



# EMC TEST REPORT

No. I15Z40879-EMC03

for

**TCL Communication Ltd.**

**CDMA+LTE mobile phone for Sprint**

**Model Name: 5017B**

**FCC ID: 2ACCJB011**

with

**Hardware Version: VE**

**Software Version: 5017BA0B**

**Issued Date: 2015-05-25**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL Beijing.

**Test Laboratory:**

***FCC 2.948 Listed: No. 525429***

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## **REPORT HISTORY**

| <b>Report Number</b> | <b>Revision</b> | <b>Description</b>      | <b>Issue Date</b> |
|----------------------|-----------------|-------------------------|-------------------|
| I15Z40879-EMC03      | Rev.0           | 1 <sup>st</sup> edition | 2015-05-19        |
| I15Z40879-EMC03      | Rev.1           | 2 <sup>nd</sup> edition | 2015-05-25        |

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## **1. Test Laboratory**

### **1.1. Testing Location**

#### **Location 2: CTTL(Shouxiang)**

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China 100191

### **1.2. Testing Environment**

Normal Temperature: 15-35℃  
Relative Humidity: 20-75%  
Air pressure 980 - 1040 hPa

The climatic requirements above are general exclude the special requirements for dedicated test environments listed in section 5 and some specific test cases in other parts of this report.

### **1.3. Project data**

Testing Start Date: 2015-05-15  
Testing End Date: 2015-05-15

### **1.4. Signature**



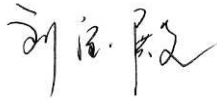
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**Zhang Hui**  
**(Prepared this test report)**



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**Qu Pengfei**  
**(Reviewed this test report)**



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**Liu Baodian**  
**(Approved this test report)**



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: TCL Communication Ltd.  
Address /Post: 5F, C building, No. 232, Liang Jing Road, ZhangJiang High-Tech  
Park, Pudong Area, Shanghai, P.R. China. 201203  
City: Shanghai  
Postal Code: 201203  
Country: China  
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Contact Email: zhizhou.gong@tcl.com  
Telephone: +86 21 51798260  
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### **2.2. Manufacturer Information**

Company Name: TCL Communication Ltd.  
Address /Post: 5F, C building, No. 232, Liang Jing Road, ZhangJiang High-Tech  
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Postal Code: 201203  
Country: China  
Telephone: +86 21 51798260  
Fax: +86 21 61460602

### **3. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

#### **3.1. About EUT**

|                     |  |
|---------------------|--|
| Description         | LTE FDD band 25/26; LTE TDD band 41; CDMA Band Class 0/1/10 1X RTT、EV-DO、rev0、rev.A<br>MP3, camera, USB, FM mobile phone |
| FCC ID              | 2ACCJB011  |
| Antenna             | Internal   |
| Power supply        | Battery ( charged by travel adapter or vehicle charger )   |
| Extreme vol. Limits | 3.5VDC to 4.35VDC (nominal: 3.8VDC)  |

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Telecommunication Metrology Center of MIIT of People's Republic of China.

#### **3.2. Internal Identification of EUT used during the test**

| EUT ID* | IMEI           | HW Version | SW Version |
|---------|----------------|------------|------------|
| EUT1    | 35820406010175 | VE         | 5017BA0B   |

\*EUT ID: is used to identify the test sample in the lab internally.

#### **3.3. Internal Identification of AE used during the test**

| AE ID* | Description | SN | Revision      |
|--------|-------------|----|---------------|
| AE1    | Battery     | /  | 15TCT-BA-0280 |
| AE2    | Battery     | /  | 15TCT-BA-0275 |
| AE3    | Battery     | /  | 15TCT-BA-0274 |
| AE4    | Battery     | /  | 15TCT-BA-0279 |

AE1,AE2,AE3,AE4

|                 |          |
|-----------------|----------|
| Model           | TLi020F2 |
| Manufacturer    | SCUD     |
| Capacitance     | 2000 mAh |
| Nominal voltage | 3.8 V    |

\*AE ID: is used to identify the test sample in the lab internally.

### **3.4. General Description**

The Equipment Under Test (EUT) is a model of CDMA+LTE mobile phone for Sprint with integrated antenna and embedded battery.

The EUT supports LTE FDD bands 25/26 , TDD LTE band 41 and CDMA Band class 0/Band class 1/ Band class 10(subclass 2 and 3), supports 1X RTT、 EV-DO、 rev0、 rev.A. It has MP3, camera, USB memory, FM radio functions.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

### **3.5. EUT set-ups**

| <b>EUT Set-up No.</b> | <b>Combination of EUT and AE</b> | <b>Remarks</b>     |
|-----------------------|----------------------------------|--------------------|
| Set.1                 | EUT1 +AE1                        | ERP/EIRP/RSE tests |

## 4. Reference Documents

### 4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

| Reference      | Title  | Version            |
|----------------|--|--------------------|
| FCC Part 90    | PRIVATE LAND MOBILE RADIO SERVICES   | 10-1-14<br>Edition |
| ANSI/TIA-603-C | Land Mobile FM or PM Communications Equipment<br>Measurement and Performance Standards   | 2004               |
| ANSI C63.4     | Methods of Measurement of Radio-Noise Emissions from<br>Low-Voltage Electrical and Electronic Equipment in the<br>Range of 9 kHz to 40 GHz | 2009               |
| KDB 971168 D01 | Measurement Guidance for Certification of Licensed Digital<br>Transmitters   | v02r02             |



## 5. LABORATORY ENVIRONMENT

**Fully-anechoic chamber FAC-3** (9 meters×6.5 meters×4 meters) did not exceed following limits along the EMC testing:

|   |   |
|---|---|
| Temperature                                     | Min. = 15 °C, Max. = 35 °C                        |
| Relative humidity                               | Min. = 15 %, Max. = 75 %                          |
| Shielding effectiveness                         | 0.014MHz - 1MHz, >60dB;<br>1MHz - 1000MHz, >90dB. |
| Electrical insulation                           | > 2 MΩ  |
| Ground system resistance                        | < 4 Ω   |
| Site voltage standing-wave ratio ( $S_{VSWR}$ ) | Between 0 and 6 dB, from 1GHz to 18GHz            |
| Uniformity of field strength                    | Between 0 and 6 dB, from 80 to 4000 MHz           |

## 6. SUMMARY OF TEST RESULTS

### 6.1. Summary of test results

| Abbreviations used in this clause: |         |   |
|------------------------------------|---------|---|
| Verdict Column                     | P       | Pass  |
|                                    | F       | Fail  |
|                                    | NA      | Not applicable  |
|                                    | NM      | Not measured  |
| Location Column                    | 1/2/3/4 | The test is performed in test location 1, 2, 3 or 4 which are described in section 1.1 of this report |

#### CDMA800 BC10

| Items | Test Name      | Clause in FCC rules | Section in this report | Verdict | Test Location |
|-------|----------------|---------------------|------------------------|---------|---------------|
| 1     | Output Power   | 90.635(b)           | 5.4                    | A.1     | 2             |
| 2     | Emission Limit | 90.691, 2.1051      | 5.5                    | A.2     | 2             |

## **6.2. Statements**

The test cases listed in section 6.1 of this report for the EUT specified in section 3 were performed by TMC according to the standards or reference documents in section 4.1

The EUT met all applicable requirements of the standards or reference documents in section 4.1.

This report only deals with the CDMA functions among the features described in section 3.

## 7. Test Equipments Utilized

| NO. | NAME                                    | TYPE      | PRODUCER    | SERIES<br>NUMBER | CAL. DUE<br>DATE | CAL.<br>INTERVAL |
|-----|---|-----------|-------------|------------------|------------------|------------------|
| 1.  | EMI Antenna                             | VULB 9163 | Schwarzbeck | 9163-235         | 2017-10-29       | 3 Years          |
| 2.  | EMI Antenna                             | 3117      | 00119024    | ETS-Lindgren     | 2016-01-20       | 3 Years          |
| 3.  | EMI Antenna                             | 3117      | 00058889    | ETS-Lindgren     | 2017-12-15       | 3 Years          |
| 4.  | Signal Generator                        | N5183A    | Agilent     | MY49060052       | 2016-03-02       | 1 Year           |
| 5.  | Power Amplifier                         | 5S1G4     | AR          | 0341863          | /                | 1 Year           |
| 6.  | Spectrum Analyzer                       | E4440A    | Agilent     | MY48250642       | 2016-03-02       | 1 Year           |
| 7.  | Universal Radio<br>Communication Tester | E5515C    | Agilent     | MY48363198       | 2015-07-06       | 1 Year           |

## **ANNEX A: MEASUREMENT RESULTS**

### **A.1 OUTPUT POWER**

#### **Reference**

FCC: CFR Part 90.635, and 2.1053

#### **A.1.1 Summary**

During the process of testing, the EUT was controlled via Agilent Universal Radio Communication Tester (E5515C) to ensure max power transmission and proper modulation.

This result contains peak output power and ERP/EIRP measurements for the EUT.

In all cases, output power is within the specified limits.

#### **A.1.2 Radiated**

##### **A.1.2.1 Description**

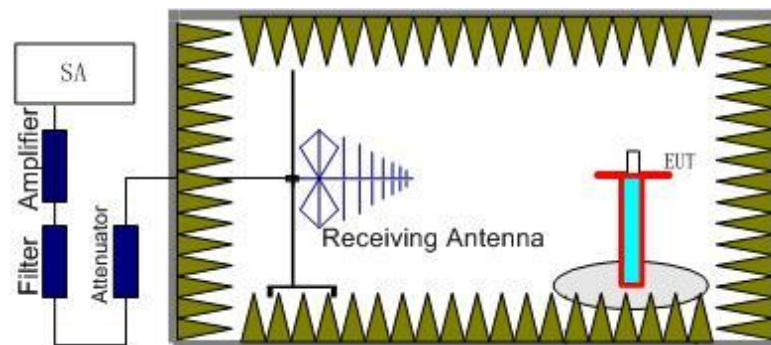
This is the test for the maximum radiated power from the EUT.

Rule Part 90.635(b) specifies "The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw)."

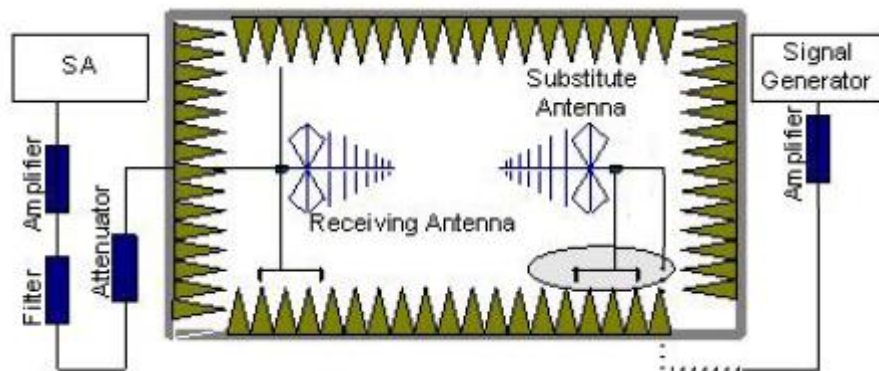
##### **A.1.2.2 Method of Measurement**

The measurements procedures in TIA-603C-2004 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. An amplifier should be connected to the Signal Source output port. And the cable should be connected between the amplifier and the substitution antenna.  
The cable loss ( $P_{cl}$ ), the substitution antenna Gain ( $G_a$ ) and the amplifier Gain ( $P_{Ag}$ ) should be recorded after test.  
The measurement results are obtained as described below:  
Power (EIRP) =  $P_{Mea} - P_{Ag} - P_{cl} - G_a$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (Unit dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15$ .

For test layout photo, please refer to Pic.1 in Annex B.

### CDMA800(BC10)- ERP

#### Limits

| Band          | Peak ERP (dBm)             |
|---------------|----------------------------|
| CDMA800(BC10) | $\leq 50\text{dBm}$ (100W) |

#### Measurement result

##### 1x RTT

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $P_{Ag}$ (dB) | $G_a$ (dBi) | Correction (dB) | Peak ERP(dBm) | Polarization |
|-----------------|-----------------|---------------|---------------|-------------|-----------------|---------------|--------------|
| 817.90          | -19.36          | 2.18          | -45.87        | -1.03       | 2.15            | 23.21         | Horizontal   |
| 823.10          | -18.32          | 2.24          | -45.80        | -0.10       | 2.15            | 23.19         | Horizontal   |

Sample calculation: 817.90MHz

$$\begin{aligned} \text{Peak ERP (dBm)} &= P_{Mea}(-19.36\text{dBm}) - G_a(-1.03\text{dBi}) - P_{Ag}(-45.87\text{dB}) - P_{cl}(2.18\text{dB}) - 2.15 \\ &= 23.21 \text{ dBm} \end{aligned}$$

**Ev-Do**

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | P <sub>Ag</sub><br>(dB) | G <sub>a</sub><br>(dBi) | Correction<br>(dB) | Peak<br>ERP(dBm) | Polarization |
|--------------------|---------------------------|-------------------------|-------------------------|-------------------------|--------------------|------------------|--------------|
| 817.90             | -19.31                    | 2.18                    | -45.87                  | -1.03                   | 2.15               | 23.26            | Horizontal   |
| 823.10             | -18.24                    | 2.24                    | -45.80                  | -0.10                   | 2.15               | 23.27            | Horizontal   |

Sample calculation: 823.10MHz

$$\begin{aligned} \text{Peak ERP (dBm)} &= P_{\text{Mea}}(-18.24\text{dBm}) - G_a(-0.10\text{dBi}) - P_{\text{Ag}}(-45.80\text{dB}) - P_{\text{cl}}(2.24\text{dB}) - 2.15 \\ &= 23.27 \text{ dBm} \end{aligned}$$

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

Note: Expanded measurement uncertainty for CDMA800 (BC10) is  $U = 0.96 \text{ dB}$ ,  $k=2$ .

## A.2 EMISSION LIMIT

### Reference

FCC: CFR Part 90.691 and 2.1053

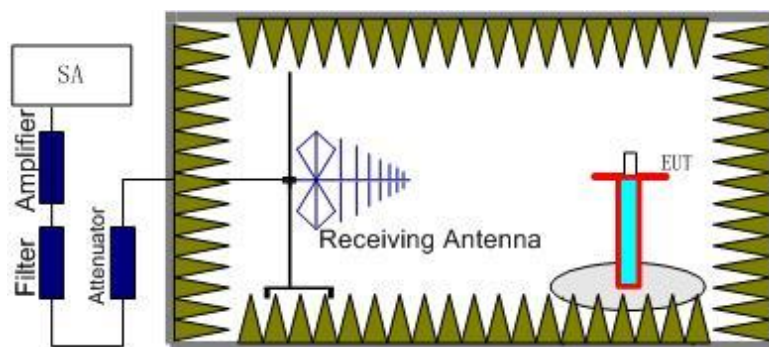
### A.2.1 Measurement Method

The measurements procedures in TIA-603C-2004 are used. This measurement is carried out in fully-anechoic chamber 3.

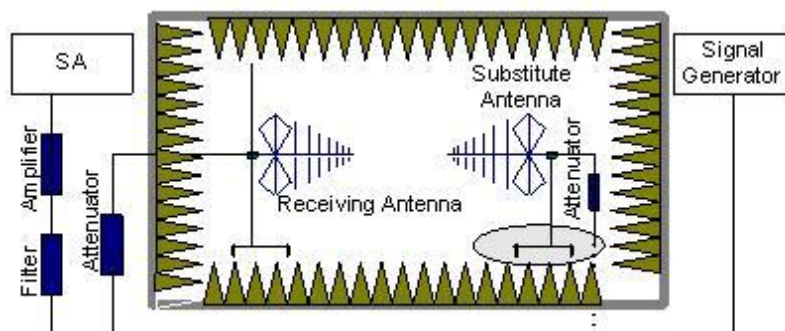
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set 1MHz as outlined in CFR Part 90.691. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of CDMA800 BC10.

### The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.





In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss ( $P_{pl}$ ) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain ( $G_a$ ) should be recorded after test.

An amplifier should be connected in for the test.

The Path loss ( $P_{pl}$ ) is the summation of the cable loss and the gain of the amplifier.

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{Mea} + P_{pl} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dB}$ .

### A.2.2 Measurement Limit

CFR Part 90.691 all specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power ( $P$ ) by a factor of at least  $43 + 10 \log(P)$  dB. The specification that emissions shall be attenuated below the transmitter power ( $P$ ) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

### A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper and lower carrier frequencies of the CDMA BC10 (817.9MHz and 823.1MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the CDMA BC0, CDMA BC1 or CDMA BC10 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

**The worst case**
**CDMA BC10, Channel 475/817.9MHz**

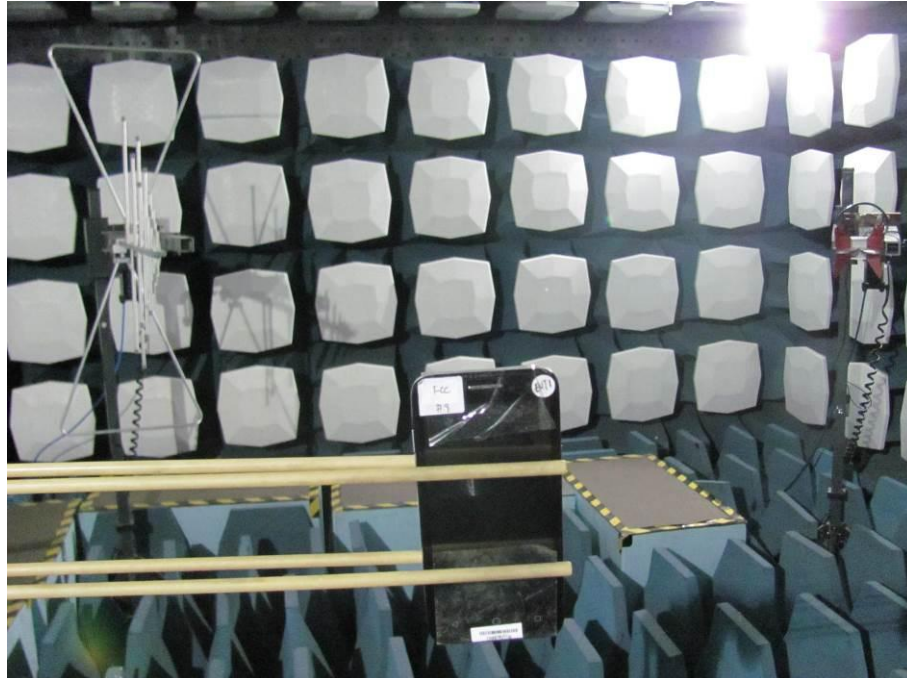
| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP(dBm) | Limit (dBm) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|---------------|-------------|--------------|
| 1635.20         | -54.12                 | 3.36          | -5.26             | 2.15            | -54.37        | -13.00      | Vertical     |
| 3282.43         | -58.13                 | 5.19          | -7.68             | 2.15            | -57.79        | -13.00      | Vertical     |
| 4092.11         | -54.47                 | 5.69          | -8.99             | 2.15            | -53.32        | -13.00      | Horizontal   |
| 4907.26         | -59.34                 | 6.27          | -9.81             | 2.15            | -57.95        | -13.00      | Vertical     |
| 5728.61         | -56.78                 | 6.76          | -10.55            | 2.15            | -55.14        | -13.00      | Horizontal   |
| 6549.64         | -57.68                 | 7.02          | -11.06            | 2.15            | -55.79        | -13.00      | Horizontal   |

**CDMA BC10, Channel 684/823.1MHz**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP(dBm) | Limit (dBm) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|---------------|-------------|--------------|
| 1646.08         | -55.44                 | 3.40          | -5.24             | 2.15            | -55.75        | -13.00      | Vertical     |
| 3284.99         | -56.69                 | 5.22          | -7.68             | 2.15            | -56.38        | -13.00      | Horizontal   |
| 4117.83         | -55.71                 | 5.80          | -9.02             | 2.15            | -54.64        | -13.00      | Horizontal   |
| 4948.94         | -58.44                 | 6.32          | -9.85             | 2.15            | -57.06        | -13.00      | Vertical     |
| 5756.64         | -59.37                 | 6.78          | -10.55            | 2.15            | -57.75        | -13.00      | Vertical     |
| 6576.35         | -56.71                 | 7.06          | -11.09            | 2.15            | -54.83        | -13.00      | Vertical     |

Note: Expanded measurement uncertainty for this test item is  $U = 4.2$  dB,  $k = 2$ .

## **ANNEX B: TEST LAYOUT**



**Pic.1 Radiated spurious emission**

**\*\*\*END OF REPORT\*\*\***