RADIO TEST REPORT

(for Bluetooth Low Energy)

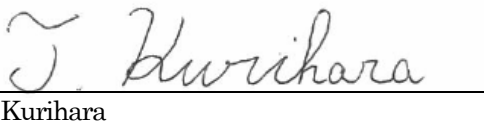
Project No.	:	JB-Z0407-A
Client	:	Sony Corporation
Address	:	1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
Type of Equipment	:	Wireless Noise Canceling Stereo Headset
Model No.	:	WH-1000XM3
FCC ID	:	AK8WH1000XM3
Regulation Applied	:	47 CFR Part 15 Subpart C
Final Judgment	:	**Passed**
Sample Receipt	:	April 10, 2018
Testing	:	April 26, 2018 - May 23, 2018
Original Reported	:	May 7, 2018
Amend Reported	:	May 24, 2018

Amend:
Original report JB-Z0407 is replaced to this report for the following reasons;
- Re-measurement for Power Spectral Density

Reported by :

Takanori Oho
Technical Manager
EMC/RF Test Laboratory, Main Lab.
Design Technology Division
Sony Global Manufacturing & Operations Corporation

Approved Signatory :



Teruki Kurihara
Technical Manager
EMC/RF Test Laboratory, Main Lab.
Design Technology Division
Sony Global Manufacturing & Operations Corporation

Notice
* *These test results relate only to the items (combination equipment, test configuration, operation condition etc.) tested.*
* *This report shall not be reproduced except in full, without written approval of the laboratory.*
* *This report must not be used by the client to claim product endorsement by A2LA or any agency of the U.S. Government.*
* *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.

TESTING CERT #3203.01

TABLE OF CONTENTS

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.

1. General Information

1.1. Description of Equipment Under Test (EUT)

General specification

Test Sample Condition	: ☐ Prototype ☒ Pre-production ☐ Mass-production
Type of Equipment	: Wireless Noise Canceling Stereo Headset
Trade Name	: SONY
Model No.	: WH-1000XM3
Serial No.	: 310, 316
Power Rating	: DC 3.7V (The EUT was 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	: 2 MHz
Number of channels	: 40
Antenna Type	: Chip Antenna
Antenna connector Type	: None
Antenna Gain	: 1.6 dBi
Operating Temperature	: +0 to +40 deg.C

1.2. Summary of Test Result

47 CFR Part 15 Subpart C §15.247 [DTS]

Test Item	Worst Margin	Test Frequency band	Results
AC Power-line Conducted Emissions	-	150 kHz - 30 MHz	N/A *2
6dB Bandwidth	Refer to the test data	Carrier	Complied
Maximum Peak Conducted Output Power	29.69 dB	Carrier	Complied
Power Spectral Density	24.46 dB	Carrier	Complied
Radiated Spurious Emissions	8.6 dB (AV) 4804.118 MHz Vertical	9 kHz - 25 GHz (excluding carrier and band edge)	Complied
Conducted Spurious Emissions for Band Edge *1	27.19 dB 2399.99 MHz	Carrier band edge	Complied

*1: Conducted Spurious Emission 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 Emission measurement.

*2: This item was not applied to the EUT since its transmission is stopped when the battery is being charged by the AC Adaptor 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 DTS Meas. Guidance v04

Test Condition
Radiated Spurious Emissions
Test Distance : ☒ 3 m ☐ 10m (9 kHz - 30 MHz)
☒ 3 m ☐ 10m (30 - 1000 MHz)
☒ 3 m (1 - 25 GHz)
Dimensions of the EUT table : 0.8m (below 1 GHz) or 1.5m (above 1 GHz) height, 2m width and 1m 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

Antenna-port Conducted Measurement

1. Antenna-port of the EUT was connected to the power sensor (Maximum peak conducted output power) or spectrum analyzer. (other test items).

2. For each EUT operation mode, the Antenna-port Conducted Measurements were measured with power meter or spectrum analyzer.

Test Item * Antenna-port Conducted Measurements	Detector	RBW
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 compensated the distance factor with follows;
   9 kHz - 490 kHz [Limit at 3m] = [Limit at 300m] + 40log (300[m] / 3[m])
   490 kHz - 30 MHz [Limit at 3m] = [Limit at 30m] + 40log (30[m] / 3[m])

5. Find the worst arrangement of the EUT as follows;
   - Rotate the turntable and/or scanning the antenna.
   - On every condition, explore the highest emissions with the spectrum analyzer.
     (9 kHz - 25 GHz, peak detector)

6. On the worst arrangement of the EUT found in above, choose the three highest harmonics or spurious emissions on the spectrum data.(*excluding carrier band edges)
   The final measurements are performed with all test operating modes for these emissions as follows;

   The test antenna and the turntable were performed with follows;

	9 kHz - 30 MHz	30 MHz - 1000 MHz	1 GHz - 25 GHz
Antenna	Loop Antenna	Bi-conical Antenna, Log-periodic Antenna	Horn Antenna
Antenna scanning range	1m, Vertical, 360 degrees	1 - 4m, Horizontal and Vertical	1 - 4m *, 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 - 90 kHz 110 kHz - 490 kHz	90 kHz- 110 kHz 490 kHz - 30 MHz	30 MHz - 1000 MHz	1 GHz - 25 GHz
Detector	Peak / Average	Quasi-peak	Quasi-peak	Peak / Average
RBW	200 Hz (6dB) or 9 kHz (6dB) *1	200 Hz (6dB) or 9 kHz (6dB) *1	120 kHz (6dB)	1 MHz (6dB)
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)

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 - 150 kHz	150 kHz - 30 MHz	30 MHz - 25 GHz
Detector	Peak	Peak	Peak
RBW	3 dB RBW: 300 Hz *	3 dB RBW: 10 kHz *	3 dB RBW: 100 kHz
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;

	2483.5 - 2485.5 MHz
Detector	Peak
RBW	3 dB RBW: 100 kHz
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 Facility

Address of Test Facility

Test Facility Name : Sony Global Manufacturing & Operations Corporation
EMC/ RF Test Laboratory, Main Lab.

Address : Kisarazu Site 8-4 Shiomi Kisarazu-shi Chiba, 292-0834 Japan

Phone : +81 438 37 2750

Radiated Spurious Emission

Semi-Anechoic chamber

☒ 4th Site ☐ EMC Site

Antenna-port Conducted Measurements *

Shielded Room

☒ 4th Site SR1

*Note: This item contains the following

-6dB Bandwidth

-Maximum Peak Conducted Output Power

-Power Spectral Density

-Conducted Spurious Emissions for Band Edge

A2LA Accreditation for Test Facility

The above test facility has been fully reported to A2LA and accepted as follows:

A2LA Certificate No. : 3203.01

Cert. Validated Date : 31 Oct 2019

1.6. Uncertainty

Test Item	Frequency	4th Site SR1
Conducted Output Power	1 - 6 GHz	± 0.84 dB
Power Spectral Density, Conducted Spurious Emissions	1 - 6 GHz	± 0.89 dB

Test Item	Frequency	4th Site	
AC Power-line Conducted Emissions	150 kHz - 30 MHz	± 3.34 dB	
Radiated Emissions	9 kHz - 30 MHz	3m	± 3.12 dB
	30 - 300 MHz	3m	± 5.26 dB
	300 - 1000 MHz	3m	± 4.37 dB
	1 - 7 GHz	3m	± 4.90 dB
	7 - 18 GHz	3m	± 5.50 dB
	18 - 25 GHz	3m	± 5.63 dB

2. System Test Configuration

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. Test Operating Conditions

The tests have been carried out the following conditions.

Test Items	Operating Mode	Data Rate	Test Channels
6dB Bandwidth, Maximum Peak Conducted Output Power, Power Spectral Density, Radiated Spurious Emissions	Bluetooth Low Energy	1 Mbps	2402 MHz, 2440 MHz, 2480 MHz
Conducted Spurious Emissions for Band Edge	Bluetooth Low Energy	1 Mbps	2402 MHz

The Software for Operating Mode Nam : BlueSuite
Version : 2.5.8

Special accessories needed for connecting the EUT to achieve compliance:

Item	Manufacturer	Model No.	Serial No.	Remark
Personal Computer	SONY	PCG-71611N	1006554	-
AC Adaptor	SONY	VGP-AC19V41	148753032 0255555	-

2.3. 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 :

2.4. Configuration of Tested System

Antenna-port Conducted Measurements

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A	Wireless Noise Canceling Stereo Headset	SONY	WH-1000XM3	316

Support equipment for operation

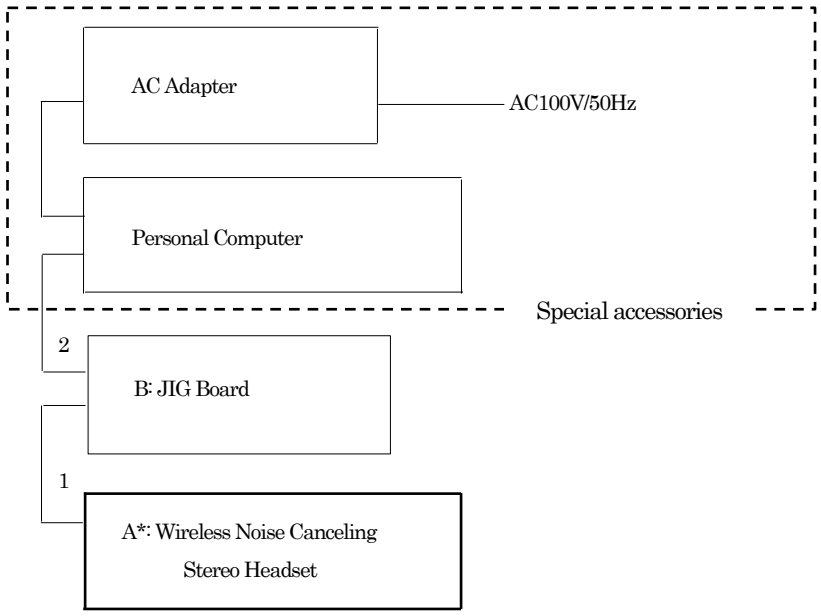
Symbol	Item	Manufacturer	Model No.	Serial No.
B	JIG Board	-	B to B jig	-

Type of cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Length (m)	Bundled
1	USB Cable	-	YES	NO	0.5	-
2	USB Cable	-	YES	NO	1.0	-

System configuration

*: EUT



Radiated Spurious Emissions Measurement

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A	Wireless Noise Canceling Stereo Headset	SONY	WH-1000XM3	310

Support equipment for operation

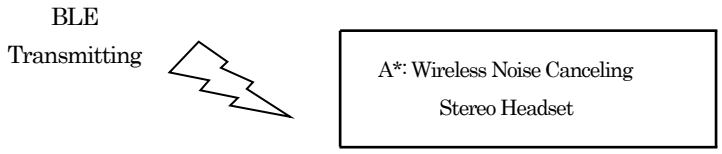
Symbol	Item	Manufacturer	Model No.	Serial No.
-	-	-	-	-

Type of cable

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

System configuration

*: EUT



3. Test Data

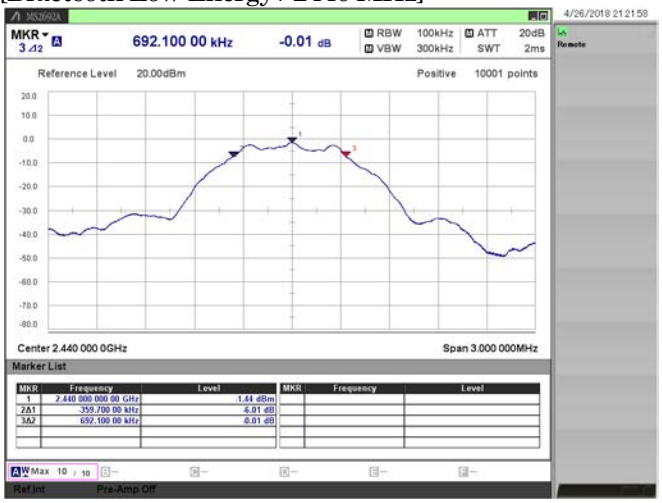
3.1. 6dB Bandwidth

1) Ambient temperature : 21.9 deg.C
2) Relative humidity : 46.0 %
3) Date of measurement : April 26, 2018
4) Measured by : M.KOUGA
5) Operating mode : Transmitting mode

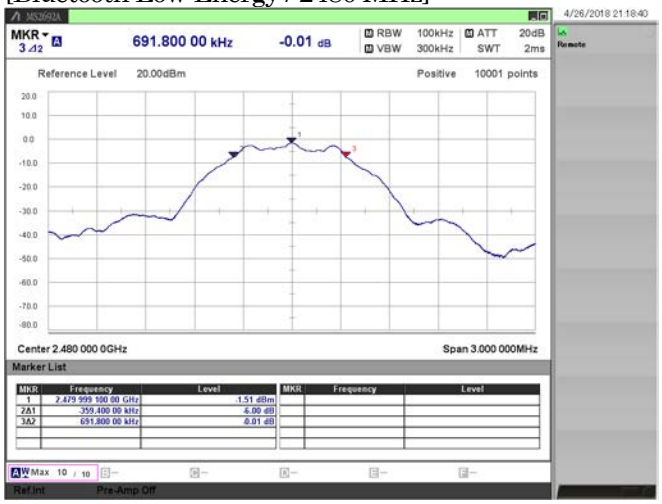
Mode	Rate [Mbps]	Channel [MHz]	Result [MHz]	Limit [MHz]
BLE	1	2402	0.696	0.5
		2440	0.692	0.5
		2480	0.692	0.5

[Bluetooth Low Energy / 2402 MHz]

[Bluetooth Low Energy / 2440 MHz]



[Bluetooth Low Energy / 2480 MHz]



3.2. Maximum Peak Conducted Output Power

1) Ambient temperature : 21.9 deg.C
2) Relative humidity : 46.0 %
3) Date of measurement : April 26, 2018
4) Measured by : M.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]	Margin [dB]
BLE	1	2402	-0.69	0.53	-0.16	0.00096	30.0	30.16
		2440	-0.40	0.53	0.13	0.00103	30.0	29.87
		2480	-0.22	0.53	0.31	0.00107	30.0	29.69

Maximum Average Conducted Output Power (for SAR measurement)

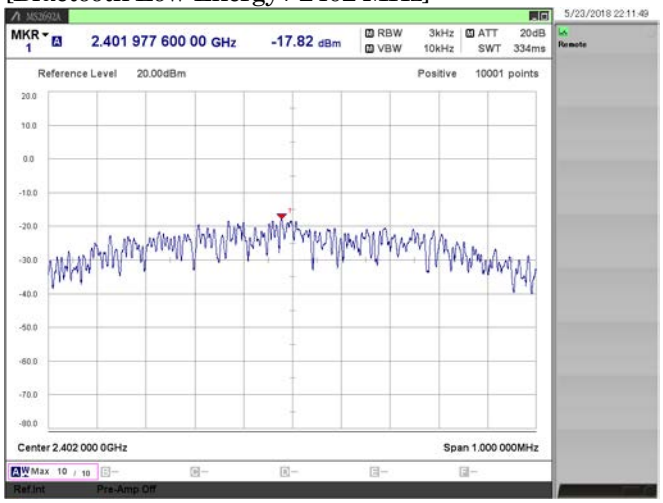
Mode	Rate [Mbps]	Channel [MHz]	Reading(AV) [dBm]	C.F. [dB]	Duty Factor [dB]	Result(AV) [dBm]	Result(AV) [W]
BLE	1	2402	-3.39	0.53	2.01	-0.85	0.00082
		2440	-3.05	0.53	2.01	-0.51	0.00089
		2480	-2.83	0.53	2.01	-0.29	0.00094

3.3. Power Spectral Density

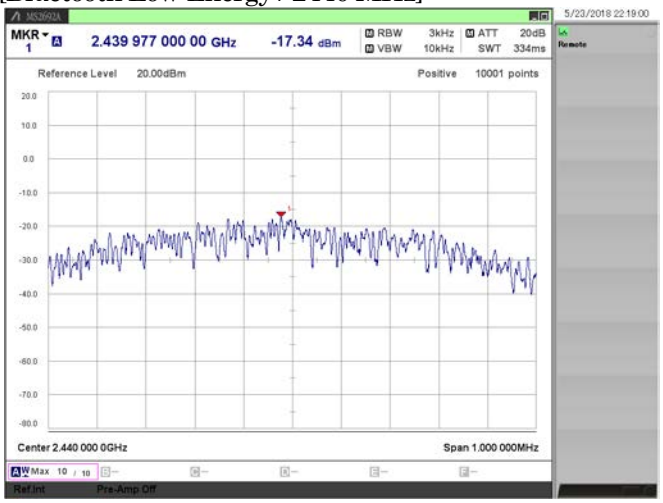
1) Ambient temperature : 21.9 deg.C
2) Relative humidity : 46.0 %
3) Date of measurement : May 23, 2018
4) Measured by : M.KOUGA
5) Operating mode : Transmitting mode

Mode	Rate [Mbps]	Channel [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Limit [dBm]	Margin [dB]
BLE	1	2402	-17.82	0.83	-16.99	8.0	24.99
		2440	-17.34	0.84	-16.50	8.0	24.50
		2480	-17.30	0.84	-16.46	8.0	24.46

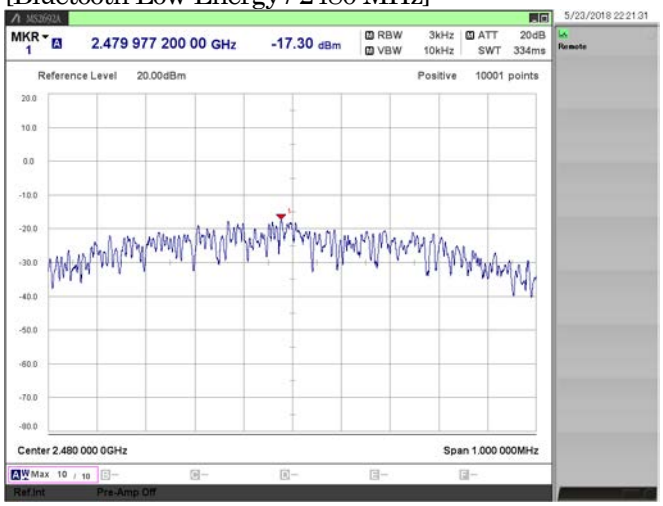
[Bluetooth Low Energy / 2402 MHz]



[Bluetooth Low Energy / 2440 MHz]



[Bluetooth Low Energy / 2480 MHz]



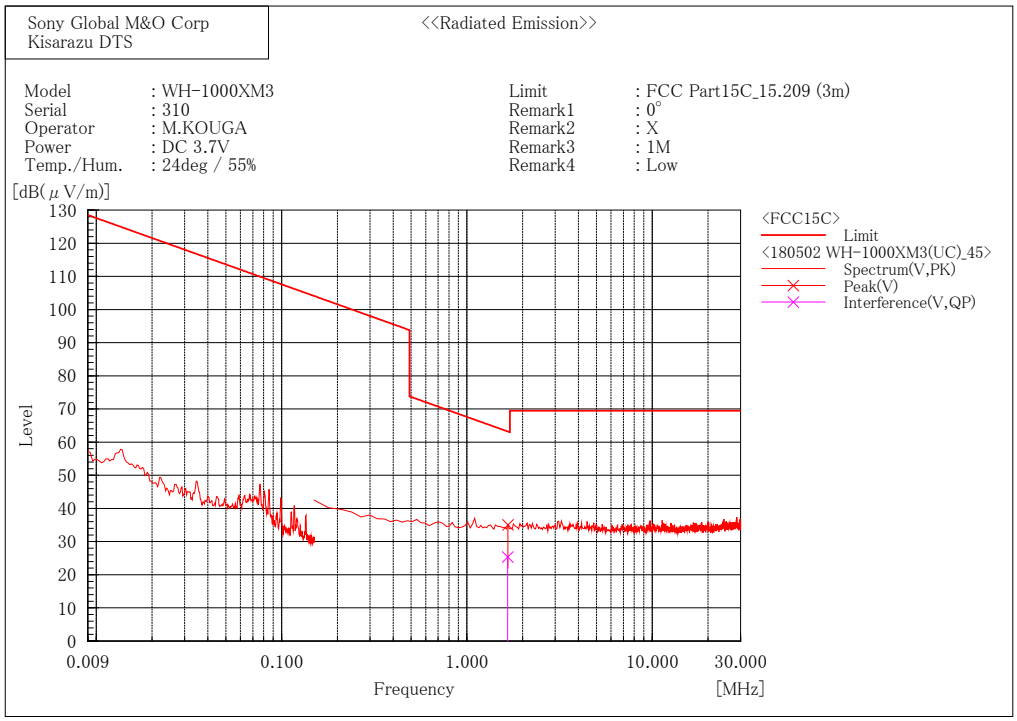
3.4. Radiated Spurious Emissions

1) Date of measurement

9 kHz - 30 MHz	: March 2, 2018	(all mode)	
30 MHz - 1000 MHz	: March 2, 2018	(all mode)	
1 GHz - 7GHz	: March 1, 2018	(all mode)	May 1, 2018 (band edge plot data)
7GHz - 18GHz	: March 2, 2018	(all mode)	
18GHz - 25GHz	: March 2, 2018	(all mode)	

9 kHz - 30 MHz

[Bluetooth Low Energy (1 Mbps) / 2402 MHz]

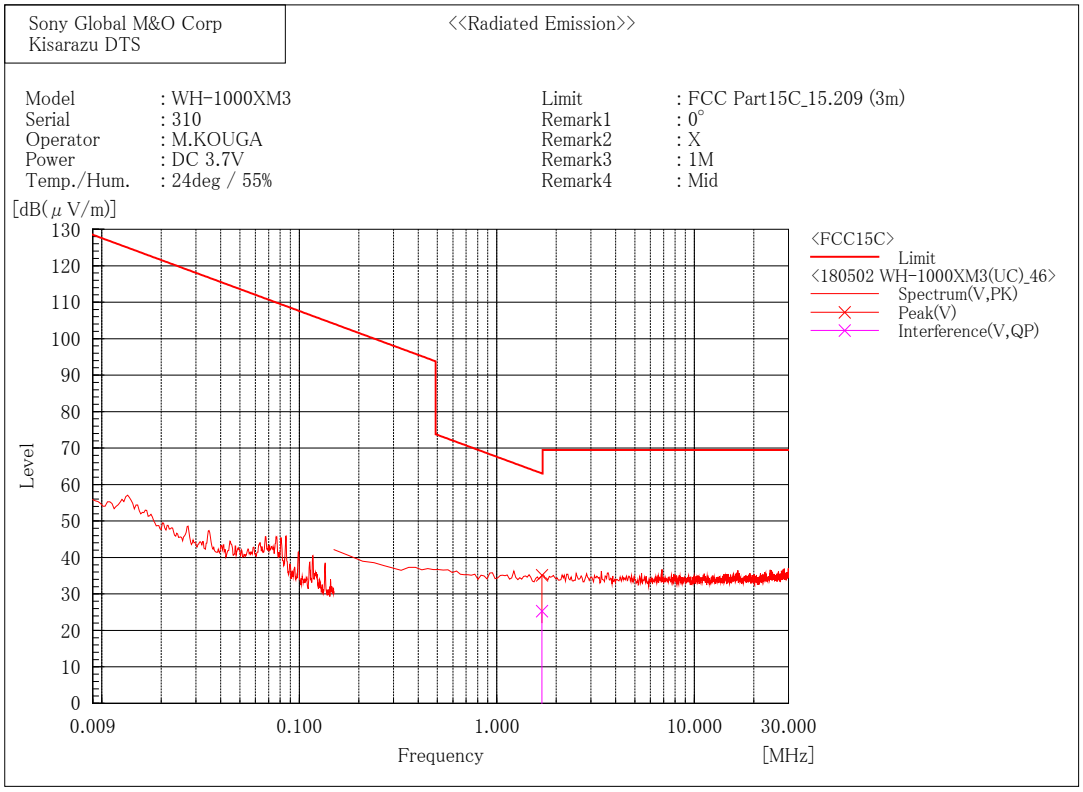


Final Result

--- 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	1.661	5.5	19.9	25.4	63.2	37.8	100.0	115.1

[Bluetooth Low Energy (1 Mbps) / 2440 MHz]



Final Result

--- Vertical Polarization (QP)---

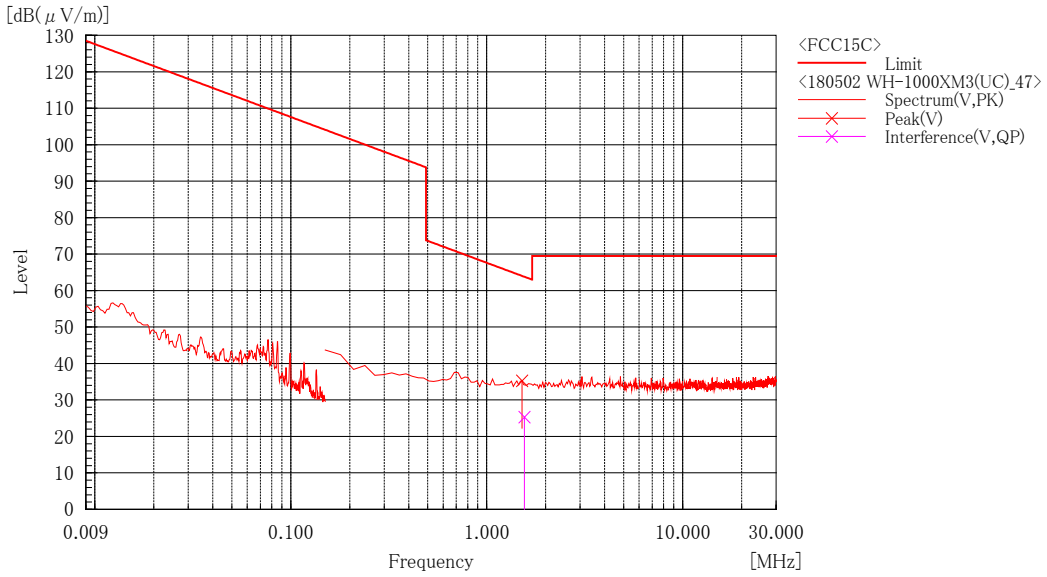
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	1.693	5.4	19.9	25.3	63.1	37.8	100.0	112.1

[Bluetooth Low Energy (1 Mbps) / 2480 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C_15.209 (3m)
Serial	: 310	Remark1	: 0°
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: High

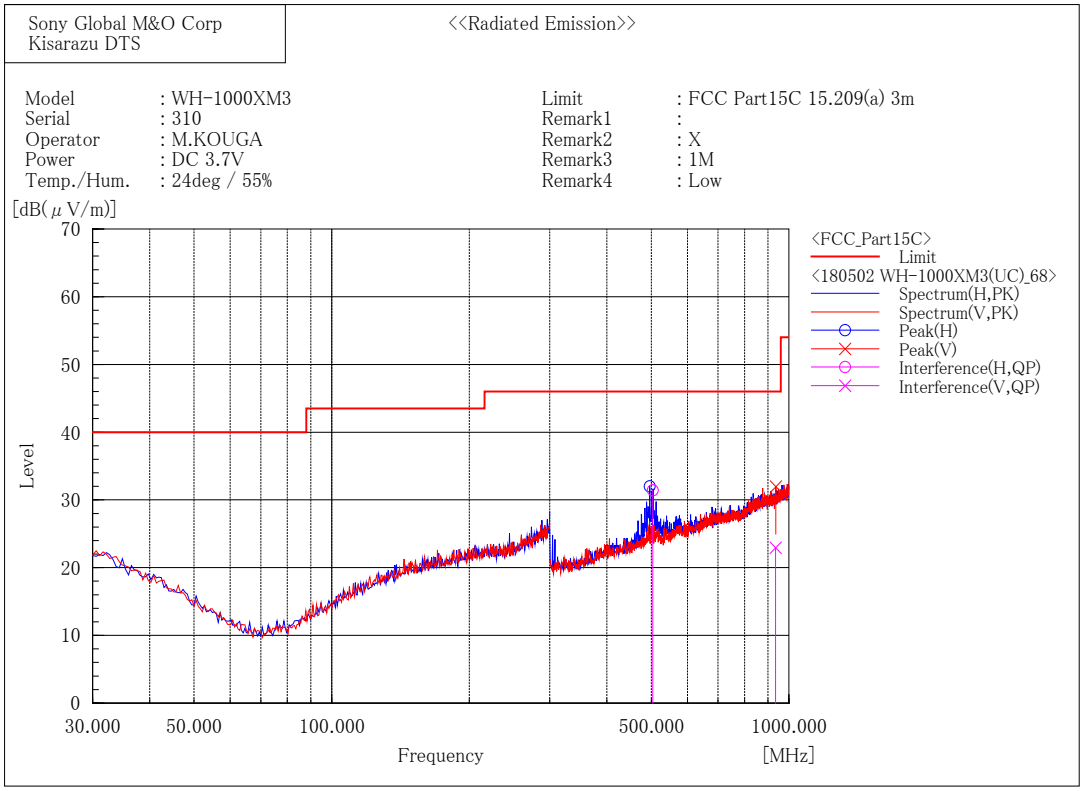


Final Result

--- 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	1.557	5.5	19.8	25.3	63.8	38.5	100.0	107.1

30 MHz - 1000 MHz
[Bluetooth Low Energy (1 Mbps) / 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	504.000	39.7	-8.3	31.4	46.0	14.6	178.9	162.1

--- Vertical Polarization (QP)---

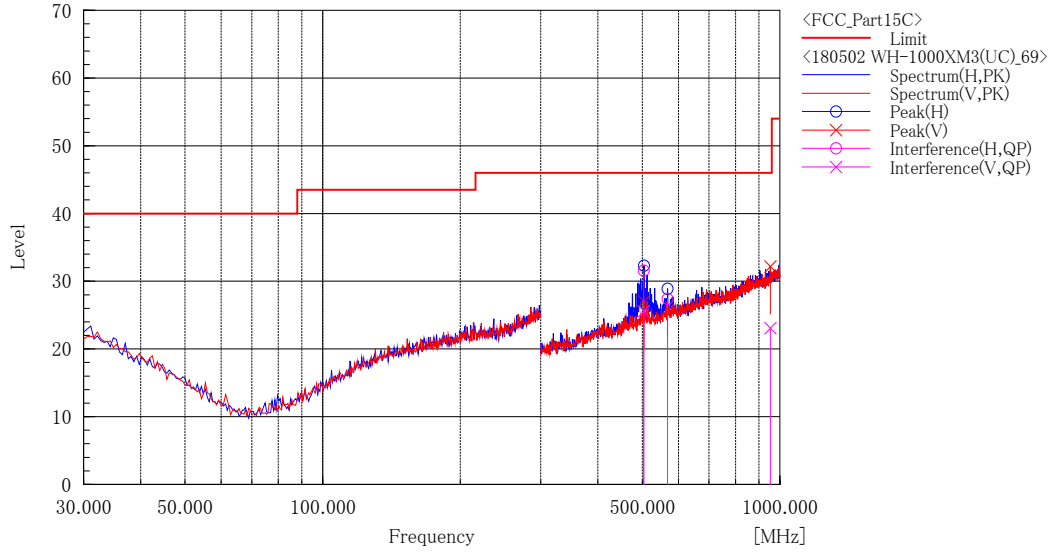
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	934.920	24.3	-1.4	22.9	46.0	23.1	100.0	80.1

[Bluetooth Low Energy (1 Mbps) / 2440 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: Mid



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	504.002	39.9	-8.3	31.6	46.0	14.4	178.0	145.1
2	568.000	34.4	-7.0	27.4	46.0	18.6	151.1	159.2

--- Vertical Polarization (QP)---

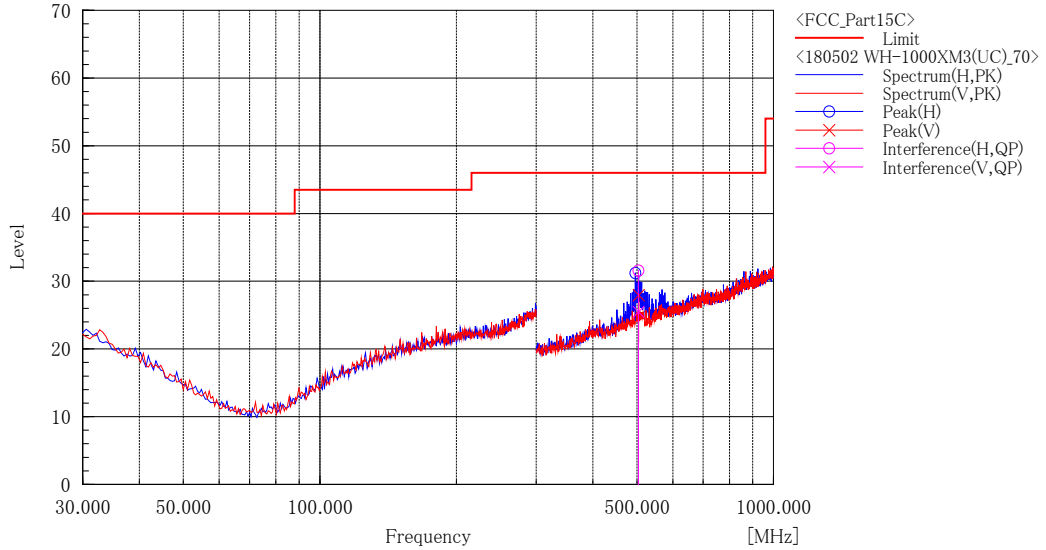
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	504.000	33.9	-8.3	25.6	46.0	20.4	148.1	194.6
2	953.200	24.2	-1.1	23.1	46.0	22.9	202.0	163.1

[Bluetooth Low Energy (1 Mbps) / 2480 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: High



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	504.002	39.9	-8.3	31.6	46.0	14.4	175.0	144.1

--- Vertical Polarization (QP)---

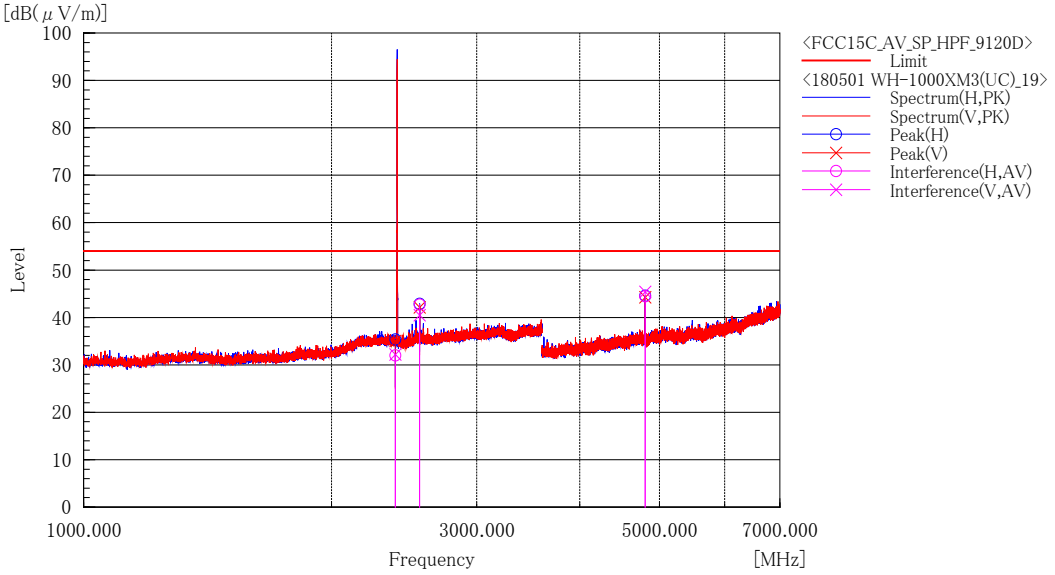
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	504.008	33.8	-8.3	25.5	46.0	20.5	145.0	194.4

1 GHz - 7 GHz
[Bluetooth Low Energy (1 Mbps) / 2402 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 57%	Remark4	: Low



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	39.6	-7.6	32.0	54.0	22.0	198.0	121.1
2	2557.993	49.3	-6.6	42.7	54.0	11.3	225.0	295.4
3	4804.206	48.3	-3.8	44.5	54.0	9.5	337.0	314.0

--- Vertical Polarization (AV)---

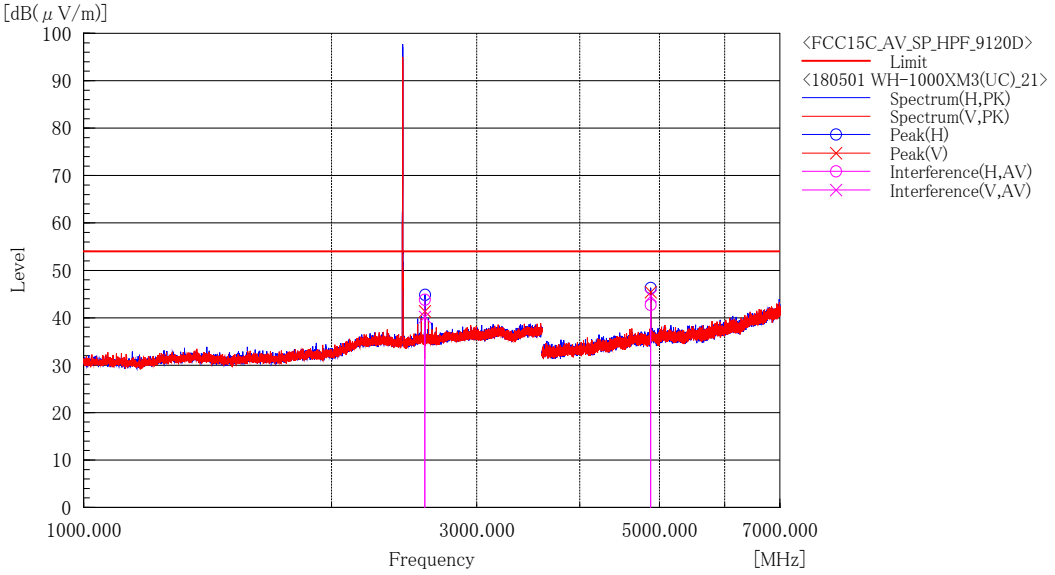
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	39.8	-7.6	32.2	54.0	21.8	107.0	189.3
2	2558.169	47.1	-6.6	40.5	54.0	13.5	196.1	257.9
3	4804.118	49.2	-3.8	45.4	54.0	8.6	370.1	268.6

[Bluetooth Low Energy (1 Mbps) / 2440 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 57%	Remark4	: Mid



Final Result

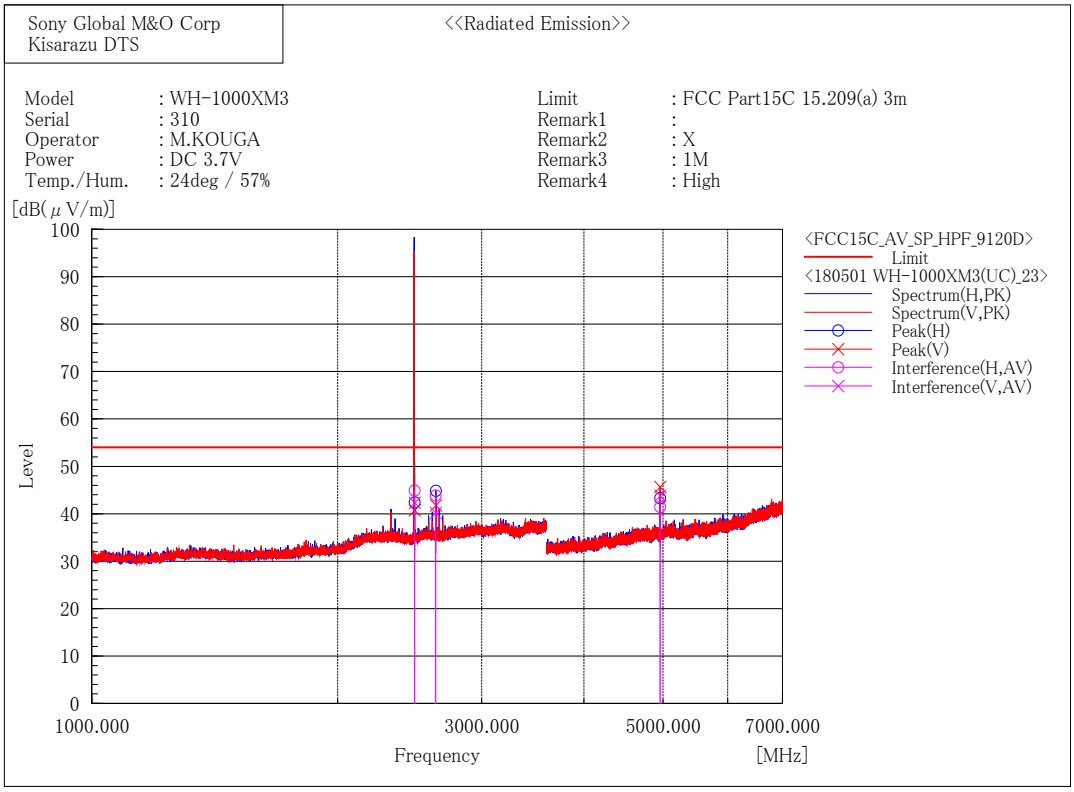
--- Horizontal Polarization (AV)---

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	2595.859	50.2	-6.4	43.8	54.0	10.2	379.0	288.1
2	4879.754	46.4	-3.7	42.7	54.0	11.3	237.0	302.1

--- 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	2595.967	46.6	-6.4	40.2	54.0	13.8	204.0	249.8
2	4879.672	48.3	-3.7	44.6	54.0	9.4	154.0	278.1

[Bluetooth Low Energy (1 Mbps) / 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	52.1	-7.2	44.9	54.0	9.1	268.7	297.1
2	2635.955	50.4	-6.5	43.9	54.0	10.1	293.2	291.1
3	4959.702	44.8	-3.4	41.4	54.0	12.6	260.0	290.1

--- Vertical Polarization (AV)---

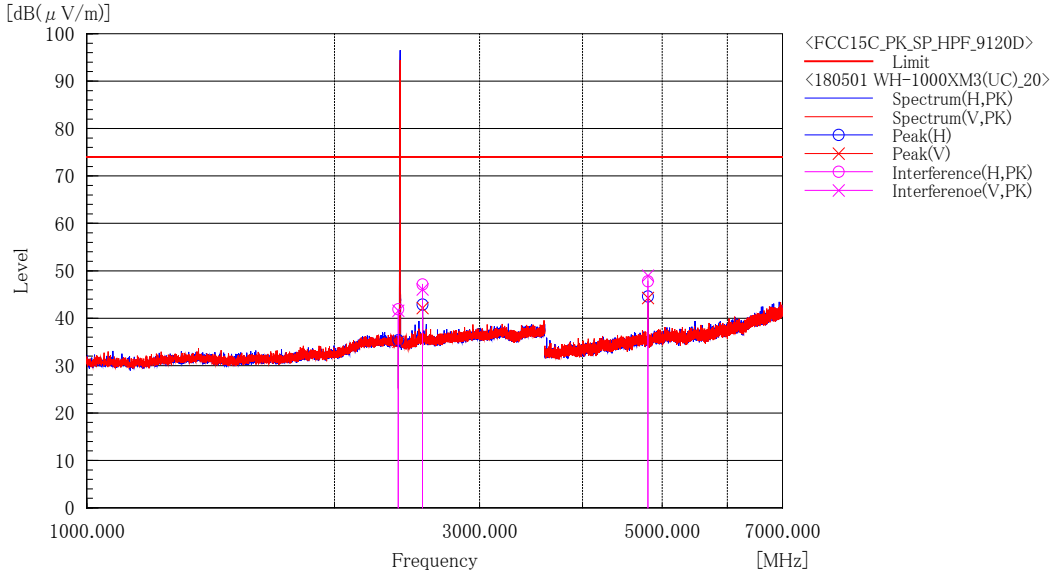
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	49.5	-7.2	42.3	54.0	11.7	171.8	255.0
2	2635.878	46.7	-6.5	40.2	54.0	13.8	145.5	257.1
3	4959.831	47.2	-3.4	43.8	54.0	10.2	147.8	272.3

[Bluetooth Low Energy (1 Mbps) / 2402 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 57%	Remark4	: Low



Final Result

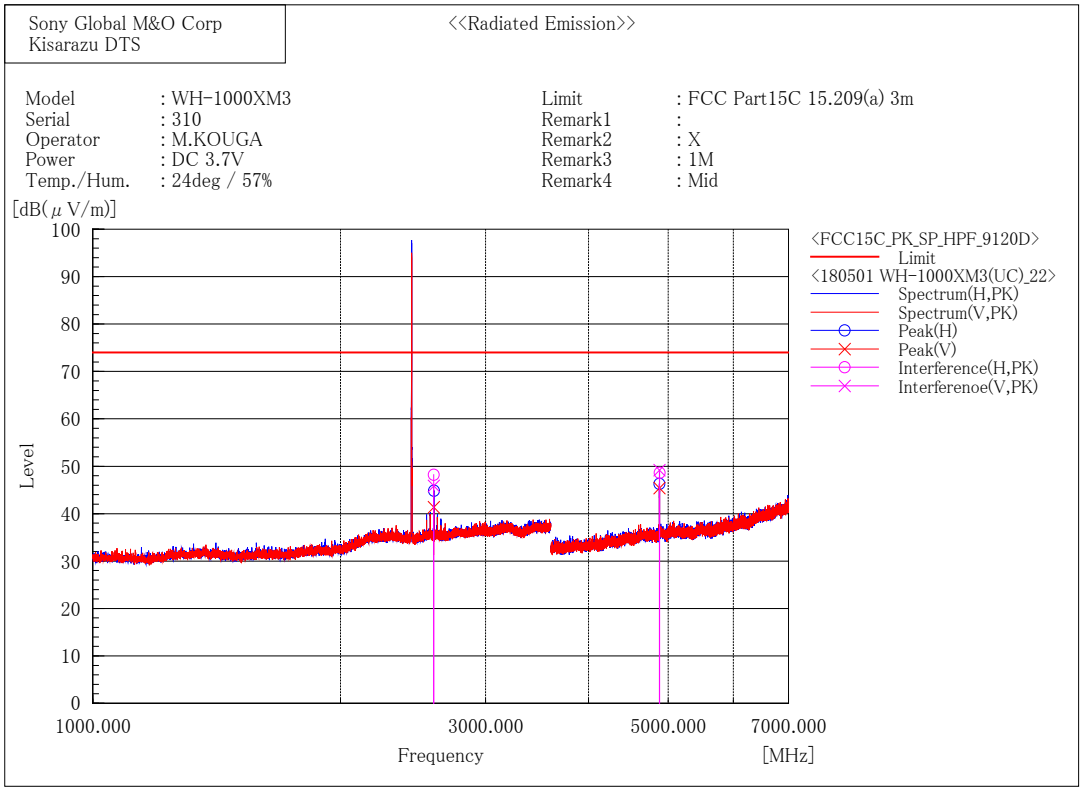
--- Horizontal Polarization (PK)---

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	49.5	-7.6	41.9	74.0	32.1	198.0	122.1
2	2557.954	53.7	-6.6	47.1	74.0	26.9	225.0	296.1
3	4803.669	51.6	-3.8	47.8	74.0	26.2	336.9	313.6

--- 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	2390.000	49.2	-7.6	41.6	74.0	32.4	108.0	190.1
2	2558.024	52.7	-6.6	46.1	74.0	27.9	195.0	258.1
3	4803.832	52.8	-3.8	49.0	74.0	25.0	370.1	269.1

[Bluetooth Low Energy (1 Mbps) / 2440 MHz]



Final Result

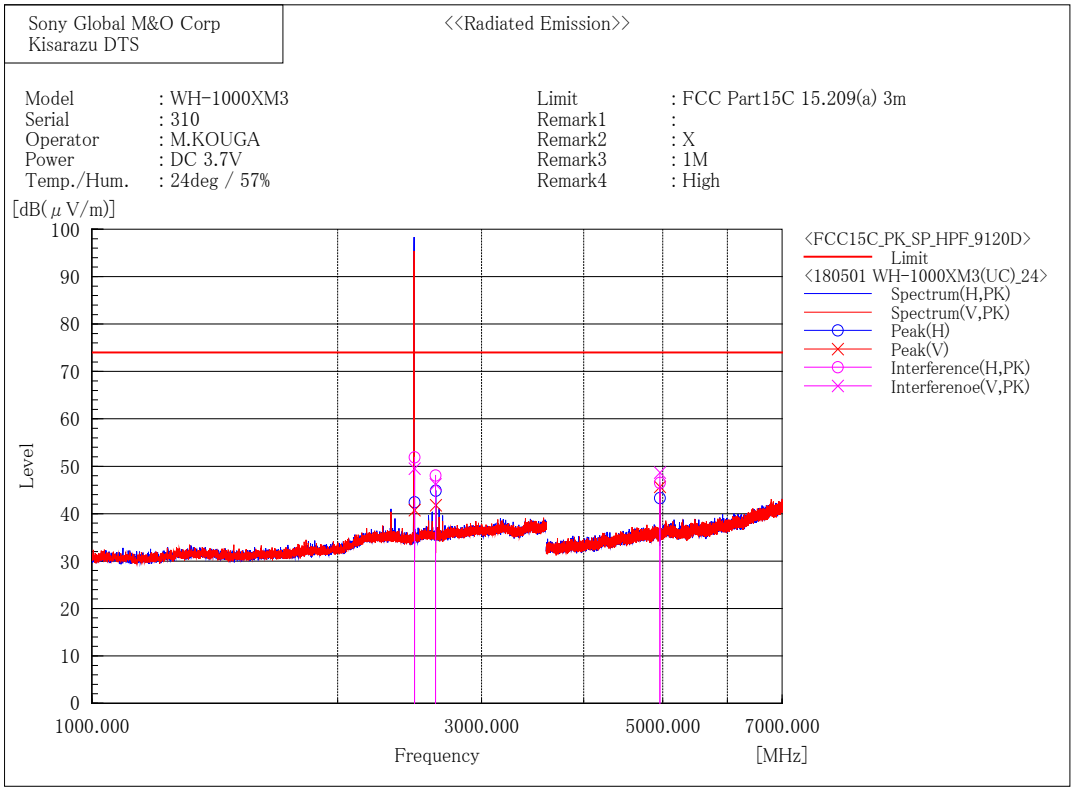
--- Horizontal Polarization (PK)---

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	2595.628	54.6	-6.4	48.2	74.0	25.8	380.0	289.1
2	4880.561	52.3	-3.7	48.6	74.0	25.4	237.0	302.1

--- 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	2595.750	52.3	-6.4	45.9	74.0	28.1	205.0	250.1
2	4879.547	52.9	-3.7	49.2	74.0	24.8	154.0	278.1

[Bluetooth Low Energy (1 Mbps) / 2480 MHz]



Final Result

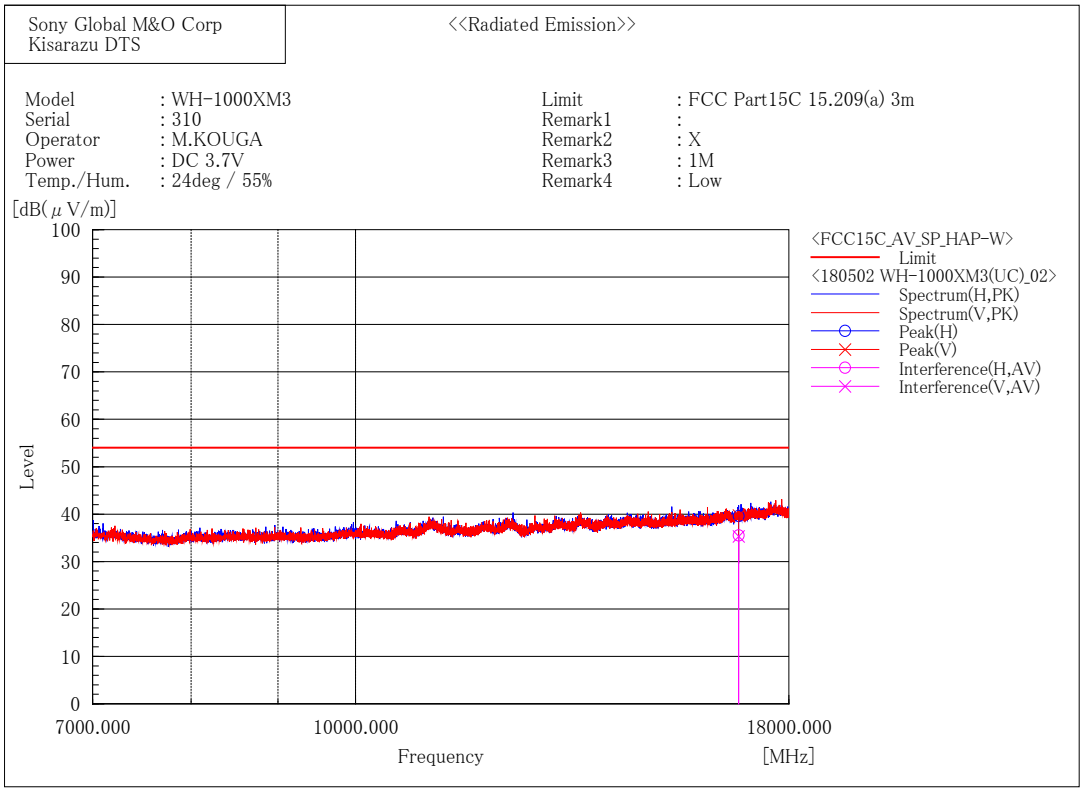
--- Horizontal Polarization (PK)---

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	59.1	-7.2	51.9	74.0	22.1	269.0	298.1
2	2635.751	54.6	-6.5	48.1	74.0	25.9	292.0	292.1
3	4959.429	49.9	-3.4	46.5	74.0	27.5	260.0	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	2483.500	56.7	-7.2	49.5	74.0	24.5	171.0	255.1
2	2635.594	52.7	-6.5	46.2	74.0	27.8	145.5	256.1
3	4960.390	52.1	-3.4	48.7	74.0	25.3	148.0	272.4

7 GHz - 18 GHz
[Bluetooth Low Energy (1 Mbps) / 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	16814.000	36.8	-1.3	35.5	54.0	18.5	304.3	273.1

--- Vertical Polarization (AV)---

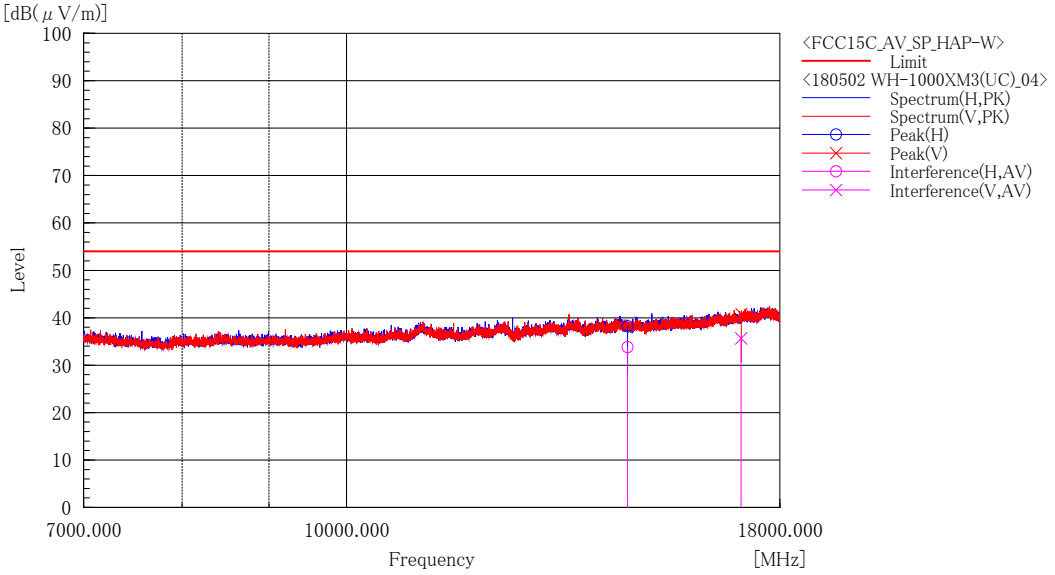
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	16814.000	36.6	-1.3	35.3	54.0	18.7	239.1	250.0

[Bluetooth Low Energy (1 Mbps) / 2440 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: Mid



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	14640.000	37.8	-4.0	33.8	54.0	20.2	205.0	90.1

--- Vertical Polarization (AV)---

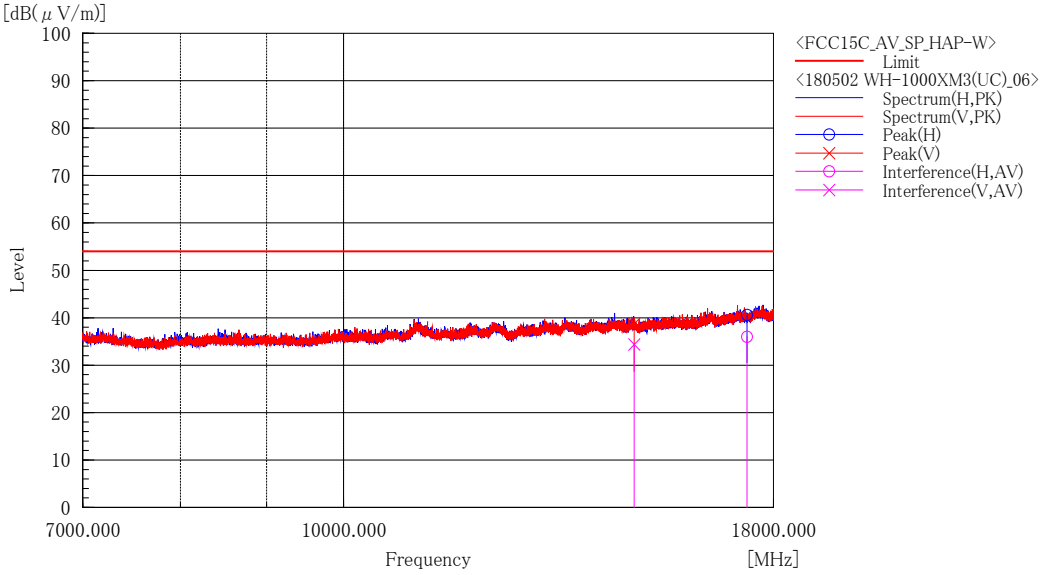
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	17080.000	36.3	-0.6	35.7	54.0	18.3	289.0	306.6

[Bluetooth Low Energy (1 Mbps) / 2480 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: High



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	17360.000	36.2	-0.2	36.0	54.0	18.0	280.6	85.7

--- Vertical Polarization (AV)---

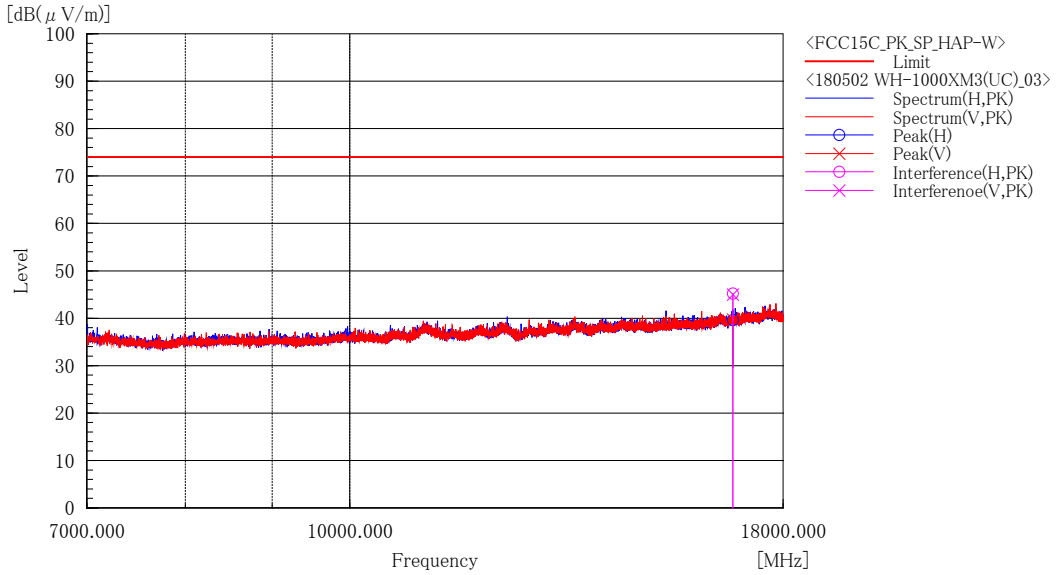
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	14880.000	38.3	-3.9	34.4	54.0	19.6	140.0	148.1

[Bluetooth Low Energy (1 Mbps) / 2402 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: Low



Final Result

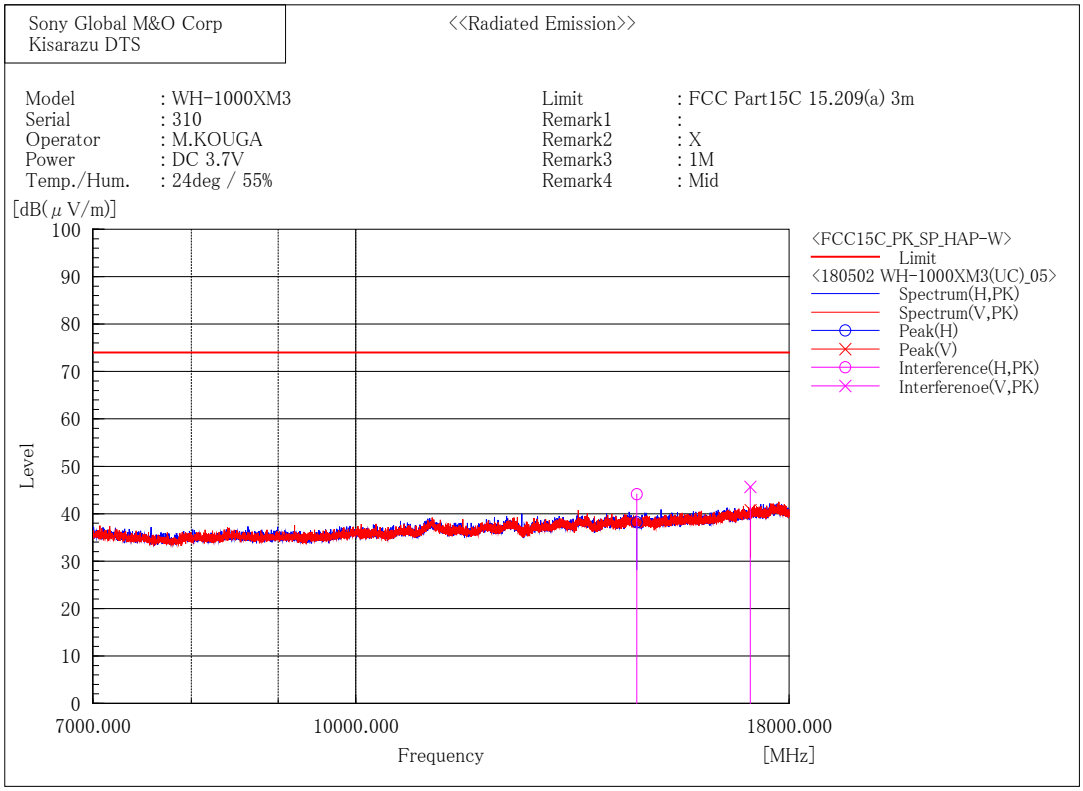
--- Horizontal Polarization (PK)---

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	16814.000	46.5	-1.3	45.2	74.0	28.8	304.3	273.1

--- 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	16814.000	46.3	-1.3	45.0	74.0	29.0	240.0	250.1

[Bluetooth Low Energy (1 Mbps) / 2440 MHz]



Final Result

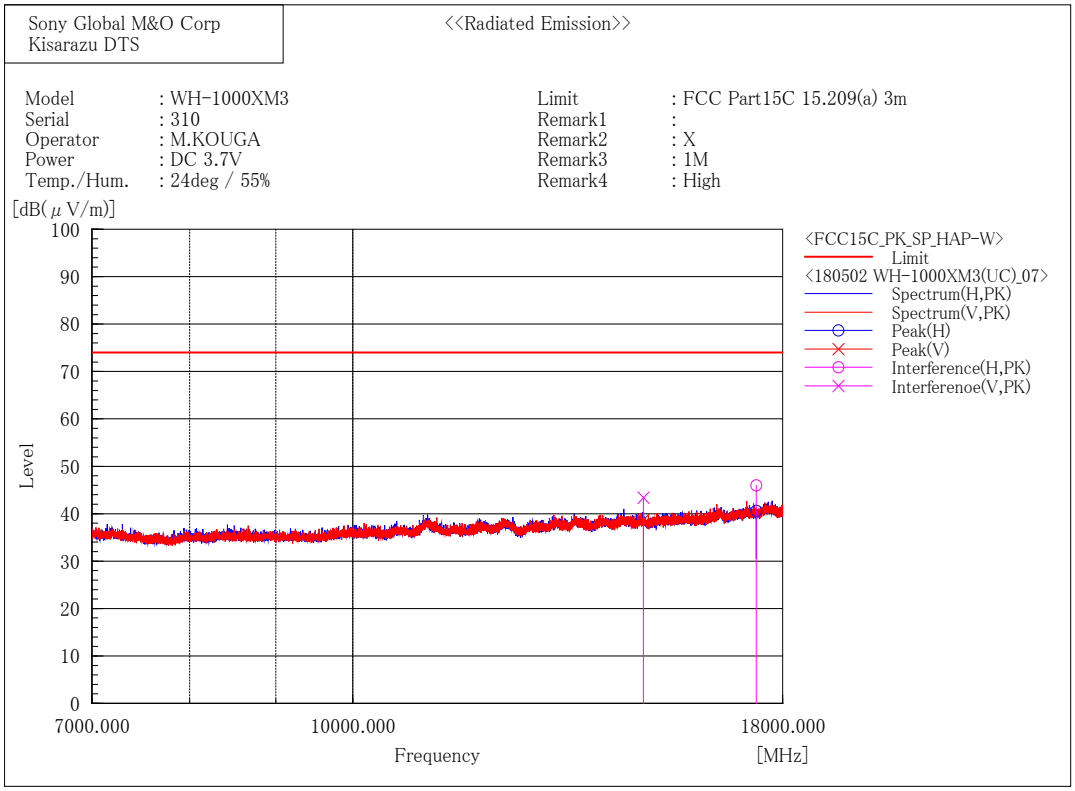
--- Horizontal Polarization (PK)---

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	14640.000	48.1	-4.0	44.1	74.0	29.9	204.0	89.1

--- 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	17080.000	46.3	-0.6	45.7	74.0	28.3	289.0	306.1

[Bluetooth Low Energy (1 Mbps) / 2480 MHz]



Final Result

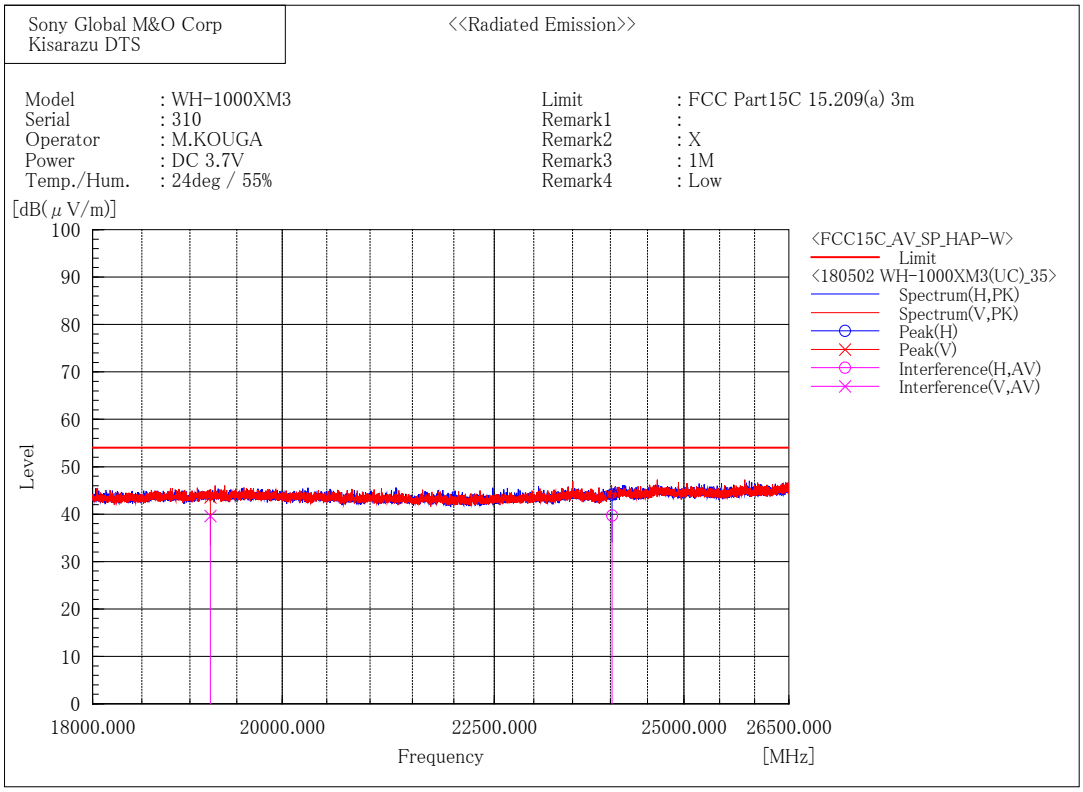
--- Horizontal Polarization (PK)---

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	17360.000	46.2	-0.2	46.0	74.0	28.0	280.0	86.1

--- 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	14880.000	47.3	-3.9	43.4	74.0	30.6	140.0	136.1

18 GHz - 25 GHz
[Bluetooth Low Energy (1 Mbps) / 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	24020.000	35.3	4.4	39.7	54.0	14.3	381.0	73.9

--- Vertical Polarization (AV)---

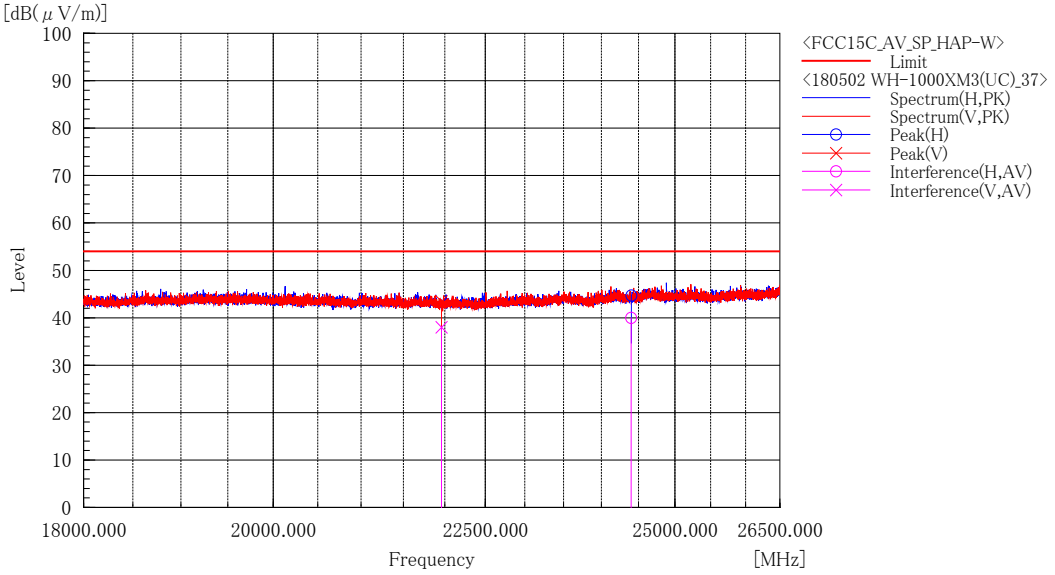
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19216.000	34.2	5.4	39.6	54.0	14.4	308.0	343.1

[Bluetooth Low Energy (1 Mbps) / 2440 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: Mid



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	24400.000	35.5	4.5	40.0	54.0	14.0	136.0	281.0

--- Vertical Polarization (AV)---

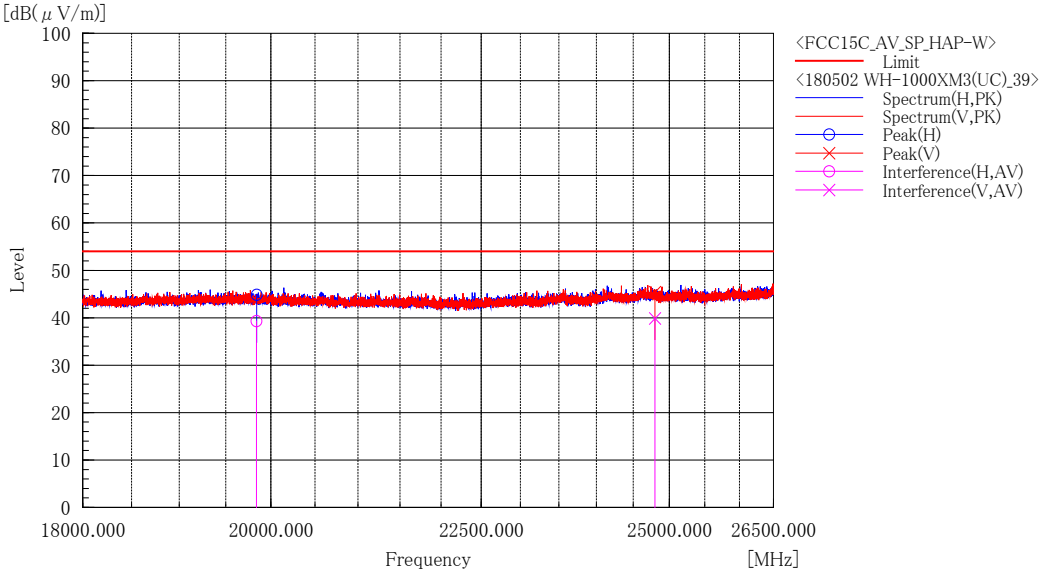
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	21960.000	34.0	4.0	38.0	54.0	16.0	173.0	166.1

[Bluetooth Low Energy (1 Mbps) / 2480 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: High



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	33.8	5.5	39.3	54.0	14.7	282.0	214.1

--- Vertical Polarization (AV)---

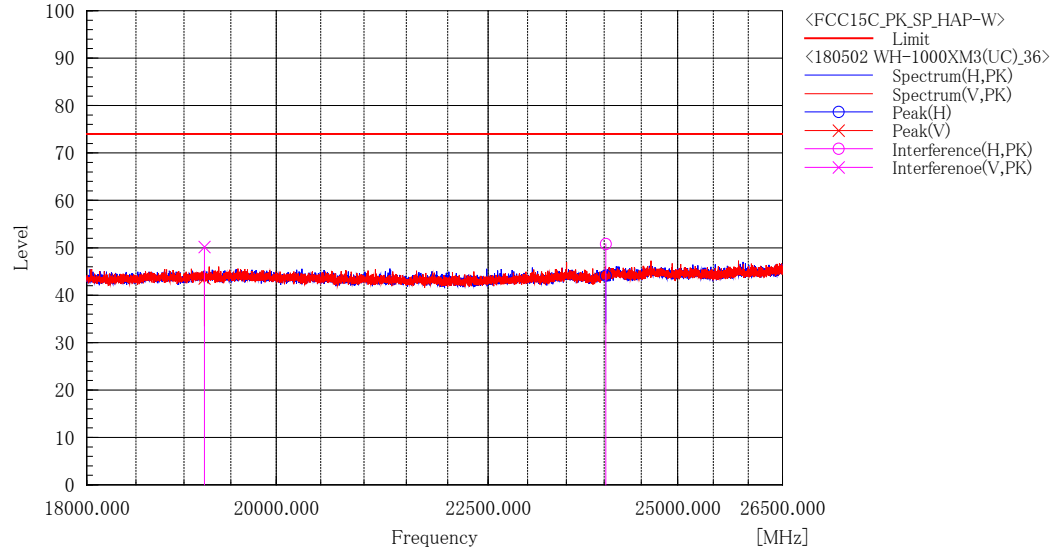
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	24800.000	35.4	4.5	39.9	54.0	14.1	335.1	322.4

[Bluetooth Low Energy (1 Mbps) / 2402 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: Low



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	24020.000	46.4	4.4	50.8	74.0	23.2	381.0	74.1

--- Vertical Polarization (PK)---

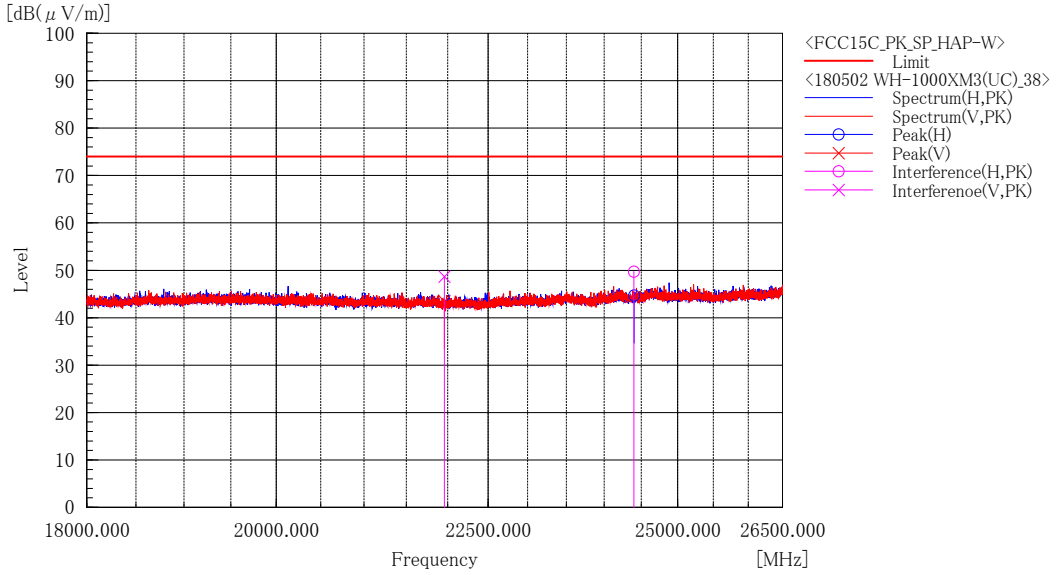
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19216.000	44.8	5.4	50.2	74.0	23.8	308.0	344.1

[Bluetooth Low Energy (1 Mbps) / 2440 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: Mid



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	24400.000	45.2	4.5	49.7	74.0	24.3	136.0	280.1

--- Vertical Polarization (PK)---

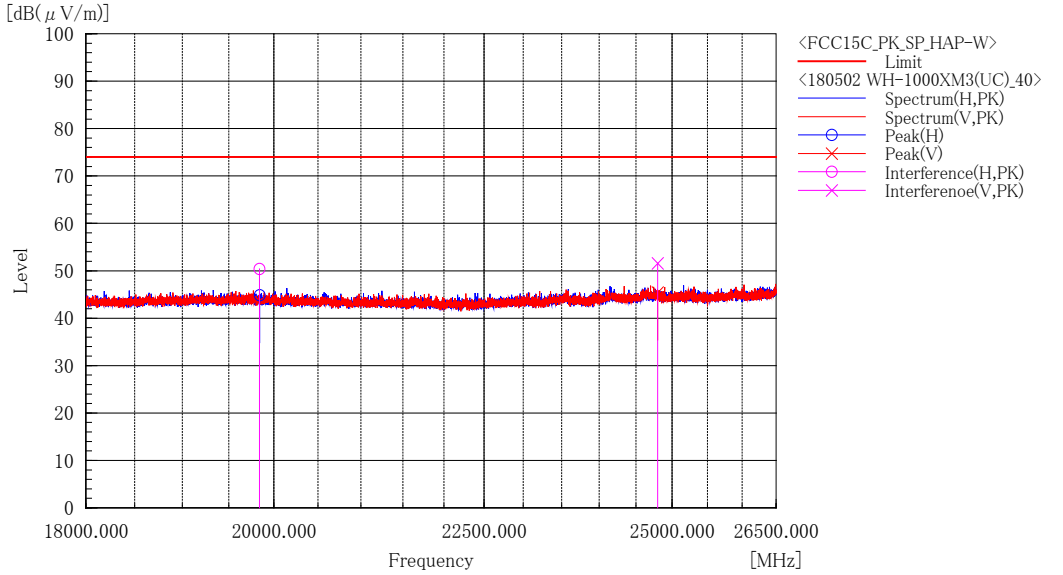
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	21960.000	44.7	4.0	48.7	74.0	25.3	175.0	167.1

[Bluetooth Low Energy (1 Mbps) / 2480 MHz]

Sony Global M&O Corp
Kisarazu DTS

<<Radiated Emission>>

Model	: WH-1000XM3	Limit	: FCC Part15C 15.209(a) 3m
Serial	: 310	Remark1	:
Operator	: M.KOUGA	Remark2	: X
Power	: DC 3.7V	Remark3	: 1M
Temp./Hum.	: 24deg / 55%	Remark4	: High



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	44.9	5.5	50.4	74.0	23.6	282.0	216.1

--- Vertical Polarization (PK)---

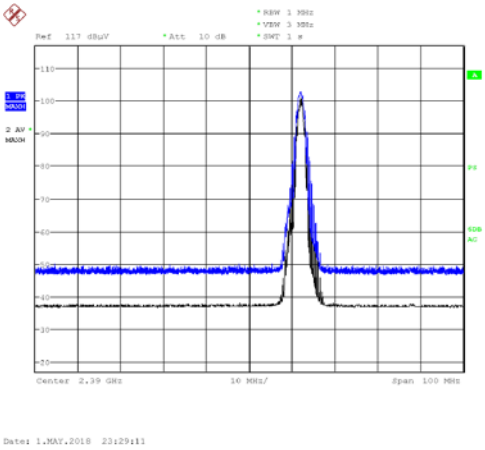
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	24800.000	47.1	4.5	51.6	74.0	22.4	333.0	323.1

2.4GHz Restricted-Band Edge (Plot data)

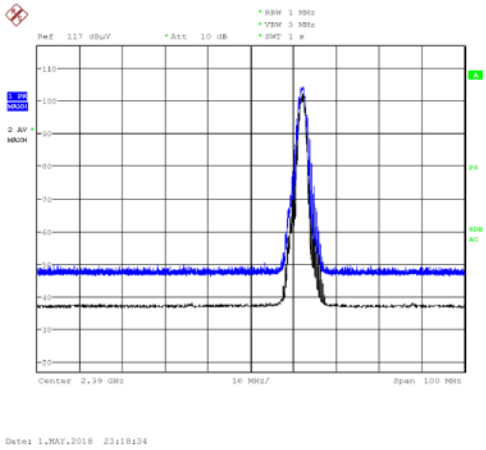
These plot data show peak (trace blue) and average (trace black) spectrum for worst case emissions in the restricted-band edges. (Restricted band edges: below 2390 MHz and above 2483.5 MHz)
The result of the final radiated emissions measurement refers in previous pages.

[Bluetooth Low Energy / 2402MHz]

Horizontal

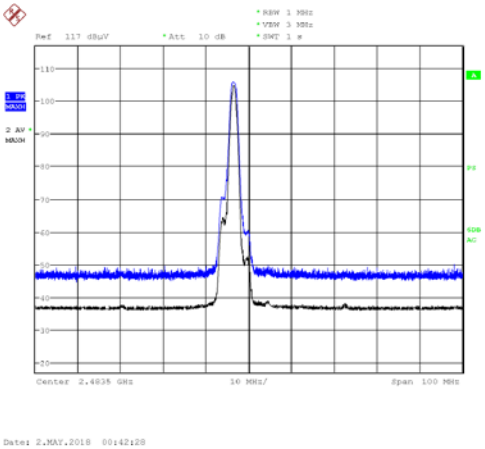


Vertical

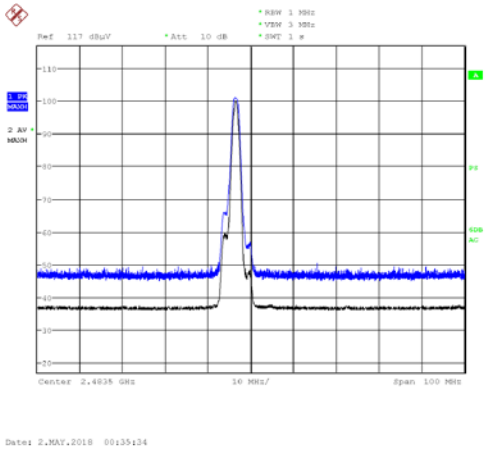


[Bluetooth Low Energy / 2480MHz]

Horizontal



Vertical

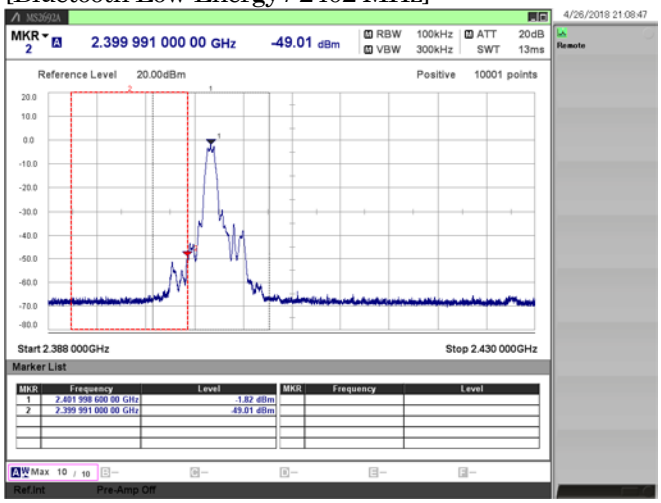


3.5. Conducted Spurious Emissions for Band Edge

1) Ambient temperature : 21.9 deg.C
2) Relative humidity : 46.0 %
3) Date of measurement : March 26, 2018
4) Measured by : M.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	2402.00	-1.82	0.83	-0.99	-	-
			2399.99	-49.01	0.83	-48.18	-21.0	27.19

[Bluetooth Low Energy / 2402 MHz]



4. Method of Calculation

4.1. Maximum Peak Conducted Output Power Measurement

Method of calculation	:	Software	
The Software for Calculation	Name	: SW-316	
	Version	: Ver.1.3	

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

Notes :
- (a) Meter Reading : Reading of the power meter.
- (b) C.F. : Attenuator Loss + EUT Cable Loss
- (c) Duty Factor : 10log {(Tx ON Time + Tx OFF Time) / (Tx ON Time)}

4.2. Power Density Measurement

Method of calculation	:	Software	
The Software for Calculation	Name	: SW-316	
	Version	: Ver.1.3	

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

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

4.3. Radiated Spurious Emission Measurement

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

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

Notes :
- (a) Meter Reading : Reading of the EMI test receiver or 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)

4.4. Conducted Spurious Emission for Band Edge Measurement

Method of calculation	:	Software
The Software for Calculation	Name	: SW-316
	Version	: Ver.1.3

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

Notes :

(a) Meter Reading : Reading of the spectrum analyzer.

(b) C.F. : System Cable Loss + Attenuator 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

4th Site Shielded Room 1

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	-	Shield Room	B83117-B2432-T161	P26428	Albatross Project	-	-
x	W0101	Spectrum Analyzer	MS2692A	6201338955	Anritsu	12	18.04.03
x	W0006	Power Meter	N1911A	MY50000295	Keysight Technologies	12	17.10.03
x	W0007	Power Sensor	N1922A	MY50180022	Keysight Technologies	12	17.10.04
-	W0029	10dB Attenuator	8493C	76549	Keysight Technologies	12	17.08.03
x	WC0005	RF Cable	SUCOFLEX 102	34287	HUBER + SUHNER	12	17.08.03
x	M0720	Thermometer	TH-321	140044	AS ONE	12	17.06.09

5.2. Radiated Spurious Emissions

4th Site 10m Semi-Anechoic Chamber

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	M0506	EMC Chamber	None	-	TDK	12	17.07.10
x	M0515	EMI Receiver	ESCI	100606	Rohde & Schwarz	12	17.09.29
x	M0504	EMI Receiver	ESU40	100086	Rohde & Schwarz	12	17.11.02
x	A0073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12	17.11.01
x	A0043	Biconical Antenna	BBA9106	VHA91032598 (V5)	Schwarzbeck	12	17.11.13
x	A0046	Log periodic Antenna	UHALP9108A1	0830	Schwarzbeck	12	17.11.13
x	A0056	Horn Antenna	BBHA9120D	670	Schwarzbeck	12	17.11.18
x	A0057	Horn Antenna=	HAP06-18W	00000037	TOYO Corporation	12	17.11.18
x	A0058	Horn Antenna	HAP18-26W	00000016	TOYO Corporation	12	17.12.01
-	CS0037	Fourth Site RE Cable SYS1	-	-	EMC/RF Test Lab.	12	17.11.19
x-	CS0039	Fourth Site RE Cable SYS3	-	-	EMC/RF Test Lab.	12	17.11.19
x	CS0054	Fourth Site EMF Cable SYS	-	-	EMC/RF Test Lab.	12	17.11.19
x	CS0064/0065	Fourth Site RE Cable SYS8	-	-	EMC/RF Test Lab.	12	17.11.19
x	M0510	RF Selector	NS4900	0802-226	TOYO Corporation	12	17.11.19
x	M0620	RF Pre-Amp	8447D	2944A10720	Keysight Technologies	12	17.11.19
x	M0706	3dB Attenuator	8491A	MY39267782	Keysight Technologies	12	17.11.19
x	M0831	GHz Filter Box	FB-G1	002	Sony GM&O	12	17.11.19
x	M0690	Thermometer	AD-5640A	201304	AND	12	17.11.14

About calibration interval

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