

RADIO TEST REPORT

(for Bluetooth Low Energy)

Project No. : JB-Z0893
Client's Control No : AF21017
Client : Sony Corporation
Client's Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
Product Name : Wireless Noise Canceling Stereo Headset
Model No. : YY2951
FCC ID : AK8YY2951
Test Standard : 47 CFR Part 15 Subpart C
Sample Receipt Date : April 12, 2021
Test Date : April 13, 2021 to April 30, 2021
Report Date : May 20, 2021
Test Result : Complied

Notice:

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- * 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.

Reported by:

H. Takayama

Hisae Takayama
Test Engineer
EMC/RF Test Laboratory, Main Lab.
Design Technology Division

Approved Signatory:

T. Yamada

Takashi Yamada
Technical Manager
EMC/RF Test Laboratory, Main Lab.
Design Technology Division



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TABLE OF CONTENTS

1. General Information	3
1.1. Description of Equipment Under Test (EUT).....	3
1.2. Summary of Test Result.....	3
1.3. Tested Methodology	4
1.4. Measurement Procedures	4
1.5. Test Location.....	6
1.6. Uncertainty	6
2. Test Specification.....	7
2.1. Validation	7
2.2. Operating Condition.....	7
2.3. Special Accessories	7
2.4. EUT Modifications	7
2.5. Configuration of EUT System.....	8
2.6. Typical setup arrangement.....	10
3. Test Data.....	12
3.1. 6dB Bandwidth.....	12
3.2. Maximum Peak Conducted Output Power.....	13
3.3. Power Spectral Density	14
3.4. Radiated Spurious Emissions.....	15
3.5. Conducted Spurious Emissions for Band Edge.....	21
4. Method of Calculation.....	22
4.1. Maximum Peak Conducted Output Power.....	22
4.2. Power Spectral Density	22
4.3. Radiated Spurious Emissions.....	22
4.4. Conducted Spurious Emissions for Band Edge.....	22
5. List of Test Equipment	23
5.1. Antenna-port Conducted Measurements.....	23
5.2. Radiated Spurious Emissions.....	23
6. Photographs of test setup	24
6.1. Antenna-port Conducted Measurements Photo(s)	24
6.2. Radiated Spurious Emissions Photo(s).....	24

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-Z0893 (Original)	May 20, 2021	-	-

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 Noise Canceling Stereo Headset
 Trade Name : SONY
 Model No. : YY2951
 Serial No. : 1100027, 1100059
 Power Rating of the EUT : DC 3.85 V (The EUT is supplied with the power from 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 : GFSK
 Channel Spacing : 2 MHz
 Channel Bandwidth : 1 MHz / 2 MHz
 Number of channels : 40
 Antenna Type : Chip Antenna
 Antenna Connector Type : None
 Antenna Gain : 1.6 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	*2
6dB Bandwidth	Conducted	Refer to the test data	Complied	-
Maximum Peak Conducted Output Power	Conducted	24.54 dB	Complied	-
Power Spectral Density	Conducted	18.33 dB	Complied	-
Radiated Spurious Emissions	Radiated	13.2 dB (AV) 4960.063 MHz Vertical	Complied	-
Conducted Spurious Emissions for Band Edge	Conducted	11.77 dB 2400.00 MHz	Complied	*1

Note

*1: 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.

*2: 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.

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.

Dimensions of validated test volume : 2 m diameter, 3 m top height, 0.5 m bottom height.

1.4. Measurement Procedures

We performed the measurements in accordance with NV3-06, 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	Detector	RBW
Antenna-port Conducted Measurements		
6dB Bandwidth	Peak	100 kHz
Maximum Peak Conducted Output Power	Peak	-
Power Spectral Density	Peak	3 kHz
Conducted Spurious Emissions for Band Edge	Peak	100 kHz

Radiated Spurious Emissions

- The non-conductive table (EUT table) made of (FRP, Styrene Foam, other non-conductive material) was placed in the center of the turntable.
- The EUT was placed on the center of the tabletop.
- The test antenna was placed away from the EUT at test distance.
- The limits were compensated the distance factor with follows:
 $9 \text{ kHz to } 490 \text{ kHz [Limit at } 3 \text{ m]} = [\text{Limit at } 300 \text{ m}] + 40\log(300[\text{m}] / 3[\text{m}])$
 $490 \text{ kHz to } 30 \text{ MHz [Limit at } 3 \text{ m]} = [\text{Limit at } 30 \text{ m}] + 40\log(30[\text{m}] / 3[\text{m}])$
- 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)
- 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)

- If the final measurement result exceeded the limit in non-restricted band (excluding carrier band edges), the measurement is carried out additionally with follows:

Measurement points

- 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.

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

8. If the final average measurement result exceeded the limit in the authorized band edge, the integration method is carried out with follows;

	2.4835 GHz to 2.4855 GHz
Detector	Peak
RBW	100 kHz (6 dB)
Instrument	Spectrum analyzer
Function	Channel Power (integration BW : 1 MHz)

9. 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
Expiration : 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
Power Spectral Density 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	Data Rate
Radiated Spurious Emissions (below 1GHz) *1	2402 MHz	1 Mbps
6dB Bandwidth, Maximum Conducted Output Power, Power Spectral Density, Radiated Spurious Emissions (above 1GHz)	2402 MHz 2440 MHz 2480 MHz	1 Mbps 2 Mbps
Conducted Spurious Emissions for Band Edge	2402 MHz	1 Mbps 2 Mbps

Note

*1: 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 : MT2822S Headset BT Test
Software Version : 0.22

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

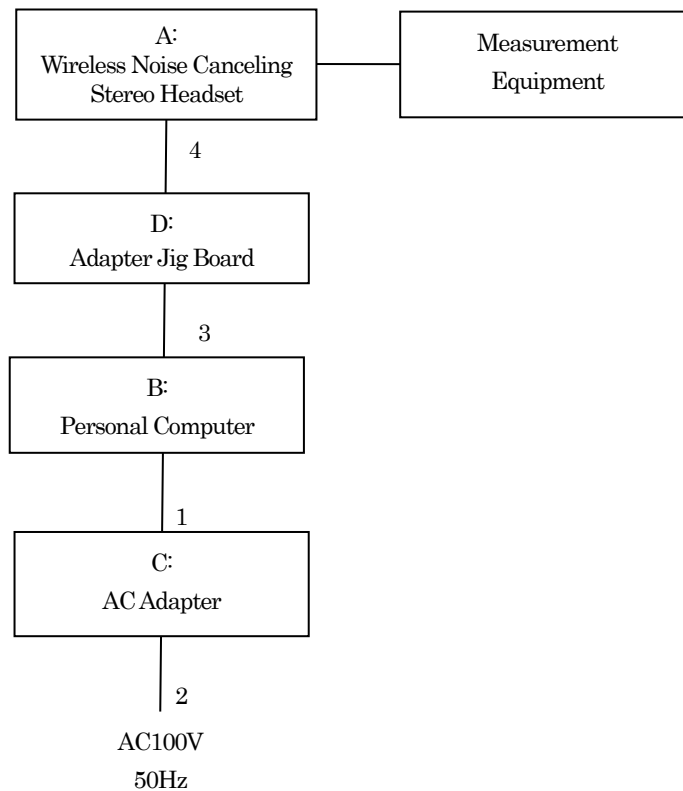
[EUT and Associated Equipment (AE)]

Symbol	EUT/ AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Wireless Noise Canceling Stereo Headset	SONY	YY2951	1100027
B	AE	Personal Computer	SONY	VJS131C11N	4120398
C	AE	AC Adapter	SONY	VJ8AC10V9	274969
D	AE	Adapter Jig Board	-	-	-

[Type of Cable]

Symbol	Description	Identification (Manufacturer etc.)	Shielded Yes / No	Ferrite Core	Length (m)	Bundled
1	DC Cable	-	No	No	1.8	-
2	AC Cable	-	No	No	0.9	-
3	USB Cable (Type B)	-	Yes	No	0.6	-
4	USB Cable (Type C)	-	Yes	No	1.0	-

[Connecting Diagram]



Radiated Spurious Emissions

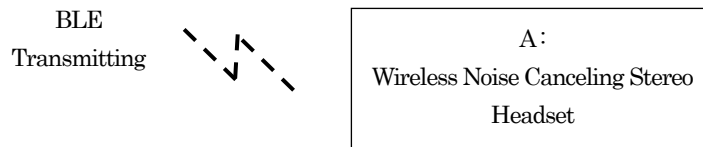
[EUT and Associated Equipment (AE)]

Symbol	EUT/AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Wireless Noise Canceling Stereo Headset	SONY	YY2951	1100059

[Type of Cable]

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

[Connecting Diagram]

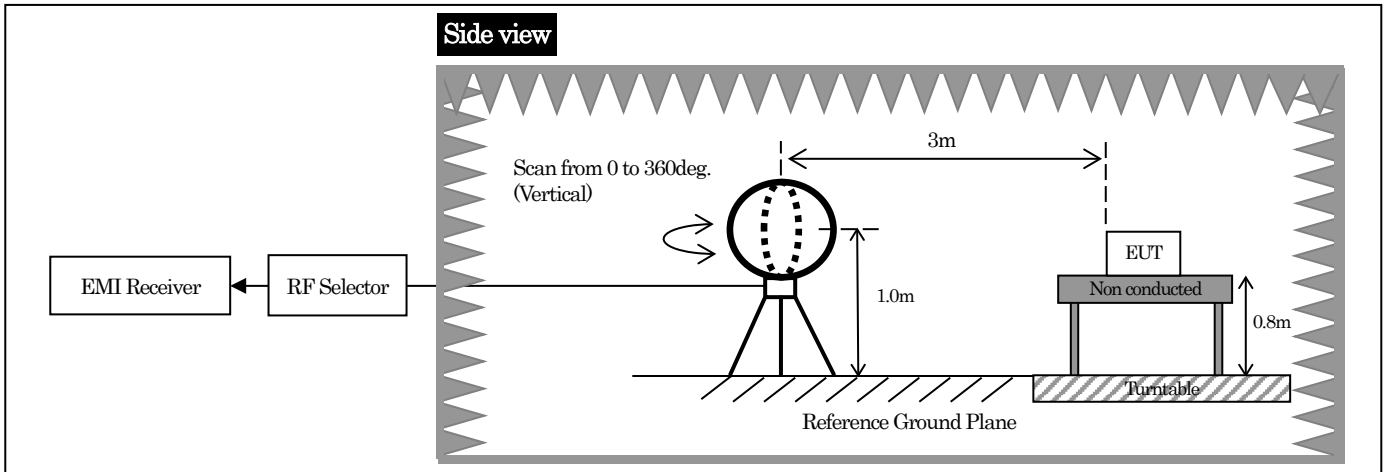


2.6. Typical setup arrangement

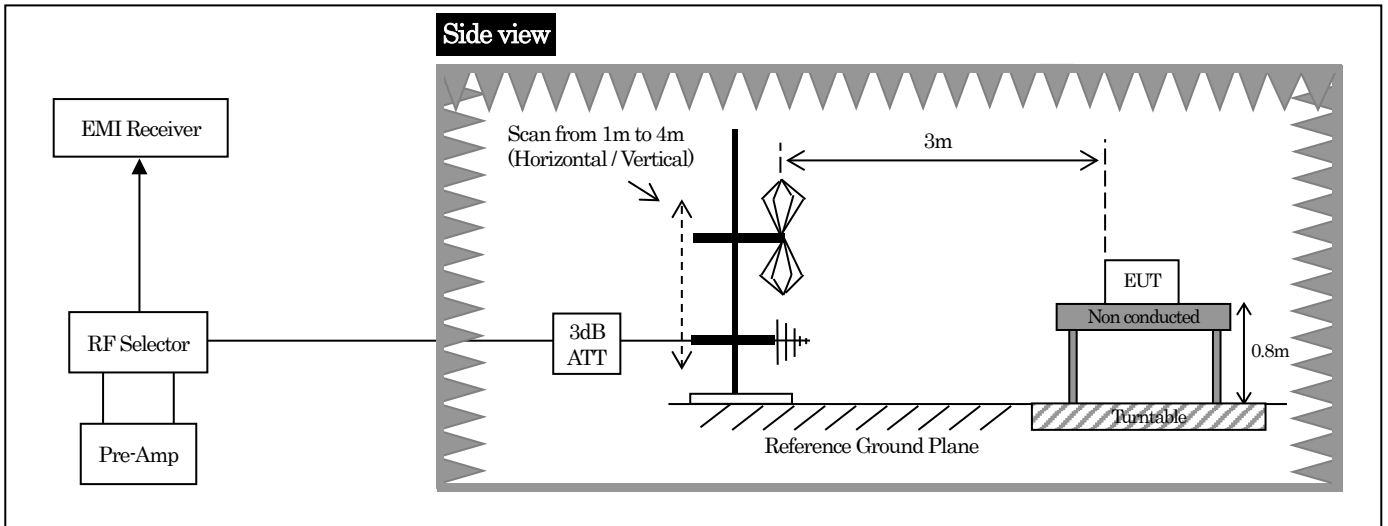
Radiated spurious emissions

4th Site

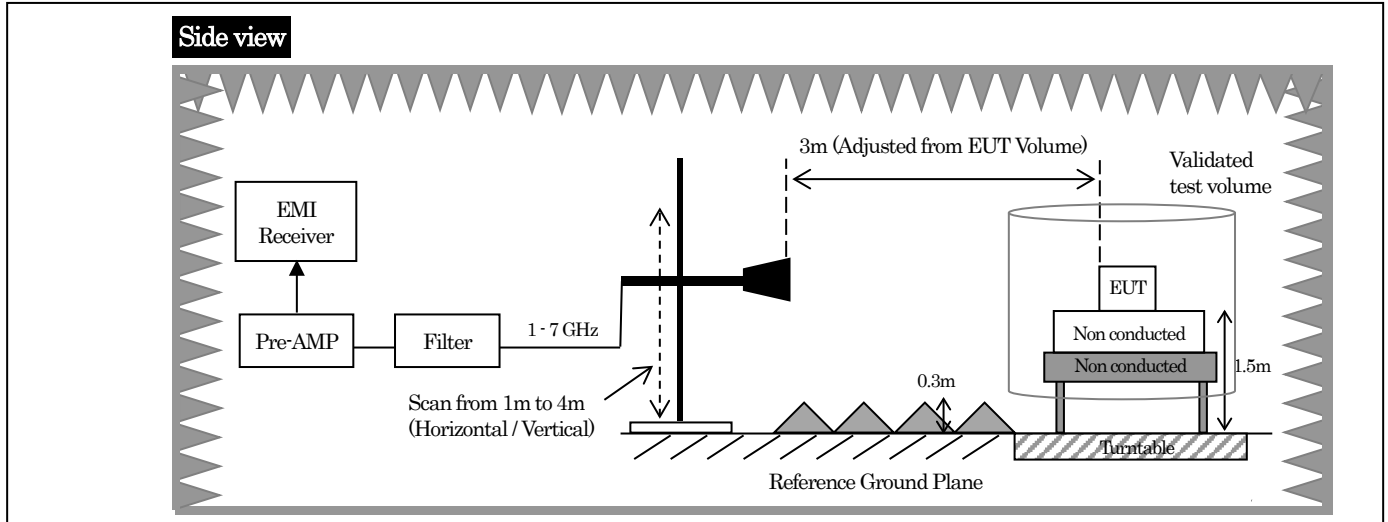
< 9 kHz - 30 MHz >



< 30 MHz - 1000 MHz >

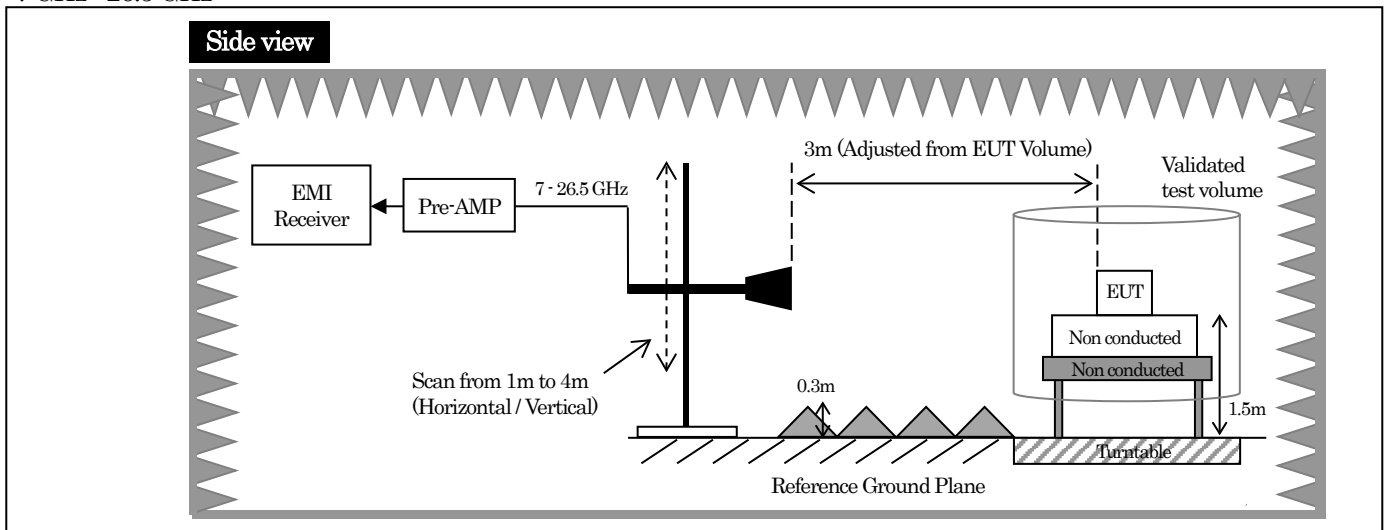


< 1 GHz - 7 GHz >



EMC Site

< 7 GHz - 26.5 GHz >

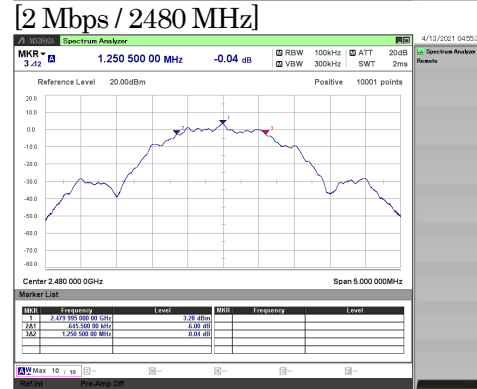
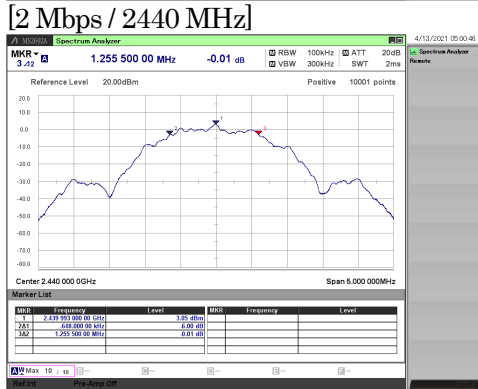
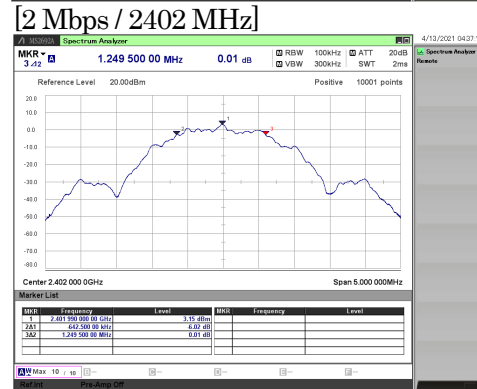
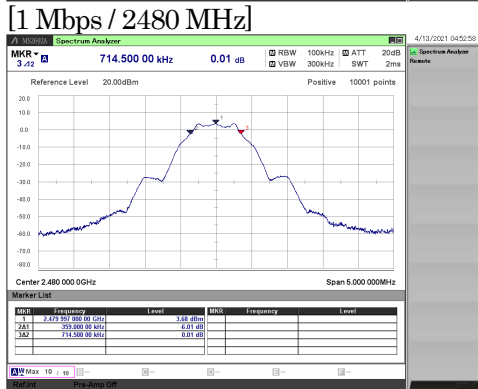
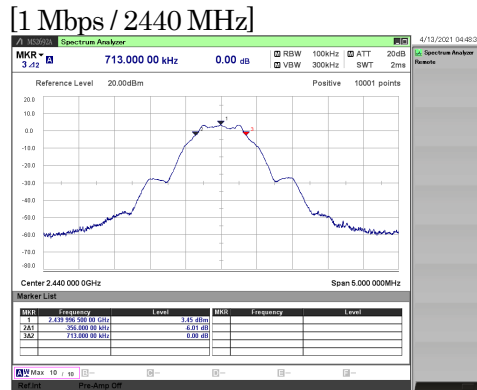
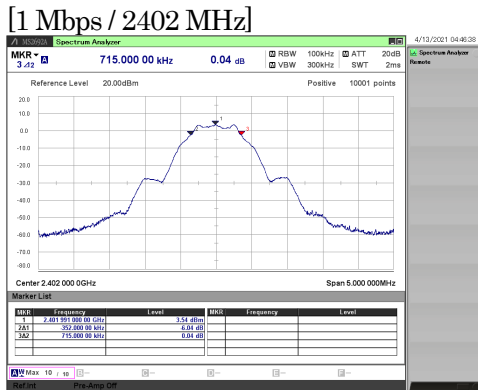


3. Test Data

3.1. 6dB Bandwidth

- 1) Ambient temperature : 23.3 deg.C
- 2) Relative humidity : 40.6 %
- 3) Date of measurement : April 13, 2021
- 4) Measured by : Mikiko Kouga
- 5) Operating mode : Transmitting mode

Mode	Rate [Mbps]	Channel [MHz]	Result [MHz]	Limit [MHz]
BLE	1	2402	0.715	≥ 0.5
		2440	0.713	≥ 0.5
		2480	0.715	≥ 0.5
	2	2402	1.250	≥ 0.5
		2440	1.256	≥ 0.5
		2480	1.251	≥ 0.5



3.2. Maximum Peak Conducted Output Power

- 1) Ambient temperature : 23.3 deg.C
- 2) Relative humidity : 40.6 %
- 3) Date of measurement : April 13, 2021
- 4) Measured by : Mikiko Kouga
- 5) Operating mode : Transmitting mode

Maximum Peak Conducted Output Power

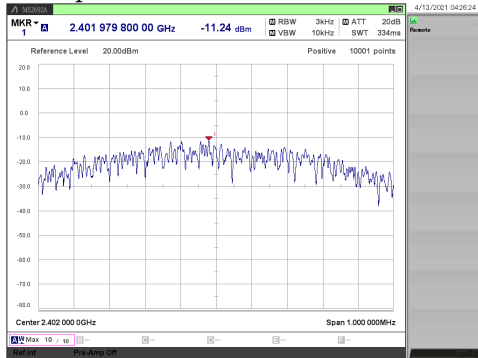
Mode	Rate [Mbps]	Channel [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Result(PK) [W]	Limit [dBm]	Limit [W]	Margin [dB]
BLE	1	2402	4.65	0.40	5.05	0.00320	≤ 30.0	≤ 1.0	24.95
		2440	4.83	0.40	5.23	0.00333	≤ 30.0	≤ 1.0	24.77
		2480	5.02	0.40	5.42	0.00348	≤ 30.0	≤ 1.0	24.58
	2	2402	4.70	0.40	5.10	0.00324	≤ 30.0	≤ 1.0	24.90
		2440	4.89	0.40	5.29	0.00338	≤ 30.0	≤ 1.0	24.71
		2480	5.06	0.40	5.46	0.00352	≤ 30.0	≤ 1.0	24.54

3.3. Power Spectral Density

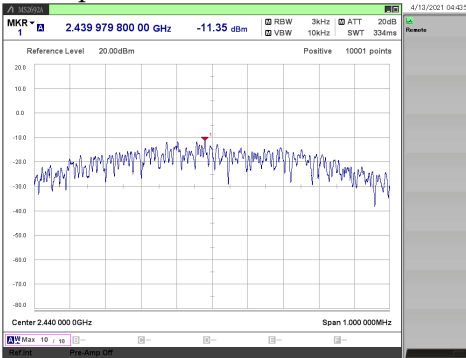
- 1) Ambient temperature : 23.3 deg.C
- 2) Relative humidity : 40.6 %
- 3) Date of measurement : April 13, 2021
- 4) Measured by : Mikiko Kouga
- 5) Operating mode : Transmitting mode

Mode	Rate [Mbps]	Channel [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Limit [dBm]	Margin [dB]
BLE	1	2402	-11.24	0.75	-10.49	≤ 8.0	18.49
		2440	-11.35	0.75	-10.60	≤ 8.0	18.60
		2480	-11.08	0.75	-10.33	≤ 8.0	18.33
	2	2402	-13.67	0.75	-12.92	≤ 8.0	20.92
		2440	-13.71	0.75	-12.96	≤ 8.0	20.96
		2480	-13.47	0.75	-12.72	≤ 8.0	20.72

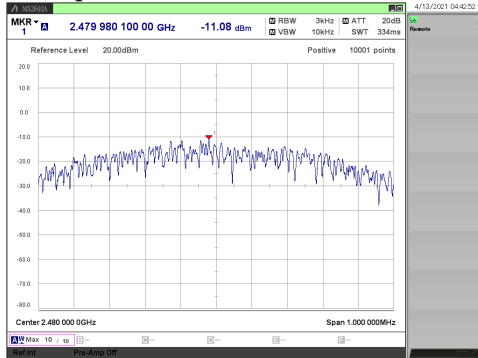
[1 Mbps / 2402 MHz]



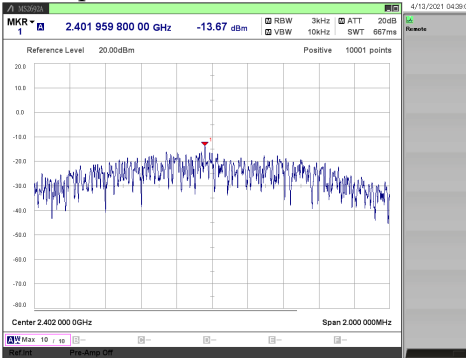
[1 Mbps / 2440 MHz]



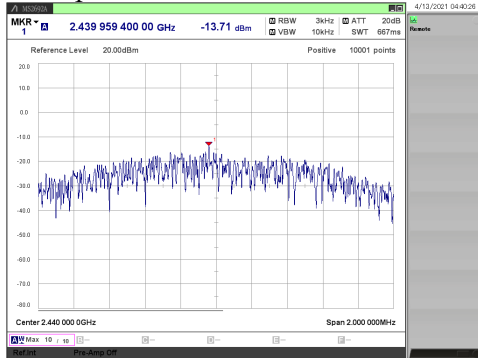
[1 Mbps / 2480 MHz]



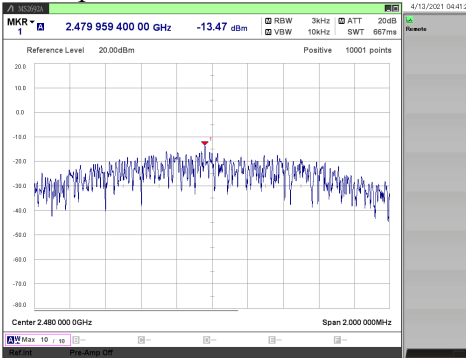
[2 Mbps / 2402 MHz]



[2 Mbps / 2442 MHz]



[2 Mbps / 2480 MHz]

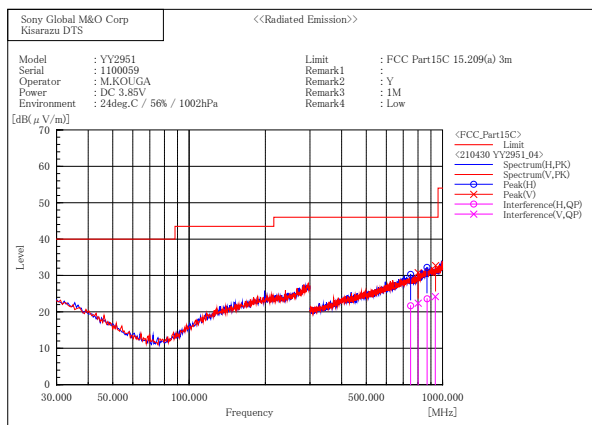
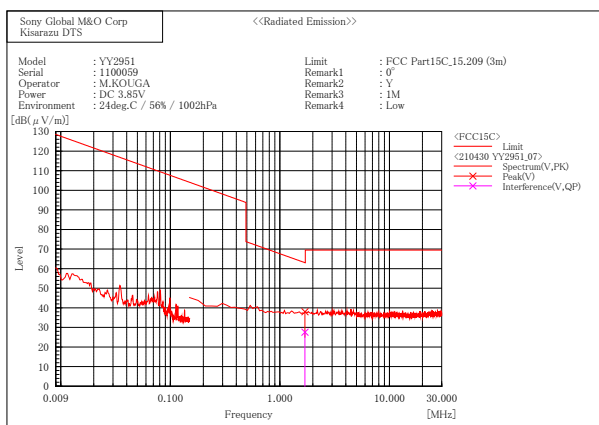


3.4. Radiated Spurious Emissions

Measurement band	Date of measurement	Ambient temperature	Relative humidity	Measured by
9 kHz to 1000 MHz	April 30, 2021	24.0 deg.C	56.0 %	Mikiko Kouga
1 GHz to 7 GHz	April 22, 2021	23.0 deg.C	52.0 %	Mikiko Kouga
	April 23, 2021	23.0 deg.C	55.0 %	Mikiko Kouga
7 GHz to 18 GHz	April 26, 2021	20.6 deg.C	44.4 %	Shingo Onotora
18 GHz to 26.5 GHz	April 30, 2021	21.0 deg.C	58.0 %	Taito Nakamura

9 kHz to 1000 MHz
[1 Mbps / 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
748.000	QP	H	25.6	-3.9	21.7	≤ 46.0	24.3	242.0	58.0	Y
868.735	QP	H	25.1	-1.5	23.6	≤ 46.0	22.4	100.0	120.0	Y
1.692	QP	V	7.6	20.0	27.6	≤ 63.1	35.5	100.0	0.0	Y
800.950	QP	V	25.4	-3.0	22.4	≤ 46.0	23.6	228.0	15.0	Y
936.097	QP	V	25.1	-0.9	24.2	≤ 46.0	21.8	288.0	5.0	Y



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.

[1 Mbps / 2402 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB μ V]	C.F. [dB/m]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2390.000	AV	H	43.3	-7.0	36.3	≤ 54.0	17.7	100.0	24.8	X	10.0
2390.000	PK	H	52.9	-7.0	45.9	≤ 74.0	28.1	100.0	24.8	X	-
4804.005	AV	H	39.9	-3.5	36.4	≤ 54.0	17.6	139.0	74.8	X	10.0
4804.153	PK	H	46.9	-3.5	43.4	≤ 74.0	30.6	142.0	75.8	X	-
12010.000	AV	H	36.3	-2.6	33.7	≤ 54.0	20.3	326.9	260.5	X	10.0
12010.000	PK	H	46.4	-2.6	43.8	≤ 74.0	30.2	326.9	260.5	X	-
19216.000	AV	H	36.5	-0.8	35.7	≤ 54.0	18.3	139.1	309.8	X	10.0
19216.000	PK	H	45.8	-0.8	45.0	≤ 74.0	29.0	137.9	311.3	X	-
2390.000	AV	V	43.3	-7.0	36.3	≤ 54.0	17.7	254.0	107.8	X	10.0
2390.000	PK	V	53.1	-7.0	46.1	≤ 74.0	27.9	252.0	103.8	X	-
4803.822	PK	V	48.3	-3.5	44.8	≤ 74.0	29.2	140.0	24.8	X	-
4803.991	AV	V	42.6	-3.5	39.1	≤ 54.0	14.9	140.0	21.8	X	10.0
12010.000	AV	V	36.5	-2.6	33.9	≤ 54.0	20.1	270.5	283.8	X	10.0
12010.000	PK	V	46.3	-2.6	43.7	≤ 74.0	30.3	270.5	281.9	X	-
19216.000	AV	V	36.8	-0.8	36.0	≤ 54.0	18.0	241.9	356.0	X	10.0
19216.000	PK	V	46.0	-0.8	45.2	≤ 74.0	28.8	240.1	356.5	X	-

[1 Mbps / 2440 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB μ V]	C.F. [dB/m]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
4879.914	PK	H	47.6	-3.4	44.2	≤ 74.0	29.8	155.0	66.2	X	-
4879.942	AV	H	41.0	-3.4	37.6	≤ 54.0	16.4	154.0	64.2	X	10.0
7320.000	AV	H	41.1	-9.4	31.7	≤ 54.0	22.3	347.7	146.4	X	10.0
7320.000	PK	H	51.1	-9.4	41.7	≤ 74.0	32.3	347.7	144.4	X	-
12200.000	AV	H	36.4	-2.7	33.7	≤ 54.0	20.3	181.4	327.8	X	10.0
12200.000	PK	H	46.4	-2.7	43.7	≤ 74.0	30.3	181.4	329.8	X	-
4879.886	PK	V	49.0	-3.4	45.6	≤ 74.0	28.4	140.0	32.2	X	-
4880.010	AV	V	44.1	-3.4	40.7	≤ 54.0	13.3	149.1	31.2	X	10.0
7320.000	AV	V	41.0	-9.4	31.6	≤ 54.0	22.4	165.2	28.4	X	10.0
7320.000	PK	V	51.2	-9.4	41.8	≤ 74.0	32.2	165.2	30.4	X	-
12200.000	AV	V	36.5	-2.7	33.8	≤ 54.0	20.2	269.2	190.1	X	10.0
12200.000	PK	V	46.5	-2.7	43.8	≤ 74.0	30.2	269.2	190.1	X	-

[1 Mbps / 2480 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB μ V]	C.F. [dB/m]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2483.500	AV	H	44.2	-6.7	37.5	≤ 54.0	16.5	134.0	59.4	X	10.0
2483.500	PK	H	54.5	-6.7	47.8	≤ 74.0	26.2	136.0	60.2	X	-
4959.903	AV	H	40.5	-3.0	37.5	≤ 54.0	16.5	125.0	70.2	X	10.0
4959.911	PK	H	47.1	-3.0	44.1	≤ 74.0	29.9	134.0	68.7	X	-
12400.000	AV	H	36.7	-3.0	33.7	≤ 54.0	20.3	131.1	48.9	X	10.0
12400.000	PK	H	46.8	-3.0	43.8	≤ 74.0	30.2	131.1	50.9	X	-
19840.000	AV	H	37.4	-0.7	36.7	≤ 54.0	17.3	126.1	50.9	X	10.0
19840.000	PK	H	46.0	-0.7	45.3	≤ 74.0	28.7	123.6	52.6	X	-
2483.500	AV	V	43.8	-6.7	37.1	≤ 54.0	16.9	144.0	61.2	X	10.0
2483.500	PK	V	53.8	-6.7	47.1	≤ 74.0	26.9	145.0	61.2	X	-
4959.990	PK	V	48.8	-3.0	45.8	≤ 74.0	28.2	140.0	42.2	X	-
4960.058	AV	V	43.6	-3.0	40.6	≤ 54.0	13.4	140.0	40.2	X	10.0
7440.000	AV	V	41.0	-9.6	31.4	≤ 54.0	22.6	158.7	184.3	X	10.0
7440.000	PK	V	52.1	-9.6	42.5	≤ 74.0	31.5	158.7	184.3	X	-
22320.000	AV	V	37.9	-1.9	36.0	≤ 54.0	18.0	309.4	216.5	X	10.0
22320.000	PK	V	47.3	-1.9	45.4	≤ 74.0	28.6	303.7	217.9	X	-

[2 Mbps / 2402 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB μ V]	C.F. [dB/m]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2390.000	AV	H	43.3	-7.0	36.3	≤ 54.0	17.7	112.0	67.8	X	10.0
2390.000	PK	H	53.0	-7.0	46.0	≤ 74.0	28.0	116.0	68.8	X	-
4803.965	AV	H	39.6	-3.5	36.1	≤ 54.0	17.9	129.0	70.8	X	10.0
4804.227	PK	H	46.6	-3.5	43.1	≤ 74.0	30.9	126.0	67.8	X	-
12010.000	AV	H	36.3	-2.6	33.7	≤ 54.0	20.3	327.0	290.0	X	10.0
12010.000	PK	H	46.4	-2.6	43.8	≤ 74.0	30.2	327.0	287.9	X	-
19216.000	AV	H	36.7	-0.8	35.9	≤ 54.0	18.1	304.5	69.5	X	10.0
19216.000	PK	H	45.1	-0.8	44.3	≤ 74.0	29.7	300.7	73.2	X	-
2390.000	AV	V	43.5	-7.0	36.5	≤ 54.0	17.5	112.0	19.8	X	10.0
2390.000	PK	V	52.8	-7.0	45.8	≤ 74.0	28.2	111.0	17.8	X	-
4804.061	AV	V	42.0	-3.5	38.5	≤ 54.0	15.5	145.0	34.8	X	10.0
4804.229	PK	V	47.3	-3.5	43.8	≤ 74.0	30.2	145.0	31.8	X	-
12010.000	AV	V	36.4	-2.6	33.8	≤ 54.0	20.2	297.2	198.2	X	10.0
12010.000	PK	V	46.5	-2.6	43.9	≤ 74.0	30.1	297.2	198.2	X	-
19216.000	AV	V	36.9	-0.8	36.1	≤ 54.0	17.9	183.2	330.8	X	10.0
19216.000	PK	V	45.7	-0.8	44.9	≤ 74.0	29.1	181.1	335.6	X	-

[2 Mbps / 2440 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB μ V]	C.F. [dB/m]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
4879.932	PK	H	47.7	-3.4	44.3	≤ 74.0	29.7	160.0	65.2	X	-
4879.965	AV	H	41.0	-3.4	37.6	≤ 54.0	16.4	158.0	66.2	X	10.0
7320.000	AV	H	41.3	-9.4	31.9	≤ 54.0	22.1	379.2	292.7	X	10.0
7320.000	PK	H	51.1	-9.4	41.7	≤ 74.0	32.3	379.2	294.8	X	-
12200.000	AV	H	36.7	-2.7	34.0	≤ 54.0	20.0	243.5	35.4	X	10.0
12200.000	PK	H	46.5	-2.7	43.8	≤ 74.0	30.2	243.5	35.4	X	-
19520.000	AV	H	36.9	-0.7	36.2	≤ 54.0	17.8	364.0	287.8	X	10.0
19520.000	PK	H	46.5	-0.7	45.8	≤ 74.0	28.2	354.8	294.0	X	-
4879.996	PK	V	49.2	-3.4	45.8	≤ 74.0	28.2	126.0	35.2	X	-
4880.021	AV	V	43.7	-3.4	40.3	≤ 54.0	13.7	125.0	25.2	X	10.0
7320.000	AV	V	41.1	-9.4	31.7	≤ 54.0	22.3	167.3	309.4	X	10.0
7320.000	PK	V	51.1	-9.4	41.7	≤ 74.0	32.3	167.3	307.5	X	-
12200.000	AV	V	36.5	-2.7	33.8	≤ 54.0	20.2	370.9	322.1	X	10.0
12200.000	PK	V	46.6	-2.7	43.9	≤ 74.0	30.1	370.9	320.3	X	-
19520.000	AV	V	37.0	-0.7	36.3	≤ 54.0	17.7	131.3	162.1	X	10.0
19520.000	PK	V	47.7	-0.7	47.0	≤ 74.0	27.0	128.0	163.4	X	-

[2 Mbps / 2480 MHz]

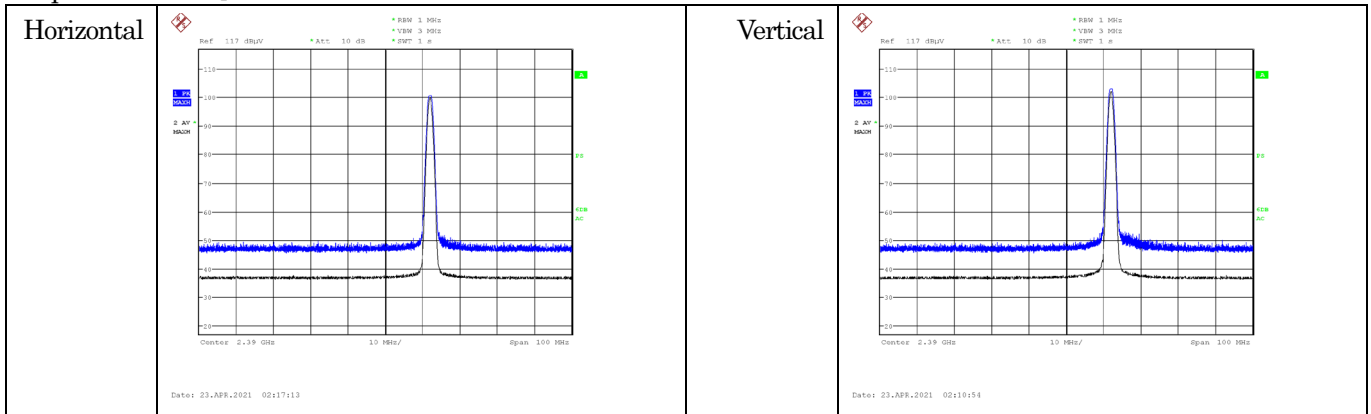
Frequency [MHz]	Detector	Polar.	Reading [dBμV]	C.F. [dB/m]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2483.500	AV	H	44.2	-6.7	37.5	≤ 54.0	16.5	140.1	61.1	X	10.0
2483.500	PK	H	54.8	-6.7	48.1	≤ 74.0	25.9	141.0	60.2	X	-
4959.961	AV	H	40.4	-3.0	37.4	≤ 54.0	16.6	156.0	68.0	X	10.0
4959.961	PK	H	46.6	-3.0	43.6	≤ 74.0	30.4	154.0	65.4	X	-
12400.000	AV	H	36.8	-3.0	33.8	≤ 54.0	20.2	231.0	242.5	X	10.0
12400.000	PK	H	46.9	-3.0	43.9	≤ 74.0	30.1	231.0	244.6	X	-
22320.000	AV	H	37.9	-1.9	36.0	≤ 54.0	18.0	242.0	106.6	X	10.0
22320.000	PK	H	47.4	-1.9	45.5	≤ 74.0	28.5	235.4	101.1	X	-
2483.500	AV	V	45.4	-6.7	38.7	≤ 54.0	15.3	160.0	326.2	X	10.0
2483.500	PK	V	55.6	-6.7	48.9	≤ 74.0	25.1	159.0	325.2	X	-
4960.063	AV	V	43.8	-3.0	40.8	≤ 54.0	13.2	114.0	35.2	X	10.0
4960.098	PK	V	48.9	-3.0	45.9	≤ 74.0	28.1	112.0	34.2	X	-
7440.000	AV	V	41.1	-9.6	31.5	≤ 54.0	22.5	261.2	15.9	X	10.0
7440.000	PK	V	52.1	-9.6	42.5	≤ 74.0	31.5	261.2	15.9	X	-
19840.000	AV	V	37.1	-0.7	36.4	≤ 54.0	17.6	302.3	122.7	X	10.0
19840.000	PK	V	46.0	-0.7	45.3	≤ 74.0	28.7	299.6	124.9	X	-

Plot data for 2.4 GHz Restricted-Band Edge

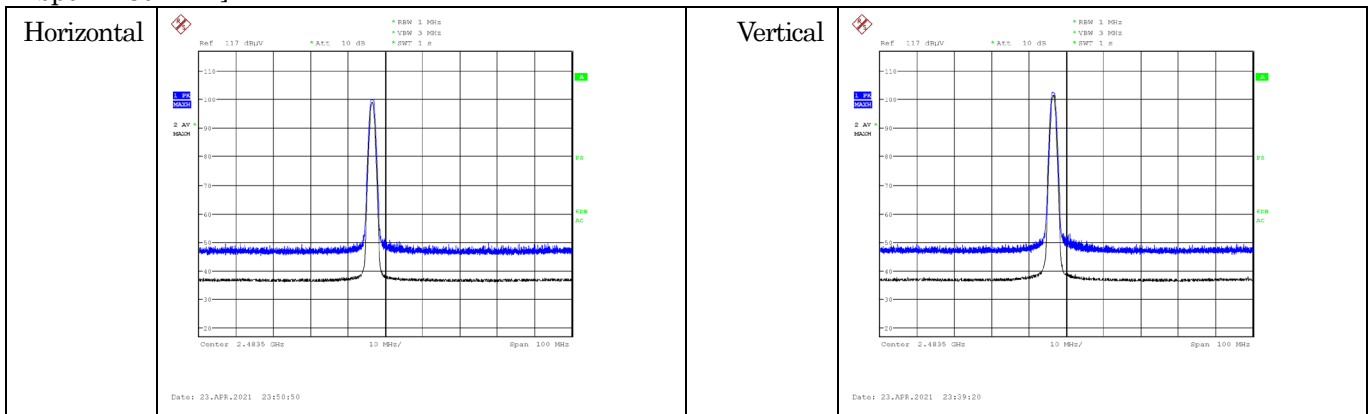
These plot data show peak (trace blue) and average (trace black) spectrum for worst case emissions in the restricted-band edges. (Restricted band edges: below 2390 MHz and above 2483.5 MHz)

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

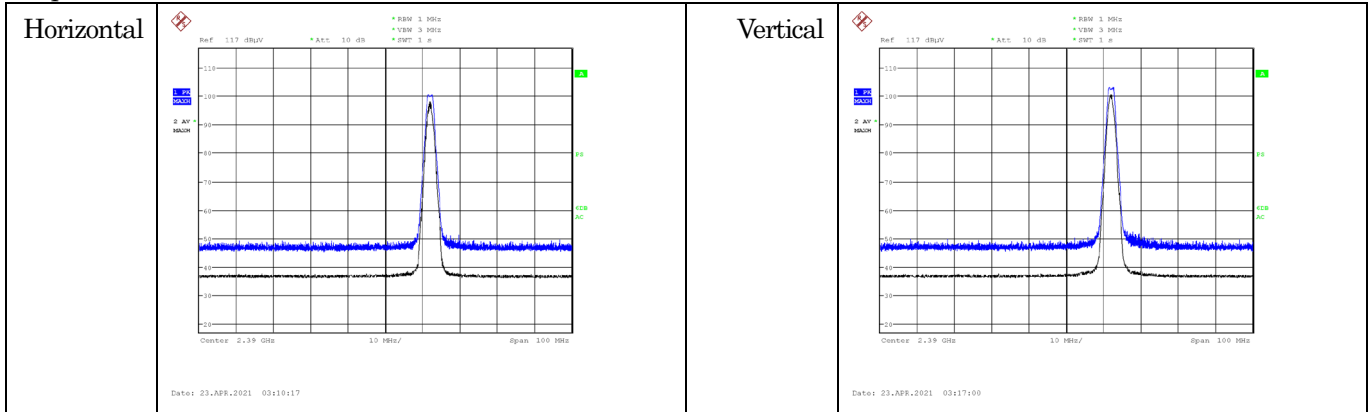
[1 Mbps / 2402 MHz]



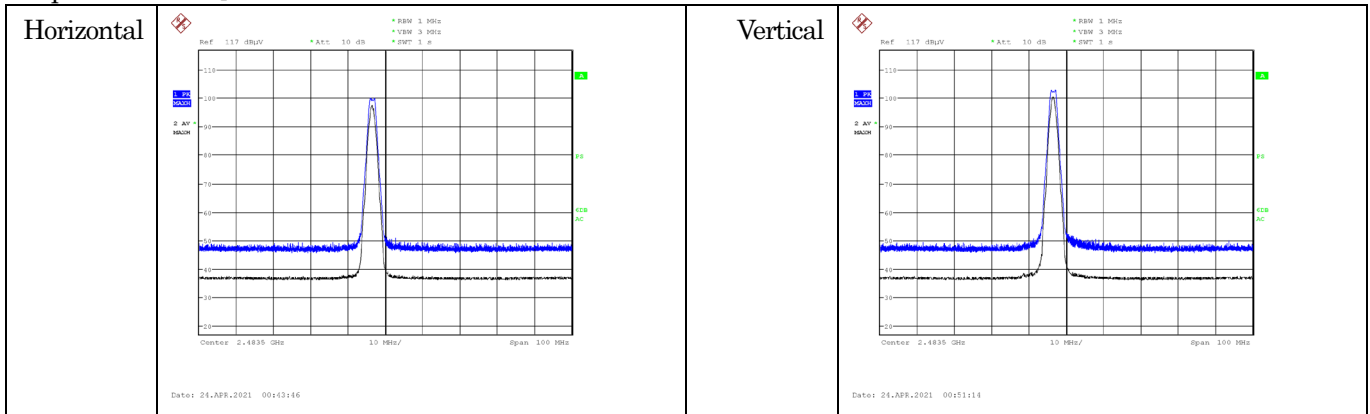
[1 Mbps / 2480 MHz]



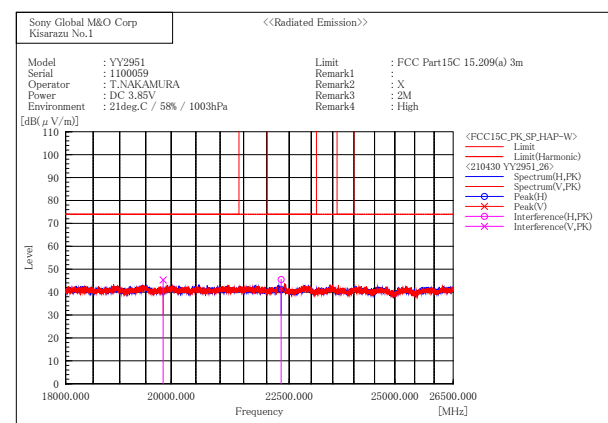
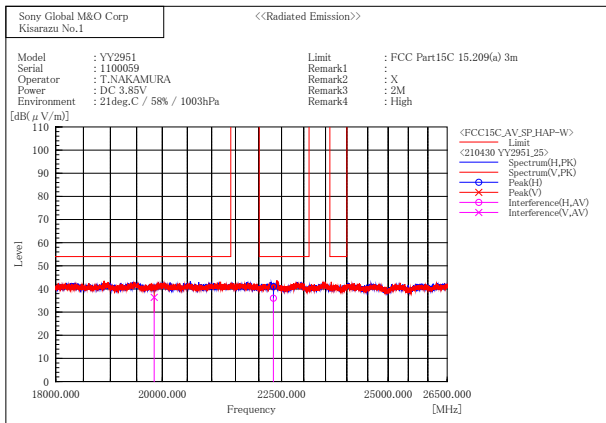
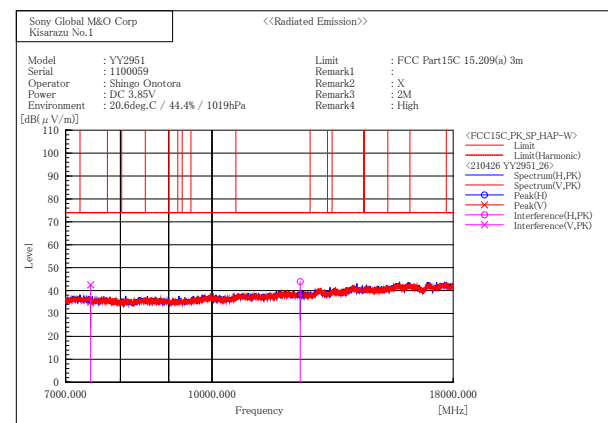
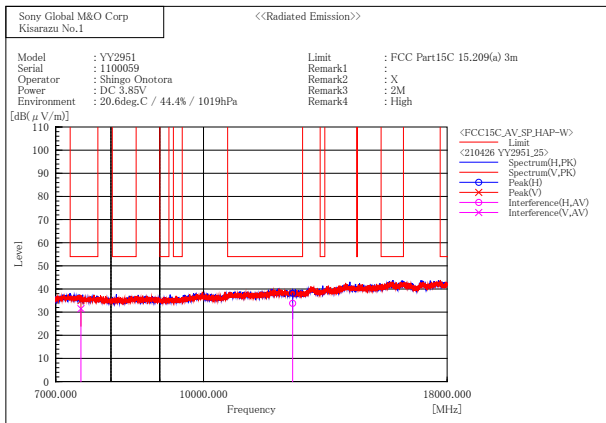
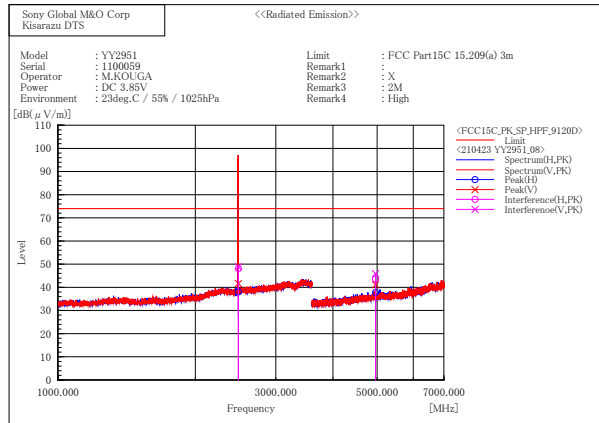
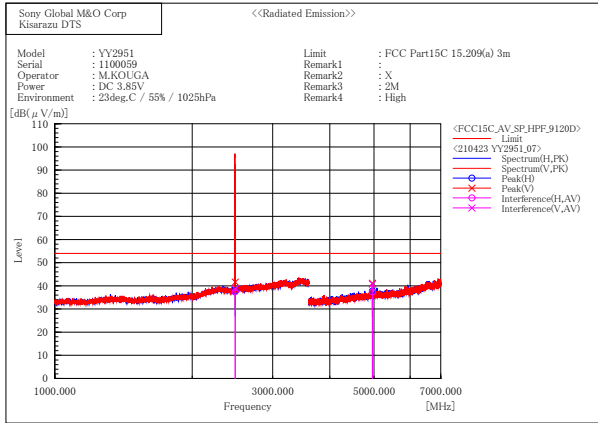
[2 Mbps / 2402 MHz]



[2 Mbps / 2480 MHz]



Plot data for above 1GHz in worst mode

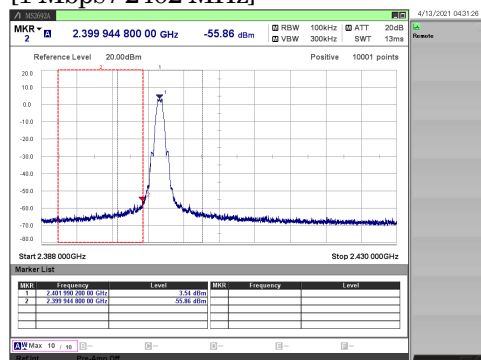


3.5. Conducted Spurious Emissions for Band Edge

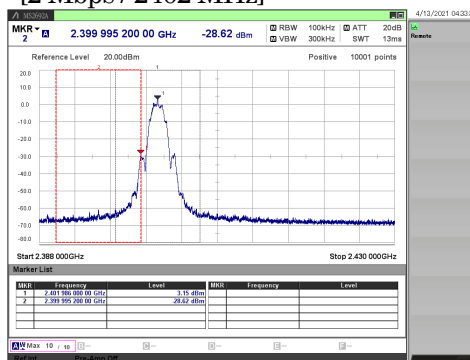
- 1) Ambient temperature : 23.3 deg.C
- 2) Relative humidity : 40.6 %
- 3) Date of measurement : April 13, 2021
- 4) Measured by : Mikiko Kouga
- 5) Operating mode : Transmitting mode

Mode	Rate [Mbps]	Channel [MHz]	Frequency [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
BLE	1	2402	2401.99	3.54	0.75	4.29	-	-
			2399.94	-55.86	0.75	-55.11	≤ -15.71	39.40
	2	2402	2401.99	3.15	0.75	3.90	-	-
			2400.00	-28.62	0.75	-27.87	≤ -16.10	11.77

[1 Mbps / 2402 MHz]



[2 Mbps / 2402 MHz]



4. Method of Calculation

4.1. Maximum Peak Conducted Output Power

Method of calculation : Software
 Software Name : SW-0316
 Software Version : Ver.3

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

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

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

4.2. Power Spectral Density

Method of calculation : Software
 Software Name : SW-0316
 Software Version : Ver.3

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

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]

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 + $20 \log (3 \text{ m} / 10 \text{ m})$

4.4. Conducted Spurious Emissions for Band Edge

Method of calculation : Software
 Software Name : SW-0316
 Software Version : Ver.3

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
-	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
x	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	20.10.03
-	WC0006	RF Cable	SUCOFLEX 102	34289/2	HUBER + SUHNER	12 months	20.10.03
-	WC0007	RF Cable	SUCOFLEX 102	34286/2	HUBER + SUHNER	12 months	20.10.03
x	M0720	Thermometer	TH-321	140044	AS ONE	12 months	20.07.10

5.2. Radiated Spurious Emissions

4th Site

Used	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
-	M0515	EMI Receiver	ESCI	100606	Rohde & Schwarz	12 months	20.11.18
x	M0504	EMI Receiver	ESU40	100086	Rohde & Schwarz	12 months	20.12.02
x	A0073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12 months	20.12.01
x	A0043	Biconical Antenna	BBA9106	V5(91032598)	Schwarzbeck	12 months	20.12.07
x	A0046	Log periodic Antenna	UHALP9108A1	0830	Schwarzbeck	12 months	20.12.07
x	A0056	Horn Antenna	BBHA9120D	670	Schwarzbeck	12 months	20.06.14
-	A0057	Horn Antenna	HAP06-18W	00000037	Toyo Corporation	12 months	20.06.14
-	A0058	Horn Antenna	HAP18-26W	00000016	Toyo Corporation	12 months	20.10.02
x	CS0037	Fourth Site RE Cable SYS1	-	-	-	12 months	20.06.14
x	CS0039	Fourth Site RE Cable SYS3	-	-	-	12 months	20.06.14
x	CS0054	Fourth Site EMF Cable SYS	-	-	-	12 months	20.06.14
x	M1055	GHz Filter Box	WSF-109	17111786	Wakoh	12 months	20.06.14
x	M0510	RF Selector	NS4900	0802-226	Toyo Corporation	12 months	20.06.14
x	M0620	RF Pre-Amp	8447D	2944A10720	Agilent Technologies	12 months	20.06.14
x	M0706	3dB Attenuator	8491A	MY39267782	Agilent Technologies	12 months	20.06.14
x	M5151	Temperature Meter	608-H2	41475968	testo	24 months	19.11.20
x	M5061	Scientific Ambient Monitor	0560 6220	39515471/801	testo	12 months	20.04.17
x	M1048	Scientific Ambient Monitor	0560 6220	39512479/703	testo	12 months	20.07.15

EMC Site

Used	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
-	M0686	EMI Receiver	N9038A	MY52260113	Agilent Technologies	12 months	20.12.04
-	M0562	EMI Receiver	ESU26	100068	Rohde & Schwarz	12 months	20.08.01
x	M0959	EMI Receiver	ESU40	100041	Rohde & Schwarz	12 months	21.02.05
-	A0073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12 months	20.12.01
-	A0089	Biconical Antenna	BBA9106	VHA91032835	Schwarzbeck	12 months	20.12.07
-	A0088	Log periodic Antenna	UHALP9108A1	0649	Schwarzbeck	12 months	20.12.07
-	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
-	CS0017	N-RE Cable System 1	-	-	-	12 months	20.11.01
-	CS0018	N-RE Cable System 2	-	-	-	12 months	20.11.01
-	CS0045	N-3m EMF Cable System	-	-	-	12 months	20.11.01
-	CS0074/0075	N-RE Cable SYSTEM 4	-	-	-	12 months	20.11.01
-	M0126	Step Attenuator	8494H	3837M01144	Agilent	12 months	20.11.01
-	M0752	Pre Amplifier	310N	320621	SONOMA INSTRUMENT	12 months	20.11.01
-	M0128	3dB Attenuator	8491A	53541	Agilent Technologies	12 months	20.11.01
-	M0609	3dB Attenuator	8491B	MY39265960	Agilent Technologies	12 months	20.11.01
-	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	20.12.04

About calibration interval

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