RADIO TEST REPORT

Test Report No. : 11390225S-E

Applicant	:	**Sony Corporation**
Type of Equipment	:	**Bluetooth Audio System**
Model No.	:	**MEX-N4200BT**
FCC ID	:	**AK8MEXN4200BT**
Test regulation	:	**FCC Part 15 Subpart C: 2016**
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. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
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: August 10 to September 5, 2016

Representative test engineer: S. Takano
Shinichi Takano
Engineer
Consumer Technology Division

Approved by: A. Hayashi
Akio Hayashi
Leader
Consumer Technology Division

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

RTL02610

REVISION HISTORY

Original Test Report No.: 11390225S-E

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11390225S-E	September 27, 2016	-	-

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SECTION 1: Customer information

Company Name	:	Sony Technology (Thailand) Co., Ltd.
Address	:	700/402 Moo 7, Amata Nakorn Industrial Estate, Don Hua Roh, Muang Chonburi, Chonburi 20000, Thailand
Telephone Number	:	+66 38 214900 17 Ext : 1937
Contact Person	:	Sira Sotthiphinyo

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

2.1 Identification of E.U.T.

Type of Equipment	:	Bluetooth Audio System
Model No.	:	MEX-N4200BT
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	August 5, 2016
Country of Mass-production	:	Thailand
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: MEX-N4200BT (referred to as the EUT in this report) is a Bluetooth Audio System.

General Specification

Clock frequency(ies) in the system	:	12 MHz, 9.25 MHz, 16.934 MHz, 32.768 kHz, 26.000 MHz

Radio Specification (Bluetooth)

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	FHSS
Power Supply (radio part input)	:	DC 3.3 V
Antenna type	:	Top-GND-coupled loop
Antenna Gain	:	-2.68 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC part 15 final revised on April 6, 2016.

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 EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 11390225S-G.

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	-	-	N/A *1)
Carrier Frequency Separation	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1) **IC:** RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	**FCC:** FCC Public Notice DA 00-705 **IC:** -	**FCC:** Section15.247(a)(1) **IC:** RSS-247 5.1 (1)		-	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	7.6 dB 12400.00 MHz, AV, Horizontal Tx 2480 MHz, DH5	Complied	Conducted/ Radiated (above 30 MHz) *2)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) The test is not applicable since the EUT has no AC mains.
*2) 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 equipment provides the wireless transmitter with stable power supply (DC 3.3 V). Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement.

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

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

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 dB	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-

SAC=Semi-Anechoic Chamber
SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

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

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

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)

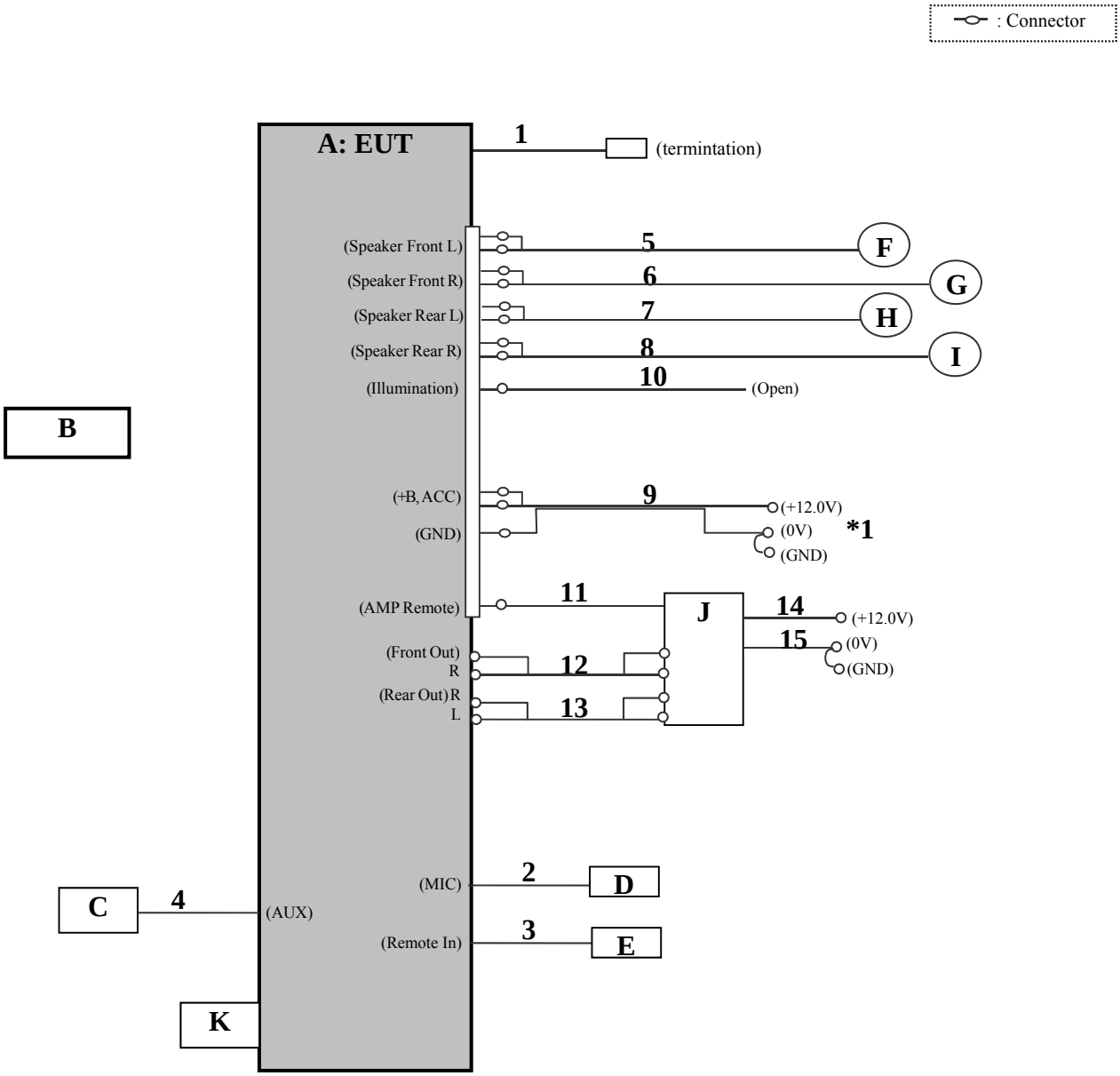
Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

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

*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)
*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.
*EUT has the power settings by the software as follows;
Power settings: BDR: Ext.=23, Int.=39
EDR: Ext.=73, Int.=48
Software: CSR BlueSuite BlueTest 3 Version 2.5.0.93
*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Audio System	MEX-N4200BT	33 *1), 16 *2)	Sony	EUT
B	Remote Commander	RM-X231	-	Sony	-
C	Digital Media Player	NW-A829	5017289	Sony	-
D	MIC	-	-	Sony	-
E	Wired Remote Controller	RM-X2S	-	Sony	-
F	Speaker 1	IS-10	-	Sony	-
G	Speaker 2	IS-10	-	Sony	-
H	Speaker 3	XS-GTF1625R	-	Sony	-
I	Speaker 4	XS-GTF1625R	-	Sony	-
J	Stereo Power Amplifier	XM-4S-020	S0C5	Sony	-
K	USB Memory	SDK-USM4GL(B)	10615MEDB	Sony	-

*1) Used for Antenna Terminal conducted test
*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	FM antenna	1.1	Shielded	Shielded	-
2	MIC	3.0	Shielded	Shielded	-
3	REMOTE IN	2.0	Shielded	Shielded	-
4	Audio	2.0	Shielded	Shielded	-
5	Speaker (1)	0.15+2.1	Unshielded	Unshielded	-
6	Speaker (2)	0.15+2.1	Unshielded	Unshielded	-
7	Speaker (3)	0.15+2.1	Unshielded	Unshielded	-
8	Speaker (4)	0.15+2.1	Unshielded	Unshielded	-
9	DC Power	0.15+2.1	Unshielded	Unshielded	-
10	Illumination	0.15+1.5	Unshielded	Unshielded	-
11	AMP Remote	0.15+1.4	Unshielded	Unshielded	-
12	RCA (Front Audio Out)	5.0	Shielded	Shielded	-
13	RCA (Rear Audio Out)	5.0	Shielded	Shielded	-
14	DC Power (+)	1.3	Unshielded	Unshielded	-
15	DC Power (-)	1.3	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]
EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.
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 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.88 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.88 m*2) (1 GHz – 13 GHz), 1 m*3) (13 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 (3.88 m/3.0 m) = 2.24 dB
*2) Distance Factor: 20 x log (1.0 m/3.0 m) = -9.54 dB

The carrier level and noise levels were confirmed at angle of 0 deg. to 45 deg. based on the product specification to see the position of maximum noise, and the test was made at the position (0 deg.)

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

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

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 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) The measurement was performed with Max Hold since the duty cycle was not 100 %.
*2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)
*3) Reference data

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

20dB Bandwidth and Carrier Frequency Separation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.956	1.000	>= 0.637
DH5	2441.0	1.016	1.000	>= 0.677
DH5	2480.0	0.998	1.000	>= 0.665
3DH5	2402.0	1.297	1.000	>= 0.865
3DH5	2441.0	1.287	1.000	>= 0.858
3DH5	2480.0	1.286	1.000	>= 0.857

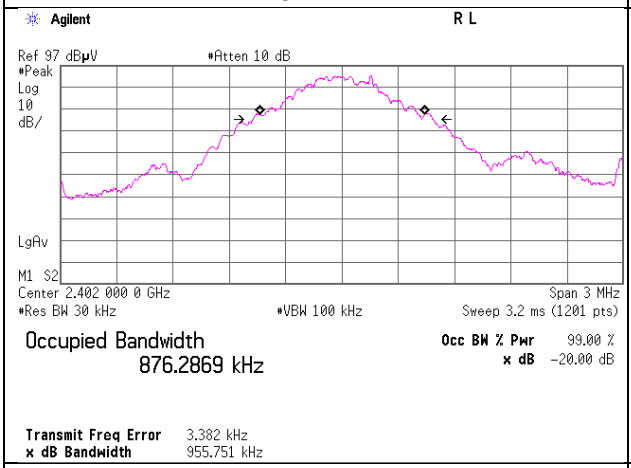
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation

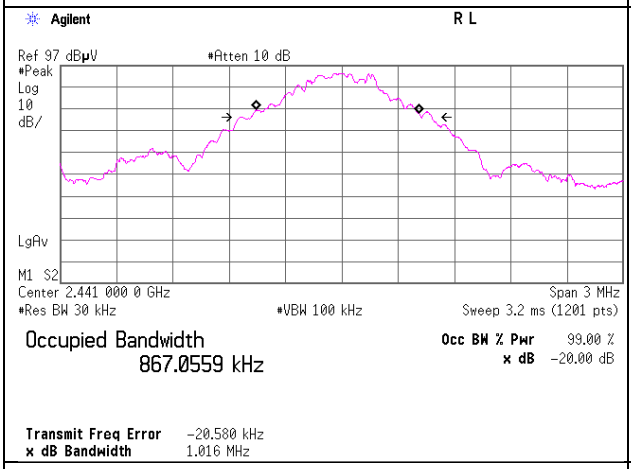
DH5

20 dB Bandwidth

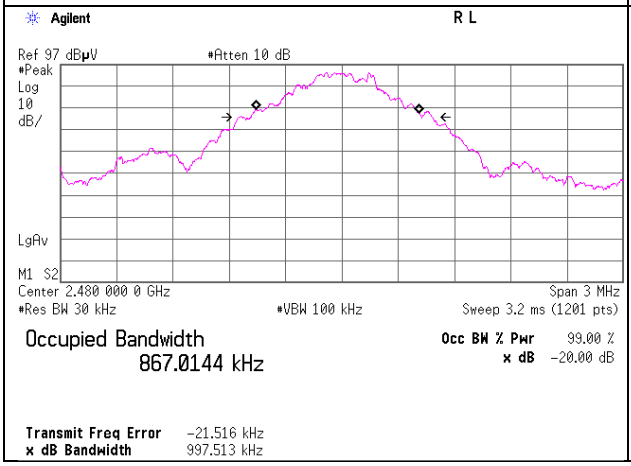
2402 MHz



2441 MHz

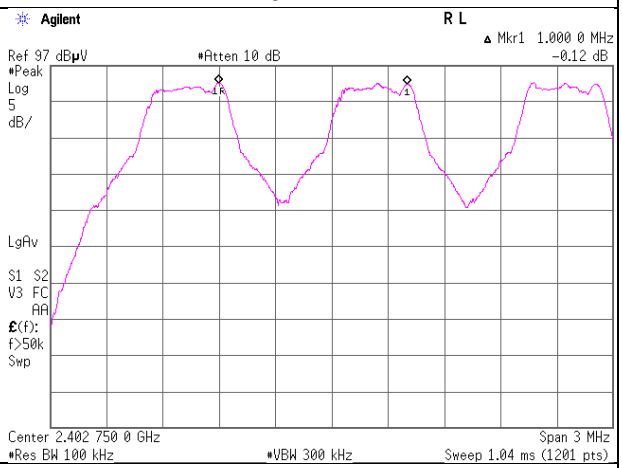


2480 MHz



Carrier Frequency Separation

2402 MHz



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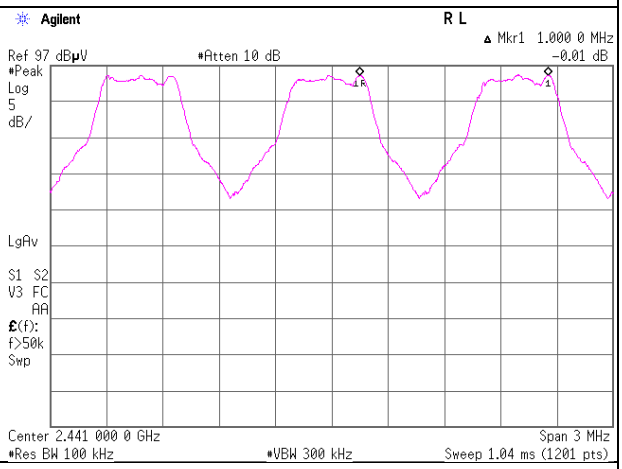
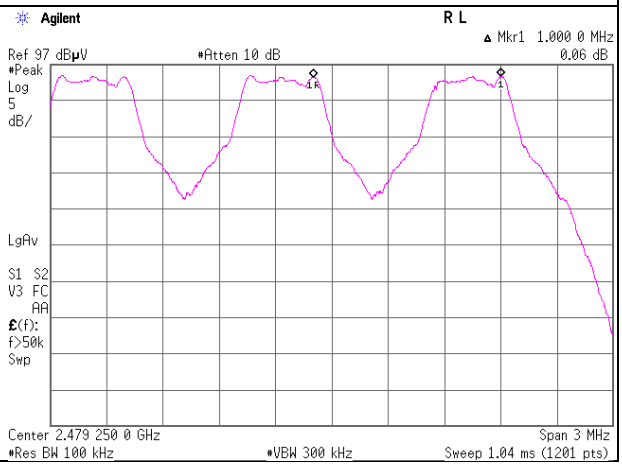


2480 MHz

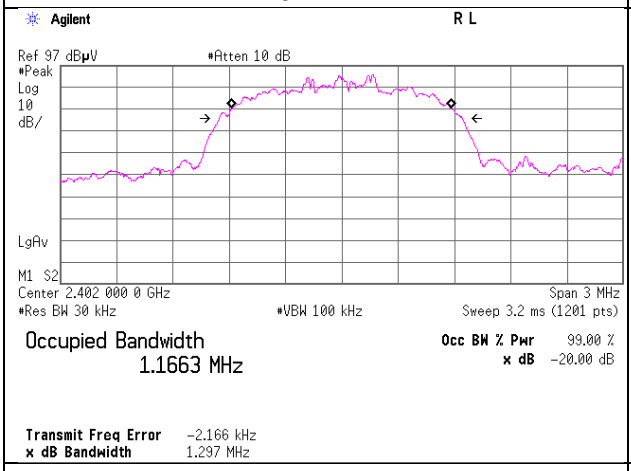


20dB Bandwidth and Carrier Frequency Separation

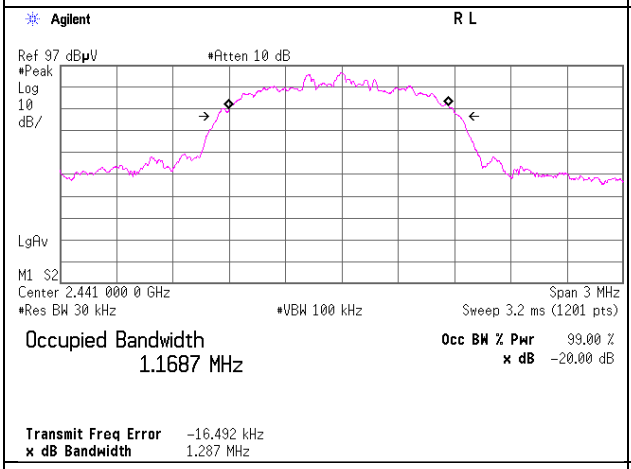
3DH5

20 dB Bandwidth

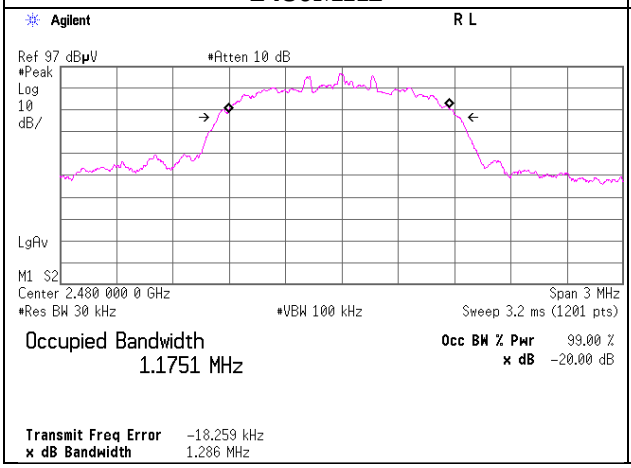
2402 MHz



2441MHz

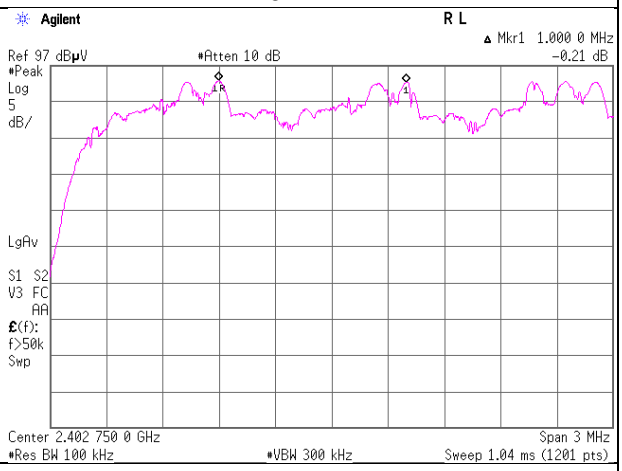


2480MHz

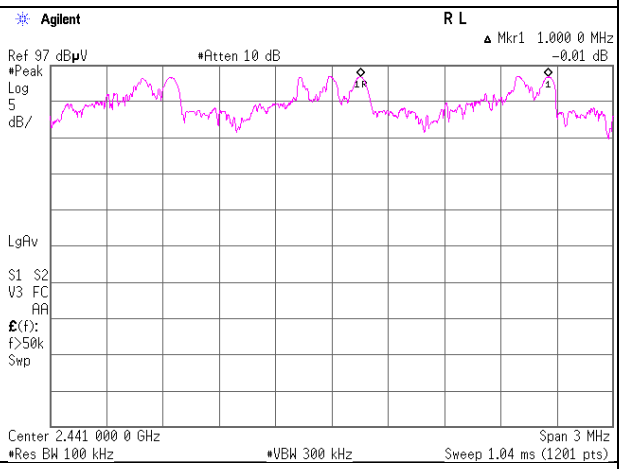


Carrier Frequency Separation

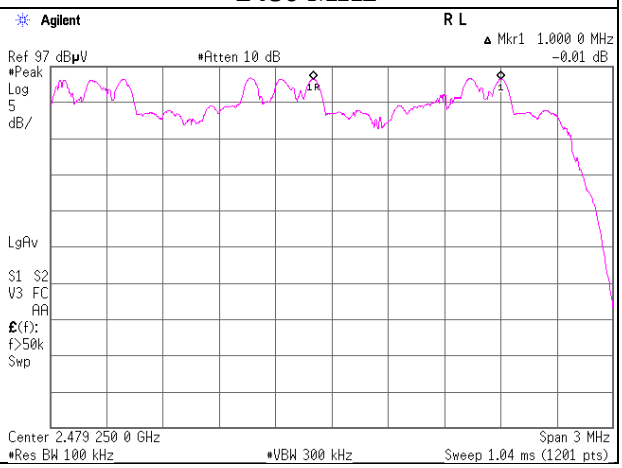
2402 MHz



2441 MHz



2480 MHz



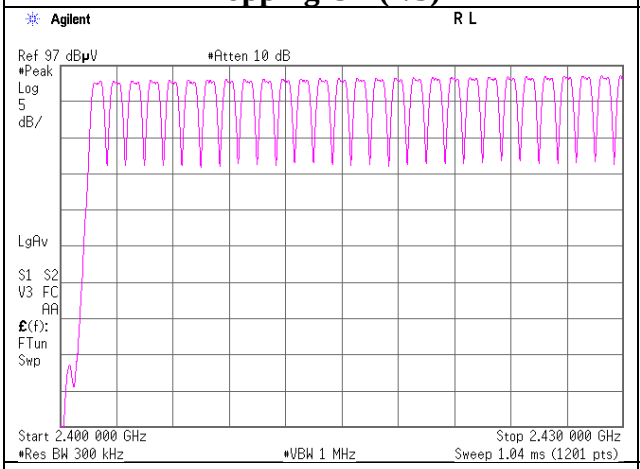
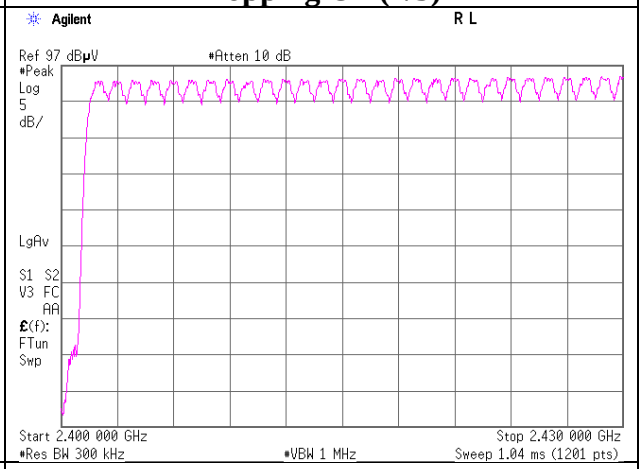
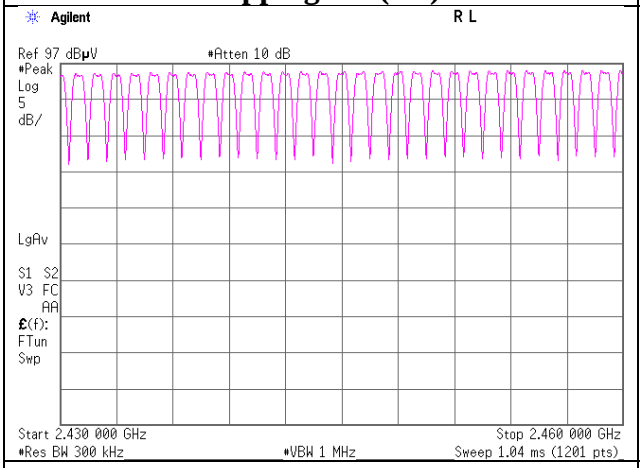
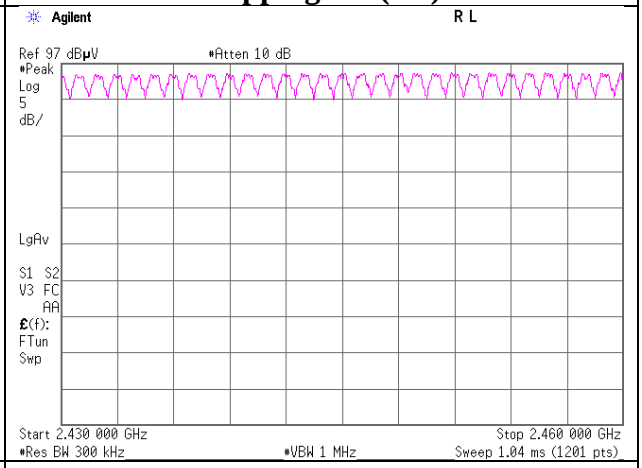
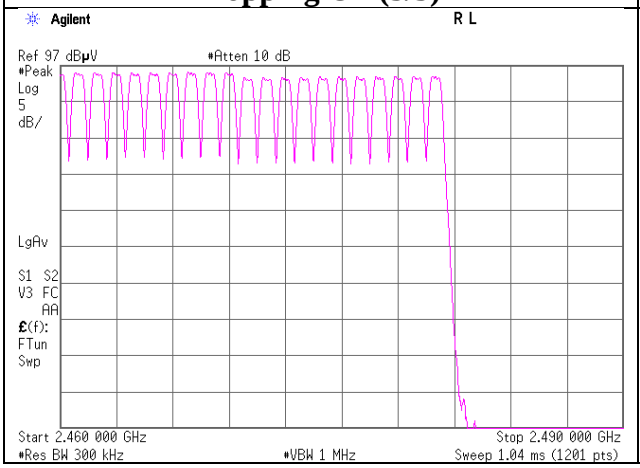
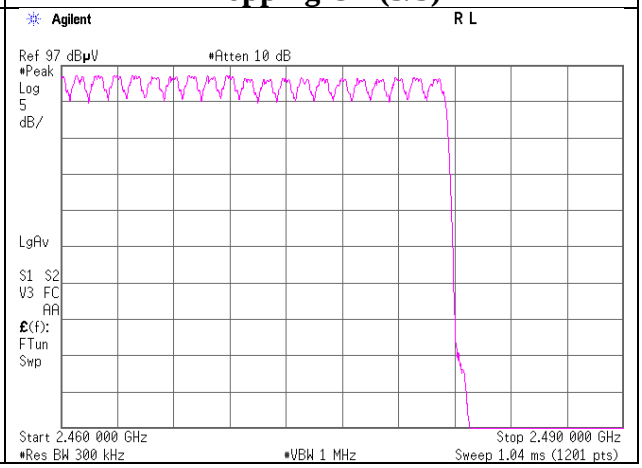
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
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	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping On

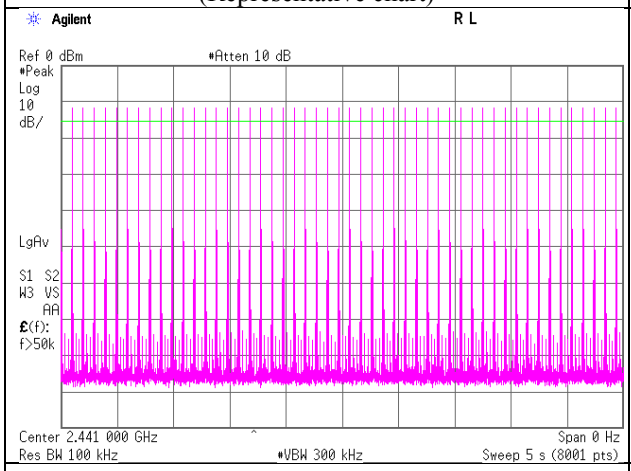
Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.415	134	400
DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.671	276	400
DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.918	315	400
3DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.433	140	400
3DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.684	278	400
3DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.934	317	400

Sample Calculation
Result = Number of transmission x Length of transmission

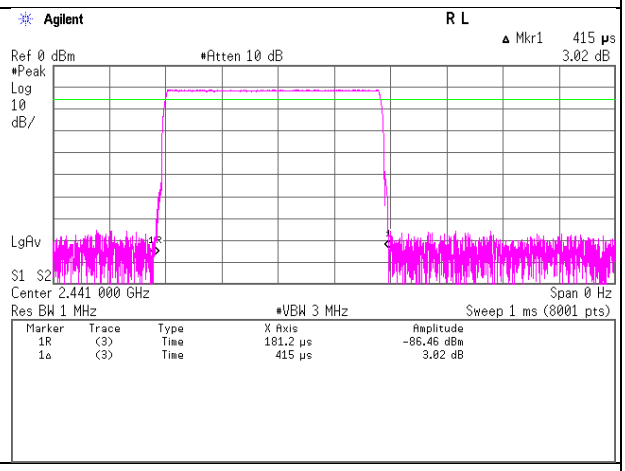
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless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

Dwell time

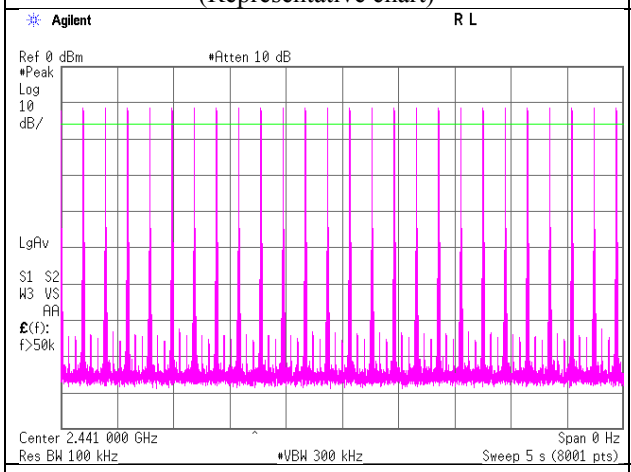
DH1 (1/2)
(Representative chart)



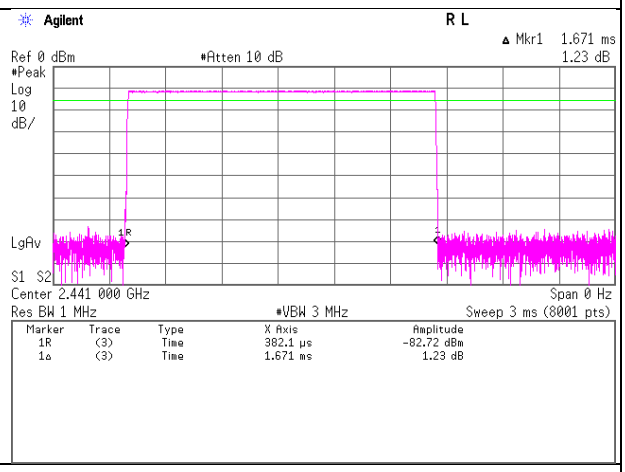
DH1 (2/2)



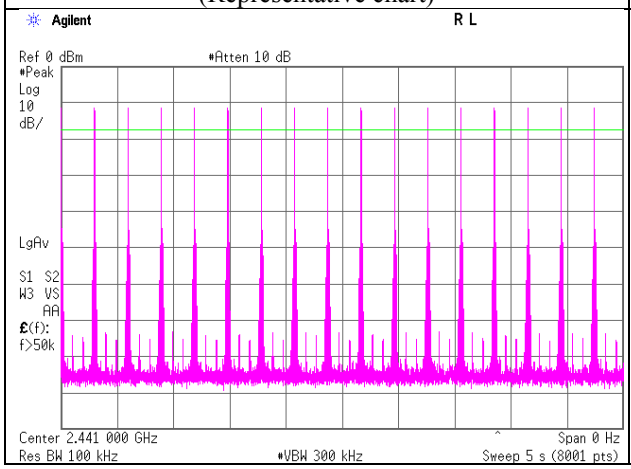
DH3 (1/2)
(Representative chart)



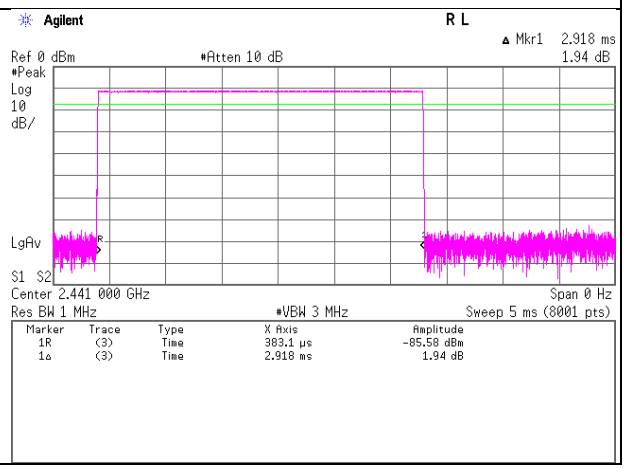
DH3 (2/2)



DH5 (1/2)
(Representative chart)

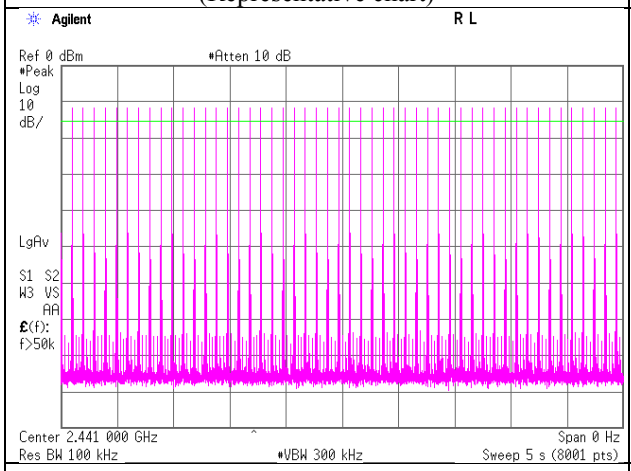


DH5 (2/2)

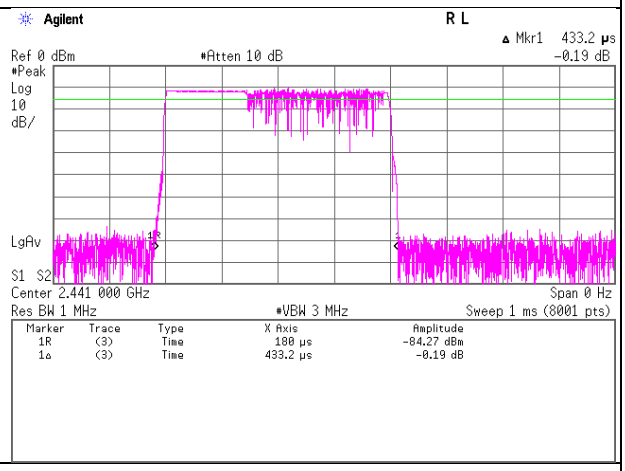


Dwell time

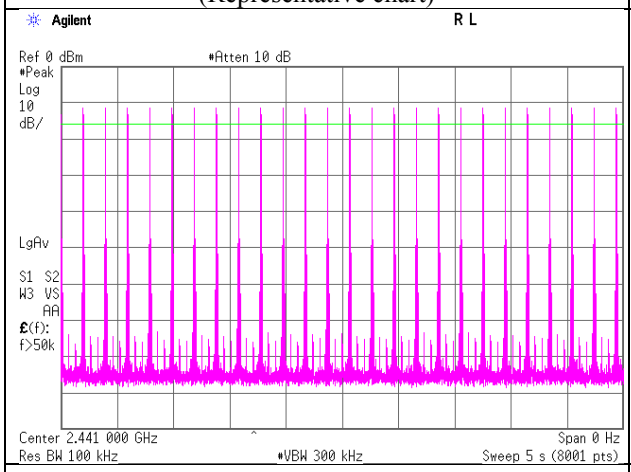
3DH1 (1/2)
(Representative chart)



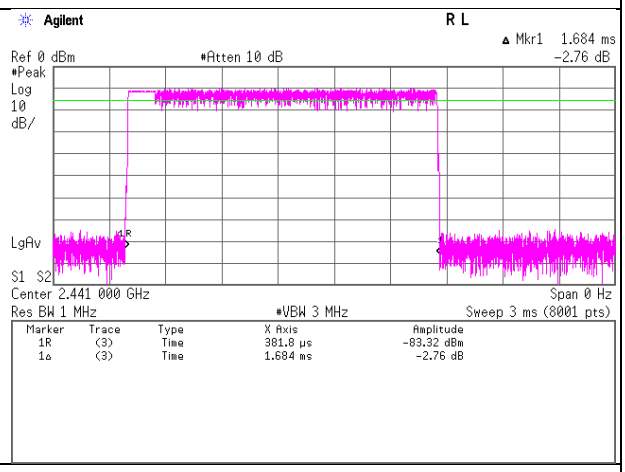
3DH1 (2/2)



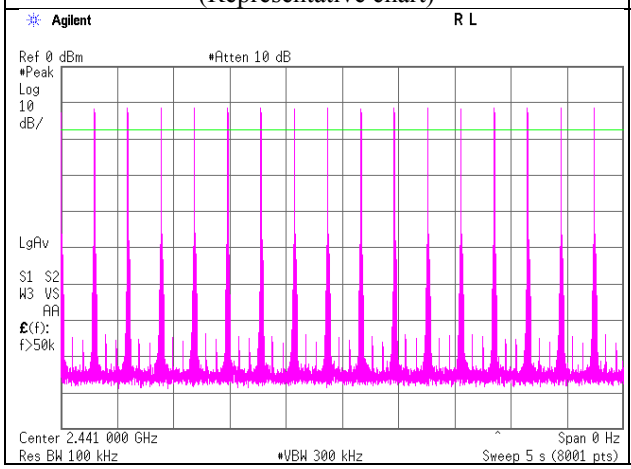
3DH3 (1/2)
(Representative chart)



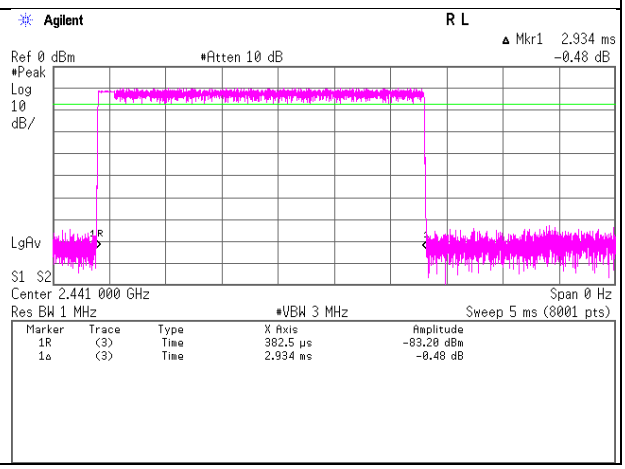
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
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	-11.63	1.62	9.67	-0.34	0.92	20.96	125	21.30
DH5	2441.0	-10.73	1.63	9.67	0.57	1.14	20.96	125	20.39
DH5	2480.0	-10.99	1.64	9.67	0.32	1.08	20.96	125	20.64
2DH5	2402.0	-10.44	1.62	9.67	0.85	1.22	20.96	125	20.11
2DH5	2441.0	-9.78	1.63	9.67	1.52	1.42	20.96	125	19.44
2DH5	2480.0	-9.94	1.64	9.67	1.37	1.37	20.96	125	19.59
3DH5	2402.0	-10.05	1.62	9.67	1.24	1.33	20.96	125	19.72
3DH5	2441.0	-9.38	1.63	9.67	1.92	1.56	20.96	125	19.04
3DH5	2480.0	-9.58	1.64	9.67	1.73	1.49	20.96	125	19.23

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

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

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

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	Result (Time average) [mW]	Duty factor [dB]	Result (Burst power average) [dBm]	Result (Burst power average) [mW]
DH5	2402.0	-13.36	1.62	9.67	-2.07	0.62	1.09	-0.98	0.80
DH5	2441.0	-12.48	1.63	9.67	-1.18	0.76	1.09	-0.09	0.98
DH5	2480.0	-12.67	1.64	9.67	-1.36	0.73	1.09	-0.27	0.94
2DH5	2402.0	-14.30	1.62	9.67	-3.01	0.50	1.07	-1.94	0.64
2DH5	2441.0	-13.58	1.63	9.67	-2.28	0.59	1.07	-1.21	0.76
2DH5	2480.0	-13.75	1.64	9.67	-2.44	0.57	1.07	-1.37	0.73
3DH5	2402.0	-14.28	1.62	9.67	-2.99	0.50	1.07	-1.92	0.64
3DH5	2441.0	-13.57	1.63	9.67	-2.27	0.59	1.07	-1.20	0.76
3DH5	2480.0	-13.73	1.64	9.67	-2.42	0.57	1.07	-1.35	0.73

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

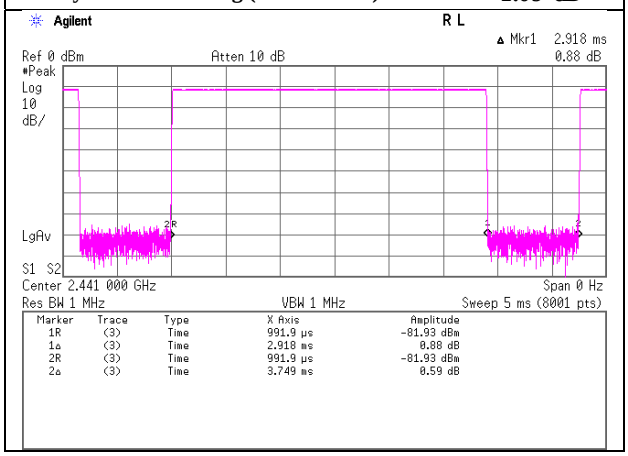
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off

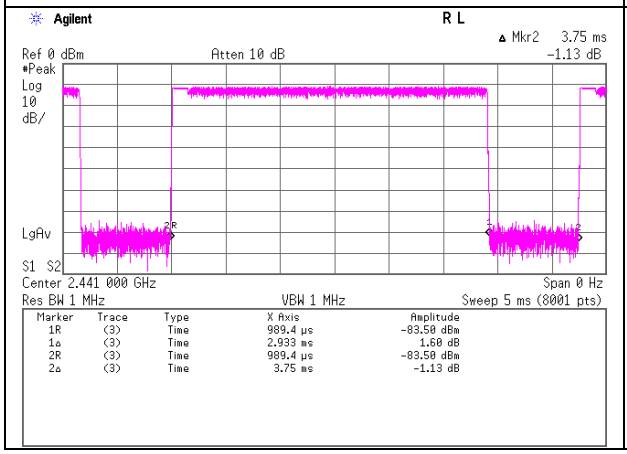
DH5

Tx on / (Tx on + Tx off) =	**0.778**
Tx on / (Tx on + Tx off) * 100 =	**77.8 %**
Duty factor = 10 * log (3.749 / 2.918) =	**1.09 dB**



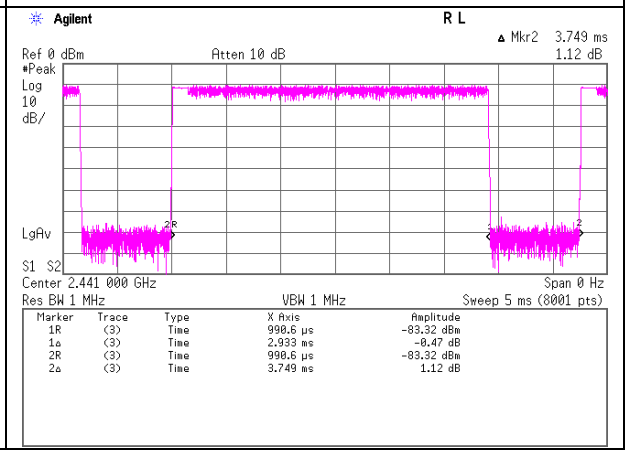
2DH5

Tx on / (Tx on + Tx off) =	**0.782**
Tx on / (Tx on + Tx off) * 100 =	**78.2 %**
Duty factor = 10 * log (3.75 / 2.933) =	**1.07 dB**



3DH5

Tx on / (Tx on + Tx off) =	**0.782**
Tx on / (Tx on + Tx off) * 100 =	**78.2 %**
Duty factor = 10 * log (3.749 / 2.933) =	**1.07 dB**



Radiated Spurious Emission

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	11390225S-E	
Date	August 10, 2016	August 11, 2016
Temperature / Humidity	24 deg. C / 61 % RH	24 deg. C / 62 % RH
Engineer	Kazutaka Takeyama	Takahiro Suzuki
	(1-13 GHz)	(30-1000 MHz)
	(13-18 GHz)	(18-26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	77.792	QP	30.89	6.15	7.95	31.87	0.00	13.12	40.00	26.8	245	25	
Hori.	197.943	QP	25.78	16.34	8.79	31.76	0.00	19.15	43.50	24.3	216	251	
Hori.	311.914	QP	27.69	13.87	6.64	31.66	0.00	16.54	46.00	29.4	100	108	
Hori.	342.025	QP	24.57	14.70	6.86	31.64	0.00	14.49	46.00	31.5	100	50	
Hori.	448.024	QP	28.13	16.89	7.54	31.64	0.00	20.92	46.00	25.0	100	181	
Hori.	479.878	QP	23.54	17.28	7.72	31.61	0.00	16.93	46.00	29.0	100	276	
Hori.	2390.000	PK	42.01	27.72	13.70	37.06	2.24	48.61	73.90	25.2	143	71	
Hori.	2400.000	PK	42.79	27.74	13.71	37.05	2.24	49.43	73.90	24.4	143	71	
Hori.	4804.000	PK	43.28	31.37	5.98	37.12	2.24	45.75	73.90	28.1	146	118	
Hori.	7206.000	PK	43.67	36.85	7.40	37.84	2.24	52.32	73.90	21.5	150	0	
Hori.	9608.000	PK	43.52	38.00	7.93	39.13	2.24	52.56	73.90	21.3	150	0	
Hori.	12010.000	PK	45.39	39.66	9.65	39.38	2.24	57.56	73.90	16.3	150	0	
Hori.	2390.000	AV	30.29	27.72	13.70	37.06	2.24	36.89	53.90	17.0	143	71	
Hori.	2400.000	AV	30.45	27.74	13.71	37.05	2.24	37.09	53.90	16.8	143	71	
Hori.	4804.000	AV	32.56	31.37	5.98	37.12	2.24	35.03	53.90	18.8	146	118	
Hori.	7206.000	AV	32.03	36.85	7.40	37.84	2.24	40.68	53.90	13.2	150	0	
Hori.	9608.000	AV	32.36	38.00	7.93	39.13	2.24	41.40	53.90	12.5	150	0	
Hori.	12010.000	AV	33.62	39.66	9.65	39.38	2.24	45.79	53.90	**8.1**	150	0	
Vert.	54.425	QP	31.77	9.42	7.20	31.90	0.00	16.49	40.00	23.5	100	65	
Vert.	101.824	QP	28.76	10.38	7.97	31.85	0.00	15.26	43.50	28.2	100	338	
Vert.	162.030	QP	26.18	15.11	8.70	31.80	0.00	18.19	43.50	25.3	100	354	
Vert.	2390.000	PK	43.02	27.72	13.70	37.06	2.24	49.62	73.90	24.2	143	338	
Vert.	2400.000	PK	42.87	27.74	13.71	37.05	2.24	49.51	73.90	24.3	143	338	
Vert.	4804.000	PK	43.98	31.37	5.98	37.12	2.24	46.45	73.90	27.4	167	3	
Vert.	7206.000	PK	43.16	36.85	7.40	37.84	2.24	51.81	73.90	22.0	150	0	
Vert.	9608.000	PK	44.87	38.00	7.93	39.13	2.24	53.91	73.90	19.9	150	0	
Vert.	12010.000	PK	44.92	39.66	9.65	39.38	2.24	57.09	73.90	16.8	150	0	
Vert.	2390.000	AV	30.50	27.72	13.70	37.06	2.24	37.10	53.90	16.8	143	338	
Vert.	2400.000	AV	30.71	27.74	13.71	37.05	2.24	37.35	53.90	16.5	143	338	
Vert.	4804.000	AV	31.78	31.37	5.98	37.12	2.24	34.25	53.90	19.6	167	3	
Vert.	7206.000	AV	32.06	36.85	7.40	37.84	2.24	40.71	53.90	13.1	150	0	
Vert.	9608.000	AV	32.31	38.00	7.93	39.13	2.24	41.35	53.90	12.5	150	0	
Vert.	12010.000	AV	33.48	39.66	9.65	39.38	2.24	45.65	53.90	8.2	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	75.33	27.75	13.71	37.05	2.24	81.98	-	-	Carrier
Hori.	2400.000	PK	33.45	27.74	13.71	37.05	2.24	40.09	61.98	21.9	
Vert.	2402.000	PK	76.48	27.75	13.71	37.05	2.24	83.13	-	-	Carrier
Vert.	2400.000	PK	33.24	27.74	13.71	37.05	2.24	39.88	63.13	23.3	

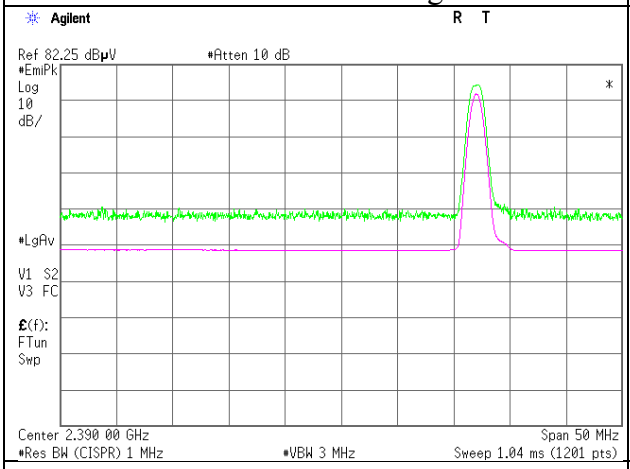
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11390225S-E
Date	August 10, 2016
Temperature / Humidity	24 deg. C / 61 % RH
Engineer	Kazutaka Takeyama (1-13 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz

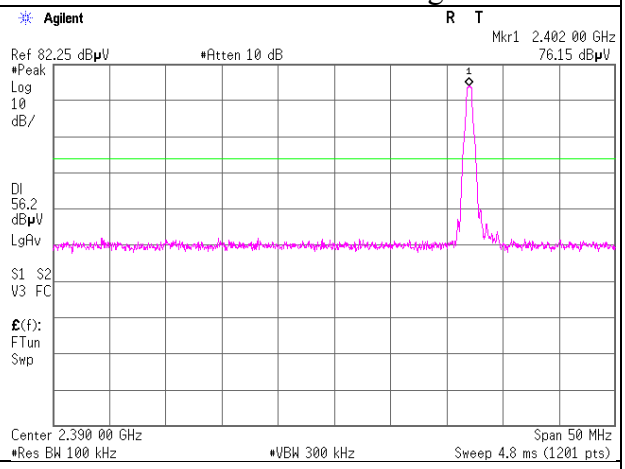
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

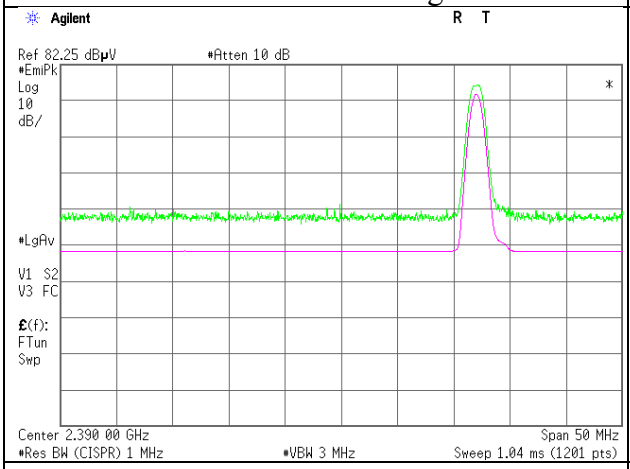
Authorized-band band-edge Plot



20dBc Plot

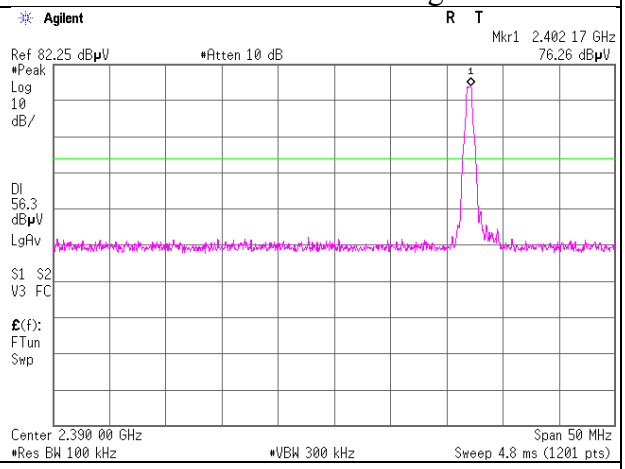
Vertical

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

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	11390225S-E	
Date	August 10, 2016	August 11, 2016
Temperature / Humidity	24 deg. C / 61 % RH	24 deg. C / 62 % RH
Engineer	Kazutaka Takeyama	Takahiro Suzuki
	(1-13 GHz)	(30-1000 MHz)
	(13-18 GHz	(18-26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	77.559	QP	31.86	6.15	7.93	31.87	0.00	14.07	40.00	25.9	248	21	
Hori.	89.581	QP	28.79	8.14	8.14	31.86	0.00	13.21	43.50	30.2	223	128	
Hori.	101.822	QP	25.00	10.38	7.97	31.85	0.00	11.50	43.50	32.0	170	139	
Hori.	198.208	QP	27.92	16.35	8.79	31.76	0.00	21.30	43.50	22.2	106	240	
Hori.	330.444	QP	30.03	14.38	6.78	31.65	0.00	19.54	46.00	26.4	111	97	
Hori.	425.989	QP	25.24	16.61	7.39	31.64	0.00	17.60	46.00	28.4	103	145	
Hori.	437.920	QP	24.75	16.76	7.47	31.64	0.00	17.34	46.00	28.6	100	91	
Hori.	4882.000	PK	42.49	31.64	6.04	37.16	2.24	45.25	73.90	28.6	187	350	
Hori.	7323.000	PK	43.88	36.90	7.55	37.92	2.24	52.65	73.90	21.2	150	0	
Hori.	9764.000	PK	43.92	38.09	8.12	39.20	2.24	53.17	73.90	20.7	150	0	
Hori.	12205.000	PK	45.71	39.59	9.81	39.39	2.24	57.96	73.90	15.9	150	0	
Hori.	4882.000	AV	30.72	31.64	6.04	37.16	2.24	33.48	53.90	20.4	187	350	
Hori.	7323.000	AV	32.16	36.90	7.55	37.92	2.24	40.93	53.90	12.9	150	0	
Hori.	9764.000	AV	32.50	38.09	8.12	39.20	2.24	41.75	53.90	12.1	150	0	
Hori.	12205.000	AV	33.70	39.59	9.81	39.39	2.24	45.95	53.90	7.9	150	0	
Vert.	54.013	QP	32.65	9.54	7.20	31.90	0.00	17.49	40.00	22.5	100	66	
Vert.	89.937	QP	29.99	8.22	8.14	31.86	0.00	14.49	43.50	29.0	100	132	
Vert.	4882.000	PK	42.18	31.64	6.04	37.16	2.24	44.94	73.90	28.9	165	287	
Vert.	7323.000	PK	43.76	36.90	7.55	37.92	2.24	52.53	73.90	21.3	150	0	
Vert.	9764.000	PK	43.77	38.09	8.12	39.20	2.24	53.02	73.90	20.8	150	0	
Vert.	12205.000	PK	44.61	39.59	9.81	39.39	2.24	56.86	73.90	17.0	150	0	
Vert.	4882.000	AV	30.55	31.64	6.04	37.16	2.24	33.31	53.90	20.5	165	287	
Vert.	7323.000	AV	32.26	36.90	7.55	37.92	2.24	41.03	53.90	12.8	150	0	
Vert.	9764.000	AV	32.66	38.09	8.12	39.20	2.24	41.91	53.90	11.9	150	0	
Vert.	12205.000	AV	33.79	39.59	9.81	39.39	2.24	46.04	53.90	**7.8**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	11390225S-E	
Date	August 10, 2016	August 11, 2016
Temperature / Humidity	24 deg. C / 61 % RH	24 deg. C / 62 % RH
Engineer	Kazutaka Takeyama	Takahiro Suzuki
	(1-13 GHz)	(30-1000 MHz)
	(13-18 GHz)	(18-26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	77.544	QP	31.75	6.15	7.93	31.87	0.00	13.96	40.00	26.0	249	42	
Hori.	89.529	QP	29.11	8.13	8.14	31.86	0.00	13.52	43.50	29.9	271	113	
Hori.	113.964	QP	25.56	12.21	7.90	31.84	0.00	13.83	43.50	29.6	201	76	
Hori.	162.034	QP	23.78	15.11	8.70	31.80	0.00	15.79	43.50	27.7	182	99	
Hori.	221.977	QP	27.24	17.00	9.15	31.73	0.00	21.66	46.00	24.3	124	206	
Hori.	467.997	QP	27.00	17.13	7.66	31.62	0.00	20.17	46.00	25.8	100	266	
Hori.	2483.500	PK	42.81	27.90	13.79	37.01	2.24	49.73	73.90	24.1	121	58	
Hori.	4960.000	PK	44.13	31.91	6.10	37.19	2.24	47.19	73.90	26.7	143	259	
Hori.	7440.000	PK	45.86	36.95	7.69	37.99	2.24	54.75	73.90	19.1	100	0	
Hori.	9920.000	PK	45.98	38.18	8.32	39.26	2.24	55.46	73.90	18.4	100	0	
Hori.	12400.000	PK	47.24	39.52	9.95	39.40	2.24	59.55	73.90	14.3	100	0	
Hori.	2483.500	AV	29.95	27.90	13.79	37.01	2.24	36.87	53.90	17.0	121	58	
Hori.	4960.000	AV	30.92	31.91	6.10	37.19	2.24	33.98	53.90	19.9	143	259	
Hori.	7440.000	AV	32.19	36.95	7.69	37.99	2.24	41.08	53.90	12.8	100	0	
Hori.	9920.000	AV	33.22	38.18	8.32	39.26	2.24	42.70	53.90	11.2	100	0	
Hori.	12400.000	AV	33.95	39.52	9.95	39.40	2.24	46.26	53.90	**7.6**	100	0	
Vert.	89.931	QP	29.91	8.22	8.14	31.86	0.00	14.41	43.50	29.0	100	219	
Vert.	137.998	QP	26.03	14.22	8.33	31.82	0.00	16.76	43.50	26.7	100	221	
Vert.	221.966	QP	24.86	17.00	9.15	31.73	0.00	19.28	46.00	26.7	100	1	
Vert.	843.929	QP	23.45	21.43	9.55	31.11	0.00	23.32	46.00	22.6	100	298	
Vert.	2483.500	PK	42.31	27.90	13.79	37.01	2.24	49.23	73.90	24.6	162	159	
Vert.	4960.000	PK	43.86	31.91	6.10	37.19	2.24	46.92	73.90	26.9	145	24	
Vert.	7440.000	PK	45.12	36.95	7.69	37.99	2.24	54.01	73.90	19.8	100	0	
Vert.	9920.000	PK	46.68	38.18	8.32	39.26	2.24	56.16	73.90	17.7	100	0	
Vert.	12400.000	PK	47.06	39.52	9.95	39.40	2.24	59.37	73.90	14.5	100	0	
Vert.	2483.500	AV	30.33	27.90	13.79	37.01	2.24	37.25	53.90	16.6	162	159	
Vert.	4960.000	AV	31.04	31.91	6.10	37.19	2.24	34.10	53.90	19.8	145	24	
Vert.	7440.000	AV	32.17	36.95	7.69	37.99	2.24	41.06	53.90	12.8	100	0	
Vert.	9920.000	AV	33.15	38.18	8.32	39.26	2.24	42.63	53.90	11.2	100	0	
Vert.	12400.000	AV	33.84	39.52	9.95	39.40	2.24	46.15	53.90	7.7	100	0	

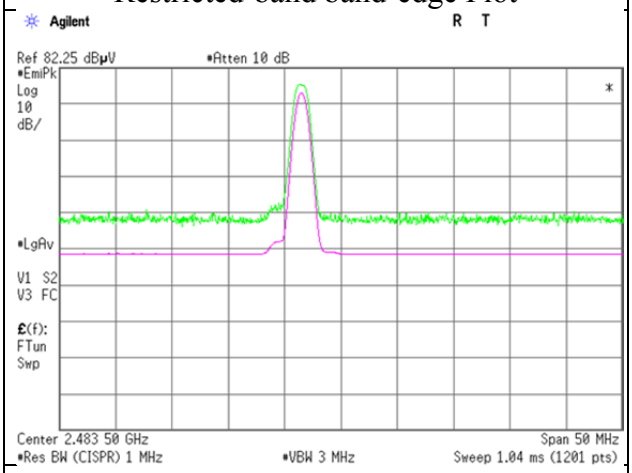
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11390225S-E
Date	August 10, 2016
Temperature / Humidity	24 deg. C / 61 % RH
Engineer	Kazutaka Takeyama (1-13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

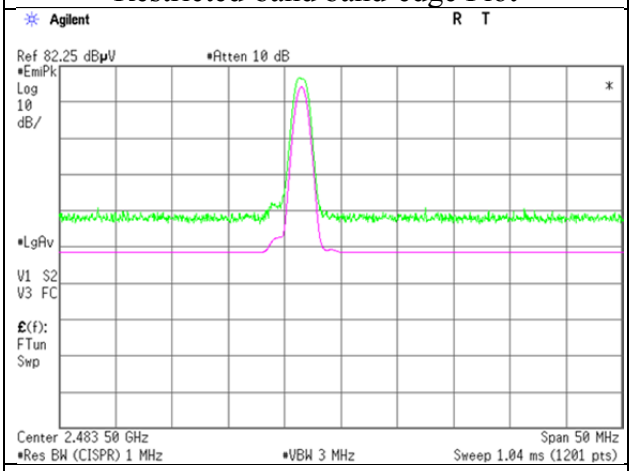
Restricted-band band-edge Plot



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

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	11390225S-E	
Date	August 10, 2016	August 11, 2016
Temperature / Humidity	24 deg. C / 61 % RH	24 deg. C / 61 % RH
Engineer	Kazutaka Takeyama	Takahiro Suzuki
	(1-13 GHz)	(30-1000 MHz)
	(13-18 GHz)	(18-26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	77.556	QP	32.13	6.15	7.93	31.87	0.00	14.34	40.00	25.6	260	26	
Hori.	89.931	QP	30.21	8.22	8.14	31.86	0.00	14.71	43.50	28.7	350	124	
Hori.	174.038	QP	24.68	15.65	8.72	31.79	0.00	17.26	43.50	26.2	202	82	
Hori.	186.079	QP	26.32	16.06	8.72	31.77	0.00	19.33	43.50	24.1	191	272	
Hori.	365.759	QP	26.15	15.35	7.02	31.64	0.00	16.88	46.00	29.1	100	357	
Hori.	447.684	QP	35.94	16.88	7.54	31.64	0.00	28.72	46.00	17.2	100	209	
Hori.	2390.000	PK	42.72	27.72	13.70	37.06	2.24	49.32	73.90	24.5	163	45	
Hori.	2400.000	PK	43.42	27.74	13.71	37.05	2.24	50.06	73.90	23.8	163	45	
Hori.	4804.000	PK	42.83	31.37	5.98	37.12	2.24	45.30	73.90	28.6	165	31	
Hori.	7206.000	PK	44.19	36.85	7.40	37.84	2.24	52.84	73.90	21.0	150	0	
Hori.	9608.000	PK	43.82	38.00	7.93	39.13	2.24	52.86	73.90	21.0	150	0	
Hori.	12010.000	PK	44.51	39.66	9.65	39.38	2.24	56.68	73.90	17.2	150	0	
Hori.	2390.000	AV	30.69	27.72	13.70	37.06	2.24	37.29	53.90	16.6	163	45	
Hori.	2400.000	AV	30.66	27.74	13.71	37.05	2.24	37.30	53.90	16.6	163	45	
Hori.	4804.000	AV	30.64	31.37	5.98	37.12	2.24	33.11	53.90	20.7	165	31	
Hori.	7206.000	AV	31.84	36.85	7.40	37.84	2.24	40.49	53.90	13.4	150	0	
Hori.	9608.000	AV	32.04	38.00	7.93	39.13	2.24	41.08	53.90	12.8	150	0	
Hori.	12010.000	AV	33.48	39.66	9.65	39.38	2.24	45.65	53.90	8.2	150	0	
Vert.	41.876	QP	21.11	13.74	7.08	31.90	0.00	10.03	40.00	29.9	100	15	
Vert.	54.299	QP	32.53	9.46	7.20	31.90	0.00	17.29	40.00	22.7	100	74	
Vert.	221.976	QP	24.74	17.00	9.15	31.73	0.00	19.16	46.00	26.8	100	1	
Vert.	2390.000	PK	42.15	27.72	13.70	37.06	2.24	48.75	73.90	25.1	165	14	
Vert.	2400.000	PK	45.06	27.74	13.71	37.05	2.24	51.70	73.90	22.2	165	14	
Vert.	4804.000	PK	43.97	31.37	5.98	37.12	2.24	46.44	73.90	27.4	223	341	
Vert.	7206.000	PK	43.07	36.85	7.40	37.84	2.24	51.72	73.90	22.1	150	0	
Vert.	9608.000	PK	43.69	38.00	7.93	39.13	2.24	52.73	73.90	21.1	150	0	
Vert.	12010.000	PK	44.81	39.66	9.65	39.38	2.24	56.98	73.90	16.9	150	0	
Vert.	2390.000	AV	28.70	27.72	13.70	37.06	2.24	35.30	53.90	18.6	165	14	
Vert.	2400.000	AV	29.43	27.74	13.71	37.05	2.24	36.07	53.90	17.8	165	14	
Vert.	4804.000	AV	30.80	31.37	5.98	37.12	2.24	33.27	53.90	20.6	223	341	
Vert.	7206.000	AV	32.26	36.85	7.40	37.84	2.24	40.91	53.90	12.9	150	0	
Vert.	9608.000	AV	32.17	38.00	7.93	39.13	2.24	41.21	53.90	12.6	150	0	
Vert.	12010.000	AV	33.56	39.66	9.65	39.38	2.24	45.73	53.90	**8.1**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	76.26	27.75	13.71	37.05	2.24	82.91	-	-	Carrier
Hori.	2400.000	PK	34.38	27.74	13.71	37.05	2.24	41.02	62.91	21.9	
Vert.	2402.000	PK	78.64	27.75	13.71	37.05	2.24	85.29	-	-	Carrier
Vert.	2400.000	PK	34.08	27.74	13.71	37.05	2.24	40.72	65.29	24.6	

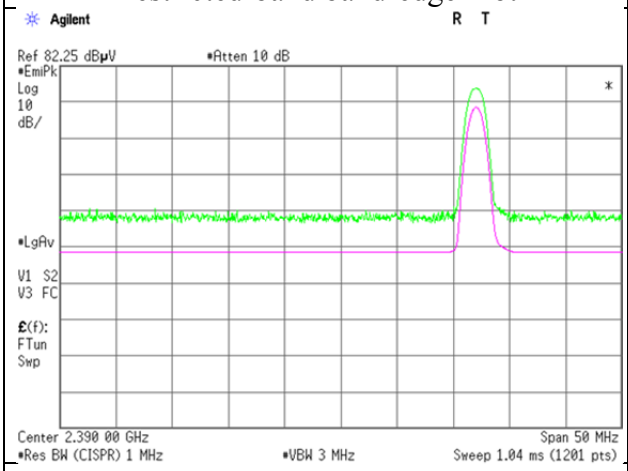
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11390225S-E
Date	August 10, 2016
Temperature / Humidity	24 deg. C / 61 % RH
Engineer	Kazutaka Takeyama (1-13 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz

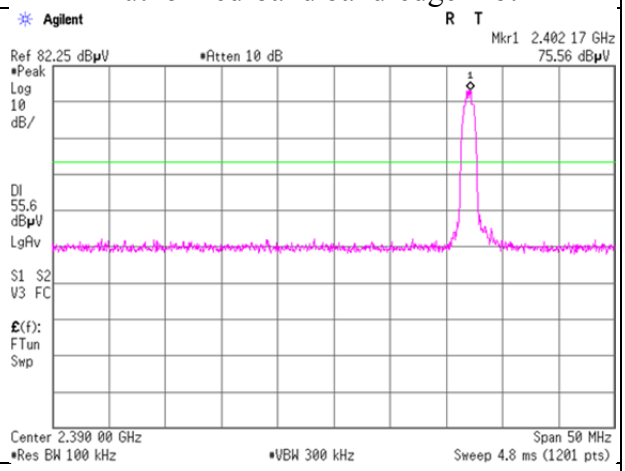
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

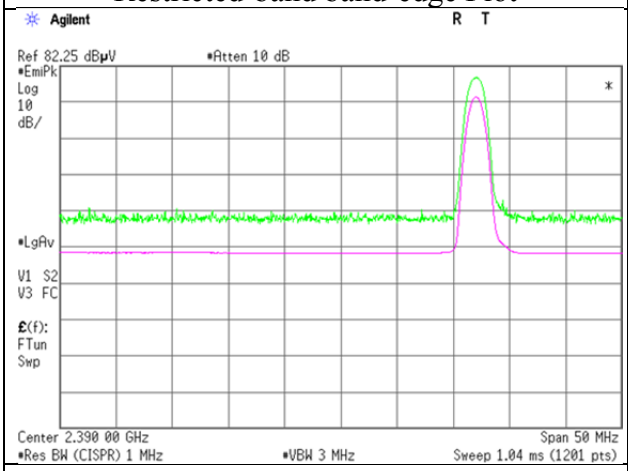
Authorized-band band-edge Plot



20dBc Plot

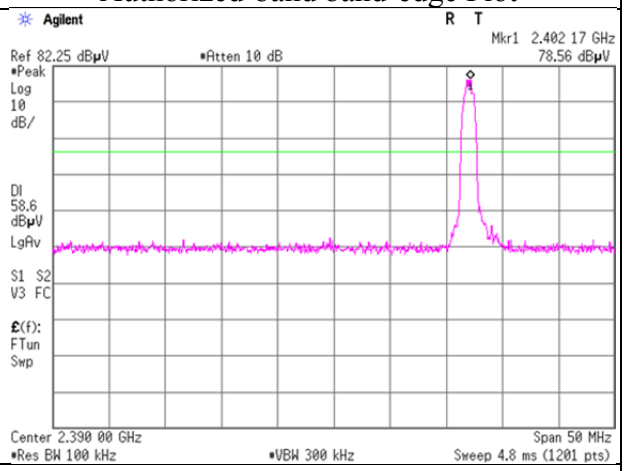
Vertical

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

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	11390225S-E	
Date	August 10, 2016	August 11, 2016
Temperature / Humidity	24 deg. C / 61 % RH	24 deg. C / 62 % RH
Engineer	Kazutaka Takeyama	Takahiro Suzuki
	(1-13 GHz)	(30-1000 MHz)
	(13-18 GHz)	(18-26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	89.936	QP	29.67	8.22	8.14	31.86	0.00	14.17	43.50	29.3	340	131	
Hori.	102.079	QP	27.00	10.41	7.96	31.85	0.00	13.52	43.50	29.9	330	52	
Hori.	113.989	QP	25.18	12.21	7.90	31.84	0.00	13.45	43.50	30.0	249	235	
Hori.	320.016	QP	37.63	14.09	6.70	31.66	0.00	26.76	46.00	19.2	145	88	
Hori.	384.000	QP	37.26	15.85	7.12	31.63	0.00	28.60	46.00	17.4	100	180	
Hori.	448.006	QP	36.09	16.89	7.54	31.64	0.00	28.88	46.00	17.1	100	198	
Hori.	4882.000	PK	43.18	31.64	6.04	37.16	2.24	45.94	73.90	27.9	201	143	
Hori.	7323.000	PK	44.60	36.90	7.55	37.92	2.24	53.37	73.90	20.5	150	0	
Hori.	9764.000	PK	44.79	38.09	8.12	39.20	2.24	54.04	73.90	19.8	150	0	
Hori.	12205.000	PK	44.96	39.59	9.81	39.39	2.24	57.21	73.90	16.6	150	0	
Hori.	4882.000	AV	30.65	31.64	6.04	37.16	2.24	33.41	53.90	20.4	201	143	
Hori.	7323.000	AV	32.16	36.90	7.55	37.92	2.24	40.93	53.90	12.9	150	0	
Hori.	9764.000	AV	32.64	38.09	8.12	39.20	2.24	41.89	53.90	12.0	150	0	
Hori.	12205.000	AV	33.75	39.59	9.81	39.39	2.24	46.00	53.90	7.9	150	0	
Vert.	42.382	QP	31.36	13.55	7.09	31.90	0.00	20.10	40.00	19.9	100	336	
Vert.	221.962	QP	24.45	17.00	9.15	31.73	0.00	18.87	46.00	27.1	100	355	
Vert.	384.026	QP	32.53	15.85	7.13	31.63	0.00	23.88	46.00	22.1	100	290	
Vert.	4882.000	PK	41.05	31.64	6.04	37.16	2.24	43.81	73.90	30.0	146	189	
Vert.	7323.000	PK	45.23	36.90	7.55	37.92	2.24	54.00	73.90	19.9	150	0	
Vert.	9764.000	PK	44.67	38.09	8.12	39.20	2.24	53.92	73.90	19.9	150	0	
Vert.	12205.000	PK	45.70	39.59	9.81	39.39	2.24	57.95	73.90	15.9	150	0	
Vert.	4882.000	AV	30.97	31.64	6.04	37.16	2.24	33.73	53.90	20.1	146	189	
Vert.	7323.000	AV	32.29	36.90	7.55	37.92	2.24	41.06	53.90	12.8	150	0	
Vert.	9764.000	AV	33.28	38.09	8.12	39.20	2.24	42.53	53.90	11.3	150	0	
Vert.	12205.000	AV	33.78	39.59	9.81	39.39	2.24	46.03	53.90	**7.8**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	11390225S-E	
Date	August 10, 2016	August 11, 2016
Temperature / Humidity	24 deg. C / 61 % RH	24 deg. C / 62 % RH
Engineer	Kazutaka Takeyama	Takahiro Suzuki
	(1-13 GHz)	(30-1000 MHz)
	(13-18 GHz)	(18-26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	113.976	QP	25.42	12.21	7.90	31.84	0.00	13.69	43.50	29.8	251	223	
Hori.	174.146	QP	24.59	15.66	8.72	31.79	0.00	17.18	43.50	26.3	205	355	
Hori.	329.519	QP	30.09	14.35	6.77	31.65	0.00	19.56	46.00	26.4	100	87	
Hori.	365.849	QP	26.03	15.35	7.02	31.64	0.00	16.76	46.00	29.2	100	355	
Hori.	383.882	QP	37.52	15.85	7.12	31.63	0.00	28.86	46.00	17.1	100	180	
Hori.	447.608	QP	36.89	16.88	7.54	31.64	0.00	29.67	46.00	16.3	100	190	
Hori.	456.133	QP	36.03	16.99	7.60	31.63	0.00	28.99	46.00	17.0	100	303	
Hori.	2483.500	PK	42.71	27.90	13.79	37.01	2.24	49.63	73.90	24.2	140	300	
Hori.	4960.000	PK	42.96	31.91	6.10	37.19	2.24	46.02	73.90	27.8	151	32	
Hori.	7440.000	PK	44.81	36.95	7.69	37.99	2.24	53.70	73.90	20.2	150	0	
Hori.	9920.000	PK	45.28	38.18	8.32	39.26	2.24	54.76	73.90	19.1	150	0	
Hori.	12400.000	PK	45.50	39.52	9.95	39.40	2.24	57.81	73.90	16.0	150	0	
Hori.	2483.500	AV	30.36	27.90	13.79	37.01	2.24	37.28	53.90	16.6	140	300	
Hori.	4960.000	AV	30.97	31.91	6.10	37.19	2.24	34.03	53.90	19.8	151	32	
Hori.	7440.000	AV	32.04	36.95	7.69	37.99	2.24	40.93	53.90	12.9	150	0	
Hori.	9920.000	AV	33.02	38.18	8.32	39.26	2.24	42.50	53.90	11.4	150	0	
Hori.	12400.000	AV	33.74	39.52	9.95	39.40	2.24	46.05	53.90	**7.8**	150	0	
Vert.	41.903	QP	31.55	13.73	7.08	31.90	0.00	20.46	40.00	19.5	100	104	
Vert.	54.010	QP	32.64	9.54	7.20	31.90	0.00	17.48	40.00	22.5	100	112	
Vert.	2483.500	PK	42.44	27.90	13.79	37.01	2.24	49.36	73.90	24.5	164	161	
Vert.	4960.000	PK	42.61	31.91	6.10	37.19	2.24	45.67	73.90	28.2	165	18	
Vert.	7440.000	PK	43.85	36.95	7.69	37.99	2.24	52.74	73.90	21.1	150	0	
Vert.	9920.000	PK	45.06	38.18	8.32	39.26	2.24	54.54	73.90	19.3	150	0	
Vert.	12400.000	PK	44.93	39.52	9.95	39.40	2.24	57.24	73.90	16.6	150	0	
Vert.	2483.500	AV	30.20	27.90	13.79	37.01	2.24	37.12	53.90	16.7	164	161	
Vert.	4960.000	AV	30.85	31.91	6.10	37.19	2.24	33.91	53.90	19.9	165	18	
Vert.	7440.000	AV	32.03	36.95	7.69	37.99	2.24	40.92	53.90	12.9	150	0	
Vert.	9920.000	AV	32.92	38.18	8.32	39.26	2.24	42.40	53.90	11.5	150	0	
Vert.	12400.000	AV	33.69	39.52	9.95	39.40	2.24	46.00	53.90	7.9	150	0	

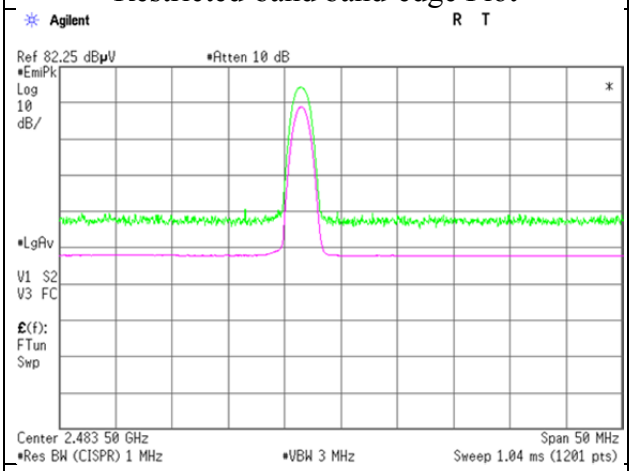
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	11390225S-E	
Date	August 10, 2016	August 11, 2016
Temperature / Humidity	24 deg. C / 61 % RH	24 deg. C / 62 % RH
Engineer	Kazutaka Takeyama	Takahiro Suzuki
	(1-13 GHz)	(30-1000 MHz)
	(13-18 GHz)	(18-26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

Horizontal

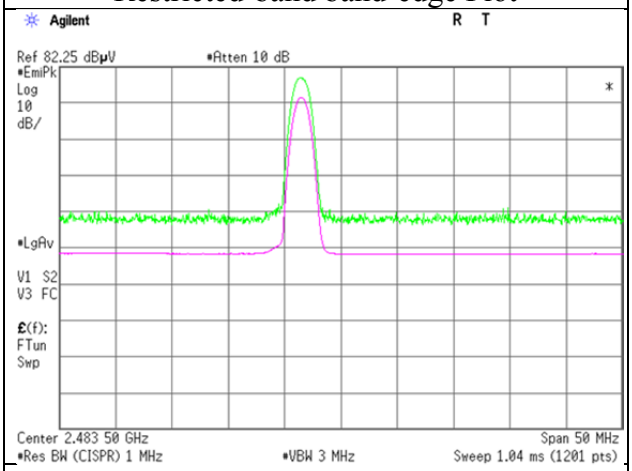
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

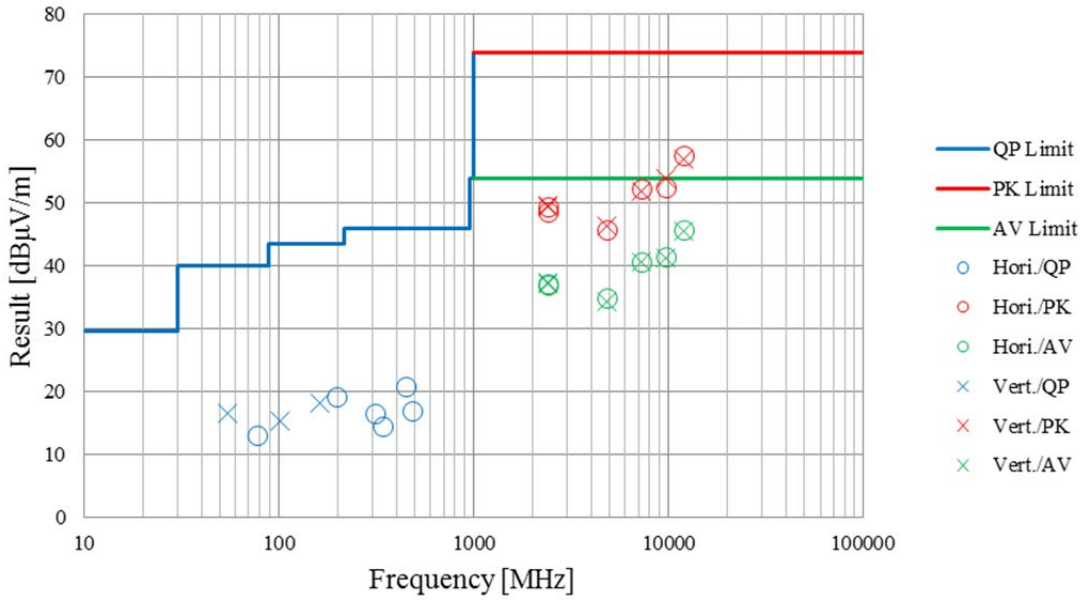


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	11390225S-E	
Date	August 10, 2016	August 11, 2016
Temperature / Humidity	24 deg. C / 61 % RH	24 deg. C / 62 % RH
Engineer	Kazutaka Takeyama	Takahiro Suzuki
	(1-13 GHz)	(30-1000 MHz)
	(13-18 GHz)	(18-26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz	



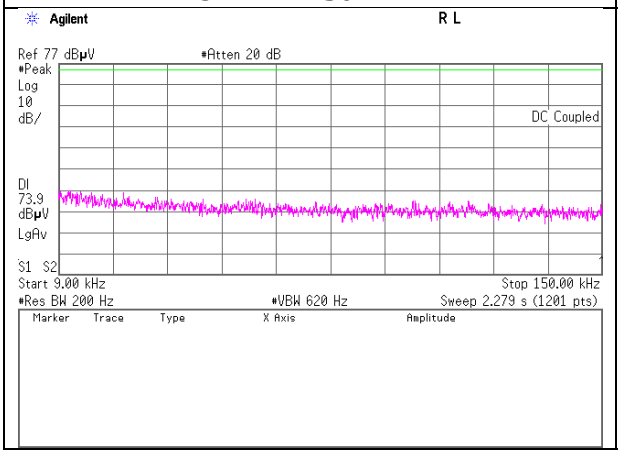
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

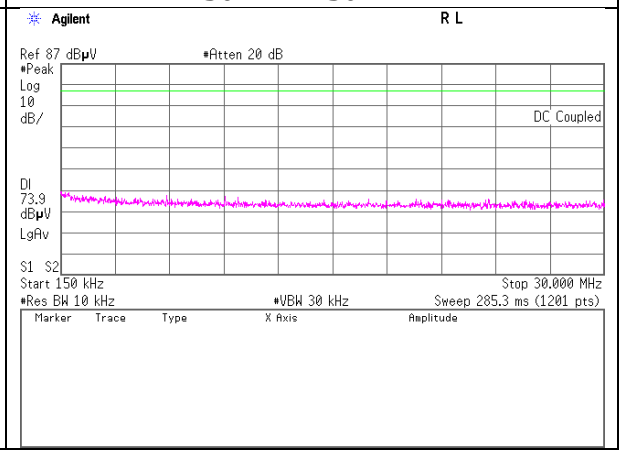
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, DH5

2402 MHz

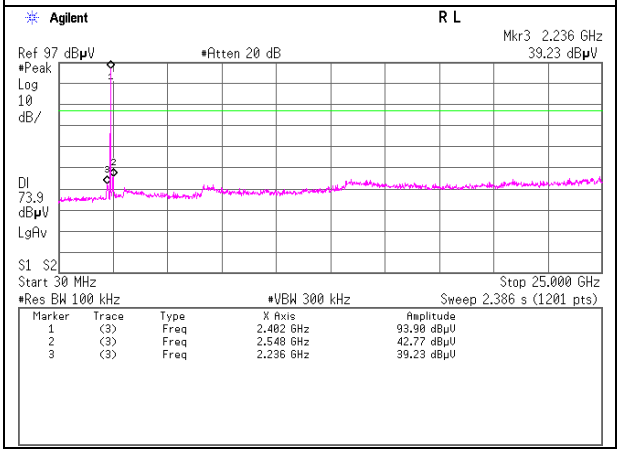
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

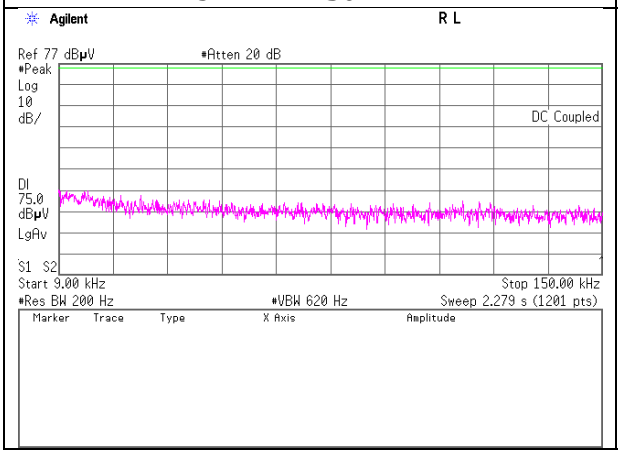


Conducted Spurious Emission

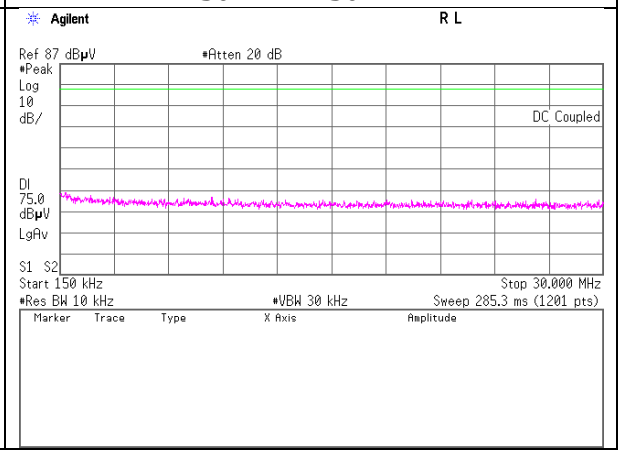
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, DH5

2441 MHz

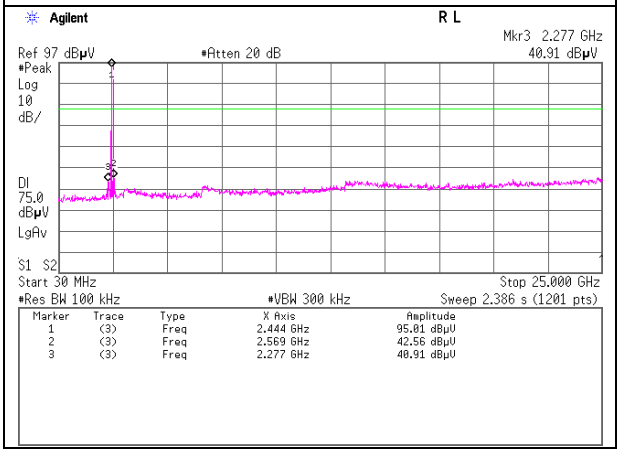
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

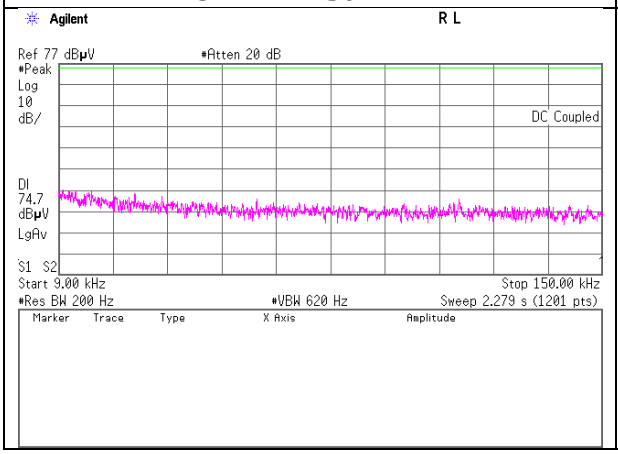


Conducted Spurious Emission

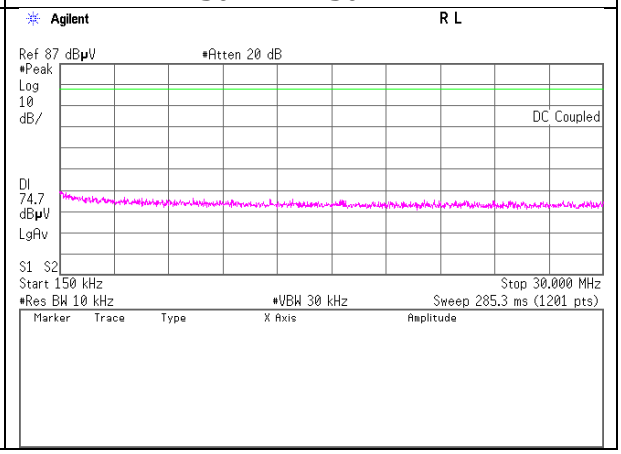
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, DH5

2480 MHz

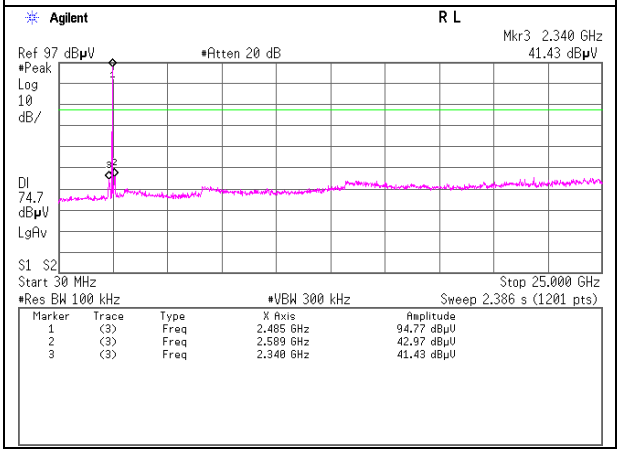
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

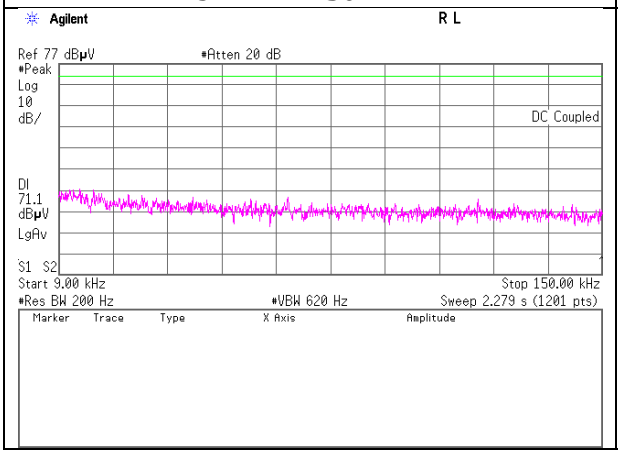


Conducted Spurious Emission

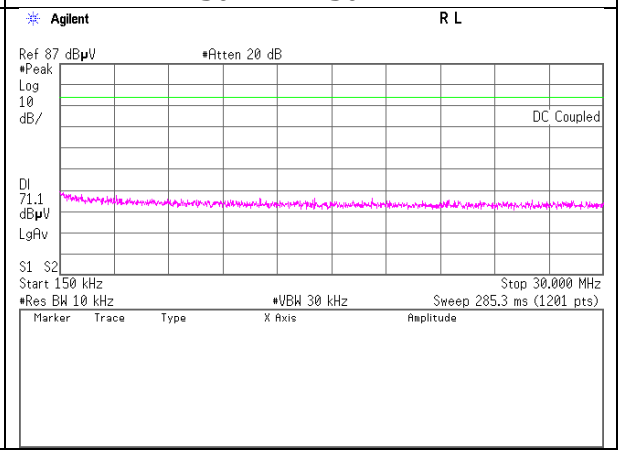
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, DH5

2402 MHz

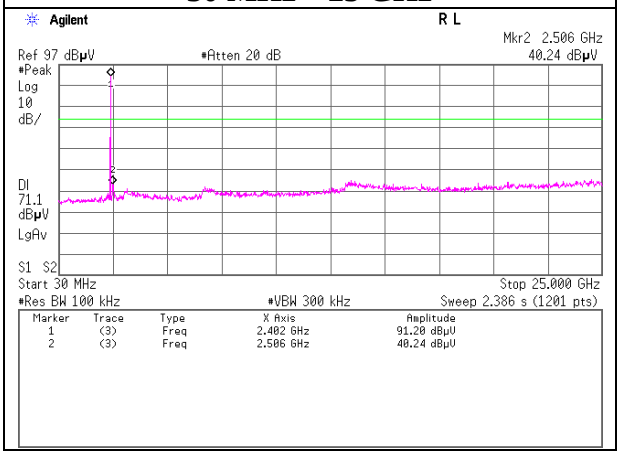
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

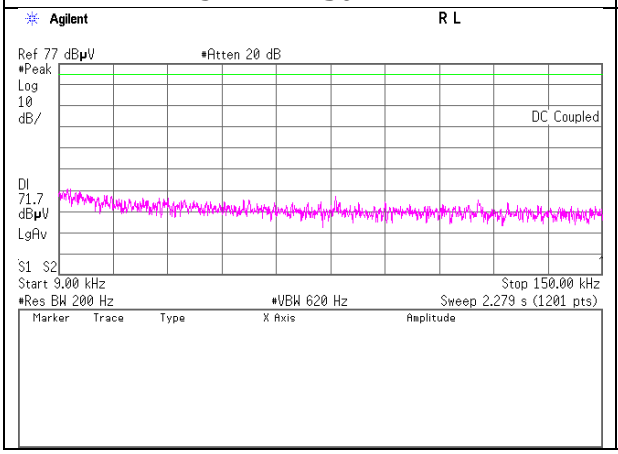


Conducted Spurious Emission

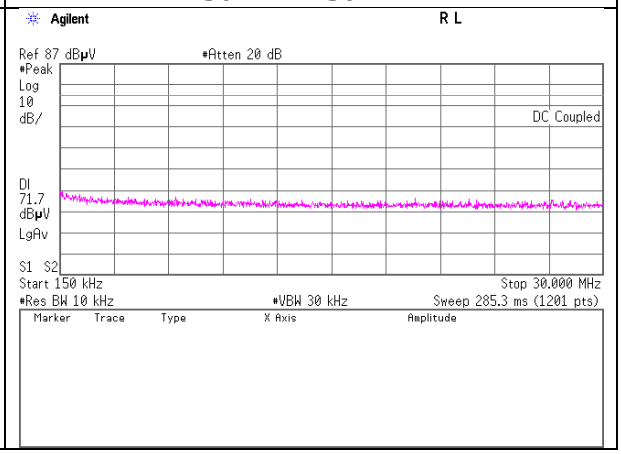
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, 3DH5

2441 MHz

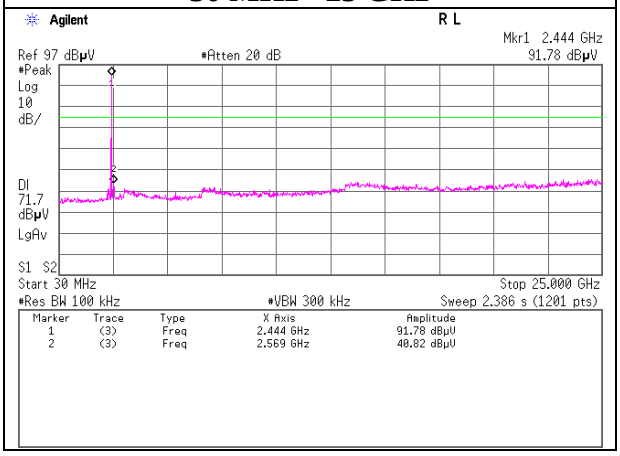
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

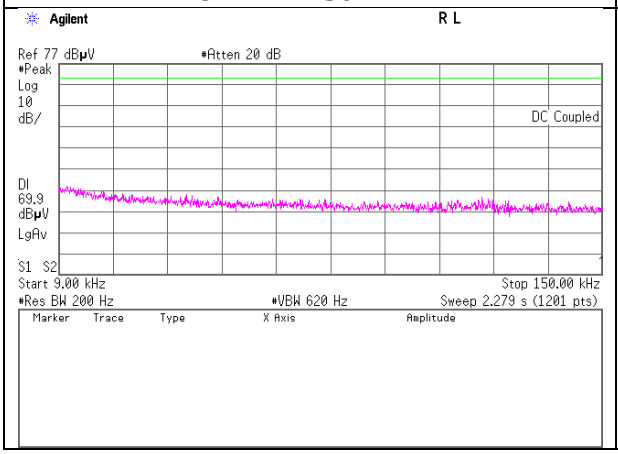


Conducted Spurious Emission

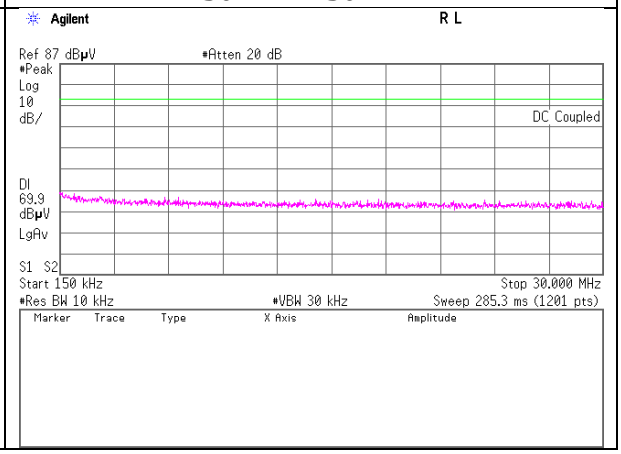
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, 3DH5

2480 MHz

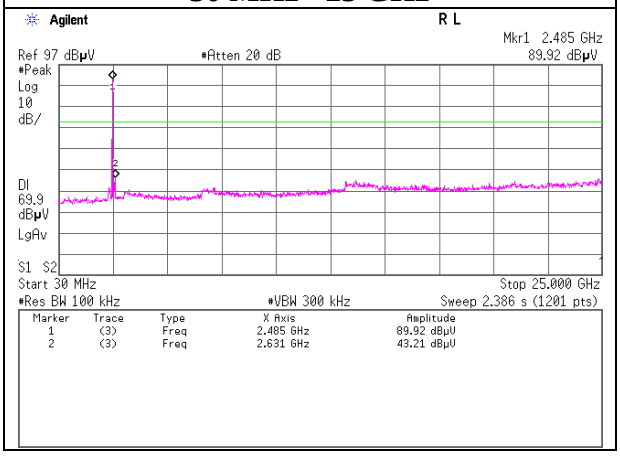
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

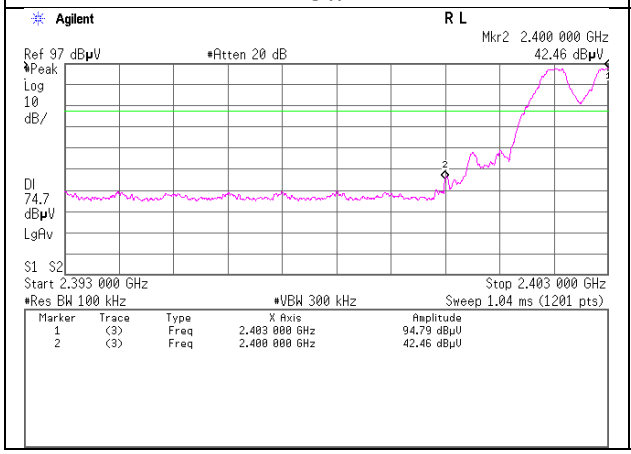


Conducted Emission Band Edge compliance

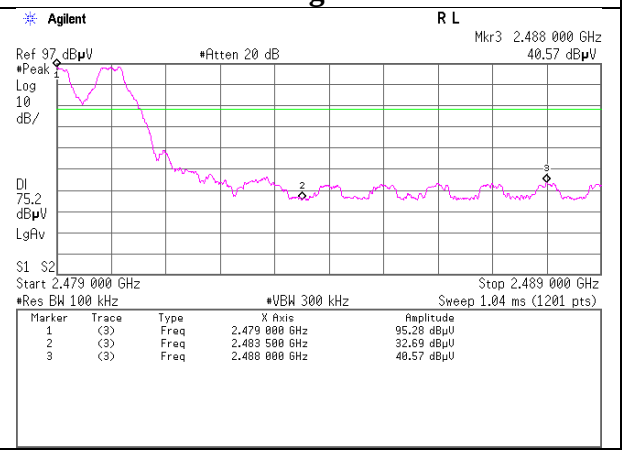
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx DH5

Hopping On

Low

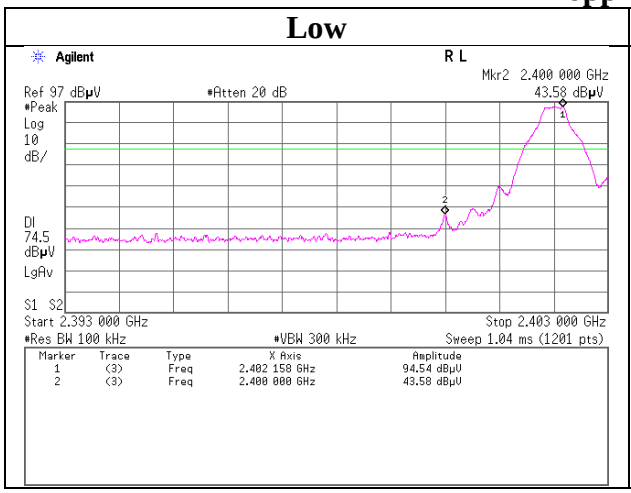


High

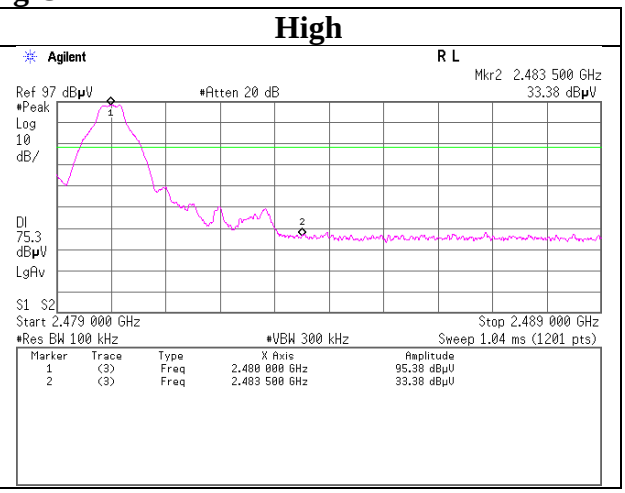


Hopping Off

Low



High

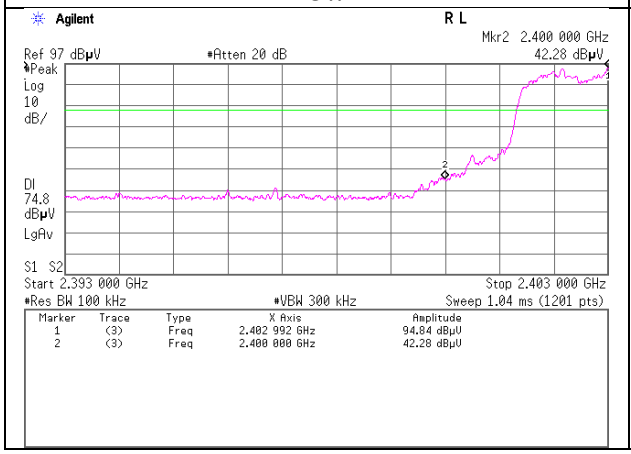


Conducted Emission Band Edge compliance

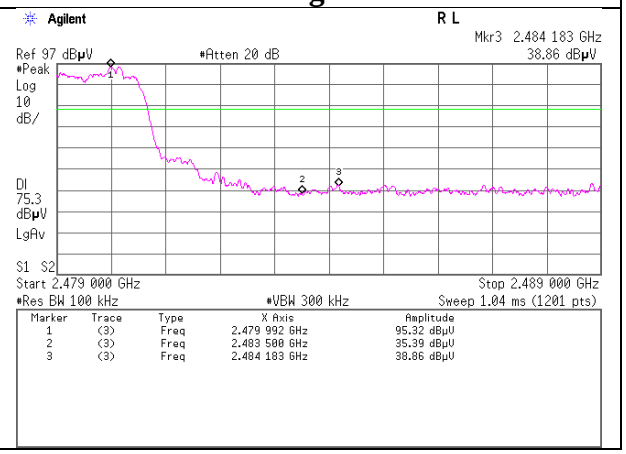
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx 3DH5

Hopping On

Low

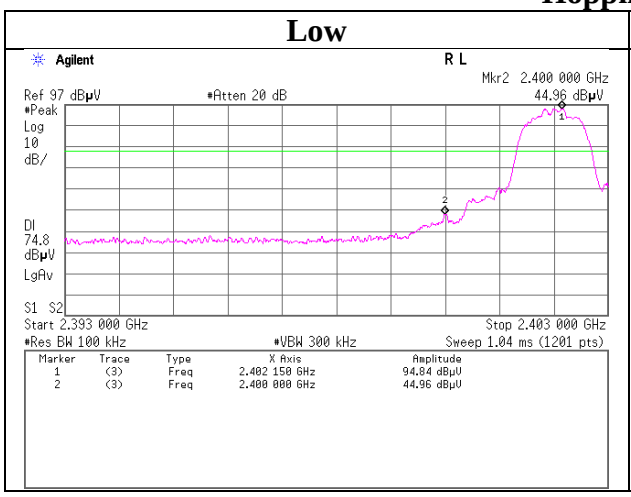


High

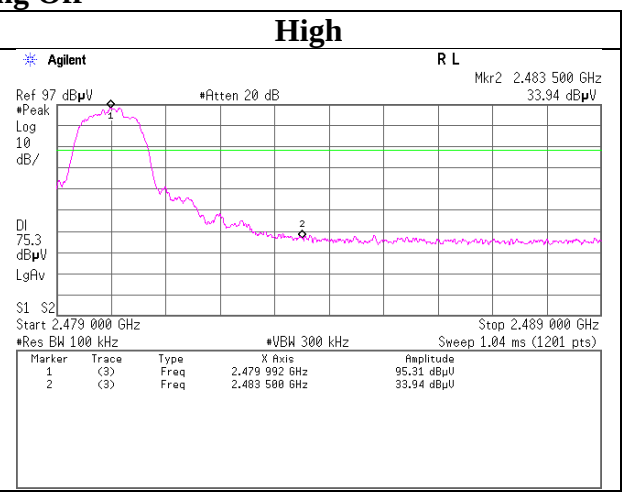


Hopping Off

Low



High

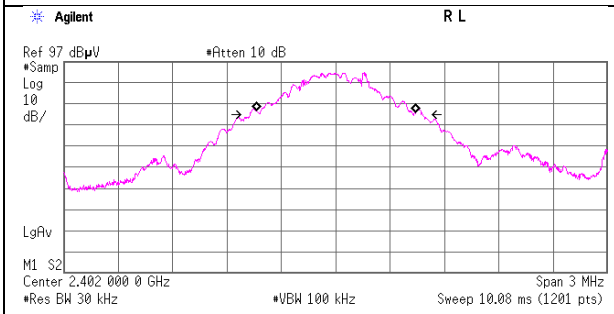


99%Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx Hopping Off

Hopping Off, DH5

2402 MHz

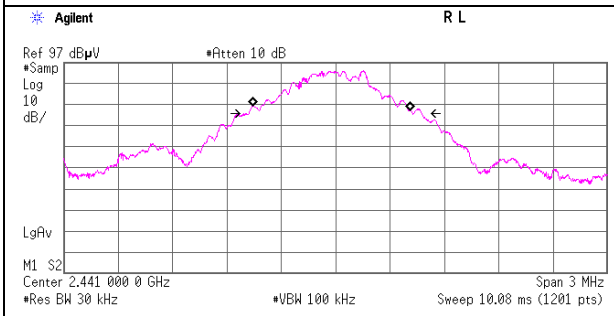


Occupied Bandwidth
878.9348 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error 1.794 kHz
x dB Bandwidth 952.078 kHz*

2441 MHz

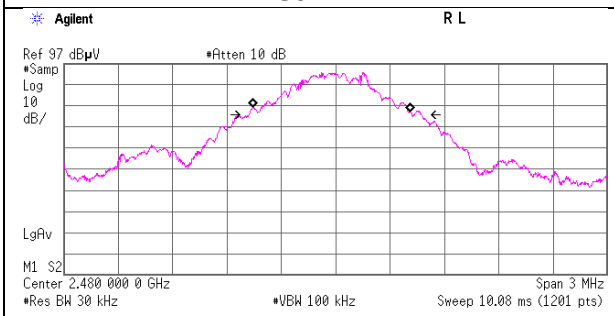


Occupied Bandwidth
864.9702 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -22.905 kHz
x dB Bandwidth 952.143 kHz*

2480 MHz



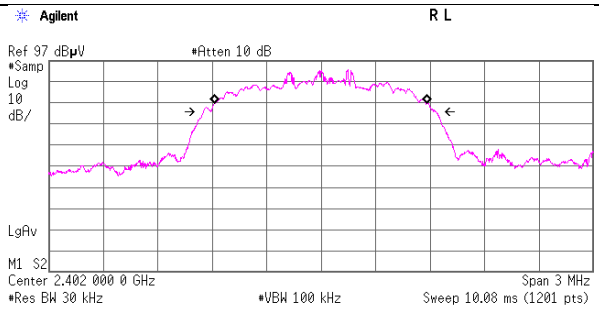
Occupied Bandwidth
865.3156 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -22.399 kHz
x dB Bandwidth 952.759 kHz*

Hopping Off, 3DH5

2402 MHz

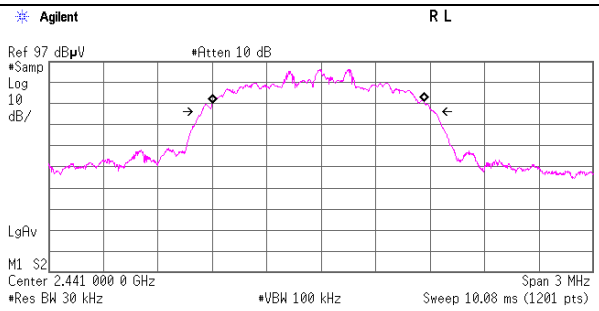


Occupied Bandwidth
1.1668 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -3.314 kHz
x dB Bandwidth 1.286 MHz*

2441 MHz

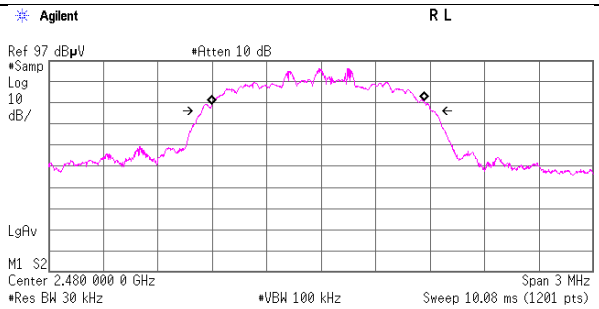


Occupied Bandwidth
1.1627 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -16.795 kHz
x dB Bandwidth 1.279 MHz*

2480 MHz



Occupied Bandwidth
1.1664 MHz

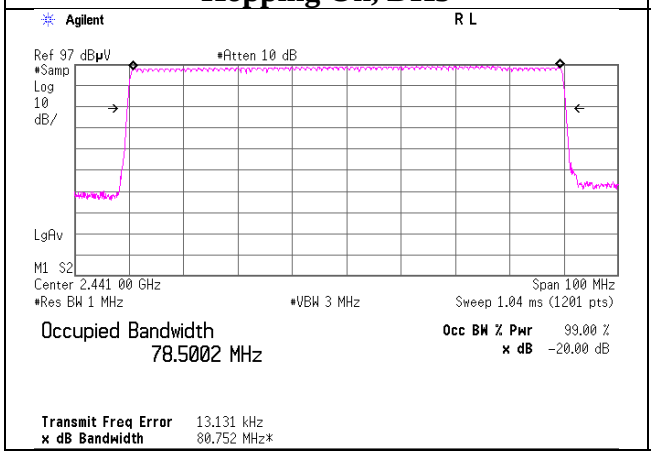
Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -18.099 kHz
x dB Bandwidth 1.279 MHz*

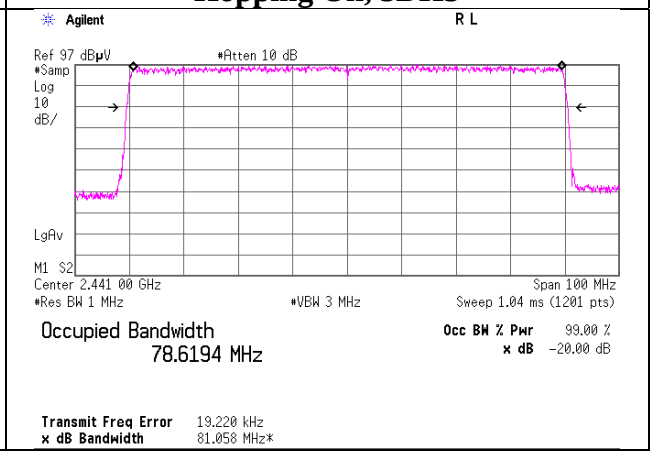
99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11390225S-E
Date	September 5, 2016
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx Hopping On

Hopping On, DH5



Hopping On, 3DH5



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2016/02/10 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2016/05/24 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2016/05/11 * 12
SHA-RS01	Horn Antenna	Schwarzbeck	BBHA9120D	770	RE	2016/08/22 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2015/10/22 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2016/03/28 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2016/07/22 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2016/03/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2015/11/16 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2015/11/04 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KMSKMS	-	RE	2016/04/18 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2016/02/19 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2016/02/25 * 12
KAT3-10	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2016/07/26 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2015/11/02 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2016/04/22 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2016/04/22 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2015/11/03 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2015/09/04 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2016/07/13 * 12
SRENT-06	Spectrum Analyzer	KEYSIGHT	E4440A	MY48250921	AT	2016/08/07 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2015/11/04 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2016/03/23 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2016/04/01 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2016/04/01 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2015/11/18 * 12

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

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

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