

## FCC Test Report

### (TR-0908-015-01)

**Applicant** : GOLDEN REGENT ELECTRONICS INDUSTRIAL LTD

**Address** : SUN ON TOWN.KUNG LOK INDUSTRIAL VILLAGE..  
SHENZHEN.GUANGDONG, CHINA

**Manufacturer** : GOLDEN REGENT ELECTRONICS INDUSTRIAL LTD

**Address** : SUN ON TOWN.KUNG LOK INDUSTRIAL VILLAGE..  
SHENZHEN.GUANGDONG, CHINA

**Product Name** : Reader

**Trademark** : None

**Model(s)** : RDR 7(GNG-A741-02)

**Standard(s)** : FCC Part 15 Subpart C

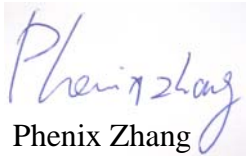

**Test Result** : Pass

**Date of Test** : Nov 11, 2009 to Feb 04, 2010

**Report issued Dated** : Feb 04, 2010

The report shall not be reproduced except in full, without the written approval of the TDK EMC Center.

The results in this report apply only to the sample(s) tested. The production units are required to conform to the initial sample as received when the units are placed in the market.

Responsible Engineer	:	 Phenix Zhang	Approved by	:	 CHAN king-chui
Date	:	2010.02.04	Technical manager	:	2010.02.04

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## 1. Description of the Test Site

### 1.1 Test Site Location:

Laboratory	:	TDK South China EMC Center SAE Technologies Development (Dongguan) Co., Ltd. Changan Branch
Address	:	Zhenan Hi-tech Industrial Park, Dongguan City, Guangdong Province, China
Phone no.	:	(86)-769-8564-4678
Fax no.	:	(86)-769-8564-4499
Email	:	<a href="mailto:emc@cn.tdk.com">emc@cn.tdk.com</a>

### 1.2 Site Registration

VCCI (September, 2008)	:	Reg. No. R-2205, C-2392
FCC site registration (July, 2008)	:	Reg. No. 732901
IC registration	:	Reg. No. 7993
EMCC (September, 2008)	:	Reg. No. NAR/tl-060330

### 1.3 Test Scope

EMC and RF testing according to national / international standards

## 2. Description of the Tested Samples

### 2.1 Customer Information

Customer : GOLDEN REGENT ELECTRONICS INDUSTRIAL LTD  
Address : SUN ON TOWN.KUNG LOK INDUSTRIAL VILLAGE..  
SHENZHEN.GUANGDONG, CHINA  
Phone no. : 0086-755-29667713  
Fax no. : 0086-755-29667044

### 2.2 Identification of EUT

Trademark : None  
Model(s) No. : Reader  
Serial No. : R-1098S50011A

### 2.3 Spec of EUT

Description of EUT : This product is a RFID reader, which has a 13.56MHz module to read a passive tag. It also has a 2.4GHz module to communicate with GSC(Gas Station Communicator). In this report, only 13.56MHz part was tested and recorded.

Description of Antenna : fixed permanent antenna, 3dBi gain for 13.56MHz  
3dBi gain for 2.4GHz

Power Supply : Internal battery 3.6V DC

Operation Frequency : 13.56MHz and 2450 MHz

Number of Channels : 2

Bandwidth : 0.4MHz at 13.56MHz and 64MHz at 2450MHz

Type of Modulation : ASK for 13.56MHz  
CSS for 2450MHz

### 2.4 Test Standards List

FCC Part 15 (2008)

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 40GHz.

### 3. Test Specifications

#### 3.1 Standard(s) Used

FCC Rules	Description Of Test	Result
15.203/15.247(b)	Antenna Requirement	Pass
15.207	Conducted Emission	N/A
15.225(d)/15.209	General Radiated Emission	Pass
15.225(a)(b)(c)	Transmitter radiated emissions-Fundamental, Harmonic and Spurious	Pass
15.225(e)	Frequency Stability	Pass

#### 3.2 Deviations from the Test Specification

N/A

## **4. Test Result**

### **4.1 Antenna Requirement**

#### **4.1.1 Standard Applicable**

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 James or electrical connector is prohibited.

Section 15.247(b):

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **4.1.2 Antenna Connected Construction**

The antenna connector is designed with permanent attachment and no consideration of replacement.

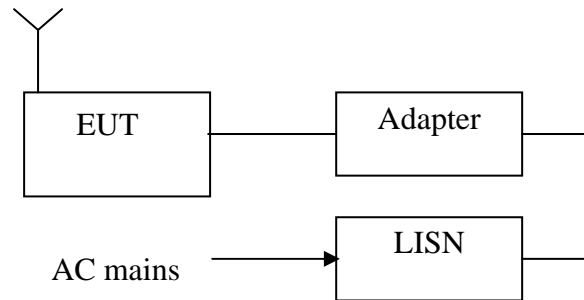
Transmitter antenna of directional gain is 3dBi.

## 4.2 Conducted Emission (mains)

### 4.2.1 Test Summary

Test Room	: Shielded Room
Power Source	: AC 120V / 60Hz
Standards:	: FCC Part15 B : 2008
EUT Type	: Table Top
EUT configuration	: EUT's highest possible emission level

### 4.2.2 Block diagram of test setup



### 4.2.3 Measurement method

The EUT along with its peripherals were placed on a 1.0m (W) x 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4m space from a vertical reference plane. The EUT was connected to power mains through a Artificial Mains Network(AMN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.

The excess power cable between the EUT and the AMN was bundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

### 4.2.4. Result

N/A

**Because the power of EUT is internal battery, this test item is not applicable.**

### 4.3 Spurious Radiated Emission

#### 4.3.1 Applicable Standard

15.225 (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.

15.209 Limit:

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

#### 4.3.2 Block diagram of test setup

Below 30MHz:

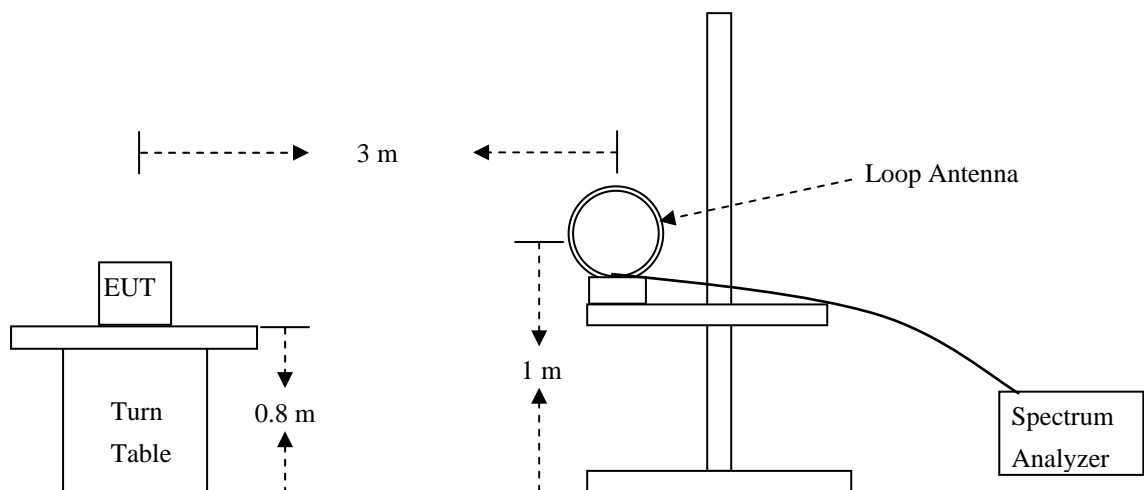


Figure 3: Frequencies measured below 30MHz configuration



Above 30MHz:

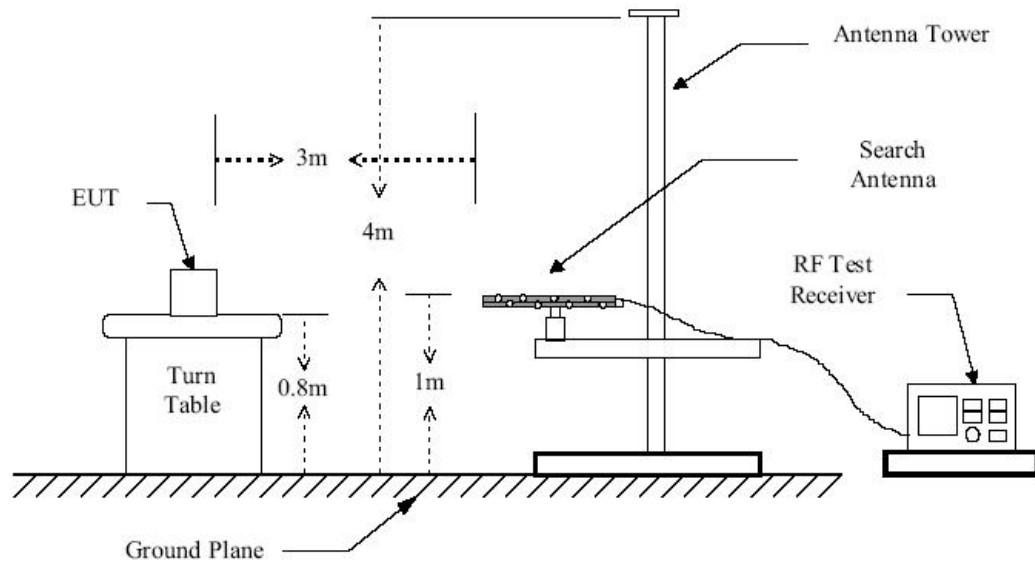


Figure 1 : Frequencies measured below 1 GHz configuration

#### 4.3.3 Measurement method

1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on the top of the turntable 0.8 meter above ground.
3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
4. Power on the EUT and all the supporting units.
5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
7. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.

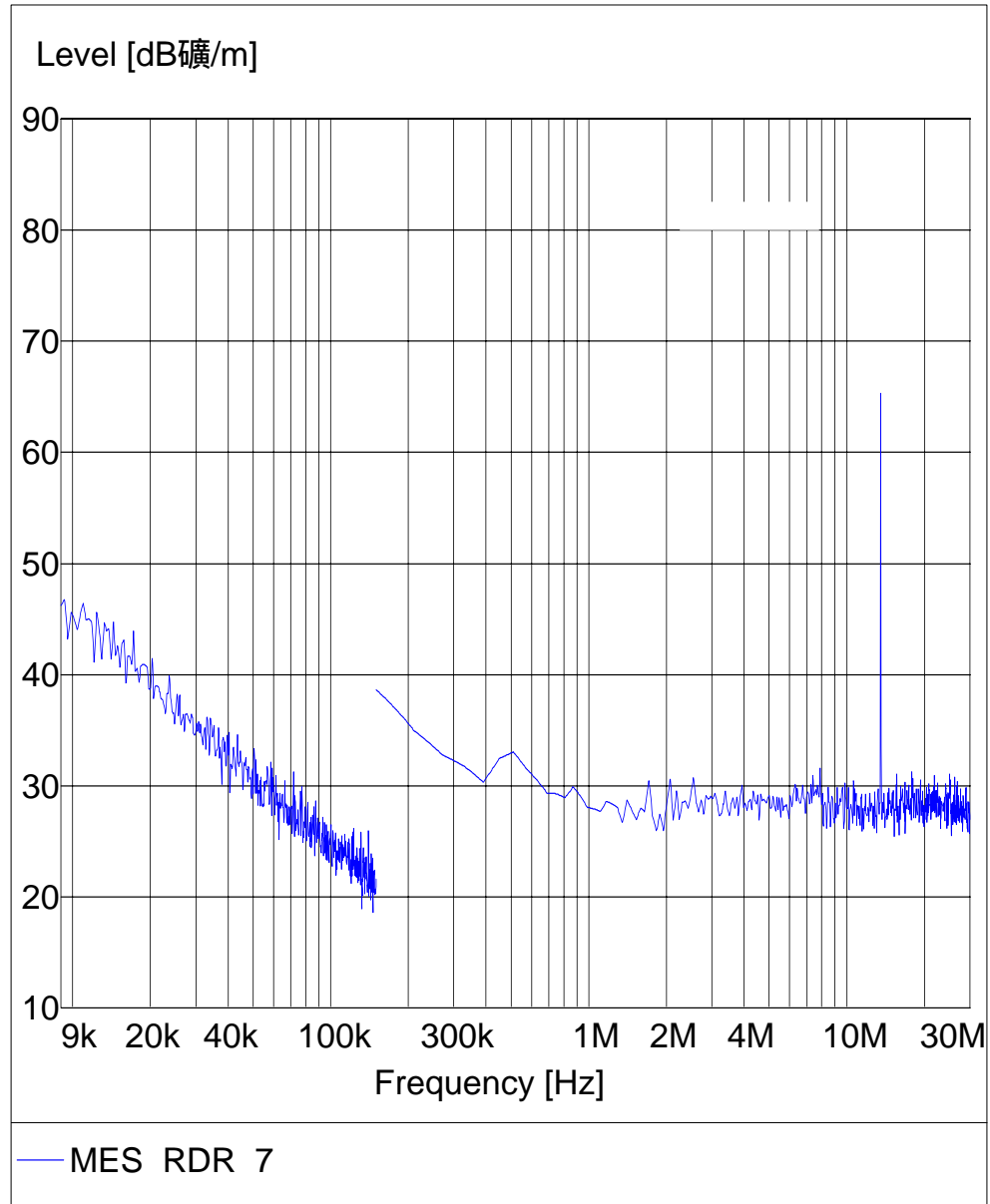
## 4.3.4. Result

**PASS**

Temperature ( ) : 22~23	EUT: Reader
Humidity (%RH) : 50~54	M/N: RDR 7(GNG-A741-02)
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: 13.56MHz Tx
Test data: Dec 02, 2009	Test engineer: Phenix

Frequency (kHz)	Reading (dBμV)	ANT Factory (dB)	Cable Loss (dB)	Test Result (dBμV)	Limit at 3m (dBμV)	Margin (dB)
9	26.76	19.5	0.1	46.36	128.5	82.14
150	19.27	19.5	0.1	38.87	104.1	65.23
5033	10.2	19.7	0.1	30.0	69.5	39.5

Below 30MHz:



Above 30MHz:

2009-11-11 15:07:51

## RADIATED EMISSION

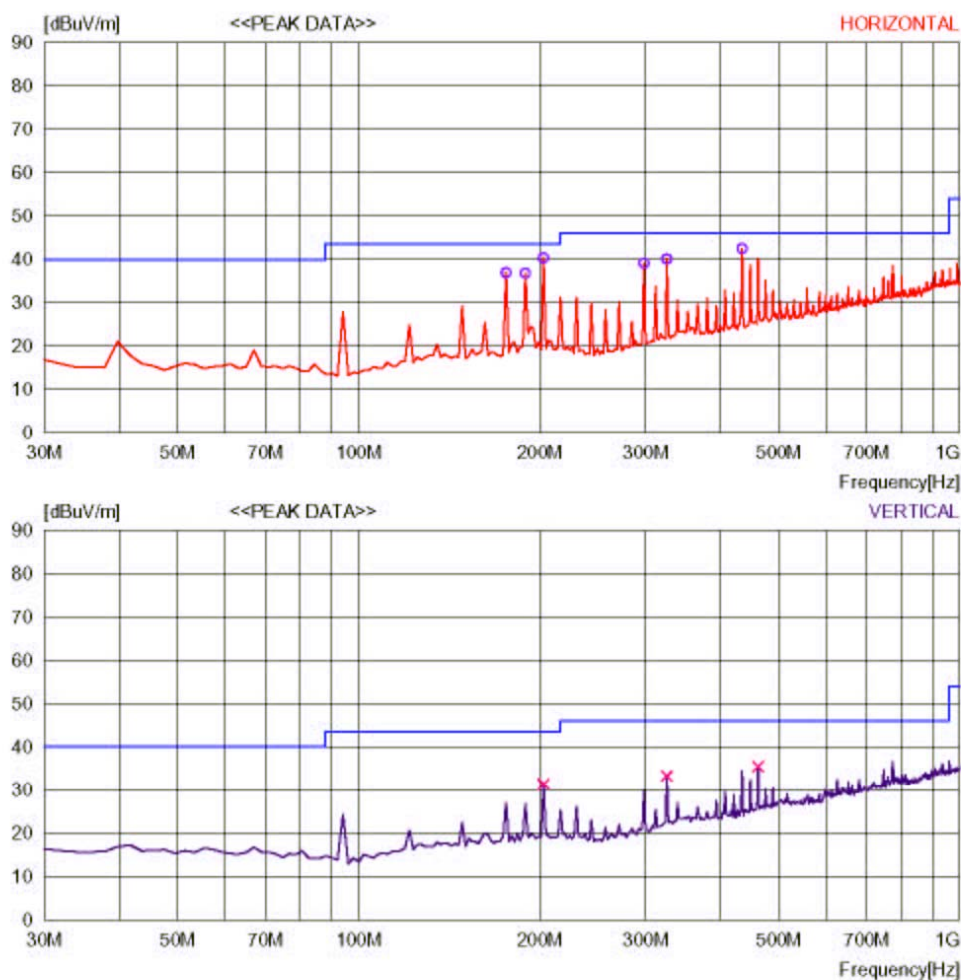
Date : 2009-11-11 15:07:42

Trade Name : GOLDEN  
Model Name : RDR 7(GNG-A741-02)  
Product Name : Reader  
Test Condition : TX ON 13.56MHz

Document No. :  
Power Supply : Internal Battery  
Temp/Humi : 27/55RH%  
Operator : Phenix

Memo :

LIMIT : FCC Part15 Class B(3m)/USA



2009-11-11 15:07:51

## RADIATED EMISSION

Date : 2009-11-11 15:07:42

Trade Name	: GOLDEN	Document No.	:
Model Name	: RDR 7(GNG-A741-02)	Power Supply	: Internal Battery
Product Name	: Reader	Temp/Humi	: 27/55RH%
Test Condition	: TX ON 13.56MHz	Operator	: Phenix

Memo :

LIMIT : FCC Part15 Class B(3m)/USA

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
---- Horizontal ----										
1	175.792	48.2	12.3	7.9	31.5	36.9	43.5	6.6	200	359
2	189.399	47.5	12.9	7.9	31.5	36.8	43.5	6.7	200	12
3	203.006	50.5	13.3	8.0	31.5	40.3	43.5	3.2	200	4
4	298.257	48.3	13.5	8.6	31.3	39.1	46	6.9	100	201
5	325.471	47.8	14.9	8.7	31.3	40.1	46	5.9	100	329
6	434.328	47.4	17.2	9.2	31.3	42.5	46	3.5	100	142
---- Vertical ----										
7	203.006	41.5	13.3	8.0	31.5	31.3	43.5	12.2	199	270
8	325.471	40.9	14.9	8.7	31.3	33.2	46	12.8	199	39
9	461.542	39.2	18.0	9.5	31.3	35.4	46	10.6	199	0

#### 4.4 Transmitter radiated emissions-Fundamental, Harmonic and Spurious

##### 4.4.1 Applicable Standard

15.225(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.

15.225(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.

15.225(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.

##### 4.4.2 Limit

Frequency Range (MHz)	Limit at 30m ( $\mu\text{V/m}$ )	Limit at 30m (dB $\mu\text{V/m}$ )	Limit at 3m * (dB $\mu\text{V/m}$ )
13.553-13.567	15848	84	124
13.410-13.553	334	50.4	90.4
13.567-13.710	334	50.4	90.4
13.110-13.410	106	40.5	80.5
13.710-14.010	106	40.5	80.5

\* : According to FCC 15.31(2), at frequencies below 30MHz, we use square of an inverse linear distance extrapolation factor (40dB/decade).

##### 4.4.3 Block diagram of test setup

Below 30MHz:

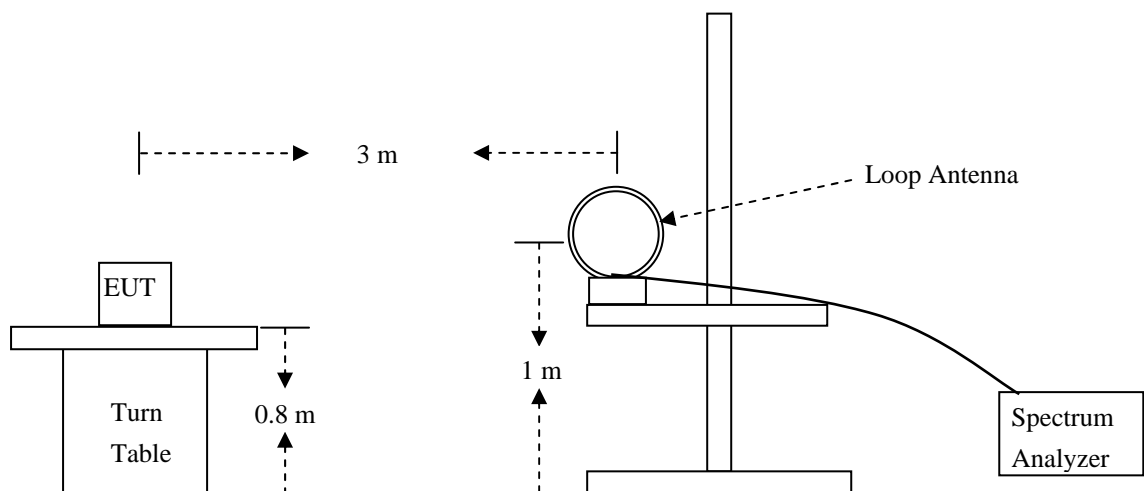


Figure 3: Frequencies measured below 30MHz configuration

## 4.4.4. Result

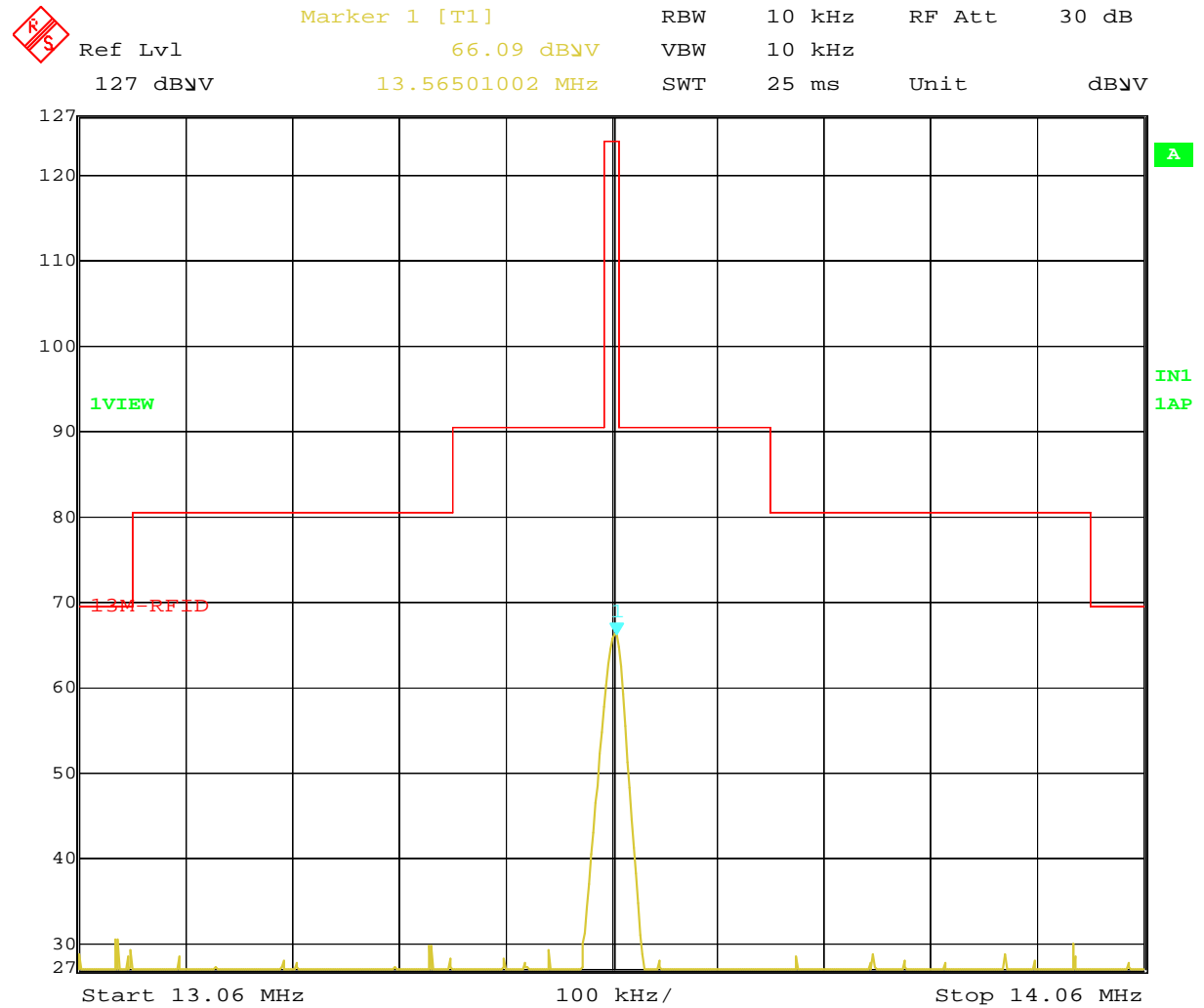
Temperature ( ) : 22~23	EUT: Reader
Humidity (%RH ) : 50~54	M/N: RDR 7(GNG-A741-02)
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: 13.56MHz Tx Mode
Test data: Feb 04, 2010	Test engineer: Phenix

## Measurement Set:

9K-150KHz: RBW=200Hz, VBW=1KHz;

150KHz-30MHz: RBW=10KHz, VBW=10KHz

### Test Plot (prescan):



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### Max level point for final test:

Frequency (MHz)	Reading (dBμV)	ANT Factory (dB)	Cable Loss (dB)	Test Result (dBμV)	Limit at 3m (dBμV)	Margin (dB)
13.565	46.1	19.8	0.2	66.1	124	57.9



## 4.5 Frequency Stability

### 4.5.1 Applicable Standard

15.225(e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a 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.

### 4.5.2 Measurement method

- 1, Set the environmental temperature chamber to temperature of (-20 to +50 ) wait the temperature of the chamber to stabilize.
- 2, Set EUT on the TX mode of 13.56MHz, and wait 10 minutes.
- 3, Set spectrum to RBW = 3kHz, Span = 100kHz
- 4, Read value of max. from -20 to 50 .

### 4. 5.3 Result

#### Test Data:

Temperature:	-20	-10	0	10	20	30	40	50
Frequency: (MHz)	13.561000	13.561000	13.561000	13.561000	13.561000	13.561000	13.561025	13.561025

Maximum frequency drift	Limit	Result
+0.001025	$13.56 \times 0.01\% = 0.001356\text{MHz}$	PASS

## 5. Test Setup

### 5.1 Ancillary and Accessory Equipment Used

Connect to GSC, for control EUT:

No.	Description	Specification	Quantity
1.	PC	DELL, M/N:540, S/N: 124XK2X	1
2.	Monitor	DELL, M/N:E157FPc, S/N:CN-OFJ061-64180-69A-06CS	1
3.	Keyboard	DELL, M/N:L100, S/N: CN0RH6566589006860007J	1
4.	Mouse	HP, M/N:M-SBF96	1

## 5.2 Photographs of the Test Configuration

### 5.2.1 Radiated emission

Below 30MHz:



Above 30MHz:



### 5.3 Photographs of the EUT

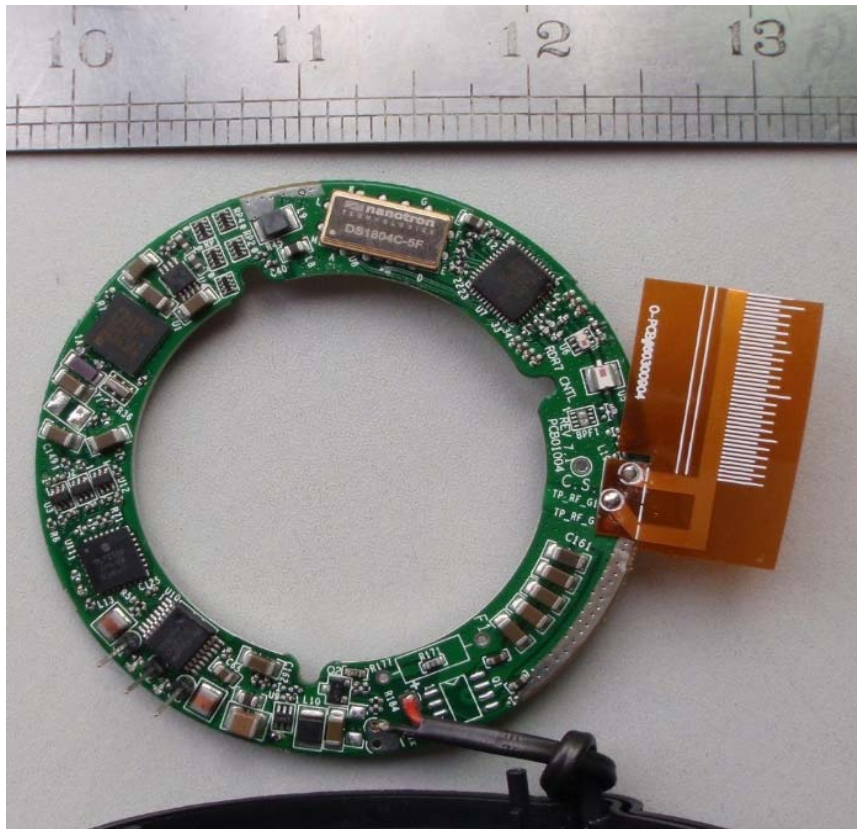


Enclosure of EUT

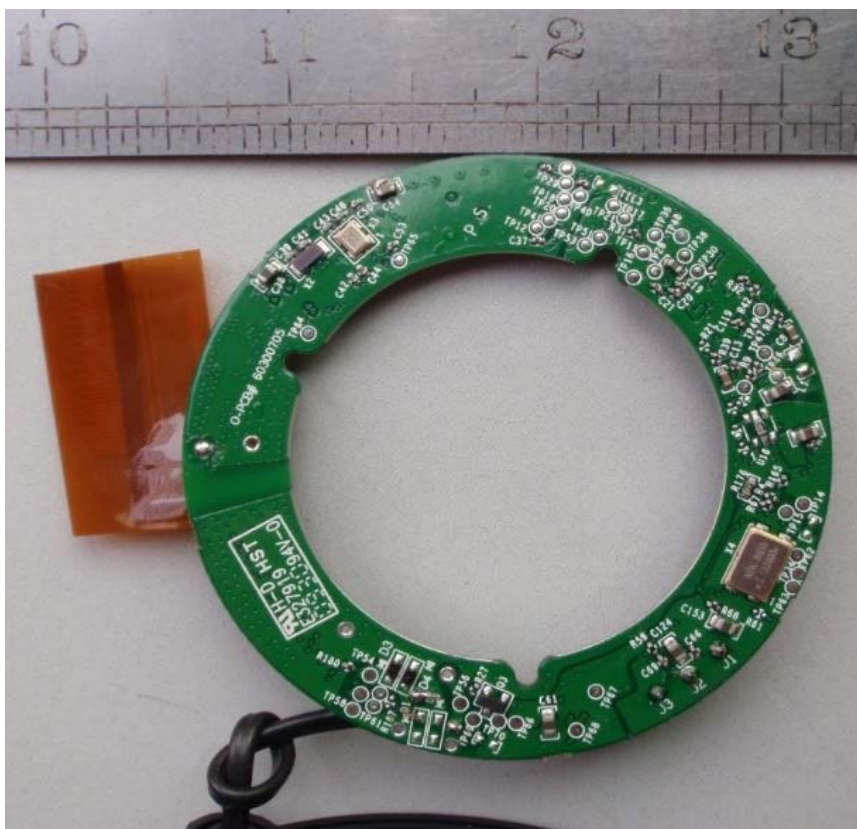


Enclosure of EUT





PCB of EUT



PCB of EUT



Photo of Battery



Photo of Battery



Connectors

## 6. Equipment List

No.	Equipment	Manufacturer	Model	Serial No.	Calibration Date
1	Precision Biconical Antenna	TDK Co.	PBA-2030	090500	2009-09-18
2	Precision Log Periodic Antenna	TDK Co.	PLP-3003	061001	2009-09-18
3	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130174	2009-09-18
4	Horn antenna	TDK	HRN-0118	130186	2009-04-07
5	Attenuator 6 dB	Agilent	8491B	MY39260147	2009-09-18
6	Preamplifier	TDK Sonoma	310	242803	2009-04-07
7	Preamplifier	ELENA	EAU-3718 GXA	A070701	2009-04-07
8	EMI Receiver	Rohde & Schwarz	ESIB26	100234	2009-04-07
9	EMI Receiver	Rohde & Schwarz	ESCS30	100350	2009-04-07
10	Spectrum Analyzer	Agilent	E4403B	MY44210199	2009-04-07
11	Art. Mains Network	EMCO	3816/2	00044921	2009-04-07
12	Transient Limiter(10 dB)	Agilent	11947A	3107A03736	2009-04-07
13	Personal Computer	HP	DX2000MT	MXD4250FZM	N/A
14	Personal Computer	HP	DX2000MT	MXD4130B2N	N/A
15	Semi-Anechoic Chamber	TDK Co.	N/A	N/A	2009-04-07
16	Shielded Room	TDK Co.	N/A	N/A	N/A
17	Loop Antenna	EMCO	6502	9107-2440	2009-04-07
18	oven	ESPEC	LU-213	2010081029	2009-03-23



## 7. Test Uncertainty

Test	Range	Confidence Level	Calculated Uncertainty
Radiated emission(3m)	30-1000MHz	95%	4.3dB
Conducted emission	0.15-30MHz	95%	3.3dB

## 8. Appendix

### 8.1 Confirmation of Compliance within the Limits

#### 8.1.1 Method of calculating measurement result

Radiated Emission

For example the point of 203.006MHz, vertical, Page 13.

	Reading	+	Antenna factor	+	Cable loss	-	Gain	=	Result
Example	40.9	+	13.3	+	8.0	-	31.5	=	30.7