RADIO TEST REPORT

Test Report No. : 10706993H-A-R1

Applicant	:	**MITSUBISHI ELECTRIC CORPORATION SANDA WORKS**
Type of Equipment	:	**Display Audio**
Model No.	:	**NR-000**
FCC ID	:	**UJHNR000**
Test regulation	:	**FCC Part 15 Subpart C: 2015** ***WLAN part**
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 10706993H-A. 10706993H-A is replaced with this report.

Date of test: April 20 to 28, 2015

Representative test engineer:
S. Matsuyama
Satofumi Matsuyama
Engineer
Consumer Technology Division

Approved by:
M. Imura
Motoya Imura
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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REVISION HISTORY

Original Test Report No.: 10706993H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10706993H-A	June 3, 2015	-	-
1	10706993H-A-R1	June 5, 2015	P5, 10	Addition of Power Supply (inner): DC 1.8 V
1	10706993H-A-R1	June 5, 2015	P6	Correction of sentence for FCC 15.31 (e)
1	10706993H-A-R1	June 5, 2015	P12	Correction of test position sentence

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SECTION 1: Customer information

Company Name	:	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS
Address	:	2-3-33, Miwa, Sanda-city, Hyogo, 669-1513, Japan
Telephone Number	:	+81-79-559-3623
Facsimile Number	:	+81-79-559-3875
Contact Person	:	Kenji Otani

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

2.1 Identification of E.U.T.

Type of Equipment	:	Display Audio
Model No.	:	NR-000
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample	:	March 7, 2015
Country of Mass-production	:	Thailand
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

General Specification

Clock frequency(ies) in the system : 900 MHz (Radio part: 26 MHz)

Radio Specification

Radio Type : Transceiver
Power Supply (inner) : DC 3.3 V / DC 1.8 V

Radio Specification

	IEEE802.11b	IEEE802.11g/n (20 M band)	IEEE802.11a/n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412 MHz -2462 MHz *1)	2412 MHz - 2462 MHz *1)	**[For FCC]** 5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz **[For IC]** 5280 MHz - 5320 MHz 5745 MHz - 5825 MHz	**[For FCC]** 5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz 5755 MHz - 5795 MHz **[For IC]** 5310 MHz 5755 MHz - 5795 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5 MHz		20 MHz	40 MHz
Antenna type	Inverted F Antenna			
Antenna Gain	0.29 dBi		W52, W53 band: 3.6 dBi W56, W58 band: 2.17 dBi	

*1) This test report applies for WLAN (IEEE802.11b/g/n-20 [2412 MHz -2462 MHz]).

	GPS/GLONASS	Bluetooth Ver.3.0 with EDR function
Frequency of operation	GPS: 1575.42 MHz GLONASS: 1597.55 MHz - 1605.89 MHz	2402 MHz - 2480 MHz
Type of modulation	GPS: BPSK GLONASS: BPSK	FHSS (GFSK, π/4-DQPSK, 8-DPSK)
Channel spacing	GLONASS: 0.5625 MHz	1 MHz
Antenna type	Inverted F Antenna	Inverted F Antenna
Antenna Gain	0 dBi	0.29 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2015, final revised on January 21, 2015
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.4:2009 7. AC powerline Conducted Emission measurements	**FCC:** Section 15.207	N/A *1)	N/A	-
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)"	**FCC:** Section 15.247(a)(2)	See data.	Complied	Conducted
	IC: -	**IC:** RSS-247 5.2(1)			
Maximum Peak Output Power	**FCC:** "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)"	**FCC:** Section 15.247(b)(3)		Complied	Conducted
	IC: RSS-Gen 6.12	**IC:** RSS-247 5.4(4)			
Power Density	**FCC:** "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)"	**FCC:** Section 15.247(e)		Complied	Conducted
	IC: -	**IC:** RSS-247 5.2(2)			
Spurious Emission Restricted Band Edges	**FCC:** "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)"	**FCC:** Section15.247(d)	4.7 dB 4924.000 MHz, Horizontal, AV	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
	IC: RSS-Gen 6.13	**IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 12.2.7.

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

FCC 15.31 (e)

The EUT provides stable voltage (DC 3.3 V / DC 1.8 V) constantly to the wireless transmitter regardless of input voltage.
Instead of a new battery, DC power supply was used for the test.
That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

3.3 Addition to standard

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

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor *k* = 2.

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

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

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

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

Radiated emission test (3 m)

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

3.5 Test Location

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

	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 7.7 m	7.0 x 6.0 m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2 m	4.0 x 4.0 m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9 m	6.8 x 5.75 m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7 m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9 m	6.8 x 5.75 m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7 m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9 m	6.0 x 6.0 m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7 m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0 m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7 m	4.7 x 7.5 m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7 m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8 m	2.4 x 2.4 m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0 m	4.8 x 4.6 m	-

* 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.

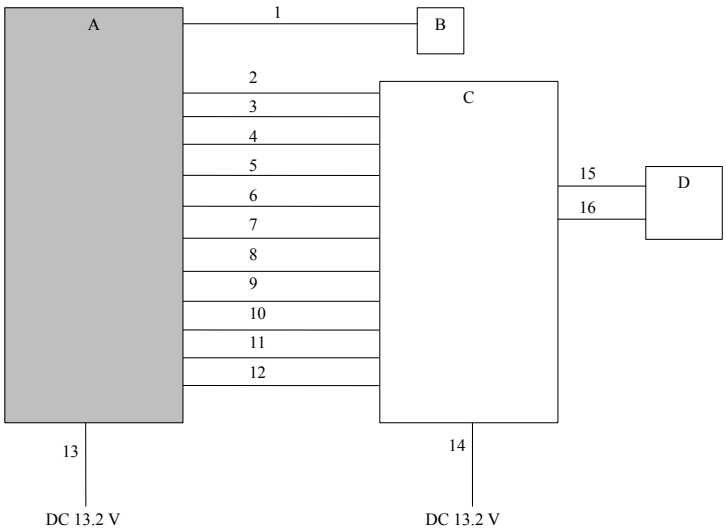
Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	54 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20) (2.4GHz)	MCS 3, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: IEEE 802.11b: 11dBm, IEEE 802.11g/n-20: 8dBm Software: Internal Software Ver1.0 *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.	

<2.4GHz band>
*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Spurious Emission (Above 1GHz)	11b Tx 11n-20 Tx *1)	2412 MHz 2437 MHz 2462 MHz
Conducted Spurious Emission Spurious Emission (Below 1GHz)	11n-20 Tx *2)	2462 MHz *2)
6 dB Bandwidth Maximum Peak Output Power Power Density 99 % Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
Band Edge confirmation	11b Tx 11n-20 Tx	2412 MHz 2462 MHz

*1) Since 11g 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.
*2) The operating mode and tested frequency were tested as a representative, because it had the highest power at antenna terminal test.

4.2 Configuration and peripherals



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

* The testing was performed with DC 13.2 V only.
As the stable voltage (DC 3.3 V / DC 1.8 V) is provided to RF module via the internal regulator, it does not influence on the test result.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Display Audio	NR-000	94ZN6004 *1) 94ZN6003 *2)	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS	EUT
B	GPS Antenna	-	-	MITSUMI	-
C	Dummy board	-	320496A002	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS	-
D	Display	39710-TBAA-A110-M1	411VIFW000803	LG	-

*1) Used for Antenna terminal conducted test.
*2) Used for Spurious Emission test.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	GPS Cable	3.0	Shielded	Shielded	-
2	Signal Cable	2.0	Shielded	Shielded	-
3	Signal Cable	2.0	Shielded	Shielded	-
4	Signal Cable	2.0	Shielded	Shielded	-
5	Signal Cable	2.0	Shielded	Shielded	-
6	Signal Cable	2.0	Unshielded	Unshielded	-
7	Signal Cable	2.0	Unshielded	Unshielded	-
8	Signal Cable	2.0	Unshielded	Unshielded	-
9	Signal Cable	2.0	Shielded	Shielded	-
10	Signal Cable	2.0	Shielded	Shielded	-
11	Signal Cable	2.0	Shielded	Shielded	-
12	Signal Cable	2.0	Unshielded	Unshielded	-
13	DC Cable	2.0	Unshielded	Unshielded	-
14	DC Cable	2.0	Unshielded	Unshielded	-
15	Display Cable	0.3	Shielded	Shielded	-
16	Display Cable	0.3	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)".

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.
The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: 12.2.5.2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results. Integration Method: 13.3.1 RBW: 100kHz VBW: 300kHz Span: 2MHz Detector: Power Averaging (RMS) Trace: 100 traces	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3 m (below 10 GHz), 1 m *2) (above 10 GHz)		3 m (below 10 GHz), 1 m *2) (above 10 GHz)

*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)"
*2) Distance Factor: 20 x log (3.0 m / 1.0 m) = 9.5 dB

The test was performed with the worst angle of carrier and noise levels.

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

Measurement range : 30 MHz - 26.5 GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6 dB Bandwidth	20 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6 dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
Band Edge confirmation	40 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *2)

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 10.2 Method PKPSD (peak PSD) of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)".
*4) 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

6dB Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11b Tx / 11g Tx / 11n-20 Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	10.567	>500
2437	10.328	>500
2462	9.938	>500

11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.419	>500
2437	15.117	>500
2462	15.405	>500

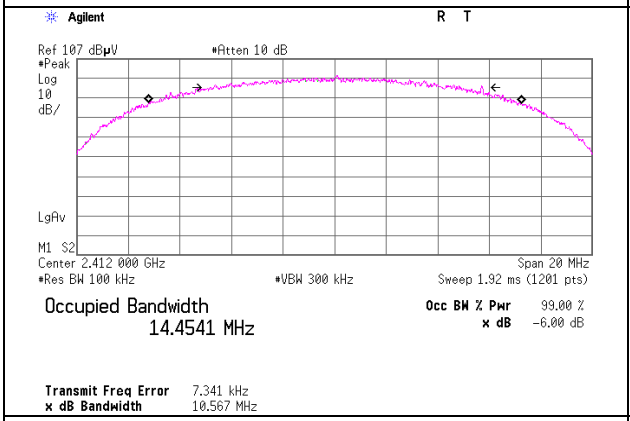
11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.118	>500
2437	15.116	>500
2462	15.122	>500

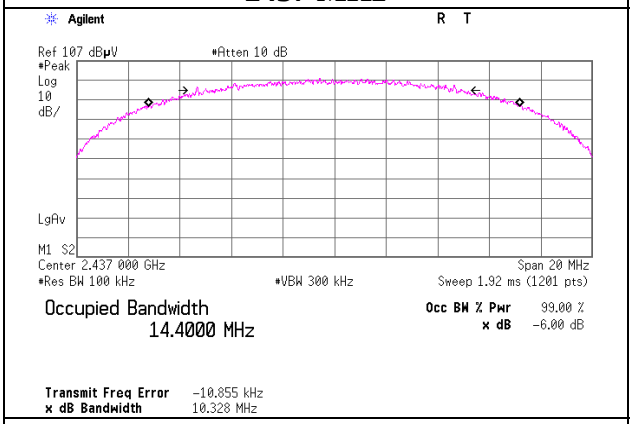
6dB Bandwidth

11b

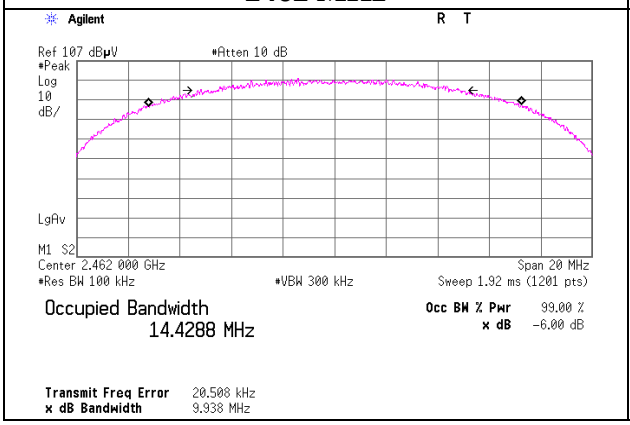
2412 MHz



2437 MHz

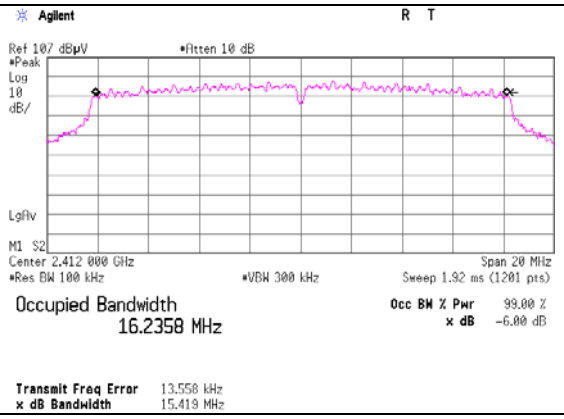


2462 MHz

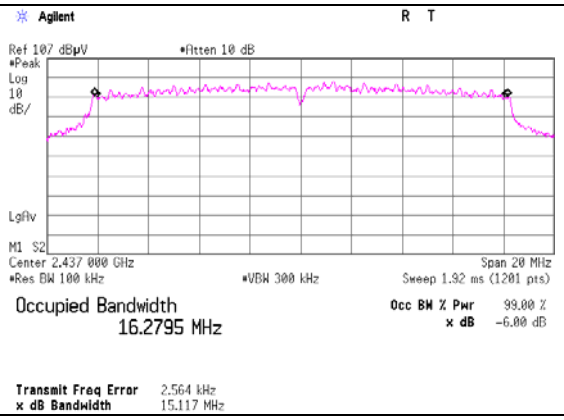


11g

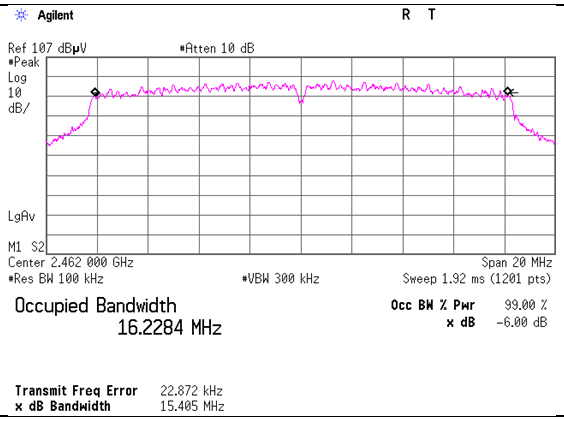
2412 MHz



2437 MHz



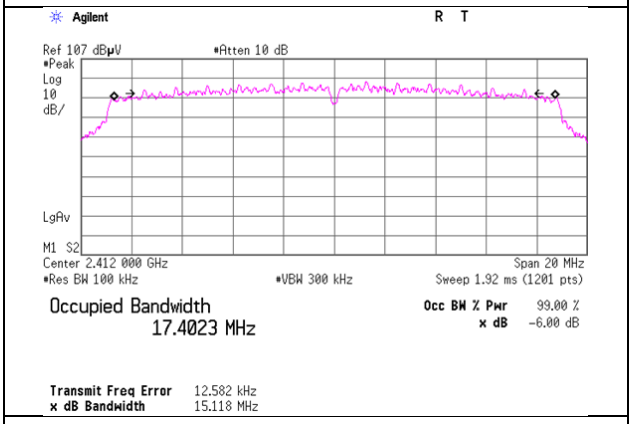
2462 MHz



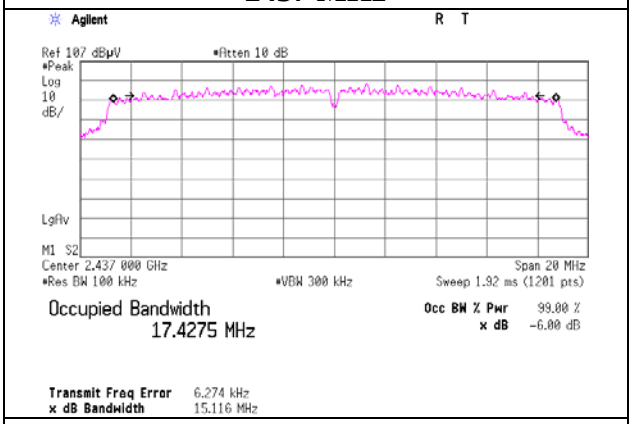
6dB Bandwidth

11n-20

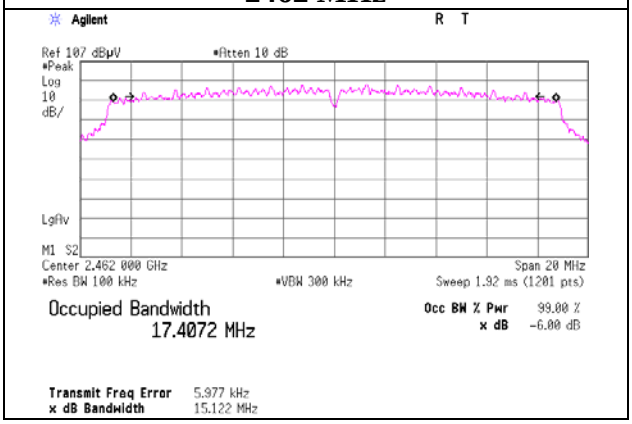
2412 MHz



2437 MHz



2462 MHz



Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/23/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11b Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	1.69	1.39	10.06	13.14	20.61	30.00	1000	16.86
2437	1.72	1.39	10.06	13.17	20.75	30.00	1000	16.83
2462	1.68	1.39	10.06	13.13	20.56	30.00	1000	16.87

Sample Calculation:
Result = Reading + Cable Loss (included customer's supply cable) + Attenuator

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
1	1.19	
2	1.44	
5.5	1.66	
11	1.72	*

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/23/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11g Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	6.28	1.39	10.06	17.73	59.29	30.00	1000	12.27
2437	6.31	1.39	10.06	17.76	59.70	30.00	1000	12.24
2462	6.39	1.39	10.06	17.84	60.81	30.00	1000	12.16

Sample Calculation:
Result = Reading + Cable Loss (included customer's supply cable) + Attenuator

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
6	4.03	
9	3.98	
12	4.19	
18	4.45	
24	4.34	
36	6.07	
48	6.15	
54	6.31	*

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/23/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11n-20 Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	6.66	1.86	10.00	18.52	71.12	30.00	1000	11.48
2437	6.47	1.87	10.00	18.34	68.23	30.00	1000	11.66
2462	6.64	1.87	10.00	18.51	70.96	30.00	1000	11.49

Sample Calculation:
Result = Reading + Cable Loss (included customer's supply cable) + Attenuator

2437MHz

Rate [MCS]	Reading [dBm]	Remark
0	6.30	
1	6.37	
2	6.42	
3	6.47	*
4	6.36	
5	6.39	
6	6.32	
7	6.17	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Average Output Power (Reference data)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/23/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11b Tx / 11g Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result (Cond.) [dBm]	Result (Cond.) [mW]	Result (e.i.r.p) [dBm]	Result (e.i.r.p) [mW]
2412	-1.03	1.39	10.06	0.29	10.42	11.02	10.71	11.78
2437	-0.97	1.39	10.06	0.29	10.48	11.17	10.77	11.94
2462	-1.02	1.39	10.06	0.29	10.43	11.04	10.72	11.80

Result(Cond.) = Reading + Cable Loss + Attenuator Loss
Result(e.i.r.p.) = Reading + Cable Loss (included customer's supply cable) + Attenuator Loss + Antenna Gain

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
1	-0.97	*
2	-1.03	
5.5	-1.50	
11	-2.04	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result (Cond.) [dBm]	Result (Cond.) [mW]	Result (e.i.r.p) [dBm]	Result (e.i.r.p) [mW]
2412	-3.93	1.39	10.06	0.29	7.52	5.65	7.81	6.04
2437	-3.88	1.39	10.06	0.29	7.57	5.71	7.86	6.11
2462	-3.87	1.39	10.06	0.29	7.58	5.73	7.87	6.12

Result(Cond.) = Reading + Cable Loss + Attenuator Loss
Result(e.i.r.p.) = Reading + Cable Loss (included customer's supply cable) + Attenuator Loss + Antenna Gain

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
6	-3.88	*
9	-4.41	
12	-4.72	
18	-5.24	
24	-6.05	
36	-7.03	
48	-7.59	
54	-8.11	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Average Output Power (Reference data)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/23/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11n-20 Tx

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result (Cond.) [dBm]	Result (Cond.) [mW]	Result (e.i.r.p) [dBm]	Result (e.i.r.p) [mW]
2412	-3.62	1.39	10.06	0.29	7.83	6.07	8.12	6.49
2437	-3.75	1.39	10.06	0.29	7.70	5.89	7.99	6.30
2462	-3.60	1.39	10.06	0.29	7.85	6.10	8.14	6.52

Result(Cond.) = Reading + Cable Loss + Attenuator Loss
Result(e.i.r.p.) = Reading + Cable Loss (included customer's supply cable) + Attenuator Loss + Antenna Gain

2437MHz

Rate [MCS]	Reading [dBm]	Remark
0	-3.75	*
1	-4.52	
2	-5.03	
3	-5.89	
4	-6.93	
5	-7.46	
6	-7.84	
7	-7.93	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber			
Report No.	10706993H			
Date	04/20/2015	04/21/2015	04/22/2015	04/23/2015
Temperature/ Humidity	20 deg. C / 50 % RH	25 deg. C / 38 % RH	22 deg. C / 39 % RH	22 deg. C / 35 % RH
Engineer	Tomoki Matsui (Band Edge)	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (10 GHz - 18 GHz)	Satofumi Matsuyama (Above 18 GHz)
Mode	11b Tx 2412 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	2390.000	PK	53.5	26.8	2.8	32.0	-	51.1	73.9	22.8	
Hori	4824.000	PK	46.6	30.6	5.3	31.3	-	51.2	73.9	22.7	
Hori	7236.000	PK	41.7	35.9	6.6	32.0	-	52.2	73.9	21.7	
Hori	9648.000	PK	42.2	38.5	7.0	32.4	-	55.3	73.9	18.6	
Hori	2390.000	AV	42.6	26.8	2.8	32.0	1.8	42.0	53.9	12.0	Integration Method *1)
Hori	4824.000	AV	39.3	30.6	5.3	31.3	1.8	45.7	53.9	8.2	
Hori	7236.000	AV	32.9	35.9	6.6	32.0	-	43.4	53.9	10.5	Floor Noise
Hori	9648.000	AV	33.8	38.5	7.0	32.4	-	46.9	53.9	7.0	Floor Noise
Vert	2390.000	PK	54.3	26.8	2.8	32.0	-	51.9	73.9	22.0	
Vert	4824.000	PK	44.4	30.6	5.3	31.3	-	49.0	73.9	24.9	
Vert	7236.000	PK	41.3	35.9	6.6	32.0	-	51.8	73.9	22.1	
Vert	9648.000	PK	41.9	38.5	7.0	32.4	-	55.0	73.9	18.9	
Vert	2390.000	AV	43.1	26.8	2.8	32.0	1.8	42.5	53.9	11.5	Integration Method *1)
Vert	4824.000	AV	36.3	30.6	5.3	31.3	1.8	42.7	53.9	11.3	
Vert	7236.000	AV	32.9	35.9	6.6	32.0	-	43.4	53.9	10.5	Floor Noise
Vert	9648.000	AV	33.8	38.5	7.0	32.4	-	46.9	53.9	7.0	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty Factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
*1) Not Out of Band emission (Leakage Power)

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	104.0	26.8	2.8	32.0	101.6	-	-	Carrier
Hori	2400.000	PK	52.5	26.8	2.8	32.0	50.1	81.6	31.5	
Vert	2412.000	PK	101.2	26.8	2.8	32.0	98.8	-	-	Carrier
Vert	2400.000	PK	52.7	26.8	2.8	32.0	50.3	78.8	28.5	

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	10706993H		
Date	04/21/2015	04/22/2015	04/23/2015
Temperature/ Humidity	25 deg. C / 38 % RH	22 deg. C / 39 % RH	22 deg. C / 35 % RH
Engineer	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (10 GHz - 18 GHz)	Satofumi Matsuyama (Above 18 GHz)
Mode	11b Tx 2437 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	4874.000	PK	48.5	30.7	5.3	31.3	-	53.2	73.9	20.7	
Hori	7311.000	PK	42.3	35.9	6.5	32.0	-	52.7	73.9	21.2	
Hori	9748.000	PK	42.6	38.7	7.1	32.4	-	56.0	73.9	17.9	
Hori	4874.000	AV	40.1	30.7	5.3	31.3	1.8	46.6	53.9	7.4	
Hori	7311.000	AV	33.1	35.9	6.5	32.0	-	43.5	53.9	10.4	Floor Noise
Hori	9748.000	AV	33.2	38.7	7.1	32.4	-	46.6	53.9	7.3	Floor Noise
Vert	4874.000	PK	45.2	30.7	5.3	31.3	-	49.9	73.9	24.0	
Vert	7311.000	PK	41.8	35.9	6.5	32.0	-	52.2	73.9	21.7	
Vert	9748.000	PK	41.6	38.7	7.1	32.4	-	55.0	73.9	18.9	
Vert	4874.000	AV	37.1	30.7	5.3	31.3	1.8	43.6	53.9	10.4	
Vert	7311.000	AV	33.1	35.9	6.5	32.0	-	43.5	53.9	10.4	Floor Noise
Vert	9748.000	AV	33.2	38.7	7.1	32.4	-	46.6	53.9	7.3	Floor Noise

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber			
Report No.	10706993H			
Date	04/20/2015	04/21/2015	04/22/2015	04/23/2015
Temperature/ Humidity	20 deg. C / 50 % RH	25 deg. C / 38 % RH	22 deg. C / 39 % RH	22 deg. C / 35 % RH
Engineer	Tomoki Matsui (Band Edge)	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (10 GHz - 18 GHz)	Satofumi Matsuyama (Above 18 GHz)
Mode	11b Tx 2462 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	2483.500	PK	53.8	26.9	2.8	32.0	-	51.5	73.9	22.4	
Hori	4924.000	PK	48.8	30.8	5.3	31.3	-	53.6	73.9	20.3	
Hori	7386.000	PK	41.5	35.9	6.5	32.1	-	51.8	73.9	22.1	
Hori	9848.000	PK	43.0	38.8	7.1	32.5	-	56.4	73.9	17.5	
Hori	2483.500	AV	41.9	26.9	2.8	32.0	1.8	41.4	53.9	12.6	Integration Method *1)
Hori	4924.000	AV	41.7	30.8	5.3	31.3	1.8	48.3	53.9	5.7	
Hori	7386.000	AV	32.9	35.9	6.5	32.1	-	43.2	53.9	10.7	Floor Noise
Hori	9848.000	AV	33.7	38.8	7.1	32.5	-	47.1	53.9	6.8	Floor Noise
Vert	2483.500	PK	51.0	26.9	2.8	32.0	-	48.7	73.9	25.2	
Vert	4924.000	PK	46.4	30.8	5.3	31.3	-	51.2	73.9	22.7	
Vert	7386.000	PK	42.0	35.9	6.5	32.1	-	52.3	73.9	21.6	
Vert	9848.000	PK	42.8	38.8	7.1	32.5	-	56.2	73.9	17.7	
Vert	2483.500	AV	39.7	26.9	2.8	32.0	1.8	39.2	53.9	14.8	Integration Method *1)
Vert	4924.000	AV	39.0	30.8	5.3	31.3	1.8	45.6	53.9	8.4	
Vert	7386.000	AV	32.9	35.9	6.5	32.1	-	43.2	53.9	10.7	Floor Noise
Vert	9848.000	AV	33.7	38.8	7.1	32.5	-	47.1	53.9	6.8	Floor Noise

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

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

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

*1) Not Out of Band emission (Leakage Power)

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	10706993H		
Date	04/21/2015	04/22/2015	04/23/2015
Temperature/ Humidity	25 deg. C / 38 % RH	22 deg. C / 39 % RH	22 deg. C / 35 % RH
Engineer	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (10 GHz - 18 GHz)	Satofumi Matsuyama (Above 18 GHz)
Mode	11n-20 Tx 2412 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	2390.000	PK	67.7	26.8	2.5	32.0	-	65.0	73.9	8.9	
Hori	4824.000	PK	45.0	30.6	5.3	31.3	-	49.6	73.9	24.3	
Hori	7236.000	PK	41.7	35.9	6.6	32.0	-	52.2	73.9	21.7	
Hori	9648.000	PK	42.3	38.5	7.0	32.4	-	55.4	73.9	18.5	
Hori	2390.000	AV	40.2	26.8	2.5	32.0	5.6	43.1	53.9	10.8	Integration Method *1)
Hori	4824.000	AV	37.9	30.6	5.3	31.3	5.6	48.1	53.9	5.8	
Hori	7236.000	AV	32.9	35.9	6.6	32.0	-	43.4	53.9	10.5	Floor Noise
Hori	9648.000	AV	33.9	38.5	7.0	32.4	-	47.0	53.9	6.9	Floor Noise
Vert	2390.000	PK	66.8	26.8	2.5	32.0	-	64.1	73.9	9.8	
Vert	4824.000	PK	43.4	30.6	5.3	31.3	-	48.0	73.9	25.9	
Vert	7236.000	PK	41.3	35.9	6.6	32.0	-	51.8	73.9	22.1	
Vert	9648.000	PK	43.1	38.5	7.0	32.4	-	56.2	73.9	17.7	
Vert	2390.000	AV	39.4	26.8	2.5	32.0	5.6	42.3	53.9	11.6	Integration Method *1)
Vert	4824.000	AV	35.0	30.6	5.3	31.3	5.6	45.2	53.9	8.7	
Vert	7236.000	AV	32.9	35.9	6.6	32.0	-	43.4	53.9	10.5	Floor Noise
Vert	9648.000	AV	33.9	38.5	7.0	32.4	-	47.0	53.9	6.9	Floor Noise

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

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

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

*1) Not Out of Band emission (Leakage Power)

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	98.7	26.8	2.5	32.0	96.0	-	-	Carrier
Hori	2400.000	PK	61.0	26.8	2.5	32.0	58.3	76.0	17.7	
Vert	2412.000	PK	98.2	26.8	2.5	32.0	95.5	-	-	Carrier
Vert	2400.000	PK	59.9	26.8	2.5	32.0	57.2	75.5	18.3	

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	10706993H		
Date	04/21/2015	04/22/2015	04/23/2015
Temperature/ Humidity	25 deg. C / 38 % RH	22 deg. C / 39 % RH	22 deg. C / 35 % RH
Engineer	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (10 GHz - 18 GHz)	Satofumi Matsuyama (Above 18 GHz)
Mode	11n-20 Tx 2437 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	4874.000	PK	45.8	30.7	5.3	31.3	-	50.5	73.9	23.4	
Hori	7311.000	PK	42.2	35.9	6.5	32.0	-	52.6	73.9	21.3	
Hori	9748.000	PK	41.9	38.7	7.1	32.4	-	55.3	73.9	18.6	
Hori	4874.000	AV	38.2	30.7	5.3	31.3	5.6	48.5	53.9	5.4	
Hori	7311.000	AV	32.9	35.9	6.5	32.0	-	43.3	53.9	10.6	Floor Noise
Hori	9748.000	AV	33.3	38.7	7.1	32.4	-	46.7	53.9	7.2	Floor Noise
Vert	4874.000	PK	44.0	30.7	5.3	31.3	-	48.7	73.9	25.2	
Vert	7311.000	PK	41.2	35.9	6.5	32.0	-	51.6	73.9	22.3	
Vert	9748.000	PK	42.7	38.7	7.1	32.4	-	56.1	73.9	17.8	
Vert	4874.000	AV	35.6	30.7	5.3	31.3	5.6	45.9	53.9	8.0	
Vert	7311.000	AV	32.9	35.9	6.5	32.0	-	43.3	53.9	10.6	Floor Noise
Vert	9748.000	AV	33.3	38.7	7.1	32.4	-	46.7	53.9	7.2	Floor Noise

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	10706993H		
Date	04/21/2015	04/22/2015	04/23/2015
Temperature/ Humidity	25 deg. C / 38 % RH	22 deg. C / 39 % RH	22 deg. C / 35 % RH
Engineer	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (10 GHz - 18 GHz)	Satofumi Matsuyama (Above 18 GHz and Below 1 GHz)
Mode	11n-20 Tx 2462 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	76.802	QP	38.8	6.6	7.8	32.0	-	21.2	40.0	18.8	
Hori	112.893	QP	37.2	11.8	8.2	32.2	-	25.0	43.5	18.5	
Hori	124.192	QP	36.7	13.1	8.3	32.2	-	25.9	43.5	17.6	
Hori	135.202	QP	35.7	14.0	8.5	32.2	-	26.0	43.5	17.5	
Hori	443.989	QP	35.2	17.9	10.8	32.1	-	31.8	46.0	14.2	
Hori	540.823	QP	33.7	18.7	11.4	32.1	-	31.7	46.0	14.3	
Hori	2483.500	PK	68.0	26.9	2.5	32.0	-	65.4	73.9	8.5	
Hori	4924.000	PK	46.0	30.8	5.3	31.3	-	50.8	73.9	23.1	
Hori	7386.000	PK	41.9	35.9	6.5	32.1	-	52.2	73.9	21.7	
Hori	9848.000	PK	43.3	38.8	7.1	32.5	-	56.7	73.9	17.2	
Hori	2483.500	AV	42.2	26.9	2.5	32.0	5.6	45.2	53.9	8.7	Integration Method *1)
Hori	4924.000	AV	38.8	30.8	5.3	31.3	5.6	49.2	53.9	4.7	
Hori	7386.000	AV	32.9	35.9	6.5	32.1	-	43.2	53.9	10.7	Floor Noise
Hori	9848.000	AV	33.8	38.8	7.1	32.5	-	47.2	53.9	6.7	Floor Noise
Vert	76.801	QP	41.9	6.6	7.8	32.0	-	24.3	40.0	15.7	
Vert	112.894	QP	40.7	11.8	8.2	32.2	-	28.5	43.5	15.0	
Vert	124.186	QP	37.0	13.1	8.3	32.2	-	26.2	43.5	17.3	
Vert	135.200	QP	37.2	14.0	8.5	32.2	-	27.5	43.5	16.0	
Vert	444.002	QP	34.4	17.9	10.8	32.1	-	31.0	46.0	15.0	
Vert	540.793	QP	33.1	18.7	11.4	32.1	-	31.1	46.0	14.9	
Vert	2483.500	PK	64.8	26.9	2.5	32.0	-	62.2	73.9	11.7	
Vert	4924.000	PK	45.2	30.8	5.3	31.3	-	50.0	73.9	23.9	
Vert	7386.000	PK	41.6	35.9	6.5	32.1	-	51.9	73.9	22.0	
Vert	9848.000	PK	43.0	38.8	7.1	32.5	-	56.4	73.9	17.5	
Vert	2483.500	AV	43.4	26.9	2.5	32.0	5.6	46.4	53.9	7.5	Integration Method *1)
Vert	4924.000	AV	38.2	30.8	5.3	31.3	5.6	48.6	53.9	5.3	
Vert	7386.000	AV	32.9	35.9	6.5	32.1	-	43.2	53.9	10.7	Floor Noise
Vert	9848.000	AV	33.8	38.8	7.1	32.5	-	47.2	53.9	6.7	Floor Noise

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

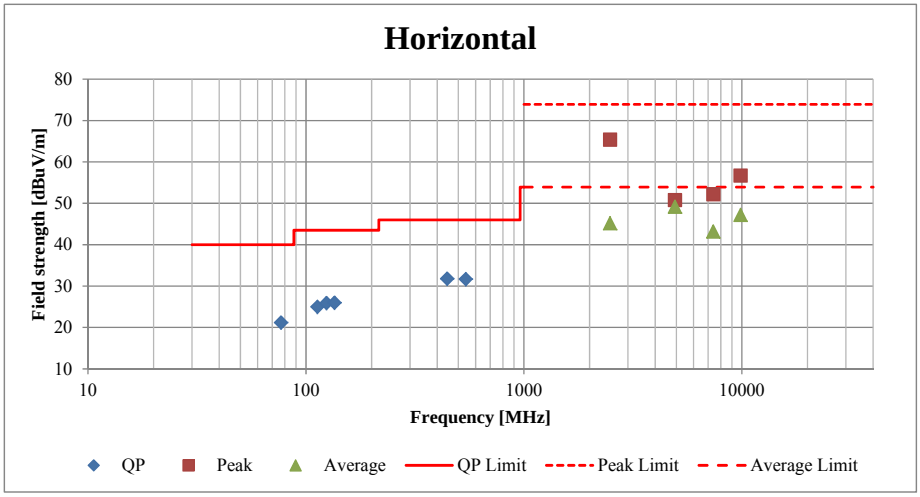
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

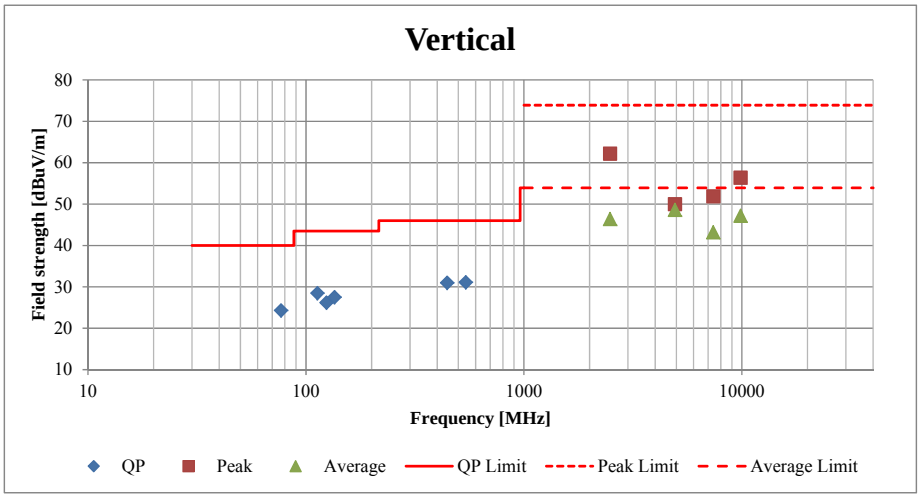
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

*1) Not Out of Band emission (Leakage Power)

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	10706993H		
Date	04/21/2015	04/22/2015	04/23/2015
Temperature/ Humidity	25 deg. C / 38 % RH	22 deg. C / 39 % RH	22 deg. C / 35 % RH
Engineer	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (10 GHz - 18 GHz)	Satofumi Matsuyama (Above 18 GHz and Below 1 GHz)
Mode	11n-20 Tx 2462 MHz		



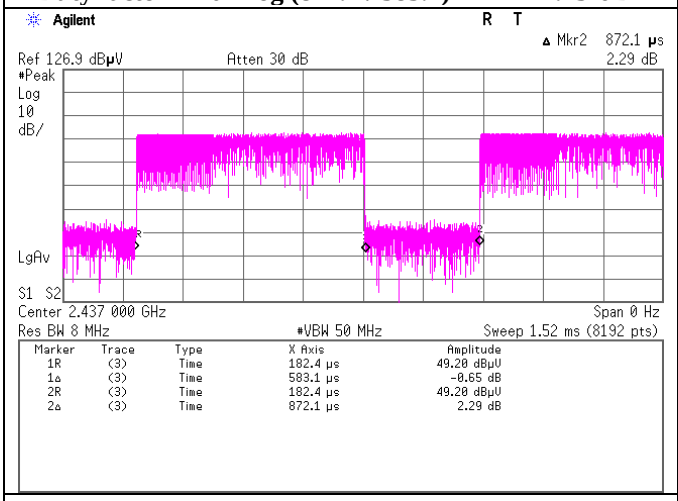


Burst rate confirmation

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber and No.11 Measurement Room	
Report No.	10706993H	
Date	04/20/2015	04/23/2015
Temperature/ Humidity	20 deg. C / 50 % RH	20 deg. C / 45 % RH
Engineer	Tomoki Matsui	Yuta Moriya
Mode	11b Tx / 11g Tx / 11n-20 Tx	

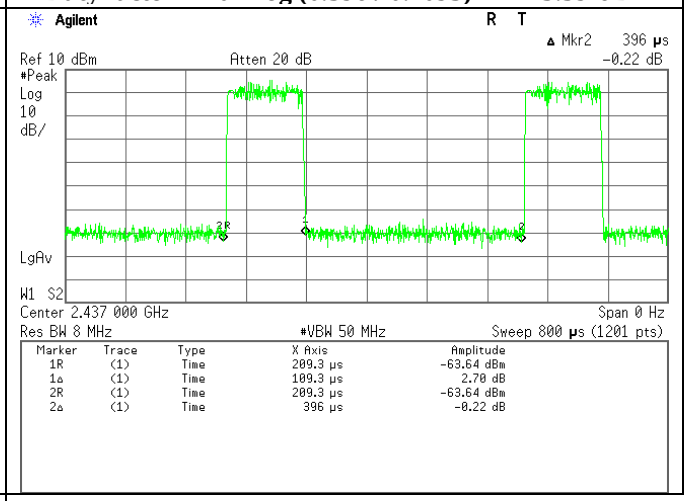
11b 11 Mbps

Tx on / (Tx on + Tx off) =	**0.669**
Tx on / (Tx on + Tx off) * 100 =	**66.9 %**
Duty factor = 10 * log (872.1 / 583.1) =	**1.75 dB**



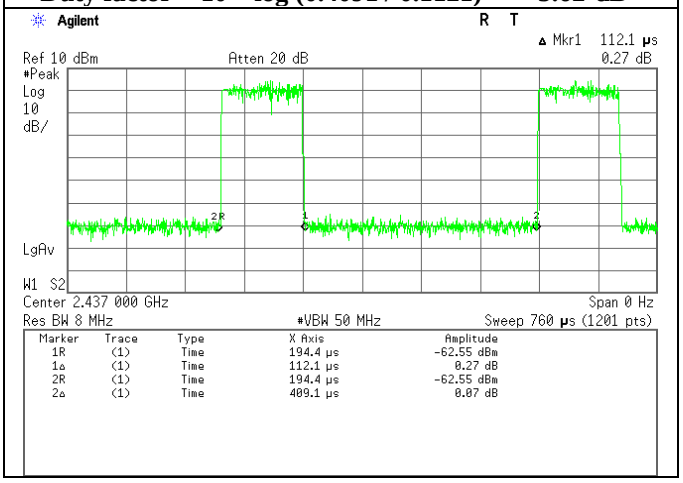
11g 54 Mbps

Tx on / (Tx on + Tx off) =	**0.276**
Tx on / (Tx on + Tx off) * 100 =	**27.6 %**
Duty factor = 10 * log (0.396 / 0.1093) =	**5.59 dB**



11n-20 MCS 7

Tx on / (Tx on + Tx off) =	**0.274**
Tx on / (Tx on + Tx off) * 100 =	**27.4 %**
Duty factor = 10 * log (0.4091 / 0.1121)	**5.62 dB**

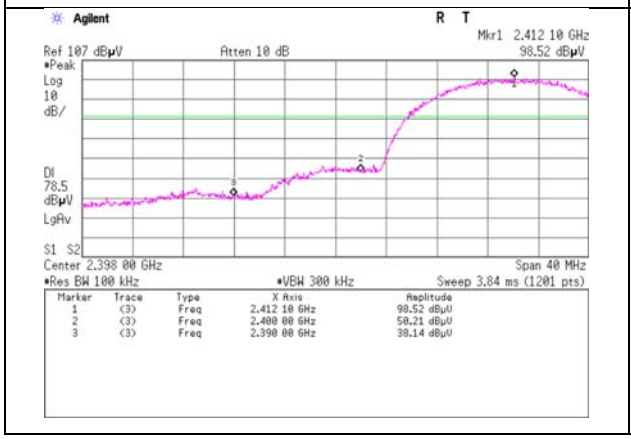


Band Edge confirmation

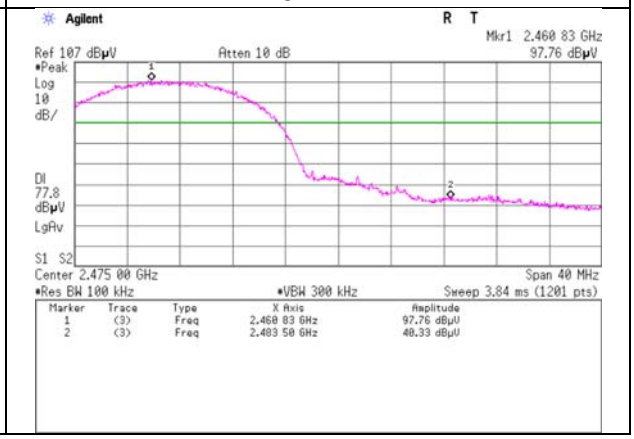
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10706993H
Date	04/20/2015
Temperature/ Humidity	20 deg. C / 50 % RH
Engineer	Tomoki Matsui
Mode	11b Tx / 11n-20 Tx

11b

2412 MHz

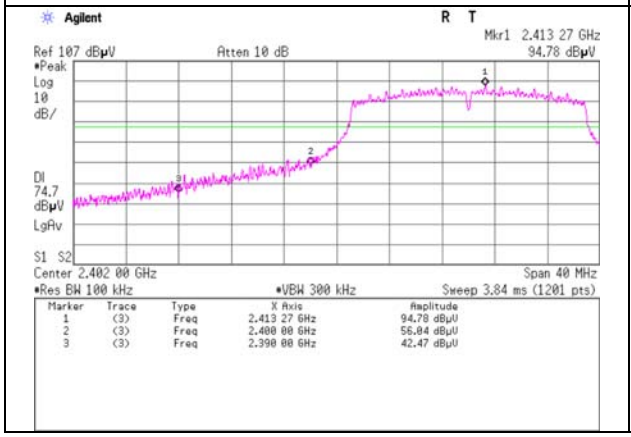


2462 MHz

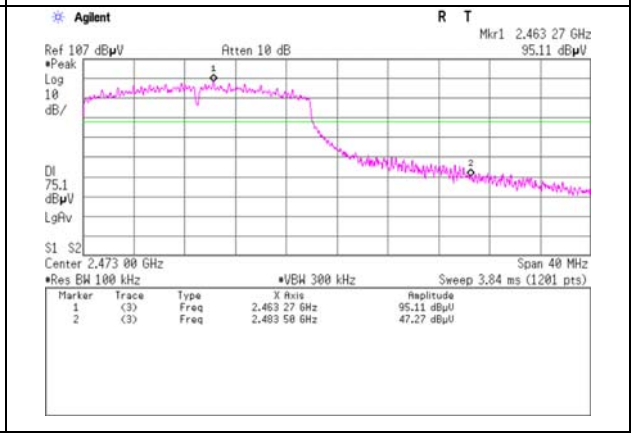


11n-20

2412 MHz



2462 MHz



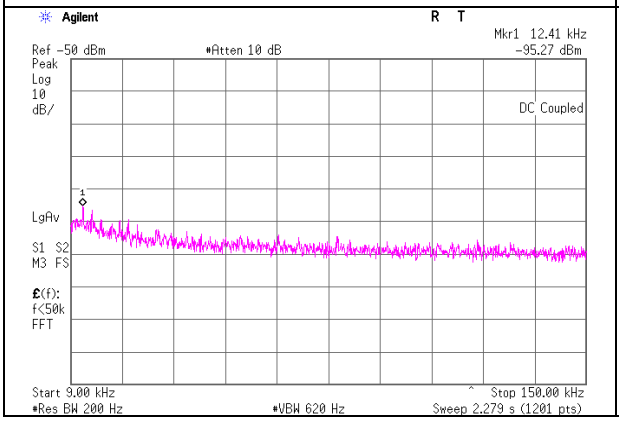
* Final result of band edge was measured as radiated spurious emission. Refer to Radiated Spurious Emission's pages.

Conducted Spurious Emission

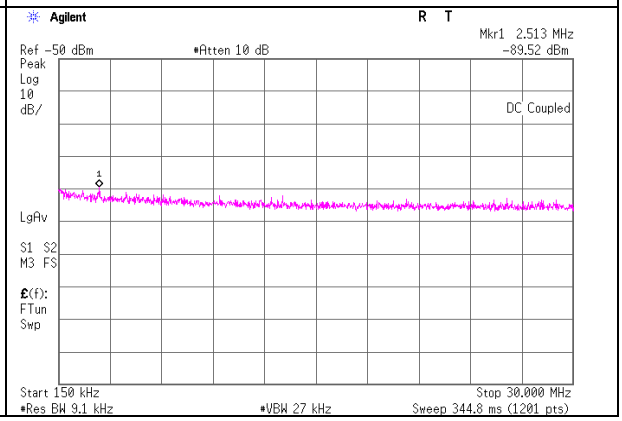
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11n-20 Tx

11n-20 Tx 2412 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenator [dB]	Antenna Gain [dBi]	N (Number of Output	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
12.41	-95.3	1.0	9.8	2.0	1	-82.4	300	6.0	-21.2	45.7	66.9	
2513.00	-89.5	1.0	9.8	2.0	1	-76.7	30	6.0	4.6	29.5	25.0	

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

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

Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11b Tx / 11g Tx / 11n-20 Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-23.55	1.39	10.06	-12.10	8.00	20.10
2437.00	-24.14	1.39	10.06	-12.69	8.00	20.69
2462.00	-23.99	1.39	10.06	-12.54	8.00	20.54

11g

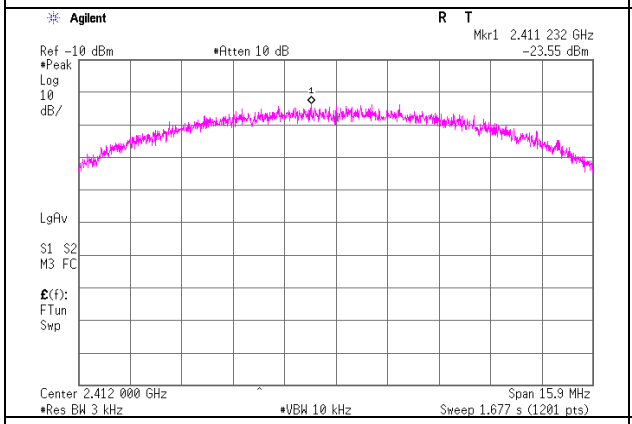
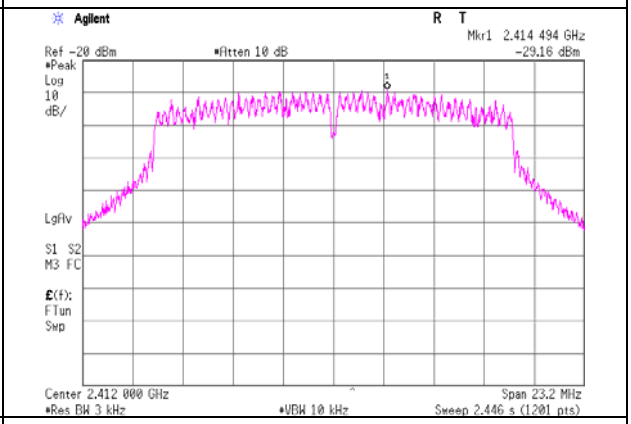
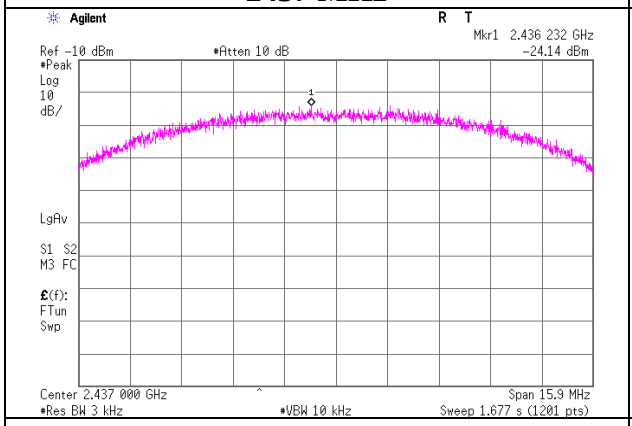
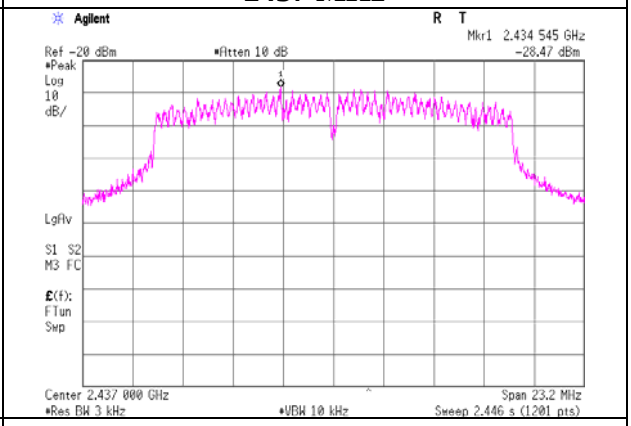
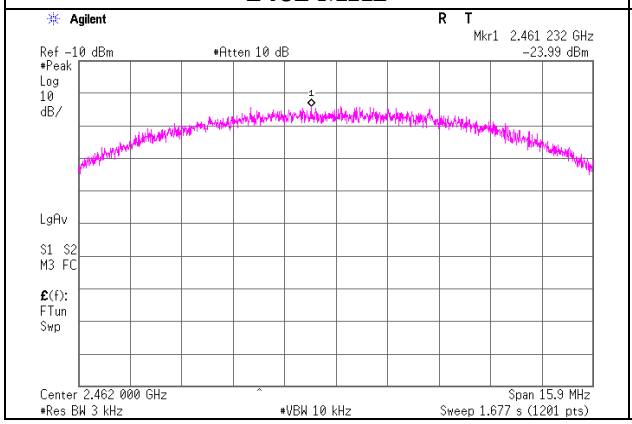
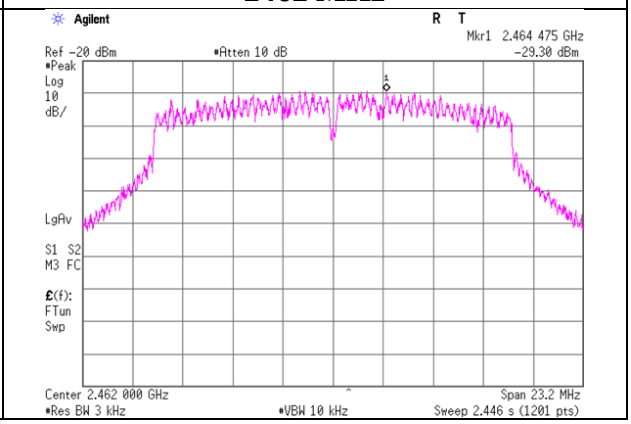
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-29.16	1.39	10.06	-17.71	8.00	25.71
2437.00	-28.47	1.39	10.06	-17.02	8.00	25.02
2462.00	-29.30	1.39	10.06	-17.85	8.00	25.85

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-28.03	1.39	10.06	-16.58	8.00	24.58
2437.00	-28.33	1.39	10.06	-16.88	8.00	24.88
2462.00	-28.16	1.39	10.06	-16.71	8.00	24.71

Sample Calculation:
Result = Reading + Cable Loss (included customer's supply cable) + Attenuator

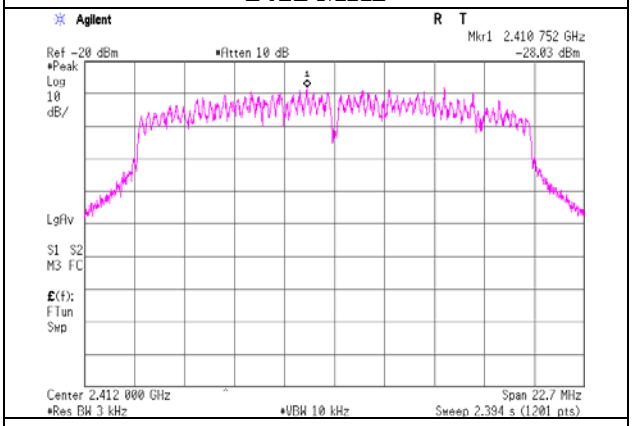
Power Density

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

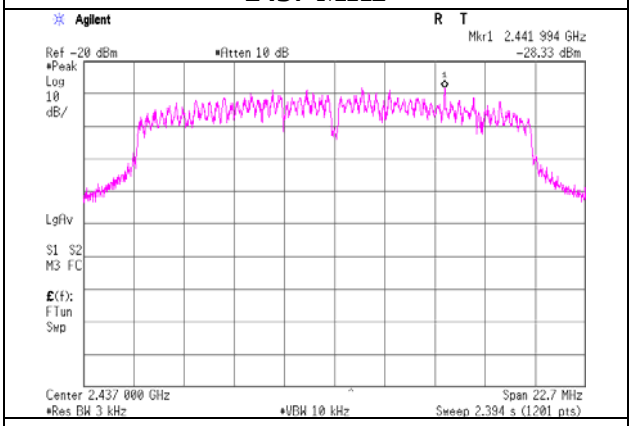
Power Density

11n-20

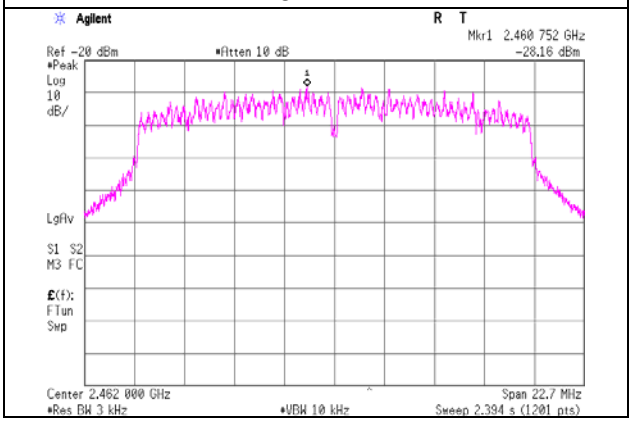
2412 MHz



2437 MHz

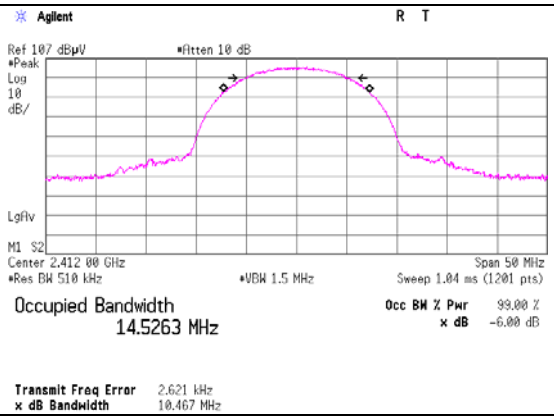
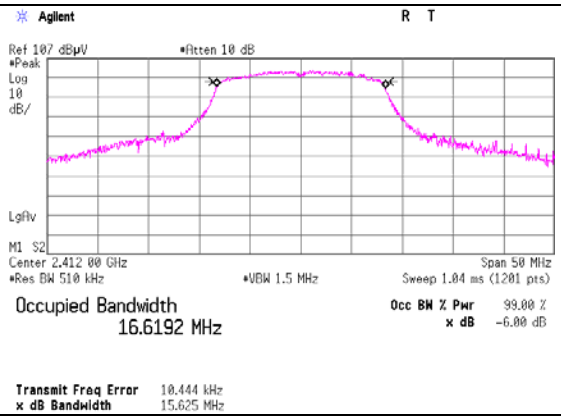
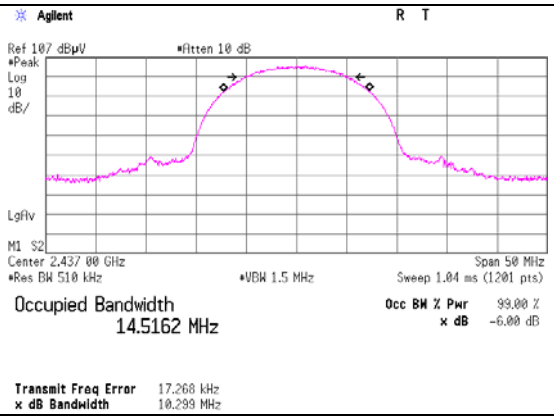
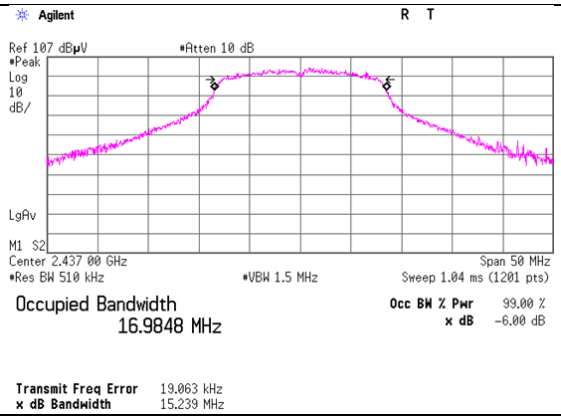
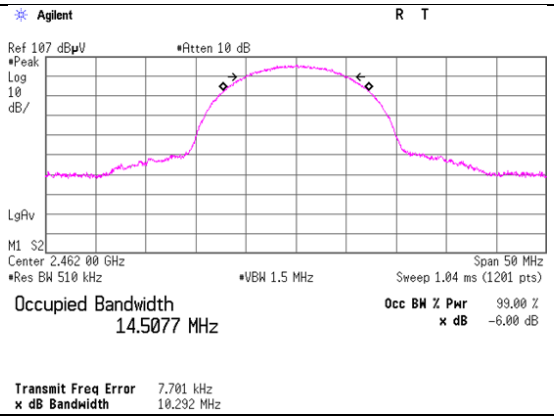
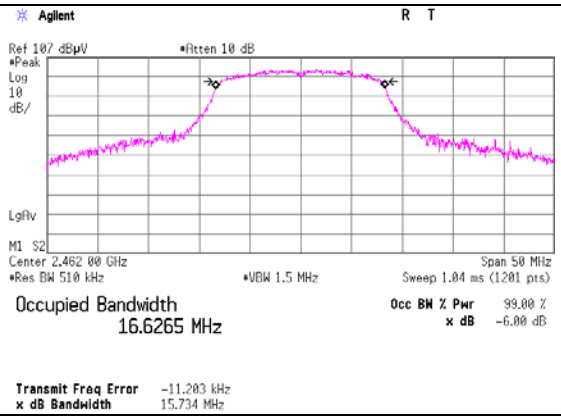


2462 MHz



99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11b Tx / 11g Tx

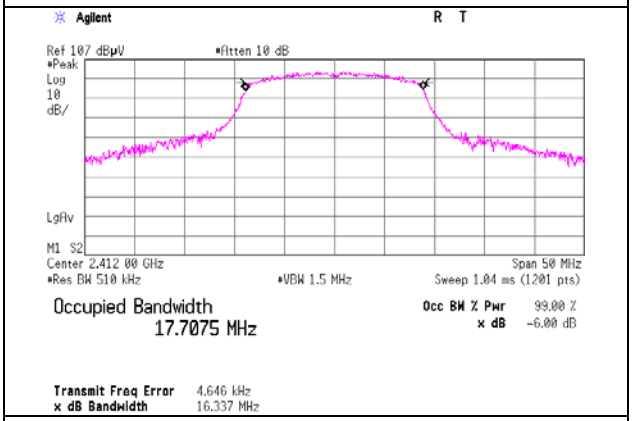
11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

99 % Occupied Bandwidth

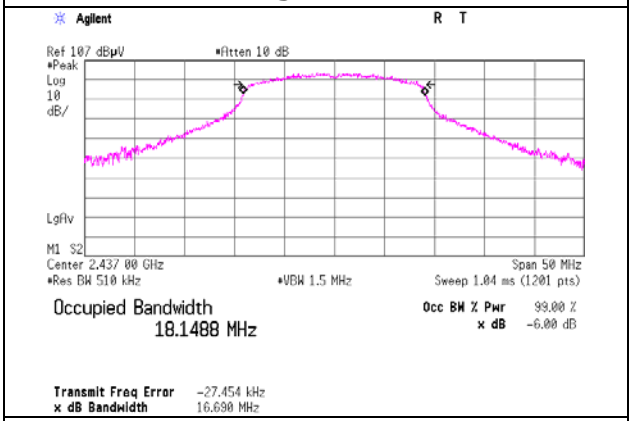
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	11n-20 Tx

11n-20

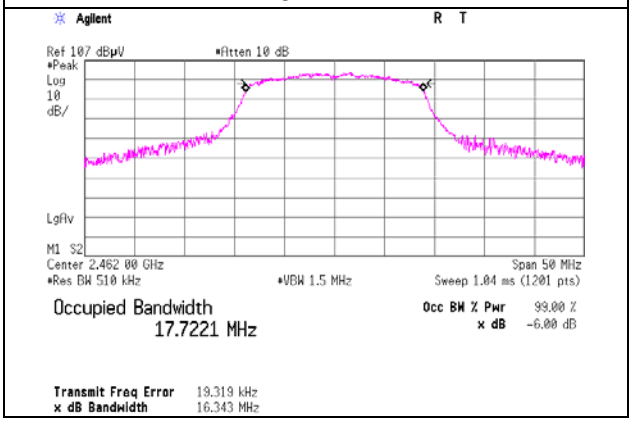
2412 MHz



2437 MHz



2462 MHz



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/02/19 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2015/01/13 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
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	2014/10/18 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2014/10/18 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2014/07/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2014/04/14 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	RE	2015/03/09 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2014/05/26 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2014/09/24 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2015/03/19 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2014/05/26 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2014/09/22 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2015/02/26 * 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	2015/03/09 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2014/06/30 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2014/12/22 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	AT	2015/02/26 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2014/06/16 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2014/06/16 * 12
MCC-98	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	30819/2	AT	2014/05/16 * 12
MAT-20	Attenuator(10dB)(above1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2015/01/08 * 12

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: RE: Radiated Emission test
AT: Antenna Terminal Conducted test