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FCC PART 15 SUBPART C TEST REPORT

FCC Part 15.225

Report Reference No......: **CTL1406171383-WF**

Compiled by

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Tracy Qi

Date of issue.....: July 08, 2014

Test Firm.....: **Shenzhen CTL Testing Technology Co., Ltd.**

Address.....: Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China.

Applicant's name.....: **Shenzhen Doorate Information Technology Co., LTD**

Address.....: Room 1102, Shanghai Automotive Building, No.4050 of Nanhai Boulevard, Nanshan District, Shenzhen, China

Test specification:

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

Master TRF.....: Dated 2011-01

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Test item description: Portable Terminal

FCC ID.....: **2ACNYHH-22**

Trade Mark: N/A

Model/Type reference.....: HH-22

Transmit Frequency.....: 13.56MHz

Number of channels: 1

Modulation Type: ASK

Antenna type: Loop antenna

Result.....: **Positive**

TEST REPORT

Test Report No. :	CTL1406171383-WF	July 08, 2014
		Date of issue

Equipment under Test : Portable Terminal

Model /Type : HH-22

Applicant : **Shenzhen Doorate Information Technology Co., LTD**

Address : Room 1102, Shanghai Automotive Building, No.4050 of Nanhai Boulevard, Nanshan District, Shenzhen, China

Manufacturer : **Shenzhen Doorate Information Technology Co., LTD**

Address : Room 1102, Shanghai Automotive Building, No.4050 of Nanhai Boulevard, Nanshan District, Shenzhen, China

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

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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 C63.4-2009

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	:	June 26, 2014
Testing commenced on	:	June 26, 2014
Testing concluded on	:	July 07, 2014

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 120V / 60 Hz	<input type="radio"/> 115V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.7V

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

A Portable Terminal 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: 2ACNYHH-22** 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)	CTL1406171383-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

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

3.2. Test Facility

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

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., 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 970318, December 19, 2013.

3.3. Environmental conditions

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

Temperature:	<u>15-35 ° C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>950-1050mbar</u>

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 Shenzhen CTL Testing Technology Co., 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 CTL 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	PASS
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.

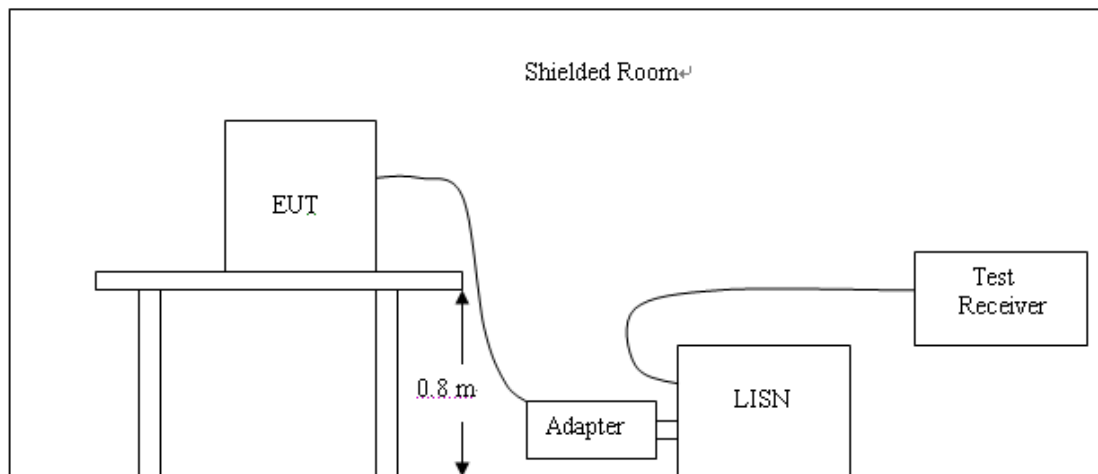
3.6. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2014/07/06	2015/07/05
EMI Test Receiver	R&S	ESCI	103710	2014/07/06	2015/07/05
Spectrum Analyzer	Agilent	E4407B	MY45108355	2014/07/06	2015/07/05
Controller	EM Electronics	Controller EM 1000	N/A	2014/07/06	2015/07/05
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2014/07/06	2015/07/05
Horn Antenna	SCHWARZBECK	BBHA9170	1562	2014/07/06	2015/07/05
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2014/07/06	2015/07/05
LISN	R&S	ENV216	101316	2014/07/06	2015/07/05
LISN	SCHWARZBECK	NSLK8127	8127687	2014/07/06	2015/07/05
Microwave Preamplifier	HP	8349B	3155A00882	2014/07/06	2015/07/05
Amplifier	HP	8447D	3113A07663	2014/07/06	2015/07/05
Transient Limiter	Com-Power	LIT-153	532226	2014/07/06	2015/07/05
Radio Communication Tester	R&S	CMU200	3655A03522	2014/07/06	2015/07/05
Temperature/Humidity Meter	zhicheng	ZC1-2	22522	2014/07/06	2015/07/05
SIGNAL GENERATOR	HP	8647A	3200A00852	2014/07/06	2015/07/05
Wideband Peak Power Meter	Anritsu	ML2495A	220.23.35	2014/07/06	2015/07/05
Climate Chamber	ESPEC	EL-10KA	A20120523	2014/07/06	2015/07/05
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	/	2014/07/06	2015/07/05
High-Pass Filter	K&L	41H10-1375/U12750-O/O	/	2014/07/06	2015/07/05

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

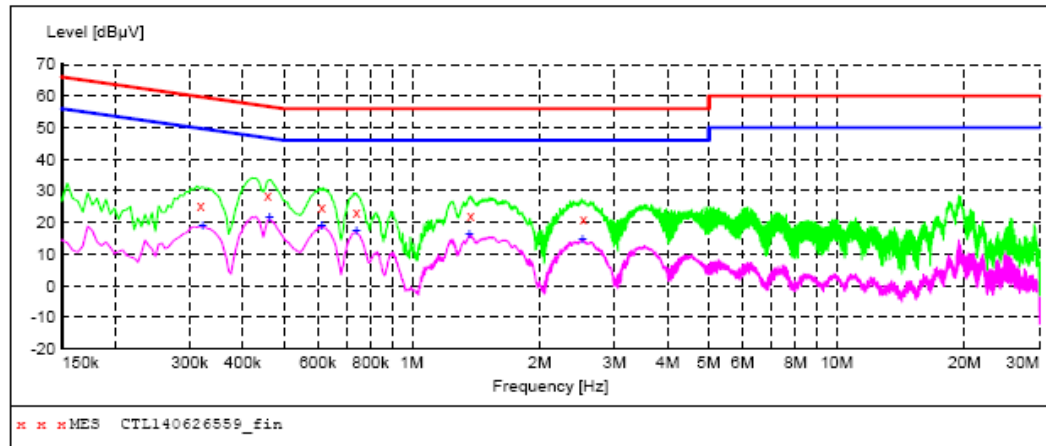
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

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**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL140626559_fin"**

6/26/2014 4:00PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.318000	25.60	10.2	60	34.2	QP	N	GND
0.458000	28.40	10.2	57	28.3	QP	N	GND
0.614000	24.90	10.2	56	31.1	QP	N	GND
0.740000	23.30	10.2	56	32.7	QP	N	GND
1.376000	22.10	10.3	56	33.9	QP	N	GND
2.534000	21.30	10.4	56	34.7	QP	N	GND

MEASUREMENT RESULT: "CTL140626559_fin2"

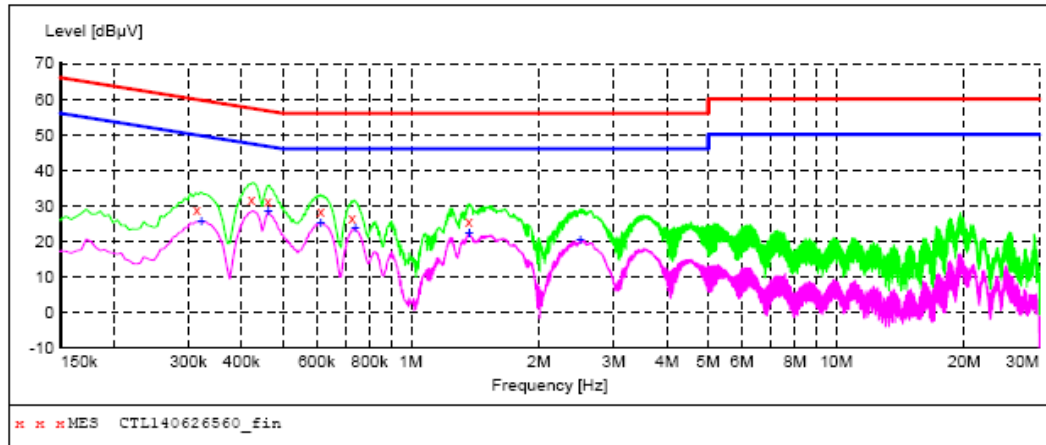
6/26/2014 4:00PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.322000	18.90	10.2	50	30.8	AV	N	GND
0.462000	21.50	10.2	47	25.2	AV	N	GND
0.614000	18.80	10.2	46	27.2	AV	N	GND
0.740000	17.30	10.2	46	28.7	AV	N	GND
1.364000	16.40	10.3	46	29.6	AV	N	GND
2.522000	14.90	10.4	46	31.1	AV	N	GND



SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL140626560_fin"**

6/26/2014 4:05PM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.314000	28.70	10.2	60	31.2	QP	L1	GND
0.422000	31.70	10.2	57	25.7	QP	L1	GND
0.462000	31.40	10.2	57	25.3	QP	L1	GND
0.614000	28.20	10.2	56	27.8	QP	L1	GND
0.728000	26.40	10.2	56	29.6	QP	L1	GND
1.370000	25.40	10.3	56	30.6	QP	L1	GND

MEASUREMENT RESULT: "CTL140626560_fin2"

6/26/2014 4:05PM

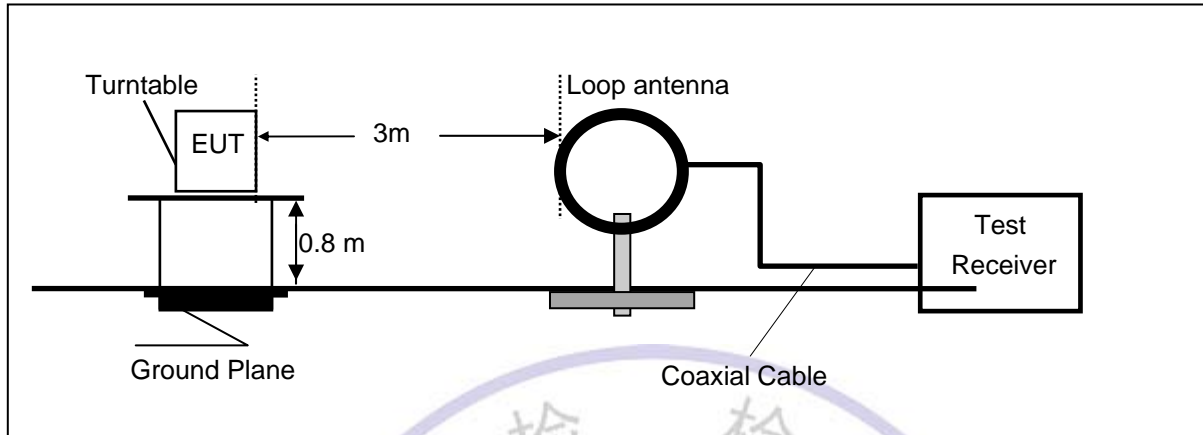
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.322000	25.60	10.2	50	24.1	AV	L1	GND
0.462000	28.30	10.2	47	18.4	AV	L1	GND
0.614000	25.20	10.2	46	20.8	AV	L1	GND
0.740000	23.50	10.2	46	22.5	AV	L1	GND
1.370000	22.10	10.3	46	23.9	AV	L1	GND
2.504000	20.20	10.4	46	25.8	AV	L1	GND



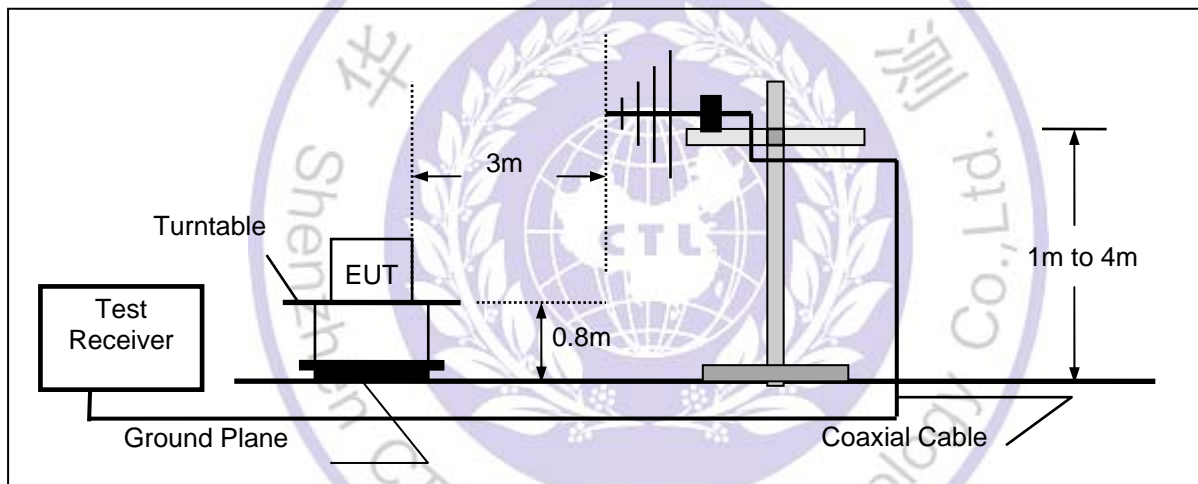
4.2. Radiated Emission

TEST CONFIGURATION

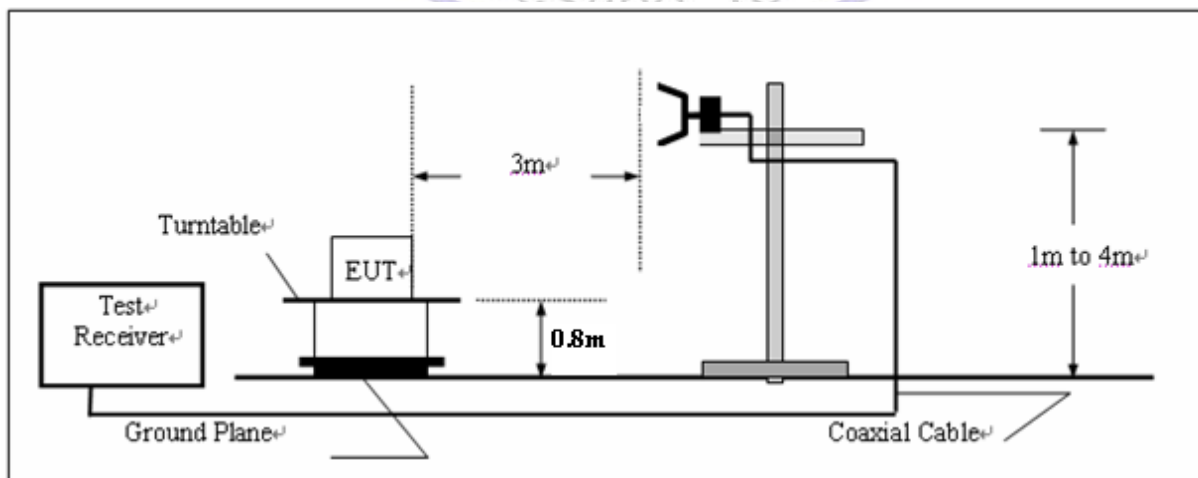
Radiated Emission Test Set-Up
Frequency range 9KHz – 30MHz



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°C to 360°C 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

$$\text{Transd} = \text{AF} + \text{CL} - \text{AG}$$

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 (dB μ V/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

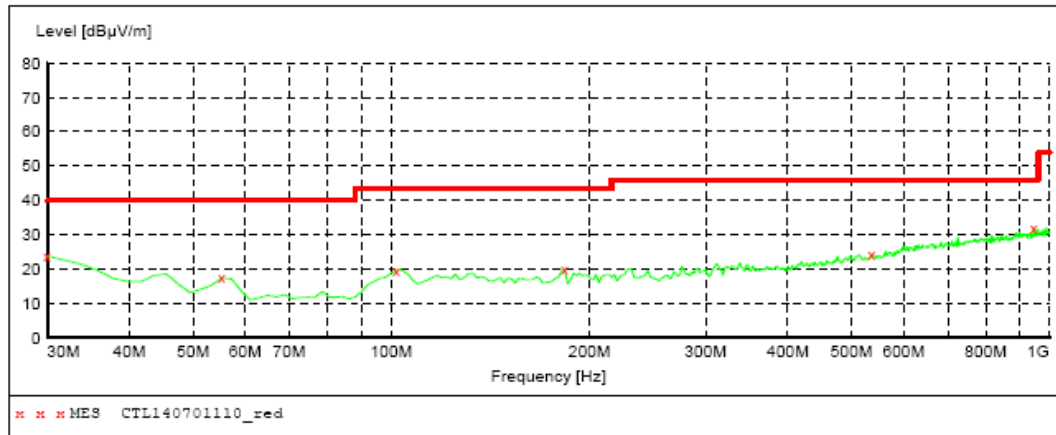
Frequency (MHz)	Meter Reading (dB μ V)	Polar H/V	Antenna Factor (dB/m)	Cable Loss (dB)	Emission Levels (dB μ V/m)	Limits at 3m (dB μ V/m)	Margin (dB)	Detector Mode QP /AV
13.560	58.17	V	10.35	1.34	69.86	124	54.14	QP
13.550	31.06	V	10.35	1.35	42.76	90.5	47.74	QP
13.569	29.61	V	10.35	1.34	41.30	90.5	49.20	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:

SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency				
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTT140701110_red"

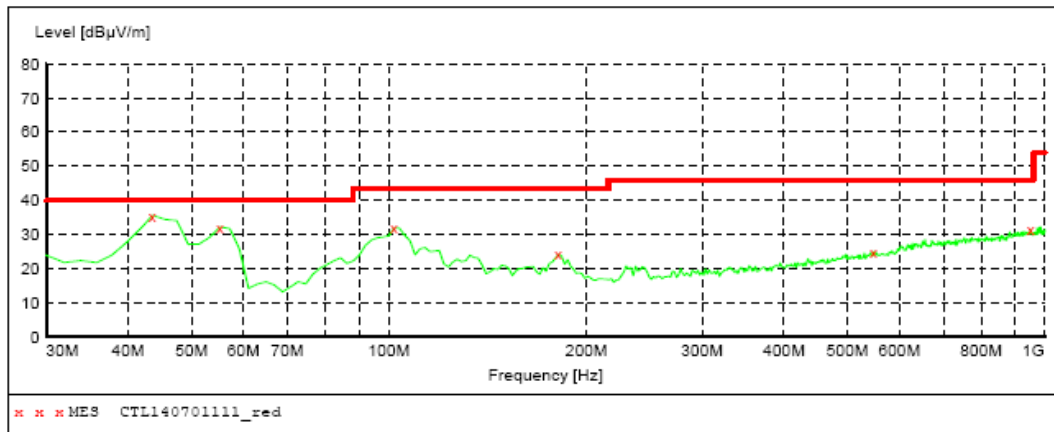
7/1/2014 10:17AM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	23.80	21.1	40.0	16.2	---	0.0	0.00	HORIZONTAL
55.220000	17.40	8.3	40.0	22.6	---	0.0	0.00	HORIZONTAL
101.780000	19.70	12.0	43.5	23.8	---	0.0	0.00	HORIZONTAL
183.260000	20.00	13.3	43.5	23.5	---	0.0	0.00	HORIZONTAL
536.340000	24.30	20.7	46.0	21.7	---	0.0	0.00	HORIZONTAL
945.680000	32.00	26.6	46.0	14.0	---	0.0	0.00	HORIZONTAL



SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

***MEASUREMENT RESULT: "CTL140701111_red"***

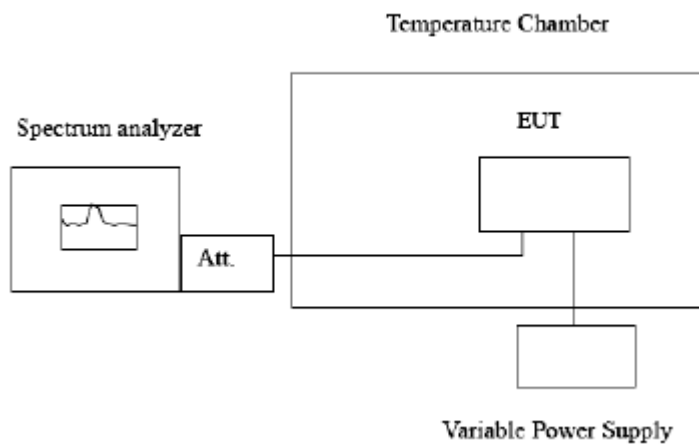
7/1/2014 10:20AM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.580000	35.60	11.0	40.0	4.4	---	0.0	0.00	VERTICAL
55.220000	32.20	8.3	40.0	7.8	---	0.0	0.00	VERTICAL
101.780000	31.90	12.0	43.5	11.6	---	0.0	0.00	VERTICAL
181.320000	24.20	13.3	43.5	19.3	---	0.0	0.00	VERTICAL
547.980000	25.00	21.0	46.0	21.0	---	0.0	0.00	VERTICAL
951.500000	31.40	26.7	46.0	14.6	---	0.0	0.00	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 °C +50°C 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

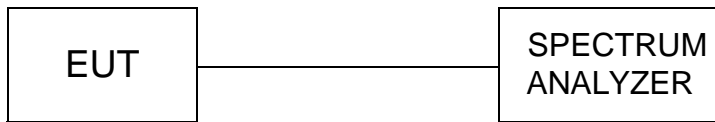
The frequency tolerance of the carrier shall be maintained within $\pm 0.01\%$ of the operating frequency.

TEST RESULTS

Voltage (%)	Power (VDC)	Temperature (°C)	Frequency (MHz)	Deviation (%)
100	3.7	+20°C (Ref)	13.559912	0.0006
100	3.7	-20	13.559430	0.0042
100	3.7	-10	13.559364	0.0047
100	3.7	0	13.559510	0.0036
100	3.7	10	13.559528	0.0035
100	3.7	25	13.559656	0.0025
100	3.7	30	13.559741	0.0019
100	3.7	40	13.559452	0.0040
100	3.7	50	13.559383	0.0046
85	3.145	20	13.559698	0.0022
115	4.255	20	13.559811	0.0014

4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

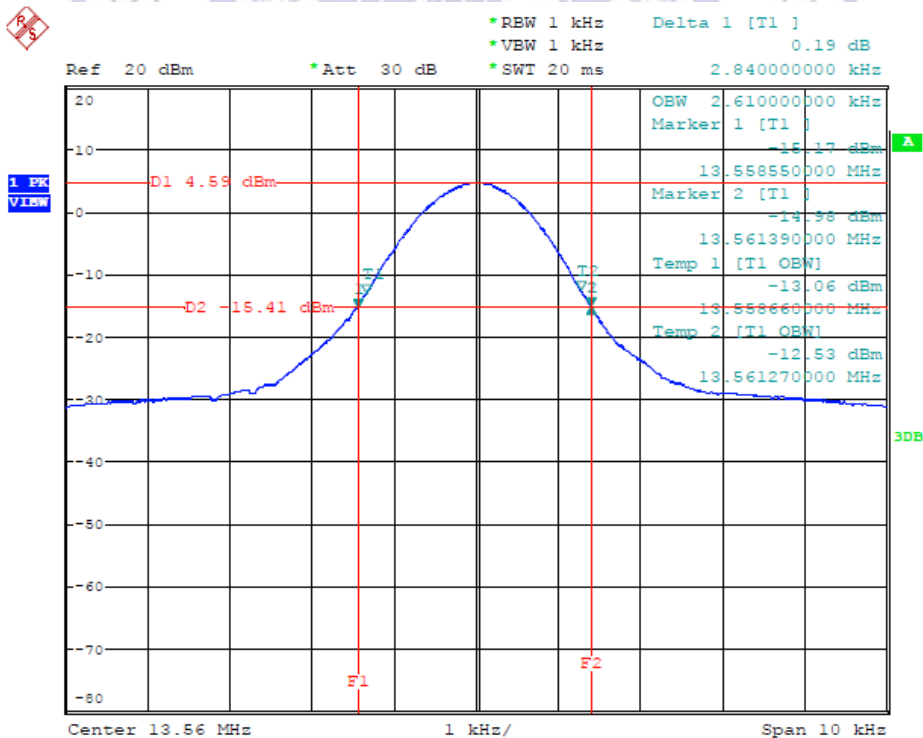
The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1KHz RBW and 3KHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

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

TEST RESULTS

Occupied Channel Bandwidth Result					
Modulation Mode	Frequency (MHz)	20dB Bandwidth (kHz)	F _L at 20dB BW (kHz)	F _H at 20dB BW (MHz)	99% Bandwidth (kHz)
Read/Write	13.56	2.84	13.55855	13.56139	2.61
Limit		N/A	13.553	13.567	N/A
Result		Complied			



20dB Bandwidth: 2.64KHz

4.5. ANTENNA REQUIREMENT

STANDARD APPLICABLE

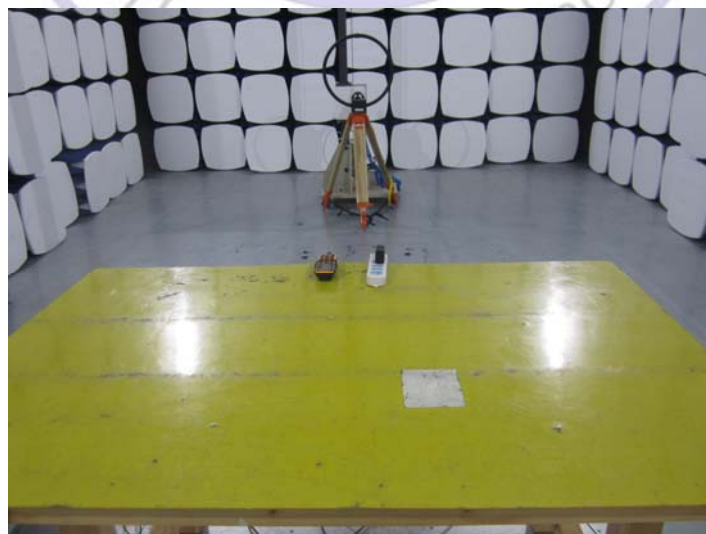
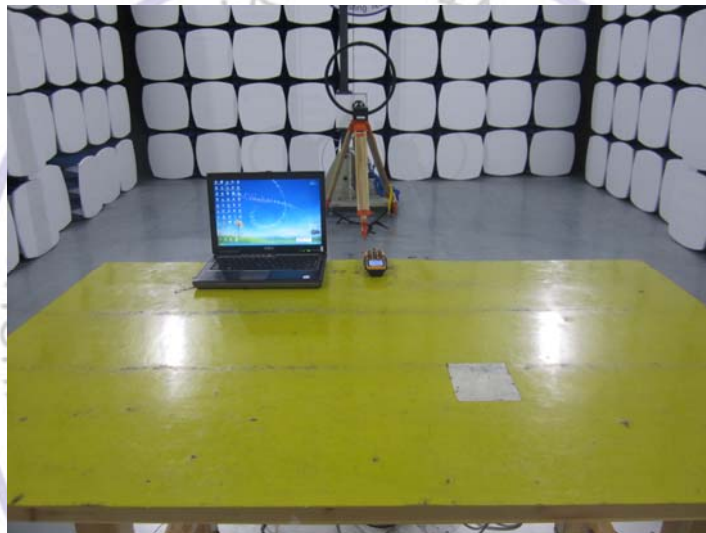
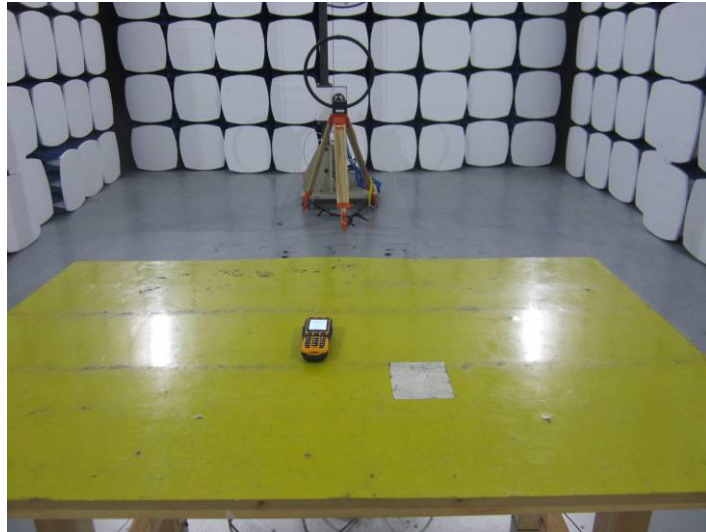
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling 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.

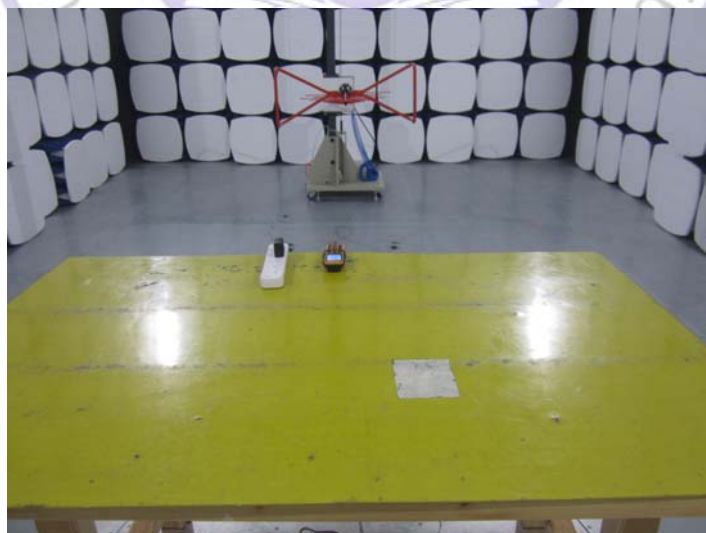
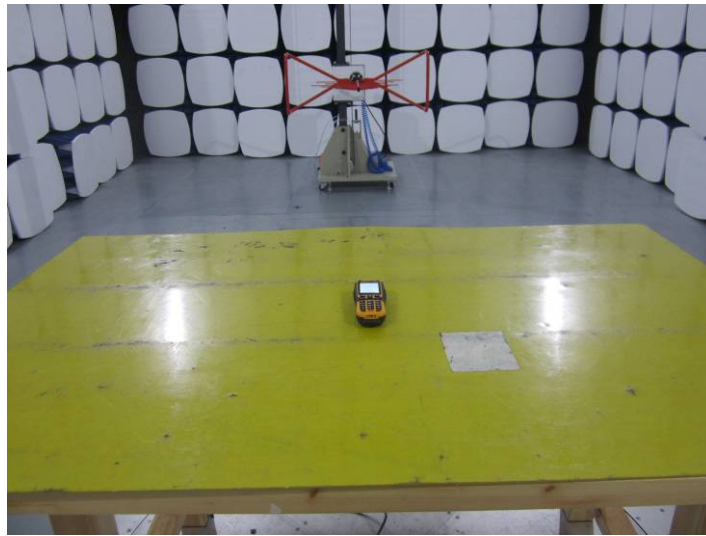
ANTENNA CONNECTED CONSTRUCTION

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





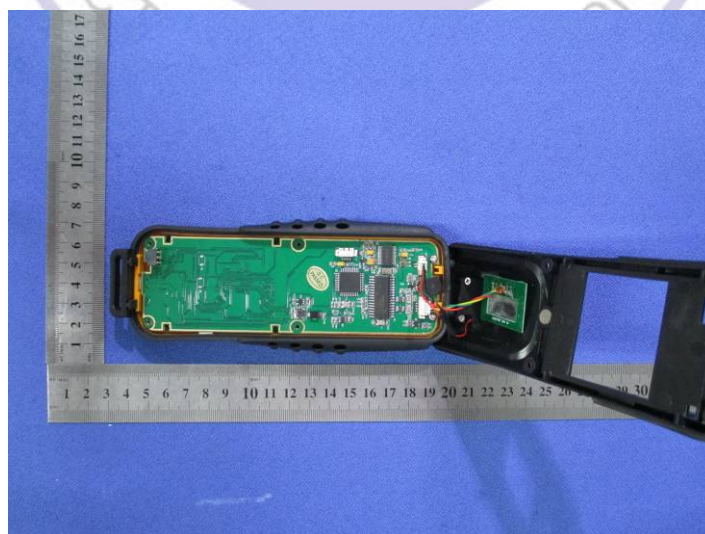
6. External and Internal Photos of the EUT

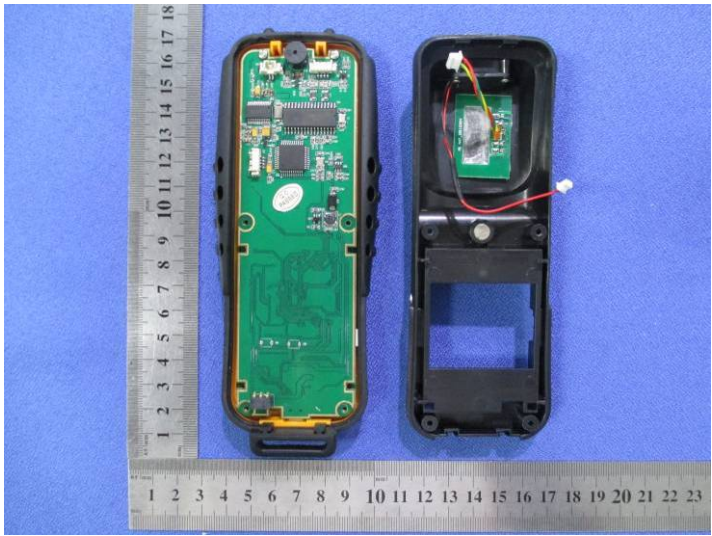
External Photos of EUT

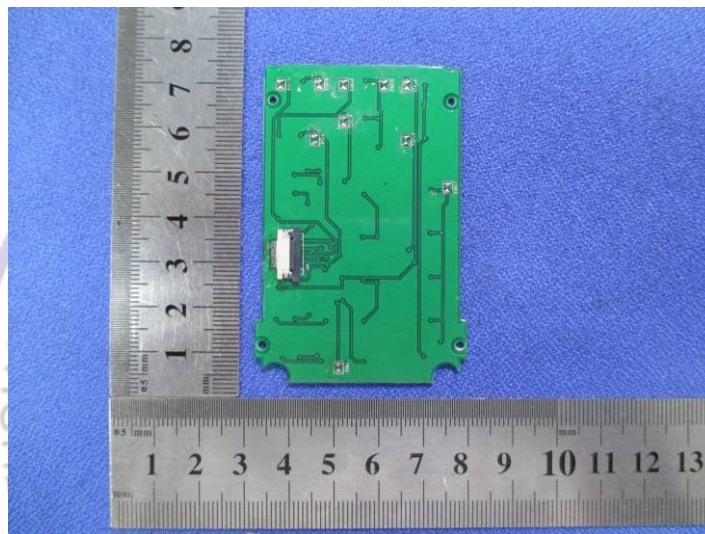
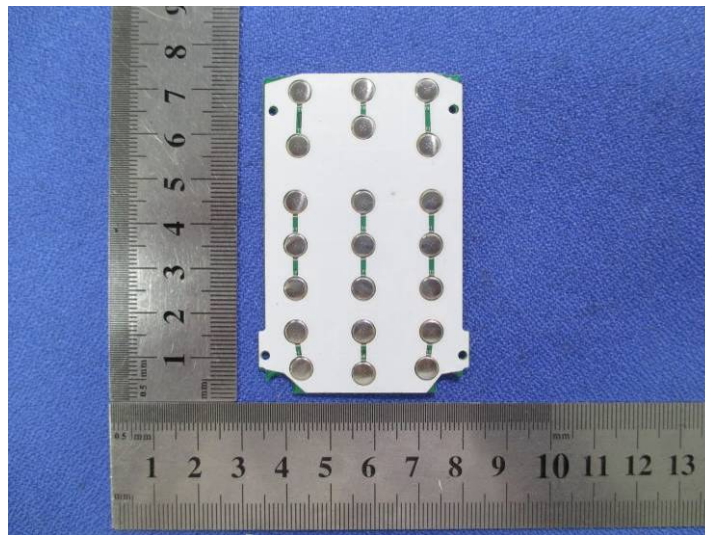


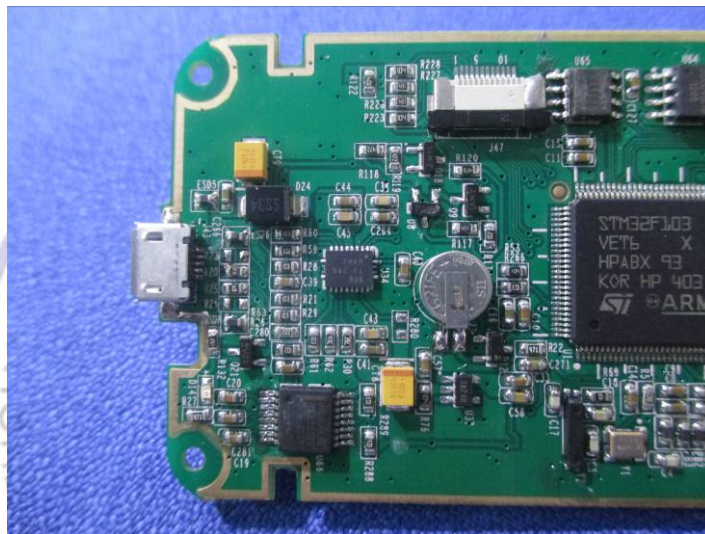


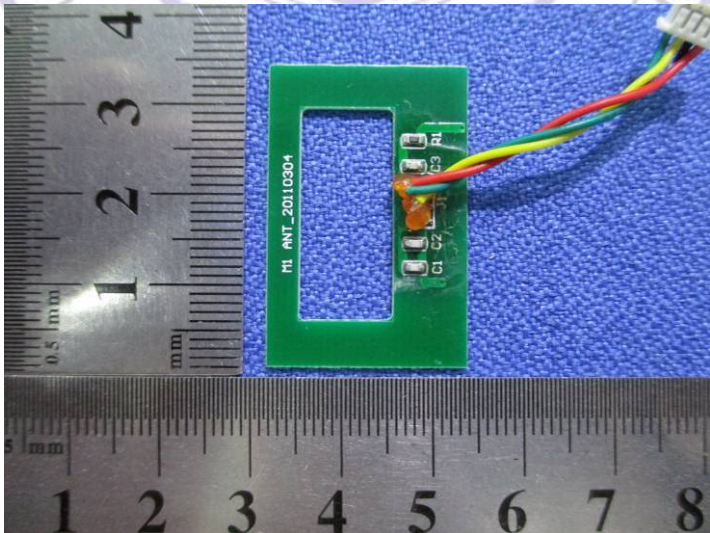
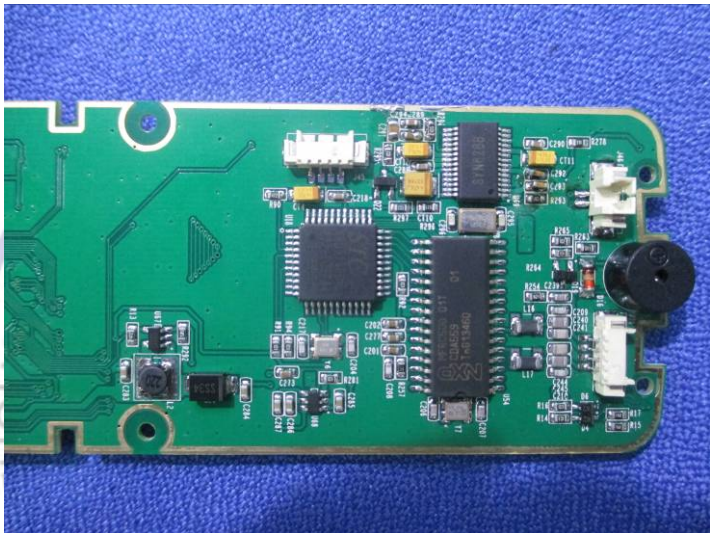
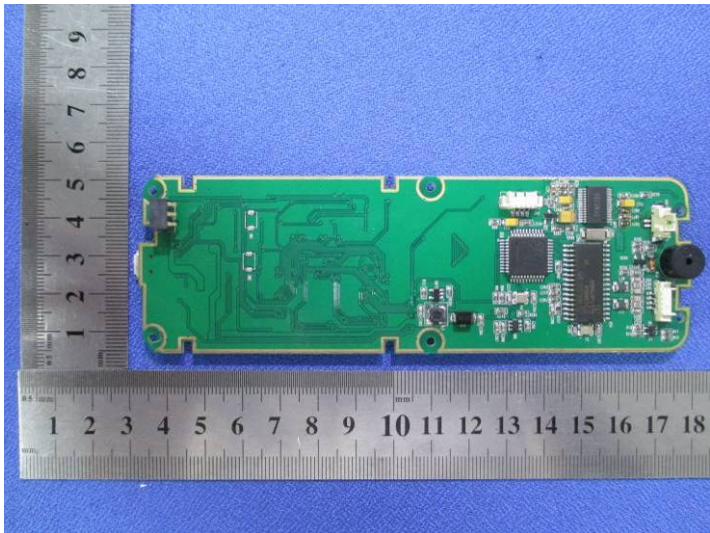


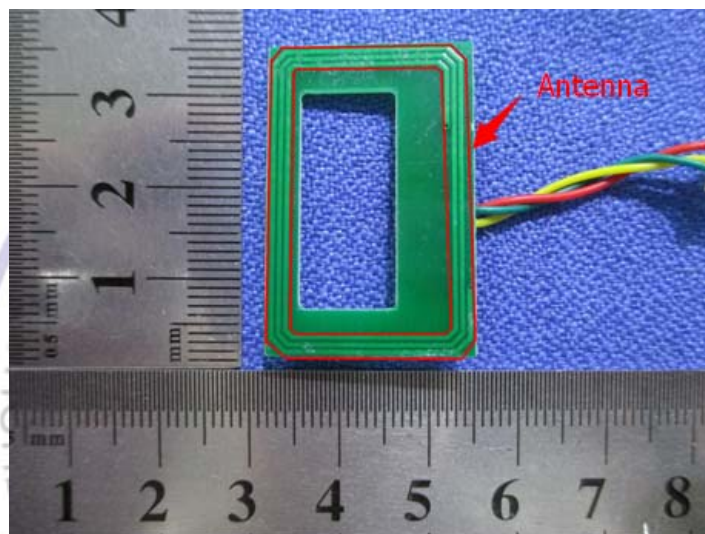
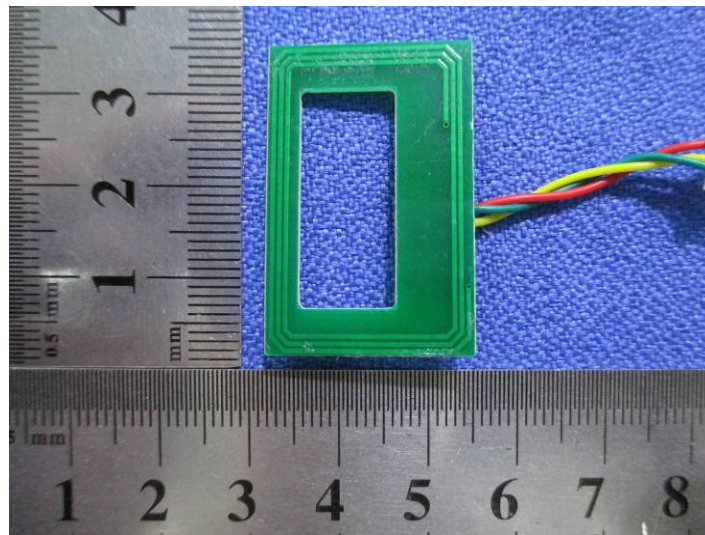
Internal Photos of EUT











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