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FCC PART 15 SUBPART C TEST REPORT

FCC Part 15.225

Report Reference No.....:	**CTL1309051385-WF**
Compiled by (position+printed name+signature)..:	File administrators Jacky Chen
Name of the organization performing the tests (position+printed name+signature)..:	Test Engineer Tracy Qi
Approved by (position+printed name+signature)..:	Manager Tracy Qi
Date of issue.....:	Dec. 23, 2013
Representative Laboratory Name .:	**Shenzhen CTL Electromagnetic Technology Co., Ltd.**
Address.....:	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
Test Firm.....:	**Bontek Compliance Testing Laboratory Ltd**
Address.....:	1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China
Applicant's name.....:	**3core Technologies, Inc.**
Address.....:	No.7, Lane 175, Wanhangdu Road, Jingan District, Shanghai, PR China
Test specification:	
Standard .....:	FCC Part 15.225: Operation within the band 13.110–14.010 MHz.
Master TRF.....:	Dated 2011-01

Test item description ..... :	**RFID Reader**
FCC ID……..:	**2ABM3TCE7100**
Trade Mark .....:	3CORE
Model/Type reference.....:	TCE7100
Transmit Frequency.....:	13.56MHz
Number of channels .....:	1
Modulation Type .....:	ASK
Antenna type .....:	Loop antenna
Result.....:	**Positive**

TEST REPORT

Test Report No. :	CTL1309051385-WF	Dec. 23, 2013 Date of issue

Equipment under Test	:	RFID Reader
Model /Type	:	TCE7100
Applicant	:	**3core Technologies, Inc.**
Address	:	No.7, Lane 175, Wanhangdu Road, Jingan District, Shanghai, PR China
Manufacturer	:	**3core Technologies, Inc.**
Address	:	No.7, Lane 175, Wanhangdu Road, Jingan District, Shanghai, PR China

Test Result according to the standards on page 4:	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.225: Operation within the band of 13.110–14.010 MHz.

ANSI C63.4-2003

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The public notice DA 00-705 for frequency hopping spread spectrum systems shall be performed also.

2 . SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Dec. 12, 2013
Testing commenced on	:	Dec. 12, 2013
Testing concluded on	:	Dec. 21, 2013

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		●	12 V DC	○	24 V DC
		○	Other (specified in blank below)		

/

2.3. Short description of the Equipment under Test (EUT)

A RFID Reader work frequency at 13.56MHz.
For more details, refer to the user's manual of the EUT.
Serial number: Prototype

2.4. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting mode for testing.

2.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

○ - supplied by the manufacturer
○ - supplied by the lab

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2ABM3TCE7100** filing to comply with Section 15.225 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

2.8. NOTE

1. The EUT is a/an RFID Reader, The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 15 Subpart C (Section15.225)	CTL1309051385-WF

2. The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	13.110–14.010 MHz
	√

3. The EUT provides one completed transmitter.

Modulation Mode	TX Function
ASK	1TX

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Bontek Compliance Testing Laboratory Ltd
1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

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

IC Registration No.: 7631A

The 3m alternate test site of Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7631A on March, 2011.

FCC-Registration No.: 338263

Bontek Compliance Testing Laboratory Ltd 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 338263, March 24, 2008.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 950-1050mbar

3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Bontek Compliance Testing Laboratory Ltd quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Bontek laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	Above 1GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.5. Test Description

FCC PART 15 Subpart C		
FCC Part 15.207	AC Power Conducted Emission	N/A
FCC Part 15.225(a)(b)(c)(d)	Radiated Emission (9kHz ~ 30MHz)	PASS
FCC Part 15.225(d),15.209	Radiated Emission (30MHz ~ 1GHz)	PASS
FCC §15.225(e)	Frequency stability	PASS
FCC Part 2.1049	20dB Bandwidth	PASS

Remark: The measurement uncertainty is not included in the test result.

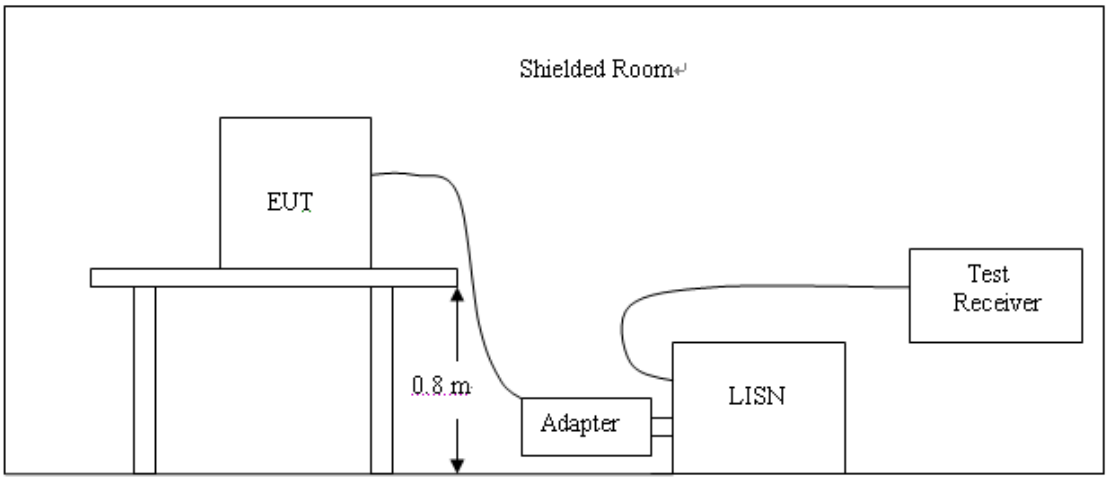
3.6. Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Last Cal.	Due. Date
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	2013/04/14	2014/04/13
2	Radio Communication Tester	ROHDE & SCHWARZ	CMU200	2013/04/14	2014/04/13
3	Dual Directional Coupler	Agilent	778D	2013/04/14	2014/04/13
4	10dB attenuator	SCHWARZBECK	MTAIMP-136	2013/04/14	2014/04/13
5	Tunable Bandreject filter	K&L	3TNF-800	2013/04/14	2014/04/13
6	Tunable Bandreject filter	K&L	5TNF-1700	2013/04/14	2014/04/13
7	High-Pass Filter	K&L	9SH10-2700/X12750-O/O	2013/04/14	2014/04/13
8	High-Pass Filter	K&L	41H10-1375/U12750-O/O	2013/04/14	2014/04/13
9	Coaxial Cable	Huber+Suhner	AC4-RF-H	2013/04/14	2014/04/13
10	AC Power Supply	IDRC	CF-500TP	2013/04/14	2014/04/13
11	DC Power Supply	IDRC	CD-035-020PR	2013/04/14	2014/04/13
12	RF Current Probe	FCC	F-33-4	2013/04/14	2014/04/13
13	Temperature /Humidity Meter	zhicheng	ZC1-2	2013/04/14	2014/04/13
14	MICROWAVE AMPLIFIER	HP	8349B	2013/04/14	2014/04/13
15	Amplifier	HP	8447D	2013/04/14	2014/04/13
16	SIGNAL GENERATOR	HP	8647A	2013/04/14	2014/04/13
17	Log Periodic Antenna	ELECTRO-METRICS	EM-6950	2013/04/14	2014/04/13
18	Horn Antenna	Schwarzbeck	BBHA9120A	2013/04/14	2014/04/13
19	EMI Test Receiver	R&S	ESPI	2013/04/14	2014/04/13
20	Loop Antenna	ZHINAN	ZN30900A	2013/04/14	2014/04/13
21	Horn Antenna	Schwarzbeck	BBHA9120D	2013/04/14	2014/04/13
22	Horn Antenna	Schwarzbeck	BBHA9170	2013/04/14	2014/04/13
23	Spectrum Analyzer	Agilent	E4446A	2013/04/14	2014/04/13
24	Wideband Peak Power Meter	Anritsu	ML2495A	2013/04/14	2014/04/13
25	Power Sensor	Anritsu	MA2411B	2013/04/14	2014/04/13

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2009.
2 Support equipment, if needed, was placed as per ANSI C63.10-2009
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2009
4 The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

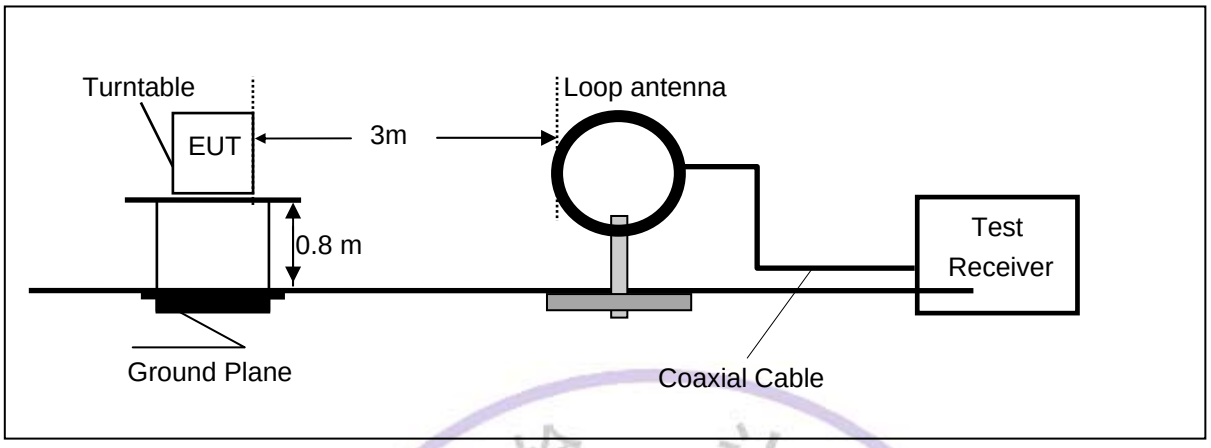
TEST RESULTS

Not Applicable to this device owing powered by battery.

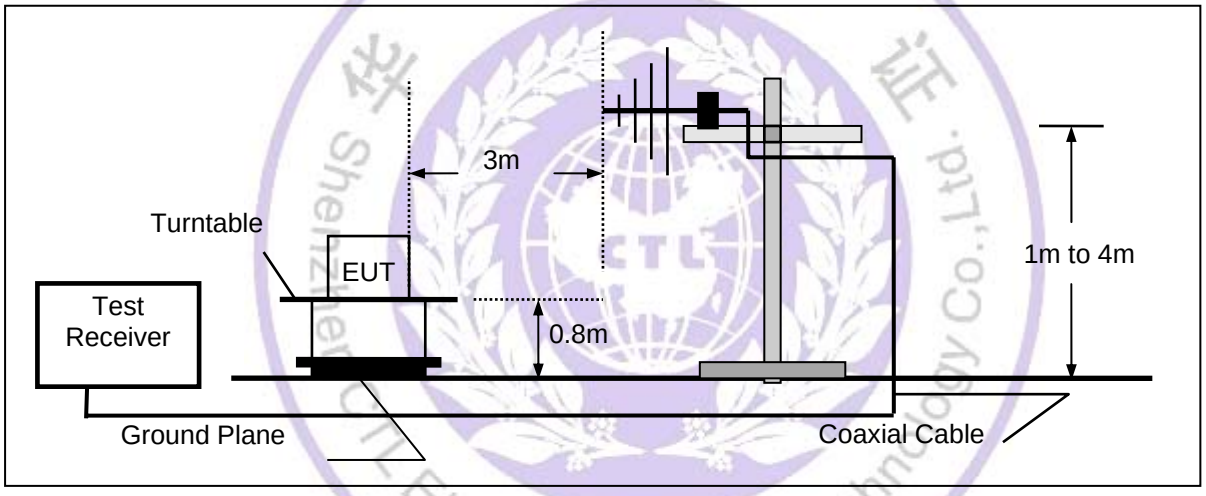
4.2. Radiated Emission

TEST CONFIGURATION

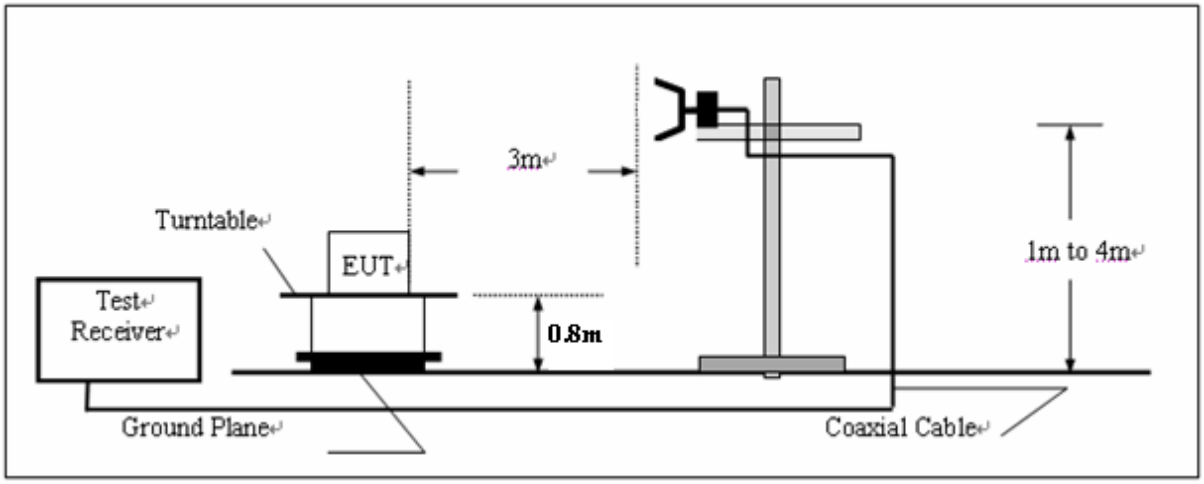
Radiated Emission Test Set-Up
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4 Repeat above procedures until all frequency measurements have been completed.

Field Strength Calculation

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

FS = RA + AF + CL – AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

Transd=AF +CL-AG

RADIATION LIMIT

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 @30m (uV/m)	Field strength @30m (dBuV/m)	Field strength @3m (dBuV/m)
Below 13.110	30	29.5	69.5
13.110 ~13.410	106	40.5	80.5
13.410~13.553	334	50.5	90.5
13.553~13.567	15,848	84	124
13.567~13.710	334	50.5	90.5
13.710~14.010	106	40.5	80.5
Above 14.010	30	29.5	69.5

Note:
(1) The tighter limit shall apply at the edge between two frequency bands.
(2) dBuV/m = 20*log(uV/m)
(3) Distance factor = 40dB / decade(15.31(f))

FCC Part15, Subpart C Section 15.209 limit of radiated emission for frequency below1000MHz. The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Distance (Meters)	Field Strengths Limits (dBμV/m)
0.009 -0.490	300	2400/F(KHz)
0.490 -1.705	30	24000/F(KHz)
1.705 -30	30	30
30 -88	3	40.0
88 -216	3	43.5
216 -960	3	46.0
Above 960	3	54.0

Note:
(1) The tighter limit shall apply at the edge between two frequency bands.
(2) Distance refers to the distance in meters between the test instrument antenna and the closest point of any part of the E.U.T.

TEST RESULTS

WORST-CASE RADIATED EMISSION BELOW 30 MHz

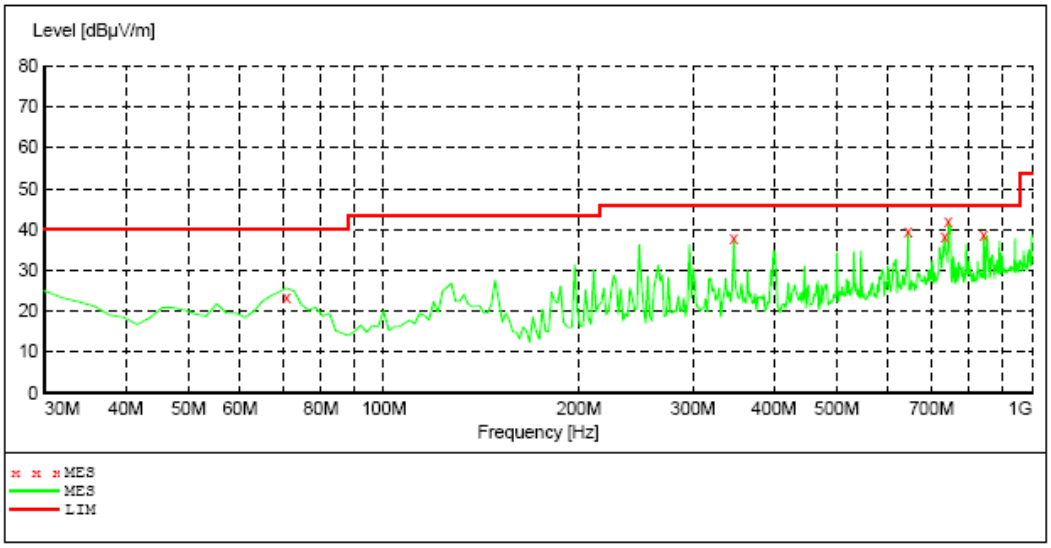
Frequency	Meter Reading	Polar	Antenna Factor	Cable Loss	Emission Levels	Limits at 3m	Margin	Detector Mode
(MHz)	(dBμV)	H/V	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	QP /AV
13.560	58.17	V	10.35	1.34	69.86	124	54.14	QP
13.550	31.06	V	10.35	1.35	42.76	90.5	47.74	QP
13.569	29.61	V	10.35	1.34	41.30	90.5	49.20	QP
22.631	20.39	V	8.67	1.64	30.70	49.5	18.80	QP
27.120	23.48	V	7.39	1.67	32.54	49.5	16.96	QP
27.120	18.55	H	7.39	1.67	24.27	49.5	25.23	QP

Remark: 1. Data of measurement within this frequency range shown " -" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
2. The test limit distance is 3m limit. 3. PK means Peak Value, QP means Quasi Peak Value, AV means Average Value.

Radiated Emission Test Data 30-1000MHz:

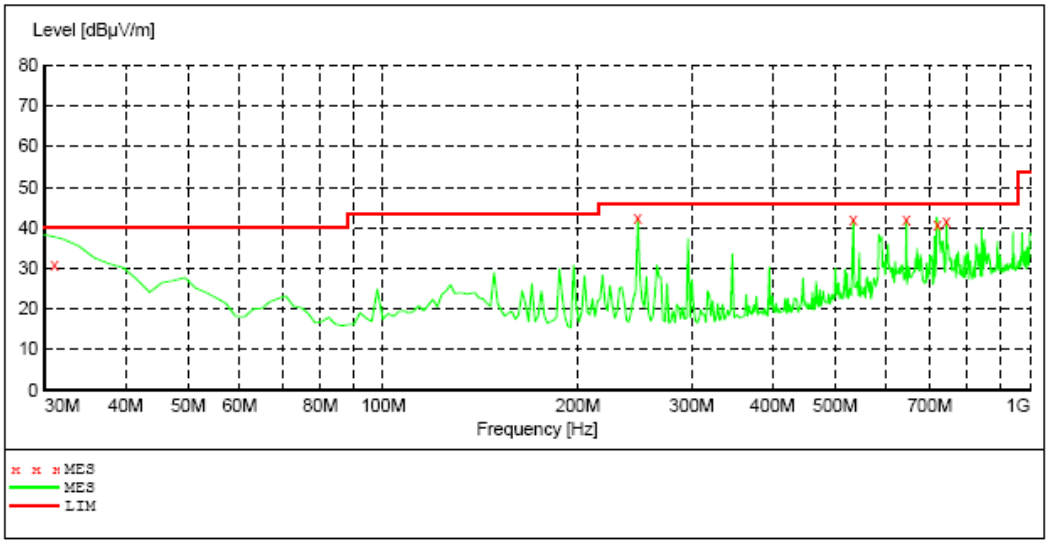
SCAN TABLE: "test Field(30M-1G)QP"

Short Description:			Field Strength(30M-1G)			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562 09



MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
70.820000	23.50	-4.8	40.0	16.5	QP	100.0	48.00	HORIZONTAL
346.850000	37.90	-9.8	46.0	8.1	QP	100.0	167.00	HORIZONTAL
644.260000	39.40	-3.2	46.0	6.6	QP	100.0	53.00	HORIZONTAL
733.680000	38.20	-2.6	46.0	7.8	QP	100.0	227.00	HORIZONTAL
743.400000	42.00	-2.2	46.0	4.0	QP	100.0	207.00	HORIZONTAL
842.540000	38.70	-0.7	46.0	7.3	QP	100.0	187.00	HORIZONTAL

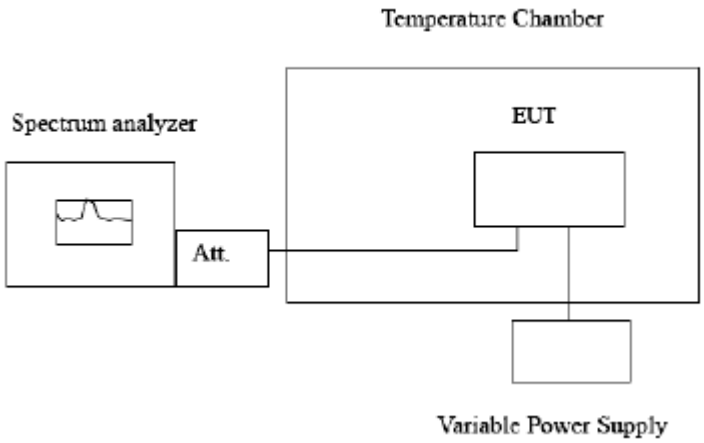


MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
31.080000	30.80	-5.3	40.0	9.2	QP	100.0	89.00	VERTICAL
247.710000	42.50	-12.5	46.0	3.5	QP	100.0	137.00	VERTICAL
533.460000	41.90	-5.8	46.0	4.1	QP	100.0	352.00	VERTICAL
644.260000	42.00	-3.2	46.0	4.0	QP	100.0	130.00	VERTICAL
720.060000	40.60	-2.9	46.0	5.4	QP	100.0	184.00	VERTICAL
743.400000	41.70	-2.2	46.0	4.3	QP	100.0	137.00	VERTICAL

4.3. Frequency Tolerance

TEST CONFIGURATION



TEST PROCEDURE

The frequency stability of the transmitter is measured by: (a) Temperature: The temperature is varied from -20 to ℃ +50℃ using an environmental chamber. (b) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the voltage normally input to the device or at the power supply terminals if cables are not normally supplied.

LIMIT

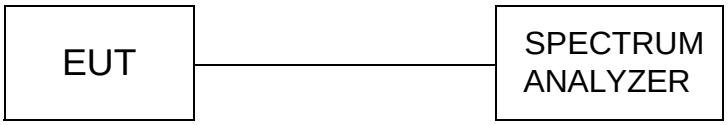
The frequency tolerance of the carrier shall be maintained within ±0.01% of the operating frequency.

TEST RESULTS

Voltage (%)	Power (VDC)	Temperature (℃)	Frequency (MHz)	Deviation (%)
100	12	+20℃(Ref)	13.559912	0.0006
100	12	-20	13.559430	0.0042
100	12	-10	13.559364	0.0047
100	12	0	13.559510	0.0036
100	12	10	13.559528	0.0035
100	12	25	13.559656	0.0025
100	12	30	13.559741	0.0019
100	12	40	13.559452	0.0040
100	12	50	13.559383	0.0046
85	10.2	20	13.559698	0.0022
115	13.8	20	13.559811	0.0014

4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

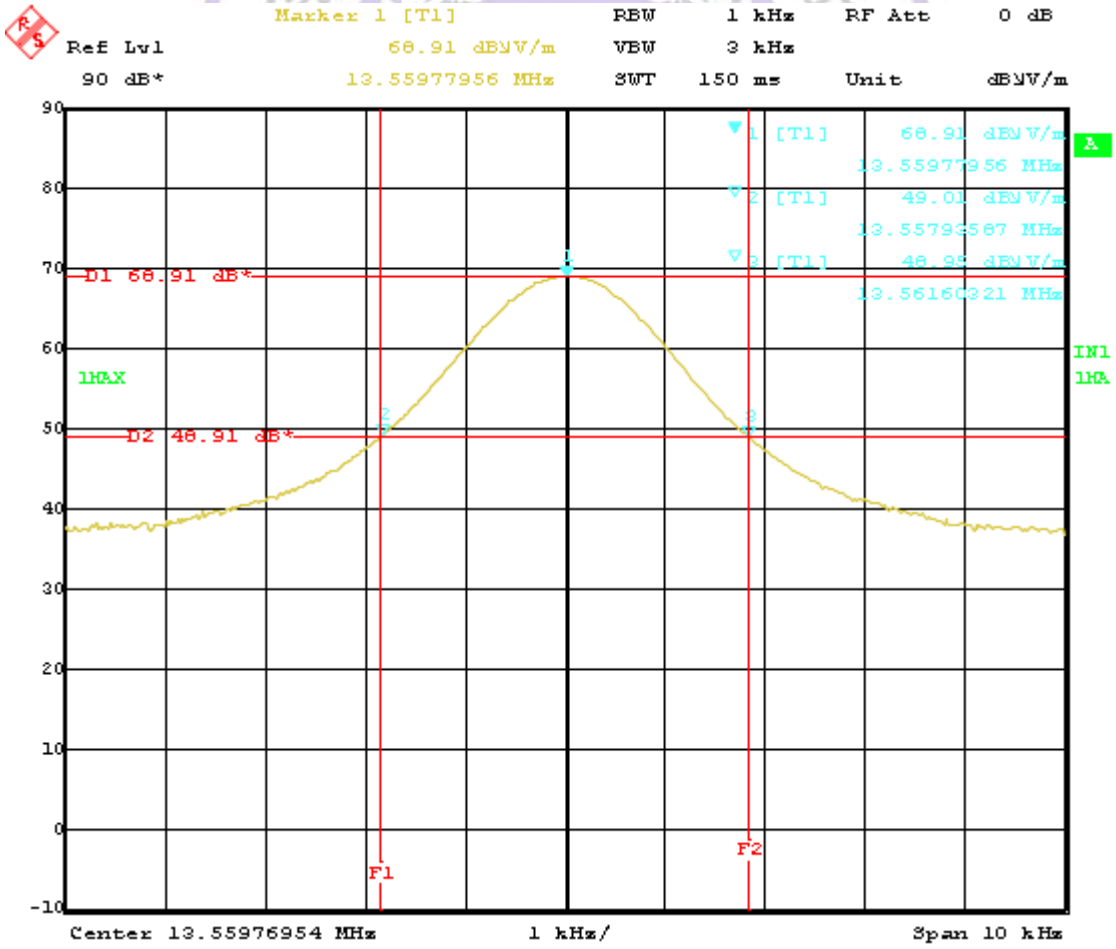
The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1KHz RBW and 3KHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

The 20dB bandwidth shall be specified in operating frequency band.

TEST RESULTS

20dBc point (Low)	20dBc point (High)	Operating frequency band (MHz)	PASS/FAIL
13.5579 MHz	13.5616 MHz	13.553~13.567	PASS



4.5. ANTENNA REQUIREMENT

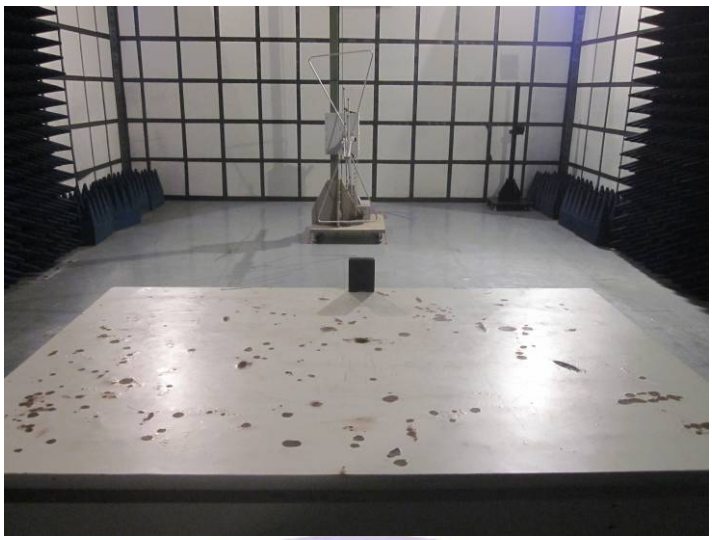
STANDARD APPLICABLE

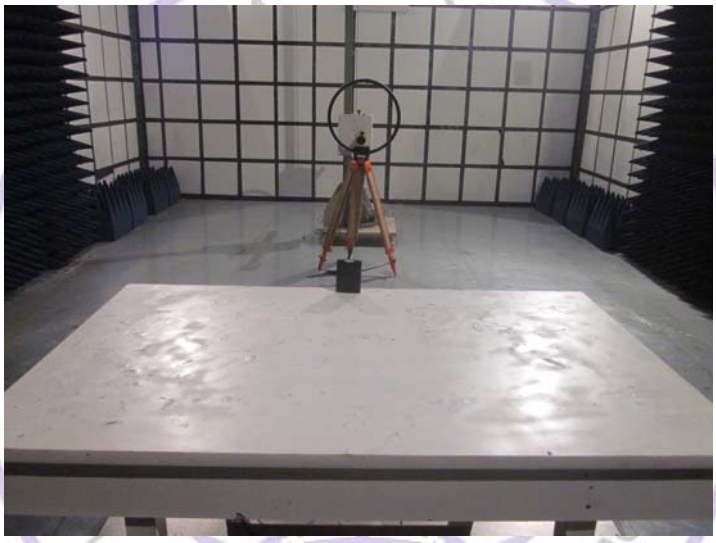
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

ANTENNA CONNECTED CONSTRUCTION

The antenna is a loop antenna and connector is designed with permanent attachment no consideration of replacement. The antenna used in this product is complied with Standard. The maximum Gain of the antenna lower than 6.0dBi and has the definite antenna Specification.

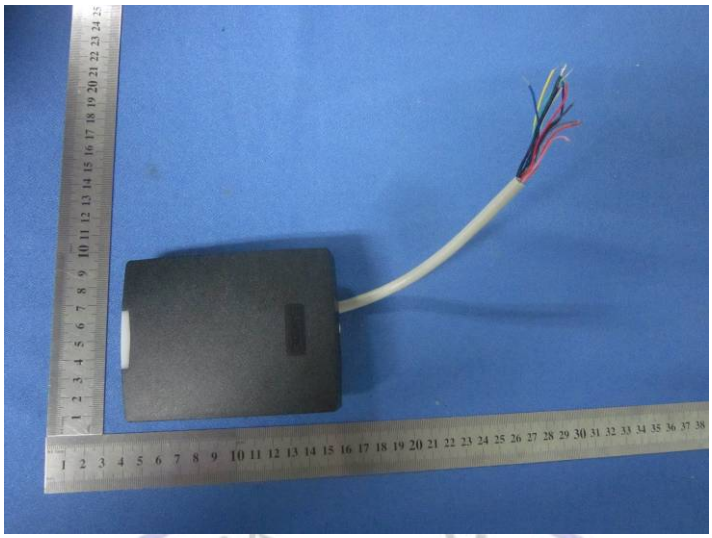
5. Test Setup Photos of the EUT

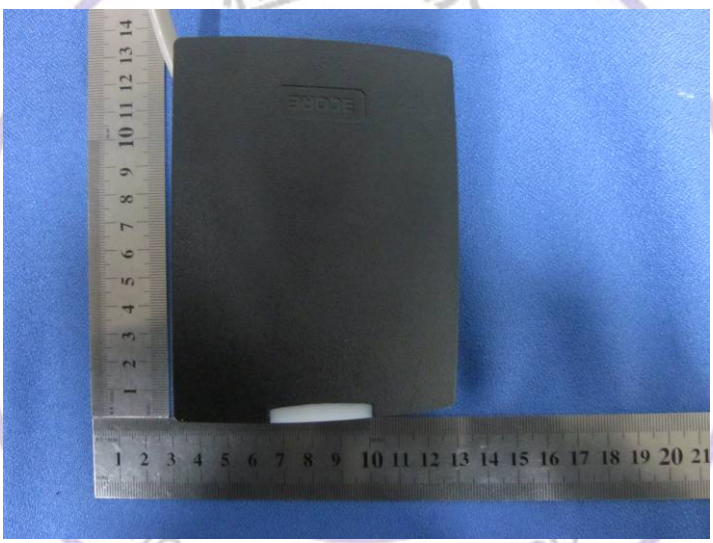


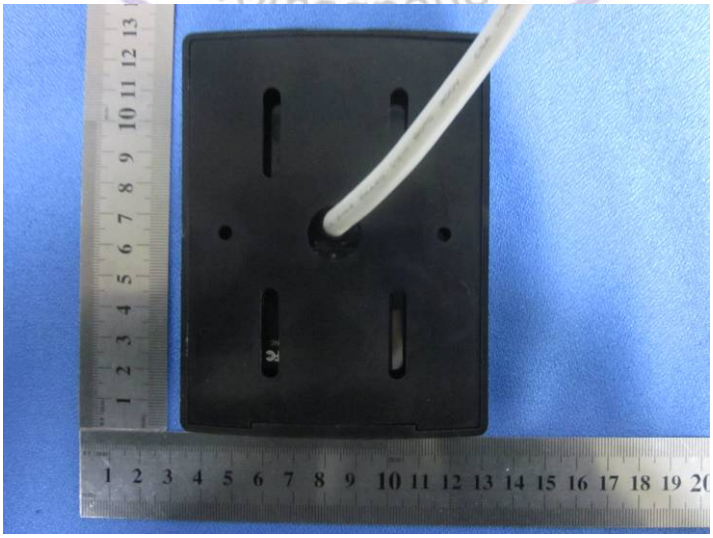


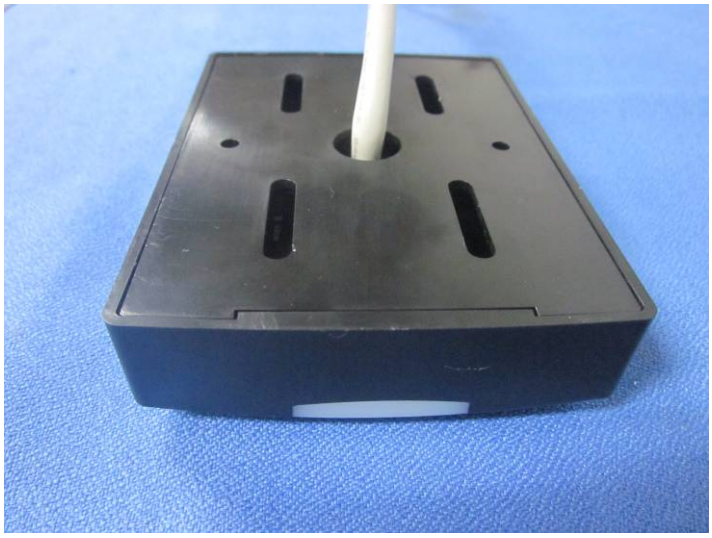
6. External and Internal Photos of the EUT

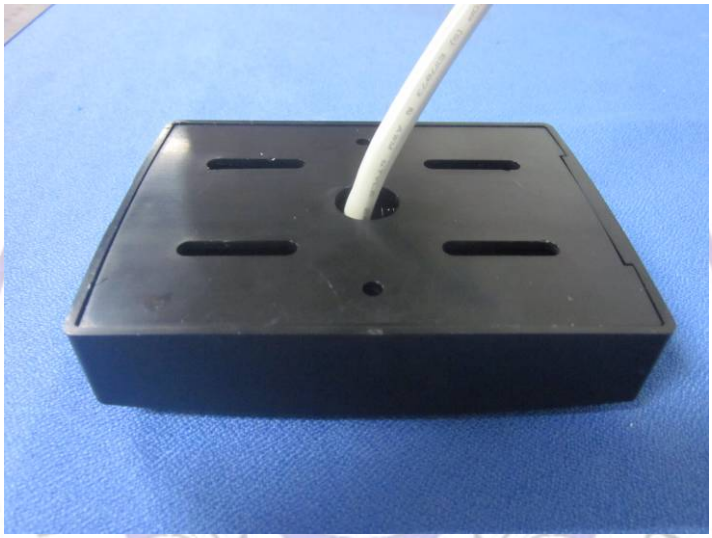
External Photos of EUT

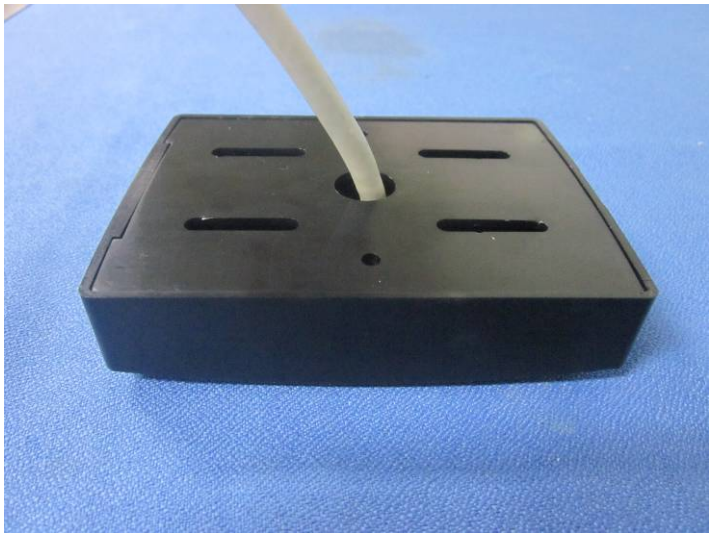




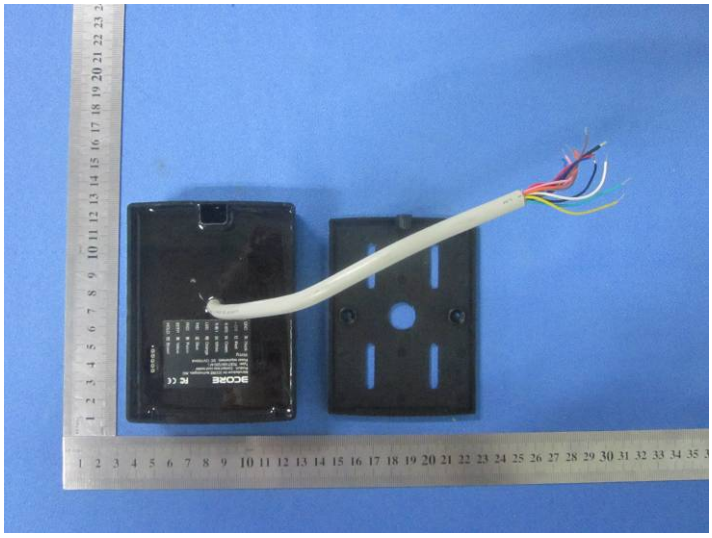


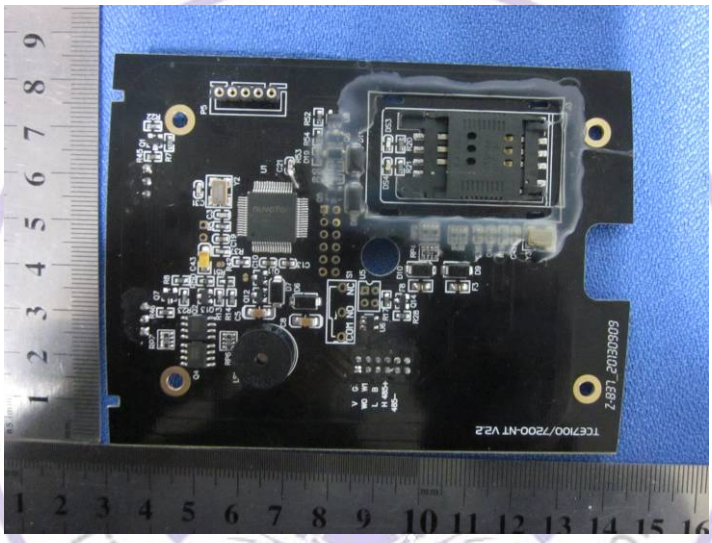


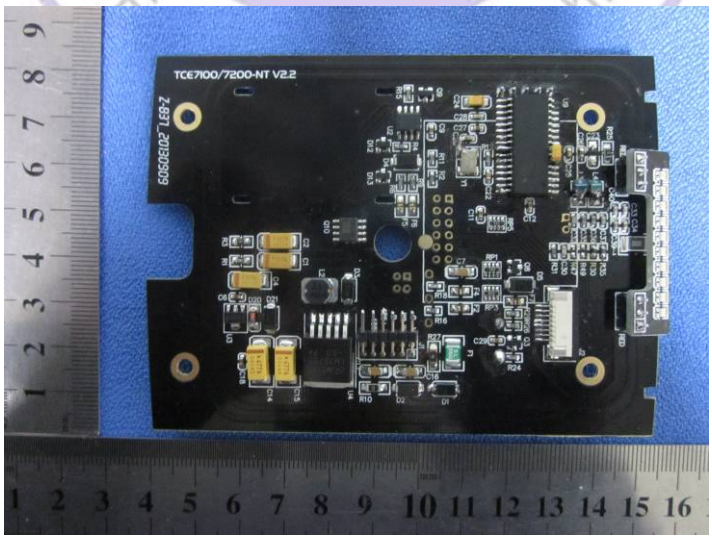


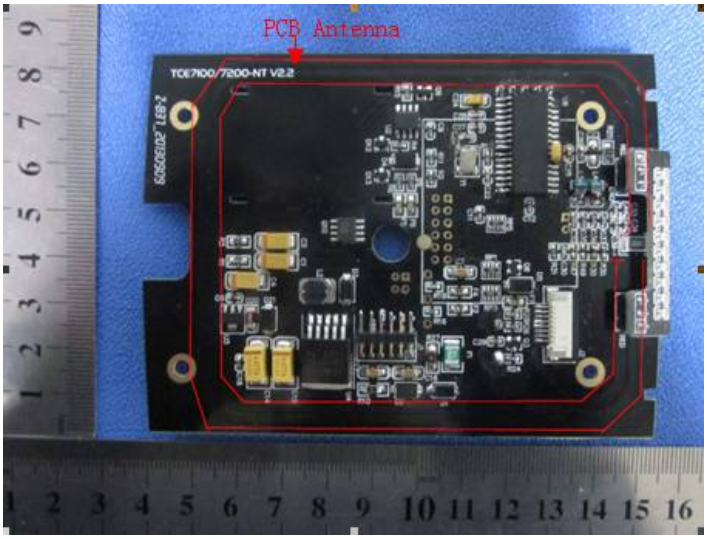


Internal Photos of EUT









.....End of Report.....