



RADIO TEST REPORT

Test Report No. : 11154454H-A

Applicant : Panasonic Corporation
Type of Equipment : Digital Wireless Stereo Earphones
Model No. : RP-BTS50
FCC ID : ACJ-RP-BTS50
Test regulation : FCC Part 15 Subpart C: 2015
(Permissive Change Class II Application)
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.
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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)

Date of test: February 9 and 11, 2016

Representative test engineer:



Hiroyuki Furutaka
Engineer
Consumer Technology Division

Approved by:



Takayuki Shimada
Engineer
Consumer Technology Division



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://japan.ul.com/resources/emc_accredited/

UL Japan, Inc.

Ise EMC Lab.

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Panasonic Corporation
Address : 1-15 Matsuo-cho, Kadoma-shi, Osaka, 571-8504 Japan
Telephone Number : +81-6-6905-4787
Contact Person : Tsuyoshi Maruoka

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

2.1 Identification of E.U.T.

Type of Equipment : Digital Wireless Stereo Earphones
Model No. : RP-BTS50
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.7 V
Receipt Date of Sample : February 8, 2016
Country of Mass-production : China
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: RP-BTS50 (referred to as the EUT in this report) is the Digital Wireless Stereo Earphones.

General Specification

Clock frequency(ies) in the system : 26 MHz

Radio Specification

Bluetooth (Ver.4.1)

Equipment Type	Transceiver
Frequency of Operation	2402 - 2480 MHz
Bandwidth & Channel spacing	Bandwidth : 1 MHz Ch spacing : 1 MHz
Type of Modulation	FHSS
Antenna Type / Antenna Gain	Chip antenna / 3.1dBi
Power Supply (inner)	DC 1.35 V / 1.8 V
Operating temperature range	0 to +40 deg. C

<Contents of the change from original model>

Original test report number of this report is 11025351H-A-R1.

The EUT is changed the specification from original model as below.

* The form change of the antenna design.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015
*Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

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
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.3 dB 4882.000 MHz, AV, Horizontal	Complied	Radiated (above 30 MHz) *1)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) Radiated test was selected over 30 MHz based on section 15.247(d)

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)

The EUT is a battery-operated device and test was performed with the full-charged battery.
This EUT provides stable voltage (DC 1.35 V / 1.8 V) constantly to RF Module regardless of input voltage. Therefore, this 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 EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 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 $k = 2$.
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Antenna terminal test Uncertainty (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz - 3 GHz	3 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	

Test distance	Radiated emission (+dB) 9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 dB

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+dB)		(10 m*)(+dB)	
	30 - 300 MHz	300 - 1000MHz	30 - 300 MHz	300 - 1000MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	4.5 dB	5.9 dB	4.8 dB	5.1 dB

Radiated emission				
(3 m*)(+dB)		(1 m*)(+dB)	(0.5 m*)(+dB)	(10 m*)(+dB)
1 - 6GHz	6 - 18GHz	10 - 26.5 GHz	26.5 - 40GHz	1 - 18 GHz
5.1 dB	5.3 dB	5.1 dB	5.1 dB	5.3 dB

*Measurement distance

Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
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Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m 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

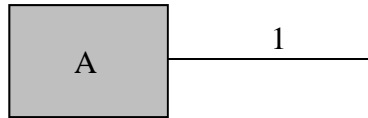
4.1 Operating Mode(s)

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Radiated Spurious Emission	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Radiated)	Tx DH5, 3DH5 -Hopping Off	2402 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows; Power settings: BDR: Ext.=31, Int.=31 EDR: Ext.=31, Int.=31 Software: RP-BTS50_PSR, Ver2.1 *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.</p>		

4.2 Configuration and peripherals



*Setup was taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Digital Wireless Stereo Earphones	RP-BTS50	03	Panasonic Corporation	EUT

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Jig Cable	0.15	Unshielded	Unshielded	*1)

*1) The use of a jig does not influence on the test result.

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m 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	30 MHz to 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20 dBc 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 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	4.4 m*2) (below 10 GHz), 1 m*3) (above 10 GHz)		4.4 m *2) (below 10 GHz), 1 m*3) (above 10 GHz)

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

*2) Distance Factor: $20 \times \log(4.4 \text{ m} / 3.0 \text{ m}) = 3.3 \text{ dB}$

*3) Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

- 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 : 30 M - 26.5 GHz

Test data : APPENDIX

Test result : Pass

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APPENDIX 1: Test data

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 and No.1 Semi Anechoic Chamber
Report No. 11154454H
Date February 9, 2016 February 9, 2016 February 11, 2016
Temperature / Humidity 20 deg. C / 30 % RH 20 deg. C / 30 % RH 20 deg. C / 33 % RH
Engineer Hiroyuki Furutaka Shinichi Miyazono Hiroyuki Furutaka
(1 GHz – 10 GHz) (10 GHz – 26.5GHz) (30 MHz – 1000 MHz)
Mode Tx, Hopping Off, DH5 2402 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	204.001	QP	40.8	16.5	9.7	38.9	28.1	43.5	15.4	
Hori	208.004	QP	44.0	16.6	9.7	38.9	31.4	43.5	12.1	
Hori	212.000	QP	37.1	16.7	9.8	38.9	24.7	43.5	18.8	
Hori	391.999	QP	43.6	17.4	11.2	38.6	33.6	46.0	12.4	
Hori	395.997	QP	43.1	17.5	11.3	38.6	33.3	46.0	12.7	
Hori	399.999	QP	43.7	17.6	11.3	38.6	34.0	46.0	12.0	
Hori	2390.000	PK	41.4	27.9	6.6	32.1	43.8	73.9	30.1	
Hori	2506.045	PK	49.4	28.1	6.7	32.1	52.1	73.9	21.8	
Hori	4804.000	PK	43.7	32.8	9.0	31.3	54.2	73.9	19.7	
Hori	7206.000	PK	41.3	36.8	10.2	32.6	55.7	73.9	18.2	Floor Noise
Hori	9608.000	PK	41.0	38.1	10.9	32.6	57.4	73.9	16.5	Floor Noise
Hori	2390.000	AV	29.4	27.9	6.6	32.1	31.8	53.9	22.1	
Hori	2506.045	AV	44.1	28.1	6.7	32.1	46.8	53.9	7.1	
Hori	4804.000	AV	35.4	32.8	9.0	31.3	45.9	53.9	8.0	
Hori	7206.000	AV	29.8	36.8	10.2	32.6	44.2	53.9	9.7	Floor Noise
Hori	9608.000	AV	29.0	38.1	10.9	32.6	45.4	53.9	8.5	Floor Noise
Vert	204.000	QP	29.8	16.5	9.7	38.9	17.1	43.5	26.4	
Vert	208.000	QP	32.4	16.6	9.7	38.9	19.8	43.5	23.7	
Vert	212.000	QP	29.8	16.7	9.8	38.9	17.4	43.5	26.1	
Vert	392.000	QP	40.5	17.4	11.2	38.6	30.5	46.0	15.5	
Vert	395.999	QP	39.2	17.5	11.3	38.6	29.4	46.0	16.6	
Vert	399.999	QP	39.7	17.6	11.3	38.6	30.0	46.0	16.0	
Vert	2390.000	PK	41.7	27.9	6.6	32.1	44.1	73.9	29.8	
Vert	2505.835	PK	49.2	28.1	6.7	32.1	51.9	73.9	22.0	
Vert	4804.000	PK	45.5	32.8	9.0	31.3	56.0	73.9	17.9	
Vert	7206.000	PK	43.0	36.8	10.2	32.6	57.4	73.9	16.5	Floor Noise
Vert	9608.000	PK	40.9	38.1	10.9	32.6	57.3	73.9	16.6	Floor Noise
Vert	2390.000	AV	29.3	27.9	6.6	32.1	31.7	53.9	22.2	
Vert	2505.835	AV	44.1	28.1	6.7	32.1	46.8	53.9	7.1	
Vert	4804.000	AV	36.8	32.8	9.0	31.3	47.3	53.9	6.6	
Vert	7206.000	AV	29.9	36.8	10.2	32.6	44.3	53.9	9.6	Floor Noise
Vert	9608.000	AV	29.0	38.1	10.9	32.6	45.4	53.9	8.5	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz 20log(4.4 m / 3.0 m) = 3.3 dB
10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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	2402.000	PK	90.8	28.0	6.6	32.1	93.3	-	-	Carrier
Hori	2400.000	PK	37.9	28.0	6.6	32.1	40.4	73.3	32.9	
Vert	2402.000	PK	88.7	28.0	6.6	32.1	91.2	-	-	Carrier
Vert	2400.000	PK	37.2	28.0	6.6	32.1	39.7	71.2	31.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1GHz)) - Gain(Amplifier)

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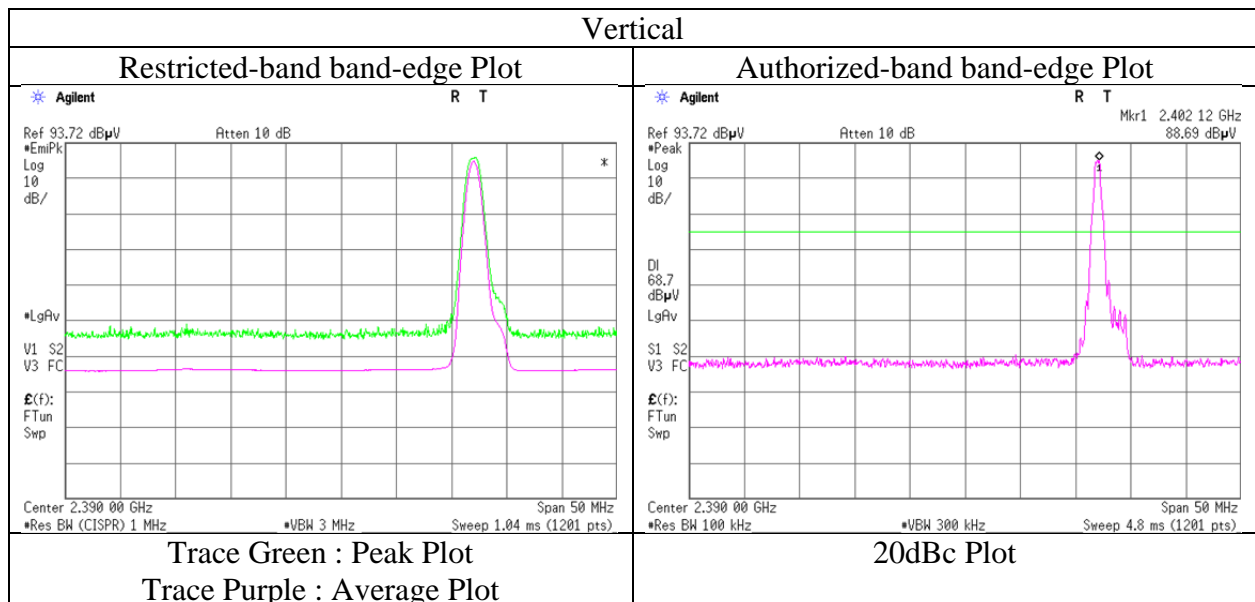
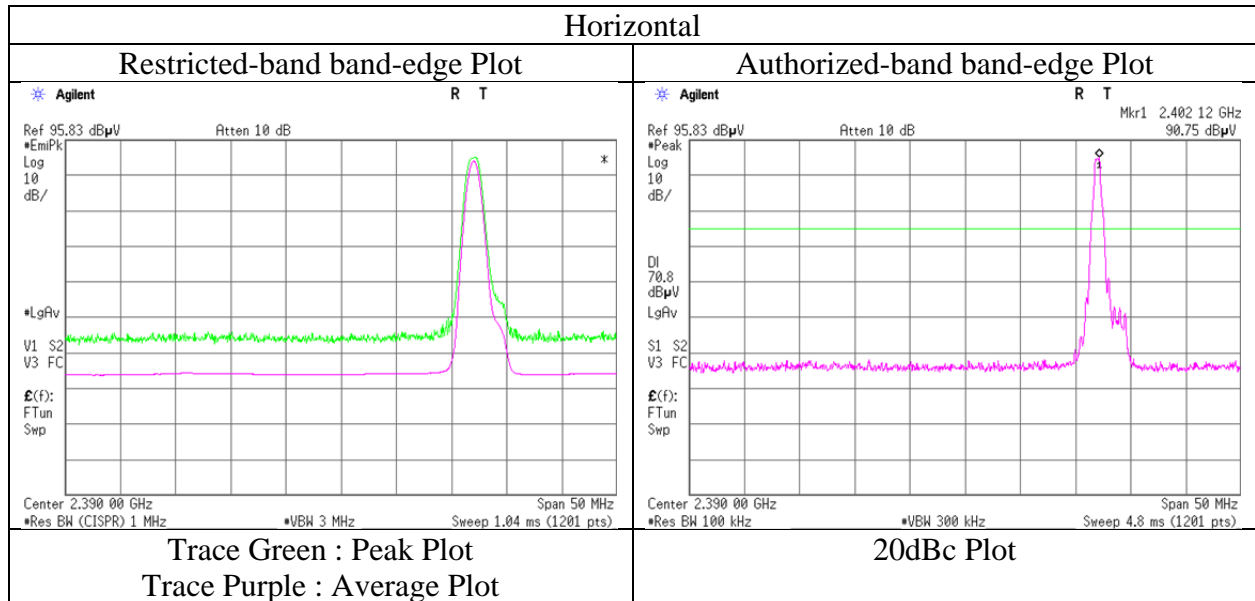
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Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11154454H
Date	February 9, 2016
Temperature / Humidity	20 deg. C / 30 % RH
Engineer	Hiroyuki Furutaka (1 GHz – 10 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 and No.1 Semi Anechoic Chamber
Report No. 11154454H
Date February 9, 2016 February 9, 2016 February 11, 2016
Temperature / Humidity 20 deg. C / 30 % RH 20 deg. C / 30 % RH 20 deg. C / 33 % RH
Engineer Hiroyuki Furutaka Shinichi Miyazono Hiroyuki Furutaka
(1 GHz – 10 GHz) (10 GHz – 26.5GHz) (30 MHz – 1000 MHz)
Mode Tx, Hopping Off, DH5 2441 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	195.998	QP	44.3	16.3	9.6	38.9	31.3	43.5	12.2	
Hori	204.000	QP	38.2	16.5	9.7	38.9	25.5	43.5	18.0	
Hori	384.000	QP	41.9	17.1	11.2	38.7	31.5	46.0	14.5	
Hori	388.000	QP	41.5	17.3	11.2	38.6	31.4	46.0	14.6	
Hori	392.000	QP	45.1	17.4	11.2	38.6	35.1	46.0	10.9	
Hori	399.999	QP	44.5	17.6	11.3	38.6	34.8	46.0	11.2	
Hori	2544.980	PK	51.2	28.1	6.7	32.1	53.9	73.9	20.0	
Hori	4882.000	PK	47.2	33.1	9.1	31.3	58.1	73.9	15.8	
Hori	7323.000	PK	41.5	36.8	10.2	32.6	55.9	73.9	18.0	Floor Noise
Hori	9764.000	PK	41.0	38.2	11.0	32.7	57.5	73.9	16.4	Floor Noise
Hori	2544.980	AV	47.4	28.1	6.7	32.1	50.1	53.9	3.8	
Hori	4882.000	AV	39.7	33.1	9.1	31.3	50.6	53.9	3.3	
Hori	7323.000	AV	30.4	36.8	10.2	32.6	44.8	53.9	9.1	Floor Noise
Hori	9764.000	AV	29.0	38.2	11.0	32.7	45.5	53.9	8.4	Floor Noise
Vert	195.999	QP	37.0	16.3	9.6	38.9	24.0	43.5	19.5	
Vert	204.000	QP	32.4	16.5	9.7	38.9	19.7	43.5	23.8	
Vert	392.000	QP	44.0	17.4	11.2	38.6	34.0	46.0	12.0	
Vert	395.999	QP	42.5	17.5	11.3	38.6	32.7	46.0	13.3	
Vert	399.999	QP	44.2	17.6	11.3	38.6	34.5	46.0	11.5	
Vert	412.000	QP	44.0	17.7	11.4	38.6	34.5	46.0	11.5	
Vert	2544.832	PK	50.2	28.1	6.7	32.1	52.9	73.9	21.0	
Vert	4882.000	PK	46.9	33.1	9.1	31.3	57.8	73.9	16.1	
Vert	7323.000	PK	41.6	36.8	10.2	32.6	56.0	73.9	17.9	Floor Noise
Vert	9764.000	PK	41.1	38.2	11.0	32.7	57.6	73.9	16.3	Floor Noise
Vert	2544.832	AV	45.8	28.1	6.7	32.1	48.5	53.9	5.4	
Vert	4882.000	AV	38.4	33.1	9.1	31.3	49.3	53.9	4.6	
Vert	7323.000	AV	30.2	36.8	10.2	32.6	44.6	53.9	9.3	Floor Noise
Vert	9764.000	AV	28.8	38.2	11.0	32.7	45.3	53.9	8.6	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz $20\log(4.4\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 and No.1 Semi Anechoic Chamber
Report No. 11154454H
Date February 9, 2016 February 9, 2016 February 11, 2016
Temperature / Humidity 20 deg. C / 30 % RH 20 deg. C / 30 % RH 20 deg. C / 33 % RH
Engineer Hiroyuki Furutaka Shinichi Miyazono Hiroyuki Furutaka
(1 GHz – 10 GHz) (10 GHz – 26.5GHz) (30 MHz – 1000 MHz)
Mode Tx, Hopping Off, DH5 2480 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	195.998	QP	44.0	16.3	9.6	38.9	31.0	43.5	12.5	
Hori	204.000	QP	38.2	16.5	9.7	38.9	25.5	43.5	18.0	
Hori	384.000	QP	41.9	17.1	11.2	38.7	31.5	46.0	14.5	
Hori	388.000	QP	41.5	17.3	11.2	38.6	31.4	46.0	14.6	
Hori	392.000	QP	45.1	17.4	11.2	38.6	35.1	46.0	10.9	
Hori	399.999	QP	44.5	17.6	11.3	38.6	34.8	46.0	11.2	
Hori	2483.500	PK	45.8	28.1	6.7	32.1	48.5	73.9	25.4	
Hori	2584.033	PK	49.2	28.1	6.7	32.1	51.9	73.9	22.0	
Hori	4960.000	PK	45.1	33.4	9.1	31.2	56.4	73.9	17.5	
Hori	7440.000	PK	41.8	36.8	10.2	32.7	56.1	73.9	17.8	Floor Noise
Hori	9920.000	PK	42.1	38.3	11.0	32.8	58.6	73.9	15.3	Floor Noise
Hori	2483.500	AV	30.2	28.1	6.7	32.1	32.9	53.9	21.0	
Hori	2584.033	AV	44.7	28.1	6.7	32.1	47.4	53.9	6.5	
Hori	4960.000	AV	38.2	33.4	9.1	31.2	49.5	53.9	4.4	
Hori	7440.000	AV	29.8	36.8	10.2	32.7	44.1	53.9	9.8	Floor Noise
Hori	9920.000	AV	29.4	38.3	11.0	32.8	45.9	53.9	8.0	Floor Noise
Vert	195.999	QP	37.0	16.3	9.6	38.9	24.0	43.5	19.5	
Vert	204.000	QP	32.4	16.5	9.7	38.9	19.7	43.5	23.8	
Vert	392.000	QP	44.0	17.4	11.2	38.6	34.0	46.0	12.0	
Vert	395.999	QP	42.5	17.5	11.3	38.6	32.7	46.0	13.3	
Vert	399.999	QP	44.2	17.6	11.3	38.6	34.5	46.0	11.5	
Vert	412.000	QP	44.0	17.7	11.4	38.6	34.5	46.0	11.5	
Vert	2483.500	PK	42.7	28.1	6.7	32.1	45.4	73.9	28.5	
Vert	2584.042	PK	48.9	28.1	6.7	32.1	51.6	73.9	22.3	
Vert	4960.000	PK	46.1	33.4	9.1	31.2	57.4	73.9	16.5	
Vert	7440.000	PK	42.1	36.8	10.2	32.7	56.4	73.9	17.5	Floor Noise
Vert	9920.000	PK	42.0	38.3	11.0	32.8	58.5	73.9	15.4	Floor Noise
Vert	2483.500	AV	29.6	28.1	6.7	32.1	32.3	53.9	21.6	
Vert	2584.042	AV	44.2	28.1	6.7	32.1	46.9	53.9	7.0	
Vert	4960.000	AV	38.3	33.4	9.1	31.2	49.6	53.9	4.3	
Vert	7440.000	AV	29.7	36.8	10.2	32.7	44.0	53.9	9.9	Floor Noise
Vert	9920.000	AV	29.3	38.3	11.0	32.8	45.8	53.9	8.1	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

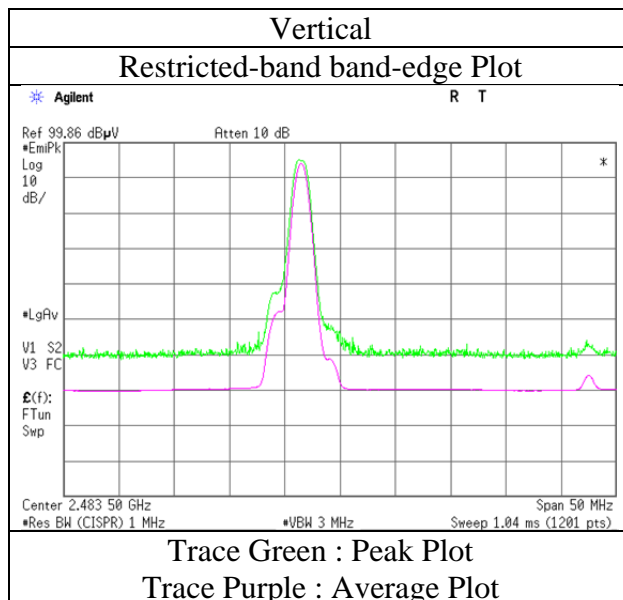
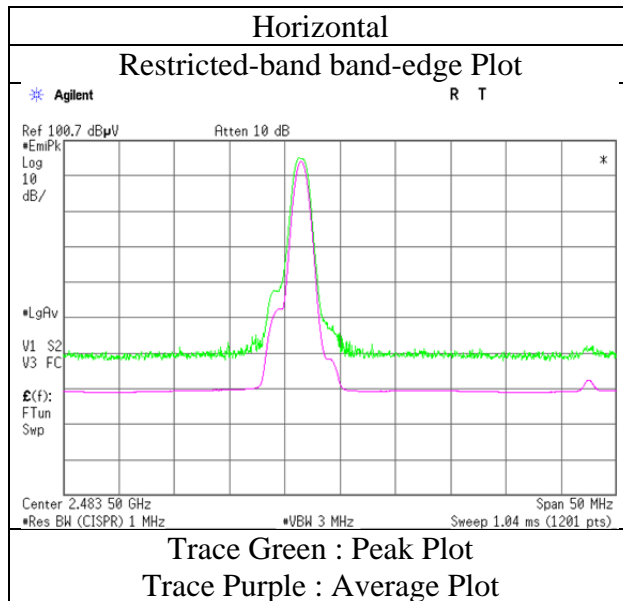
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz $20\log(4.4\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

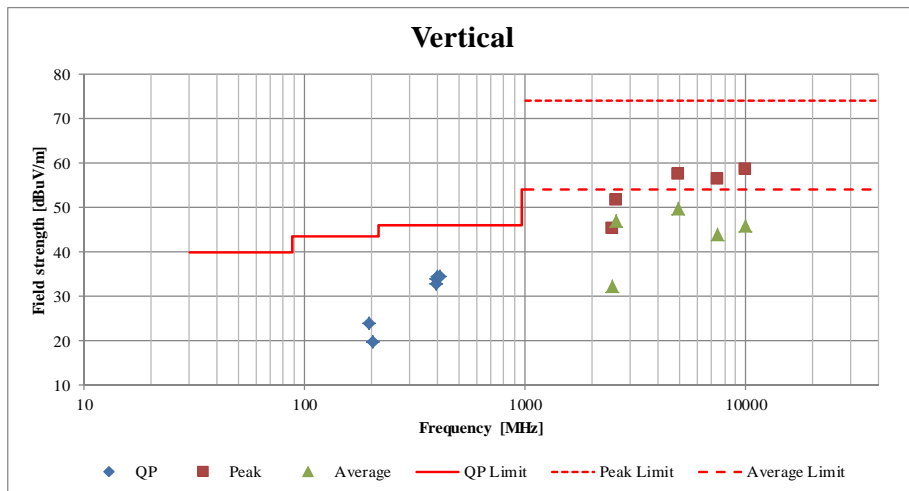
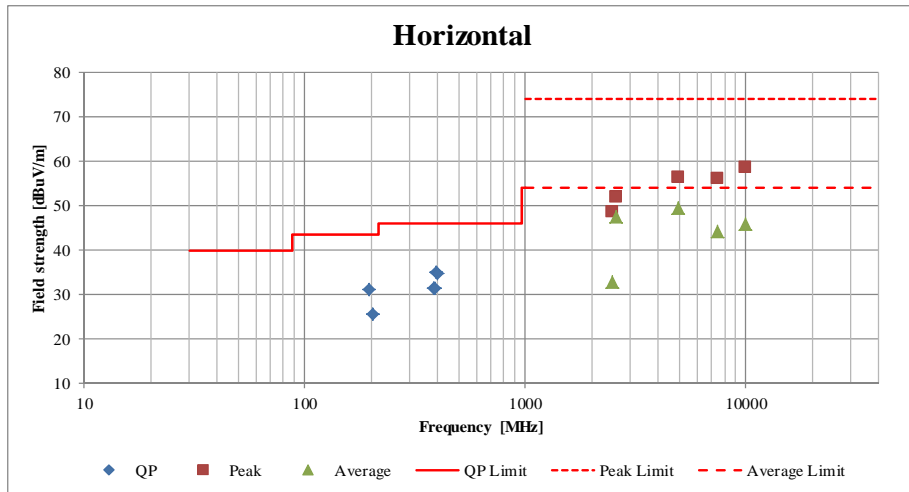
Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. 11154454H
Date February 9, 2016
Temperature / Humidity 20 deg. C / 30 % RH
Engineer Hiroyuki Furutaka
(1-10GHz)
Mode Tx, Hopping Off, DH5 2480 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.4 and No.1 Semi Anechoic Chamber		
Report No.	11154454H		
Date	February 9, 2016	February 9, 2016	February 11, 2016
Temperature / Humidity	20 deg. C / 30 % RH	20 deg. C / 30 % RH	20 deg. C / 33 % RH
Engineer	Hiroyuki Furutaka (1 GHz – 10 GHz)	Shinichi Miyazono (10 GHz – 26.5GHz)	Hiroyuki Furutaka (30 MHz – 1000 MHz)
Mode	Tx, Hopping Off, DH5 2480 MHz		



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 and No.1 Semi Anechoic Chamber
Report No. 11154454H
Date February 9, 2016 February 9, 2016 February 11, 2016
Temperature / Humidity 20 deg. C / 30 % RH 20 deg. C / 30 % RH 20 deg. C / 33 % RH
Engineer Hiroyuki Furutaka Shinichi Miyazono Hiroyuki Furutaka
(1 GHz – 10 GHz) (10 GHz – 26.5GHz) (30 MHz – 1000 MHz)
Mode Tx, Hopping Off, 3DH5 2402 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	196.000	QP	42.5	16.3	9.6	38.9	29.5	43.5	14.0	
Hori	204.010	QP	38.0	16.5	9.7	38.9	25.3	43.5	18.2	
Hori	384.000	QP	45.1	17.1	11.2	38.7	34.7	46.0	11.3	
Hori	388.000	QP	41.5	17.3	11.2	38.6	31.4	46.0	14.6	
Hori	392.000	QP	44.0	17.4	11.2	38.6	34.0	46.0	12.0	
Hori	399.999	QP	43.2	17.6	11.3	38.6	33.5	46.0	12.5	
Hori	2390.000	PK	41.7	27.9	6.6	32.1	44.1	73.9	29.8	
Hori	2505.988	PK	46.3	28.1	6.7	32.1	49.0	73.9	24.9	
Hori	4804.000	PK	41.3	32.8	9.0	31.3	51.8	73.9	22.1	
Hori	7206.000	PK	42.7	36.8	10.1	32.6	57.1	73.9	16.8	Floor Noise
Hori	9608.000	PK	41.0	38.1	10.9	32.6	57.4	73.9	16.5	Floor Noise
Hori	2390.000	AV	29.3	27.9	6.6	32.1	31.7	53.9	22.2	
Hori	2505.988	AV	38.0	28.1	6.7	32.1	40.7	53.9	13.2	
Hori	4804.000	AV	30.7	32.8	9.0	31.3	41.2	53.9	12.7	
Hori	7206.000	AV	29.7	36.8	10.2	32.6	44.1	53.9	9.8	Floor Noise
Hori	9608.000	AV	29.0	38.1	10.9	32.6	45.4	53.9	8.5	Floor Noise
Vert	195.999	QP	36.7	16.3	9.6	38.9	23.7	43.5	19.8	
Vert	204.000	QP	32.0	16.5	9.7	38.9	19.3	43.5	24.2	
Vert	392.000	QP	43.0	17.4	11.2	38.6	33.0	46.0	13.0	
Vert	396.000	QP	42.5	17.5	11.3	38.6	32.7	46.0	13.3	
Vert	399.999	QP	42.7	17.6	11.3	38.6	33.0	46.0	13.0	
Vert	408.000	QP	42.0	17.7	11.4	38.6	32.5	46.0	13.5	
Vert	2390.000	PK	42.2	27.9	6.6	32.1	44.6	73.9	29.3	
Vert	2558.117	PK	45.2	28.1	6.7	32.1	47.9	73.9	26.0	
Vert	4804.000	PK	41.5	32.8	9.0	31.3	52.0	73.9	21.9	
Vert	7206.000	PK	41.3	36.8	10.1	32.6	55.7	73.9	18.2	Floor Noise
Vert	9608.000	PK	41.4	38.1	10.9	32.6	57.8	73.9	16.1	Floor Noise
Vert	2390.000	AV	29.3	27.9	6.6	32.1	31.7	53.9	22.2	
Vert	2558.117	AV	36.4	28.1	6.7	32.1	39.1	53.9	14.8	
Vert	4804.000	AV	30.3	32.8	9.0	31.3	40.8	53.9	13.1	
Vert	7206.000	AV	29.8	36.8	10.2	32.6	44.2	53.9	9.7	Floor Noise
Vert	9608.000	AV	29.0	38.1	10.9	32.6	45.4	53.9	8.5	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz $20\log(4.4\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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	2402.000	PK	84.8	28.0	6.6	32.1	87.3	-	-	Carrier
Hori	2400.000	PK	35.7	28.0	6.6	32.1	38.2	67.3	29.1	
Vert	2402.000	PK	87.9	28.0	6.6	32.1	90.4	-	-	Carrier
Vert	2400.000	PK	38.4	28.0	6.6	32.1	40.9	70.4	29.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1GHz)) - Gain(Amplifier)

UL Japan, Inc.

Ise EMC Lab.

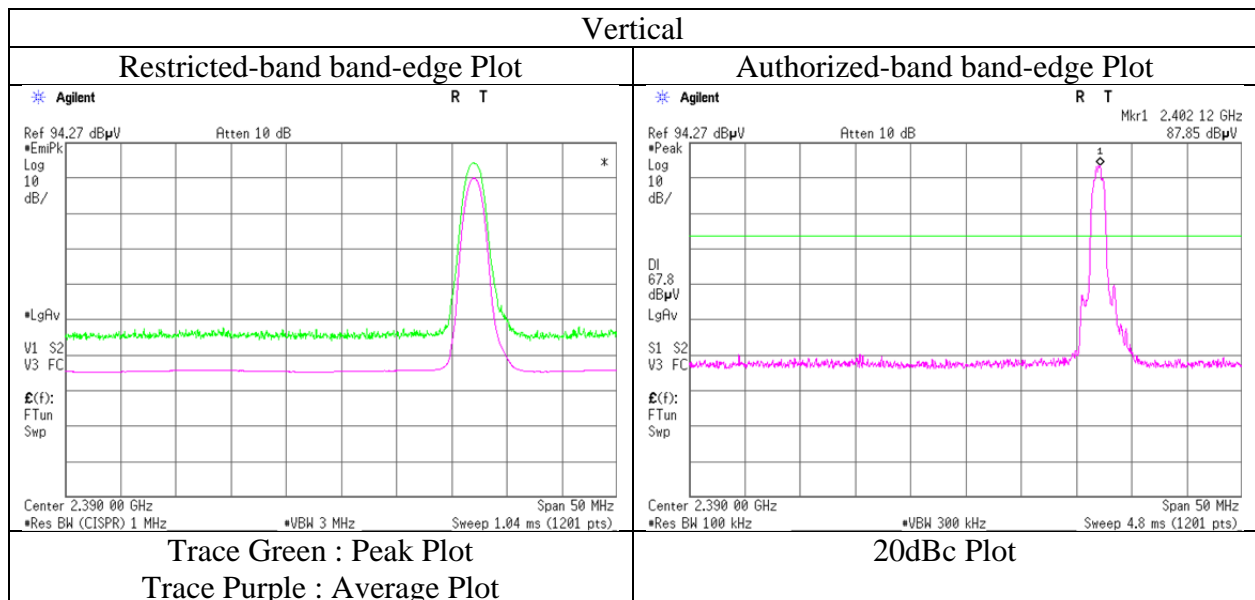
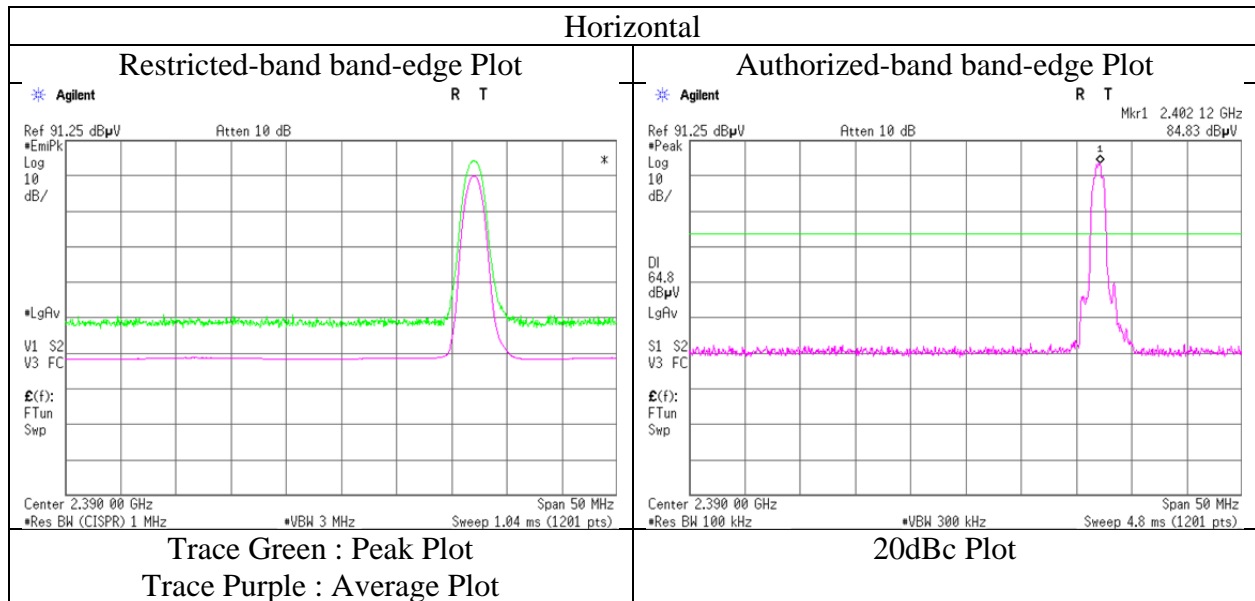
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11154454H
Date	February 9, 2016
Temperature / Humidity	20 deg. C / 30 % RH
Engineer	Hiroyuki Furutaka (1-10GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 and No.1 Semi Anechoic Chamber
Report No. 11154454H
Date February 9, 2016 February 9, 2016 February 11, 2016
Temperature / Humidity 20 deg. C / 30 % RH 20 deg. C / 30 % RH 20 deg. C / 33 % RH
Engineer Hiroyuki Furutaka Shinichi Miyazono Hiroyuki Furutaka
(1 GHz – 10 GHz) (10 GHz – 26.5GHz) (30 MHz – 1000 MHz)
Mode Tx, Hopping Off, 3DH5 2441 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	196.000	QP	42.3	16.3	9.6	38.9	29.3	43.5	14.2	
Hori	204.000	QP	37.8	16.5	9.7	38.9	25.1	43.5	18.4	
Hori	384.000	QP	44.3	17.1	11.2	38.7	33.9	46.0	12.1	
Hori	388.000	QP	41.2	17.3	11.2	38.6	31.1	46.0	14.9	
Hori	392.000	QP	43.5	17.4	11.2	38.6	33.5	46.0	12.5	
Hori	399.999	QP	43.0	17.6	11.3	38.6	33.3	46.0	12.7	
Hori	2544.904	PK	47.4	28.1	6.7	32.1	50.1	73.9	23.8	
Hori	4882.000	PK	47.3	33.1	9.1	31.3	58.2	73.9	15.7	
Hori	7323.000	PK	42.6	36.8	10.2	32.6	57.0	73.9	16.9	Floor Noise
Hori	9764.000	PK	40.9	38.2	11.0	32.7	57.4	73.9	16.5	Floor Noise
Hori	2544.904	AV	40.5	28.1	6.7	32.1	43.2	53.9	10.7	
Hori	4882.000	AV	32.8	33.1	9.1	31.3	43.7	53.9	10.2	
Hori	7323.000	AV	29.5	36.8	10.2	32.6	43.9	53.9	10.0	Floor Noise
Hori	9764.000	AV	28.9	38.2	11.0	32.7	45.4	53.9	8.5	Floor Noise
Vert	195.999	QP	36.5	16.3	9.6	38.9	23.5	43.5	20.0	
Vert	204.000	QP	32.7	16.5	9.7	38.9	20.0	43.5	23.5	
Vert	392.000	QP	42.9	17.4	11.2	38.6	32.9	46.0	13.1	
Vert	396.000	QP	43.0	17.5	11.3	38.6	33.2	46.0	12.8	
Vert	399.999	QP	42.1	17.6	11.3	38.6	32.4	46.0	13.6	
Vert	408.000	QP	41.3	17.7	11.4	38.6	31.8	46.0	14.2	
Vert	2544.800	PK	47.2	28.1	6.7	32.1	49.9	73.9	24.0	
Vert	4882.000	PK	43.7	33.1	9.1	31.3	54.6	73.9	19.3	
Vert	7323.000	PK	41.0	36.8	10.2	32.6	55.4	73.9	18.5	Floor Noise
Vert	9764.000	PK	41.2	38.2	11.0	32.7	57.7	73.9	16.2	Floor Noise
Vert	2544.800	AV	40.2	28.1	6.7	32.1	42.9	53.9	11.0	
Vert	4882.000	AV	34.0	33.1	9.1	31.3	44.9	53.9	9.0	
Vert	7323.000	AV	29.7	36.8	10.2	32.6	44.1	53.9	9.8	Floor Noise
Vert	9764.000	AV	29.1	38.2	11.0	32.7	45.6	53.9	8.3	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz $20\log(4.4\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$

10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 and No.1 Semi Anechoic Chamber
Report No. 11154454H
Date February 9, 2016 February 9, 2016 February 11, 2016
Temperature / Humidity 20 deg. C / 30 % RH 20 deg. C / 30 % RH 20 deg. C / 33 % RH
Engineer Hiroyuki Furutaka Shinichi Miyazono Hiroyuki Furutaka
(1 GHz – 10 GHz) (10 GHz – 26.5GHz) (30 MHz – 1000 MHz)
Mode Tx, Hopping Off, 3DH5 2480 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	196.000	QP	42.3	16.3	9.6	38.9	29.3	43.5	14.2	
Hori	204.000	QP	37.2	16.5	9.7	38.9	24.5	43.5	19.0	
Hori	384.000	QP	44.0	17.1	11.2	38.7	33.6	46.0	12.4	
Hori	388.000	QP	41.6	17.3	11.2	38.6	31.5	46.0	14.5	
Hori	392.000	QP	42.1	17.4	11.2	38.6	32.1	46.0	13.9	
Hori	399.999	QP	42.9	17.6	11.3	38.6	33.2	46.0	12.8	
Hori	2483.500	PK	43.2	28.1	6.7	32.1	45.9	73.9	28.0	
Hori	2584.092	PK	46.2	28.1	6.7	32.1	48.9	73.9	25.0	
Hori	4960.000	PK	41.8	33.4	9.1	31.2	53.1	73.9	20.8	
Hori	7440.000	PK	41.7	36.8	10.2	32.7	56.0	73.9	17.9	Floor Noise
Hori	9920.000	PK	42.0	38.3	11.0	32.8	58.5	73.9	15.4	Floor Noise
Hori	2483.500	AV	29.9	28.1	6.7	32.1	32.6	53.9	21.3	
Hori	2584.092	AV	38.8	28.1	6.7	32.1	41.5	53.9	12.4	
Hori	4960.000	AV	30.8	33.4	9.1	31.2	42.1	53.9	11.8	
Hori	7440.000	AV	29.7	36.8	10.2	32.7	44.0	53.9	9.9	Floor Noise
Hori	9920.000	AV	29.4	38.3	11.0	32.8	45.9	53.9	8.0	Floor Noise
Vert	196.000	QP	36.4	16.3	9.6	38.9	23.6	43.5	19.9	
Vert	204.000	QP	32.4	16.5	9.7	38.9	19.9	43.5	23.6	
Vert	392.000	QP	42.9	17.4	11.2	38.6	33.1	46.0	12.9	
Vert	396.000	QP	42.8	17.5	11.3	38.6	33.2	46.0	12.8	
Vert	399.999	QP	41.9	17.6	11.3	38.6	32.4	46.0	13.6	
Vert	408.000	QP	41.0	17.7	11.4	38.6	31.7	46.0	14.3	
Vert	2483.500	PK	42.6	28.1	6.7	32.1	45.3	73.9	28.6	
Vert	2584.115	PK	48.3	28.1	6.7	32.1	51.1	73.9	22.8	
Vert	4960.000	PK	42.2	33.4	9.1	31.2	53.5	73.9	20.4	
Vert	7440.000	PK	41.2	36.8	10.2	32.7	55.5	73.9	18.4	Floor Noise
Vert	9920.000	PK	41.9	38.3	11.0	32.8	58.4	73.9	15.5	Floor Noise
Vert	2483.500	AV	30.0	28.1	6.7	32.1	32.7	53.9	21.2	
Vert	2584.115	AV	40.5	28.1	6.7	32.1	43.2	53.9	10.7	
Vert	4960.000	AV	31.0	33.4	9.1	31.2	42.3	53.9	11.6	
Vert	7440.000	AV	29.5	36.8	10.2	32.7	43.8	53.9	10.1	Floor Noise
Vert	9920.000	AV	29.3	38.3	11.0	32.8	45.8	53.9	8.1	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

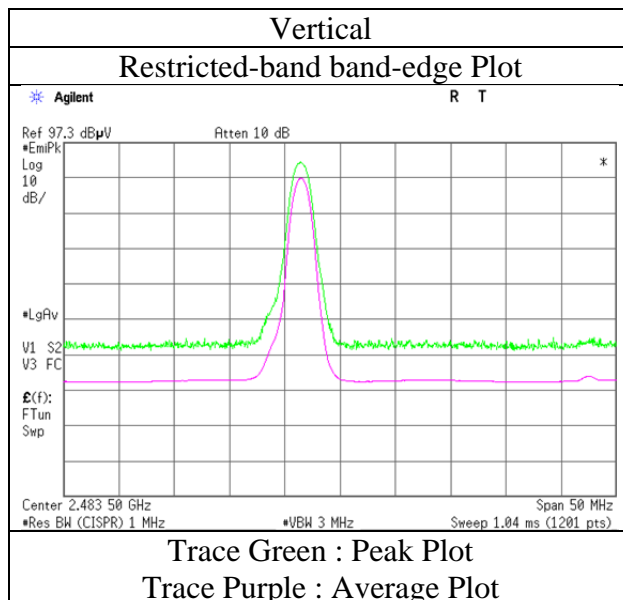
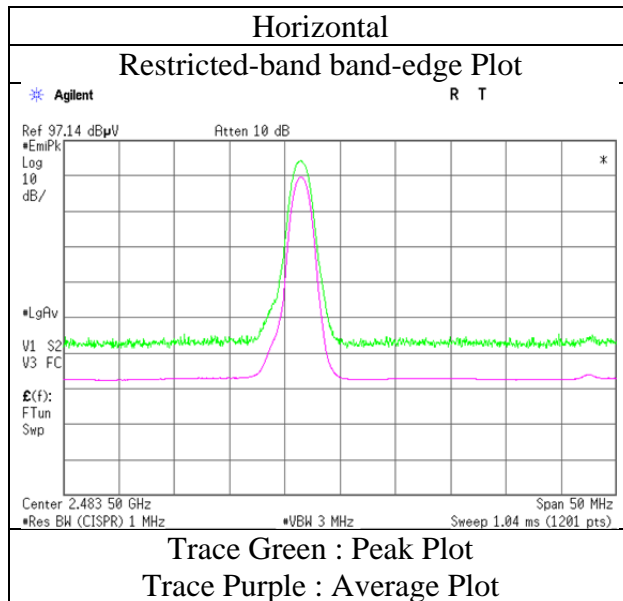
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz $20\log(4.4\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11154454H
Date	February 9, 2016
Temperature / Humidity	20 deg. C / 30 % RH
Engineer	Hiroyuki Furutaka (1-10GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



* Final result of restricted band edge was shown in tabular data.

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2015/11/11 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2015/08/10 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2015/06/22 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2015/06/06 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2015/09/17 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2015/09/19 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2016/01/21 * 12
MJM-25	Measure	KOMELON	KMC-36	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2015/06/08 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2015/11/02 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2015/11/03 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2015/11/10 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/T SJ	-	-	RE	2015/09/29 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2015/02/03 * 12
MMM-03	Digital Tester	Fluke	FLUKE 26-3	78030621	RE	2015/08/19 * 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 test

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