RADIO TEST REPORT

Test Report No. : 10990297H-A-R1

Applicant	:	**Sony Corporation**
Type of Equipment	:	**Wireless Stereo Headset**
Model No.	:	**MDR-EX750BT**
FCC ID	:	**AK8MDREX750BT**
Test regulation	:	**FCC Part 15 Subpart C: 2015**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10990297H-A. 10990297H-A is replaced with this report.

Date of test: October 9 to 12, 2015

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

Approved by:
T Hatakeda
Takahiro Hatakeda
Leader
Consumer Technology Division

NVLAP LAB CODE: 200572-0

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

REVISION HISTORY

Original Test Report No.: 10990297H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10990297H-A	October 26, 2015	-	-
1	10990297H-A-R1	November 11, 2015	P.9	Correction of clause 4.2 Configuration and peripherals

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SECTION 1: Customer information

Company Name	:	Sony Corporation
Address	:	2-10-1 Osaki, Shinagawa-ku, Tokyo 141-8610 Japan
Telephone Number	:	+81-50-3750-7634
Facsimile Number	:	+81-50-3750-6574
Contact Person	:	Shigeru Higai

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

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless Stereo Headset
Model No.	:	MDR-EX750BT
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.7 V
Receipt Date of Sample	:	October 5, 2015
Country of Mass-production	:	Malaysia
Condition of EUT	:	Engineering 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: MDR-EX750BT (referred to as the EUT in this report) is a Wireless Stereo Headset.

General Specification

Clock frequency(ies) in the system	:	Oscillator frequency: 26 MHz (Bluetooth)

Radio Specification

[Bluetooth (Ver. 4.1 with EDR function)]

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	FHSS
Power Supply (radio part input)	:	DC 1.35 V
Antenna type	:	Helical Monopole Antenna
Antenna Gain	:	0.4 dBi
Operation temperature range	:	0 to +40 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2015, final revised on September 8, 2015
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.4-2009 7. AC powerline conducted emission measurements **IC:** RSS-Gen 8.8	**FCC:** Section 15.207 **IC:** RSS-Gen 8.8	N/A	N/A *1)	-
Carrier Frequency Separation	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1) **IC:** RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1) **IC:** RSS-247 5.1 (1)		Complied	Conducted
Number of Hopping Frequency	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1)(iii) **IC:** RSS-247 5.1 (4)		Complied	Conducted
Dwell time	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1)(iii) **IC:** RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	**FCC:** FCC Public Notice DA 00-705 **IC:** RSS-Gen 6.12	**FCC:** Section15.247(a)(b)(1) **IC:** RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	**FCC:** FCC Public Notice DA 00-705 **IC:** RSS-Gen 6.13	**FCC:** Section15.247(d) **IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	5.3 dB 4804.000 MHz, AV, Hori.	Complied	Conducted/ Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) The test is not applicable since the EUT has no AC mains. During charging, the EUT does not perform BT operation.

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

FCC Part 15.31 (e)

The EUT is a battery-operated device and test was performed with the full-charged battery.
Therefore, the equipment complies with the requirement.

FCC Part 15.203 Antenna requirement

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users.

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)	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

Radiated emission test

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

3.5 Test Location

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

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

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

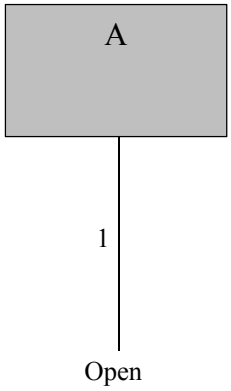
Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz

*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)
*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.
*EUT has the power settings by the software as follows;

Power settings:	DH5:	Ext.=7, Int.=34
	2DH5:	Ext.=72, Int.=43
	3DH5:	Ext.=72, Int.=43
Software:	Blue test 3 Ver.2.5.0.93	

*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.

4.2 Configuration and peripherals



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Wireless Stereo Headset	MDR-EX750BT	001	Sony Corporation	EUT

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	USB Cable	2.0	Shielded	Shielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

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

Test Antennas are used as below;

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3 m (below 10 GHz), 1 m*2) (above 10 GHz)		3 m (below 10 GHz), 1 m*2) (above 10 GHz)

*1) Although DA 00-705 accepts VBW = 10 Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.
*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 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 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 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 *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.
*2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)
*3) Reference data

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

20dB Bandwidth and Carrier Frequency Separation

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.962	1.000	>= 0.641
DH5	2441.0	0.939	1.000	>= 0.626
DH5	2480.0	0.929	1.000	>= 0.619
3DH5	2402.0	1.260	1.000	>= 0.840
3DH5	2441.0	1.259	1.000	>= 0.839
3DH5	2480.0	1.259	1.000	>= 0.839

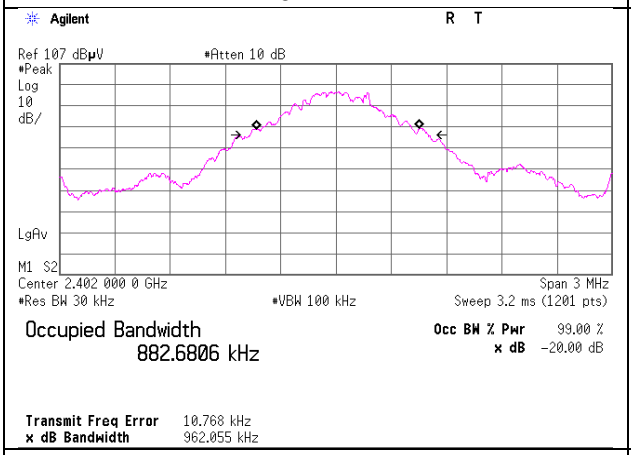
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation

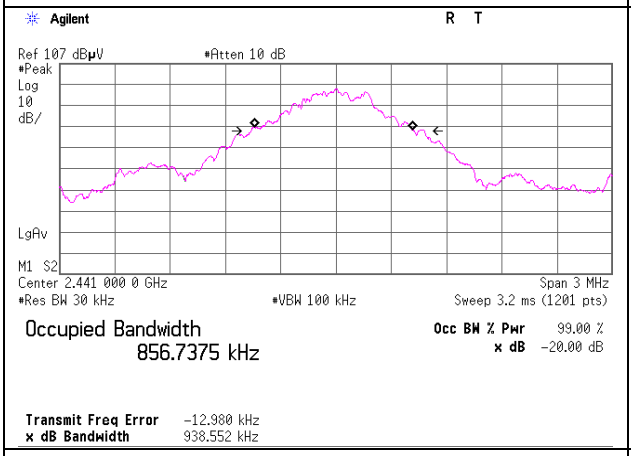
DH5

20 dB Bandwidth

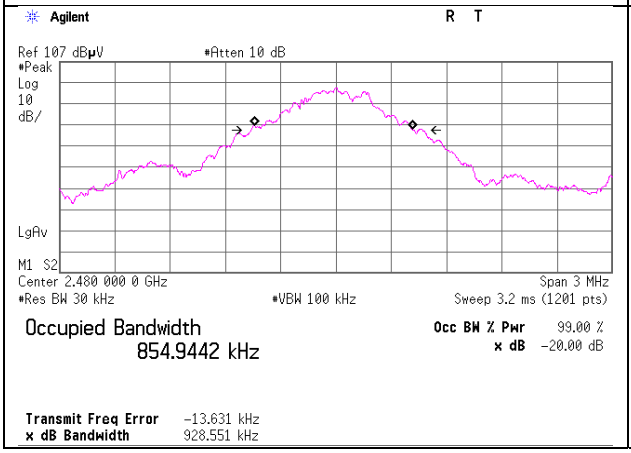
2402 MHz



2441 MHz

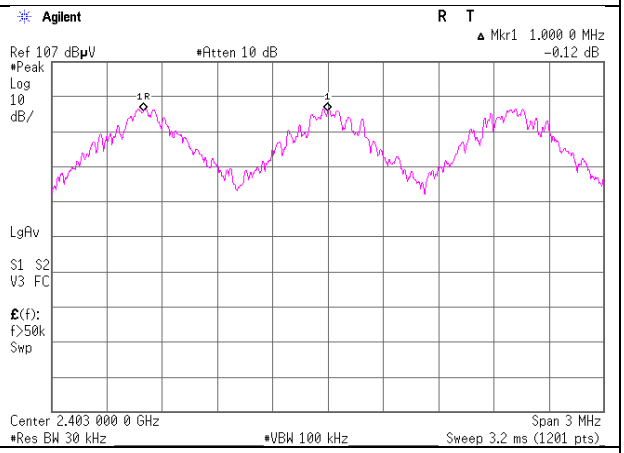


2480 MHz

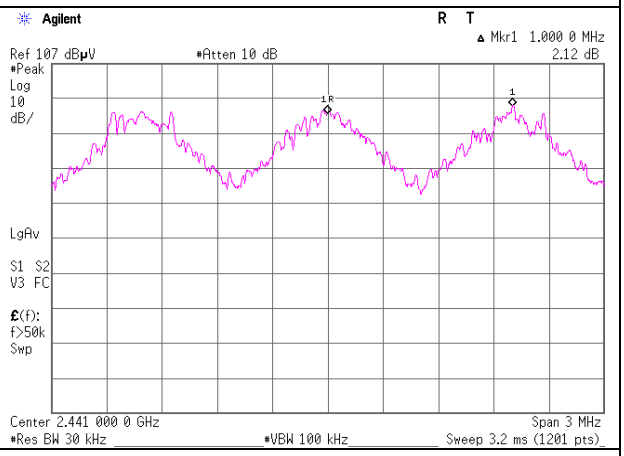


Carrier Frequency Separation

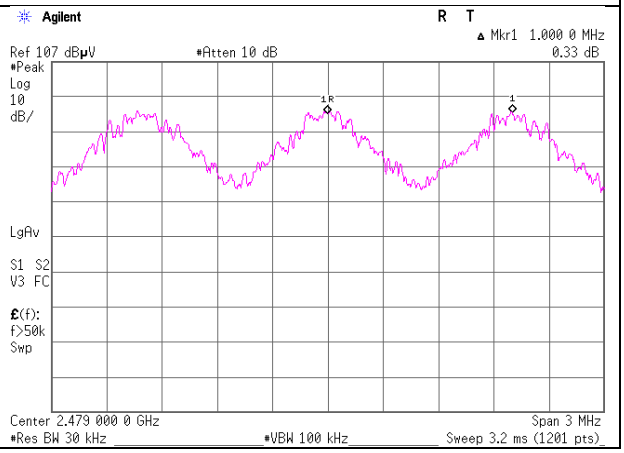
2402 MHz



2441 MHz



2480 MHz

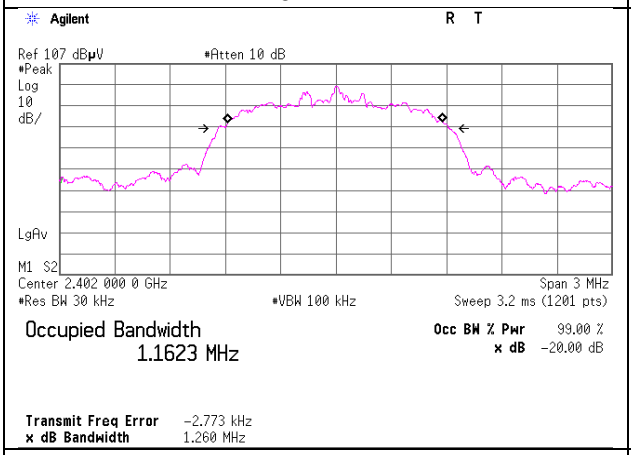


20dB Bandwidth and Carrier Frequency Separation

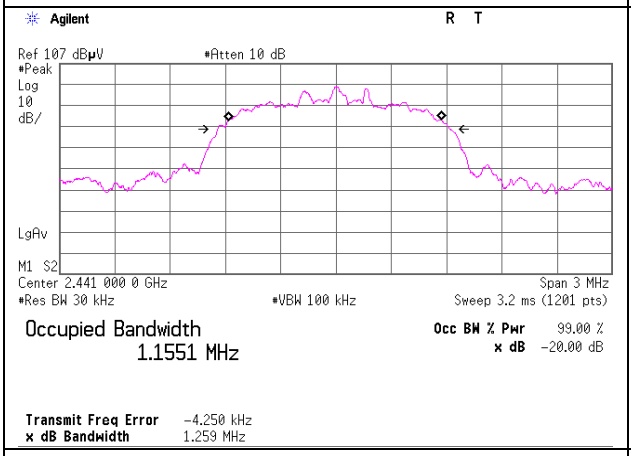
3DH5

20 dB Bandwidth

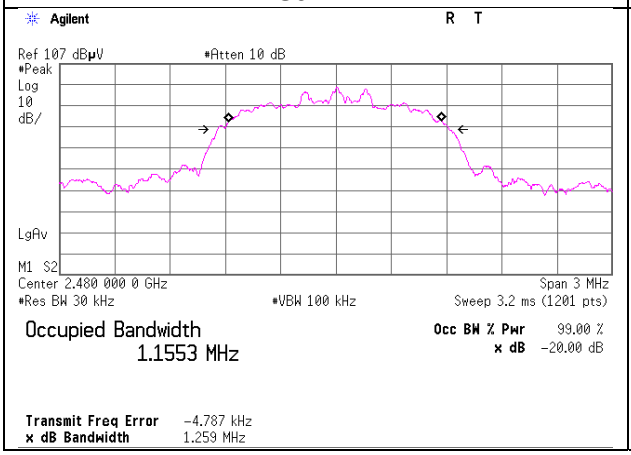
2402 MHz



2441 MHz

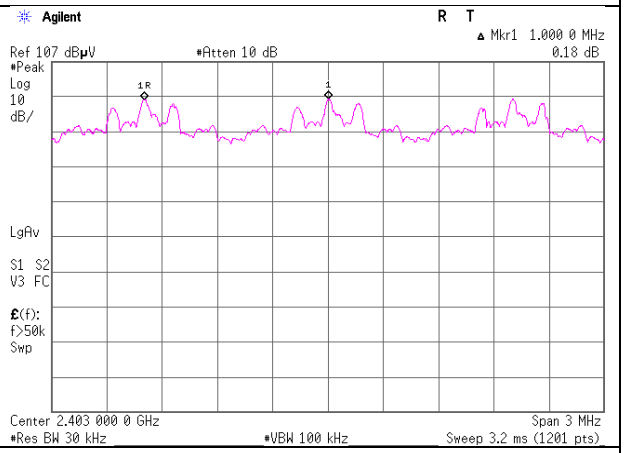


2480 MHz

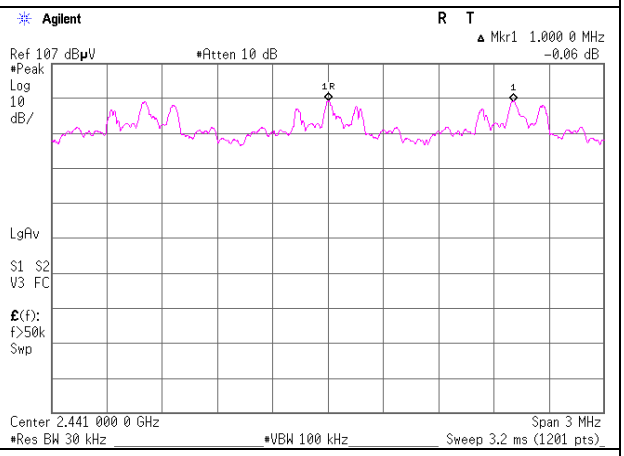


Carrier Frequency Separation

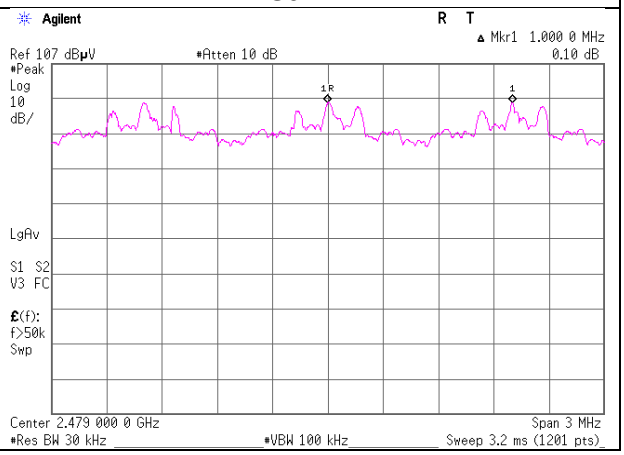
2402 MHz



2441 MHz



2480 MHz



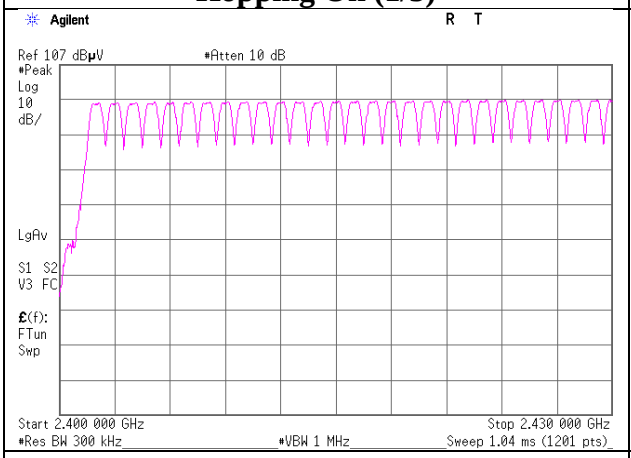
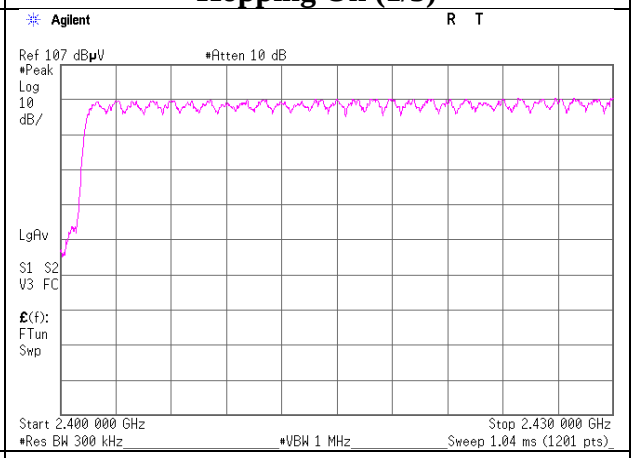
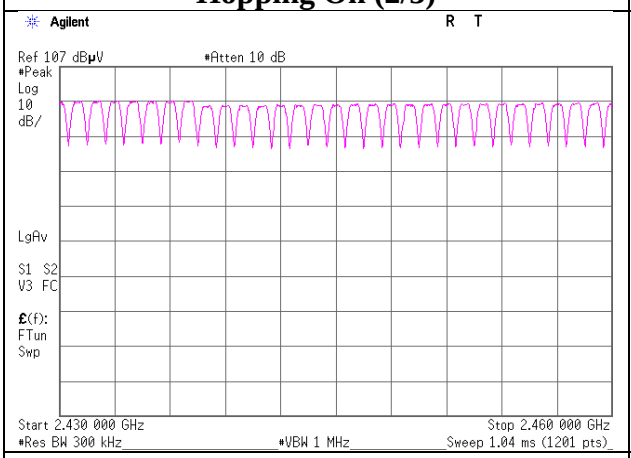
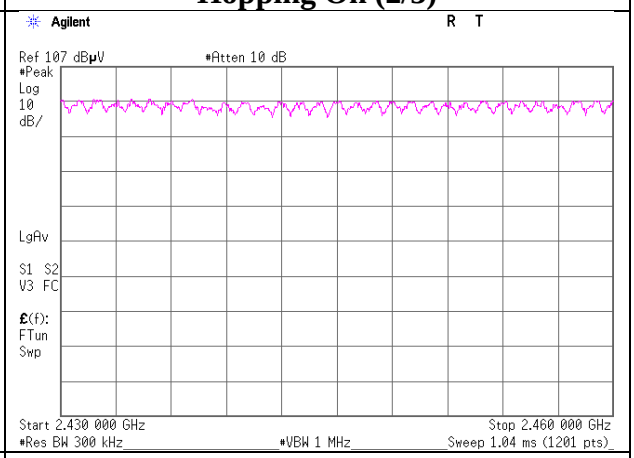
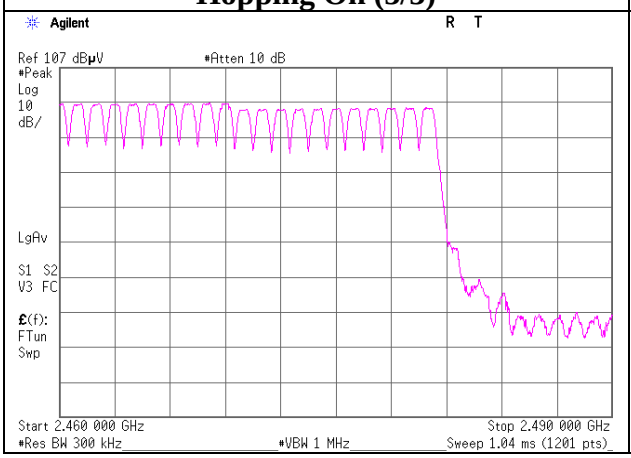
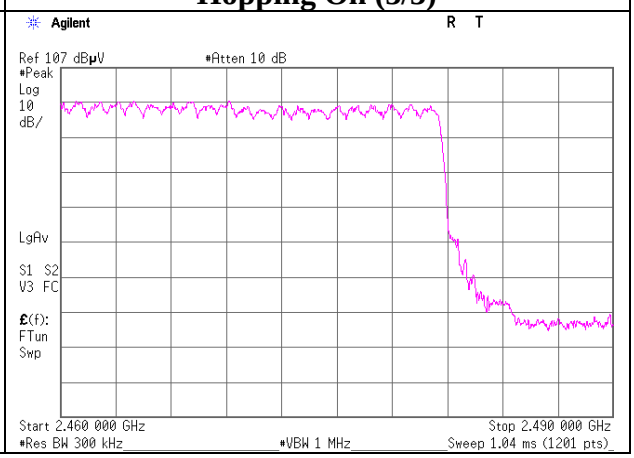
Number of Hopping Frequency

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.

Number of Hopping Frequency

DH5	3DH5
Hopping On (1/3)	**Hopping On (1/3)**
	
Hopping On (2/3)	**Hopping On (2/3)**
	
Hopping On (3/3)	**Hopping On (3/3)**
	

Dwell time

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.420	135	400
DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.688	279	400
DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.934	317	400
3DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.437	141	400
3DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.696	280	400
3DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.954	319	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

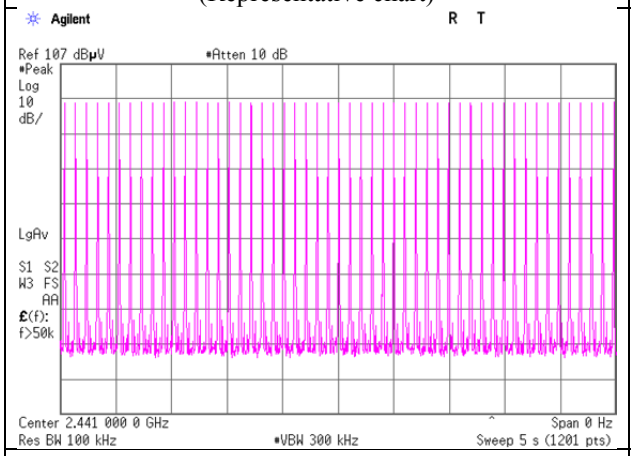
Mode	Sampling [times] 1	2	3	4	5	Average [times]
DH1	51	51	51	51	51	51
DH3	26	26	26	26	26	26
DH5	17	17	17	17	17	17
3DH1	51	51	51	51	51	51
3DH3	26	26	26	26	26	26
3DH5	17	17	17	17	17	17

Sample Calculation
Average = Summation (Sampling 1 to 5) / 5

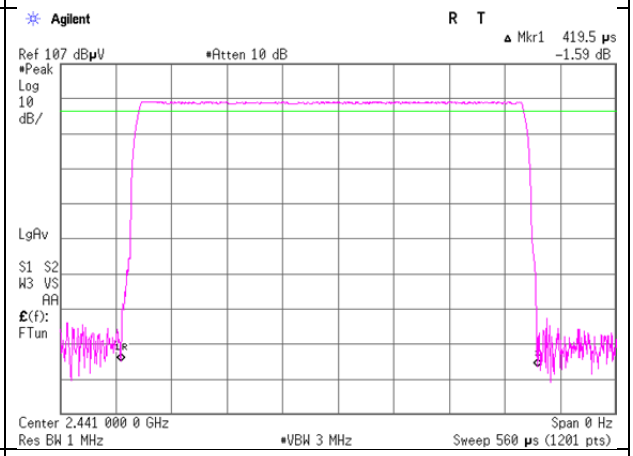
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless of packet size. This is confirmed in the test report for N = 79.

Dwell time

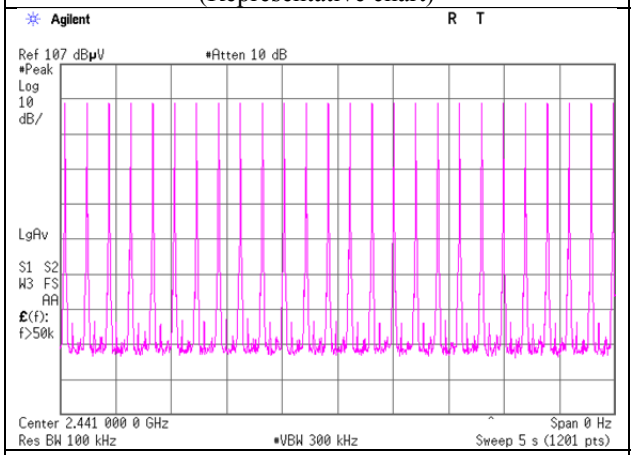
DH1 (1/2)
(Representative chart)



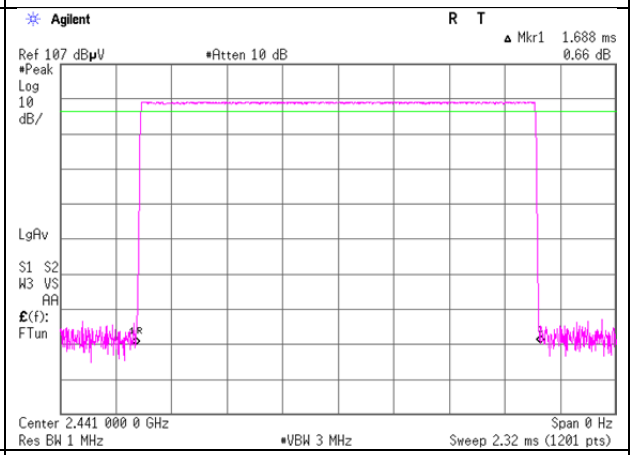
DH1 (2/2)



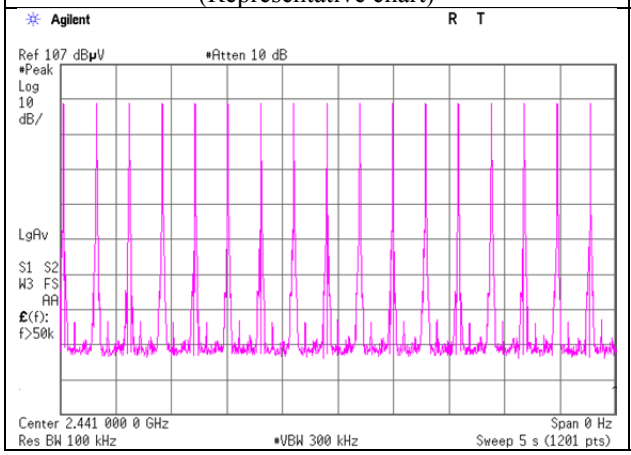
DH3 (1/2)
(Representative chart)



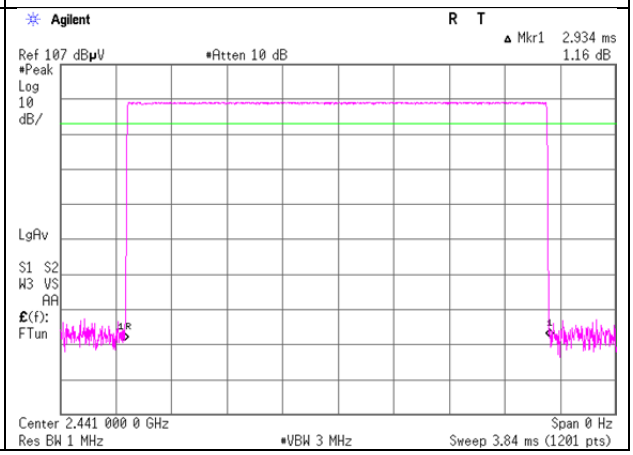
DH3 (2/2)



DH5 (1/2)
(Representative chart)

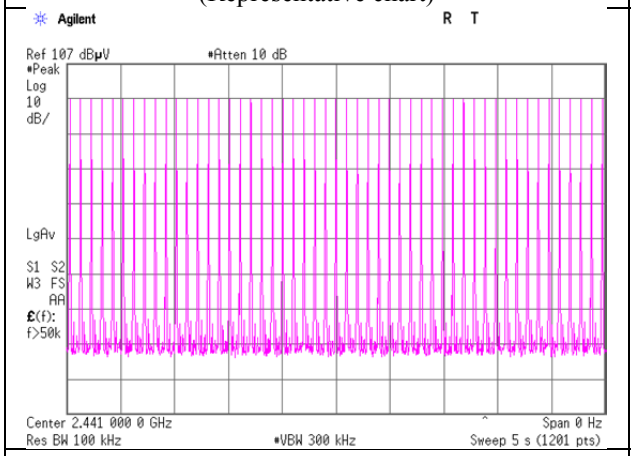


DH5 (2/2)

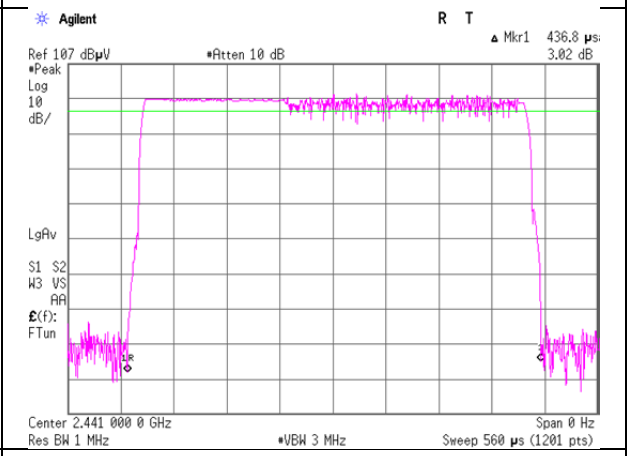


Dwell time

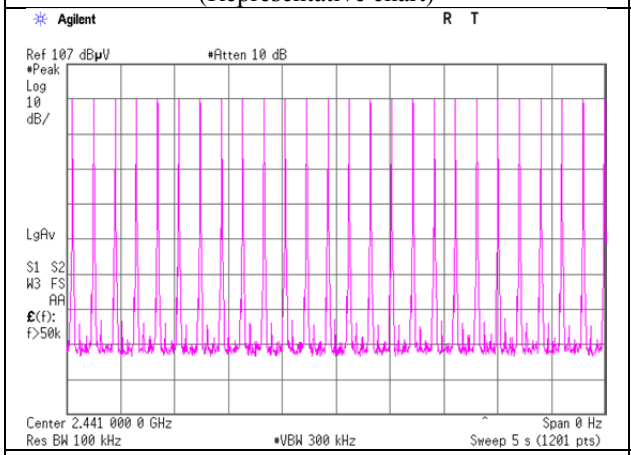
3DH1 (1/2)
(Representative chart)



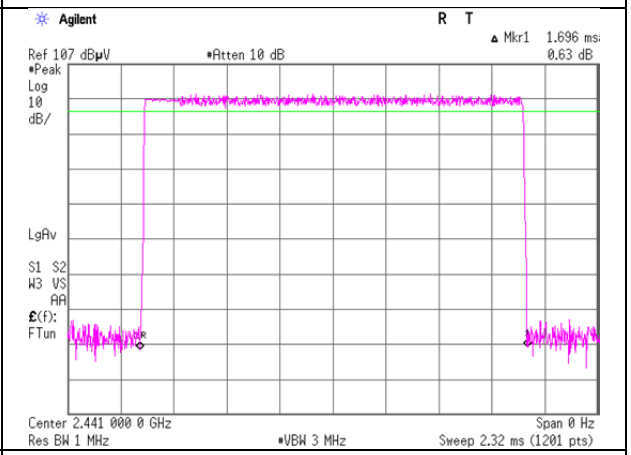
3DH1 (2/2)



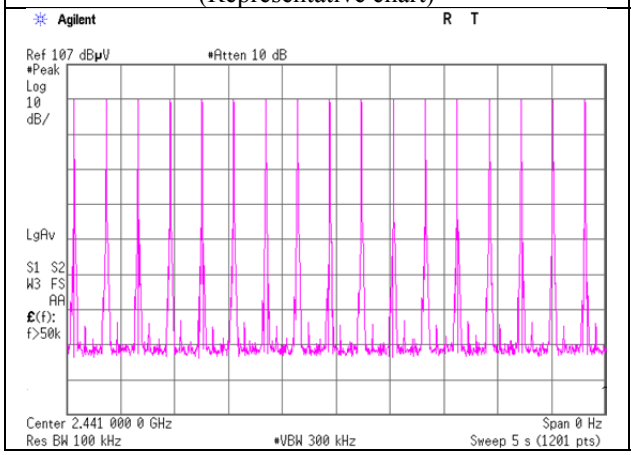
3DH3 (1/2)
(Representative chart)



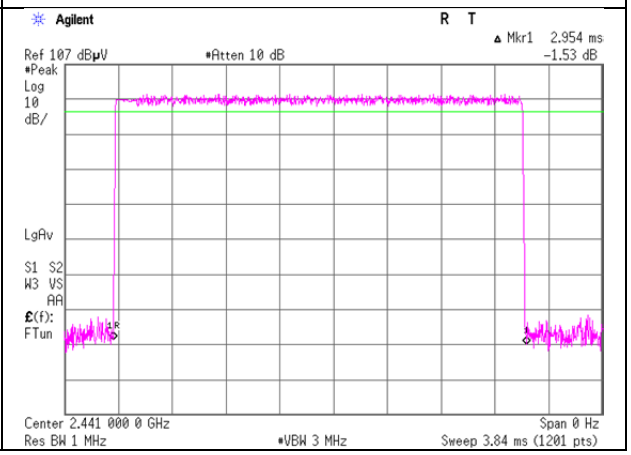
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
DH5	2402.0	-10.85	1.51	10.00	0.66	1.16	20.96	125	20.30
DH5	2441.0	-10.88	1.52	10.00	0.64	1.16	20.96	125	20.32
DH5	2480.0	-11.30	1.53	10.00	0.23	1.05	20.96	125	20.73
2DH5	2402.0	-8.85	1.51	10.00	2.66	1.85	20.96	125	18.30
2DH5	2441.0	-8.78	1.52	10.00	2.74	1.88	20.96	125	18.22
2DH5	2480.0	-9.10	1.53	10.00	2.43	1.75	20.96	125	18.53
3DH5	2402.0	-8.30	1.51	10.00	3.21	2.09	20.96	125	17.75
3DH5	2441.0	-8.21	1.52	10.00	3.31	2.14	20.96	125	17.65
3DH5	2480.0	-8.56	1.53	10.00	2.97	1.98	20.96	125	17.99

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

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

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power) [dBm]	[mW]
DH5	2402.0	-12.48	1.51	10.00	-0.97	0.80
DH5	2441.0	-12.50	1.52	10.00	-0.98	0.80
DH5	2480.0	-12.95	1.53	10.00	-1.42	0.72
2DH5	2402.0	-12.80	1.51	10.00	-1.29	0.74
2DH5	2441.0	-12.73	1.52	10.00	-1.21	0.76
2DH5	2480.0	-13.06	1.53	10.00	-1.53	0.70
3DH5	2402.0	-12.79	1.51	10.00	-1.28	0.74
3DH5	2441.0	-12.70	1.52	10.00	-1.18	0.76
3DH5	2480.0	-13.00	1.53	10.00	-1.47	0.71

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

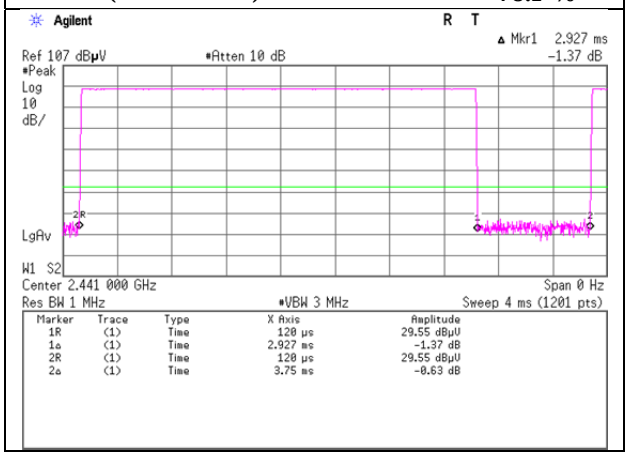
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off

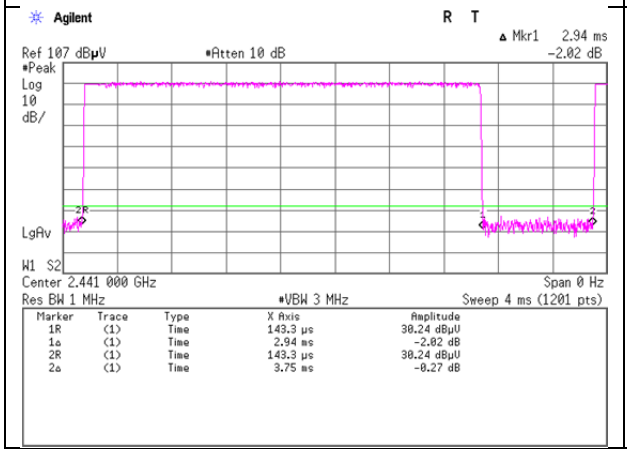
DH5

Tx on / (Tx on + Tx off) =	**0.781**
Tx on / (Tx on + Tx off) * 100 =	**78.1 %**



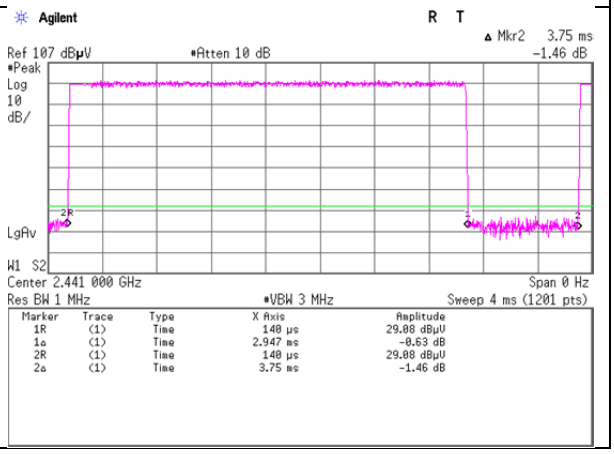
2DH5

Tx on / (Tx on + Tx off) =	**0.784**
Tx on / (Tx on + Tx off) * 100 =	**78.4 %**



3DH5

Tx on / (Tx on + Tx off) =	**0.786**
Tx on / (Tx on + Tx off) * 100 =	**78.6 %**



Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	10990297H	
Date	October 10, 2015	October 12, 2015
Temperature / Humidity	22 deg. C / 56 % RH	20 deg. C / 59 % RH
Engineer	Kazuya Yoshioka (Above 1GHz)	Yuta Moriya (Below 1GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	104.001	QP	26.4	10.7	8.1	32.1	13.1	43.5	30.4	
Hori	116.002	QP	33.4	12.2	8.3	32.1	21.8	43.5	21.7	
Hori	119.820	QP	24.7	12.7	8.3	32.0	13.7	43.5	29.8	
Hori	123.984	QP	25.7	13.1	8.4	32.0	15.2	43.5	28.3	
Hori	219.919	QP	22.4	16.8	9.3	31.8	16.7	46.0	29.3	
Hori	265.370	QP	23.7	18.0	9.6	31.8	19.5	46.0	26.5	
Hori	2390.000	PK	41.5	27.9	3.3	32.1	40.6	73.9	33.3	
Hori	2557.751	PK	50.3	28.1	3.4	32.1	49.7	73.9	24.2	
Hori	4804.000	PK	49.5	32.8	5.7	31.3	56.7	73.9	17.2	
Hori	7206.000	PK	42.6	36.8	6.9	32.6	53.7	73.9	20.2	Floor Noise
Hori	9608.000	PK	43.1	38.1	7.6	32.6	56.2	73.9	17.7	Floor Noise
Hori	2390.000	AV	28.5	27.9	3.3	32.1	27.6	53.9	26.3	
Hori	2557.751	AV	43.4	28.1	3.4	32.1	42.8	53.9	11.1	
Hori	4804.000	AV	41.4	32.8	5.7	31.3	48.6	53.9	5.3	
Hori	7206.000	AV	29.5	36.8	6.9	32.6	40.6	53.9	13.3	Floor Noise
Hori	9608.000	AV	30.4	38.1	7.6	32.6	43.5	53.9	10.4	Floor Noise
Vert	104.001	QP	28.7	10.7	8.1	32.1	15.4	43.5	28.1	
Vert	116.002	QP	33.8	12.2	8.3	32.1	22.2	43.5	21.3	
Vert	119.820	QP	24.7	12.7	8.3	32.0	13.7	43.5	29.8	
Vert	123.984	QP	27.0	13.1	8.4	32.0	16.5	43.5	27.0	
Vert	219.919	QP	25.5	16.8	9.3	31.8	19.8	46.0	26.2	
Vert	265.370	QP	22.4	18.0	9.6	31.8	18.2	46.0	27.8	
Vert	2390.000	PK	41.3	27.9	3.3	32.1	40.4	73.9	33.5	
Vert	2557.991	PK	47.8	28.1	3.4	32.1	47.2	73.9	26.7	
Vert	4804.000	PK	45.7	32.8	5.7	31.3	52.9	73.9	21.0	
Vert	7206.000	PK	42.8	36.8	6.9	32.6	53.9	73.9	20.0	Floor Noise
Vert	9608.000	PK	43.4	38.1	7.6	32.6	56.5	73.9	17.4	Floor Noise
Vert	2390.000	AV	28.3	27.9	3.3	32.1	27.4	53.9	26.5	
Vert	2557.991	AV	42.0	28.1	3.4	32.1	41.4	53.9	12.5	
Vert	4804.000	AV	38.3	32.8	5.7	31.3	45.5	53.9	8.4	
Vert	7206.000	AV	29.5	36.8	6.9	32.6	40.6	53.9	13.3	Floor Noise
Vert	9608.000	AV	30.4	38.1	7.6	32.6	43.5	53.9	10.4	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+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
26.5 GHz - 40 GHz 20log (3.0 m / 0.5 m) = 15.6 dB

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	98.4	28.0	3.3	32.1	97.6	-	-	Carrier
Hori	2400.000	PK	50.2	28.0	3.3	32.1	49.4	77.6	28.2	
Vert	2402.000	PK	98.2	28.0	3.3	32.1	97.4	-	-	Carrier
Vert	2400.000	PK	47.3	28.0	3.3	32.1	46.5	77.4	30.9	

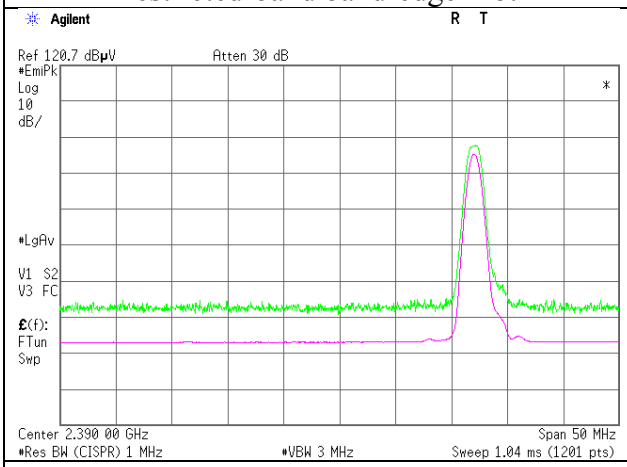
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10990297H
Date	October 10, 2015
Temperature / Humidity	22 deg. C / 56 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off, DH5 2402 MHz

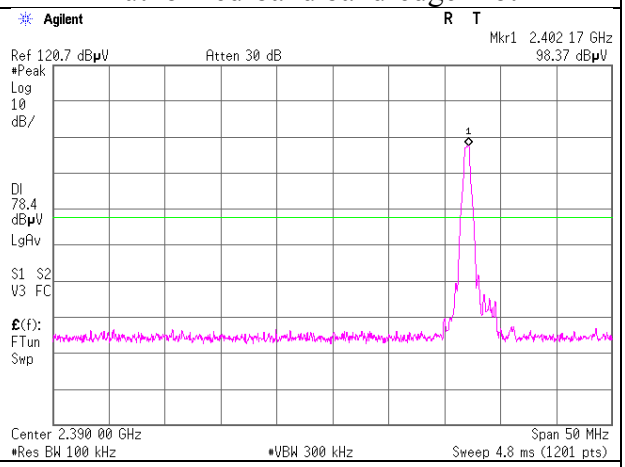
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

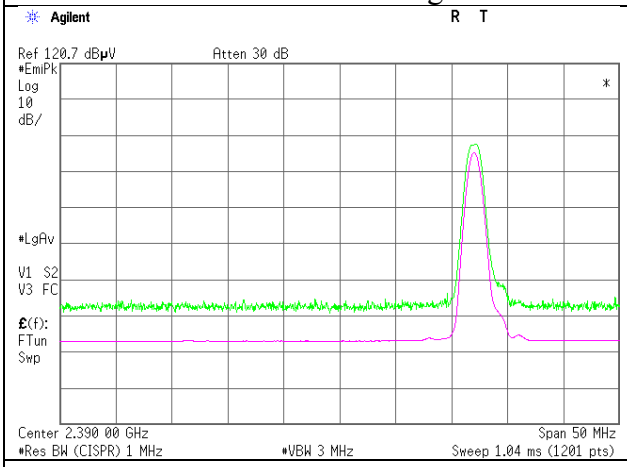
Authorized-band band-edge Plot



20dBc Plot

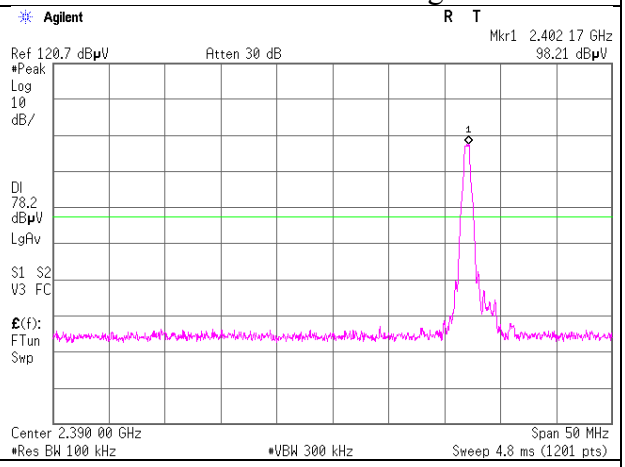
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	10990297H	
Date	October 10, 2015	October 12, 2015
Temperature / Humidity	22 deg. C / 56 % RH	20 deg. C / 59 % RH
Engineer	Kazuya Yoshioka (Above 1GHz)	Yuta Moriya (Below 1GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	104.001	QP	26.3	10.7	8.1	32.1	13.0	43.5	30.5	
Hori	116.002	QP	30.6	12.2	8.3	32.1	19.0	43.5	24.5	
Hori	119.820	QP	24.2	12.7	8.3	32.0	13.2	43.5	30.3	
Hori	123.982	QP	26.0	13.1	8.4	32.0	15.5	43.5	28.0	
Hori	228.033	QP	22.6	16.9	9.3	31.8	17.0	46.0	29.0	
Hori	265.355	QP	24.0	18.0	9.6	31.8	19.8	46.0	26.2	
Hori	2597.093	PK	49.5	28.1	3.4	32.0	49.0	73.9	24.9	
Hori	4882.000	PK	46.4	33.1	5.8	31.3	54.0	73.9	19.9	
Hori	7323.000	PK	42.2	36.8	6.9	32.6	53.3	73.9	20.6	Floor Noise
Hori	9764.000	PK	43.4	38.2	7.7	32.7	56.6	73.9	17.3	Floor Noise
Hori	2597.093	AV	44.4	28.1	3.4	32.0	43.9	53.9	10.0	
Hori	4882.000	AV	39.6	33.1	5.8	31.3	47.2	53.9	6.7	
Hori	7323.000	AV	30.1	36.8	6.9	32.6	41.2	53.9	12.7	Floor Noise
Hori	9764.000	AV	31.6	38.2	7.7	32.7	44.8	53.9	9.1	Floor Noise
Vert	104.001	QP	28.5	10.7	8.1	32.1	15.2	43.5	28.3	
Vert	116.002	QP	30.5	12.2	8.3	32.1	18.9	43.5	24.6	
Vert	119.820	QP	28.2	12.7	8.3	32.0	17.2	43.5	26.3	
Vert	123.982	QP	27.0	13.1	8.4	32.0	16.5	43.5	27.0	
Vert	228.033	QP	25.2	16.9	9.3	31.8	19.6	46.0	26.4	
Vert	265.355	QP	22.5	18.0	9.6	31.8	18.3	46.0	27.7	
Vert	2596.891	PK	46.3	28.1	3.4	32.0	45.8	73.9	28.1	
Vert	4882.000	PK	45.3	33.1	5.8	31.3	52.9	73.9	21.0	
Vert	7323.000	PK	42.0	36.8	6.9	32.6	53.1	73.9	20.8	Floor Noise
Vert	9764.000	PK	43.3	38.2	7.7	32.7	56.5	73.9	17.4	Floor Noise
Vert	2596.891	AV	40.4	28.1	3.4	32.0	39.9	53.9	14.0	
Vert	4882.000	AV	36.7	33.1	5.8	31.3	44.3	53.9	9.6	
Vert	7323.000	AV	30.1	36.8	6.9	32.6	41.2	53.9	12.7	Floor Noise
Vert	9764.000	AV	31.6	38.2	7.7	32.7	44.8	53.9	9.1	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+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
26.5 GHz - 40 GHz 20log (3.0 m / 0.5 m) = 15.6 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	10990297H	
Date	October 10, 2015	October 12, 2015
Temperature / Humidity	22 deg. C / 56 % RH	20 deg. C / 59 % RH
Engineer	Kazuya Yoshioka (Above 1GHz)	Yuta Moriya (Below 1GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	99.994	QP	28.2	10.1	8.1	32.1	14.3	43.5	29.2	
Hori	111.991	QP	29.7	11.7	8.2	32.1	17.5	43.5	26.0	
Hori	115.987	QP	31.9	12.2	8.3	32.1	20.3	43.5	23.2	
Hori	119.980	QP	28.2	12.7	8.3	32.0	17.2	43.5	26.3	
Hori	124.008	QP	24.4	13.1	8.4	32.0	13.9	43.5	29.6	
Hori	228.110	QP	22.1	16.9	9.3	31.8	16.5	46.0	29.5	
Hori	2483.500	PK	48.6	28.1	3.4	32.1	48.0	73.9	25.9	
Hori	2636.030	PK	48.5	28.1	3.5	32.0	48.1	73.9	25.8	
Hori	4960.000	PK	47.7	33.4	5.8	31.2	55.7	73.9	18.2	
Hori	7440.000	PK	41.8	36.8	6.9	32.7	52.8	73.9	21.1	Floor Noise
Hori	9920.000	PK	43.7	38.3	7.7	32.8	56.9	73.9	17.0	Floor Noise
Hori	2483.500	AV	40.1	28.1	3.4	32.1	39.5	53.9	14.4	
Hori	2636.030	AV	41.8	28.1	3.5	32.0	41.4	53.9	12.5	
Hori	4960.000	AV	39.7	33.4	5.8	31.2	47.7	53.9	6.2	
Hori	7440.000	AV	28.4	36.8	6.9	32.7	39.4	53.9	14.5	Floor Noise
Hori	9920.000	AV	29.9	38.3	7.7	32.8	43.1	53.9	10.8	Floor Noise
Vert	99.994	QP	28.9	10.1	8.1	32.1	15.0	43.5	28.5	
Vert	111.991	QP	30.0	11.7	8.2	32.1	17.8	43.5	25.7	
Vert	115.987	QP	31.7	12.2	8.3	32.1	20.1	43.5	23.4	
Vert	119.980	QP	28.9	12.7	8.3	32.0	17.9	43.5	25.6	
Vert	124.008	QP	25.0	13.1	8.4	32.0	14.5	43.5	29.0	
Vert	228.110	QP	24.3	16.9	9.3	31.8	18.7	46.0	27.3	
Vert	2483.500	PK	46.7	28.1	3.4	32.1	46.1	73.9	27.8	
Vert	2636.095	PK	46.3	28.1	3.5	32.0	45.9	73.9	28.0	
Vert	4960.000	PK	45.5	33.4	5.8	31.2	53.5	73.9	20.4	
Vert	7440.000	PK	42.0	36.8	6.9	32.7	53.0	73.9	20.9	Floor Noise
Vert	9920.000	PK	44.0	38.3	7.7	32.8	57.2	73.9	16.7	Floor Noise
Vert	2483.500	AV	39.1	28.1	3.4	32.1	38.5	53.9	15.4	
Vert	2636.095	AV	38.1	28.1	3.5	32.0	37.7	53.9	16.2	
Vert	4960.000	AV	36.6	33.4	5.8	31.2	44.6	53.9	9.3	
Vert	7440.000	AV	28.4	36.8	6.9	32.7	39.4	53.9	14.5	Floor Noise
Vert	9920.000	AV	29.9	38.3	7.7	32.8	43.1	53.9	10.8	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+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).

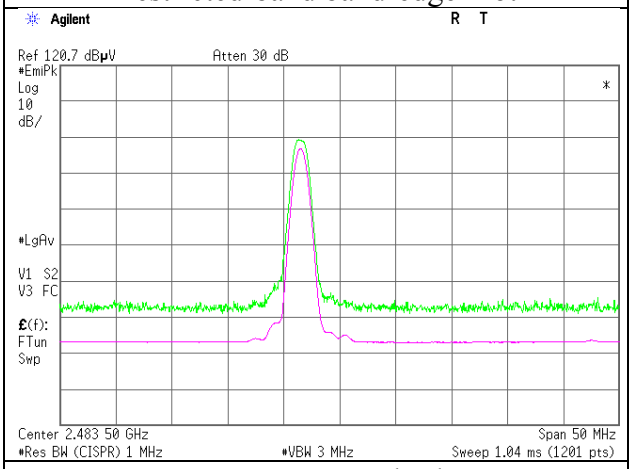
Distance factor: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB
26.5 GHz - 40 GHz 20log (3.0 m / 0.5 m) = 15.6 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10990297H
Date	October 10, 2015
Temperature / Humidity	22 deg. C / 56 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

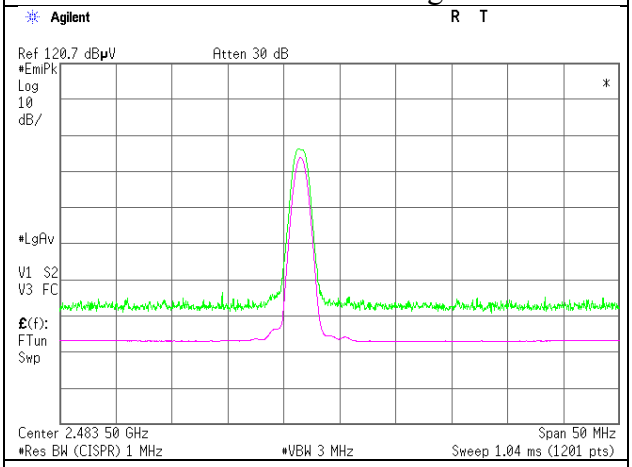
Restricted-band band-edge Plot



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

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	10990297H	
Date	October 10, 2015	October 12, 2015
Temperature / Humidity	22 deg. C / 56 % RH	20 deg. C / 59 % RH
Engineer	Kazuya Yoshioka (Above 1GHz)	Yuta Moriya (Below 1GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	99.882	QP	28.6	10.1	8.1	32.1	14.7	43.5	28.8	
Hori	111.891	QP	30.4	11.7	8.2	32.1	18.2	43.5	25.3	
Hori	115.933	QP	33.1	12.2	8.3	32.1	21.5	43.5	22.0	
Hori	120.152	QP	29.5	12.7	8.3	32.0	18.5	43.5	25.0	
Hori	124.144	QP	25.5	13.1	8.4	32.0	15.0	43.5	28.5	
Hori	220.231	QP	23.4	16.8	9.3	31.8	17.7	46.0	28.3	
Hori	2390.000	PK	41.1	27.9	3.3	32.1	40.2	73.9	33.7	
Hori	2558.115	PK	50.3	28.1	3.4	32.1	49.7	73.9	24.2	
Hori	4804.000	PK	48.1	32.8	5.7	31.3	55.3	73.9	18.6	
Hori	7206.000	PK	42.8	36.8	6.9	32.6	53.9	73.9	20.0	Floor Noise
Hori	9608.000	PK	43.6	38.1	7.6	32.6	56.7	73.9	17.2	Floor Noise
Hori	2390.000	AV	28.5	27.9	3.3	32.1	27.6	53.9	26.3	
Hori	2558.115	AV	40.5	28.1	3.4	32.1	39.9	53.9	14.0	
Hori	4804.000	AV	37.8	32.8	5.7	31.3	45.0	53.9	8.9	
Hori	7206.000	AV	29.5	36.8	6.9	32.6	40.6	53.9	13.3	Floor Noise
Hori	9608.000	AV	30.5	38.1	7.6	32.6	43.6	53.9	10.3	Floor Noise
Vert	99.882	QP	29.1	10.1	8.1	32.1	15.2	43.5	28.3	
Vert	111.891	QP	31.4	11.7	8.2	32.1	19.2	43.5	24.3	
Vert	115.933	QP	33.5	12.2	8.3	32.1	21.9	43.5	21.6	
Vert	120.152	QP	30.1	12.7	8.3	32.0	19.1	43.5	24.4	
Vert	124.144	QP	25.7	13.1	8.4	32.0	15.2	43.5	28.3	
Vert	220.231	QP	25.4	16.8	9.3	31.8	19.7	46.0	26.3	
Vert	2390.000	PK	41.4	27.9	3.3	32.1	40.5	73.9	33.4	
Vert	2557.756	PK	46.0	28.1	3.4	32.1	45.4	73.9	28.5	
Vert	4804.000	PK	44.1	32.8	5.7	31.3	51.3	73.9	22.6	
Vert	7206.000	PK	42.9	36.8	6.9	32.6	54.0	73.9	19.9	Floor Noise
Vert	9608.000	PK	43.8	38.1	7.6	32.6	56.9	73.9	17.0	Floor Noise
Vert	2390.000	AV	29.9	27.9	3.3	32.1	29.0	53.9	24.9	
Vert	2557.756	AV	36.1	28.1	3.4	32.1	35.5	53.9	18.4	
Vert	4804.000	AV	32.5	32.8	5.7	31.3	39.7	53.9	14.2	
Vert	7206.000	AV	29.5	36.8	6.9	32.6	40.6	53.9	13.3	Floor Noise
Vert	9608.000	AV	30.5	38.1	7.6	32.6	43.6	53.9	10.3	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+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
26.5 GHz - 40 GHz 20log (3.0 m / 0.5 m) = 15.6 dB

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	97.4	28.0	3.3	32.1	96.6	-	-	Carrier
Hori	2400.000	PK	55.4	28.0	3.3	32.1	54.6	76.6	22.0	
Vert	2402.000	PK	93.7	28.0	3.3	32.1	92.9	-	-	Carrier
Vert	2400.000	PK	46.4	28.0	3.3	32.1	45.6	72.9	27.3	

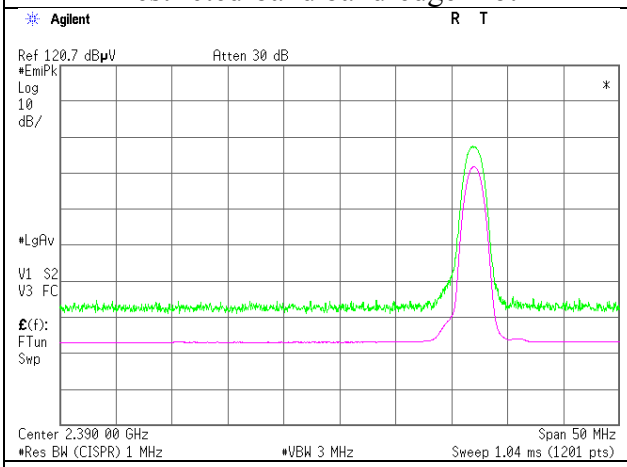
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10990297H
Date	October 10, 2015
Temperature / Humidity	22 deg. C / 56 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off, 3DH5 2402 MHz

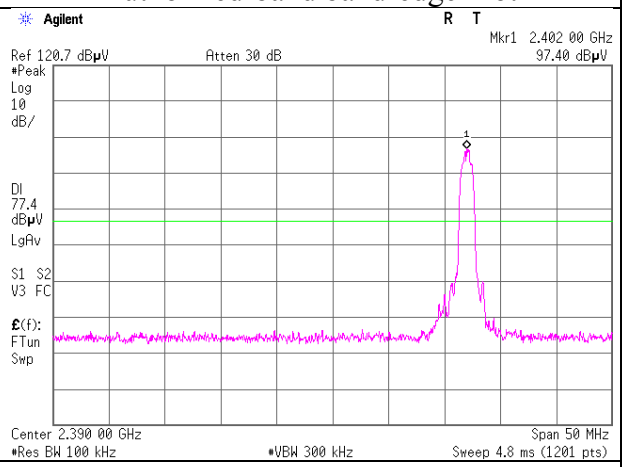
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

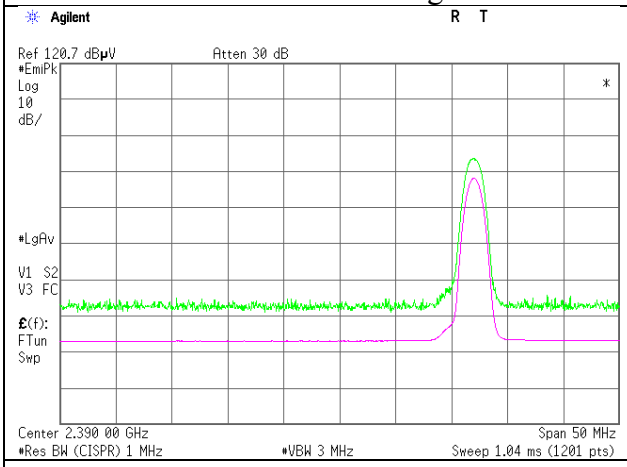
Authorized-band band-edge Plot



20dBc Plot

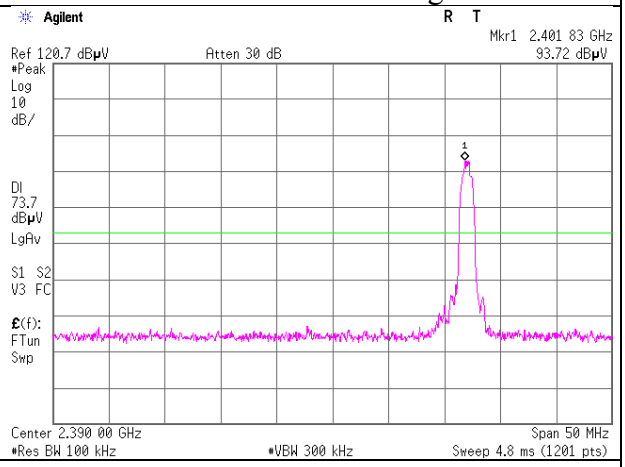
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	10990297H	
Date	October 10, 2015	October 12, 2015
Temperature / Humidity	22 deg. C / 56 % RH	20 deg. C / 59 % RH
Engineer	Kazuya Yoshioka (Above 1GHz)	Yuta Moriya (Below 1GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz	

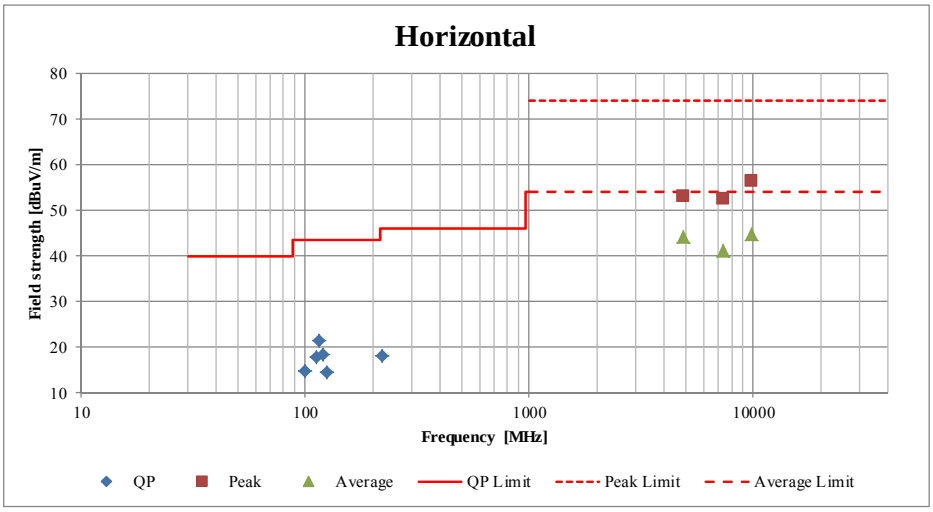
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	99.977	QP	28.7	10.1	8.1	32.1	14.8	43.5	28.7	
Hori	111.973	QP	30.1	11.7	8.2	32.1	17.9	43.5	25.6	
Hori	115.991	QP	33.0	12.2	8.3	32.1	21.4	43.5	22.1	
Hori	120.112	QP	29.3	12.7	8.3	32.0	18.3	43.5	25.2	
Hori	124.133	QP	25.0	13.1	8.4	32.0	14.5	43.5	29.0	
Hori	220.234	QP	23.8	16.8	9.3	31.8	18.1	46.0	27.9	
Hori	4882.000	PK	45.5	33.1	5.8	31.3	53.1	73.9	20.8	
Hori	7323.000	PK	41.3	36.8	6.9	32.6	52.4	73.9	21.5	Floor Noise
Hori	9764.000	PK	43.1	38.2	7.7	32.7	56.3	73.9	17.6	Floor Noise
Hori	4882.000	AV	36.5	33.1	5.8	31.3	44.1	53.9	9.8	
Hori	7323.000	AV	30.0	36.8	6.9	32.6	41.1	53.9	12.8	Floor Noise
Hori	9764.000	AV	31.6	38.2	7.7	32.7	44.8	53.9	9.1	Floor Noise
Vert	99.977	QP	29.3	10.1	8.1	32.1	15.4	43.5	28.1	
Vert	111.973	QP	31.2	11.7	8.2	32.1	19.0	43.5	24.5	
Vert	115.991	QP	33.1	12.2	8.3	32.1	21.5	43.5	22.0	
Vert	120.112	QP	30.0	12.7	8.3	32.0	19.0	43.5	24.5	
Vert	124.133	QP	25.2	13.1	8.4	32.0	14.7	43.5	28.8	
Vert	220.234	QP	25.4	16.8	9.3	31.8	19.7	46.0	26.3	
Vert	4882.000	PK	44.1	33.1	5.8	31.3	51.7	73.9	22.2	
Vert	7323.000	PK	41.6	36.8	6.9	32.6	52.7	73.9	21.2	Floor Noise
Vert	9764.000	PK	43.4	38.2	7.7	32.7	56.6	73.9	17.3	Floor Noise
Vert	4882.000	AV	33.4	33.1	5.8	31.3	41.0	53.9	12.9	
Vert	7323.000	AV	30.0	36.8	6.9	32.6	41.1	53.9	12.8	Floor Noise
Vert	9764.000	AV	31.6	38.2	7.7	32.7	44.8	53.9	9.1	Floor Noise

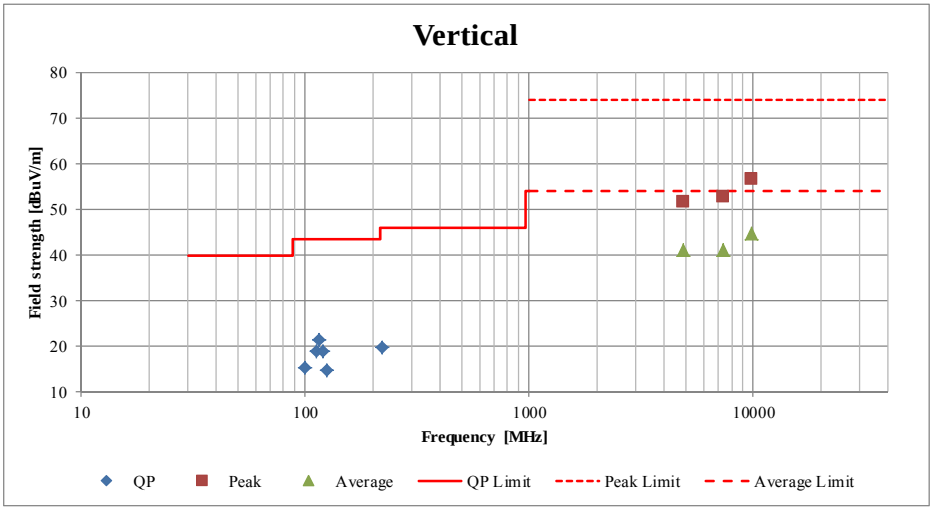
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	10990297H	
Date	October 10, 2015	October 12, 2015
Temperature / Humidity	22 deg. C / 56 % RH	20 deg. C / 59 % RH
Engineer	Kazuya Yoshioka (Above 1GHz)	Yuta Moriya (Below 1GHz)
Mode	Tx, Hopping Off, 3DH5 2441 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.4 Semi Anechoic Chamber	
Report No.	10990297H	
Date	October 10, 2015	October 12, 2015
Temperature / Humidity	22 deg. C / 56 % RH	20 deg. C / 59 % RH
Engineer	Kazuya Yoshioka (Above 1GHz)	Yuta Moriya (Below 1GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	99.988	QP	28.7	10.1	8.1	32.1	14.8	43.5	28.7	
Hori	111.989	QP	30.1	11.7	8.2	32.1	17.9	43.5	25.6	
Hori	115.991	QP	32.4	12.2	8.3	32.1	20.8	43.5	22.7	
Hori	120.044	QP	29.0	12.7	8.3	32.0	18.0	43.5	25.5	
Hori	124.112	QP	24.5	13.1	8.4	32.0	14.0	43.5	29.5	
Hori	220.221	QP	23.9	16.8	9.3	31.8	18.2	46.0	27.8	
Hori	2483.500	PK	48.5	28.1	3.4	32.1	47.9	73.9	26.0	
Hori	4960.000	PK	48.1	33.4	5.8	31.2	56.1	73.9	17.8	
Hori	7440.000	PK	41.8	36.8	6.9	32.7	52.8	73.9	21.1	Floor Noise
Hori	9920.000	PK	43.0	38.3	7.7	32.8	56.2	73.9	17.7	Floor Noise
Hori	2483.500	AV	37.9	28.1	3.4	32.1	37.3	53.9	16.6	
Hori	4960.000	AV	37.4	33.4	5.8	31.2	45.4	53.9	8.5	
Hori	7440.000	AV	28.4	36.8	6.9	32.7	39.4	53.9	14.5	Floor Noise
Hori	9920.000	AV	29.9	38.3	7.7	32.8	43.1	53.9	10.8	Floor Noise
Vert	99.988	QP	29.3	10.1	8.1	32.1	15.4	43.5	28.1	
Vert	111.989	QP	31.2	11.7	8.2	32.1	19.0	43.5	24.5	
Vert	115.991	QP	32.9	12.2	8.3	32.1	21.3	43.5	22.2	
Vert	120.044	QP	29.7	12.7	8.3	32.0	18.7	43.5	24.8	
Vert	124.112	QP	25.1	13.1	8.4	32.0	14.6	43.5	28.9	
Vert	220.221	QP	25.2	16.8	9.3	31.8	19.5	46.0	26.5	
Vert	2483.500	PK	46.6	28.1	3.4	32.1	46.0	73.9	27.9	
Vert	4960.000	PK	44.6	33.4	5.8	31.2	52.6	73.9	21.3	
Vert	7440.000	PK	42.0	36.8	6.9	32.7	53.0	73.9	20.9	Floor Noise
Vert	9920.000	PK	43.3	38.3	7.7	32.8	56.5	73.9	17.4	Floor Noise
Vert	2483.500	AV	37.7	28.1	3.4	32.1	37.1	53.9	16.8	
Vert	4960.000	AV	33.7	33.4	5.8	31.2	41.7	53.9	12.2	
Vert	7440.000	AV	28.4	36.8	6.9	32.7	39.4	53.9	14.5	Floor Noise
Vert	9920.000	AV	29.9	38.3	7.7	32.8	43.1	53.9	10.8	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+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).

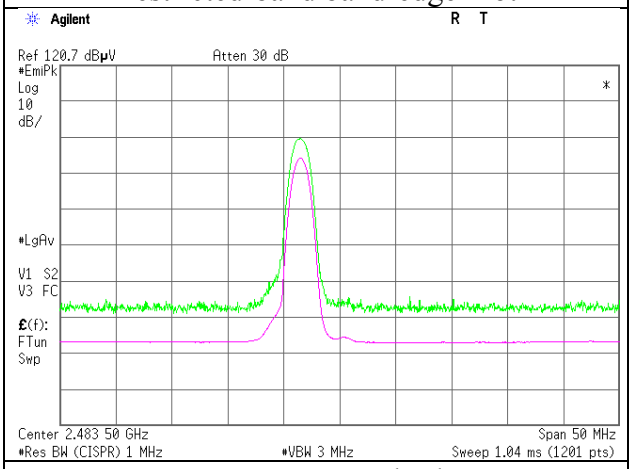
Distance factor: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB
26.5 GHz - 40 GHz 20log (3.0 m / 0.5 m) = 15.6 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10990297H
Date	October 10, 2015
Temperature / Humidity	22 deg. C / 56 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

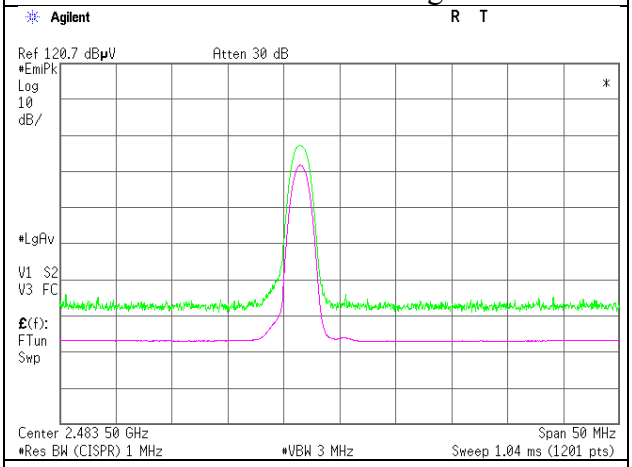
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

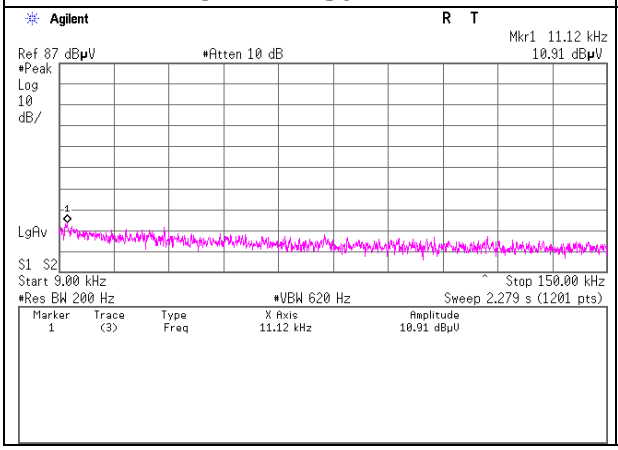
* Final result of restricted band edge was shown in tabular data.

Conducted Spurious Emission

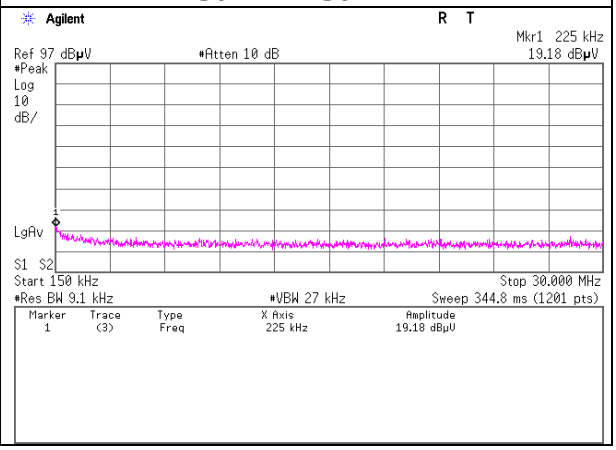
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2402 MHz

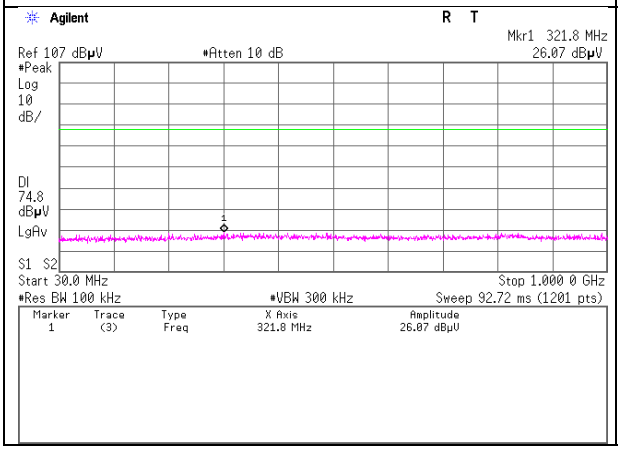
9 kHz - 150 kHz



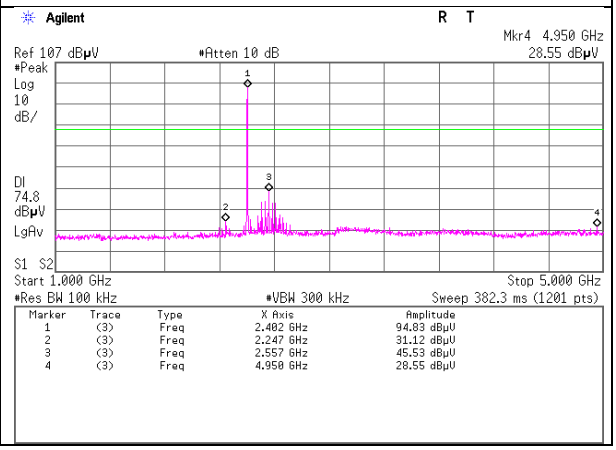
150 kHz - 30 MHz



30 MHz – 1 GHz



1 GHz – 5 GHz

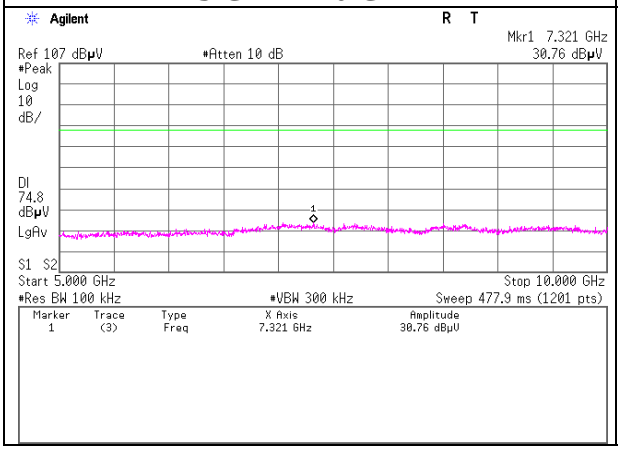


Conducted Spurious Emission

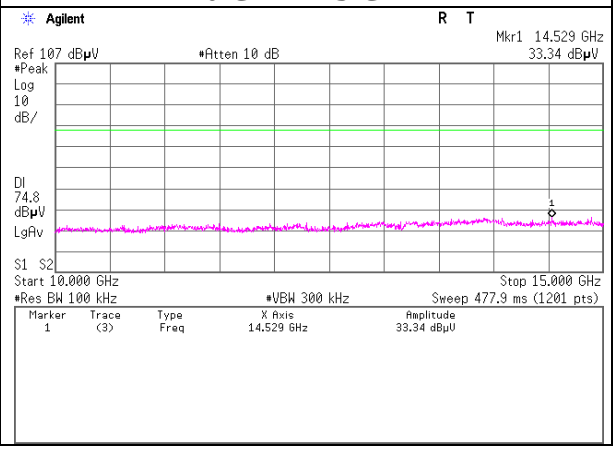
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2402 MHz

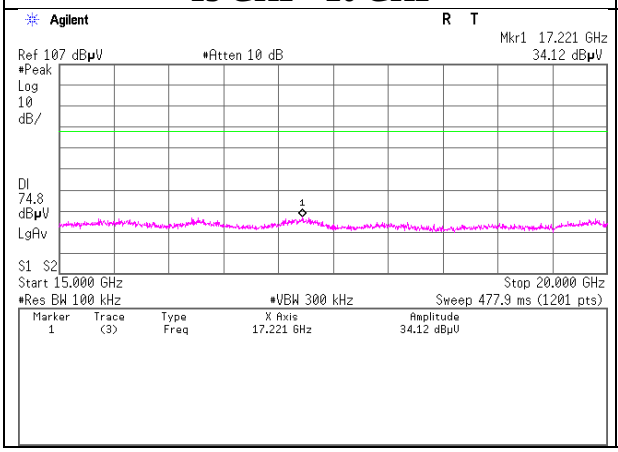
5 GHz – 10 GHz



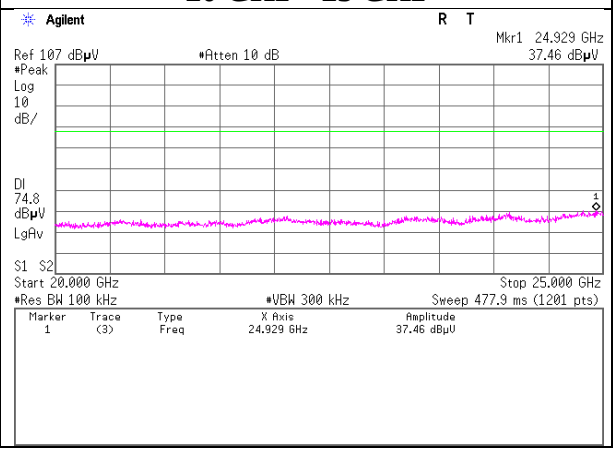
10 GHz - 15 GHz



15 GHz – 20 GHz



20 GHz – 25 GHz

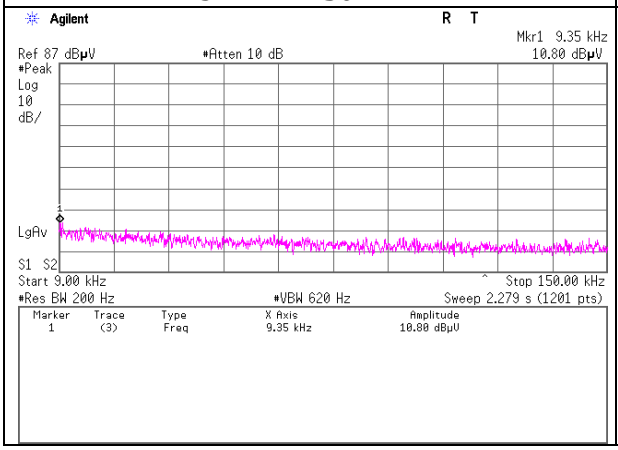


Conducted Spurious Emission

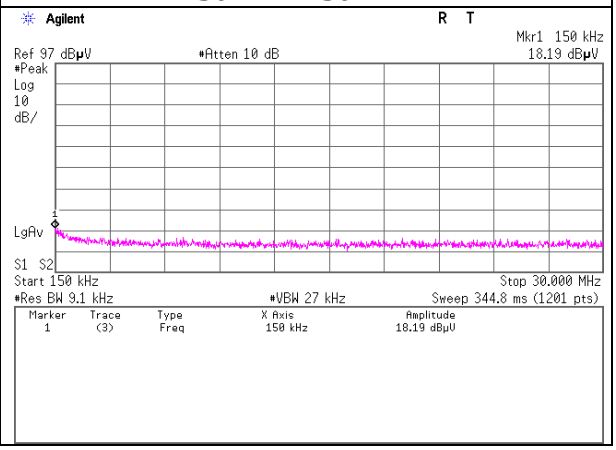
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2441 MHz

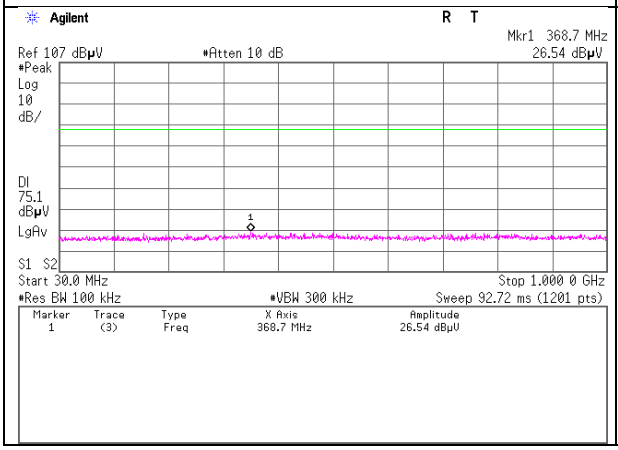
9 kHz - 150 kHz



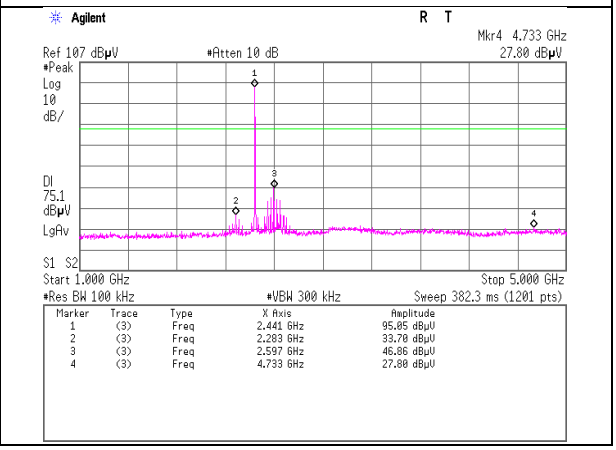
150 kHz - 30 MHz



30 MHz – 1 GHz



1 GHz – 5 GHz

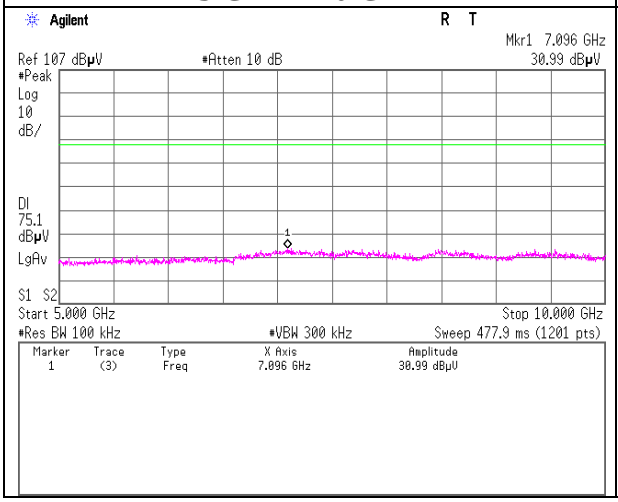


Conducted Spurious Emission

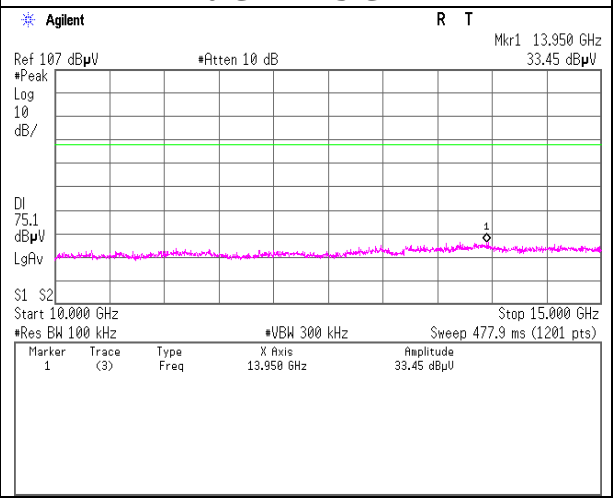
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2441 MHz

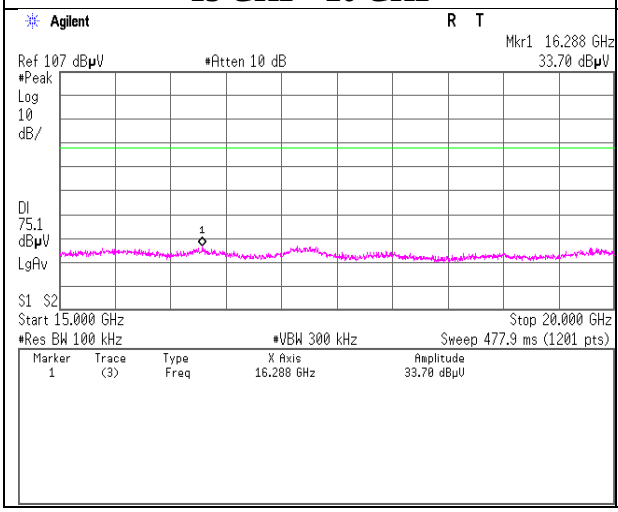
5 GHz – 10 GHz



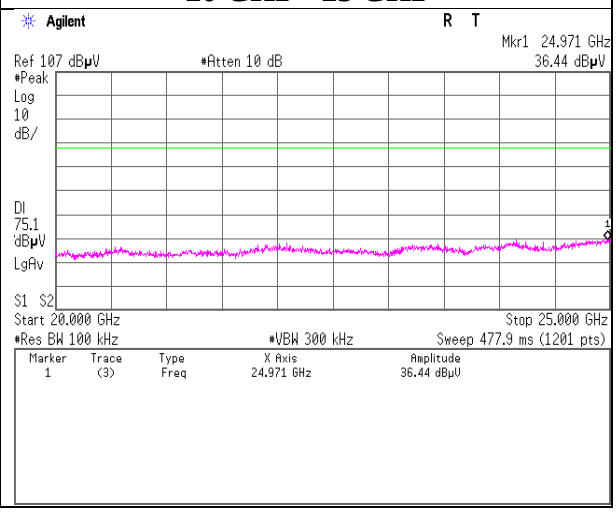
10 GHz - 15 GHz



15 GHz – 20 GHz



20 GHz – 25 GHz

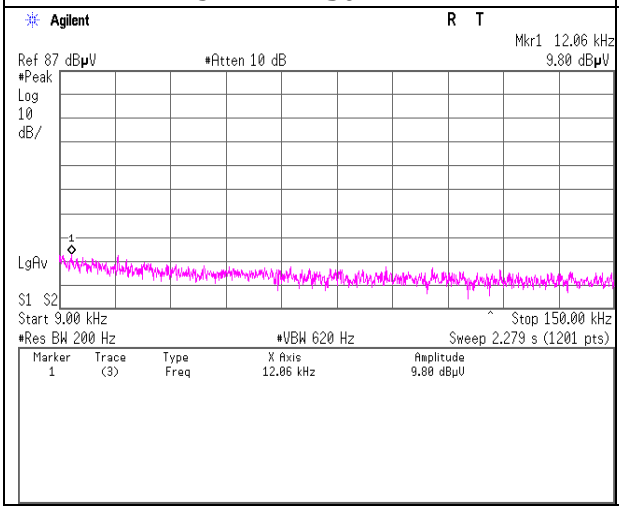


Conducted Spurious Emission

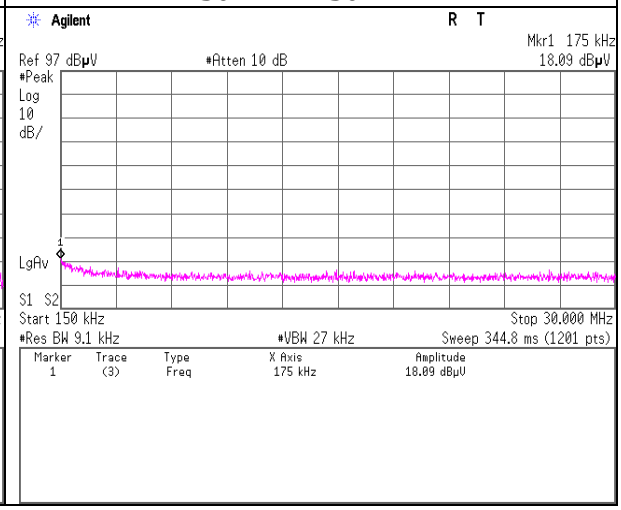
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2480 MHz

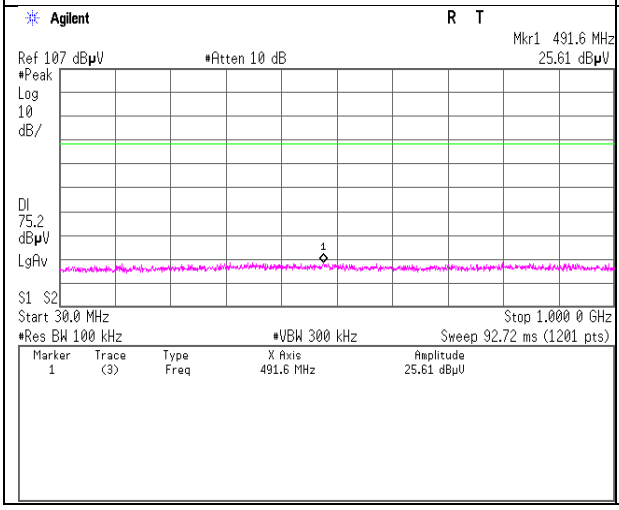
9 kHz – 150 kHz



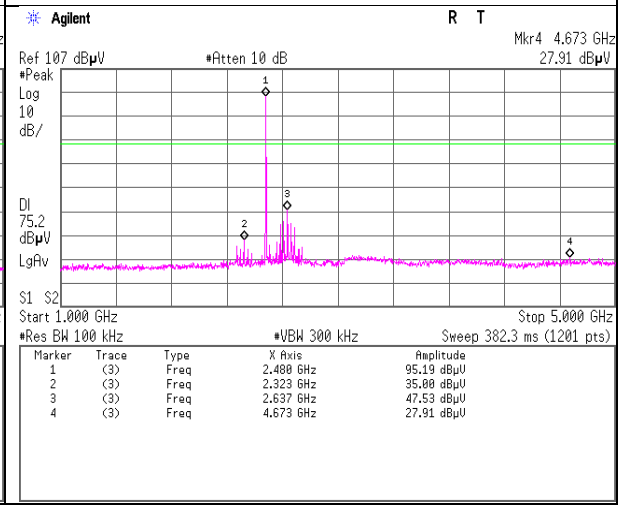
150 kHz – 30 MHz



30 MHz – 1 GHz



1 GHz – 5 GHz

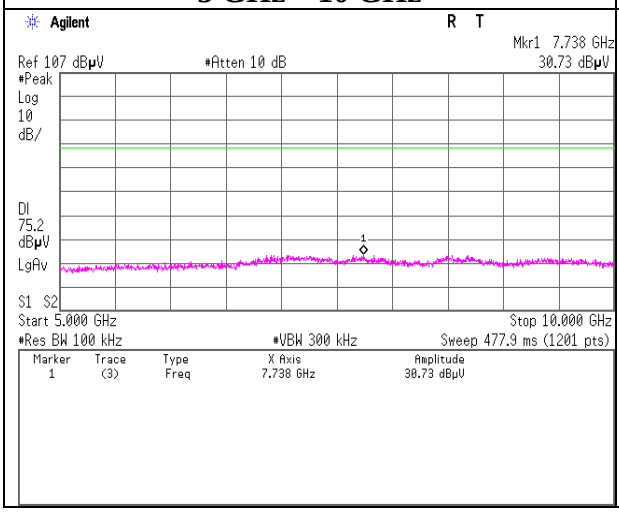


Conducted Spurious Emission

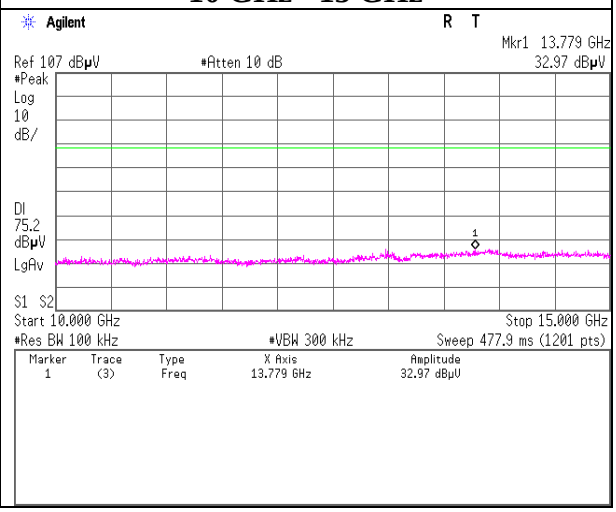
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2480 MHz

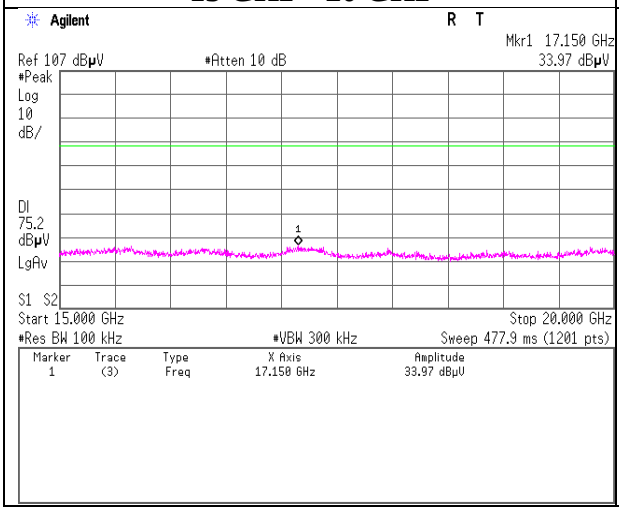
5 GHz – 10 GHz



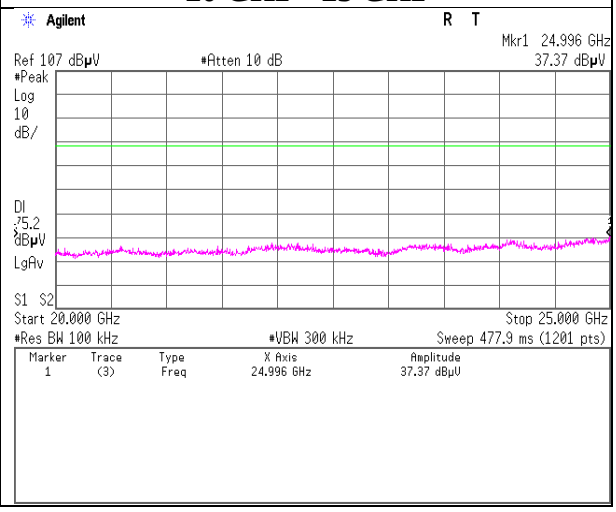
10 GHz - 15 GHz



15 GHz – 20 GHz



20 GHz – 25 GHz

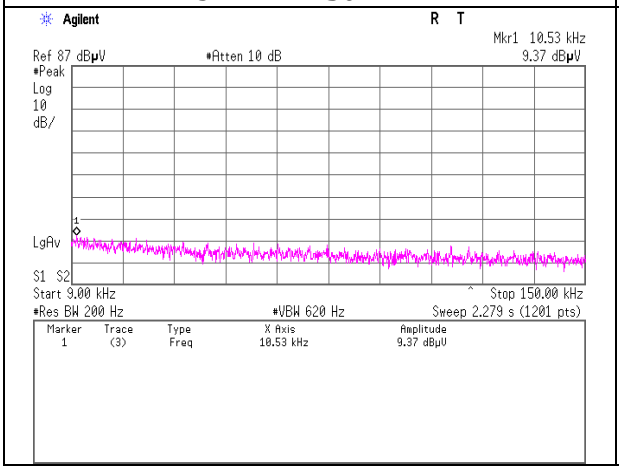


Conducted Spurious Emission

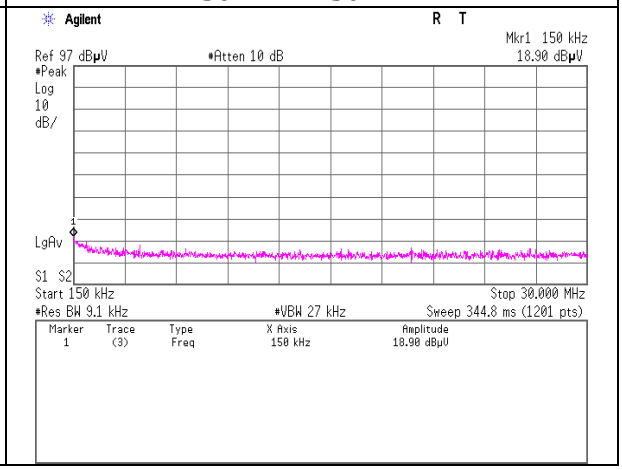
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2402 MHz

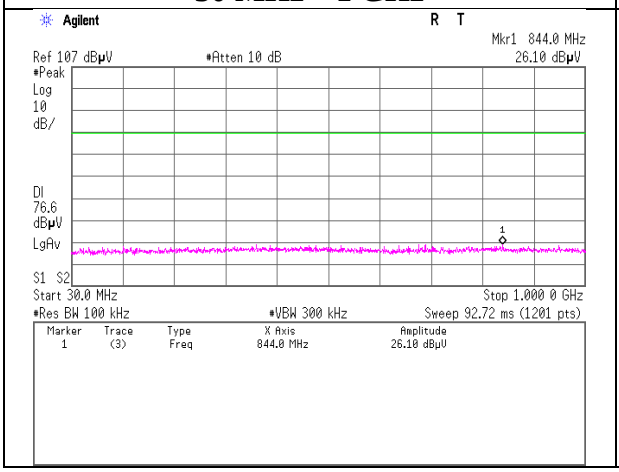
9 kHz – 150 kHz



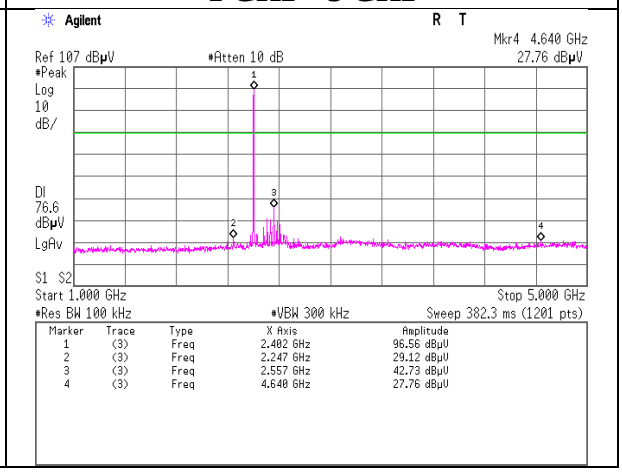
150 kHz – 30 MHz



30 MHz – 1 GHz



1 GHz – 5 GHz

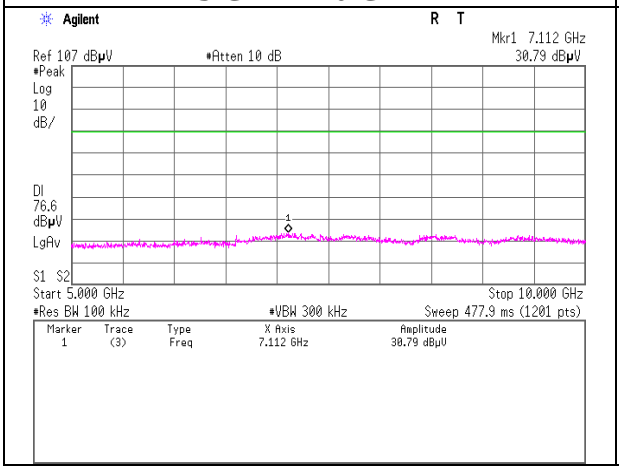


Conducted Spurious Emission

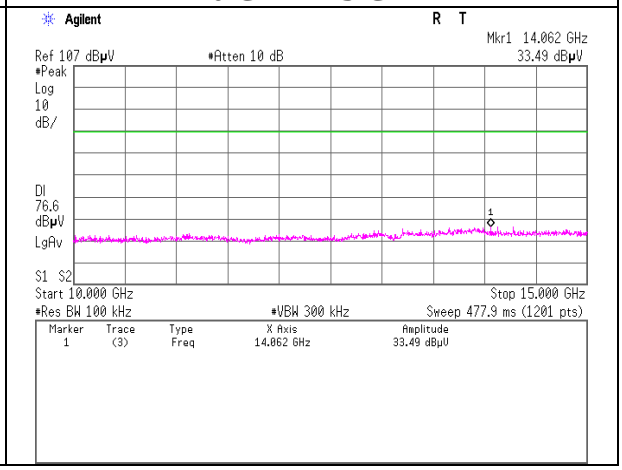
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2402 MHz

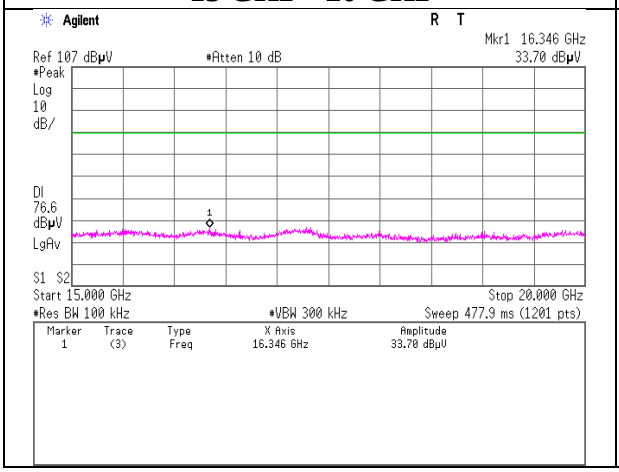
5 GHz – 10 GHz



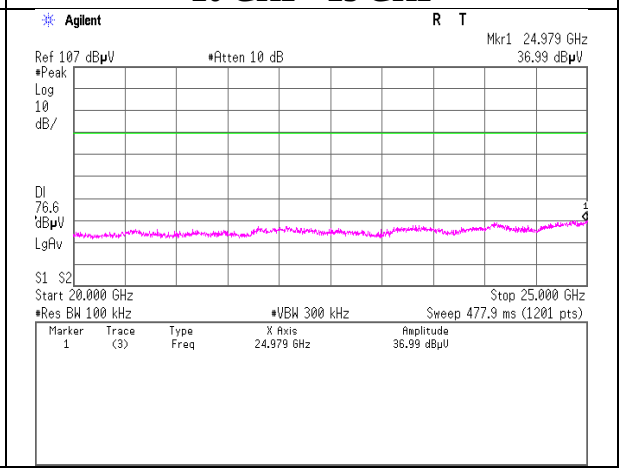
10 GHz - 15 GHz



15 GHz – 20 GHz



20 GHz – 25 GHz

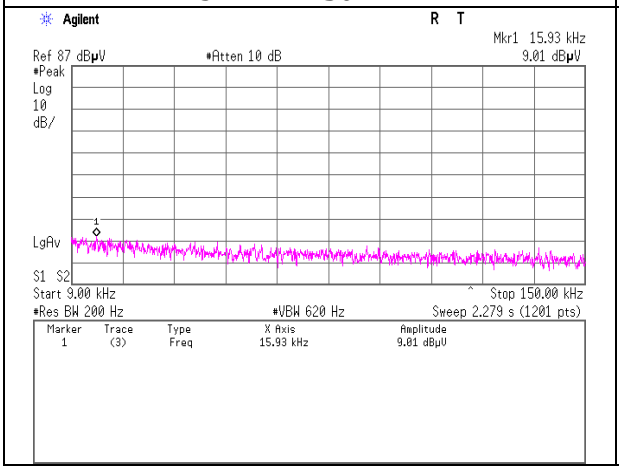


Conducted Spurious Emission

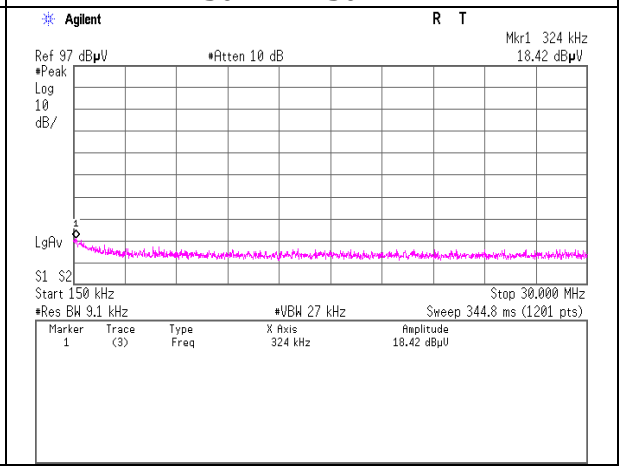
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2441 MHz

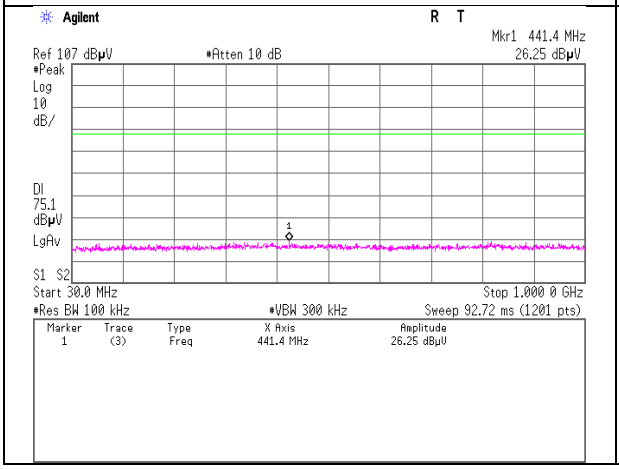
9 kHz - 150 kHz



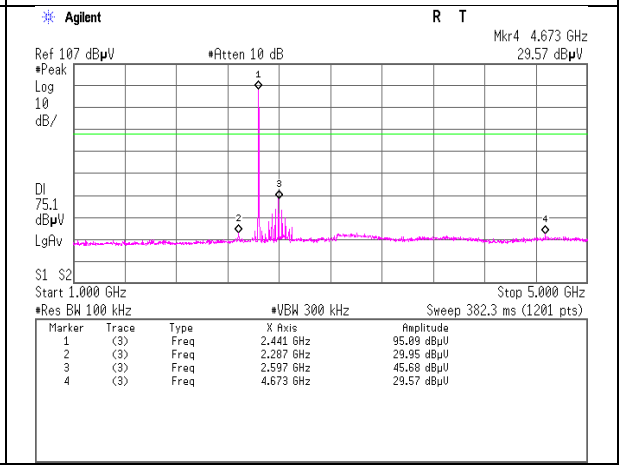
150 kHz - 30 MHz



30 MHz – 1 GHz



1 GHz – 5 GHz

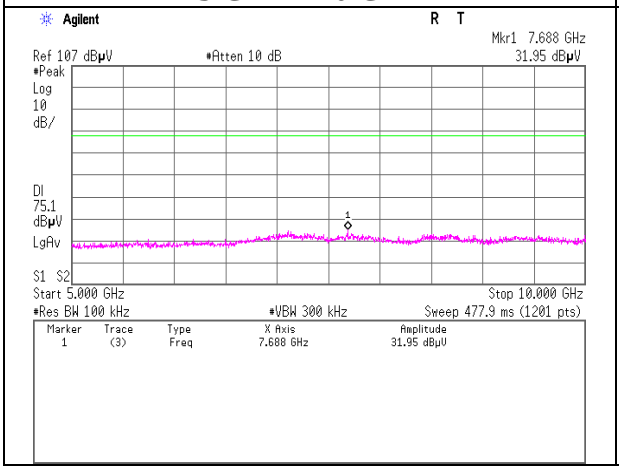


Conducted Spurious Emission

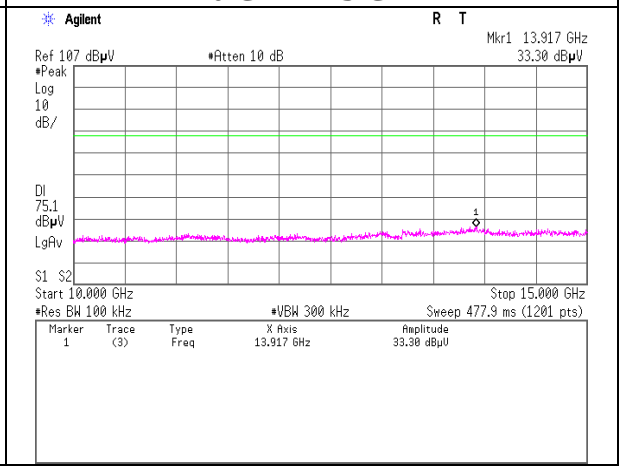
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2441 MHz

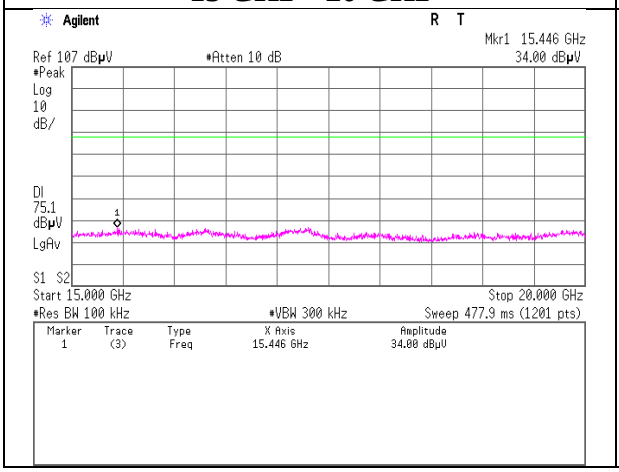
5 GHz – 10 GHz



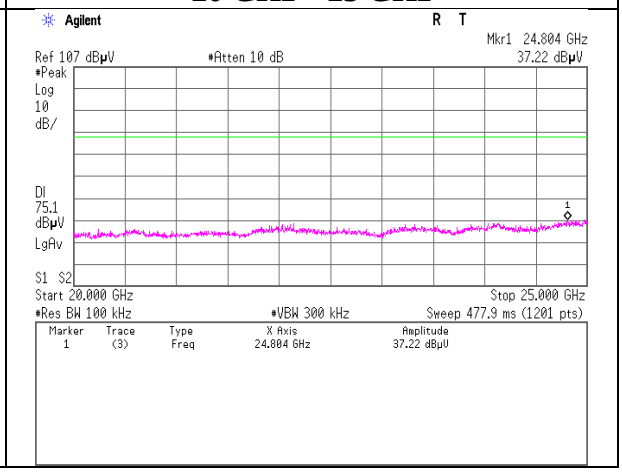
10 GHz - 15 GHz



15 GHz – 20 GHz



20 GHz – 25 GHz

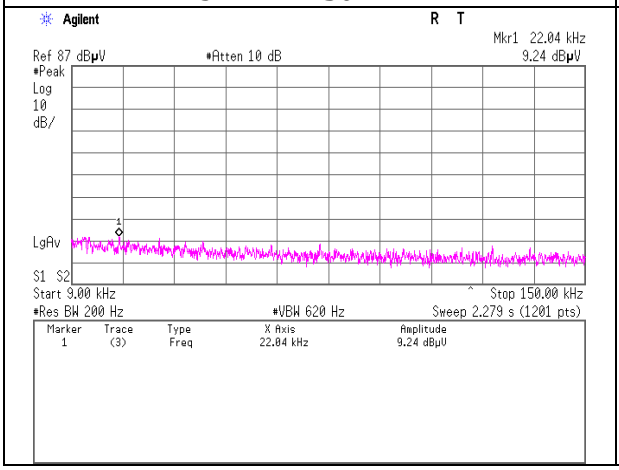


Conducted Spurious Emission

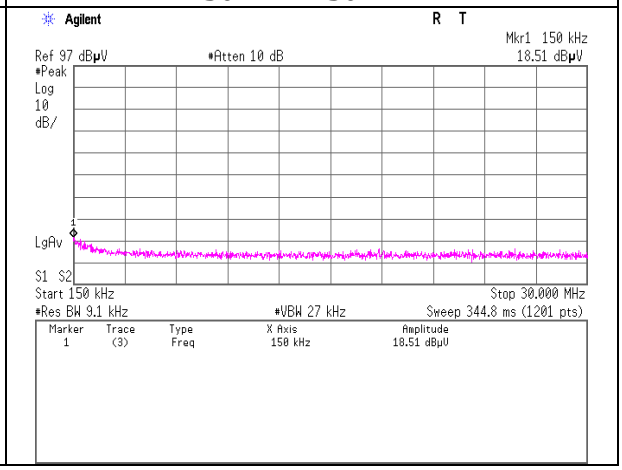
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2480 MHz

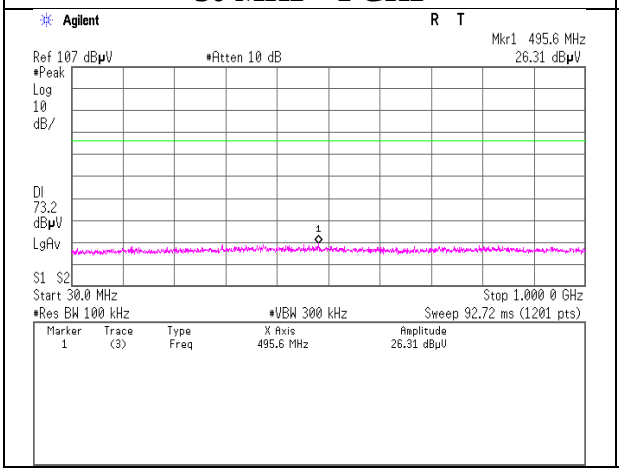
9 kHz - 150 kHz



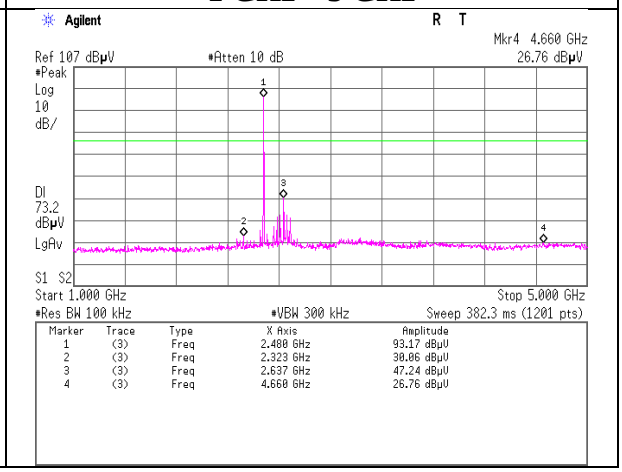
150 kHz - 30 MHz



30 MHz – 1 GHz



1 GHz – 5 GHz

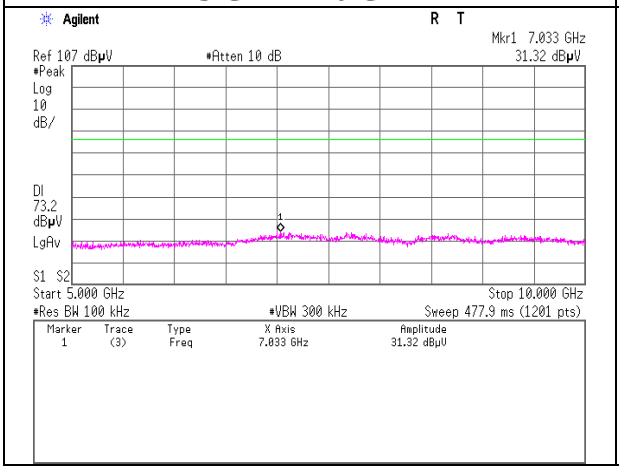


Conducted Spurious Emission

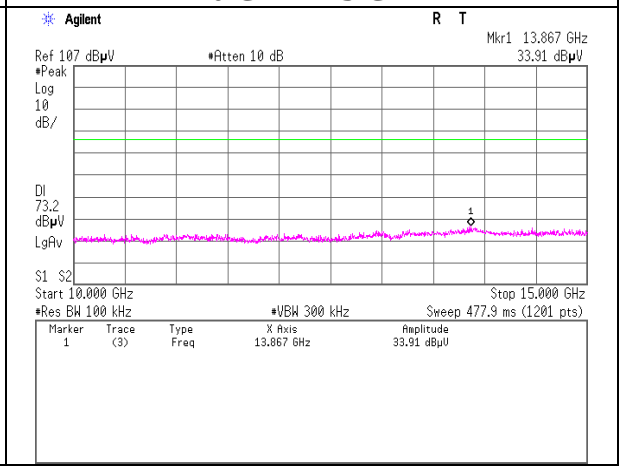
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2480 MHz

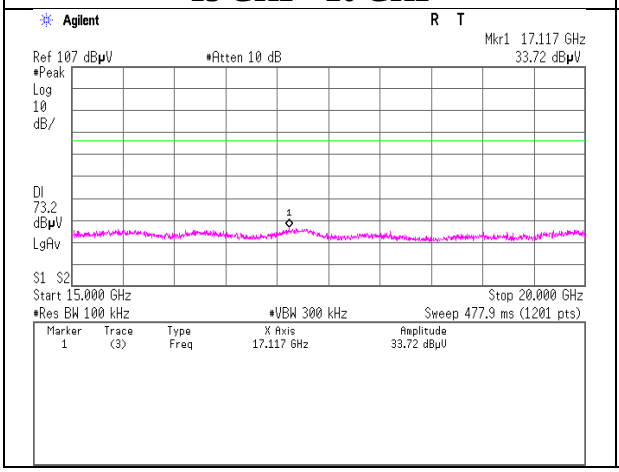
5 GHz – 10 GHz



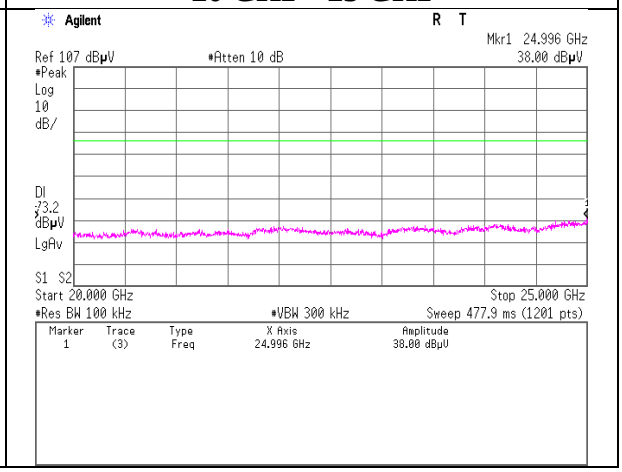
10 GHz - 15 GHz



15 GHz – 20 GHz



20 GHz – 25 GHz

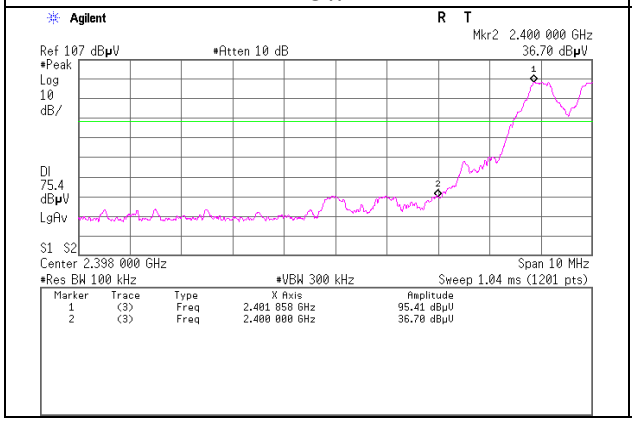


Conducted Emission Band Edge compliance

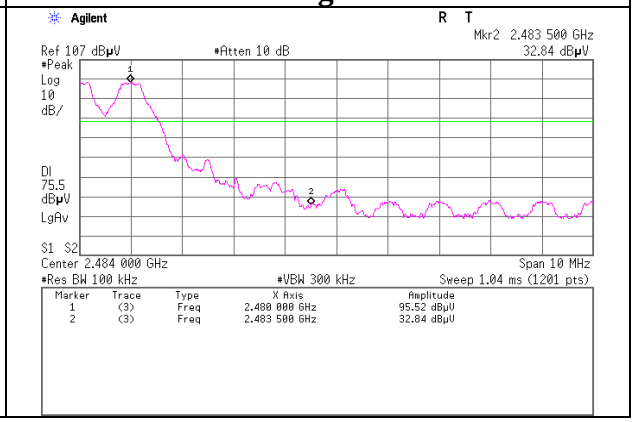
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx DH5

Hopping On

Low

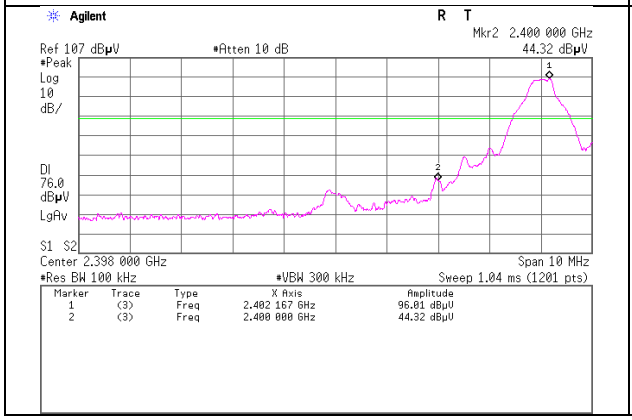


High

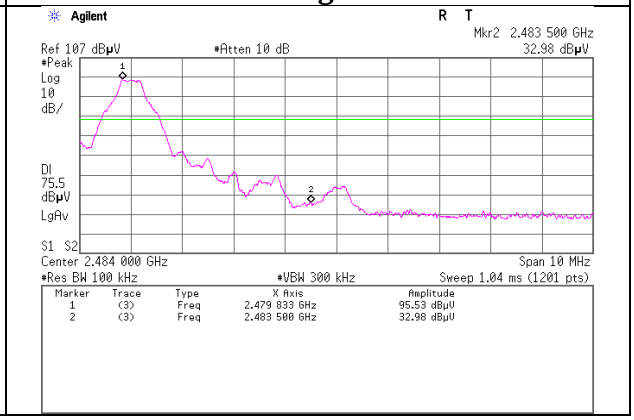


Hopping Off

Low



High

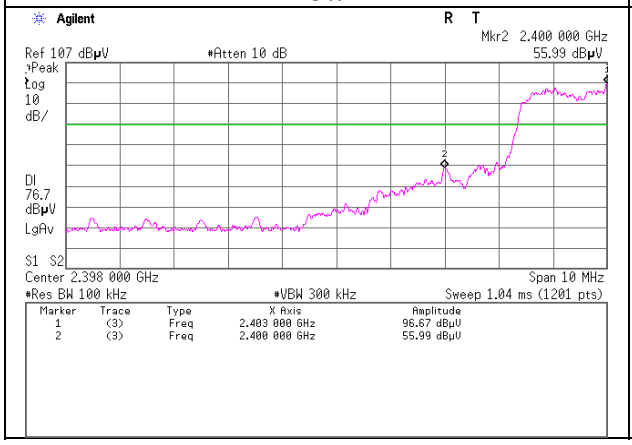


Conducted Emission Band Edge compliance

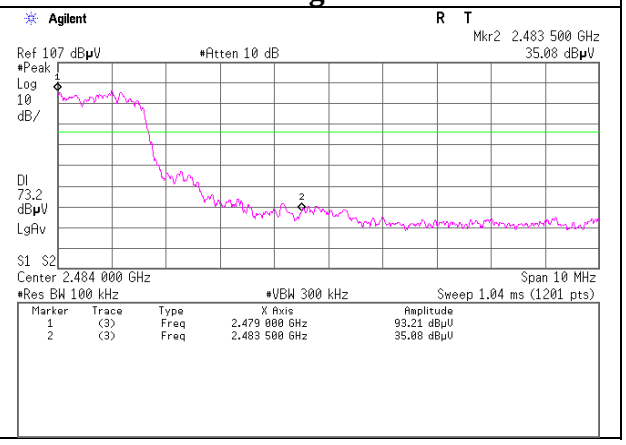
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx 3DH5

Hopping On

Low

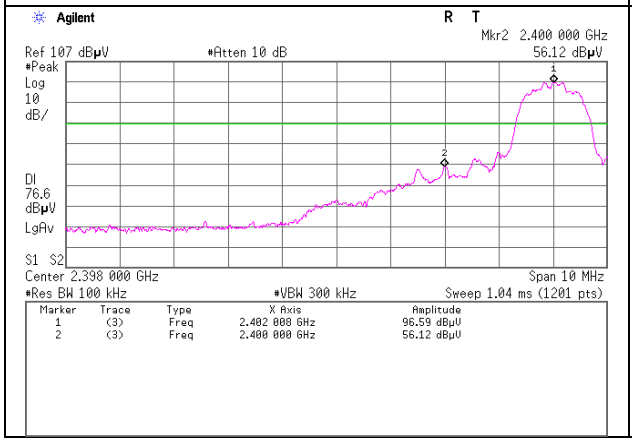


High

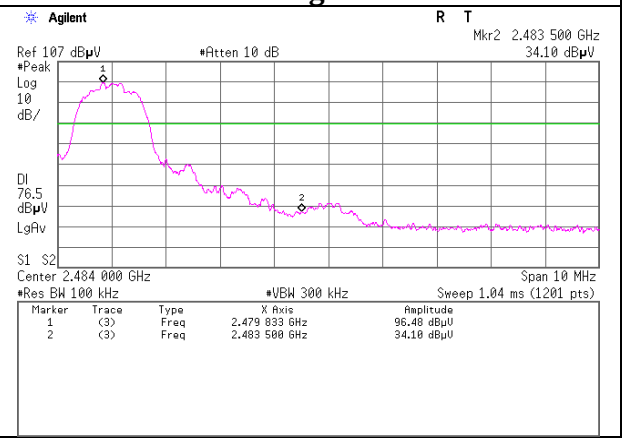


Hopping Off

Low



High

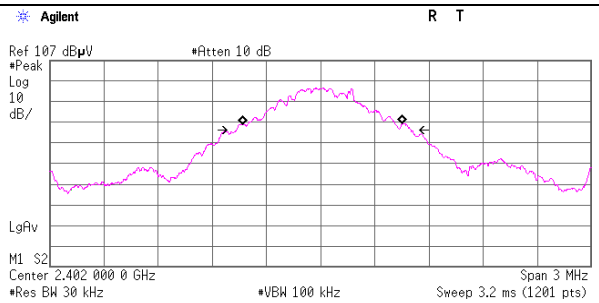


99%Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx Hopping Off

Hopping Off, DH5

2402 MHz

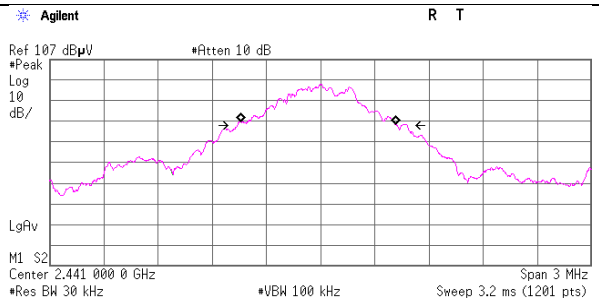


Occupied Bandwidth
882.6806 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error 10.768 kHz
x dB Bandwidth 962.055 kHz

2441 MHz

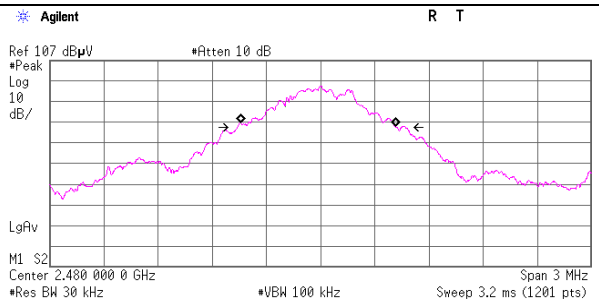


Occupied Bandwidth
856.7375 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -12.980 kHz
x dB Bandwidth 938.552 kHz

2480 MHz



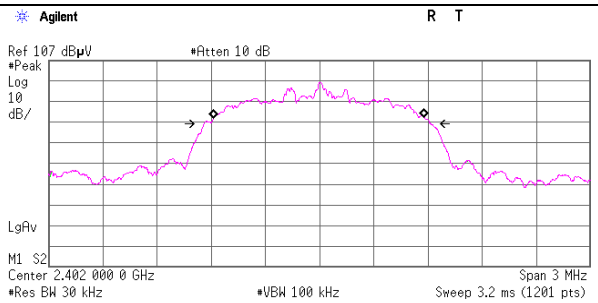
Occupied Bandwidth
854.9442 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -13.631 kHz
x dB Bandwidth 928.551 kHz

Hopping Off, 3DH5

2402 MHz

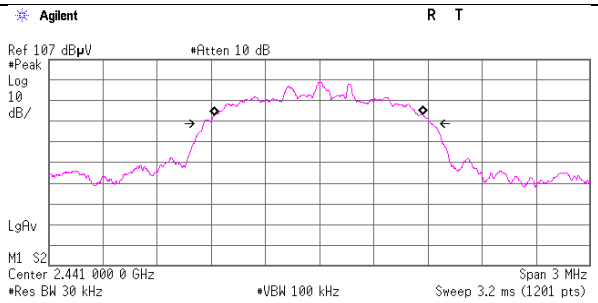


Occupied Bandwidth
1.1623 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -2.773 kHz
x dB Bandwidth 1.260 MHz

2441MHz

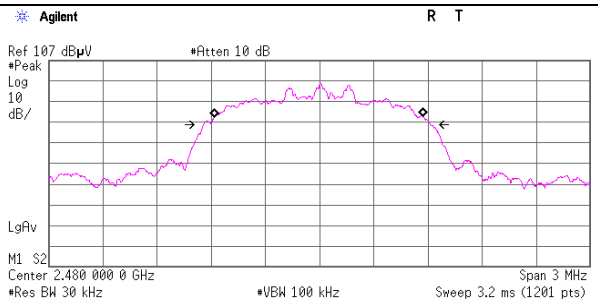


Occupied Bandwidth
1.1551 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -4.250 kHz
x dB Bandwidth 1.259 MHz

2480MHz



Occupied Bandwidth
1.1553 MHz

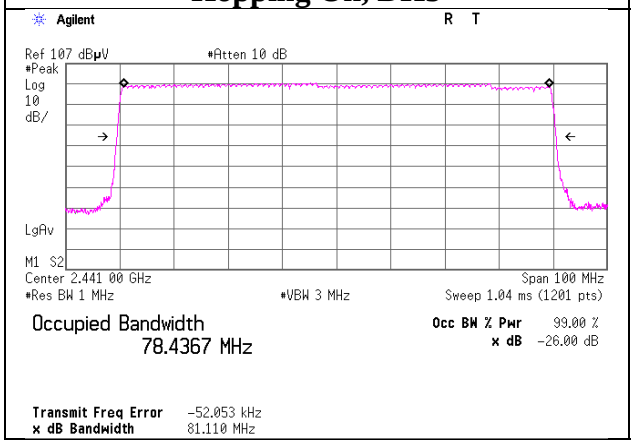
Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -4.787 kHz
x dB Bandwidth 1.259 MHz

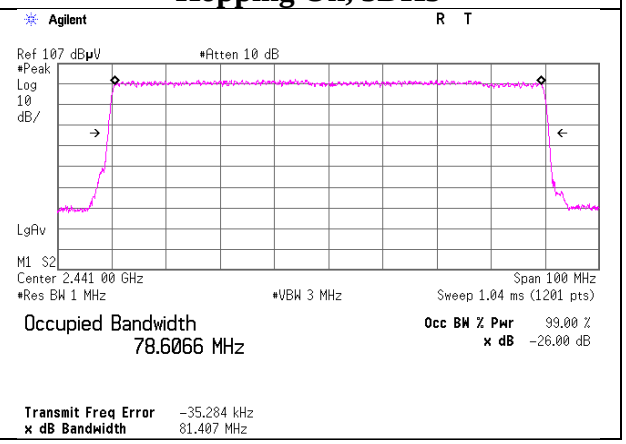
99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10990297H
Date	October 9, 2015
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takafumi Noguchi
Mode	Tx Hopping On

Hopping On, DH5



Hopping On, 3DH5



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2015/01/13 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT	2015/05/18 * 12
MAT-57	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2015/01/08 * 12
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	AT	2015/10/08 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2015/06/09 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2015/06/09 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/02/26 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2015/01/13 * 12
MJM-23	Measure	ASKUL	-	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2014/11/12 * 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-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2015/01/16 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2015/09/17 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2014/11/10 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2014/11/22 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2014/11/22 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2015/06/19 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2014/11/11 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2015/03/09 * 12

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

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

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