

# FCC PART 22 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT

For

## ZTE Corporation

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Guangdong, China 518057

**FCC ID: Q78-MC315PLUS**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Equipment Type:</b> CDMA2000 1X PCMCIA Wireless Card
<b>Test Engineer:</b> Snell Leong / 	
<b>Report No.:</b> R0511167	
<b>Report Date:</b> 2005-11-23	
<b>Reviewed By:</b> Daniel Deng / 	
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## GENERAL INFORMATION

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### Product Description for Equipment Under Test (EUT)

The *ZTE Corporation* 's product, FCC ID: *Q78-MC315PLUS* or the "EUT" as referred to in this report is a CDMA2000 1X PCMCIA Wireless Card, which measures approximately 86mm L x 54mm W x 5mm H.

The EUT fits into a standard Type II PC Card slot and can function as a wireless network card, a modem, and a mobile phone. The EUT operates at the frequency of 824.7~848.3MHz, maximum output power of 23.09dBm (0.204W), frequency tolerance 2.5ppm and emission designator 1M26F9W.

*\* The test data gathered are from typical production sample, serial number: 291518530045 provided by the manufacturer.*

### Objective

This type approval report is prepared on behalf of *ZTE Corporation* in accordance with Part 2, Subpart J, Part 22 Subpart H of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, field strength of spurious radiation, frequency stability, and conducted and radiated margin.

### Related Submittal(s)/Grant(s)

No Related Submittals

### Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 15 Subpart B – Unintentional Radiators  
Part 22 Subpart H - Public Mobile Services

Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, TIA/EIA 603-C, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

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## SYSTEM TEST CONFIGURATION

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### Justification

The EUT was configured for testing according to TIA/EIA-603.

The final qualification test was performed with the EUT operating at normal mode.

### Block Diagram

Please refer to Exhibit D.

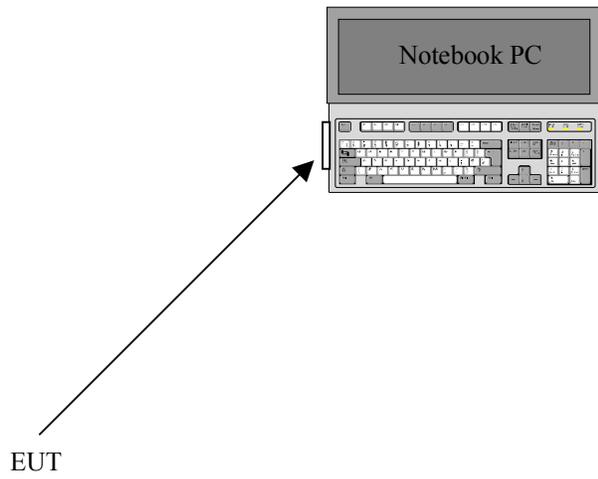
### Equipment Modifications

No modifications were made to the EUT.

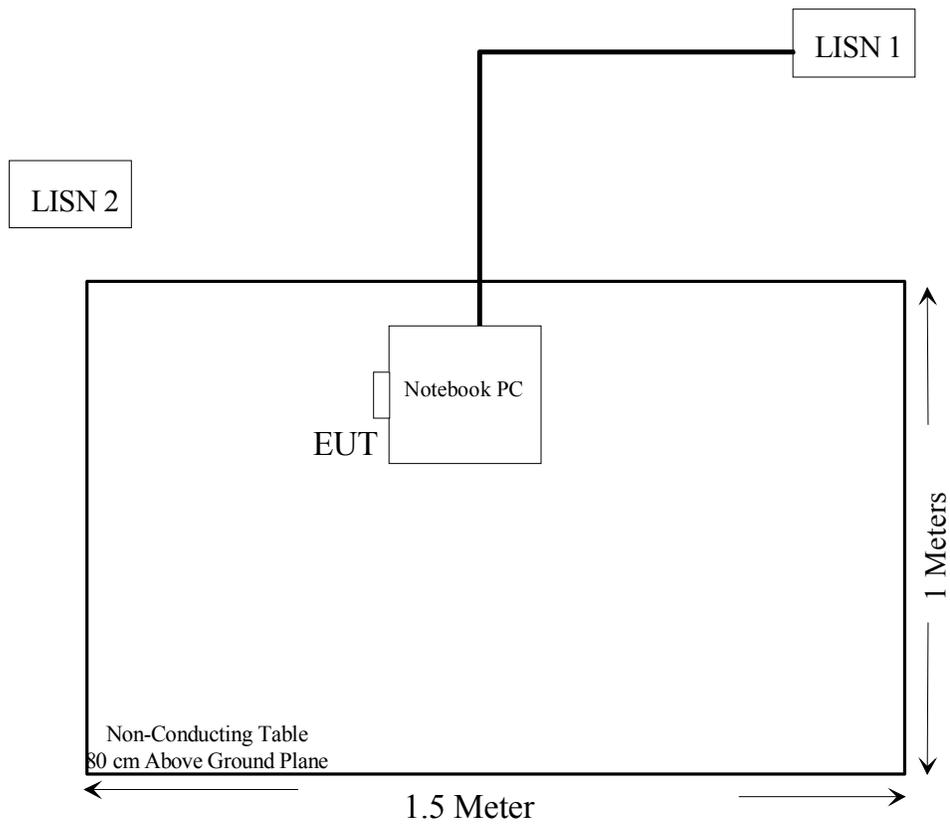
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Sony	Notebook PC	PCG-885L	283520304516747	DOC

### Configuration of Test System



### Test Setup Block Diagram



## SUMMARY OF TEST RESULTS

Results reported relate only to the product tested, serial number: 300511194096

FCC RULE	DESCRIPTION OF TEST	RESULT
§ 2.1047	Modulation Characteristics	Compliant
§ 2.1053	Field Strength of Spurious Radiation	Compliant
§ 2.1091	RF Exposure	Compliant (SAR)
§ 2.1046, § 22.912 (d)	RF Output Power	Compliant
§ 2.1046, § 22.913 (a)	Conducted Output Power	Compliant
§ 2.1049 § 22.917 § 22.905	Out of Band Emission, Occupied Bandwidth	Compliant
§ 2.1051, § 22.917	Spurious Emissions at Antenna Terminals	Compliant
§ 2.1055 (a) § 2.1055 (d) § 22.355	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
§ 22.917	Band Edge	Compliant

## §2.1047 - MODULATION CHARACTERISTIC

### Applicable Standard

Requirement: FCC § 2.1047.

### Test Procedure

CDMA digital mode is used by EUT.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

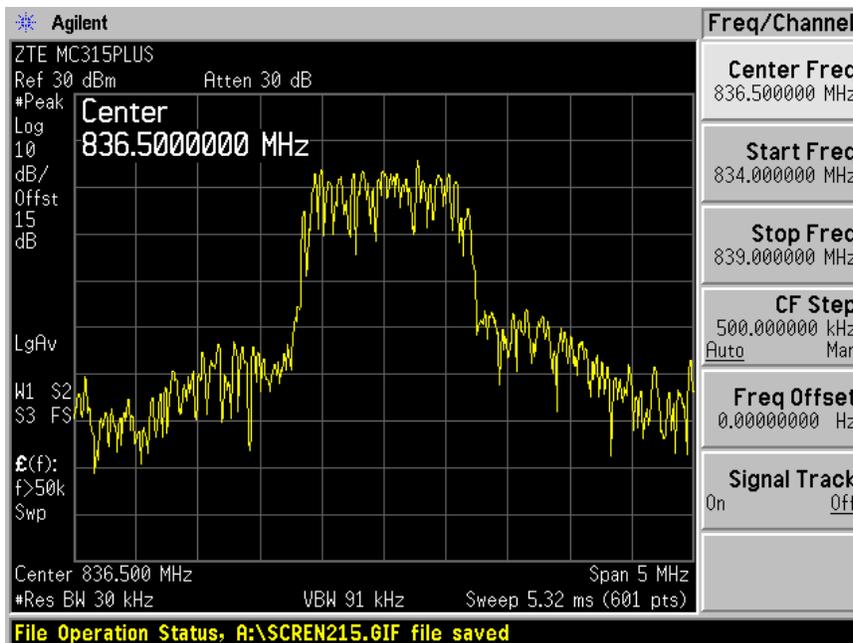
### Environmental Conditions

Temperature:	21° C
Relative Humidity:	72%
ATM Pressure:	1026 mbar

The testing was performed by Snell Leong on 2005-11-18.

### Test Results

Please refer to the hereinafter plots.



## §2.1053 - SPURIOUS RADIATED EMISSIONS

### Applicable Standard

Requirements: CFR 47, § 2.1053.

### Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions 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.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log<sub>10</sub> (power out in Watts)

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Amplifier, Pre (.1 ~1300MHz)	8447D	2944A10198	2005-08-20
Agilent	Analyzer, Spectrum	E4446A	US44300386	2005-11-10
HP	Pre, Amplifier (1 ~ 26.5 GHz)	8449B	3147A00400	2005-10-05
Sunol Science	30Mhz ~ 2 GHz Antenna	JB1	A03105-3	2005-02-11
Com-Power	Antenna, Dipole	AD-100	2219	2005-09-26
R&S	Generator, Signal	SMIQ03	849192/0085	2005-05-02
A.H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2005-04-20

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Environmental Conditions

Temperature:	21° C
Relative Humidity:	72%
ATM Pressure:	1026 mbar

*The testing was performed by Snell Leong on 2005-11-18.*

**Test Result**

The worse case reading is

-29.6 dB at 1673.04 MHz in Vertical Polarization

Primary Scan 30MHz –9GHz (TX) 836.52MHz

Indicated		Table	Test Antenna		Substituted		Antenna	Cable	Absolute	Limit	Margin
Frequency	Ampl.	Angle	Height	Polar	Frequency	Level	Gain	Loss	Level		
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm	Correction	dB	dBm	dBm	dB
1673.04	70.5	90	1.2	V	1673.04	-46.6	8.8	4.76	-42.6	-13	-29.6
2509.56	58.7	0	1.4	V	2509.56	-48.6	9.9	6.26	-45.0	-13	-32.0
1673.04	65.9	0	1.4	H	1673.04	-49.8	8.8	4.76	-45.8	-13	-32.8
2509.56	52.4	0	1.4	H	2509.56	-53.1	9.9	6.26	-49.5	-13	-36.5
817.36	40.95	0	1.4	H	817.36	-55.7	0	2.31	-58.0	-13	-45.0
817.36	36.7	0	1.4	V	817.36	-57.6	0	2.31	-59.9	-13	-46.9

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## **§2.1046, §22.913(a) - RF POWER OUTPUT**

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### **Applicable Standard**

According to FCC §2.1046 & §22.913(a), the ERP of mobile transmitters must not exceed 7 watts.

### **Test Procedure**

1. On a test site, the EUT shall be placed at 1.5m height on a turn table, and in the position closest to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3m from EUT to correspond to the frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the quasi-peak detector is used for the measurement.
4. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a horn (substitution antenna).
10. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. In necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
17. The measure of the effective radiated power is the large of the two levels recorded, at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Environmental Conditions

Temperature:	21° C
Relative Humidity:	72%
ATM Pressure:	1026 mbar

*The testing was performed by Snell Leong on 2005-11-18.*

### Test Results

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CABLE LOSS (dBm)	ERP (dBm)
836.52	25.4	0.0	2.31	23.09

Sample calculation:

Absolute level = substitution reading + antenna gain - cable loss

For example:

$$23.09 = 25.4 + 0 - 2.31$$

## §2.1046, §22.913(a) – CONDUCTED OUTPUT POWER

### Applicable Standard

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

### Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Environmental Conditions

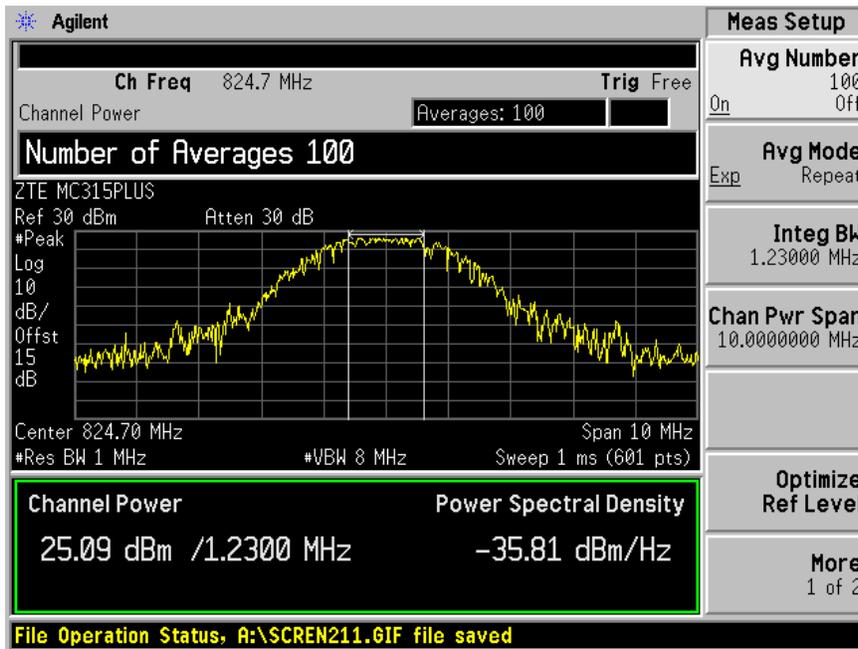
Temperature:	21° C
Relative Humidity:	72%
ATM Pressure:	1026 mbar

*The testing was performed by Snell Leong on 2005-11-18.*

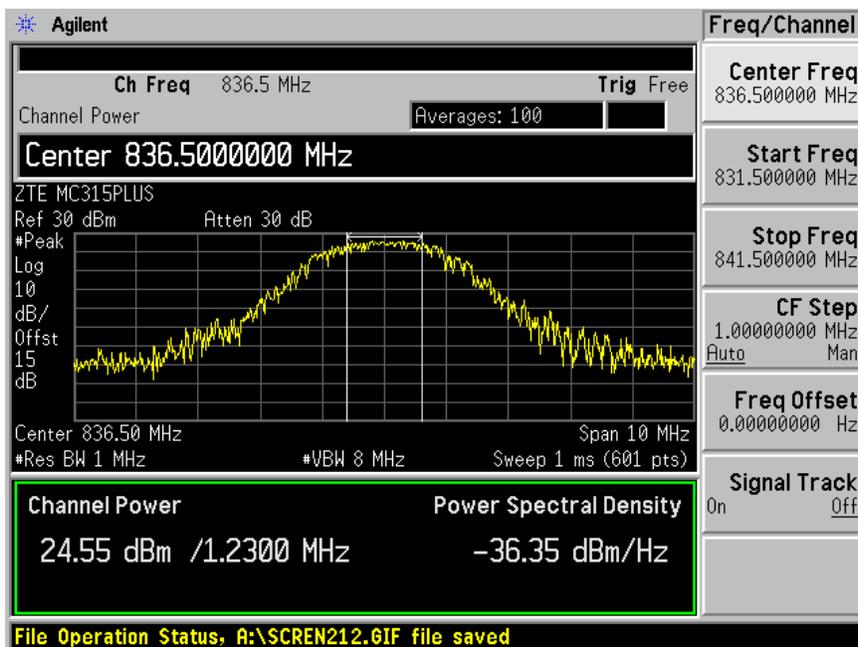
### Test Results

Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	824.7	25.09	0.323	7
MIDDLE	836.52	24.55	0.285	7
HIGH	848.3	24.86	0.306	7

*Plot of Conducted Output Power for Low Channel*



*Plot of Conducted Output Power for Middle Channel*



Plot of Conducted Output Power for High Channel



## §2.1049 - OCCUPIED BANDWIDTH

### Applicable Standard

Requirements: CFR 47, Section 2.1049 and 22.917(d).

### Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 30 KHz and the 26 dB bandwidth was recorded.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Environmental Conditions

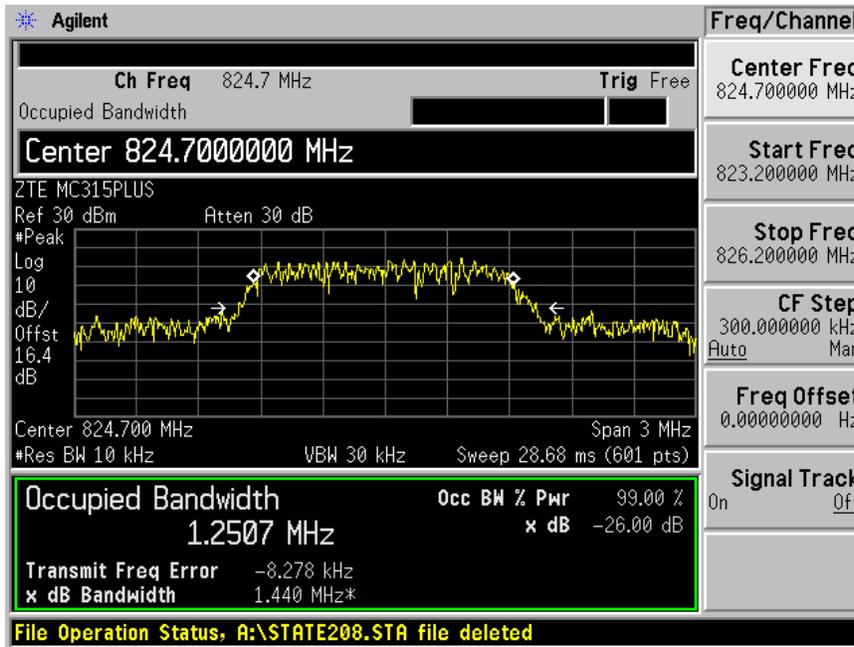
Temperature:	21° C
Relative Humidity:	72%
ATM Pressure:	1026 mbar

*The testing was performed by Snell Leong on 2005-11-18.*

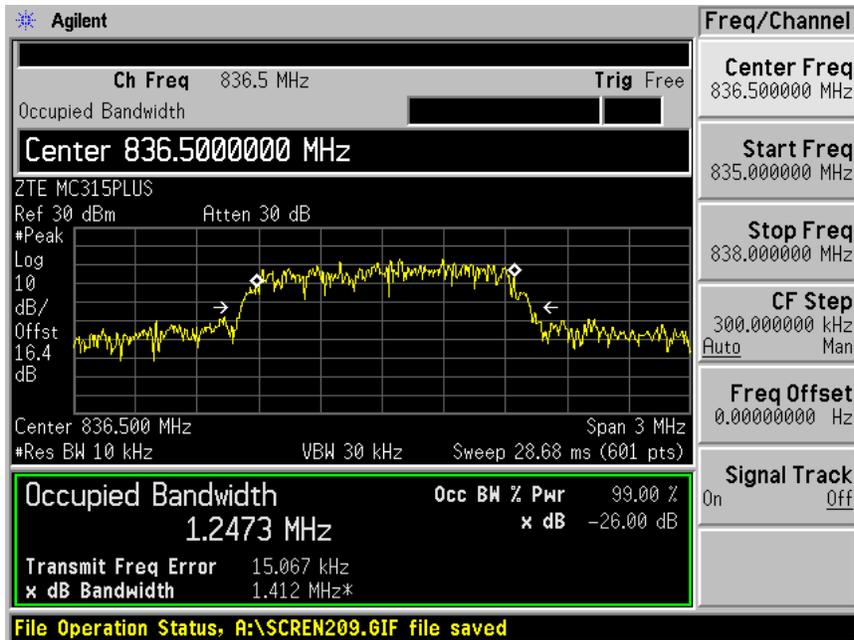
### Test Results

Please refer to the following plots.

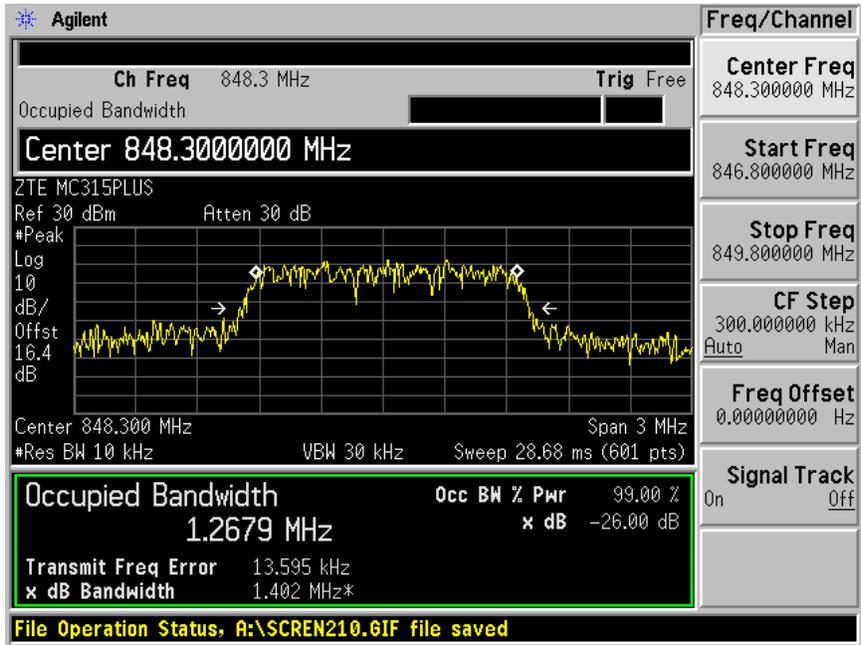
*Plot of Occupied Bandwidth for Low Channel*



*Plot of Occupied Bandwidth for Middle Channel*



Plots of Occupied Bandwidth for High Channel



## **§2.1051, §22.917 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

### **Applicable Standard**

Requirements: CFR 47, § 2.1051, § 22.917.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

### **Test Procedure**

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Cal. Date</b>
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### **Environmental Conditions**

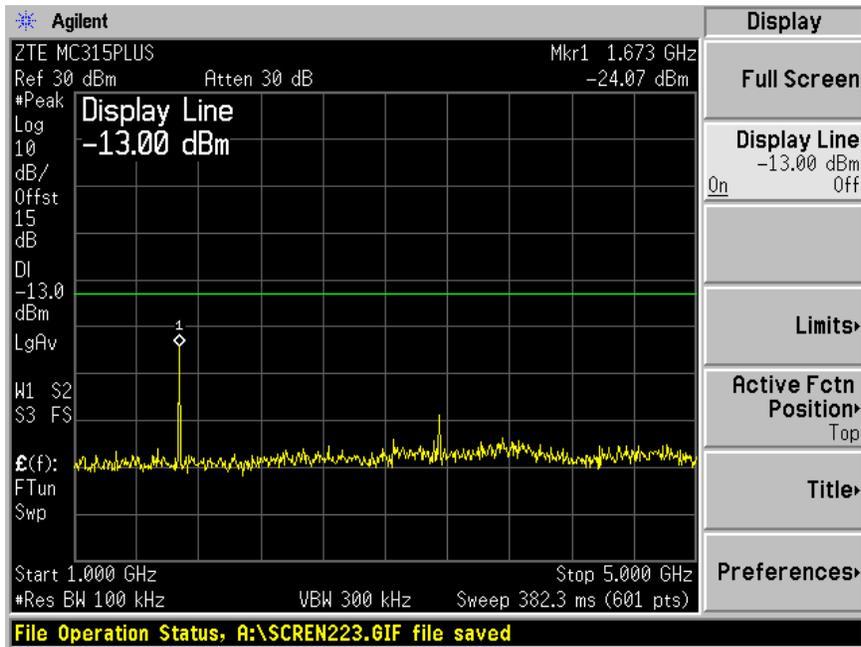
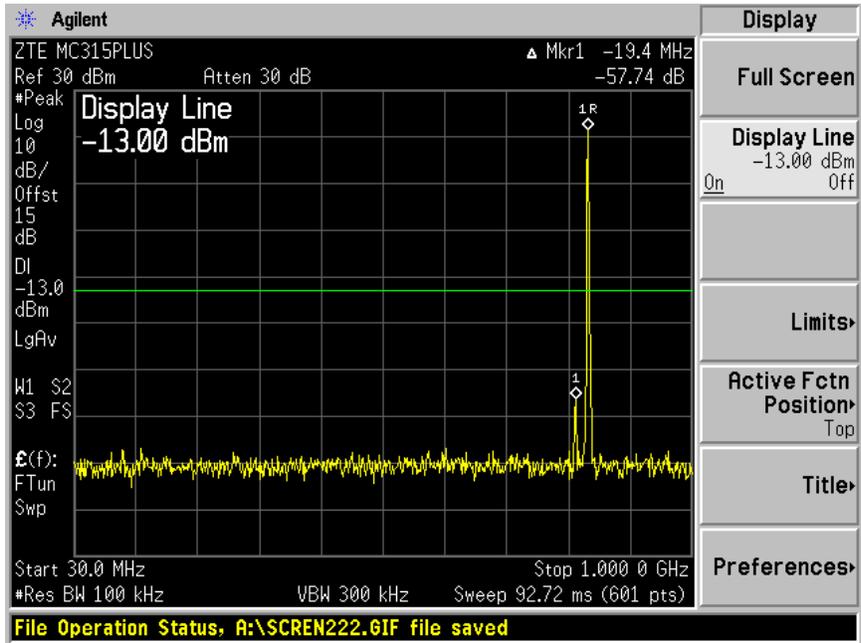
Temperature:	21° C
Relative Humidity:	72%
ATM Pressure:	1026 mbar

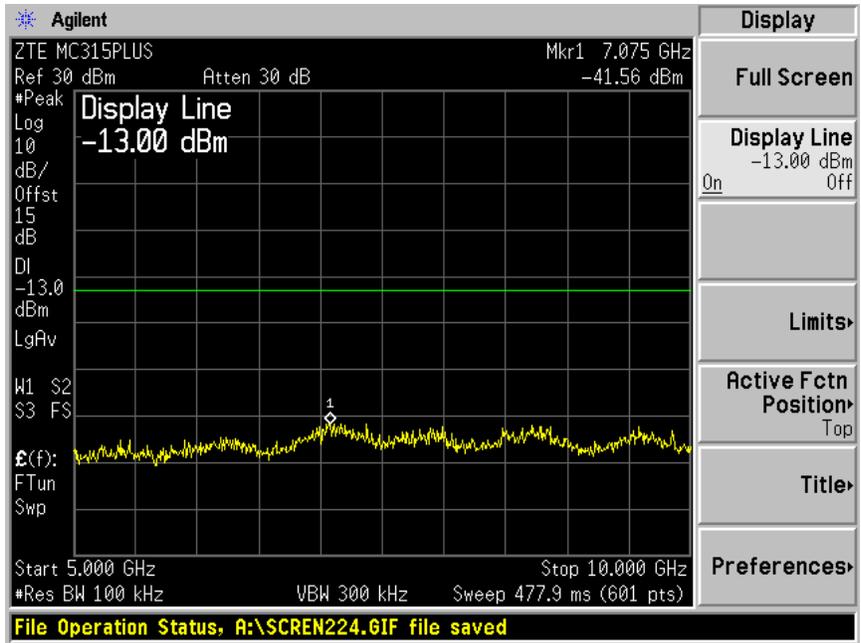
*The testing was performed by Snell Leong on 2005-11-18.*

### **Test Results**

Please refer to the hereinafter plots.

*Plots of Spurious Emission for Mid Channel*





## **§2.1055 (a), §2.1055 (d), §22.355 - FREQUENCY STABILITY**

### **Applicable Standard**

Requirements: FCC § 2.1055 (a), § 2.1055 (d) & following:

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1\_Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Mobile		Mobile SU3 watts [le]3 watts
	Base, fixed (ppm)	[SU][le]/ (ppm)	
25 to 50.....	20.0	20.0	50.0
50 to 450.....	5.0	5.0	50.0
450 to 512.....	2.5	5.0	5.0
821 to 896.....	1.5	2.5	2.5
928 to 929.....	5.0	n/a	n/a
929 to 960.....	1.5	n/a	n/a
2110 to 2220.....	10.0	n/a	n/a

### **Test Procedure**

**Frequency Stability vs. Temperature:** The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

**Frequency Stability vs. Voltage:** An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Cal. Date</b>
HP	Counter, Microwave Frequency	5342A	2232A06380	2005-09-07
Tenney	Oven, Temperature	VersaTenn	12.222-193	2005-06-27

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

## Environmental Conditions

Temperature:	21° C
Relative Humidity:	72%
ATM Pressure:	1026 mbar

*The testing was performed by Snell Leong on 2005-11-18.*

## Test Results

Condition		Ref Freq	Measured Freq	Freq Error	Limit
Voltage (v)	Temperature (C )	MHz	MHz	PPM	PPM
110	-30	836.52	836.520031	0.04	2.5
110	0	836.52	836.520022	0.03	2.5
110	20	836.52	836.520035	0.04	2.5
110	30	836.52	836.520016	0.02	2.5
110	50	836.52	836.519985	0.02	2.5
126.5	-20	836.52	836.520088	0.11	2.5
126.5	50	836.52	836.519978	0.03	2.5
93.5	-20	836.52	836.520029	0.03	2.5
93.5	50	836.52	836.519978	0.03	2.5

## §22.917 – BAND EDGE

### Applicable Standard

According to § 22.917, 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.

### Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency, RBW set to 3 kHz.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Environmental Conditions

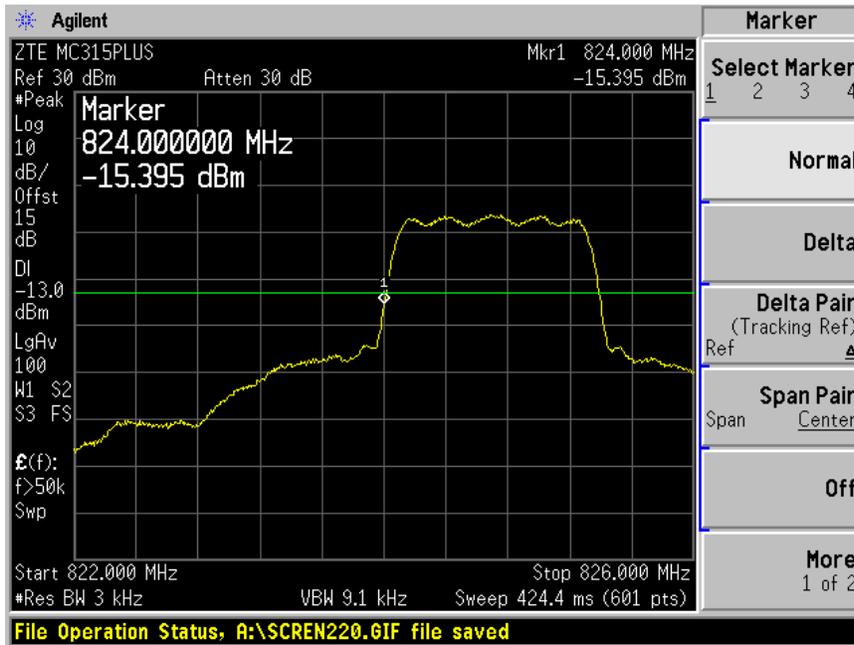
Temperature:	21° C
Relative Humidity:	72%
ATM Pressure:	1026 mbar

*The testing was performed by Snell Leong on 2005-11-18.*

### Test Results

Please refer to the following plots.

Plots of Band Edge for Low Channel



Plots of Band Edge for High Channel

