RADIO TEST REPORT

Test Report No. : 11932168H-B-R1

Applicant	:	**Murata Manufacturing Co., Ltd.**
Type of Equipment	:	**Communication Module**
Model No.	:	**Type1NX**
FCC ID	:	**VPYLB1NX**
Test regulation	:	**FCC Part 15 Subpart C: 2018 (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)
7. This report is a revised version of 11932168H-B. 11932168H-B is replaced with this report.

Date of test: September 21 to October 29, 2017

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

Approved by:
Takayuki Shimada
Leader
Consumer Technology Division

NVLAP TESTING
NVLAP LAB CODE: 200572-0

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REVISION HISTORY

Original Test Report No.: 11932168H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11932168H-B	February 13, 2018	-	-
1	11932168H-B-R1	February 26, 2018	P 20	Addition of 99 % Occupied Bandwidth data
1	11932168H-B-R1	February 26, 2018	P 21, 22	Page 50 and 51 moved to page 21 and 22.

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SECTION 1: Customer information

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

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

2.1 Identification of E.U.T.

Type of Equipment	:	Communication Module
Model No.	:	Type1NX
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	VBAT: Min. 3.35 V / Typ. 3.6 V / Max. 4.8 V *VIO: Min. 1.71 V / Typ. 1.8 V / Max. 1.89 V * VIO don't influence the RF characteristic.
Receipt Date of Sample	:	September 15, 2017
Country of Mass-production	:	China and Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: Type1NX (referred to as the EUT in this report) is a Communication Module.

General Specification

Clock frequency(ies) in the system	:	37.4 MHz (X'tal)

Radio Specification

Radio Type	Transceiver
Power Supply (inner)	DC 1.35 V, 1.2 V, 3.3 V, 2.5 V

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 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5720 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5710 MHz 5755 MHz - 5795 MHz	5210 MHz 5290 MHz 5530 MHz - 5690 MHz 5775 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM(IEEE802.11ac only))		
Channel spacing	5 MHz		20 MHz	40 MHz	80 MHz
Antenna type	Dipole antenna				
Antenna Gain	2.4 GHz: 0.2 dBi 5 GHz: 1.4dBi				

Bluetooth (Ver. 4.2 with EDR function)

	Bluetooth Ver.4.2 with EDR function *1)
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	BT: FHSS (GFSK, π/4DQPSK, 8DPSK) LE: GFSK
Channel spacing	BT: 1 MHz LE: 2 MHz
Antenna type	Dipole antenna
Antenna Gain	2.4 GHz: 0.2 dBi

*1) This test report applies to Bluetooth Ver.4.2 with EDR function (2402 MHz - 2480 MHz) except for Bluetooth Low Energy.
* WLAN and Bluetooth do not transmit simultaneously.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on February 2, 2018 and effective March 5, 2018

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

* The revisions made after testing date do not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods **IC:** RSS-Gen 8.8	**FCC:** Section 15.207 **IC:** RSS-Gen 8.8	**QP** 29.1 dB, 0.15000 MHz, N / L **AV** 24.3 dB, 29.02865 MHz, N	Complied	-
Carrier Frequency Separation	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1) **IC:** RSS-247 5.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1) **IC:** RSS-247 5.1 (a)		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 (d)		Complied	Conducted
Dwell time	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1)(iii) **IC:** RSS-247 5.1 (d)		Complied	Conducted
Maximum Peak Output Power	**FCC:** FCC Public Notice DA 00-705 **IC:** RSS-Gen 6.12	**FCC:** Section15.247(b)(1) **IC:** RSS-247 5.4 (b)		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	13.7 dB 4804.000 MHz, AV, Hori.	Complied	Conducted/ Radiated (above 30 MHz) *1)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) Radiated test was selected over 30 MHz based on section 15.247(d).					

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

FCC Part 15.31 (e)
The RF Module has its own regulator.
The RF Module is constantly provided voltage (DC 1.35 V, 1.2 V, 3.3 V, 2.5 V) through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement
The antenna is not removable from the EUT.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

Ise EMC Lab.

Antenna terminal test	Uncertainty (+/-)
RF output power	1.2 dB
Antenna terminal conducted emission / Power density / Burst power	3.1 dB
Adjacent channel power / Channel power	
Below 3 GHz	1.8 dB
3 GHz to 6 GHz	2.7 dB

Frequency range	Conducted emission using AMN(LISN) (+/-)
0.009 MHz - 0.15 MHz	3.1 dB
0.15 MHz - 30 MHz	2.5 dB

Test distance	Radiated emission (+/-) 9 kHz - 30 MHz
3 m	3.8 dB
10 m	3.6 dB

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	5.2 dB	6.3 dB	5.0 dB	5.0 dB

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

*Measurement distance

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

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

3.5 Test Location

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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

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

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Details of Operating Mode(s)

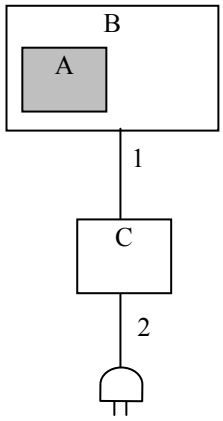
Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number 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 test items based on Bluetooth Core specification

*EUT has the power settings by the software as follows;
Power settings: CYW4373A0_001.001.025.0007.0000_02
Software: Bluetool 1.8.9.3
*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



AC 120 V / 60 Hz

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

Description of EUT

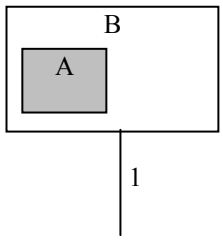
No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Communication Module	Type1NX	17	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	-	-	Murata Manufacturing Co., Ltd.	*1)
C	Regulated DC Power Supply	PW16-5ADP	171116437	TEXIO	-

*1) The test was performed with the module that as normal assumed implementation conditions.
The use of a jig does not influence on the test result.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.5	Unshielded	Unshielded	-
2	AC Cable	1.0	Unshielded	Unshielded	-

For Radiated Emission test



DC 3.6 V

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

Description of EUT

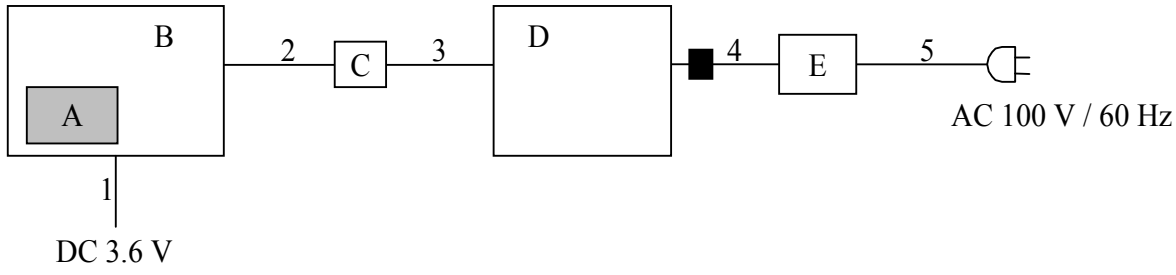
No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Communication Module	Type1NX	17	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	-	-	Murata Manufacturing Co., Ltd.	*1)

*1) The test was performed with the module that as normal assumed implementation conditions.
The use of a jig does not influence on the test result.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.5	Unshielded	Unshielded	-

[For Antenna Terminal Conducted test]



■ : Standard Ferrite Core

* 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	Type1NX	9	Murata Manufacturing Co., Ltd.	EUT
B	Jig board 1	-	-	-	*1)
C	Jig board 2	-	-	-	-
D	Laptop PC	CF-N8HWCDPS	OBKSA07449	Panasonic	-
E	AC Adaptor	CF-AA6372B	637BM610701051E	Panasonic	-

*1) The test was performed with the module that as normal assumed implementation conditions.
The use of a jig does not influence on the test result.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.55	Unshielded	Unshielded	-
2	Signal Cable	0.10	Unshielded	Unshielded	-
3	Serial Cable	0.50	Shielded	Shielded	-
4	DC Cable	1.10	Unshielded	Unshielded	-
5	AC Cable	0.90	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

1) For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

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

SECTION 6: Radiated Spurious Emission

Test Procedure

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

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

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

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	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	4.5 m*2) (1 GHz – 10 GHz), 1 m*3) (10 GHz – 26.5 GHz)		4.5 m*2) (1 GHz – 10 GHz), 1 m*3) (10 GHz – 26.5 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 (4.5 m/3.0 m) = 3.53 dB
*3) Distance Factor: 20 x log (1.0 m/3.0 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 MHz - 26.5 GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
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 *2)	-	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 *3)	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) 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.

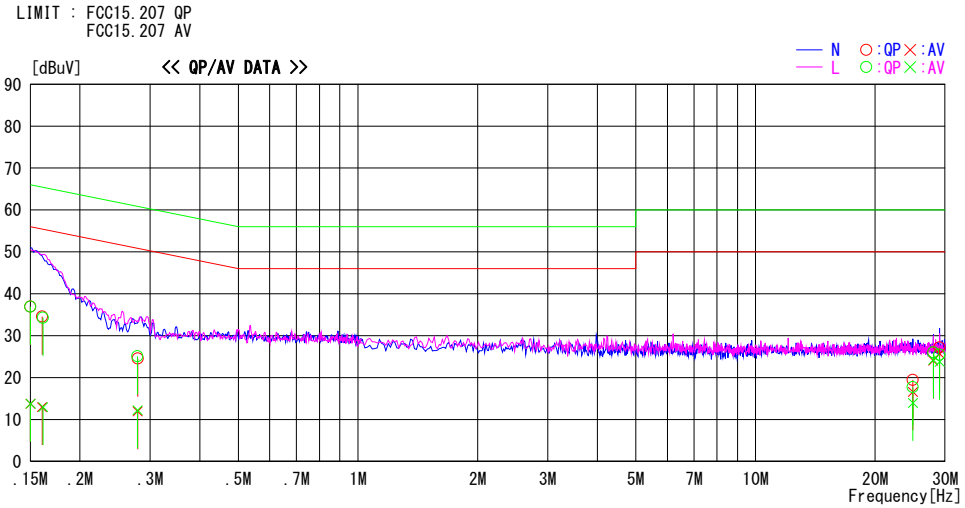
The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11932168H
Date	October 29, 2017
Temperature / Humidity	21 deg. C / 59 % RH
Engineer	Takafumi Noguchi
Mode	Tx DH5 2441 MHz



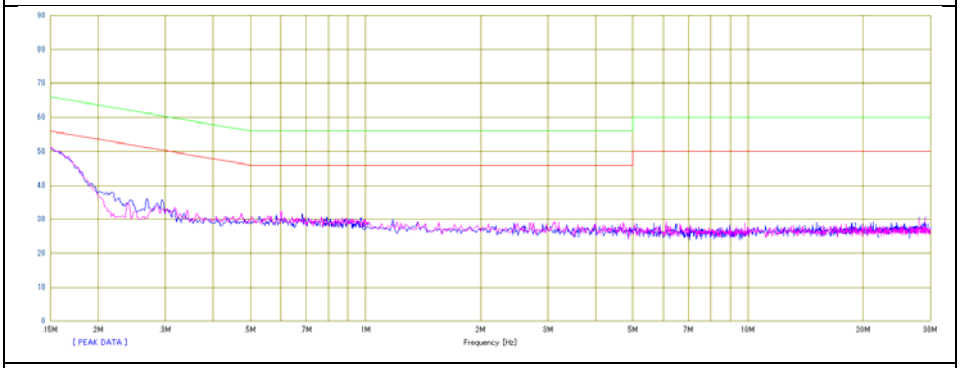
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	23.7	0.6	13.2	36.9	13.8	66.0	56.0	29.1	42.2	N	
0.16044	21.4	-0.2	13.2	34.6	13.0	65.4	55.4	30.8	42.4	N	
0.27912	11.4	-1.2	13.2	24.6	12.0	60.8	50.8	36.2	38.8	N	
24.88180	5.0	2.1	14.5	19.5	16.6	60.0	50.0	40.5	33.4	N	
27.99191	11.4	9.5	14.6	26.0	24.1	60.0	50.0	34.0	25.9	N	
29.02865	12.6	11.1	14.6	27.2	25.7	60.0	50.0	32.8	24.3	N	
0.15000	23.7	0.6	13.2	36.9	13.8	66.0	56.0	29.1	42.2	L	
0.16140	21.1	-0.2	13.2	34.3	13.0	65.4	55.4	31.1	42.4	L	
0.27898	11.9	-1.0	13.2	25.1	12.2	60.8	50.8	35.7	38.6	L	
24.88178	3.2	-0.5	14.5	17.7	14.0	60.0	50.0	42.3	36.0	L	
27.99188	11.4	9.6	14.6	26.0	24.2	60.0	50.0	34.0	25.8	L	
29.02856	10.9	9.2	14.6	25.5	23.8	60.0	50.0	34.5	26.2	L	

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

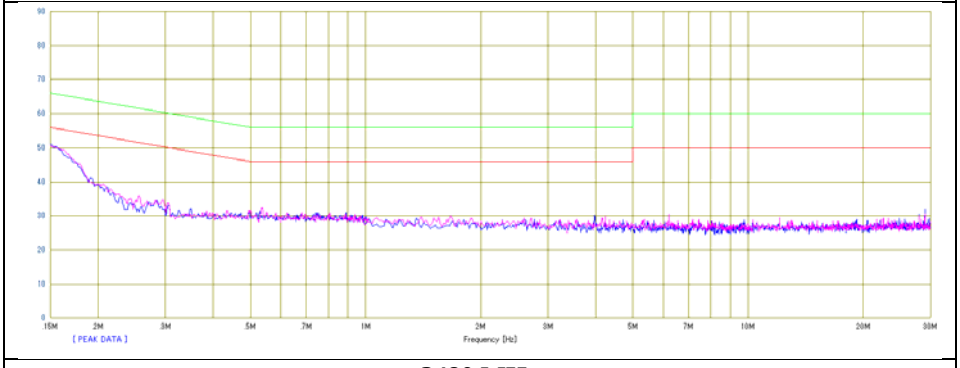
Conducted Emission

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11932168H
Date	October 29, 2017
Temperature / Humidity	21 deg. C / 59 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

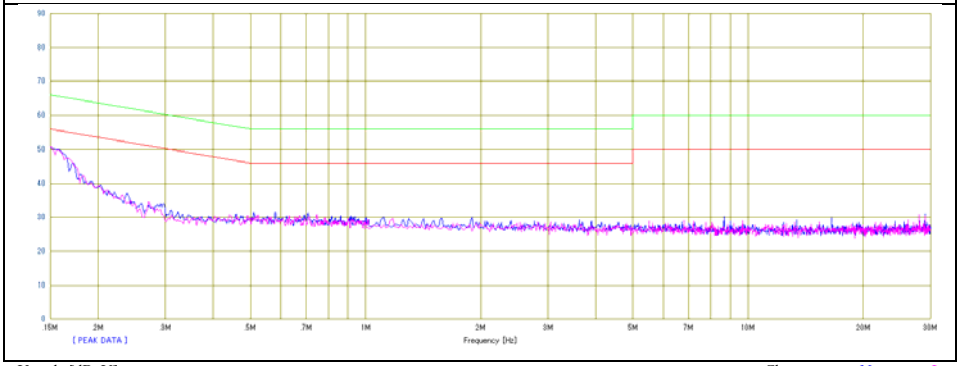
2402 MHz



2441 MHz



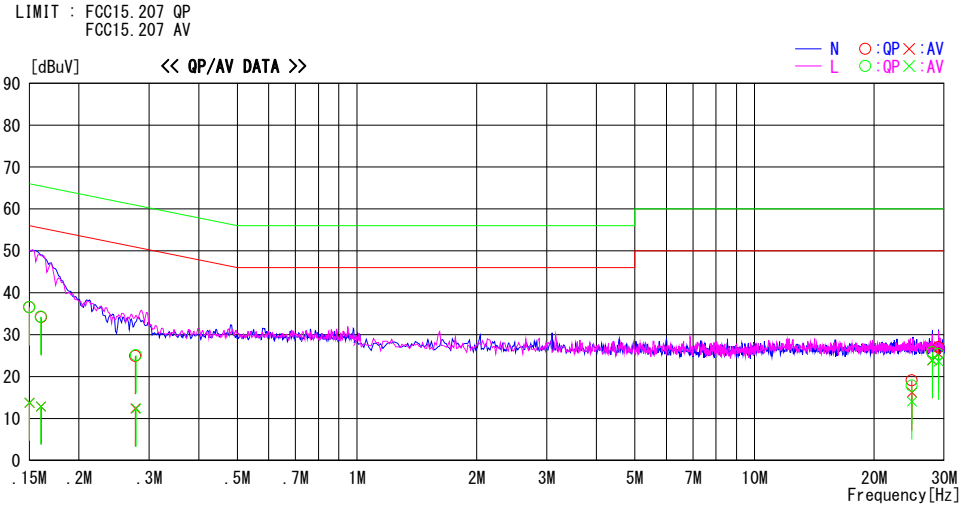
2480 MHz



Y scale [dBuV] Chart — N — L

Conducted Emission

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11932168H
Date	October 29, 2017
Temperature / Humidity	21 deg. C / 59 % RH
Engineer	Takafumi Noguchi
Mode	Tx 3DH5 2402 MHz



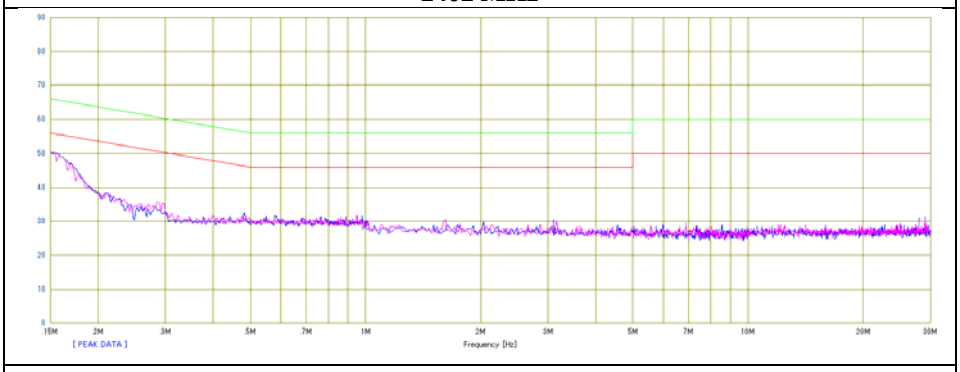
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	23.4	0.6	13.2	36.6	13.8	66.0	56.0	29.4	42.2	N	
0.16056	21.0	-0.3	13.2	34.2	12.9	65.4	55.4	31.2	42.5	N	
0.27702	11.7	-0.8	13.2	24.9	12.4	60.9	50.9	36.0	38.5	N	
24.88142	4.6	1.7	14.5	19.1	16.2	60.0	50.0	40.9	33.8	N	
27.99152	11.2	9.3	14.6	25.8	23.9	60.0	50.0	34.2	26.1	N	
29.02828	12.4	10.8	14.6	27.0	25.4	60.0	50.0	33.0	24.6	N	
0.15000	23.4	0.6	13.2	36.6	13.8	66.0	56.0	29.4	42.2	L	
0.16030	21.1	-0.3	13.2	34.3	12.9	65.4	55.4	31.1	42.5	L	
0.27841	11.9	-0.8	13.2	25.1	12.4	60.9	50.9	35.8	38.5	L	
24.88141	3.3	-0.4	14.5	17.8	14.1	60.0	50.0	42.2	35.9	L	
27.99153	11.2	9.4	14.6	25.8	24.0	60.0	50.0	34.2	26.0	L	
29.02825	10.8	9.0	14.6	25.4	23.6	60.0	50.0	34.6	26.4	L	

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

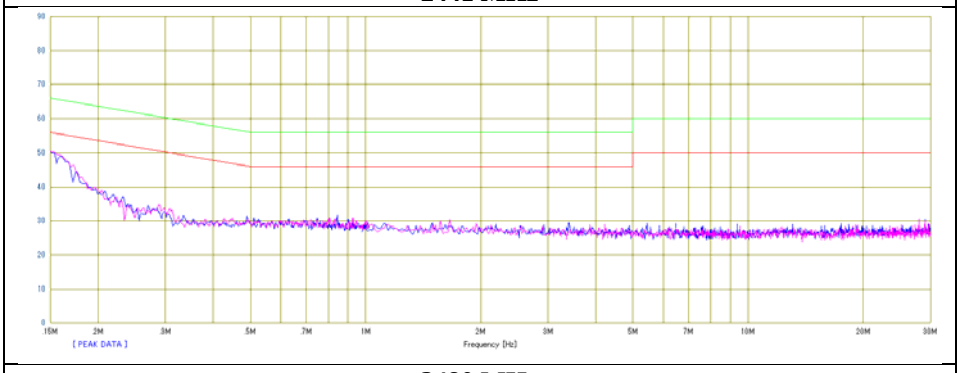
Conducted Emission

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11932168H
Date	October 29, 2017
Temperature / Humidity	21 deg. C / 59 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

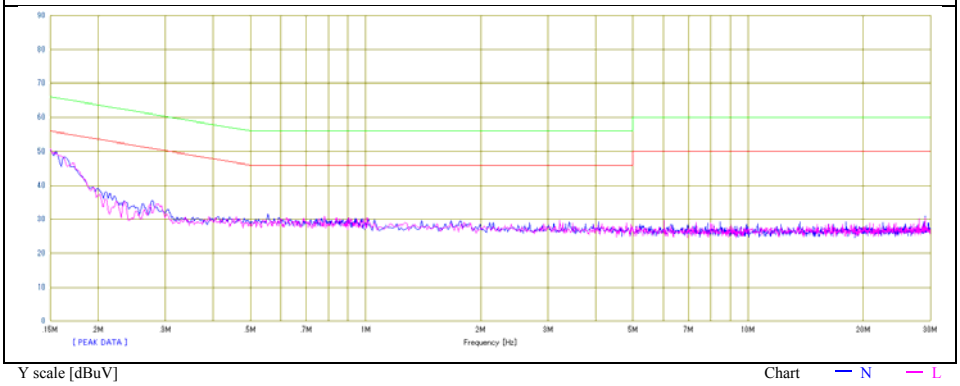
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

20 dB Bandwidth, 99 % Occupied Bandwidth and Carrier Frequency Separation

Test place	Ise EMC Lab. No.6 Measurement Room	
Report No.	11932168H	
Date	September 21, 2017	September 22, 2017
Temperature / Humidity	25.5 deg. C / 47 % RH	23 deg. C / 63 % RH
Engineer	Takafumi Noguchi	Tomohisa Nakagawa
Mode	Tx, Hopping Off, DH5	

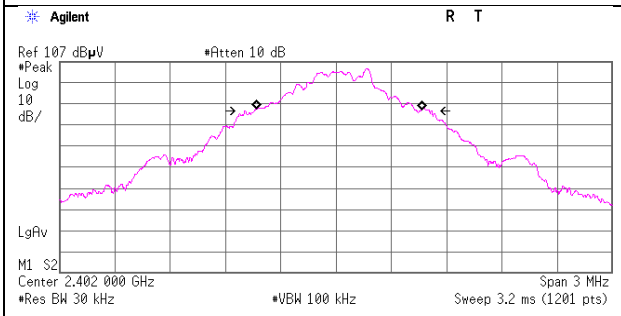
Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.013	894.3969	1.000	>= 0.675
DH5	2441.0	0.944	889.4911	1.000	>= 0.629
DH5	2480.0	1.019	897.6782	1.000	>= 0.679
DH5	Hopping On	-	78600.9000	-	-
3DH5	2402.0	1.311	1193.7000	1.000	>= 0.874
3DH5	2441.0	1.313	1190.9000	1.000	>= 0.875
3DH5	2480.0	1.316	1195.7000	1.000	>= 0.877
3DH5	Hopping On	-	78711.3000	-	-

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

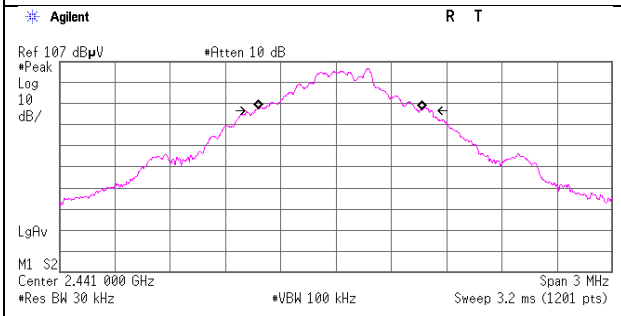
20 dB Bandwidth and 99 % Occupied Bandwidth

DH5

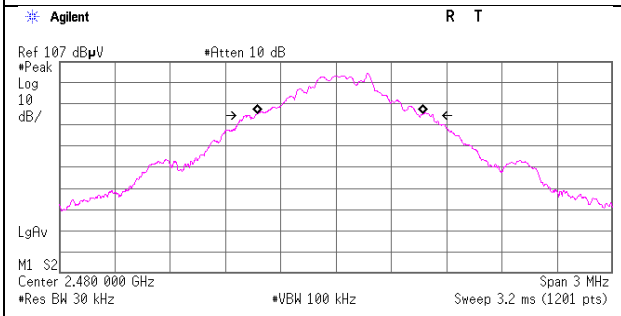
2402 MHz



2441 MHz

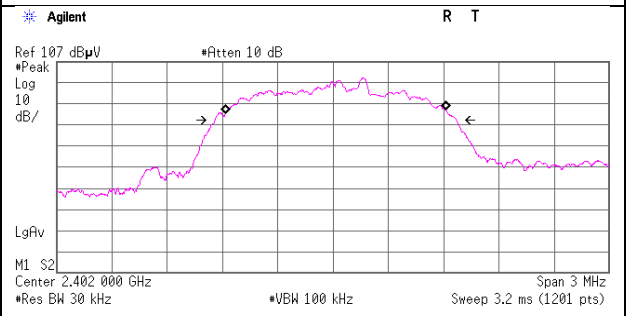


2480 MHz

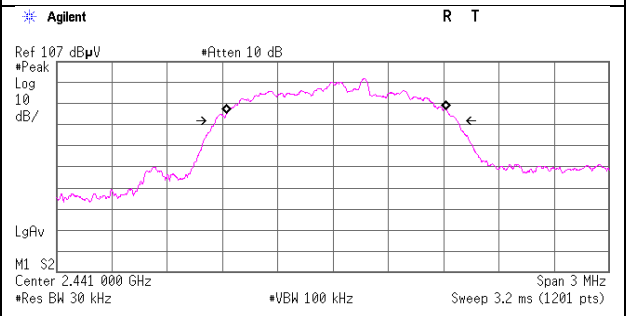


3DH5

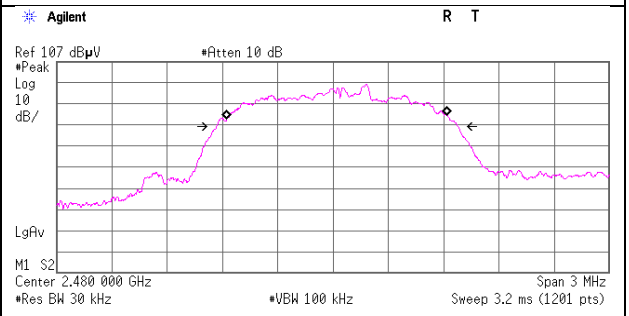
2402 MHz



2441 MHz

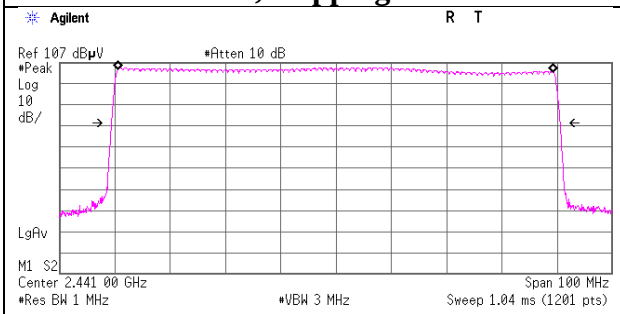


2480 MHz

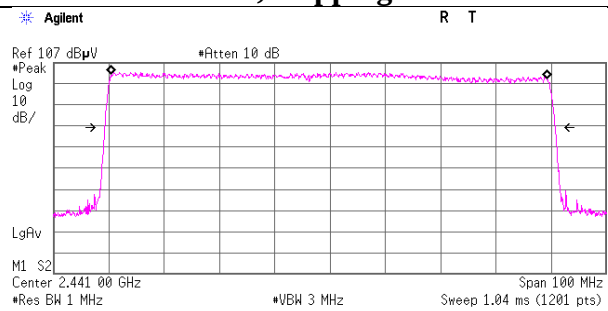


20dB Bandwidth and 99% Occupied Bandwidth

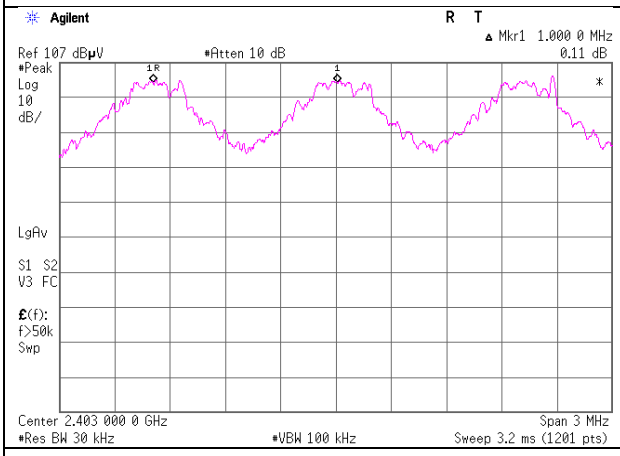
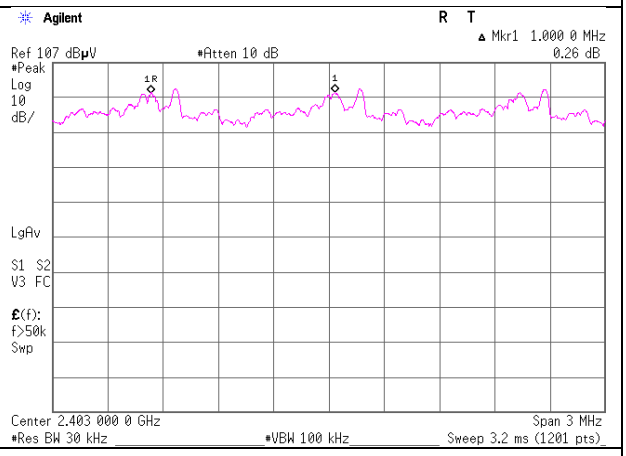
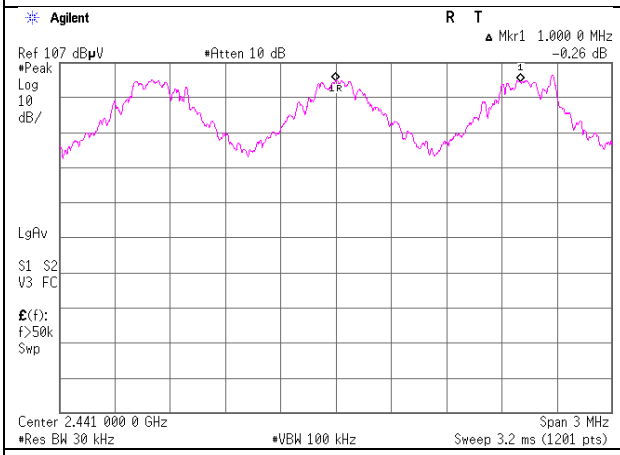
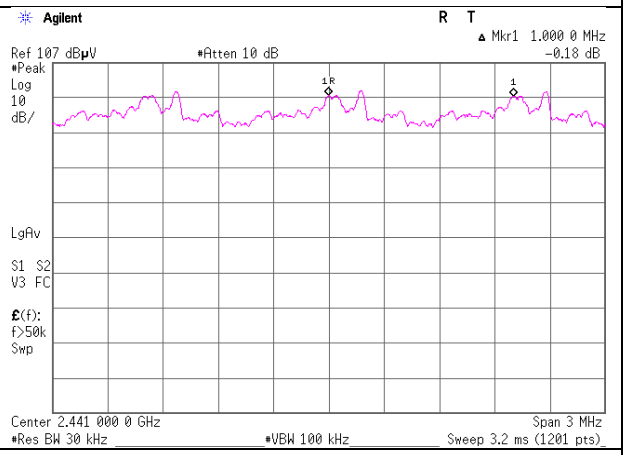
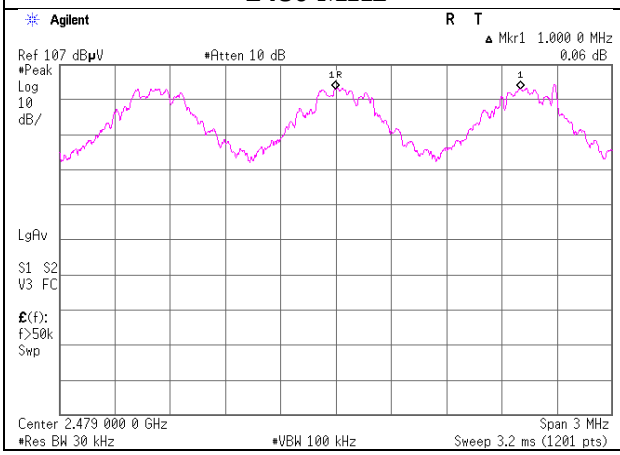
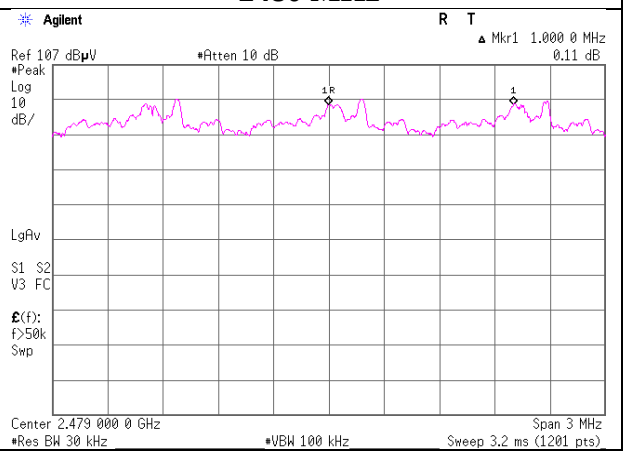
DH5, Hopping On



3DH5, Hopping On



Carrier Frequency Separation

DH5	3DH5
2402 MHz	**2402 MHz**
	
2441 MHz	**2441 MHz**
	
2480 MHz	**2480 MHz**
	

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Telephone : +81 596 24 8999
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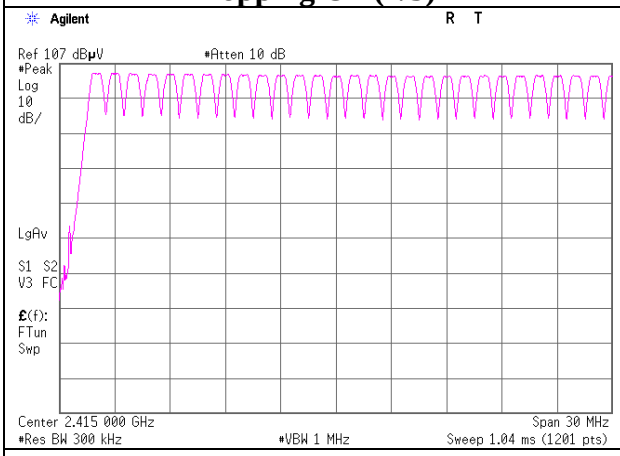
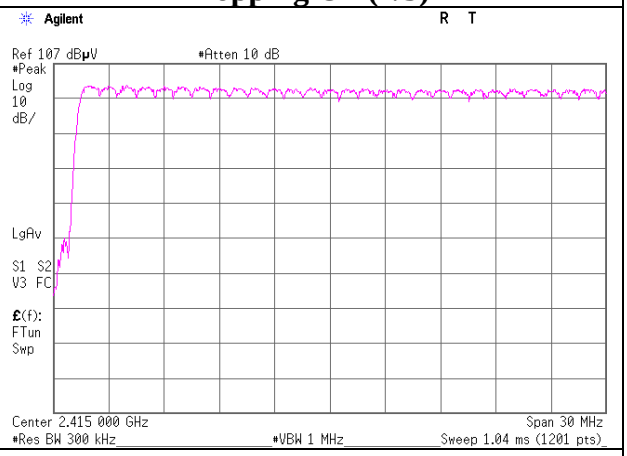
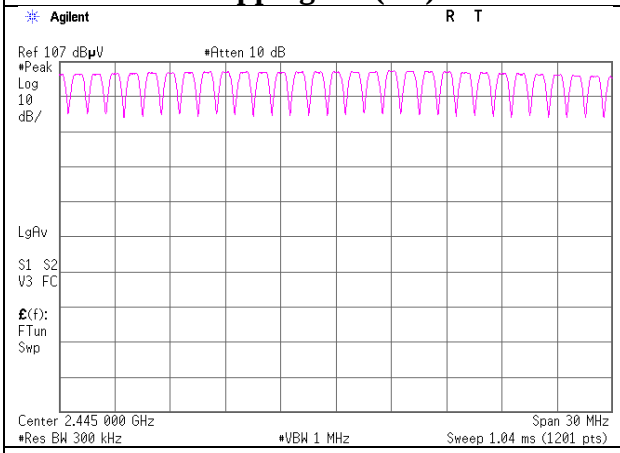
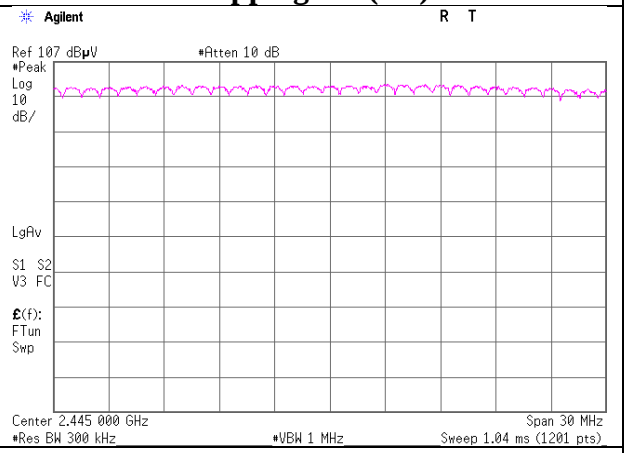
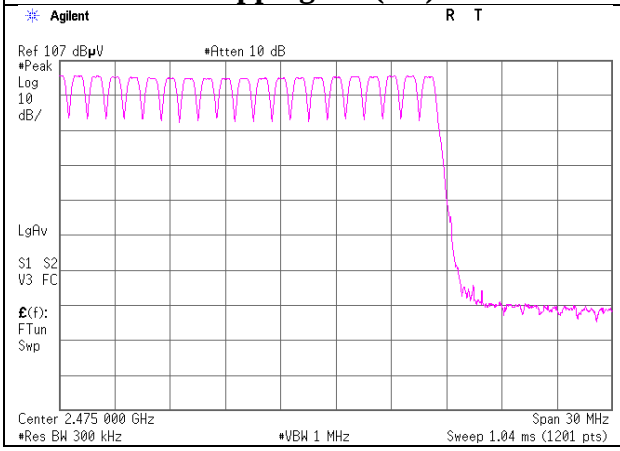
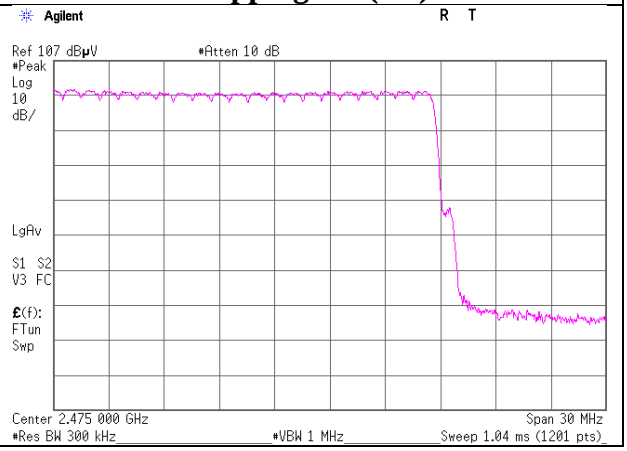
Number of Hopping Frequency

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
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.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
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	50.0 times	/ 5 sec.	x 31.6 sec.	= 316 times	0.402	127	400
DH3	26.0 times	/ 5 sec.	x 31.6 sec.	= 165 times	1.662	274	400
DH5	17.4 times	/ 5 sec.	x 31.6 sec.	= 110 times	2.920	321	400
3DH1	50.8 times	/ 5 sec.	x 31.6 sec.	= 322 times	0.406	131	400
3DH3	26.4 times	/ 5 sec.	x 31.6 sec.	= 167 times	1.669	279	400
3DH5	17.6 times	/ 5 sec.	x 31.6 sec.	= 112 times	2.920	327	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	50	51	51	49	50
DH3	27	29	24	24	26	26
DH5	15	17	19	16	20	17.4
3DH1	51	52	51	49	51	50.8
3DH3	26	29	27	25	25	26.4
3DH5	19	16	18	17	18	17.6

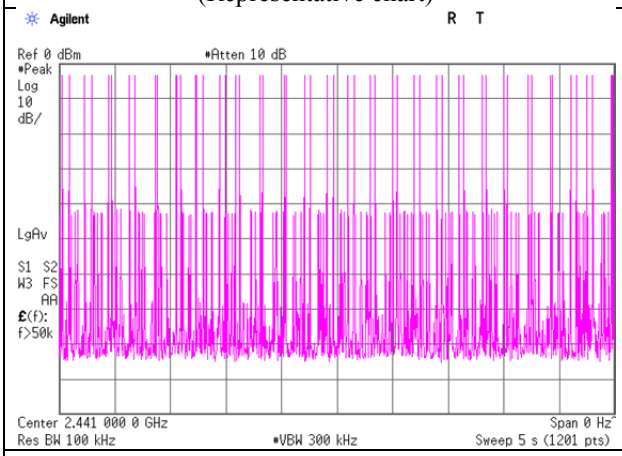
Sample Calculation
Average = Summation (Sampling 1 to 5) / 5

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.

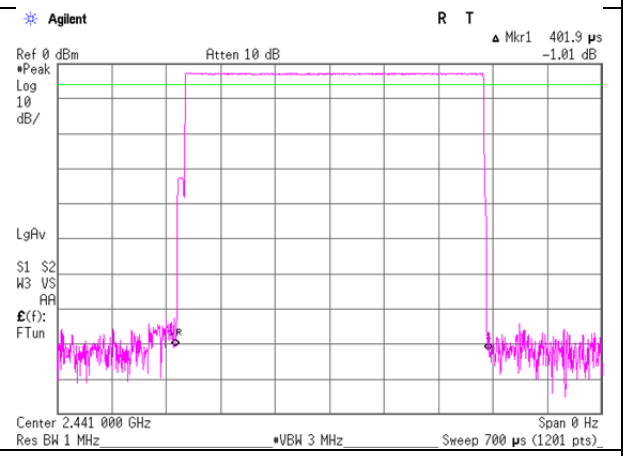
Dwell time

DH1 (1/2)

(Representative chart)

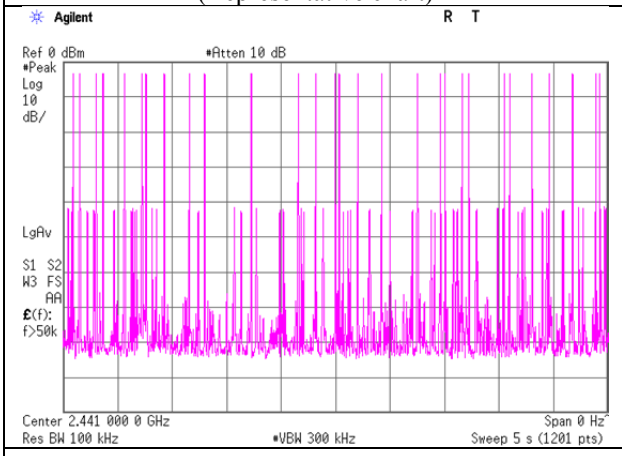


DH1 (2/2)

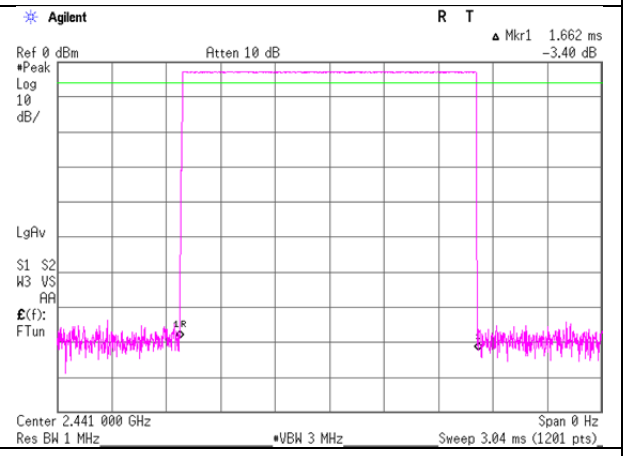


DH3 (1/2)

(Representative chart)

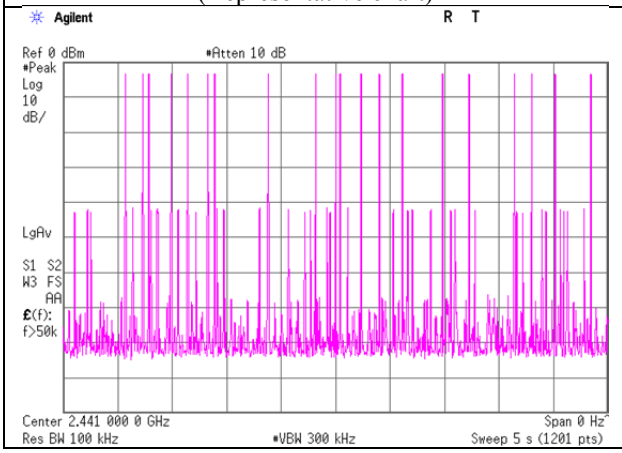


DH3 (2/2)

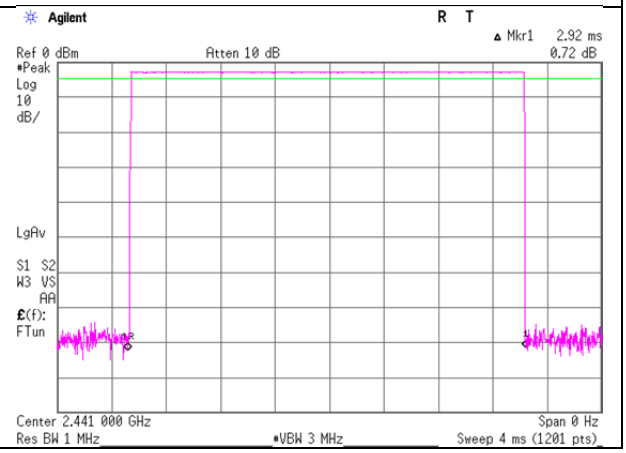


DH5 (1/2)

(Representative chart)



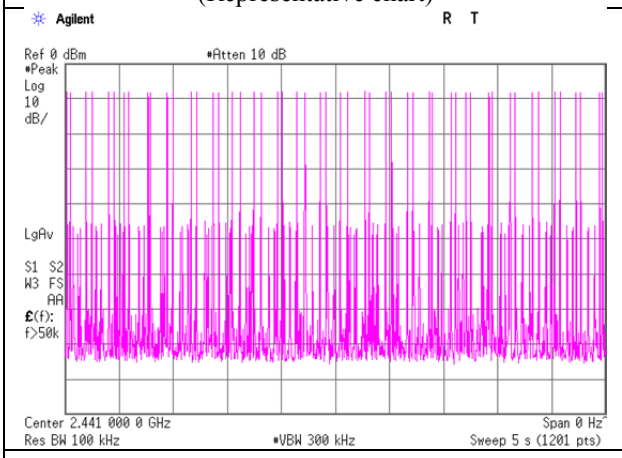
DH5 (2/2)



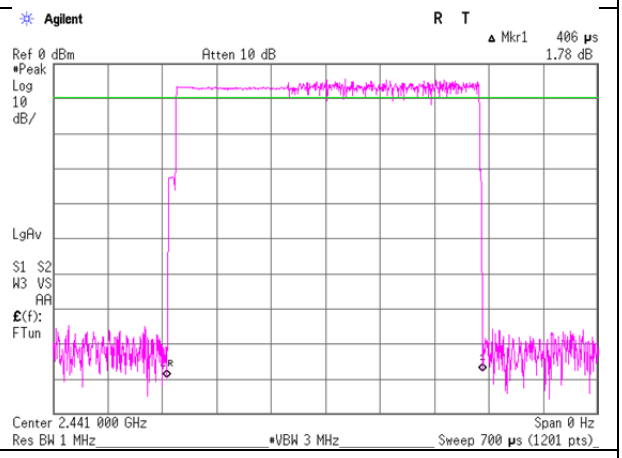
Dwell time

3DH1 (1/2)

(Representative chart)

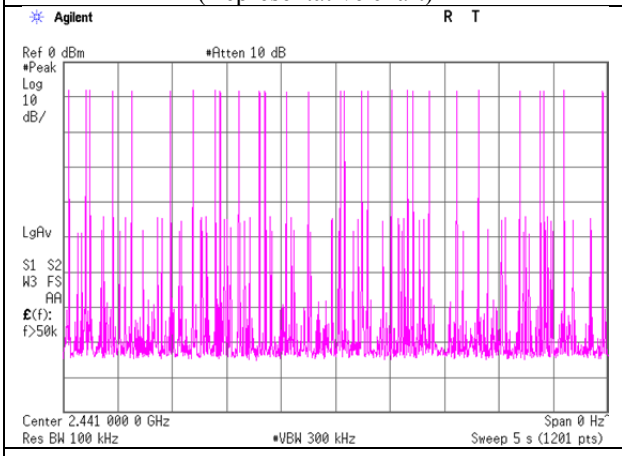


3DH1 (2/2)

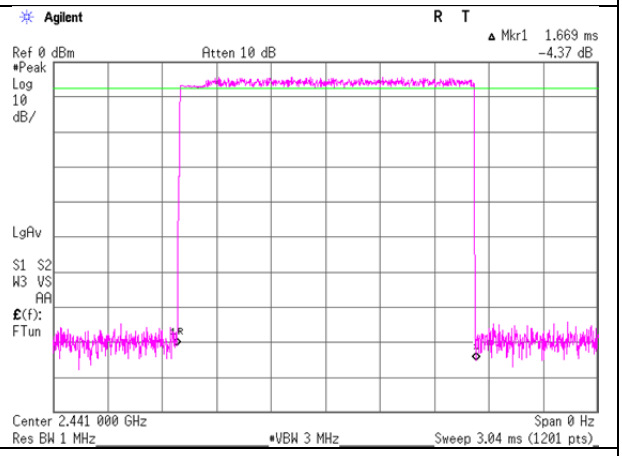


3DH3 (1/2)

(Representative chart)

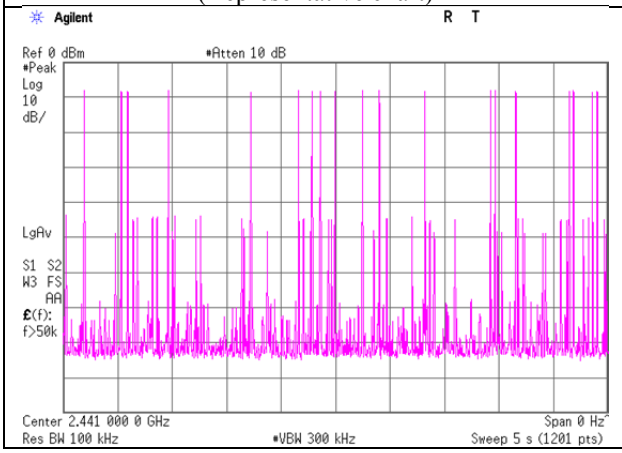


3DH3 (2/2)

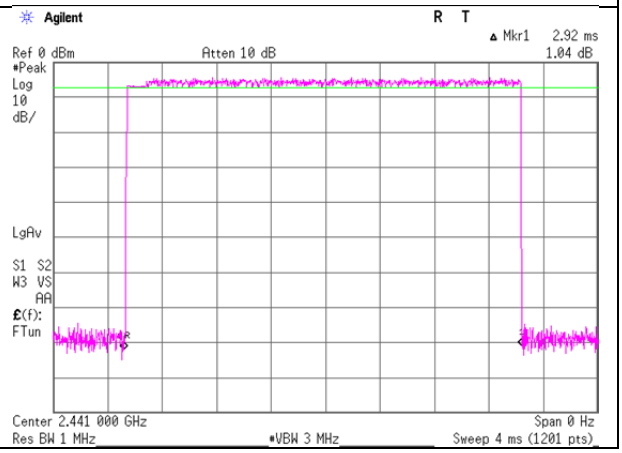


3DH5 (1/2)

(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 21, 2017
Temperature / Humidity	25.5 deg. C / 47 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-2.40	0.80	10.05	8.45	7.00	20.96	125	12.51
DH5	2441.0	-2.38	0.80	10.05	8.47	7.03	20.96	125	12.49
DH5	2480.0	-4.36	0.80	10.05	6.49	4.46	20.96	125	14.47
2DH5	2402.0	-4.00	0.80	10.05	6.85	4.84	20.96	125	14.11
2DH5	2441.0	-4.36	0.80	10.05	6.49	4.46	20.96	125	14.47
2DH5	2480.0	-6.47	0.80	10.05	4.38	2.74	20.96	125	16.58
3DH5	2402.0	-3.61	0.80	10.05	7.24	5.30	20.96	125	13.72
3DH5	2441.0	-4.08	0.80	10.05	6.77	4.75	20.96	125	14.19
3DH5	2480.0	-6.28	0.80	10.05	4.57	2.86	20.96	125	16.39

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

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 / SAR testing)

Test place	Ise EMC Lab. No.6 Measurement Room	
Report No.	11932168H	
Date	September 21, 2017	September 22, 2017
Temperature / Humidity	25.5 deg. C / 47 % RH	23 deg. C / 63 % RH
Engineer	Takafumi Noguchi	Tomohisa Nakagawa
Mode	Tx, Hopping Off	

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402.0	-3.83	0.80	10.05	7.02	5.04	1.11	8.13	6.50
DH5	2441.0	-3.99	0.80	10.05	6.86	4.85	1.11	7.97	6.27
DH5	2480.0	-5.89	0.80	10.05	4.96	3.13	1.11	6.07	4.05
2DH5	2402.0	-7.71	0.80	10.05	3.14	2.06	1.11	4.25	2.66
2DH5	2441.0	-8.22	0.80	10.05	2.63	1.83	1.11	3.74	2.37
2DH5	2480.0	-10.40	0.80	10.05	0.45	1.11	1.11	1.56	1.43
3DH5	2402.0	-7.69	0.80	10.05	3.16	2.07	1.10	4.26	2.67
3DH5	2441.0	-8.21	0.80	10.05	2.64	1.84	1.10	3.74	2.37
3DH5	2480.0	-10.39	0.80	10.05	0.46	1.11	1.10	1.56	1.43

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

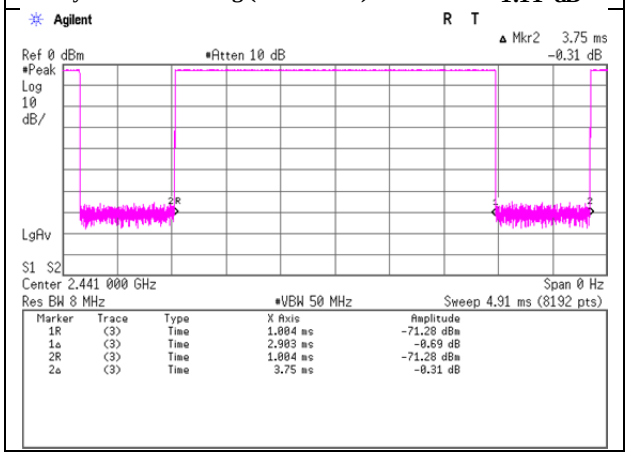
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping Off

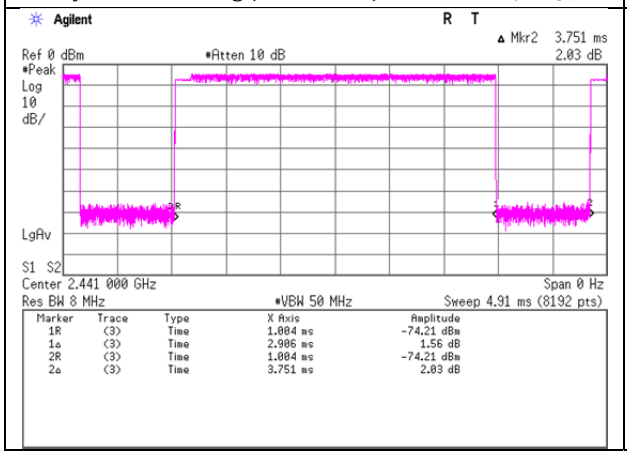
DH5

Tx on / (Tx on + Tx off) = 0.774
Tx on / (Tx on + Tx off) * 100 = 77.4 %
Duty factor = 10 * log (3.75 / 2.903) = 1.11 dB



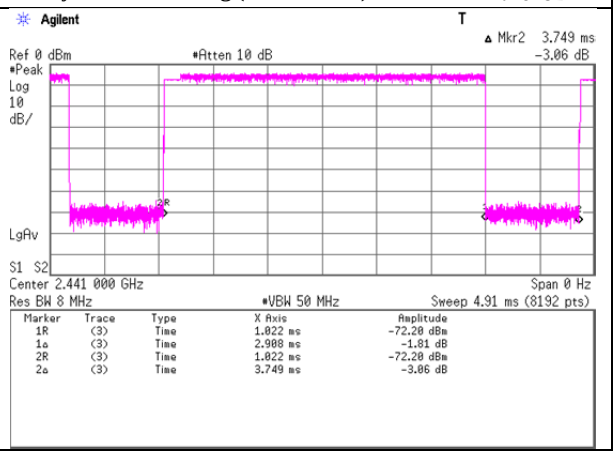
2DH5

Tx on / (Tx on + Tx off) = 0.775
Tx on / (Tx on + Tx off) * 100 = 77.5 %
Duty factor = 10 * log (3.751 / 2.906) = 1.11 dB



3DH5

Tx on / (Tx on + Tx off) = 0.776
Tx on / (Tx on + Tx off) * 100 = 77.6 %
Duty factor = 10 * log (3.749 / 2.908) = 1.10 dB



Radiated Spurious Emission

Report No.	11932168H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	September 28, 2017	October 1, 2017	October 1, 2017
Temperature / Humidity	23 deg. C / 61 % RH	22 deg. C / 51 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	31.700	QP	22.9	16.7	7.1	32.2	-	14.5	40.0	25.5	
Hori	42.000	QP	22.7	13.6	7.3	32.2	-	11.4	40.0	28.6	
Hori	48.983	QP	22.5	11.2	7.5	32.2	-	9.0	40.0	31.0	
Hori	165.000	QP	21.9	15.8	8.9	32.1	-	14.5	43.5	29.0	
Hori	610.000	QP	21.9	19.1	12.0	32.0	-	21.0	46.0	25.0	
Hori	960.000	QP	20.9	22.3	13.8	30.7	-	26.3	46.0	19.7	
Hori	2390.000	PK	41.9	27.7	6.7	32.4	-	43.9	73.9	30.0	
Hori	4804.000	PK	43.1	31.6	9.0	31.4	-	52.3	73.9	21.6	
Hori	7206.000	PK	42.2	36.0	10.4	32.1	-	56.5	73.9	17.4	Floor noise
Hori	9608.000	PK	42.2	38.5	10.9	32.9	-	58.7	73.9	15.2	Floor noise
Hori	2390.000	AV	29.6	27.7	6.7	32.4	-	31.6	53.9	22.3	
Hori	4804.000	AV	31.0	31.6	9.0	31.4	-	40.2	53.9	13.7	
Hori	7206.000	AV	29.7	36.0	10.4	32.1	-	44.0	53.9	9.9	Floor noise
Hori	9608.000	AV	28.5	38.5	10.9	32.9	-	45.0	53.9	8.9	Floor noise
Vert	31.417	QP	23.0	16.8	7.1	32.2	-	14.7	40.0	25.3	
Vert	42.467	QP	22.6	13.4	7.3	32.2	-	11.1	40.0	28.9	
Vert	49.143	QP	26.8	11.1	7.5	32.2	-	13.2	40.0	26.8	
Vert	165.000	QP	22.0	15.8	8.9	32.1	-	14.6	43.5	28.9	
Vert	610.000	QP	21.9	19.1	12.0	32.0	-	21.0	46.0	25.0	
Vert	960.000	QP	21.0	22.3	13.8	30.7	-	26.4	46.0	19.6	
Vert	2390.000	PK	42.0	27.7	6.7	32.4	-	44.0	73.9	29.9	
Vert	4804.000	PK	41.4	31.6	9.0	31.4	-	50.6	73.9	23.3	Floor noise
Vert	7206.000	PK	42.5	36.0	10.4	32.1	-	56.8	73.9	17.1	Floor noise
Vert	9608.000	PK	43.1	38.5	10.9	32.9	-	59.6	73.9	14.3	Floor noise
Vert	2390.000	AV	28.1	27.7	6.7	32.4	-	30.1	53.9	23.8	
Vert	4804.000	AV	27.4	31.6	9.0	31.4	-	36.6	53.9	17.3	Floor noise
Vert	7206.000	AV	29.5	36.0	10.4	32.1	-	43.8	53.9	10.1	Floor noise
Vert	9608.000	AV	28.5	38.5	10.9	32.9	-	45.0	53.9	8.9	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 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	98.8	27.7	6.8	32.4	100.9	-	-	Carrier
Hori	2400.000	PK	39.0	27.7	6.8	32.4	41.1	80.9	39.8	
Vert	2402.000	PK	97.6	27.7	6.8	32.4	99.7	-	-	Carrier
Vert	2400.000	PK	37.4	27.7	6.8	32.4	39.5	79.7	40.2	

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5dB

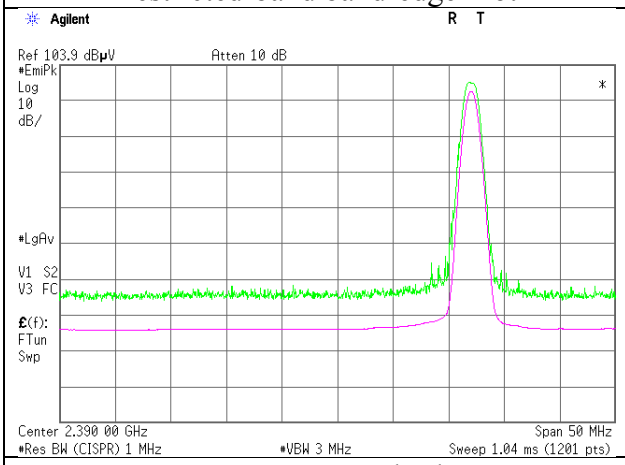
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11932168H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 28, 2017
Temperature / Humidity	23 deg. C / 61 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz

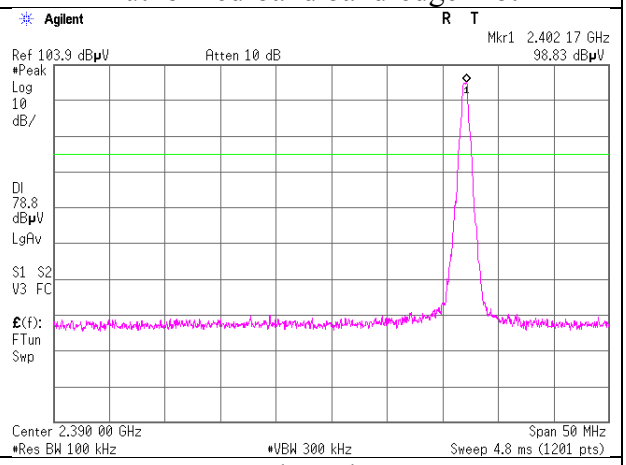
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

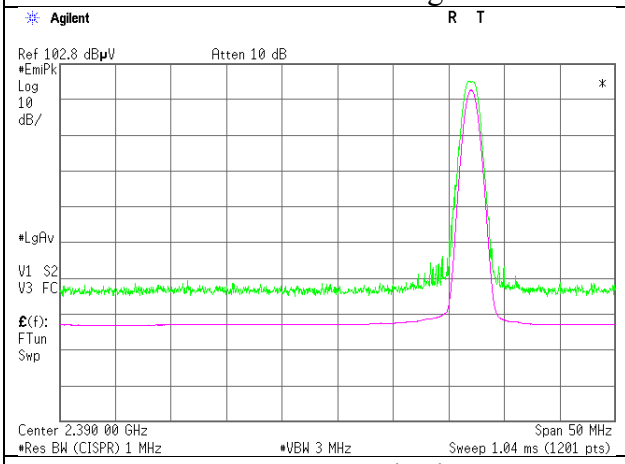
Authorized-band band-edge Plot



20dBc Plot

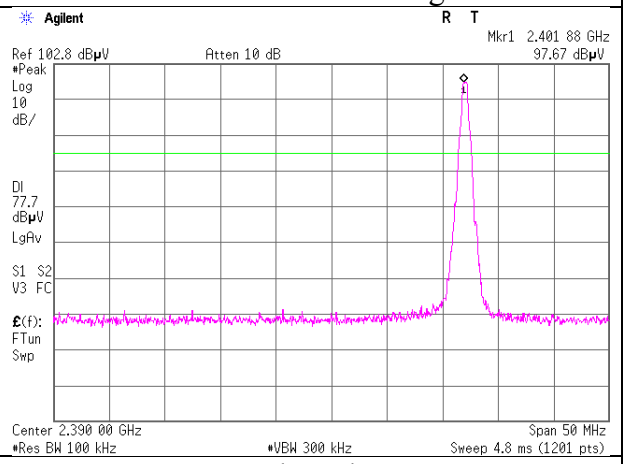
Vertical

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

Report No.	11932168H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	September 28, 2017	October 1, 2017	October 1, 2017
Temperature / Humidity	23 deg. C / 61 % RH	22 deg. C / 51 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	37.650	QP	22.4	15.1	7.3	32.2	-	12.6	40.0	27.4	
Hori	49.133	QP	22.2	11.1	7.5	32.2	-	8.6	40.0	31.4	
Hori	83.083	QP	22.7	7.3	8.0	32.2	-	5.8	40.0	34.2	
Hori	165.000	QP	21.9	15.8	8.9	32.1	-	14.5	43.5	29.0	
Hori	610.000	QP	21.8	19.1	12.0	32.0	-	20.9	46.0	25.1	
Hori	960.000	QP	20.9	22.3	13.8	30.7	-	26.3	46.0	19.7	
Hori	4882.000	PK	41.9	31.9	9.0	31.4	-	51.4	73.9	22.5	Floor noise
Hori	7323.000	PK	42.1	36.2	10.4	32.2	-	56.5	73.9	17.4	Floor noise
Hori	9764.000	PK	42.1	38.7	11.0	33.0	-	58.8	73.9	15.1	Floor noise
Hori	4882.000	AV	30.0	31.9	9.0	31.4	-	39.5	53.9	14.4	Floor noise
Hori	7323.000	AV	29.3	36.2	10.4	32.2	-	43.7	53.9	10.2	Floor noise
Hori	9764.000	AV	28.4	38.7	11.0	33.0	-	45.1	53.9	8.8	Floor noise
Vert	35.800	QP	23.0	15.8	7.2	32.2	-	13.8	40.0	26.2	
Vert	49.267	QP	26.7	11.1	7.5	32.2	-	13.1	40.0	26.9	
Vert	86.950	QP	22.9	8.0	8.0	32.2	-	6.7	40.0	33.3	
Vert	165.000	QP	22.1	15.8	8.9	32.1	-	14.7	43.5	28.8	
Vert	610.000	QP	21.9	19.1	12.0	32.0	-	21.0	46.0	25.0	
Vert	960.000	QP	21.0	22.3	13.8	30.7	-	26.4	46.0	19.6	
Vert	4882.000	PK	41.2	31.9	9.0	31.4	-	50.7	73.9	23.2	Floor noise
Vert	7323.000	PK	42.7	36.2	10.4	32.2	-	57.1	73.9	16.8	Floor noise
Vert	9764.000	PK	43.0	38.7	11.0	33.0	-	59.7	73.9	14.2	Floor noise
Vert	4882.000	AV	27.3	31.9	9.0	31.4	-	36.8	53.9	17.1	Floor noise
Vert	7323.000	AV	29.6	36.2	10.4	32.2	-	44.0	53.9	9.9	Floor noise
Vert	9764.000	AV	28.4	38.7	11.0	33.0	-	45.1	53.9	8.8	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

Report No.	11932168H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	September 28, 2017	October 1, 2017	October 1, 2017
Temperature / Humidity	23 deg. C / 61 % RH	22 deg. C / 51 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	50.400	QP	22.5	10.7	7.5	32.2	-	8.5	40.0	31.5	
Hori	90.683	QP	22.9	8.6	8.1	32.2	-	7.4	43.5	36.1	
Hori	165.000	QP	22.0	15.8	8.9	32.1	-	14.6	43.5	28.9	
Hori	183.468	QP	22.2	16.3	9.0	32.1	-	15.4	43.5	28.1	
Hori	610.000	QP	22.0	19.1	12.0	32.0	-	21.1	46.0	24.9	
Hori	960.000	QP	20.9	22.3	13.8	30.7	-	26.3	46.0	19.7	
Hori	2483.500	PK	44.2	27.8	6.8	32.4	-	46.4	73.9	27.5	
Hori	4960.000	PK	41.0	32.1	9.1	31.3	-	50.9	73.9	23.0	Floor noise
Hori	7440.000	PK	42.5	36.4	10.3	32.2	-	57.0	73.9	16.9	Floor noise
Hori	9920.000	PK	42.4	38.9	11.0	33.1	-	59.2	73.9	14.7	Floor noise
Hori	2483.500	AV	28.9	27.8	6.8	32.4	-	31.1	53.9	22.8	
Hori	4960.000	AV	28.4	32.1	9.1	31.3	-	38.3	53.9	15.6	Floor noise
Hori	7440.000	AV	31.0	36.4	10.3	32.2	-	45.5	53.9	8.4	Floor noise
Hori	9920.000	AV	28.6	38.9	11.0	33.1	-	45.4	53.9	8.5	Floor noise
Vert	49.265	QP	26.7	11.1	7.5	32.2	-	13.1	40.0	26.9	
Vert	83.522	QP	23.6	7.4	8.0	32.2	-	6.8	40.0	33.2	
Vert	165.000	QP	22.0	15.8	8.9	32.1	-	14.6	43.5	28.9	
Vert	178.751	QP	22.3	16.3	9.0	32.1	-	15.5	43.5	28.0	
Vert	610.000	QP	21.9	19.1	12.0	32.0	-	21.0	46.0	25.0	
Vert	960.000	QP	21.0	22.3	13.8	30.7	-	26.4	46.0	19.6	
Vert	2483.500	PK	43.4	27.8	6.8	32.4	-	45.6	73.9	28.3	
Vert	4960.000	PK	41.1	32.1	9.1	31.3	-	51.0	73.9	22.9	Floor noise
Vert	7440.000	PK	42.5	36.4	10.3	32.2	-	57.0	73.9	16.9	Floor noise
Vert	9920.000	PK	43.2	38.9	11.0	33.1	-	60.0	73.9	13.9	Floor noise
Vert	2483.500	AV	30.1	27.8	6.8	32.4	-	32.3	53.9	21.6	
Vert	4960.000	AV	27.2	32.1	9.1	31.3	-	37.1	53.9	16.8	Floor noise
Vert	7440.000	AV	29.8	36.4	10.3	32.2	-	44.3	53.9	9.6	Floor noise
Vert	9920.000	AV	28.6	38.9	11.0	33.1	-	45.4	53.9	8.5	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

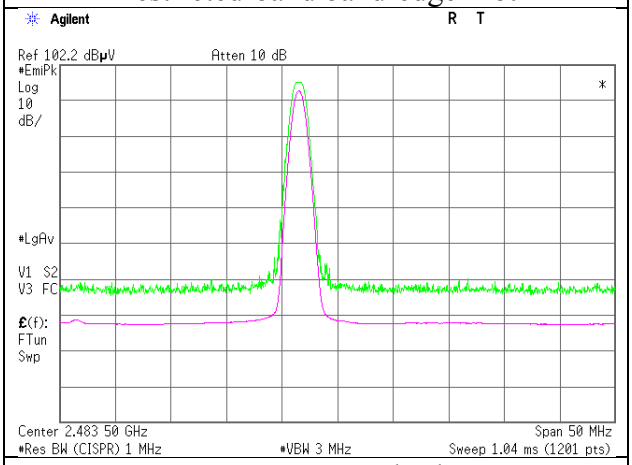
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11932168H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 28, 2017
Temperature / Humidity	23 deg. C / 61 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

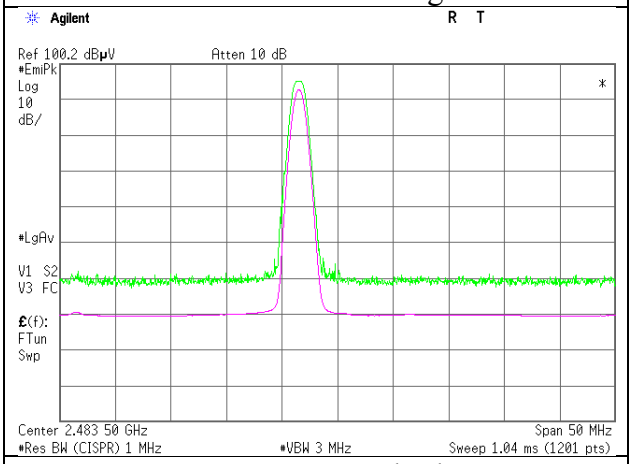
Restricted-band band-edge Plot



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

Report No.	11932168H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	September 28, 2017	October 1, 2017	October 1, 2017
Temperature / Humidity	23 deg. C / 61 % RH	22 deg. C / 51 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	48.983	QP	22.4	11.2	7.5	32.2	-	8.9	40.0	31.1	
Hori	78.933	QP	22.3	6.7	7.9	32.2	-	4.7	40.0	35.3	
Hori	157.532	QP	22.2	15.5	8.8	32.1	-	14.4	43.5	29.1	
Hori	165.000	QP	21.9	15.8	8.9	32.1	-	14.5	43.5	29.0	
Hori	610.000	QP	22.0	19.1	12.0	32.0	-	21.1	46.0	24.9	
Hori	960.000	QP	20.9	22.3	13.8	30.7	-	26.3	46.0	19.7	
Hori	2390.000	PK	41.7	27.7	6.7	32.4	-	43.7	73.9	30.2	
Hori	4804.000	PK	40.5	31.6	9.0	31.4	-	49.7	73.9	24.2	Floor noise
Hori	7206.000	PK	42.5	36.0	10.4	32.1	-	56.8	73.9	17.1	Floor noise
Hori	9608.000	PK	42.1	38.5	10.9	32.9	-	58.6	73.9	15.3	Floor noise
Hori	2390.000	AV	29.5	27.7	6.7	32.4	-	31.5	53.9	22.4	
Hori	4804.000	AV	27.3	31.6	9.0	31.4	-	36.5	53.9	17.4	Floor noise
Hori	7206.000	AV	29.6	36.0	10.4	32.1	-	43.9	53.9	10.0	Floor noise
Hori	9608.000	AV	28.4	38.5	10.9	32.9	-	44.9	53.9	9.0	Floor noise
Vert	32.432	QP	22.6	16.6	7.2	32.2	-	14.2	40.0	25.8	
Vert	49.267	QP	26.4	11.1	7.5	32.2	-	12.8	40.0	27.2	
Vert	165.000	QP	22.0	15.8	8.9	32.1	-	14.6	43.5	28.9	
Vert	179.835	QP	21.9	16.3	9.0	32.1	-	15.1	43.5	28.4	
Vert	610.000	QP	21.8	19.1	12.0	32.0	-	20.9	46.0	25.1	
Vert	960.000	QP	20.8	22.3	13.8	30.7	-	26.2	46.0	19.8	
Vert	2390.000	PK	40.7	27.7	6.7	32.4	-	42.7	73.9	31.2	
Vert	4804.000	PK	40.5	31.6	9.0	31.4	-	49.7	73.9	24.2	Floor noise
Vert	7206.000	PK	42.3	36.0	10.4	32.1	-	56.6	73.9	17.3	Floor noise
Vert	9608.000	PK	43.1	38.5	10.9	32.9	-	59.6	73.9	14.3	Floor noise
Vert	2390.000	AV	28.1	27.7	6.7	32.4	-	30.1	53.9	23.8	
Vert	4804.000	AV	27.2	31.6	9.0	31.4	-	36.4	53.9	17.5	Floor noise
Vert	7206.000	AV	29.5	36.0	10.4	32.1	-	43.8	53.9	10.1	Floor noise
Vert	9608.000	AV	28.4	38.5	10.9	32.9	-	44.9	53.9	9.0	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 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	95.0	27.7	6.8	32.4	97.1	-	-	Carrier
Hori	2400.000	PK	37.7	27.7	6.8	32.4	39.8	77.1	37.3	
Vert	2402.000	PK	94.6	27.7	6.8	32.4	96.7	-	-	Carrier
Vert	2400.000	PK	36.9	27.7	6.8	32.4	39.0	76.7	37.7	

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5dB

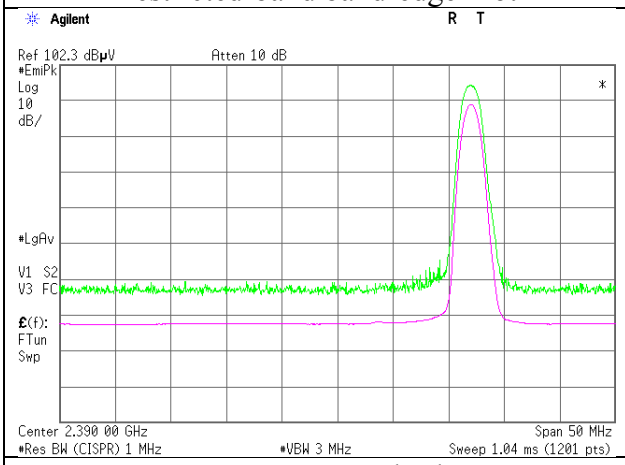
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11932168H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 28, 2017
Temperature / Humidity	23 deg. C / 61 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz

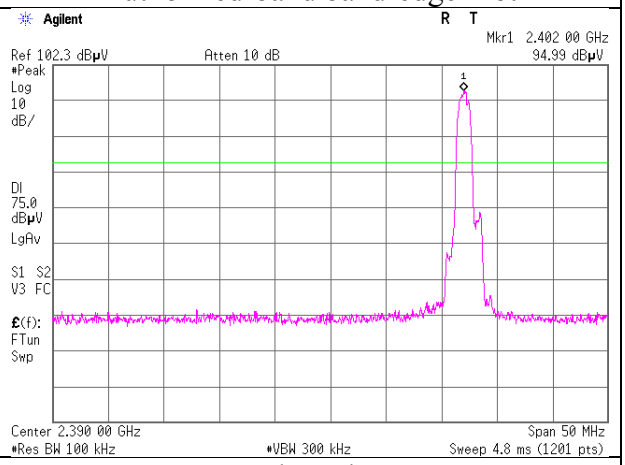
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

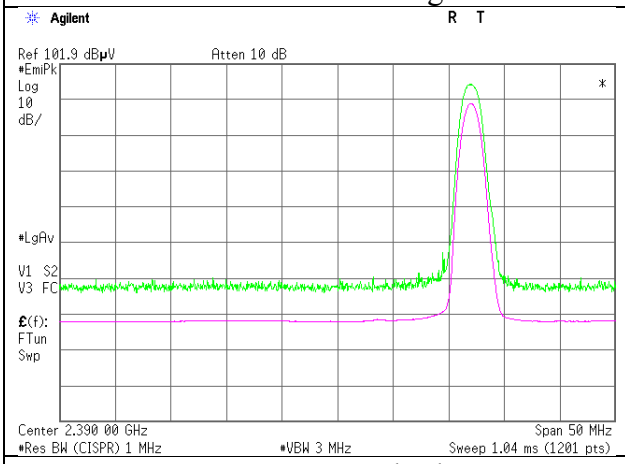
Authorized-band band-edge Plot



20dBc Plot

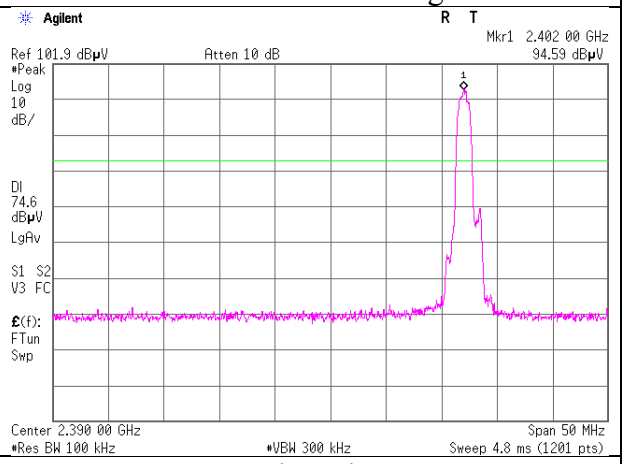
Vertical

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

Report No.	11932168H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	September 28, 2017	October 1, 2017	October 1, 2017
Temperature / Humidity	23 deg. C / 61 % RH	22 deg. C / 51 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	48.133	QP	22.4	11.5	7.4	32.2	-	9.1	40.0	30.9	
Hori	68.817	QP	22.6	6.3	7.8	32.2	-	4.5	40.0	35.5	
Hori	165.000	QP	21.9	15.8	8.9	32.1	-	14.5	43.5	29.0	
Hori	335.000	QP	21.7	14.3	10.3	32.0	-	14.3	46.0	31.7	
Hori	610.000	QP	21.8	19.1	12.0	32.0	-	20.9	46.0	25.1	
Hori	960.000	QP	20.9	22.3	13.8	30.7	-	26.3	46.0	19.7	
Hori	4882.000	PK	40.3	31.9	9.0	31.4	-	49.8	73.9	24.1	Floor noise
Hori	7323.000	PK	42.3	36.2	10.4	32.2	-	56.7	73.9	17.2	Floor noise
Hori	9764.000	PK	42.0	38.7	11.0	33.0	-	58.7	73.9	15.2	Floor noise
Hori	4882.000	AV	28.5	31.9	9.0	31.4	-	38.0	53.9	15.9	Floor noise
Hori	7323.000	AV	30.3	36.2	10.4	32.2	-	44.7	53.9	9.2	Floor noise
Hori	9764.000	AV	28.6	38.7	11.0	33.0	-	45.3	53.9	8.6	Floor noise
Vert	49.267	QP	26.8	11.1	7.5	32.2	-	13.2	40.0	26.8	
Vert	142.453	QP	22.3	14.7	8.6	32.1	-	13.5	43.5	30.0	
Vert	165.000	QP	22.1	15.8	8.9	32.1	-	14.7	43.5	28.8	
Vert	650.000	QP	21.8	19.4	12.2	32.1	-	21.3	46.0	24.7	
Vert	706.581	QP	21.9	19.8	12.5	32.1	-	22.1	46.0	23.9	
Vert	960.000	QP	21.0	22.3	13.8	30.7	-	26.4	46.0	19.6	
Vert	4882.000	PK	41.2	31.9	9.0	31.4	-	50.7	73.9	23.2	Floor noise
Vert	7323.000	PK	42.3	36.2	10.4	32.2	-	56.7	73.9	17.2	Floor noise
Vert	9764.000	PK	42.2	38.7	11.0	33.0	-	58.9	73.9	15.0	Floor noise
Vert	4882.000	AV	27.9	31.9	9.0	31.4	-	37.4	53.9	16.5	Floor noise
Vert	7323.000	AV	29.8	36.2	10.4	32.2	-	44.2	53.9	9.7	Floor noise
Vert	9764.000	AV	28.5	38.7	11.0	33.0	-	45.2	53.9	8.7	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

Report No.	11932168H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	September 28, 2017	October 1, 2017	October 1, 2017
Temperature / Humidity	23 deg. C / 61 % RH	22 deg. C / 51 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	50.683	QP	22.4	10.6	7.5	32.2	-	8.3	40.0	31.7	
Hori	85.817	QP	22.8	7.8	8.0	32.2	-	6.4	40.0	33.6	
Hori	122.650	QP	22.4	13.1	8.4	32.2	-	11.7	43.5	31.8	
Hori	165.000	QP	22.1	15.8	8.9	32.1	-	14.7	43.5	28.8	
Hori	610.000	QP	21.8	19.1	12.0	32.0	-	20.9	46.0	25.1	
Hori	960.000	QP	21.0	22.3	13.8	30.7	-	26.4	46.0	19.6	
Hori	2483.500	PK	42.6	27.8	6.8	32.4	-	44.8	73.9	29.1	
Hori	4960.000	PK	40.3	32.1	9.1	31.3	-	50.2	73.9	23.7	Floor noise
Hori	7440.000	PK	42.4	36.4	10.3	32.2	-	56.9	73.9	17.0	Floor noise
Hori	9920.000	PK	42.1	38.9	11.0	33.1	-	58.9	73.9	15.0	Floor noise
Hori	2483.500	AV	28.4	27.8	6.8	32.4	-	30.6	53.9	23.3	
Hori	4960.000	AV	28.7	32.1	9.1	31.3	-	38.6	53.9	15.3	Floor noise
Hori	7440.000	AV	30.6	36.4	10.3	32.2	-	45.1	53.9	8.8	Floor noise
Hori	9920.000	AV	28.5	38.9	11.0	33.1	-	45.3	53.9	8.6	Floor noise
Vert	49.267	QP	26.6	11.1	7.5	32.2	-	13.0	40.0	27.0	
Vert	77.498	QP	22.9	6.6	7.9	32.2	-	5.2	40.0	34.8	
Vert	86.383	QP	23.0	7.9	8.0	32.2	-	6.7	40.0	33.3	
Vert	165.000	QP	21.8	15.8	8.9	32.1	-	14.4	43.5	29.1	
Vert	610.000	QP	22.0	19.1	12.0	32.0	-	21.1	46.0	24.9	
Vert	960.000	QP	20.9	22.3	13.8	30.7	-	26.3	46.0	19.7	
Vert	2483.500	PK	43.4	27.8	6.8	32.4	-	45.6	73.9	28.3	
Vert	4960.000	PK	40.6	32.1	9.1	31.3	-	50.5	73.9	23.4	Floor noise
Vert	7440.000	PK	42.3	36.4	10.3	32.2	-	56.8	73.9	17.1	Floor noise
Vert	9920.000	PK	43.2	38.9	11.0	33.1	-	60.0	73.9	13.9	Floor noise
Vert	2483.500	AV	29.8	27.8	6.8	32.4	-	32.0	53.9	21.9	
Vert	4960.000	AV	27.3	32.1	9.1	31.3	-	37.2	53.9	16.7	Floor noise
Vert	7440.000	AV	29.7	36.4	10.3	32.2	-	44.2	53.9	9.7	Floor noise
Vert	9920.000	AV	28.5	38.9	11.0	33.1	-	45.3	53.9	8.6	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

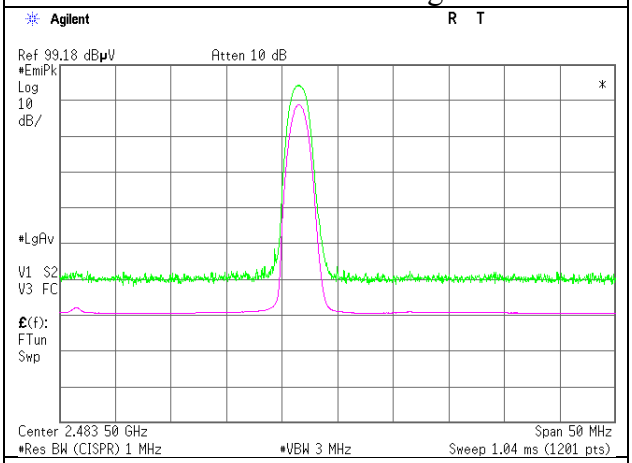
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11932168H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 28, 2017
Temperature / Humidity	23 deg. C / 61 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

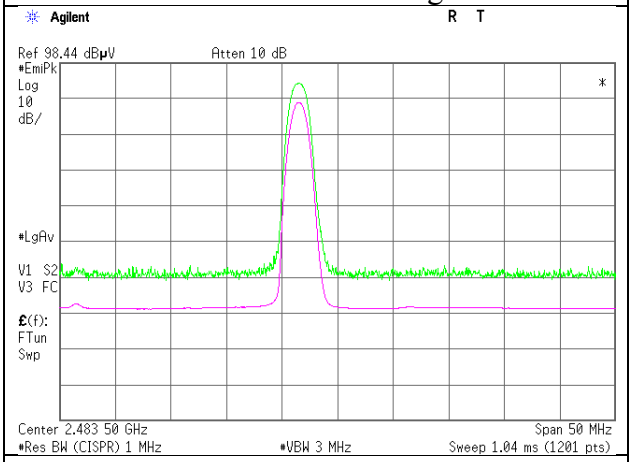
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

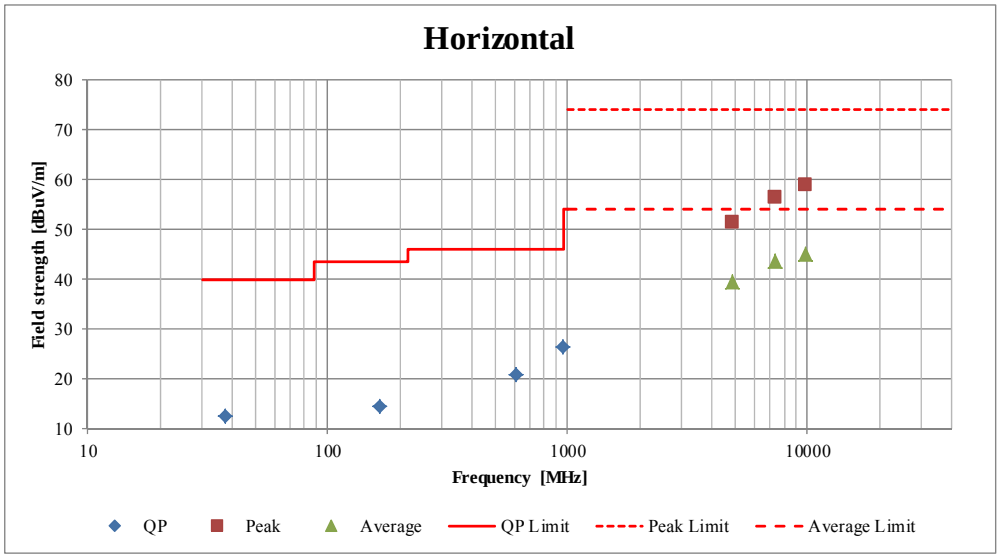


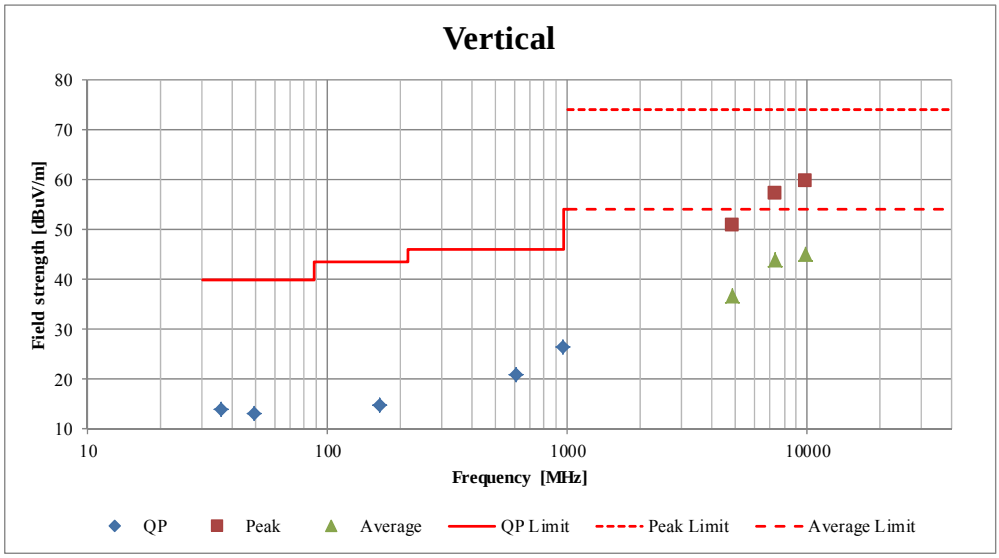
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	11932168H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	September 28, 2017	October 1, 2017	October 1, 2017
Temperature / Humidity	23 deg. C / 61 % RH	22 deg. C / 51 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya	Takumi Shimada	Takumi Shimada
	(1 GHz -10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz		





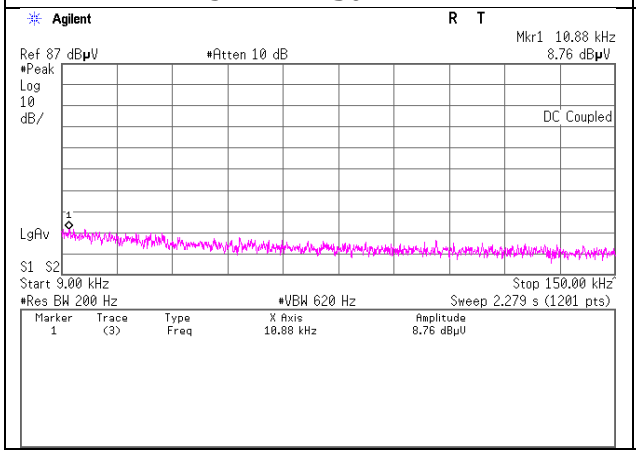
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

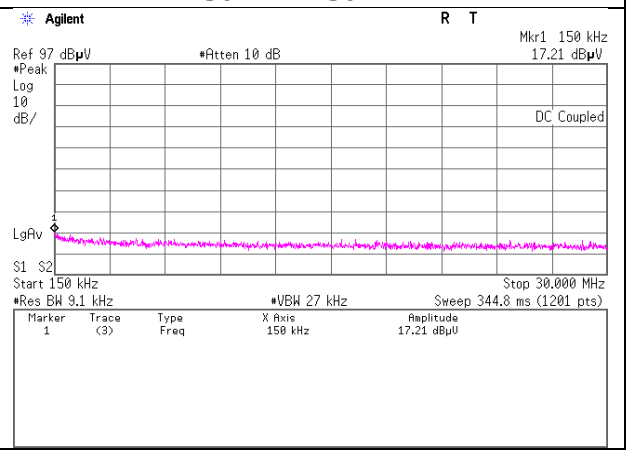
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping Off, DH5

2402 MHz

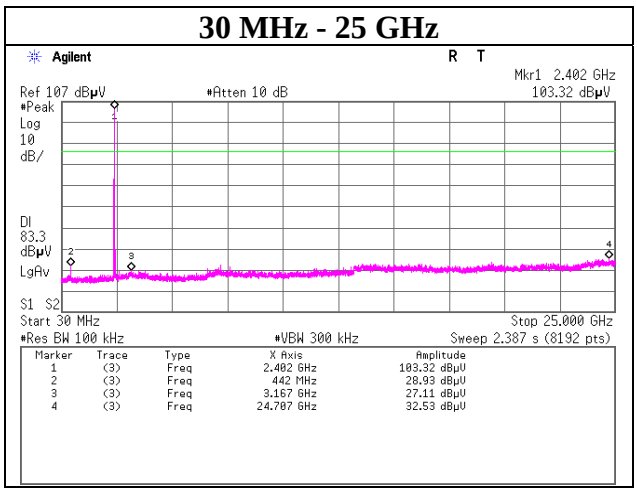
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

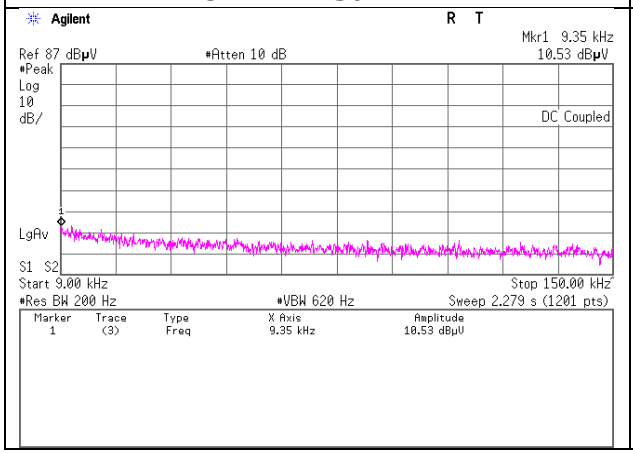


Conducted Spurious Emission

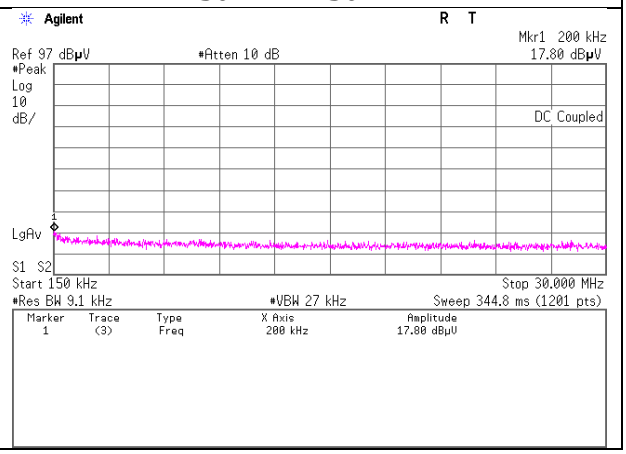
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping Off, DH5

2441 MHz

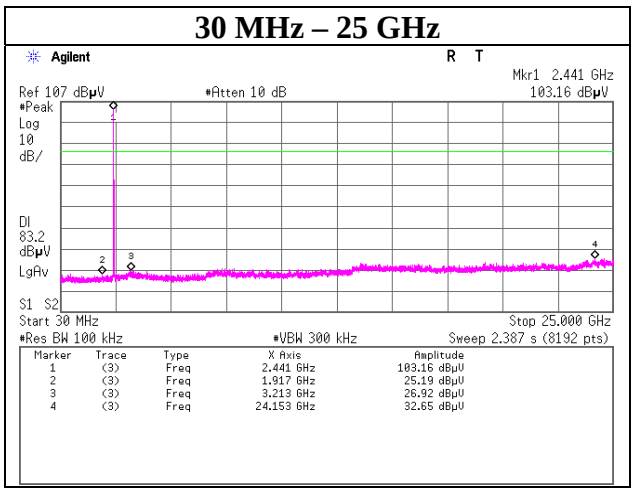
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

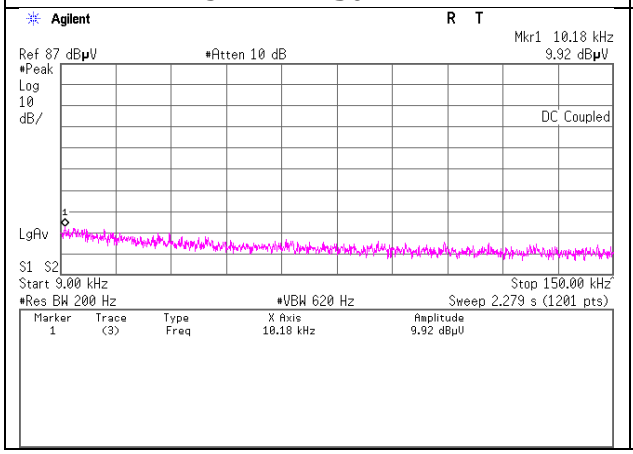


Conducted Spurious Emission

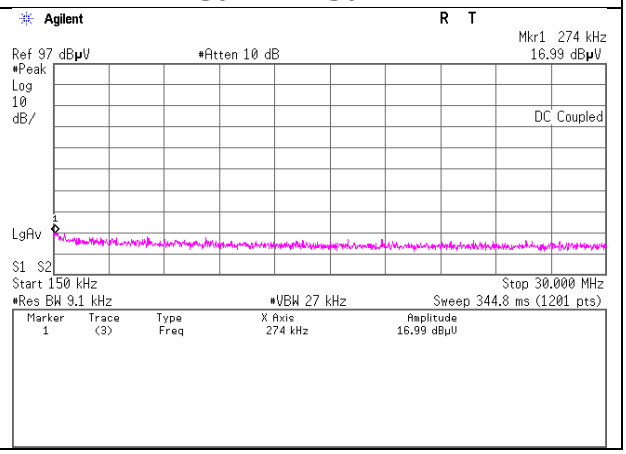
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping Off, DH5

2480 MHz

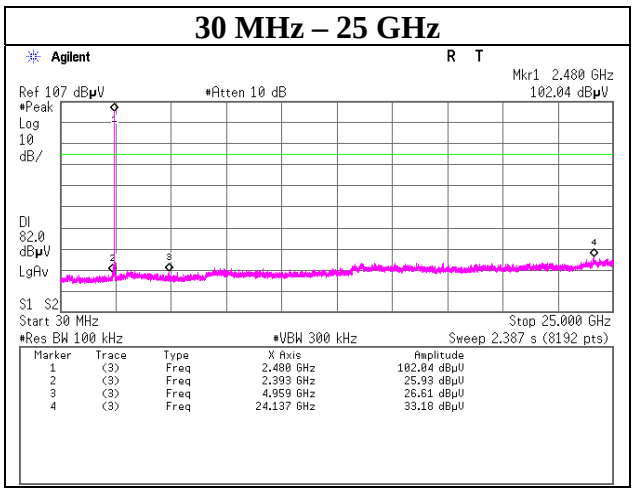
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

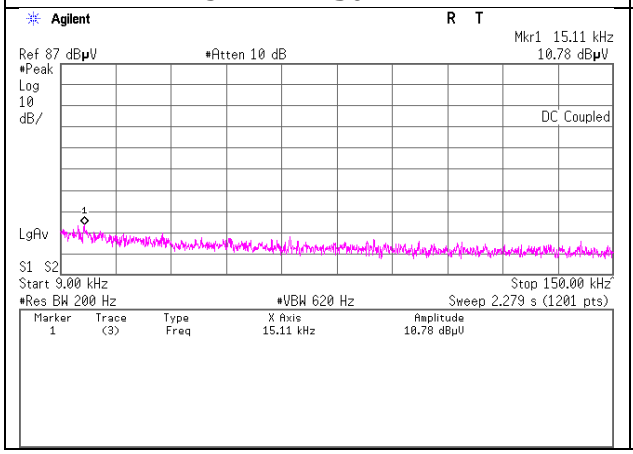


Conducted Spurious Emission

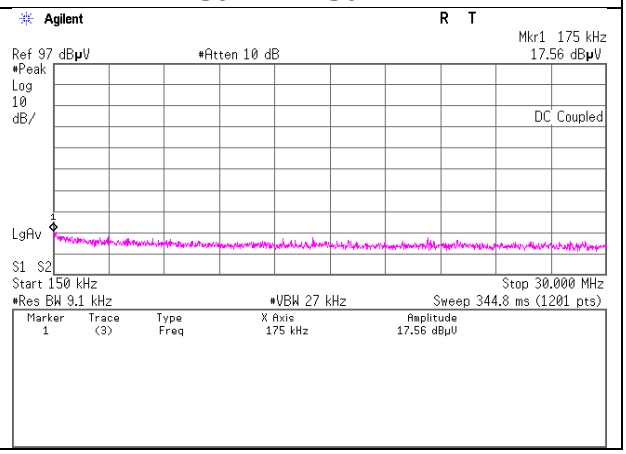
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping On, 3DH5

2402 MHz

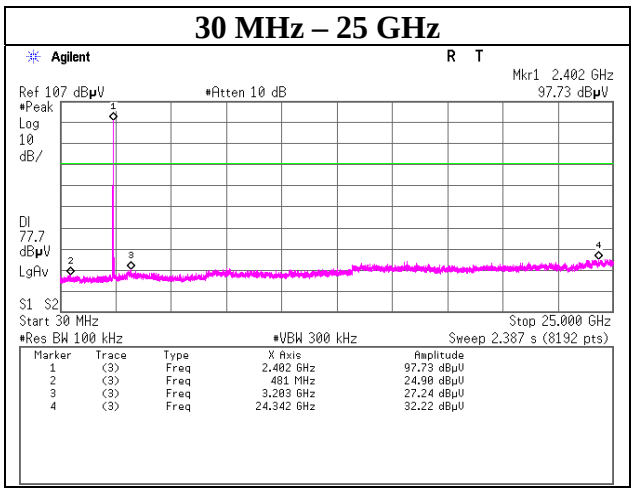
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

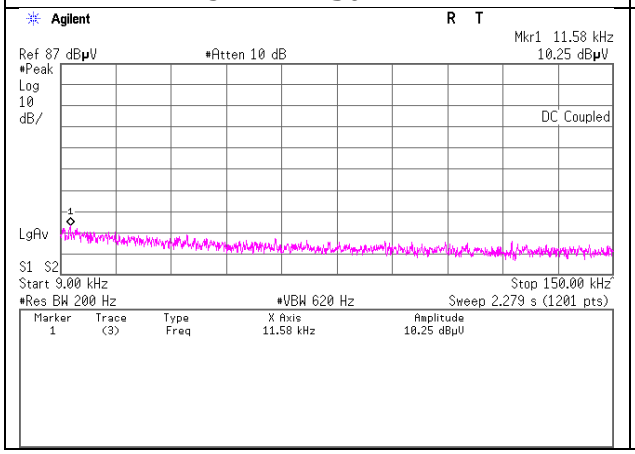


Conducted Spurious Emission

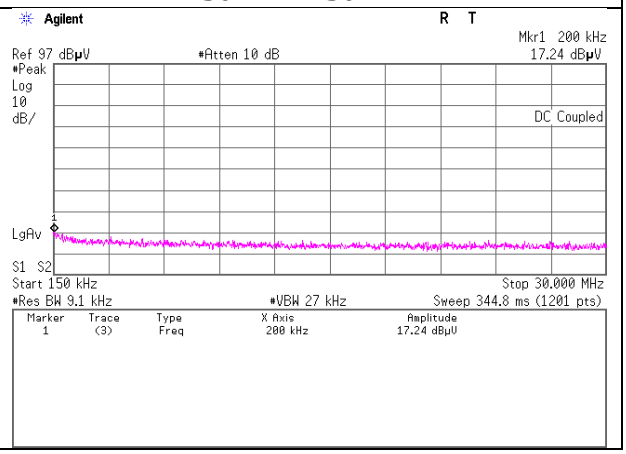
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping Off, 3DH5

2441 MHz

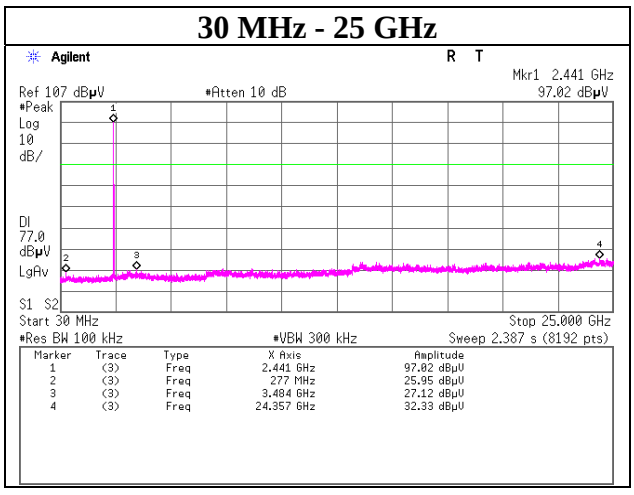
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

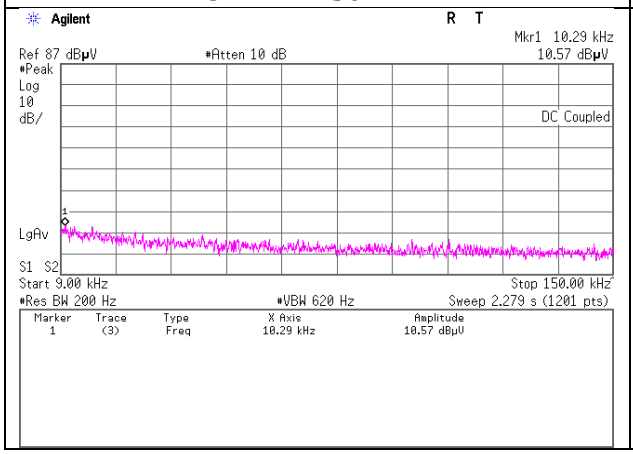


Conducted Spurious Emission

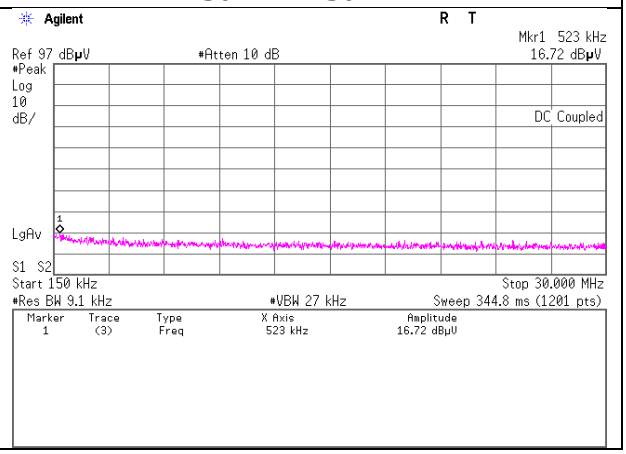
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11932168H
Date	September 22, 2017
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx, Hopping Off, 3DH5

2480 MHz

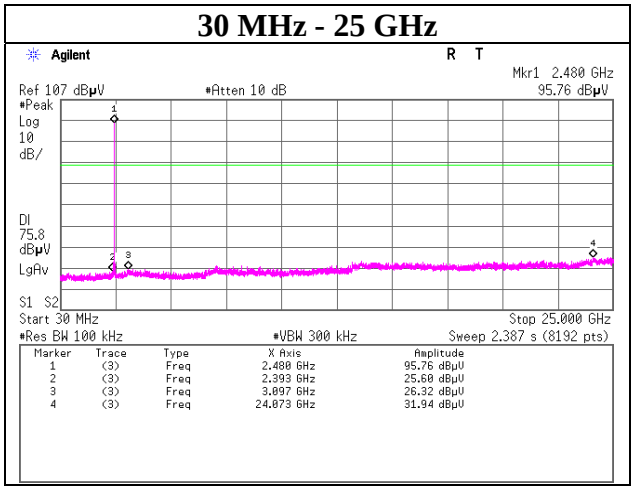
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

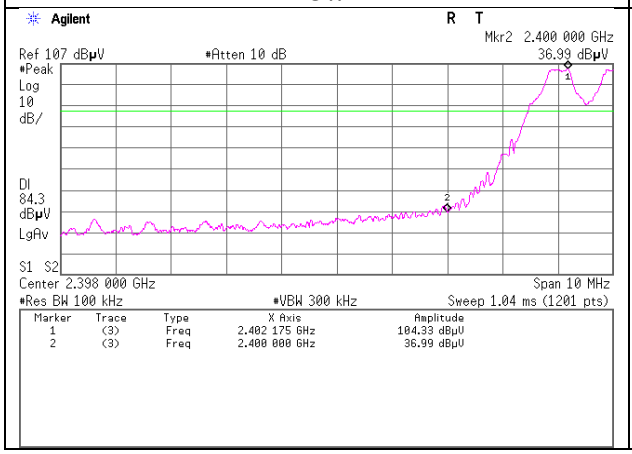


Conducted Emission Band Edge compliance

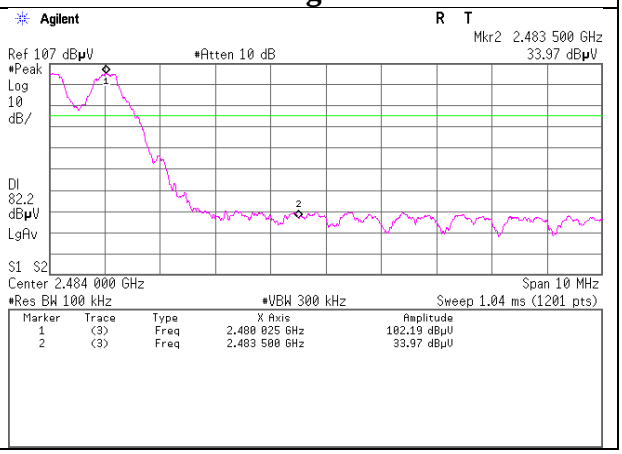
Test place	Ise EMC Lab. No.6 Measurement Room	
Report No.	11932168H	
Date	September 21, 2017	September 22, 2017
Temperature / Humidity	25.5 deg. C / 47 % RH	23 deg. C / 63 % RH
Engineer	Takafumi Noguchi	Tomohisa Nakagawa
Mode	Tx DH5	

Hopping On

Low

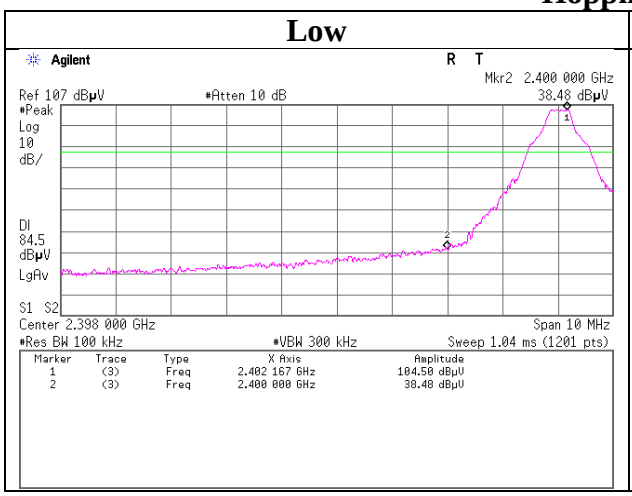


High

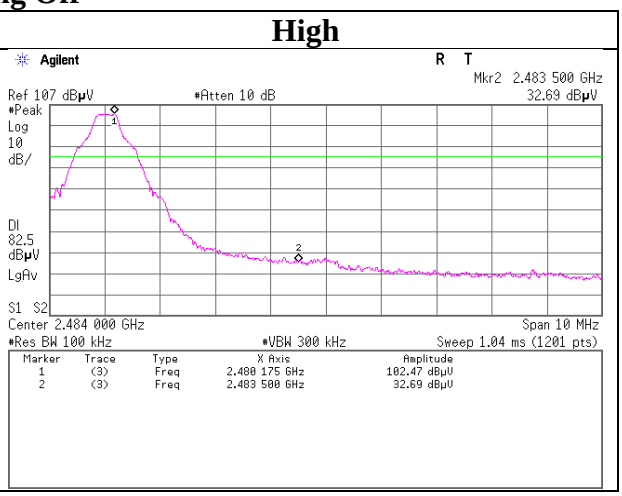


Hopping Off

Low



High

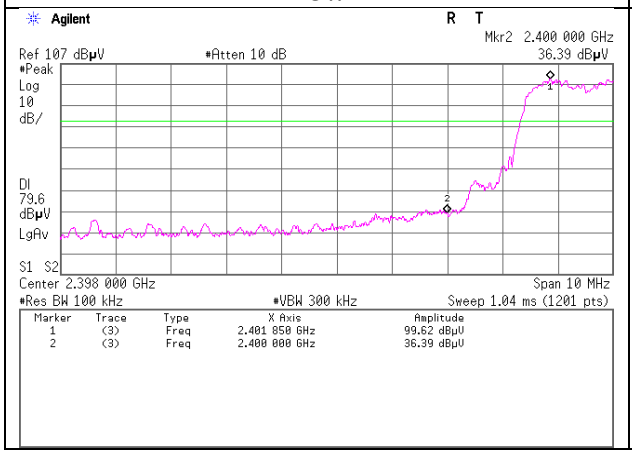


Conducted Emission Band Edge compliance

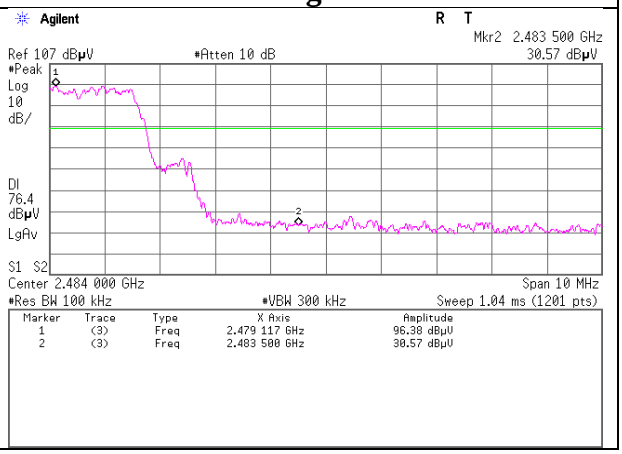
Test place	Ise EMC Lab. No.6 Measurement Room	
Report No.	11932168H	
Date	September 21, 2017	September 22, 2017
Temperature / Humidity	25.5 deg. C / 47 % RH	23 deg. C / 63 % RH
Engineer	Takafumi Noguchi	Tomohisa Nakagawa
Mode	Tx 3DH5	

Hopping On

Low

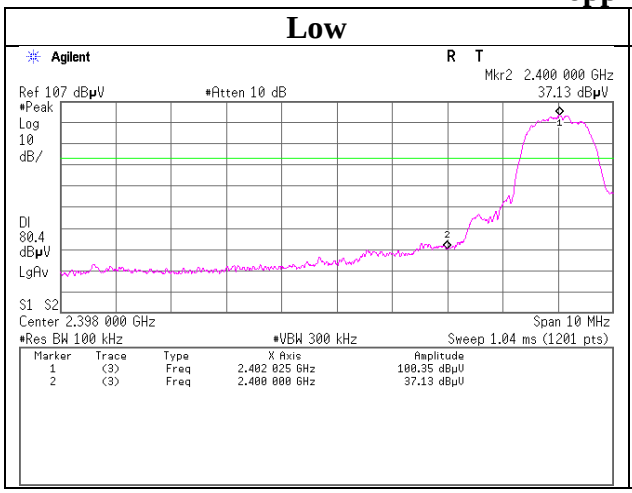


High

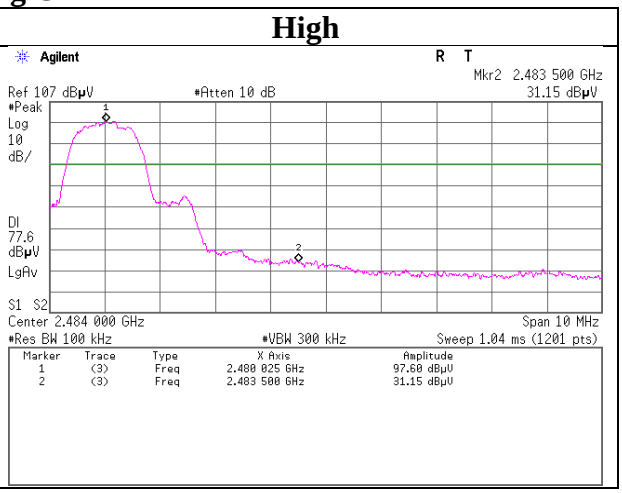


Hopping Off

Low



High



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE/CE	2017/08/22 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2017/05/22 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2017/05/29 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2017/03/21 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2017/01/19 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2017/09/22 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2017/05/14 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2017/08/22 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2016/10/15 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2017/01/26 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2017/07/12 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2016/12/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2017/07/24 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2017/07/12 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/12/24 * 12
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	AT	2017/09/20 * 12
MPM-13	Power Meter	Anritsu	ML2495A	0824014	AT	2017/11/16 * 12
MPSE-18	Power sensor	Anritsu	MA2411B	0738174	AT	2017/11/16 * 12
MAT-58	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2016/12/15 * 12
MMM-17	DIGIITAL HiTESTER	Hioki	3805	070900530	AT	2017/01/19 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2016/12/13 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2017/11/14 * 12

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

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

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