

RADIO TEST REPORT

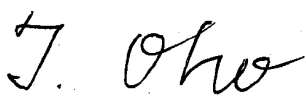
(for Bluetooth classic)

Project No. : JB-Z0788-B
Client : Sony Corporation
Client's Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
Product Name : Wireless Microphone
Model No. : ECM-W2BT(R)
FCC ID : AK8ECM-W2BTR
Test Standard : 47 CFR Part 15 Subpart C
Sample Receipt Date : October 20, 2020
Test Date : November 5, 2020 to November 19, 2020
Report Date : January 25, 2021
Test Result : Complied

Notice:

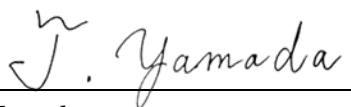
- * These test results relate only to the items (combination equipment, test configuration, operation condition etc.) tested.
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- * This report must not be used by the client to claim product endorsement by A2LA or any agency of the U.S.
- * Hereby certify that no party is subject to a denial of federal benefits pursuant to section 5301 of the Anti-Drug Abuse Act.
- * All test results are traceable to the national and / or international standards.
- * The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in Sony Global Manufacturing & Operations Corporation EMC/RF Test Laboratory.
- * This report replaces and supersedes all previous versions. Refer to Revision History on the following page.

Reported by:



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Format No.: NV1-1-01 Version 5.0

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Note

- ☒-indicates that the listed condition, standard or equipment is applicable for this report.
☐-indicates that the listed condition, standard or equipment is not applicable for this report.

Revision History

Revision	Date	Overview	Page
JB-Z0788 (Original)	December 10, 2020	-	-
JB-Z0788-A (Original)	January 19, 2021	Revised FCC ID.	P1
JB-Z0788-B (Original)	January 25, 2021	Add worst data Plot for Radiated Spurious Emissions.	P17,21

Disclaimer

This report includes the information provided by the customer as below;

- Cover page : Client and product related information
- Clause 1.1 : Description of Equipment Under Test (EUT)
- Clause 2 : Operating mode / conditions

* The laboratory is not responsible for any test results affected by the above information.

1. General Information

1.1. Description of Equipment Under Test (EUT)

General Specification

Test Sample Condition	: ☐ Prototype	☒ Pre-production	☐ Mass-production
Product Name	: Wireless Microphone		
Trade Name	: SONY		
Model No.	: ECM-W2BT(R)		
Serial No.	: 003, 007		
Power Rating of the EUT	: DC 3.7 V (The EUT is supplied with the power from the built-in battery)		

Similar model(s) to be covered by this report

Model No. : None

Radio Specification

Function of the Equipment	: Transceiver
Operating Frequency	: 2402 - 2480 MHz
Modulation Type	: FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)
Channel Spacing	: 1 MHz
Channel Bandwidth	: 1 MHz
Number of channels	: 79
Antenna Type	: Monopole Antenna
Antenna Connector Type	: None
Antenna Gain	: -0.42 dBi
Operating Temperature	: +0.0 to +40.0 deg.C

1.2. Summary of Test Result

Test Item	Test Method	Worst Margin	Results	Note
AC Power-line Conducted Emissions	-	-	N/A	*1
20dB Bandwidth	Conducted	Refer to the test data	Complied	-
Carrier Frequency Separation	Conducted	Refer to the test data	Complied	-
Number of Hopping Frequencies	Conducted	Refer to the test data	Complied	-
Time of Occupancy (Dwell Time)	Conducted	Refer to the test data	Complied	-
Maximum Peak Conducted Output Power	Conducted	7.70 dB	Complied	-
Radiated Spurious Emissions	Radiated	11.5 dB (AV) 4960.00 MHz Vertical	Complied	-
Conducted Spurious Emissions for Band Edge	Conducted	24.32 dB 2400.00 MHz	Complied	*2

Note

- *1: This item was not applied to the EUT since its transmission is stopped when the battery is being charged by the PC connected to AC Power-line.
- *2: Conducted Spurious Emissions measurement was tested for the only frequencies in the non-restricted carrier band edges, since the spurious emissions in other non-restricted band were complied with Radiated Spurious Emissions measurement

Other requirements

Part 15.31(e) Supply voltage requirement

: Complied (The EUT was tested with a new battery.)

Part 15.203 / 212 Antenna requirement

: Complied (The EUT has an internal antenna which cannot be replaced by users.)

1.3. Tested Methodology

Test Standard : 47 CFR Part15 Subpart C

Test Method : ANSI C63.10 - 2013

KDB 558074 D01 15.247 Meas Guidance v05r02

Test Condition

Radiated Spurious Emissions

Test Distance : ☒ 3 m ☐ 10m (9 kHz to 30 MHz)
☒ 3 m ☐ 10m (30 MHz to 1000 MHz)
☒ 3 m (1 GHz to 26.5 GHz)

Dimensions of the EUT table : 0.8 m (below 1 GHz) or 1.5 m (above 1 GHz) height, 1.5 m width and 1 m depth.

1.4. Measurement Procedures

We performed the measurements in accordance with NV3-12, available upon the request.

☒ No deviation

☐ Deviation from the above procedure

The summary of the above procedure is mentioned below

Antenna-port Conducted Measurements

1. Antenna-port of the EUT was connected to the power sensor (Maximum Peak Conducted Output Power) or the spectrum analyzer. (other test items).
2. For each EUT operation mode, the Antenna-port Conducted Measurements were measured with the power sensor or the spectrum analyzer.

Test Item Antenna-port Conducted Measurements	Detector	RBW
20dB Bandwidth	Peak	30 kHz
Carrier Frequency Separation	Peak	100 kHz
Number of Hopping Frequencies	Peak	100 kHz
Time of Occupancy (Dwell Time)	Peak	1 MHz
Maximum Peak Conducted Output Power	Peak	-
Conducted Spurious Emissions for Band Edge	Peak	100 kHz

Radiated Spurious Emissions

1. The non-conductive table (EUT table) made of (☐ FRP, ☒ Styrene Foam, ☐ other non-conductive material) was placed in the center of the turntable.
2. The EUT was placed on the center of the tabletop.
3. The test antenna was placed away from the EUT at test distance.
4. The limits were compensated the distance factor with follows;

$$9 \text{ kHz to } 490 \text{ kHz [Limit at 3 m]} = [\text{Limit at 300 m}] + 40\log(300[\text{m}] / 3[\text{m}])$$

$$490 \text{ kHz to } 30 \text{ MHz [Limit at 3 m]} = [\text{Limit at 30 m}] + 40\log(30[\text{m}] / 3[\text{m}])$$
5. Find the worst arrangement of the EUT according to follows;
 - Rotating the turntable and/or scanning the antenna.
 - On every condition, exploring the highest emissions with the spectrum analyzer.
(9 kHz to 26.5 GHz, peak detector)
6. On the worst arrangement of the EUT found in above, choose the six highest harmonics or spurious emissions on the spectrum data.(*excluding carrier band edges)
 The final measurements of all test operating modes carried out on these emissions as follows;

The test antenna and the turntable were performed with follows;

	9 kHz to 30 MHz	30 MHz to 1000 MHz	1 GHz to 26.5 GHz
Antenna	Loop Antenna	Bi-conical Antenna, Log-periodic Antenna	Horn Antenna
Antenna scanning range	1 m, Vertical, 360 degrees	1 m to 4 m, Horizontal and Vertical	1 m to 4 m *, Horizontal and Vertical
Turntable rotating range	360 degrees	360 degrees	360 degrees

*: When the measurement frequencies above 1 GHz, final measurements are performed keeping the antenna in the "cone of radiation" from EUT area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.

Instruments settings were carried out with follows;

	9 kHz to 90 kHz 110 kHz to 490 kHz	90 kHz to 110 kHz 490 kHz to 30 MHz	30 MHz to 1000 MHz	1 GHz to 26.5 GHz
Detector	Peak / Average	Quasi-peak	Quasi-peak	Peak / Average
RBW	200 Hz (6 dB) or 9 kHz (6 dB) *1	200 Hz (6 dB) or 9 kHz (6 dB) *1	120 kHz (6 dB)	1 MHz (6 dB)
VBW	N/A	N/A	N/A	3 MHz (for peak) 10 kHz (for average) *2
Instrument	EMI test receiver	EMI test receiver	EMI test receiver	Spectrum analyzer

*1: When the measurement frequencies below 150 kHz, RBW: 200 Hz was used.

*2: VBW setting (for average) was higher than 1/T, and up to 10 kHz. refer to the test data. (T is the minimum transmission duration)

7. If the final measurement result exceeded the limit, the measurement is carried out additionally with follows;

Measurement points in non-restricted band (excluding carrier band edges)

- Fundamental Frequency
- Frequency that exceeded the limit in non-restricted band (excluding carrier band edges)

	9 kHz to 150 kHz	150 kHz to 30 MHz	30 MHz to 26.5 GHz
Detector	Peak	Peak	Peak
RBW	300 Hz (6 dB) *	10 kHz (6 dB) *	100 kHz (6 dB)
Instrument	Spectrum analyzer	Spectrum analyzer	Spectrum analyzer

*: Correction factor of RBW was compensated to a measurement result by the following formula.

$$\text{C.F. of RBW [dB]} = 10 \cdot \log(100 \text{ kHz} / \text{used RBW})$$

Measurement points in restricted band (for average result)

- Duty Cycle Correction Factor in any 100ms at measurement point

8. Although these tests for below 30MHz were performed other than open field area test site, adequate comparison measurements were confirmed against 30 m open field area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788 D01.

Further these test for above 1GHz were performed test site complied with CISPR 16-1-4.

In the case of EUT size smaller than the validated test volume, the antenna position is adjusted such that the distance between the EUT and the antenna reference point is identical to the 3m used for the S-VSWR validation measurements. These method based on clause 7.3.1 of CISPR16-1-4 Edition 4, therefore correcting distance factor is not applied.

1.5. Test Location

Test Facility Name : Sony Global Manufacturing & Operations Corporation
EMC/RF Test Laboratory, Main Lab.
Address : 8-4 Shiomi Kisarazu-shi Chiba-ken, 292-0834, Japan
Phone : +81 438 37 2750

A2LA Certificate No. : 3203.01
Cert. Validated Date : October 31, 2021

Antenna-port Conducted Measurements

Shielded Room

☒ 4th Site SR1

Radiated Spurious Emissions

Semi-Anechoic chamber

☐ 4th Site ☒ EMC Site

1.6. Uncertainty

Test Item	Frequency	4th Site SR1
Maximum Conducted Output Power	1 GHz to 6 GHz	± 0.84 dB
Conducted Spurious Emissions	below 6 GHz	± 1.25 dB

Test Item	Frequency	Distance	4th Site	EMC Site
AC Power-line Conducted Emissions	150 kHz to 30 MHz	-	± 3.34 dB	± 3.35 dB
Radiated Emissions	9 kHz to 30 MHz	3m	± 2.60 dB	± 3.13 dB
	30 MHz to 1000 MHz	3m	± 4.96 dB	± 5.26 dB
	1 GHz to 18 GHz	3m	± 5.22 dB	± 5.50 dB
	18 GHz to 26.5 GHz	3m	± 5.36 dB	± 5.63 dB

2. Test Specification

2.1. Validation

The system was configured for testing in a typical (as a customer would normally use it).
The tests were conducted with the worst-case modes as follows.

2.2. Operating Condition

The tests have been carried out the following conditions.

[Transmitting mode]

Test Items	Test Channels	Packet Type *1 *2 *3
Radiated Spurious Emissions (below 1GHz) *4	2402 MHz	BDR : DH5
20dB Bandwidth, Maximum Peak Conducted Output Power, Radiated Spurious Emissions (above 1GHz)	2402 MHz 2441 MHz 2480 MHz	BDR : DH5 EDR : 3DH3
Carrier Frequency Separation, Number of Hopping Frequencies, Time of Occupancy (Dwell Time)	Hopping ON	BDR : DH5 EDR : 3DH3
Conducted Spurious Emissions for Band Edge	2402 MHz	BDR : DH5 EDR : 3DH3

Note

*1: Inquiry mode was not performed based on the result of pre-compliance testing.

*2: The worst packet type has been decided based on the result of maximum duty cycle and pre-compliance testing in the actual product specification.

*3: Packet type for EDR has been decided based on the result of Maximum Peak Conducted Output Power.

*4: The test was performed with the representative mode that had been found as the worst emissions while exploratory testing.

The Software for Operating Mode

Software Name : DFU Mode
Software Version : -

2.3. Special Accessories

Special accessories needed for connecting the EUT to achieve compliance:

Item	Manufacturer	Model No.	Serial No.	Remark
-	-	-	-	-

2.4. EUT Modifications

- ☒ No equipment modification to achieve compliance to the standard levels was done during the tests.
☐ Equipment was modified to achieve compliance to the standard level as below.

Responsible Party Signature

Typed/ Print Name :
Responsible Party :
Position :
Date :

2.5. Configuration of EUT System

Antenna-port Conducted Measurements

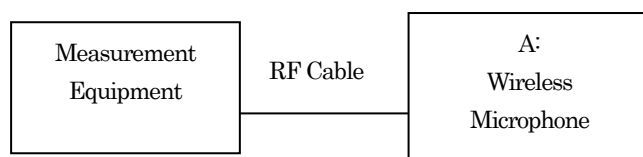
[EUT and Associated Equipment (AE)]

Symbol	EUT/ AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Wireless Microphone	SONY	ECM-W2BT(R)	003

[Type of Cable]

Symbol	Description	Identification (Manufacturer etc.)	Shielded Yes / No	Ferrite Core	Length (m)	Bundled
-	-	-	-	-	-	-

[Connecting Diagram]



Radiated Spurious Emissions

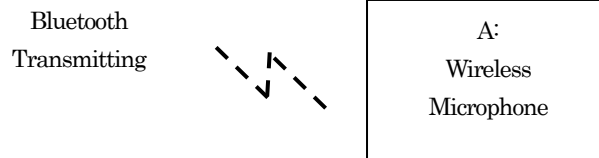
[EUT and Associated Equipment (AE)]

Symbol	EUT/ AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Wireless Microphone	SONY	ECM-W2BT(R)	007

[Type of Cable]

Symbol	Description	Identification (Manufacturer etc.)	Shielded Yes / No	Ferrite Core	Length (m)	Bundled
-	-	-	-	-	-	-

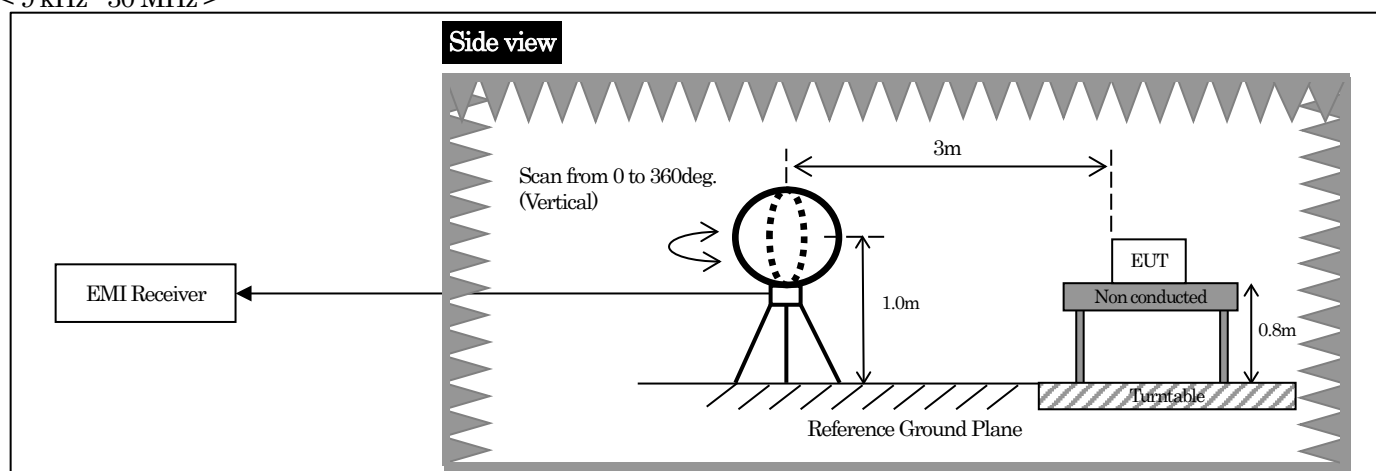
[Connecting Diagram]



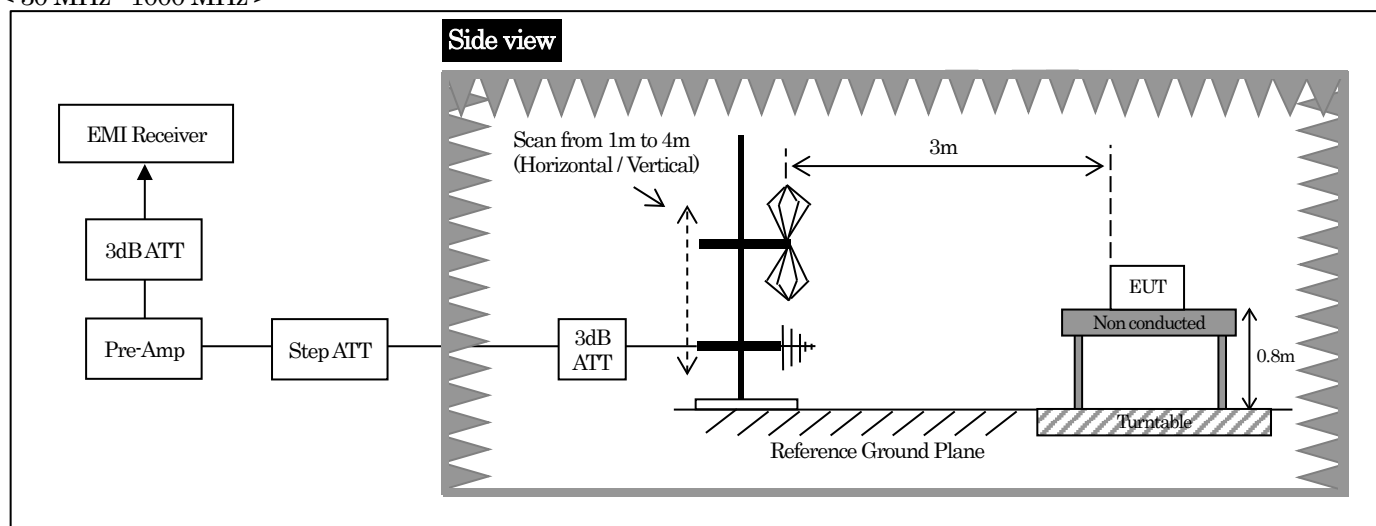
2.6. Typical setup arrangement

Radiated spurious emissions

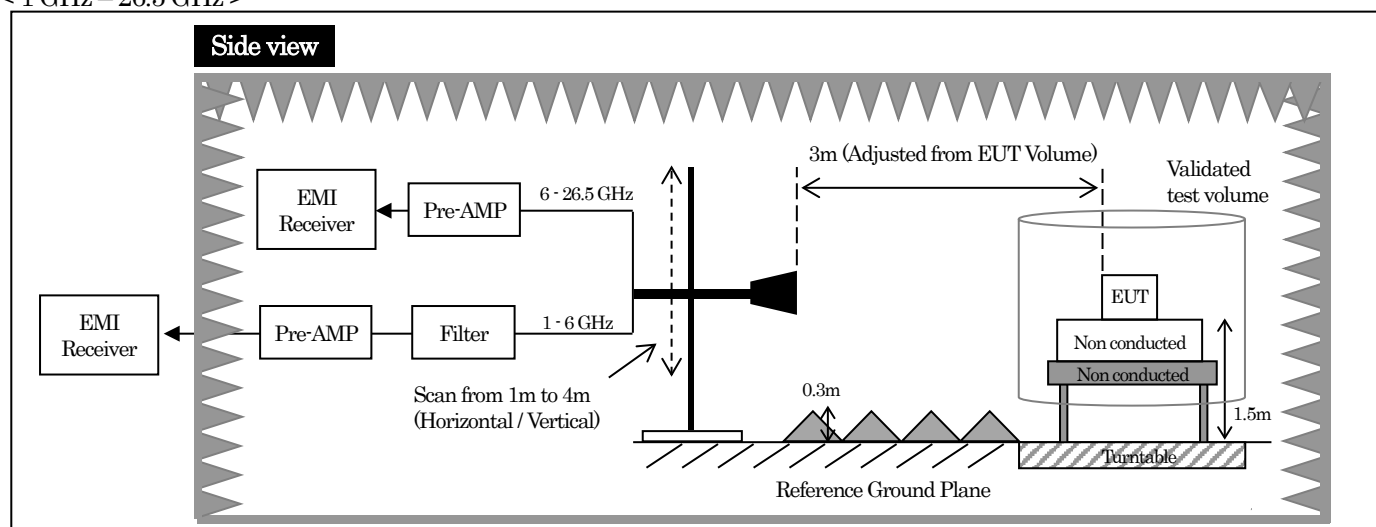
< 9 kHz - 30 MHz >



< 30 MHz - 1000 MHz >



< 1 GHz - 26.5 GHz >



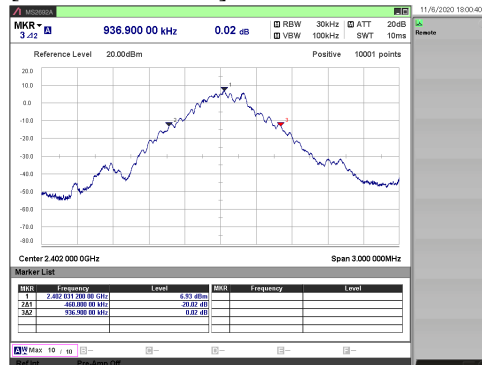
3. Test Data

3.1. 20dB Bandwidth

- 1) Ambient temperature : 22.2 deg.C
- 2) Relative humidity : 49.6 %
- 3) Date of measurement : November 6, 2020
- 4) Measured by : M.KOUGA
- 5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Result [MHz]	Limit [MHz]
BDR	DH5	2402	0.937	-
		2441	0.938	-
		2480	0.938	-
EDR	3DH3	2402	1.250	-
		2441	1.252	-
		2480	1.250	-

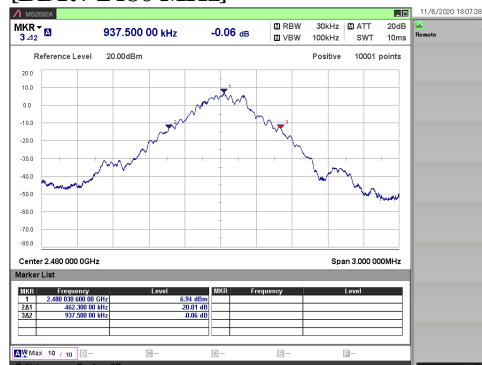
[BDR / 2402 MHz]



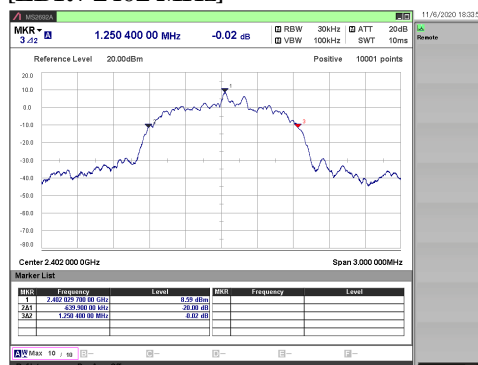
[BDR / 2441 MHz]



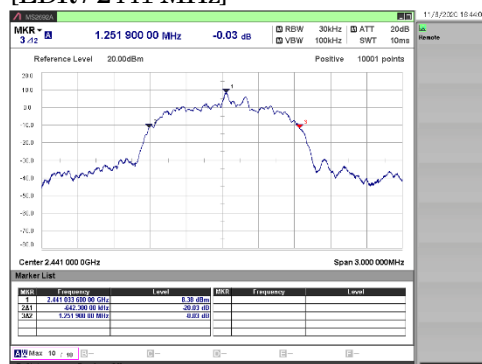
[BDR / 2480 MHz]



[EDR / 2402 MHz]



[EDR / 2441 MHz]



[EDR / 2480 MHz]

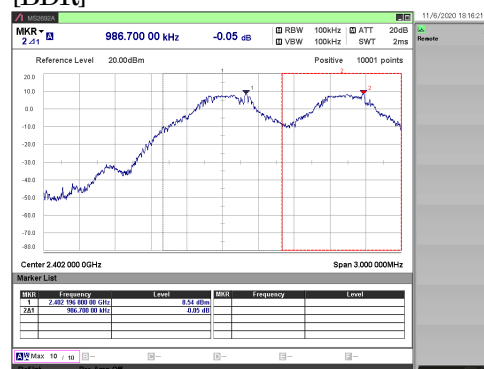


3.2. Carrier Frequency Separation

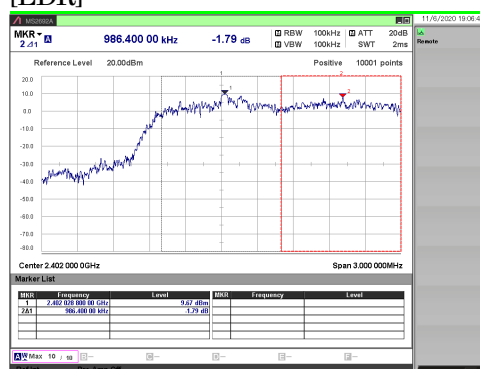
- 1) Ambient temperature : 22.2 deg.C
- 2) Relative humidity : 49.6 %
- 3) Date of measurement : November 6, 2020
- 4) Measured by : M.KOUGA
- 5) Operating mode : Transmitting mode

Mode		Reading [kHz]	Limit [kHz]
BDR	DH5	986.7	≥ 625.6
EDR	3DH3	986.4	≥ 834.6

[BDR]



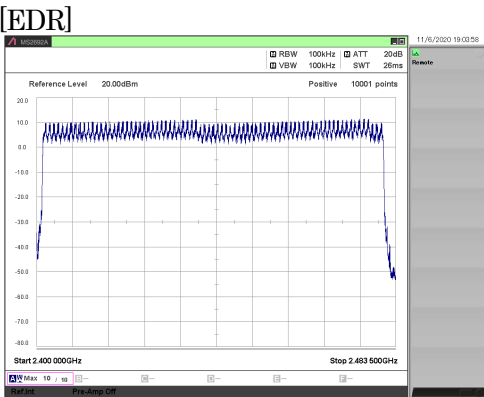
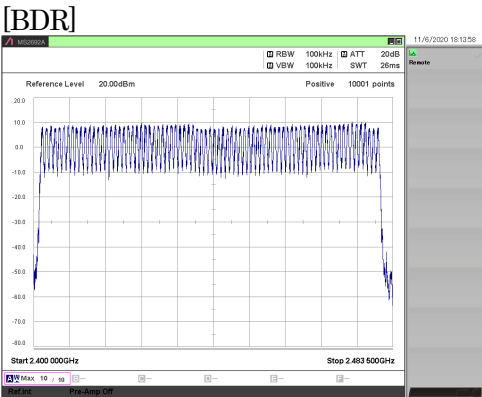
[EDR]



3.3. Number of Hopping Frequencies

- 1) Ambient temperature : 22.2 deg.C
- 2) Relative humidity : 49.6 %
- 3) Date of measurement : November 6, 2020
- 4) Measured by : M.KOUGA
- 5) Operating mode : Transmitting mode

Mode		Number [channel]	Limit [channel]
BDR	DH5	79	≥15
EDR	3DH3	79	≥15

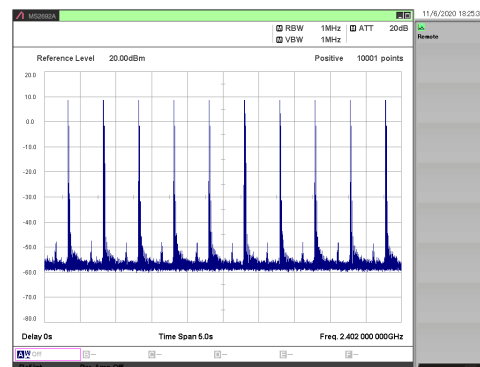
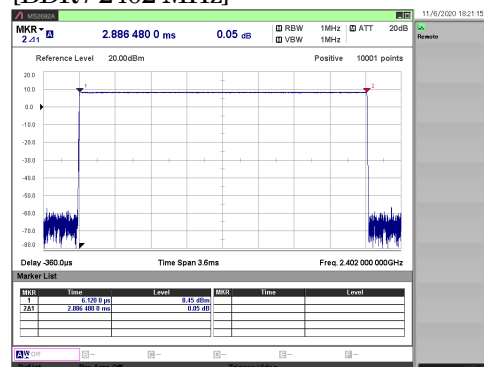


3.4. Time of Occupancy (Dwell Time)

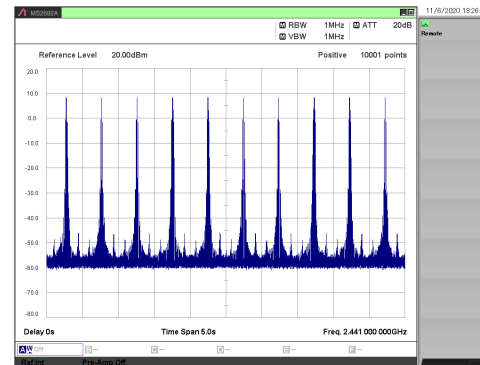
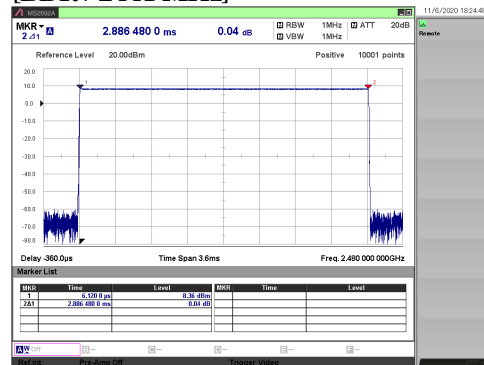
- 1) Ambient temperature : 22.2 deg.C
- 2) Relative humidity : 49.6 %
- 3) Date of measurement : November 6, 2020
- 4) Measured by : M.KOUGA
- 5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Dwell Time [msec]	Cycle [time]	Result [msec]	Limit [msec]
BDR	DH5	2402	2.89	10.0	182.4	≤ 400.0
		2441	2.89	10.0	182.4	≤ 400.0
		2480	2.89	10.0	182.4	≤ 400.0
EDR	3DH3	2402	1.65	13.0	135.8	≤ 400.0
		2441	1.65	13.0	135.8	≤ 400.0
		2480	1.65	13.0	135.8	≤ 400.0

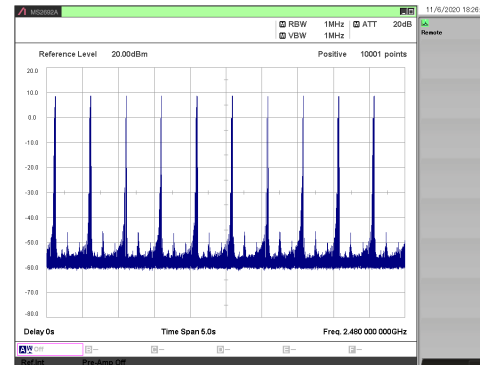
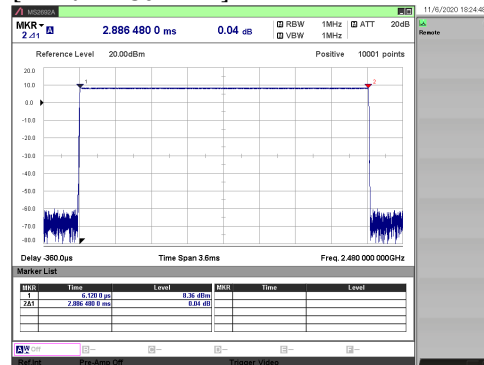
[BDR / 2402 MHz]



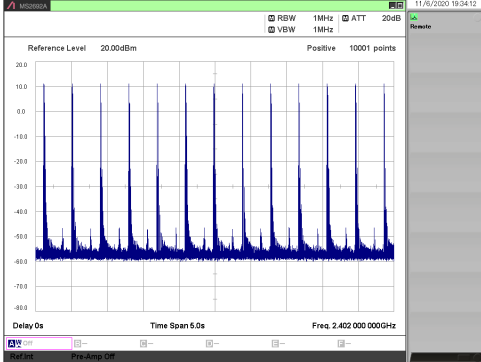
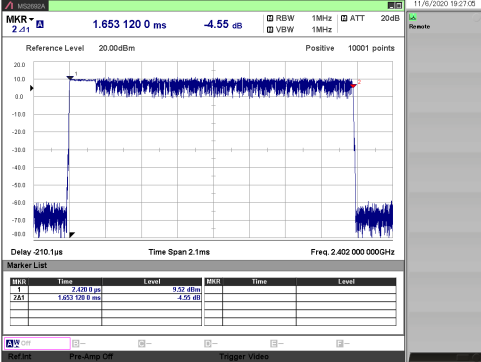
[BDR / 2441 MHz]



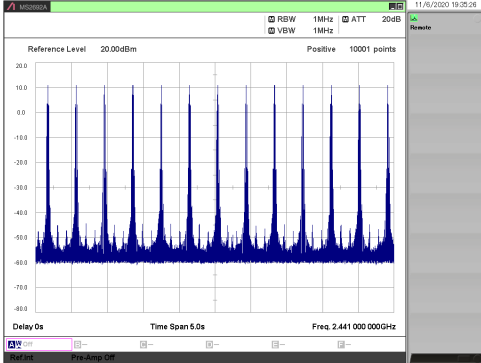
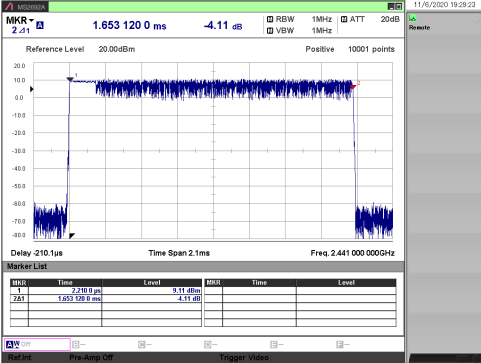
[BDR / 2480 MHz]



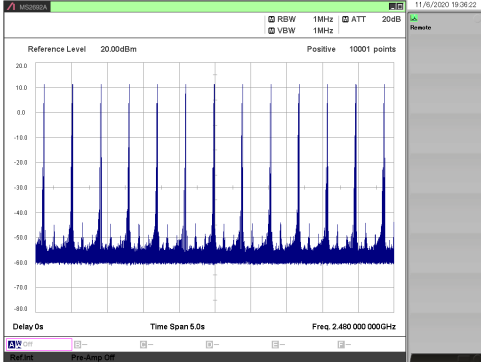
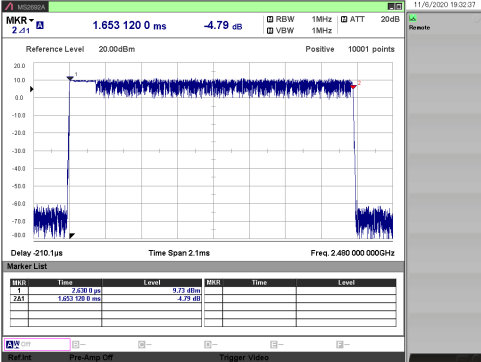
[EDR / 2402 MHz]



[EDR / 2441 MHz]



[EDR / 2480 MHz]



3.5. Maximum Peak Conducted Output Power

1) Ambient temperature	:	22.0 deg.C	22.2 deg.C
2) Relative humidity	:	50.3 %	49.6 %
3) Date of measurement	:	November 5, 2020	November 6, 2020
4) Measured by	:	M.KOUGA	M.KOUGA
5) Operating mode	:	Transmitting mode	

Maximum Peak Conducted Output Power

Mode		Channel [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Result(PK) [W]	Limit [dBm]	Limit [W]	Margin [dB]
BDR	DH5	2402	8.98	1.20	10.18	0.01042	20.97	0.125	10.79
		2441	8.95	1.20	10.15	0.01035	20.97	0.125	10.82
		2480	8.97	1.20	10.17	0.01040	20.97	0.125	10.80
EDR	2DH3	2402	11.40	1.20	12.60	0.01820	20.97	0.125	8.37
		2441	11.40	1.20	12.60	0.01820	20.97	0.125	8.37
		2480	11.40	1.20	12.60	0.01820	20.97	0.125	8.37
	3DH3	2402	12.07	1.20	13.27	0.02123	20.97	0.125	7.70
		2441	12.07	1.20	13.27	0.02123	20.97	0.125	7.70
		2480	11.93	1.20	13.13	0.02056	20.97	0.125	7.84

Duty Cycle check

Mode		Channel [MHz]	T(on+off) [msec]	T(on) [msec]	Duty Cycle [%]
BDR	DH1	2441	1.250	0.383	30.64
	DH3	2441	3.750	1.639	43.70
	DH5	2441	6.250	2.886	46.18
EDR	2DH1	2441	1.250	0.401	32.06
	2DH3	2441	5.000	1.651	33.02
	2DH5	2441	12.501	2.893	23.14
	3DH1	2441	1.250	0.401	32.08
	3DH3	2441	5.000	1.650	32.99
	3DH5	2441	12.501	2.894	23.15

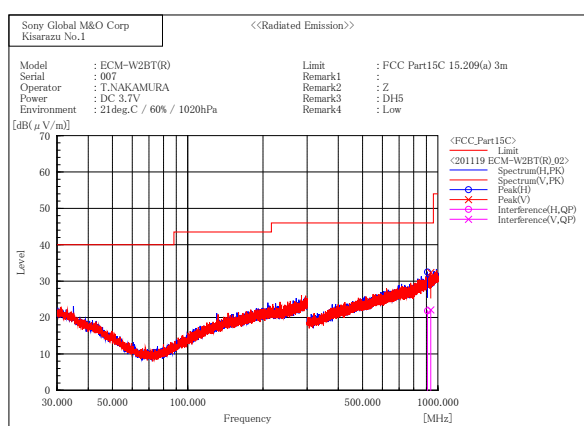
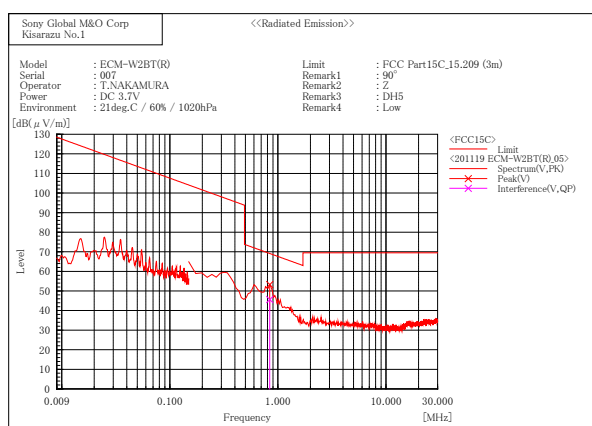
3.6. Radiated Spurious Emissions

Measurement band	Date of measurement	Ambient temperature	Relative humidity	Measured by
9 kHz to 1000 MHz	November 19, 2020	21.0 deg.C	60.0 %	T.NAKAMURA
1 GHz to 6 GHz	November 16, 2020	20.0 deg.C	55.0 %	M.KOUGA, T.NAKAMURA
	November 17, 2020	20.0 deg.C	53.0 %	M.KOUGA
6 GHz to 18 GHz	November 17, 2020	20.0 deg.C	53.0 %	T.NAKAMURA
18 GHz to 26.5 GHz	November 17, 2020	20.0 deg.C	53.0 %	M.KOUGA

9 kHz to 1000 MHz

[BDR (DH5) / 2402 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dBμV]	C.F. [dB/m]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position
909.058	QP	H	21.3	0.6	21.9	46.0	24.1	269.6	118.3	Z
0.839	QP	V	26.0	19.7	45.7	69.1	23.4	100.0	120.7	Z
936.361	QP	V	21.3	0.8	22.1	46.0	23.9	158.9	121.8	Z



1 GHz to 26.5 GHz

* Although "Height" in radiated emissions data, which shows the height of the boom of the antenna mast, might exceed 400.0 cm. because of the antenna tilt positioner attached to the edge of the boom for the bore-sighting measurement, the height of the reference point of the antenna does not exceed 400.0 cm.

[BDR (DH5) / 2402 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dBμV]	C.F. [dB/m]	DCCF [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2390.000	AV	H	38.0	3.4	-	41.4	54.0	12.6	148.0	153.6	Z	10.0
2390.000	PK	H	48.0	3.4	-	51.4	74.0	22.6	148.0	156.0	Z	-
4804.000	AV	H	29.6	11.7	-	41.3	54.0	12.7	165.0	161.3	Z	10.0
4804.000	PK	H	39.5	11.7	-	51.2	74.0	22.8	160.0	157.9	Z	-
12010.000	AV	H	36.2	-2.6	-	33.6	54.0	20.4	185.6	109.8	Z	10.0
12010.000	PK	H	46.1	-2.6	-	43.5	74.0	30.5	182.2	110.6	Z	-
19216.000	AV	H	30.9	5.4	-	36.3	54.0	17.7	226.7	18.6	Z	10.0
19216.000	PK	H	40.5	5.4	-	45.9	74.0	28.1	223.9	19.3	Z	-
2390.000	AV	V	38.0	3.4	-	41.4	54.0	12.6	100.0	20.5	Z	10.0
2390.000	PK	V	47.3	3.4	-	50.7	74.0	23.3	100.0	25.8	Z	-
4804.000	AV	V	29.4	11.7	-	41.1	54.0	12.9	257.8	218.3	Z	10.0
4804.000	PK	V	39.3	11.7	-	51.0	74.0	23.0	246.0	226.6	Z	-
12010.000	AV	V	36.3	-2.6	-	33.7	54.0	20.3	156.9	272.0	Z	10.0
12010.000	PK	V	45.9	-2.6	-	43.3	74.0	30.7	152.3	273.7	Z	-
19216.000	AV	V	31.0	5.4	-	36.4	54.0	17.6	164.9	227.3	Z	10.0
19216.000	PK	V	40.9	5.4	-	46.3	74.0	27.7	162.1	228.5	Z	-

[BDR (DH5) / 2441 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dBμV]	C.F. [dB/m]	DCCF [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
4882.000	AV	H	29.2	11.9	-	41.1	54.0	12.9	209.3	61.5	Z	10.0
4882.000	PK	H	39.0	11.9	-	50.9	74.0	23.1	205.3	64.6	Z	-
7323.000	AV	H	41.1	-9.7	-	31.4	54.0	22.6	193.2	263.2	Z	10.0
7323.000	PK	H	50.9	-9.7	-	41.2	74.0	32.8	188.9	265.1	Z	-
19528.000	AV	H	29.8	5.5	-	35.3	54.0	18.7	178.9	185.9	Z	10.0
19528.000	PK	H	39.7	5.5	-	45.2	74.0	28.8	175.6	187.4	Z	-
4882.000	AV	V	30.2	11.9	-	42.1	54.0	11.9	144.4	5.1	Z	10.0
4882.000	PK	V	39.4	11.9	-	51.3	74.0	22.7	142.2	7.6	Z	-
12205.000	AV	V	36.7	-2.9	-	33.8	54.0	20.2	100.0	121.9	Z	10.0
12205.000	PK	V	47.0	-2.9	-	44.1	74.0	29.9	100.0	122.6	Z	-
19528.000	AV	V	29.7	5.5	-	35.2	54.0	18.8	254.4	270.6	Z	10.0
19528.000	PK	V	40.1	5.5	-	45.6	74.0	28.4	251.9	271.8	Z	-

[BDR (DH5) / 2480 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dBμV]	C.F. [dB/m]	DCCF [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2483.500	AV	H	38.1	3.8	-	41.9	54.0	12.1	158.0	144.6	Z	10.0
2483.500	PK	H	47.4	3.8	-	51.2	74.0	22.8	154.7	145.8	Z	-
4960.000	AV	H	29.3	12.1	-	41.4	54.0	12.6	284.7	271.4	Z	10.0
4960.000	PK	H	38.8	12.1	-	50.9	74.0	23.1	280.5	272.4	Z	-
7440.000	AV	H	41.2	-9.9	-	31.3	54.0	22.7	293.4	16.7	Z	10.0
7440.000	PK	H	51.4	-9.9	-	41.5	74.0	32.5	289.2	18.1	Z	-
19840.000	AV	H	31.4	5.5	-	36.9	54.0	17.1	171.0	207.8	Z	10.0
19840.000	PK	H	40.6	5.5	-	46.1	74.0	27.9	165.9	209.4	Z	-
2483.500	AV	V	37.8	3.8	-	41.6	54.0	12.4	383.2	209.0	Z	10.0
2483.500	PK	V	48.0	3.8	-	51.8	74.0	22.2	381.9	209.6	Z	-
4960.000	AV	V	30.4	12.1	-	42.5	54.0	11.5	219.2	281.6	Z	10.0
4960.000	PK	V	40.0	12.1	-	52.1	74.0	21.9	214.8	287.8	Z	-
12400.000	AV	V	35.9	-3.1	-	32.8	54.0	21.2	279.5	144.8	Z	10.0
12400.000	PK	V	45.6	-3.1	-	42.5	74.0	31.5	274.9	146.4	Z	-
22320.000	AV	V	31.0	4.8	-	35.8	54.0	18.2	383.0	172.7	Z	10.0
22320.000	PK	V	41.2	4.8	-	46.0	74.0	28.0	379.0	175.6	Z	-

[EDR (3DH3) / 2402 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB μ V]	C.F. [dB/m]	DCCF [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2390.000	AV	H	37.8	3.4	-	41.2	54.0	12.8	169.9	142.4	Z	10.0
2390.000	PK	H	48.2	3.4	-	51.6	74.0	22.4	166.3	143.8	Z	-
4804.000	AV	H	29.1	11.7	-	40.8	54.0	13.2	146.9	130.4	Z	10.0
4804.000	PK	H	38.8	11.7	-	50.5	74.0	23.5	141.7	138.8	Z	-
12010.000	AV	H	36.4	-2.6	-	33.8	54.0	20.2	344.9	290.5	Z	10.0
12010.000	PK	H	46.3	-2.6	-	43.7	74.0	30.3	343.4	294.2	Z	-
19216.000	AV	H	30.9	5.4	-	36.3	54.0	17.7	196.7	255.7	Z	10.0
19216.000	PK	H	40.0	5.4	-	45.4	74.0	28.6	192.7	258.5	Z	-
2390.000	AV	V	38.1	3.4	-	41.5	54.0	12.5	320.6	228.0	Z	10.0
2390.000	PK	V	47.9	3.4	-	51.3	74.0	22.7	315.1	229.5	Z	-
4804.000	AV	V	29.2	11.7	-	40.9	54.0	13.1	274.5	46.7	Z	10.0
4804.000	PK	V	38.6	11.7	-	50.3	74.0	23.7	269.2	48.8	Z	-
12010.000	AV	V	36.0	-2.6	-	33.4	54.0	20.6	214.2	16.5	Z	10.0
12010.000	PK	V	46.5	-2.6	-	43.9	74.0	30.1	209.4	19.8	Z	-
19216.000	AV	V	31.2	5.4	-	36.6	54.0	17.4	242.9	267.7	Z	10.0
19216.000	PK	V	41.0	5.4	-	46.4	74.0	27.6	246.6	268.5	Z	-

[EDR (3DH3) / 2441 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB μ V]	C.F. [dB/m]	DCCF [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
4882.000	AV	H	29.4	11.9	-	41.3	54.0	12.7	208.0	329.3	Z	10.0
4882.000	PK	H	39.6	11.9	-	51.5	74.0	22.5	210.0	327.0	Z	-
7323.000	AV	H	41.1	-9.7	-	31.4	54.0	22.6	121.1	36.4	Z	10.0
7323.000	PK	H	51.2	-9.7	-	41.5	74.0	32.5	115.0	43.3	Z	-
19528.000	AV	H	29.5	5.5	-	35.0	54.0	19.0	246.4	107.7	Z	10.0
19528.000	PK	H	39.5	5.5	-	45.0	74.0	29.0	243.7	108.9	Z	-
4882.000	AV	V	29.5	11.9	-	41.4	54.0	12.6	190.0	345.4	Z	10.0
4882.000	PK	V	39.6	11.9	-	51.5	74.0	22.5	188.0	347.6	Z	-
12205.000	AV	V	36.6	-2.9	-	33.7	54.0	20.3	348.0	227.7	Z	10.0
12205.000	PK	V	46.7	-2.9	-	43.8	74.0	30.2	343.4	228.6	Z	-
19528.000	AV	V	29.7	5.5	-	35.2	54.0	18.8	223.7	96.9	Z	10.0
19528.000	PK	V	39.1	5.5	-	44.6	74.0	29.4	218.9	99.9	Z	-

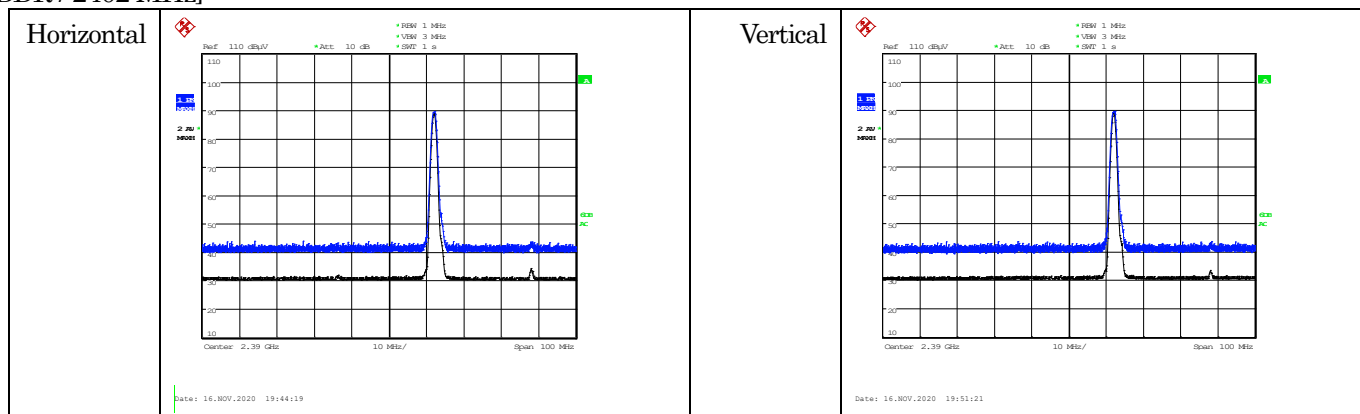
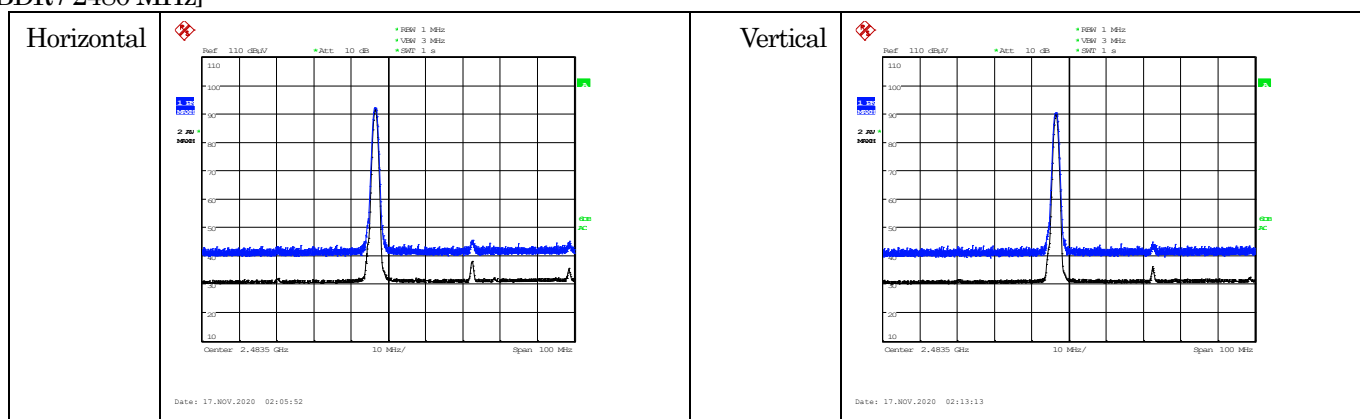
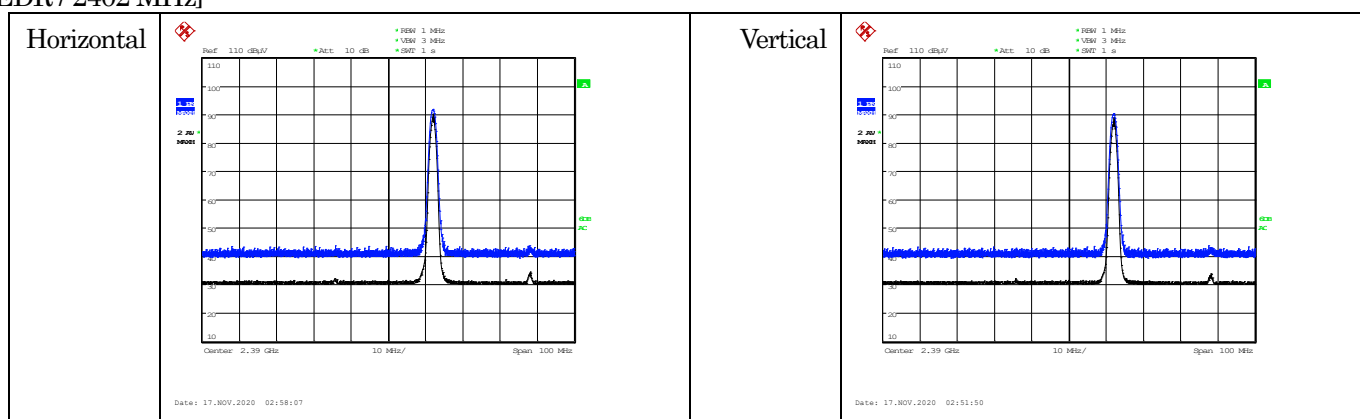
[EDR (3DH3) / 2480 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB μ V]	C.F. [dB/m]	DCCF [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2483.500	AV	H	38.6	3.8	-	42.4	54.0	11.6	160.0	155.3	Z	10.0
2483.500	PK	H	48.2	3.8	-	52.0	74.0	22.0	160.0	151.0	Z	-
4960.000	AV	H	29.3	12.1	-	41.4	54.0	12.6	165.0	168.0	Z	10.0
4960.000	PK	H	39.1	12.1	-	51.2	74.0	22.8	168.0	165.6	Z	-
7440.000	AV	H	41.4	-9.9	-	31.5	54.0	22.5	178.6	206.1	Z	10.0
7440.000	PK	H	51.2	-9.9	-	41.3	74.0	32.7	177.4	207.1	Z	-
22320.000	AV	H	31.0	4.8	-	35.8	54.0	18.2	301.4	82.3	Z	10.0
22320.000	PK	H	41.2	4.8	-	46.0	74.0	28.0	299.3	85.4	Z	-
2483.500	AV	V	38.4	3.8	-	42.2	54.0	11.8	268.0	226.8	Z	10.0
2483.500	PK	V	47.9	3.8	-	51.7	74.0	22.3	266.6	227.5	Z	-
4960.000	AV	V	29.8	12.1	-	41.9	54.0	12.1	262.0	277.3	Z	10.0
4960.000	PK	V	39.4	12.1	-	51.5	74.0	22.5	260.0	276.0	Z	-
12400.000	AV	V	36.1	-3.1	-	33.0	54.0	21.0	360.4	110.2	Z	10.0
12400.000	PK	V	45.7	-3.1	-	42.6	74.0	31.4	357.7	111.8	Z	-
19840.000	AV	V	31.3	5.5	-	36.8	54.0	17.2	289.2	326.4	Z	10.0
19840.000	PK	V	42.2	5.5	-	47.7	74.0	26.3	285.4	329.2	Z	-

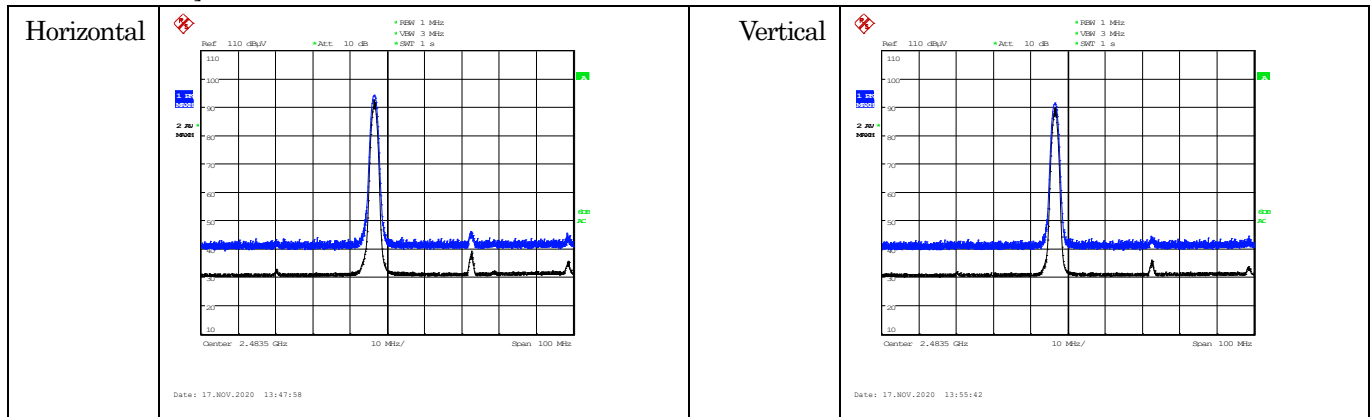
Plot data for 2.4 GHz Restricted-Band Edge

These plot data show peak (trace blue) and average (trace black) spectrum for worst case emissions in the restricted-band edges. (Restricted band edges: below 2390 MHz and above 2483.5 MHz)

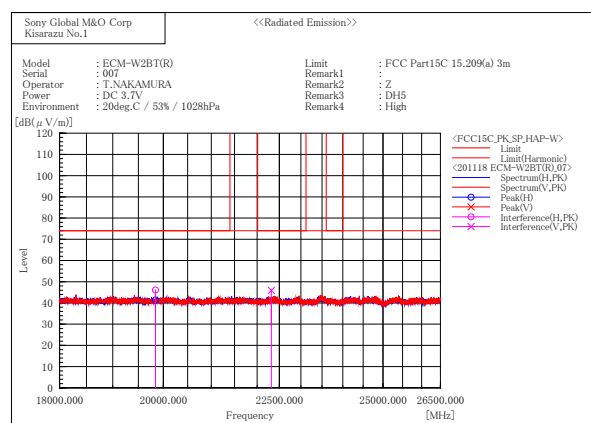
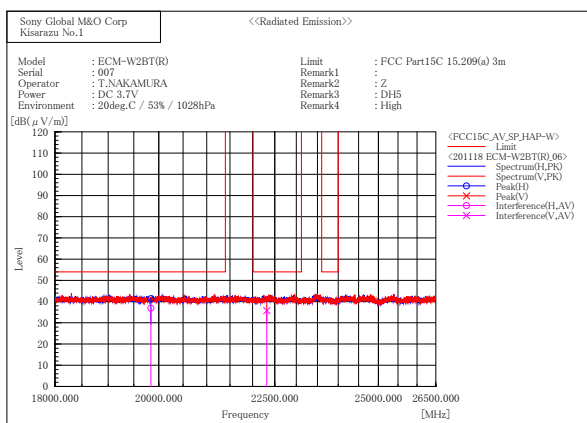
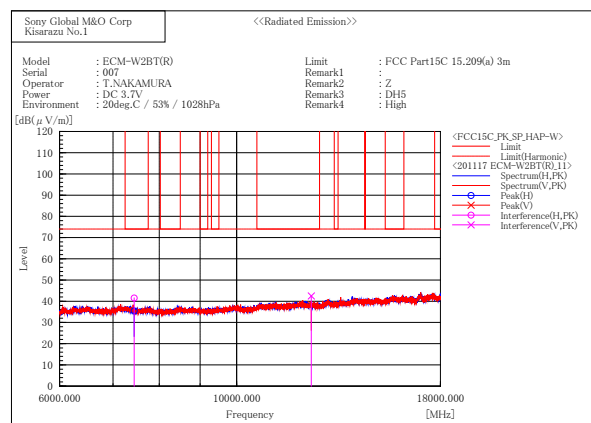
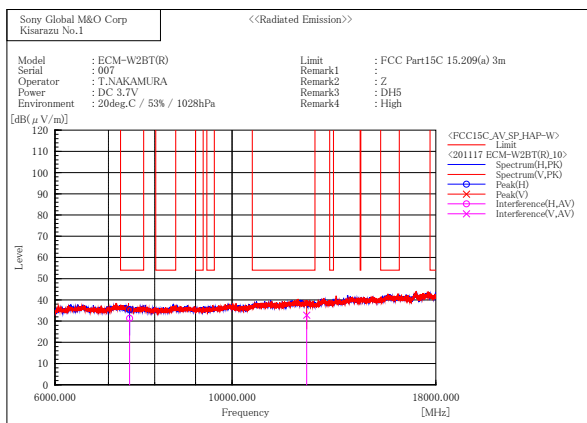
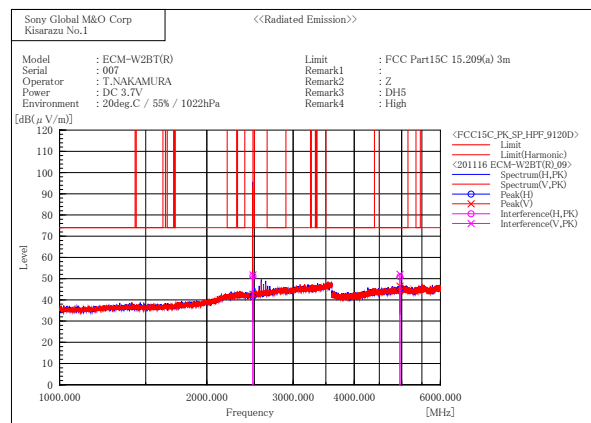
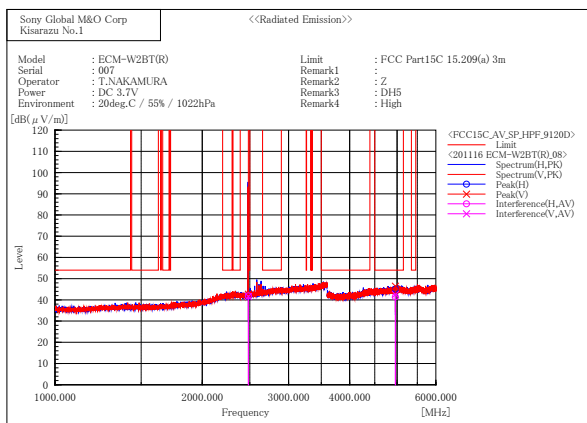
The result of the final radiated spurious emissions measurement refers in previous pages.

[BDR / 2402 MHz][BDR / 2480 MHz][EDR / 2402 MHz]

[EDR / 2480 MHz]



Plot data for above 1GHz in worst mode

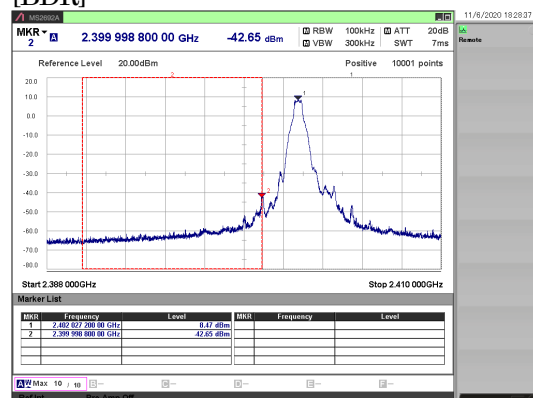


3.7. Conducted Spurious Emissions for Band Edge

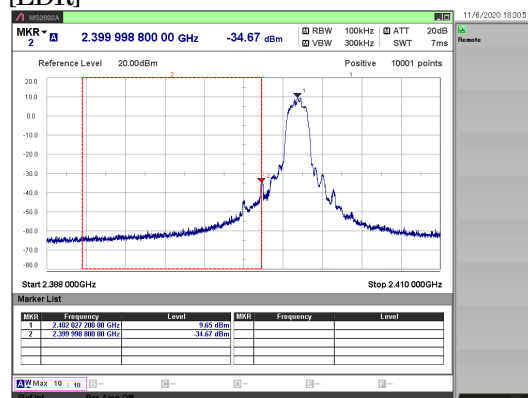
- 1) Ambient temperature : 22.2 deg.C
- 2) Relative humidity : 49.6 %
- 3) Date of measurement : November 6, 2020
- 4) Measured by : M.KOUGA
- 5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Frequency [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Limit [dBm]	Margin [dB]
BDR	DH5	2402	2402.03	8.47	1.55	10.02	-	-
			2400.00	-42.65	1.55	-41.10	-9.98	31.12
EDR	3DH3	2402	2402.03	9.65	1.55	11.20	-	-
			2400.00	-34.67	1.55	-33.12	-8.80	24.32

[BDR]



[EDR]



4. Method of Calculation

4.1. Time of Occupancy (Dwell Time)

Method of calculation : Software
 Software Name : SW-0308
 Software Version : Ver.5

Test Result [msec] = Dwell Time [msec] * Cycle [time] * 31.6 [sec] / Sweep Time [sec]

Note (a) Dwell Time : Transmission duration of 1 hopping.
 (b) Cycle : Number of hopping appearances on the spectrum analyzer.
 (c) 31.6 : $0.4 \text{ [sec]} * \text{Number of Hopping Frequencies (79)}$
 (d) Sweep Time : Sweep time settings on the spectrum analyzer.

4.2. Maximum Peak Conducted Output Power

Method of calculation : Software
 Software Name : SW-0308
 Software Version : Ver.5

Test Result (PK) [dBm] = Meter Reading [dBm] + C.F. [dB]

Test Result (AV) [dBm] = Meter Reading [dBm] + C.F. [dB] + Duty Factor [dB]

Duty Cycle [%] = $T \text{ (Tx ON Time)} / T_{\text{(on+off)}} \text{ (Tx ON Time + Tx OFF Time)} * 100$

Note (a) Meter Reading : Reading of the power meter
 (b) C.F. : System Cable Loss + EUT Cable Loss
 (c) Duty Factor : $10\log \{ (Tx \text{ ON Time} + Tx \text{ OFF Time}) / (Tx \text{ ON Time}) \}$

4.3. Radiated Spurious Emissions

Method of calculation : Software
 Software Name : V-Scan
 Software Version : Ver.4.0.30

Test Result [dBuV/ m] = Meter Reading [dBuV] + C.F. [dB/ m]

DCCF Result [dBuV/ m] = Meter Reading (for peak detector) [dBuV] + C.F. [dB/ m] + DCCF [dB]

Note (a) Meter Reading : Reading of the EMI test receiver or the spectrum analyzer.
 (b) C.F. : ☒ Antenna Factor (including Balun Loss) + System GainLoss
 : ☐ Antenna Factor (including Balun Loss) + System GainLoss + $20 \log (3 \text{ m} / 10 \text{ m})$
 (c) DCCF : $20\log (\text{Maximum dwell time in any } 100\text{ms [ms]} / 100 \text{ [ms]})$

4.4. Conducted Spurious Emissions for Band Edge

Method of calculation : Software
 Software Name : SW-0308
 Software Version : Ver.5

Test Result [dBm] = Meter Reading [dBm] + C.F. [dB]

Note (a) Meter Reading : Reading of the spectrum analyzer.
 (b) C.F. : System Cable Loss + EUT Cable Loss

5. List of Test Equipment

All test results are traceable to the national and/or international standards.

5.1. Antenna-port Conducted Measurements

Used	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
-	W0140	Spectrum Analyzer	FSU26	200717	Rohde & Schwarz	12 months	20.10.02
x	W0101	Signal Analyzer	MS2692A	6201338955	Anritsu	12 months	20.10.03
-	W0110	10dB Attenuator	6610-SK-50-1	0002	Huber + Suhner	12 months	20.10.02
-	W0100	Spectrum Analyzer	MS2692A	6201338954	Anritsu	12 months	20.11.13
x	W0006	Power Meter	N1911A	MY50000295	Keysight Technologies	12 months	20.10.03
x	W0007	Power Sensor	N1922A	MY50180022	Keysight Technologies	12 months	20.10.03
-	W0029	10dB Attenuator	8493C	76549	Keysight Technologies	12 months	20.10.02
-	WC0002	RF Cable	SUCOFLEX 102	34124/2	HUBER + SUHNER	12 months	20.10.02
-	WC0003	RF Cable	SUCOFLEX 102	34127/2	HUBER + SUHNER	12 months	20.10.02
-	WC0004	RF Cable	SUCOFLEX 102	34288/2	HUBER + SUHNER	12 months	20.10.02
x	WC0005	RF Cable	SUCOFLEX 102	34287/2	HUBER + SUHNER	12 months	20.10.02
-	WC0006	RF Cable	SUCOFLEX 102	34289/2	HUBER + SUHNER	12 months	20.10.02
-	WC0007	RF Cable	SUCOFLEX 102	34286/2	HUBER + SUHNER	12 months	20.10.02
x	M0719	Thermo Meter	TH-321	140053	AS ONE	12 months	20.04.17

5.2. Radiated Spurious Emissions

Used	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
-	M0686	EMI Receiver	N9038A	MY52260113	Agilent Technologies	12 months	19.12.01
x	M0959	EMI Receiver	ESU40	100041	Rohde & Schwarz	12 months	20.02.03
x	A0073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12 months	19.12.06
x	A0089	Biconical Antenna	BBA9106	VHA91032835	Schwarzbeck	12 months	19.12.09
x	A0088	Log periodic Antenna	UHALP9108A1	0649	Schwarzbeck	12 months	19.12.09
x	A0064	Horn Antenna	BBHA9120D	746	Schwarzbeck	12 months	20.11.01
x	A0078	Horn Antenna	HAP06-18W	00000070	Toyo Corporation	12 months	20.11.01
x	A0058	Horn Antenna	HAP18-26W	00000016	Toyo Corporation	12 months	20.10.02
x	CS0017	N-RE Cable System 1	-	-	-	12 months	20.11.01
x	CS0018	N-RE Cable System 2	-	-	-	12 months	20.11.01
x	CS0045	N-3m EMF Cable System	-	-	-	12 months	20.11.01
x	CS0074/0075	N-RE Cable SYSTEM 4	-	-	-	12 months	20.11.01
x	M0126	Step Attenuator	8494H	3837M01144	Agilent Technologies	12 months	20.11.01
x	M0752	Pre Amplifier	310N	320621	SONOMA INSTRUMENT	12 months	20.11.01
x	M0128	3dB Attenuator	8491A	53541	Agilent Technologies	12 months	20.11.01
x	M0609	3dB Attenuator	8491B	MY39265960	Agilent Technologies	12 months	20.11.01
x	M0737	GHz Filter Box	FB-G1	001	Sony EMCS	12 months	20.11.01
x	M5079	Temperature Meter	608-H2	41475953	testo	24 months	19.10.28
x	M5062	Scientific Ambient Monitor	0560 6220	39515563/802	testo	12 months	20.08.11

About calibration interval

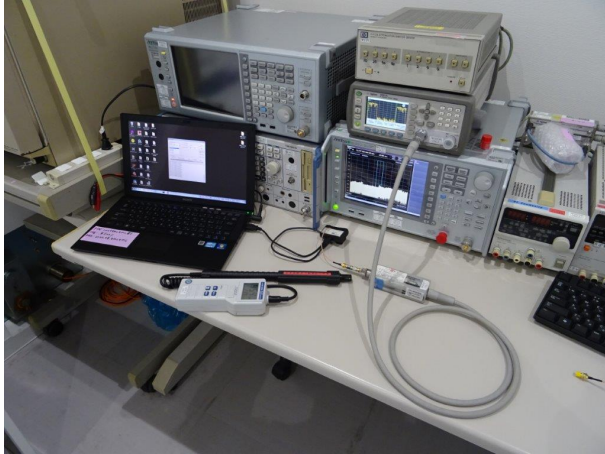
Valid until the end of the month listed in "Cal. Int." column.

6. Photographs of test setup

The following photographs show the arrangement of the worst-case.

6.1. Antenna-port Conducted Measurements Photo(s)

Maximum Peak Conducted Output Power



Others

