

**FCC PART 24 TYPE APPROVAL**  
**EMI MEASUREMENT AND TEST REPORT**

For

**ZTE Corporation**

ZTE Plaza, Hi-tech Park, Nanshan District, Shenzhen, Guangdong, China

**FCC ID: Q78-X100**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Equipment Type:</b> CDMA2000 1X Digital Mobile Phone
<b>Test Engineer:</b> Daniel Deng / 	
<b>Report No.:</b> R0506144	
<b>Test Date:</b> 2005-06-20	
<b>Reviewed By:</b> Richard Lee / 	
<b>Prepared By:</b> Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164	

**Note:** The test report is specially limited to the above company and this particular sample only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the US Government.

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## GENERAL INFORMATION

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

The ZTE Corporation's product, model number: X100 or the "EUT" as referred to in this report is a CDMA2000 1X Digital Mobile Phone. The EUT measures approximately 64.5mm L x 43.5mmW x 27.0mmH, rated input voltage: Battery 3.7 V.

*\* The test data gathered are from production sample, serial number: 200505120003, provided by the manufacturer.*

### Objective

This Type approval report is prepared on behalf of ZTE Corporation in accordance with Part 2, Subpart J, and Part 24 Subpart E 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, occupied bandwidth, band edge, frequency stability, and conducted and radiated margin.

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

No related submittal(s).

### 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 24 Subpart E - PCS

Applicable Standards: TIA EIA 137-A, TIA EIA 97-D, TIA/EIA 603-B, Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

### 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.

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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 is attached hereinafter and can also be found at <http://ts.nist.gov/ts/hdocs/210/214/scopes/2001670.htm>

## SYSTEM TEST CONFIGURATION

### Justification

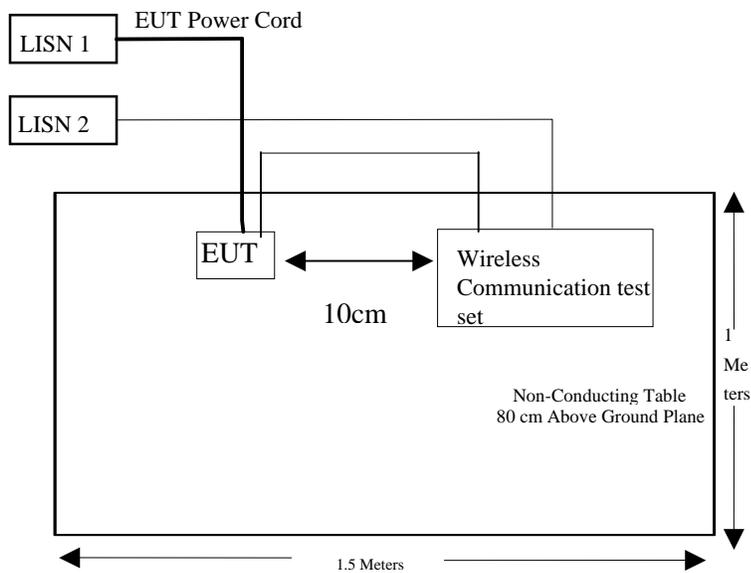
The EUT was configured for testing according to TIA/EIA 603A.

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

### Equipment Modifications

BACL has not done any modification on the EUT.

### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

FCC RULES	DESCRIPTION OF TEST	RESULT
§2.1046 §24.232	RF Output Power	Compliant
§2.1046, §24.232	Conducted Output Power	Compliant
§2.1047	Modulation characteristic	Compliant
§15.109(a)	Radiation Emission	Compliant
§2.1053	Spurious Radiated Emissions	Compliant
§2.1051, §24.238(a)	Spurious Emissions AT Antenna Terminals	Compliant
§2.1049, §24.238	Occupied Bandwidth	Compliant
§24.238	Band Edge	Compliant
§ 2.1055 (a) § 2.1055 (d) § 24.235	Frequency stability	Compliant

## §2.1046, §24.232- CONDUCTED OUTPUT POWER

### Applicable Standard

According to FCC §2.1046 and §24.232(a), in no case may the peak output power of a mobile transmitter exceed 2 watt.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Analyzer, Communications	E5515C	GB44051221	2004-5-4	2005-5-4
Agilent	Analyzer, Spectrum	E4446A	US44300386	2004-11-10	2005-11-10

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

### Test Procedure

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

### Test Data

#### Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	1023 mbar

*The testing was performed by Daniel Deng on 2005-6-20*

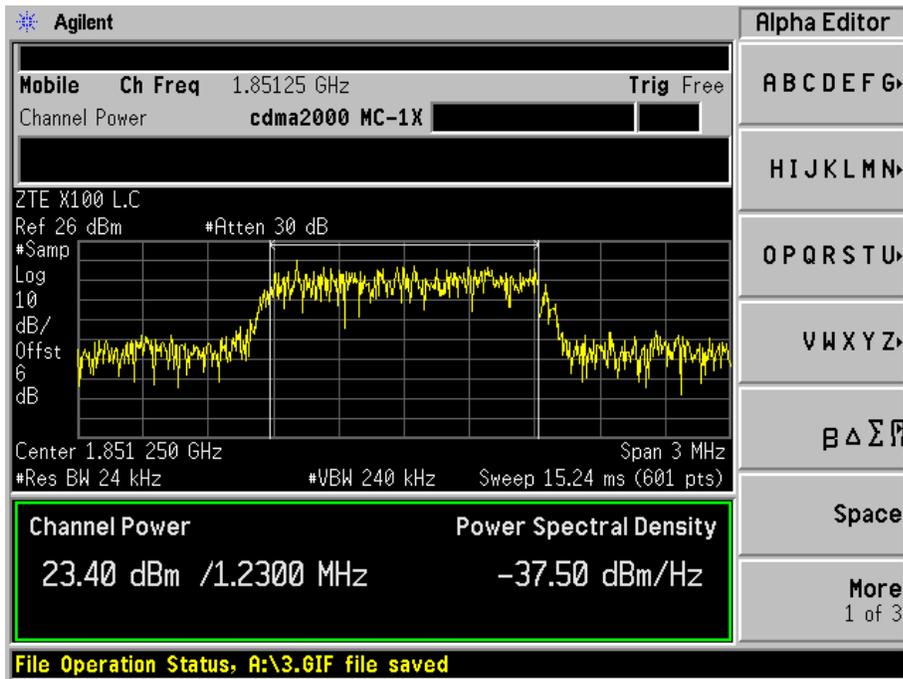
Test Result: Pass

*Test Mode: Transmitting*

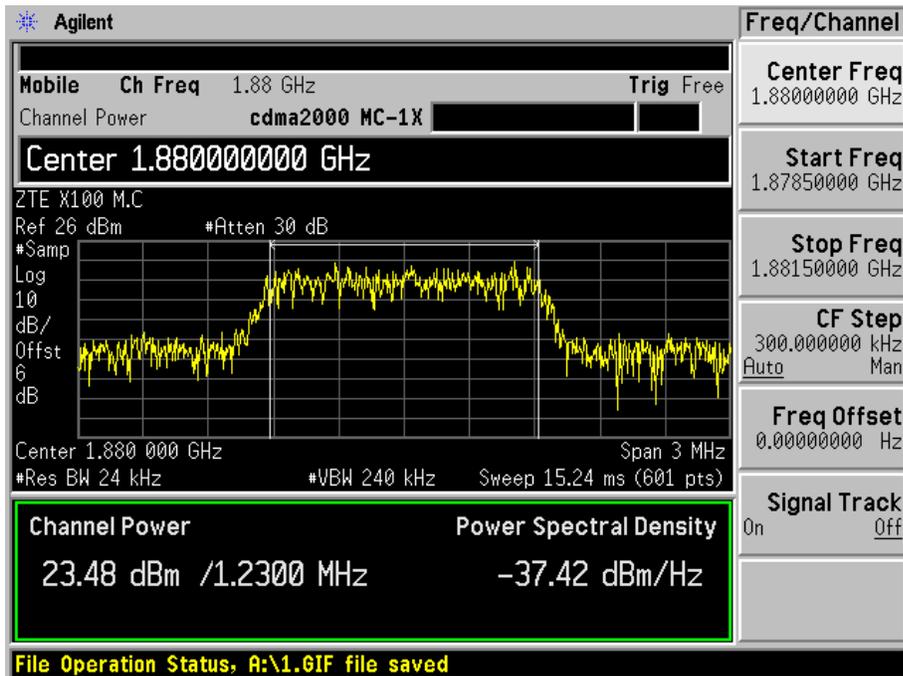
The result has been complied with the §2.1046, §24.232, see the following plot:

Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
Low Channel	1851.25	23.40	0.219	2
Middle Channel	1880.00	23.48	0.223	2
High Channel	1908.75	23.33	0.215	2

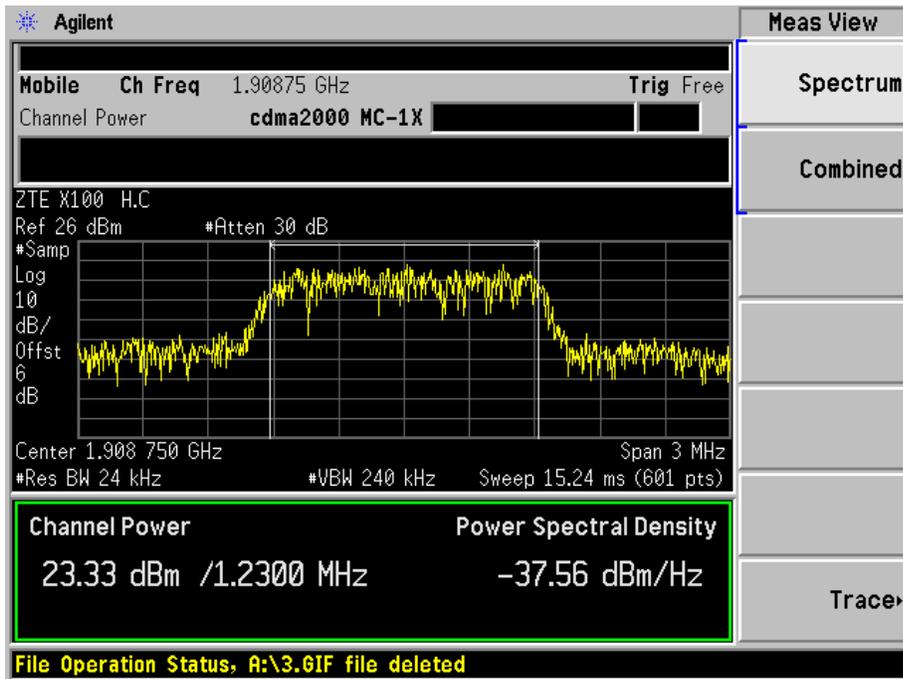
Low Channel



Middle Channel



High Channel



## §2.1046, §24.232 – RF OUTPUT POWER

### Applicable Standard

Per FCC §2.1046 and §24.232(a): in no case may the peak output power of a mobile transmitter exceed 2 watt.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Analyzer, Communications	E5515C	GB44051221	5/4/2004	5/4/2005
Agilent	Analyzer, Spectrum	E4446A	US44300386	11/10/2004	11/10/2005
ETS	Antenna, Log-Periodic	3148	4-1155	12/14/2004	12/14/2005
ETS	Antenna, Biconical	3110B	9603-2315	12/14/2004	12/14/2005
HP	Amplifier, Pre	8447D	2944A10198	8/20/2004	8/20/2005
HP	Amplifier, Pre, Microwave	8449B	3147A00400	6/14/2004	6/14/2005
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	5/2/2005	5/2/2006
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	4/20/2005	4/20/2006
HP	Generator, Signal	83650B	3614A00276	5/10/2005	5/10/2006
A.R.A.	Antenna, Horn	DRG-118/A	1132	9/30/2003	N/R
Wainwright	Filter, Band Reject	WRCG1850/1910-1835/1925-40/8SS	5	8/11/2004	8/11/2005

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

### 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 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 Data

### Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	1023 mbar

*The testing was performed by Daniel Deng on 2005-6-20*

Test Result: Pass

*Test Mode: Transmitting*

Frequency Mhz	Measured Power (dBm)	Antenna	Cable	Absolute
		Gain Correction	Loss dB	Level dBm
1851.25	14.0	9.2	1.3	21.9
1880.00	15.1	8.3	1.3	22.1
1908.75	15.0	8.3	1.3	22.0

Sample calculation:

Absolute level=substitution reading + antenna gain – cable loss

For example:

$$21.9=14+9.2-1.3$$

## §2.1047- MODULATION CHARACTERISTIC

### Applicable Standard

Requirement: §2.1047.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Test Set, Communications	E5515C	GB44051221	2005-5-4	2006-5-4
Agilent	Analyzer, Spectrum	E4446A	US44300386	2004-11-10	2005-11-10

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

### Test Procedure

The communication test set E5515C is sending a CDMA signal via a splitter. One output of the splitter goes to the EUT to generate a link & the other output of the splitter goes to the spectrum analyzer to record the waveform.

### Test Data

#### Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	1023 mbar

*The testing was performed by Daniel Deng on 2005-6-20*

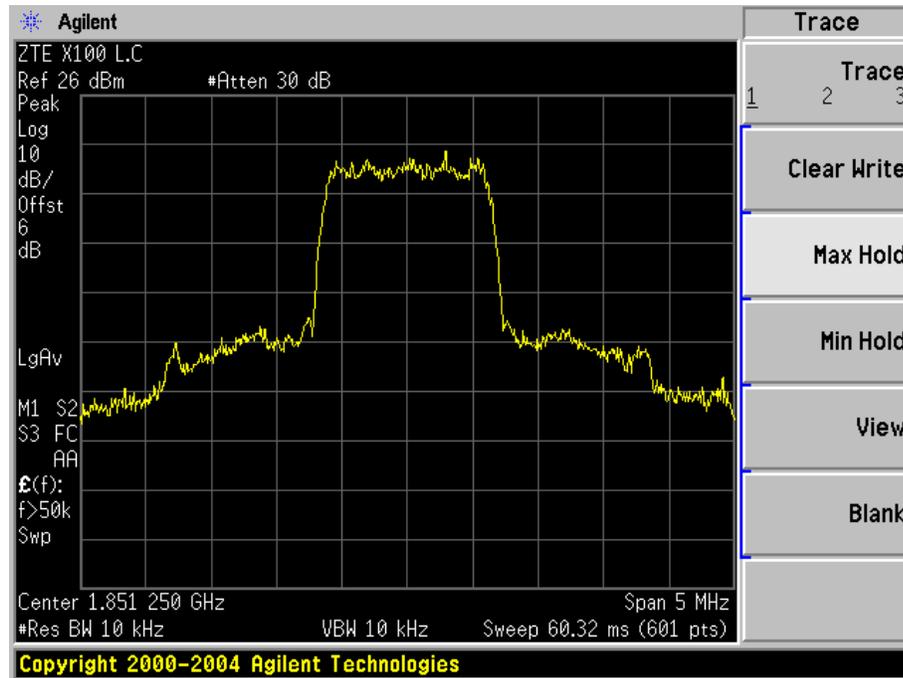
Test Result: Pass

*Test Mode: Transmitting*

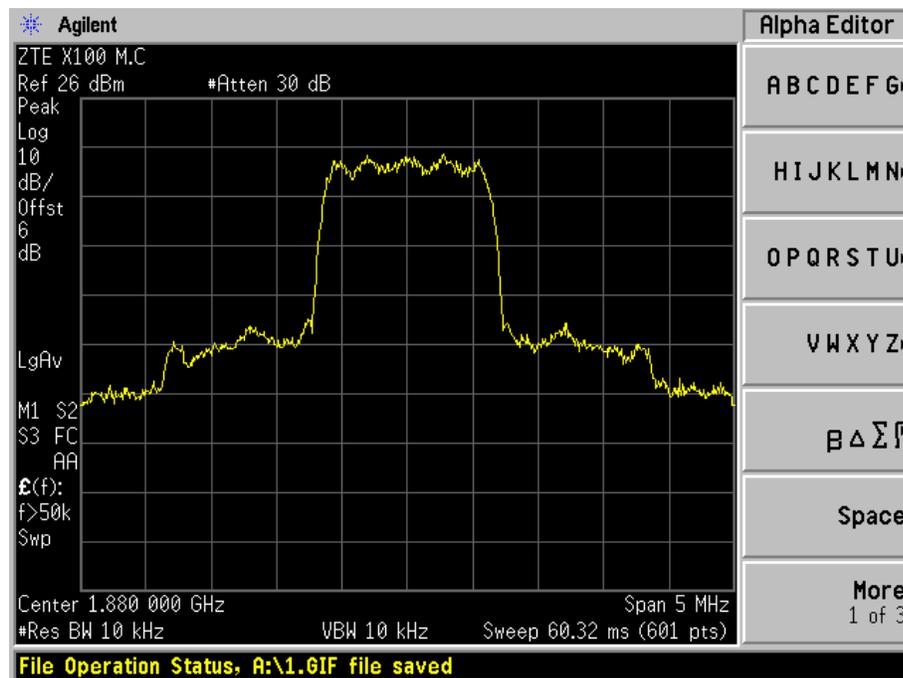
The result has been complied with the §2.1047, see the following plot:

Channel	Frequency (MHz)	Modulation Type
Low Channel	1851.25	CDMA
Middle Channel	1880.00	CDMA
High Channel	1908.75	CDMA

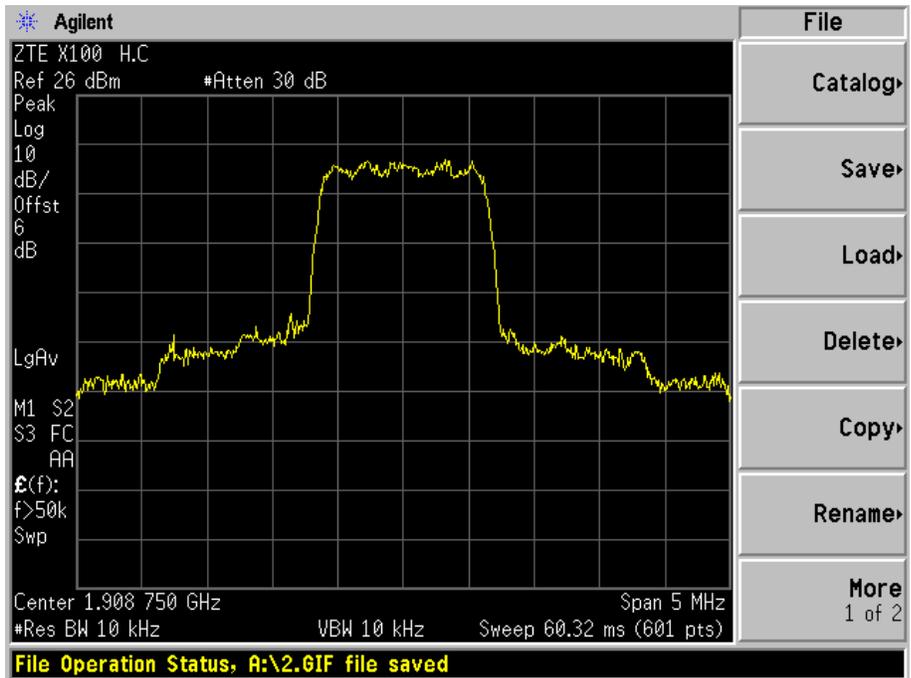
Low Channel



Middle Channel



### High Channel



## §2.1053- SPURIOUS RADIATED EMISSIONS

### Applicable Standard

Requirements: CFR 47, §2.1053

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Analyzer, Communications	E5515C	GB44051221	2005-5-4	2006-5-4
Agilent	Analyzer, Spectrum	E4446A	US44300386	2004-11-10	2005-11-10
ETS	Antenna, Log-Periodic	3148	4-1155	2004-12-14	2005-12-14
ETS	Antenna, Biconical	3110B	9603-2315	2004-12-14	2005-12-14
HP	Amplifier, Pre	8447D	2944A10198	2004-8-20	2005-8-20
HP	Amplifier, Pre, Microwave	8449B	3147A00400	2005-6-14	2006-6-14
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2005-5-2	2006-5-2
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2005-4-20	2006-4-20
HP	Generator, Signal	83650B	3614A00276	2005-5-10	2006-5-10
A.R.A.	Antenna, Horn	DRG-118/A	1132	2003-9-30	N/R
Wainwright	Filter, Band Reject	WRCG1850/1 910- 1835/1925- 40/8SS	5	2004-8-11	2005-8-11

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

### 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)

The system was investigated from 30MHz to 20GHz.

## Test Results Summary

The worse case reading is

**-17.30 dB at 5640.00 MHz in Vertical Polarization.**

## Test Data

### Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	1023 mbar

*The testing was performed by Daniel Deng on 2005-6-20*

*Test Mode: Transmitting*

Indicated Frequency MHz	Meter Reading dBuV/m	Table Angle Degree	Test Antenna		Substituted		Antenna Gain Correction	Cable Loss dB	Absolute Level dBm	Limit dBm	Margin dB
			Height Meter	Polar H/V	Frequency MHz	Level dBm					
5640.00	60.86	180	1.9	v	5640.0	-36.9	11.2	4.6	-30.3	-13	-17.3
5640.00	60.17	90	1.6	h	5640.0	-37.7	11.2	4.6	-31.1	-13	-18.1
1742.23	59.46	90	1.6	v	1742.2	-54.5	9.3	1.3	-46.5	-13	-33.5
1742.23	56.19	200	1.5	h	1742.2	-57.6	9.3	1.3	-49.6	-13	-36.6
3760.00	47.94	90	1.7	h	3760.0	-58.6	11.4	3.5	-50.7	-13	-37.7
3760.00	47.17	180	1.7	v	3760.0	-58.9	11.4	3.5	-51.0	-13	-38.0
1799.95	51.42	180	1.5	h	1800.0	-62.1	9.2	1.3	-54.2	-13	-41.2
1799.95	51.22	180	1.5	v	1800.0	-62.6	9.2	1.3	-54.7	-13	-41.7

## **§2.1051, §24.238(a)- SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

### **Applicable Standard**

Requirements: CFR 47§ 2.1051 & §24.238(a)

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

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

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Agilent	Analyzer, Communications	E5515C	GB44051221	2005-5-4	2006-5-4
Agilent	Analyzer, Spectrum	E4446A	US44300386	2004-11-10	2005-11-10

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

### **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.

The frequency of spurious emission was scanned from 30MHz to 20GHz.

### **Test Data**

#### **Environmental Conditions**

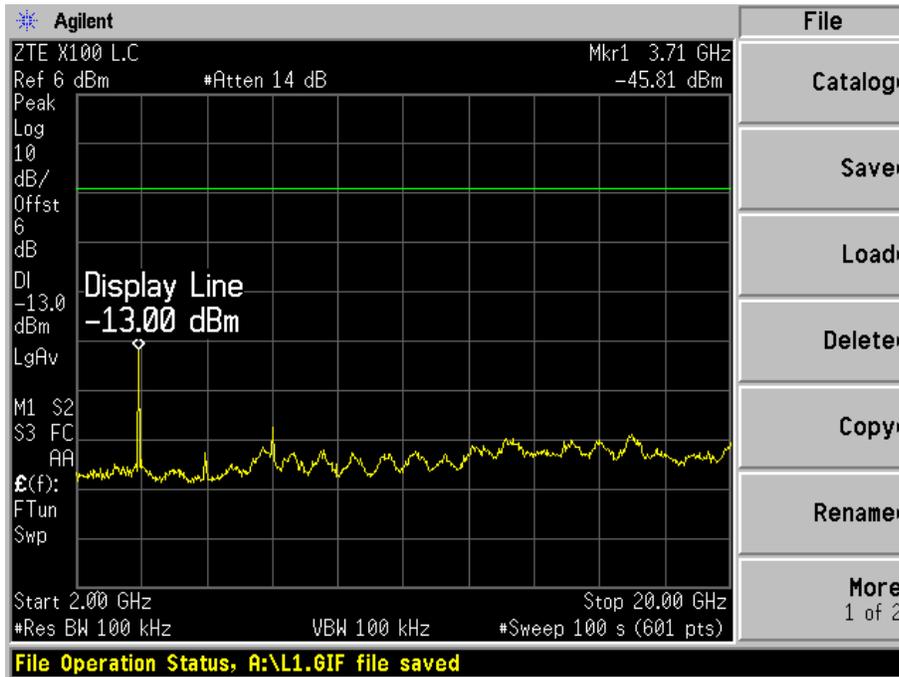
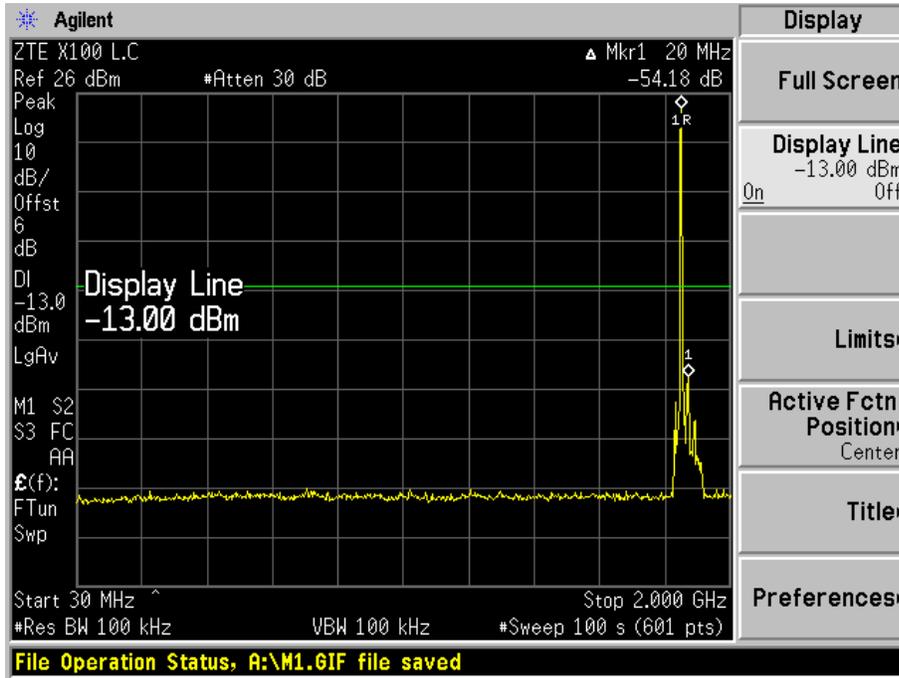
Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	1023 mbar

*The testing was performed by Daniel Deng on 2005-6-20*

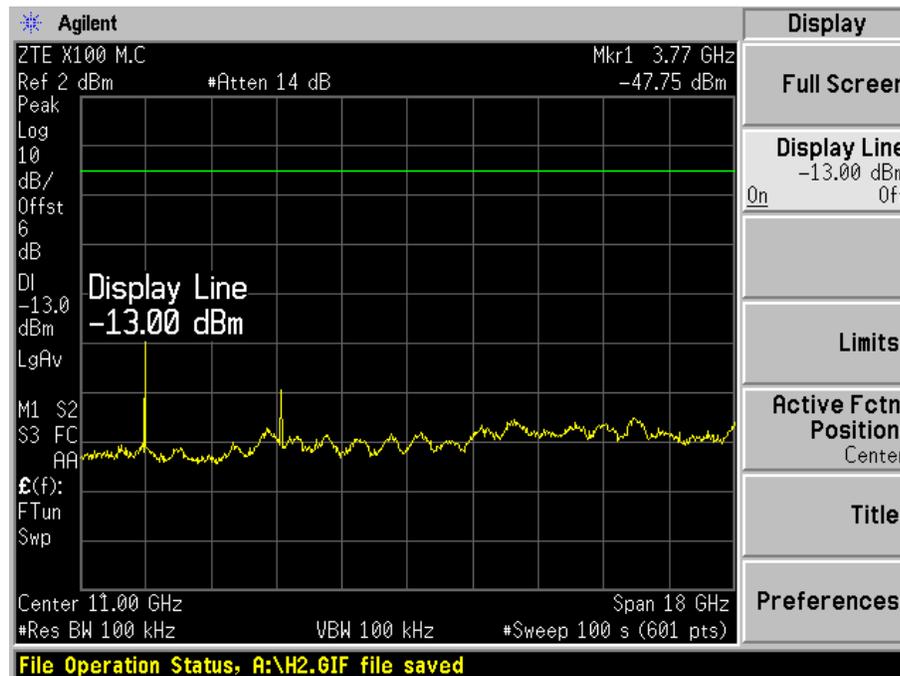
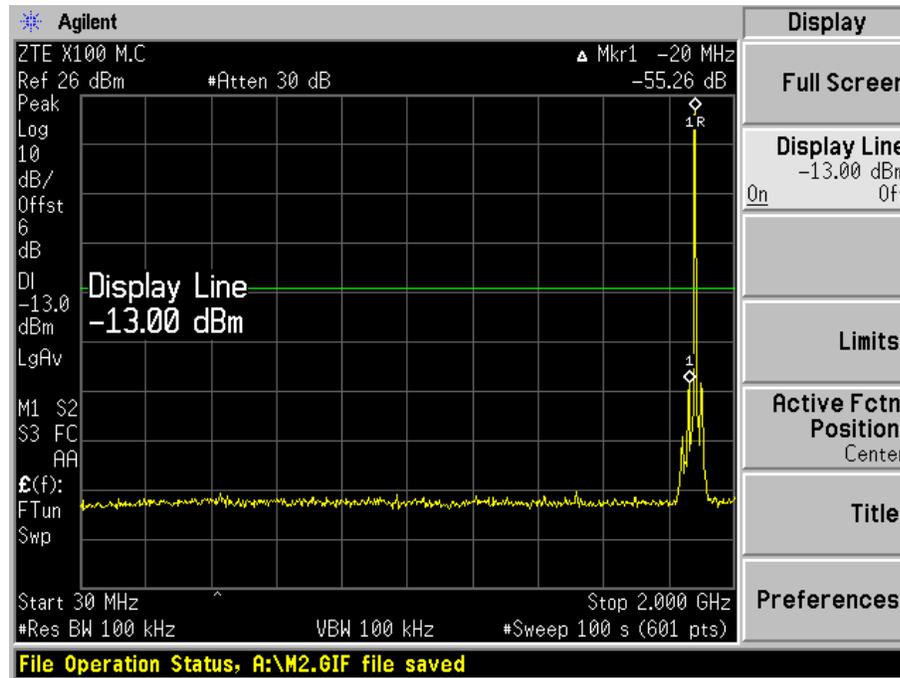
Test Result: Pass

*Test Mode: Transmitting*

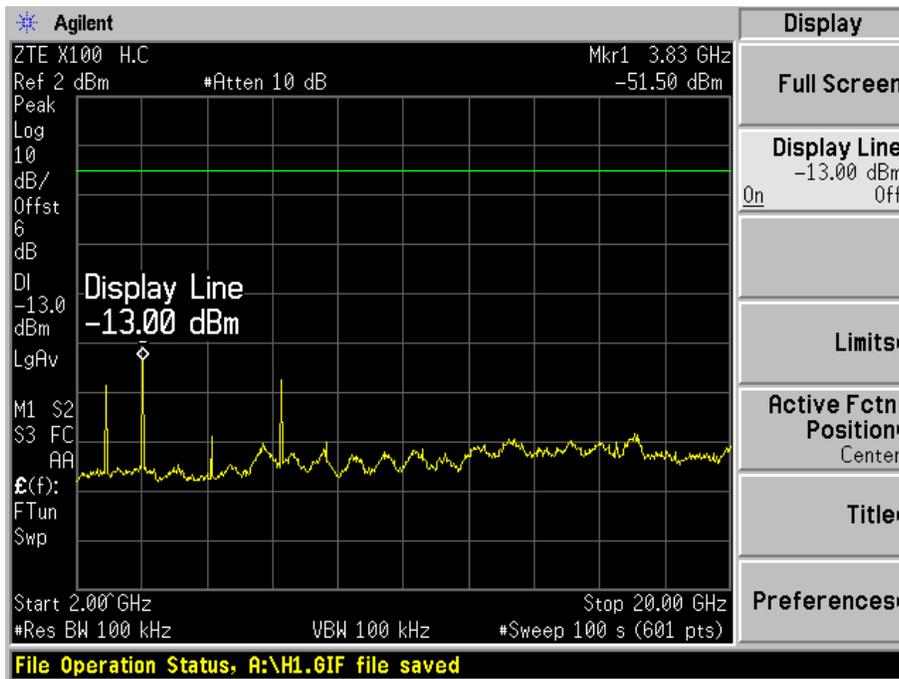
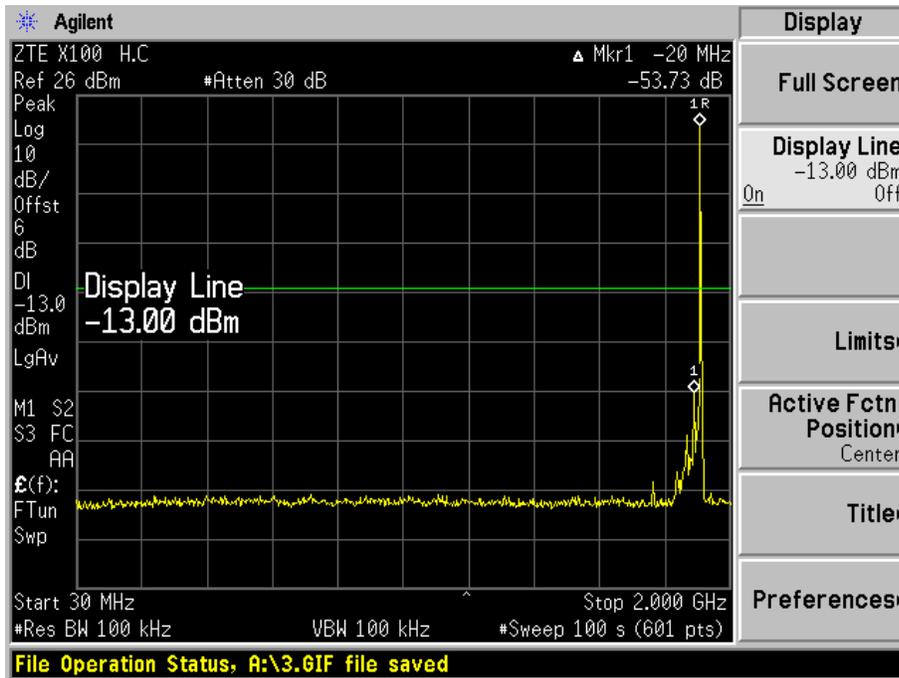
Low Channel



Middle Channel



High Channel



## §2.1049, §24.238-OCCUPIED BANDWIDTH

### Applicable Standard

Requirements: CFR 47, Section 2.1049 and Section 24.238.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Analyzer, Communications	E5515C	GB44051221	2005-5-4	2006-5-4
Agilent	Analyzer, Spectrum	E4446A	US44300386	2004-11-10	2005-11-10

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

### Test Procedure

The RF out 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 12 kHz and the 26 dB and 99% Power bandwidth was recorded.

### Test Data

#### Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	1023 mbar

*The testing was performed by Daniel Deng on 2005-6-20*

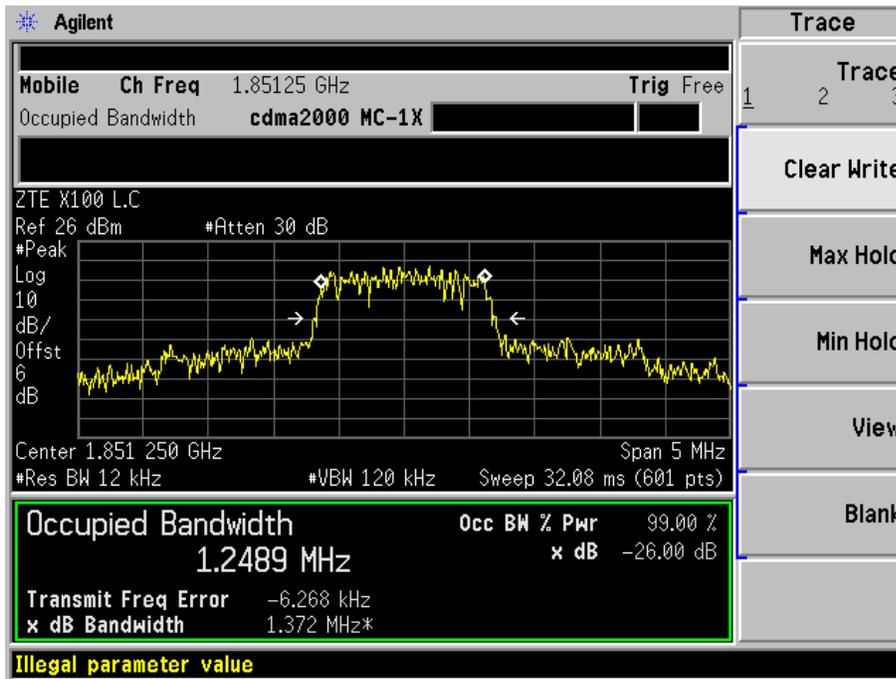
Test Result: Pass

*Test Mode: Transmitting*

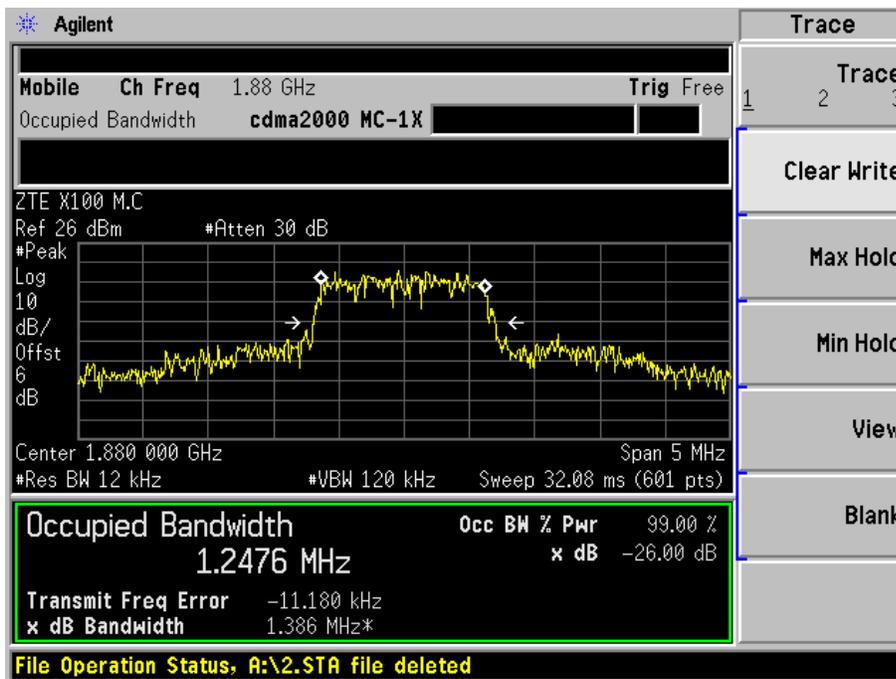
The result has been complied with the §2.1049 & §24.238, see the following plot:

Channel	Channel frequency (MHz)	99% Power Bandwidth (MHz)
Channel 25	1851.25	1.2489
Channel 600	1880.00	1.2476
Channel 1175	1908.75	1.2485

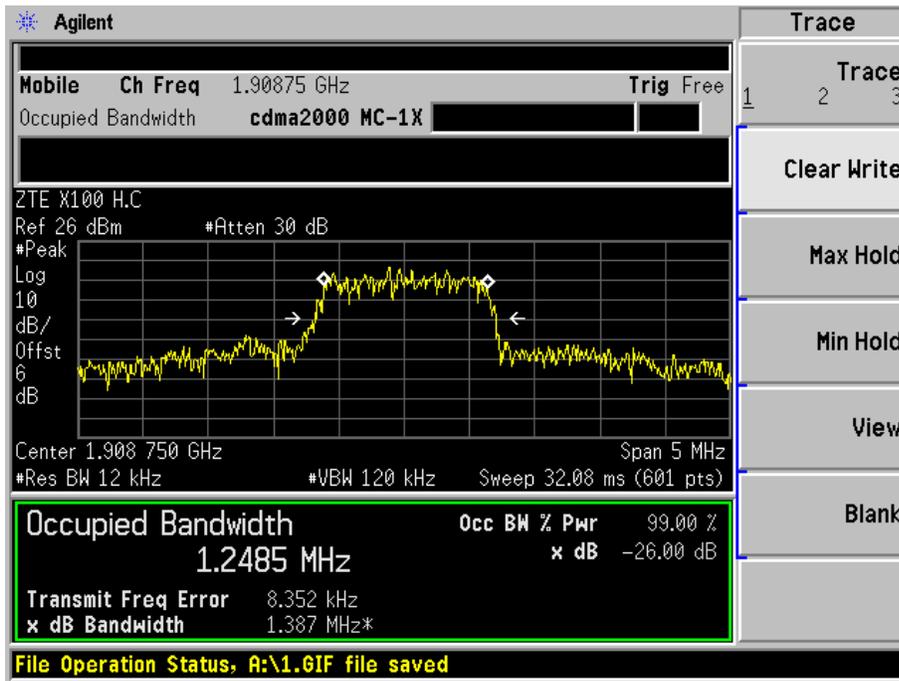
Low Channel



Middle Channel



High Channel



## §24.238- BAND EDGES

### Applicable Standard

According to §24.238, 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Analyzer, Communications	E5515C	GB44051221	2005-5-4	2006-5-4
Agilent	Analyzer, Spectrum	E4446A	US44300386	2004-11-10	2005-11-10

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

### 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 10 kHz.

### Test Data

#### Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	1023 mbar

*The testing was performed by DanielDeng on 2005-6-20*

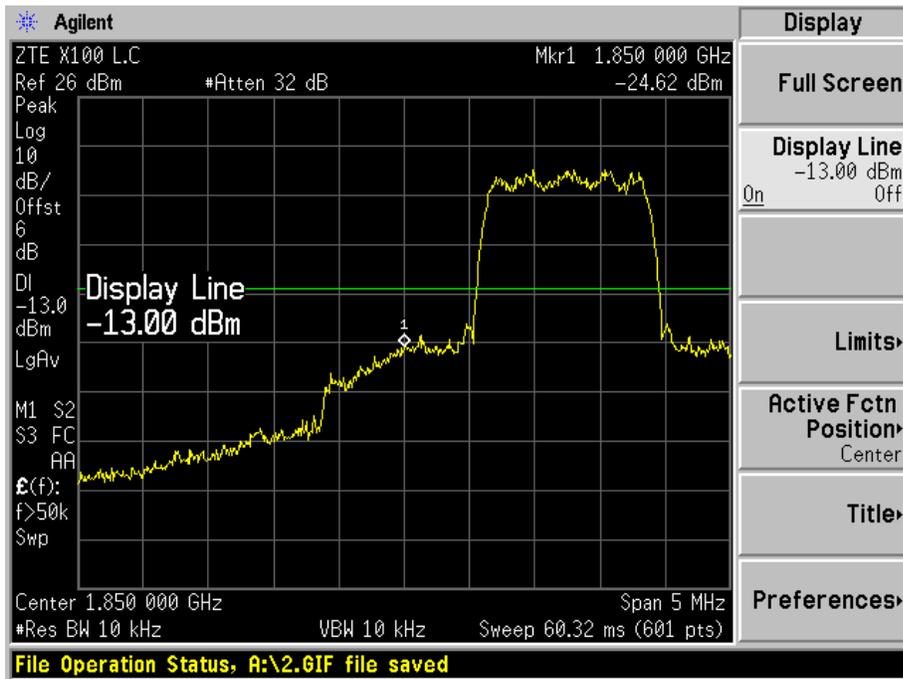
Test Result: Pass

*Test Mode: Transmitting*

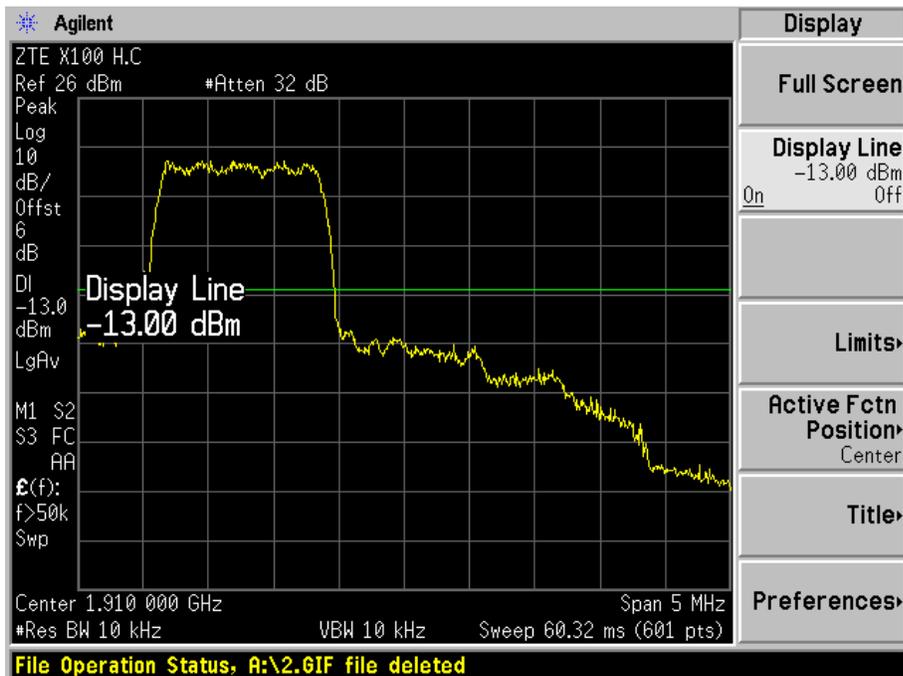
The result has been complied with the §24.238, see the following plot:

Frequency MHz	Emission dBm	Limit dBm
1850.00	-24.62	-13
1910.00	-23.00	-13

Low Channel



High Channel



## **§2.1055 (a), §2.1055 (d) & §24.235 - FREQUENCY STABILITY**

### **Applicable Standard**

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

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Agilent	Analyzer, Communications	E5515C	GB44051221	2005-5-4	2006-5-4
Tenney	Oven, Temperature	VersaTenn	12.222-193	2005-6-4	2006-6-4

\* **Statement of Traceability:** Bay Area Compliance Lab Corp. (ShenZhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### **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 f Spectrum Analyzer 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 Spectrum Analyzer.

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

### **Test Data**

#### **Environmental Conditions**

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	1023 mbar

*The testing was performed by Daniel Deng on 2005-6-20.*

Test Result: Pass

*Test Mode: Transmitting*

## Vs Temperature

Condition		Ref Freq	Measured Freq	Frequency	Limit	Result
Voltage (v)	Temperature (C )	MHz	MHz	Error (PPM)	PPM	
3.7	-30	1880	1880.000065	0.034574468	2.5	Pass
3.7	-20	1880	1880.000053	0.028191489	2.5	
3.7	-10	1880	1880.000051	0.02712766	2.5	
3.7	0	1880	1880.000042	0.022340425	2.5	
3.7	10	1880	1880.000035	0.018617021	2.5	
3.7	20	1880	1880.000026	0.013829787	2.5	
3.7	30	1880	1880.000031	0.016489362	2.5	
3.7	40	1880	1880.000038	0.020212766	2.5	
3.7	50	1880	1880.000029	0.015425532	2.5	

## Vs Vlotage

Condition		Ref Freq	Measured Freq	Frequency	Limit	Result
Voltage (v)	Temperature (C )	MHz	MHz	Error (PPM)	PPM	
3.58	20	1880	1880.000033	0.017553192	2.5	Pass