



RADIO TEST REPORT

Test Report No. : 11085654H-A-R1

Applicant : Panasonic Corporation of North America

Type of Equipment : Wireless LAN Module

Model No. : WJ-VR3004

FCC ID : ACJ9TAWJ-VR3004

**Test regulation : FCC Part 15 Subpart E: 2015
(Class II permissive change)**

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 11085654H-A. 11085654H-A is replaced with this report.

Date of test: April 22 to 24, 2016

Representative test engineer:

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Leader

Consumer Technology Division



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13-EM-F0429

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SECTION 1: Customer information

Company Name : Panasonic System Networks Co., Ltd.*
 Address : 1-62, 4-chome, Minoshima, Hakata-ku, Fukuoka 812-853 Japan
 Telephone Number : +81-50-3380-6162
 Facsimile Number : +81-92-477-1487
 Contact Person : Yukio Kaneko
 * Panasonic System Networks Co., Ltd. is on behalf of the applicant: Panasonic Corporation of North America.

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless LAN Module
 Model No. : WJ-VR3004
 Serial No. : Refer to Section 4, Clause 4.2
 Rating : DC10.5V
 Receipt Date of Sample : April 8, 2016
 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: WJ-VR3004 (referred to as the EUT in this report) is a Wireless LAN Module.

General Specification

Clock frequency(ies) in the system : 32.768kHz, 38.4MHz

Radio Specification

[WLAN (IEEE802.11a/b/g/n-20)]

Equipment Type	Transceiver	
Frequency of Operation	2412-2462MHz	W53: 5280-5320MHz W58: 5745-5825MHz *1)
Type of Modulation	DSSS, OFDM	OFDM
Antenna Type	Dual (Planar patch)	Dual (Inverted F)
Antenna connector type	Module side: Rectangular Coaxial Connector (SMT) Antenna side: RP-SMA	
Antenna Gain with cable loss	0.58dBi (2.4GHz)	-0.98dBi (5GHz)

[WLAN (IEEE802.11n-40)]

Equipment Type	Transceiver	
Frequency of Operation	2422-2452MHz	W53: 5310MHz W58: 5755-5795MHz *1)
Type of Modulation	OFDM	OFDM
Antenna Type	Dual (Planar patch)	Dual (Inverted F)
Antenna connector type	Module side: Rectangular Coaxial Connector (SMT) Antenna side: RP-SMA	
Antenna Gain with cable loss	0.58dBi (2.4GHz)	-0.98dBi (5GHz)

*1)W58 band is applied for this report.

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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
26 dB Emission Bandwidth	FCC: KDB Publication Number 789033	FCC: 15.407 (a) (1) (2) (3)	See data	N/A	Conducted
	IC: -	IC: -			
Maximum Conducted Output Power	FCC: KDB Publication Number 789033	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	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: ANSI C63.10-2013 KDB Publication Number 789033	FCC: 15.407 (b), 15.205 and 15.209	6.3 dB 374.667 MHz, QP, Hori/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.

FCC Part 15.31 (e)

The RF Module is constantly provided voltage (DC3.3/1.8V) through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique coupling/antenna connector (Module side: Rectangular Coaxial Connector (SMT), Antenna side: RP-SMA).

Therefore the equipment complies with the requirement of 15.203/212.

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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 $k=2$.
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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 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	4.9 dB	5.2 dB	4.9 dB	5.0 dB
Vertical	4.6 dB	5.9 dB	5.0 dB	5.0 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 test report has enough margin, more than the site margin.

3.5 Test Location

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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 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.

Mode	Remarks*
IEEE 802.11a (11a)	12 Mbps, PN9
IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 6, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 9, PN9
IEEE 802.11n SISO 40 MHz BW (11n-40)	MCS 5, PN9
IEEE 802.11n MIMO 40 MHz BW (11n-40)	MCS 13, PN9
*Transmitting duty was 100 % on all tests.	
*The worst antenna and condition was determined based on the test result of Maximum Conducted Output Power.	
*Power of the EUT was set by the software as follows; - Power settings: Antenna A: 11a,11n-20/40: 13dBm Antenna B: 11a: 14dBm, 11n-20/40: 15dBm - Software: Dut Wlan BT Labtool Version 1.0.8.1.6 *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.	

*The details of Operation mode(s)

Test Item	Operating Mode	Tested Antenna port	Tested Frequency
			Upper Band
99 % Occupied Bandwidth, 6 dB Bandwidth	11a Tx	A or B *3)	5745 MHz 5785 MHz 5825 MHz
	11n-20 Tx	A, B	5745 MHz 5785 MHz 5825 MHz
	11n-40 Tx	A, B	5755 MHz 5795 MHz
Maximum Conducted Output Power,	11a Tx	A, B	5745 MHz 5785 MHz 5825 MHz
	11n-20 Tx	A, B , A+B	5745 MHz 5785 MHz 5825 MHz
	11n-40 Tx	A, B , A+B	5755 MHz 5795 MHz
Maximum Power Spectral Density	11a Tx	A *3)	5745 MHz 5785 MHz 5825 MHz
	11n-20 Tx	A, B , A+B	5745 MHz 5785 MHz 5825 MHz
	11n-40 Tx	A, B , A+B	5755 MHz 5795 MHz
Radiated Spurious Emission (Above 1 GHz) *4)	11n-20 Tx *2)	A+B	5745 MHz 5785 MHz 5825 MHz
	11n-40 Tx	A+B	5755 MHz 5795 MHz
Radiated Spurious Emission (Below1 GHz) *1) Conducted Spurious Emission *1)	11n-40 Tx	B	5755 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test. *2) Since 11a and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power. *3) After the comparison between Antenna A and Antenna B, test was performed with the antenna that had higher power as a representative. *4) After the comparison MIMO and SISO in pre-check, test was performed with MIMO as a representative as it had worst case.			

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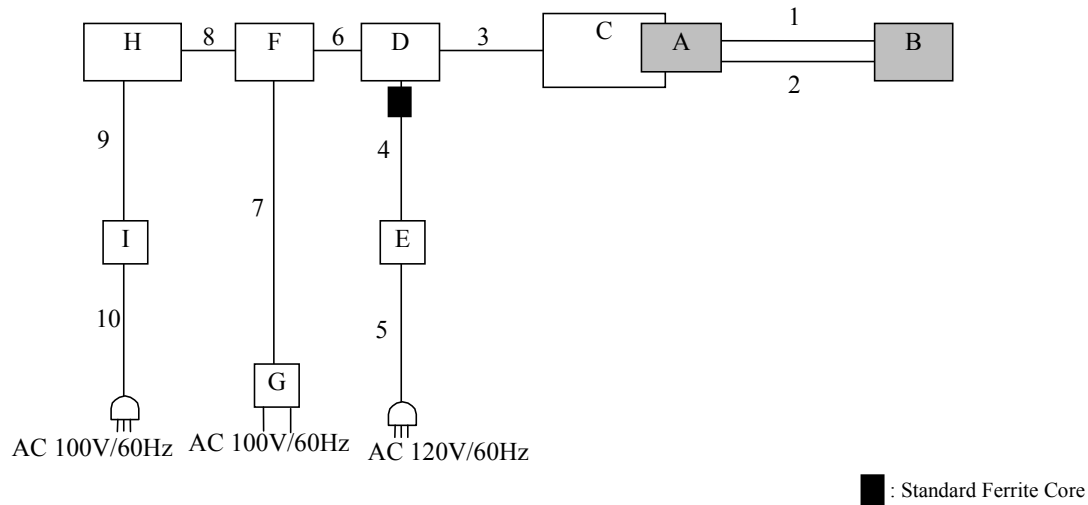
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4.2 Configuration and peripherals



* 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	Wireless LAN Module	WJ-VR3004	ES2-35	Panasonic System Networks Co., Ltd.	EUT
B	AP-Double WiFi Antenna	APP-WW	-	Antenna Plus LLC	EUT
C	Jig board	-	-	-	-
D	Laptop PC	CF-31	OJKSA31800	Panasonic System Networks Co., Ltd.	-
E	AC Adaptor	CF-AA1653A	04209776B	Panasonic System Networks Co., Ltd.	-
F	Switching HUB	CG-SW05GTPLW	1077580071000371	Corega	-
G	AC Adaptor	MU10-4033200-A1	-	Corega	-
H	Laptop PC	ProBook 6560P	1673609	HP	-
I	AC Adaptor	PPP009L-E	WBGST0A4L0U2 WT	HP	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	5.6	Shielded	Shielded	-
2	Antenna Cable	5.6	Shielded	Shielded	-
3	USB Cable	2.0	Shielded	Shielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	1.9	Unshielded	Unshielded	-
6	LAN Cable	1.0	Unshielded	Unshielded	-
7	DC Cable	1.8	Unshielded	Unshielded	-
8	LAN Cable	1.0	Unshielded	Unshielded	-
9	DC Cable	1.8	Unshielded	Unshielded	-
10	AC Cable	1.8	Unshielded	Unshielded	-

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SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< 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.

< 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 in FCC 16-24.

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.

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 If duty cycle was less than 98%, a duty factor was added to the results.
Test Distance	3 m	4.45 m*2) (1 GHz – 10GHz), 1 m*3) (10 GHz – 26.5 GHz), 0.5 m*4) (26.5 GHz – 40 GHz)	

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v01r02 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E (Issued on April 8, 2016)".

*2) Distance Factor: $20 \times \log (4.45 \text{ m}/3.0 \text{ m}) = 3.4 \text{ dB}$

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

*4) Distance Factor: $20 \times \log (0.5 \text{ m}/3.0 \text{ m}) = -15.6 \text{ dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT (Module and Antenna) 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
26 dB Bandwidth	Enough to capture the emission	Close to 1 % of EBW	> RBW	Auto	Peak	Max Hold	Spectrum Analyzer
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 Power Averaging (200 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*3)	9 kHz – 150 kHz 150 kHz – 30 MHz	200 Hz 9.1 kHz	620 Hz 27 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

* The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v01r02 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E (Issued on April 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 $10\log(500 \text{ kHz}/470 \text{ kHz})$ 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 not detected 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

26 dB Emission Bandwidth and 99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 42 % RH
Engineer	Ken Fujita
Mode	Tx

11a

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna A or B	5745	-	16.883	-
	5785	-	16.918	-
	5825	-	16.886	-

11n-20

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna A	5745	-	17.857	-
	5785	-	18.049	-
	5825	-	18.140	-
Antenna B	5745	-	18.635	-
	5785	-	18.492	-
	5825	-	18.354	-

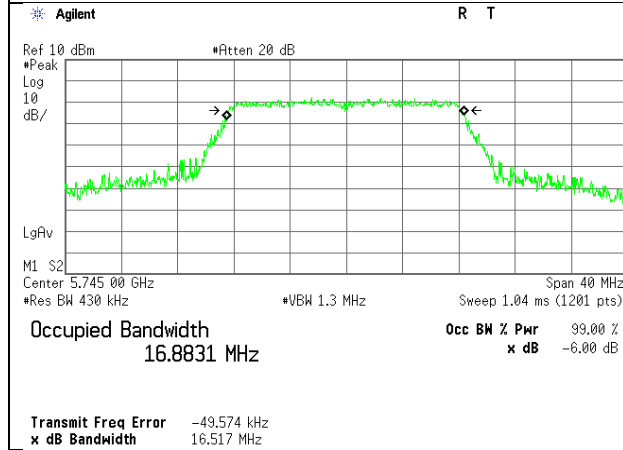
11n-40

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
Antenna A	5755	-	36.883	-
	5795	-	36.834	-
Antenna B	5755	-	40.848	-
	5795	-	40.364	-

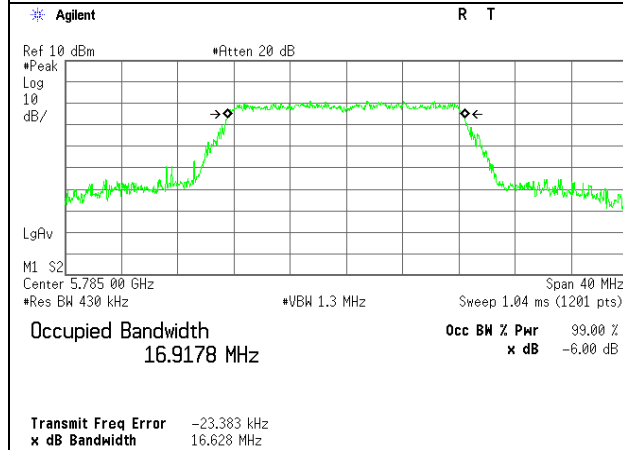
99 % Occupied Bandwidth

11a

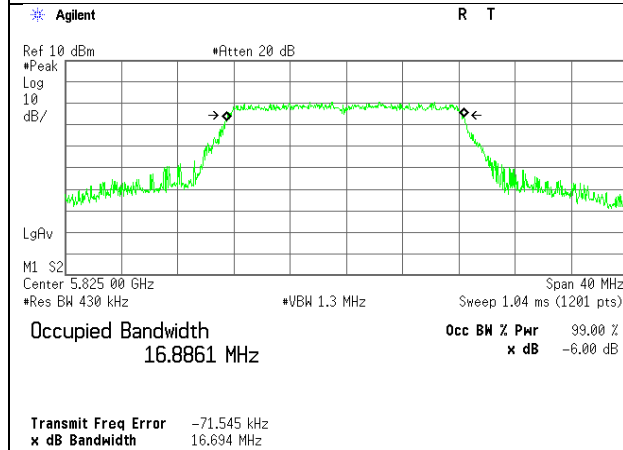
5745 MHz



5785 MHz

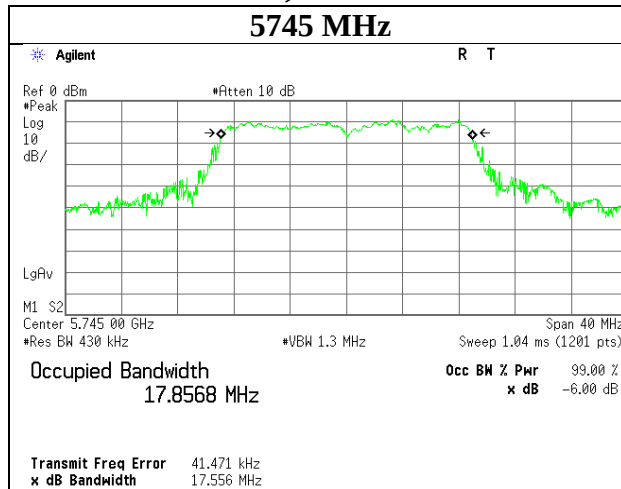


5825 MHz

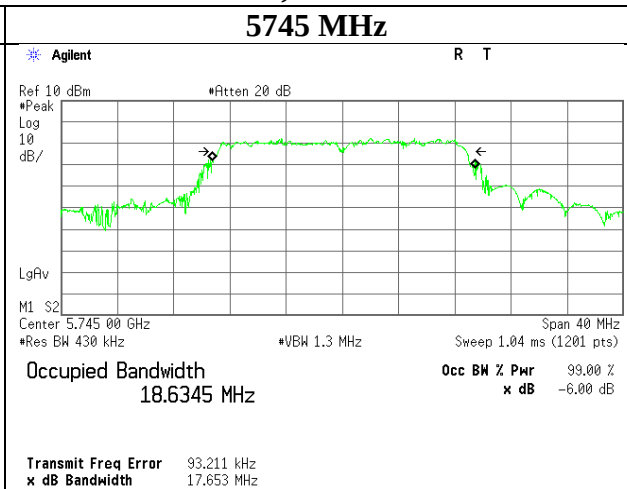


99 % Occupied Bandwidth

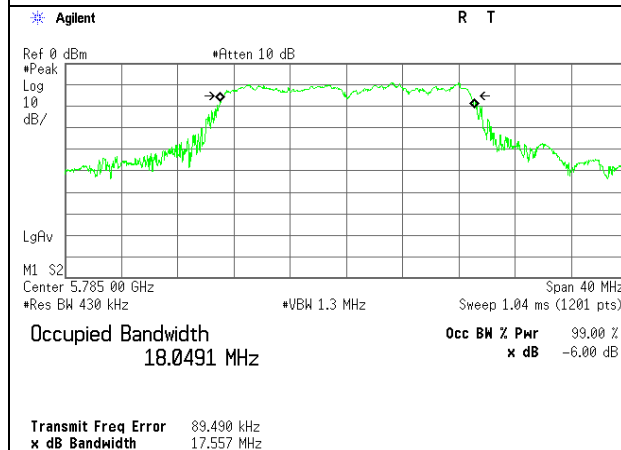
11n-20, Antenna A



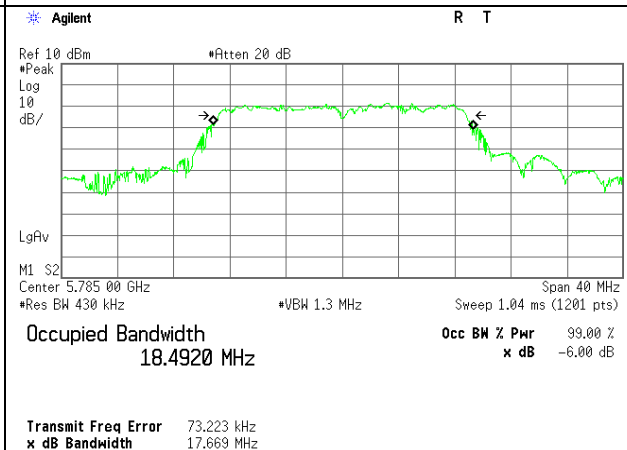
11n-20, Antenna B



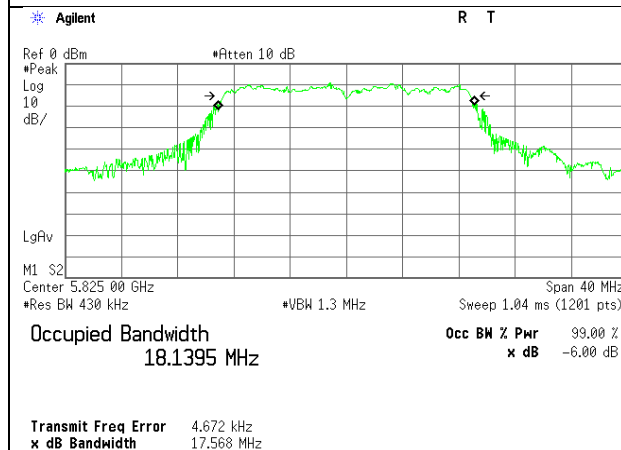
5785 MHz



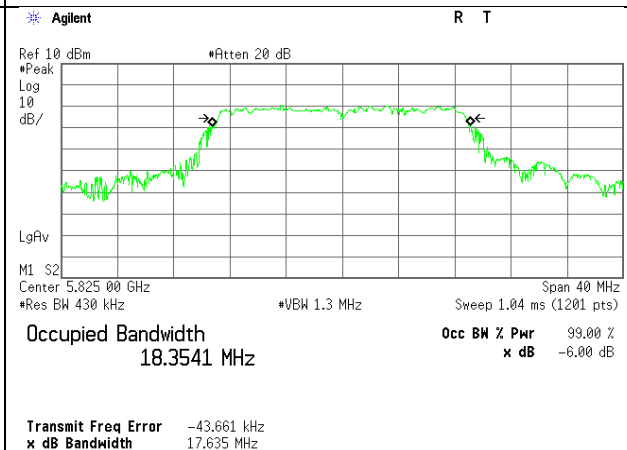
5785 MHz



5825 MHz



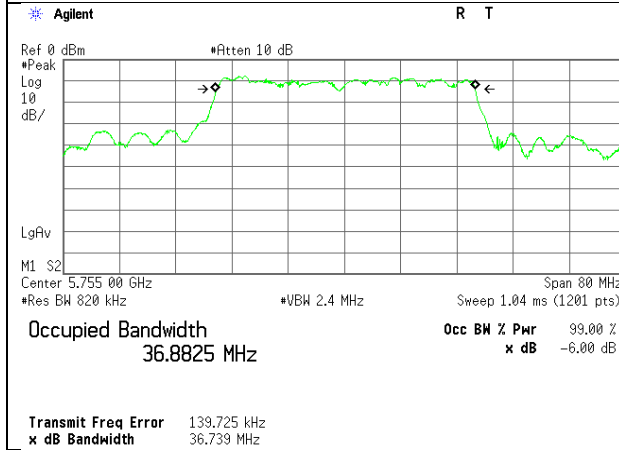
5825 MHz



99 % Occupied Bandwidth

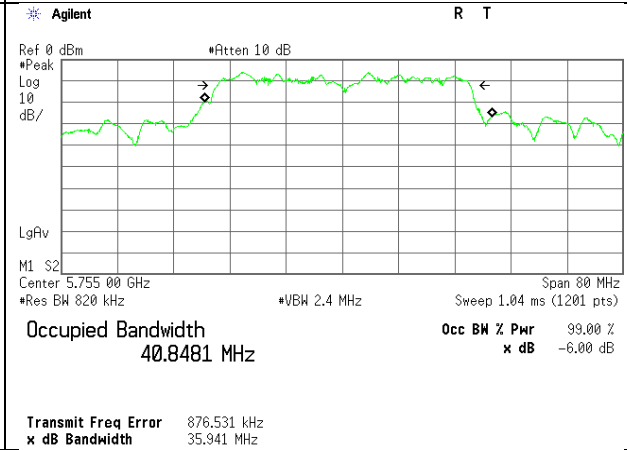
11n-40, Antenna A

5755 MHz

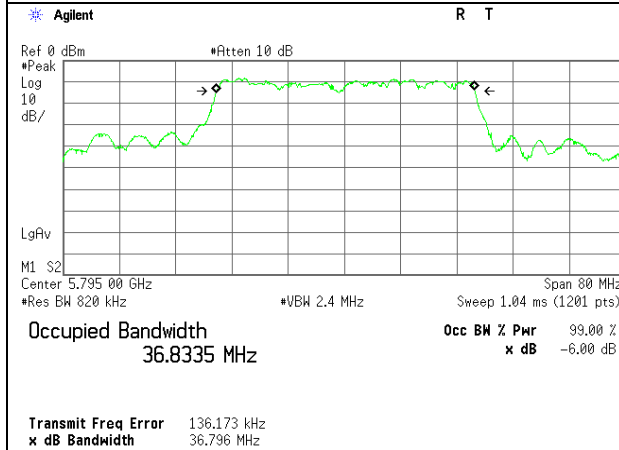


11n-40, Antenna B

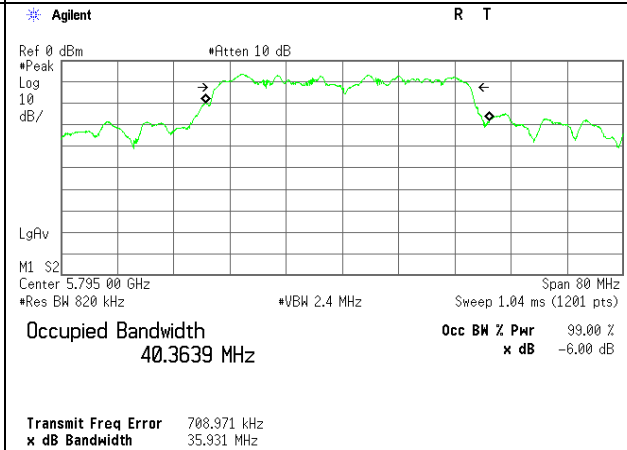
5755 MHz



5795 MHz



5795 MHz



6 dB Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 42 % RH
Engineer	Ken Fujita
Mode	Tx

11a

Antenna	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [kHz]
Antenna A or B	5745	16.427	> 500
	5785	16.420	> 500
	5825	16.377	> 500

11n-20

Antenna	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [kHz]
Antenna A	5745	16.453	> 500
	5785	16.197	> 500
	5825	15.810	> 500
Antenna B	5745	16.763	> 500
	5785	16.905	> 500
	5825	16.706	> 500

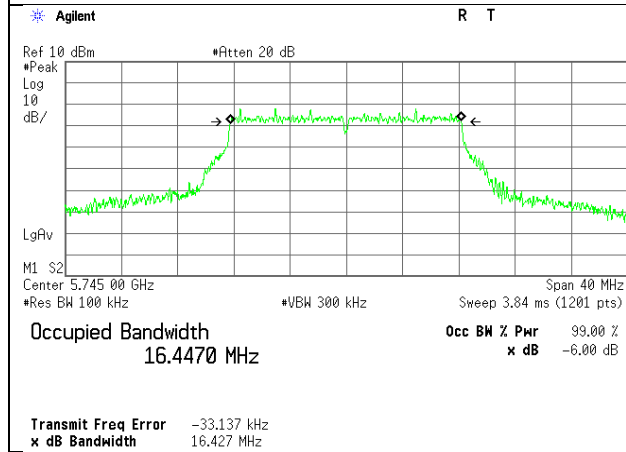
11n-40

Antenna	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [kHz]
Antenna A	5755	35.672	> 500
	5795	35.838	> 500
Antenna B	5755	35.884	> 500
	5795	35.784	> 500

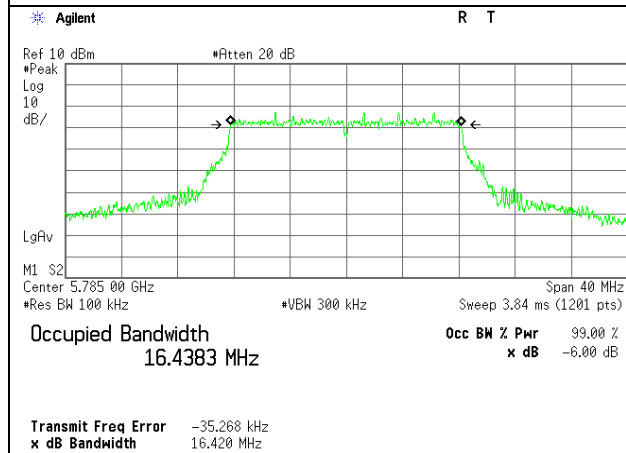
6 dB Bandwidth

11a

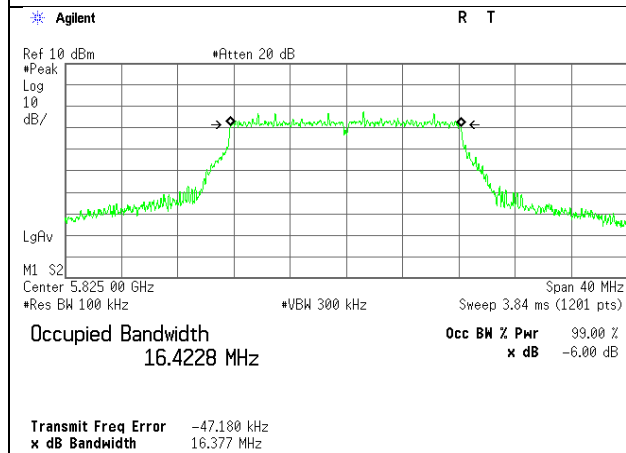
5745 MHz



5785 MHz



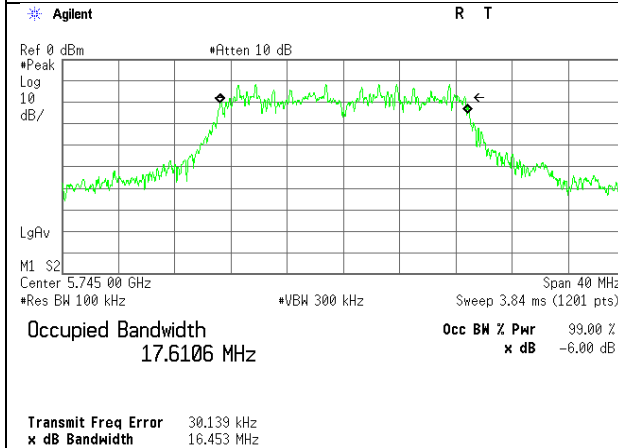
5825 MHz



6 dB Bandwidth

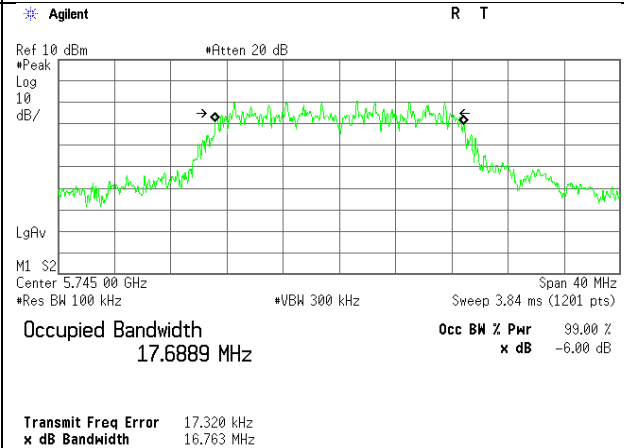
11n-20, Antenna A

5745 MHz

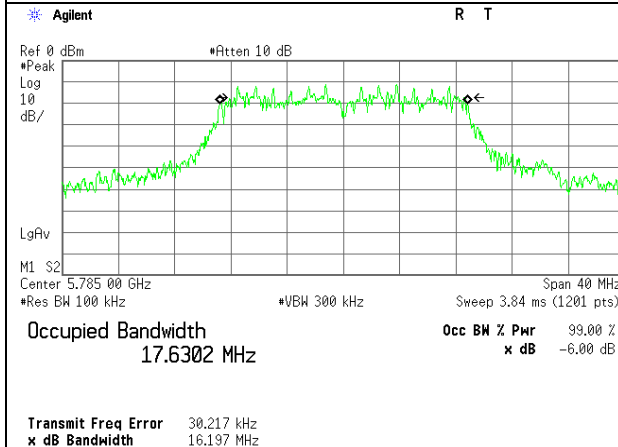


11n-20, Antenna B

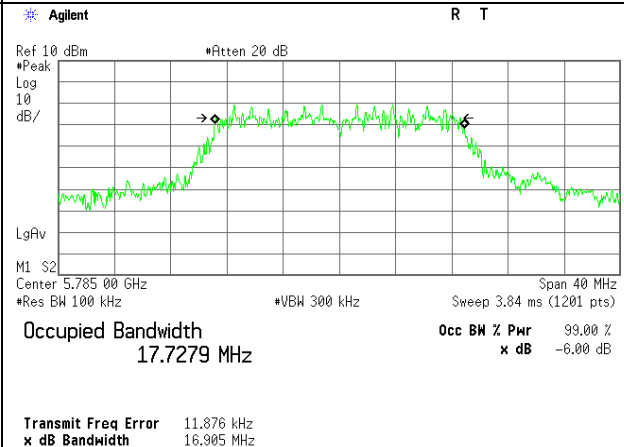
5745 MHz



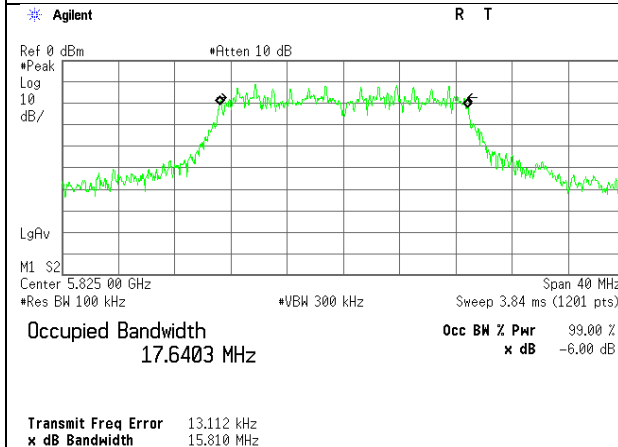
5785 MHz



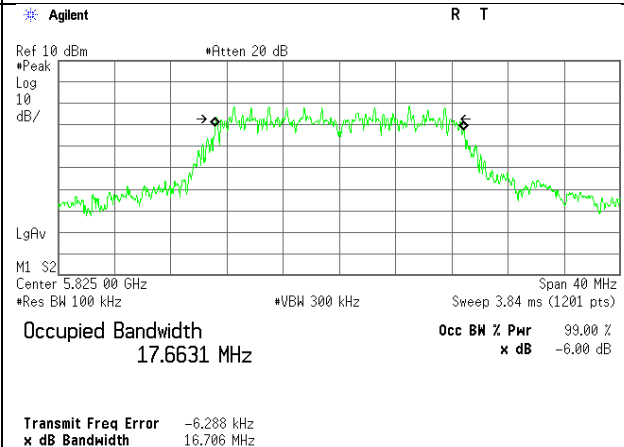
5785 MHz



5825 MHz



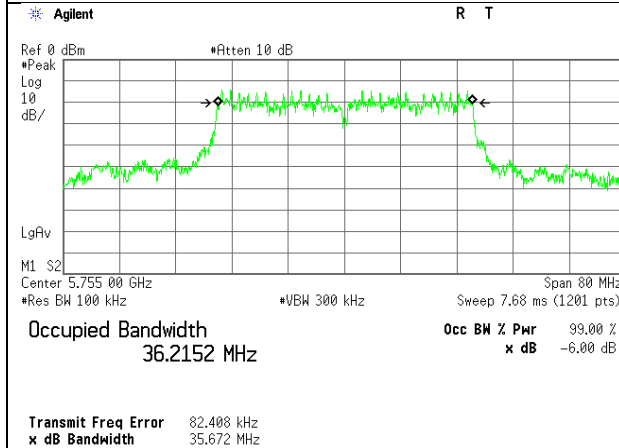
5825 MHz



6 dB Bandwidth

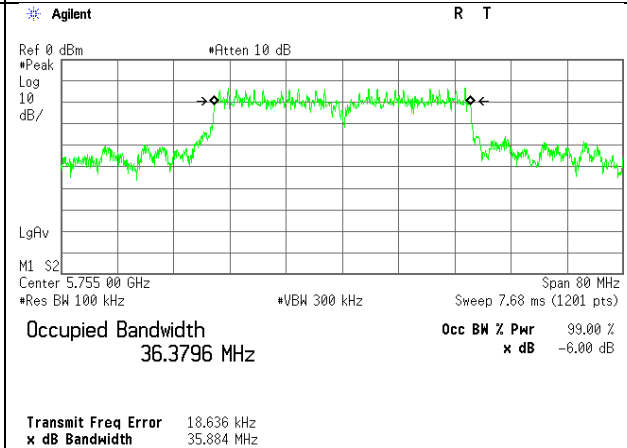
11n-40, Antenna A

5755 MHz

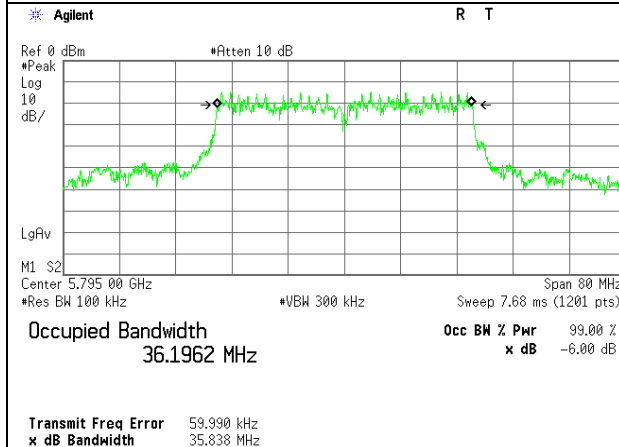


11n-40, Antenna B

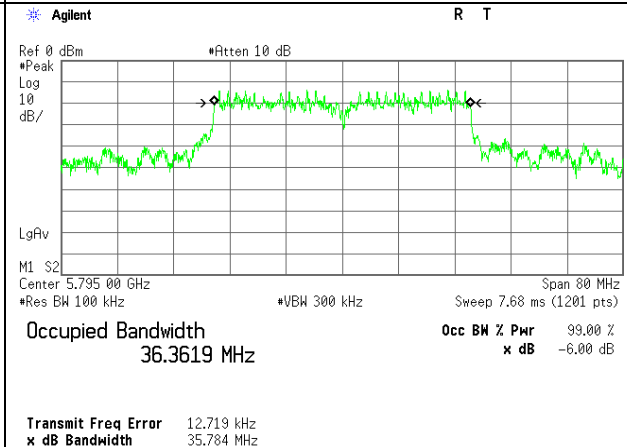
5755 MHz



5795 MHz



5795 MHz



Maximum Conducted Output Power

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11a

Antenna A

Applied limit: 15.407, access point

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Antenna Gain	26 dB EBW (B for FCC)	99% OBW (B for IC)	Conducted Power				e.i.r.p.			
							Result		Limit	Margin	Result		Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBi]	[MHz]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5745	-7.83	1.20	19.83	-0.98	-	-	13.20	20.89	30.00	16.80	12.22	16.67	36.00	23.78
5785	-9.30	1.20	19.83	-0.98	-	-	11.73	14.89	30.00	18.27	10.75	11.89	36.00	25.25
5825	-8.57	1.20	19.82	-0.98	-	-	12.45	17.58	30.00	17.55	11.47	14.03	36.00	24.53

Antenna B

Applied limit: 15.407, access point

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Antenna Gain	26 dB EBW (B for FCC)	99% OBW (B for IC)	Conducted Power				e.i.r.p.			
							Result		Limit	Margin	Result		Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBi]	[MHz]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5745	-8.00	1.20	19.73	-0.98	-	-	12.93	19.63	30.00	17.07	11.95	15.67	36.00	24.05
5785	-8.70	1.20	19.72	-0.98	-	-	12.22	16.67	30.00	17.78	11.24	13.30	36.00	24.76
5825	-9.50	1.20	19.72	-0.98	-	-	11.42	13.87	30.00	18.58	10.44	11.07	36.00	25.56

Sample Calculation:

Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

Maximum Conducted Output Power

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11n-20

Antenna A+B

Applied limit: 15.407, access point

Tested Frequency [MHz]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted power						e.i.r.p.					
			Antenna			Result [dBm]	Limit [dBm]	Margin [dB]	Antenna			Result [dBm]	Limit [dBm]	Margin [dB]
			A [mW]	B [mW]	Sum [mW]				A [mW]	B [mW]	Sum [mW]			
5745	-	-	14.96	18.32	33.29	15.22	30.00	14.78	11.94	14.62	26.56	14.24	36.00	21.76
5785	-	-	14.16	20.46	34.62	15.39	30.00	14.61	11.30	16.33	27.63	14.41	36.00	21.59
5825	-	-	14.35	17.86	32.22	15.08	30.00	14.92	11.46	14.26	25.71	14.10	36.00	21.90

Antenna A							Antenna B					
Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result		Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result	
					Cond. Power [dBm]	e.i.r.p. [dBm]					Cond. Power [dBm]	e.i.r.p. [dBm]
5745	-9.28	1.20	19.83	-0.98	11.75	10.77	-8.30	1.20	19.73	-0.98	12.63	11.65
5785	-9.52	1.20	19.83	-0.98	11.51	10.53	-7.81	1.20	19.72	-0.98	13.11	12.13
5825	-9.45	1.20	19.82	-0.98	11.57	10.59	-8.40	1.20	19.72	-0.98	12.52	11.54

Sample Calculation:

Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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Maximum Conducted Output Power

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11n-40

Antenna A+B

Applied limit: 15.407, access point

Tested Frequency [MHz]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted power						e.i.r.p.					
			Antenna			Result [dBm]	Limit [dBm]	Margin [dB]	Antenna			Result [dBm]	Limit [dBm]	Margin [dB]
			A [mW]	B [mW]	Sum [mW]				A [mW]	B [mW]	Sum [mW]			
5755	-	-	13.74	23.55	37.29	15.72	30.00	14.28	10.96	18.79	29.76	14.74	36.00	21.26
5795	-	-	14.16	20.89	35.05	15.45	30.00	14.55	11.30	16.67	27.97	14.47	36.00	21.53

Antenna A							Antenna B					
Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result		Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result	
					Cond. Power [dBm]	e.i.r.p. [dBm]					Cond. Power [dBm]	e.i.r.p. [dBm]
5755	-9.65	1.20	19.83	-0.98	11.38	10.40	-7.21	1.20	19.73	-0.98	13.72	12.74
5795	-9.51	1.20	19.82	-0.98	11.51	10.53	-7.72	1.20	19.72	-0.98	13.20	12.22

Sample Calculation:

Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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Ise EMC Lab.

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Maximum Conducted Output Power

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11a

11a 5785MHz

Method PM-G(Measurement using a Gated RF average power meter)

Mode	Rate Mbps	Reading AntA [dBm]	Reading AntB [dBm]	Remarks
11a	6	-10.43		
	9	-9.70		
	12	-9.30	-8.70	*
	18	-9.56		
	24	-9.70		
	36	-9.62		
	48	-9.47		
	54	-9.76		

Timed average

Mode	Rate Mbps	Reading AntA [dBm]	Reading AntB [dBm]	Remarks
11a	6	-10.43		
	9	-9.70		
	12	-9.30	-8.70	*
	18	-9.56		
	24	-9.70		
	36	-9.62		
	48	-9.47		
	54	-9.76		

* Worst rate

All comparison were carried out on same frequency and measurement factors.

Maximum Conducted Output Power

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11n-20

11n-20 5785MHz

Method PM-G(Measurement using a Gated RF average power meter)

Mode	MCS Number	Reading Antenna						Remarks
		A [dBm]	B [dBm]	A [mW]	B [mW]	A+B [mW]	A+B [dBm]	
11n	0	-9.78	-	-	-	-	-	
	1	-9.80	-	-	-	-	-	
	2	-10.01	-	-	-	-	-	
	3	-9.82	-	-	-	-	-	
	4	-9.74	-	-	-	-	-	
	5	-9.98	-	-	-	-	-	
	6	-9.52	-8.90	-	-	-	-	* 1 TX
	7	-9.92	-	-	-	-	-	
	8	-10.37	-9.52	0.092	0.112	0.204	-6.91	
	9	-9.98	-9.11	0.100	0.123	0.223	-6.51	* MIMO TX
	10	-10.02	-9.23	0.100	0.119	0.219	-6.60	
	11	-10.10	-9.34	0.098	0.116	0.214	-6.69	
	12	-10.23	-9.41	0.095	0.115	0.209	-6.79	
	13	-10.41	-9.53	0.091	0.111	0.202	-6.94	
	14	-10.34	-9.42	0.092	0.114	0.207	-6.85	
	15	-10.21	-9.36	0.095	0.116	0.211	-6.75	

Timed average

Mode	MCS Number	Reading Antenna						Remarks
		A [dBm]	B [dBm]	A [mW]	B [mW]	A+B [mW]	A+B [dBm]	
11n	0	-9.78	-	-	-	-	-	
	1	-9.80	-	-	-	-	-	
	2	-10.01	-	-	-	-	-	
	3	-9.82	-	-	-	-	-	
	4	-9.74	-	-	-	-	-	
	5	-9.98	-	-	-	-	-	
	6	-9.52	-8.90	-	-	-	-	* 1 TX
	7	-9.92	-	-	-	-	-	
	8	-10.37	-9.52	0.092	0.112	0.204	-6.91	
	9	-9.98	-9.11	0.100	0.123	0.223	-6.51	* MIMO TX
	10	-10.02	-9.23	0.100	0.119	0.219	-6.60	
	11	-10.10	-9.34	0.098	0.116	0.214	-6.69	
	12	-10.23	-9.41	0.095	0.115	0.209	-6.79	
	13	-10.41	-9.53	0.091	0.111	0.202	-6.94	
	14	-10.34	-9.42	0.092	0.114	0.207	-6.85	
	15	-10.21	-9.36	0.095	0.116	0.211	-6.75	

* Worst rate

All comparison were carried out on same frequency and measurement factors.

Maximum Conducted Output Power

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11n-40

11n-40 5795MHz

Method PM-G(Measurement using a Gated RF average power meter)

Mode	MCS Number	Reading Antenna						Remarks
		A [dBm]	B [dBm]	A [mW]	B [mW]	A+B [mW]	A+B [dBm]	
11n	0	-9.52	-	-	-	-	-	
	1	-9.32	-	-	-	-	-	
	2	-9.46	-	-	-	-	-	
	3	-9.25	-	-	-	-	-	
	4	-9.14	-	-	-	-	-	
	5	-8.61	-7.80	-	-	-	-	* 1 TX
	6	-8.68	-	-	-	-	-	
	7	-8.95	-	-	-	-	-	
	8	-10.10	-9.70	0.098	0.107	0.205	-6.89	
	9	-10.20	-9.50	0.095	0.112	0.208	-6.83	
	10	-9.80	-9.10	0.105	0.123	0.228	-6.43	
	11	-9.39	-9.20	0.115	0.120	0.235	-6.28	
	12	-9.83	-9.20	0.104	0.120	0.224	-6.49	
	13	-9.51	-8.90	0.112	0.129	0.241	-6.18	* MIMO TX
	14	-9.76	-9.20	0.106	0.120	0.226	-6.46	
	15	-9.70	-9.20	0.107	0.120	0.227	-6.43	

Timed average

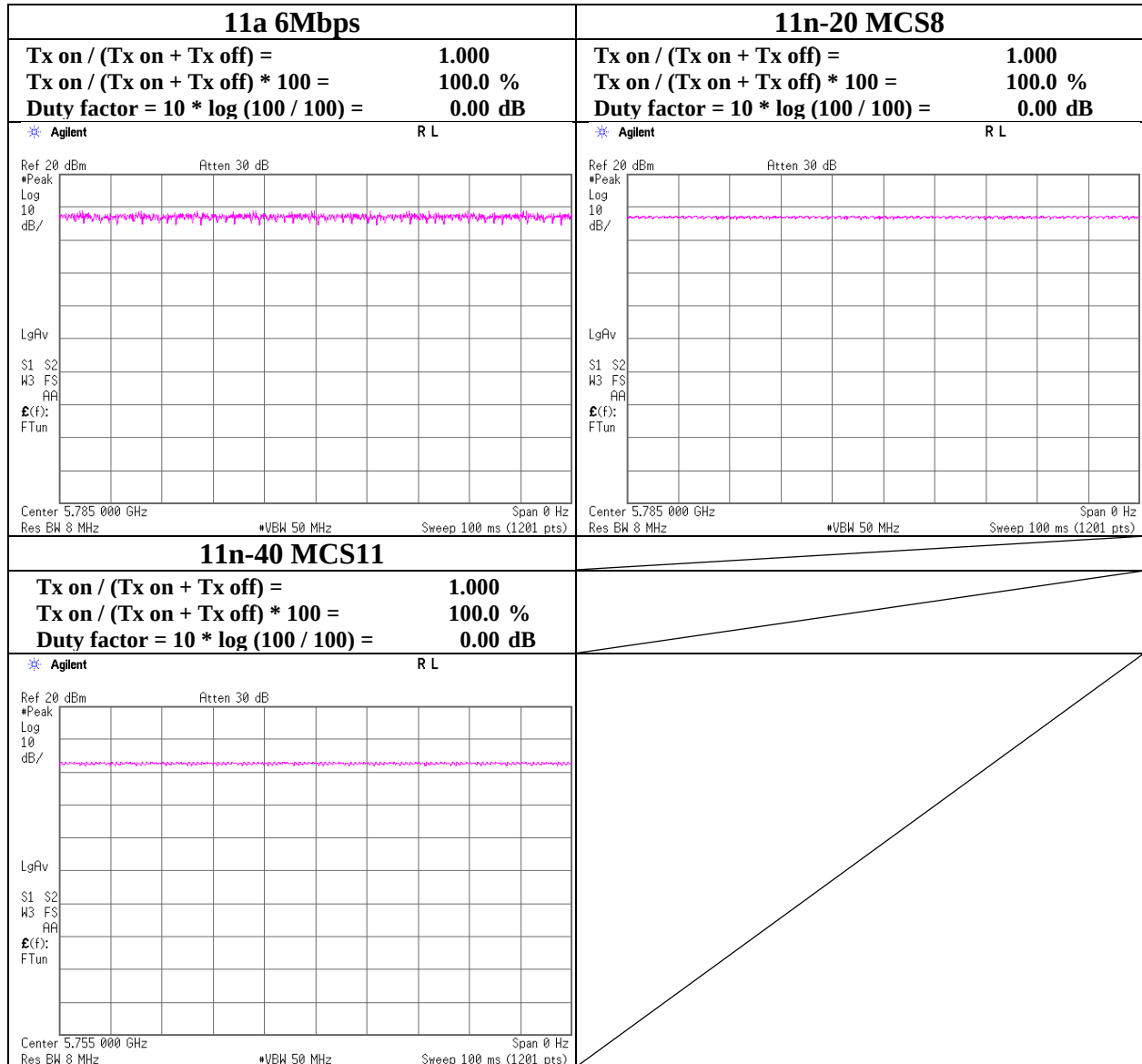
Mode	MCS Number	Reading Antenna						Remarks
		A [dBm]	B [dBm]	A [mW]	B [mW]	A+B [mW]	A+B [dBm]	
11n	0	-9.52	-	-	-	-	-	
	1	-9.32	-	-	-	-	-	
	2	-9.46	-	-	-	-	-	
	3	-9.25	-	-	-	-	-	
	4	-9.14	-	-	-	-	-	
	5	-8.61	-7.80	-	-	-	-	* 1 TX
	6	-8.68	-	-	-	-	-	
	7	-8.95	-	-	-	-	-	
	8	-10.10	-9.70	0.098	0.107	0.205	-6.89	
	9	-10.20	-9.50	0.095	0.112	0.208	-6.83	
	10	-9.80	-9.10	0.105	0.123	0.228	-6.43	
	11	-9.39	-9.20	0.115	0.120	0.235	-6.28	
	12	-9.83	-9.20	0.104	0.120	0.224	-6.49	
	13	-9.51	-8.90	0.112	0.129	0.241	-6.18	* MIMO TX
	14	-9.76	-9.20	0.106	0.120	0.226	-6.46	
	15	-9.70	-9.20	0.107	0.120	0.227	-6.43	

* Worst rate

All comparison were carried out on same frequency and measurement factors.

Burst rate confirmation

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx



Maximum Power Spectral Density

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11a

Antenna A

Applied limit 15.407, access point

Tested Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5745	-14.60	1.20	19.73	-0.98	0.27	6.59	30.00	23.41	5.61	36.00	30.39
5785	-15.47	1.20	19.72	-0.98	0.27	5.72	30.00	24.28	4.74	36.00	31.26
5825	-16.00	1.20	19.72	-0.98	0.27	5.19	30.00	24.81	4.21	36.00	31.79

Sample Calculation:

PSD: Power Spectral Density

The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.

RBW Correction Factor = $10 * \log(\text{Specified bandwidth} / \text{Measured bandwidth})$

PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + RBW Correction Factor

PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for IC)

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Maximum Power Spectral Density

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11n-20

Antenna A+B

Applied limit 15.407, access point

Tested Frequency [MHz]	PSD (Conducted)						PSD (e.i.r.p.)					
	Antenna A [mW/MHz]	Antenna B [mW/MHz]	Sum [mW/MHz]	Result [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]	Antenna A [mW/MHz]	Antenna B [mW/MHz]	Sum [mW/MHz]	Result [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5745	5.14	7.54	12.68	11.03	30.00	18.97	4.10	6.02	10.12	10.05	36.00	25.95
5785	5.40	6.58	11.98	10.78	30.00	19.22	4.31	5.25	9.56	9.80	36.00	26.20
5825	4.76	4.82	9.58	9.82	30.00	20.18	3.80	3.85	7.65	8.84	36.00	27.16

Antenna A								Antenna B						
Tested Frequency [MHz]	Duty Factor [dB]	RBW Correction Factor [dB]	PSD Reading [dBm/MHz]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	PSD Result Cond. [dBm/MHz]	PSD Result e.i.r.p. [dBm/MHz]	PSD Reading [dBm/MHz]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	PSD Result Cond. [dBm/MHz]	PSD Result e.i.r.p. [dBm/MHz]
5745	0.00	0.27	-14.09	1.20	19.73	-0.98	7.11	6.13	-12.43	1.20	19.73	-0.98	8.77	7.79
5785	0.00	0.27	-13.87	1.20	19.72	-0.98	7.32	6.34	-13.00	1.20	19.72	-0.98	8.18	7.20
5825	0.00	0.27	-14.41	1.20	19.72	-0.98	6.78	5.80	-14.36	1.20	19.72	-0.98	6.83	5.85

Sample Calculation:

PSD: Power Spectral Density

The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.

RBW Correction Factor = $10 * \log(\text{Specified bandwidth} / \text{Measured bandwidth})$

PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor

PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for IC)

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Facsimile : +81 596 24 8124

Maximum Power Spectral Density

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11n-40

Antenna A+B							Applied limit 15.407, access point					
Tested Frequency [MHz]	PSD (Conducted)						PSD (e.i.r.p.)					
	Antenna			Result	Limit	Margin	Antenna			Result	Limit	Margin
	A	B	Sum				A	B	Sum			
	[mW/MHz]	[mW/MHz]	[mW/MHz]	[dBm/MHz]	[dBm/MHz]	[dB]	[mW/MHz]	[mW/MHz]	[mW/MHz]	[dBm/MHz]	[dBm/MHz]	[dB]
5755	3.38	4.42	7.79	8.92	30.00	21.08	2.69	3.53	6.22	7.94	36.00	28.06
5795	3.11	4.12	7.23	8.59	30.00	21.41	2.48	3.29	5.77	7.61	36.00	28.39

Antenna A								Antenna B						
Tested Frequency	Duty Factor	RBW Correction Factor	PSD Reading	Cable Loss	Atten. Loss	Antenna Gain	PSD Result	PSD Reading	Cable Loss	Atten. Loss	Antenna Gain	PSD Result	PSD Reading	PSD Result
[MHz]	[dB]	[dB]	[dBm/MHz]	[dB]	[dB]	[dBi]	[dBm/MHz]	[dBm/MHz]	[dB]	[dB]	[dBi]	[dBm/MHz]	[dBm/MHz]	[dBm/MHz]
5755	0.00	0.27	-15.90	1.20	19.72	-0.98	5.28	4.30	-14.74	1.20	19.72	-0.98	6.45	5.47
5795	0.00	0.27	-16.26	1.20	19.72	-0.98	4.93	3.95	-15.04	1.20	19.72	-0.98	6.15	5.17

Sample Calculation:

PSD: Power Spectral Density

The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.

RBW Correction Factor = $10 * \log(\text{Specified bandwidth} / \text{Measured bandwidth})$

PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor

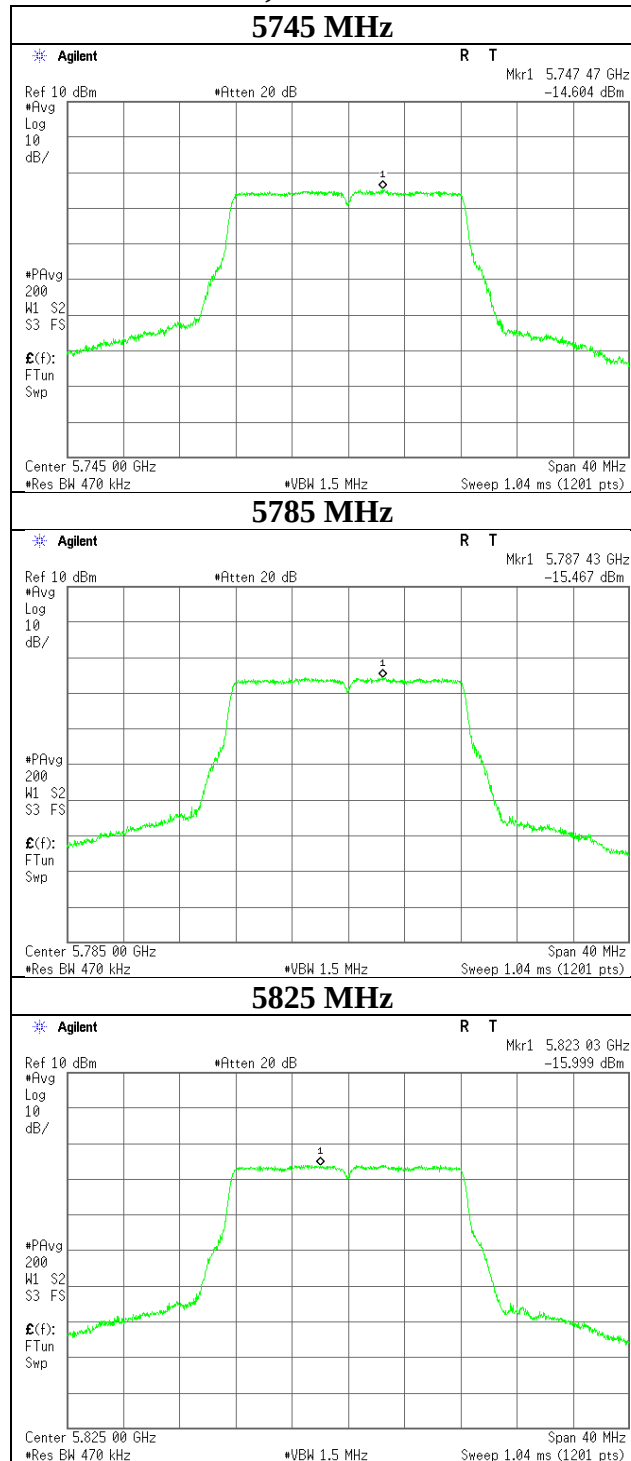
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for IC)

Maximum Power Spectral Density

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11a

11a, Antenna A



UL Japan, Inc.

Ise EMC Lab.

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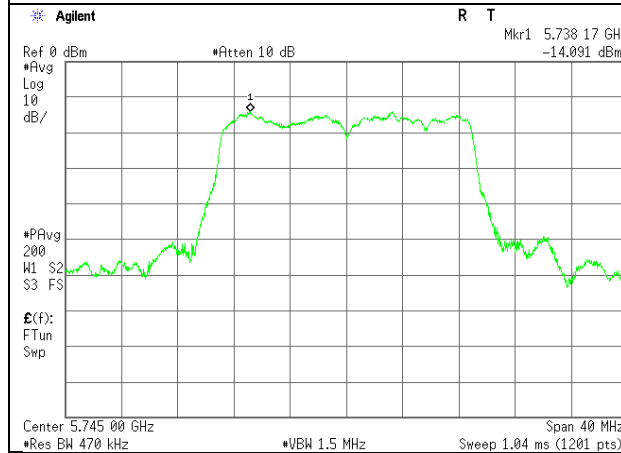
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Maximum Power Spectral Density

Test place	Ise EMC Lab. No.6 Shielded Room
Report No.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 40 % RH
Engineer	Ken Fujita
Mode	Tx 11n-20

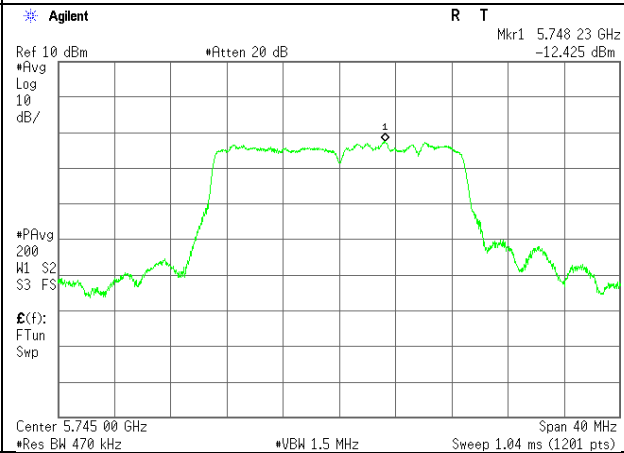
11n20, Antenna A

5745 MHz

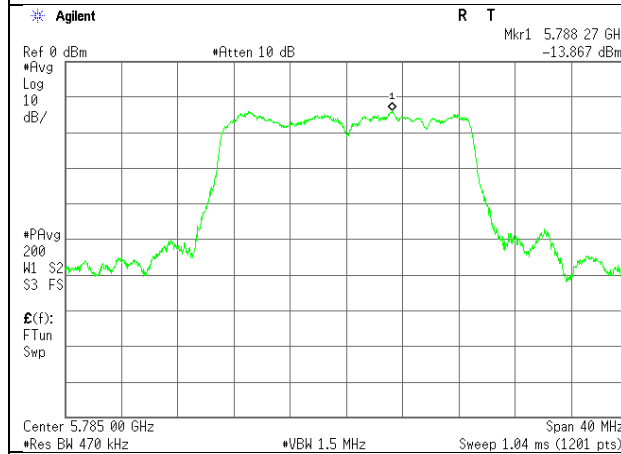


11n20, Antenna B

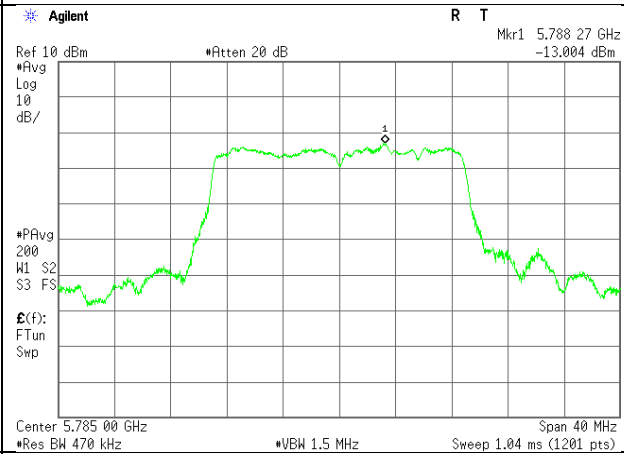
5745 MHz



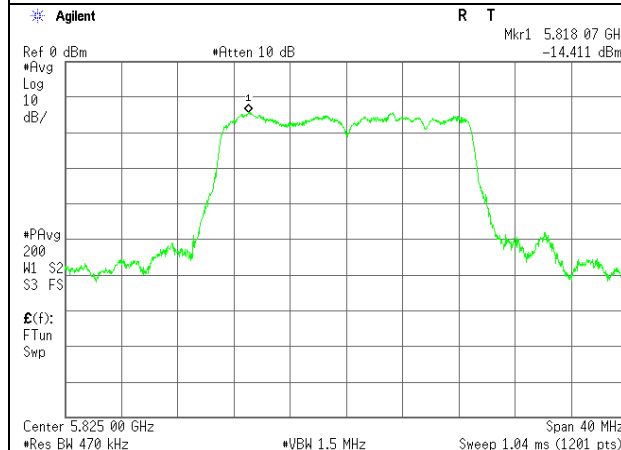
5785 MHz



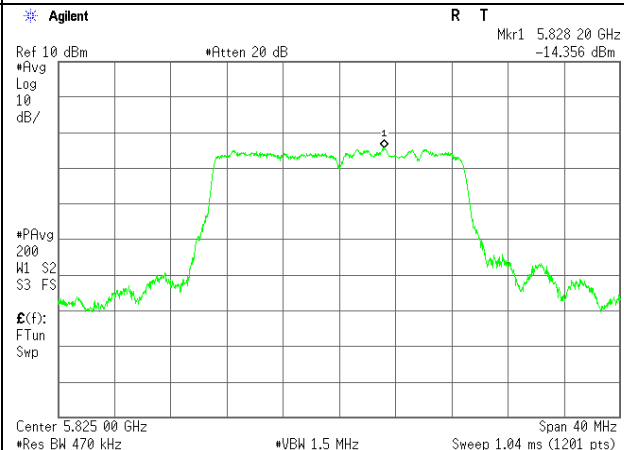
5785 MHz



5825 MHz



5825 MHz



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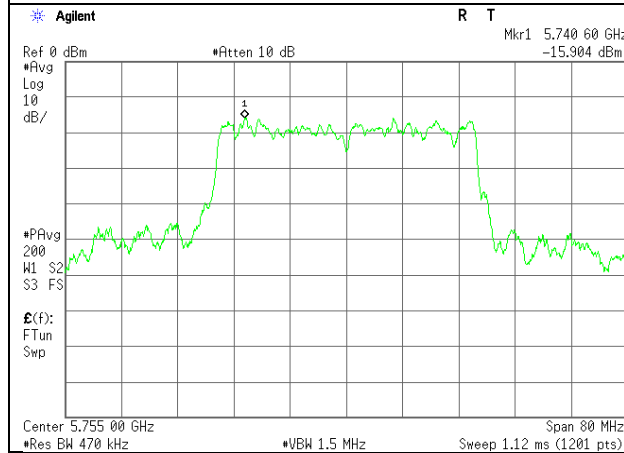
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Maximum Power Spectral Density

Test place : Ise EMC Lab. No.6 Shielded Room
Report No. : 11085654H
Date : April 22, 2016
Temperature / Humidity : 23deg. C / 40 % RH
Engineer : Ken Fujita
Mode : Tx 11ac-40

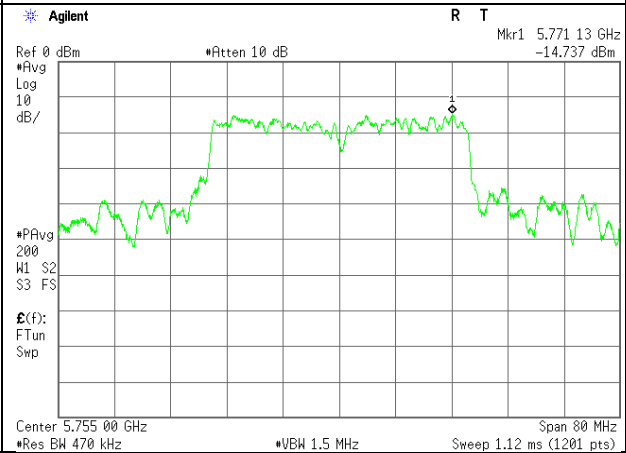
11n40, Antenna A

5755 MHz

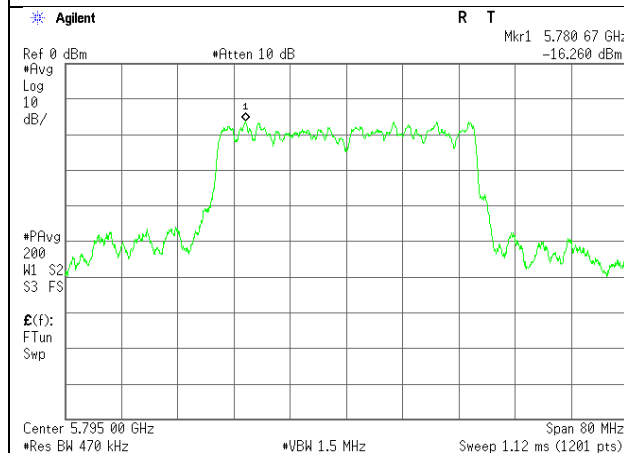


11n40, Antenna B

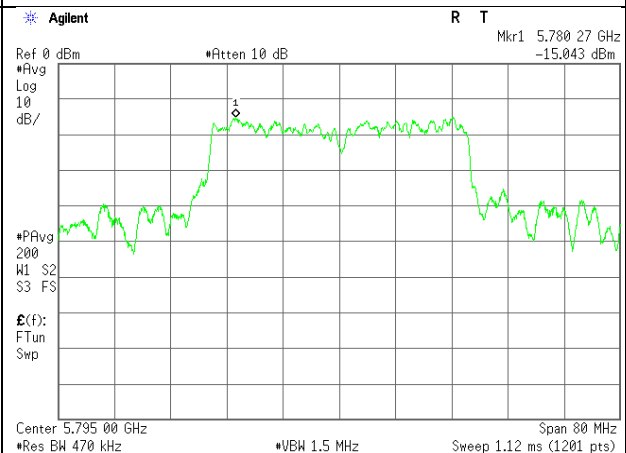
5755 MHz



5795 MHz



5795 MHz



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Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11085654H
Date	April 23, 2016 April 24, 2016
Temperature / Humidity	23deg. C / 53 % RH 23deg. C / 51 % RH
Engineer	Takumi Shimada Ken Fujita
	(1 GHz-10 GHz) (10 GHz-40 GHz)
Mode	Tx 11n-20 5745 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	5650.000	PK	41.3	32.4	7.5	31.8	-	49.4	68.2	18.8	
Hori	5700.000	PK	41.4	32.5	7.5	31.8	-	49.6	105.2	55.6	
Hori	5720.000	PK	52.5	32.6	7.6	31.8	-	60.9	110.8	49.9	
Hori	5725.000	PK	60.6	32.6	7.6	31.8	-	69.0	122.2	53.2	
Hori	11490.000	PK	42.0	41.0	-1.7	33.4	-	47.9	73.9	26.0	Floor Noise
Hori	17235.000	PK	42.2	42.4	-0.1	32.7	-	51.8	73.9	22.1	Floor Noise
Hori	22980.000	PK	44.1	37.9	-0.8	32.3	-	48.9	73.9	25.0	Floor Noise
Hori	11490.000	AV	33.3	41.0	-1.7	33.4	-	39.2	53.9	14.7	Floor Noise
Hori	17235.000	AV	33.0	42.4	-0.1	32.7	-	42.6	53.9	11.3	Floor Noise
Hori	22980.000	AV	35.2	37.9	-0.8	32.3	-	40.0	53.9	13.9	Floor Noise
Vert	5650.000	PK	41.8	32.4	7.5	31.8	-	49.9	68.2	18.3	
Vert	5700.000	PK	41.3	32.5	7.5	31.8	-	49.5	105.2	55.7	
Vert	5720.000	PK	50.3	32.6	7.6	31.8	-	58.7	110.8	52.1	
Vert	5725.000	PK	55.4	32.6	7.6	31.8	-	63.8	122.2	58.4	
Vert	11490.000	PK	42.8	41.0	-1.7	33.4	-	48.7	73.9	25.2	Floor Noise
Vert	17235.000	PK	41.6	42.4	-0.1	32.7	-	51.2	73.9	22.7	Floor Noise
Vert	22980.000	PK	44.0	37.9	-0.8	32.3	-	48.8	73.9	25.1	Floor Noise
Vert	11490.000	AV	33.2	41.0	-1.7	33.4	-	39.1	53.9	14.8	Floor Noise
Vert	17235.000	AV	33.3	42.4	-0.1	32.7	-	42.9	53.9	11.0	Floor Noise
Vert	22980.000	AV	34.8	37.9	-0.8	32.3	-	39.6	53.9	14.3	Floor Noise

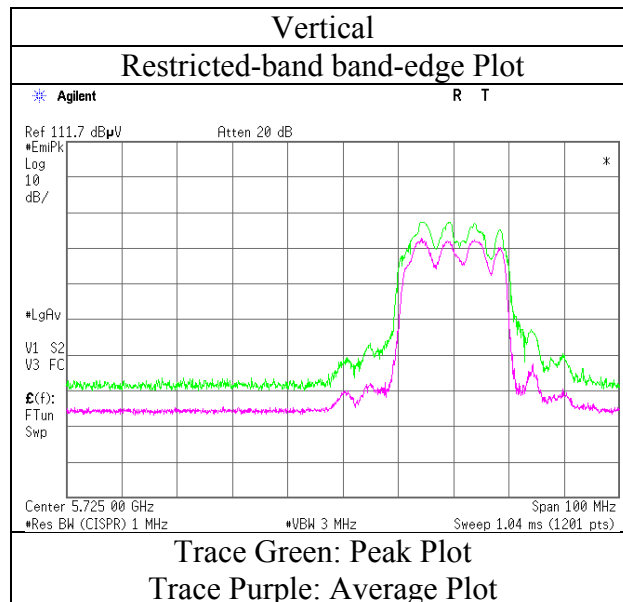
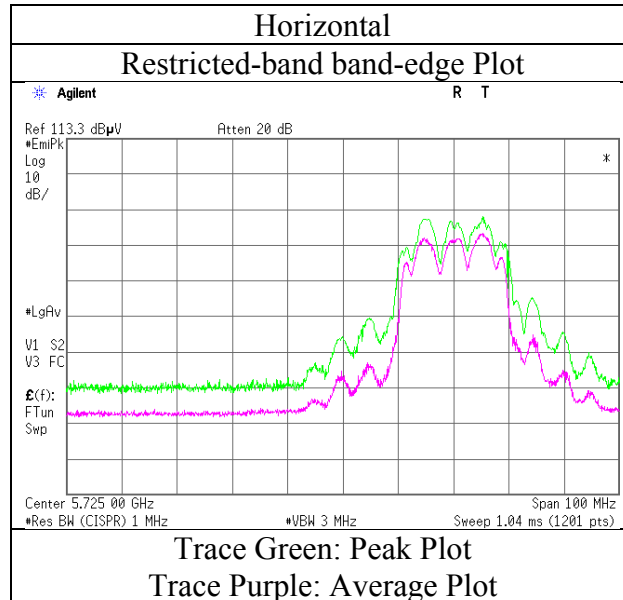
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor:	1GHz-10GHz	20log(4.45m/3.0m)= 3.4dB
	10GHz-26.5GHz	20log(1.0m/3.0m)= -9.5dB
	26.5GHz-40GHz	20log(0.5m/3.0m)= -15.6dB

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11085654H
Date : April 23, 2016
Temperature / Humidity : 23deg. C / 53 % RH
Engineer : Takumi Shimada
Mode : Tx 11n-20 5745 MHz



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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11085654H
Date	April 23, 2016 April 24, 2016
Temperature / Humidity	23deg. C / 53 % RH 23deg. C / 51 % RH
Engineer	Takumi Shimada Ken Fujita
	(1 GHz-10 GHz) (10 GHz-40 GHz)
Mode	Tx 11n-20 5785 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	11570.000	PK	41.8	40.9	-1.7	33.4	-	47.6	73.9	26.3	Floor Noise
Hori	17355.000	PK	41.9	42.9	0.0	32.7	-	52.1	73.9	21.8	Floor Noise
Hori	23140.000	PK	43.6	37.9	-0.7	32.3	-	48.5	73.9	25.4	Floor Noise
Hori	11570.000	AV	33.3	40.9	-1.7	33.4	-	39.1	53.9	14.8	Floor Noise
Hori	17355.000	AV	34.0	42.9	0.0	32.7	-	44.2	53.9	9.7	Floor Noise
Hori	23140.000	AV	34.9	37.9	-0.7	32.3	-	39.8	53.9	14.1	Floor Noise
Vert	11570.000	PK	41.7	40.9	-1.7	33.4	-	47.5	73.9	26.4	Floor Noise
Vert	17355.000	PK	42.7	42.9	0.0	32.7	-	52.9	73.9	21.0	Floor Noise
Vert	23140.000	PK	43.1	37.9	-0.7	32.3	-	48.0	73.9	25.9	Floor Noise
Vert	11570.000	AV	33.2	40.9	-1.7	33.4	-	39.0	53.9	14.9	Floor Noise
Vert	17355.000	AV	34.0	42.9	0.0	32.7	-	44.2	53.9	9.7	Floor Noise
Vert	23140.000	AV	34.4	37.9	-0.7	32.3	-	39.3	53.9	14.6	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 20dB).

Distance factor:	1GHz-10GHz	20log(4.45m/3.0m)= 3.4dB
	10GHz-26.5GHz	20log(1.0m/3.0m)= -9.5dB
	26.5GHz-40GHz	20log(0.5m/3.0m)= -15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11085654H
Date	April 23, 2016 April 24, 2016
Temperature / Humidity	23deg. C / 53 % RH 23deg. C / 51 % RH
Engineer	Takumi Shimada Ken Fujita
	(1 GHz-10 GHz) (10 GHz-40 GHz)
Mode	Tx 11n-20 5825 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	5850.000	PK	47.8	32.8	7.6	31.8	-	56.4	122.2	65.8	
Hori	5855.000	PK	42.0	32.8	7.6	31.8	-	50.6	110.8	60.2	
Hori	5875.000	PK	41.0	32.8	7.6	31.8	-	49.6	105.2	55.6	
Hori	5925.000	PK	41.2	32.9	7.6	31.8	-	49.9	68.2	18.3	
Hori	11650.000	PK	42.6	40.8	-1.5	33.4	-	48.5	73.9	25.4	Floor Noise
Hori	17475.000	PK	42.1	43.4	0.2	32.7	-	53.0	73.9	20.9	Floor Noise
Hori	23300.000	PK	43.2	37.8	-0.7	32.2	-	48.1	73.9	25.8	Floor Noise
Hori	11650.000	AV	34.3	40.8	-1.5	33.4	-	40.2	53.9	13.7	Floor Noise
Hori	17475.000	AV	33.8	43.4	0.2	32.7	-	44.7	53.9	9.2	Floor Noise
Hori	23300.000	AV	34.1	37.8	-0.7	32.2	-	39.0	53.9	14.9	Floor Noise
Vert	5850.000	PK	47.3	32.8	7.6	31.8	-	55.9	122.2	66.3	
Vert	5855.000	PK	41.7	32.8	7.6	31.8	-	50.3	110.8	60.5	
Vert	5875.000	PK	41.0	32.8	7.6	31.8	-	49.6	105.2	55.6	
Vert	5925.000	PK	40.3	32.9	7.6	31.8	-	49.0	68.2	19.2	
Vert	11650.000	PK	42.6	40.8	-1.5	33.4	-	48.5	73.9	25.4	Floor Noise
Vert	17475.000	PK	42.1	43.4	0.2	32.7	-	53.0	73.9	20.9	Floor Noise
Vert	23300.000	PK	43.6	37.8	-0.7	32.2	-	48.5	73.9	25.4	Floor Noise
Vert	11650.000	AV	34.0	40.8	-1.5	33.4	-	39.9	73.9	34.0	Floor Noise
Vert	17475.000	AV	33.9	43.4	0.2	32.7	-	44.8	53.9	9.1	Floor Noise
Vert	23300.000	AV	34.8	37.8	-0.7	32.2	-	39.7	53.9	14.2	Floor Noise

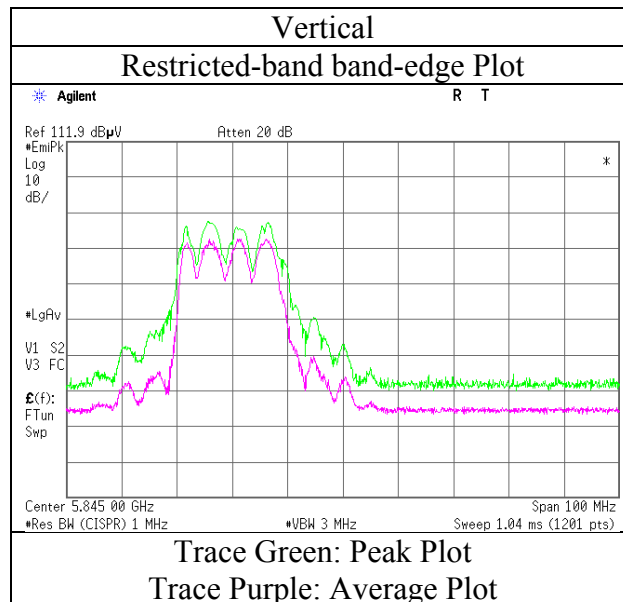
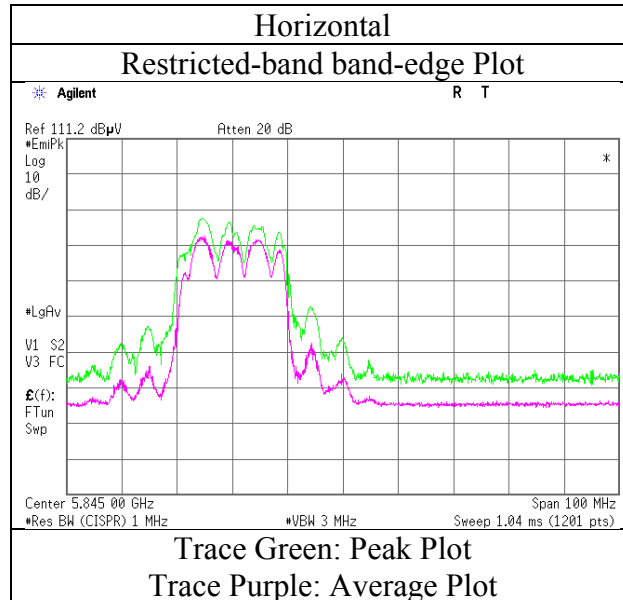
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor:	1GHz-10GHz	20log(4.45m/3.0m)= 3.4dB
	10GHz-26.5GHz	20log(1.0m/3.0m)= -9.5dB
	26.5GHz-40GHz	20log(0.5m/3.0m)= -15.6dB

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11085654H
Date : April 23, 2016
Temperature / Humidity : 23deg. C / 53 % RH
Engineer : Takumi Shimada
Mode : Tx 11n-20 5825 MHz



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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11085654H
Date : April 23, 2016 April 24, 2016 April 24, 2016
Temperature / Humidity : 23deg. C / 53 % RH 23deg. C / 51 % RH 23deg. C / 51 % RH
Engineer : Takumi Shimada Ken Fujita Ken Fujita
(1 GHz-10 GHz) (10 GHz-40 GHz) (Below 1 GHz)
Mode : Tx 11n-40 5755 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	52.504	QP	36.8	9.4	7.4	32.2	-	21.4	40.0	18.6	
Hori	79.527	QP	40.3	6.3	7.8	32.2	-	22.2	40.0	17.8	
Hori	141.657	QP	41.8	14.3	8.5	32.1	-	32.5	43.5	11.0	
Hori	250.667	QP	47.9	12.6	9.5	32.0	-	38.0	46.0	8.0	
Hori	374.667	QP	46.1	15.1	10.4	31.9	-	39.7	46.0	6.3	
Hori	500.002	QP	35.7	17.6	11.3	32.0	-	32.6	46.0	13.4	
Hori	750.665	QP	36.7	20.3	12.7	31.8	-	37.9	46.0	8.1	
Hori	5650.000	PK	40.5	32.4	7.5	31.8	-	48.6	68.2	19.6	
Hori	5700.000	PK	45.5	32.5	7.5	31.8	-	53.7	105.2	51.5	
Hori	5720.000	PK	60.5	32.6	7.6	31.8	-	68.9	110.8	41.9	
Hori	5723.050	PK	64.2	32.6	7.6	31.8	-	72.6	117.8	45.2	
Hori	5725.000	PK	57.1	32.6	7.6	31.8	-	65.5	122.2	56.7	
Hori	11510.000	PK	41.7	41.0	-1.7	33.4	-	47.6	73.9	26.3	Floor Noise
Hori	17265.000	PK	43.1	42.5	0.0	32.7	-	52.9	73.9	21.0	Floor Noise
Hori	23020.000	PK	44.1	37.9	-0.8	32.3	-	48.9	73.9	25.0	Floor Noise
Hori	11510.000	AV	33.2	41.0	-1.7	33.4	-	39.1	53.9	14.8	Floor Noise
Hori	17265.000	AV	33.6	42.5	0.0	32.7	-	43.4	73.9	30.5	Floor Noise
Hori	23020.000	AV	33.9	37.9	-0.8	32.3	-	38.7	53.9	15.2	Floor Noise
Vert	50.400	QP	41.3	10.1	7.3	32.2	-	26.5	40.0	13.5	
Vert	81.283	QP	44.5	6.6	7.8	32.2	-	26.7	40.0	13.3	
Vert	139.650	QP	39.8	14.2	8.5	32.1	-	30.4	43.5	13.1	
Vert	260.001	QP	48.3	12.7	9.6	32.0	-	38.6	46.0	7.4	
Vert	374.667	QP	46.1	15.1	10.4	31.9	-	39.7	46.0	6.3	
Vert	500.002	QP	35.7	17.6	11.3	32.0	-	32.6	46.0	13.4	
Vert	749.331	QP	34.9	20.3	12.7	31.8	-	36.1	46.0	9.9	
Vert	5650.000	PK	41.2	32.4	7.5	31.8	-	49.3	68.2	18.9	
Vert	5700.000	PK	44.9	32.5	7.5	31.8	-	53.1	105.2	52.1	
Vert	5720.000	PK	59.0	32.6	7.6	31.8	-	67.4	110.8	43.4	
Vert	5723.050	PK	65.1	32.6	7.6	31.8	-	73.5	117.8	44.3	
Vert	5725.000	PK	58.5	32.6	7.6	31.8	-	66.9	122.2	55.3	
Vert	11510.000	PK	42.5	41.0	-1.7	33.4	-	48.4	73.9	25.5	Floor Noise
Vert	17265.000	PK	42.7	42.5	0.0	32.7	-	52.5	73.9	21.4	Floor Noise
Vert	23020.000	PK	44.0	37.9	-0.8	32.3	-	48.8	73.9	25.1	Floor Noise
Vert	11510.000	AV	33.4	41.0	-1.7	33.4	-	39.3	53.9	14.6	Floor Noise
Vert	17265.000	AV	33.6	42.5	0.0	32.7	-	43.4	53.9	10.5	Floor Noise
Vert	23020.000	AV	34.2	37.9	-0.8	32.3	-	39.0	53.9	14.9	Floor Noise

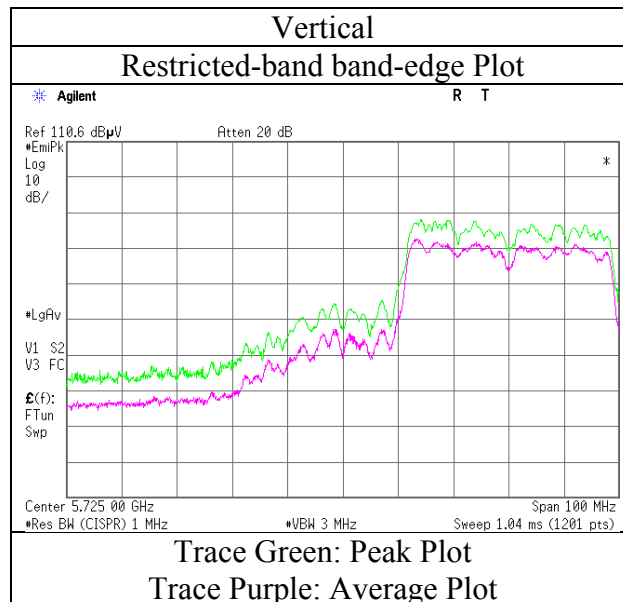
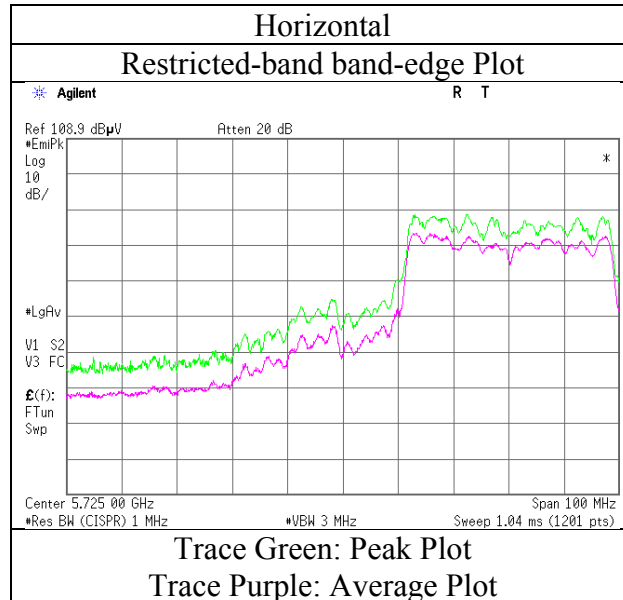
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1GHz-10GHz 20log(4.45m/3.0m)= 3.4dB
 10GHz-26.5GHz 20log(1.0m/3.0m)= -9.5dB
 26.5GHz-40GHz 20log(0.5m/3.0m)= -15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11085654H
Date	April 23, 2016
Temperature / Humidity	23deg. C / 53 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-40 5755 MHz



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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11085654H
Date : April 23, 2016 April 24, 2016
Temperature / Humidity : 23deg. C / 53 % RH 23deg. C / 51 % RH
Engineer : Takumi Shimada Ken Fujita
 (1 GHz-10 GHz) (10 GHz-40 GHz)
Mode : Tx 11n-40 5795 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	5850.000	PK	44.9	32.8	7.6	31.8	-	53.5	122.2	68.7	
Hori	5855.000	PK	42.2	32.8	7.6	31.8	-	50.8	110.8	60.0	
Hori	5875.000	PK	40.6	32.8	7.6	31.8	-	49.2	105.2	56.0	
Hori	5925.000	PK	40.0	32.9	7.6	31.8	-	48.7	68.2	19.5	
Hori	11590.000	PK	41.8	40.9	-1.6	33.4	-	47.7	73.9	26.2	Floor Noise
Hori	17385.000	PK	42.4	43.0	0.1	32.7	-	52.8	73.9	21.1	Floor Noise
Hori	23180.000	PK	44.3	37.9	-0.7	32.3	-	49.2	73.9	24.7	Floor Noise
Hori	11590.000	AV	33.1	40.9	-1.6	33.4	-	39.0	53.9	14.9	Floor Noise
Hori	17385.000	AV	33.9	43.0	0.1	32.7	-	44.3	53.9	9.6	Floor Noise
Hori	23180.000	AV	33.5	37.9	-0.7	32.3	-	38.4	53.9	15.5	Floor Noise
Vert	5850.000	PK	44.1	32.8	7.6	31.8	-	52.7	122.2	69.5	
Vert	5855.000	PK	42.1	32.8	7.6	31.8	-	50.7	110.8	60.1	
Vert	5875.000	PK	41.2	32.8	7.6	31.8	-	49.8	105.2	55.4	
Vert	5925.000	PK	41.5	32.9	7.6	31.8	-	50.2	68.2	18.0	
Vert	11590.000	PK	42.2	40.9	-1.6	33.4	-	48.1	73.9	25.8	Floor Noise
Vert	17385.000	PK	42.8	43.0	0.1	32.7	-	53.2	73.9	20.7	Floor Noise
Vert	23180.000	PK	44.2	37.9	-0.7	32.3	-	49.1	73.9	24.8	Floor Noise
Vert	11590.000	AV	33.4	40.9	-1.6	33.4	-	39.3	53.9	14.6	Floor Noise
Vert	17385.000	AV	34.0	43.0	0.1	32.7	-	44.4	53.9	9.5	Floor Noise
Vert	23180.000	AV	34.1	37.9	-0.7	32.3	-	39.0	53.9	14.9	Floor Noise

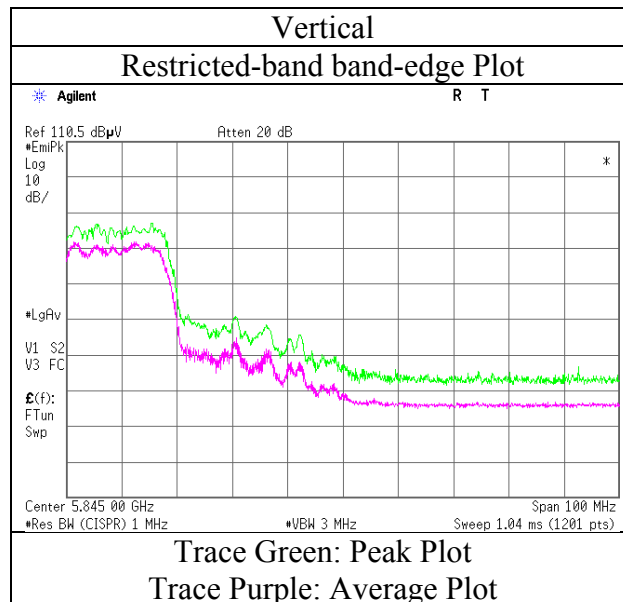
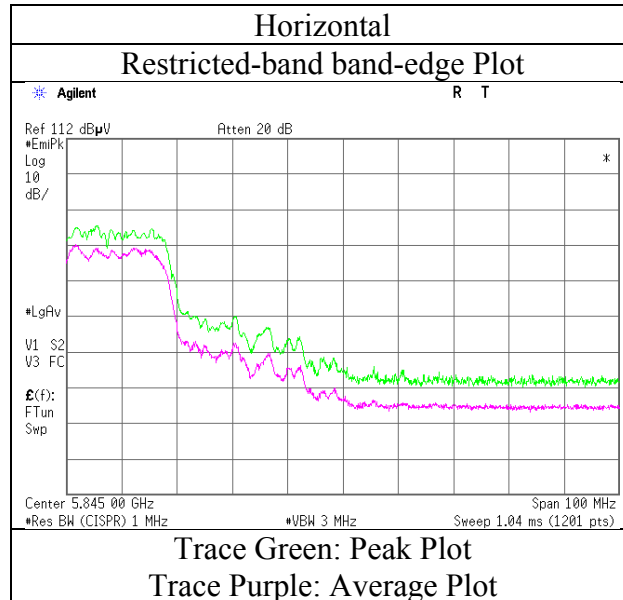
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1GHz-10GHz 20log(4.45m/3.0m)= 3.4dB
 10GHz-26.5GHz 20log(1.0m/3.0m)= -9.5dB
 26.5GHz-40GHz 20log(0.5m/3.0m)= -15.6dB

Radiated Spurious Emission

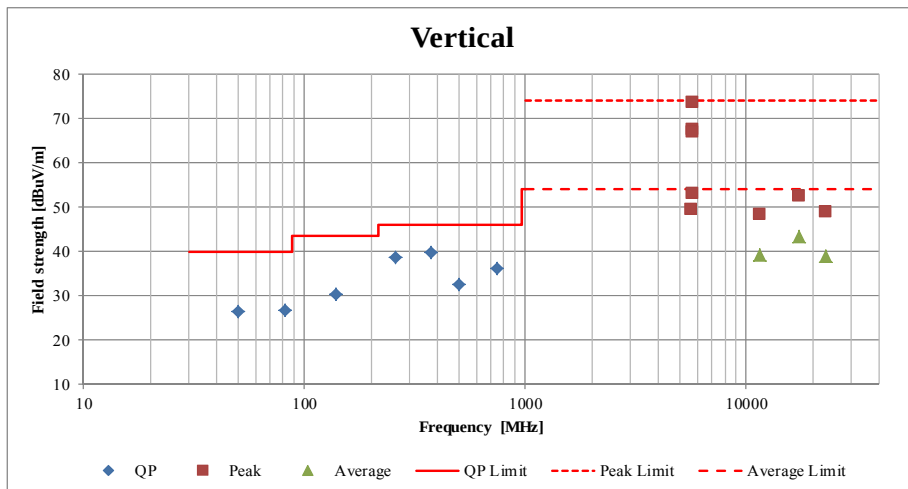
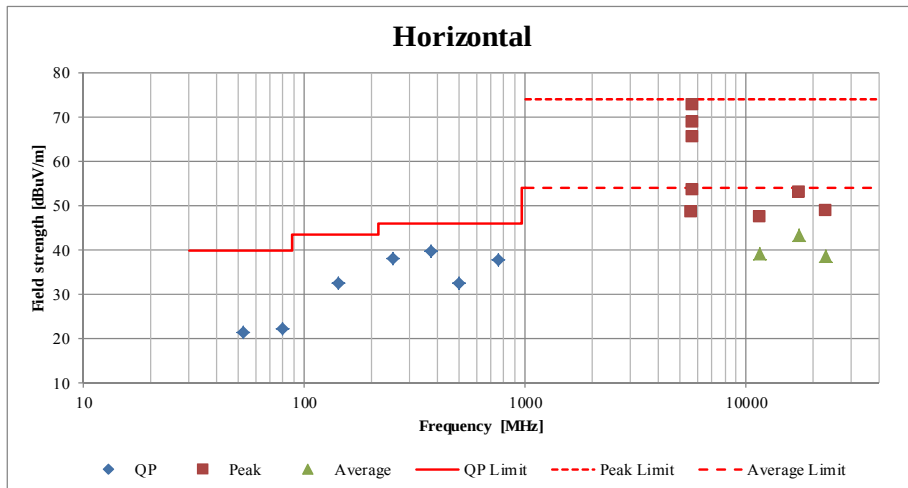
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11085654H
Date	April 23, 2016
Temperature / Humidity	23deg. C / 53 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-40 5795 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

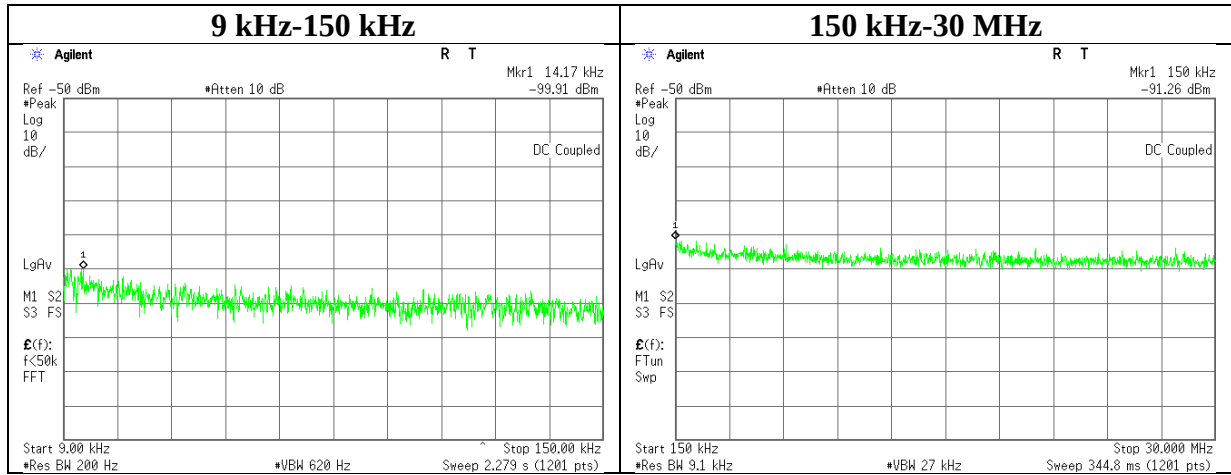
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11085654H		
Date	April 23, 2016	April 24, 2016	April 24, 2016
Temperature / Humidity	23deg. C / 53 % RH	23deg. C / 51 % RH	23deg. C / 51 % RH
Engineer	Takumi Shimada	Ken Fujita	Ken Fujita
	(1 GHz-10 GHz)	(10 GHz-40 GHz)	(Below 1 GHz)
Mode	Tx 11n-40 5755 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.	11085654H
Date	April 22, 2016
Temperature / Humidity	23deg. C / 42 % RH
Engineer	Ken Fujita
Mode	Tx 11n-40 5755 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [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
14.17	-99.9	0.01	10.0	2.00	2	-84.9	300	6.0	-23.6	44.5	68.1	
150.00	-91.3	0.01	10.0	2.00	2	-76.2	300	6.0	-15.0	24.0	39.0	

$E = \text{EIRP} - 20 \cdot \log(D) + \text{Ground bounce} + 104.8 \text{ [dBuV/m]}$

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain} + 10 \cdot \log(N)$

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-19	Power Meter	DARE!! Instruments	RPR3006W	14I00048SNO083	AT	2015/11/09 * 12
MPM-20	Power Meter	DARE!! Instruments	RPR3006W	14I00048SNO084	AT	2015/11/09 * 12
MAT-80	Attenuator	Weinschel Associates	WA1-20-33	100130	AT	2015/05/04 * 12
MAT-82	Attenuator	Weinschel Associates	WA1-20-33	100132	AT	2015/05/04 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2015/12/08 * 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-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2016/02/24 * 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
MHF-22	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCB	602	RE	2016/01/19 * 12
MCC-177	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S304	RE	2016/03/10 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2015/05/19 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2016/01/13 * 12
MCC-54	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	RE	2016/03/18 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2015/06/02 * 12
MHA-29	Horn Antenna 26.5-40GHz	ETS LINDGREN	3160-10	00152399	RE	2015/09/04 * 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-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2015/09/02 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-22	Logperiodic Antenna(200-1000M Hz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2016/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2015/07/13 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2016/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 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.

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