

# Ke Mei Ou Laboratory Co., Ltd.

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FEDERAL COMMUNICATIONS COMMISSION  
Registration Number: 125782  
INDUSTRY CANADA  
Registration Number: IC4986

## FCC TEST REPORT

Under  
FCC Part 24 Subpart E: 2004

Prepared For :

**Wacal Inc**

10501 Valley Blvd., Suite 1860, E1 Monte CA91731 USA

<b>FCC ID: P3CSIM200</b>
<b>EUT: GPRS Vehicle Terminal</b>
<b>Model: SIM200</b>

March 2, 2007

<b>Report Type:</b> Original Report
<b>Test Engineer:</b> <u>Jacky Huang</u>
<b>Test Date:</b> <u>February 12, 2007</u>

<b>Review By:</b> _____
Apollo Liu / Manager

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## 1. General Information

### 1. 1 Notes

The test results of this report relate exclusively to the test item specified in 1.5. The KMO Lab does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the KMO Lab.

### 1. 2 Testing Laboratory

#### **Ke Mei Ou Laboratory Co., Ltd.**

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Site on File with the Federal Communications Commission – United States  
Registration Number: 125782  
For 3 & 10 meter OATS

Site Listed with Industry Canada of Ottawa, Canada  
Registration Number: IC4986  
For 3 & 10 meter OATS

### 1. 3 Details of Applicant

Name	: Wacal Inc
Address	: 10501 Valley Blvd, Suite 1860, E1 Monte CA91731 USA
Contact	: N/A
Tel	: N/A
Fax	: N/A

### 1. 4 Application Details

Date of Receipt of Application	: February 12, 2007
Date of Receipt of Test Item	: February 12, 2007
Date of Test	: February 12~March 2, 2007

### 1. 5 Test Item

Manufacturer	: See Applicant
Trade Name	: Wacal
Model No.	: SIM200
Description	: GPRS Vehicle Terminal

### Additional Information

Frequency	: 1850.2MHz~1909.8MHz
RF Power	: 0.34W
Number of Channels	: N/A
Power Supply	: DC 12V
Dimension	: N/A
Weight	: N/A

### 1. 6 Test Standards

FCC Part 24 Subpart E: 2004

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

## 2. Technical Test Results

### 2. 1 Summary of Test Results

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.107	AC Line Conducted Emission	N/A	Owing to the DC operation of EUT, this test item is not performed.
FCC 2.1046 & 90.205(h)	RF Output Power	PASS	Complies
FCC 24.232	EIRP	PASS	Complies
FCC 2.1049 & 24.238(b)	Occupied Bandwidth & Band Edge	PASS	Complies
FCC 2.1051	Conducted Emission	PASS	Complies.
FCC 2.1053	Field Strength of Spurious Radiation	PASS	Complies.
FCC 2.1055 & 24.235	Frequency Stability Vs. Temperature	PASS	Complies.
FCC 2.1055 & 24.235	Frequency Stability Vs. Voltage	PASS	Complies.

### 2. 2 EUT Modifications

No modification by Ke Mei Ou Laboratory Co., Ltd.

### 3. Technical Characteristics Test

#### 3.1 Conducted Emission Test

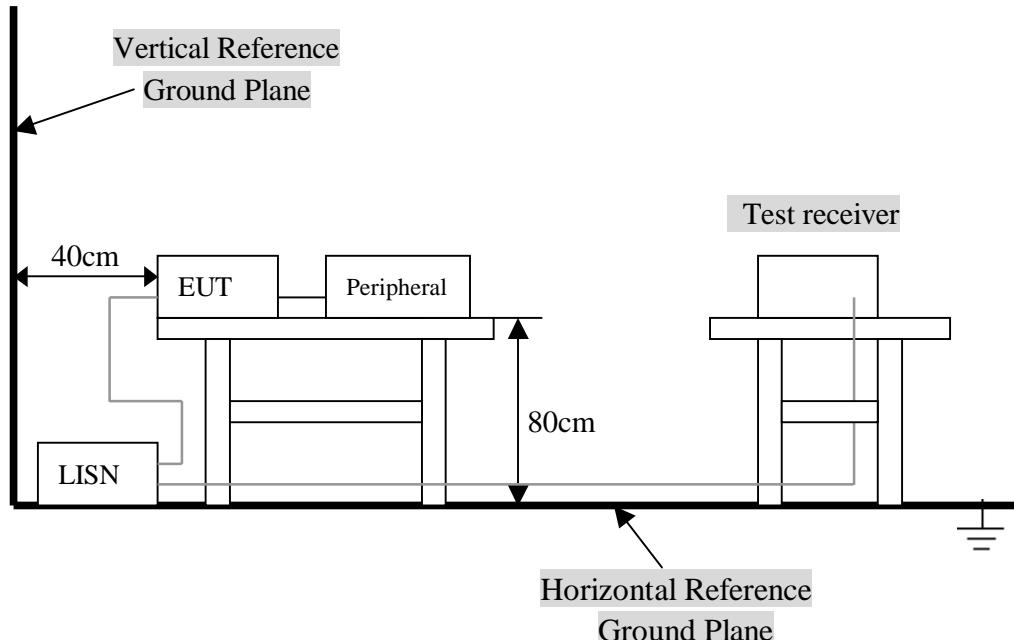
##### 3.1.1 Test Equipment

Please refer to Section 6 this report.

##### 3.1.2 Test Procedure

The EUT was tested according to ANSI C63.4 - 2001. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 uHenry as specified by section 5.1 of ANSI C63.4 - 2003. cables and peripherals were moved to find the maximum emission levels for each frequency.

##### 3.1.3 Test Setup



For the actual test configuration, Please refer to the related items – Photos of Testing.

### 3.1.4 Configuration of the EUT

Prepared in accordance with the requirements of the FCC Rules and Regulations Part 2. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer or receiver was off throughout evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. The EUT was configured according to ANSI C63.4-2003. EUT was used DC 12V. The operation frequency is from 1850.2MHz~1909.8MHz. Enable the signal transmitted from the external antenna from EUT to receiver. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

#### A. EUT

Device	Manufacturer	Model #	FCC ID
GRPS Vehicle Terminal	Wacal Inc	SIM200	P3CSIM200

#### B. Internal Devices

Device	Manufacturer	Model #	FCCID / DoC
N/A			

#### C. Peripherals

Device	Manufacturer	Model # Serial #	FCC ID/ DoC	Cable
N/A				

### 3.1.5 EUT Operating Condition

Operating condition is according to ANSI C63.4 - 2001.

- Setup the EUT and simulators as shown on follow.
- Enable RF signal and confirm EUT active.
- Modulate output capacity of EUT up to specification.

### 3.1.6 Conducted Power Line Emission Limits

FCC Part 15 Paragraph 15.107 (dBuV)		
Frequency Range (MHz)	Class A QP/AV	Class B QP/AV
0.15 – 0.5	79/66	66-56/56-46
0.5 – 5.0	73/60	56/46
5.0 - 30	73/60	60/50

**NOTE** : In the above table, the tighter limit applies at the band edges.

### 3.1.7 Conducted Power Line Test Result

Owing to the DC operation of EUT, this test item is not performed.

### 3.2 RF Output Power

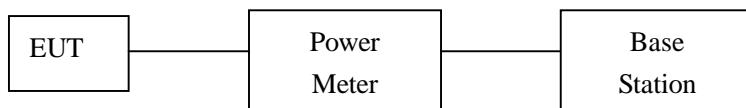
#### 3.2.1 Test Equipment

Please refer to section 6 this report.

#### 3.2.2 Test Procedure

The transmitter output was connected to power meter and base station through power divider. Set EUT at PCL=0 for PCS 1900 through base station. Select lowest, middle, and highest channels for each band.

#### 3.2.3 Test Setup



#### 3.2.4 Configuration of The EUT

Same as section 3.1.4 of this report

#### 3.2.5 EUT Operating Condition

Same as section 3.1.5 of this report

#### 3.2.6 Limit

According to FCC 2.1046 and FCC 24.232(b), mobile stations are limited to 2 watts eirp peak power.

#### 3.2.7 RF Output Power Test Result

Product	: GPRS Vehicle Terminal	Test Mode	: CH Low ~ CH High
Test Item	: RF Output Power	Temperature	: 25 °C
Test Voltage	: DC 12V (External Power Supply)	Humidity	: 56% RH
Test Result	: <b>PASS</b>		

##### CH Low

Freq. (MHz)	Conducted Power (dBm)	Conducted Power (Watts)
1850.2	29.1	0.813

##### CH Middle

Freq. (MHz)	Conducted Power (dBm)	Conducted Power (Watts)
1880.0	29.1	0.832

##### CH High

Freq. (MHz)	Conducted Power (dBm)	Conducted Power (Watts)
1909.8	30.0	1.000

### 3.3 ERP / EIRP Measurement

#### 3.3.1 Test Equipment

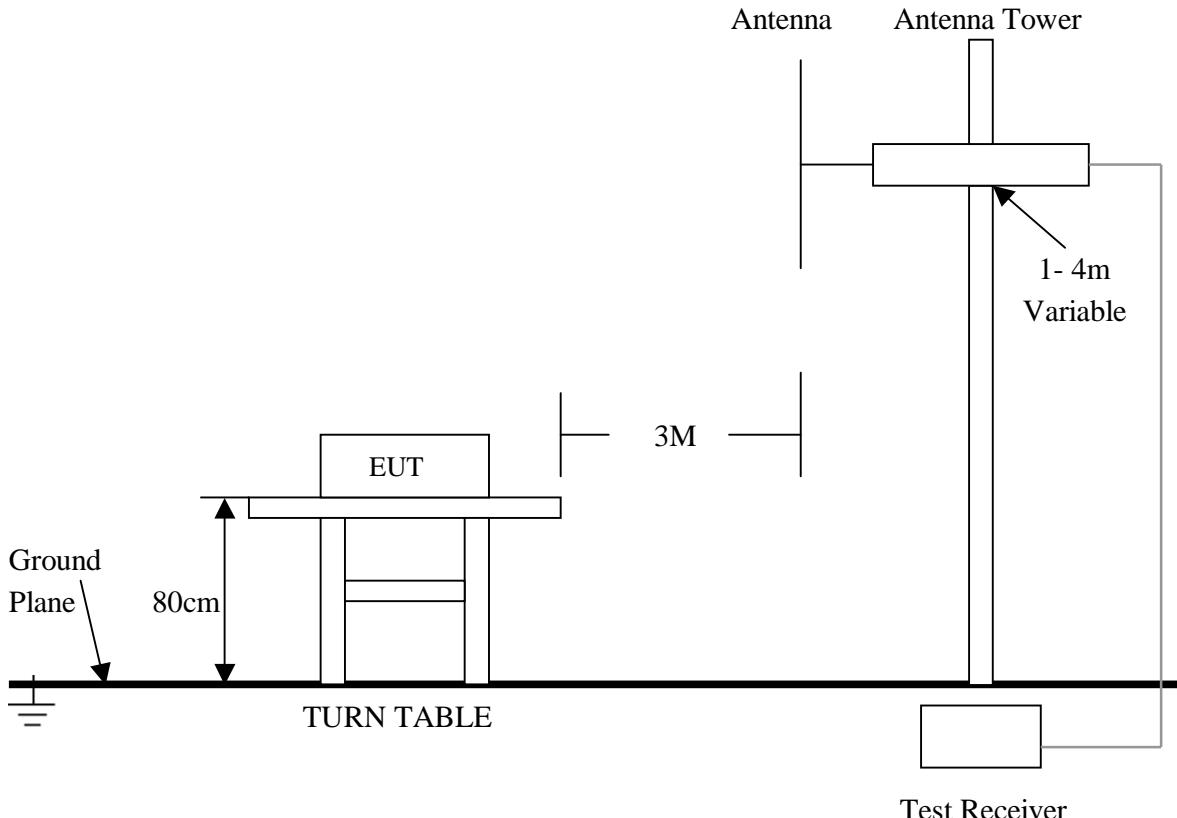
Please refer to section 6 this report.

#### 3.3.2 Test Procedure

1. Setup the configuration as section 3.3.3 this report test setup for frequencies measured below and above 1GHz respectively. adjusting the input voltage to produce the maximum power as measured.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1MHz frequency span and 1MHz resolution bandwidth.
3. 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 test receiver, then change the orientation of EUT on test table over a range from 0 degree to 360 degree, and record the highest value indicated on test receiver as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator(SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on test receiver, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on test receiver. Record this value for result calculated.
7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

Result calculation is as following:  
 Result = SG Reading + Cable Loss + Antenna Gain Corrected

#### 3.3.3 Test Setup



For the actual test configuration, please refer to the related items – Photos of Testing.

#### 3.3.4 Configuration of The EUT

Same as section 3.1.4 of this report

#### 3.3.5 EUT Operating Condition

Same as section 3.1.5 of this report

### 3.3.6 Test Result

Product	: GPRS Vehicle Terminal	Test Mode	: CH Low ~ CH High
Test Item	: ERP/EIRP Measurement	Temperature	: 25 °C
Test Voltage	: DC 12V (External Power Supply)	Humidity	: 56% RH
Test Result	: <b>PASS</b>		

#### CH Low

Frequency. (MHz)	Result (dBm)	Output Power (Watts)
1850.2	26.91	0.49

#### CH Middle

Frequency. (MHz)	Result (dBm)	Output Power (Watts)
1880.0	26.96	0.50

#### CH High

Frequency. (MHz)	Result (dBm)	Output Power (Watts)
1909.8	27.01	0.50

### 3.4 Occupied Bandwidth and Band Edge Measurement

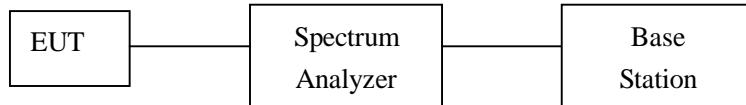
#### 3.4.1 Test Equipment

Please refer to section 6 this report.

#### 3.4.2 Test Procedure

The EUT was connected to Spectrum Analyzer and Base Station via power divider. The occupied bandwidth of middle channel for the highest RF powers was measured. The bandedge of low and high channels for the highest RF powers within the transmitting frequency band were measured. Setting RBW as roughly BW/10.

#### 3.4.3 Test Setup



#### 3.4.4 Configuration of The EUT

Same as section 3.1.4 of this report

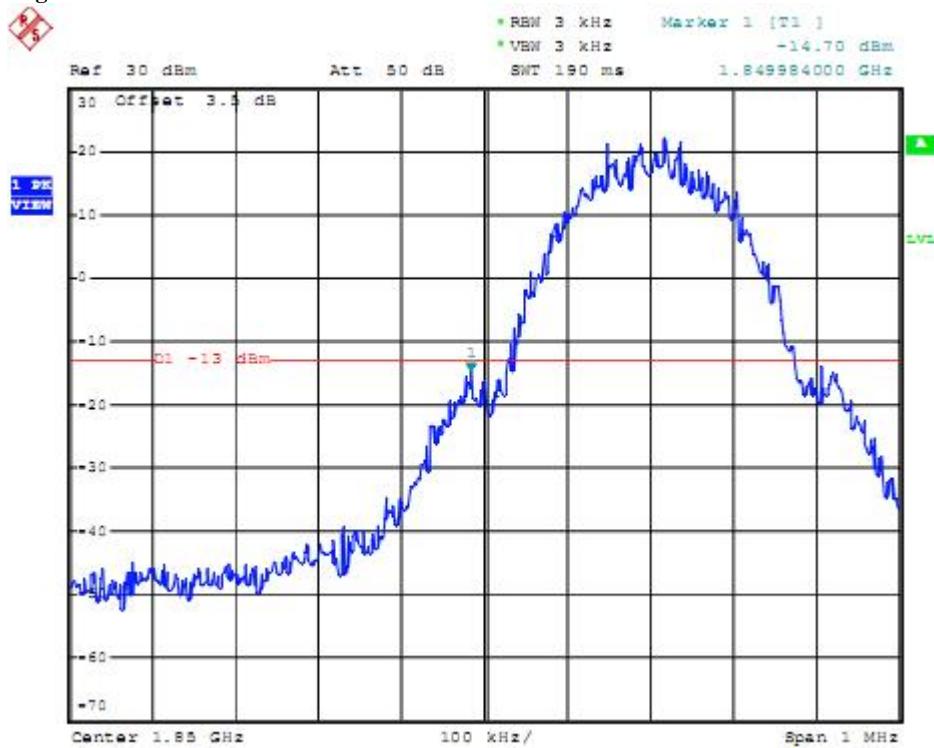
#### 3.4.5 EUT Operating Condition

Same as section 3.1.5 of this report

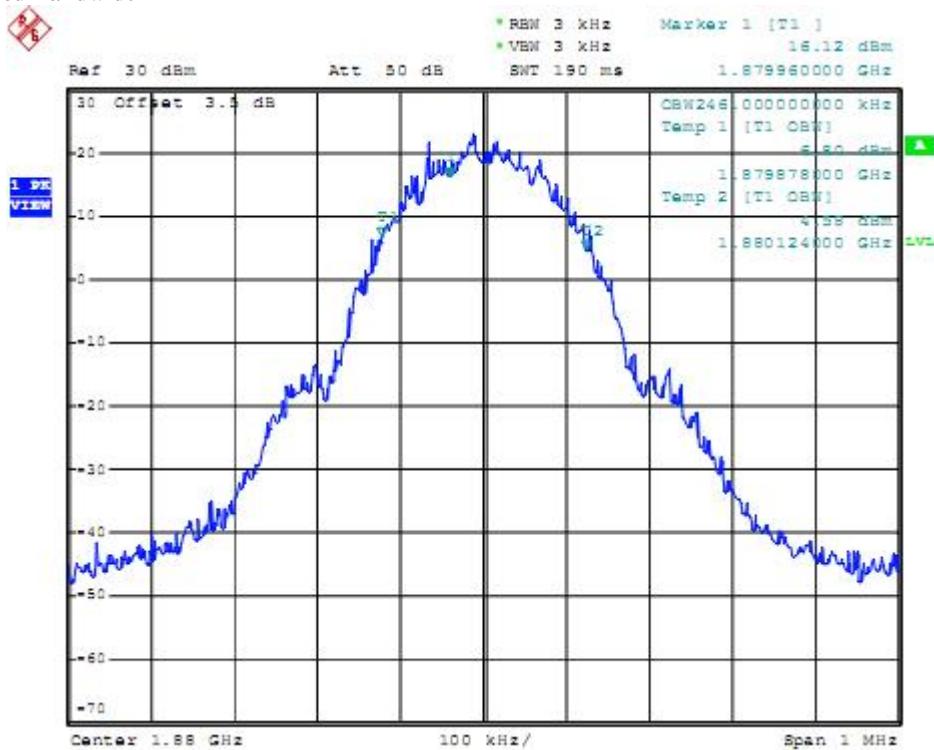
### 3.4.7 Occupied Bandwidth Test Result

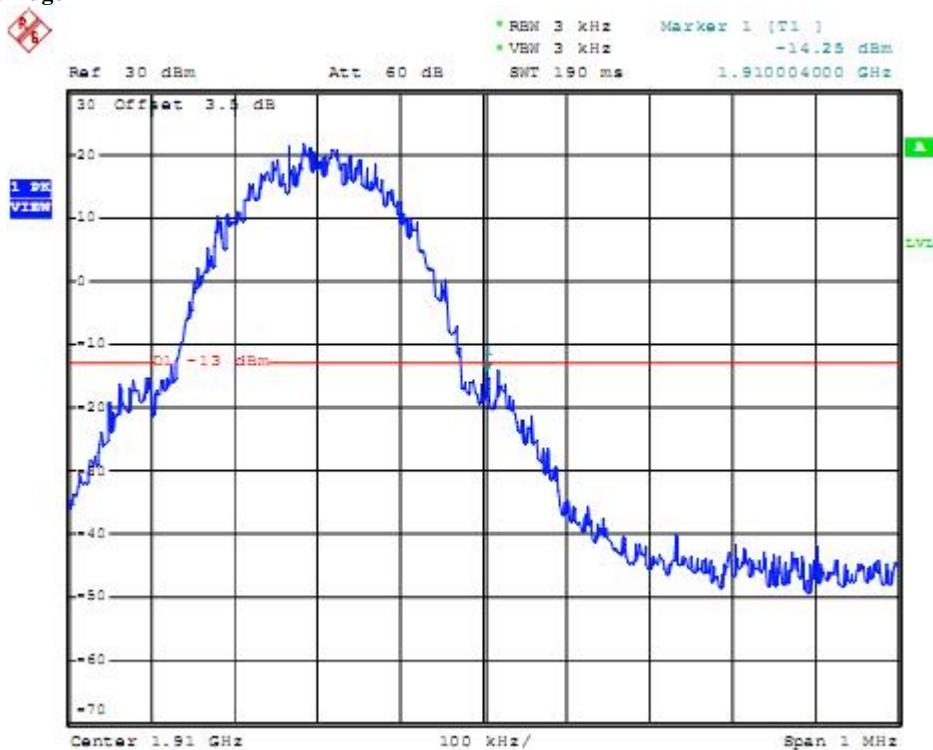
Product	: GPRS Vehicle Terminal	Test Mode	: CH Low ~ CH High
Test Item	: Occupied Bandwidth	Temperature	: 25 °C
Test Voltage	: DC 12V (External Power Supply)	Humidity	: 56%RH
Test Result	: <b>PASS</b>		

## Lower Band Edge



## 99% Occupied Bandwidth



**Higher Band Edge**

### 3.5 Radiated Spurious Emission

#### 3.5.1 Test Equipment

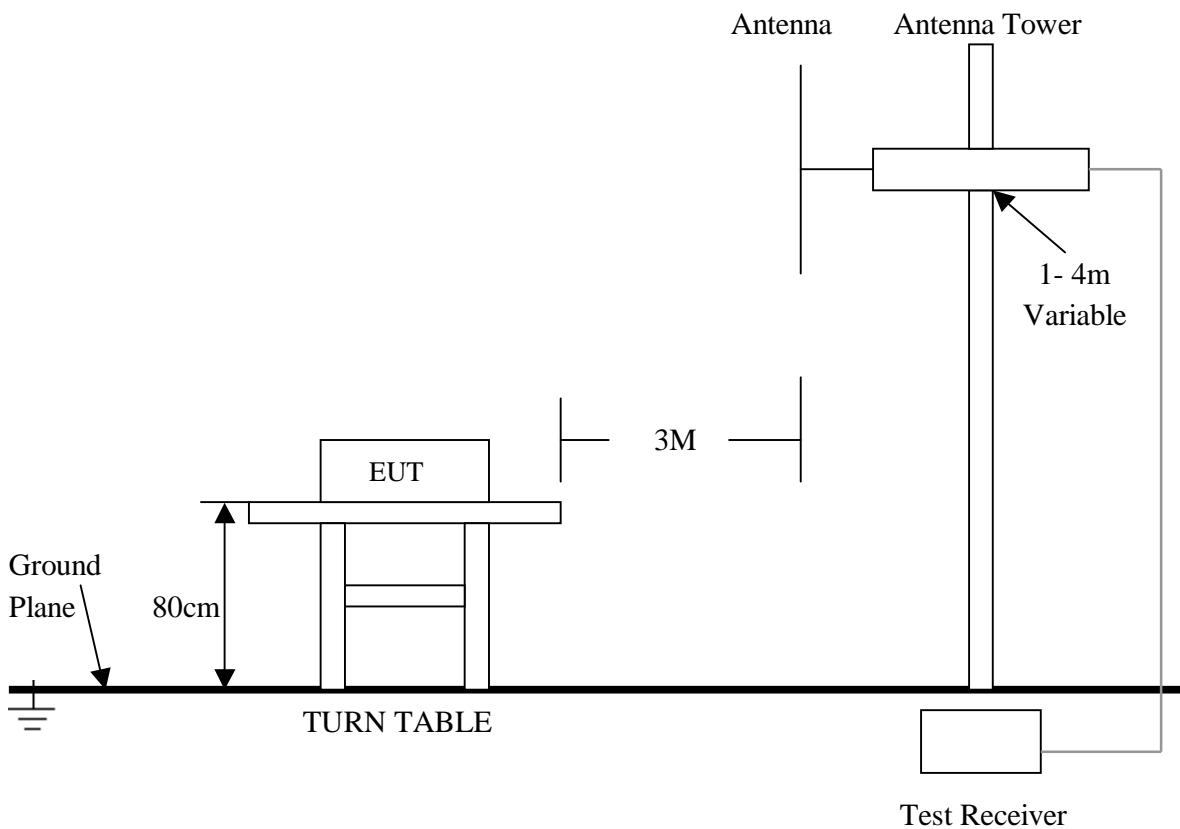
Please refer to section 6 this report.

#### 3.5.2 Test Procedure

The transmitter was placed on a wooden turntable and was transmitting in a non radiating dummy load which was directly connected to the antenna connector. The battery was replaced by monitored voltage source. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna was height and polarization as well as the EUT azimuth where varied in orders to identify the maximum level of emission from the EUT. The test was performed by placing the EUT on 3 orthogonal axis. The frequency range up to tenth harmonic of the fundamental frequency was investigated. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution. All tests was performed for the lower, the middle and the highest frequency.

Spurious emissions in dB =  $10 \lg(\text{Tx power in Watts}/0.001)$  – absolute level  
 Spurious attenuation limit in dB =  $43 + 10\lg(\text{power out in Watts})$

#### 3.5.3 Test Setup



For the actual test configuration, please refer to the related items – Photos of Testing.

#### 3.5.4 Configuration of The EUT

Same as section 3.1.4 of this report

#### 3.5.5 EUT Operating Condition

Same as section 3.1.5 of this report

#### 3.5.6 Limit

FCC Part 2.1053, and 24.238(a).

### 3.5.7 Radiated Spurious Emission Test Result

Product	: GPRS Vehicle Terminal	Test Mode	: CH Low ~ CH High
Test Item	: Radiated Spurious Emission	Temperature	: 25 °C
Test Voltage	: DC 12V (External Power Supply)	Humidity	: 56% RH
Test Result	: <b>PASS</b>		

#### CH Middle

Frequency (MHz)	Result (dBm) Hori. / Vert.		Limit (dBm)	Margin (dB) Hori. / Vert.	
2775.480	-65.14	-63.24	-13	-52.14	-50.24
3760.500	-59.14	-55.44	-13	-46.14	-42.44
5640.500	-64.24	-60.94	-13	-51.24	-47.94
7520.500	-48.94	-45.13	-13	-35.94	-32.13
-			-13		
-			-13		

Note: “-“ means that the emission level is too low to be measured or at least 20 dB down than the limit.

### 3.6 Conducted Emission

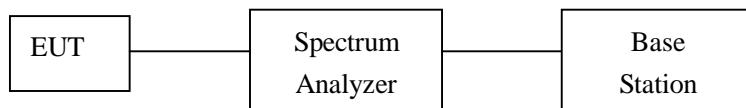
#### 3.6.1 Test Equipment

Please refer to section 6 this report.

#### 3.6.2 Test Procedure

The EUT was connected to Spectrum Analyzer and Base Station via power divider. The middle channel for the highest RF power within the transmitting frequency was measured. The conducted spurious emission for the whole frequency range was taken.

#### 3.6.3 Test Setup



#### 3.6.4 Configuration of The EUT

Same as section 3.1.4 of this report

#### 3.6.5 EUT Operating Condition

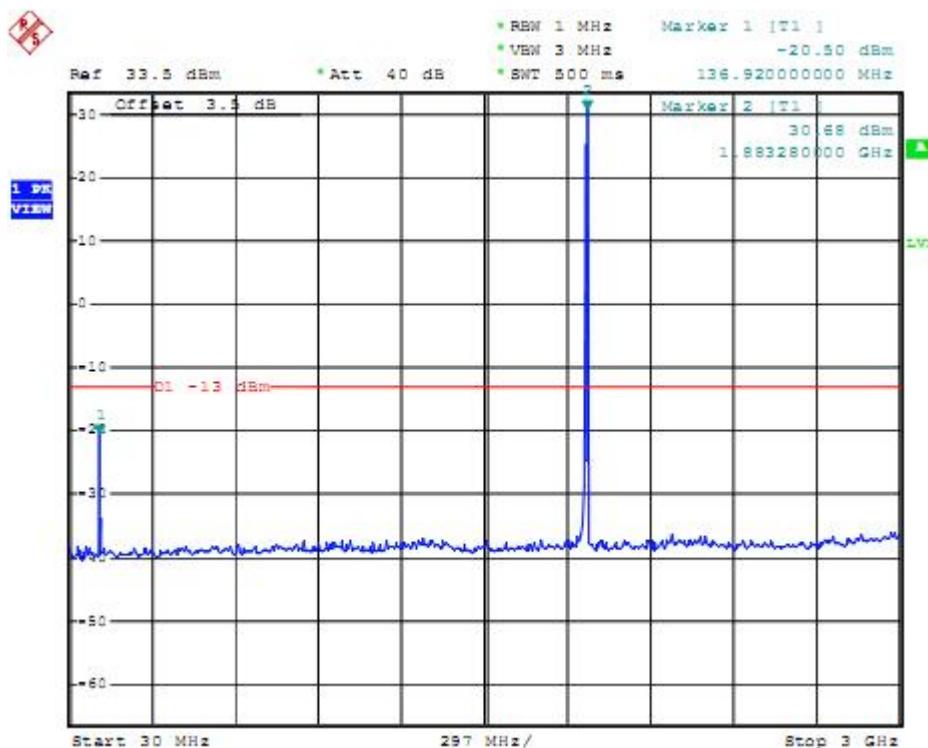
Same as section 3.1.5 of this report

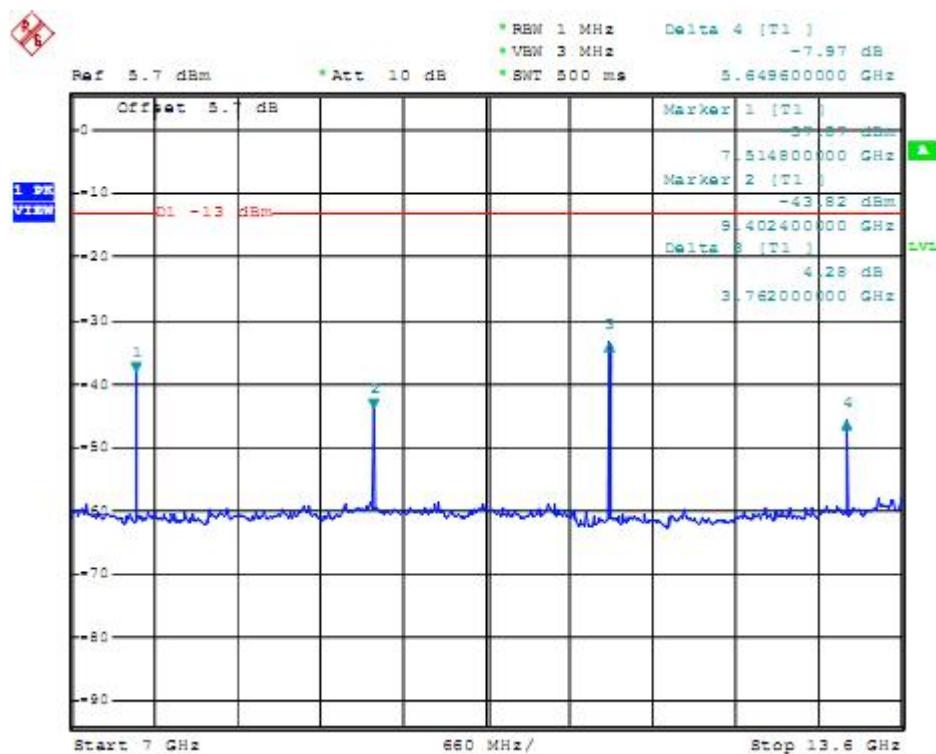
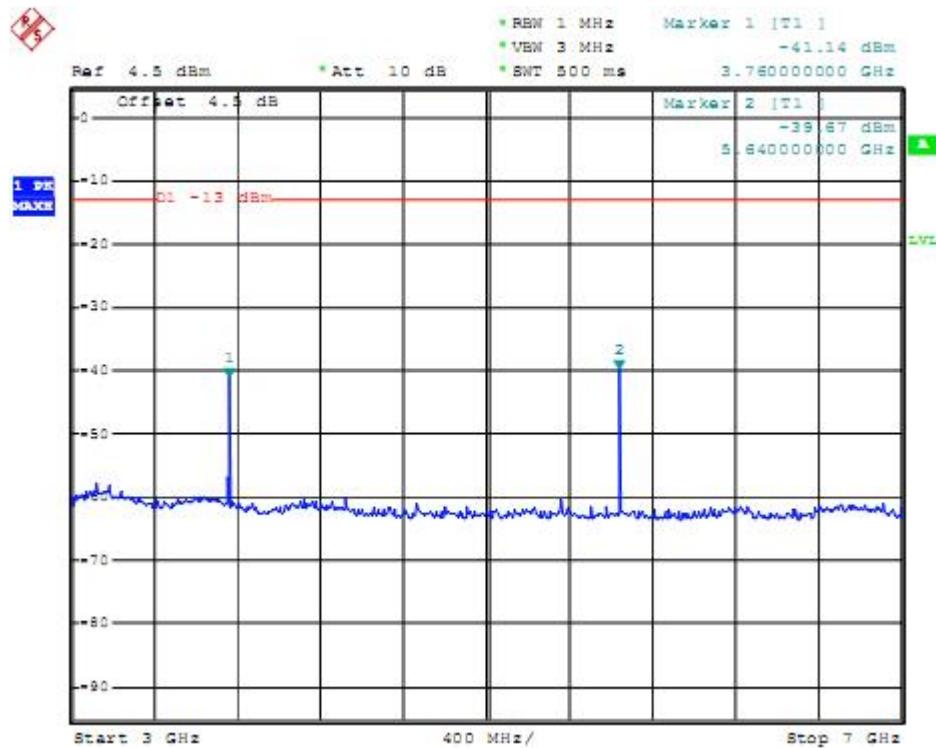
#### 3.6.6 Limit

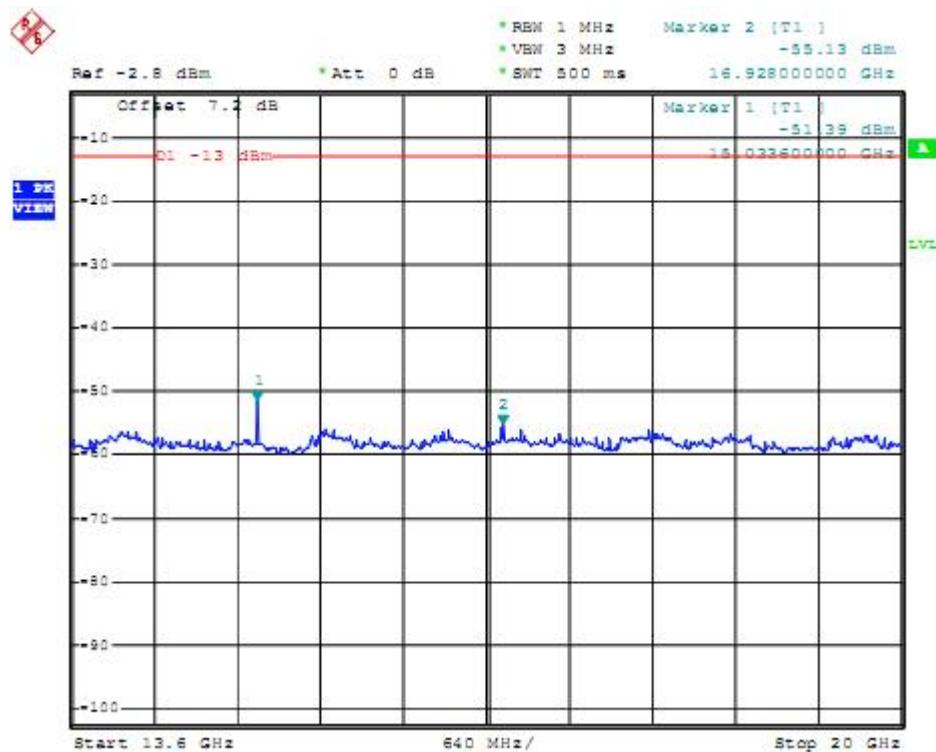
According to FCC 2.1049 and 24.238, on any frequency outside a license's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10\log(P)$  dB.

#### 3.6.7 Spurious Emission on Antenna Port Test Result

Product	: GPRS Vehicle Terminal	Test Mode	: CH Low ~ CH High
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 °C
Test Voltage	: DC 12V (External Power Supply)	Humidity	: 56%RH
Test Result	: <b>PASS</b>		







### 3.7 Frequency Stability

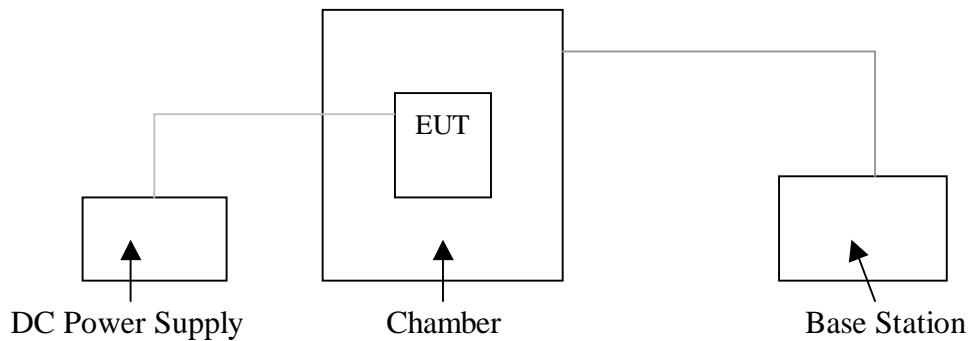
#### 3.7.1 Test Equipment

Please refer to section 6 this report.

#### 3.7.2 Test Procedure

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Base Station. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage: An external variable DC power supply source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated. The result was recorded.

#### 3.7.3 Test Setup



#### 3.7.4 Configuration of The EUT

Same as section 3.1.4 of this report

#### 3.7.5 EUT Operating Condition

Same as section 3.1.5 of this report

#### 3.7.6 Limit

FCC Part 2.1055(a), 2.1055(d) and According to FCC 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### 3.7.7 Frequency Stability Test Result

Frequency stability versus temperature 1880MHz

Environment Temperature (°C)	Power Supplied Vdc	Change (Hz)	Change (ppm)	Limit (ppm)
50	12V	32	0.02	2.5
40	12V	30	0.02	2.5
30	12V	26	0.01	2.5
20	12V	22	0.01	2.5
10	12V	21	0.01	2.5
0	12V	22	0.01	2.5
-10	12V	20	0.01	2.5
-20	12V	25	0.01	2.5
-30	12V	34	0.02	2.5

Frequency stability versus end-point supplied voltage (10.8Vdc)

Reference Frequency: 1880 MHz		Limit: 2.5 ppm
Environment Temperature (°C)	Power Supplied (Vdc)	Change (Hz) (ppm)
25	End-Point	24 0.01

### 3.8 RF Exposure Requirements

#### 3.8.1 Test Equipment

Please refer to section 6 this report.

#### 3.8.2 Limit

According to FCC 1.1307(b)(1) and 2.1091, Systems operating under provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commissions guidelines.

FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (Vm)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3–0.3	61.4	1.63	7(100)	5
3.0–30	1842 <sup>a</sup>	4.85 <sup>a</sup>	7(90/24)	5
30–300	61.4	0.163	1.0	5
300–1000			1/300	5
1000–100,000			5	5
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34	61.4	1.63	7(100)	30
1.34–30	824 <sup>a</sup>	2.16 <sup>a</sup>	7(100/2)	30
30–300	27.5	0.073	0.2	30
300–1500			1/1500	30
1500–100,000			1.0	30

<sup>a</sup> = Frequency in MHz

<sup>a</sup> = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

#### 3.8.3 Test Result

Product	: GPRS Vehicle Terminal	Test Mode	: CH Low ~ CH High
Test Item	: RF Exposure	Temperature	: 25 °C
Test Voltage	: DC 12V (Power by DC Power Supply)	Humidity	: 56% RH
Test Result	: PASS		

Evaluation of RF Exposure Compliance Requirements MPE Prediction of MPE according to equation from page 19 of OET Bulletin 65, Edition 97-01	
RF Exposure Requirements	Compliance with FCC Rules
$S = PG/4\pi R^2$ <p>Where:  <math>S</math>=Power density  <math>P</math>=Power input to antenna  <math>G</math>=Power gain of the antenna relative to an isotropic radiator  <math>R</math>=Distance to the center of radiation of the antenna</p>	<p>Maximum EIRP:  <math>27.01 \text{ dBm} = 502.34 \text{ mW}</math>          Antenna Gain (typical): 0 dBi          Maximum antenna gain: 1 (numeric)          Prediction distance: 20 cm          Prediction frequency: 1909.8MHz          MPE limit for uncontrolled exposure at prediction frequency: <math>1.0 \text{ mW/cm}^2</math></p> <p>Power density at 20 cm: <math>0.100 \text{ mW/cm}^2</math></p>

## 4. Photos of Testing

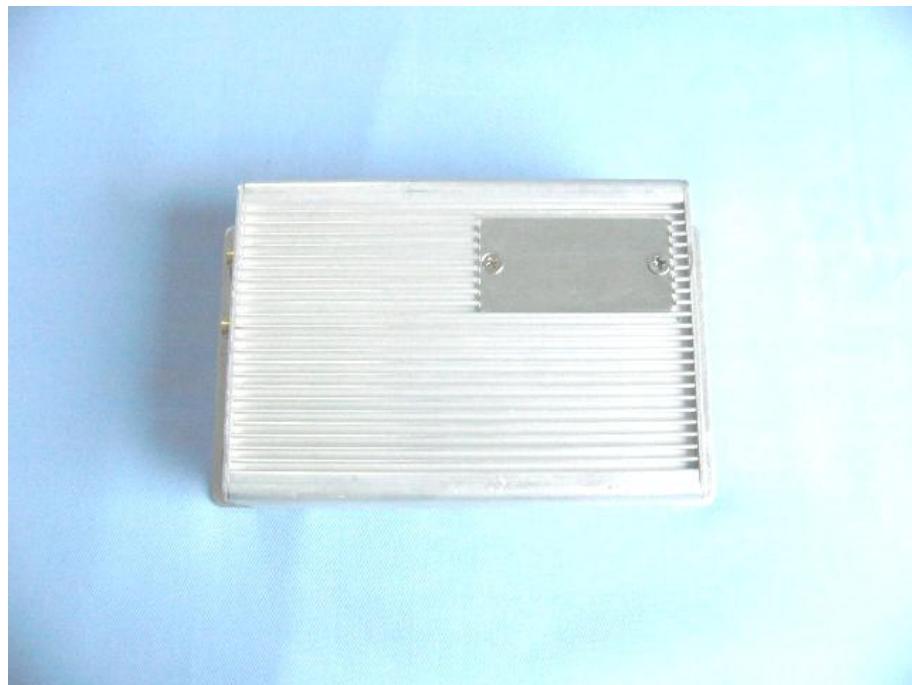
### 4. 1 EUT Test Photographs

Radiated emission test view



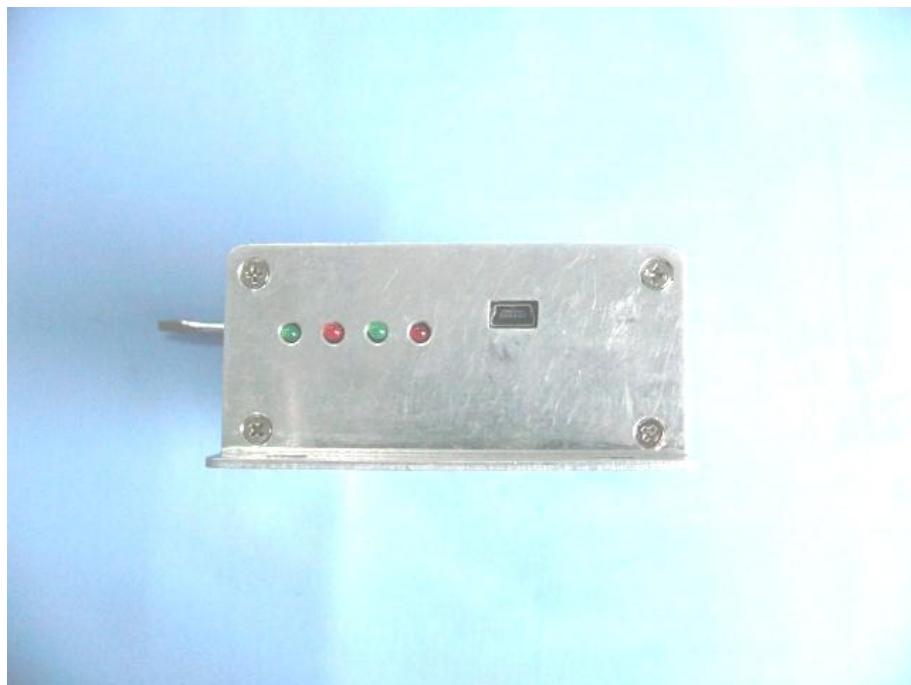
## 4.2 EUT Detailed Photographs

EUT top view



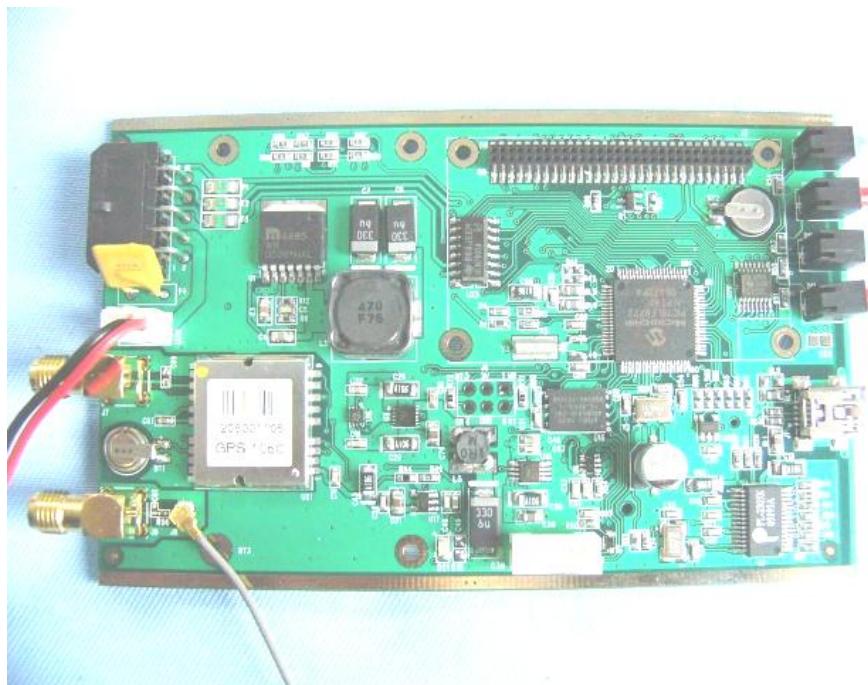
EUT bottom view

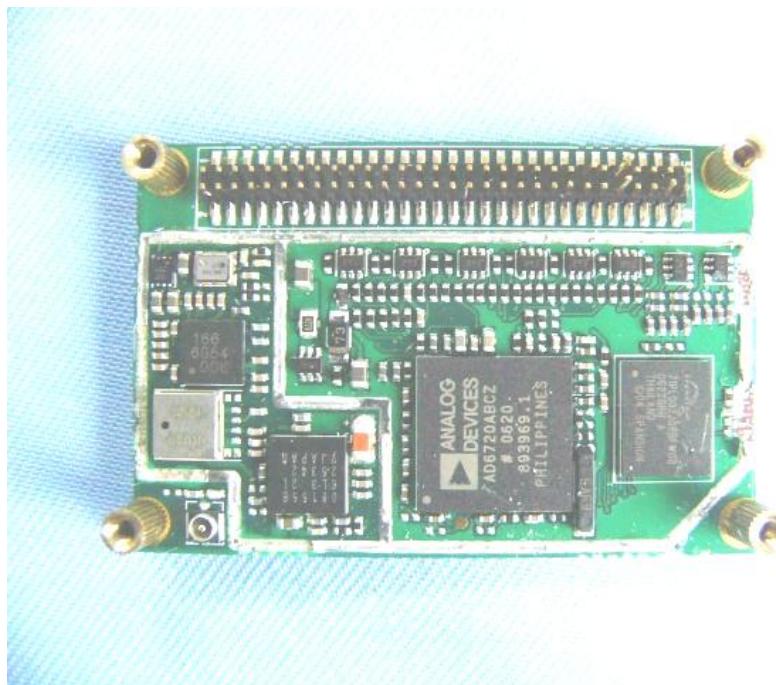




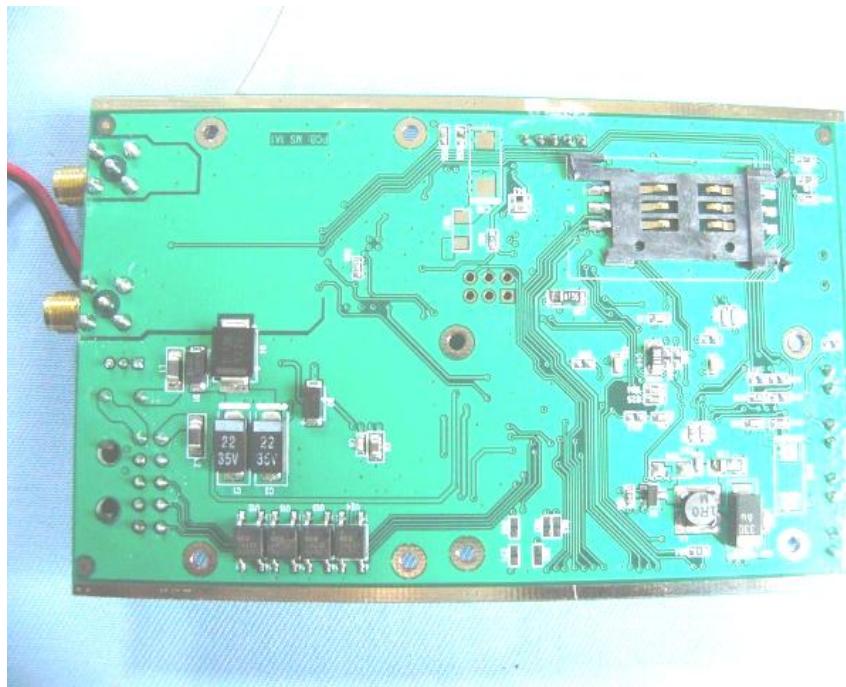
EUT inside whole view







Main board component side





## 5. FCC ID Label

**FCC ID: P3CSIM200**

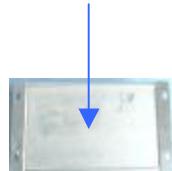
**WARNING:**

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

The Label must not be a stick-on paper label. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

**Proposed Label Location on EUT**

EUT Bottom View/Proposed FCC ID Label Location



## 6. Test Equipment

The following test equipments were used during the radiated & conducted emission test:

Equipment/ Facilities	Manufacturer	Model #	Serial No.	Date of Cal.	Due Date
Turntable	KMO	KSZ001T	200306	NCR	NCR
Antenna Tower	KMO	KSZ002AT	200307	NCR	NCR
OATS	KMO	KSZSITE001	N/A	July 06, 2006	July 06, 2007
EMI Test Receiver	Rohde & Schwarz	ESPI3	100180	Oct.18, 2006	Oct.18, 2007
Spectrum Analyzer	Rohde & Schwarz	FSP40	100273	Sep. 18, 2006	Sep. 18, 2007
Signal Generator	FLUKE	PM5418+Y/C	LO747012	Feb.10, 2007	Feb.10, 2008
Signal Generator	FLUKE	PM5418TX	LO738007	Feb.10, 2007	Feb.10, 2008
Loop Antenna	SCHWARZBECK	FMZB1516	113	Jan. 30, 2007	Jan. 30, 2008
Loop Antenna	Rohde & Schwarz	HFH2-Z2	872096/16	Jan. 30, 2007	Jan. 30, 2008
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	9161-4079	Sep.18, 2006	Sep.18, 2007
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	9161-4080	Sep.18, 2006	Sep.18, 2007
Broad-Band Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-564	Sep.18, 2006	Sep.18, 2007
Broad-Band Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-565	Sep.18, 2006	Sep.18, 2007
Ultra Broadband Antenna	Rohde & Schwarz	HL 562	100110	June.05, 2006	June.05, 2007
AMN	Rohde & Schwarz	ESH3-Z5	100196	Oct. 23, 2006	Oct. 23, 2007
AMN	Rohde & Schwarz	ESH3-Z5	100197	Oct. 23, 2006	Oct. 23, 2007
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	N/A	N/A	N/A
Absorbing Clamp	Rohde & Schwarz	MDS-21	N/A	Oct. 29, 2006	Oct. 29, 2007
KMO Shielded Room	KMO	KMO-001	N/A	N/A	N/A
EMI Test Receiver	Rohde & Schwarz	ESCS30	100003	Feb. 27, 2006	Feb.27, 2007
Coaxial Cable with N-Connectors	SCHWARZBECK	AK9515H	95549	Sep.18, 2006	Sep.18, 2007
Power Meter	Rohde & Schwarz	NRVD	100041	Feb.10, 2007	Feb.10, 2008
Radio Communication Test Set	Rohde & Schwarz	CMS 54	846621/024	Feb.10, 2007	Feb.10, 2008
Radio Communication Tester	Rohde & Schwarz	CMU200	100680	Feb.10, 2007	Feb.10, 2008
Modulation Analyzer	Hewlett-Packard	8901B	2303A00362	Feb.10, 2007	Feb.10, 2008
Communication Analyzer	Wavetek Stabilock	4032	N/A	Feb. 01, 2007	Feb.01, 2008
Storage Oscilloscope	Tektronix	TDS3052	N/A	Feb. 01, 2007	Feb.01, 2008
Scanner Receiver	Yaesu	VR-500	2G300051	Feb. 01, 2007	Feb.01, 2008
Attenuator	Schwarzbeck	20dB	N/A	Feb. 01, 2007	Feb.01, 2008
Attenuator	Rohde & Schwarz	10dB	N/A	Feb. 01, 2007	Feb.01, 2008
SOHO Telephone Switching System	IKE	2000-108C	N/A	Feb.10, 2007	Feb.10, 2008
Temperature Chamber	TABAI	PSL-4GTW	N/A	Feb.10, 2007	Feb.10, 2008
3m Semi-Anechoic Chamber	Albatross Projects	9mX6mX6m	N/A	Feb.10, 2007	Feb.10, 2008