

EMI TEST REPORT

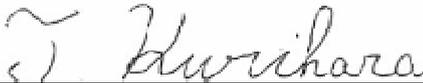
Project No. : JB-Z0191
Client : Sony Corporation
Address : 1-7-1 Konan Minato-Ku Tokyo, 108-0075 Japan
Type of Equipment : Digital Music Player
Model No. : NW-WS623
Serial No. : 2000170
FCC ID : AK8NWWS620
IC : 409B-NWWS620
Regulation Applied : 47 CFR Part 15 Subpart B, Class B
ICES-003 Issue 6, Class B
Final Judgment : Passed
Sample Receipt : October 18, 2016
Testing : November 02, 2016
Reported : November 08, 2016

Reported by :

Approved by :



Yoichi Furukawa



Teruki Kurihara

EMC/ RF Test Laboratory Main Lab.
Design Technology Division
Sony Global Manufacturing & Operations Corporation

EMC/ RF Test Laboratory Main Lab.
Design Technology Division
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- 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.*



TESTING CERT #3203.01

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

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.

1.3. Summary of Test Result

Conducted Emissions Applicable Not Applicable
 The requirements are Passed Not Passed
 Measurement of Frequency 0.15 MHz - 30 MHz
 Worst Point Freq. 0.150 MHz Line N Margin 10.7 dB (QP)

Radiated Emissions (below 1 GHz) Applicable Not Applicable
 The requirements are Passed Not Passed
 Measurement of Frequency 30 MHz - 1 GHz
 Worst Point Freq. 125.006 MHz Polarization Horizontal Margin 6.0 dB (QP)

Radiated Emissions (above 1 GHz) Applicable Not Applicable
 The requirements are Passed Not Passed
 Measurement of Frequency 1 GHz – 2 GHz
 Worst Point Freq. 1064.117 MHz Polarization Vertical Margin 21.8 dB (PK)

1.4. Uncertainty

For calculated uncertainty, the measurement instrumentation uncertainty, contained in the CISPR 16-4-2 as required in the referenced standard(s) is considered, and this is the expanded uncertainty expressed in the confidence level of 95%, using the coverage factor k=2.

Calculated uncertainty is not to be applied when determining “Pass” or “Fail” of the EUT.

Test Item	Frequency	EMC Site	
Conducted Emissions	0.15 - 30 MHz	± 3.35 dB	
Radiated Emissions	30 - 300 MHz	3m	H: ± 4.24 dB V: ± 5.10 dB
	300 - 1000 MHz		H: ± 3.58 dB V: ± 5.34 dB
	1 - 2 GHz	3m	H: ± 3.81 dB V: ± 3.84 dB

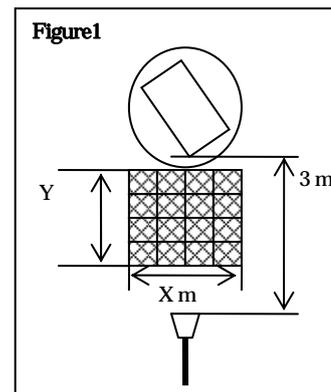
CE (Conducted Emissions)

1. The rear of the top of the non-conductive table (EUT table) made of (FRP, wood, styrene foam, other non-conductive material) was placed 0.4 m from the vertical ground reference plane on the one of the walls of the shielded room.
2. The dimensions of the EUT table were 0.8 m high, 1.5 m long and 1.0 m wide.
3. The connection of the EUT to the line impedance stabilization network (LISN) was performed.
4. The LISN was placed in 80 cm from the nearest part of the EUT chassis.
5. The excess length of the AC cable between the EUT and the LISN receptacle shall be folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. The connection of the all other equipment to the second LISN was performed. The second LISN was terminated with a 50-ohm terminator.
7. Interconnecting cables that hang closer than 40 cm to the horizontal ground reference plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between the horizontal ground reference plane and the EUT table.
8. Find the worst mode and set-up of the EUT according to the following measurement.
How to find the worst operation mode:
Connect all peripherals and check all operation modes of the EUT.
The worst point can be observed with the spectrum analyzer (peak detector mode, RBW: 10 kHz).
How to find the worst set-up:
Connect all peripherals and exchange the position of peripherals and cables.
The worst point can be observed with the spectrum analyzer (peak detector mode, RBW: 10 kHz)
9. With the condition mentioned in the above 8, the measurement in peak detector mode was carried out with the spectrum analyzer.
10. Choose the 6 worst points on the data of the spectrum analyzer.
11. Then, the measurements in quasi-peak detector mode (RBW: 9 kHz) and average detector mode (RBW: 9 kHz) on those points were carried out with the EMI test receiver.
12. The measurement has been conducted with both line and neutral power supply polarization.

RE (Radiated Emissions)

1. The center of the top of the non-conductive table (EUT table) made of (FRP, wood, styrene foam, other non-conductive material) was placed in the center of the turntable.
2. The dimensions of the EUT table were 0.8 m high, 1.5 m long and 1.0 m wide.

For measurement frequency above 1000 MHz, an area (either (X)2.4 m x (Y)2.4 m or (X)3.0 m x (Y)3.0 m) on the ground plane shall be covered by RF absorbing material. (see Figure 1)



3. Find the worst operation mode and set-up of the EUT according to the following measurement.
How to find the worst operation mode:
Connect all peripherals and check all operation modes of the EUT while rotating the turntable and moving the antenna up and down.
The worst point can be observed with the spectrum analyzer (peak detector mode, 3 dB RBW: 100 kHz).

How to find the worst set-up:

Connect all peripherals and exchange the position of peripherals and cables while rotating the turntable and moving the antenna up and down.
The worst point can be observed with the spectrum analyzer (peak detector mode, 3 dB RBW: 100 kHz).

4. With the condition mentioned in the above 4, the antenna and the turntable must be actuated with the following range, the measurement in peak detector mode was carried out with the spectrum analyzer.
Antenna : Biconical Antenna & Logperiodic Antenna
Antenna scanning range : 1 - 4 m, Horizontal and Vertical
Rotating angle of turntable : 360 degrees

For measurement frequency above 1000 MHz, place the measurement antenna so that the EUT system is covered within 3dB beam width of the measurement antenna at the specified measurement distance. When the beam widths of the measurement antenna are smaller than the width of the EUT system, move the measurement antenna to the left and right. The measurement distance shall be more than the Rayleigh distance.

The measurement antenna aimed at the source of emission to get the maximum emission, and the final measurement is performed at the angle where the maximum emission is observed.

5. Choose the 6 worst points on the data of the spectrum analyzer.
6. Among the points chosen in the above 6, the EUT's maximum emissions were observed with the following method.
First, set the antenna height to 1 m and rotate the turntable until the maximum emission was observed. Then, move the antenna up and down to observe the maximum emission without rotating the turntable. Again with that position, rotate the turntable to find the worst point without moving the antenna. For measurement frequency above 1000 MHz, use the same antenna position as the preliminary testing to the final test.
7. Then measurement frequency below 1000 MHz, the measurement in quasi-peak detector mode (6 dB RBW: 120 kHz) on that worst points were carried out with the EMI test receiver.
Then measurement frequency above 1000 MHz, the measurement in peak detector mode (3 dB RBW: 1 MHz) and average detector mode (3 dB RBW: 1 MHz) on that worst points were carried out with the spectrum analyzer.

1.6. 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

Conducted Emissions

Shielded Room

EMC Site 4th Site

Radiated Emissions (Below 1 GHz)

Semi-Anechoic chamber

EMC Site 4th Site

Radiated Emissions (Above 1 GHz)

Semi-Anechoic chamber

EMC Site 4th Site

A2LA Accreditation for Test Facility

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

Effective dates: 2015-09-15 through 2017-10-31

FCC Registration for Test Facility

Designation Number : JP4005
 Test Firm Registration Number : 633008

2. System Test Configuration

2.1. Validation

The system was configured for testing in a typical (as a customer would normally use it). Refer to Section 1.2 'Tested System Details' for details.

2.2. Operating Condition

Power Supply Voltage : AC 120 V / 60 Hz
The power supply voltage 120 V/ 60 Hz for the host equipment.

The tests have been carried out the following running modes.

: PC Communication mode
Data transferred from PC to EUT via USB cable.

: Music Play mode
Playing 1kHz 0 dB audio signal stored on EUT.

Please refer to attached test data for details.

2.3. Special Accessories

Special accessories needed for connecting the EUT to achieve compliance:

None

Note :

2.4. EUT Modifications

- No equipment modification to achieve compliance to Class B levels was done during the tests.
- Equipment was modified to achieve compliance to Class B level as below.

Responsible Party Signature

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

2.5. Configuration of Test System

The equipment under test (EUT) consists of:

Symbol	Item	Manufacturer	Model No.	FCC ID / DoC	Serial No.
A	Digital Music Player	SONY	NW-WS623	AK8NWWS620	2000170
B	Remote Commander	SONY	RMT-NWS10B	AK8RMTNWS10B	-
C	USB Cradle	SONY	BCR-NWWS620	N/A	-

The measurement was carried out with the following support equipment connected:

Symbol	Item	Manufacturer	Model No.	FCC ID / DoC	Serial No.
D	Personal Computer	HP	HSTNN-I42C	N/A	JPH6308MMN
E	Hub	BUFFALO	LSW-TX-5NP	N/A	16481504774092
F	AC Adaptor	HP	-	N/A	-

Type of Cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Bundled	Length (m)
1	USB Cable	ACON	YES	NO	-	0.1
2	LAN Cable	Cat6_STP_SANWA	YES	NO	-	1.0
3	DC Cable	-	NO	NO	-	1.7
4	AC Cable	-	NO	NO	-	1.0
5	AC Cable	-	NO	NO	-	1.7

System configuration

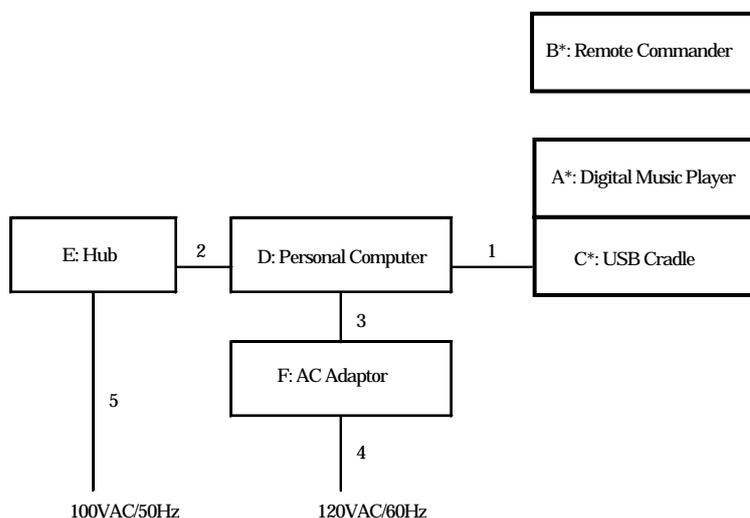
Music Play Mode

* : EUT



PC Communication Mode

* : EUT



Interconnecting Cables

Cables that hang closer than 40 cm to the ground plane is folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between the ground plane and the EUT table, shown "Bundled" in the above table.

Arrangement information on AC adaptor

Symbol "F": Arranged on ground plane (for Radiated Emissions)

Symbol "F": Arranged on the EUT table (for Conducted Emissions)

3. Conducted Emissions Measurement Photo(s)

The following photographs show the arrangement of the worst case.

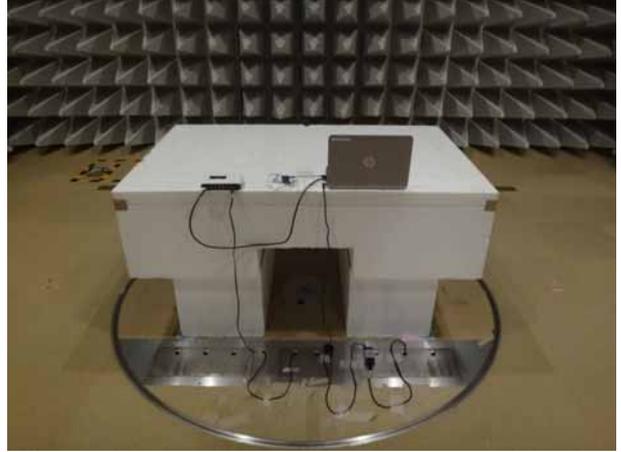
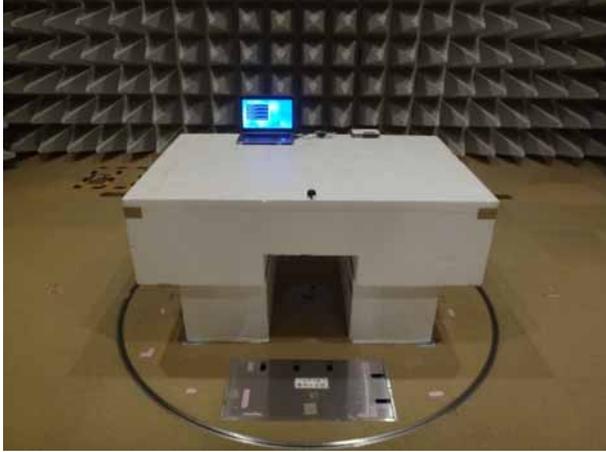
PC Communication mode



4. Radiated Emissions Measurement Photo(s)

PC Communication mode

Below 1 GHz (30 MHz – 1000 MHz)

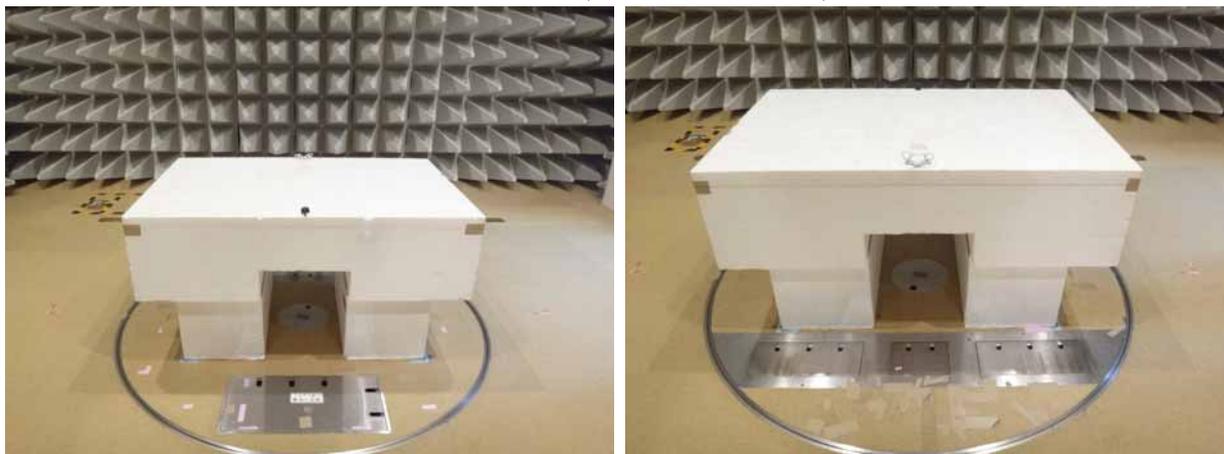


Above 1 GHz (1 GHz – 2 GHz)

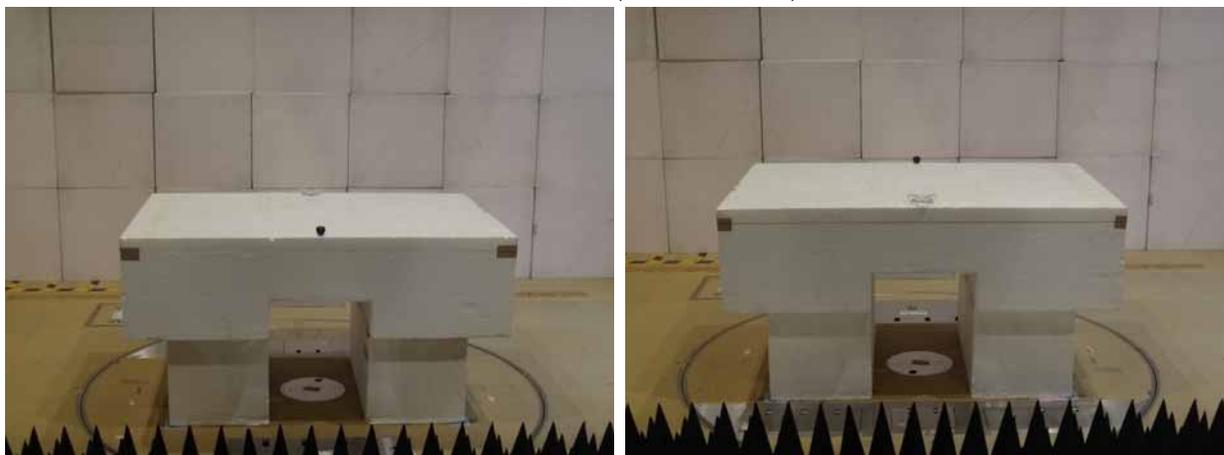


Music Play mode

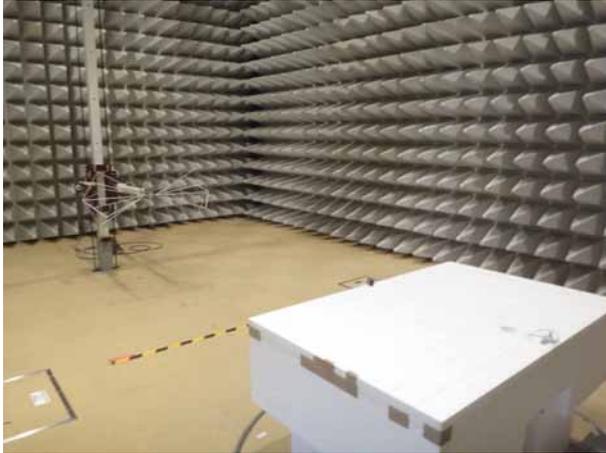
Below 1GHz (30 MHz – 1000 MHz)



Above 1GHz (1 GHz – 2 GHz)



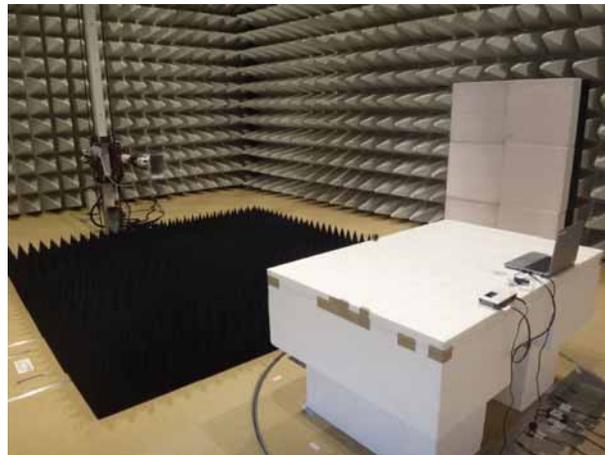
30 MHz – 300 MHz



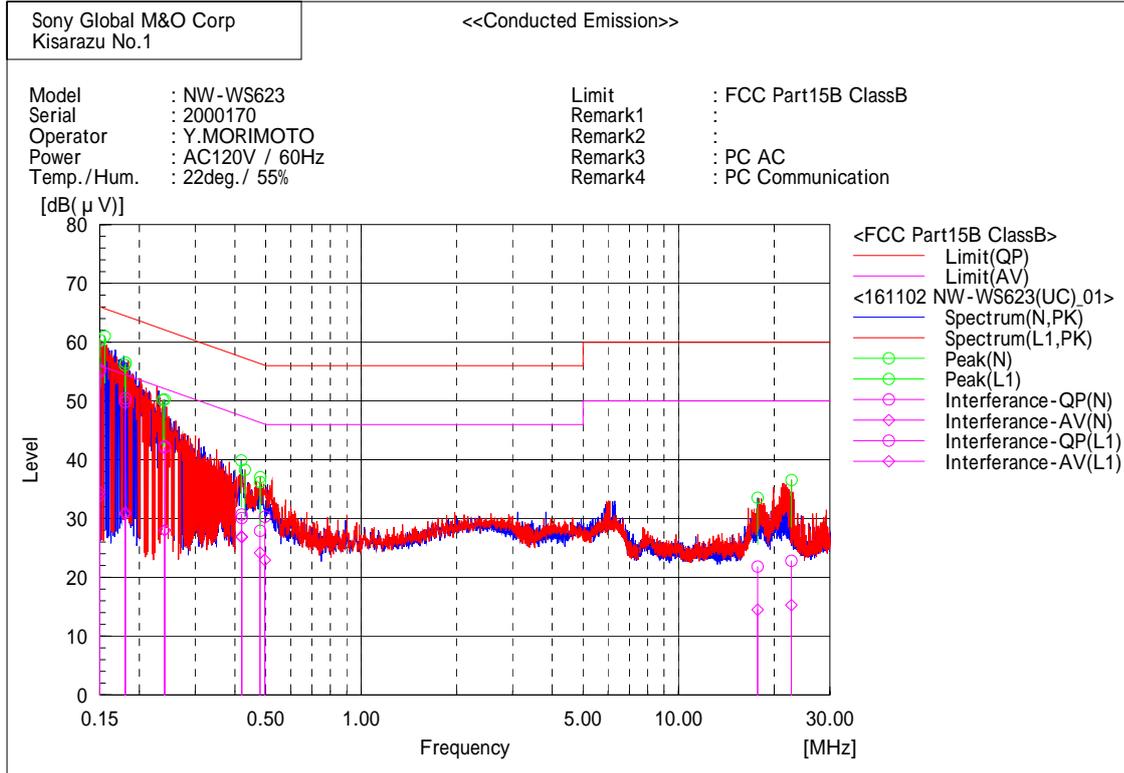
300 MHz – 1000 MHz



1 GHz – 2 GHz



PC Communication mode



Final Result

--- N Phase ---

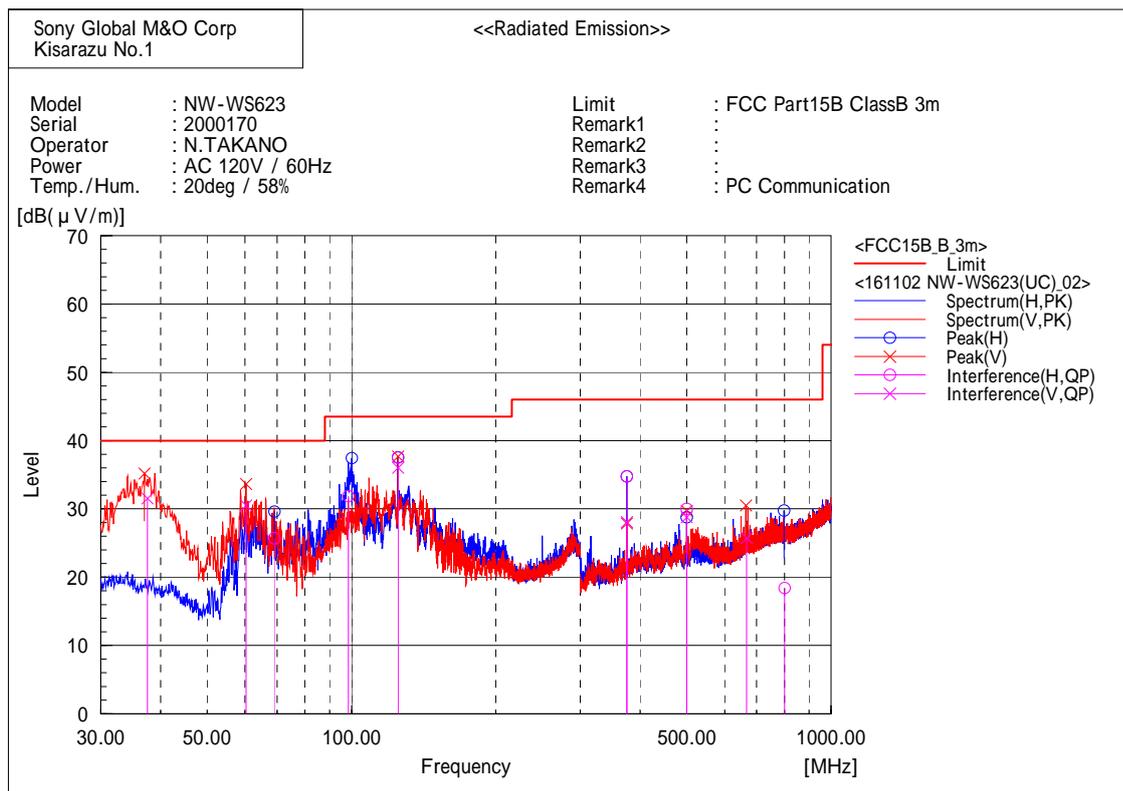
No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c.f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.150	39.3	18.5	16.0	55.3	34.5	66.0	56.0	10.7	21.5
2	0.181	34.2	14.7	16.3	50.5	31.0	64.5	54.5	14.0	23.5
3	0.241	26.6	12.3	15.7	42.3	28.0	62.1	52.1	19.8	24.1
4	0.421	14.0	10.7	16.1	30.1	26.8	57.4	47.4	27.3	20.6
5	0.480	11.8	8.1	16.1	27.9	24.2	56.3	46.3	28.4	22.1
6	17.744	5.5	-1.8	16.3	21.8	14.5	60.0	50.0	38.2	35.5

--- 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	0.150	39.1	17.9	15.9	55.0	33.8	66.0	56.0	11.0	22.2
2	0.180	33.5	14.4	16.3	49.8	30.7	64.5	54.5	14.7	23.8
3	0.240	26.4	12.3	15.7	42.1	28.0	62.1	52.1	20.0	24.1
4	0.420	14.6	10.8	16.1	30.7	26.9	57.5	47.5	26.8	20.6
5	0.497	14.2	6.8	16.1	30.3	22.9	56.0	46.0	25.7	23.1
6	22.680	6.5	-1.0	16.3	22.8	15.3	60.0	50.0	37.2	34.7

Below 1 GHz (30 - 1000 MHz)

PC Communication mode



Final Result

--- Horizontal Polarization (QP)---

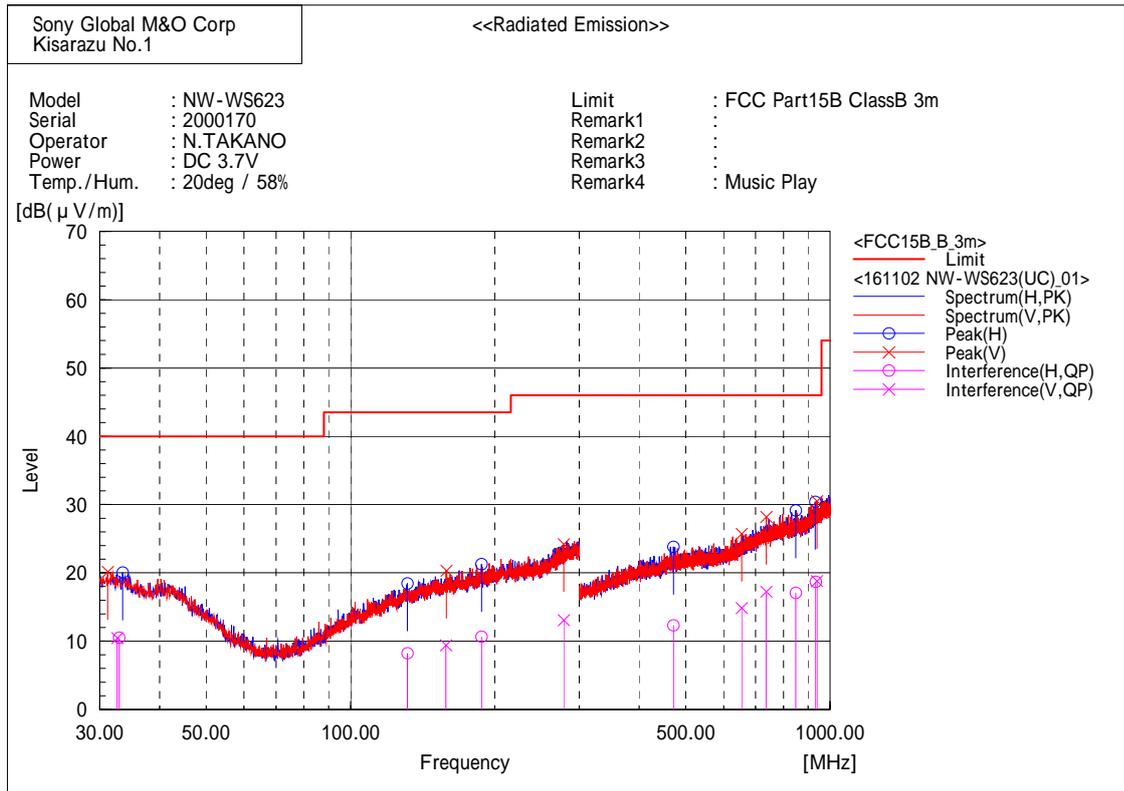
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	69.035	44.5	-18.8	25.7	40.0	14.3	247.7	186.6
2	98.477	46.1	-14.2	31.9	43.5	11.6	290.9	194.0
3	125.006	48.6	-11.1	37.5	43.5	6.0	241.5	192.1
4	375.016	42.7	-7.9	34.8	46.0	11.2	100.0	199.5
5	500.020	35.7	-5.7	30.0	46.0	16.0	100.0	217.5
6	800.037	20.0	-1.6	18.4	46.0	27.6	100.0	139.4

--- 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	37.540	40.9	-9.4	31.5	40.0	8.5	100.0	180.1
2	60.226	48.2	-17.7	30.5	40.0	9.5	152.1	126.4
3	125.006	47.1	-11.1	36.0	43.5	7.5	100.0	122.2
4	375.020	36.0	-7.9	28.1	46.0	17.9	144.4	182.4
5	500.022	34.5	-5.7	28.8	46.0	17.2	111.4	141.0
6	666.673	29.2	-3.5	25.7	46.0	20.3	100.0	148.6

Below 1 GHz (30 - 1000 MHz)

Music Play mode



Final Result

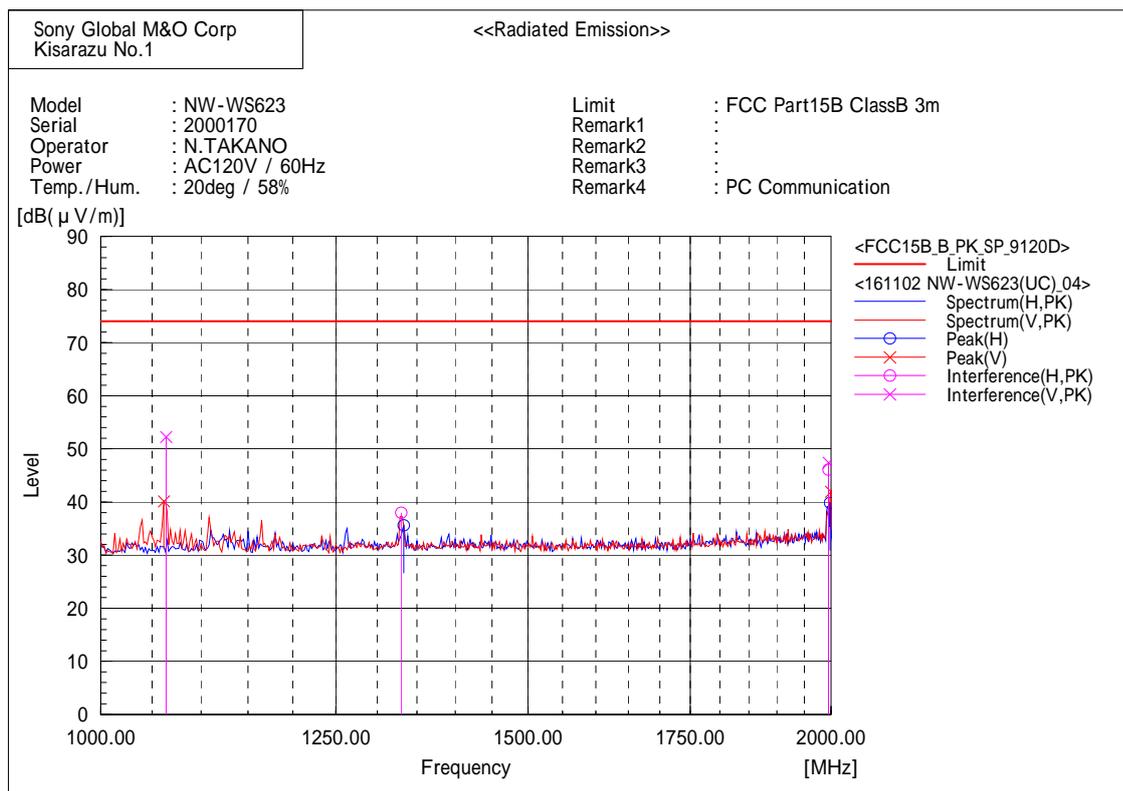
--- Horizontal Polarization (QP)---

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	32.937	19.0	-8.5	10.5	40.0	29.5	202.3	171.0
2	131.463	18.7	-10.5	8.2	43.5	35.3	363.3	31.9
3	187.615	18.7	-8.0	10.7	43.5	32.8	103.0	354.2
4	471.983	18.3	-6.0	12.3	46.0	33.7	162.6	142.0
5	848.523	18.3	-1.2	17.1	46.0	28.9	159.9	152.8
6	934.400	18.0	0.7	18.7	46.0	27.3	134.0	32.1

--- 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	32.630	19.0	-8.5	10.5	40.0	29.5	201.0	237.1
2	158.065	18.5	-9.1	9.4	43.5	34.1	396.8	228.5
3	278.369	17.8	-4.7	13.1	46.0	32.9	384.1	148.0
4	654.275	18.7	-3.8	14.9	46.0	31.1	213.3	225.0
5	736.332	19.5	-2.2	17.3	46.0	28.7	230.3	324.9
6	939.648	17.9	0.9	18.8	46.0	27.2	195.0	150.0

Above 1 GHz (1 GHz - 2 GHz): Peak
PC Communication mode



Final Result

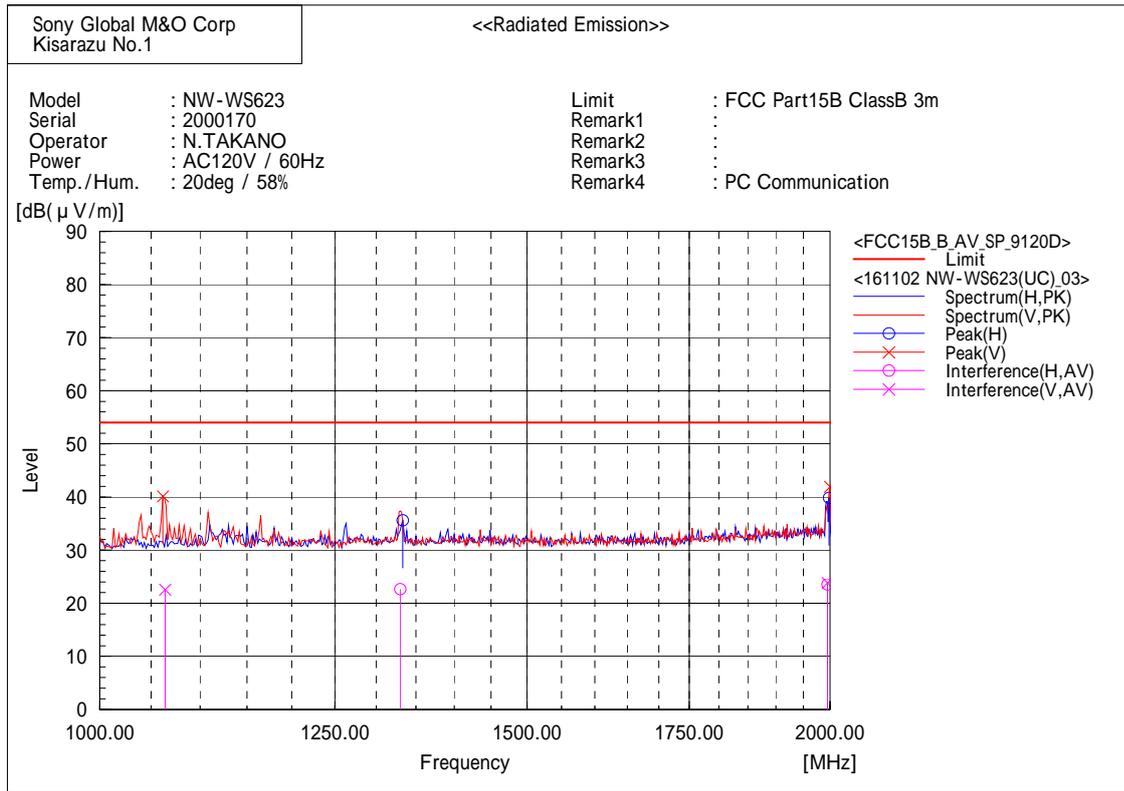
--- Horizontal Polarization (PK)---

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	1330.037	41.3	-3.3	38.0	74.0	36.0	103.6	151.4
2	1995.483	47.2	-1.1	46.1	74.0	27.9	326.1	302.7

--- 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	1064.117	56.5	-4.3	52.2	74.0	21.8	278.1	316.6
2	1995.500	48.5	-1.1	47.4	74.0	26.6	354.3	74.5

Above 1 GHz (1 GHz - 2 GHz): Average
PC Communication mode



Final Result

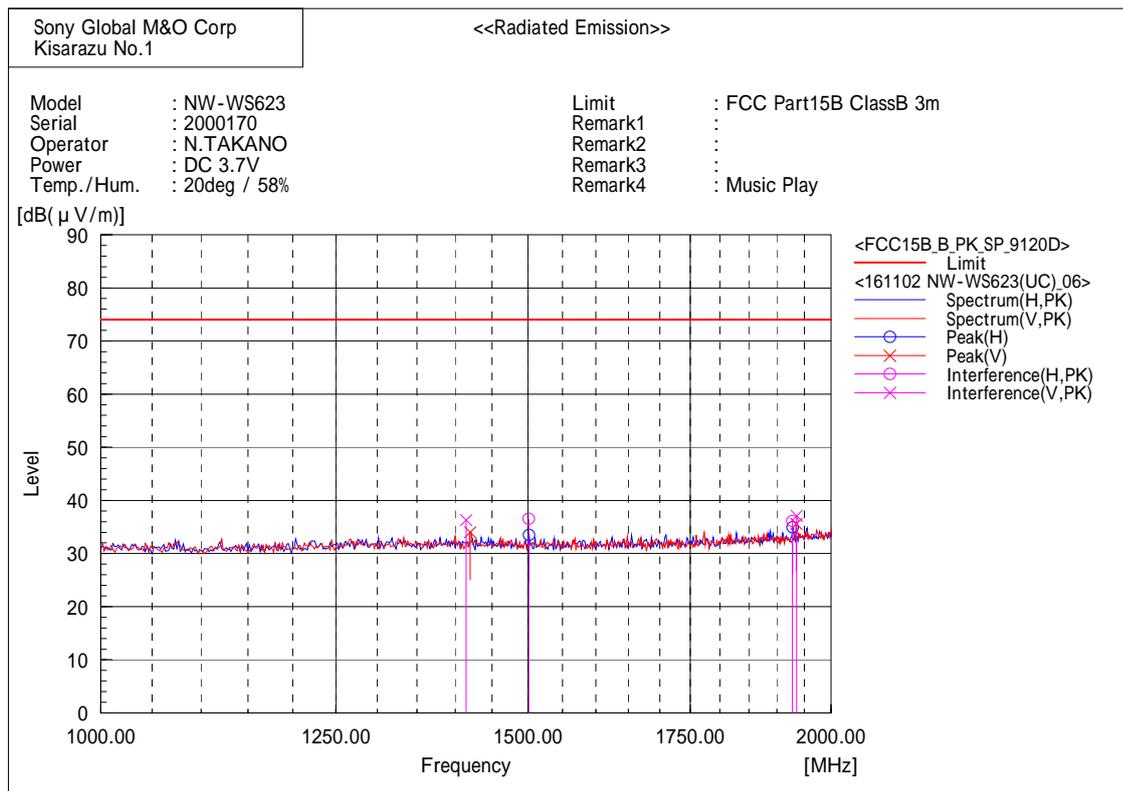
--- Horizontal Polarization (AV)---

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	1330.037	26.0	-3.3	22.7	54.0	31.3	103.2	145.4
2	1995.483	24.6	-1.1	23.5	54.0	30.5	325.1	347.5

--- 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	1064.117	26.9	-4.3	22.6	54.0	31.4	279.1	334.0
2	1995.500	24.9	-1.1	23.8	54.0	30.2	350.9	66.1

Above 1 GHz (1 GHz - 2 GHz): Peak
Music Play mode



Final Result

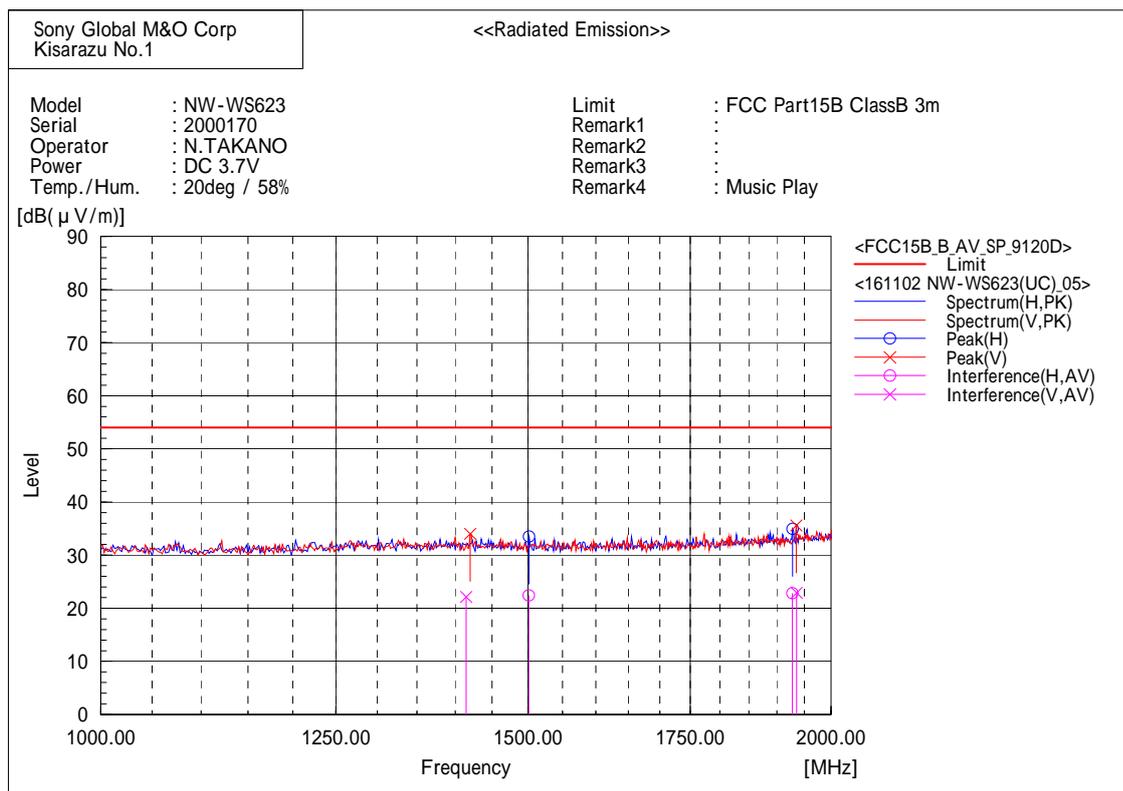
--- Horizontal Polarization (PK)---

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	1501.354	39.6	-3.1	36.5	74.0	37.5	240.0	68.6
2	1928.116	37.7	-1.6	36.1	74.0	37.9	241.0	62.6

--- 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	1414.454	39.4	-3.1	36.3	74.0	37.7	365.1	55.4
2	1935.706	38.7	-1.6	37.1	74.0	36.9	287.8	175.0

Above 1 GHz (1 GHz - 2 GHz): Average
Music Play mode



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	1501.354	25.5	-3.1	22.4	54.0	31.6	237.0	62.9
2	1928.116	24.4	-1.6	22.8	54.0	31.2	218.3	173.2

--- 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	1414.454	25.3	-3.1	22.2	54.0	31.8	366.8	68.6
2	1935.706	24.5	-1.6	22.9	54.0	31.1	287.4	166.0

8. List of Test Equipment

8.1 Conducted Emissions

EMC Site Shielded Room:

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	M485	EMI Receiver	ESCI	100626	Rohde & Schwarz	12	16.04.18
x	CS015	N-CE Cable System	-	-	EMC/RF Test Lab.	12	16.06.03
x	M569	HIGH FREQUENCY FUSE	MP612A	-	Anritsu	12	16.06.03
x	M663	6dB Attenuator	6806.01.A	-	Anritsu	12	16.06.03
x	M130	RF Selector	NS4903	0109001	TOYO Corp.	12	16.06.03
x	M605	LISN	ENV216	101305	Rohde & Schwarz	12	16.08.04
-	M027	LISN	KNW-407	8-714-1	Kyoritsu	12	16.02.01
-	M621	LISN	KNW-407	8-665-11	Kyoritsu	12	16.09.15
-	M622	LISN	KNW-242	8-688-1	Kyoritsu	12	16.09.15
x	M625	LISN	KNW-242C	8-875-9	Kyoritsu	12	16.08.23
-	M832	LISN	ENV216	100281	Rohde & Schwarz	12	15.12.01
-	M056	50 ohm Terminator	CT-01	No.1	TME	12	16.01.27
x	M645	50 ohm Terminator	T1302	-	Stack	12	16.08.23
-	M155	50 ohm Terminator	T1302	-	Stack	12	16.09.15
-	M166	50 ohm Terminator	T1302	-	Stack	12	16.09.15
x	M688	Thermo Meter	AD-5640A	201302	A&D	12	16.10.06
-	M749	Thermo Meter	CTH-201	004	Nihon Denkei	12	16.09.02

8.2 Radiated Emissions

EMC Site 3m Semi-Anechoic Chamber

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	M115	Semi-Anechoic Chamber	3m	7D1-8A11	Otsuka Science	12	16.06.03
x	M686	EMI Receiver	N9038A	MY52260113	Agilent	12	15.11.11
x	A089	Biconical Antenna	BBA9106	VHA91032835	Schwarzbeck	12	16.01.27
x	A088	Log periodic Antenna	UHALP9108A1	0643	Schwarzbeck	12	16.01.27
x	A064	Horn Antenna (1-6GHz)	BBHA9120D	746	SCHAFFNER	12	16.01.27
-	A026	Horn Antenna (1-6GHz)	BBHA9120B	222	SCHAFFNER	12	16.01.27
-	A078	Horn Antenna (6-18GHz)	HAP6-18W	00000070	TOYO Corp.	12	16.02.04
x	CS017	N-RE Cable SYSTEM 1	-	-	EMC/RF Test Lab.	12	16.06.03
x	CS018	N-RE Cable SYSTEM 2	-	-	EMC/RF Test Lab.	12	16.06.03
x	CS074/075	N-RE Cable SYSTEM 4	-	-	EMC/RF Test Lab.	12	16.06.03
x	M126	Step Attenuator	8494H	3837M01144	Agilent	12	16.06.03
-	M752	Pre Amplifier	310N	320621	SONOMA INSTRUMENT	12	16.06.03
x	M128	Attenuator (3dB)	8491A	53541	Agilent	12	16.06.03
x	M609	Attenuator (3dB)	8491B	MY39265960	Agilent	12	16.06.03
x	M737	GHz Filter Box	FB-G1	001	Sony EMCS	12	16.06.03
-	A401	Test Loop	LPT-070	3487212	Leader	-	N/A
x	M687	Thermo Meter	AD-5640A	201301	A&D	12	16.10.06

8.3 Measurement software

	Cont.#	Description	Model No.	Ver. No.	Manufacturer
x	SW-012	Radiated Emission Software	V-Scan	4.0.30	Toyo Corporation
x	SW-014	Conducted Emission Software	EP5/CE	5.0.0	Toyo Corporation

About calibration interval

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