

MPE TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310
FCC ID: A3LGTY3400X

Equipment Under Test : 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Module
Model Name : GT-Y3400
Serial No. : N/A
Applicant : Samsung Electronics Co., Ltd.
Manufacturer : Samsung Electronics Co., Ltd.
Date of Test(s) : 2011. 12. 02 ~ 2011. 12. 05
Date of Issue : 2011. 12. 05

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date

2011. 12. 05

Alvin Kim

Approved By:



Date

2011. 12. 05

Feel Jeong

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd.(Gunpo Laboratory)

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1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.

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Contact Person : Lee, Sang-Cheong

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1.3. Description of EUT

Host Name	Notebook PC (with HSPA)
Module Name	GT-Y3400
Host Model Name / Brand Name	XE500C21 / SAMSUNG
GSM & WCDMA Module ID	FCC ID: A3LGTY3400X IC ID:649E-GTY3400X
WLAN Module ID	FCC ID: PPD-AR5BHB116 IC ID: 4104A-AR5BHB116
Host Power Supply	AC 100 ~ 240 V (output: DC 19 V)
Rated Power	GSM850: 32.6 dB m GSM1900: 28.2 dB m WCDMA850: 22.8 dB m WCDMA1700: 22.4 dB m
Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1 850.2 MHz ~ 1 909.8 MHz WCDMA850: 826.4 MHz ~ 846.6 MHz WCDMA1900: 1 852.4 MHz ~ 1 907.6 MHz
Class of GPRS	Class 12, Class B
Emission Designator	252KGXW (GSM850), 242KG7W (GSM850 EDGE), 247KGXW (GSM1900), 250KG7W (GSM1900 EDGE), 4M14F9W (WCDMA850), 4M15F9W (WCDMA1900)

1.4 Test Report Revision

Revision	Report number	Description
0	F690501/RF-RTL005158	Initial
1	F690501/RF-RTL005158-1	Re-calculated and modified GSM1900
2	F690501/RF-RTL005158-2	Added RF evaluation assessment

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2. RF Exposure Evaluation

2.1 Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
<u>300 – 1 500</u>	--	--	<u>F/1500</u>	<u>30</u>
<u>1 500 – 100 000</u>	--	--	<u>1</u>	<u>30</u>

2.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

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2.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

2.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

Mode: GSM850

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	824.2	32.6	12.5	1.8	0.068 492	0.55
Middle	836.6	32.5	12.5	1.8	0.066 933	0.56
High	848.8	32.4	12.5	1.8	0.065 409	0.57

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit .

Mode: GSM1900

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	1 850.2	28.2	12.5	0.8	0.019 753	1
Middle	1 880.0	27.9	12.5	0.8	0.018 435	1
High	1 909.8	28.1	12.5	0.8	0.019 304	1

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit .

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Mode: WCDMA850

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	826.4	22.8	100	1.8	0.057 376	0.55
Middle	836.6	22.8	100	1.8	0.057 376	0.56
High	846.6	22.3	100	1.8	0.051 136	0.56

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit.

Mode: WCDMA1900

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	1 852.4	22.2	100	0.8	0.039 694	1
Middle	1 880.0	22.4	100	0.8	0.041 565	1
High	1 907.6	22.0	100	0.8	0.037 908	1

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit .

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RF EXPOSURE RESULTS

Band	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
GSM850	824.2	32.6	12.5	1.8	0.068 492	0.55
WCDMA850	826.4	22.8	100	1.8	0.057 376	0.55
GSM1900	1 850.2	28.2	12.5	0.8	0.019 753	1
WCDMA1900	1 880.0	22.4	100	0.8	0.041 565	1
2.4 GHz	2 437	20.27	100	4.25	0.056 329	1
5 GHz	5 745	18.69	100	-0.47	0.013 205	1

SIMULTANEOUS MULTIPLE BAND RF EXPOSURE RESULTS

Band	Channel Frequency (MHz)	Output Average Power (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Corrd EIRP (W)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
GSM850	824.2	32.6	12.5	1.8	0.34	0.068 492	0.55
WCDMA850	826.4	22.8	100	1.8	0.29	0.057 376	0.55
GSM1900	1 850.2	28.2	12.5	0.8	0.10	0.019 753	1
WCDMA1900	1 880.0	22.4	100	0.8	0.21	0.041 565	1
2.4 GHz	2 437	20.27	100	4.25	0.28	0.056 329	1
5 GHz	5 745	18.69	100	-0.47	0.07	0.013 205	1
Combined		-	-	-	1.29	0.256 720	0.55

Note :

The most stringent limit (for the WCDMA850) is applied for all transmitters operating simultaneously.

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3. RF Evaluation Assessment of KDB616217 D01

Table1 – Example Output Power and Separation Distance Considerations

Output power, P (mW)		MHz				
$\frac{1}{2} \cdot n$	cm	835	1900	2450	5200	5800
0		≤ 143	≤ 63	≤ 48	≤ 23	≤ 20
1		144	64	49	24	21
2		288	127	98	47	42
3		432	190	147	70	63
4		575	253	196	93	83
5		719	316	245	116	104
N=P/(60/f)-1;P is rounded to the nearest mW and($\frac{1}{2} \cdot n$) is rounded to the nearest cm Antenna-to-antenna distance = $(5+\frac{1}{2} \cdot n_x+\frac{1}{2} \cdot n_y)$ cm. Antenna-to-user distance = $(5+\frac{1}{2} \cdot n)$ cm						

Table2 – Summary of SAR Evaluation Requirements

Antenna Output Power (mW)	$\leq 60/f(\text{GHz})$	$> 60/f(\text{GHz})$
Individual Transmitter or Antenna	SAR not required	Antenna-to-user distance – $\geq (5 + \frac{1}{2} \cdot n)$ cm: test SAR on highest Output channel only $< (5 + \frac{1}{2} \cdot n)$ cm: test SAR according to normal procedures
Simultaneous Transmitting Antennas	SAR not required: antenna-to-antenna or Antenna-to-person distance ≥ 5 cm	SAR not required: antenna-to-antenna $(5 + \frac{1}{2} \cdot n_x + \frac{1}{2} \cdot n_y)$ and antenna-to-person $\geq (5 + \frac{1}{2} \cdot n_x)$ cm
	SAR not required: when $\sum(\text{SAR}_{1g}) < \text{SAR limit}$, antenna-to-antenna distances > 5 cm And antenna-to-user distance > 5 cm if output $> 50/f$	
	Otherwise, test antenna(s) using highest SAR configuration for the individual transmitter/antenna	

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3.1. Test Result of RF evaluation assessment

Test Item : RF Evaluation Assessment

3.1.1 Closest antenna-to-antenna distances

3G WWAN & 802.11 a/b/g/n: 16.7 cm (d1)

Max average output power of WWAN, WLAN:

WWAN (824.2 MHz)= 227 mW (source-based time averaged output power)

WLAN (2.437 GHz)= 106 mW

WLAN(5.745 GHz)= 74 mW

3.1.2 Antenna-to-user distances

3G WWAN: >20.8 cm (r1) SAR does not apply to mobile exposure conditions

802.11 a/b/g/n: >1.1 cm (r2);

3.1.3 Antenna-to-user separation distance calculations for independent SAR requirements:

Output > 60/f: SAR evaluation is required when antenna-to-user distance is < $(5 + \frac{1}{2} \cdot n)$ cm

3G WWAN: $(5 + \frac{1}{2} \cdot n) = 5 + \frac{1}{2} [227 / (60 / 0.824) - 1] = 5 + 1 = 6$ cm (R1)

802.11 at 2.437 GHz: $(5 + \frac{1}{2} \cdot n) = 5 + \frac{1}{2} [106 / (60 / 2.437) - 1] = 5 + 1.7 = 7$ cm (R2)

802.11 at 5.745 GHz: $(5 + \frac{1}{2} \cdot n) = 5 + \frac{1}{2} [74 / (60 / 5.745) - 1] = 5 + 3 = 8$ cm (R3)

**SAR does not apply to the WWAN antenna due to mobile exposure conditions; therefore, R1 does not apply

**r2 < R2 and R3; SAR evaluation is required for the WLAN that a C2PC filing filed FCC ID: PPD-AR5BHB116 in 4/27/2011.

3.1.4 Antenna-to-antenna separation distance calculations for simultaneous SAR requirements:

Output > 60/f: SAR evaluation is required when antenna-to-antenna distance is < $(5 + \frac{1}{2} \cdot n_x + \frac{1}{2} \cdot n_y)$ cm

3G WWAN & 802.11 (2.437 GHz): $(5 + \frac{1}{2} \cdot n_x + \frac{1}{2} \cdot n_y) = (5 + 1 + 7)$ cm = 13 cm (D1)

3G WWAN & 802.11 (5.745 GHz): $(5 + \frac{1}{2} \cdot n_x + \frac{1}{2} \cdot n_y) = (5 + 1 + 3)$ cm = 9 cm (D2)

**d1 (16.7 cm) > D1 (13 cm) and > D2 (9 cm), SAR evaluation for simultaneous transmission is not required for the WWAN-WLAN antenna

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