

# RADIO TEST REPORT

(for Bluetooth Low Energy)

Project No. : JB-Z0964  
Client's Control No. : AF21038  
Client : Sony Corporation  
Client's Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan  
Product Name : Digital Media Player  
Model No. : YY1299B  
FCC ID : AK8YY1299B  
Test Standard : 47 CFR Part 15 Subpart C  
Sample Receipt Date : July 29, 2021  
Test Date : August 2, 2021 to September 27, 2021  
Report Date : October 4, 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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- \* 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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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-Z0964 (Original)	October 4, 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 : Digital Media Player  
 Trade Name : SONY  
 Model No. : YY1299B  
 Serial No. :

Serial No.	Test Method	Note
0310105 0310124	Radiated Conducted (AC Power-line Conducted Emissions only)	-
0310068 0310150	Conducted (Others)	The tests were performed on model YY1298B with the same RF module, circuits, and specifications as the EUT.

Power Rating of the EUT : DC 3.8 V (Internal Battery) or DC 5 V (USB)

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  
 Number of channels : 40  
 Antenna Type : Inverted-F Antenna  
 Antenna Connector Type : None  
 Antenna Gain : +2.12 dBi  
 Operating Temperature : +5.0 to +35.0 deg.C

## 1.2. Summary of Test Result

Test Item	Test Method	Worst Margin	Results	Note
AC Power-line Conducted Emissions	Conducted	18.7 dB (QP) 0.209 MHz L1	Complied	-
6dB Bandwidth	Conducted	Refer to the test data	Complied	-
Maximum Peak Conducted Output Power	Conducted	23.27 dB	Complied	-
Power Spectral Density	Conducted	17.11 dB	Complied	-
Radiated Spurious Emissions	Radiated	2.3 dB (AV) 4804.022 MHz Vertical	Complied	-
Conducted Spurious Emissions for Band Edge	Conducted	37.02 dB 2399.90 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.

### Other requirements

Part 15.31(e) Supply voltage requirement

: Complied (The voltage supplied from USB or battery are converted to regulated DC voltage by the built-in power circuit of the EUT.)

Part 15.203 / 212 Antenna requirement

: Complied (The EUT has an internal antenna which can't 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

### AC Power-line Conducted Emissions

Dimensions of the EUT table : 0.8 m height, 2 m width and 1 m depth.

### 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 : 2.0 m diameter, 3.5 m top height, 0 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

### AC Power-line Conducted Emissions

- The non-conductive table (EUT table) made of ( FRP,  wood,  other non-conductive material) was placed 0.4 m from its rear to the vertical reference ground plane.
- The EUT was placed on the center of tabletop and its rear was flush with the rear of the table, connected through a LISN to the input power mains.
- The LISN was placed in 80 cm from the nearest part of the EUT chassis.
- The excess length of the AC cable between the EUT and the LISN receptacle, or an adaptor or extension cable connected to and measured with LISN, was folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- The connection of the all other equipment to the second LISN was performed. The second LISN was terminated with a 50-ohm terminator.
- Interconnecting cables that hang closer than 40 cm to the horizontal reference ground plane was folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between the horizontal reference ground plane and the tabletop.
- Find the worst mode and arrangement of the EUT according to the follows:
  - Connecting all peripherals and change the position of peripherals and cables.
  - Changing the all test operation modes of the EUT.
  - On every condition, exploring the highest emissions with the spectrum analyzer. (150 kHz to 30 MHz, peak detector, RBW: 10 kHz)
- On the worst condition of the EUT found in above, choose the six highest emissions on the spectrum data. The final measurements carried out on these emissions with EMI test receiver. (quasi-peak and average detector, RBW: 9 kHz)

### Antenna-port Conducted Measurements

- Antenna-port of the EUT was connected to the power sensor (Maximum Peak Conducted Output Power) or the spectrum analyzer (other test items).
- 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**

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 kHz to 490 kHz [Limit at 3 m] = [Limit at 300 m] + 40 log (300[m] / 3[m])  
 490 kHz to 30 MHz [Limit at 3 m] = [Limit at 30 m] + 40 log (30[m] / 3[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 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.  
 C.F. of RBW [dB] = 10\*log (100 kHz / 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

### AC Power-line Conducted Emissions

Shielded Room

4th Site     EMC Site

### 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	± 5.68 dB	± 5.94 dB
	18 GHz to 26.5 GHz	3m	± 4.66 dB	± 4.98 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
AC Power-line Conducted Emissions *1	2402 MHz	1 Mbps
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
Conducted Spurious Emissions for Band Edge	2402 MHz	1 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 : BT Test Tool  
Software Version : 003

### 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

### AC Power-line Conducted Emissions

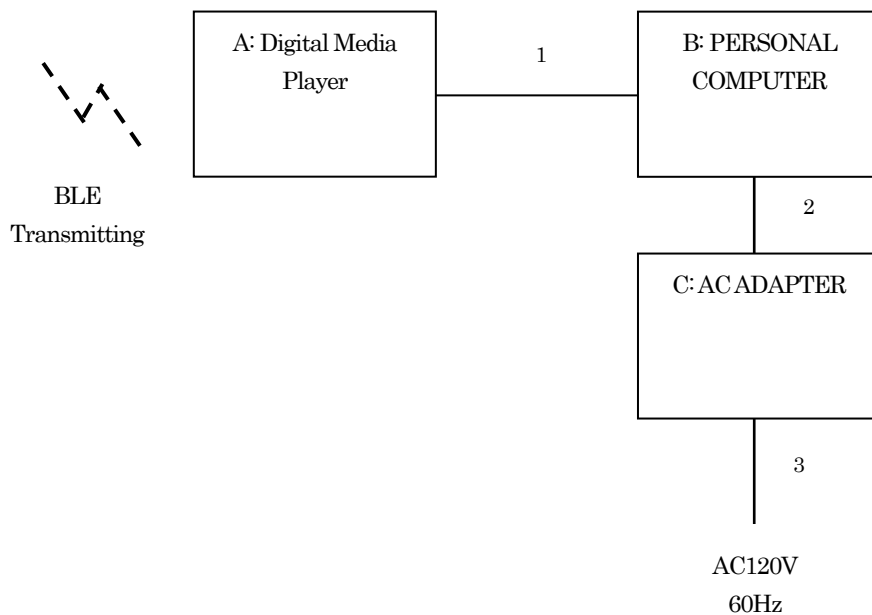
[ EUT and Associated Equipment (AE) ]

Symbol	EUT/ AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Digital Media Player	SONY	YY1299B	0310124
B	AE	PERSONAL COMPUTER	SONY	VJPF11C11N	4350372
C	AE	AC ADAPTER	SONY	VJ8AC10V9	0077385

[ Type of Cable ]

Symbol	Description	Identification (Manufacturer etc.)	Shielded Yes / No	Ferrite Core	Length (m)	Bundled
1	USB Cable	-	Yes	No	0.5	No
2	DC Cable	-	No	No	1.7	Yes
3	AC Cable	-	No	No	1.0	No

[ Connecting Diagram ]



**Antenna-port Conducted Measurements**

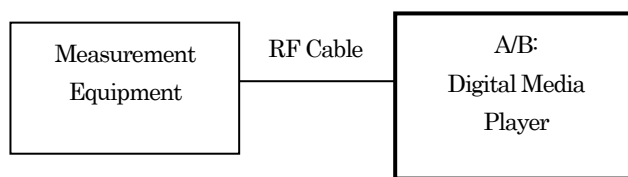
[ EUT and Associated Equipment (AE) ]

Symbol	EUT/AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Digital Media Player	SONY	YY1298B	0310068 (for Maximum Conducted Output Power)
B	EUT	Digital Media Player	SONY	YY1298B	0310150 (for others)

[ Type of Cable ]

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

[ Connecting Diagram ]

**Radiated Spurious Emissions**

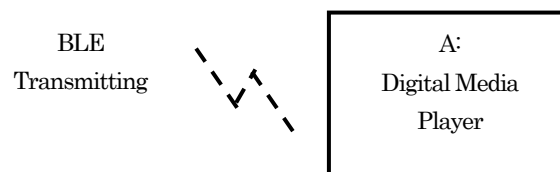
[ EUT and Associated Equipment (AE) ]

Symbol	EUT/AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Digital Media Player	SONY	YY1299B	0310105

[ Type of Cable ]

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

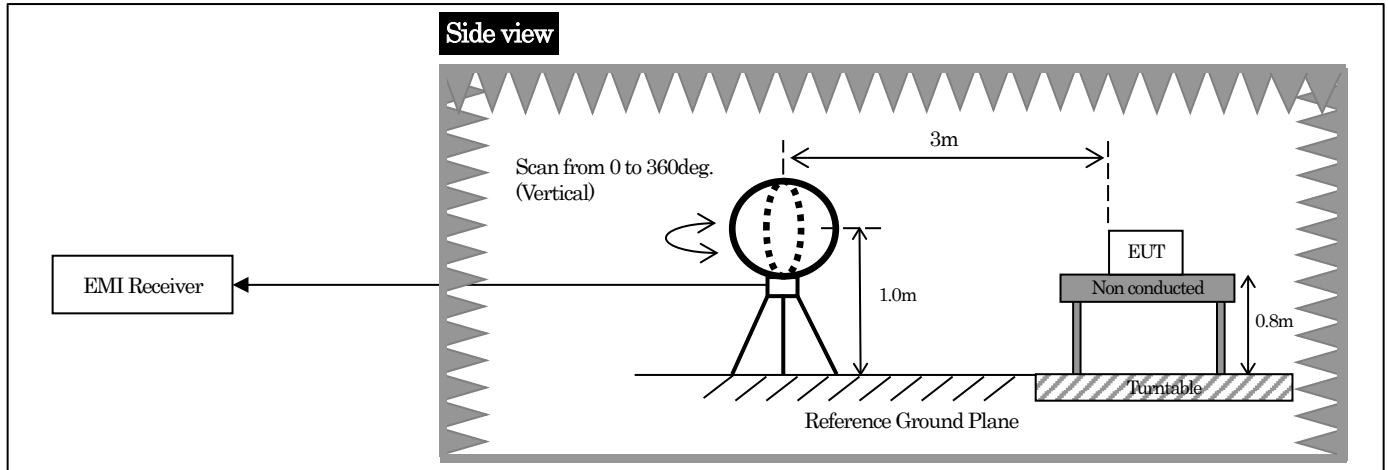
[ Connecting Diagram ]



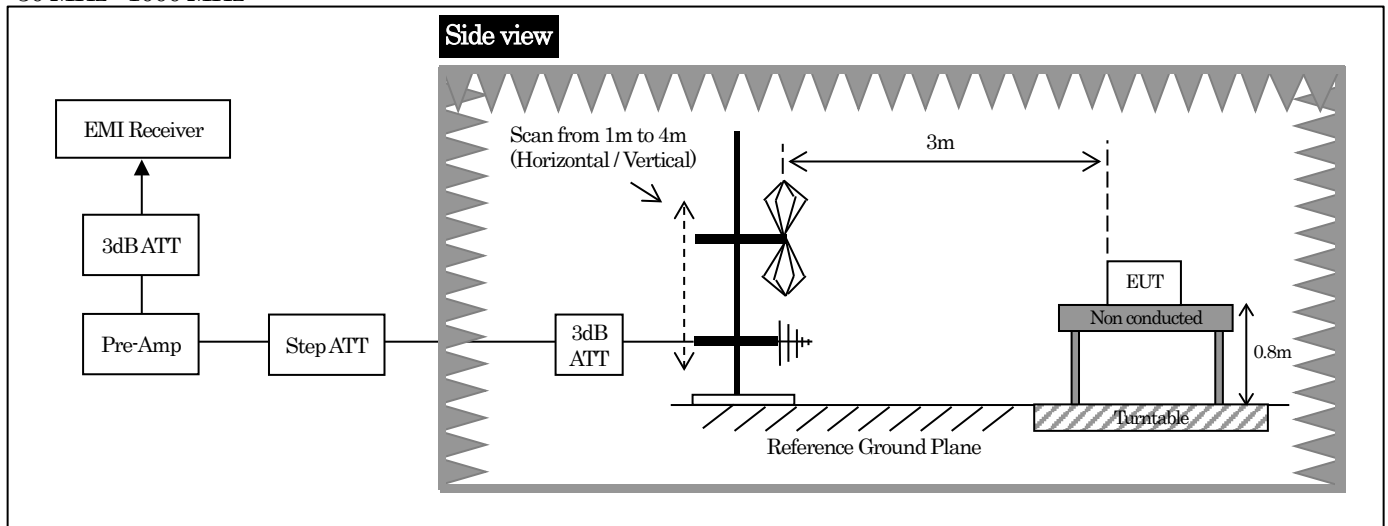
## 2.6. Typical setup arrangement

### Radiated spurious emissions

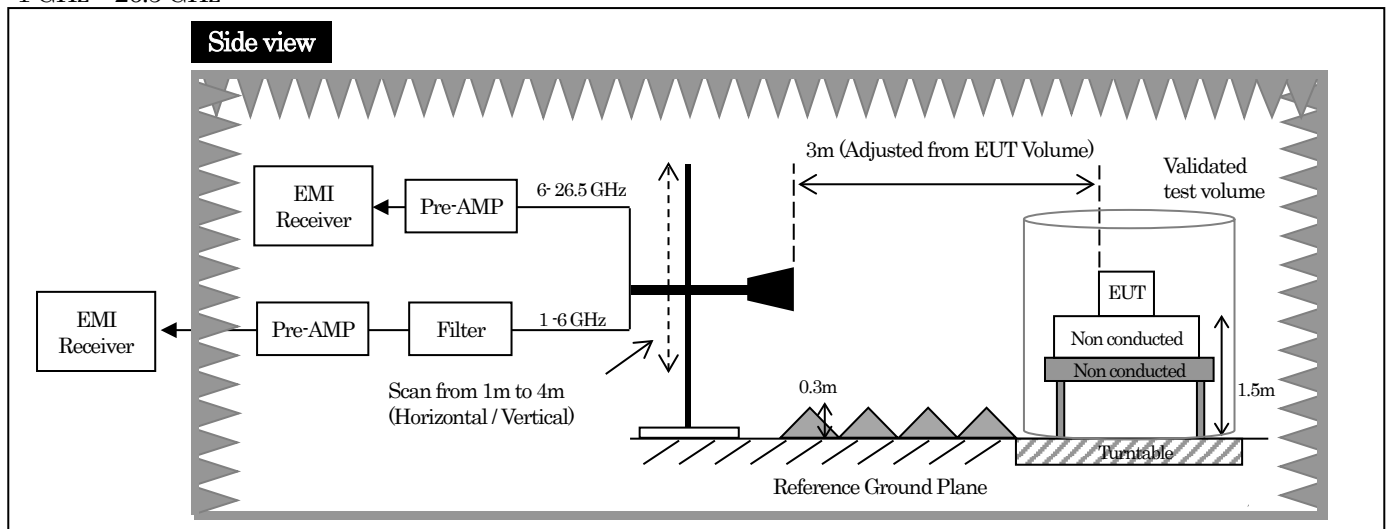
< 9 kHz - 30 MHz >



< 30 MHz - 1000 MHz >



< 1 GHz - 26.5 GHz >

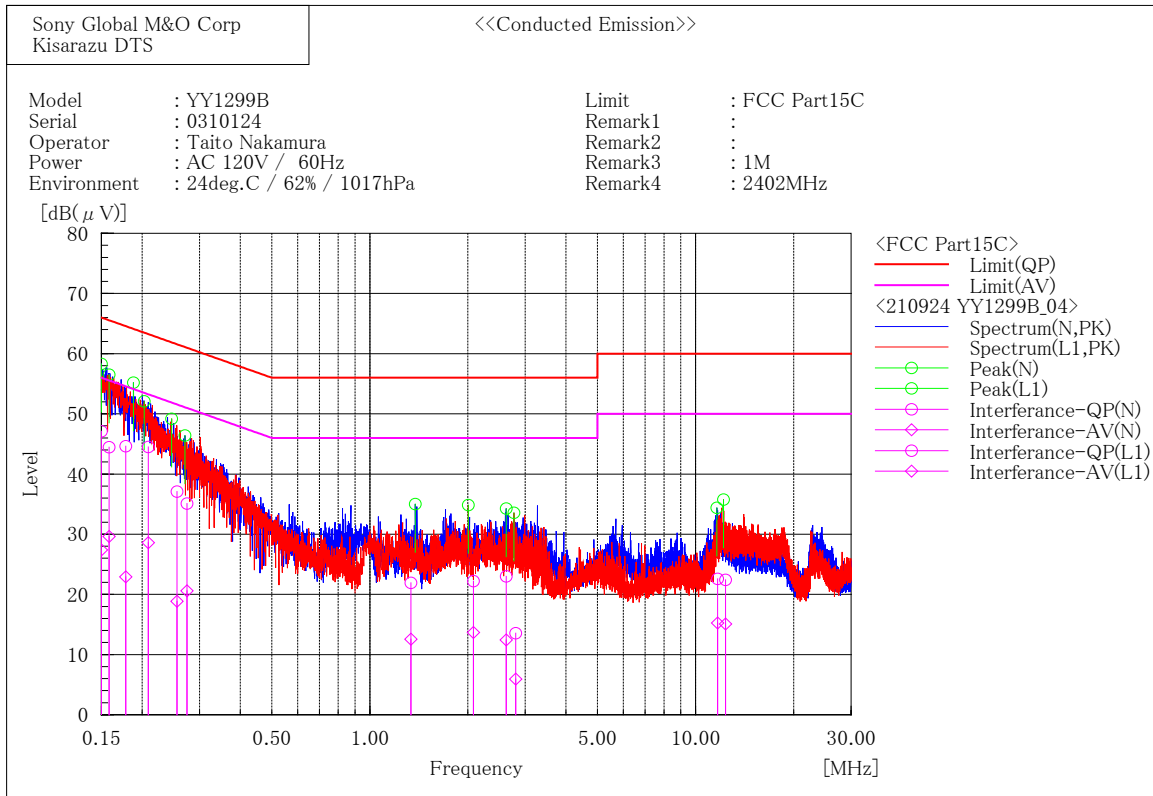


### 3. Test Data

#### 3.1. AC Power-line Conducted Emissions

Date of measurement	Ambient temperature	Relative humidity	Measured by
September 24, 2021	24.0 deg.C	62.0 %	Taito Nakamura

[1 Mbps / 2402 MHz]



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading		c. f [dB]	Result		Limit		Margin	
		QP [dB(μV)]	CAV [dB(μV)]		QP [dB(μV)]	CAV [dB(μV)]	QP [dB(μV)]	AV [dB(μV)]	QP [dB]	CAV [dB]
1	0.150	37.4	17.7	9.7	47.1	27.4	66.0	56.0	18.9	28.6
2	0.178	34.9	13.2	9.7	44.6	22.9	64.6	54.6	20.0	31.7
3	0.274	25.4	10.9	9.7	35.1	20.6	61.0	51.0	25.9	30.4
4	1.337	12.1	2.8	9.8	21.9	12.6	56.0	46.0	34.1	33.4
5	2.621	13.2	2.6	9.8	23.0	12.4	56.0	46.0	33.0	33.6
6	11.681	12.4	5.0	10.2	22.6	15.2	60.0	50.0	37.4	34.8

--- L1 Phase ---

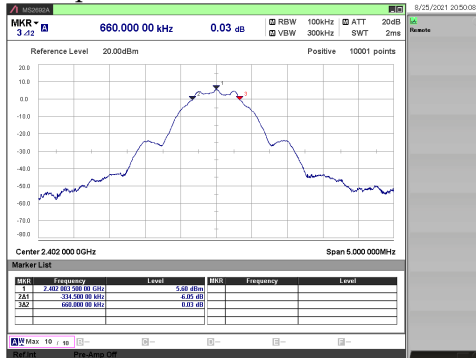
No.	Frequency [MHz]	Reading		c. f [dB]	Result		Limit		Margin	
		QP [dB(μV)]	CAV [dB(μV)]		QP [dB(μV)]	CAV [dB(μV)]	QP [dB(μV)]	AV [dB(μV)]	QP [dB]	CAV [dB]
1	0.158	34.8	19.9	9.7	44.5	29.6	65.6	55.6	21.1	26.0
2	0.209	34.8	18.9	9.7	44.5	28.6	63.2	53.2	18.7	24.6
3	0.256	27.4	9.2	9.7	37.1	18.9	61.6	51.6	24.5	32.7
4	2.080	12.4	3.9	9.8	22.2	13.7	56.0	46.0	33.8	32.3
5	2.806	3.7	-4.0	9.9	13.6	5.9	56.0	46.0	42.4	40.1
6	12.343	12.2	4.9	10.2	22.4	15.1	60.0	50.0	37.6	34.9

### 3.2. 6dB Bandwidth

Date of measurement	Ambient temperature	Relative humidity	Measured by
August 25, 2021	21.4 deg.C	58.8 %	Mikiko Kouga

Mode	Rate [Mbps]	Channel [MHz]	Result [MHz]	Limit [MHz]
BLE	1	2402	0.660	≥ 0.5
		2440	0.664	≥ 0.5
		2480	0.666	≥ 0.5

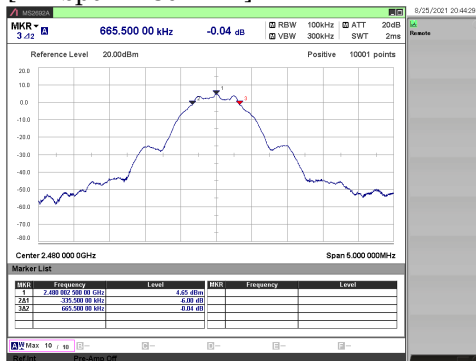
[1 Mbps / 2402 MHz]



[1 Mbps / 2440 MHz]



[1 Mbps / 2480 MHz]



### 3.3. Maximum Peak Conducted Output Power

Date of measurement	Ambient temperature	Relative humidity	Measured by
August 2, 2021	23.6 deg.C	58.3 %	Mikiko Kouga

#### Maximum Peak Conducted Output Power

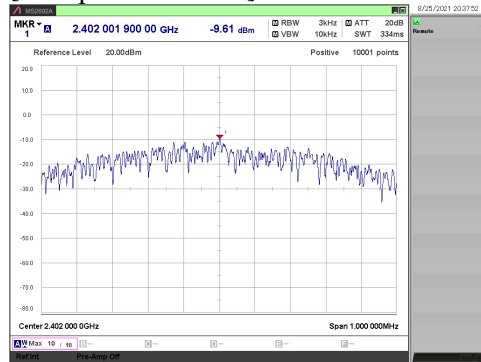
Mode	Rate [Mbps]	Channel [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Result(PK) [W]	Limit [dBm]	Limit [W]	Margin [dB]
BLE	1	2402	6.58	0.15	6.73	0.00471	≤ 30.0	≤ 1.0	23.27
		2440	5.99	0.15	6.14	0.00411	≤ 30.0	≤ 1.0	23.86
		2480	5.16	0.15	5.31	0.00340	≤ 30.0	≤ 1.0	24.69

### 3.4. Power Spectral Density

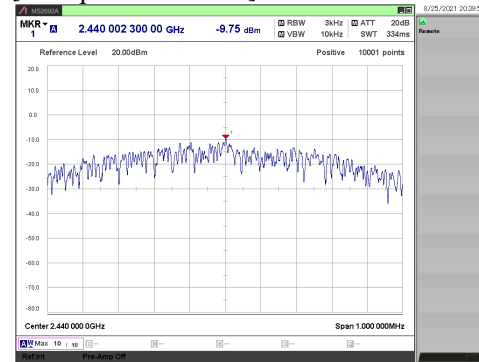
Date of measurement	Ambient temperature	Relative humidity	Measured by
August 25, 2021	21.4 deg.C	58.8 %	Mikiko Kouga

Mode	Rate [Mbps]	Channel [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Limit [dBm]	Margin [dB]
BLE	1	2402	-9.61	0.50	-9.11	≤ 8.0	17.11
		2440	-9.75	0.50	-9.25	≤ 8.0	17.25
		2480	-10.49	0.50	-9.99	≤ 8.0	17.99

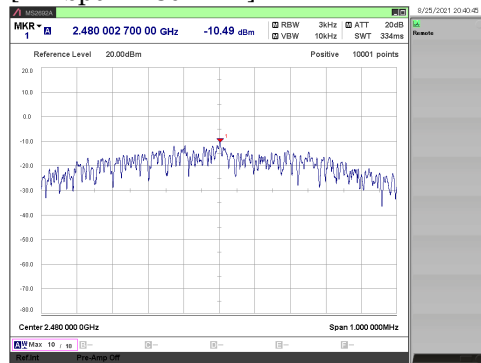
[1 Mbps / 2402 MHz]



[1 Mbps / 2440 MHz]



[1 Mbps / 2480 MHz]





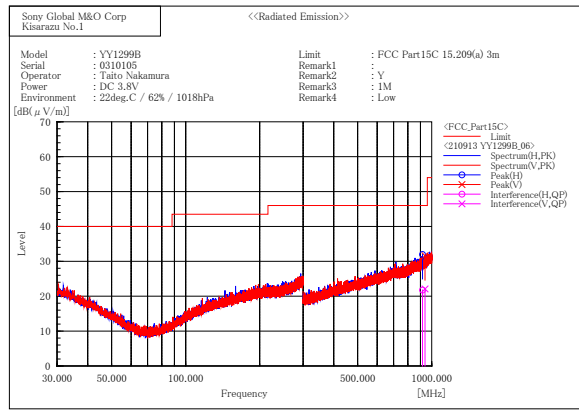
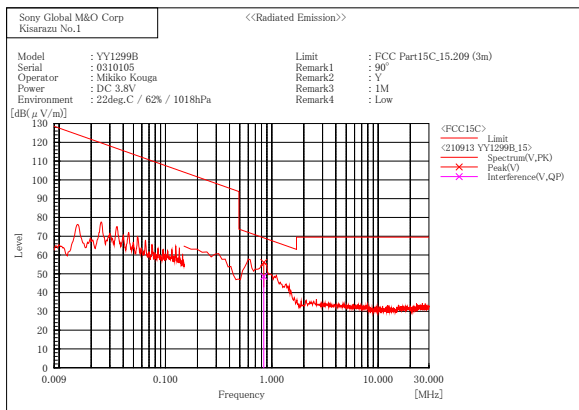
### 3.5. Radiated Spurious Emissions

Measurement band	Date of measurement	Ambient temperature	Relative humidity	Measured by
9 kHz to 1000 MHz	September 13, 2021	22.0 deg.C	62.0 %	Kouga Mikiko Taito Nakamura
1 GHz to 6 GHz	August 31, 2021	23.0 deg.C	65.0 %	Shingo Onotora
	September 18, 2021	24.0 deg.C	68.0 %	Shingo Onotora
6 GHz to 18 GHz	September 22, 2021	24.0 deg.C	70.0 %	Yosuke Kamiko
18 GHz to 26.5 GHz	September 25, 2021	22.0 deg.C	66.0 %	Taito Nakamura
	September 27, 2021	23.0 deg.C	63.0 %	Taito Nakamura

#### 9 kHz to 1000 MHz

[1 Mbps / 2402 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB $\mu$ V]	C.F. [dB/m]	Result [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position
917.366	QP	H	21.3	0.5	21.8	≤ 46.0	24.2	271.9	267.3	Y
0.840	QP	V	29.0	19.6	48.6	≤ 69.1	20.5	100.0	25.0	Y
938.969	QP	V	21.3	0.8	22.1	≤ 46.0	23.9	192.6	211.9	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 $\mu$ V]	C.F. [dB/m]	Result [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2390.000	AV	H	37.7	5.3	43.0	≤ 54.0	11.0	360.0	127.1	Z	10.0
2390.000	PK	H	47.7	5.3	53.0	≤ 74.0	21.0	360.0	125.1	Z	-
4804.012	PK	H	41.6	13.6	55.2	≤ 74.0	18.8	408.5	40.6	Z	-
4804.044	AV	H	35.1	13.6	48.7	≤ 54.0	5.3	408.5	38.5	Z	10.0
12010.000	AV	H	36.7	-2.6	34.1	≤ 54.0	19.9	309.7	319.3	Z	10.0
12010.000	PK	H	46.1	-2.6	43.5	≤ 74.0	30.5	310.0	318.2	Z	-
16092.768	AV	H	34.7	2.7	37.4	≤ 54.0	16.6	243.0	7.6	Z	10.0
16169.264	PK	H	44.0	2.9	46.9	≤ 74.0	27.1	242.5	6.1	Z	-
19216.000	AV	H	37.1	-0.8	36.3	≤ 54.0	17.7	311.0	95.2	Z	10.0
19216.000	PK	H	46.2	-0.8	45.4	≤ 74.0	28.6	302.4	99.3	Z	-
22462.438	PK	H	47.3	-1.9	45.4	≤ 74.0	28.6	249.0	197.6	Z	-
22463.130	AV	H	37.4	-1.9	35.5	≤ 54.0	18.5	249.0	199.7	Z	10.0
2390.000	AV	V	37.5	5.3	42.8	≤ 54.0	11.2	409.0	84.3	Z	10.0
2390.000	PK	V	47.8	5.3	53.1	≤ 74.0	20.9	409.0	82.4	Z	-
4804.022	AV	V	38.1	13.6	51.7	≤ 54.0	2.3	119.6	58.5	Z	10.0
4804.436	PK	V	44.3	13.6	57.9	≤ 74.0	16.1	119.6	60.5	Z	-
12010.000	AV	V	36.0	-2.6	33.4	≤ 54.0	20.6	100.0	131.9	Z	10.0
12010.000	PK	V	46.0	-2.6	43.4	≤ 74.0	30.6	100.0	130.6	Z	-
16169.996	AV	V	34.8	2.9	37.7	≤ 54.0	16.3	423.0	187.7	Z	10.0
16170.823	PK	V	44.3	2.9	47.2	≤ 74.0	26.8	422.8	188.6	Z	-
19216.000	AV	V	36.9	-0.8	36.1	≤ 54.0	17.9	136.4	325.7	Z	10.0
19216.000	PK	V	46.3	-0.8	45.5	≤ 74.0	28.5	128.0	329.1	Z	-
22729.272	AV	V	38.0	-2.1	35.9	≤ 54.0	18.1	236.4	164.4	Z	10.0
22730.164	PK	V	48.1	-2.1	46.0	≤ 74.0	28.0	227.8	168.0	Z	-

[1 Mbps / 2440 MHz]

Frequency [MHz]	Detector	Polar.	Reading [dB $\mu$ V]	C.F. [dB/m]	Result [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
4879.978	AV	H	32.1	13.5	45.6	≤ 54.0	8.4	395.4	61.6	Z	10.0
4879.978	PK	H	40.2	13.5	53.7	≤ 74.0	20.3	395.4	61.6	Z	-
7320.000	AV	H	41.0	-9.4	31.6	≤ 54.0	22.4	426.9	138.0	Z	10.0
7320.000	PK	H	50.8	-9.4	41.4	≤ 74.0	32.6	427.0	139.0	Z	-
12200.000	AV	H	36.4	-2.7	33.7	≤ 54.0	20.3	205.4	35.5	Z	10.0
12200.000	PK	H	46.0	-2.7	43.3	≤ 74.0	30.7	205.0	35.3	Z	-
19520.000	AV	H	36.2	-0.7	35.5	≤ 54.0	18.5	227.7	359.3	Z	10.0
19520.000	PK	H	45.0	-0.7	44.3	≤ 74.0	29.7	219.9	2.7	Z	-
22536.046	AV	H	38.3	-2.0	36.3	≤ 54.0	17.7	167.0	69.6	Z	10.0
22536.978	PK	H	48.0	-2.0	46.0	≤ 74.0	28.0	163.6	71.8	Z	-
4879.672	AV	V	36.0	13.5	49.5	≤ 54.0	4.5	100.0	58.1	Z	10.0
4879.672	PK	V	43.1	13.5	56.6	≤ 74.0	17.4	100.0	58.8	Z	-
7320.000	AV	V	41.0	-9.4	31.6	≤ 54.0	22.4	429.0	215.5	Z	10.0
7320.000	PK	V	51.1	-9.4	41.7	≤ 74.0	32.3	431.0	222.1	Z	-
12200.000	AV	V	37.1	-2.7	34.4	≤ 54.0	19.6	430.0	293.3	Z	10.0
12200.000	PK	V	46.6	-2.7	43.9	≤ 74.0	30.1	431.0	295.9	Z	-
19520.000	AV	V	36.1	-0.7	35.4	≤ 54.0	18.6	301.6	80.8	Z	10.0
19520.000	PK	V	45.6	-0.7	44.9	≤ 74.0	29.1	286.7	94.5	Z	-
22473.172	AV	V	38.1	-1.9	36.2	≤ 54.0	17.8	323.4	133.4	Z	10.0
22473.448	PK	V	47.8	-1.9	45.9	≤ 74.0	28.1	316.1	136.9	Z	-

[1 Mbps / 2480 MHz]

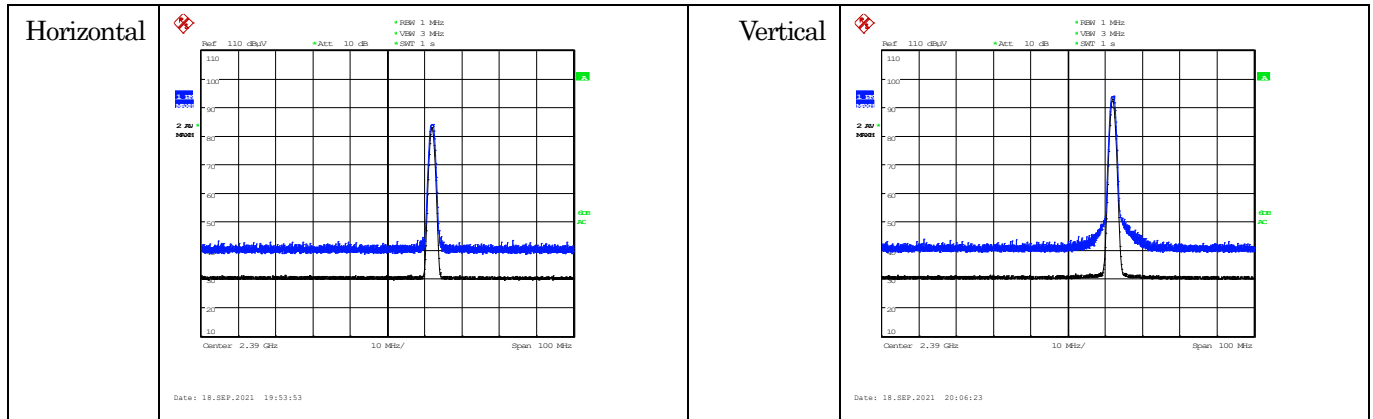
Frequency [MHz]	Detector	Polar.	Reading [dB $\mu$ V]	C.F. [dB/m]	Result [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [degree]	EUT Position	VBW [kHz]
2483.500	AV	H	37.8	5.6	43.4	≤ 54.0	10.6	378.8	44.0	Z	10.0
2483.500	PK	H	48.3	5.6	53.9	≤ 74.0	20.1	378.8	45.8	Z	-
4959.327	PK	H	39.9	13.9	53.8	≤ 74.0	20.2	398.2	56.7	Z	-
4959.565	AV	H	31.7	13.9	45.6	≤ 54.0	8.4	398.2	58.5	Z	10.0
7440.000	AV	H	40.9	-9.6	31.3	≤ 54.0	22.7	309.0	127.9	Z	10.0
7440.000	PK	H	50.7	-9.6	41.1	≤ 74.0	32.9	310.5	128.7	Z	-
12400.000	AV	H	36.2	-3.0	33.2	≤ 74.0	20.8	150.0	58.8	Z	10.0
12400.000	PK	H	45.8	-3.0	42.8	≤ 54.0	31.2	152.0	59.8	Z	-
19840.000	AV	H	37.4	-0.7	36.7	≤ 54.0	17.3	100.0	30.6	Z	10.0
19840.000	PK	H	48.5	-0.7	47.8	≤ 74.0	26.2	100.0	38.7	Z	-
22320.000	AV	H	37.8	-1.9	35.9	≤ 54.0	18.1	232.8	123.5	Z	10.0
22320.000	PK	H	46.7	-1.9	44.8	≤ 74.0	29.2	240.2	127.5	Z	-
2483.500	AV	V	38.6	5.6	44.2	≤ 54.0	9.8	421.2	96.0	Z	10.0
2483.500	PK	V	52.4	5.6	58.0	≤ 74.0	16.0	421.2	94.0	Z	-
4959.625	AV	V	33.7	13.9	47.6	≤ 74.0	6.4	122.7	58.4	Z	10.0
4960.399	PK	V	42.0	13.9	55.9	≤ 54.0	18.1	122.7	60.4	Z	-
7440.000	AV	V	41.4	-9.6	31.8	≤ 54.0	22.2	167.0	232.6	Z	10.0
7440.000	PK	V	51.1	-9.6	41.5	≤ 74.0	32.5	167.8	232.9	Z	-
12400.000	AV	V	36.2	-3.0	33.2	≤ 74.0	20.8	431.0	248.1	Z	10.0
12400.000	PK	V	46.5	-3.0	43.5	≤ 54.0	30.5	431.0	248.7	Z	-
19840.000	AV	V	37.5	-0.7	36.8	≤ 54.0	17.2	253.6	202.7	Z	10.0
19840.000	PK	V	47.2	-0.7	46.5	≤ 74.0	27.5	252.3	203.4	Z	-
22320.000	AV	V	37.7	-1.9	35.8	≤ 54.0	18.2	346.7	152.6	Z	10.0
22320.000	PK	V	46.6	-1.9	44.7	≤ 74.0	29.3	334.3	159.9	Z	-

Plot data for 2.4 GHz Restricted-Band Edge

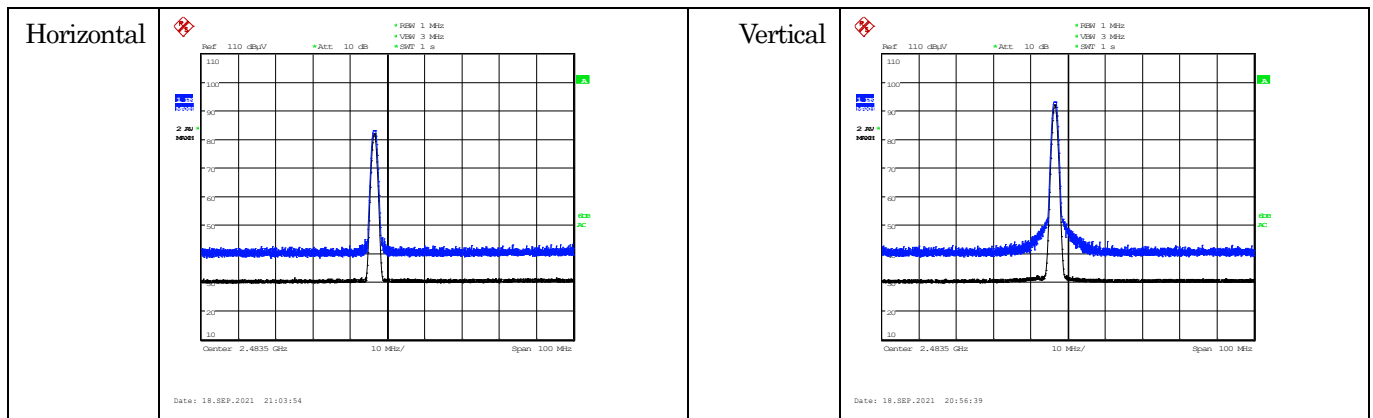
These plot data show peak (trace blue) and average (trace black) spectrum for worst case emissions in the restricted-band edges. (Restricted band edges: below 2390 MHz and above 2483.5 MHz)

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

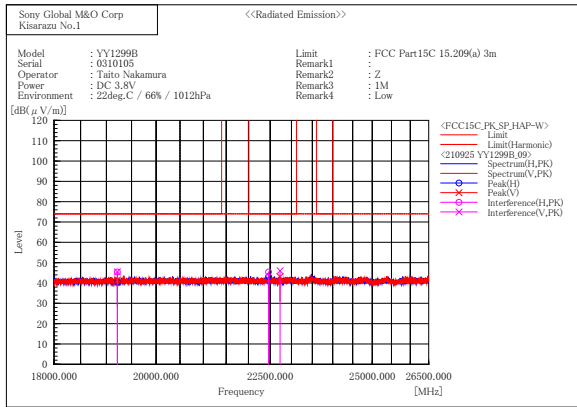
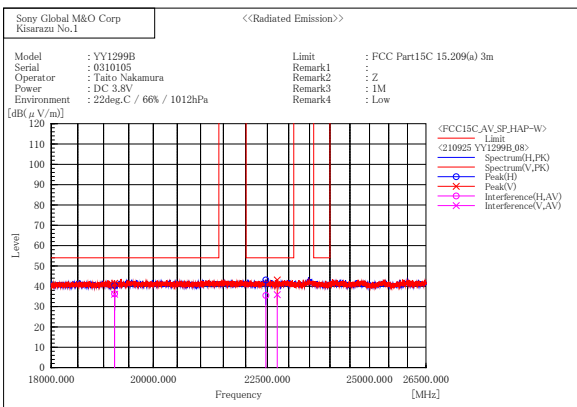
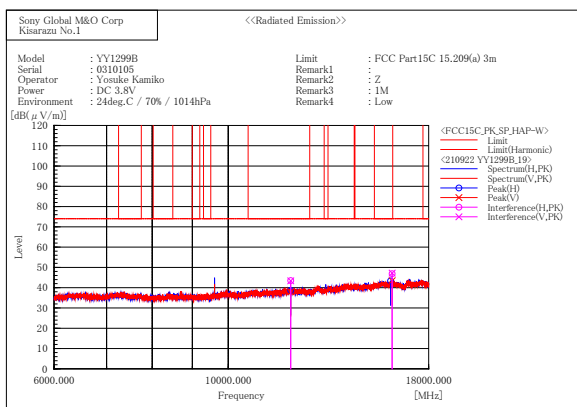
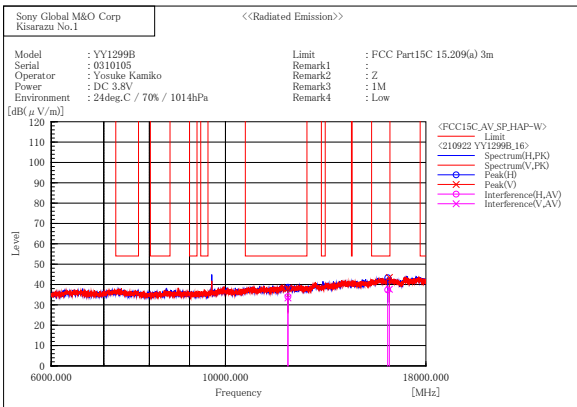
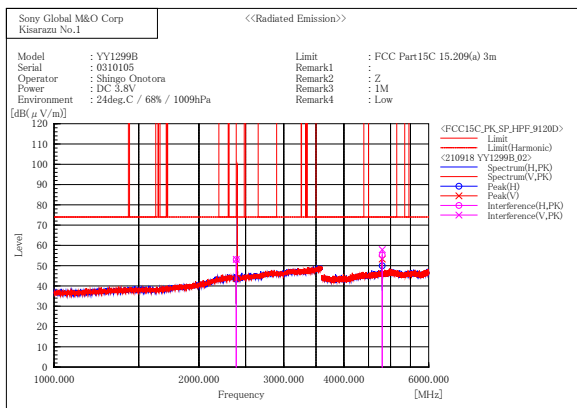
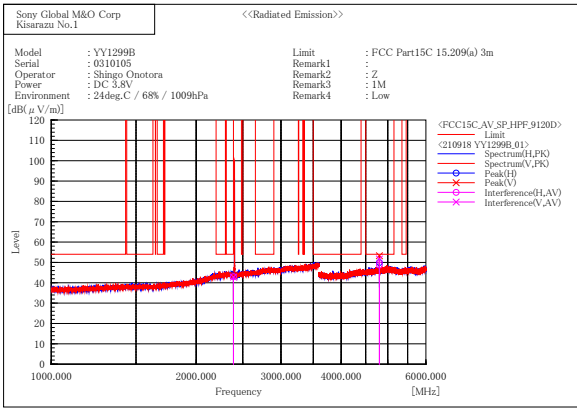
[1 Mbps / 2402 MHz]



[1 Mbps / 2480 MHz]



Plot data for above 1GHz in worst mode

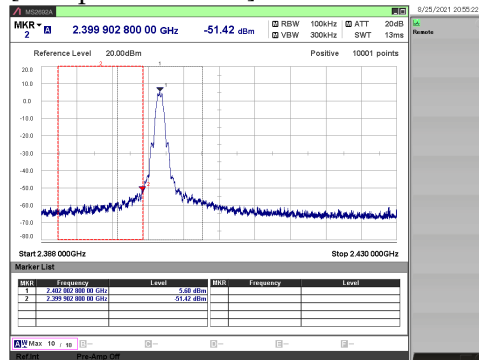


### 3.6. Conducted Spurious Emissions for Band Edge

Date of measurement	Ambient temperature	Relative humidity	Measured by
August 25, 2021	21.4 deg.C	58.8 %	Mikiko Kouga

Mode	Rate [Mbps]	Channel [MHz]	Frequency [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
BLE	1	2402	2402.00	5.60	0.50	6.10	-	-
			2399.90	-51.42	0.50	-50.92	≤ -13.90	37.02

[1 Mbps / 2402 MHz]



## 4. Method of Calculation

### 4.1. AC Power-line Conducted Emissions

Method of calculation : Software  
 Software Name : EP5 / CE  
 Software Version : Ver5.6.30

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

Note (a) Meter Reading : Reading of the EMI test receiver.  
 (b) C.F. : System Loss + Correction Factor of LISN

### 4.2. 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 :  $10 \log \{ (Tx \text{ ON Time} + Tx \text{ OFF Time}) / (Tx \text{ ON Time}) \}$

### 4.3. 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

#### 4.4. 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 m/ 10 m)

#### 4.5. 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. AC Power-line Conducted Emissions

Used	Ctrl#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
x	M5342	EMI Receiver	ESW8	101137	Rohde & Schwarz	12 months	21.04.01
x	CS0043	Fourth Site CE Cable SYSTEM	-	-	-	12 months	21.06.06
x	M0664	6dB Attenuator	6806.01A	-	HUBER+SUHNER AG	12 months	21.06.06
-	M0514	LISN	ENV216	100424	Rohde & Schwarz	12 months	21.04.01
x	M0606	LISN/AMN	ENV216	101306	Rohde & Schwarz	12 months	21.04.01
-	M2289	LISN	KNW-407	8-1182-12	Kyoritsu	12 months	21.04.01
-	M2290	LISN	KNW-242C	8-1183-1	Kyoritsu	12 months	21.04.01
-	M0153	50 ohm Terminator	CT-01	-	TME	12 months	21.04.01
-	M0597	50 ohm Terminator	CT-01	-	TME	12 months	21.06.01
-	M2292	50 ohm Terminator	T1302	-	Stack	12 months	21.04.01
-	M2293	50 ohm Terminator	T1302	-	Stack	12 months	21.04.01
x	M5065	Scientific Ambient Monitor	0560 6220	39515743/802	testo	24 months	20.09.04
-	M3528	Temperature Meter	608-H2	30038344	testo	24 months	21.08.05

### 5.2. 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
x	W0006	Power Meter	N1911A	MY50000295	Agilent Technologies	12 months	20.10.03
x	W0007	Power Sensor	N1922A	MY50180022	Agilent Technologies	12 months	20.10.03
-	W0029	10dB Attenuator	8493C	76549	Agilent Technologies	12 months	20.10.02
-	WC0002	50ohm Coaxial Cable (1m)	SUCOFLEX102	34124/2	HUBER + SUHNER	12 months	20.10.02
-	WC0003	50ohm Coaxial Cable (1m)	SUCOFLEX102	34127/2	HUBER + SUHNER	12 months	20.10.02
-	WC0004	50ohm Coaxial Cable (0.5m)	SUCOFLEX102	34288/2	HUBER + SUHNER	12 months	20.10.02
x	WC0005	50ohm Coaxial Cable (0.5m)	SUCOFLEX102	34287/2	HUBER + SUHNER	12 months	20.10.02
-	WC0006	50ohm Coaxial Cable (0.5m)	SUCOFLEX102	34289/2	HUBER + SUHNER	12 months	20.10.02
-	WC0007	50ohm Coaxial Cable (0.5m)	SUCOFLEX102	34286/2	HUBER + SUHNER	12 months	20.10.02
x	M0719	Thermo Meter	TH-321	140053	AS ONE	12 months	21.04.02

### 5.3. Radiated Spurious Emissions

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	21.05.01
x	M0959	EMI Receiver	ESU40	100041	Rohde & Schwarz	12 months	21.02.05
x	A0073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12 months	20.12.01
x	A0089	Biconical Antenna	BBA9106	VHA91032835	Schwarzbeck	12 months	20.12.07
x	A0088	Log periodic Antenna	UHALP9108A1	0649	Schwarzbeck	12 months	20.12.07
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	21.02.05
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	21.05.06
x	M0126	Step Attenuator	8494H	3837M01144	Agilent	12 months	21.05.06
x	M0752	Pre Amplifier	310N	320621	SONOMA INSTRUMENT	12 months	21.05.06
x	M0128	3dB Attenuator	8491A	53541	Agilent	12 months	21.05.06
x	M5320	3dB Attenuator	8491A 3dB	53652	Agilent Technologies	12 months	20.11.01
x	M0737	GHz Filter Box	FB-G1	001	Sony EMCS	12 months	21.05.06
x	M5079	Temperature Meter	608-H2	41475953	testo	24 months	19.10.28
x	M1048	Scientific Ambient Monitor	0560 6220	39512479/703	testo	12 months	21.08.05

About calibration interval

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