



RADIO TEST REPORT

Test Report No. : 12432582S-A-R2

Applicant : CASIO COMPUTER CO., LTD.
Type of Equipment : Smart Outdoor Watch
Model No. : WSD-F30
(Bluetooth BDR/EDR part)
FCC ID : BBQ-WSDF30
Test regulation : FCC Part 15 Subpart C: 2018
Test Result : Complied

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2. The results in this report apply only to the sample tested.
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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. This report is a revised version of 12432582S-A-R1. 12432582S-A-R1 is replaced with this report.

Date of test: June 22 to August 24, 2018

Representative test engineer:

Yosuke Ishikawa
Engineer
Consumer Technology Division

Approved by:

Akio Hayashi
Leader
Consumer Technology Division



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

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13-EM-F0429

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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

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

2.1 Identification of E.U.T.

Type of Equipment : Smart Outdoor Watch
Model No. : WSD-F30
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.7 V typical (battery) (DC 3.5 V to 4.2 V) , DC 5 V typical (AC Adapter)
Receipt Date of Sample : June 18, 2018
Country of Mass-production : Japan, 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: WSD-F30 (referred to as the EUT in this report) is a Smart Outdoor Watch.

Radio Specification

Bluetooth (Ver.4.1 with EDR function)

Radio Type : Transceiver
Frequency of Operation : 2402 MHz- 2480 MHz
Modulation : (BDR/EDR): GFSK, $\pi/4$ DQPSK, 8DPSK, (LE): GFSK
Antenna type : Inverted F type
Antenna Gain : -6.81 dBi (max)

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

Radio Type : Transceiver
Frequency of Operation : 2412 MHz- 2462 MHz
Modulation : DSSS/CCK, OFDM
Antenna type : Inverted F type
Antenna Gain : -6.81 dBi (max)

* Wireless LAN and Bluetooth do not transmit simultaneously.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on 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	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	16.8 dB 18.24400 MHz, AV, L1, (Tx, 3DH5, 2480 MHz)	Complied	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (b)	See data.	Complied	Conducted
20 dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (b)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	4.3 dB 51.603 MHz, QP, Vertical, (Tx, Hopping Off, 3DH5, 2402 MHz)	Complied#	Conducted/ Radiated (above 30 MHz) *1)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) Radiated test was selected over 30 MHz based on section 15.247(d).

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 EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.
Therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

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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	4.9 dB	4.8 dB	4.9 dB	-	-
	200 MHz-1 GHz	6.1 dB	6.1 dB	6.1 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	-	-
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	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	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 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	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

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3.5 Test Location

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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

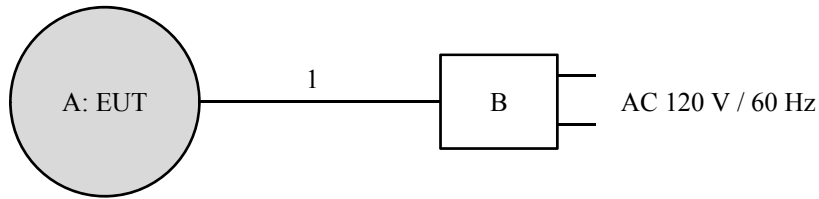
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20 dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99 % Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*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)</p> <p>*2DH mode (2 Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* 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.</p> <p>*EUT has the power settings by the software as follows; Power settings: Fixed Software: WSD-F30-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.</p>		

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Smart Outdoor Watch	WSD-F30	No.8 *1) No.5 *2)	CASIO COMPUTER CO., LTD.	EUT
B	AC Adapter	AD-W50100U1	-	CASIO COMPUTER CO., LTD.	-

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	0.8	Unshielded	Unshielded	-

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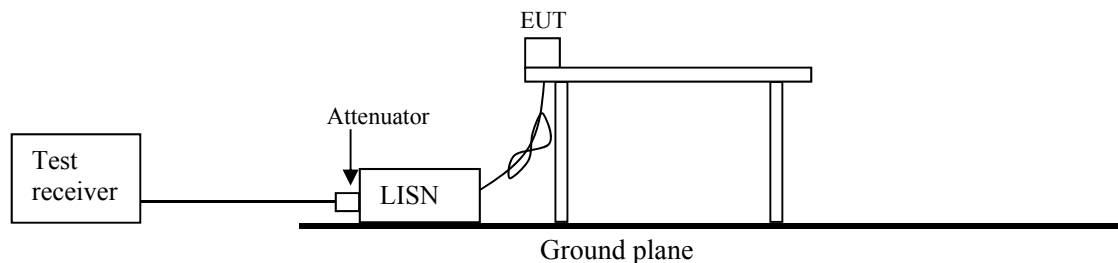
SECTION 5: Conducted Emission

Test Procedure and conditions

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

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.



The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT via AC adapter in a Shielded room.

The EUT via AC adapter 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

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SECTION 6: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 2.0 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

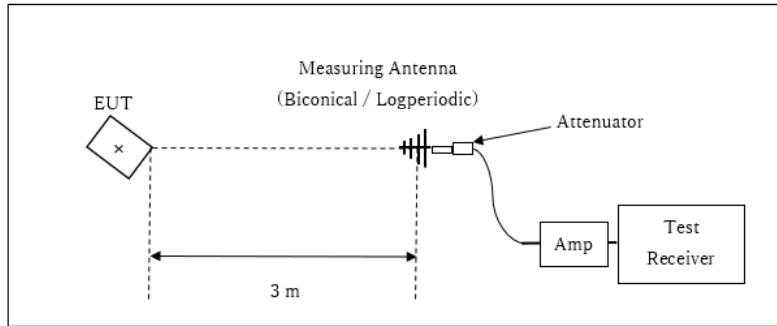
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz

*1) Although DA 00-705 accepts VBW = 10 Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.

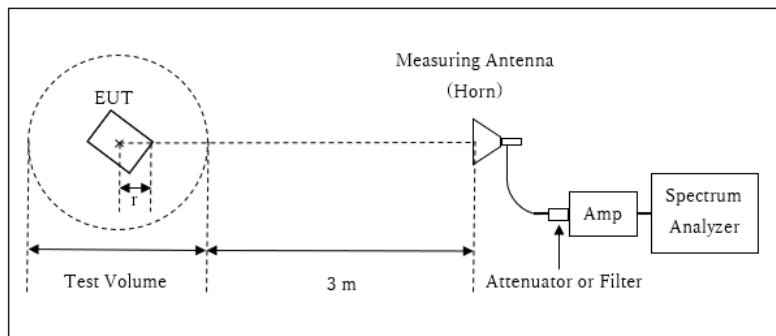
Below 1 GHz



x : Center of turn table

Test Distance : 3 m

1 GHz - 13 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

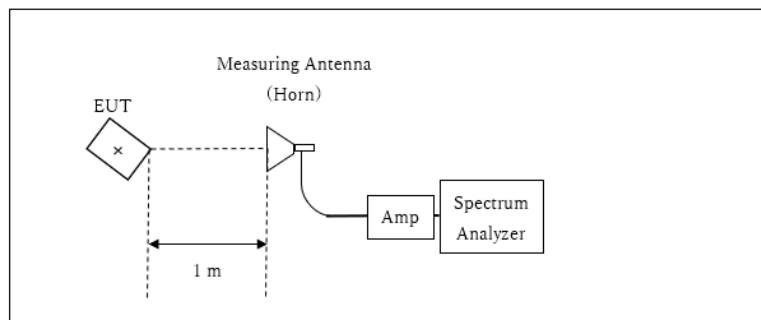
Distance Factor: $20 \times \log(3.97 \text{ m}^*/3.0 \text{ m}) = 2.44 \text{ dB}$

*Test Distance : $(3 + \text{Test Volume} / 2) - r = 3.97 \text{ m}$

Test Volume : 2 m (Test Volume has been calibrated based on CISPR16-1-4.)

r = 0.03 m

13 GHz - 26.5 GHz



x : Center of turn table

Distance Factor: $20 \times \log(1.0 \text{ m}^* / 3.0 \text{ m}) = -9.54 \text{ dB}$

*Test Distance : 1 m

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- 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.

Test Antenna	Frequency	Carrier	Spurious			
			30 MHz-1 GHz	1-13 GHz	13-18 GHz	18-26 GHz
Horizontal		Z	X	Z	Z	Z
Vertical		Y	X	Z	Z	Z

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
20 dB 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: 160 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	30kHz				
	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.

Test data : **APPENDIX**

Test result : **Pass**

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

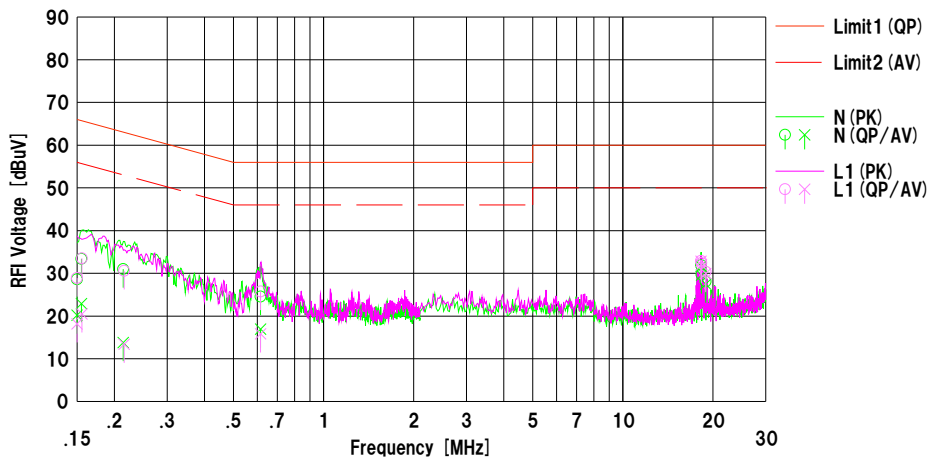
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2018/08/24

Mode : Tx, DH5, 2480 MHz
Power : AC 120 V, 60 Hz
Temp./Humi. : 24 deg.C / 48 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazutaka Takeyama

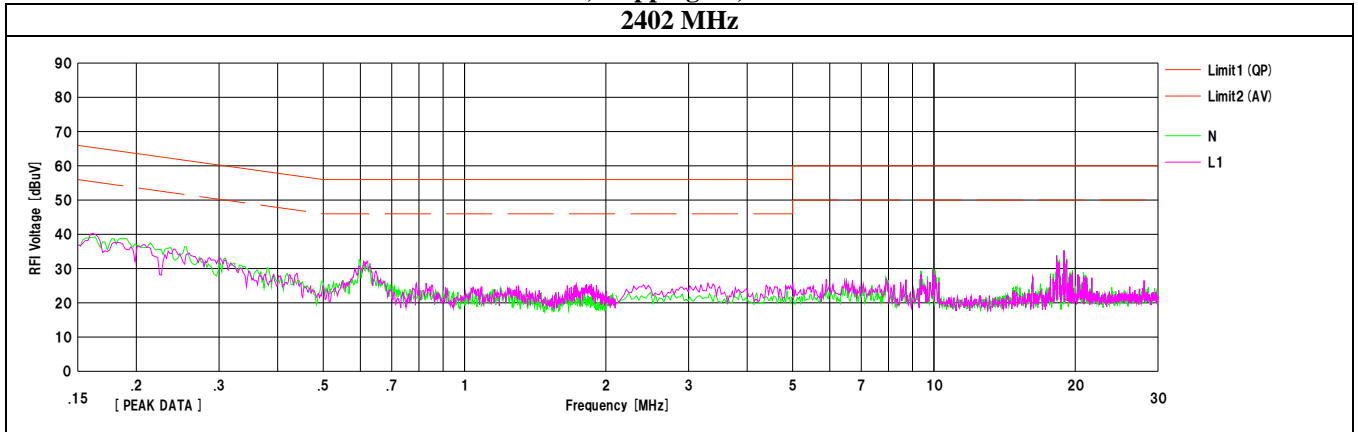


No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	16.10	7.70	12.49	28.59	20.19	66.00	56.00	37.4	35.8	N	
2	0.15514	20.90	10.40	12.49	33.39	22.89	65.72	55.72	32.3	32.8	N	
3	0.21400	18.50	1.30	12.49	30.99	13.79	63.05	53.05	32.0	39.2	N	
4	0.61570	12.00	4.40	12.54	24.54	16.94	56.00	46.00	31.4	29.0	N	
5	18.24360	17.20	17.00	14.71	31.91	31.71	60.00	50.00	28.0	18.2	N	
6	18.30450	15.00	14.90	14.71	29.71	29.61	60.00	50.00	30.2	20.3	N	
7	18.91520	13.30	12.70	14.77	28.07	27.47	60.00	50.00	31.9	22.5	N	
8	0.15000	16.40	5.70	12.49	28.89	18.19	66.00	56.00	37.1	37.8	L1	
9	0.15586	21.00	8.00	12.49	33.49	20.49	65.68	55.68	32.1	35.1	L1	
10	0.21550	18.10	0.90	12.49	30.59	13.39	62.99	52.99	32.4	39.6	L1	
11	0.61560	13.20	3.30	12.54	25.74	15.84	56.00	46.00	30.2	30.1	L1	
12	18.24320	18.20	18.10	14.71	32.91	32.81	60.00	50.00	27.0	17.1	L1	
13	18.30495	17.70	17.30	14.71	32.41	32.01	60.00	50.00	27.5	17.9	L1	
14	18.91530	15.60	15.20	14.77	30.37	29.97	60.00	50.00	29.6	20.0	L1	

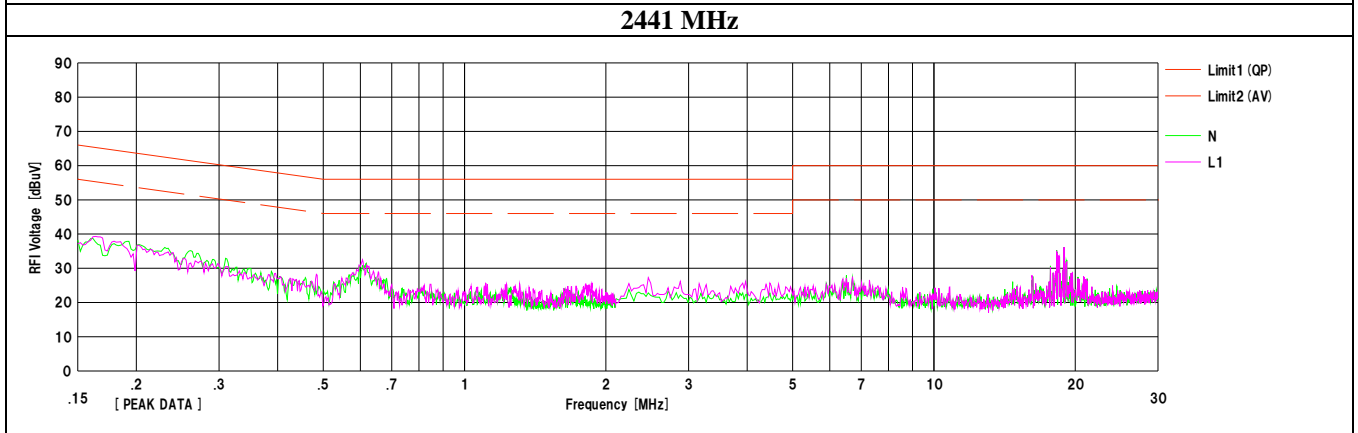
Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) = SLS-02

Conducted Emission

Tx, Hopping off, DH5
2402 MHz



2441 MHz



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Conducted Emission

DATA OF CONDUCTED EMISSION TEST

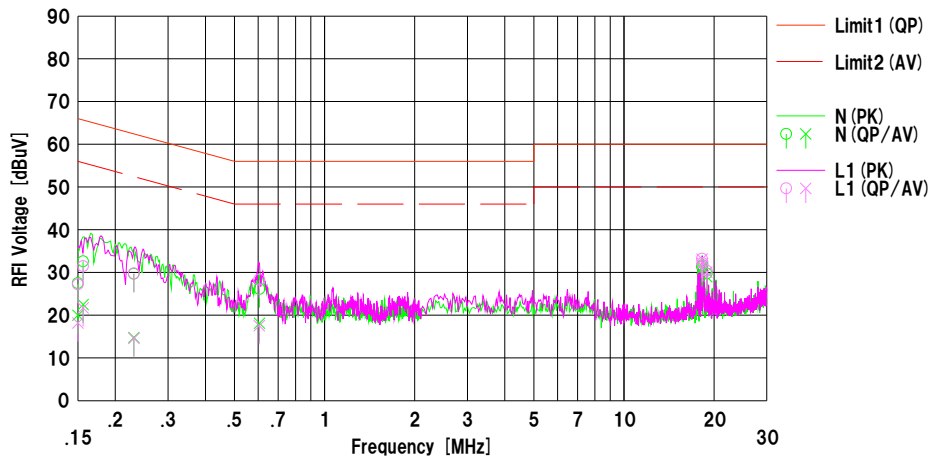
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2018/08/24

Mode : Tx.3DH5,2480 MHz
Power : AC 120 V, 60 Hz
Temp./Humi. : 24 deg.C / 48 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazutaka Takeyama

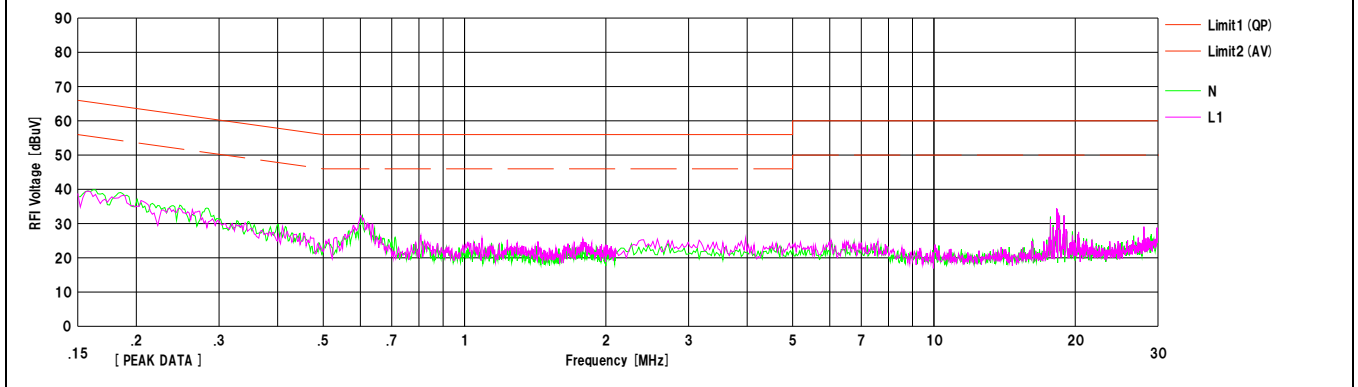


No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dB]	<AV> [dB]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	15.00	7.50	12.49	27.49	19.99	66.00	56.00	38.5	36.0	N	
2	0.15620	20.10	10.00	12.49	32.59	22.49	65.66	55.66	33.0	33.1	N	
3	0.23070	17.20	2.30	12.48	29.68	14.78	62.42	52.42	32.7	37.6	N	
4	0.60620	13.60	5.60	12.53	26.13	18.13	56.00	46.00	29.8	27.8	N	
5	18.24370	16.60	16.20	14.71	31.31	30.91	60.00	50.00	28.6	19.0	N	
6	18.30446	17.00	16.60	14.71	31.71	31.31	60.00	50.00	28.2	18.6	N	
7	18.92364	15.00	14.20	14.77	29.77	28.97	60.00	50.00	30.2	21.0	N	
8	0.15000	14.70	5.70	12.49	27.19	18.19	66.00	56.00	38.8	37.8	L1	
9	0.15620	19.00	9.20	12.49	31.49	21.69	65.66	55.66	34.1	33.9	L1	
10	0.23090	17.30	2.10	12.48	29.78	14.58	62.42	52.42	32.6	37.8	L1	
11	0.60530	15.80	5.00	12.53	28.33	17.53	56.00	46.00	27.6	28.4	L1	
12	18.24400	18.50	18.40	14.71	33.21	33.11	60.00	50.00	26.7	16.8	L1	
13	18.30450	17.50	17.40	14.71	32.21	32.11	60.00	50.00	27.7	17.8	L1	
14	18.91500	15.60	15.30	14.77	30.37	30.07	60.00	50.00	29.6	19.9	L1	

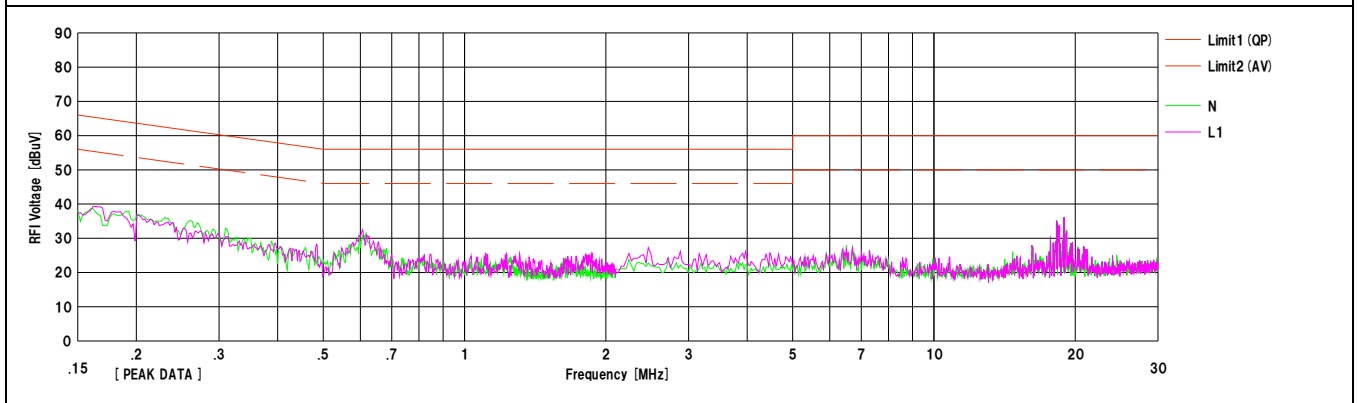
Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) = SLS-02

Conducted Emission

Tx, Hopping off, 3DH5
2402 MHz



2441 MHz



UL Japan, Inc.

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

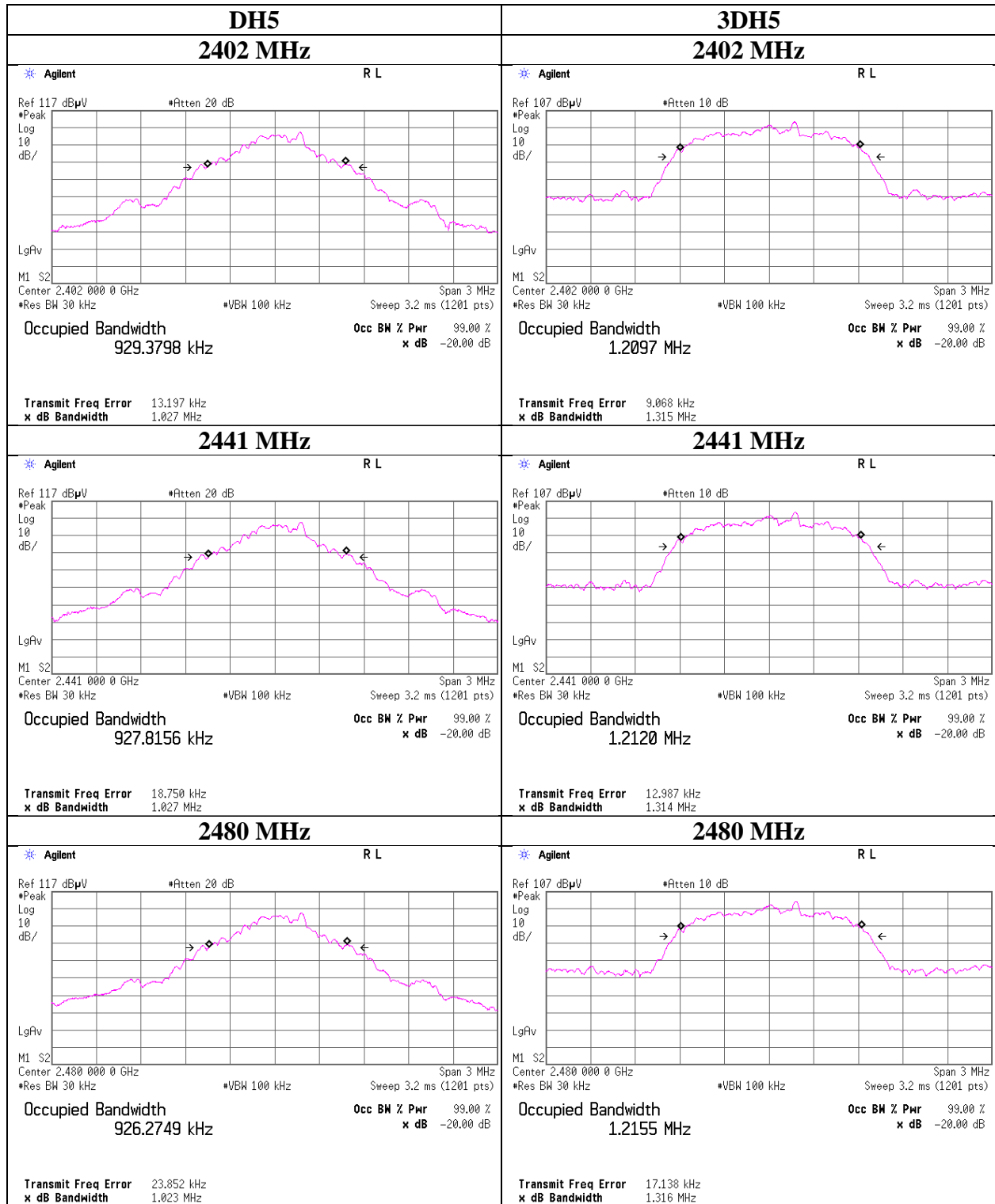
Report No. 12432582S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date July 3, 2018
Temperature / Humidity 25 deg. C / 42 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.027	929.4	1.000	≥ 0.685
DH5	2441.0	1.027	927.8	1.000	≥ 0.684
DH5	2480.0	1.023	926.3	1.000	≥ 0.682
DH5	Hopping On	-	78649.0	-	-
3DH5	2402.0	1.315	1209.7	1.000	≥ 0.876
3DH5	2441.0	1.314	1212.0	1.000	≥ 0.876
3DH5	2480.0	1.316	1215.5	1.000	≥ 0.877
3DH5	Hopping On	-	78753.9	-	-

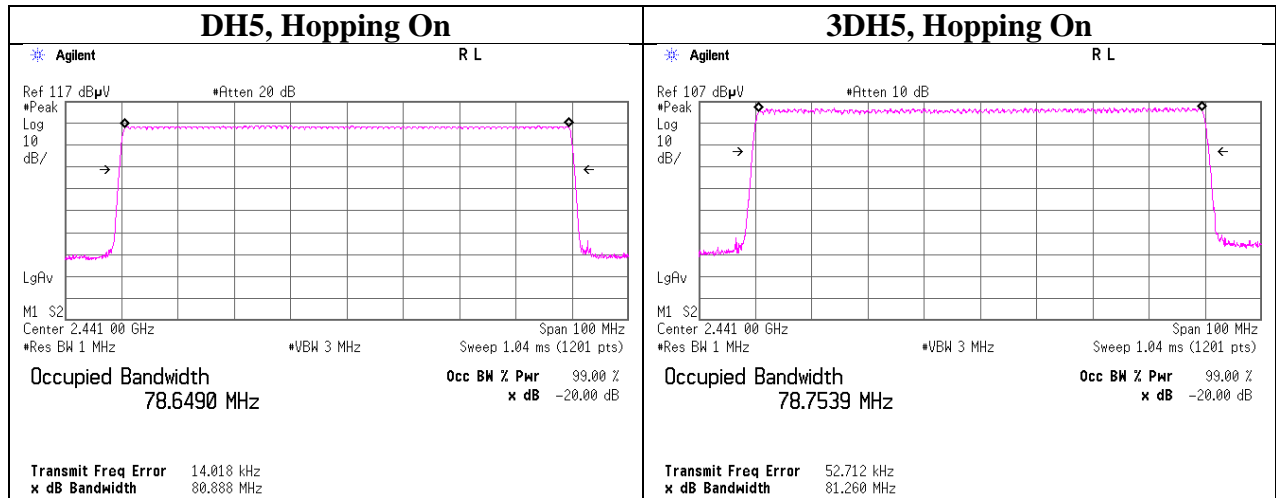
Limit: Two-thirds of 20 dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20 dB Bandwidth.

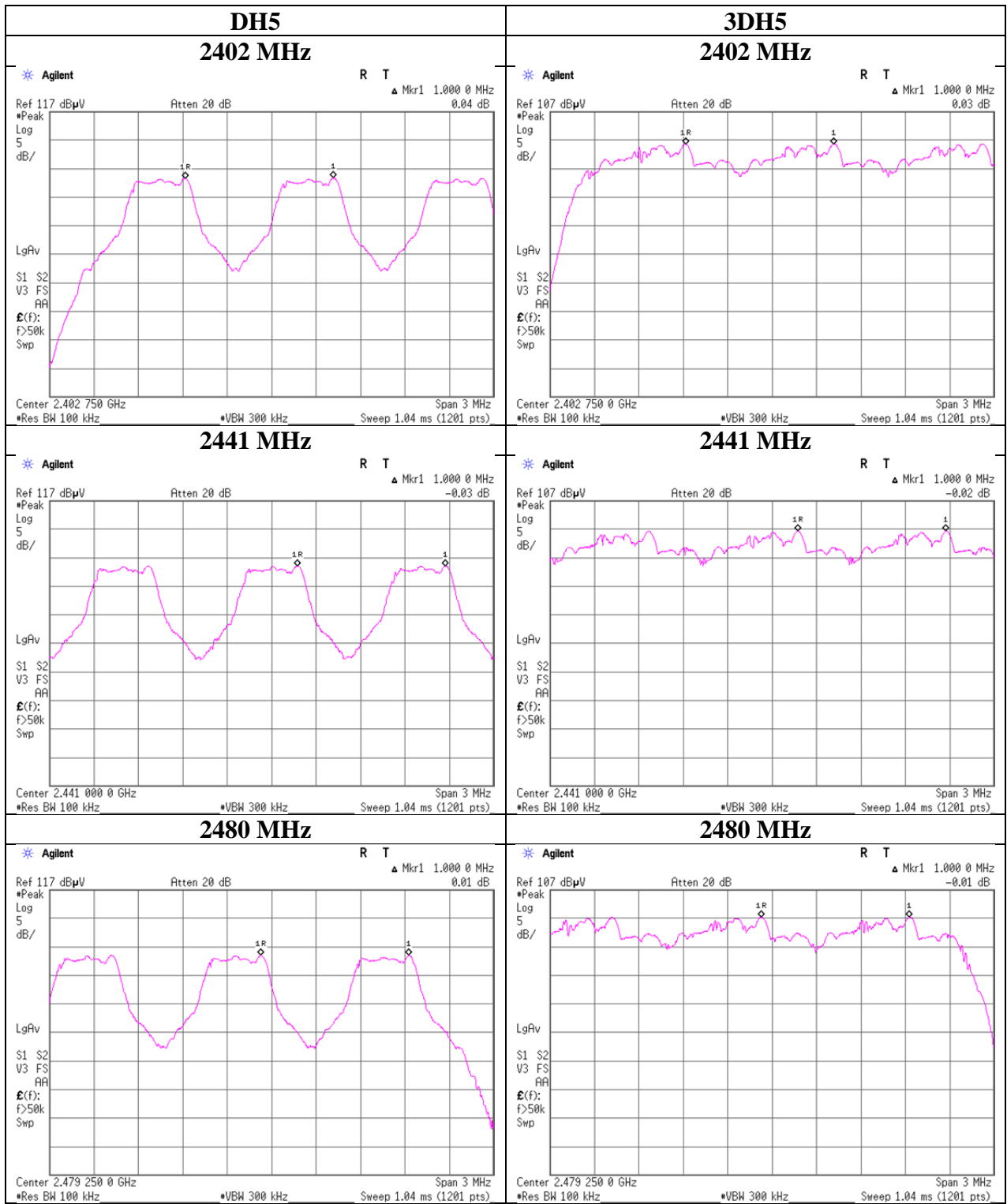
20 dB Bandwidth and 99 % Occupied Bandwidth



20 dB Bandwidth and 99 % Occupied Bandwidth



Carrier Frequency Separation



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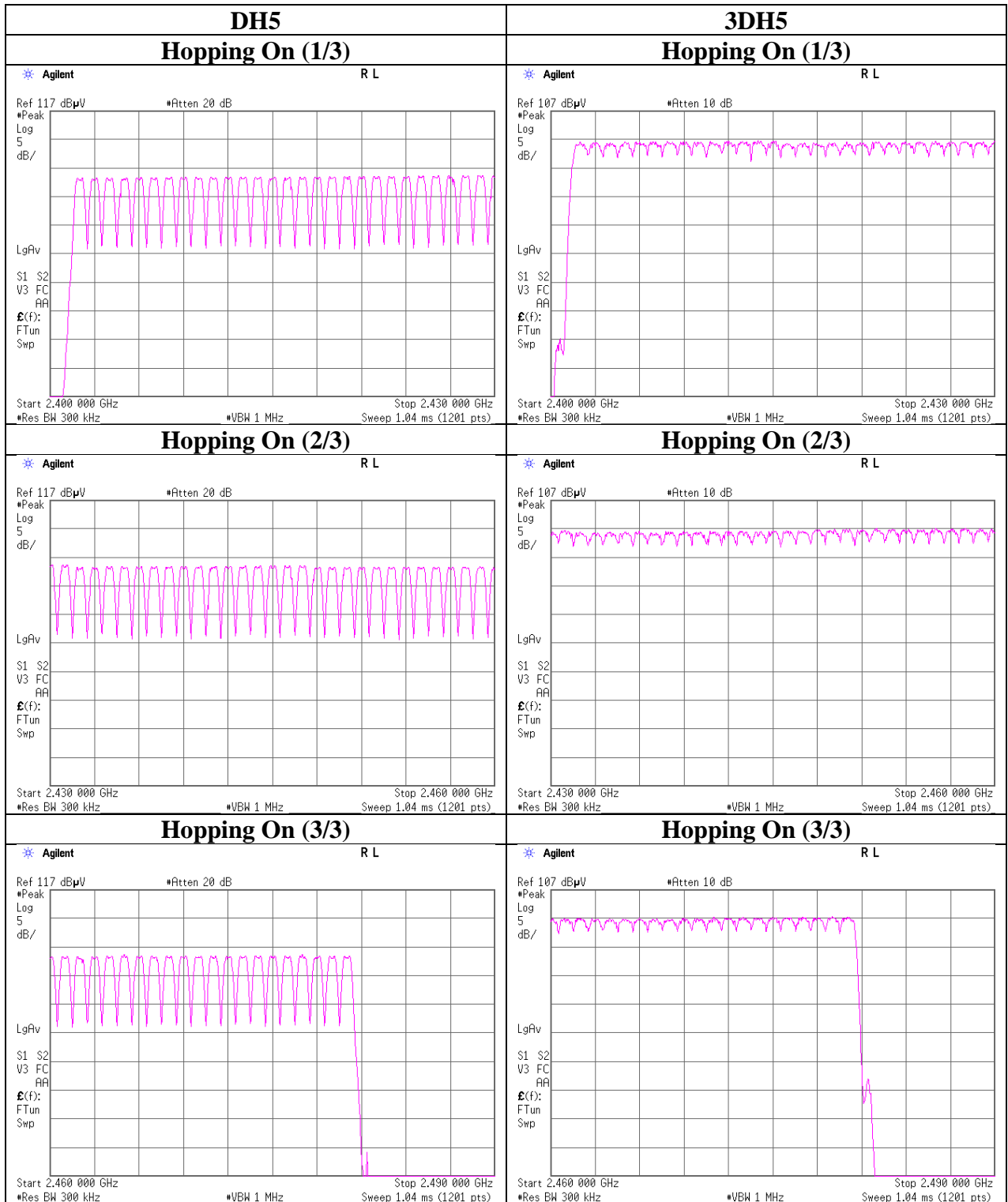
Number of Hopping Frequency

Report No. 12432582S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date July 3, 2018
Temperature / Humidity 25 deg. C / 42 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping On

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

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

Number of Hopping Frequency



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Dwell time

Report No. 12432582S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date July 3, 2018
Temperature / Humidity 25 deg. C / 42 % RH
Engineer Shiro Kobayashi
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	49.0 times / 5 sec. x 31.6 sec. = 310 times	0.432	134	400
DH3	25.2 times / 5 sec. x 31.6 sec. = 160 times	1.680	269	400
DH5	15.8 times / 5 sec. x 31.6 sec. = 100 times	2.947	295	400
3DH1	49.4 times / 5 sec. x 31.6 sec. = 313 times	0.428	134	400
3DH3	25.0 times / 5 sec. x 31.6 sec. = 158 times	1.680	265	400
3DH5	16.0 times / 5 sec. x 31.6 sec. = 102 times	2.942	300	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

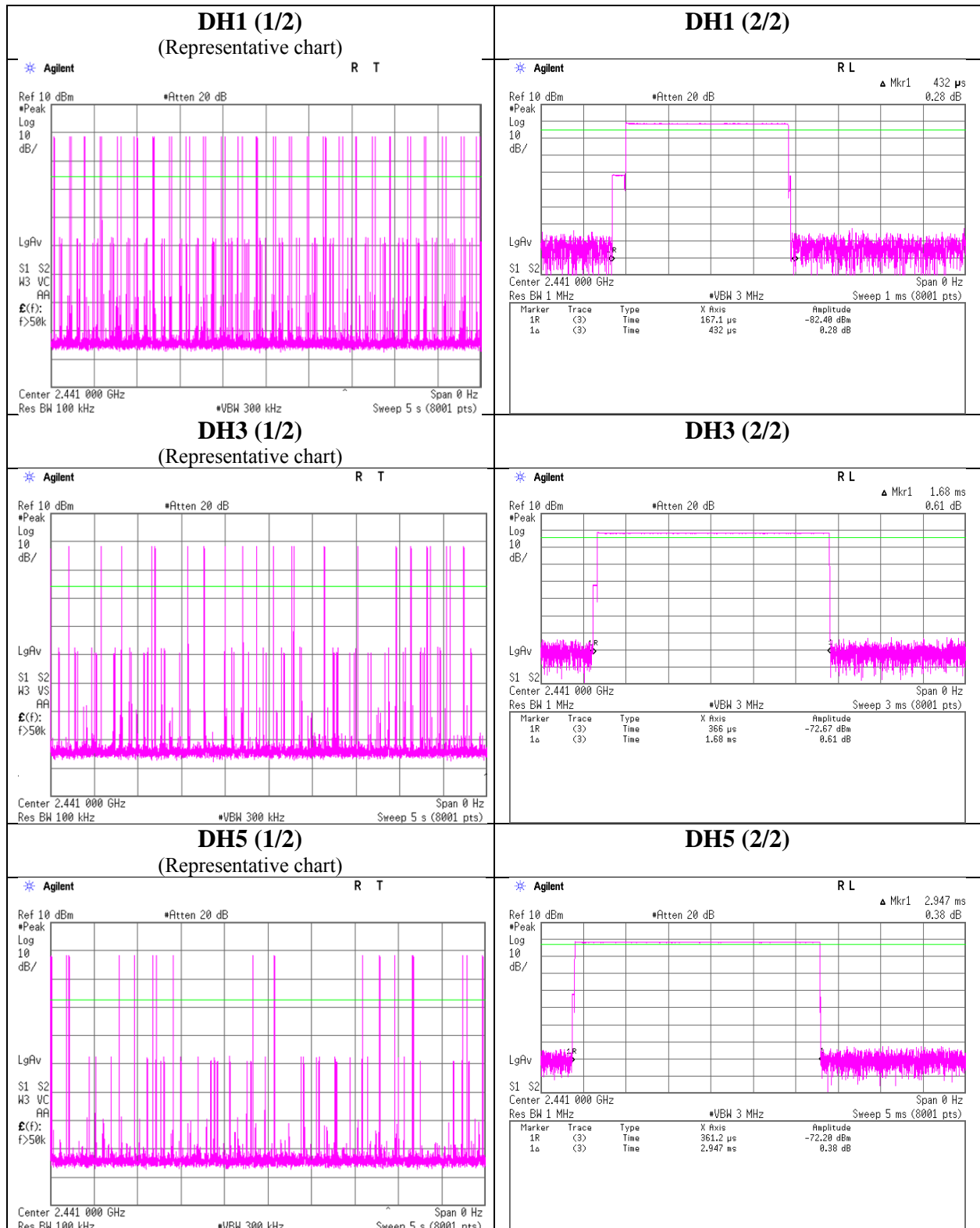
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	46	51	50	48	50	49.0
DH3	23	24	26	24	29	25.2
DH5	17	14	15	19	14	15.8
3DH1	49	50	50	49	49	49.4
3DH3	25	26	25	25	24	25.0
3DH5	15	15	20	15	15	16.0

Sample Calculation

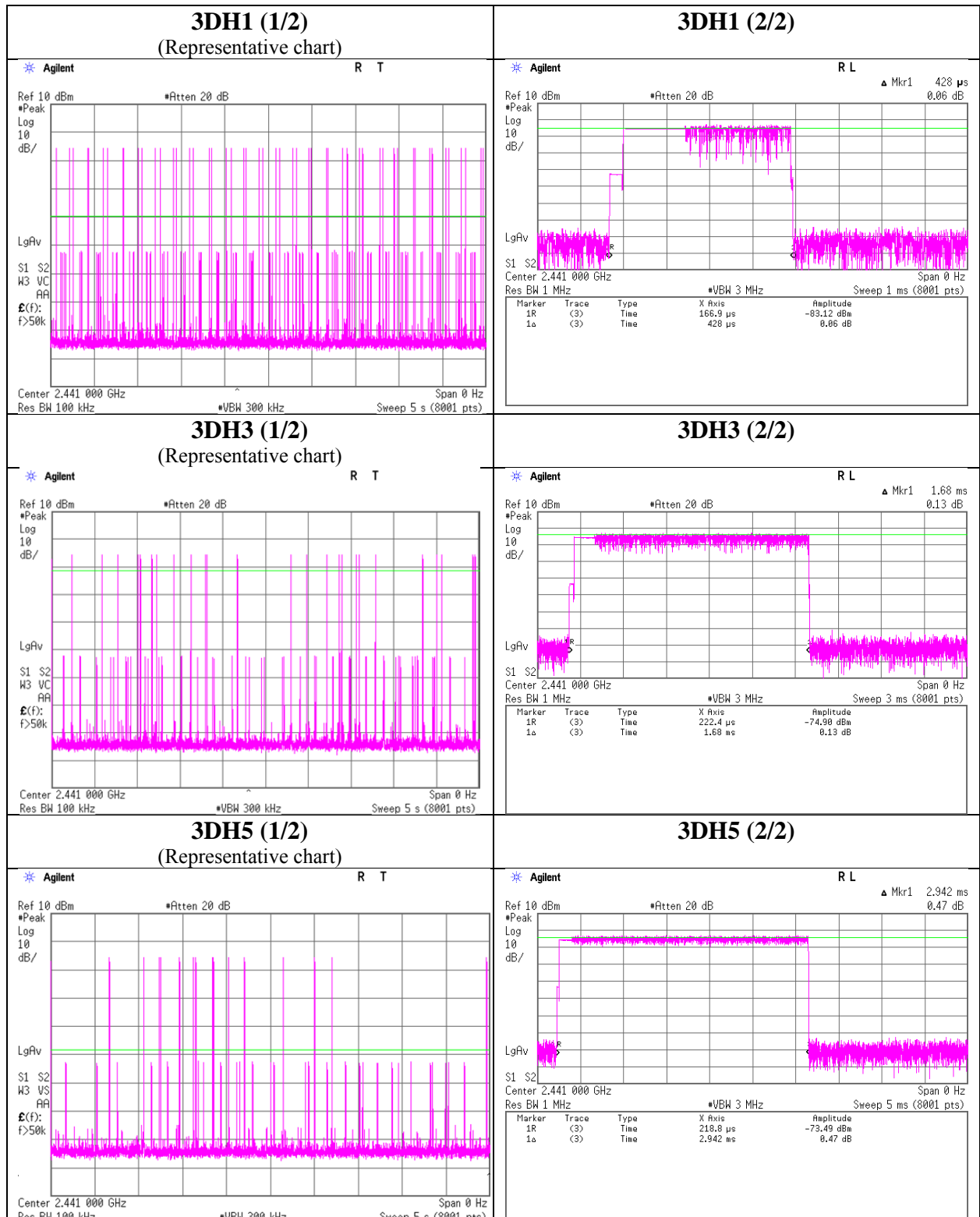
Average = Summation (Sampling 1 to 5) / 5

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 $N \times 0.4s$, 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



Dwell time



Maximum Peak Output Power

Report No. 12432582S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date June 22, 2018
Temperature / Humidity 25 deg. C / 55 % RH
Engineer Yosuke Ishikawa
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
					Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-1.13	1.68	9.86	10.41	10.99	20.96	125	10.55	-6.81	3.60	2.29	36.02	4000	32.42
DH5	2441.0	-0.93	1.69	9.86	10.62	11.53	20.96	125	10.34	-6.81	3.81	2.40	36.02	4000	32.21
DH5	2480.0	-0.86	1.70	9.85	10.69	11.72	20.96	125	10.27	-6.81	3.88	2.44	36.02	4000	32.14
2DH5	2402.0	-2.63	1.68	9.86	8.91	7.78	20.96	125	12.05	-6.81	2.10	1.62	36.02	4000	33.92
2DH5	2441.0	-2.58	1.69	9.86	8.97	7.89	20.96	125	11.99	-6.81	2.16	1.64	36.02	4000	33.86
2DH5	2480.0	-2.13	1.70	9.85	9.42	8.75	20.96	125	11.54	-6.81	2.61	1.82	36.02	4000	33.41
3DH5	2402.0	-2.40	1.68	9.86	9.14	8.20	20.96	125	11.82	-6.81	2.33	1.71	36.02	4000	33.69
3DH5	2441.0	-2.37	1.69	9.86	9.18	8.28	20.96	125	11.78	-6.81	2.37	1.73	36.02	4000	33.65
3DH5	2480.0	-1.93	1.70	9.85	9.62	9.16	20.96	125	11.34	-6.81	2.81	1.91	36.02	4000	33.21

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.

However, the limit level 125mW of AFH mode was used for the test.

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Average Output Power
(Reference data for SAR testing)

Report No. 12432582S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date June 22, 2018
Temperature / Humidity 25 deg. C / 55 % RH
Engineer Yosuke Ishikawa
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-2.70	1.68	9.86	8.84	7.66	1.07	9.91	9.79
DH5	2441.0	-2.61	1.69	9.86	8.94	7.83	1.07	10.01	10.02
DH5	2480.0	-2.66	1.70	9.85	8.89	7.74	1.07	9.96	9.91
2DH5	2402.0	-6.44	1.68	9.86	5.10	3.24	1.07	6.17	4.14
2DH5	2441.0	-6.31	1.69	9.86	5.24	3.34	1.07	6.31	4.28
2DH5	2480.0	-5.67	1.70	9.85	5.88	3.87	1.07	6.95	4.95
3DH5	2402.0	-6.39	1.68	9.86	5.15	3.27	1.07	6.22	4.19
3DH5	2441.0	-6.31	1.69	9.86	5.24	3.34	1.07	6.31	4.28
3DH5	2480.0	-5.66	1.70	9.85	5.89	3.88	1.07	6.96	4.97

Sample Calculation:

Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

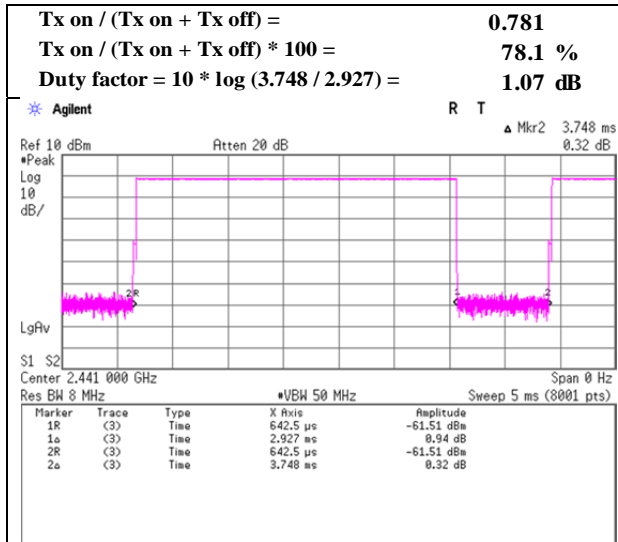
Result (Burst power average) = Time average + Duty factor

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

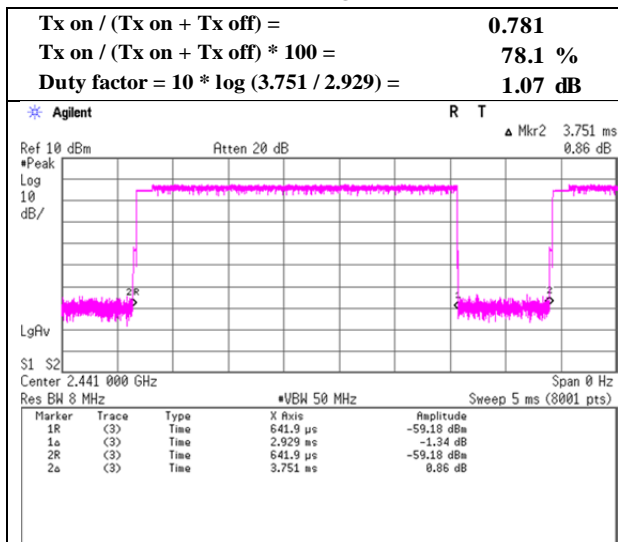
Burst Rate Confirmation

Report No. 12432582S-A-R2
 Test place Shonan EMC Lab. No.5 Shielded Room
 Date June 22, 2018
 Temperature / Humidity 25 deg. C / 55 % RH
 Engineer Yosuke Ishikawa
 Mode Tx, Hopping Off

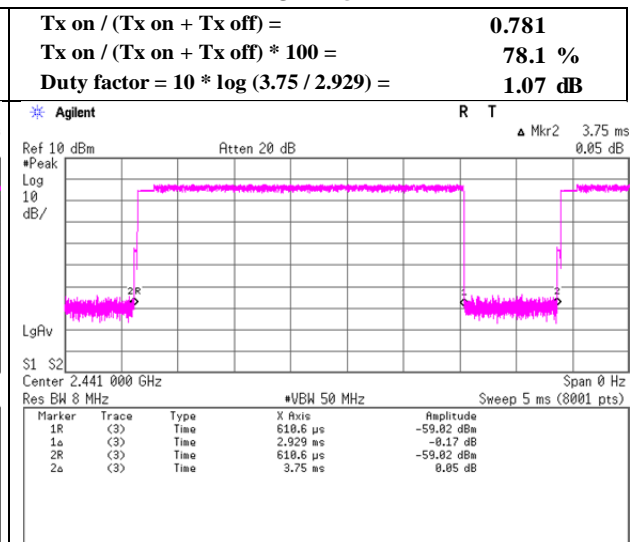
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No.	12432582S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	August 18, 2018	August 13, 2018	August 16, 2018	August 19, 2018
Temperature / Humidity	25 deg.C / 50 %RH	24 deg.C / 57 %RH	25 deg.C / 55 %RH	25 deg.C / 50 %RH
Engineer	Kazutaka Takeyama (30 MHz – 1000 MHz)	Takahiro Suzuki (1 GHz – 2.8 GHz)	Kazutaka Takeyama (2.8 GHz – 18 GHz)	Kazutaka Takeyama (18 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.	52.027	QP	32.00	10.49	7.16	31.91	0.00	17.74	40.00	22.2	300	202	
Hori.	799.000	QP	22.70	20.82	8.67	31.41	0.00	20.78	46.00	25.2	100	3	
Hori.	2390.000	PK	49.66	27.91	13.97	36.58	2.44	57.40	73.90	16.5	133	186	
Hori.	4804.000	PK	44.40	31.31	6.60	36.88	2.44	47.87	73.90	26.0	150	146	
Hori.	7206.000	PK	44.80	36.77	7.65	37.26	2.44	54.40	73.90	19.5	150	0	Floor Noise
Hori.	9608.000	PK	43.80	38.11	8.71	38.47	2.44	54.59	73.90	19.3	150	0	Floor Noise
Hori.	12010.000	PK	44.60	39.10	10.16	38.04	2.44	58.26	73.90	15.6	150	0	Floor Noise
Hori.	2390.000	AV	36.11	27.91	13.97	36.58	2.44	43.85	53.90	10.1	133	186	
Hori.	4804.000	AV	32.80	31.31	6.60	36.88	2.44	36.27	53.90	17.6	150	146	
Hori.	7206.000	AV	32.50	36.77	7.65	37.26	2.44	42.10	53.90	11.8	150	0	Floor Noise
Hori.	9608.000	AV	33.00	38.11	8.71	38.47	2.44	43.79	53.90	10.1	150	0	Floor Noise
Hori.	12010.000	AV	33.30	39.10	10.16	38.04	2.44	46.96	53.90	6.9	150	0	Floor Noise
Vert.	51.508	QP	49.70	10.65	7.16	31.91	0.00	35.60	40.00	4.4	100	171	
Vert.	56.206	QP	45.80	9.14	7.09	31.91	0.00	30.12	40.00	9.8	100	280	
Vert.	76.590	QP	46.80	6.30	7.80	31.89	0.00	29.01	40.00	10.9	100	186	
Vert.	96.380	QP	42.80	9.53	8.00	31.88	0.00	28.45	43.50	15.0	100	3	
Vert.	236.466	QP	27.40	11.47	5.70	31.74	0.00	12.83	46.00	33.1	100	256	
Vert.	2390.000	PK	45.13	27.91	13.97	36.58	2.44	52.87	73.90	21.0	142	28	
Vert.	4804.000	PK	44.50	31.31	6.60	36.88	2.44	47.97	73.90	25.9	150	130	
Vert.	7206.000	PK	44.00	36.77	7.65	37.26	2.44	53.60	73.90	20.3	150	0	Floor Noise
Vert.	9608.000	PK	43.60	38.11	8.71	38.47	2.44	54.39	73.90	19.5	150	0	Floor Noise
Vert.	12010.000	PK	44.10	39.10	10.16	38.04	2.44	57.76	73.90	16.1	150	0	Floor Noise
Vert.	2390.000	AV	30.37	27.91	13.97	36.58	2.44	38.11	53.90	15.8	142	28	
Vert.	4804.000	AV	34.50	31.31	6.60	36.88	2.44	37.97	53.90	15.9	150	130	
Vert.	7206.000	AV	32.60	36.77	7.65	37.26	2.44	42.20	53.90	11.7	150	0	Floor Noise
Vert.	9608.000	AV	33.10	38.11	8.71	38.47	2.44	43.89	53.90	10.0	150	0	Floor Noise
Vert.	12010.000	AV	33.50	39.10	10.16	38.04	2.44	47.16	53.90	6.7	150	0	Floor Noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

* 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	88.07	27.90	13.98	36.57	2.44	95.82	-	-	Carrier
Hori.	2400.000	PK	35.26	27.91	13.98	36.58	2.44	43.01	75.82	32.8	
Vert.	2402.000	PK	88.26	27.90	13.98	36.57	2.44	96.01	-	-	Carrier
Vert.	2400.000	PK	35.67	27.91	13.98	36.58	2.44	43.42	76.01	32.6	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

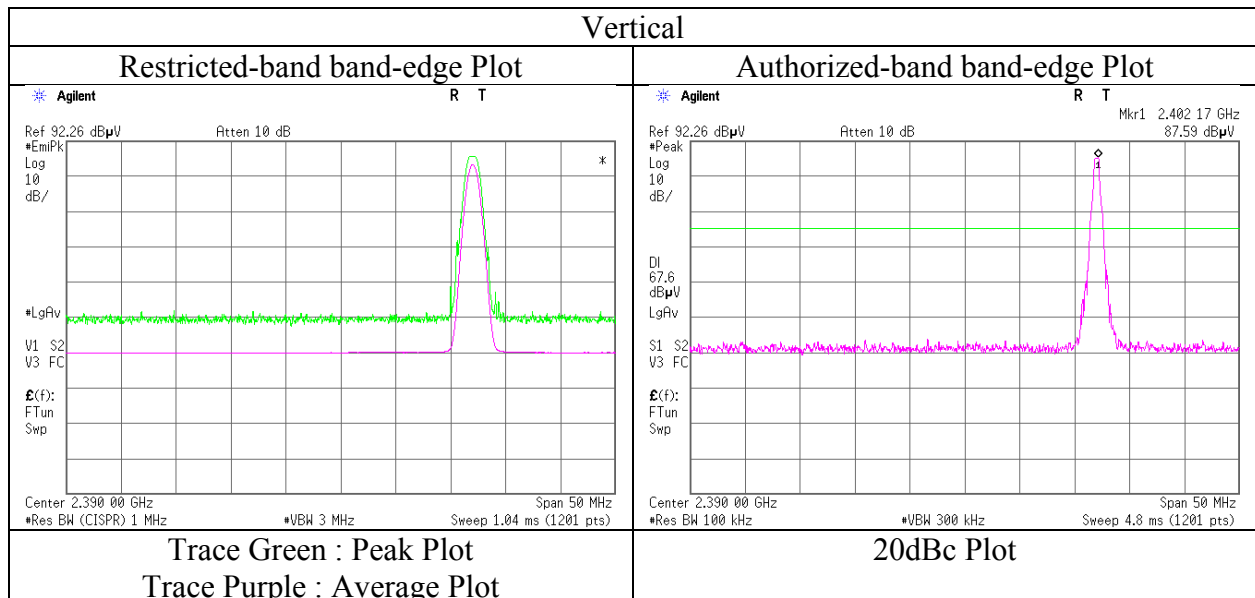
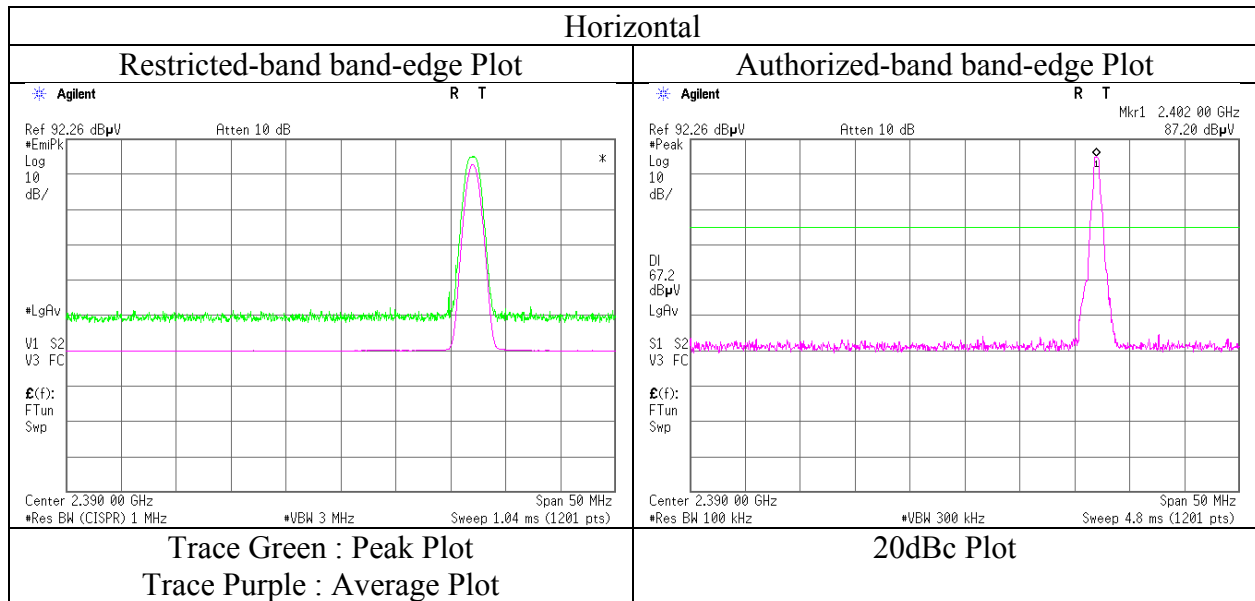
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12432582S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	August 13, 2018
Temperature / Humidity	24 deg.C / 57 %RH
Engineer	Takahiro Suzuki
	(1 GHz – 2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12432582S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	August 18, 2018	August 13, 2018	August 16, 2018	August 19, 2018
Temperature / Humidity	25 deg.C / 50 %RH	24 deg.C / 57 %RH	25 deg.C / 55 %RH	25 deg.C / 50 %RH
Engineer	Kazutaka Takeyama (30 MHz – 1000 MHz)	Takahiro Suzuki (1 GHz – 2.8 GHz)	Kazutaka Takeyama (2.8 GHz – 18 GHz)	Kazutaka Takeyama (18 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.	51.520	QP	32.20	10.64	7.16	31.91	0.00	18.09	40.00	21.9	300	193	
Hori.	799.953	QP	21.20	20.83	8.67	31.41	0.00	19.29	46.00	26.7	150	320	
Hori.	4882.000	PK	43.80	31.14	6.64	36.91	2.44	47.11	73.90	26.7	150	168	
Hori.	7323.000	PK	44.70	36.84	7.72	37.44	2.44	54.26	73.90	19.6	150	44	
Hori.	9764.000	PK	43.50	38.59	8.85	38.66	2.44	54.72	73.90	19.1	150	0	Floor Noise
Hori.	12205.000	PK	44.00	39.00	10.30	38.38	2.44	57.36	73.90	16.5	150	0	Floor Noise
Hori.	4882.000	AV	34.30	31.14	6.64	36.91	2.44	37.61	53.90	16.2	150	168	
Hori.	7323.000	AV	34.40	36.84	7.72	37.44	2.44	43.96	53.90	9.9	150	44	
Hori.	9764.000	AV	33.00	38.59	8.85	38.66	2.44	44.22	53.90	9.6	150	0	Floor Noise
Hori.	12205.000	AV	33.50	39.00	10.30	38.38	2.44	46.86	53.90	7.0	150	0	Floor Noise
Vert.	51.534	QP	49.70	10.64	7.16	31.91	0.00	35.59	40.00	4.4	100	170	
Vert.	57.654	QP	45.40	8.72	7.04	31.91	0.00	29.25	40.00	10.7	100	316	
Vert.	76.611	QP	46.00	6.30	7.80	31.89	0.00	28.21	40.00	11.7	100	202	
Vert.	96.379	QP	43.00	9.53	8.00	31.88	0.00	28.65	43.50	14.8	100	257	
Vert.	236.450	QP	27.10	11.47	5.70	31.74	0.00	12.53	46.00	33.4	100	247	
Vert.	4882.000	PK	45.40	31.14	6.64	36.91	2.44	48.71	73.90	25.1	137	121	
Vert.	7323.000	PK	44.10	36.84	7.72	37.44	2.44	53.66	73.90	20.2	150	0	Floor Noise
Vert.	9764.000	PK	44.40	38.59	8.85	38.66	2.44	55.62	73.90	18.2	150	0	Floor Noise
Vert.	12205.000	PK	44.70	39.00	10.30	38.38	2.44	58.06	73.90	15.8	150	0	Floor Noise
Vert.	4882.000	AV	35.70	31.14	6.64	36.91	2.44	39.01	53.90	14.8	137	121	
Vert.	7323.000	AV	33.30	36.84	7.72	37.44	2.44	42.86	53.90	11.0	150	0	Floor Noise
Vert.	9764.000	AV	33.20	38.59	8.85	38.66	2.44	44.42	53.90	9.4	150	0	Floor Noise
Vert.	12205.000	AV	33.70	39.00	10.30	38.38	2.44	47.06	53.90	6.8	150	0	Floor Noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

Radiated Spurious Emission

Report No.	12432582S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	August 18, 2018	August 13, 2018	August 16, 2018	August 19, 2018
Temperature / Humidity	25 deg.C / 50 %RH	24 deg.C / 57 %RH	25 deg.C / 55 %RH	25 deg.C / 50 %RH
Engineer	Kazutaka Takeyama (30 MHz – 1000 MHz)	Takahiro Suzuki (1 GHz – 2.8 GHz)	Kazutaka Takeyama (2.8 GHz – 18 GHz)	Kazutaka Takeyama (18 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.	51.531	QP	32.10	10.64	7.16	31.91	0.00	17.99	40.00	22.0	300	219	
Hori.	800.074	QP	22.50	20.83	8.67	31.41	0.00	20.59	46.00	25.4	100	357	
Hori.	2483.500	PK	48.30	27.67	14.04	36.52	2.44	55.93	73.90	18.0	213	50	
Hori.	4960.000	PK	44.20	31.33	6.69	36.93	2.44	47.73	73.90	26.1	150	189	
Hori.	7440.000	PK	43.70	36.97	7.78	37.63	2.44	53.26	73.90	20.6	150	199	
Hori.	9920.000	PK	43.00	38.80	9.00	38.84	2.44	54.40	73.90	19.5	150	0	Floor Noise
Hori.	12400.000	PK	44.50	38.29	10.44	38.72	2.44	56.95	73.90	16.9	150	0	Floor Noise
Hori.	2483.500	AV	32.12	27.67	14.04	36.52	2.44	39.75	53.90	14.2	213	50	
Hori.	4960.000	AV	34.90	31.33	6.69	36.93	2.44	38.43	53.90	15.4	150	189	
Hori.	7440.000	AV	34.20	36.97	7.78	37.63	2.44	43.76	53.90	10.1	150	199	
Hori.	9920.000	AV	32.50	38.80	9.00	38.84	2.44	43.90	53.90	10.0	150	0	Floor Noise
Hori.	12400.000	AV	32.50	38.29	10.44	38.72	2.44	44.95	53.90	8.9	150	0	Floor Noise
Vert.	51.597	QP	49.10	10.62	7.16	31.91	0.00	34.97	40.00	5.0	100	179	
Vert.	56.862	QP	45.50	8.96	7.07	31.91	0.00	29.62	40.00	10.3	100	114	
Vert.	76.566	QP	47.00	6.30	7.80	31.89	0.00	29.21	40.00	10.7	100	206	
Vert.	96.410	QP	42.70	9.54	8.00	31.88	0.00	28.36	43.50	15.1	100	249	
Vert.	236.908	QP	27.70	11.47	5.71	31.74	0.00	13.14	46.00	32.8	100	248	
Vert.	2483.500	PK	47.58	27.67	14.04	36.52	2.44	55.21	73.90	18.7	122	27	
Vert.	4960.000	PK	43.40	31.33	6.69	36.93	2.44	46.93	73.90	26.9	150	152	
Vert.	7440.000	PK	43.80	36.97	7.78	37.63	2.44	53.36	73.90	20.5	150	98	
Vert.	9920.000	PK	44.00	38.80	9.00	38.84	2.44	55.40	73.90	18.5	150	0	Floor Noise
Vert.	12400.000	PK	45.00	38.29	10.44	38.72	2.44	57.45	73.90	16.4	150	0	Floor Noise
Vert.	2483.500	AV	32.06	27.67	14.04	36.52	2.44	39.69	53.90	14.2	122	27	
Vert.	4960.000	AV	34.20	31.33	6.69	36.93	2.44	37.73	53.90	16.1	150	152	
Vert.	7440.000	AV	33.80	36.97	7.78	37.63	2.44	43.36	53.90	10.5	150	98	
Vert.	9920.000	AV	32.70	38.80	9.00	38.84	2.44	44.10	53.90	9.8	150	0	Floor Noise
Vert.	12400.000	AV	33.20	38.29	10.44	38.72	2.44	45.65	53.90	8.2	150	0	Floor Noise

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

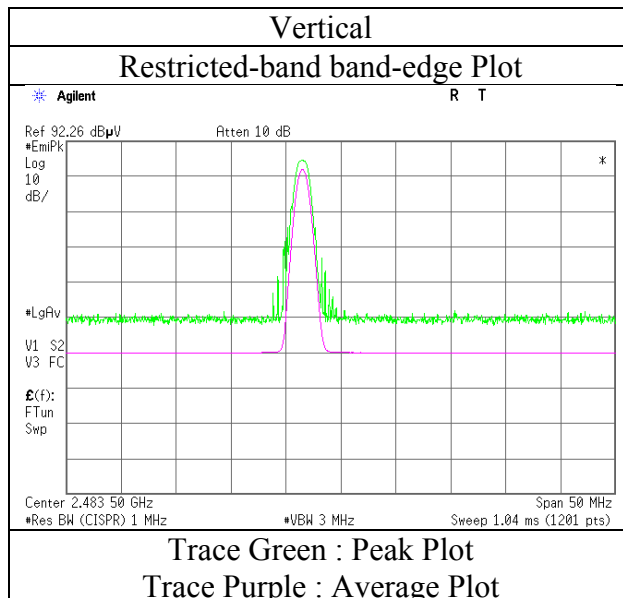
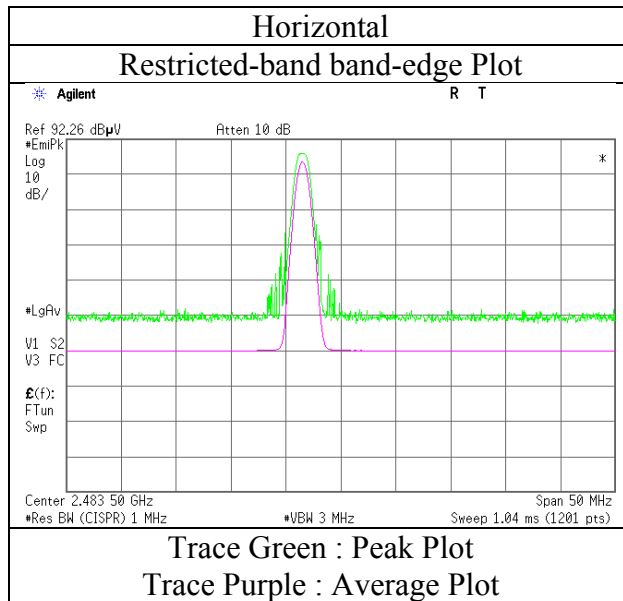
Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12432582S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	August 13, 2018
Temperature / Humidity	24 deg.C / 57 %RH
Engineer	Takahiro Suzuki
	(1 GHz – 2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No.	12432582S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	August 18, 2018	August 13, 2018	August 16, 2018	August 19, 2018
Temperature / Humidity	25 deg.C / 50 %RH	24 deg.C / 57 %RH	25 deg.C / 55 %RH	25 deg.C / 50 %RH
Engineer	Kazutaka Takeyama (30 MHz – 1000 MHz)	Takahiro Suzuki (1 GHz – 2.8 GHz)	Kazutaka Takeyama (2.8 GHz – 18 GHz)	Kazutaka Takeyama (18 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.	51.532	QP	32.00	10.64	7.16	31.91	0.00	17.89	40.00	22.1	300	223	
Hori.	800.100	QP	22.50	20.83	8.67	31.41	0.00	20.59	46.00	25.4	100	326	
Hori.	2390.000	PK	45.21	27.91	13.97	36.58	2.44	52.95	73.90	21.0	207	184	
Hori.	4804.000	PK	43.50	31.31	6.60	36.88	2.44	46.97	73.90	26.9	150	0	Floor Noise
Hori.	7206.000	PK	44.10	36.77	7.65	37.26	2.44	53.70	73.90	20.2	150	0	Floor Noise
Hori.	9608.000	PK	44.40	38.11	8.71	38.47	2.44	55.19	73.90	18.7	150	0	Floor Noise
Hori.	12010.000	PK	43.40	39.10	10.16	38.04	2.44	57.06	73.90	16.8	150	0	Floor Noise
Hori.	2390.000	AV	31.97	27.91	13.97	36.58	2.44	39.71	53.90	14.2	207	184	
Hori.	4804.000	AV	31.70	31.31	6.60	36.88	2.44	35.17	53.90	18.7	150	0	Floor Noise
Hori.	7206.000	AV	32.40	36.77	7.65	37.26	2.44	42.00	53.90	11.9	150	0	Floor Noise
Hori.	9608.000	AV	33.30	38.11	8.71	38.47	2.44	44.09	53.90	9.8	150	0	Floor Noise
Hori.	12010.000	AV	33.50	39.10	10.16	38.04	2.44	47.16	53.90	6.7	150	0	Floor Noise
Vert.	51.603	QP	49.80	10.62	7.16	31.91	0.00	35.67	40.00	4.3	100	186	
Vert.	56.932	QP	45.50	8.94	7.07	31.91	0.00	29.60	40.00	10.4	100	130	
Vert.	76.725	QP	46.30	6.31	7.81	31.89	0.00	28.53	40.00	11.4	100	190	
Vert.	97.094	QP	42.80	9.65	7.99	31.88	0.00	28.56	43.50	14.9	100	178	
Vert.	236.415	QP	27.20	11.47	5.70	31.74	0.00	12.63	46.00	33.3	100	247	
Vert.	2390.000	PK	45.17	27.91	13.97	36.58	2.44	52.91	73.90	21.0	100	41	
Vert.	4804.000	PK	43.30	31.31	6.60	36.88	2.44	46.77	73.90	27.1	150	0	Floor Noise
Vert.	7206.000	PK	43.50	36.77	7.65	37.26	2.44	53.10	73.90	20.8	150	0	Floor Noise
Vert.	9608.000	PK	43.40	38.11	8.71	38.47	2.44	54.19	73.90	19.7	150	0	Floor Noise
Vert.	12010.000	PK	42.20	39.10	10.16	38.04	2.44	55.86	73.90	18.0	150	0	Floor Noise
Vert.	2390.000	AV	31.93	27.91	13.97	36.58	2.44	39.67	53.90	14.2	100	41	
Vert.	4804.000	AV	32.20	31.31	6.60	36.88	2.44	35.67	53.90	18.2	150	0	Floor Noise
Vert.	7206.000	AV	32.60	36.77	7.65	37.26	2.44	42.20	53.90	11.7	150	0	Floor Noise
Vert.	9608.000	AV	33.20	38.11	8.71	38.47	2.44	43.99	53.90	9.9	150	0	Floor Noise
Vert.	12010.000	AV	33.40	39.10	10.16	38.04	2.44	47.06	53.90	6.8	150	0	Floor Noise

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.44 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	84.93	27.90	13.98	36.57	2.44	92.68	-	-	Carrier
Hori.	2400.000	PK	37.74	27.91	13.98	36.58	2.44	45.49	72.68	27.2	
Vert.	2402.000	PK	84.22	27.90	13.98	36.57	2.44	91.97	-	-	Carrier
Vert.	2400.000	PK	36.71	27.91	13.98	36.58	2.44	44.46	71.97	27.5	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.44 dB

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

UL Japan, Inc.

Shonan EMC Lab.

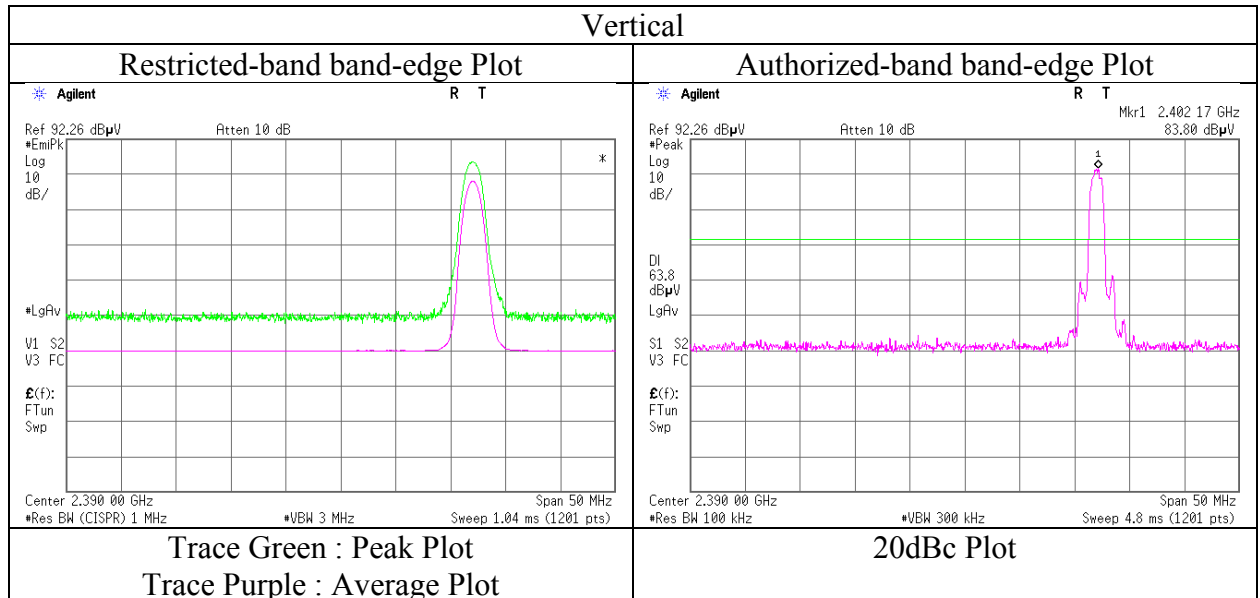
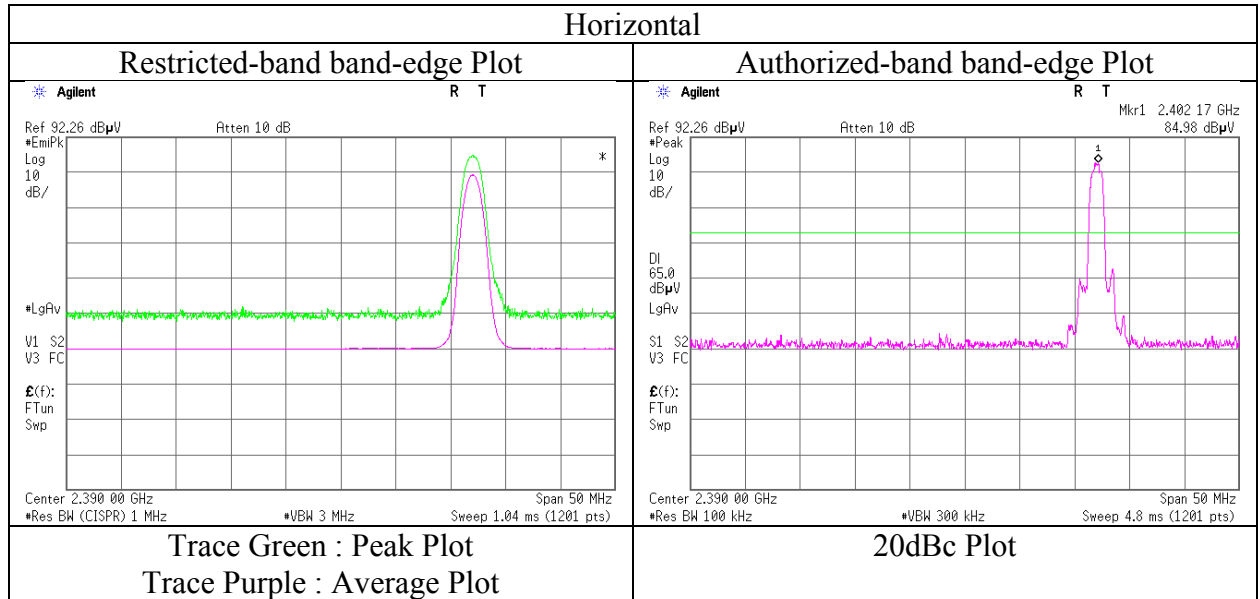
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 12432582S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date August 13, 2018
Temperature / Humidity 24 deg.C / 57 %RH
Engineer Takahiro Suzuki
(1 GHz – 2.8 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12432582S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	August 18, 2018	August 13, 2018	August 16, 2018	August 19, 2018
Temperature / Humidity	25 deg.C / 50 %RH	24 deg.C / 57 %RH	25 deg.C / 55 %RH	25 deg.C / 50 %RH
Engineer	Kazutaka Takeyama (30 MHz – 1000 MHz)	Takahiro Suzuki (1 GHz – 2.8 GHz)	Kazutaka Takeyama (2.8 GHz – 18 GHz)	Kazutaka Takeyama (18 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.	51.500	QP	32.00	10.65	7.16	31.91	0.00	17.90	40.00	22.1	300	203	
Hori.	800.040	QP	22.40	20.83	8.67	31.41	0.00	20.49	46.00	25.5	150	193	
Hori.	4882.000	PK	42.80	31.14	5.79	36.91	2.44	45.26	73.90	28.6	150	180	
Hori.	7323.000	PK	43.30	36.84	6.66	37.44	2.44	51.80	73.90	22.1	150	0	Floor Noise
Hori.	9764.000	PK	44.00	38.59	7.69	38.66	2.44	54.06	73.90	19.8	150	0	Floor Noise
Hori.	12205.000	PK	45.00	39.00	8.87	38.38	2.44	56.93	73.90	16.9	150	0	Floor Noise
Hori.	4882.000	AV	32.30	31.14	5.79	36.91	2.44	34.76	53.90	19.1	150	180	
Hori.	7323.000	AV	32.30	36.84	6.66	37.44	2.44	40.80	53.90	13.1	150	0	Floor Noise
Hori.	9764.000	AV	32.90	38.59	7.69	38.66	2.44	42.96	53.90	10.9	150	0	Floor Noise
Hori.	12205.000	AV	33.60	39.00	8.87	38.38	2.44	45.53	53.90	8.3	150	0	Floor Noise
Vert.	51.587	QP	49.60	10.62	7.16	31.91	0.00	35.47	40.00	4.5	100	200	
Vert.	56.824	QP	45.50	8.97	7.07	31.91	0.00	29.63	40.00	10.3	100	164	
Vert.	76.563	QP	46.10	6.30	7.80	31.89	0.00	28.31	40.00	11.6	100	166	
Vert.	96.890	QP	44.00	9.61	7.99	31.88	0.00	29.72	43.50	13.7	100	235	
Vert.	236.804	QP	27.00	11.47	5.70	31.74	0.00	12.43	46.00	33.5	100	276	
Vert.	4882.000	PK	42.80	31.14	5.79	36.91	2.44	45.26	73.90	28.6	150	126	
Vert.	7323.000	PK	43.40	36.84	6.66	37.44	2.44	51.90	73.90	22.0	150	0	Floor Noise
Vert.	9764.000	PK	44.20	38.59	7.69	38.66	2.44	54.26	73.90	19.6	150	0	Floor Noise
Vert.	12205.000	PK	45.10	39.00	8.87	38.38	2.44	57.03	73.90	16.8	150	0	Floor Noise
Vert.	4882.000	AV	32.70	31.14	5.79	36.91	2.44	35.16	53.90	18.7	150	126	
Vert.	7323.000	AV	32.40	36.84	6.66	37.44	2.44	40.90	53.90	13.0	150	0	Floor Noise
Vert.	9764.000	AV	33.00	38.59	7.69	38.66	2.44	43.06	53.90	10.8	150	0	Floor Noise
Vert.	12205.000	AV	33.70	39.00	8.87	38.38	2.44	45.63	53.90	8.2	150	0	Floor Noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

Radiated Spurious Emission

Report No.	12432582S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	August 18, 2018	August 13, 2018	August 16, 2018	August 19, 2018
Temperature / Humidity	25 deg.C / 50 %RH	24 deg.C / 57 %RH	25 deg.C / 55 %RH	25 deg.C / 50 %RH
Engineer	Kazutaka Takeyama (30 MHz – 1000 MHz)	Takahiro Suzuki (1 GHz – 2.8 GHz)	Kazutaka Takeyama (2.8 GHz – 18 GHz)	Kazutaka Takeyama (18 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.	51.680	QP	32.20	10.60	7.16	31.91	0.00	18.05	40.00	21.9	300	201	
Hori.	800.035	QP	22.40	20.83	8.67	31.41	0.00	20.49	46.00	25.5	150	215	
Hori.	2483.500	PK	48.97	27.67	14.04	36.52	2.44	56.60	73.90	17.3	100	37	
Hori.	4960.000	PK	45.00	31.33	6.69	36.93	2.44	48.53	73.90	25.3	121	203	
Hori.	7440.000	PK	43.40	36.97	7.78	37.63	2.44	52.96	73.90	20.9	150	0	Floor Noise
Hori.	9920.000	PK	43.30	38.80	9.00	38.84	2.44	54.70	73.90	19.2	150	0	Floor Noise
Hori.	12400.000	PK	44.70	38.29	10.44	38.72	2.44	57.15	73.90	16.7	150	0	Floor Noise
Hori.	2483.500	AV	32.59	27.67	14.04	36.52	2.44	40.22	53.90	13.7	100	37	
Hori.	4960.000	AV	33.40	31.33	6.69	36.93	2.44	36.93	53.90	16.9	121	203	
Hori.	7440.000	AV	32.70	36.97	7.78	37.63	2.44	42.26	53.90	11.6	150	0	Floor Noise
Hori.	9920.000	AV	32.60	38.80	9.00	38.84	2.44	44.00	53.90	9.9	150	0	Floor Noise
Hori.	12400.000	AV	33.70	38.29	10.44	38.72	2.44	46.15	53.90	7.7	150	0	Floor Noise
Vert.	51.532	QP	49.70	10.64	7.16	31.91	0.00	35.59	40.00	4.4	100	105	
Vert.	56.860	QP	45.90	8.96	7.07	31.91	0.00	30.02	40.00	9.9	100	177	
Vert.	76.333	QP	46.60	6.29	7.78	31.89	0.00	28.78	40.00	11.2	100	181	
Vert.	96.562	QP	43.30	9.56	7.99	31.88	0.00	28.97	43.50	14.5	100	225	
Vert.	236.808	QP	27.00	11.47	5.70	31.74	0.00	12.43	46.00	33.5	100	253	
Vert.	2483.500	PK	49.57	27.67	14.04	36.52	2.44	57.20	73.90	16.7	212	154	
Vert.	4960.000	PK	44.40	31.33	6.69	36.93	2.44	47.93	73.90	25.9	150	352	
Vert.	7440.000	PK	43.90	36.97	7.78	37.63	2.44	53.46	73.90	20.4	150	0	Floor Noise
Vert.	9920.000	PK	43.50	38.80	9.00	38.84	2.44	54.90	73.90	19.0	150	0	Floor Noise
Vert.	12400.000	PK	44.50	38.29	10.44	38.72	2.44	56.95	73.90	16.9	150	0	Floor Noise
Vert.	2483.500	AV	32.86	27.67	14.04	36.52	2.44	40.49	53.90	13.4	212	154	
Vert.	4960.000	AV	32.70	31.33	6.69	36.93	2.44	36.23	53.90	17.6	150	352	
Vert.	7440.000	AV	32.10	36.97	7.78	37.63	2.44	41.66	53.90	12.2	150	0	Floor Noise
Vert.	9920.000	AV	33.00	38.80	9.00	38.84	2.44	44.40	53.90	9.5	150	0	Floor Noise
Vert.	12400.000	AV	33.60	38.29	10.44	38.72	2.44	46.05	53.90	7.8	150	0	Floor Noise

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

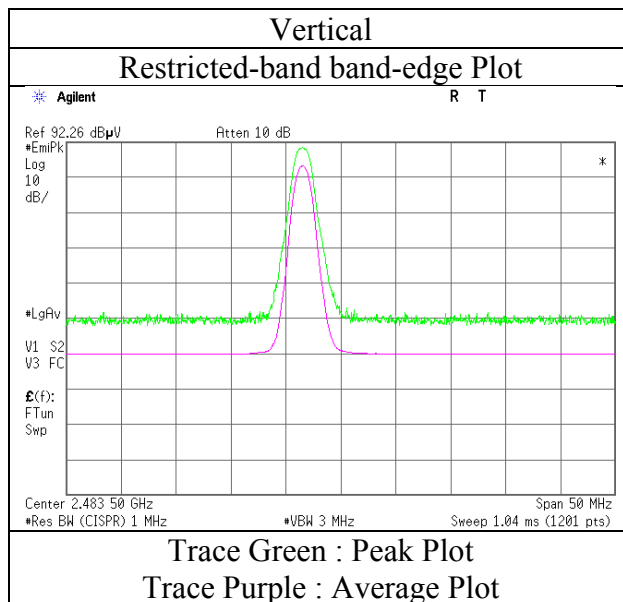
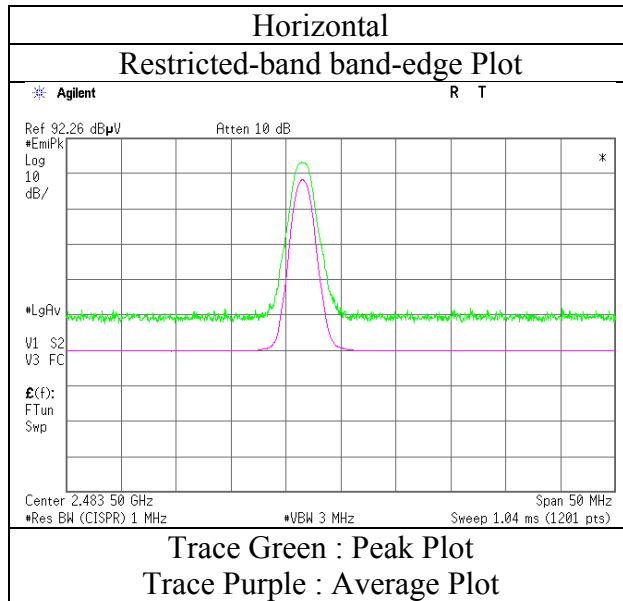
Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

Radiated Spurious Emission
(Reference Plot for band-edge)

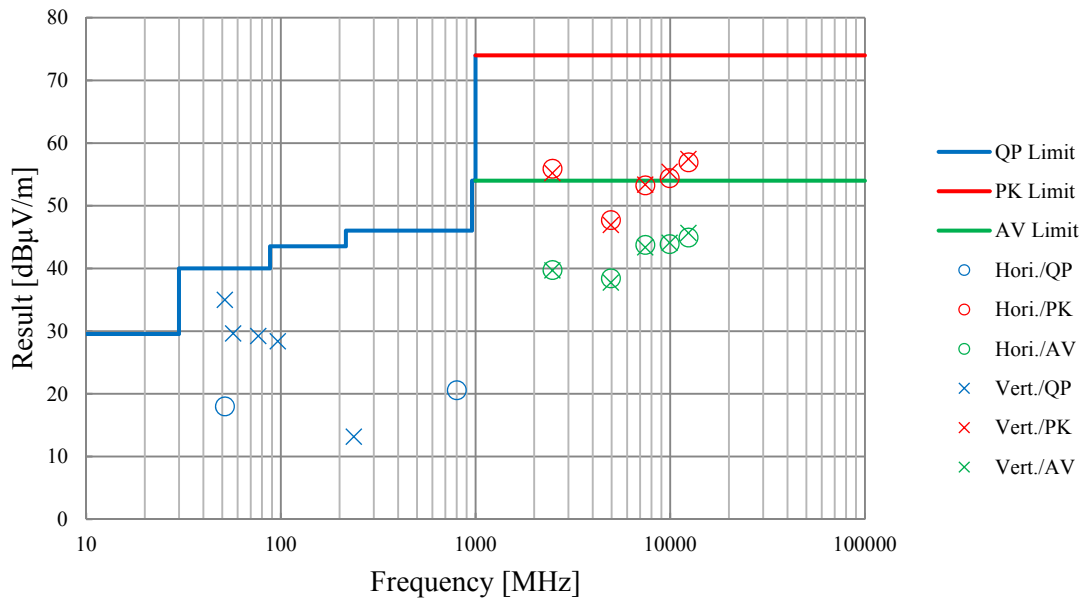
Report No. 12432582S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date August 13, 2018
Temperature / Humidity 24 deg.C / 57 %RH
Engineer Takahiro Suzuki
(1 GHz – 2.8 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12432582S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	August 18, 2018	August 13, 2018	August 16, 2018	August 19, 2018
Temperature / Humidity	25 deg.C / 50 %RH	24 deg.C / 57 %RH	25 deg.C / 55 %RH	25 deg.C / 50 %RH
Engineer	Kazutaka Takeyama (30 MHz – 1000 MHz)	Takahiro Suzuki (1 GHz – 2.8 GHz)	Kazutaka Takeyama (2.8 GHz – 18 GHz)	Kazutaka Takeyama (18 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz			

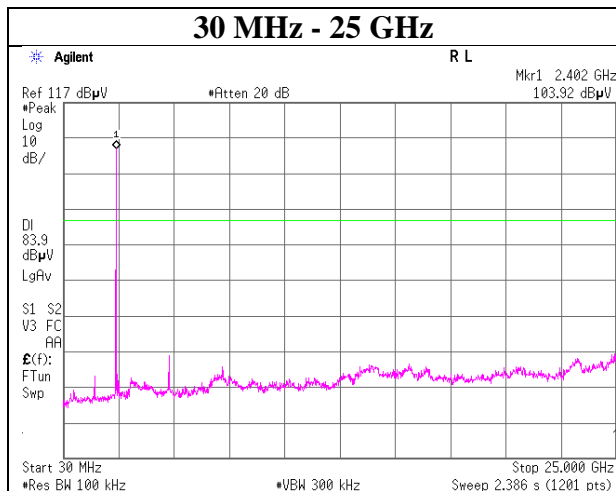
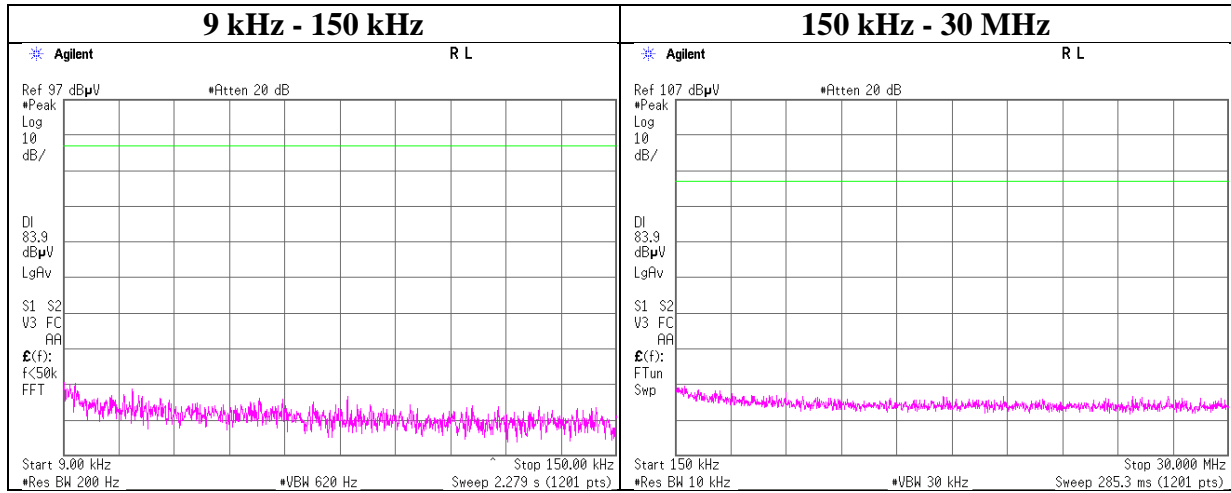


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Report No.	12432582S-A-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 3, 2018
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

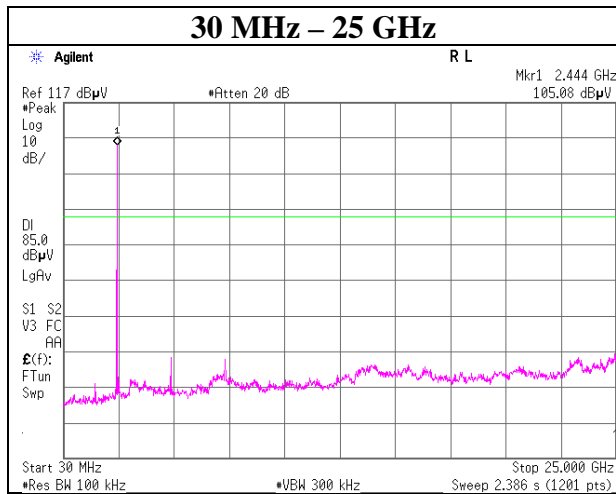
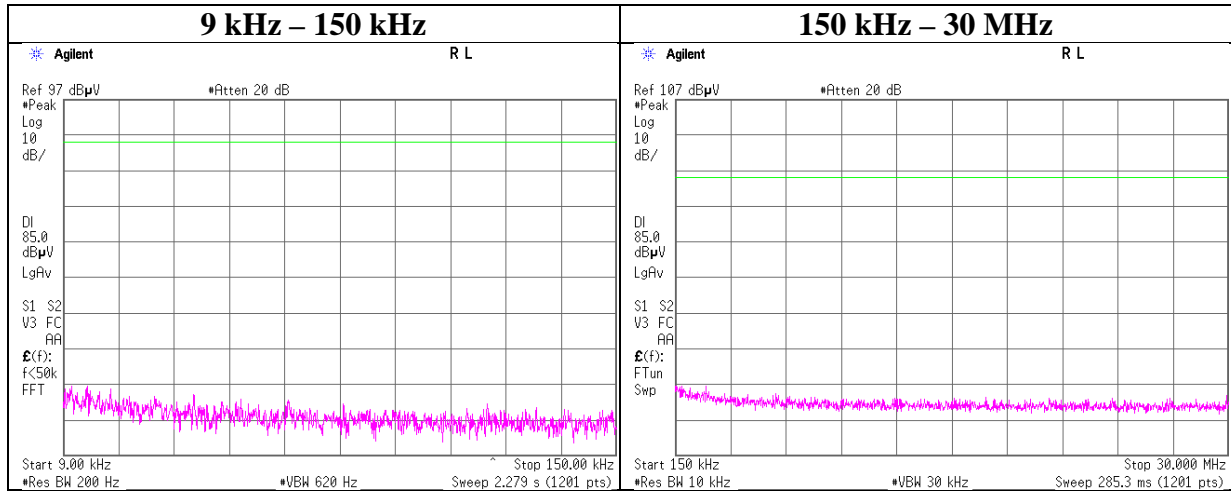
2402 MHz



Conducted Spurious Emission

Report No.	12432582S-A-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 3, 2018
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

2441 MHz



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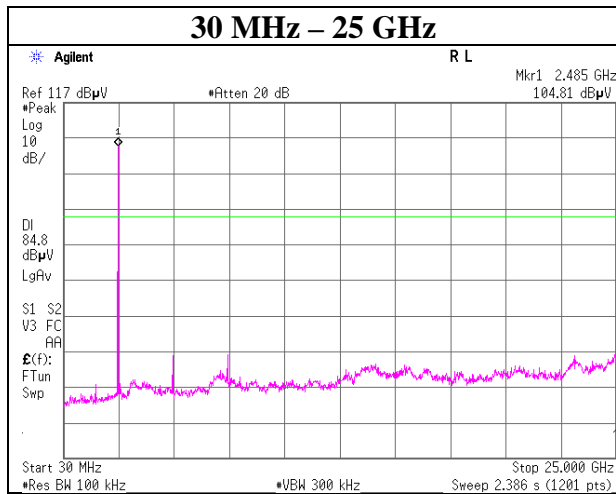
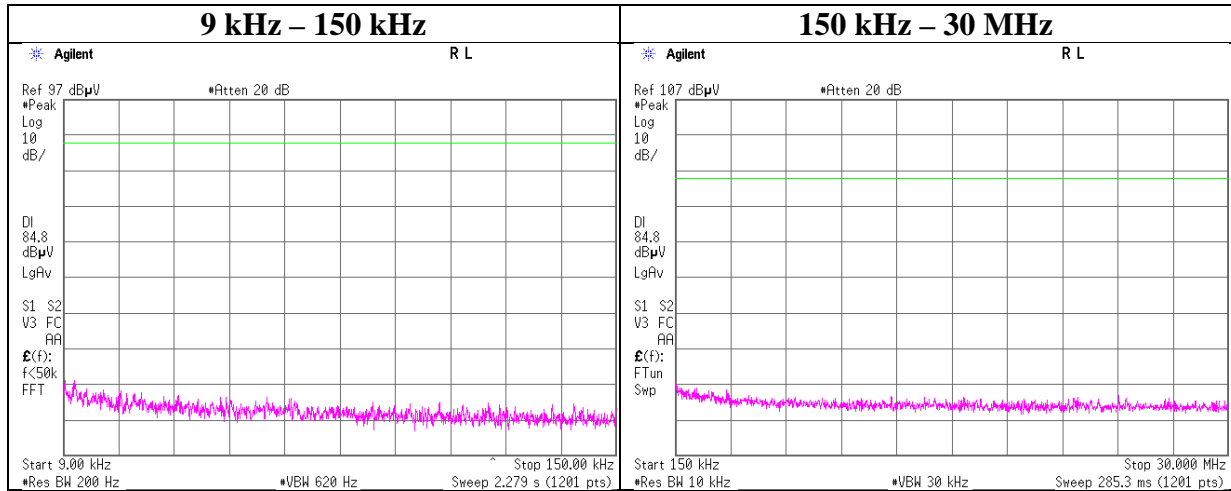
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Report No.	12432582S-A-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 3, 2018
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

2480 MHz



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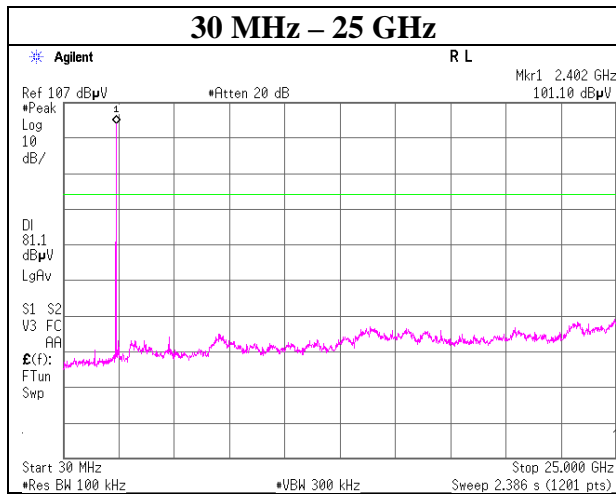
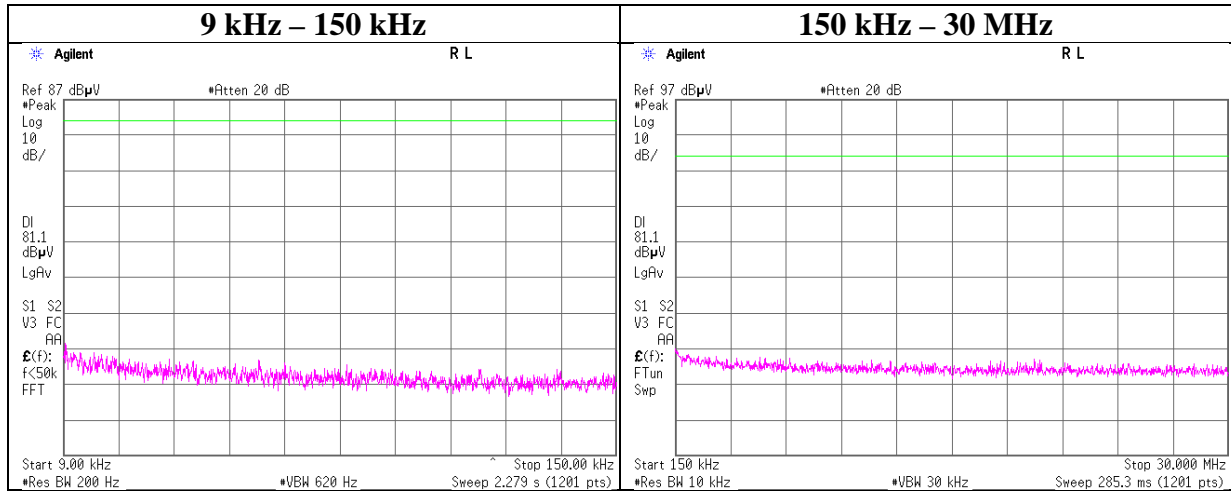
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Report No.	12432582S-A-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 3, 2018
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2402 MHz



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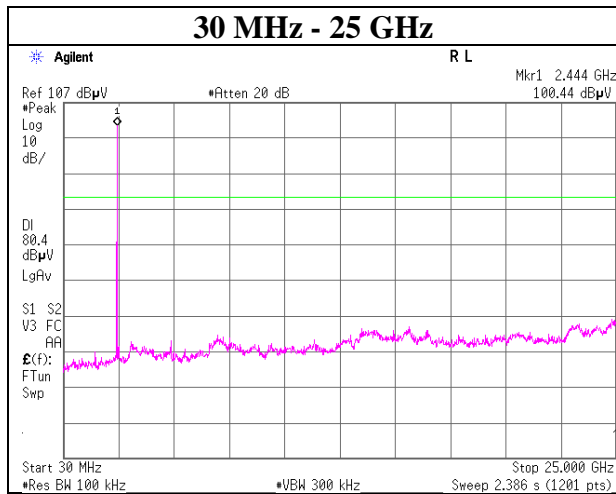
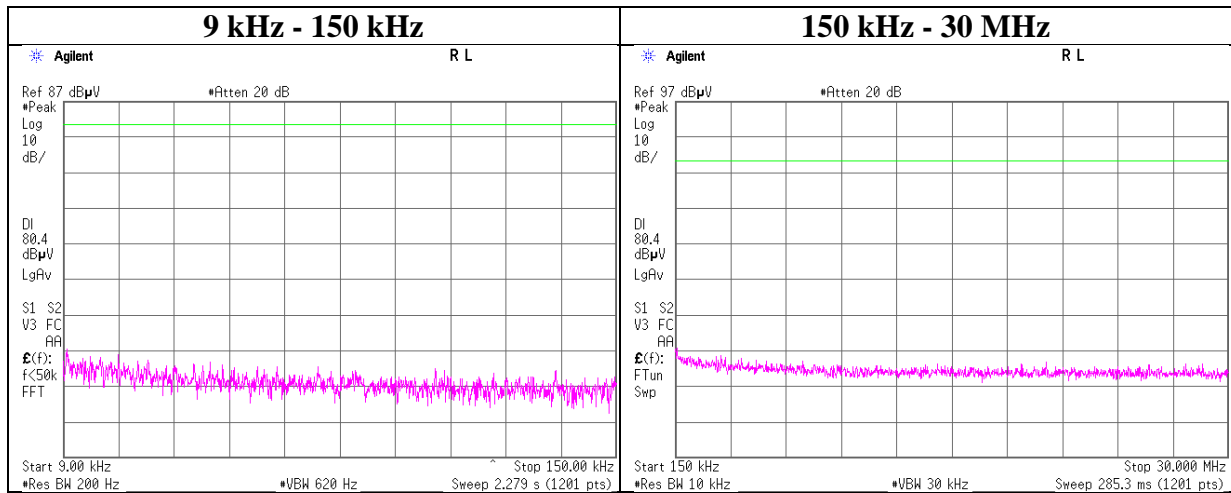
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Report No.	12432582S-A-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 3, 2018
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2441 MHz



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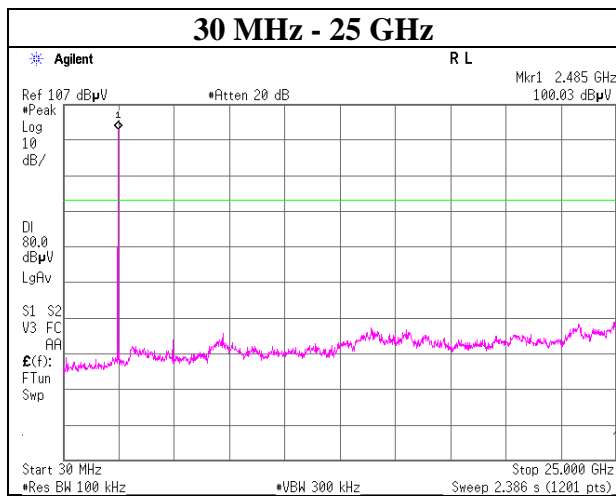
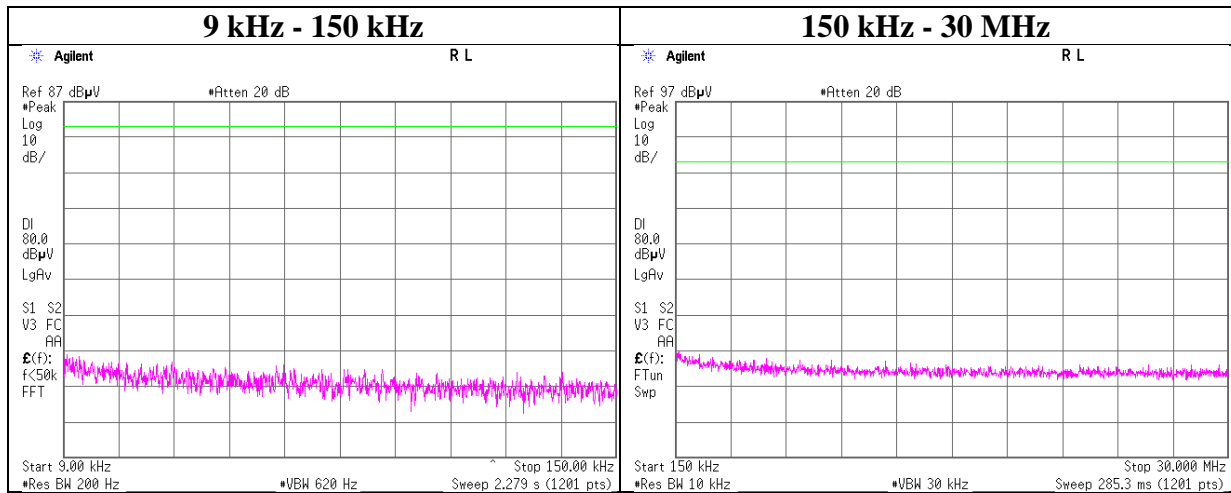
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Report No.	12432582S-A-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 3, 2018
Temperature / Humidity	25 deg. C / 42 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2480 MHz



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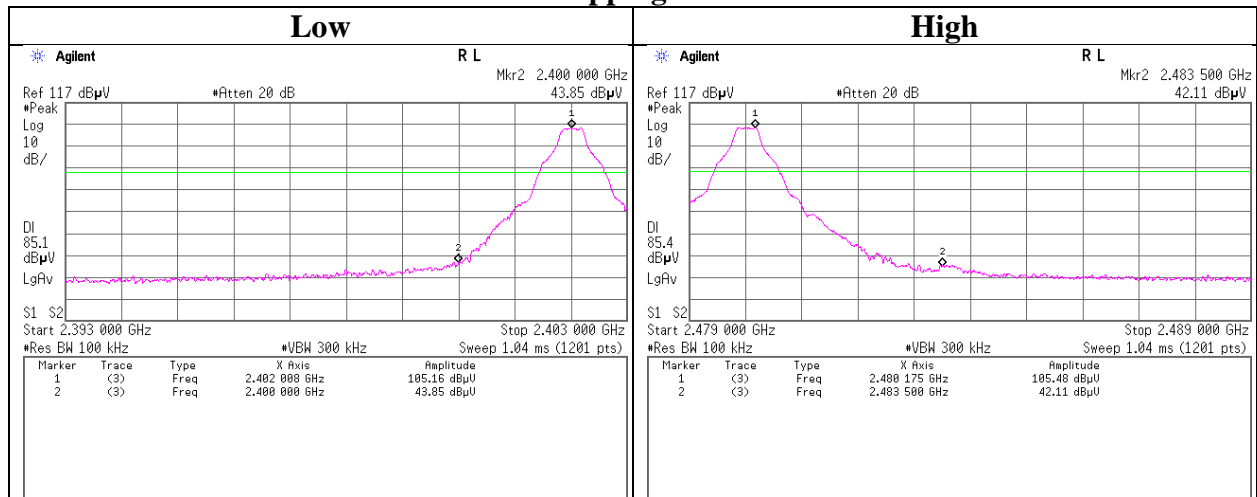
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

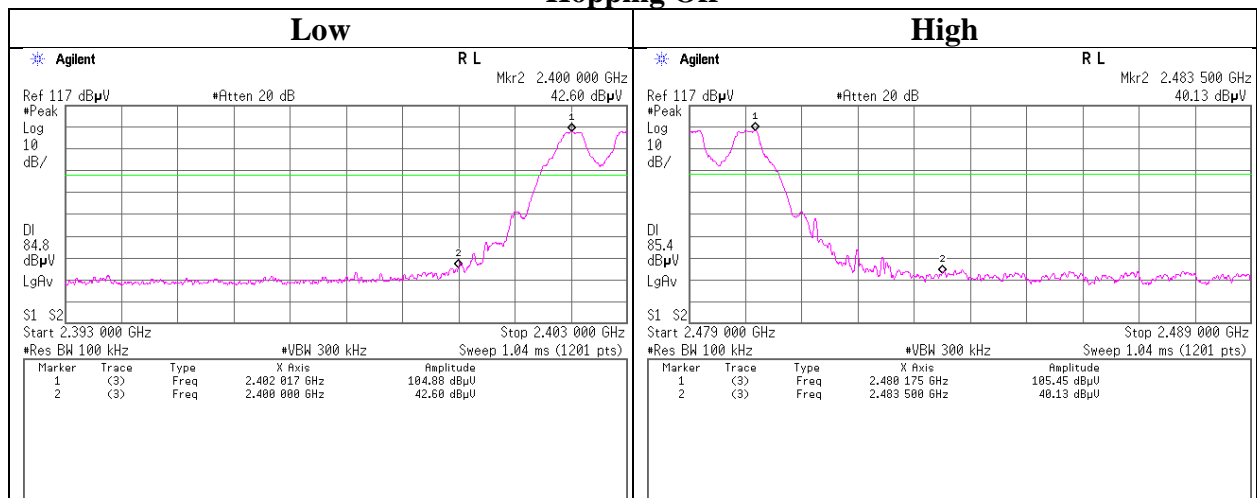
Conducted Emission Band Edge compliance

Report No. 12432582S-A-R2
 Test place Shonan EMC Lab. No.5 Shielded Room
 Date July 3, 2018
 Temperature / Humidity 25 deg. C / 42 % RH
 Engineer Shiro Kobayashi
 Mode Tx DH5

Hopping On



Hopping Off



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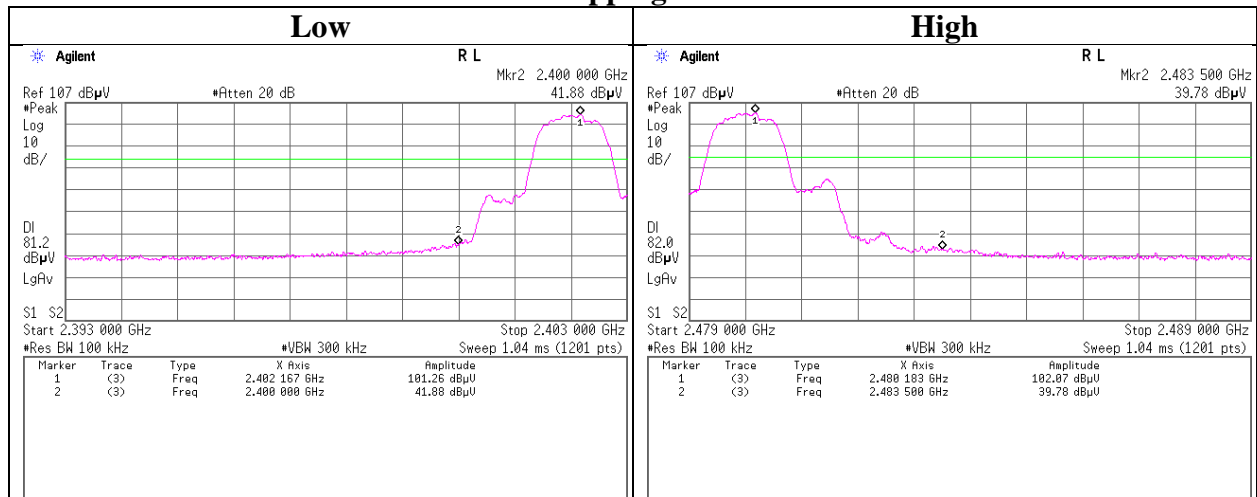
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

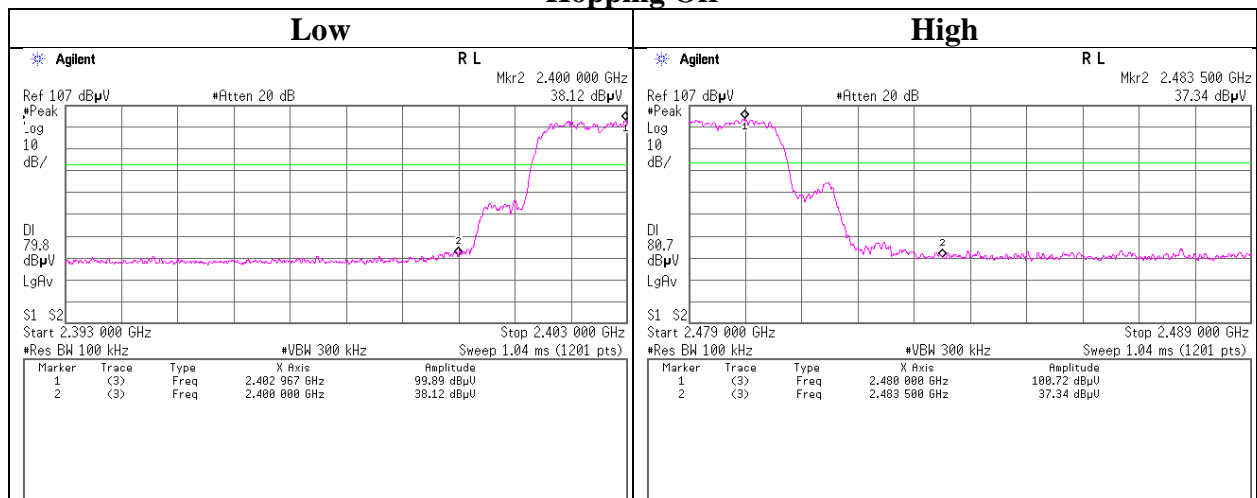
Conducted Emission Band Edge compliance

Report No. 12432582S-A-R2
 Test place Shonan EMC Lab. No.5 Shielded Room
 Date July 3, 2018
 Temperature / Humidity 25 deg. C / 42 % RH
 Engineer Shiro Kobayashi
 Mode Tx 3DH5

Hopping On



Hopping Off



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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-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2018/03/05 * 12
SPM-13	Power Meter	KEYSIGHT	8990B	MY51000448	AT	2018/05/18 * 12
SPSS-06	Power sensor	KEYSIGHT	N1923A	MY57270004	AT	2018/05/18 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2018/03/19 * 12
SAT10-12	Attenuator	Weinschel Corp.	54A-10	81601	AT	2018/03/22 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2017/12/21 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2017/10/11 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2017/08/20 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2018/02/15 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	RE	2018/01/29 * 12
SCC-G43	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 104 E	SN MY 13406/4E	RE	2018/07/10 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2018/07/23 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2017/10/30 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE,CE	-
SAEC-02(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2018/07/15 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE,CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE,CE	2018/03/08 * 12
SCC-G44	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 104	800070/4A	RE	2018/03/28 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2018/04/20 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SAT10-05	Attenuator(above1 GHz)	Agilent	8493C-010	74864	AT	2017/11/22 * 12
SRENT-15	Spectrum Analyzer	Agilent	E4440A	MY46185516	AT	2017/12/26 * 12
SCC-G45	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102 E	800137/2EA	RE	2018/03/28 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2018/07/23 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2018/03/27 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KMSKMS	-	AT	2018/04/20 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2018/02/16 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2018/02/16 * 12
SAT3-11	Attenuator	JFW	50HF-003N	-	RE	2018/02/22 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2018/06/05 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2018/04/07 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2018/04/07 * 12
SLA-06	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	195	RE	2018/06/05 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2017/09/26 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2018/05/31 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

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

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