

FCC TEST REPORT
for
Honeywell (China) Co., LTD
Contactless Smart Card Reader
Model No.: JT-MCR45-32C

Prepared for : Honeywell (China) Co., LTD
Address : Block 28, Section 2, Huai De Cui Gang Industrial Estate, Fu Yong,
Bao An, Shenzhen, 518103, China

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited
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Report Number : 201312890F
Date of Test : Jan. 08~ Apr. 20, 2014
Date of Report : Apr. 20, 2014

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APPENDIX I (External Photos) (1 Pages)

APPENDIX II (Internal Photos) (3 Pages)

TEST REPORT VERIFICATION

Applicant : Honeywell (China) Co., LTD
Manufacturer : Honeywell (China) Co., LTD
EUT : Contactless Smart Card Reader
Model No. : JT-MCR45-32C
Rating : DC 8-16V, 120mA
Trade Mark : Honeywell

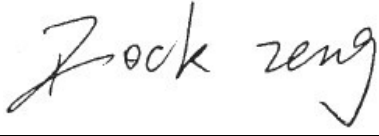
Measurement Procedure Used:


FCC Rules and Regulations Part 15 Subpart C 15.225 & FCC / ANSI C63.4-2009

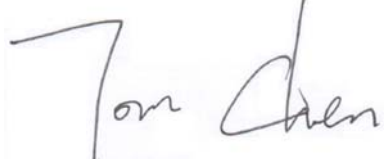
The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited To determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both radiated and conducted emissions. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited Is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : Jan. 08~ Apr. 20, 2014

Prepared by : 
(Tested Engineer / Rock Zeng)

Reviewer : 
(Project Manager / Sally Zhang)

Approved & Authorized Signer : 
(Manager / Tom Chen)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Description	: Contactless Smart Card Reader
Model Number	: JT-MCR45-32C
Test Power Supply	: DC 12V
Frequency	: 13.56 MHz
Antenna Gain	: 0 dBi
Antenna Type	: Integrated
Applicant	: Honeywell (China) Co., LTD
Address	: Block 28, Section 2, Huai De Cui Gang Industrial Estate, Fu Yong, Bao An, Shenzhen, 518103, China
Manufacturer	: Honeywell (China) Co., LTD
Address	: Block 28, Section 2, Huai De Cui Gang Industrial Estate, Fu Yong, Bao An, Shenzhen, 518103, China
Date of Sample received	: Jan. 08, 2014
Date of Test	: Jan. 08~ Apr. 20, 2014

1.2. Auxiliary Equipment Used during Test

N/A

1.3. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS - LAB Code: L3503

Shenzhen Anbotek Compliance Laboratory Limited., Laboratory has been assessed and in compliance with CNAS/CL01: 2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 10, 2013.

IC-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A-1, February 22, 2013.

Test Location

All Emissions tests were performed
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

1.4. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.3dB
Conduction Uncertainty	:	Uc = 3.4dB

2. Test Procedure

GENERAL: This report shall NOT be reproduced except in full without the written approval of Shenzhen Anbotek Compliance Laboratory Limited. The EUT was transmitting a test signal during the testing.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-2009 using a spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. The ambient temperature of the EUT was 74.3oF with a humidity of 69%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz) METER READING + ACF = FS
33 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

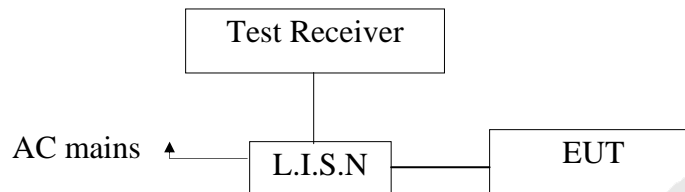
ANSI STANDARD C63.4-2009 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

3. POWER LINE CONDUCTED MEASUREMENT

3.1. Block Diagram of Test Setup

3.1.1 Block diagram of connection between the EUT and simulators



3.2. Power Line Conducted Emission Measurement Limits (FCC Part 15

15.207)

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3.3. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.4. Operating Condition of EUT

3.4.1. Setup the EUT and simulator as shown as Section 3.1.

3.4.2. Turn on the power of all equipment.

3.4.3. Let the EUT work in test mode (ON) and measure it.

3.5. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.4-2009 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9KHz.

The frequency range from 150KHz to 30MHz is checked.

The test result are reported on Section 3.6.

Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	10055	Apr. 23, 2013	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Apr. 23, 2013	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Apr. 23, 2013	1 Year

3.6. Power Line Conducted Emission Measurement Results

Pass.

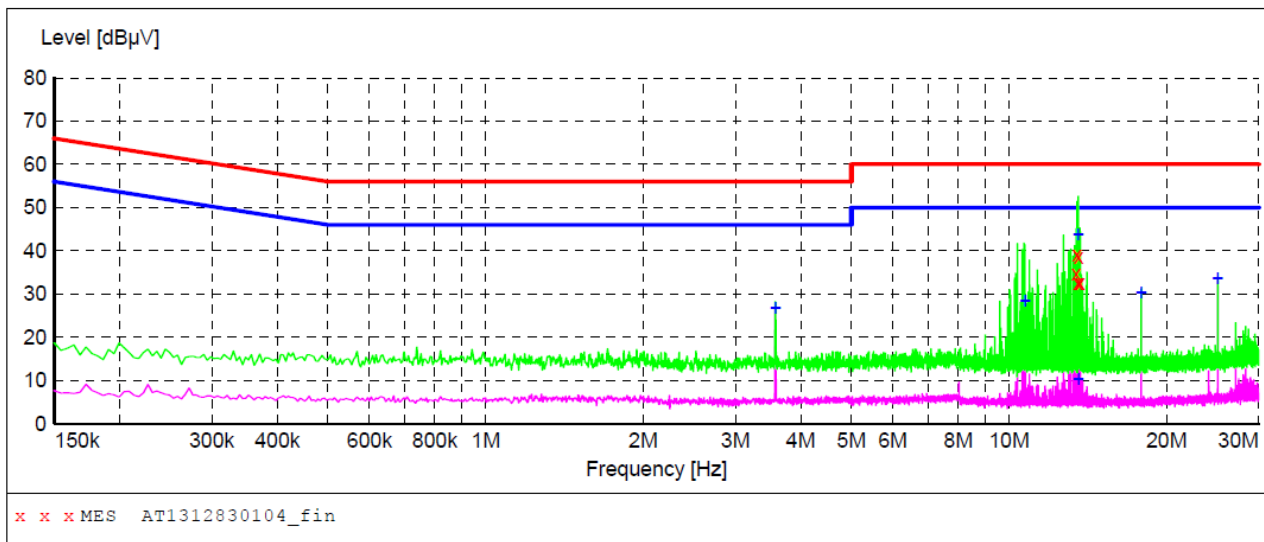
Please refer to the following pages.

CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room
Operating Condition: ON
Test Specification: DC 12V
Comment: L
Tem:25°C Hum:50%

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages



MEASUREMENT RESULT: "AT1312830104_fin"

4/2/2014 11:36AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
13.442500	34.80	20.7	60	25.2	QP	L1	GND
13.487500	39.10	20.7	60	20.9	QP	L1	GND
13.532500	32.60	20.7	60	27.4	QP	L1	GND
13.573000	38.60	20.7	60	21.4	QP	L1	GND
13.618000	32.60	20.7	60	27.4	QP	L1	GND
13.658500	32.40	20.7	60	27.6	QP	L1	GND

MEASUREMENT RESULT: "AT1312830104_fin2"

4/2/2014 11:36AM

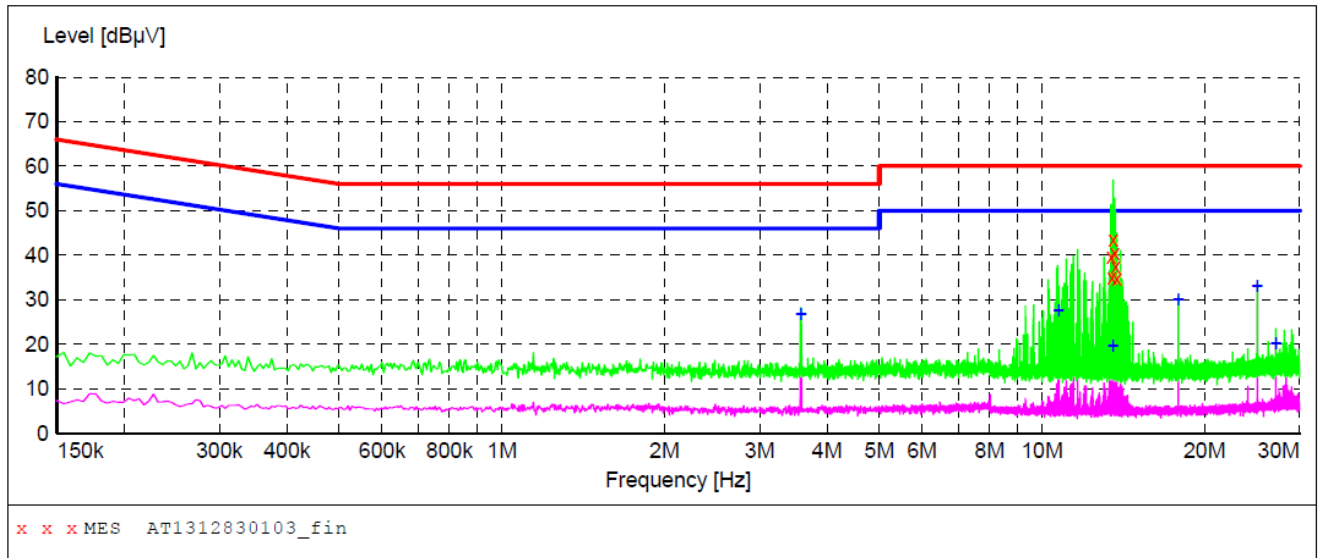
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
3.578500	26.80	20.4	46	19.2	AV	L1	GND
10.738000	28.30	20.6	50	21.7	AV	L1	GND
13.559500	43.80	20.7	50	6.2	AV	L1	GND
13.573000	10.30	20.7	50	39.7	AV	L1	GND
17.897500	30.20	20.8	50	19.8	AV	L1	GND
25.057000	33.50	20.9	50	16.5	AV	L1	GND

CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room
Operating Condition: ON
Test Specification: DC 12V
Comment: N
Tem:25°C Hum:50%

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages



MEASUREMENT RESULT: "AT1312830103_fin"

4/2/2014 11:33AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
13.424500	39.80	20.7	60	20.2	QP	N	GND
13.465000	35.10	20.7	60	24.9	QP	N	GND
13.550500	43.60	20.7	60	16.4	QP	N	GND
13.636000	40.50	20.7	60	19.5	QP	N	GND
13.681000	37.40	20.7	60	22.6	QP	N	GND
13.766500	34.60	20.7	60	25.4	QP	N	GND

MEASUREMENT RESULT: "AT1312830103_fin2"

4/2/2014 11:33AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
3.578500	26.70	20.4	46	19.3	AV	N	GND
10.738000	27.50	20.6	50	22.5	AV	N	GND
13.550500	19.70	20.7	50	30.3	AV	N	GND
17.897500	30.10	20.8	50	19.9	AV	N	GND
25.057000	33.10	20.9	50	16.9	AV	N	GND
27.122500	20.10	20.9	50	29.9	AV	N	GND

4. RADIATED EMISSION MEASUREMENT

4.1. Radiated Emission Limits

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Note:

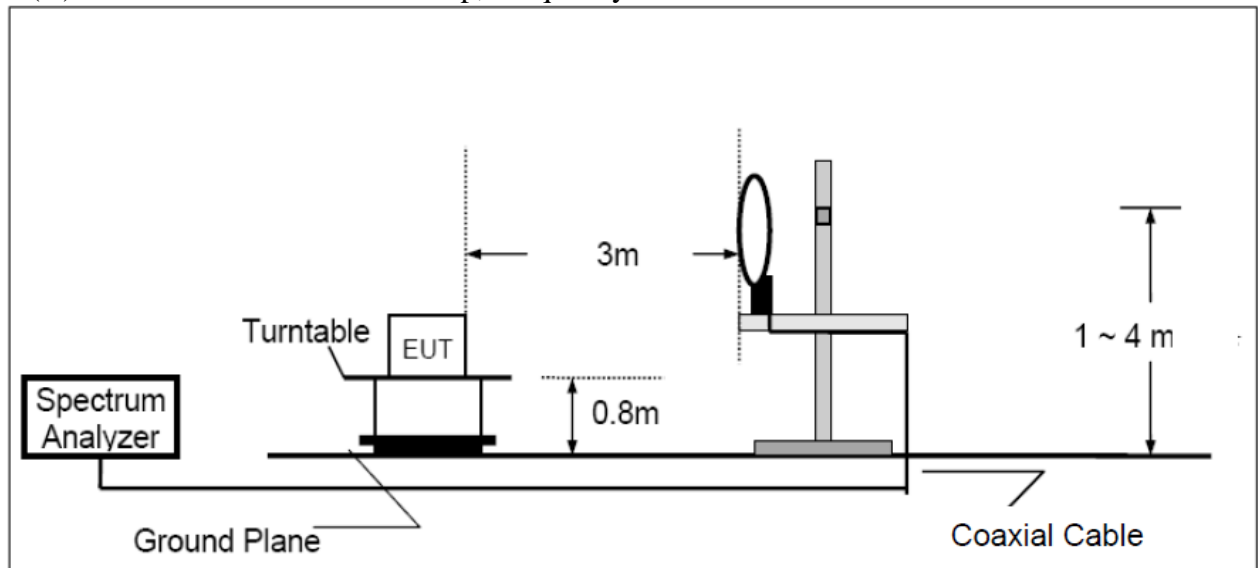
- (1) The tighter limit shall apply at the boundary between two frequency range.
- (2) Limitation expressed in dBuV/m is calculated by $20\log$ Emission Level (uV/m).
- (3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^2$.
Example:
F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 3m distance is adjusted as
 $Ld1 = L1 = 30\text{uV/m} * (10)^2 = 100 * 30 \text{ uV/m}$

4.2. Test Procedure

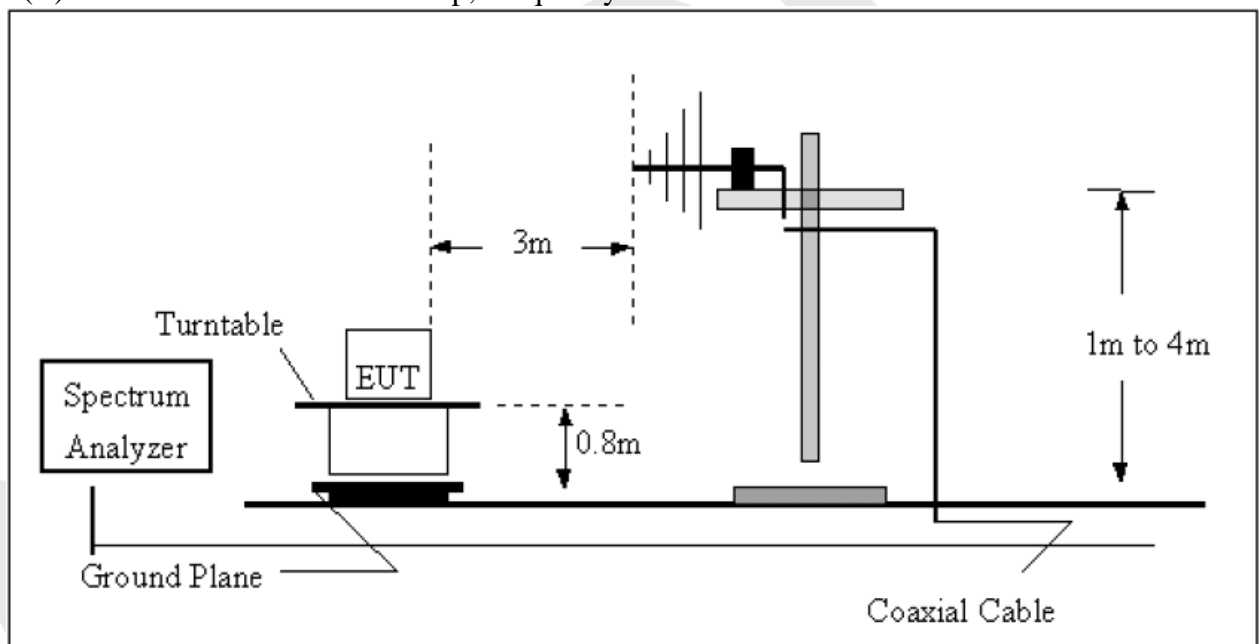
- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.3. Test Setup

(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30-1000MHz



Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Aug. 09, 2013	1 Year
2.	Preamplifier	Instruments corporation	EMC011830	980100	Aug. 09, 2013	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 23, 2013	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Aug. 09, 2013	3 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Apr. 23, 2013	3 Year
6.	Loop Antenna	ARA	PLA-1030/B	1029	Apr. 23, 2013	3 Year
7.	Pre-amplifier	SONOMA	310N	186860	Apr. 23, 2013	1 Year
8.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A

4.4. Test Results (Field Strength within the band of operation)

Freq.(MHz)	Ant. Orientation	Result at 3m (dBuV/m)	Limitation Converted 3m dist. (dBuV/m)	Margin dB
13.110	Front	58.04	80.50	-22.46
13.410	Front	62.55	80.50	-17.95
13.553	Front	71.39	90.50	-19.11
13.560	Front	83.08	124.00	-40.92
13.567	Front	65.77	90.50	-24.73
13.710	Front	62.19	80.50	-18.31
14.010	Front	58.32	80.50	-22.18
--	--	--	--	--
13.110	Side	58.77	80.50	-21.73
13.410	Side	64.94	80.50	-15.56
13.553	Side	72.47	90.50	-18.03
13.560	Side	86.84	124.00	-37.16
13.567	Side	65.32	90.50	-25.18
13.710	Side	62.17	80.50	-18.33
14.010	Side	57.88	80.50	-22.62
--	--	--	--	--

Remark:

(1) Spectrum Setting:

150 K Hz – 30 MHz, RBW= 9 KHz, VBW=9 KHz, Sweep time = 200 ms.

(2) The Log-Bicon Antenna will use to test frequency range from 30MHz to 1000MHz and the Loop Antenna will use to test frequency below 30MHz.

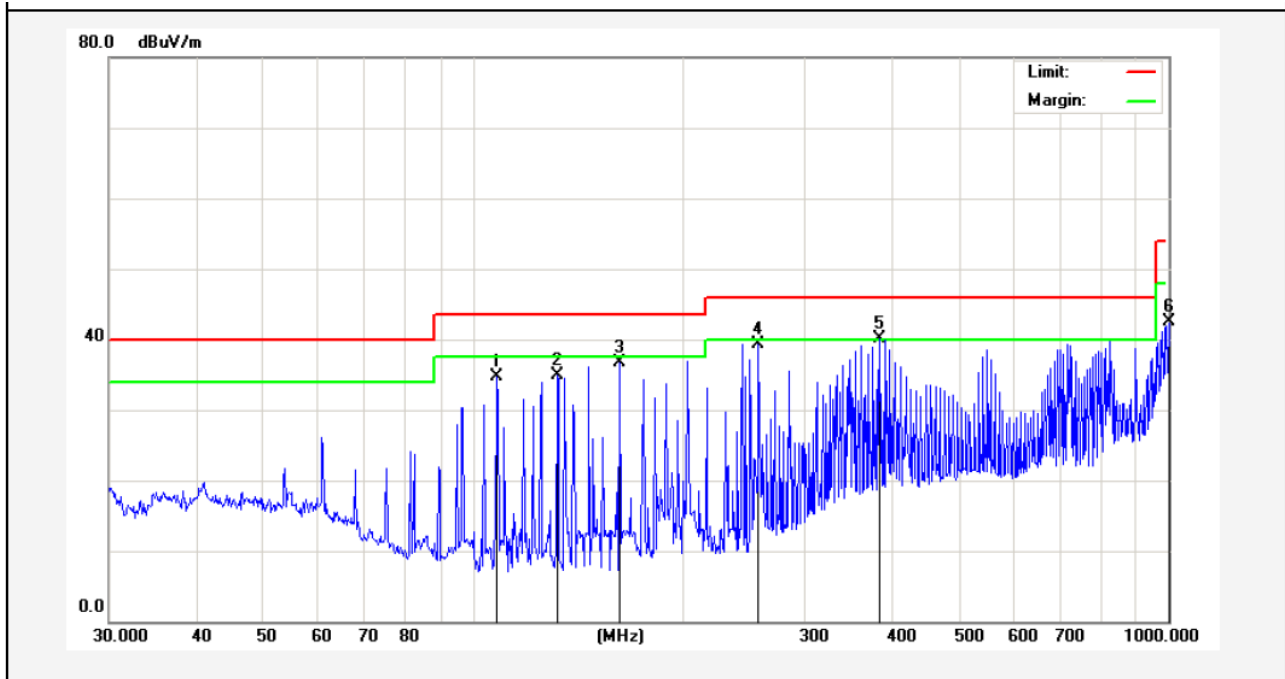
(3) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

4.5. Test Results (Field strength outside of the band of operation)

Pass.

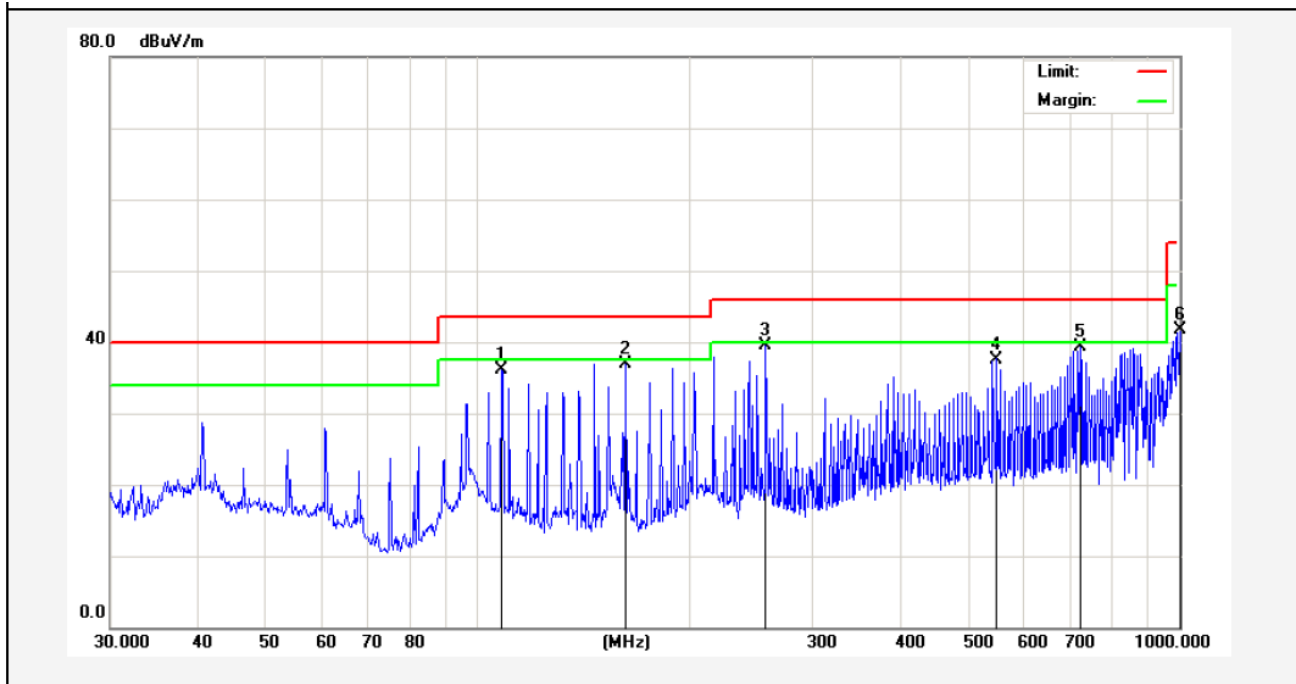
The test curves are shown in the following pages.

Job No.:	AT1312830F	Polarization:	Horizontal
Standard:	(RE)FCC PART15C _3m	Power Source:	DC 12V
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Mode:	ON	Distance:	3m
Note:			



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	108.2667	55.34	-20.65	34.69	43.50	-8.81	peak			
2	132.2205	57.94	-22.96	34.98	43.50	-8.52	peak			
3	162.6106	59.46	-22.79	36.67	43.50	-6.83	peak			
4	257.4221	58.27	-18.88	39.39	46.00	-6.61	peak			
5	383.9318	53.28	-13.19	40.09	46.00	-5.91	peak			
6	1000.0000	45.57	-3.13	42.44	54.00	-11.56	peak			

Job No.:	AT1312830F	Polarization:	Vertical
Standard:	(RE)FCC PART15C _3m	Power Source:	DC 12V
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Mode:	ON	Distance:	3m
Note:			



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	108.2667	51.69	-15.65	36.04	43.50	-7.46	peak			
2	162.6106	54.79	-17.79	37.00	43.50	-6.50	peak			
3	257.4221	53.41	-14.00	39.41	46.00	-6.59	peak			
4	549.0193	47.70	-10.10	37.60	46.00	-8.40	peak			
5	721.7259	47.07	-7.82	39.25	46.00	-6.75	peak			
6	1000.0000	43.86	-2.13	41.73	54.00	-12.27	peak			

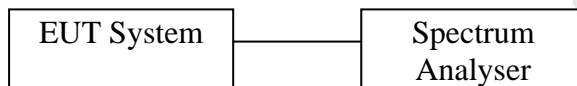
5. Frequency Tolerance

5.1. Frequency Tolerance Limits

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

Fundamental Frequency (MHz)	Limit of Tolerance Bandwidth (Hz)
13.56	$13.56 \times 1000 \times 1000 \times 0.01\% = 1356$

5.2. Test Setups



Test Equipment

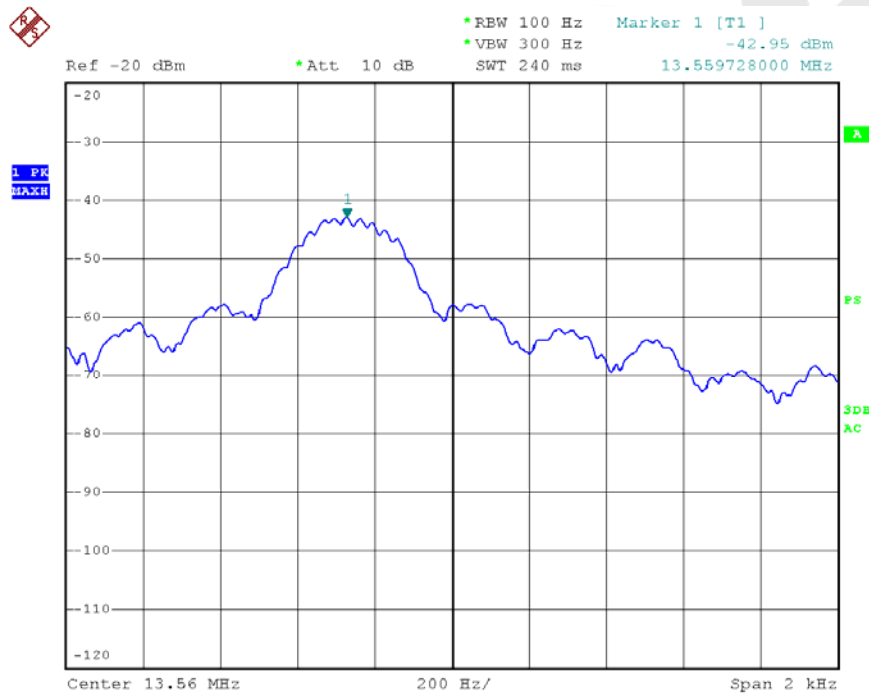
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyser	Agilent	E4407B	US39390582	Apr. 23, 2013	1 Year
2	EMI Receiver	Rohde & Schwarz	ESCI	100627	Apr. 23, 2013	1 Year
3.	Preamplifier	Instruments corporation	EMC011830	980100	Apr. 23, 2013	1 Year
4	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Apr. 23, 2013	1 Year
5	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A

5.3. Test Procedure

Let the EUT works on temperature variation of -20 degrees to $+50$ degrees C 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 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4. Test Results

Test Condition				
	Voltage (V)	Temperature (°C)	Test Result (Hz)	Limit (Hz)
Normal Condition	AC 12V	-20	268	1356
		+20	272	1356
		+50	274	1356
Extreme Condition	AC 13.2V	+20	267	1356
	AC 10.8V	+20	271	1356



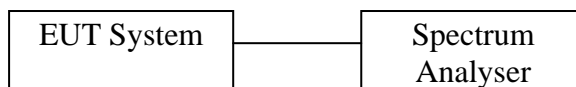
6. 20dB Bandwidth

6.1. Limits

According to 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.

6.2. Test Setups



Test Equipment

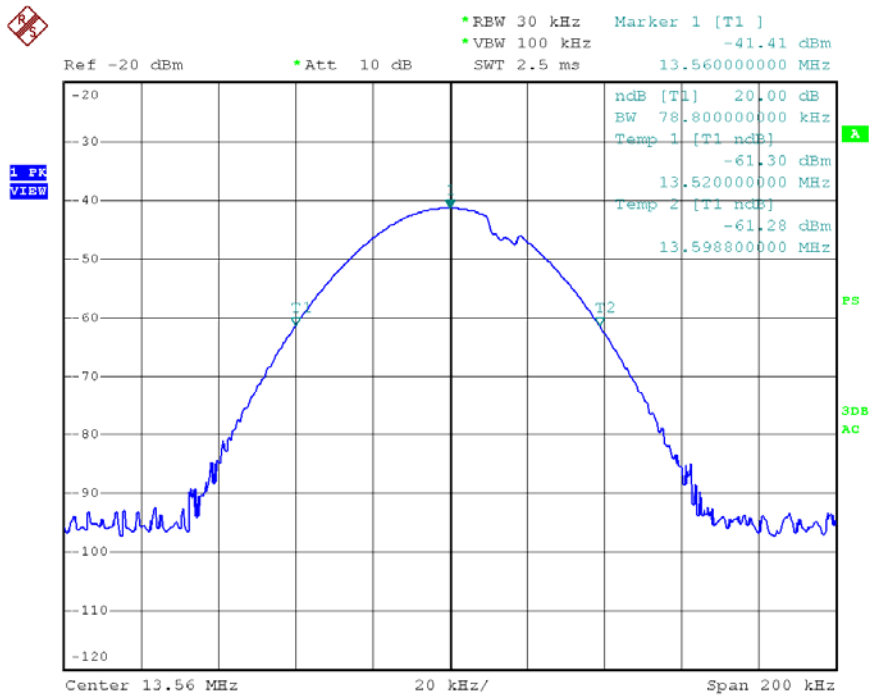
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyser	Agilent	E4407B	US39390582	Apr. 23, 2013	1 Year
2	EMI Receiver	Rohde & Schwarz	ESCI	100627	Apr. 23, 2013	1 Year
3.	Preamplifier	Instruments corporation	EMC011830	980100	Apr. 23, 2013	1 Year
4	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Apr. 23, 2013	1 Year
5	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A

6.3. Test Procedure

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

6.4. Test Results

Frequency (MHz)	20dB BW (kHz)
13.56	78.8



7. Antenna Application

7.1. Antenna Requirement

The EUT'S antenna should met the requirement of FCC part 15C section 15.203.

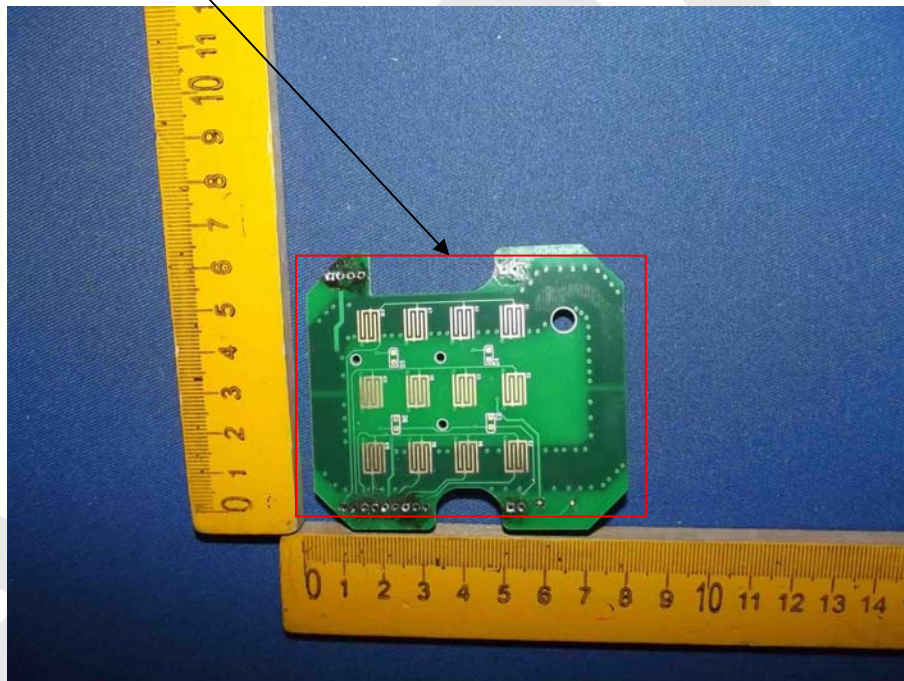
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

- 1) Antenna must be permanently attached to device.
- 2) The antenna must use a unique type of connector to attach to the device.
- 3) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.

7.2. Result

The RFID antenna is integral to the PCB board permanently to the device which meets the requirement, see the below:

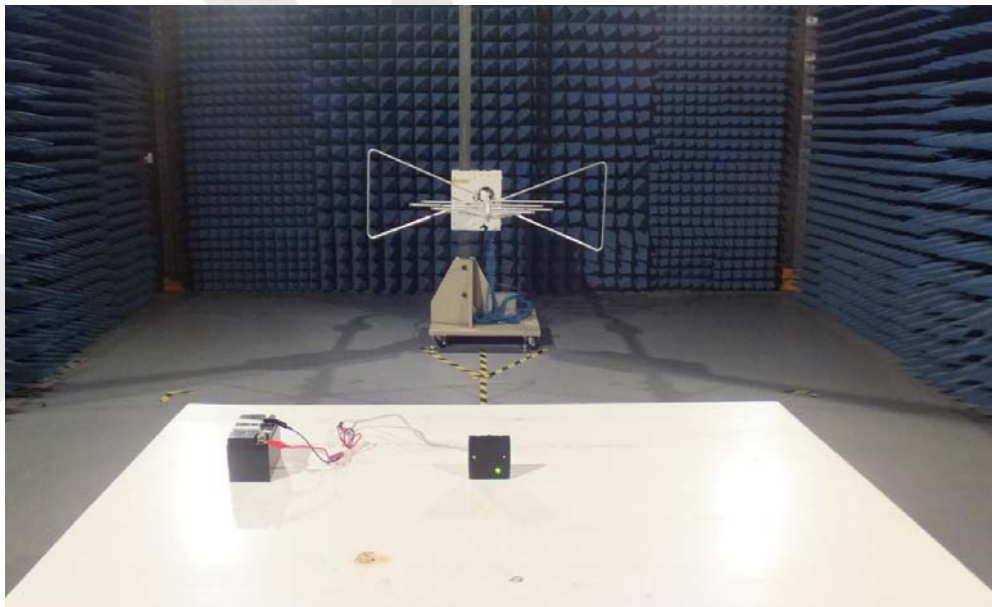


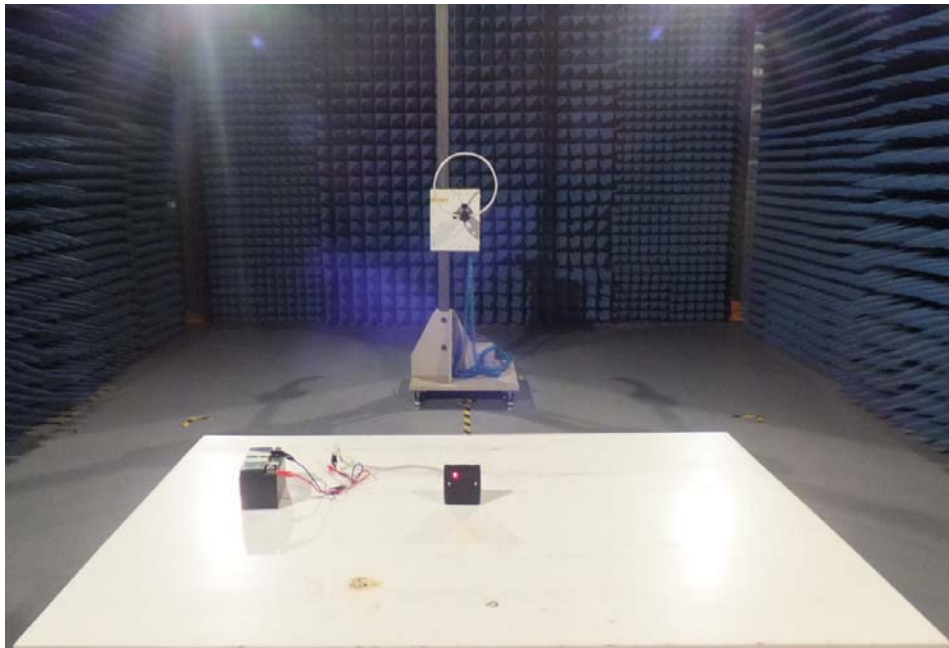
8. PHOTOGRAPH

8.1. Photo of Conducted Emission Test



8.2. Photo of Radiation Emission Test





Appendix I (External Photos)

Figure 1
The EUT-Overall View



Figure 2
The EUT-Front View



Figure 3
The EUT- Back View

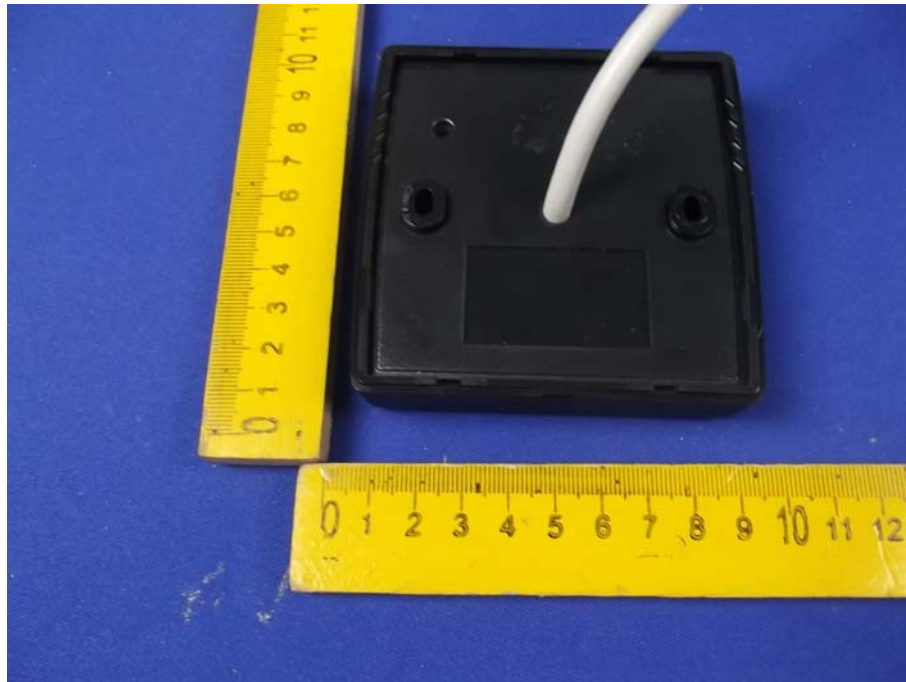


Figure 4
The EUT-Top View



Figure 5
The EUT-Bottom View

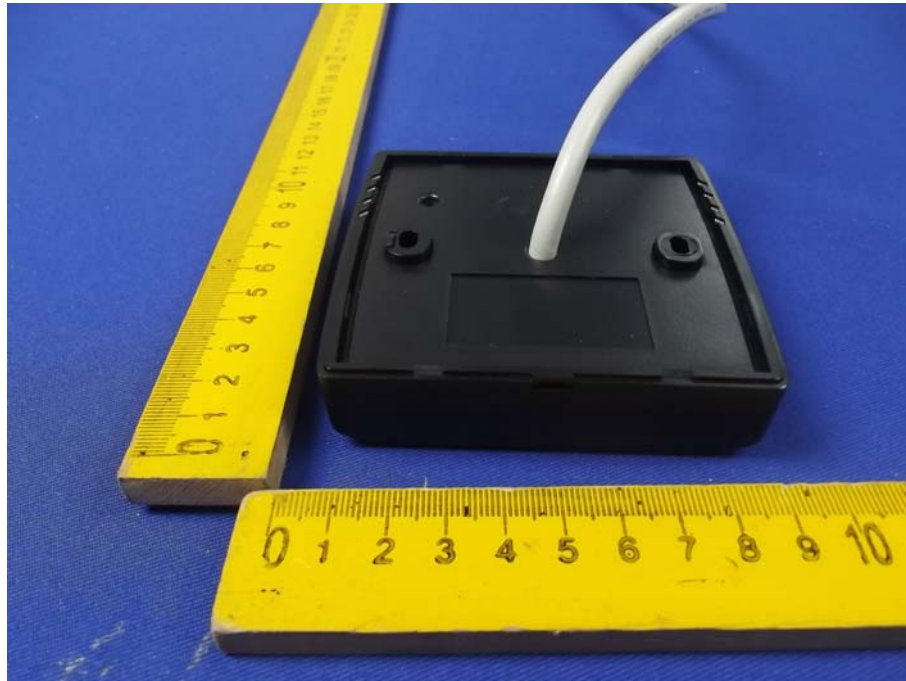


Figure 6
The EUT-Left View

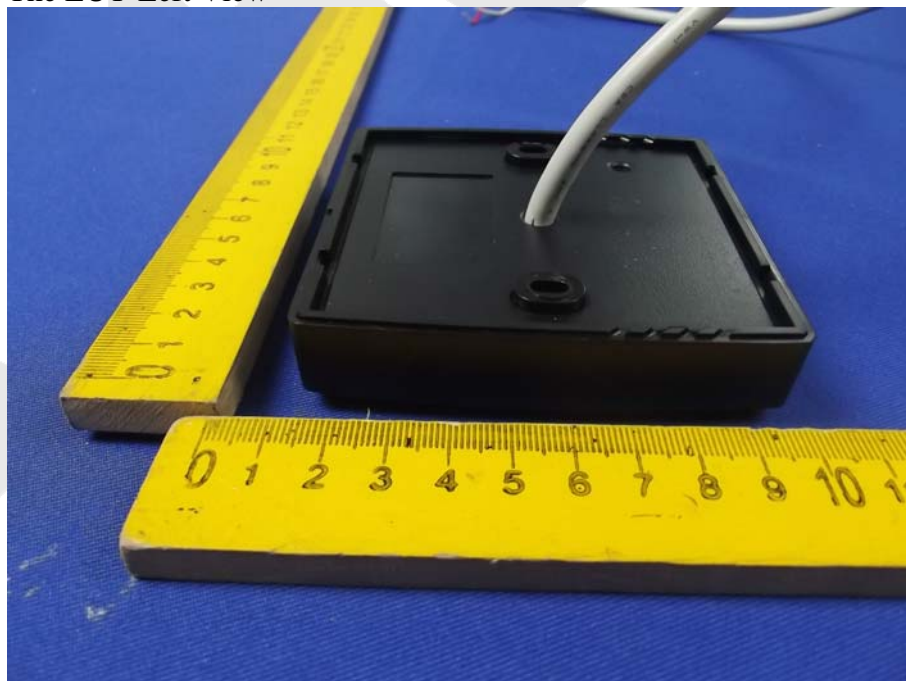
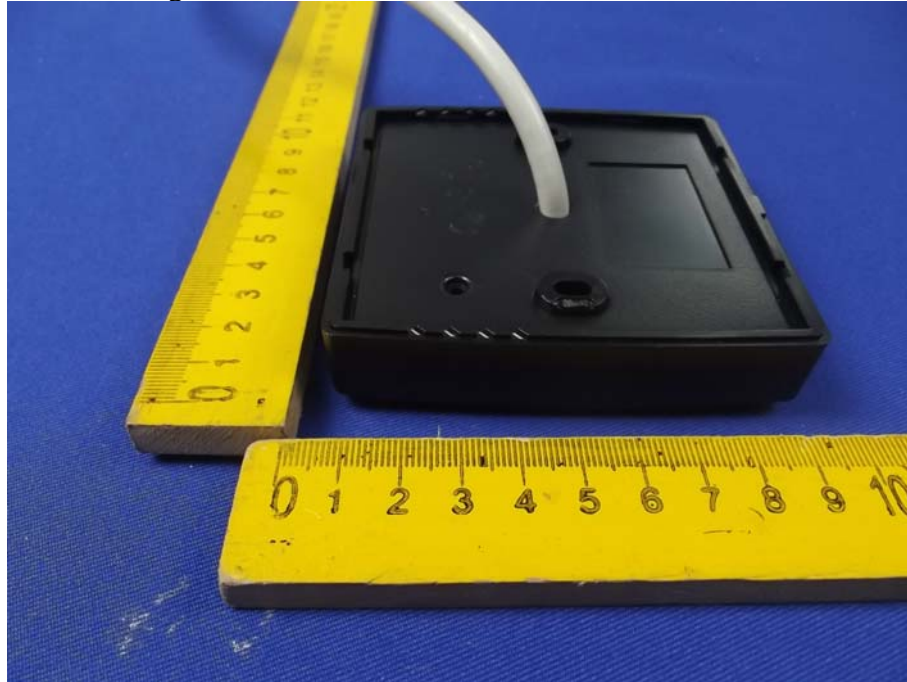


Figure 7
The EUT-Right View



Appendix II (Internal Photos)

Figure 8
The EUT-Inside View



Figure 9
PCB of the EUT-Front View

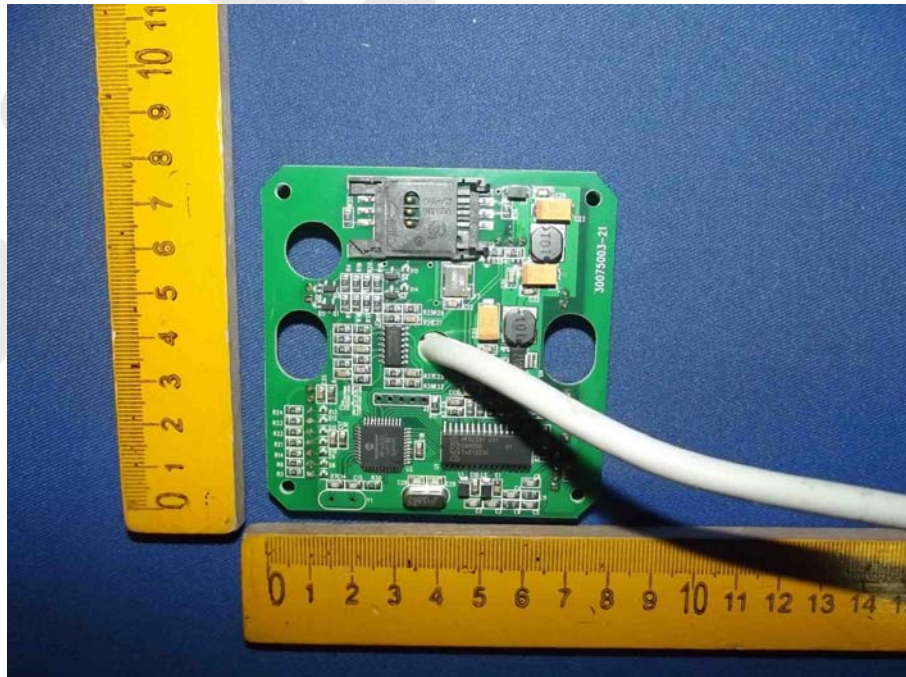


Figure 10
PCB of the EUT-Back View

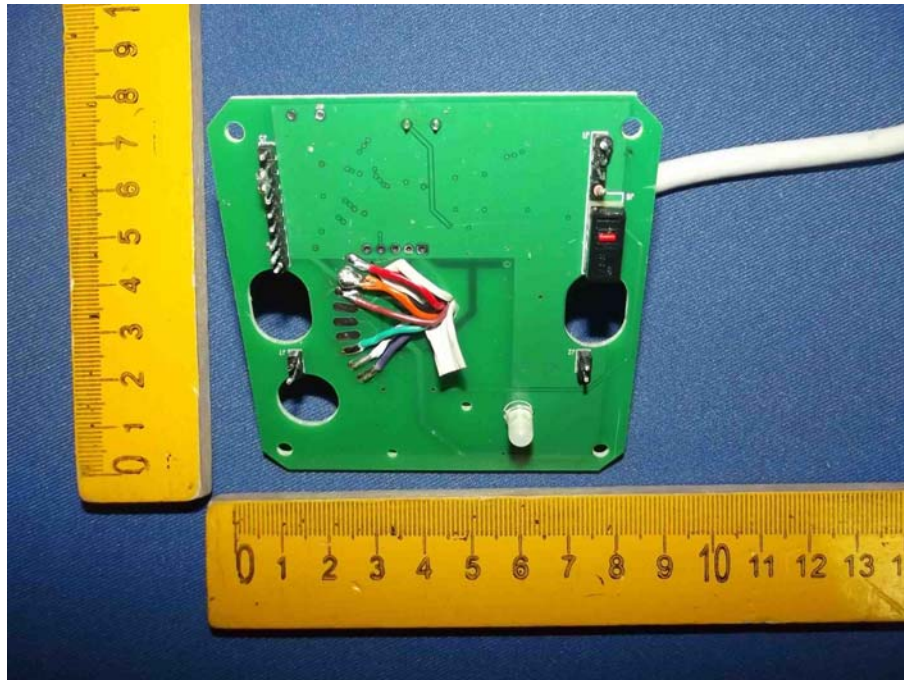


Figure 11
PCB of the EUT-Front View

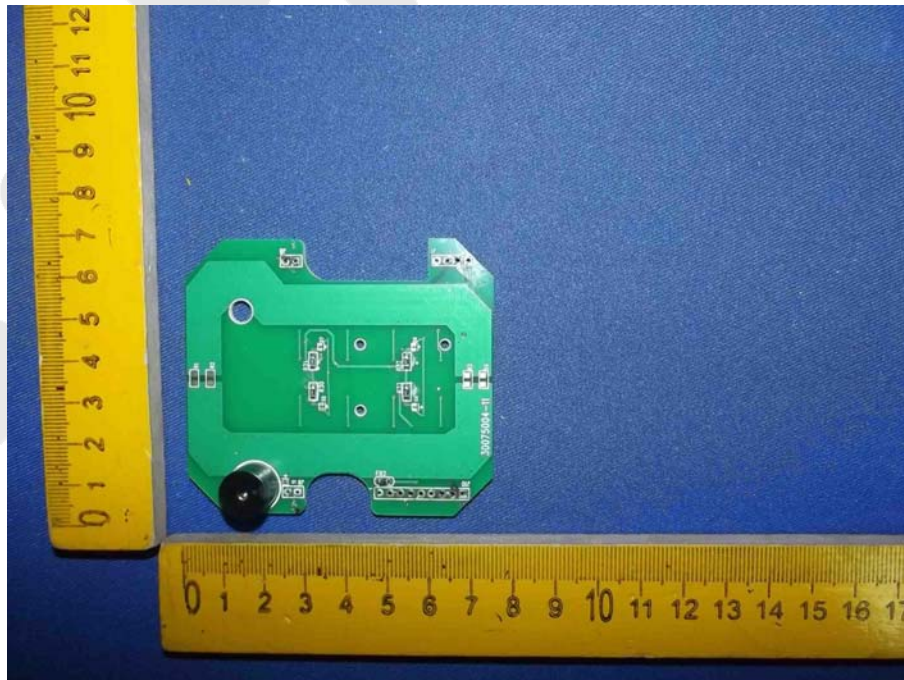


Figure 12
PCB of the EUT-Back View

