CONFORMANCE TEST REPORT
FOR
FCC 47 CFR, Part 15 Subpart B & Subpart C

Report No.: 07-03-MAS-166-01

Client:	Boryeu Technology Co., Ltd
Product:	Long Range RFID System
Trade Name:	PC-SAFE
Model No.:	PC-1015CR
Manufacturer/supplier:	Boryeu Technology Co., Ltd

Date test item received:	2007/03/20
Date test campaign completed:	2007/04/19
Date of issue:	2007/05/07

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Total number of pages of this test report: 19 pages

Total number of pages of photos: External photos 1 pages

Internal photos 4 pages

Setup photos 4 pages

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Manufacturer	: Boryeu Technology Co., Ltd
Address	: 6F-2, No.189, Sec.2, Keelung Rd., Sinyi District, Taipei City 110, Taiwan.
EUT	: Long Range RFID System
Trade name	: PC-SAFE
Model No.	: PC-1015CR
Power Source	: 12V DC
Regulations applied	: FCC 47 CFR, Part 15 Subpart B & Subpart C (2006)
Test Specifications	: Class B

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⑤ FCC Registration Number: 90588, 91094, 91095

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : Long Range RFID System

b) Model No. : PC-1015CR

c) FCC ID : VALPC-1015R

d) Working Frequency : 125kHz

The EUT is a RFID card reader of Long Range RFID System included a long-range antenna. The system are used in vehicle and personnel access control which can detect IDs in a distance. The reader transmits the signal to the card by 125 kHz and receives the signal from the card by 433.92 MHz.

1.2 Test Methodology

Both conducted and radiated emissions were performed according to the procedures in ANSI C63.4 (2003).

1.3 Test Facility

The Semi-Anechoic Chamber and conducted measurement facility used to collect the radiated and conducted data are located inside the Building at No.8, Lane 29, Wen-ming Road, Lo-shan Tsun, Kweishan Hsiang, Taoyuan, Taiwan, R.O.C.
This site has been accreditation as a FCC filing site.

2. PROVISIONS APPLICABLE

2.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.25
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

Remark "**" : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.3 Limitation

(1) Conducted Emission Limits :

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the conducted limit is the following:

Frequency MHz	Quasi Peak dB μV	Average dB μV
0.15 - 0.5	66-56	56-46
0.5 - 5.0	56	46
5.0 - 30.0	60	50

(2) Radiated Emission Limits :

According to **FCC §15.109(a)**, the field strength of radiated emissions from unintentional digital device radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	Distance Meters	Radiated μV/m	Radiated dB μV/m
30 - 88	3	100	40.0
88 - 216	3	150	43.5
216 - 960	3	200	46.0
above 960	3	500	54.0

According to **FCC §15.209(a)**, the emission from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency MHz	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F (kHz)	300
0.40 –1.705	24000/F (kHz)	30
1.705 –30.0	30	30
30 -80	100 **	3
88 -216	150 **	3
216 -960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 –72 MHz, 76-88 MHz, 174 – 216 MHz or 470 – 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

To comply with the FCC RF exposure compliance requirement, this device and its antenna must not be co-located or operating to conjunction with any other antenna or transmitter.

3. SYSTEM TEST CONFIGURATION

3.1 EUT configuration and operating

Test operation mode: (1) 125 kHz Transmitting Mode.

(2) 433 MHz Receive Mode.

3.2 Devices for Tested System

Description	Manufacturer	Model No.	I/O Cable
* Long Range RFID System	Boryeu Technology Co., Ltd	PC-1015CR	3.0m Unshielded Signal Line
DC Power Supply	GW	GPS 3030D	1.8m Unshielded Power Cable

"*" means Equipment Under Test

3.3 Deviation Statement

(If any deviation from additions to or exclusions from test method must be stated)

N/A

3.4 Modification Record

N/A

4. RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For unintentional radiator digital devices, the radiated emission shall comply with §15.109(a) and § 15.209.

4.2 Measurement Procedure

A.Preliminary Measurement For Portable Devices.

For antenna movable devices, the following procedure was performed to determine the maximum emission axis of EUT (X,Y and Z axis):

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antennna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. The axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.
4. The position in which the maximum noise occurred was “Y axis”. (Please see the test setup photos)

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in continuous operating function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions and then each selected frequency is precisely measured. As the same purpose, for emission measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission measured below and above 1 GHz, set the spectrum analyzer on a 120 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

Figure 1: Frequencies measured 30MHz ~ 1GHz configuration

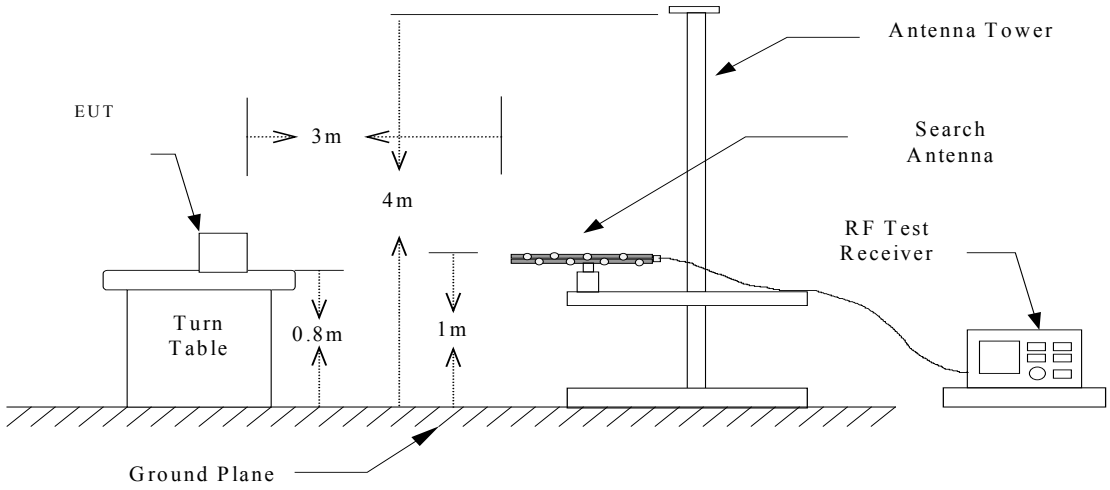


Figure 2 : Frequencies measured above 1 GHz configuration

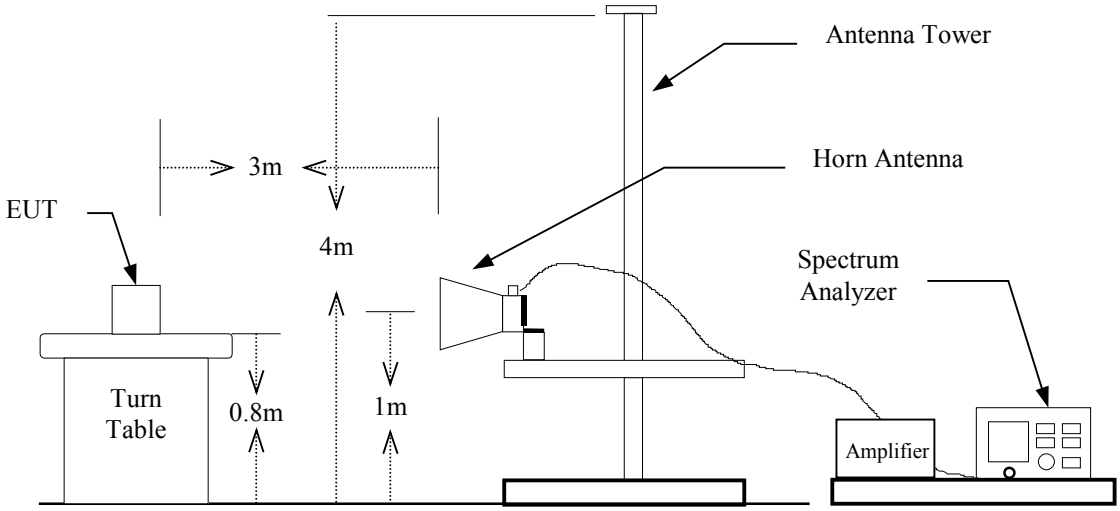
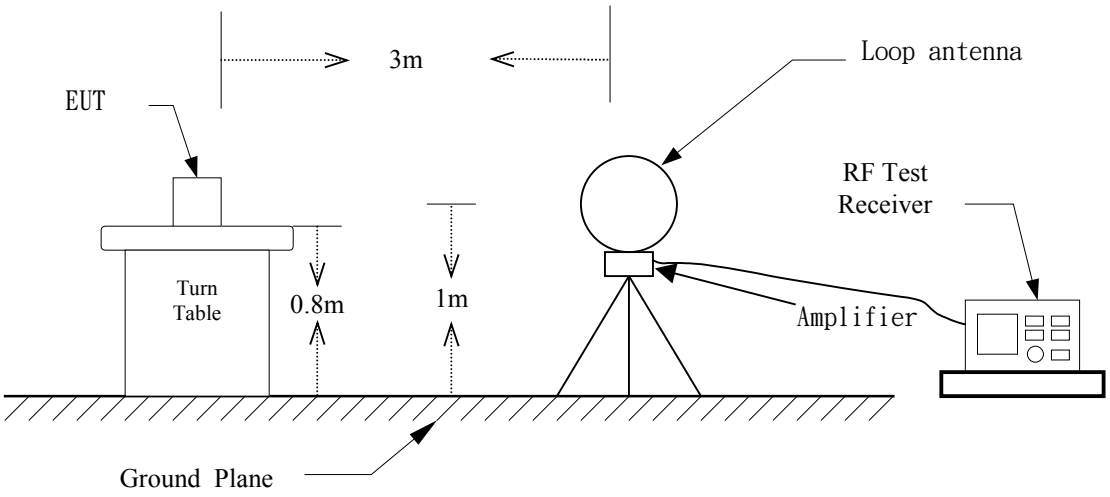


Figure 3 : Frequencies measured below 30MHz configuration



4.3 Radiated Emission Data

Operated mode : Continue Tx
Frequency : 125 kHz
Test Date : Apr. 12, 2007 Temperature : 16℃ Humidity : 76%

4.3.1 Fundamental

Frequency (kHz)	Reading (dBuV/m) Peak	AV	Correct Factor (dB/m)	Result @3m (dBuV/m) Peak	AV	Result @300m (uV/m) Peak	AV	Limit @300m (uV/m) AV	Margins (uV/m)
115.224	67.5	----	30.3	97.8	----	7.8	----	20.8	-13.0

4.3.2 Harmonic

Frequency (kHz)	Reading (dBuV)		Correct Factor (dB/m)	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margins @3m (dBuV/m)
230.448	---- PK	---- AV	24.5	---- PK	---- AV	120.4 PK	100.4 AV	----
345.672	---- PK	---- AV	20.6	---- PK	---- AV	116.8 PK	96.8 AV	----
460.896	---- PK	---- AV	20.6	---- PK	---- AV	114.3 PK	94.3 AV	----
576.120	----		16.6	----		72.4 QP		
691.344	----		15.3	----		70.8 QP		
806.568	----		13.9	----		69.5 QP		
921.792	----		12.6	----		68.3 QP		
1037.016	----		12.1	----		67.3 QP		
1152.240	----		11.6	----		66.4 QP		

Note:

If the data table appeared symbol of "----" means the value was too low to be measured.

4.3.3 Other Emission

4.3.3.1 Operated mode : 125 kHz Tx

EUT : RFID (125KHz)	Model :	Status : TX	
Condition : Horizontal	Date : 2007/4/12	Temp. : 16℃	Humi. : 76%

	Freq (MHz)	QP Level (dBuV)	Factor (dB/m)	QP Result (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
1	30.000	9.2	13.1	22.3	40.0	-17.7
2	72.766	11.2	10.8	22.0	40.0	-18.0
3	181.623	5.7	14.2	19.9	43.5	-23.6
4	290.481	7.5	16.1	23.6	46.0	-22.4
5	362.405	7.1	18.3	25.4	46.0	-20.6
6	556.794	3.0	22.7	25.7	46.0	-20.3

EUT : RFID (125KHz)	Model :	Status : TX	
Condition : Vertical	Date : 2007/4/12	Temp. : 16℃	Humi. : 76%

	Freq (MHz)	QP Level (dBuV)	Factor (dB/m)	QP Result (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
1	45.551	21.8	13.2	35.0	40.0	-5.0
2	109.699	10.2	12.6	22.8	43.5	-20.7
3	352.685	7.9	18.0	25.9	46.0	-20.1
4	541.242	3.9	22.5	26.4	46.0	-19.6
5	821.162	3.1	27.6	30.7	46.0	-15.3
6	951.403	2.0	29.6	31.6	46.0	-14.4

Note:

1. Place of Measurement: Measuring site of the ETC.
2. If the data table appeared symbol of "***" means the value was too low to be measured.
3. The estimated measurement uncertainty of the result measurement is
   ±4.6dB (30MHz≦f<300MHz).
   ±4.4dB (300MHz≦f<1000MHz).
   ±4.1dB (1GHz≦f≦18GHz).

4.3.3.2 Operated mode : 433.92 MHz Rx

A. below 1GHz

EUT : RFID (125KHz)	Model :	Status : RX	
Condition : Horizontal	Date : 2007/4/12	Temp. : 16℃	Humi. : 76%

	Freq (MHz)	QP Level (dBuV)	Factor (dB/m)	QP Result (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
1	31.944	9.7	13.1	22.8	40.0	-17.2
2	230.220	4.8	14.1	18.9	46.0	-27.1
3	249.659	4.3	14.8	19.1	46.0	-26.9
4	376.012	3.1	18.8	21.9	46.0	-24.1
5	512.084	3.5	22.0	25.5	46.0	-20.5
6	564.569	3.5	22.8	26.3	46.0	-19.7

EUT : RFID (125KHz)	Model :	Status : RX	
Condition : Vertical	Date : 2007/4/12	Temp. : 16℃	Humi. : 76%

	Freq (MHz)	QP Level (dBuV)	Factor (dB/m)	QP Result (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
1	31.944	15.5	13.1	28.6	40.0	-11.4
2	45.551	10.5	13.2	23.7	40.0	-16.3
3	101.924	6.5	11.5	18.0	43.5	-25.5
4	251.603	3.7	14.8	18.5	46.0	-27.5
5	582.064	2.7	23.1	25.8	46.0	-20.2
6	924.188	1.8	29.3	31.1	46.0	-14.9

B. above 1GHz

Frequency (MHz)	Ant Pol H / V	Reading (dBuV) Peak	Correct Factor (dB)	Duty Factor (dB)	Result @3m (dBuV/m) Peak	Result @3m (dBuV/m) AVG	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) AVG	Margins (dB)
Radiated emission frequencies above 1 GHz to 4.5 GHz were too low to be measured.									

Note:

1. Place of Measurement: Measuring site of the ETC.
2. If the data table appeared symbol of "***" means the value was too low to be measured.
3. The estimated measurement uncertainty of the result measurement is
   ±4.6dB (30MHz≦f<300MHz).
   ±4.4dB (300MHz≦f<1000MHz).
   ±4.1dB (1GHz≦f≦18GHz).

4.4 Field Strength Calculation

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

Result = Reading + Corrected Factor

where

Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain

4.5 Radiated Measuring Instrument

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
EMI Receiver	R&S	ESIB 7	100328	May 17, 2007
BiLog Antenna	Schaffner	CBL 6112B	2927	Jun. 11, 2007
Horn Antenna	EMCO	3115	9107-3729	Jun. 06, 2007
PRE-Amplifier	Agilent	8449B	3008A01648	Sep. 17, 2007
Spectrum Analyzer	R&S	FSU46	13040904-001	Oct. 31, 2007
Spectrum Analyzer	Agilent	8564EC	4123A00585	Sep. 22, 2007
Loop Antenna	EMCO	6512	----	Jul. 15, 2007
PRE-Amplifier	ADVANTEST	BB525C	----	Sep. 17, 2007

Note: The standards used to perform this calibration are traceable to NML/ROC and NIST/USA.

5. CONDUCTED EMISSION MEASUREMENT

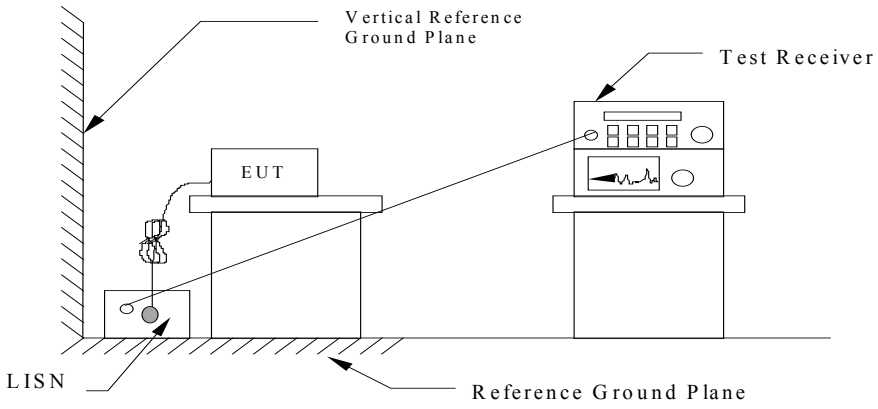
5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and §15.207(a) respectively. Both Limits are identical specification.

5.2 Measurement Procedure

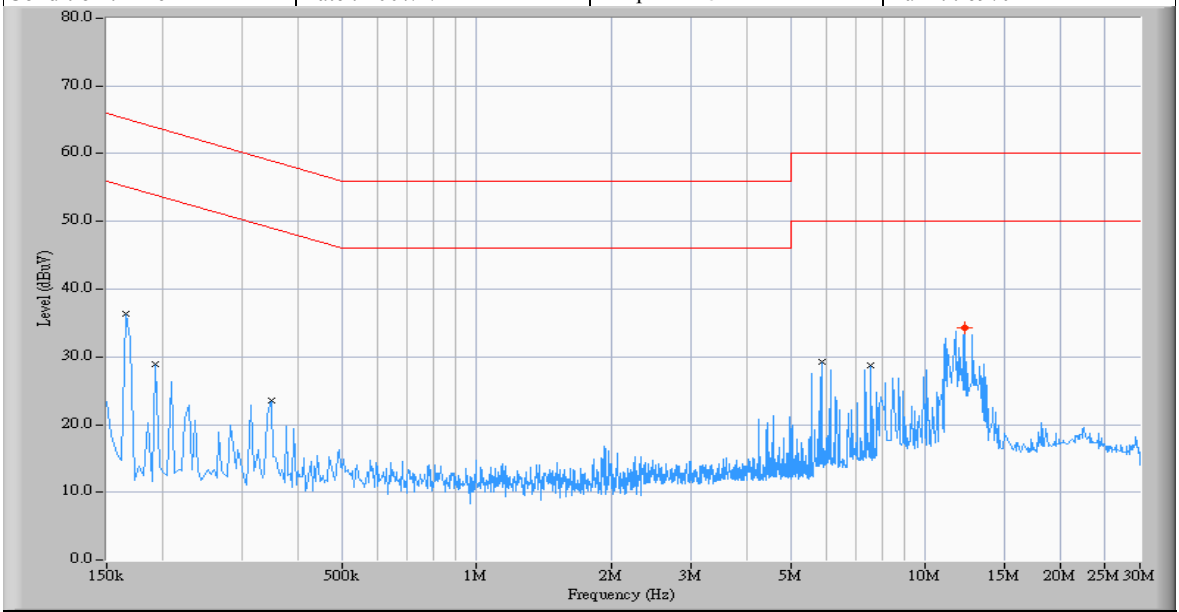
1. Setup the configuration per figure 4.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 4 : Conducted emissions measurement configuration



5.3 Conducted Emission Data

EUT : RFID (125KHz)	Model :	Status : RX	
Condition : Line 1	Date : 2007/4/12	Temp. : 24℃	Humi. : 69%

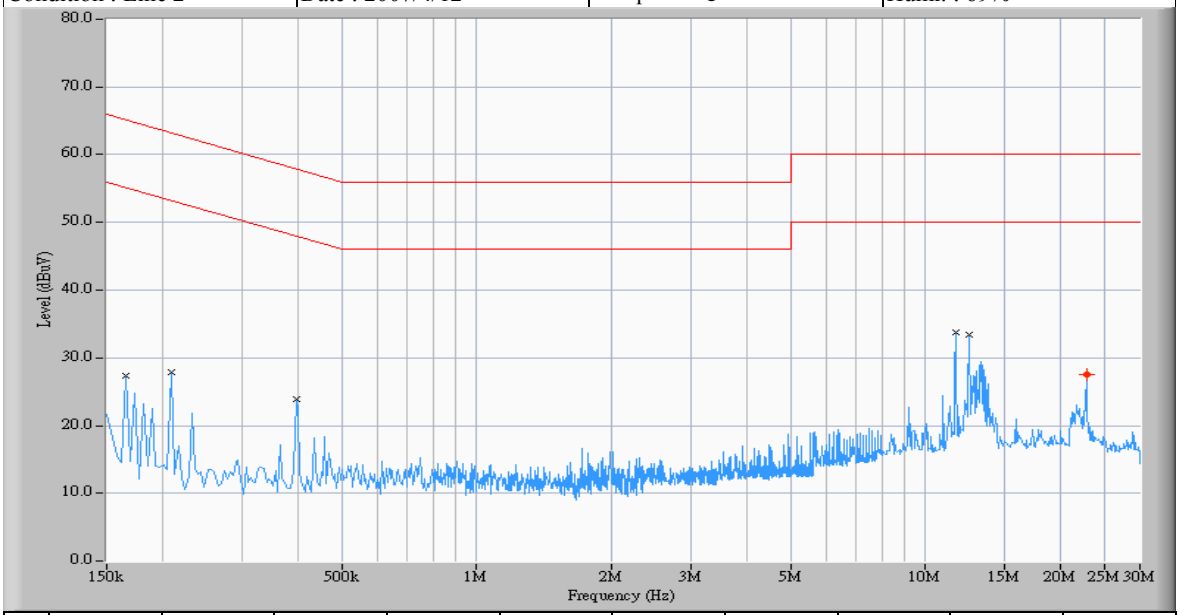


	Freq (MHz)	QP Level (dBuV)	AVG Level (dBuV)	Factor (dB)	QP Result (dBuV)	AVG Result (dBuV)	QP Limit (dBuV)	AVG Limit (dBuV)	QP Margin (dB)	AVG Margin (dB)
1	0.166	36.4	----	0.3	36.7	----	65.2	55.2	-28.5	----
2	0.193	28.9	----	0.3	29.2	----	63.9	53.9	-34.7	----
3	0.349	23.6	----	0.2	23.8	----	59.0	49.0	-35.2	----
4	5.857	29.3	----	0.2	29.5	----	60.0	50.0	-30.5	----
5	7.525	28.8	----	0.2	29.0	----	60.0	50.0	-31.0	----
6	12.255	34.3	----	0.2	34.5	----	60.0	50.0	-25.5	----

Note:

1. “***” means the value was too low to be measured.
2. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
3. “#” means the noise was too low, so record the peak value.
4. The estimated measurement uncertainty of the result measurement is ±2.5dB.

EUT : RFID (125KHz)	Model :	Status : RX	
Condition : Line 2	Date : 2007/4/12	Temp. : 24℃	Humi. : 69%



	Freq (MHz)	QP Level (dBuV)	AVG Level (dBuV)	Factor (dB)	QP Result (dBuV)	AVG Result (dBuV)	QP Limit (dBuV)	AVG Limit (dBuV)	QP Margin (dB)	AVG Margin (dB)
1	0.166	27.4	----	0.3	27.7	----	65.2	55.2	-37.5	----
2	0.209	27.9	----	0.2	28.1	----	63.3	53.3	-35.2	----
3	0.396	23.9	----	0.2	24.1	----	57.9	47.9	-33.8	----
4	11.638	33.7	----	0.2	33.9	----	60.0	50.0	-26.1	----
5	12.509	33.4	----	0.2	33.6	----	60.0	50.0	-26.4	----
6	22.880	27.5	----	0.4	27.9	----	60.0	50.0	-32.1	----

Note:

1. “***” means the value was too low to be measured.
2. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
3. “#” means the noise was too low, so record the peak value.
4. The estimated measurement uncertainty of the result measurement is ±2.5dB.

5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR (Included Cable Loss)

5.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test.

Equipment	Manufacturer	Model No.	Next Cal. Due
RF Test Receiver	Rohde and Schwarz	ESCS30	05/19/2007
Line Impedance Stabilization network	EMCO	3825	03/22/2008