

RADIO TEST REPORT

(for NFC)

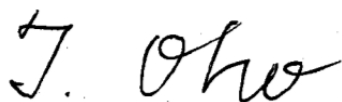
Project No. : JB-Z0282-A
Client : Sony Corporation
Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
Type of Equipment : Digital Music Player
Model No. : NW-A45
FCC ID : AK8NWA40
Regulation Applied : 47 CFR Part 15 Subpart C
Final Judgment : **Passed**
Sample Receipt : April 24, 2017
Testing : May 10, 2017 - June 22, 2017
Original Reported : June 22, 2017
Amend Reported : June 28, 2017

Amend:

Original report JB-Z0285 is replaced to this report for the following reasons:

- Correction for KDB number on page 6
- Addition of AC Power-line Conducted Emissions 13.56 MHz on Page 12

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

1. General Information	3
1.1. Description of Equipment Under Test (EUT).....	3
1.2. Summary of Test Result.....	3
1.3. Tested Methodology	4
1.4. Measurement Procedures	4
1.5. Test Facility.....	7
1.6. Uncertainty	7
2. System Test Configuration.....	8
2.1. Validation	8
2.2. Test Operating Conditions	8
2.3. Special Accessories	8
2.4. EUT Modifications	8
2.5. Configuration of Tested System	9
3. Test Data.....	12
3.1. AC Power-line Conducted Emissions	12
3.2. 20dB Bandwidth.....	13
3.3. Frequency Tolerance.....	14
3.4. Electric field strength (Fundamental and Spurious emissions).....	14
4. Method of Calculation.....	17
4.1. AC Power-line Conducted Emissions Measurement.....	17
4.2. Frequency Tolerance Measurement	17
4.3. Electric field strength Measurement	17
5. List of Test Equipment	18
5.1. AC Power-line Conducted Emissions	18
5.2. 20dB Bandwidth / Frequency Tolerance	18
5.3. Electric field strength (Fundamental and Spurious emissions).....	18
6. Photographs of test setup	19
6.1. AC Power-line Conducted Emissions Measurement Photo(s)	19
6.2. 20dB Bandwidth / Frequency Tolerance Measurements Photo(s)	19
6.3. Electric field strength Measurement Photo(s).....	20

Note

☒-indicates that be listed condition, standard or equipment is applicable for this report.

☐-indicates that be 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 : Digital Music Player
 Trade Name : SONY
 Model No. : NW-A45
 Serial No. : 1000057, 1000279
 Power Rating : DC 3.7V

Similar model(s) to be covered by this report

Model No. :

Model No.	Point of Difference
NW-A45	Memory size only. (16 GB) *EUT
NW-A46	Memory size only. (32 GB)
NW-A47	Memory size only. (64 GB)

This point of difference do not affect the measurement results.
 Total 3 models are covered by this report.

Radio specification

Function of the Equipment : Transceiver
 Operating Frequency : 13.56MHz
 Modulation Type : ASK
 Antenna Type : Loop antenna
 Operating Temperature : +5 to +35 deg.C

1.2. Summary of Test Result

Test Item	Worst Margin	Test Frequency band	Results
AC Power-line Conducted Emissions	12.1 dB (QP) 0.151 MHz L1	150 kHz - 30 MHz	Complied
Electric field strength of fundamental emissions	77.10 dB (QP) 13.560 MHz Vertical	13.553 - 13.567 MHz	Complied
Electric field strength of Spurious emissions within 13.110 - 14.010MHz	54.71 dB (QP) 13.364 MHz Vertical	13.110 - 14.010 MHz (excluding 13.553 - 13.567MHz band)	Complied
Electric field strength of Spurious emissions outside 13.110 - 14.010MHz	22.9 dB (QP) 940.800 MHz Horizontal	9 kHz - 1 GHz (excluding 13.110 - 14.010MHz band)	Complied
20dB Bandwidth	Refer to the test data	Carrier	Complied
Frequency Tolerance	Refer to the test data	Carrier	Complied

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 Part 15 Subpart C
Test Method : ANSI C63.10 - 2013

Test Condition

Radiated Spurious Emissions

Test Distance : ☒ 3 m ☐ 10m (9kHz - 30 MHz)
☒ 3 m ☐ 10m (30 - 1000 MHz)

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

AC Power-line Conducted Emissions

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

1.4. Measurement Procedures

We performed the measurements in accordance with NV3-14, available upon the request.

- ☒ No deviation
☐ Deviation from the above procedure

The summary of the above procedure is mentioned below

20dB Bandwidth

1. The magnetic field probe was located near the EUT and connected to the spectrum analyzer.
2. For each EUT operation mode, the 20dB Bandwidth was measured with spectrum analyzer.
Detector type : Peak
RBW : 30kHz

Frequency Tolerance

1. The EUT was placed in the temperature chamber.
2. The magnetic field probe was located near the EUT and connected to the spectrum analyzer.
3. For each EUT operation mode, the Frequency Tolerance was measured with spectrum analyzer at the start-up, and 2, 5, and 10 minutes, after the start-up.
Detector type : Peak
RBW : 100Hz
4. Frequency stability measurement was carried out from the high temperature to low temperature in order.

AC Power-line Conducted Emissions

1. 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.
2. 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.
3. The LISN was placed in 80 cm from the nearest part of the EUT chassis.
4. 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.
5. The connection of the all other equipment to the second LISN was performed. The second LISN was terminated with a 50-ohm terminator.
6. 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.
7. 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.
(150kHz - 30MHz, peak detector, RBW: 10 kHz)
8. On the worst condition of the EUT found in above, choose the 6 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)

Electric field strength (Fundamental and 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. 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 - 1 GHz, peak detector)

5. On the worst arrangement of the EUT found in above, choose the fundamental emissions and three highest harmonics or spurious emissions on the spectrum data.

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;

	9kHz - 30MHz	30MHz - 1000MHz
Antenna	Loop Antenna	Bi-conical Antenna, Log-periodic Antenna
Antenna scanning range	1m, Vertical, 360 degrees	1 - 4m, Horizontal and Vertical
Turntable rotating range	360 degrees	360 degrees

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
Detector	Peak / Average	Quasi-Peak	Quasi-Peak
RBW	200 Hz (6dB) or 9 kHz (6dB) *1	200 Hz (6dB) or 9 kHz (6dB) *1	120 kHz (6dB)
Instrument	EMI test receiver	EMI test receiver	EMI test receiver

*1: When the measurement frequencies below 150 kHz, RBW: 200 Hz was used.

6. The measurement values were compensated the distance factor with follows;

$$9 \text{ kHz} - 490 \text{ kHz} [\text{value at } 300\text{m}] = [\text{value at } 3\text{m}] + 40\log(3[\text{m}] / 300[\text{m}])$$

$$490 \text{ kHz} - 30 \text{ MHz} [\text{value at } 30\text{m}] = [\text{value at } 3\text{m}] + 40\log(3[\text{m}] / 30[\text{m}])$$
7. 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

AC Power-line Conducted Emissions

Shielded Room
☒ 4th Site ☐ EMC Site

20dB Bandwidth

Shielded Room
☒ 4th Site SR1

Frequency Tolerance

Shielded Room
☒ 4th Site SR1

Electric field strength (Fundamental and Spurious emissions)

Semi-Anechoic chamber
☒ 4th Site ☐ EMC 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

1.6. Uncertainty

Test Item	4th Site SR1
Frequency Tolerance	$\pm 1.77 * 10^{-6}$

Test Item	Frequency		4th Site	EMC Site
AC Power-line Conducted Emissions	150kHz - 30MHz		± 3.34 dB	± 3.35 dB
Radiated Emissions (EUT height 0.8m)	below 30 MHz	3m	± 2.59 dB	± 3.12 dB
	30 - 300 MHz	3m	± 4.18 dB	± 5.26 dB
	300 - 1000 MHz	3m	± 4.04 dB	± 4.37 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 *1	Data Rate	Test Channels
AC Power-line Conducted Emissions	Type F (with Tag) *2, 4	212kbps *3	13.56MHz
Electric field strength (Fundamental and Spurious emissions), 20dB Bandwidth	Type F (without Tag) *2	212kbps *3	13.56MHz
Frequency Tolerance	Unmodulated	-	13.56MHz

Note:

*1: The operating mode(s) has been configured by the software: Diagnosis Ver.1.02.10

*2: The operating with Tag mode was performed while exploratory testing.

*3: Data Rate has been decided based on the result of Electric field strength of fundamental emissions.

*4: The final test was performed with the representative mode that had been found as the worst emission mode while exploratory testing.

Extreme test condition:

Test Items	Test Temperature	Test Voltage
Frequency Tolerance	-30 deg.C to +50 deg.C	3.7V
	+20 deg.C	3.15V and 4.26V

2.3. Special Accessories

Special accessories needed for connecting the EUT to achieve compliance:

Item	Manufacturer	Model No.	Serial No.	Remark
Tag (Type F)	SONY	-	-	-

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 Tested System

Electric field strength Measurement

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A-1	Digital Music Player	SONY	NW-A45	1000057

Support equipment for operation

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

Type of cable

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

System configuration

*: EUT



20dB Bandwidth / Frequency Tolerance Measurements

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A-2	Digital Music Player	SONY	NW-A45	1000279

Support equipment for operation

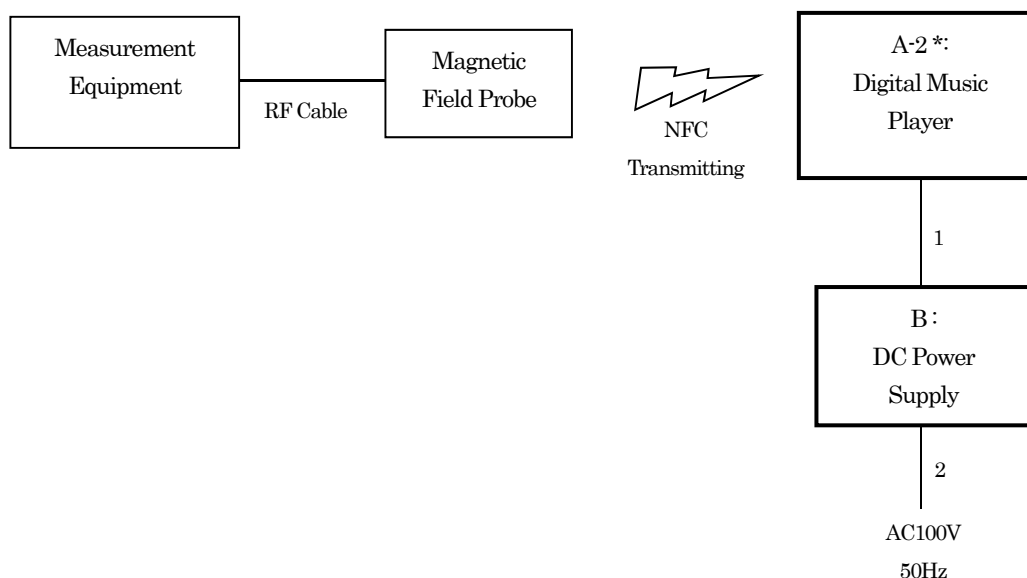
Symbol	Item	Manufacturer	Model No.	Serial No.
B	Regulated DC Power Supply	KENWOOD	PW18-1.3AT	08046429

Type of cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Bundled	Length (m)
1	DC cable	-	NO	NO	NO	1.8
2	AC cable	-	NO	NO	NO	0.9

System configuration

*: EUT



AC Power-line Conducted Emissions Measurement

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A-1	Digital Music Player	SONY	NW-A45	1000057

Support equipment for operation

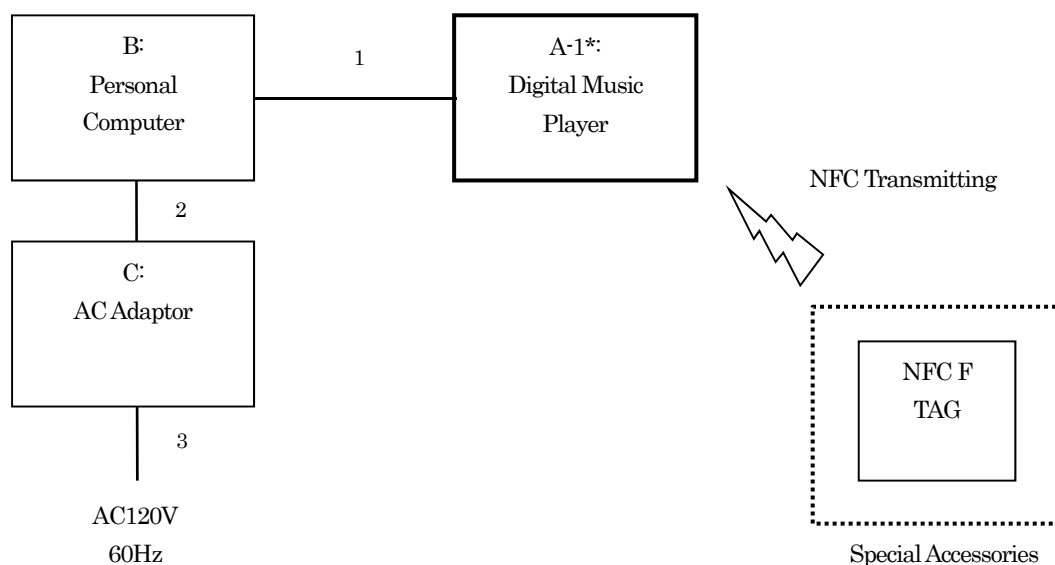
Symbol	Item	Manufacturer	Model No.	Serial No.
B	Personal Computer	HP	HSTNN-I42C	JPH6308MMN
C	AC Adaptor	HP	HSTNN-CA41	WDVTN0CGC9X3WG 0C

Type of cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Length (m)	Bundled
1	USB cable	SONY	YES	NO	1.0	-
2	DC cable	-	NO	NO	1.8	-
3	AC cable	-	NO	NO	0.9	-

System configuration

*: EUT

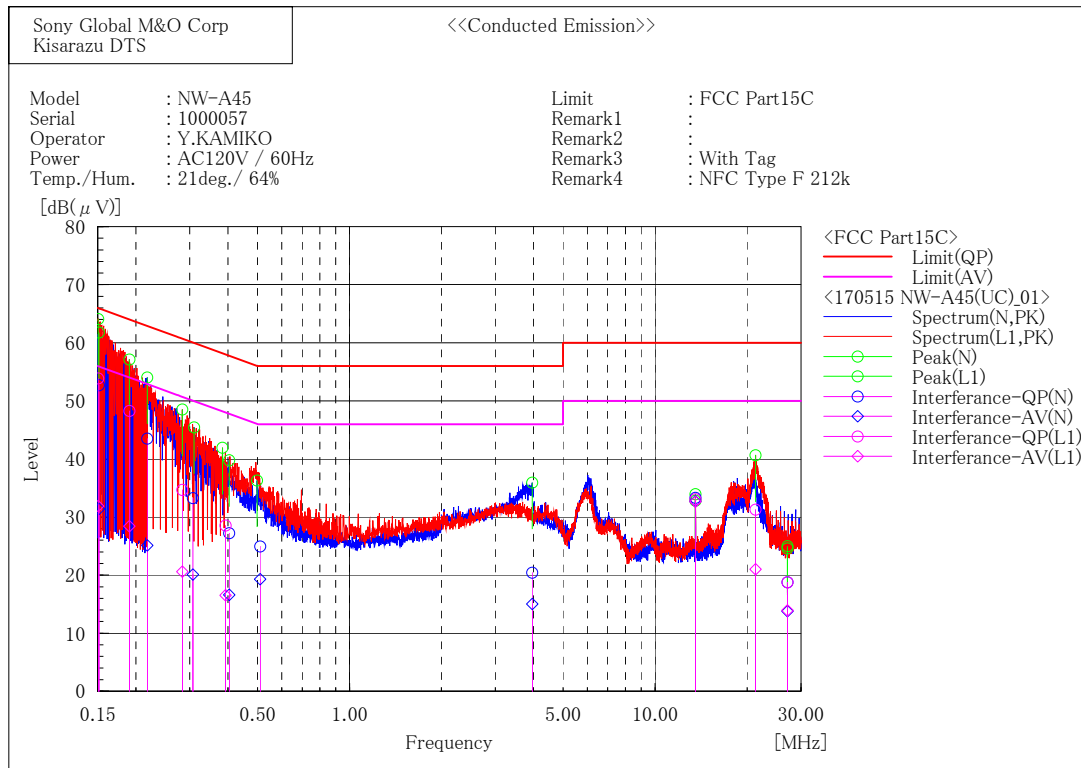


3. Test Data

3.1. AC Power-line Conducted Emissions

1) Date of measurement : May 15, 2017

[Type F]



Final Result

--- N Phase ---										
No.	Frequency [MHz]	Reading QP [dB(μ V)]	Reading AV [dB(μ V)]	c.f [dB]	Result QP [dB(μ V)]	Result AV [dB(μ V)]	Limit QP [dB(μ V)]	Limit AV [dB(μ V)]	Margin QP [dB]	Margin AV [dB]
1	0.152	36.8	15.5	15.9	52.7	31.4	65.9	55.9	13.2	24.5
2	0.218	27.7	9.3	15.8	43.5	25.1	62.9	52.9	19.4	27.8
3	0.307	17.3	4.1	16.0	33.3	20.1	60.0	50.0	26.7	29.9
4	0.404	11.0	0.4	16.2	27.2	16.6	57.8	47.8	30.6	31.2
5	0.510	8.7	3.1	16.2	24.9	19.3	56.0	46.0	31.1	26.7
6	3.960	4.4	-0.9	16.0	20.4	15.1	56.0	46.0	35.6	30.9
7	13.560	17.0	16.4	16.3	33.3	32.7	60.0	50.0	26.7	17.3
8	27.120	2.3	-2.7	16.5	18.8	13.8	60.0	50.0	41.2	36.2

--- L1 Phase ---										
No.	Frequency [MHz]	Reading QP [dB(μ V)]	Reading AV [dB(μ V)]	c.f [dB]	Result QP [dB(μ V)]	Result AV [dB(μ V)]	Limit QP [dB(μ V)]	Limit AV [dB(μ V)]	Margin QP [dB]	Margin AV [dB]
1	0.151	38.1	16.1	15.8	53.9	31.9	66.0	56.0	12.1	24.1
2	0.191	32.3	12.4	16.0	48.3	28.4	64.0	54.0	15.7	25.6
3	0.284	18.8	4.7	15.9	34.7	20.6	60.7	50.7	26.0	30.1
4	0.393	12.3	0.3	16.2	28.5	16.5	58.0	48.0	29.5	31.5
5	13.560	16.8	16.4	16.2	33.0	32.6	60.0	50.0	27.0	17.4
6	21.308	14.9	4.6	16.4	31.3	21.0	60.0	50.0	28.7	29.0
7	27.120	2.3	-2.6	16.5	18.8	13.9	60.0	50.0	41.2	36.1

3.2. 20dB Bandwidth

- 1) Ambient temperature
- : 23.4 deg.C
- 2) Relative humidity
- : 59.5 %
- 3) Date of measurement
- : May 15, 2017
- 4) Measured by
- : M.KOUGA
- 5) Operating mode
- : Transmitting mode

Mode		Channel [MHz]	Result [kHz]	Limit [kHz]
Type F	212kbps	13.56	76.60	-

[Type F]



3.3. Frequency Tolerance

- 1) Ambient temperature : 23.4 deg.C
 2) Relative humidity : 59.5 %
 3) Date of measurement : May 15, 2017
 4) Measured by : M.KOUGA
 5) Operating mode : Transmitting mode (Unmodulated)

Test Temperature	Test Voltage	Test Conditions	Frequency [MHz]	Reading [MHz]	Tolerance [MHz]	Tolerance [%]	Limit [%]
50deg.C	3.7V	Start up	13.56	13.559946	-0.000054	-0.000398	± 0.01
		After 2min	13.56	13.559940	-0.000060	-0.000442	± 0.01
		After 5min	13.56	13.559937	-0.000063	-0.000465	± 0.01
		After 10min	13.56	13.559936	-0.000064	-0.000472	± 0.01
40deg.C	3.7V	Start up	13.56	13.559990	-0.000010	-0.000074	± 0.01
		After 2min	13.56	13.559979	-0.000021	-0.000155	± 0.01
		After 5min	13.56	13.559974	-0.000026	-0.000192	± 0.01
		After 10min	13.56	13.559969	-0.000031	-0.000229	± 0.01
30deg.C	3.7V	Start up	13.56	13.560045	0.000045	0.000332	± 0.01
		After 2min	13.56	13.560030	0.000030	0.000221	± 0.01
		After 5min	13.56	13.560021	0.000021	0.000155	± 0.01
		After 10min	13.56	13.560014	0.000014	0.000103	± 0.01
20deg.C	3.7V	Start up	13.56	13.560054	0.000054	0.000398	± 0.01
		After 2min	13.56	13.560053	0.000053	0.000391	± 0.01
		After 5min	13.56	13.560053	0.000053	0.000391	± 0.01
		After 10min	13.56	13.560053	0.000053	0.000391	± 0.01
10deg.C	3.7V	Start up	13.56	13.560082	0.000082	0.000605	± 0.01
		After 2min	13.56	13.560083	0.000083	0.000612	± 0.01
		After 5min	13.56	13.560089	0.000089	0.000656	± 0.01
		After 10min	13.56	13.560093	0.000093	0.000686	± 0.01
0deg.C	3.7V	Start up	13.56	13.560120	0.000120	0.000885	± 0.01
		After 2min	13.56	13.560121	0.000121	0.000892	± 0.01
		After 5min	13.56	13.560124	0.000124	0.000914	± 0.01
		After 10min	13.56	13.560126	0.000126	0.000929	± 0.01
-10deg.C	3.7V	Start up	13.56	13.560138	0.000138	0.001018	± 0.01
		After 2min	13.56	13.560139	0.000139	0.001025	± 0.01
		After 5min	13.56	13.560140	0.000140	0.001032	± 0.01
		After 10min	13.56	13.560140	0.000140	0.001032	± 0.01
-20deg.C	3.7V	Start up	13.56	13.560134	0.000134	0.000988	± 0.01
		After 2min	13.56	13.560133	0.000133	0.000981	± 0.01
		After 5min	13.56	13.560130	0.000130	0.000959	± 0.01
		After 10min	13.56	13.560128	0.000128	0.000944	± 0.01
-30deg.C	3.7V	Start up	13.56	13.560092	0.000092	0.000678	± 0.01
		After 2min	13.56	13.560095	0.000095	0.000701	± 0.01
		After 5min	13.56	13.560088	0.000088	0.000649	± 0.01
		After 10min	13.56	13.560083	0.000083	0.000612	± 0.01
20deg.C	3.15V	Start up	13.56	13.560056	0.000056	0.000413	± 0.01
		After 2min	13.56	13.560053	0.000053	0.000391	± 0.01
		After 5min	13.56	13.560054	0.000054	0.000398	± 0.01
		After 10min	13.56	13.560055	0.000055	0.000406	± 0.01
20deg.C	4.26V	Start up	13.56	13.560055	0.000055	0.000406	± 0.01
		After 2min	13.56	13.560051	0.000051	0.000376	± 0.01
		After 5min	13.56	13.560051	0.000051	0.000376	± 0.01
		After 10min	13.56	13.560051	0.000051	0.000376	± 0.01

3.4. Electric field strength (Fundamental and Spurious emissions)

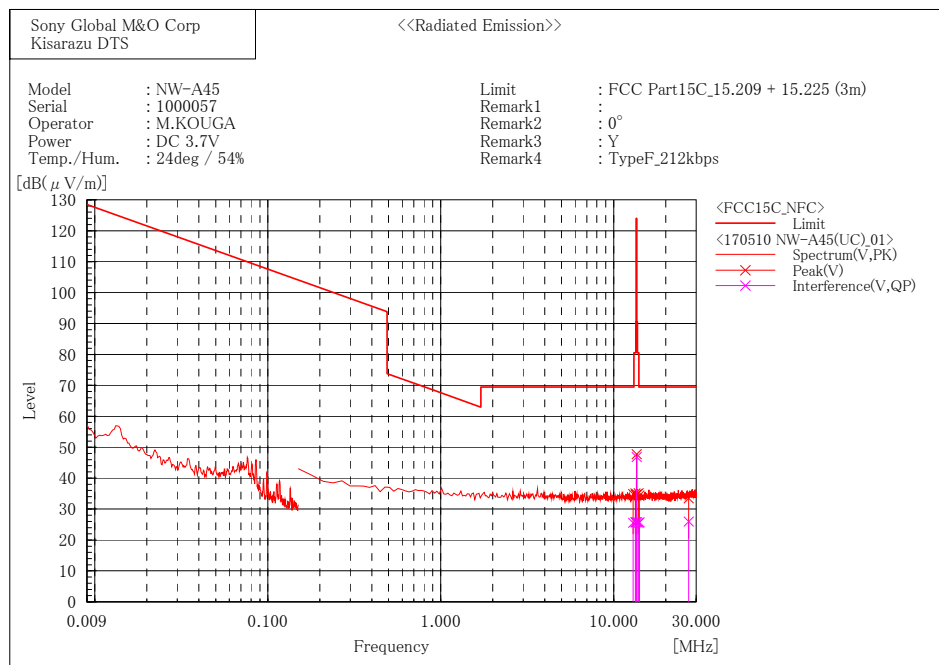
1) Date of measurement

9kHz - 30MHz : May 10, 2017 (all mode)

30MHz - 1000MHz : May 11, 2017 (all mode)

9 kHz - 30 MHz

[Type F]



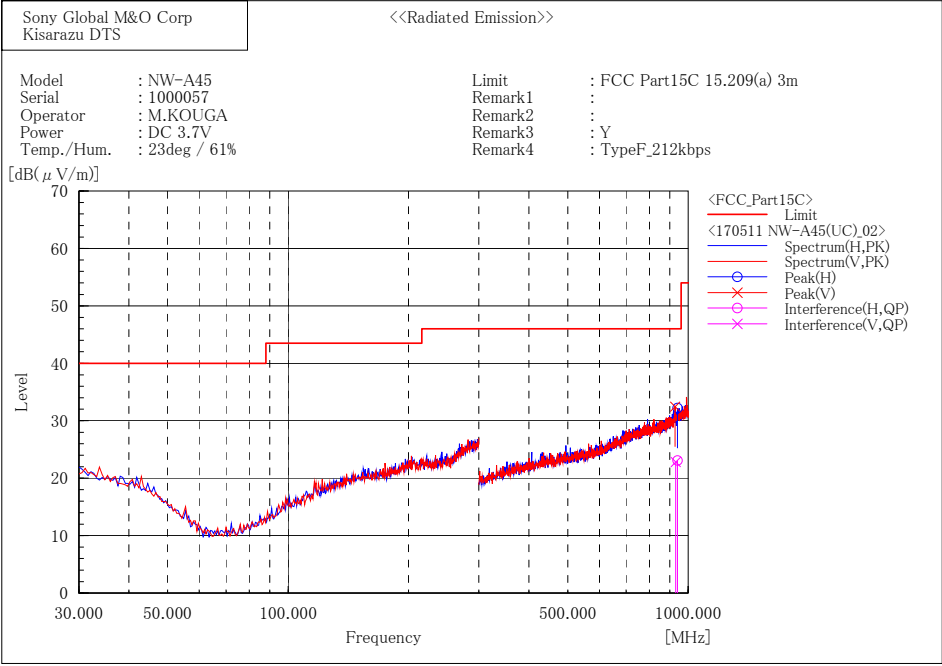
Final Result

--- 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	12.950	5.4	20.2	25.6	69.5	43.9	100.0	29.0
2	13.364	5.6	20.2	25.8	80.5	54.7	100.0	260.2
3	13.435	5.5	20.2	25.7	90.5	64.8	100.0	226.5
4	13.560	26.7	20.2	46.9	124.0	77.1	100.0	269.9
5	13.638	5.6	20.2	25.8	90.5	64.7	100.0	275.6
6	13.931	5.5	20.1	25.6	80.5	54.9	100.0	285.1
7	14.129	5.6	20.1	25.7	69.5	43.8	100.0	90.3
8	27.121	5.4	20.6	26.0	69.5	43.5	100.0	264.9

Mode		Frequency [MHz]	Polar.	Result (3m) [dBuV/m]	Distance Factor [dB]	Result(30m) [dBuV/m]	Limit (30m) [dBuV/m]	Margin [dB]
Type F	212kbps	12.950	V	25.60	-40.00	-14.40	29.54	43.94
		13.364	V	25.80	-40.00	-14.20	40.51	54.71
		13.435	V	25.70	-40.00	-14.30	50.47	64.77
		13.560	V	46.90	-40.00	6.90	84.00	77.10
		13.638	V	25.80	-40.00	-14.20	50.47	64.67
		13.931	V	25.60	-40.00	-14.40	40.51	54.91
		14.129	V	25.70	-40.00	-14.30	29.54	43.84
		27.121	V	26.00	-40.00	-14.00	29.54	43.54

30 MHz - 1000 MHz
[Type F]



Final Result

--- Horizontal Polarization (QP)---									
No.	Frequency	Reading	c.f	Result	Limit	Margin	Height	Angle	
	[MHz]	[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	[cm]	[°]	
1	940.800	24.4	-1.3	23.1	46.0	22.9	100.0	258.2	
--- Vertical Polarization (QP)---									
No.	Frequency	Reading	c.f	Result	Limit	Margin	Height	Angle	
	[MHz]	[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	[cm]	[°]	
1	930.200	24.5	-1.6	22.9	46.0	23.1	130.2	246.6	

4. Method of Calculation

4.1. AC Power-line Conducted Emissions Measurement

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

$$\text{Test Result [dBuV]} = \text{Meter Reading [dBuV]} + \text{C.F. [dB]}$$

Notes :

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

4.2. Frequency Tolerance Measurement

Method of calculation : Software
 The Software for Calculation Name : SW-310
 Version : Ver2.2

$$\text{Test Result [\%]} = (\text{Meter Reading [MHz]} - 13.56 [\text{MHz}]) / 13.56 [\text{MHz}] * 100$$

Notes :

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

4.3. Electric field strength Measurement

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

$$\text{Test Result [dBuV/m]} = \text{Meter Reading [dBuV]} + \text{C.F. [dB/m]}$$

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)

5. List of Test Equipment

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

5.1. AC Power-line Conducted Emissions

4th Site Shielded Room

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	-	Shielded Room	-	-	TDK	-	-
x	M515	EMI Receiver	ESCI	100606	Rohde & Schwarz	12	16.08.04
x	CS043	4th Site CE Cable SYSTEM	-	-	EMC/RF Test Lab.	12	17.01.16
x	M664	6dB Attenuator	6806.01A	N/A	HUBER+SUHNER AG	12	17.01.16
x	M619	HIGH FREQUENCY FUSE	MP612A	N/A	Anritsu	12	17.01.16
-	M026	LISN	KNW-407	8-541-1	Kyoritsu	12	17.02.16
-	M116	LISN	KNW-242	8-888-6	Kyoritsu	12	16.07.16
-	M505	LISN	ENV216	100425	Rohde & Schwarz	12	16.06.23
x	M833	LISN (for EUT)	ENV216	100293	Rohde & Schwarz	12	17.01.11
-	M152	50 ohm Terminator	CT-01	N/A	TME	12	17.01.15
-	M153	50 ohm Terminator	CT-01	N/A	TME		16.06.23
-	M159	50 ohm Terminator	T1302	N/A	Stack	12	16.07.16
x	M690	Thermo Meter	AD-5640A	201304	A&D	12	16.11.07

5.2. 20dB Bandwidth / Frequency Tolerance

4th Site Shielded Room 1

	Control No.	Equipment	Model No.	Serial No.	Manufacturer	Cal. Int.	Last Cal.
x	-	Shield Room	B83117-B2432-T161	P26428	Albatross Project	-	-
x	W054	TEMP & HUMID CHAMBER	SH-240	91006788	ESPEC CORP.	-	-
x	W100	Signal Analyzer	MS2692A	6201338954	Anritsu	12	17.04.04
x	W057	EMI Probe	MA2601C	No.1	Anritsu	12	16.08.02
-	W029	10dB Attenuator	8493C	76549	Keysight Technologies	12	16.08.01
x	W106	Digital Multimeter	R6452A	120600443	ADVANTEST	12	16.07.21
x	M719	Thermo Meter	TH-321	140053	AS ONE	12	17.04.28
x	M722	Thermo Meter	TM-305	140005	AS ONE	12	16.07.07
		Thermo Sensor	LP-200	002	AS ONE	12	16.07.07

5.3. Electric field strength (Fundamental and Spurious emissions)

4th Site 10m Semi-Anechoic Chamber:

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	M506	EMC Chamber	10m	-	TDK	12	16.06.04
x	M575	EMI Receiver	ESCI	100161	Rohde & Schwarz	12	17.04.19
-	M669	EMI Receiver	N9038A	MY51210223	Keysight Technologies	12	16.06.08
x	A073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12	16.10.04
x	A043	Biconical Antenna	BBA9106	V5(91032598)	Schwarzbeck	12	16.06.01
x	A046	Log periodic Antenna	UHALP9108A1	0830	Schwarzbeck	12	16.06.01
x	CS039	4th Site RE Cable SYS3	-	-	EMC/RF Test Lab.	12	17.01.16
x	CS054	4th Site EMF Cable SYSTEM	-	-		12	17.01.16
x	M706	3dB Attenuator	8491A	MY39267782	Keysight Technologies	12	17.01.16
x	M510	RF Selector	NS4900	0802-226	TOYO Corp.	12	17.01.16
x	M620	RF Pre-Amp	8447D	2944A10720	Keysight Technologies	12	17.01.16
x	M689	Thermo Meter	AD-5640A	201303	A&D	12	16.11.07

About calibration interval

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