RADIO TEST REPORT

Test Report No. : 10689818H-B

Applicant	:	**Murata Manufacturing Company, Ltd.**
Type of Equipment	:	**Communication Module**
Model No.	:	**LBEE5ZZ1EN**
FCC ID	:	**VPYLB1EN**
Test regulation	:	**FCC Part 15 Subpart C: 2015** ***Bluetooth Part**
Test Result	:	**Complied**

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

Date of test: March 28 to April 20, 2015

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

Approved by:
Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

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

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REVISION HISTORY

Original Test Report No.: 10689818H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10689818H-B	June 17, 2015	-	-

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SECTION 1: Customer information

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

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

2.1 Identification of E.U.T.

Type of Equipment	:	Communication Module
Model No.	:	LBEE5ZZ1EN
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	Typ. 3.3V, Min.3.0V, Max.3.6V
Receipt Date of Sample	:	January 19, 2015
Country of Mass-production	:	Japan
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

General Specification

Clock frequency(ies) in the system	:	40 MHz (Crystal)
Operating temperature	:	-30 deg. C to +85 deg. C

Radio Specification

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

Specification of Wireless LAN (IEEE802.11b/g/a/n-20/n-40/11ac-20/11ac-40/11ac-80)

Type of radio	IEEE802.11b	IEEE802.11g/n (20 M band)	IEEE802.11a/n/ac (20 M band)	IEEE802.11n/ac (40 M band)	IEEE802.11ac (80 M band)
Frequency of operation	2412-2462MHz	2412-2462MHz	5180-5240MHz 5260-5320MHz 5500-5700MHz 5745-5825MHz	5190-5230MHz 5270-5310MHz 5510-5670MHz 5755-5795MHz	5210MHz 5290MHz 5530-5610MHz 5775MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM(IEEE802.11ac only))		
Channel spacing	5MHz		20MHz	40MHz	80MHz
Antenna type	Antenna 1: Dipole Antenna Antenna 2: Dipole Antenna				
Antenna Gain	2.4GHz: 3.5 dBi 5GHz: 5.0 dBi				

Specification of Bluetooth (BR/EDR)* / Bluetooth (Low Energy: LE)

	Bluetooth Ver.4.1 with EDR function
Frequency of operation	2402-2480MHz
Type of modulation	BT: FHSS (GFSK, π/4-DQPSK, 8-DPSK) LE: GFSK
Channel spacing	BT: 1MHz LE: 2MHz
Antenna type	Antenna 2: Dipole Antenna *1)
Antenna Gain	3.5 dBi

*1) The EUT can use only Antenna 2 for Bluetooth part.

*This test report applies to Bluetooth (BR/EDR).

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.4:2009 7. AC powerline conducted emission measurements **IC:** RSS-Gen 8.8	**FCC:** Section 15.207 **IC:** RSS-Gen 8.8	**QP** 29.1 dB, 0.15349 MHz, L **AV** 38.1 dB, 0.22323 MHz, L	Complied	-
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	10.2 dB 9920.000 MHz, Horizontal, AV	Complied	Conducted/ Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					

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

FCC Part 15.31 (e)

The EUT has the power supply regulator. However one of the input voltages to RF part doesn't go through the regulator. The stable voltage will be supplied by the end product, which will be required to have a power supply regulator. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique antenna connector (U.FL on the Module and Reverse SMA for Antenna itself). 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 $k = 2$.

Test room (semi-anechoic chamber)	**Conducted emission (±dB)**
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.4dB
No.4	3.5dB

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

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

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

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

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

Radiated emission test (3m)
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

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 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)

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

Details of Operating Mode(s)

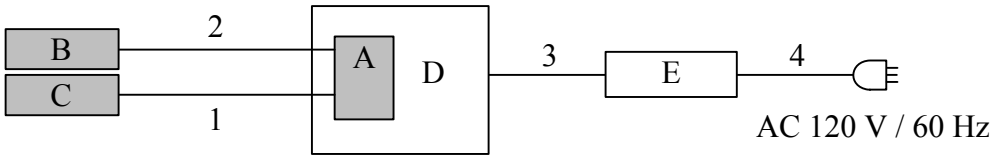
Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping off) DH5, 3DH5	2402MHz 2441MHz 2480MHz
Carrier Frequency Separation	Tx (Hopping on) DH5, 3DH5 Inquiry	2402MHz 2441MHz 2480MHz
20dB Bandwidth	Tx (Hopping off) DH5, 3DH5 Inquiry	2402MHz 2441MHz 2480MHz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

*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.

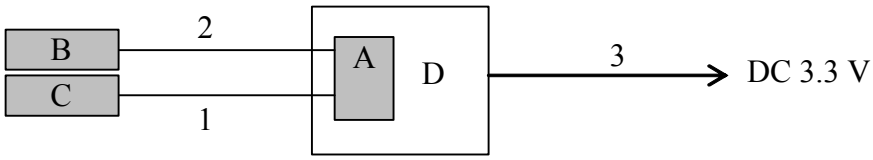
*EUT has the power settings by the software as follows;
Power settings: 2 dBm
Software: WLAN / BT Labtool ver.2.0.0.38
*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

4.2 Configuration and peripherals

For Conducted Emission test



For all tests other than Conducted 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	LBEE5ZZ1EN	12 for AT* 17 for other tests	Murata Manufacturing Company, Ltd.	EUT
B	Antenna	GW.71.5153	3	Murata Manufacturing Company, Ltd.	EUT
C	Antenna	GW.71.5153	4	Murata Manufacturing Company, Ltd.	EUT
D	Jig	-	-	Murata Manufacturing Company, Ltd.	-
E	DC Power Supply	PMC35-2A	13090501	KIKUSUI	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.05	Shielded	Shielded	-
2	Antenna Cable	0.05	Shielded	Shielded	-
3	DC Cable	0.4	Unshielded	Unshielded	-
4	AC Cable	1.8	Unshielded	Unshielded	-

*AT: Antenna Terminal Conducted Tests

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm 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 80cm 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 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm 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 : 0.15-30MHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Radiated Spurious Emission

Test Procedure
EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m 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 and 4m 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	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

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

*1) Although 00-705 accepts VBW=10Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.
*2) Distance Factor: 20 x log (3.0m/1.0m) = 9.5dB

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT 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 : 30M-25GHz
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
20dB Bandwidth	3MHz	30kHz	100kHz	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: 50MHz BW)
Carrier Frequency Separation	5MHz or 3MHz	100kHz or 30kHz	300kHz or 100kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30MHz	300kHz	1MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100kHz, 1MHz	300kHz, 3MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
	30MHz to 25GHz (Less or equal to 5GHz)	100kHz	300kHz				
Conducted Spurious Emission Band Edge compliance	10MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart. (9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz).

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

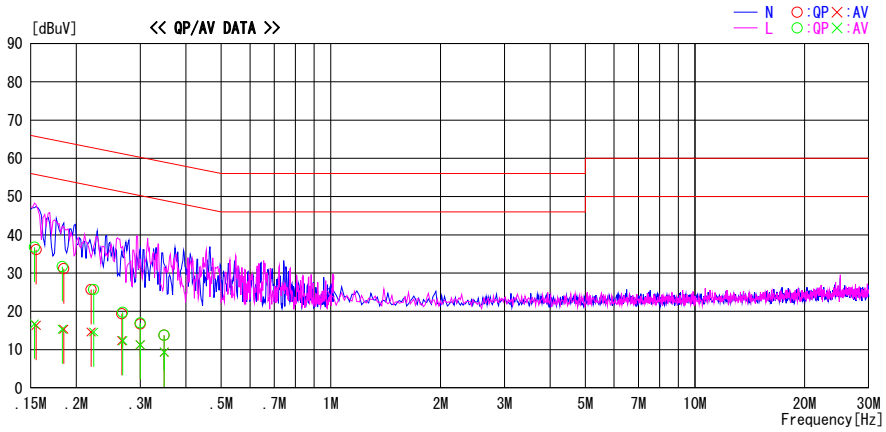
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2015/04/20

Report No. : 10689818H
Power : AC 120V / 60Hz
Temp./Humi. : 26deg. C / 57% RH
Engineer : Keisuke Kawamura

Mode / Remarks : BT DH5 2441MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



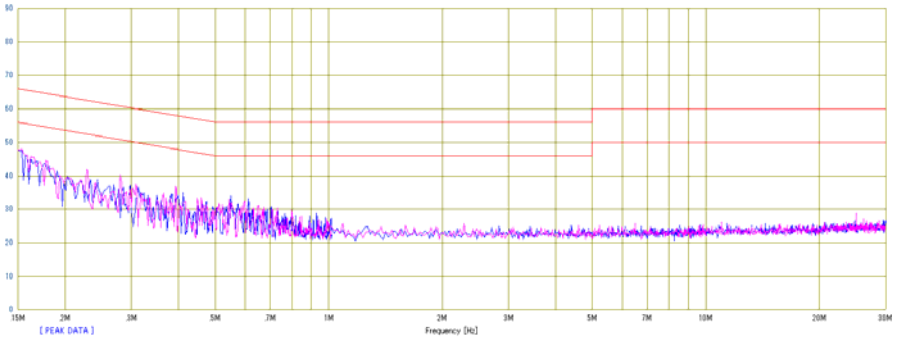
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15523	22.8	3.1	13.3	36.1	16.4	65.7	55.7	29.6	39.3	N	
0.18487	17.8	2.0	13.3	31.1	15.3	64.3	54.3	33.2	39.0	N	
0.21974	12.4	1.3	13.3	25.7	14.6	62.8	52.8	37.1	38.2	N	
0.26681	6.0	-1.0	13.3	19.3	12.3	61.2	51.2	41.9	38.9	N	
0.29994	3.4	-2.0	13.3	16.7	11.3	60.2	50.2	43.5	38.9	N	
0.34876	0.5	-4.0	13.3	13.8	9.3	59.0	49.0	45.2	39.7	N	
0.15349	23.4	3.4	13.3	36.7	16.7	65.8	55.8	29.1	39.1	L	
0.18313	18.4	2.0	13.3	31.7	15.3	64.3	54.3	32.6	39.0	L	
0.22323	12.4	1.3	13.3	25.7	14.6	62.7	52.7	37.0	38.1	L	
0.26856	6.5	-1.0	13.3	19.8	12.3	61.2	51.2	41.4	38.9	L	
0.29994	3.7	-2.0	13.3	17.0	11.3	60.2	50.2	43.2	38.9	L	
0.34876	0.5	-4.0	13.3	13.8	9.3	59.0	49.0	45.2	39.7	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.

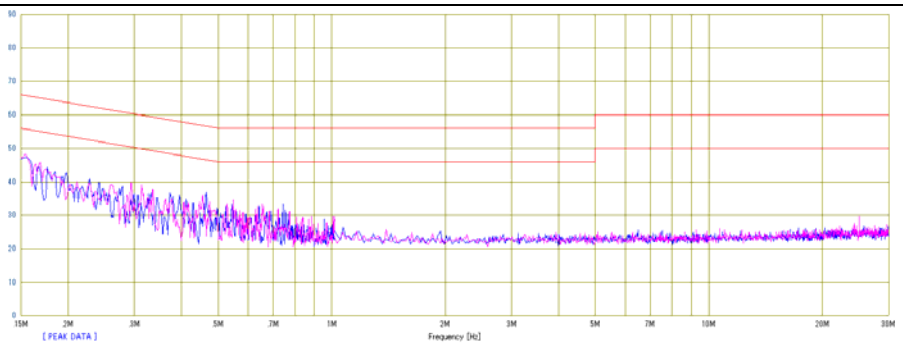
Conducted Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10689818H
Date	04/20/2015
Temperature/ Humidity	26deg. C / 57% RH
Engineer	Keisuke Kawamura
Mode	Tx DH5

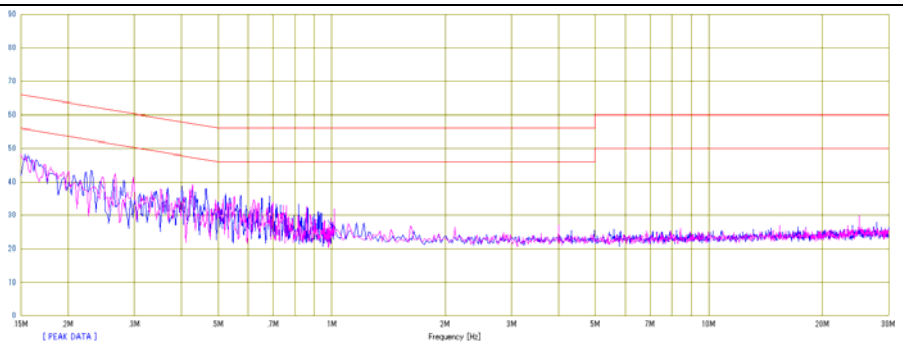
2402MHz



2441MHz



2480MHz



Y scale [dBuV] Chart — N — L

Conducted Emission

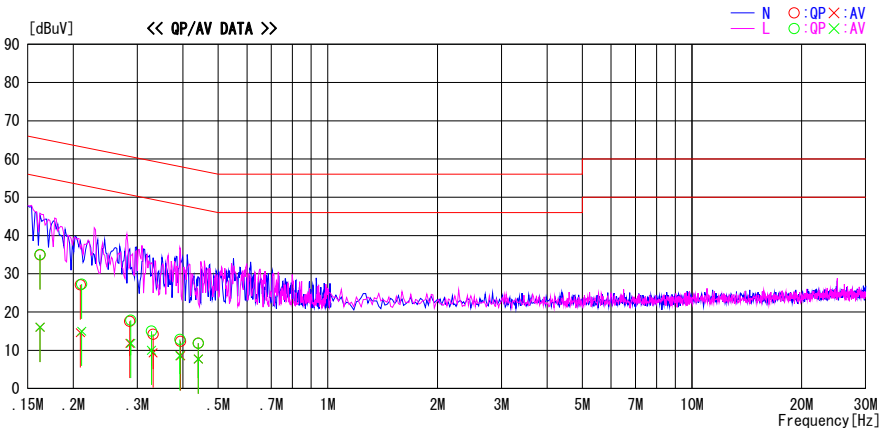
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2015/04/20

Report No. : 10689818H
Power : AC 120V / 60Hz
Temp./Humi. : 26deg. C / 57% RH
Engineer : Keisuke Kawamura

Mode / Remarks : BT 3DH5 2441MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



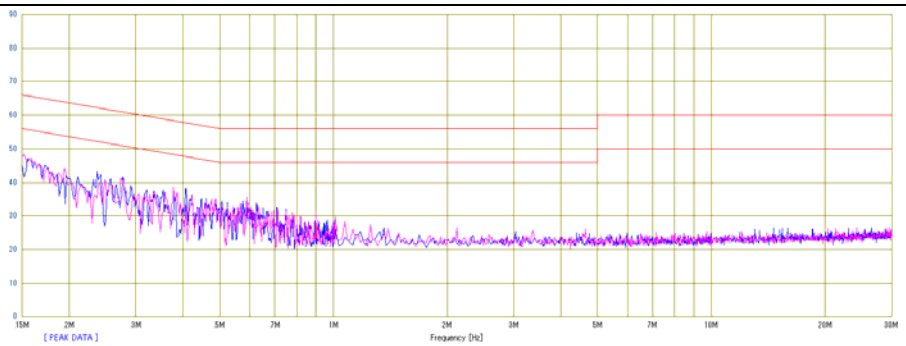
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.16221	21.6	2.7	13.3	34.9	16.0	65.4	55.4	30.5	39.4	N	
0.20928	13.8	1.3	13.3	27.1	14.6	63.2	53.2	36.1	38.6	N	
0.28599	4.3	-1.5	13.3	17.6	11.8	60.6	50.6	43.0	38.8	N	
0.33132	0.9	-4.0	13.3	14.2	9.3	59.4	49.4	45.2	40.1	N	
0.39409	-1.0	-4.7	13.3	12.3	8.6	58.0	48.0	45.7	39.4	N	
0.44116	-1.5	-5.6	13.3	11.8	7.7	57.0	47.0	45.2	39.3	N	
0.16221	21.7	2.7	13.3	35.0	16.0	65.4	55.4	30.4	39.4	L	
0.21102	14.0	1.7	13.3	27.3	15.0	63.2	53.2	35.9	38.2	L	
0.28774	4.5	-1.5	13.3	17.8	11.8	60.6	50.6	42.8	38.8	L	
0.32784	1.7	-3.3	13.3	15.0	10.0	59.5	49.5	44.5	39.5	L	
0.39235	-0.5	-4.7	13.3	12.8	8.6	58.0	48.0	45.2	39.4	L	
0.44116	-1.5	-5.6	13.3	11.8	7.7	57.0	47.0	45.2	39.3	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.

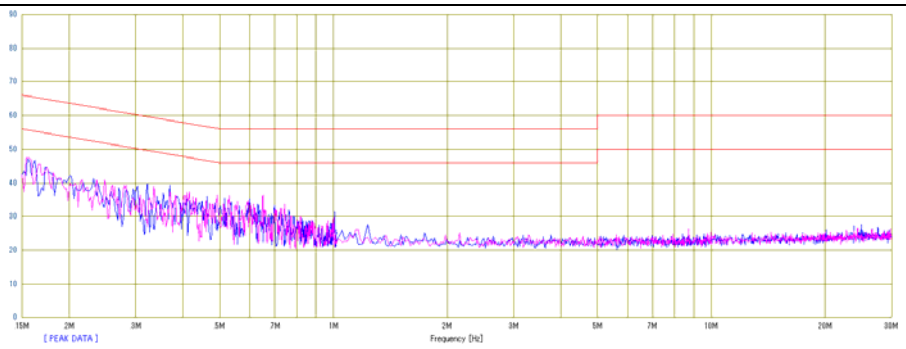
Conducted Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10689818H
Date	04/20/2015
Temperature/ Humidity	26deg. C / 57% RH
Engineer	Keisuke Kawamura
Mode	Tx 3DH5

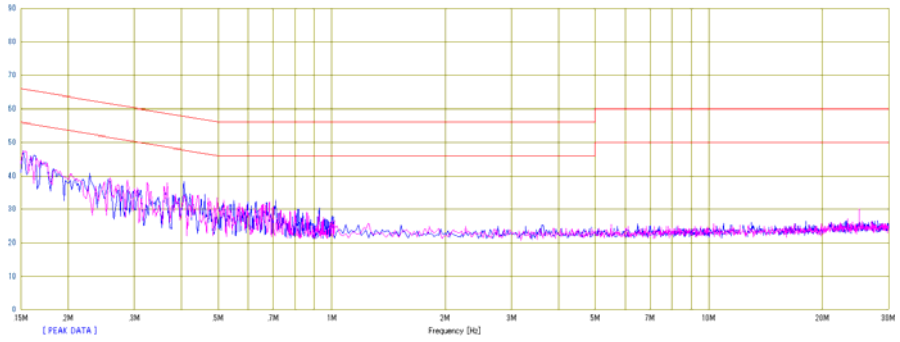
2402MHz



2441MHz



2480MHz



Y scale [dBuV] Chart — N — L

20dB Bandwidth and Carrier Frequency Separation

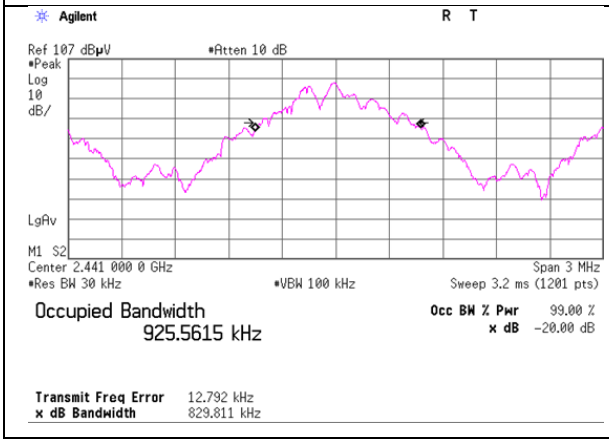
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10689818H
Date	03/30/2015
Temperature/ Humidity	23deg. C / 32% RH
Engineer	Shinichi Miyazono
Mode	Tx DH5 / 3DH5 / Inquiry

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.960	1.000	>= 0.640
	2441.0	0.958	1.000	>= 0.638
	2480.0	0.954	1.000	>= 0.636
3DH5	2402.0	1.304	1.000	>= 0.869
	2441.0	1.306	1.000	>= 0.871
	2480.0	1.301	1.000	>= 0.867
Inquiry	2441.0	0.830	2.000	>= 0.553

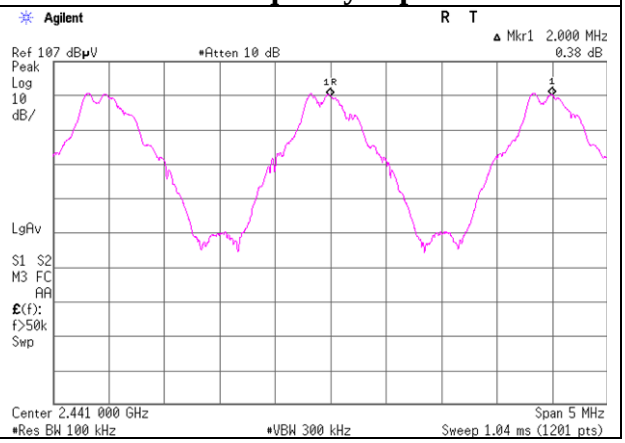
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

Inquiry

20dB Bandwidth



Carrier Frequency Separation

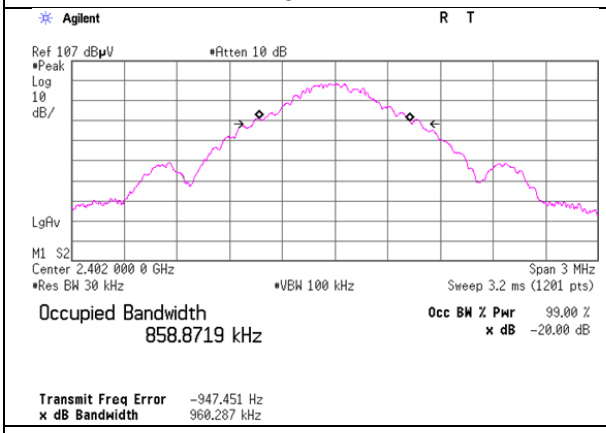


20dB Bandwidth and Carrier Frequency Separation

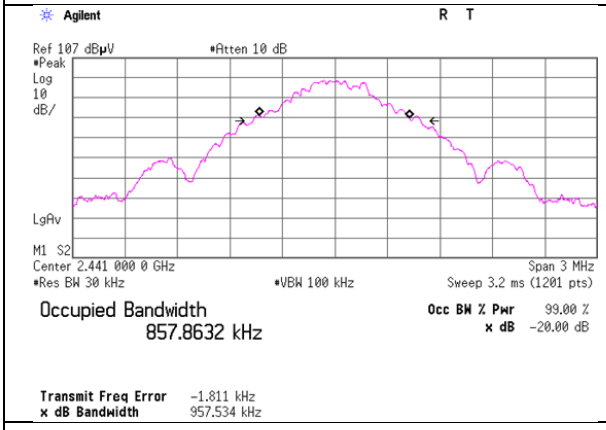
Tx DH5

20dB Bandwidth

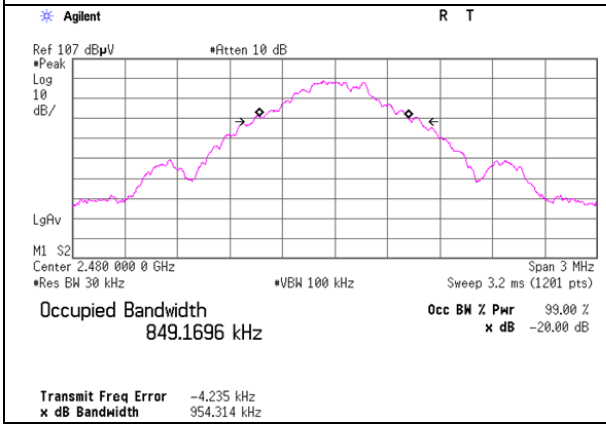
2402MHz



2441MHz

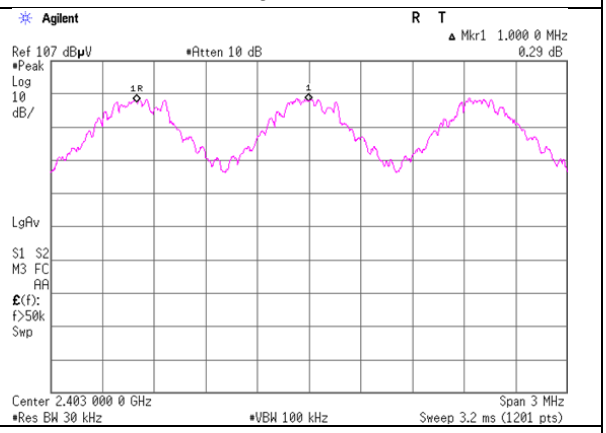


2480MHz

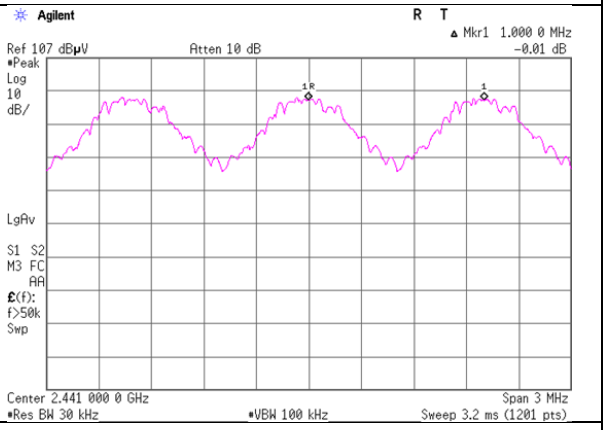


Carrier Frequency Separation

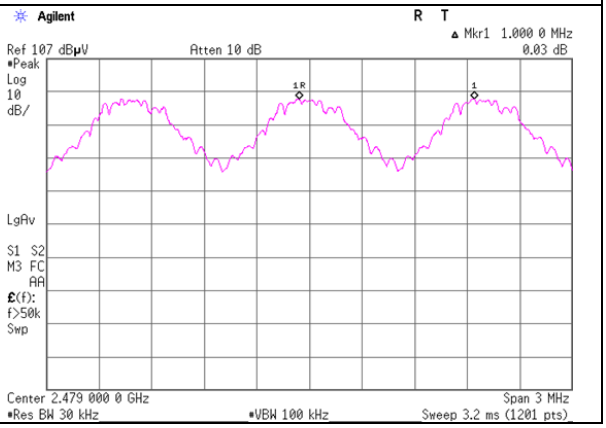
2402MHz



2441MHz



2480MHz

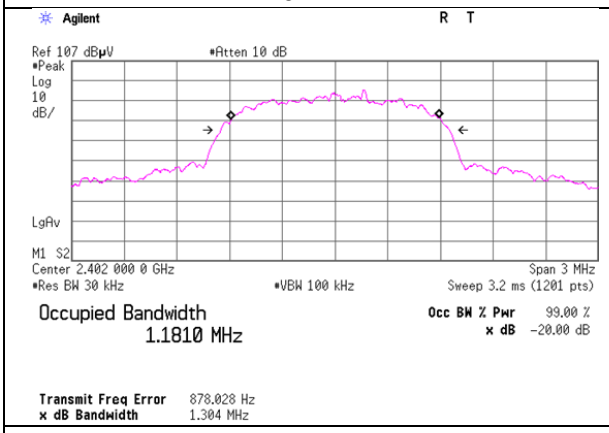


20dB Bandwidth and Carrier Frequency Separation

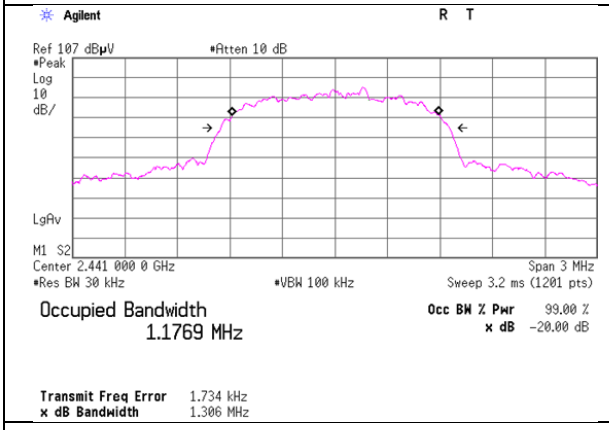
Tx 3DH5

20dB Bandwidth

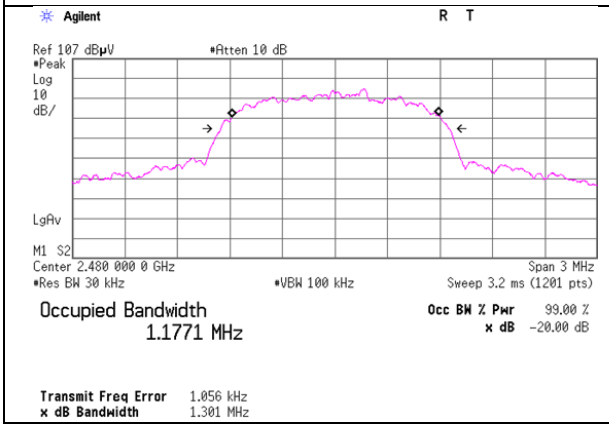
2402MHz



2441MHz

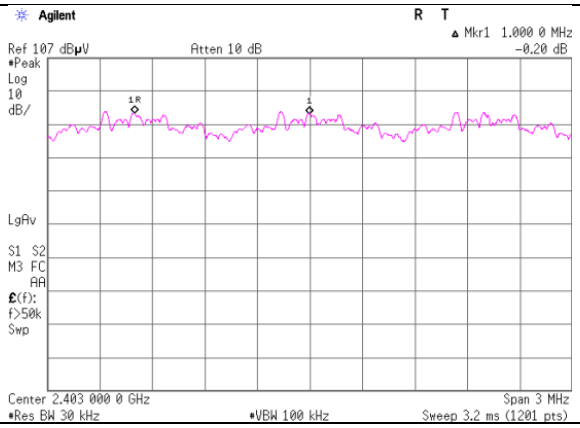


2480MHz

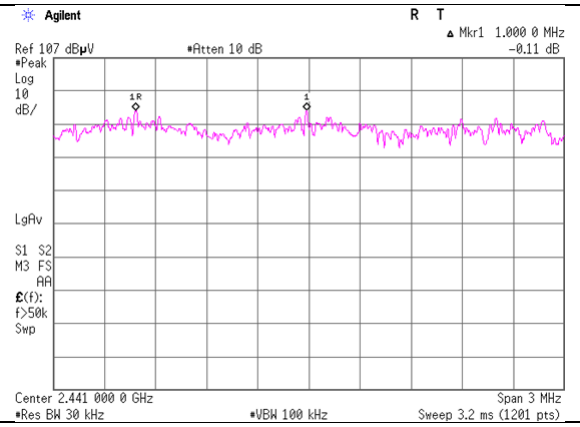


Carrier Frequency Separation

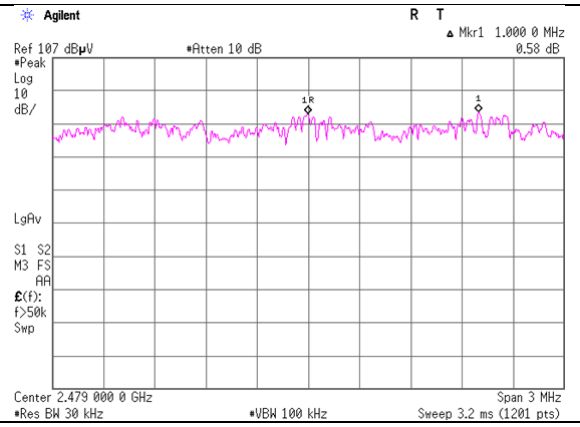
2402MHz



2441MHz



2480MHz



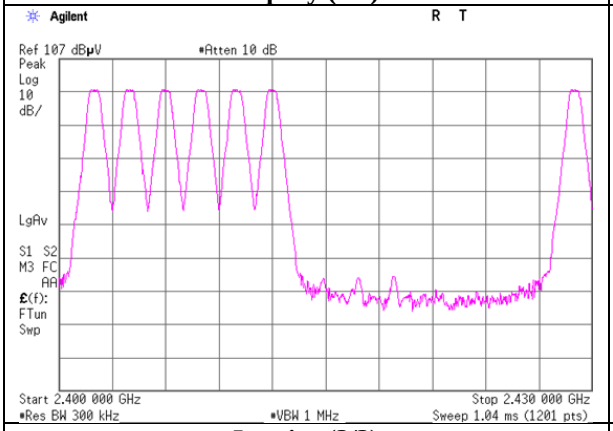
Number of Hopping Frequency

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10689818H
Date	03/30/2015
Temperature/ Humidity	23deg. C / 32% RH
Engineer	Shinichi Miyazono
Mode	Tx (Hopping on) DH5/3DH5/Inquiry

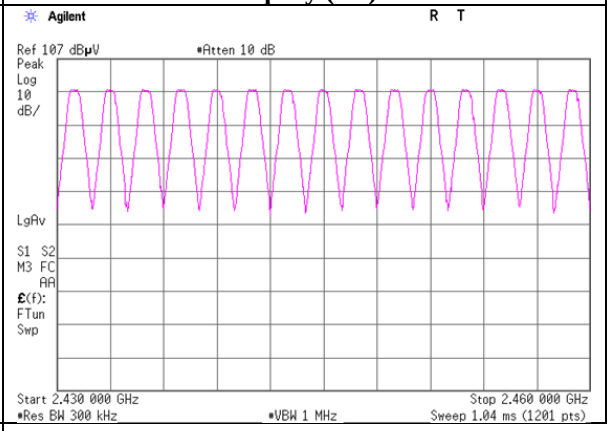
Mode	Number of channel [times]	Limit [times]
DH5	79	>= 15
3DH5	79	>= 15
Inquiry	32	>= 15

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.

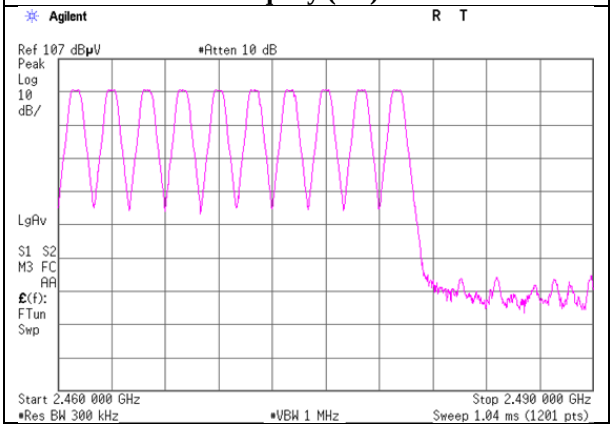
Inquiry (1/3)



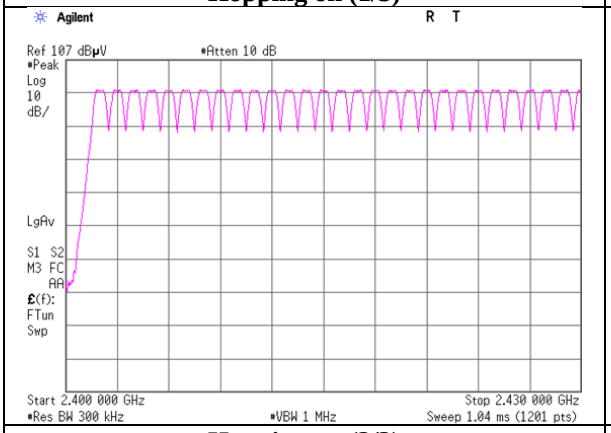
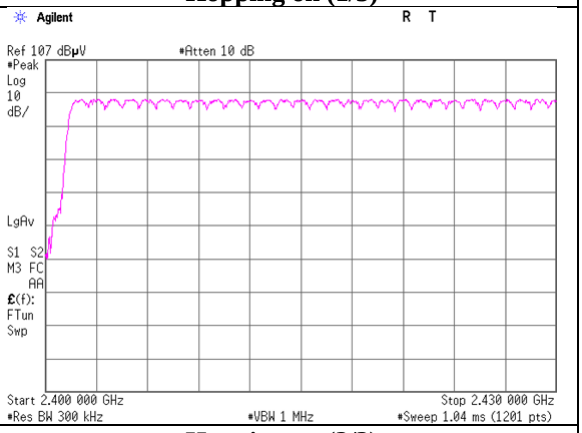
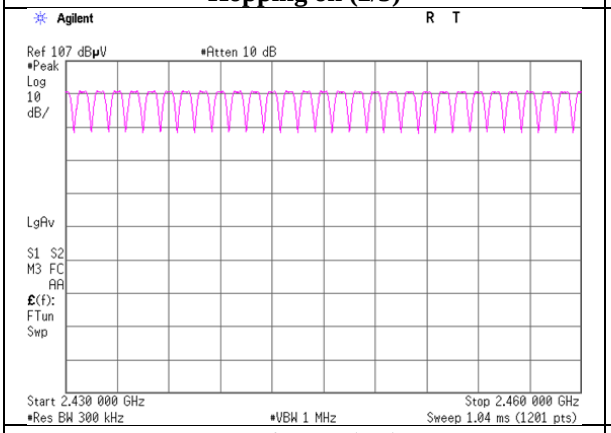
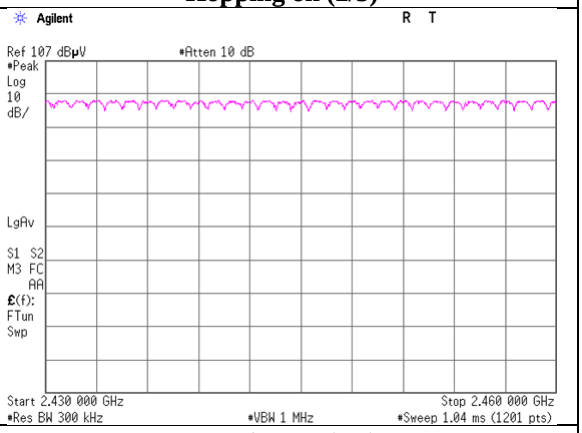
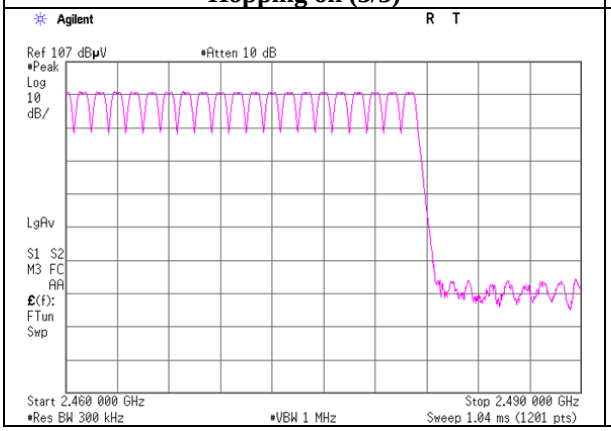
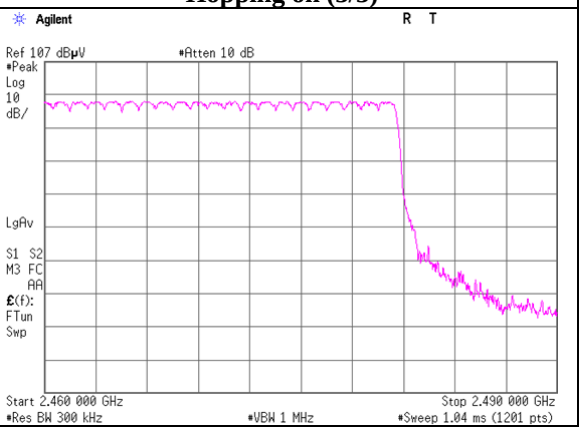
Inquiry (2/3)



Inquiry (3/3)



Number of Hopping Frequency

Tx DH5	Tx 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)
	

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

Dwell time

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10689818H
Date	03/30/2015
Temperature/ Humidity	23deg. C / 32% RH
Engineer	Shinichi Miyazono
Mode	Tx (Hopping on) DH5 / 3DH5 / Inquiry

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 time [msec]	Result [msec]	Limit [msec]
DH1	51.4 times	/ 5 sec.	x 31.6 sec.	= 325 times	0.402	131	400
DH3	27.0 times	/ 5 sec.	x 31.6 sec.	= 171 times	1.661	284	400
DH5	19.8 times	/ 5 sec.	x 31.6 sec.	= 126 times	2.914	367	400
3DH1	50.4 times	/ 5 sec.	x 31.6 sec.	= 319 times	0.405	129	400
3DH3	25.4 times	/ 5 sec.	x 31.6 sec.	= 161 times	1.658	267	400
3DH5	18.8 times	/ 5 sec.	x 31.6 sec.	= 119 times	2.910	346	400
Inquiry	100.0 times	/ 1 sec.	x 12.8 sec.	= 1280 times	0.109	139	400

Sample Calculation
Result = Number of transmission x Length of transmition time

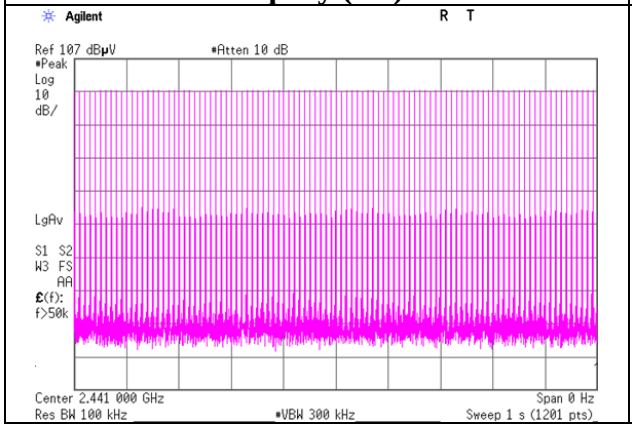
*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	52	50	51	52	52	51.4
DH3	27	27	29	25	27	27
DH5	23	17	17	18	24	19.8
3DH1	51	49	51	50	51	50.4
3DH3	26	27	28	25	21	25.4
3DH5	16	15	20	20	23	18.8

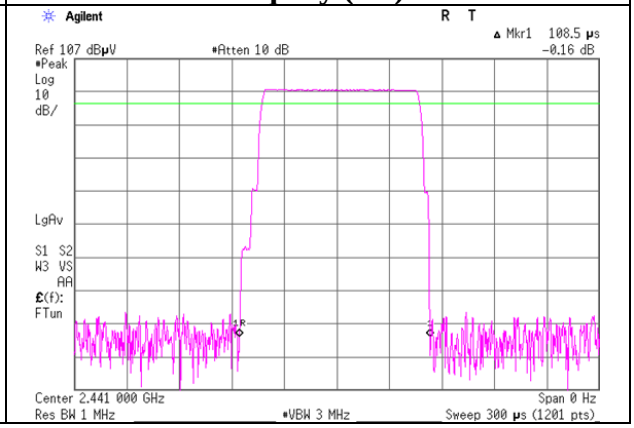
Sample Calculation
Average= Summation(Sampling 1 to 5) / 5

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.

Inquiry (1/2)

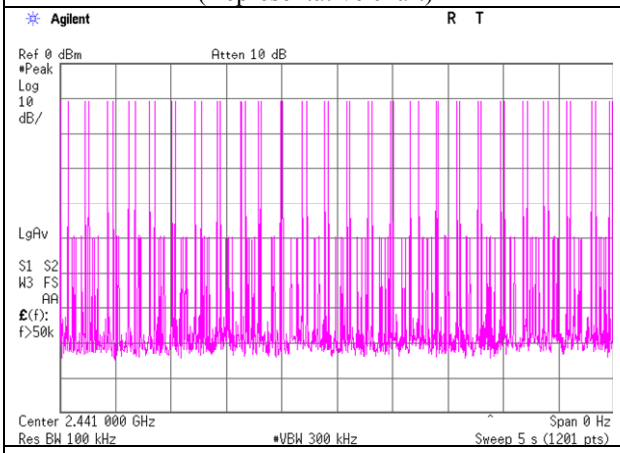


Inquiry (2/2)

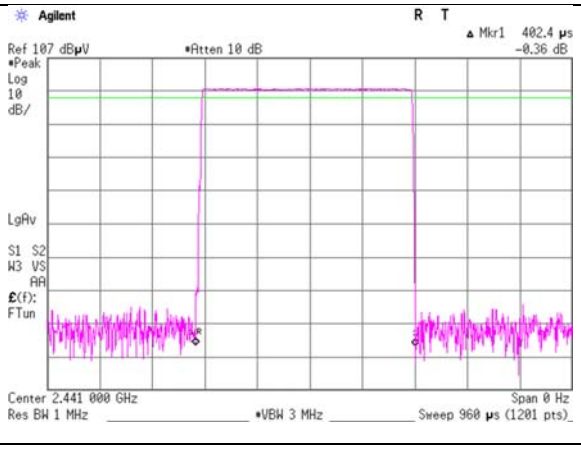


Dwell time

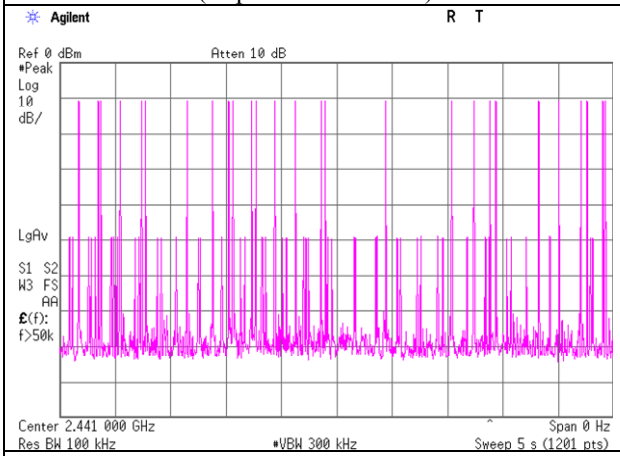
DH1 (1/2)
(Representative chart)



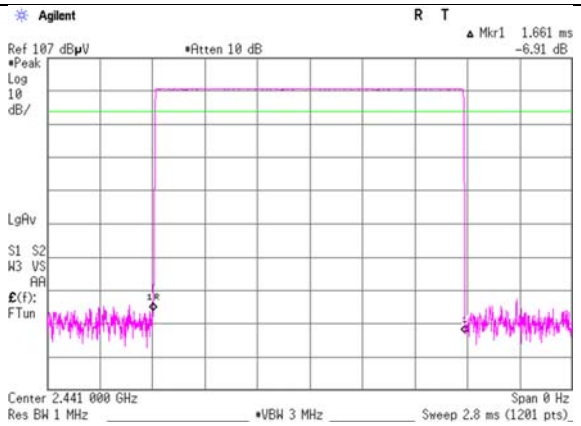
DH1 (2/2)



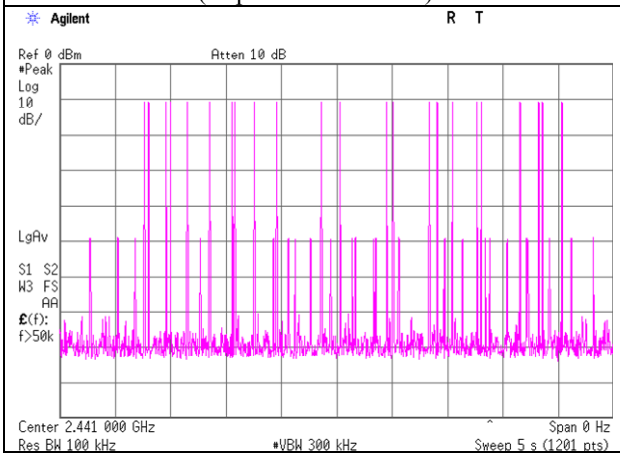
DH3 (1/2)
(Representative chart)



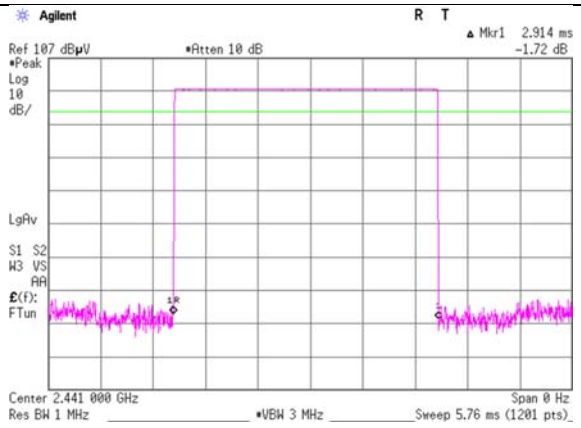
DH3 (2/2)



DH5 (1/2)
(Representative chart)

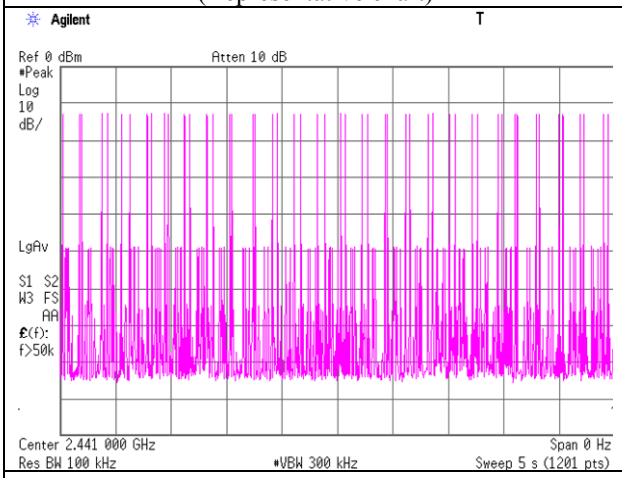


DH5 (2/2)

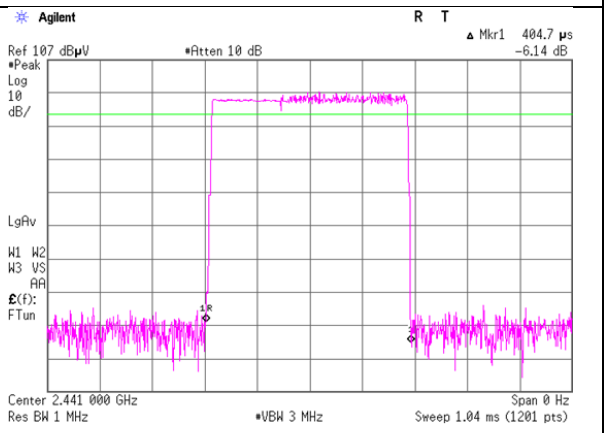


Dwell time

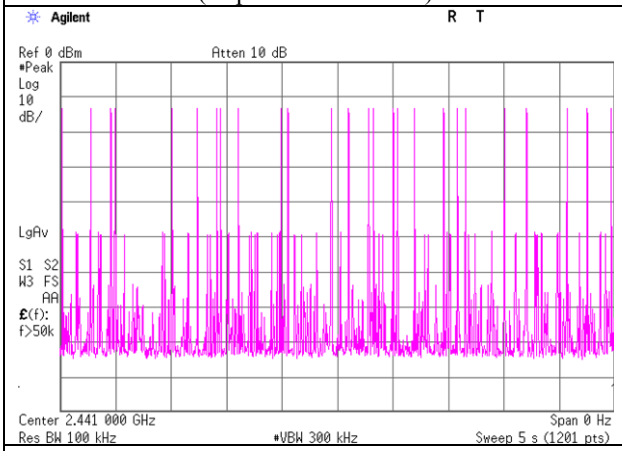
3DH1 (1/2)
(Representative chart)



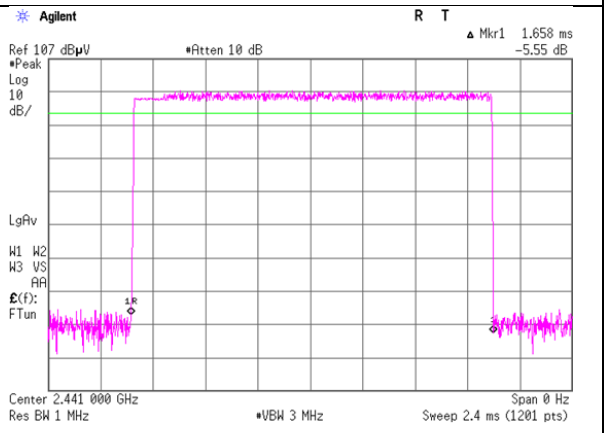
3DH1 (2/2)



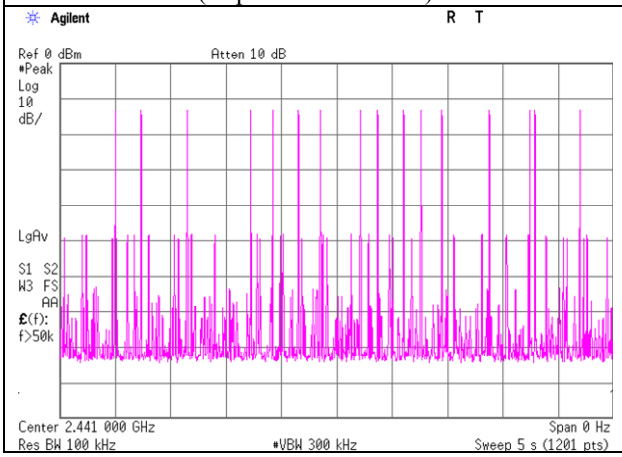
3DH3 (1/2)
(Representative chart)



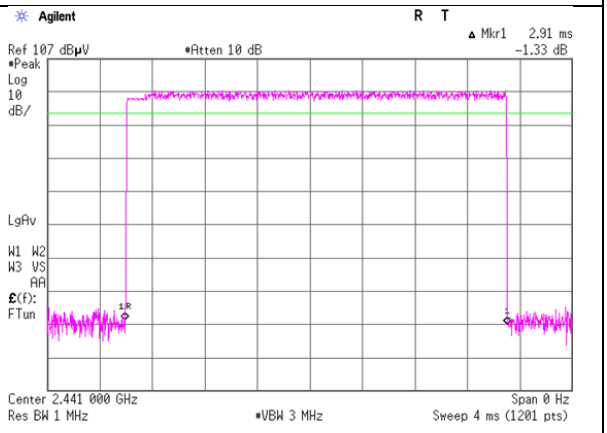
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10689818H
Date	03/30/2015
Temperature/ Humidity	23deg. C / 32% RH
Engineer	Shinichi Miyazono
Mode	Tx (Hopping off) DH5/2DH5/3DH5/Inquiry

Mode	Freq.	Reading	Cable Loss	Atten.	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-10.12	1.64	9.98	1.50	1.41	20.96	125	19.46
DH5	2441.0	-9.23	1.66	9.98	2.41	1.74	20.96	125	18.55
DH5	2480.0	-9.31	1.68	9.98	2.35	1.72	20.96	125	18.61
2DH5	2402.0	-9.57	1.64	9.98	2.05	1.60	20.96	125	18.91
2DH5	2441.0	-9.66	1.66	9.98	1.98	1.58	20.96	125	18.98
2DH5	2480.0	-9.77	1.68	9.98	1.89	1.55	20.96	125	19.07
3DH5	2402.0	-9.26	1.64	9.98	2.36	1.72	20.96	125	18.60
3DH5	2441.0	-9.37	1.66	9.98	2.27	1.69	20.96	125	18.69
3DH5	2480.0	-9.46	1.68	9.98	2.20	1.66	20.96	125	18.76
Inquiry	2441.0	-9.30	1.66	9.98	2.34	1.71	20.96	125	18.62

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

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)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10689818H
Date	03/30/2015
Temperature/ Humidity	23deg. C / 32% RH
Engineer	Shinichi Miyazono
Mode	Tx (Hopping off) DH5/2DH5/3DH5

Mode	Freq.	Reading	Cable Loss	Atten.	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
DH5	2402.0	-11.49	1.64	9.98	0.13	1.03
DH5	2441.0	-10.57	1.66	9.98	1.07	1.28
DH5	2480.0	-10.63	1.68	9.98	1.03	1.27
2DH5	2402.0	-13.44	1.64	9.98	-1.82	0.66
2DH5	2441.0	-13.53	1.66	9.98	-1.89	0.65
2DH5	2480.0	-13.56	1.68	9.98	-1.90	0.65
3DH5	2402.0	-13.43	1.64	9.98	-1.81	0.66
3DH5	2441.0	-13.52	1.66	9.98	-1.88	0.65
3DH5	2480.0	-13.55	1.68	9.98	-1.89	0.65

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

Radiated Spurious Emission

Report No.	10689818H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	03/28/2015	04/02/2015	04/20/2015
Temperature/ Humidity	23deg. C / 30% RH	20deg. C / 35% RH	23 deg. C / 52% RH
Engineer	Yuta Moriya (1-10GHz)	Takafumi Noguchi (10-26.5GHz)	Takafumi Noguchi (Below 1GHz)
Mode	Tx (Hopping off) DH5 2402MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.025	QP	23.3	14.2	7.3	28.5	16.3	40.0	23.7	
Hori	62.189	QP	23.2	7.1	7.6	28.4	9.5	40.0	30.5	
Hori	79.952	QP	23.3	6.8	7.9	28.4	9.6	40.0	30.4	
Hori	123.514	QP	23.0	13.0	8.4	28.1	16.3	43.5	27.2	
Hori	129.493	QP	23.0	13.5	8.5	28.1	16.9	43.5	26.6	
Hori	251.949	QP	21.7	17.3	9.5	27.6	20.9	46.0	25.1	
Hori	2390.000	PK	47.3	29.3	3.5	35.0	45.1	73.9	28.8	
Hori	4804.000	PK	44.8	32.7	5.8	34.2	49.1	73.9	24.8	
Hori	7206.000	PK	43.6	36.8	7.2	34.1	53.5	73.9	20.4	
Hori	9608.000	PK	42.4	38.9	8.1	34.7	54.7	73.9	19.2	
Hori	2390.000	AV	35.0	29.3	3.5	35.0	32.8	53.9	21.1	
Hori	4804.000	AV	34.0	32.7	5.8	34.2	38.3	53.9	15.6	
Hori	7206.000	AV	31.9	36.8	7.2	34.1	41.8	53.9	12.1	
Hori	9608.000	AV	30.7	38.9	8.1	34.7	43.0	53.9	10.9	
Vert	41.968	QP	23.2	13.4	7.3	28.5	15.4	40.0	24.6	
Vert	60.856	QP	23.1	7.3	7.6	28.4	9.6	40.0	30.4	
Vert	79.905	QP	23.1	6.8	7.9	28.4	9.4	40.0	30.6	
Vert	123.917	QP	22.9	13.0	8.4	28.1	16.2	43.5	27.3	
Vert	130.019	QP	23.1	13.6	8.5	28.1	17.1	43.5	26.4	
Vert	250.041	QP	21.7	17.2	9.5	27.6	20.8	46.0	25.2	
Vert	2390.000	PK	45.2	29.3	3.5	35.0	43.0	73.9	30.9	
Vert	4804.000	PK	43.0	32.7	5.8	34.2	47.3	73.9	26.7	
Vert	7206.000	PK	43.7	36.8	7.2	34.1	53.6	73.9	20.3	
Vert	9608.000	PK	42.8	38.9	8.1	34.7	55.1	73.9	18.8	
Vert	2390.000	AV	33.5	29.3	3.5	35.0	31.3	53.9	22.6	
Vert	4804.000	AV	31.6	32.7	5.8	34.2	35.9	53.9	18.0	
Vert	7206.000	AV	30.7	36.8	7.2	34.1	40.6	53.9	13.3	
Vert	9608.000	AV	30.8	38.9	8.1	34.7	43.1	53.9	10.8	

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

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	105.1	29.3	3.5	35.0	102.9	-	-	Carrier
Hori	2400.000	PK	45.5	29.3	3.5	35.0	43.3	82.9	39.6	
Vert	2402.000	PK	101.9	29.3	3.5	35.0	99.7	-	-	Carrier
Vert	2400.000	PK	43.9	29.3	3.5	35.0	41.7	79.7	38.0	

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

Radiated Spurious Emission

Report No.	10689818H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	03/28/2015	04/02/2015	04/20/2015
Temperature/ Humidity	23deg. C / 30% RH	20deg. C / 35% RH	23 deg. C / 52% RH
Engineer	Yuta Moriya	Takafumi Noguchi	Takafumi Noguchi
	(1-10GHz)	(10-26.5GHz)	(Below 1GHz)
Mode	Tx (Hopping off) DH5 2441MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.123	QP	23.3	14.1	7.3	28.5	16.2	40.0	23.8	
Hori	62.174	QP	23.1	7.1	7.6	28.4	9.4	40.0	30.6	
Hori	79.994	QP	23.1	6.8	7.9	28.4	9.4	40.0	30.6	
Hori	123.521	QP	23.0	13.0	8.4	28.1	16.3	43.5	27.2	
Hori	129.472	QP	23.0	13.5	8.5	28.1	16.9	43.5	26.6	
Hori	251.969	QP	21.7	17.3	9.5	27.6	20.9	46.0	25.1	
Hori	4882.000	PK	44.0	32.8	5.9	34.2	48.5	73.9	25.5	
Hori	7323.000	PK	42.1	36.8	7.1	34.1	51.9	73.9	22.0	
Hori	9764.000	PK	42.1	39.0	8.1	34.7	54.5	73.9	19.4	
Hori	4882.000	AV	33.3	32.8	5.9	34.2	37.8	53.9	16.1	
Hori	7323.000	AV	30.4	36.8	7.1	34.1	40.2	53.9	13.7	
Hori	9764.000	AV	30.3	39.0	8.1	34.7	42.7	53.9	11.2	
Vert	41.732	QP	23.3	13.5	7.3	28.5	15.6	40.0	24.4	
Vert	60.879	QP	23.2	7.3	7.6	28.4	9.7	40.0	30.3	
Vert	79.755	QP	23.1	6.7	7.9	28.4	9.3	40.0	30.7	
Vert	123.840	QP	22.9	13.0	8.4	28.1	16.2	43.5	27.3	
Vert	130.033	QP	23.1	13.6	8.5	28.1	17.1	43.5	26.4	
Vert	250.016	QP	21.7	17.2	9.5	27.6	20.8	46.0	25.2	
Vert	4882.000	PK	43.0	32.8	5.9	34.2	47.5	73.9	26.4	
Vert	7323.000	PK	43.0	36.8	7.1	34.1	52.8	73.9	21.1	
Vert	9764.000	PK	42.7	39.0	8.1	34.7	55.1	73.9	18.8	
Vert	4882.000	AV	32.0	32.8	5.9	34.2	36.5	53.9	17.4	
Vert	7323.000	AV	30.4	36.8	7.1	34.1	40.2	53.9	13.7	
Vert	9764.000	AV	30.2	39.0	8.1	34.7	42.6	53.9	11.3	

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

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

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

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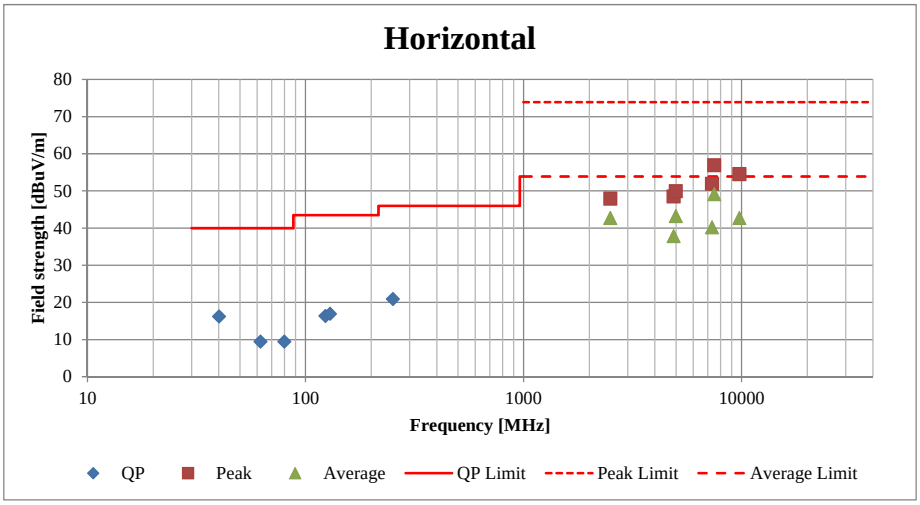
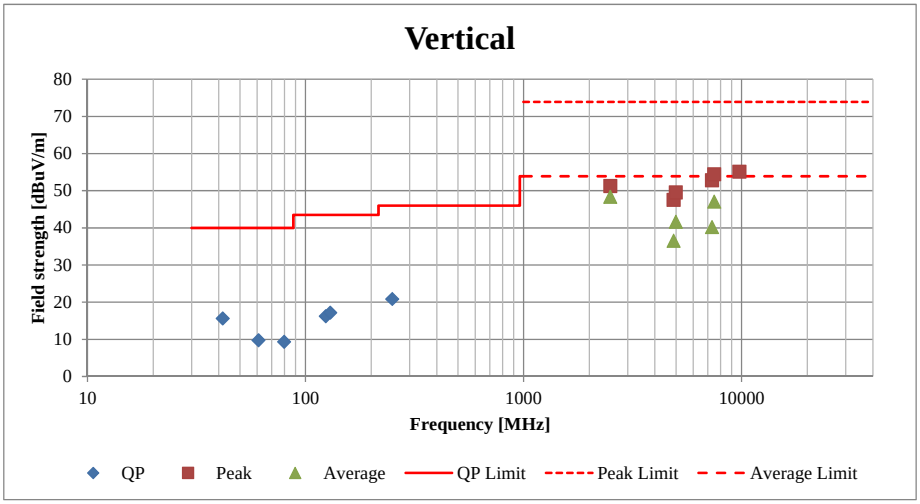
Radiated Spurious Emission
(Plot data, Worst case)

Report No.	10689818H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	03/28/2015	04/02/2015	04/20/2015
Temperature/ Humidity	23deg. C / 30% RH	20deg. C / 35% RH	23 deg. C / 52% RH
Engineer	Yuta Moriya (1-10GHz)	Takafumi Noguchi (10-26.5GHz)	Takafumi Noguchi (Below 1GHz)
Mode	Tx (Hopping off) DH5 2441MHz		





*These plots data contains sufficient number to show the trend of characteristic features for EUT.
ANSI C63.10:2013 Clause 6.3.4 states “For radiated emission test data reporting, both plots and tabular data shall be included”.

Radiated Spurious Emission

Report No.	10689818H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	03/28/2015	04/02/2015	04/20/2015
Temperature/ Humidity	23deg. C / 30% RH	20deg. C / 35% RH	23 deg. C / 52% RH
Engineer	Yuta Moriya	Takafumi Noguchi	Takafumi Noguchi
	(1-10GHz)	(10-26.5GHz)	(Below 1GHz)
Mode	Tx (Hopping off) DH5 2480MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.003	QP	23.3	14.2	7.3	28.5	16.3	40.0	23.7	
Hori	61.978	QP	23.2	7.1	7.6	28.4	9.5	40.0	30.5	
Hori	79.967	QP	23.1	6.8	7.9	28.4	9.4	40.0	30.6	
Hori	123.565	QP	22.9	13.0	8.4	28.1	16.2	43.5	27.3	
Hori	129.585	QP	23.0	13.5	8.5	28.1	16.9	43.5	26.6	
Hori	251.805	QP	21.7	17.3	9.5	27.6	20.9	46.0	25.1	
Hori	2483.500	PK	50.3	29.3	3.5	34.9	48.2	73.9	25.7	
Hori	4960.000	PK	42.7	33.0	5.9	34.3	47.3	73.9	26.6	
Hori	7440.000	PK	42.6	36.8	7.0	34.2	52.2	73.9	21.7	
Hori	9920.000	PK	43.3	39.0	8.2	34.7	55.8	73.9	18.1	
Hori	2483.500	AV	36.3	29.3	3.5	34.9	34.2	53.9	19.7	
Hori	4960.000	AV	32.1	33.0	5.9	34.3	36.7	53.9	17.2	
Hori	7440.000	AV	30.7	36.8	7.0	34.2	40.3	53.9	13.6	
Hori	9920.000	AV	31.2	39.0	8.2	34.7	43.7	53.9	10.2	
Vert	41.892	QP	23.2	13.5	7.3	28.5	15.5	40.0	24.5	
Vert	60.051	QP	23.4	7.4	7.6	28.4	10.0	40.0	30.0	
Vert	79.843	QP	23.1	6.8	7.9	28.4	9.4	40.0	30.6	
Vert	124.057	QP	22.9	13.1	8.4	28.1	16.3	43.5	27.2	
Vert	130.161	QP	23.1	13.6	8.5	28.1	17.1	43.5	26.4	
Vert	249.787	QP	21.6	17.1	9.5	27.6	20.6	46.0	25.4	
Vert	2483.500	PK	48.8	29.3	3.5	34.9	46.7	73.9	27.2	
Vert	4960.000	PK	42.6	33.0	5.9	34.3	47.2	73.9	26.7	
Vert	7440.000	PK	42.5	36.8	7.0	34.2	52.1	73.9	21.8	
Vert	9920.000	PK	42.6	39.0	8.2	34.7	55.1	73.9	18.8	
Vert	2483.500	AV	35.9	29.3	3.5	34.9	33.8	53.9	20.1	
Vert	4960.000	AV	32.5	33.0	5.9	34.3	37.1	53.9	16.9	
Vert	7440.000	AV	30.8	36.8	7.0	34.2	40.4	53.9	13.5	
Vert	9920.000	AV	31.1	39.0	8.2	34.7	43.6	53.9	10.3	

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

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

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

Radiated Spurious Emission

Report No.	10689818H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	03/28/2015	04/02/2015	04/20/2015
Temperature/ Humidity	23deg. C / 30% RH	20deg. C / 35% RH	23 deg. C / 52% RH
Engineer	Yuta Moriya	Takafumi Noguchi	Takafumi Noguchi
	(1-10GHz)	(10-26.5GHz)	(Below 1GHz)
Mode	Tx (Hopping off) 3DH5 2402MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	39.790	QP	23.3	14.3	7.3	28.5	16.4	40.0	23.6	
Hori	62.057	QP	23.2	7.1	7.6	28.4	9.5	40.0	30.5	
Hori	80.194	QP	23.0	6.8	7.9	28.4	9.3	40.0	30.7	
Hori	123.429	QP	23.0	13.0	8.4	28.1	16.3	43.5	27.2	
Hori	129.819	QP	23.0	13.6	8.5	28.1	17.0	43.5	26.5	
Hori	251.589	QP	21.7	17.2	9.5	27.6	20.8	46.0	25.2	
Hori	2390.000	PK	46.5	29.3	3.5	35.0	44.3	73.9	29.6	
Hori	4804.000	PK	41.7	32.7	5.8	34.2	46.0	73.9	27.9	
Hori	7206.000	PK	42.8	36.8	7.2	34.1	52.7	73.9	21.2	
Hori	9608.000	PK	42.6	38.9	8.1	34.7	54.9	73.9	19.0	
Hori	2390.000	AV	32.8	29.3	3.5	35.0	30.6	53.9	23.4	
Hori	4804.000	AV	30.6	32.7	5.8	34.2	34.9	53.9	19.0	
Hori	7206.000	AV	30.6	36.8	7.2	34.1	40.5	53.9	13.5	
Hori	9608.000	AV	30.7	38.9	8.1	34.7	43.0	53.9	10.9	
Vert	41.725	QP	23.2	13.5	7.3	28.5	15.5	40.0	24.5	
Vert	60.000	QP	23.4	7.4	7.6	28.4	10.0	40.0	30.0	
Vert	79.624	QP	23.1	6.7	7.9	28.4	9.3	40.0	30.7	
Vert	123.873	QP	23.0	13.0	8.4	28.1	16.3	43.5	27.2	
Vert	130.176	QP	23.0	13.6	8.5	28.1	17.0	43.5	26.5	
Vert	249.806	QP	21.7	17.1	9.5	27.6	20.7	46.0	25.3	
Vert	2390.000	PK	45.5	29.3	3.5	35.0	43.3	73.9	30.6	
Vert	4804.000	PK	42.1	32.7	5.8	34.2	46.4	73.9	27.5	
Vert	7206.000	PK	42.3	36.8	7.2	34.1	52.2	73.9	21.7	
Vert	9608.000	PK	42.3	38.9	8.1	34.7	54.6	73.9	19.3	
Vert	2390.000	AV	32.6	29.3	3.5	35.0	30.4	53.9	23.5	
Vert	4804.000	AV	30.5	32.7	5.8	34.2	34.8	53.9	19.1	
Vert	7206.000	AV	30.5	36.8	7.2	34.1	40.4	53.9	13.5	
Vert	9608.000	AV	30.7	38.9	8.1	34.7	43.0	53.9	10.9	

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

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

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

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	100.7	29.3	3.5	35.0	98.5	-	-	Carrier
Hori	2400.000	PK	51.3	29.3	3.5	35.0	49.1	78.5	29.4	
Vert	2402.000	PK	100.1	29.3	3.5	35.0	97.9	-	-	Carrier
Vert	2400.000	PK	50.6	29.3	3.5	35.0	48.4	77.9	29.5	

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

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Radiated Spurious Emission

Report No.	10689818H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	03/28/2015	04/02/2015	04/20/2015
Temperature/ Humidity	23deg. C / 30% RH	20deg. C / 35% RH	23 deg. C / 52% RH
Engineer	Yuta Moriya	Takafumi Noguchi	Takafumi Noguchi
	(1-10GHz)	(10-26.5GHz)	(Below 1GHz)
Mode	Tx (Hopping off) 3DH5 2441MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.040	QP	23.3	14.2	7.3	28.5	16.3	40.0	23.7	
Hori	62.264	QP	23.1	7.1	7.6	28.4	9.4	40.0	30.6	
Hori	80.136	QP	23.0	6.8	7.9	28.4	9.3	40.0	30.7	
Hori	123.421	QP	23.0	13.0	8.4	28.1	16.3	43.5	27.2	
Hori	129.827	QP	23.0	13.6	8.5	28.1	17.0	43.5	26.5	
Hori	251.351	QP	21.7	17.2	9.5	27.6	20.8	46.0	25.2	
Hori	4882.000	PK	42.7	32.8	5.9	34.2	47.2	73.9	26.7	
Hori	7323.000	PK	42.3	36.8	7.1	34.1	52.1	73.9	21.8	
Hori	9764.000	PK	42.2	39.0	8.1	34.7	54.6	73.9	19.3	
Hori	4882.000	AV	30.6	32.8	5.9	34.2	35.1	53.9	18.8	
Hori	7323.000	AV	30.4	36.8	7.1	34.1	40.2	53.9	13.7	
Hori	9764.000	AV	30.3	39.0	8.1	34.7	42.7	53.9	11.2	
Vert	41.888	QP	23.3	13.5	7.3	28.5	15.6	40.0	24.4	
Vert	59.826	QP	23.4	7.4	7.6	28.4	10.0	40.0	30.0	
Vert	79.536	QP	23.1	6.7	7.9	28.4	9.3	40.0	30.7	
Vert	123.962	QP	22.9	13.1	8.4	28.1	16.3	43.5	27.2	
Vert	130.158	QP	23.1	13.6	8.5	28.1	17.1	43.5	26.4	
Vert	249.634	QP	21.6	17.1	9.5	27.6	20.6	46.0	25.4	
Vert	4882.000	PK	42.5	32.8	5.9	34.2	47.0	73.9	26.9	
Vert	7323.000	PK	42.1	36.8	7.1	34.1	51.9	73.9	22.0	
Vert	9764.000	PK	42.2	39.0	8.1	34.7	54.6	73.9	19.3	
Vert	4882.000	AV	30.4	32.8	5.9	34.2	34.9	53.9	19.1	
Vert	7323.000	AV	30.4	36.8	7.1	34.1	40.2	53.9	13.7	
Vert	9764.000	AV	30.3	39.0	8.1	34.7	42.7	53.9	11.2	

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

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

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

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Radiated Spurious Emission

Report No.	10689818H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	03/28/2015	04/02/2015	04/20/2015
Temperature/ Humidity	23deg. C / 30% RH	20deg. C / 35% RH	23 deg. C / 52% RH
Engineer	Yuta Moriya	Takafumi Noguchi	Takafumi Noguchi
	(1-10GHz)	(10-26.5GHz)	(Below 1GHz)
Mode	Tx (Hopping off) 3DH5 2480MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	39.901	QP	23.3	14.2	7.3	28.5	16.3	40.0	23.7	
Hori	62.310	QP	23.2	7.1	7.6	28.4	9.5	40.0	30.5	
Hori	80.251	QP	23.0	6.8	7.9	28.4	9.3	40.0	30.7	
Hori	123.327	QP	23.0	13.0	8.4	28.1	16.3	43.5	27.2	
Hori	129.820	QP	23.0	13.6	8.5	28.1	17.0	43.5	26.5	
Hori	251.524	QP	21.7	17.2	9.5	27.6	20.8	46.0	25.2	
Hori	2483.500	PK	58.5	29.3	3.5	34.9	56.4	73.9	17.5	
Hori	4960.000	PK	42.2	33.0	5.9	34.3	46.8	73.9	27.1	
Hori	7440.000	PK	42.2	36.8	7.0	34.2	51.8	73.9	22.1	
Hori	9920.000	PK	42.9	39.0	8.2	34.7	55.4	73.9	18.6	
Hori	2483.500	AV	40.1	29.3	3.5	34.9	38.0	53.9	15.9	
Hori	4960.000	AV	30.2	33.0	5.9	34.3	34.8	53.9	19.1	
Hori	7440.000	AV	30.5	36.8	7.0	34.2	40.1	53.9	13.8	
Hori	9920.000	AV	30.9	39.0	8.2	34.7	43.4	53.9	10.5	
Vert	42.138	QP	23.3	13.4	7.3	28.5	15.5	40.0	24.5	
Vert	59.586	QP	23.7	7.5	7.6	28.4	10.4	40.0	29.6	
Vert	79.398	QP	23.1	6.7	7.9	28.4	9.3	40.0	30.7	
Vert	123.873	QP	22.9	13.0	8.4	28.1	16.2	43.5	27.3	
Vert	129.922	QP	23.0	13.6	8.5	28.1	17.0	43.5	26.5	
Vert	249.643	QP	21.6	17.1	9.5	27.6	20.6	46.0	25.4	
Vert	2483.500	PK	57.7	29.3	3.5	34.9	55.6	73.9	18.3	
Vert	4960.000	PK	42.4	33.0	5.9	34.3	47.0	73.9	26.9	
Vert	7440.000	PK	42.2	36.8	7.0	34.2	51.8	73.9	22.1	
Vert	9920.000	PK	42.7	39.0	8.2	34.7	55.2	73.9	18.7	
Vert	2483.500	AV	39.6	29.3	3.5	34.9	37.5	53.9	16.4	
Vert	4960.000	AV	30.4	33.0	5.9	34.3	35.0	53.9	18.9	
Vert	7440.000	AV	30.5	36.8	7.0	34.2	40.1	53.9	13.8	
Vert	9920.000	AV	30.9	39.0	8.2	34.7	43.4	53.9	10.5	

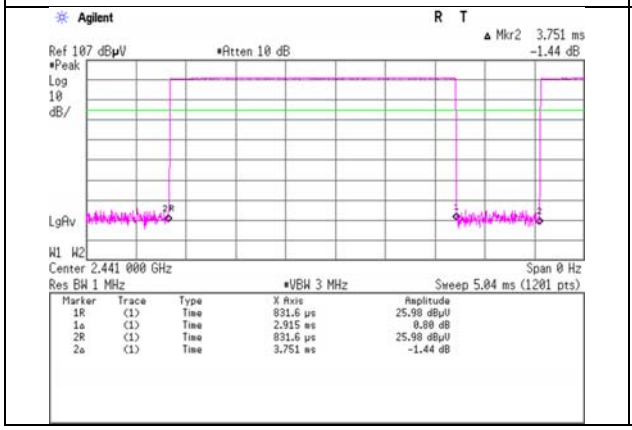
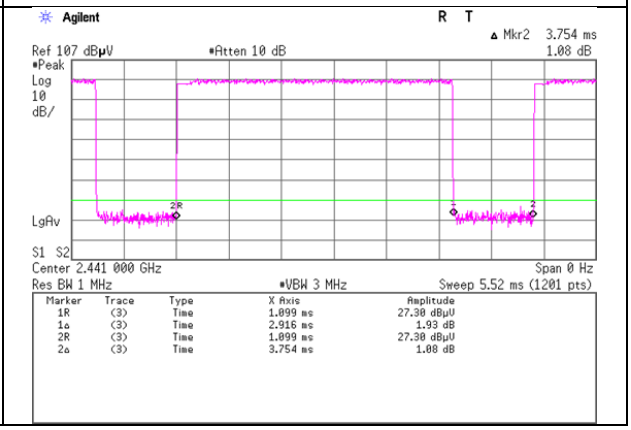
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

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

Burst Rate Confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10689818H
Date	03/30/2015
Temperature/ Humidity	23deg. C / 32% RH
Engineer	Shinichi Miyazono
Mode	Tx (Hopping on)

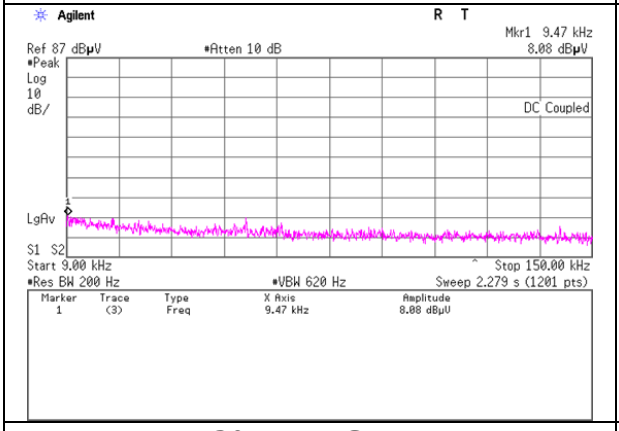
DH5	3DH5
	

Conducted Spurious Emission

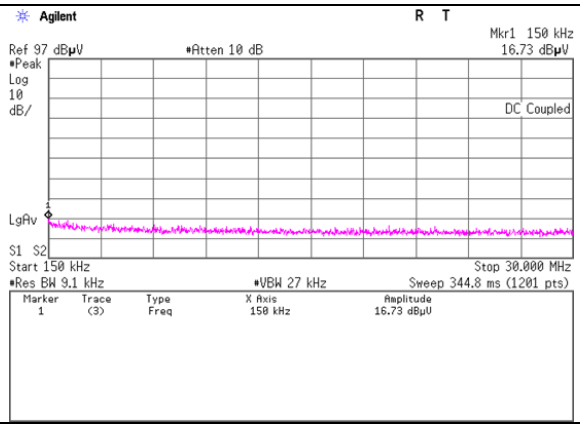
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10689818H
Date	03/30/2015
Temperature/ Humidity	23deg. C / 32% RH
Engineer	Shinichi Miyazono
Mode	Tx (Hopping on) DH5

Tx DH5 2402MHz

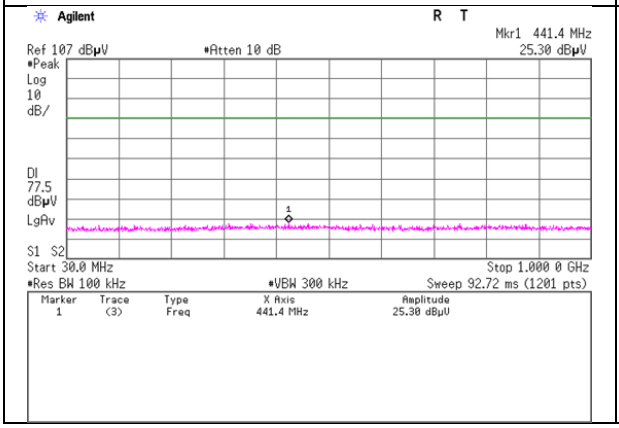
9kHz-150kHz



150kHz-30MHz



30MHz-1GHz



1GHz-5GHz