



RADIO TEST REPORT

Test Report No. : 12193629S-B-R2

Applicant : TAIYO YUDEN CO., LTD.
Type of Equipment : Wireless LAN & Bluetooth Combo Module
Model No. : WYSAGVDXG, WYSEGVDXG
* Bluetooth BDR/EDR part
FCC ID : RYYWYSAGVDXG
Test regulation : FCC Part 15 Subpart C: 2018
Test Result : Complied (Refer to SECTION 3.2)

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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. The information provided from the customer for this report is identified in SECTION 1.
 10. This report is a revised version of 12193629S-B-R1. 12193629S-B-R1 is replaced with this report.

Date of test: March 16 to April 27, 2018

Representative test engineer:

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- ☐ 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.: 12193629S-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12193629S-B	June 27, 2018	-	-
1	12193629S-B-R1	March 28, 2019	1	Addition of Comment “(Refer to SECTION 3.2)” “9. The information...”
			4	Addition of Comment “The information...” “(Information from test lab.)” Addition of Similar model Correction of Rating “Vmain: DC 3 V-3.6 V VIO: DC 5 V -> VIO : DC 1.8/ 3.3 V, VDD33 : DC 3.3 V”
			5	Correction of Antenna Gain “-0.1 dBi ->2.1 dBi” “4.4 dBi (1001932PT and 1001932FT), 2.2 dBi (AH104N2450D1) -> 4.5 dBi (1001932PT), 4.4 dBi (1001932FT), 2.4 dBi (AH104N2450D1)” Deletion of Comment “*EUT has two external antennas ...”
			6	Addition of Comment “*2) Since measurement...” “a) - g) Refer to APPENDIX 1 ...”
			7	Addition of Comment “b) Refer to APPENDIX 1 ...”
			9	Correction of Comment “(Conducted) *1) (Radiated) *3)”
			10	Addition of Item “F : Jig Board...” Addition of Comment “*3) VIO is converted...” Correction of Diagram
			11	Addition of Figure (Conducted emission)
			12	Deletion of Test Distance
			13	Addition of Figure (Radiated emission)
2	12193629S-B-R2	April 9, 2019	10	Addition of Serial number A: “TYWLAN-AC3FA4001B79 *1), TYWLAN-AC3FA4001B7D *2)” Deletion of Serial number C: “TYWLAN-AC3FA4001B79 *1)”
			13	Correction of *Test Distance External Antenna type: “0.08 m -> 3.92 m” Chip Antenna type: “0.05 m -> 3.95 m”

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SECTION 1: Customer information

Company Name	:	TAIYO YUDEN CO., LTD.
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Telephone Number	:	+81-27-324-2313
Facsimile Number	:	+81-27-324-2314
Contact Person	:	Masaki Naganuma

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	:	Wireless LAN & Bluetooth Combo Module
Model No.	:	WYSAGVDXG, WYSEGVDXG
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	VIO : DC 1.8/ 3.3 V, VDD 33 : DC 3.3 V
Receipt Date of Sample (Information from test lab.)	:	March 14, 2018
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: WYSAGVDXG, WYSEGVDXG (referred to as the EUT in this report) is a Wireless LAN & Bluetooth Combo Module.

Differences between WYSAGVDXG and WYSEGVDXG are as follows.

- WYSAGVDXG: Internal Antenna type (Chip Antenna)
- WYSEGVDXG: External Antenna type

Similar model : WYSAGVDXG-F, WYSEGVDXG-F

Radio Specification

Radio Type	: Transceiver
Frequency of Operation	: 2.4 GHz: 2402 MHz - 2480 MHz (Bluetooth BDR/EDR, Bluetooth Low Energy) 2412 MHz - 2462 MHz (IEEE 802.11b/g/11n-20) 2422 MHz - 2452 MHz (IEEE 802.11n-40) U-NII-1 / 5180 MHz - 5320 MHz (IEEE 802.11a/n-20/ac-20) U-NII-2 5190 MHz - 5310 MHz (IEEE 802.11n-40/ac-40) A: 5210 MHz - 5290 MHz (IEEE 802.11ac-80) U-NII-2C 5500 MHz - 5700 MHz (IEEE 802.11a/n-20/ac-20) : 5510 MHz - 5670 MHz (IEEE 802.11n-40/ac-40) 5530 MHz - 5610 MHz (IEEE 802.11ac-80) U-NII-3: 5745 MHz - 5825 MHz (IEEE 802.11a/n-20/ac-20) 5755 MHz - 5795 MHz (IEEE 802.11n-40/ac-40) 5775 MHz (IEEE 802.11ac-80)
Modulation	: DSSS : IEEE 802.11b OFDM : IEEE 802.11g/n/a/ac FHSS(GFSK, /4-DQPSK, 8DPSK) : Bluetooth BDR/EDR GFSK : Bluetooth Low Energy
Antenna type	: [WYSAGVDXG] Chip Antenna (AH104N2450D1) [WYSEGVDXG] External Antenna (1001932PT and 1001932FT)
Antenna Gain	: 2.4 GHz: 2.5 dBi (1001932PT and 1001932FT), 2.1 dBi (AH104N2450D1) 5 GHz: 4.5 dBi (1001932PT), 4.4 dBi (1001932FT), 2.4 dBi (AH104N2450D1)
Operating Temperature	: -30 deg. C to +85 deg. C
Clock frequency	: 37.4 MHz

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	Test Procedure *2)	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	23.0 dB, 2.65676 MHz, L1, AV, 3DH5 2402 MHz, Antenna:1001932PT, VIO	Complied a)	-
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 b)	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (a)		Complied b)	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 c)	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii)		Complied d)	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	IC: RSS-247 5.4 (b)		Complied e)	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	9.8 dB 9608.000 MHz, AV, Hori. Tx Hopping Off, DH5 2402 MHz, Antenna: 1001932PT	Complied f), g)	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).

*2) Since measurement was performed before issue of KDB 558074 v05r01, we referred to DA 00-705.

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)

This EUT provides stable voltage constantly to RF Module regardless of input voltage from host device. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

[WYSAGVDXG]

It is impossible for end users to replace the antenna, because it is soldered on the circuit board. Therefore the equipment complies with the requirement.

[WYSEGVDXG]

The EUT has a unique coupling/antenna connector. Therefore the equipment complies with the 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	- b)	Conducted
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. b) 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 $k=2$.
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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	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.48 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
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 %

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) *1) (Radiated) *3)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation *2)	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth *2)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency *2)	Tx (Hopping On) DH5, 3DH5	-
Dwell time *2)	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power *2)	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted) *2)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth *2)	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: 0 dBm
EDR: 0 dBm

Software: Dut labtool Version 2.0.0.96

*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.

*1) Conducted emission has been measured with WYSEGVDXG (Antenna: 1001932PT).

WYSEGVDXG (Antenna: 1001932FT) and WYSAGVDXG were confirmed with Peak chart at only Tx 2402 MHz as representative.

*2) Antenna terminal test has been measured with WYSEGVDXG as representative.

*3) Full measurement of Radiated emission in 30 MHz - 26.5 GHz has been performed with WYSEGVDXG (Antenna: 1001932 PT).

-WYSEGVDXG (Antenna: 1001932 FT) was tested at only Tx 2402 MHz in 30 MHz - 26.5 GHz and band edge measurement. Because the antennas 1001932 PT and 1001932 FT have the same antenna shape and gain, the difference is only the material of the base.

-WYSAGVDXG (Chip Antenna) was also tested at only Tx 2402 MHz in 30 MHz - 26.5 GHz and band edge measurement since it was confirmed by pretest that carrier and spurious emission were equivalent or less than WYSEGVDXG (Antenna: 1001932 PT).

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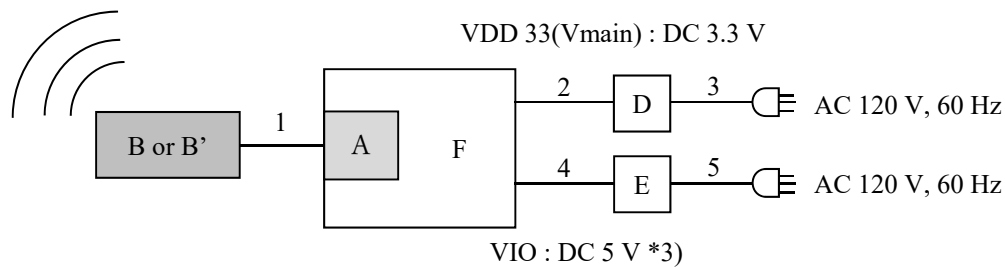
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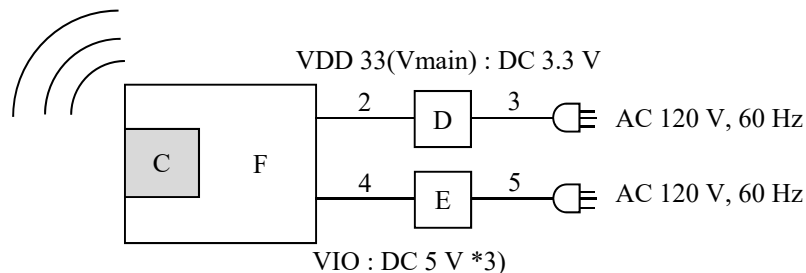
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4.2 Configuration and peripherals

External Antenna type



Chip Antenna type



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Wireless LAN & Bluetooth Combo Module (External Antenna type)	WYSEGVDXG	TYWLAN-AC3FA 4001B79 *1) TYWLAN-AC3FA 4001B7D *2)	TAIYO YUDEN CO., LTD.	EUT
B	Tunable Embedded FPC Antenna	1001932PT	PT-AC3FA4001B7D	TAIYO YUDEN CO., LTD.	EUT
B'	Tunable Embedded FPC Antenna	1001932FT	FT-AC3FA4001B7D	TAIYO YUDEN CO., LTD.	EUT
C	Wireless LAN & Bluetooth Combo Module (Chip Antenna type)	WYSAGVDXG	TYWLAN-AC3FA 4001B7B *2)	TAIYO YUDEN CO., LTD.	EUT
D	Power Supply(DC)	PAN35-10A	DE001677	Kikusui	-
E	Power Supply(DC)	PAN60-10A	NL002383	Kikusui	-
F	Jig Board	-	-	TAIYO YUDEN CO., LTD.	-

*1) Used for Antenna Terminal conducted test

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

*3) VIO is converted to DC 3.3 V on Jig Board and supplied to EUT

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna	0.1	Shielded	Shielded	-
2	DC	0.2 + 1.0	Unshielded	Unshielded	-
3	AC	3.0	Unshielded	Unshielded	-
4	DC	0.2 + 1.0	Unshielded	Unshielded	-
5	AC	3.0	Unshielded	Unshielded	-

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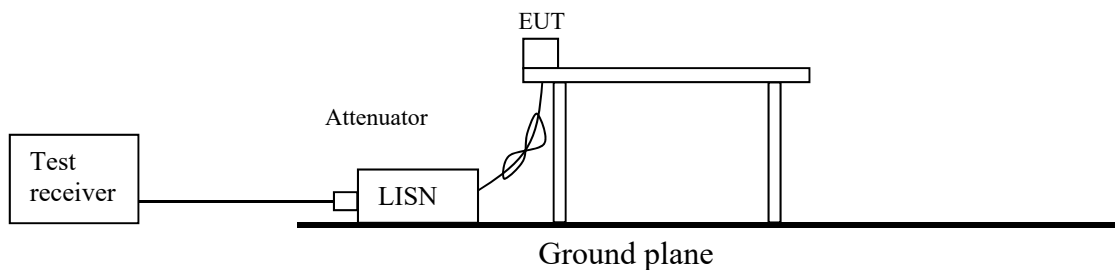
Facsimile : +81 463 50 6401

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 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.

Conducted emission



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

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

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

The EUT was connected to a LISN (AMN) via DC power source.

An overview sweep with peak detection has been performed.

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

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

SECTION 6: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

(Antenna:1001932PT, 1001932FT)

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.

(Antenna:AH104N2450D1)

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 expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

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

[For above 1 GHz]

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

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

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

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

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

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

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

Test Antennas are used as below;

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

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

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

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

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

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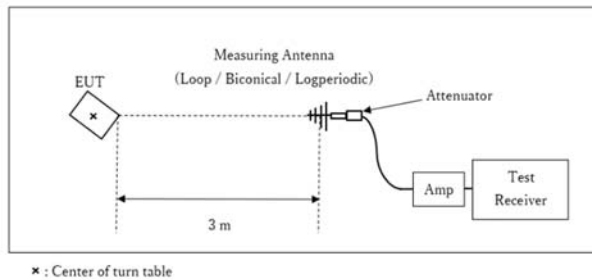
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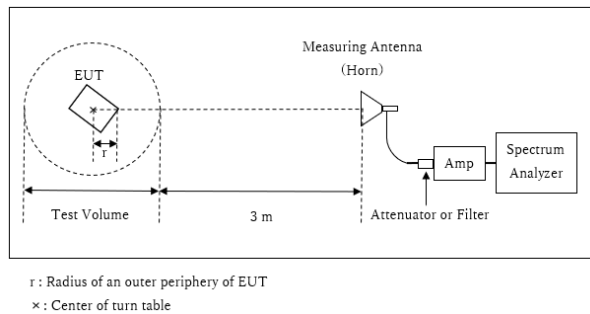
Radiated emission

Below 1 GHz



Test Distance: 3 m

1 GHz - 13 GHz



External Antenna type

Distance Factor: $20 \times \log (3.92 \text{ m}^*/3.0 \text{ m}) = 2.33 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.92 \text{ m}$

Chip Antenna type

Distance Factor: $20 \times \log (3.95 \text{ m}^*/3.0 \text{ m}) = 2.39 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.95 \text{ m}$

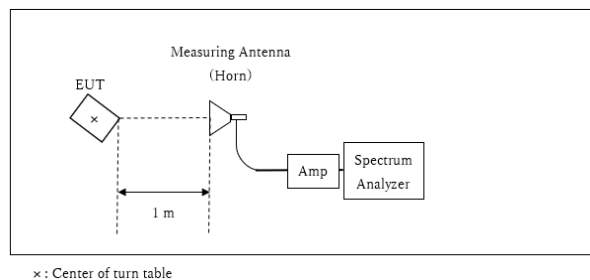
Test Volume: 2 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

r = 0.08 m (External Antenna type)

r = 0.05 m (Chip Antenna type)

13 GHz - 26.5 GHz



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

*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.

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

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Shonan EMC Lab.

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SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 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	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) Peak hold was applied as Worst-case measurement. *2) Reference data *3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was 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

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APPENDIX 1: Test data

Conducted Emission

Antenna: 1001932PT
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

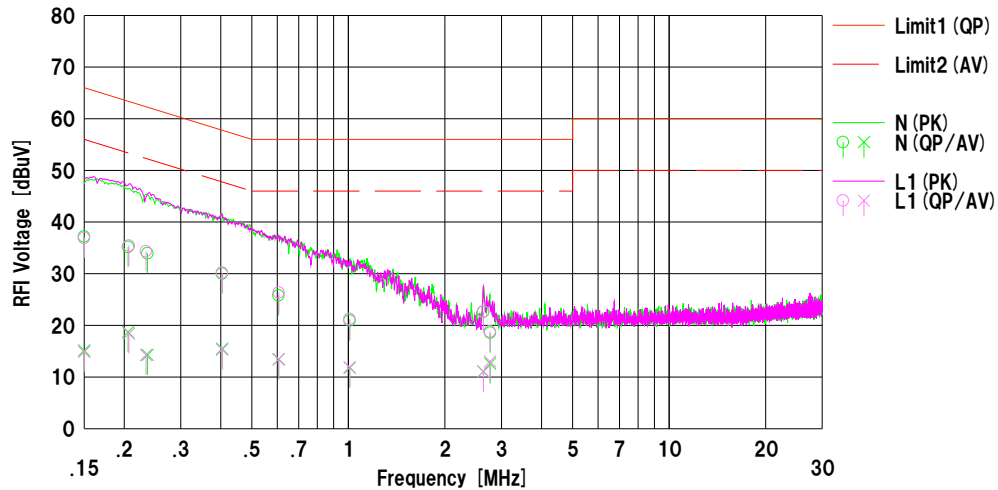
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

Mode : Tx DH5 2402 MHz
Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932PT

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

Engineer : Kazuya Noda



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	24.81	2.76	12.38	37.19	15.14	66.00	56.00	28.8	40.8	N	
2	0.20578	22.81	6.34	12.38	35.19	18.72	63.37	53.37	28.1	34.6	N	
3	0.23646	21.55	1.88	12.40	33.95	14.28	62.22	52.22	28.2	37.9	N	
4	0.40402	17.58	3.06	12.43	30.01	15.49	57.77	47.77	27.7	32.2	N	
5	0.60574	13.33	0.97	12.45	25.78	13.42	56.00	46.00	30.2	32.5	N	
6	1.00996	8.46	-0.64	12.46	20.92	11.82	56.00	46.00	35.0	34.1	N	
7	2.63494	10.04	-1.52	12.55	22.59	11.03	56.00	46.00	33.4	34.9	N	
8	2.76583	6.02	0.05	12.55	18.57	12.60	56.00	46.00	37.4	33.4	N	
9	0.15000	24.53	2.46	12.38	36.91	14.84	66.00	56.00	29.0	41.1	L1	
10	0.20697	23.04	6.02	12.38	35.42	18.40	63.33	53.33	27.9	34.9	L1	
11	0.23404	21.95	1.89	12.40	34.35	14.29	62.31	52.31	27.9	38.0	L1	
12	0.40417	17.77	2.86	12.43	30.20	15.29	57.77	47.77	27.5	32.4	L1	
13	0.60700	13.89	1.02	12.45	28.34	13.47	56.00	46.00	29.6	32.5	L1	
14	1.00890	8.76	-0.56	12.46	21.22	11.90	56.00	46.00	34.7	34.1	L1	
15	2.63566	10.12	-1.48	12.55	22.67	11.07	56.00	46.00	33.3	34.9	L1	
16	2.76258	6.25	0.46	12.55	18.80	13.01	56.00	46.00	37.2	32.9	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: 1001932PT
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

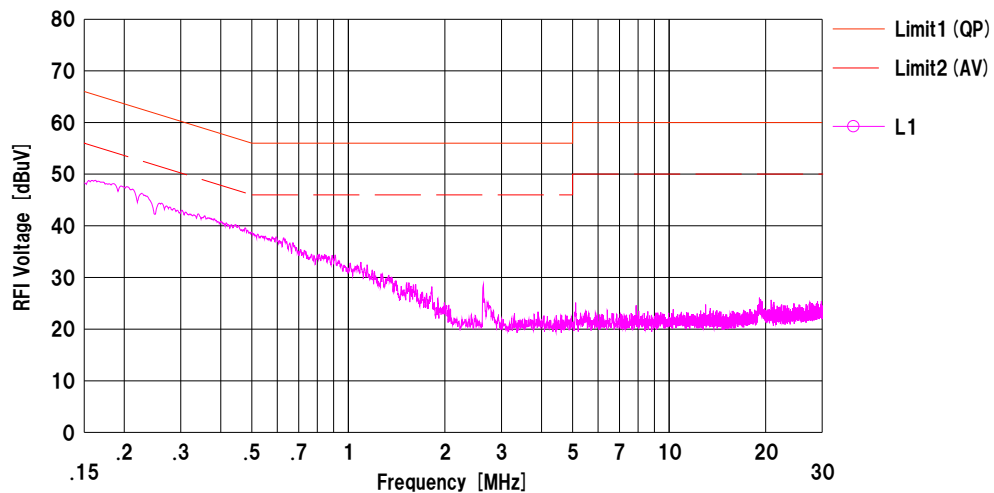
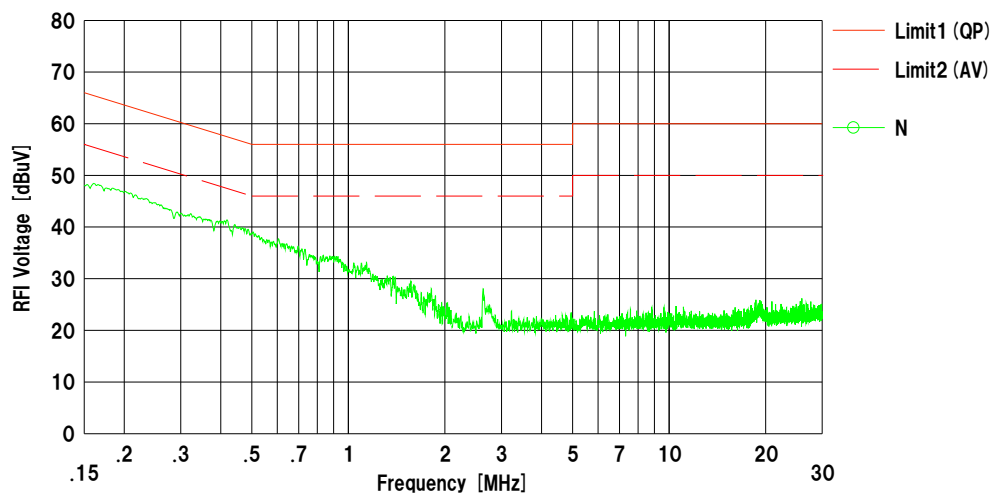
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

Mode : Tx DH5 2441 MHz
Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932PT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: 1001932PT
Test Point: Vmain

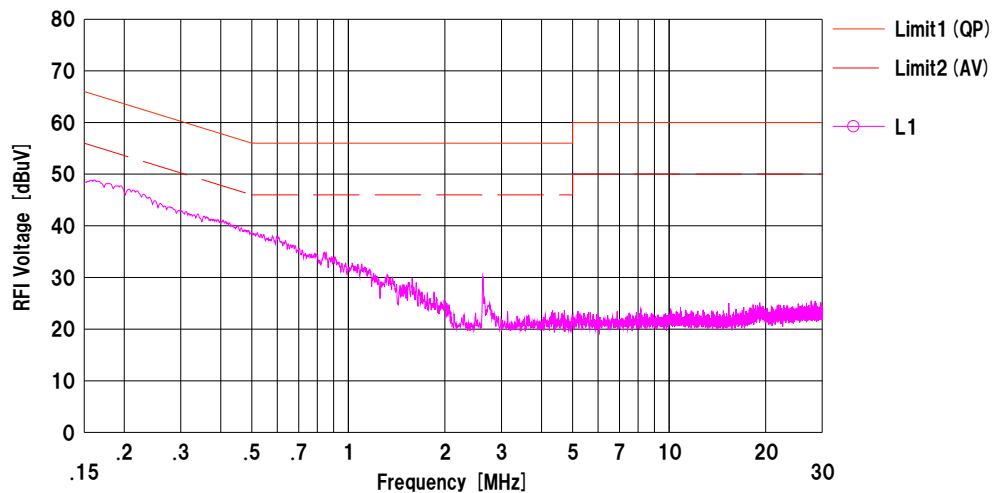
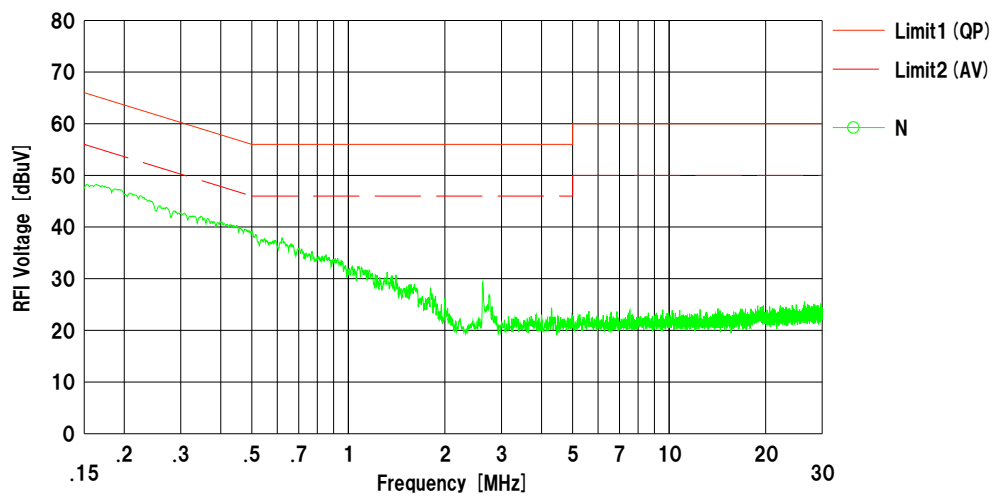
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

Mode : Tx DH5 2480 MHz
Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH
Remarks : Vmain
Ant : 1001932PT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: 1001932PT
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

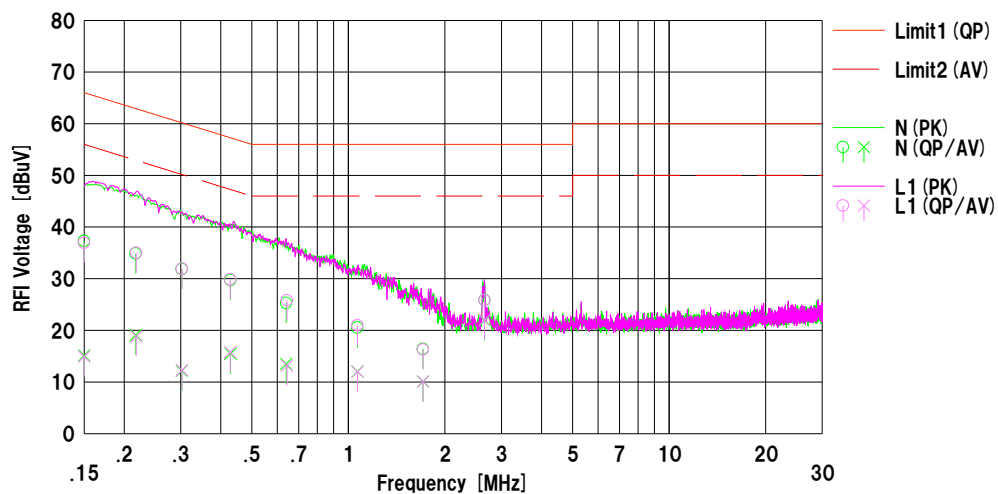
Mode : Tx 3DH5 2402 MHz

Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932PT

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

Engineer : Kazuya Noda



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	24.94	2.75	12.38	37.32	15.13	66.00	56.00	28.6	40.8	N	
2	0.21724	22.48	6.71	12.39	34.87	19.10	62.92	52.92	28.0	33.8	N	
3	0.30246	19.44	-0.23	12.41	31.85	12.18	60.17	50.17	28.3	37.9	N	
4	0.42914	17.28	3.02	12.42	29.70	15.44	57.27	47.27	27.5	31.8	N	
5	0.64004	12.84	1.07	12.44	25.28	13.51	56.00	46.00	30.7	32.4	N	
6	1.06713	8.07	-0.43	12.47	20.54	12.04	56.00	46.00	35.4	33.9	N	
7	1.70792	3.91	-2.44	12.49	16.40	10.05	56.00	46.00	39.6	35.9	N	
8	2.65842	13.31	9.35	12.55	25.86	21.90	56.00	46.00	30.1	24.1	N	
9	0.15000	24.56	2.54	12.38	36.94	14.92	66.00	56.00	29.0	41.0	L1	
10	0.21818	22.64	6.43	12.39	35.03	18.82	62.89	52.89	27.8	34.0	L1	
11	0.30298	19.52	-0.12	12.41	31.93	12.29	60.16	50.16	28.2	37.8	L1	
12	0.42806	17.45	3.34	12.42	29.87	15.76	57.29	47.29	27.4	31.5	L1	
13	0.64366	13.37	0.73	12.44	25.81	13.17	56.00	46.00	30.1	32.8	L1	
14	1.06792	8.52	-0.49	12.47	20.99	11.98	56.00	46.00	35.0	34.0	L1	
15	1.71010	3.78	-2.40	12.49	16.27	10.09	56.00	46.00	39.7	35.9	L1	
16	2.65931	13.28	9.47	12.55	25.83	22.02	56.00	46.00	30.1	23.9	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: 1001932PT
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

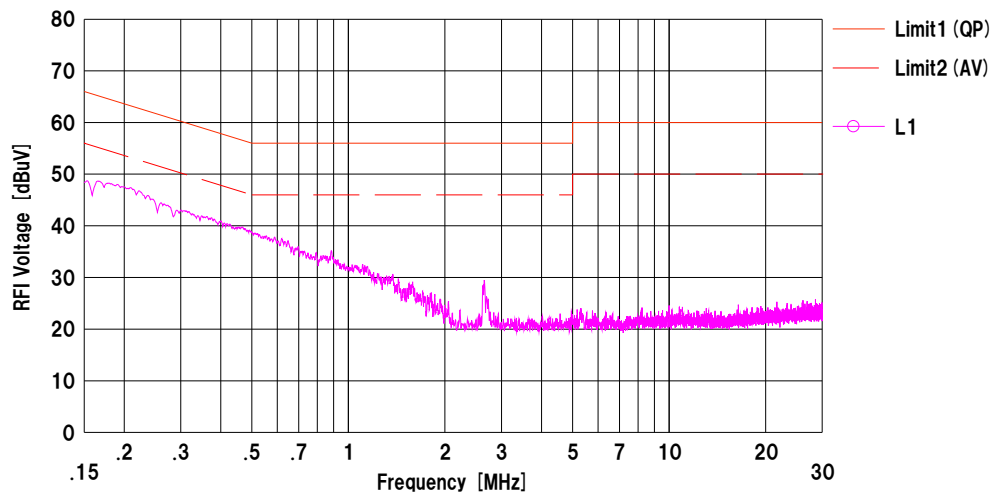
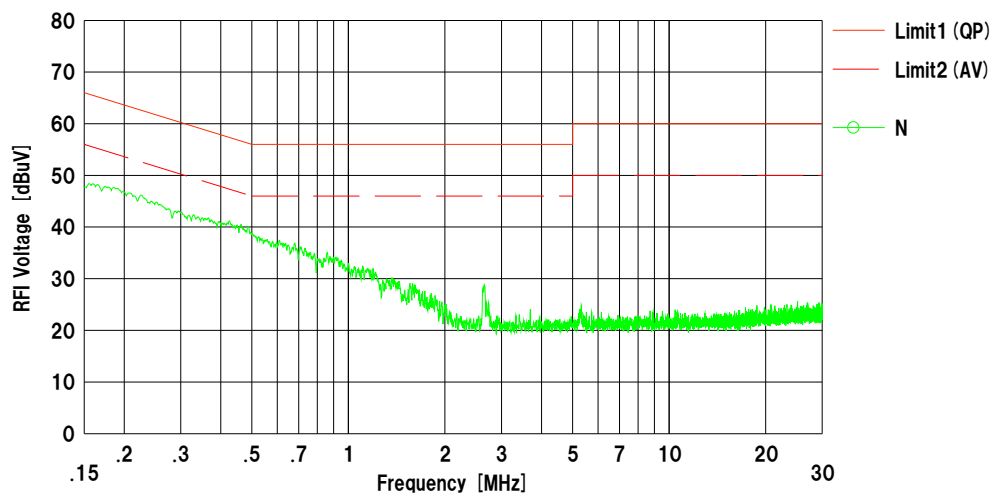
Mode : Tx 3DH5 2441 MHz

Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932PT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: 1001932PT
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

Mode : Tx 3DH5 2480 MHz

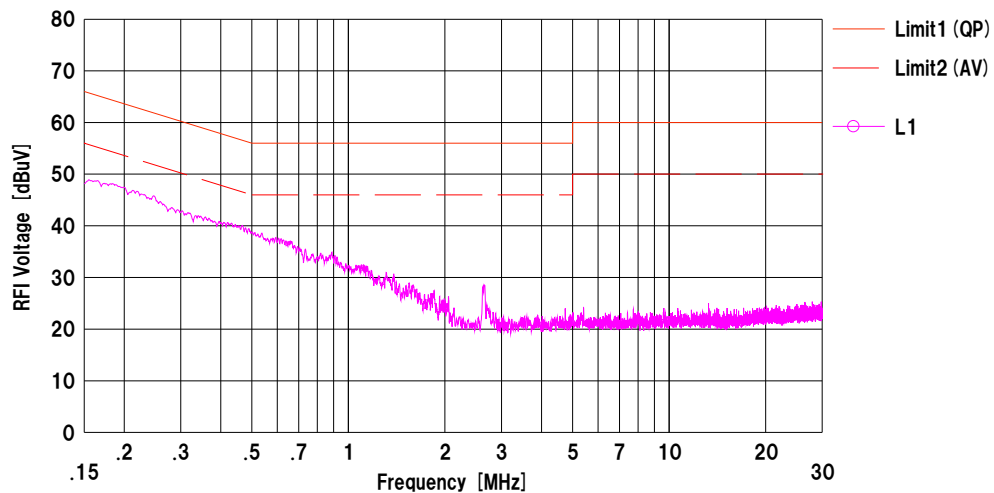
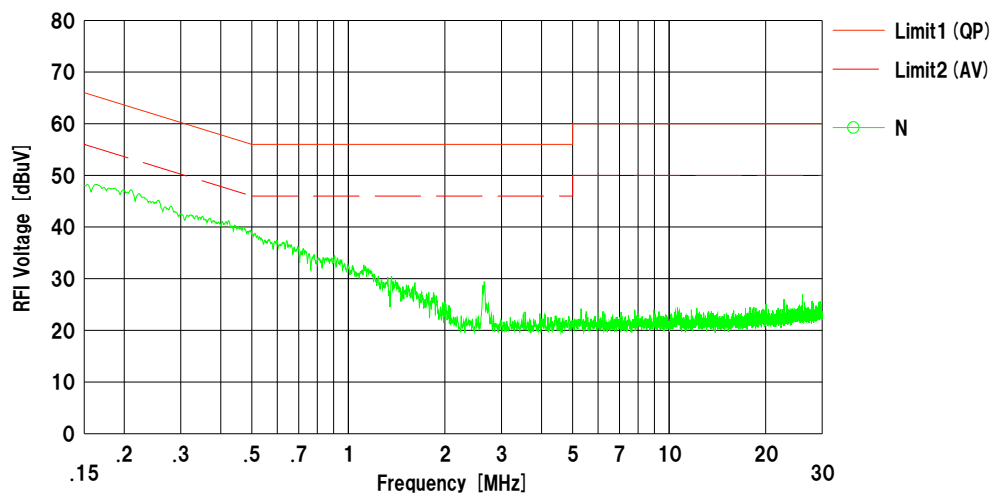
Power : DC 3.3 V

Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932PT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: 1001932PT
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

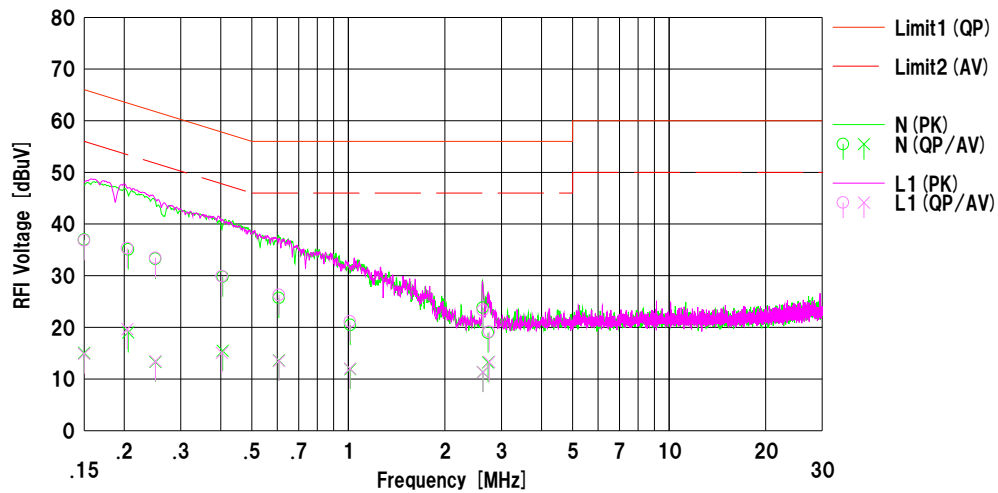
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

Mode : Tx DH5 2402 MHz
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

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

Engineer : Kazuya Noda



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	24.59	2.67	12.38	36.97	15.05	66.00	56.00	29.0	40.9	N	
2	0.20592	22.68	6.62	12.38	35.06	19.00	63.37	53.37	28.3	34.3	N	
3	0.25024	20.86	0.91	12.40	33.26	13.31	61.75	51.75	28.4	38.4	N	
4	0.40568	17.38	3.01	12.43	29.81	15.44	57.74	47.74	27.9	32.3	N	
5	0.60702	13.24	1.15	12.45	25.69	13.60	56.00	46.00	30.3	32.4	N	
6	1.01345	8.00	-0.57	12.46	20.46	11.89	56.00	46.00	35.5	34.1	N	
7	2.62664	11.26	-1.21	12.55	23.81	11.34	56.00	46.00	32.1	34.6	N	
8	2.72632	6.41	0.65	12.55	18.96	13.20	56.00	46.00	37.0	32.8	N	
9	0.15000	24.44	2.48	12.38	36.82	14.86	66.00	56.00	29.1	41.1	L1	
10	0.20448	22.93	7.25	12.38	35.31	19.63	63.43	53.43	28.1	33.8	L1	
11	0.25039	21.04	1.03	12.40	33.44	13.43	61.74	51.74	28.3	38.3	L1	
12	0.40309	17.45	2.62	12.43	29.88	15.05	57.79	47.79	27.9	32.7	L1	
13	0.60776	13.82	1.05	12.45	26.27	13.50	56.00	46.00	29.7	32.5	L1	
14	1.01164	8.66	-0.43	12.46	21.12	12.03	56.00	46.00	34.8	33.9	L1	
15	2.62889	10.74	-1.24	12.55	23.29	11.31	56.00	46.00	32.7	34.6	L1	
16	2.74808	6.59	0.74	12.55	19.14	13.29	56.00	46.00	36.8	32.7	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: 1001932PT
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

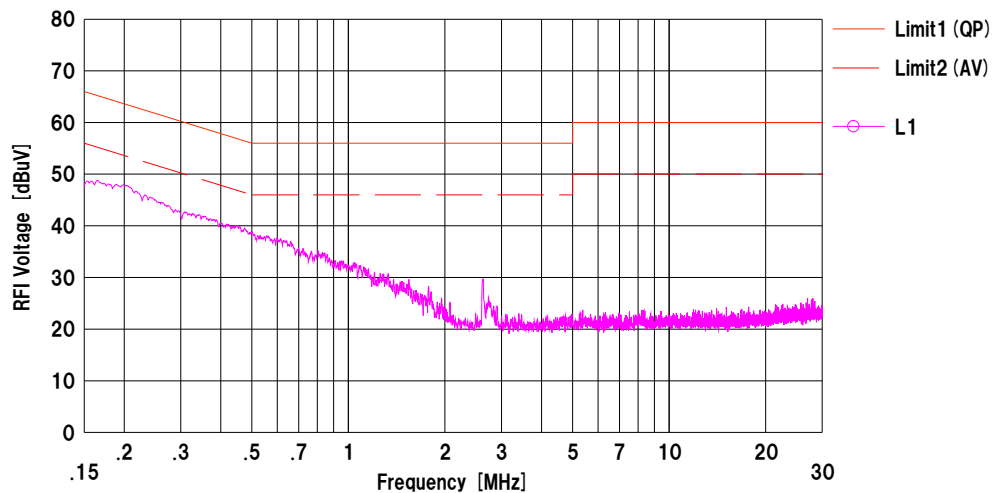
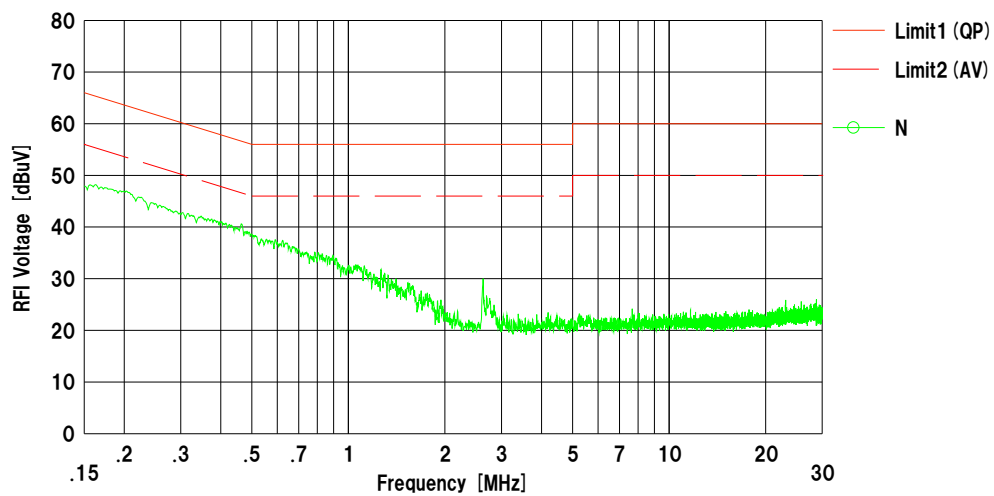
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

Mode : Tx DH5 2441 MHz
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: 1001932PT
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

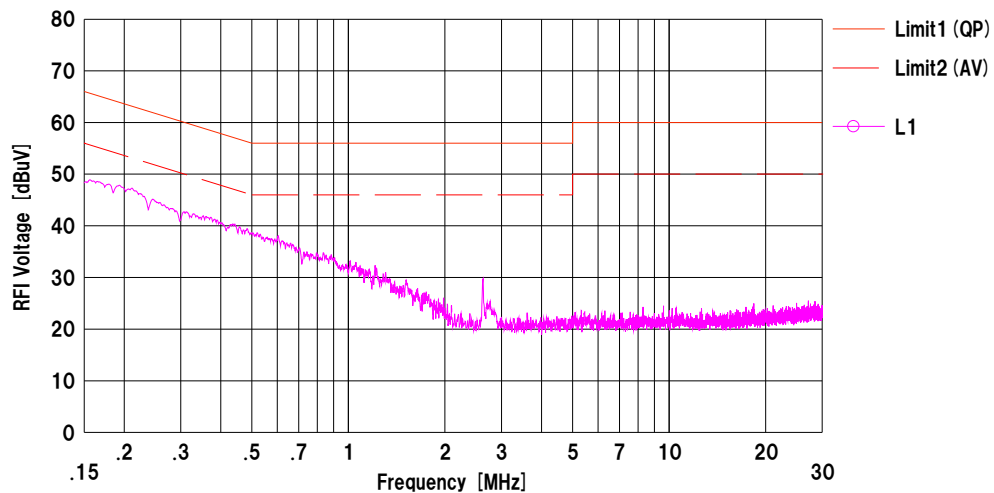
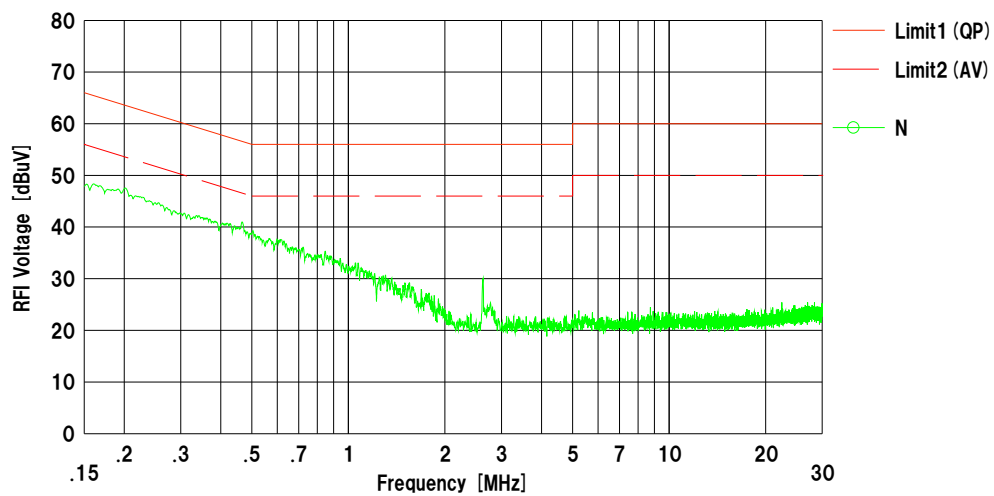
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

Mode : Tx DH5 2402 MHz
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: 1001932PT
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

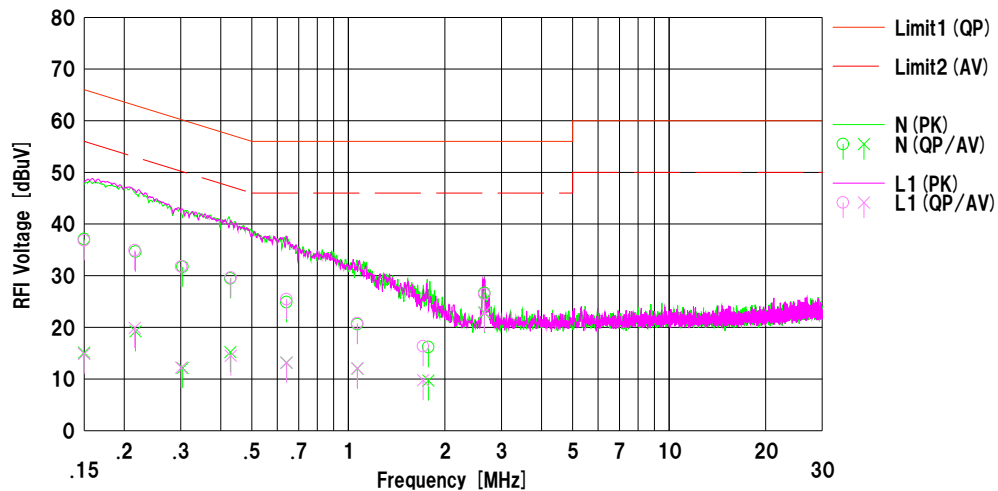
Mode : Tx 3DH5 2402 MHz

Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

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

Engineer : Kazuya Noda



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	24.69	2.72	12.38	37.07	15.10	66.00	56.00	28.9	40.9	N	
2	0.21688	22.26	6.83	12.39	34.65	19.22	62.94	52.94	28.2	33.7	N	
3	0.30423	19.31	-0.28	12.41	31.72	12.13	60.13	50.13	28.4	38.0	N	
4	0.42854	17.06	2.79	12.42	29.48	15.21	57.28	47.28	27.8	32.0	N	
5	0.64152	12.44	0.72	12.44	24.88	13.16	56.00	46.00	31.1	32.8	N	
6	1.06702	8.14	-0.47	12.47	20.61	12.00	56.00	46.00	35.3	34.0	N	
7	1.77595	3.67	-2.81	12.50	16.17	9.69	56.00	46.00	39.8	36.3	N	
8	2.65691	14.12	10.23	12.55	26.67	22.78	56.00	46.00	29.3	23.2	N	
9	0.15000	24.45	2.49	12.38	36.83	14.87	66.00	56.00	29.1	41.1	L1	
10	0.21570	22.53	7.51	12.39	34.92	19.90	62.98	52.98	28.0	33.0	L1	
11	0.30133	19.34	-0.21	12.41	31.75	12.20	60.21	50.21	28.4	38.0	L1	
12	0.42976	17.21	2.09	12.42	29.63	14.51	57.26	47.26	27.6	32.7	L1	
13	0.64122	13.02	0.71	12.44	25.46	13.15	56.00	46.00	30.5	32.8	L1	
14	1.06650	8.31	-0.42	12.47	20.78	12.05	56.00	46.00	35.2	33.9	L1	
15	1.70971	3.84	-2.73	12.49	16.33	9.76	56.00	46.00	39.6	36.2	L1	
16	2.65676	13.85	10.41	12.55	26.40	22.96	56.00	46.00	29.6	23.0	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

UL Japan, Inc.

Shonan EMC Lab.

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Conducted Emission

Antenna: 1001932PT
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

Mode : Tx 3DH5 2441 MHz

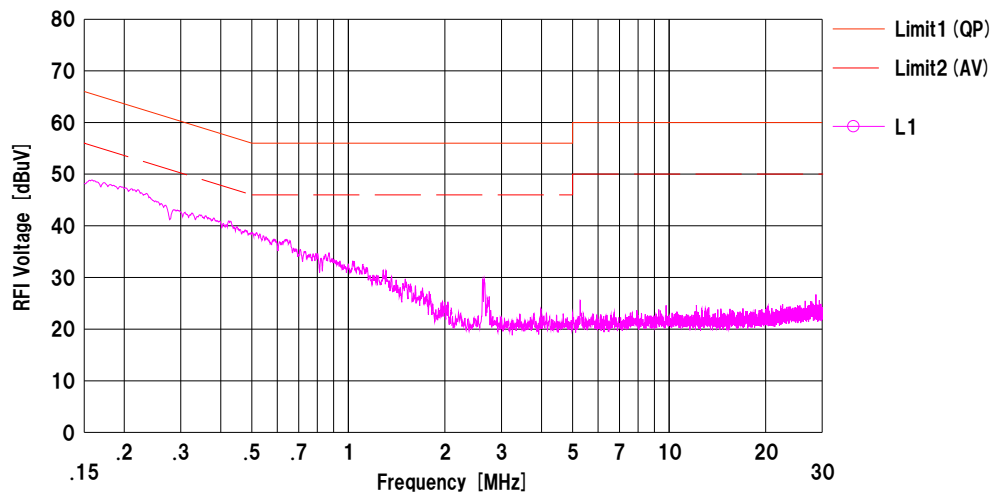
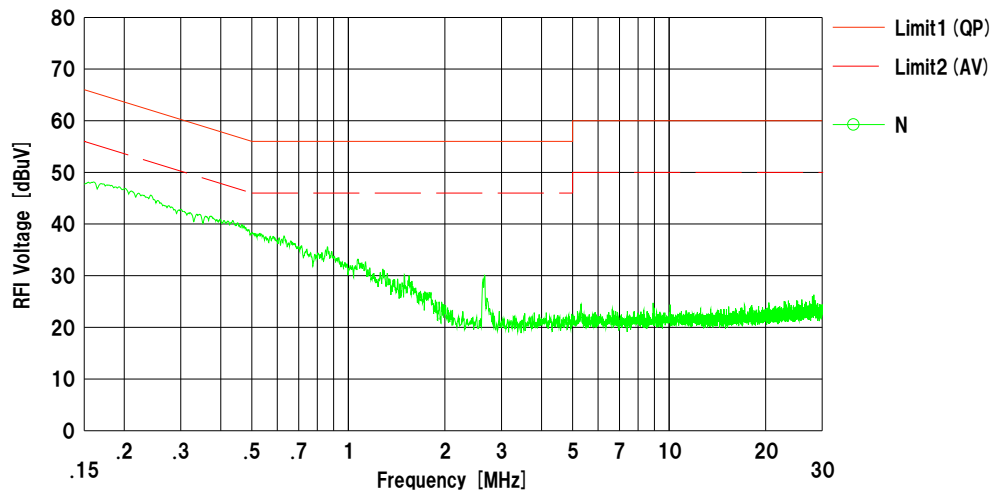
Power : DC 5 V

Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: 1001932PT
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

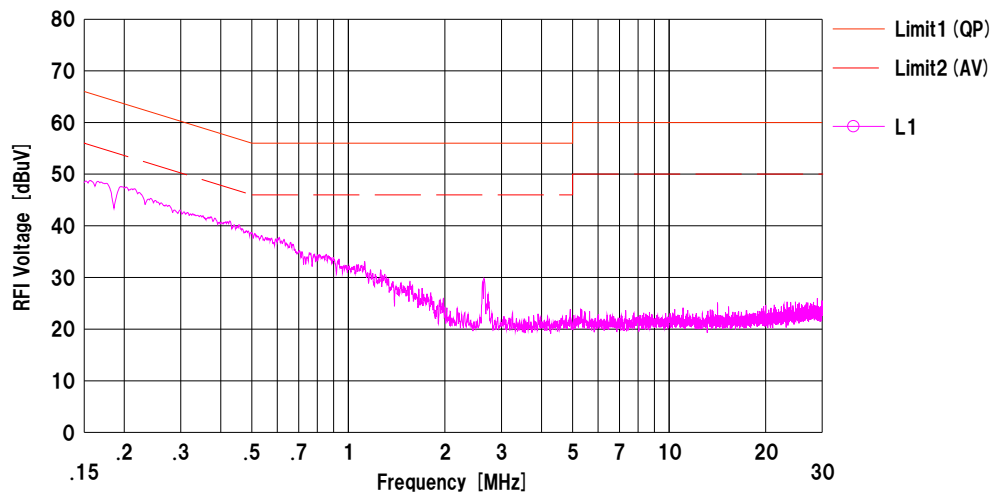
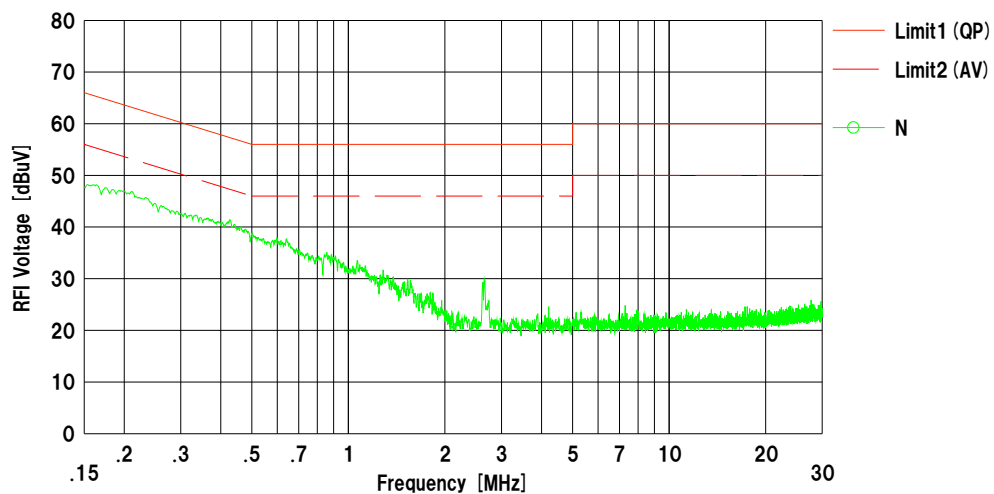
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

Mode : Tx 3DH5 2480 MHz
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: 1001932FT
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

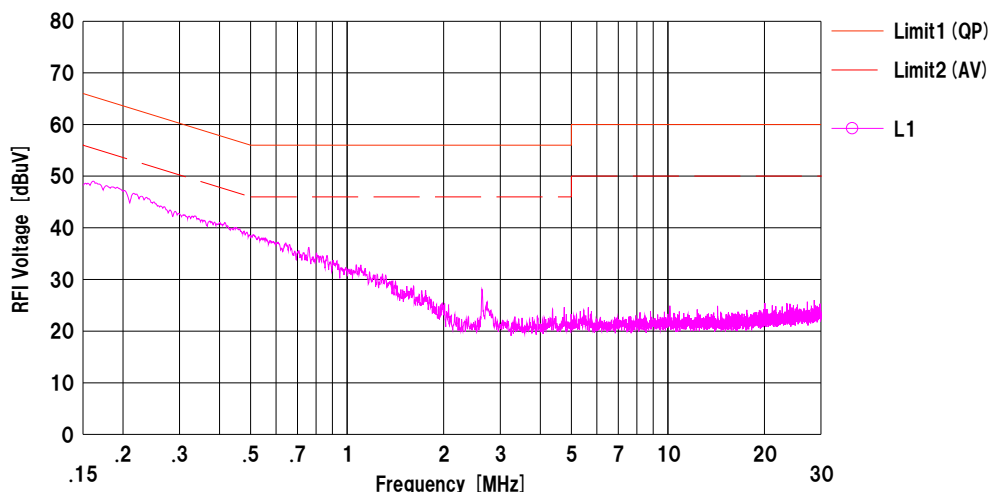
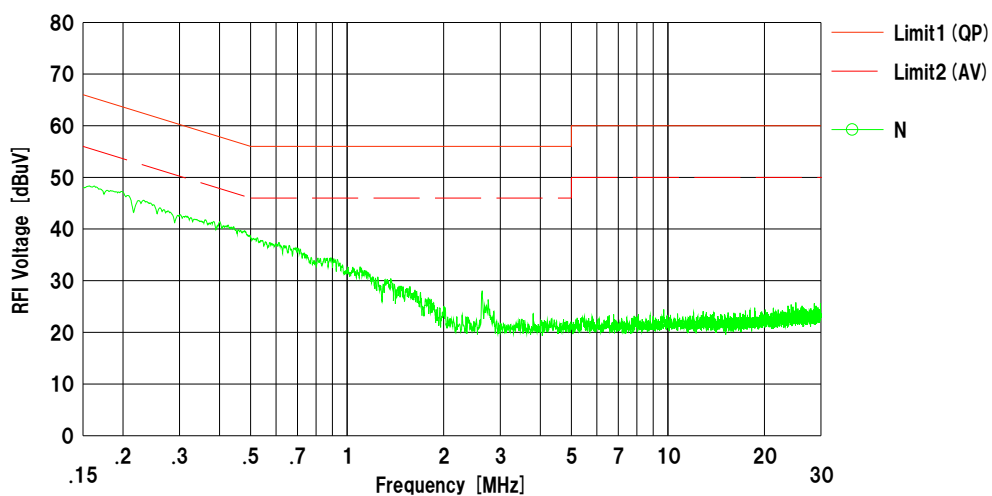
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

Mode : Tx DH5 2402 MHz
Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932FT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: 1001932FT
Test Point: Vmain

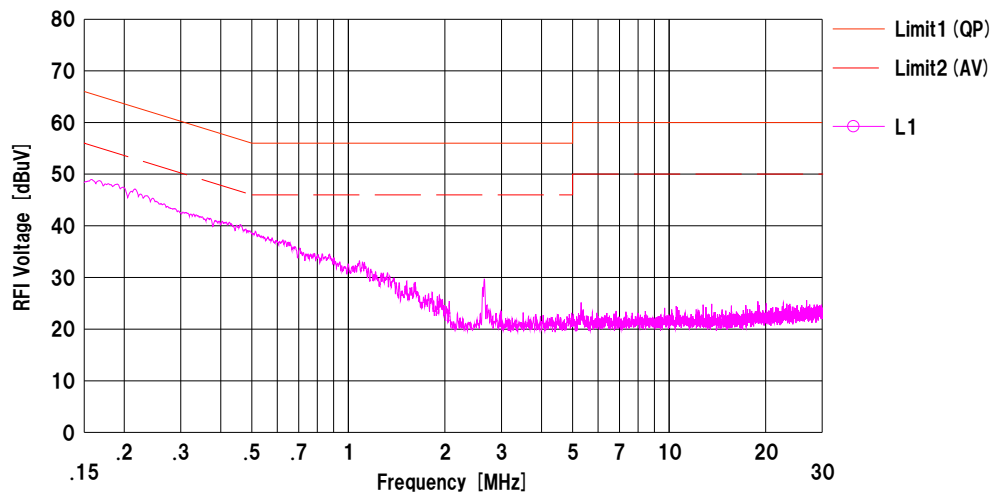
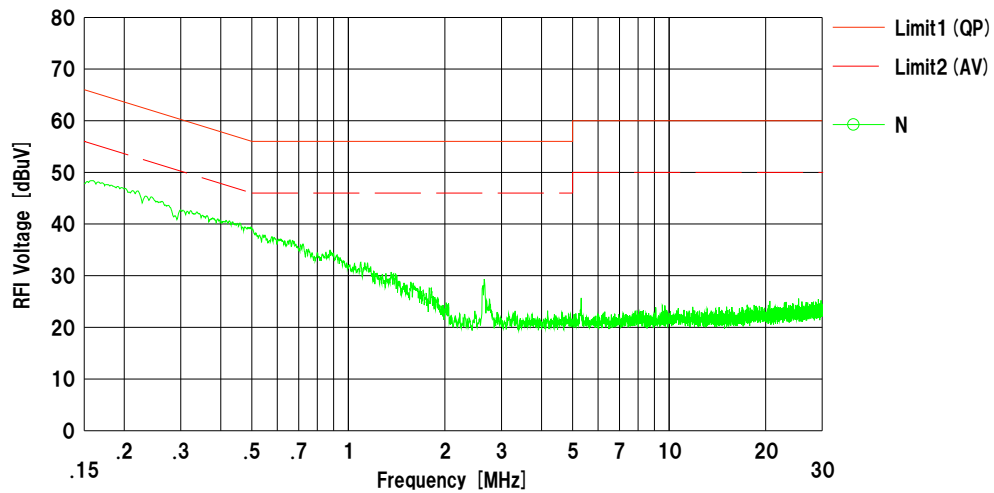
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

Mode : Tx 3DH5 2402 MHz
Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH
Remarks : Vmain
Ant : 1001932FT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: 1001932FT
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

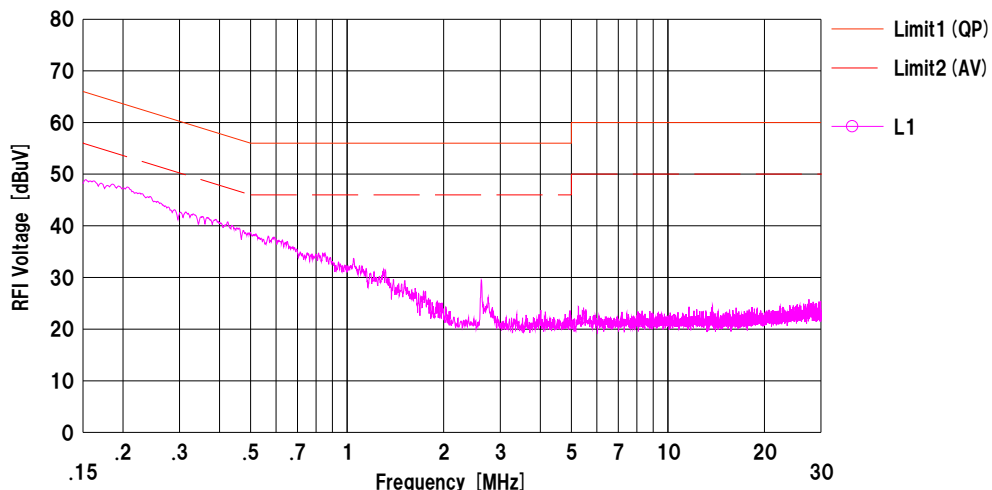
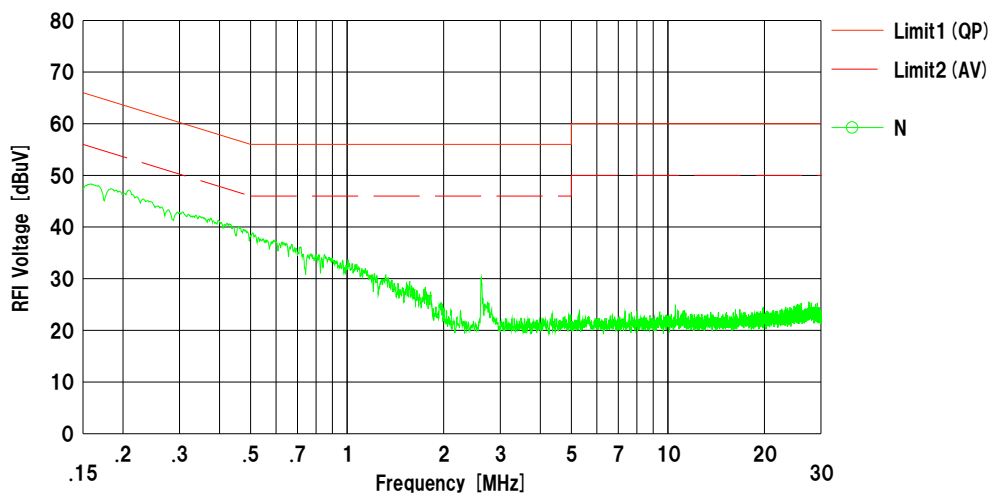
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

Mode : Tx DH5 2402 MHz
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932FT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: 1001932FT
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

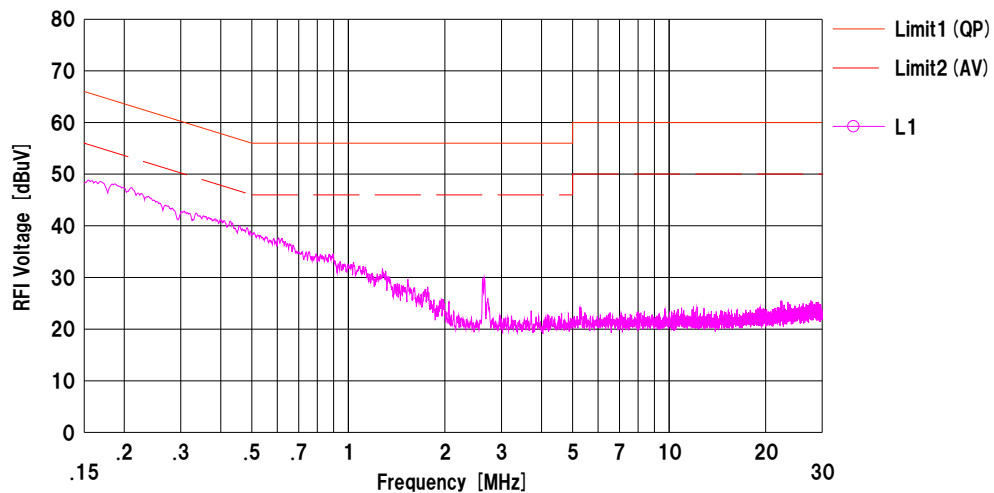
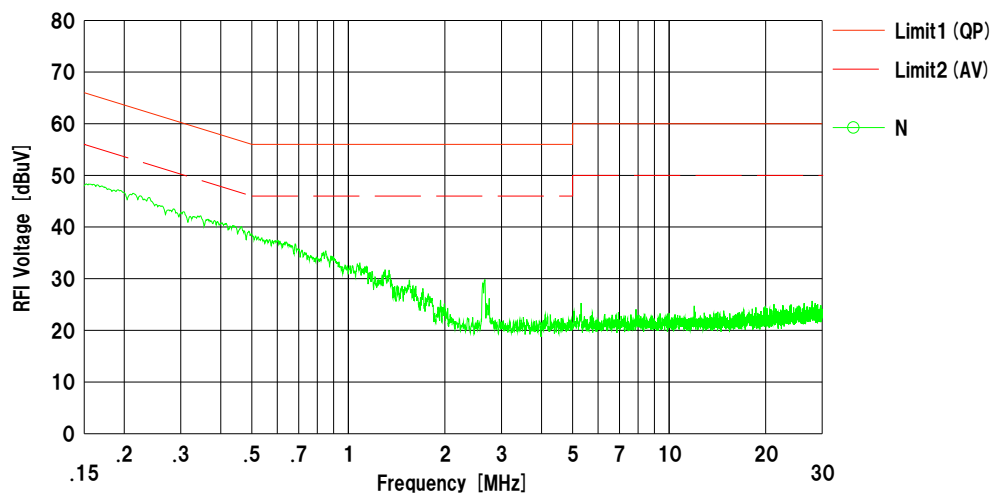
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

Mode : Tx 3DH5 2402 MHz
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932FT

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: Chip
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

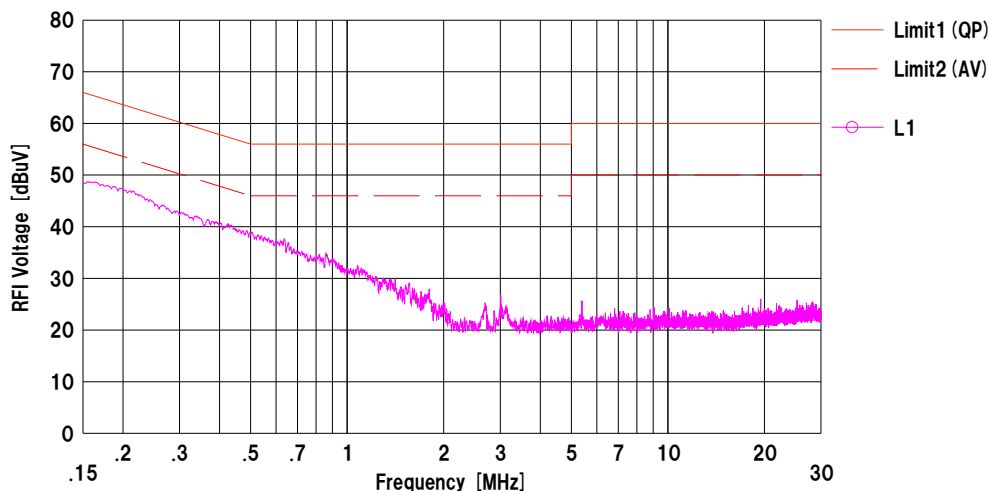
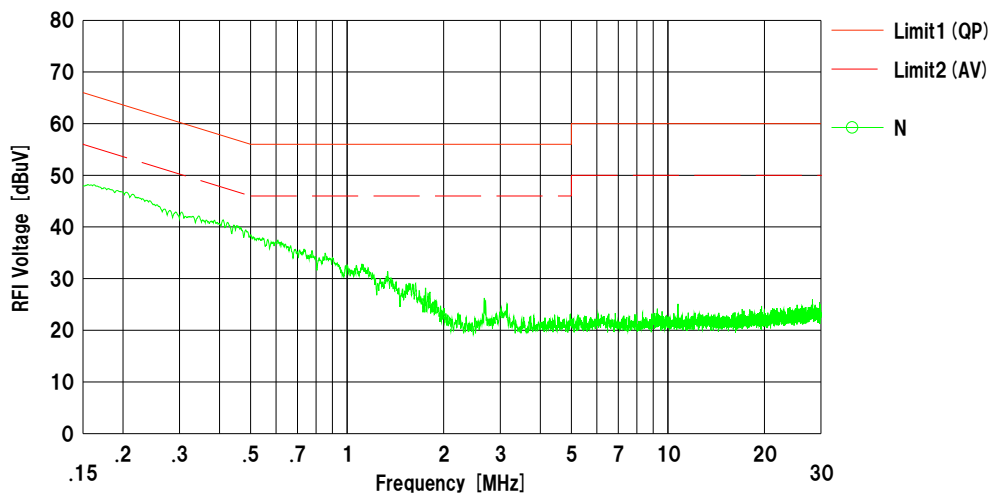
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

Mode : Tx DH5 2402 MHz
Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : Vmain

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: Chip
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

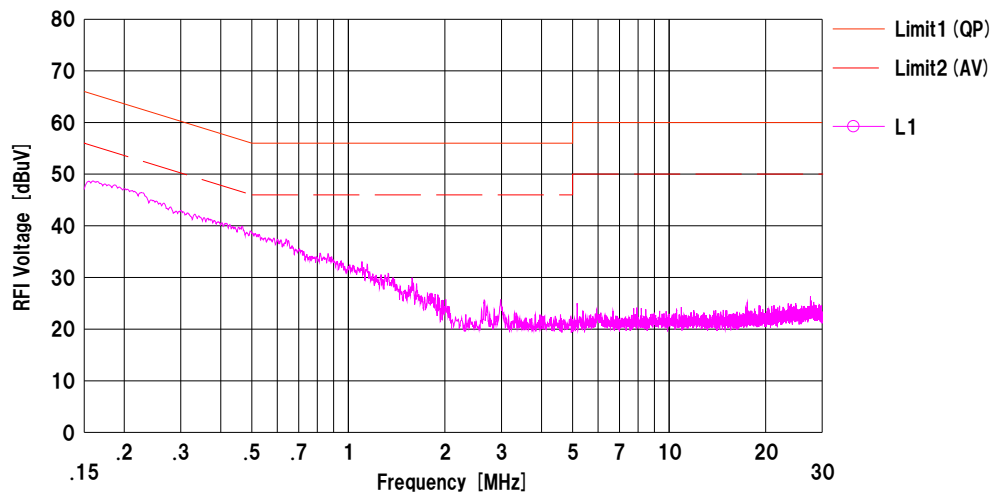
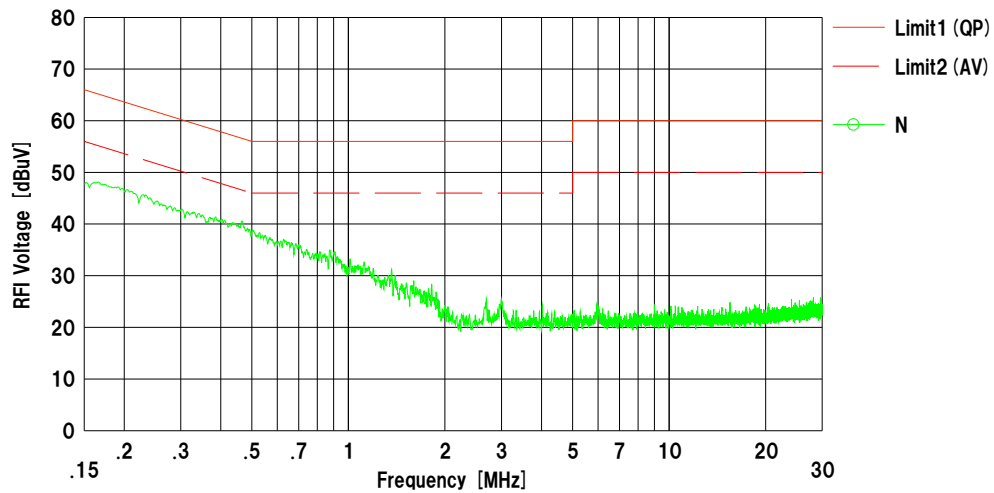
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

Mode : Tx 3DH5 2402 MHz
Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : Vmain

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: Chip
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

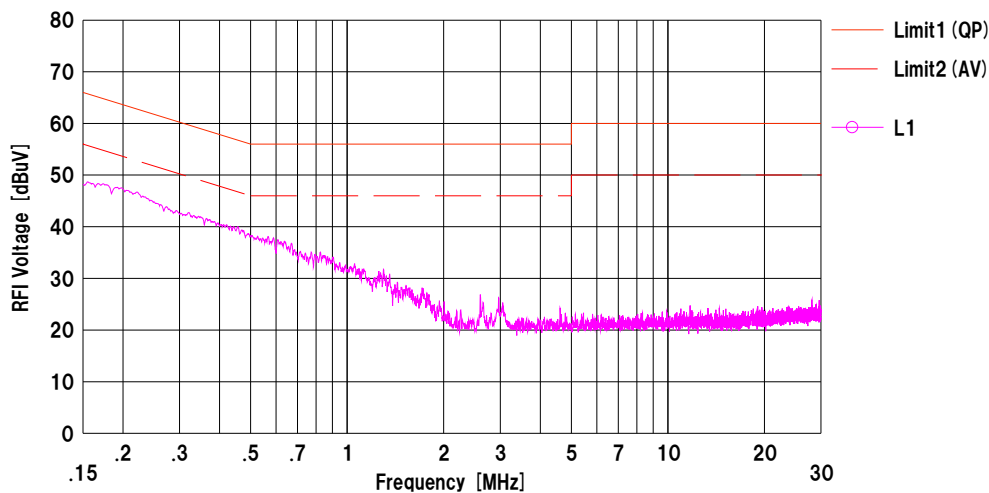
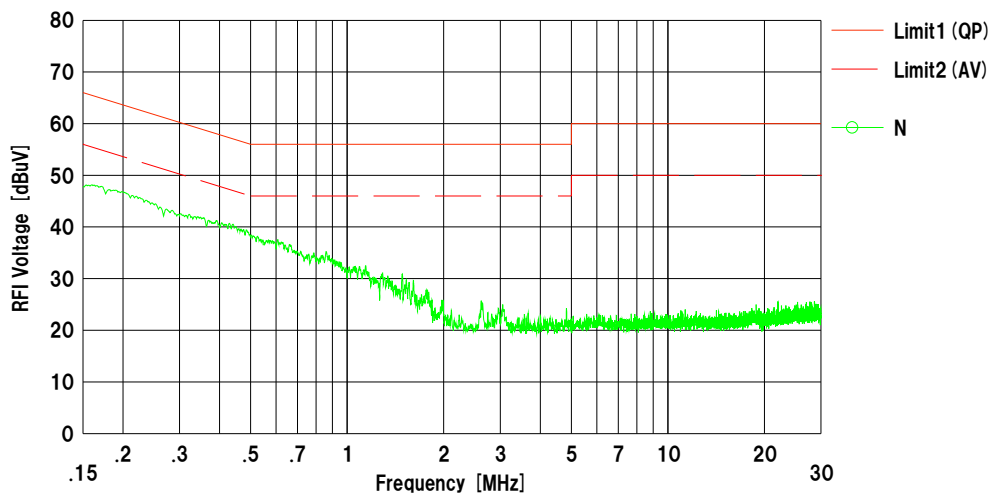
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

Mode : Tx DH5 2402 MHz
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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Conducted Emission

Antenna: Chip
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

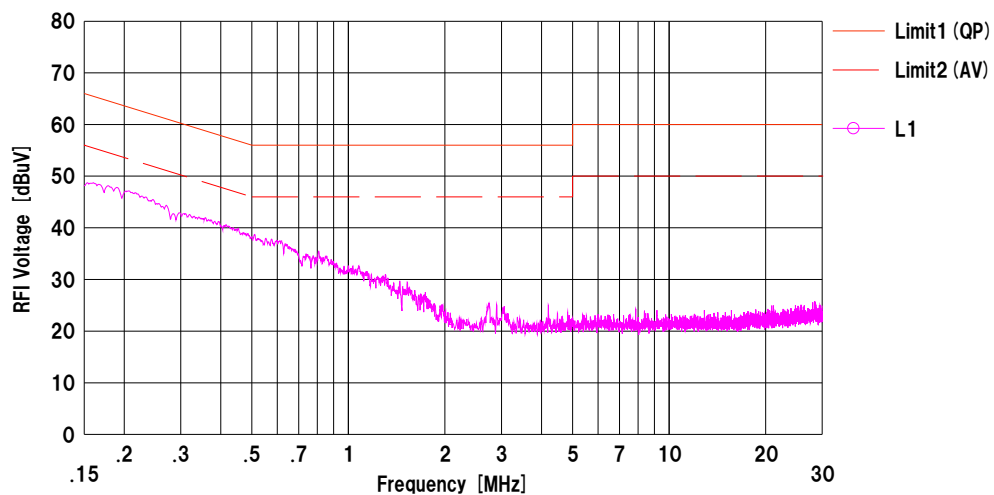
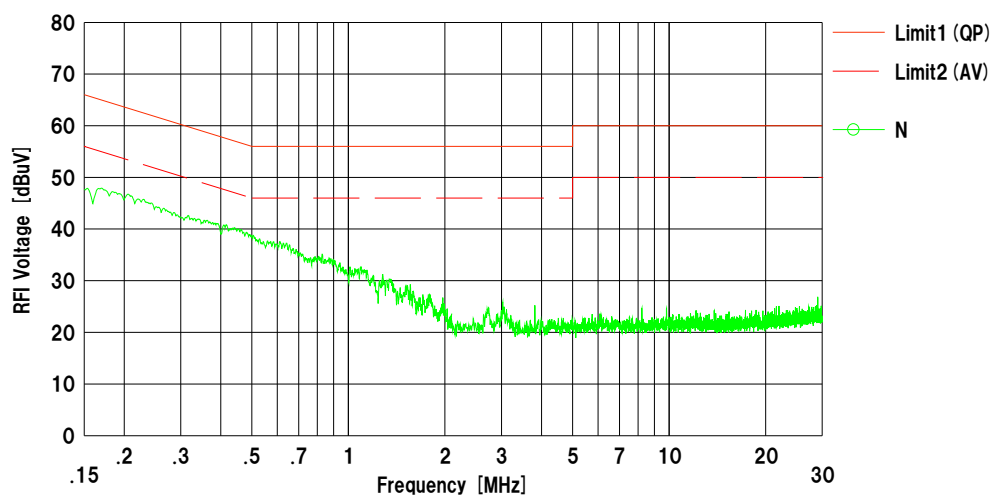
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

Mode : Tx 3DH5 2402 MHz
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO

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

Engineer : Kazuya Noda



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) : SLS-05

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

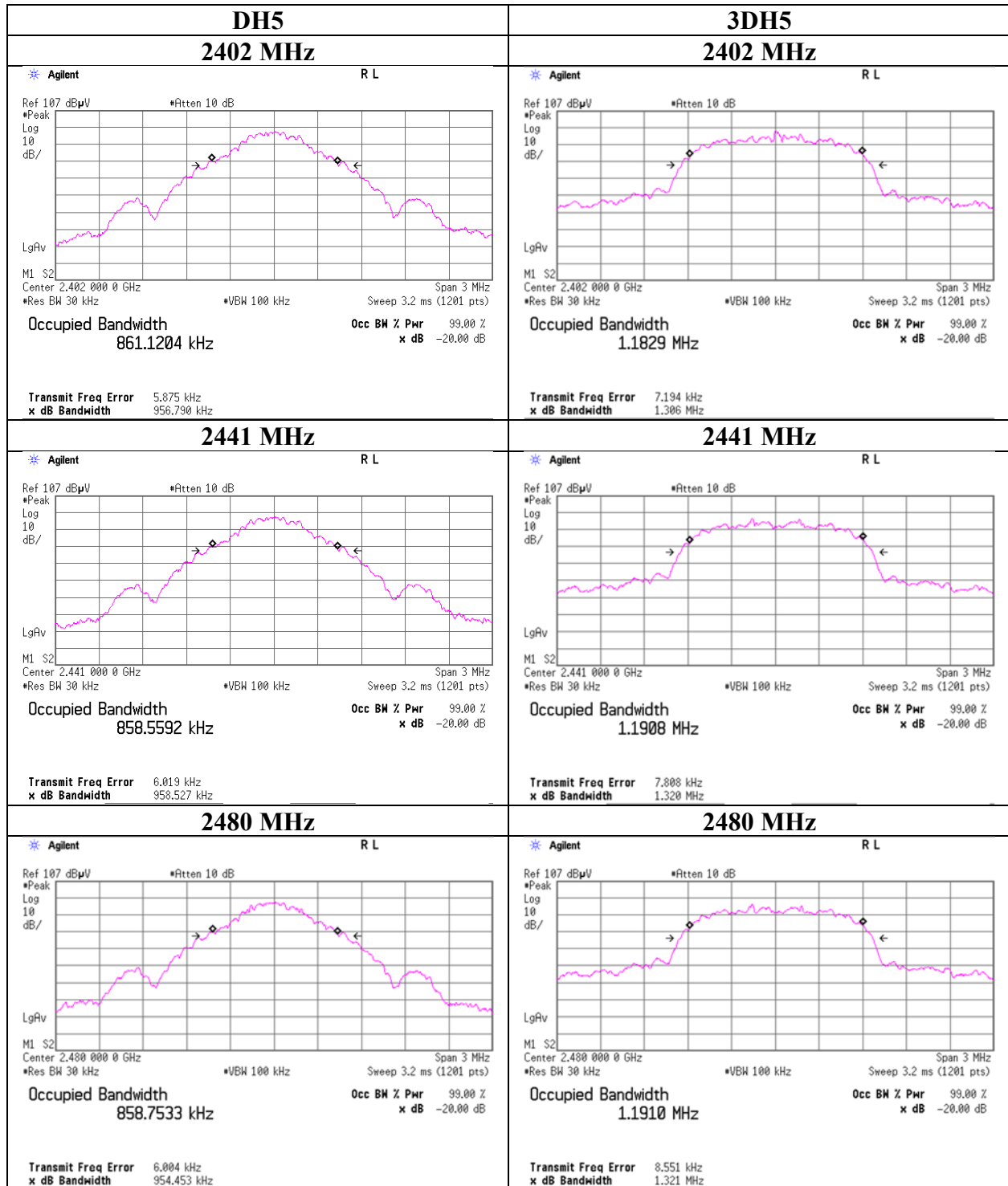
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-B-R2
Date	March 30, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.957	861.1	1.000	>= 0.638
DH5	2441.0	0.959	858.6	1.000	>= 0.639
DH5	2480.0	0.954	858.8	1.000	>= 0.636
DH5	Hopping On	-	78654.8	-	-
3DH5	2402.0	1.306	1182.9	1.000	>= 0.871
3DH5	2441.0	1.320	1190.8	1.000	>= 0.880
3DH5	2480.0	1.321	1191.0	1.000	>= 0.881
3DH5	Hopping On	-	78714.4	-	-

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

No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth



UL Japan, Inc.

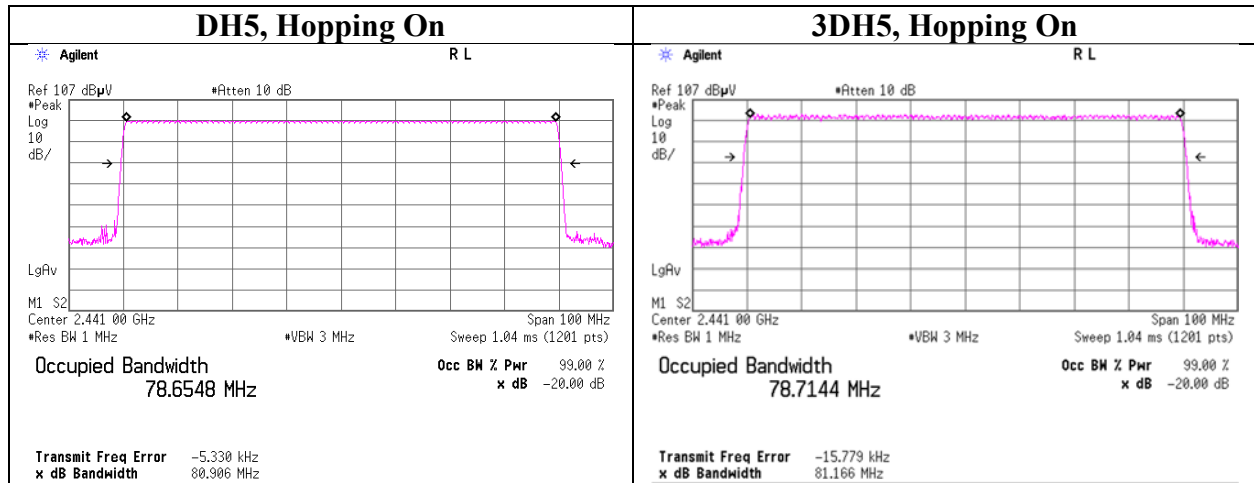
Shonan EMC Lab.

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20dB Bandwidth and 99% Occupied Bandwidth



UL Japan, Inc.

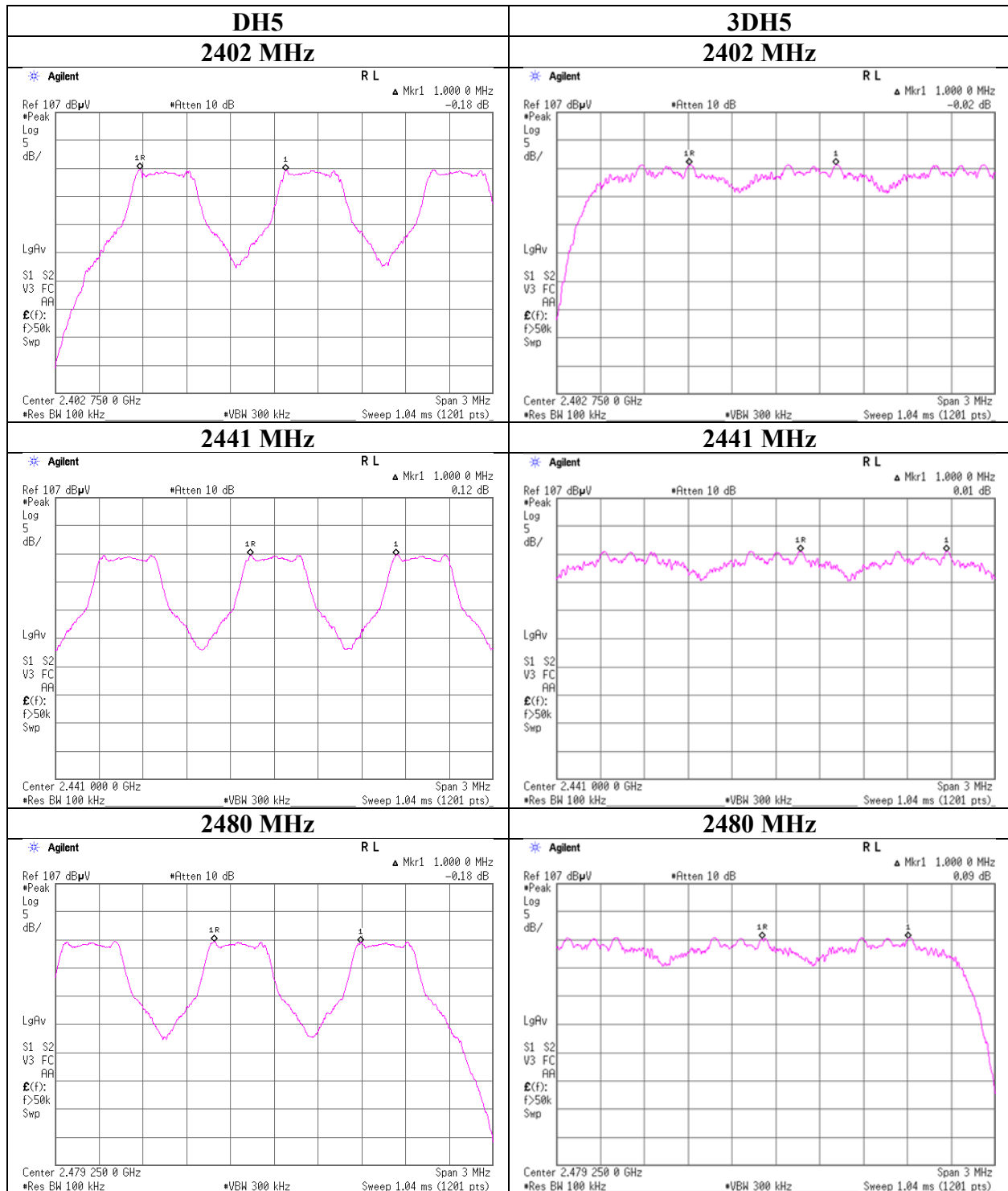
Shonan EMC Lab.

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Carrier Frequency Separation



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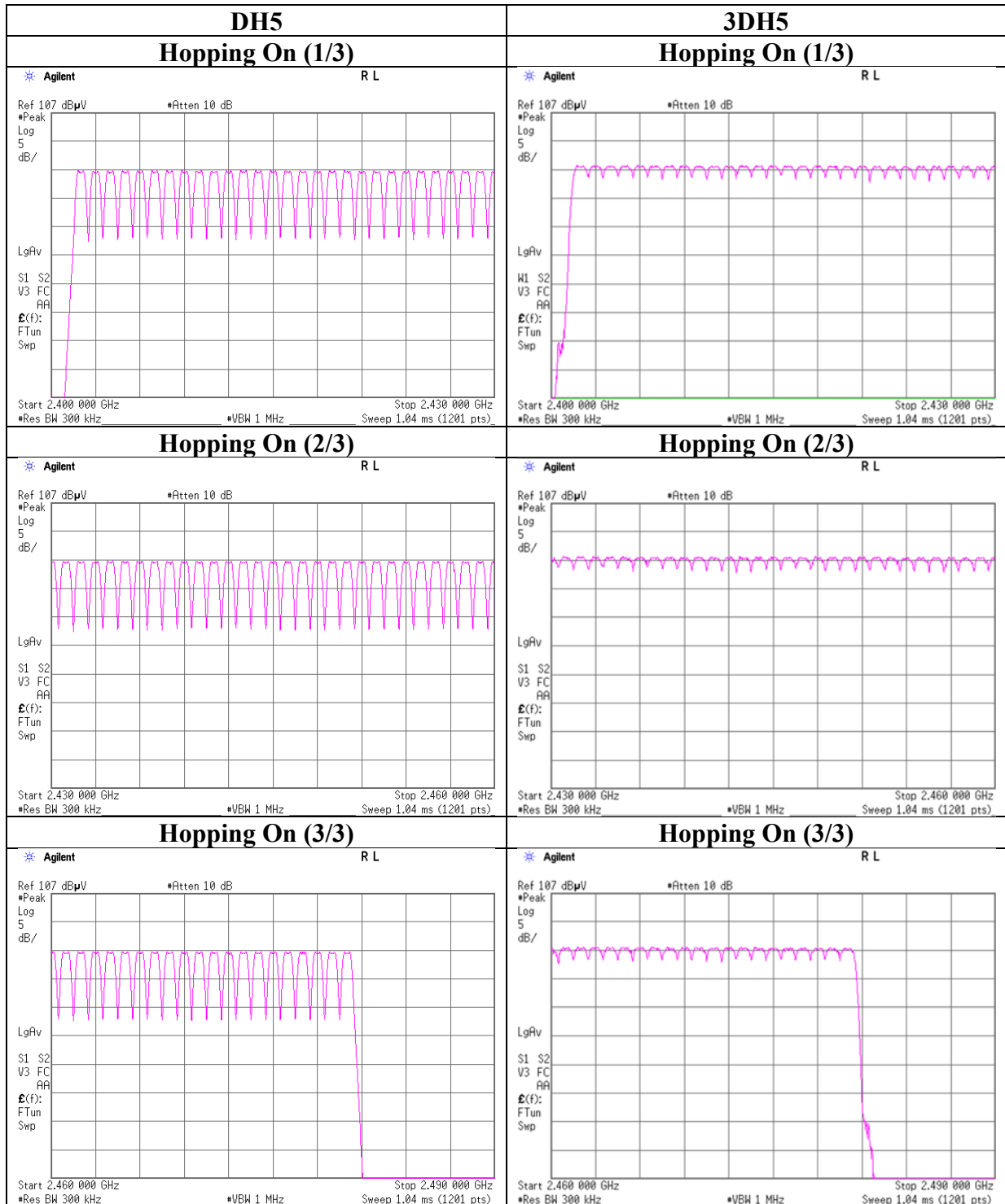
Number of Hopping Frequency

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 12193629S-B-R2
Date March 30, 2018
Temperature / Humidity 24 deg. C / 35 % 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.

Number of Hopping Frequency



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Shonan EMC Lab.

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Dwell time

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 12193629S-B-R2
Date : March 30, 2018
Temperature / Humidity : 24 deg. C / 35 % 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	49.6 times	/	5 sec.	x	31.6 sec. =	314 times	400
DH3	26.6 times	/	5 sec.	x	31.6 sec. =	169 times	400
DH5	20.0 times	/	5 sec.	x	31.6 sec. =	127 times	400
3DH1	49.4 times	/	5 sec.	x	31.6 sec. =	313 times	400
3DH3	26.4 times	/	5 sec.	x	31.6 sec. =	167 times	400
3DH5	18.2 times	/	5 sec.	x	31.6 sec. =	116 times	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

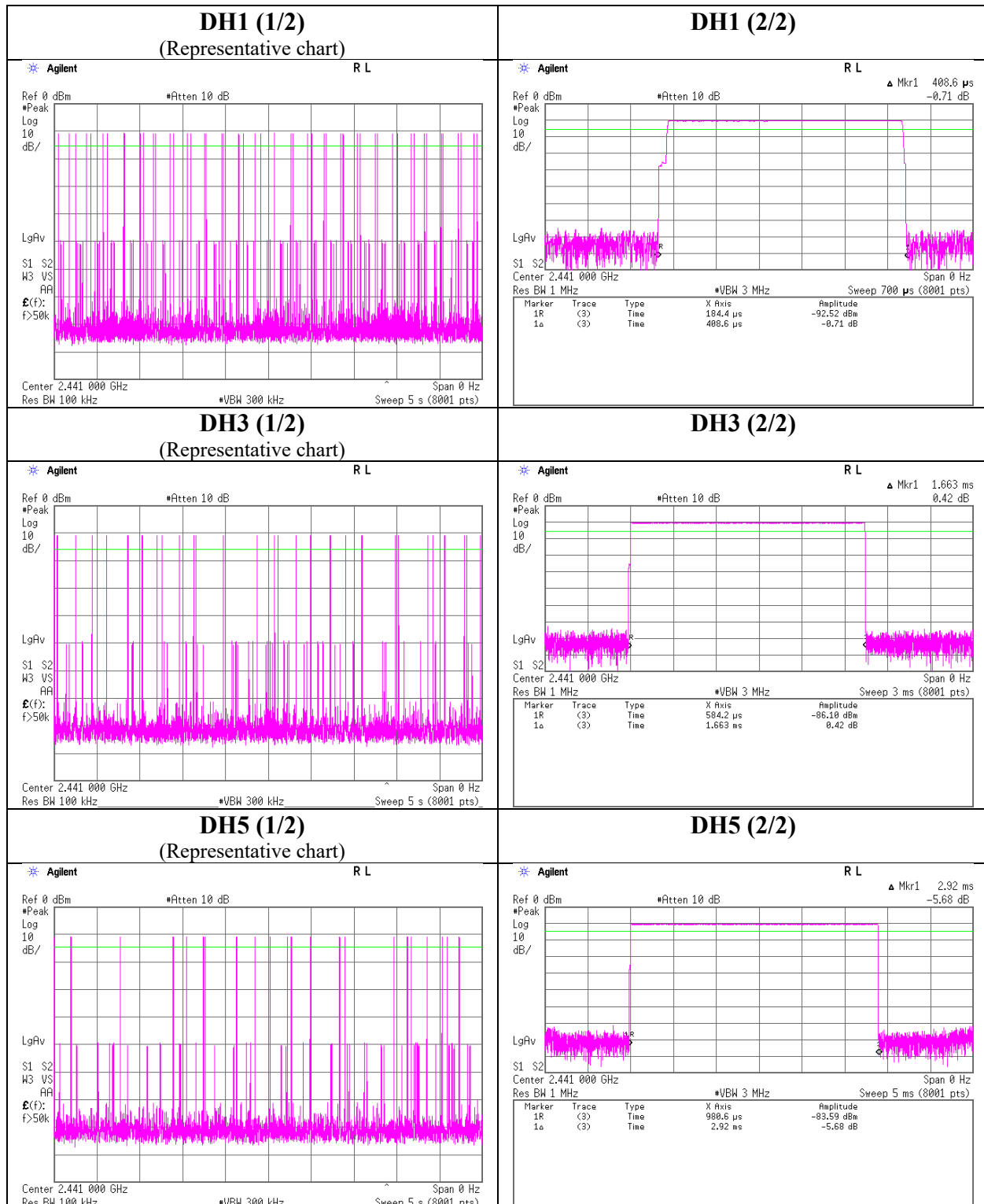
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	50	49	50	50	49.6
DH3	29	28	24	27	25	26.6
DH5	20	18	20	22	20	20
3DH1	50	49	50	49	49	49.4
3DH3	26	26	28	24	28	26.4
3DH5	16	21	17	20	17	18.2

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 $N \times 0.4s$, 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



UL Japan, Inc.

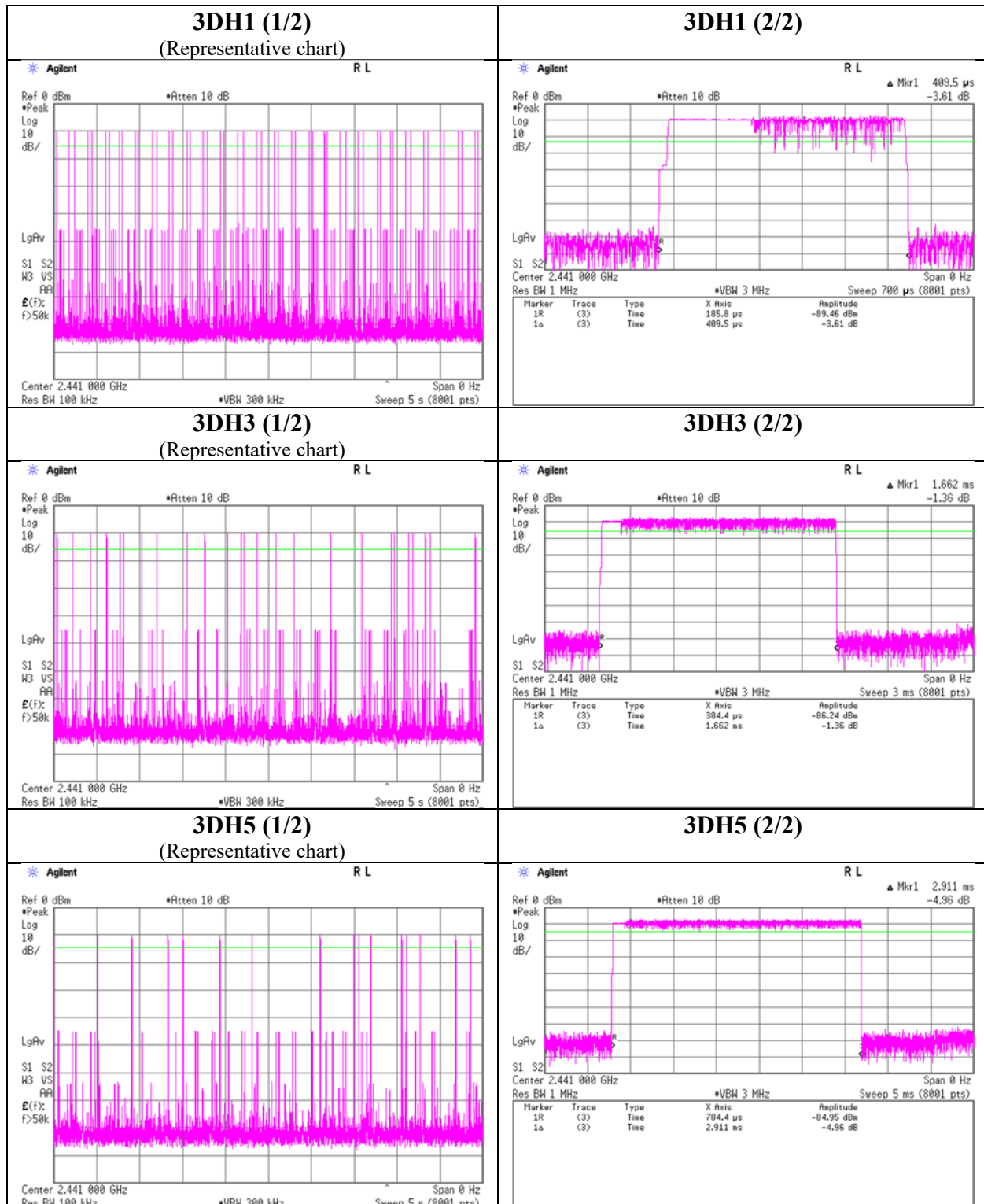
Shonan EMC Lab.

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Dwell time



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Maximum Peak Output Power

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 12193629S-B-R2
Date : March 16, 2018
Temperature / Humidity : 24 deg. C / 40 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off

					Conducted Power					e.i.r.p.						
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	-10.27	1.12	9.85	0.70	1.17	20.96	125	20.26	2.50	3.20	2.09	36.02	4000	32.82	
DH5	2441.0	-10.27	1.12	9.84	0.69	1.17	20.96	125	20.27	2.50	3.19	2.08	36.02	4000	32.83	
DH5	2480.0	-10.35	1.13	9.84	0.62	1.15	20.96	125	20.34	2.50	3.12	2.05	36.02	4000	32.90	
2DH5	2402.0	-7.14	1.12	9.85	3.83	2.42	20.96	125	17.13	2.50	6.33	4.30	36.02	4000	29.69	
2DH5	2441.0	-7.26	1.12	9.84	3.70	2.34	20.96	125	17.26	2.50	6.20	4.17	36.02	4000	29.82	
2DH5	2480.0	-7.49	1.13	9.84	3.48	2.23	20.96	125	17.48	2.50	5.98	3.96	36.02	4000	30.04	
3DH5	2402.0	-6.87	1.12	9.85	4.10	2.57	20.96	125	16.86	2.50	6.60	4.57	36.02	4000	29.42	
3DH5	2441.0	-6.96	1.12	9.84	4.00	2.51	20.96	125	16.96	2.50	6.50	4.47	36.02	4000	29.52	
3DH5	2480.0	-7.17	1.13	9.84	3.80	2.40	20.96	125	17.16	2.50	6.30	4.27	36.02	4000	29.72	

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

*Maximum antenna gain

Average Output Power (Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-B-R2
Date	March 16, 2018
Temperature / Humidity	24 deg. C / 40 % 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	-11.79	1.12	9.85	-0.82	0.83	1.12	0.30	1.07
DH5	2441.0	-11.81	1.12	9.84	-0.85	0.82	1.12	0.27	1.06
DH5	2480.0	-11.89	1.13	9.84	-0.92	0.81	1.12	0.20	1.05
2DH5	2402.0	-10.98	1.12	9.85	-0.01	1.00	1.12	1.11	1.29
2DH5	2441.0	-11.08	1.12	9.84	-0.12	0.97	1.12	1.00	1.26
2DH5	2480.0	-11.33	1.13	9.84	-0.36	0.92	1.12	0.76	1.19
3DH5	2402.0	-10.97	1.12	9.85	0.00	1.00	1.12	1.12	1.29
3DH5	2441.0	-11.07	1.12	9.84	-0.11	0.97	1.12	1.01	1.26
3DH5	2480.0	-11.32	1.13	9.84	-0.35	0.92	1.12	0.77	1.19

Sample Calculation:

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

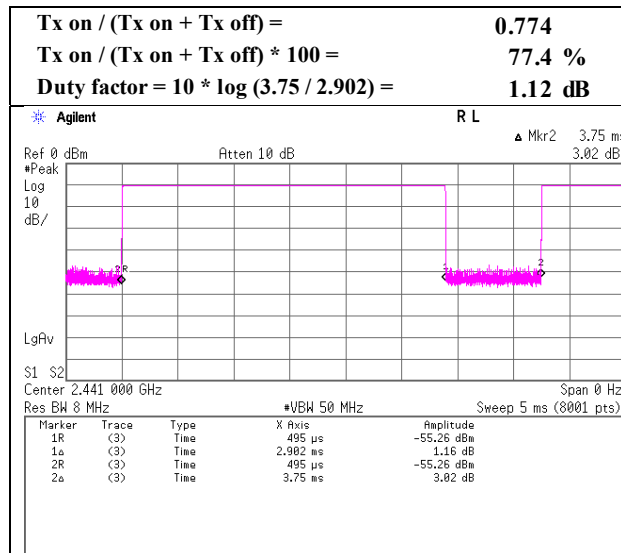
Result (Burst power average) = Time average + Duty factor

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

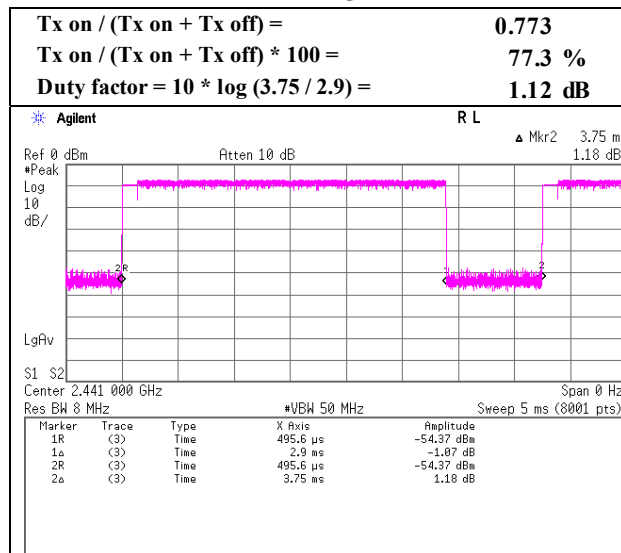
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-B-R2
Date	March 16, 2018
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off

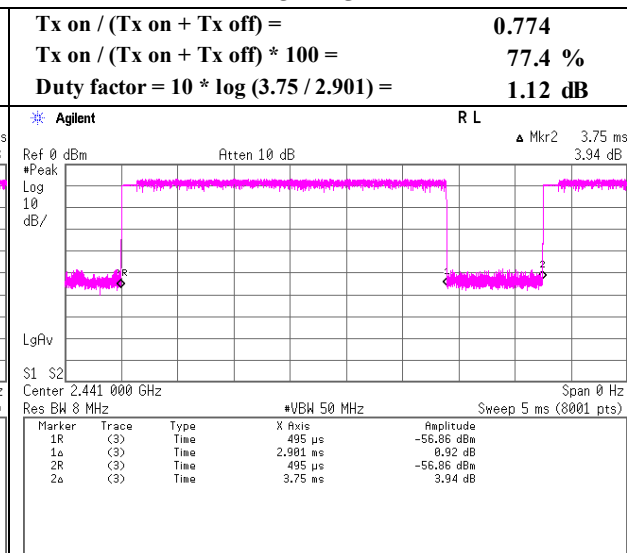
DH5



2DH5



3DH5



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

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Radiated Spurious Emission

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 2 3 3
Date April 5, 2018 March 16, 2018 March 17, 2018 March 20, 2018
Temperature / Humidity 23 deg. C / 39 % RH 22 deg. C / 42 % RH 22 deg. C / 34 % RH 23 deg. C / 39 % RH
Engineer Shiro Kobayashi Shiro Kobayashi Yosuke Ishikawa Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -13 GHz) (13 GHz -26.5 GHz)
Antenna 1001932PT
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.	359.997	QP	22.32	14.57	9.03	31.95	0.00	13.97	46.00	32.0	108	71	
Hori.	479.996	QP	22.60	17.05	9.56	31.96	0.00	17.25	46.00	28.7	192	204	
Hori.	2390.000	PK	43.97	27.16	14.56	36.58	2.33	51.44	73.90	22.4	157	272	
Hori.	4804.000	PK	51.02	31.40	6.74	44.45	2.33	47.04	73.90	26.8	100	190	
Hori.	7206.000	PK	48.02	36.56	8.41	43.99	2.33	51.33	73.90	22.5	100	0	
Hori.	9608.000	PK	49.14	38.61	9.28	43.83	2.33	55.53	73.90	18.3	100	0	
Hori.	2390.000	AV	31.90	27.16	14.56	36.58	2.33	39.37	53.90	14.5	157	272	
Hori.	4804.000	AV	41.33	31.40	6.74	44.45	2.33	37.35	53.90	16.5	100	190	
Hori.	7206.000	AV	36.49	36.56	8.41	43.99	2.33	39.80	53.90	14.1	100	0	
Hori.	9608.000	AV	37.69	38.61	9.28	43.83	2.33	44.08	53.90	9.8	100	0	
Vert.	37.400	QP	23.41	15.13	6.85	32.20	0.00	13.19	40.00	26.8	100	0	
Vert.	70.248	QP	26.77	6.21	7.19	32.18	0.00	7.99	40.00	32.0	100	339	
Vert.	168.000	QP	23.53	15.54	7.95	32.10	0.00	14.92	43.50	28.5	100	105	
Vert.	239.998	QP	26.25	11.57	8.38	32.03	0.00	14.17	46.00	31.8	243	352	
Vert.	252.685	QP	30.57	11.67	8.46	32.01	0.00	18.69	46.00	27.3	100	270	
Vert.	328.669	QP	24.68	13.92	8.87	31.98	0.00	15.49	46.00	30.5	100	257	
Vert.	479.996	QP	22.26	17.05	9.56	31.96	0.00	16.91	46.00	29.0	100	186	
Vert.	2390.000	PK	43.88	27.16	14.56	36.58	2.33	51.35	73.90	22.5	139	310	
Vert.	4804.000	PK	52.10	31.40	6.74	44.45	2.33	48.12	73.90	25.7	100	233	
Vert.	7206.000	PK	47.64	36.56	8.41	43.99	2.33	50.95	73.90	22.9	100	0	
Vert.	9608.000	PK	49.45	38.61	9.28	43.83	2.33	55.84	73.90	18.0	100	0	
Vert.	2390.000	AV	31.42	27.16	14.56	36.58	2.33	38.89	53.90	15.0	139	310	
Vert.	4804.000	AV	43.17	31.40	6.74	44.45	2.33	39.19	53.90	14.7	100	233	
Vert.	7206.000	AV	36.49	36.56	8.41	43.99	2.33	39.80	53.90	14.1	100	0	
Vert.	9608.000	AV	37.60	38.61	9.28	43.83	2.33	43.99	53.90	9.9	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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	87.20	27.20	14.57	36.57	2.33	94.73	-	-	Carrier
Hori.	2400.000	PK	36.81	27.20	14.57	36.58	2.33	44.33	74.73	30.4	
Vert.	2402.000	PK	86.88	27.20	14.57	36.57	2.33	94.41	-	-	Carrier
Vert.	2400.000	PK	36.48	27.20	14.57	36.58	2.33	44.00	74.41	30.4	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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

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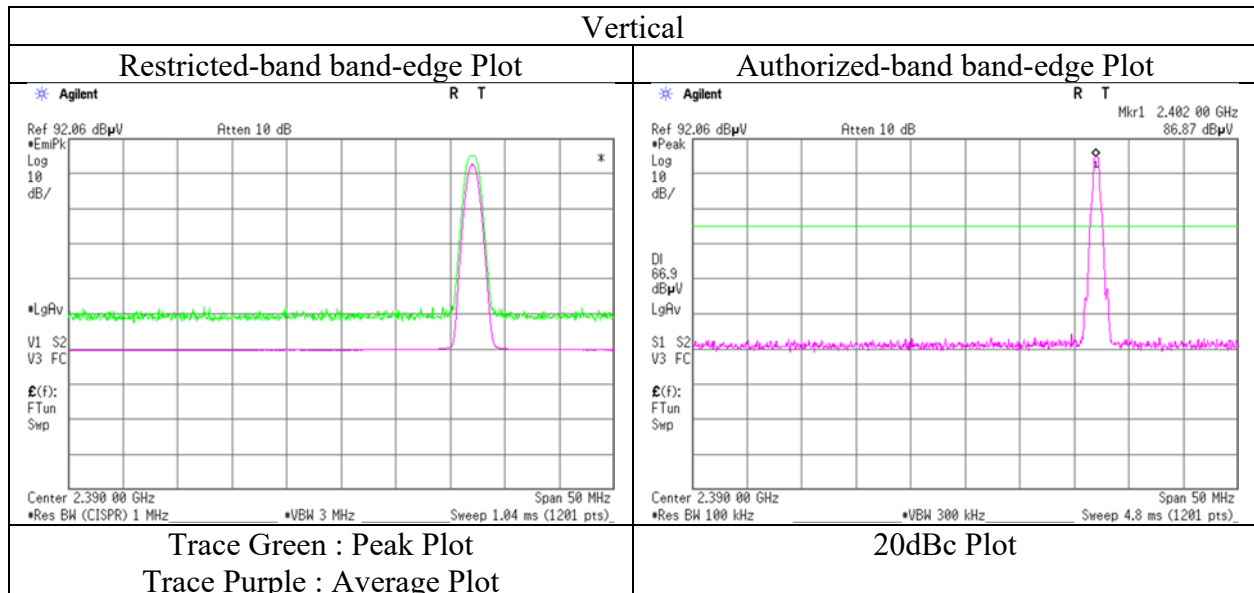
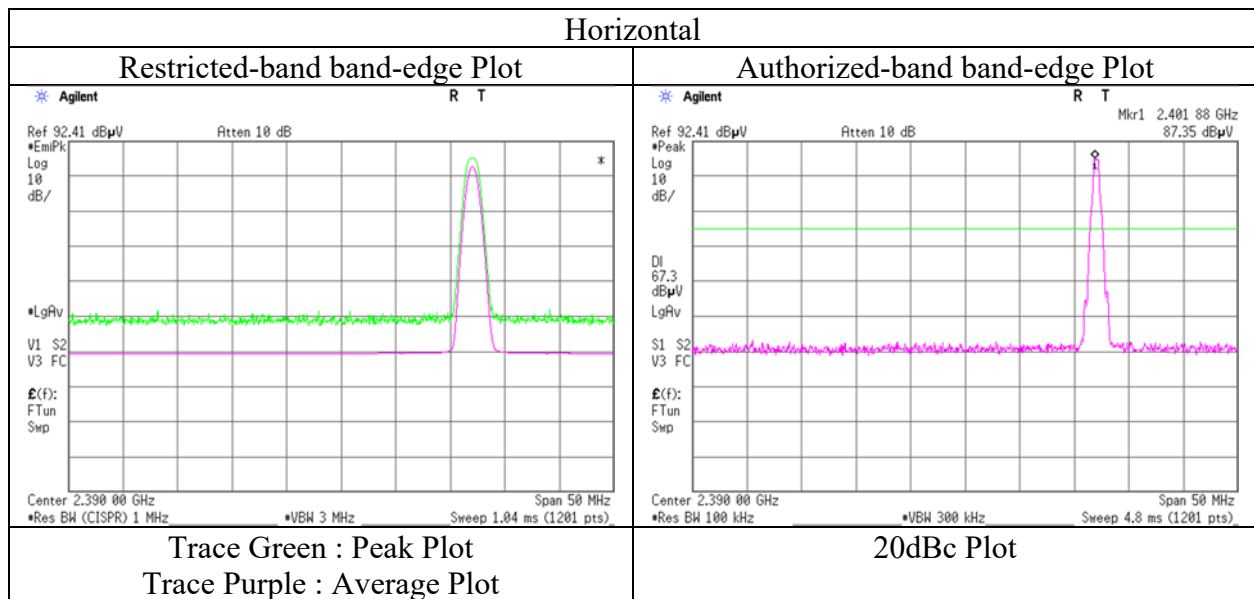
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	March 16, 2018
Temperature / Humidity	22 deg. C / 42 % RH
Engineer	Shiro Kobayashi (1 GHz -2.8 GHz)
Antenna	1001932PT
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 2 3 3
Date April 5, 2018 March 16, 2018 March 17, 2018 March 20, 2018
Temperature / Humidity 23 deg. C / 39 % RH 22 deg. C / 42 % RH 22 deg. C / 34 % RH 23 deg. C / 39 % RH
Engineer Shiro Kobayashi Shiro Kobayashi Yosuke Ishikawa Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -13 GHz) (13 GHz -26.5 GHz)
Antenna 1001932PT
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.	252.538	QP	24.03	11.67	8.46	32.01	0.00	12.15	46.00	33.8	130	323	
Hori.	359.997	QP	22.30	14.57	9.03	31.95	0.00	13.95	46.00	32.0	126	112	
Hori.	479.996	QP	22.32	17.05	9.56	31.96	0.00	16.97	46.00	29.0	194	197	
Hori.	4882.000	PK	50.73	31.62	6.82	44.48	2.33	47.02	73.90	26.8	156	337	
Hori.	7323.000	PK	48.05	36.77	8.52	44.03	2.33	51.64	73.90	22.2	100	0	
Hori.	9764.000	PK	47.37	38.80	9.41	43.85	2.33	54.06	73.90	19.8	100	0	
Hori.	4882.000	AV	39.52	31.62	6.82	44.48	2.33	35.81	53.90	18.0	156	337	
Hori.	7323.000	AV	36.11	36.77	8.52	44.03	2.33	39.70	53.90	14.2	100	0	
Hori.	9764.000	AV	36.67	38.80	9.41	43.85	2.33	43.36	53.90	10.5	100	0	
Vert.	37.400	QP	22.98	15.13	6.85	32.20	0.00	12.76	40.00	27.2	100	0	
Vert.	70.295	QP	26.94	6.21	7.19	32.18	0.00	8.16	40.00	31.8	100	278	
Vert.	120.000	QP	22.70	12.97	7.60	32.14	0.00	11.13	43.50	32.3	100	118	
Vert.	168.000	QP	23.67	15.54	7.95	32.10	0.00	15.06	43.50	28.4	102	269	
Vert.	239.998	QP	26.08	11.57	8.38	32.03	0.00	14.00	46.00	32.0	234	334	
Vert.	252.194	QP	30.47	11.66	8.46	32.01	0.00	18.58	46.00	27.4	100	284	
Vert.	328.719	QP	25.28	13.92	8.87	31.98	0.00	16.09	46.00	29.9	100	262	
Vert.	479.996	QP	22.30	17.05	9.56	31.96	0.00	16.95	46.00	29.0	100	190	
Vert.	4882.000	PK	51.58	31.62	6.82	44.48	2.33	47.87	73.90	26.0	100	239	
Vert.	7323.000	PK	47.20	36.77	8.52	44.03	2.33	50.79	73.90	23.1	100	0	
Vert.	9764.000	PK	47.93	38.80	9.41	43.85	2.33	54.62	73.90	19.2	100	0	
Vert.	4882.000	AV	41.97	31.62	6.82	44.48	2.33	38.26	53.90	15.6	100	239	
Vert.	7323.000	AV	36.15	36.77	8.52	44.03	2.33	39.74	53.90	14.1	100	0	
Vert.	9764.000	AV	36.70	38.80	9.41	43.85	2.33	43.39	53.90	10.5	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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.

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Engineer Shiro Kobayashi Shiro Kobayashi Yosuke Ishikawa Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -13 GHz) (13 GHz -26.5 GHz)
Antenna 1001932PT
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.	359.997	QP	22.42	14.57	9.03	31.95	0.00	14.07	46.00	31.9	100	58	
Hori.	479.996	QP	22.18	17.05	9.56	31.96	0.00	16.83	46.00	29.1	193	194	
Hori.	2483.500	PK	44.31	27.48	14.66	36.52	2.33	52.26	73.90	21.6	245	266	
Hori.	4960.000	PK	50.54	31.83	6.89	44.51	2.33	47.08	73.90	26.8	107	341	
Hori.	7440.000	PK	47.05	36.97	8.63	44.08	2.33	50.90	73.90	23.0	100	0	
Hori.	9920.000	PK	47.30	38.98	9.53	43.87	2.33	54.27	73.90	19.6	100	0	
Hori.	2483.500	AV	32.17	27.48	14.66	36.52	2.33	40.12	53.90	13.7	245	266	
Hori.	4960.000	AV	40.31	31.83	6.89	44.51	2.33	36.85	53.90	17.0	107	341	
Hori.	7440.000	AV	36.65	36.97	8.63	44.08	2.33	40.50	53.90	13.4	100	0	
Hori.	9920.000	AV	36.13	38.98	9.53	43.87	2.33	43.10	53.90	10.8	100	0	
Vert.	37.400	QP	22.95	15.13	6.85	32.20	0.00	12.73	40.00	27.2	100	0	
Vert.	70.200	QP	26.90	6.21	7.19	32.18	0.00	8.12	40.00	31.8	100	285	
Vert.	168.000	QP	23.60	15.54	7.95	32.10	0.00	14.99	43.50	28.5	100	65	
Vert.	239.998	QP	26.06	11.57	8.38	32.03	0.00	13.98	46.00	32.0	240	349	
Vert.	252.325	QP	30.38	11.66	8.46	32.01	0.00	18.49	46.00	27.5	100	265	
Vert.	326.201	QP	23.94	13.86	8.86	31.98	0.00	14.68	46.00	31.3	100	317	
Vert.	479.996	QP	22.31	17.05	9.56	31.96	0.00	16.96	46.00	29.0	100	191	
Vert.	2483.500	PK	43.81	27.48	14.66	36.52	2.33	51.76	73.90	22.1	152	332	
Vert.	4960.000	PK	50.29	31.83	6.89	44.51	2.33	46.83	73.90	27.0	124	24	
Vert.	7440.000	PK	47.01	36.97	8.63	44.08	2.33	50.86	73.90	23.0	100	0	
Vert.	9920.000	PK	47.09	38.98	9.53	43.87	2.33	54.06	73.90	19.8	100	0	
Vert.	2483.500	AV	32.23	27.48	14.66	36.52	2.33	40.18	53.90	13.7	152	332	
Vert.	4960.000	AV	39.59	31.83	6.89	44.51	2.33	36.13	53.90	17.7	124	24	
Vert.	7440.000	AV	36.63	36.97	8.63	44.08	2.33	40.48	53.90	13.4	100	0	
Vert.	9920.000	AV	36.09	38.98	9.53	43.87	2.33	43.06	53.90	10.8	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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

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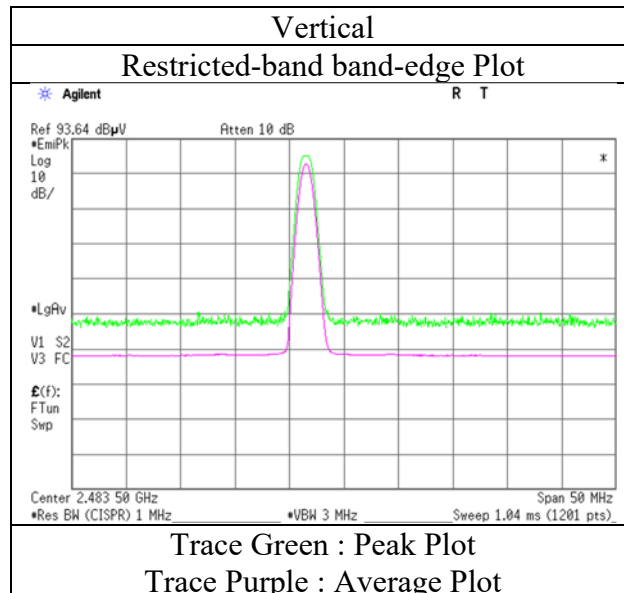
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Mode	Tx, Hopping Off, DH5 2480 MHz



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

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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.	359.997	QP	22.42	14.57	9.03	31.95	0.00	14.07	46.00	31.9	100	95	
Hori.	479.996	QP	22.32	17.05	9.56	31.96	0.00	16.97	46.00	29.0	195	178	
Hori.	2390.000	PK	44.22	27.16	14.56	36.58	2.33	51.69	73.90	22.2	147	275	
Hori.	4804.000	PK	49.94	31.40	6.74	44.45	2.33	45.96	73.90	27.9	100	334	
Hori.	7206.000	PK	48.89	36.56	8.41	43.99	2.33	52.20	73.90	21.7	100	0	
Hori.	9608.000	PK	49.14	38.61	9.28	43.83	2.33	55.53	73.90	18.3	100	0	
Hori.	2390.000	AV	31.42	27.16	14.56	36.58	2.33	38.89	53.90	15.0	147	275	
Hori.	4804.000	AV	39.08	31.40	6.74	44.45	2.33	35.10	53.90	18.8	100	334	
Hori.	7206.000	AV	36.04	36.56	8.41	43.99	2.33	39.35	53.90	14.5	100	0	
Hori.	9608.000	AV	37.59	38.61	9.28	43.83	2.33	43.98	53.90	9.9	100	0	
Vert.	37.400	QP	22.99	15.13	6.85	32.20	0.00	12.77	40.00	27.2	100	0	
Vert.	70.730	QP	26.36	6.21	7.19	32.18	0.00	7.58	40.00	32.4	100	263	
Vert.	168.000	QP	23.56	15.54	7.95	32.10	0.00	14.95	43.50	28.5	100	18	
Vert.	239.998	QP	26.02	11.57	8.38	32.03	0.00	13.94	46.00	32.0	238	356	
Vert.	252.020	QP	31.09	11.65	8.46	32.01	0.00	19.19	46.00	26.8	100	286	
Vert.	327.748	QP	25.59	13.90	8.86	31.98	0.00	16.37	46.00	29.6	100	262	
Vert.	479.996	QP	22.34	17.05	9.56	31.96	0.00	16.99	46.00	29.0	100	172	
Vert.	2390.000	PK	43.82	27.16	14.56	36.58	2.33	51.29	73.90	22.6	136	330	
Vert.	4804.000	PK	49.90	31.40	6.74	44.45	2.33	45.92	73.90	27.9	100	189	
Vert.	7206.000	PK	48.16	36.56	8.41	43.99	2.33	51.47	73.90	22.4	100	0	
Vert.	9608.000	PK	48.19	38.61	9.28	43.83	2.33	54.58	73.90	19.3	100	0	
Vert.	2390.000	AV	31.89	27.16	14.56	36.58	2.33	39.36	53.90	14.5	136	330	
Vert.	4804.000	AV	38.83	31.40	6.74	44.45	2.33	34.85	53.90	19.0	100	189	
Vert.	7206.000	AV	36.38	36.56	8.41	43.99	2.33	39.69	53.90	14.2	100	0	
Vert.	9608.000	AV	37.52	38.61	9.28	43.83	2.33	43.91	53.90	9.9	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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	87.83	27.20	14.57	36.57	2.33	95.36	-	-	Carrier
Hori.	2400.000	PK	37.90	27.20	14.57	36.58	2.33	45.42	75.36	29.9	
Vert.	2402.000	PK	87.65	27.20	14.57	36.57	2.33	95.18	-	-	Carrier
Vert.	2400.000	PK	37.58	27.20	14.57	36.58	2.33	45.10	75.18	30.1	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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

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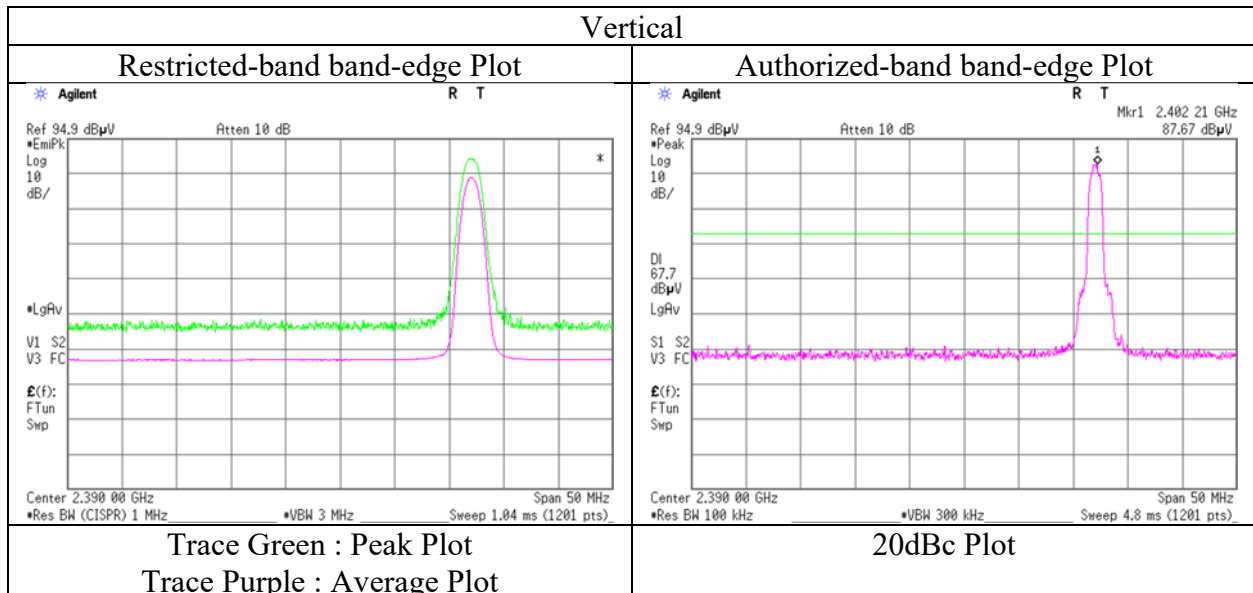
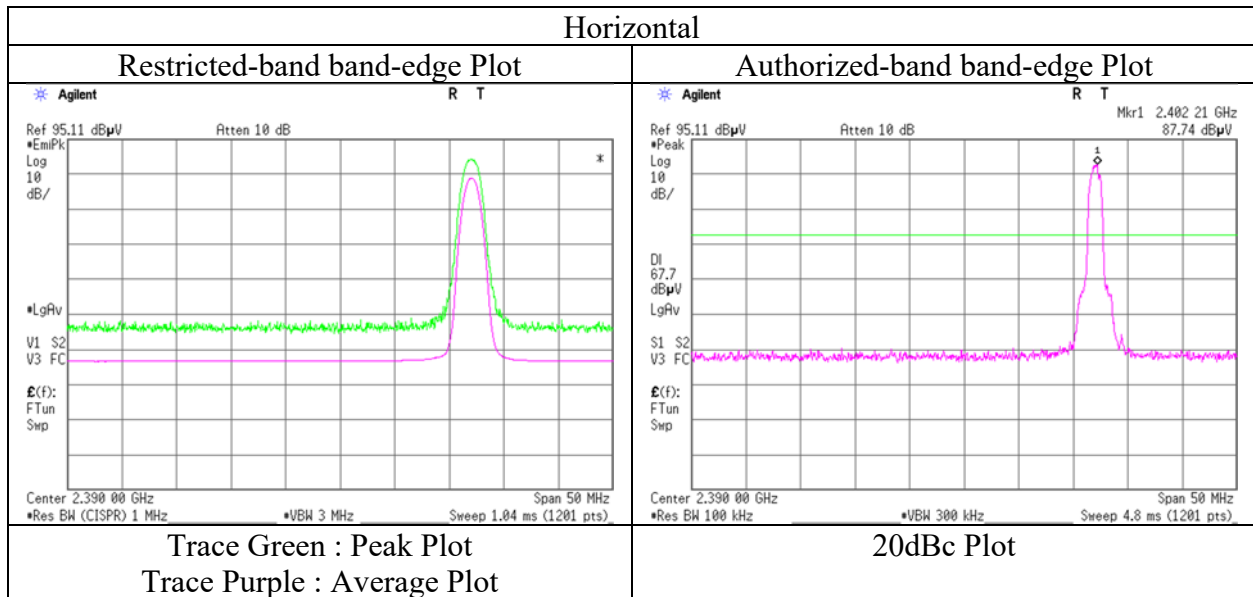
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	March 16, 2018
Temperature / Humidity	22 deg. C / 42 % RH
Engineer	Shiro Kobayashi (1 GHz -2.8 GHz)
Antenna	1001932PT
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 2 3 3
Date April 5, 2018 March 16, 2018 March 17, 2018 March 20, 2018
Temperature / Humidity 23 deg. C / 39 % RH 22 deg. C / 42 % RH 22 deg. C / 34 % RH 23 deg. C / 39 % RH
Engineer Shiro Kobayashi Shiro Kobayashi Yosuke Ishikawa Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -13 GHz) (13 GHz -26.5 GHz)
Antenna 1001932PT
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.	359.997	QP	22.36	14.57	9.03	31.95	0.00	14.01	46.00	31.9	100	43	
Hori.	479.996	QP	22.21	17.05	9.56	31.96	0.00	16.86	46.00	29.1	198	164	
Hori.	4882.000	PK	49.45	31.62	6.82	44.48	2.33	45.74	73.90	28.1	136	341	
Hori.	7323.000	PK	46.85	36.77	8.52	44.03	2.33	50.44	73.90	23.4	100	0	
Hori.	9764.000	PK	47.49	38.80	9.41	43.85	2.33	54.18	73.90	19.7	100	0	
Hori.	4882.000	AV	38.99	31.62	6.82	44.48	2.33	35.28	53.90	18.6	136	341	
Hori.	7323.000	AV	36.07	36.77	8.52	44.03	2.33	39.66	53.90	14.2	100	0	
Hori.	9764.000	AV	36.69	38.80	9.41	43.85	2.33	43.38	53.90	10.5	100	0	
Vert.	37.400	QP	22.97	15.13	6.85	32.20	0.00	12.75	40.00	27.2	100	0	
Vert.	70.758	QP	26.23	6.21	7.19	32.18	0.00	7.45	40.00	32.5	100	275	
Vert.	168.000	QP	23.69	15.54	7.95	32.10	0.00	15.08	43.50	28.4	100	14	
Vert.	239.998	QP	25.14	11.57	8.38	32.03	0.00	13.06	46.00	32.9	238	338	
Vert.	253.069	QP	31.07	11.69	8.47	32.01	0.00	19.22	46.00	26.7	100	275	
Vert.	327.663	QP	24.24	13.90	8.86	31.98	0.00	15.02	46.00	30.9	100	256	
Vert.	479.996	QP	22.30	17.05	9.56	31.96	0.00	16.95	46.00	29.0	100	152	
Vert.	4882.000	PK	50.18	31.62	6.82	44.48	2.33	46.47	73.90	27.4	147	358	
Vert.	7323.000	PK	46.86	36.77	8.52	44.03	2.33	50.45	73.90	23.4	100	0	
Vert.	9764.000	PK	47.52	38.80	9.41	43.85	2.33	54.21	73.90	19.6	100	0	
Vert.	4882.000	AV	39.03	31.62	6.82	44.48	2.33	35.32	53.90	18.5	147	358	
Vert.	7323.000	AV	36.00	36.77	8.52	44.03	2.33	39.59	53.90	14.3	100	0	
Vert.	9764.000	AV	36.70	38.80	9.41	43.85	2.33	43.39	53.90	10.5	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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.

UL Japan, Inc.

Shonan EMC Lab.

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

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Radiated Spurious Emission

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 2 3 3
Date April 5, 2018 March 16, 2018 March 17, 2018 March 20, 2018
Temperature / Humidity 23 deg. C / 39 % RH 22 deg. C / 42 % RH 22 deg. C / 34 % RH 23 deg. C / 39 % RH
Engineer Shiro Kobayashi Shiro Kobayashi Yosuke Ishikawa Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -13 GHz) (13 GHz -26.5 GHz)
Antenna 1001932PT
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.	359.997	QP	22.25	14.57	9.03	31.95	0.00	13.90	46.00	32.1	100	35	
Hori.	480.000	QP	22.28	17.05	9.56	31.96	0.00	16.93	46.00	29.0	202	213	
Hori.	2483.500	PK	45.88	27.48	14.66	36.52	2.33	53.83	73.90	20.0	242	269	
Hori.	4960.000	PK	49.57	31.83	6.89	44.51	2.33	46.11	73.90	27.7	100	136	
Hori.	7440.000	PK	47.28	36.97	8.63	44.08	2.33	51.13	73.90	22.7	100	0	
Hori.	9920.000	PK	47.55	38.98	9.53	43.87	2.33	54.52	73.90	19.3	100	0	
Hori.	2483.500	AV	32.84	27.48	14.66	36.52	2.33	40.79	53.90	13.1	242	269	
Hori.	4960.000	AV	37.99	31.83	6.89	44.51	2.33	34.53	53.90	19.3	100	136	
Hori.	7440.000	AV	36.59	36.97	8.63	44.08	2.33	40.44	53.90	13.4	100	0	
Hori.	9920.000	AV	36.07	38.98	9.53	43.87	2.33	43.04	53.90	10.8	100	0	
Vert.	37.400	QP	22.95	15.13	6.85	32.20	0.00	12.73	40.00	27.2	100	0	
Vert.	70.185	QP	25.51	6.21	7.19	32.18	0.00	6.73	40.00	33.2	100	296	
Vert.	168.000	QP	22.68	15.54	7.95	32.10	0.00	14.07	43.50	29.4	100	0	
Vert.	239.998	QP	26.13	11.57	8.38	32.03	0.00	14.05	46.00	31.9	238	351	
Vert.	253.075	QP	29.16	11.69	8.47	32.01	0.00	17.31	46.00	28.6	100	275	
Vert.	326.513	QP	23.31	13.87	8.86	31.98	0.00	14.06	46.00	31.9	100	181	
Vert.	479.996	QP	22.28	17.05	9.56	31.96	0.00	16.93	46.00	29.0	100	159	
Vert.	2483.500	PK	46.47	27.48	14.66	36.52	2.33	54.42	73.90	19.4	158	150	
Vert.	4960.000	PK	50.11	31.83	6.89	44.51	2.33	46.65	73.90	27.2	100	190	
Vert.	7440.000	PK	47.34	36.97	8.63	44.08	2.33	51.19	73.90	22.7	100	0	
Vert.	9920.000	PK	47.38	38.98	9.53	43.87	2.33	54.35	73.90	19.5	100	0	
Vert.	2483.500	AV	32.94	27.48	14.66	36.52	2.33	40.89	53.90	13.0	158	150	
Vert.	4960.000	AV	38.32	31.83	6.89	44.51	2.33	34.86	53.90	19.0	100	190	
Vert.	7440.000	AV	36.59	36.97	8.63	44.08	2.33	40.44	53.90	13.4	100	0	
Vert.	9920.000	AV	36.20	38.98	9.53	43.87	2.33	43.17	53.90	10.7	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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.

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Shonan EMC Lab.

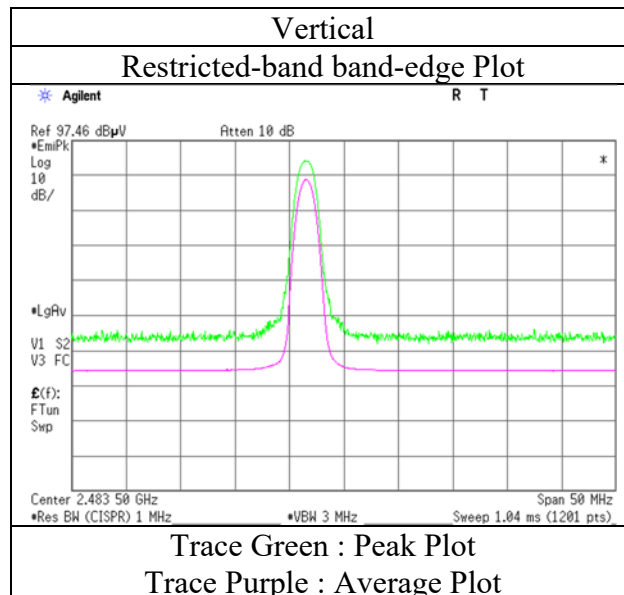
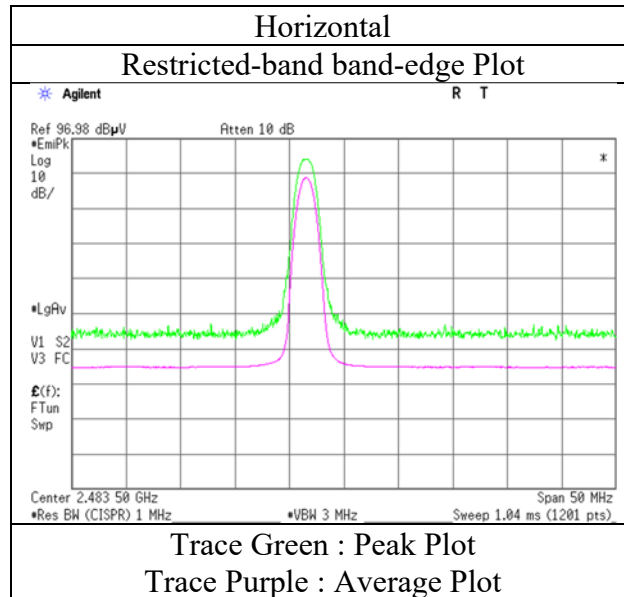
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Radiated Spurious Emission (Reference Plot for band-edge)

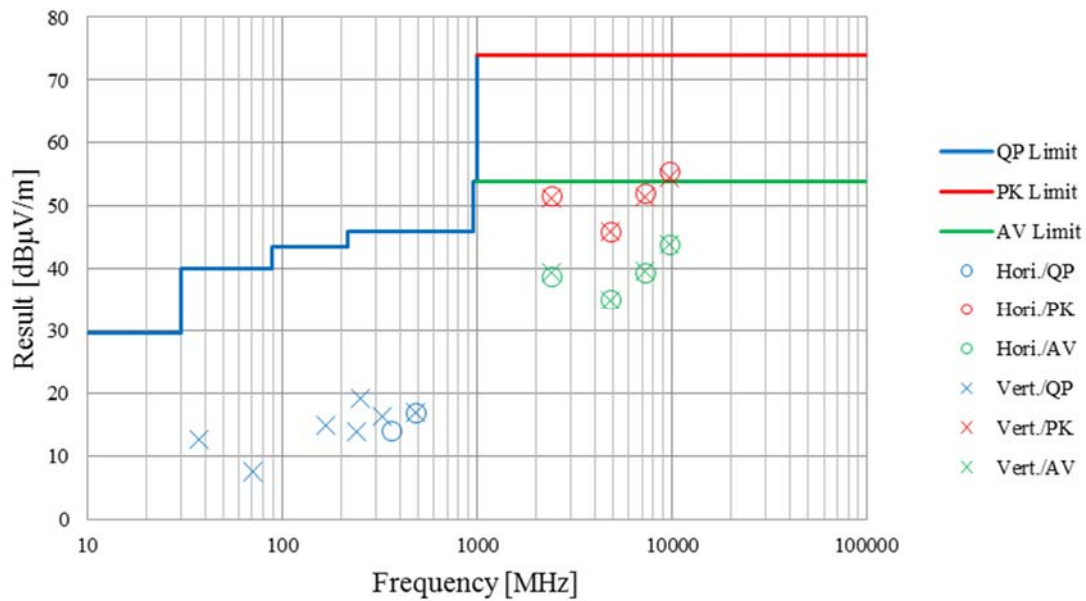
Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	March 16, 2018
Temperature / Humidity	22 deg. C / 42 % RH
Engineer	Shiro Kobayashi (1 GHz -2.8 GHz)
Antenna	1001932PT
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission **(Plot data, Worst case)**

Report No.	12193629S-B-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	2	3	3
Date	April 5, 2018	March 16, 2018	March 17, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 39 % RH	22 deg. C / 42 % RH	22 deg. C / 34 % RH	23 deg. C / 39 % RH
Engineer	Shiro Kobayashi (30 MHz -1 GHz)	Shiro Kobayashi (1 GHz -2.8 GHz)	Yosuke Ishikawa (2.8 GHz -13 GHz)	Kazutaka Takeyama (13 GHz -26.5 GHz)
Antenna	1001932PT			
Mode	Tx, Hopping Off, 3DH5 2402 MHz			



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

Radiated Spurious Emission

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 1 3
Date April 7, 2018 March 19, 2018 March 20, 2018
Temperature / Humidity 23 deg. C / 52 % RH 21 deg. C / 31 % RH 23 deg. C / 39 % RH
Engineer Makoto Hosaka Kazutaka Takeyama Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -26.5 GHz)
Antenna 1001932FT
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.	359.995	QP	22.62	14.57	9.03	31.95	0.00	14.27	46.00	31.7	100	1	
Hori.	480.002	QP	22.03	17.05	9.56	31.96	0.00	16.68	46.00	29.3	100	1	
Hori.	2390.000	PK	44.39	27.14	14.56	36.93	2.33	51.49	73.90	22.4	162	140	
Hori.	4804.000	PK	49.25	31.40	6.68	44.45	2.33	45.21	73.90	28.6	161	131	
Hori.	7206.000	PK	48.74	36.56	8.24	43.99	2.33	51.88	73.90	22.0	150	1	
Hori.	9608.000	PK	49.14	38.61	9.27	43.83	2.33	55.52	73.90	18.3	150	1	
Hori.	2390.000	AV	31.33	27.14	14.56	36.93	2.33	38.43	53.90	15.4	162	140	
Hori.	4804.000	AV	33.01	31.13	7.23	36.46	2.33	37.24	53.90	16.6	151	164	
Hori.	4804.000	AV	38.72	31.40	6.68	44.45	2.33	34.68	53.90	19.2	161	131	
Hori.	7206.000	AV	36.69	36.56	8.24	43.99	2.33	39.83	53.90	14.0	150	1	
Hori.	9608.000	AV	36.81	38.61	9.27	43.83	2.33	43.19	53.90	10.7	150	1	
Vert.	37.400	QP	23.01	15.13	6.77	32.20	0.00	12.71	40.00	27.2	100	2	
Vert.	70.245	QP	24.39	6.21	6.96	32.18	0.00	5.38	40.00	34.6	100	115	
Vert.	168.000	QP	22.69	15.54	8.03	32.10	0.00	14.16	43.50	29.3	100	90	
Vert.	239.992	QP	22.07	11.57	8.38	32.03	0.00	9.99	46.00	36.0	100	1	
Vert.	252.684	QP	21.97	11.67	8.46	32.01	0.00	10.09	46.00	35.9	100	1	
Vert.	328.665	QP	22.10	13.92	8.87	31.98	0.00	12.91	46.00	33.0	100	1	
Vert.	348.632	QP	26.89	14.33	8.97	31.95	0.00	18.24	46.00	27.7	100	189	
Vert.	479.992	QP	22.19	17.05	9.56	31.96	0.00	16.84	46.00	29.1	100	1	
Vert.	2390.000	PK	43.45	27.14	14.56	36.93	2.33	50.55	73.90	23.3	162	182	
Vert.	4804.000	PK	51.24	31.40	6.68	44.45	2.33	47.20	73.90	26.7	162	210	
Vert.	7206.000	PK	48.10	36.56	8.24	43.99	2.33	51.24	73.90	22.6	150	1	
Vert.	9608.000	PK	48.22	38.61	9.27	43.83	2.33	54.60	73.90	19.3	150	1	
Vert.	2390.000	AV	31.36	27.14	14.56	36.93	2.33	38.46	53.90	15.4	162	182	
Vert.	4804.000	AV	39.81	31.40	6.68	44.45	2.33	35.77	53.90	18.1	162	210	
Vert.	7206.000	AV	36.74	36.56	8.24	43.99	2.33	39.88	53.90	14.0	150	1	
Vert.	9608.000	AV	36.97	38.61	9.27	43.83	2.33	43.35	53.90	10.5	150	1	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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	82.98	27.18	14.57	36.93	2.33	90.13	-	-	Carrier
Hori.	2400.000	PK	35.91	27.17	14.57	36.93	2.33	43.05	70.13	27.1	
Vert.	2402.000	PK	87.18	27.18	14.57	36.93	2.33	94.33	-	-	Carrier
Vert.	2400.000	PK	35.96	27.17	14.57	36.93	2.33	43.10	74.33	31.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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

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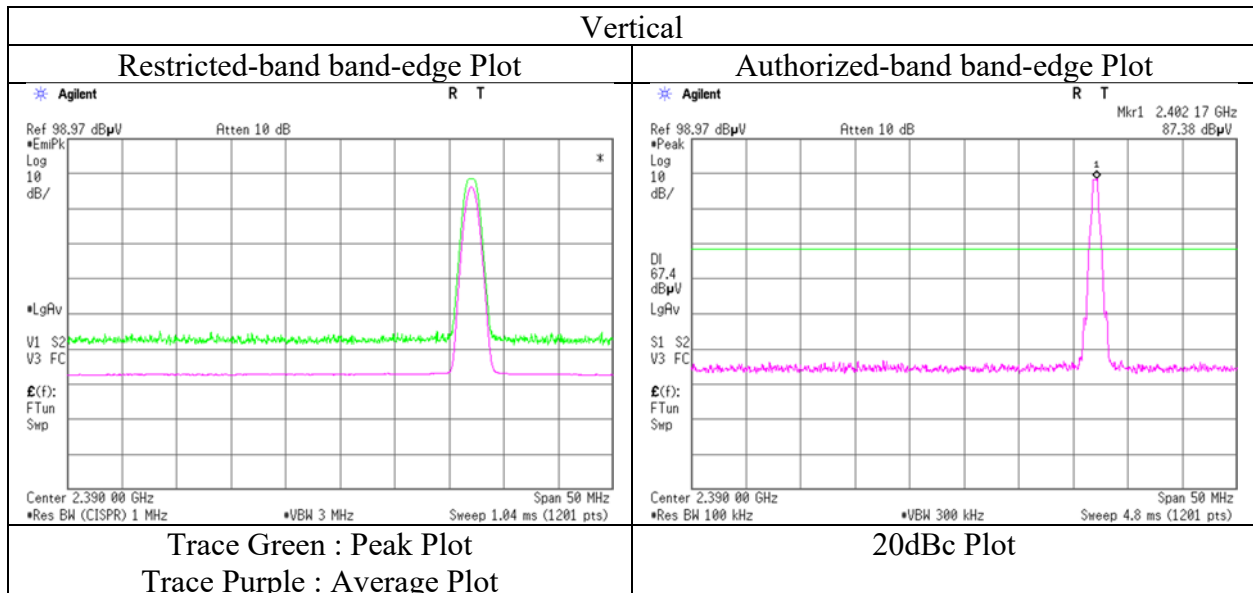
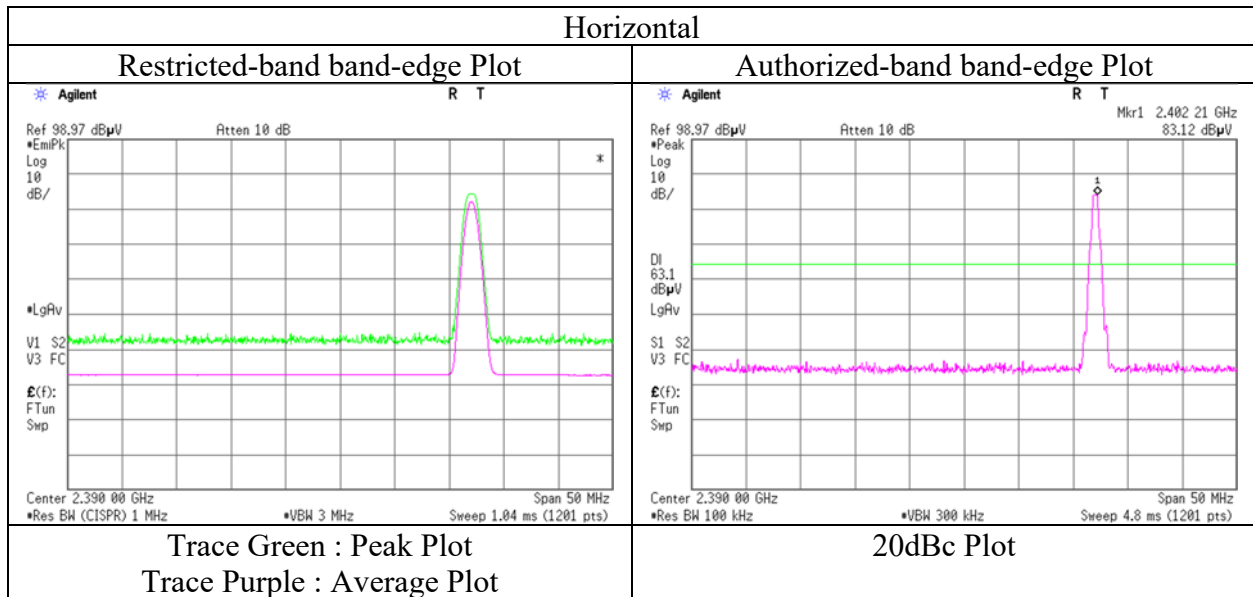
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama (1 GHz ~2.8 GHz)
Antenna	1001932FT
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama
	(1 GHz -2.8 GHz)
Antenna	1001932FT
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.	2483.500	PK	44.35	27.45	14.66	36.92	2.33	51.87	73.90	22.0	163	144	
Hori.	2483.500	AV	31.69	27.45	14.66	36.92	2.33	39.21	53.90	14.6	163	144	
Vert.	2483.500	PK	44.10	27.45	14.66	36.92	2.33	51.62	73.90	22.2	165	187	
Vert.	2483.500	AV	31.86	27.45	14.66	36.92	2.33	39.38	53.90	14.5	165	187	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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

* This mode was performed only band edges measurement.

UL Japan, Inc.

Shonan EMC Lab.

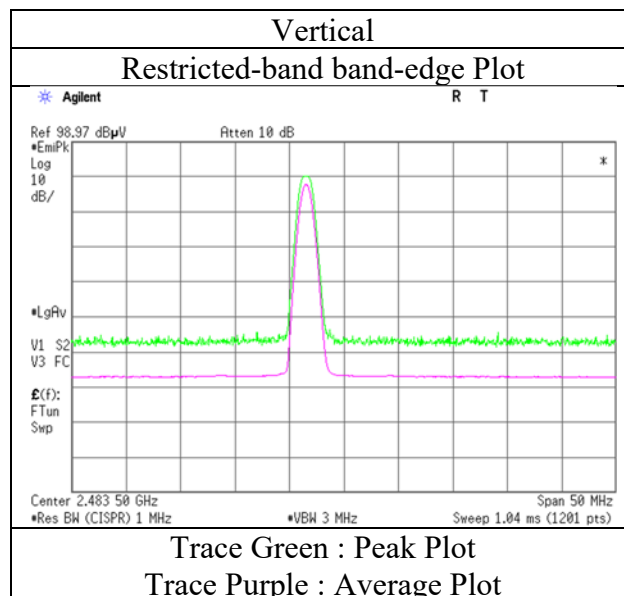
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama (1 GHz -2.8 GHz)
Antenna	1001932FT
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 1 3
Date April 7, 2018 March 19, 2018 March 20, 2018
Temperature / Humidity 23 deg. C / 52 % RH 21 deg. C / 31 % RH 23 deg. C / 39 % RH
Engineer Makoto Hosaka Kazutaka Takeyama Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -26.5 GHz)
Antenna 1001932FT
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.	359.996	QP	22.65	14.57	9.03	31.95	0.00	14.30	46.00	31.7	100	1	
Hori.	479.994	QP	22.18	17.05	9.56	31.96	0.00	16.83	46.00	29.1	100	1	
Hori.	2390.000	PK	43.91	27.14	14.56	36.93	2.33	51.01	73.90	22.8	164	134	
Hori.	4804.000	PK	49.78	31.40	6.68	44.45	2.33	45.74	73.90	28.1	165	208	
Hori.	7206.000	PK	48.69	36.56	8.24	43.99	2.33	51.83	73.90	22.0	150	1	
Hori.	9608.000	PK	38.33	38.61	9.27	43.83	2.33	44.71	73.90	29.1	150	1	
Hori.	2390.000	AV	31.37	27.14	14.56	36.93	2.33	38.47	53.90	15.4	164	134	
Hori.	4804.000	AV	38.91	31.40	6.68	44.45	2.33	34.87	53.90	19.0	165	208	
Hori.	7206.000	AV	36.91	36.56	8.24	43.99	2.33	40.05	53.90	13.8	150	1	
Hori.	9608.000	AV	36.77	38.61	9.27	43.83	2.33	43.15	53.90	10.7	150	1	
Vert.	37.400	QP	23.11	15.13	6.77	32.20	0.00	12.81	40.00	27.1	100	1	
Vert.	70.244	QP	23.78	6.21	6.96	32.18	0.00	4.77	40.00	35.2	100	122	
Vert.	168.000	QP	22.58	15.54	8.03	32.10	0.00	14.05	43.50	29.4	100	88	
Vert.	239.995	QP	22.32	11.57	8.38	32.03	0.00	10.24	46.00	35.7	100	2	
Vert.	252.689	QP	22.18	11.67	8.46	32.01	0.00	10.30	46.00	35.7	100	1	
Vert.	328.663	QP	22.09	13.92	8.87	31.98	0.00	12.90	46.00	33.1	100	1	
Vert.	348.634	QP	26.77	14.33	8.97	31.95	0.00	18.12	46.00	27.8	100	179	
Vert.	479.995	QP	22.21	17.05	9.56	31.96	0.00	16.86	46.00	29.1	100	1	
Vert.	2390.000	PK	44.28	27.14	14.56	36.93	2.33	51.38	73.90	22.5	164	178	
Vert.	4804.000	PK	51.01	31.40	6.68	44.45	2.33	46.97	73.90	26.9	163	133	
Vert.	7206.000	PK	48.72	36.56	8.24	43.99	2.33	51.86	73.90	22.0	150	1	
Vert.	9608.000	PK	38.40	38.61	9.27	43.83	2.33	44.78	73.90	29.1	150	1	
Vert.	2390.000	AV	31.44	27.14	14.56	36.93	2.33	38.54	53.90	15.3	164	178	
Vert.	4804.000	AV	38.98	31.40	6.68	44.45	2.33	34.94	53.90	18.9	163	133	
Vert.	7206.000	AV	36.74	36.56	8.24	43.99	2.33	39.88	53.90	14.0	150	1	
Vert.	9608.000	AV	36.89	38.61	9.27	43.83	2.33	43.27	53.90	10.6	150	1	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 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	84.10	27.18	14.57	36.93	2.33	91.25	-	-	Carrier
Hori.	2400.000	PK	35.59	27.17	14.57	36.93	2.33	42.73	71.25	28.5	
Vert.	2402.000	PK	87.68	27.18	14.57	36.93	2.33	94.83	-	-	Carrier
Vert.	2400.000	PK	38.01	27.17	14.57	36.93	2.33	45.15	74.83	29.7	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB

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

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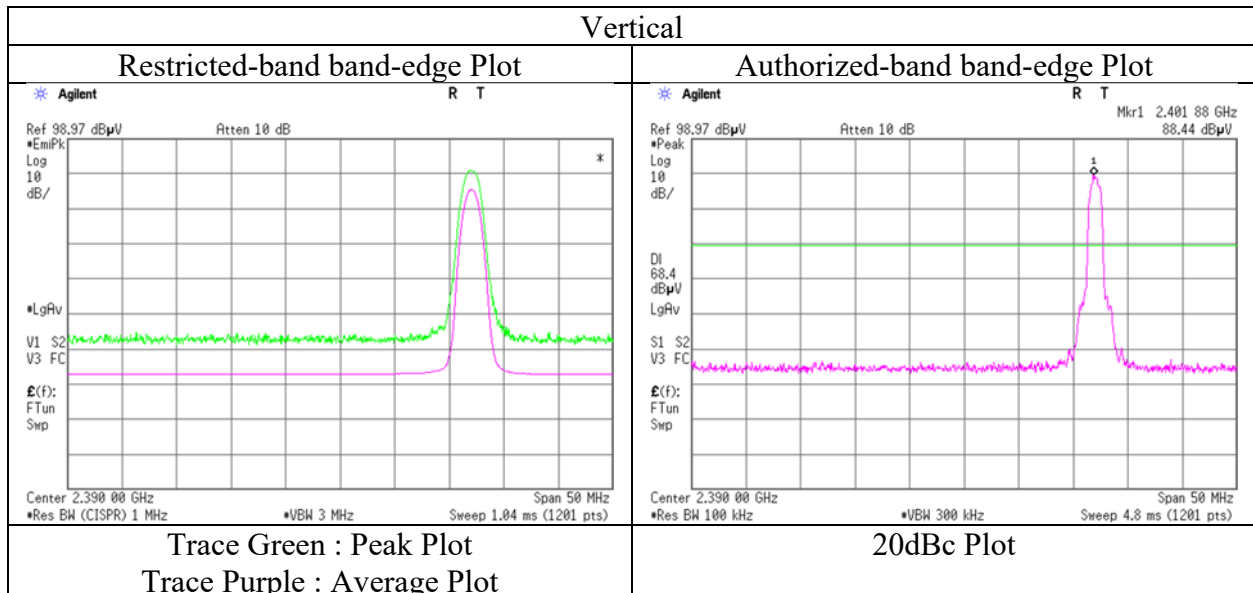
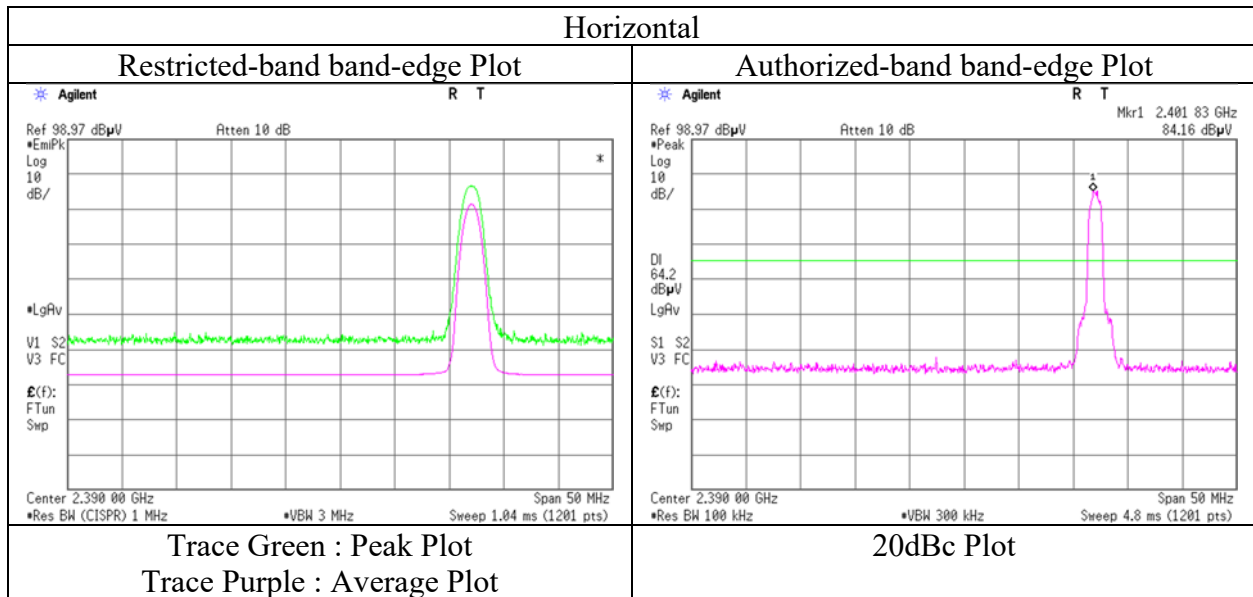
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama (1 GHz ~2.8 GHz)
Antenna	1001932FT
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama
	(1 GHz -2.8 GHz)
Antenna	1001932FT
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.	2483.500	PK	45.16	27.45	14.66	36.92	2.33	52.68	73.90	21.2	169	133	
Hori.	2483.500	AV	32.02	27.45	14.66	36.92	2.33	39.54	53.90	14.3	169	133	
Vert.	2483.500	PK	49.01	27.45	14.66	36.92	2.33	56.53	73.90	17.3	165	188	
Vert.	2483.500	AV	33.91	27.45	14.66	36.92	2.33	41.43	53.90	12.4	165	188	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.92\text{ m} / 3.0\text{ m}) = 2.33\text{ dB}$

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

* This mode was performed only band edges measurement.

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Shonan EMC Lab.

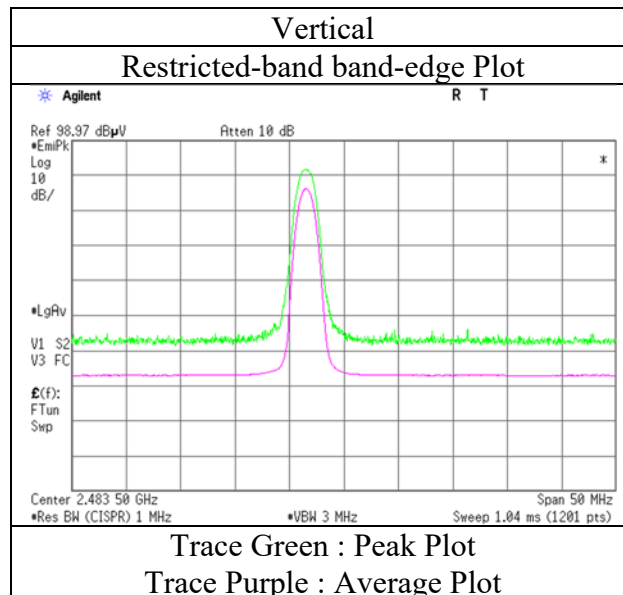
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

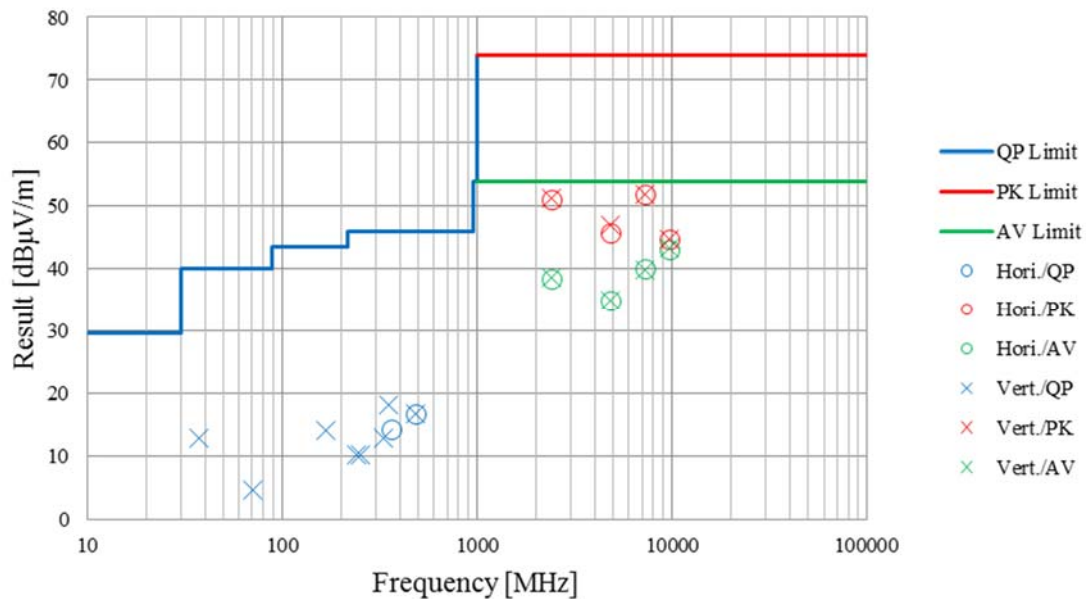
Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama (1 GHz -2.8 GHz)
Antenna	1001932FT
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

Report No.	12193629S-B-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	1	3
Date	April 7, 2018	March 19, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 52 % RH	21 deg. C / 31 % RH	23 deg. C / 39 % RH
Engineer	Makoto Hosaka (30 MHz -1 GHz)	Kazutaka Takeyama (1 GHz -2.8 GHz)	Kazutaka Takeyama (2.8 GHz -26.5 GHz)
Antenna	1001932FT		
Mode	Tx, Hopping Off, 3DH5 2402 MHz		



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

Radiated Spurious Emission

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 3 3
Date April 7, 2018 March 20, 2018 March 20, 2018
Temperature / Humidity 23 deg. C / 52 % RH 22 deg. C / 40 % RH 23 deg. C / 39 % RH
Engineer Makoto Hosaka Hiroyuki Morikawa Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -18 GHz) (18 GHz -26.5 GHz)
Antenna AH104N2450D1
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.	359.998	QP	22.31	14.57	9.03	31.95	0.00	13.96	46.00	32.0	100	2	
Hori.	479.999	QP	22.12	17.05	9.56	31.96	0.00	16.77	46.00	29.2	100	1	
Hori.	2390.000	PK	48.12	27.26	14.19	44.13	2.39	47.83	73.90	26.0	225	136	
Hori.	4804.000	PK	49.78	31.40	6.68	44.45	2.39	45.80	73.90	28.1	396	235	
Hori.	7206.000	PK	47.18	36.56	8.24	43.99	2.39	50.38	73.90	23.5	150	0	
Hori.	9608.000	PK	47.87	38.61	9.27	43.83	2.39	54.31	73.90	19.5	150	0	
Hori.	2390.000	AV	36.75	27.26	14.19	44.13	2.39	36.46	53.90	17.4	225	136	
Hori.	4804.000	AV	38.40	31.40	6.68	44.45	2.39	34.42	53.90	19.4	396	235	
Hori.	7206.000	AV	35.55	36.56	8.24	43.99	2.39	38.75	53.90	15.1	150	0	
Hori.	9608.000	AV	36.41	38.61	9.27	43.83	2.39	42.85	53.90	11.0	150	0	
Vert.	37.400	QP	23.01	15.13	6.77	32.20	0.00	12.71	40.00	27.2	100	1	
Vert.	70.245	QP	22.58	6.21	6.96	32.18	0.00	3.57	40.00	36.4	100	2	
Vert.	168.000	QP	22.15	15.54	8.03	32.10	0.00	13.62	43.50	29.8	100	3	
Vert.	239.998	QP	22.20	11.57	8.38	32.03	0.00	10.12	46.00	35.8	100	2	
Vert.	252.683	QP	22.05	11.67	8.46	32.01	0.00	10.17	46.00	35.8	100	1	
Vert.	328.661	QP	21.99	13.92	8.87	31.98	0.00	12.80	46.00	33.2	100	1	
Vert.	479.993	QP	22.13	17.05	9.56	31.96	0.00	16.78	46.00	29.2	100	1	
Vert.	2390.000	PK	49.12	27.26	14.19	44.13	2.39	48.83	73.90	25.0	390	194	
Vert.	4804.000	PK	49.08	31.40	6.68	44.45	2.39	45.10	73.90	28.8	398	86	
Vert.	7206.000	PK	47.18	36.56	8.24	43.99	2.39	50.38	73.90	23.5	150	0	
Vert.	9608.000	PK	48.66	38.61	9.27	43.83	2.39	55.10	73.90	18.8	150	0	
Vert.	2390.000	AV	36.77	27.26	14.19	44.13	2.39	36.48	53.90	17.4	390	194	
Vert.	4804.000	AV	37.68	31.40	6.68	44.45	2.39	33.70	53.90	20.2	398	86	
Vert.	7206.000	AV	35.60	36.56	8.24	43.99	2.39	38.80	53.90	15.1	150	0	
Vert.	9608.000	AV	36.41	38.61	9.27	43.83	2.39	42.85	53.90	11.0	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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	93.10	27.29	14.20	44.14	2.39	92.84	-	-	Carrier
Hori.	2400.000	PK	40.50	27.29	14.19	44.14	2.39	40.23	72.84	32.6	Carrier
Vert.	2402.000	PK	88.59	27.29	14.20	44.14	2.39	88.33	-	-	Carrier
Vert.	2400.000	PK	38.74	27.29	14.19	44.14	2.39	38.47	68.33	29.9	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

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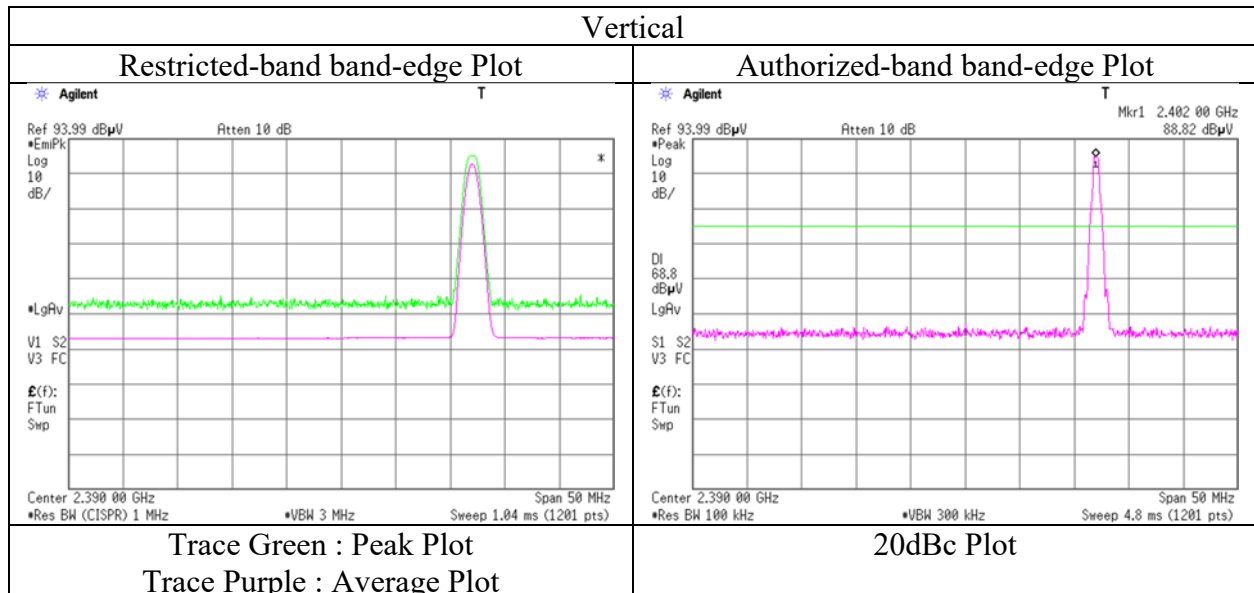
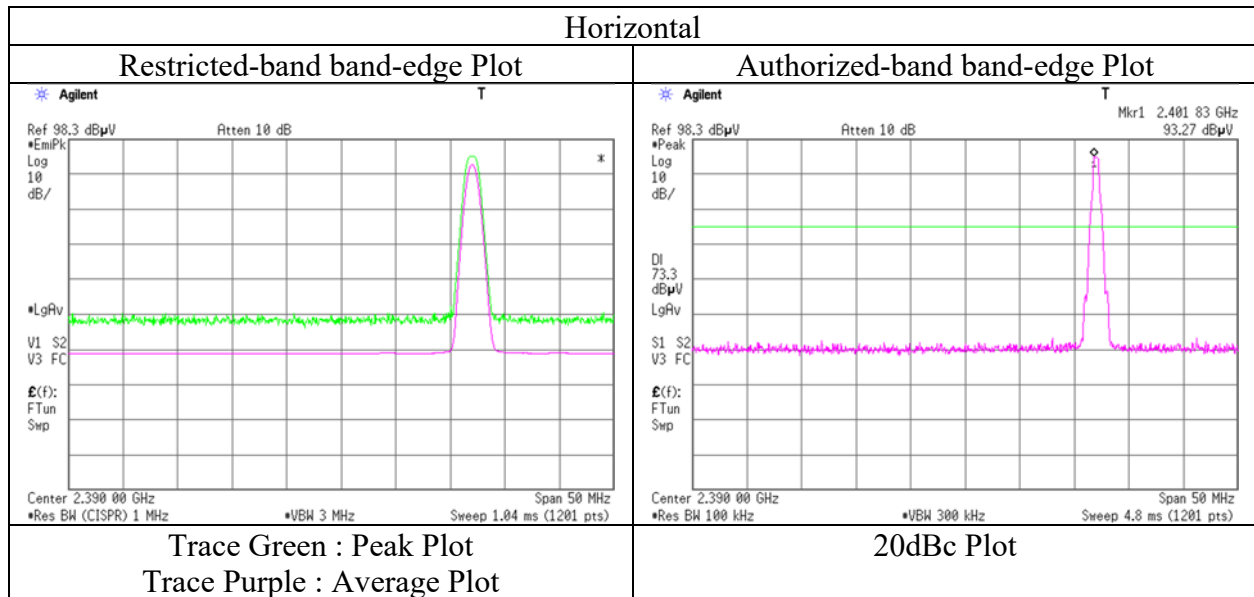
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1 GHz -18 GHz)
Antenna	AH104N2450D1
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
	(1 GHz -18 GHz)
Antenna	AH104N2450D1
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.	2483.500	PK	50.08	27.55	14.29	44.16	2.39	50.15	73.90	23.7	144	138	
Hori.	2483.500	AV	37.51	27.55	14.29	44.16	2.39	37.58	53.90	16.3	144	138	
Vert.	2483.500	PK	49.79	27.55	14.29	44.16	2.39	49.86	73.90	24.0	330	130	
Vert.	2483.500	AV	37.39	27.55	14.29	44.16	2.39	37.46	53.90	16.4	330	130	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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.

* This mode was performed only band edges measurement.

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Shonan EMC Lab.

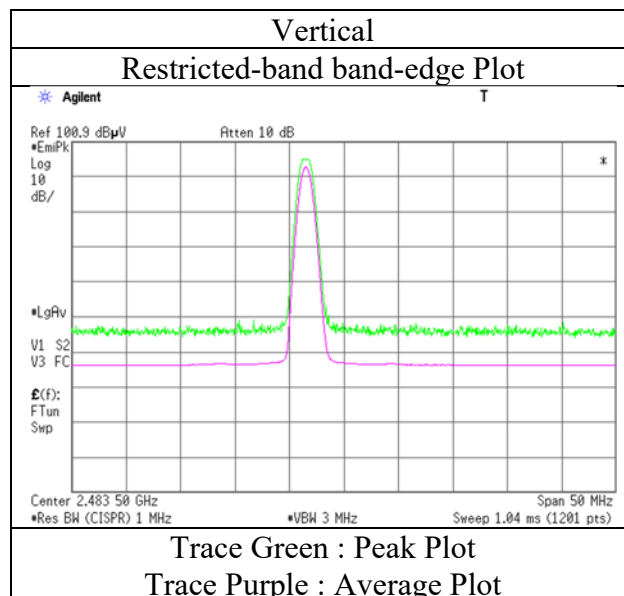
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3
Date March 20, 2018
Temperature / Humidity 22 deg. C / 40 % RH
Engineer Hiroyuki Morikawa
(1 GHz -18 GHz)
Antenna AH104N2450D1
Mode Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No. 12193629S-B-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 3 3
Date April 7, 2018 March 20, 2018 March 20, 2018
Temperature / Humidity 23 deg. C / 52 % RH 22 deg. C / 40 % RH 23 deg. C / 39 % RH
Engineer Makoto Hosaka Hiroyuki Morikawa Kazutaka Takeyama
(30 MHz -1 GHz) (1 GHz -18 GHz) (18 GHz -26.5 GHz)
Antenna AH104N2450D1
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.	359.993	QP	22.51	14.57	9.03	31.95	0.00	14.16	46.00	31.8	100	1	
Hori.	479.994	QP	22.14	17.05	9.56	31.96	0.00	16.79	46.00	29.2	100	1	
Hori.	2390.000	PK	48.44	27.26	14.19	44.13	2.39	48.15	73.90	25.7	151	133	
Hori.	4804.000	PK	48.85	31.40	6.68	44.45	2.39	44.87	73.90	29.0	163	0	
Hori.	7206.000	PK	48.28	36.56	8.24	43.99	2.39	51.48	73.90	22.4	150	0	
Hori.	9608.000	PK	48.59	38.61	9.27	43.83	2.39	55.03	73.90	18.8	150	0	
Hori.	2390.000	AV	36.75	27.26	14.19	44.13	2.39	36.46	53.90	17.4	151	133	
Hori.	4804.000	AV	37.67	31.40	6.68	44.45	2.39	33.69	53.90	20.2	163	0	
Hori.	7206.000	AV	35.52	36.56	8.24	43.99	2.39	38.72	53.90	15.1	150	0	
Hori.	9608.000	AV	36.36	38.61	9.27	43.83	2.39	42.80	53.90	11.1	150	0	
Vert.	37.400	QP	23.01	15.13	6.77	32.20	0.00	12.71	40.00	27.2	100	2	
Vert.	70.245	QP	22.57	6.21	6.96	32.18	0.00	3.56	40.00	36.4	100	1	
Vert.	168.000	QP	22.12	15.54	8.03	32.10	0.00	13.59	43.50	29.9	100	1	
Vert.	239.995	QP	22.31	11.57	8.38	32.03	0.00	10.23	46.00	35.7	100	2	
Vert.	252.685	QP	22.06	11.67	8.46	32.01	0.00	10.18	46.00	35.8	100	2	
Vert.	328.664	QP	21.95	13.92	8.87	31.98	0.00	12.76	46.00	33.2	100	1	
Vert.	479.992	QP	22.07	17.05	9.56	31.96	0.00	16.72	46.00	29.2	100	1	
Vert.	2390.000	PK	48.84	27.26	14.19	44.13	2.39	48.55	73.90	25.3	390	196	
Vert.	4804.000	PK	49.23	31.40	6.68	44.45	2.39	45.25	73.90	28.6	155	219	
Vert.	7206.000	PK	46.40	36.56	8.24	43.99	2.39	49.60	73.90	24.3	150	0	
Vert.	9608.000	PK	48.41	38.61	9.27	43.83	2.39	54.85	73.90	19.0	150	0	
Vert.	2390.000	AV	36.73	27.26	14.19	44.13	2.39	36.44	53.90	17.4	390	196	
Vert.	4804.000	AV	38.47	31.40	6.68	44.45	2.39	34.49	53.90	19.4	155	219	
Vert.	7206.000	AV	35.51	36.56	8.24	43.99	2.39	38.71	53.90	15.1	150	0	
Vert.	9608.000	AV	36.38	38.61	9.27	43.83	2.39	42.82	53.90	11.0	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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	92.88	27.29	14.20	44.14	2.39	92.62	-	-	Carrier
Hori.	2400.000	PK	41.88	27.29	14.19	44.14	2.39	41.61	72.62	31.0	
Vert.	2402.000	PK	88.73	27.29	14.20	44.14	2.39	88.47	-	-	Carrier
Vert.	2400.000	PK	41.54	27.29	14.19	44.14	2.39	41.27	68.47	27.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

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Shonan EMC Lab.

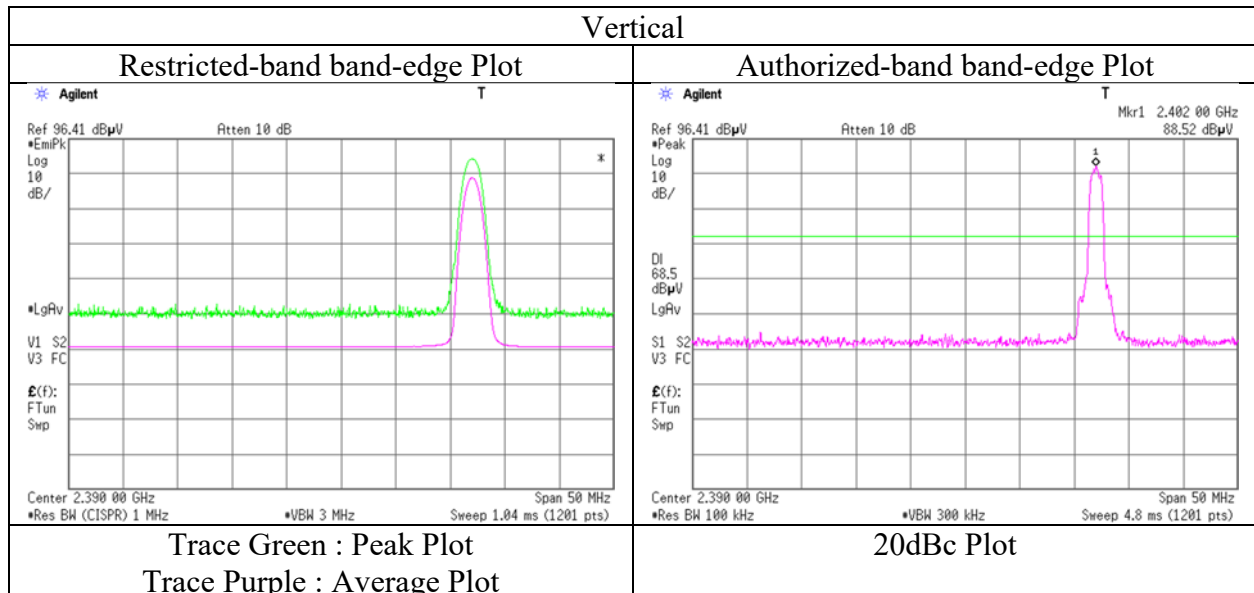
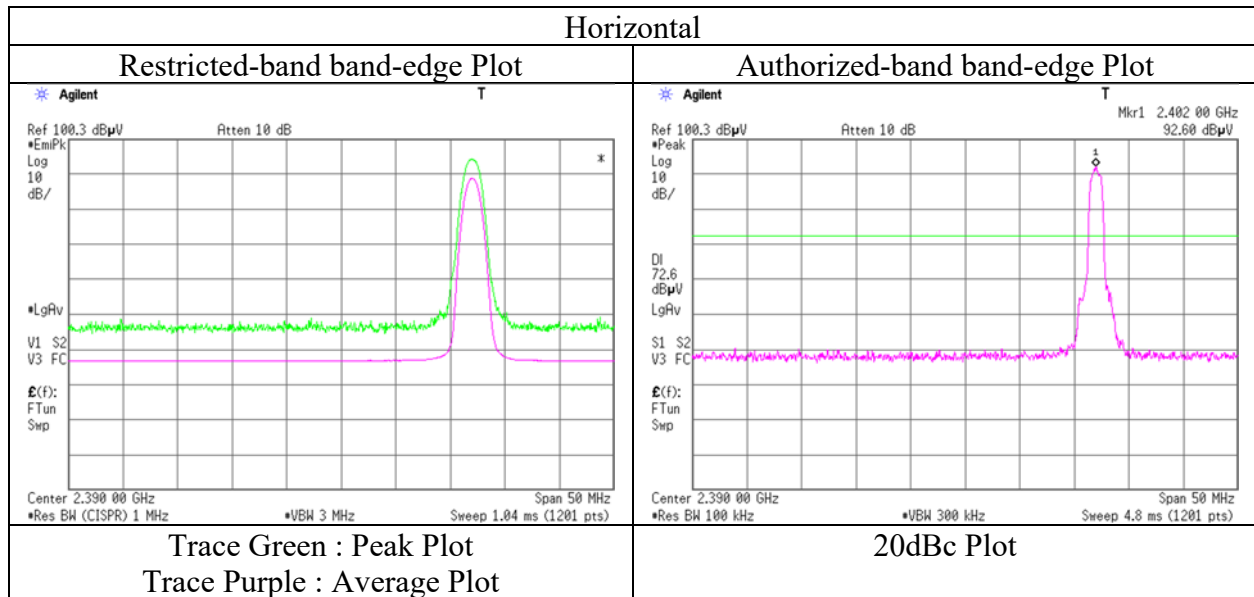
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1 GHz -18 GHz)
Antenna	AH104N2450D1
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
	(1 GHz -18 GHz)
Antenna	AH104N2450D1
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.	2483.500	PK	52.85	27.55	14.29	44.16	2.39	52.92	73.90	20.9	144	139	
Hori.	2483.500	AV	38.09	27.55	14.29	44.16	2.39	38.16	53.90	15.7	144	139	
Vert.	2483.500	PK	52.55	27.55	14.29	44.16	2.39	52.62	73.90	21.2	328	129	
Vert.	2483.500	AV	37.80	27.55	14.29	44.16	2.39	37.87	53.90	16.0	328	129	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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.

* This mode was performed only band edges measurement.

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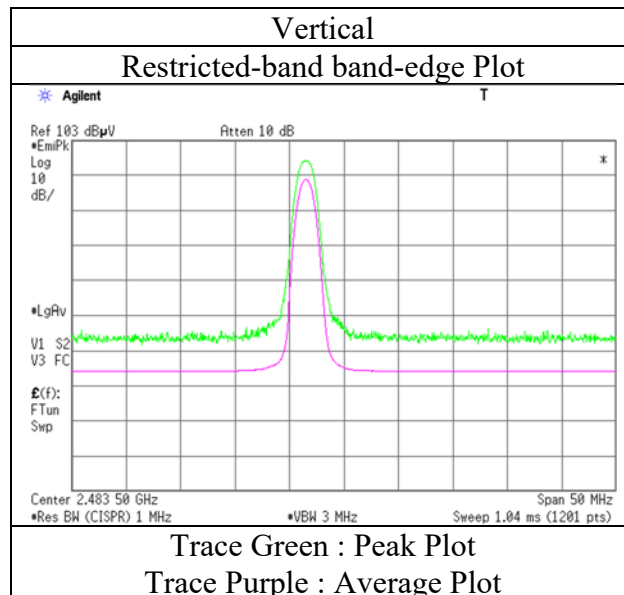
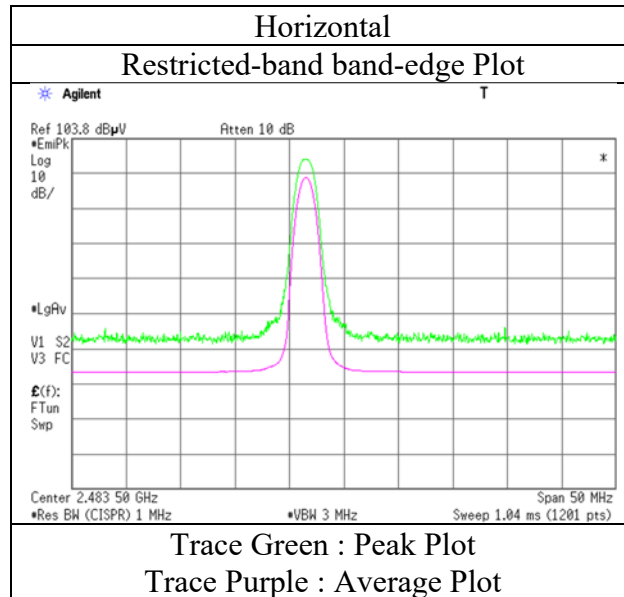
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Radiated Spurious Emission (Reference Plot for band-edge)

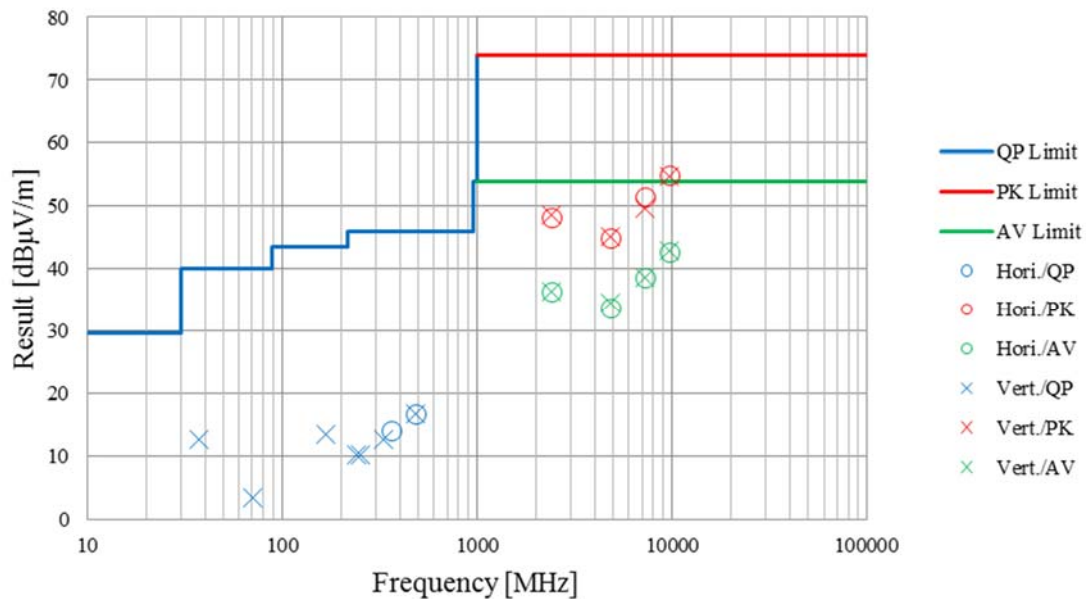
Report No.	12193629S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1 GHz -18 GHz)
Antenna	AH104N2450D1
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission **(Plot data, Worst case)**

Report No.	12193629S-B-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	April 7, 2018	March 20, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 52 % RH	22 deg. C / 40 % RH	23 deg. C / 39 % RH
Engineer	Makoto Hosaka (30 MHz -1 GHz)	Hiroyuki Morikawa (1 GHz -18 GHz)	Kazutaka Takeyama (18 GHz -26.5 GHz)
Antenna	AH104N2450D1		
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

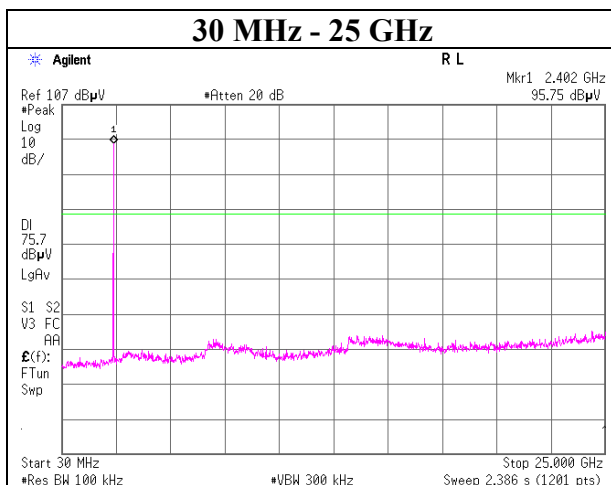
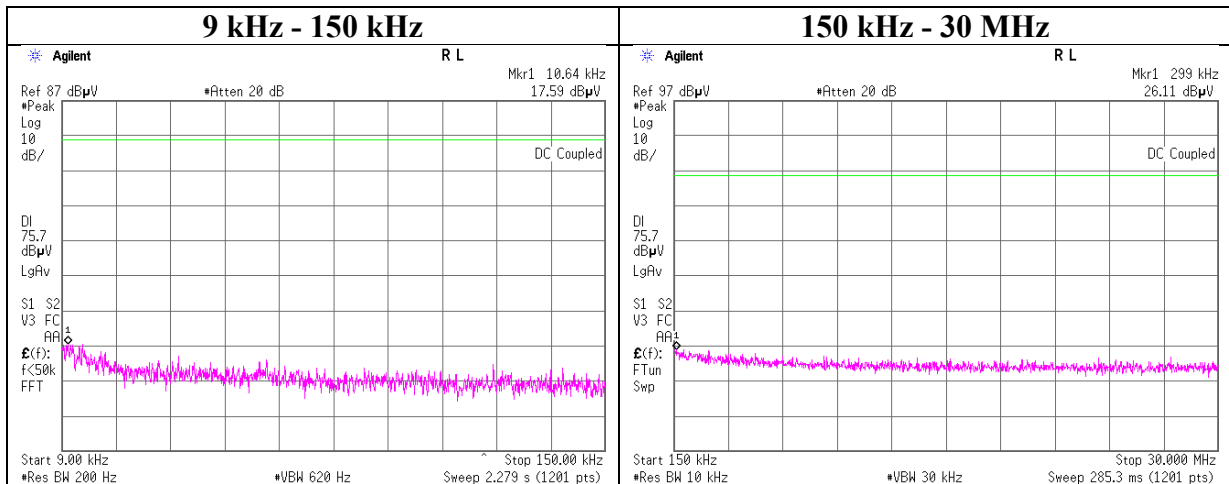


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 12193629S-B-R2
Date : March 30, 2018
Temperature / Humidity : 24 deg. C / 35 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, DH5

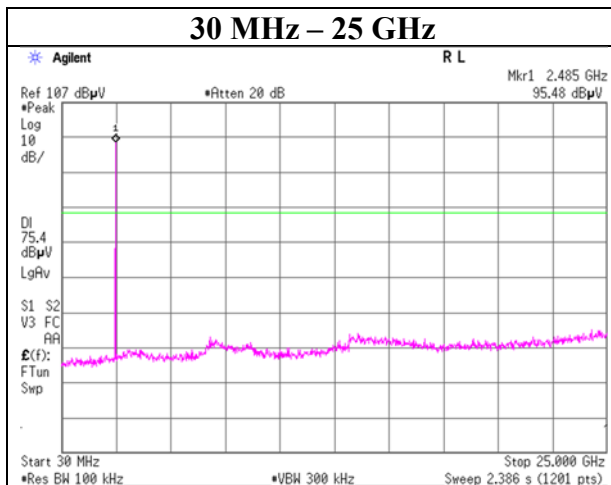
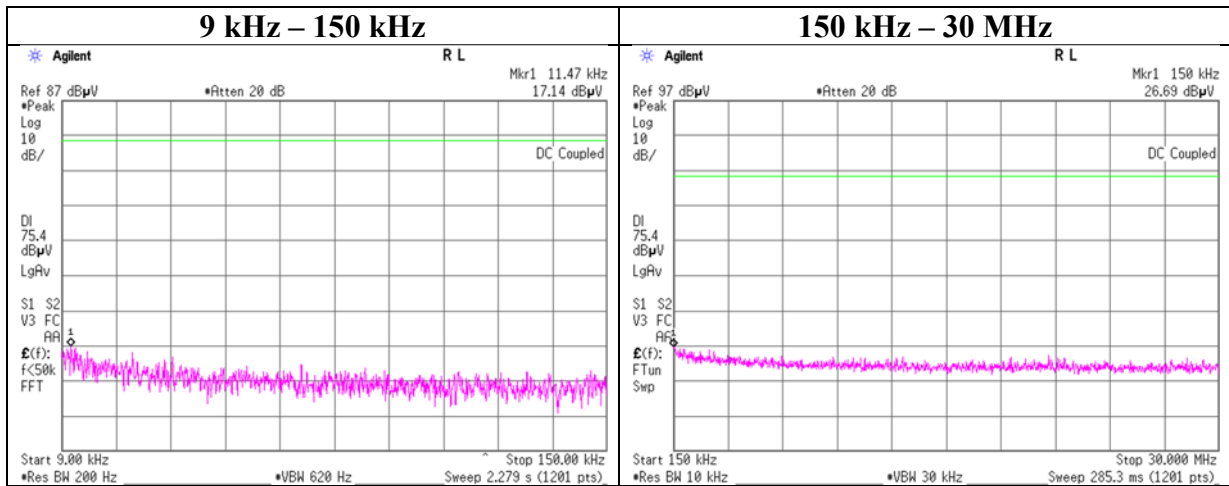
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 12193629S-B-R2
Date : March 30, 2018
Temperature / Humidity : 24 deg. C / 35 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, DH5

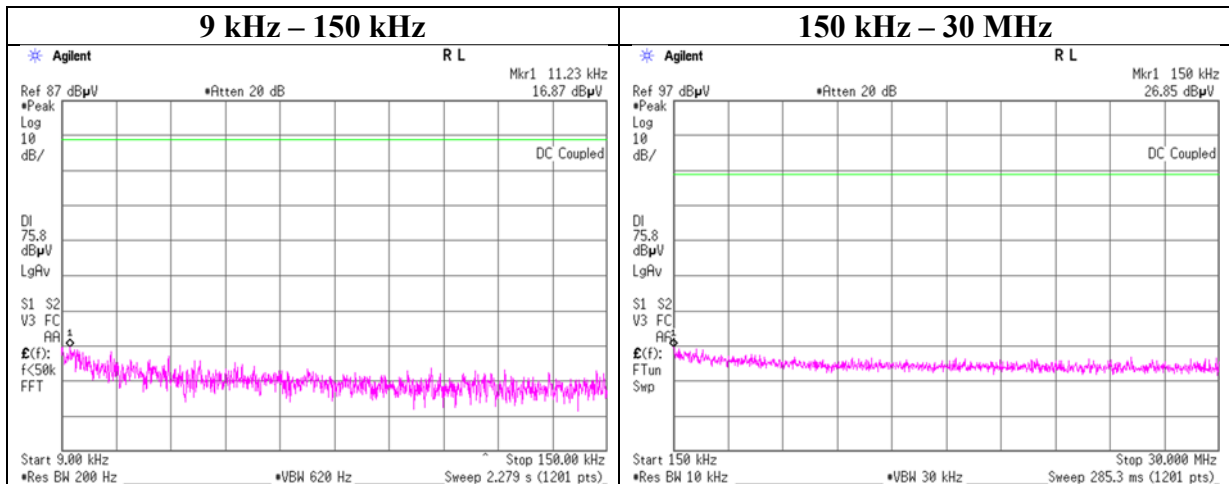
2480 MHz



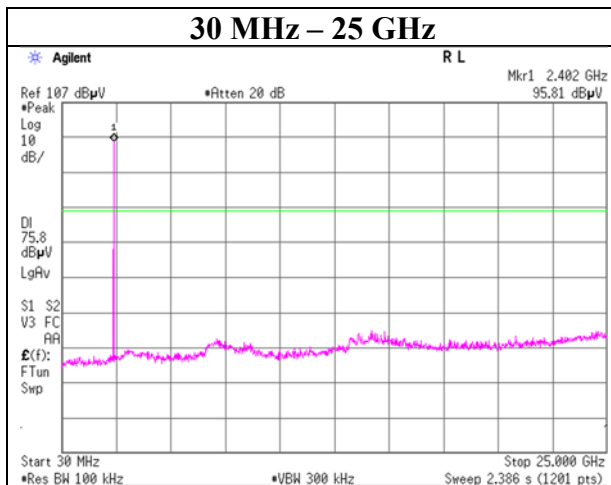
Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 12193629S-B-R2
Date : March 30, 2018
Temperature / Humidity : 24 deg. C / 35 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, 3DH5

2402 MHz



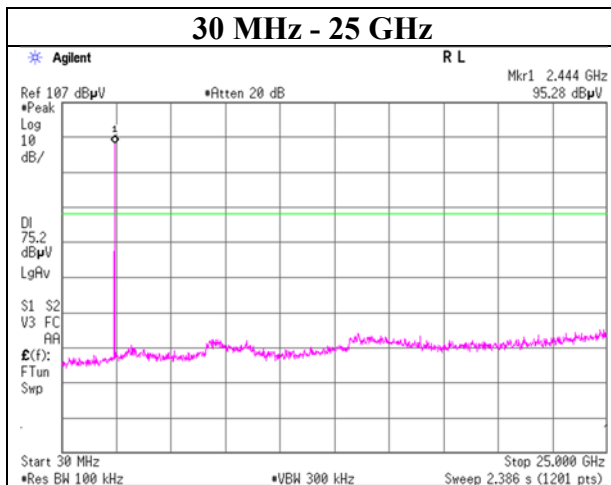
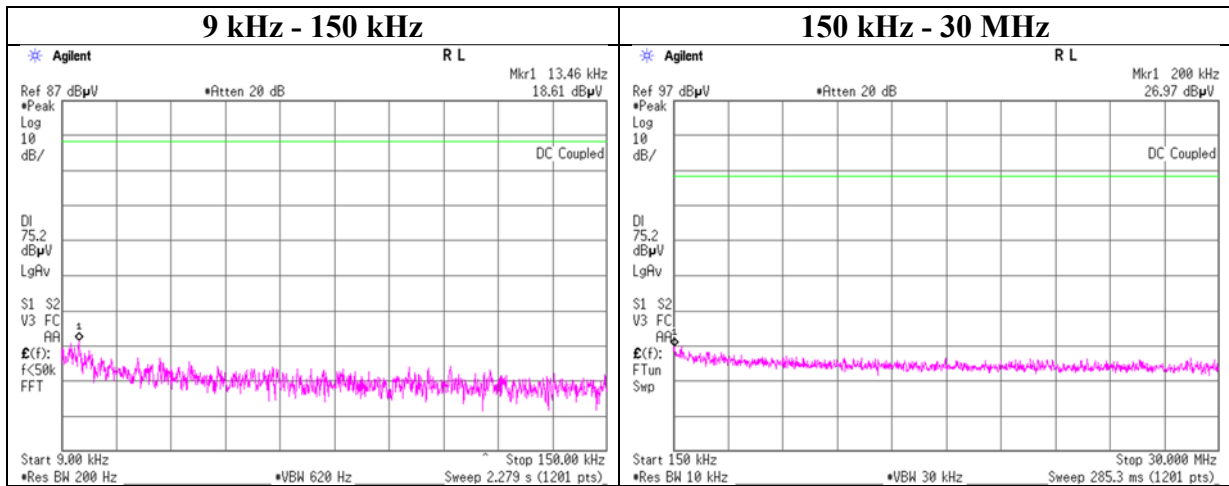
30 MHz – 25 GHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 12193629S-B-R2
Date : March 30, 2018
Temperature / Humidity : 24 deg. C / 35 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, 3DH5

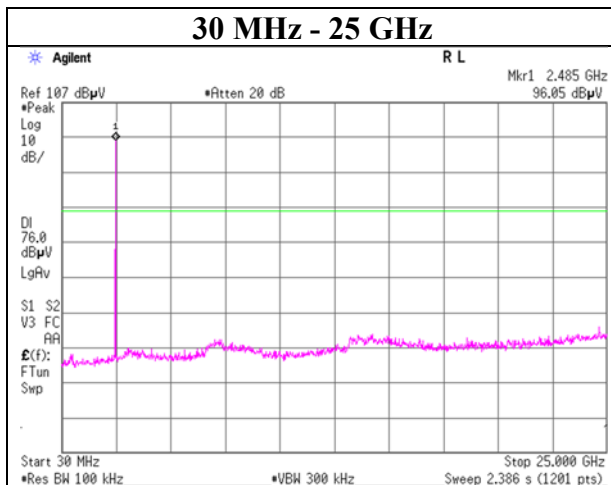
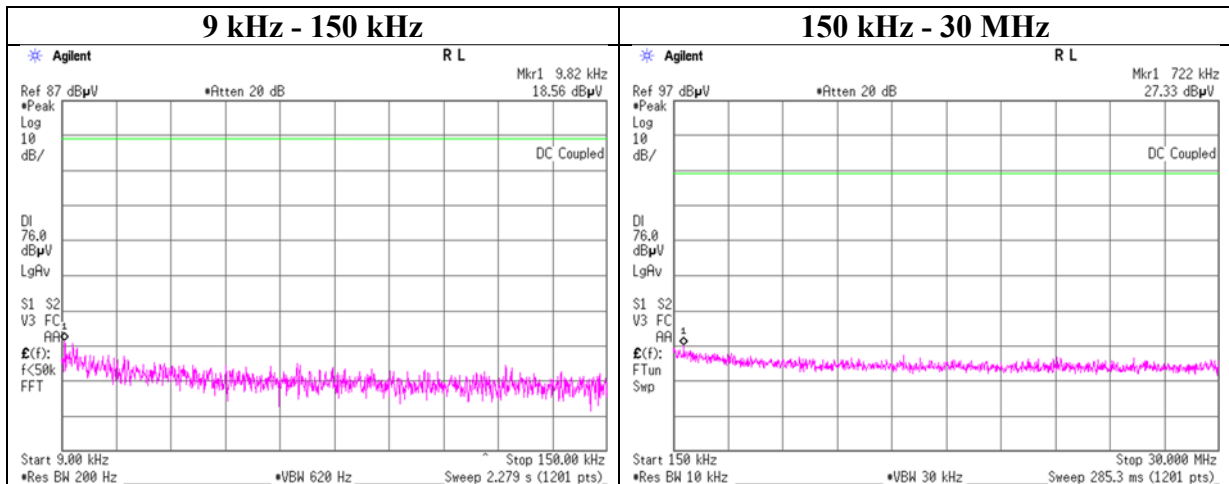
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 12193629S-B-R2
Date : March 30, 2018
Temperature / Humidity : 24 deg. C / 35 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, 3DH5

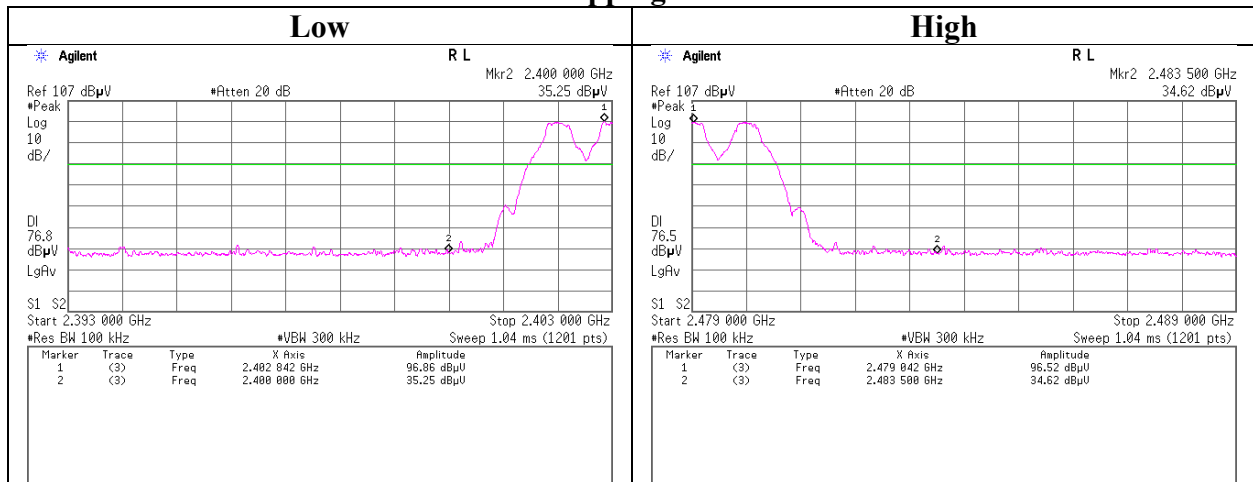
2480 MHz



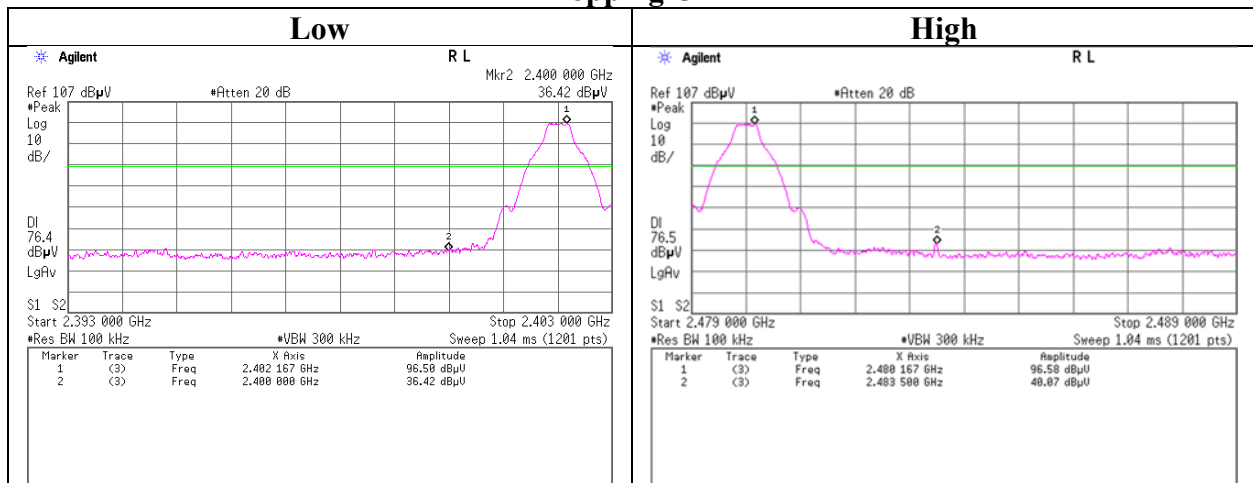
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-B-R2
Date	March 30, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx DH5

Hopping On



Hopping Off



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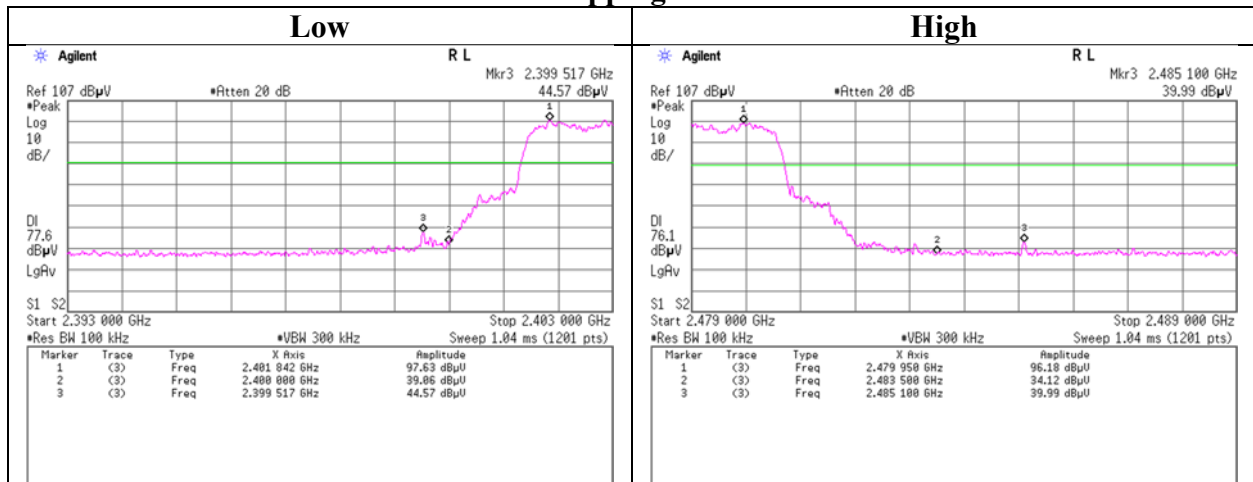
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

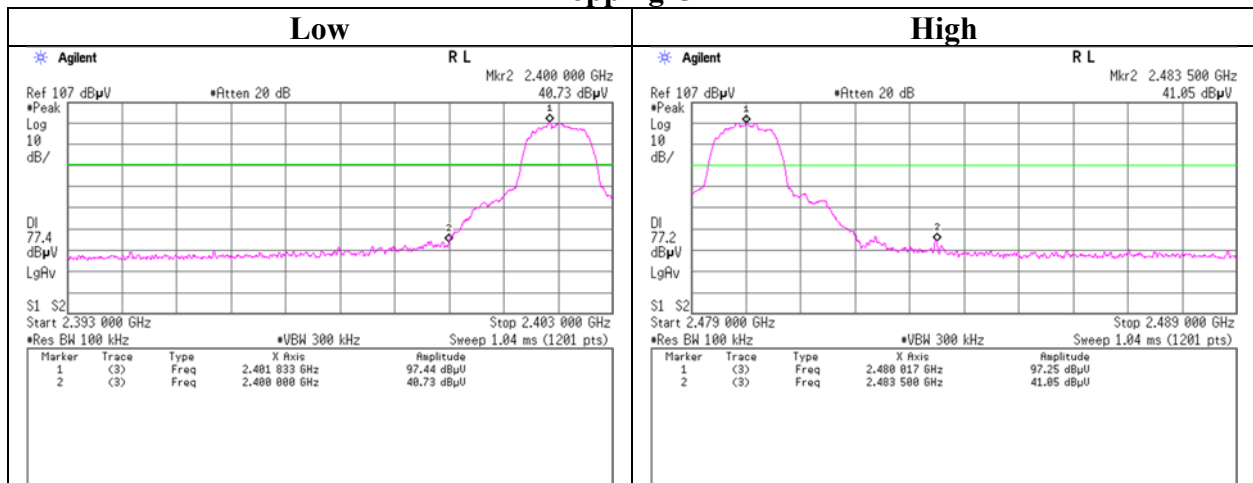
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-B-R2
Date	March 30, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx 3DH5

Hopping On



Hopping Off



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APPENDIX 2: Test instruments

Test Instruments (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SRENT-09	Spectrum Analyzer	Agilent	E4440A	MY46186392	AT	2017/11/08 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2017/05/01 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2017/05/01 * 12
SAT10-16	Attenuator	Weinschel Corp.	54A-10	83420	AT	2017/12/08 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2018/03/19 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2017/12/21 * 12
SRENT-15	Spectrum Analyzer	Agilent	E4440A	MY46185516	AT	2017/12/26 * 12
KTS-08	Digital Tester	SANWA	PC500	7019224	AT	2018/03/05 * 12
SCC-C9/C10/SR SE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/ NS4906	-/0901-271(RF Selector)	CE	2018/04/09 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2018/02/26 * 12
SAT3-10	Attenuator	JFW	50HF-003N	-	CE	2017/08/24 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2017/12/21 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2017/12/14 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	CE,RE	2017/11/24 * 12
SJM-02	Measure	KOMELON	KMC-36	-	CE,RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE, CE,RFL,MF)	-	CE,RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	CE,RE	2017/10/16 * 12
SLS-04	LISN	Rohde & Schwarz	ENV216	100514	CE	2018/02/27 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2018/02/15 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2018/01/29 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000 NFSNMS/B	1612S006	RE	2018/01/29 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01000 NFSNMS/B	1612S005	RE	2018/01/29 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2017/08/14 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2017/10/30 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2018/03/05 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSW R)	2	RE	2017/07/18 * 12
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2018/03/08 * 12
SAT10-05	Attenuator(above 1 GHz)	Agilent	8493C-010	74864	RE	2017/11/22 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2017/06/13 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2017/05/08 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12

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Test Instruments (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-03(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSW R)	3	RE	2017/07/17 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 12
SAEC-01(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSW R)	1	RE	2017/07/20 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2017/08/14 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2017/10/30 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2017/10/16 * 12
SRENT-15	Spectrum Analyzer	Agilent	E4440A	MY46185516	RE	2017/12/26 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2017/07/11 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2017/03/17 * 12 *1)
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KMSKMS	-	RE	2017/04/20 * 12 *1)
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2018/03/19 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2017/04/20 * 12 *1)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2017/10/02 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2018/01/30 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2017/08/24 * 12
SCC-C1/C2/C3/C4/C5/C10/SRS E-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2017/04/07 * 12 *1)
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2018/02/16 * 12

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

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

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

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

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

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