

MPE Evaluation Report

Applicant Name: Sierra Wireless Inc

Applicant Address: 13811 Wireless Way Richmond, British Columbia Canada, V6V 3A4

The following samples were submitted and identified on behalf of the client as:

Sample Description	Module
SGS Ref	GSM10166004M02
Model Number	Airprime Q2687
FCC ID	N7NQ2687
IC ID	2417C-Q2687
Final Hardware Version Tested	520
Final Software Version Tested	Firmware 7.43
Date Initial Sample Received	03-15,2010
Testing Start Date	03-15,2010
Testing End Date	03-16,2010

According to:

FCC Rules 47 CFR §2.1091, FCC OET Bulletin 65 supplement C
 FCC Rules 47 CFR §22.913, FCC Rules 47 CFR §24.232
 Radio Standards Specification 102 (RSS-102)

Comments/ Conclusion:

The configuration tested complied to the certification requirements specified in this report.

Signed for on behalf of SGS



Project Manager



Technical Manager

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SHGSM

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Change History

Version	Change Contents	Author	Date
V1.0	First edition	Ken Wang	03-16,2010
V1.1	Update client information	Roger Ruan	04-08,2010

1. Report Overview

This report details the results of testing carried out on the samples listed in section 15, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this test report is used in any configuration other than that detailed in the test report, the manufacturer must ensure the new configuration complies with all relevant standards and certification requirements. Any mention of SGS Shanghai Wireless Telecommunications lab or testing done by SGS Shanghai Wireless Telecommunications lab made in connection with the distribution or use of the tested product must be approved in writing by SGS Shanghai Wireless Telecommunications lab.

2. Test Lab Declaration or Comments

None

3. Applicant Declaration or Comments

None

4. Measurement Uncertainty

Measurements and results are all in compliance with the standards listed in section 10 of this report. All measurements and results are recorded and maintained at the laboratory performing the tests and measurement uncertainties are taken into account when comparing measurements to pass/ fail criteria.

5. Testing Environment

Normal Temperature	+20 to +24 °C
Relative Humidity	35 to 60 %

6. Primary Test Laboratory

Name:	Wireless Telecommunications Laboratory SGS-CSTC Standards Technical Services(Shanghai) Co., Ltd
Address:	9F, 3rd Building, No.889, Yishan Rd, Xuhui District, Shanghai, China 200233
Telephone:	+86 (0) 21 6140 2666
Fax:	+86 (0) 21 5450 0149
Internet:	http://www.cn.sgs.com
Contact:	Mr. Peter Xue
Email:	peter.xue@sgs.com

7. Details of Applicant

Company Name	Sierra Wireless Inc
Address	13811 Wireless Way Richmond, British Columbia Canada, V6V 3A4
Telephone	+1-604-232-1440
Contact	Ying Wang
Fax	+1-604-231-1109
Email	ywang@sierrawireless.com

8. Details of Manufacturer

Company Name	Sierra Wireless Inc
Address	13811 Wireless Way Richmond, British Columbia Canada, V6V 3A4
Telephone	+1-604-232-1440
Contact	Ying Wang
Fax	+1-604-231-1109
Email	ywang@sierrawireless.com

9. Other testing Locations

Name:	Not Required
Address:	--
Telephone:	--
Contact:	--
Email:	--

10. Referenced Documents

The Equipment under Test (EUT) has been tested at SGS's (own or subcontracted) laboratories according to

FCC Rules 47 CFR §2.1091 & FCC OET Bulletin 65 supplement C

The following table summarizes the specific reference documents such as harmonized standards or test specifications which were used for testing at SGS's (own or subcontracted) laboratories.

Identity	Document Title	Version
FCC Rules 47 CFR§2.1091	Radiofrequency radiation exposure evaluation:mobile devices	-
FCC OET Bulletin 65 supplement C	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields	2001

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

RF Exposure Limits

11. Primary Laboratory Accreditation Details



12. SGS Shanghai Wireless Telecommunications lab, Personnel

SGS Wireless Shanghai Project Management Team and list of approved Testers for SGS Wireless Shanghai.

Surname	Forename	Initials
CAI	CAI	CAICAI
Xue	Peter	PETERXUE
Xu	Anya	ANYA
Ni	Lemon	LEMONNI
Tao	Kevin	KEVINTAO

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Wang	Lawrence	LAWRENCE
Zhang	Sean	SEANZH
Liu	Felix	FILEX
Ruan	Roger	ROGER
Tan	Terry	TERRY
Zhang	Zenger	ZENGER
Wang	Ken	KENWANG
Gao	Keilefen	KEILEFENGAO
Tang	Eva	EVATANG
Ho	James	JAMESHO
Tang	Kenny	KENNY
Hailiang	Cai	HAILIANG
Kuang	Connie	CONNIE
Chan	Hik Kwong	HKC
Nie	Neo	Neo

Version 2009-10-20

13. Test Equipment Information

Equipment	Model	S/N	Cal. date	Cal. due date
R&S Universal Radio Communication Tester	CMU200	103633	2009-11-26	2010-11-25

14. Detailed Results

14.1 Summary of Results

Frequency Band	Limit (mW/ cm ²)	Result (mW/ cm ²)	Verdict
850 MHz	0.55	0.54	passed
1900 MHz	1	0.1	passed

14.2 Measurement of RF conducted Power

Mode		GPRS (GMSK)	
Slot (Uplink)		1	2
Duty factor		1/8	1/4
Band	Channel	Peak Power (dBm)	
850	128	32.0	32.0
	189	31.9	31.9
	251	31.7	31.7
1900	512	29.4	29.4
	661	29.3	29.3
	810	29.5	29.5

Mode		EGPRS(8PSK)	
Slot (Uplink)		1	2
Duty factor		1/8	1/4
Band	Channel	Peak Power (dBm)	
850	128	29.2	29.1
	189	29.4	29.6
	251	29.4	29.6
1900	512	28.6	28.6
	661	28.3	28.4
	810	28.4	28.4

14.3 Calculation of time-averaged power

$10\text{Log}1/8=-9.0$, $10\text{log}1/4=-6.0$

Mode		GPRS (GMSK)	
Slot (Uplink)		1	2
Duty factor		1/8	1/4
Band	Channel	Peak Power (dBm)	
850	128	23.0	26.0
	189	22.9	25.9
	251	22.7	25.7
1900	512	20.4	23.4
	661	20.3	23.3
	810	20.5	23.5

Mode		EGPRS(8PSK)	
Slot (Uplink)		1	2
Duty factor		1/8	1/4
Band	Channel	Peak Power (dBm)	
850	128	20.2	23.1
	189	20.4	23.6
	251	20.4	23.6
1900	512	19.6	22.6
	661	19.3	22.4
	810	19.4	22.4

14.4 MPE Evaluation

$$S = PG * \text{Duty factor} / 4\pi R^2$$

P = Peak Power Input to antenna (milli watts)

G = Antenna Gain (numeric)

R = distance to the center of radiation of antenna (in meter) = 20 cm

Note:

1) P (milli watts) = $10^{\frac{dBm}{10}}$

2) G (Antenna gain in numeric) = $10^{(\text{Antenna gain in dBi} / 10)}$

3) Duty factor

	Mode	Duty factor
GSM/GPRS/EGPRS	1 Slot uplink	1/8
	2 Slot uplink	1/4

4) $\pi = 3.142$

The maximum power density at a distance of 20 cm for 850 MHz is shown as below:

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Duty factor	The maximum sourced based time-averaged transmit power(mW)	Calculated RF Exposure (mW/cm ²)	Limit (mW/cm ²)
8.4	6.92	32.0	1584.89	1/4	396.22	0.54	0.55

The maximum power density at a distance of 20 cm for 1900MHz is shown as below:

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Duty factor	The maximum sourced based time-averaged transmit power(mW)	Calculated RF Exposure (mW/cm ²)	Limit (mW/cm ²)
3.5	2.24	29.5	891.25	1/4	222.81	0.10	1

If the maximum antenna gain is less than 8.4dBi for 850MHz,and 3.5dBi for 1900MHz,the product complys the FCC Rules 47 CFR and MPE limit

14.5 Measurement Uncertainty

Extended Uncertainty (k=2) 95%	0.5dB
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15. Identification of Samples

Product Name	Airprime Q2687
Brand Name	WAVECOM
Model Name	Airprime Q2687
FCC ID	N7NQ2687
IC ID	2417C-Q2687
Final Hardware Version	520
Final Software Version	Firmware 7.43
Normal Voltage	3.6 V

Low Voltage	3.2 V	
High Voltage	4.8 V	
Antenna Type	external Antenna	
GSM Frequency Bands	GSM850(tested)	Tx: 824~849 MHz
		Rx: 869~894 MHz
	GSM900	Tx: 880~915 MHz
		Rx: 925~960MHz
	DCS1800	Tx: 1710~1785MHz
Rx: 1805~1880 MHz		
PCS1900(tested)	Tx: 1850~1910 MHz	
	Rx: 1930~1990 MHz	
Modulation Mode	GMSK,8PSK	
GSM /GPRS Power Class	GSM 850(tested)	4: 33dBm(Nominal)
	GSM900	4: 33dBm(Nominal)
	DCS1800	1: 30dBm(Nominal)
	PCS 1900(tested)	1: 30dBm(Nominal)
EGPRS Power Class	GSM 850, PCS1900(tested)	E2
	GSM900, DCS1800	E2
GPRS Multislot Class	Class10	
EGPRS Multislot Class	Class10	
Reference Number	GSM10166004M02	
IMEI	35406001385405	

16. Photographs of EUT

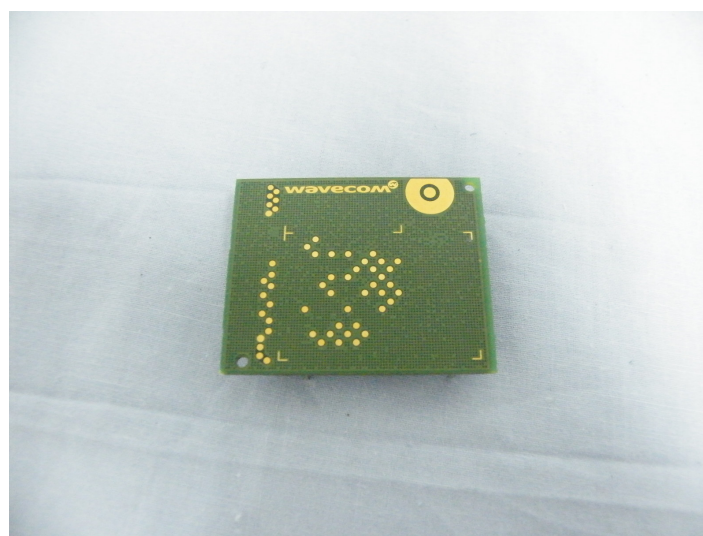


Fig.16-1 Front View



Fig.16-2 Back View



Fig.16-3 Antenna

Annex The acceptable maximum antenna gain

1)According FCC OET Bulletin 65 supplement C the limits are for the following frequency:

300-1500MHz: f/1500 mW/ cm²,therefore 850MHz: 0.55 mW/ cm²

1500MHz-100000MHz:1mW/ cm²

The maximum sourced based time-averaged transmit power for 850 MHz cellular band is 0.396 Watts (GPRS 2uplink slot,32.0dBm,duty factor=1/4)

The maximum sourced based time-averaged transmit power for 1900MHz cellular band is 0.223 Watts (GPRS 2uplink slot,29.5 dBm,duty factor=1/4)

a.calculation for 850MHz

$$G=10\log(0.55*4*\pi*400/ \text{duty factor})-32.0=8.4 \text{ dBi (duty factor=1/4)}$$

b. calculation for 1900 MHz

$$G=10\log(1*4*\pi*400/ \text{duty factor})-29.5= 13.5 \text{ dBi (duty factor=1/4)}$$

2)According FCC Rules 47 CFR the limits are for the following frequency:

850MHz:ERP 7W

1900MHz:EIRP 2W

The maximum transmit power for this product in the 850 MHz cellular band is 1.58 Watts (32.0 dBm)

The maximum transmit power for this product in the 1900 MHz cellular band is 0.89 Watts (29.5dBm)

a. calculation for 850MHz

$$G=10\log(7000)-32.0+2.15=8.6 \text{ dBi}$$

b. calculation for 1900 MHz

$$G=10\log(2000)-29.5=3.5 \text{ dBi}$$

So the acceptable maximum gain is 8.4dBi for 850MHz,3.5dBi for 1900MHz

END OF REPORT