MEASUREMENT/TECHNICAL REPORT
FCC Part 15 Subpart C

Issued: February 17, 2014

Name and Address of the Applicant:	Yuyama Mfg. Co., Ltd. 3-3-1 Meishinguchi Toyonaka Osaka 561-0841 Japan
Test Item:	PROUD Lower Unit
Identification:	TR-FDK
Serial No.:	S1002
FCC ID:	WSLFDK (Grantee Code + Product Code)
Sample Receipt Date:	August 8, 2013
Test Specification:	FCC Part 15 Subpart C
Date of Testing:	October 7, 8, 9, 10, 11, 14 and 15, 2013
Test Result:	PASS

Report Prepared by:	Cosmos Corporation 3571-2 Oonoki, Watarai-cho, Watarai-gun, Mie-ken 516-2102, Japan Phone: +81-596-63-0707 Fax: +81-596-63-0777

Tested by: K. Miyaji (2014-02-17)
iNARTE : EMC-003627-NE

Reviewed by: H. Onishi, EMC Manager (2014-02-17)
iNARTE : EMC-003318-NT

Note:
1. This Test Report should not be reproduced except in full, without the written approval of Cosmos Corporation.
2. All measurement data contained in this Test Report may have uncertainty. A judgment for the limitation should be taken into the count.
3. The test result of this Test Report is based on the tests made for sample provided, and it is not applicable to individual product identical to the sample or similar product.
4. The judgment of this Test Report validates the test item only specified in "4. Summary of Test Results".

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1. Description of Equipment under Test

1.1 Product Description

Manufacturer	Yuyama Mfg. Co., Ltd.
Model (referred to as the EUT)	TR-FDK
Transmitter Type	☐WLAN ☐Bluetooth ☐Zigbee ☒RFID ☐Other ( )
Nominal Voltage	AC 120 V, 50/60 Hz
Type of Modulation	ASK
Mode of Operation	☐Duplex ☒Simplex ☐Other
Type of Equipment	☒Stand-alone ☐Combined Equipment ☐Plug -In Card ☐Other (Module Unit)
Type of Antenna	☒Integral ☐External ☐Other
Type of Power Source	☒AC mains ☐Dedicated AC adaptor ( ) ☐DC voltage ☐Battery
Type of Battery (if applicable)	None
Type of Operation	☒Continuous ☐Burst ☐Intermittent
Stand by Mode	☐Available ☒N/A
Frequency of Operating	13.56 MHz
Thermal Limitation	0 to 50 ℃

1.2 Antenna Description

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.

Therefore, the equipment complies with the antenna requirement of Section 15.203.

No.	Model	Gain	Antenna Type	Remarks
1	YG-1040006	-59.17 dBi	Integral	Ink Ribbon No.1 Antenna
2	YG-1040006	-59.17 dBi	Integral	Ink Ribbon No.2 Antenna
3	YG-1040007	-59.90 dBi	Integral	Paper Core Antenna

1.3 Tested System Details

Equipment	Manufacturer	Model	Serial No.	Rating
PROUD Lower Unit (EUT1)	Yuyama Mfg.	TR-FDK	S1002	AC 120 V, 50/60 Hz
R/W Module Controlller (EUT2)	Tokyo Communication Equipment Manufacturing	YG-1140001	A-00205	DC 5 V, 280 mA
RFID Antenna (EUT3)	Tokyo Communication Equipment Manufacturing	YG-1040006	0208	---
RFID Antenna (EUT4)	Tokyo Communication Equipment Manufacturing	YG-1040006	0215	---
RFID Antenna (EUT5)	Tokyo Communication Equipment Manufacturing	YG-1040007	---	---
Jig Board	Yuyama Mfg.	Un-specified	M1280220	DC 5 V

2. General Information

2.1 Test Methodology

All measurement subject to the present test report is carried out according to the procedures in ANSI C63.4:2003.

2.2 Test Facility

The measurement was carried out at the following facility.

Cosmos Corporation EMC Lab. Oonoki
3571-2 Oonoki, Watarai-cho, Watarai-gun, Mie-ken 516-2102, Japan
☒Semi anechoic Chamber 3 m
☒Shielded Room

Cosmos Corporation EMC Lab. Oonoki is accredited in accordance with the International Standard ISO/IEC 17025 by the following accreditation bodies and the test facility is registered by the following bodies.

Accreditation: A2LA Accredited Laboratory. No. 2900.01
Nemko Laboratory Authorisation. No. ELA 621

Registration: FCC Registration No. 604492
Industry Canada Registration No. 3958B

2.3 Tractability

The calibration of measurement equipment used in the test subject to the present report is designed and operated to ensure that the measurement is traceable to national standards of measurement or equivalent abroad.

3. Test Condition (Manufacturer's Specification)

3.1 Mode of Operation

Mode of operation: RFID three antennas operating

Note: These three antennas are one set in all.
The antenna model: YG-1040006 is the antenna for discriminating between Ink Ribbon No.1 and No.2.
The antenna model: YG-1040007 is the antenna for discriminating the paper core.
These antennas are equipped on this module as standard, and these three antennas are sequentially switched by the transmission substrate.
One antenna at a time transmits and more than two antennas do not transmit at the same time.
Fundamental emission was measured with each antenna; spurious emissions were tested at the nearly general using state.
(three antennas were sequentially switched)

The EUT makes communication emission with the maximum RF power by a special test program.

The test of Field Strength of Fundamental Emission was performed under the following condition:

Voltage: 5 VDC ±15%

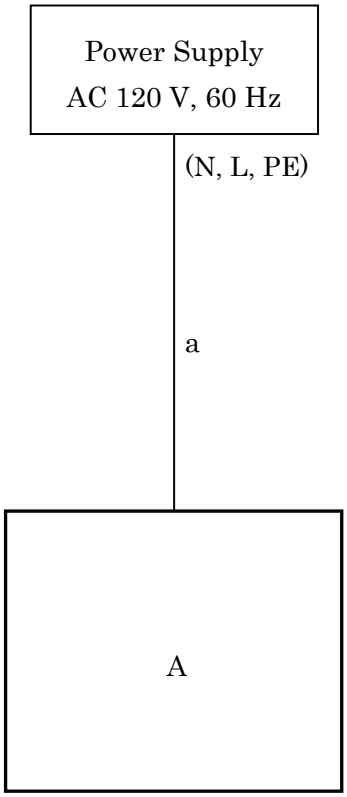
The test of Frequency Tolerance was performed under the following condition:

Temperature: -20℃ to +50℃
Voltage: 5 VDC ±15%

3.2 Test Configuration

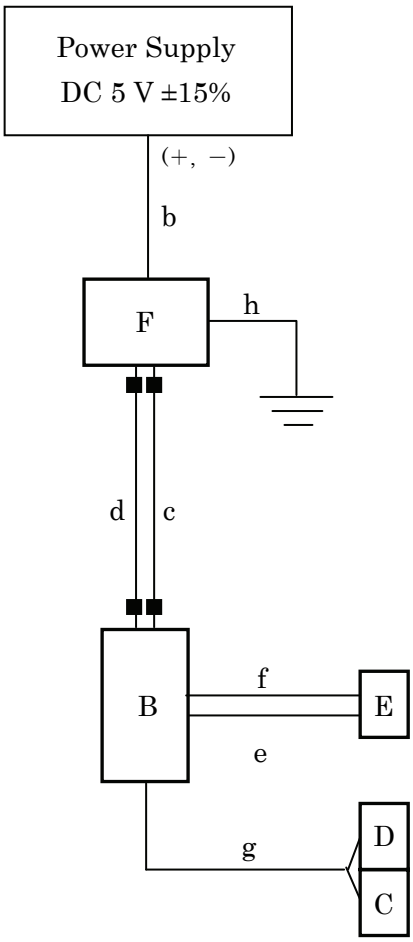
	Instrument	Model		Cable	Length	Shield
A	EUT1	TR-FDK	a	AC Power Cord	3.1 m	×
B	EUT2	YG-1140001	b	DC Power Cord	0.3 m	×
C	EUT3	YG-1040006	c	Signal Cable	2.6 m	○
D	EUT4	YG-1040006	d	Signal Cable	2.6 m	○
E	EUT5	YG-1040007	e	Antenna Cable	0.4 m	×
F	Jig Board	Un-specified	f	Antenna Cable	0.4 m	○
			g	Antenna Cable	0.3 m	○
			h	Earth Cable	3.0 m	×

AC Power Line Conducted Emission
Radiated Spurious Emission



3.2 Test Configuration (Continued)

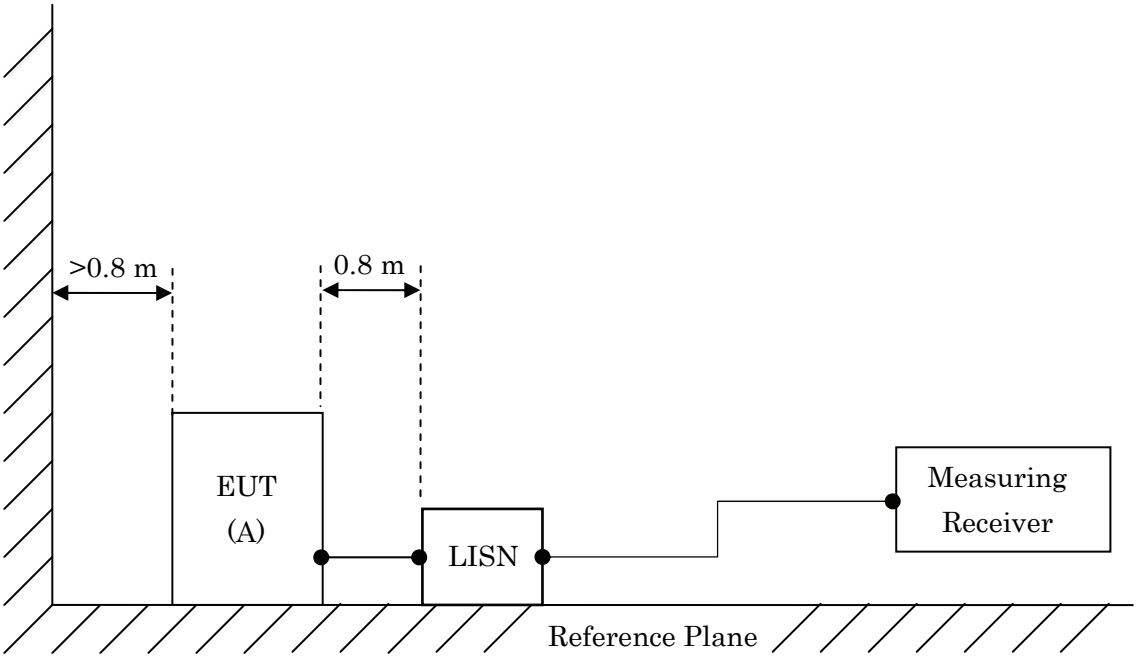
20 dB Bandwidth
Field Strength of Fundamental Emission
Frequency Tolerance



■ Ferrite Core: 2 turn (ZCAT1730-0730, TDK)

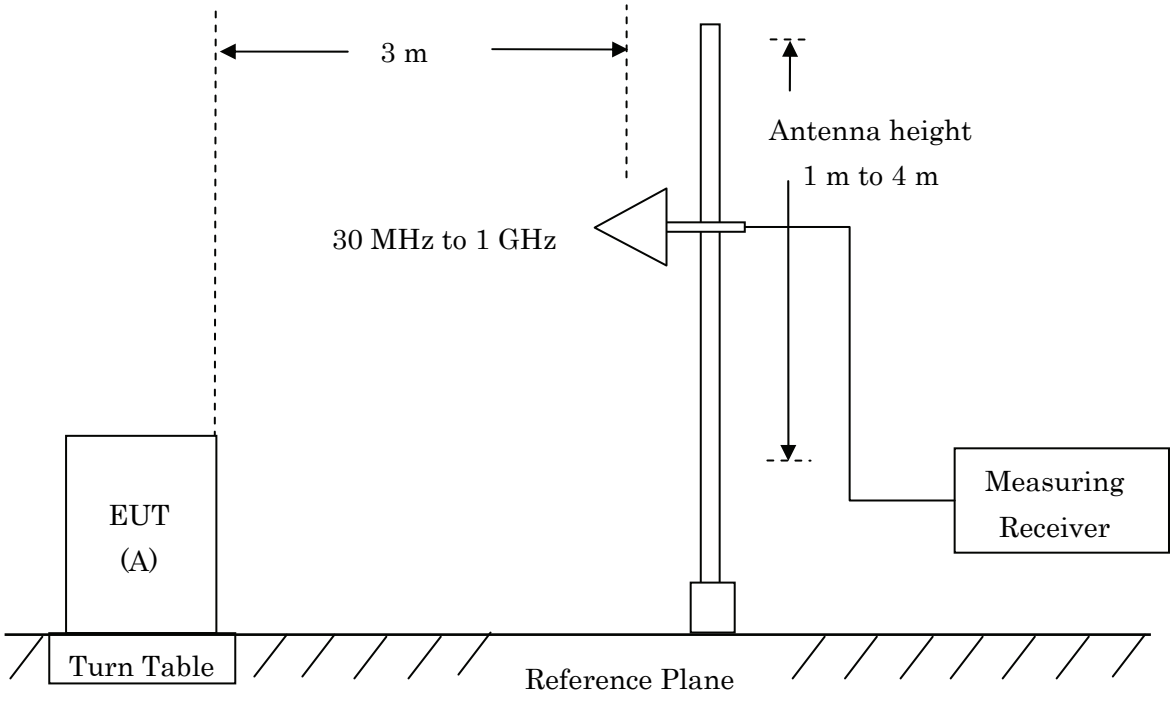
3.2 Test Configuration (Continued)

AC Power Line Conducted Emission



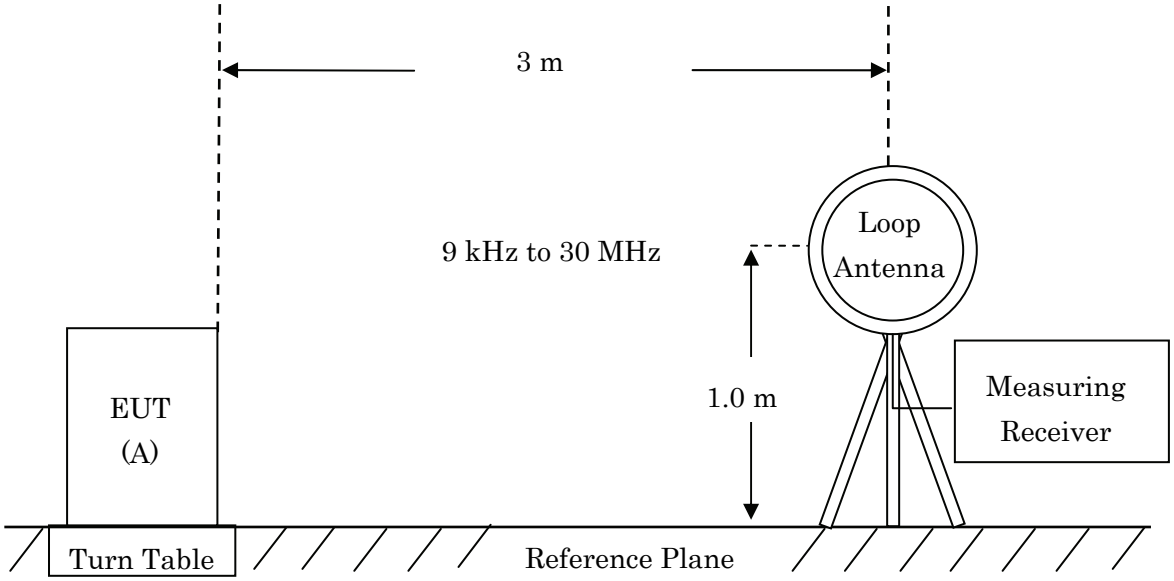
Note: AC power cord was bundled with the bundles 0.4 m and placed on the insulating support which was the same height as the AC inlet.

Radiated Spurious Emission



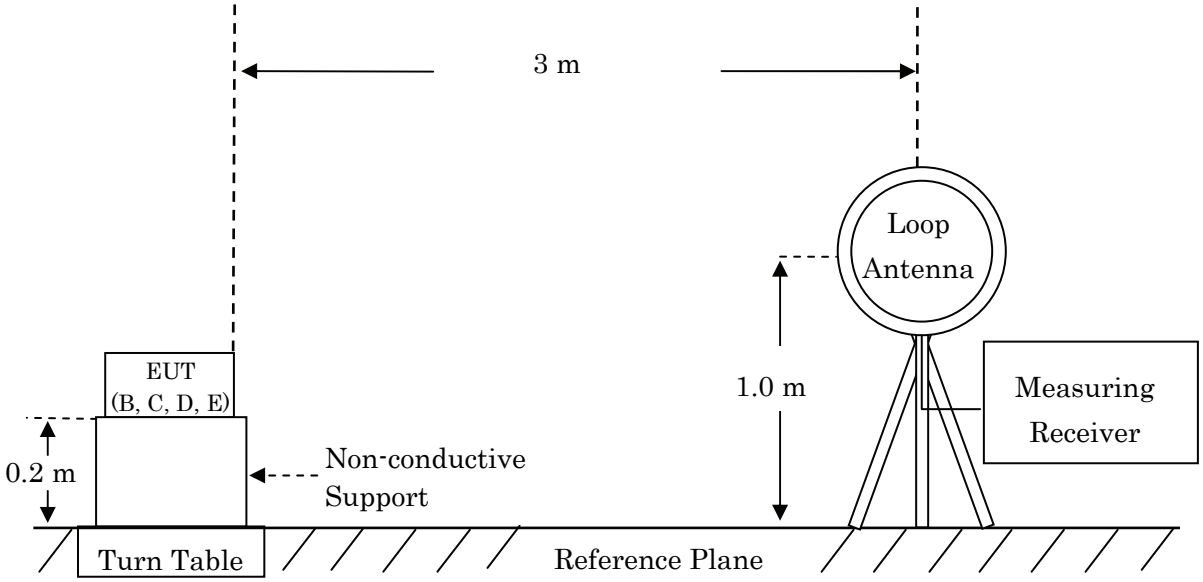
3.2 Test Configuration (Continued)

Radiated Spurious Emission



20 dB Bandwidth

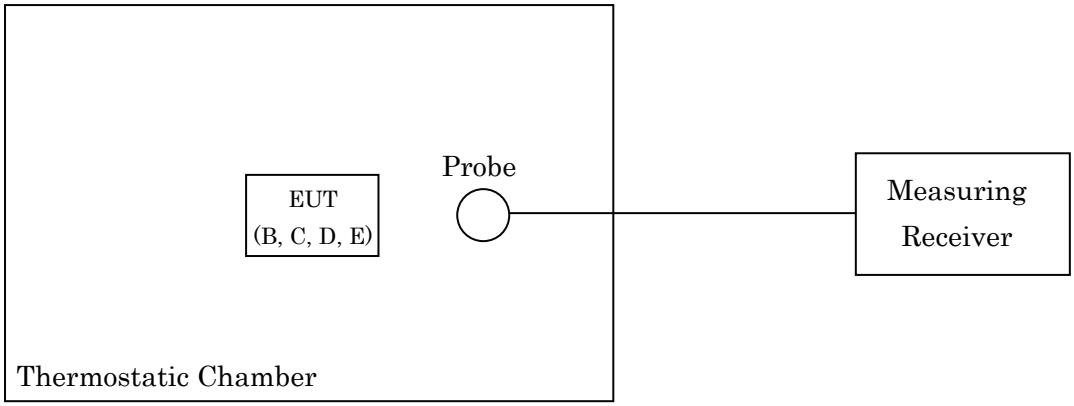
Field Strength of Fundamental Emission



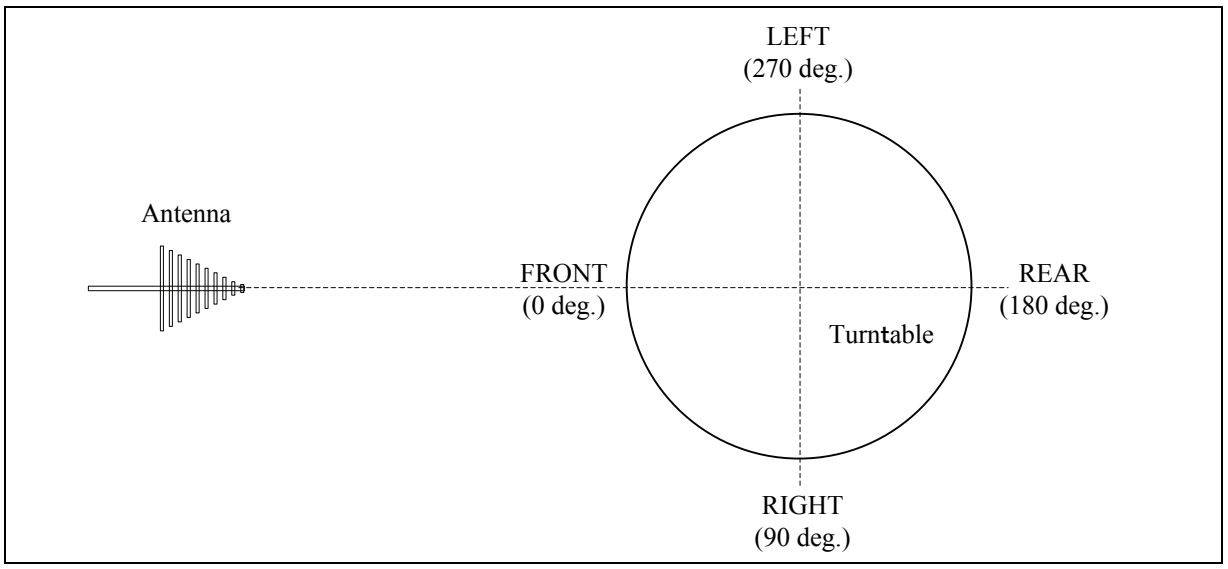
Note: It is not realistic that this product is placed on the table 80 cm high because it is a heavy floor-standing equipment.
However, the RF part is mounted on the large enclosure and attached to the position 20 cm high from a floor, so the test was performed with the above test set-up.

3.2 Test Configuration (Continued)

Frequency Tolerance



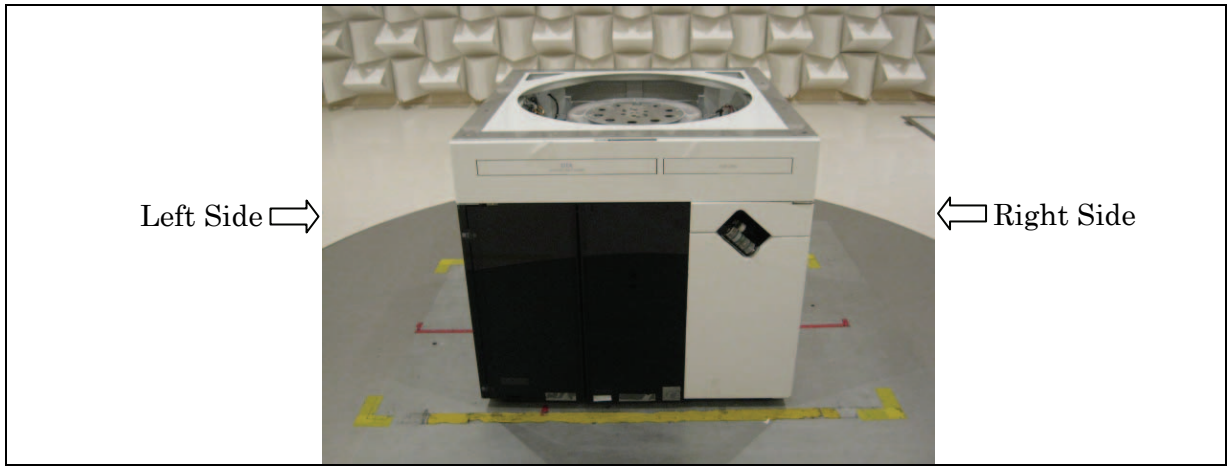
3.3 EUT Angle



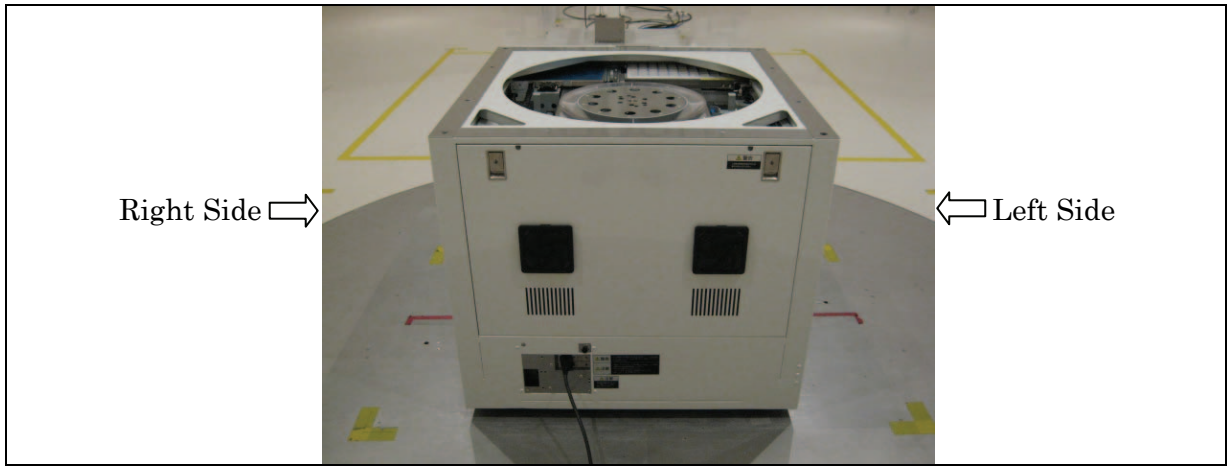
3.4 Photograph of EUT

[EUT A]

Front View



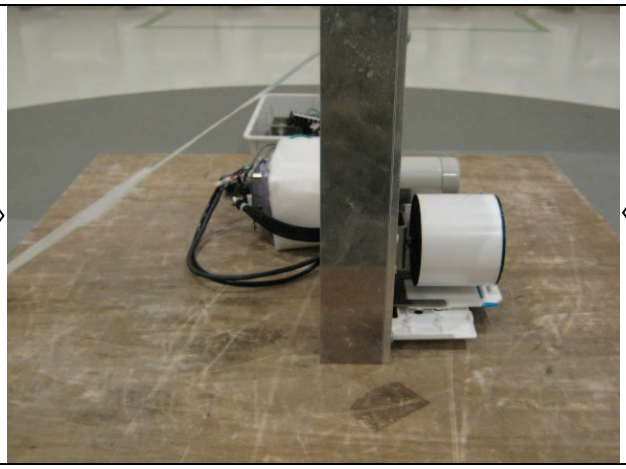
Rear View



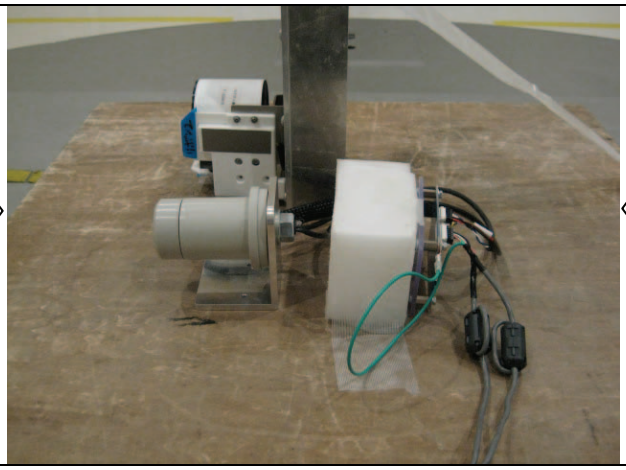
3.4 Photograph of EUT (Continued)

[EUT B, C, D, E]

Front View



Rear View



4. Summary of Test Results

These test results are the test results of the condition specified with “3. Test Condition”.

Section	Test Item	Result
15.207	AC Power Line Conducted Emission	Pass
15.209, 15.225 (d)	Radiated Spurious Emission	Pass
15.215 (c)	20 dB Bandwidth	Pass *1
15.225 (a)(b)(c)(d)	Field Strength of Fundamental Emission	Pass *1
15.225 (e)	Frequency Tolerance	Pass *2

Note: *1: These were set to be able to operate with each PCB which the special program is installed for test. So, it was performed with chassis off.
*2: The extreme temperature test was performed with the module single body because the EUT was too large.

5. Measurement Result

5.1 15.207 AC Power Line Conducted Emission

5.1.1 Setting Remarks

・The conducted disturbance voltage of AC power line in the frequency range from 0.15 MHz to 30 MHz was measured in accordance with ANSI C63.4:2003.
・The test setup was made in accordance with ANSI C63.4:2003 in a shielded room.
・The EUT was placed on the reference ground plane. The EUT was insulated from the reference ground plane by the castors.
・The used line impedance stabilizing Network (LISN) has a rated impedance of 50 Ω/50 μH as specified in CISPR16-1-1.
・The test receiver with Quasi Peak and Average detector is in accordance with CISPR 16-1-2.
・The conducted emission level is calculated by adding Cable Attenuation Factor and Insertion Loss of LISN.
・Activate the EUT System and run the software prepared for the test.
・Refer to the figure of 3.2 Test configuration.
・Durinig the test, EUT was performed with the Tx - mode condition.

Setting Condition of Test receiver

Frequency range	Detector	RBW
150 kHz to 30 MHz	Quasi-peak	9 kHz
	Average	9 kHz

5.1.2 Minimum Standard

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

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

* Decreases with the logarithm of the frequency.

5.1.3 Result

EUT complies with the requirement.

Uncertainty of measurement result	:	±2.26 dB
Date of testing	:	October 15, 2013
Temperature	:	22℃
Humidity	:	55%

5.1.4 Measured Data

Calculation

C.Fac = LISN Factor + Cable Attenuation Factor
Result = Reading + C.Fac
Margin = Limit - Result

117935E FCC CE Total01s.CED

<<Conducted Emission>>

Cosmos Corporation Oonoki Lab.
Date : 2013/10/15 10:31:08

Model Name : TR-FDK
Serial No. : S1002
Operator : K.Miyaji
Power Supply : AC 120V, 60Hz

Temp/Humi : 22℃ / 55%
Mode : RFID 3antenna operating
Remark1 :
Remark2 :

Memo : RBW:9kHz

LIMIT : FCC 15.207(QP)
FCC 15.207(AV)

<< QP/AV DATA >>

No	Freq.	Reading Level		C.Fac	Results		Limit		Margin		Phase
		QP	AV		QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
1	0.15079	41.2	31.2	10.7	51.9	41.9	66.0	56.0	14.1	14.1	La
2	0.17821	38.3	28.3	10.6	48.9	38.9	64.6	54.6	15.7	15.7	La
3	4.93000	12.0	6.3	10.6	22.6	16.9	56.0	46.0	33.4	29.1	La
4	13.56005	26.7	25.9	10.9	37.6	36.8	60.0	50.0	22.4	13.2	La
5	0.15043	41.0	31.0	10.7	51.7	41.7	66.0	56.0	14.3	14.3	Lb
6	0.18500	37.1	27.0	10.6	47.7	37.6	64.3	54.3	16.6	16.7	Lb
7	4.90444	11.6	6.6	10.6	22.2	17.2	56.0	46.0	33.8	28.8	Lb
8	13.56029	26.3	24.7	10.9	37.2	35.6	60.0	50.0	22.8	14.4	Lb

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5.1.4 Measured Data (Continued)

117935E FCC CE Total01s.CED

<<Conducted Emission>>

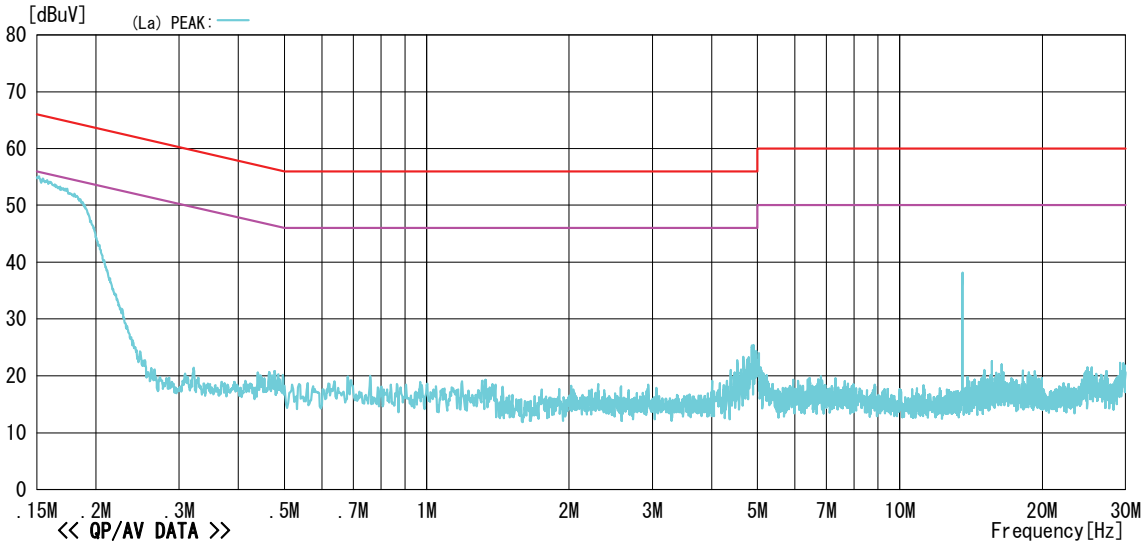
Cosmos Corporation Oonoki Lab.
Date : 2013/10/15 10:31:08

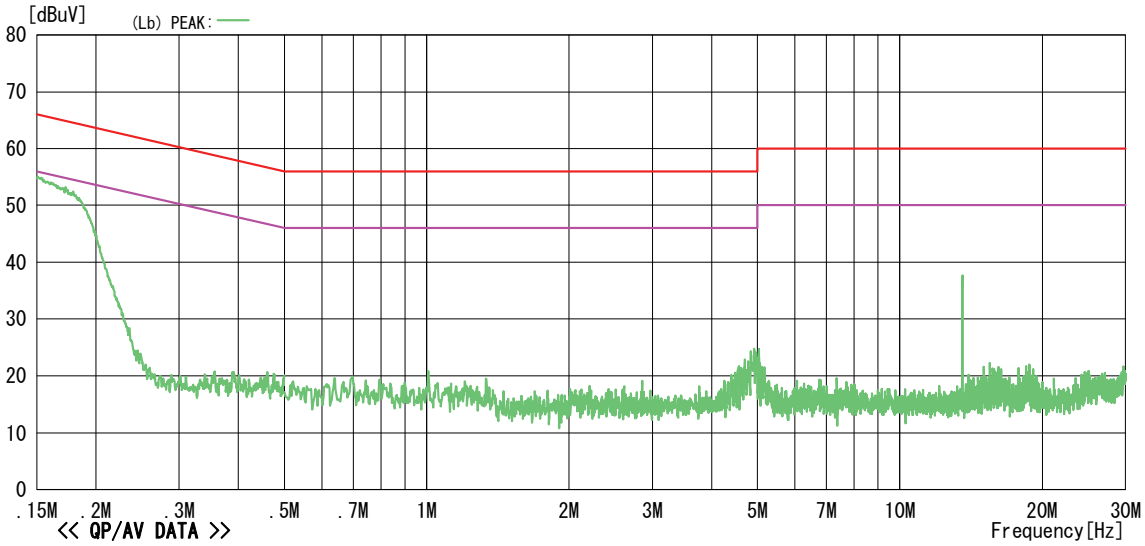
Model Name : TR-FDK
Serial No. : S1002
Operator : K.Miyaji
Power Supply : AC 120V, 60Hz

Temp/Humi : 22℃ / 55%
Mode : RFID 3antenna operating
Remark1 :
Remark2 :

Memo : RBW:9kHz

LIMIT : FCC 15.207(QP)
FCC 15.207(AV)





-TEPTO-DV/CE Ver1.90.0048

5.2 15.209, 15.225 (d) Radiated Spurious Emission

5.2.1 Setting Remarks

・In the frequency range from 9 kHz to 1 GHz (over 10th harmonics), the electric field strength was measured in accordance with ANSI C63.4:2003.
・The test setup was made in accordance with ANSI C63.4:2003 on the table installed in a semi-anechoic chamber.
・The EUT was placed on the reference ground plane. The EUT was insulated from the reference ground plane by the castors.
・The EUT was measured at 1 m to 4 m height of the antenna.
・The turntable was fully rotated. The highest radiation from the equipment was recorded.
・The measurement was carried out with both horizontal and vertical antenna polarization.
・The test receiver with Quasi Peak detector is in accordance with CISPR 16-1-1.
・The measurement was carried out with the measuring distance of 3 m.
Then the limit of 30 m distance below 30 MHz was converted to the limit of 3 m distance with the 40log(30 m/ 3 m).
・Refer to the figure of 3.2 Test configuration.

Frequency range	Detector	RBW
9 kHz to 150 kHz	Quasi-peak	200 Hz
150 kHz to 30 MHz	Quasi-peak	9 kHz
30 MHz to 1 GHz	Quasi-peak	120 kHz

5.2.2 Minimum Standard

15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
0.009 to 0.490	2400/F (kHz)	300
0.490 to 1.705	24000/F (kHz)	30
1.705 to 30.0	30	30
30 to 88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960	500	3

15.225 (d) The field strength of any emissions appearing outside of the 13.110 MHz to 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

EUT complies with the requirement.

Uncertainty of measurement result	:	±3.64 dB
Date of testing	:	October 7, 2013
Temperature	:	23℃
Humidity	:	50%
Date of testing	:	October 8, 2013
Temperature	:	24℃
Humidity	:	53%

5.2.3 Measured Data

9 kHz to 30 MHz (Antenna: 0 deg.)

117935E FCC ME Total01s.MED

<<Electromagnetic Radiation>>

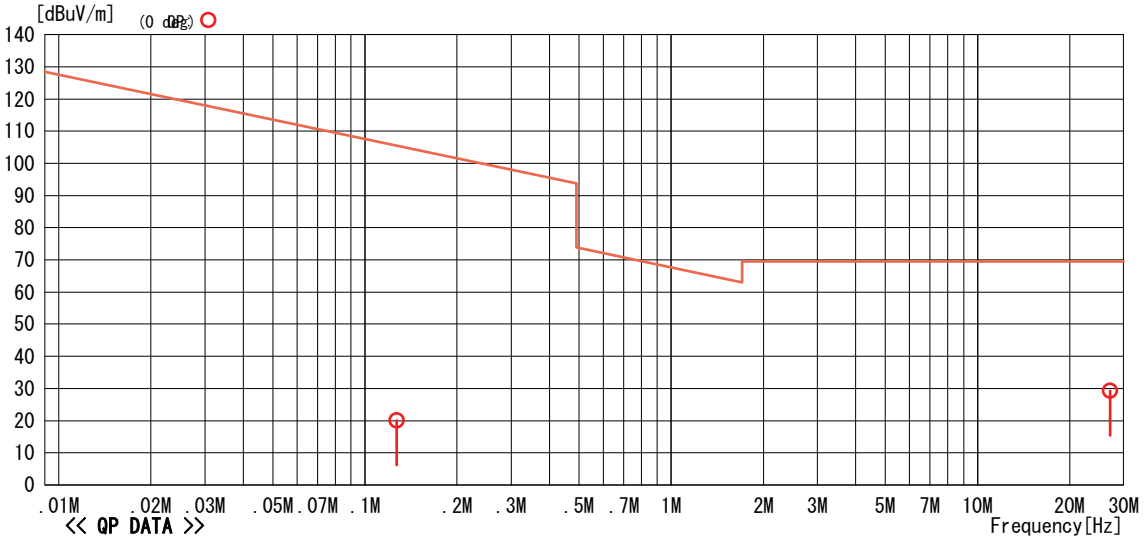
Cosmos Corporation Oonoki Lab.
Date : 2013/10/08 22:04:38

Model Name : TR-FDK
Serial No. : S1002
Operator : K.Miyaji
Power Supply : AC 120V, 60Hz

Temp./Humi. : 24℃/53%
Mode : RFID 3antenna operating
Remark1 :
Remark2 :

Memo : RBW:200Hz(9k-150kHz),9kHz(150kHz-30MHz)

LIMIT : FCC Part15 SubpartC 15.209 9KHz-30MHz



No	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna	Angle [deg]
1	0.12662	0.5	19.5	0.1	20.1	105.5	85.4	0deg	133
2	27.12044	6.5	21.3	1.5	29.3	69.5	40.2	0deg	235

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5.2.3 Measured Data (Continued)

9 kHz to 30 MHz (Antenna: 90 deg.)

117935E FCC ME Total01s.MED

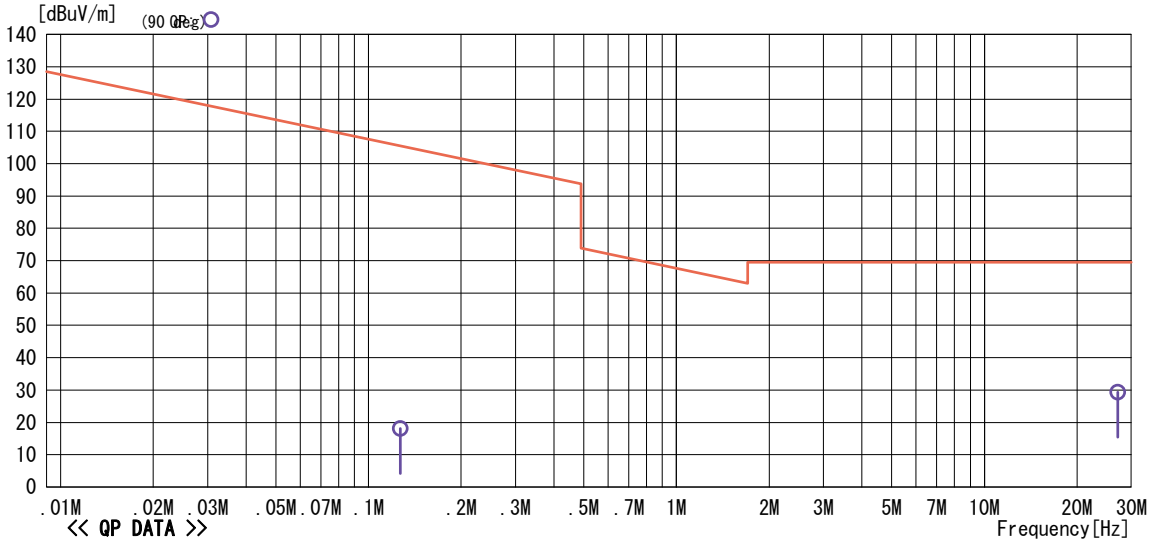
<<Electromagnetic Radiation>>

Cosmos Corporation Oonoki Lab.
Date : 2013/10/08 22:04:38

Model Name	: TR-FDK	Temp./Humi.	: 24℃/53%
Serial No.	: S1002	Mode	: RFID 3antenna operating
Operator	: K.Miyaji	Remark1	:
Power Supply	: AC 120V, 60Hz	Remark2	:

Memo : RBW:200Hz(9k-150kHz),9kHz(150kHz-30MHz)

LIMIT : FCC Part15 SubpartC 15.209 9KHz-30MHz



No	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna	Angle [deg]
1	0.12661	-1.5	19.5	0.1	18.1	105.5	87.4	90deg	179
2	27.12043	6.5	21.3	1.5	29.3	69.5	40.2	90deg	358

-TEPTO-DV/ME Ver1.90.0048

5.2.3 Measured Data (Continued)

30 MHz to 1 GHz

117935E FCC RE Total01.RED

<<Radiated Emission>>

Cosmos Corporation Oonoki Lab.
Date : 2013/10/07 23:53:19

Model Name : TR-FDK
Serial No. : S1002
Operator : K.Miyaji
Power Supply : AC 120V, 60Hz

Temp./Humi. : 23℃/50%
Mode : RFID 3antenna operating
Remark1 :
Remark2 :

Memo : RBW:120kHz

LIMIT : FCC Part15 SubpartC 3m MHz

<< QP DATA >>

No	Freq.	Reading	C.Fac	Result	Limit	Margin	Pola.	Height	Angle	Ant
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type
1	406.813	45.1	-4.8	40.3	46.0	5.7	Hori.	116	159	LP
2	433.932	45.7	-4.5	41.2	46.0	4.8	Hori.	100	47	LP
3	488.173	47.2	-3.5	43.7	46.0	2.3	Hori.	100	3	LP
4	515.296	46.3	-2.8	43.5	46.0	2.5	Hori.	116	358	LP
5	542.415	45.4	-2.1	43.3	46.0	2.7	Hori.	128	319	LP
6	650.896	39.7	0.1	39.8	46.0	6.2	Hori.	100	32	LP
7	67.808	46.8	-14.7	32.1	40.0	7.9	Vert.	100	5	BC
8	81.367	52.1	-15.2	36.9	40.0	3.1	Vert.	100	4	BC
9	406.813	46.8	-4.8	42.0	46.0	4.0	Vert.	137	312	LP
10	488.173	46.1	-3.5	42.6	46.0	3.4	Vert.	112	0	LP
11	515.294	45.9	-2.8	43.1	46.0	2.9	Vert.	231	341	LP
12	542.415	46.2	-2.1	44.1	46.0	1.9	Vert.	174	4	LP

-TEPTO-DV/RE Ver 1.90.0048

5.2.3 Measured Data (Continued)

117935E FCC RE Total01.RED

<<Radiated Emission>>

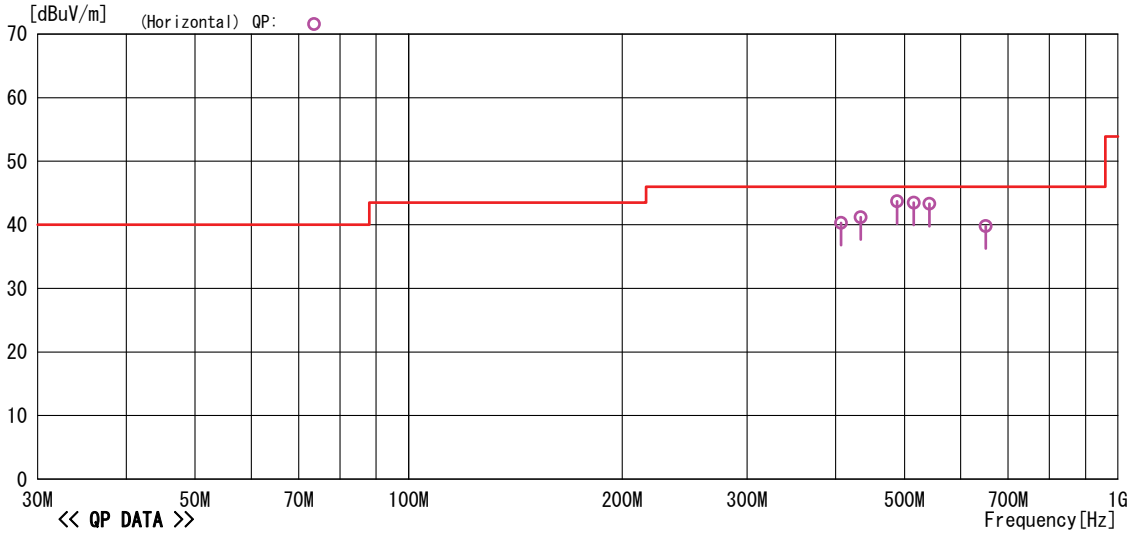
Cosmos Corporation Oonoki Lab.
Date : 2013/10/07 23:53:19

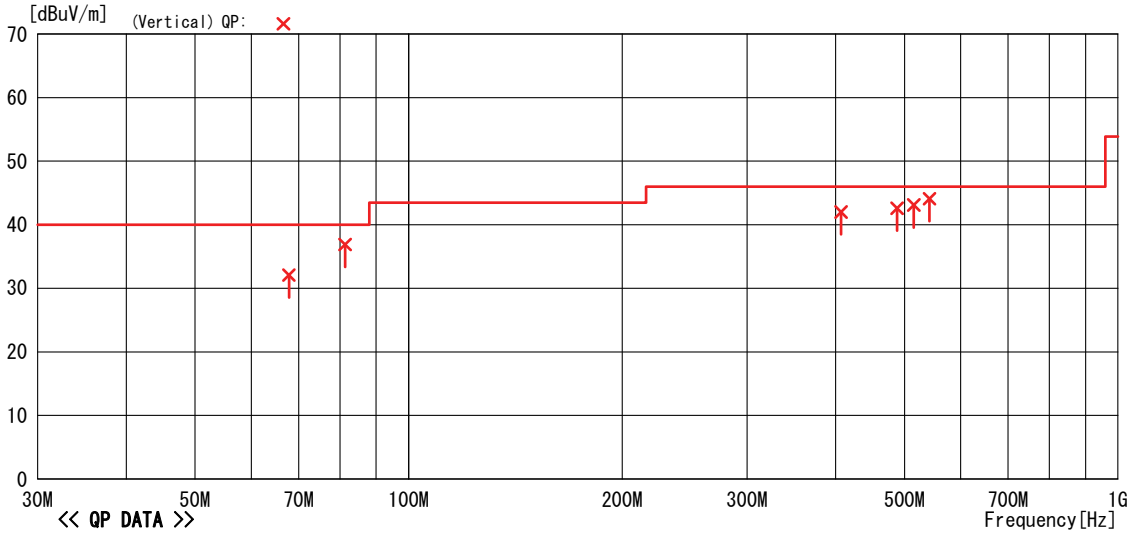
Model Name : TR-FDK
Serial No. : S1002
Operator : K.Miyaji
Power Supply : AC 120V, 60Hz

Temp./Humi. : 23℃/50%
Mode : RFID 3antenna operating
Remark1 :
Remark2 :

Memo : RBW:120kHz

LIMIT : FCC Part15 SubpartC 3m MHz





-TEPTO-DV/RE Ver 1.90.0048

5.3 15.215 (c) 20 dB bandwidth

5.3.1 Setting Remarks

・The both side of 20 dB down value from peak power were measured by using 20 dB bandwidth measurement function of the spectrum analyzer.
・The spectrum analyzer is set as following;

- ✓ Frequency Span : 50 kHz
- ✓ Resolution Bandwidth : 1 kHz
- ✓ Video Bandwidth : 3 kHz
- ✓ Detector Mode : Peak
- ✓ Trace Mode : Max Hold

・Refer to the figure of 3.2 Test configuration.

5.3.2 Minimum Standard

15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

5.3.3 Result

EUT complies with the requirement.

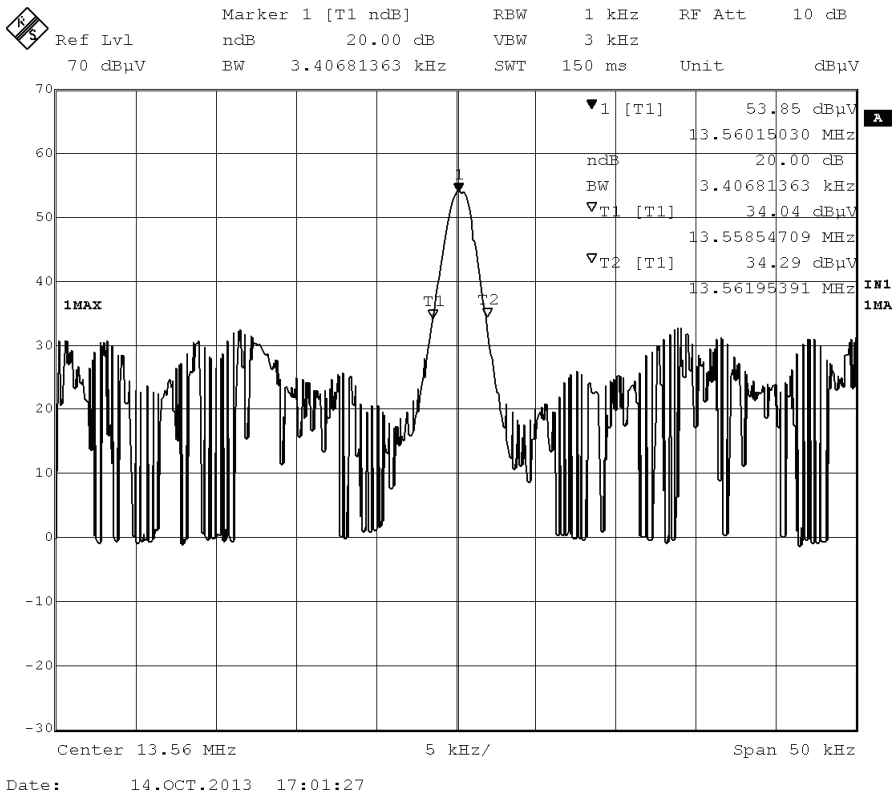
Uncertainty of measurement	:	±0.8 dB
Date of testing	:	October 14, 2013
Room temperature	:	24℃
Relative humidity	:	57%

5.3.4 Measured Data

Antenna	Measured Bandwidth (kHz)
Paper Core	3.407
Ink Ribbon No.1	3.407
Ink Ribbon No.2	3.407

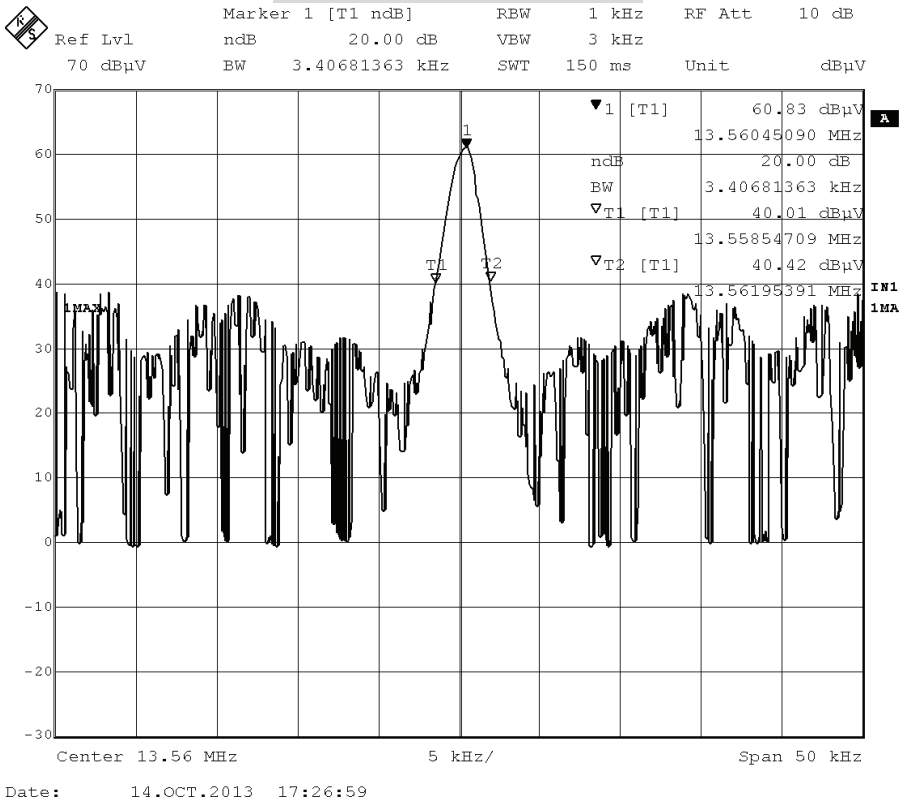
Edge of Bandwidth (MHz)	Limit (MHz)	Margin (kHz)
Paper Core		
13.558	13.11	448
13.562	14.01	448
Ink Ribbon No.1		
13.558	13.11	448
13.562	14.01	448
Ink Ribbon No.2		
13.558	13.11	448
13.562	14.01	448

For Paper Core Module



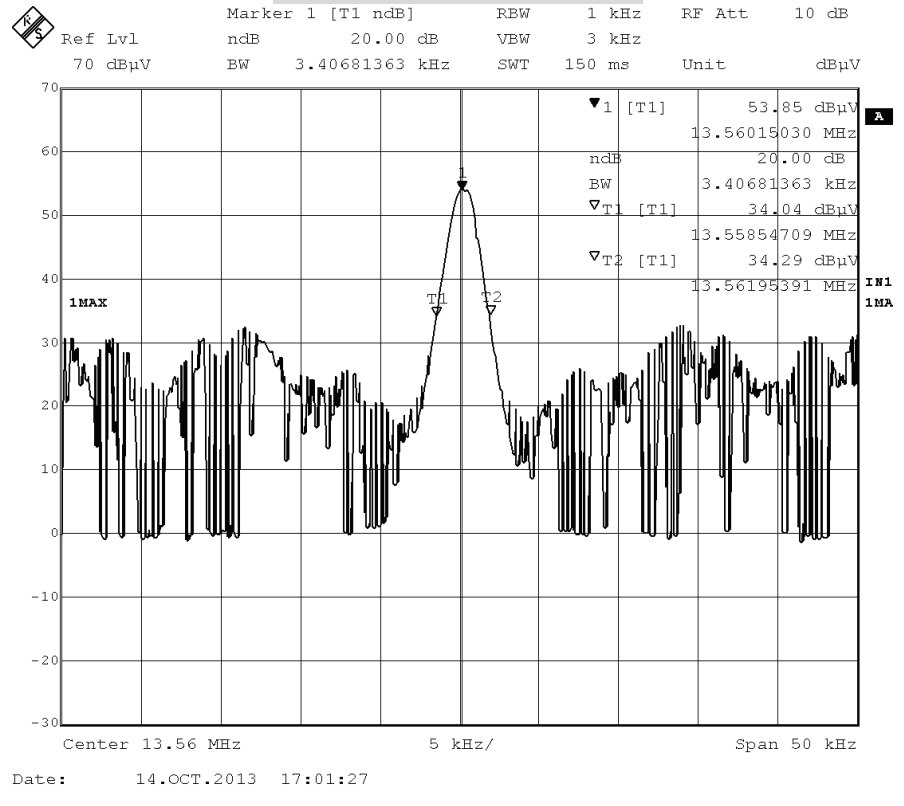
5.3.4 Measured Data (Continued)

For Ink Ribbon No.1 Module



Date: 14.OCT.2013 17:26:59

For Ink Ribbon No.2 Module



Date: 14.OCT.2013 17:01:27

5.4 15.225 (a)(b)(c)(d) Field Strength of Fundamental Emission

5.4.1 Setting Remarks

・The test setup was made in accordance with ANSI C63.4:2003 on the table installed in a semi-anechoic chamber.
・The turntable was fully rotated. The highest radiation from the equipment was recorded.
・The measurement was carried out with both horizontal and vertical antenna polarization.
・The measurement was carried out with the measuring distance of 3 m.
・The test receiver with Quasi Peak detector is in accordance with CISPR 16-1-1.
・The measurement was carried out with the measuring distance of 3 m.
Then the limit of 30 m distance was converted to the limit of 3 m distance with the 40log(30 m/ 3 m).
・Refer to the figure of 3.2 Test configuration.

5.4.2 Minimum Standard

15.225 (a) The field strength of any emissions within the band 13.553 MHz to 13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
(b) Within the bands 13.410 MHz to 13.553 MHz and 13.567 MHz to 13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110 MHz to 13.410 MHz and 13.710 MHz to 14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

5.4.3 Result

EUT complies with the requirement.

Uncertainty of measurement result	:	±3.64 dB
Date of testing	:	October 9, 2013
Temperature	:	23℃
Humidity	:	52%

5.4.4 Measured Data

For Paper Core Module

【-15%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	0	4.26	20.2	24.5	69.5	45.0
13.410	0	4.26	20.2	24.5	80.5	56.0
13.553	0	25.17	20.3	45.5	90.4	44.9
13.560	0	38.30	20.3	58.6	123.9	65.3
13.567	0	25.54	20.3	45.9	90.4	44.5
13.710	0	4.26	20.3	24.6	80.5	55.9
14.010	0	4.26	20.3	24.6	69.5	44.9

【±0%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	0	4.26	20.2	24.5	69.5	45.0
13.410	0	4.26	20.2	24.5	80.5	56.0
13.553	0	29.10	20.3	49.4	90.4	41.0
13.560	0	42.30	20.3	62.6	123.9	61.3
13.567	0	29.49	20.3	49.8	90.4	40.6
13.710	0	4.80	20.3	25.1	80.5	55.4
14.010	0	4.26	20.3	24.6	69.5	44.9

【+15%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	0	4.26	20.2	24.5	69.5	45.0
13.410	0	4.26	20.2	24.5	80.5	56.0
13.553	0	30.54	20.3	50.9	90.4	39.5
13.560	0	43.71	20.3	64.1	123.9	59.8
13.567	0	30.88	20.3	51.2	90.4	39.2
13.710	0	5.06	20.3	25.4	80.5	55.1
14.010	0	4.26	20.3	24.6	69.5	44.9

5.4.4 Measured Data (Continued)

For Ink Ribbon No.1 Module

【-15%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	90	4.26	20.2	24.5	69.5	45.0
13.410	90	4.26	20.2	24.5	80.5	56.0
13.553	90	26.45	20.3	46.8	90.4	43.6
13.560	90	39.67	20.3	60.0	123.9	63.9
13.567	90	26.84	20.3	47.2	90.4	43.2
13.710	90	4.26	20.3	24.6	80.5	55.9
14.010	90	4.26	20.3	24.6	69.5	44.9

【±0%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	90	4.26	20.2	24.5	69.5	45.0
13.410	90	4.26	20.2	24.5	80.5	56.0
13.553	90	29.23	20.3	49.6	90.4	40.8
13.560	90	42.46	20.3	62.8	123.9	61.1
13.567	90	29.66	20.3	50.0	90.4	40.4
13.710	90	4.26	20.3	24.6	80.5	55.9
14.010	90	4.26	20.3	24.6	69.5	44.9

【+15%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	90	4.26	20.2	24.5	69.5	45.0
13.410	90	4.26	20.2	24.5	80.5	56.0
13.553	90	30.81	20.3	51.2	90.4	39.2
13.560	90	43.96	20.3	64.3	123.9	59.6
13.567	90	31.15	20.3	51.5	90.4	38.9
13.710	90	4.54	20.3	24.9	80.5	55.6
14.010	90	4.26	20.3	24.6	69.5	44.9

5.4.4 Measured Data (Continued)

For Ink Ribbon No.2 Module

【-15%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	0	4.26	20.2	24.5	69.5	45.0
13.410	0	4.26	20.2	24.5	80.5	56.0
13.553	0	27.42	20.3	47.8	90.4	42.6
13.560	0	40.66	20.3	61.0	123.9	62.9
13.567	0	27.78	20.3	48.1	90.4	42.3
13.710	0	4.26	20.3	24.6	80.5	55.9
14.010	0	4.26	20.3	24.6	69.5	44.9

【±0%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	0	4.26	20.2	24.5	69.5	45.0
13.410	0	4.54	20.2	24.8	80.5	55.7
13.553	0	30.28	20.3	50.6	90.4	39.8
13.560	0	43.42	20.3	63.8	123.9	60.1
13.567	0	30.64	20.3	51.0	90.4	39.4
13.710	0	4.26	20.3	24.6	80.5	55.9
14.010	0	4.26	20.3	24.6	69.5	44.9

【+15%V】

Frequency [MHz]	Antenna Pola. [deg.]	Reading [dBμV]	Correction Factor [dB]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin [dB]
13.110	0	4.26	20.2	24.5	69.5	45.0
13.410	0	4.80	20.2	25.0	80.5	55.5
13.553	0	31.44	20.3	51.8	90.4	38.6
13.560	0	44.60	20.3	64.9	123.9	59.0
13.567	0	31.75	20.3	52.1	90.4	38.3
13.710	0	4.26	20.3	24.6	80.5	55.9
14.010	0	4.26	20.3	24.6	69.5	44.9

5.5 15.225 (e) Frequency Tolerance

5.5.1 Setting Remarks

・The EUT was placed in an environmental test chamber, exposed in extreme temperatures until its temperature is stabilized.
・The measurement was carried out at every 10℃ from -20℃ to +50℃ in the most common nominal supply voltage and the measurement was carried out at ±15 % of rated voltage at 20℃.
・Refer to the figure of 3.2 Test configuration.

5.5.2 Minimum Standard

15.225 (e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20℃ to +50℃ at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20℃. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.5.3 Result

EUT complies with the requirement.

Uncertainty of measurement result	:	±1 Hz
Date of testing	:	October 10, 11 and 14, 2013

5.5.4 Measured Data

For Paper Core Module

Temp [℃]	Supply Voltage [V]	Measured Frequency [Hz]	Limit [±Hz]	Deviation [Hz]	Limit [%]	Error [%]
-20	5	13560159.0	1356.00	159.0	±0.01	0.00117
-10	5	13560205.1	1356.00	205.1	±0.01	0.00151
0	5	13560218.4	1356.00	218.4	±0.01	0.00161
10	5	13560214.7	1356.00	214.7	±0.01	0.00158
20	5	13560197.6	1356.00	197.6	±0.01	0.00146
30	5	13560173.7	1356.00	173.7	±0.01	0.00128
40	5	13560152.7	1356.00	152.7	±0.01	0.00113
50	5	13560142.3	1356.00	142.3	±0.01	0.00105

Temp [℃]	Supply Voltage [V]	Measured Frequency [Hz]	Limit [±Hz]	Deviation [Hz]	Limit [%]	Error [%]
20	4.25	13560193.3	1356.00	193.3	±0.01	0.00143
20	5.00	13560197.6	1356.00	197.6	±0.01	0.00146
20	5.75	13560194.9	1356.00	194.9	±0.01	0.00144

5.5.4 Measured Data (Continued)

For Ink Ribbon No.1 Module

Temp [℃]	Supply Voltage [V]	Measured Frequency [Hz]	Limit [±Hz]	Deviation [Hz]	Limit [%]	Error [%]
-20	5	13560158.8	1356.00	158.8	±0.01	0.00117
-10	5	13560205.9	1356.00	205.9	±0.01	0.00152
0	5	13560219.5	1356.00	219.5	±0.01	0.00162
10	5	13560215.9	1356.00	215.9	±0.01	0.00159
20	5	13560198.5	1356.00	198.5	±0.01	0.00146
30	5	13560174.5	1356.00	174.5	±0.01	0.00129
40	5	13560153.8	1356.00	153.8	±0.01	0.00113
50	5	13560142.7	1356.00	142.7	±0.01	0.00105

Temp [℃]	Supply Voltage [V]	Measured Frequency [Hz]	Limit [±Hz]	Deviation [Hz]	Limit [%]	Error [%]
20	4.25	13560193.7	1356.00	193.7	±0.01	0.00143
20	5.00	13560198.5	1356.00	198.5	±0.01	0.00146
20	5.75	13560200.2	1356.00	200.2	±0.01	0.00148

5.5.4 Measured Data (Continued)

For Ink Ribbon No.2 Module

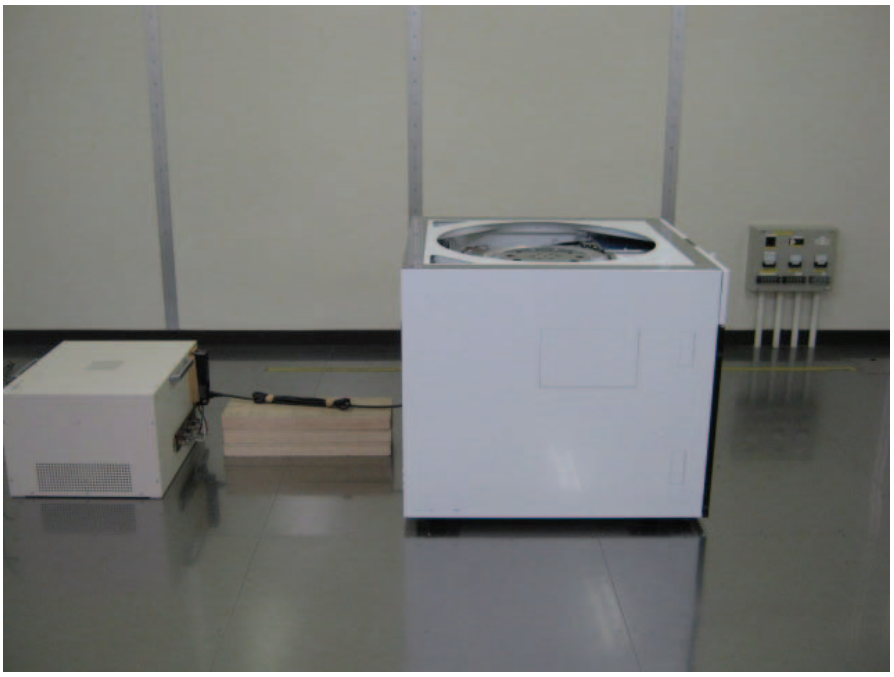
Temp [℃]	Supply Voltage [V]	Measured Frequency [Hz]	Limit [±Hz]	Deviation [Hz]	Limit [%]	Error [%]
-20	5	13560159.2	1356.00	159.2	±0.01	0.00117
-10	5	13560205.4	1356.00	205.4	±0.01	0.00151
0	5	13560219.8	1356.00	219.8	±0.01	0.00162
10	5	13560216.0	1356.00	216.0	±0.01	0.00159
20	5	13560198.5	1356.00	198.5	±0.01	0.00146
30	5	13560174.6	1356.00	174.6	±0.01	0.00129
40	5	13560153.6	1356.00	153.6	±0.01	0.00113
50	5	13560142.7	1356.00	142.7	±0.01	0.00105

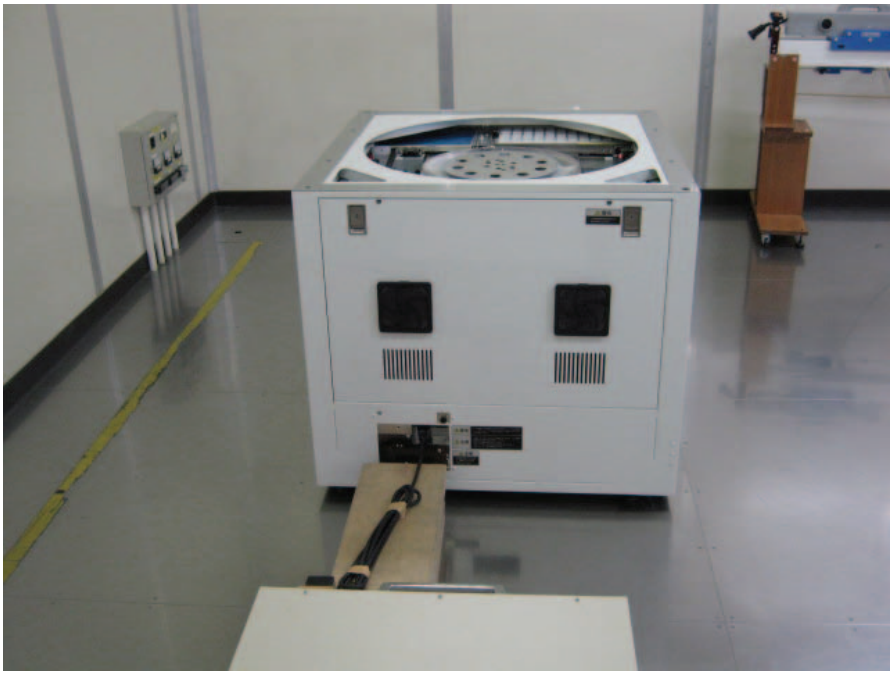
Temp [℃]	Supply Voltage [V]	Measured Frequency [Hz]	Limit [±Hz]	Deviation [Hz]	Limit [%]	Error [%]
20	4.25	13560194.3	1356.00	194.3	±0.01	0.00143
20	5.00	13560198.5	1356.00	198.5	±0.01	0.00146
20	5.75	13560201.1	1356.00	201.1	±0.01	0.00148

6. Photos

6.1 Photo of the EUT

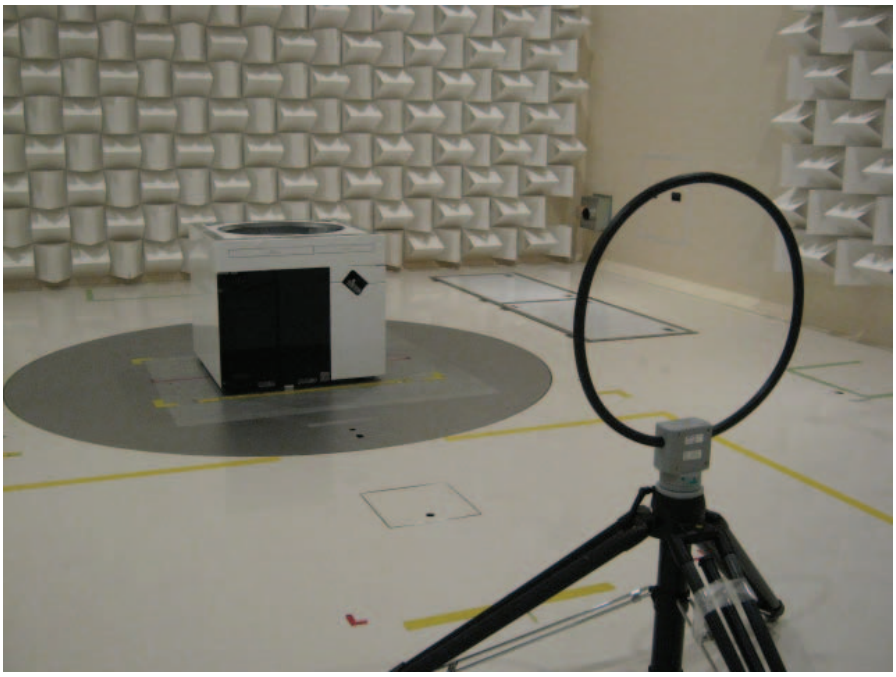
6.2 Setup Photo (AC Power Line Conducted Emission)

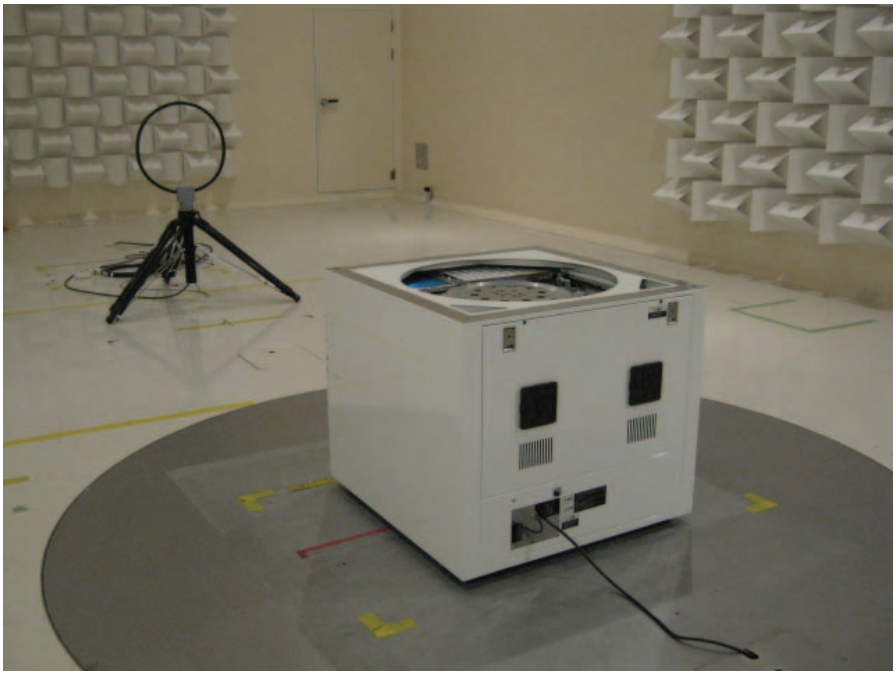




6.3 Setup Photo (Radiated Spurious Emission)

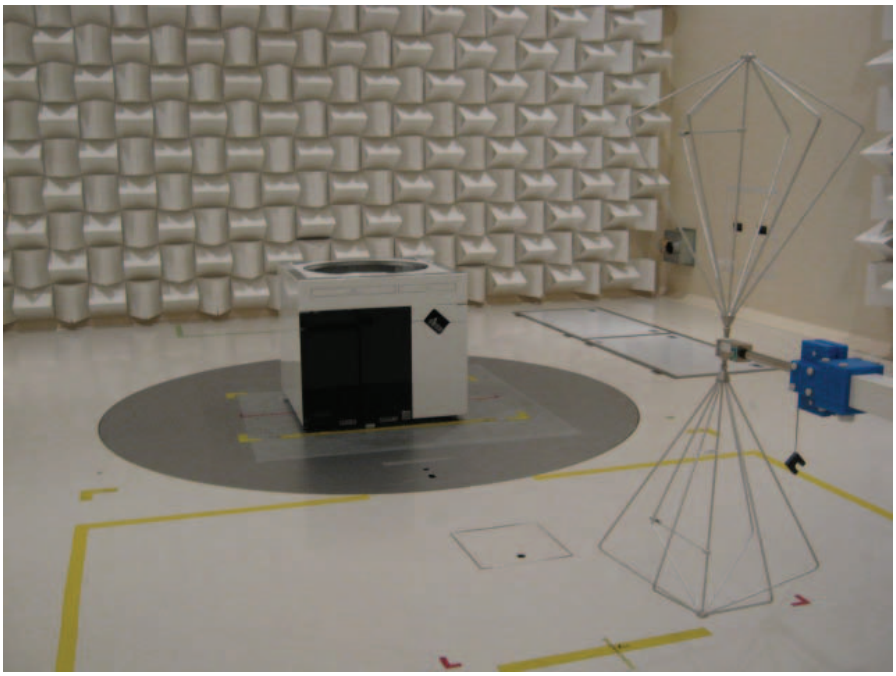
9 kHz to 30 MHz

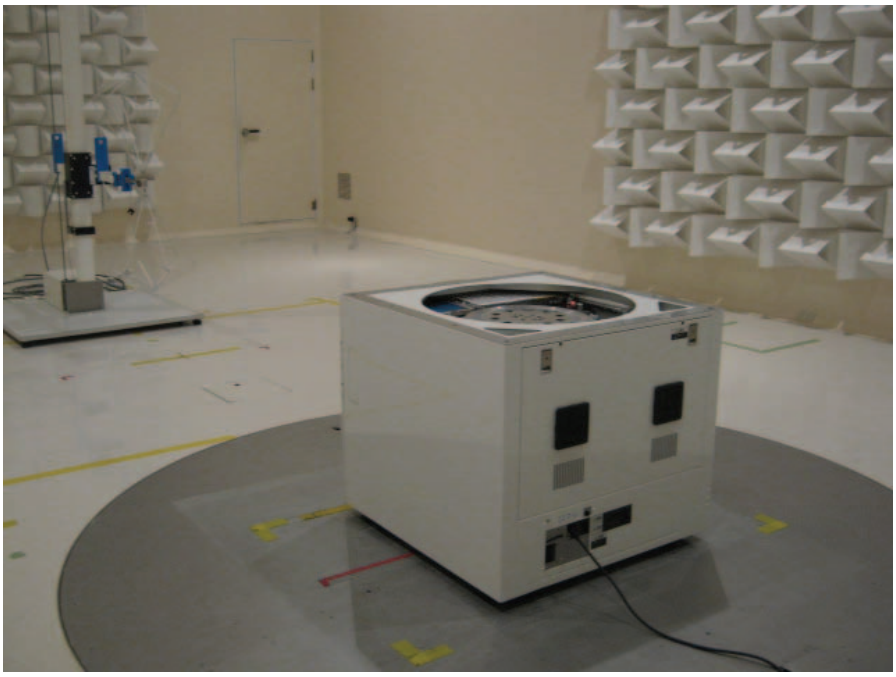




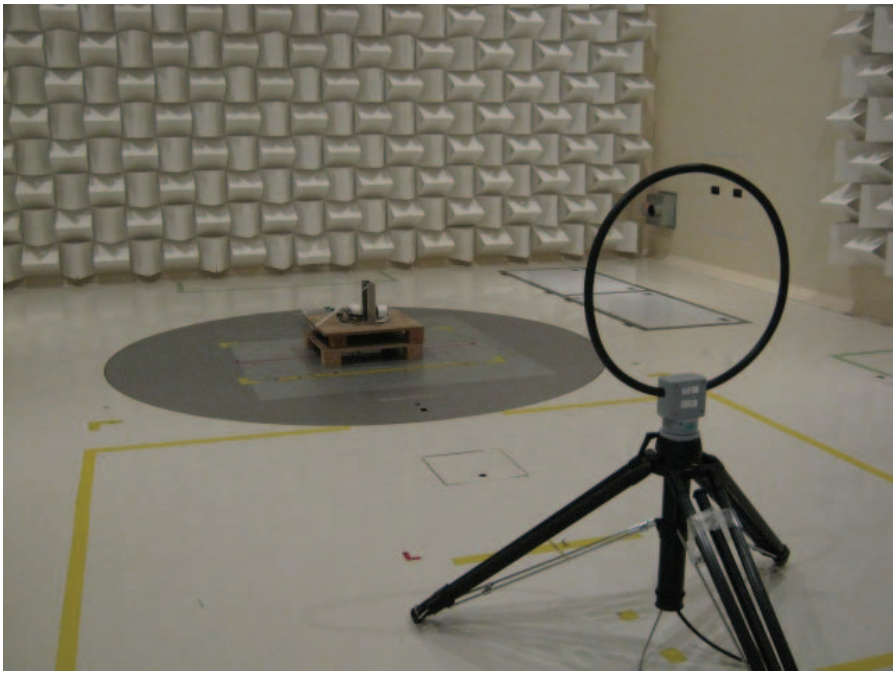
6.3 Setup Photo (Radiated Spurious Emission) (Continued)

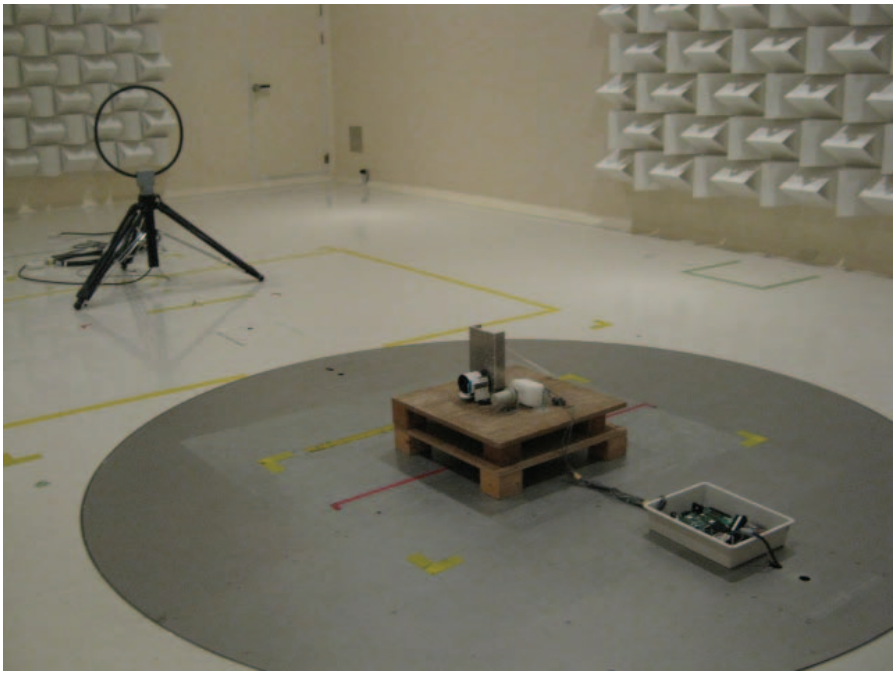
30 MHz to 1 GHz





6.4 Setup Photo (Field Strength of the Fundamental Emission)





7. List of Test Measurement Instruments

AC Power Line Conducted Emission

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
EMI Test Receiver	ROHDE& SCHWARZ	ESCI	100413	2012/12/22 2013/12/21
Artificial-Mains Network	Kyoritsu	KNW-341C (F)	8-1659-1	2013/01/18 2014/01/17
RF Cable	Fujikura	3D-2W	OC01	2013/05/10 2014/05/09
RF Cable	SUHNER	RG223/U	OC02 OC04	2013/05/10 2014/05/09
RF Selector	TSJ	RFM-E221	3148	2013/05/10 2014/05/09

Radiated Emission
Field Strength of Fundamental Emission

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
EMI Test Receiver	ROHDE & SCHWARZ	ESIB40	100211	2013/03/30 2014/03/29
Pre-Amplifier (30 MHz to 1 GHz)	HEWLETT PACKARD	8447D OPT 010	2944A07891	2013/04/15 2014/04/14
Active Loop Antenna (150 kHz to 30 MHz)	ROHDE & SCHWARZ / TOYO	HFH2-Z2 / HFH2-Z2P	827945 /011/127	2013/10/05 2014/10/04
Biconical Antenna (30 MHz to 300 MHz)	SCHWARZBECK	VHBB9124	311	2012/11/24 2013/11/23
Log-Periodic Antenna (300 MHz to 1 GHz)	SCHWARZBECK	UHALP 9108 A	645	2012/11/24 2013/11/23
RF Cable (9 kHz to 30 MHz)	Fujikura	5D-2W	OC09	2013/05/21 2014/05/20
RF Cable (9 kHz to 30 MHz)	SUHNER	RG223/U	OC10 OC11	2013/05/21 2014/05/20
RF Cable (9 kHz to 30 MHz)	SUHNER	RG213/U	OC13	2013/05/21 2014/05/20
RF Cable (30 MHz to 1 GHz)	Fujikura	8D-2W	OC14	2013/04/23 2014/04/22
RF Cable (30 MHz to 1 GHz)	SUHNER	RG214/U	OC15 OC16	2013/04/23 2014/04/22
RF Cable (30 MHz to 1 GHz)	SUHNER	RG400/U	OC17	2013/04/23 2014/04/22
RF Selector	TSJ	RFM-E121	03149	2013/04/23 2014/04/22

7. List of Test Measurement Instruments (Continued)

Frequency Tolerance

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
EMI Test Receiver	ROHDE & SCHWARZ	ESIB40	100211	2013/03/30 2014/03/29
Thermostatic Chamber	ESPEC	PU-2KP	14010422	2013/08/22 2014/08/31