

TEST REPORT

For

NFC Reader / Writer module

In conformity with

FCC Part15 subpart B

Model: TN33MUE002L

FCC ID: Not Applicable

Test Item: NFC Reader / Writer module

Report No: RY0911H27R2

Issue Date: November, 2009

Prepared for

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Prepared by

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RF Technologies Ltd. is managed to ISO17025 and has the necessary knowledge and test facilities for
testing according to the referenced standards.**

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History

Report No.	Date	Revisions	Issued By
RY0911H27R2	November 27, 2009	Initial Issue	T. Hori

1 General information

1.1 Product description

Test item : NFC Reader / Writer module
Manufacturer : FDK Corporation
Address : Hamagomu Bldg.5-36-11 Shinbashi, Minato-ku, Tokyo 105-8677, JAPAN
360-0847, Japan
Model : TN33MUE002L
FCC ID/ IC Certification No. : Not Applicable
Serial numbers : M0001 (No.05)
Operating Frequency : Tx / Rx Freq. (13.56 MHz)
Oscillator frequencies : 27.12 MHz
Receipt date of EUT : November 16, 2009
Nominal power source voltages : DC 5.0V (From USB)

1.2 Test(s) performed/ Summary of test result

Test specification(s) : FCC CFR 47. Part 15 subpart B (October 1, 2008)
Test method(s) : ANSI C63.4: 2003
Test(s) started : November 16, 2009
Test(s) completed : November 25, 2009

Summary of test result : Complied

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.

The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.

Compliance of the EUT is more probable than non-compliance in case that the margin is less than the measurement uncertainty in the Laboratory.

Test engineer

: T. Hori
T. Hori
Engineer
EMC testing Department

Reviewer

: K. Ohnishi
K. Ohnishi
Manager
EMC testing Department

1.3 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at **RF Technologies Ltd.**, located in 472, Nippa-cho, Kohoku-ku, Yokohama, 223-0057, Japan, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, per October 1, 2008. The description of the test facilities has been filed under registration number 319924 at the Office of the Federal Communications Commission. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at <http://www.fcc.gov>.

Registered by Voluntary Control Council for Interference by Information Technology Equipment (VCCI)

Each registered facility number is as follows;

Test site (Semi Anechoic chamber 3m) R-2393

Test site (Shielded room) C-2617

Registered by Industry Canada (IC) Each registered facility number is as follows;

Test site No.1 (Semi Anechoic chamber 3m): 6974A

Accredited by **National Voluntary Laboratory Accreditation Program** (NVLAP) for the emission tests stated in the scope of the certificate under Certificate Number 200780-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



NVLAP LAB CODE 200780-0

1.4 Measurement uncertainty

The treatment of uncertainty is based on the general matters on the definition of uncertainty in "Guide to the expression of uncertainty in measurement (GUM)" published by ISO. The Lab's uncertainty is determined by referring UKAS Publication LAB34: 2002 "The Expression of Uncertainty in EMC Testing" and CISPR16-4-2: 2003 "Uncertainty in EMC Measurements".

The uncertainty of the measurement result in the level of confidence of approximately 95% (k=2) is as follows;

Conducted emission: ± 1.9 dB (10 kHz – 30 MHz)

Radiated emission (30MHz - 1000MHz): ± 5.7 dB

1.5 Test results

Requirement of;	Section in FCC15	Result	Section in this report
1.5.1 Radiated emission	15.109	Complied	2.1
1.5.2 Conducted emission	15.107	Complied	2.2

1.5.1 Radiated emission:

Min. Limit Margin 4.2 dB at 910.392 MHz

Remarks : The measurement results is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

1.5.2 Conducted emission:

Min. Limit Margin 2.9 dB at 0.38515 MHz

Remarks : The measurement results is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

1.6 Setup of equipment under test (EUT)

1.6.1 Test configuration of EUT

Equipment(s) under test:

	Item	Manufacturer	Model No.	Serial No.	Remarks
A	NFC Reader / Writer module	Zixsys Inc	TN33MUE002L	M0001 (No.05)	-

Support Equipment(s):

	Item	Manufacturer	Model No.	Serial No.	FCC ID
B	Personal computer	NEC	PC-VY17FLVEW	5X001001A	-
C	AC Adaptor	NEC	ADP-60JH	56108098DA	-
D	Mouse	NEC	M/N:M-UV55a	L7553202220	-

Connected cable(s):

No.	Item	Identification (Manu.e.t.c)	Shielded YES / NO	Ferrite Core YES / NO	Connector Type Shielded YES / NO	Length (m)
1	USB Cable	-	No	No	No	1.5
2	AC Cable	NEC	No	No	No	1.8
3	DC Cable	NEC	No	Yes	No	1.8
4	Mouse Cable	NEC	No	No	No	0.8

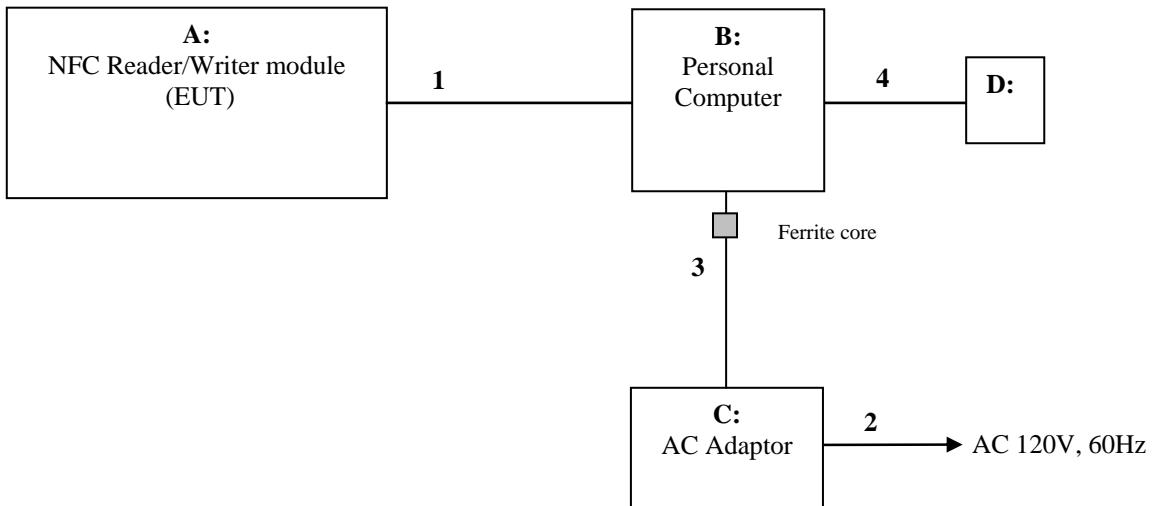
1.6.2 Operating condition:

Operating mode:

The EUT was tested under the following test mode prepared by the applicant:

- (1-1) Connection with PC (Standby)

1.6.3 Setup diagram of tested system:



1.7 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the applicable standards described in clause 1.2.

1.8 Deviation from the standard

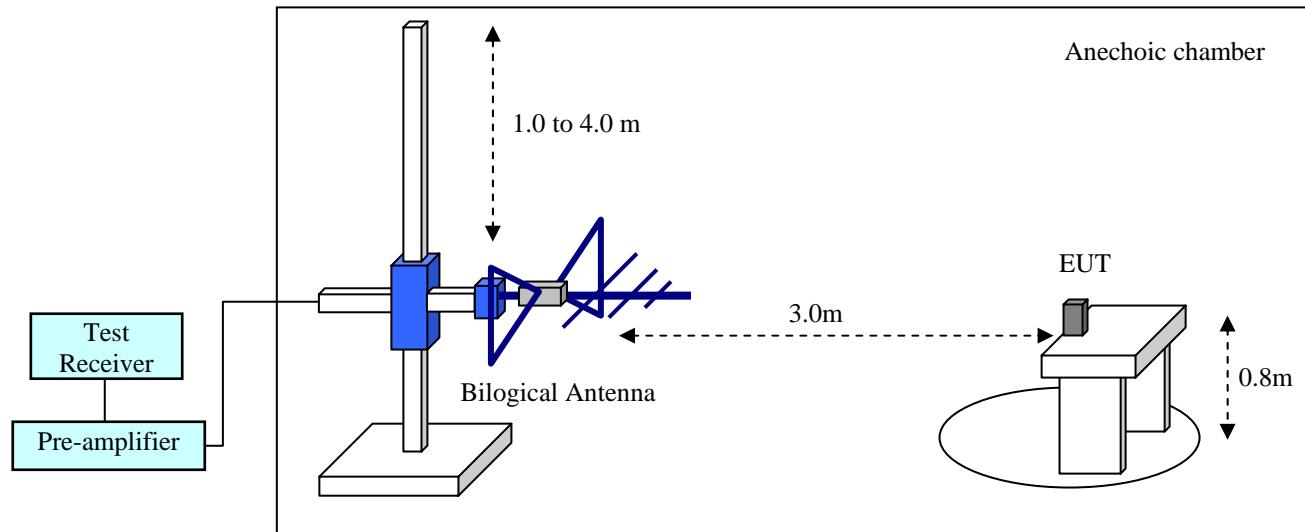
No deviations from the standards described in clause 1.2.

2 Test procedure and test data

2.1 Radiated spurious emissions

Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 clause 6 “General requirements for EUT equipment arrangements and operation”, clause 8 “Radiated emission measurements” and clause 11 “Measurement of ITE”.



Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 8.2.3 and clause 11.6 “Radiated emission measurements”.

Exploratory radiated measurements were performed at the measurement distance of 3 meters using broadband antennas and a spectrum analyzer. The EUT was set up in its typical configuration and arrangement, and operated in its various modes.

For each mode of operation required to be tested, the frequency spectrum were monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) were explored to produce the emission that has the highest amplitude relative to the limit.

Based on the exploratory measurement results, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. This investigation was performed with the EUT rotated 360 °, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Applicable rule and limitation at 3m

§15.109 radiated emission limitation

Frequency (MHz)	Measurement Distance (m)	Field Strength (uV/m)	Field Strength (dBuV/m)
30 – 88	3	100	40.0
88 – 216	3	150	43.5
216 – 960	3	200	46.0
Above 960	3	500	53.9

In the emission table above, the tighter limit applies at the band edges.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector.

Test equipment used (refer to List of utilized test equipment)

BA04	CL11	PR03	TR06
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Test results - Complied with requirement.

2.1.1 Between 30 - 1000 MHz

Test Data

Tested Date: November 19, 2009

Temperature: 21 °C
 Humidity: 30 %
 Atmos. Press: 1027 hPa

Operating Mode: Connection with PC (Standby)

Measurement distance: 3 m

No.	Frequency [MHz]	Reading [dBuV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna Polarization
1	133.347	47.7	11.4	8.8	29.5	38.4	43.5	5.1	Hori.
2	133.379	37.0	11.4	8.8	29.5	27.7	43.5	15.8	Vert.
3	148.698	36.5	10.6	8.9	29.5	26.5	43.5	17.0	Hori.
4	260.066	47.4	12.5	10.1	29.6	40.4	46.0	5.6	Hori.
5	399.250	35.2	15.8	12.1	29.7	33.4	46.0	12.6	Vert.
6	455.196	39.5	16.8	13.7	29.7	40.3	46.0	5.7	Vert.
7	455.197	36.2	16.8	13.7	29.7	37.0	46.0	9.0	Hori.
8	520.224	34.2	17.9	14.5	29.7	36.9	46.0	9.1	Vert.
9	910.392	35.9	20.6	14.2	28.9	41.8	46.0	4.2	Hori.
10	934.105	30.4	20.9	14.3	28.7	36.9	46.0	9.1	Vert.

Calculation method

The Correction Factors and RESULT are calculated as followings.

Correction Factor [dB/m] = FACTOR [dB/m] + LOSS [dB] – GAIN [dB]

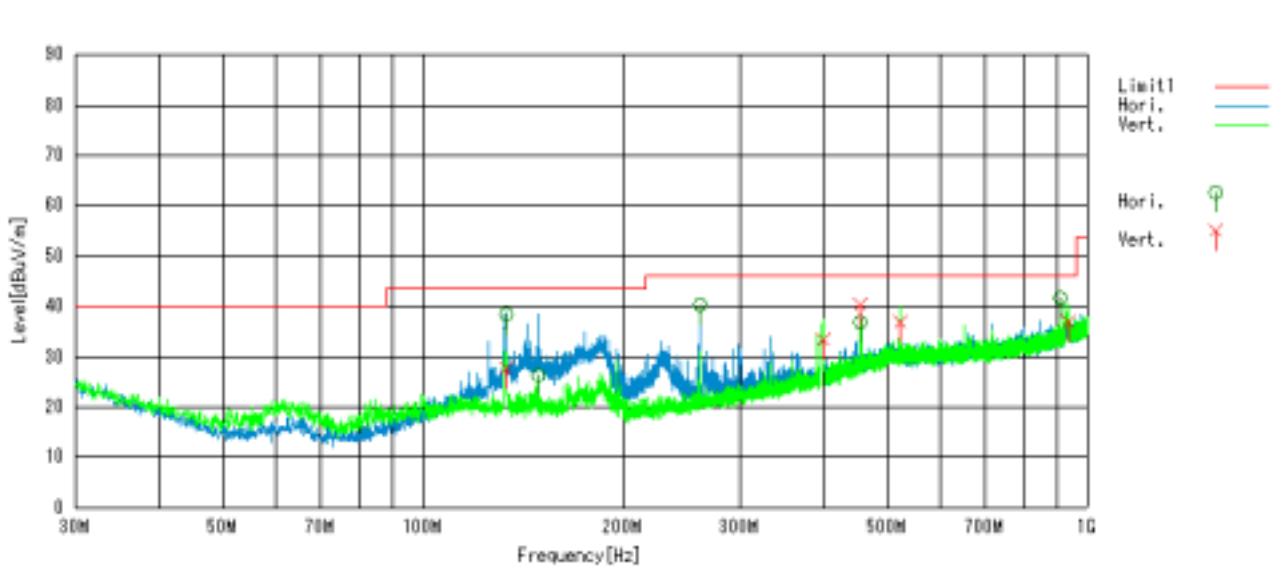
RESULT [dBuV/m] = READING [dBuV] + Correction Factor [dB/m]

Sample calculation at 910.392 MHz vertical result as follow:

Result [dBuV/m] = Reading + C.F = 35.9 + 20.6 + 14.2 – 28.9 = 41.8

Margin [dB] = Limit – Result = 46.0 – 41.8 = 4.2

Graphical express of test result (30MHz-1000MHz)



2.2 AC power line conducted emissions

Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 clause 6 “General requirements for EUT equipment arrangements and operation” clause 7 and clause 11 “Measurement of ITE”.

Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 7.2 and clause 11.5 “AC power line conducted emission measurements”.

Exploratory measurements were used the spectrum analyzer to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement.

Final ac power line conducted emission measurements were performed based on the exploratory tests.

The EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit are selected for the final measurement.

When the measurement value is grater than average limitation the average detection measurements were performed.

Applicable rule and limitation

§15.107 (a) AC power line conducted limits

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

The lower limit applies at the band edges.

Test equipment used (refer to List of utilized test equipment)

TR04	LN06	CL11
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Test results - Complied with requirement.

Test Data

Tested Date: 19 October, 2009

Temperature: 23 °C
 Humidity: 55 %
 Atmos. Press: 1008 hPa

Operating Mode: Connection with PC (Standby)

No.	Frequency [MHz]	Reading		C.F. [dB]	Result		Limit		Margin		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.27879	46.7	29.4	0.1	46.8	29.5	60.9	50.9	14.1	21.4	Va
2	0.32342	40.3	38.0	0.1	40.4	38.1	59.6	49.6	19.2	11.5	Vb
3	0.33498	46.7	36.6	0.1	46.8	36.7	59.3	49.3	12.5	12.6	Va
4	0.38515	47.9	45.2	0.1	48.0	45.3	58.2	48.2	10.2	2.9	Vb
5	0.38954	49.2	40.4	0.1	49.3	40.5	58.1	48.1	8.8	7.6	Va
6	0.45012	43.0	43.0	0.1	49.3	43.1	56.9	46.9	7.6	3.8	Vb
7	0.45244	46.5	39.0	0.1	46.6	39.1	56.8	46.8	10.2	7.7	Va
8	0.52619	45.4	34.8	0.1	45.5	34.9	56.0	46.0	10.5	11.1	Va

The power line conducted emission voltage is calculated by adding the LISN factor and Cable loss attenuation from the measured reading. The calculation is as follows:

$$\text{Result} = \text{Reading} + \text{C. F}$$

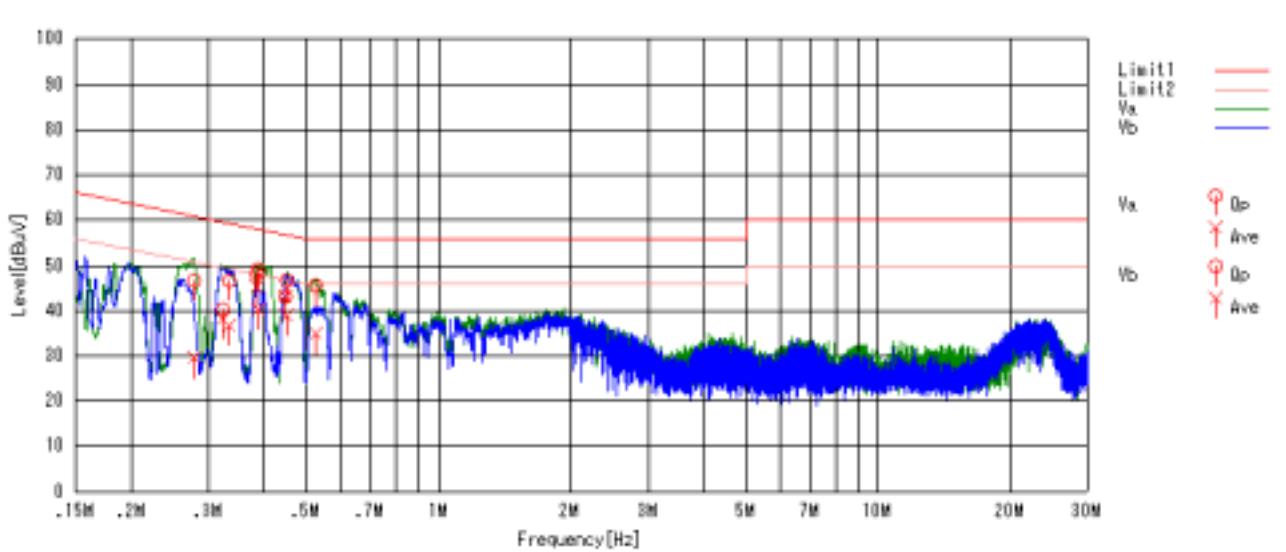
$$\text{where C.F} = \text{LISN Factor} + \text{Cable Loss} \quad [\text{dB}]$$

Sample calculation at 0.38515 MHz AV result as follow:

$$\text{Result [dBuV]} = \text{Reading} + \text{C.F} = 45.2 + 0.1 = 45.3$$

$$\text{Margin} = \text{Limit} - \text{Result} = 48.2 - 45.3 = 2.9 \text{ [dB]}$$

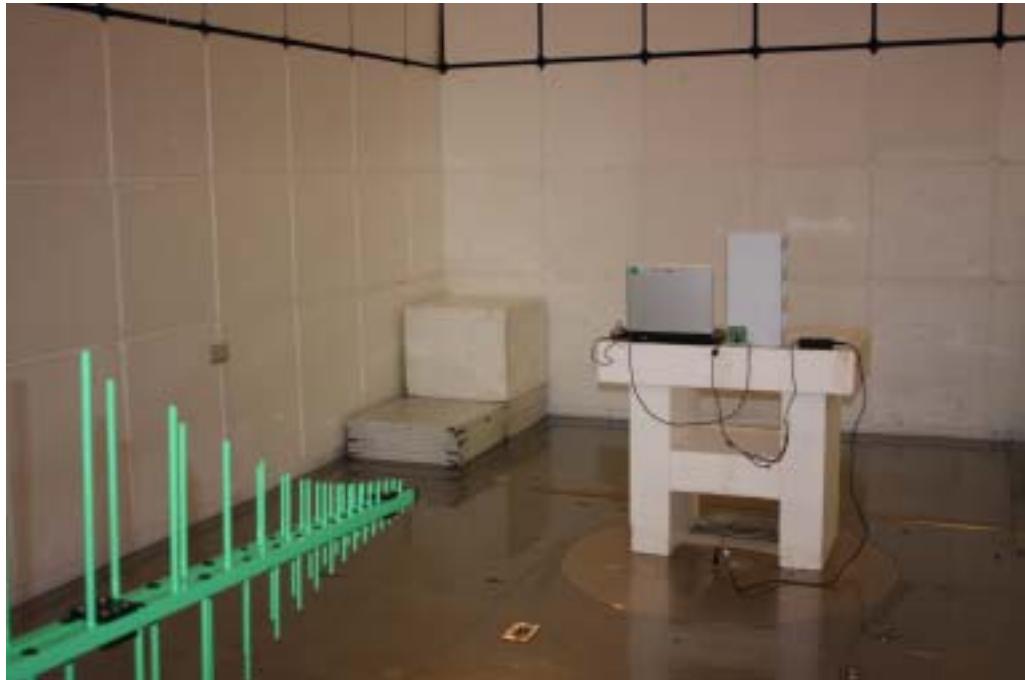
Graphical express of test result (0.15 MHz-30MHz)



3 Test setup photographs

3.1 Radiated spurious emissions

Between 30 -1000 MHz



3.2 AC power line conducted emissions



4 List of utilized test equipment/ calibration

RFT ID No.	Kind of Equipment and Precision	Manufacturer	Model No.	Serial Number	Calibration Date	Calibrated until
AC01(EM)	Anechoic Chamber (1st test room)	JSE	203397C	-	2009/04/09	2010/04/30
BA04	Biological Antenna	SCHAFFNER	CA2855	2903	2009/01/06	2010/01/31
CL11	Antenna Cable for RE	RFT	-	-	2009/04/13	2010/04/30
PR03	Pre. Amplifier	Anritsu	MH648A	M41984	2009/05/26	2010/05/31
LN06	LISN	Kyoritsu	KNW-407	8-1773-3	2009/05/26	2010/05/31
TR04	Test Receiver (F/W : 4.32)	Rohde & Schwarz	ESCI	100447	2009/9/7	2010/9/30
TR06	Test Receiver (F/W : 3.93 SP2)	Rohde & Schwarz	ESU26	100002	2009/09/16	2010/09/30

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.