

**FCC Test Report** 

APPLICANT : ZTE CORPORATION

EQUIPMENT : CDMA 1X Wireless data terminal

BRAND NAME : ZTE

MODEL NAME : AC8720

FCC ID : Q78-AC8720

STANDARD : 47 CFR Part 2, 22(H)

CLASSIFICATION : PCS Licensed Transmitter (PCB)

Tx/Rx FREQUENCY RANGE : 824.70 ~ 848.31 MHz / 869.70 ~ 893.31 MHz

MAX. ERP POWER : 0.07 W EMISSION DESIGNATOR : 1M28F9W

The product sample received on Apr. 09, 2009 and completely tested on Apr. 22, 2009. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Roy Wu<mark>//</mark>Manager

ilac MRA

Page Number

Report Version



: 1 of 27

: Rev. 01

Report Issued Date: Apr. 22, 2009

Report No.: FG940920

SPORTON INTERNATIONAL (KUNSHAN) INC. No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.



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# **REVISION HISTORY**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG940920	Rev. 01	Initial issue of report	Apr. 22, 2009

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# **SUMMARY OF TEST RESULT**

Report Section	FCC Rule	IC Rule	Description	Limit	Result
3.1	§2.1046	N/A	Conducted Output Power	N/A	PASS
3.2	§22.913(a)(2)	RSS-132(4.4) SRSP-503(5.1.3)	Effective Radiated Power	< 7 Watts for FCC (<6.3 Watts for IC)	PASS
3.3	§2.1049 §22.917(a)	N/A	Occupied Bandwidth	N/A	PASS
3.4	§2.1051 §22.917(a)	RSS-132 (4.5.1)	Band Edge Measurement	< 43+10log <sub>10</sub> (P[Watts])	PASS
3.5	§2.1051 §22.917(a)	RSS-132 (4.5.1)	Conducted Emission	< 43+10log <sub>10</sub> (P[Watts])	PASS
3.6	§2.1053 §22.917(a)	RSS-132 (4.5.1)	Field Strength of Spurious Radiation	< 43+10log <sub>10</sub> (P[Watts])	PASS
3.7	§2.1055 §22.355	RSS-132(4.3)	Frequency Stability for Temperature & Voltage	< 2.5 ppm	PASS

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1 **General Description** 

# 1.1 Applicant

#### **ZTE CORPORATION**

ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China

# 1.2 Manufacturer

#### **ZTE CORPORATION**

ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China

# 1.3 Feature of Equipment Under Test

Product Feature & Specification				
Equipment	CDMA 1X Wireless data terminal			
Brand Name	ZTE			
Model Name	AC8720			
FCC ID	Q78-AC8720			
Tx Frequency	824 MHz ~ 849 MHz			
Rx Frequency	869 MHz ~ 894 MHz			
Maximum Output Power to Antenna	20.12 dBm			
Maximum ERP	0.07 W (18.70 dBm)			
Antenna Type	Fixed Internal Antenna			
HW Version	AC2726MD_C2			
SW Version	LU9A7200			
Type of Modulation	QPSK			
Type of Emission	1M28F9W			
EUT Stage	Production Unit			

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## 1.4 Testing Site

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.		
	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.		
Test Site Location	TEL: +86-0512-5790-0158		
	FAX: +86-0512-5790-0958		
Test Site No.	Sporton	Site No.	
Test Site No.	TH01-KS	03CH01-KS	

## 1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- Preliminary Guidance for Receiving Applications for Certification of 3G Device. May 9, 2006.
- 47 CFR Part 2, 22(H)
- ANSI C63.4-2003
- ANSI / TIA / EIA-603-C-2004
- IC RSS-132 Issue 2

#### Remark:

- All test items were verified and recorded according to the standards and without any deviation during the test.
- This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B (DoC), recorded in a separate test report.

# 1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	PC	DELL	MT320	FCC DoC	N/A	Unshielded, 1.8 m
3.	Monitor	Q.Bell	L91C	FCC DoC	Shielded, 1.2 m	Unshielded, 1.8 m
4.	(USB)Mouse	DELL	MO56UC	FCC DoC	Shielded, 1.8 m	N/A
5.	(USB)Keyboard	DELL	L100	FCC DoC	Shielded, 1.8 m with core	N/A

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2 Test Configuration of Equipment Under Test

#### 2.1 Test Mode

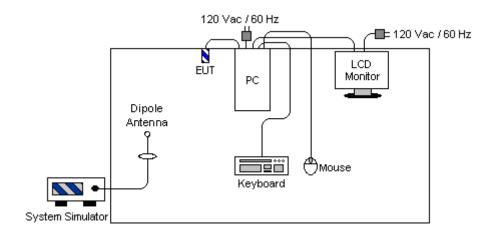
During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Frequency range investigated for radiated emission is as follows:

1. 30 MHz to 9000 MHz for CDMA2000 Cellular

	Test Modes					
Band	Radiated TCs	Conducted TCs				
CDMA2000	- AuDTT Link Made	- 4. DTT Link Made				
Cellular	■ 1xRTT Link Mode	■ 1xRTT Link Mode				

## 2.2 Connection Diagram of Test System



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3 Test Result

## 3.1 Conducted Output Power Measurement

## 3.1.1 Description of the Conducted Output Power Measurement

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals shall be reported.

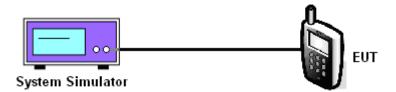
#### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.1.3 Test Procedures

- 1. The transmitter output port was connected to base station.
- 2. Set EUT at maximum power through base station.
- 3. Select lowest, middle, and highest channels for each band and different modulation.

## 3.1.4 Test Setup



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## 3.1.5 Test Result of Conducted Output Power

CDMA2000 Cellular					
Test Mode	Test Status	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watts)
		1013 (Low)	824.70	20.02	0.10
	FCH_RC1	384 (Mid)	836.52	18.12	0.06
		777 (High)	848.31	18.65	0.07
	FCH_RC3	1013 (Low)	824.70	20.12	0.10
CDMA 2000 1xRTT		384 (Mid)	836.52	18.20	0.07
.,		777 (High)	848.31	18.73	0.07
		1013 (Low)	824.70	19.84	0.10
	FCH+SCH_RC3	384 (Mid)	836.52	18.07	0.06
		777 (High)	848.31	18.68	0.07

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#### 3.2 Effective Radiated Power and

#### 3.2.1 Description of the ERP Measurement

ERP is measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The ERP of mobile transmitters must not exceed 7 Watts.

## 3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.2.3 Test Procedures

- 1. The EUT was placed on a turntable with 1.0 meter height in a fully anechoic chamber.
- 2. The EUT was set at 1.2 meters from the receiving antenna, which was mounted on the antenna tower.
- 3. The table was rotated 360 degrees to determine the position of the highest radiated power.
- 4. The height of the receiving antenna is adjusted to look for the maximum ERP.
- 5. Taking the record of maximum ERP.
- 6. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
- 7. The conducted power at the terminal of the dipole antenna is measured.
- 8. Repeat step 3 to step 5 to get the maximum ERP of the substitution antenna.
- 9. ERP = Ps + Et Es + Gs = Ps + Rt Rs + Gs

Ps (dBm): Input power to substitution antenna.

Gs (dBi or dBd): Substitution antenna Gain.

Et = Rt + AF

Es = Rs + AF

AF (dB/m): Receive antenna factor

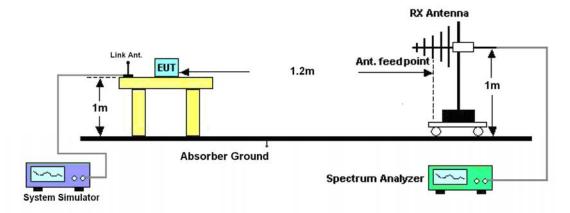
Rt: The highest received signal in spectrum analyzer for EUT.

Rs: The highest received signal in spectrum analyzer for substitution antenna.

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## 3.2.4 Test Setup



## 3.2.5 Test Result of ERP

CDMA2000 Cellular 1xRTT_FCH_RC3 Radiated Power ERP						
		Hori	zontal Polariza	ntion		
Frequency	Rt	Rs	Ps	Gs	ERP	ERP
(MHz)	(dBm)	(dBm)	(dBm)	(dBd)	(dBm)	(W)
824.70	-28.34	-48.12	0.00	-1.08	18.70	0.07
836.52	-34.79	-48.28	0.00	-0.93	12.56	0.02
848.31	-31.61	-48.35	0.00	-0.76	15.98	0.04
		Ve	rtical Polarizat	ion		
Frequency	Rt	Rs	Ps	Gs	ERP	ERP
(MHz)	(dBm)	(dBm)	(dBm)	(dBd)	(dBm)	(W)
824.70	-30.43	-47.97	0.00	-1.08	16.46	0.04
836.52	-36.25	-48.01	0.00	-0.93	10.83	0.01
848.31	-32.56	-48.05	0.00	-0.76	14.73	0.03

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## 3.3 Occupied Bandwidth Measurement

## 3.3.1 Description of Occupied Bandwidth Measurement

The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

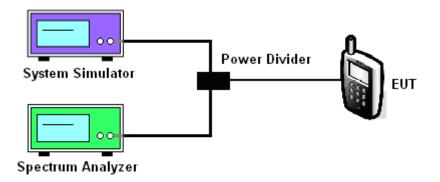
## 3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.3.3 Test Procedures

- 1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
- 2. The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers were measured.
- The RBW was replaced by 10 kHz, due to the spectrum analyzer IF-Filter including an excess 3. of the limit. A worst case correction factor of 10 log (1% BW/measurement RBW) was implemented.

#### 3.3.4 Test Setup



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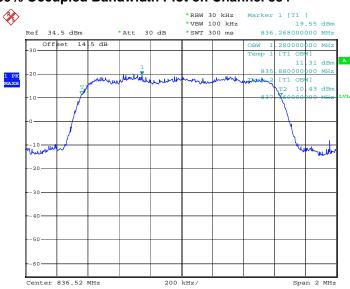
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## 3.3.5 Test Result (Plots) of Occupied Bandwidth

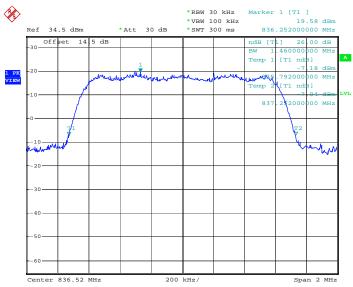
Band:	CDMA2000 Cellular	Power Stage :	High
Test Mode :	1xRTT_FCH_RC3		

## 99% Occupied Bandwidth Plot on Channel 384



Date: 9.APR.2009 18:55:12

## 26dB Bandwidth Plot on Channel 384



Date: 9.APR.2009 18:46:39

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## 3.4 Band Edge Measurement

## 3.4.1 Description of Band Edge Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

## 3.4.2 Measuring Instruments

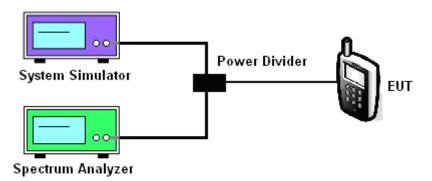
See list of measuring instruments of this test report.

#### 3.4.3 Test Procedures

- 1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
- 2. The band edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.

## 3.4.4 Test Setup

## <Conducted Band Edge >



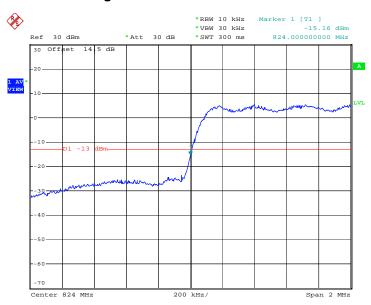
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## 3.4.5 Test Result (Plots) of Conducted Band Edge

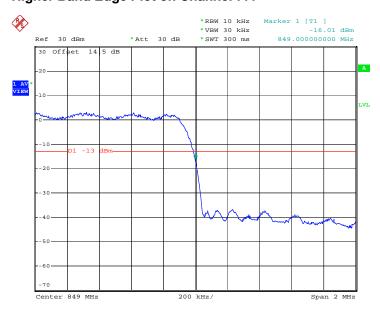
Band:	CDMA2000 Cellular	Power Stage :	High
Test Mode :	1xRTT_FCH_RC3		

## **Lower Band Edge Plot on Channel 1013**



Date: 22.APR.2009 15:43:30

## **Higher Band Edge Plot on Channel 777**



Date: 22.APR.2009 15:42:53

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3.5 Conducted Emission Measurement

## 3.5.1 Description of Conducted Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10<sup>th</sup> harmonic.

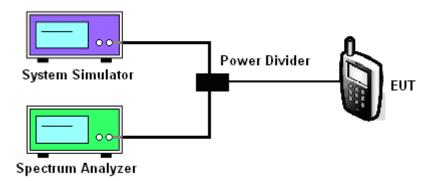
## 3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.5.3 Test Procedures

- 3. The EUT was connected to spectrum analyzer and base station via power divider.
- 4. The middle channel for the highest RF power within the transmitting frequency was measured.
- 5. The conducted spurious emission for the whole frequency range was taken.

## 3.5.4 Test Setup



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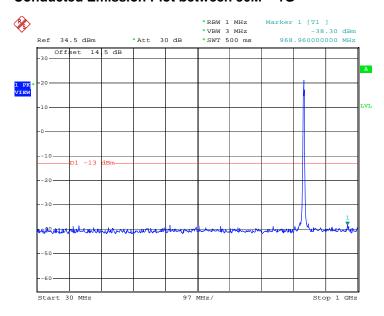




## Test Result (Plots) of Conducted Emission

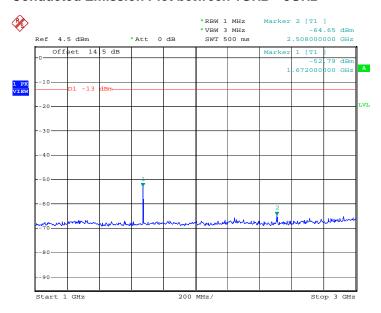
Band:	CDMA2000 Cellular	Power Stage :	High
Test Mode :	1xRTT_FCH_RC3		

#### Conducted Emission Plot between 30M ~ 1G



Date: 22.APR.2009 16:21:35

#### Conducted Emission Plot between 1GHz ~ 3GHz



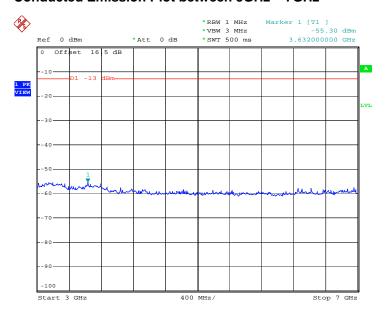
Date: 13.APR.2009 04:19:50

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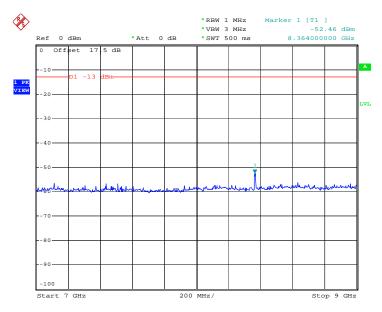


#### Conducted Emission Plot between 3GHz ~ 7GHz



Date: 13.APR.2009 04:23:31

#### Conducted Emission Plot between 7GHz ~ 9GHz



Date: 13.APR.2009 04:24:52

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## 3.6 Field Strength of Spurious Radiation Measurement

#### 3.6.1 Description of Field Strength of Spurious Radiated Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43+10log<sub>10</sub>(P[Watts]) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

## 3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.6.3 Test Procedures

- 6. The EUT was placed on a rotatable wooden table with 0.8 meter about ground.
- 7. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
- 8. The table was rotated 360 degrees to determine the position of the highest spurious emission.
- 9. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
- 10. Taking the record of maximum spurious emission.
- 11. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
- 12. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
- 13. Taking the record of output power at antenna port.
- Repeat step 7 to step 8 for another polarization.
- 15. Emission level (dBm) = output power + substitution Gain.

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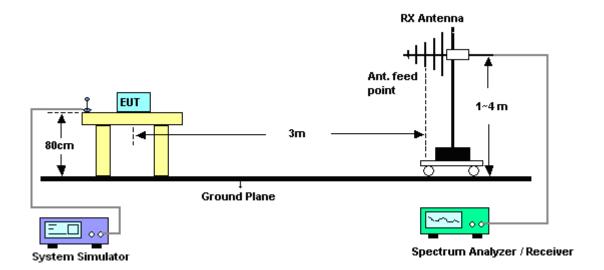
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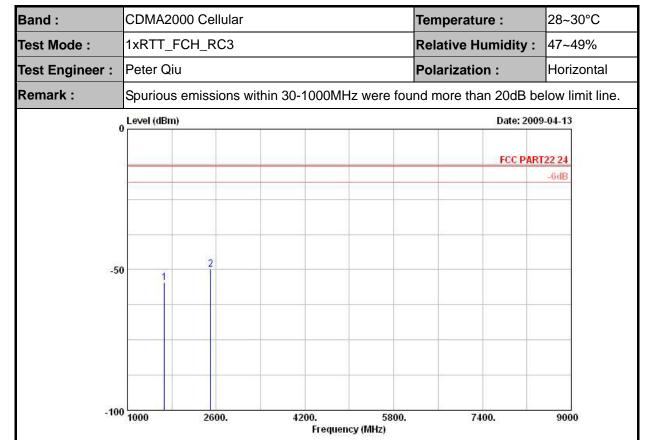
## 3.6.4 Test Setup



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## 3.6.5 Test Result of Field Strength of Spurious Radiated



Site : 03CH01-KS

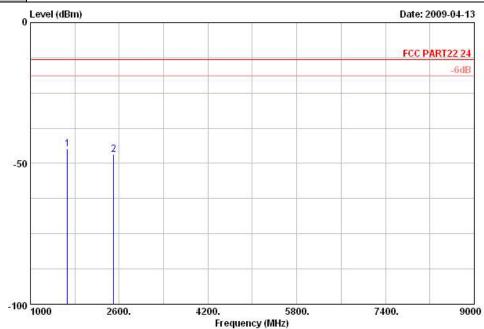
Condition: FCC PART22 24 HF EIRP FACTOR-09020 HORIZONTAL

Frequency	ERP	Limit	Over	SPA	S.G.	TX Cable	TX Antenna	Polarization	Result
			Limit	Reading	Power	loss	Gain		
(MHz)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	( dB )	(dBi)	(H/V)	
1666	-54.69	-13	-41.69	-62.29	-57.90	0.69	6.05	Н	Pass
2500	-49.89	-13	-36.89	-58.23	-52.69	0.82	5.77	Н	Pass

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Band :	CDMA2000 Cellular	Temperature :	28~30°C			
Test Mode :	1xRTT_FCH_RC3	Relative Humidity :	47~49%			
Test Engineer :	Peter Qiu	Polarization :	Vertical			
Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.						



Site : 03CH01-KS Condition: FCC PART22 24 HF EIRP FACTOR-09020 VERTICAL

Frequency	ERP	Limit	Over	SPA	S.G.	TX Cable	TX Antenna	Polarization	Result
			Limit	Reading	Power	loss	Gain		
(MHz)	(dBm)	(dBm)	( dB )	(dBm)	(dBm)	( dB )	(dBi)	(H/V)	
1666	-44.81	-13	-31.81	-52.41	-48.02	0.69	6.05	V	Pass
2502	-46.69	-13	-33.69	-55.03	-49.49	0.82	5.77	V	Pass

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3.7 Frequency Stability Measurement

#### 3.7.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

## 3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

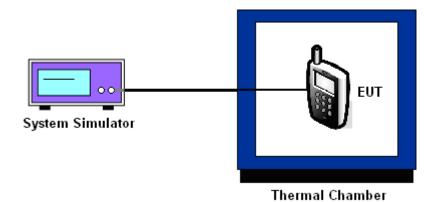
## 3.7.3 Test Procedures for Temperature Variation

- 16. The EUT was set up in the thermal chamber and connected with the base station.
- 17. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized for three hours. Power was applied and the maximum change in frequency was recorded within one minute.
- 18. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.
- 19. If the EUT can not be turned on at -30°C, the testing lowest temperature will be raised in 10°C step until the EUT can be turned on.

#### 3.7.4 Test Procedures for Voltage Variation

- 20. The EUT was placed in a temperature chamber at 25±5° C and connected with the base station.
- 21. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.
- 22. The variation in frequency was measured for the worst case.

#### 3.7.5 Test Setup



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## 3.7.6 Test Result of Temperature Variation

Band :	CDMA2000 Cellular	Channel:	384
Test Mode :	1xRTT_FCH_RC3	Limit (ppm):	2.5

Temperature (°C)	Freq. Dev. (Hz)	Deviation (ppm)	Result
-30	-6	-0.01	
-20	-7	-0.01	
-10	5	0.01	
0	1	0.00	
10	-3	0.00	PASS
20	6	0.01	
30	5	0.01	
40	3	0.00	
50	-6	-0.01	

## 3.7.7 Test Result of Voltage Variation

Band & Channel	Mode	Voltage (Volt)	Freq. Dev. (Hz)	Deviation (ppm)	Limit (ppm)	Result
CDMA2000 Cellular CH384	r 1xRTT FCH_RC3	5.0	5.0	0.01		
		4.3	-4.0	0.00	2.5	PASS
		5.8	4.0	0.00		

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# **List of Measuring Equipment**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Dec. 08, 2008	Dec. 07, 2009	Conducted (TH01-KS)
Power Meter	Agilent	E4416A	MY45101555	N/A	Jun. 18, 2007	Jun. 17, 2009	Conducted (TH01-KS)
Power Sensor	Agilent	E9327A	MY44421198	N/A	Jun. 12, 2007	Jun. 11, 2009	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-930701	N/A	Dec. 15, 2008	Dec. 14, 2009	Conducted (TH01-KS)
DC Power Supply	TOPWARD	3306D	N/A	N/A	N/A	N/A	Conducted (TH01-KS)
System Simulator	R&S	CMU200	837587/066	Full-Band/BT	Jan. 08, 2009	Jan. 07, 2011	Conducted (TH01-KS)
Spectrum Analyzer	R&S	ESCI	100534	9kHz – 2.75GHz	Dec. 08, 2008	Dec. 07, 2009	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Dec. 08, 2008	Dec. 07, 2009	Radiation (03CH01-KS)
Bilog Antenna	SCHAFFNER	CBL6112D	23182	25MHz~2GHz	Dec. 17, 2008	Dec. 16, 2009	Radiation (03CH01-KS)
Double Ridge Horn Antenna	EMCO	3117	75959	1GHz~18GHz	Dec. 17, 2008	Dec. 16, 2009	Radiation (03CH01-KS)
Amplifier	Wireless	FPA6592G	600006	30MHz~2GHz	Dec. 17, 2008	Dec. 16, 2009	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Dec. 17, 2008	Dec. 16, 2009	Radiation (03CH01-KS)
Signal Generator	R&S	SMR40	100455	10MHz~40GHz	Aug. 29, 2007	Aug. 28, 2009	Radiation (03CH01-KS)

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5 **Uncertainty of Evaluation** 

## Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

	Uncert	ainty of $X_i$		
Contribution	dB	Probability	$u(x_i)$	
	dБ	Distribution		
Receiver reading	0.41	Normal(k=2)	0.21	
Antenna factor calibration	0.83	Normal(k=2)	0.42	
Cable loss calibration	0.25	Normal(k=2)	0.13	
Pre Amplifier Gain calibration	0.27	Normal(k=2)	0.14	
RCV/SPA specification	2.50	Rectangular	0.72	
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29	
Site imperfection	1.43	Rectangular	0.83	
Mismatch	+0.39/-0.41	U-shaped	0.28	
Combined standard uncertainty Uc(y)		1.27		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)		2.54		

## **Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)**

	Uncerta	inty of $x_i$			$Ci*u(x_i)$
Contribution	dB	Probability Distribution	$u(x_i)$	Ci	$Ci \cdot u(x_i)$
Receiver reading	±0.10	Normal(k=1)	0.10	1	0.10
Antenna factor calibration	±1.70	Normal(k=2)	0.85	1	0.85
Cable loss calibration	±0.50	Normal(k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR Γ1= 0.197 Antenna VSWR Γ2= 0.194 Uncertainty=20log(1-Γ1*Γ2)	+0.34/-0.35	U-shaped	0.244	1	0.244
Combined standard uncertainty Uc(y)	2.36				
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)		4	1.72		

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## 6 Certification of TAF Accreditation



Certificate No. : 1.1190-081212

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財團法人全國認證基金會 Taiwan Accreditation Foundation

## Certificate of Accreditation

This is to certify that

#### Sporton International Inc.

## **EMC & Wireless Communications Laboratory**

No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

#### is accredited in respect of laboratory

Accreditation Criteria : ISO/IEC 17025:2005

Accreditation Number : 1190

Originally Accredited : December 15, 2003

Effective Period : January 10, 2007 to January 09, 2010

Accredited Scope : Testing Field, see described in the Appendix

Specific Accreditation : Accreditation Program for Designated Testing Laboratory

Program for Commodities Inspection

Accreditation Program for Telecommunication Equipment

Testing Laboratory

Accreditation Program for BSMI Mutual Recognition

Arrangment with Foreign Authorities

Jay-San Chen

President, Taiwan Accreditation Foundation

Date: December 12, 2008

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The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix

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# Appendix A. Photographs of EUT

Please refer to Sporton report number EP940920 as below.

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