



RADIO TEST REPORT

Test Report No. : 10517042H-R1

Applicant : silex technology, Inc.
Type of Equipment : SDIO Wireless Module
Model No. : SX-SDMAN
FCC ID : N6C-SDMAN
Test regulation : **FCC Part 15 Subpart E: 2014**
(Permissive Change Class II Application)
***26dB Emission Bandwidth, Maximum Conducted Output**
Power, Peak Power Spectral Density, Spurious Emission
Restricted Band Edge, 6dB Emission Bandwidth tests only.

Test Result : **Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with 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 10517042H. 10517042H is replaced with this report.

Date of test: October 3 to 8, 2014

Representative test engineer:


Yutaka Yoshida

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.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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SECTION 1: Customer information

Company Name	:	silex technology, Inc.
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Telephone Number	:	+81-774-98-3878
Facsimile Number	:	+81-774-98-3758
Contact Person	:	Toshiro Kometani

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

2.1 Identification of E.U.T.

Type of Equipment	:	SDIO Wireless Module
Model No.	:	SX-SDMAN
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC3.3V
Receipt Date of Sample	:	October 2, 2014
Country of Mass-production	:	Japan
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab

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2.2 Product Description

Model No: SX-SDMAN (referred to as the EUT in this report) is the SDIO Wireless Module.

General Specification

Clock frequency(ies) in the system : 26MHz

Radio Specification

Radio Type : Transceiver
Method of Frequency Generation : Synthesizer
Power Supply (inner) : DC1.2V

Specification of Wireless LAN (IEEE802.11b/g/a/n-20/n-40)

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412-2462MHz	2412-2462MHz	5180-5320MHz 5500-5580MHz 5660-5700MHz 5745-5825MHz *1)	2412-2462MHz 5180-5320MHz 5500-5580MHz 5660-5700MHz 5745-5825MHz *1)	5190-5310MHz 5510-5550MHz 5670MHz 5755-5795MHz *1)
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)		
Channel spacing	5MHz		20MHz	<u>2.4GHz band</u> 5MHz <u>5GHz band</u> 20MHz	40MHz
Antenna type	Sleeve antenna: Sansei Embedded antenna: Ethertronics				
Antenna Gain	Sleeve antenna: 1.0dBi (2.4GHz including cableloss 0.5dB), 1.1dBi (5GHz including cableloss 1.0dB) Embedded antenna: 2.0dBi (2.4GHz including cableloss 0.5dB), 2.5dBi (5GHz including cableloss 1.0dB)				
Antenna Connector type	U.FL connector				

*1) 5745-5825MHz and 5755 - 5795MHz are applied for this test report.

Specification of Bluetooth (Ver.4.0 + EDR)

Type of radio	Bluetooth
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS
Channel spacing	1MHz
Antenna type	Embedded antenna: Ethertronics
Antenna Gain	2.0dBi (2.4GHz including cableloss 0.5dB), 2.5dBi (5GHz including cableloss 1.0dB)
Antenna Connector Type	U.FL Alternative connector

Specification of Low Energy (Ver.4.0 + EDR/LE Dual mode)

Type of radio	Low Energy
Frequency of Operation	2402-2480MHz
Type of Modulation	DSSS
Channel spacing	2MHz
Antenna type	Embedded antenna: Ethertronics
Antenna Gain	2.0dBi (2.4GHz including cableloss 0.5dB), 2.5dBi (5GHz including cableloss 1.0dB)
Antenna Connector Type	U.FL Alternative connector

*This test report applies for Wireless LAN (IEEE802.11a/n-20/n-40).

Wireless LAN and Bluetooth do not transmit simultaneously.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E: 2014, final revised on August 15, 2014 and effective October 14, 2014

Title : FCC 47CFR Part15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

* The revision on August 15, 2014 does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
26dB Emission Bandwidth	FCC :ANSI C63.4:2003 FCC KDB Publication Number 789033 IC: -	FCC : 15.407(a)(1)(2)(3) IC: -	See data	N/A	Conducted
Maximum Conducted Output Power	FCC :ANSI C63.4:2003, FCC KDB Publication Number 789033 IC: -	FCC : 15.407(a)(1)(2)(3) IC: RSS-210 A9.2(1)(2)(3)		Complied	Conducted
Peak Power Spectral Density	FCC :ANSI C63.4:2003, FCC KDB Publication Number 789033 IC: -	FCC : 15.407(a)(1)(2)(3) IC: RSS-210 A9.2(1)(2)(3)		Complied	Conducted
Spurious Emission Restricted Band Edge	FCC: ANSI C63.4:2003 IC: -	FCC : 15.407(b), 15.205 and 15.209 IC: RSS-210 A.9.2(1)(2)(3)	0.3dB 5715.000MHz, PK, Vert.	Complied	Conducted / Radiated
6dB Emission Bandwidth	FCC :ANSI C63.4:2003	FCC : 15.407(e)	See data	Complied	Conducted

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

FCC 15.31 (e)

The RF Module has own regulator.

The RF Module is constantly provided voltage through own regulator regardless of input voltage (DC3.3V).

Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique antenna connector (U.FL).

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

*The EUT is a Client Device without Radar detection capability, follows the channel selection by a Master device, and its DFS function was not changed from the original model.
KDB 905462 D03 Client Without DFS New Rules v01r01 was satisfied with original test report (32IE0154-HO-01-D-R1 issued by UL Japan), so additional test was not performed.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Band Width	RSS-Gen 4.6.1	RSS-210 A9.2 (1)(2)(3)	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.

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

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

Radiated emission test(3m)

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

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3.5 Test Location

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

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Modes

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)	6Mbps, PN9
IEEE 802.11n 20MHz BW (11n-20)	MCS 3, PN9
IEEE 802.11n 40MHz BW (11n-40)	MCS 3, PN9
*Transmitting duty was 100% on Spurious emission test. *The worst condition was determined based on the test result of Maximum Conducted Output Power. *EUT has the power settings by the software as follows; Power settings: 13dBm Software: Atheros Radio Test (ART) - Revision 0.2 BUILD #33 ART_11n - Customer Version (ANWI BUILD) *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 Operating mode(s)

Test Item	Operating Mode	Tested Antenna port	Tested Frequency
			Upper Band
26dB Emission Bandwidth, 99% Occupied Bandwidth, 6dB Bandwidth, Maximum Power Spectral Density	11a Tx 11n-20 Tx	2 *2)	5745MHz 5785MHz 5825MHz
	11n-40 Tx	2 *2)	5755MHz 5795MHz
Maximum Conducted Output Power	11a Tx 11n-20 Tx	1, 2	5745MHz 5785MHz 5825MHz
	11n-40 Tx	1, 2	5755MHz 5795MHz
Spurious Emission (Radiated)	11n-20 Tx *1)	1, 2	5745MHz 5785MHz 5825MHz
	11n-40 Tx	1, 2	5755MHz 5795MHz
Spurious Emission(Conducted)	11n-40 Tx *3)	2 *2)	5755MHz *3)

*1) 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 conducted output power.

*2) After the comparison between Antenna port 1 and Antenna port 2, test was performed with the antenna that had higher power as a representative.

*3) The mode was tested as a representative, because it had the highest power at antenna terminal test.

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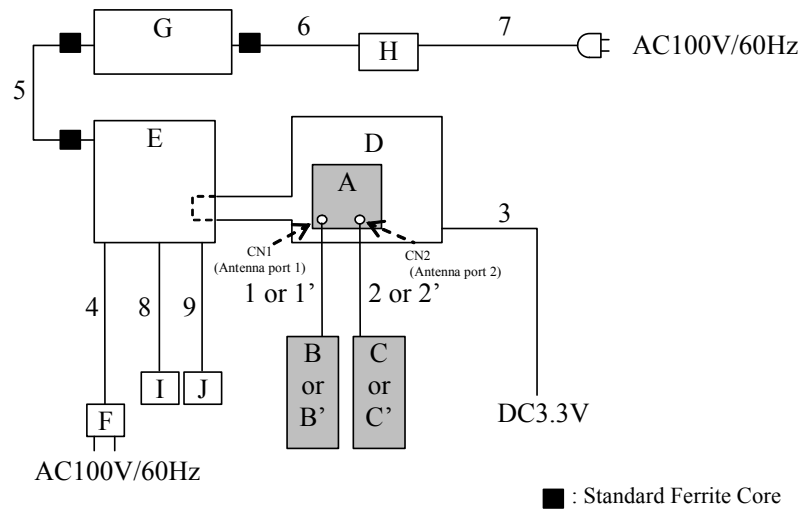
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4.2 Configuration and peripherals



- * Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
* Sleeve antenna and Embadded antenna are not used in combination.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	SDIO Wireless Module	SX-SDMAN	0080925099DC *1), *2) 0080925099DA *2)	silex technology, Inc.	EUT
B	Sleeve Antenna	ANTDP-027A0	001	Sansei Denki	EUT
B'	Embedded Antenna	1000418	001	Ethertronics	EUT
C	Sleeve Antenna	ANTDP-027A0	002	Sansei Denki	EUT
C'	Embedded Antenna	1000418	002	Ethertronics	EUT
D	Jig Board	-	-	silex technology, Inc.	-
E	Quick Start Board	iMX53	K1141 229339-118	Freescale	-
F	AC Adaptor	XA012AM0500200	-	Freescale	-
G	LCD	1702FP	KR07G197476021ATA 2LV	DELL	-
H	AC Adaptor	PSCV420102A	C011021821	DELL	-
I	USB Keyboard	TK-FCP026	1X000689	ELECOM	-
J	USB Mouse	M056UC	520026409	DELL	-

*1) Used for Antenna terminal conducted tests

*2) Used for spurious emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable (for Sleeve Antenna)	0.12	Shielded	Shielded	-
1'	Antenna Cable (for Embedded Antenna)	0.1	Shielded	Shielded	-
2	Antenna Cable (for Sleeve Antenna)	0.12	Shielded	Shielded	-
2'	Antenna Cable (for Embedded Antenna)	0.1	Shielded	Shielded	-
3	DC Cable	1.0	Unshielded	Unshielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	RGB Cable	1.5	Unshielded	Unshielded	-
6	DC Cable	1.0	Unshielded	Unshielded	-
7	AC Cable	1.8	Unshielded	Unshielded	-
8	USBC Cable	1.8	Shielded	Shielded	-
9	USB Cable	1.5	Shielded	Shielded	-

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SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

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

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

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 68.2dBuV/m(−27dBm e.i.r.p. ^{*})
in the Section 15.407(b)(1)(2)(3).
Apply to limit 68.2dBuV/m(−27dBm e.i.r.p. ^{*}) or
78.2dBuV/m(−17dBm e.i.r.p. ^{*}) in the Section 15.407(b)(4).

*Electric Field Strength to e.i.r.p. Conversion

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

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Test Antennas are used as below;

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

Frequency	Below 1GHz	Above 1GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	PK	AV
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	Method AD *1) RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Method VB*1) RBW: 1MHz When duty cycle ≥ 98 percent, VBW was set at 10Hz.
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz), 0.5m*3) (above 26.5GHz)	

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E (Issued on June 6, 2014)".

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

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

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

Measurement range : 30M-40GHz
Test data : APPENDIX
Test result : Pass

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SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used and Test method
26dB Bandwidth	40MHz, 80MHz	Close to 1% of EBW	Greater than RBW	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	Close to 1% of Span	Three times of RBW	Auto	Sample	Clear Write	Spectrum Analyzer
6dB Bandwidth	20MHz, 40MHz	100kHz	300MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Conducted Output Power	-	-	-	Auto	Averaging	-	Power Meter (Sensor: 50MHz BW)
Maximum Power Spectral Density	24MHz, 48MHz	300kHz *1)	910kHz	Auto	Sample Power Averaging (100 times)	Clear Write	Spectrum Analyzer method 2
Conducted Spurious Emission*2)	9kHz-150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz-30MHz	10kHz	30kHz				

*The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E (Issued on June 6, 2014)".

*1) FCC standard says that RBW is set to be 500kHz for 5.725-5850GHz, but it is not possible with spectrum analyzer, so $10\log(500\text{kHz}/300\text{kHz})$ was added to the test result.

*2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

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

Test data : APPENDIX
Test result : Pass

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APPENDIX 1: Data of EMI test

26dB Emission Bandwidth and 99% Occupied Bandwidth

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10517042H
Date 10/08/2014
Temperature/ Humidity 24 deg. C / 50% RH
Engineer Yutaka Yoshida
Mode 11a/11n-20/11n-40 Tx

11a, Antenna Port 2

Frequency [MHz]	26dB Emission Bandwidth [MHz]	99% Occupied Bandwidth [MHz]	Limit [MHz]
5745	23.174	16.486	-
5785	23.069	16.444	-
5825	23.310	16.497	-

11n-20, Antenna Port 2

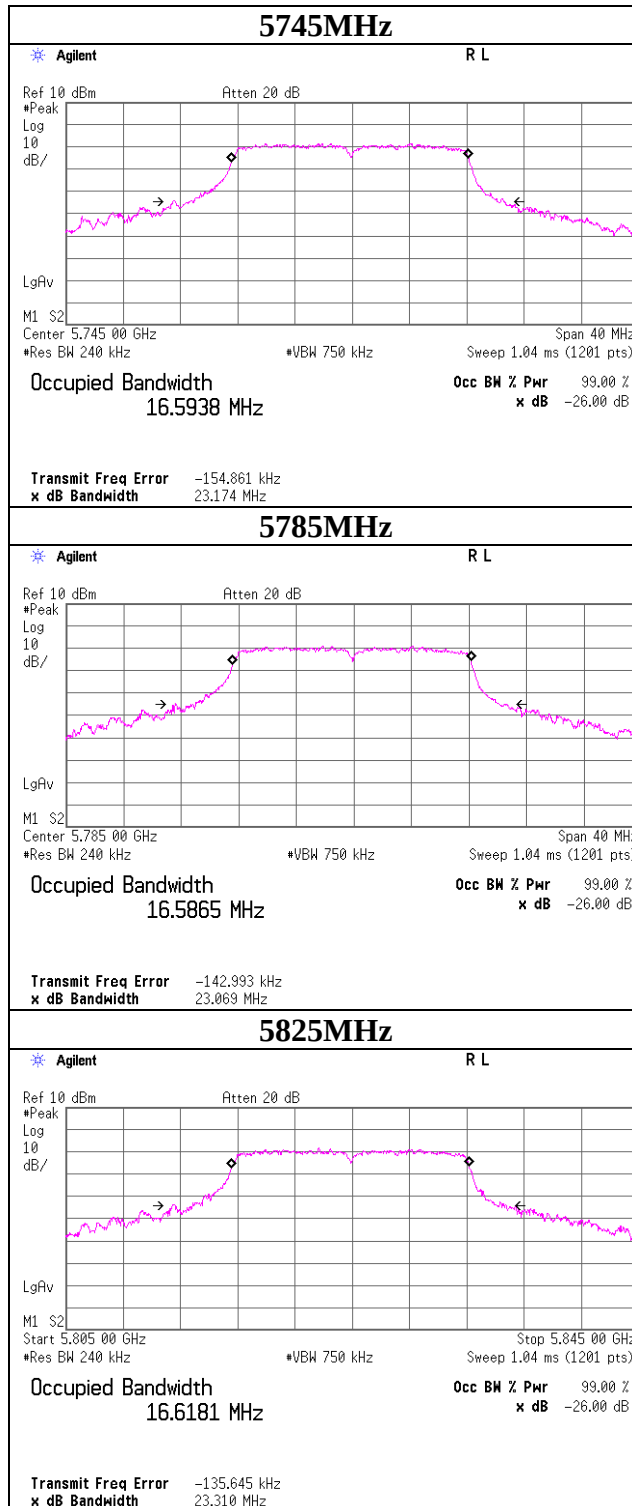
Frequency [MHz]	26dB Emission Bandwidth [MHz]	99% Occupied Bandwidth [MHz]	Limit [MHz]
5745	21.502	17.526	-
5785	21.339	17.656	-
5825	22.378	17.716	-

11n-40, Antenna Port 2

Frequency [MHz]	26dB Emission Bandwidth [MHz]	99% Occupied Bandwidth [MHz]	Limit [MHz]
5755	46.413	35.915	-
5795	46.178	36.415	-

26dB Emission Bandwidth

11a Antenna Port 2



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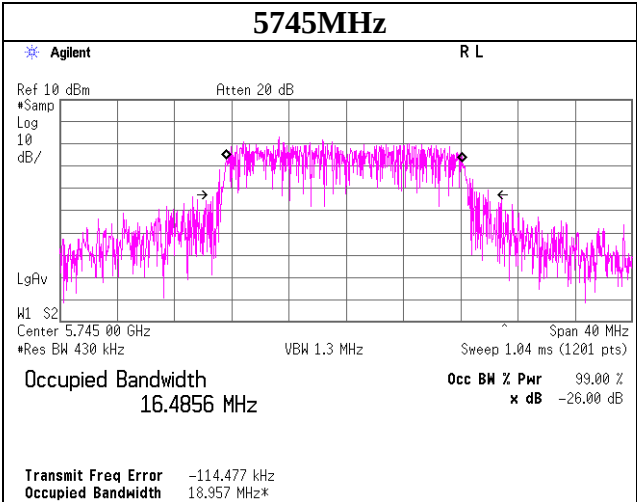
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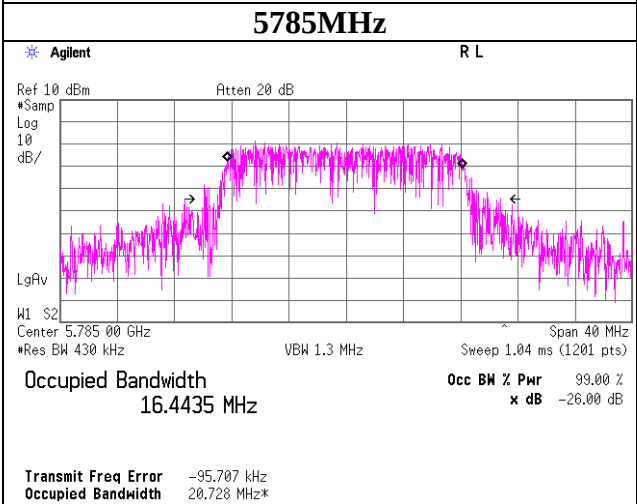
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99% Occupied Bandwidth

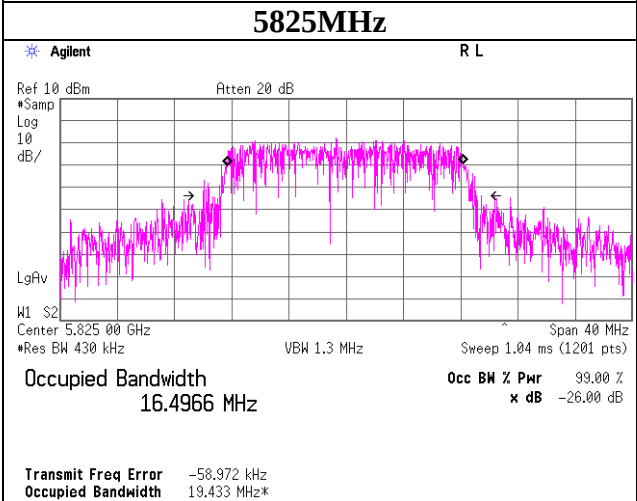
11a Antenna Port 2
5745MHz



5785MHz

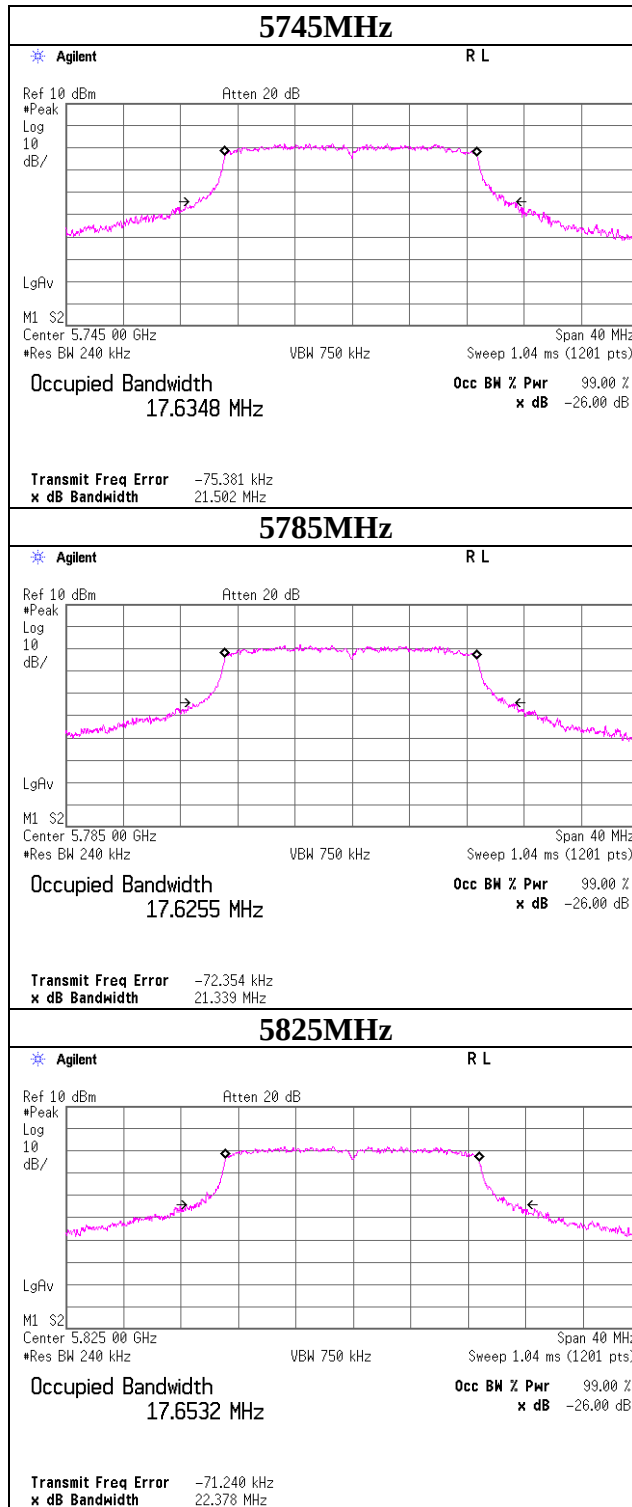


5825MHz



26dB Emission Bandwidth

11n-20 Antenna Port 2



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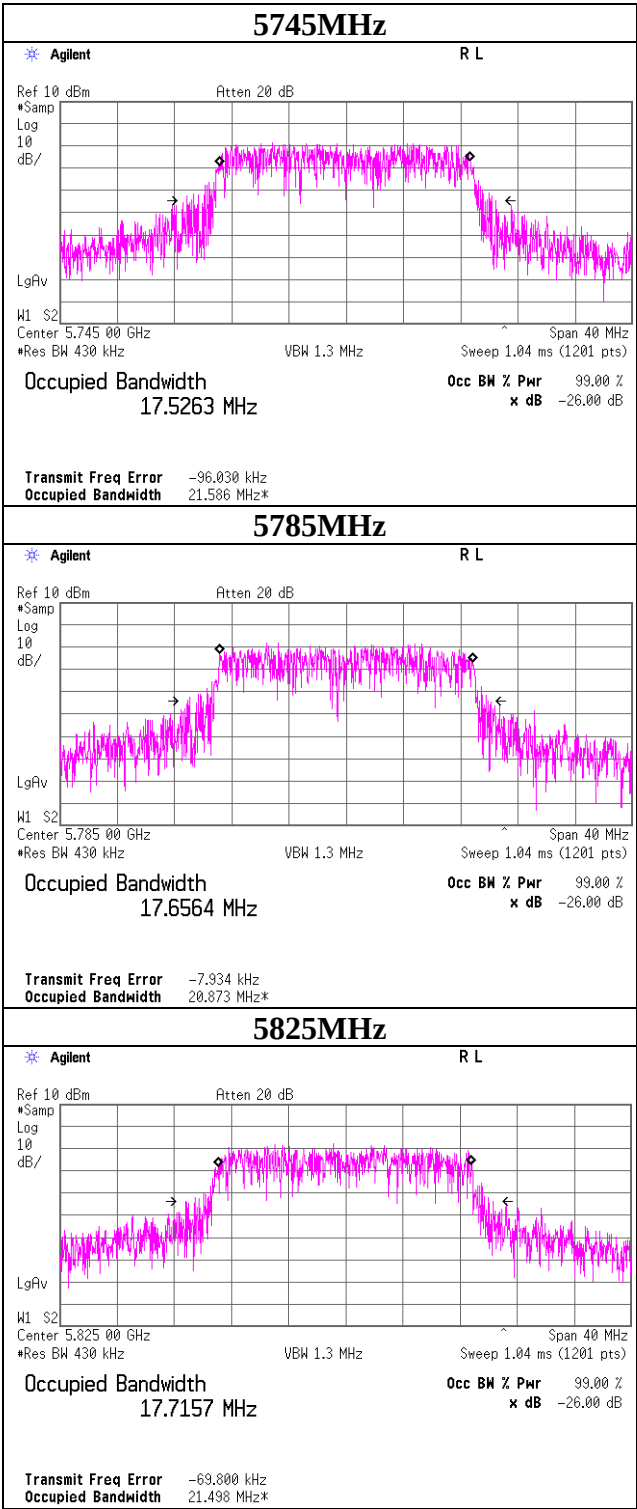
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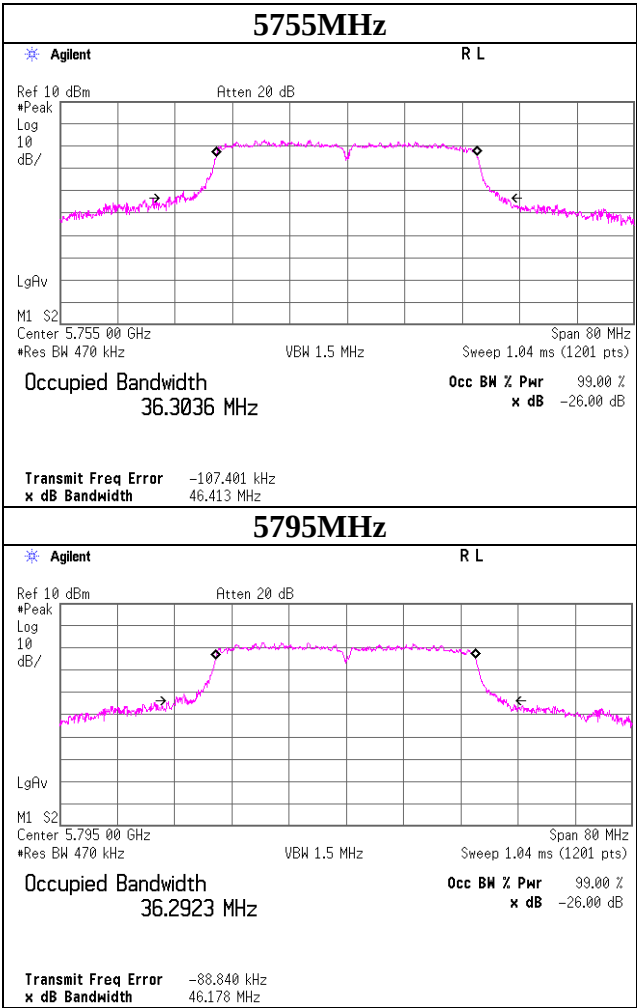
99% Occupied Bandwidth

11n-20 Antenna Port 2



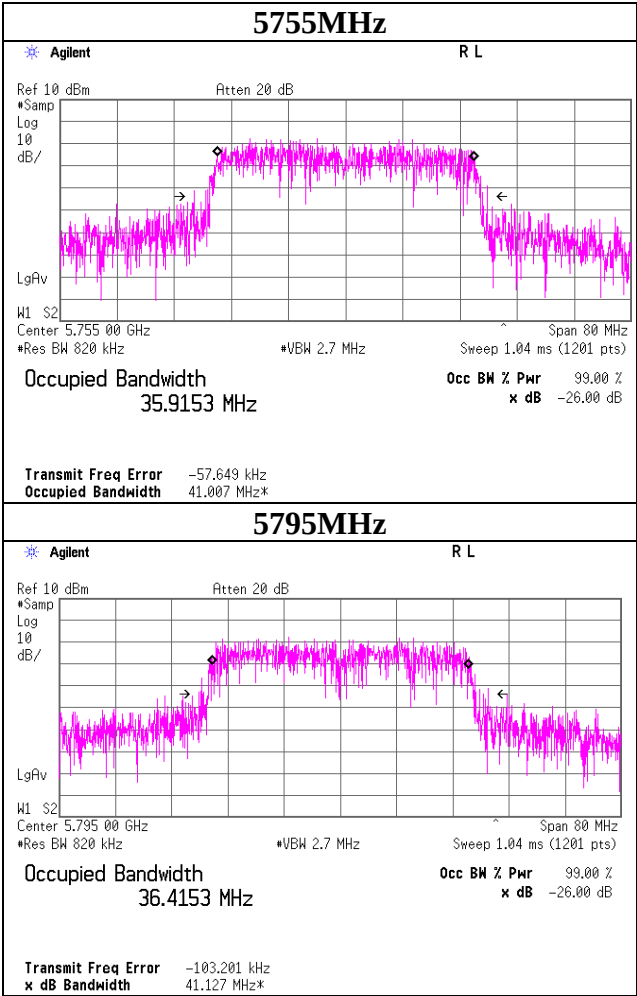
26dB Emission Bandwidth

11n-40 Antenna Port 2



99% Occupied Bandwidth

11n-40 Antenna Port 2



6dB Bandwidth

Test place Ise EMC Lab. No.11 measurement room
Report No. 10517042H
Date 10/08/2014
Temperature/ Humidity 24 deg. C / 50% RH
Engineer Yutaka Yoshida
Mode 11a/11n-20/11n-40 Tx

11a Antenna Port 2

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
5745	16.096	>500
5785	16.098	>500
5825	16.279	>500

11n-20 Antenna Port 2

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
5745	17.277	>500
5785	17.248	>500
5825	17.275	>500

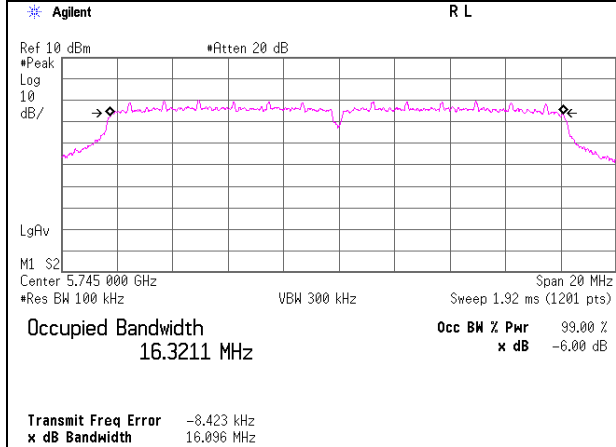
11n-40 Antenna Port 2

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
5755	35.642	>500
5795	35.479	>500

6dB Bandwidth

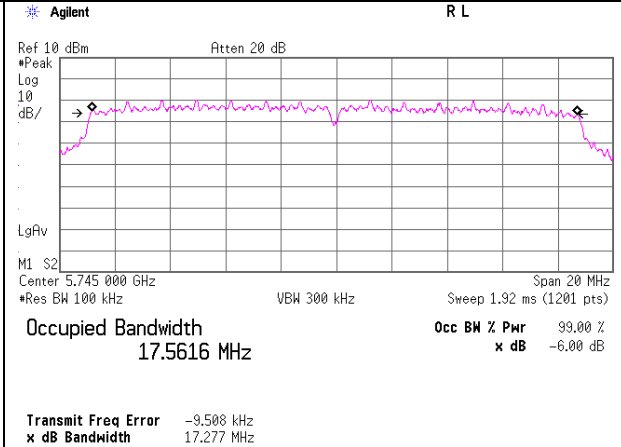
11a, Antenna Port 2

5745MHz

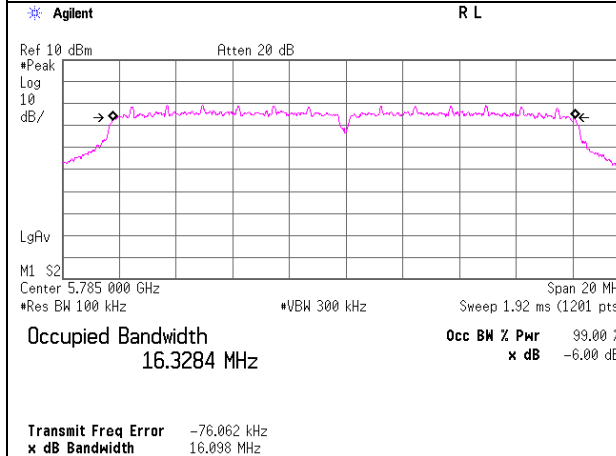


11n-20, Antenna Port 2

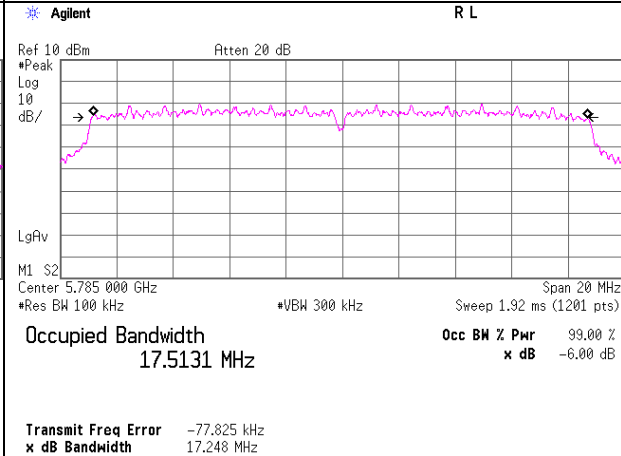
5745MHz



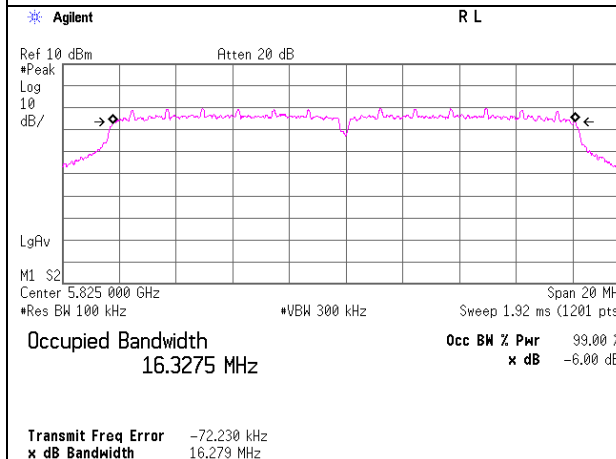
5785MHz



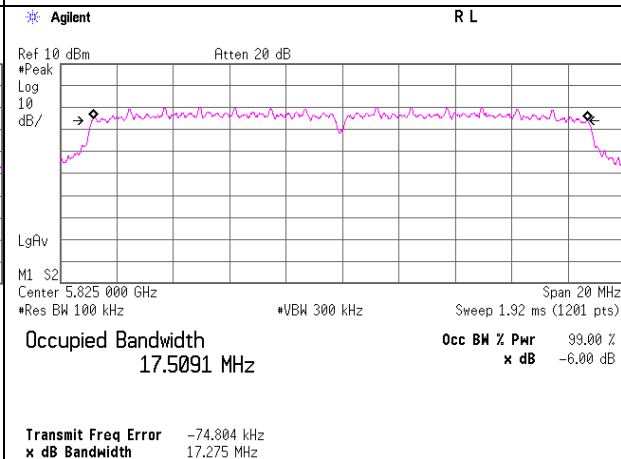
5785MHz



5825MHz



5825MHz



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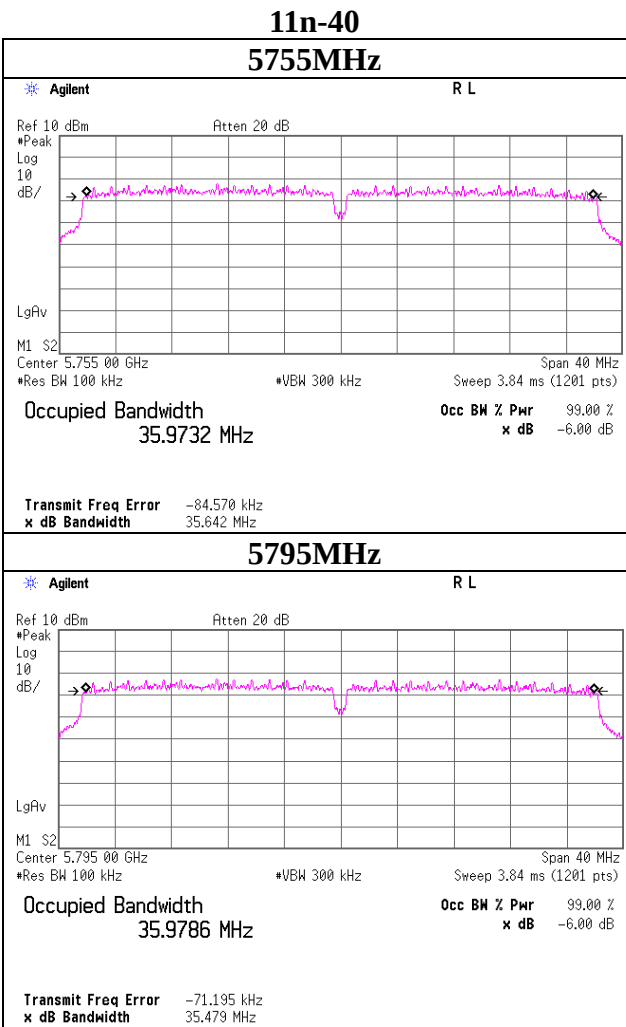
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6dB Bandwidth



Maximum Conducted Output Power

Test place Ise EMC Lab. No.11 measurement room
Report No. 10517042H
Date 10/07/2014
Temperature/ Humidity 25deg.C. / 30% RH
Engineer Yutaka Yoshida
Mode 11a Tx

Antenna port 1

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result (Cond.) [dBm]	Limit (Cond.) [dBm]	Margin (Cond.) [dB]
5745.0	-0.62	2.86	10.04	0.05	12.33	30.00	17.67
5785.0	-0.94	2.86	10.04	0.05	12.01	30.00	17.99
5825.0	-0.64	2.88	10.04	0.05	12.33	30.00	17.67

Antenna port 2

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result (Cond.) [dBm]	Limit (Cond.) [dBm]	Margin (Cond.) [dB]
5745.0	0.46	2.86	10.04	0.05	13.41	30.00	16.59
5785.0	0.53	2.86	10.04	0.05	13.48	30.00	16.52
5825.0	0.43	2.88	10.04	0.05	13.40	30.00	16.60

Result(Cond.) = Reading + Cable Loss + Atten.Loss + Duty Factor

Maximum Conducted Output Power

Test place Ise EMC Lab. No.3 shielded room
Report No. 10517042H
Date 10/07/2014
Temperature/ Humidity 25deg.C. / 30% RH
Engineer Yutaka Yoshida
Mode 11n-20 Tx

Antenna port 1

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result (Cond.) [dBm]	Limit (Cond.) [dBm]	Margin (Cond.) [dB]
5745.0	-0.44	2.86	10.04	0.22	12.68	30.00	17.32
5785.0	-0.87	2.86	10.04	0.22	12.25	30.00	17.75
5825.0	-0.73	2.88	10.04	0.22	12.41	30.00	17.59

Antenna port 2

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result (Cond.) [dBm]	Limit (Cond.) [dBm]	Margin (Cond.) [dB]
5745.0	0.61	2.86	10.04	0.22	13.73	30.00	16.27
5785.0	0.57	2.86	10.04	0.22	13.69	30.00	16.31
5825.0	0.47	2.88	10.04	0.22	13.61	30.00	16.39

Result(Cond.) = Reading + Cable Loss + Atten.Loss + Duty Factor

Maximum Conducted Output Power

Test place : Ise EMC Lab. No.3 shielded room
Report No. : 10517042H
Date : 10/07/2014
Temperature/ Humidity : 25deg.C. / 30% RH
Engineer : Yutaka Yoshida
Mode : 11n-40 Tx

Antenna port 1

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result (Cond.) [dBm]	Limit (Cond.) [dBm]	Margin (Cond.) [dB]
5755.0	-0.52	2.86	10.04	0.42	12.80	30.00	17.20
5795.0	-0.77	2.87	10.04	0.42	12.56	30.00	17.44

Antenna port 2

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result (Cond.) [dBm]	Limit (Cond.) [dBm]	Margin (Cond.) [dB]
5755.0	0.51	2.86	10.04	0.42	13.83	30.00	16.17
5795.0	-0.13	2.87	10.04	0.42	13.20	30.00	16.80

Result(Cond.) = Reading + Cable Loss + Atten.Loss + Duty Factor

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Maximum Conducted Output Power (Reference data)

Test place : Ise EMC Lab. No.11 measurement room
Report No. : 10517042H
Date : 10/07/2014
Temperature/ Humidity : 25deg.C. / 30% RH
Engineer : Yutaka Yoshida
Mode : 11a/11n-20/11n-40 Tx

Antenna port 2, 11a 5745MHz

Rate [Mbps]	Reading Long GI [dBm]	Duty factor [dB]	Result [dBm]	Remark
6	0.53	0.05	0.58	*
9	0.42	0.08	0.50	
12	0.44	0.10	0.54	
18	0.31	0.13	0.44	
24	0.67	0.21	0.88	
36	-0.37	0.31	-0.06	
48	-0.94	0.39	-0.55	
54	-2.76	0.44	-2.32	

Rate [Mbps]	Reading Short GI [dBm]	Duty factor [dB]	Result [dBm]	Remark
6	0.29	0.05	0.34	
9	-	-	-	
12	-	-	-	
18	-	-	-	
24	-	-	-	
36	-	-	-	
48	-	-	-	
54	-	-	-	

Antenna port 2, 11n-20 5745MHz

MCS Number	Reading Long GI [dBm]	Duty factor [dB]	Result [dBm]	Remark
0	0.11	0.05	0.16	
1	0.13	0.10	0.23	
2	0.19	0.17	0.36	
3	0.57	0.22	0.79	*
4	-0.45	0.32	-0.13	
5	-1.50	0.41	-1.09	
6	-3.01	0.44	-2.57	
7	-7.73	0.48	-7.25	

MCS Number	Reading Short GI [dBm]	Duty factor [dB]	Result [dBm]	Remark
0	-	-	-	
1	-	-	-	
2	-	-	-	
3	0.55	0.22	0.77	
4	-	-	-	
5	-	-	-	
6	-	-	-	
7	-	-	-	

Antenna port 2, 11n-40 5755MHz

MCS Number	Reading Long GI [dBm]	Duty factor [dB]	Result [dBm]	Remark
0	0.31	0.12	0.43	
1	0.32	0.22	0.54	
2	0.19	0.33	0.52	
3	0.51	0.42	0.93	*
4	-0.54	0.61	0.07	
5	-1.62	0.71	-0.91	
6	-2.94	0.77	-2.17	
7	-7.65	0.83	-6.82	

MCS Number	Reading Short GI [dBm]	Duty factor [dB]	Result [dBm]	Remark
0	-	-	-	
1	-	-	-	
2	-	-	-	
3	0.46	0.42	0.88	
4	-	-	-	
5	-	-	-	
6	-	-	-	
7	-	-	-	

*: Worst Rate

Result = Reading + Duty Factor

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

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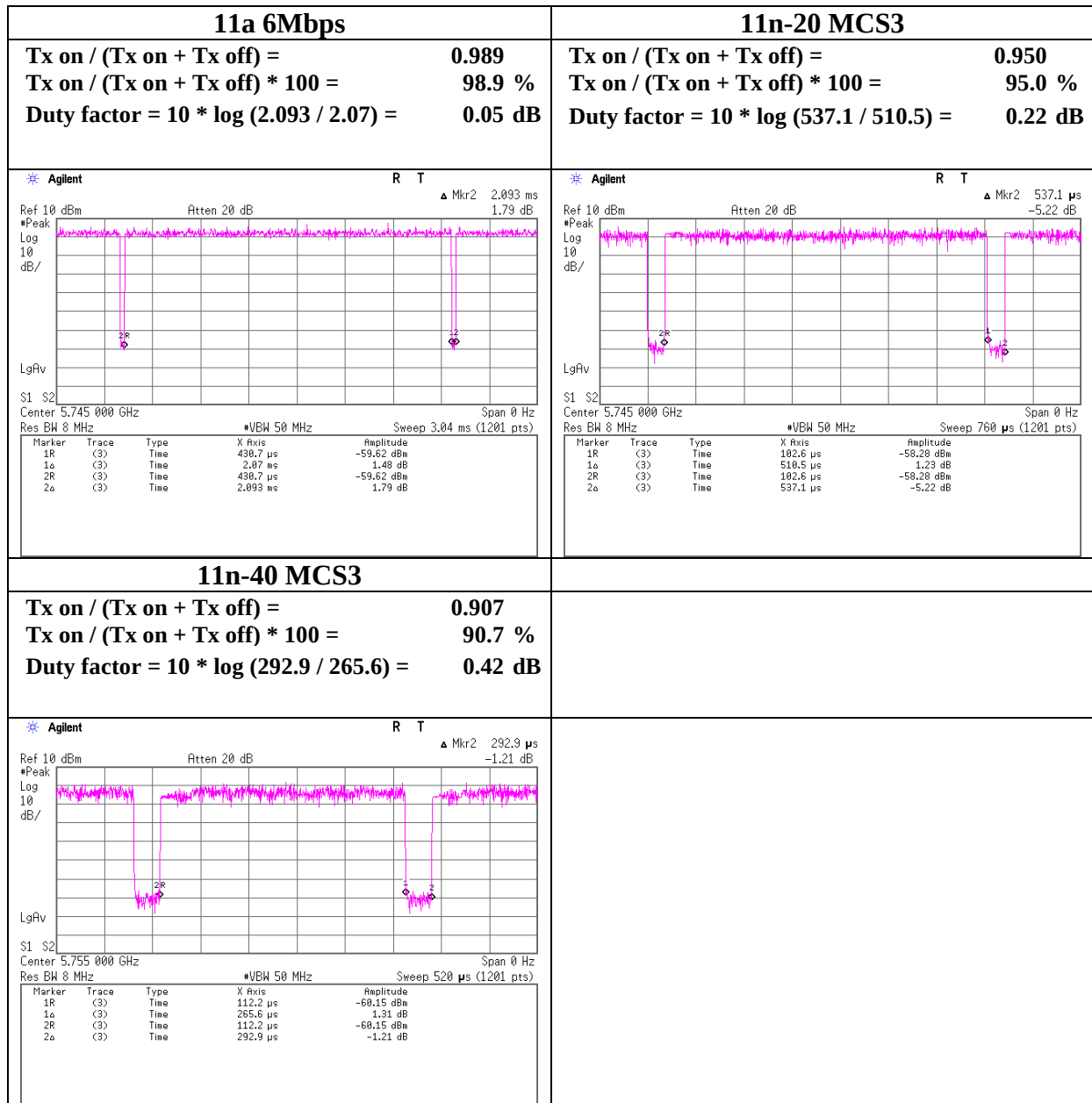
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DutyCycle

Test place	Ise EMC Lab. No.3 shielded room
Report No.	10517042H
Date	10/03/2014
Temperature/ Humidity	23deg.C. / 64% RH
Engineer	Kazuya Yoshioka
Mode	11a/11n-20/11n-40 Tx



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Maximum Power Spectral Density

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 10517042H
Date : 10/08/2014
Temperature/ Humidity : 24 deg. C / 50% RH
Engineer : Yutaka Yoshida
Mode : 11a/11n-20/11n-40 Tx

11a, Antenna Port 2

Freq.	Reading	Cable Loss	Atten. Loss	Duty factor	Correction factor	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dB]	[dBm/500kHz]	[dBm/500kHz]	[dB]
5745.0	-14.86	2.86	10.04	0.05	2.22	0.31	30.00	29.69
5785.0	-15.61	2.86	10.04	0.05	2.22	-0.44	30.00	30.44
5825.0	-15.07	2.88	10.04	0.05	2.22	0.12	30.00	29.88

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

11n-20, Antenna Port 2

Freq.	Reading	Cable Loss	Atten. Loss	Duty factor	Correction factor	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dB]	[dBm/500kHz]	[dBm/500kHz]	[dB]
5745.0	-14.98	2.86	10.04	0.22	2.22	0.36	30.00	29.64
5785.0	-15.31	2.86	10.04	0.22	2.22	0.03	30.00	29.97
5825.0	-14.71	2.88	10.04	0.22	2.22	0.65	30.00	29.35

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

11n-40, Antenna Port 2

Freq.	Reading	Cable Loss	Atten. Loss	Duty factor	Correction factor	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dB]	[dBm/500kHz]	[dBm/500kHz]	[dB]
5755.0	-17.90	2.86	10.04	0.42	2.22	-2.36	30.00	32.36
5795.0	-18.14	2.87	10.04	0.42	2.22	-2.59	30.00	32.59

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

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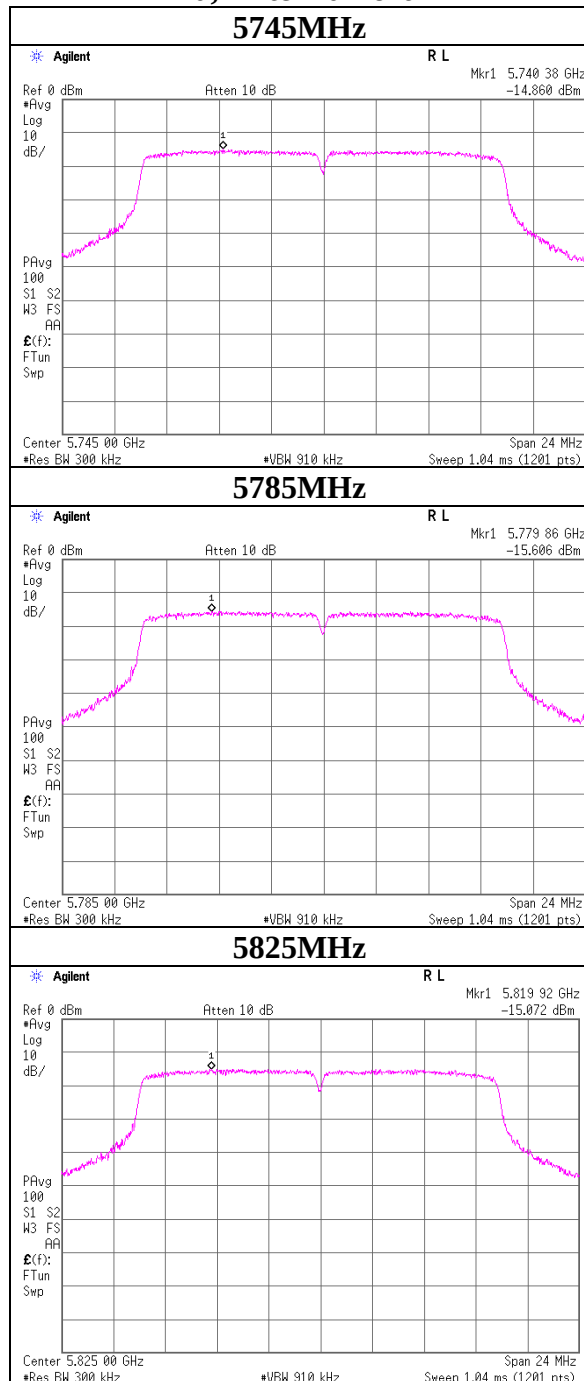
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Maximum Power Spectral Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10517042H
Date	10/08/2014
Temperature/ Humidity	24 deg. C / 50% RH
Engineer	Yutaka Yoshida
Mode	11a Tx

11a, Antenna Port 2



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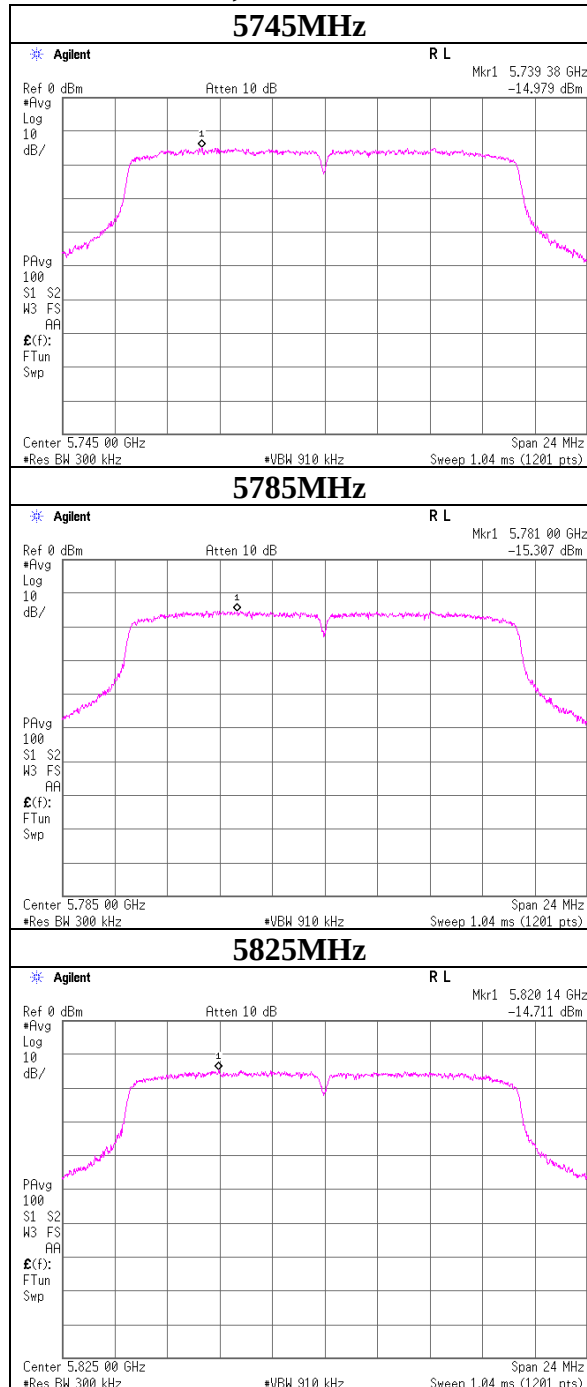
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Maximum Power Spectral Density

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10517042H
Date 10/08/2014
Temperature/ Humidity 24 deg. C / 50% RH
Engineer Yutaka Yoshida
Mode 11n-20 Tx

11n-20, Antenna Port 2



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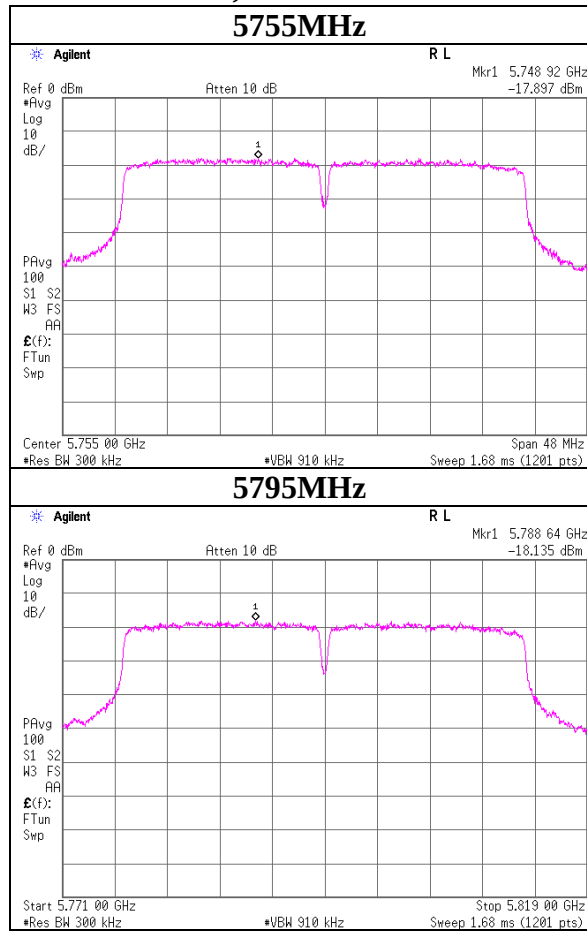
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Maximum Power Spectral Density

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10517042H
Date 10/08/2014
Temperature/ Humidity 24 deg. C / 50% RH
Engineer Yutaka Yoshida
Mode 11n-40 Tx

11n-40, Antenna Port 2



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Radiated Spurious Emission [Sleeve antenna]

Test place : Ise EMC Lab. No.3 Anechoic Chamber
Report No. : 10517042H
Date : 10/06/2014 10/07/2014
Temperature/ Humidity : 24deg.C. / 56% 22deg.C. / 52%
Engineer : Tsubasa Takayama Keisuke Kawamura
(1-10GHz) (10-40GHz)
Mode : 11n-20 Tx 5745MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	5715.000	PK	55.3	32.1	3.9	31.8	59.5	68.2	8.7	Outside	
Hori	5725.000	PK	67.1	32.1	3.9	31.8	71.3	78.2	6.9	Bandedge	
Hori	11490.000	PK	47.8	39.6	-2.3	33.6	51.5	73.9	22.4	Inside	
Hori	17235.000	PK	45.3	42.1	-0.7	32.2	54.5	68.2	13.7	Outside	Floor Noise
Hori	22980.000	PK	42.2	37.9	-1.0	31.6	47.5	73.9	26.4	Inside	Floor Noise
Hori	11490.000	AV	38.7	39.6	-2.3	33.6	42.4	53.9	11.5	Inside	Method AD
Hori	22980.000	AV	34.8	37.9	-1.0	31.6	40.1	53.9	13.8	Inside	Floor Noise / Method AD
Vert	5715.000	PK	50.8	32.1	3.9	31.8	55.0	68.2	13.2	Outside	
Vert	5725.000	PK	63.3	32.1	3.9	31.8	67.5	78.2	10.7	Bandedge	
Vert	11490.000	PK	53.2	39.6	-2.3	33.6	56.9	73.9	17.0	Inside	
Vert	17235.000	PK	44.7	42.1	-0.7	32.2	53.9	68.2	14.3	Outside	Floor Noise
Vert	22980.000	PK	44.2	37.9	-1.0	31.6	49.5	73.9	24.4	Inside	Floor Noise
Vert	11490.000	AV	44.0	39.6	-2.3	33.6	47.7	53.9	6.2	Inside	Method AD
Vert	22980.000	AV	35.6	37.9	-1.0	31.6	40.9	53.9	13.0	Inside	Floor Noise / Method AD

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

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

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

*Duty cycle was 100% on this test.

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Radiated Spurious Emission [Sleeve antenna]

Test place : Ise EMC Lab. No.3 Anechoic Chamber
Report No. : 10517042H
Date : 10/06/2014 10/07/2014
Temperature/ Humidity : 24deg.C. / 56% 22deg.C. / 52%
Engineer : Tsubasa Takayama Keisuke Kawamura
(1-10GHz) (10-40GHz)
Mode : 11n-20 Tx 5785MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	11570.000	PK	45.8	39.6	-2.2	33.6	49.6	73.9	24.3	Inside	
Hori	17355.000	PK	43.8	43.0	-0.7	32.2	53.9	68.2	14.3	Outside	Floor Noise
Hori	23140.000	PK	44.8	37.9	-1.0	31.5	50.2	68.2	18.0	Outside	Floor Noise
Hori	11570.000	AV	37.6	39.6	-2.2	33.6	41.4	53.9	12.5	Inside	Method AD
Vert	11570.000	PK	49.9	39.6	-2.2	33.6	53.7	73.9	20.2	Inside	
Vert	17355.000	PK	43.4	43.0	-0.7	32.2	53.5	68.2	14.7	Outside	Floor Noise
Vert	23140.000	PK	45.1	37.9	-1.0	31.5	50.5	68.2	17.7	Outside	Floor Noise
Vert	11570.000	AV	41.1	39.6	-2.2	33.6	44.9	53.9	9.0	Inside	Method AD

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

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

Distance factor: 10GHz-26.5GHz $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$
26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*Duty cycle was 100% on this test.

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Radiated Spurious Emission [Sleeve antenna]

Test place : Ise EMC Lab. No.3 Anechoic Chamber
Report No. : 10517042H
Date : 10/06/2014 10/07/2014
Temperature/ Humidity : 24deg.C. / 56% 22deg.C. / 52%
Engineer : Tsubasa Takayama Keisuke Kawamura
(1-10GHz) (10-40GHz)
Mode : 11n-20 Tx 5825MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	5850.000	PK	56.5	32.2	4.0	31.8	60.9	78.2	17.3	Bandedge	
Hori	5860.000	PK	47.5	32.2	4.0	31.8	51.9	68.2	16.3	Outside	
Hori	11650.000	PK	45.1	39.6	-2.2	33.5	49.0	73.9	24.9	Inside	
Hori	17475.000	PK	43.9	44.0	-0.6	32.2	55.1	68.2	13.1	Outside	Floor Noise
Hori	23300.000	PK	45.2	37.9	-1.0	31.4	50.7	68.2	17.5	Outside	Floor Noise
Hori	11650.000	AV	36.4	39.6	-2.2	33.5	40.3	53.9	13.6	Inside	Method AD
Vert	5850.000	PK	52.4	32.2	4.0	31.8	56.8	78.2	21.4	Bandedge	
Vert	5860.000	PK	44.7	32.2	4.0	31.8	49.1	68.2	19.1	Outside	
Vert	11650.000	PK	48.4	39.6	-2.2	33.5	52.3	73.9	21.6	Inside	
Vert	17475.000	PK	44.0	44.0	-0.6	32.2	55.2	68.2	13.0	Outside	Floor Noise
Vert	23300.000	PK	46.5	37.9	-1.0	31.4	52.0	68.2	16.2	Outside	Floor Noise
Vert	11650.000	AV	39.3	39.6	-2.2	33.5	43.2	53.9	10.7	Inside	Method AD

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

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

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

*Duty cycle was 100% on this test.

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission [Sleeve antenna]

Test place	Ise EMC Lab. No.3 Anechoic Chamber		
Report No.	10517042H		
Date	10/06/2014	10/07/2014	10/07/2014
Temperature/ Humidity	24deg.C. / 56%	22deg.C. / 52%	22deg.C. / 52%
Engineer	Tsubasa Takayama (1-10GHz)	Keisuke Kawamura (10-40GHz)	Takumi Shimada (30-1000MHz)
Mode	11n-40 Tx 5755MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	44.267	QP	30.2	12.9	7.3	32.2	18.2	40.0	21.8	Outside	
Hori	350.000	QP	34.4	16.0	10.3	31.9	28.8	46.0	17.2	Outside	
Hori	400.000	QP	30.5	17.5	10.5	32.0	26.5	46.0	19.5	Inside	
Hori	411.424	QP	29.7	17.6	10.6	32.0	25.9	46.0	20.1	Outside	
Hori	641.200	QP	31.8	19.8	12.0	32.0	31.6	46.0	14.4	Outside	
Hori	822.847	QP	28.0	22.1	12.8	31.3	31.6	46.0	14.4	Outside	
Hori	5715.000	PK	67.7	32.1	3.9	31.8	71.9	73.9	2.0	Outside	
Hori	5725.000	PK	71.7	32.1	3.9	31.8	75.9	78.2	2.3	Bandedge	
Hori	11510.000	PK	44.5	39.6	-2.3	33.6	48.2	73.9	25.7	Inside	
Hori	17265.000	PK	45.7	42.3	-0.7	32.2	55.1	68.2	13.1	Outside	Floor Noise
Hori	23020.000	PK	44.4	37.9	-1.0	31.6	49.7	73.9	24.2	Inside	Floor Noise
Hori	5715.000	AV	48.9	32.1	3.9	31.8	53.1	53.9	0.8	Outside	Method VB
Hori	11510.000	AV	36.3	39.6	-2.3	33.6	40.0	53.9	13.9	Inside	Method AD
Hori	23020.000	AV	36.0	37.9	-1.0	31.6	41.3	53.9	12.6	Inside	Floor Noise / Method AD
Vert	44.917	QP	43.6	12.7	7.3	32.2	31.4	40.0	8.6	Outside	
Vert	350.166	QP	24.3	16.0	10.3	31.9	18.7	46.0	27.3	Outside	
Vert	411.424	QP	29.0	17.6	10.6	32.0	25.2	46.0	20.8	Outside	
Vert	641.000	QP	27.5	19.8	12.0	32.0	27.3	46.0	18.7	Outside	
Vert	814.983	QP	22.6	22.1	12.9	31.4	26.2	46.0	19.8	Outside	
Vert	946.339	QP	21.4	23.3	13.4	30.7	27.4	46.0	18.6	Outside	
Vert	5715.000	PK	63.6	32.1	3.9	31.8	67.8	68.2	0.4	Outside	
Vert	5725.000	PK	65.9	32.1	3.9	31.8	70.1	78.2	8.1	Bandedge	
Vert	11510.000	PK	49.3	39.6	-2.3	33.6	53.0	73.9	20.9	Inside	
Vert	17265.000	PK	44.8	42.3	-0.7	32.2	54.2	68.2	14.0	Outside	Floor Noise
Vert	23020.000	PK	47.1	37.9	-1.0	31.6	52.4	73.9	21.5	Inside	Floor Noise
Vert	11510.000	AV	40.9	39.6	-2.3	33.6	44.6	53.9	9.3	Inside	Method AD
Vert	23020.000	AV	35.9	37.9	-1.0	31.6	41.2	53.9	12.7	Inside	Floor Noise / Method AD

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

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

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

*Duty cycle was 100% on this test.

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Radiated Spurious Emission [Sleeve antenna]

Test place : Ise EMC Lab. No.3 Anechoic Chamber
Report No. : 10517042H
Date : 10/06/2014 10/07/2014
Temperature/ Humidity : 24deg.C. / 56% 22deg.C. / 52%
Engineer : Tsubasa Takayama Keisuke Kawamura
(1-10GHz) (10-40GHz)
Mode : 11n-40 Tx 5795MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	5850.000	PK	47.5	32.2	4.0	31.8	51.9	78.2	26.3	Bandedge	
Hori	5860.000	PK	45.8	32.2	4.0	31.8	50.2	68.2	18.0	Outside	
Hori	11590.000	PK	54.2	39.6	-2.2	33.5	58.1	73.9	15.8	Inside	
Hori	17385.000	PK	42.1	43.3	-0.7	32.2	52.5	68.2	15.7	Outside	Floor Noise
Hori	23180.000	PK	45.5	37.9	-1.0	31.5	50.9	68.2	17.3	Outside	Floor Noise
Hori	11590.000	AV	46.9	39.6	-2.2	33.5	50.8	53.9	3.1	Inside	Method AD
Vert	5850.000	PK	47.0	32.2	4.0	31.8	51.4	78.2	26.8	Bandedge	
Vert	5860.000	PK	43.7	32.2	4.0	31.8	48.1	68.2	20.1	Outside	
Vert	11590.000	PK	52.4	39.6	-2.2	33.5	56.3	73.9	17.6	Inside	
Vert	17385.000	PK	42.7	43.3	-0.7	32.2	53.1	68.2	15.1	Outside	Floor Noise
Vert	23180.000	PK	45.2	37.9	-1.0	31.5	50.6	68.2	17.6	Outside	Floor Noise
Vert	11590.000	AV	44.8	39.6	-2.2	33.5	48.7	53.9	5.2	Inside	Method AD

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

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

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

26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*Duty cycle was 100% on this test.

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Radiated Spurious Emission [Embedded antenna]

Test place : Ise EMC Lab. No.3 Anechoic Chamber
Report No. : 10517042H
Date : 10/06/2014 10/07/2014
Temperature/ Humidity : 24deg.C. / 56% 22deg.C. / 52%
Engineer : Tsubasa Takayama Keisuke Kawamura
(1-10GHz) (10-40GHz)
Mode : 11n-20 Tx 5745MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	5715.000	PK	48.4	32.1	3.9	31.8	52.6	68.2	15.6	Outside	
Hori	5725.000	PK	60.2	32.1	3.9	31.8	64.4	78.2	13.8	Bandedge	
Hori	11490.000	PK	49.2	39.6	-2.3	33.6	52.9	73.9	21.0	Inside	
Hori	17235.000	PK	44.1	42.1	-0.7	32.2	53.3	68.2	14.9	Outside	Floor Noise
Hori	22980.000	PK	44.6	37.9	-1.0	31.6	49.9	73.9	24.0	Inside	Floor Noise
Hori	11490.000	AV	34.2	39.6	-2.3	33.6	37.9	53.9	16.0	Inside	Method AD
Hori	22980.000	AV	34.9	37.9	-1.0	31.6	40.2	53.9	13.7	Inside	Floor Noise / Method AD
Vert	5715.000	PK	53.6	32.1	3.9	31.8	57.8	68.2	10.4	Outside	
Vert	5725.000	PK	65.4	32.1	3.9	31.8	69.6	78.2	8.6	Bandedge	
Vert	11490.000	PK	49.9	39.6	-2.3	33.6	53.6	73.9	20.3	Inside	
Vert	17235.000	PK	44.7	42.1	-0.7	32.2	53.9	68.2	14.3	Outside	Floor Noise
Vert	22980.000	PK	44.3	37.9	-1.0	31.6	49.6	73.9	24.3	Inside	Floor Noise
Vert	11490.000	AV	37.9	39.6	-2.3	33.6	41.6	53.9	12.3	Inside	Method AD
Vert	22980.000	AV	35.5	37.9	-1.0	31.6	40.8	53.9	13.1	Inside	Floor Noise / Method AD

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

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

Distance factor: 10GHz-26.5GHz $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$
26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*Duty cycle was 100% on this test.

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Radiated Spurious Emission [Embedded antenna]

Test place : Ise EMC Lab. No.3 Anechoic Chamber
Report No. : 10517042H
Date : 10/06/2014 10/07/2014
Temperature/ Humidity : 24deg.C. / 56% 22deg.C. / 52%
Engineer : Tsubasa Takayama Keisuke Kawamura
(1-10GHz) (10-40GHz)
Mode : 11n-20 Tx 5785MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	11570.000	PK	50.7	39.6	-2.2	33.6	54.5	73.9	19.4	Inside	
Hori	17355.000	PK	43.9	43.0	-0.7	32.2	54.0	68.2	14.2	Outside	Floor Noise
Hori	23140.000	PK	44.7	37.9	-1.0	31.5	50.1	68.2	18.1	Outside	Floor Noise
Hori	11570.000	AV	40.1	39.6	-2.2	33.6	43.9	53.9	10.0	Inside	Method AD
Vert	11570.000	PK	52.6	39.6	-2.2	33.6	56.4	73.9	17.5	Inside	
Vert	17355.000	PK	44.5	43.0	-0.7	32.2	54.6	68.2	13.6	Outside	Floor Noise
Vert	23140.000	PK	45.0	37.9	-1.0	31.5	50.4	68.2	17.8	Outside	Floor Noise
Vert	11570.000	AV	43.3	39.6	-2.2	33.6	47.1	53.9	6.8	Inside	Method AD

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

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

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

*Duty cycle was 100% on this test.

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Radiated Spurious Emission [Embedded antenna]

Test place : Ise EMC Lab. No.3 Anechoic Chamber
Report No. : 10517042H
Date : 10/06/2014 10/07/2014
Temperature/ Humidity : 24deg.C. / 56% 22deg.C. / 52%
Engineer : Tsubasa Takayama Keisuke Kawamura
(1-10GHz) (10-40GHz)
Mode : 11n-20 Tx 5825MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	5850.000	PK	48.2	32.2	4.0	31.8	52.6	78.2	25.6	Bandedge	
Hori	5860.000	PK	44.5	32.2	4.0	31.8	48.9	68.2	19.3	Outside	
Hori	11650.000	PK	52.3	39.6	-2.2	33.5	56.2	73.9	17.7	Inside	
Hori	17475.000	PK	43.1	44.0	-0.6	32.2	54.3	68.2	13.9	Outside	Floor Noise
Hori	23300.000	PK	45.1	37.9	-1.0	31.4	50.6	68.2	17.6	Outside	Floor Noise
Hori	11650.000	AV	43.2	39.6	-2.2	33.5	47.1	53.9	6.8	Inside	Method AD
Vert	5850.000	PK	55.2	32.2	4.0	31.8	59.6	78.2	18.6	Bandedge	
Vert	5860.000	PK	47.7	32.2	4.0	31.8	52.1	68.2	16.1	Outside	
Vert	11650.000	PK	57.2	39.6	-2.2	33.5	61.1	73.9	12.8	Inside	
Vert	17475.000	PK	43.9	44.0	-0.6	32.2	55.1	68.2	13.1	Outside	Floor Noise
Vert	23300.000	PK	46.0	37.9	-1.0	31.4	51.5	68.2	16.7	Outside	Floor Noise
Vert	11650.000	AV	47.4	39.6	-2.2	33.5	51.3	53.9	2.6	Inside	Method AD

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

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

Distance factor: 10GHz-26.5GHz $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$
26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*Duty cycle was 100% on this test.

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Radiated Spurious Emission [Embedded antenna]

Test place	Ise EMC Lab. No.3 Anechoic Chamber		
Report No.	10517042H		
Date	10/06/2014	10/07/2014	10/07/2014
Temperature/ Humidity	24deg.C. / 56%	22deg.C. / 52%	22deg.C. / 52%
Engineer	Tsubasa Takayama	Keisuke Kawamura	Takumi Shimada
	(1-10GHz)	(10-40GHz)	(30-1000MHz)
Mode	11n-40 Tx 5755MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	45.730	QP	31.8	12.4	7.3	32.2	19.3	40.0	20.7	Outside	
Hori	400.000	QP	33.0	17.5	10.5	32.0	29.0	46.0	17.0	Inside	
Hori	411.424	QP	32.9	17.6	10.6	32.0	29.1	46.0	16.9	Outside	
Hori	500.000	QP	34.0	18.1	11.2	32.0	31.3	46.0	14.7	Outside	
Hori	637.600	QP	33.9	19.8	12.0	32.0	33.7	46.0	12.3	Outside	
Hori	820.447	QP	26.3	22.1	12.8	31.3	29.9	46.0	16.1	Outside	
Hori	5715.000	PK	61.4	32.1	3.9	31.8	65.6	68.2	2.6	Outside	
Hori	5725.000	PK	65.2	32.1	3.9	31.8	69.4	78.2	8.8	Bandedge	
Hori	11510.000	PK	45.5	39.6	-2.3	33.6	49.2	73.9	24.7	Inside	
Hori	17265.000	PK	44.3	42.3	-0.7	32.2	53.7	68.2	14.5	Outside	Floor Noise
Hori	23020.000	PK	44.7	37.9	-1.0	31.6	50.0	73.9	23.9	Inside	Floor Noise
Hori	11510.000	AV	36.1	39.6	-2.3	33.6	39.8	53.9	14.1	Inside	Method AD
Hori	23020.000	AV	36.0	37.9	-1.0	31.6	41.3	53.9	12.6	Inside	Floor Noise / Method AD
Vert	45.760	QP	45.4	12.4	7.3	32.2	32.9	40.0	7.1	Outside	
Vert	411.424	QP	29.7	17.6	10.6	32.0	25.9	46.0	20.1	Outside	
Vert	500.000	QP	29.6	18.1	11.2	32.0	26.9	46.0	19.1	Outside	
Vert	653.000	QP	27.7	19.9	12.1	32.0	27.7	46.0	18.3	Outside	
Vert	810.789	QP	22.5	22.0	12.9	31.4	26.0	46.0	20.0	Outside	
Vert	946.339	QP	22.0	23.3	13.4	30.7	28.0	46.0	18.0	Outside	
Vert	5715.000	PK	63.7	32.1	3.9	31.8	67.9	68.2	0.3	Outside	
Vert	5725.000	PK	68.1	32.1	3.9	31.8	72.3	78.2	5.9	Bandedge	
Vert	11510.000	PK	46.2	39.6	-2.3	33.6	49.9	73.9	24.0	Inside	
Vert	17265.000	PK	45.0	42.3	-0.7	32.2	54.4	68.2	13.8	Outside	Floor Noise
Vert	23020.000	PK	45.6	37.9	-1.0	31.6	50.9	73.9	23.0	Inside	Floor Noise
Vert	11510.000	AV	36.7	39.6	-2.3	33.6	40.4	53.9	13.5	Inside	Method AD
Vert	23020.000	AV	35.9	37.9	-1.0	31.6	41.2	53.9	12.7	Inside	Floor Noise / Method AD

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

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

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

*Duty cycle was 100% on this test.

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Radiated Spurious Emission [Embedded antenna]

Test place : Ise EMC Lab. No.3 Anechoic Chamber
Report No. : 10517042H
Date : 10/06/2014 10/07/2014
Temperature/ Humidity : 24deg.C. / 56% 22deg.C. / 52%
Engineer : Tsubasa Takayama Keisuke Kawamura
(1-10GHz) (10-40GHz)
Mode : 11n-40 Tx 5795MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	5850.000	PK	45.7	32.2	4.0	31.8	50.1	78.2	28.1	Bandedge	
Hori	5860.000	PK	43.9	32.2	4.0	31.8	48.3	68.2	19.9	Outside	
Hori	11590.000	PK	48.4	39.6	-2.2	33.5	52.3	73.9	21.6	Inside	
Hori	17385.000	PK	46.0	43.3	-0.7	32.2	56.4	68.2	11.8	Outside	Floor Noise
Hori	23180.000	PK	45.0	37.9	-1.0	31.5	50.4	68.2	17.8	Outside	Floor Noise
Hori	11590.000	AV	38.6	39.6	-2.2	33.5	42.5	53.9	11.4	Inside	Method AD
Vert	5850.000	PK	48.6	32.2	4.0	31.8	53.0	78.2	25.2	Bandedge	
Vert	5860.000	PK	46.7	32.2	4.0	31.8	51.1	68.2	17.1	Outside	
Vert	11590.000	PK	52.6	39.6	-2.2	33.5	56.5	73.9	17.4	Inside	
Vert	17385.000	PK	45.0	43.3	-0.7	32.2	55.4	68.2	12.8	Outside	Floor Noise
Vert	23180.000	PK	45.2	37.9	-1.0	31.5	50.6	68.2	17.6	Outside	Floor Noise
Vert	11590.000	AV	41.4	39.6	-2.2	33.5	45.3	53.9	8.6	Inside	Method AD

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

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

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

26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*Duty cycle was 100% on this test.

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Duty Cycle

Test place	Ise EMC Lab. No.3 Anechoic Chamber
Report No.	10517042H
Date	10/06/2014
Temperature/ Humidity	24deg.C. / 56%
Engineer	Tsubasa Takayama
Mode	11a/11n-20/11n-40 Tx

11a 6Mbps	11n-20 MCS3
Tx on / (Tx on + Tx off) = 1.000 Tx on / (Tx on + Tx off) * 100 = 100.0 % Duty factor = 10 * log (100 / 100) = 0.00 dB	Tx on / (Tx on + Tx off) = 1.000 Tx on / (Tx on + Tx off) * 100 = 100.0 % Duty factor = 10 * log (100 / 100) = 0.00 dB
11n-40 MCS3	
Tx on / (Tx on + Tx off) = 1.000 Tx on / (Tx on + Tx off) * 100 = 100.0 % Duty factor = 10 * log (100 / 100) = 0.00 dB	

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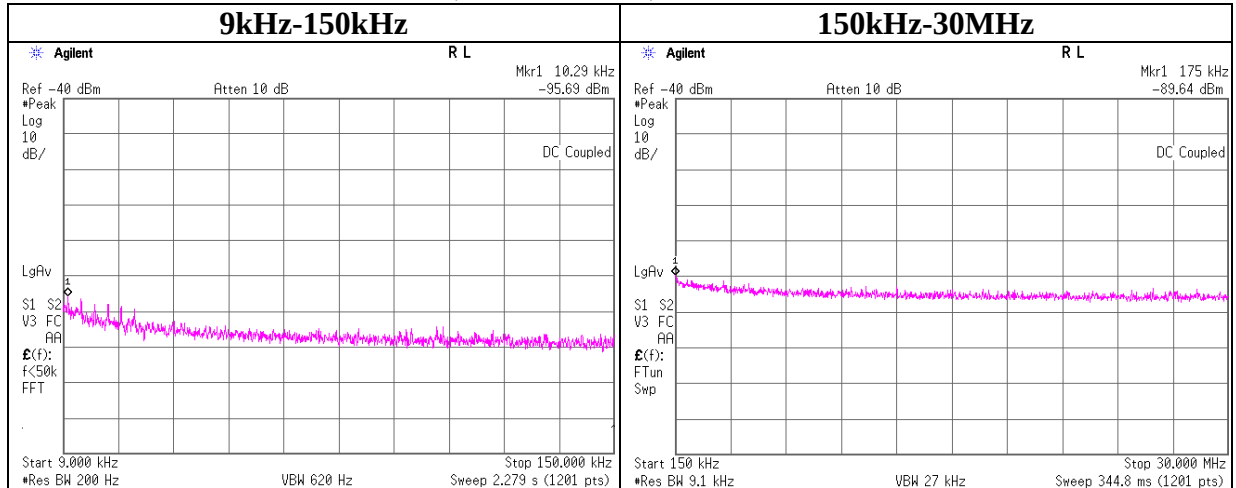
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Conducted Spurious Emission

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 10517042H
Date : 10/08/2014
Temperature/ Humidity : 24deg. C / 50% RH
Engineer : Yutaka Yoshida
Mode : 11n-40 Tx

11n-40, Tx 5755MHz, Antenna Port 2



Frequency	Reading	Cable Loss	Attenuator	Antenna Gain	RBW factor	EIRP	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]	
10.29	-95.7	0.6	10.0	2.5	37.0	-45.6	-27.0	18.6	
175.00	-89.6	0.6	10.0	2.5	20.4	-56.2	-27.0	29.2	

EIRP=Reading + Cable Loss + Attenuator + Antenna Gain + RBW factor

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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	AT	2014/06/06 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2013/10/21 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2013/10/21 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2014/03/13 * 12
MCC-36	Microwave Cable	Hirose Electric	U.FL-2LP-066-A-(200)	-	AT	2014/09/12 * 12
MCC-144	Microwave Cable	Junkosha	MWX221	1207S407	AT	2014/08/08 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2013/12/17 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2014/02/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-112	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2013/10/04 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2014/05/26 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2014/05/26 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2014/03/24 * 12
MCC-79	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278923/4	RE	2013/12/24 * 12
MHF-23	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCC	603	RE	2014/01/16 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2013/11/25 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2014/04/08 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2014/05/26 * 12
MCC-54	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	RE	2014/03/11 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2014/06/30 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2014/04/08 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2014/08/19 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2014/07/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2014/04/14 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 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

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