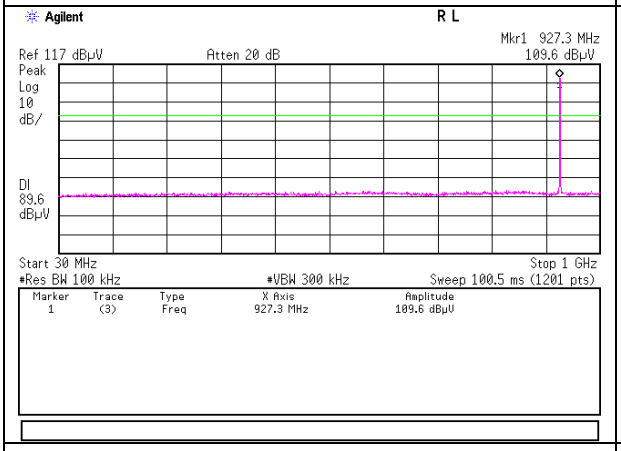
9kHz-150kHz



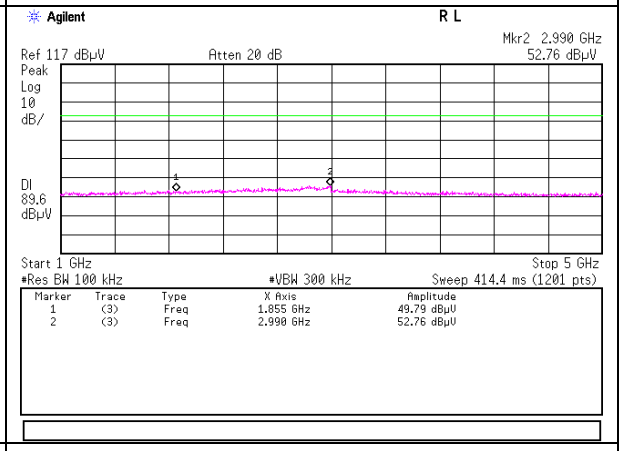
150kHz-30MHz



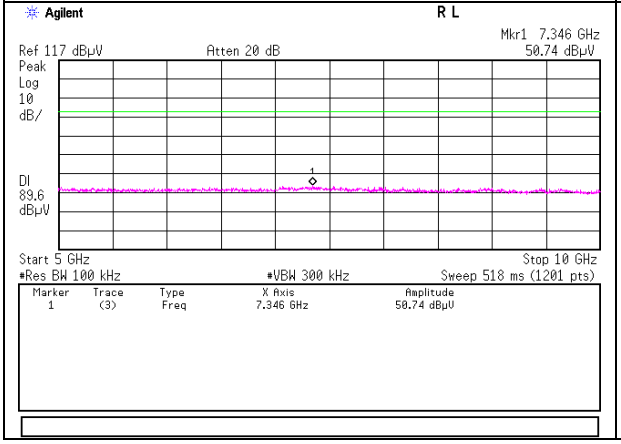
30MHz-1GHz



1GHz-5GHz



5GHz-10GHz

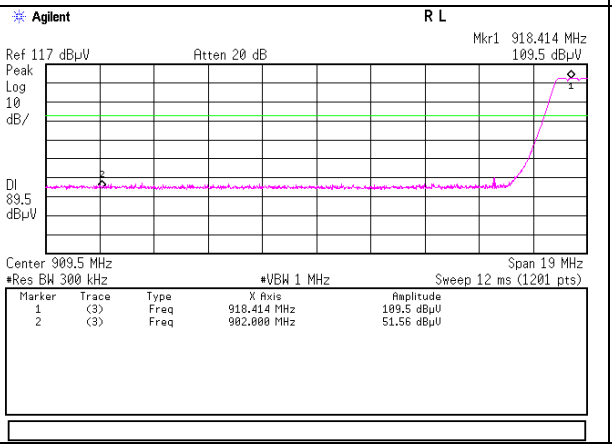


UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

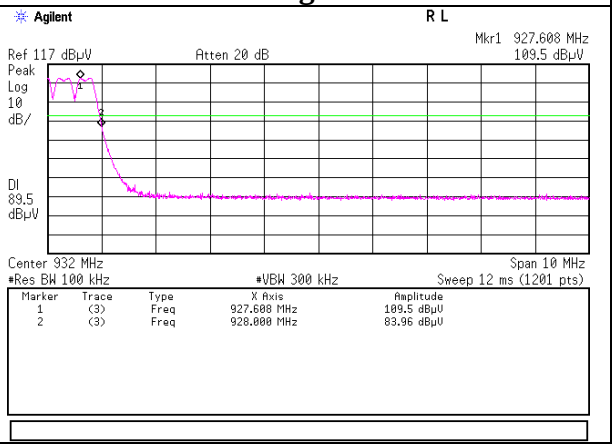
Conducted Emission Band Edge compliance

Tx Hopping on

Low

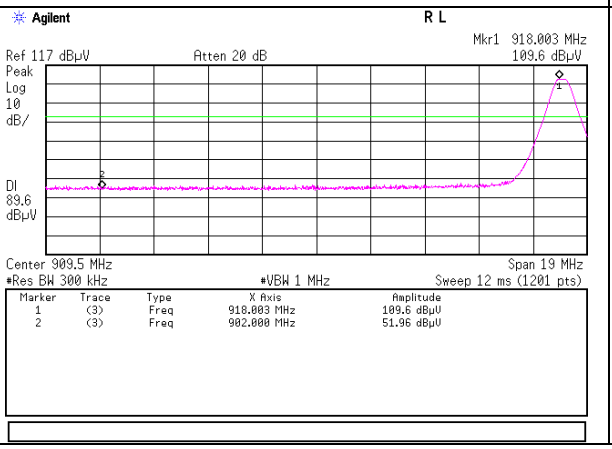


High

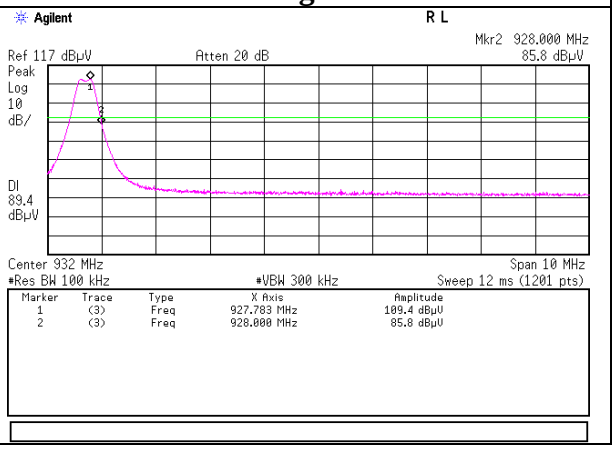


Tx Hopping off

Low



High



UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
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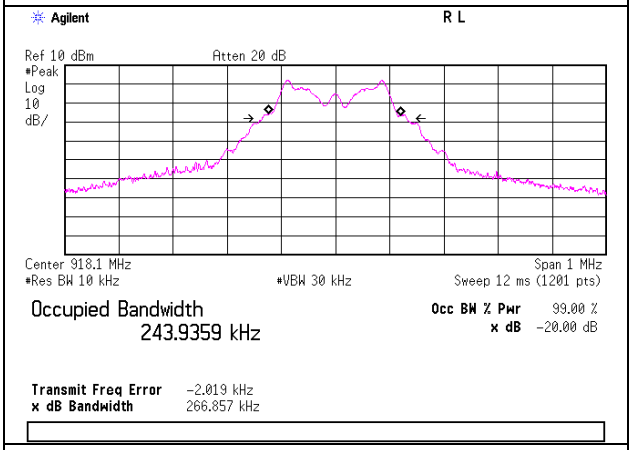
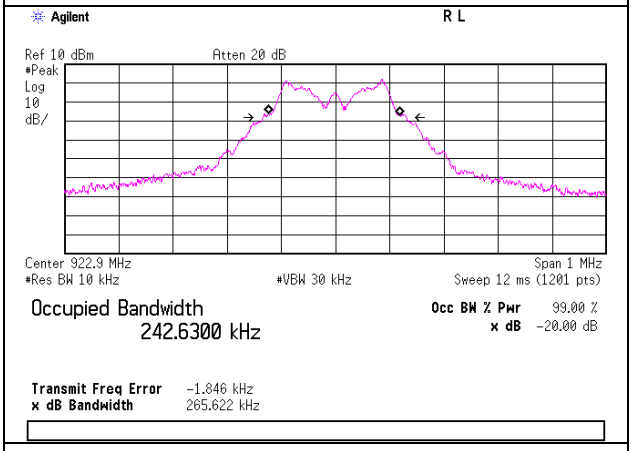
99%Occupied Bandwidth

Tx

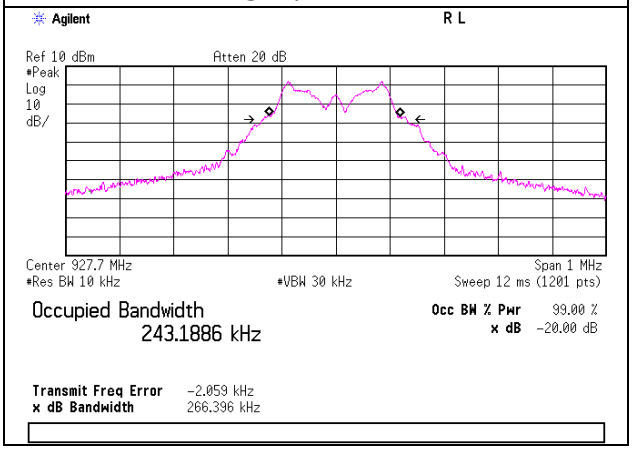
918.1MHz



922.9MHz



927.7MHz



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2013/02/26 * 12
MSA-06	Spectrum Analyzer	Agilent	E4407B	MY45107638	AT	2013/04/05 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2012/11/06 * 12
MCC-105	Microwave Cable	Hirose Electric	U.FL-2LP-066J1-A(200)	-	AT	2013/06/25 * 12
MPM-13	Power Meter	Anritsu	ML2495A	0824014	AT	2012/11/26 * 12
MPSE-18	Power sensor	Anritsu	MA2411B	0738174	AT	2012/11/26 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE/CE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE/CE	2013/02/26 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE/CE	2013/04/03 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2013/02/15 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2013/01/10 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2013/09/27 * 12
MHF-03	High pass Filter 1.4-5.0GHz	Mini-Circuit	VHF-1320	10411	RE	2013/08/21 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2013/05/30 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2013/06/11 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE	2013/01/07 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/ 5D-2W(5m)/ 5D-2W(0.8m)/ 5D-2W(1m)	-	CE	2013/02/06 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2013/01/09 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2012/10/08 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2012/10/08 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2013/02/06 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2012/11/06 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2013/09/12 * 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
RE: Radiated Emission
AT: Antenna Terminal Conducted test