



# EMC TEST REPORT

Applicant : MIWA LOCK CO., LTD.  
3-1-12, Shiba, Minato-ku, Tokyo, 105-8510 Japan

Type of Equipment : Contactless Smart Card Reader

Model Number : RDFL-B03

FCC ID : VBU-RDFL-B03

Standard : 47 CFR Part 15 Subpart C Section 15.225

Receipt Date of Sample : 2012-01-11

Date Tested : 2012-01-12, 2012-01-13, 2012-01-17 and 2012-02-02

Date Report Issued : 2012-02-13


Report Number : EMC12005

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## 1 GENERAL INFORMATION

### 1.1 Product Description

The Equipment Under Test (EUT) Model: RDFL-B03 is a Contactless Smart Card Reader. This is card reader for exclusive use of the entrance of the Hotel Card Lock “ALV2”, which reads key data of the card key and output the signal. When a contactless smart card issued by card issuing machine installed in the front desk is used, it collates the various information such as a Hotel code and room number with stored data. If the card is confirmed valid, it output the signal to the external system.

This is marketed by MIWA LOCK CO., LTD. This product was tested according to the standards below.

#### Condition of EUT

: Mass-production       : Pre-production       : Engineering prototype

### 1.2 Product Specification

- Power Supply Rating : DC12-24V, 200mA
- Weight : 250g
- Dimensions (Panel) : W 116 x D 7 x H 120 (mm)
- (Main body) : W 90 x D 35 x H 70 (mm)
- Transmitting Frequency : 13.56MHz

#### Power source

AC/DC	Phases and Wires, or Volt	EUT
AC	Single Phase : Without PE	<input type="checkbox"/>
	: With PE	<input type="checkbox"/>
	Three Phases : Three wires with PE	<input type="checkbox"/>
	: Four wires with PE	<input type="checkbox"/>
DC	24 V	<input checked="" type="checkbox"/>

### 1.3 Summary of Test Result

Test method	Measurement Frequency Range	Result
Code of Federal Regulation 47 Part 15 Subpart C		
Sec. 15.207 Conducted Emission	150kHz – 30MHz	Pass
Sec. 15.225 (a), (b), (c) and (d)		
Radiated Emission	9kHz – 30MHz	Pass
Sec. 15.225 (d) Radiated Emission	30MHz – 1GHz	Pass
Sec. 15.225 (e) Frequency Stability		Pass

## 1.4 Measurement Uncertainty

## Emission Test

Conducted Emission Test	AMN	Frequency range	Polarization	U (dB)						
				Open Site		No3, 10m Semi-Anechoic Chamber		No2, 3m Semi-Anechoic Chamber		
Main port	LISN (ESH2-Z5, KNW-407, KNW-411)	9kHz-30MHz	-	1.7		1.7		1.7		
Telecommunication port	ISN (ISN T8, ISN ST08)	150kHz-30MHz	-	1.1		1.1		1.1		
	Probe (CVP 2200A, F-35A)	150kHz-30MHz	-	1.2		1.2		1.2		
Radiated Emission Test	Antenna, Clamp	Frequency range	Polarization	U (dB)						
				Open Site		No3, 10m Semi-Anechoic Chamber		No2, 3m Semi-Anechoic Chamber		
				10m	3m	10m	3m	10m	3m	
Radiated Emission	Biconical (BBA9106)	30MHz-300MHz	Horizontal	3.9	3.9	3.9	3.9	-	4.0	
			Vertical	4.1	4.1	4.0	4.0	-	4.1	
	Log.-Periodic (UHALP9108-A)	300MHz-1GHz	Horizontal	4.1	4.1	4.1	4.1	-	4.1	
			Vertical	4.2	4.1	4.1	4.1	-	4.1	
	Dipole (VHA9103)	30MHz-300MHz	Horizontal	3.9	3.9	3.8	3.8	-	3.8	
			Vertical	4.0	4.1	4.0	4.0	-	4.0	
	Dipole (UHA9105)	300MHz-1GHz	Horizontal	3.9	3.9	3.8	3.8	-	3.8	
			Vertical	4.1	4.1	4.0	4.0	-	4.0	
	Bilog (CBL6111, CBL6112B)	30MHz-1GHz	Horizontal	4.6	-	4.2	-	-	-	
			Vertical	4.3	-	4.2	-	-	-	
	Guide Horn	(EMCO3115, 3117)	1GHz-18GHz	Horizontal & Vertical	-	2.6	-	2.6	-	2.6
		* (EMCO3116)	18GHz-40GHz		-	2.6	-	2.6	-	2.6
Magnetic Field Emission	Loop (HLA6120)	9kHz-30MHz	-	-	2.6	-	2.6	-	2.6	
Disturbance Power	Absorbing (KT-10)	30MHz-300MHz	-	-		3.5		3.5		

Note : Coverage factor k=2

: \* Applied for Code of Federal Regulation 47 Part 15

## 1.5 Tested Systems Details

### EUT, PERIPHERALS, AND CABLES USED

#### EUT

Equipment		Manufacturer	Model No.	Serial No.	Note
ID	Name				
A	Contactless Smart Card Reader	COWBELL ENGINEERING CO.,LTD.	RDFL-B03	11K000002T	VBURDFL-B03

#### Peripherals

Equipment		Manufacturer	Model No.	Serial No.	FCC ID and Note
ID	Name				
B	REGULATED DC POWER SUPPLY	KIKUSUI	PAN35-5A	LA002428	

#### Interface Cables

Cable		Connection Equipment ID (From – To)	Length	Shield	Bundle	FCC ID and Note
ID	Name					
a	Communication Cable	A – Connector	0.05m	No	No	EUT
b	Communication Cable	Connector – B	10.0m	Yes	No, 3)	EUT
c	AC Cable	B – AC	2.9m	No	No, 1)	AC100V/60Hz
d	FG Cable	B – Ground	1.2m	No	Yes	2)

Note: Bundle No: The cable is not bundled.

Yes: Excess length of the cable is bundled at the approximate center of the cable with the bundles 30cm to 40cm in length.

- 1) The cable was bundled, when it was measured, at the middle of the cable between EUT and LISN forming a bundle of less than 40cm for Conducted Emission Test.
- 2) Used for Conducted Emission Test.
- 3) Coiled for Conducted Emission Test.

## 1.6 Test Facility

The test facilities are located in following places of IPS Corporation.

- EMC Center  
1878-1 Harumiya Ono, Tatsuno-machi, Kamiina-gun, Nagano-ken 399-0601 Japan.

The test site is registered to FCC pursuant to title 47 CFR § 2.948 (e)(1)

Test Firm Registration Number: 93663 Anechoics chambers (3 and 3 & 10 meters)

## 2 SYSTEM TEST CONFIGURATION

### 2.1 Justification

- All tests were performed without any deviation from the ANSI C63.4:2003.
- The system was configured for testing a typical fashion (as a customer would normally use it). The test data of the Conducted emission and Radiated emission are presented for the “worst case” measurements, that test program as clause 2.2 should be working and the cable routing was attempted to maximize the emission.
- EUT was tested in three orthogonal orientation for Radiated emission in order to present “the worst case”.
- EUT was set to transmit continuously during test.
- Tests were performed with power supply DC24V from DC Power Supply.

### 2.2 EUT Exercise Software

The EUT exercise program used during all testing was designed to exercise the various system components in manner similar to a typical use.

### 2.3 Special Accessories

None.

### 2.4 Equipment Conditions

The condition at the time of receipt of EUT: Good

The condition at the time of return of EUT: Good

Limited conditions: None

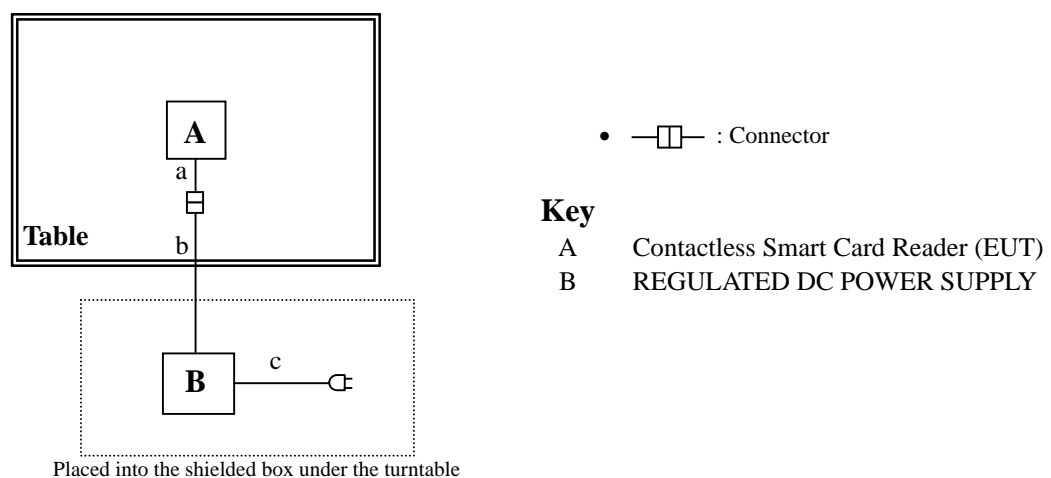
No modification has been carried out by the test laboratory.

EUT has a DIP switch which can control to set to transmit 13.56MHz continuously.

This DIP switch has placed for test purpose only.

### 2.5 Configuration of Tested System

#### **Figure**



Note: This figure shows Radiated Emission Test as a representative figure.  
Refer to the figure/photos of each test for the actual test arrangement.

### 3 CONDUCTED EMISSION TEST

#### 3.1 Test Setup

The test setup was made according to ANSI C63.4:2003.

- The rears of EUT and peripherals were aligned to the rear of a non-conductive table.
- The rear of that tabletop was 40 cm away from a vertical metal reference, which is one of the walls of the shielded room.
- The table size was 0.8 m high × 1.8 m wide × 1.0 m deep.
- Minimum spacing of 10 cm was maintained between equipments.
- The EUT was connected with the artificial mains network (LISN) that was placed at a distance of 0.8m away from all surface of EUT.

#### 3.2 Testing System

##### Instruments

Equipment	Manufacturer	Model	S/N	Calibration		Note
				Date	Due	
Shielded room	IPS Corporation	N/A	N/A	Non Calibration		
EMI Test Receiver	Rohde & Schwarz	ESCS30	827413/019	2011-06-02	2012-06-30	1)
Spectrum Analyzer	ADVANTEST	R3132	131201410	2011-08-01	2012-08-31	2)
LISN for EUT	Kyoritsu	KNW-407	8-1370-3	2011-05-06	2012-05-31	
10dB Fixed Attenuator	Yuetsu Seiki	090-0110A	4	2011-05-06	2012-05-31	
Cable System	IPS Corporation	CE (1)	N/A	2011-11-22	2012-11-30	

Note: 1) System Bandwidth=9kHz, Detector Mode=Quasi-Peak and Average Value.

2) Detector Mode=Peak.

##### Software:

Toyo Corporation, EP5/CE, Version 3.0.20

#### 3.3 Conducted Disturbance Voltage Calculation

The Conducted Disturbance Voltage is calculated by adding the LISN Factor and Cable Loss, and adding the Transient Limiter Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$c. f. = LISN + CL + TL$$

$$CDV = RA + c.f.$$

Where

- c.f. = Correction Factor
- CDV = Conducted Disturbance Voltage (Emission Level - Result)
- RA = Receiver Amplitude (Reading Level)
- LISN = LISN Factor
- CL = Cable Loss
- TL = Transient Limiter Factor

Assume a receiver reading of 54.4 dB  $\mu$  V is obtained. The LISN Factor of 0.2dB and a Cable Loss and Transient Limiter Factor of 10.2 dB are added giving a Conducted Disturbance Voltage of 64.8 dB  $\mu$  V. The 64.8 dB  $\mu$  V value was mathematically converted to its corresponding level in  $\mu$  V.

$$CDV = 54.4dB \mu V + 10.4dB = 64.8 dB \mu V$$

### 3.4 Test Details

#### **Test Details**

Test Date: 2012-02-02

Test data: Refer to Section 7 of this report for test data and spectrum chart.  
(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

Phase N, 27.120MHz, 45.4dB(  $\mu$  V) Quasi-Peak Value and it has 14.6dB margin from the Limit (60.0dB(  $\mu$  V)).

Phase N, 27.120MHz, 45.4dB(  $\mu$  V) Average Value and it has 4.6dB margin from the Limit (50.0dB(  $\mu$  V)).

Test configuration photo: Refer to Section 8.1



## 4 RADIATED EMISSION TEST 9kHz – 30MHz

### 4.1 Test Setup

The test setup was made according to ANSI C63.4: 2003

The measurement distances were 3m.

- The test was performed with frequency range 9kHz-30MHz.
- The center of EUT was aligned to the center of a non-conductive table.
- The table size was 0.8 m high × 2.0 m wide × 1.0 m deep.
- The mains power cable was dropped to the floor and was routed over to receptacle.
- The dimension of Loop Antenna can be completely enclosed by a square having sides of 60cm in length.
- The antenna was located at 3m of distance horizontally from the boundary of the EUT. The antenna height was 1 m.

### 4.2 Testing System

#### Instruments

Equipment	Manufacturer	Model	S/N	Calibration		Note
				Date	Due	
Semi-Anechoic Chamber	Otsuka Science	10m	No.3	2011-02-07	2012-02-28	
EMI Test Receiver	Rohde & Schwarz	ESCS30	836858/002	2011-04-12	2012-04-30	1)
MXA Signal Analyzer	Agilent	N9020A	MY49100247	2011-06-01	2012-06-30	2)
Loop Antenna	Chase	HLA6120	1131	2011-03-31	2012-03-31	
Cable System	IPS Corporation	RE (31)	N/A	2011-02-04	2012-02-28	

Note: 1) System Bandwidth=120kHz, Detector Mode= Quasi-Peak

2) Detector Mode=Peak

#### Software:

Toyo Corporation, EP5/RE, Version 4.1.10

### 4.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$c. f. = AF + CL - AG$$

$$F S = RA + c.f.$$

Where	c.f.	= Correction Factor
	FS	= Field Strength (Emission Level - Result)
	RA	= Receiver Amplitude (Reading Level)
	AF	= Antenna Factor
	CL	= Cable Loss
	AG	= Amplifier Gain

#### 4.3 Field Strength Calculation (Continued)

Assume a receiver reading of 52.5 dB  $\mu$  V is obtained. The Antenna Factor of 7.4dB/m and a Cable Loss of 1.1dB is added. The Amplifier Gain of 29.0 dB is subtracted, giving a field strength of 32.0 dB  $\mu$  V/m. The 32.0 dB  $\mu$  V/m value was mathematically converted to its corresponding level in  $\mu$  V/m.

$$FS = 52.5\text{dB } \mu\text{ V} + 7.4\text{dB/m} + 1.1\text{dB} - 29.0\text{dB} = 32.0\text{ dB } \mu\text{ V/m}$$

$$\text{Level in } \mu\text{ V/m} = \text{Common Antilogarithm} [(32.0\text{ dB } \mu\text{ V/m})/20] = 39.8\text{ } \mu\text{ V/m}$$

#### 4.4 Test Details

##### **For 13.110MHz-14.010MHz**

##### **Test Detail 1: X Axis**

Test Date: 2012-01-12

Test data: Refer to Section 7 of this report for test data and spectrum chart.

(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

13.772MHz, 57.2dB(  $\mu$  V/m) Quasi-Peak Value

and it has 23.3dB margin from the limit(80.5dB(  $\mu$  V/m)).

Test configuration photo: Refer to Section 8.2 and 8.3

##### **Test Detail 2: Y Axis**

Test Date: 2012-01-13

Test data: Refer to Section 7 of this report for test data and spectrum chart.

(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

13.772MHz, 57.2dB(  $\mu$  V/m) Quasi-Peak Value

and it has 23.3dB margin from the limit(80.5dB(  $\mu$  V/m)).

Test configuration photo: Refer to Section 8.2 and 8.3

##### **Test Detail 3: Z Axis**

Test Date: 2012-01-13

Test data: Refer to Section 7 of this report for test data and spectrum chart.

(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

13.772MHz, 45.9dB(  $\mu$  V/m) Quasi-Peak Value

and it has 34.6dB margin from the limit(80.5dB(  $\mu$  V/m)).

Test configuration photo: Refer to Section 8.2 and 8.3

#### 4.4 Test Details (Continued)

##### **For 9kHz-30MHz**

##### **Test Detail 1: X Axis**

Test Date: 2012-01-12

Test data: Refer to Section 7 of this report for test data and spectrum chart.

(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

27.120MHz, 48.5dB(  $\mu$  V/m) Quasi-Peak Value  
and it has 21.0dB margin from the limit(69.5dB(  $\mu$  V/m)).

Test configuration photo: Refer to Section 8.2 and 8.3

##### **Test Detail 2: Y Axis**

Test Date: 2012-01-13

Test data: Refer to Section 7 of this report for test data and spectrum chart.

(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

27.120MHz, 49.2dB(  $\mu$  V/m) Quasi-Peak Value  
and it has 20.3dB margin from the limit(69.5dB(  $\mu$  V/m)).

Test configuration photo: Refer to Section 8.2 and 8.3

##### **Test Detail 3: Z Axis**

Test Date: 2012-01-13

Test data: Refer to Section 7 of this report for test data and spectrum chart.

(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

27.120MHz, 48.2dB(  $\mu$  V/m) Quasi-Peak Value  
and it has 21.3dB margin from the limit(69.5dB(  $\mu$  V/m)).

Test configuration photo: Refer to Section 8.2 and 8.3

## 5 RADIATED EMISSION TEST 30MHz – 1GHz

### 5.1 Test Setup

The test setup was made according to ANSI C63.4: 2003

The measurement distances were 3m.

- The test was performed with frequency range 30MHz-1GHz.
- The center of EUT was aligned to the center of a non-conductive table.
- The table size was 0.8 m high × 2.0 m wide × 1.0 m deep.
- The mains power cable was dropped to the floor and was routed over to receptacle.
- The antenna was located at 3m of distance horizontally from the boundary of the EUT. The antenna was scanned in height from 1 m to 4 m.

### 5.2 Testing System

#### Instruments

Equipment	Manufacturer	Model	S/N	Calibration		Note
				Date	Due	
Semi-Anechoic Chamber	Otsuka Science	10m	No.3	2011-02-07	2012-02-28	
EMI Test Receiver	Rohde & Schwarz	ESCS30	836858/002	2011-04-12	2012-04-30	1)
MXA Signal Analyzer	Agilent	N9020A	MY49100247	2011-06-01	2012-06-30	2)
Biconical Antenna	Schwarzbeck	BBA9106	1513	2011-12-17	2012-12-31	
Log.-Periodic Antenna	Schwarzbeck	UHALP9108-A	0715	2011-12-17	2012-12-31	
Cable System	IPS Corporation	RE (28)	N/A	2011-02-04	2012-02-28	

Note: 1) System Bandwidth=120kHz, Detector Mode= Quasi-Peak

2) Detector Mode=Peak

#### Software:

Toyo Corporation, EP5/RE, Version 4.1.10

### 5.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$c. f. = AF + CL - AG$$

$$FS = RA + c.f.$$

Where	c.f.	= Correction Factor
	FS	= Field Strength (Emission Level - Result)
	RA	= Receiver Amplitude (Reading Level)
	AF	= Antenna Factor
	CL	= Cable Loss
	AG	= Amplifier Gain

Assume a receiver reading of 52.5 dB  $\mu$  V is obtained. The Antenna Factor of 7.4dB/m and a Cable Loss of 1.1dB is added. The Amplifier Gain of 29.0 dB is subtracted, giving a field strength of 32.0 dB  $\mu$  V/m. The 32.0 dB  $\mu$  V/m value was mathematically converted to its corresponding level in  $\mu$  V/m.

$$FS = 52.5\text{dB } \mu \text{ V} + 7.4\text{dB/m} + 1.1\text{dB} - 29.0\text{dB} = 32.0 \text{ dB } \mu \text{ V/m}$$

$$\text{Level in } \mu \text{ V/m} = \text{Common Antilogarithm} [(32.0 \text{ dB } \mu \text{ V/m})/20] = 39.8 \text{ } \mu \text{ V/m}$$

## 5.4 Test Details

### **Test Detail 1: X Axis**

Test Date: 2012-01-12

Test data: Refer to Section 7 of this report for test data and spectrum chart.  
(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

Vertical Polarization, 34.334MHz, 36.4dB(  $\mu$  V/m) Quasi-Peak Value  
and it has 3.6dB margin from the limit(40.0dB(  $\mu$  V/m)).

Test configuration photo: Refer to Section 8.2 and 8.3

### **Test Detail 2: Y Axis**

Test Date: 2012-01-13

Test data: Refer to Section 7 of this report for test data and spectrum chart.  
(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

Vertical Polarization, 33.493MHz, 37.0dB(  $\mu$  V/m) Quasi-Peak Value  
and it has 3.0dB margin from the limit(40.0dB(  $\mu$  V/m)).

Test configuration photo: Refer to Section 8.2 and 8.3

### **Test Detail 3: Z Axis**

Test Date: 2012-01-13

Test data: Refer to Section 7 of this report for test data and spectrum chart.  
(Spectrum chart is presented)

Summary of the measurement data (Worst measurement):

Vertical Polarization, 33.493MHz, 36.3dB(  $\mu$  V/m) Quasi-Peak Value  
and it has 3.7dB margin from the limit(40.0dB(  $\mu$  V/m)).

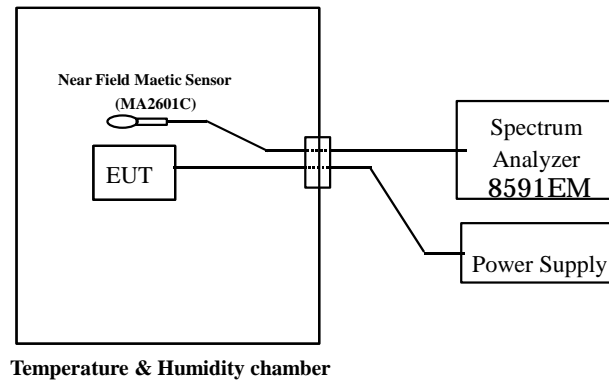
Test configuration photo: Refer to Section 8.2 and 8.3

## 6 FREQUENCY STABILITY TEST

### 6.1 Test Setup

The test setup was made according to ANSI C63.4: 2003

- The EUT was placed in a temperature and humidity chamber.
- The near field magnetic sensor was placed near the EUT inside the chamber.



### 6.2 Testing System

Equipment	Manufacturer	Model	S/N	Calibration		Note
				Date	Due	
Temp. & Humi. Chamber	ESPEC	MC-811P	112000892	2011-09-08	2012-09-30	
Spectrum Analyzer	Hewlett-Packard	HP8591EM	3628A00876	2010-12-06	2012-12-31	
Near Field Magnetic Sensor	Anritsu	MA2601C	MA01	2011-02-06	2012-02-29	
DC Power supply	KIKUSUI	PAN35-5A	LA002428	Non Calibration		

## 6.3 Test Details

JOB No. : 1E12012

Date : :2012.1.17

Engineer : H.Fujimoto

Product Name : Contactless Smart Card Reader Model : RDFL-B03

S/N : 11K000002T

Reference Condition: Temp/Humi: 22.4 / 26 %

## Temperature variation

Temperature : -20

Voltage : DC24.0V

Time	Start Up	2.min	5.min	10.min	Diviation	
Frequency (MHz)	13.559925	13.559897	13.559983	13.559988	-0.000103	MHz
					-0.000760	%

Temperature : 20

Voltage : DC24.0V

Time	Start Up	2.min	5.min	10.min	Diviation	
Frequency (MHz)	13.559905	13.55988	13.559891	13.559932	-0.000120	MHz
					-0.000885	%

Temperature : 50

Voltage : DC24.0V

Time	Start Up	2.min	5.min	10.min	Diviation	
Frequency (MHz)	13.559898	13.559967	13.559972	13.559983	-0.000102	MHz
					-0.000752	%

## Voltage variation

Primary voltage : DC12V - 24V

Temperature : 20

Voltage : DC24.0V

Voltage	Start Up	2.min	5.min	10.min	Diviation	
Frequency (MHz)	13.559988	13.559984	13.559986	13.559982	-0.000018	MHz
					-0.000133	%

Temperature : 20

Voltage : DC10.2V

Voltage	Start Up	2.min	5.min	10.min	Diviation	
Frequency (MHz)	13.559978	13.559976	13.559981	13.559979	-0.000024	MHz
					-0.000177	%

Temperature : 20

Voltage : DC27.6V

Voltage	Start Up	2.min	5.min	10.min	Diviation	
Frequency (MHz)	13.559976	13.559976	13.559974	13.559973	-0.000027	MHz
					-0.000199	%

Test configuration photo: Refer to Section 8.4

## 7 TEST DATA

- Conducted Emission at Main port Test Data ..... Page 17 to 18
  
- Radiated Emission Test Data
  - 13.110MHz-14.010MHz
    - X Axis ..... Page 19
    - Y Axis ..... Page 20
    - Z Axis ..... Page 21
  - 9kHz-30MHz
    - X Axis ..... Page 22
    - Y Axis ..... Page 23
    - Z Axis ..... Page 24
  - 30MHz-1GHz
    - X Axis ..... Page 25
    - Y Axis ..... Page 26
    - Z Axis ..... Page 27



\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Conducted Emission>>

2 February, 2012 11:13  
 1E12012006.dat

Standard : FCC Part15 SubpartC §15.207  
 Model : RDFL-B03  
 S/N : 11K000002T  
 Product Name : Contactless Smart Card Reader  
 File No. : 006  
 Power Source : AC120V / 60Hz (PS OUT DC24V)  
 Temp/Humi : 18.5 / 46%  
 Test Mode :  
 Remarks :  
 Operator : H.Fujimoto

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	0.150	28.6	10.3	10.3	38.9	20.6	66.0	56.0	27.1	35.4
2	0.296	23.6	5.1	10.2	33.8	15.3	60.4	50.4	26.6	35.1
3	0.500	19.1	0.8	10.1	29.2	10.9	56.0	46.0	26.8	35.1
4	13.560	53.1	53.1	10.8	63.9	63.9	60.0	50.0	-3.9	-13.9 *1
5	13.560	3.8	3.4	10.8	14.6	14.2	60.0	50.0	45.4	35.8 *2
6	27.120	34.5	34.5	10.9	45.4	45.4	60.0	50.0	14.6	4.6

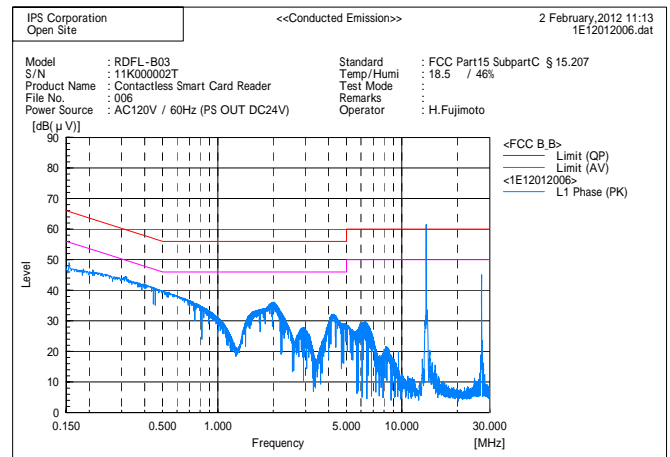
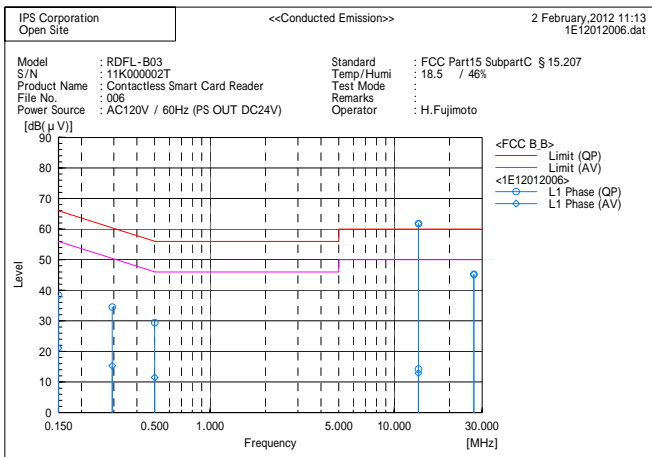
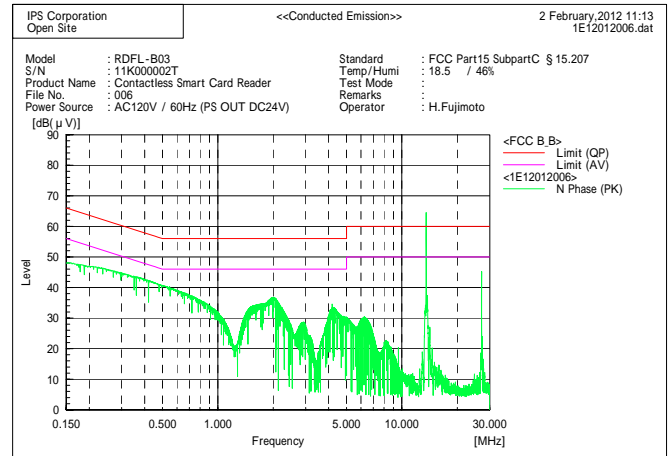
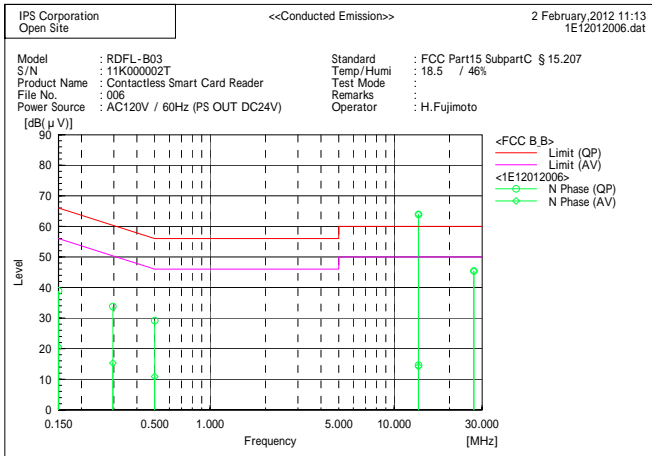
--- L1 Phase ---

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	0.150	28.1	10.8	10.3	38.4	21.1	66.0	56.0	27.6	34.9
2	0.294	24.3	5.1	10.2	34.5	15.3	60.4	50.4	25.9	35.1
3	0.500	19.3	1.4	10.1	29.4	11.5	56.0	46.0	26.6	34.5
4	13.560	51.0	51.0	10.8	61.8	61.8	60.0	50.0	-1.8	-11.8 *1
5	13.560	3.4	2.1	10.8	14.2	12.9	60.0	50.0	45.8	37.1 *2
6	27.120	34.3	34.3	10.9	45.2	45.2	60.0	50.0	14.8	4.8

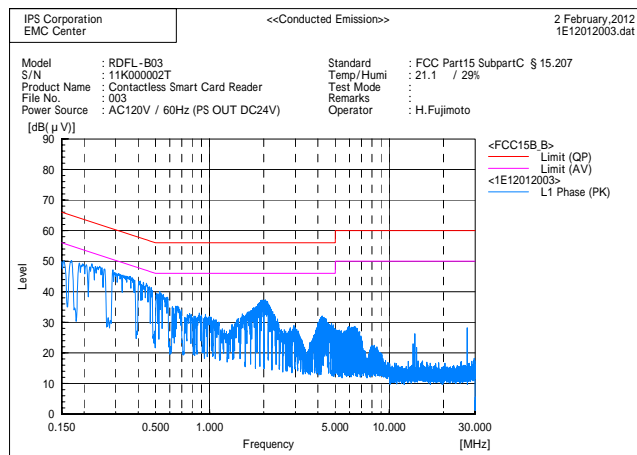
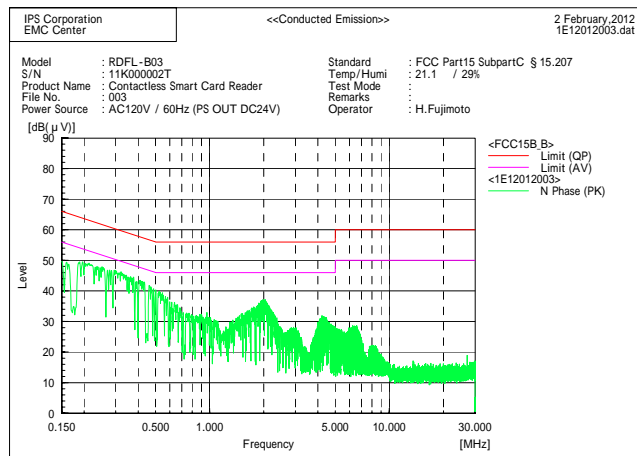
Note \*1:A normal state

\*2:Antenna was terminated

**Normal state**



**Terminated state**



\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 12 January, 2012 19:05  
 IE12012007.dat

Standard : FCC 15C 13.56MHz 3m  
 Model : RDFL-B03  
 S/N : 11K00002T  
 Product Name : Contactless Smart Card Reader  
 File No : 007  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 19.1°C / 30%  
 Test Mode :  
 Remarks : X Axis  
 Operator : M.Horigane

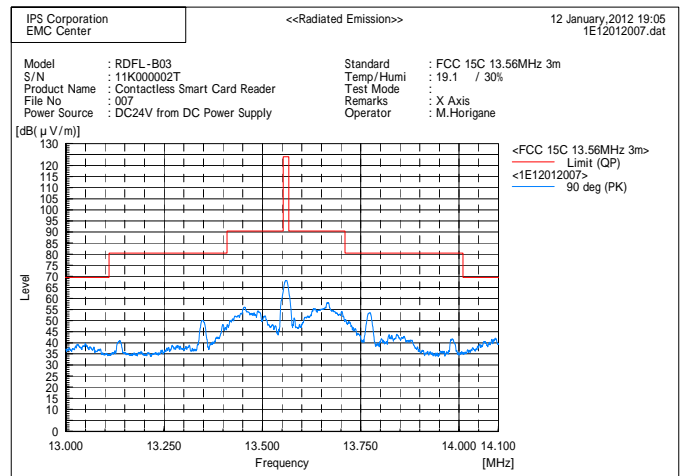
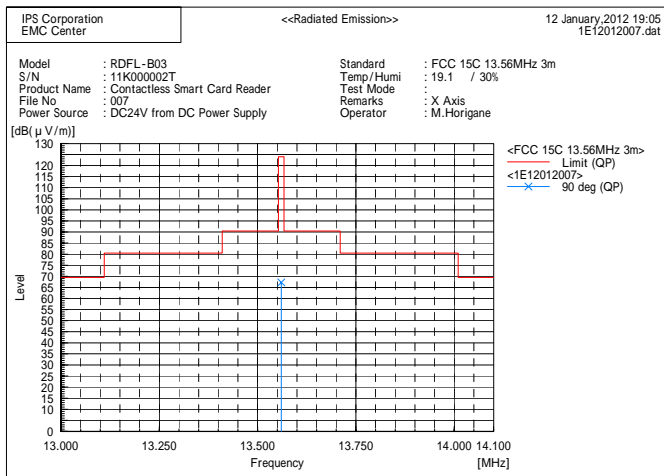
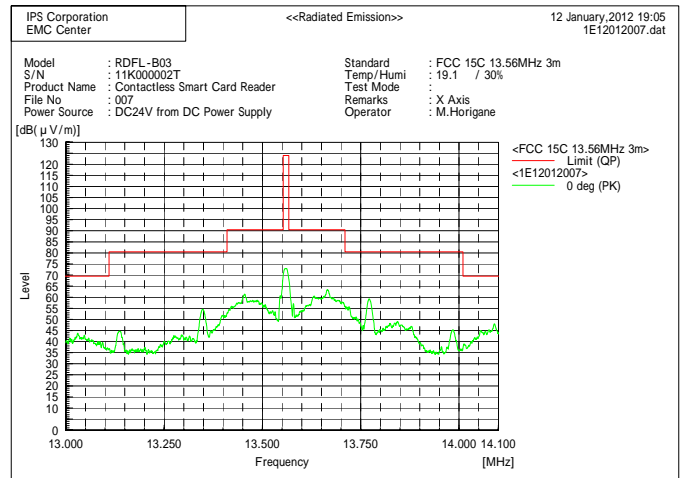
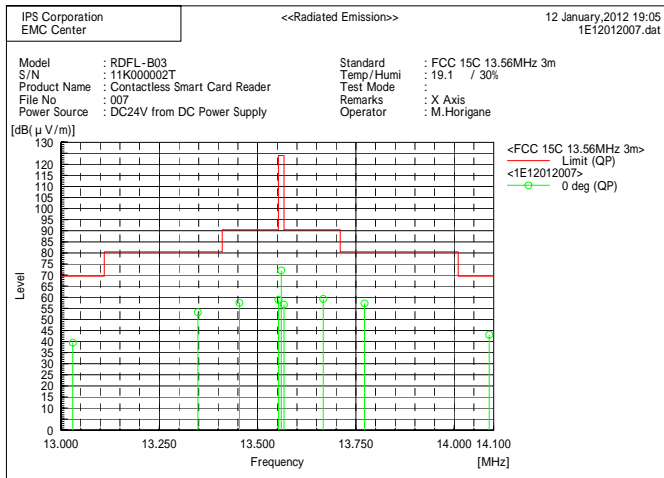
Final Result

--- 0 deg (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	13.030	17.4	22.1	39.5	69.5	30.0	100.0	356.0
2	13.348	31.1	22.1	53.2	80.5	27.3	100.0	357.0
3	13.454	35.3	22.2	57.5	90.5	33.0	100.0	359.0
4	13.553	36.6	22.2	58.8	90.5	31.7	100.0	0.0
5	13.560	49.9	22.2	72.1	124.0	51.9	100.0	178.0
6	13.567	34.5	22.2	56.7	90.5	33.8	100.0	357.0
7	13.667	37.1	22.2	59.3	90.5	31.2	100.0	358.0
8	13.772	35.0	22.2	57.2	80.5	23.3	100.0	357.0
9	14.089	20.8	22.3	43.1	69.5	26.4	100.0	356.0

--- 90 deg (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	13.560	45.1	22.2	67.3	124.0	56.7	100.0	292.0



\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 13 January, 2012 09:48  
 1E12012009. dat

Standard : FCC 15C 13.56MHz 3m  
 Model : RDFL-B03  
 S/N : 11K00002T  
 Product Name : Contactless Smart Card Reader  
 File No : 009  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 15.1°C / 29%  
 Test Mode :  
 Remarks : Y Axis  
 Operator : M.Horigane

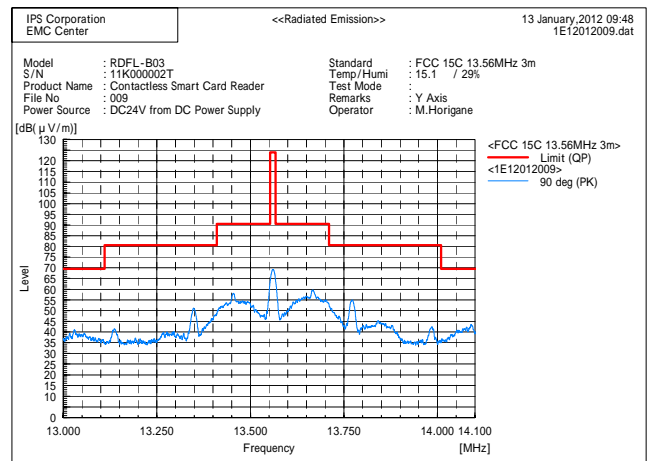
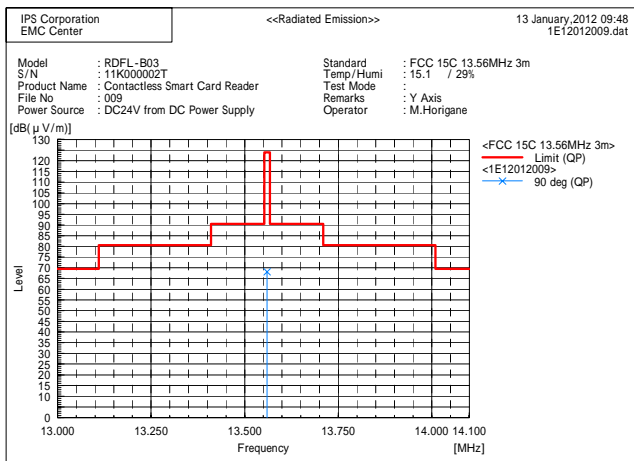
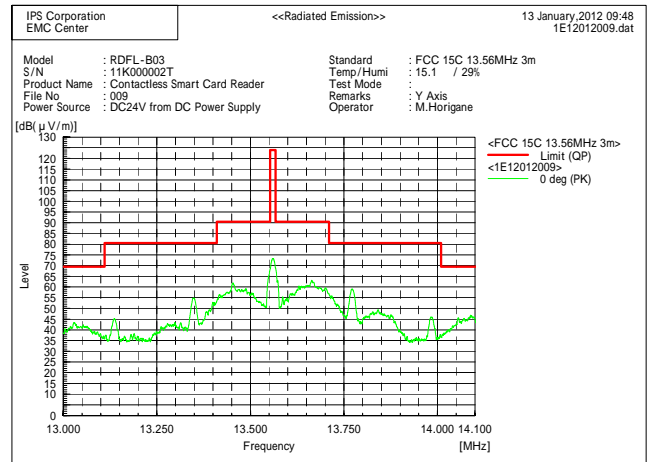
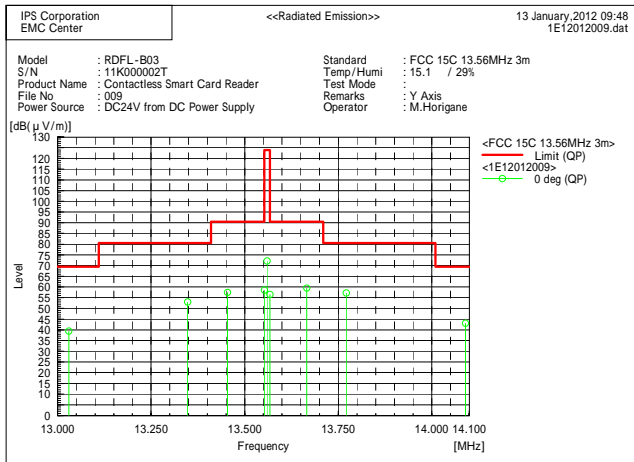
Final Result

--- 0 deg (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	13.030	17.3	22.1	39.4	69.5	30.1	100.0	351.0
2	13.348	30.9	22.1	53.0	80.5	27.5	100.0	352.0
3	13.454	35.2	22.2	57.4	90.5	33.1	100.0	355.0
4	13.553	36.4	22.2	58.6	90.5	31.9	100.0	355.0
5	13.560	49.9	22.2	72.1	124.0	51.9	100.0	358.0
6	13.567	34.3	22.2	56.5	90.5	34.0	100.0	357.0
7	13.666	37.3	22.2	59.5	90.5	31.0	100.0	357.0
8	13.772	35.0	22.2	57.2	80.5	23.3	100.0	356.0
9	14.090	20.7	22.3	43.0	69.5	26.5	100.0	356.0

--- 90 deg (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	13.560	45.9	22.2	68.1	124.0	55.9	100.0	285.0



\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 13 January, 2012 11:06  
 1E12012011.dat

Standard : FCC 15C 13.56MHz 3m  
 Model : RDFL-B03  
 S/N : 11K000002T  
 Product Name : Contactless Smart Card Reader  
 File No : 011  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 15.1°C / 29%  
 Test Mode :  
 Remarks : Z Axis  
 Operator : M.Horigane

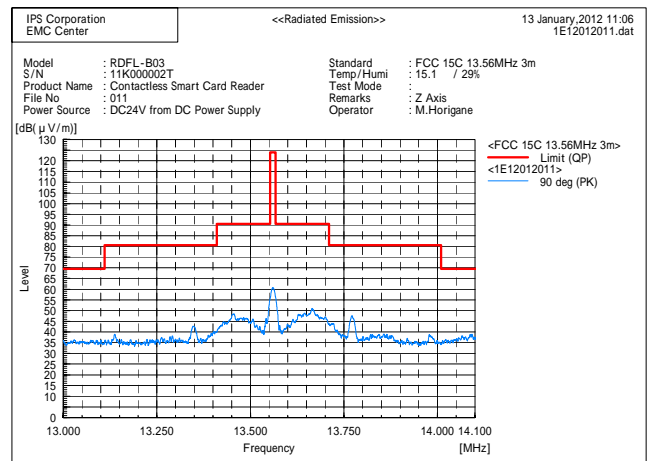
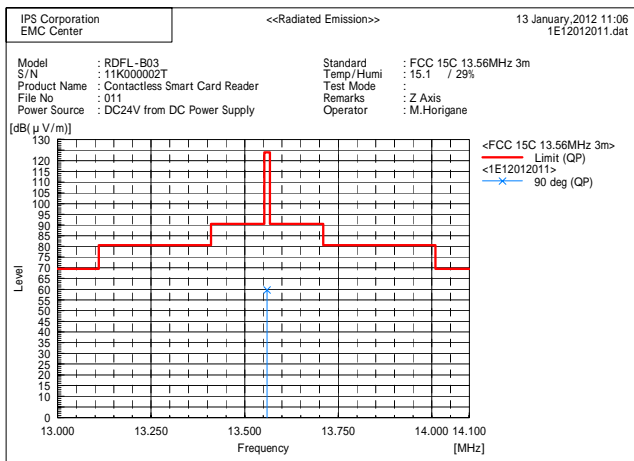
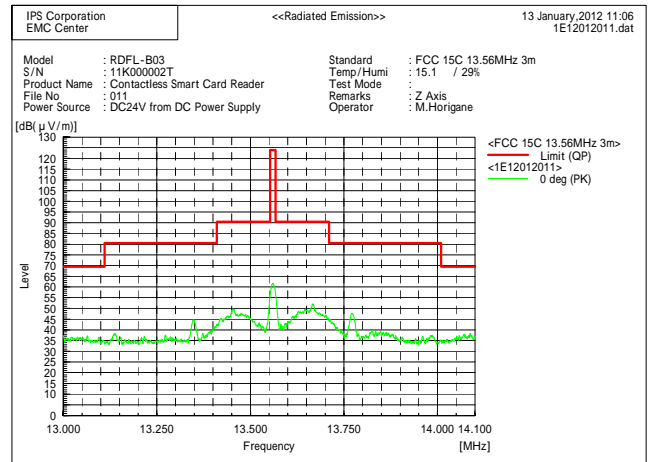
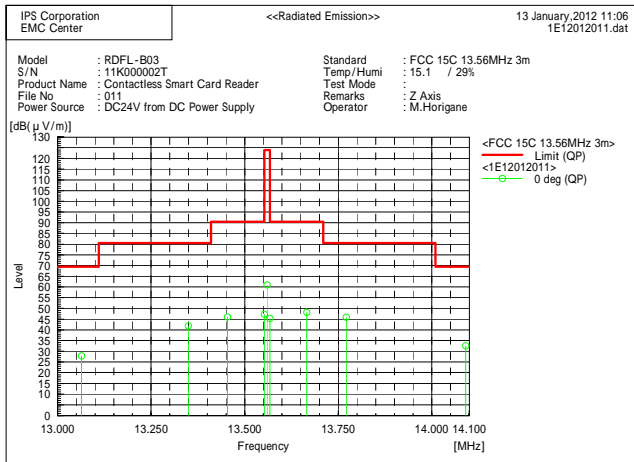
Final Result

--- 0 deg (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	13.064	5.7	22.1	27.8	69.5	41.7	100.0	150.0
2	13.349	19.7	22.1	41.8	80.5	38.7	100.0	123.0
3	13.454	23.8	22.2	46.0	90.5	44.5	100.0	155.0
4	13.553	25.1	22.2	47.3	90.5	43.2	100.0	128.0
5	13.560	38.7	22.2	60.9	124.0	63.1	100.0	153.0
6	13.567	23.1	22.2	45.3	90.5	45.2	100.0	143.0
7	13.666	26.0	22.2	48.2	90.5	42.3	100.0	127.0
8	13.772	23.7	22.2	45.9	80.5	34.6	100.0	136.0
9	14.091	10.2	22.3	32.5	69.5	37.0	100.0	160.0

--- 90 deg (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	13.560	37.5	22.2	59.7	124.0	64.3	100.0	189.0



\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 12 January, 2012 18:37  
 IE12012006.dat

Standard : FCC Part15 SubpartC  
 Model : RDFL-B03  
 S/N : 11K00002T  
 Product Name : Contactless Smart Card Reader  
 File No : 006  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 19.1°C / 30%  
 Test Mode :  
 Remarks : X Axis  
 Operator : M.Horigane

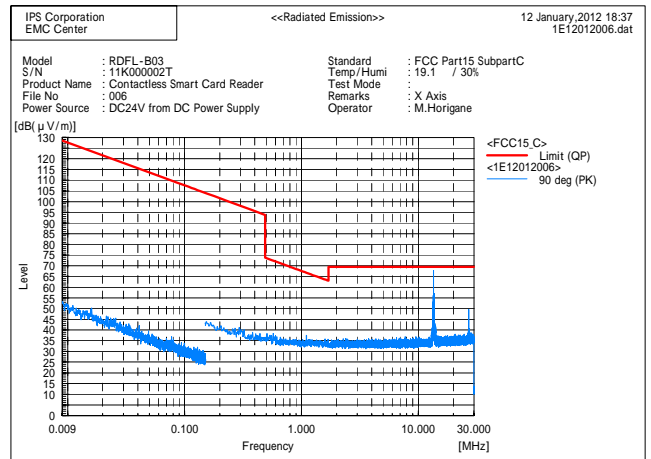
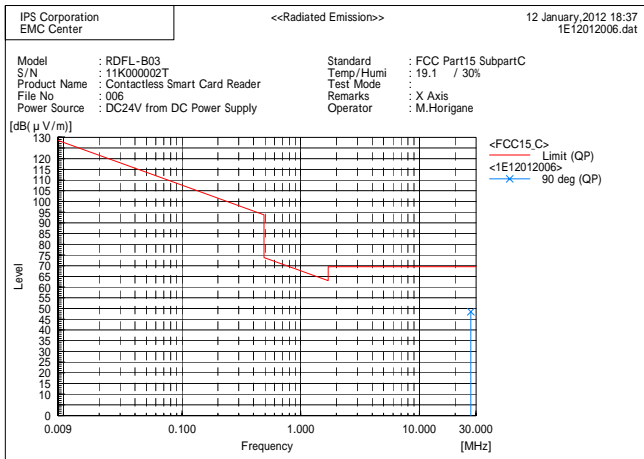
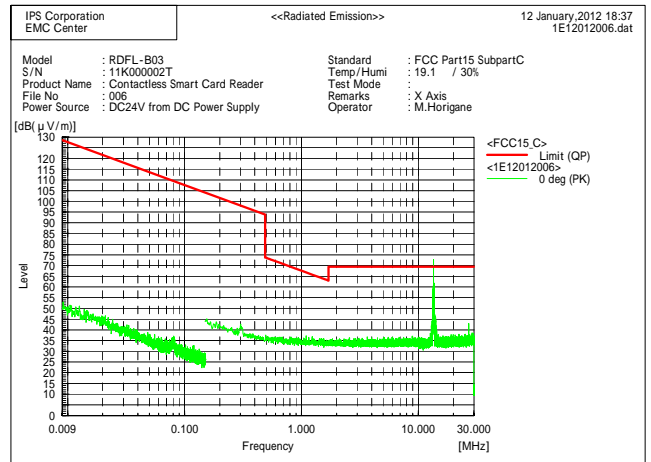
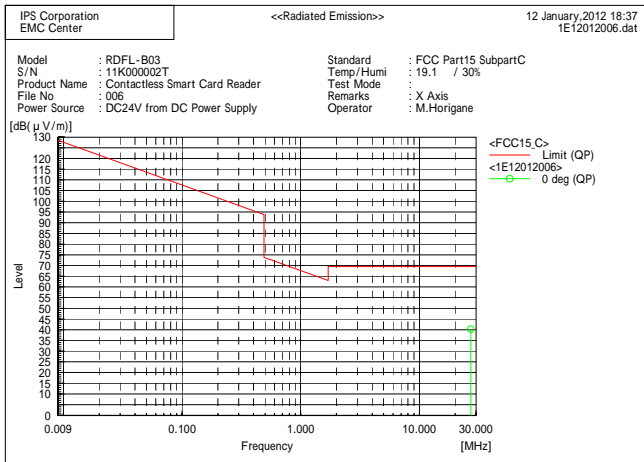
Final Result

--- 0 deg (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	27.120	16.1	24.2	40.3	69.5	29.2	100.0	244.0

--- 90 deg (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	27.120	24.3	24.2	48.5	69.5	21.0	100.0	209.0



\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 13 January, 2012 09:14  
 1E12012008.dat

Standard : FCC Part15 SubpartC  
 Model : RDFL-B03  
 S/N : 11K00002T  
 Product Name : Contactless Smart Card Reader  
 File No : 008  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 15.1°C / 29%  
 Test Mode :  
 Remarks : Y Axis  
 Operator : M.Horigane

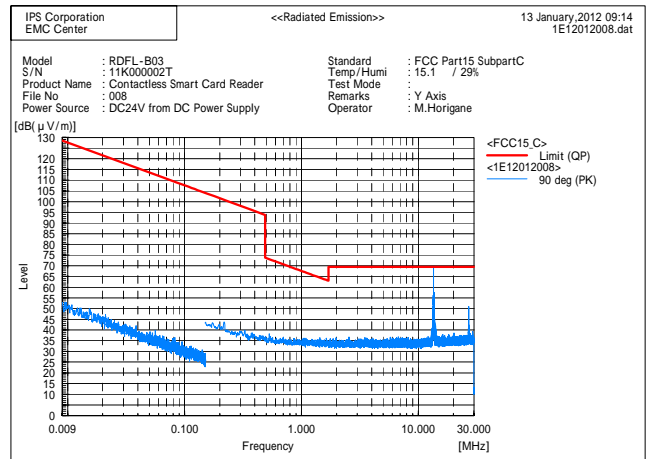
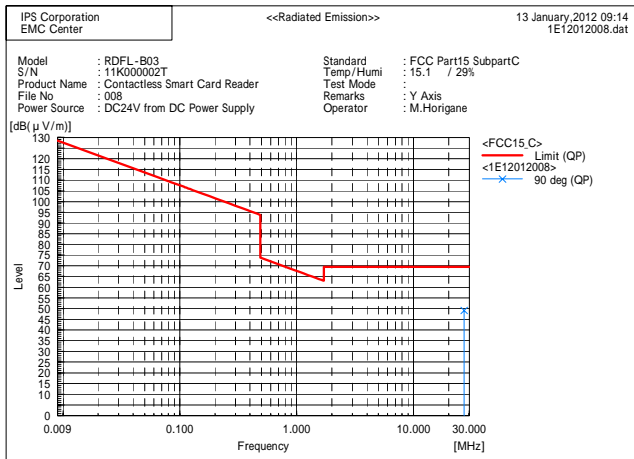
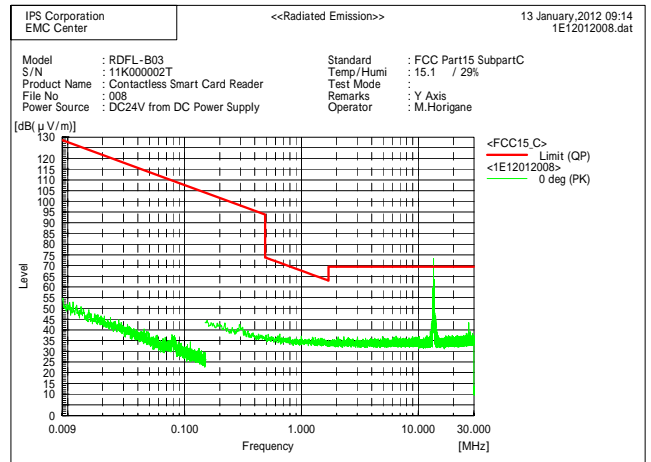
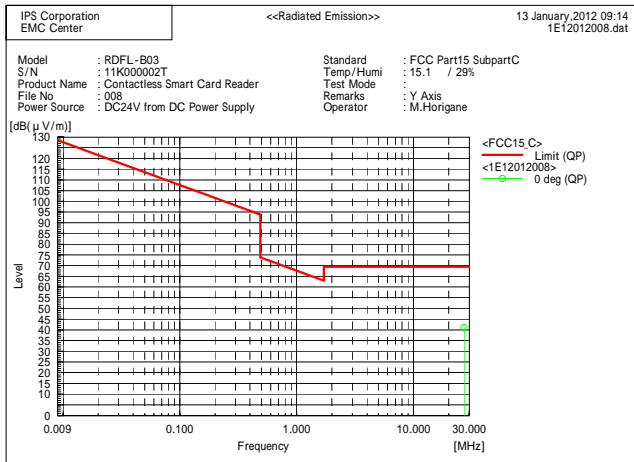
Final Result

--- 0 deg (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	27.120	16.9	24.2	41.1	69.5	28.4	100.0	252.0

--- 90 deg (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	27.120	25.0	24.2	49.2	69.5	20.3	100.0	211.0





\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 13 January, 2012 10:42  
 1E12012010.dat

Standard : FCC Part15 SubpartC  
 Model : RDFL-B03  
 S/N : 11K00002T  
 Product Name : Contactless Smart Card Reader  
 File No : 010  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 15.1°C / 29%  
 Test Mode :  
 Remarks : Z Axis  
 Operator : M.Horigane

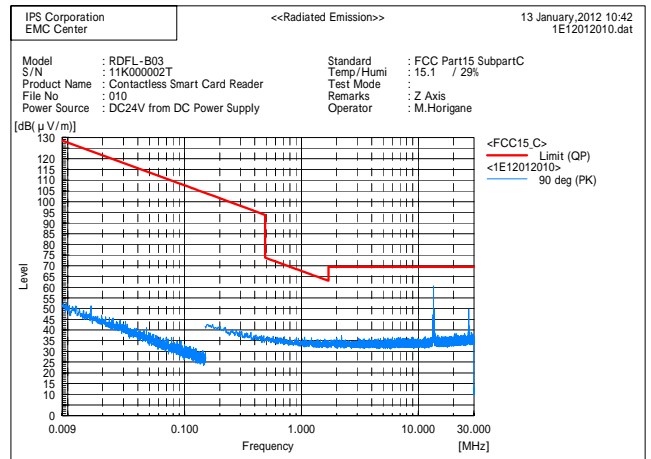
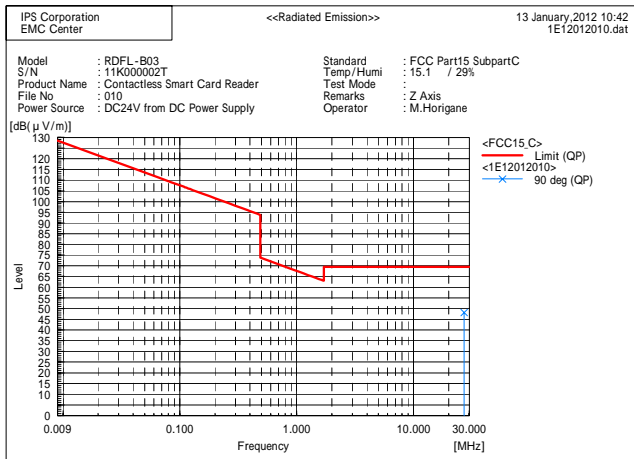
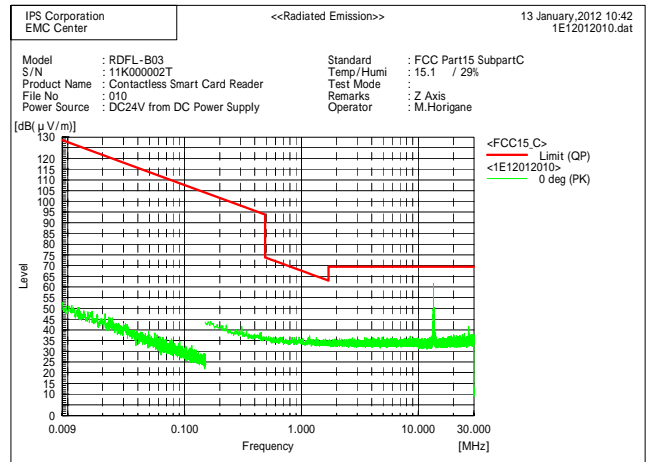
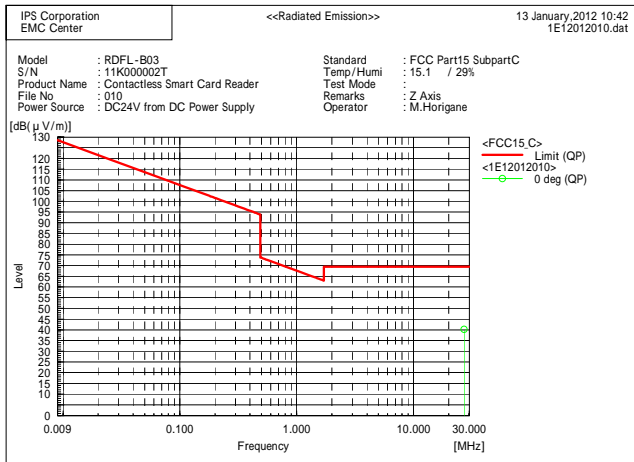
Final Result

--- 0 deg (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	27.120	16.1	24.2	40.3	69.5	29.2	100.0	271.0

--- 90 deg (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	27.120	24.0	24.2	48.2	69.5	21.3	100.0	197.0





\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 12 January,2012 16:50  
 1E12012005.dat

Standard : FCC Part15 SubpartC  
 Model : RDFL-B03  
 S/N : 11K000002T  
 Product Name : Contactless Smart Card Reader  
 File No : 005  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 18.3 / 30%  
 Test Mode :  
 Remarks : X Axis  
 Operator : M.Horigane

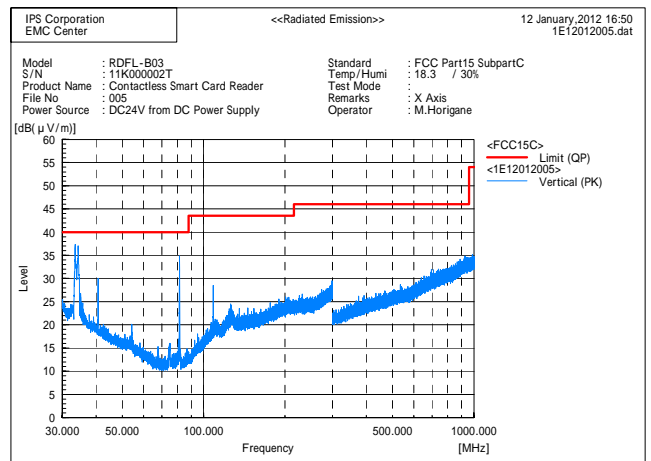
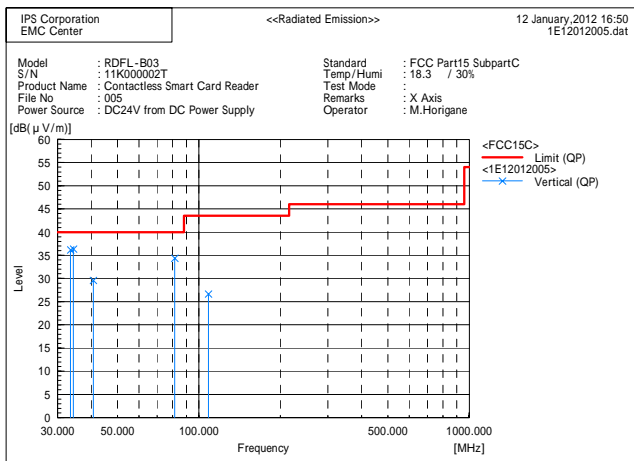
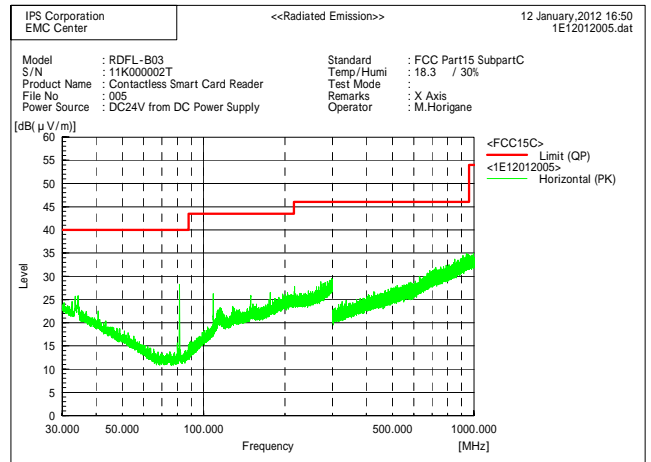
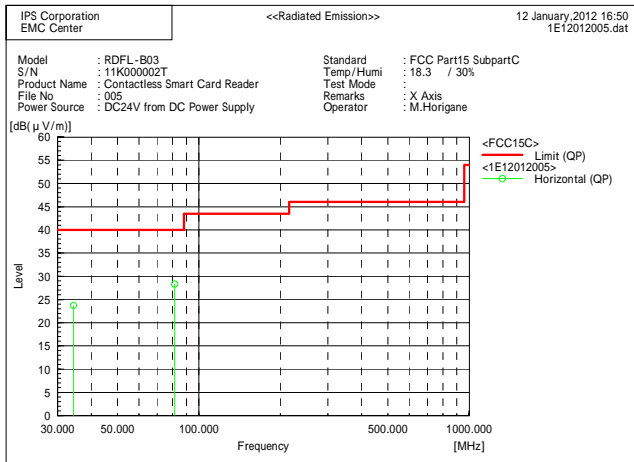
Final Result

--- 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	34.334	27.8	-4.1	23.7	40.0	16.3	201.6	263.0
2	81.382	42.0	-13.7	28.3	40.0	11.7	226.3	275.0

--- 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	33.497	40.0	-3.8	36.2	40.0	3.8	100.0	220.0
2	34.334	40.5	-4.1	36.4	40.0	3.6	100.0	221.0
3	40.697	35.9	-6.3	29.6	40.0	10.4	100.0	292.0
4	81.372	48.1	-13.7	34.4	40.0	5.6	100.0	168.0
5	108.492	34.5	-7.8	26.7	43.5	16.8	100.0	172.0



\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 13 January,2012 13:38  
 1E12012013.dat

Standard : FCC Part15 SubpartC  
 Model : RDFL-B03  
 S/N : 11K000002T  
 Product Name : Contactless Smart Card Reader  
 File No : 013  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 16.8 / 30%  
 Test Mode :  
 Remarks : Y Axis  
 Operator : M.Horigane

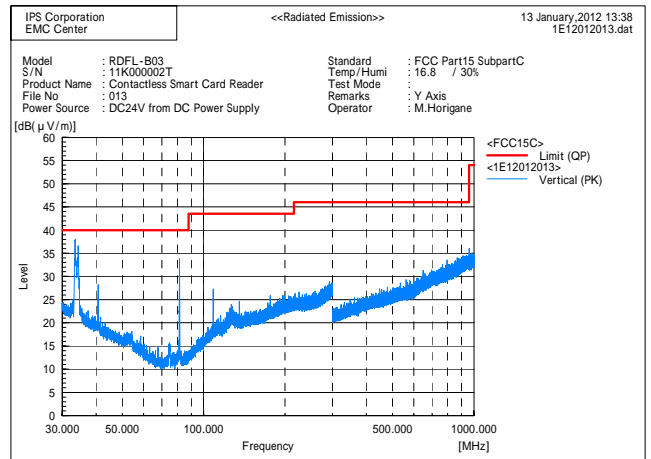
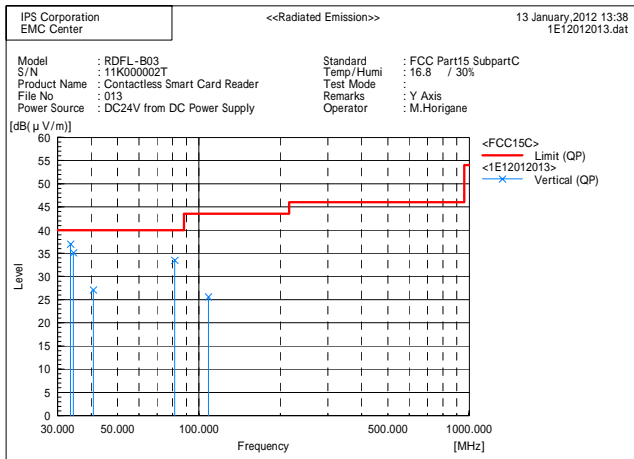
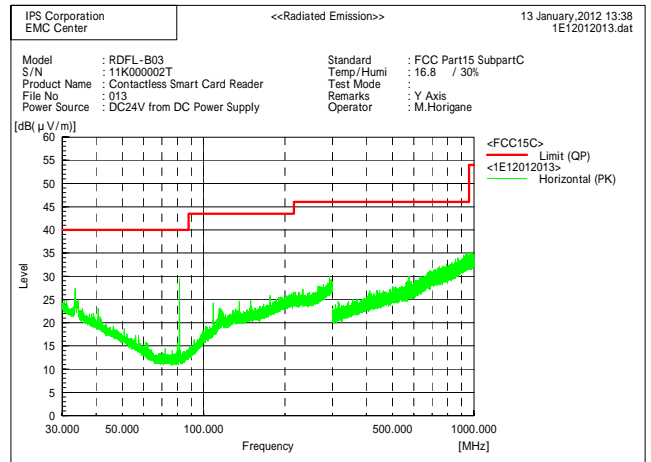
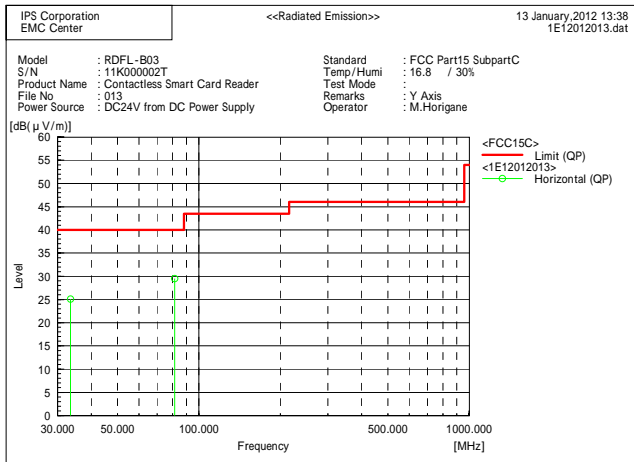
Final Result

--- 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	33.491	28.9	-3.8	25.1	40.0	14.9	267.6	256.0
2	81.373	43.2	-13.7	29.5	40.0	10.5	219.0	117.0

--- 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	33.493	40.8	-3.8	37.0	40.0	3.0	100.0	198.0
2	34.343	39.2	-4.1	35.1	40.0	4.9	100.0	204.0
3	40.696	33.4	-6.3	27.1	40.0	12.9	100.0	110.0
4	81.376	47.2	-13.7	33.5	40.0	6.5	100.0	189.0
5	108.498	33.4	-7.8	25.6	43.5	17.9	100.0	226.0



\*\*\*\*\* IPS Corporation \*\*\*\*\*  
 <<Radiated Emission>> 13 January,2012 12:03  
 1E12012012.dat

Standard : FCC Part15 SubpartC  
 Model : RDFL-B03  
 S/N : 11K000002T  
 Product Name : Contactless Smart Card Reader  
 File No : 012  
 Power Source : DC24V from DC Power Supply  
 Temp/Humi : 15.3 / 30%  
 Test Mode :  
 Remarks : Z Axis  
 Operator : M.Horigane

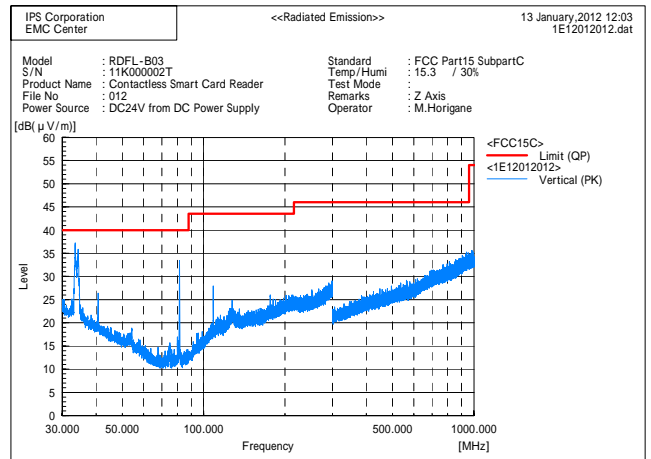
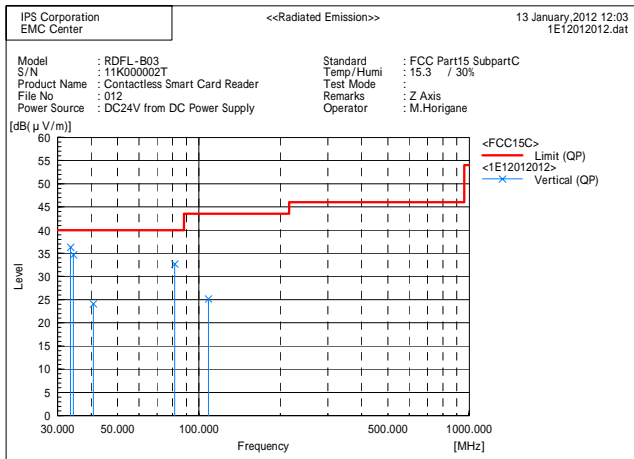
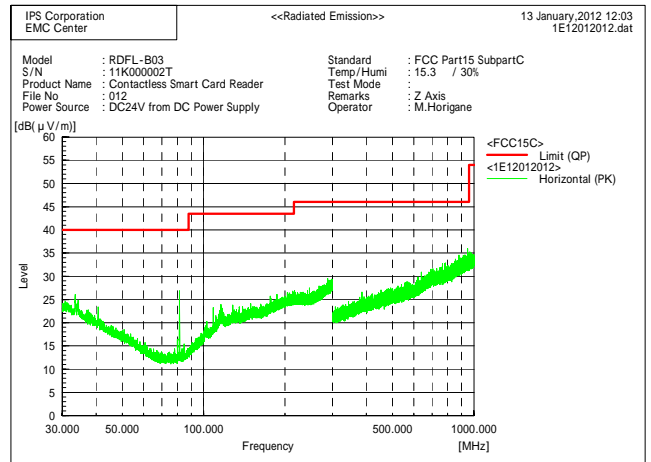
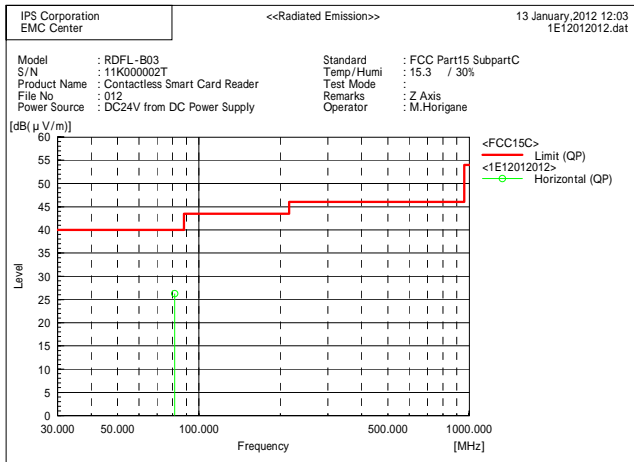
Final Result

--- 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	81.373	40.0	-13.7	26.3	40.0	13.7	211.6	134.0

--- 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	33.493	40.1	-3.8	36.3	40.0	3.7	100.0	205.0
2	34.340	38.8	-4.1	34.7	40.0	5.3	100.0	192.0
3	40.694	30.4	-6.3	24.1	40.0	15.9	100.0	56.0
4	81.375	46.4	-13.7	32.7	40.0	7.3	100.0	173.0
5	108.492	33.0	-7.8	25.2	43.5	18.3	100.0	167.0



## 8 TEST CONFIGURATION PHOTOS

### 8.1 Conducted Emission Test at Main port Test



This cable routing was attempted to maximize the conducted emission.

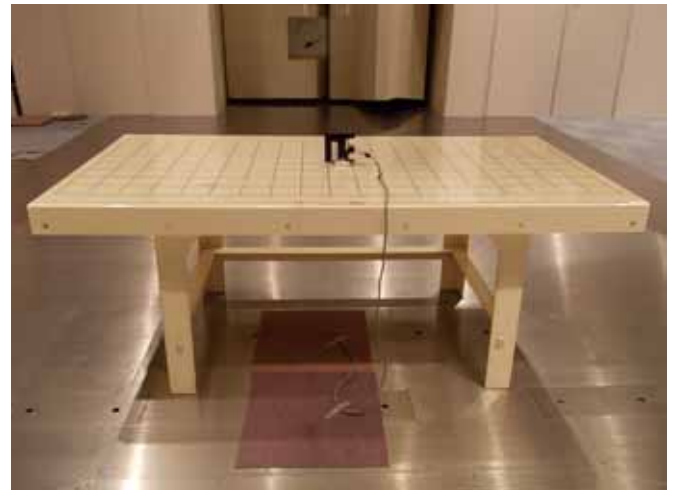
## 8 TEST CONFIGURATION PHOTOS

### 8.2 Radiated Emission Test (Overview)

#### X Axis



#### Y Axis



#### Z Axis

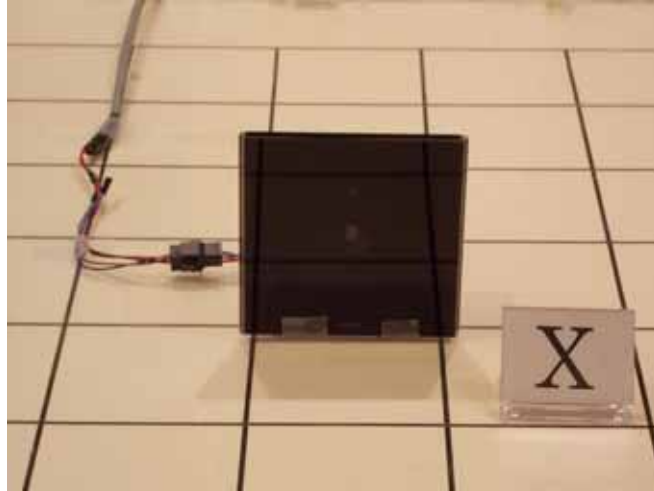


This cable routing was attempted to maximize the radiated emission.

## 8 TEST CONFIGURATION PHOTOS

### 8.3 Radiated Emission Test (Close-up)

**X Axis**



**Y Axis**



**Z Axis**





## 8 TEST CONFIGURATION PHOTOS

### 8.4 Frequency stability

#### Temp. & Humi. Chamber

