




RADIO TEST REPORT

Test Report No. : 10749723H-C-R1

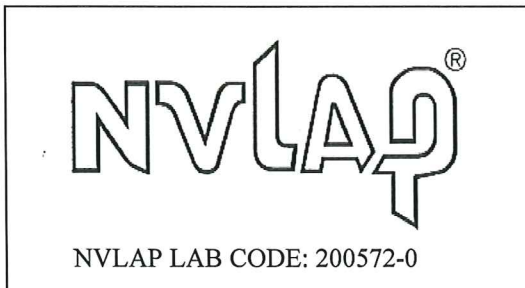
Applicant : OMRON Automotive Electronics Co. Ltd.
Type of Equipment : Remote engine starter (Antenna-M function)
Model No. : RJ333N-A
FCC ID : OUCRJ333N-A
Test regulation : FCC Part 15 Subpart C: 2015
Test Result : Complied

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2. The results in this report apply only to the sample tested.
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4. The test results in this report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10749723H-C. 10749723H-C is replaced with this report.

Date of test: April 16 to 18, 2015

Representative test engineer: 
Satofumi Matsuyama
Engineer
Consumer Technology Division

Approved by: 
Motoya Imura
Engineer
Consumer Technology Division



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SECTION 1: Customer information

Company Name : OMRON Automotive Electronics Co. Ltd.
Address : 6368 NENJOZAKA OKUSA KOMAKI AICHI, 485-0802 JAPAN
Telephone Number : +81-568-78-6159
Facsimile Number : +81-568-78-7659
Contact Person : Masashi Matsuda

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

2.1 Identification of E.U.T.

Type of Equipment : Remote engine starter (Antenna-M function)
Model No. : RJ333N-A
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 4.2 V
Receipt Date of Sample : April 15, 2015
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: RJ333N-A (referred to as the EUT in this report) is the Remote engine starter (Antenna-M function).

General Specification

Clock frequencies in the system : 12.800 MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 915.4 MHz to 925.0 MHz
Modulation : FHSS, FSK
Operating voltage (inner) : DC 3.3V
Antenna type : $\lambda/4$ monopole antenna
Antenna Gain : +1.0 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015

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 C63.4:2009 7. AC powerline conducted emission measurements IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	N/A	N/A *1)	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) ----- IC: RSS-210 A8.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) ----- IC: RSS-210 A8.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(i) ----- IC: RSS-210 A8.1 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(i) ----- IC: RSS-210 A8.1 (d)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(b)(2) ----- IC: RSS-210 A8.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 8.9 RSS-Gen 8.10		6.4 dB 2775.000 MHz, AV, Horizontal	Complied
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.					

* In case any questions arise about test procedure, ANSI C63.4: 2009 is also referred.

FCC Part 15.31 (e)

The EUT provides stable voltage (DC 3.3V) constantly to the wireless transmitter regardless of input voltage. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	-	Conducted

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)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9 kHz -30 MHz	30 MHz -300 MHz	300 MHz -1 GHz	1 GHz -10 GHz	10 GHz -18 GHz	18 GHz -26.5 GHz	26.5 GHz -40 GHz
No.1	4.3 dB	5.5 dB	6.3 dB	5.5 dB	5.8 dB	5.8 dB	4.3 dB
No.2	4.2 dB	5.4 dB	6.3 dB	5.4 dB	5.7 dB	5.9 dB	5.6 dB
No.3	4.4 dB	5.4 dB	6.4 dB	5.2 dB	5.5 dB	5.8 dB	5.5 dB
No.4	4.7 dB	5.6 dB	6.4 dB	5.3 dB	5.7 dB	5.9 dB	5.5 dB

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

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

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

Radiated emission test(3m)

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

3.5 Test Location

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	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	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	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	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	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	4.8 x 4.6m	-

* 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 Test data, Test instruments, and Test set up

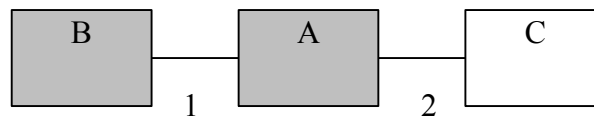
Refer to APPENDIX.

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

4.1 Operating Mode(s)

Mode	Tested Frequency
Transmitting mode (Tx mode)	915.4MHz 920.2MHz 925.0MHz
*Power of the EUT was set by the software as follows; Power settings: +9dBm Software: V1.08N *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



* 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	Remote engine starter (Antenna-M function)	RJ333N-A	FB000001	OMRON Automotive Electronics Co. Ltd.	EUT
B	Car antenna	RJ139-ANT-T	8	OMRON Automotive Electronics Co. Ltd.	EUT
C	Jig	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	2.0	Shielded	Shielded	-
2	Signal Cable	0.3	Unshielded	Unshielded	-

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SECTION 5: 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 4 of RSS-Gen 8.9 (IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz *1)	RBW: 100kHz VBW: 300kHz
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 : 9kHz-10GHz
Test data : APPENDIX
Test result : Pass

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SECTION 6: 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 *1)	Enough width to display emission skirts	1 to 5% of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	1.25MHz	15kHz	51kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30MHz	120kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	300kHz	1MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	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 25GHz (Less or equal to 5GHz)	100kHz	300kHz				
Conducted Spurious Emission Band Edge compliance	10MHz	200kHz	620kHz	Auto	Peak	Max Hold	Spectrum Analyzer
<p>*1) Peak hold was applied as Worst-case measurement. *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</p>							

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: Test data

20dB Bandwidth and Carrier Frequency Separation

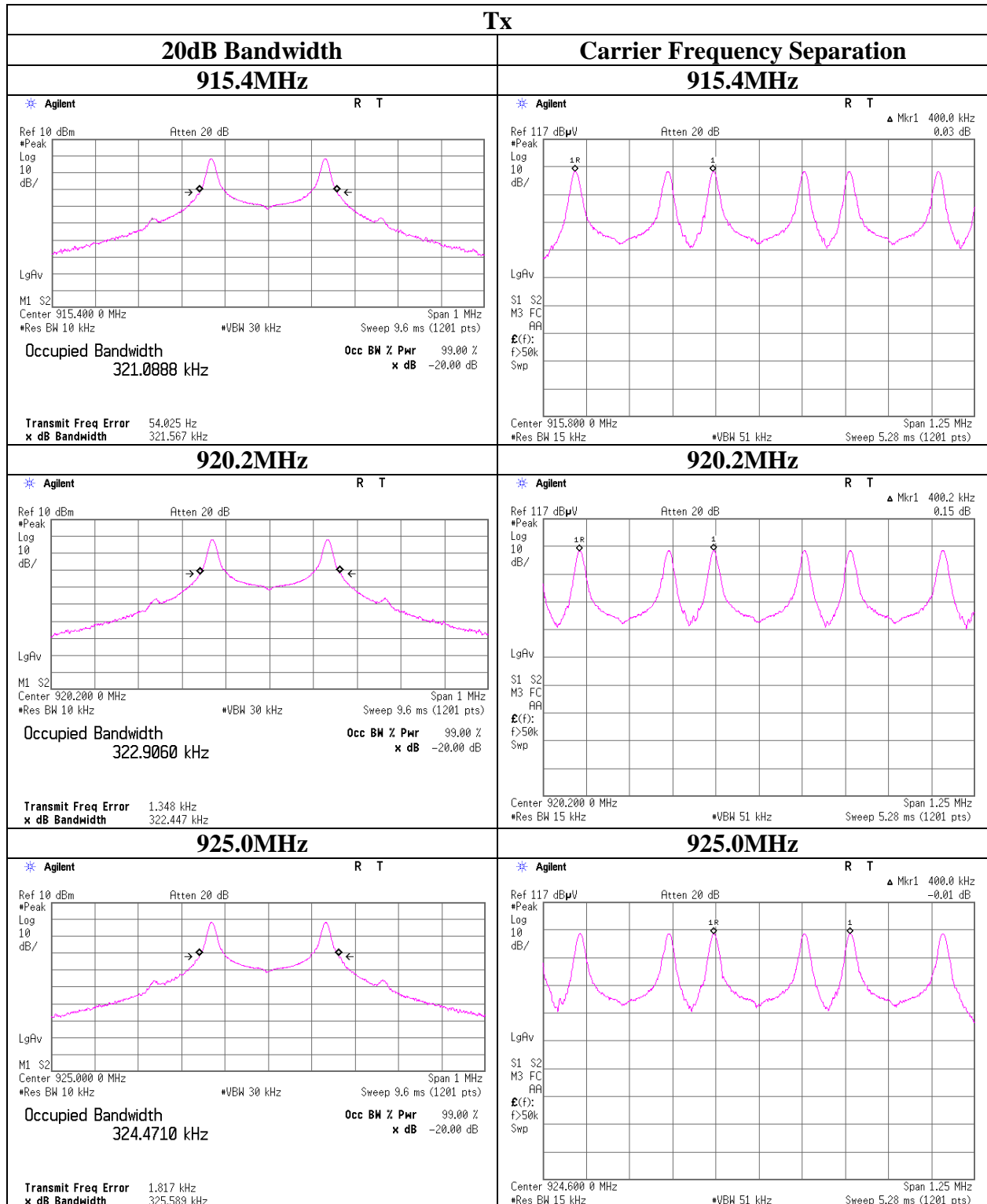
Test place Ise EMC Lab. No.2 Measurement Room
Report No. 10749723H
Date 04/16/2015
Temperature/ Humidity 23deg. C / 38% RH
Engineer Satofumi Matsuyama
Mode Tx (Hopping off/on)

Freq. [MHz]	20dB Bandwidth [MHz]	Limit for 20dB Bandwidth [MHz]
915.4	0.322	≤ 0.5
920.2	0.322	≤ 0.5
925.0	0.326	≤ 0.5

Freq. [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
915.4	0.400	≥ 0.322
920.2	0.400	≥ 0.322
925.0	0.400	≥ 0.326

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

20dB Bandwidth and Carrier Frequency Separation



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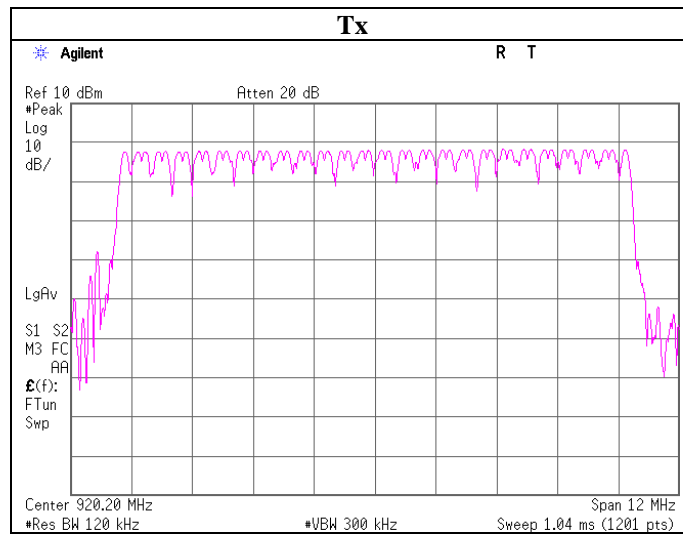
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Number of Hopping Frequency

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	10749723H
Date	04/16/2015
Temperature/ Humidity	23deg. C / 38% RH
Engineer	Satofumi Matsuyama
Mode	Tx (Hopping on)

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

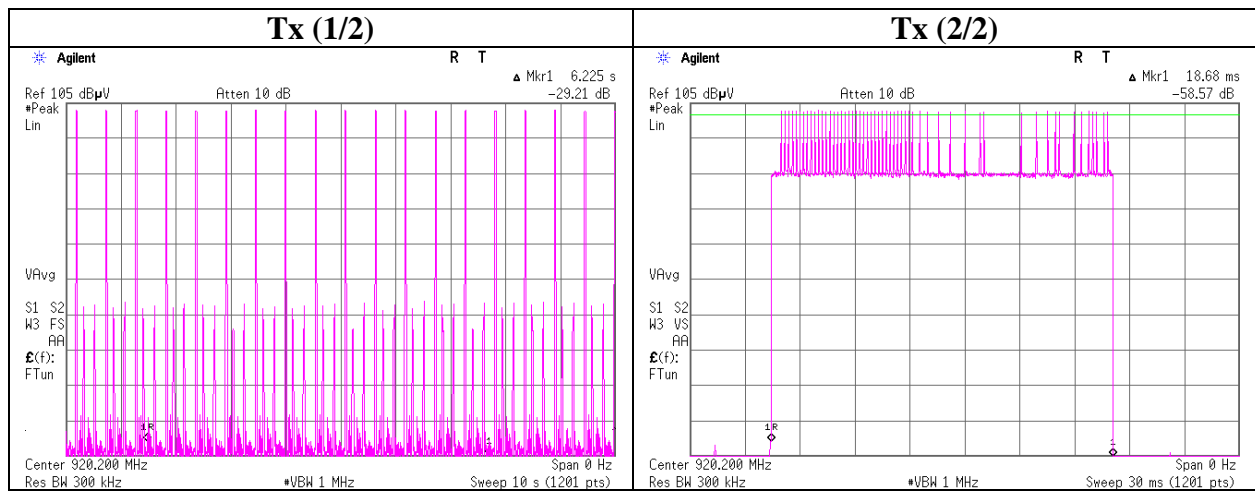


Dwell time

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	10749723H
Date	04/16/2015
Temperature/ Humidity	23deg. C / 38% RH
Engineer	Satofumi Matsuyama
Mode	Tx (Hopping on)

Mode	Number of transmission in 10sec [times]	Length of transmission time [msec]	Result [msec]	Limit [msec]
Tx	19	18.7	354.9	400

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



Maximum Peak Output Power

Test place : Ise EMC Lab. No.2 Measurement Room
Report No. : 10749723H
Date : 04/16/2015
Temperature/ Humidity : 23deg. C / 38% RH
Engineer : Satofumi Matsuyama
Mode : Tx (Hopping off)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
915.4	-1.50	0.42	9.90	8.82	7.62	23.97	250	15.15
920.2	-1.13	0.42	9.90	9.19	8.29	23.97	250	14.78
925.0	-1.22	0.42	9.90	9.10	8.12	23.97	250	14.87

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied)+ Attenuator

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Average Output Power
(Reference data for SAR testing)

Test place : Ise EMC Lab. No.2 Measurement Room
Report No. : 10749723H
Date : 04/16/2015
Temperature/ Humidity : 23deg. C / 38% RH
Engineer : Satofumi Matsuyama
Mode : Tx (Hopping off)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
915.4	-1.71	0.42	9.90	8.61	7.26
920.2	-1.33	0.42	9.90	8.99	7.92
925.0	-1.35	0.42	9.90	8.97	7.88

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied)+ Attenuator

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Report No.	10749723H	
Date	04/17/2015	04/18/2015
Temperature/ Humidity	26 deg. C / 32 % RH	21 deg. C / 40 % RH
Engineer	Yuta Moriya (Below 1GHz)	Koji Yamamoto (Above 1GHz)
Mode	Tx, 915.4MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	109.213	QP	22.2	11.4	8.2	32.2	9.6	43.5	33.9	
Hori	203.249	QP	21.8	16.5	9.1	32.1	15.3	43.5	28.2	
Hori	265.349	QP	21.8	18.0	9.6	32.0	17.4	46.0	28.6	
Hori	711.835	QP	27.0	20.7	12.3	32.1	27.9	46.0	18.1	
Hori	813.691	QP	30.7	22.3	12.8	31.5	34.3	46.0	11.7	
Hori	928.066	QP	33.6	22.8	13.4	30.9	38.9	46.0	7.1	
Hori	2746.200	PK	54.6	29.5	4.0	34.8	53.3	73.9	20.6	
Hori	3661.600	PK	52.6	30.3	4.6	34.2	53.3	73.9	20.6	
Hori	4577.000	PK	42.4	32.2	5.1	34.1	45.6	73.9	28.3	Floor Noise
Hori	5492.400	PK	43.7	32.8	5.6	33.9	48.2	73.9	25.7	
Hori	6407.800	PK	43.6	35.2	6.2	34.0	51.0	73.9	22.9	
Hori	7323.200	PK	43.1	36.8	6.5	34.1	52.3	73.9	21.6	Floor Noise
Hori	8238.600	PK	43.8	36.6	6.7	34.4	52.7	73.9	21.2	Floor Noise
Hori	9154.000	PK	43.5	38.0	7.4	34.6	54.3	73.9	19.6	Floor Noise
Hori	2746.200	AV	48.3	29.5	4.0	34.8	47.0	53.9	6.9	
Hori	3661.600	AV	43.6	30.3	4.6	34.2	44.3	53.9	9.6	
Hori	4577.000	AV	30.1	32.2	5.1	34.1	33.3	53.9	20.6	Floor Noise
Hori	5492.400	AV	31.9	32.8	5.6	33.9	36.4	53.9	17.5	
Hori	6407.800	AV	31.4	35.2	6.2	34.0	38.8	53.9	15.1	
Hori	7323.200	AV	30.3	36.8	6.5	34.1	39.5	53.9	14.4	Floor Noise
Hori	8238.600	AV	30.7	36.6	6.7	34.4	39.6	53.9	14.3	Floor Noise
Hori	9154.000	AV	30.7	38.0	7.4	34.6	41.5	53.9	12.4	Floor Noise
Vert	109.213	QP	22.0	11.4	8.2	32.2	9.4	43.5	34.1	
Vert	203.249	QP	26.6	16.5	9.1	32.1	20.1	43.5	23.4	
Vert	265.349	QP	21.9	18.0	9.6	32.0	17.5	46.0	28.5	
Vert	711.835	QP	28.8	20.7	12.3	32.1	29.7	46.0	16.3	
Vert	813.691	QP	30.4	22.3	12.8	31.5	34.0	46.0	12.0	
Vert	928.066	QP	31.8	22.8	13.4	30.9	37.1	46.0	8.9	
Vert	2746.200	PK	52.9	29.5	4.0	34.8	51.6	73.9	22.3	
Vert	3661.600	PK	50.3	30.3	4.6	34.2	51.0	73.9	22.9	
Vert	4577.000	PK	42.7	32.2	5.1	34.1	45.9	73.9	28.0	Floor Noise
Vert	5492.400	PK	43.8	32.8	5.6	33.9	48.3	73.9	25.6	
Vert	6407.800	PK	42.9	35.2	6.2	34.0	50.3	73.9	23.6	
Vert	7323.200	PK	43.4	36.8	6.5	34.1	52.6	73.9	21.3	Floor Noise
Vert	8238.600	PK	42.4	36.6	6.7	34.4	51.3	73.9	22.6	Floor Noise
Vert	9154.000	PK	43.0	38.0	7.4	34.6	53.8	73.9	20.1	Floor Noise
Vert	2746.200	AV	45.9	29.5	4.0	34.8	44.6	53.9	9.3	
Vert	3661.600	AV	39.9	30.3	4.6	34.2	40.6	53.9	13.3	
Vert	4577.000	AV	30.2	32.2	5.1	34.1	33.4	53.9	20.5	Floor Noise
Vert	5492.400	AV	31.4	32.8	5.6	33.9	35.9	53.9	18.0	
Vert	6407.800	AV	30.6	35.2	6.2	34.0	38.0	53.9	15.9	
Vert	7323.200	AV	30.4	36.8	6.5	34.1	39.6	53.9	14.3	Floor Noise
Vert	8238.600	AV	30.6	36.6	6.7	34.4	39.5	53.9	14.4	Floor Noise
Vert	9154.000	AV	30.7	38.0	7.4	34.6	41.5	53.9	12.4	Floor Noise

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

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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Report No.	10749723H	
Date	04/17/2015	04/18/2015
Temperature/ Humidity	26 deg. C / 32 % RH	21 deg. C / 40 % RH
Engineer	Yuta Moriya (Below 1GHz)	Koji Yamamoto (Above 1GHz)
Mode	Tx, 915.4MHz	

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]									
Hori	915.400	PK	104.0	22.6	13.3	30.9	109.0	-	-	Carrier
Hori	902.000	PK	31.1	22.5	13.2	31.0	35.8	89.0	53.2	
Hori	1830.800	PK	60.4	28.4	3.7	35.2	57.3	89.0	31.7	
Vert	915.400	PK	100.5	22.6	13.3	30.9	105.5	-	-	Carrier
Vert	902.000	PK	30.1	22.5	13.2	31.0	34.8	85.5	50.7	
Vert	1830.800	PK	63.2	28.4	3.7	35.2	60.1	85.5	25.4	

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Report No.	10749723H	
Date	04/17/2015	04/18/2015
Temperature/ Humidity	26 deg. C / 32 % RH	21 deg. C / 40 % RH
Engineer	Yuta Moriya (Below 1GHz)	Koji Yamamoto (Above 1GHz)
Mode	Tx, 920.2MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	109.222	QP	22.1	11.4	8.2	32.2	9.5	43.5	34.0	
Hori	203.254	QP	21.7	16.5	9.1	32.1	15.2	43.5	28.3	
Hori	265.344	QP	21.9	18.0	9.6	32.0	17.5	46.0	28.5	
Hori	715.578	QP	31.1	20.7	12.3	32.1	32.0	46.0	14.0	
Hori	817.956	QP	31.3	22.3	12.8	31.4	35.0	46.0	11.0	
Hori	932.867	QP	32.6	22.8	13.4	30.8	38.0	46.0	8.0	
Hori	2760.600	PK	52.4	29.5	4.0	34.8	51.1	73.9	22.8	
Hori	3680.800	PK	52.5	30.3	4.6	34.1	53.3	73.9	20.6	
Hori	4601.000	PK	42.2	32.2	5.1	34.1	45.4	73.9	28.5	Floor Noise
Hori	5521.200	PK	42.8	32.9	5.7	33.9	47.5	73.9	26.4	
Hori	6441.400	PK	43.6	35.3	6.2	34.0	51.1	73.9	22.8	
Hori	7361.600	PK	42.4	36.8	6.5	34.1	51.6	73.9	22.3	Floor Noise
Hori	8281.800	PK	43.5	36.6	6.7	34.4	52.4	73.9	21.5	Floor Noise
Hori	9202.000	PK	43.4	38.1	7.4	34.6	54.3	73.9	19.6	Floor Noise
Hori	2760.600	AV	45.9	29.5	4.0	34.8	44.6	53.9	9.3	
Hori	3680.800	AV	42.9	30.3	4.6	34.1	43.7	53.9	10.2	
Hori	4601.000	AV	30.0	32.2	5.1	34.1	33.2	53.9	20.7	Floor Noise
Hori	5521.200	AV	32.1	32.9	5.7	33.9	36.8	53.9	17.1	
Hori	6441.400	AV	31.6	35.3	6.2	34.0	39.1	53.9	14.8	
Hori	7361.600	AV	30.2	36.8	6.5	34.1	39.4	53.9	14.5	Floor Noise
Hori	8281.800	AV	30.7	36.6	6.7	34.4	39.6	53.9	14.3	Floor Noise
Hori	9202.000	AV	30.5	38.1	7.4	34.6	41.4	53.9	12.5	Floor Noise
Vert	109.222	QP	22.1	11.4	8.2	32.2	9.5	43.5	34.0	
Vert	203.254	QP	26.7	16.5	9.1	32.1	20.2	43.5	23.3	
Vert	265.344	QP	21.9	18.0	9.6	32.0	17.5	46.0	28.5	
Vert	715.578	QP	30.2	20.7	12.3	32.1	31.1	46.0	14.9	
Vert	817.956	QP	30.8	22.3	12.8	31.4	34.5	46.0	11.5	
Vert	932.867	QP	30.8	22.8	13.4	30.8	36.2	46.0	9.8	
Vert	2760.600	PK	50.8	29.5	4.0	34.8	49.5	73.9	24.4	
Vert	3680.800	PK	50.1	30.3	4.6	34.1	50.9	73.9	23.0	
Vert	4601.000	PK	42.6	32.2	5.1	34.1	45.8	73.9	28.1	Floor Noise
Vert	5521.200	PK	44.2	32.9	5.7	33.9	48.9	73.9	25.0	
Vert	6441.400	PK	43.8	35.3	6.2	34.0	51.3	73.9	22.6	
Vert	7361.600	PK	42.8	36.8	6.5	34.1	52.0	73.9	21.9	Floor Noise
Vert	8281.800	PK	43.8	36.6	6.7	34.4	52.7	73.9	21.2	Floor Noise
Vert	9202.000	PK	44.5	38.1	7.4	34.6	55.4	73.9	18.5	Floor Noise
Vert	2760.600	AV	42.9	29.5	4.0	34.8	41.6	53.9	12.3	
Vert	3680.800	AV	39.7	30.3	4.6	34.1	40.5	53.9	13.4	
Vert	4601.000	AV	30.1	32.2	5.1	34.1	33.3	53.9	20.6	Floor Noise
Vert	5521.200	AV	31.2	32.9	5.7	33.9	35.9	53.9	18.0	
Vert	6441.400	AV	31.1	35.3	6.2	34.0	38.6	53.9	15.3	
Vert	7361.600	AV	30.3	36.8	6.5	34.1	39.5	53.9	14.4	Floor Noise
Vert	8281.800	AV	30.9	36.6	6.7	34.4	39.8	53.9	14.1	Floor Noise
Vert	9202.000	AV	30.6	38.1	7.4	34.6	41.5	53.9	12.4	Floor Noise

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Report No.	10749723H	
Date	04/17/2015	04/18/2015
Temperature/ Humidity	26 deg. C / 32 % RH	21 deg. C / 40 % RH
Engineer	Yuta Moriya	Koji Yamamoto
	(Below 1GHz)	(Above 1GHz)
Mode	Tx, 920.2MHz	

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	920.200	PK	103.9	22.7	13.3	30.9	109.0	-	-	Carrier
Hori	1840.400	PK	59.6	28.5	3.7	35.2	56.6	89.0	32.4	
Vert	920.200	PK	101.0	22.7	13.3	30.9	106.1	-	-	Carrier
Vert	1840.400	PK	64.0	28.5	3.7	35.2	61.0	86.1	25.1	

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

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Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Report No.	10749723H	
Date	04/17/2015	04/18/2015
Temperature/ Humidity	26 deg. C / 32 % RH	21 deg. C / 40 % RH
Engineer	Yuta Moriya (Below 1GHz)	Koji Yamamoto (Above 1GHz)
Mode	Tx, 925.0 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	109.232	QP	22.2	11.4	8.2	32.2	9.6	43.5	33.9	
Hori	203.222	QP	21.5	16.5	9.1	32.1	15.0	43.5	28.5	
Hori	265.414	QP	21.8	18.0	9.6	32.0	17.4	46.0	28.6	
Hori	719.316	QP	28.8	20.8	12.3	32.0	29.9	46.0	16.1	
Hori	822.222	QP	31.1	22.3	12.8	31.4	34.8	46.0	11.2	
Hori	937.667	QP	28.3	22.9	13.4	30.8	33.8	46.0	12.2	
Hori	2775.000	PK	54.6	29.5	4.0	34.8	53.3	73.9	20.6	
Hori	3700.000	PK	53.7	30.4	4.6	34.1	54.6	73.9	19.3	
Hori	4625.000	PK	42.3	32.3	5.2	34.1	45.7	73.9	28.2	Floor Noise
Hori	5550.000	PK	43.3	32.9	5.7	33.9	48.0	73.9	25.9	
Hori	6475.000	PK	42.9	35.4	6.2	34.0	50.5	73.9	23.4	
Hori	7400.000	PK	42.6	36.8	6.5	34.2	51.7	73.9	22.2	Floor Noise
Hori	8325.000	PK	42.5	36.5	6.8	34.5	51.3	73.9	22.6	Floor Noise
Hori	9250.000	PK	43.6	38.3	7.4	34.6	54.7	73.9	19.2	Floor Noise
Hori	2775.000	AV	48.8	29.5	4.0	34.8	47.5	53.9	6.4	
Hori	3700.000	AV	44.7	30.4	4.6	34.1	45.6	53.9	8.3	
Hori	4625.000	AV	29.9	32.3	5.2	34.1	33.3	53.9	20.6	Floor Noise
Hori	5550.000	AV	32.4	32.9	5.7	33.9	37.1	53.9	16.8	
Hori	6475.000	AV	29.9	35.4	6.2	34.0	37.5	53.9	16.4	
Hori	7400.000	AV	30.4	36.8	6.5	34.2	39.5	53.9	14.4	Floor Noise
Hori	8325.000	AV	30.4	36.5	6.8	34.5	39.2	53.9	14.7	Floor Noise
Hori	9250.000	AV	30.8	38.3	7.4	34.6	41.9	53.9	12.0	Floor Noise
Vert	109.232	QP	22.1	11.4	8.2	32.2	9.5	43.5	34.0	
Vert	203.222	QP	26.8	16.5	9.1	32.1	20.3	43.5	23.2	
Vert	265.414	QP	21.9	18.0	9.6	32.0	17.5	46.0	28.5	
Vert	719.316	QP	28.1	20.8	12.3	32.0	29.2	46.0	16.8	
Vert	822.222	QP	31.1	22.3	12.8	31.4	34.8	46.0	11.2	
Vert	937.667	QP	27.9	22.9	13.4	30.8	33.4	46.0	12.6	
Vert	2775.000	PK	52.9	29.5	4.0	34.8	51.6	73.9	22.3	
Vert	3700.000	PK	50.6	30.4	4.6	34.1	51.5	73.9	22.4	
Vert	4625.000	PK	42.7	32.3	5.2	34.1	46.1	73.9	27.8	Floor Noise
Vert	5550.000	PK	43.2	32.9	5.7	33.9	47.9	73.9	26.0	
Vert	6475.000	PK	43.1	35.4	6.2	34.0	50.7	73.9	23.2	
Vert	7400.000	PK	42.2	36.8	6.5	34.2	51.3	73.9	22.6	Floor Noise
Vert	8325.000	PK	42.9	36.5	6.8	34.5	51.7	73.9	22.2	Floor Noise
Vert	9250.000	PK	43.3	38.3	7.4	34.6	54.4	73.9	19.5	Floor Noise
Vert	2775.000	AV	46.6	29.5	4.0	34.8	45.3	53.9	8.6	
Vert	3700.000	AV	40.7	30.4	4.6	34.1	41.6	53.9	12.3	
Vert	4625.000	AV	29.8	32.3	5.2	34.1	33.2	53.9	20.7	Floor Noise
Vert	5550.000	AV	30.5	32.9	5.7	33.9	35.2	53.9	18.7	
Vert	6475.000	AV	29.9	35.4	6.2	34.0	37.5	53.9	16.4	
Vert	7400.000	AV	30.5	36.8	6.5	34.2	39.6	53.9	14.3	Floor Noise
Vert	8325.000	AV	30.4	36.5	6.8	34.5	39.2	53.9	14.7	Floor Noise
Vert	9250.000	AV	30.7	38.3	7.4	34.6	41.8	53.9	12.1	Floor Noise

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

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

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Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Report No.	10749723H	
Date	04/17/2015	04/18/2015
Temperature/ Humidity	26 deg. C / 32 % RH	21 deg. C / 40 % RH
Engineer	Yuta Moriya (Below 1GHz)	Koji Yamamoto (Above 1GHz)
Mode	Tx, 925.0 MHz	

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	925.000	PK	103.9	22.7	13.3	30.9	109.0	-	-	Carrier
Hori	928.000	PK	35.3	22.8	13.4	30.9	40.6	89.0	48.4	
Hori	1850.000	PK	55.2	28.5	3.7	35.2	52.2	89.0	36.8	
Vert	925.000	PK	100.6	22.7	13.3	30.9	105.7	-	-	Carrier
Vert	928.000	PK	35.5	22.8	13.4	30.9	40.8	85.7	44.9	
Vert	1850.000	PK	58.1	28.5	3.7	35.2	55.1	85.7	30.6	

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

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Ise EMC Lab.

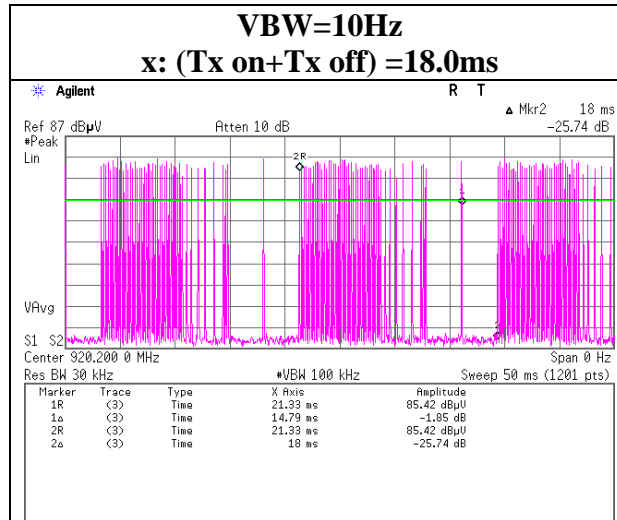
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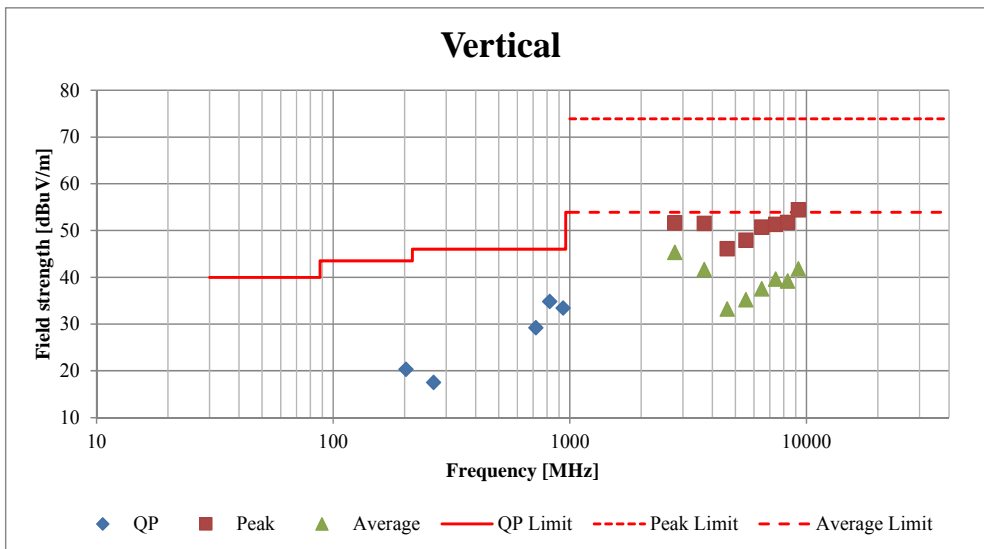
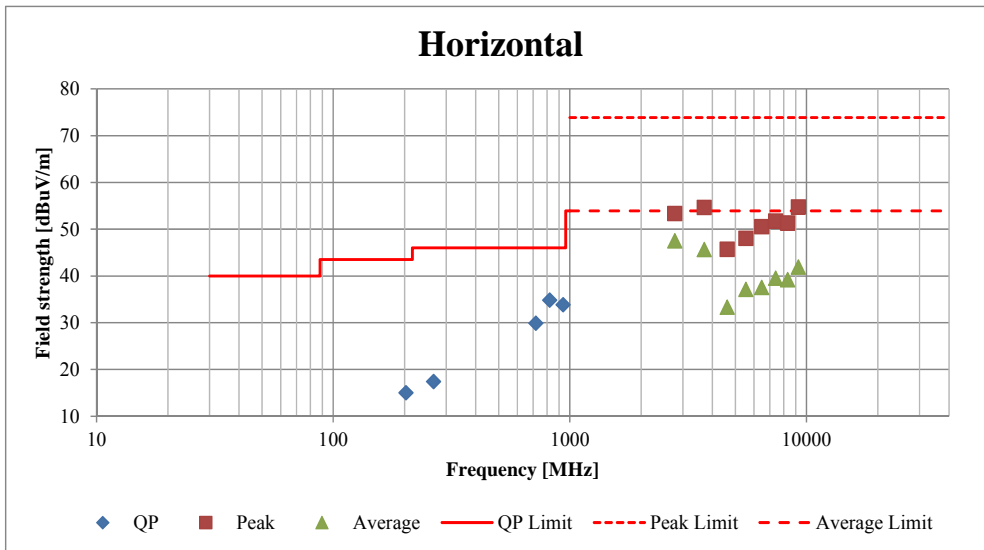
VBW (AV) Calculation

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10749723H
Date	04/17/2015
Temperature/ Humidity	26deg. C / 32% RH
Engineer	Yuta Moriya
Mode	Tx, 920.2MHz



Radiated Spurious Emission
(Plot data, Worst case)

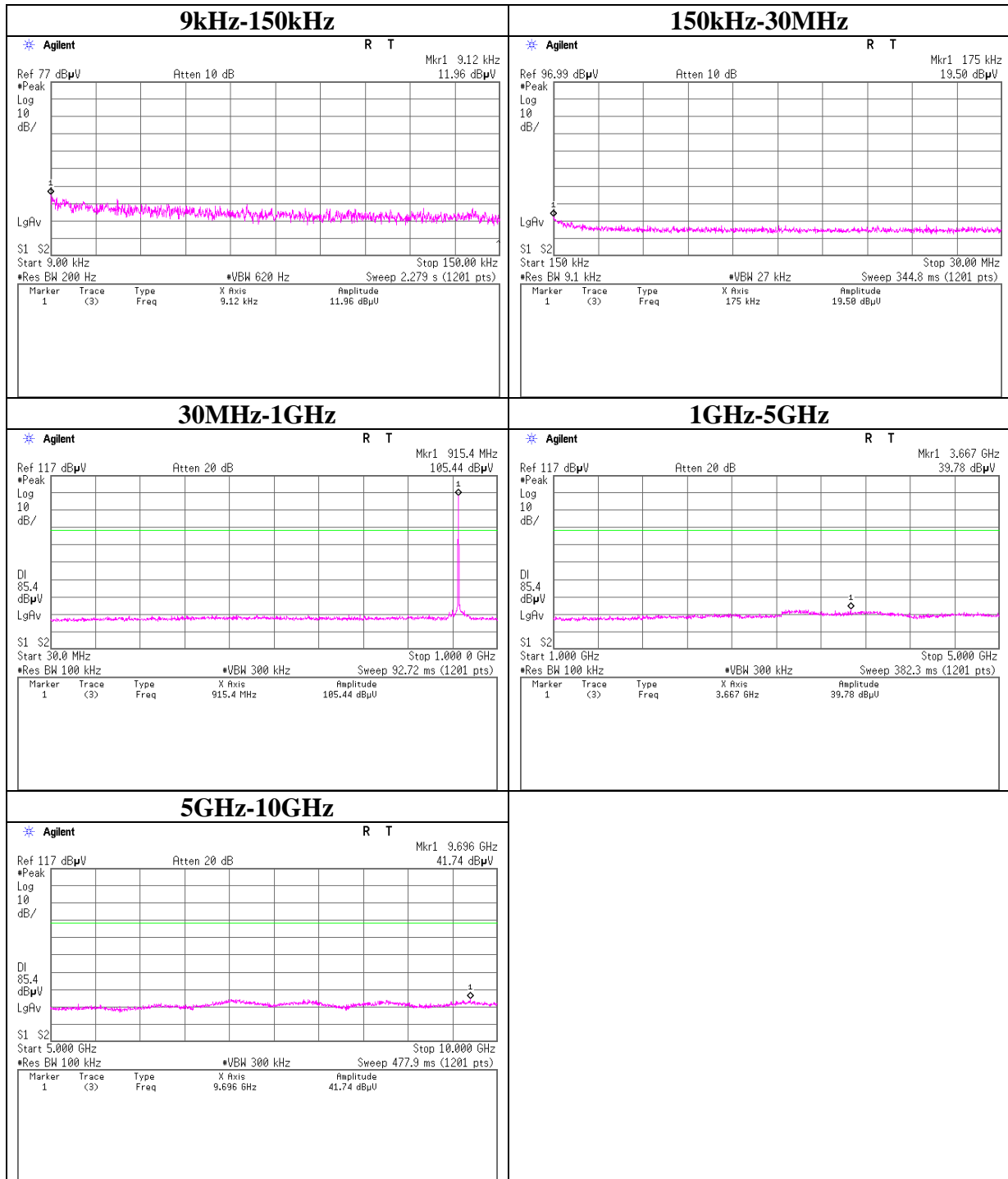
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Report No.	10749723H	
Date	04/17/2015	04/18/2015
Temperature/ Humidity	26 deg. C / 32 % RH	21 deg. C / 40 % RH
Engineer	Yuta Moriya (Below 1GHz)	Koji Yamamoto (Above 1GHz)
Mode	Tx, 925.0 MHz	



Conducted Spurious Emission

Test place	Ise EMC Lab. No.2 Measurement Room	
Report No.	10749723H	
Date	04/16/2015	04/17/2015
Temperature/ Humidity	23deg. C / 38% RH	23deg. C / 42% RH
Engineer	Satofumi Matsuyama	Takafumi Noguchi
Mode	Tx (Hopping off)	

Tx 915.4MHz



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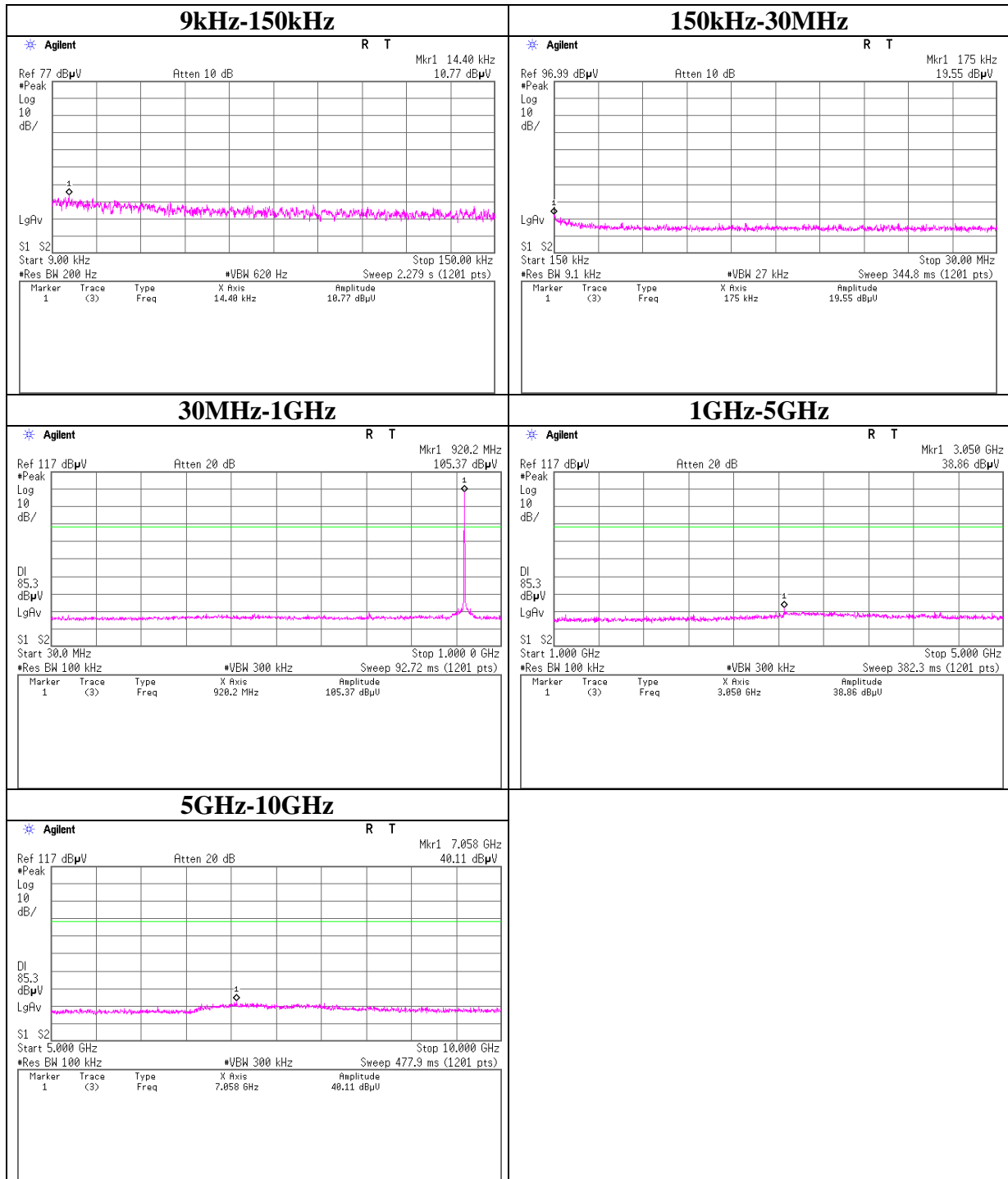
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.2 Measurement Room	
Report No.	10749723H	
Date	04/16/2015	04/17/2015
Temperature/ Humidity	23deg. C / 38% RH	23deg. C / 42% RH
Engineer	Satofumi Matsuyama	Takafumi Noguchi
Mode	Tx (Hopping off)	

Tx 920.2MHz



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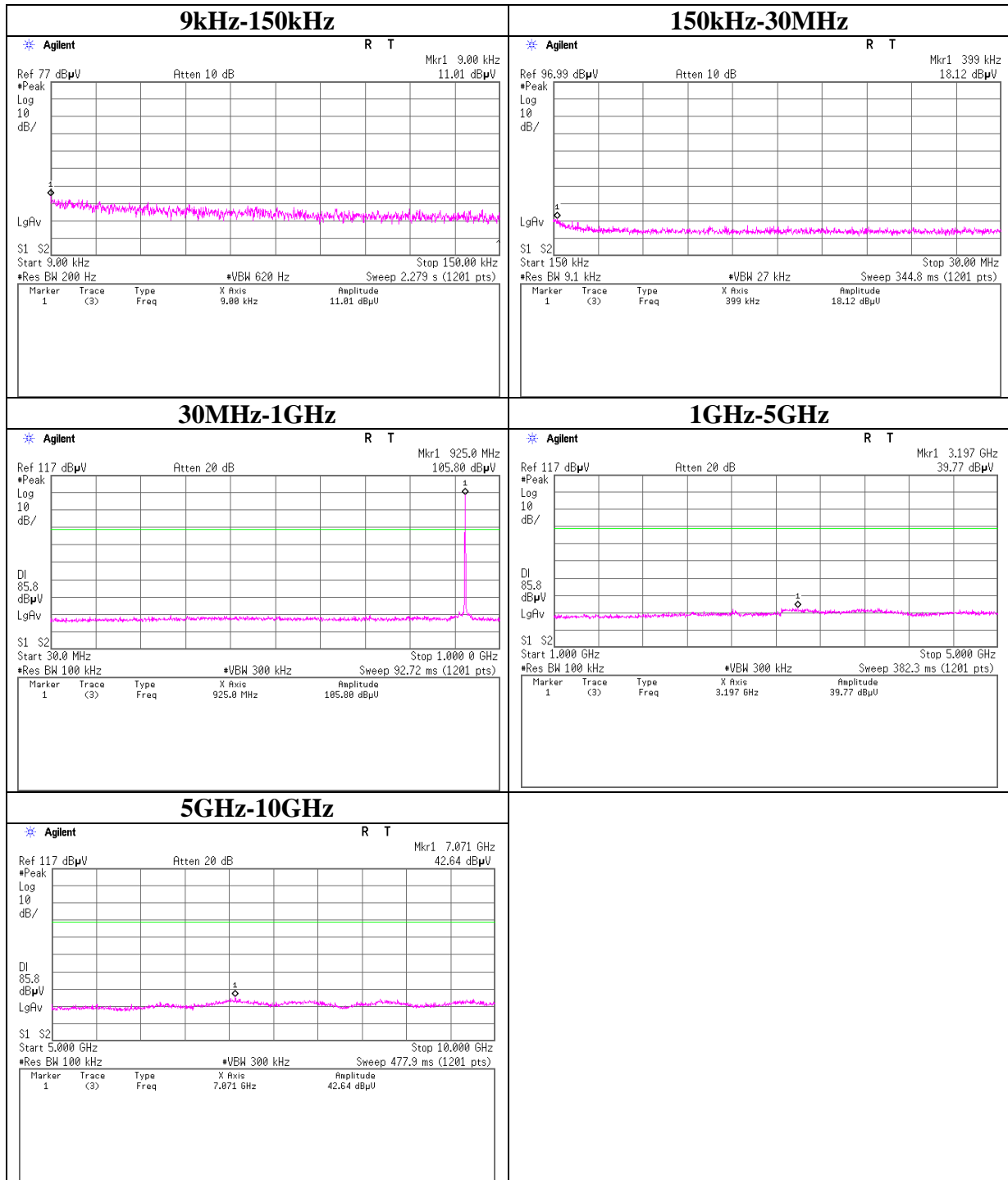
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.2 Measurement Room	
Report No.	10749723H	
Date	04/16/2015	04/17/2015
Temperature/ Humidity	23deg. C / 38% RH	23deg. C / 42% RH
Engineer	Satofumi Matsuyama	Takafumi Noguchi
Mode	Tx (Hopping off)	

Tx 925.0MHz



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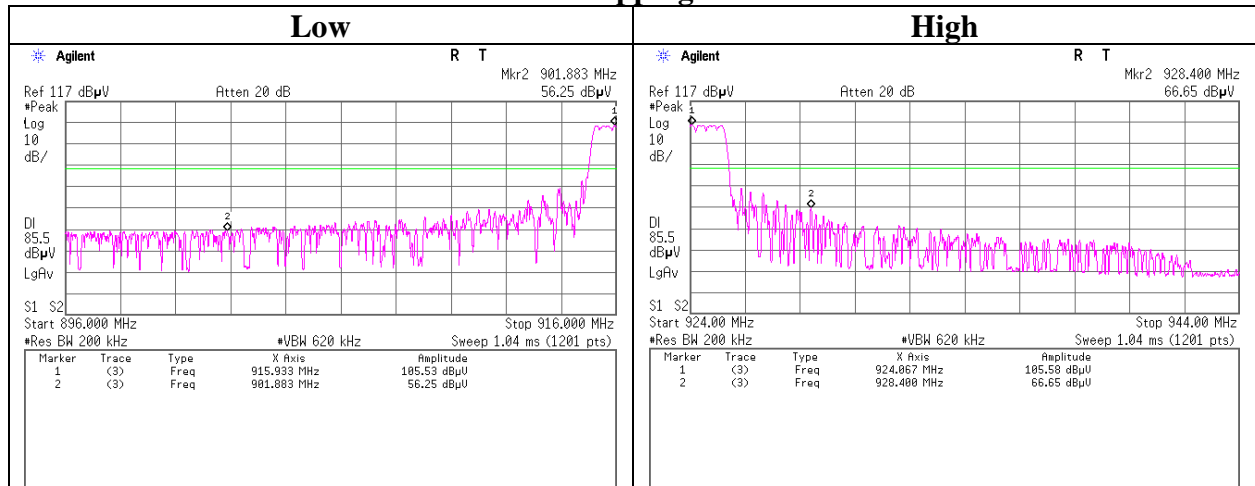
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

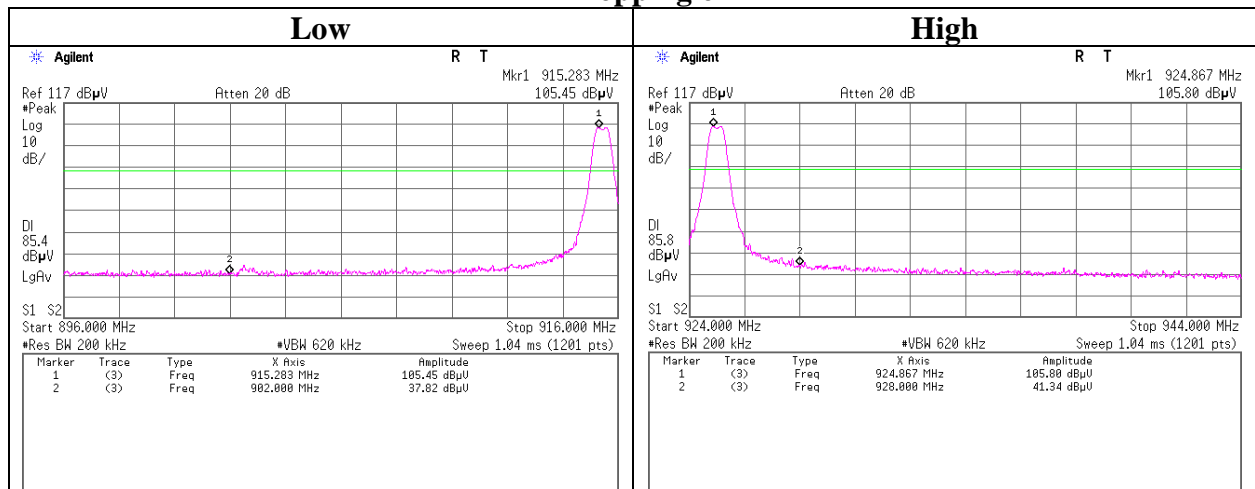
Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	10749723H
Date	04/16/2015
Temperature/ Humidity	23deg. C / 38% RH
Engineer	Satofumi Matsuyama
Mode	Tx (Hopping on/off)

Tx Hopping on



Tx Hopping off



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Ise EMC Lab.

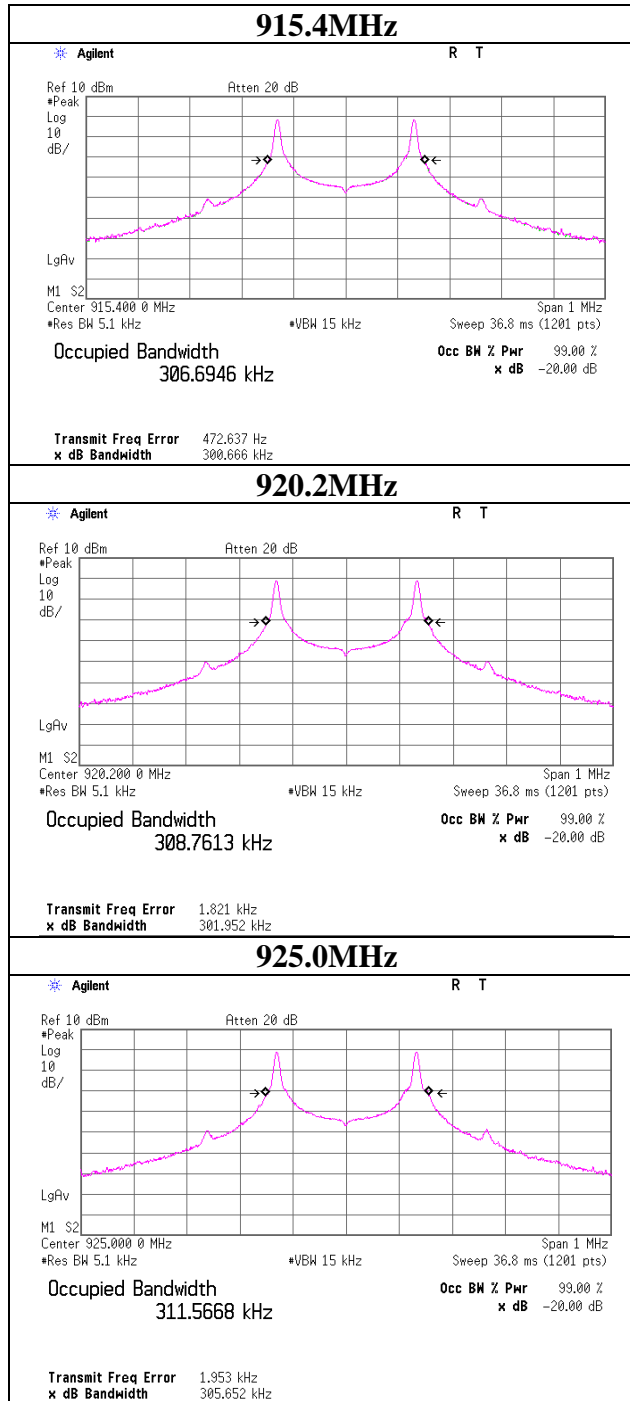
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99% Occupied Bandwidth

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	10749723H
Date	04/16/2015
Temperature/ Humidity	23deg. C / 38% RH
Engineer	Satofumi Matsuyama
Mode	Tx (Hopping off)



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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2014/06/16 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2014/06/16 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2014/11/12 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2014/11/19 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	AT	2015/01/13 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/02/19 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2015/01/13 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	RE	2015/03/09 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2014/08/19 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2014/10/18 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2014/10/18 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2014/07/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2015/04/08 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2015/01/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2014/10/17 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2015/02/05 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2014/09/24 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2015/01/28 * 12
MHF-27	High Pass Filter(1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	RE	2015/01/23 * 12
MCC-176	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S303	RE	2015/03/27 * 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:

RE: Radiated Emission

AT Antenna Terminal Conducted test

UL Japan, Inc.

Ise EMC Lab.

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