RADIO TEST REPORT

Test Report No. : 10936450H-A-R1

Applicant	:	**Murata Manufacturing Co., Ltd.**
Type of Equipment	:	**Communication Module**
Model No.	:	**LBEE5UW1FS**
FCC ID	:	**VPYLB1FS**
Test regulation	:	**FCC Part 15 Subpart C: 2015** ***WLAN, Bluetooth Low Energy parts**
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.
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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 10936450H-A. 10936450H-A is replaced with this report.

Date of test: August 26 to September 3, 2015

Representative test engineer:
T. Noguchi
Takafumi Noguchi
Engineer
Consumer Technology Division

Approved by:
Takayuki Shimada
Engineer
Consumer Technology Division

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REVISION HISTORY

Original Test Report No.: 10936450H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10936450H-A	January 7, 2016	-	-
1	10936450H-A-R1	January 12, 2016	P.5	Correction of Power Supply (inner)
1	10936450H-A-R1	January 12, 2016	P.6	Correction of FCC Part 15.31 (e) sentence
1	10936450H-A-R1	January 12, 2016	P.11	Typing error: Antenna cable (0.01 m)→Antenna cable (0.1 m)

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SECTION 1: Customer information

Company Name	:	Murata Manufacturing Co., Ltd.
Address	:	1-10-1 Higashikotari, 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.	:	LBEE5UW1FS
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.3 V
Receipt Date of Sample	:	August 26, 2015
Country of Mass-production	:	Japan and China
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: LBEE5UW1FS (referred to as the EUT in this report) is a Communication Module.

General Specification

Clock frequency(ies) in the system	:	BT/WLAN-Ref: 37.4 MHz, LPO: 32.768 kHz, CPU: 26 MHz
Operating temperature	:	-10 deg. C to +50 deg. C

Radio Specification

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

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	20MHz & 5MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 1.2 V
Antenna Type	Pattern Antenna
Antenna Gain	+0.7 dBi: 55 mm cable +0.7 dBi: 58 mm cable -2.1 dBi: 100 mm cable

Bluetooth (Ver. 4.1 with EDR function)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	BT: FHSS (GFSK, π/4DQPSK, 8DPSK) LE: GFSK
Bandwidth & Channel spacing	BT: 1MHz & 1MHz LE: 2MHz & 2MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 1.2 V
Antenna Type	Pattern Antenna
Antenna Gain	+0.7 dBi: 55 mm cable +0.7 dBi: 58 mm cable -2.1 dBi: 100 mm cable

*This test report applies for WLAN and Bluetooth Low Energy parts.

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
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	**QP** 29.3 dB, 0.15000 MHz, L **AV** 28.9 dB, 0.51098 MHz, L	Complied	-
6dB Bandwidth	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r03 **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 v03r03 **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 v03r03 **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 v03r03 **IC:** RSS-Gen 6.13	**FCC:** Section15.247(d) **IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	4.1 dB 2390.000 MHz, AV, Hori.	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r03 12.2.7.

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

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 1.2 V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique antenna connector (Microwave Coaxial Connector (MM5829-2700) on the Module). Therefore the equipment complies with the requirement of Section 15.203/212.

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.

Test site (semi anechoic chamber)	Conducted emission Uncertainty (+/-)			
	No. 1	No. 2	No. 3	No. 4
150 kHz - 30 MHz	3.5 dB	3.5 dB	3.4 dB	3.5 dB

Test site (semi anechoic chamber)	Radiated emission Uncertainty (+/-)						
	Measurement distance: 3 m				1 m		0.5 m
	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	5.1 dB	6.2 dB	5.5 dB	5.8 dB	5.8 dB	4.3 dB
No. 2	4.2 dB	5.1 dB	6.2 dB	5.4 dB	5.7 dB	5.9 dB	5.6 dB
No. 3	4.4 dB	5.1 dB	6.3 dB	5.2 dB	5.5 dB	5.8 dB	5.5 dB
No. 4	4.7 dB	5.3 dB	6.3 dB	5.3 dB	5.7 dB	5.9 dB	5.5 dB

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	
0.7 dB	1.5 dB	1.5 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	2.6 dB

Conducted Emission test

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

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
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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	-	-

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

3.6 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 SISO 20MHz BW (11n-20)	MCS 6, PN9
Bluetooth(BT) Low Energy (LE)	Maximum Packet Size, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Low Channel)	
*The power value of the EUT was set for testing as follows (setting value might be different from product specification value); Power settings: WLAN 9 dBm BT LE 5 dBm Software: MFG Tool v1.0 *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.	

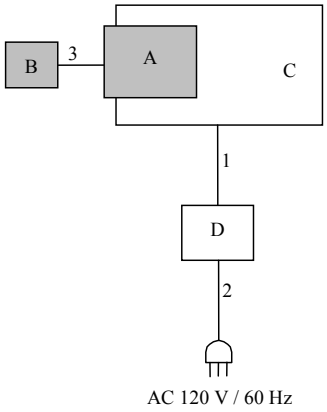
*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission	11g Tx *1)	2412MHz
	BT LE Tx	2402MHz 2440MHz 2480MHz
Spurious Emission above 1GHz (Radiated)	11b Tx 11g Tx *2)	2412MHz 2437MHz 2462MHz
	BT LE Tx	2402MHz 2440MHz 2480MHz
Band edge of Spurious Emission above 1GHz (Radiated)	11n-20 Tx *3)	2412MHz 2462MHz
Spurious Emission below 1GHz (Radiated)	11g Tx *1)	2412MHz
	BT LE Tx	2402MHz 2440MHz 2480MHz
6dB Bandwidth 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412MHz 2437MHz 2462MHz
	BT LE Tx	2402MHz 2440MHz 2480MHz
Maximum Peak Output Power, Power Density	11b Tx 11g Tx 11n-20 Tx	2412MHz 2437MHz 2462MHz
	BT LE Tx	2402MHz 2440MHz 2480MHz
Spurious Emission (Conducted)	11g Tx *1)	2412MHz
	BT LE Tx	2402MHz 2440MHz 2480MHz

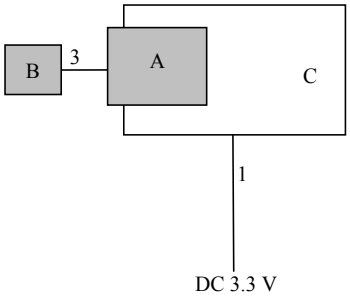
*1) The operating mode and tested frequency were tested as a representative, because it had the highest power at antenna terminal test.
*2) Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power
*3) Only band edge test was tested on this mode, because the 11g Tx mode had the higher power at antenna terminal test.

4.2 Configuration and peripherals

[Conducted emission test]



[Radiated emission test]



* 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	Communication Module	LBEE5UW1FS	00006EC53E: AT 00006EC5FB: RE	Murata Manufacturing Co., Ltd.	EUT
B	Antenna	Type1FU	001	Murata Manufacturing Co., Ltd.	EUT
C	Jig Board	P2ML4233	-	Murata Manufacturing Co., Ltd.	-
D	DC Power Supply	PMC35-2A	13090501	KIKUSUI	-

AT: Antenna terminal conducted tests
RE: Spurious emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.1: CE 1.8: RE	Unshielded	Unshielded	-
2	AC Cable	1.8	Unshielded	Unshielded	-
3	Antenna Cable	0.055 *1)	Shielded	Shielded	-

CE: Conducted emission test
RE: Radiated emission test
*1) After the comparison between Antenna cable (0.055 m) and Antenna cable (0.1 m), test was performed with the antenna cable that had worst case as a representative.

SECTION 5: Conducted Emission

Test Procedure and conditions

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 rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

Detector	**: QP and CISPR AV**
Measurement range	**: 0.15 MHz – 30 MHz**
Test data	**: APPENDIX**
Test result	**: Pass**

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 v03r03".

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

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

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

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.	RBW: 100 kHz VBW: 300kHz
Test Distance	3m	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 "KDB 558074 D01 DTS Meas Guidance v03r03"
*2) Distance Factor: 20 x log (3.0 m / 1.0 m) = 9.5 dB

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

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

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

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	3 MHz, 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 v03r03".
*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 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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

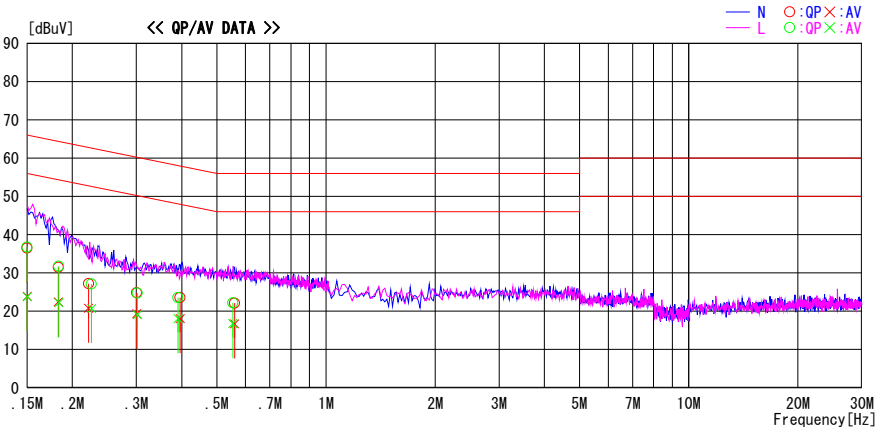
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/09/03

Report No. : 10936450H

Temp./Humi. : 24deg. C / 72% RH
Engineer : Takafumi Noguchi

Mode / Remarks : 11g 2412MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	23.3	10.7	13.2	36.5	23.9	66.0	56.0	29.5	32.1	N	
0.18279	18.3	9.2	13.2	31.5	22.4	64.4	54.4	32.9	32.0	N	
0.22157	13.9	7.5	13.3	27.2	20.8	62.8	52.8	35.6	32.0	N	
0.30084	11.5	6.0	13.3	24.8	19.3	60.2	50.2	35.4	30.9	N	
0.39629	10.3	4.8	13.3	23.6	18.1	57.9	47.9	34.3	29.8	N	
0.55940	8.8	3.4	13.3	22.1	16.7	56.0	46.0	33.9	29.3	N	
0.15000	23.5	10.6	13.2	36.7	23.8	66.0	56.0	29.3	32.2	L	
0.18349	18.5	9.0	13.2	31.7	22.2	64.3	54.3	32.6	32.1	L	
0.22558	13.8	7.4	13.3	27.1	20.7	62.6	52.6	35.5	31.9	L	
0.30209	11.4	5.8	13.3	24.7	19.1	60.2	50.2	35.5	31.1	L	
0.39091	10.3	4.8	13.3	23.6	18.1	58.0	48.0	34.4	29.9	L	
0.55341	8.9	3.5	13.3	22.2	16.8	56.0	46.0	33.8	29.2	L	

CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATTEN + CABLE)
Except for the above table : adequate margin data below the limits.

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

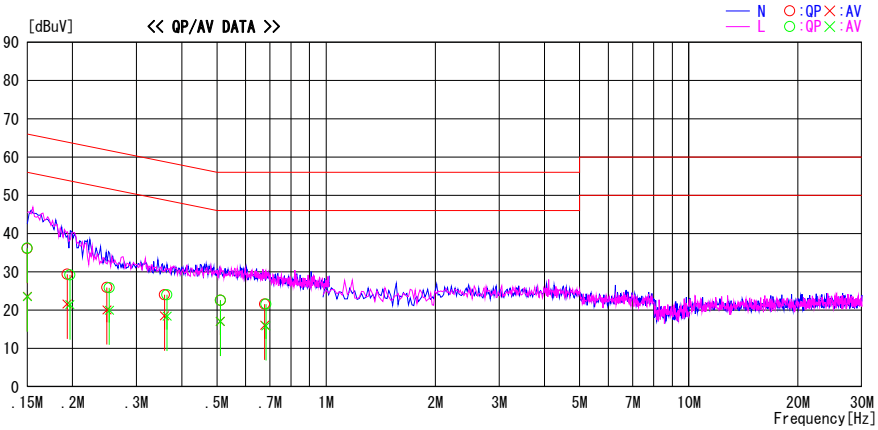
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/09/03

Report No. : 10936450H

Temp./Humi. : 24deg. C / 72% RH
Engineer : Takafumi Noguchi

Mode / Remarks : BLE 2480MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



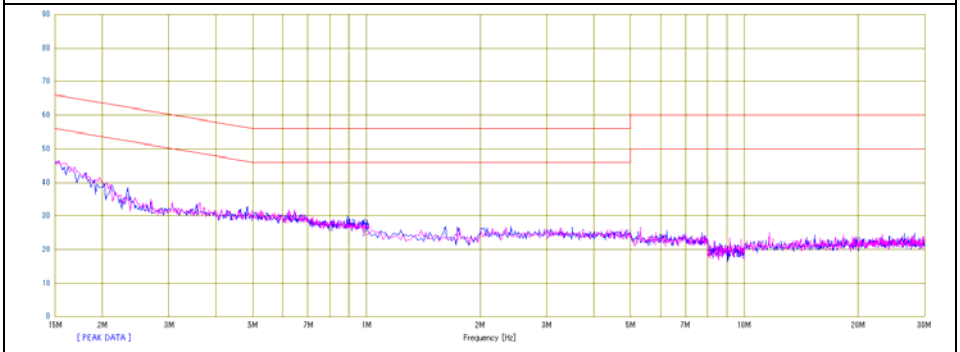
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	22.9	10.4	13.2	36.1	23.6	66.0	56.0	29.9	32.4	N	
0.19311	16.2	8.4	13.2	29.4	21.6	63.9	53.9	34.5	32.3	N	
0.24861	12.6	6.8	13.3	25.9	20.1	61.8	51.8	35.9	31.7	N	
0.35843	10.7	5.2	13.3	24.0	18.5	58.8	48.8	34.8	30.3	N	
0.51128	9.3	3.8	13.3	22.6	17.1	56.0	46.0	33.4	28.9	N	
0.67763	8.2	2.7	13.4	21.6	16.1	56.0	46.0	34.4	29.9	N	
0.15000	23.0	10.3	13.2	36.2	23.5	66.0	56.0	29.8	32.5	L	
0.19656	16.0	8.2	13.2	29.2	21.4	63.8	53.8	34.6	32.4	L	
0.25259	12.5	6.7	13.3	25.8	20.0	61.7	51.7	35.9	31.7	L	
0.36426	10.7	5.1	13.3	24.0	18.4	58.6	48.6	34.6	30.2	L	
0.51098	9.3	3.8	13.3	22.6	17.1	56.0	46.0	33.4	28.9	L	
0.68281	8.2	2.5	13.4	21.6	15.9	56.0	46.0	34.4	30.1	L	

CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATTEN + CABLE)
Except for the above table : adequate margin data below the limits.

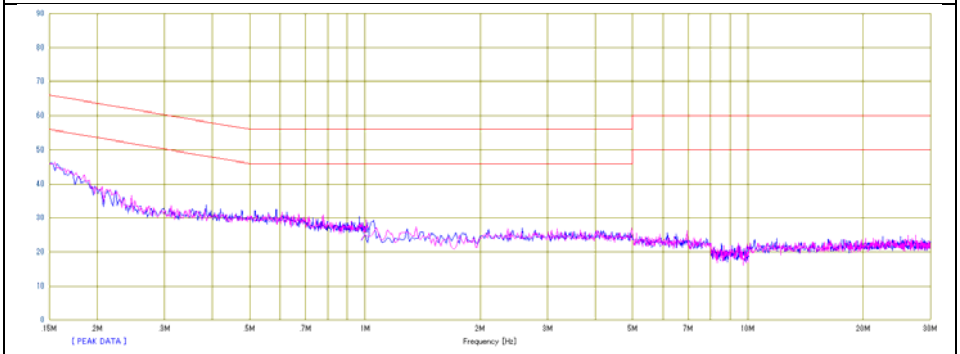
Conducted Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	September 3, 2015
Temperature / Humidity	24 deg. C / 72 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

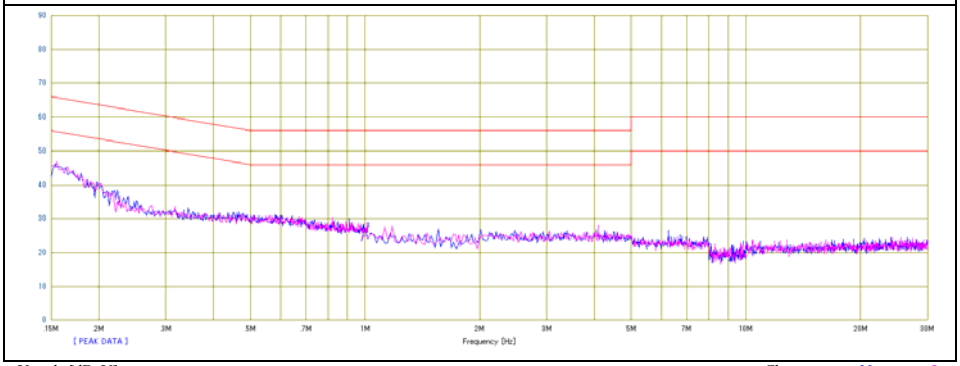
2402 MHz



2440 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

6dB Bandwidth

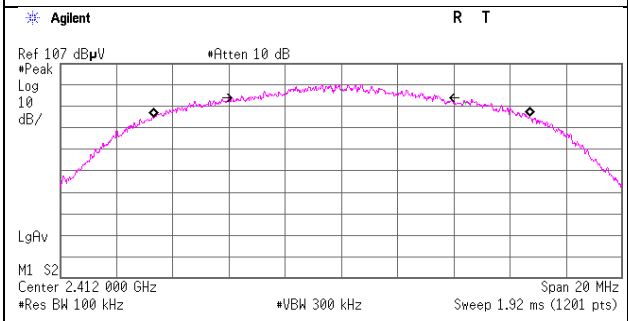
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11b / 11g / 11n-20

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	7.052	> 500
	2437	7.005	> 500
	2462	7.386	> 500
11g	2412	15.076	> 500
	2437	15.088	> 500
	2462	15.091	> 500
11n-20	2412	15.062	> 500
	2437	15.056	> 500
	2462	15.089	> 500

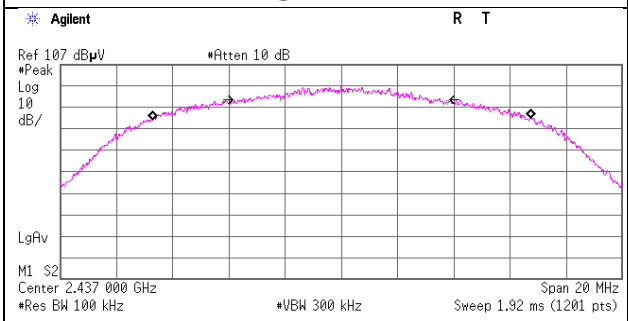
6dB Bandwidth

11b

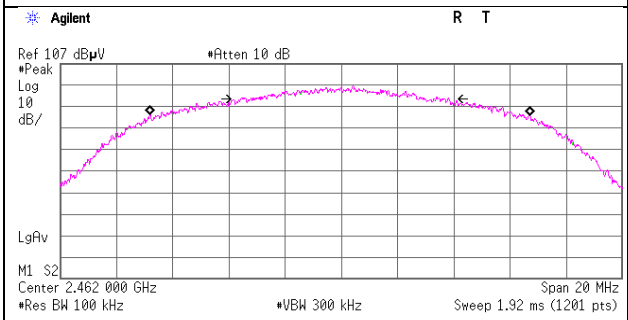
2412 MHz



2437 MHz

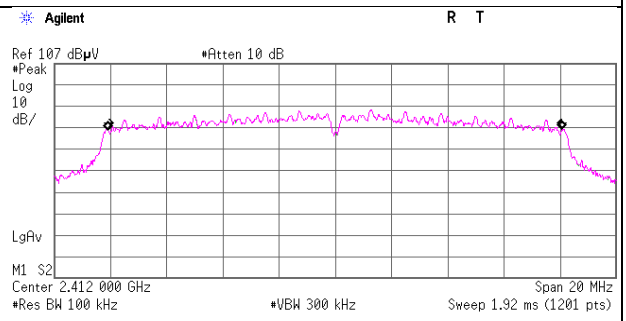


2462 MHz

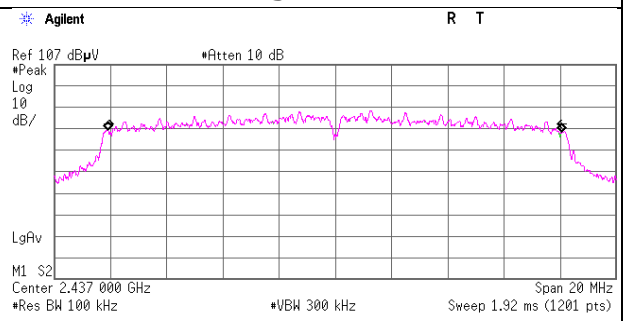


11g

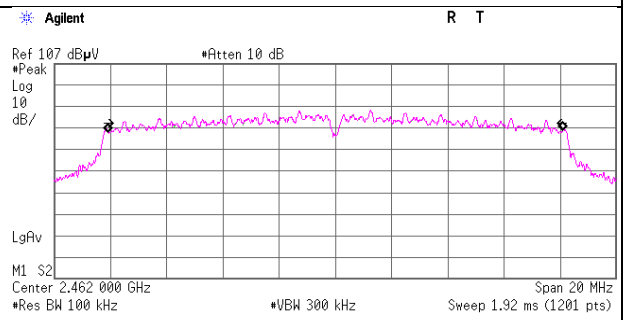
2412 MHz



2437 MHz



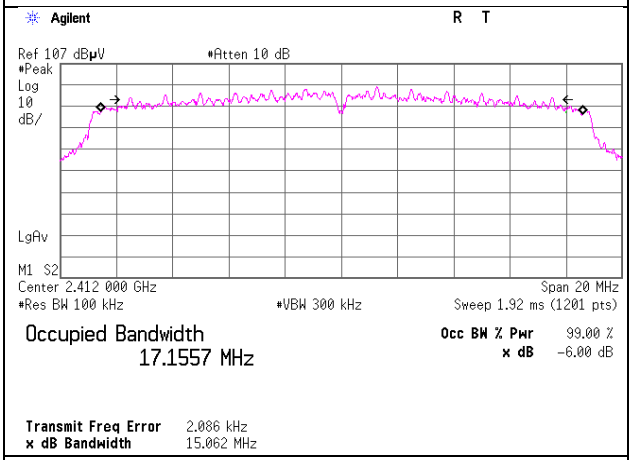
2462 MHz



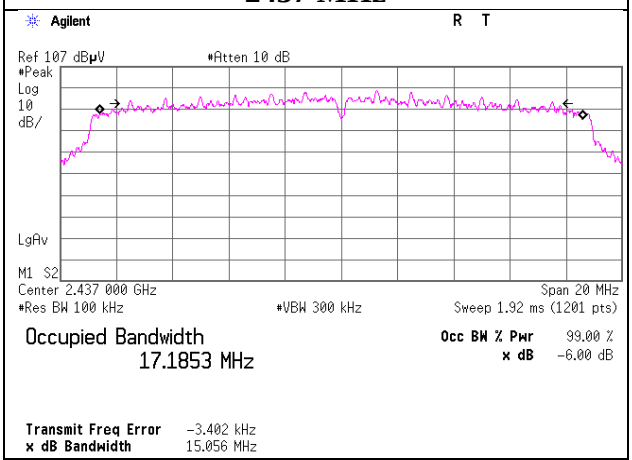
6dB Bandwidth

11n-20

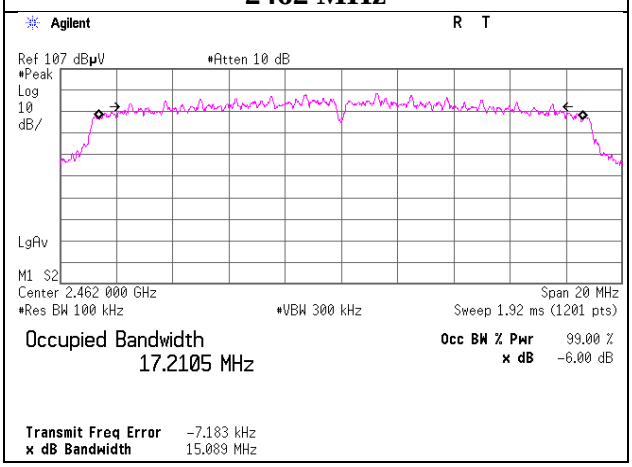
2412 MHz



2437 MHz



2462 MHz



6dB Bandwidth

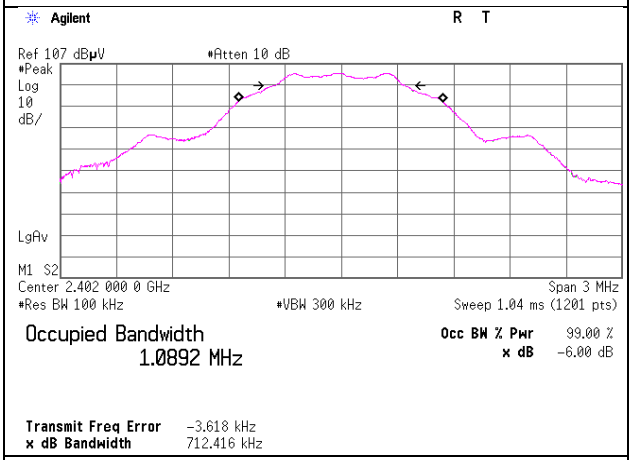
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2402	0.712	> 500
2440	0.717	> 500
2480	0.699	> 500

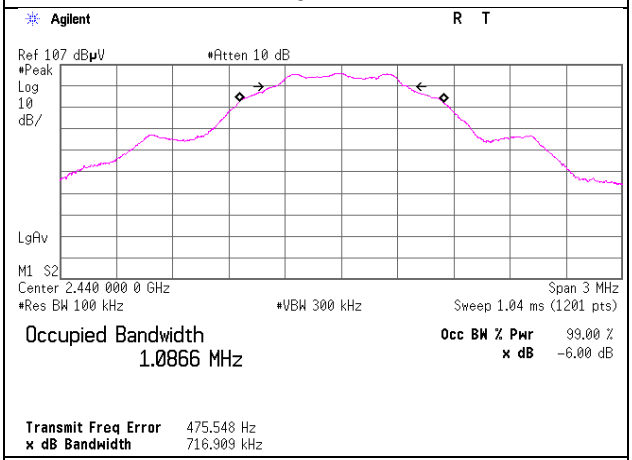
6dB Bandwidth

BT LE

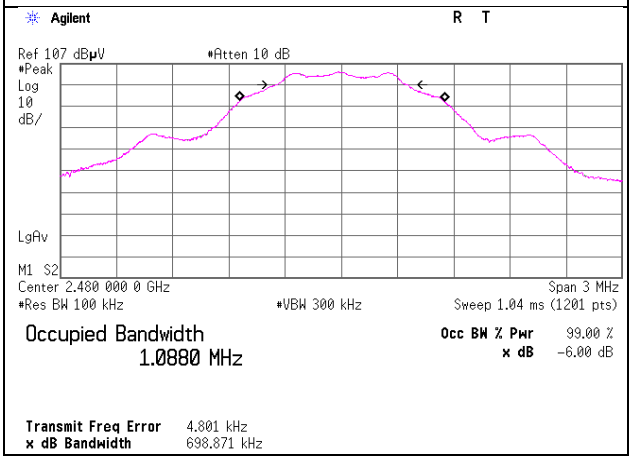
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 26, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Koji Yamamoto
Mode	Tx 11b

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	1.71	0.65	10.06	12.42	17.46	30.00	1000	17.58
2437	1.35	0.65	10.06	12.06	16.07	30.00	1000	17.94
2462	1.16	0.65	10.06	11.87	15.38	30.00	1000	18.13

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

2412MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	1.27	
2	1.31	
5.5	1.37	
11	1.71	*

*: 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.	10936450H
Date	August 26, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Koji Yamamoto
Mode	Tx 11g

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	7.15	0.65	10.06	17.86	61.09	30.00	1000	12.14
2437	6.77	0.65	10.06	17.48	55.98	30.00	1000	12.52
2462	6.46	0.65	10.06	17.17	52.12	30.00	1000	12.83

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

2412 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	6.88	
9	6.89	
12	6.85	
18	6.92	
24	6.96	
36	7.00	
48	7.09	
54	7.15	*

*: 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.	10936450H
Date	August 26, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Koji Yamamoto
Mode	Tx 11n-20

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	7.13	0.65	10.06	17.84	60.81	30.00	1000	12.16
2437	6.92	0.65	10.06	17.63	57.94	30.00	1000	12.37
2462	6.71	0.65	10.06	17.42	55.21	30.00	1000	12.58

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

2412 MHz

MCS Number	Reading [dBm]	Remark
0	6.75	
1	6.98	
2	6.94	
3	7.00	
4	6.96	
5	7.10	
6	7.13	*
7	7.10	

*: 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.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-3.52	1.02	10.06	7.56	5.70	30.00	1000	22.44
2440	-3.36	1.02	10.06	7.72	5.92	30.00	1000	22.28
2480	-2.83	1.03	10.06	8.26	6.70	30.00	1000	21.74

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 26, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Koji Yamamoto
Mode	Tx 11b / 11g / 11n-20

11b **2 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Frame power)		Duty factor	Result (Burst power)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-1.65	1.59	10.06	10.00	10.00	0.08	10.08	10.19
2437	-1.92	1.60	10.06	9.74	9.42	0.08	9.82	9.59
2462	-1.99	1.60	10.06	9.67	9.27	0.08	9.75	9.44

11g **24 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Frame power)		Duty factor	Result (Burst power)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-2.13	1.59	10.06	9.52	8.95	1.00	10.52	11.27
2437	-2.61	1.60	10.06	9.05	8.04	1.00	10.05	10.12
2462	-2.78	1.60	10.06	8.88	7.73	1.00	9.88	9.73

11n-20 **MCS 7**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Frame power)		Duty factor	Result (Burst power)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-3.28	1.59	10.06	8.37	6.87	1.98	10.35	10.84
2437	-3.82	1.60	10.06	7.84	6.08	1.98	9.82	9.59
2462	-3.99	1.60	10.06	7.67	5.85	1.98	9.65	9.23

Sample Calculation:
Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator
Result (Burst power) = Frame power + Duty factor

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 26, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Koji Yamamoto
Mode	Tx 11b / 11g / 11n-20

11b 2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
1	-1.41	
2	-1.08	*
5.5	-1.23	
11	-1.25	

*: Worst Rate

11g 2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	-0.99	
9	-1.15	
12	-1.14	
18	-1.05	
24	-0.83	*
36	-0.90	
48	-0.98	
54	-1.01	

*: Worst Rate

11n-20 2437 MHz

MCS	Reading [dBm]	Remark
0	-1.26	
1	-1.18	
2	-1.33	
3	-1.31	
4	-1.28	
5	-1.36	
6	-1.10	
7	-1.06	*

*: Worst Rate

Sample Calculation:
All comparisons 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.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Result (Frame power)		Duty factor	Result (Burst power)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-5.82	1.02	10.06	5.26	3.36	1.78	7.04	5.06
2440	-5.54	1.02	10.06	5.54	3.58	1.78	7.32	5.40
2480	-5.28	1.03	10.06	5.81	3.81	1.78	7.59	5.74

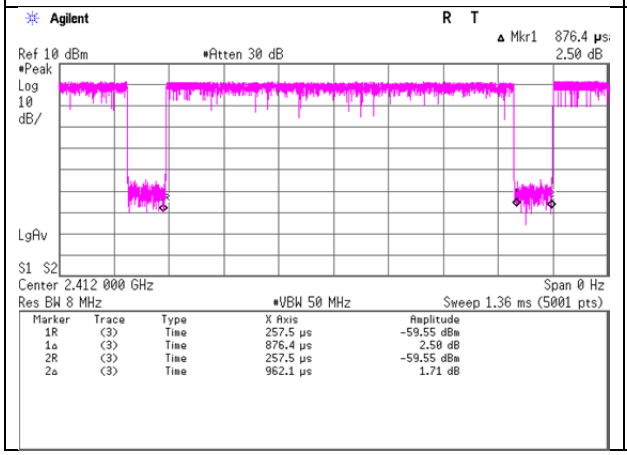
Sample Calculation:
Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator
Result (Burst power) = Frame power + Duty factor

Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 26, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Koji Yamamoto
Mode	Tx 11b / 11g / 11n-20

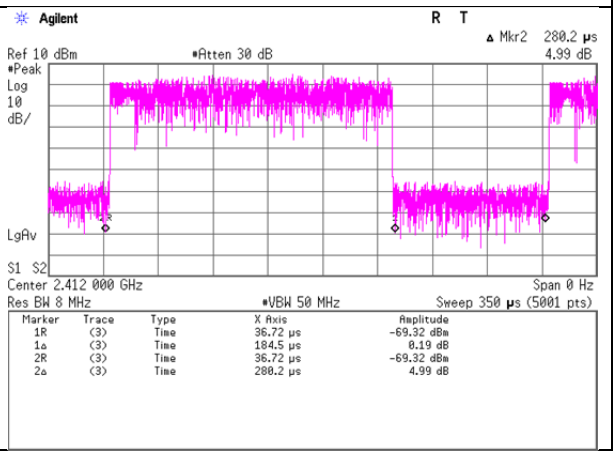
11b 11 Mbps

Tx on / (Tx on + Tx off) =	**0.911**
Tx on / (Tx on + Tx off) * 100 =	**91.1 %**
Duty factor = 10 * log (962.1 / 876.4) =	**0.41 dB**



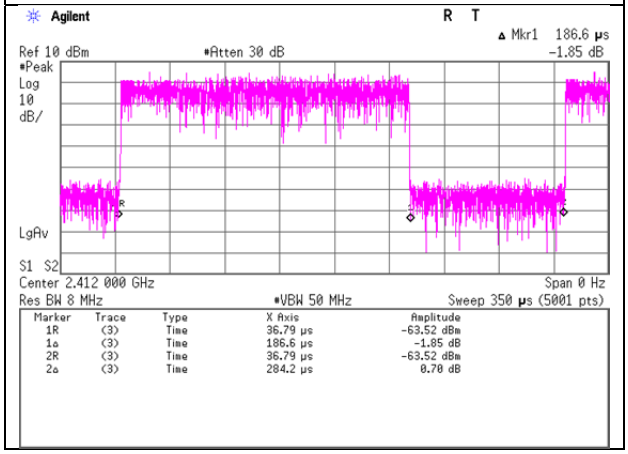
11g 54 Mbps

Tx on / (Tx on + Tx off) =	**0.658**
Tx on / (Tx on + Tx off) * 100 =	**65.8 %**
Duty factor = 10 * log (280.2 / 184.5) =	**1.81 dB**



11n-20 MCS 6

Tx on / (Tx on + Tx off) =	**0.657**
Tx on / (Tx on + Tx off) * 100 =	**65.7 %**
Duty factor = 10 * log (284.2 / 186.6) =	**1.83 dB**

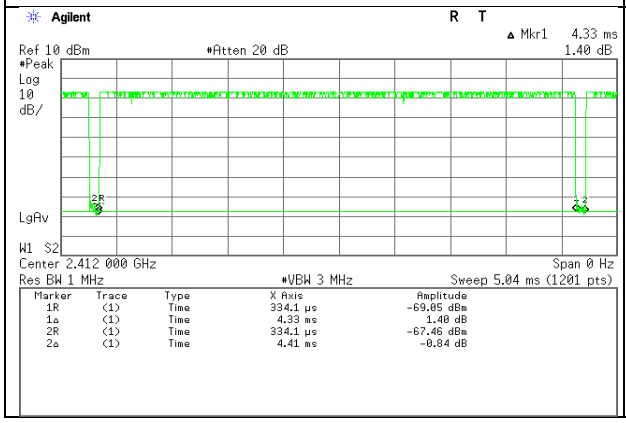


Burst rate confirmation
(Reference data for Average power)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	09/02/2015
Temperature/ Humidity	24 deg. C / 48% RH
Engineer	Yuta Moriya
Mode	Tx 11b / 11g / 11n-20

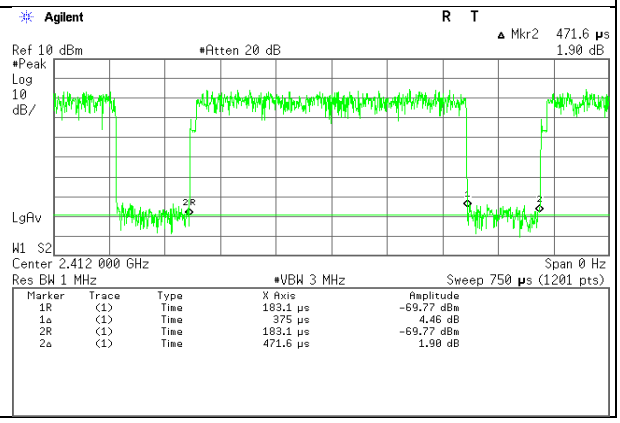
11b 2 Mbps

Tx on / (Tx on + Tx off) = 0.982
Tx on / (Tx on + Tx off) * 100 = 98.2 %
Duty factor = 10 * log (4.41 / 4.33) = 0.08 dB



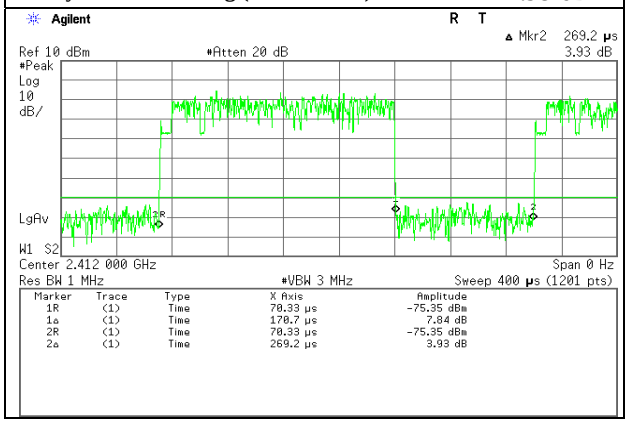
11g 24 Mbps

Tx on / (Tx on + Tx off) = 0.795
Tx on / (Tx on + Tx off) * 100 = 79.5 %
Duty factor = 10 * log (471.6 / 375) = 1.00 dB



11n-20 MCS 7

Tx on / (Tx on + Tx off) = 0.634
Tx on / (Tx on + Tx off) * 100 = 63.4 %
Duty factor = 10 * log (269.2 / 170.7) = 1.98 dB

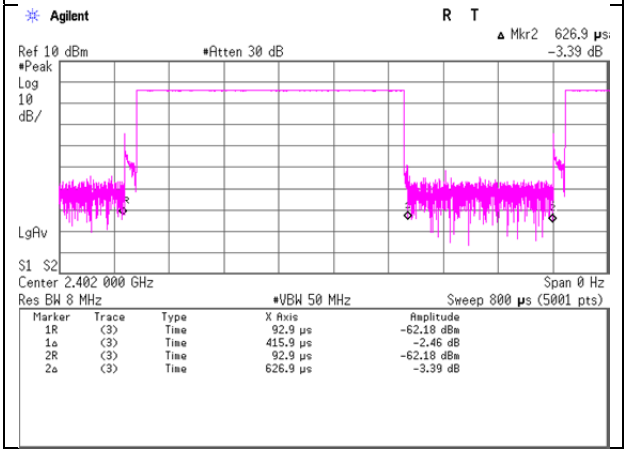


Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 26, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Koji Yamamoto
Mode	Tx BT LE

BT LE

Tx on / (Tx on + Tx off) = 0.663
Tx on / (Tx on + Tx off) * 100 = 66.3 %
Duty factor = 10 * log (626.9 / 415.9) = 1.78 dB



Radiated Spurious Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 27, 2015	August 28, 2015
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 65 % RH
Engineer	Koji Yamamoto (1-10GHz)	Koji Yamamoto (10-26.5GHz)
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	50.1	26.8	3.5	36.1	-	44.3	73.9	29.6	
Hori	3618.000	PK	49.5	29.6	4.4	35.9	-	47.6	73.9	26.3	
Hori	4824.000	PK	43.6	31.9	4.9	35.6	-	44.8	73.9	29.1	Floor Noise
Hori	7236.000	PK	43.9	36.1	6.3	35.6	-	50.7	73.9	23.2	Floor Noise
Hori	9648.000	PK	45.1	38.6	7.2	36.3	-	54.6	73.9	19.3	Floor Noise
Hori	2390.000	AV	42.3	26.8	3.5	36.1	0.4	36.9	53.9	17.0	*1)
Hori	3618.000	AV	45.0	29.6	4.4	35.9	-	43.1	53.9	10.8	
Hori	4824.000	AV	35.5	31.9	4.9	35.6	-	36.7	53.9	17.2	Floor Noise
Hori	7236.000	AV	35.1	36.1	6.3	35.6	-	41.9	53.9	12.0	Floor Noise
Hori	9648.000	AV	35.8	38.6	7.2	36.3	-	45.3	53.9	8.6	Floor Noise
Vert	2390.000	PK	47.4	26.8	3.5	36.1	-	41.6	73.9	32.3	
Vert	3618.000	PK	48.9	29.6	4.4	35.9	-	47.0	73.9	26.9	
Vert	4824.000	PK	45.1	31.9	4.9	35.6	-	46.3	73.9	27.6	Floor Noise
Vert	7236.000	PK	43.2	36.1	6.3	35.6	-	50.0	73.9	23.9	Floor Noise
Vert	9648.000	PK	44.1	38.6	7.2	36.3	-	53.6	73.9	20.3	Floor Noise
Vert	2390.000	AV	39.8	26.8	3.5	36.1	0.4	34.4	53.9	19.5	*1)
Vert	3618.000	AV	43.8	29.6	4.4	35.9	-	41.9	53.9	12.0	
Vert	4824.000	AV	35.2	31.9	4.9	35.6	-	36.4	53.9	17.5	Floor Noise
Vert	7236.000	AV	35.5	36.1	6.3	35.6	-	42.3	53.9	11.6	Floor Noise
Vert	9648.000	AV	36.0	38.6	7.2	36.3	-	45.5	53.9	8.4	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 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	103.9	26.8	3.5	36.1	98.1	-	-	Carrier
Hori	2400.000	PK	54.0	26.8	3.5	36.1	48.2	78.1	29.9	
Vert	2412.000	PK	100.0	26.8	3.5	36.1	94.2	-	-	Carrier
Vert	2400.000	PK	50.8	26.8	3.5	36.1	45.0	74.2	29.2	

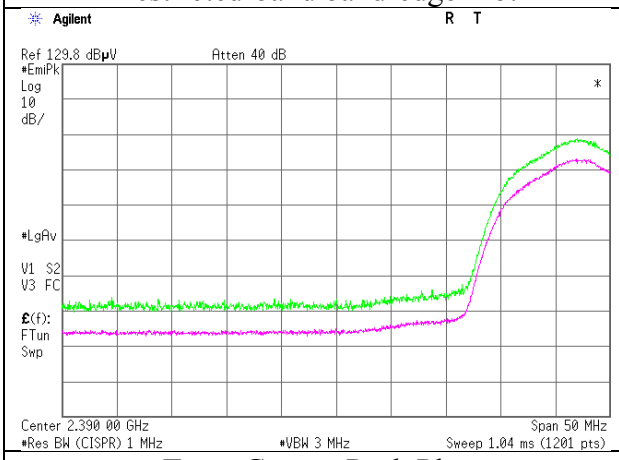
Result = Reading + Ant Factor + Loss (Cable+Filter) - Gain(Amprifier)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 27, 2015
Temperature / Humidity	22 deg. C / 61 % RH
Engineer	Koji Yamamoto
Mode	Tx 11b 2412 MHz

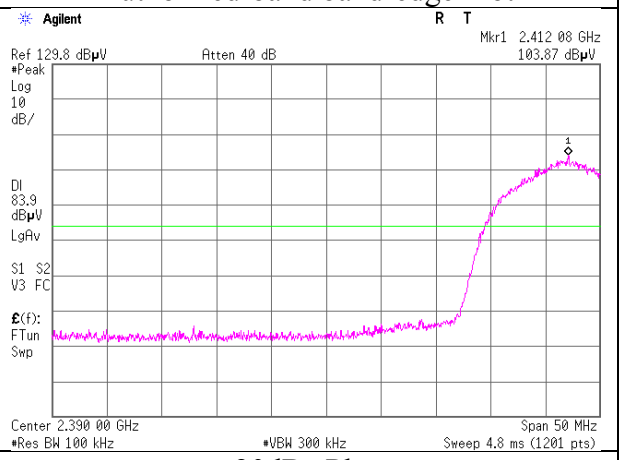
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

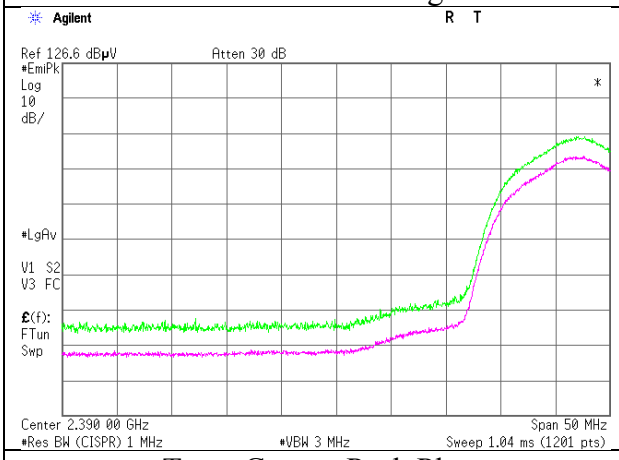
Authorized-band band-edge Plot



20dBc Plot

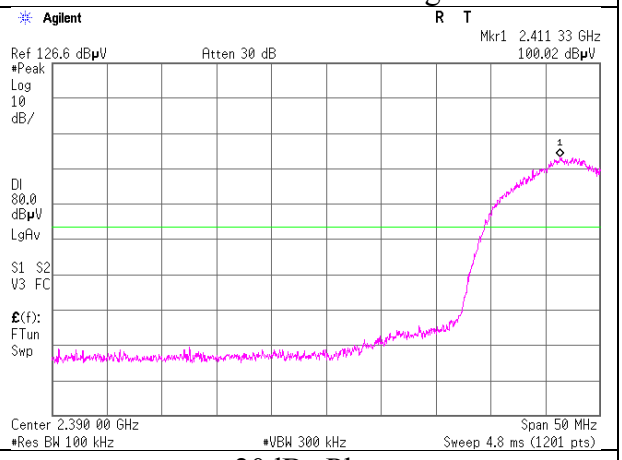
Vertical

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.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 27, 2015	August 28, 2015
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 65 % RH
Engineer	Koji Yamamoto (1-10GHz)	Koji Yamamoto (10-26.5GHz)
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	3655.471	PK	49.1	29.7	4.4	35.9	-	47.3	73.9	26.6	
Hori	4874.000	PK	43.9	32.0	5.0	35.6	-	45.3	73.9	28.6	Floor Noise
Hori	7311.000	PK	43.2	36.1	6.3	35.6	-	50.0	73.9	23.9	Floor Noise
Hori	9748.000	PK	44.5	38.6	7.2	36.3	-	54.0	73.9	19.9	Floor Noise
Hori	3655.471	AV	44.7	29.7	4.4	35.9	-	42.9	53.9	11.0	
Hori	4874.000	AV	34.9	32.0	5.0	35.6	-	36.3	53.9	17.6	Floor Noise
Hori	7311.000	AV	35.6	36.1	6.3	35.6	-	42.4	53.9	11.5	Floor Noise
Hori	9748.000	AV	35.2	38.6	7.2	36.3	-	44.7	53.9	9.2	Floor Noise
Vert	3655.471	PK	47.8	29.7	4.4	35.9	-	46.0	73.9	27.9	
Vert	4874.000	PK	43.7	32.0	5.0	35.6	-	45.1	73.9	28.8	Floor Noise
Vert	7311.000	PK	43.5	36.1	6.3	35.6	-	50.3	73.9	23.6	Floor Noise
Vert	9748.000	PK	44.3	38.6	7.2	36.3	-	53.8	73.9	20.1	Floor Noise
Vert	3655.471	AV	43.7	29.7	4.4	35.9	-	41.9	53.9	12.0	
Vert	4874.000	AV	35.0	32.0	5.0	35.6	-	36.4	53.9	17.5	Floor Noise
Vert	7311.000	AV	35.2	36.1	6.3	35.6	-	42.0	53.9	11.9	Floor Noise
Vert	9748.000	AV	35.3	38.6	7.2	36.3	-	44.8	53.9	9.1	Floor Noise

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 27, 2015	August 28, 2015
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 65 % RH
Engineer	Koji Yamamoto (1-10GHz)	Koji Yamamoto (10-26.5GHz)
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	47.3	26.9	3.5	36.1	-	41.6	73.9	32.3	
Hori	3692.990	PK	49.1	29.8	4.4	35.9	-	47.4	73.9	26.5	
Hori	4924.000	PK	44.6	32.0	5.0	35.6	-	46.0	73.9	27.9	Floor Noise
Hori	7386.000	PK	44.5	36.1	6.3	35.6	-	51.3	73.9	22.6	Floor Noise
Hori	9848.000	PK	43.9	38.6	7.2	36.4	-	53.3	73.9	20.6	Floor Noise
Hori	2483.500	AV	38.8	26.9	3.5	36.1	0.4	33.5	53.9	20.4	*1)
Hori	3692.990	AV	44.6	29.8	4.4	35.9	-	42.9	53.9	11.0	
Hori	4924.000	AV	35.3	32.0	5.0	35.6	-	36.7	53.9	17.2	Floor Noise
Hori	7386.000	AV	34.7	36.1	6.3	35.6	-	41.5	53.9	12.4	Floor Noise
Hori	9848.000	AV	34.9	38.6	7.2	36.4	-	44.3	53.9	9.6	Floor Noise
Vert	2483.500	PK	48.0	26.9	3.5	36.1	-	42.3	73.9	31.6	
Vert	3692.990	PK	48.2	29.8	4.4	35.9	-	46.5	73.9	27.4	
Vert	4924.000	PK	44.0	32.0	5.0	35.6	-	45.4	73.9	28.5	Floor Noise
Vert	7386.000	PK	43.8	36.1	6.3	35.6	-	50.6	73.9	23.3	Floor Noise
Vert	9848.000	PK	44.3	38.6	7.2	36.4	-	53.7	73.9	20.2	Floor Noise
Vert	2483.500	AV	38.6	26.9	3.5	36.1	0.4	33.3	53.9	20.6	*1)
Vert	3692.990	AV	42.5	29.8	4.4	35.9	-	40.8	53.9	13.1	
Vert	4924.000	AV	35.2	32.0	5.0	35.6	-	36.6	53.9	17.3	Floor Noise
Vert	7386.000	AV	34.9	36.1	6.3	35.6	-	41.7	53.9	12.2	Floor Noise
Vert	9848.000	AV	35.8	38.6	7.2	36.4	-	45.2	53.9	8.7	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

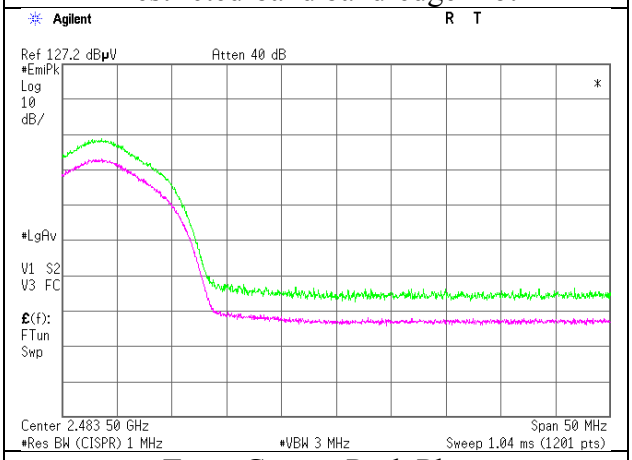
*1) Not Out of Band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 27, 2015
Temperature / Humidity	22 deg. C / 61 % RH
Engineer	Koji Yamamoto
Mode	Tx 11b 2462 MHz

Horizontal

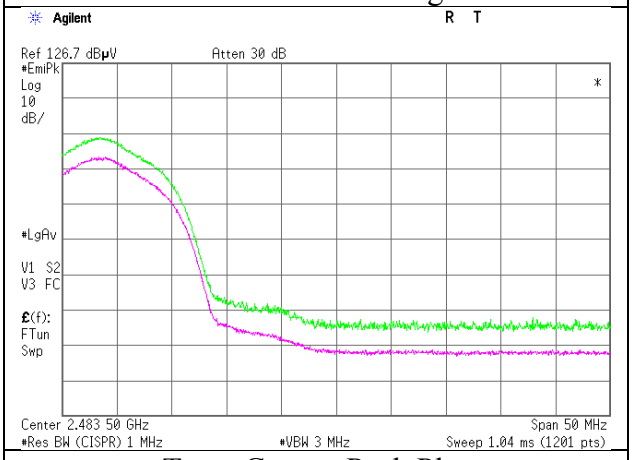
Restricted-band band-edge Plot



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.1 Semi Anechoic Chamber		
Report No.	10936450H		
Date	August 27, 2015	August 28, 2015	September 2, 2015
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 65 % RH	23 deg. C / 72 % RH
Engineer	Koji Yamamoto (1-10GHz)	Koji Yamamoto (10-26.5GHz)	Takafumi Noguchi (Below 1GHz)
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	87.360	QP	29.5	7.9	8.3	38.8	-	6.9	40.0	33.1	
Hori	540.001	QP	39.5	18.6	12.2	38.1	-	32.2	46.0	13.8	
Hori	600.000	QP	39.4	19.5	12.5	38.1	-	33.3	46.0	12.7	
Hori	660.000	QP	33.3	20.1	12.9	38.1	-	28.2	46.0	17.8	
Hori	720.003	QP	37.5	20.7	13.2	38.2	-	33.2	46.0	12.8	
Hori	840.002	QP	41.1	21.9	13.8	38.1	-	38.7	46.0	7.3	
Hori	2390.000	PK	68.2	26.8	3.5	36.1	-	62.4	73.9	11.5	
Hori	3618.000	PK	48.8	29.6	4.4	35.9	-	46.9	73.9	27.0	
Hori	4824.000	PK	43.2	31.9	4.9	35.6	-	44.4	73.9	29.5	Floor Noise
Hori	7236.000	PK	43.5	36.1	6.3	35.6	-	50.3	73.9	23.6	Floor Noise
Hori	9648.000	PK	44.6	38.6	7.2	36.3	-	54.1	73.9	19.8	Floor Noise
Hori	2390.000	AV	53.1	26.8	3.5	36.1	1.8	49.1	53.9	4.8	*1)
Hori	3618.000	AV	44.3	29.6	4.4	35.9	-	42.4	53.9	11.5	
Hori	4824.000	AV	35.1	31.9	4.9	35.6	-	36.3	53.9	17.6	Floor Noise
Hori	7236.000	AV	34.8	36.1	6.3	35.6	-	41.6	53.9	12.3	Floor Noise
Hori	9648.000	AV	35.2	38.6	7.2	36.3	-	44.7	53.9	9.2	Floor Noise
Vert	87.360	QP	45.6	7.9	8.3	38.8	-	23.0	40.0	17.0	
Vert	540.001	QP	37.3	18.6	12.2	38.1	-	30.0	46.0	16.0	
Vert	600.000	QP	40.7	19.5	12.5	38.1	-	34.6	46.0	11.4	
Vert	660.000	QP	36.0	20.1	12.9	38.1	-	30.9	46.0	15.1	
Vert	720.003	QP	34.7	20.7	13.2	38.2	-	30.4	46.0	15.6	
Vert	840.002	QP	39.4	21.9	13.8	38.1	-	37.0	46.0	9.0	
Vert	2390.000	PK	65.1	26.8	3.5	36.1	-	59.3	73.9	14.6	
Vert	3618.000	PK	48.0	29.6	4.4	35.9	-	46.1	73.9	27.8	
Vert	4824.000	PK	44.3	31.9	4.9	35.6	-	45.5	73.9	28.4	Floor Noise
Vert	7236.000	PK	44.1	36.1	6.3	35.6	-	50.9	73.9	23.0	Floor Noise
Vert	9648.000	PK	44.7	38.6	7.2	36.3	-	54.2	73.9	19.7	Floor Noise
Vert	2390.000	AV	50.8	26.8	3.5	36.1	1.8	46.8	53.9	7.1	*1)
Vert	3618.000	AV	43.1	29.6	4.4	35.9	-	41.2	53.9	12.7	
Vert	4824.000	AV	35.3	31.9	4.9	35.6	-	36.5	53.9	17.4	Floor Noise
Vert	7236.000	AV	35.9	36.1	6.3	35.6	-	42.7	53.9	11.2	Floor Noise
Vert	9648.000	AV	35.6	38.6	7.2	36.3	-	45.1	53.9	8.8	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 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	101.3	26.8	3.5	36.1	95.5	-	-	Carrier
Hori	2400.000	PK	64.5	26.8	3.5	36.1	58.7	75.5	16.8	
Vert	2412.000	PK	99.0	26.8	3.5	36.1	93.2	-	-	Carrier
Vert	2400.000	PK	61.6	26.8	3.5	36.1	55.8	73.2	17.4	

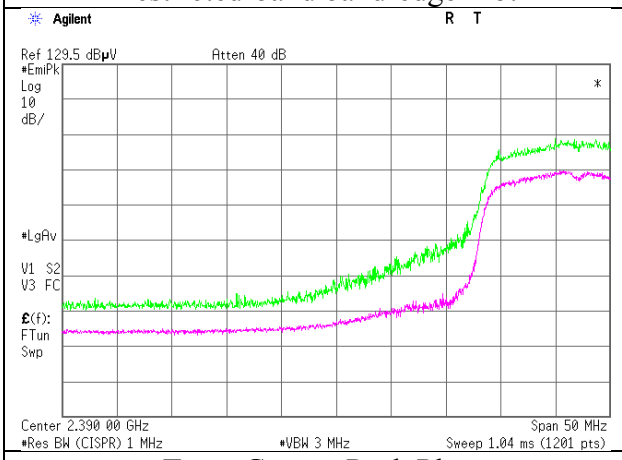
Result = Reading + Ant Factor + Loss (Cable+Filter) - Gain(Amprifier)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 27, 2015
Temperature / Humidity	22 deg. C / 61 % RH
Engineer	Koji Yamamoto
Mode	Tx 11g 2412 MHz

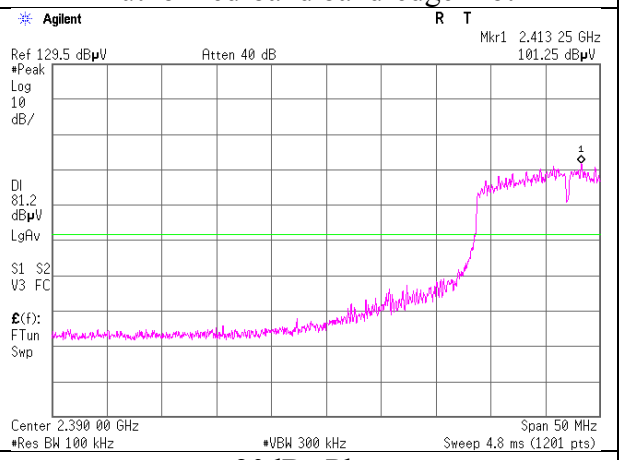
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

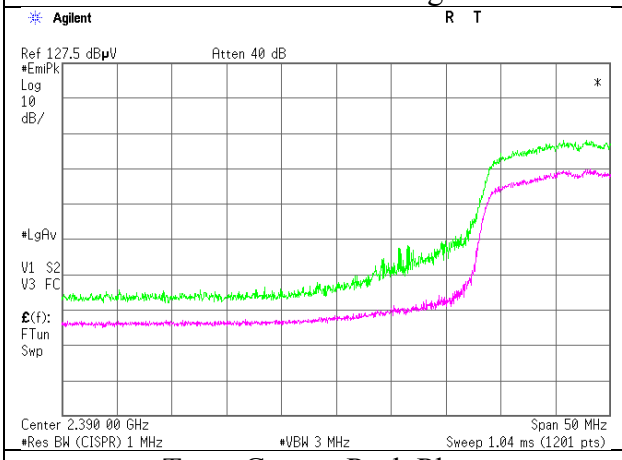
Authorized-band band-edge Plot



20dBc Plot

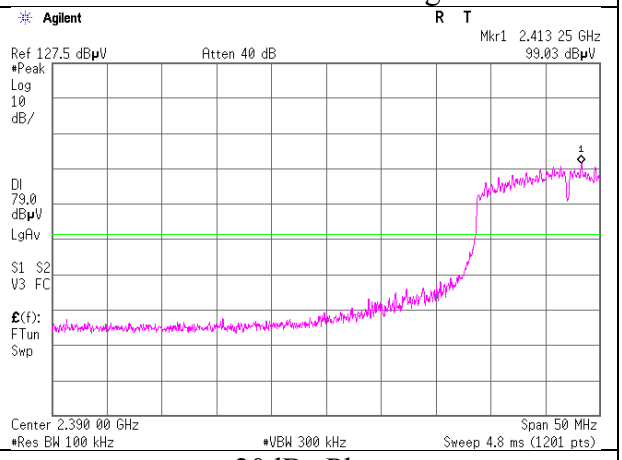
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot

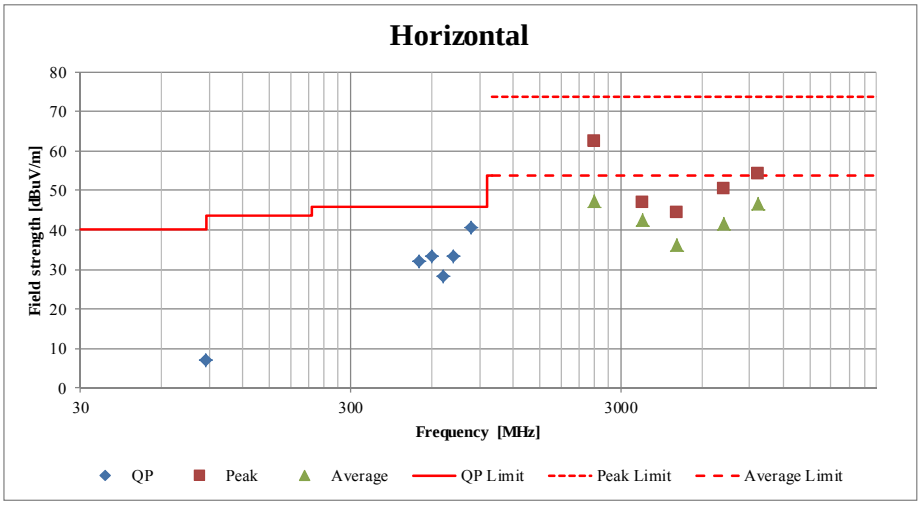


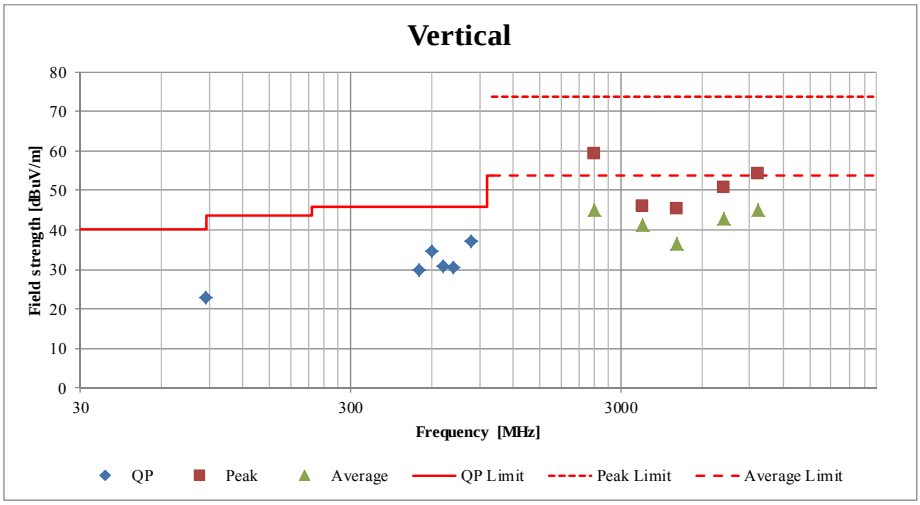
20dBc Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber		
Report No.	10936450H		
Date	August 27, 2015	August 28, 2015	September 2, 2015
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 65 % RH	23 deg. C / 72 % RH
Engineer	Koji Yamamoto (1-10GHz)	Koji Yamamoto (10-26.5GHz)	Takafumi Noguchi (Below 1GHz)
Mode	Tx 11g 2412 MHz		





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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 27, 2015	August 28, 2015
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 65 % RH
Engineer	Koji Yamamoto (1-10GHz)	Koji Yamamoto (10-26.5GHz)
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	3655.471	PK	48.3	29.7	4.4	35.9	-	46.5	73.9	27.4	
Hori	4874.000	PK	43.3	32.0	5.0	35.6	-	44.7	73.9	29.2	Floor Noise
Hori	7311.000	PK	43.9	36.1	6.3	35.6	-	50.7	73.9	23.2	Floor Noise
Hori	9748.000	PK	45.0	38.6	7.2	36.3	-	54.5	73.9	19.4	Floor Noise
Hori	3655.471	AV	43.7	29.7	4.4	35.9	-	41.9	53.9	12.0	
Hori	4874.000	AV	35.5	32.0	5.0	35.6	-	36.9	53.9	17.0	Floor Noise
Hori	7311.000	AV	35.1	36.1	6.3	35.6	-	41.9	53.9	12.0	Floor Noise
Hori	9748.000	AV	35.6	38.6	7.2	36.3	-	45.1	53.9	8.8	Floor Noise
Vert	3655.471	PK	48.1	29.7	4.4	35.9	-	46.3	73.9	27.6	
Vert	4874.000	PK	43.7	32.0	5.0	35.6	-	45.1	73.9	28.8	Floor Noise
Vert	7311.000	PK	44.3	36.1	6.3	35.6	-	51.1	73.9	22.8	Floor Noise
Vert	9748.000	PK	44.9	38.6	7.2	36.3	-	54.4	73.9	19.5	Floor Noise
Vert	3655.471	AV	41.8	29.7	4.4	35.9	-	40.0	53.9	13.9	
Vert	4874.000	AV	34.6	32.0	5.0	35.6	-	36.0	53.9	17.9	Floor Noise
Vert	7311.000	AV	34.7	36.1	6.3	35.6	-	41.5	53.9	12.4	Floor Noise
Vert	9748.000	AV	35.8	38.6	7.2	36.3	-	45.3	53.9	8.6	Floor Noise

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 27, 2015	August 28, 2015
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 65 % RH
Engineer	Koji Yamamoto (1-10GHz)	Koji Yamamoto (10-26.5GHz)
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	63.9	26.9	3.5	36.1	-	58.2	73.9	15.7	
Hori	3692.990	PK	48.5	29.8	4.4	35.9	-	46.8	73.9	27.1	
Hori	4924.000	PK	44.7	32.0	5.0	35.6	-	46.1	73.9	27.8	Floor Noise
Hori	7386.000	PK	45.6	36.1	6.3	35.6	-	52.4	73.9	21.5	Floor Noise
Hori	9848.000	PK	45.2	38.6	7.2	36.4	-	54.6	73.9	19.3	Floor Noise
Hori	2483.500	AV	50.1	26.9	3.5	36.1	1.8	46.2	53.9	7.7	*1)
Hori	3692.990	AV	43.8	29.8	4.4	35.9	-	42.1	53.9	11.8	
Hori	4924.000	AV	35.1	32.0	5.0	35.6	-	36.5	53.9	17.4	Floor Noise
Hori	7386.000	AV	35.3	36.1	6.3	35.6	-	42.1	53.9	11.8	Floor Noise
Hori	9848.000	AV	35.1	38.6	7.2	36.4	-	44.5	53.9	9.4	Floor Noise
Vert	2483.500	PK	64.5	26.9	3.5	36.1	-	58.8	73.9	15.1	
Vert	3692.990	PK	48.1	29.8	4.4	35.9	-	46.4	73.9	27.5	
Vert	4924.000	PK	44.8	32.0	5.0	35.6	-	46.2	73.9	27.7	Floor Noise
Vert	7386.000	PK	44.6	36.1	6.3	35.6	-	51.4	73.9	22.5	Floor Noise
Vert	9848.000	PK	45.7	38.6	7.2	36.4	-	55.1	73.9	18.8	Floor Noise
Vert	2483.500	AV	51.2	26.9	3.5	36.1	1.8	47.3	53.9	6.6	*1)
Vert	3692.990	AV	42.6	29.8	4.4	35.9	-	40.9	53.9	13.0	
Vert	4924.000	AV	34.2	32.0	5.0	35.6	-	35.6	53.9	18.3	Floor Noise
Vert	7386.000	AV	34.2	36.1	6.3	35.6	-	41.0	53.9	12.9	Floor Noise
Vert	9848.000	AV	35.2	38.6	7.2	36.4	-	44.6	53.9	9.3	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

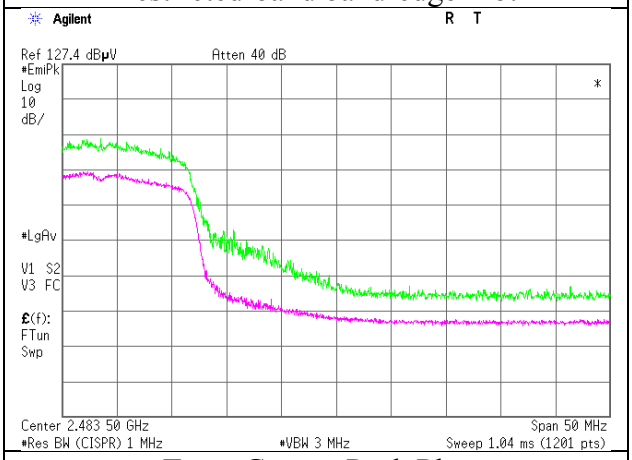
*1) Not Out of Band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 27, 2015
Temperature / Humidity	22 deg. C / 61 % RH
Engineer	Koji Yamamoto
Mode	Tx 11g 2462 MHz

Horizontal

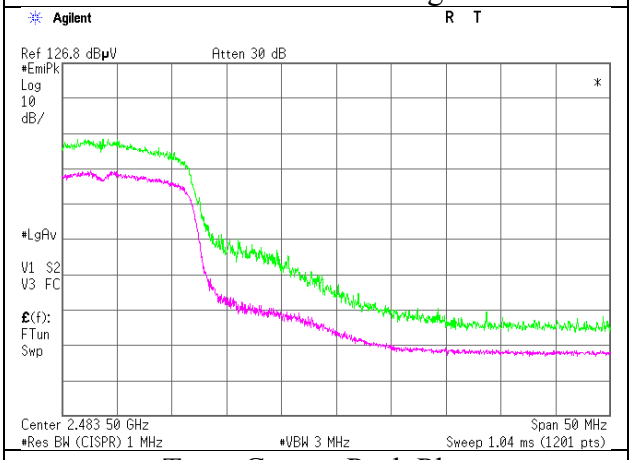
Restricted-band band-edge Plot



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.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 27, 2015
Temperature / Humidity	22 deg. C / 61 % RH
Engineer	Koji Yamamoto
	(1-10GHz)
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	67.3	26.8	3.5	36.1	-	61.5	73.9	12.4	
Hori	2390.000	AV	53.8	26.8	3.5	36.1	1.8	49.8	53.9	4.1	*1)
Vert	2390.000	PK	64.2	26.8	3.5	36.1	-	58.4	73.9	15.5	
Vert	2390.000	AV	51.5	26.8	3.5	36.1	1.8	47.5	53.9	6.4	*1)

Result = Reading + Ant Factor + Loss (Cable+Filter) - Gain(Amplifier) + Duty factor

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

Distance factor: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 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	100.9	26.8	3.5	36.1	95.1	-	-	Carrier
Hori	2400.000	PK	65.5	26.8	3.5	36.1	59.7	75.1	15.4	
Vert	2412.000	PK	98.9	26.8	3.5	36.1	93.1	-	-	Carrier
Vert	2400.000	PK	62.6	26.8	3.5	36.1	56.8	73.1	16.3	

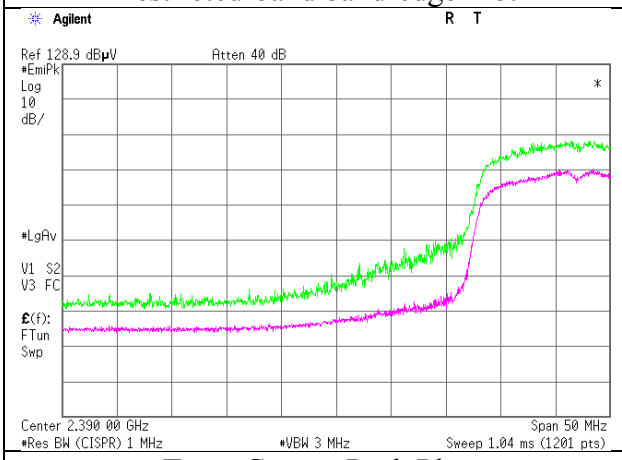
Result = Reading + Ant Factor + Loss (Cable+Filter) - Gain(Amprifier)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 27, 2015
Temperature / Humidity	22 deg. C / 61 % RH
Engineer	Koji Yamamoto
Mode	Tx 11n-20 2412 MHz

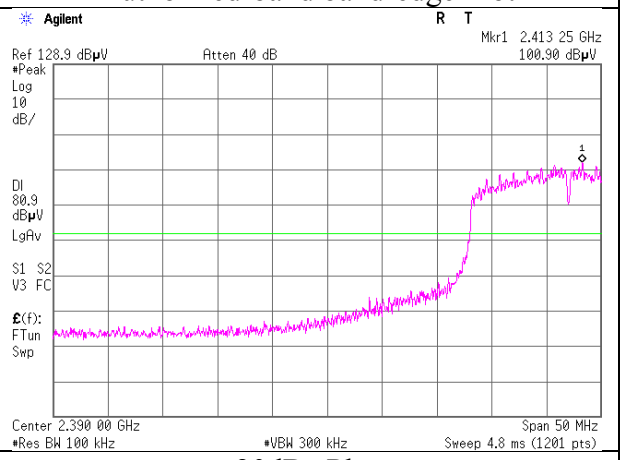
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

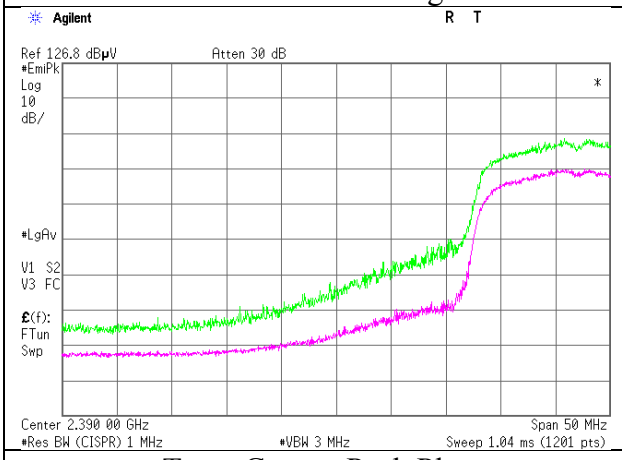
Authorized-band band-edge Plot



20dBc Plot

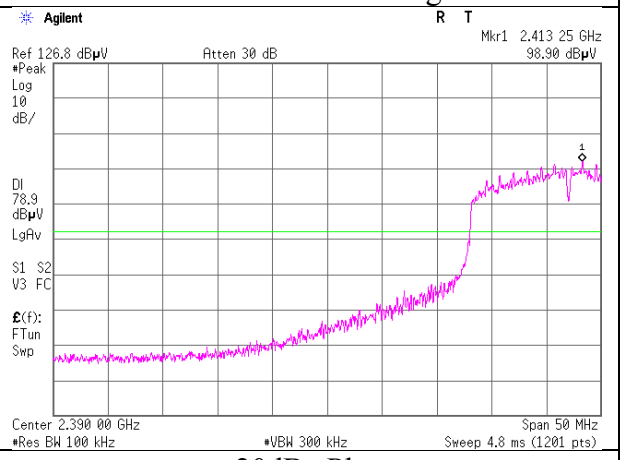
Vertical

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.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 27, 2015
Temperature / Humidity	22 deg. C / 61 % RH
Engineer	Koji Yamamoto
	(1-10GHz)
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	64.5	26.9	3.5	36.1	-	58.8	73.9	15.1	
Hori	2483.500	AV	49.7	26.9	3.5	36.1	1.8	45.8	53.9	8.1	*1)
Vert	2483.500	PK	64.3	26.9	3.5	36.1	-	58.6	73.9	15.3	
Vert	2483.500	AV	50.2	26.9	3.5	36.1	1.8	46.3	53.9	7.6	*1)

Result = Reading + Ant Factor + Loss (Cable+Filter) - Gain(Amplifier) + Duty factor

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

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

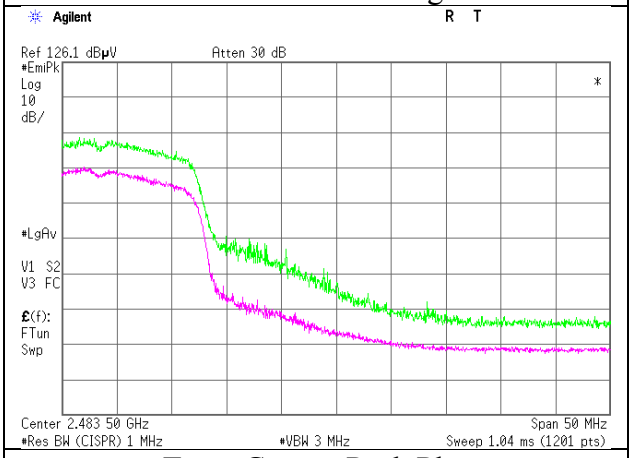
*1) Not Out of Band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 27, 2015
Temperature / Humidity	22 deg. C / 61 % RH
Engineer	Koji Yamamoto
Mode	Tx 11n-20 2462 MHz

Horizontal

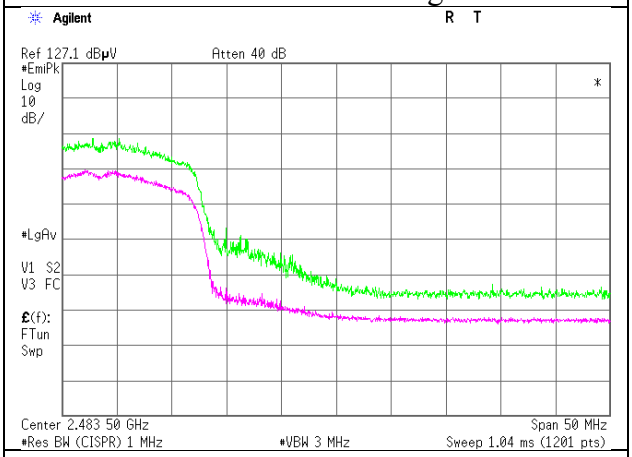
Restricted-band band-edge Plot



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.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 28, 2015	September 2, 2015
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 72 % RH
Engineer	Koji Yamamoto (Above 1GHz)	Takafumi Noguchi (Below 1GHz)
Mode	Tx BT LE 2402 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	87.360	QP	29.7	7.9	8.3	38.8	-	7.1	40.0	32.9	
Hori	540.001	QP	37.9	18.6	12.2	38.1	-	30.6	46.0	15.4	
Hori	600.000	QP	39.5	19.5	12.5	38.1	-	33.4	46.0	12.6	
Hori	660.000	QP	33.1	20.1	12.9	38.1	-	28.0	46.0	18.0	
Hori	720.003	QP	37.5	20.7	13.2	38.2	-	33.2	46.0	12.8	
Hori	840.002	QP	41.2	21.9	13.8	38.1	-	38.8	46.0	7.2	
Hori	2390.000	PK	46.0	26.8	3.5	36.1	-	40.2	73.9	33.7	
Hori	4804.000	PK	49.1	31.8	4.8	35.6	-	50.1	73.9	23.8	
Hori	7206.000	PK	43.8	36.1	6.2	35.6	-	50.5	73.9	23.4	Floor Noise
Hori	9608.000	PK	43.5	38.6	7.2	36.3	-	53.0	73.9	20.9	Floor Noise
Hori	2390.000	AV	36.8	26.8	3.5	36.1	1.8	32.8	53.9	21.1	*1)
Hori	4804.000	AV	40.1	31.8	4.8	35.6	1.8	42.9	53.9	11.0	
Hori	7206.000	AV	33.6	36.1	6.2	35.6	-	40.3	53.9	13.6	Floor Noise
Hori	9608.000	AV	33.9	38.6	7.2	36.3	-	43.4	53.9	10.5	Floor Noise
Vert	87.360	QP	45.6	7.9	8.3	38.8	-	23.0	40.0	17.0	
Vert	540.001	QP	37.4	18.6	12.2	38.1	-	30.1	46.0	15.9	
Vert	600.000	QP	40.4	19.5	12.5	38.1	-	34.3	46.0	11.7	
Vert	660.000	QP	35.4	20.1	12.9	38.1	-	30.3	46.0	15.7	
Vert	720.003	QP	34.4	20.7	13.2	38.2	-	30.1	46.0	15.9	
Vert	840.002	QP	39.0	21.9	13.8	38.1	-	36.6	46.0	9.4	
Vert	2390.000	PK	42.8	26.8	3.5	36.1	-	37.0	73.9	36.9	
Vert	4804.000	PK	50.2	31.8	4.8	35.6	-	51.2	73.9	22.7	
Vert	7206.000	PK	42.5	36.1	6.2	35.6	-	49.2	73.9	24.7	Floor Noise
Vert	9608.000	PK	43.1	38.6	7.2	36.3	-	52.6	73.9	21.3	Floor Noise
Vert	2390.000	AV	36.6	26.8	3.5	36.1	1.8	32.6	53.9	21.3	*1)
Vert	4804.000	AV	40.9	31.8	4.8	35.6	1.8	43.7	53.9	10.2	
Vert	7206.000	AV	33.8	36.1	6.2	35.6		40.5	53.9	13.4	Floor Noise
Vert	9608.000	AV	34.3	38.6	7.2	36.3		43.8	53.9	10.1	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

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

20dBc Data Sheet

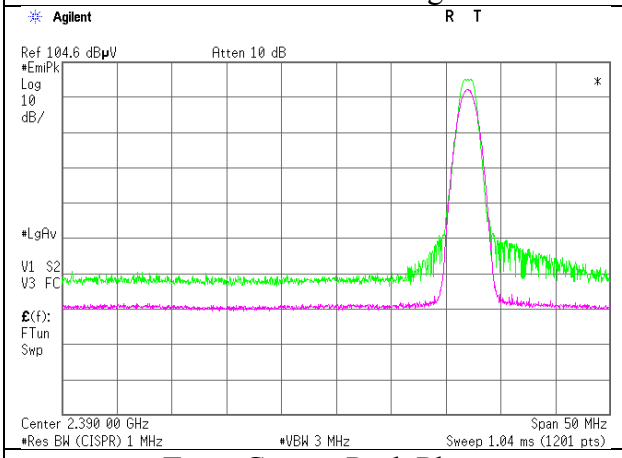
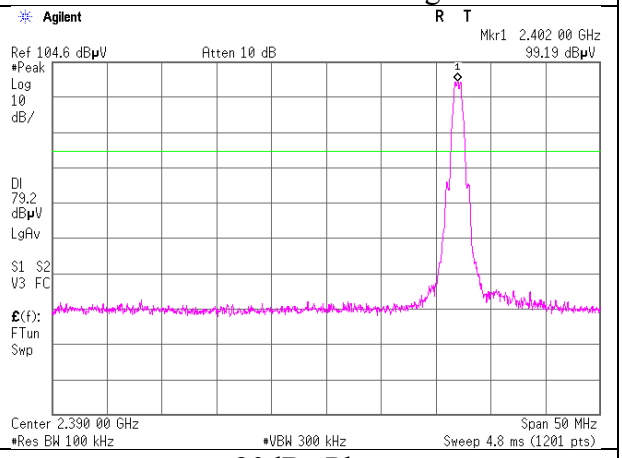
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	99.2	26.8	3.5	36.1	93.4	-	-	Carrier
Hori	2400.000	PK	44.1	26.8	3.5	36.1	38.3	73.4	35.1	
Vert	2402.000	PK	96.5	26.8	3.5	36.1	90.7	-	-	Carrier
Vert	2400.000	PK	41.5	26.8	3.5	36.1	35.7	70.7	35.0	

Result = Reading + Ant Factor + Loss (Cable+Filter) - Gain(Amprifier)

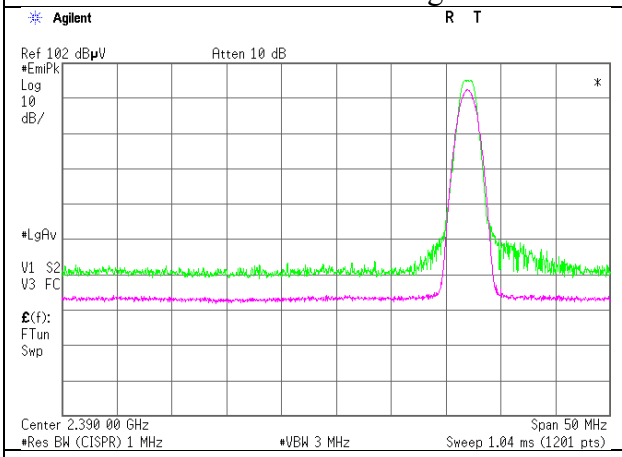
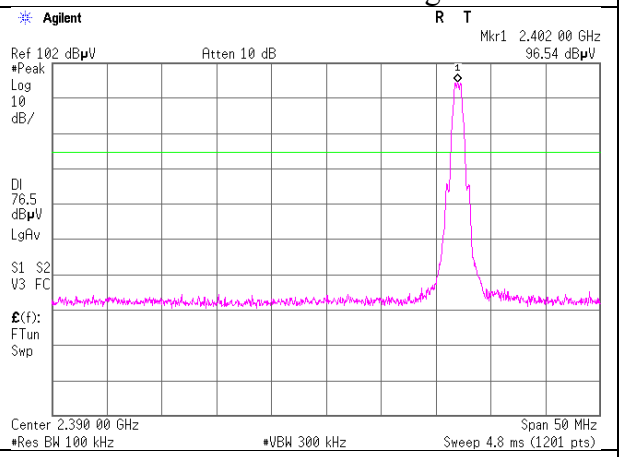
Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 28, 2015
Temperature / Humidity	23 deg. C / 65 % RH
Engineer	Koji Yamamoto
Mode	Tx BT LE 2402 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.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 28, 2015	September 2, 2015
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 72 % RH
Engineer	Koji Yamamoto (Above 1GHz)	Takafumi Noguchi (Below 1GHz)
Mode	Tx BT LE 2440 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	87.360	QP	29.5	7.9	8.3	38.8	-	6.9	40.0	33.1	
Hori	540.001	QP	37.9	18.6	12.2	38.1	-	30.6	46.0	15.4	
Hori	600.000	QP	39.3	19.5	12.5	38.1	-	33.2	46.0	12.8	
Hori	660.000	QP	33.2	20.1	12.9	38.1	-	28.1	46.0	17.9	
Hori	720.003	QP	37.3	20.7	13.2	38.2	-	33.0	46.0	13.0	
Hori	840.002	QP	41.2	21.9	13.8	38.1	-	38.8	46.0	7.2	
Hori	4880.000	PK	46.5	32.0	4.9	35.6	-	47.8	73.9	26.1	
Hori	7320.000	PK	44.5	36.1	6.2	35.6	-	51.2	73.9	22.7	Floor Noise
Hori	9760.000	PK	44.3	38.6	7.2	36.3	-	53.8	73.9	20.1	Floor Noise
Hori	4880.000	AV	38.4	32.0	4.9	35.6	1.8	41.5	53.9	12.4	
Hori	7320.000	AV	34.1	36.1	6.2	35.6	-	40.8	53.9	13.1	Floor Noise
Hori	9760.000	AV	34.3	38.6	7.2	36.3	-	43.8	53.9	10.1	Floor Noise
Vert	87.360	QP	45.6	7.9	8.3	38.8	-	23.0	40.0	17.0	
Vert	540.001	QP	37.6	18.6	12.2	38.1	-	30.3	46.0	15.7	
Vert	600.000	QP	40.3	19.5	12.5	38.1	-	34.2	46.0	11.8	
Vert	660.000	QP	35.5	20.1	12.9	38.1	-	30.4	46.0	15.6	
Vert	720.003	QP	34.5	20.7	13.2	38.2	-	30.2	46.0	15.8	
Vert	840.002	QP	39.2	21.9	13.8	38.1	-	36.8	46.0	9.2	
Vert	4880.000	PK	47.0	32.0	4.9	35.6	-	48.3	73.9	25.6	
Vert	7320.000	PK	43.9	36.1	6.2	35.6	-	50.6	73.9	23.3	Floor Noise
Vert	9760.000	PK	43.7	38.6	7.2	36.3	-	53.2	73.9	20.7	Floor Noise
Vert	4880.000	AV	40.3	32.0	4.9	35.6	1.8	43.4	53.9	10.5	
Vert	7320.000	AV	34.6	36.1	6.2	35.6	-	41.3	53.9	12.6	Floor Noise
Vert	9760.000	AV	34.5	38.6	7.2	36.3	-	44.0	53.9	9.9	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 28, 2015	September 2, 2015
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 72 % RH
Engineer	Koji Yamamoto (Above 1GHz)	Takafumi Noguchi (Below 1GHz)
Mode	Tx BT LE 2480 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	87.360	QP	29.5	7.9	8.3	38.8	-	6.9	40.0	33.1	
Hori	540.001	QP	37.8	18.6	12.2	38.1	-	30.5	46.0	15.5	
Hori	600.000	QP	39.3	19.5	12.5	38.1	-	33.2	46.0	12.8	
Hori	660.000	QP	33.2	20.1	12.9	38.1	-	28.1	46.0	17.9	
Hori	720.003	QP	37.4	20.7	13.2	38.2	-	33.1	46.0	12.9	
Hori	840.002	QP	41.1	21.9	13.8	38.1	-	38.7	46.0	7.3	
Hori	2483.500	PK	57.5	26.9	3.5	36.1	-	51.8	73.9	22.1	
Hori	4960.000	PK	45.5	32.1	4.9	35.6	-	46.9	73.9	27.0	
Hori	7440.000	PK	44.5	36.1	6.2	35.6	-	51.2	73.9	22.7	Floor Noise
Hori	9920.000	PK	44.6	38.6	7.3	36.4	-	54.1	73.9	19.8	Floor Noise
Hori	2483.500	AV	39.5	26.9	3.5	36.1	1.8	35.6	53.9	18.3	*1)
Hori	4960.000	AV	37.5	32.1	4.9	35.6	1.8	40.7	53.9	13.2	
Hori	7440.000	AV	34.3	36.1	6.2	35.6	-	41.0	53.9	12.9	Floor Noise
Hori	9920.000	AV	34.6	38.6	7.3	36.4	-	44.1	53.9	9.8	Floor Noise
Vert	87.360	QP	45.5	7.9	8.3	38.8	-	22.9	40.0	17.1	
Vert	540.001	QP	37.3	18.6	12.2	38.1	-	30.0	46.0	16.0	
Vert	600.000	QP	40.5	19.5	12.5	38.1	-	34.4	46.0	11.6	
Vert	660.000	QP	35.5	20.1	12.9	38.1	-	30.4	46.0	15.6	
Vert	720.003	QP	34.7	20.7	13.2	38.2	-	30.4	46.0	15.6	
Vert	840.002	QP	39.4	21.9	13.8	38.1	-	37.0	46.0	9.0	
Vert	2483.500	PK	55.9	26.9	3.5	36.1	-	50.2	73.9	23.7	
Vert	4960.000	PK	47.8	32.1	4.9	35.6	-	49.2	73.9	24.7	
Vert	7440.000	PK	44.7	36.1	6.2	35.6	-	51.4	73.9	22.5	Floor Noise
Vert	9920.000	PK	43.8	38.6	7.3	36.4	-	53.3	73.9	20.6	Floor Noise
Vert	2483.500	AV	40.6	26.9	3.5	36.1	1.8	36.7	53.9	17.2	*1)
Vert	4960.000	AV	38.6	32.1	4.9	35.6	1.8	41.8	53.9	12.1	
Vert	7440.000	AV	34.9	36.1	6.2	35.6		41.6	53.9	12.3	Floor Noise
Vert	9920.000	AV	35.2	38.6	7.3	36.4		44.7	53.9	9.2	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

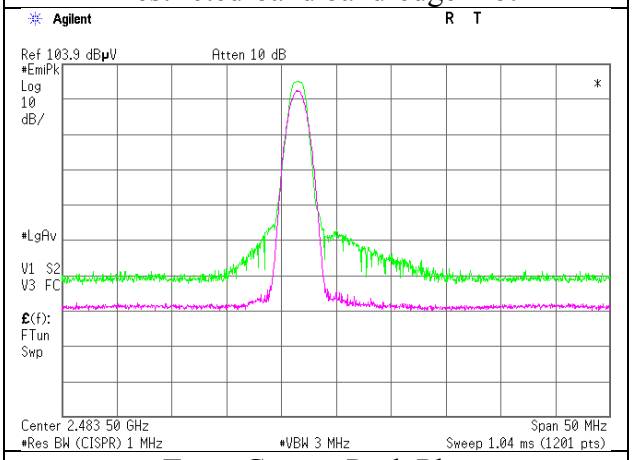
*1) Not Out of Band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10936450H
Date	August 28, 2015
Temperature / Humidity	23 deg. C / 65 % RH
Engineer	Koji Yamamoto
Mode	Tx BT LE 2480 MHz

Horizontal

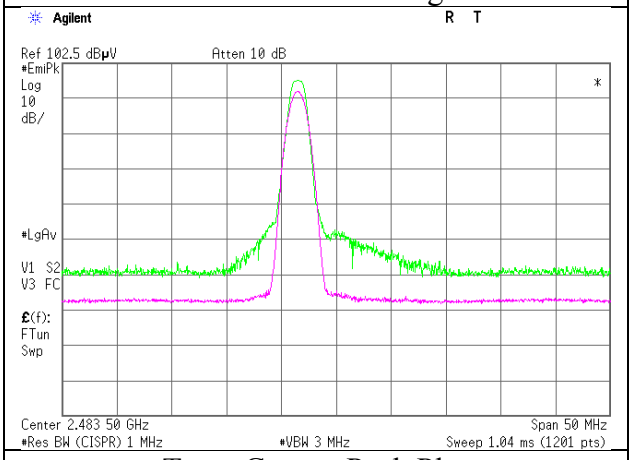
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

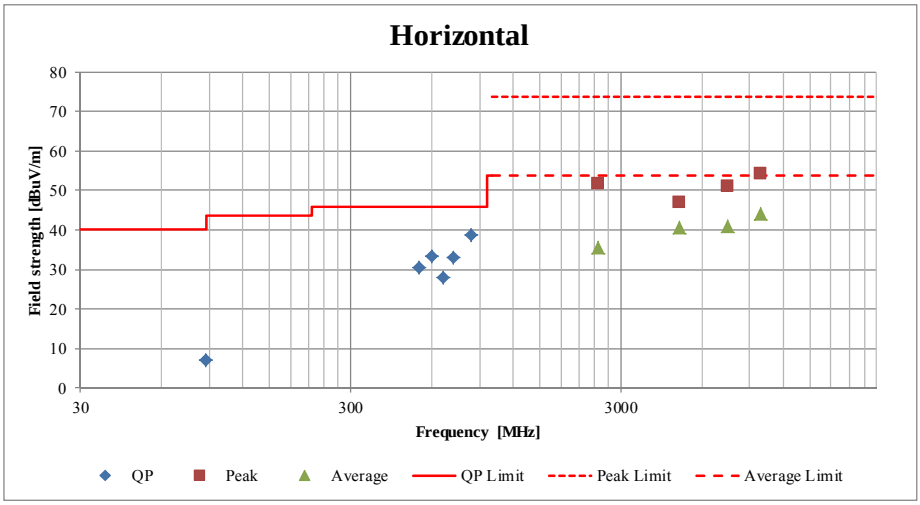


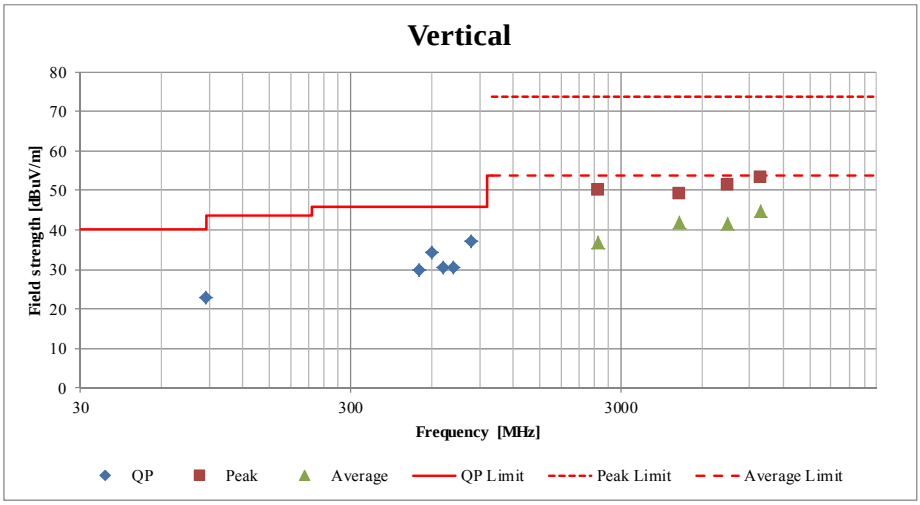
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber	
Report No.	10936450H	
Date	August 28, 2015	September 2, 2015
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 72 % RH
Engineer	Koji Yamamoto (Above 1GHz)	Takafumi Noguchi (Below 1GHz)
Mode	Tx BT LE 2480 MHz	



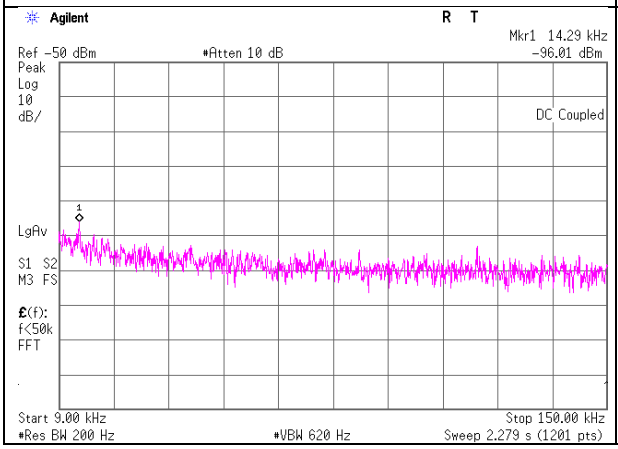


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

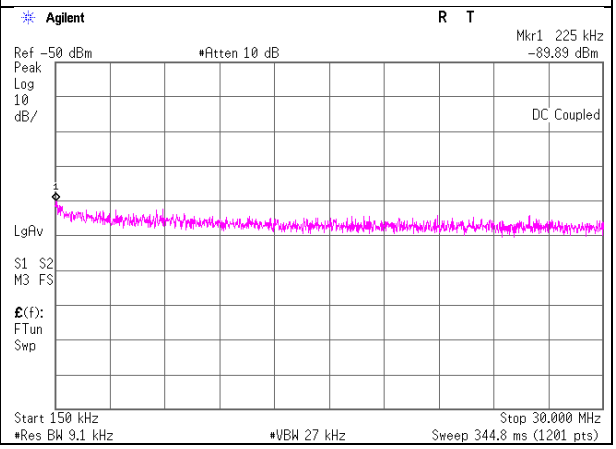
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11g 2412 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



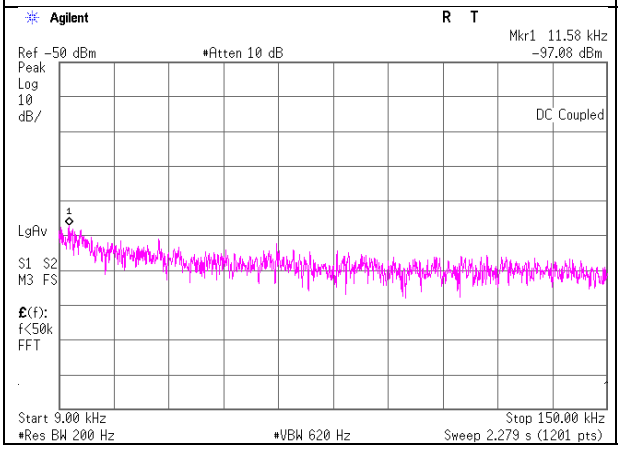
Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenator Loss [dB]	Antenna Gain [dBi]	N (Number of Output	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
14.29	-96.0	0.91	10.1	2.0	1	-83.1	300	6.0	-21.8	44.5	66.3	
225.00	-89.9	0.91	10.1	2.0	1	-76.9	300	6.0	-15.7	20.5	36.2	

E = EIRP - 20 log (D) + Ground bounce + 104.8 [dBuV/m]
EIRP = Reading + Cable Loss + Attenator Loss + Antenna Gain + 10 * log (N)

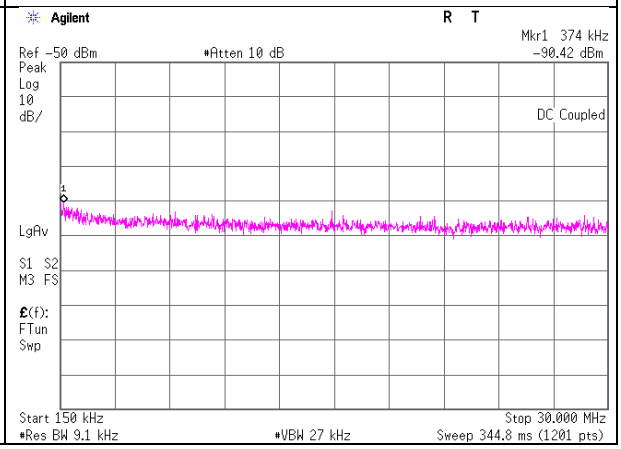
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



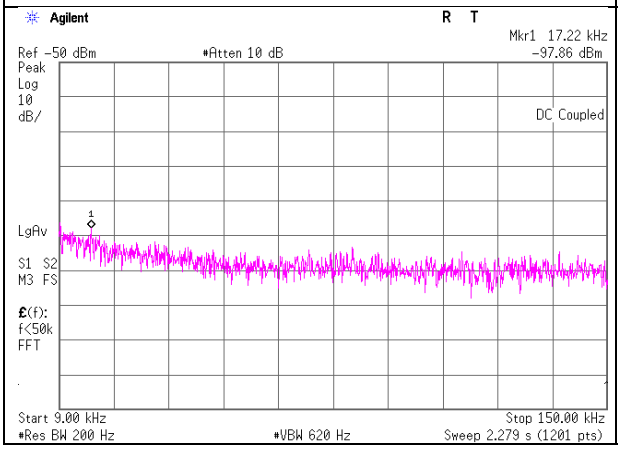
Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenator Loss [dB]	Antenna Gain [dBi]	N (Number of Output	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.58	-97.1	0.91	10.1	2.0	1	-84.1	300	6.0	-22.9	46.3	69.2	
374.00	-90.4	0.91	10.1	2.0	1	-77.5	300	6.0	-16.2	16.1	32.3	

E = EIRP - 20 log (D) + Ground bounce + 104.8 [dBuV/m]
EIRP = Reading + Cable Loss + Attenator Loss + Antenna Gain + 10 * log (N)

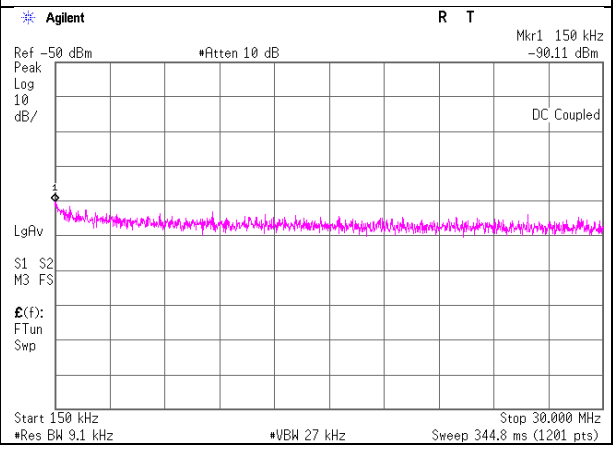
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



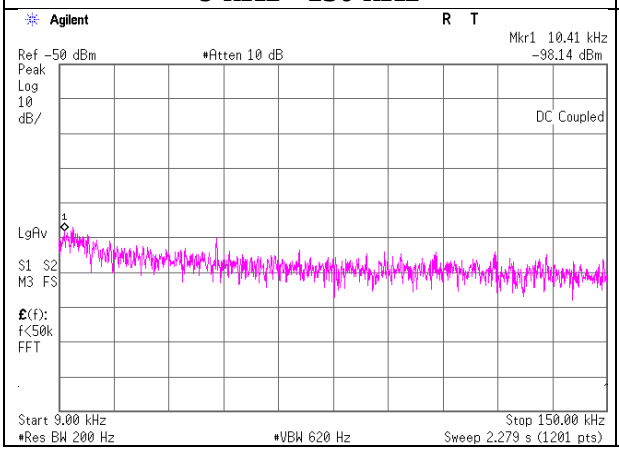
Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenator Loss [dB]	Antenna Gain [dBi]	N (Number of Output	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
17.22	-97.9	0.91	10.1	2.0	1	-84.9	300	6.0	-23.6	42.8	66.4	
150.00	-90.1	0.91	10.1	2.0	1	-77.2	300	6.0	-15.9	24.0	39.9	

E = EIRP - 20 log (D) + Ground bounce + 104.8 [dBuV/m]
EIRP = Reading + Cable Loss + Attenator Loss + Antenna Gain + 10 * log (N)

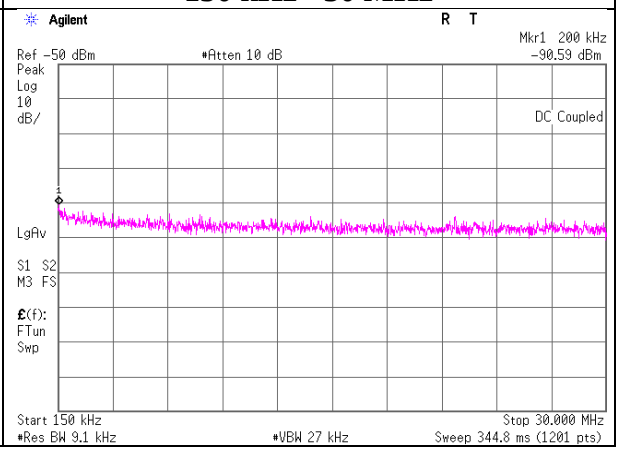
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2480 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
10.41	-98.1	0.91	10.1	2.0	1	-85.2	300	6.0	-23.9	47.2	71.1	
200.00	-90.6	0.91	10.1	2.0	1	-77.6	300	6.0	-16.4	21.5	37.9	

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.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11b / 11g / 11n-20

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-25.69	1.02	10.06	-14.61	8.00	22.61
2437.00	-25.64	1.02	10.06	-14.56	8.00	22.56
2462.00	-25.89	1.03	10.06	-14.80	8.00	22.80

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-27.56	1.02	10.06	-16.48	8.00	24.48
2437.00	-27.75	1.02	10.06	-16.67	8.00	24.67
2462.00	-26.37	1.03	10.06	-15.28	8.00	23.28

11n-20

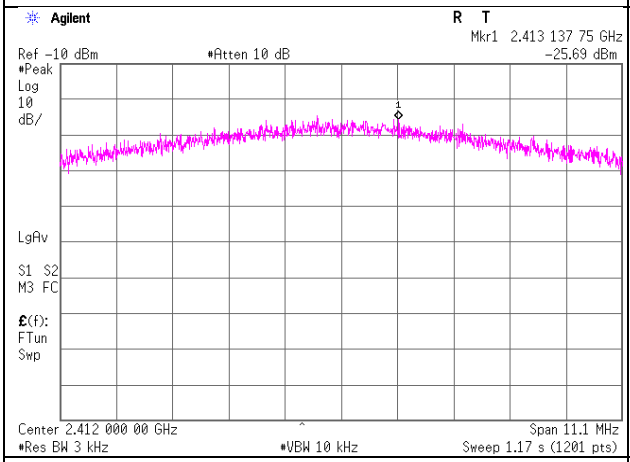
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-28.40	1.02	10.06	-17.32	8.00	25.32
2437.00	-27.71	1.02	10.06	-16.63	8.00	24.63
2462.00	-27.96	1.03	10.06	-16.87	8.00	24.87

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

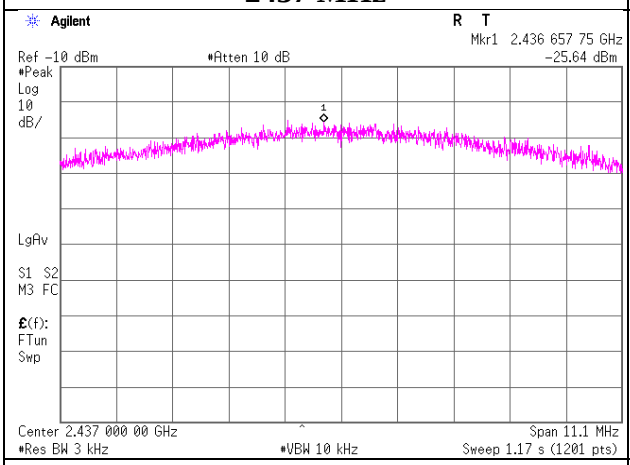
Power Density

11b

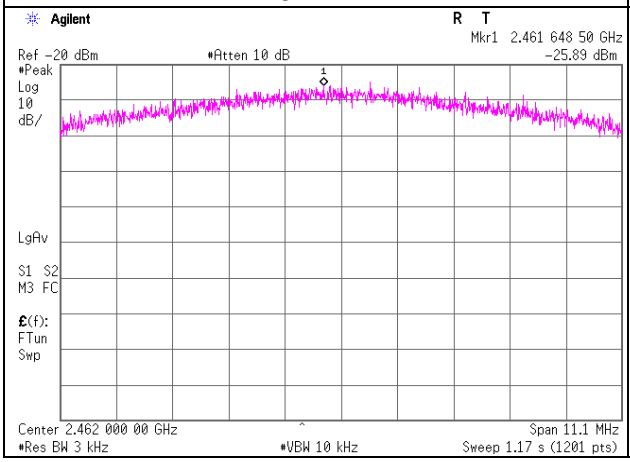
2412 MHz



2437 MHz

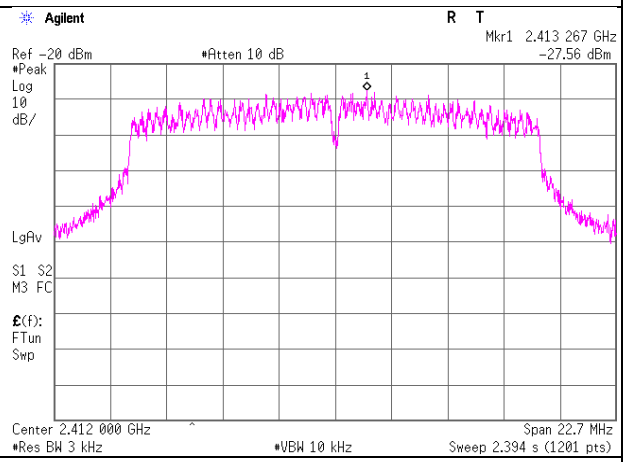


2462 MHz

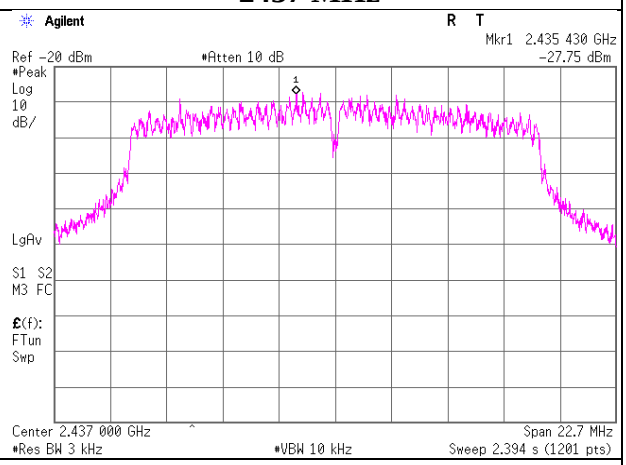


11g

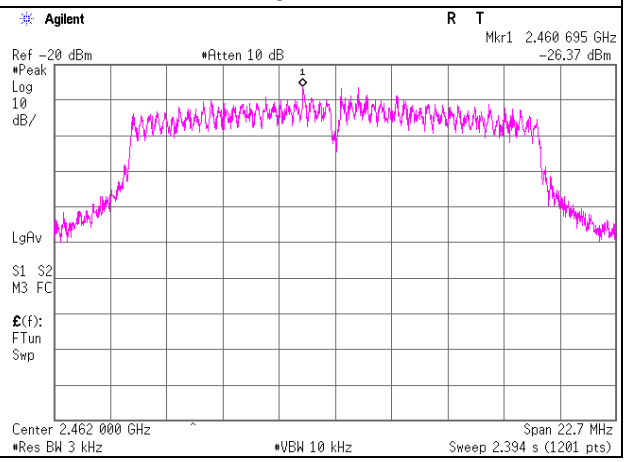
2412 MHz



2437 MHz



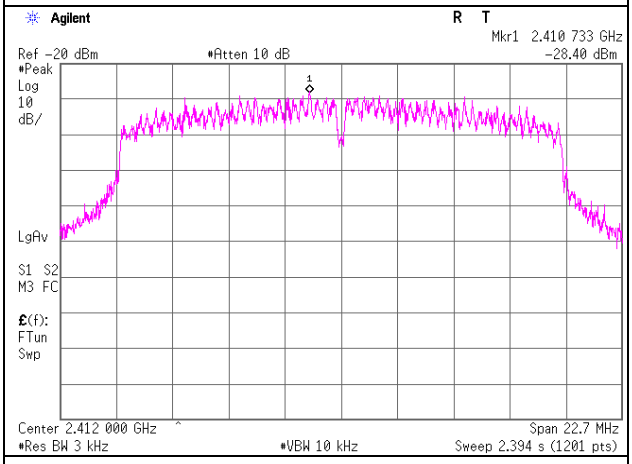
2462 MHz



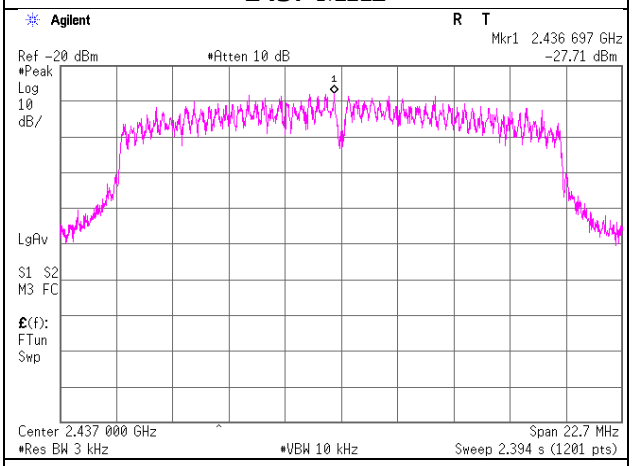
Power Density

11n-20

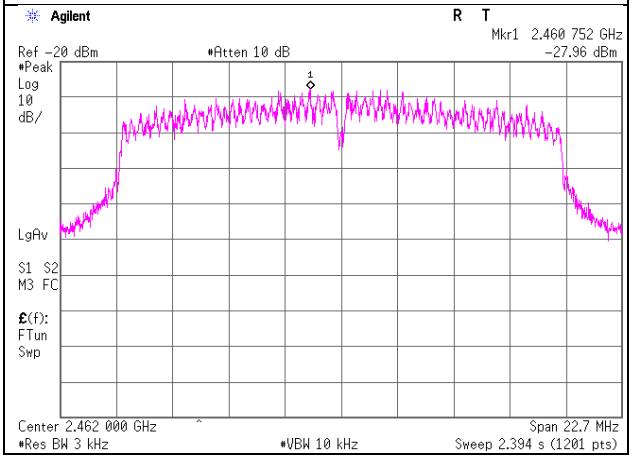
2412 MHz



2437 MHz



2462 MHz



Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

BT LE

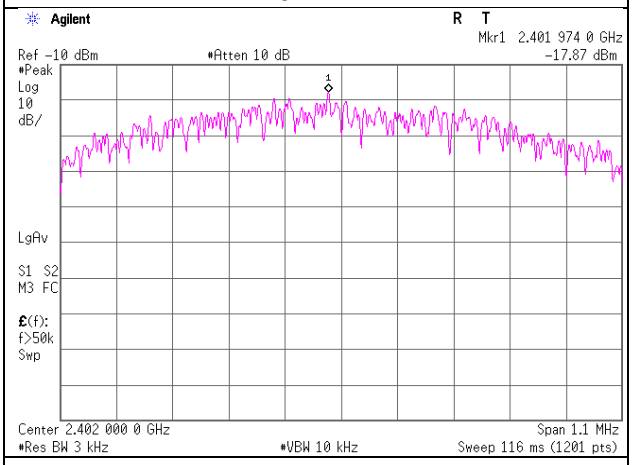
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-17.87	1.02	10.06	-6.79	8.00	14.79
2440.00	-17.61	1.02	10.06	-6.53	8.00	14.53
2480.00	-17.58	1.03	10.06	-6.49	8.00	14.49

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

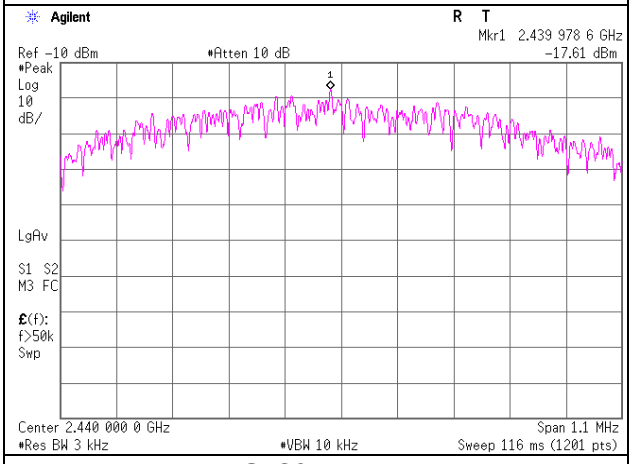
Power Density

BT LE

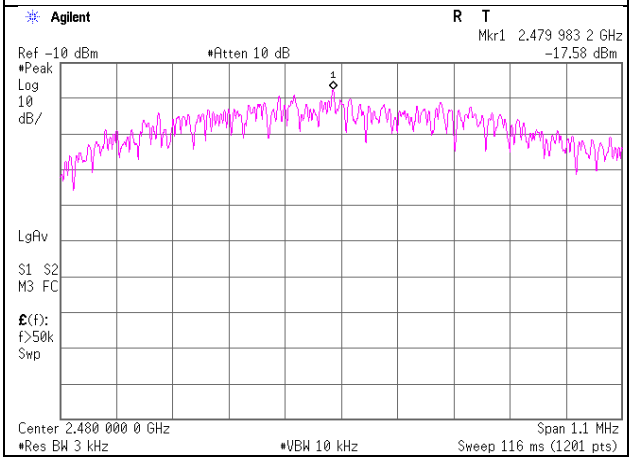
2402 MHz



2440 MHz



2480 MHz

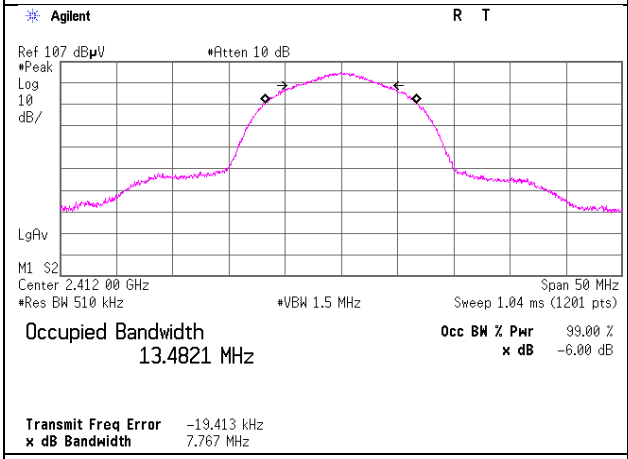


99% Occupied Bandwidth

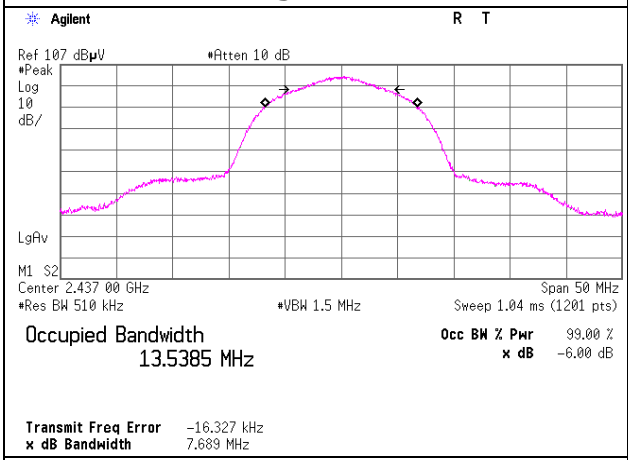
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11b / 11g

11b

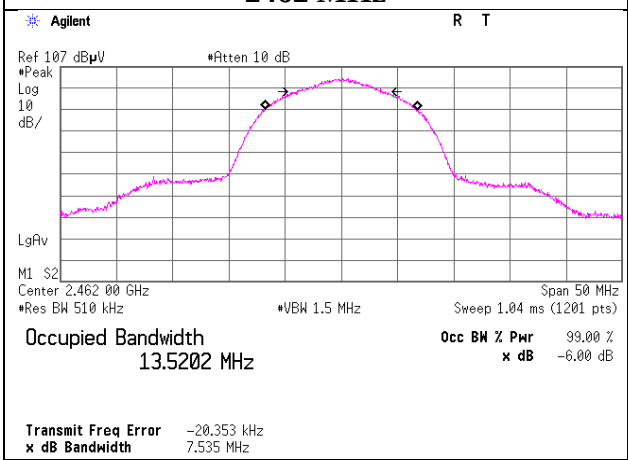
2412 MHz



2437 MHz

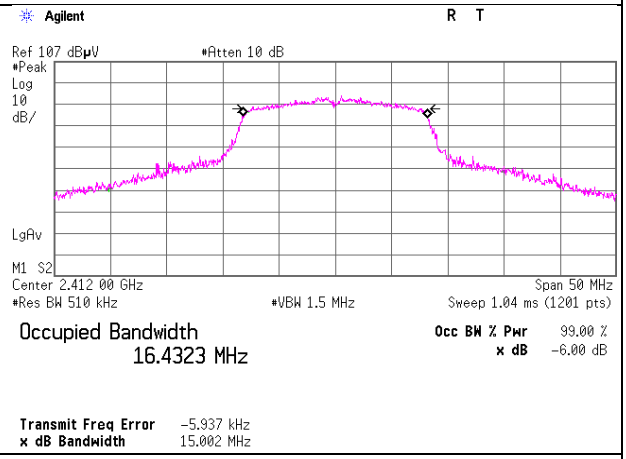


2462 MHz

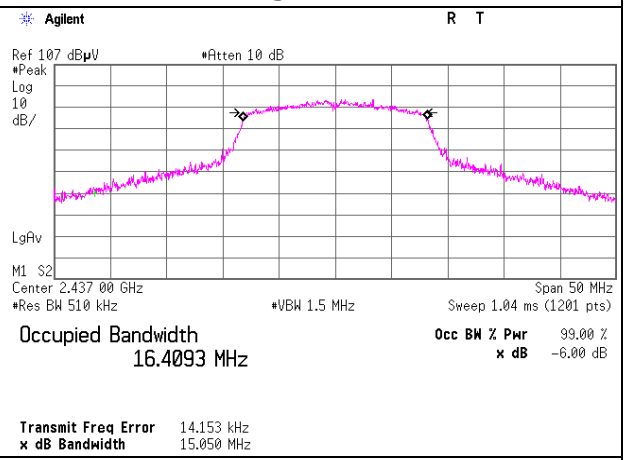


11g

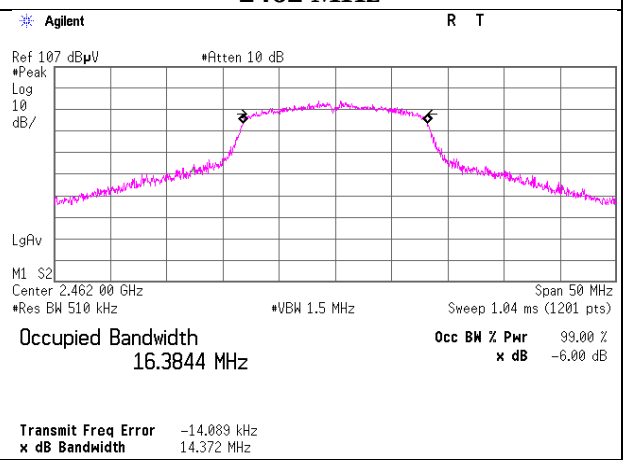
2412 MHz



2437 MHz



2462 MHz

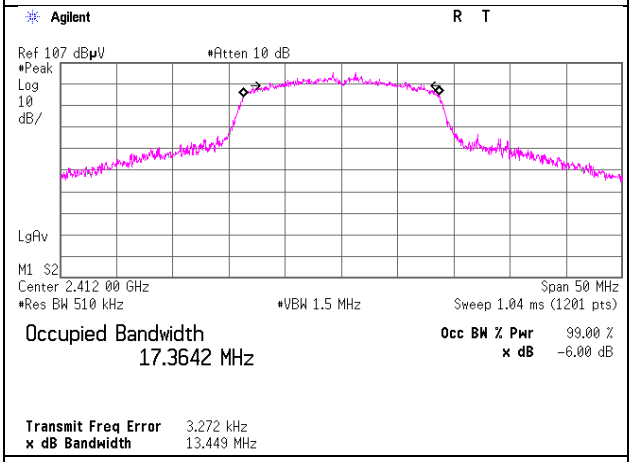


99% Occupied Bandwidth

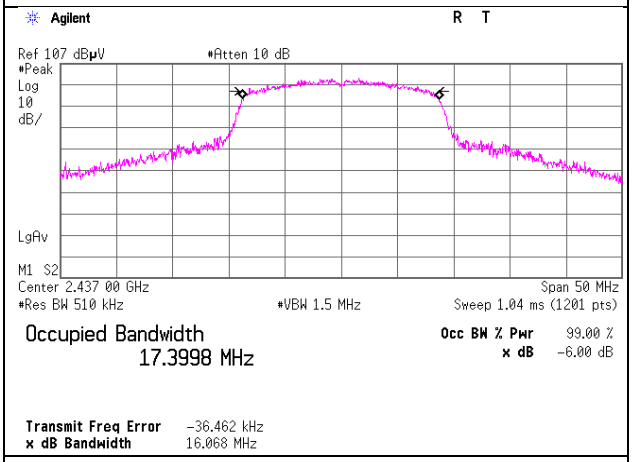
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11n-20

11n-20

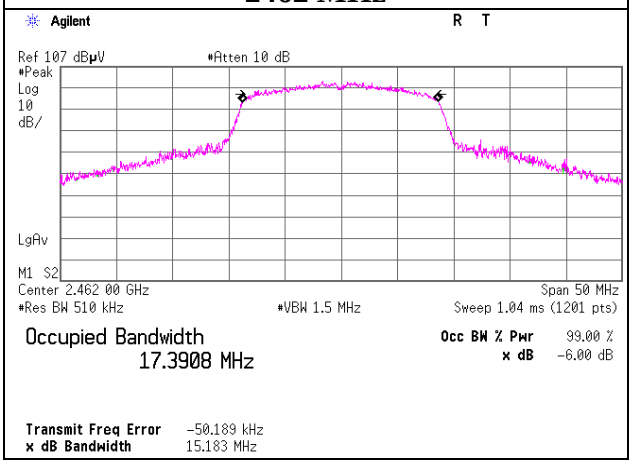
2412 MHz



2437 MHz



2462 MHz

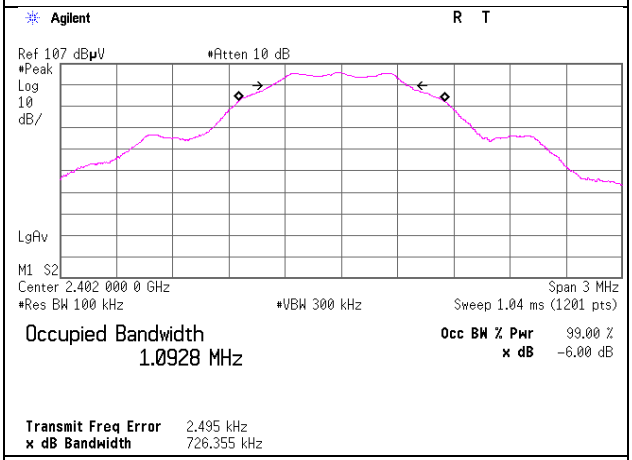


99% Occupied Bandwidth

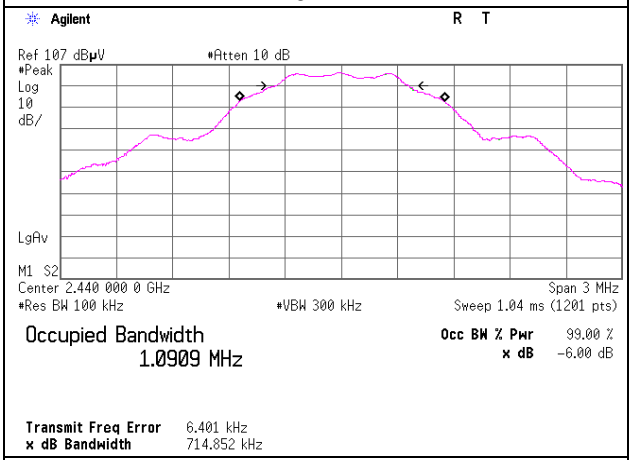
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10936450H
Date	August 29, 2015
Temperature / Humidity	24 deg. C / 69 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

BT LE

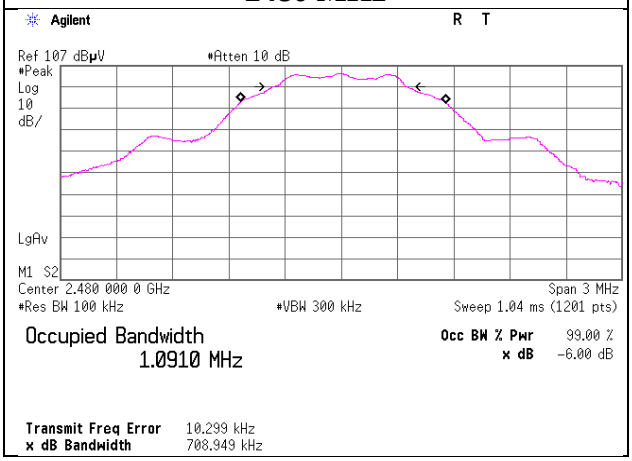
2402 MHz



2440 MHz



2480 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	2014/12/22 * 12
MMM-17	DIGIITAL HiTESTER	Hioki	3805	070900530	AT	2015/01/16 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT	2015/05/18 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2015/06/09 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2015/06/09 * 12
MCC-144	Microwave Cable	Junkosha	MWX221	1207S407	AT	2015/08/06 * 12
MAT-20	Attenuator(10dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2015/01/08 * 12
MCC-92	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	30813/2	AT	2015/05/01 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE/CE	2014/09/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE/CE	2015/01/13 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MHA-05	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	253	RE	2015/05/18 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2014/09/24 * 12
MPA-01	Pre Amplifier	Agilent	8449B	3008A01671	RE	2015/02/04 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2014/09/24 * 12
MMM-03	Digital Tester	Fluke	FLUKE 26-3	78030621	RE/CE	2015/08/19 * 12
MRENT-123	Spectrum Analyzer	KEYSIGHT	E4440A	MY46187067	RE	2015/06/23 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2015/06/02 * 12
MHA-01	Horn Antenna 18-26.5GHz	EMCO	3160-09	1266	RE	2015/06/06 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2014/09/22 * 12
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE/CE	2015/06/08 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2014/11/22 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2014/11/22 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2014/11/20 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2014/09/12 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2015/02/03 * 12
MLS-25	LISN(AMN)	Schwarzbeck	NSLK8127	8127-731	CE	2015/07/17 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	-/01068(Switcher)	CE	2014/09/12 * 12
MAT-64	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2015/01/29 * 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: **CE: Conducted Emission test**
RE: Radiated Emission test
AT: Antenna Terminal Conducted test