

RADIO TEST REPORT

(for Bluetooth Low Energy)

Project No. : JB-Z0491-A
 Client : Sony Corporation, Japan and Other Sony Group Companies
 Client's Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
 Product Name : Wireless Transceiver Module
 Model No. : BNSY25
 FCC ID : AK8BNSY25
 Test Standard : 47 CFR Part 15 Subpart C
 Sample Receipt Date : October 16, 2018
 Test Date : January 7, 2019 to January 23, 2019
 Report Date : January 25, 2019
 Amend Report Date : February 15, 2019
 Test Result : Complied

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A2LA Cert. #3203.01

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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-Z0491 (Original)	January 25, 2019	-	-
JB-Z0491-A	February 15, 2019	Change model name to module name.	P1,3

1. General Information

1.1. Description of Equipment Under Test (EUT)

General Specification

Test Sample Condition : Prototype Pre-production Mass-production
 Product Name : Wireless Transceiver Module
 Trade Name : SONY
 Model No. : BNSY25
 Serial No. : 001
 Power Rating of the EUT : DC 3.3 V, DC 2.8 V, DC 1.8 V
 (The EUT was supplied with the power from the host device)

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 : Pattern antenna
 Antenna Connector Type : None
 Antenna Gain : -2.91 dBi

1.2. Summary of Test Result

Test Item	Worst Margin	Results	Note
AC Power-line Conducted Emissions	31.3 dB (AV) 0.502 MHz N	Complied	-
6dB Bandwidth	-	N/A	*1
Maximum Peak Conducted Output Power	-	N/A	*1
Power Spectral Density	-	N/A	*1
Radiated Spurious Emissions	9.3 dB (AV) 2483.500 MHz Vertical	Complied	-
Conducted Spurious Emissions for Band Edge	-	N/A	*1

Note

*1: This item is referred to BNSY25 Radio Test Report (issued by UL Japan Inc.).

Other requirements

Part 15.31(e) Supply voltage requirement

: Complied (The EUT is provided with stable DC Voltage from the host device)

Part 15.203 / 212 Antenna requirement

: Complied (Users cannot replace the external antenna, since it is mounted to the inside of the host device.)

1.3. Tested Methodology

Test Standard : 47 CFR Part15 Subpart C
 Test Method : ANSI C63.10 - 2013
 KDB 558074 D01 15.247 Meas Guidance v05

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.

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)

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:
 $9 \text{ kHz to } 490 \text{ kHz [Limit at 3 m]} = [\text{Limit at 300 m}] + 40\log(300[\text{m}] / 3[\text{m}])$
 $490 \text{ kHz to } 30 \text{ MHz [Limit at 3 m]} = [\text{Limit at 30 m}] + 40\log(30[\text{m}] / 3[\text{m}])$
- 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. (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 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.

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 : Oct. 31, 2019

AC Power-line Conducted Emissions

Shielded Room

4th Site EMC Site

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
AC Power-line Conducted Emissions *1	2402 MHz	1 Mbps
Radiated Spurious Emissions (below 1GHz) *1	2402 MHz	1 Mbps
Radiated Spurious Emissions (above 1GHz)	2402 MHz	1 Mbps
	2440 MHz	
	2480 MHz	

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 (Control Software of Personal Computer)

Software Name : MT6625 BT Test
Software Version : 0.2

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

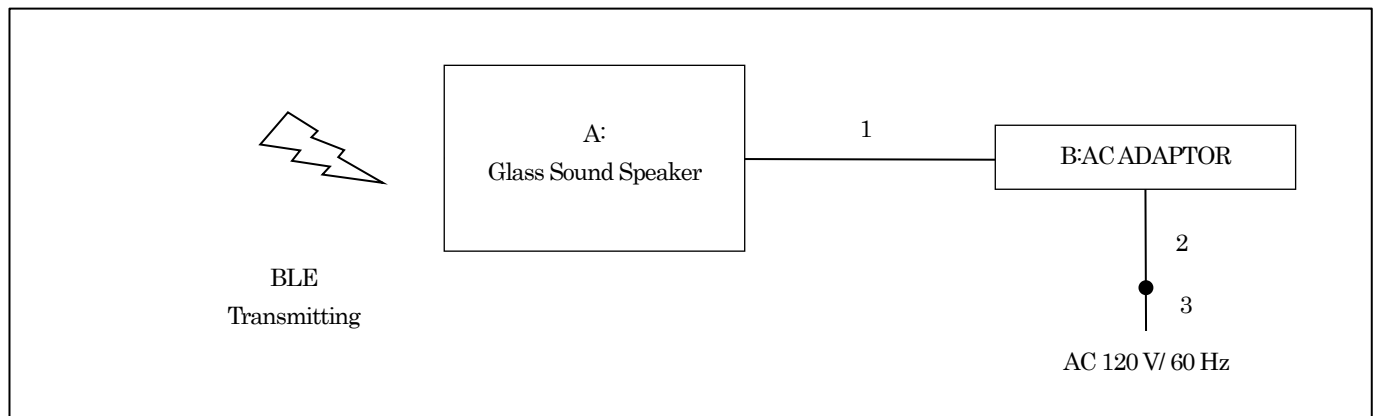
[EUT and Associated Equipment (AE)]

Symbol	EUT/AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Glass Sound Speaker	SONY	LSPX-S2	0001048
B	AE	AC ADAPTOR	SONY	AC-UUE12	17115KD1004705

[Type of Cable]

Symbol	Description	Identification (Manufacturer etc.)	Shielded Yes / No	Ferrite Core	Length (m)	Bundled
1	USB Cable	iTak	Yes	No	1.0	-
2	AC Cable	I-Shen	No	No	0.5	-
3	Extension Cable	SANWA	No	No	0.3	-

[Connecting Diagram]



Radiated Spurious Emissions

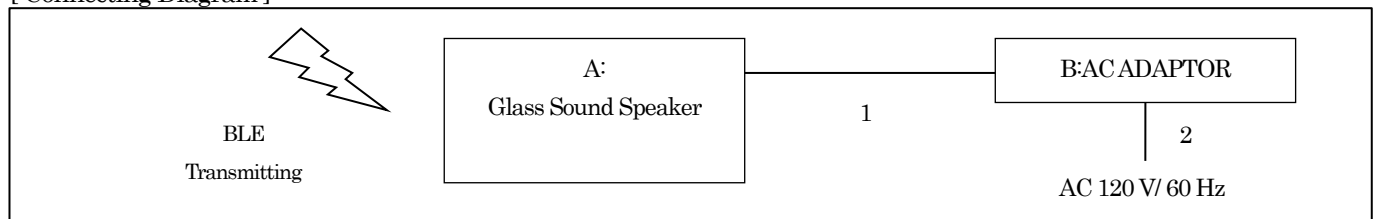
[EUT and Associated Equipment (AE)]

Symbol	EUT/AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Glass Sound Speaker	SONY	LSPX-S2	0001048
B	AE	AC ADAPTOR	SONY	AC-UUE12	17115KD1004705

[Type of Cable]

Symbol	Description	Identification (Manufacturer etc.)	Shielded Yes / No	Ferrite Core	Length (m)	Bundled
1	USB Cable	ELECOM	Yes	No	2.0	-
2	AC Cable	I-Shen	No	No	0.5	-

[Connecting Diagram]



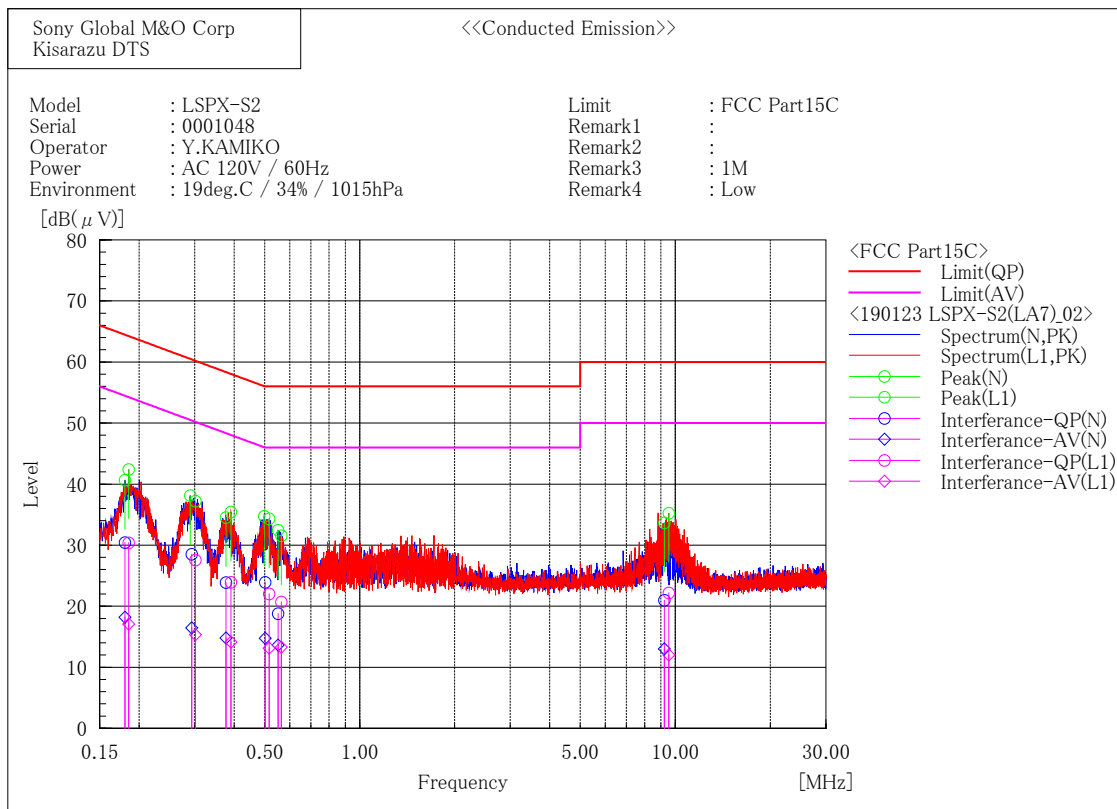
3. Test Data

3.1. AC Power-line Conducted Emissions

1) Date of measurement : January 23, 2019

The test data is mentioned as follows.

[Bluetooth Low Energy / 2402 MHz]



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.181	13.9	1.7	16.5	30.4	18.2	64.5	54.5	34.1	36.3
2	0.294	12.4	0.4	16.1	28.5	16.5	60.4	50.4	31.9	33.9
3	0.377	7.6	-1.5	16.3	23.9	14.8	58.3	48.3	34.4	33.5
4	0.502	7.6	-1.6	16.3	23.9	14.7	56.0	46.0	32.1	31.3
5	0.551	2.5	-2.7	16.3	18.8	13.6	56.0	46.0	37.2	32.4
6	9.237	4.7	-3.3	16.3	21.0	13.0	60.0	50.0	39.0	37.0

--- L1 Phase ---

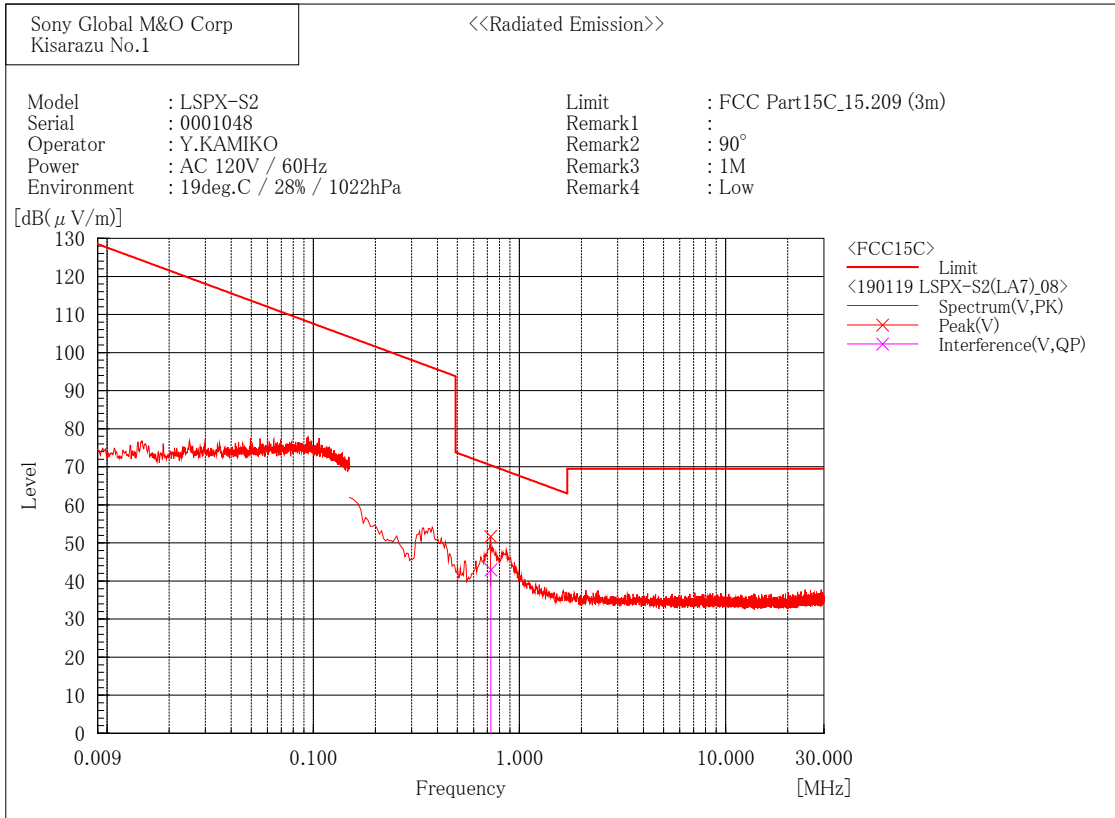
No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.186	13.9	0.6	16.5	30.4	17.1	64.2	54.2	33.8	37.1
2	0.302	11.4	-0.8	16.1	27.5	15.3	60.2	50.2	32.7	34.9
3	0.391	7.6	-2.2	16.3	23.9	14.1	58.0	48.0	34.1	33.9
4	0.517	5.7	-3.2	16.3	22.0	13.1	56.0	46.0	34.0	32.9
5	0.565	4.4	-3.0	16.3	20.7	13.3	56.0	46.0	35.3	32.7
6	9.534	5.9	-4.3	16.3	22.2	12.0	60.0	50.0	37.8	38.0

3.2. Radiated Spurious Emissions

1) Date of measurement		
9 kHz to 30 MHz	: January 19, 2019	(all mode)
30 MHz to 1000 MHz	: January 18, 2019	(all mode)
1 GHz to 6 GHz	: January 7, 2019	(all mode)
6 GHz to 18 GHz	: January 17, 2019	(all mode)
18 GHz to 26.5 GHz	: January 23, 2019	(all mode)

The test data is mentioned as follows.

9 kHz to 30 MHz
 [Bluetooth Low Energy / 2440 MHz]

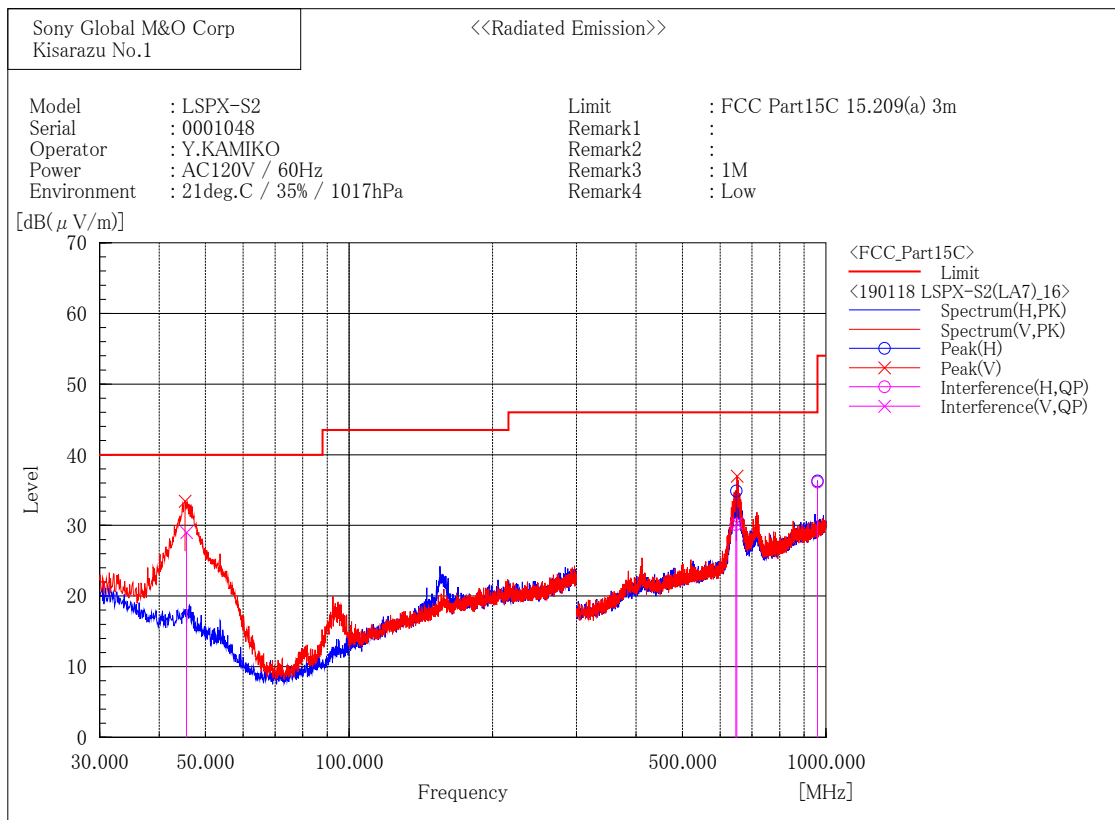


Final Result

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	0.728	23.3	19.7	43.0	70.4	27.4	128.5	338.1

30 MHz to 1000 MHz
 [Bluetooth Low Energy / 2402 MHz]



Final Result

--- Horizontal Polarization (QP) ---

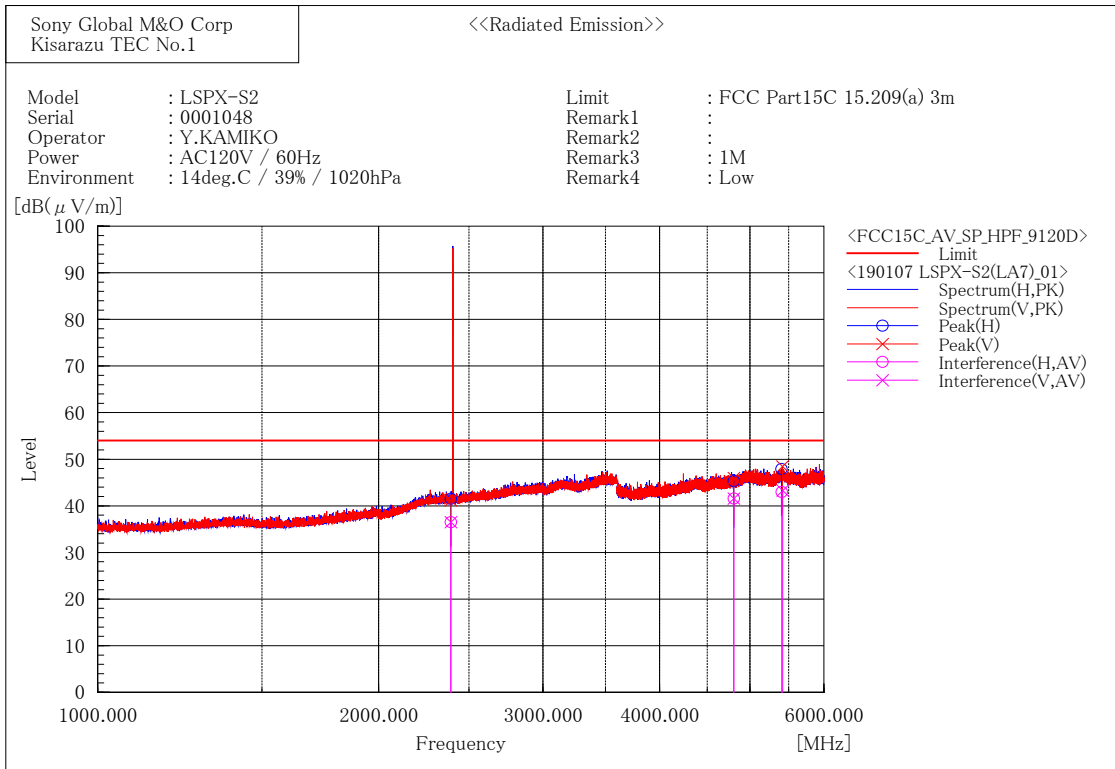
No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	647.000	33.2	-3.1	30.1	46.0	15.9	125.0	128.5
2	960.000	34.5	1.6	36.1	46.0	9.9	149.0	124.3

--- Vertical Polarization (QP) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	45.660	41.5	-12.5	29.0	40.0	11.0	100.0	2.8
2	650.667	33.4	-3.1	30.3	46.0	15.7	150.2	165.0

1 GHz to 6 GHz

[Bluetooth Low Energy / 2402 MHz]



Final Result

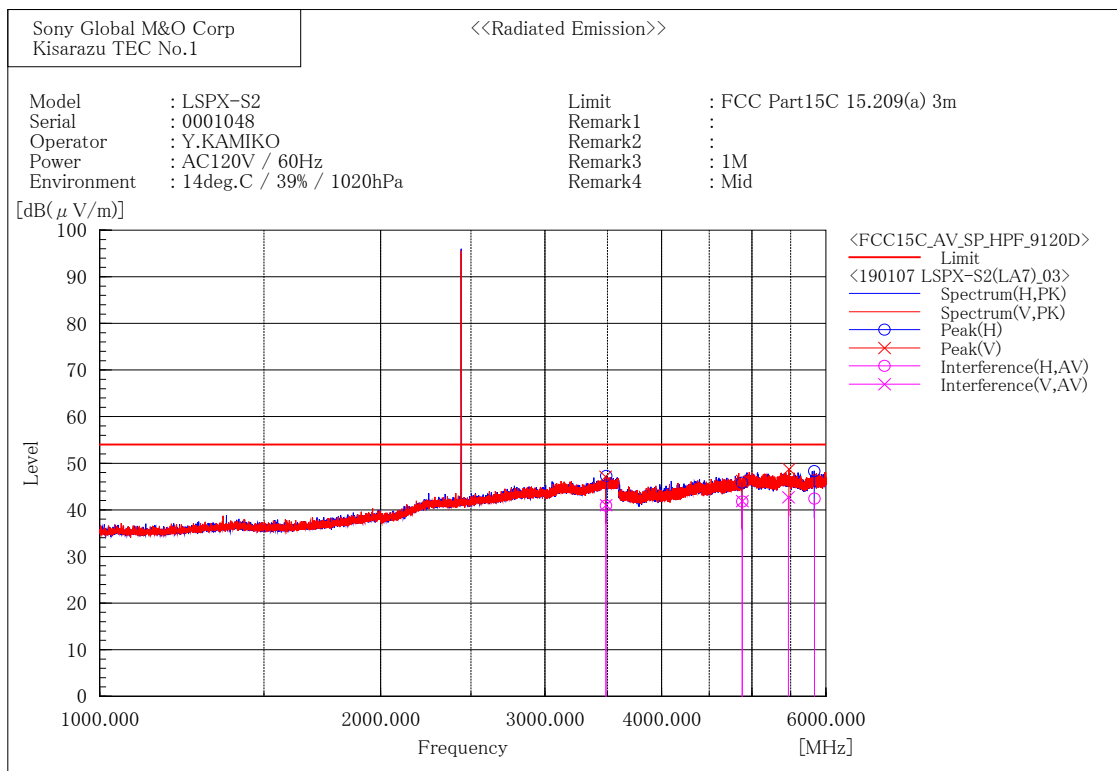
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	33.8	2.7	36.5	54.0	17.5	351.1	136.5
2	4804.000	30.7	10.9	41.6	54.0	12.4	324.4	349.6
3	5406.592	31.4	11.6	43.0	54.0	11.0	198.3	183.8

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	33.8	2.7	36.5	54.0	17.5	103.2	210.4
2	4804.000	30.7	10.9	41.6	54.0	12.4	159.9	129.3
3	5419.281	31.6	11.7	43.3	54.0	10.7	123.4	352.0

[Bluetooth Low Energy / 2440 MHz]



Final Result

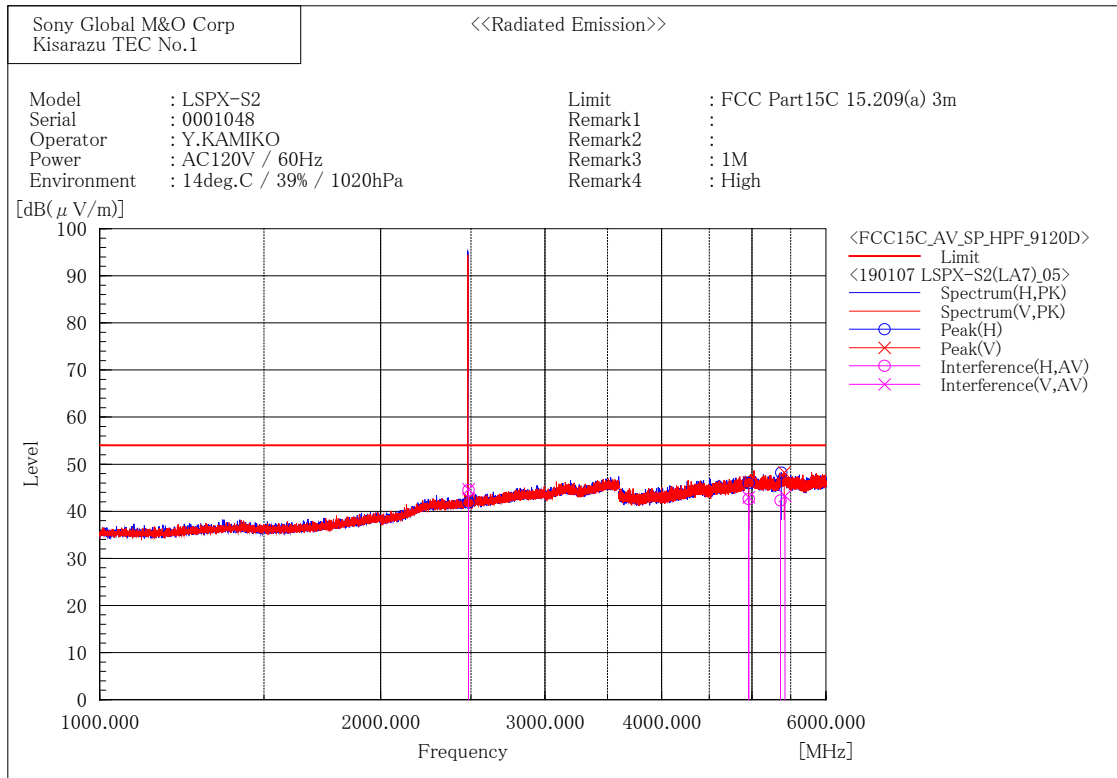
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	3487.803	34.1	6.8	40.9	54.0	13.1	309.4	213.2
2	4880.000	30.8	11.0	41.8	54.0	12.2	187.7	74.7
3	5834.627	30.3	12.1	42.4	54.0	11.6	222.0	198.0

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	3488.172	34.2	6.8	41.0	54.0	13.0	282.1	79.0
2	4880.000	30.9	11.0	41.9	54.0	12.1	384.0	211.1
3	5469.839	31.1	11.6	42.7	54.0	11.3	135.5	44.8

[Bluetooth Low Energy / 2480 MHz]



Final Result

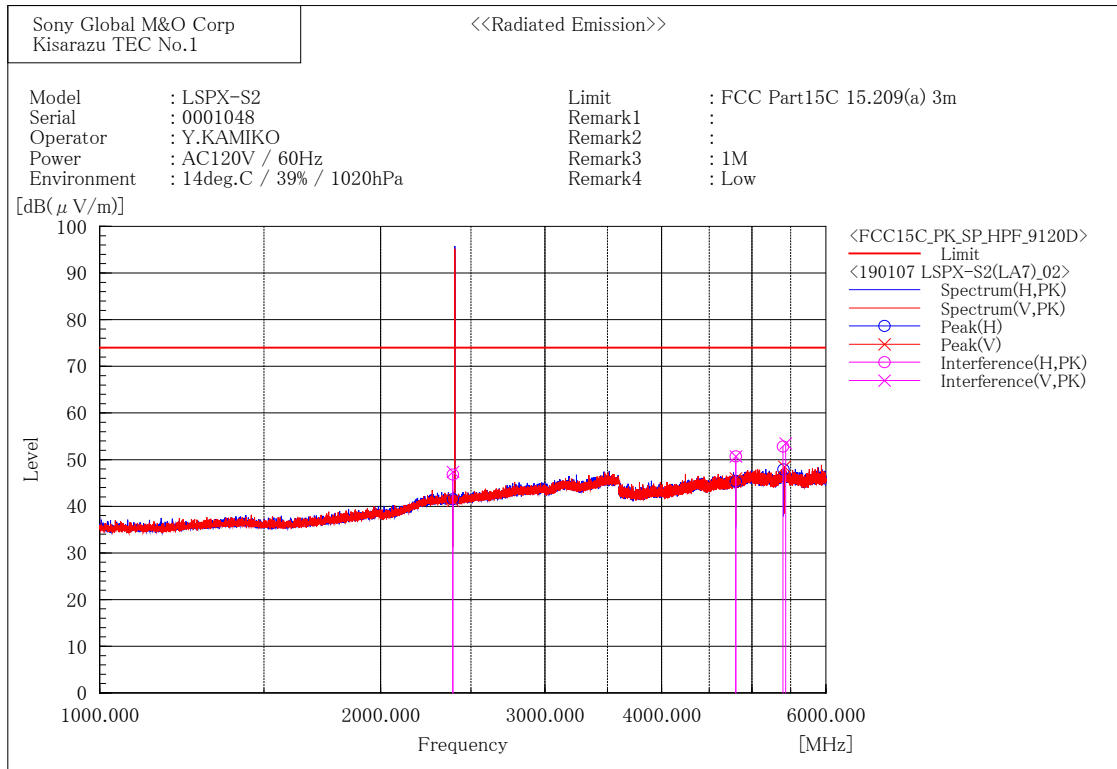
--- Horizontal Polarization (AV) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	41.4	3.1	44.5	54.0	9.5	338.7	260.2
2	4960.000	31.3	11.3	42.6	54.0	11.4	120.7	342.8
3	5364.398	30.9	11.4	42.3	54.0	11.7	231.5	275.3

--- Vertical Polarization (AV) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	41.6	3.1	44.7	54.0	9.3	199.8	181.8
2	4960.000	31.7	11.3	43.0	54.0	11.0	386.1	16.8
3	5422.937	31.6	11.7	43.3	54.0	10.7	343.0	180.2

[Bluetooth Low Energy / 2402 MHz]



Final Result

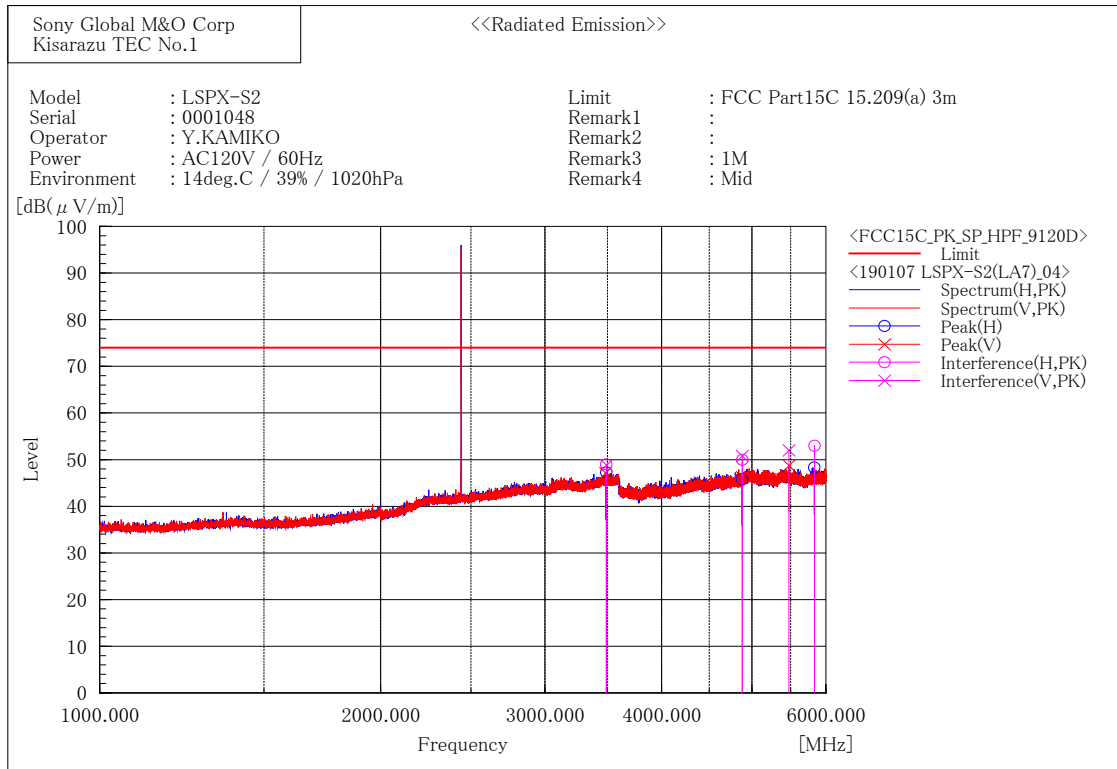
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	44.1	2.7	46.8	74.0	27.2	351.1	136.5
2	4804.000	39.8	10.9	50.7	74.0	23.3	324.4	351.6
3	5396.933	41.2	11.6	52.8	74.0	21.2	195.5	186.4

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	44.7	2.7	47.4	74.0	26.6	103.2	208.5
2	4804.000	39.8	10.9	50.7	74.0	23.3	159.9	131.3
3	5431.705	41.8	11.7	53.5	74.0	20.5	123.4	353.9

[Bluetooth Low Energy / 2440 MHz]



Final Result

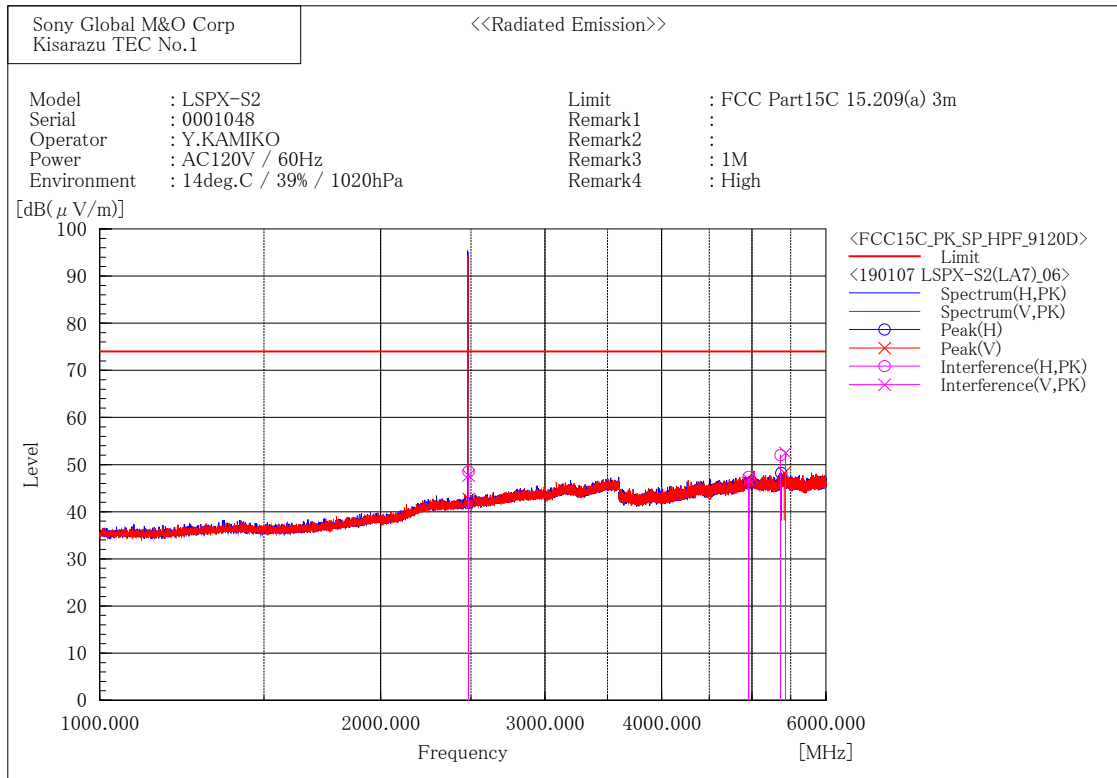
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	3489.372	42.2	6.8	49.0	74.0	25.0	309.0	217.3
2	4880.000	39.0	11.0	50.0	74.0	24.0	187.0	62.4
3	5834.913	40.9	12.1	53.0	74.0	21.0	222.0	198.0

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	3491.720	42.0	6.8	48.8	74.0	25.2	284.0	89.6
2	4880.000	39.8	11.0	50.8	74.0	23.2	388.4	212.9
3	5477.082	40.4	11.6	52.0	74.0	22.0	140.9	55.4

[Bluetooth Low Energy / 2480 MHz]



Final Result

--- Horizontal Polarization (PK) ---

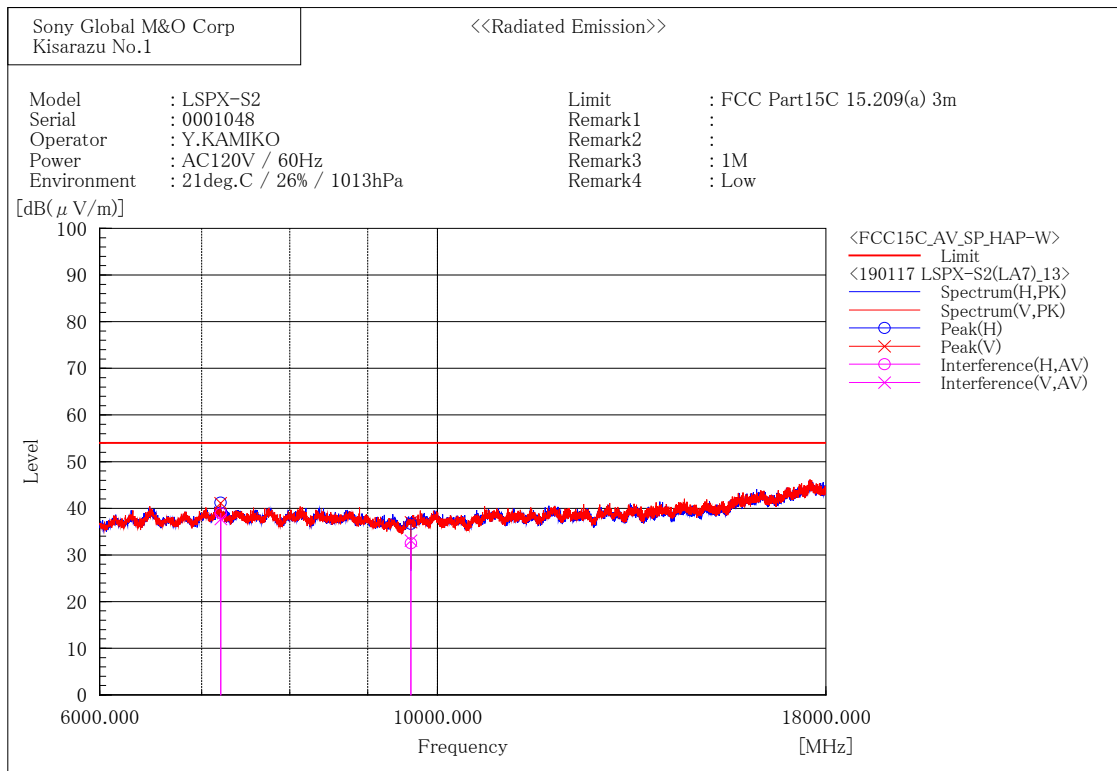
No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	45.4	3.1	48.5	74.0	25.5	338.5	273.4
2	4960.000	36.1	11.3	47.4	74.0	26.6	133.8	8.7
3	5363.009	40.6	11.4	52.0	74.0	22.0	220.0	271.2

--- Vertical Polarization (PK) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	44.6	3.1	47.7	74.0	26.3	199.8	181.8
2	4960.000	35.5	11.3	46.8	74.0	27.2	373.0	1.8
3	5431.231	40.8	11.7	52.5	74.0	21.5	343.8	183.1

6 GHz to 18 GHz

[Bluetooth Low Energy / 2402 MHz]



Final Result

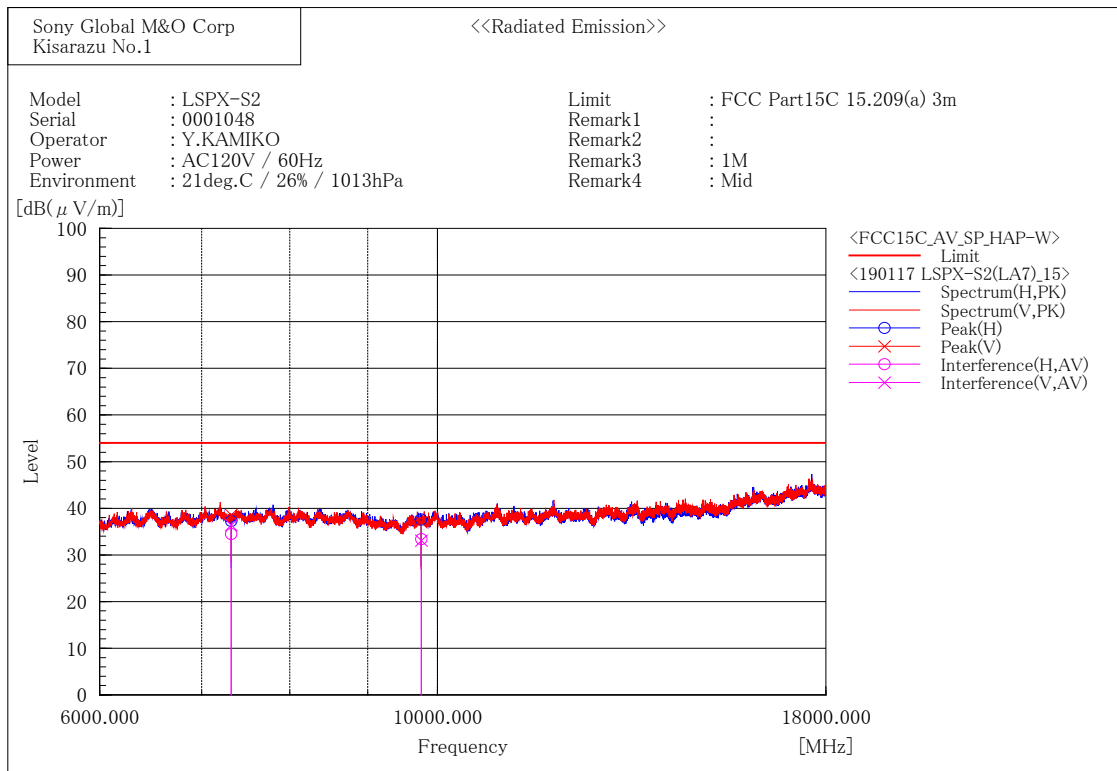
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7206.000	46.5	-7.6	38.9	54.0	15.1	394.9	45.8
2	9608.000	38.5	-6.0	32.5	54.0	21.5	196.4	207.9

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7206.000	45.3	-7.6	37.7	54.0	16.3	428.4	133.9
2	9608.000	39.1	-6.0	33.1	54.0	20.9	228.8	78.1

[Bluetooth Low Energy / 2440 MHz]



Final Result

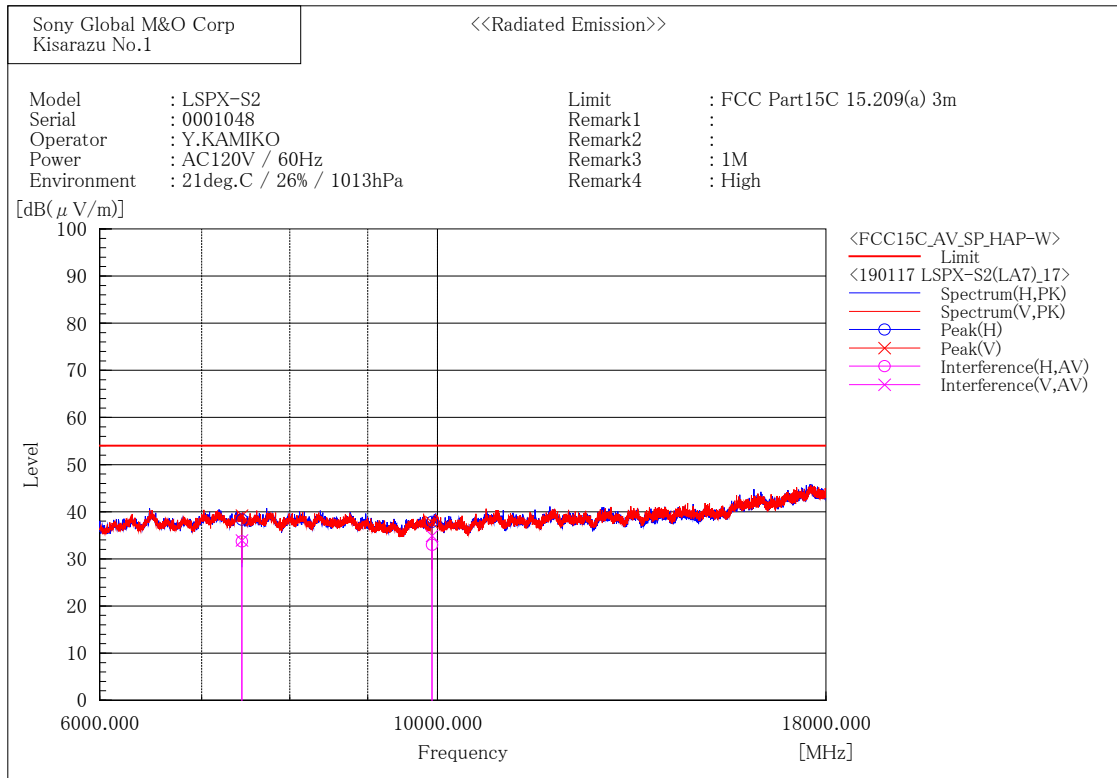
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7320.000	42.3	-7.8	34.5	54.0	19.5	345.4	209.3
2	9760.000	38.9	-5.5	33.4	54.0	20.6	313.2	335.9

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7320.000	44.2	-7.8	36.4	54.0	17.6	364.1	230.8
2	9760.000	38.6	-5.5	33.1	54.0	20.9	288.0	9.0

[Bluetooth Low Energy / 2480 MHz]



Final Result

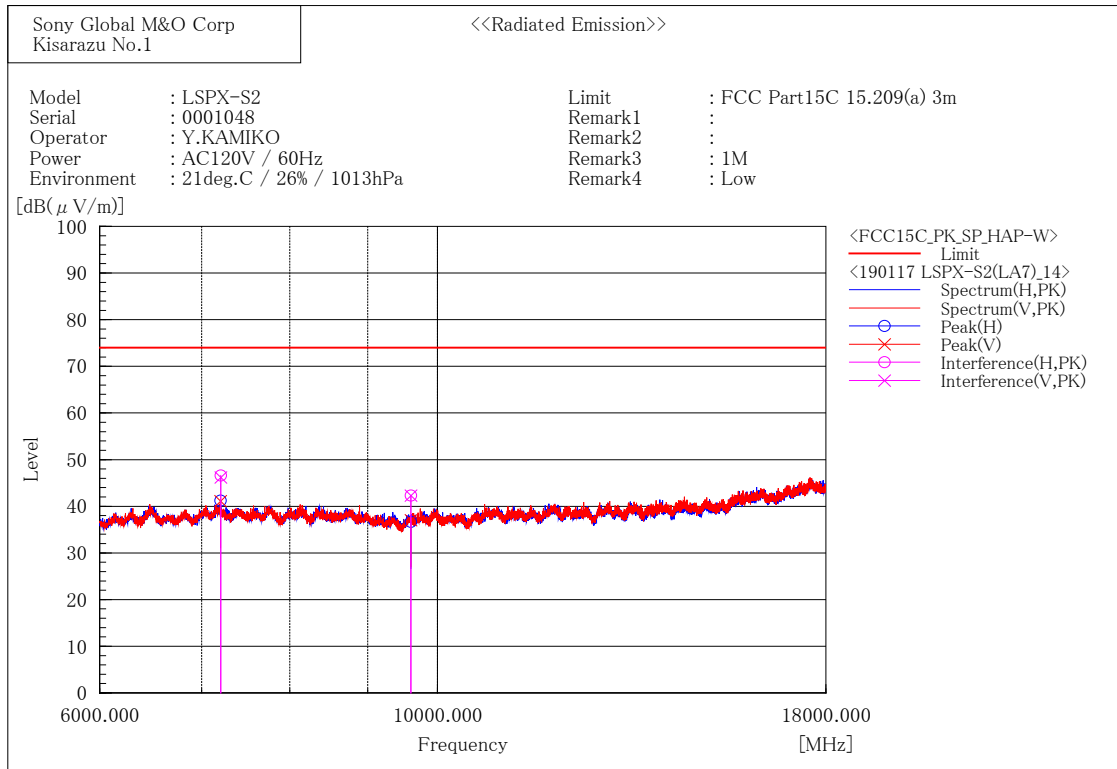
--- Horizontal Polarization (AV) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7440.000	41.6	-7.9	33.7	54.0	20.3	134.0	69.2
2	9920.000	37.8	-4.8	33.0	54.0	21.0	142.0	84.6

--- Vertical Polarization (AV) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7440.000	41.8	-7.9	33.9	54.0	20.1	265.1	350.3
2	9920.000	39.7	-4.8	34.9	54.0	19.1	376.0	60.5

[Bluetooth Low Energy / 2402 MHz]



Final Result

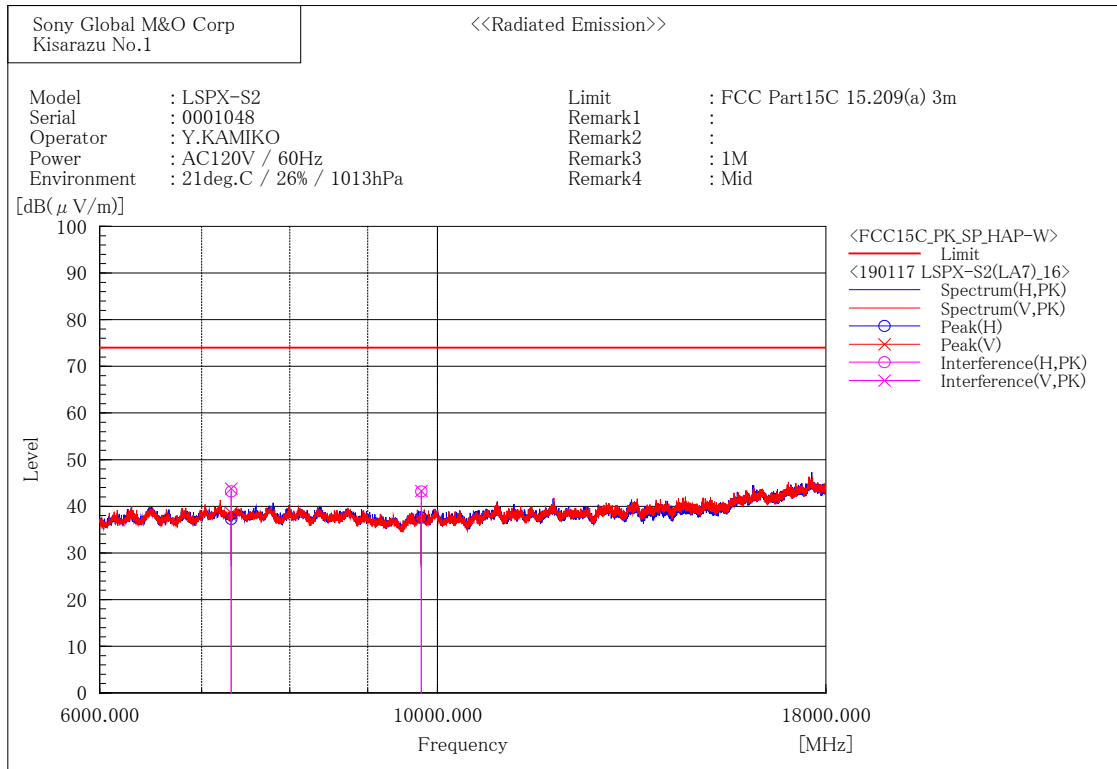
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7206.000	54.2	-7.6	46.6	74.0	27.4	394.9	45.8
2	9608.000	48.3	-6.0	42.3	74.0	31.7	196.4	206.0

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7206.000	53.8	-7.6	46.2	74.0	27.8	428.4	131.8
2	9608.000	48.3	-6.0	42.3	74.0	31.7	228.8	80.0

[Bluetooth Low Energy / 2440 MHz]



Final Result

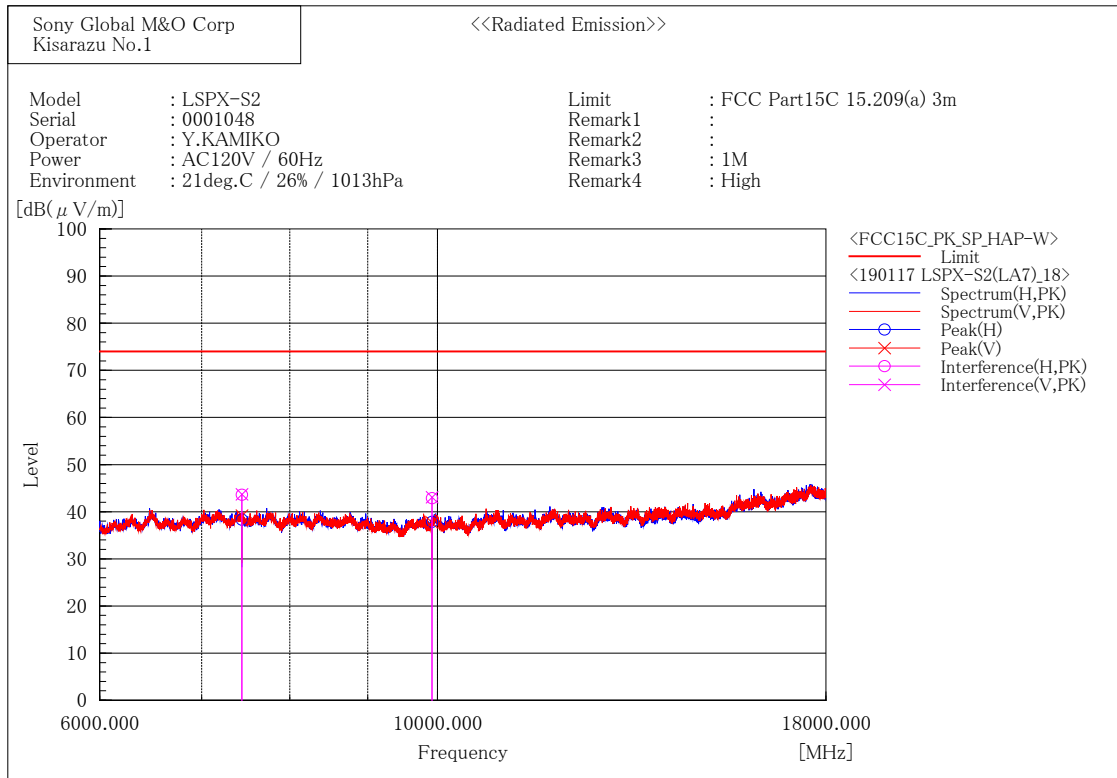
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7320.000	51.0	-7.8	43.2	74.0	30.8	353.0	203.0
2	9760.000	48.7	-5.5	43.2	74.0	30.8	318.6	342.2

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7320.000	51.6	-7.8	43.8	74.0	30.2	364.1	230.8
2	9760.000	48.8	-5.5	43.3	74.0	30.7	288.2	13.9

[Bluetooth Low Energy / 2480 MHz]



Final Result

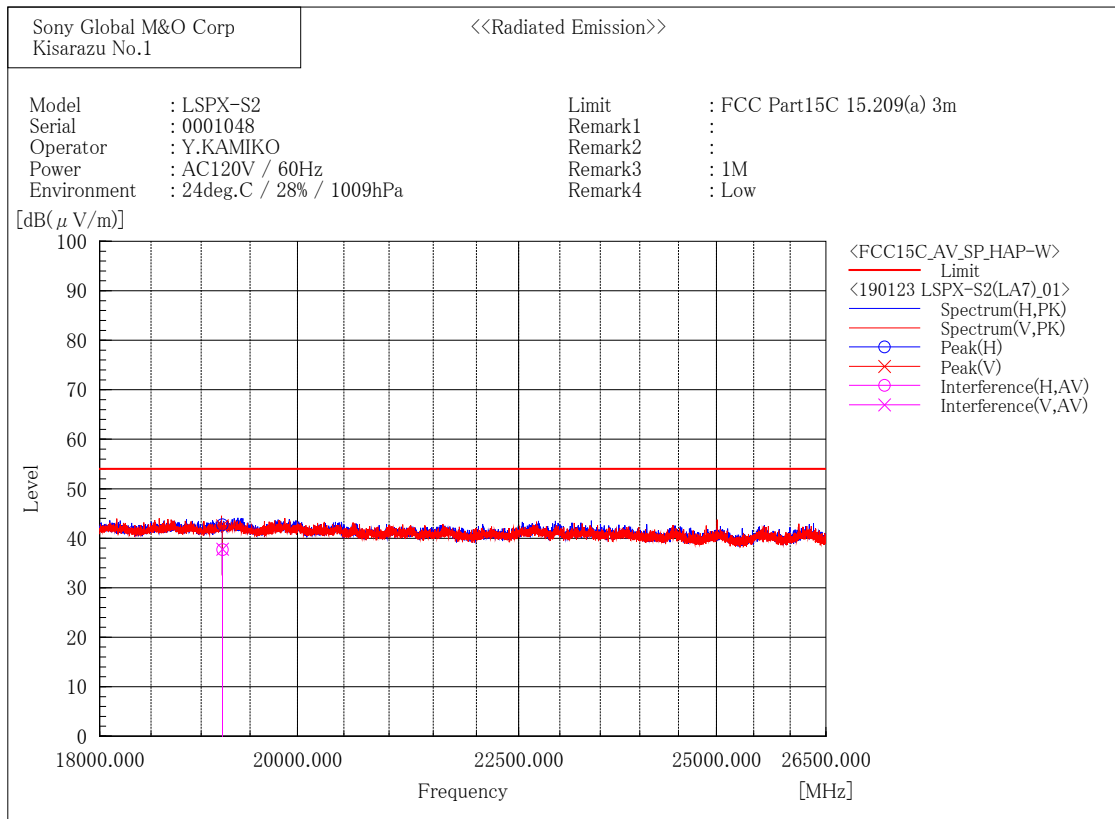
--- Horizontal Polarization (PK) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7440.000	51.5	-7.9	43.6	74.0	30.4	134.7	83.9
2	9920.000	47.7	-4.8	42.9	74.0	31.1	142.0	84.6

--- Vertical Polarization (PK) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7440.000	51.6	-7.9	43.7	74.0	30.3	265.1	352.4
2	9920.000	47.9	-4.8	43.1	74.0	30.9	376.0	59.9

18 GHz to 26.5 GHz
 [Bluetooth Low Energy / 2402 MHz]



Final Result

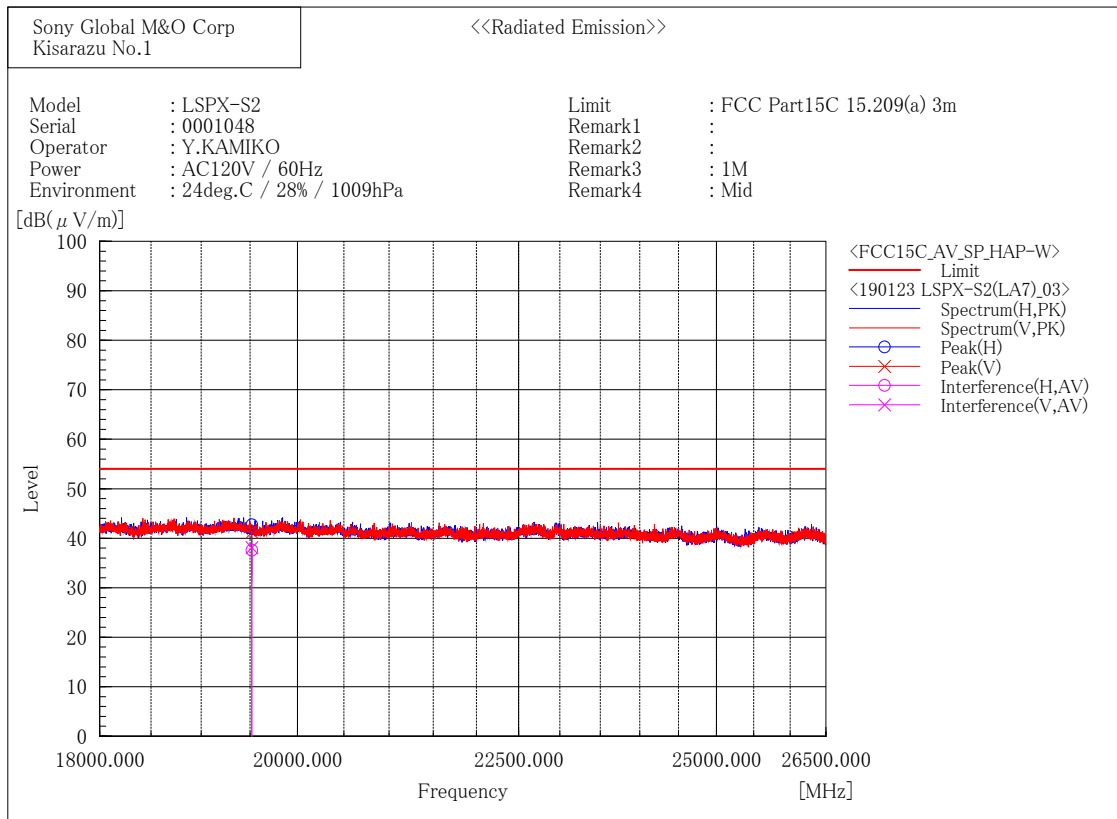
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19216.000	38.5	-0.8	37.7	54.0	16.3	100.0	24.4

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19216.000	38.6	-0.8	37.8	54.0	16.2	175.4	258.6

[Bluetooth Low Energy / 2440 MHz]



Final Result

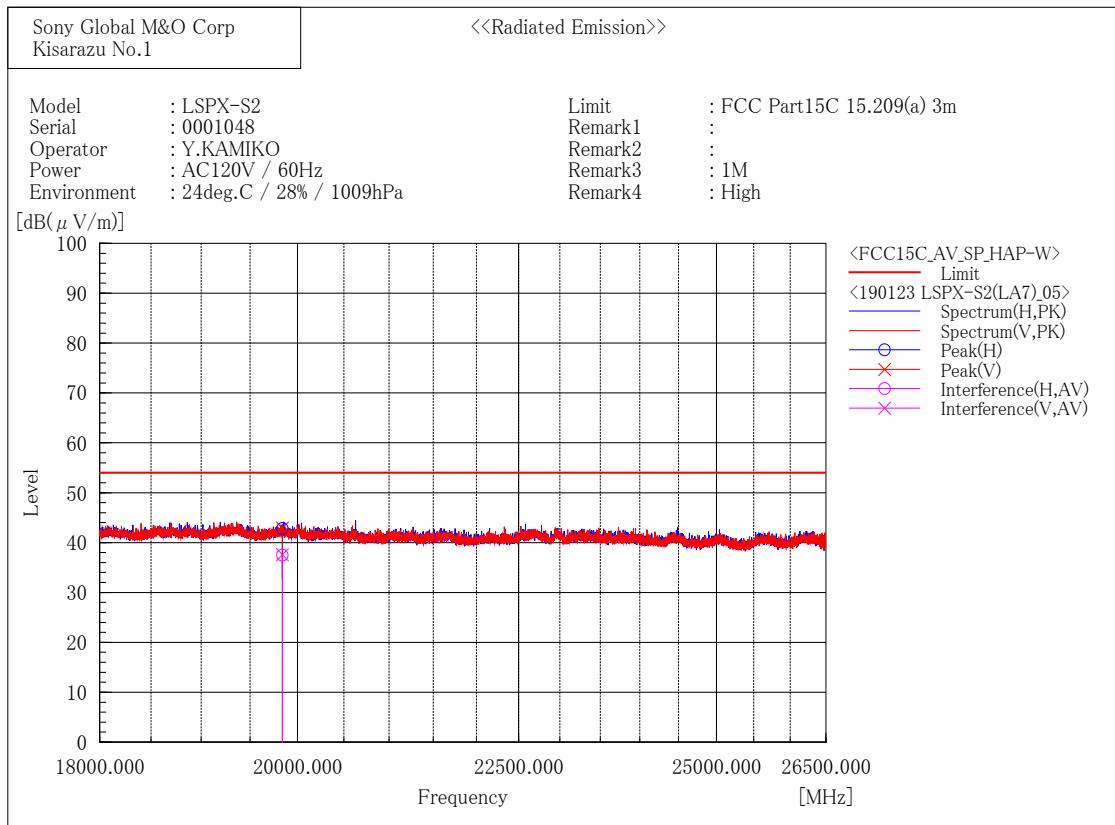
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19520.000	38.4	-0.8	37.6	54.0	16.4	149.1	290.1

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19520.000	38.9	-0.8	38.1	54.0	15.9	431.0	58.7

[Bluetooth Low Energy / 2480 MHz]



Final Result

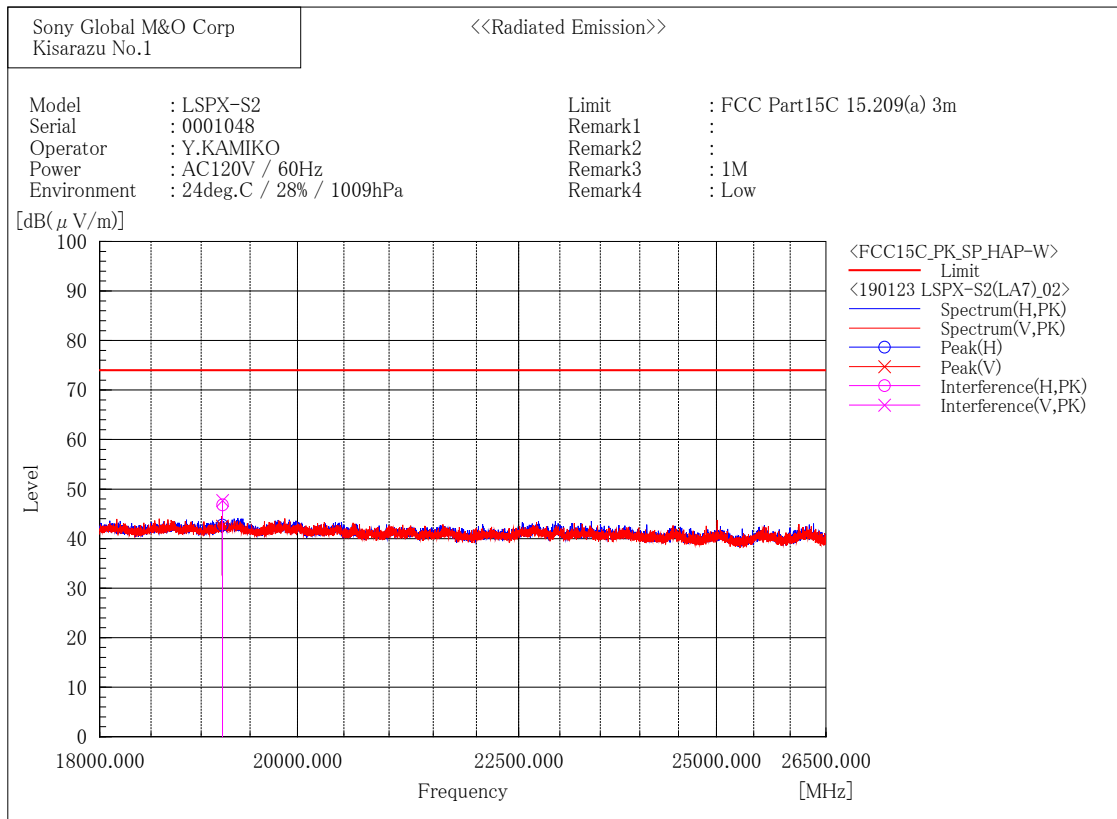
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19840.000	38.4	-0.9	37.5	54.0	16.5	150.0	288.8

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19840.000	38.5	-0.9	37.6	54.0	16.4	103.4	167.9

[Bluetooth Low Energy / 2402 MHz]



Final Result

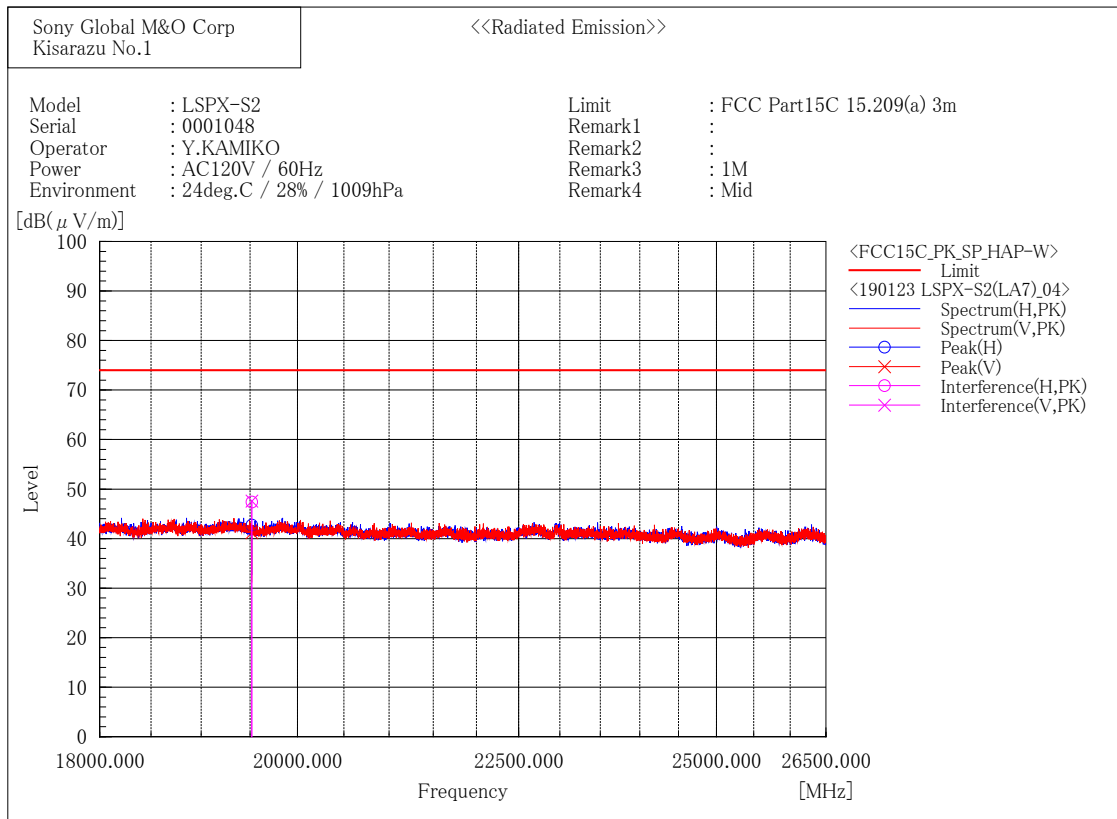
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19216.000	47.6	-0.8	46.8	74.0	27.2	108.1	48.4

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19216.000	48.5	-0.8	47.7	74.0	26.3	175.4	258.6

[Bluetooth Low Energy / 2440 MHz]



Final Result

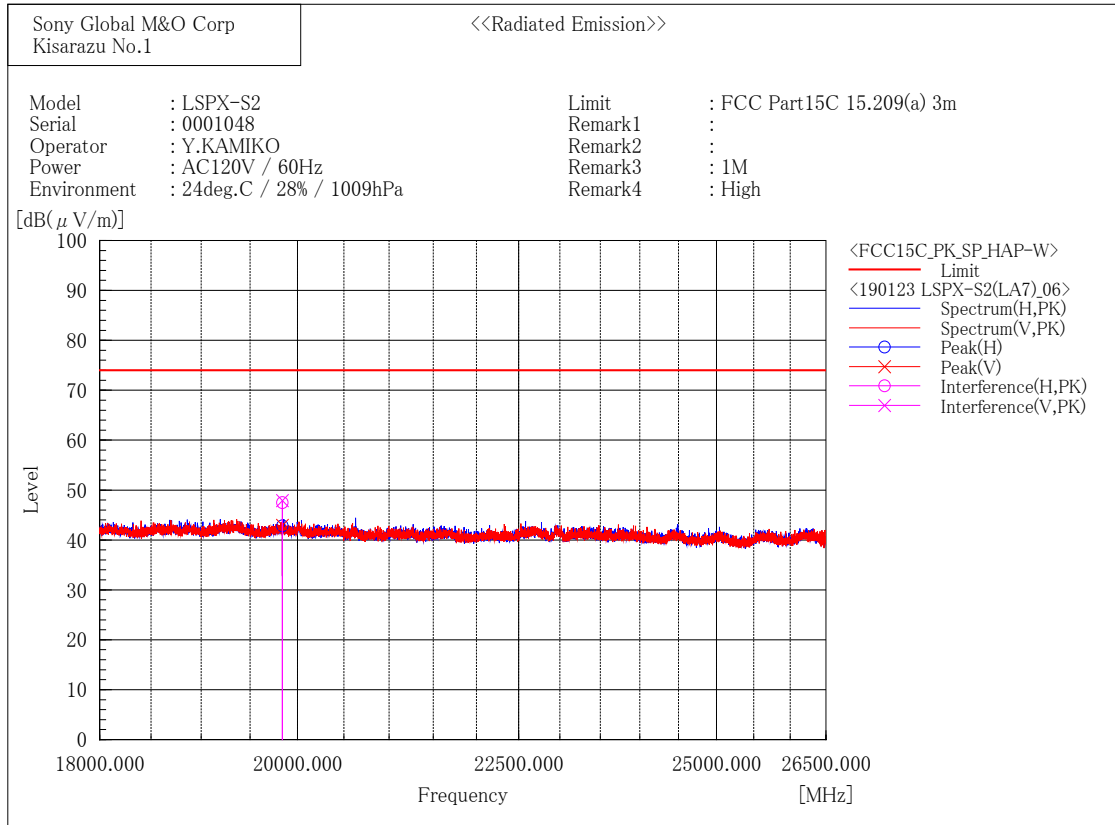
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19520.000	48.2	-0.8	47.4	74.0	26.6	149.1	290.1

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19520.000	48.4	-0.8	47.6	74.0	26.4	431.0	53.8

[Bluetooth Low Energy / 2480 MHz]



Final Result

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19840.000	48.4	-0.9	47.5	74.0	26.5	150.0	291.2

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c. f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19840.000	48.8	-0.9	47.9	74.0	26.1	103.4	167.9

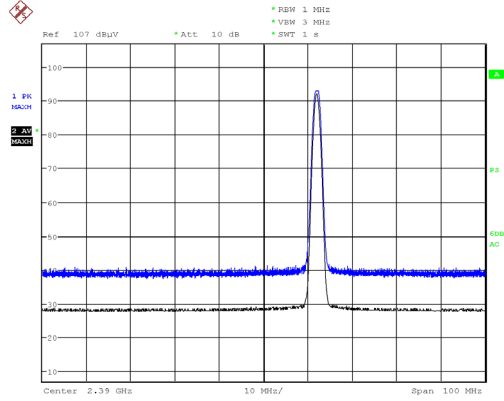
2.4 GHz Restricted-Band Edge (Plot data)

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.

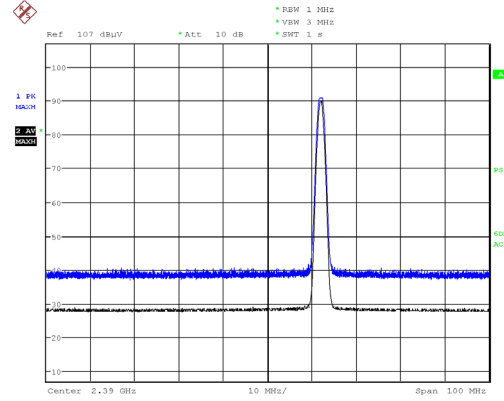
[Bluetooth Low Energy / 2402 MHz]

Horizontal



Date: 7.JAN.2019 13:01:28

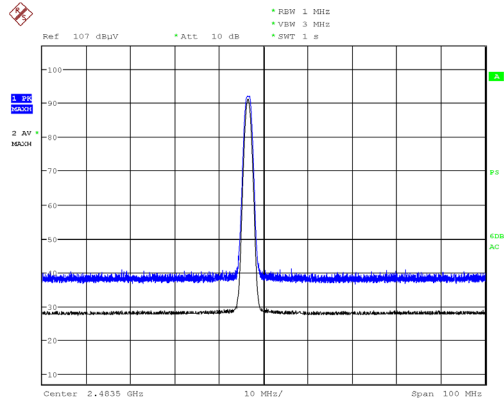
Vertical



Date: 7.JAN.2019 13:21:42

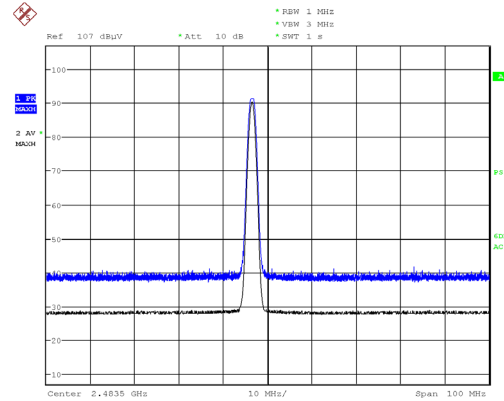
[Bluetooth Low Energy / 2480 MHz]

Horizontal



Date: 7.JAN.2019 16:03:37

Vertical



Date: 7.JAN.2019 15:49:27

4. Method of Calculation

4.1. AC Power-line Conducted Emissions

Method of calculation : Software
Software Name : EP5/ CE
Software Version : Ver5.0.0

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. 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)

5. List of Test Equipment

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

5.1. AC Power-line Conducted Emissions

	Ctrl#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
x	M0575	EMI Receiver	ESCI	100161	Rohde & Schwarz	12 months	18.04.18
x	CS0043	Fourth Site CE Cable SYSTEM1	-	-	-	12 months	18.06.01
x	M0664	6dB Attenuator	6806.01A	-	HUBER+SUHNERAG	12 months	18.06.01
x	M0619	HIGH FREQUENCY FUSE	MP612A	-	Anritsu	12 months	18.06.01
x	M0514	LISN	ENV216	100424	Rohde & Schwarz	12 months	18.04.17
-	M0505	LISN	ENV216	100425	Rohde & Schwarz	12 months	18.04.17
-	M2289	LISN	KNW-407	8-1182-12	Kyoritsu	12 months	18.04.23
-	M2290	LISN	KNW-242C	8-1183-1	Kyoritsu	12 months	18.04.23
-	M0153	50 ohm Terminator	CT-01	-	TME	12 months	18.04.17
-	M0597	50 ohm Terminator	CT-01	-	TME	12 months	18.08.02
-	M2292	50 ohm Terminator	T1302	-	Stack	12 months	18.04.23
-	M2293	50 ohm Terminator	T1302	-	Stack	12 months	18.04.23
x	M5061	Scientific Ambient Monitor	0560 6220	39515471/801	testo	12 months	18.07.17
x	M5152	Temperature Meter	608-H2	41475965	testo	12 months	18.11.08

5.2. Radiated Spurious Emissions

	Ctrl#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
x	M0686	EMI Receiver	N9038A	MY52260113	Agilent Technologies	12 months	18.11.13
x	M0486	EMI Receiver	ESU40	100050	Rohde & Schwarz	12 months	18.10.01
-	M0562	EMI Receiver	ESU26	100068	Rohde & Schwarz	12 months	18.07.25
-	M0959	EMI Receiver	ESU40	100041	Rohde & Schwarz	12 months	18.01.30
x	A0073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12 months	18.12.10
x	A0089	Biconical Antenna	BBA9106	VHA91032835	Schwarzbeck	12 months	18.12.03
x	A0088	Log periodic Antenna	UHALP9108A1	0649	Schwarzbeck	12 months	18.12.03
x	A0064	Horn Antenna	BBHA9120D	746	Schwarzbeck	12 months	18.11.04
x	A0078	Horn Antenna	HAP06-18W	00000070	Toyo Corporation	12 months	18.11.04
x	A0058	Horn Antenna	HAP18-26W	00000016	Toyo Corporation	12 months	18.12.01
x	CS0017	N-RE Cable System 1	-	-	-	12 months	18.11.04
x	CS0018	N-RE Cable System 2	-	-	-	12 months	18.11.04
x	CS0045	N-3m EMF Cable	-	-	-	12 months	18.11.04
x	CS0074/0075	N-RE Cable SYSTEM 4	-	-	-	12 months	18.11.04
x	M0126	Step Attenuator	8494H	3837M01144	Agilent Technologies	12 months	18.11.04
x	M0752	Pre Amplifier	310N	320621	SONOMA INSTRUMENT	12 months	18.11.04
x	M0128	3dB Attenuator	8491A	53541	Agilent Technologies	12 months	18.11.04
x	M0609	3dB Attenuator	8491B	MY39265960	Agilent Technologies	12 months	18.11.04
x	M0737	GHz Filter Box	FB-G1	001	Sony EMCS	12 months	18.11.04
x	M5079	Temperature Meter	608-H2	41475953	testo	12 months	18.10.18
x	M5062	Scientific Ambient Monitor	0560 6220	39515563/802	testo	12 months	18.07.17

About calibration interval

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