



# FCC Test Report

**Product Name: Fixed Wireless Terminal**

**Model Number: ETS225M**

**Report No: SYBHZ(R)E030122008EB-2**

**FCC ID: QISETS225M**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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## REPORT ON

FCC Test of ETS225M Fixed Wireless Terminal

M/N: ETS225M

Report No: SYBHZ(R)E030122008EB-2

## REGULATION

FCC CFR47 Part 2: Subpart J;

FCC CFR47 Part 22: Subpart H;

## CONCLUSION

Pass

General Manager

2009.05.24  
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## Contents

|          |                                               |           |
|----------|-----------------------------------------------|-----------|
| <b>1</b> | <b><u>Summary</u></b>                         | <b>5</b>  |
| <b>2</b> | <b><u>Product Description</u></b>             | <b>6</b>  |
| 2.1      | PRODUCTION INFORMATION                        | 6         |
| 2.2      | MODIFICATION INFORMATION                      | 6         |
| <b>3</b> | <b><u>Test Site Description</u></b>           | <b>7</b>  |
| 3.1      | TESTING PERIOD                                | 7         |
| 3.2      | GENERAL SET UP DESCRIPTION                    | 7         |
| <b>4</b> | <b><u>Product Description</u></b>             | <b>8</b>  |
| 4.1      | TECHNICAL CHARACTERISTICS                     | 8         |
| 4.2      | EUT IDENTIFICATION LIST                       | 10        |
| <b>5</b> | <b><u>Main Test Instruments</u></b>           | <b>11</b> |
| <b>6</b> | <b><u>Transmitter Measurements</u></b>        | <b>12</b> |
| 6.1      | EFFECTIVE RADIATED POWER OF TRANSMITTER (ERP) | 12        |
| 6.2      | CONDUCTED OUTPUT POWER                        | 15        |
| 6.3      | MODULATION CHARACTERISTICS                    | 17        |
| 6.4      | OCCUPIED BANDWIDTH                            | 19        |
| 6.5      | BAND EDGES COMPLIANCE                         | 21        |
| 6.6      | SPURIOUS EMISSION AT ANTENNA TERMINAL         | 23        |
| 6.7      | FREQUENCY STABILITY                           | 25        |
| <b>7</b> | <b><u>System Measurement Uncertainty</u></b>  | <b>28</b> |
| <b>8</b> | <b><u>Appendixes</u></b>                      | <b>29</b> |

## 1 Summary

The table below summarizes the measurements and results for the ETS225M Fixed Wireless Terminal. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

| FCC Measurement Specification | FCC Limits Part(s) | Description                             | Result |
|-------------------------------|--------------------|-----------------------------------------|--------|
| 2.1046                        | 22.913             | Effective Radiated Power of Transmitter | PASS   |
| 2.1046                        | 22.913             | Conducted Power of Transmitter          | PASS   |
| 2.1047                        |                    | Modulation Characteristics              | PASS   |
| 2.1049                        |                    | Occupied Bandwidth                      | PASS   |
| 2.1051                        | 22.917             | Band Edges compliance                   | PASS   |
| 2.1051                        | 22.917             | Spurious Emission at Antenna Terminal   | PASS   |
| 2.1053                        | 22.917             | Radiated Spurious Emission              | PASS   |
| 2.1055                        | 22.355             | Frequency Stability                     | PASS   |

Note: The Radiated Spurious Emissions' test results are shown in the EMC report.

## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

ETS225M Fixed Wireless Terminal is subscriber equipment in the CDMA system. The frequency band is US Cellular. The ETS225M Fixed Wireless Terminal implements such functions as RF signal receiving / Transmitting, CDMA protocol processing, voice and SMS service etc. The ETS225M Fixed Wireless Terminal uses MSM6010 chipset and Zero-IF technologies.

#### 2.1.2 Support function and Service

The ETS225M Fixed Wireless Terminal support the function and service as follows:

Table 2 Service and Test mode List

| Service Name   | Characteristic   | Corresponding Test Mode | Note |
|----------------|------------------|-------------------------|------|
| voice and data | Modulation: QPSK | TM1*                    |      |
| voice and data | Modulation: HPSK | TM3*                    |      |

Note: \* Refer to ANSI/TIA-98-E section 1.3 for the information of TM (Test Mode) .

### 2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

| Model Number    | Board/Module | Original Version | New Version | Modify Information |
|-----------------|--------------|------------------|-------------|--------------------|
| Not applicable! |              |                  |             |                    |
|                 |              |                  |             |                    |
|                 |              |                  |             |                    |
|                 |              |                  |             |                    |



### 3 Test Site Description

The test site of:

***Huawei Technologies Co. Ltd.  
P.O. Box 518129  
Huawei base, bantian,  
Longgang District, Shenzhen, China***

#### 3.1 Testing Period

The test have been performed during the period of

May. 10, 2009 to May. 16, 2009

#### 3.2 General Set up Description

ETS225M Fixed Wireless Terminal can only support CDMA mode and US Cellular Band. During this measurement, the ETS225M Fixed Wireless Terminal just works in CDMA mode and US Cellular Band.

**TM1:** Forward Traffic Channel Radio Configuration 1, Reverse Traffic Channel Radio Configuration 1

**TM3:** Forward Traffic Channel Radio Configuration 3, Reverse Traffic Channel Radio Configuration 3

| Parameter                   | Units        | Value |
|-----------------------------|--------------|-------|
| $\hat{I}_{or}$              | dBm/1.23 MHz | -104  |
| $\frac{Pilot Ec}{I_{or}}$   | dB           | -7    |
| $\frac{Traffic Ec}{I_{or}}$ | dB           | -7.4  |



## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 4 Frequency Range

|                |                |
|----------------|----------------|
| Uplink band:   | 824 to 849 MHz |
| Downlink band: | 869 to 894 MHz |

#### 4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

|                  |          |
|------------------|----------|
| Channel spacing: | 1.23 MHz |
| Channel raster:  | 30 KHz   |

#### 4.1.3 Type of Emission

Table 6 Type of Emission

|                       |         |
|-----------------------|---------|
| Emission Designation: | 1M23F9W |
|-----------------------|---------|

According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202

#### 4.1.4 Environmental Requirements

Table 7 Environmental Requirements

|                      |          |
|----------------------|----------|
| Minimum temperature: | - 10 °C  |
| Maximum temperature: | + 55 °C  |
| Relative Humidity:   | 5%-95%RH |

#### 4.1.5 Power Source

Table 8 Power Source

|                     |          |
|---------------------|----------|
| AC voltage nominal: | ~120V    |
| AC voltage range    | ~90-240V |
| AC current maximal: | 650mA    |

#### 4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

#### 4.1.7 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current in the final RF stage is:

Table 9 Applied RF module DC Voltages and Currents

|          |                                                                                            |
|----------|--------------------------------------------------------------------------------------------|
| Voltage: |  +2.85V |
| Current: | 150mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)                      |

## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 10 Board Information

| 800MHz CDMA Fixed Wireless Terminal |                  |          |
|-------------------------------------|------------------|----------|
| ETS225M                             |                  |          |
| Board and Module                    |                  |          |
| Equipment Designation / Description | Serial Number    | Remarks  |
| -Module board                       | 020CFL1067845874 | WL32SLPU |
| -Interface board                    | 0284291067801587 | WLA2PIPU |
| -Battery                            | 20060520002746   | NA       |

### 4.2.2 Adapter Technical Data

AC/DCAdapter Model: HF-120050E3  
Manufacturer: Dongguan Shilong Fuhua Electronic Co.,Ltd.  
Input Voltage: ~90-240V ;50/60Hz  
Output Voltage:  +12V

AC/DCAdapter Model: HF-120050E3  
Manufacturer: Shenzhen OCT Xinqiao Techonoly Co.,Ltd.  
Input Voltage: ~90-240V ;50/60Hz  
Output Voltage:  +12V

AC/DCAdapter Model: HF-120050E3  
Manufacturer: Shenzhen Moso Power Supply Techonoly Co.,Ltd.  
Input Voltage: ~90-240V ;50/60Hz  
Output Voltage:  +12V

### 4.2.3 Battery Technical Data

Type: NI-MH Battery  
Manufacturer: HUAWEI Techonoly Co.,Ltd.  
Battery Model: HGB-2A10x3  
Rated capacity: 1000mAH  
Nominal Voltage:  +3.7V  
Charging Voltage:  +4.2V

### 4.2.4 FCC Identification

Grantee Code: QIS  
Product Code: ETS225M  
FCC Identification: QISETS225M

## 5 Main Test Instruments

Table 11 Main Test Equipments

| Equipment Description                | Manufacturer | Model                   | Serial Number  | Calibrated until (MM.DD.YYYY) |
|--------------------------------------|--------------|-------------------------|----------------|-------------------------------|
| Test Receiver Display Unit           | R&S          | ESMI 804.8932.52        | 829214/011     | 04.22.2010                    |
| Test Receiver RF Unit                | R&S          | ESMI 1032.5640.53       | 829550/008     | 04.22.2010                    |
| Receiver                             | R&S          | ESIB 26                 | 100318         | 08.21.2009                    |
| Receiver                             | R&S          | ESCS30                  | 830245/018     | 08.29.2009                    |
| Pre-Amplifier                        | Agilent      | 8447D                   | 2944A10146     | 08.21.2009                    |
| Pre-Amplifier                        | Agilent      | 83017A                  | 3950M00246     | 08.21.2009                    |
| Loop Antenna                         | Schwarzbeck  | FMZB1516                | 1516115        | 08.29.2009                    |
| BiLog Antenna                        | Schaffner    | CBL 6112B               | 2747           | 02.25.2010                    |
| BiLog Antenna                        | Schaffner    | CBL 6112B               | 2536           | 06.07.2009                    |
| Horn Antenna                         | ETS-Lindgren | 3117                    | 00062549       | 06.05.2009                    |
| Horn Antenna                         | ETS-Lindgren | 3116                    | 00031541       | 03.20.2010                    |
| Dipole                               | Schwarzbeck  | D69250-UHAP/D69250-VHAP | 979/917        | 08.27.2009                    |
| Signal Generator                     | R&S          | SMT06                   | 830264/009     | 09.29.2009                    |
| Signal Generator                     | R&S          | SMR 40                  | 100325         | 09.09.2009                    |
| Artificial Mains Network             | R&S          | ENV4200                 | 100001         | 07.20.2009                    |
| Power Supply                         | Keithley     | 2306                    | 1045337        | 09.14.2009                    |
| Climate Chamber                      | WEISS        | WK11-180                | 58226049470010 | 12.09.2009                    |
| Universal Radio Communication Tester | R&S          | CMU200                  | 108522         | 08.29.2009                    |
| Wireless communication test set      | Agilent      | 8960                    | GB45360866     | 11.20.2009                    |
| Spectrum Analyzer                    | Agilent      | PSA E4440A              | MY46187137     | 11.24.2009                    |
| Vector Generator                     | R&S          | SMU 200A                | 101717         | 06.20.2009                    |

## 6 Transmitter Measurements

### 6.1 Effective Radiated Power of Transmitter (ERP)

#### 6.1.1 Test Conditions

Table 12 Test Conditions

|                      |                                  |
|----------------------|----------------------------------|
| Preconditioning:     | 0.5 hour                         |
| Measured at:         | enclosure                        |
| Ambient temperature: | 25°C                             |
| Relative humidity:   | 55%                              |
| Test Configurations: | TM1 and TM3 at frequency B, M, T |

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

##### 6.1.2.2 Supporting Standards

Table 13 Supporting Standards:

|                     |                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                     |
| ANSI/TIA-98-E: 2003 | Recommended Minimum Performance Standards for cdma2000 Spread Spectrum ETS225M Fixed Wireless Terminals |

##### 6.1.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a ETS225M Fixed Wireless Terminal transmitter exceed 7 W. The calculated longitude ERP by following formula:  $ERP(dBm) = 10 \cdot \log(ERP_{in\ mwatts})$ .

Table 14 Limits

|                              |            |
|------------------------------|------------|
| Maximum Output Power (Watts) | < 7 Watts  |
| Maximum Output Power (dBm)   | < 38.5 dBm |

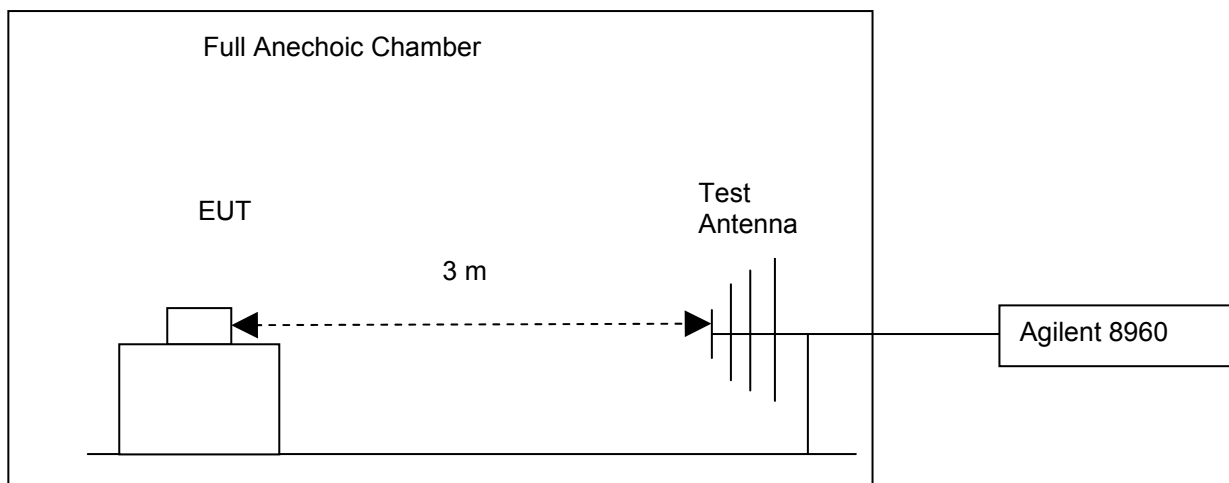
#### 6.1.3 Test Method and Setup

- For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the ETS225M Fixed Wireless Terminal to the wireless communication tester Agilent 8960 via the air interface. The band class is set as US Cellular.
- Test the Radiated maximum output power by the Agilent 8960 received from test antenna.
- Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on Agilent 8960, and record

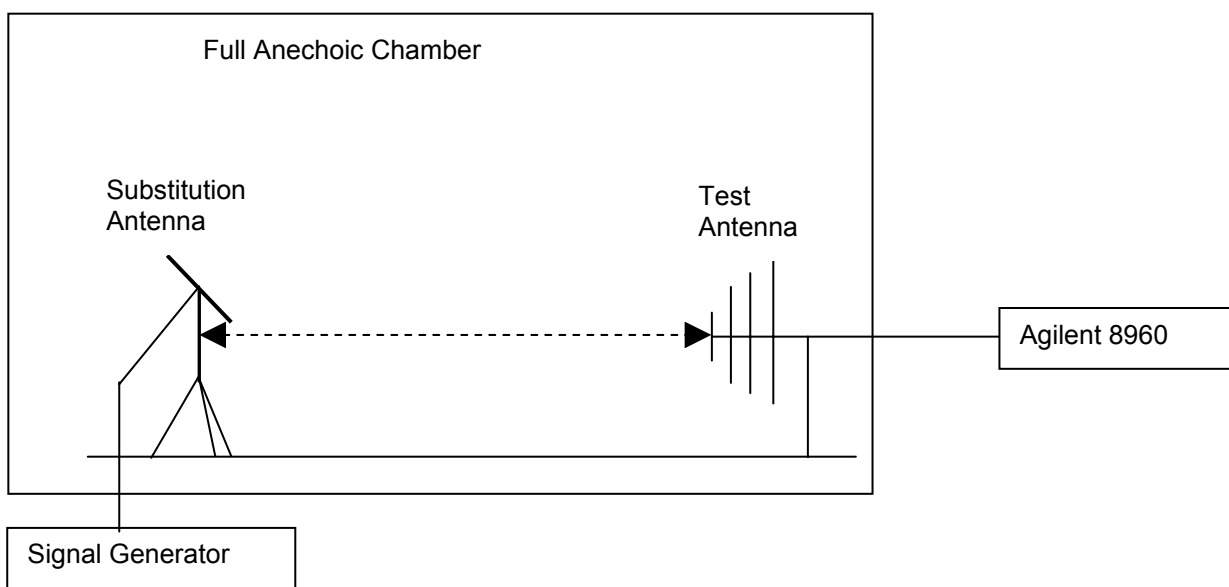
the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

## **Test setup**

### **Step 1: Pre-test**



### **Step 2: Substitution method to verify the maximum ERP**



**Figure 1. Test Set-up**

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

## **6.1.4 Measurement Results**

Table 15 Measurement Results

| TEST CONDITIONS |                                                      | RF Output Power(ERP)       |       |                            |       |                            |       |
|-----------------|------------------------------------------------------|----------------------------|-------|----------------------------|-------|----------------------------|-------|
|                 |                                                      | Channel1013(B)<br>824.7MHz |       | Channel283(M)<br>833.49Mhz |       | Channel777(T)<br>848.31MHz |       |
|                 |                                                      | dBm                        |       | dBm                        |       | dBm                        |       |
|                 |                                                      | Measured                   | Limit | Measured                   | Limit | Measured                   | Limit |
| TM1             | T <sub>nom</sub> (25 °C)<br>V <sub>nom</sub> (3.7 V) | 25.64                      | 38.5  | 25.87                      | 38.5  | 25.49                      | 38.5  |
| TM3             | T <sub>nom</sub> (25 °C)<br>V <sub>nom</sub> (3.7 V) | 25.84                      | 38.5  | 25.94                      | 38.5  | 25.63                      | 38.5  |

#### 6.1.4.1 Substitution Results

Table 16 Substitution Results

| Test Mode | Freq. [MHz] | Meas. Level [dBm] | Substitution Antenna Type | SGP [dBm] | Substitution Gain [dBd] | Cable Loss [dB] | Substitution Level (ERP) [dBm] | Limit [dBm] | Result |
|-----------|-------------|-------------------|---------------------------|-----------|-------------------------|-----------------|--------------------------------|-------------|--------|
| TM1       | 824.7       | 25.64             | Dipole Ant.               | 29.11     | -2.95                   | 0.6             | 25.56                          | 38.5        | Pass   |
| TM1       | 833.49      | 25.87             | Dipole Ant.               | 29.3      | -3.02                   | 0.6             | 25.68                          | 38.5        | Pass   |
| TM1       | 848.31      | 25.49             | Dipole Ant.               | 28.96     | -3.11                   | 0.6             | 25.25                          | 38.5        | Pass   |
| TM3       | 824.7       | 25.84             | Dipole Ant.               | 29        | -2.95                   | 0.6             | 25.45                          | 38.5        | Pass   |
| TM3       | 833.49      | 25.94             | Dipole Ant.               | 29.2      | -3.02                   | 0.6             | 25.58                          | 38.5        | Pass   |
| TM3       | 848.31      | 25.63             | Dipole Ant.               | 28.94     | -3.11                   | 0.6             | 25.23                          | 38.5        | Pass   |

Note: a, For get the ERP (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

b, A CDMA signal with bandwidth of 1.23MHz is created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 1.23MHz.

#### 6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 6.2 Conducted output power

### 6.2.1 Test Conditions

Table 17 Test Conditions

|                      |                                  |
|----------------------|----------------------------------|
| Preconditioning:     | 0.5 hour                         |
| Measured at:         | Antenna connector                |
| Ambient temperature: | 25°C                             |
| Relative humidity:   | 55%                              |
| Test Configurations: | TM1 and TM3 at frequency B, M, T |

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

#### 6.2.2.2 Supporting Standards

Table 18 Supporting Standards:

|                     |                                                                                        |
|---------------------|----------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards    |
| ANSI/TIA-98-E: 2003 | Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations |

#### 6.2.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a mobile station transmitter exceed 7 W. The calculated longitude ERP by following formula:

$$ERP(\text{dBm}) = 10 \cdot \log(ERP_{\text{in mwatts}}).$$

And for conducted power, we can use Antenna Gain to calculate the limit. So the conducted power:

$$P_{\text{cod}}(\text{dBm}) = ERP(\text{dBm}) - \text{Gain}(\text{dBd}).$$

and  $\text{Gain}(\text{dBd}) = \text{Gain}(\text{dBi}) - 2.15\text{dB}$

Table 19 Limits

|                                      |            |
|--------------------------------------|------------|
| Maximum Output Power (Watts)         | < 7 Watts  |
| Antenna Gain(dBd):                   | -0.15      |
| Maximum Conducted Output Power (dBm) | < 38.65dBm |

### 6.2.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements

specified in 2.1033(c)(8). Connect the Mobile Station to the wireless communication tester Agilent 8960 via the antenna connector. The band class is set as US Cellular.  
(b)Test the Conducted maximum output power by the Agilent 8960.

### Test setup

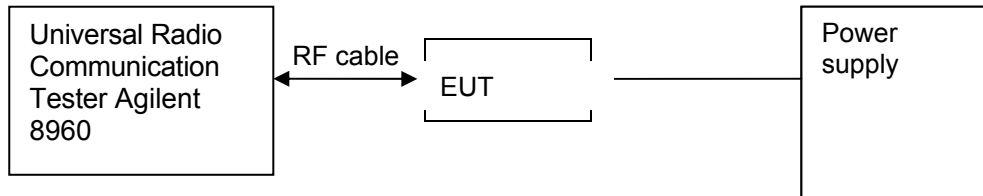


Figure 2. Test Set-up

## 6.2.4 Measurement Results

Table 20 Measurement Results

| TEST CONDITIONS |                                                      | RF Output Power(ERP)       |       |                            |       |                            |       |
|-----------------|------------------------------------------------------|----------------------------|-------|----------------------------|-------|----------------------------|-------|
|                 |                                                      | Channel1013(B)<br>824.7MHz |       | Channel283(M)<br>833.49Mhz |       | Channel777(T)<br>848.31MHz |       |
|                 |                                                      | dBm                        |       | dBm                        |       | dBm                        |       |
|                 |                                                      | Measured                   | Limit | Measured                   | Limit | Measured                   | Limit |
| TM1             | T <sub>nom</sub> (25 °C)<br>V <sub>nom</sub> (3.7V)  | 25.64                      | 38.5  | 25.87                      | 38.5  | 25.49                      | 38.5  |
| TM3             | T <sub>nom</sub> (25 °C)<br>V <sub>nom</sub> (3.7 V) | 25.84                      | 38.5  | 25.94                      | 38.5  | 25.63                      | 38.5  |

## 6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 6.3 Modulation Characteristics

### 6.3.1 Test Conditions

Table 21 Test Conditions

|                      |                            |
|----------------------|----------------------------|
| Preconditioning:     | 0.5 hour                   |
| Measured at:         | Antenna connector          |
| Ambient temperature: | 25 °C                      |
| Relative humidity:   | 47 %                       |
| Test Configurations: | TM1 and TM3 at frequency M |

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H.

#### 6.3.2.2 Supporting Standards

Table 22 Supporting Standards:

|                      |                                                                                                          |
|----------------------|----------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                      |
| ANSI/TIA-98-E: 2003  | Recommended Minimum Performance Standards for cdma2000 Spread Spectrum ETS225M Fixed Wireless Terminals. |

#### 6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 22 subpart H.

Table 23 Limits

|        |                |
|--------|----------------|
| Limits | Not applicable |
|--------|----------------|

### 6.3.3 Test Method and Setup

Connect the ETS225M Fixed Wireless Terminal to Universal Radio Communication Tester CMU200 via the antenna connector. The band class is set as US Cellular; the ETS225M Fixed Wireless Terminal's output is matched with 50  $\Omega$  loads, test method was according to ANSI/TIA-98-E. The waveform quality and constellation of the ETS225M Fixed Wireless Terminal were tested.

#### Test setup

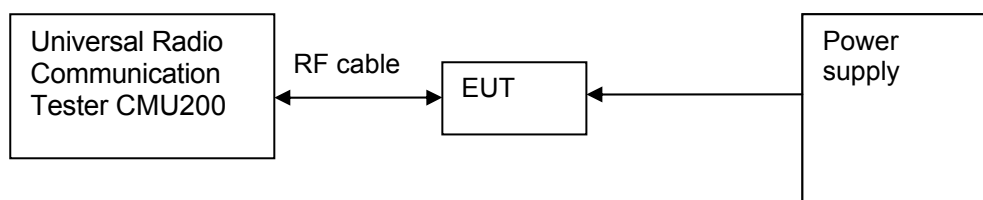


Figure 3. Test Set-up

### 6.3.4 Measurement Results

Table 24 Measurement Results

| TEST CONDITIONS          |                         | Modulation Characteristic   |                     |
|--------------------------|-------------------------|-----------------------------|---------------------|
|                          |                         | Channel 283(M)<br>833.49MHz |                     |
|                          |                         | Measured                    |                     |
|                          |                         | TM1                         | TM3                 |
| T <sub>nom</sub> (25 °C) | V <sub>nom</sub> (3.7V) | Refer to Appendix A         | Refer to Appendix A |
|                          |                         |                             |                     |

### 6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix A.

## 6.4 Occupied Bandwidth

### 6.4.1 Test Conditions

Table 25 Test Conditions

|                      |                                 |
|----------------------|---------------------------------|
| Preconditioning:     | 0.5 hour                        |
| Measured at:         | Antenna connector               |
| Ambient temperature: | 25 °C                           |
| Relative humidity:   | 55 %                            |
| Test Configurations: | TM1 and TM3 at frequency B,M, T |

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 22 subpart H.

#### 6.4.2.2 Supporting Standards

Table 26 Supporting Standards:

|                      |                                                                                                          |
|----------------------|----------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                      |
| ANSI/TIA-98-E: 2003  | Recommended Minimum Performance Standards for cdma2000 Spread Spectrum ETS225M Fixed Wireless Terminals. |

#### 6.4.2.3 Limits

No specific occupied bandwidth requirement in part 22 subpart H, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Table 27 Limits

|                               |                        |
|-------------------------------|------------------------|
| Upper /lower frequency limits | 0.5% of the mean power |
|-------------------------------|------------------------|

### 6.4.3 Test Method and Setup

ETS225M Fixed Wireless Terminal was connected to the wireless signal analyzer PSA E4440A via the one RF connector. The band class is set as US Cellular; ETS225M Fixed Wireless Terminal was controlled to transmit maximum power. Measure and record the occupied bandwidth of the ETS225M Fixed Wireless Terminal by the Agilent E4440A.

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g)&(h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules,

the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

Measurement bandwidth (RBW): 30 kHz (Resolution bandwidth)

Video bandwidth (VBW): 300 kHz

## Test Set-up

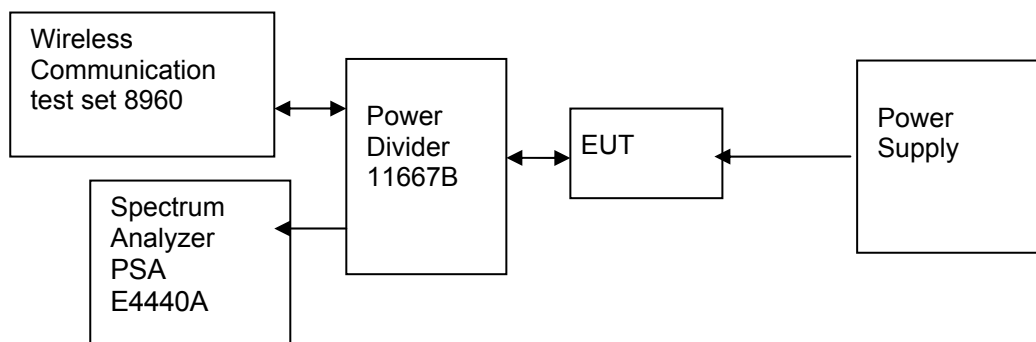


Figure 4. Test Set-up

## 6.4.4 Measurement Results

Table 28 Measurement Results

| TEST CONDITIONS          |                         | Occupied Bandwidth           |        |                             |        |                              |        |
|--------------------------|-------------------------|------------------------------|--------|-----------------------------|--------|------------------------------|--------|
|                          |                         | Channel 1013 (B)<br>824.7MHz |        | Channel283 (M)<br>833.49MHz |        | Channel 777 (T)<br>848.31MHz |        |
|                          |                         | Measured<br>(MHz)            |        | Measured<br>(MHz)           |        | Measured<br>(MHz)            |        |
|                          |                         | TM1                          | TM3    | TM1                         | TM3    | TM1                          | TM3    |
| T <sub>nom</sub> (25 °C) | V <sub>nom</sub> (3.7V) | 1.2496                       | 1.2685 | 1.2615                      | 1.2498 | 1.2301                       | 1.2645 |

## 6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix B.

## 6.5 Band Edges Compliance

### 6.5.1 Test Conditions

Table 29 Test Conditions

|                      |                               |
|----------------------|-------------------------------|
| Preconditioning:     | 0.5 hour                      |
| Measured at:         | Antenna connector             |
| Ambient temperature: | 25°C                          |
| Relative humidity:   | 55 %                          |
| Test Configurations: | TM1 and TM3 at frequency B, T |

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.5.2.2 Supporting Standards

Table 30 Supporting Standards:

|                      |                                                                                                          |
|----------------------|----------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                      |
| ANSI/TIA-98-E: 2003  | Recommended Minimum Performance Standards for cdma2000 Spread Spectrum ETS225M Fixed Wireless Terminals. |

#### 6.5.2.3 Limits

Compliance with 22.917, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT in Watt).

Table 31 Limits

|                       |                                             |
|-----------------------|---------------------------------------------|
| Rated Power:          | 24 dBm                                      |
| Required attenuation: | $43 + 10 \log (0.25) = 37$ , 24 dBm – 37 dB |
| Absolute level        | - 13 dBm                                    |

### 6.5.3 Test Method and Setup

ETS225M Fixed Wireless Terminal was connected to the wireless signal analyzer PSA E4440A via the one RF connector, the band class is set as US Cellular. ETS225M Fixed Wireless Terminal was controlled to transmit maximum power. Measure and record Band edge compliance of the ETS225M Fixed Wireless Terminal by the Agilent PSA E4440A.

Measurement bandwidth (RBW): 20 kHz (Resolution bandwidth)  
Video bandwidth (VBW): 200 kHz

## Test Set-up

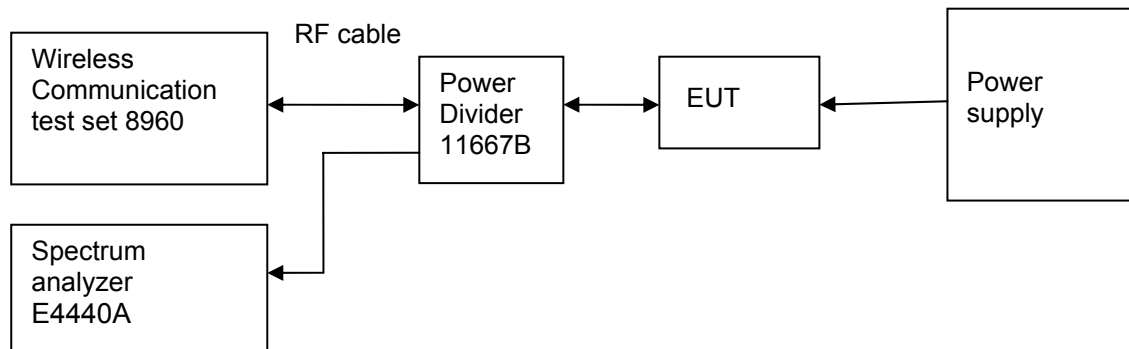


Figure 5. Test Set-up

## 6.5.4 Measurement Results

Table 32 Measurement Results outside Band Edges-- Single Carrier

| Band        | Frequency of Band edges [MHz]       | Channel Number | Test Mode | Power [dBm] | Spurious Level measured [dBm] | FCC limit | Result |
|-------------|-------------------------------------|----------------|-----------|-------------|-------------------------------|-----------|--------|
| US Cellular | $T_{nom}$ (25 °C), $V_{nom}$ (3.7V) |                |           |             |                               |           |        |
|             | 824                                 | 1013 (B)       | TM1 & TM3 | 24          | <-13(See appendix C)          | - 13 dBm  | Pass   |
|             | 849                                 | 777 (T)        | TM1 & TM3 | 24          | <-13(See appendix C)          | - 13 dBm  | Pass   |

## 6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix C.

## 6.6 Spurious Emission at Antenna Terminal

### 6.6.1 Test Conditions

Table 33 Test Conditions

|                      |                                  |
|----------------------|----------------------------------|
| Preconditioning:     | 0.5 hour                         |
| Measured at:         | Antenna connector                |
| Ambient temperature: | 25°C                             |
| Relative humidity:   | 50 %                             |
| Test Configurations: | TM1 and TM3 at frequency B, M, T |

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.6.2.2 Supporting Standards

Table 34 Supporting Standards:

|                      |                                                                                                          |
|----------------------|----------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                      |
| ANSI/TIA-98-E: 2003  | Recommended Minimum Performance Standards for cdma2000 Spread Spectrum ETS225M Fixed Wireless Terminals. |

#### 6.6.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT in Watt).

Table 35 Limits

|                       |                                             |
|-----------------------|---------------------------------------------|
| Rated Power:          | 24 dBm                                      |
| Required attenuation: | $43 + 10 \log (0.25) = 37$ , 24 dBm – 37 dB |
| Absolute level        | - 13 dBm                                    |

### 6.6.3 Test Method and Setup

ETS225M Fixed Wireless Terminal was connected to the wireless signal analyzer PSA E4440A via the one RF connector, the band class is set as US Cellular. ETS225M Fixed Wireless Terminal was controlled to transmit maximum power.

Measure and record the Conducted Spurious Emission of the ETS225M Fixed Wireless Terminal by the Agilent PSA E4440A.

According to part 22.917, the defined measurement bandwidth as following:

22.917(b) Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;  
Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;  
Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz;  
Measurement bandwidth (RBW) for 1GHz up to 12.75GHz: 1MHz;

## Test Set-up

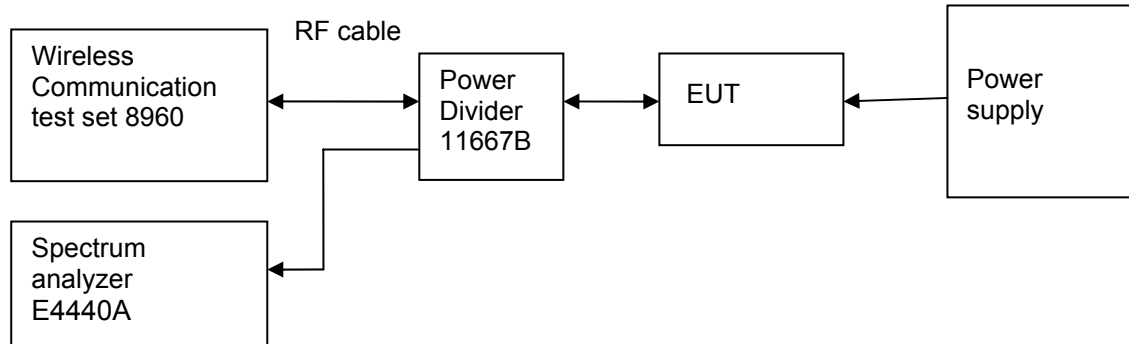


Figure 6. Test Set-up

## 6.6.4 Measurement Results

Table 36 Measurement Results

| Channel Number  | Test Mode | Test Range (Frequency) | Output Power [dBm] | Spurious Level measured [dBm] | FCC limit | Result |
|-----------------|-----------|------------------------|--------------------|-------------------------------|-----------|--------|
| Channel 1013(B) | TM1       | 9 kHz ~12.75GHz        | 24                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
|                 | TM3       | 9 kHz ~12.75GHz        | 24                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
| Channel 283(M)  | TM1       | 9 kHz ~12.75GHz        | 24                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
|                 | TM3       | 9 kHz ~12.75GHz        | 24                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
| Channel 777(T)  | TM1       | 9 kHz ~12.75GHz        | 24                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
|                 | TM3       | 9 kHz ~12.75GHz        | 24                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |

## 6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix D.

## 6.7 Frequency Stability

### 6.7.1 Test Conditions

Table 37 Test Conditions

|                      |                            |
|----------------------|----------------------------|
| Preconditioning:     | 0.5 hour                   |
| Measured at:         | Antenna connector          |
| Ambient temperature: | See below                  |
| Relative humidity:   | 55 % at 25 °C              |
| Test Configurations: | TM1 and TM3 at frequency M |

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 22.355

#### 6.7.2.2 Supporting Standards

Table 38 Supporting Standards:

|                      |                                                                                                          |
|----------------------|----------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                      |
| ANSI/TIA-98E: 2003   | Recommended Minimum Performance Standards for cdma2000 Spread Spectrum ETS225M Fixed Wireless Terminals. |

#### 6.7.2.3 Limits

According to part 22.355, from 821MHz to 896MHz, for mobile device, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances 2.5ppm.

### 6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) From  $-30^{\circ}$  to  $+50^{\circ}$  centigrade for all equipment except that specified in subparagraphs
- (2) and (3) of paragraph 2.1055

(a) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than  $10^{\circ}$  centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(b) The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.
- (3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply

voltage and at each extreme also shall be shown.

(c) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

The EUT can only work in such extreme voltage 3.5V and 4.2V, so here the EUT is tested in the 3.5V and 4.2V.

## Test Set up

Connect the ETS225M Fixed Wireless Terminal to the Wireless Communication test set 8960 via the connector. Then measure the frequency error by the Wireless Communication test set 8960. The ETS225M Fixed Wireless Terminal's output is matched with a 50  $\Omega$  loads.

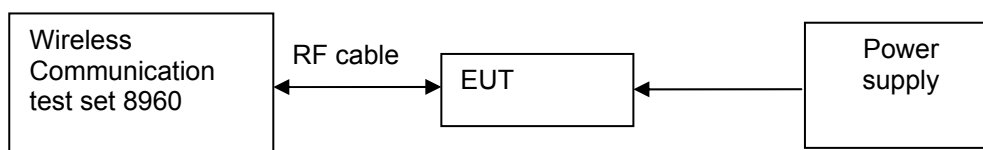


Figure 7. Test Set up

## 6.7.4 Measurement Results

### 6.7.4.1 Measurement Results vs. Variation of Temperature

#### ● TM1, 3.7V DC Channel No.283(833.49MHz)

Table 39 Measurement Results vs. Variation of Temperature—TM1

| Temperature | Power (dBm) | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|-------------|-------------|-------------------------|------------------------------|--------|
| -30 °C      | 24          | 833.49                  | -1                           | Pass   |
| -20 °C      | 24          | 833.49                  | 4                            | Pass   |
| -10 °C      | 24          | 833.49                  | -9                           | Pass   |
| 0 °C        | 24          | 833.49                  | -3                           | Pass   |
| +10 °C      | 24          | 833.49                  | 7                            | Pass   |
| +20 °C      | 24          | 833.49                  | 1                            | Pass   |
| +30 °C      | 24          | 833.49                  | -5                           | Pass   |
| +40 °C      | 24          | 833.49                  | 9                            | Pass   |
| +50 °C      | 24          | 833.49                  | -4                           | Pass   |

#### ● TM3, 3.7V DC Channel No.283(833.49MHz)

Table 40 Measurement Results vs. Variation of Temperature—TM3

| Temperature | Power (dBm) | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|-------------|-------------|-------------------------|------------------------------|--------|
|             |             |                         |                              |        |

|        |    |        |    |      |
|--------|----|--------|----|------|
| -30 °C | 24 | 833.49 | 3  | Pass |
| -20 °C | 24 | 833.49 | 5  | Pass |
| -10 °C | 24 | 833.49 | 5  | Pass |
| 0 °C   | 24 | 833.49 | 7  | Pass |
| +10 °C | 24 | 833.49 | -5 | Pass |
| +20 °C | 24 | 833.49 | 8  | Pass |
| +30 °C | 24 | 833.49 | -7 | Pass |
| +40 °C | 24 | 833.49 | 9  | Pass |
| +50 °C | 24 | 833.49 | 11 | Pass |

#### 6.7.4.2 Measurement Results vs. Variation of Voltage

- TM1, 25 °C ,Channel No. **283(833.49MHz)**

Table 41 Measurement Results vs. Variation of Voltage—TM1

| Voltage | Power (dBm) | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---------|-------------|-------------------------|------------------------------|--------|
| 3.5     | 24          | 833.49                  | 3                            | Pass   |
| 3.7     | 24          | 833.49                  | -5                           | Pass   |
| 4.2     | 24          | 833.49                  | -2                           | Pass   |

- TM3, 25 °C ,Channel No. **283(833.49MHz)**

Table 42 Measurement Results vs. Variation of Voltage—TM3

| Voltage | Power (dBm) | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---------|-------------|-------------------------|------------------------------|--------|
| 3.5     | 24          | 833.49                  | 4                            | Pass   |
| 3.7     | 24          | 833.49                  | -4                           | Pass   |
| 4.2     | 24          | 833.49                  | 7                            | Pass   |

#### 6.7.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 43 System Measurement Uncertainty

| Items                                           |                         | Extended Uncertainty |
|-------------------------------------------------|-------------------------|----------------------|
| Effective Radiated Power of Transmitter         | ERP(dBm)                | U=3dB; k=2           |
| Band Width                                      | Magnitude (%)           | U=0.2%; k=2          |
| Band Edge Compliance                            | Disturbance Power (dBm) | U=2.0dB; k=2         |
| Conducted Spurious Emission at Antenna Terminal | Disturbance Power (dBm) | U=2.0dB; k=2         |
| Frequency Stability                             | Frequency Accuracy(ppm) | U=0.21ppm; k=2       |
| Field Strength of Spurious Radiation            | ERP(dBm)                | U=2.2dB; k=2         |
| Conducted Output Power                          | Power(dBm)              | U=0.39dB; k=2        |



## 8 Appendixes

|            |                                                           |          |
|------------|-----------------------------------------------------------|----------|
| Appendix A | Measurement Results Modulation Characteristics            | 3 pages  |
| Appendix B | Measurement Results Occupied Bandwidth                    | 7 pages  |
| Appendix C | Measurement Results Band Edges                            | 5 pages  |
| Appendix D | Measurement Results Spurious Emission at Antenna Terminal | 25 pages |

----- END OF REPORT -----