RADIO TEST REPORT

Test Report No. : 11255696H-A

Applicant	:	**Murata Manufacturing Company, Ltd.**
Type of Equipment	:	**Communication Module**
Model No.	:	**TypeYD**
FCC ID	:	**VPYLBYD**
Test regulation	:	**FCC Part 15 Subpart C: 2015** **(Class II permissive change)** *** Radiated Spurious Emission test only**
Test Result	:	**Complied**

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

Date of test: May 3 to 11, 2016

Representative test engineer:
Shinichi Miyazono
Engineer
Consumer Technology Division

Approved by:
Takayuki Shimada
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.: 11255696H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11255696H-A	May 20, 2016	-	-

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

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SECTION 1: Customer information

Company Name	:	Murata Manufacturing Company, Ltd.
Address	:	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555 Japan
Telephone Number	:	+81-75-955-6736
Facsimile Number	:	+81-75-955-6634
Contact Person	:	Motoo Hayashi

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

2.1 Identification of E.U.T.

Type of Equipment	:	Communication Module
Model No.	:	TypeYD
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC3.3V
Receipt Date of Sample	:	April 28, 2016
Country of Mass-production	:	China/Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Specification of WLAN (IEEE802.11b/g/n)

Type of radio	Wireless LAN (IEEE802.11b/g)	Wireless LAN (IEEE802.11n) 2.4G Band SISO (20M Band)
Equipment Type	Transceiver	
Frequency of Operation	2412MHz - 2462MHz	
Bandwidth & Channel spacing	Bandwidth : 20MHz Ch spacing : 5MHz	
Type of Modulation	11b: DSSS 11g: OFDM	OFDM
Antenna Type / Antenna Gain	Monopole antenna: -2.7dBi (Peak)	
Power Supply (inner)	DC 3.3V	
Operating temperature range	-20 to +70 deg. C.	

<Contents of the change from original model>
Test Report Number of original model is 10124906H-A-R1(issued by UL Japan, Inc.).
Specification was changed from the original model as follows:
* The form change of the antenna design.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2015, final revised on November 23, 2015 *Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart 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
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05	**FCC:** Section15.247(d)	1.4 dB 249.964 MHz, QP, Hori.	Complied	Radiated (above 30 MHz) *1)
	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) 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 15.31 (e)
The stable voltage (DC3.3V) is constantly supplied to the EUT by the end product.
Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement
The EUT has a unique coupling/antenna connector (Reverse SMA). Therefore the equipment complies with the requirement of 15.203.

3.3 Addition to standard

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

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(±dB)		(10 m*)(±dB)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	4.9 dB	5.2 dB	4.9 dB	5.0 dB
Vertical	4.6 dB	5.9 dB	5.0 dB	5.0 dB

Radiated emission				
(3 m*)(±dB)		(1 m*)(±dB)	(0.5 m*)(±dB)	(10 m*)(±dB)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.0 dB	5.2 dB	5.1 dB	5.0 dB	5.2 dB

*Measurement distance

Radiated emission test

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

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
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)

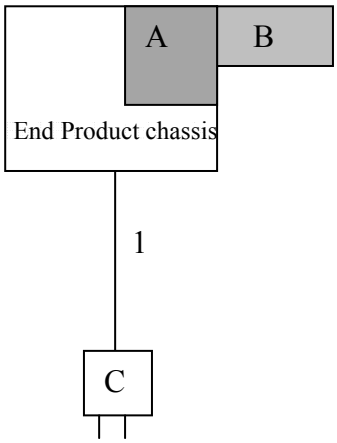
Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - " of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	5.5Mbps, PN9
IEEE 802.11g (11g)	36Mbps, PN9
IEEE 802.11n SISO 20MHz BW (11n-20)	MCS 1, 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: 11b: 17dBm 11g: 13dBm 11n: 12dBm Software: mfgtest *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.	

*Details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Spurious Emission (Radiated below 1GHz)	11g Tx *1)	2412MHz
Spurious Emission (Radiated above 1GHz)	11b Tx 11g Tx *2)	2412MHz 2437MHz 2462MHz
Spurious Emission (Band Edge)	11b Tx 11g Tx 11n-20 Tx	2412MHz 2462MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test. *2) 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 higher peak output power.		

4.2 Configuration and peripherals



AC120V/60Hz

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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Communication Module	TypeYD	SS5422048	Murata Manufacturing Company, Ltd.	EUT
B	Antenna	SMC-ANT-1	SA-10001	Software Motor Corporation	EUT
C	AC Adaptor	WAV240750	-	TRIAD	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.7	Unshielded	Unshielded	-

SECTION 6: 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	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)		4.4 m *1) (1 GHz – 10 GHz), 1 m *2) (10 GHz – 26.5 GHz)

*1) Distance Factor: 20 x log (4.4m / 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 carrier level and noise levels were confirmed at each position of X0, X90, Y0, Y90, Z0 and Z90 axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

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

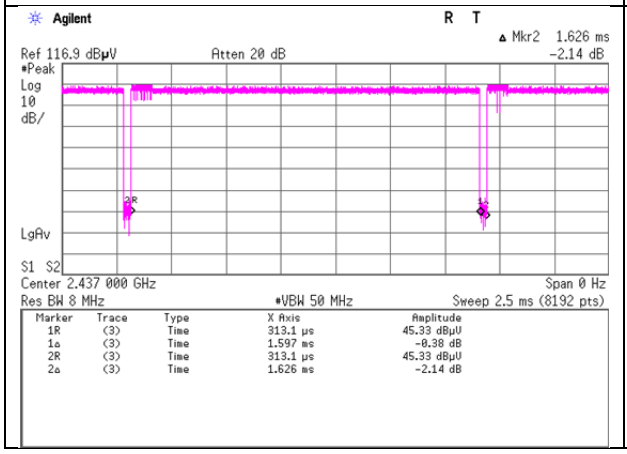
APPENDIX 1: Test data

Burst rate confirmation

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11255696H
Date	May 3, 2016
Temperature / Humidity	22 deg. C / 57 % RH
Engineer	Shinichi Miyazono
Mode	Tx

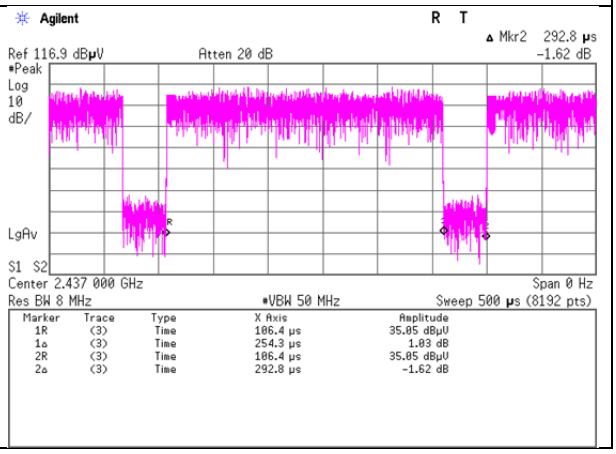
11b 5.5 Mbps

Tx on / (Tx on + Tx off) = 0.982
Tx on / (Tx on + Tx off) * 100 = 98.2 %
Duty factor = 10 * log (1.626 / 1.597) = 0.08 dB



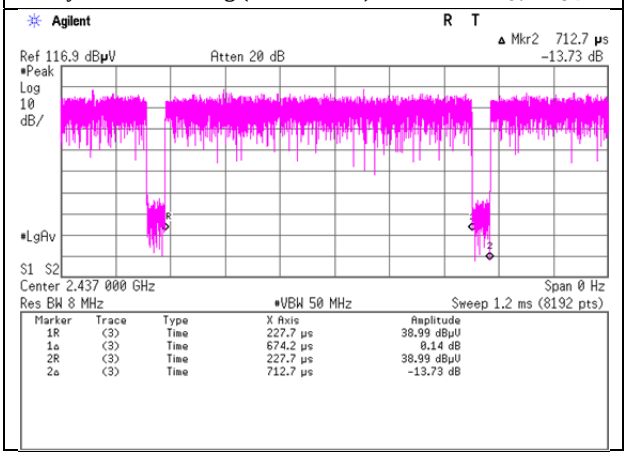
11g 36 Mbps

Tx on / (Tx on + Tx off) = 0.869
Tx on / (Tx on + Tx off) * 100 = 86.9 %
Duty factor = 10 * log (292.8 / 254.3) = 0.61 dB



11n-20 MCS 1

Tx on / (Tx on + Tx off) = 0.946
Tx on / (Tx on + Tx off) * 100 = 94.6 %
Duty factor = 10 * log (712.7 / 674.2) = 0.24 dB



Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	11255696H	
Date	May 3, 2016	May 4, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH
Engineer	Shinichi Miyazono	Shinichi Miyazono
	(1 GHz – 10 GHz)	(10 GHz – 26.5 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	49.4	27.9	6.6	32.1	-	51.8	73.9	22.1	
Hori	4824.000	PK	40.4	32.9	9.0	31.3	-	51.0	73.9	22.9	Floor Noise
Hori	7236.000	PK	40.7	36.8	10.2	32.6	-	55.1	73.9	18.8	Floor Noise
Hori	9648.000	PK	42.0	38.1	9.5	32.6	-	57.0	73.9	16.9	Floor Noise
Hori	2390.000	AV	41.5	27.9	6.6	32.1	-	43.9	53.9	10.0	
Hori	4824.000	AV	31.6	32.9	9.0	31.3	-	42.2	53.9	11.7	Floor Noise
Hori	7236.000	AV	32.5	36.8	10.2	32.6	-	46.9	53.9	7.0	Floor Noise
Hori	9648.000	AV	32.9	38.1	9.5	32.6	-	47.9	53.9	6.0	Floor Noise
Vert	2390.000	PK	48.3	27.9	6.6	32.1	-	50.7	73.9	23.2	
Vert	4824.000	PK	40.3	32.9	9.0	31.3	-	50.9	73.9	23.0	Floor Noise
Vert	7236.000	PK	40.6	36.8	10.2	32.6	-	55.0	73.9	18.9	Floor Noise
Vert	9648.000	PK	41.9	38.1	9.5	32.6	-	56.9	73.9	17.0	Floor Noise
Vert	2390.000	AV	39.7	27.9	6.6	32.1	-	42.1	53.9	11.8	
Vert	4824.000	AV	31.6	32.9	9.0	31.3	-	42.2	53.9	11.7	Floor Noise
Vert	7236.000	AV	32.4	36.8	10.2	32.6	-	46.8	53.9	7.1	Floor Noise
Vert	9648.000	AV	32.8	38.1	9.5	32.6	-	47.8	53.9	6.1	Floor Noise

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

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

20dBc Data Sheet

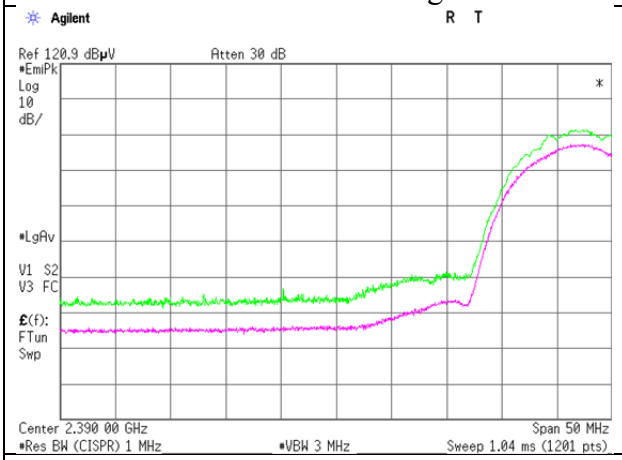
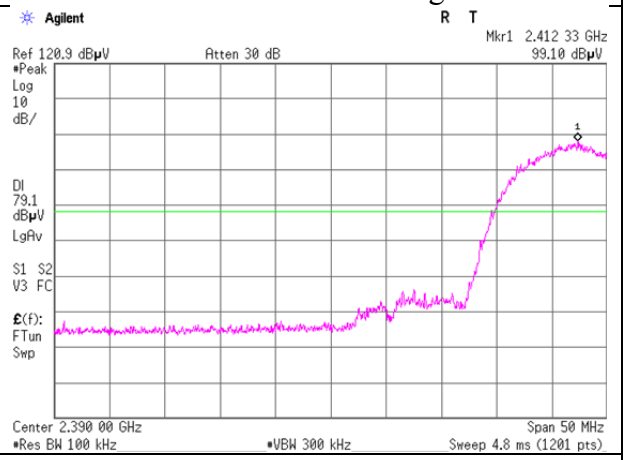
Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
Hori	2412.000	PK	99.1	28.0	6.6	32.1	101.6	-	-	Carrier
Hori	2400.000	PK	54.6	28.0	6.6	32.1	57.1	81.6	24.5	
Vert	2412.000	PK	96.2	28.0	6.6	32.1	98.7	-	-	Carrier
Vert	2400.000	PK	52.8	28.0	6.6	32.1	55.3	78.7	23.4	

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

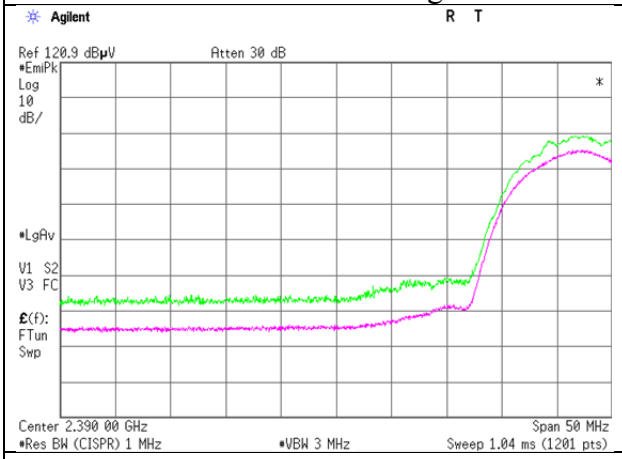
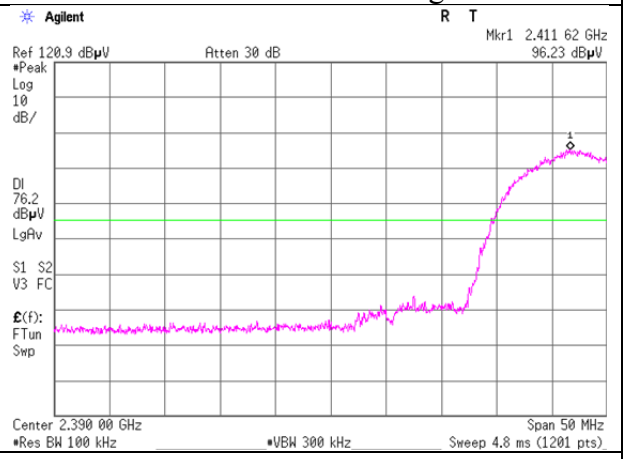
Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11255696H
Date	May 3, 2016
Temperature / Humidity	22 deg. C / 57 % RH
Engineer	Shinichi Miyazono (1 GHz – 10 GHz)
Mode	Tx 11b 2412 MHz

Horizontal

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	11255696H	
Date	May 3, 2016	May 4, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH
Engineer	Shinichi Miyazono	Shinichi Miyazono
	(1 GHz – 10 GHz)	(10 GHz – 26.5 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	40.6	33.1	9.0	31.3	-	51.4	73.9	22.5	Floor Noise
Hori	7311.000	PK	40.9	36.8	10.2	32.6	-	55.3	73.9	18.6	Floor Noise
Hori	9748.000	PK	40.1	38.2	9.5	32.7	-	55.1	73.9	18.8	Floor Noise
Hori	4874.000	AV	31.3	33.1	9.0	31.3	-	42.1	53.9	11.8	Floor Noise
Hori	7311.000	AV	32.0	36.8	10.2	32.6	-	46.4	53.9	7.5	Floor Noise
Hori	9748.000	AV	31.8	38.2	9.5	32.7	-	46.8	53.9	7.1	Floor Noise
Vert	4874.000	PK	40.5	33.1	9.0	31.3	-	51.3	73.9	22.6	Floor Noise
Vert	7311.000	PK	40.8	36.8	10.2	32.6	-	55.2	73.9	18.7	Floor Noise
Vert	9748.000	PK	40.0	38.2	9.5	32.7	-	55.0	73.9	18.9	Floor Noise
Vert	4874.000	AV	31.2	33.1	9.0	31.3	-	42.0	53.9	11.9	Floor Noise
Vert	7311.000	AV	31.9	36.8	10.2	32.6	-	46.3	53.9	7.6	Floor Noise
Vert	9748.000	AV	31.7	38.2	9.5	32.7	-	46.7	53.9	7.2	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.4m / 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 Semi Anechoic Chamber	
Report No.	11255696H	
Date	May 3, 2016	May 4, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH
Engineer	Shinichi Miyazono (1 GHz – 10 GHz)	Shinichi Miyazono (10 GHz – 26.5 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	48.4	28.1	6.7	32.1	-	51.1	73.9	22.8	
Hori	4924.000	PK	39.7	33.3	9.1	31.3	-	50.8	73.9	23.1	Floor Noise
Hori	7386.000	PK	40.5	36.8	10.2	32.6	-	54.9	73.9	19.0	Floor Noise
Hori	9848.000	PK	40.4	38.2	9.4	32.7	-	55.3	73.9	18.6	Floor Noise
Hori	2483.500	AV	39.9	28.1	6.7	32.1	-	42.6	53.9	11.3	
Hori	4924.000	AV	30.8	33.3	9.1	31.3	-	41.9	53.9	12.0	Floor Noise
Hori	7386.000	AV	32.0	36.8	10.2	32.6	-	46.4	53.9	7.5	Floor Noise
Hori	9848.000	AV	32.2	38.2	9.4	32.7	-	47.1	53.9	6.8	Floor Noise
Vert	2483.500	PK	44.6	28.1	6.7	32.1	-	47.3	73.9	26.6	
Vert	4924.000	PK	39.6	33.3	9.1	31.3	-	50.7	73.9	23.2	Floor Noise
Vert	7386.000	PK	40.4	36.8	10.2	32.6	-	54.8	73.9	19.1	Floor Noise
Vert	9848.000	PK	40.3	38.2	9.4	32.7	-	55.2	73.9	18.7	Floor Noise
Vert	2483.500	AV	36.6	28.1	6.7	32.1	-	39.3	53.9	14.6	
Vert	4924.000	AV	30.7	33.3	9.1	31.3	-	41.8	53.9	12.1	Floor Noise
Vert	7386.000	AV	31.9	36.8	10.2	32.6	-	46.3	53.9	7.6	Floor Noise
Vert	9848.000	AV	32.1	38.2	9.4	32.7	-	47.0	53.9	6.9	Floor Noise

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

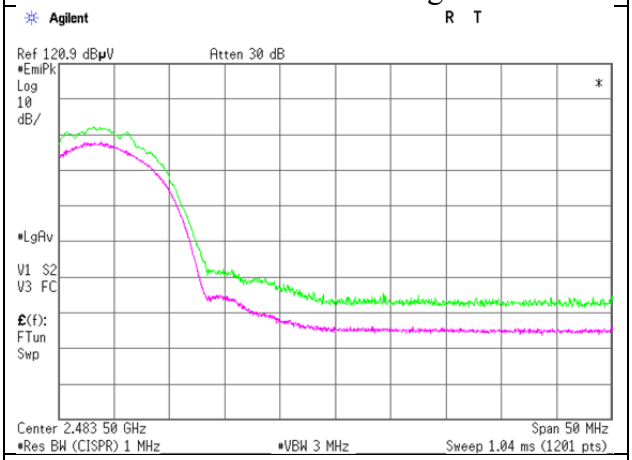
Distance factor: 1 GHz - 10 GHz 20log (4.4m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11255696H
Date	May 3, 2016
Temperature / Humidity	22 deg. C / 57 % RH
Engineer	Shinichi Miyazono (1 GHz – 10 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

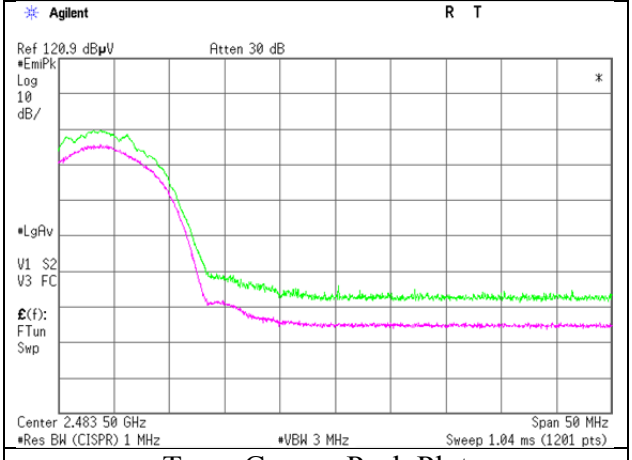
Restricted-band band-edge Plot



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 Semi Anechoic Chamber		
Report No.	11255696H		
Date	May 3, 2016	May 4, 2016	May 11, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH	24 deg. C / 6 % RH
Engineer	Shinichi Miyazono (1 GHz – 10 GHz)	Shinichi Miyazono (10 GHz – 26.5 GHz)	Yuta Moriya (30 MHz – 1000 MHz)
Mode	Tx 11g 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	150.261	QP	39.0	14.9	8.7	32.0	-	30.6	43.5	12.9	
Hori	199.971	QP	42.3	16.4	9.1	31.9	-	35.9	43.5	7.6	
Hori	249.964	QP	54.7	12.3	9.5	31.9	-	44.6	46.0	1.4	
Hori	299.956	QP	48.0	13.4	9.9	31.8	-	39.5	46.0	6.5	
Hori	499.800	QP	42.8	17.5	11.2	32.2	-	39.3	46.0	6.7	
Hori	626.454	QP	43.6	19.2	11.9	32.2	-	42.5	46.0	3.5	
Hori	849.849	QP	35.5	21.3	13.1	31.4	-	38.5	46.0	7.5	
Hori	2390.000	PK	58.1	27.9	6.6	32.1	-	60.5	73.9	13.4	
Hori	4824.000	PK	40.3	32.9	9.0	31.3	-	50.9	73.9	23.0	Floor Noise
Hori	7236.000	PK	40.6	36.8	10.2	32.6	-	55.0	73.9	18.9	Floor Noise
Hori	9648.000	PK	41.9	38.1	9.5	32.6	-	56.9	73.9	17.0	Floor Noise
Hori	2390.000	AV	47.5	27.9	6.6	32.1	0.6	50.5	53.9	3.4	*1)
Hori	4824.000	AV	31.6	32.9	9.0	31.3	-	42.2	53.9	11.7	Floor Noise
Hori	7236.000	AV	32.4	36.8	10.2	32.6	-	46.8	53.9	7.1	Floor Noise
Hori	9648.000	AV	32.8	38.1	9.5	32.6	-	47.8	53.9	6.1	Floor Noise
Vert	127.435	QP	43.9	13.5	8.4	32.0	-	33.8	43.5	9.7	
Vert	149.979	QP	49.9	14.9	8.6	32.0	-	41.4	43.5	2.1	
Vert	249.964	QP	47.6	12.3	9.5	31.9	-	37.5	46.0	8.5	
Vert	349.938	QP	40.9	14.6	10.3	31.9	-	33.9	46.0	12.1	
Vert	499.800	QP	43.3	17.5	11.2	32.2	-	39.8	46.0	6.2	
Vert	626.454	QP	41.0	19.2	11.9	32.2	-	39.9	46.0	6.1	
Vert	2390.000	PK	56.8	27.9	6.6	32.1	-	59.2	73.9	14.7	
Vert	4824.000	PK	40.2	32.9	9.0	31.3	-	50.8	73.9	23.1	Floor Noise
Vert	7236.000	PK	40.5	36.8	10.2	32.6	-	54.9	73.9	19.0	Floor Noise
Vert	9648.000	PK	41.8	38.1	9.5	32.6	-	56.8	73.9	17.1	Floor Noise
Vert	2390.000	AV	45.3	27.9	6.6	32.1	0.6	48.3	53.9	5.6	*1)
Vert	4824.000	AV	31.5	32.9	9.0	31.3	-	42.1	53.9	11.8	Floor Noise
Vert	7236.000	AV	32.3	36.8	10.2	32.6	-	46.7	53.9	7.2	Floor Noise
Vert	9648.000	AV	32.7	38.1	9.5	32.6	-	47.7	53.9	6.2	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 (4.4m / 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)

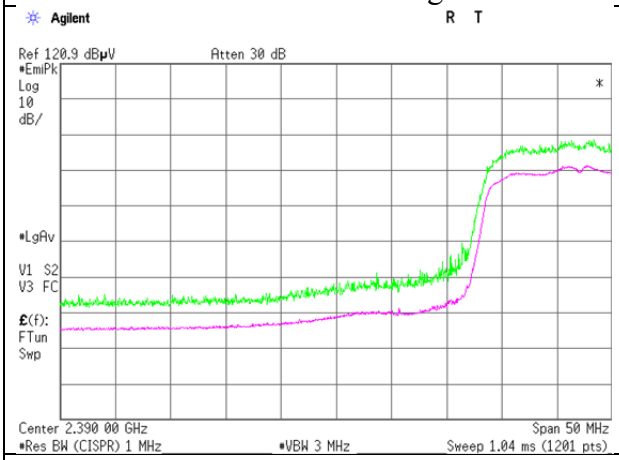
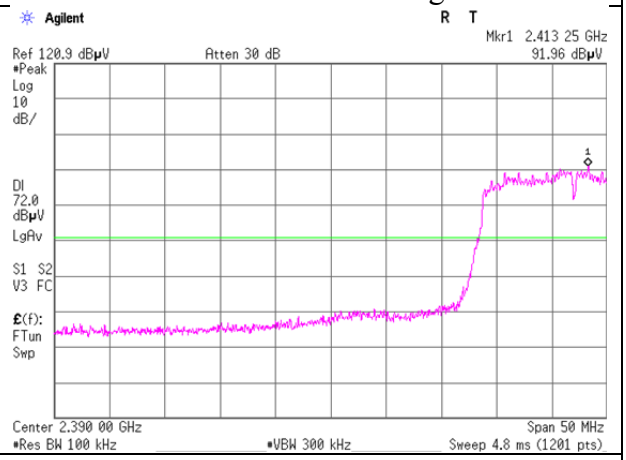
20dBc Data Sheet

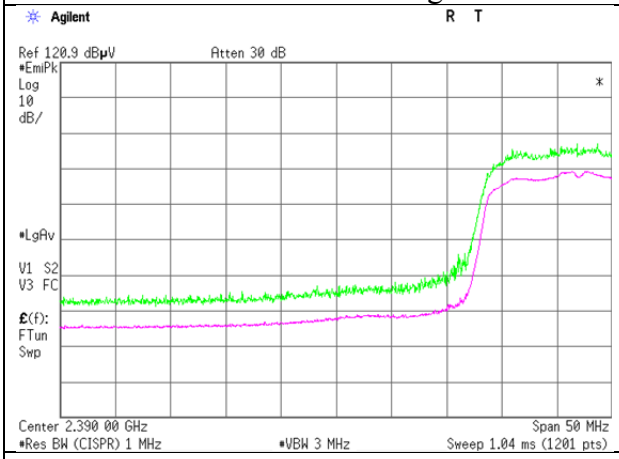
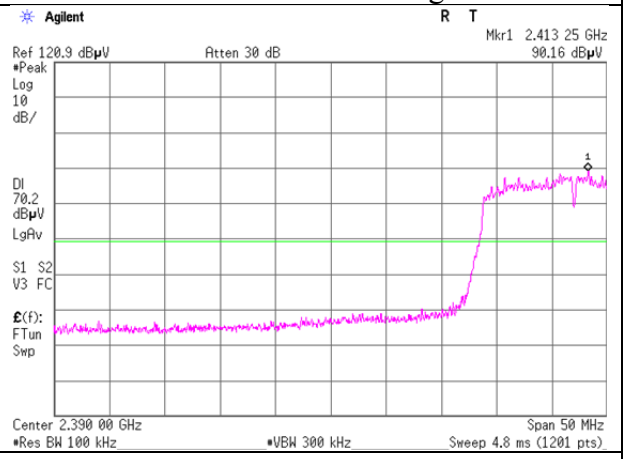
Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
Hori	2412.000	PK	92.0	28.0	6.6	32.1	94.5	-	-	Carrier
Hori	2400.000	PK	49.9	28.0	6.6	32.1	52.4	74.5	22.1	
Vert	2412.000	PK	90.0	28.0	6.6	32.1	92.5	-	-	Carrier
Vert	2400.000	PK	49.4	28.0	6.6	32.1	51.9	72.5	20.6	

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.	11255696H
Date	May 3, 2016
Temperature / Humidity	22 deg. C / 57 % RH
Engineer	Shinichi Miyazono (1 GHz – 10 GHz)
Mode	Tx 11g 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	11255696H	
Date	May 3, 2016	May 4, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH
Engineer	Shinichi Miyazono	Shinichi Miyazono
	(1 GHz – 10 GHz)	(10 GHz – 26.5 GHz)
Mode	Tx 11g 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	40.5	33.1	9.0	31.3	-	51.3	73.9	22.6	Floor Noise
Hori	7311.000	PK	40.8	36.8	10.2	32.6	-	55.2	73.9	18.7	Floor Noise
Hori	9748.000	PK	40.0	38.2	9.5	32.7	-	55.0	73.9	18.9	Floor Noise
Hori	4874.000	AV	31.2	33.1	9.0	31.3	-	42.0	53.9	11.9	Floor Noise
Hori	7311.000	AV	31.9	36.8	10.2	32.6	-	46.3	53.9	7.6	Floor Noise
Hori	9748.000	AV	31.7	38.2	9.5	32.7	-	46.7	53.9	7.2	Floor Noise
Vert	4874.000	PK	40.4	33.1	9.0	31.3	-	51.2	73.9	22.7	Floor Noise
Vert	7311.000	PK	40.7	36.8	10.2	32.6	-	55.1	73.9	18.8	Floor Noise
Vert	9748.000	PK	39.9	38.2	9.5	32.7	-	54.9	73.9	19.0	Floor Noise
Vert	4874.000	AV	31.1	33.1	9.0	31.3	-	41.9	53.9	12.0	Floor Noise
Vert	7311.000	AV	31.8	36.8	10.2	32.6	-	46.2	53.9	7.7	Floor Noise
Vert	9748.000	AV	31.6	38.2	9.5	32.7	-	46.6	53.9	7.3	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 (4.4m / 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 Semi Anechoic Chamber	
Report No.	11255696H	
Date	May 3, 2016	May 4, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH
Engineer	Shinichi Miyazono	Shinichi Miyazono
	(1 GHz – 10 GHz)	(10 GHz – 26.5 GHz)
Mode	Tx 11g 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	55.4	28.1	6.7	32.1	-	58.1	73.9	15.8	
Hori	4924.000	PK	39.6	33.3	9.1	31.3	-	50.7	73.9	23.2	Floor Noise
Hori	7386.000	PK	40.4	36.8	10.2	32.6	-	54.8	73.9	19.1	Floor Noise
Hori	9848.000	PK	40.3	38.2	9.4	32.7	-	55.2	73.9	18.7	Floor Noise
Hori	2483.500	AV	44.8	28.1	6.7	32.1	0.6	48.1	53.9	5.8	*1)
Hori	4924.000	AV	30.7	33.3	9.1	31.3	-	41.8	53.9	12.1	Floor Noise
Hori	7386.000	AV	31.9	36.8	10.2	32.6	-	46.3	53.9	7.6	Floor Noise
Hori	9848.000	AV	32.1	38.2	9.4	32.7	-	47.0	53.9	6.9	Floor Noise
Vert	2483.500	PK	51.0	28.1	6.7	32.1	-	53.7	73.9	20.2	
Vert	4924.000	PK	39.5	33.3	9.1	31.3	-	50.6	73.9	23.3	Floor Noise
Vert	7386.000	PK	40.3	36.8	10.2	32.6	-	54.7	73.9	19.2	Floor Noise
Vert	9848.000	PK	40.2	38.2	9.4	32.7	-	55.1	73.9	18.8	Floor Noise
Vert	2483.500	AV	40.6	28.1	6.7	32.1	0.6	43.9	53.9	10.0	*1)
Vert	4924.000	AV	30.6	33.3	9.1	31.3	-	41.7	53.9	12.2	Floor Noise
Vert	7386.000	AV	31.8	36.8	10.2	32.6	-	46.2	53.9	7.7	Floor Noise
Vert	9848.000	AV	32.0	38.2	9.4	32.7	-	46.9	53.9	7.0	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).

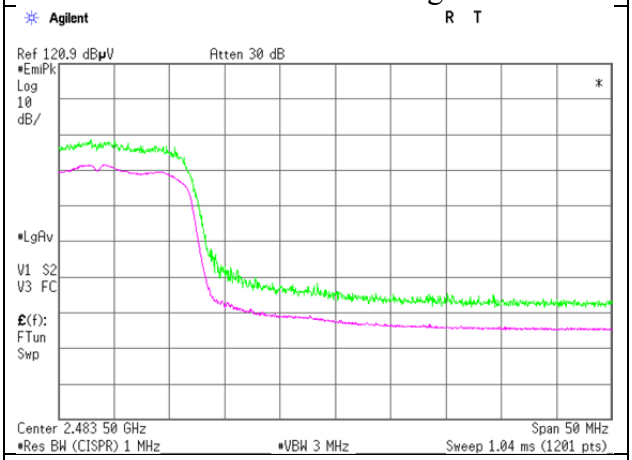
Distance factor: 1 GHz - 10 GHz 20log (4.4m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11255696H
Date	May 3, 2016
Temperature / Humidity	22 deg. C / 57 % RH
Engineer	Shinichi Miyazono (1 GHz – 10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

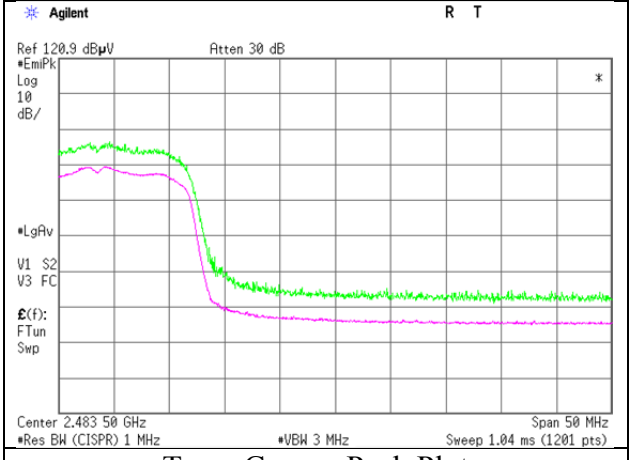
Restricted-band band-edge Plot



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

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	11255696H	
Date	May 3, 2016	May 4, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH
Engineer	Shinichi Miyazono	Shinichi Miyazono
	(1 GHz – 10 GHz)	(10 GHz – 26.5 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	2390.000	PK	57.0	27.9	6.6	32.1	-	59.4	73.9	14.5	
Hori	2390.000	AV	46.5	27.9	6.6	32.1	0.2	49.1	53.9	4.8	*1)
Vert	2390.000	PK	56.2	27.9	6.6	32.1	-	58.6	73.9	15.3	
Vert	2390.000	AV	44.5	27.9	6.6	32.1	0.2	47.1	53.9	6.8	*1)

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 (4.4m / 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)

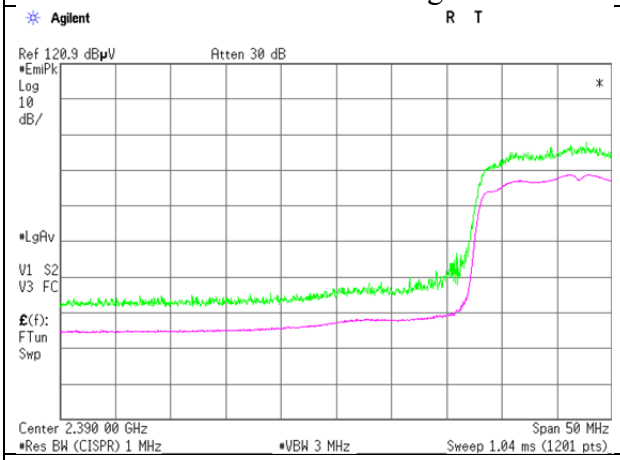
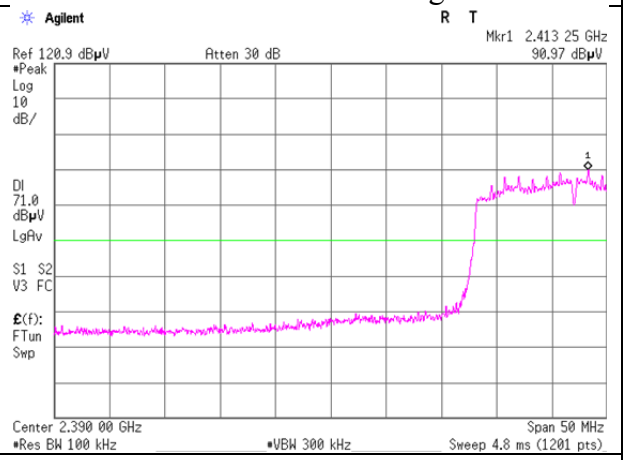
20dBc Data Sheet

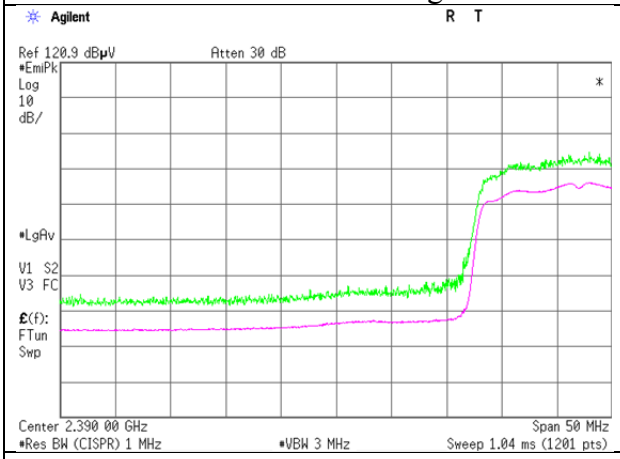
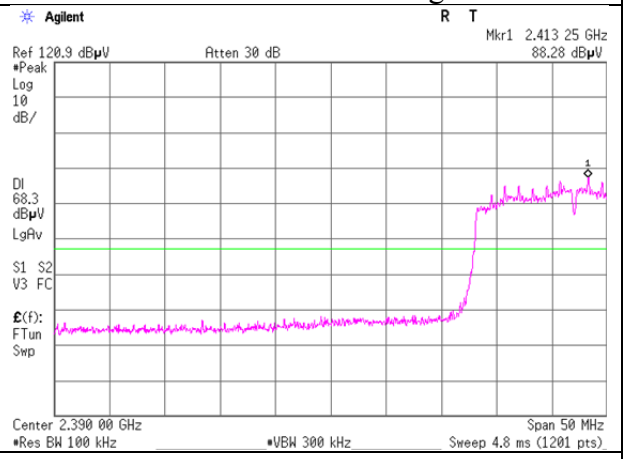
Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
Hori	2412.000	PK	91.0	28.0	6.6	32.1	93.5	-	-	Carrier
Hori	2400.000	PK	49.7	28.0	6.6	32.1	52.2	73.5	21.3	
Vert	2412.000	PK	88.3	28.0	6.6	32.1	90.8	-	-	Carrier
Vert	2400.000	PK	46.9	28.0	6.6	32.1	49.4	70.8	21.4	

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.	11255696H
Date	May 3, 2016
Temperature / Humidity	22 deg. C / 57 % RH
Engineer	Shinichi Miyazono
	(1 GHz – 10 GHz)
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	11255696H	
Date	May 3, 2016	May 4, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH
Engineer	Shinichi Miyazono	Shinichi Miyazono
	(1 GHz – 10 GHz)	(10 GHz – 26.5 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	55.8	28.1	6.7	32.1	-	58.5	73.9	15.4	
Hori	2483.500	AV	43.7	28.1	6.7	32.1	0.2	46.6	53.9	7.3	*1)
Vert	2483.500	PK	49.6	28.1	6.7	32.1	-	52.3	73.9	21.6	
Vert	2483.500	AV	39.0	28.1	6.7	32.1	0.2	41.9	53.9	12.0	*1)

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).

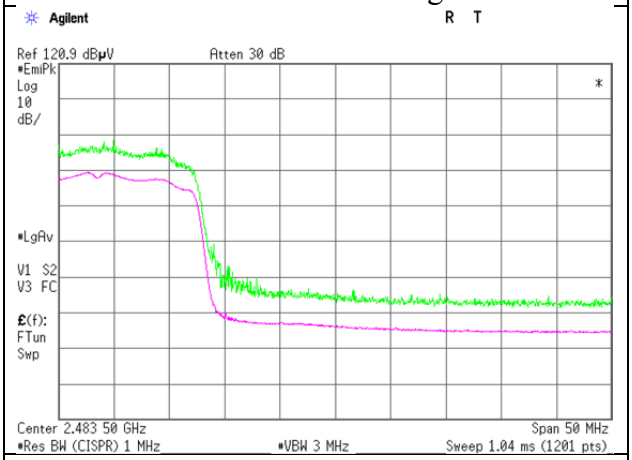
Distance factor: 1 GHz - 10 GHz 20log (4.4m / 3.0 m) = 3.33 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11255696H
Date	May 3, 2016
Temperature / Humidity	22 deg. C / 57 % RH
Engineer	Shinichi Miyazono (1 GHz – 10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

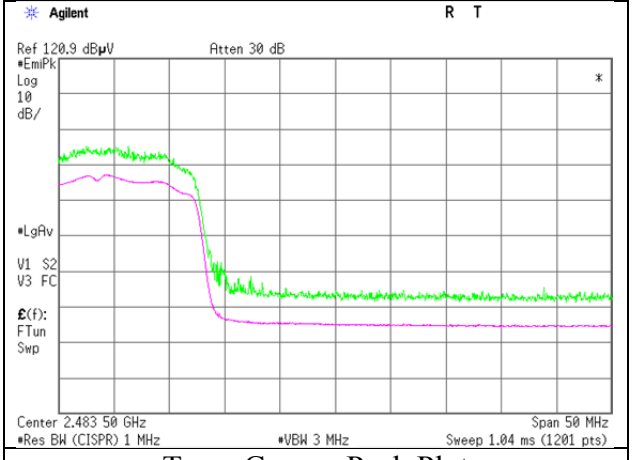
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

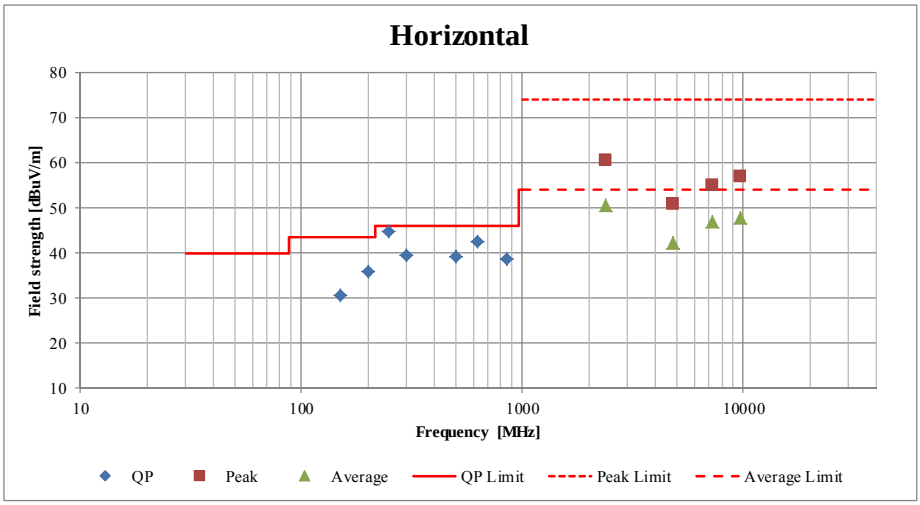


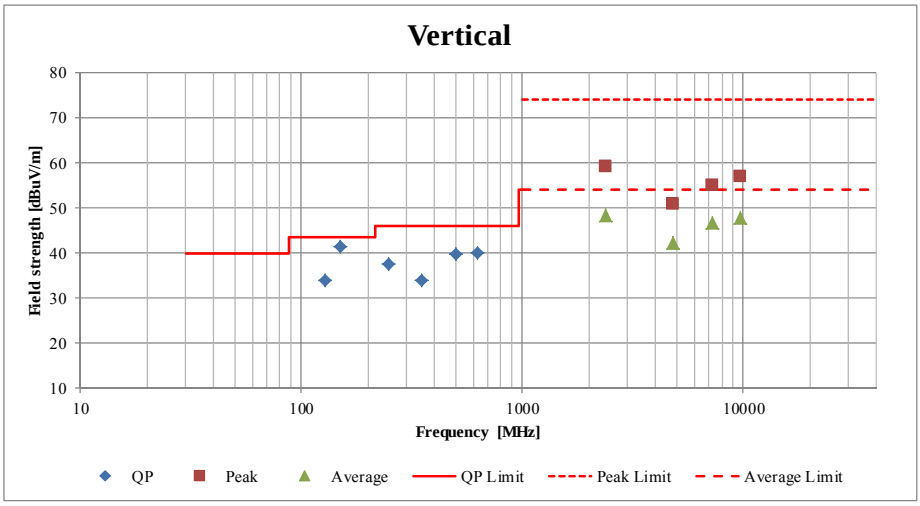
Trace Green : Peak Plot
Trace Purple : Average Plot

* 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 Semi Anechoic Chamber		
Report No.	11255696H		
Date	May 3, 2016	May 4, 2016	May 11, 2016
Temperature / Humidity	22 deg. C / 57 % RH	22 deg. C / 64 % RH	24 deg. C / 6 % RH
Engineer	Shinichi Miyazono (1 GHz – 10 GHz)	Shinichi Miyazono (10 GHz – 26.5 GHz)	Yuta Moriya (30 MHz – 1000 MHz)
Mode	Tx 11g 2412 MHz		





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

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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
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-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2015/05/18 * 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	2015/06/22 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2015/06/06 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2015/09/17 * 12
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2016/01/29 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2015/11/02 * 12
MLA-23	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	RE	2016/01/30 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2015/06/19 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2015/11/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2016/03/18 * 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