RADIO TEST REPORT

Test Report No. : 11328915H-A-R1

Applicant	:	**FUJITSU TEN LIMITED**
Type of Equipment	:	**Car Navigation**
Model No.	:	**FT0091A**
FCC ID	:	**BABFT0091A**
Test regulation	:	**FCC Part 15 Subpart C: 2016** ***WLAN part**
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 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 11328915H-A. 11328915H-A is replaced with this report.

Date of test: July 19 to August 7, 2016

Representative test engineer:
Keisuke Kawamura
Engineer
Consumer Technology Division

Approved by:
Tsubasa Takayama
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

REVISION HISTORY

Original Test Report No.: 11328915H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11328915H-A	October 3, 2016	-	-
1	11328915H-A-R1	October 27, 2016	P10	Correction of Cable No.7 GPS Cable → Camera Cable

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SECTION 1: Customer information

Company Name	:	FUJITSU TEN LIMITED
Address	:	2-28, Gosho-dori 1-Chome, Hyogo-ku, Kobe, 652-8510 JAPAN
Telephone Number	:	+81-78-682-2159
Facsimile Number	:	+81-78-671-7160
Contact Person	:	FUKII DAISUKE

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

2.1 Identification of E.U.T.

Type of Equipment	:	Car Navigation
Model No.	:	FT0091A
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	July 12, 2016
Country of Mass-production	:	Mexico
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: FT0091A (referred to as the EUT in this report) is a Car Navigation.

Radio Specification

Radio Type : Transceiver
Power Supply (inner) : DC 3.3 V, DC 1.8 V
Clock frequency(ies) : 26 MHz

	IEEE802.11b *1)	IEEE802.11g/n (20 M band) *1)	IEEE802.11a/n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz 5755 MHz - 5795 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM)	
Channel spacing	5MHz		20MHz	40MHz
Antenna type	Surface Mountable Dielectric Chip Antenna			
Antenna Connector type	-			
Antenna Gain	1.6 dBi (2.4 GHz Band), 0 dBi (5 GHz Band)			

	Bluetooth Ver.3.0 with EDR function
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	BT: FHSS (GFSK, π/4-DQPSK, 8-DPSK)
Channel spacing	BT: 1 MHz
Antenna type	Surface Mountable Dielectric Chip Antenna
Antenna Connector type	-
Antenna Gain	1.6 dBi

*1) This test report applies to WLAN (2.4 GHz Band only).
*Wireless LAN and Bluetooth do not transmit simultaneously.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC part 15 final revised on April 6, 2016.

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

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods **IC:** RSS-Gen 8.8	**FCC:** Section 15.207 **IC:** RSS-Gen 8.8	-	N/A *1)	-
6dB Bandwidth	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** -	**FCC:** Section 15.247(a)(2) **IC:** RSS-247 5.2(1)	See data.	Complied	Conducted
Maximum Peak Output Power	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** RSS-Gen 6.12	**FCC:** Section 15.247(b)(3) **IC:** RSS-247 5.4(4)		Complied	Conducted
Power Density	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** -	**FCC:** Section 15.247(e) **IC:** RSS-247 5.2(2)		Complied	Conducted
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** RSS-Gen 6.13	**FCC:** Section15.247(d) **IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	6.0 dB 4824.000 MHz, AV, Horizontal	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) The test was not performed since the EUT was DC device.
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r05 12.2.7.

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

FCC Part 15.31 (e)
The test was performed with the New Battery (DC 3.3 V, DC 1.8 V) and the EUT constantly provides the stable voltage to RF part through the regulator regardless of input voltage from New Battery. Therefore, this EUT complies with the requirement.

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

3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

Ise EMC Lab.

Antenna terminal test Uncertainty (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz -3 GHz	3 GHz -18 GHz	18 GHz -26.5 GHz	26.5 GHz -40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	2.6 dB

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

Polarity	Radiated emission (Below 1GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

*Measurement distance

<u>Radiated emission test</u>

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

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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

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.

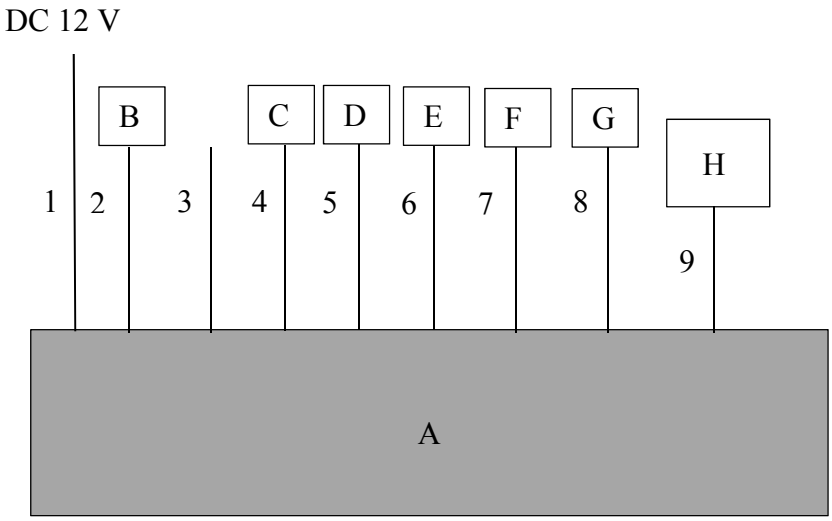
Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	54 Mbps, PN9
IEEE 802.11n (11n-20)	MCS 7, PN9 (Short)
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b : +13dBm 11g/n-20 : +11dBm Software: Ver.00.005 *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 frequency
Radiated Spurious Emission (Above 1GHz)	11b Tx 11n-20 Tx *1)	2412 MHz 2437 MHz 2462 MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
Conducted Spurious Emission, Radiated Spurious Emission (Below 1GHz)	11n-20 Tx *2)	2412 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 mode was 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.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Navigation	FT0091A	No, 19 *1) No, 23 *2)	FUJITSU TEN LIMITED	EUT
B	Load resistance	-	-	-	-
C	USB	RUF2-JV4GSWH	121101	BUFFALO	-
D	USB	RUF2-JV4GSWH	121201	BUFFALO	-
E	MIC ASSY	W01B-5012-D210	0700700000853	TRANSTRON Inc.	-
F	Camera	39530-T5A-003	15	-	-
G	GPS	3985-TSA-E010-M1	25260094	yokowo	-
H	Jig board	-	-	-	-

*1) Used for Radiated Emission test
*2) Used for Antenna Terminal conducted test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	3.9	Unshielded	Unshielded	-
2	Signal Cable	0.7	Unshielded	Unshielded	-
3	Signal Cable	0.2	Unshielded	Unshielded	-
4	USB Cable	1.0	Shielded	Shielded	-
5	USB Cable	1.0	Shielded	Shielded	-
6	Signal Cable	0.5	Unshielded	Unshielded	-
7	Camera Cable	5.0	Shielded	Shielded	-
8	GPS Cable	0.5	Shielded	Shielded	-
9	FFC Cable	0.1	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 v03r05".

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 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 *3)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	4.4 m *1) (1 GHz – 10 GHz), 1 m *2) (10 GHz – 26.5 GHz)		3 m *1) (1 GHz – 10 GHz), 1 m *2) (10 GHz – 26.5 GHz)

*1) Distance Factor: 20 x log (4.4 m / 3.0 m) = 3.33 dB
*2) Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*3) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r05"

The test was made on EUT at the normal use position.

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
6dB 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 6dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v03r05".
*4) 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 low enough as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz).

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

Test data : **APPENDIX**
Test result : **Pass**

APPENDIX 1: Test data

6dB Bandwidth

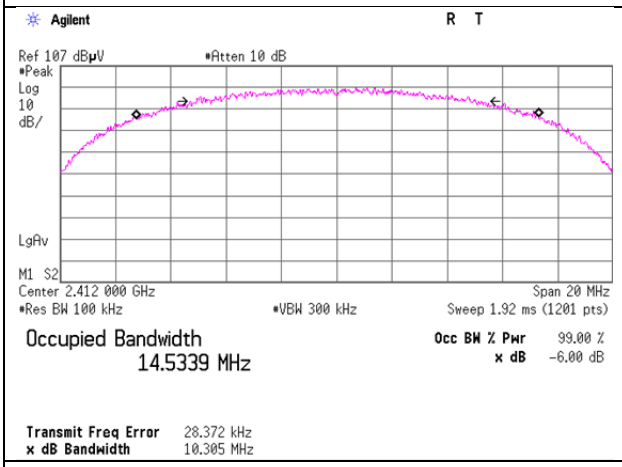
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 21, 2016
Temperature / Humidity	25 deg. C / 41 % RH
Engineer	Shinichi Miyazono
Mode	Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	10.305	> 500
	2437	10.353	> 500
	2462	10.367	> 500
11g	2412	15.136	> 500
	2437	15.113	> 500
	2462	15.115	> 500
11n-20	2412	15.137	> 500
	2437	15.117	> 500
	2462	15.117	> 500

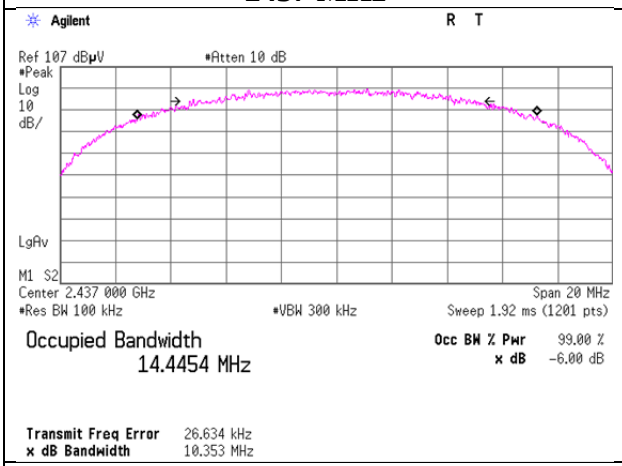
6dB Bandwidth

11b

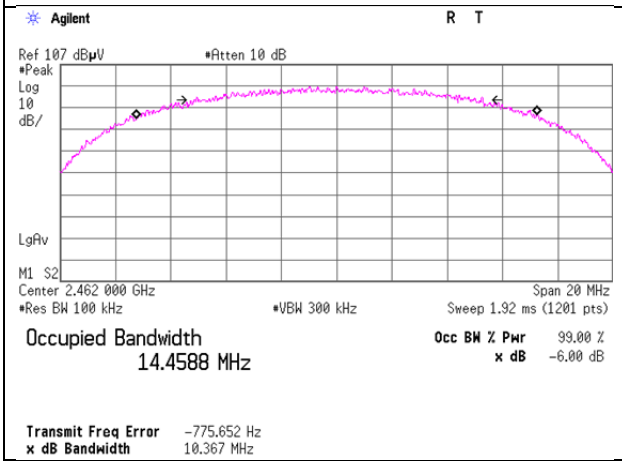
2412 MHz



2437 MHz

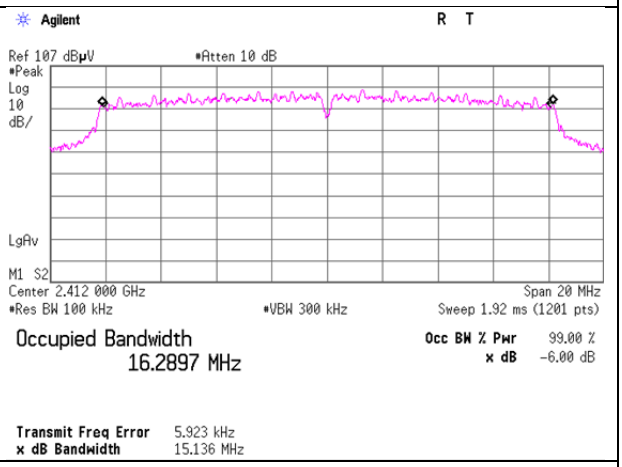


2462 MHz

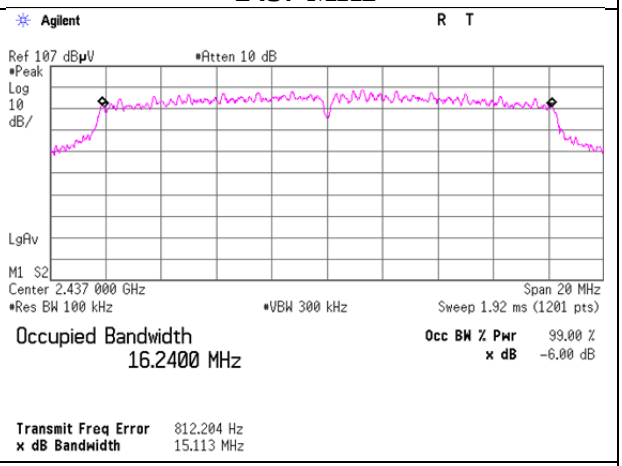


11g

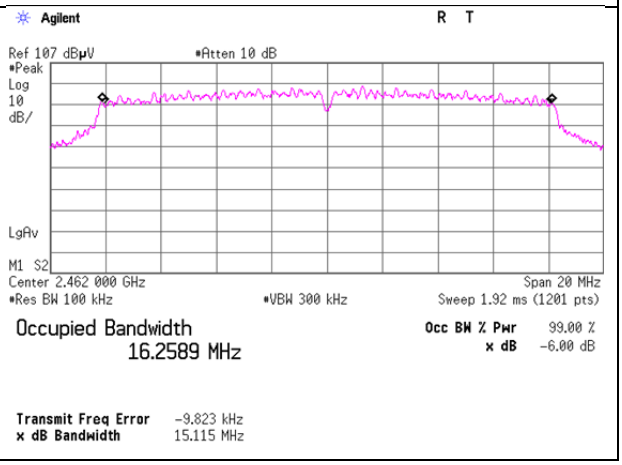
2412 MHz



2437 MHz



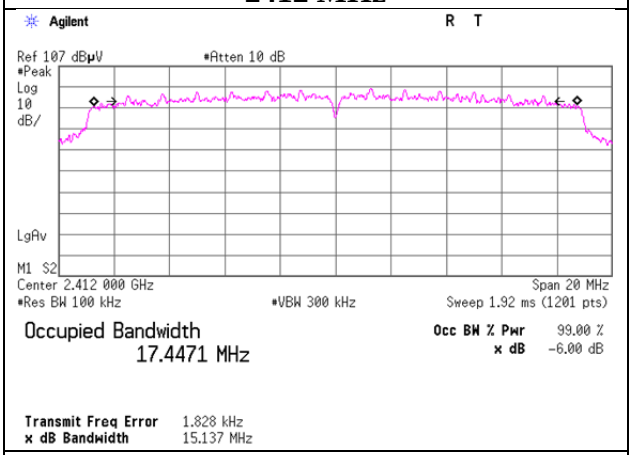
2462 MHz



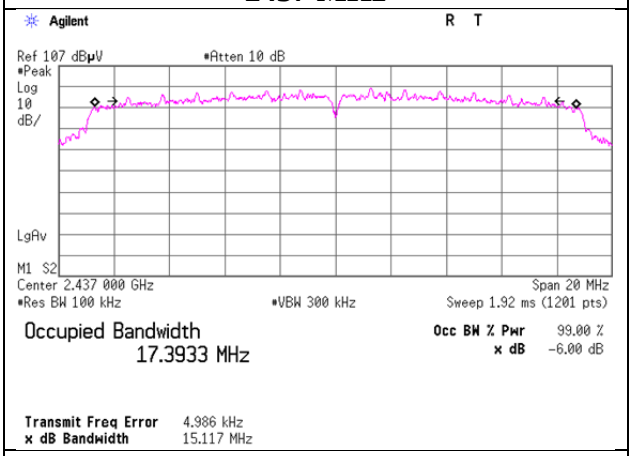
6dB Bandwidth

11n-20

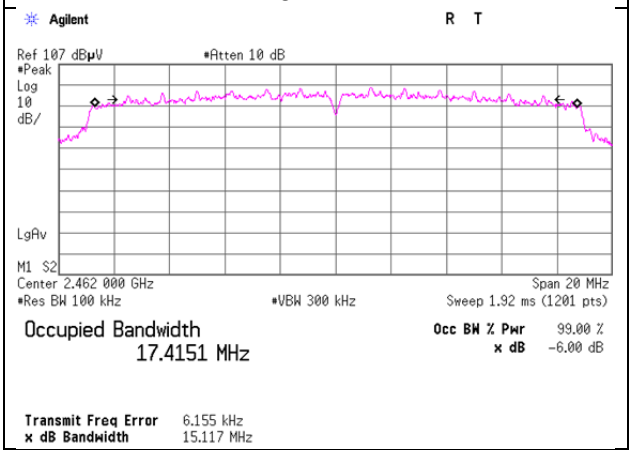
2412 MHz



2437 MHz



2462 MHz



Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 19, 2016
Temperature / Humidity	23 deg. C / 31 % RH
Engineer	Masafumi Niwa
Mode	Tx 11b

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	1.31	2.01	9.78	13.10	20.42	30.00	1000	16.90
2437	1.06	2.02	9.78	12.86	19.32	30.00	1000	17.14
2462	0.79	2.02	9.78	12.59	18.16	30.00	1000	17.41

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
1	0.94	
2	0.93	
5.5	0.99	
11	1.06	*

*: 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.	11328915H
Date	July 19, 2016
Temperature / Humidity	23 deg. C / 31 % RH
Engineer	Masafumi Niwa
Mode	Tx 11g

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	7.64	2.01	9.78	19.43	87.70	30.00	1000	10.57
2437	7.42	2.02	9.78	19.22	83.56	30.00	1000	10.78
2462	7.24	2.02	9.78	19.04	80.17	30.00	1000	10.96

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	5.72	
9	5.48	
12	5.87	
18	5.79	
24	5.82	
36	7.40	
48	7.31	
54	7.42	*

*: 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.	11328915H
Date	July 19, 2016
Temperature / Humidity	23 deg. C / 31 % RH
Engineer	Masafumi Niwa
Mode	Tx 11n-20

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	7.68	2.01	9.78	19.47	88.51	30.00	1000	10.53
2437	7.46	2.02	9.78	19.26	84.33	30.00	1000	10.74
2462	7.26	2.02	9.78	19.06	80.54	30.00	1000	10.94

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz Long GI

Rate [MCS]	Reading [dBm]	Remark
0	5.63	
1	5.67	
2	5.68	
3	5.96	
4	7.22	
5	7.32	
6	7.40	
7	7.43	

2437 MHz Short GI

Rate [MCS]	Reading [dBm]	Remark
0	5.67	
1	5.72	
2	5.67	
3	5.97	
4	7.23	
5	7.30	
6	7.44	
7	7.46	*

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 21, 2016
Temperature / Humidity	25 deg. C / 41 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11b 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	[mW]
2412	-1.10	2.01	9.78	10.69	11.72
2437	-1.19	2.02	9.78	10.61	11.51
2462	-1.11	2.02	9.78	10.69	11.72

11g 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	[mW]
2412	-1.49	2.01	9.78	10.30	10.72
2437	-1.69	2.02	9.78	10.11	10.26
2462	-1.88	2.02	9.78	9.92	9.82

11n-20 MCS 0 Short GI

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	[mW]
2412	-1.42	2.01	9.78	10.37	10.89
2437	-1.46	2.02	9.78	10.34	10.81
2462	-1.76	2.02	9.78	10.04	10.09

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) custome

The test was performed with condition that obtained the maximum frame power in pre-check.

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 21, 2016
Temperature / Humidity	25 deg. C / 41 % RH
Engineer	Shinichi Miyazono
Mode	Tx

2437 MHz

Mode	Rate Mbps	Reading [dBm]	Remarks
11b	1	-1.19	*
	2	-1.29	
	5.5	-1.36	
	11	-1.48	
11g	6	-1.69	*
	9	-1.86	
	12	-1.88	
	18	-2.09	
	24	-2.66	
	36	-2.98	
	48	-3.14	
	54	-3.53	

Mode	Rate MCS	Reading Short GI [dBm]	Reading Long GI [dBm]	Remarks
11n-20	0	-1.46	-1.48	* Short GI
	1	-1.91		
	2	-2.13		
	3	-2.33		
	4	-3.11		
	5	-3.27		
	6	-3.39		
	7	-3.62		

* Worst rate

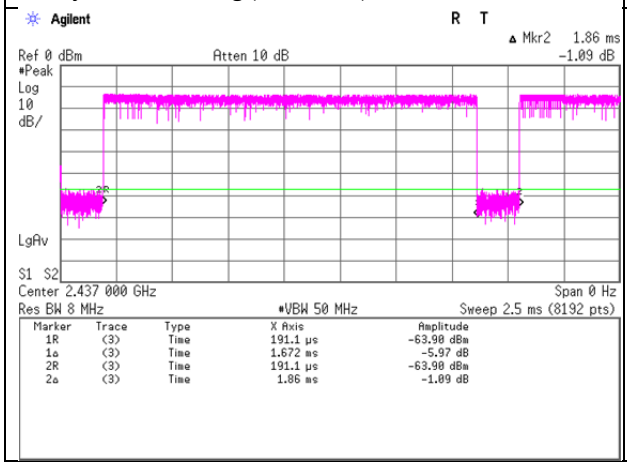
All comparison were carried out on same frequency and measurement factors.

Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 19, 2016
Temperature / Humidity	23 deg. C / 31 % RH
Engineer	Masafumi Niwa
Mode	Tx

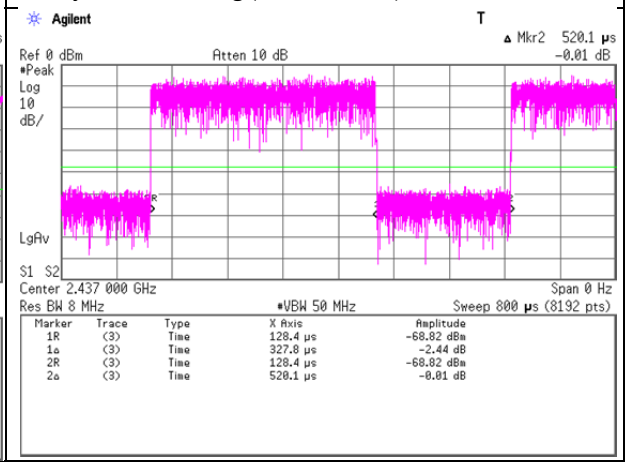
11b 11 Mbps

Tx on / (Tx on + Tx off) = 0.899
Tx on / (Tx on + Tx off) * 100 = 89.9 %
Duty factor = 10 * log (1.86 / 1.672) = 0.46 dB



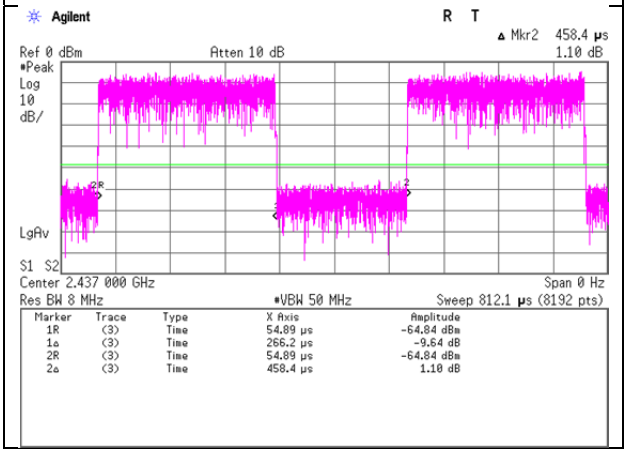
11g 54 Mbps

Tx on / (Tx on + Tx off) = 0.630
Tx on / (Tx on + Tx off) * 100 = 63.0 %
Duty factor = 10 * log (0.5201 / 0.3278) = 2.00 dB



11n-20 MCS 7 (Short GI)

Tx on / (Tx on + Tx off) = 0.581
Tx on / (Tx on + Tx off) * 100 = 58.1 %
Duty factor = 10 * log (0.4584 / 0.2662) = 2.36 dB



Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 and No.2 Semi Anechoic Chamber	
Report No.	11328915H	
Date	July 28, 2016	August 3, 2016
Temperature / Humidity	23 deg. C / 54 % RH	20 deg. C / 59 % RH
Engineer	Keisuke Kawamura (1 GHz - 10 GHz)	Keisuke Kawamura (Above 10 GHz)
Mode	Tx 11b 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	42.7	27.9	6.5	32.1	-	45.0	73.9	28.9	
Hori	4824.000	PK	44.2	32.9	8.8	31.3	-	54.6	73.9	19.3	
Hori	7236.000	PK	42.4	36.8	9.9	32.6	-	56.5	73.9	17.4	Floor noise
Hori	9648.000	PK	44.1	38.1	10.8	32.6	-	60.4	73.9	13.5	Floor noise
Hori	2390.000	AV	34.1	27.9	6.5	32.1	0.5	36.9	53.9	17.0	*1)
Hori	4824.000	AV	35.5	32.9	8.8	31.3	0.5	46.4	53.9	7.5	
Hori	7236.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Hori	9648.000	AV	31.4	38.1	10.8	32.6	-	47.7	53.9	6.2	Floor noise
Vert	2390.000	PK	39.0	27.9	6.5	32.1	-	41.3	73.9	32.6	
Vert	4824.000	PK	42.2	32.9	8.8	31.3	-	52.6	73.9	21.3	
Vert	7236.000	PK	41.2	36.8	9.9	32.6	-	55.3	73.9	18.6	Floor noise
Vert	9648.000	PK	43.3	38.1	10.8	32.6	-	59.6	73.9	14.3	Floor noise
Vert	2390.000	AV	33.5	27.9	6.5	32.1	0.5	36.3	53.9	17.6	*1)
Vert	4824.000	AV	35.3	32.9	8.8	31.3	0.5	46.2	53.9	7.7	
Vert	7236.000	AV	33.0	36.8	9.9	32.6	-	47.1	53.9	6.8	Floor noise
Vert	9648.000	AV	31.0	38.1	10.8	32.6	-	47.3	53.9	6.6	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*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	89.9	28.0	6.5	32.1	92.3	-	-	Carrier
Hori	2400.000	PK	41.4	28.0	6.5	32.1	43.8	72.3	28.5	
Vert	2412.000	PK	85.0	28.0	6.5	32.1	87.4	-	-	Carrier
Vert	2400.000	PK	39.0	28.0	6.5	32.1	41.4	67.4	26.0	

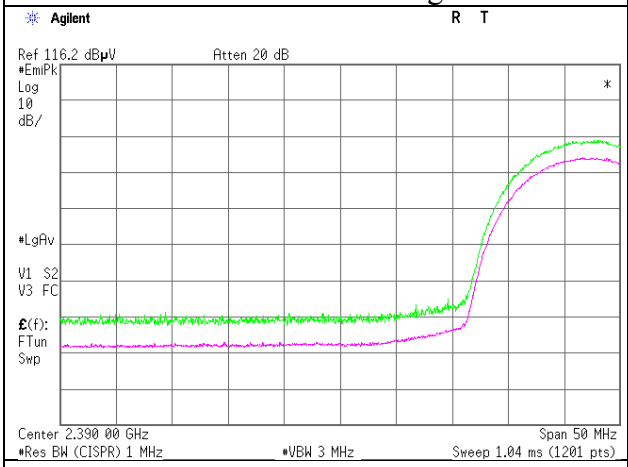
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11328915H
Date	July 28, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Keisuke Kawamura
Mode	Tx 11b 2412 MHz

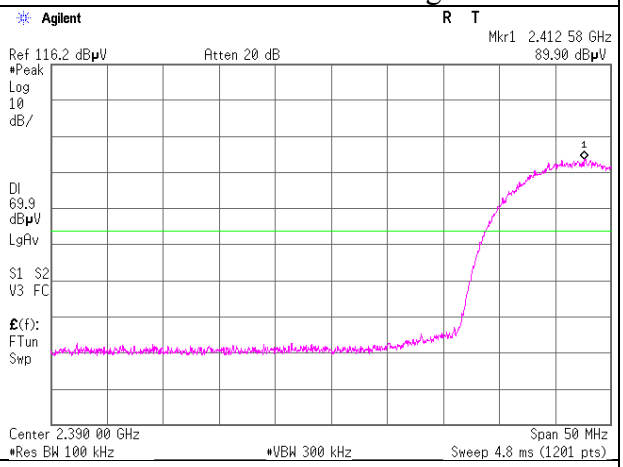
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

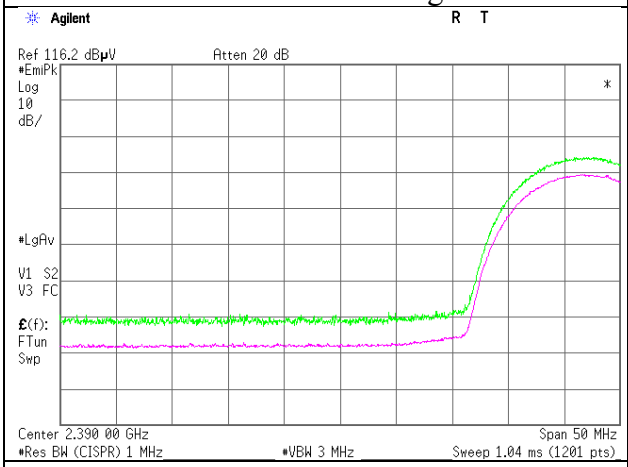
Authorized-band band-edge Plot



20dBc Plot

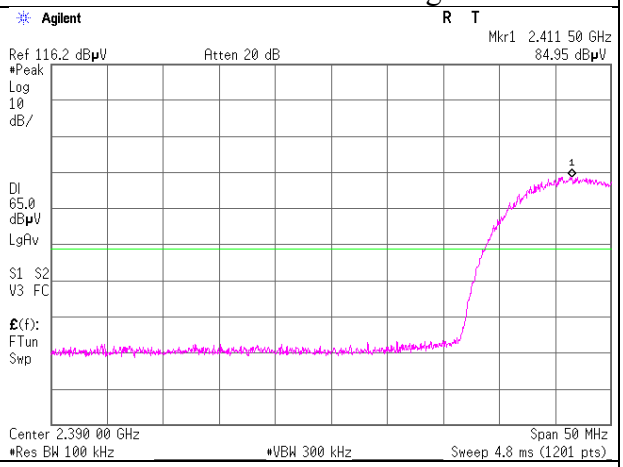
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 and No.2 Semi Anechoic Chamber	
Report No.	11328915H	
Date	July 28, 2016	August 3, 2016
Temperature / Humidity	23 deg. C / 54 % RH	20 deg. C / 59 % RH
Engineer	Keisuke Kawamura (1 GHz - 10 GHz)	Keisuke Kawamura (Above 10 GHz)
Mode	Tx 11b 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	42.5	33.1	8.8	31.3	-	53.1	73.9	20.8	
Hori	7311.000	PK	42.4	36.8	9.9	32.6	-	56.5	73.9	17.4	Floor noise
Hori	9748.000	PK	44.1	38.2	10.8	32.7	-	60.4	73.9	13.5	Floor noise
Hori	4874.000	AV	34.4	33.1	8.8	31.3	0.5	45.5	53.9	8.4	
Hori	7311.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Hori	9748.000	AV	31.4	38.2	10.8	32.7	-	47.7	53.9	6.2	Floor noise
Vert	4874.000	PK	42.3	33.1	8.8	31.3	-	52.9	73.9	21.0	
Vert	7311.000	PK	41.2	36.8	9.9	32.6	-	55.3	73.9	18.6	Floor noise
Vert	9748.000	PK	43.3	38.2	10.8	32.7	-	59.6	73.9	14.3	Floor noise
Vert	4874.000	AV	34.4	33.1	8.8	31.3	0.5	45.5	53.9	8.4	
Vert	7311.000	AV	33.0	36.8	9.9	32.6	-	47.1	53.9	6.8	Floor noise
Vert	9748.000	AV	31.0	38.2	10.8	32.7	-	47.3	53.9	6.6	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 and No.2 Semi Anechoic Chamber	
Report No.	11328915H	
Date	July 28, 2016	August 3, 2016
Temperature / Humidity	23 deg. C / 54 % RH	20 deg. C / 59 % RH
Engineer	Keisuke Kawamura (1 GHz - 10 GHz)	Keisuke Kawamura (Above 10 GHz)
Mode	Tx 11b 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	42.4	28.1	6.6	32.1	-	45.0	73.9	28.9	
Hori	4924.000	PK	41.8	33.3	8.9	31.3	-	52.7	73.9	21.2	
Hori	7386.000	PK	42.4	36.8	9.9	32.6	-	56.5	73.9	17.4	Floor noise
Hori	9848.000	PK	44.1	38.2	10.8	32.7	-	60.4	73.9	13.5	Floor noise
Hori	2483.500	AV	34.1	28.1	6.6	32.1	0.5	37.2	53.9	16.7	*1)
Hori	4924.000	AV	33.1	33.3	8.9	31.3	0.5	44.5	53.9	9.4	
Hori	7386.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Hori	9848.000	AV	31.4	38.2	10.8	32.7	-	47.7	53.9	6.2	Floor noise
Vert	2483.500	PK	42.5	28.1	6.6	32.1	-	45.1	73.9	28.8	
Vert	4924.000	PK	42.2	33.3	8.9	31.3	-	53.1	73.9	20.8	
Vert	7386.000	PK	41.2	36.8	9.9	32.6	-	55.3	73.9	18.6	Floor noise
Vert	9848.000	PK	43.3	38.2	10.8	32.7	-	59.6	73.9	14.3	Floor noise
Vert	2483.500	AV	31.9	28.1	6.6	32.1	0.5	35.0	53.9	18.9	*1)
Vert	4924.000	AV	33.3	33.3	8.9	31.3	0.5	44.7	53.9	9.2	
Vert	7386.000	AV	33.0	36.8	9.9	32.6	-	47.1	53.9	6.8	Floor noise
Vert	9848.000	AV	31.0	38.2	10.8	32.7	-	47.3	53.9	6.6	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

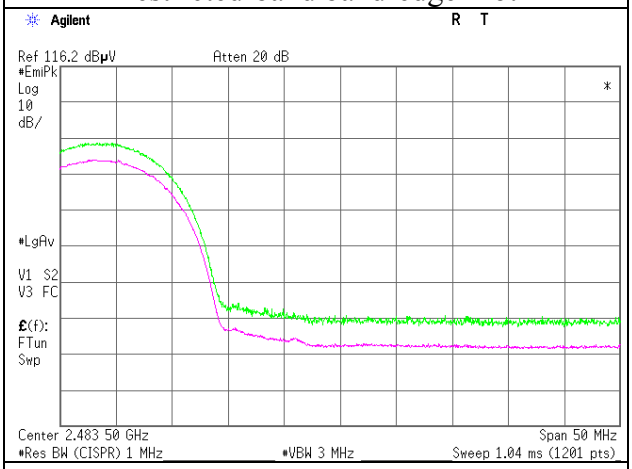
Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11328915H
Date	July 28, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Keisuke Kawamura
Mode	Tx 11b 2462 MHz

Horizontal

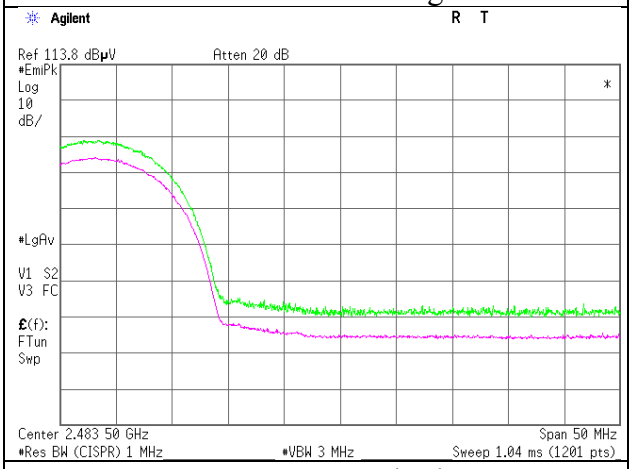
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 and No.2 Semi Anechoic Chamber		
Report No.	11328915H		
Date	July 28, 2016	August 3, 2016	August 7, 2016
Temperature / Humidity	23 deg. C / 54 % RH	20 deg. C / 59 % RH	20 deg. C / 61 % RH
Engineer	Keisuke Kawamura (1 GHz - 10 GHz)	Keisuke Kawamura (Above 10 GHz)	Keisuke Kawamura (Below 1 GHz)
Mode	Tx 11n-20 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	35.111	QP	23.5	15.6	6.8	28.5	-	17.4	40.0	22.6	
Hori	147.983	QP	38.7	14.7	7.8	28.0	-	33.2	43.5	10.3	
Hori	156.002	QP	31.9	15.2	7.8	27.9	-	27.0	43.5	16.5	
Hori	164.017	QP	33.9	15.5	7.9	27.9	-	29.4	43.5	14.1	
Hori	325.121	QP	33.6	14.1	9.0	27.6	-	29.1	46.0	16.9	
Hori	397.368	QP	33.0	15.5	9.4	28.2	-	29.7	46.0	16.3	
Hori	2390.000	PK	60.2	27.9	6.5	32.1	-	62.5	73.9	11.4	
Hori	4824.000	PK	42.2	32.9	8.8	31.3	-	52.6	73.9	21.3	
Hori	7236.000	PK	42.4	36.8	9.9	32.6	-	56.5	73.9	17.4	Floor noise
Hori	9648.000	PK	44.1	38.1	10.8	32.6	-	60.4	73.9	13.5	Floor noise
Hori	2390.000	AV	35.8	27.9	6.5	32.1	2.4	40.5	53.9	13.4	*1)
Hori	4824.000	AV	35.1	32.9	8.8	31.3	2.4	47.9	53.9	6.0	
Hori	7236.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Hori	9648.000	AV	31.4	38.1	10.8	32.6	-	47.7	53.9	6.2	Floor noise
Vert	577.995	QP	30.6	18.6	10.0	28.5	-	30.7	46.0	15.3	
Vert	650.246	QP	31.2	19.3	10.2	28.2	-	32.5	46.0	13.5	
Vert	722.491	QP	30.4	20.0	10.5	28.0	-	32.9	46.0	13.1	
Vert	794.748	QP	30.3	20.7	10.8	27.9	-	33.9	46.0	12.1	
Vert	866.997	QP	27.3	21.5	11.0	27.5	-	32.3	46.0	13.7	
Vert	939.247	QP	27.1	22.1	11.2	27.2	-	33.2	46.0	12.8	
Vert	2390.000	PK	56.6	27.9	6.5	32.1	-	58.9	73.9	15.0	
Vert	4824.000	PK	41.3	32.9	8.8	31.3	-	51.7	73.9	22.2	
Vert	7236.000	PK	41.2	36.8	9.9	32.6	-	55.3	73.9	18.6	Floor noise
Vert	9648.000	PK	43.3	38.1	10.8	32.6	-	59.6	73.9	14.3	Floor noise
Vert	2390.000	AV	40.2	27.9	6.5	32.1	2.4	44.9	53.9	9.0	*1)
Vert	4824.000	AV	33.3	32.9	8.8	31.3	2.4	46.1	53.9	7.8	
Vert	7236.000	AV	33.0	36.8	9.9	32.6	-	47.1	53.9	6.8	Floor noise
Vert	9648.000	AV	31.0	38.1	10.8	32.6	-	47.3	53.9	6.6	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*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	89.9	28.0	6.5	32.1	92.3	-	-	Carrier
Hori	2400.000	PK	59.6	28.0	6.5	32.1	62.0	72.3	10.3	
Vert	2412.000	PK	86.3	28.0	6.5	32.1	88.7	-	-	Carrier
Vert	2400.000	PK	55.7	28.0	6.5	32.1	58.1	68.7	10.6	

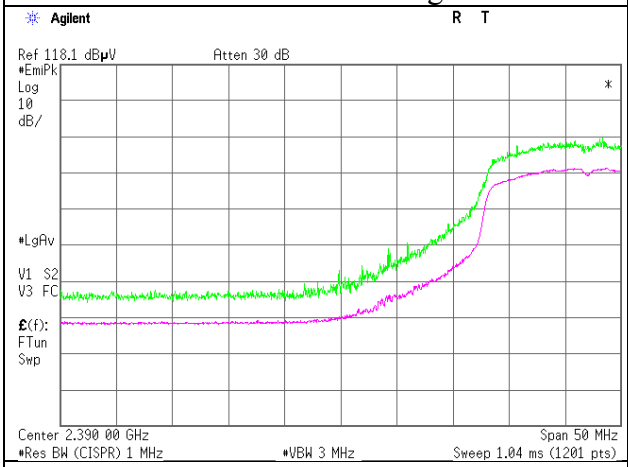
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11328915H
Date	July 28, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Keisuke Kawamura
Mode	Tx 11n-20 2412 MHz

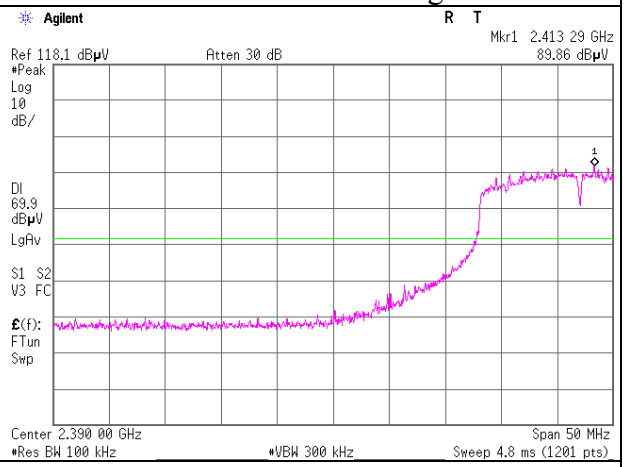
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

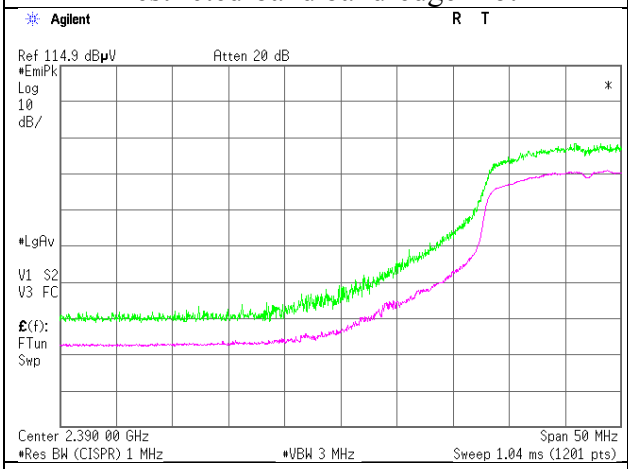
Authorized-band band-edge Plot



20dBc Plot

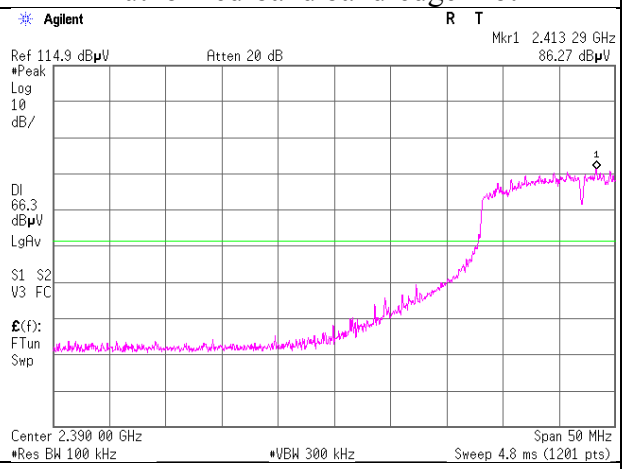
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 and No.2 Semi Anechoic Chamber	
Report No.	11328915H	
Date	July 28, 2016	August 3, 2016
Temperature / Humidity	23 deg. C / 54 % RH	20 deg. C / 59 % RH
Engineer	Keisuke Kawamura (1 GHz - 10 GHz)	Keisuke Kawamura (Above 10 GHz)
Mode	Tx 11n-20 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	41.3	33.1	8.8	31.3	-	51.9	73.9	22.0	
Hori	7311.000	PK	42.4	36.8	9.9	32.6	-	56.5	73.9	17.4	Floor noise
Hori	9748.000	PK	44.1	38.2	10.8	32.7	-	60.4	73.9	13.5	Floor noise
Hori	4874.000	AV	34.2	33.1	8.8	31.3	2.4	47.2	53.9	6.7	
Hori	7311.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Hori	9748.000	AV	31.4	38.2	10.8	32.7	-	47.7	53.9	6.2	Floor noise
Vert	4874.000	PK	41.6	33.1	8.8	31.3	-	52.2	73.9	21.7	
Vert	7311.000	PK	41.2	36.8	9.9	32.6	-	55.3	73.9	18.6	Floor noise
Vert	9748.000	PK	43.3	38.2	10.8	32.7	-	59.6	73.9	14.3	Floor noise
Vert	4874.000	AV	33.7	33.1	8.8	31.3	2.4	46.7	53.9	7.2	
Vert	7311.000	AV	33.0	36.8	9.9	32.6	-	47.1	53.9	6.8	Floor noise
Vert	9748.000	AV	31.0	38.2	10.8	32.7	-	47.3	53.9	6.6	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 and No.2 Semi Anechoic Chamber	
Report No.	11328915H	
Date	July 28, 2016	August 3, 2016
Temperature / Humidity	23 deg. C / 54 % RH	20 deg. C / 59 % RH
Engineer	Keisuke Kawamura (1 GHz - 10 GHz)	Keisuke Kawamura (Above 10 GHz)
Mode	Tx 11n-20 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	58.6	28.1	6.6	32.1	-	61.2	73.9	12.7	
Hori	4924.000	PK	41.5	33.3	8.9	31.3	-	52.4	73.9	21.5	
Hori	7386.000	PK	42.4	36.8	9.9	32.6	-	56.5	73.9	17.4	Floor noise
Hori	9848.000	PK	44.1	38.2	10.8	32.7	-	60.4	73.9	13.5	Floor noise
Hori	2483.500	AV	34.2	28.1	6.6	32.1	2.4	39.2	53.9	14.7	*1)
Hori	4924.000	AV	33.4	33.3	8.9	31.3	2.4	46.7	53.9	7.2	
Hori	7386.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Hori	9848.000	AV	31.4	38.2	10.8	32.7	-	47.7	53.9	6.2	Floor noise
Vert	2483.500	PK	57.3	28.1	6.6	32.1	-	59.9	73.9	14.0	
Vert	4924.000	PK	41.5	33.3	8.9	31.3	-	52.4	73.9	21.5	
Vert	7386.000	PK	41.2	36.8	9.9	32.6	-	55.3	73.9	18.6	Floor noise
Vert	9848.000	PK	43.3	38.2	10.8	32.7	-	59.6	73.9	14.3	Floor noise
Vert	2483.500	AV	40.9	28.1	6.6	32.1	2.4	45.9	53.9	8.0	*1)
Vert	4924.000	AV	33.2	33.3	8.9	31.3	2.4	46.5	53.9	7.4	
Vert	7386.000	AV	33.0	36.8	9.9	32.6	-	47.1	53.9	6.8	Floor noise
Vert	9848.000	AV	31.0	38.2	10.8	32.7	-	47.3	53.9	6.6	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

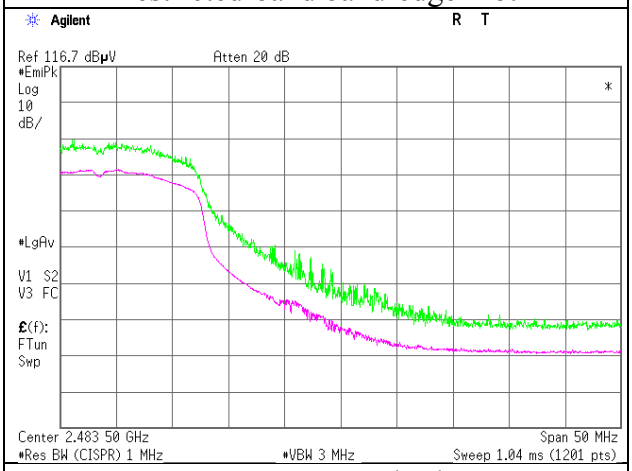
Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11328915H
Date	July 28, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Keisuke Kawamura
Mode	Tx 11n-20 2462 MHz

Horizontal

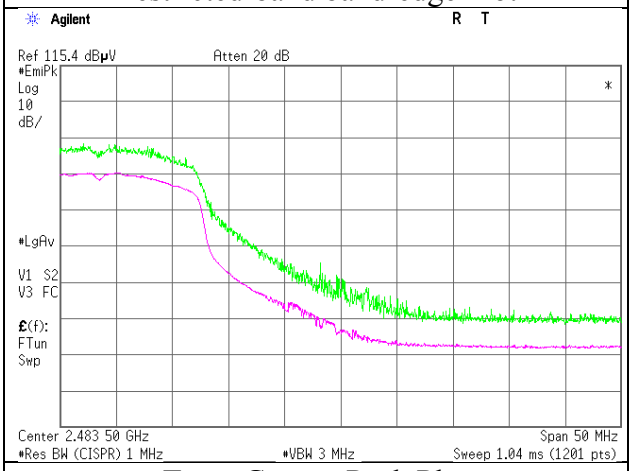
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

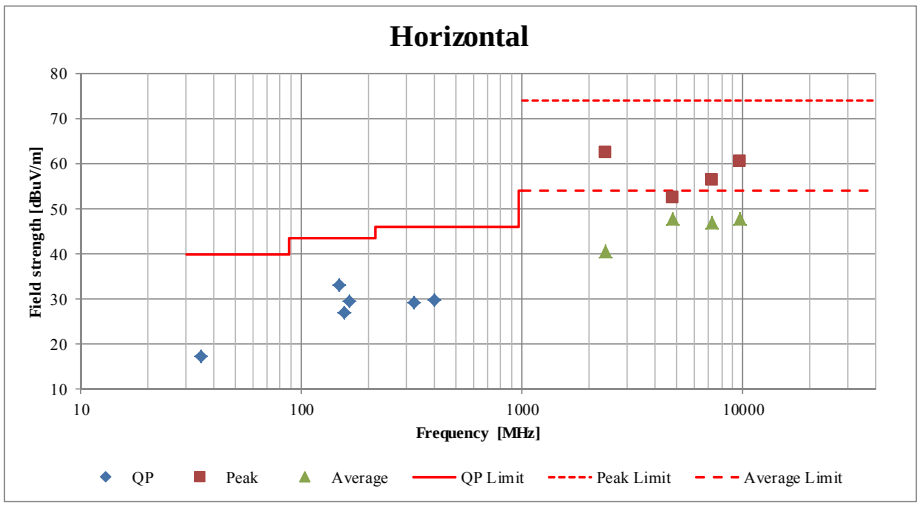


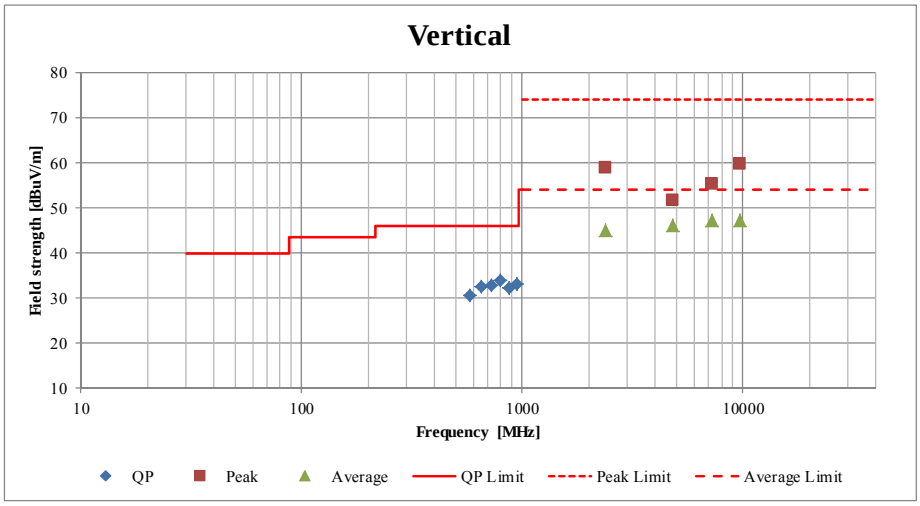
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.4 and No.2 Semi Anechoic Chamber		
Report No.	11328915H		
Date	July 28, 2016	August 3, 2016	August 7, 2016
Temperature / Humidity	23 deg. C / 54 % RH	20 deg. C / 59 % RH	20 deg. C / 61 % RH
Engineer	Keisuke Kawamura (1 GHz - 10 GHz)	Keisuke Kawamura (Above 10 GHz)	Keisuke Kawamura (Below 1 GHz)
Mode	Tx 11n-20 2412 MHz		



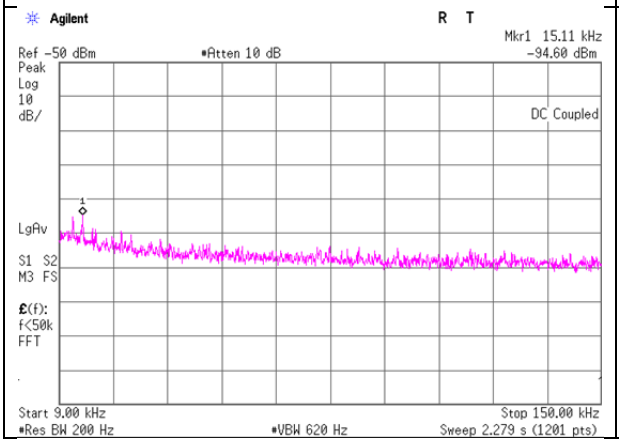


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

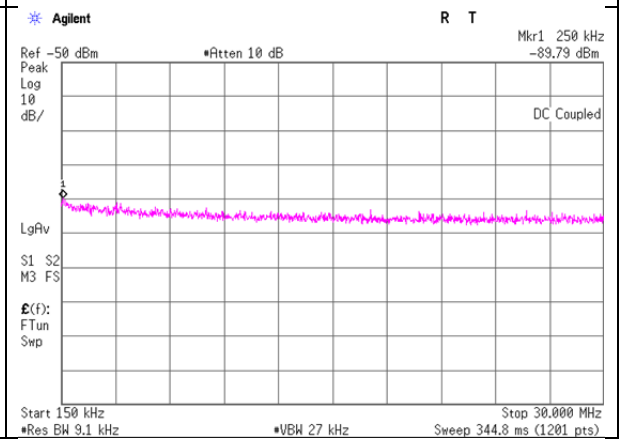
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 21, 2016
Temperature / Humidity	25 deg. C / 41 % RH
Engineer	Shinichi Miyazono
Mode	Tx 11n-20 2412 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenator Loss [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
15.11	-94.6	0.00	9.82	2.0	1	-82.8	300	6.0	-21.5	44.0	65.5	
250.00	-89.8	0.01	9.85	2.0	1	-77.9	300	6.0	-16.7	19.6	36.3	

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

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

Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 21, 2016
Temperature / Humidity	25 deg. C / 41 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-24.26	2.01	9.78	-12.47	8.00	20.47
2437.00	-23.97	2.02	9.78	-12.17	8.00	20.17
2462.00	-24.86	2.02	9.78	-13.06	8.00	21.06

11g

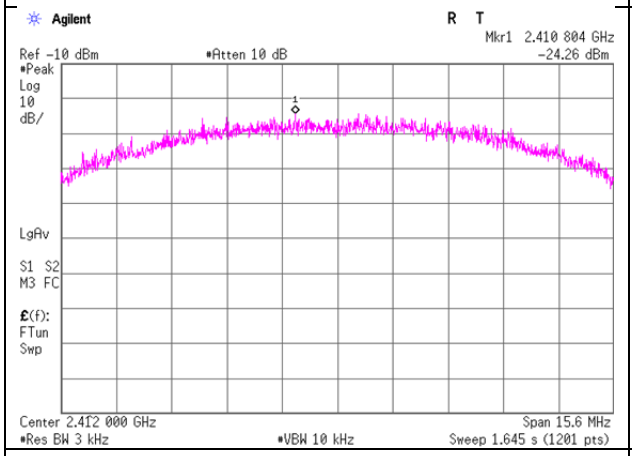
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-27.37	2.01	9.78	-15.58	8.00	23.58
2437.00	-27.31	2.02	9.78	-15.51	8.00	23.51
2462.00	-27.96	2.02	9.78	-16.16	8.00	24.16

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

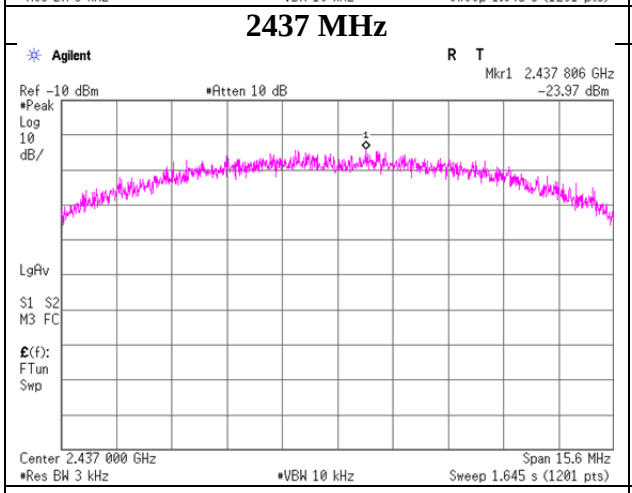
Power Density

11b

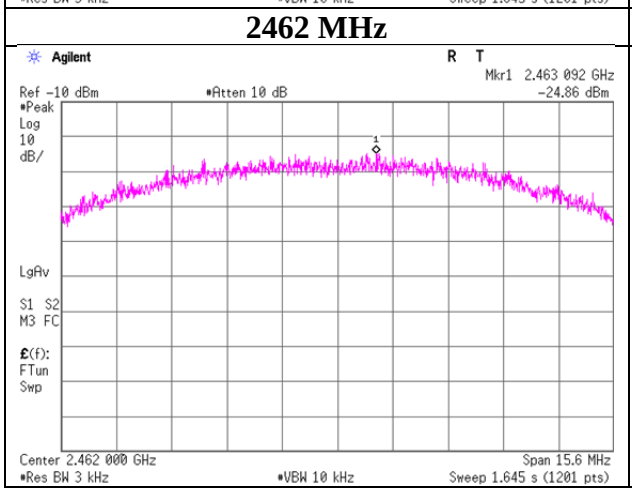
2412 MHz



2437 MHz

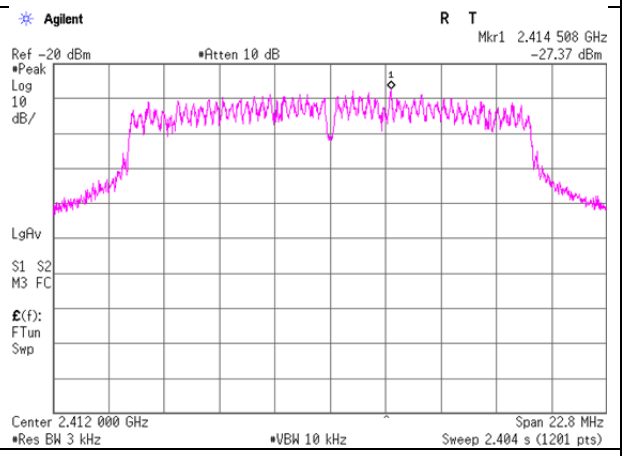


2462 MHz

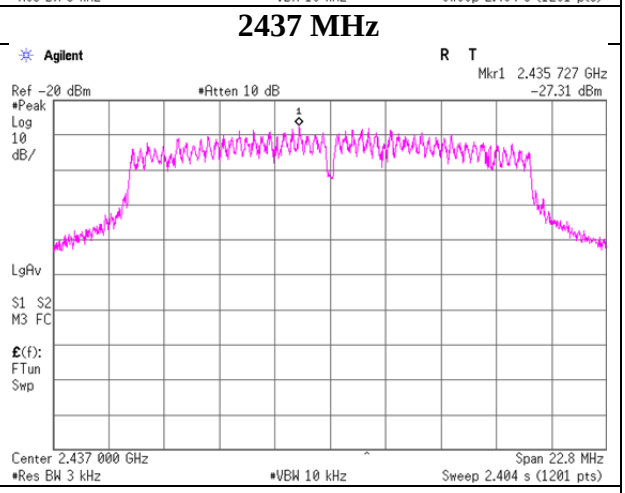


11g

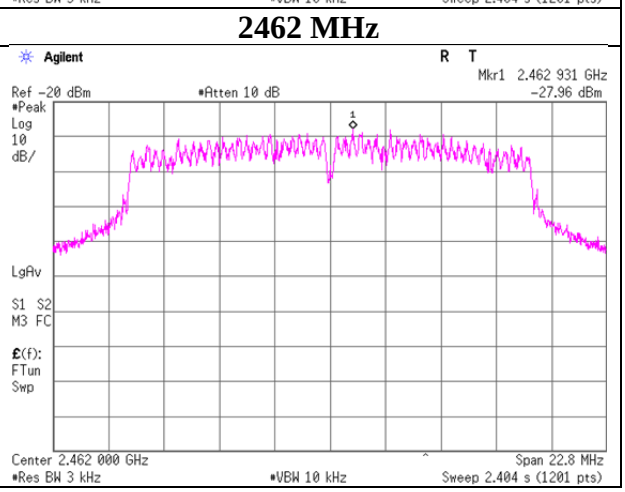
2412 MHz



2437 MHz



2462 MHz



Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 21, 2016
Temperature / Humidity	25 deg. C / 41 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11n20

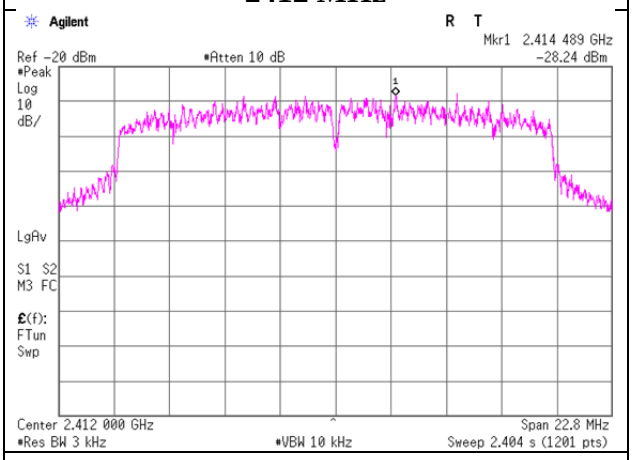
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-28.24	2.01	9.78	-16.45	8.00	24.45
2437.00	-27.12	2.02	9.78	-15.32	8.00	23.32
2462.00	-27.99	2.02	9.78	-16.19	8.00	24.19

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

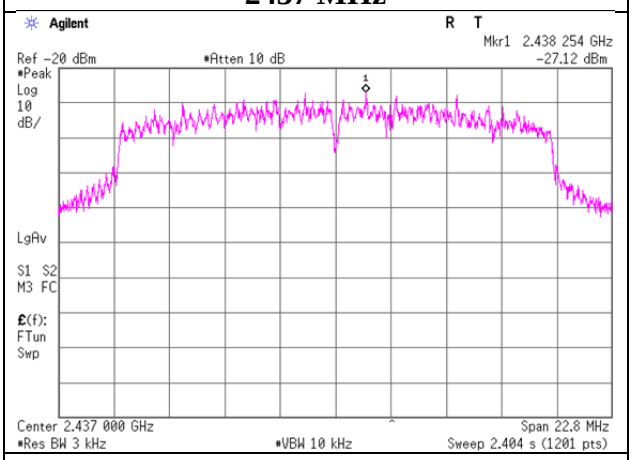
Power Density

11n-20

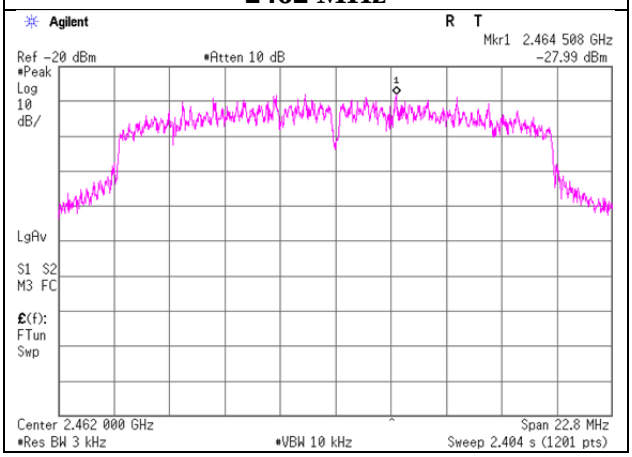
2412 MHz



2437 MHz



2462 MHz

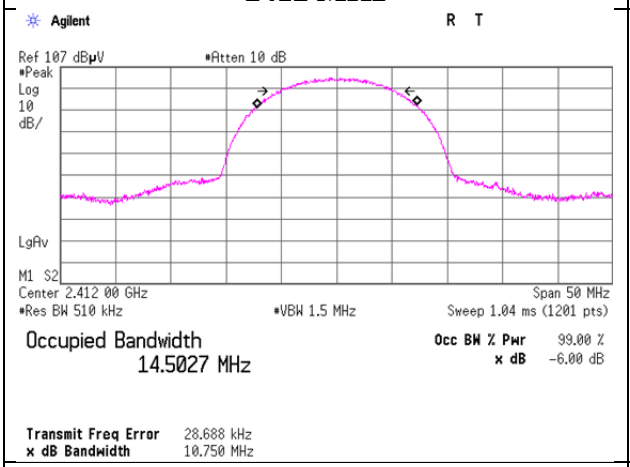


99%Occupied Bandwidth

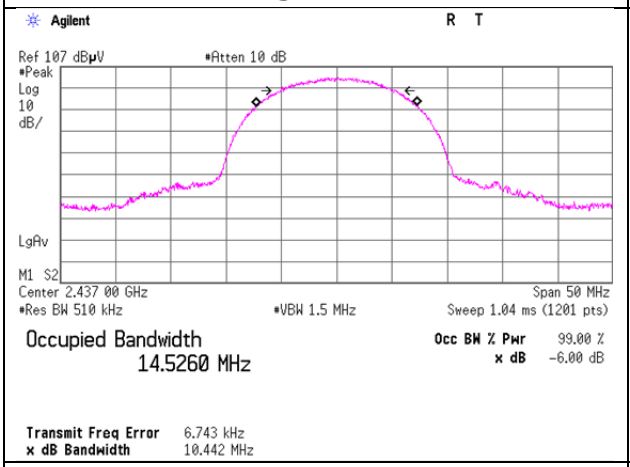
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 21, 2016
Temperature / Humidity	25 deg. C / 41 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11b

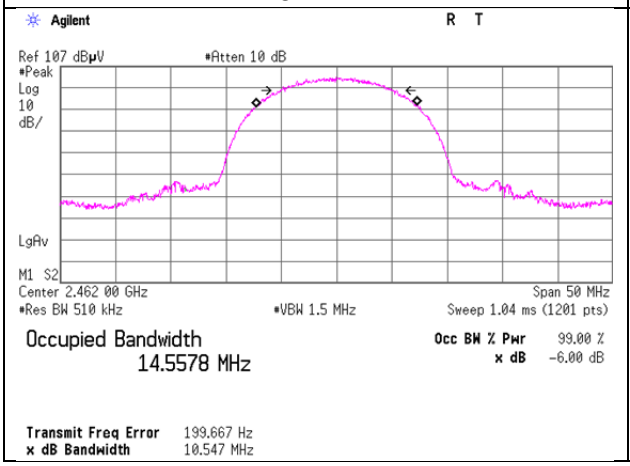
2412 MHz



2437 MHz

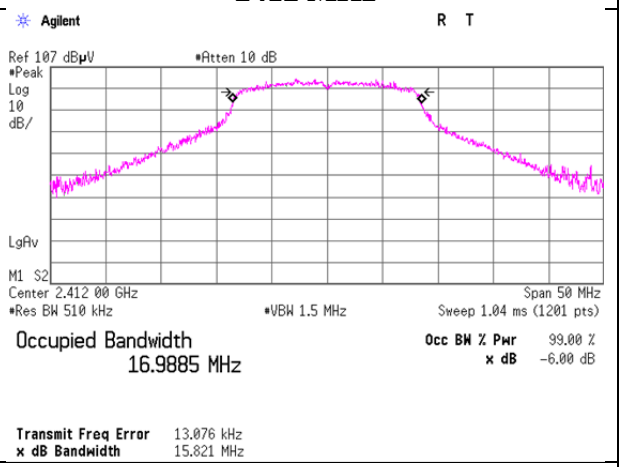


2462 MHz

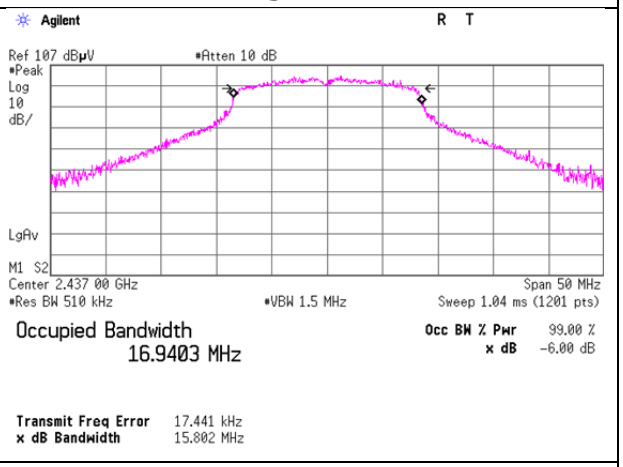


11g

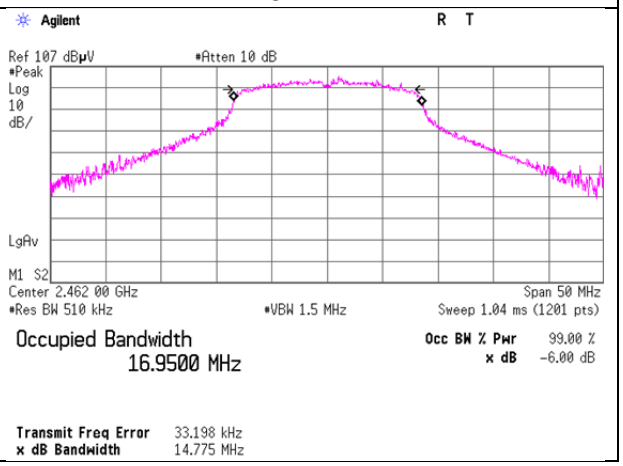
2412 MHz



2437 MHz



2462 MHz

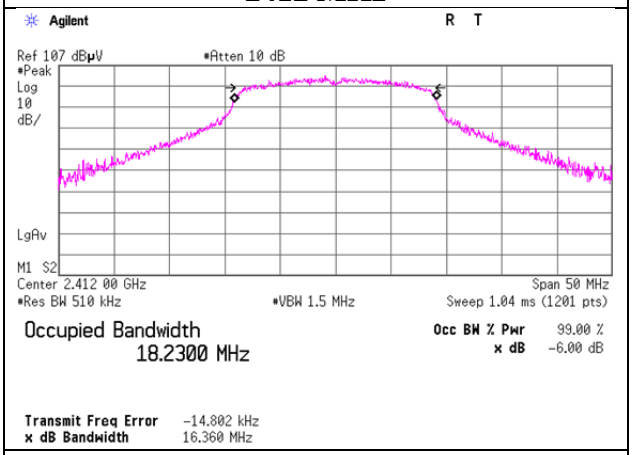


99% Occupied Bandwidth

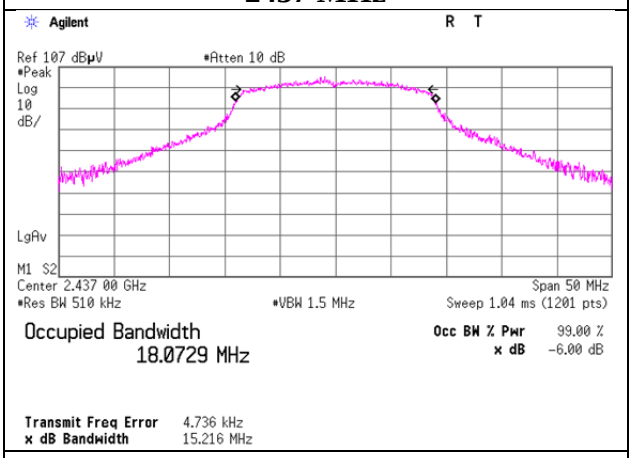
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11328915H
Date	July 21, 2016
Temperature / Humidity	25 deg. C / 41 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11n-20

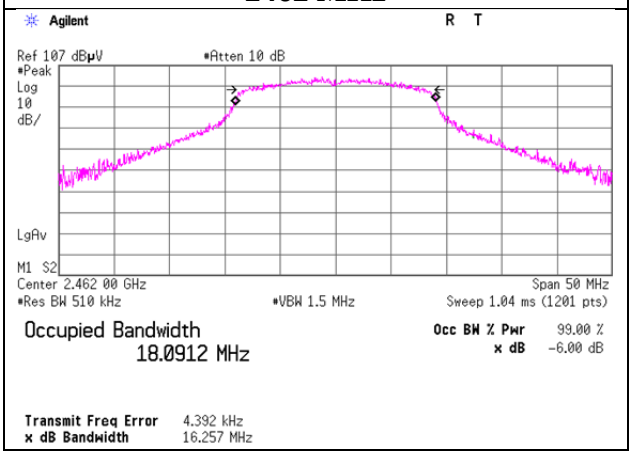
2412 MHz



2437 MHz



2462 MHz



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2015/12/08 * 12
MMM-17	DIGIITAL HiTESTER	Hioki	3805	070900530	AT	2016/01/13 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2015/10/19 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2015/10/19 * 12
MRENT-130	Spectrum Analyzer	Agilent	E4440A	MY46187750	AT	2016/06/03 * 12
MCC-172	Microwave Cable	Junkosha	MWX221	1409S495	AT	2016/03/11 * 12
MAT-92	Attenuator	Weinschel Associates	WA56-10	56100308	AT	2016/06/09 * 12
MCC-38	Coaxial Cable	UL Japan	-	-	AT	2015/12/07 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2015/11/10 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2015/11/06 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2015/08/10 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2016/06/21 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2015/09/17 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/01/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2016/06/17 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2016/02/29 * 12
MCC-165	Microwave Cable	Junkosha	MWX221	1203S213(1m) / 1311S166(5m)	RE	2015/11/10 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2016/01/19 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2016/02/29 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2015/08/19 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2015/10/11 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2016/01/30 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2016/02/08 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2015/11/10 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2015/09/04 * 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