RADIO TEST REPORT

Project No.	:	JB-Z0048-C
Client	:	Sony Corporation
Address	:	1-7-1 Konan, Minato-ku Tokyo 108-0075, Japan
Type of Equipment	:	Digital Media Player (for NFC part)
Model No.	:	NW-A27
Serial No.	:	001, 002
FCC ID	:	AK8NWA20
IC	:	409B-NWA20
Regulation Applied	:	47 CFR Part 15 Subpart C / RSS-Gen Issue 4 / RSS-210 Issue 8 + Amendment 1
Final Judgment	**:**	**Passed**
Sample Receipt	:	March 16, 2015
Testing	:	April 13, 2015 - April 16, 2015
Reported	:	May 11, 2015

Reported by :

Takanori Oho
Test Engineer
EMC/ RF Test Laboratory Main Lab.
Design Technology Division
Sony EMCS Corporation

Approved Signatory :

Teruki Kurihara
Technical Manager
EMC/ RF Test Laboratory Main Lab.
Design Technology Division
Sony EMCS 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 EMCS EMC/ RF Test Laboratory.

ACCREDITED
TESTING CERT #3203.01

TABLE OF CONTENTS

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 Media Player
Trade Name : SONY
Model No. : NW-A27
Serial No. : 001, 002
Power Rating : DC 3.7V (The EUT was supplied with the power from built-in battery)
Clock Frequency in used : 533 MHz (*Highest Frequency)

Similar model(s) to be covered by this report

Model No. : NW-A25, NW-A26

* The only difference between the models is the memory size as below and do not affect the Radio measurement.

Model No.	Memory Size	Note(s)
NW-A25	16 GB	Similar model
NW-A26	32 GB	Similar model
NW-A27	64 GB	EUT (representative)

Radio specification

Function of the Equipment : Transceiver
Operating Frequency : 13.56MHz
Modulation Type : ASK
Antenna Type : Pattern Antenna
Antenna connector Type : None
Operating Temperature : +5 to +35 deg.C

1.2. Summary of Test Result

Test Item	Worst Margin	Measurement Detector	Test Frequency band	Results
AC Power-line Conducted Emissions	-	-	-	N/A *1
Electric field strength of fundamental emissions	79.8 dB (QP) 13.56 MHz Vertical	Quasi-peak	13.553 - 13.567 MHz	Complied
Electric field strength of Spurious emissions within 13.110 – 14.010MHz	44.0 dB (QP) 13.110 MHz Vertical	Quasi-peak	13.110 - 14.010 MHz (excluding 13.553 - 13.567MHz band)	Complied
Electric field strength of Spurious emissions outside 13.110 – 14.010MHz	21.4 dB (QP) 355.007 MHz Horizontal	Average or Quasi-peak	9 kHz - 1 GHz (excluding 13.110 - 14.010MHz band)	Complied
20dB Bandwidth	Refer to the test data	Peak	Carrier	Complied
Frequency Tolerance	Refer to the test data	Peak	Carrier	Complied

*1: This item was not applied to the EUT since its transmission is stopped when the battery is being charged by the PC connected to AC power line.

Test Item	Worst Margin	Measurement Detector	Test Frequency band	Results
99% Occupied Bandwidth	Refer to the test data	Sample-peak	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 Part15 Subpart C Section 15.207 / 15.215 / 15.225
RSS-Gen Issue 4 / RSS-210 Issue 8 + Amendment 1
Test Method : ANSI C63.4 - 2009 / ANSI C63.10 - 2013

Test Distance for Electric field strength emissions : ☒ 3 m ☐ 10m (9kHz - 30 MHz)
☒ 3 m ☐ 10m (30 - 1000 MHz)

1.4. Measurement Procedures

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

☐ No deviation

☒ Deviation from the above procedure

In case any questions arise about test procedure, ANSI C 63.10:2013 is also referred.
However, there are two deviations from ANSI C 63.10:2013. (ANSI C63.10:20013 is Non-accreditation)
Measurement height is not 1.5m, but 0.8m and also SVSWR has been conducted up to 6 GHz.

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 : 1kHz

99% Occupied Bandwidth

1. Magnetic field probe was placed close to the EUT and connected to the spectrum analyzer.

2. For each EUT operation mode, the 99% Occupied Bandwidth was measured with spectrum analyzer.
   Detector type : Sample-peak
   RBW : 1kHz

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.

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 dimensions of the EUT table were 0.8 m height, 2.0 m width and 1.0 m depth.

3. The EUT was placed on the center of the tabletop and its rear was flush with the rear of the table.

4. The test antenna was placed away from the EUT at 3m distance.

5. Interconnecting cables that hang closer than 40 cm to the ground plane was folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between the ground plane and the tabletop.

6. Find the worst arrangement of the EUT according to follows;
   - Connecting all peripherals and change the position of EUT, peripherals and cables.
   - 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)

7. 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.

8. The measurement values were compensated the distance factor with follows;
   9 kHz - 490 kHz [value at 300m] = [value at 3m] + 40log (3[m] / 300[m])
   490 kHz - 30 MHz [value at 30m] = [value at 3m] + 40log (3[m] / 30[m])

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 937606.

1.5. Test Facility

Address of Test Facility

Test Facility Name : Sony EMCS 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

20dB Bandwidth / 99% Occupied 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

A2LA Accreditation for Test Facility

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

Effective dates: 2013-09-30 through 2015-10-31

Canada Registered Test Site

IC Assigned Code: 409R-1

1.6. Uncertainty

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

Test Item	Frequency	4th Site	
AC Power-line Conducted Emissions	150kHz - 30MHz	± 2.57 dB	
Radiated Emissions (EUT height 0.8m)	below 30 MHz	3m	± 2.60 dB
	30 - 300 MHz	3m	± 3.70 dB
	300 - 1000 MHz	3m	± 5.23 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
Electric field strength (Fundamental and Spurious emissions), 20dB Bandwidth, 99% Occupied Bandwidth	Type F (without Tag)	212kbps *2	13.56MHz
Frequency Tolerance	Unmodulated	-	13.56MHz

Note:
*1: The operating mode(s) has been configured by the software: MPTAPP Ver.0.98.75
*2: Data Rate has been decided based on the result of Electric field strength of fundamental emissions.

Extreme test condition:

Test Items	Test Temperature	Test Voltage
Frequency Tolerance	-30 deg.C to +50 deg.C	3.7V
	+20 deg.C	3.4V and 4.2V *1

Note:
*1: The voltage variation for testing was set to 3.4 to 4.2 V, according to the EUT's specification. The EUT does not operate outside the range. (The test lab has confirmed that operation.)

2.3. Special Accessories

Special accessories needed for connecting the EUT to achieve compliance:

Item	Manufacturer	Model No.	Serial No.	Remark
Tag	SONY	X-2587-453-1	-	for worst emission check

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) consists of :

Symbol	Item	Manufacturer	Model No.	FCC ID	Serial No.
A	Digital Media Player	SONY	NW-A27	AK8NWA20	002

The measurement was carried out with the following support equipment connected

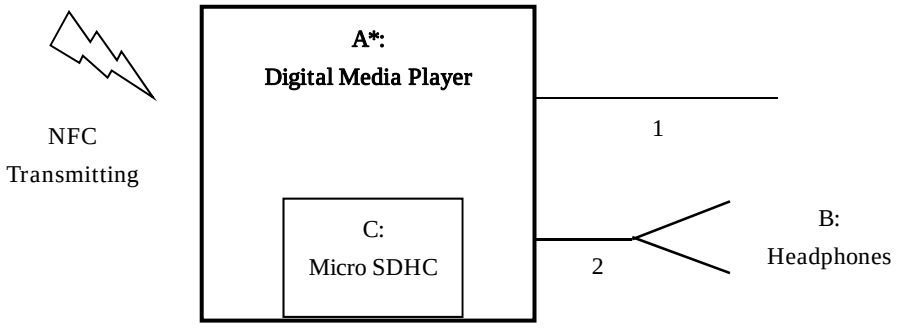
Symbol	Item	Manufacturer	Model No.	FCC ID	Serial No.
B	Headphones	SONY	MDR-NW750N	N/A	-
C	Micro SDHC	SONY	SR-32UYA	N/A	-

Type of Cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Bundled	Length (m)
1	USB Cable	WMC-NW20MU	YES	NO	Bundled	1.0
2	Headphones Cable	-	NO	NO	-	1.1

System configuration

*: EUT



20dB Bandwidth / 99% Occupied Bandwidth / Frequency Tolerance Measurements

The equipment under test (EUT) consists of :

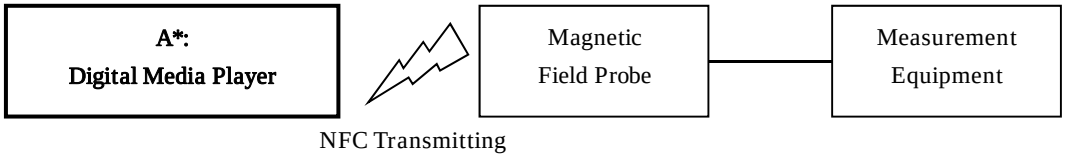
Symbol	Item	Manufacturer	Model No.	FCC ID	Serial No.
A	Digital Media Player	SONY	NW-A27	AK8NWA20	001 (for Extreme Voltage) 002 (others)

Type of Cable

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

System configuration

*: EUT

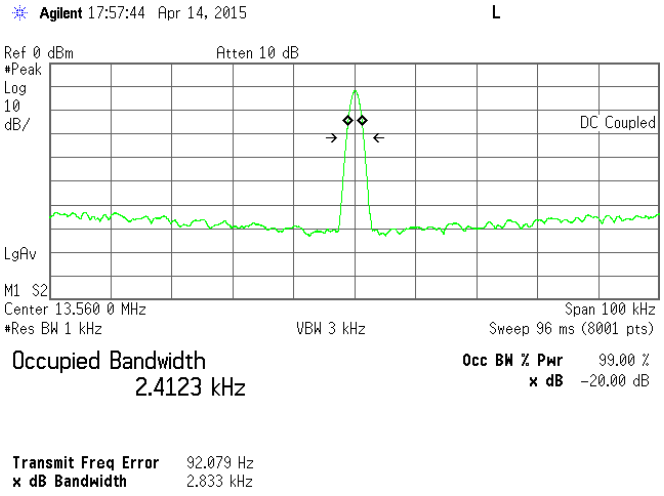


3. Test Data

3.1. 20dB Bandwidth

1) Ambient temperature : 24.9deg.C
2) Relative humidity : 48.9%
3) Date of measurement : April 14, 2015
4) Measured by : T.OHO
5) Operating mode : Transmitting mode

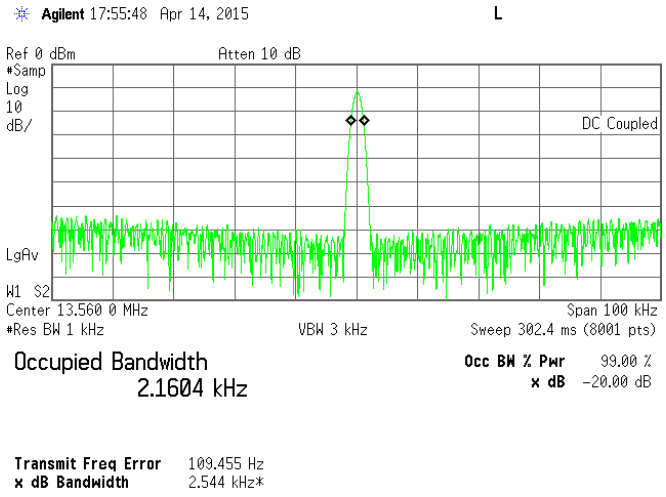
Mode		Channel [MHz]	Result [kHz]	Limit [kHz]
Type F	212kbps	13.56	2.833	-



3.2. 99% Occupied Bandwidth

1) Ambient temperature : 24.9deg.C
2) Relative humidity : 48.9%
3) Date of measurement : April 14, 2015
4) Measured by : T.OHO
5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Result [kHz]	Limit [kHz]
Type F	212kbps	13.56	2.160	-



3.3. Frequency Tolerance

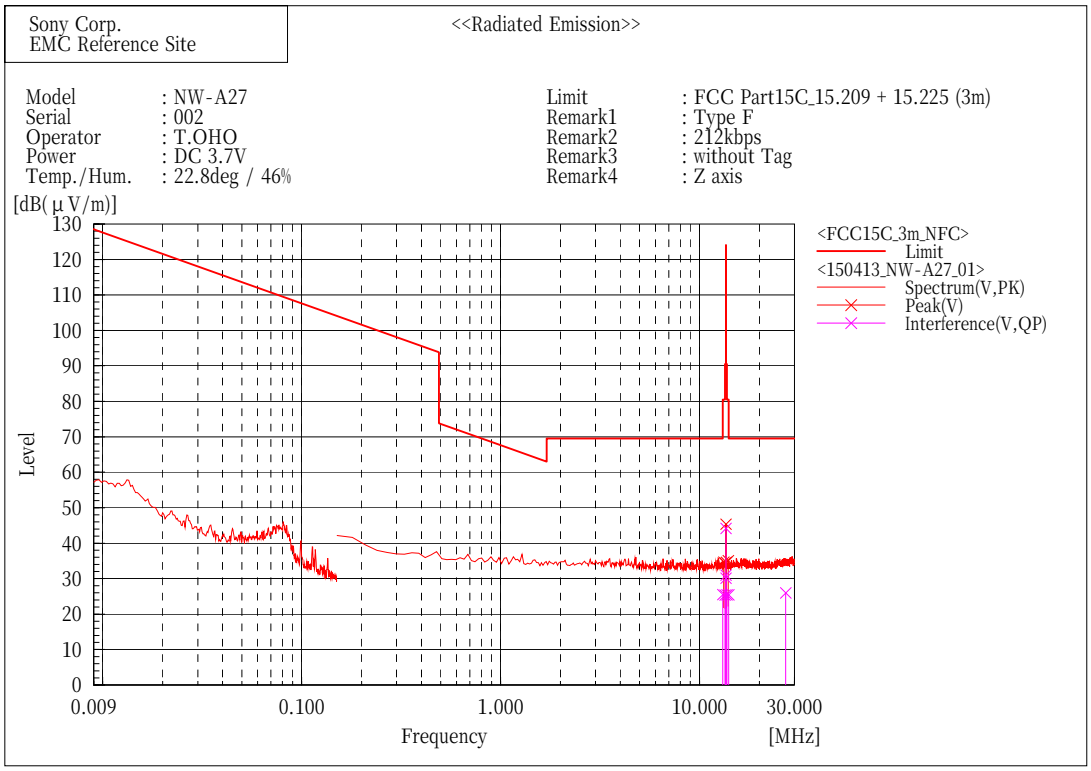
1) Ambient temperature : 24.9deg.C
2) Relative humidity : 48.9%
3) Date of measurement : April 14, 2015
4) Measured by : T.OHO
5) Operating mode : Transmitting mode (Unmodulated)

Test Temperature	Test Voltage	Test Conditions	Frequency [MHz]	Reading [MHz]	Tolerance [MHz]	Tolerance [%]	Limit [%]
50deg	3.7V	Start up	13.56	13.560061	0.000061	0.00045	± 0.01
		After 2min	13.56	13.560056	0.000056	0.00041	± 0.01
		After 5min	13.56	13.560055	0.000055	0.00041	± 0.01
		After 10min	13.56	13.560053	0.000053	0.00039	± 0.01
40deg	3.7V	Start up	13.56	13.560085	0.000085	0.00063	± 0.01
		After 2min	13.56	13.560080	0.000080	0.00059	± 0.01
		After 5min	13.56	13.560078	0.000078	0.00058	± 0.01
		After 10min	13.56	13.560076	0.000076	0.00056	± 0.01
30deg	3.7V	Start up	13.56	13.560122	0.000122	0.00090	± 0.01
		After 2min	13.56	13.560117	0.000117	0.00086	± 0.01
		After 5min	13.56	13.560114	0.000114	0.00084	± 0.01
		After 10min	13.56	13.560112	0.000112	0.00083	± 0.01
20deg	3.7V	Start up	13.56	13.560140	0.000140	0.00103	± 0.01
		After 2min	13.56	13.560138	0.000138	0.00102	± 0.01
		After 5min	13.56	13.560139	0.000139	0.00103	± 0.01
		After 10min	13.56	13.560141	0.000141	0.00104	± 0.01
10deg	3.7V	Start up	13.56	13.560175	0.000175	0.00129	± 0.01
		After 2min	13.56	13.560174	0.000174	0.00128	± 0.01
		After 5min	13.56	13.560176	0.000176	0.00130	± 0.01
		After 10min	13.56	13.560178	0.000178	0.00131	± 0.01
0deg	3.7V	Start up	13.56	13.560200	0.000200	0.00147	± 0.01
		After 2min	13.56	13.560201	0.000201	0.00148	± 0.01
		After 5min	13.56	13.560201	0.000201	0.00148	± 0.01
		After 10min	13.56	13.560202	0.000202	0.00149	± 0.01
-10deg	3.7V	Start up	13.56	13.560204	0.000204	0.00150	± 0.01
		After 2min	13.56	13.560205	0.000205	0.00151	± 0.01
		After 5min	13.56	13.560204	0.000204	0.00150	± 0.01
		After 10min	13.56	13.560204	0.000204	0.00150	± 0.01
-20deg	3.7V	Start up	13.56	13.560188	0.000188	0.00139	± 0.01
		After 2min	13.56	13.560185	0.000185	0.00136	± 0.01
		After 5min	13.56	13.560181	0.000181	0.00133	± 0.01
		After 10min	13.56	13.560178	0.000178	0.00131	± 0.01
-30deg	3.7V	Start up	13.56	13.560104	0.000104	0.00077	± 0.01
		After 2min	13.56	13.560109	0.000109	0.00080	± 0.01
		After 5min	13.56	13.560109	0.000109	0.00080	± 0.01
		After 10min	13.56	13.560109	0.000109	0.00080	± 0.01
20deg	3.4V	Start up	13.56	13.560130	0.000130	0.00096	± 0.01
		After 2min	13.56	13.560129	0.000129	0.00095	± 0.01
		After 5min	13.56	13.560130	0.000130	0.00096	± 0.01
		After 10min	13.56	13.560130	0.000130	0.00096	± 0.01
20deg	4.2V	Start up	13.56	13.560136	0.000136	0.00100	± 0.01
		After 2min	13.56	13.560132	0.000132	0.00097	± 0.01
		After 5min	13.56	13.560131	0.000131	0.00097	± 0.01
		After 10min	13.56	13.560130	0.000130	0.00096	± 0.01

3.4. Electric field strength (Fundamental and Spurious emissions)

9 kHz - 30 MHz

[Type F (212kbps)]



Final Result

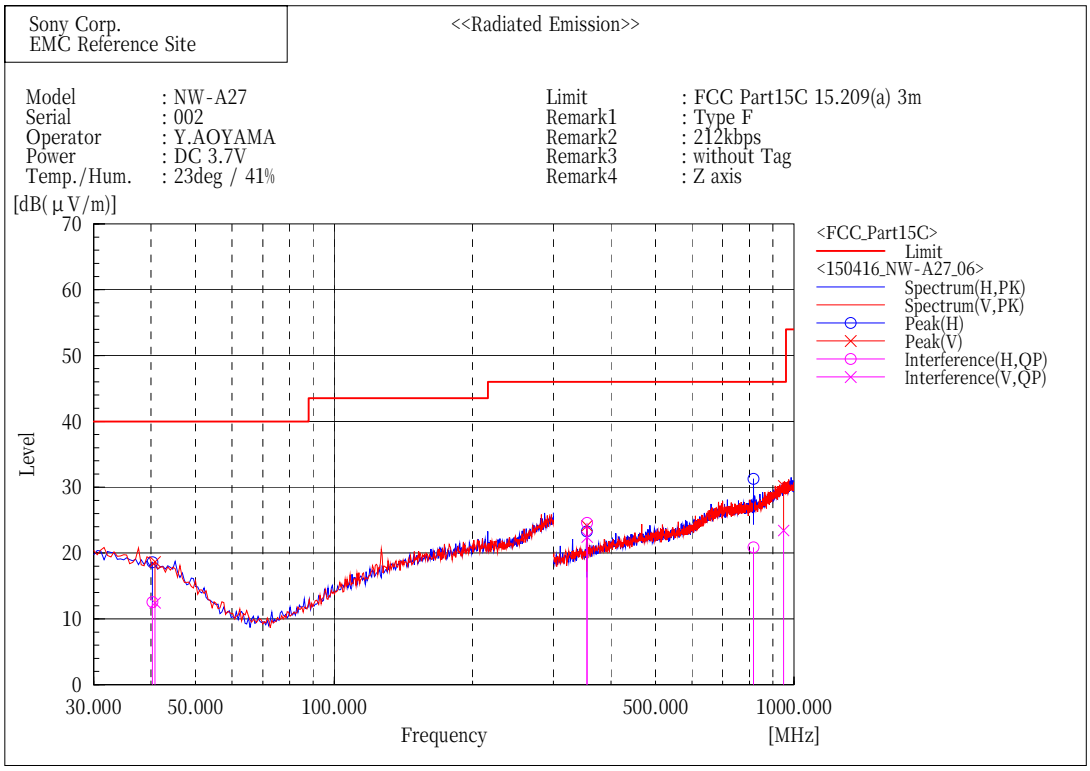
--- Vertical Polarization (QP)---

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	13.110	5.4	20.1	25.5	69.5	44.0	100.0	0.0
2	13.410	5.3	20.1	25.4	80.5	55.1	100.0	359.9
3	13.553	10.0	20.1	30.1	90.5	60.4	100.0	185.5
4	13.560	24.1	20.1	44.2	124.0	79.8	100.0	183.0
5	13.567	10.9	20.1	31.0	90.5	59.5	100.0	181.2
6	13.710	5.3	20.1	25.4	80.5	55.1	100.0	359.9
7	14.010	5.3	20.1	25.4	69.5	44.1	100.0	359.9
8	27.120	5.3	20.7	26.0	69.5	43.5	100.0	359.9

Mode		Frequency [MHz]	Polar.	Result (3m) [dBuV/m]	Distance Factor [dB]	Result(30m) [dBuV/m]	Limit (30m) [dBuV/m]	Margin [dB]
Type F	212kbps	13.110	V	25.5	-40.0	-14.5	29.5	44.0
		13.410	V	25.4	-40.0	-14.6	40.5	55.1
		13.553	V	30.1	-40.0	-9.9	50.5	60.4
		13.560	V	44.2	-40.0	4.2	84.0	79.8
		13.567	V	31.0	-40.0	-9.0	50.5	59.5
		13.710	V	25.4	-40.0	-14.6	40.5	55.1
		14.010	V	25.4	-40.0	-14.6	29.5	44.1
		27.120	V	26.0	-40.0	-14.0	29.5	43.5

30 MHz - 1000 MHz

[Type F (212kbps)]



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	40.260	25.4	-12.9	12.5	40.0	27.5	244.0	45.9
2	355.007	35.2	-10.6	24.6	46.0	21.4	100.0	44.4
3	816.600	25.0	-4.1	20.9	46.0	25.1	327.7	134.4

--- 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	40.800	25.4	-13.0	12.4	40.0	27.6	388.1	107.1
2	355.000	33.0	-10.6	22.4	46.0	23.6	261.8	320.4
3	949.550	24.5	-1.1	23.4	46.0	22.6	100.0	287.5

Note: This test report is used the same limits of FCC, as FCC limits are stricter than IC for over 14.010MHz. (same limits for below 13.110MHz based on RSS-GEN section 8.10(c).)

4. Method of Calculation

4.1. Frequency Tolerance Measurement

Method of calculation : Software
The Software for Calculation Name : SW-310
Version : Ver1.0

Test Result [%] = (Meter Reading [MHz] - 13.56 [MHz]) / 13.56 [MHz] * 100

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

4.2. Electric field strength 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)

5. List of Test Equipment

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

5.1. 20dB Bandwidth / 99% Occupied Bandwidth / Frequency Tolerance

4th Site Shielded Room 1

	Control No.	Equipment	Model No.	Serial No.	Manufacturer	Cal. Int.	Last Cal.
☒	-	Shield Room	B83117-B2432-T161	P26428	Albatross Project	-	-
☒	W054	TEMP & HUMID CHAMBER	SH-240	91006788	ESPEC CORP.	-	-
☒	W003	Spectrum Analyzer	E4440A	US42511926	Keysight Technologies	12	14.05.19
☒	W057	EMI Probe	MA2601C	No.1	Anritsu	12	14.05.16
☐	W029	10dB Attenuator	8493C	76549	Keysight Technologies	12	14.09.26
☒	W106	Digital Multimeter	R6452A	120600443	ADVANTEST	12	14.05.30
☒	W724	Stop Watch	HS70W	002	CASIO	12	14.06.03
☒	M719	Thermo Meter	TH-321	140044	AS ONE	12	14.06.02
☒	M722	Thermo Meter	TM-305	140005	AS ONE	12	14.06.02
		Thermo Sensor	LP-200	002	AS ONE	12	14.06.02

5.2. Electric field strength (Fundamental and Spurious emissions)

4th Site 10m Semi-Anechoic Chamber

	Control No.	Equipment	Model No.	Serial No.	Manufacturer	Cal. Int.	Last Cal.
☒	M506	Semi-Anechoic Chamber	-	-	TDK	12	14.05.20
☒	M575	EMI Receiver	ESCI	100161	Rohde & Schwarz	12	14.10.23
☐	M669	EMI Receiver	N9038A	MY51210223	Keysight Technologies	12	14.05.23
☒	A073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12	14.04.08
☒	A043	Biconical Antenna	BBA9106	V5 (91032598)	Schwarzbeck	12	14.08.19
☒	A046	Logperiodic Antenna	UHALP9108A1	0830	Schwarzbeck	12	14.08.20
☐	A056	Horn Antenna	BBHA9120D	670	Schwarzbeck	12	15.01.26
☐	A057	Horn Antenna	HAP06-18W	00000037	TOYO Corporation	12	14.08.22
☐	A058	Horn Antenna	HAP18-26W	00000016	TOYO Corporation	12	15.01.14
☐	CS037	4th Site RE Cable SYS1	-	-	EMC/RF Test Lab.	12	14.11.20
☒	CS039	4th Site RE Cable SYS3	-	-	EMC/RF Test Lab.	12	14.11.20
☒	CS054	4th Site EMF Cable SYS	-	-	EMC/RF Test Lab.	12	14.11.20
☐	CS064/065	Ref Site RE Cable SYS8	-	-	EMC/RF Test Lab.	12	14.05.19
☒	M510	RF Selector	NS4900	0802-226	TOYO Corporation	12	14.11.20
☒	M706	3dB Attenuator	8491A	MY39267782	Keysight Technologies	12	14.11.20
☒	M620	RF Pre-Amp	8447D	2944A10720	Keysight Technologies	12	14.11.20
☐	M737	GHz Filter Box	GB-G01	001	Sony EMCS	12	14.05.19
☒	M689	Thermo Meter	AD-5640A	201303	A&D	12	14.10.03