RADIO TEST REPORT

Test Report No. : 11220710H-R1

Applicant	:	**PANASONIC CORPORATION OF NORTH AMERICA**
Type of Equipment	:	**Wireless Module (Tested inside of Panasonic Tablet PC FZ-M1)**
Model No.	:	**WL15B**
FCC ID	:	**ACJ9TGWL15B**
Test regulation	:	**FCC Part 15 Subpart E: 2015**
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 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 11220710H. 11220710H is replaced with this report.

Date of test: April 5 to 7, 2016

Representative test engineer:
Tomoki Matsui
Engineer
Consumer Technology Division

Approved by:
Takahiro Hatakeda
Leader
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.
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REVISION HISTORY

Original Test Report No.: 11220710H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11220710H	April 13, 2016	-	-
1	11220710H-R1	April 20, 2016	P.5	Correction of KDB number
1	11220710H-R1	April 20, 2016	P.8	Addition of explanatory note for worst rate
1	11220710H-R1	April 20, 2016	P.9	Addition of explanatory note for test antenna

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SECTION 1: Customer information

Company Name	:	PANASONIC CORPORATION OF NORTH AMERICA
Address	:	Two Riverfront Plaza, 9th Floor, Newark, NJ 07102-5490

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

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless Module (Tested inside of Panasonic Tablet PC FZ-M1)
Model No.	:	WL15B
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	April 1, 2016
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: WL15B (referred to as the EUT in this report) is a Wireless Module.

Radio Specification

Tx Frequency Bands	802.11a/b/g/n/ac: 2412 - 2462 MHz, b / g / HT20 / HT40 5180 - 5240 MHz, a / HT20 / HT40 / HT80 5260 - 5320 MHz, a / HT20 / HT40 / HT80 5500 - 5720 MHz, a / HT20 / HT40 / HT80 5745 - 5825 MHz, a / HT20 / HT40 / HT80 Bluetooth: 2402 - 2480 MHz
Modulation	802.11a/b/g/n/ac : BPSK, QPSK, CCK, 16-QAM and 64-QAM and 256-QAM Bluetooth 4.0+LE: GFSK, DQPSK, 8-DPSK

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart E: 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 E Unlicensed National Information Infrastructure Devices Section 15.407 General technical requirements

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013	**FCC:** 15.407 (b) (6) / 15.207	**QP** 11.4 dB, 0.52649 MHz, N 0.52480 MHz, L **AV** 10.1 dB, 0.52649 MHz, N 0.52480 MHz, L	Complied	-
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
26 dB Emission Bandwidth	**FCC:** KDB Publication Number 789033 D02, 662911 D01 and D02	**FCC:** 15.407 (a) (1) (2) (3)	See data	N/A	Conducted
	IC: -	**IC:** -			
Maximum Conducted Output Power	**FCC:** KDB Publication Number 789033 D02, 662911 D01 and D02	**FCC:** 15.407 (a) (1) (2) (3)		Complied	Conducted
	IC: -	**IC:** RSS-247 6.2.1 (1) 6.2.2 (1) 6.2.3 (1) 6.2.4 (1)			
Maximum Power Spectral Density	**FCC:** KDB Publication Number 789033 D02, 662911 D01 and D02	**FCC :** 15.407 (a) (1) (2) (3)		Complied	Conducted
	IC: -	**IC:** RSS-247 6.2.1 (1) 6.2.2 (1) 6.2.3 (1) 6.2.4 (1)			
Spurious Emission Restricted Band Edge	**FCC:** KDB Publication Number 789033 D02, 662911 D01 and D02	**FCC:** 15.407 (b), 15.205 and 15.209	0.2 dB 5715.000 MHz, PK, Vert.	Complied	Conducted (< 30 MHz) / Radiated (> 30 MHz) *1)
	IC: -	**IC:** RSS-247 6.2.1 (2) 6.2.2 (2) 6.2.3 (2) 6.2.4 (2)			
6 dB Emission Bandwidth	**FCC:** ANSI C63.10-2013	**FCC:** 15.407 (e)	See data	Complied	Conducted
	IC: -	**IC:** RSS-247 6.2.4 (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 FCC 15.407 (b) and KDB 789033 D02 G.3.b).

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

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Band Width	RSS-Gen 6.6	**IC:** -	N/A	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.

Ise EMC Lab.

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	2.6 dB

Frequency range	Conducted emission using AMN(LISN) (±dB)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	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

Conducted Emission test

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

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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Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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 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)

Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals -" of TCB Council Workshop October 2009 and also was judged the necessity of 802.11ac mode by the pre-test.

Mode	Remarks*
IEEE 802.11a (11a)	6 Mbps, PN9
IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 0 (Long GI), PN9
IEEE 802.11ac SISO 20 MHz BW (11ac-20)	VHT 0 (Long GI), PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 8 (Long GI), PN9
IEEE 802.11ac MIMO 20 MHz BW (11ac-20)	VHT 0 (Long GI), PN9
IEEE 802.11n SISO 40 MHz BW (11n-40)	MCS 0 (Long GI), PN9
IEEE 802.11ac SISO 40 MHz BW (11ac-40)	VHT 0 (Long GI), PN9
IEEE 802.11n MIMO 40 MHz BW (11n-40)	MCS 8 (Long GI), PN9
IEEE 802.11ac MIMO 40 MHz BW (11ac-40)	VHT 0 (Long GI), PN9
IEEE 802.11ac SISO 80 MHz BW (11ac-80)	VHT 0 (Long GI), PN9
IEEE 802.11ac MIMO 80 MHz BW (11ac-80)	VHT 0 (Long GI), PN9

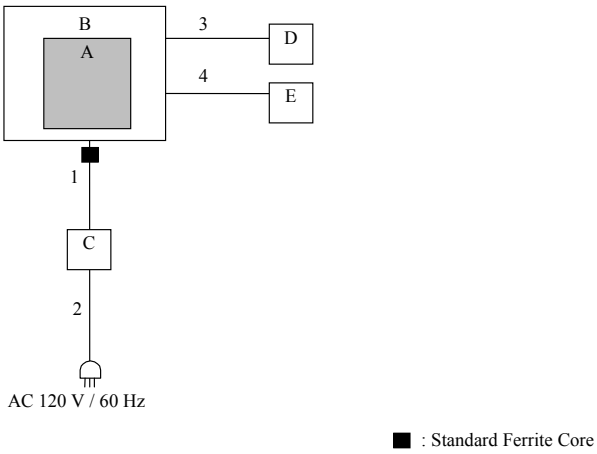
*Above worst rate was decided based on a maximum conducted output power (reference data) result.

*The details of Operation mode(s)

Test Item	Operating Mode	Tested Antenna	Tested Frequency
			Upper Band
Conducted Emission, Conducted Spurious Emission, Radiated Spurious Emission (Below 1 GHz) *1)	11ac-40 Tx *2)	A+B	5795 MHz
99 % Occupied Bandwidth, 6 dB Bandwidth *1)	11a Tx 11ac-20 Tx	A, B	5745 MHz 5785 MHz 5825 MHz
	11ac-40 Tx	A, B	5755 MHz 5795 MHz
	11ac-80 Tx	A, B	5775 MHz
Maximum Power Spectral Density *1)	11a Tx	A, B	5745 MHz 5785 MHz 5825 MHz
	11ac-20 Tx	A+B	5745 MHz 5785 MHz 5825 MHz
	11ac-40 Tx	A+B	5755 MHz 5795 MHz
	11ac-80 Tx	A+B	5775 MHz
Maximum Conducted Output Power *1)	11a Tx	A, B	5745 MHz 5785 MHz 5825 MHz
	11n-20 Tx 11ac-20 Tx	A, B, A+B	5745 MHz 5785 MHz 5825 MHz
	11n-40 Tx 11ac-40 Tx	A, B, A+B	5755 MHz 5795 MHz
	11ac-80 Tx	A, B, A+B	5775 MHz
Radiated Spurious Emission (Above 1 GHz) *1)	11ac-20 Tx	A+B *3)	5745 MHz 5785 MHz 5825 MHz
	11ac-40 Tx	A+B *3)	5755 MHz 5795 MHz
	11ac-80 Tx	A+B *3)	5775 MHz

*1) The test was only performed with UNII-3 band.
*2) The test was performed with the worst case.
The highest mode in Maximum conducted output power result was selected as the worst case.
The highest rate in Maximum conducted output power (reference data) result was selected as the worst case.
*3) After the comparison MIMO and SISO in pre-check, test was performed with MIMO as a representative as it had worst case.

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Module	WL15B	*1)	Panasonic	EUT
B	Tablet PC	FZ-M1	AB01234567895HTSA00138	Panasonic	-
C	AC Adapter	CF-AA6373A	6373AM315302418A	Panasonic	-
D	USB Mouse	M-U0026	1552HS02RRR8	Logicool	-
E	Ear phone	-	-	Panasonic	-

*1) This item controlled with B: Personal Computer.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.0	Unshielded	Unshielded	-
2	AC Cable	1.8	Unshielded	Unshielded	-
3	USB Cable	1.8	Shielded	Shielded	-
4	Audio Cable	0.9	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m 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 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm 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 Average**
Measurement range	**: 0.15 MHz-30 MHz**
Test data	**: APPENDIX**
Test result	**: Pass**

SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

[For below 1GHz]
EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 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.

< Below 1GHz >

The result also satisfied with the general limits specified in section 15.209 (a).

< Above 1GHz >

Inside of restricted bands (Section 15.205):

Apply to limit in the Section 15.209 (a).

Outside of the restricted bands:

Apply to limit 68.2 dBuV/m, 3 m (-27 dBm e.i.r.p.*) in the Section 15.407 (b) (1) (2) (3).
Apply to limit 68.2 dBuV/m, 3 m (-27 dBm e.i.r.p.*) or
78.2 dBuV/m, 3 m (-17 dBm e.i.r.p.*) in the Section 15.407 (b).

Restricted band edge:

Apply to limit in the Section 15.209 (a).
Since this limit is severer than the limit of the inside of restricted bands.

*Electric field strength to e.i.r.p. conversion:

$$E = \frac{1000000\sqrt{30P}}{3} \quad \text{(uV/m)} \qquad :P \text{ is the e.i.r.p. (Watts)}$$

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

Frequency	Below 1 GHz	Above 1 GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	Peak	Average
IF Bandwidth	BW: 120 kHz	RBW: 1 MHz VBW: 3 MHz	Method AD *1) RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: ≥ 100 traces Duty factor was added to the results.
Test Distance	3 m	4.5 m *2) (below 10 GHz), 1 m*3) (above 10 GHz), 0.5 m*4) (above 26.5 GHz)	

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v01r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E (Issued on January 8, 2016)".
*2) Distance Factor: 20 x log (4.5 m/3.0 m) = 3.5 dB
*3) Distance Factor: 20 x log (1.0 m/3.0 m) = -9.5 dB
*4) Distance Factor: 20 x log (0.5 m/3.0 m) = -15.6 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 MHz-40 GHz
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 and Test method
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 % to 5 % of OBW	≥ 3 RBW	Auto	Peak	Max Hold	Spectrum Analyzer
6 dB Bandwidth	Enough to capture the emission	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Conducted Output Power	-	-	-	Auto	Average	-	Power Meter (Sensor: 80 MHz BW) (Method PM-G)
Maximum Power Spectral Density	Encompass the entire EBW	470 kHz *2)	≥ 3 RBW	Auto	RMS or Sample Power Averaging (200 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*3)	9 kHz – 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz – 30 MHz	9.1 kHz	27 kHz				

* The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v01r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E (Issued on January 8, 2016)".
*1) Peak hold was applied as Worst-case measurement.
*2) FCC standard says that RBW is set to be 500 kHz for 5.725 GHz-5.850 GHz, but it is not possible with spectrum analyzer, so 10log(500 kHz/470 kHz) was added to the test result.
*3) In the frequency range below 30 MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.
(9 kHz-150 kHz: RBW = 200 Hz, 150 kHz-30 MHz: RBW = 9.1 kHz).

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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

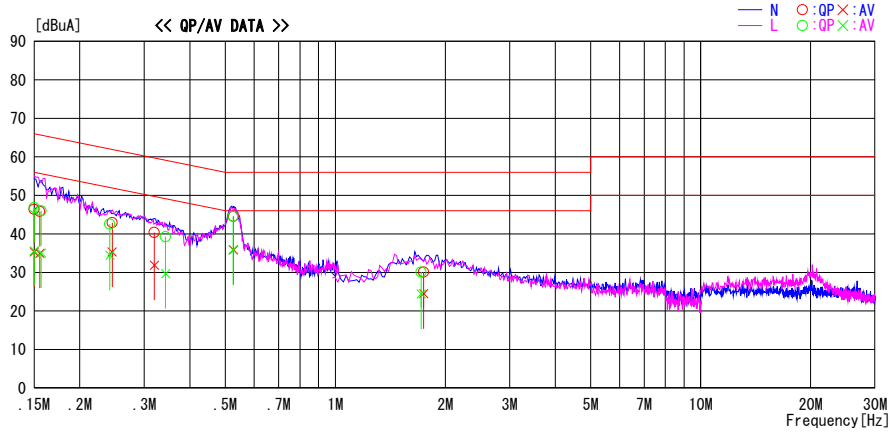
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/04/07

Report No. : 11220710

Temp./Humi. : 21deg. C / 50% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx 11ac40 5795MHz

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]	[dBuA]	[dBuA]	[dBuA]	[dBuA]	[dB]	[dB]		
0.15000	33.2	22.1	13.2	46.4	35.3	66.0	56.0	19.6	20.7	N	
0.15550	32.6	21.8	13.2	45.8	35.0	65.7	55.7	19.9	20.7	N	
0.24529	29.6	22.0	13.3	42.9	35.3	61.9	51.9	19.0	16.6	N	
0.31981	27.1	18.6	13.3	40.4	31.9	59.7	49.7	19.3	17.8	N	
0.52649	31.3	22.6	13.3	44.6	35.9	56.0	46.0	11.4	10.1	N	
1.74500	16.6	11.0	13.5	30.1	24.5	56.0	46.0	25.9	21.5	N	
0.15000	33.6	22.4	13.2	46.8	35.6	66.0	56.0	19.2	20.4	L	
0.15681	32.8	21.9	13.2	46.0	35.1	65.6	55.6	19.6	20.5	L	
0.24160	29.3	21.2	13.3	42.6	34.5	62.0	52.0	19.4	17.5	L	
0.34322	26.0	16.4	13.3	39.3	29.7	59.1	49.1	19.8	19.4	L	
0.52480	31.3	22.6	13.3	44.6	35.9	56.0	46.0	11.4	10.1	L	
1.71800	16.6	10.9	13.5	30.1	24.4	56.0	46.0	25.9	21.6	L	

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

99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11220710H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 41 % RH
Engineer	Satofumi Matsuyama
Mode	Tx 11a

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna A	5745	-	16.890	-
	5785	-	16.864	-
	5825	-	16.901	-

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna B	5745	-	16.822	-
	5785	-	16.886	-
	5825	-	16.825	-

99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11220710H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 41 % RH
Engineer	Satofumi Matsuyama
Mode	Tx 11ac-20

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna A	5745	-	18.006	-
	5785	-	17.972	-
	5825	-	18.019	-

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna B	5745	-	18.025	-
	5785	-	17.991	-
	5825	-	17.958	-

99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11220710H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 41 % RH
Engineer	Satofumi Matsuyama
Mode	Tx 11ac-40

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna A	5755	-	36.248	-
	5795	-	36.377	-

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna B	5755	-	36.269	-
	5795	-	36.289	-

99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11220710H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 41 % RH
Engineer	Satofumi Matsuyama
Mode	Tx 11ac-80

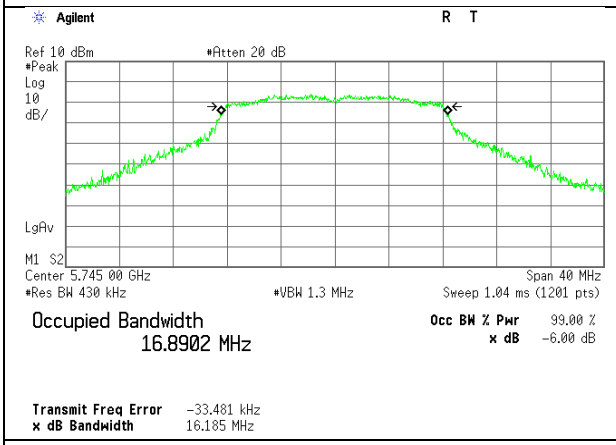
Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna A	5775	-	74.972	-

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna B	5775	-	74.924	-

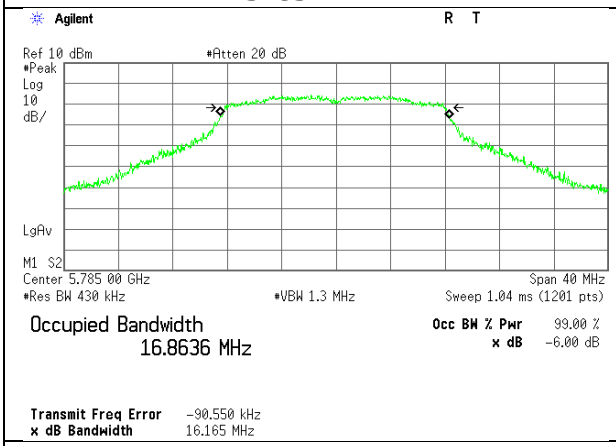
99 % Occupied Bandwidth

11a, Antenna A

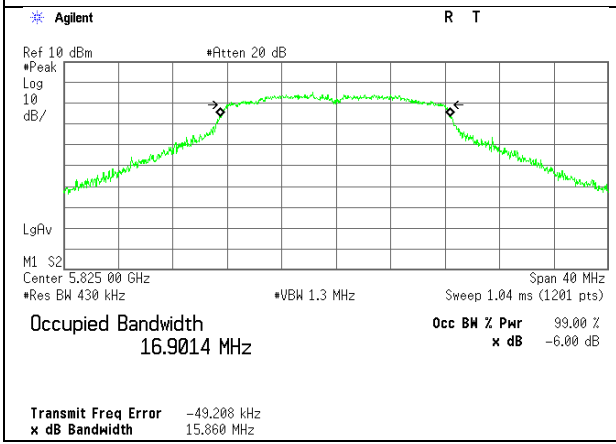
5745 MHz



5785 MHz

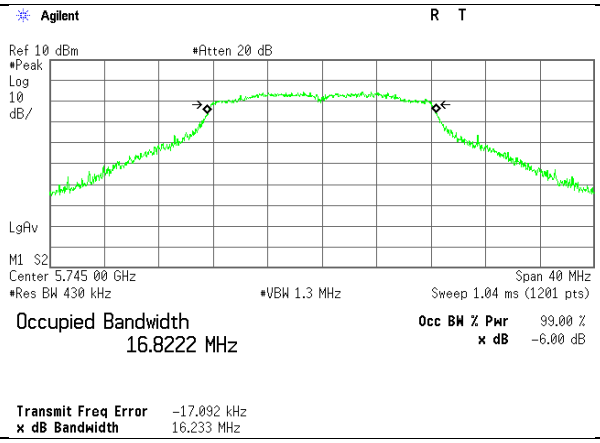


5825 MHz

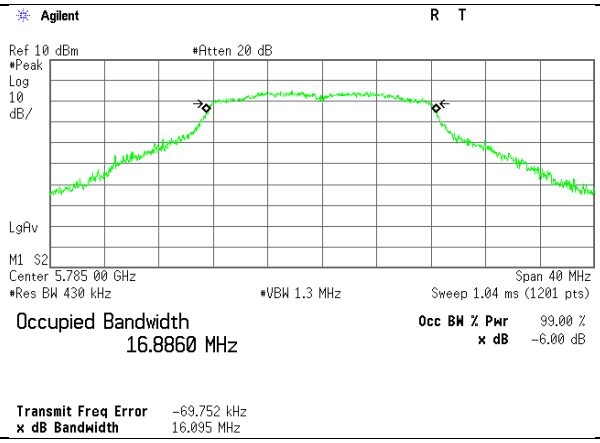


11a, Antenna B

5745 MHz



5785 MHz



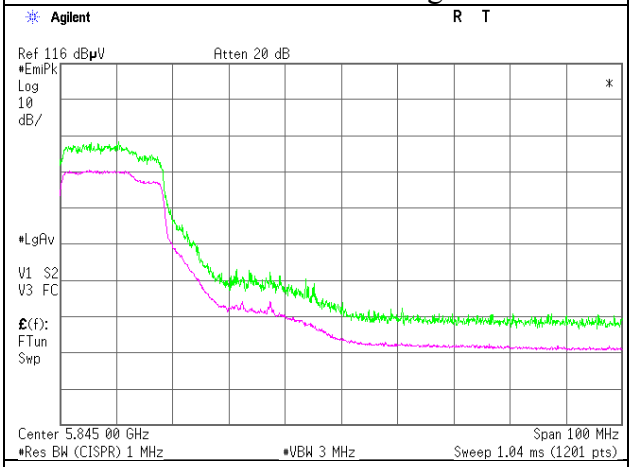
5825 MHz

Radiated Spurious Emission

Test place	Ise EMC Lab.
Report No.	11220710H
Semi Anechoic Chamber	No.3
Date	April 6, 2016
Temperature / Humidity	22deg. C / 34 % RH
Engineer	Tomoki Matsui
Mode	Tx 11ac-40 5795 MHz

Horizontal

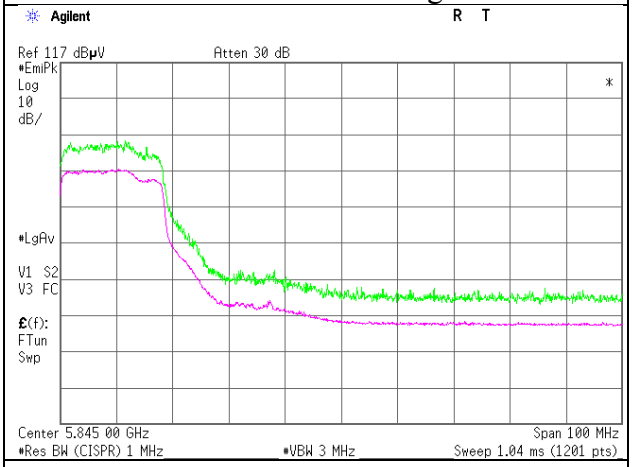
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Report No.	11220710H	
Semi Anechoic Chamber	No.3	No.1
Date	April 6, 2016	April 7, 2016
Temperature / Humidity	22deg. C / 34 % RH	21deg. C / 50 % RH
Engineer	Tomoki Matsui (1-18GHz)	Tomoki Matsui (Above 18GHz)
Mode	Tx 11ac-80 5775 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4949.917	PK	43.7	32.1	7.3	31.7	-	51.4	73.9	22.5	
Hori	5715.000	PK	58.4	32.6	7.6	31.8	-	66.8	68.2	1.4	
Hori	5725.000	PK	60.0	32.6	7.7	31.8	-	68.5	78.2	9.7	
Hori	5850.000	PK	59.0	32.8	7.7	31.8	-	67.7	78.2	10.5	
Hori	5860.000	PK	57.9	32.8	7.7	31.8	-	66.6	68.2	1.6	
Hori	11550.000	PK	41.1	40.9	-1.7	33.4	-	46.9	73.9	27.0	Floor Noise
Hori	17325.000	PK	41.5	42.8	0.0	32.7	-	51.6	73.9	22.3	Floor Noise
Hori	23100.000	PK	46.0	41.2	-0.6	34.6	-	52.0	73.9	21.9	Floor Noise
Hori	4949.917	AV	36.8	32.1	7.3	31.7	-	44.5	53.9	9.4	
Hori	11550.000	AV	32.4	40.9	-1.7	33.4	-	38.2	53.9	15.7	Floor Noise
Hori	17325.000	AV	33.3	42.8	0.0	32.7	-	43.4	53.9	10.5	Floor Noise
Hori	23100.000	AV	37.5	41.2	-0.6	34.6	-	43.5	53.9	10.4	Floor Noise
Vert	4949.917	PK	45.0	32.1	7.3	31.7	-	52.7	73.9	21.2	
Vert	5715.000	PK	59.6	32.6	7.6	31.8	-	68.0	68.2	0.2	
Vert	5725.000	PK	61.6	32.6	7.7	31.8	-	70.1	78.2	8.1	
Vert	5850.000	PK	55.1	32.8	7.7	31.8	-	63.8	78.2	14.4	
Vert	5860.000	PK	53.3	32.8	7.7	31.8	-	62.0	68.2	6.2	
Vert	11550.000	PK	41.0	40.9	-1.7	33.4	-	46.8	73.9	27.1	Floor Noise
Vert	17325.000	PK	41.8	42.8	0.0	32.7	-	51.9	73.9	22.0	Floor Noise
Vert	23100.000	PK	45.7	41.2	-0.6	34.6	-	51.7	73.9	22.2	Floor Noise
Vert	4949.917	AV	37.7	32.1	7.3	31.7	-	45.4	53.9	8.5	
Vert	11550.000	AV	32.3	40.9	-1.7	33.4	-	38.1	53.9	15.8	Floor Noise
Vert	17325.000	AV	33.1	42.8	0.0	32.7	-	43.2	53.9	10.7	Floor Noise
Vert	23100.000	AV	37.4	41.2	-0.6	34.6	-	43.4	53.9	10.5	Floor Noise

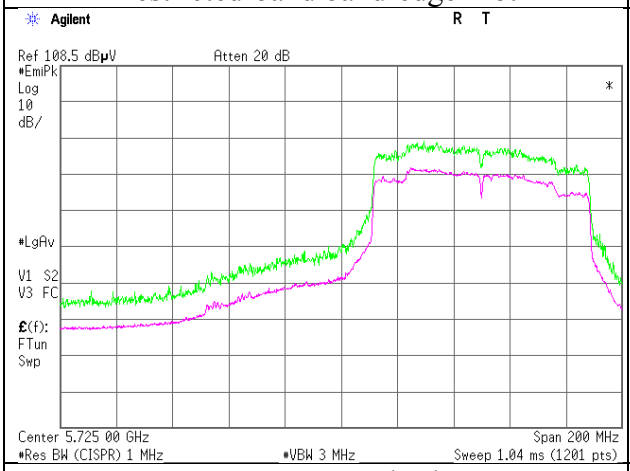
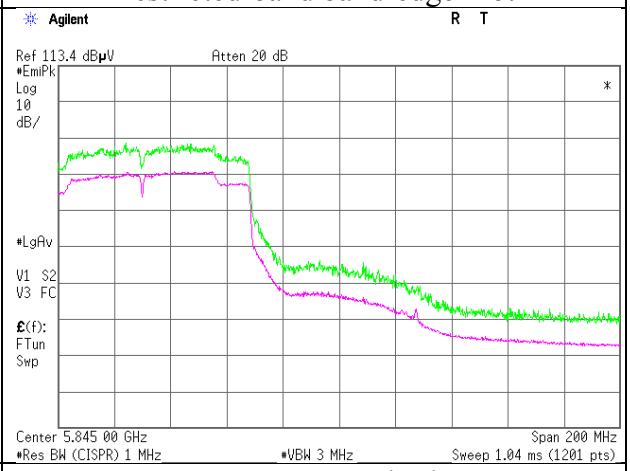
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

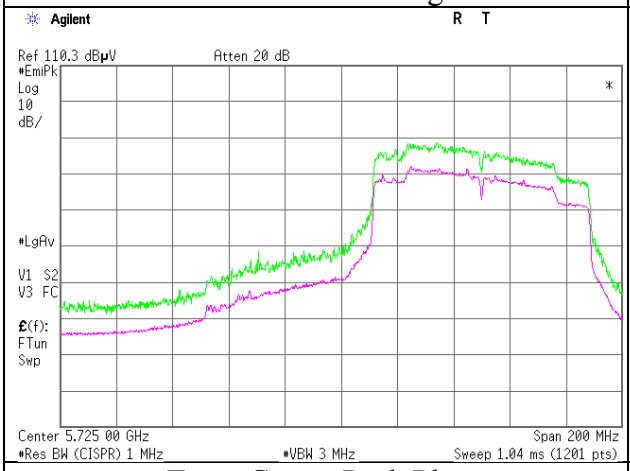
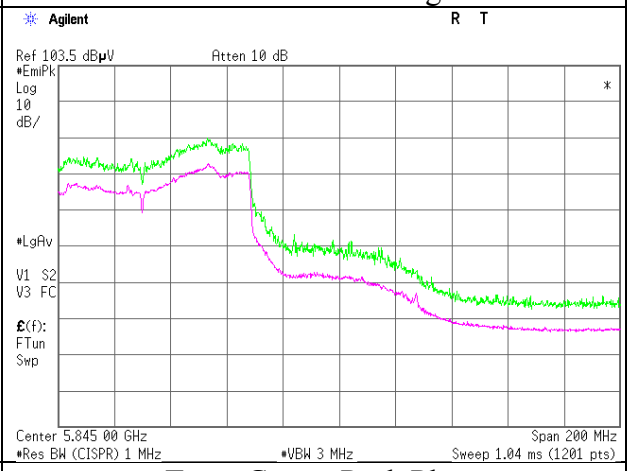
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
26.5 GHz - 40 GHz 20log (0.5 m / 3.0 m) = -15.6 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Report No.	11220710H
Semi Anechoic Chamber	No.3
Date	April 6, 2016
Temperature / Humidity	22deg. C / 34 % RH
Engineer	Tomoki Matsui
Mode	Tx 11ac-80 5775 MHz

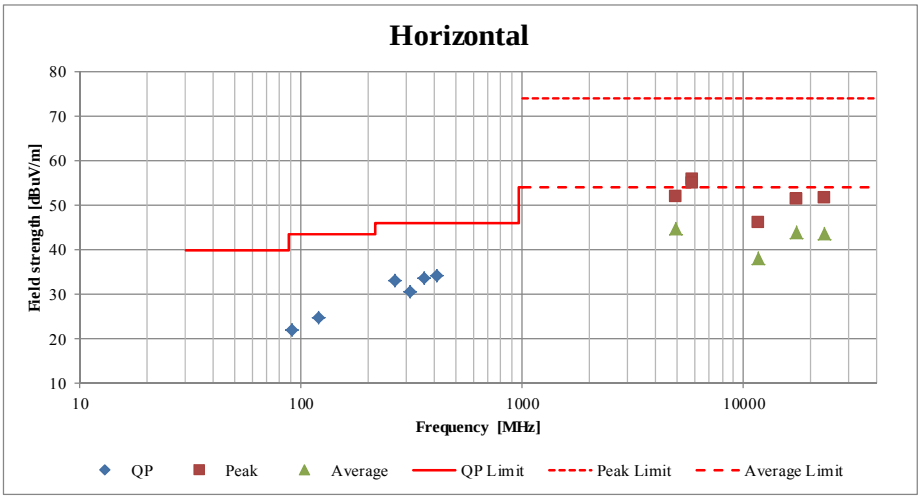
Horizontal	Horizontal
Restricted-band band-edge Plot	Restricted-band band-edge Plot
	
Trace Green: Peak Plot Trace Purple: Average Plot	Trace Green: Peak Plot Trace Purple: Average Plot

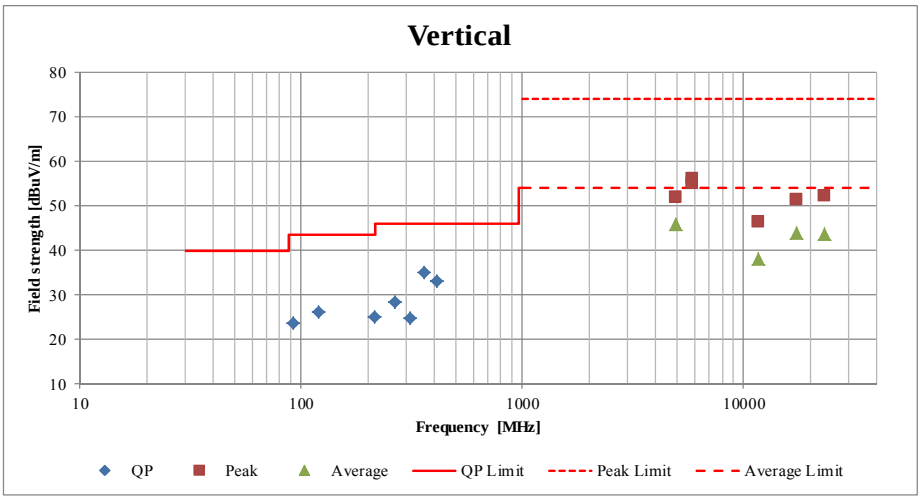
Vertical	Vertical
Restricted-band band-edge Plot	Restricted-band band-edge Plot
	
Trace Green: Peak Plot Trace Purple: Average Plot	Trace Green: Peak Plot Trace Purple: Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab.	
Report No.	11220710H	
Semi Anechoic Chamber	No.3	No.1
Date	April 6, 2016	April 7, 2016
Temperature / Humidity	22deg. C / 34 % RH	21deg. C / 50 % RH
Engineer	Tomoki Matsui (1-18GHz)	Tomoki Matsui (Above 18GHz and Below 1GHz)
Mode	Tx 11ac-40 5795 MHz	



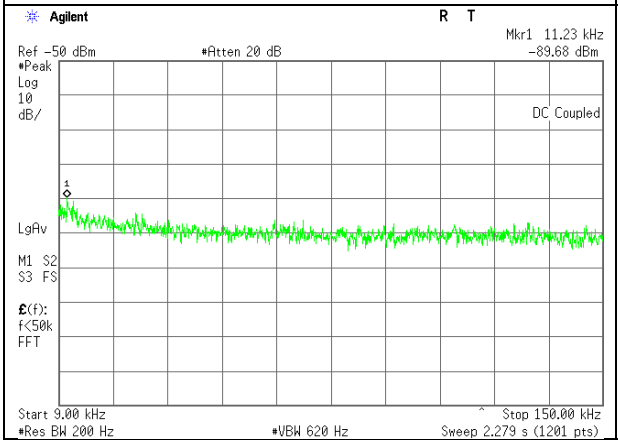


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

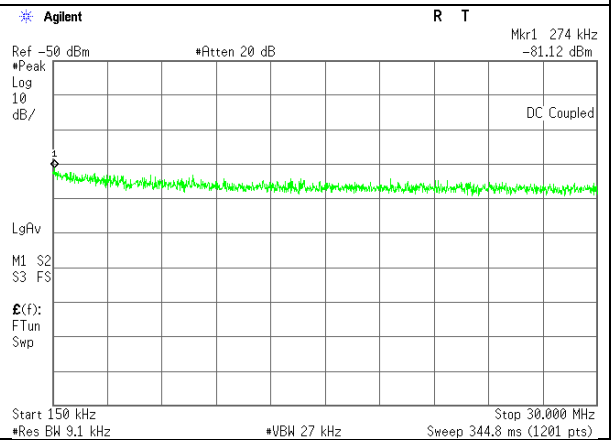
Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11220710H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 41 % RH
Engineer	Satofumi Matsuyama
Mode	Tx 11ac-40 5795MHz

9 kHz-150 kHz



150 kHz-30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenator [dB]	Antenna Gain [dBi]	N (Number of Output	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-89.7	0.55	10.0	2.0	2	-74.1	300	6.0	-12.9	46.5	59.4	
274.00	-81.1	0.75	10.0	2.0	2	-65.4	300	6.0	-4.1	18.8	22.9	

E = EIRP - 20*log(D) + Ground bounce + 104.8 [dBuV/m]

EIRP = Reading + Cable Loss + Attenator + Antenna Gain + 10*log(N)

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-17	Power Meter	DARE!! Instruments	RPR3006W	14I00048SNO081	AT	2015/11/09 * 12
COTS-MPM	RPR3006W measurement soft	DARE!! Instruments	RadiMation 2014.2.1	-	AT	-
MAT-57	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2016/01/18 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2016/01/21 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2016/01/21 * 12
MJM-16	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-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2015/05/18 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2015/05/21 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2016/03/24 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2016/01/13 * 12
MHF-22	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCB	602	RE	2016/01/19 * 12
MCC-177	Microwave Cable	Junkosha	MMX221-00500D MSDMS	1502S304	RE	2016/03/10 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE/CE	2015/09/19 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE/CE	2016/01/21 * 12
MJM-25	Measure	KOMELON	KMC-36	-	RE/CE	-
MHA-01	Horn Antenna 18-26.5GHz	EMCO	3160-09	1266	RE	2015/06/06 * 12
MPA-01	Pre Amplifier	Agilent	8449B	3008A01671	RE	2016/02/26 * 12
MCC-165	Microwave Cable	Junkosha	MWX221	1203S213(1m) / 1311S166(5m)	RE	2015/11/10 * 12
MMM-03	Digital Tester	Fluke	FLUKE 26-3	78030621	RE	2015/08/19 * 12
MHA-29	Horn Antenna 26.5-40GHz	ETS LINDGREN	3160-10	00152399	RE	2015/09/04 * 12
MCC-54	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	RE	2016/03/18 * 12
MPA-22	Pre Amplifier	MITEQ, Inc	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 /1871328	RE	2015/09/03 * 12
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE/CE	2015/06/08 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2015/11/02 * 12
MLA-20	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-189	RE	2016/01/30 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2015/11/10 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2015/09/29 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2016/02/25 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2015/05/18 * 12
MLS-26	LISN(AMN)	Schwarzbeck	NSLK8127	8127-732	CE(EUT)	2015/07/17 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	-/01068(Switcher)	CE	2015/09/29 * 12
MAT-64	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MCC-170	Microwave Cable	Junkosha	MWX221	1409S493	AT	2016/03/11 * 12
MRENT-126	Spectrum Analyzer	KEYSIGHT	E4440A	MY46185516	AT	2015/07/31 * 12
MOTS-MATM	Antenna Terminal Measurement Software	UL Japan	-	-	AT	-

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