RADIO TEST REPORT

Test Report No. : 12669312S-A-R1

Applicant	:	**CASIO COMPUTER CO., LTD.**
Type of Equipment	:	**RF Module**
Model No.	:	**WSD-F21**
FCC ID	:	**BBQ-WSDF21**
Test regulation	:	**FCC Part 15 Subpart C: 2018** * Bluetooth BDR/EDR part
Test Result	:	**Complied (Refer to SECTION 3.2)**

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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 limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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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. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 12669312S-A. 12669312S-A is replaced with this report.

Date of test: February 19 to March 8, 2019

Representative test engineer: K.Takeyama
Kazutaka Takeyama
Engineer
Consumer Technology Division

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

CERTIFICATE 1266.03

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

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REVISION HISTORY

Original Test Report No.: 12669312S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12669312S-A	March 14, 2019	-	-
1	12669312S-A-R1	March 20, 2019	P9	Correction of typo: From “*1)” to “*4)”. From “*2)” to “*5)”.
			P34	Delete the description about “1 cycle time “. Correction of typo: From “Dwell time factor” to “DCCF”.

CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	CASIO COMPUTER CO., LTD.
Address	:	2-1, Sakaecho 3 chome, Hamura-shi, Tokyo 205-8555 Japan
Telephone Number	:	+81-42-579-7282
Contact Person	:	Hiroaki Suzuki

The information provided from the customer is as follows;
- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	:	RF Module
Model No.	:	WSD-F21
Serial No.	:	Refer to SECTION 4, SECTION 4.2
Rating	:	DC 3.8 V (Battery), DC 5.0 V (USB)
Receipt Date of Sample (Information from test lab.)	:	February 4, 2019
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: WSD-F21 (referred to as the EUT in this report) is an RF Module.

Radio Specification

WLAN (IEEE802.11b/g/n-20)

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Modulation	:	DSSS, OFDM
Antenna type	:	Inverted L type
Antenna Gain	:	-6.9 dBi
Clock frequency (Maximum)	:	32.768 kHz

Bluetooth (Ver. 4.2 with EDR function)

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	BT: FHSS (GFSK, π/4DQPSK, 8DPSK) LE: GFSK
Antenna type	:	Inverted L type
Antenna Gain	:	-6.9 dBi
Clock frequency (Maximum)	:	32.768 kHz

*This test report applies for Bluetooth parts.
**Wireless LAN and Bluetooth and Bluetooth Low Energy do not transmit simultaneously.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on March 12, 2018 and effective April 11, 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

3.2 Procedures and results

Item	Procedure	cification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	22.9 dB, (DC 5 V line) 0.58780 MHz, AV, N, Tx, DH5, 2480 MHz	Complied a)	-
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
Carrier Frequency Separation	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section15.247(a)(1)	See data.	Complied b)	Conducted
	IC: -	**IC:** RSS-247 5.1 (b)			
20dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section15.247(a)(1)		Complied b)	Conducted
	IC: -	**IC:** RSS-247 5.1 (a)			
Number of Hopping Frequency	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section15.247(a)(1)(iii)		Complied c)	Conducted
	IC: -	**IC:** RSS-247 5.1 (d)			
Dwell time	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section15.247(a)(1)(iii)		Complied d)	Conducted
	IC: -	**IC:** RSS-247 5.1 (d)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section15.247(a)(b)(1)		Complied e)	Conducted
	IC: RSS-Gen 6.12	**IC:** RSS-247 5.4 (b)			
Spurious Emission & Band Edge Compliance	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section15.247(d)	12.7 dB 2483.500 MHz, PK, Vert. Tx, Hopping Off, DH5 2480 MHz	Complied f)/g)	Conducted/ Radiated (above 30 MHz) *1)
	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) Radiated test was selected over 30 MHz based on section 15.247(d).
a) Refer to APPENDIX 1 (data of Conducted Emission)b) Refer to APPENDIX 1(data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)
c) Refer to APPENDIX 1 (data of Number of Hopping Frequency)
d) Refer to APPENDIX 1 (data of Dwell time)
e) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
f) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
g) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:

Complied	The data of this test item has enough margin, more than the measurement uncertainty.
Complied#	The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

FCC Part 15.31 (e)
The RF Module is constantly provided voltage through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

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

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	RSS-Gen 6.7	**IC:** -	N/A	- a)	Conducted
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					

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

3.4 Uncertainty

EMI

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)		
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.9 dB	2.8 dB	2.9 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.1 dB
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.7 dB
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.1 dB
	1 GHz-6 GHz	4.8 dB	4.8 dB	4.8 dB
	6 GHz-18 GHz	5.4 dB	5.4 dB	5.4 dB
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.7 dB	5.7 dB	5.7 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	0.81 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.53 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.95 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.21 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.90 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.04 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.3 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.4 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	0.61 %
Duty cycle and Time Measurement	0.012 %

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
A2LA Certificate Number: 1266.03
FCC Test Firm Registration Number: 626366

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

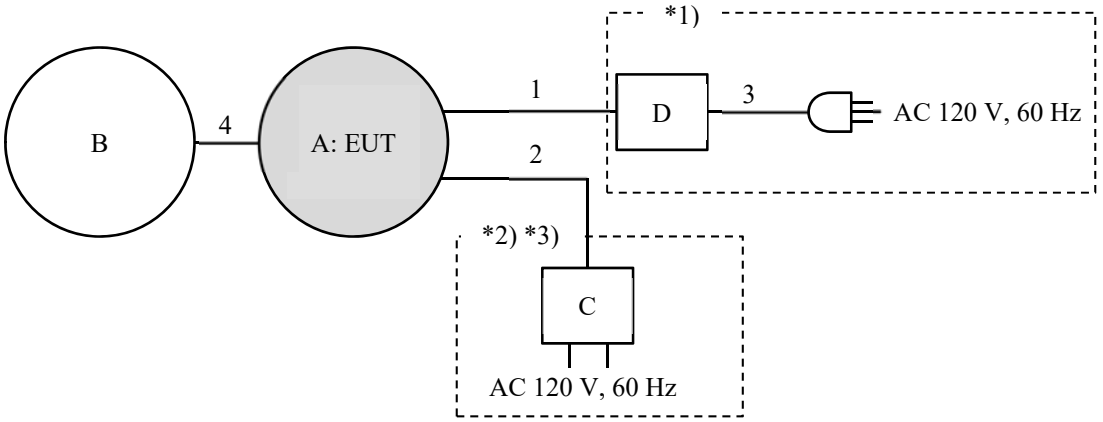
Details of Operating Mode(s)

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

*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)
*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.
*EUT has the power settings by the software as follows;
Power settings: BDR: Fixed
EDR: Fixed
Software: WSD-F21-radio ver1.0

*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



*1) It is Open during Conducted Emission test with DC 5.0 V line.
*2) It is Open during Radiated Emission test and Conducted Emission test with DC 3.8 V line.
*3) Radiated emission has been tested with power supply of DC 3.8 V representatively. The RF part is constantly provided voltage through the regulator and it has been confirmed that the variation of power supply does not affect the test result.
* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RF Module	WSD-F21	1 *4) 3 *5)	CASIO COMPUTER CO., LTD.	EUT
B	LCD	-	-	CASIO COMPUTER CO., LTD.	-
C	AC Adapter	AD-W50100U1	-	CASIO COMPUTER CO., LTD.	-
D	Power Supply(DC)	PAN60-10A	DE001677	Kikusui	-

*4) Used for Antenna Terminal conducted test
*5) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.2 + 2.0	Unshielded	Unshielded	-
2	USB Cable	0.4	Shielded	Shielded	-
3	AC Cable	3.0	Unshielded	Unshielded	-
4	Signal	0.01	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

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

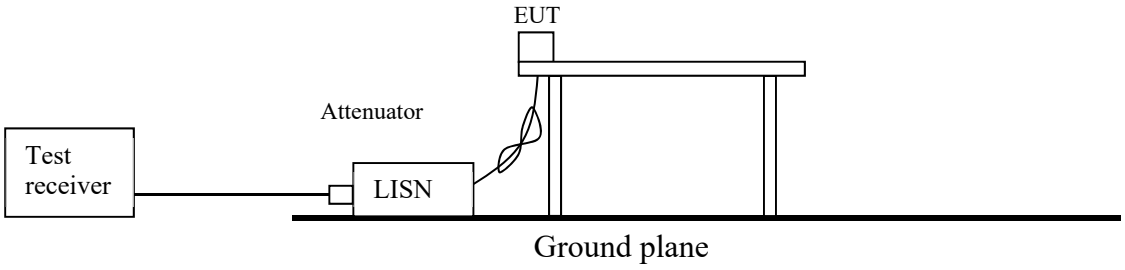
For the tests on EUT itself (as a standalone equipment)
Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN / (AMN) to the input power source.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Sheilded room.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

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

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission

Test Procedure

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

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

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

Test Antennas are used as below;

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

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

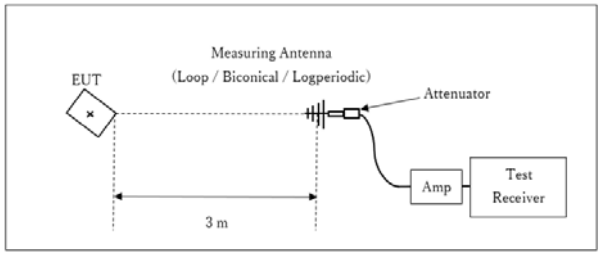
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1) *2)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	-	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r01.
*2) Measurement with Average detector was not performed. The limit for Average detector is applied to the measurement value with Peak detector used Duty cycle correction factor (DCCF).

Figure 2: Test Setup

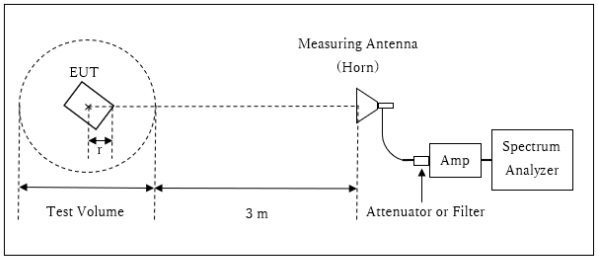
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz

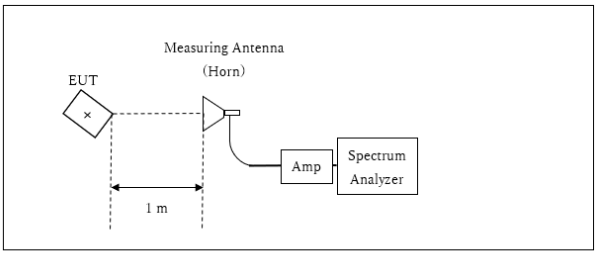


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.92 m / 3.0 m) = 2.32 dB
* Test Distance: (3 + Test Volume /2) - r = 3.92 m

Test Volume : 2.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.08 m

13 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 dB
*Test Distance: 1 m

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Frequency / Test / Antenna	Carrier	Spurious			
		30 MHz-1 GHz	1 GHz -13 GHz	13 GHz -18 GHz	18 GHz -26.5 GHz
Horizontal	X	Y	X	X	X
Vertical	Y	Y	Y	X	X

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

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

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50 MHz 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 %. Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) In the frequency range below 30 MHz, 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.
The equipment and cables were not used for factor 0 dB of the data sheets.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

(DC 3.8 V line)

DATA OF CONDUCTED EMISSION TEST

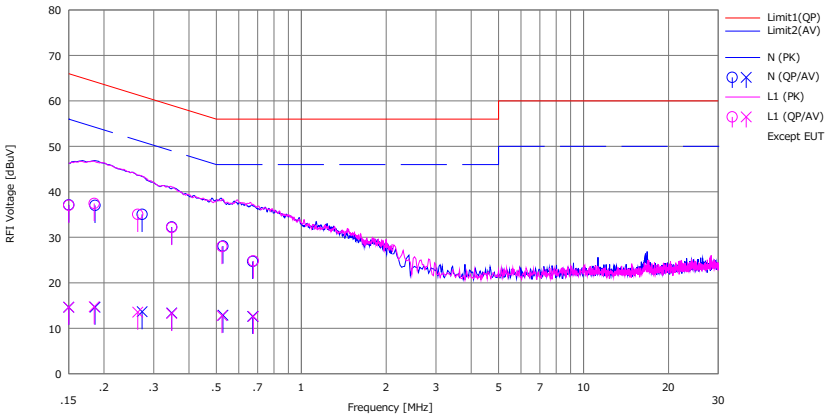
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2019/03/07

Mode : Tx DH5_2480 MHz

Power : AC 120 V / 60 Hz (EUT input: DC 3.8 V)
Temp./Humi. : 22 deg.C / 40 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yosuke Ishikawa



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)		(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	24.70	2.20	12.44	37.14	14.64	66.00	56.00	28.8	41.3	N	
2	0.18580	24.60	2.20	12.43	37.03	14.63	64.22	54.22	27.1	39.5	N	
3	0.27300	22.60	1.20	12.45	35.05	13.65	61.03	51.03	25.9	37.3	N	
4	0.34770	19.80	0.90	12.46	32.26	13.36	59.02	49.02	26.7	35.6	N	
5	0.52780	15.60	0.40	12.47	28.07	12.87	56.00	46.00	27.9	33.1	N	
6	0.67250	12.20	0.10	12.50	24.70	12.60	56.00	46.00	31.3	33.4	N	
7	0.15000	24.60	2.20	12.44	37.04	14.64	66.00	56.00	28.9	41.3	L1	
8	0.18460	25.00	2.30	12.44	37.44	14.74	64.28	54.28	26.8	39.5	L1	
9	0.26341	22.60	1.10	12.45	35.05	13.55	61.32	51.32	26.2	37.7	L1	
10	0.34740	19.70	0.80	12.46	32.16	13.26	59.02	49.02	26.8	35.7	L1	
11	0.52390	15.50	0.30	12.47	27.97	12.77	56.00	46.00	28.0	33.2	L1	
12	0.67600	12.30	0.10	12.51	24.81	12.61	56.00	46.00	31.1	33.3	L1	

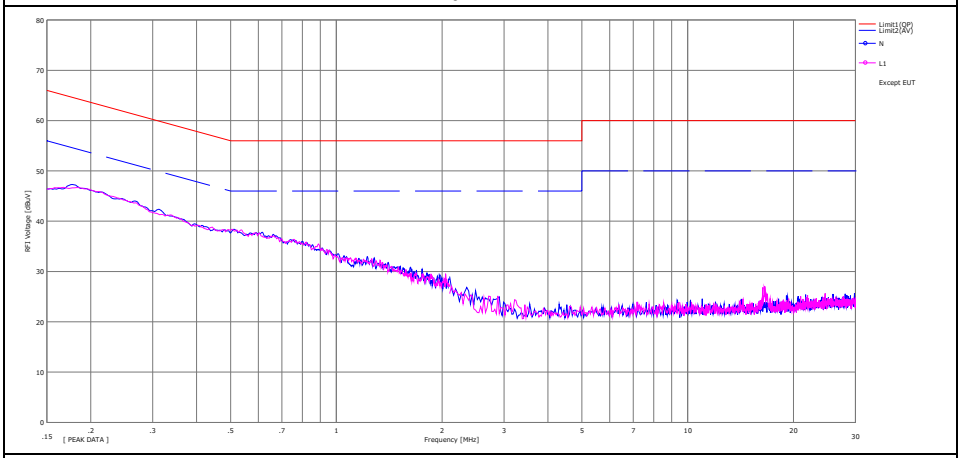
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN+Cable+ATT)[dB]
LISN: SLS-02

Conducted Emission

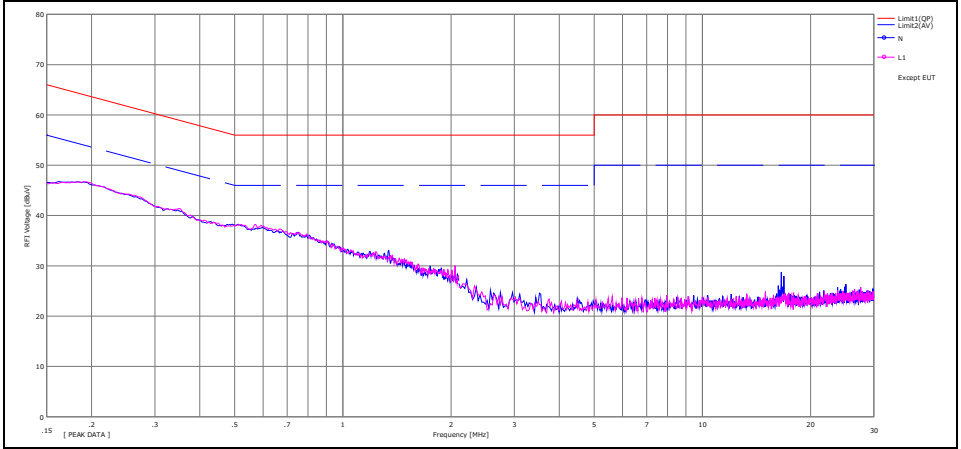
(DC 3.8 V line)

Test place	Shonan EMC Lab. No.3 Shielded room
Report No.	12669312S-A-R1
Date	March 7, 2019
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5

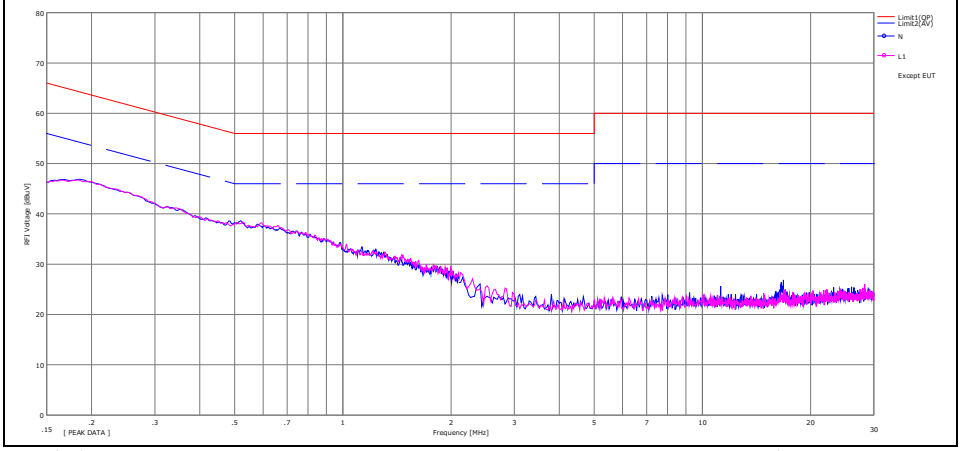
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

Conducted Emission

(DC 3.8 V line)

DATA OF CONDUCTED EMISSION TEST

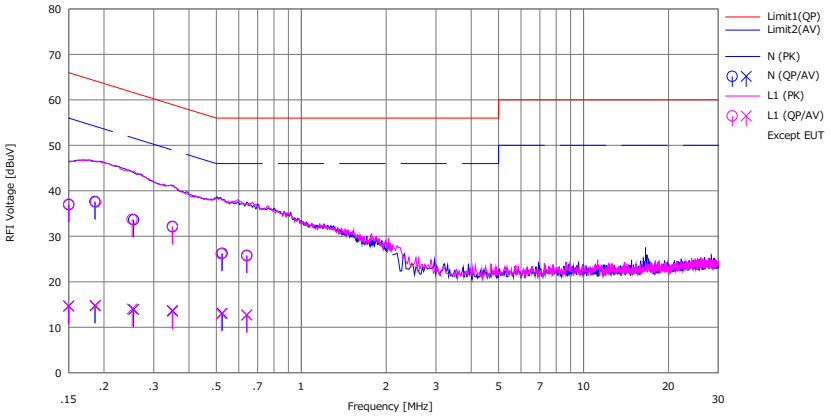
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2019/03/07

Mode : Tx 3DH5 2480 MHz

Power : AC 120 V / 60 Hz (EUT input: DC 3.8 V)
Temp./Humi. : 22 deg.C / 40 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yosuke Ishikawa



No.	Freq.	Reading ⟨QP⟩	Reading ⟨AV⟩	C.Fac	Results ⟨QP⟩	Results ⟨AV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	24.50	2.20	12.44	36.94	14.64	66.00	56.00	29.0	41.3	N	
2	0.18570	25.20	2.30	12.43	37.63	14.73	64.23	54.23	26.6	39.5	N	
3	0.25470	21.20	1.50	12.44	33.64	13.94	61.60	51.60	27.9	37.6	N	
4	0.34940	19.70	1.20	12.46	32.16	13.66	58.98	48.98	26.8	35.3	N	
5	0.52439	13.80	0.60	12.47	26.27	13.07	56.00	46.00	29.7	32.9	N	
6	0.64110	13.30	0.20	12.50	25.80	12.70	56.00	46.00	30.2	33.3	N	
7	0.15000	24.60	2.30	12.44	37.04	14.74	66.00	56.00	28.9	41.2	L1	
8	0.18670	25.10	2.30	12.43	37.53	14.73	64.18	54.18	26.6	39.4	L1	
9	0.25140	21.30	1.60	12.44	33.74	14.04	61.71	51.71	27.9	37.6	L1	
10	0.34980	19.60	1.00	12.46	32.06	13.46	58.97	48.97	26.9	35.5	L1	
11	0.52059	13.70	0.50	12.47	26.17	12.97	56.00	46.00	29.8	33.0	L1	
12	0.64120	13.20	0.20	12.50	25.70	12.70	56.00	46.00	30.3	33.3	L1	

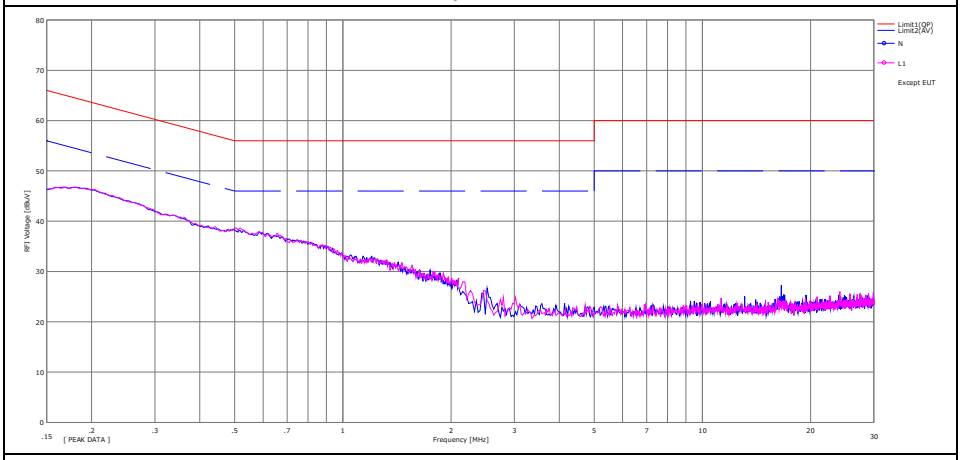
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN+Cable+ATT)[dB]
LISN: SLS-02

Conducted Emission

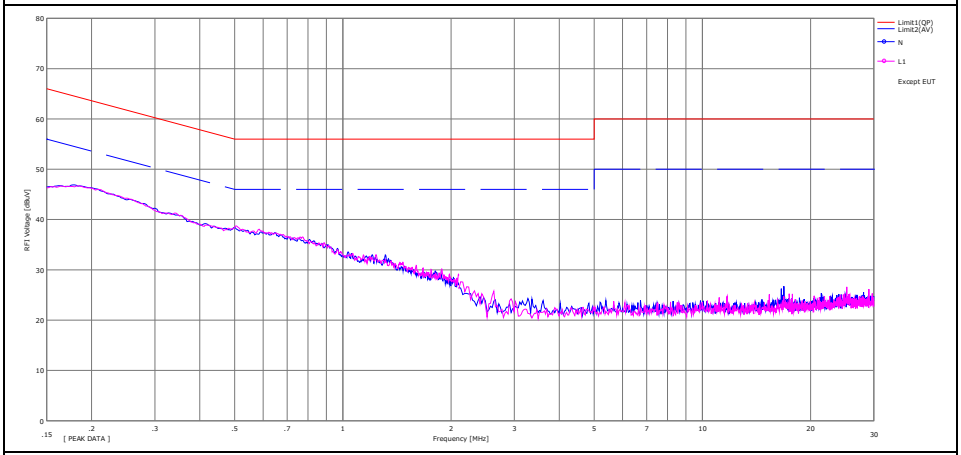
(DC 3.8 V line)

Test place	Shonan EMC Lab. No.3 Shielded room
Report No.	12669312S-A-R1
Date	March 7, 2019
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3-DH5

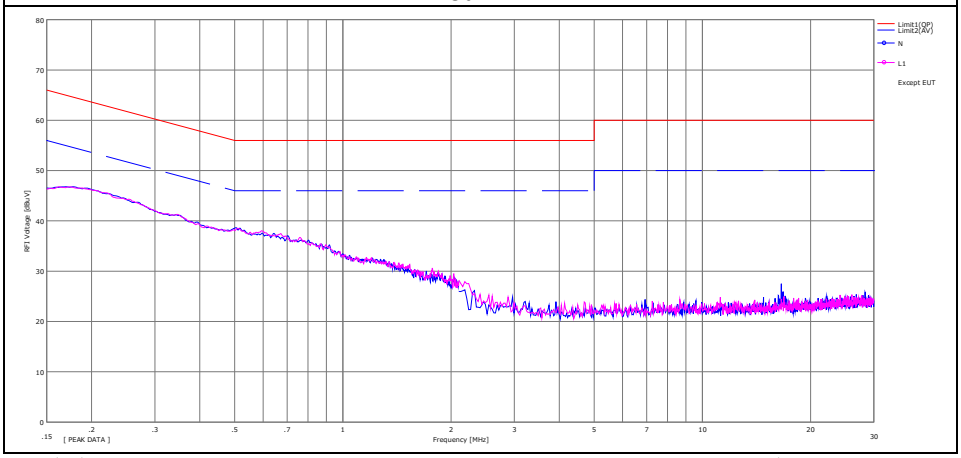
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

Conducted Emission

(DC 5.0 V line)

DATA OF CONDUCTED EMISSION TEST

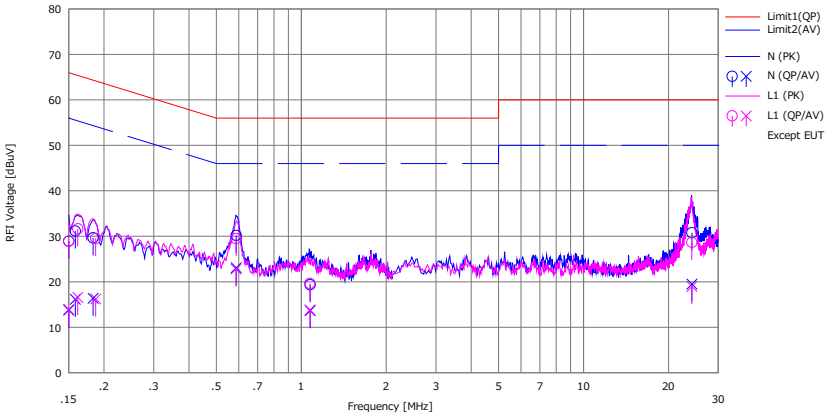
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2019/03/08

Mode : Tx DH5_2480 MHz

Power : DC 5 V (AC adapter input: AC 120 V / 60 Hz)
Temp./Humi. : 22 deg.C / 40 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yosuke Ishikawa



No.	Freq.	Reading ⟨QP⟩	Reading ⟨AV⟩	C.Fac	Results ⟨QP⟩	Results ⟨AV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	16.50	1.30	12.44	28.94	13.74	66.00	56.00	37.0	42.2	N	
2	0.15830	18.70	3.70	12.45	31.15	16.15	65.55	55.55	34.4	39.4	N	
3	0.18290	17.20	3.90	12.44	29.64	16.34	64.35	54.35	34.7	38.0	N	
4	0.58780	17.70	10.60	12.49	30.19	23.09	56.00	46.00	25.8	22.9	N	
5	1.07440	6.80	1.10	12.53	19.33	13.63	56.00	46.00	36.6	32.3	N	
6	24.20929	17.30	6.00	13.47	30.77	19.47	60.00	50.00	29.2	30.5	N	
7	0.15000	16.50	1.50	12.44	28.94	13.94	66.00	56.00	37.0	42.0	L1	
8	0.16150	19.20	4.10	12.45	31.65	16.55	65.39	55.39	33.7	38.8	L1	
9	0.18690	17.10	3.80	12.43	29.53	16.23	64.17	54.17	34.6	37.9	L1	
10	0.58700	17.00	10.30	12.49	29.49	22.79	56.00	46.00	26.5	23.2	L1	
11	1.07330	7.10	1.30	12.53	19.63	13.83	56.00	46.00	36.3	32.1	L1	
12	24.20280	15.20	5.50	13.47	28.67	18.97	60.00	50.00	31.3	31.0	L1	

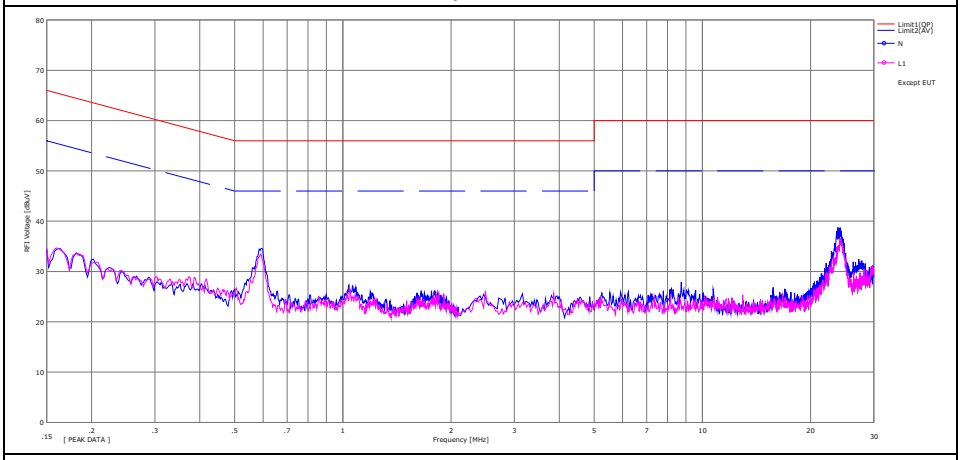
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN+Cable+ATT)[dB]
LISN: SLS-02

Conducted Emission

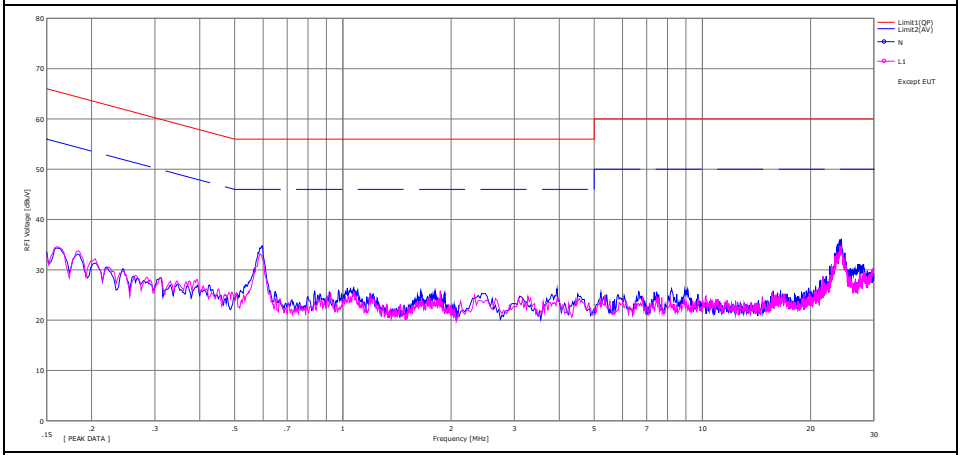
(DC 5.0 V line)

Test place	Shonan EMC Lab. No.3 Shielded room
Report No.	12669312S-A-R1
Date	March 8, 2019
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5

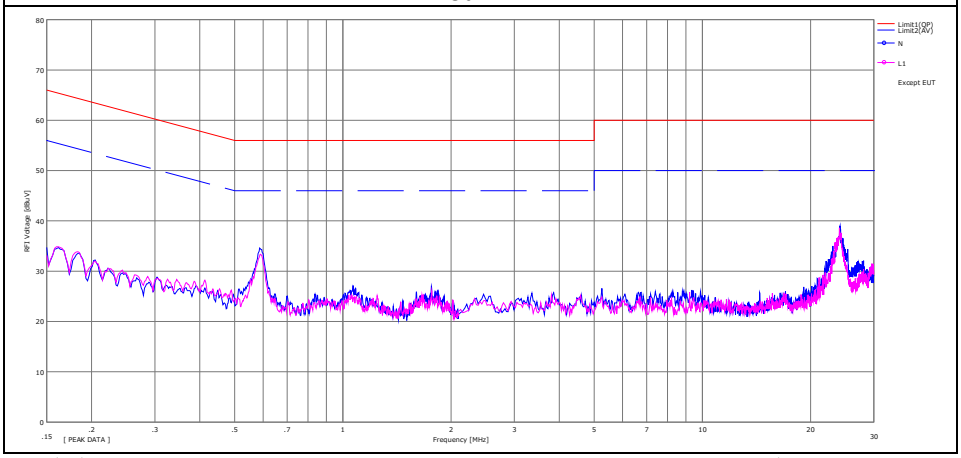
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

Conducted Emission

(DC 5.0 V line)

DATA OF CONDUCTED EMISSION TEST

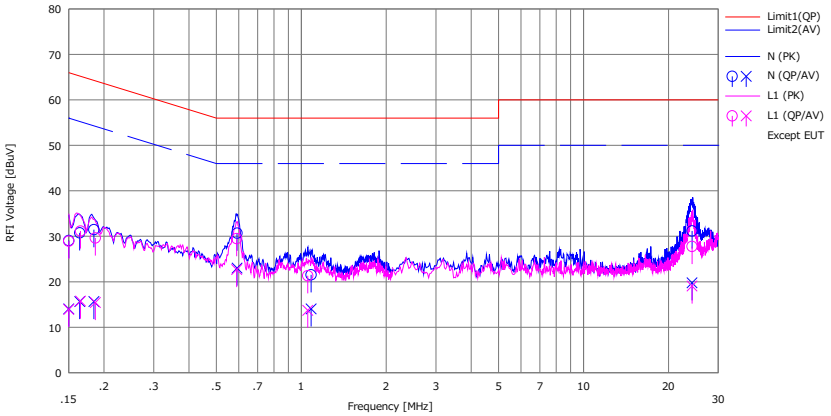
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2019/03/08

Mode : Tx 3DH5_2480 MHz

Power : DC 5 V (AC adapter input: AC 120 V / 60 Hz)
Temp./Humi. : 22 deg.C / 40 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yosuke Ishikawa



No.	Freq.	Reading ⟨QP⟩	Reading ⟨AV⟩	C.Fac	Results ⟨QP⟩	Results ⟨AV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	16.60	1.60	12.44	29.04	14.04	66.00	56.00	36.9	41.9	N	
2	0.16400	18.30	3.20	12.45	30.75	15.65	65.26	55.26	34.5	39.6	N	
3	0.18410	19.00	3.20	12.44	31.44	15.64	64.30	54.30	32.8	38.6	N	
4	0.59200	18.20	10.50	12.49	30.69	22.99	56.00	46.00	25.3	23.0	N	
5	1.08347	9.00	1.50	12.53	21.53	14.03	56.00	46.00	34.4	31.9	N	
6	24.23018	17.70	6.30	13.47	31.17	19.77	60.00	50.00	28.8	30.2	N	
7	0.15000	16.50	1.50	12.44	28.94	13.94	66.00	56.00	37.0	42.0	L1	
8	0.16510	18.70	3.30	12.46	31.16	15.76	65.20	55.20	34.0	39.4	L1	
9	0.18640	17.20	3.00	12.43	29.63	15.43	64.20	54.20	34.5	38.7	L1	
10	0.59060	17.00	10.20	12.49	29.49	22.69	56.00	46.00	26.5	23.3	L1	
11	1.05400	8.80	1.20	12.53	21.33	13.73	56.00	46.00	34.6	32.2	L1	
12	24.22679	14.30	5.60	13.47	27.77	19.07	60.00	50.00	32.2	30.9	L1	

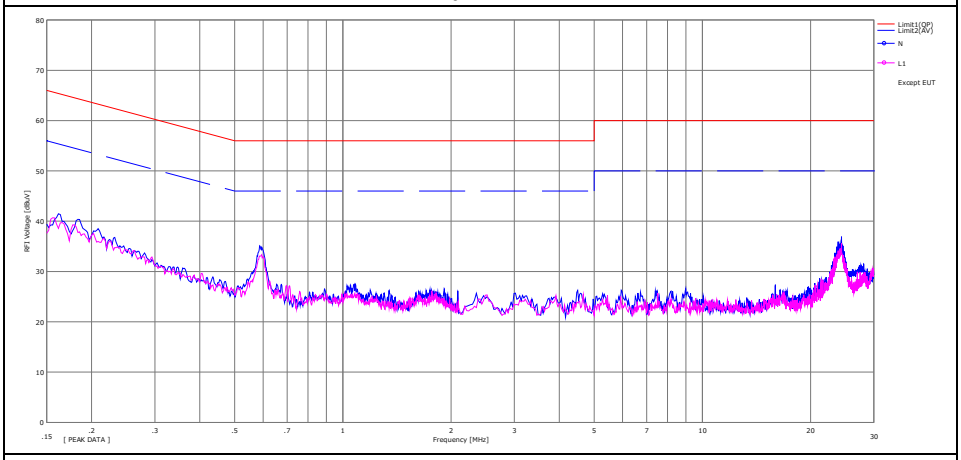
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN+Cable+ATT)[dB]
LISN: SLS-02

Conducted Emission

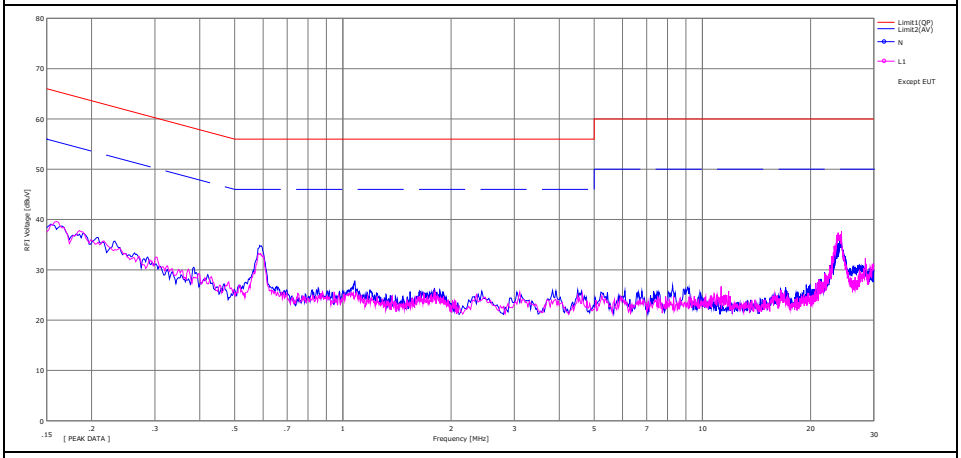
(DC 5.0 V line)

Test place	Shonan EMC Lab. No.3 Shielded room
Report No.	12669312S-A-R1
Date	March 8, 2019
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3-DH5

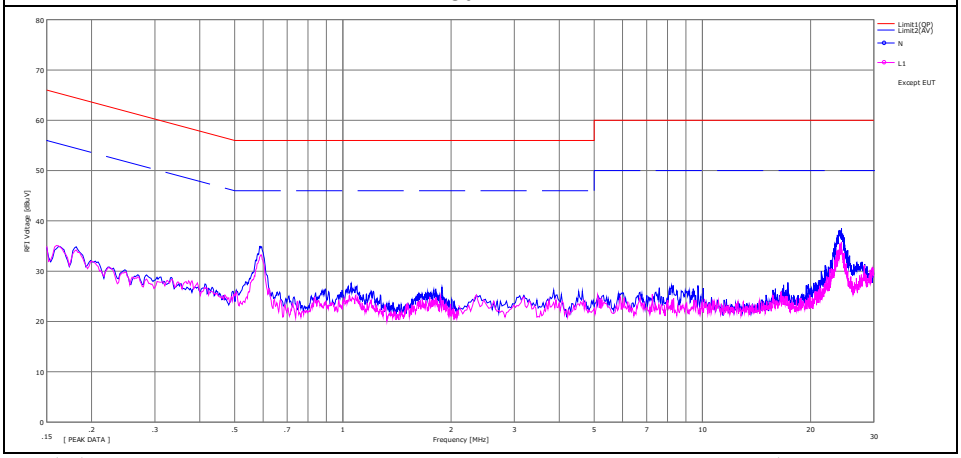
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

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

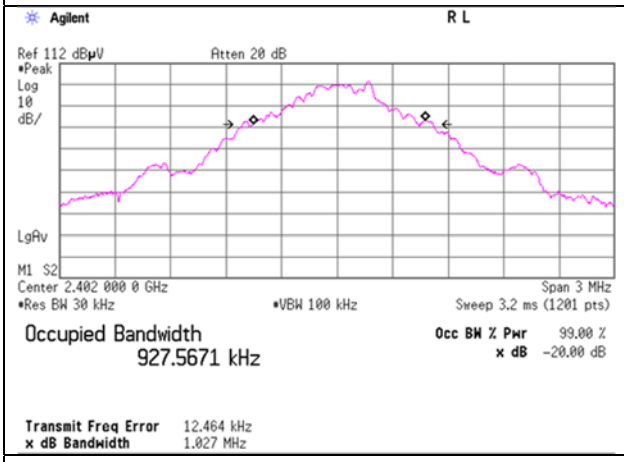
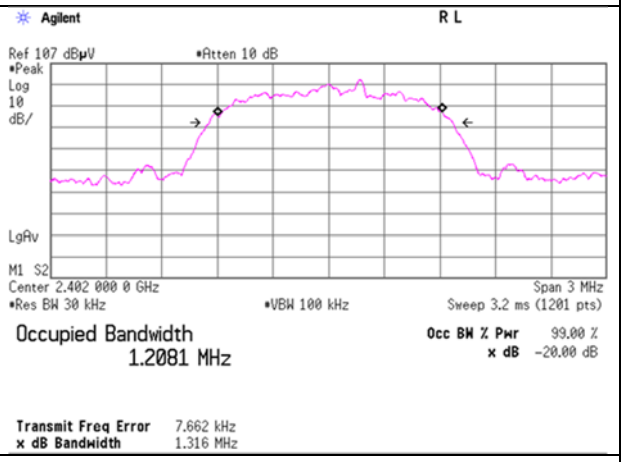
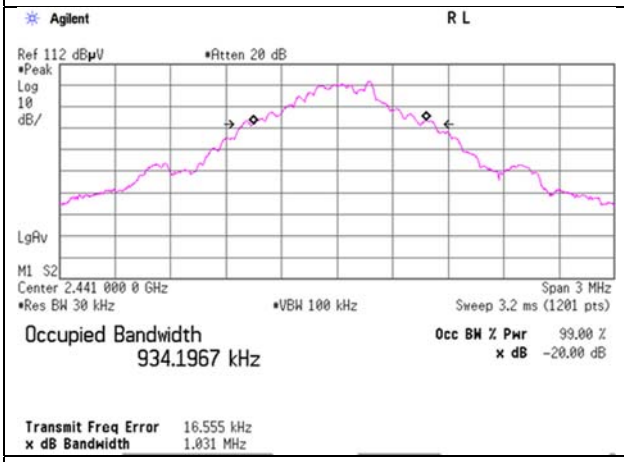
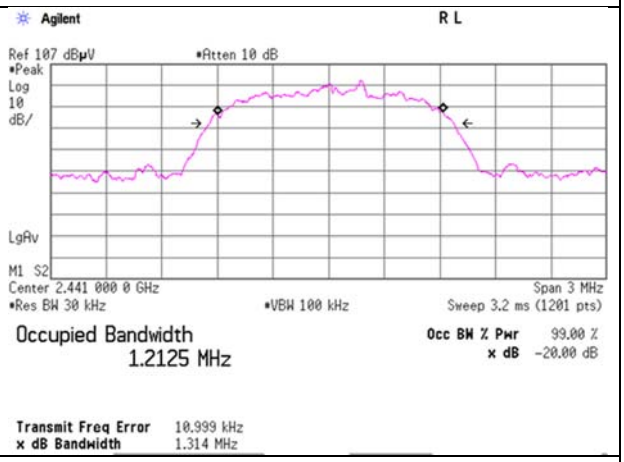
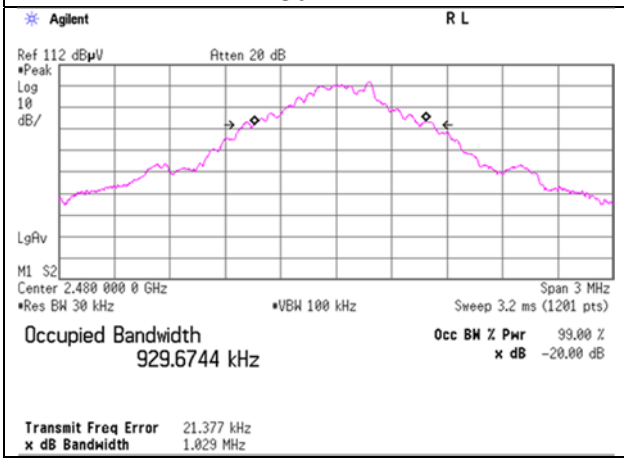
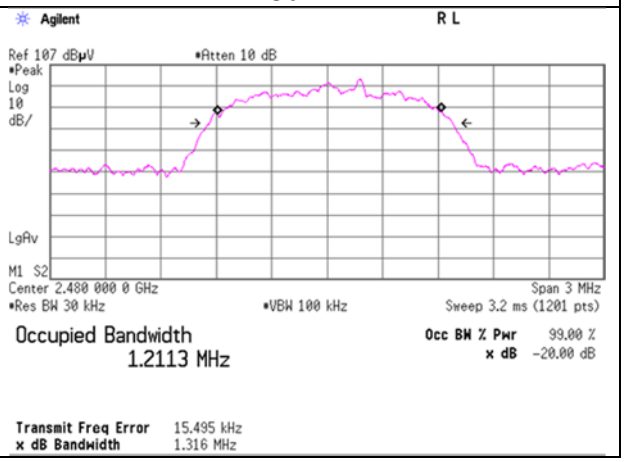
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.027	927.5671	1.000	>= 0.685
DH5	2441.0	1.031	934.1967	1.000	>= 0.687
DH5	2480.0	1.029	929.6744	1.000	>= 0.686
DH5	Hopping On	-	78649.3	-	-
3DH5	2402.0	1.316	1208.1	1.000	>= 0.878
3DH5	2441.0	1.314	1212.5	1.000	>= 0.876
3DH5	2480.0	1.316	1211.3	1.000	>= 0.877
3DH5	Hopping On	-	78767.2	-	-

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

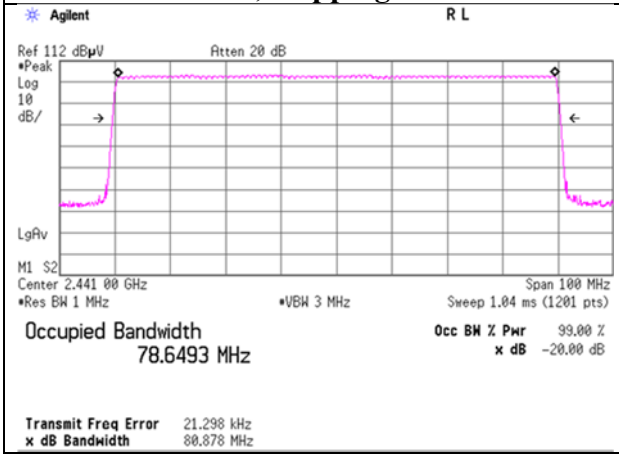
No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth

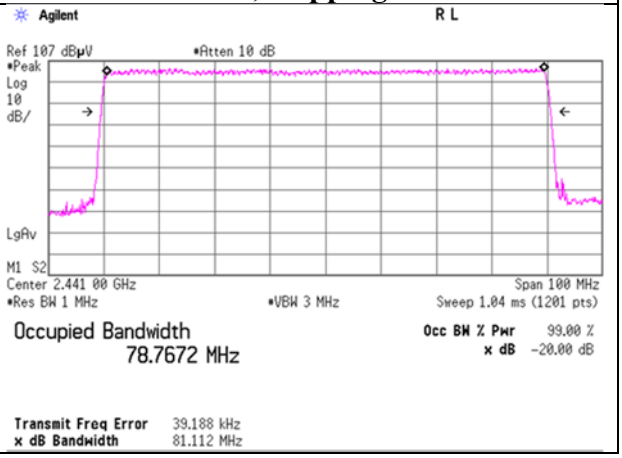
DH5	3DH5
2402 MHz	**2402 MHz**
	
2441 MHz	**2441 MHz**
	
2480 MHz	**2480 MHz**
	

20dB Bandwidth and 99% Occupied Bandwidth

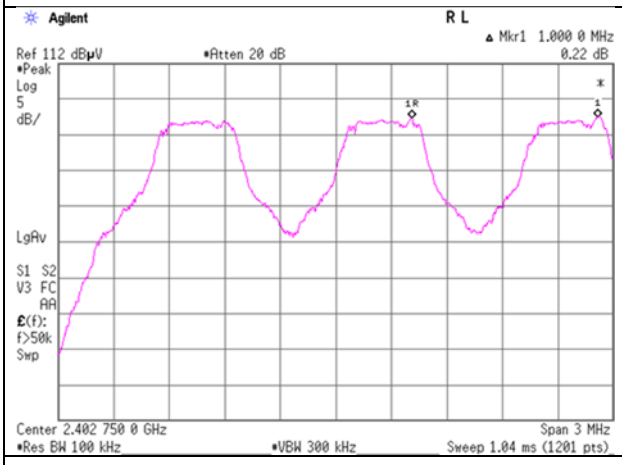
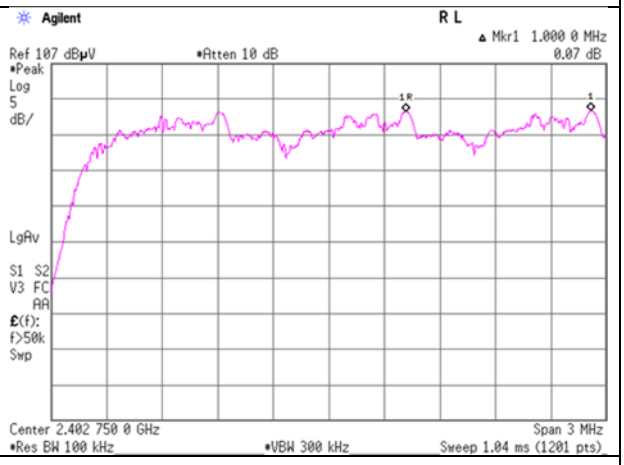
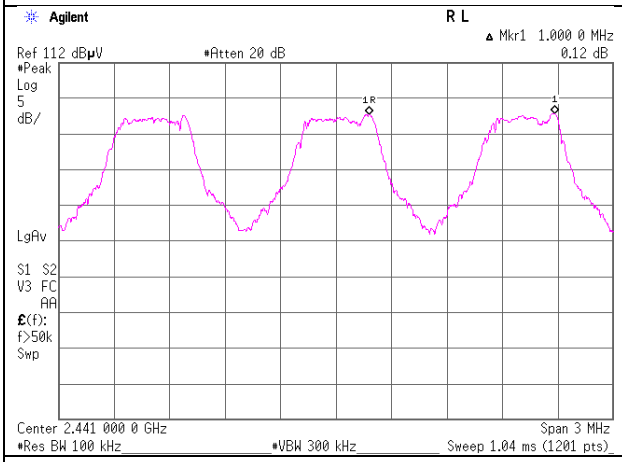
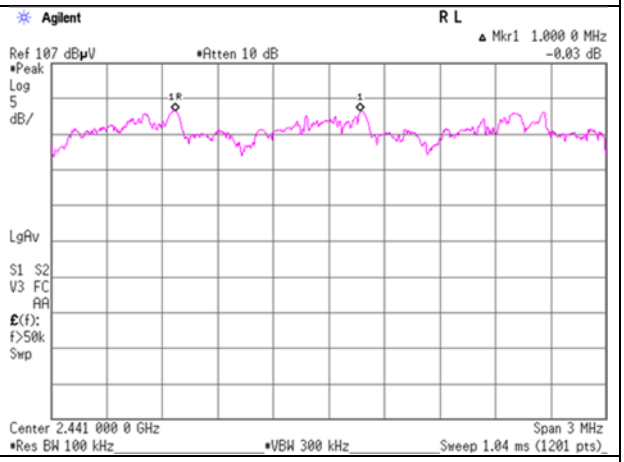
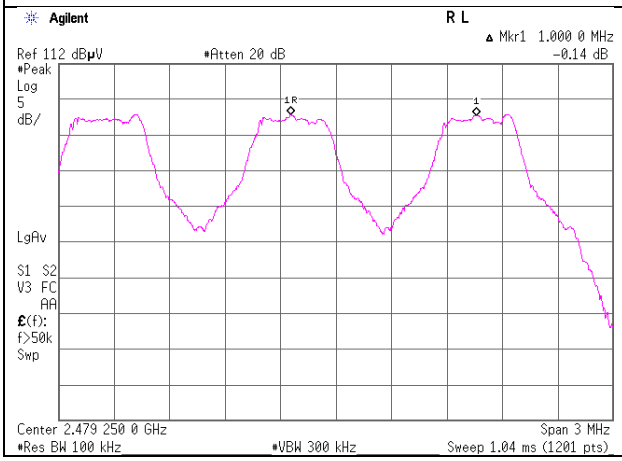
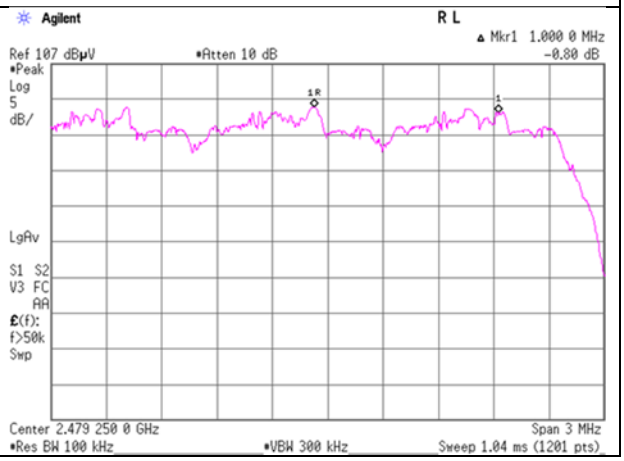
DH5, Hopping On



3DH5, Hopping On



Carrier Frequency Separation

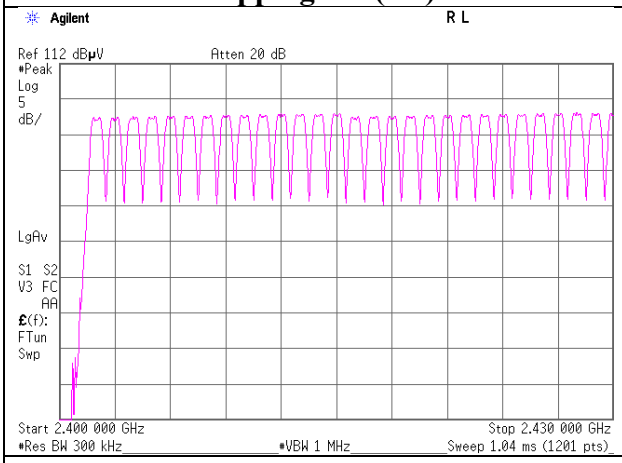
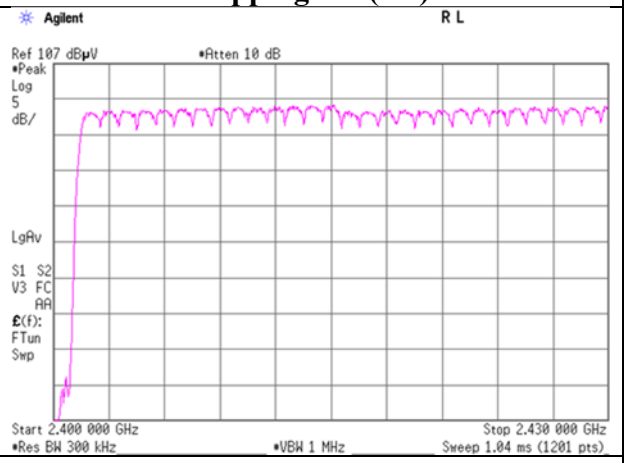
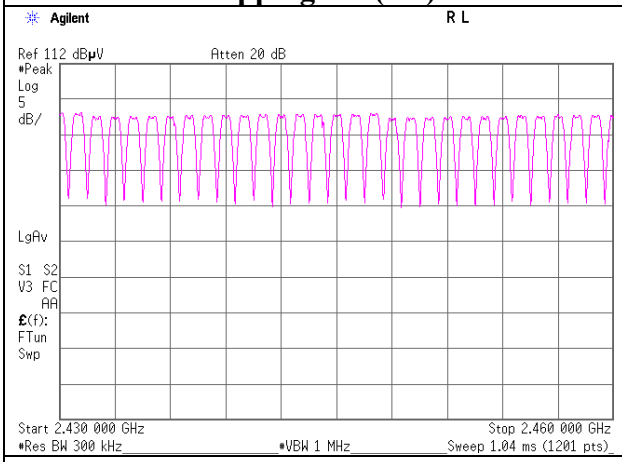
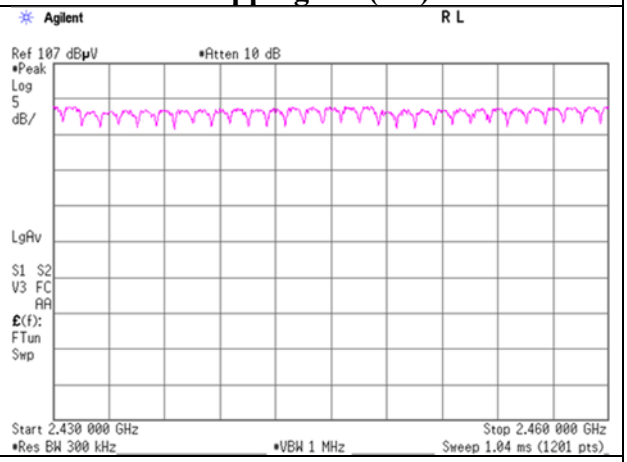
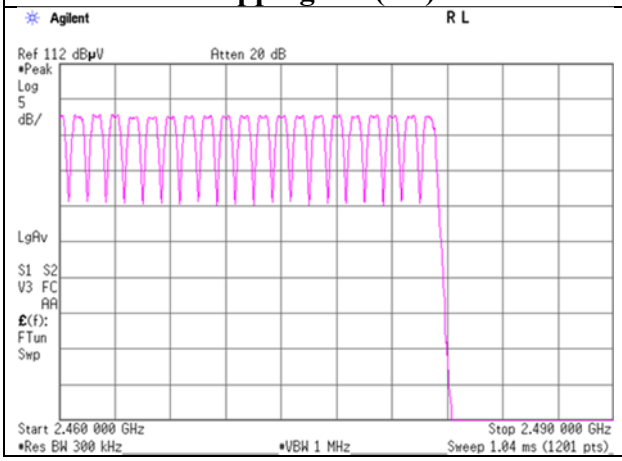
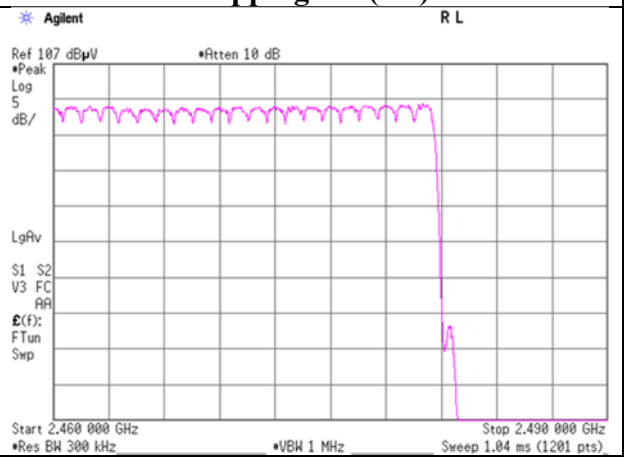
DH5	3DH5
2402 MHz	2402 MHz
	
2441 MHz	2441 MHz
	
2480 MHz	2480 MHz
	

Number of Hopping Frequency

Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping On

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

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

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

Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	50.2 times / 5 sec. x 31.6 sec. = 318 times	0.422	134	400
DH3	26.6 times / 5 sec. x 31.6 sec. = 169 times	1.681	284	400
DH5	19.2 times / 5 sec. x 31.6 sec. = 122 times	2.927	357	400
3DH1	50.0 times / 5 sec. x 31.6 sec. = 316 times	0.428	135	400
3DH3	24.4 times / 5 sec. x 31.6 sec. = 155 times	1.679	260	400
3DH5	20.2 times / 5 sec. x 31.6 sec. = 128 times	2.933	375	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

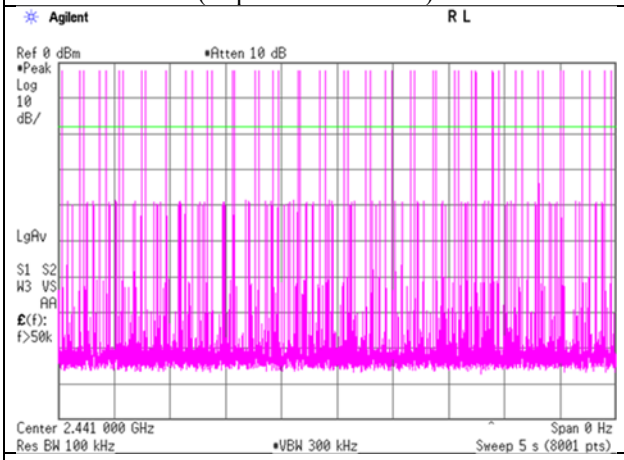
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	51	51	50	49	50.2
DH3	29	29	22	26	27	26.6
DH5	19	20	18	21	18	19.2
3DH1	48	50	51	50	51	50
3DH3	24	23	25	24	26	24.4
3DH5	21	21	20	19	20	20.2

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

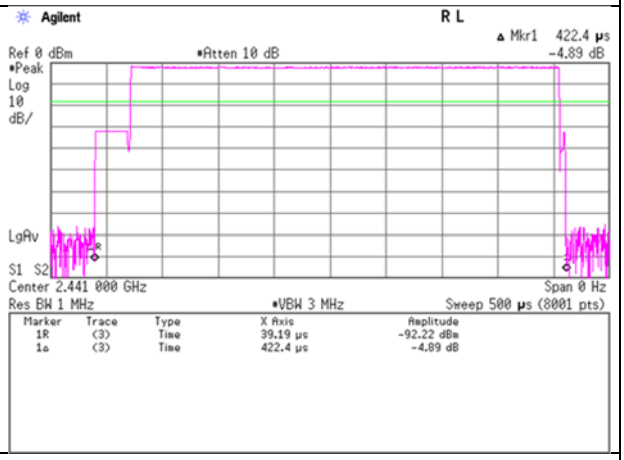
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless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

Dwell time

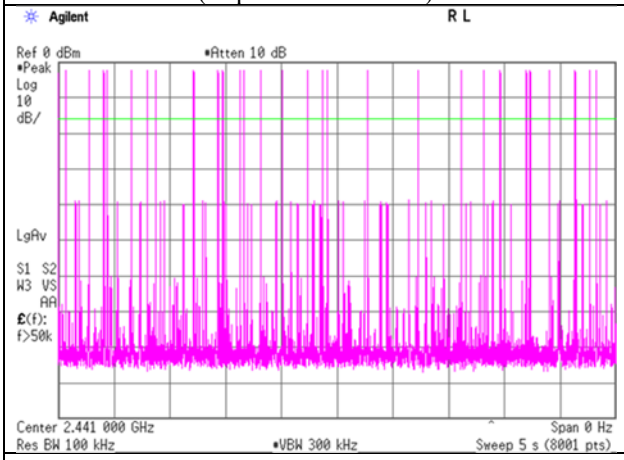
DH1 (1/2)
(Representative chart)



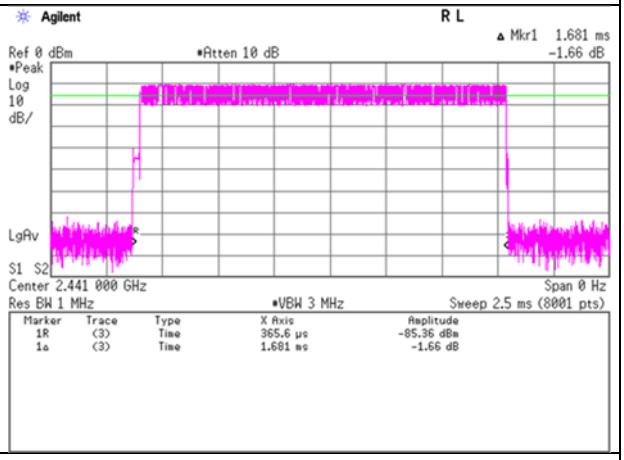
DH1 (2/2)



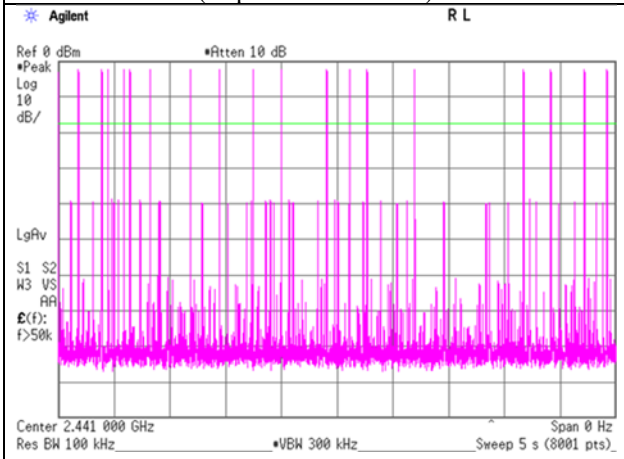
DH3 (1/2)
(Representative chart)



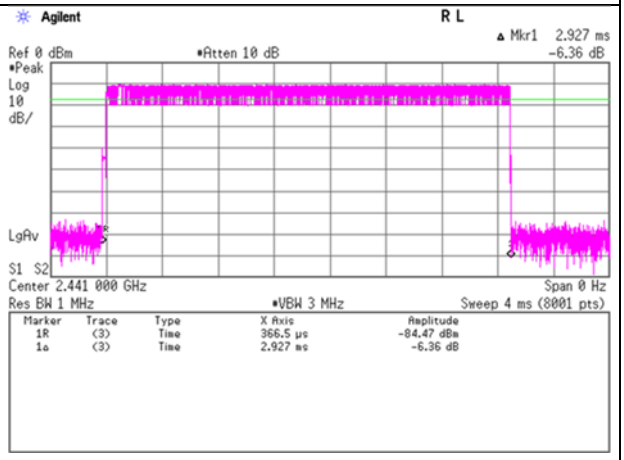
DH3 (2/2)



DH5 (1/2)
(Representative chart)

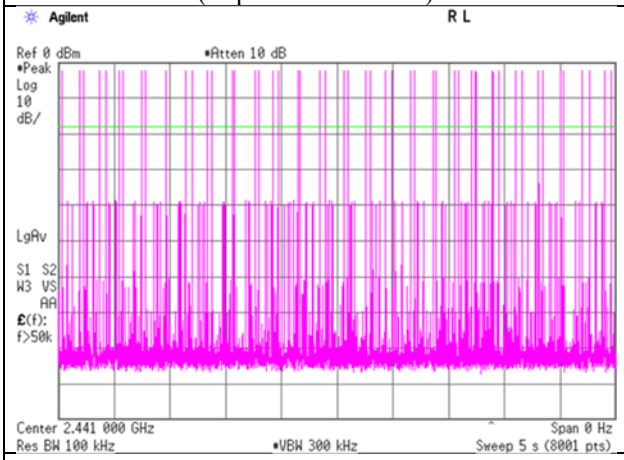


DH5 (2/2)

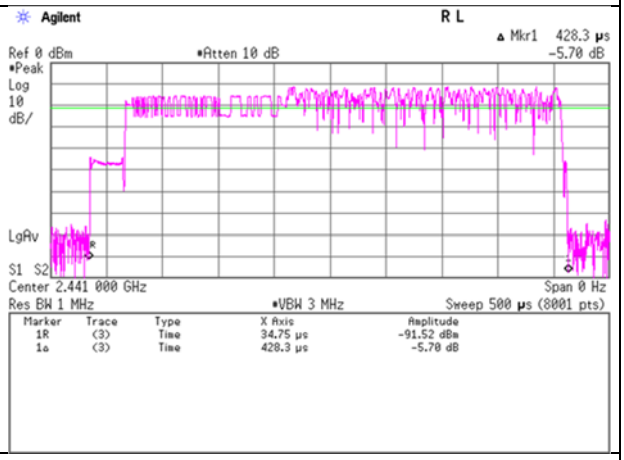


Dwell time

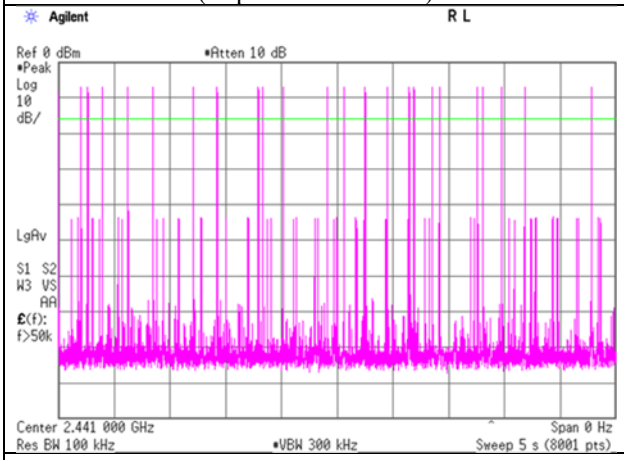
3DH1 (1/2)
(Representative chart)



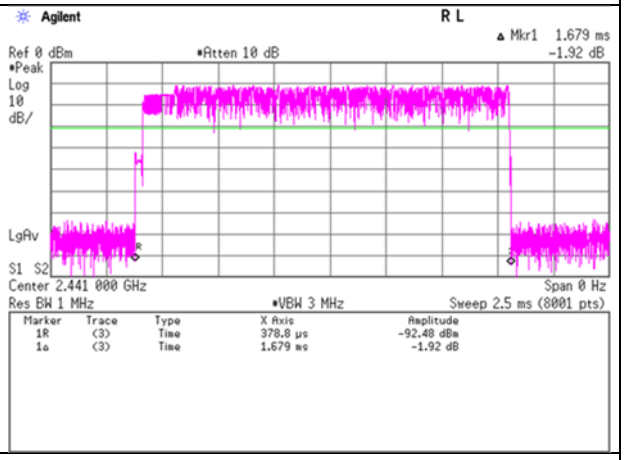
3DH1 (2/2)



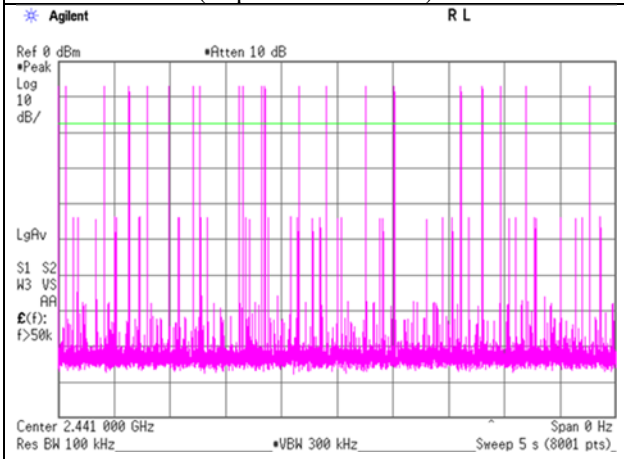
3DH3 (1/2)
(Representative chart)



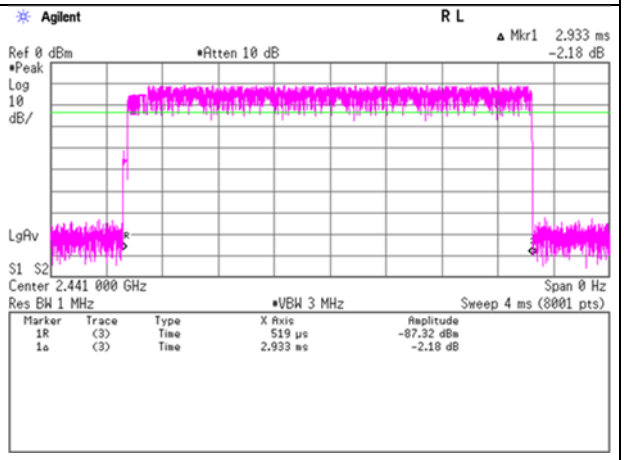
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 19, 2019
Temperature / Humidity	25 deg. C / 51 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off

					Conducted Power					e.i.r.p. for RSS-247					
Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-2.27	1.62	9.82	9.17	8.26	20.96	125	11.79	-6.90	2.27	1.69	36.02	4000	33.75
DH5	2441.0	-1.82	1.64	9.82	9.64	9.20	20.96	125	11.32	-6.90	2.74	1.88	36.02	4000	33.28
DH5	2480.0	-1.47	1.65	9.82	10.00	10.00	20.96	125	10.96	-6.90	3.10	2.04	36.02	4000	32.92
2DH5	2402.0	-3.70	1.62	9.82	7.74	5.94	20.96	125	13.22	-6.90	0.84	1.21	36.02	4000	35.18
2DH5	2441.0	-3.52	1.64	9.82	7.94	6.22	20.96	125	13.02	-6.90	1.04	1.27	36.02	4000	34.98
2DH5	2480.0	-3.03	1.65	9.82	8.44	6.98	20.96	125	12.52	-6.90	1.54	1.43	36.02	4000	34.48
3DH5	2402.0	-3.43	1.62	9.82	8.01	6.32	20.96	125	12.95	-6.90	1.11	1.29	36.02	4000	34.91
3DH5	2441.0	-3.35	1.64	9.82	8.11	6.47	20.96	125	12.85	-6.90	1.21	1.32	36.02	4000	34.81
3DH5	2480.0	-2.82	1.65	9.82	8.65	7.33	20.96	125	12.31	-6.90	1.75	1.50	36.02	4000	34.27

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

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)

Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 19, 2019
Temperature / Humidity	25 deg. C / 51 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402.0	-3.60	1.62	9.82	7.84	6.08	1.09	8.93	7.82
DH5	2441.0	-3.30	1.64	9.82	8.16	6.55	1.09	9.25	8.41
DH5	2480.0	-3.19	1.65	9.82	8.28	6.73	1.09	9.37	8.65
2DH5	2402.0	-7.57	1.62	9.82	3.87	2.44	1.09	4.96	3.13
2DH5	2441.0	-7.37	1.64	9.82	4.09	2.56	1.09	5.18	3.30
2DH5	2480.0	-6.72	1.65	9.82	4.75	2.99	1.09	5.84	3.84
3DH5	2402.0	-7.55	1.62	9.82	3.89	2.45	1.09	4.98	3.15
3DH5	2441.0	-7.34	1.64	9.82	4.12	2.58	1.09	5.21	3.32
3DH5	2480.0	-6.65	1.65	9.82	4.82	3.03	1.09	5.91	3.90

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

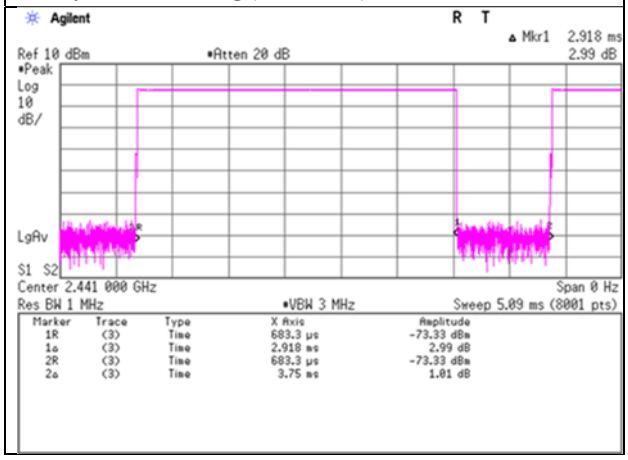
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off

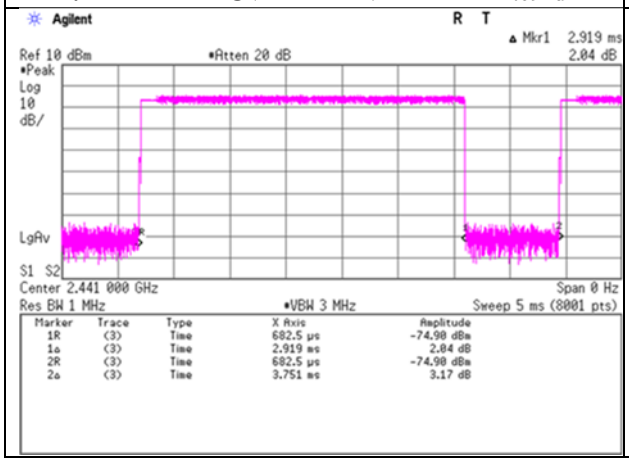
DH5

Tx on / (Tx on + Tx off) =	**0.778**
Tx on / (Tx on + Tx off) * 100 =	**77.8 %**
Duty factor = 10 * log (3.75 / 2.918) =	**1.09 dB**



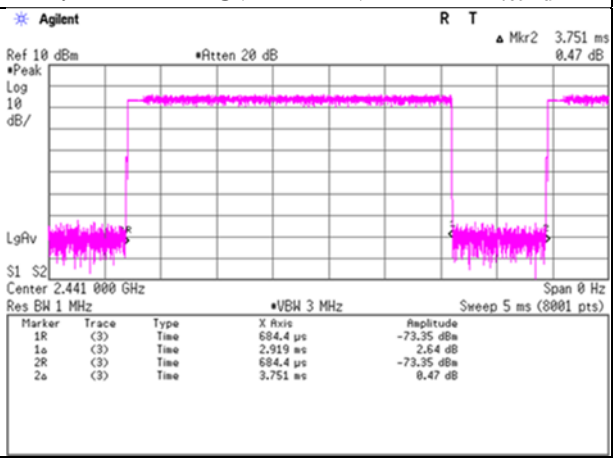
2DH5

Tx on / (Tx on + Tx off) =	**0.778**
Tx on / (Tx on + Tx off) * 100 =	**77.8 %**
Duty factor = 10 * log (3.751 / 2.919) =	**1.09 dB**



3DH5

Tx on / (Tx on + Tx off) =	**0.778**
Tx on / (Tx on + Tx off) * 100 =	**77.8 %**
Duty factor = 10 * log (3.751 / 2.919) =	**1.09 dB**



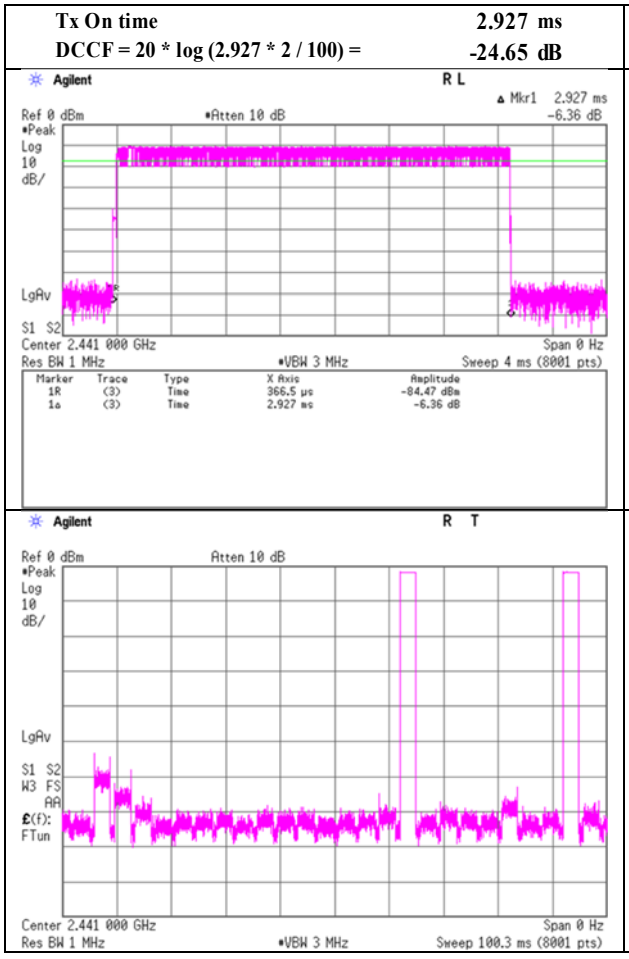
Duty cycle correction factor

Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping On

DH5

Tx On time **2.927 ms**

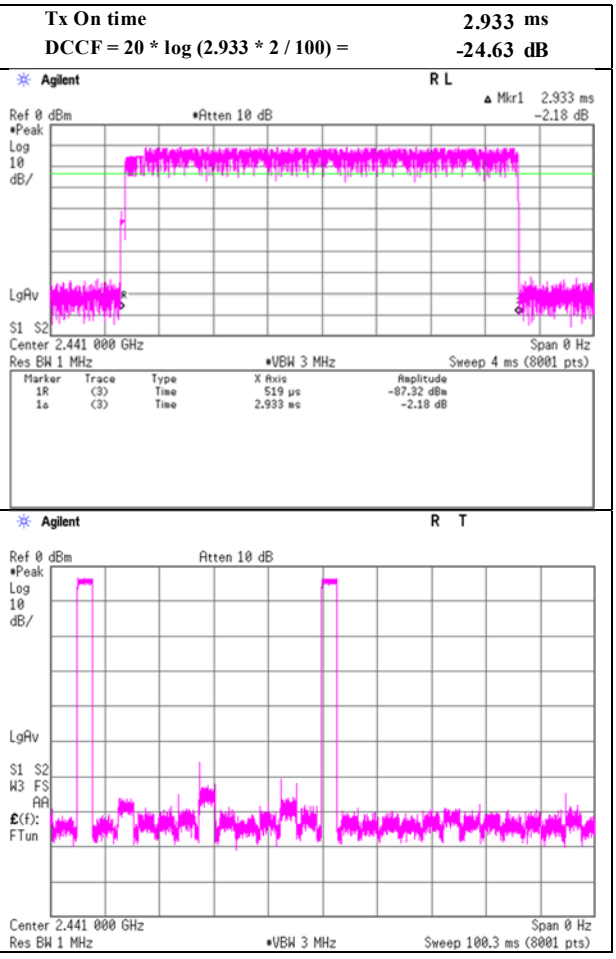
DCCF = 20 * log (2.927 * 2 / 100) = **-24.65 dB**



3DH5

Tx On time **2.933 ms**

DCCF = 20 * log (2.933 * 2 / 100) = **-24.63 dB**



A hopping channel might be occupied 2 times within 100 ms on minimum hopping mode (AFH). Therefore Tx On time was multiplied by 2.

Radiated Spurious Emission

Report No.	12669312S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.3	No.2
Date	February 20, 2019	February 23, 2019	February 25, 2019
Temperature / Humidity	25 deg. C / 30 % RH	22 deg. C / 30 % RH	25 deg. C / 34 % RH
Engineer	Yosuke Ishikawa (30 MHz -1 GHz)	Kenichi Adachi (1 GHz -13 GHz)	Kazutaka Takeyama (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.	32.268	QP	24.50	17.72	7.07	31.84	0.00	17.45	40.00	22.5	151	97	
Hori.	185.734	QP	24.30	16.34	8.97	31.77	0.00	17.84	43.50	25.6	255	355	
Hori.	364.625	QP	25.70	15.08	7.31	31.79	0.00	16.30	46.00	29.7	155	290	
Hori.	611.611	QP	23.80	19.59	8.37	32.02	0.00	19.74	46.00	26.2	150	288	
Hori.	916.408	QP	23.80	22.12	9.72	31.24	0.00	24.40	46.00	21.6	173	151	
Hori.	2390.000	PK	47.46	27.86	14.79	41.59	2.32	50.84	73.90	23.0	247	20	
Hori.	4804.000	PK	58.40	31.43	7.42	42.88	2.32	56.69	73.90	**17.2**	106	9	
Hori.	7206.000	PK	49.53	36.79	9.18	42.92	2.32	54.90	73.90	19.0	149	186	
Hori.	9608.000	PK	48.02	38.51	10.63	43.17	2.32	56.31	73.90	17.5	107	118	
Vert.	32.476	QP	23.80	17.67	7.07	31.84	0.00	16.70	40.00	23.3	100	51	
Vert.	67.794	QP	27.70	6.82	7.37	31.82	0.00	10.07	40.00	29.9	100	295	
Vert.	189.239	QP	24.00	16.57	8.98	31.77	0.00	17.78	43.50	25.7	100	156	
Vert.	348.777	QP	26.60	15.01	7.23	31.77	0.00	17.07	46.00	28.9	100	180	
Vert.	907.097	QP	23.30	22.10	9.69	31.31	0.00	23.78	46.00	22.2	100	259	
Vert.	2390.000	PK	47.73	27.86	14.79	41.59	2.32	51.11	73.90	22.7	239	1	
Vert.	4804.000	PK	58.08	31.43	7.42	42.88	2.32	56.37	73.90	17.5	176	7	
Vert.	7206.000	PK	49.49	36.79	9.18	42.92	2.32	54.86	73.90	19.0	152	180	
Vert.	9608.000	PK	48.04	38.51	10.63	43.17	2.32	56.33	73.90	17.5	173	261	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	47.46	27.86	14.79	41.59	-24.65	2.32	26.19	53.90	27.7	
Hori.	4804.000	PK	58.40	31.43	7.42	42.88	-24.65	2.32	32.04	53.90	**21.9**	
Hori.	7206.000	PK	49.53	36.79	9.18	42.92	-24.65	2.32	30.25	53.90	23.7	
Hori.	9608.000	PK	48.02	38.51	10.63	43.17	-24.65	2.32	31.66	53.90	22.2	
Vert.	2390.000	PK	47.73	27.86	14.79	41.59	-24.65	2.32	26.46	53.90	27.4	
Vert.	4804.000	PK	58.08	31.43	7.42	42.88	-24.65	2.32	31.72	53.90	22.2	
Vert.	7206.000	PK	49.49	36.79	9.18	42.92	-24.65	2.32	30.21	53.90	23.7	
Vert.	9608.000	PK	48.04	38.51	10.63	43.17	-24.65	2.32	31.68	53.90	22.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

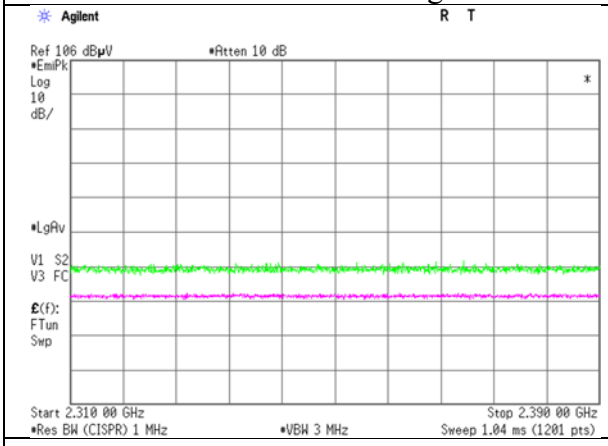
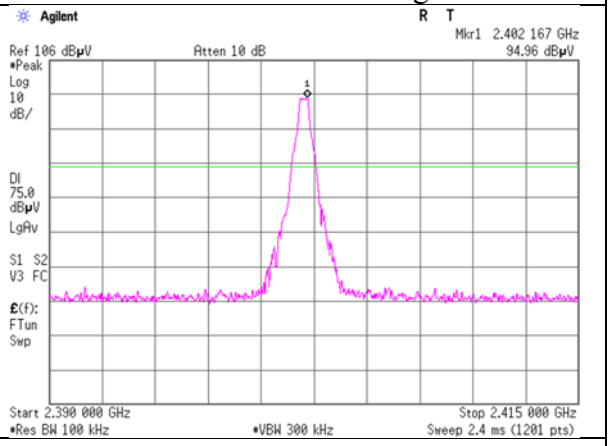
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

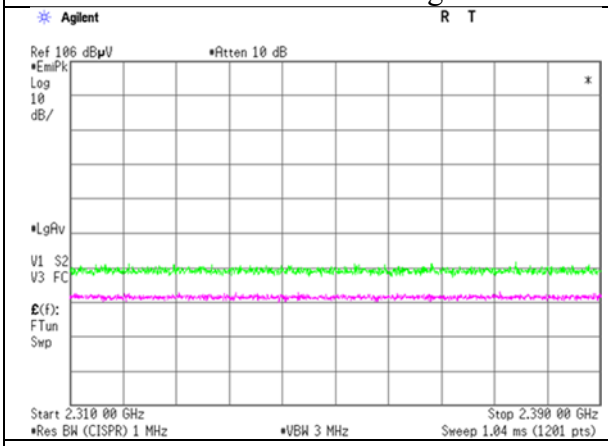
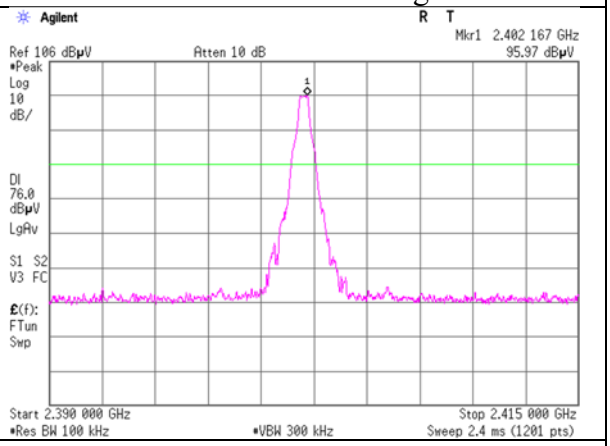
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	95.14	27.86	14.80	41.60	2.32	98.52	-	-	Carrier
Hori.	2399.930	PK	42.79	27.86	14.80	41.60	2.32	46.17	78.52	32.3	
Hori.	2400.000	PK	41.48	27.86	14.80	41.60	2.32	44.86	78.52	33.6	
Vert.	2402.000	PK	95.92	27.86	14.80	41.60	2.32	99.30	-	-	Carrier
Vert.	2399.990	PK	42.45	27.86	14.80	41.60	2.32	45.83	79.30	33.4	
Vert.	2400.000	PK	41.95	27.86	14.80	41.60	2.32	45.33	79.30	33.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 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.	12669312S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 23, 2019
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Kenichi Adachi (1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 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

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12669312S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.3	No.2
Date	February 20, 2019	February 23, 2019	February 25, 2019
Temperature / Humidity	25 deg. C / 30 % RH	22 deg. C / 30 % RH	25 deg. C / 34 % RH
Engineer	Yosuke Ishikawa (30 MHz -1 GHz)	Kenichi Adachi (1 GHz -13 GHz)	Kazutaka Takeyama (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.	32.429	QP	23.80	17.68	7.07	31.84	0.00	16.71	40.00	23.2	153	98	
Hori.	188.305	QP	24.50	16.54	8.98	31.77	0.00	18.25	43.50	25.2	256	353	
Hori.	618.027	QP	23.60	19.66	8.40	32.03	0.00	19.63	46.00	26.3	156	300	
Hori.	899.036	QP	23.70	22.03	9.67	31.36	0.00	24.04	46.00	21.9	151	290	
Hori.	4882.000	PK	61.30	31.37	7.51	42.89	2.32	59.61	73.90	**14.2**	104	4	
Hori.	7323.000	PK	49.16	37.01	9.29	43.15	2.32	54.63	73.90	19.2	125	114	
Hori.	9764.000	PK	47.29	38.92	10.60	43.01	2.32	56.12	73.90	17.7	146	126	
Vert.	33.408	QP	23.60	17.34	7.10	31.84	0.00	16.20	40.00	23.8	100	106	
Vert.	67.651	QP	27.80	6.84	7.37	31.82	0.00	10.19	40.00	29.8	100	241	
Vert.	194.113	QP	23.80	16.65	9.01	31.77	0.00	17.69	43.50	25.8	100	322	
Vert.	619.419	QP	24.10	19.69	8.41	32.03	0.00	20.17	46.00	25.8	152	205	
Vert.	672.377	QP	26.20	19.50	8.68	32.05	0.00	22.33	46.00	23.6	148	36	
Vert.	879.570	QP	23.50	21.94	9.60	31.45	0.00	23.59	46.00	22.4	100	157	
Vert.	4882.000	PK	59.23	31.37	7.51	42.89	2.32	57.54	73.90	16.3	146	65	
Vert.	7323.000	PK	49.65	37.01	9.29	43.15	2.32	55.12	73.90	18.7	155	128	
Vert.	9764.000	PK	47.47	38.92	10.60	43.01	2.32	56.30	73.90	17.6	143	292	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	PK	61.30	31.37	7.51	42.89	-24.65	2.32	34.96	53.90	**18.9**	
Hori.	7323.000	PK	49.16	37.01	9.29	43.15	-24.65	2.32	29.98	53.90	23.9	
Hori.	9764.000	PK	47.29	38.92	10.60	43.01	-24.65	2.32	31.47	53.90	22.4	
Vert.	4882.000	PK	59.23	31.37	7.51	42.89	-24.65	2.32	32.89	53.90	21.0	
Vert.	7323.000	PK	49.65	37.01	9.29	43.15	-24.65	2.32	30.47	53.90	23.4	
Vert.	9764.000	PK	47.47	38.92	10.60	43.01	-24.65	2.32	31.65	53.90	22.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission

Report No.	12669312S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.3	No.2
Date	February 20, 2019	February 23, 2019	February 25, 2019
Temperature / Humidity	25 deg. C / 30 % RH	22 deg. C / 30 % RH	25 deg. C / 34 % RH
Engineer	Yosuke Ishikawa	Kenichi Adachi	Kazutaka Takeyama
	(30 MHz -1 GHz)	(1 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.	30.477	QP	24.20	18.40	7.02	31.84	0.00	17.78	40.00	22.2	153	269	
Hori.	181.452	QP	24.10	16.22	8.96	31.77	0.00	17.51	43.50	25.9	251	357	
Hori.	636.235	QP	23.80	19.39	8.49	32.05	0.00	19.63	46.00	26.3	152	291	
Hori.	906.406	QP	23.80	22.09	9.69	31.31	0.00	24.27	46.00	21.7	175	358	
Hori.	2483.500	PK	57.19	27.65	14.88	41.62	2.32	60.42	73.90	13.4	145	10	
Hori.	2483.947	PK	54.97	27.65	14.88	41.62	2.32	58.20	73.90	15.7	145	10	
Hori.	4960.000	PK	61.47	31.54	7.61	42.91	2.32	60.03	73.90	13.8	130	9	
Hori.	7440.000	PK	49.28	37.10	9.39	43.38	2.32	54.71	73.90	19.1	121	116	
Hori.	9920.000	PK	48.84	38.97	10.56	42.84	2.32	57.85	73.90	16.0	150	0	
Vert.	30.885	QP	24.00	18.24	7.04	31.84	0.00	17.44	40.00	22.5	100	222	
Vert.	68.823	QP	28.00	6.72	7.43	31.82	0.00	10.33	40.00	29.6	100	215	
Vert.	187.751	QP	23.80	16.46	8.98	31.77	0.00	17.47	43.50	26.0	100	357	
Vert.	431.985	QP	26.10	16.21	7.62	31.87	0.00	18.06	46.00	27.9	100	16	
Vert.	628.083	QP	23.60	19.55	8.45	32.04	0.00	19.56	46.00	26.4	100	211	
Vert.	922.664	QP	23.50	22.09	9.73	31.19	0.00	24.13	46.00	21.8	100	348	
Vert.	2483.500	PK	57.93	27.65	14.88	41.62	2.32	61.16	73.90	**12.7**	147	3	
Vert.	2483.969	PK	55.77	27.65	14.88	41.62	2.32	59.00	73.90	14.9	147	3	
Vert.	4960.000	PK	61.45	31.54	7.61	42.91	2.32	60.01	73.90	13.8	133	66	
Vert.	7440.000	PK	50.35	37.10	9.39	43.38	2.32	55.78	73.90	18.1	119	128	
Vert.	9920.000	PK	48.37	38.97	10.56	42.84	2.32	57.38	73.90	16.5	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 (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	57.19	27.65	14.88	41.62	-24.65	2.32	35.77	53.90	18.1	
Hori.	2483.947	PK	54.97	27.65	14.88	41.62	-24.65	2.32	33.55	53.90	20.4	
Hori.	4960.000	PK	61.47	31.54	7.61	42.91	-24.65	2.32	35.38	53.90	18.5	
Hori.	7440.000	PK	49.28	37.10	9.39	43.38	-24.65	2.32	30.06	53.90	23.8	
Hori.	9920.000	PK	48.84	38.97	10.56	42.84	-24.65	2.32	33.20	53.90	20.7	
Vert.	2483.500	PK	57.93	27.65	14.88	41.62	-24.65	2.32	36.51	53.90	**17.4**	
Vert.	2483.969	PK	55.77	27.65	14.88	41.62	-24.65	2.32	34.35	53.90	19.6	
Vert.	4960.000	PK	61.45	31.54	7.61	42.91	-24.65	2.32	35.36	53.90	18.5	
Vert.	7440.000	PK	50.35	37.10	9.39	43.38	-24.65	2.32	31.13	53.90	22.8	
Vert.	9920.000	PK	48.37	38.97	10.56	42.84	-24.65	2.32	32.73	53.90	21.2	

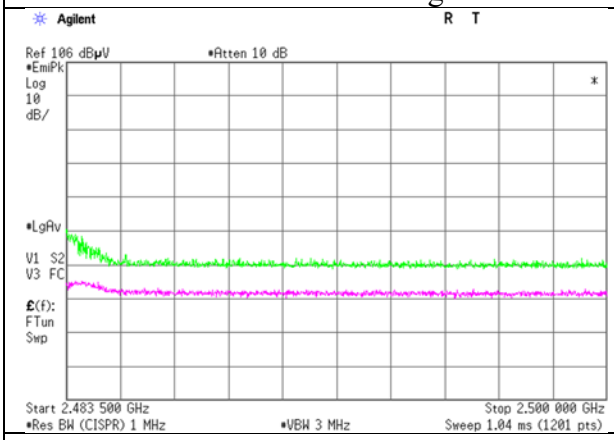
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12669312S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 23, 2019
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Kenichi Adachi
	(1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

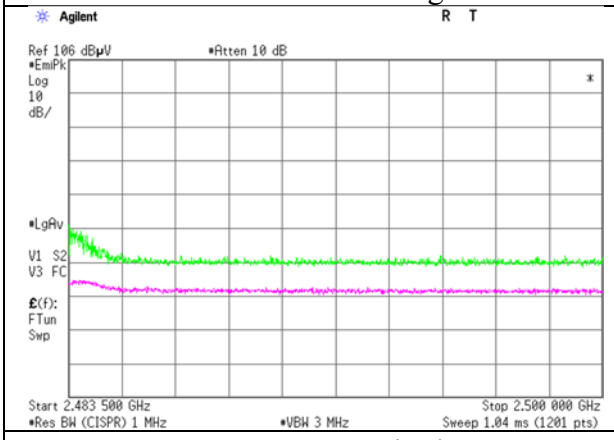
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12669312S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.3	No.2
Date	February 20, 2019	February 23, 2019	February 25, 2019
Temperature / Humidity	25 deg. C / 30 % RH	22 deg. C / 30 % RH	25 deg. C / 34 % RH
Engineer	Yosuke Ishikawa	Kenichi Adachi	Kazutaka Takeyama
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.183	QP	24.20	17.44	7.09	31.84	0.00	16.89	40.00	23.1	152	229	
Hori.	188.477	QP	23.80	16.55	8.98	31.77	0.00	17.56	43.50	25.9	256	359	
Hori.	614.744	QP	24.10	19.58	8.38	32.02	0.00	20.04	46.00	25.9	100	84	
Hori.	864.498	QP	23.80	21.77	9.53	31.52	0.00	23.58	46.00	22.4	157	12	
Hori.	2390.000	PK	47.67	27.86	14.79	41.59	2.32	51.05	73.90	22.8	140	177	
Hori.	4804.000	PK	55.29	31.43	7.42	42.88	2.32	53.58	73.90	20.3	131	10	
Hori.	7206.000	PK	48.37	36.79	9.18	42.92	2.32	53.74	73.90	20.1	150	0	
Hori.	9608.000	PK	48.44	38.51	10.63	43.17	2.32	56.73	73.90	**17.1**	150	0	
Vert.	33.822	QP	23.70	17.14	7.10	31.84	0.00	16.10	40.00	23.9	100	60	
Vert.	68.037	QP	28.10	6.79	7.39	31.82	0.00	10.46	40.00	29.5	100	290	
Vert.	191.941	QP	24.20	16.51	9.00	31.77	0.00	17.94	43.50	25.5	100	67	
Vert.	277.397	QP	26.60	13.19	6.67	31.76	0.00	14.70	46.00	31.3	100	168	
Vert.	608.664	QP	24.10	19.55	8.36	32.01	0.00	20.00	46.00	26.0	132	152	
Vert.	896.299	QP	24.00	21.96	9.66	31.38	0.00	24.24	46.00	21.7	100	130	
Vert.	2390.000	PK	47.65	27.86	14.79	41.59	2.32	51.03	73.90	22.8	144	114	
Vert.	4804.000	PK	54.95	31.43	7.42	42.88	2.32	53.24	73.90	20.6	119	2	
Vert.	7206.000	PK	48.17	36.79	9.18	42.92	2.32	53.54	73.90	20.3	150	0	
Vert.	9608.000	PK	47.94	38.51	10.63	43.17	2.32	56.23	73.90	17.6	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 (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	47.67	27.86	14.79	41.59	-24.63	2.32	26.42	53.90	27.5	
Hori.	4804.000	PK	55.29	31.43	7.42	42.88	-24.63	2.32	28.95	53.90	25.0	
Hori.	7206.000	PK	48.37	36.79	9.18	42.92	-24.63	2.32	29.11	53.90	24.8	
Hori.	9608.000	PK	48.44	38.51	10.63	43.17	-24.63	2.32	32.10	53.90	**21.8**	
Vert.	2390.000	PK	47.65	27.86	14.79	41.59	-24.63	2.32	26.40	53.90	27.5	
Vert.	4804.000	PK	54.95	31.43	7.42	42.88	-24.63	2.32	28.61	53.90	25.3	
Vert.	7206.000	PK	48.17	36.79	9.18	42.92	-24.63	2.32	28.91	53.90	25.0	
Vert.	9608.000	PK	47.94	38.51	10.63	43.17	-24.63	2.32	31.60	53.90	22.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

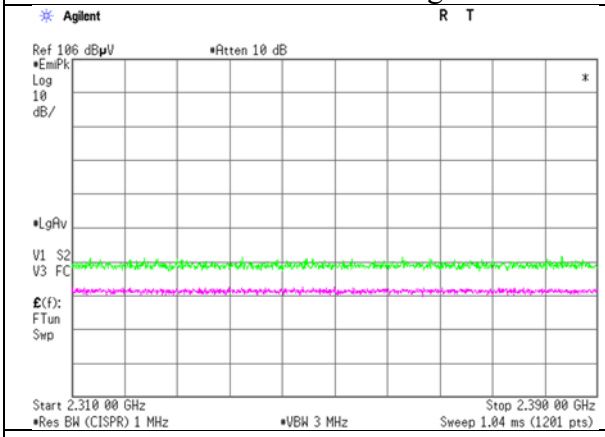
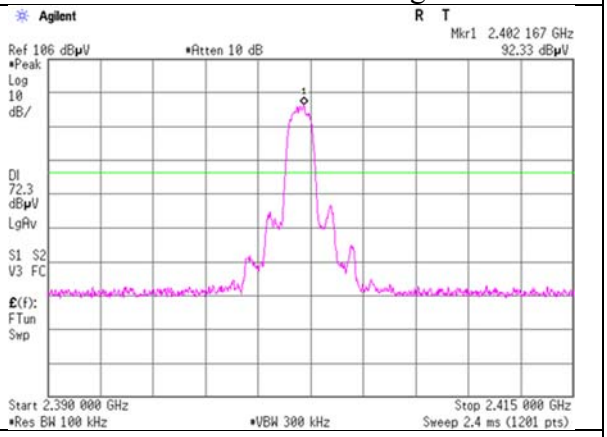
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

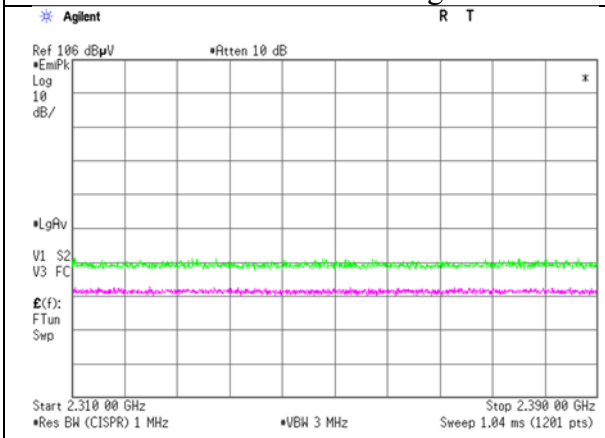
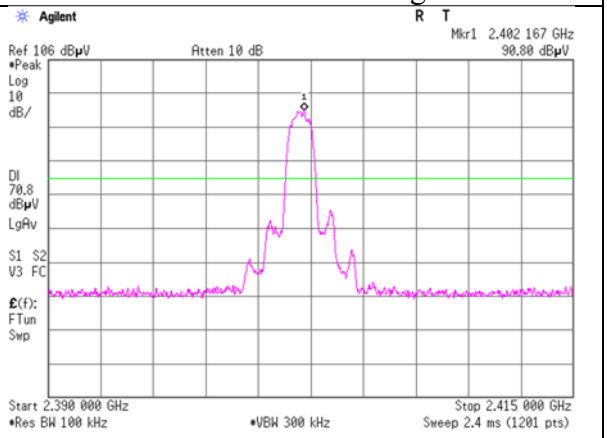
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	92.20	27.86	14.80	41.60	2.32	95.58	-	-	Carrier
Hori.	2399.550	PK	49.59	27.86	14.80	41.60	2.32	52.97	75.58	22.6	
Hori.	2400.000	PK	44.82	27.86	14.80	41.60	2.32	48.20	75.58	27.3	
Vert.	2402.000	PK	90.83	27.86	14.80	41.60	2.32	94.21	-	-	Carrier
Vert.	2399.530	PK	47.81	27.86	14.80	41.60	2.32	51.19	74.21	23.0	
Vert.	2400.000	PK	43.49	27.86	14.80	41.60	2.32	46.87	74.21	27.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 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.	12669312S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 23, 2019
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Kenichi Adachi (1 GHz -13 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

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12669312S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.3	No.2
Date	February 20, 2019	February 23, 2019	February 25, 2019
Temperature / Humidity	25 deg. C / 30 % RH	22 deg. C / 30 % RH	25 deg. C / 34 % RH
Engineer	Yosuke Ishikawa (30 MHz -1 GHz)	Kenichi Adachi (1 GHz -13 GHz)	Kazutaka Takeyama (13 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.062	QP	24.30	17.50	7.08	31.84	0.00	17.04	40.00	22.9	153	359	
Hori.	188.591	QP	23.80	16.56	8.98	31.77	0.00	17.57	43.50	25.9	256	26	
Hori.	617.621	QP	24.00	19.65	8.40	32.02	0.00	20.03	46.00	25.9	151	307	
Hori.	858.864	QP	24.20	21.65	9.51	31.55	0.00	23.81	46.00	22.1	162	67	
Hori.	4882.000	PK	59.11	31.37	7.51	42.89	2.32	57.42	73.90	**16.4**	100	4	
Hori.	7323.000	PK	48.58	37.01	9.29	43.15	2.32	54.05	73.90	19.8	150	0	
Hori.	9764.000	PK	47.68	38.92	10.60	43.01	2.32	56.51	73.90	17.3	150	0	
Vert.	34.339	QP	24.00	16.93	7.11	31.84	0.00	16.20	40.00	23.8	100	355	
Vert.	68.437	QP	27.80	6.75	7.41	31.82	0.00	10.14	40.00	29.8	100	1	
Vert.	180.413	QP	23.60	16.15	8.96	31.77	0.00	16.94	43.50	26.5	100	25	
Vert.	356.392	QP	27.00	15.10	7.27	31.78	0.00	17.59	46.00	28.4	100	352	
Vert.	614.757	QP	23.60	19.58	8.38	32.02	0.00	19.54	46.00	26.4	133	259	
Vert.	868.649	QP	23.70	21.85	9.55	31.51	0.00	23.59	46.00	22.4	100	16	
Vert.	4882.000	PK	57.91	31.37	7.51	42.89	2.32	56.22	73.90	17.6	117	1	
Vert.	7323.000	PK	48.21	37.01	9.29	43.15	2.32	53.68	73.90	20.2	150	0	
Vert.	9764.000	PK	47.62	38.92	10.60	43.01	2.32	56.45	73.90	17.4	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 (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	PK	59.11	31.37	7.51	42.89	-24.63	2.32	32.79	53.90	**21.1**	
Hori.	7323.000	PK	48.58	37.01	9.29	43.15	-24.63	2.32	29.42	53.90	24.5	
Hori.	9764.000	PK	47.68	38.92	10.60	43.01	-24.63	2.32	31.88	53.90	22.0	
Vert.	4882.000	PK	57.91	31.37	7.51	42.89	-24.63	2.32	31.59	53.90	22.3	
Vert.	7323.000	PK	48.21	37.01	9.29	43.15	-24.63	2.32	29.05	53.90	24.9	
Vert.	9764.000	PK	47.62	38.92	10.60	43.01	-24.63	2.32	31.82	53.90	22.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission

Report No.	12669312S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.3	No.2
Date	February 20, 2019	February 23, 2019	February 25, 2019
Temperature / Humidity	25 deg. C / 30 % RH	22 deg. C / 30 % RH	25 deg. C / 34 % RH
Engineer	Yosuke Ishikawa (30 MHz -1 GHz)	Kenichi Adachi (1 GHz -13 GHz)	Kazutaka Takeyama (13 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	32.210	QP	24.30	17.74	7.07	31.84	0.00	17.27	40.00	22.7	158	294	
Hori.	187.716	QP	24.10	16.45	8.97	31.77	0.00	17.75	43.50	25.7	253	359	
Hori.	392.242	QP	26.10	15.50	7.44	31.82	0.00	17.22	46.00	28.7	147	70	
Hori.	850.961	QP	24.10	21.50	9.48	31.59	0.00	23.49	46.00	22.5	173	193	
Hori.	932.398	QP	23.80	22.08	9.76	31.12	0.00	24.52	46.00	21.4	182	281	
Hori.	2483.500	PK	56.13	27.65	14.88	41.62	2.32	59.36	73.90	14.5	236	0	
Hori.	4960.000	PK	61.19	31.54	7.61	42.91	2.32	59.75	73.90	**14.1**	106	5	
Hori.	7440.000	PK	49.54	37.10	9.39	43.38	2.32	54.97	73.90	18.9	136	167	
Hori.	9920.000	PK	48.10	38.97	10.56	42.84	2.32	57.11	73.90	16.7	100	0	
Vert.	33.361	QP	24.00	17.36	7.10	31.84	0.00	16.62	40.00	23.3	100	359	
Vert.	68.417	QP	28.10	6.75	7.41	31.82	0.00	10.44	40.00	29.5	100	321	
Vert.	193.477	QP	24.20	16.68	9.01	31.77	0.00	18.12	43.50	25.3	100	172	
Vert.	845.886	QP	23.80	21.41	9.46	31.62	0.00	23.05	46.00	22.9	100	216	
Vert.	919.433	QP	23.60	22.10	9.72	31.22	0.00	24.20	46.00	21.8	100	88	
Vert.	2483.500	PK	55.51	27.65	14.88	41.62	2.32	58.74	73.90	15.1	227	21	
Vert.	4960.000	PK	60.86	31.54	7.61	42.91	2.32	59.42	73.90	14.4	136	2	
Vert.	7440.000	PK	48.69	37.10	9.39	43.38	2.32	54.12	73.90	19.7	100	0	
Vert.	9920.000	PK	48.01	38.97	10.56	42.84	2.32	57.02	73.90	16.8	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

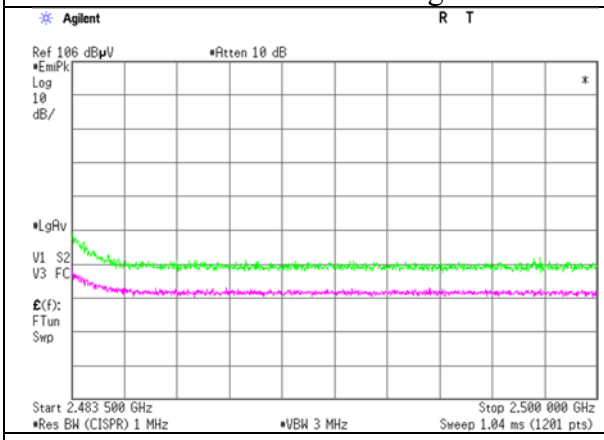
Peak measurement value with Duty cycle correction factor (DCCF)

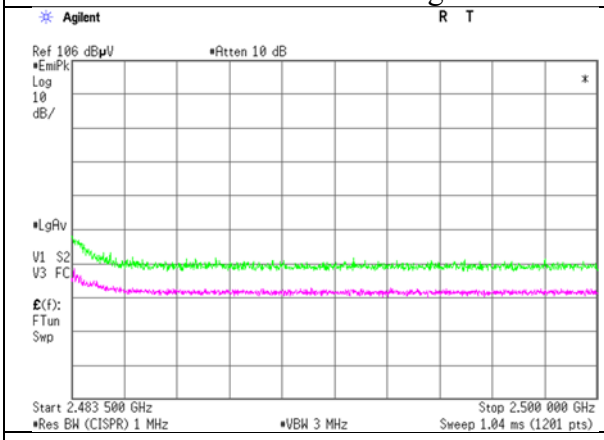
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	56.13	27.65	14.88	41.62	-24.63	2.32	34.73	53.90	19.2	
Hori.	4960.000	PK	61.19	31.54	7.61	42.91	-24.63	2.32	35.12	53.90	**18.8**	
Hori.	7440.000	PK	49.54	37.10	9.39	43.38	-24.63	2.32	30.34	53.90	23.6	
Hori.	9920.000	PK	48.10	38.97	10.56	42.84	-24.63	2.32	32.48	53.90	21.4	
Vert.	2483.500	PK	55.51	27.65	14.88	41.62	-24.63	2.32	34.11	53.90	19.8	
Vert.	4960.000	PK	60.86	31.54	7.61	42.91	-24.63	2.32	34.79	53.90	19.1	
Vert.	7440.000	PK	48.69	37.10	9.39	43.38	-24.63	2.32	29.49	53.90	24.4	
Vert.	9920.000	PK	48.01	38.97	10.56	42.84	-24.63	2.32	32.39	53.90	21.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.32 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12669312S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 23, 2019
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Kenichi Adachi (1 GHz -13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

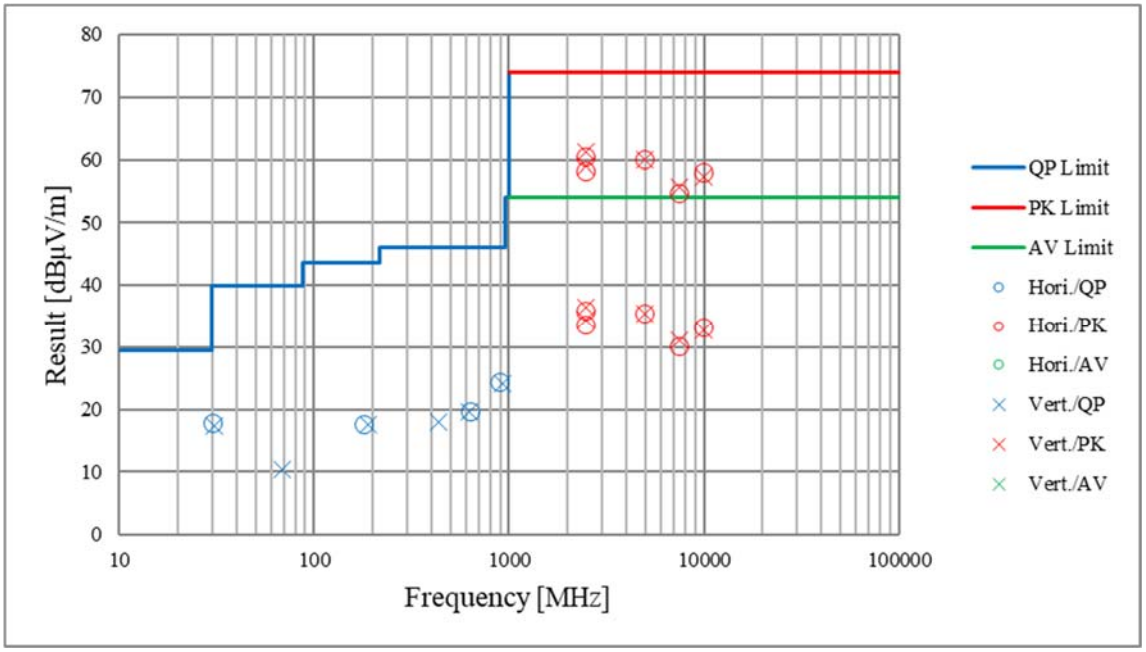
Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12669312S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.3	No.2
Date	February 20, 2019	February 23, 2019	February 25, 2019
Temperature / Humidity	25 deg. C / 30 % RH	22 deg. C / 30 % RH	25 deg. C / 34 % RH
Engineer	Yosuke Ishikawa (30 MHz -1 GHz)	Kenichi Adachi (1 GHz -13 GHz)	Kazutaka Takeyama (13 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz		



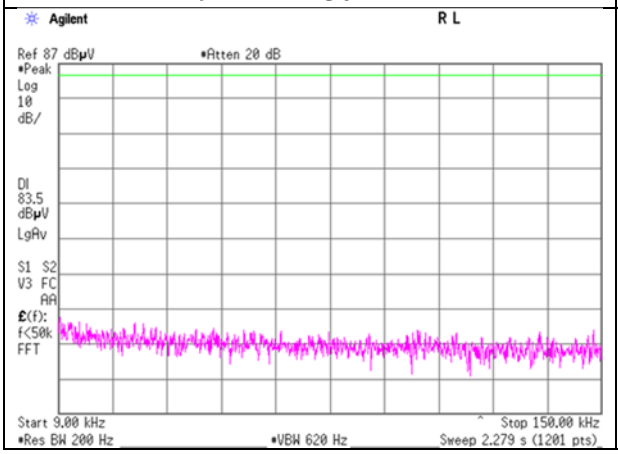
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

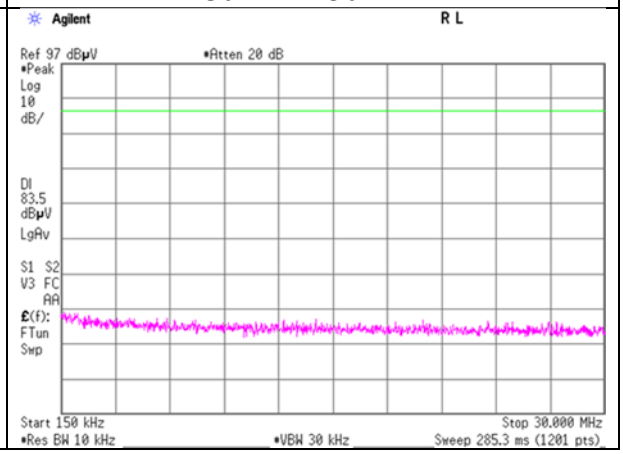
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, DH5

2402 MHz

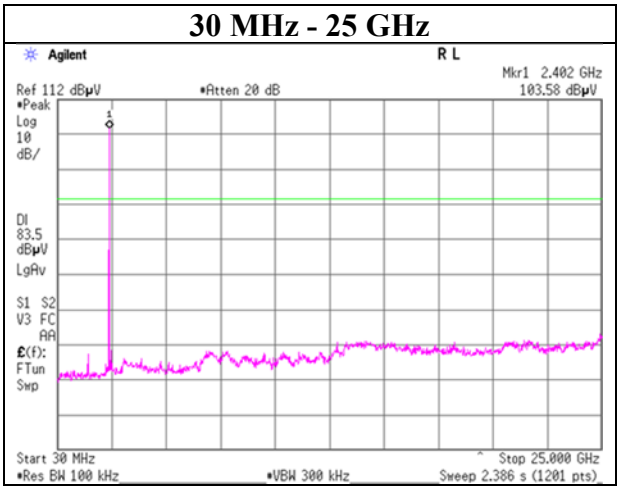
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz



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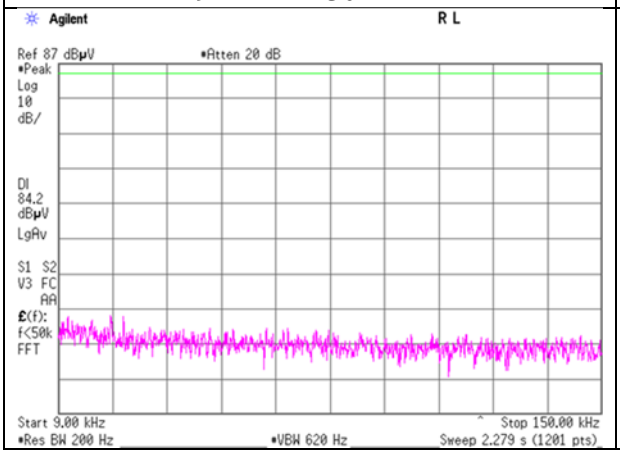
Conducted Spurious Emission

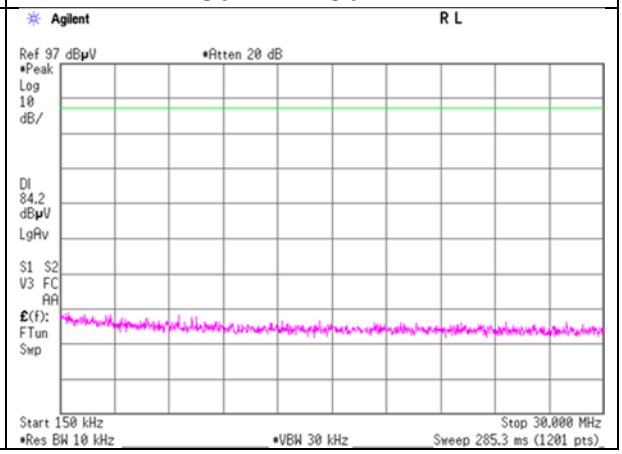
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, DH5

2441 MHz

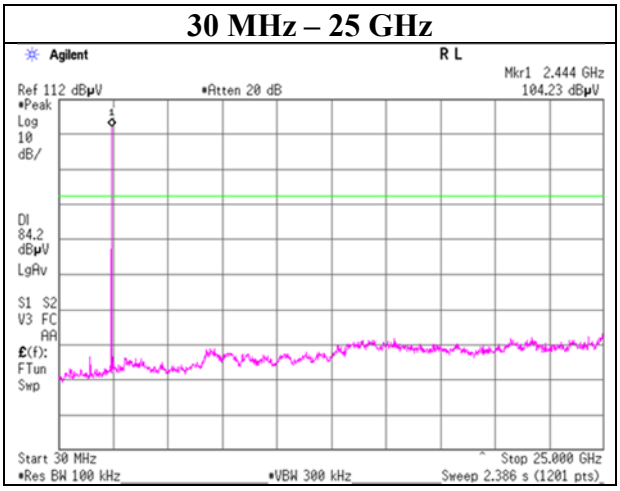
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

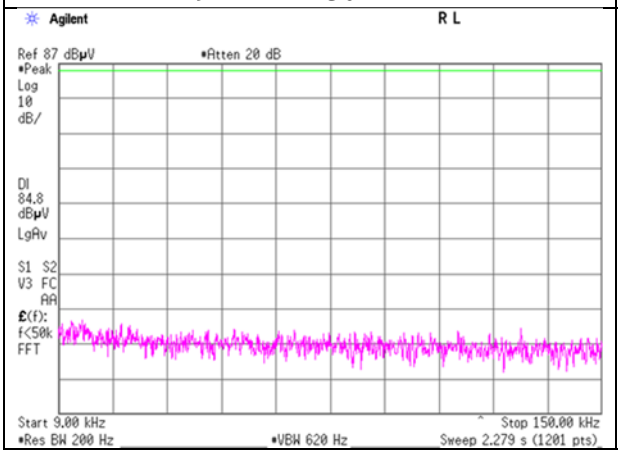


Conducted Spurious Emission

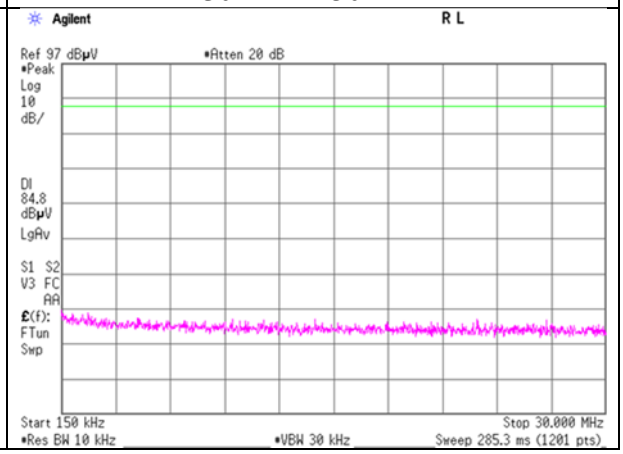
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, DH5

2480 MHz

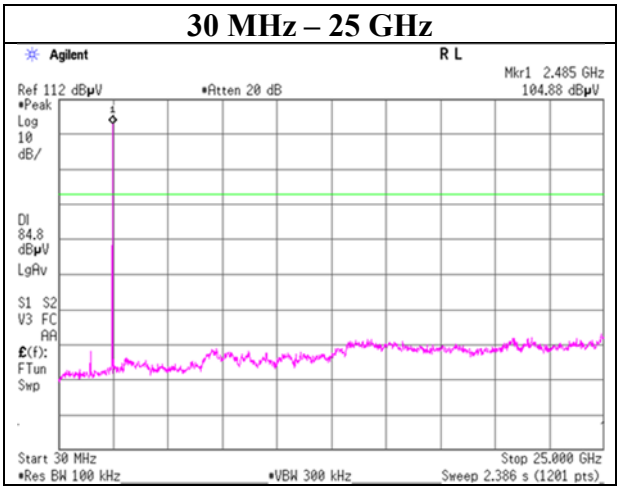
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

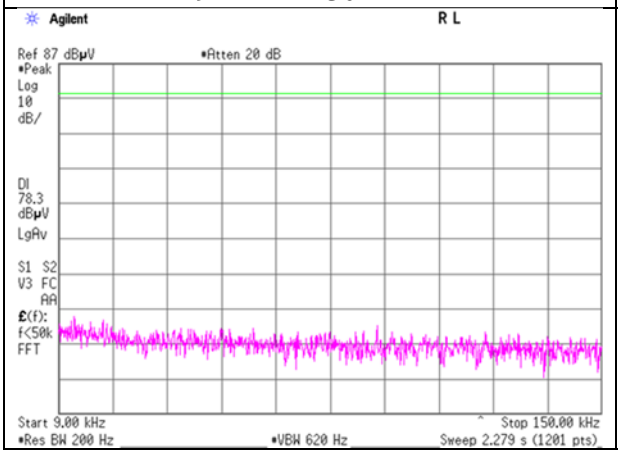


Conducted Spurious Emission

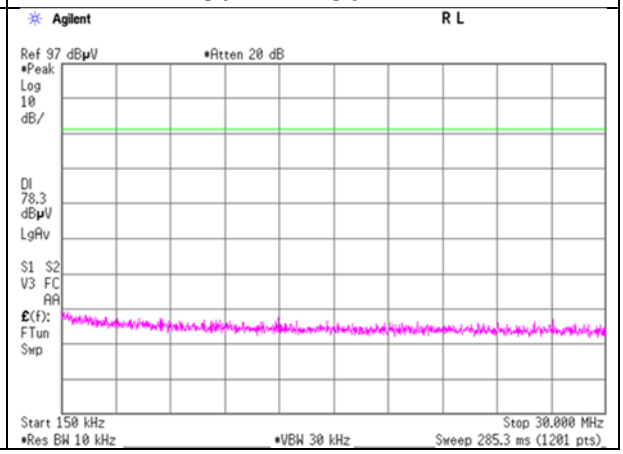
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, 3DH5

2402 MHz

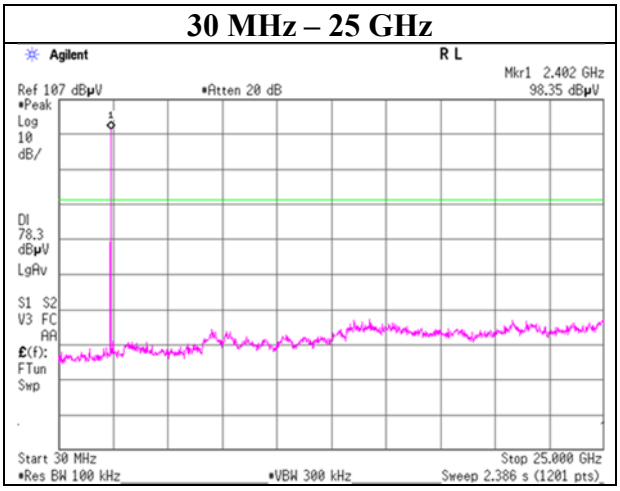
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz



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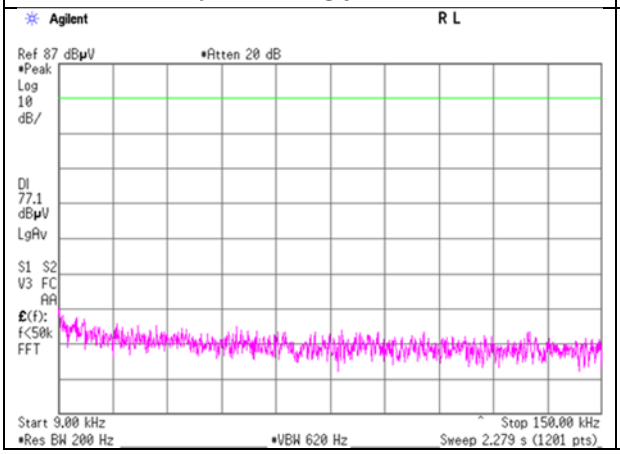
Conducted Spurious Emission

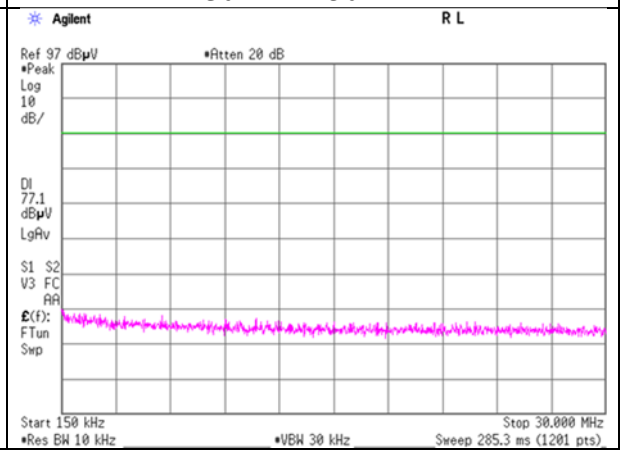
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, 3DH5

2441 MHz

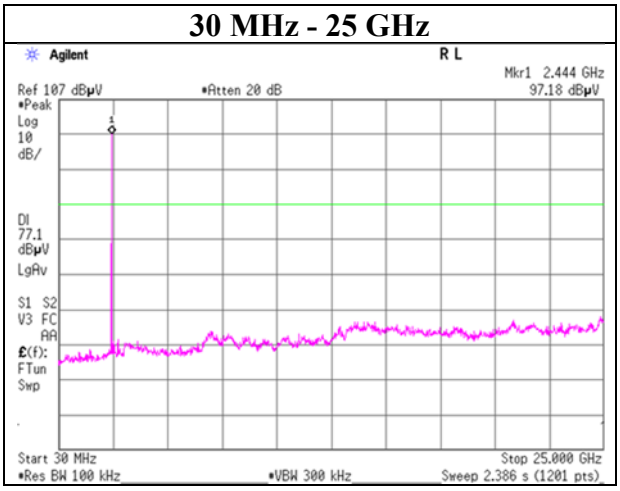
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

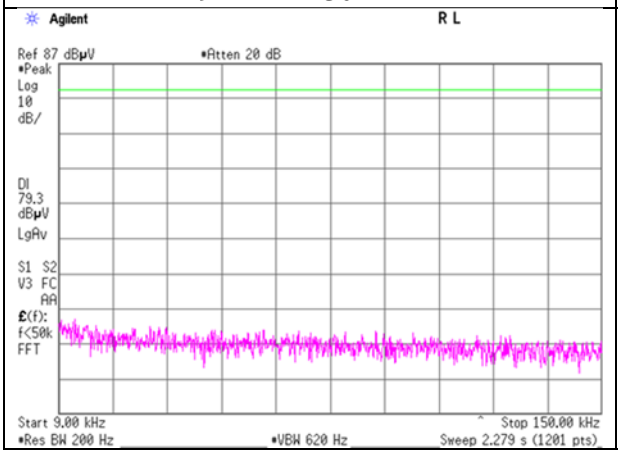


Conducted Spurious Emission

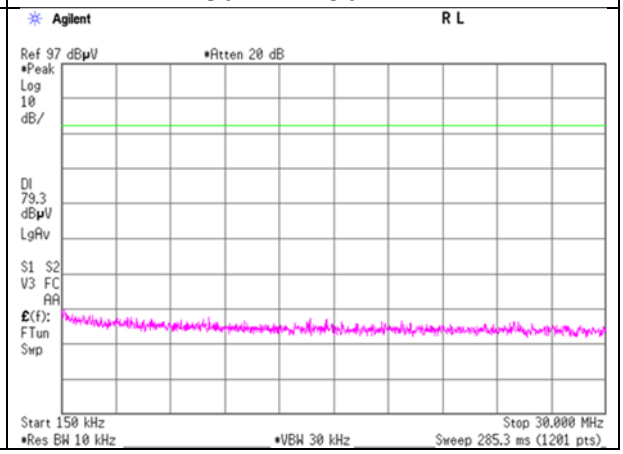
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, 3DH5

2480 MHz

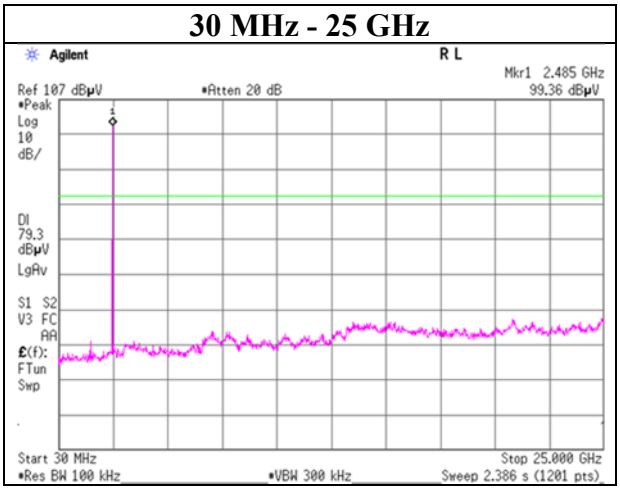
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

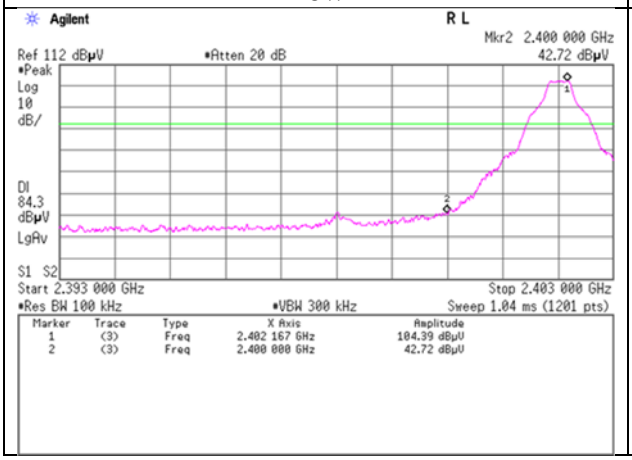


Conducted Emission Band Edge compliance

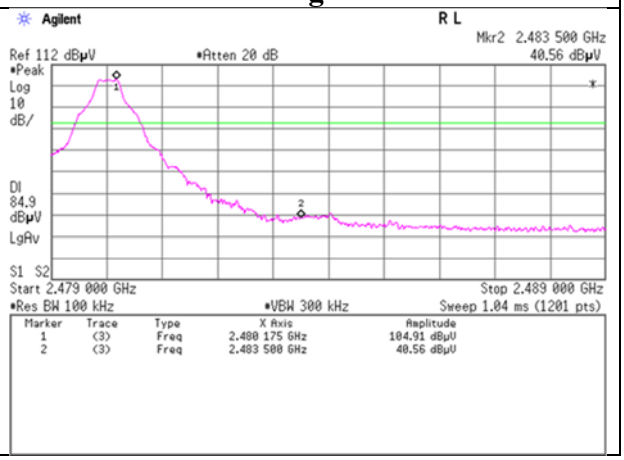
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx DH5

Hopping On

Low

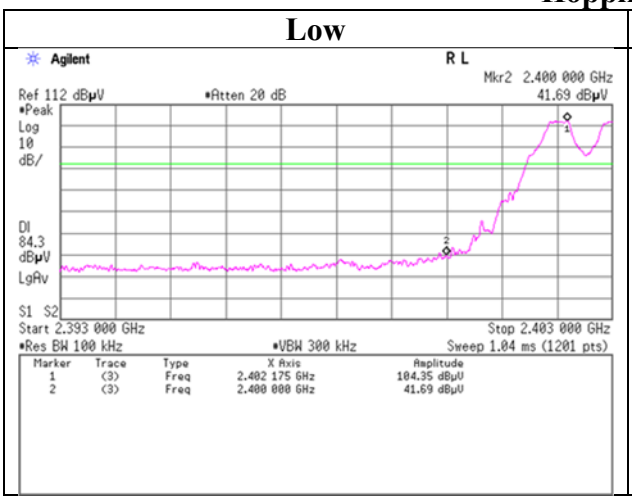


High

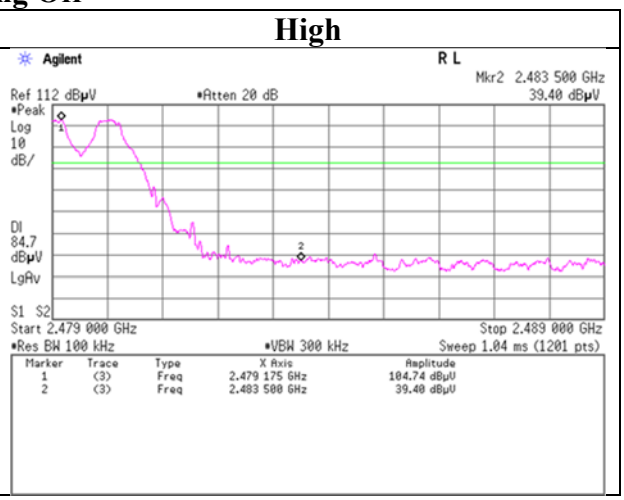


Hopping Off

Low



High

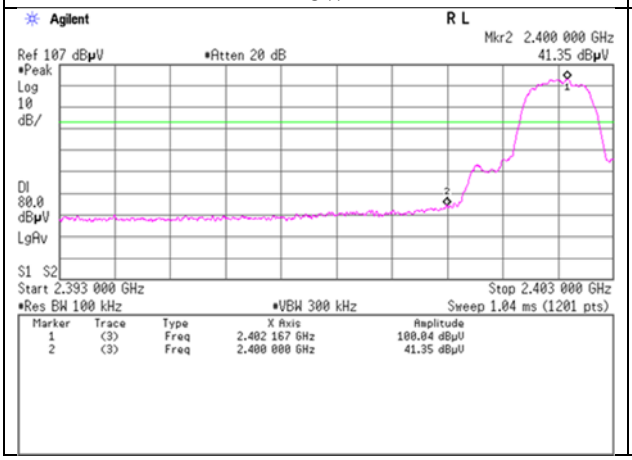


Conducted Emission Band Edge compliance

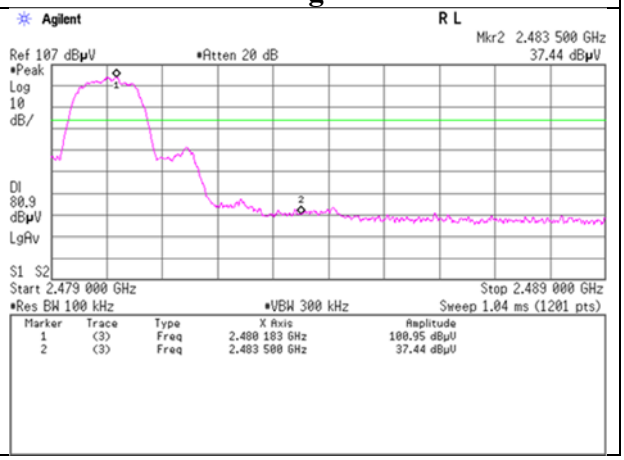
Report No.	12669312S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 20, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Kazuya Noda
Mode	Tx 3DH5

Hopping On

Low

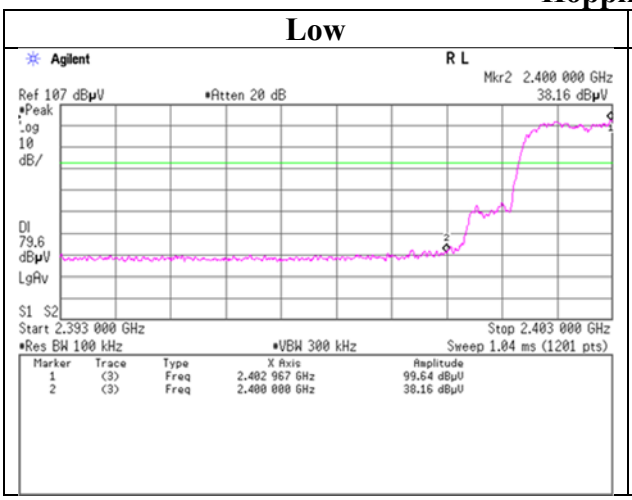


High

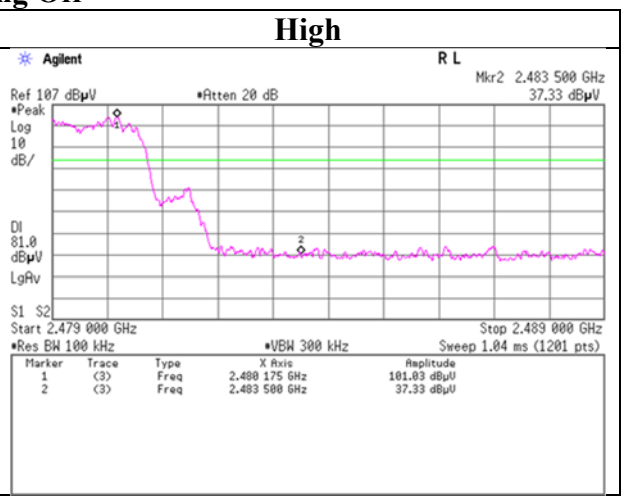


Hopping Off

Low



High



APPENDIX 2: Test instruments

Test Instruments (1 / 2)

Local ID	Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Calibration Interval (Month)
SAT10-14	AT	154591	Attenuator	Weinschel Corp.	54A-10	81595	2018/4/20	2019/4/30	12
SCC-G32	AT	145183	Coaxial Cable	Junkosha	MWX241-02000KMSKMS	OCT-09-13-005	2018/11/25	2019/11/30	12
SOS-09	AT	146318	Humidity Indicator	A&D	AD-5681	4061484	2018/12/5	2019/12/31	12
SPM-06	AT	146267	Power Meter	ANRITSU	ML2495A	850009	2018/5/10	2019/5/31	12
SPSS-03	AT	146309	Power sensor	ANRITSU	MA2411B	917063	2018/5/10	2019/5/31	12
SSA-02	AT	145800	Spectrum Analyzer	AGILENT	E4448A	MY48250106	2018/3/5	2019/3/31	12
STS-05	AT	146212	Digital Hitester	HIOKI	3805-50	80997828	2018/10/16	2019/10/31	12
COTS-SEMI-5	RE,CE	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,ME,PE)	-	-	-	-
KAT6-04	RE	144899	Attenuator	Inmet	18N-6dB	-	2018/12/25	2019/12/31	12
KJM-02	RE,CE	146432	Measure	TAJIMA	GL19-55	-	-	-	-
KJM-09	RE,CE	145929	Measure	KOMELON	KMC-36	-	-	-	-
KSA-08	RE	145089	Spectrum Analyzer	AGILENT	E4446A	MY46180525	2018/10/7	2019/10/31	12
SAEC-01(NSA)	RE	145597	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	2018/5/29	2019/5/31	12
SAEC-03(SVSWR)	RE	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2018/7/17	2019/7/31	12
SAF-01	RE	145003	Pre Amplifier	SONOMA	310N	290211	2019/2/5	2020/2/29	12
SAF-06	RE	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2019/2/8	2020/2/29	12
SAT10-05	RE	145136	Attenuator(above1GHz)	AGILENT	8493C-010	74864	2018/11/25	2019/11/30	12
SAT3-09	RE	144959	Attenuator	JFW	50HF-003N	-	2018/8/23	2019/8/31	12
SBA-01	RE	145161	Biconical Antenna	Schwarzbeck	BBA9106	91032664	2018/6/5	2019/6/30	12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	RE	144967	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141P	-/0901-269(RF Selector)	2018/4/9	2019/4/30	12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	RE	144968	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141P	-/0901-269(RF Selector)	2018/4/9	2019/4/30	12
SCC-G05	RE	145039	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	2019/1/25	2020/1/31	12
SCC-G22	RE	145180	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	2018/5/11	2019/5/31	12
SCC-G41	RE	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	2019/1/25	2020/1/31	12
SFL-18	RE	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2018/4/20	2019/4/30	12
SHA-03	RE	145501	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	2018/7/23	2019/7/31	12
SLA-05	RE	145527	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	2018/6/5	2019/6/30	12
SOS-01	RE	146316	Humidity Indicator	A&D	AD-5681	4062555	2018/10/25	2019/10/31	12
SOS-05	RE	146293	Humidity Indicator	A&D	AD-5681	4062518	2018/10/25	2019/10/31	12
STR-07	RE	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2018/9/26	2019/9/30	12

Test Instruments (2 / 2)

Local ID	Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Calibration Interval (Month)
STS-01	RE	145792	Digital Hitester	HIOKI	3805-50	80997812	2018/10/16	2019/10/31	12
STS-03	RE	146210	Digital Hitester	HIOKI	3805-50	80997823	2018/10/16	2019/10/31	12
SCC-G05	RE	145039	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	2019/1/25	2020/1/31	12
SCC-G22	RE	145180	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	2018/5/11	2019/5/31	12
SCC-G41	RE	151617	Coaxial Cable	Junkosha	MWX221-01000NFSN MS/B	1612S006	2019/1/25	2020/1/31	12
SFL-18	RE	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2018/4/20	2019/4/30	12
SHA-03	RE	145501	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	2018/7/23	2019/7/31	12
SLA-05	RE	145527	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	2018/6/5	2019/6/30	12
SOS-01	RE	146316	Humidity Indicator	A&D	AD-5681	4062555	2018/10/25	2019/10/31	12
SOS-05	RE	146293	Humidity Indicator	A&D	AD-5681	4062518	2018/10/25	2019/10/31	12
STR-07	RE	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2018/9/26	2019/9/30	12
STS-01	RE	145792	Digital Hitester	HIOKI	3805-50	80997812	2018/10/16	2019/10/31	12
STS-03	RE	146210	Digital Hitester	HIOKI	3805-50	80997823	2018/10/16	2019/10/31	12
SAT3-13	CE	150923	Attenuator	JFW	50HF-003N		2019/1/25	2020/1/31	12
SCC-C9/C10/SR SE-03	CE	145036	Coaxial Cable&RF Selector	Suhner/Suhner/ TOYO	RG223U/141 PE/NS4906	-/0901-271(RF Selector)	2018/4/9	2019/4/30	12
SLS-02	CE	145539	LISN	Rohde & Schwarz	ENV216	100512	2019/2/20	2020/2/29	12
SOS-06	CE	146294	Humidity Indicator	A&D	AD-5681	4062118	2018/12/5	2019/12/31	12
STR-08	CE	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2018/11/28	2019/11/30	12

***Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.**

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

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

Test item:

CE: Conducted Emission
RE: Radiated Emission test
AT: Antenna Terminal Conducted test