

RADIO TEST REPORT

(for NFC)

Project No. : JB-Z0454-A
Client : Sony Corporation
Client's Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
Product Name : Linear PCM Recorder
Model No. : PCM-D10
FCC ID : AK8PCMD10
Test Standard : 47 CFR Part 15 Subpart C
Sample Receipt Date : September 20, 2018
Test Date : October 2, 2018 to October 20, 2018
Original Report Date : October 22, 2018
Amend Report Date : October 29, 2018

Test Result : Complied

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Note

- ☒ indicates that the listed condition, standard or equipment is applicable for this report.
☐ indicates that the listed condition, standard or equipment is not applicable for this report.

Revision History

Revision	Date	Overview	Page
JB-Z0454 (Original)	October 22, 2018	-	-
JB-Z0454-A	October 29, 2018	Changed the description of Supply voltage requirement.	P.3

1. General Information

1.1. Description of Equipment Under Test (EUT)

General Specification

Test Sample Condition : ☐ Prototype ☒ Pre-production ☐ Mass-production
 Product Name : Linear PCM Recorder
 Trade Name : SONY
 Model No. : PCM-D10
 Serial No. : 270
 Power Rating of the EUT : DC 5V(USB) or DC 6V(Battery)

Similar model(s) to be covered by this report

Model No. : None

Radio Specification

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

1.2. Summary of Test Result

Test Item	Worst Margin	Results	Note
AC Power-line Conducted Emissions	11.8 dB (AV) 13.560 MHz N	Complied	-
20dB Bandwidth	Refer to the test data	Complied	-
Frequency Tolerance	Refer to the test data	Complied	-
Electric Field Strength of Fundamental Emissions	65.1 dB (QP) 13.56 MHz Vertical	Complied	-
Electric Field Strength of Spurious Emissions within 13.110 MHz to 14.010 MHz	37.51 dB (QP) 13.772 MHz Vertical	Complied	-
Electric Field Strength of Spurious Emissions outside 13.110 MHz to 14.010 MHz	17.0 dB (QP) 135.600 MHz Vertical	Complied	-

Other requirements

Part 15.31(e) Supply voltage requirement

: Complied (The voltage supplied from USB or battery are converted to regulated DC voltage by the built-in power circuit of the EUT.)

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

AC Power-line Conducted Emissions

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

Electric Field Strength (Fundamental Emissions and Spurious Emissions)

Test Distance : ☒ 3 m ☐ 10m (9 kHz to 30 MHz)
☒ 3 m ☐ 10m (30 MHz to 1000 MHz)
 Dimensions of the EUT table : 0.8 m height, 2 m width and 1 m 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

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.
(150 kHz to 30 MHz, peak detector, RBW: 10 kHz)
8. On the worst condition of the EUT found in above, choose the six highest emissions on the spectrum data.
 The final measurements carried out on these emissions with EMI test receiver.
 (quasi-peak and average detector, RBW: 9 kHz)

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 the spectrum analyzer.
 Detector type : Peak
 RBW : 30 kHz

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 the spectrum analyzer at the start-up and 2, 5, and 10 minutes, after the start-up.
 Detector type : Peak
 RBW : 100 Hz
4. Frequency Tolerance was repeated in extreme conditions.

Electric Field Strength (Fundamental Emissions 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 table top.
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 to 1000 MHz, 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;

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

Instruments settings were carried out with follows;

	9 kHz to 90 kHz 110 kHz to 490 kHz	90 kHz to 110 kHz 490 kHz to 30 MHz	30 MHz to 1000 MHz
Detector	Peak / Average	Quasi-peak	Quasi-peak
RBW	200 Hz (6 dB) or 9 kHz (6 dB) *1	200 Hz (6 dB) or 9 kHz (6 dB) *1	120 kHz (6 dB)
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;

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

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

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

A2LA Certificate No. : 3203.01
Cert. Validated Date : Oct. 31, 2019

AC Power-line Conducted Emissions

Shielded Room

☒ 4th Site ☐ EMC Site
20 dB Bandwidth

Shielded Room

☒ 4th Site SR1
Frequency Tolerance

Shielded Room

☒ 4th Site SR1
Electric Field Strength (Fundamental Emissions and Spurious Emissions)

Semi-Anechoic chamber

☒ 4th Site ☐ EMC Site

1.6. Uncertainty

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

Test Item	Frequency	Distance	4th Site	EMC Site
AC Power-line Conducted Emissions	150 kHz to 30 MHz	-	± 3.34 dB	± 3.34 dB
Electric Field Strength (Fundamental Emissions and Spurious Emissions)	9 kHz to 30 MHz	3m	± 2.60 dB	± 3.13 dB
	30 MHz to 300 MHz	3m	± 2.61 dB	± 3.14 dB
	300 MHz to 1000 MHz	3m	± 2.59 dB	± 3.12 dB

2. Test Specification

2.1. Validation

The system was configured for testing in a typical (as a customer would normally use it).
The tests were conducted with the worst-case modes as follows.

2.2. Operating Condition

The tests have been carried out the following conditions.

[Transmitting mode]

Test Items	Test Channel	Worst Data Rate
AC Power-line Conducted Emissions	13.56 MHz	Type F (without Tag) : 424 kbps *1, *2,*3
20dB Bandwidth, Electric Field Strength (Fundamental Emissions and Spurious Emissions)	13.56 MHz	Type A (without Tag) : 106 kbps *2
		Type F (without Tag) : 212 kbps *1, *2
Frequency Tolerance	13.56 MHz	Unmodulated

Note

*1: Data Rate has been decided based on the result of Electric Field Strength of Fundamental Emissions.

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

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

Extreme test conditions:

[Transmitting mode]

Test Items	Test Temperature	Test Voltage for battery	Test Voltage for USB
Frequency Tolerance	-30 deg.C to +50 deg.C	6 V	5 V
	+20 deg.C	5.10 V and 6.90 V	4.25 V and 5.75 V

The Software for Operating Mode

Software Name : nmobile_icx0470

Software Version : 0.00.00

2.3. Special Accessories

Special accessories needed for connecting the EUT to achieve compliance:

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

2.4. EUT Modifications

- ☒ No equipment modification to achieve compliance to the standard levels was done during the tests.
☐ Equipment was modified to achieve compliance to the standard level as below.

Responsible Party Signature

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

2.5. Configuration of EUT System

AC Power-line Conducted Emissions

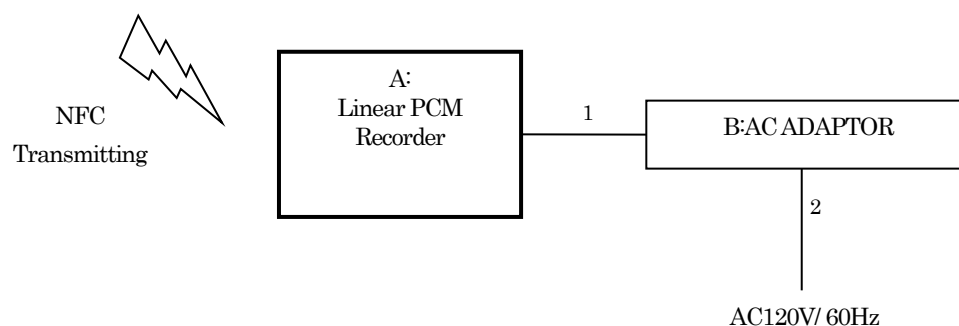
[EUT and Associated Equipment (AE)]

Symbol	EUT/ AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Linear PCM Recorder	SONY	PCM-D10	270
B	AE	AC ADAPTOR	SONY	AC-UD20	13096000163

[Type of Cable]

Symbol	Description	Identification (Manufacturer etc.)	Shielded Yes / No	Ferrite Core	Length (m)	Bundled
1	USB Cable	SONY	YES	NO	0.5	-
2	AC Cable	-	NO	NO	0.8	-

[Connecting Diagram]



20dB Bandwidth / Frequency Tolerance

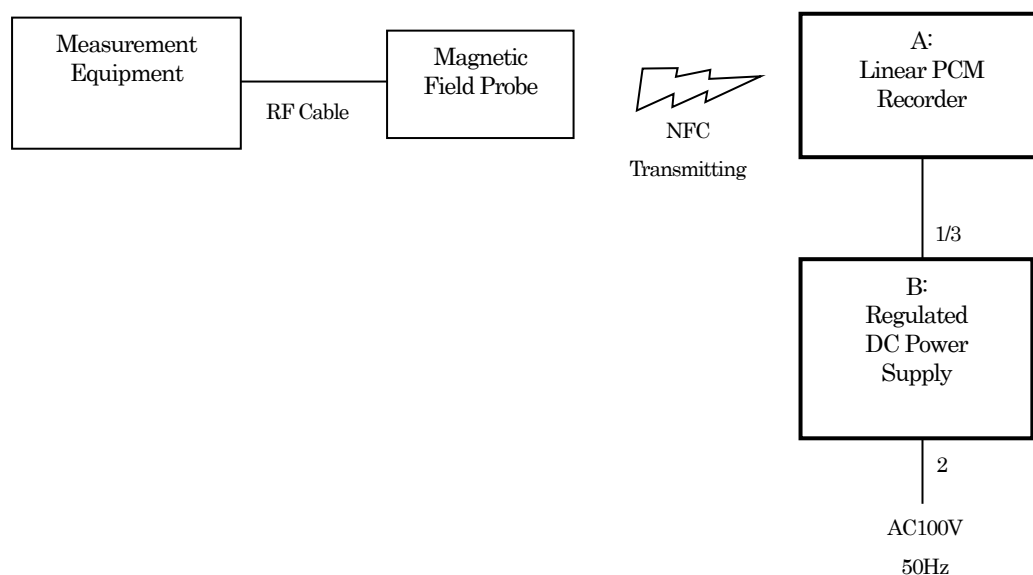
[EUT and Associated Equipment (AE)]

Symbol	EUT/ AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Linear PCM Recorder	SONY	PCM-D10	270
B	AE	Regulated DC Power Supply	KENWOOD	PW18-1.3AT	08046429

[Type of Cable]

Symbol	Description	Identification (Manufacturer etc.)	Shielded Yes / No	Ferrite Core	Length (m)	Bundled
1	DC cable	-	NO	NO	1.8	NO
2	AC cable	-	NO	NO	0.9	NO
3	USB Cable	-	YES	NO	0.13	NO

[Connecting Diagram]



Electric Field Strength (Fundamental Emissions and Spurious Emissions)

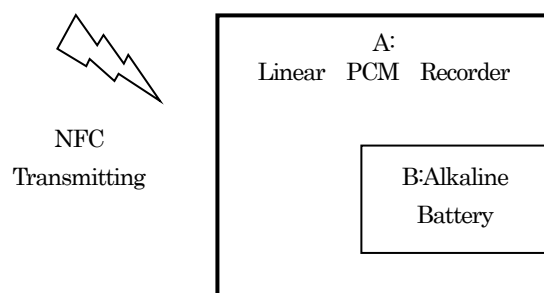
[EUT and Associated Equipment (AE)]

Symbol	EUT/ AE	Item	Manufacturer	Model No.	Serial No.
A	EUT	Linear PCM Recorder	SONY	PCM-D10	270
B	AE	Alkaline Battery	-	-	-

[Type of Cable]

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

[Connecting Diagram]



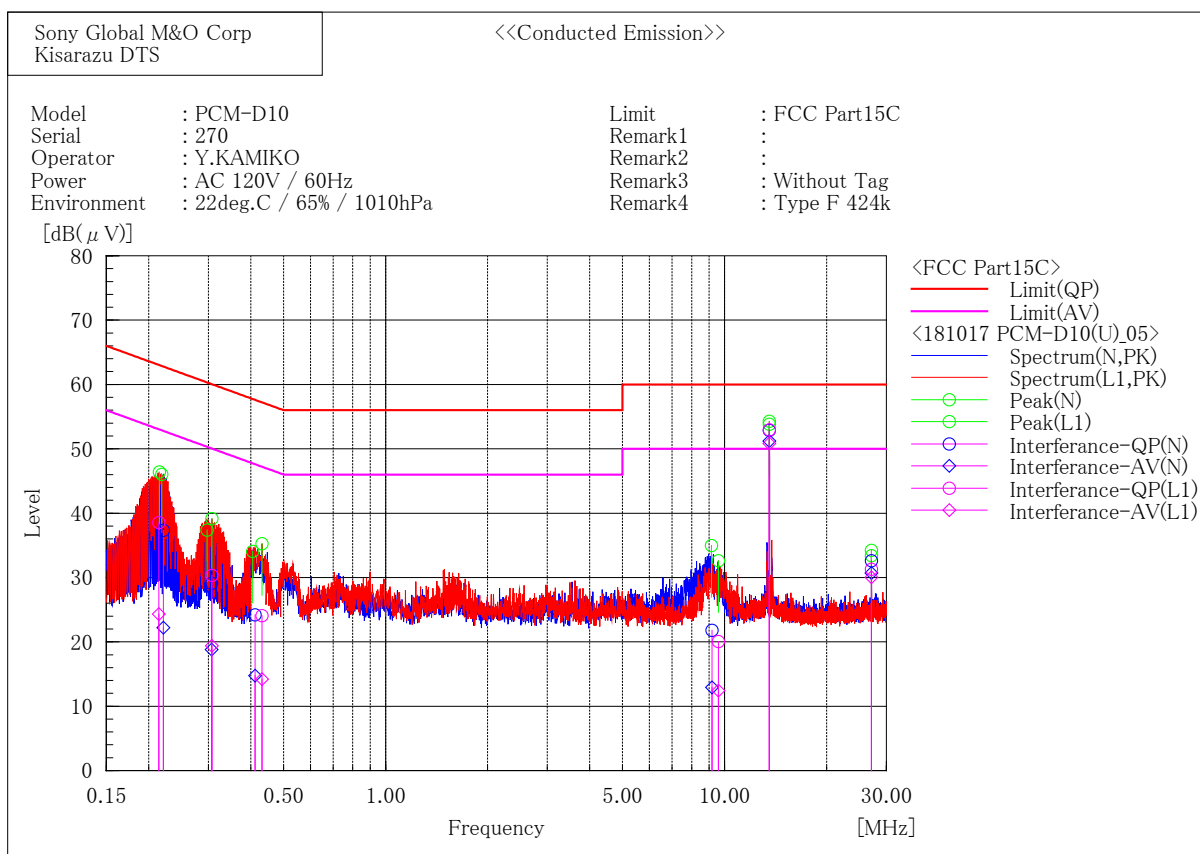
3. Test Data

3.1. AC Power-line Conducted Emissions

1) Date of measurement : October 17, 2018

The test data is mentioned as follows.

[Type F / 424 kbps]



Final Result

--- N Phase ---

No.	Frequency	Reading QP	Reading AV	c. f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV
	[MHz]	[dB(μV)]	[dB(μV)]	[dB]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB]	[dB]
1	0.221	21.3	6.2	16.0	37.3	22.2	62.8	52.8	25.5	30.6
2	0.307	13.0	2.7	16.1	29.1	18.8	60.1	50.1	31.0	31.3
3	0.412	7.9	-1.6	16.3	24.2	14.7	57.6	47.6	33.4	32.9
4	9.176	5.5	-3.4	16.3	21.8	12.9	60.0	50.0	38.2	37.1
5	13.560	36.3	34.7	16.5	52.8	51.2	60.0	50.0	7.2	-1.2
6	27.120	15.7	13.8	16.9	32.6	30.7	60.0	50.0	27.4	19.3

--- L1 Phase ---

No.	Frequency	Reading QP	Reading AV	c. f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV
	[MHz]	[dB(μV)]	[dB(μV)]	[dB]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB]	[dB]
1	0.214	22.4	8.2	16.1	38.5	24.3	63.0	53.0	24.5	28.7
2	0.308	14.2	3.3	16.1	30.3	19.4	60.0	50.0	29.7	30.6
3	0.432	7.8	-2.1	16.3	24.1	14.2	57.2	47.2	33.1	33.0
4	9.588	3.7	-3.9	16.3	20.0	12.4	60.0	50.0	40.0	37.6
5	13.560	36.5	34.4	16.4	52.9	50.8	60.0	50.0	7.1	-0.8
6	27.120	14.6	13.3	16.7	31.3	30.0	60.0	50.0	28.7	20.0

*Final result that 13.56MHz (fundamental emission) was retested with connection dummy load instead of EUT's transmit antenna according to KDB174176 D01 is as follows.

Frequency [MHz]	Phase	Reading QP [dBuV]	Reading AV [dBuV]	c.f. [dB]	Result QP [dBuV]	Result AV [dBuV]	Limit QP [dBuV]	Limit AV [dBuV]	Margin QP [dB]	Margin AV [dB]
13.560	N	24.3	21.7	16.5	40.8	38.2	60.0	50.0	19.2	11.8
13.560	L1	24.1	21.6	16.4	40.5	38.0	60.0	50.0	19.5	12.0

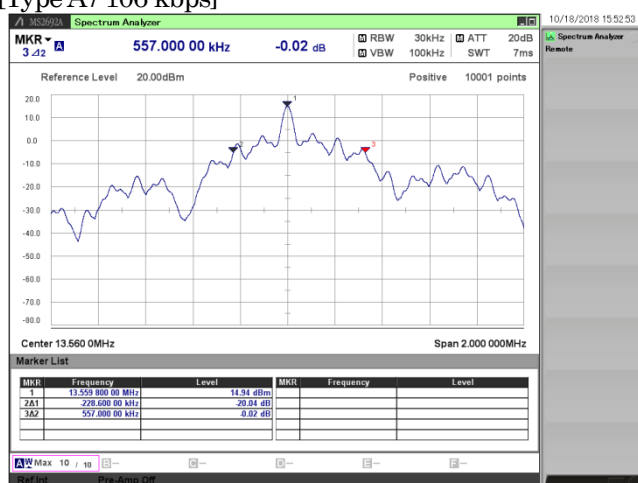
3.2. 20dB Bandwidth

- | | |
|------------------------|---------------------|
| 1) Ambient temperature | : 21.0 deg.C |
| 2) Relative humidity | : 56.2 % |
| 3) Date of measurement | : October 18, 2018 |
| 4) Measured by | : M.KOUGA |
| 5) Operating mode | : Transmitting mode |

Power Rating : DC 6 V

Mode		Channel [MHz]	Result [kHz]	Limit [kHz]
Type A	106 kbps	13.56	557.000	-
Type F	212 kbps	13.56	77.000	-

[Type A / 106 kbps]



[Type F / 212 kbps]



3.3. Frequency Tolerance

- 1) Ambient temperature : 21.0 deg.C
 2) Relative humidity : 56.2 %
 3) Date of measurement : October 18, 2018
 4) Measured by : M.KOUGA
 5) Operating mode : Transmitting mode (Unmodulated)

Power Rating : DC 6 V

Test Temperature	Test Voltage	Test Conditions	Frequency [MHz]	Reading [MHz]	Tolerance [MHz]	Tolerance [%]	Limit [%]
50deg.C	6.000 V	Start up	13.56	13.559881	-0.000119	-0.000878	± 0.01
		After 2min	13.56	13.559872	-0.000128	-0.000944	± 0.01
		After 5min	13.56	13.559869	-0.000131	-0.000966	± 0.01
		After 10min	13.56	13.559866	-0.000134	-0.000988	± 0.01
40deg.C	6.000 V	Start up	13.56	13.559881	-0.000119	-0.000878	± 0.01
		After 2min	13.56	13.559876	-0.000124	-0.000914	± 0.01
		After 5min	13.56	13.559878	-0.000122	-0.000900	± 0.01
		After 10min	13.56	13.559881	-0.000119	-0.000878	± 0.01
30deg.C	6.000 V	Start up	13.56	13.559900	-0.000100	-0.000737	± 0.01
		After 2min	13.56	13.559898	-0.000102	-0.000752	± 0.01
		After 5min	13.56	13.559904	-0.000096	-0.000708	± 0.01
		After 10min	13.56	13.559912	-0.000088	-0.000649	± 0.01
20deg.C	6.000 V	Start up	13.56	13.559957	-0.000043	-0.000317	± 0.01
		After 2min	13.56	13.559950	-0.000050	-0.000369	± 0.01
		After 5min	13.56	13.559950	-0.000050	-0.000369	± 0.01
		After 10min	13.56	13.559950	-0.000050	-0.000369	± 0.01
10deg.C	6.000 V	Start up	13.56	13.559988	-0.000012	-0.000088	± 0.01
		After 2min	13.56	13.559981	-0.000019	-0.000140	± 0.01
		After 5min	13.56	13.559984	-0.000016	-0.000118	± 0.01
		After 10min	13.56	13.559988	-0.000012	-0.000088	± 0.01
0deg.C	6.000 V	Start up	13.56	13.560012	0.000012	0.000088	± 0.01
		After 2min	13.56	13.560009	0.000009	0.000066	± 0.01
		After 5min	13.56	13.560012	0.000012	0.000088	± 0.01
		After 10min	13.56	13.560016	0.000016	0.000118	± 0.01
-10deg.C	6.000 V	Start up	13.56	13.560018	0.000018	0.000133	± 0.01
		After 2min	13.56	13.560022	0.000022	0.000162	± 0.01
		After 5min	13.56	13.560021	0.000021	0.000155	± 0.01
		After 10min	13.56	13.560020	0.000020	0.000147	± 0.01
-20deg.C	6.000 V	Start up	13.56	13.559998	-0.000002	-0.000015	± 0.01
		After 2min	13.56	13.560007	0.000007	0.000052	± 0.01
		After 5min	13.56	13.560002	0.000002	0.000015	± 0.01
		After 10min	13.56	13.559996	-0.000004	-0.000029	± 0.01
-30deg.C	6.000 V	Start up	13.56	13.559915	-0.000085	-0.000627	± 0.01
		After 2min	13.56	13.559946	-0.000054	-0.000398	± 0.01
		After 5min	13.56	13.559944	-0.000056	-0.000413	± 0.01
		After 10min	13.56	13.559938	-0.000062	-0.000457	± 0.01
20deg.C	5.100 V	Start up	13.56	13.559954	-0.000046	-0.000339	± 0.01
		After 2min	13.56	13.559951	-0.000049	-0.000361	± 0.01
		After 5min	13.56	13.559951	-0.000049	-0.000361	± 0.01
		After 10min	13.56	13.559952	-0.000048	-0.000354	± 0.01
20deg.C	6.900 V	Start up	13.56	13.559954	-0.000046	-0.000339	± 0.01
		After 2min	13.56	13.559950	-0.000050	-0.000369	± 0.01
		After 5min	13.56	13.559950	-0.000050	-0.000369	± 0.01
		After 10min	13.56	13.559950	-0.000050	-0.000369	± 0.01

- 1) Ambient temperature : 22.6 deg.C
- 2) Relative humidity : 58.3 %
- 3) Date of measurement : October 20, 2018
- 4) Measured by : M.KOUGA
- 5) Operating mode : Transmitting mode (Unmodulated)

Power Rating : DC 5 V

Test Temperature	Test Voltage	Test Conditions	Frequency [MHz]	Reading [MHz]	Tolerance [MHz]	Tolerance [%]	Limit [%]
50deg.C	5.000 V	Start up	13.56	13.559874	-0.000126	-0.000929	± 0.01
		After 2min	13.56	13.559865	-0.000135	-0.000996	± 0.01
		After 5min	13.56	13.559863	-0.000137	-0.001010	± 0.01
		After 10min	13.56	13.559862	-0.000138	-0.001018	± 0.01
40deg.C	5.000 V	Start up	13.56	13.559871	-0.000129	-0.000951	± 0.01
		After 2min	13.56	13.559866	-0.000134	-0.000988	± 0.01
		After 5min	13.56	13.559868	-0.000132	-0.000973	± 0.01
		After 10min	13.56	13.559872	-0.000128	-0.000944	± 0.01
30deg.C	5.000 V	Start up	13.56	13.559896	-0.000104	-0.000767	± 0.01
		After 2min	13.56	13.559888	-0.000112	-0.000826	± 0.01
		After 5min	13.56	13.559892	-0.000108	-0.000796	± 0.01
		After 10min	13.56	13.559899	-0.000101	-0.000745	± 0.01
20deg.C	5.000 V	Start up	13.56	13.560126	0.000126	0.000929	± 0.01
		After 2min	13.56	13.559936	-0.000064	-0.000472	± 0.01
		After 5min	13.56	13.559936	-0.000064	-0.000472	± 0.01
		After 10min	13.56	13.559936	-0.000064	-0.000472	± 0.01
10deg.C	5.000 V	Start up	13.56	13.559955	-0.000045	-0.000332	± 0.01
		After 2min	13.56	13.559943	-0.000057	-0.000420	± 0.01
		After 5min	13.56	13.559953	-0.000047	-0.000347	± 0.01
		After 10min	13.56	13.559964	-0.000036	-0.000265	± 0.01
0deg.C	5.000 V	Start up	13.56	13.559987	-0.000013	-0.000096	± 0.01
		After 2min	13.56	13.559990	-0.000010	-0.000074	± 0.01
		After 5min	13.56	13.559996	-0.000004	-0.000029	± 0.01
		After 10min	13.56	13.560002	0.000002	0.000015	± 0.01
-10deg.C	5.000 V	Start up	13.56	13.560019	0.000019	0.000140	± 0.01
		After 2min	13.56	13.560022	0.000022	0.000162	± 0.01
		After 5min	13.56	13.560022	0.000022	0.000162	± 0.01
		After 10min	13.56	13.560022	0.000022	0.000162	± 0.01
-20deg.C	5.000 V	Start up	13.56	13.560005	0.000005	0.000037	± 0.01
		After 2min	13.56	13.560018	0.000018	0.000133	± 0.01
		After 5min	13.56	13.560016	0.000016	0.000118	± 0.01
		After 10min	13.56	13.560012	0.000012	0.000088	± 0.01
-30deg.C	5.000 V	Start up	13.56	13.559945	-0.000055	-0.000406	± 0.01
		After 2min	13.56	13.559982	-0.000018	-0.000133	± 0.01
		After 5min	13.56	13.559979	-0.000021	-0.000155	± 0.01
		After 10min	13.56	13.559970	-0.000030	-0.000221	± 0.01
20deg.C	4.250 V	Start up	13.56	13.559947	-0.000053	-0.000391	± 0.01
		After 2min	13.56	13.559938	-0.000062	-0.000457	± 0.01
		After 5min	13.56	13.559939	-0.000061	-0.000450	± 0.01
		After 10min	13.56	13.559940	-0.000060	-0.000442	± 0.01
20deg.C	5.750 V	Start up	13.56	13.559948	-0.000052	-0.000383	± 0.01
		After 2min	13.56	13.559934	-0.000066	-0.000487	± 0.01
		After 5min	13.56	13.559933	-0.000067	-0.000494	± 0.01
		After 10min	13.56	13.559932	-0.000068	-0.000501	± 0.01

3.4. Electric Field Strength (Fundamental Emissions and Spurious Emissions)

1) Date of measurement

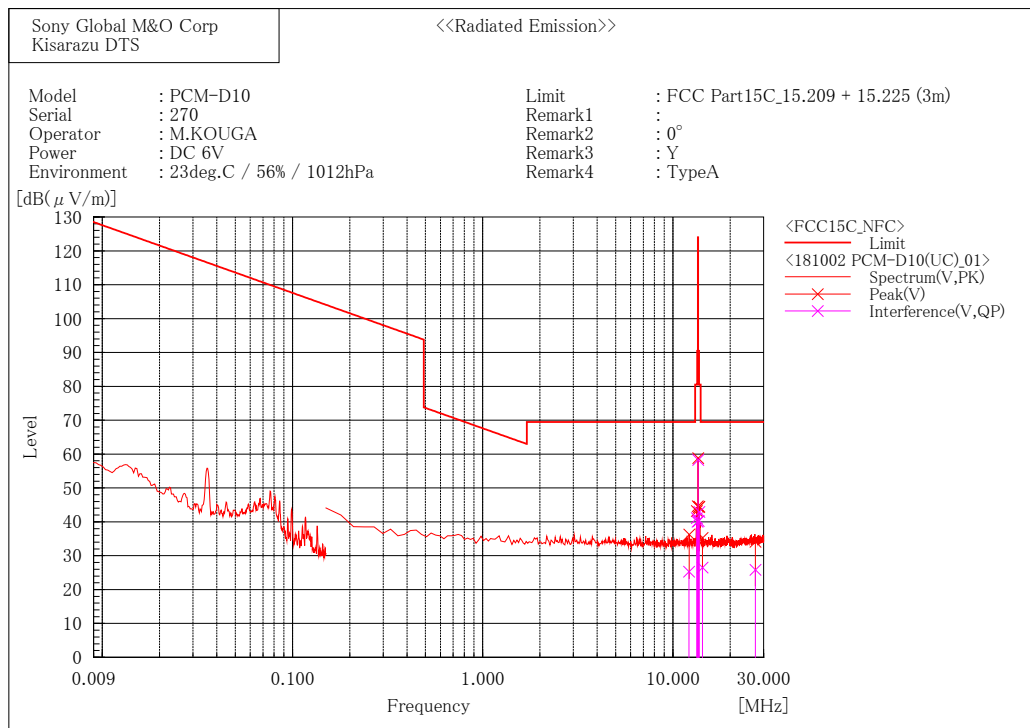
9 kHz to 30 MHz : October 2, 2018

30 MHz to 1000 MHz : October 2, 2018

The test data is mentioned as follows.

9 kHz to 30 MHz

[Type A / 106 kbps]



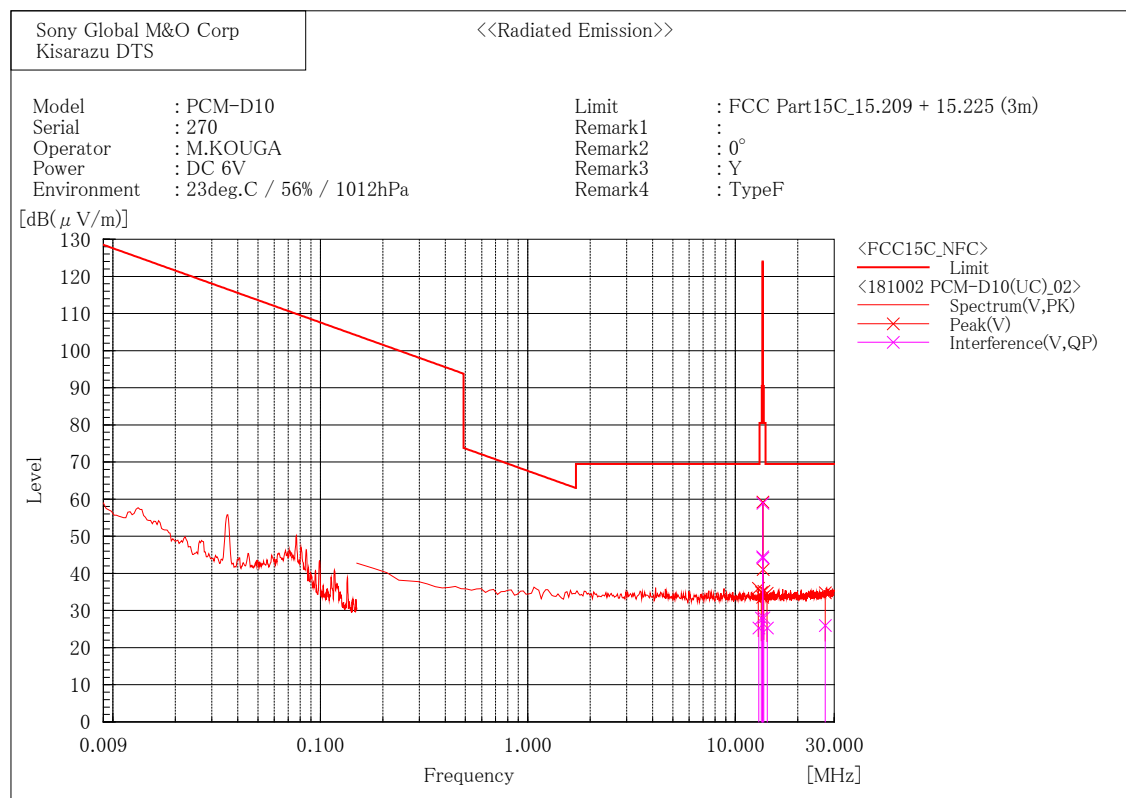
Final Result

--- 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	12.163	5.2	20.1	25.3	69.5	44.2	100.0	151.0
2	13.349	21.2	20.0	41.2	80.5	39.3	100.0	255.0
3	13.454	20.1	20.0	40.1	90.5	50.4	100.0	256.0
4	13.560	38.3	20.0	58.3	124.0	65.7	100.0	255.0
5	13.664	20.3	20.0	40.3	90.5	50.2	100.0	255.0
6	13.772	23.0	20.0	43.0	80.5	37.5	100.0	252.0
7	14.315	6.6	19.9	26.5	69.5	43.0	100.0	241.2
8	27.120	5.1	20.7	25.8	69.5	43.7	100.0	276.0

Mode		Frequency [MHz]	Polar.	Result (3m) [dBuV/m]	Distance Factor [dB]	Result(30m) [dBuV/m]	Limit (30m) [dBuV/m]	Margin [dB]
Type A	106 kbps	12.163	V	25.30	-40.00	-14.70	29.54	44.24
		13.349	V	41.20	-40.00	1.20	40.51	39.31
		13.454	V	40.10	-40.00	0.10	50.47	50.37
		13.560	V	58.30	-40.00	18.30	84.00	65.70
		13.664	V	40.30	-40.00	0.30	50.47	50.17
		13.772	V	43.00	-40.00	3.00	40.51	37.51
		14.315	V	26.50	-40.00	-13.50	29.54	43.04
		27.120	V	25.80	-40.00	-14.20	29.54	43.74

[Type F / 212 kbps]



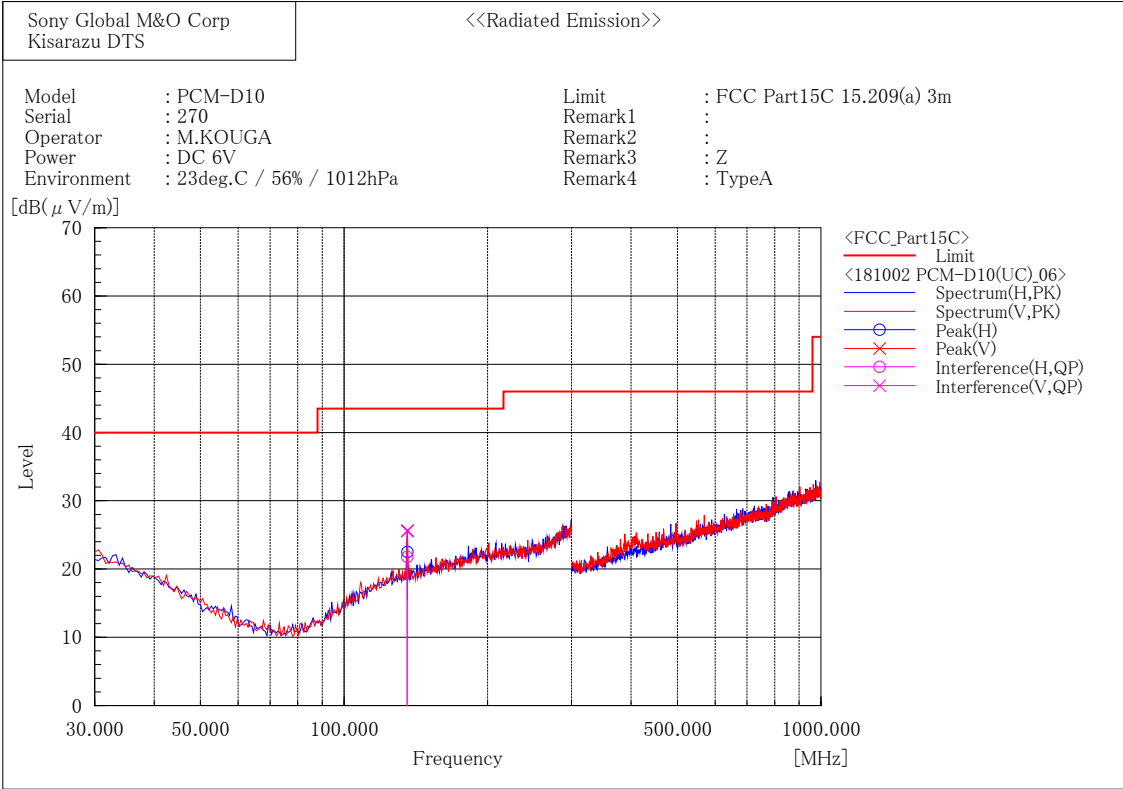
Final Result

--- 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	13.000	5.3	20.0	25.3	69.5	44.2	100.0	75.0
2	13.339	8.0	20.0	28.0	80.5	52.5	100.0	263.0
3	13.553	24.5	20.0	44.5	90.5	46.0	100.0	254.0
4	13.560	38.9	20.0	58.9	124.0	65.1	100.0	256.0
5	13.567	24.1	20.0	44.1	90.5	46.4	100.0	255.0
6	13.729	8.1	20.0	28.1	80.5	52.4	100.0	252.0
7	14.276	5.4	19.9	25.3	69.5	44.2	100.0	243.0
8	27.120	5.3	20.7	26.0	69.5	43.5	100.0	265.0

Mode	Frequency [MHz]	Polar.	Result (3m) [dBuV/m]	Distance Factor [dB]	Result(30m) [dBuV/m]	Limit (30m) [dBuV/m]	Margin [dB]
Type F	13.000	V	25.30	-40.00	-14.70	29.54	44.24
	13.339	V	28.00	-40.00	-12.00	40.51	52.51
	13.553	V	44.50	-40.00	4.50	50.47	45.97
	13.560	V	58.90	-40.00	18.90	84.00	65.10
	13.567	V	44.10	-40.00	4.10	50.47	46.37
	13.729	V	28.10	-40.00	-11.90	40.51	52.41
	14.276	V	25.30	-40.00	-14.70	29.54	44.24
	27.120	V	26.00	-40.00	-14.00	29.54	43.54

30 MHz to 1000 MHz
[Type A / 106 kbps]



Final Result

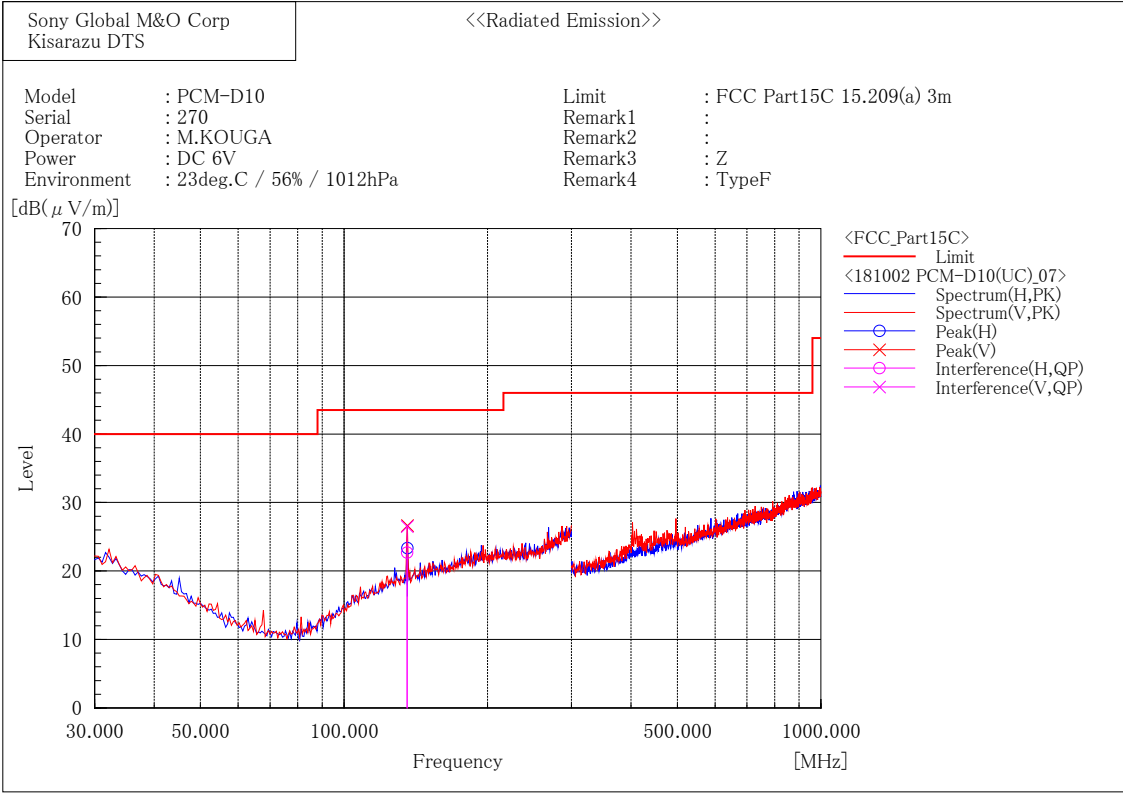
--- Horizontal Polarization (QP) ---

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	135.599	34.6	-12.8	21.8	43.5	21.7	129.0	163.0

--- 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	135.599	38.4	-12.8	25.6	43.5	17.9	100.0	236.0

[Type F / 212 kbps]



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	135.600	35.5	-12.8	22.7	43.5	20.8	125.0	164.0

--- 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	135.600	39.3	-12.8	26.5	43.5	17.0	100.0	239.0

4. Method of Calculation

4.1. AC Power-line Conducted Emissions

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

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

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

4.2. Frequency Tolerance

Method of calculation : Software
Software Name : SW-0310
Software Version : Ver.3.1

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

Note (a) Meter Reading : Reading Frequency of the spectrum analyzer

4.3. Electric Field Strength (Fundamental Emissions and Spurious Emissions)

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

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

Note (a) Meter Reading : Reading of the EMI test receiver or the spectrum analyzer.
(b) C.F. : ☒ Antenna Factor (including Balun Loss) + System GainLoss
: ☐ Antenna Factor (including Balun Loss) + System GainLoss + 20 log (3 m/ 10 m)

5. List of Test Equipment

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

5.1. AC Power-line Conducted Emissions

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
x	M0575	EMI Receiver	ESCI	100161	Rohde & Schwarz	12 months	18.04.18
x	CS0043	4th Site CE Cable SYSTEM	-	-	-	12 months	18.06.01
x	M0664	6dB Attenuator	6806.01A	-	HUBER+SUHNER AG	12 months	18.06.01
x	M0619	HIGH FREQUENCY FUSE	MP612A	-	Anritsu	12 months	18.06.01
x	M0514	LISN	ENV216	100424	Rohde & Schwarz	12 months	18.04.17
-	M0505	LISN	ENV216	100425	Rohde & Schwarz	12 months	18.04.17
-	M2289	LISN	KNW-407	8-1182-12	Kyoritsu	12 months	18.04.23
-	M2290	LISN	KNW-242C	8-1183-1	Kyoritsu	12 months	18.04.23
-	M0153	50 ohm Terminator	CT-01	-	TME	12 months	18.04.17
-	M0597	50 ohm Terminator	CT-01	-	TME	12 months	18.08.02
-	M2292	50 ohm Terminator	T1302	-	Stack	12 months	18.04.23
-	M2293	50 ohm Terminator	T1302	-	Stack	12 months	18.04.23
x	M0690	Thermometer	AD-5640A	201304	AND	12 months	17.11.14

5.2. 20dB Bandwidth / Frequency Tolerance

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
x	W0054	TEMP & HUMID CHAMBER	SH-240	91006788	ESPEC CORP.	-	-
x	W0100	Signal Analyzer	MS2692A	6201338954	Anritsu	12 months	18.04.03
x	W0057	EMI Probe	MA2601C	No.1	Anritsu	12 months	18.10.15
-	W0029	10dB Attenuator	8493C	76549	Keysight Technologies	12 months	18.09.01
-	W0106	Digital Multimeter	R6452A	120600443	ADVANTEST	12 months	18.07.21
x	M0721	Thermo Meter	TM-305	140025	AS ONE	12 months	18.06.25

5.3. Electric Field Strength (Fundamental Emissions and Spurious Emissions)

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Interval	Last Cal.
x	M0506-N	EMC Chamber for NSAANSI	10m	-	TDK	12 months	18.07.20
x	M1038	EMI Receiver	ESCI	100566	Rohde&Schwarz	12 months	18.08.17
-	M0504	EMI Receiver	ESU40	100086	Rohde&Schwarz	12 months	17.11.01
x	A0073	Loop Antenna	HFH2-Z2	100171	Rohde&Schwarz	12 months	17.11.01
x	A0043	Biconical Antenna	BBA9106	V5(91032598)	Schwarzbeck	12 months	17.12.15
x	A0046	Log periodic Antenna	UHALP9108A1	0830	Schwarzbeck	12 months	17.12.15
-	CS0037	Fourth Site RE Cable SYS1	-	-	-	12 months	18.06.01
x	CS0039	Fourth Site RE Cable SYS3	-	-	-	12 months	18.06.01
x	CS0054	Fourth Site EMF Cable SYS	-	-	-	12 months	18.06.01
x	M0510	RF Selector	NS4900	0802-226	TOYO Corporation	12 months	18.06.01
x	M0620	RF Pre-Amp	8447D	2944A10720	Keysight Technologies	12 months	18.06.01
x	M0706	3dB Attenuator	8491A	MY39267782	Keysight Technologies	12 months	18.06.01
x	M0689	Thermometer	AD-5640A	201303	AND	12 months	17.11.14

About calibration interval

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