
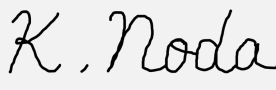






RADIO TEST REPORT

Test Report No. 14480127S-C

Customer	Sony Group Corporation
Description of EUT	Communication module
Model Number of EUT	M1506GR
FCC ID	AK8M1506GR
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied (Refer to SECTION 3)
Issue Date	May 18, 2023
Remarks	-

Representative Test Engineer	Approved By
	
Shiro Kobayashi Engineer	Kazuya Noda Leader
	
	
CERTIFICATE 1266.03	
<input type="checkbox"/> The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.	
<input checked="" type="checkbox"/> There is no testing item of "Non-accreditation".	

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 21.0

ANNOUNCEMENT

- This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
- The results in this report apply only to the sample tested.
- This sample tested is in compliance with the limits of the above regulation.
- The test results in this test report are traceable to the national or international standards.
- This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
- This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
- The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
- The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
- The information provided from the customer for this report is identified in Section 1.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No.: 14480127S-C

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14480127S-C	May 18, 2023	-

Reference: Abbreviations (Including words undescribed in this report)

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

CONTENTS	PAGE
SECTION 1: Customer Information	5
SECTION 2: Equipment Under Test (EUT).....	5
SECTION 3: Test Specification, Procedures & Results	6
SECTION 4: Operation of EUT during testing.....	9
SECTION 5: Conducted Emission	13
SECTION 6: Radiated Spurious Emission	14
SECTION 7: Antenna Terminal Conducted Tests.....	16
APPENDIX 1: Test data	17
Conducted Emission	17
20 dB Bandwidth, 99 % Occupied Bandwidth and Carrier Frequency Separation	20
Number of Hopping Frequency	23
Dwell time.....	24
Maximum Peak Output Power.....	25
Average Output Power.....	26
Radiated Spurious Emission	28
Conducted Spurious Emission	34
Conducted Emission Band Edge compliance	37
6 dB Bandwidth	38
Power Density.....	40
APPENDIX 2: Test Instruments.....	42
APPENDIX 3: Photographs of test setup.....	44
Conducted Emission	44
Radiated Spurious Emission	45
Pre-check of Worst Case Position.....	46
Antenna Terminal Conducted Tests.....	47

SECTION 1: Customer Information

Company Name	Sony Group Corporation
Address	1-7-1 Konan, Minato-ku, Tokyo 108-0075, Japan
Telephone Number	+81-50-3141-6220
Contact Person	Kazuyuki Hori

The information provided from the customer is as follows;

- Customer, Description 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) other than the Receipt Date and Test Date
- 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

Description	Communication module
Model Number	M1506GR
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab.
Receipt Date	April 28, 2023
Test Date	May 5 to 9, 2023

2.2 Product Description

General Specification

Rating	DC 2.0 V
Operating temperature	-25 deg. C to +85 deg. C

Radio Specification

Equipment Type	Transceiver
Frequency of Operation	902.4 MHz to 907.2 MHz
Type of Modulation	$\pi/2$ Shift BPSK + linear chirp modulation
Antenna Gain	3 dBi

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
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 ISED: RSS-Gen 8.8	FCC: Section 15.207 ISED: RSS-Gen 8.8	17.4 dB, 0.15285 MHz, QP, N Mode: Tx 907.2 MHz	Complied a)	-
Carrier Frequency Separation	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1) ISED: RSS-247 5.1 (b)	See data.	Complied b)	Conducted
20dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.215(c) ISED: -		Complied b)	Conducted
Number of Hopping Frequency	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1)(i) ISED: RSS-247 5.1 (c)		N/A c)	Conducted
Dwell time	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(f) ISED: RSS-247 5.3 (a)		Complied d)	Conducted
The maximum conducted output power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ISED: RSS-247 5.4(d)		Complied e)	Conducted
Spurious Emission & Band Edge Compliance	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9, RSS-Gen 8.10	3.9 dB 2707.200 MHz, AV, Horizontal Tx 902.4 MHz	Complied f) / g)	Conducted/ Radiated (above 30 MHz) *1)
6dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(2) ISED: RSS-247 5.2(a)	See data.	N/A h)	Conducted
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(f) ISED: RSS-247 5.3(b)		Complied i)	Conducted

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.

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

The EUT was tested as the hybrid system equipment in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02 Section 10. Therefore, Number of Hopping Frequency and 6dB Bandwidth were not applicable.

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

- a) Refer to APPENDIX 1 (data of Conducted Emission)
- b) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99% Occupied Bandwidth and Carrier Frequency Separation)
- c) Refer to APPENDIX 1 (data of Number of Hopping Frequency)
- d) Refer to APPENDIX 1 (data of Dwell time)
- e) Refer to APPENDIX 1 (data of The maximum conducted output power)
- f) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
- g) Refer to APPENDIX 1 (data of Radiated Spurious Emission)
- h) Refer to APPENDIX 1 (data of 6 dB Bandwidth)
- i) Refer to APPENDIX 1 (data of Power Density)

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 EUT is mounted to the jig board and the jig board has a unique antenna connector (SMA Reverse). Therefore, the equipment complies with the antenna requirement.

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 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

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.

Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

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

Item	Frequency range	Uncertainty (+/-)
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	3.1 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.3 dB
	30 MHz-200 MHz	4.8 dB
	200 MHz-1 GHz	6.1 dB
	1 GHz-6 GHz	4.7 dB
	6 GHz-18 GHz	5.3 dB
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	5.5 dB
	1 GHz-18 GHz	5.6 dB
	18 GHz-40 GHz	5.8 dB

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	1.3 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	2.1 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	1.1 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.2 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.1 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.4 dB
Spurious emission (Conducted) below 1 GHz	0.84 dB
Conducted emissions Power Density Measurement 1 GHz-3 GHz	0.86 dB
Conducted emissions Power Density Measurement 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.4 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.2 dB
Bandwidth Measurement	0.012 %
Duty cycle and Time Measurement	0.27 %
Temperature_SCH-01	0.87 deg.C.
Humidity_SCH-01	3.5 %
Temperature_SCH-02	2.0 deg.C.
Humidity_SCH-02	6.7 %
Voltage	0.92 %

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

A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

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 EUT during testing

4.1 Operating Mode(s)

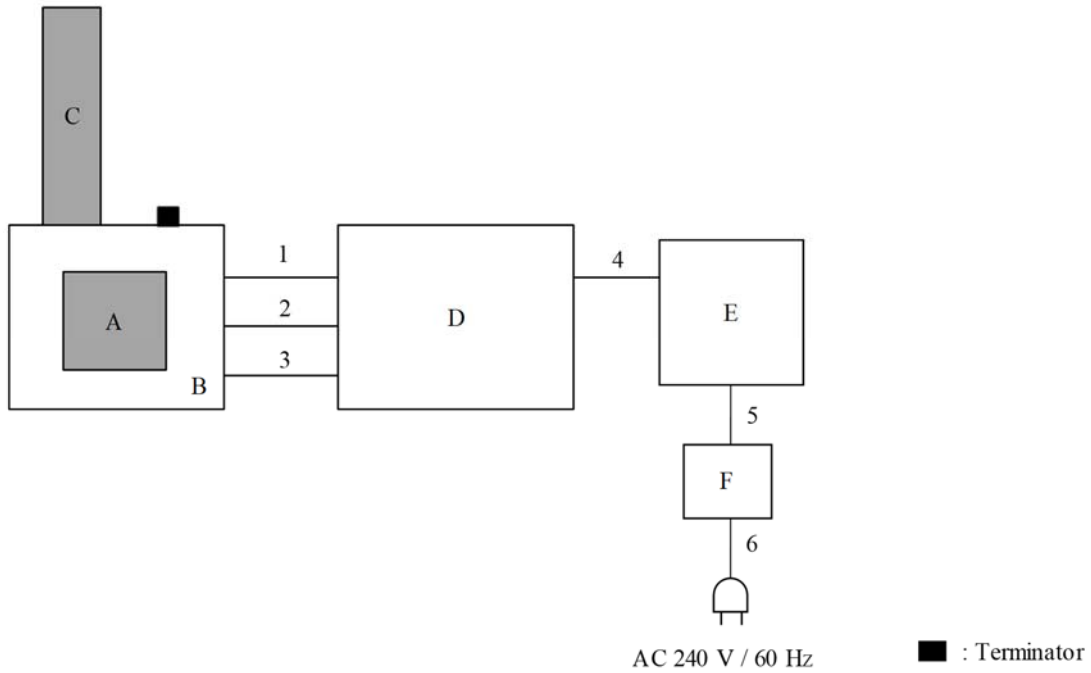
Mode	Remarks*
Transmitting (Tx)	Payload: PRBS9
<p>*EUT has the power settings by the software as follows; Power Setting: 0x00000030 Software: FW Ver TU1417 33D55A9C (Date: 2022.12 12, Storage location: Driven by connected PC)</p> <p>*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.</p>	

Details of Operating Mode(s)

Test Item	Mode	Hopping	Tested Frequency
Conducted Emission, Conducted Spurious Emission, Radiated Spurious Emission, 20 dB Bandwidth, 6 dB Bandwidth, The maximum conducted Output Power, Maximum power spectral density	Tx	Off	902.4 MHz 904.8 MHz 907.2 MHz
Carrier Frequency Separation	Tx	On	902.4 MHz 904.8 MHz 907.2 MHz
Number of Hopping Frequency, Dwell time	Tx	On	-
Band Edge Compliance (Conducted)	Tx	On ----- Off	902.4 MHz 907.2 MHz
99 % Occupied Bandwidth	Tx	On ----- Off	902.4 MHz 904.8 MHz 907.2 MHz

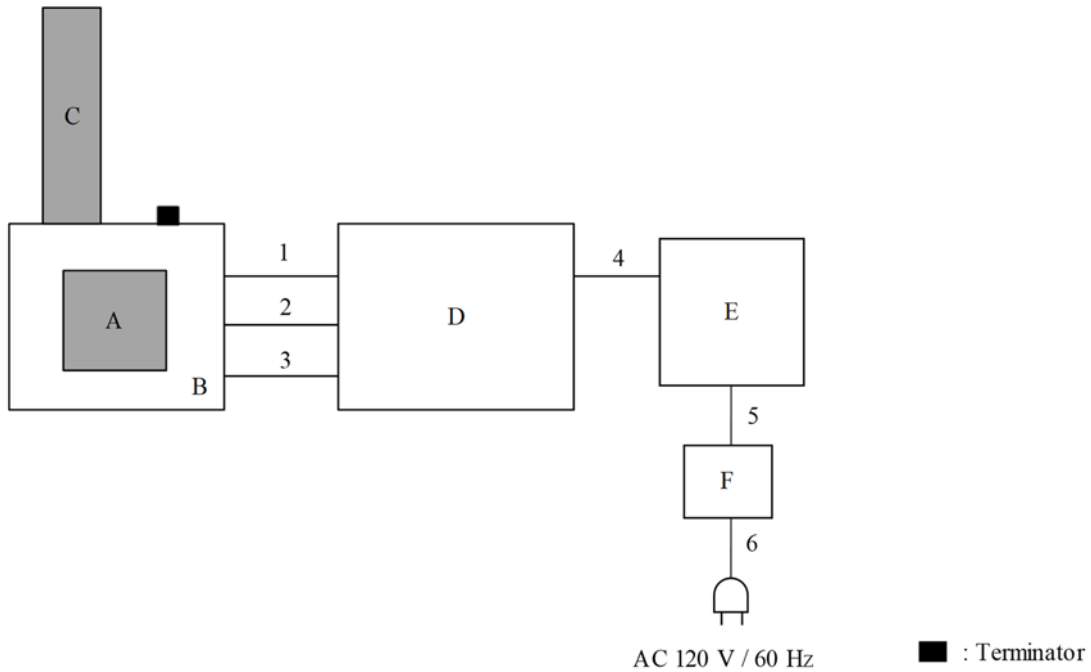
4.2 Configuration and Peripherals

[Conducted emission test]



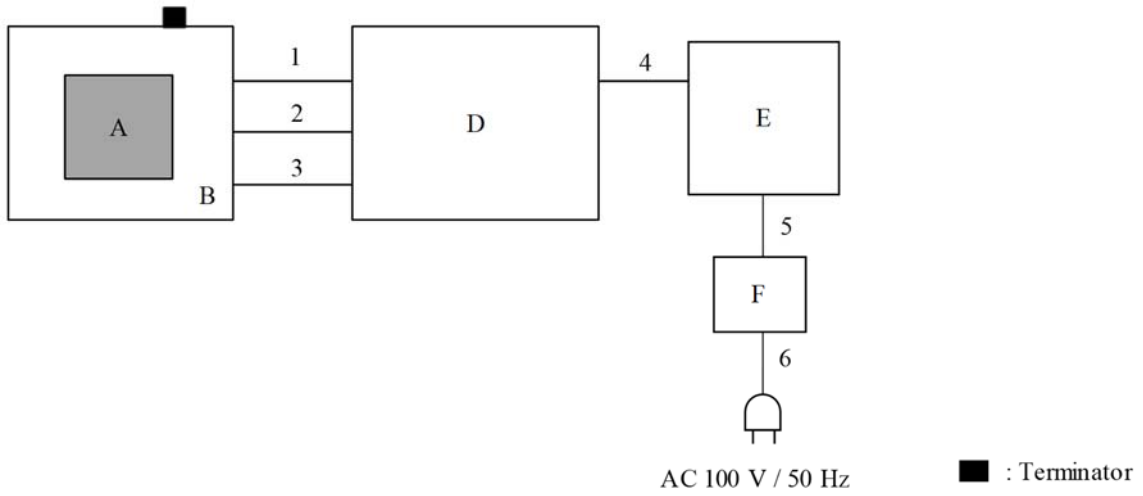
* As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 240 V of the worst voltage as representative.

[Radiated emission test]

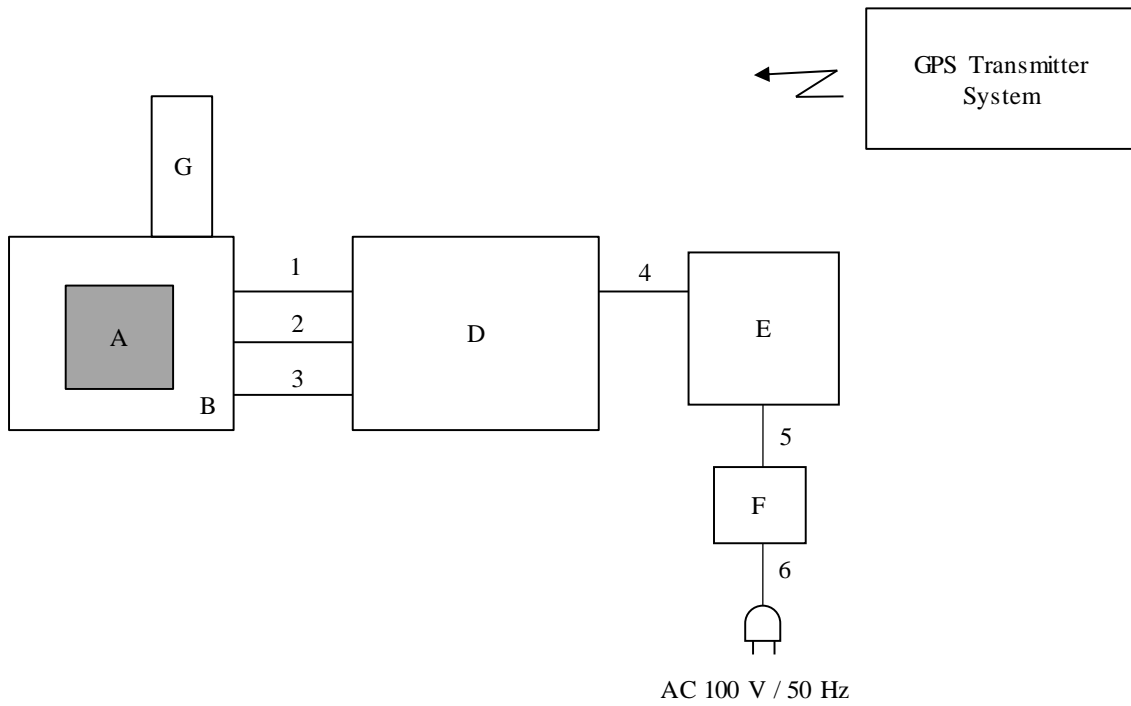


* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

[Antenna terminal conducted test (Except Dwell time test)]



[Antenna terminal conducted test (Dwell time test)]



Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Communication module	M1506GR	19d77	SONY	EUT
B	Jig Board	CXM1501 AGR-EVB	1	SONY	-
C	Antenna	T13-047-1039	-	STAF	EUT
D	Jig Board	NUCLEO-L073RZ	217350706	STMicroelectronics	-
E	Laptop Computer	ThinkPad L580	PF1PLZHX	LENOVO	-
F	AC Adapter	ADLX45YCC2A	8SSA10E75844C1SG94BG7T0	LENOVO	-
G	GNSS Antenna	APAE1575R2520ABDD7-T	-	Abracon	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC, GND	0.3	Unshielded	Unshielded	-
2	Signal	0.3	Unshielded	Unshielded	-
3	Signal	0.3	Unshielded	Unshielded	-
4	USB	1.5	Shielded	Shielded	-
5	DC	1.7	Unshielded	Unshielded	-
6	AC	0.8	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and Conditions

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

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

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

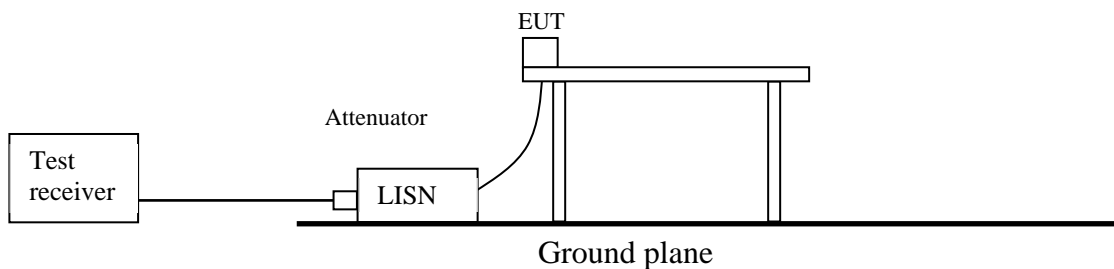
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Shielded room. The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

Detector	: QP and CISPR AV
Measurement Range	: 0.15 MHz to 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 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 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 30 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.

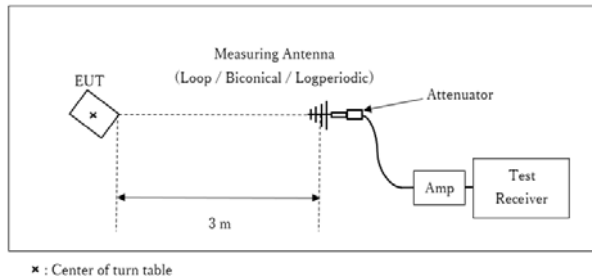
30 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	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

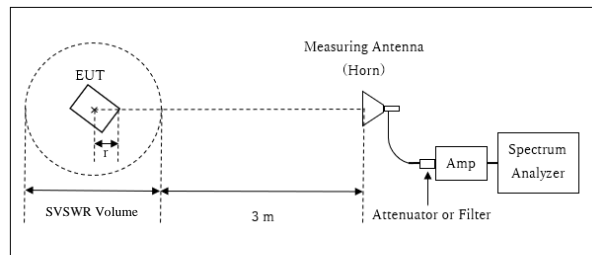
Below 1 GHz



Test Distance: 3 m

× : Center of turn table

1 GHz to 10 GHz



Distance Factor: $20 \times \log(3.89 \text{ m} / 3.0 \text{ m}) = 2.26 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.89 \text{ m}$

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.11 \text{ m}$

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

- 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.

Antenna polarization	Carrier	Spurious (30 MHz to 1 GHz)	Spurious (1 GHz to 10 GHz)
Horizontal	X	Z	X
Vertical	Z	Z	Z

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

Measurement Range : 30 MHz to 10 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	500 kHz	5.1 kHz	15 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
The maximum conducted output power	-	-	-	Auto	Average	-	Power Meter (Sensor: 160 MHz BW)
Carrier Frequency Separation	Wide enough to capture the peaks of two adjacent channels.	30 kHz	91 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	5.5 MHz	30 kHz	91 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz	300 kHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2) *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 10 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	4 MHz (Low) 26 MHz (High)	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
6 dB Bandwidth	1.5 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Power Density	1.5 times the 6 dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *4)
<p>*1) Peak hold was applied as Worst-case measurement. *2) 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 = 9.1 kHz) *3) 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 Ohms. 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. *4) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".</p>							

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

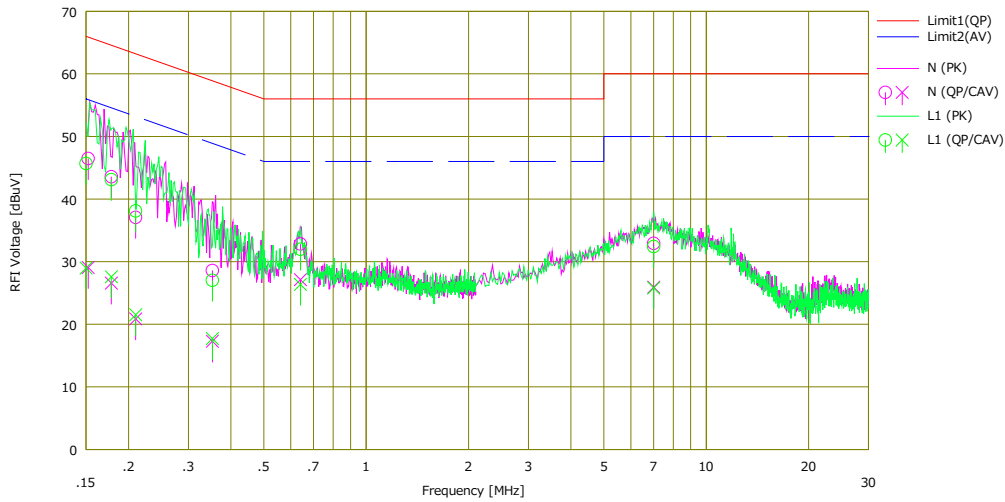
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2023/05/08

Mode : Tx_902.4 MHz
Power : AC 240 V / 60 Hz
Temp./Humi. : 20 deg.C. / 55 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Akihiro Oda



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]		<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15217	34.00	16.60	12.46	46.46	29.06	65.88	55.88	19.4	26.8	N	
2	0.17800	31.10	14.10	12.47	43.57	26.57	64.58	54.58	21.0	28.0	N	
3	0.21000	24.60	8.40	12.47	37.07	20.87	63.21	53.21	26.1	32.3	N	
4	0.35300	16.10	4.80	12.49	28.59	17.29	58.89	48.89	30.3	31.6	N	
5	0.64100	20.30	14.60	12.52	32.82	27.12	56.00	46.00	23.1	18.8	N	
6	7.00800	20.00	13.00	12.92	32.92	25.92	60.00	50.00	27.0	24.0	N	
7	0.15000	33.20	16.50	12.48	45.68	28.98	66.00	56.00	20.3	27.0	L1	
8	0.17800	30.60	15.10	12.49	43.09	27.59	64.58	54.58	21.4	26.9	L1	
9	0.21000	25.60	9.00	12.50	38.10	21.50	63.21	53.21	25.1	31.7	L1	
10	0.35300	14.50	5.20	12.51	27.01	17.71	58.89	48.89	31.8	31.1	L1	
11	0.64100	19.40	13.80	12.57	31.97	26.37	56.00	46.00	24.0	19.6	L1	
12	7.00800	19.40	12.80	13.01	32.41	25.81	60.00	50.00	27.5	24.1	L1	

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

Conducted Emission

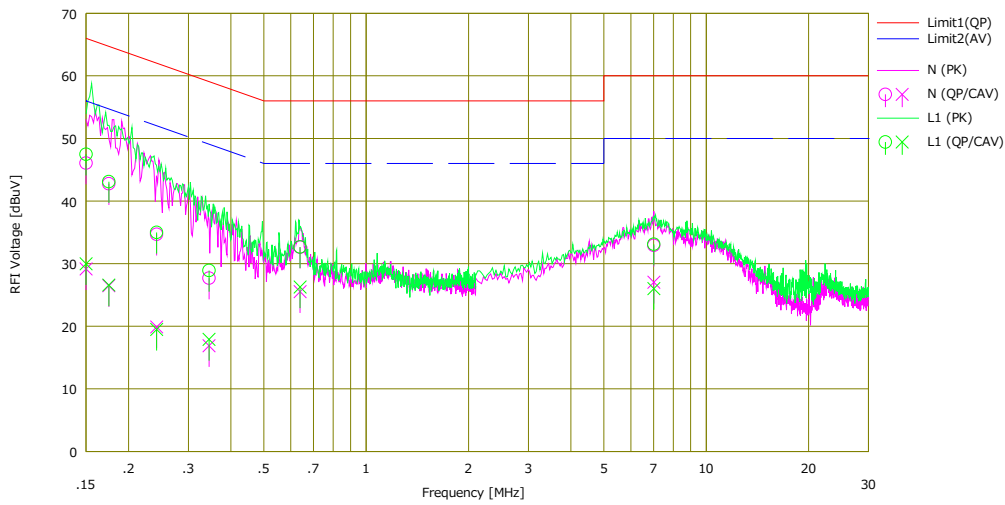
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2023/05/08

Mode : Tx_904.8 MHz
Power : AC 240 V / 60 Hz
Temp./Humi. : 20 deg.C. / 55 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Akihiro Oda



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]		<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	33.60	16.70	12.46	46.06	29.16	66.00	56.00	19.9	26.8	N	
2	0.17500	30.30	14.00	12.47	42.77	26.47	64.72	54.72	21.9	28.2	N	
3	0.24200	22.20	7.40	12.48	34.68	19.88	62.03	52.03	27.3	32.1	N	
4	0.34500	15.20	4.40	12.49	27.69	16.89	59.08	49.08	31.3	32.1	N	
5	0.63900	20.10	13.00	12.52	32.62	25.52	56.00	46.00	23.3	20.4	N	
6	7.01300	20.00	14.10	12.92	32.92	27.02	60.00	50.00	27.0	22.9	N	
7	0.15000	35.00	17.50	12.48	47.48	29.98	66.00	56.00	18.5	26.0	L1	
8	0.17500	30.60	14.10	12.49	43.09	26.59	64.72	54.72	21.6	28.1	L1	
9	0.24200	22.50	7.00	12.49	34.99	19.49	62.03	52.03	27.0	32.5	L1	
10	0.34500	16.40	5.40	12.51	28.91	17.91	59.08	49.08	30.1	31.1	L1	
11	0.63900	20.10	13.70	12.57	32.67	26.27	56.00	46.00	23.3	19.7	L1	
12	7.01292	20.10	13.00	13.01	33.11	26.01	60.00	50.00	26.8	23.9	L1	

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

Conducted Emission

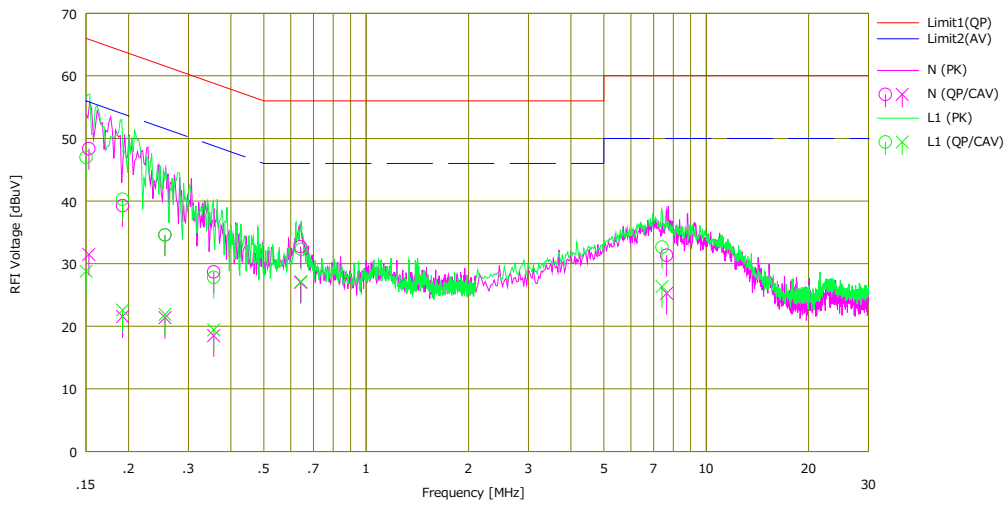
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2023/05/08

Mode : Tx_907.2 MHz
Power : AC 240 V / 60 Hz
Temp./Humi. : 20 deg.C. / 55 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Akihiro Oda



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]		<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15285	35.90	19.00	12.46	48.36	31.46	65.84	55.84	17.4	24.3	N	
2	0.19200	26.80	9.10	12.46	39.26	21.56	63.95	53.95	24.6	32.3	N	
3	0.25600	22.10	8.90	12.48	34.58	21.38	61.56	51.56	26.9	30.1	N	
4	0.35600	16.20	6.00	12.49	28.69	18.49	58.82	48.82	30.1	30.3	N	
5	0.64100	20.20	14.50	12.52	32.72	27.02	56.00	46.00	23.2	18.9	N	
6	7.64717	18.40	12.30	12.95	31.35	25.25	60.00	50.00	28.6	24.7	N	
7	0.15000	34.50	16.30	12.48	46.98	28.78	66.00	56.00	19.0	27.2	L1	
8	0.19200	27.80	10.10	12.49	40.29	22.59	63.95	53.95	23.6	31.3	L1	
9	0.25600	22.10	9.40	12.49	34.59	21.89	61.56	51.56	26.9	29.6	L1	
10	0.35600	15.30	6.90	12.51	27.81	19.41	58.82	48.82	31.0	29.4	L1	
11	0.64411	19.70	14.50	12.57	32.27	27.07	56.00	46.00	23.7	18.9	L1	
12	7.41304	19.60	13.30	13.03	32.63	26.33	60.00	50.00	27.3	23.6	L1	

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

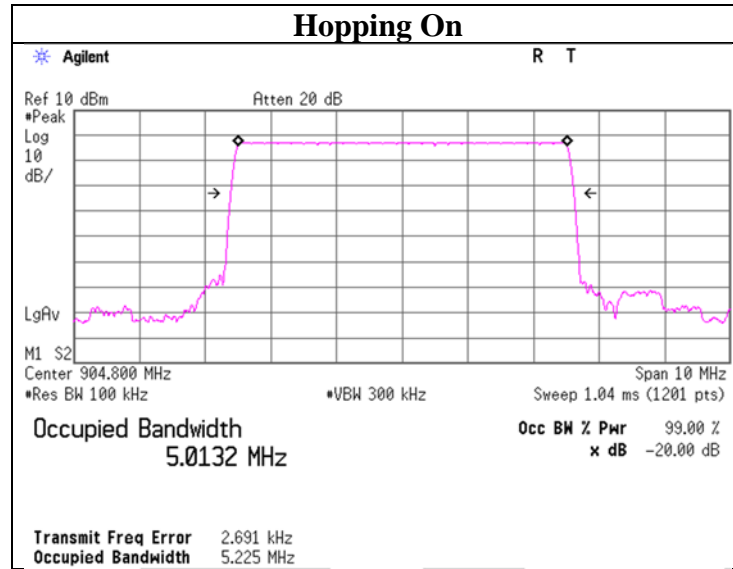
20 dB Bandwidth, 99 % Occupied Bandwidth and Carrier Frequency Separation

Test place Shonan EMC Lab. No.5 Shielded Room
 Date May 5, 2023
 Temperature / Humidity 24 deg. C / 32 % RH
 Engineer Shiro Kobayashi
 Mode Tx, Hopping Off, Tx, Hopping On

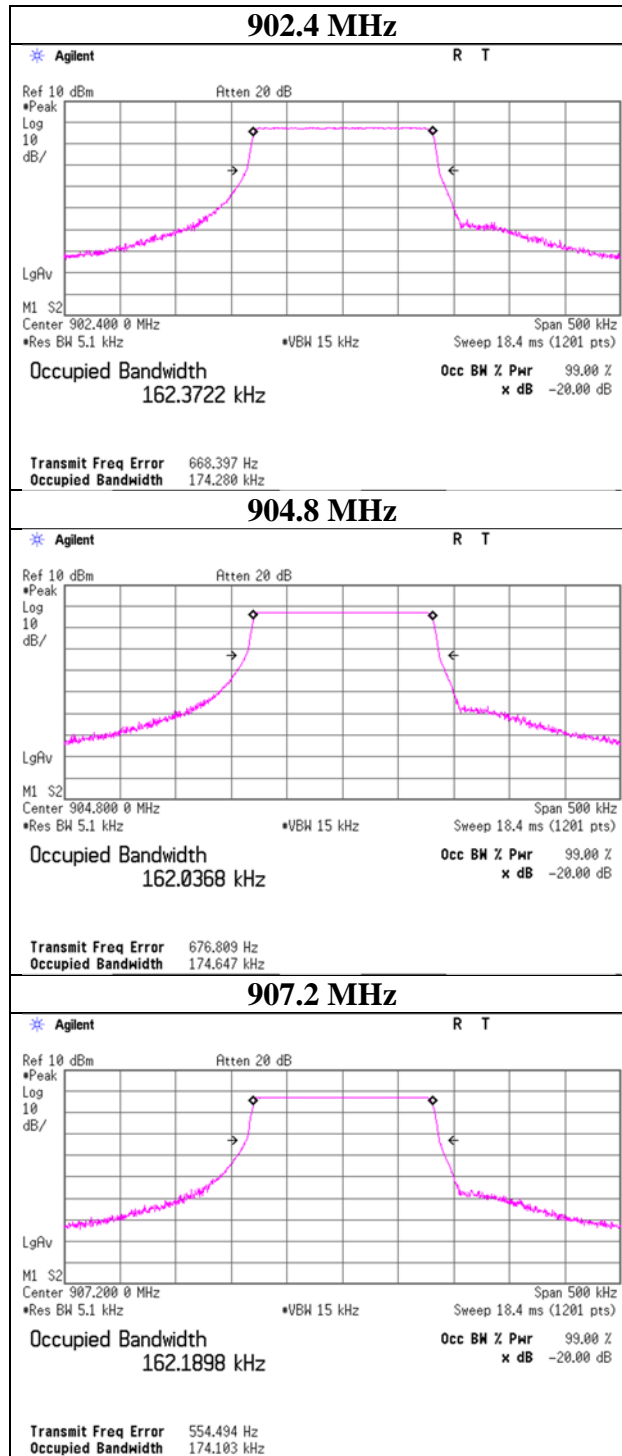
Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
902.4	0.174	162.372	0.200	>= 0.174
904.8	0.175	162.037	0.200	>= 0.175
907.2	0.174	162.190	0.200	>= 0.174
Hopping On	-	5013.200	-	-

Limit: 20 dB Bandwidth or 25 kHz (whichever is greater).

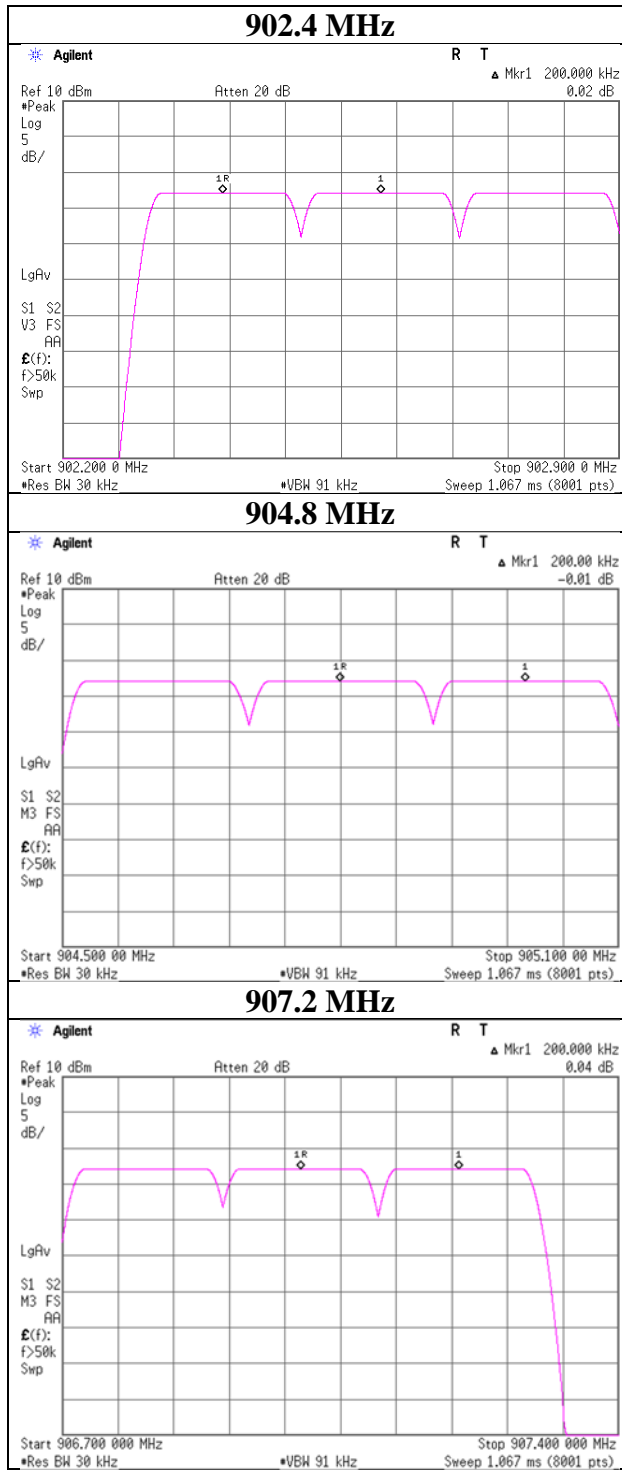
99 % Occupied Bandwidth



20 dB Bandwidth and 99 % Occupied Bandwidth



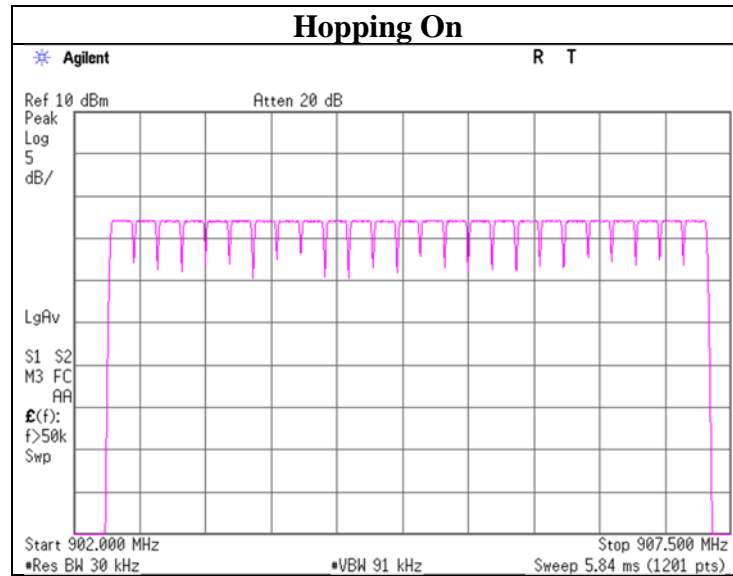
Carrier Frequency Separation



Number of Hopping Frequency

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	May 5, 2023
Temperature / Humidity	24 deg. C / 32 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping On

Number of channel [channels]
25



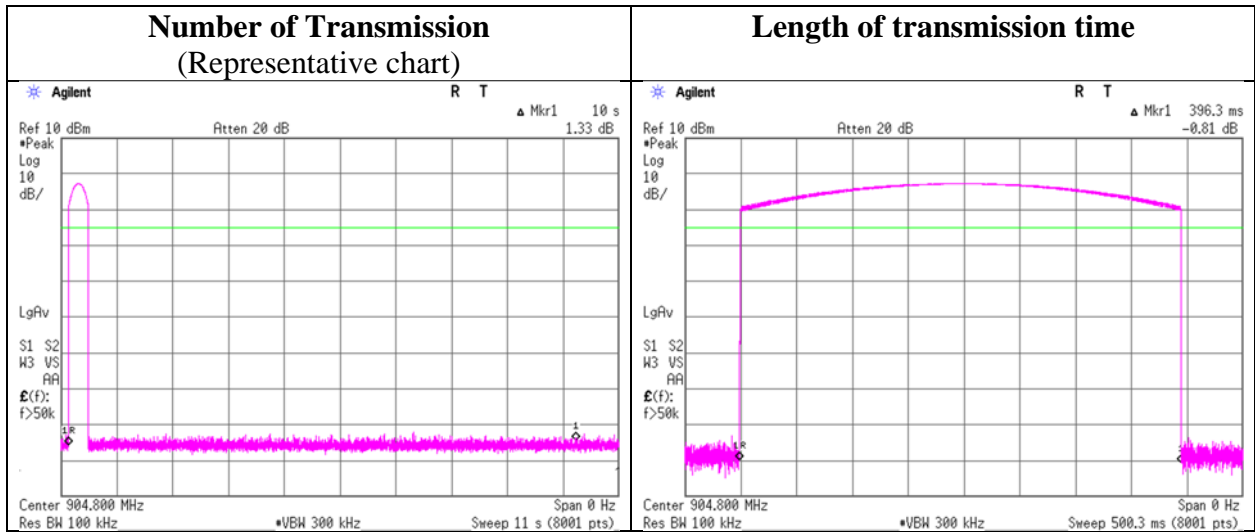
Dwell time

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	May 5, 2023
Temperature / Humidity	24 deg. C / 32 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping On

Number of transmission in a 10 s (25 Hopping x 0.4)	Length of transmission [ms]	Result [ms]	Limit [ms]
1 times	396.3	396.3	400

Sample Calculation

Result = Number of transmission x Length of transmission



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	May 5, 2023
Temperature / Humidity	24 deg. C / 32 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]			[dB]	[dBm]	[mW]	[dBm]	
902.4	-2.76	0.41	9.84	7.49	5.61	30.00	1000	22.51	3.00	10.49	11.19	36.02	4000	25.53
904.8	-2.75	0.41	9.84	7.50	5.62	30.00	1000	22.50	3.00	10.50	11.22	36.02	4000	25.52
907.2	-2.72	0.42	9.84	7.54	5.68	30.00	1000	22.46	3.00	10.54	11.32	36.02	4000	25.48

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

Average Output Power
(Reference data for RF Exposure)

Test place Shonan EMC Lab. No.5 Shielded Room
Date May 5, 2023
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
902.4	-3.18	0.41	9.84	7.07	5.09	0.30	7.37	5.46
904.8	-3.16	0.41	9.84	7.09	5.12	0.30	7.39	5.48
907.2	-3.14	0.42	9.84	7.12	5.15	0.30	7.42	5.52

Sample Calculation:

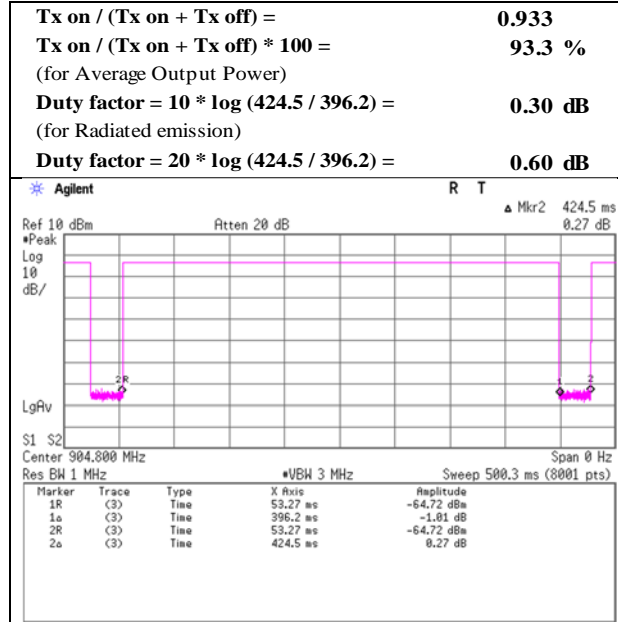
Result (Time average) = Reading + Cable Loss + Attenuator Loss

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.5 Shielded Room
Date May 5, 2023
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off



Radiated Spurious Emission

Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date May 8, 2023 May 9, 2023
Temperature / Humidity 20 deg. C / 50 % RH 22 deg. C / 43 % RH
Engineer Akihiro Oda Akihiro Oda
(30 MHz -1 GHz) (1 GHz -10 GHz)
Mode Tx, Hopping Off, 902.4 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.	152.701	QP	31.40	14.96	8.88	31.77	0.00	23.47	43.5	20.0	211	311	-
Hori.	213.311	QP	38.10	11.04	5.87	31.76	0.00	23.25	43.5	20.2	189	305	-
Hori.	287.947	QP	50.30	13.77	6.45	31.75	0.00	38.77	46.0	7.2	100	101	-
Hori.	1804.800	PK	47.45	25.11	5.47	39.36	2.26	40.93	73.9	32.9	123	87	-
Hori.	2707.200	PK	54.46	27.82	6.12	39.56	2.26	51.10	73.9	22.8	109	40	-
Hori.	3609.600	PK	46.25	28.97	6.96	39.61	2.26	44.83	73.9	29.0	100	39	-
Hori.	4512.000	PK	46.07	30.45	7.66	39.62	2.26	46.82	73.9	27.0	141	206	-
Hori.	5414.400	PK	46.22	31.72	8.40	39.85	2.26	48.75	73.9	25.1	153	0	-
Hori.	6316.800	PK	46.70	33.54	9.09	39.94	2.26	51.65	73.9	22.2	150	49	-
Vert.	40.001	QP	42.30	14.83	7.27	31.83	0.00	32.57	40.0	7.4	100	352	-
Vert.	48.002	QP	38.50	11.89	7.44	31.83	0.00	26.00	40.0	14.0	100	342	-
Vert.	55.996	QP	38.90	9.21	7.40	31.83	0.00	23.68	40.0	16.3	100	0	-
Vert.	119.997	QP	37.10	13.10	8.20	31.79	0.00	26.61	43.5	16.8	100	84	-
Vert.	135.999	QP	41.30	14.22	8.53	31.78	0.00	32.27	43.5	11.2	100	42	-
Vert.	1804.800	PK	46.66	25.11	5.47	39.36	2.26	40.14	73.9	33.7	132	111	-
Vert.	2707.200	PK	51.75	27.82	6.12	39.56	2.26	48.39	73.9	25.5	100	237	-
Vert.	3609.600	PK	45.56	28.97	6.96	39.61	2.26	44.14	73.9	29.7	153	242	-
Vert.	4512.000	PK	45.94	30.45	7.66	39.62	2.26	46.69	73.9	27.2	150	13	-
Vert.	5414.400	PK	46.03	31.72	8.40	39.85	2.26	48.56	73.9	25.3	150	183	-
Vert.	6316.800	PK	46.54	33.54	9.09	39.94	2.26	51.49	73.9	22.4	150	109	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1804.800	AV	42.77	25.11	5.47	39.36	0.60	2.26	36.85	53.9	17.0	-
Hori.	2707.200	AV	52.70	27.82	6.12	39.56	0.60	2.26	49.94	53.9	3.9	-
Hori.	3609.600	AV	41.12	28.97	6.96	39.61	0.60	2.26	40.30	53.9	13.6	-
Hori.	4512.000	AV	39.41	30.45	7.66	39.62	0.60	2.26	40.76	53.9	13.1	-
Hori.	5414.400	AV	38.71	31.72	8.40	39.85	0.60	2.26	41.84	53.9	12.0	-
Hori.	6316.800	AV	39.98	33.54	9.09	39.94	0.60	2.26	45.53	53.9	8.3	-
Vert.	1804.800	AV	43.08	25.11	5.47	39.36	0.60	2.26	37.16	53.9	16.7	-
Vert.	2707.200	AV	48.72	27.82	6.12	39.56	0.60	2.26	45.96	53.9	7.9	-
Vert.	3609.600	AV	39.67	28.97	6.96	39.61	0.60	2.26	38.85	53.9	15.0	-
Vert.	4512.000	AV	39.89	30.45	7.66	39.62	0.60	2.26	41.24	53.9	12.6	-
Vert.	5414.400	AV	39.89	31.72	8.40	39.85	0.60	2.26	43.02	53.9	10.8	-
Vert.	6316.800	AV	40.20	33.54	9.09	39.94	0.60	2.26	45.75	53.9	8.1	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 dB
Duty factor refer to "Burst rate confirmation" sheet.

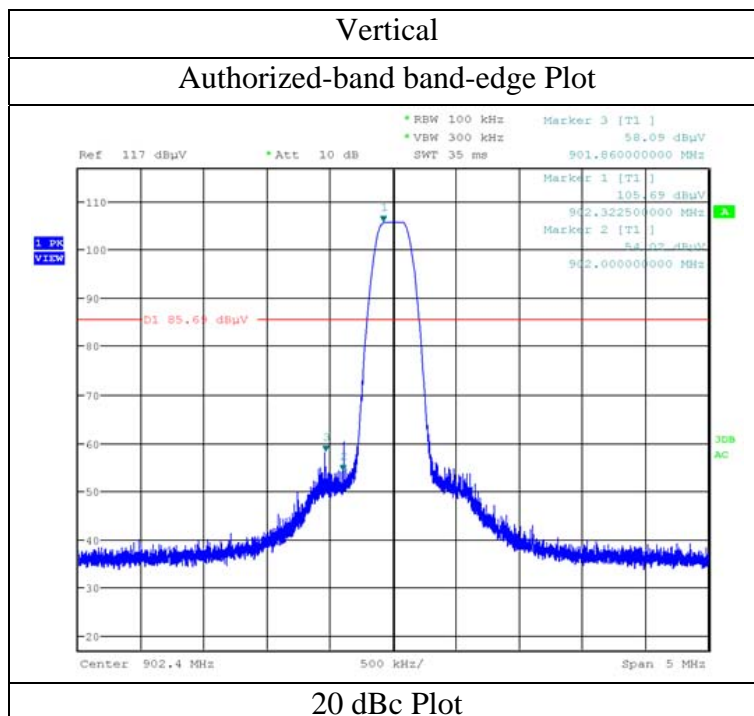
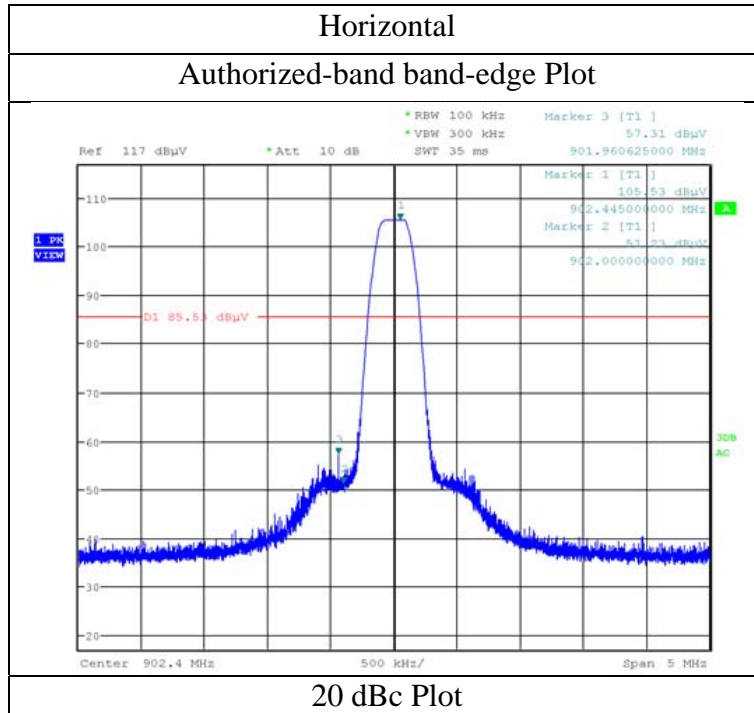
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	901.957	PK	58.33	22.12	10.01	31.28	0.00	59.18	87.2	28.0	-
Hori.	901.961	PK	59.01	22.12	10.01	31.28	0.00	59.86	87.2	27.3	-
Hori.	902.000	PK	60.54	22.12	10.01	31.28	0.00	61.39	87.2	25.8	-
Hori.	902.400	PK	106.41	22.12	10.01	31.28	0.00	107.26	-	-	Carrier
Hori.	928.000	PK	53.54	22.13	10.08	31.12	0.00	54.63	87.2	32.5	-
Vert.	901.860	PK	57.92	22.12	10.01	31.28	0.00	58.77	86.8	28.0	-
Vert.	901.957	PK	58.87	22.12	10.01	31.28	0.00	59.72	86.8	27.0	-
Vert.	902.000	PK	60.23	22.12	10.01	31.28	0.00	61.08	86.8	25.7	-
Vert.	902.400	PK	106.01	22.12	10.01	31.28	0.00	106.86	-	-	Carrier
Vert.	928.000	PK	50.85	22.13	10.08	31.12	0.00	51.94	86.8	34.8	-

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	
Date	May 8, 2023	May 9, 2023
Temperature / Humidity	20 deg. C / 50 % RH	22 deg. C / 43 % RH
Engineer	Akihiro Oda	Akihiro Oda
	(30 MHz -1 GHz)	
Mode	Tx, Hopping Off, 902.4 MHz	



* 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

Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date May 8, 2023 May 9, 2023
Temperature / Humidity 20 deg. C / 50 % RH 22 deg. C / 43 % RH
Engineer Akihiro Oda Akihiro Oda
 (30 MHz -1 GHz) (1 GHz -10 GHz)
Mode Tx, Hopping Off, 904.8 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.	155.975	QP	31.70	15.07	8.92	31.77	0.00	23.92	43.5	19.5	300	57	-
Hori.	213.478	QP	38.50	11.04	5.87	31.76	0.00	23.65	43.5	19.8	150	155	-
Hori.	287.986	QP	50.00	13.77	6.45	31.75	0.00	38.47	46.0	7.5	100	95	-
Hori.	1809.600	PK	46.93	25.12	5.48	39.36	2.26	40.43	73.9	33.4	120	91	-
Hori.	2714.400	PK	54.00	27.84	6.13	39.56	2.26	50.67	73.9	23.2	104	45	-
Hori.	3619.200	PK	46.27	29.00	6.96	39.61	2.26	44.88	73.9	29.0	122	42	-
Hori.	4524.000	PK	45.43	30.48	7.66	39.63	2.26	46.20	73.9	27.7	139	331	-
Hori.	5428.800	PK	46.54	31.75	8.42	39.85	2.26	49.12	73.9	24.7	146	138	-
Hori.	6333.600	PK	47.62	33.62	9.10	39.93	2.26	52.67	73.9	21.2	150	19	-
Vert.	40.003	QP	42.10	14.83	7.27	31.83	0.00	32.37	40.0	7.6	100	271	-
Vert.	47.904	QP	38.80	11.93	7.43	31.83	0.00	26.33	40.0	13.6	100	0	-
Vert.	55.995	QP	39.10	9.21	7.40	31.83	0.00	23.88	40.0	16.1	100	341	-
Vert.	120.016	QP	37.00	13.10	8.20	31.79	0.00	26.51	43.5	16.9	100	80	-
Vert.	136.014	QP	41.10	14.22	8.53	31.78	0.00	32.07	43.5	11.4	100	64	-
Vert.	1809.600	PK	46.59	25.12	5.48	39.36	2.26	40.09	73.9	33.8	153	89	-
Vert.	2714.400	PK	50.31	27.84	6.13	39.56	2.26	46.98	73.9	26.9	100	85	-
Vert.	3619.200	PK	46.05	29.00	6.96	39.61	2.26	44.66	73.9	29.2	135	291	-
Vert.	4524.000	PK	46.39	30.48	7.66	39.63	2.26	47.16	73.9	26.7	145	165	-
Vert.	5428.800	PK	47.53	31.75	8.42	39.85	2.26	50.11	73.9	23.7	150	311	-
Vert.	6333.600	PK	46.91	33.62	9.10	39.93	2.26	51.96	73.9	21.9	150	5	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1809.600	AV	41.71	25.12	5.48	39.36	0.60	2.26	35.81	53.9	18.0	-
Hori.	2714.400	AV	52.02	27.84	6.13	39.56	0.60	2.26	49.29	53.9	4.6	-
Hori.	3619.200	AV	41.09	29.00	6.96	39.61	0.60	2.26	40.30	53.9	13.6	-
Hori.	4524.000	AV	39.99	30.48	7.66	39.63	0.60	2.26	41.36	53.9	12.5	-
Hori.	5428.800	AV	39.82	31.75	8.42	39.85	0.60	2.26	43.00	53.9	10.9	-
Hori.	6333.600	AV	40.37	33.62	9.10	39.93	0.60	2.26	46.02	53.9	7.8	-
Vert.	1809.600	AV	42.11	25.12	5.48	39.36	0.60	2.26	36.21	53.9	17.6	-
Vert.	2714.400	AV	48.01	27.84	6.13	39.56	0.60	2.26	45.28	53.9	8.6	-
Vert.	3619.200	AV	39.67	29.00	6.96	39.61	0.60	2.26	38.88	53.9	15.0	-
Vert.	4524.000	AV	40.03	30.48	7.66	39.63	0.60	2.26	41.40	53.9	12.5	-
Vert.	5428.800	AV	39.62	31.75	8.42	39.85	0.60	2.26	42.80	53.9	11.1	-
Vert.	6333.600	AV	40.03	33.62	9.10	39.93	0.60	2.26	45.68	53.9	8.2	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 dB
Duty factor refer to "Burst rate confirmation" sheet.

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	902.000	PK	38.90	22.12	10.01	31.28	0.00	39.75	87.1	47.3	-
Hori.	904.800	PK	106.25	22.12	10.01	31.26	0.00	107.12	-	-	Carrier
Hori.	928.000	PK	38.44	22.13	10.08	31.12	0.00	39.53	87.1	47.5	-
Vert.	902.000	PK	37.99	22.12	10.01	31.28	0.00	38.84	87.0	48.1	-
Vert.	904.800	PK	106.20	22.12	10.01	31.26	0.00	107.07	-	-	Carrier
Vert.	928.000	PK	38.00	22.13	10.08	31.12	0.00	39.09	87.0	47.9	-

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

Radiated Spurious Emission

Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date May 8, 2023 May 9, 2023
Temperature / Humidity 20 deg. C / 50 % RH 22 deg. C / 43 % RH
Engineer Akihiro Oda Akihiro Oda
 (30 MHz -1 GHz) (1 GHz -10 GHz)
Mode Tx, Hopping Off, 907.2 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.	152.016	QP	31.40	14.92	8.87	31.77	0.00	23.42	43.5	20.0	218	207	-
Hori.	213.491	QP	38.60	11.04	5.87	31.76	0.00	23.75	43.5	19.7	142	300	-
Hori.	287.984	QP	50.20	13.77	6.45	31.75	0.00	38.67	46.0	7.3	100	108	-
Hori.	1814.400	PK	46.37	25.12	5.48	39.36	2.26	39.87	73.9	34.0	117	91	-
Hori.	2721.600	PK	54.05	27.85	6.14	39.55	2.26	50.75	73.9	23.1	103	39	-
Hori.	3628.800	PK	45.88	29.02	6.97	39.61	2.26	44.52	73.9	29.3	114	323	-
Hori.	4536.000	PK	45.71	30.51	7.67	39.63	2.26	46.52	73.9	27.3	149	66	-
Hori.	5443.200	PK	46.22	31.78	8.43	39.85	2.26	48.84	73.9	25.0	155	201	-
Hori.	6350.400	PK	46.97	33.70	9.11	39.93	2.26	52.11	73.9	21.7	145	43	-
Vert.	40.000	QP	42.40	14.83	7.26	31.83	0.00	32.66	40.0	7.3	100	335	-
Vert.	48.006	QP	37.60	11.89	7.44	31.83	0.00	25.10	40.0	14.9	100	304	-
Vert.	55.998	QP	38.80	9.21	7.40	31.83	0.00	23.58	40.0	16.4	100	296	-
Vert.	119.999	QP	37.10	13.10	8.20	31.79	0.00	26.61	43.5	16.8	100	250	-
Vert.	135.998	QP	41.40	14.22	8.53	31.78	0.00	32.37	43.5	11.1	100	52	-
Vert.	1814.400	PK	46.64	25.12	5.48	39.36	2.26	40.14	73.9	33.7	115	90	-
Vert.	2721.600	PK	49.85	27.85	6.14	39.55	2.26	46.55	73.9	27.3	100	115	-
Vert.	3628.800	PK	46.62	29.02	6.97	39.61	2.26	45.26	73.9	28.6	151	261	-
Vert.	4536.000	PK	45.05	30.51	7.67	39.63	2.26	45.86	73.9	28.0	133	0	-
Vert.	5443.200	PK	46.82	31.78	8.43	39.85	2.26	49.44	73.9	24.4	150	220	-
Vert.	6350.400	PK	47.02	33.70	9.11	39.93	2.26	52.16	73.9	21.7	145	10	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1814.400	AV	42.67	25.12	5.48	39.36	0.60	2.26	36.77	53.9	17.1	-
Hori.	2721.600	AV	52.16	27.85	6.14	39.55	0.60	2.26	49.46	53.9	4.4	-
Hori.	3628.800	AV	42.22	29.02	6.97	39.61	0.60	2.26	41.46	53.9	12.4	-
Hori.	4536.000	AV	39.52	30.51	7.67	39.63	0.60	2.26	40.93	53.9	12.9	-
Hori.	5443.200	AV	40.10	31.78	8.43	39.85	0.60	2.26	43.32	53.9	10.5	-
Hori.	6350.400	AV	40.37	33.70	9.11	39.93	0.60	2.26	46.11	53.9	7.7	-
Vert.	1814.400	AV	41.50	25.12	5.48	39.36	0.60	2.26	35.60	53.9	18.3	-
Vert.	2721.600	AV	47.42	27.85	6.14	39.55	0.60	2.26	44.72	53.9	9.1	-
Vert.	3628.800	AV	40.65	29.02	6.97	39.61	0.60	2.26	39.89	53.9	14.0	-
Vert.	4536.000	AV	39.80	30.51	7.67	39.63	0.60	2.26	41.21	53.9	12.6	-
Vert.	5443.200	AV	39.76	31.78	8.43	39.85	0.60	2.26	42.98	53.9	10.9	-
Vert.	6350.400	AV	40.72	33.70	9.11	39.93	0.60	2.26	46.46	53.9	7.4	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 dB
Duty factor refer to "Burst rate confirmation" sheet.

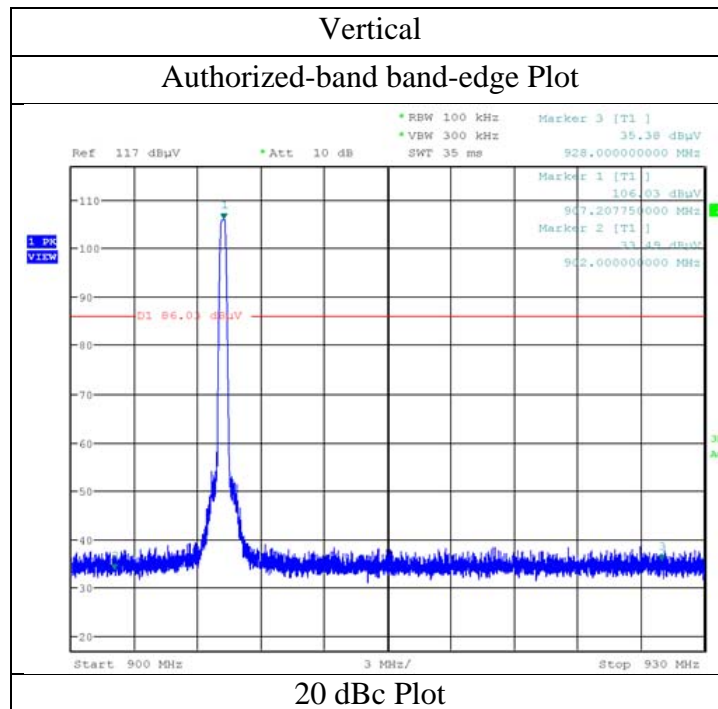
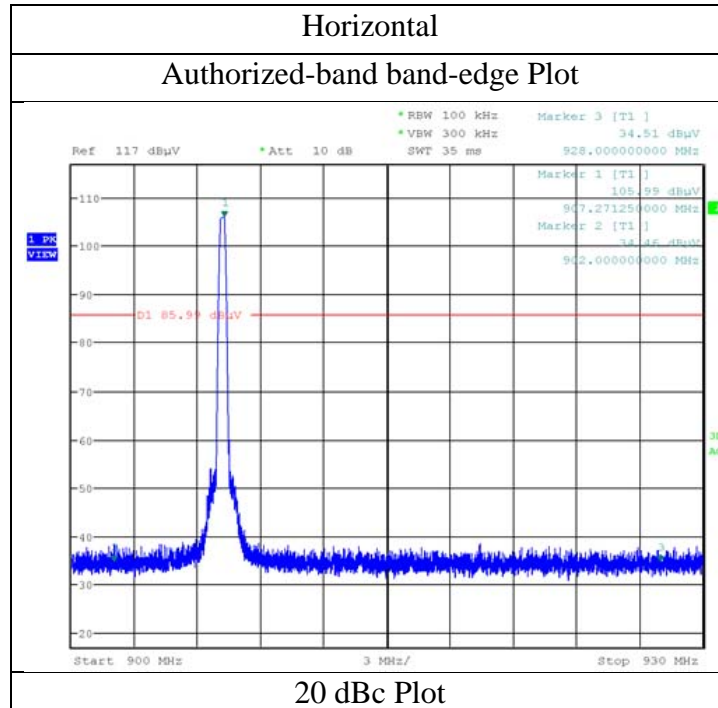
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	902.000	PK	39.07	22.12	10.01	31.28	0.00	39.92	86.8	46.8	-
Hori.	907.200	PK	105.92	22.12	10.02	31.25	0.00	106.81	-	-	Carrier
Hori.	928.000	PK	38.90	22.13	10.08	31.12	0.00	39.99	86.8	46.8	-
Vert.	902.000	PK	38.91	22.12	10.01	31.28	0.00	39.76	86.7	46.9	-
Vert.	907.200	PK	105.89	22.12	10.02	31.25	0.00	106.78	-	-	Carrier
Vert.	928.000	PK	38.67	22.13	10.08	31.12	0.00	39.76	86.7	46.9	-

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

Radiated Spurious Emission
(Reference Plot for band-edge)

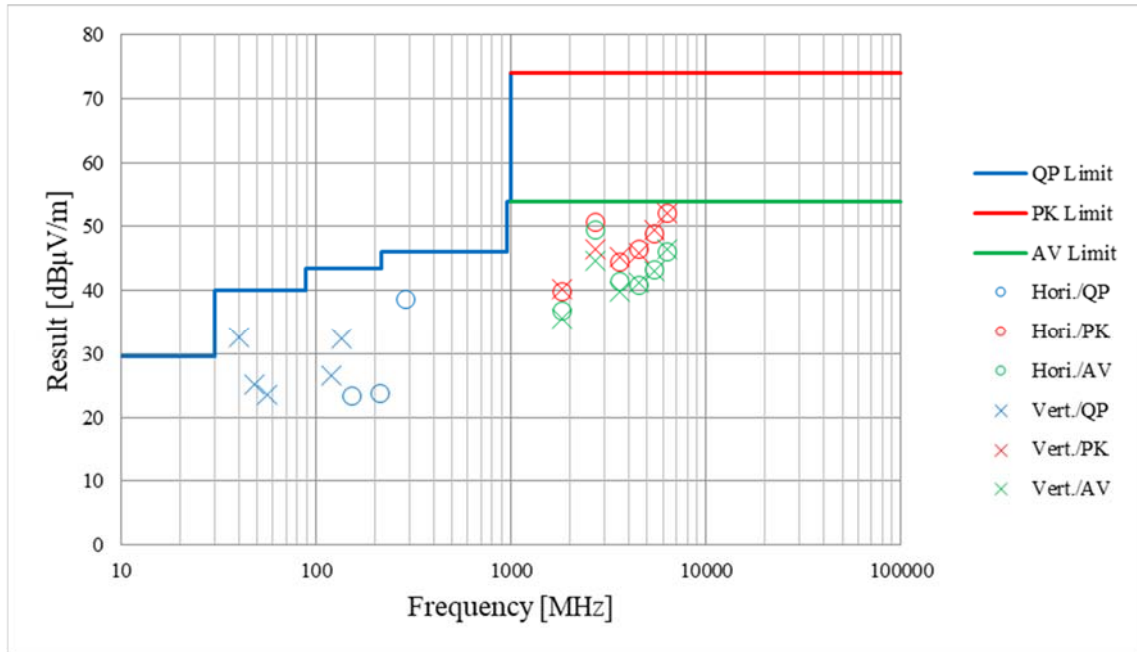
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date May 8, 2023
Temperature / Humidity 20 deg. C / 50 % RH
Engineer Akihiro Oda
 (30 MHz -1 GHz)
Mode Tx, Hopping Off, 907.2 MHz



* 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 mode for Maximum Peak Output Power)

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	
Date	May 8, 2023	May 9, 2023
Temperature / Humidity	20 deg. C / 50 % RH	22 deg. C / 43 % RH
Engineer	Akihiro Oda	Akihiro Oda
	(30 MHz -1 GHz)	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, 907.2 MHz	

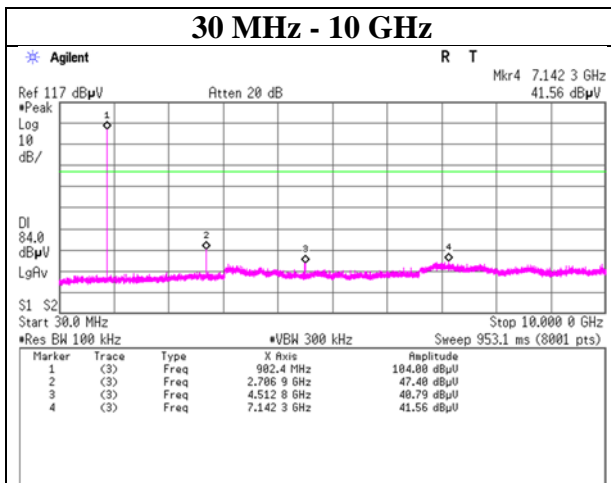
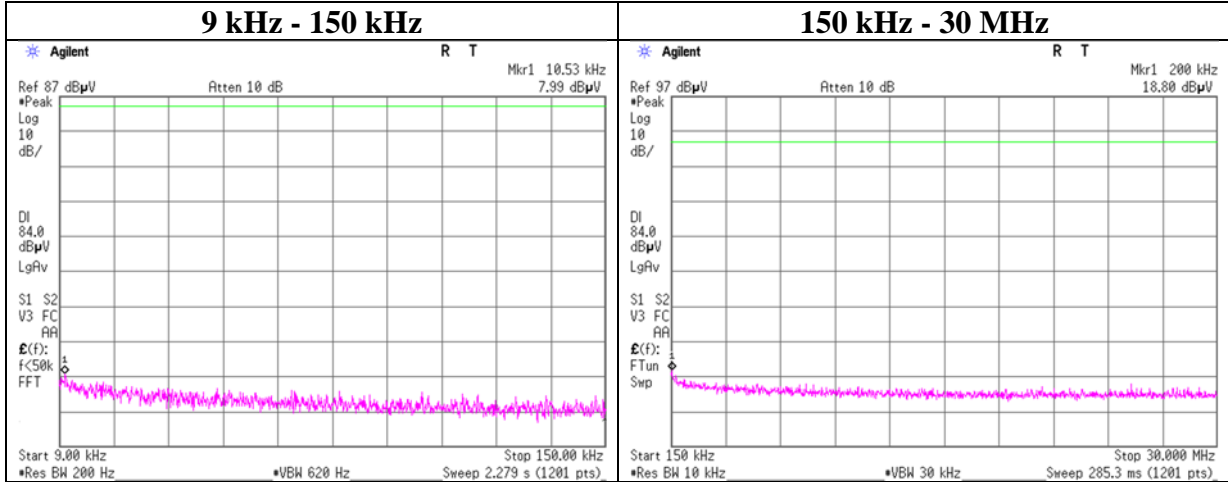


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date May 5, 2023
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off

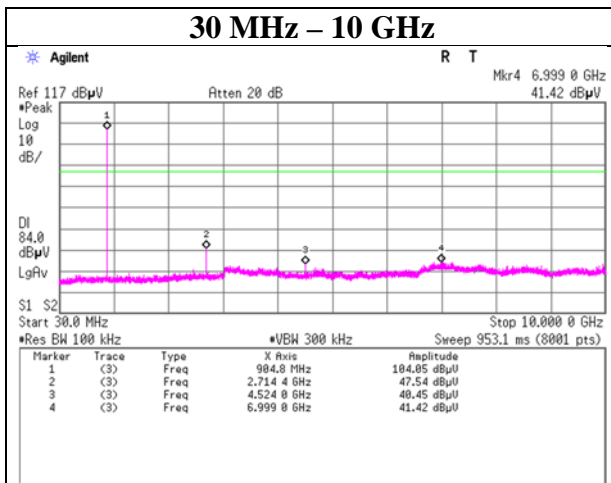
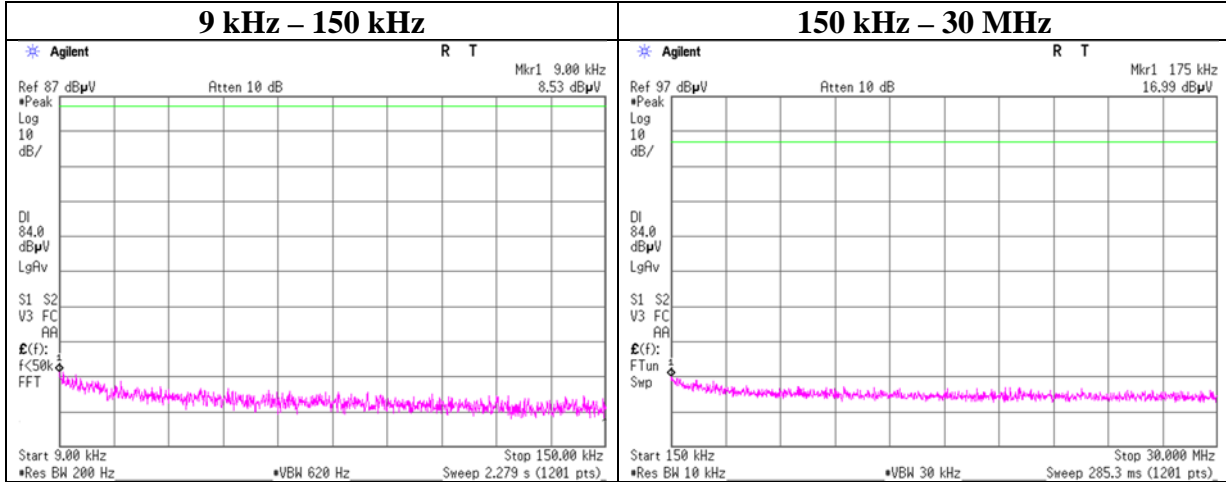
902.4 MHz



Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date May 5, 2023
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off

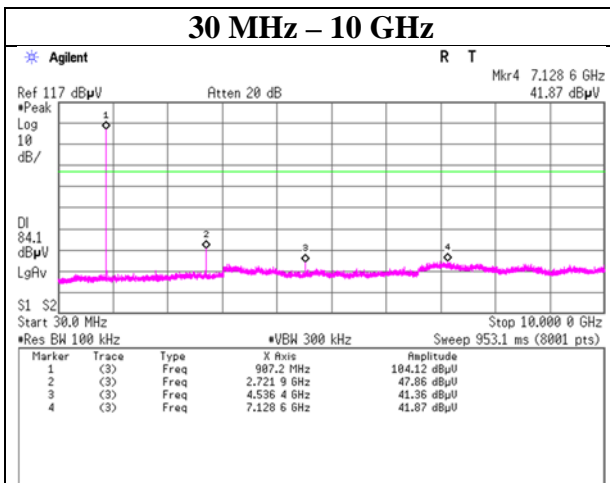
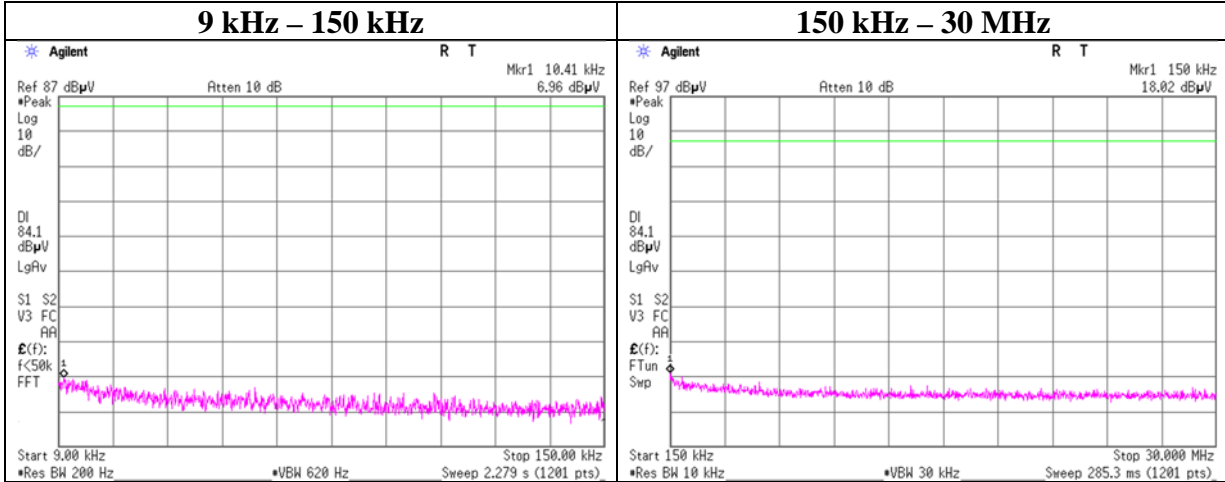
904.8 MHz



Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date May 5, 2023
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off

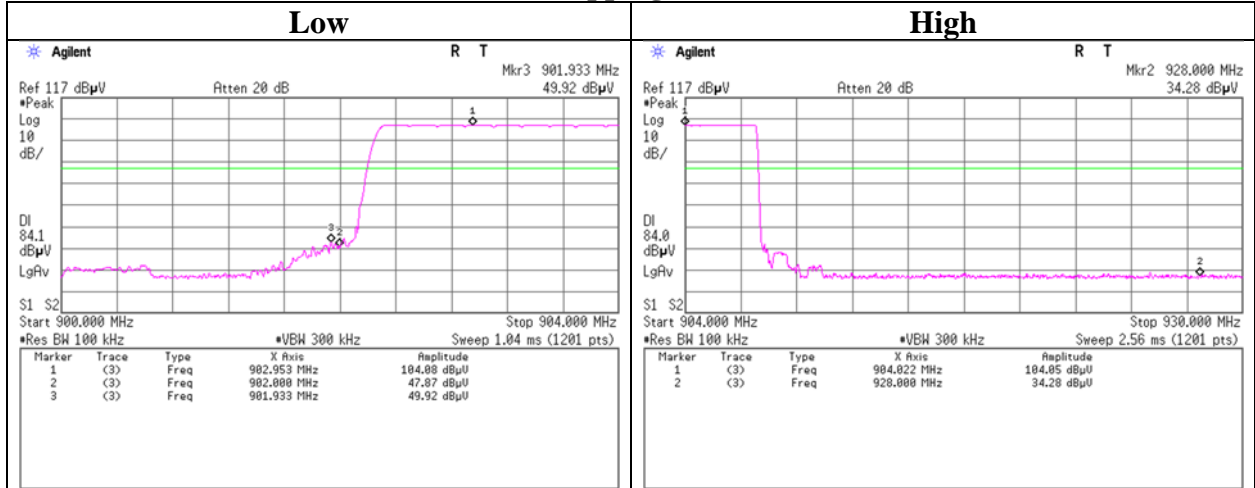
907.2 MHz



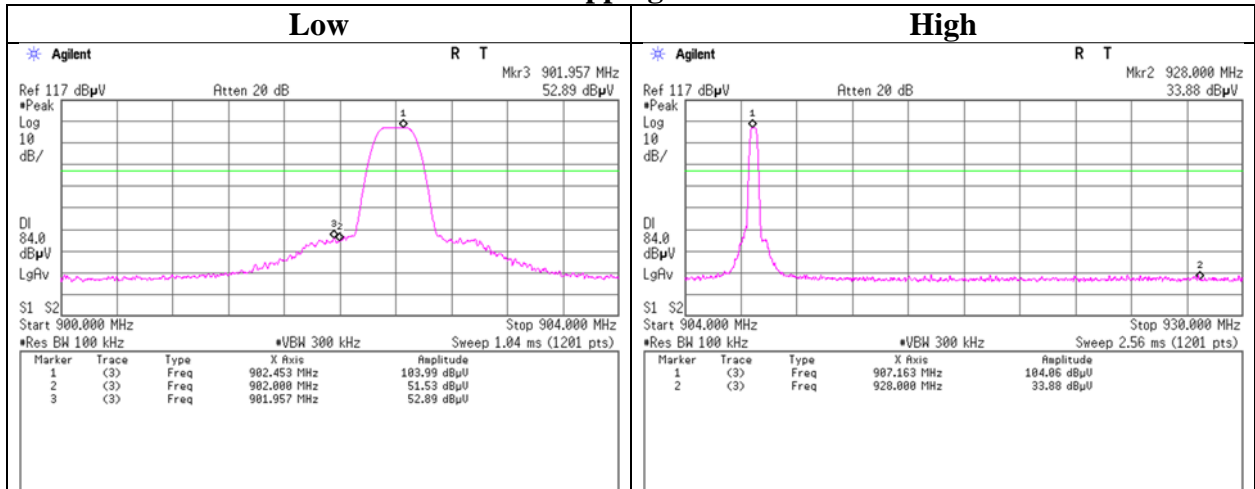
Conducted Emission Band Edge compliance

Test place Shonan EMC Lab. No.5 Shielded Room
Date May 5, 2023
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Shiro Kobayashi
Mode Tx

Hopping On



Hopping Off

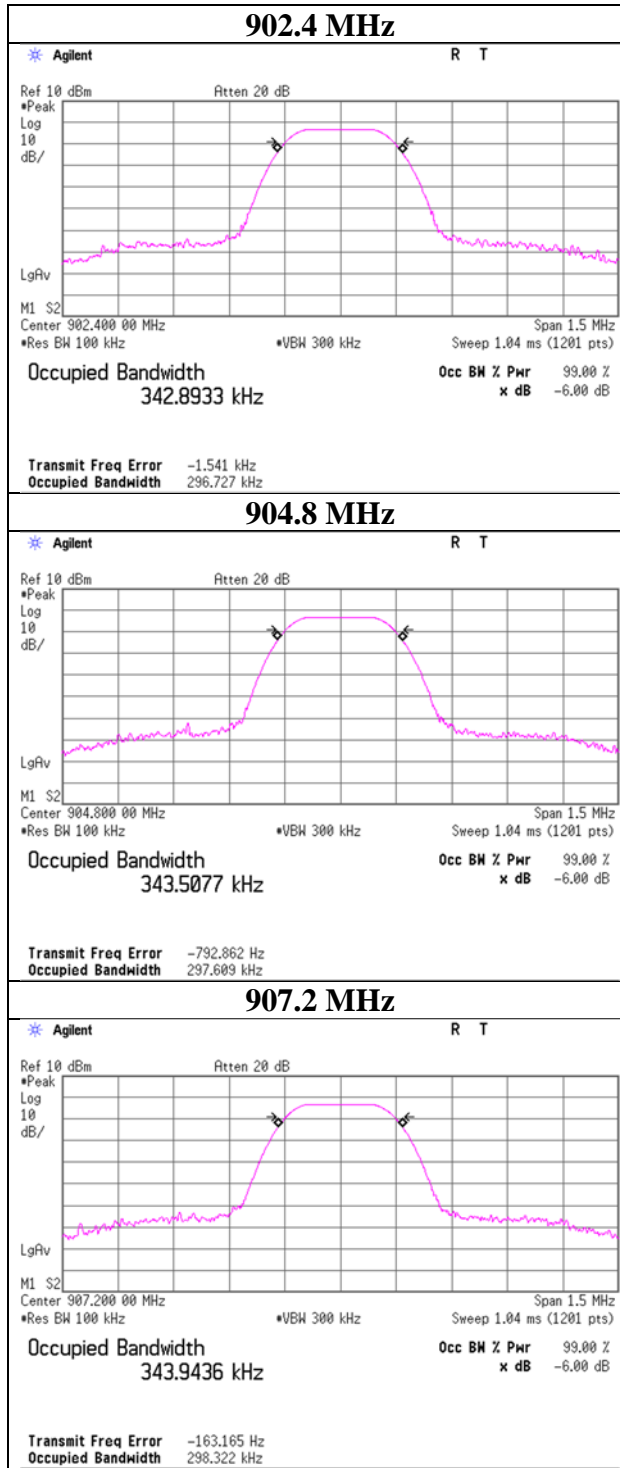


6 dB Bandwidth

Test place Shonan EMC Lab. No.5 Shielded Room
Date May 5, 2023
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Shiro Kobayashi
Mode Tx Hopping Off

Frequency	6 dB Bandwidth
[MHz]	[kHz]
902.4	296.727
904.8	297.609
907.2	298.322

6 dB Bandwidth



Power Density

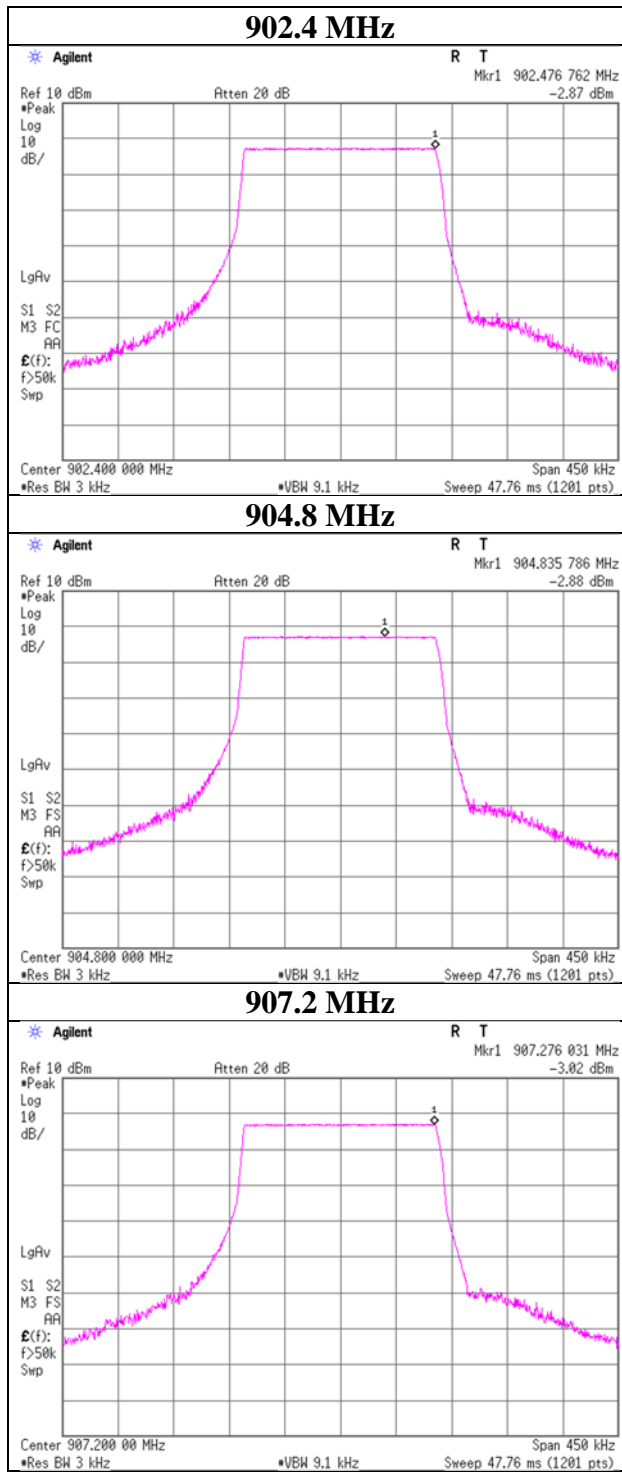
Test place Shonan EMC Lab. No.5 Shielded Room
Date May 5, 2023
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Shiro Kobayashi
Mode Tx Hopping Off

Freq. [MHz]	Reading (Peak) [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
902.4	-2.87	0.41	9.84	7.38	8.00	0.62
904.8	-2.88	0.41	9.84	7.37	8.00	0.63
907.2	-3.02	0.42	9.84	7.24	8.00	0.76

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

Power Density



APPENDIX 2: Test Instruments

Test Equipment(1/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2022/09/20	12
AT	SAT10-14	154591	Attenuator	Weinschel Corp.	54A-10	81595	2023/04/12	12
AT	SCC-G64	196945	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803414/2	2023/03/02	12
AT	SGPS-02	215689	GPS L1 Band GPS Reradiator Kits	San Jose Navigation	Receive Ant:SA-200G,Re-radiator Ant:RK-106,1FCable	I1705001300001	-	-
AT	SOS-27	191845	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2022/11/08	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2022/11/08	12
AT	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2022/08/04	12
CE	SAT3-13	150923	Attenuator	JFW	50HF-003N	-	2023/02/09	12
CE	SCC-A12/A13/SRSE-01	144966	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-269(RF Selector)	2023/04/18	12
CE	SLS-02	145539	LISN	Rohde & Schwarz	ENV216	100512	2023/02/21	12
CE	SOS-16	167990	Thermo-Hygrometer	CUSTOM. Inc	CTH-202	708Q08R	2022/10/18	12
CE,RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
CE,RE	SJM-22	207279	Tape Measure	ASKUL	-	-	-	-
CE,RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2022/09/14	12
CE,RE	STS-01	145792	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997812	2022/09/20	12
RE	KAT6-04	144899	Attenuator	Inmet	18N-6dB	-	2022/12/16	12
RE	SAEC-01(NSA)	145597	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	2023/04/04	12
RE	SAEC-01(SVSWR)	145561	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	2022/05/13	12
RE	SAF-01	145003	Pre Amplifier	SONOMA	310N	290211	2023/02/09	12
RE	SAF-04	145127	Pre Amplifier	Toyo Corporation	TPA0118-36	2072554	2022/05/20	12
RE	SAT10-05	145136	Attenuator	Keysight Technologies Inc	8493C-010	74864	2022/10/20	12
RE	SAT3-09	144959	Attenuator	JFW	50HF-003N	-	2022/08/23	12
RE	SBA-01	145161	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032664	2023/04/12	12
RE	SCC-A1/A3/A5/A7/A8/A13/SRSE-01	144967	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	2023/04/18	12
RE	SCC-A2/A4/A6/A7/A8/A13/SRSE-01	144968	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	2023/04/18	12

Test Equipment(2/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SCC-G05	145039	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	2023/01/12	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2023/01/12	12
RE	SCC-G62	196985	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803650/2	2023/03/02	12
RE	SFL-22	168802	Highpass Filter	MICRO-TRONICS	HPM50114	G035	2023/03/02	12
RE	SHA-01	145383	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-725	2023/03/01	12
RE	SLA-05	145527	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	193	2023/04/12	12
RE	SOS-20	191837	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/06	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
 RE: Radiated Emission
 AT: Antenna Terminal Conducted