RADIO TEST REPORT

Test Report No. : 12170940S-B-R2

Applicant	:	**Panasonic Corporation**
Type of Equipment	:	**Car Audio System**
Model No.	:	**AT1801**
FCC ID	:	**ACJ932AT1801**
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. 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)
7. This report is a revised version of 12170940S-B-R1. 12170940S-B-R1 is replaced with this report.

Date of test: October 29 to November 10, 2015
February 8 to 15, 2018

Representative test engineer: K. Noda
Kazuya Noda
Engineer
Consumer Technology Division

Approved by: S. Takano
Shinichi Takano
Engineer
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.: 112170940S-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12170940S-B	February 26, 2018	-	-
1	12170940S-B-R1	March 7, 2018	27, 29, 30, 32, 34, 35, 37	Correction of data
2	12170940S-B-R2	March 14, 2018	1 9-10 13-17, 23-24, 27-29, 33, 35, 49-54, 61-62	Addition of test date Update of 4.2 Addition of data

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SECTION 1: Customer information

Company Name	:	Panasonic Corporation
Address	:	4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-city, 224-8520, Japan
Telephone Number	:	+81-50-3689-7051
Contact Person	:	Syuuichi Suzuki

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

2.1 Identification of E.U.T.

Type of Equipment	:	Car Audio System
Model No.	:	AT1801
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 13.2 V
Receipt Date of Sample	:	October 27, 2015 (AT1603) February 7, 2018 (AT1801)
Country of Mass-production	:	Japan, Czech, Mexico, Thailand
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: AT1801 (referred to as the EUT in this report) is a Car Audio System.

General Specification

Clock frequency(ies) in the system	:	37 MHz, 48 MHz, 54.9 MHz, 194 MHz, 795 MHz, 1.56 GHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	FHSS
Power Supply (radio part input)	:	DC 3.3 V, DC 1.8 V
Antenna type	:	Dipole Antenna
Antenna gain with cable loss	:	-1.15 dBi

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	**FCC:** Section 15.207	N/A	N/A	*1)
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
Carrier Frequency Separation	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)	See data.	Complied	Conducted
	IC: -	**IC:** RSS-247 5.1 (b)			
20dB Bandwidth	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)		Complied	Conducted
	IC: -	**IC:** RSS-247 5.1 (a)			
Number of Hopping Frequency	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)(iii)		Complied	Conducted
	IC: -	**IC:** RSS-247 5.1 (d)			
Dwell time	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)(iii)		Complied	Conducted
	IC: -	**IC:** RSS-247 5.1 (d)			
Maximum Peak Output Power	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(b)(1)		Complied	Conducted
	IC: RSS-Gen 6.12	**IC:** RSS-247 5.4 (b)			
Spurious Emission & Band Edge Compliance	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(d)	3.1 dB 658.568 MHz, QP, Hori. Tx Hopping Off DH5 2480 MHz	Complied	Conducted/ Radiated (above 30 MHz) *2)
	IC: RSS-Gen 6.13	**IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

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 (RF: DC 3.3 V, I/O: DC 1.8 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

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

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.5 dB	2.5 dB	2.5 dB	2.6 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.3 dB	4.3 dB	4.3 dB	-	-
	200 MHz-1 GHz	5.9 dB	5.9 dB	5.9 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 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
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 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
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.0066
Duty cycle and Time Measurement	0.012 %

Radiated emission test
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. 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
FCC Test Firm Registration Number: 839876

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	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
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
Inquiry

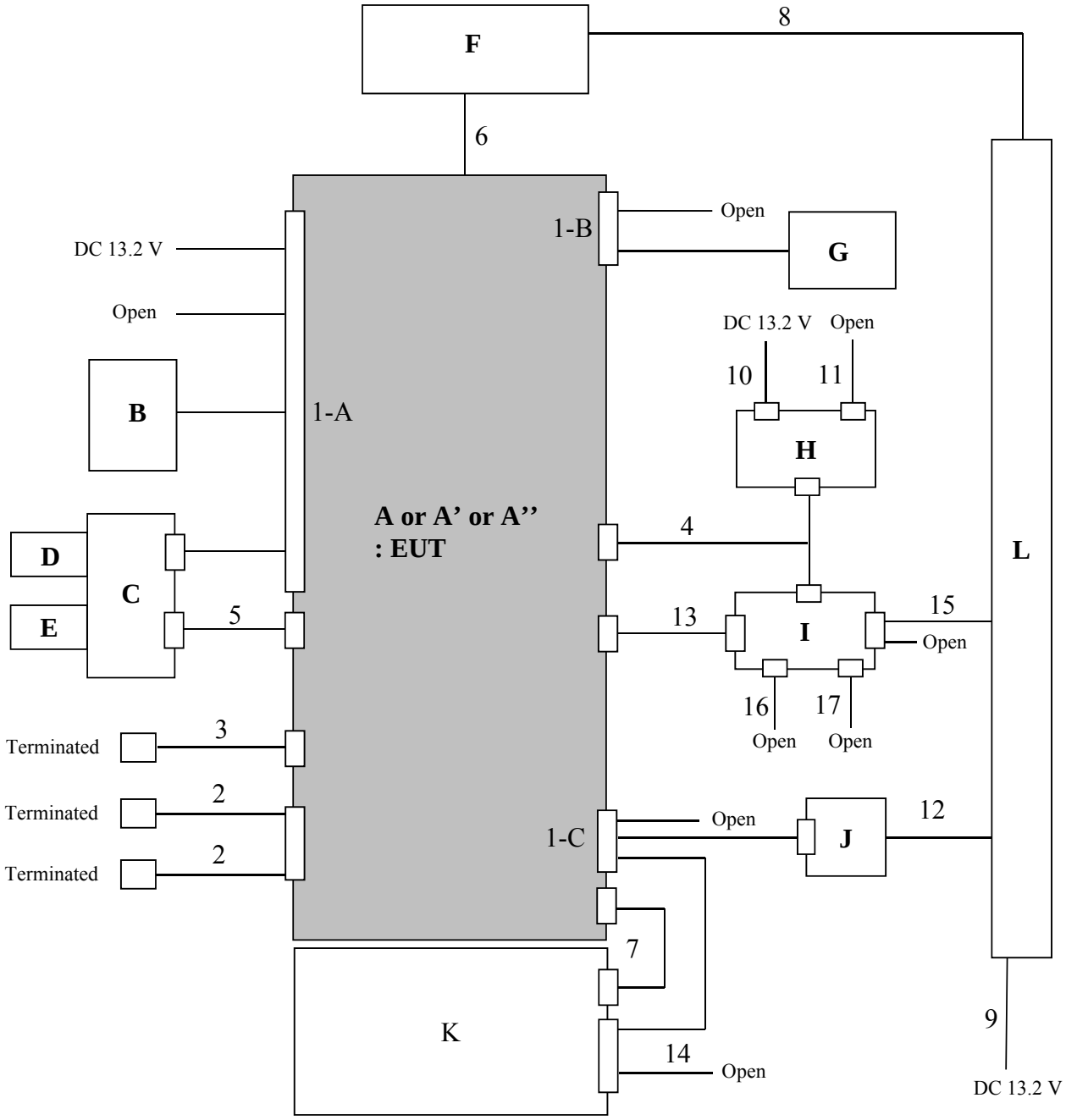
Details of Operating Mode(s)

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 Inquiry	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5 Inquiry	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5 Inquiry	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5 Inquiry	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	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.

*EUT has the power settings by the software as follows;
Power settings : Fixed
Software (Firmware) : D17517010700001V0, Ver. 1.0
*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

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	Remark
A	Car Audio System	AT1801	CV-DL58N0AJ No. 500030	Panasonic Corporation	EUT
A'	Car Audio System	AT1603 (Display Combined Type (T2))	CV-CS87N08X No.180	Panasonic Corporation	EUT *1)
A''	Car Audio System	AT1603 (Display Separated Type (L2))	CV-DL56N0AJ No.13	Panasonic Corporation	EUT *1)
B	Steering SW	-	0009	-	-
C	IF-Box	CA-UL56X0AJ	3	Panasonic	-
D	USB Memory	SDK-USM4GL(B)	-	SONY	-
E	USB Memory	SDK-USM4GL(B)	-	SONY	-
F	Display	83290-48130	No.1	DENSO	-
G	Microphone	86730-20050	-	-	-
H	AMP	86280-76050	521343	Panasonic	-
I	RSE-ECU	CV-UL45H0AJ	-	Panasonic	-
J	DCM	86741-53054	8KYLK327398	DENSO	-
K	MEU	CN-SL56N0AJ	004	Panasonic	-
L	Jig Board	-	-	-	-

*1) As for Antenna conducted test, the result of AT1603 (Display Combined Type (T2)) and AT1603 (Display Separate Type (L2)) was used. There is no difference in the radio block of AT1801, AT1603 (Display Combined Type (T2)) and AT1603 (Display Separate Type (L2)).

List of cables used

No.	Name	Length (m)	Cable Shield	Connector Shield	Remark
1-A	General-purpose	2.0	Unshielded	Unshielded	-
1-B	General-purpose	2.0	Unshielded	Unshielded	-
1-C	General-purpose	2.0	Unshielded	Unshielded	-
2	Radio/D-Radio antenna	0.15 + 1.2	Shielded	Shielded	-
3	XM antenna	1.0	Shielded	Shielded	-
4	AVC-LAN Step3	2.0	Unshielded	Unshielded	-
5	USB (IF-BOX)	2.0	Shielded	Shielded	-
6	GVIF	2.0	Shielded	Shielded	-
7	GVIF, USB from MEU	0.15	Unshielded	Unshielded	-
8	DC Power / Signal	0.9	Unshielded	Unshielded	-
9	DC Power	0.5	Unshielded	Unshielded	-
10	DC Power	1.0 + 1.5	Unshielded	Unshielded	-
11	Signal	1.0	Unshielded	Unshielded	-
12	DC Power / Signal	1.0	Unshielded	Unshielded	-
13	GVIF	2.0	Unshielded	Unshielded	-
14	Signal	2.0	Unshielded	Unshielded	-
15	DC Power / Signal	2.0	Unshielded	Unshielded	-
16	Signal	2.0	Unshielded	Unshielded	-
17	Signal	2.0	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 2.0 m, raised 0.8 m above the conducting ground plane.
The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. 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 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	3.85 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.85 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 (3.85 m/3.0 m) = 2.17 dB
*3) Distance Factor: 20 x log (1.0 m/3.0 m) = -9.54 dB

The EUT was set at 10 degree as normal position according to the EUT's specification.

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 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	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 *3)	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) 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 not detected as shown in the chart.
(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

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

Test data : **APPENDIX**
Test result : **Pass**

APPENDIX 1: Test data

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

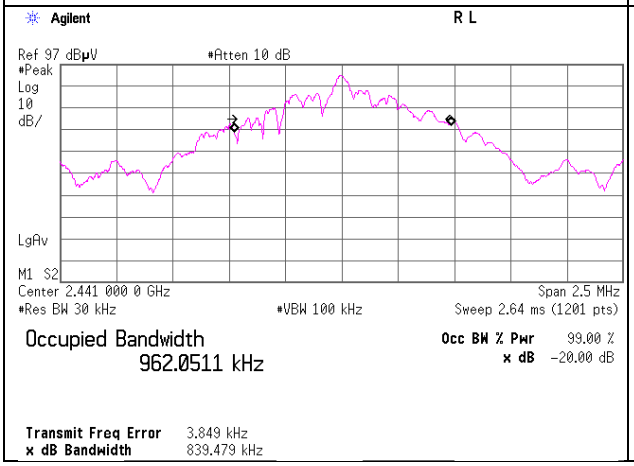
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, Tx, Hopping On (AT1603 Display Combined Type(T2))

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.958	906.3	1.000	>= 0.639
DH5	2441.0	1.033	908.1	1.000	>= 0.688
DH5	2480.0	0.956	903.3	1.000	>= 0.638
DH5	Hopping On	-	78551.3	-	-
3DH5	2402.0	1.299	1179.3	1.000	>= 0.866
3DH5	2441.0	1.295	1180.2	1.000	>= 0.863
3DH5	2480.0	1.299	1181.2	1.000	>= 0.866
3DH5	Hopping On	-	78572.1	-	-
Inquiry	2441.0	0.839	77952.1	1.996	>= 0.560

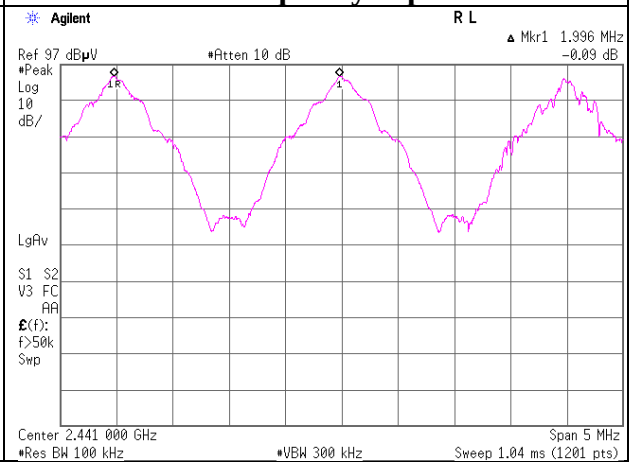
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

Inquiry

20 dB Bandwidth



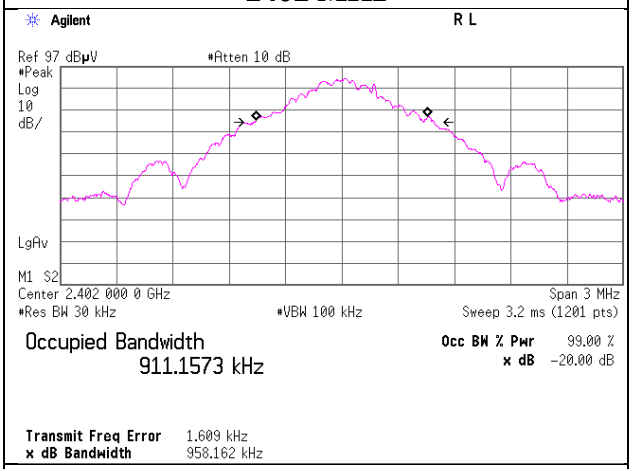
Carrier Frequency Separation



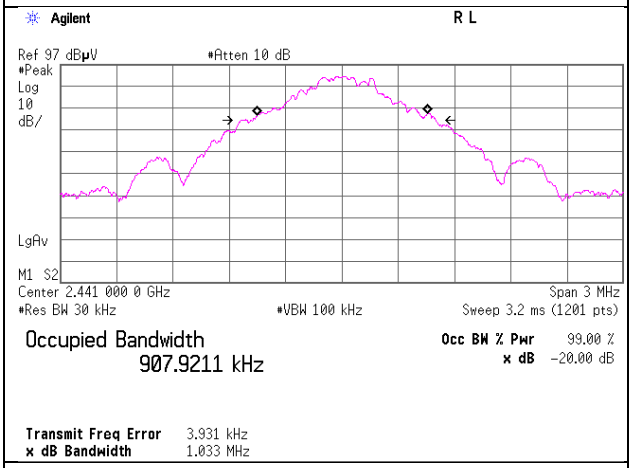
20dB Bandwidth

DH5

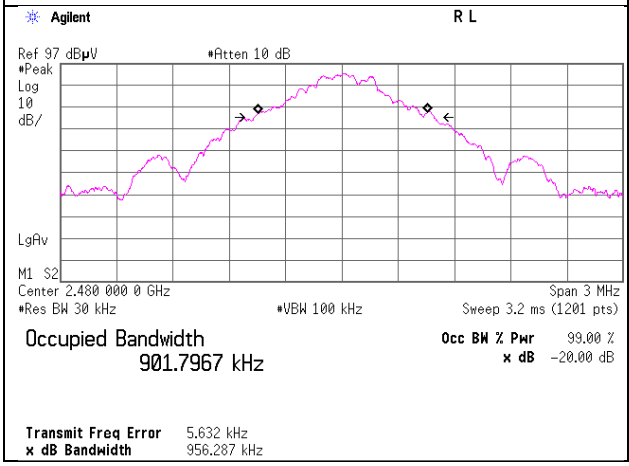
2402 MHz



2441 MHz

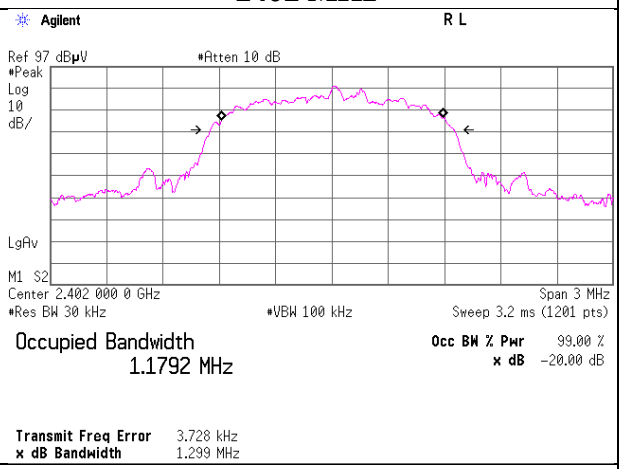


2480 MHz

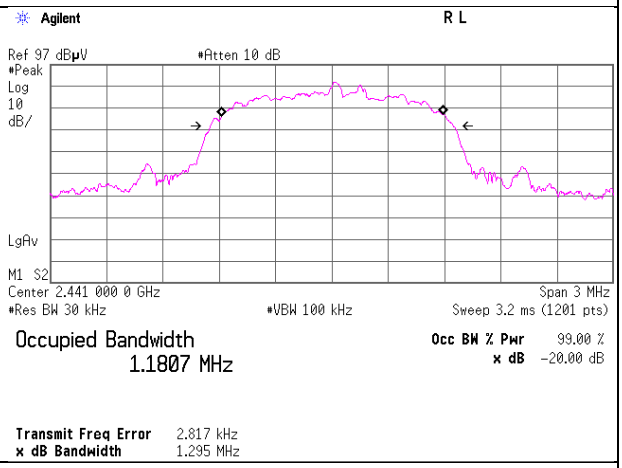


3DH5

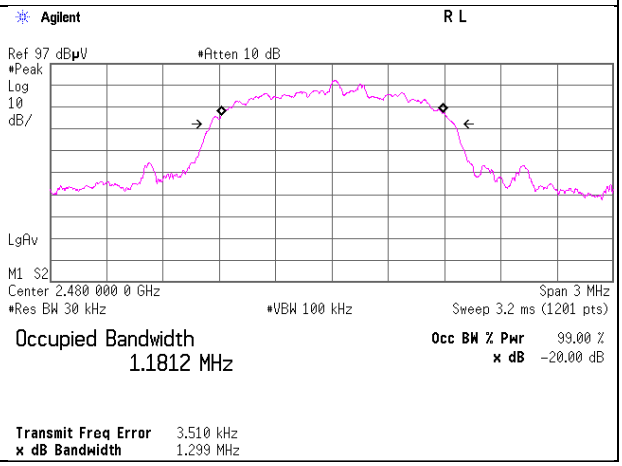
2402 MHz



2441 MHz



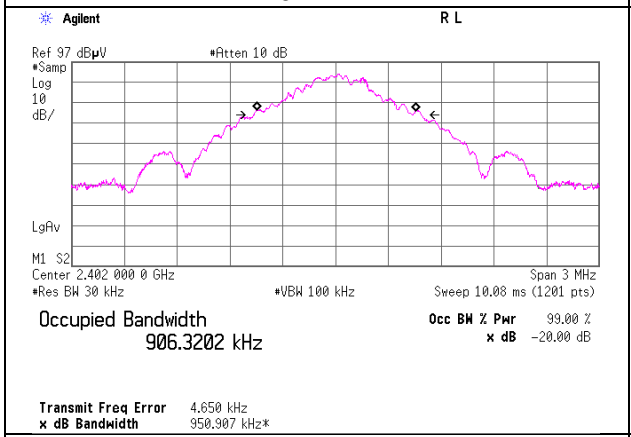
2480 MHz



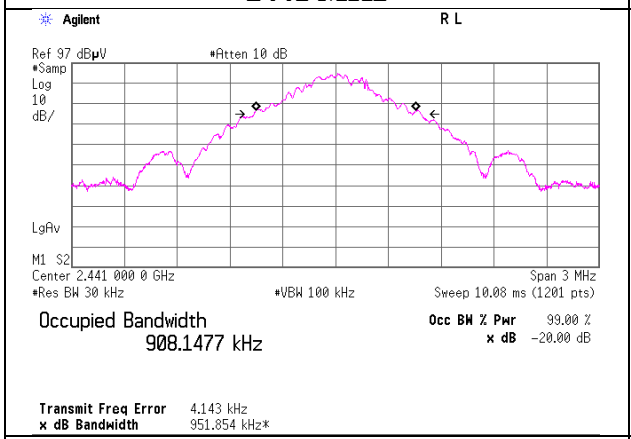
99%Occupied Bandwidth

Hopping Off, DH5

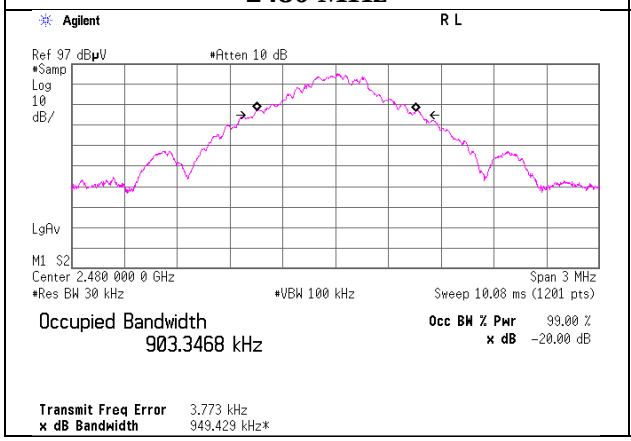
2402 MHz



2441 MHz

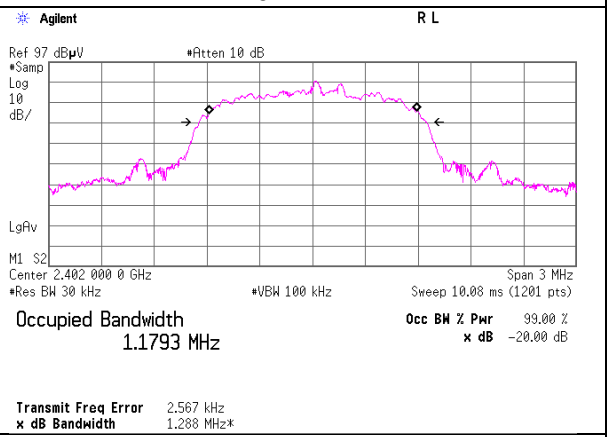


2480 MHz

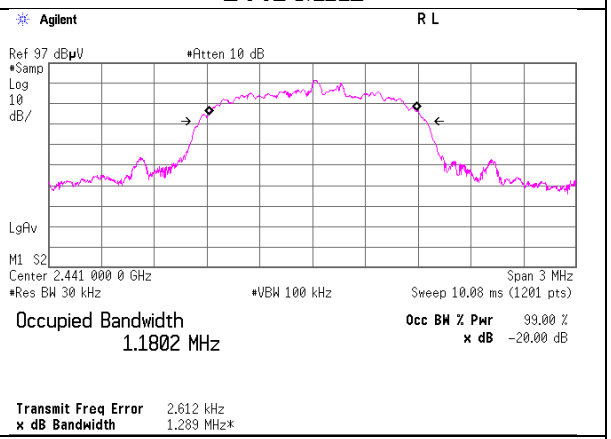


Hopping Off, 3DH5

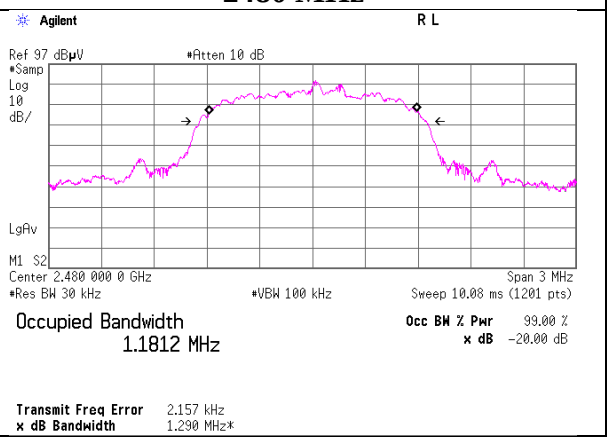
2402 MHz



2441 MHz

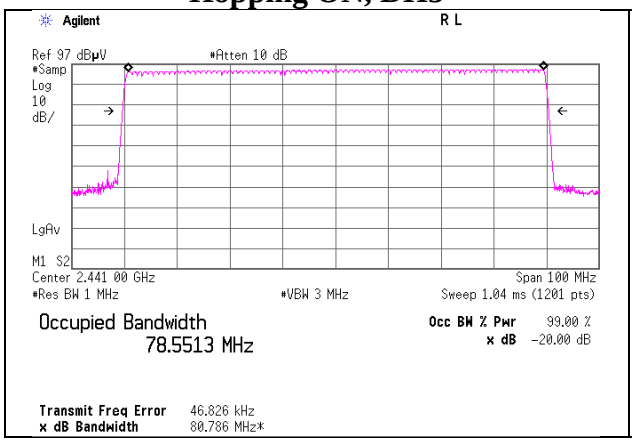


2480 MHz

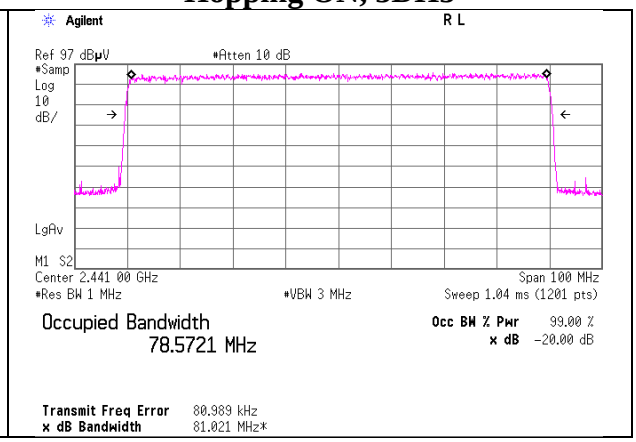


99%Occupied Bandwidth

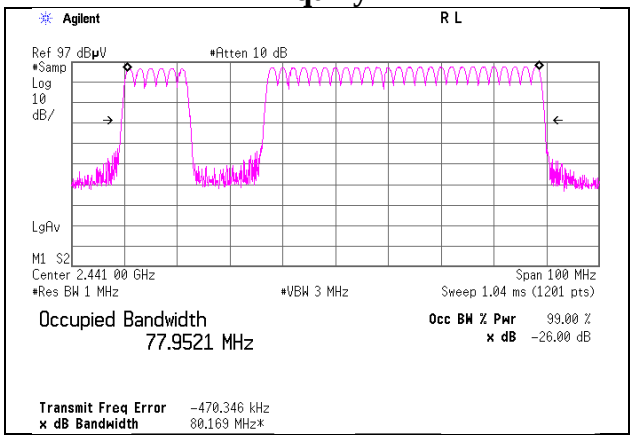
Hopping ON, DH5



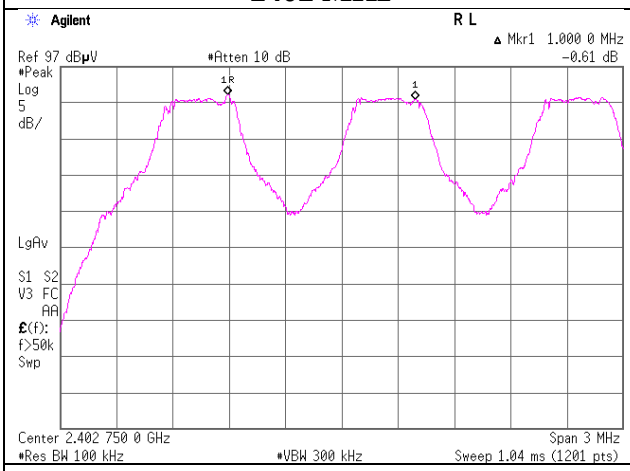
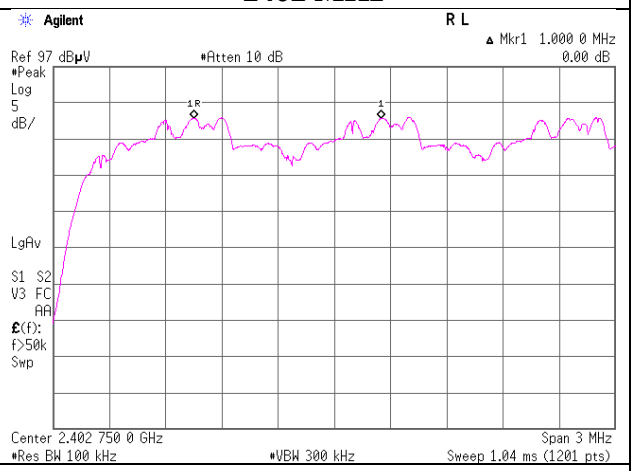
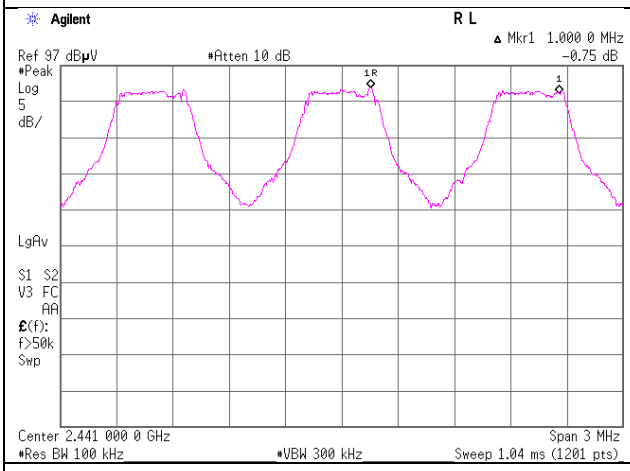
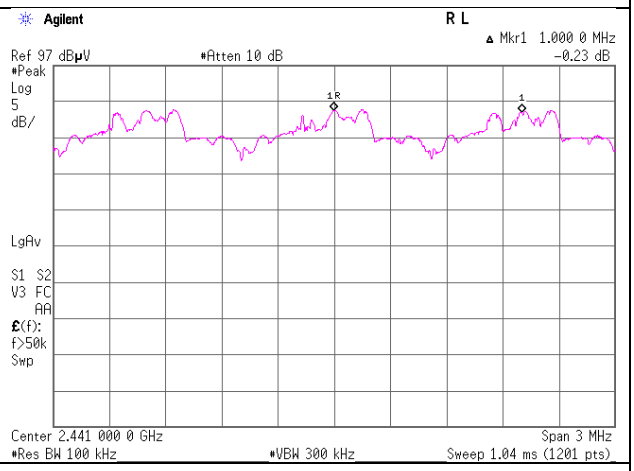
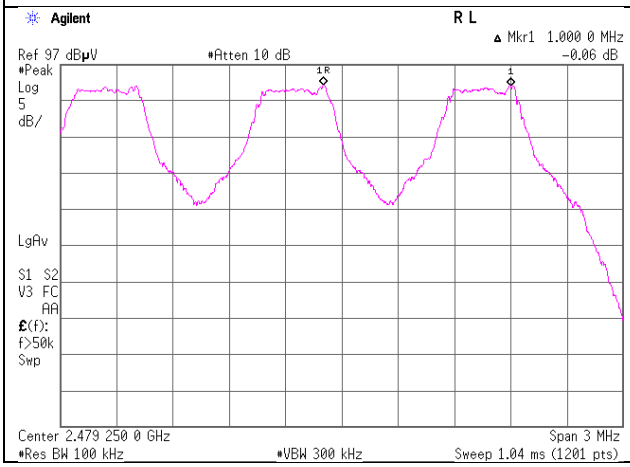
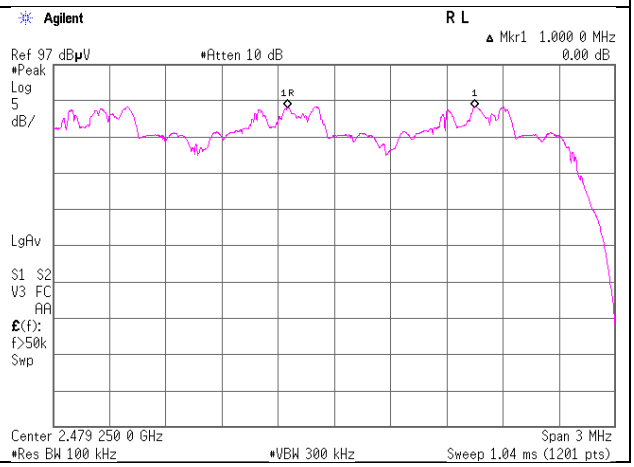
Hopping ON, 3DH5



Inquiry



Carrier Frequency Separation

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

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

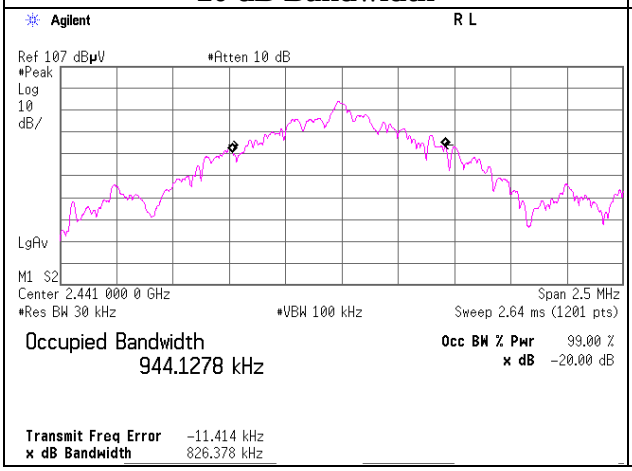
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, Tx, Hopping On (AT1603 Display Separated Type(L2))

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.970	902.2	1.000	>= 0.646
DH5	2441.0	0.964	904.2	1.000	>= 0.643
DH5	2480.0	0.973	905.1	1.000	>= 0.649
DH5	Hopping On	-	78523.9	-	-
3DH5	2402.0	1.295	1180.1	1.000	>= 0.863
3DH5	2441.0	1.301	1181.0	1.000	>= 0.867
3DH5	2480.0	1.297	1179.7	1.000	>= 0.865
3DH5	Hopping On	-	78660.3	-	-
Inquiry	2441.0	0.826	77907.3	2.000	>= 0.551

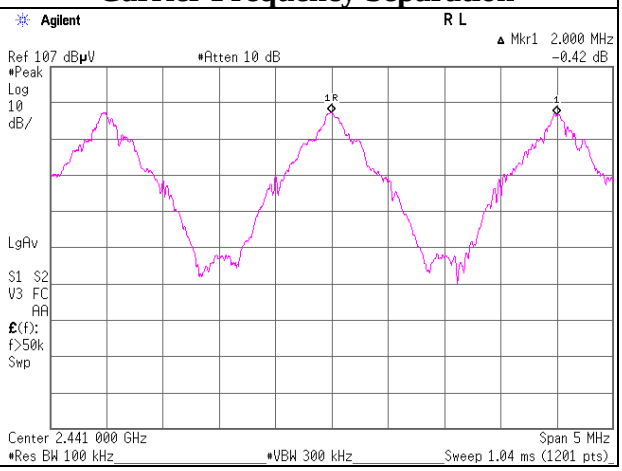
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

Inquiry

20 dB Bandwidth



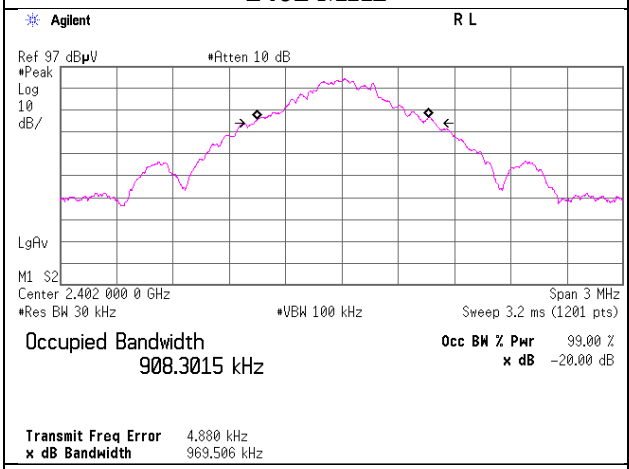
Carrier Frequency Separation



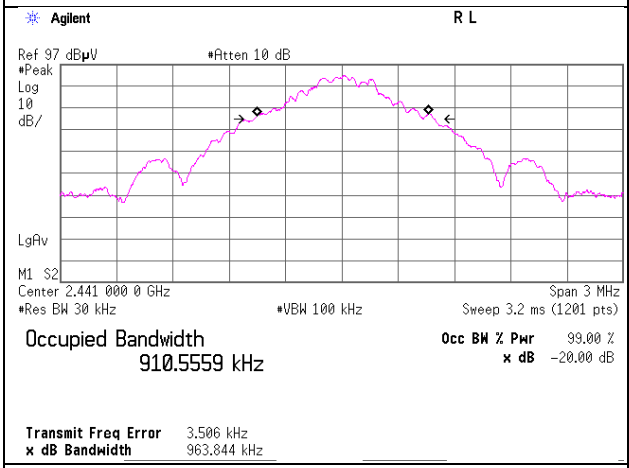
20dB Bandwidth

DH5

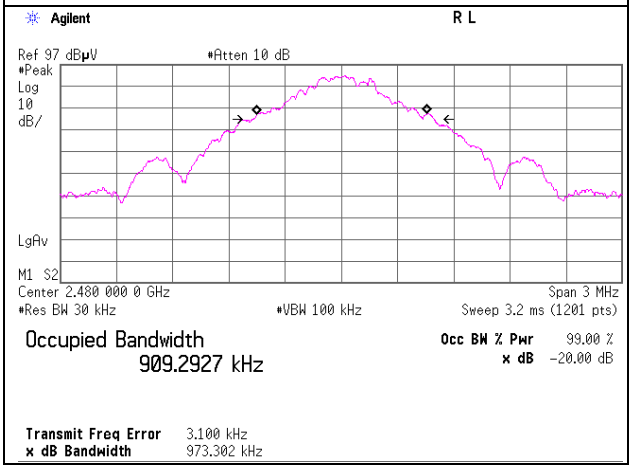
2402 MHz



2441 MHz

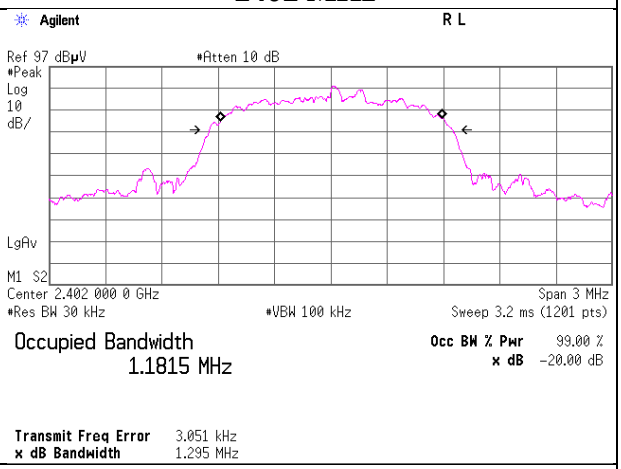


2480 MHz

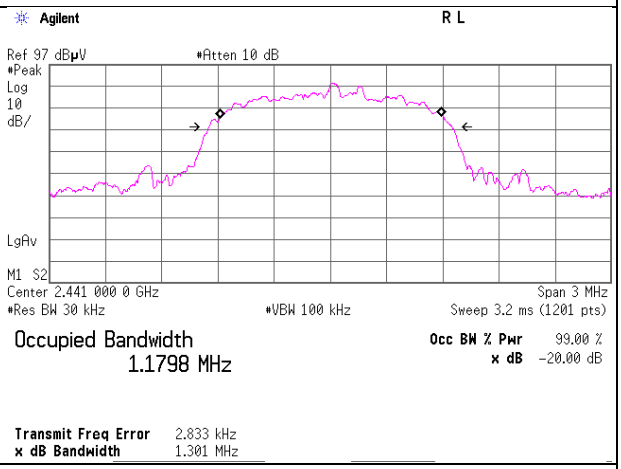


3DH5

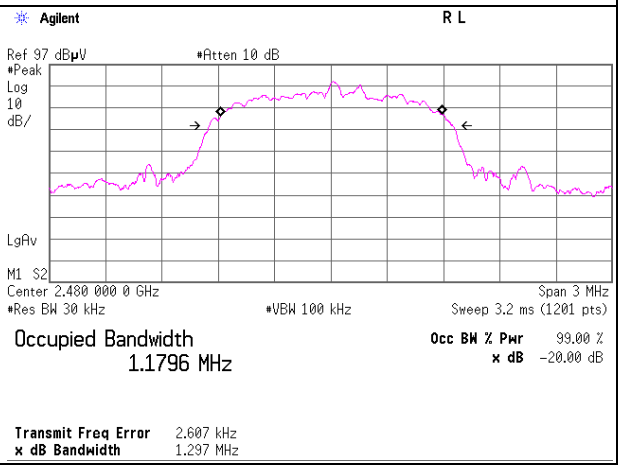
2402 MHz



2441 MHz



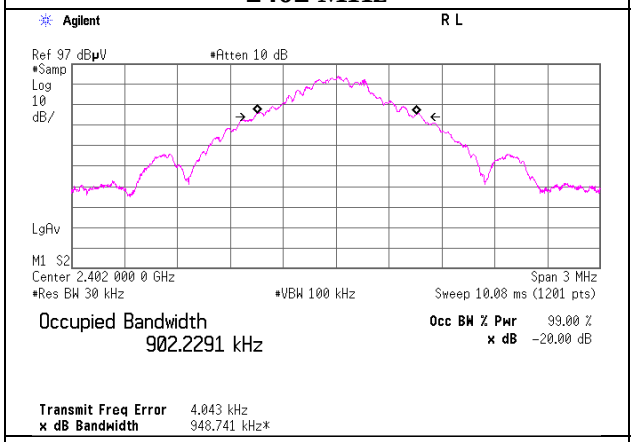
2480 MHz



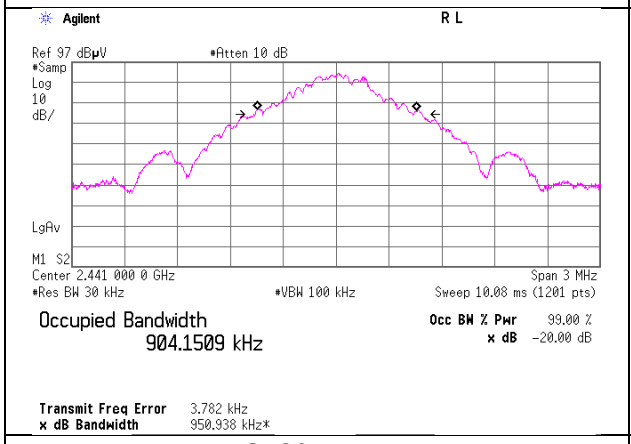
99%Occupied Bandwidth

Hopping Off, DH5

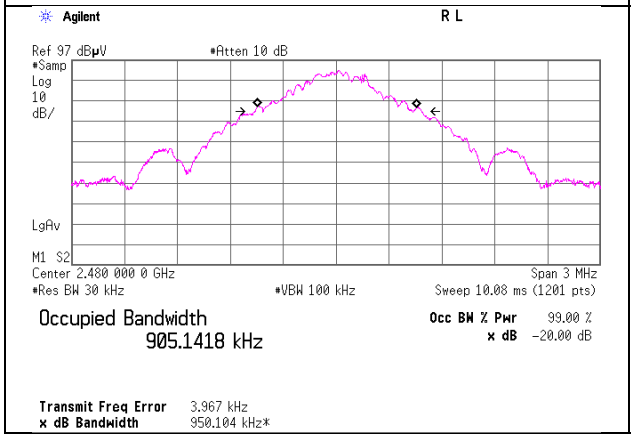
2402 MHz



2441 MHz

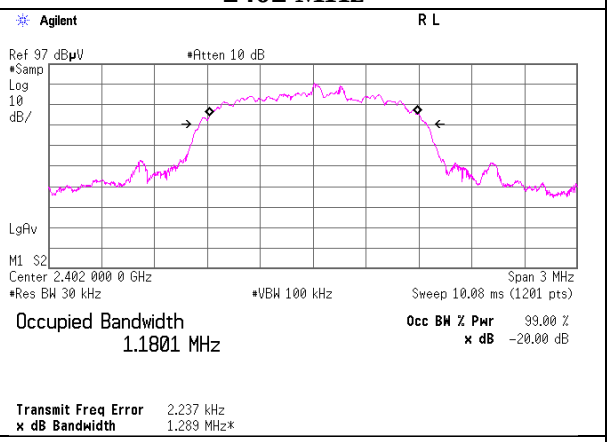


2480 MHz

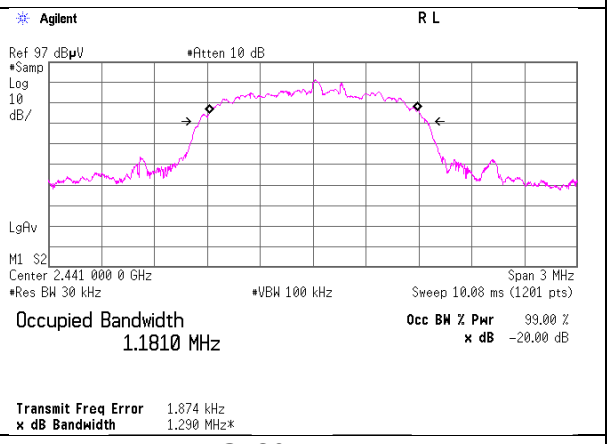


Hopping Off, 3DH5

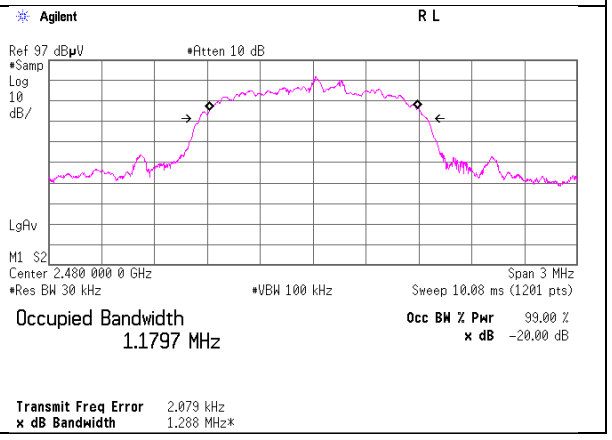
2402 MHz



2441 MHz

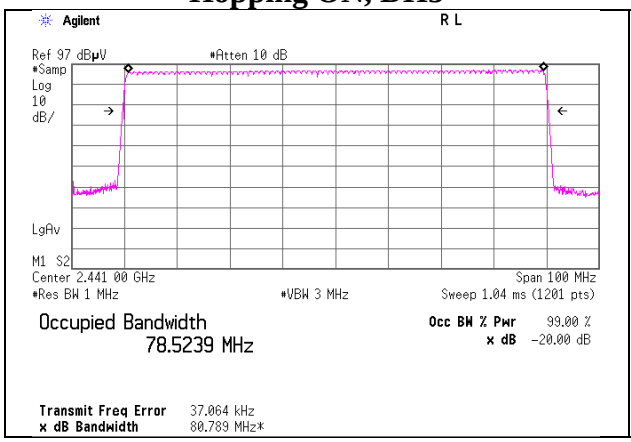


2480 MHz

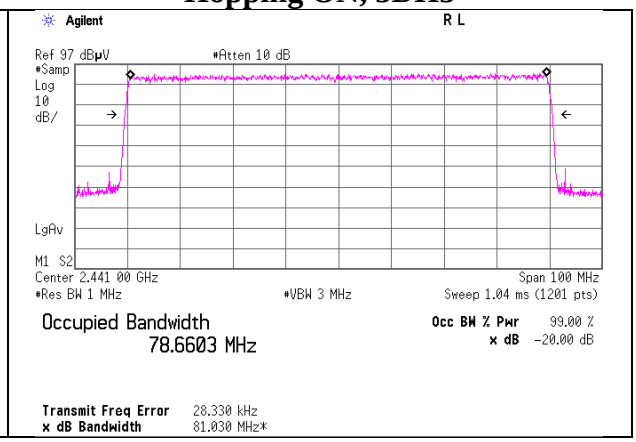


99%Occupied Bandwidth

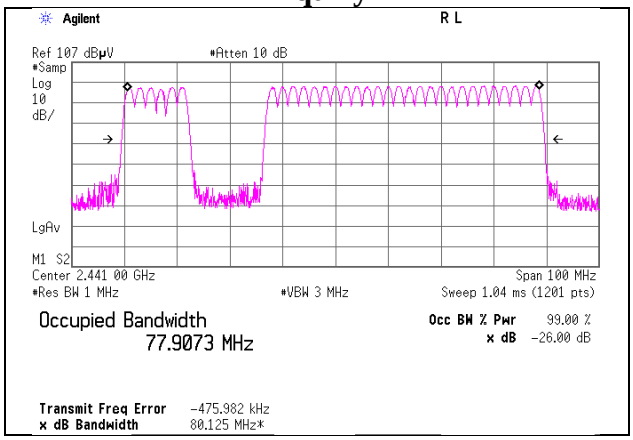
Hopping ON, DH5



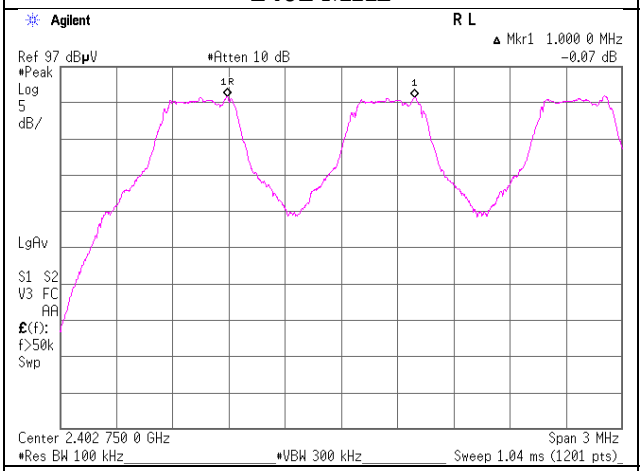
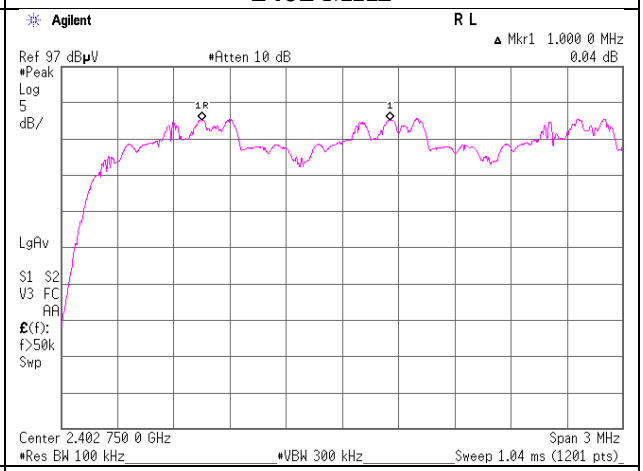
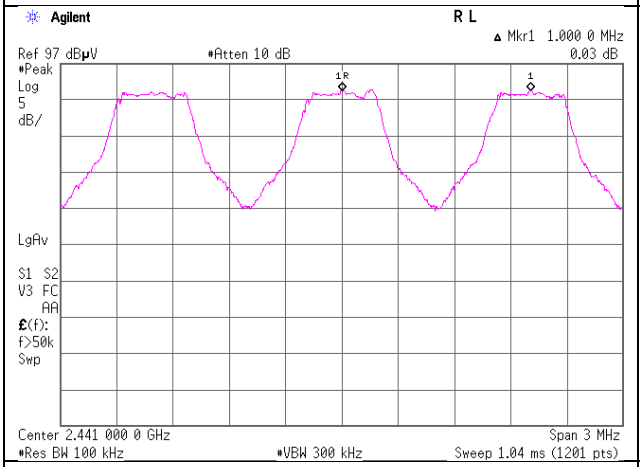
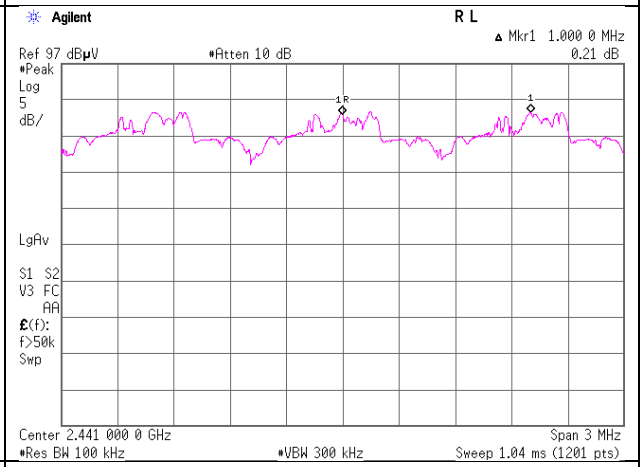
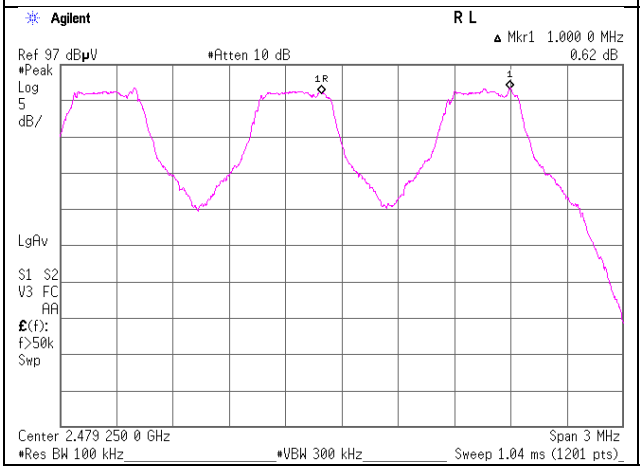
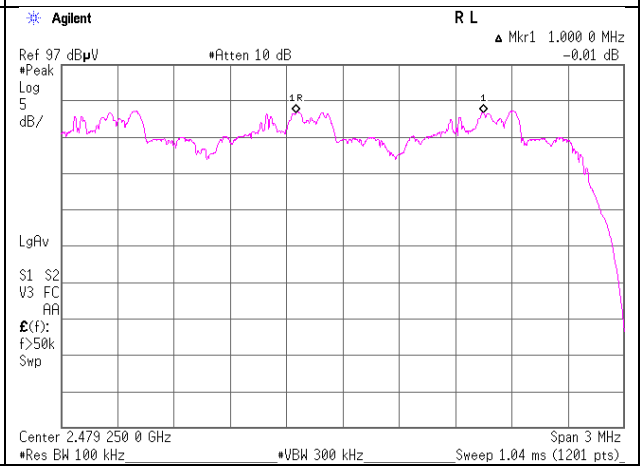
Hopping ON, 3DH5



Inquiry



Carrier Frequency Separation

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

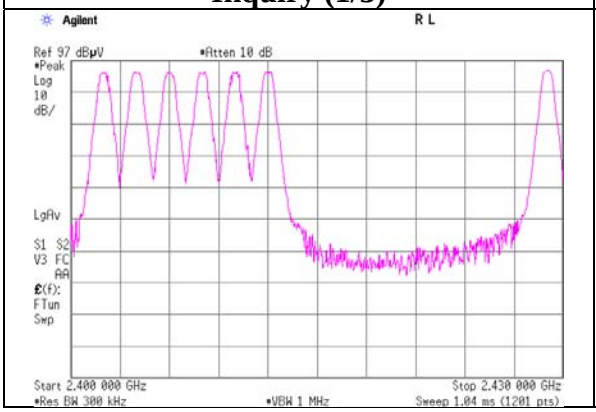
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping On (AT1603 Display Combined Type(T2))

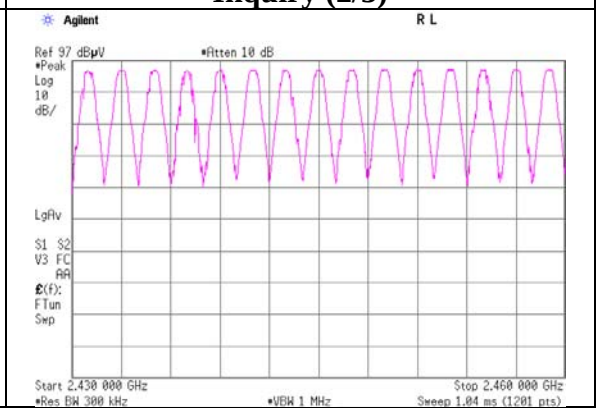
Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15
Inquiry	32	>= 15

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

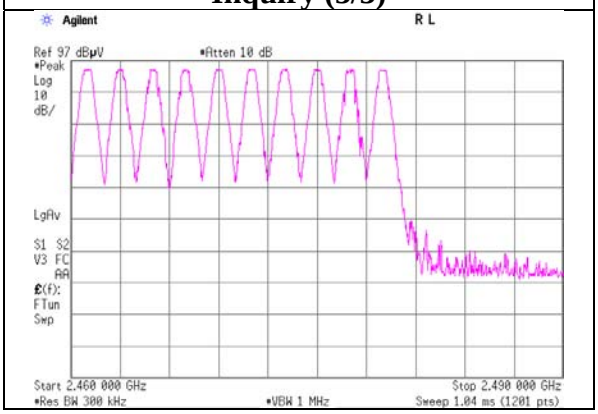
Inquiry (1/3)



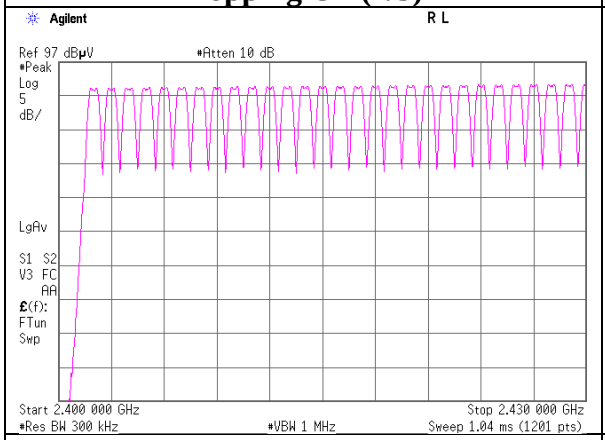
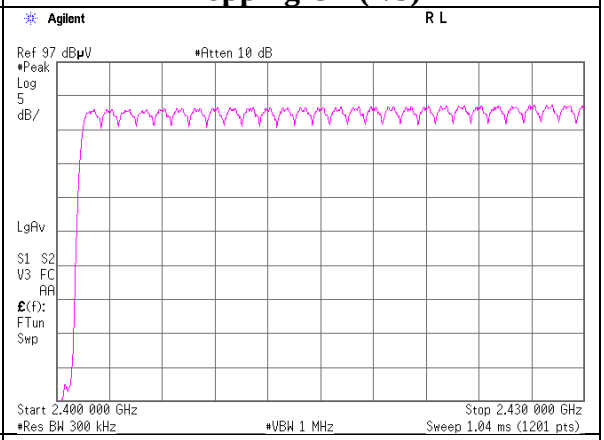
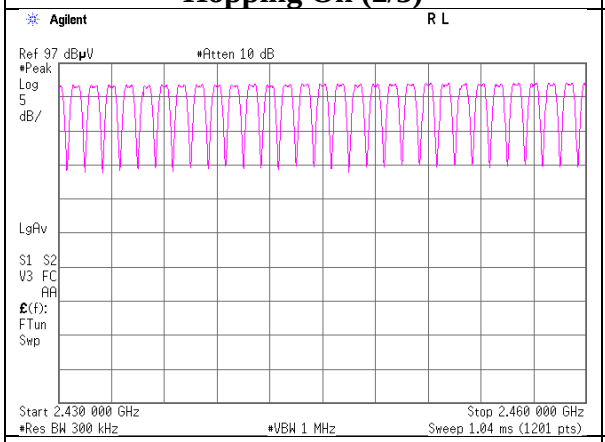
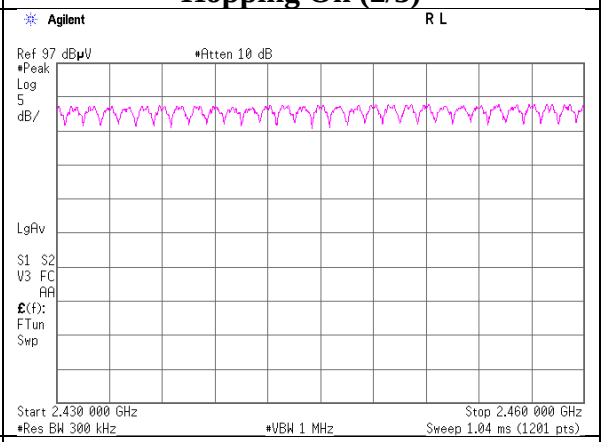
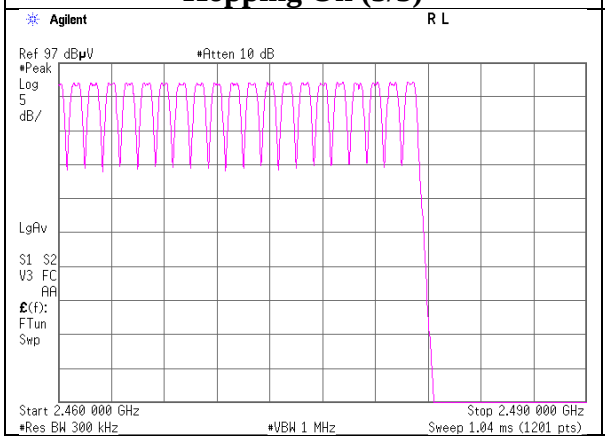
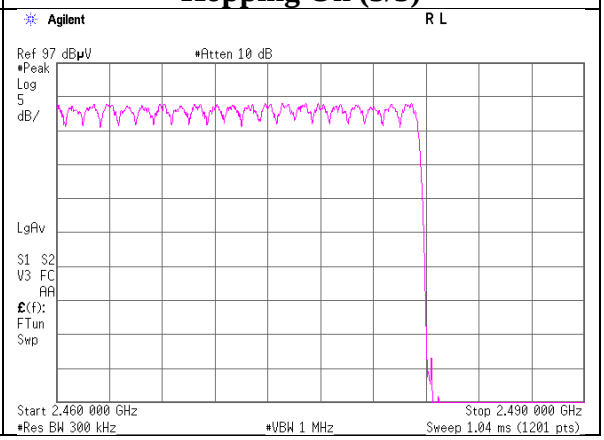
Inquiry (2/3)



Inquiry (3/3)



Number of Hopping Frequency

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)**
	

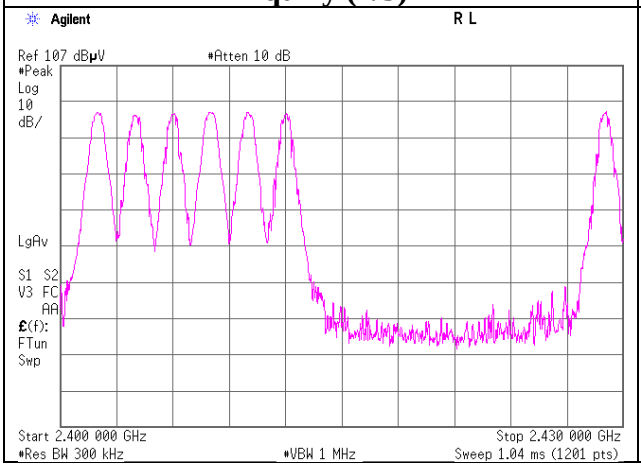
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping On (AT1603 Display Separated Type(L2))

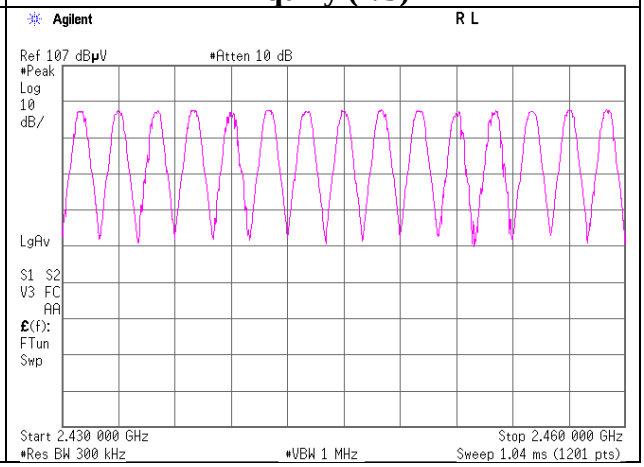
Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15
Inquiry	32	>= 15

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

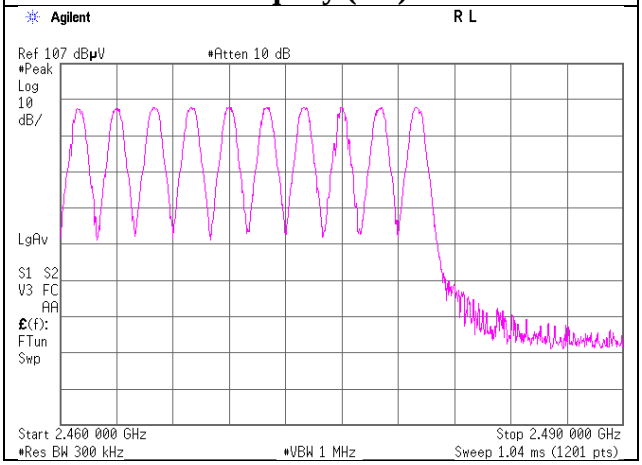
Inquiry (1/3)



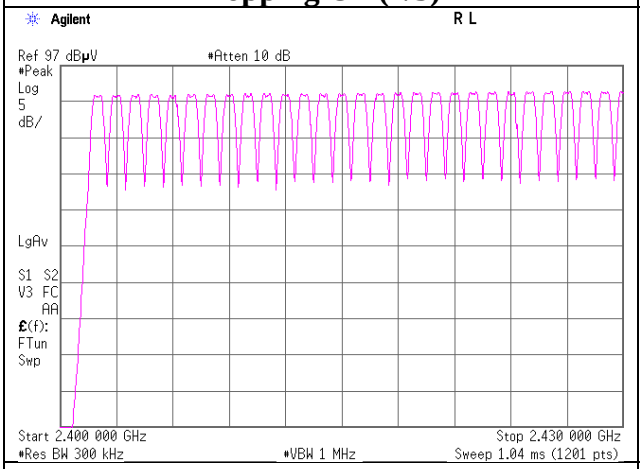
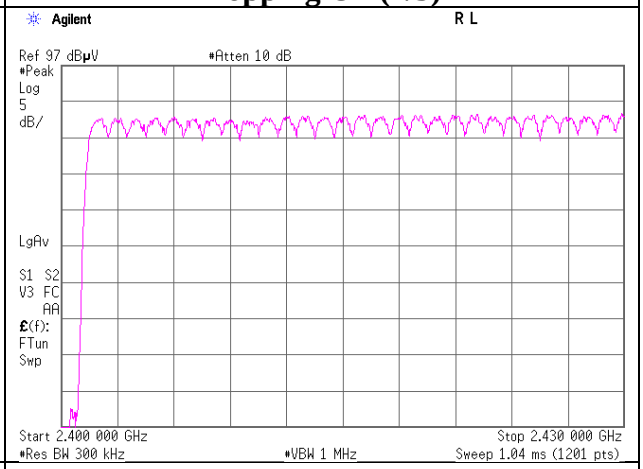
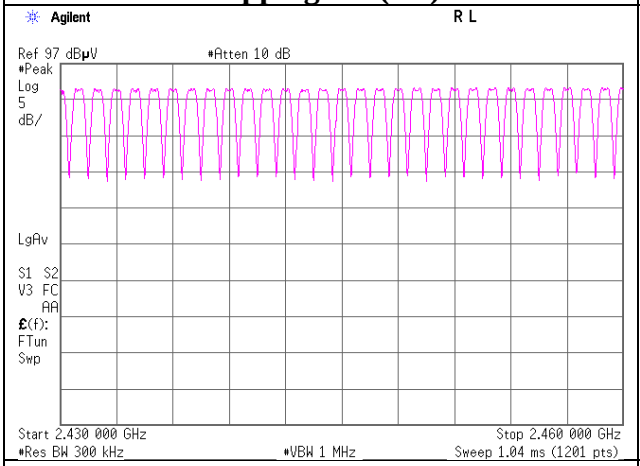
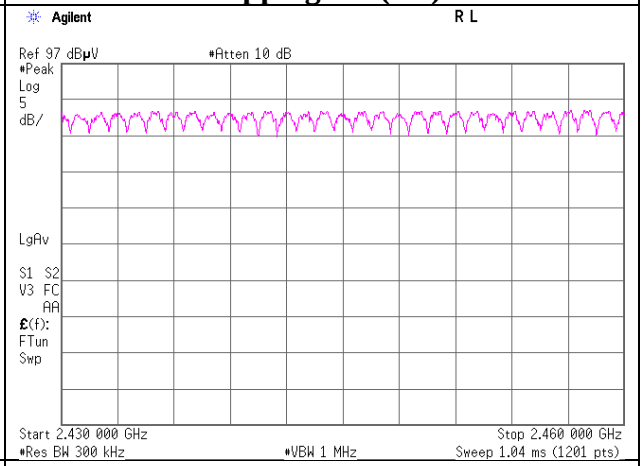
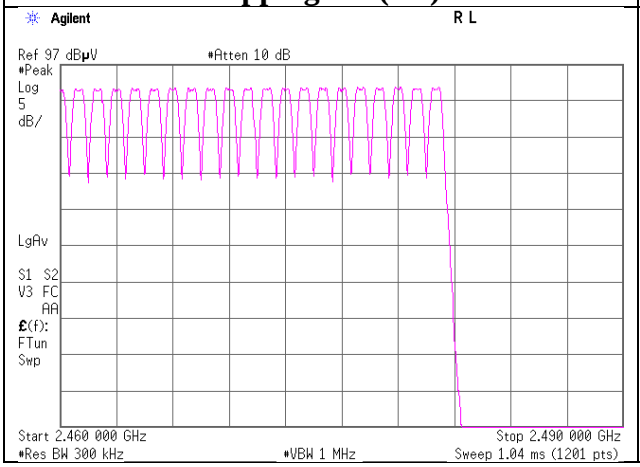
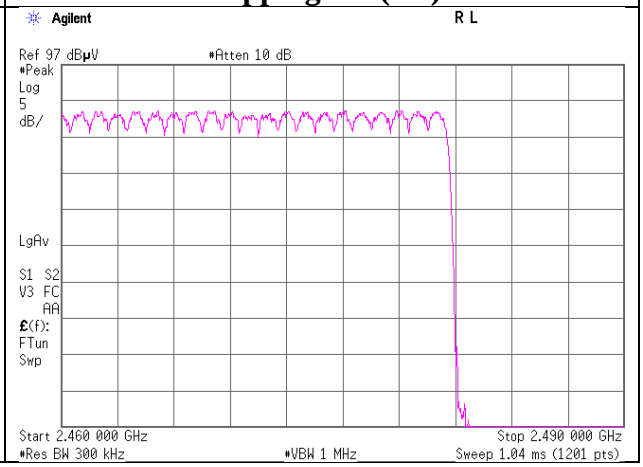
Inquiry (2/3)



Inquiry (3/3)



Number of Hopping Frequency

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.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping On (AT1603 Display Combined Type(T2))

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	49.6 times / 5 sec. x 31.6 sec. = 314 times	0.401	126	400
DH3	28.2 times / 5 sec. x 31.6 sec. = 179 times	1.658	297	400
DH5	19.0 times / 5 sec. x 31.6 sec. = 121 times	2.909	352	400
3DH1	51.6 times / 5 sec. x 31.6 sec. = 327 times	0.406	133	400
3DH3	25.0 times / 5 sec. x 31.6 sec. = 158 times	1.659	262	400
3DH5	19.4 times / 5 sec. x 31.6 sec. = 123 times	2.910	358	400
Inquiry	100.0 times / 1 sec. x 12.8 sec. = 1280 times	0.102	131	400

Sample Calculation
Result = Number of transmission x Length of transmission

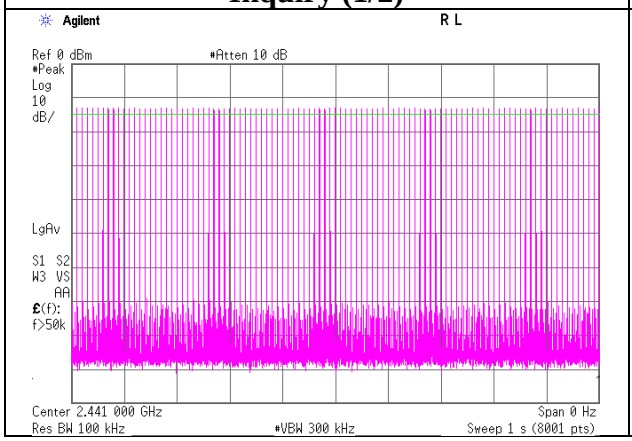
*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times] 1	2	3	4	5	Average [times]
DH1	49	48	48	51	52	49.6
DH3	30	28	30	24	29	28.2
DH5	20	15	17	19	24	19
3DH1	49	59	49	51	50	51.6
3DH3	22	25	24	26	28	25
3DH5	17	25	17	15	23	19.4

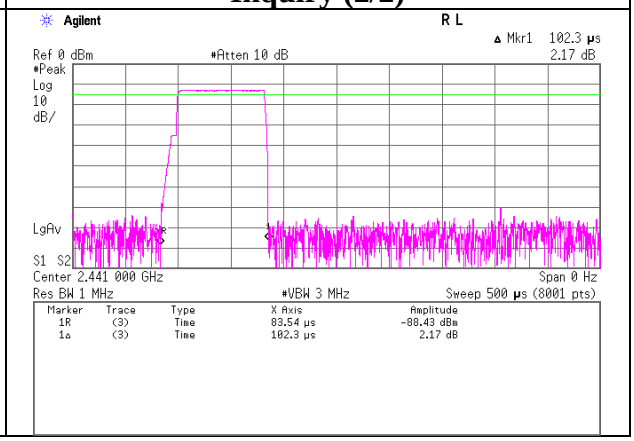
Sample Calculation
Average = Summation (Sampling 1 to 5) / 5

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 ≤ N ≤ 79), is always less than 0.4s regardless of packet size. This is confirmed in the test report for N = 79.

Inquiry (1/2)

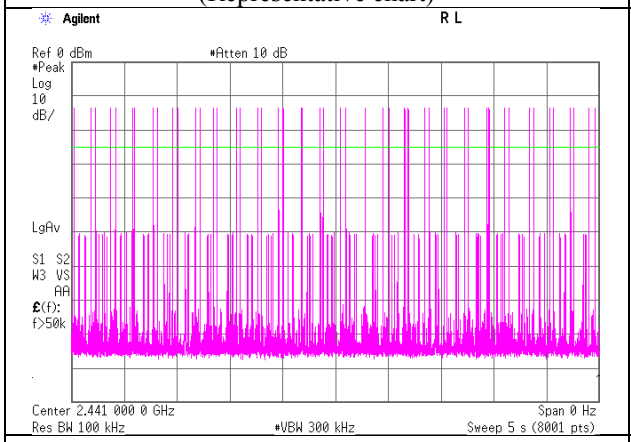


Inquiry (2/2)

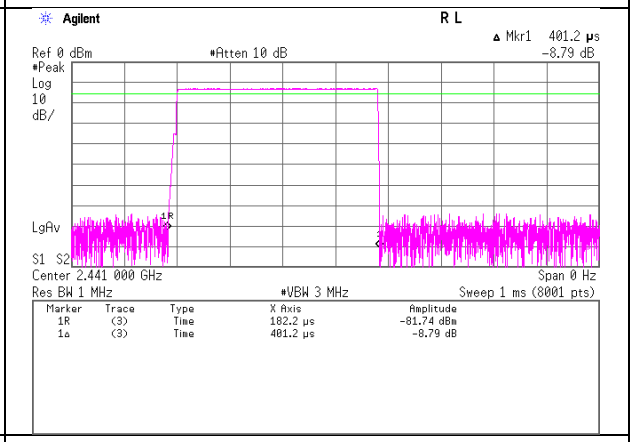


Dwell time

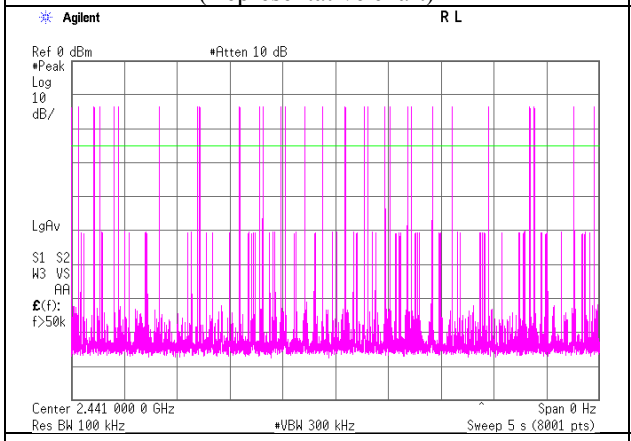
DH1 (1/2)
(Representative chart)



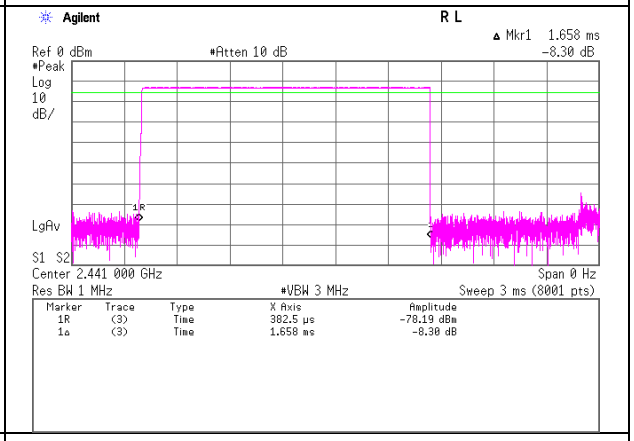
DH1 (2/2)



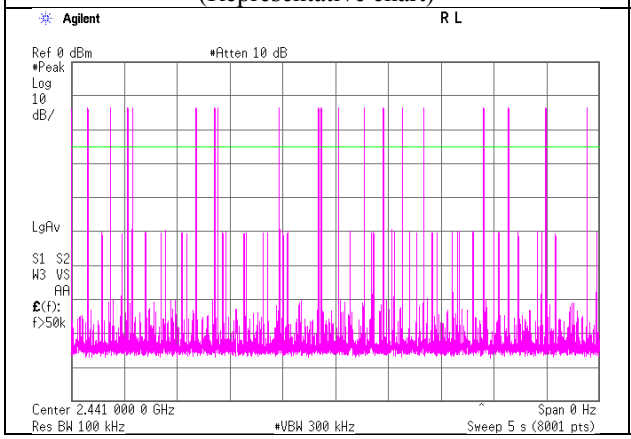
DH3 (1/2)
(Representative chart)



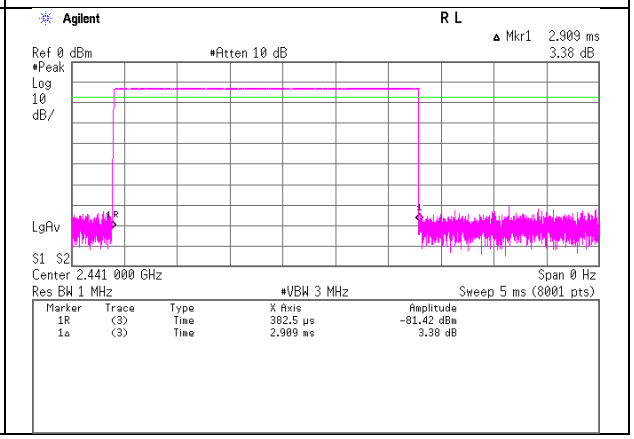
DH3 (2/2)



DH5 (1/2)
(Representative chart)

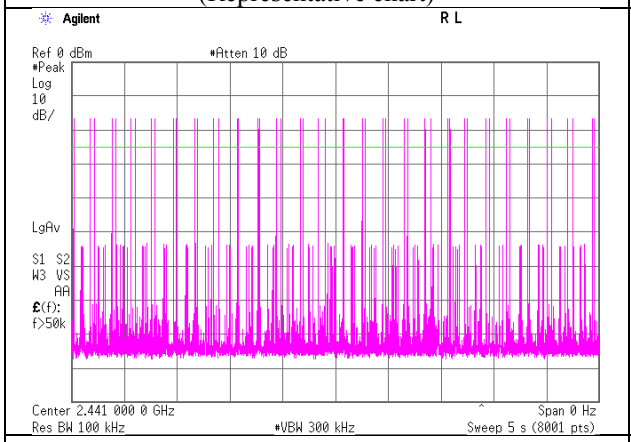


DH5 (2/2)

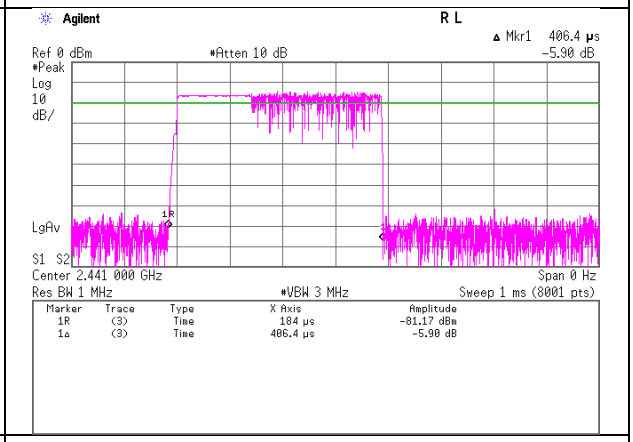


Dwell time

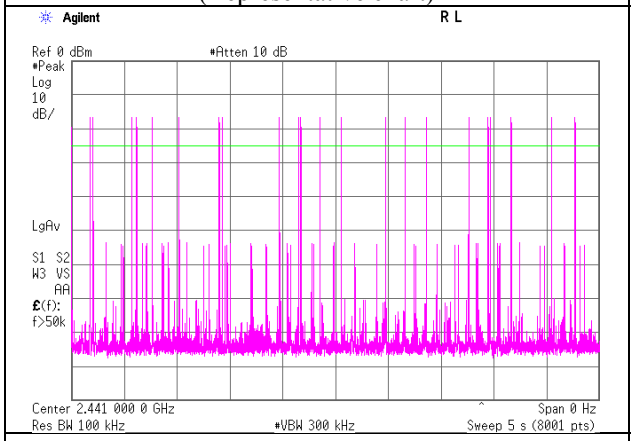
3DH1 (1/2)
(Representative chart)



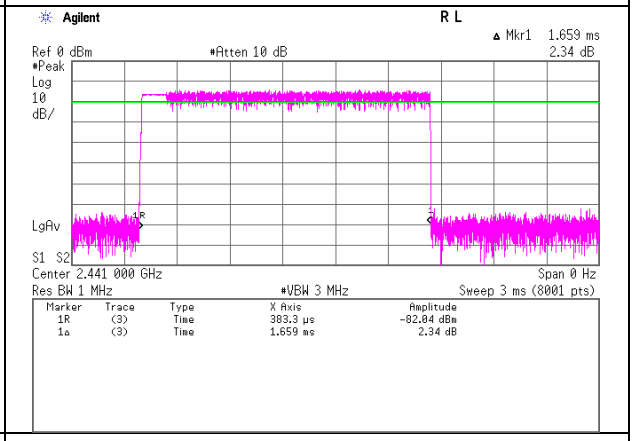
3DH1 (2/2)



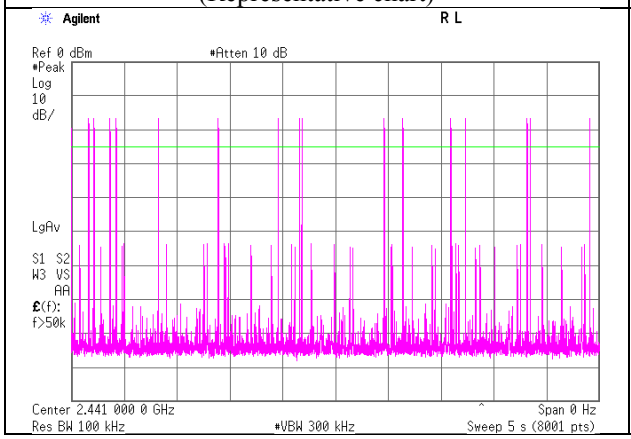
3DH3 (1/2)
(Representative chart)



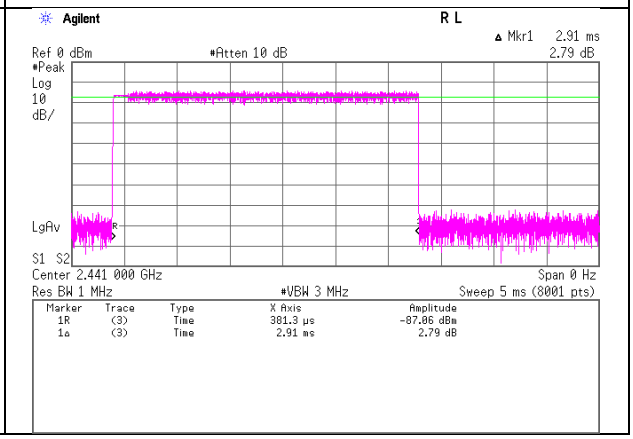
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Dwell time

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping On (AT1603 Display Separated Type(L2))

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	50.2 times / 5 sec. x 31.6 sec. = 318 times	0.401	128	400
DH3	24.4 times / 5 sec. x 31.6 sec. = 155 times	1.658	257	400
DH5	18.2 times / 5 sec. x 31.6 sec. = 116 times	2.906	337	400
3DH1	48.2 times / 5 sec. x 31.6 sec. = 305 times	0.406	124	400
3DH3	26.6 times / 5 sec. x 31.6 sec. = 169 times	1.660	281	400
3DH5	20.2 times / 5 sec. x 31.6 sec. = 128 times	2.910	372	400
Inquiry	100.0 times / 1 sec. x 12.8 sec. = 1280 times	0.103	132	400

Sample Calculation
Result = Number of transmission x Length of transmission

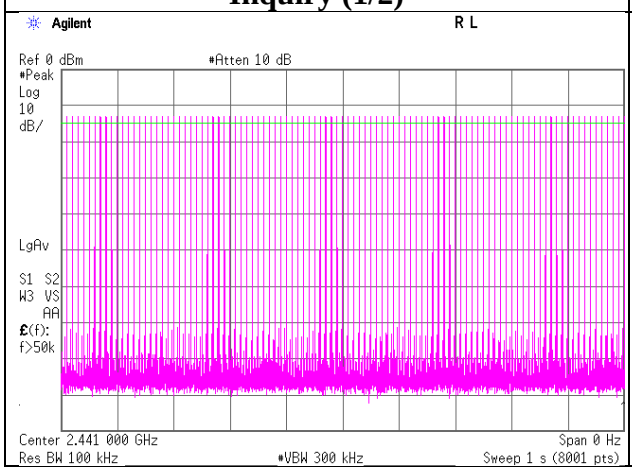
*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times] 1	2	3	4	5	Average [times]
DH1	50	50	50	50	51	50.2
DH3	28	25	24	23	22	24.4
DH5	15	15	24	17	20	18.2
3DH1	50	49	46	48	48	48.2
3DH3	29	28	27	26	23	26.6
3DH5	22	25	19	18	17	20.2

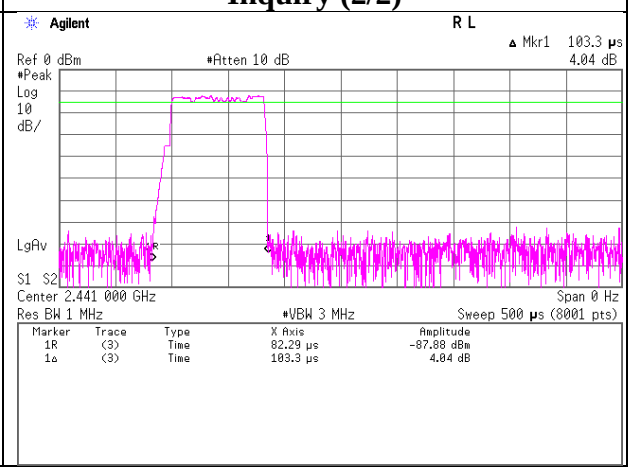
Sample Calculation
Average = Summation (Sampling 1 to 5) / 5

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 ≤ N ≤ 79), is always less than 0.4s regardless of packet size. This is confirmed in the test report for N = 79.

Inquiry (1/2)

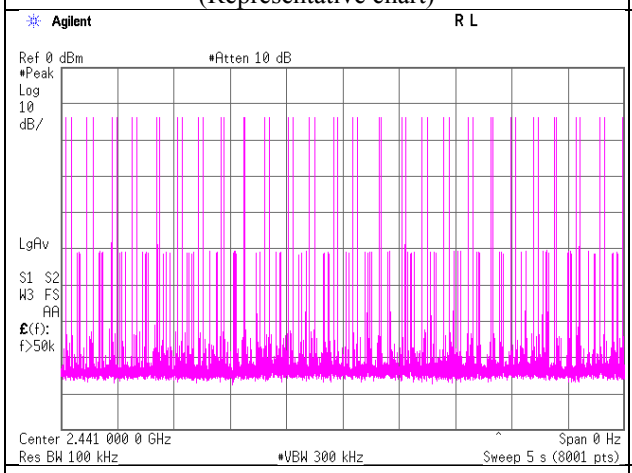


Inquiry (2/2)

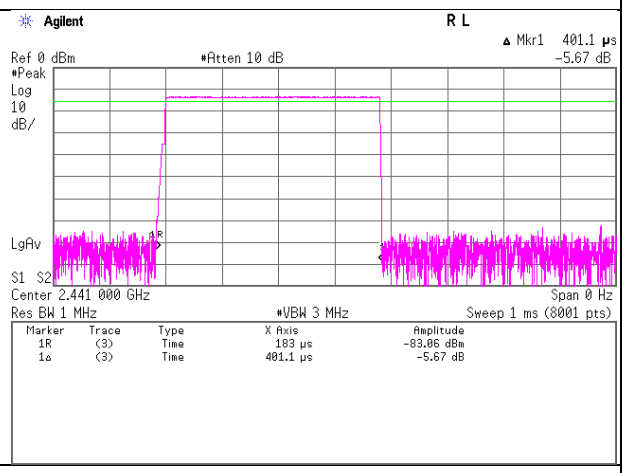


Dwell time

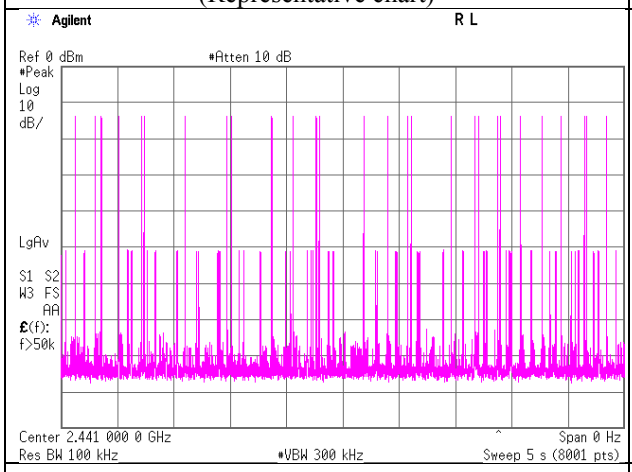
DH1 (1/2)
(Representative chart)



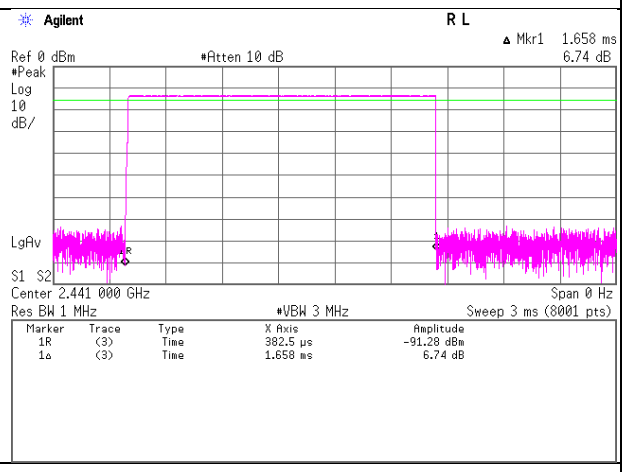
DH1 (2/2)



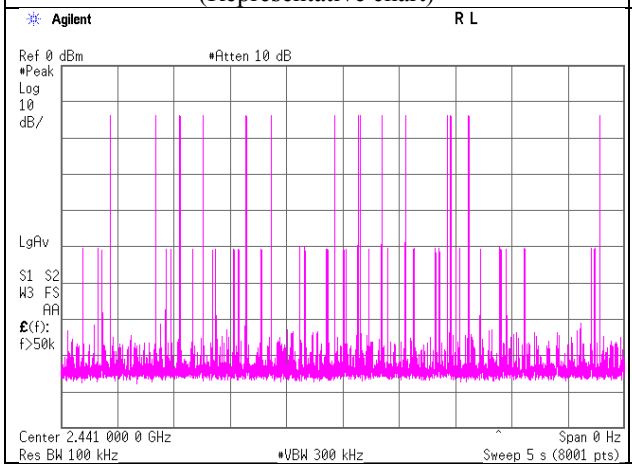
DH3 (1/2)
(Representative chart)



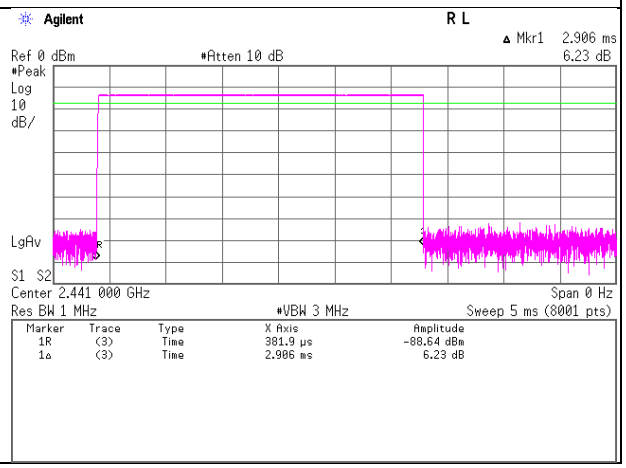
DH3 (2/2)



DH5 (1/2)
(Representative chart)

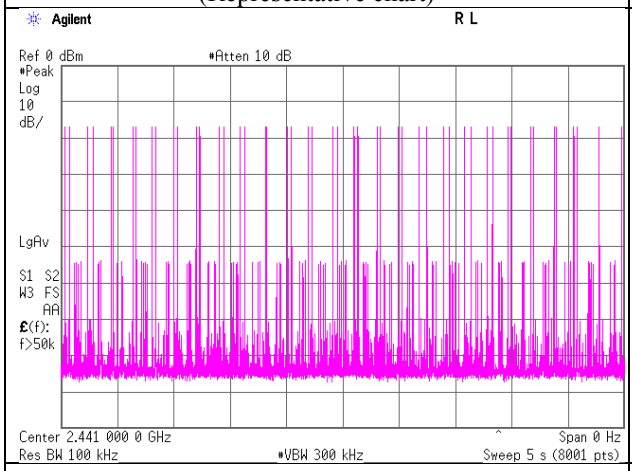


DH5 (2/2)

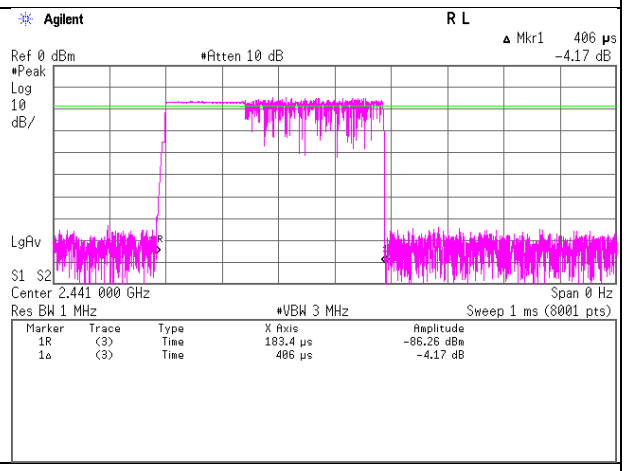


Dwell time

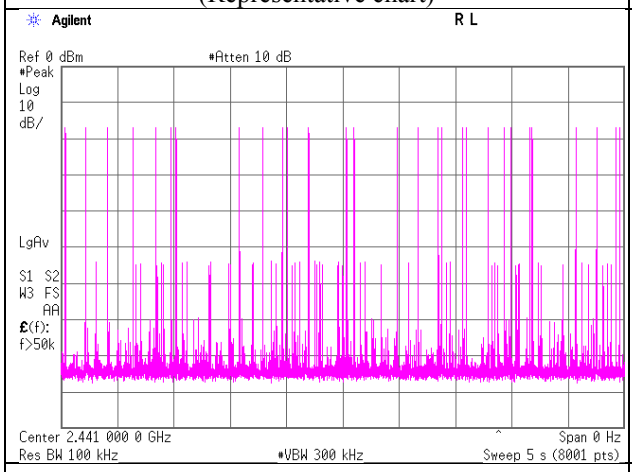
3DH1 (1/2)
(Representative chart)



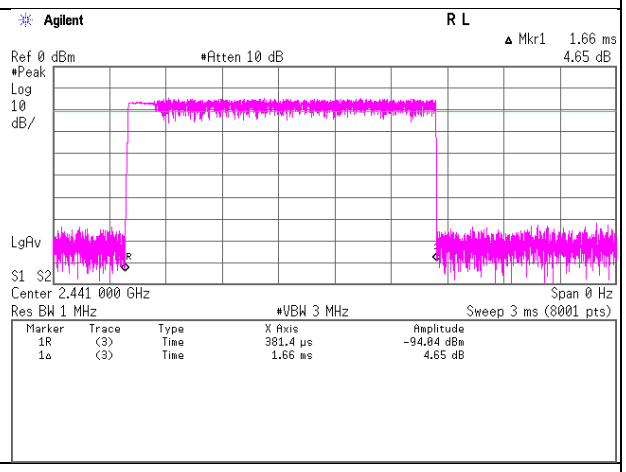
3DH1 (2/2)



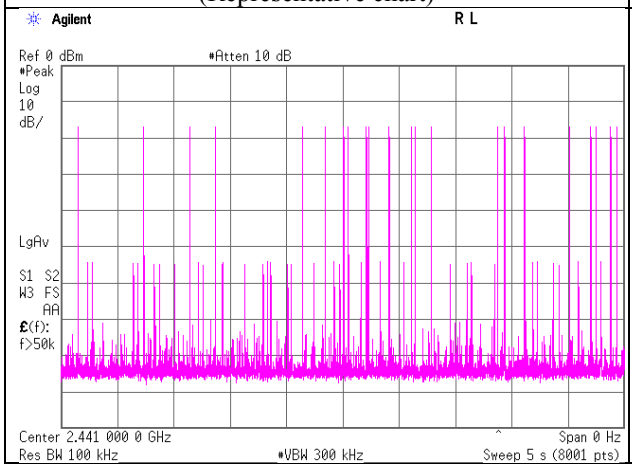
3DH3 (1/2)
(Representative chart)



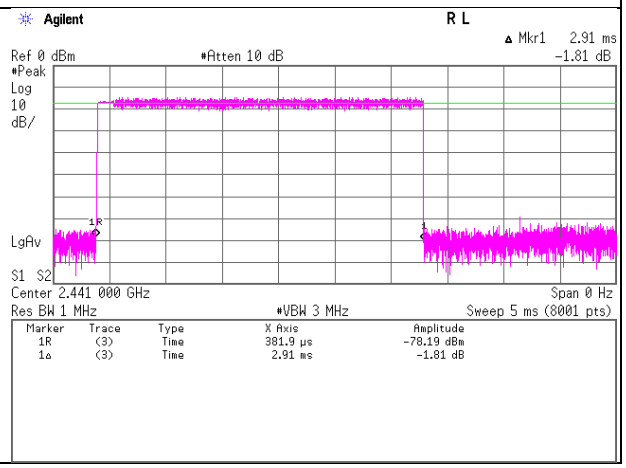
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off (AT1603 Display Combined Type(T2))

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-13.06	2.03	9.63	-1.40	0.72	20.96	125	22.36
DH5	2441.0	-12.39	2.04	9.63	-0.72	0.85	20.96	125	21.68
DH5	2480.0	-12.12	2.05	9.63	-0.44	0.90	20.96	125	21.40
2DH5	2402.0	-14.30	2.03	9.63	-2.64	0.54	20.96	125	23.60
2DH5	2441.0	-13.60	2.04	9.63	-1.93	0.64	20.96	125	22.89
2DH5	2480.0	-13.37	2.05	9.63	-1.69	0.68	20.96	125	22.65
3DH5	2402.0	-13.75	2.03	9.63	-2.09	0.62	20.96	125	23.05
3DH5	2441.0	-13.03	2.04	9.63	-1.36	0.73	20.96	125	22.32
3DH5	2480.0	-12.90	2.05	9.63	-1.22	0.76	20.96	125	22.18

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.

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off (AT1603 Display Separated Type(L2))

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-13.31	2.03	10.01	-1.27	0.75	20.96	125	22.23
DH5	2441.0	-12.88	2.04	10.01	-0.83	0.83	20.96	125	21.79
DH5	2480.0	-12.51	2.05	10.01	-0.45	0.90	20.96	125	21.41
2DH5	2402.0	-14.50	2.03	10.01	-2.46	0.57	20.96	125	23.42
2DH5	2441.0	-13.99	2.04	10.01	-1.94	0.64	20.96	125	22.90
2DH5	2480.0	-13.64	2.05	10.01	-1.58	0.70	20.96	125	22.54
3DH5	2402.0	-14.17	2.03	10.01	-2.13	0.61	20.96	125	23.09
3DH5	2441.0	-13.54	2.04	10.01	-1.49	0.71	20.96	125	22.45
3DH5	2480.0	-13.28	2.05	10.01	-1.22	0.76	20.96	125	22.18

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.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off (AT1603 Display Combined Type(T2))

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Frame power)		Duty factor	Result (Burst power)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402.0	-15.02	2.03	9.63	-3.36	0.46	1.11	-2.25	0.60
DH5	2441.0	-14.27	2.04	9.63	-2.60	0.55	1.11	-1.49	0.71
DH5	2480.0	-13.98	2.05	9.63	-2.30	0.59	1.11	-1.19	0.76
2DH5	2402.0	-18.74	2.03	9.63	-7.08	0.20	1.11	-5.97	0.25
2DH5	2441.0	-18.00	2.04	9.63	-6.33	0.23	1.11	-5.22	0.30
2DH5	2480.0	-17.72	2.05	9.63	-6.04	0.25	1.11	-4.93	0.32
3DH5	2402.0	-18.69	2.03	9.63	-7.03	0.20	1.11	-5.92	0.26
3DH5	2441.0	-17.93	2.04	9.63	-6.26	0.24	1.11	-5.15	0.31
3DH5	2480.0	-17.68	2.05	9.63	-6.00	0.25	1.11	-4.89	0.32

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

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

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off (AT1603 Display Separated Type(L2))

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Frame power)		Duty factor	Result (Burst power)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402.0	-15.36	2.03	10.01	-3.32	0.47	1.08	-2.24	0.60
DH5	2441.0	-14.75	2.04	10.01	-2.70	0.54	1.08	-1.62	0.69
DH5	2480.0	-14.42	2.05	10.01	-2.36	0.58	1.08	-1.28	0.74
2DH5	2402.0	-19.09	2.03	10.01	-7.05	0.20	1.09	-5.96	0.25
2DH5	2441.0	-18.48	2.04	10.01	-6.43	0.23	1.09	-5.34	0.29
2DH5	2480.0	-18.18	2.05	10.01	-6.12	0.24	1.09	-5.03	0.31
3DH5	2402.0	-19.09	2.03	10.01	-7.05	0.20	1.08	-5.97	0.25
3DH5	2441.0	-18.51	2.04	10.01	-6.46	0.23	1.08	-5.38	0.29
3DH5	2480.0	-18.20	2.05	10.01	-6.14	0.24	1.08	-5.06	0.31

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

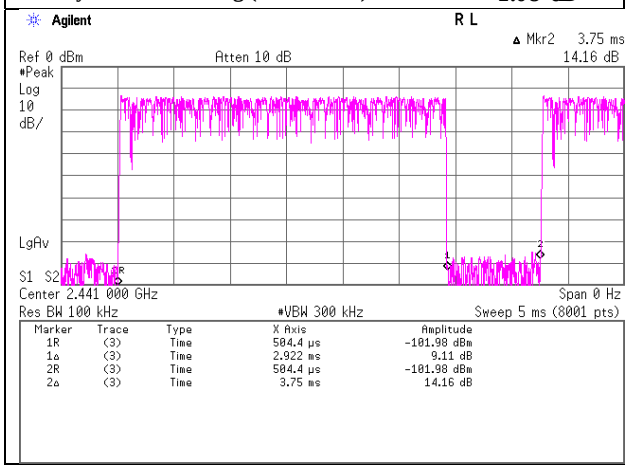
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off

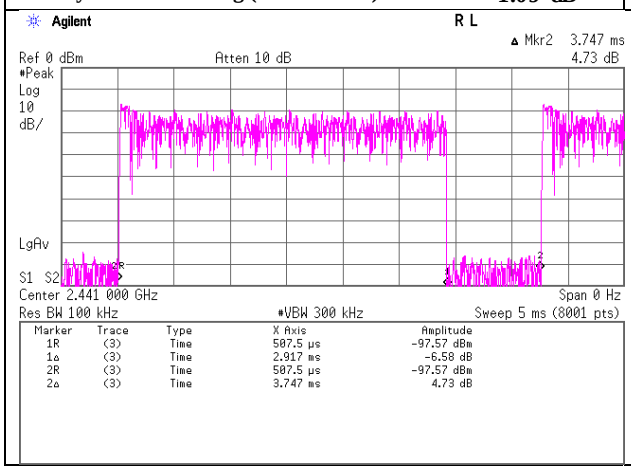
DH5

Tx on / (Tx on + Tx off) =	**0.779**
Tx on / (Tx on + Tx off) * 100 =	**77.9 %**
Duty factor = 10 * log (3.75 / 2.922) =	**1.08 dB**



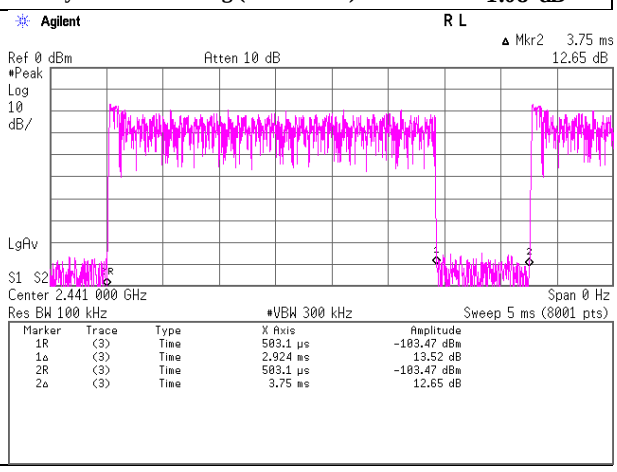
2DH5

Tx on / (Tx on + Tx off) =	**0.779**
Tx on / (Tx on + Tx off) * 100 =	**77.9 %**
Duty factor = 10 * log (3.747 / 2.918) =	**1.09 dB**



3DH5

Tx on / (Tx on + Tx off) =	**0.780**
Tx on / (Tx on + Tx off) * 100 =	**78.0 %**
Duty factor = 10 * log (3.75 / 2.924) =	**1.08 dB**



Radiated Spurious Emission

Report No.	12170940S-B-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	3	3	3
Date	February 8, 2018	February 9, 2018	February 13, 2018	February 15, 2018
Temperature / Humidity	24 deg. C / 31 % RH	23 deg. C / 33 % RH	21 deg. C / 34 % RH	21 deg. C / 30 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz – 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.	181.245	QP	37.14	16.07	7.97	32.01	0.00	29.17	43.50	14.3	255	268	
Hori.	270.002	QP	42.13	12.28	8.56	31.92	0.00	31.05	46.00	14.9	174	239	
Hori.	372.060	QP	38.57	14.82	9.09	31.85	0.00	30.63	46.00	15.3	100	343	
Hori.	542.400	QP	38.01	18.13	9.80	31.88	0.00	34.06	46.00	11.9	100	167	
Hori.	658.566	QP	44.40	19.29	10.23	31.83	0.00	42.09	46.00	**3.9**	103	346	
Hori.	1594.561	PK	49.51	25.20	13.37	37.21	2.17	53.04	73.90	20.8	244	311	
Hori.	2390.000	PK	43.23	27.26	14.15	36.83	2.17	49.98	73.90	23.9	152	343	
Hori.	3531.491	PK	50.17	28.88	6.21	36.73	2.17	50.70	73.90	23.2	169	242	
Hori.	4804.000	PK	44.53	31.40	6.68	36.99	2.17	47.79	73.90	26.1	153	355	
Hori.	7206.000	PK	43.61	36.56	8.24	37.81	2.17	52.77	73.90	21.1	150	0	
Hori.	1594.561	AV	37.96	25.20	13.37	37.21	2.17	41.49	53.90	12.4	244	311	
Hori.	2390.000	AV	31.82	27.26	14.15	36.83	2.17	38.57	53.90	15.3	152	343	
Hori.	3531.491	AV	45.57	28.88	6.21	36.73	2.17	46.10	53.90	7.8	169	242	
Hori.	4804.000	AV	33.59	31.40	6.68	36.99	2.17	36.85	53.90	17.0	153	355	
Hori.	7206.000	AV	31.77	36.56	8.24	37.81	2.17	40.93	53.90	12.9	150	0	
Vert.	202.495	QP	41.86	11.51	8.16	31.99	0.00	29.54	43.50	13.9	100	112	
Vert.	269.998	QP	42.62	12.28	8.56	31.92	0.00	31.54	46.00	14.4	210	187	
Vert.	658.565	QP	43.94	19.29	10.23	31.83	0.00	41.63	46.00	4.3	119	359	
Vert.	960.272	QP	38.44	22.10	11.23	30.40	0.00	41.37	53.90	12.5	145	36	
Vert.	1594.565	PK	46.13	25.20	13.37	37.21	2.17	49.66	73.90	24.2	177	341	
Vert.	2390.000	PK	44.01	27.26	14.15	36.83	2.17	50.76	73.90	23.1	163	27	
Vert.	3531.493	PK	50.64	28.88	6.21	36.73	2.17	51.17	73.90	22.7	144	337	
Vert.	4804.000	PK	43.57	31.40	6.68	36.99	2.17	46.83	73.90	27.0	138	10	
Vert.	7206.000	PK	44.21	36.56	8.24	37.81	2.17	53.37	73.90	20.5	150	0	
Vert.	1594.565	AV	34.56	25.20	13.37	37.21	2.17	38.09	53.90	15.8	177	341	
Vert.	2390.000	AV	32.01	27.26	14.15	36.83	2.17	38.76	53.90	15.1	163	27	
Vert.	3531.493	AV	46.96	28.88	6.21	36.73	2.17	47.49	53.90	6.4	144	337	
Vert.	4804.000	AV	31.57	31.40	6.68	36.99	2.17	34.83	53.90	19.0	138	10	
Vert.	7206.000	AV	31.98	36.56	8.24	37.81	2.17	41.14	53.90	12.7	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 (3.85 m / 3.0 m) = 2.17 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	82.64	27.29	14.16	36.83	2.17	89.43	-	-	Carrier
Hori.	2400.000	PK	34.79	27.29	14.15	36.83	2.17	41.57	69.43	27.9	
Hori.	9608.000	PK	36.63	38.61	9.27	38.48	2.17	48.20	69.43	21.2	
Vert.	2402.000	PK	83.49	27.29	14.16	36.83	2.17	90.28	-	-	Carrier
Vert.	2400.000	PK	34.75	27.29	14.15	36.83	2.17	41.53	70.28	28.8	
Vert.	9608.000	PK	37.12	38.61	9.27	38.48	2.17	48.69	70.28	21.6	

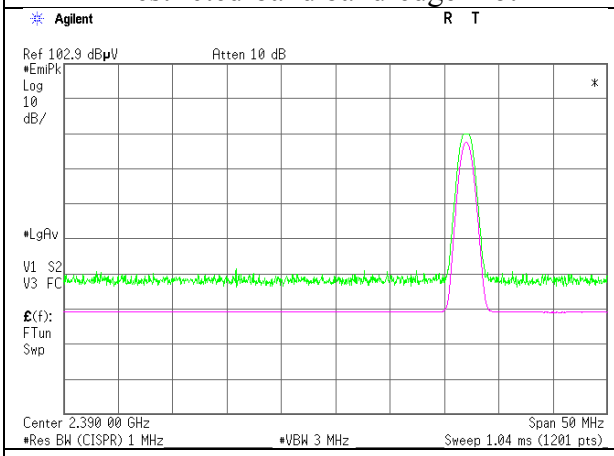
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12170940S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	February 9, 2018
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Kazuya Noda (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz

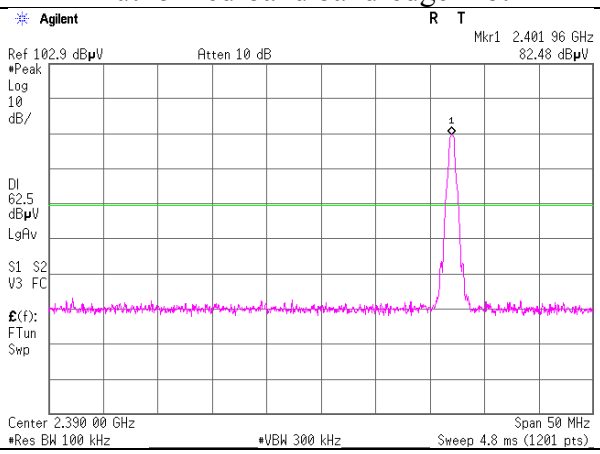
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

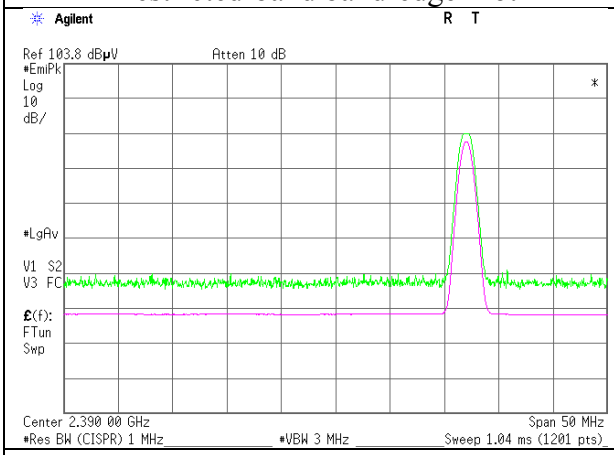
Authorized-band band-edge Plot



20dBc Plot

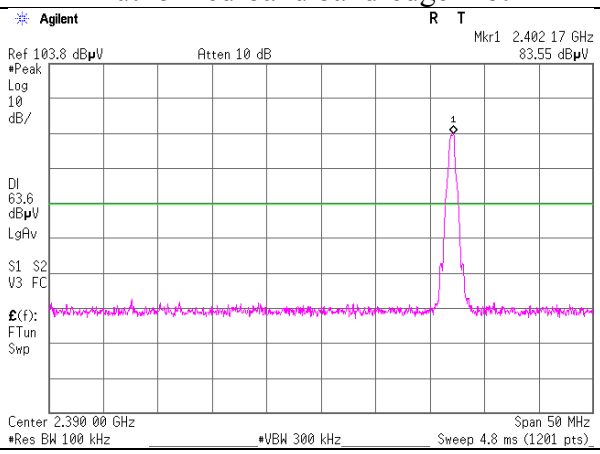
Vertical

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.	12170940S-B-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	3	3	3
Date	February 8, 2018	February 9, 2018	February 13, 2018	February 15, 2018
Temperature / Humidity	24 deg. C / 31 % RH	23 deg. C / 33 % RH	21 deg. C / 34 % RH	21 deg. C / 30 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz – 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.	181.246	QP	37.09	16.07	7.97	32.01	0.00	29.12	43.50	14.3	209	265	
Hori.	269.999	QP	41.91	12.28	8.56	31.92	0.00	30.83	46.00	15.1	174	238	
Hori.	372.063	QP	38.59	14.82	9.09	31.85	0.00	30.65	46.00	15.3	100	346	
Hori.	542.405	QP	37.82	18.13	9.80	31.88	0.00	33.87	46.00	12.1	100	166	
Hori.	658.570	QP	43.81	19.29	10.23	31.83	0.00	41.50	46.00	4.5	106	351	
Hori.	1594.565	PK	49.23	25.20	13.37	37.21	2.17	52.76	73.90	21.1	246	313	
Hori.	3531.491	PK	50.11	28.88	6.21	36.73	2.17	50.64	73.90	23.2	170	243	
Hori.	4882.000	PK	45.11	31.62	6.70	37.03	2.17	48.57	73.90	25.3	149	357	
Hori.	7323.000	PK	43.81	36.77	8.26	37.88	2.17	53.13	73.90	20.7	150	0	
Hori.	1594.565	AV	38.02	25.20	13.37	37.21	2.17	41.55	53.90	12.3	246	313	
Hori.	3531.491	AV	45.36	28.88	6.21	36.73	2.17	45.89	53.90	8.0	170	243	
Hori.	4882.000	AV	34.63	31.62	6.70	37.03	2.17	38.09	53.90	15.8	149	357	
Hori.	7323.000	AV	31.85	36.77	8.26	37.88	2.17	41.17	53.90	12.7	150	0	
Vert.	202.497	QP	41.54	11.51	8.16	31.99	0.00	29.22	43.50	14.2	100	116	
Vert.	269.997	QP	42.57	12.28	8.56	31.92	0.00	31.49	46.00	14.5	210	188	
Vert.	656.564	QP	44.25	19.28	10.22	31.84	0.00	41.91	46.00	**4.0**	119	358	
Vert.	960.272	QP	39.85	22.10	11.23	30.40	0.00	42.78	53.90	11.1	148	37	
Vert.	1594.565	PK	45.89	25.20	13.37	37.21	2.17	49.42	73.90	24.4	176	350	
Vert.	3531.489	PK	50.53	28.88	6.21	36.73	2.17	51.06	73.90	22.8	144	338	
Vert.	4882.000	PK	43.68	31.62	6.70	37.03	2.17	47.14	73.90	26.7	131	15	
Vert.	7323.000	PK	43.53	36.77	8.26	37.88	2.17	52.85	73.90	21.0	150	0	
Vert.	1594.565	AV	34.56	25.20	13.37	37.21	2.17	38.09	53.90	15.8	176	350	
Vert.	3531.489	AV	46.53	28.88	6.21	36.73	2.17	47.06	53.90	6.8	144	338	
Vert.	4882.000	AV	31.67	31.62	6.70	37.03	2.17	35.13	53.90	18.7	131	15	
Vert.	7323.000	AV	31.47	36.77	8.26	37.88	2.17	40.79	53.90	13.1	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 (3.85 m / 3.0 m) = 2.17 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.	2441.000	PK	82.45	27.42	14.21	36.81	2.17	89.44	-	-	Carrier
Hori.	9764.000	PK	36.53	38.80	9.33	38.67	2.17	48.16	69.44	21.3	
Vert.	2441.000	PK	83.18	27.42	14.21	36.81	2.17	90.17	-	-	Carrier
Vert.	9764.000	PK	36.09	38.80	9.33	38.67	2.17	47.72	70.17	22.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	12170940S-B-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	3	3	3
Date	February 8, 2018	February 9, 2018	February 13, 2018	February 15, 2018
Temperature / Humidity	24 deg. C / 31 % RH	23 deg. C / 33 % RH	21 deg. C / 34 % RH	21 deg. C / 30 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz – 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.	181.245	QP	37.15	16.07	7.97	32.01	0.00	29.18	43.50	14.3	251	268	
Hori.	270.300	QP	40.21	12.29	8.56	31.92	0.00	29.14	46.00	16.8	176	228	
Hori.	372.062	QP	38.61	14.82	9.09	31.85	0.00	30.67	46.00	15.3	100	348	
Hori.	542.401	QP	37.71	18.13	9.80	31.88	0.00	33.76	46.00	12.2	100	174	
Hori.	658.568	QP	45.12	19.29	10.23	31.83	0.00	42.81	46.00	**3.1**	102	354	
Hori.	1594.565	PK	48.75	25.20	13.37	37.21	2.17	52.28	73.90	21.6	244	316	
Hori.	2483.500	PK	43.04	27.55	14.25	36.79	2.17	50.22	73.90	23.6	152	349	
Hori.	3531.489	PK	50.21	28.88	6.21	36.73	2.17	50.74	73.90	23.1	168	244	
Hori.	4960.000	PK	44.71	31.83	6.72	37.07	2.17	48.36	73.90	25.5	149	355	
Hori.	7440.000	PK	43.02	36.97	8.27	37.95	2.17	52.48	73.90	21.4	150	0	
Hori.	1594.565	AV	37.96	25.20	13.37	37.21	2.17	41.49	53.90	12.4	244	316	
Hori.	2483.500	AV	31.18	27.55	14.25	36.79	2.17	38.36	53.90	15.5	152	349	
Hori.	3531.489	AV	45.13	28.88	6.21	36.73	2.17	45.66	53.90	8.2	168	244	
Hori.	4960.000	AV	32.21	31.83	6.72	37.07	2.17	35.86	53.90	18.0	149	355	
Hori.	7440.000	AV	31.34	36.97	8.27	37.95	2.17	40.80	53.90	13.1	150	0	
Vert.	202.495	QP	42.05	11.51	8.16	31.99	0.00	29.73	43.50	13.7	100	97	
Vert.	269.999	QP	40.01	12.28	8.56	31.92	0.00	28.93	46.00	17.0	208	182	
Vert.	658.567	QP	43.86	19.29	10.23	31.83	0.00	41.55	46.00	4.4	131	355	
Vert.	960.275	QP	40.24	22.10	11.23	30.40	0.00	43.17	53.90	10.7	147	33	
Vert.	1594.561	PK	45.82	25.20	13.37	37.21	2.17	49.35	73.90	24.5	254	61	
Vert.	2483.500	PK	42.72	27.55	14.25	36.79	2.17	49.90	73.90	24.0	171	29	
Vert.	3531.486	PK	50.50	28.88	6.21	36.73	2.17	51.03	73.90	22.8	147	336	
Vert.	4960.000	PK	43.72	31.83	6.72	37.07	2.17	47.37	73.90	26.5	160	14	
Vert.	7440.000	PK	43.64	36.97	8.27	37.95	2.17	53.10	73.90	20.8	150	0	
Vert.	1594.561	AV	34.51	25.20	13.37	37.21	2.17	38.04	53.90	15.8	254	61	
Vert.	2483.500	AV	31.38	27.55	14.25	36.79	2.17	38.56	53.90	15.3	171	29	
Vert.	3531.486	AV	46.39	28.88	6.21	36.73	2.17	46.92	53.90	6.9	147	336	
Vert.	4960.000	AV	31.99	31.83	6.72	37.07	2.17	35.64	53.90	18.2	160	14	
Vert.	7440.000	AV	31.25	36.97	8.27	37.95	2.17	40.71	53.90	13.1	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 (3.85 m / 3.0 m) = 2.17 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.	2480.000	PK	82.30	27.54	14.24	36.79	2.17	89.46	-	-	Carrier
Hori.	9920.000	PK	36.02	38.98	9.38	38.87	2.17	47.68	69.46	21.8	
Vert.	2480.000	PK	82.82	27.54	14.24	36.79	2.17	89.98	-	-	Carrier
Vert.	9920.000	PK	35.91	38.98	9.38	38.87	2.17	47.57	69.98	22.4	

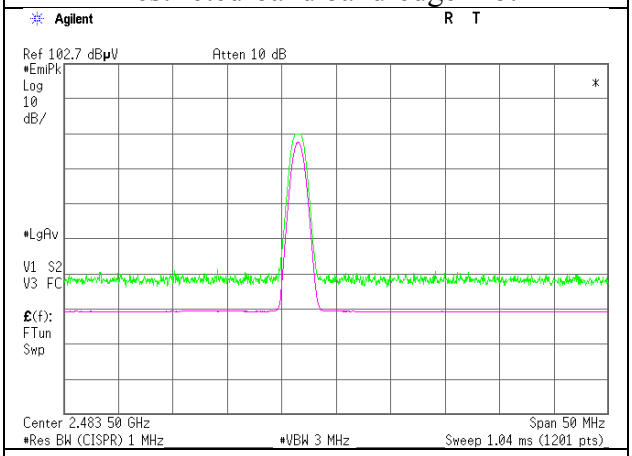
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12170940S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	February 9, 2018
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Kazuya Noda (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

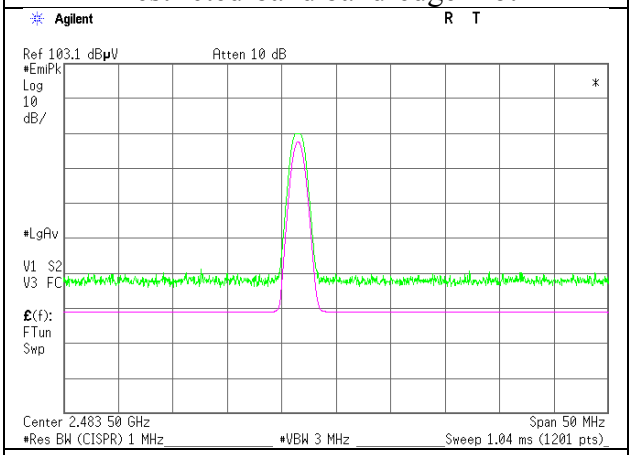
Restricted-band band-edge Plot



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.	12170940S-B-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	3	3	3
Date	February 8, 2018	February 9, 2018	February 13, 2018	February 15, 2018
Temperature / Humidity	24 deg. C / 31 % RH	23 deg. C / 33 % RH	21 deg. C / 34 % RH	21 deg. C / 30 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx, Hopping On, 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.	181.245	QP	36.98	16.07	7.97	32.01	0.00	29.01	43.50	14.4	254	266	
Hori.	269.998	QP	40.87	12.28	8.56	31.92	0.00	29.79	46.00	16.2	175	212	
Hori.	372.065	QP	38.68	14.82	9.09	31.85	0.00	30.74	46.00	15.2	100	346	
Hori.	542.406	QP	37.53	18.13	9.80	31.88	0.00	33.58	46.00	12.4	100	168	
Hori.	658.565	QP	44.73	19.29	10.23	31.83	0.00	42.42	46.00	**3.5**	102	351	
Hori.	1594.565	PK	48.79	25.20	13.37	37.21	2.17	52.32	73.90	21.5	244	316	
Hori.	2390.000	PK	44.19	27.26	14.15	36.83	2.17	50.94	73.90	22.9	152	338	
Hori.	3531.488	PK	49.77	28.88	6.21	36.73	2.17	50.30	73.90	23.6	167	240	
Hori.	4824.000	PK	43.25	31.46	6.69	37.00	2.17	46.57	73.90	27.3	150	0	
Hori.	7236.000	PK	43.56	36.62	8.24	37.83	2.17	52.76	73.90	21.1	150	0	
Hori.	1594.565	AV	37.87	25.20	13.37	37.21	2.17	41.40	53.90	12.5	244	316	
Hori.	2390.000	AV	31.77	27.26	14.15	36.83	2.17	38.52	53.90	15.3	152	338	
Hori.	3531.488	AV	45.07	28.88	6.21	36.73	2.17	45.60	53.90	8.3	167	240	
Hori.	4824.000	AV	30.94	31.46	6.69	37.00	2.17	34.26	53.90	19.6	150	0	
Hori.	7236.000	AV	31.94	36.62	8.24	37.83	2.17	41.14	53.90	12.7	150	0	
Vert.	202.503	QP	42.56	11.51	8.16	31.99	0.00	30.24	43.50	13.2	100	104	
Vert.	269.999	QP	41.82	12.28	8.56	31.92	0.00	30.74	46.00	15.2	210	184	
Vert.	658.663	QP	44.15	19.29	10.23	31.83	0.00	41.84	46.00	4.1	131	356	
Vert.	960.276	QP	37.81	22.10	11.23	30.40	0.00	40.74	53.90	13.1	148	33	
Vert.	1594.565	PK	45.92	25.20	13.37	37.21	2.17	49.45	73.90	24.4	178	352	
Vert.	2390.000	PK	44.17	27.26	14.15	36.83	2.17	50.92	73.90	22.9	167	29	
Vert.	3531.491	PK	50.45	28.88	6.21	36.73	2.17	50.98	73.90	22.9	144	338	
Vert.	4824.000	PK	43.92	31.46	6.69	37.00	2.17	47.24	73.90	26.6	150	0	
Vert.	7236.000	PK	44.41	36.62	8.24	37.83	2.17	53.61	73.90	20.2	150	0	
Vert.	1594.565	AV	34.51	25.20	13.37	37.21	2.17	38.04	53.90	15.8	178	352	
Vert.	2390.000	AV	31.74	27.26	14.15	36.83	2.17	38.49	53.90	15.4	167	29	
Vert.	3531.491	AV	46.25	28.88	6.21	36.73	2.17	46.78	53.90	7.1	144	338	
Vert.	4824.000	AV	31.69	31.46	6.69	37.00	2.17	35.01	53.90	18.8	150	0	
Vert.	7236.000	AV	31.84	36.62	8.24	37.83	2.17	41.04	53.90	12.8	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 (3.85 m / 3.0 m) = 2.17 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.

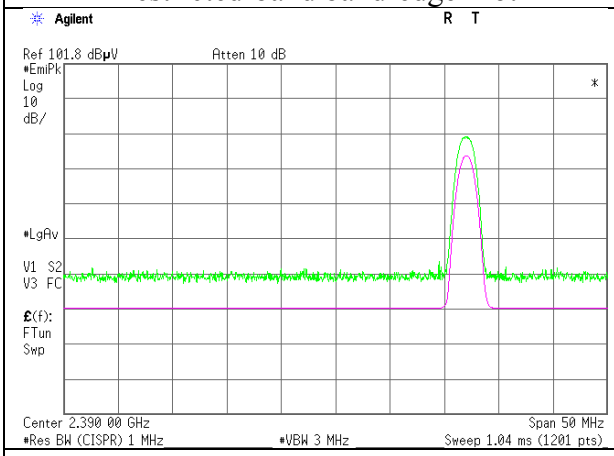
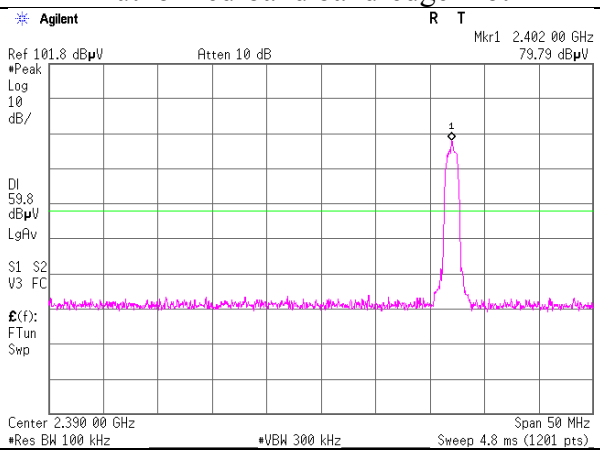
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

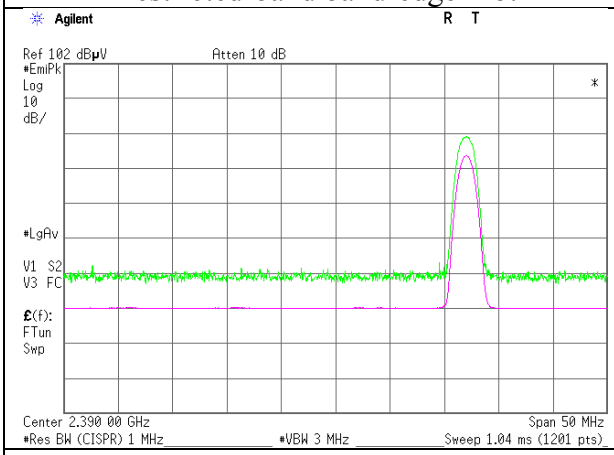
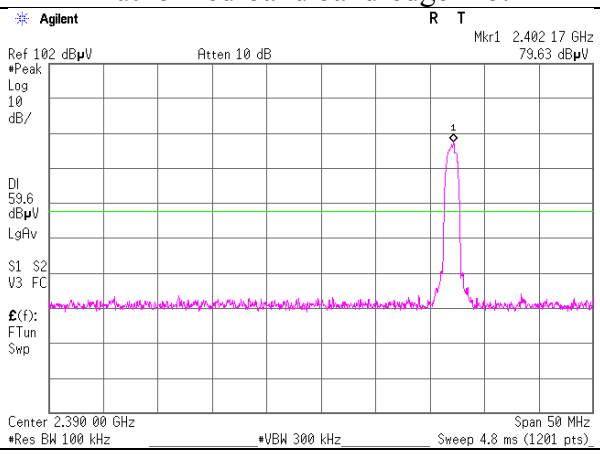
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	79.62	27.29	14.16	36.83	2.17	86.41	-	-	Carrier
Hori.	2400.000	PK	34.66	27.29	14.15	36.83	2.17	41.44	66.41	25.0	
Hori.	9648.000	PK	36.62	38.66	9.27	38.53	2.17	48.19	66.41	18.2	
Vert.	2402.000	PK	79.69	27.29	14.16	36.83	2.17	86.48	-	-	Carrier
Vert.	2400.000	PK	34.67	27.29	14.15	36.83	2.17	41.45	66.48	25.0	
Vert.	9648.000	PK	36.96	38.66	9.27	38.53	2.17	48.53	66.48	18.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12170940S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	February 9, 2018
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Kazuya Noda (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	12170940S-B-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	3	3	3
Date	February 8, 2018	February 9, 2018	February 13, 2018	February 15, 2018
Temperature / Humidity	24 deg. C / 31 % RH	23 deg. C / 33 % RH	21 deg. C / 34 % RH	21 deg. C / 30 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx, Hopping On, 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.	181.246	QP	37.03	16.07	7.97	32.01	0.00	29.06	43.50	14.4	255	258	
Hori.	270.001	QP	40.57	12.28	8.56	31.92	0.00	29.49	46.00	16.5	175	232	
Hori.	372.065	QP	38.51	14.82	9.09	31.85	0.00	30.57	46.00	15.4	100	342	
Hori.	542.403	QP	37.76	18.13	9.80	31.88	0.00	33.81	46.00	12.1	100	171	
Hori.	658.526	QP	44.72	19.29	10.23	31.83	0.00	42.41	46.00	**3.5**	103	347	
Hori.	1594.566	PK	48.73	25.20	13.37	37.21	2.17	52.26	73.90	21.6	248	311	
Hori.	3531.490	PK	49.36	28.88	6.21	36.73	2.17	49.89	73.90	24.0	172	239	
Hori.	4882.000	PK	43.23	31.62	6.70	37.03	2.17	46.69	73.90	27.2	150	0	
Hori.	7323.000	PK	42.98	36.77	8.26	37.88	2.17	52.30	73.90	21.6	150	0	
Hori.	1594.566	AV	37.91	25.20	13.37	37.21	2.17	41.44	53.90	12.4	248	311	
Hori.	3531.490	AV	44.56	28.88	6.21	36.73	2.17	45.09	53.90	8.8	172	239	
Hori.	4882.000	AV	31.43	31.62	6.70	37.03	2.17	34.89	53.90	19.0	150	0	
Hori.	7323.000	AV	31.30	36.77	8.26	37.88	2.17	40.62	53.90	13.2	150	0	
Vert.	202.498	QP	43.45	11.51	8.16	31.99	0.00	31.13	43.50	12.3	100	118	
Vert.	269.998	QP	41.03	12.28	8.56	31.92	0.00	29.95	46.00	16.0	213	179	
Vert.	658.566	QP	42.31	19.29	10.23	31.83	0.00	40.00	46.00	6.0	137	356	
Vert.	960.274	QP	38.21	22.10	11.23	30.40	0.00	41.14	53.90	12.7	143	36	
Vert.	1594.565	PK	45.88	25.20	13.37	37.21	2.17	49.41	73.90	24.4	173	355	
Vert.	3531.491	PK	50.34	28.88	6.21	36.73	2.17	50.87	73.90	23.0	154	334	
Vert.	4882.000	PK	43.92	31.62	6.70	37.03	2.17	47.38	73.90	26.5	150	0	
Vert.	7323.000	PK	44.07	36.77	8.26	37.88	2.17	53.39	73.90	20.5	150	0	
Vert.	1594.565	AV	34.55	25.20	13.37	37.21	2.17	38.08	53.90	15.8	173	355	
Vert.	3531.491	AV	46.05	28.88	6.21	36.73	2.17	46.58	53.90	7.3	154	334	
Vert.	4882.000	AV	31.55	31.62	6.70	37.03	2.17	35.01	53.90	18.8	150	0	
Vert.	7323.000	AV	31.51	36.77	8.26	37.88	2.17	40.83	53.90	13.0	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 (3.85 m / 3.0 m) = 2.17 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.	2441.000	PK	79.59	27.42	14.21	36.81	2.17	86.58	-	-	Carrier
Hori.	9764.000	PK	36.31	38.80	9.33	38.67	2.17	47.94	66.58	18.6	
Vert.	2441.000	PK	79.73	27.42	14.21	36.81	2.17	86.72	-	-	Carrier
Vert.	9764.000	PK	36.67	38.80	9.33	38.67	2.17	48.30	66.72	18.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	12170940S-B-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	3	3	3
Date	February 8, 2018	February 9, 2018	February 13, 2018	February 15, 2018
Temperature / Humidity	24 deg. C / 31 % RH	23 deg. C / 33 % RH	21 deg. C / 34 % RH	21 deg. C / 30 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx, Hopping On, 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.	181.244	QP	37.82	16.07	7.97	32.01	0.00	29.85	43.50	13.6	200	215	
Hori.	269.999	QP	40.63	12.28	8.56	31.92	0.00	29.55	46.00	16.4	174	241	
Hori.	372.059	QP	37.91	14.82	9.09	31.85	0.00	29.97	46.00	16.0	100	347	
Hori.	542.402	QP	37.47	18.13	9.80	31.88	0.00	33.52	46.00	12.4	100	178	
Hori.	658.567	QP	44.42	19.29	10.23	31.83	0.00	42.11	46.00	**3.8**	103	352	
Hori.	1594.562	PK	49.01	25.20	13.37	37.21	2.17	52.54	73.90	21.3	247	311	
Hori.	2483.500	PK	43.75	27.55	14.25	36.79	2.17	50.93	73.90	22.9	145	353	
Hori.	3531.491	PK	50.21	28.88	6.21	36.73	2.17	50.74	73.90	23.1	172	240	
Hori.	4960.000	PK	43.11	31.83	6.72	37.07	2.17	46.76	73.90	27.1	150	0	
Hori.	7440.000	PK	42.75	36.97	8.27	37.95	2.17	52.21	73.90	21.6	150	0	
Hori.	1594.562	AV	37.62	25.20	13.37	37.21	2.17	41.15	53.90	12.7	247	311	
Hori.	2483.500	AV	31.40	27.55	14.25	36.79	2.17	38.58	53.90	15.3	145	353	
Hori.	3531.491	AV	45.30	28.88	6.21	36.73	2.17	45.83	53.90	8.0	172	240	
Hori.	4960.000	AV	31.02	31.83	6.72	37.07	2.17	34.67	53.90	19.2	150	0	
Hori.	7440.000	AV	31.10	36.97	8.27	37.95	2.17	40.56	53.90	13.3	150	0	
Vert.	202.494	QP	43.03	11.51	8.16	31.99	0.00	30.71	43.50	12.7	100	111	
Vert.	269.999	QP	41.76	12.28	8.56	31.92	0.00	30.68	46.00	15.3	211	183	
Vert.	658.565	QP	43.74	19.29	10.23	31.83	0.00	41.43	46.00	4.5	132	353	
Vert.	960.272	QP	37.74	22.10	11.23	30.40	0.00	40.67	53.90	13.2	148	35	
Vert.	1594.564	PK	45.91	25.20	13.37	37.21	2.17	49.44	73.90	24.4	179	351	
Vert.	2483.500	PK	43.84	27.55	14.25	36.79	2.17	51.02	73.90	22.8	167	38	
Vert.	3531.491	PK	50.73	28.88	6.21	36.73	2.17	51.26	73.90	22.6	146	337	
Vert.	4960.000	PK	43.13	31.83	6.72	37.07	2.17	46.78	73.90	27.1	150	0	
Vert.	7440.000	PK	43.12	36.97	8.27	37.95	2.17	52.58	73.90	21.3	150	0	
Vert.	1594.564	AV	34.51	25.20	13.37	37.21	2.17	38.04	53.90	15.8	179	351	
Vert.	2483.500	AV	31.51	27.55	14.25	36.79	2.17	38.69	53.90	15.2	167	38	
Vert.	3531.491	AV	46.34	28.88	6.21	36.73	2.17	46.87	53.90	7.0	146	337	
Vert.	4960.000	AV	31.16	31.83	6.72	37.07	2.17	34.81	53.90	19.0	150	0	
Vert.	7440.000	AV	31.28	36.97	8.27	37.95	2.17	40.74	53.90	13.1	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 (3.85 m / 3.0 m) = 2.17 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.	2480.000	PK	80.34	27.54	14.24	36.79	2.17	87.50	-	-	Carrier
Hori.	9920.000	PK	36.28	38.98	9.38	38.87	2.17	47.94	67.50	19.6	
Vert.	2480.000	PK	80.24	27.54	14.24	36.79	2.17	87.40	-	-	Carrier
Vert.	9920.000	PK	35.82	38.98	9.38	38.87	2.17	47.48	67.40	19.9	

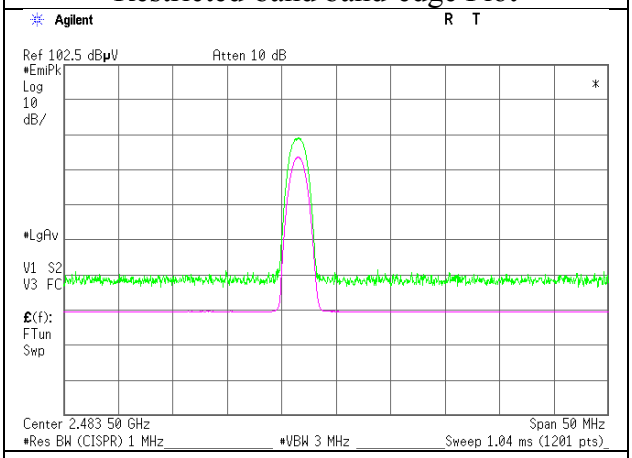
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12170940S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	February 9, 2018
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Kazuya Noda (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

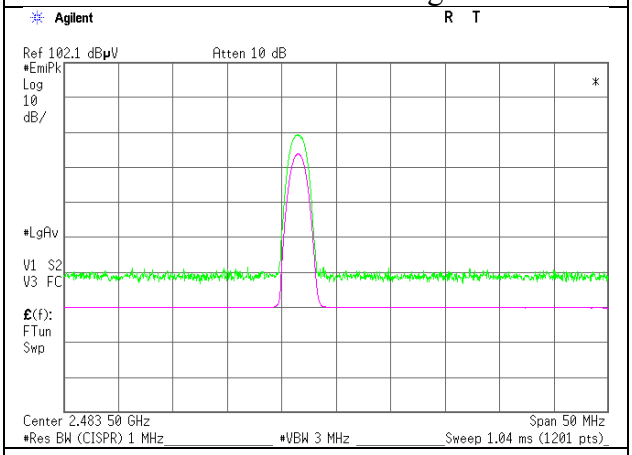
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

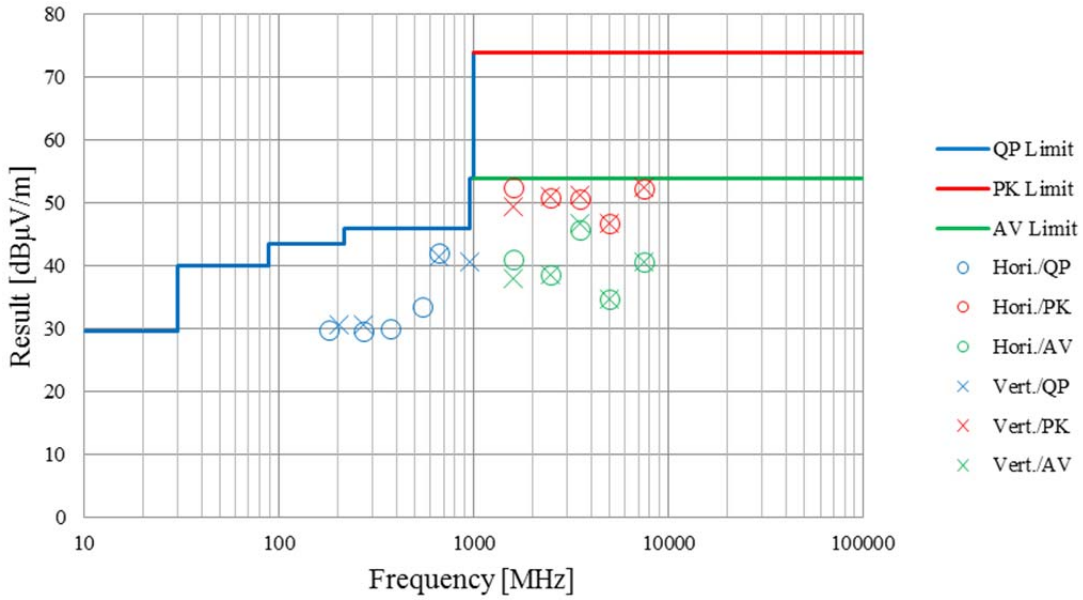


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12170940S-B-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	3	3	3
Date	February 8, 2018	February 9, 2018	February 13, 2018	February 15, 2018
Temperature / Humidity	24 deg. C / 31 % RH	23 deg. C / 33 % RH	21 deg. C / 34 % RH	21 deg. C / 30 % RH
Engineer	Kazuya Noda (30 MHz -1 GHz)	Kazuya Noda (1 GHz -2.8 GHz)	Kazuya Noda (2.8 GHz -13 GHz)	Shiro Kobayashi (13 GHz – 26.5 GHz)
Mode	Tx, Hopping On, 3DH5 2480 MHz			



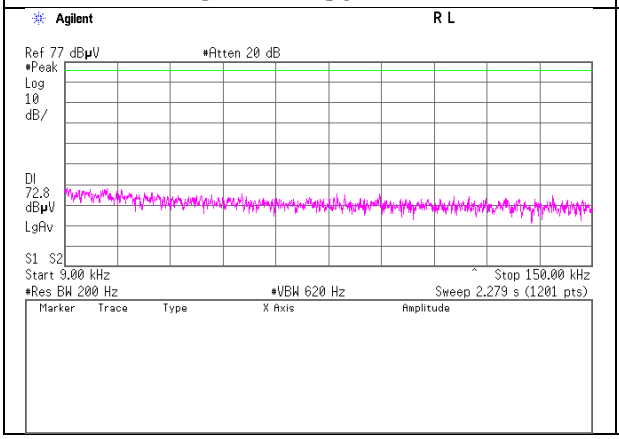
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

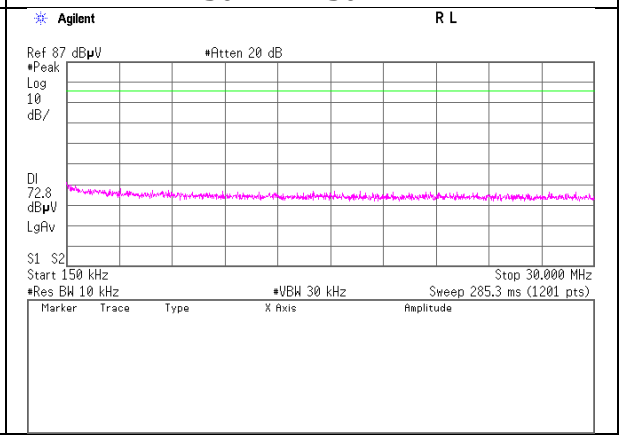
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5 (AT1603 Display Combined Type(T2))

2402 MHz

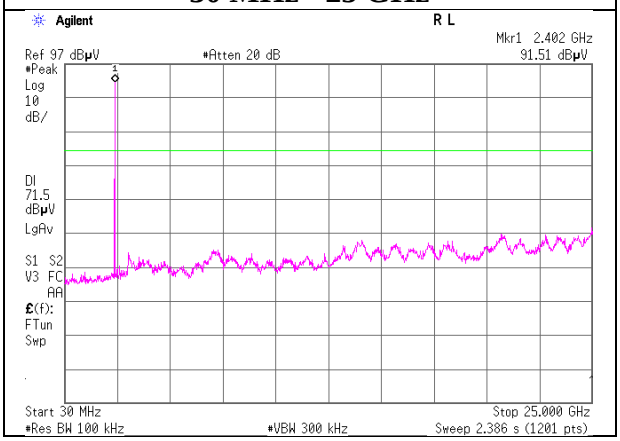
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

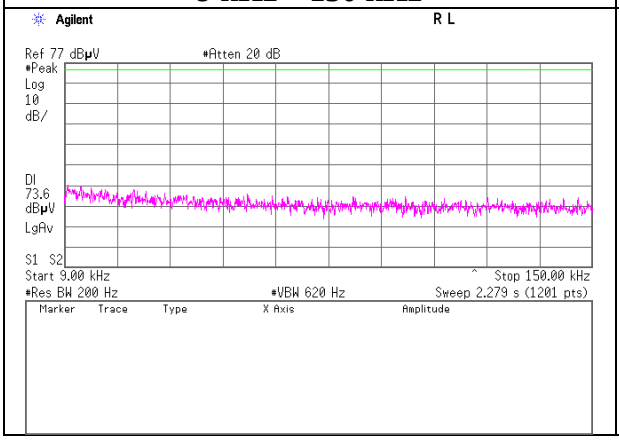


Conducted Spurious Emission

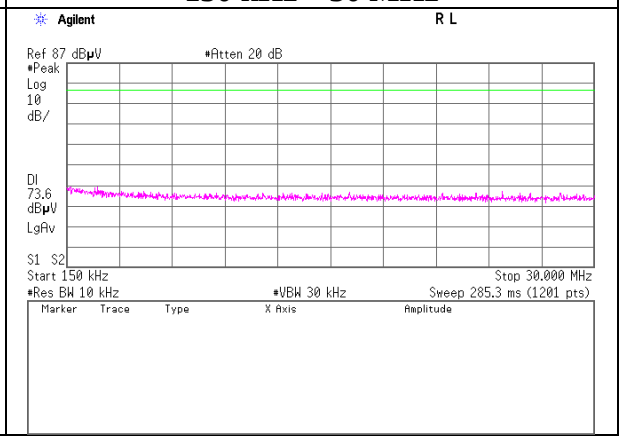
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5 (AT1603 Display Combined Type(T2))

2441 MHz

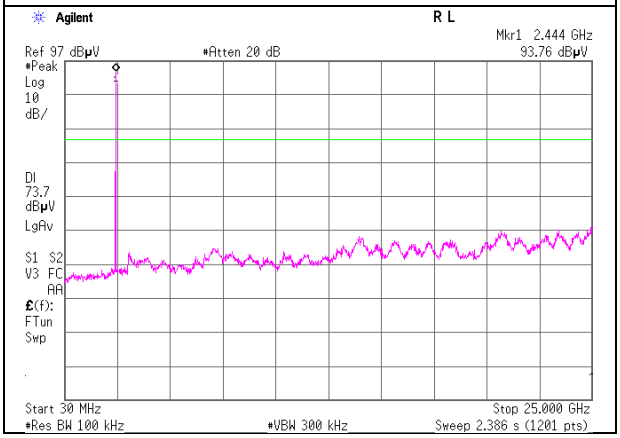
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

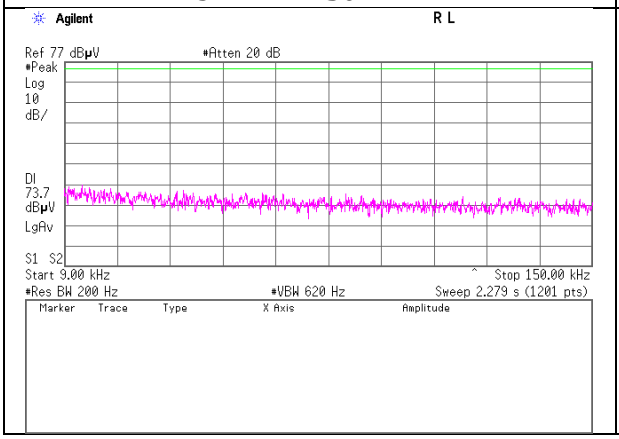


Conducted Spurious Emission

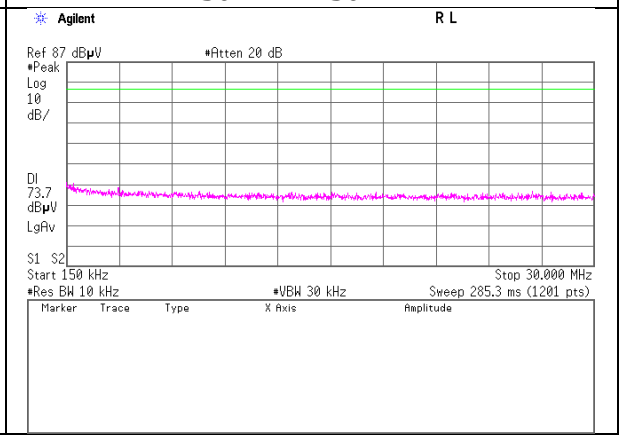
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5 (AT1603 Display Combined Type(T2))

2480 MHz

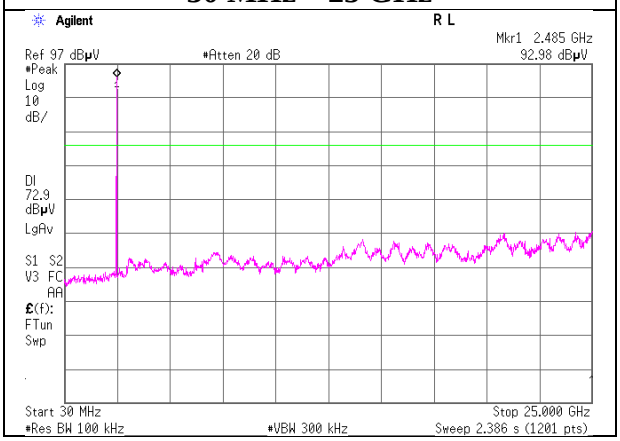
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

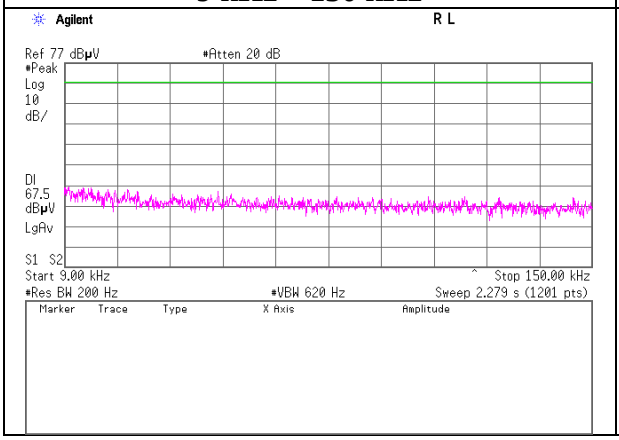


Conducted Spurious Emission

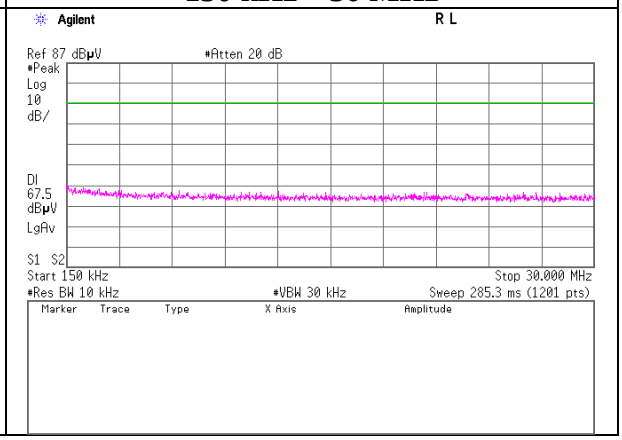
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5 (AT1603 Display Combined Type(T2))

2402 MHz

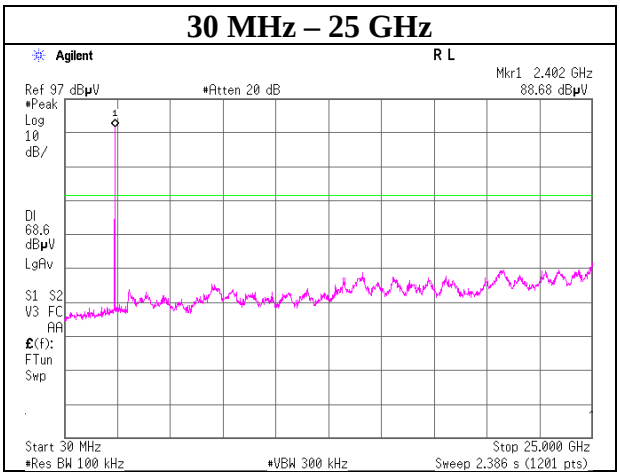
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

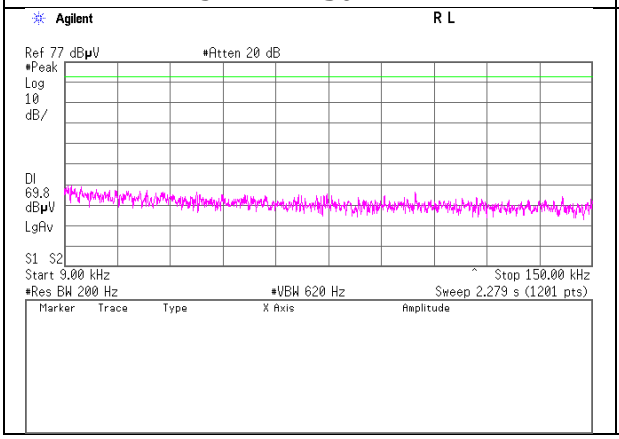


Conducted Spurious Emission

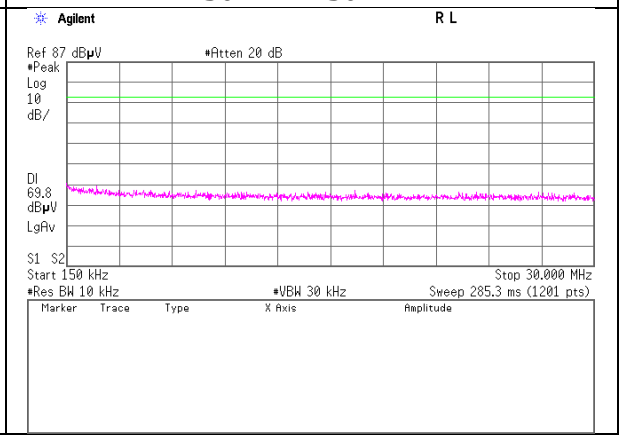
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5 (AT1603 Display Combined Type(T2))

2441 MHz

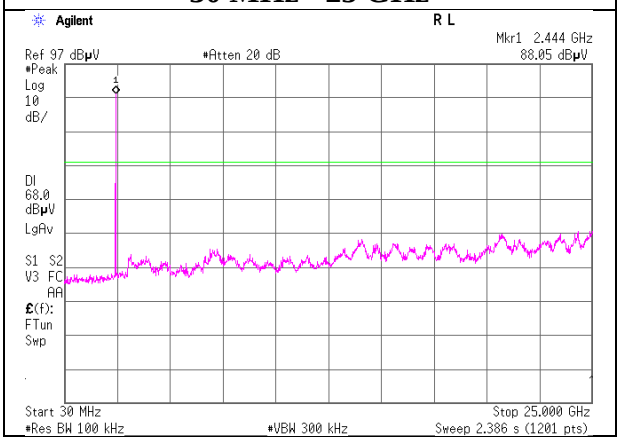
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

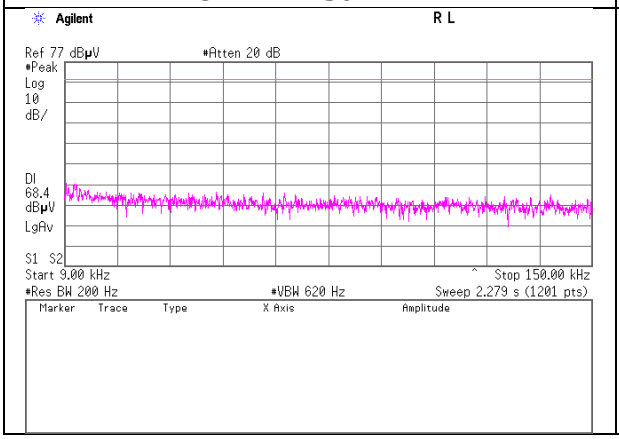


Conducted Spurious Emission

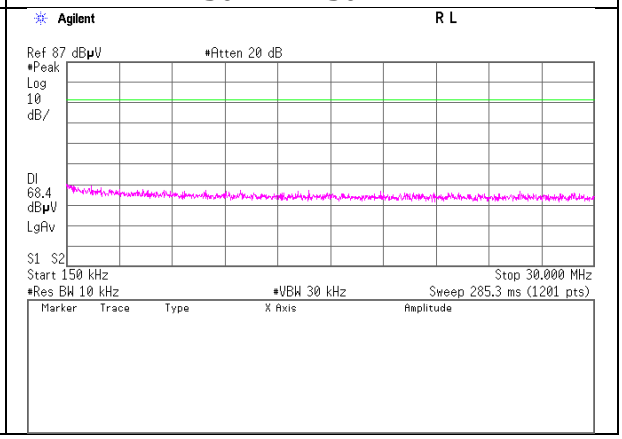
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5 (AT1603 Display Combined Type(T2))

2480 MHz

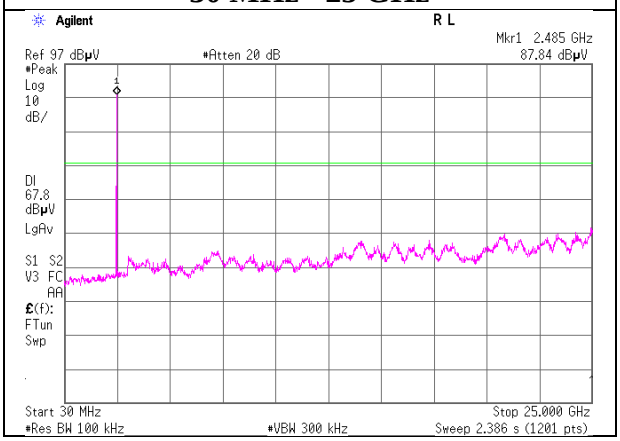
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

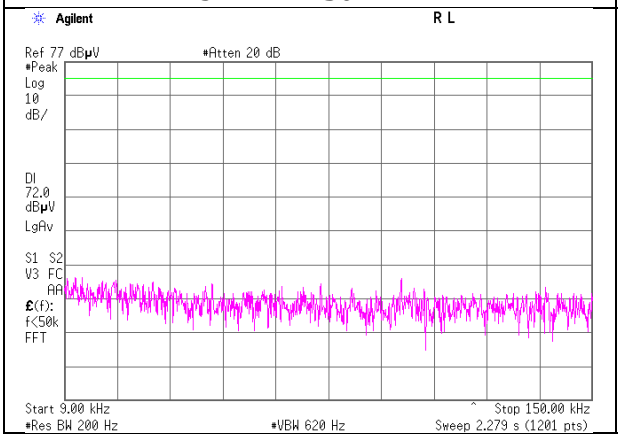


Conducted Spurious Emission

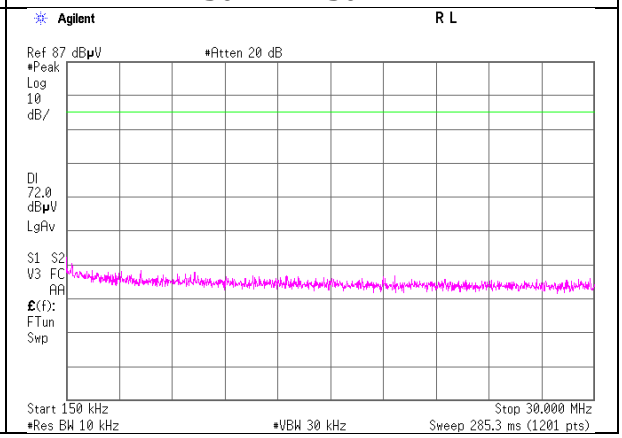
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5 (AT1603 Display Separated Type(L2))

2402 MHz

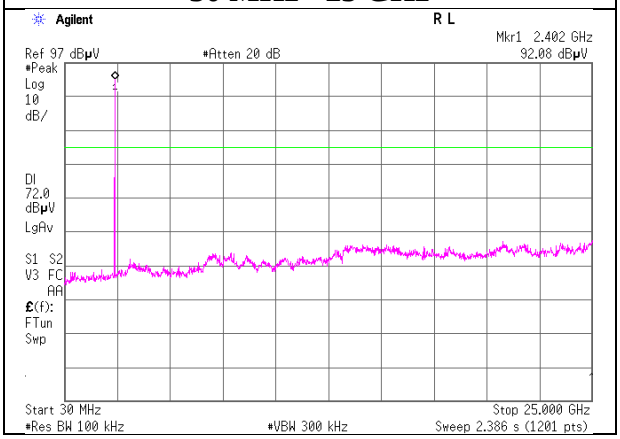
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

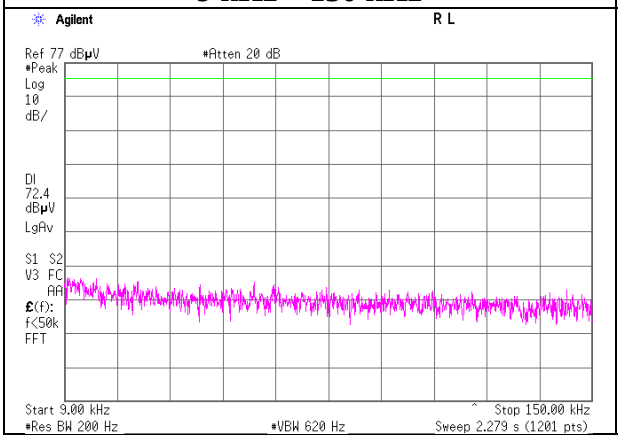


Conducted Spurious Emission

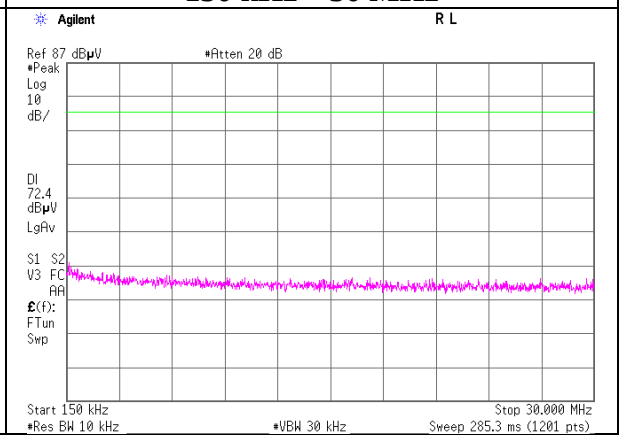
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5 (AT1603 Display Separated Type(L2))

2441 MHz

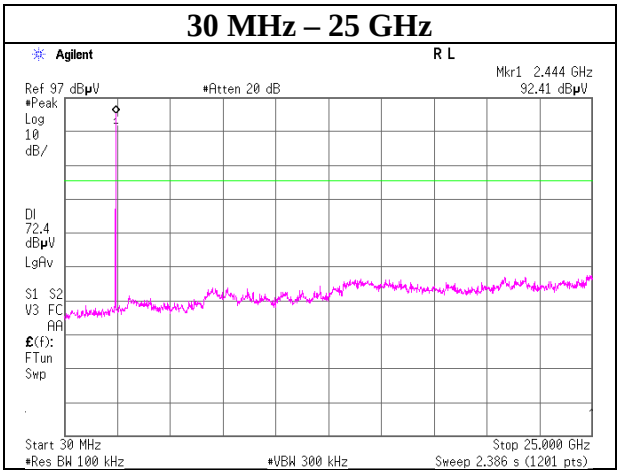
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

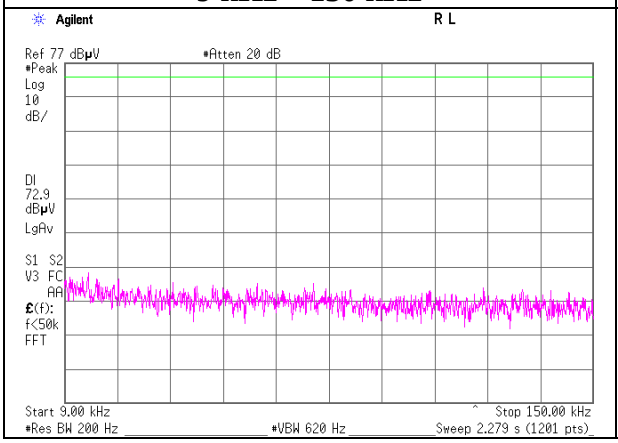


Conducted Spurious Emission

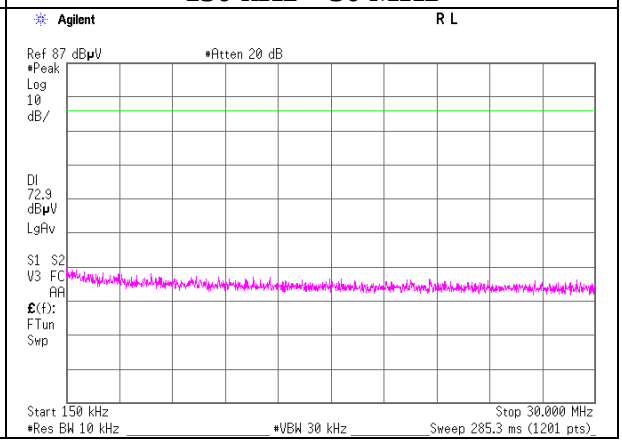
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5 (AT1603 Display Separated Type(L2))

2480 MHz

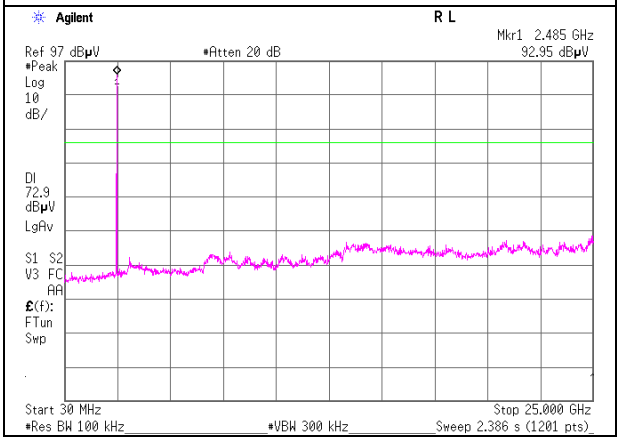
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

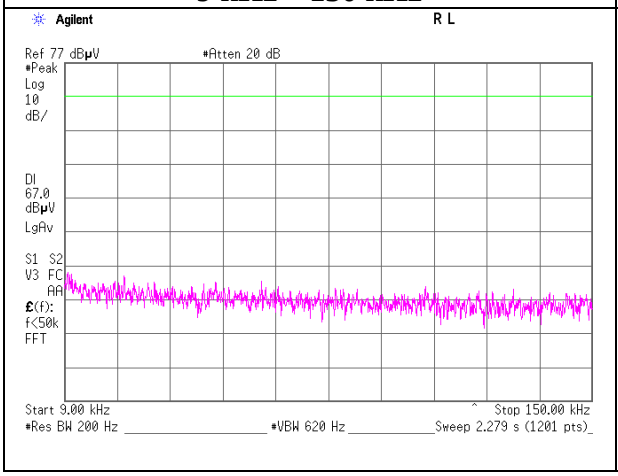


Conducted Spurious Emission

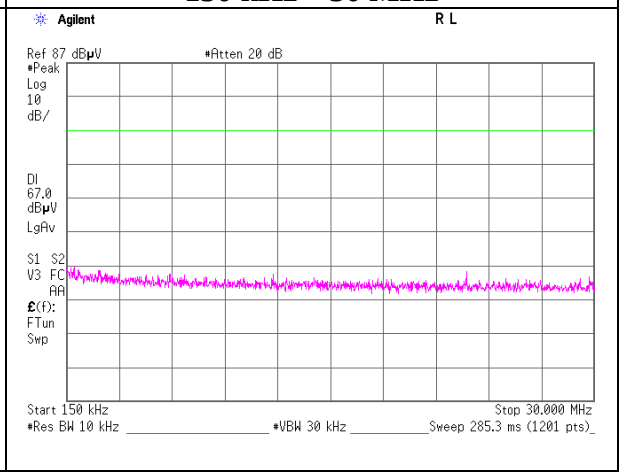
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5 (AT1603 Display Separated Type(L2))

2402 MHz

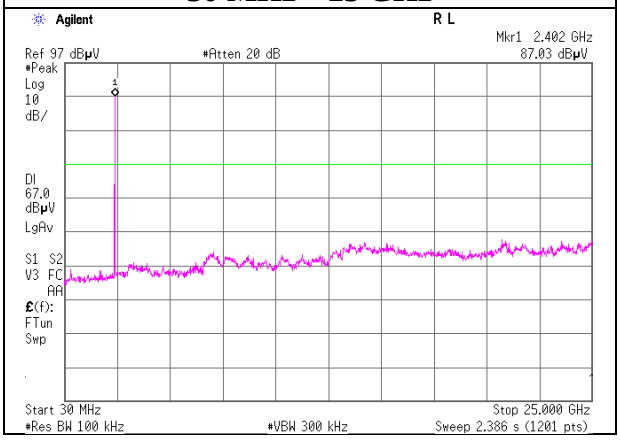
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

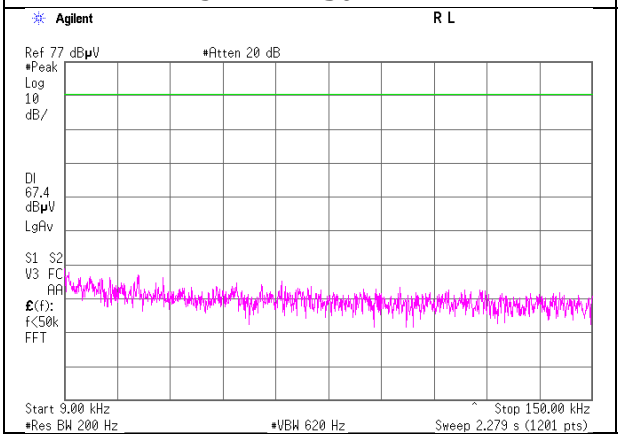


Conducted Spurious Emission

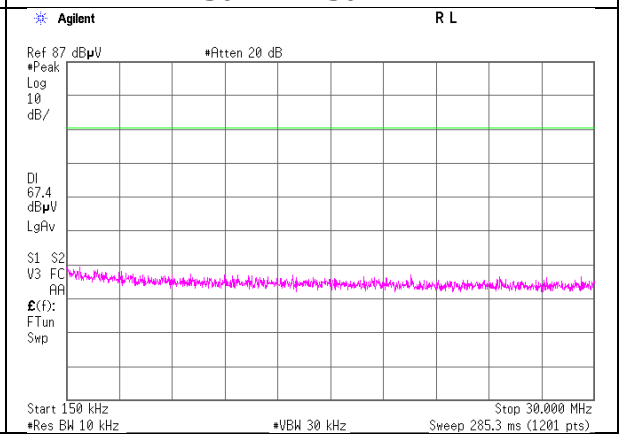
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5 (AT1603 Display Separated Type(L2))

2441 MHz

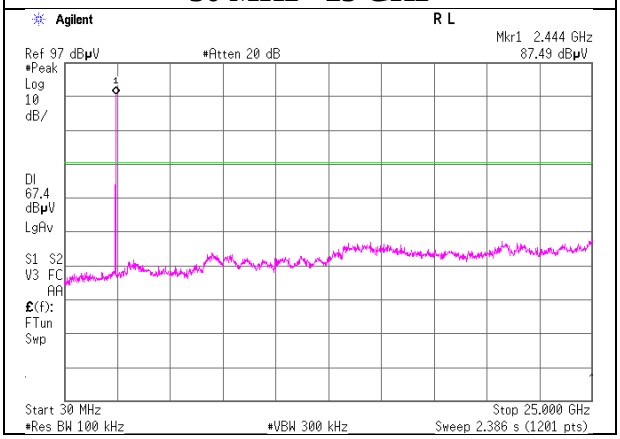
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

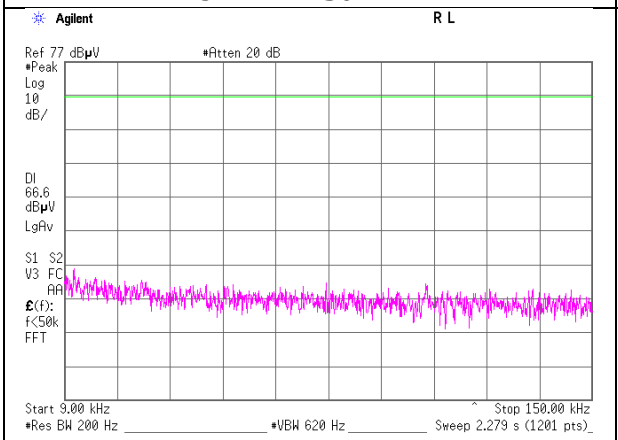


Conducted Spurious Emission

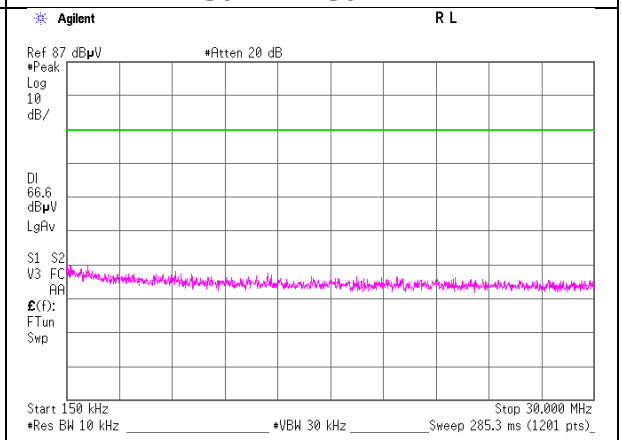
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5 (AT1603 Display Separated Type(L2))

2480 MHz

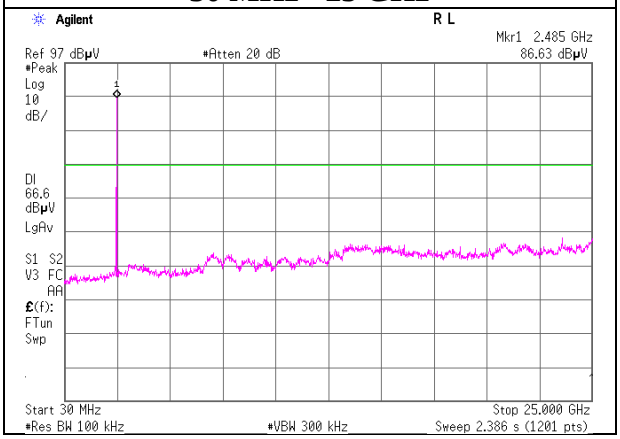
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

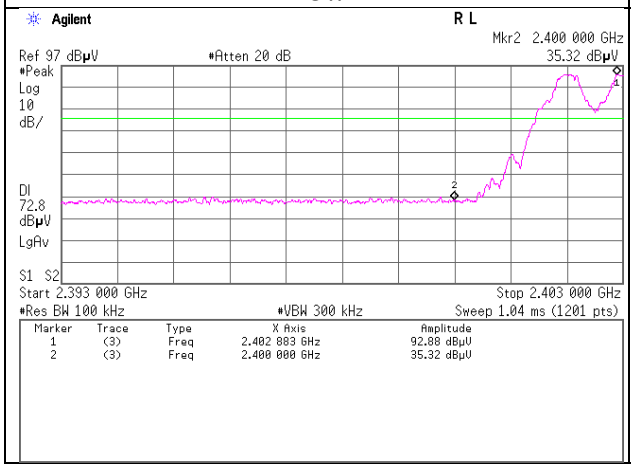


Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx DH5 (AT1603 Display Combined Type(T2))

Hopping On

Low



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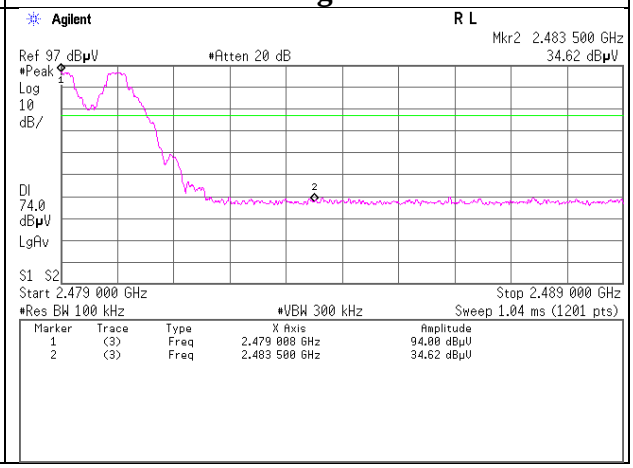

Hopping Off

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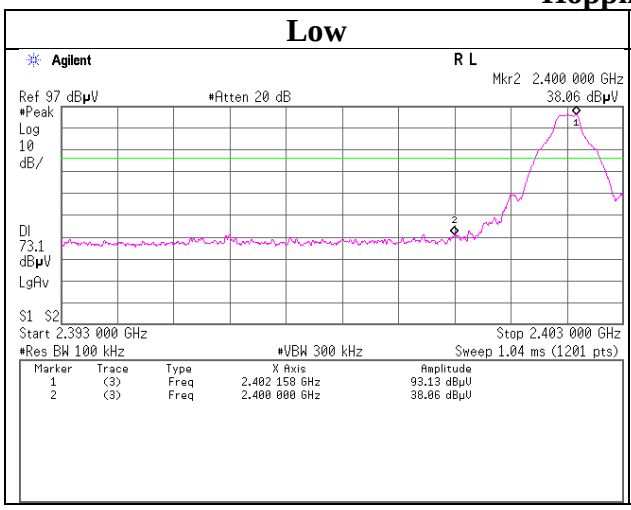

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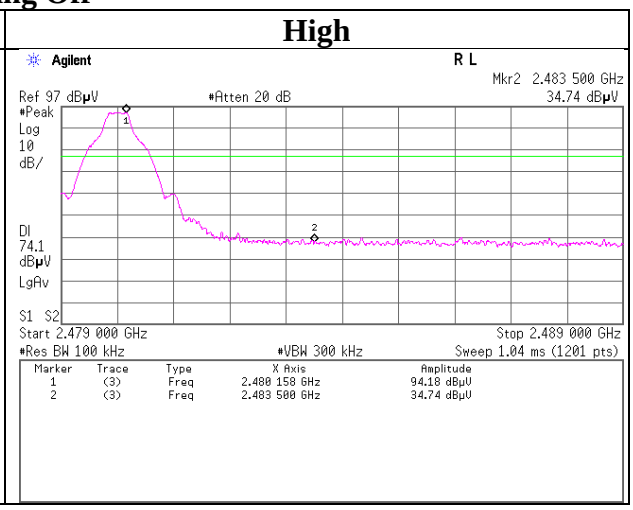
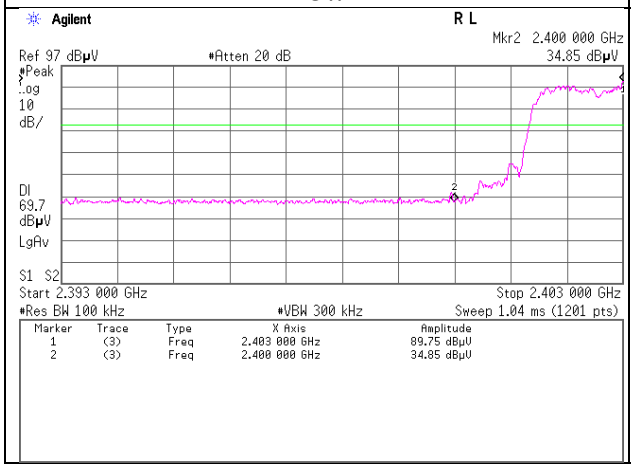


Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx 3DH5 (AT1603 Display Combined Type(T2))

Hopping On

Low



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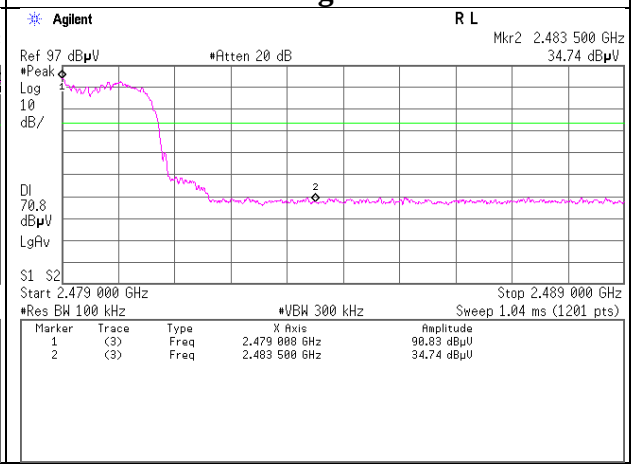

Hopping Off

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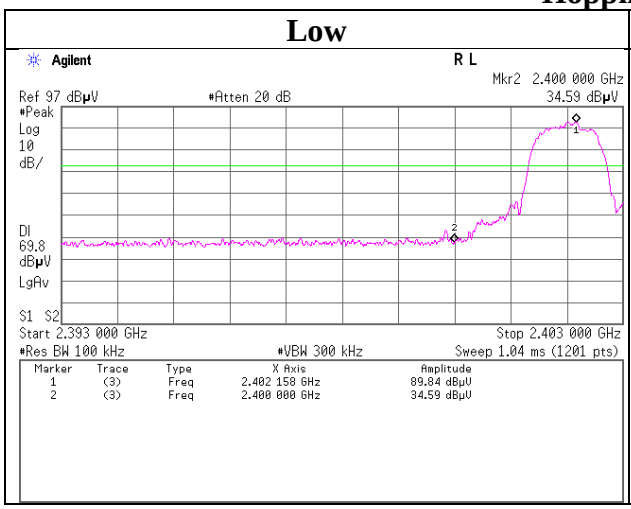

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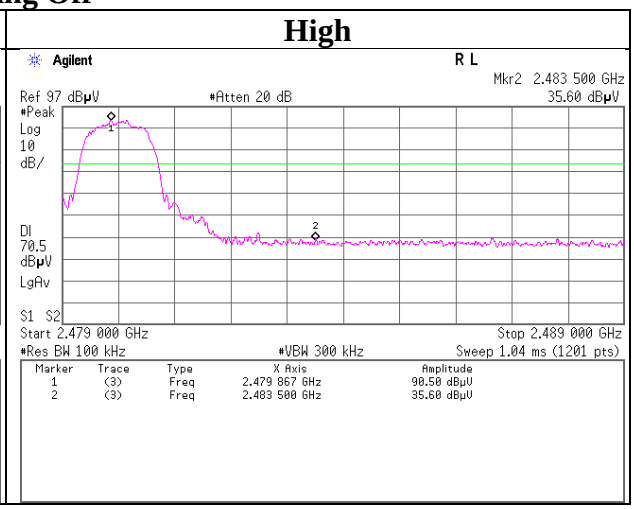
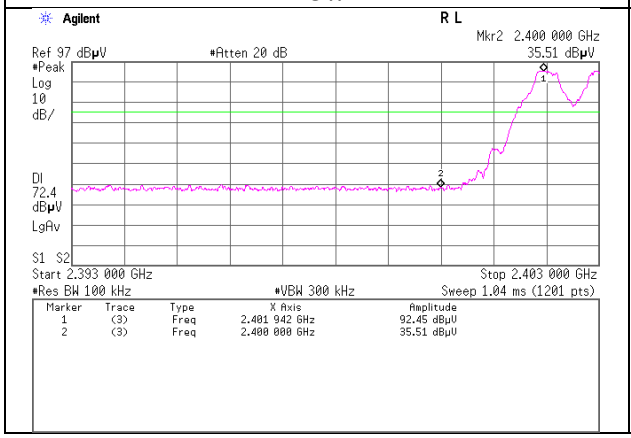


Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx DH5 (AT1603 Display Separated Type(L2))

Hopping On

Low



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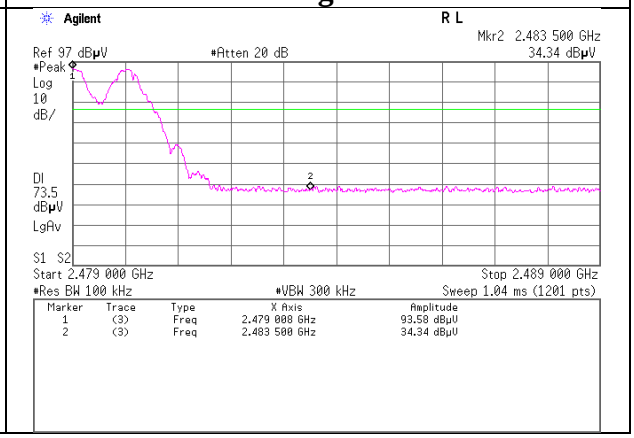
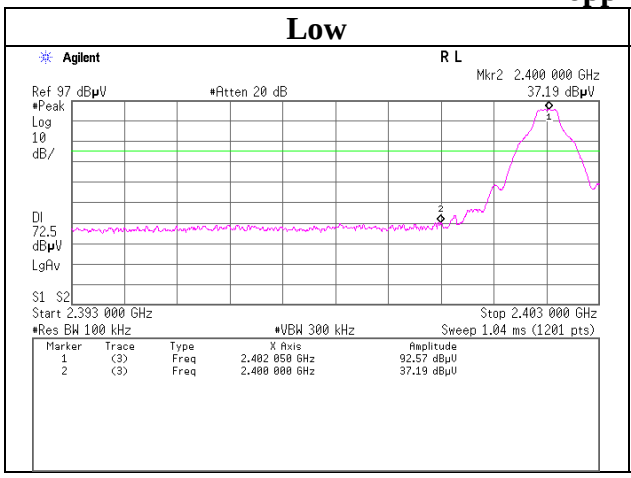


Hopping Off

Low



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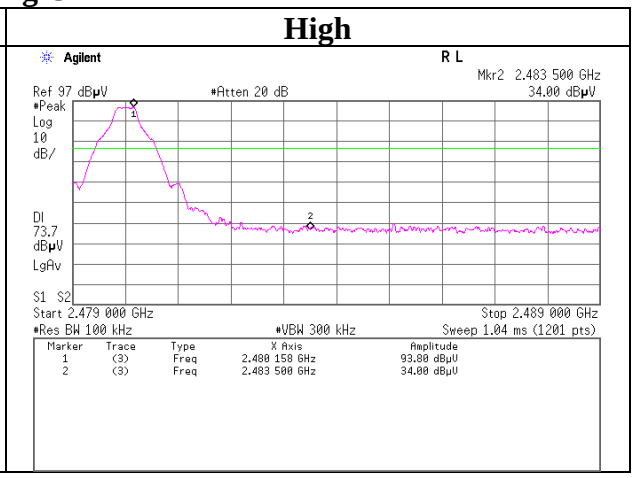
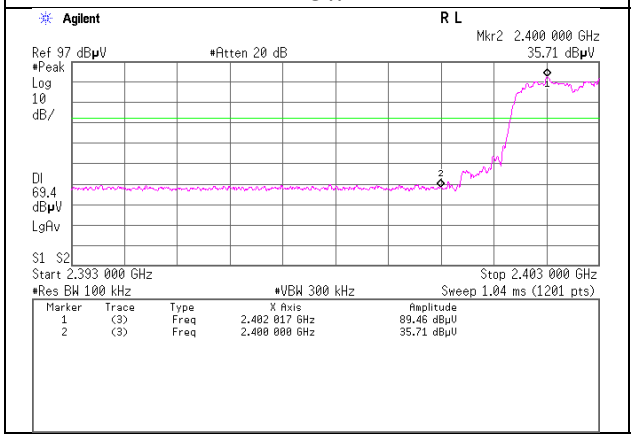


Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12170940S-B-R2
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx 3DH5 (AT1603 Display Separated Type(L2))

Hopping On

Low



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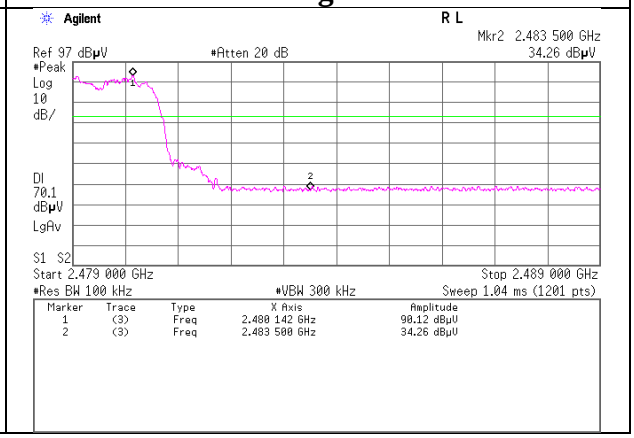

Hopping Off

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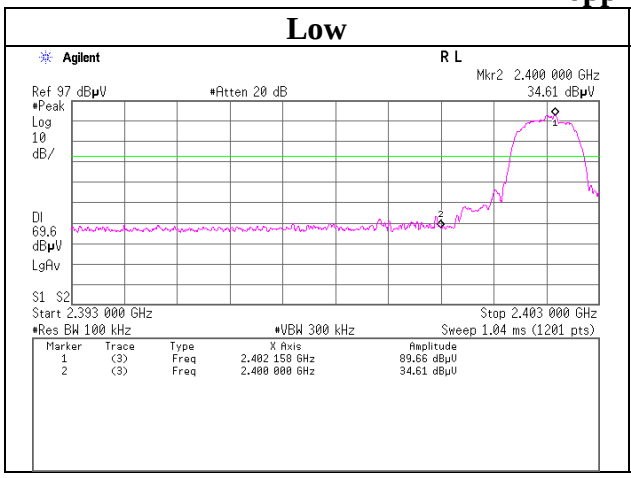

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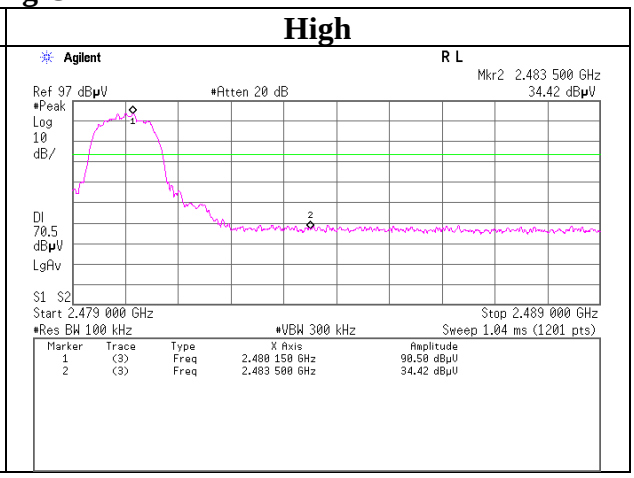

APPENDIX 2: Test instruments

Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2016/09/26 * 12 *1)
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2016/04/04 * 12 *1)
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2016/04/04 * 12 *1)
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2016/03/23 * 12 *1)
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2016/11/07 * 12 *1)
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12 *1)
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2016/10/17 * 12 *1)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2017/10/02 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2018/01/30 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2017/08/24 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2017/04/07 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2017/02/09 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE	2017/11/24 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2017/10/16 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2017/02/17 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2018/01/29 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2017/05/08 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2017/03/07 * 12
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2017/07/17 * 12
SAT10-05	Attenuator(above1 GHz)	Agilent	8493C-010	74864	RE	2017/11/22 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	RE	2018/01/29 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2017/04/20 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2018/01/29 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2017/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2017/09/22 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2017/03/23 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KMSKMS	-	RE	2017/04/20 * 12

***1) This test equipment was used for the tests before the expiration date of the calibration.**
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