

# RADIO TEST REPORT

(for NFC)

Project No. : JB-Z0426-A  
 Client : Sony Corporation  
 Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan  
 Type of Equipment : Linear PCM Recorder  
 Model No. : PCM-A10  
 FCC ID : AK8PCMA10  
 Regulation Applied : 47 CFR Part 15 Subpart C  
**Final Judgment : Passed**  
 Sample Receipt : June 4, 2018  
 Testing : June 11, 2018 - July 10, 2018  
 Original Reported : June 25, 2018  
 Amend Reported : July 10, 2018

**Amend:**

*Original report JB-Z0426 is replaced to this report for the following reasons:*  
 - Revised the Frequency Tolerance measurement

Reported by :

Approved Signatory :




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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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\* 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.

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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. General Information

### 1.1. Description of Equipment Under Test (EUT)

#### General specification

Test Sample Condition :  Prototype  Pre-production  Mass-production  
 Type of Equipment : Linear PCM Recorder  
 Trade Name : SONY  
 Model No. : PCM-A10  
 Serial No. : 0314002, 0314004, 0314005  
 Power Rating : DC 3.7V (The EUT was supplied with the power from built-in battery)  
 : DC 5V (The EUT was supplied with the power from USB port)

#### 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	Test Frequency band	Results
AC Power-line Conducted Emissions	3.3 dB (AV) 13.560 MHz L1	150 kHz - 30 MHz	Complied
Electric field strength of fundamental emissions	68.10 dB (QP) 13.560 MHz Vertical	13.553 - 13.567 MHz	Complied
Electric field strength of Spurious emissions within 13.110 - 14.010 MHz	40.01 dB (QP) 13.771 MHz Vertical	13.110 - 14.010 MHz (excluding 13.553 - 13.567 MHz band)	Complied
Electric field strength of Spurious emissions outside 13.110 - 14.010 MHz	22.5 dB (QP) 945.400 MHz Horizontal	9 kHz - 1 GHz (excluding 13.110 - 14.010 MHz 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

AC Power-line Conducted Emissions

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

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.

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

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 - 30 MHz, 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 - 30 MHz	30 MHz - 1000 MHz
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:

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

## 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	150 kHz - 30 MHz		$\pm 3.34$ dB	$\pm 3.35$ dB
Radiated Emissions (EUT height 0.8m)	9 kHz - 30 MHz	3m	$\pm 2.59$ dB	$\pm 3.12$ dB
	30 - 300 MHz	3m	$\pm 4.18$ dB	$\pm 5.26$ dB
	300 - 1000 MHz	3m	$\pm 4.04$ dB	$\pm 4.37$ 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 A (without Tag) *2	106kbps	13.56 MHz
	Type F (without Tag) *2	212kbps *3	
Frequency Tolerance	Unmodulated	-	13.56 MHz

Note:

- \*1: The operating mode(s) has been configured by the software: nmobile\_icx0471\_0.80.00
- \*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	5V
	+20 deg.C	3.145V and 4.255V	4.250V and 5.750V

Special accessories needed for connecting the EUT to achieve compliance:

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



2.3. EUT Modifications

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

Responsible Party Signature

---

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

## 2.4. Configuration of Tested System

Electric field strength Measurement

## The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A	Linear PCM Recorder	SONY	PCM-A10	0314002

## Support equipment for operation

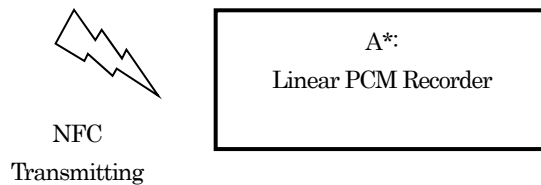
Symbol	Item	Manufacturer	Model No.	Serial No.
-	-	-	-	-

## 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	Linear PCM Recorder	SONY	PCM-A10	0314004

Support equipment for operation

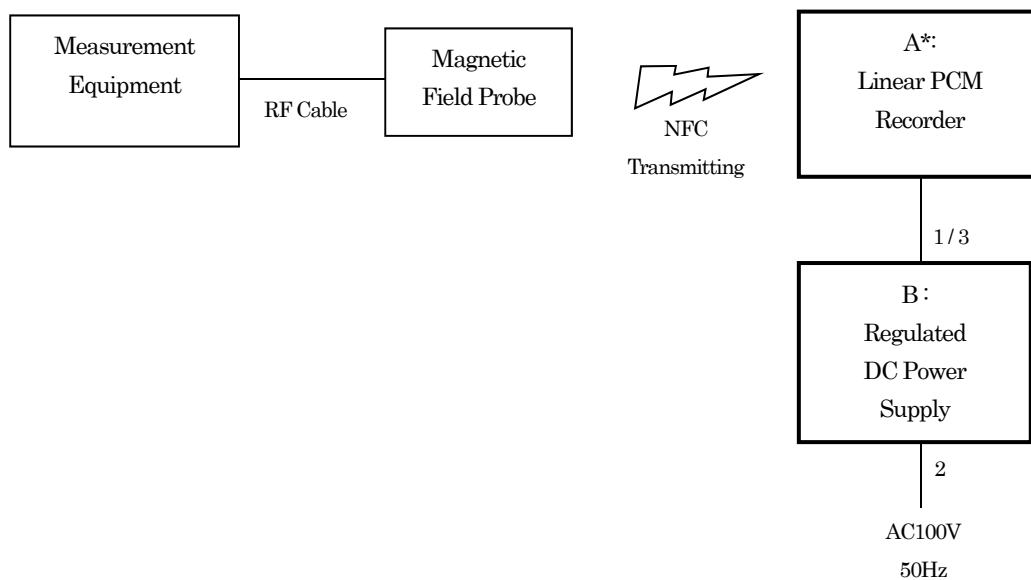
Symbol	Item	Manufacturer	Model No.	Serial No.
B	Regulated DC Power Supply	KENWOOD	PW18-1.3AT	08046429

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
3	USB Cable	-	YES	NO	NO	0.13

System configuration

\*: EUT



AC Power-line Conducted Emissions Measurement

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A	Linear PCM Recorder	SONY	PCM-A10	0314005

Support equipment for operation

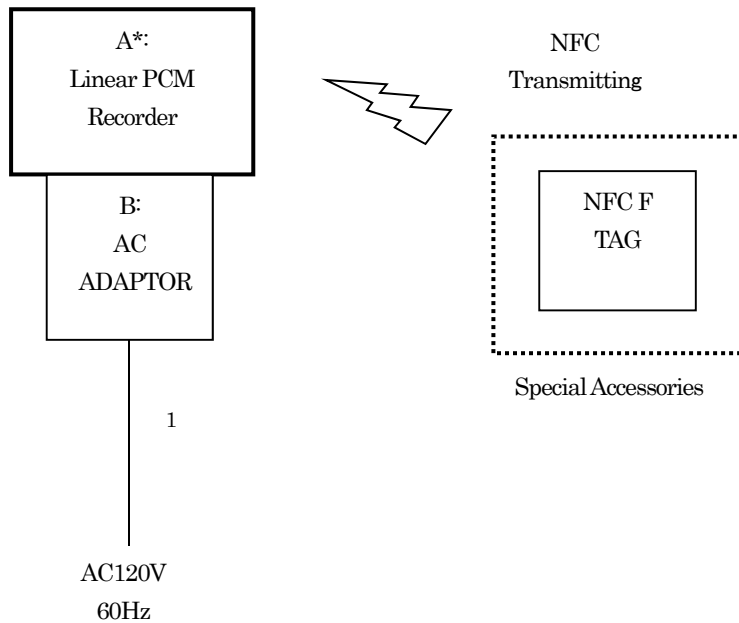
Symbol	Item	Manufacturer	Model No.	Serial No.
B	AC ADAPTOR	SONY	AC-UD20	13026000126

Type of cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Length (m)	Bundled
1	AC Extension Cable	-	NO	NO	0.8	-

System configuration

\*: EUT

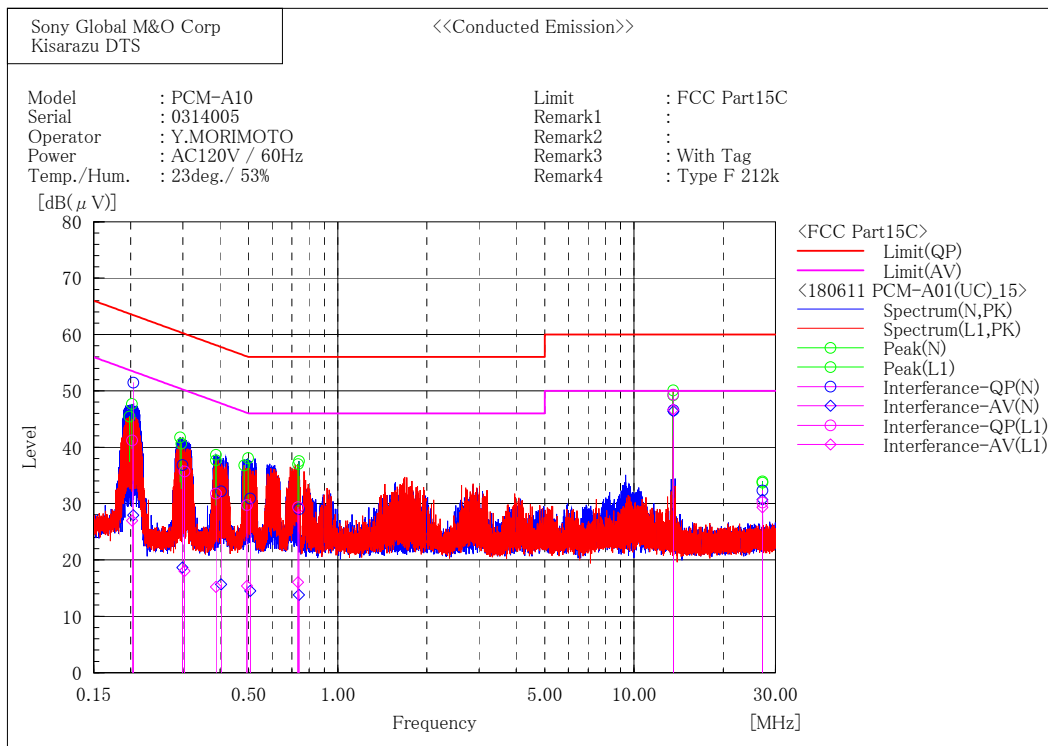


### 3. Test Data

#### 3.1. AC Power-line Conducted Emissions

1)Date of measurement : June 11, 2018

[Type F]



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	0.204	35.2	11.7	16.2	51.4	27.9	63.4	53.4	12.0	25.5
2	0.299	20.7	2.5	16.1	36.8	18.6	60.3	50.3	23.5	31.7
3	0.404	15.9	-0.6	16.3	32.2	15.7	57.8	47.8	25.6	32.1
4	0.507	14.6	-1.8	16.3	30.9	14.5	56.0	46.0	25.1	31.5
5	0.739	12.8	-2.4	16.2	29.0	13.8	56.0	46.0	27.0	32.2
6	13.561	30.1	29.9	16.5	46.6	46.4	60.0	50.0	13.4	3.6
7	27.120	15.4	13.8	16.9	32.3	30.7	60.0	50.0	27.7	19.3

--- L1 Phase ---

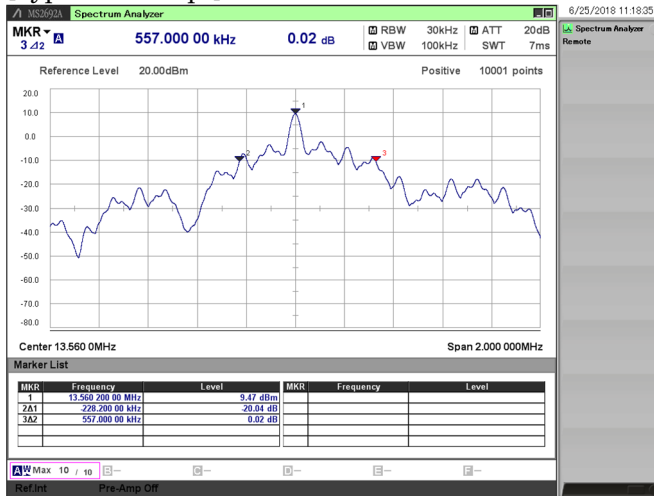
No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.202	25.0	10.8	16.2	41.2	27.0	63.5	53.5	22.3	26.5
2	0.304	19.6	1.9	16.1	35.7	18.0	60.1	50.1	24.4	32.1
3	0.388	15.5	-1.1	16.3	31.8	15.2	58.1	48.1	26.3	32.9
4	0.494	13.4	-0.9	16.3	29.7	15.4	56.1	46.1	26.4	30.7
5	0.734	13.1	-0.3	16.3	29.4	16.0	56.0	46.0	26.6	30.0
6	13.560	32.9	30.3	16.4	49.3	46.7	60.0	50.0	10.7	3.3
7	27.121	13.5	12.6	16.7	30.2	29.3	60.0	50.0	29.8	20.7

### 3.2. 20dB Bandwidth

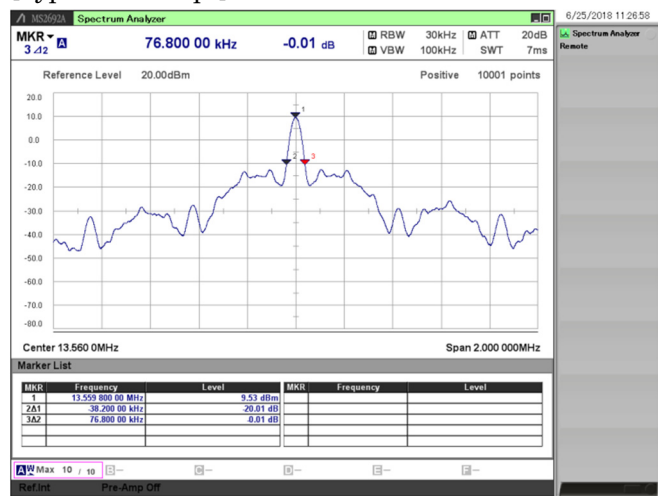
- 1) Ambient temperature : 20.0deg.C
- 2) Relative humidity : 56.6%
- 3) Date of measurement : June 25, 2018
- 4) Measured by : M.KOUGA
- 5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Result [kHz]	Limit [kHz]
Type A	106kbps	13.56	557.000	-
Type F	212kbps	13.56	76.800	-

[Type A / 106kbps]



[Type F / 212kbps]



## 3.3. Frequency Tolerance

- 1) Ambient temperature : 20.0deg.C  
 2) Relative humidity : 56.6%  
 3) Date of measurement : June 25, 2018  
 4) Measured by : M.KOUGA  
 5) Operating mode : Transmitting mode (Unmodulated)

Power Rating : DC 3.7V

Test Temperature	Test Voltage	Test Conditions	Frequency [MHz]	Reading [MHz]	Tolerance [MHz]	Tolerance [%]	Limit [%]
50deg.C	3.700 V	Start up	13.56	13.559829	-0.000171	-0.001261	± 0.01
		After 2min	13.56	13.559820	-0.000180	-0.001327	± 0.01
		After 5min	13.56	13.559817	-0.000183	-0.001350	± 0.01
		After 10min	13.56	13.559817	-0.000183	-0.001350	± 0.01
40deg.C	3.700 V	Start up	13.56	13.559852	-0.000148	-0.001091	± 0.01
		After 2min	13.56	13.559837	-0.000163	-0.001202	± 0.01
		After 5min	13.56	13.559833	-0.000167	-0.001232	± 0.01
		After 10min	13.56	13.559829	-0.000171	-0.001261	± 0.01
30deg.C	3.700 V	Start up	13.56	13.559886	-0.000114	-0.000841	± 0.01
		After 2min	13.56	13.559866	-0.000134	-0.000988	± 0.01
		After 5min	13.56	13.559858	-0.000142	-0.001047	± 0.01
		After 10min	13.56	13.559852	-0.000148	-0.001091	± 0.01
20deg.C	3.700 V	Start up	13.56	13.559893	-0.000107	-0.000789	± 0.01
		After 2min	13.56	13.559881	-0.000119	-0.000878	± 0.01
		After 5min	13.56	13.559880	-0.000120	-0.000885	± 0.01
		After 10min	13.56	13.559879	-0.000121	-0.000892	± 0.01
10deg.C	3.700 V	Start up	13.56	13.559909	-0.000091	-0.000671	± 0.01
		After 2min	13.56	13.559903	-0.000097	-0.000715	± 0.01
		After 5min	13.56	13.559903	-0.000097	-0.000715	± 0.01
		After 10min	13.56	13.559903	-0.000097	-0.000715	± 0.01
0deg.C	3.700 V	Start up	13.56	13.559911	-0.000089	-0.000656	± 0.01
		After 2min	13.56	13.559913	-0.000087	-0.000642	± 0.01
		After 5min	13.56	13.559913	-0.000087	-0.000642	± 0.01
		After 10min	13.56	13.559913	-0.000087	-0.000642	± 0.01
-10deg.C	3.700 V	Start up	13.56	13.559902	-0.000098	-0.000723	± 0.01
		After 2min	13.56	13.559910	-0.000090	-0.000664	± 0.01
		After 5min	13.56	13.559909	-0.000091	-0.000671	± 0.01
		After 10min	13.56	13.559908	-0.000092	-0.000678	± 0.01
-20deg.C	3.700 V	Start up	13.56	13.559866	-0.000134	-0.000988	± 0.01
		After 2min	13.56	13.559886	-0.000114	-0.000841	± 0.01
		After 5min	13.56	13.559881	-0.000119	-0.000878	± 0.01
		After 10min	13.56	13.559878	-0.000122	-0.000900	± 0.01
-30deg.C	3.700 V	Start up	13.56	13.559816	-0.000184	-0.001357	± 0.01
		After 2min	13.56	13.559850	-0.000150	-0.001106	± 0.01
		After 5min	13.56	13.559839	-0.000161	-0.001187	± 0.01
		After 10min	13.56	13.559823	-0.000177	-0.001305	± 0.01
20deg.C	3.145 V	Start up	13.56	13.559887	-0.000113	-0.000833	± 0.01
		After 2min	13.56	13.559883	-0.000117	-0.000863	± 0.01
		After 5min	13.56	13.559885	-0.000115	-0.000848	± 0.01
		After 10min	13.56	13.559885	-0.000115	-0.000848	± 0.01
20deg.C	4.255 V	Start up	13.56	13.560439	0.000439	0.003237	± 0.01
		After 2min	13.56	13.559876	-0.000124	-0.000914	± 0.01
		After 5min	13.56	13.559875	-0.000125	-0.000922	± 0.01
		After 10min	13.56	13.559875	-0.000125	-0.000922	± 0.01

- 1) Ambient temperature : 20.5deg.C  
 2) Relative humidity : 53.5%  
 3) Date of measurement : July 10, 2018  
 4) Measured by : M.KOUGA  
 5) Operating mode : Transmitting mode (Unmodulated)

Power Rating : DC 5V

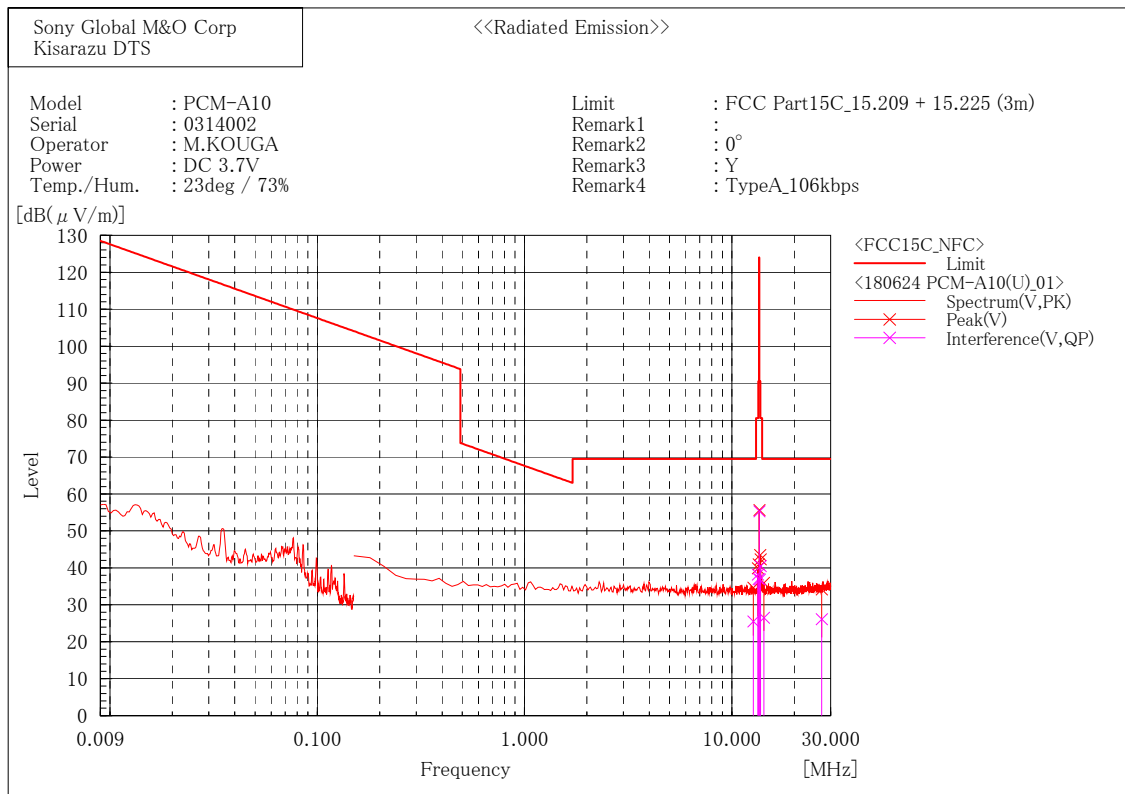
Test Temperature	Test Voltage	Test Conditions	Frequency [MHz]	Reading [MHz]	Tolerance [MHz]	Tolerance [%]	Limit [%]
50deg.C	5.000 V	Start up	13.56	13.559823	-0.000177	-0.001305	± 0.01
		After 2min	13.56	13.559815	-0.000185	-0.001364	± 0.01
		After 5min	13.56	13.559815	-0.000185	-0.001364	± 0.01
		After 10min	13.56	13.559816	-0.000184	-0.001357	± 0.01
40deg.C	5.000 V	Start up	13.56	13.559842	-0.000158	-0.001165	± 0.01
		After 2min	13.56	13.559826	-0.000174	-0.001283	± 0.01
		After 5min	13.56	13.559822	-0.000178	-0.001313	± 0.01
		After 10min	13.56	13.559820	-0.000180	-0.001327	± 0.01
30deg.C	5.000 V	Start up	13.56	13.559869	-0.000131	-0.000966	± 0.01
		After 2min	13.56	13.559847	-0.000153	-0.001128	± 0.01
		After 5min	13.56	13.559842	-0.000158	-0.001165	± 0.01
		After 10min	13.56	13.559840	-0.000160	-0.001180	± 0.01
20deg.C	5.000 V	Start up	13.56	13.559890	-0.000110	-0.000811	± 0.01
		After 2min	13.56	13.559872	-0.000128	-0.000944	± 0.01
		After 5min	13.56	13.559868	-0.000132	-0.000973	± 0.01
		After 10min	13.56	13.559866	-0.000134	-0.000988	± 0.01
10deg.C	5.000 V	Start up	13.56	13.559904	-0.000096	-0.000708	± 0.01
		After 2min	13.56	13.559895	-0.000105	-0.000774	± 0.01
		After 5min	13.56	13.559896	-0.000104	-0.000767	± 0.01
		After 10min	13.56	13.559897	-0.000103	-0.000760	± 0.01
0deg.C	5.000 V	Start up	13.56	13.559912	-0.000088	-0.000649	± 0.01
		After 2min	13.56	13.559914	-0.000086	-0.000634	± 0.01
		After 5min	13.56	13.559913	-0.000087	-0.000642	± 0.01
		After 10min	13.56	13.559912	-0.000088	-0.000649	± 0.01
-10deg.C	5.000 V	Start up	13.56	13.559901	-0.000099	-0.000730	± 0.01
		After 2min	13.56	13.559913	-0.000087	-0.000642	± 0.01
		After 5min	13.56	13.559914	-0.000086	-0.000634	± 0.01
		After 10min	13.56	13.559914	-0.000086	-0.000634	± 0.01
-20deg.C	5.000 V	Start up	13.56	13.559860	-0.000140	-0.001032	± 0.01
		After 2min	13.56	13.559893	-0.000107	-0.000789	± 0.01
		After 5min	13.56	13.559896	-0.000104	-0.000767	± 0.01
		After 10min	13.56	13.559897	-0.000103	-0.000760	± 0.01
-30deg.C	5.000 V	Start up	13.56	13.559823	-0.000177	-0.001305	± 0.01
		After 2min	13.56	13.559870	-0.000130	-0.000959	± 0.01
		After 5min	13.56	13.559864	-0.000136	-0.001003	± 0.01
		After 10min	13.56	13.559858	-0.000142	-0.001047	± 0.01
20deg.C	4.250 V	Start up	13.56	13.559878	-0.000122	-0.000900	± 0.01
		After 2min	13.56	13.559870	-0.000130	-0.000959	± 0.01
		After 5min	13.56	13.559871	-0.000129	-0.000951	± 0.01
		After 10min	13.56	13.559872	-0.000128	-0.000944	± 0.01
20deg.C	5.750 V	Start up	13.56	13.559879	-0.000121	-0.000892	± 0.01
		After 2min	13.56	13.559864	-0.000136	-0.001003	± 0.01
		After 5min	13.56	13.559862	-0.000138	-0.001018	± 0.01
		After 10min	13.56	13.559862	-0.000138	-0.001018	± 0.01



3.4. Electric field strength (Fundamental and Spurious emissions)

9 kHz - 30 MHz

[Type A (106kbps)]



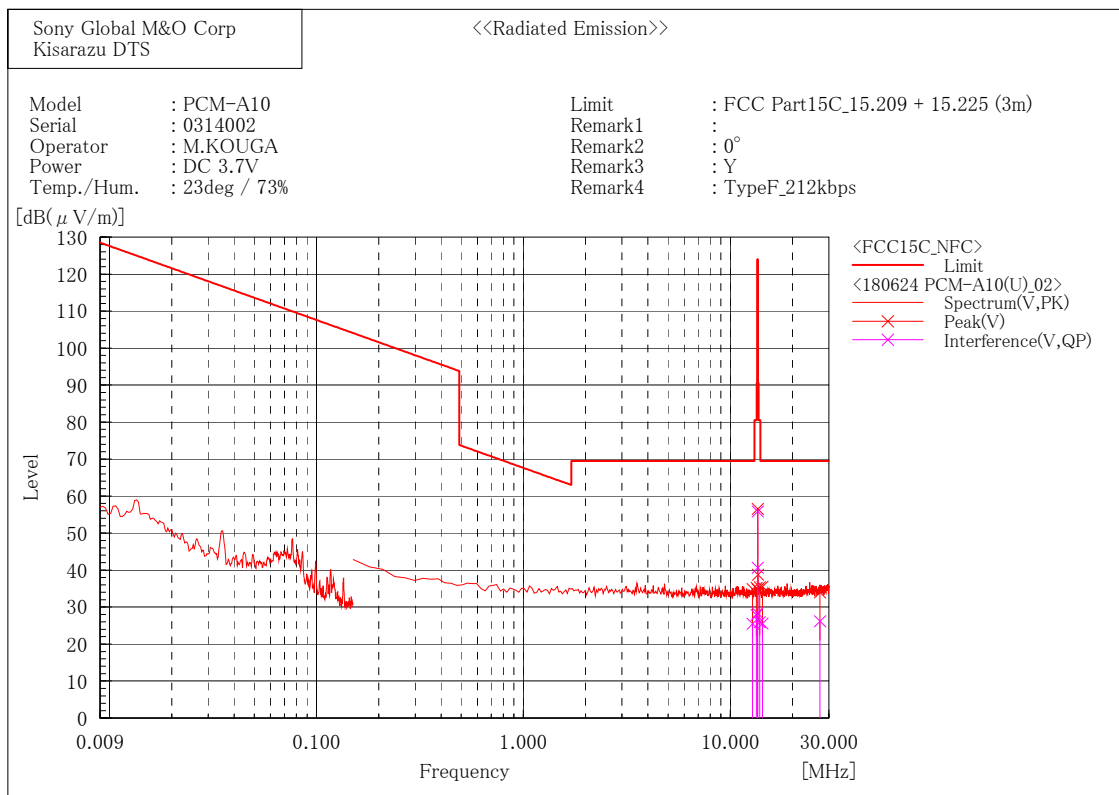
Final Result

--- 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	12.713	5.5	20.0	25.5	69.5	44.0	100.0	359.0
2	13.349	18.2	20.0	38.2	80.5	42.3	100.0	270.0
3	13.456	17.0	20.0	37.0	90.5	53.5	100.0	276.0
4	13.560	35.4	20.0	55.4	124.0	68.6	100.0	273.0
5	13.663	16.9	20.0	36.9	90.5	53.6	100.0	276.0
6	13.771	20.5	20.0	40.5	80.5	40.0	100.0	272.0
7	14.287	6.6	19.9	26.5	69.5	43.0	100.0	267.0
8	27.120	5.4	20.7	26.1	69.5	43.4	100.0	268.0

Mode	Frequency [MHz]	Polar.	Result (3m) [dBuV/m]	Distance Factor [dB]	Result(30m) [dBuV/m]	Limit (30m) [dBuV/m]	Margin [dB]
Type A 106kbps	12.713	V	25.50	-40.00	-14.50	29.54	44.04
	13.349	V	38.20	-40.00	-1.80	40.51	42.31
	13.456	V	37.00	-40.00	-3.00	50.47	53.47
	13.560	V	55.40	-40.00	15.40	84.00	68.60
	13.663	V	36.90	-40.00	-3.10	50.47	53.57
	13.771	V	40.50	-40.00	0.50	40.51	40.01
	14.287	V	26.50	-40.00	-13.50	29.54	43.04
	27.120	V	26.10	-40.00	-13.90	29.54	43.44

[Type F (212kbps) ]



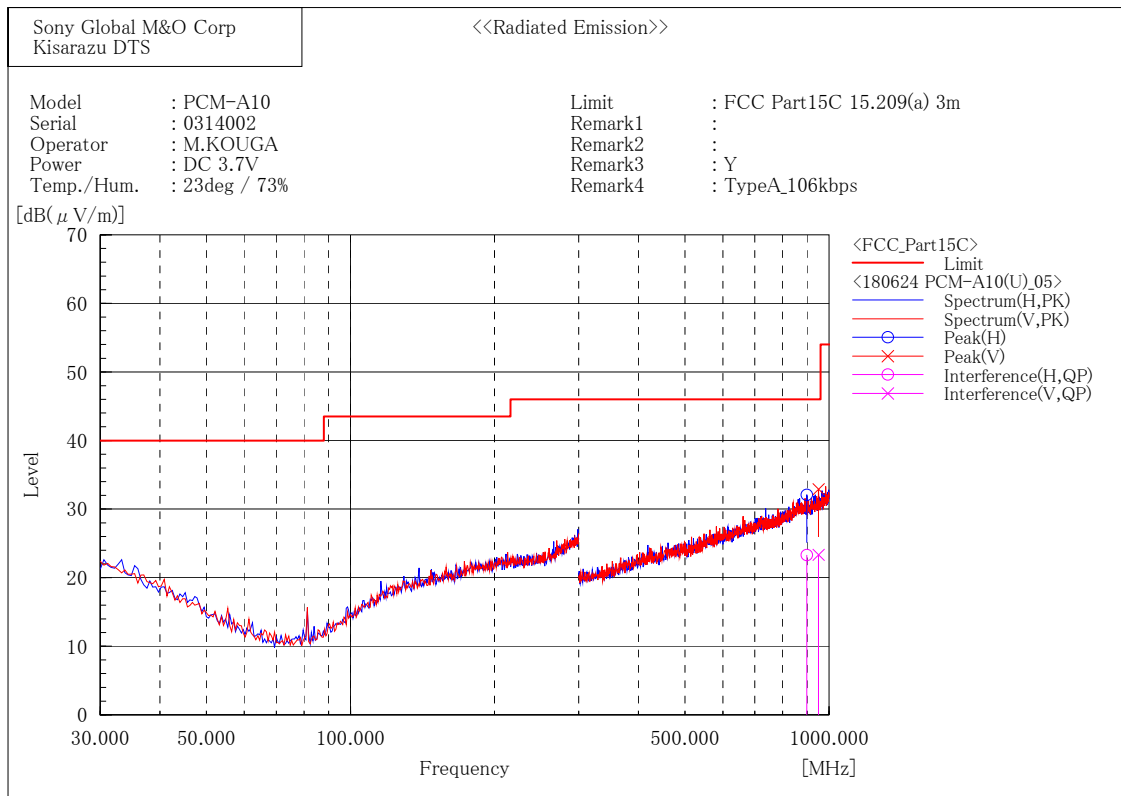
Final Result

--- 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	12.802	5.5	20.0	25.5	69.5	44.0	100.0	244.0
2	13.396	7.9	20.0	27.9	80.5	52.6	100.0	278.0
3	13.550	8.4	20.0	28.4	90.5	62.1	100.0	276.0
4	13.560	35.9	20.0	55.9	124.0	68.1	100.0	274.0
5	13.567	20.6	20.0	40.6	90.5	49.9	100.0	274.0
6	13.871	5.9	20.0	25.9	80.5	54.6	100.0	289.0
7	14.317	5.7	19.9	25.6	69.5	43.9	100.0	279.0
8	27.120	5.5	20.7	26.2	69.5	43.3	100.0	42.0

Mode	Frequency [MHz]	Polar.	Result (3m) [dBuV/m]	Distance Factor [dB]	Result(30m) [dBuV/m]	Limit (30m) [dBuV/m]	Margin [dB]
Type F 212kbps	12.802	V	25.50	-40.00	-14.50	29.54	44.04
	13.396	V	27.90	-40.00	-12.10	40.51	52.61
	13.550	V	28.40	-40.00	-11.60	50.47	62.07
	13.560	V	55.90	-40.00	15.90	84.00	68.10
	13.567	V	40.60	-40.00	0.60	50.47	49.87
	13.871	V	25.90	-40.00	-14.10	40.51	54.61
	14.317	V	25.60	-40.00	-14.40	29.54	43.94
	27.120	V	26.20	-40.00	-13.80	29.54	43.34

30 MHz - 1000 MHz  
[Type A (106kbps)]



Final Result

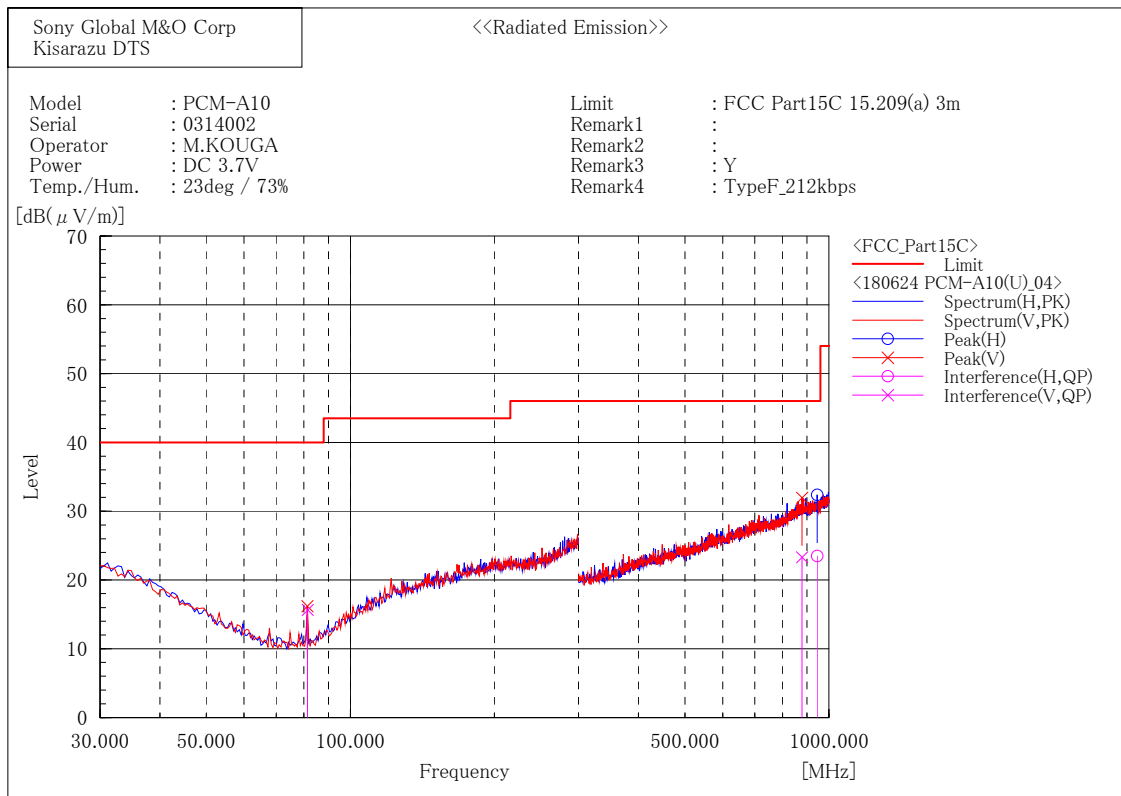
--- Horizontal Polarization (QP) ---

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	899.200	24.6	-1.3	23.3	46.0	22.7	100.0	102.0

--- 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	951.000	24.2	-0.8	23.4	46.0	22.6	145.6	295.0

[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	945.400	24.3	-0.8	23.5	46.0	22.5	100.0	285.0

--- 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	81.362	36.7	-21.0	15.7	40.0	24.3	100.0	278.0
2	878.900	24.7	-1.4	23.3	46.0	22.7	127.0	217.0

## 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 : Ver3.0

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

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	-	Shield Room	-	-	TDK	-	-
x	M0575	EMI Receiver	ESCI	100161	Rohde & Schwarz	12	18.04.18
-	M0109	EMI Receiver	ESI7	100051	Rohde & Schwarz	12	18.04.13
x	CS0043	4th Site CE Cable SYSTEM	-	-	EMC/RF Test Lab.	12	18.06.01
x	M0664	6dB Attenuator	6806.01A	N/A	HUBER+SUHNER AG	12	18.06.01
x	M0619	HIGH FREQUENCY FUSE	MP612A	N/A	Anritsu	12	18.06.01
-	M0026	LISN	KNW-407	8-541-1	Kyoritsu	12	17.07.24
-	M0420	LISN	ESH3-Z5	829996/008	Rohde & Schwarz	12	17.08.04
x	M0514	LISN (for EUT)	ENV216	100424	Rohde & Schwarz	12	18.04.17
-	M0152	50 ohm Terminator	CT-01	N/A	TME	12	17.12.01
-	M0158	50 ohm Terminator	T1302	N/A	Stack	12	17.12.04
x	M0690	Thermometer	AD-5640A	201304	AND	12	17.11.14

### 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	W0054	TEMP & HUMID CHAMBER	SH-240	91006788	ESPEC CORP.	-	-
x	W0100	Signal Analyzer	MS2692A	6201338954	Anritsu	12	18.04.24
x	W0057	EMI Probe	MA2601C	No.1	Anritsu	12	17.10.25
-	W0029	10dB Attenuator	8493C	76549	Keysight Technologies	12	17.08.03
x	W0106	Digital Multimeter	R6452A	120600443	ADVANTEST	12	17.07.27
x	M0722	Thermo Meter	TM-305	140005	AS ONE	12	17.07.20
		Thermo Sensor	LP-200	002	AS ONE	12	17.07.20

### 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	M0506	EMC Chamber	10m	-	TDK	12	18.06.01
-	M0575	EMI Receiver	ESCI	100161	Rohde & Schwarz	12	18.04.18
-	M0669	EMI Receiver	N9038A	MY51210223	Keysight Technologies	12	17.06.28
x	M0515	EMI Receiver	ESCI	100606	Rohde & Schwarz	12	17.09.29
x	A0073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12	17.11.01
x	A0043	Biconical Antenna	BBA9106	V5(91032598)	Schwarzbeck	12	17.12.15
x	A0046	Log periodic Antenna	UHALP9108A1	0830	Schwarzbeck	12	17.12.15
x	CS0039	4th Site RE Cable SYS3	-	-	EMC/RF Test Lab.	12	18.06.01
x	CS0054	4th Site EMF Cable SYS	-	-	SKZ Lab.	12	18.06.01
x	M0706	3dB Attenuator	8491A	MY39267782	Keysight Technologies	12	18.06.01
x	M0510	RF Selector	NS4900	0802-226	TOYO Corp.	12	18.06.01
x	M0620	RF Pre-Amp	8447D	2944A10720	Keysight Technologies	12	18.06.01
-	M0688	Thermo Meter	AD-5640A	201302	A&D	12	17.10.16
x	M0689	Thermometer	AD-5640A	201303	AND	12	17.11.14

About calibration interval

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