RADIO TEST REPORT

Test Report No. : 13282402S-A-R1

Applicant	:	**CASIO COMPUTER CO., LTD.**
Type of EUT	:	**RF Module**
Model Number of EUT	:	**GSW-H1000**
FCC ID	:	**BBQ-GSWH1000**
Test regulation	:	**FCC Part 15 Subpart C: 2020** *** Bluetooth part**
Test Result	:	**Complied (Refer to SECTION 3.2)**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements.
   It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13282402S-A. 13282402S-A is replaced with this report.

Date of test: April 21 to May 15, 2020

Representative test engineer:

Takahiro Kawakami
Engineer
Consumer Technology Division

Approved by:

Akio Hayashi
Leader
Consumer Technology Division

CERTIFICATE 1266.03

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

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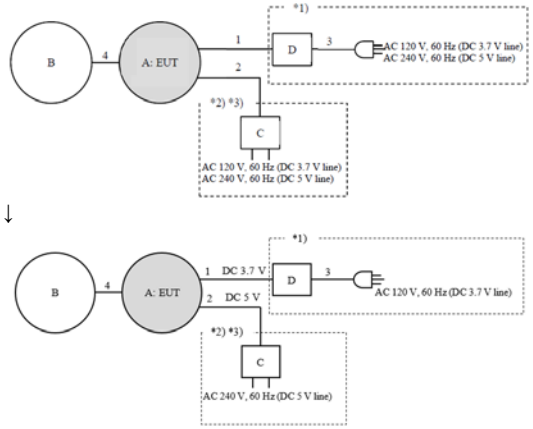
REVISION HISTORY

Original Test Report No.: 13282402S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13282402S-A	May 29, 2020	-	-
1	13282402S-A-R1	June 11, 2020	P.11	Correction of 4.2 Configuration and peripherals:  Correction of description *1) It is Open during Conducted Emission test with DC 5.0 V line. *2) It is Open during Radiated Emission test and Conducted Emission test with DC 3.7 V line. ↓ *1) Not used during Conducted Emission test with DC 5.0 V line. *2) Not used during Radiated Emission test and Conducted Emission test with DC 3.7 V line. Addition of remarks: *3) Used for other than Conducted emission test of DC 5.0 V line *4) Used for Conducted emission test of DC 5.0 V line

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation
AC	Alternating Current
AFH	Adaptive Frequency Hopping
AM	Amplitude Modulation
Amp, AMP	Amplifier
ANSI	American National Standards Institute
Ant, ANT	Antenna
AP	Access Point
ASK	Amplitude Shift Keying
Atten., ATT	Attenuator
AV	Average
BPSK	Binary Phase-Shift Keying
BR	Bluetooth Basic Rate
BT	Bluetooth
BT LE	Bluetooth Low Energy
BW	BandWidth
Cal Int	Calibration Interval
CCK	Complementary Code Keying
Ch., CH	Channel
CISPR	Comite International Special des Perturbations Radioelectriques
CW	Continuous Wave
DBPSK	Differential BPSK
DC	Direct Current
D-factor	Distance factor
DFS	Dynamic Frequency Selection
DQPSK	Differential QPSK
DSSS	Direct Sequence Spread Spectrum
EDR	Enhanced Data Rate
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EN	European Norm
ERP, e.r.p.	Effective Radiated Power
EU	European Union
EUT	Equipment Under Test
Fac.	Factor
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
FM	Frequency Modulation
Freq.	Frequency
FSK	Frequency Shift Keying
GFSK	Gaussian Frequency-Shift Keying
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
Hori.	Horizontal
ICES	Interference-Causing Equipment Standard
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IF	Intermediate Frequency
ILAC	International Laboratory Accreditation Conference
ISED	Innovation, Science and Economic Development Canada
ISO	International Organization for Standardization
JAB	Japan Accreditation Board
LAN	Local Area Network
LIMS	Laboratory Information Management System
MCS	Modulation and Coding Scheme
MRA	Mutual Recognition Arrangement
N/A	Not Applicable
NIST	National Institute of Standards and Technology
NS	No signal detect.
NSA	Normalized Site Attenuation
NVLAP	National Voluntary Laboratory Accreditation Program
OBW	Occupied Band Width
OFDM	Orthogonal Frequency Division Multiplexing
P/M	Power meter
PCB	Printed Circuit Board
PER	Packet Error Rate
PHY	Physical Layer
PK	Peak
PN	Pseudo random Noise
PRBS	Pseudo-Random Bit Sequence
PSD	Power Spectral Density
QAM	Quadrature Amplitude Modulation
QP	Quasi-Peak
QPSK	Quadri-Phase Shift Keying
RBW	Resolution Band Width
RDS	Radio Data System
RE	Radio Equipment
RF	Radio Frequency
RMS	Root Mean Square
RSS	Radio Standards Specifications
Rx	Receiving
SA, S/A	Spectrum Analyzer
SG	Signal Generator
SVSWR	Site-Voltage Standing Wave Ratio
TR	Test Receiver
Tx	Transmitting
VBW	Video BandWidth
Vert.	Vertical
WLAN	Wireless LAN

CONTENTS **PAGE**

SECTION 1: Customer information

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

The information provided from the customer is as follows;
- Applicant, Type of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT)
- SECTION 4: Operation of EUT 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 (EUT)

2.1 Identification of EUT

Type of Equipment	:	RF Module
Model No.	:	GSW-H1000
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 3.7 V typical (battery) (DC 3.5 V to 4.2 V) DC 5 V typical (Charging Pad)
Receipt Date of Sample (Information from test lab.)	:	April 14, 2020
Country of Mass-production	:	Japan, Thailand
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: GSW-H1000 (referred to as the EUT in this report) is a RF Module.
* GSW-H1000 has alternative name as S001.

Radio Specification

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

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Modulation	:	DSSS, OFDM
Antenna type	:	Inverted F type
Antenna Gain	:	-3.7 dBi
Clock frequency (Maximum)	:	32.768 kHz

Bluetooth (Ver. 4.2 with EDR function)

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	BT: FHSS (GFSK, π/4DQPSK, 8DPSK) LE: GFSK
Antenna type	:	Inverted F type
Antenna Gain	:	-3.7 dBi
Clock frequency (Maximum)	:	32.768 kHz

*This test report applies for Bluetooth (BR/EDR) parts.
**Wireless LAN and Bluetooth and Bluetooth Low Energy do not transmit simultaneously.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on April 1, 2020 and effective June 1, 2020 except 15.258 * The revision does not affect the test result conducted before its effective date.
Title	:	FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	11.8 dB 11.45217 MHz, QP, N Tx DH5 2402 MHz (DC 5.0 V line)	Complied a)	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
Carrier Frequency Separation	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)	See data.	Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (b)			
20 dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)		Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (a)			
Number of Hopping Frequency	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied c)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Dwell time	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied d)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(b)(1)		Complied e)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4 (b)			
Spurious Emission & Band Edge Compliance	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	9.0 dB 7440.000 MHz, AV, Vert. Tx, DH5 2480 MHz	Complied f) / g)	Conducted/ Radiated (above 30 MHz) *1)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) Radiated test was selected over 30 MHz based on section 15.247(d).
a) Refer to APPENDIX 1 (data of Conducted Emission)
b) Refer to APPENDIX 1 (data of 20 dB Bandwidth, 99 % Occupied Bandwidth and Carrier Frequency Separation)
c) Refer to APPENDIX 1 (data of Number of Hopping Frequency)
d) Refer to APPENDIX 1 (data of Dwell time)
e) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
f) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
g) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:

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

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

FCC Part 15.31 (e)

The RF Module has its own regulator. The RF Module is constantly provided voltage through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

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

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	- b)	Conducted
b) Refer to APPENDIX 1 (data of 20 dB 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

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

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

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 dB	-
	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
	18 GHz-40 GHz	5.7 dB	5.7 dB	5.7 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	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %
Temperature	0.95 deg.C.
Voltage	0.83 %

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	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 EUT during testing

4.1 Operating Mode(s)

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

Details of Operating Mode(s)

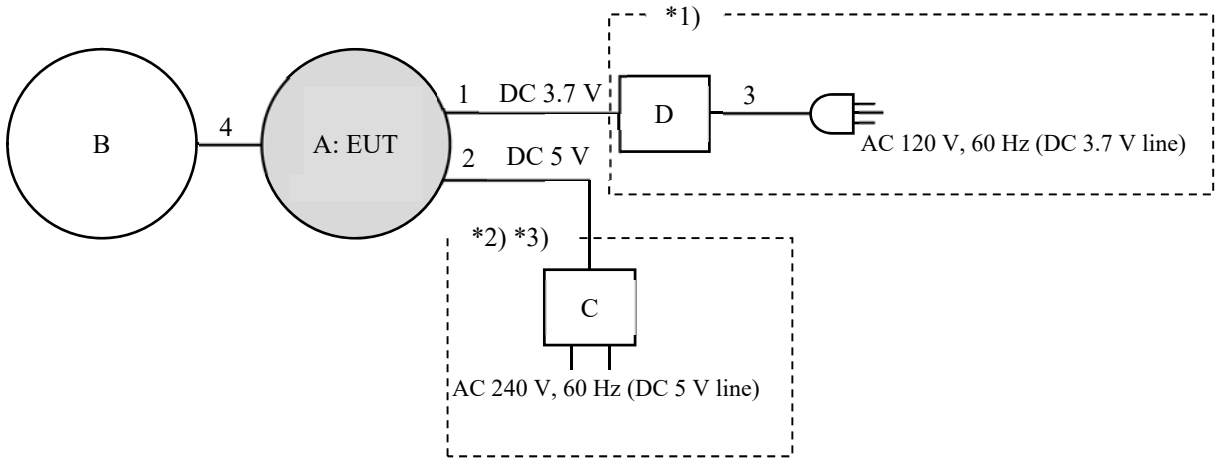
Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20 dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number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

*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: Fixed
Software: GSW-H1000-Radio, ver1.0
(Date: March 9, 2020, Storage location: EUT memory)

*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

4.2 Configuration and peripherals



*1) Not used during Conducted Emission test with DC 5.0 V line.
*2) Not used during Radiated Emission test and Conducted Emission test with DC 3.7 V line.
*3) Radiated emission has been tested with power supply of DC 3.7 V representatively. The RF part is constantly provided voltage through the regulator and it has been confirmed that the variation of power supply does not affect the test result.

*As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with the following worst voltage as representative; AC 120 V (for DC 3.7 V line) and AC 240 V (for DC 5 V line).

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RF Module	GSW-H1000	54 *1) 55 *2)	CASIO COMPUTER CO., LTD.	EUT
B	LCD	-	-	CASIO COMPUTER CO., LTD.	-
C	AC Adapter	PSAA05A-050QL6	-	CASIO COMPUTER CO., LTD.	-
D	Power Supply (DC)	NL002383	PAN60-10A	Kikusui	-

*1) Used for Antenna Terminal Conducted test
*2) Used for Radiated emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.1 + 2.0	Unshielded	Unshielded	-
2	USB Cable	0.4 *3)	Shielded	Shielded	-
		0.4 + 1.7 *4)	Shielded	Shielded	-
3	AC Cable	3.0	Unshielded	Unshielded	-
4	Signal	0.01	Unshielded	Unshielded	-

*3) Used for other than Conducted emission test of DC 5.0 V line
*4) Used for Conducted emission test of DC 5.0 V line

SECTION 5: Conducted Emission

Test Procedure and conditions

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

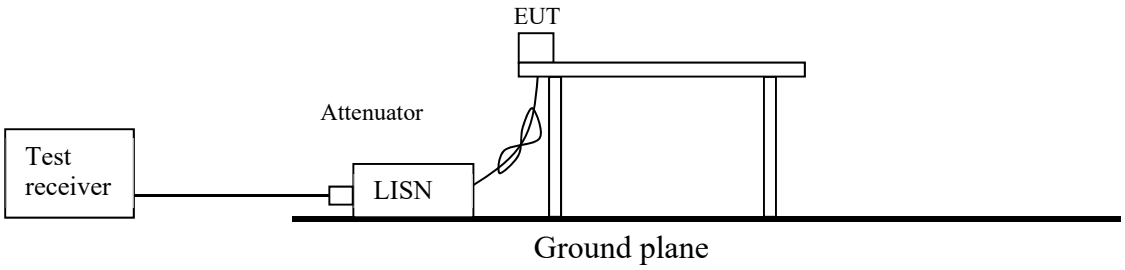
For the tests on EUT itself (as a standalone equipment)
Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN / (AMN) to the input power source.

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

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

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

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission

Test Procedure

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

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

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.
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.

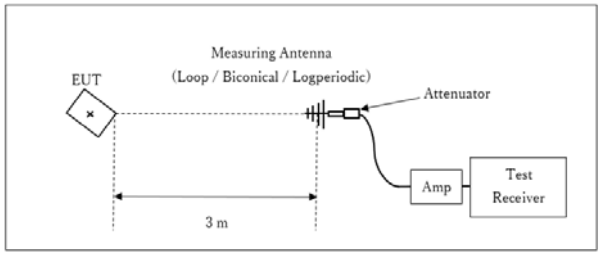
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 1/T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r02.

Figure 2: Test Setup

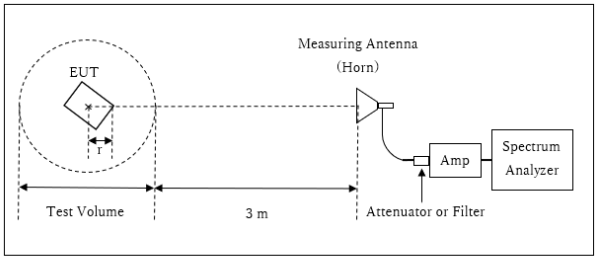
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz



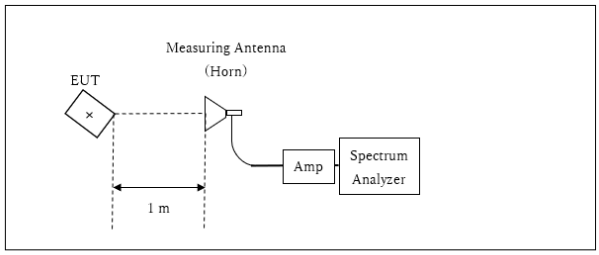
r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.96 m / 3.0 m) = 2.41 dB
* Test Distance: (3 + Test Volume /2) - r = 3.96 m

Test Volume : 2.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.04 m

.

13 GHz - 26.5 GHz



× : Center of turn table

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

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

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

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

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

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20 dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 160MHz 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) *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) The measurement was performed with Max Hold since the duty cycle was not 100 %. Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) In the frequency range below 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)
*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 – 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

The test results and limit are rounded off to two decimals place, so some differences might be observed.
The equipment and cables were not used for factor 0 dB of the data sheets.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

(DC 3.7 V line)

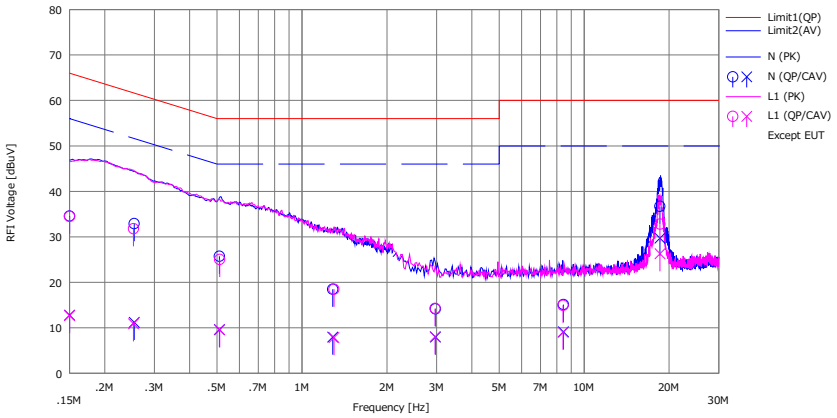
DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/15

Mode : Tx_DH5_2402 MHz

Power : AC 120 V / 60 Hz (EUT Input: DC 3.7 V)
Temp./Humi. : 21 deg.C / 43 %RH

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading ⟨QP⟩	Reading ⟨CAV⟩	C.Fac	Results ⟨QP⟩	Results ⟨CAV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.150000	22.10	0.30	12.48	34.58	12.78	66.00	56.00	31.4	43.2	N	
2	0.254430	20.40	-1.30	12.49	32.89	11.19	61.61	51.61	28.7	40.4	N	
3	0.509630	13.20	-2.90	12.52	25.72	9.62	56.00	46.00	30.2	36.3	N	
4	1.285530	5.90	-4.60	12.57	18.47	7.97	56.00	46.00	37.5	38.0	N	
5	2.970270	1.50	-4.70	12.66	14.16	7.96	56.00	46.00	41.8	38.0	N	
6	8.447960	2.20	-3.80	12.92	15.12	9.12	60.00	50.00	44.8	40.8	N	
7	18.563100	23.40	16.40	13.31	36.71	29.71	60.00	50.00	23.2	20.2	N	
8	0.150000	22.00	0.20	12.48	34.48	12.68	66.00	56.00	31.5	43.3	L1	
9	0.252980	19.30	-1.60	12.49	31.79	10.89	61.66	51.66	29.8	40.7	L1	
10	0.510860	12.50	-3.00	12.52	25.02	9.52	56.00	46.00	30.9	36.4	L1	
11	1.298570	5.90	-4.70	12.57	18.47	7.87	56.00	46.00	37.5	38.1	L1	
12	2.964670	1.60	-4.60	12.66	14.26	8.06	56.00	46.00	41.7	37.9	L1	
13	8.420190	2.00	-3.90	12.92	14.92	9.02	60.00	50.00	45.0	40.9	L1	
14	18.568200	19.50	13.00	13.31	32.81	26.31	60.00	50.00	27.1	23.6	L1	

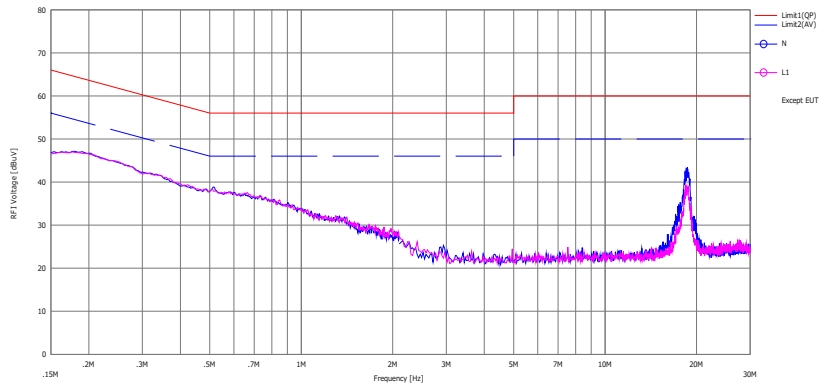
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN): SLS-02

Conducted Emission

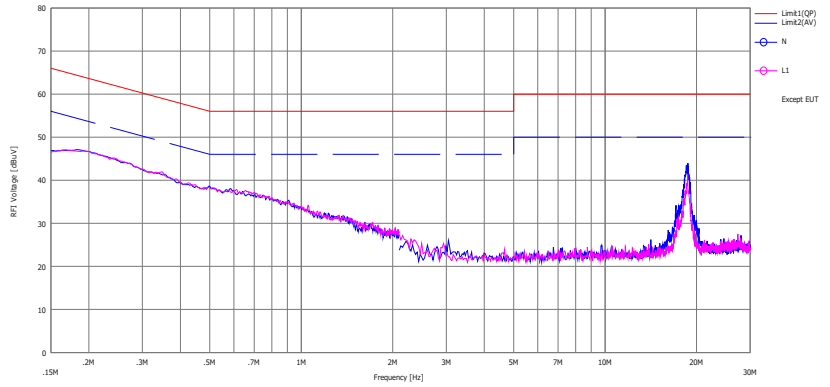
(DC 3.7 V line)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded room
Date	May 14, 2020
Temperature / Humidity	21 deg. C / 43 % RH
Engineer	Hiromasa Sato
Mode	Tx DH5

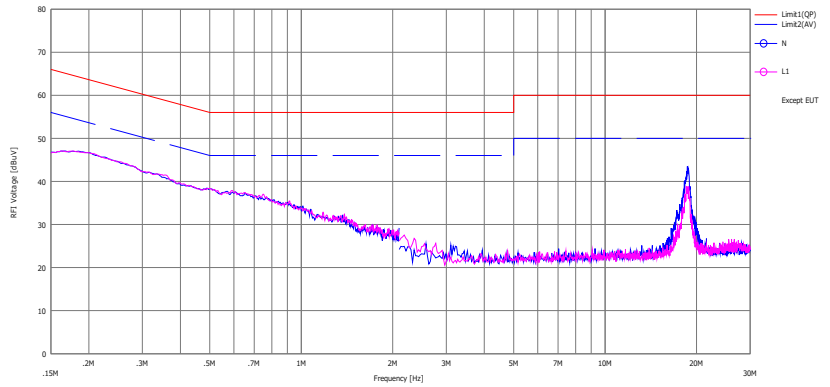
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

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Conducted Emission
(DC 3.7 V line)

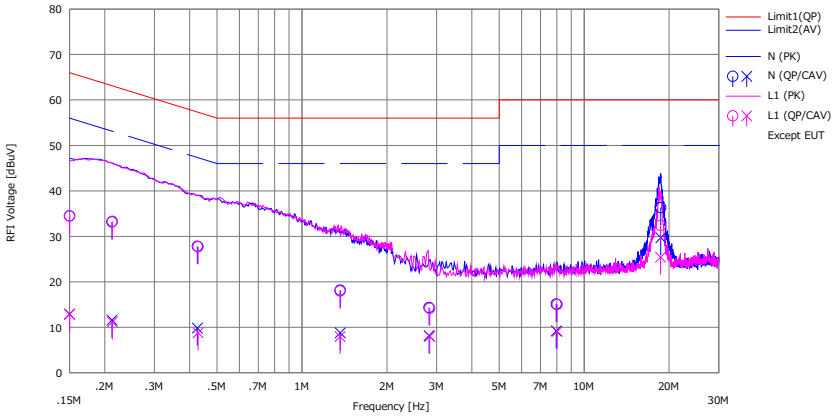
DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/15

Mode : Tx_3DH5_2480 MHz

Power : AC 120 V / 60 Hz (EUT Input: DC 3.7 V)
Temp./Humi. : 21 deg.C / 43 %RH

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		(QP)	(CAV)		(QP)	(CAV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	22.00	0.40	12.48	34.48	12.88	66.00	56.00	31.5	43.1	N	
2	0.21219	20.70	-0.90	12.48	33.18	11.58	63.12	53.12	29.9	41.5	N	
3	0.42602	15.30	-2.70	12.51	27.81	9.81	57.33	47.33	29.5	37.5	N	
4	1.36643	5.60	-3.80	12.56	18.16	8.76	56.00	46.00	37.8	37.2	N	
5	2.82079	1.70	-4.50	12.65	14.35	8.15	56.00	46.00	41.6	37.8	N	
6	7.96825	2.20	-3.70	12.90	15.10	9.20	60.00	50.00	44.9	40.8	N	
7	18.68548	23.00	16.40	13.31	36.31	29.71	60.00	50.00	23.6	20.2	N	
8	0.15000	22.00	0.40	12.48	34.48	12.88	66.00	56.00	31.5	43.1	L1	
9	0.21282	20.80	-1.30	12.48	33.28	11.18	63.09	53.09	29.8	41.9	L1	
10	0.42821	15.20	-3.70	12.51	27.71	8.81	57.29	47.29	29.5	38.4	L1	
11	1.36508	5.40	-4.60	12.56	17.96	7.96	56.00	46.00	38.0	38.0	L1	
12	2.83766	1.50	-4.70	12.65	14.15	7.95	56.00	46.00	41.8	38.0	L1	
13	8.02639	2.10	-3.80	12.90	15.00	9.10	60.00	50.00	45.0	40.9	L1	
14	18.66048	19.10	12.10	13.31	32.41	25.41	60.00	50.00	27.5	24.5	L1	

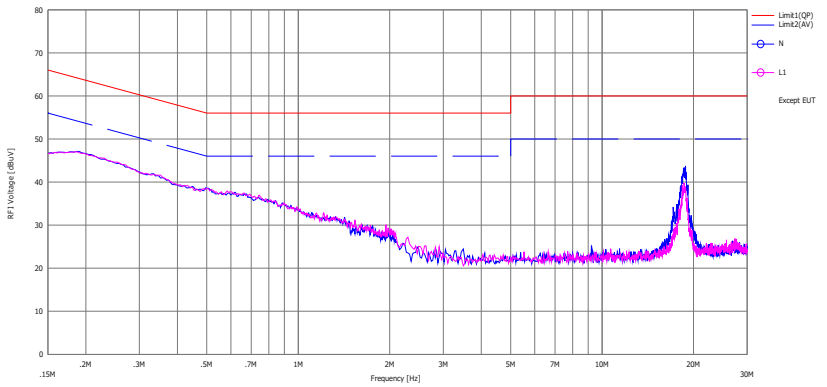
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN): SLS-02

Conducted Emission

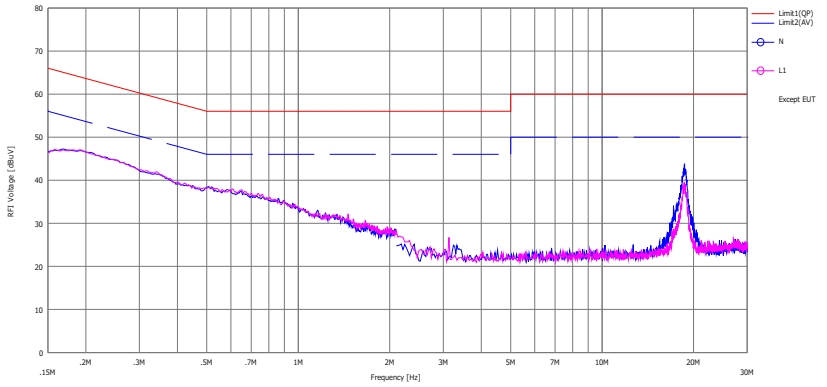
(DC 3.7 V line)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded room
Date	May 14, 2020
Temperature / Humidity	21 deg. C / 43 % RH
Engineer	Hiromasa Sato
Mode	Tx 3DH5

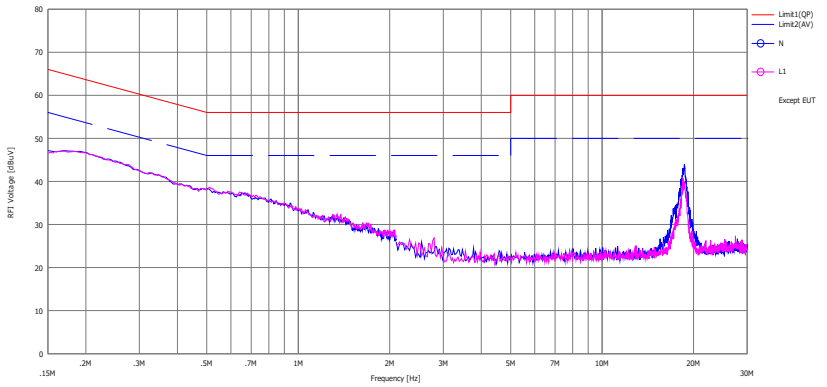
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

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Conducted Emission

(DC 5.0 V line)

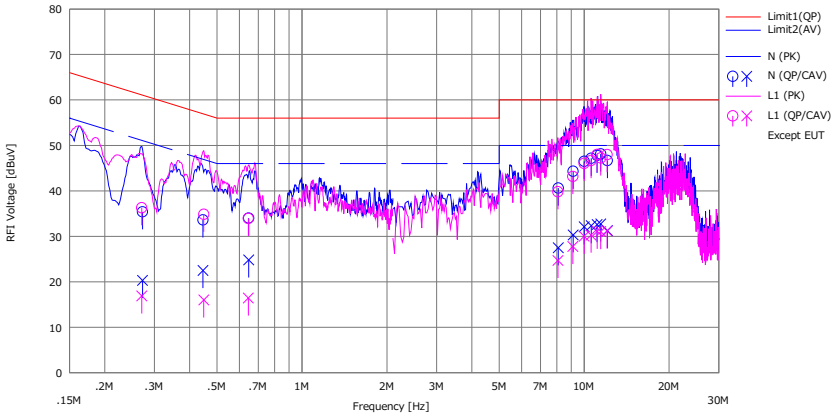
DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/14

Mode : Tx_DH5_2402 MHz

Power : AC 240 V / 60 Hz (EUT Input: DC 5 V)
Temp./Humi. : 23 deg.C / 40 %RH

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈CAV〉		〈QP〉	〈CAV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.272102	22.80	7.70	12.60	35.40	20.30	61.05	51.05	25.6	30.7	N	
2	0.445672	21.00	9.90	12.61	33.61	22.51	56.96	46.96	23.3	24.4	N	
3	0.647232	21.40	12.20	12.62	34.02	24.82	56.00	46.00	21.9	21.1	N	
4	8.100562	27.30	14.20	13.31	40.61	27.51	60.00	50.00	19.3	22.4	N	
5	9.142082	30.90	16.90	13.42	44.32	30.32	60.00	50.00	15.6	19.6	N	
6	10.009992	33.00	18.60	13.50	46.50	32.10	60.00	50.00	13.5	17.9	N	
7	10.596372	33.60	18.80	13.55	47.15	32.35	60.00	50.00	12.8	17.6	N	
8	11.110822	34.20	19.00	13.60	47.80	32.60	60.00	50.00	12.2	17.4	N	
9	11.452172	34.50	19.10	13.63	48.13	32.73	60.00	50.00	11.8	17.2	N	
10	12.090682	33.00	17.60	13.68	46.68	31.28	60.00	50.00	13.3	18.7	N	
11	0.270502	23.70	4.30	12.59	36.29	16.89	61.10	51.10	24.8	34.2	L1	
12	0.448772	22.20	3.40	12.63	34.83	16.03	56.90	46.90	22.0	30.8	L1	
13	0.645342	21.30	3.80	12.65	33.95	16.45	56.00	46.00	22.0	29.5	L1	
14	8.072392	26.60	11.50	13.20	39.80	24.70	60.00	50.00	20.2	25.3	L1	
15	9.119512	29.90	14.50	13.28	43.18	27.78	60.00	50.00	16.8	22.2	L1	
16	10.001662	32.70	16.70	13.34	46.04	30.04	60.00	50.00	13.9	19.9	L1	
17	10.582182	33.30	16.90	13.38	46.68	30.28	60.00	50.00	13.3	19.7	L1	
18	11.130592	34.60	17.70	13.42	48.02	31.12	60.00	50.00	11.9	18.8	L1	
19	11.449002	33.80	17.60	13.44	47.24	31.04	60.00	50.00	12.7	18.9	L1	
20	12.061512	34.50	17.70	13.48	47.98	31.18	60.00	50.00	12.0	18.8	L1	

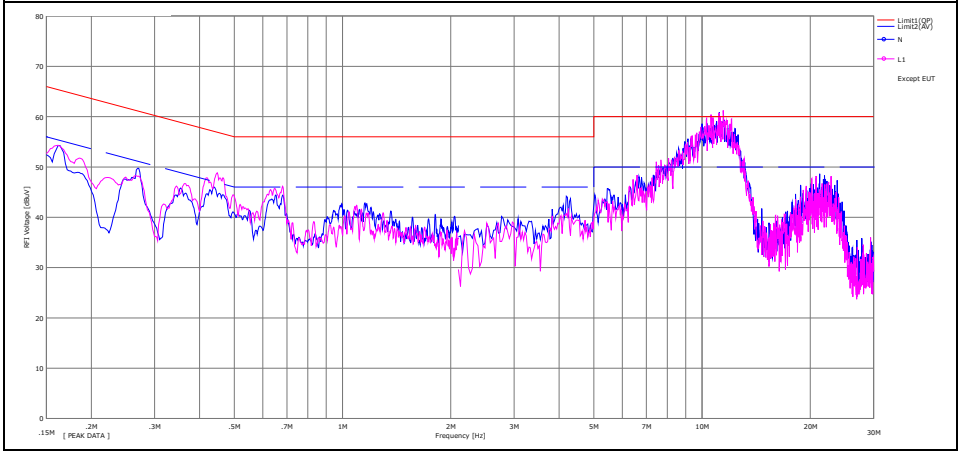
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN): SLS-02

Conducted Emission

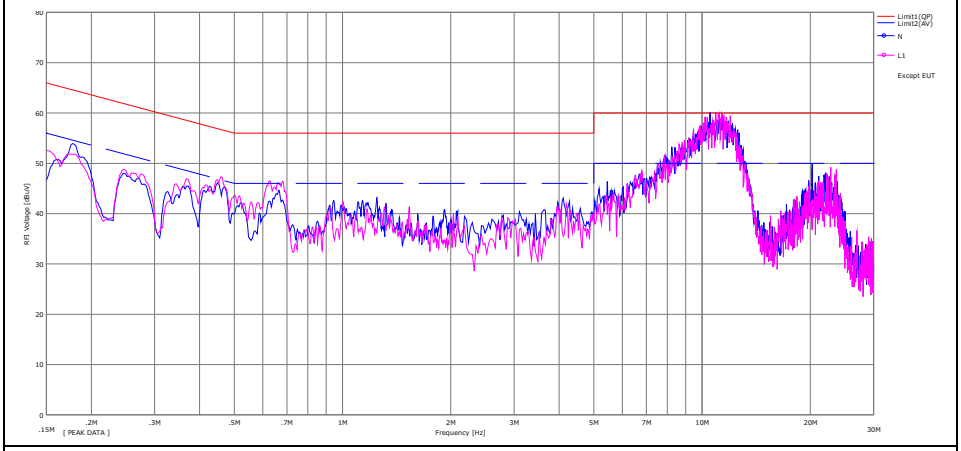
(DC 5.0 V line)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded room
Date	May 14, 2020
Temperature / Humidity	23 deg. C / 40 % RH
Engineer	Yasumasa Owaki
Mode	Tx DH5

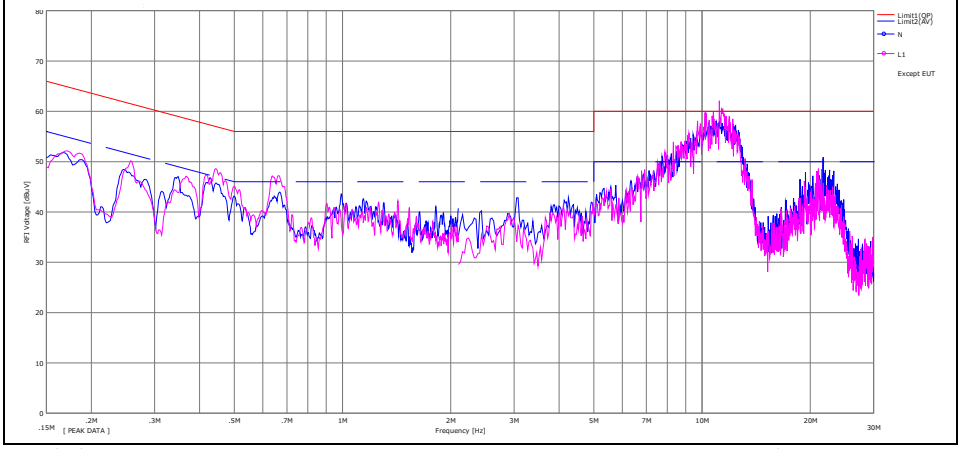
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

Conducted Emission
(DC 5.0 V line)

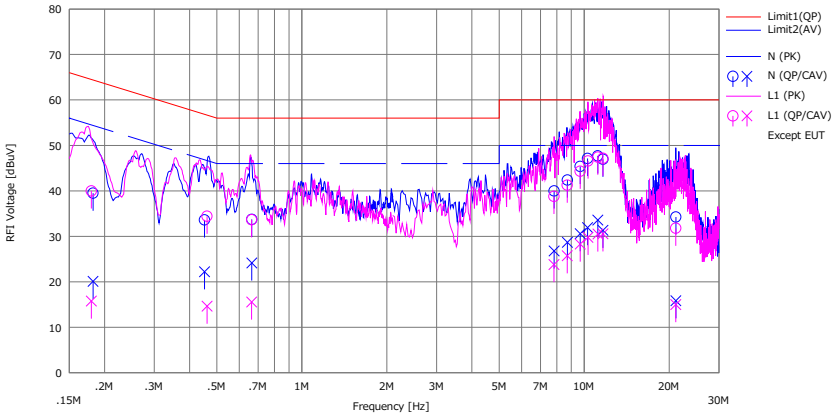
DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/14

Mode : Tx_3DH5_2480 MHz

Power : AC 240 V / 60 Hz (EUT Input: DC 5 V)
Temp./Humi. : 23 deg.C / 40 %RH

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		(QP)	(CAV)		(QP)	(CAV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.18205	26.90	7.50	12.59	39.49	20.09	64.39	54.39	24.9	34.3	N	
2	0.45185	21.00	9.60	12.61	33.61	22.21	56.84	46.84	23.2	24.6	N	
3	0.66456	21.10	11.50	12.63	33.73	24.13	56.00	46.00	22.2	21.8	N	
4	7.82779	26.70	13.50	13.29	39.99	26.79	60.00	50.00	20.0	23.2	N	
5	8.71849	29.00	15.30	13.38	42.38	28.68	60.00	50.00	17.6	21.3	N	
6	9.67680	31.90	17.10	13.47	45.37	30.57	60.00	50.00	14.6	19.4	N	
7	10.27444	33.60	18.40	13.52	47.12	31.92	60.00	50.00	12.8	18.0	N	
8	11.16621	34.10	20.00	13.60	47.70	33.60	60.00	50.00	12.3	16.4	N	
9	11.64980	33.30	17.70	13.64	46.94	31.34	60.00	50.00	13.0	18.6	N	
10	21.11698	20.00	1.60	14.25	34.25	15.85	60.00	50.00	25.7	34.1	N	
11	0.17956	27.40	3.20	12.58	39.98	15.78	64.51	54.51	24.5	38.7	L1	
12	0.46144	21.80	2.00	12.63	34.43	14.63	56.67	46.67	22.2	32.0	L1	
13	0.66346	21.00	2.90	12.65	33.65	15.55	56.00	46.00	22.3	30.4	L1	
14	7.81401	25.60	10.60	13.19	38.79	23.79	60.00	50.00	21.2	26.2	L1	
15	8.70947	28.00	12.50	13.25	41.25	25.75	60.00	50.00	18.7	24.2	L1	
16	9.67528	31.00	15.00	13.32	44.32	28.32	60.00	50.00	15.6	21.6	L1	
17	10.31408	33.20	16.40	13.37	46.57	29.77	60.00	50.00	13.4	20.2	L1	
18	11.17858	34.00	17.10	13.42	47.42	30.52	60.00	50.00	12.5	19.4	L1	
19	11.64597	33.70	17.10	13.45	47.15	30.55	60.00	50.00	12.8	19.4	L1	
20	21.10079	17.80	1.00	13.99	31.79	14.99	60.00	50.00	28.2	35.0	L1	

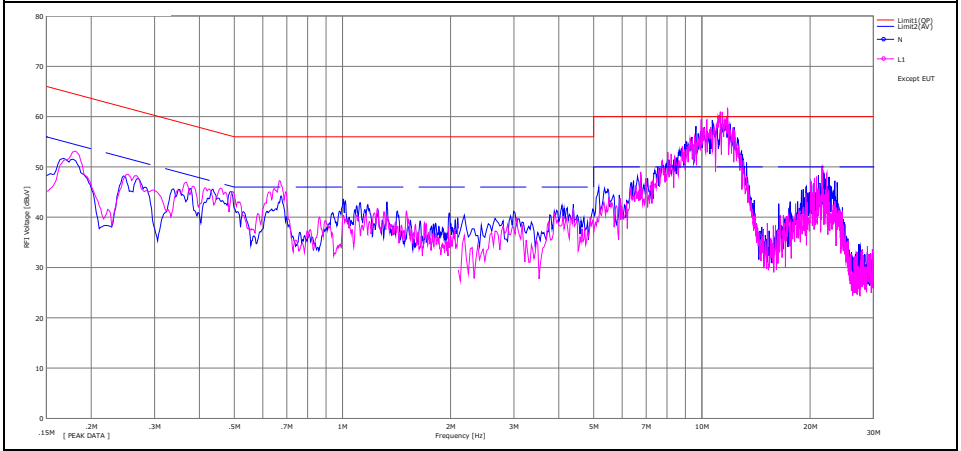
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN): SLS-02

Conducted Emission

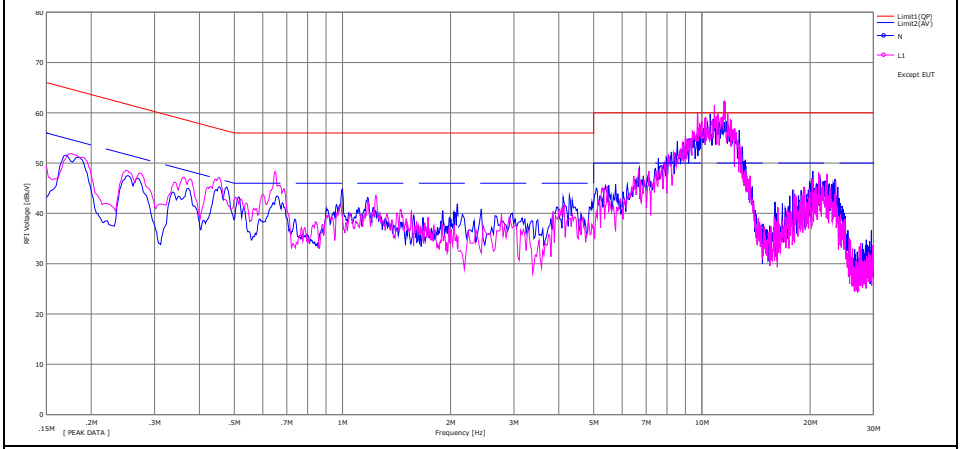
(DC 5.0 V line)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded room
Date	May 14, 2020
Temperature / Humidity	23 deg. C / 40 % RH
Engineer	Yasumasa Owaki
Mode	Tx DH5

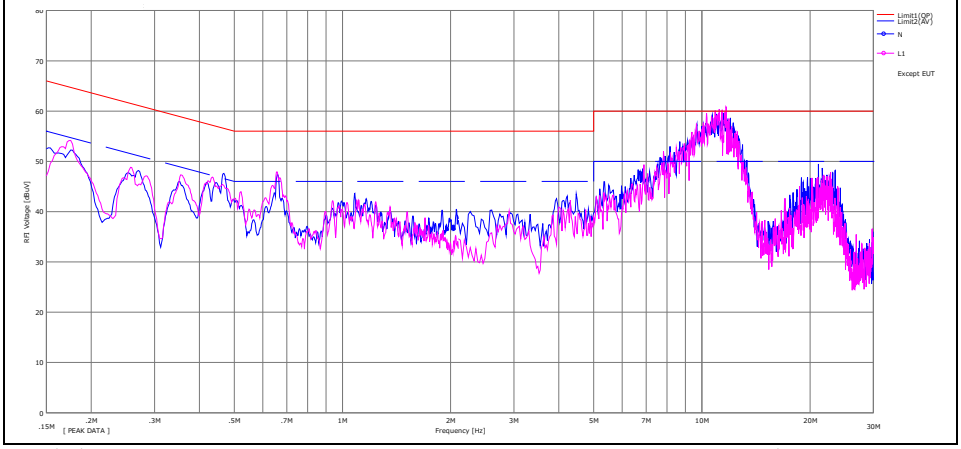
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

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

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, Tx, Hopping On

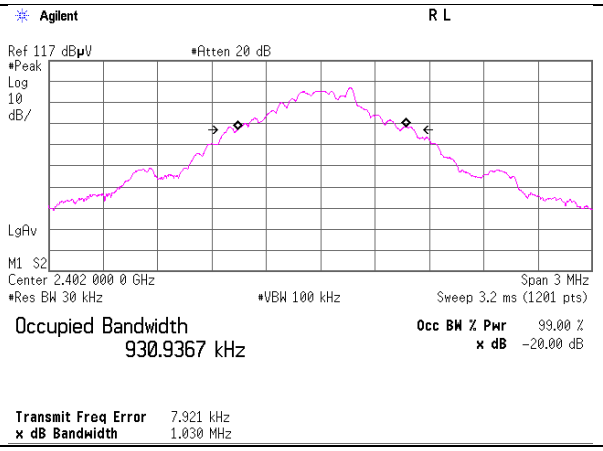
Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.030	930.937	1.000	>= 0.687
DH5	2441.0	1.031	932.905	1.000	>= 0.687
DH5	2480.0	1.026	930.288	1.000	>= 0.684
DH5	Hopping On	-	78651.0	-	-
3DH5	2402.0	1.315	1211.2	1.000	>= 0.877
3DH5	2441.0	1.314	1214.9	1.000	>= 0.876
3DH5	2480.0	1.318	1236.2	1.000	>= 0.878
3DH5	Hopping On	-	78836.7	-	-

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

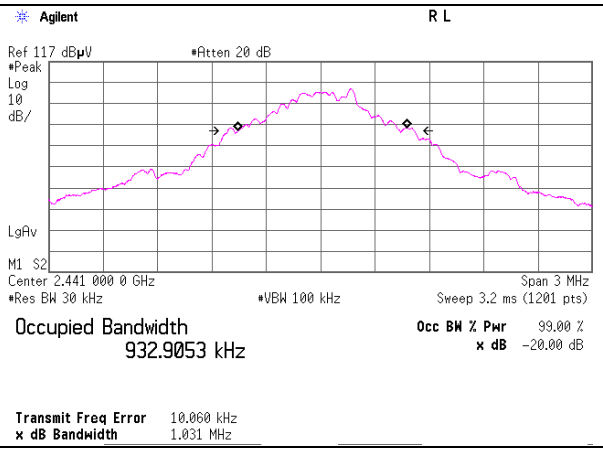
20 dB Bandwidth and 99 % Occupied Bandwidth

DH5

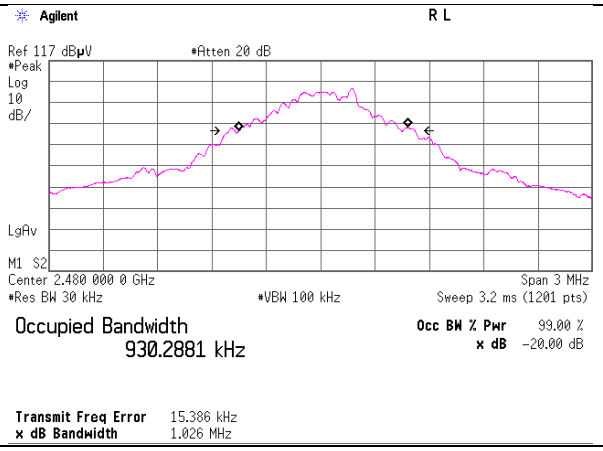
2402 MHz



2441 MHz

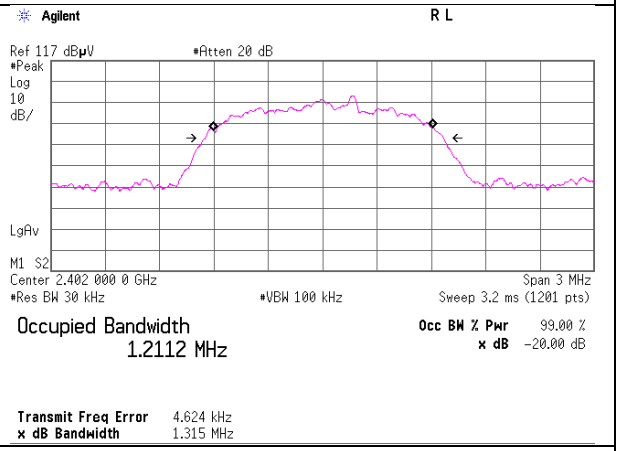


2480 MHz

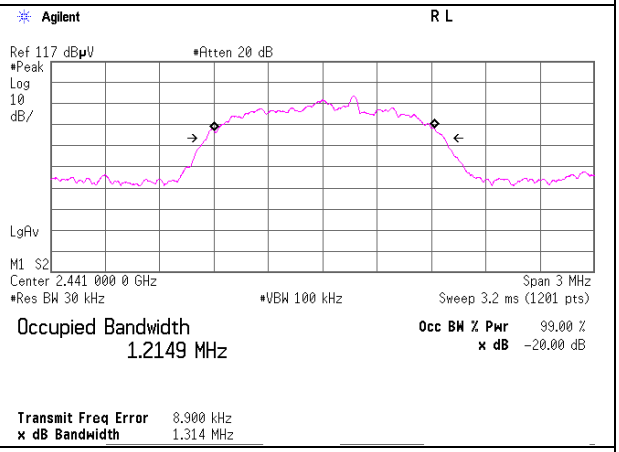


3DH5

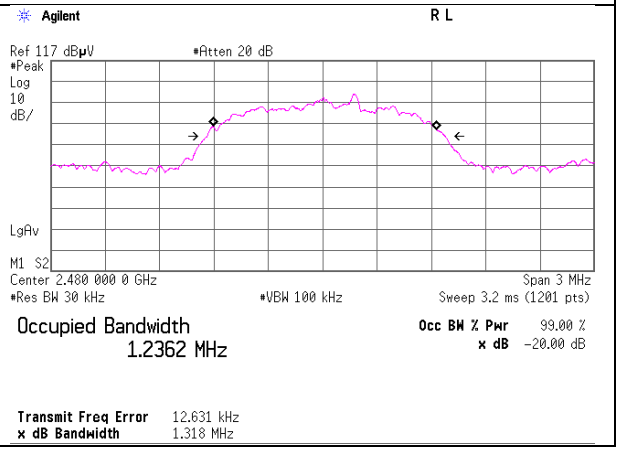
2402 MHz



2441 MHz

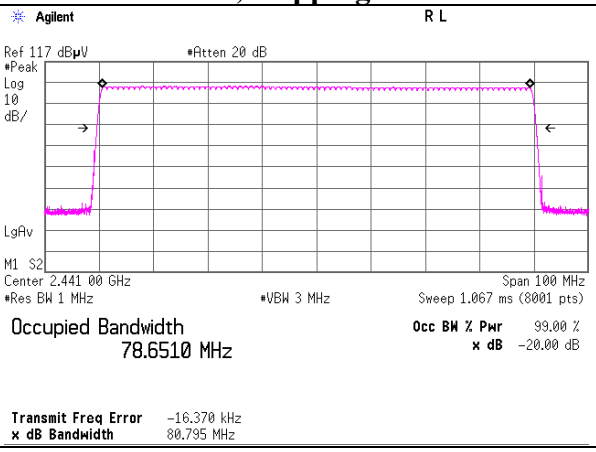


2480 MHz

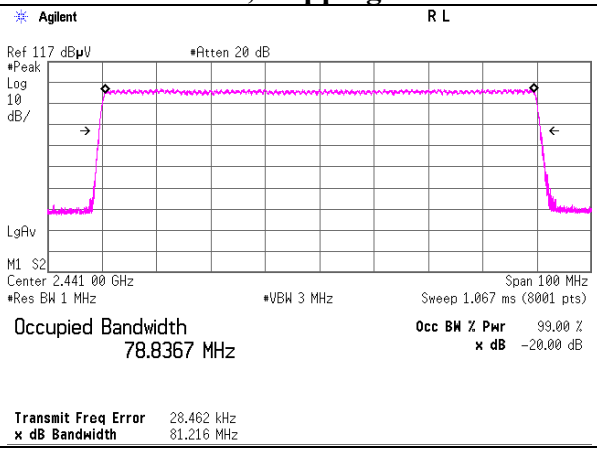


20 dB Bandwidth and 99 % Occupied Bandwidth

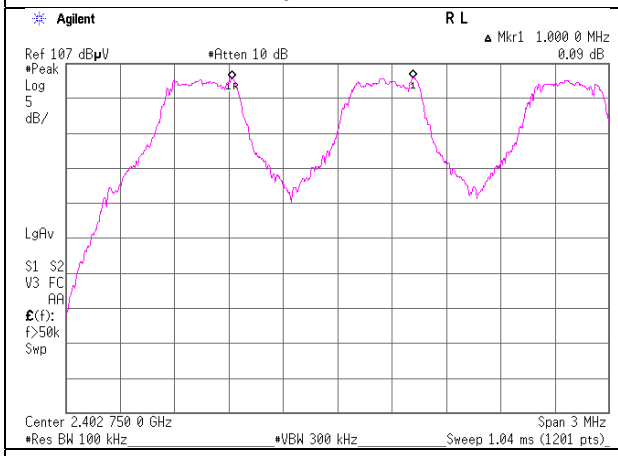
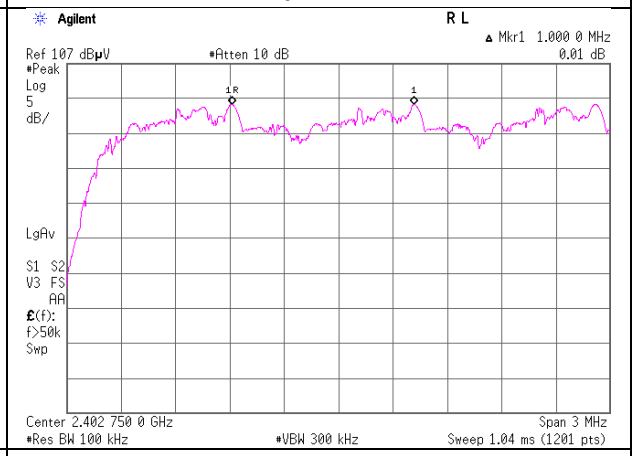
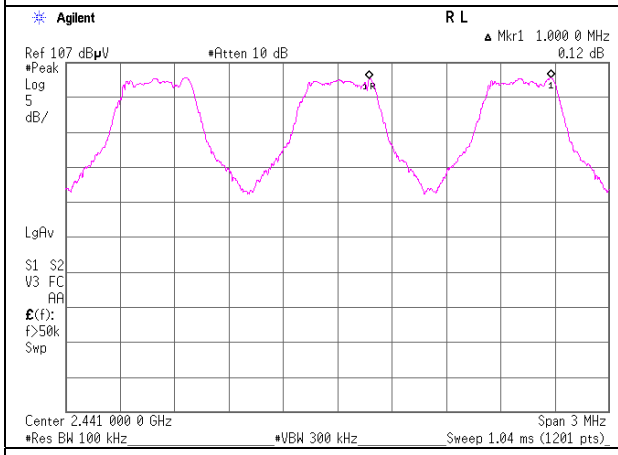
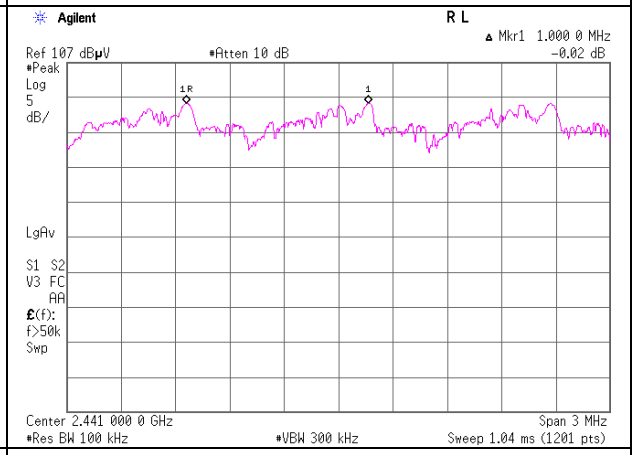
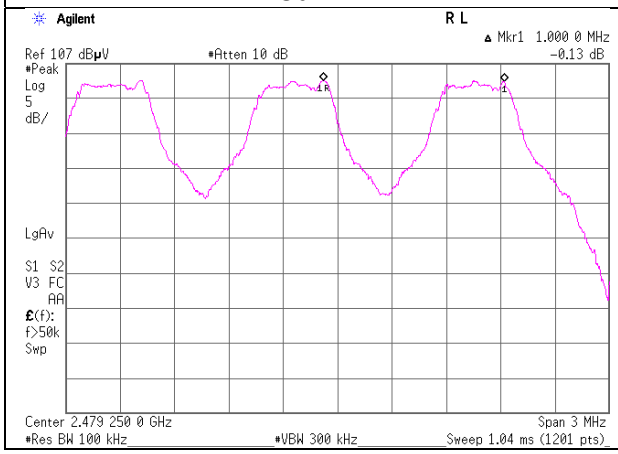
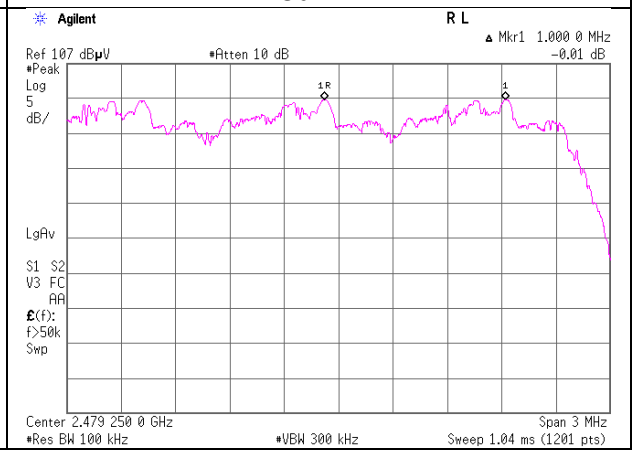
DH5, Hopping On



3DH5, Hopping On



Carrier Frequency Separation

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

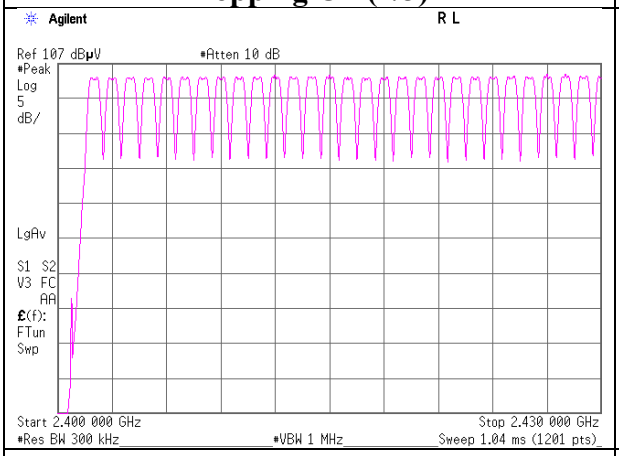
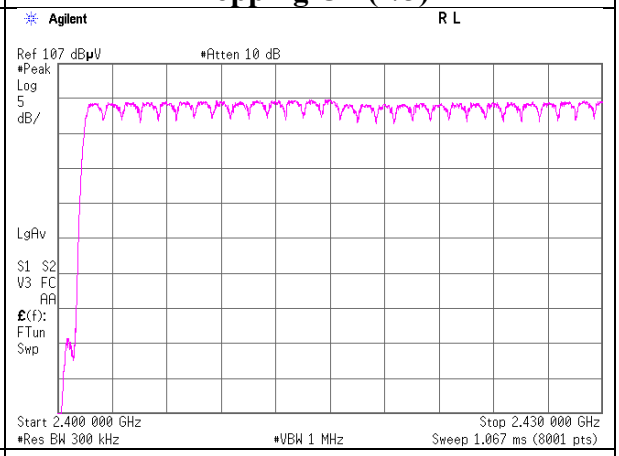
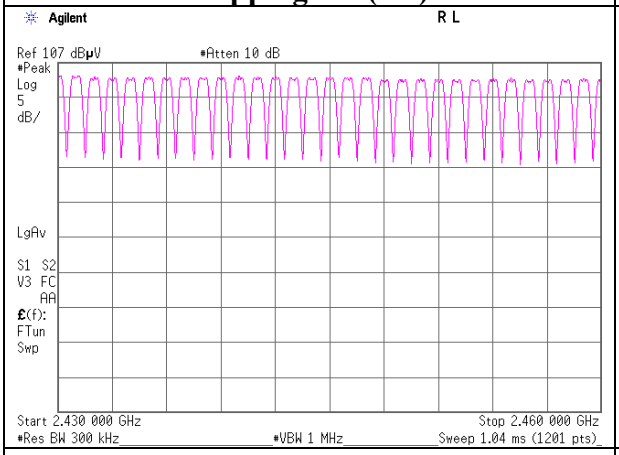
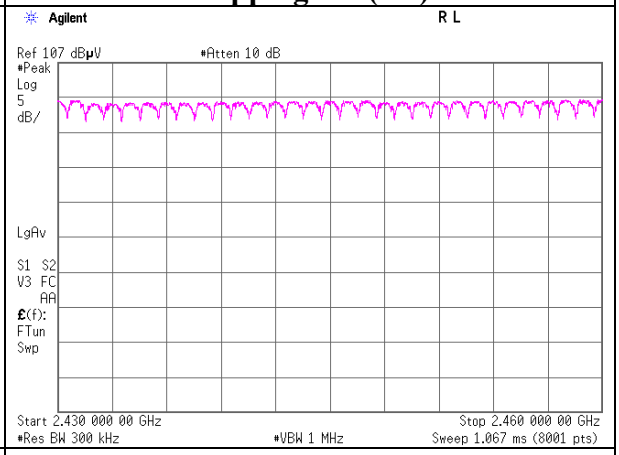
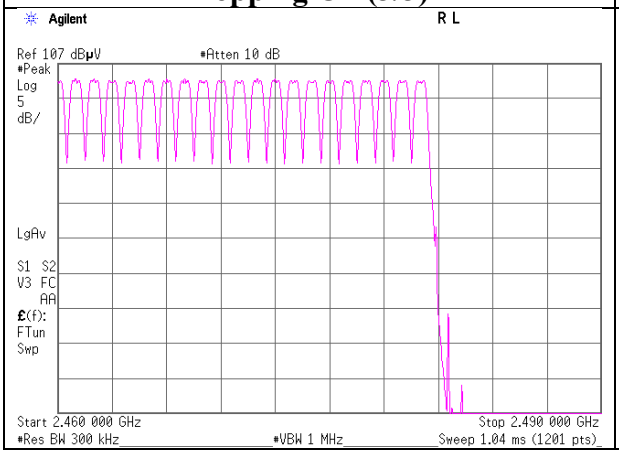
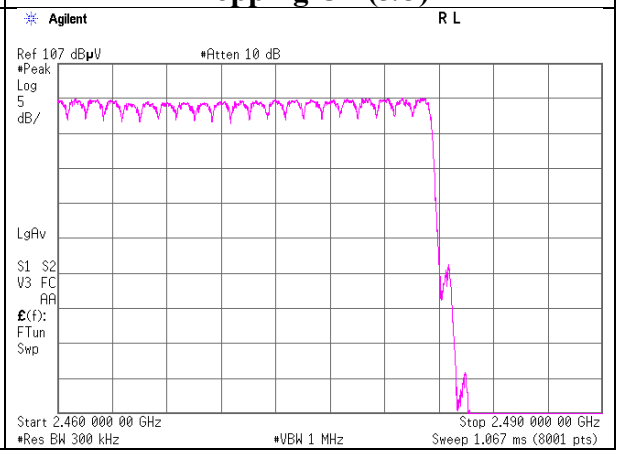
Number of Hopping Frequency

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping On

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

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

Number of Hopping Frequency

DH5	3DH5
Hopping On (1/3)	Hopping On (1/3)
	
Hopping On (2/3)	Hopping On (2/3)
	
Hopping On (3/3)	Hopping On (3/3)
	

Dwell time

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second period	Length of transmission [ms]	Result [ms]	Limit [ms]
DH1	49.8 times / 5 s x 31.6 s = 315 times	0.421	132.7	400
DH3	26.6 times / 5 s x 31.6 s = 169 times	1.679	283.8	400
DH5	20.0 times / 5 s x 31.6 s = 127 times	2.928	371.9	400
3DH1	50.8 times / 5 s x 31.6 s = 322 times	0.427	137.5	400
3DH3	28.6 times / 5 s x 31.6 s = 181 times	1.680	304.1	400
3DH5	20.2 times / 5 s x 31.6 s = 128 times	2.930	375.0	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.

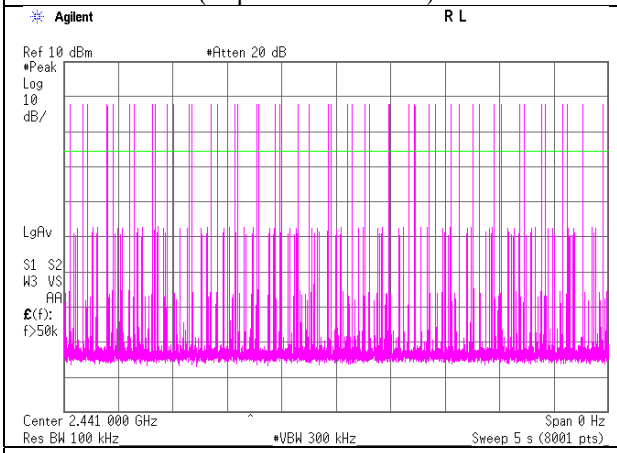
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	49	50	51	50	49.8
DH3	28	25	23	30	27	26.6
DH5	19	21	21	21	18	20.0
3DH1	52	50	51	52	49	50.8
3DH3	29	23	29	33	29	28.6
3DH5	20	19	20	21	21	20.2

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

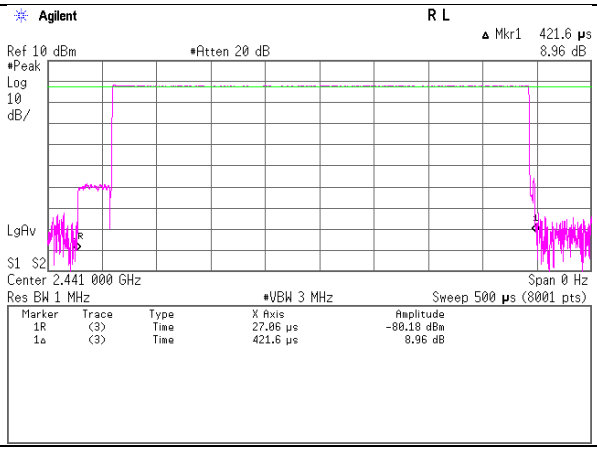
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless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

Dwell time

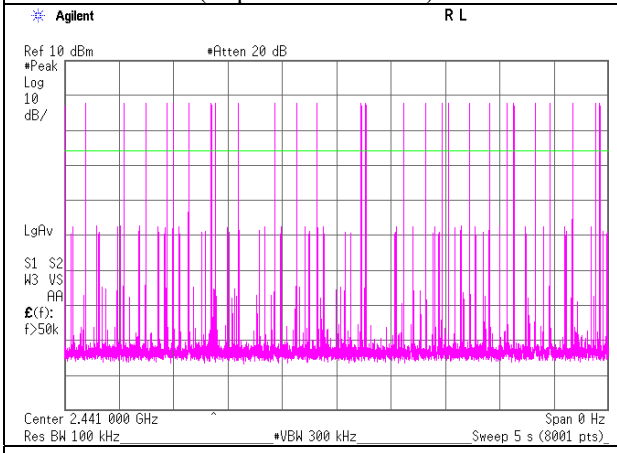
DH1 (1/2)
(Representative chart)



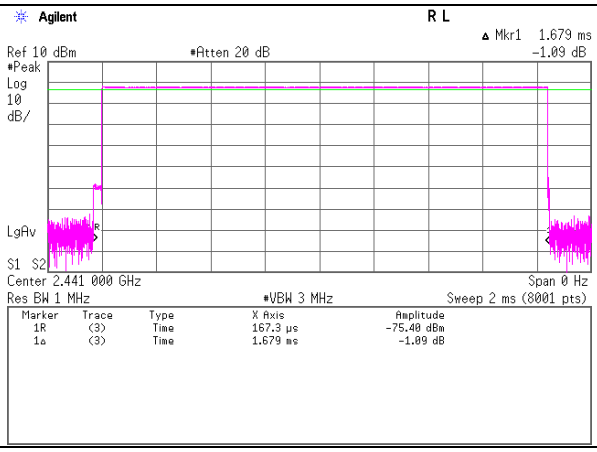
DH1 (2/2)



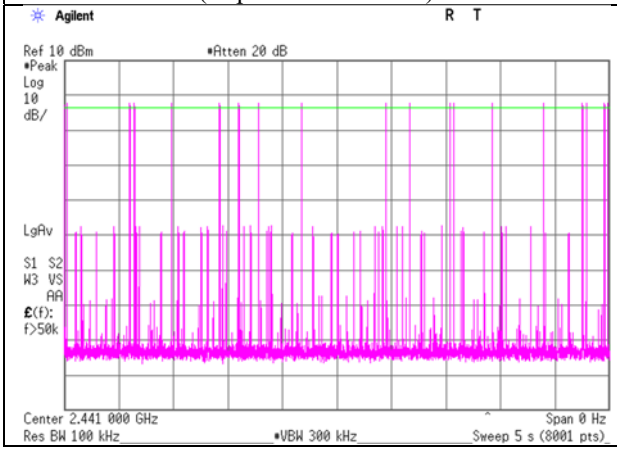
DH3 (1/2)
(Representative chart)



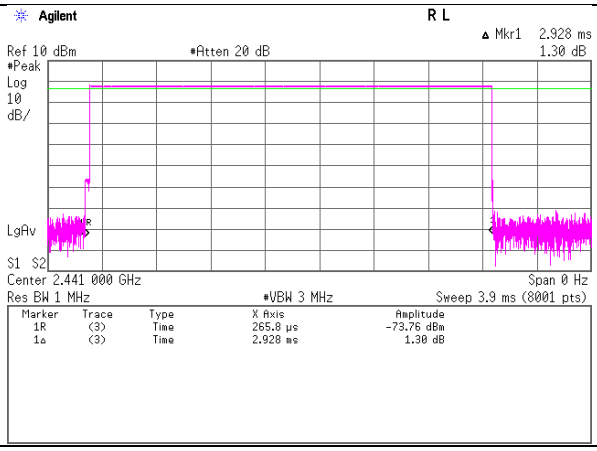
DH3 (2/2)



DH5 (1/2)
(Representative chart)

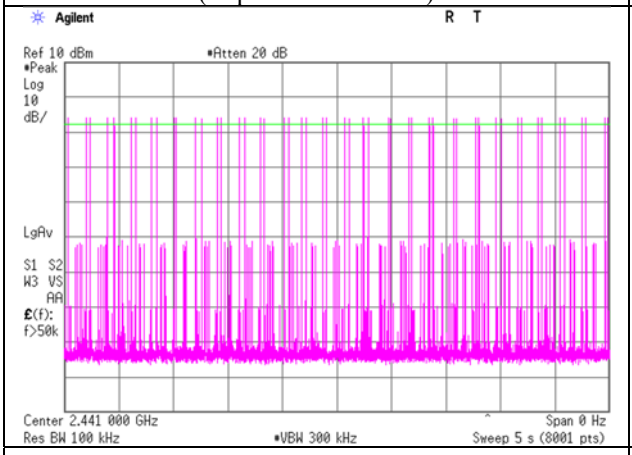


DH5 (2/2)

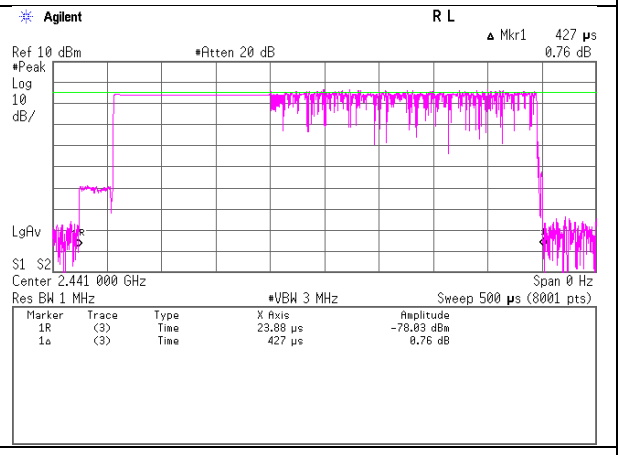


Dwell time

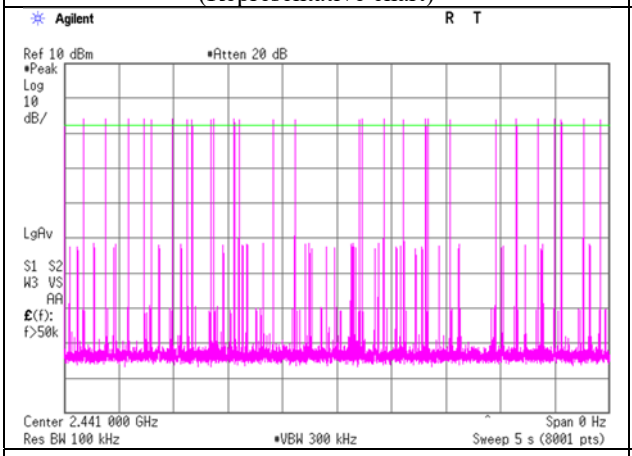
3DH1 (1/2)
(Representative chart)



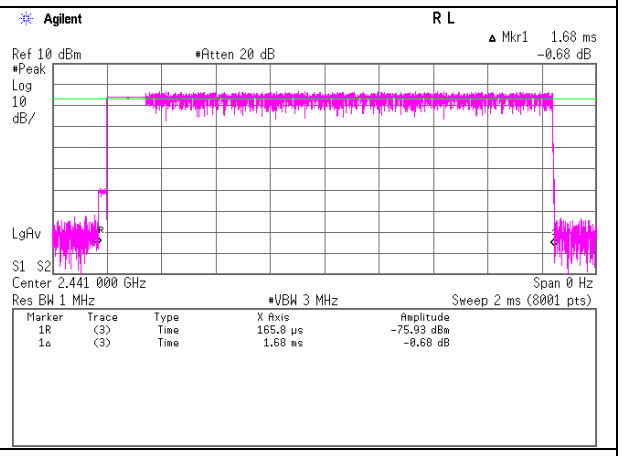
3DH1 (2/2)



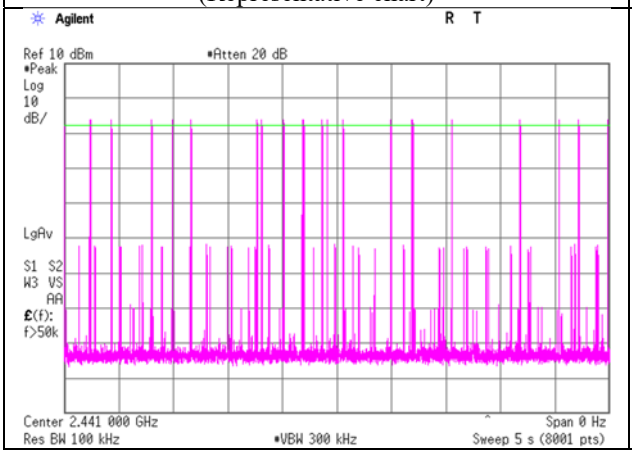
3DH3 (1/2)
(Representative chart)



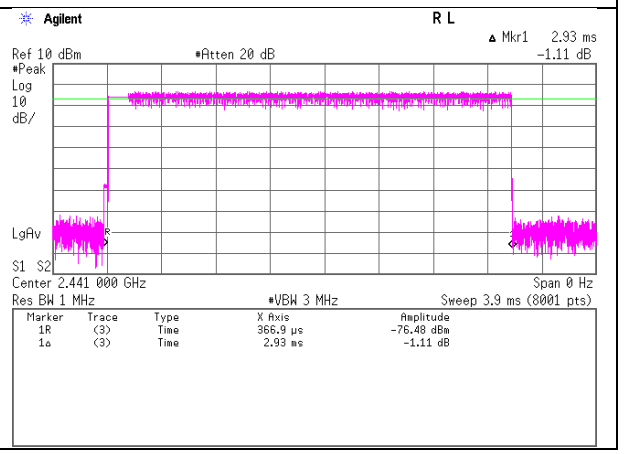
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 21, 2020
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off

					Conducted Power					e.i.r.p. for RSS-247					
Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-1.79	1.43	9.63	**9.27**	8.45	20.96	125	**11.69**	-3.70	**5.57**	3.61	36.02	4000	**30.45**
DH5	2441.0	-1.88	1.44	9.63	9.19	8.30	20.96	125	11.77	-3.70	5.49	3.54	36.02	4000	30.53
DH5	2480.0	-2.04	1.46	9.63	9.05	8.04	20.96	125	11.91	-3.70	5.35	3.43	36.02	4000	30.67
2DH5	2402.0	-3.12	1.43	9.63	7.94	6.22	20.96	125	13.02	-3.70	4.24	2.65	36.02	4000	31.78
2DH5	2441.0	-3.13	1.44	9.63	7.94	6.22	20.96	125	13.02	-3.70	4.24	2.65	36.02	4000	31.78
2DH5	2480.0	-2.86	1.46	9.63	8.23	6.65	20.96	125	12.73	-3.70	4.53	2.84	36.02	4000	31.49
3DH5	2402.0	-2.96	1.43	9.63	8.10	6.46	20.96	125	12.86	-3.70	4.40	2.75	36.02	4000	31.62
3DH5	2441.0	-2.97	1.44	9.63	8.10	6.46	20.96	125	12.86	-3.70	4.40	2.75	36.02	4000	31.62
3DH5	2480.0	-2.76	1.46	9.63	8.33	6.81	20.96	125	12.63	-3.70	4.63	2.90	36.02	4000	31.39

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

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

Average Output Power
(Reference data for RF Exposure)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 21, 2020
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402.0	-3.37	1.43	9.63	7.69	5.87	1.07	8.76	7.52
DH5	2441.0	-3.52	1.44	9.63	7.55	5.69	1.07	8.62	7.28
DH5	2480.0	-3.78	1.46	9.63	7.31	5.38	1.07	8.38	6.89
2DH5	2402.0	-6.99	1.43	9.63	4.07	2.55	1.07	5.14	3.27
2DH5	2441.0	-6.85	1.44	9.63	4.22	2.64	1.07	5.29	3.38
2DH5	2480.0	-6.14	1.46	9.63	4.95	3.13	1.07	6.02	4.00
3DH5	2402.0	-6.98	1.43	9.63	4.08	2.56	1.07	5.15	3.27
3DH5	2441.0	-6.84	1.44	9.63	4.23	2.65	1.07	5.30	3.39
3DH5	2480.0	-6.13	1.46	9.63	4.96	3.13	1.07	6.03	4.01

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

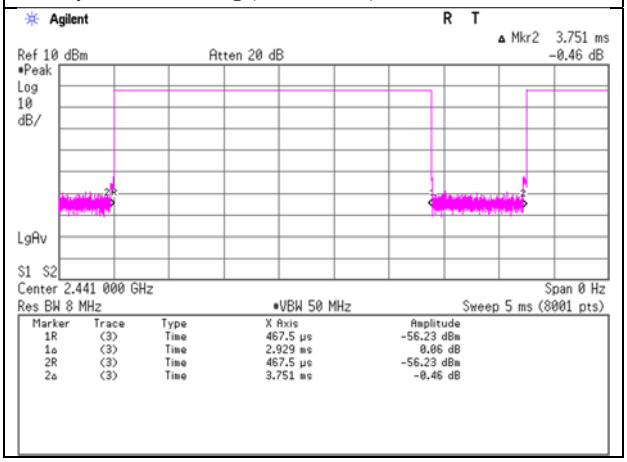
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 21, 2020
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off

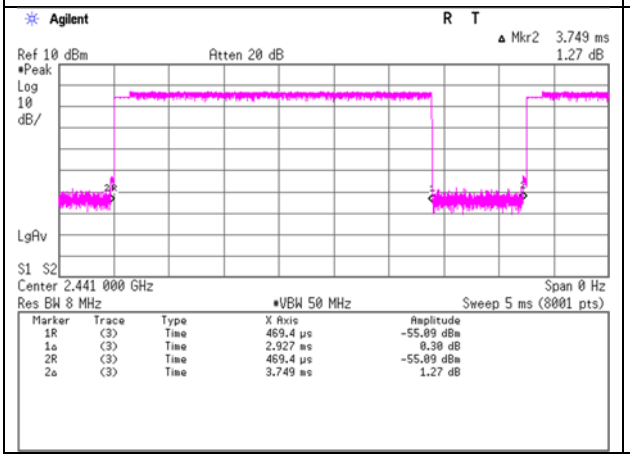
DH5

Tx on / (Tx on + Tx off) =	0.781
Tx on / (Tx on + Tx off) * 100 =	78.1 %
Duty factor = 10 * log (3.751 / 2.929) =	1.07 dB



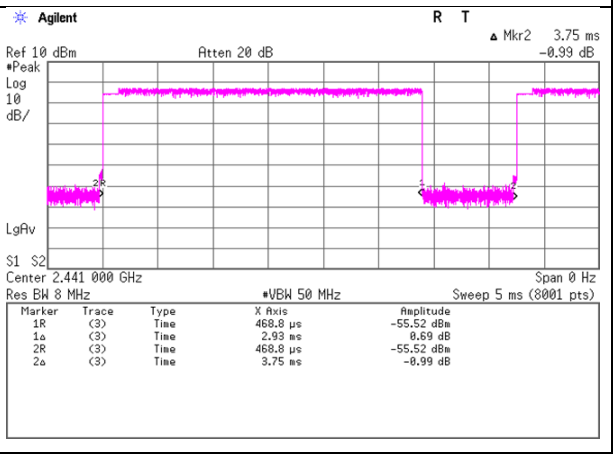
2DH5

Tx on / (Tx on + Tx off) =	0.781
Tx on / (Tx on + Tx off) * 100 =	78.1 %
Duty factor = 10 * log (3.749 / 2.927) =	1.07 dB



3DH5

Tx on / (Tx on + Tx off) =	0.781
Tx on / (Tx on + Tx off) * 100 =	78.1 %
Duty factor = 10 * log (3.75 / 2.93) =	1.07 dB



Radiated Spurious Emission

Report No.	13282402S-A-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	April 27, 2020	April 23, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	21 deg. C / 31 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	30.776	QP	22.20	18.33	6.47	32.18	0.00	14.82	40.0	25.1	100	0	
Hori.	926.148	QP	20.10	21.98	10.90	30.84	0.00	22.14	46.0	23.8	100	0	
Hori.	2390.000	PK	47.40	28.33	14.07	41.66	2.41	50.55	73.9	23.3	108	139	
Hori.	4804.000	PK	48.95	31.62	6.58	42.92	2.41	46.64	73.9	27.2	107	160	
Hori.	7206.000	PK	47.67	37.23	8.08	43.39	2.41	52.00	73.9	21.9	108	5	
Hori.	9608.000	PK	47.25	38.84	9.21	43.14	2.41	54.57	73.9	19.3	150	0	
Hori.	2390.000	AV	35.52	28.33	14.07	41.66	2.41	38.67	53.9	15.2	108	139	VBW: 360 Hz
Hori.	4804.000	AV	39.20	31.62	6.58	42.92	2.41	36.89	53.9	17.0	107	160	VBW: 360 Hz
Hori.	7206.000	AV	35.58	37.23	8.08	43.39	2.41	39.91	53.9	13.9	108	5	VBW: 360 Hz
Hori.	9608.000	AV	34.72	38.84	9.21	43.14	2.41	42.04	53.9	**11.8**	150	0	VBW: 360 Hz
Vert.	30.203	QP	22.20	18.55	6.45	32.18	0.00	15.02	40.0	24.9	100	0	
Vert.	66.438	QP	31.10	6.95	6.55	32.15	0.00	12.45	40.0	27.5	100	249	
Vert.	68.182	QP	31.80	6.75	6.65	32.15	0.00	13.05	40.0	26.9	100	149	
Vert.	68.771	QP	31.50	6.64	6.68	32.15	0.00	12.67	40.0	27.3	100	195	
Vert.	69.348	QP	31.00	6.56	6.72	32.15	0.00	12.13	40.0	27.8	100	149	
Vert.	69.352	QP	31.00	6.56	6.72	32.15	0.00	12.13	40.0	27.8	100	161	
Vert.	69.931	QP	30.40	6.51	6.75	32.15	0.00	11.51	40.0	28.4	100	123	
Vert.	917.179	QP	20.20	21.98	10.87	30.91	0.00	22.14	46.0	23.8	100	0	
Vert.	2390.000	PK	46.50	28.33	14.07	41.66	2.41	49.65	73.9	24.2	109	148	
Vert.	4804.000	PK	48.50	31.62	6.58	42.92	2.41	46.19	73.9	27.7	255	273	
Vert.	7206.000	PK	48.55	37.23	8.08	43.39	2.41	52.88	73.9	21.0	398	87	
Vert.	9608.000	PK	47.02	38.84	9.21	43.14	2.41	54.34	73.9	19.5	150	0	
Vert.	2390.000	AV	35.50	28.33	14.07	41.66	2.41	38.65	53.9	15.2	109	148	VBW: 360 Hz
Vert.	4804.000	AV	38.23	31.62	6.58	42.92	2.41	35.92	53.9	17.9	255	273	VBW: 360 Hz
Vert.	7206.000	AV	36.58	37.23	8.08	43.39	2.41	40.91	53.9	12.9	398	87	VBW: 360 Hz
Vert.	9608.000	AV	34.62	38.84	9.21	43.14	2.41	41.94	53.9	11.9	150	0	VBW: 360 Hz

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.96 m / 3.0 m) = 2.41 dB
13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

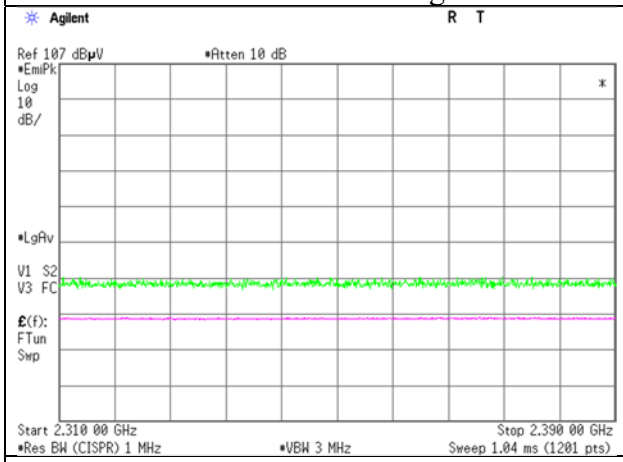
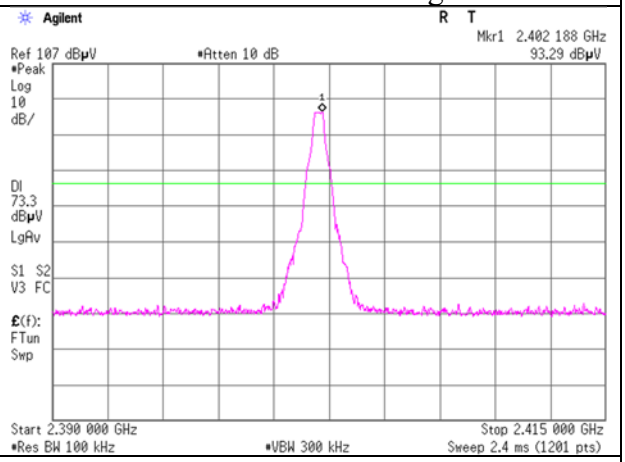
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

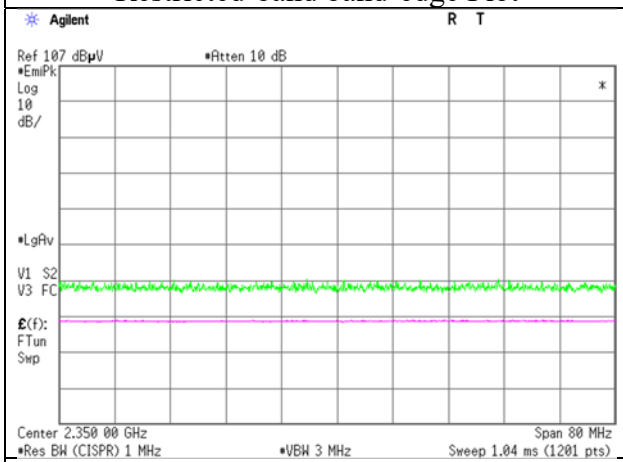
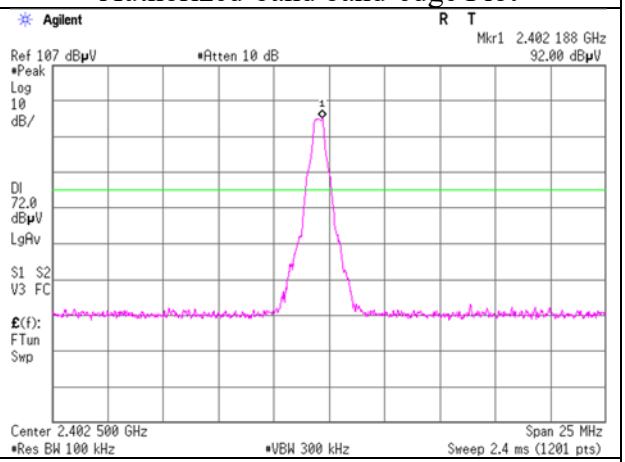
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	93.36	28.31	14.08	41.67	2.41	96.49	-	-	Carrier
Hori.	2400.000	PK	40.35	28.31	14.07	41.67	2.41	43.47	76.49	33.0	
Vert.	2402.000	PK	92.00	28.31	14.08	41.67	2.41	95.13	-	-	Carrier
Vert.	2400.000	PK	39.83	28.31	14.07	41.67	2.41	42.95	75.13	32.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.96 m / 3.0 m) = 2.41 dB
13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 23, 2020
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz

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

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

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

Radiated Spurious Emission

	13282402S-A-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	April 27, 2020	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	31.354	QP	22.10	18.08	6.48	32.18	0.00	14.48	40.0	25.5	100	0	
Hori.	67.733	QP	21.90	6.80	6.62	32.15	0.00	3.17	40.0	36.8	100	0	
Hori.	872.001	QP	20.40	21.94	10.74	31.20	0.00	21.88	46.0	24.1	100	0	
Hori.	4882.000	PK	49.25	31.71	6.62	42.93	2.41	47.06	73.9	26.8	113	160	
Hori.	7323.000	PK	48.92	37.39	8.15	43.49	2.41	53.38	73.9	20.5	121	356	
Hori.	9764.000	PK	47.44	39.34	9.32	42.96	2.41	55.55	73.9	18.3	150	0	
Hori.	4882.000	AV	39.45	31.71	6.62	42.93	2.41	37.26	53.9	16.6	113	160	VBW: 360 Hz
Hori.	7323.000	AV	37.27	37.39	8.15	43.49	2.41	41.73	53.9	12.1	121	356	VBW: 360 Hz
Hori.	9764.000	AV	36.35	39.34	9.32	42.96	2.41	44.46	53.9	**9.4**	150	0	VBW: 360 Hz
Vert.	30.406	QP	22.20	18.47	6.45	32.18	0.00	14.94	40.0	25.0	100	0	
Vert.	62.952	QP	26.70	7.65	6.49	32.15	0.00	8.69	40.0	31.3	100	149	
Vert.	64.705	QP	29.00	7.28	6.47	32.15	0.00	10.60	40.0	29.4	100	203	
Vert.	65.286	QP	29.80	7.18	6.48	32.15	0.00	11.31	40.0	28.6	100	189	
Vert.	68.171	QP	31.60	6.76	6.65	32.15	0.00	12.86	40.0	27.1	100	158	
Vert.	68.811	QP	31.30	6.63	6.68	32.15	0.00	12.46	40.0	27.5	100	191	
Vert.	70.535	QP	29.20	6.43	6.80	32.15	0.00	10.28	40.0	29.7	100	218	
Vert.	908.923	QP	20.30	21.94	10.85	30.98	0.00	22.11	46.0	23.8	100	0	
Vert.	4882.000	PK	48.85	31.71	6.62	42.93	2.41	46.66	73.9	27.2	315	290	
Vert.	7323.000	PK	49.44	37.39	8.15	43.49	2.41	53.90	73.9	20.0	338	68	
Vert.	9764.000	PK	46.98	39.34	9.32	42.96	2.41	55.09	73.9	18.8	150	0	
Vert.	4882.000	AV	38.64	31.71	6.62	42.93	2.41	36.45	53.9	17.4	315	290	VBW: 360 Hz
Vert.	7323.000	AV	37.86	37.39	8.15	43.49	2.41	42.32	53.9	11.5	338	68	VBW: 360 Hz
Vert.	9764.000	AV	36.22	39.34	9.32	42.96	2.41	44.33	53.9	9.5	150	0	VBW: 360 Hz

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.96 m / 3.0 m) = 2.41 dB
13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission

	13282402S-A-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	April 27, 2020	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	30.573	QP	22.20	18.41	6.46	32.18	0.00	14.89	40.0	25.1	100	0	
Hori.	932.528	QP	20.00	21.95	10.92	30.79	0.00	22.08	46.0	23.9	100	0	
Hori.	2483.500	PK	54.22	28.24	14.16	41.69	2.41	57.34	73.9	16.5	260	131	
Hori.	4960.000	PK	48.97	31.96	6.67	42.94	2.41	47.07	73.9	26.8	114	158	
Hori.	7440.000	PK	49.74	37.56	8.21	43.60	2.41	54.32	73.9	19.5	122	356	
Hori.	9920.000	PK	47.86	39.18	9.42	42.78	2.41	56.09	73.9	17.8	150	0	
Hori.	2483.500	AV	35.96	28.24	14.16	41.69	2.41	39.08	53.9	14.8	260	131	VBW: 360 Hz
Hori.	4960.000	AV	38.35	31.96	6.67	42.94	2.41	36.45	53.9	17.4	114	158	VBW: 360 Hz
Hori.	7440.000	AV	40.02	37.56	8.21	43.60	2.41	44.60	53.9	9.3	122	356	VBW: 360 Hz
Hori.	9920.000	AV	35.92	39.18	9.42	42.78	2.41	44.15	53.9	9.7	150	0	VBW: 360 Hz
Vert.	33.206	QP	21.70	17.36	6.52	32.18	0.00	13.40	40.0	26.6	100	0	
Vert.	65.876	QP	29.80	7.06	6.52	32.15	0.00	11.23	40.0	28.7	100	227	
Vert.	66.449	QP	30.50	6.95	6.55	32.15	0.00	11.85	40.0	28.1	100	112	
Vert.	68.786	QP	31.10	6.63	6.68	32.15	0.00	12.26	40.0	27.7	100	159	
Vert.	69.355	QP	31.00	6.56	6.72	32.15	0.00	12.13	40.0	27.8	100	238	
Vert.	69.965	QP	30.70	6.50	6.75	32.15	0.00	11.80	40.0	28.2	100	126	
Vert.	953.198	QP	19.90	22.06	10.99	30.61	0.00	22.34	46.0	23.6	100	0	
Vert.	2483.500	PK	53.04	28.24	14.16	41.69	2.41	56.16	73.9	17.7	114	209	
Vert.	4960.000	PK	48.77	31.96	6.67	42.94	2.41	46.87	73.9	27.0	244	260	
Vert.	7440.000	PK	49.87	37.56	8.21	43.60	2.41	54.45	73.9	19.4	399	77	
Vert.	9920.000	PK	47.75	39.18	9.42	42.78	2.41	55.98	73.9	17.9	150	0	
Vert.	2483.500	AV	35.84	28.24	14.16	41.69	2.41	38.96	53.9	14.9	114	209	VBW: 360 Hz
Vert.	4960.000	AV	38.09	31.96	6.67	42.94	2.41	36.19	53.9	17.7	244	260	VBW: 360 Hz
Vert.	7440.000	AV	40.23	37.56	8.21	43.60	2.41	44.81	53.9	**9.0**	399	77	VBW: 360 Hz
Vert.	9920.000	AV	35.98	39.18	9.42	42.78	2.41	44.21	53.9	9.6	150	0	VBW: 360 Hz

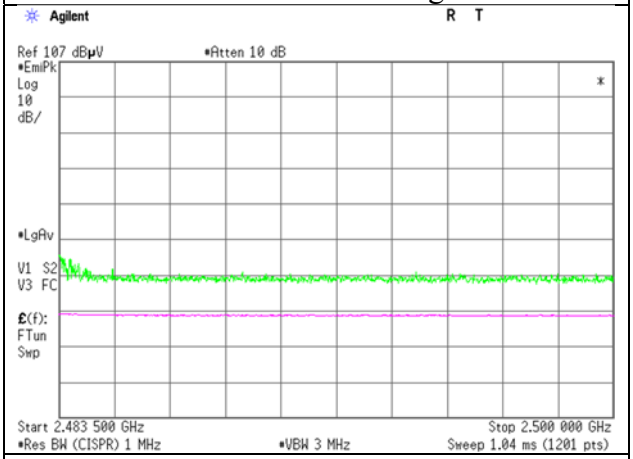
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.96 m / 3.0 m) = 2.41 dB
13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 23, 2020
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

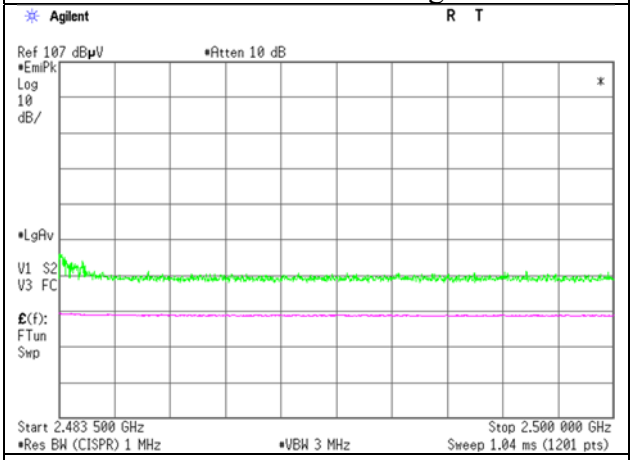
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Report No.	13282402S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 27, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	31.925	QP	22.00	17.82	6.49	32.18	0.00	14.13	40.0	25.8	100	0	
Hori.	874.004	QP	20.40	21.94	10.74	31.19	0.00	21.89	46.0	24.1	100	0	
Hori.	2390.000	PK	47.52	28.33	14.07	41.66	2.41	50.67	73.9	23.2	108	154	
Hori.	4804.000	PK	48.38	31.62	6.58	42.92	2.41	46.07	73.9	27.8	137	161	
Hori.	7206.000	PK	48.47	37.23	8.08	43.39	2.41	52.80	73.9	21.1	150	0	
Hori.	9608.000	PK	49.42	38.84	9.21	43.14	2.41	56.74	73.9	17.1	150	0	
Hori.	2390.000	AV	35.42	28.33	14.07	41.66	2.41	38.57	53.9	15.3	108	154	VBW: 360 Hz
Hori.	4804.000	AV	37.42	31.62	6.58	42.92	2.41	35.11	53.9	18.7	137	161	VBW: 360 Hz
Hori.	7206.000	AV	37.32	37.23	8.08	43.39	2.41	41.65	53.9	12.2	150	0	VBW: 360 Hz
Hori.	9608.000	AV	36.03	38.84	9.21	43.14	2.41	43.35	53.9	10.5	150	0	VBW: 360 Hz
Vert.	31.687	QP	22.00	17.93	6.48	32.18	0.00	14.23	40.0	25.7	100	0	
Vert.	67.058	QP	31.20	6.84	6.59	32.15	0.00	12.48	40.0	27.5	100	216	
Vert.	67.598	QP	32.70	6.81	6.61	32.15	0.00	13.97	40.0	26.0	100	156	
Vert.	68.173	QP	30.80	6.76	6.65	32.15	0.00	12.06	40.0	27.9	100	248	
Vert.	68.783	QP	31.10	6.63	6.68	32.15	0.00	12.26	40.0	27.7	100	209	
Vert.	69.944	QP	31.00	6.51	6.75	32.15	0.00	12.11	40.0	27.8	100	204	
Vert.	948.550	QP	19.90	22.03	10.98	30.66	0.00	22.25	46.0	23.7	100	0	
Vert.	2390.000	PK	47.15	28.33	14.07	41.66	2.41	50.30	73.9	23.6	114	220	
Vert.	4804.000	PK	47.85	31.62	6.58	42.92	2.41	45.54	73.9	28.3	225	277	
Vert.	7206.000	PK	49.04	37.23	8.08	43.39	2.41	53.37	73.9	20.5	150	0	
Vert.	9608.000	PK	49.07	38.84	9.21	43.14	2.41	56.39	73.9	17.5	150	0	
Vert.	2390.000	AV	35.58	28.33	14.07	41.66	2.41	38.73	53.9	15.1	114	220	VBW: 360 Hz
Vert.	4804.000	AV	37.13	31.62	6.58	42.92	2.41	34.82	53.9	19.0	225	277	VBW: 360 Hz
Vert.	7206.000	AV	36.64	37.23	8.08	43.39	2.41	40.97	53.9	12.9	150	0	VBW: 360 Hz
Vert.	9608.000	AV	36.11	38.84	9.21	43.14	2.41	43.43	53.9	**10.4**	150	0	VBW: 360 Hz

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.96 m / 3.0 m) = 2.41 dB
13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

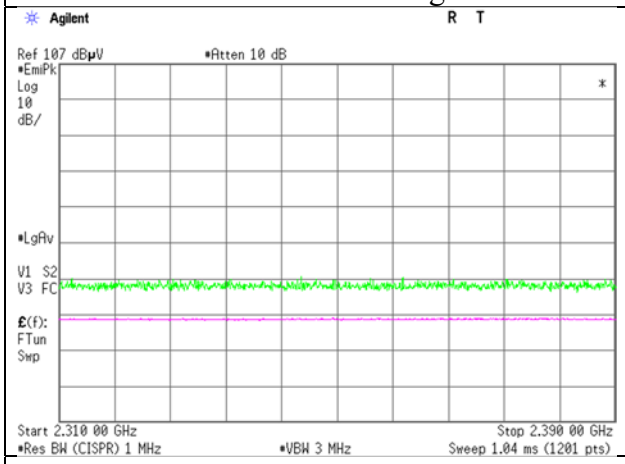
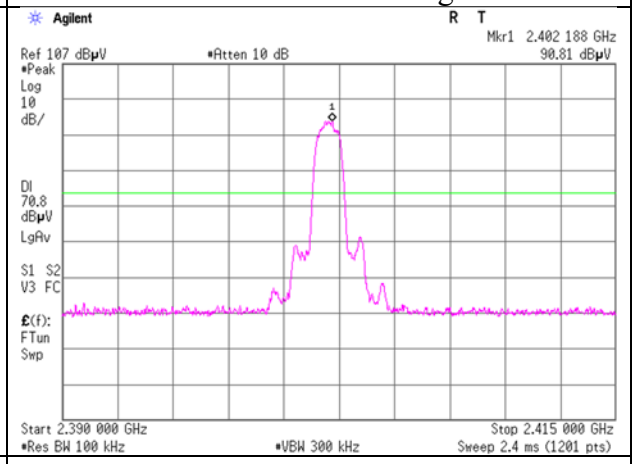
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

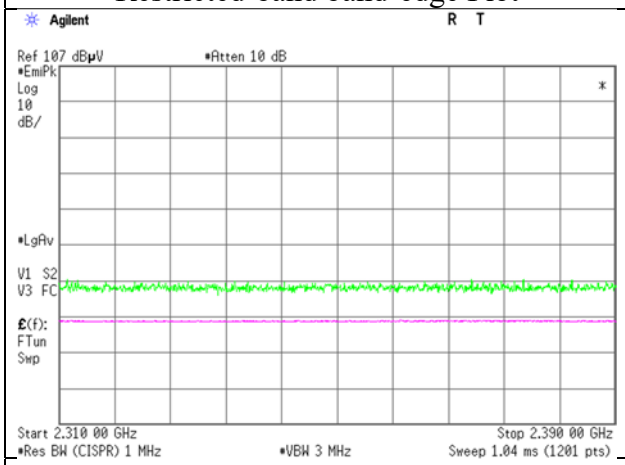
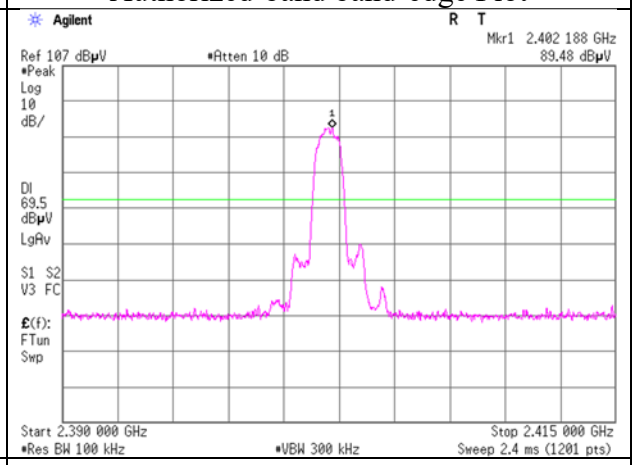
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.80	28.31	14.08	41.67	2.41	93.93	-	-	Carrier
Hori.	2400.000	PK	41.33	28.31	14.07	41.67	2.41	44.45	73.93	29.4	
Vert.	2402.000	PK	89.48	28.31	14.08	41.67	2.41	92.61	-	-	Carrier
Vert.	2400.000	PK	40.64	28.31	14.07	41.67	2.41	43.76	72.61	28.8	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.96 m / 3.0 m) = 2.41 dB
13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 24, 2020
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami
	(1 GHz – 2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz

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

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

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

Radiated Spurious Emission

Report No.	13282402S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 27, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	31.249	QP	22.10	18.13	6.47	32.18	0.00	14.52	40.0	25.4	200	0	
Hori.	945.678	QP	19.90	22.02	10.97	30.68	0.00	22.21	46.0	23.7	100	0	
Hori.	4882.000	PK	48.81	31.71	6.62	42.93	2.41	46.62	73.9	27.2	135	157	
Hori.	7323.000	PK	48.50	37.39	8.15	43.49	2.41	52.96	73.9	20.9	150	0	
Hori.	9764.000	PK	47.77	39.34	9.32	42.96	2.41	55.88	73.9	18.0	150	0	
Hori.	4882.000	AV	37.12	31.71	6.62	42.93	2.41	34.93	53.9	18.9	135	157	VBW: 360 Hz
Hori.	7323.000	AV	36.55	37.39	8.15	43.49	2.41	41.01	53.9	12.8	150	0	VBW: 360 Hz
Hori.	9764.000	AV	36.20	39.34	9.32	42.96	2.41	44.31	53.9	**9.5**	150	0	VBW: 360 Hz
Vert.	32.060	QP	22.00	17.77	6.49	32.18	0.00	14.08	40.0	25.9	100	0	
Vert.	66.416	QP	30.80	6.96	6.55	32.15	0.00	12.16	40.0	27.8	100	332	
Vert.	67.058	QP	31.20	6.84	6.59	32.15	0.00	12.48	40.0	27.5	100	168	
Vert.	67.599	QP	34.00	6.81	6.61	32.15	0.00	15.27	40.0	24.7	100	124	
Vert.	68.196	QP	31.10	6.75	6.65	32.15	0.00	12.35	40.0	27.6	100	226	
Vert.	68.745	QP	31.20	6.64	6.68	32.15	0.00	12.37	40.0	27.6	100	156	
Vert.	908.732	QP	20.30	21.94	10.85	30.98	0.00	22.11	46.0	23.8	100	0	
Vert.	4882.000	PK	47.35	31.71	6.62	42.93	2.41	45.16	73.9	28.7	283	266	
Vert.	7323.000	PK	48.56	37.39	8.15	43.49	2.41	53.02	73.9	20.8	150	0	
Vert.	9764.000	PK	48.06	39.34	9.32	42.96	2.41	56.17	73.9	17.7	150	0	
Vert.	4882.000	AV	36.93	31.71	6.62	42.93	2.41	34.74	53.9	19.1	283	266	VBW: 360 Hz
Vert.	7323.000	AV	36.56	37.39	8.15	43.49	2.41	41.02	53.9	12.8	150	0	VBW: 360 Hz
Vert.	9764.000	AV	36.18	39.34	9.32	42.96	2.41	44.29	53.9	9.6	150	0	VBW: 360 Hz

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.96 m / 3.0 m) = 2.41 dB
13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission

Report No.	13282402S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 27, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	31.553	QP	22.00	17.99	6.48	32.18	0.00	14.29	40.0	25.7	100	0	
Hori.	936.405	QP	20.00	21.95	10.94	30.76	0.00	22.13	46.0	23.8	100	0	
Hori.	2483.500	PK	57.20	28.24	14.16	41.69	2.41	60.32	73.9	13.5	129	155	
Hori.	4960.000	PK	48.09	31.96	6.67	42.94	2.41	46.19	73.9	27.7	189	180	
Hori.	7440.000	PK	47.58	37.56	8.21	43.60	2.41	52.16	73.9	21.7	150	0	
Hori.	9920.000	PK	48.32	39.18	9.42	42.78	2.41	56.55	73.9	17.3	150	0	
Hori.	2483.500	AV	41.50	28.24	14.16	41.69	2.41	44.62	53.9	**9.2**	129	155	VBW: 360 Hz
Hori.	4960.000	AV	37.06	31.96	6.67	42.94	2.41	35.16	53.9	18.7	189	180	VBW: 360 Hz
Hori.	7440.000	AV	36.35	37.56	8.21	43.60	2.41	40.93	53.9	12.9	150	0	VBW: 360 Hz
Hori.	9920.000	AV	36.07	39.18	9.42	42.78	2.41	44.30	53.9	9.6	150	0	VBW: 360 Hz
Vert.	31.112	QP	22.20	18.19	6.47	32.18	0.00	14.68	40.0	25.3	100	0	
Vert.	66.452	QP	30.10	6.95	6.55	32.15	0.00	11.45	40.0	28.5	100	188	
Vert.	67.627	QP	32.80	6.81	6.62	32.15	0.00	14.08	40.0	25.9	100	157	
Vert.	69.358	QP	30.80	6.56	6.72	32.15	0.00	11.93	40.0	28.0	100	121	
Vert.	69.994	QP	30.50	6.50	6.75	32.15	0.00	11.60	40.0	28.4	100	212	
Vert.	70.534	QP	29.80	6.43	6.80	32.15	0.00	10.88	40.0	29.1	100	150	
Vert.	71.141	QP	29.00	6.36	6.85	32.15	0.00	10.06	40.0	29.9	100	171	
Vert.	950.823	QP	19.90	22.05	10.98	30.64	0.00	22.29	46.0	23.7	100	0	
Vert.	2483.500	PK	56.62	28.24	14.16	41.69	2.41	59.74	73.9	14.1	109	219	
Vert.	4960.000	PK	47.94	31.96	6.67	42.94	2.41	46.04	73.9	27.8	254	261	
Vert.	7440.000	PK	47.89	37.56	8.21	43.60	2.41	52.47	73.9	21.4	150	0	
Vert.	9920.000	PK	48.83	39.18	9.42	42.78	2.41	57.06	73.9	16.8	150	0	
Vert.	2483.500	AV	40.60	28.24	14.16	41.69	2.41	43.72	53.9	10.1	109	219	VBW: 360 Hz
Vert.	4960.000	AV	37.19	31.96	6.67	42.94	2.41	35.29	53.9	18.6	254	261	VBW: 360 Hz
Vert.	7440.000	AV	36.80	37.56	8.21	43.60	2.41	41.38	53.9	12.5	150	0	VBW: 360 Hz
Vert.	9920.000	AV	36.25	39.18	9.42	42.78	2.41	44.48	53.9	9.4	150	0	VBW: 360 Hz

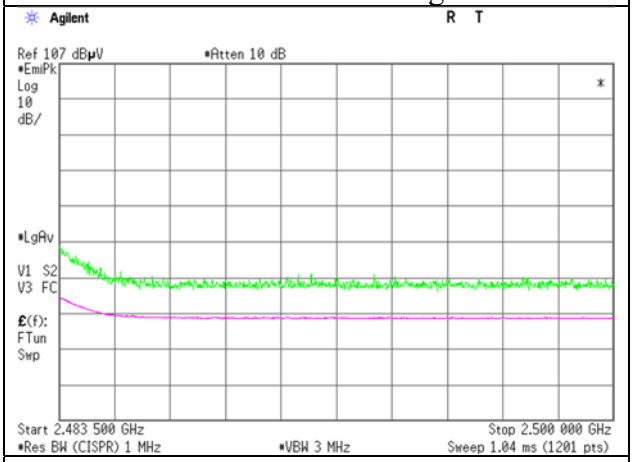
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.96 m / 3.0 m) = 2.41 dB
13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13282402S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 24, 2020
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami
	(1 GHz – 2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

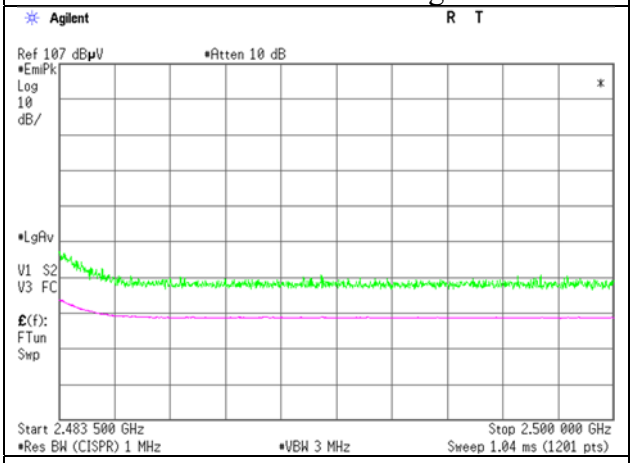
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

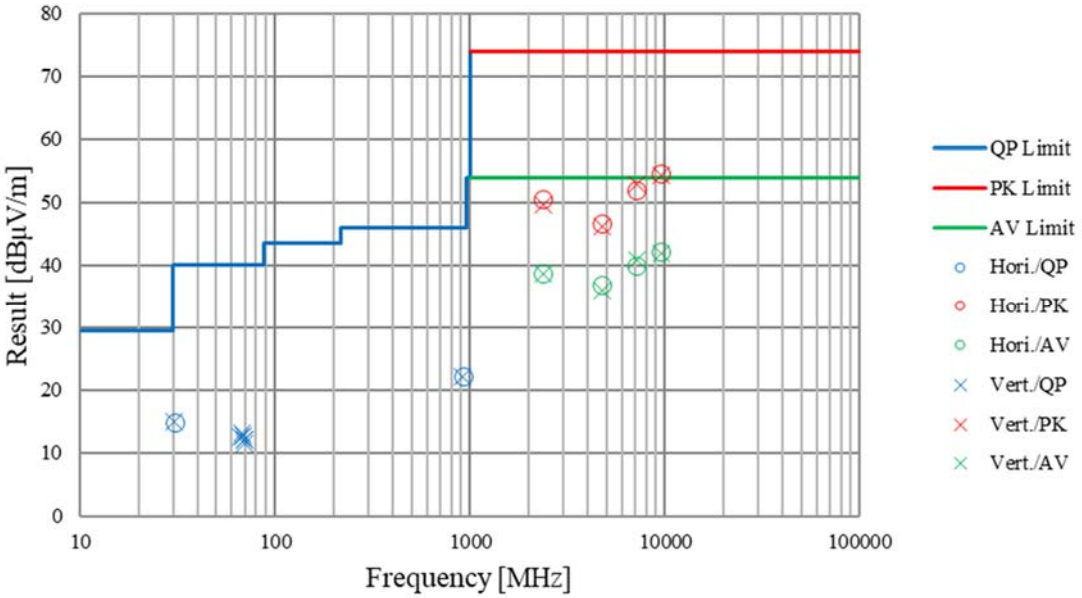


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13282402S-A-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	April 27, 2020	April 23, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	21 deg. C / 31 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz			



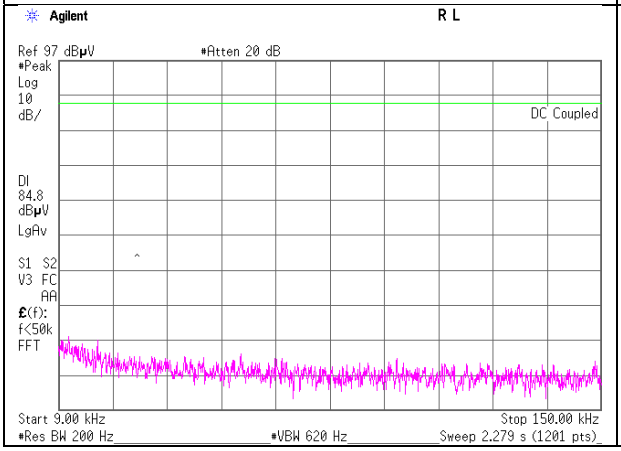
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

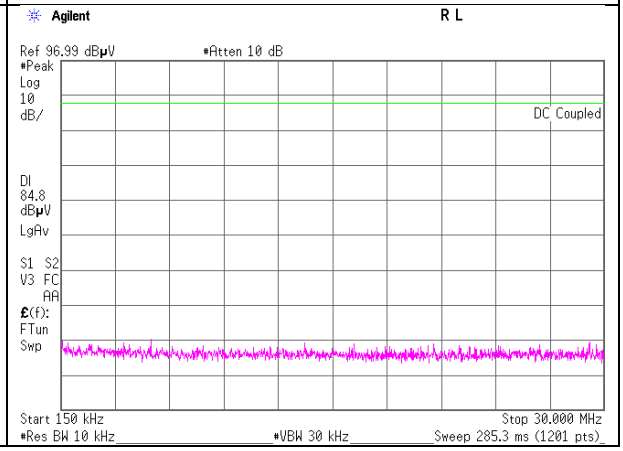
Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, DH5, 2402 MHz

2402 MHz

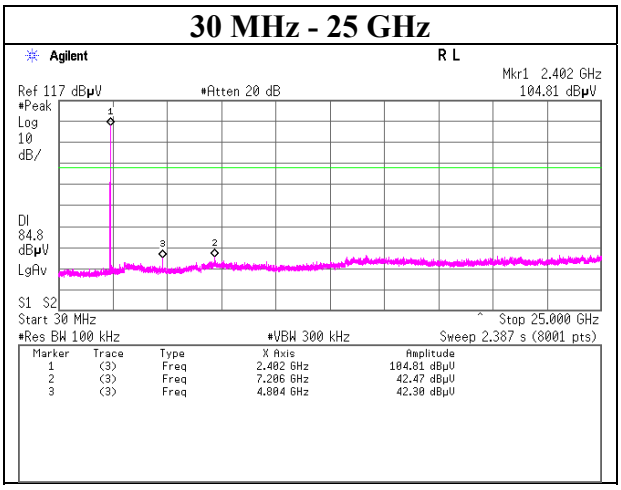
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

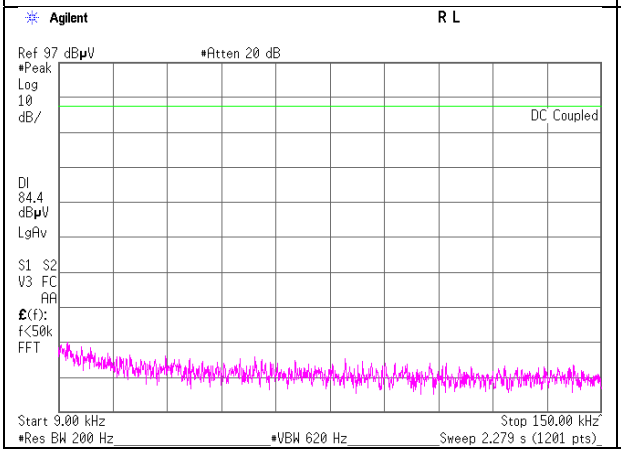


Conducted Spurious Emission

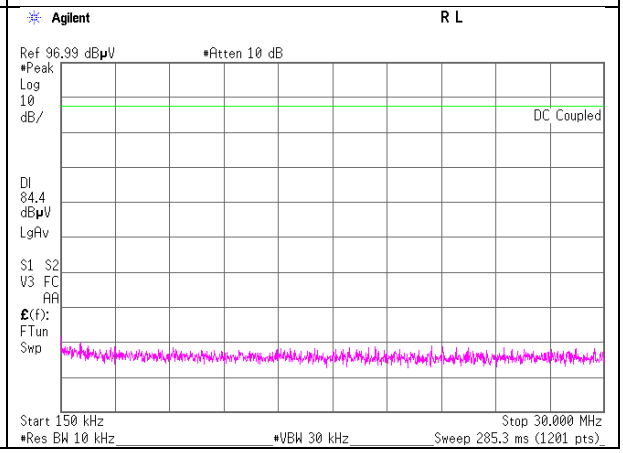
Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping On, DH5, 2441 MHz

2441 MHz

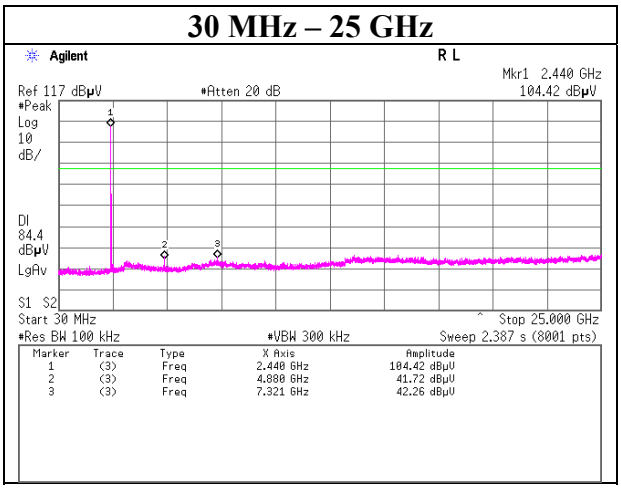
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

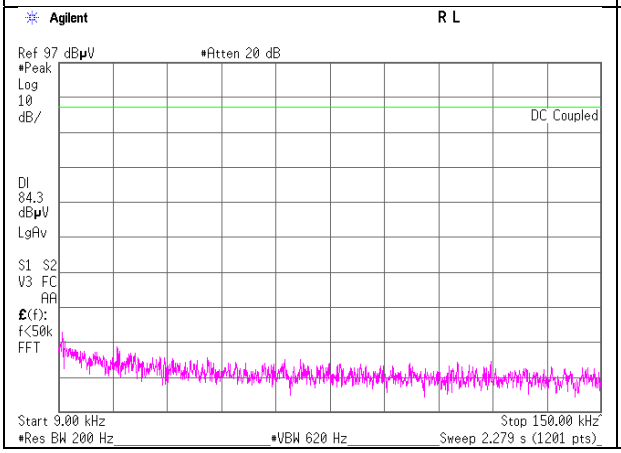


Conducted Spurious Emission

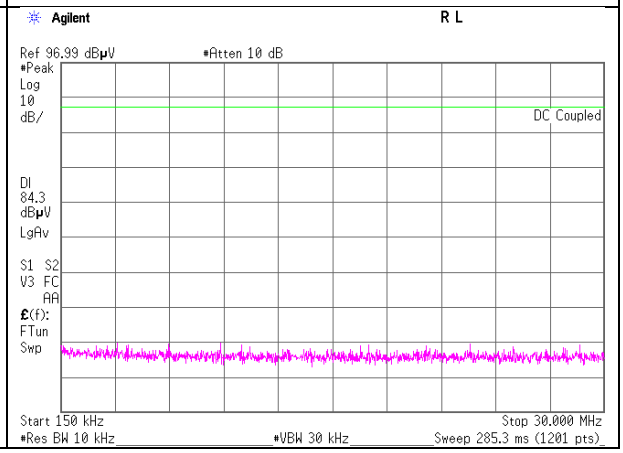
Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, DH5, 2480 MHz

2480 MHz

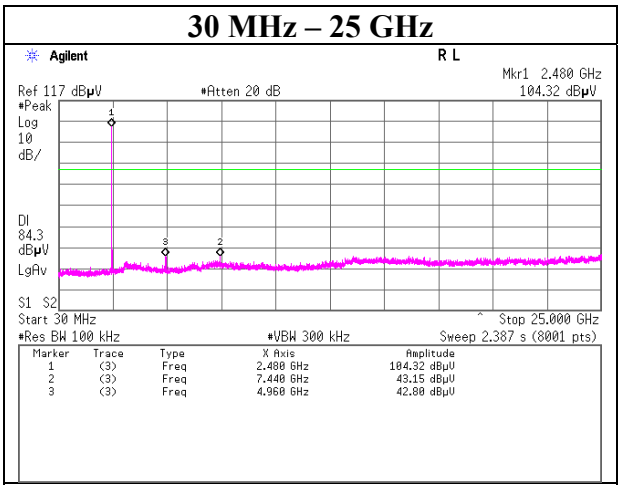
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

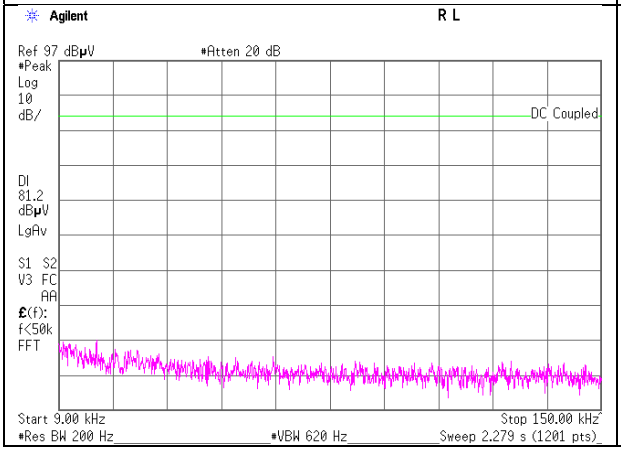


Conducted Spurious Emission

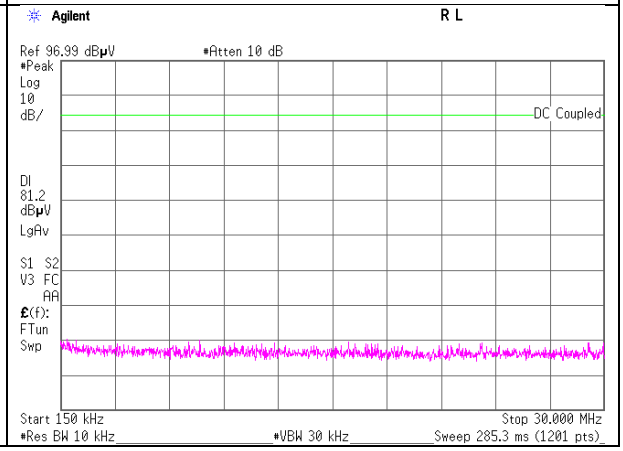
Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, 3DH5, 2402 MHz

2402 MHz

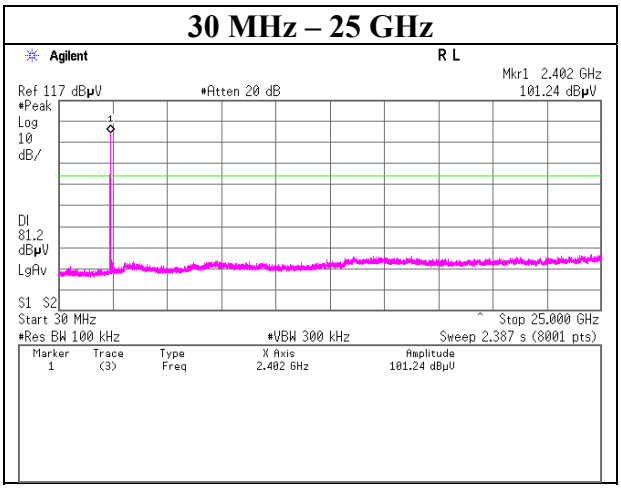
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

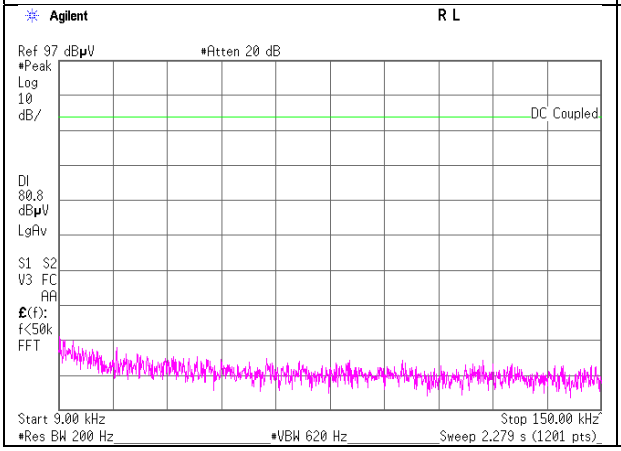


Conducted Spurious Emission

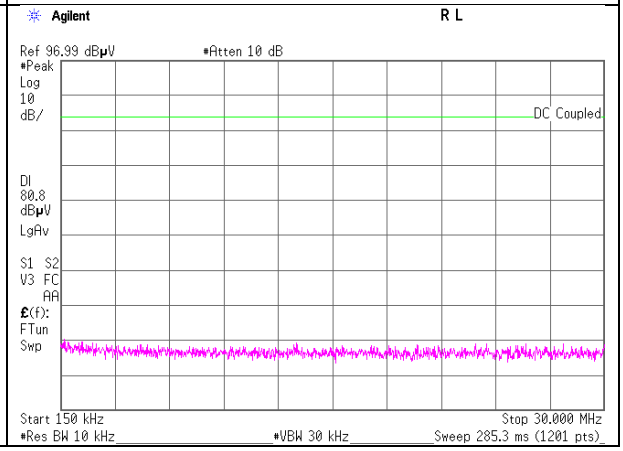
Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, 3DH5, 2441 MHz

2441 MHz

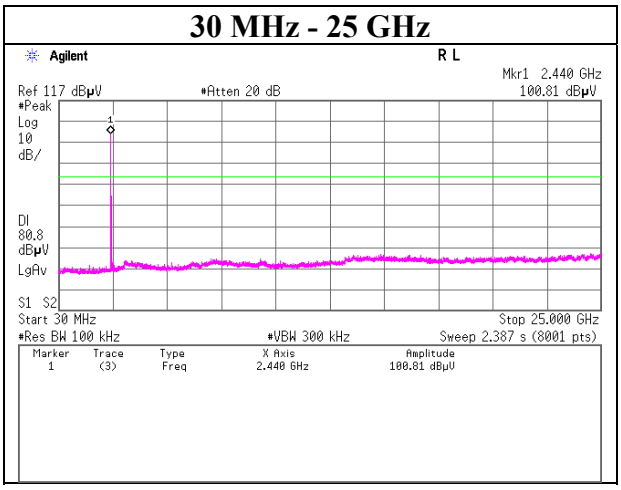
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

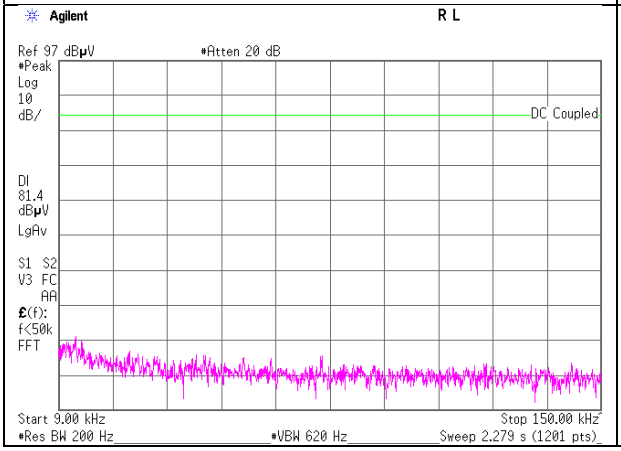


Conducted Spurious Emission

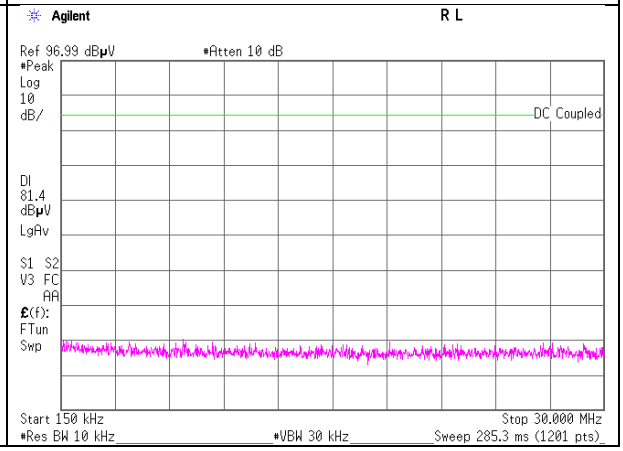
Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, 3DH5, 2480 MHz

2480 MHz

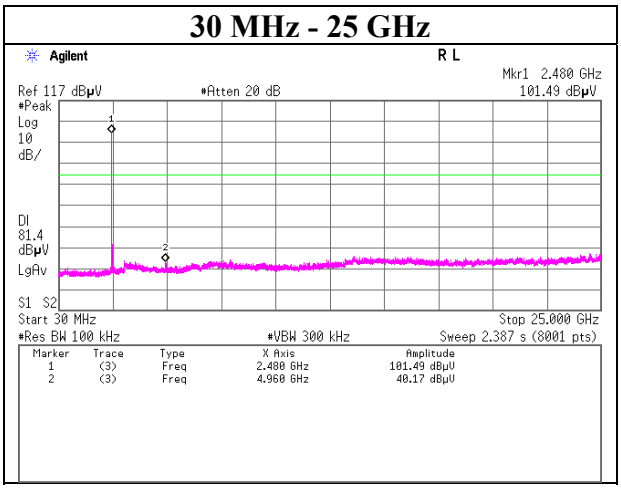
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

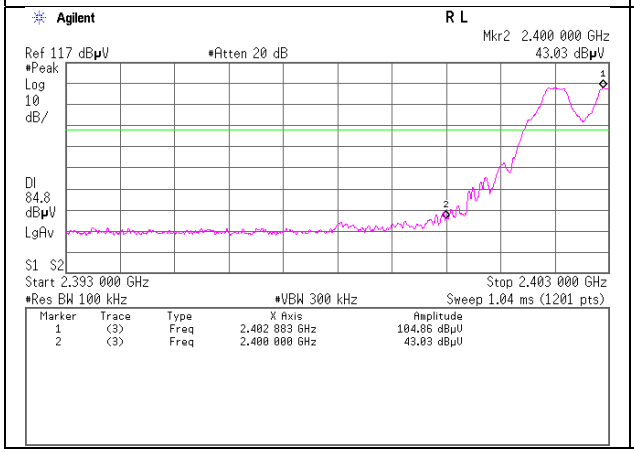


Conducted Emission Band Edge compliance

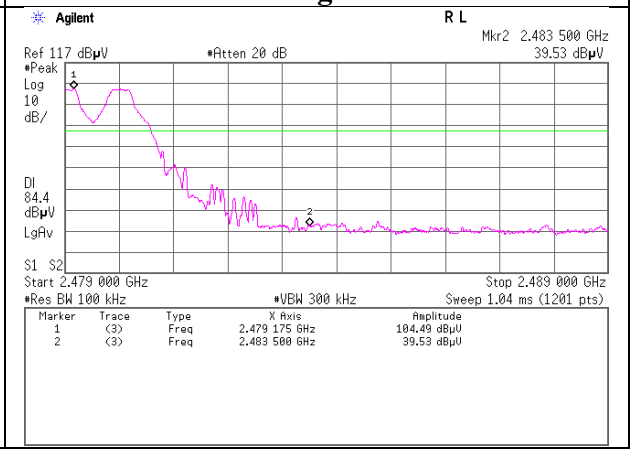
Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx DH5

Hopping On

Low

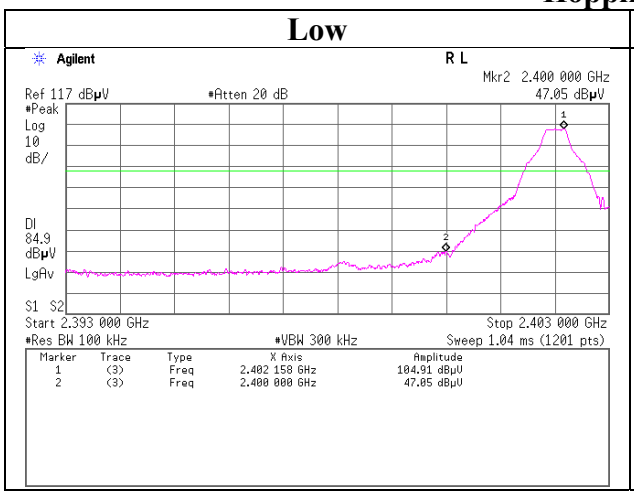


High

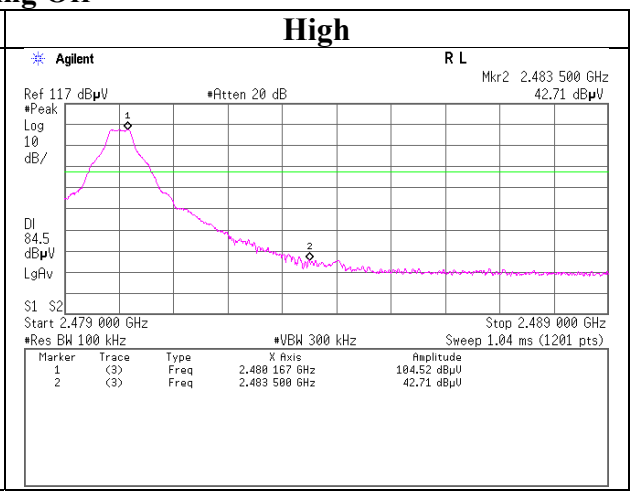


Hopping Off

Low



High

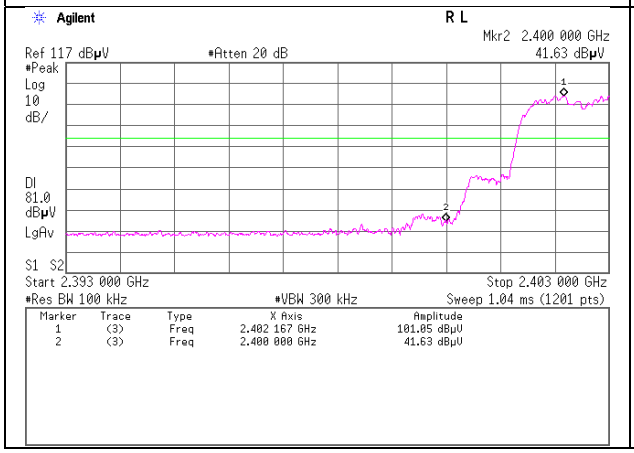


Conducted Emission Band Edge compliance

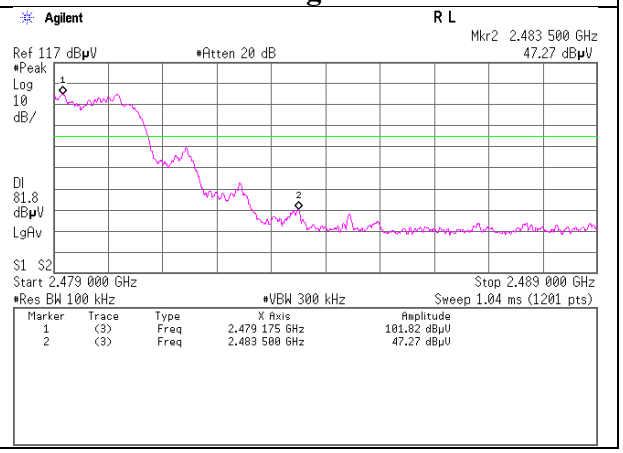
Report No.	13282402S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 24, 2020
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Kenichi Adachi
Mode	Tx 3DH5

Hopping On

Low

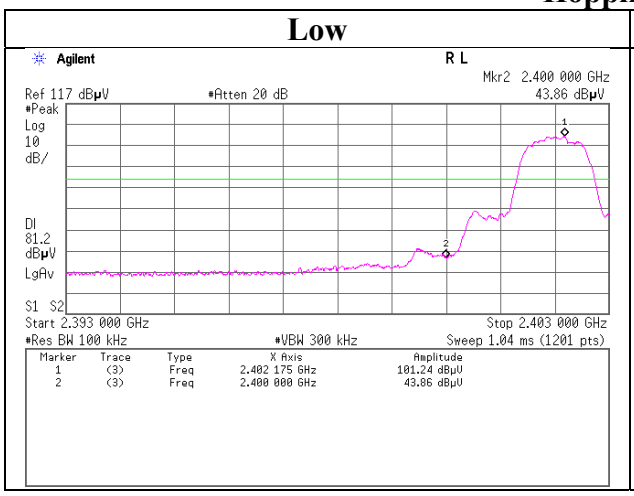


High

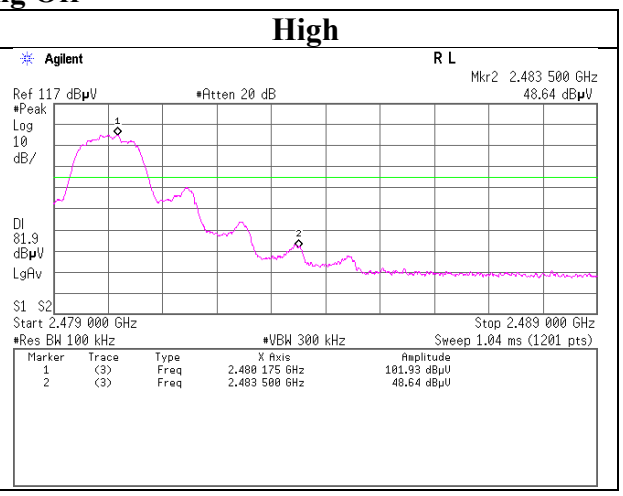


Hopping Off

Low



High



APPENDIX 2: Test instruments

Test equipment(1 / 2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2019/10/01	12
AT	SAT10-09	145132	Attenuator	Weinschel Corp.	54A-10	W5692	2019/11/05	12
AT	SCC-G13	145166	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	2019/12/12	12
AT	SOS-13	146321	Humidity Indicator	CUSTOM	CTH-202	Q.C.17	2019/12/19	12
AT	SPM-07	146247	Power Meter	Keysight Technologies Inc	8990B	MY5100272	2019/07/16	12
AT	SPSS-04	146310	Power sensor	Keysight Technologies Inc	N1923A	MY5326009	2019/07/16	12
AT	SRENT-09	150461	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186392	2020/02/10	12
CE	SAT3-13	150923	Attenuator	JFW	50HF-003N	-	2020/01/30	12
CE	SCC-C9/C10/SRSE-03	145036	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271(RF Selector)	2020/04/12	12
CE	SLS-02	145539	LISN	Rohde & Schwarz	ENV216	100512	2020/02/18	12
CE	SOS-24	191841	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
CE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2019/11/22	12
CE,RE	COTS-SEMI-5	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
CE,RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
CE,RE	STS-03	146210	Digital Hitester	Hioki	3805-50	80997823	2019/10/01	12
RE	KBA-01	146343	Biconical Antenna	Schwarzbeck Mess - Elektronik	BBA9106	1748	2019/06/05	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2020/04/12	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2019/05/03	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2020/02/19	12
RE	SAF-04	145127	Pre Amplifier	Toyo Corporation	TPA0118-36	2072554	2019/06/04	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2020/02/20	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2020/03/03	12
RE	SAT10-05	145136	Attenuator(above1GHz)	Keysight Technologies Inc	8493C-010	74864	2019/11/06	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2020/02/21	12

Test equipment(2/ 2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	SCC-C1/C2/C3/C4/C5/C10/SRSE-03	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	2020/04/12	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2020/03/04	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2020/01/08	12
RE	SCC-G43	156380	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	SN MY 13406/4E	2019/07/03	12
RE	SCC-G44	168300	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800375/4A	2019/11/11	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2020/05/12	12
RE	SCC-G58	183047	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800287/4A	2019/07/23	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2019/11/06	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-739	2019/06/26	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2019/06/26	12
RE	SLA-01	145531	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	UHALP9108A	UHALP 9108-A 0888	2019/06/05	12
RE	SOS-23	191840	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2019/08/08	12
RE	STR-06	146208	Test Receiver	Rohde & Schwarz	ESCI	101259	2020/04/01	12

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

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

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

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