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File No.: MC17075
Report No.: 12CA41629-FCC-3
Date: July 23, 2012
Model No.: SWB-A52H
FCC ID.: E2XSWB-A52H

FCC Maximum Permissible Exposure Report

**in accordance with
FCC Part 1 Subpart I §1.1307(b) & §1.1310**

for

WiFi Module

Samsung Electro-Mechanics Co., Ltd.

150 Maeyoungro, Yeongtong-gu, Suwon, Gyeonggi-do, Korea

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Summary of Test Results:

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 1 I
Section 1.1307(b) & 1.1310

No	Reference Clause No.	Conformance Requirements	Result	Verdict	Remark
1	1.1307(b)(1) 1.1310	Maximum Permissible Exposure (Exposure of Humans to RF Fields)		Complied	

Conclusion:

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.



Tested by
Kyung Duk Ko, WiSE Project Engineer
UL Verification Services- 3014ASEO
UL Korea Ltd.
July 23, 2012



Tested by
Jeawoon, Choi, WiSE Engineering Leader
UL Verification Services- 3014ASEO
UL Korea Ltd.
July 23, 2012

Test Report Details

Tests Performed By: UL Korea Ltd.
33rd FL. GFC Center, 737 Yeoksam-dong, Gangnam-gu, Seoul, 135-984, Korea

Test Site: ESTECH CO., LTD.
97-1, Hoeok-Ri, Majang-Myun, Icheon-City, Kyunggi-Do, 467-811, Korea

Applicant: Samsung Electro-Mechanics Co., Ltd.
150 Maeyoungro, Yeongtong-gu, Suwon, Gyeonggi-do, Korea

Applicant Contact: Seung Pil Jung
Title: Senior Engineer
Phone: +82-31-210-5748
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Product Type: WiFi Module

Model Number: SWB-A52H

Trademark: SEMCO

Sample Serial Number: N/A

Test standards: FCC Part 1 I Section 1.1307(b) & 1.1310
Maximum Permissible Exposure

Sample Serial Number: N / A

Sample Receive Date: 2012-07-02

Testing Date: 2012-07-02 ~ 2012-07-20

Overall Results: **Pass**

UL Korea Ltd. reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

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1. General Product Information

1.1. Equipment Description

SWB-A52H is the module that integrates Wireless LAN (WLAN). This embedded module is optimized for WLAN enabled handheld mobile device.

1.2. Details of Test Equipment (EUT)

- Equipment Type : WiFi Module
- Model No. : SWB-A52H
- Trade name : SEMCO
- Type of test Equipment : module type
- Operating characteristic : Short range wireless device operating in the 2400 – 2483.5 ISM frequency band
- Manufacturer : Samsung Electro-Mechanics Co., Ltd.
Samsung Electro-Mechanics(Thailand), Ltd/93 Moo 5 T.Bangsmak, A.Bangpakong, Chachoengsao 24180, Thailand

1.3. Equipment Configuration

The EUT is consisted of the following component provided by the manufacturer.

Use*	Product Type	Manufacturer	Model	Comments
EUT	Module	Samsung Electrical-Mechanics	SWB-A52H	-
EUT	Antenna	SEMCO	MSA-4008-25GC1-A1-500002	-

Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)

1.4. Technical Data

Item	Type of WiFi module
Frequency Ranges	2400 – 2483.5 MHz 5150 – 5350 MHz, 5470 – 5725 MHz, 5725 – 5850 MHz,
Output power	2.4 G : Max. 22.11 dBm 5 G : Max. 15.58 dBm
Kind of modulation (s)	CCK, OFDM, BPSK, QPSK, 16QAM, 64QAM
Emission Designator	G1D, D2D
Channel	2.4 G : 13 channel(11b/g/n_HT20) 5 G : 5 channel (11a/n_HT20 – DTS), 2 channel (11n_HT40 – DTS) 4 channel(11a/n_HT20 – Non DFS), 2 channel(11a/n_HT40 – Non DFS) 15 channel (11a/n_HT20_DFS), 7 channel (11a/n_HT40_DFS)
Antenna Gain	2.4 G : Max. 3.51 dBi, 5 G : Max. 4.07 dBi
Antenna information	Integral antenna (Metal Stamping Antenna Assembly)
Working temperature	-20 ~ 70 °C
Supply Voltage	DC 3.3 V

Note ;

1. All the technical data described above were provided by the manufacturer.

1.5. Antenna Information

Antenna Model Name : MSA-4008-25GC1-A1-500002
Antenna Type : Metal Stamping Antenna Assembly
Manufacturer : MAG. LAYERS SCIENTIFIC-TECHNICS CO., LTD.
Transmit Gain dBi : 2.4 G : Max. 3.51 dBi, 5 G : Max. 4.07 dBi
Azimuth Beam Pattern : Linear vertical

1.6. Equipment Type :

- Radio and ancillary equipment for fixed or semi-fixed use
- Radio and ancillary equipment for vehicular mounted use
- Radio and ancillary equipment for portable or handheld use

- Stand alone Host connected Host connected
- Self contained single unit Module with associated connection or interface

1.7. Technical descriptions and documents

The following documents was provided by the manufacturer.

No.	Document Title and Description
1	User Manual
2	MAG. LAYERS SCIENTIFIC-TECHNICS CO., LTD., APPROVAL SHEET (RoHS) / MSA-4008-25GC1-A1-500002

1.8. Description of additional model name

Model name	Model name Designation	Description of design
SWB-A52H	Basic model	-

2. Test Specification

The following test specifications and standards have been applied and used for testing.

KDB 447498 : Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

3. Operating Frequencies

Mode #	Frequency tested
1	2 412 MHz ~ 2 462 MHz : 802.11b/g_SISO & 11n_HT20_MIMO - Low : 2412 MHz / CH = 1 - Mid : 2437 MHz / CH = 6 - Top : 2462 MHz / CH= 11
2	2 422 MHz ~ 2 452 MHz : 802.11n_HT40_MIMO - Low : 2422 MHz / CH = 3 - Mid : 2437 MHz / CH = 6 - Top : 2452 MHz / CH= 9
3	5 745 MHz ~ 5 825 MHz : 802.11a_SISO & 11n_HT20_MIMO - Low : 5745 MHz / CH = 149 - Mid : 5785 MHz / CH = 157 - Top : 5825 MHz / CH= 165
4	5 755 MHz ~ 5 795 MHz : 802.11n_HT40_MIMO - Low : 5755 MHz / CH = 149 - Top : 5795 MHz / CH= 157
5	5.15 ~ 5.25 GHz : 11a_SISO & 11n_HT20_MIMO - Low : 5 180 MHz / CH = 36 - Mid : 5 220 MHz / CH = 44 - High : 5 240 MHz / CH= 48
6	5.25 ~ 5.35 GHz : 11n_HT40_MIMO - Low : 5 190 MHz / CH = 36 - High : 5 230 MHz / CH= 44
7	5.25 ~ 5.35 GHz : 11a_SISO & 11n_HT20_MIMO - Low : 5 260 MHz / CH = 52 - Mid : 5 300 MHz / CH = 60 - High : 5 320 MHz / CH= 64
8	5.25 ~ 5.35 GHz : 11n_HT40_MIMO - Low : 5 270 MHz / CH = 52 - High : 5 310 MHz / CH= 60
9	5.47 ~ 5.725 GHz : 11a_SISO & 11n_HT20_MIMO - Low : 5 500 MHz / CH = 100 - Mid : 5 580 MHz / CH = 116 - High : 5 700 MHz / CH= 140
10	5.47 GHz ~ 5.725 GHz : 11n_HT40_MIMO - Low : 5 510 MHz / CH = 100 - High : 5 670 MHz / CH= 132

4. Test Results of RF Exposure Evaluation

TEST: RF Exposure Evaluation					
Method	<p>RF Exposure Evaluation of the EUT were measured according to the dictates in KDB 447498</p> <p>Pd 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.</p> <p>Friis transmission formula: $Pd = (Pout*G)/(4*pi*R^2)$</p> <p>Where Pd = power density in mW/cm²</p> <p>Pout = output power to antenna in mW</p> <p>G = gain of antenna in linear scale</p> <p>Pi = 3.1416</p> <p>R = distance between observation point and center of the radiator in cm</p>				
Reference Clause	Part1 I Section 1.1307(b) & 1.1310				
Parameters recorded during the test	<table border="1"> <tr> <td>Laboratory Ambient Temperature</td><td>22 °C</td></tr> <tr> <td>Relative Humidity</td><td>36 %</td></tr> </table>	Laboratory Ambient Temperature	22 °C	Relative Humidity	36 %
Laboratory Ambient Temperature	22 °C				
Relative Humidity	36 %				
	<table border="1"> <tr> <th>Frequency range</th><th>Measurement Point</th></tr> <tr> <td>2 412 MHz – 2 462 MHz 5 745 MHz – 5 825 MHz 5 180 MHz – 5 240 MHz 5 260 MHz – 5 320 MHz 5 500 MHz – 5 700 MHz</td><td>Antenna port</td></tr> </table>	Frequency range	Measurement Point	2 412 MHz – 2 462 MHz 5 745 MHz – 5 825 MHz 5 180 MHz – 5 240 MHz 5 260 MHz – 5 320 MHz 5 500 MHz – 5 700 MHz	Antenna port
Frequency range	Measurement Point				
2 412 MHz – 2 462 MHz 5 745 MHz – 5 825 MHz 5 180 MHz – 5 240 MHz 5 260 MHz – 5 320 MHz 5 500 MHz – 5 700 MHz	Antenna port				
Fully configured sample scanned over the following frequency range					

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
Rated	1	1
Supplementary information: None		

Limits

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)

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				
300 – 1 500	--	--	F/1500	6
1 500 – 100 000	--	--	1	30

4.1. Output Power into Antenna & RF Exposure Evaluation Distance

4.1.1. Result of Section 15.247

Operation Mode	Data Rate (Mbps)	Channel	Channel Frequency (MHz)	Output Peak Power (dBm)	Duty Cycle (%)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
2.4GHz Band 802.11b	11	Low	2412	20.67	100	3.51	0.0521	1
		Middle	2437	20.46	100	3.51	0.0497	
		High	2462	19.89	100	3.51	0.0435	
2.4GHz Band 802.11g	54	Low	2412	20.96	100	3.51	0.0557	1
		Middle	2437	21.94	100	3.51	0.0698	
		High	2462	20.56	100	3.51	0.0508	
2.4GHz Band 802.11n-HT20	MCS7	Low	2412	19.77	100	3.51	0.0424	1
		Middle	2437	22.11	100	3.51	0.0726	
		High	2462	19.78	100	3.51	0.0425	
5.8GHz Band 802.11a	54	Low	5745	17.64	100	4.07	0.0295	1
		Middle	5785	17.16	100	4.07	0.0264	
		High	5825	17.72	100	4.07	0.0301	
5.8GHz Band 802.11n-HT20	MCS7	Low	5745	18.08	100	4.07	0.0327	1
		Middle	5785	17.77	100	4.07	0.0304	
		High	5825	17.53	100	4.07	0.0288	
5.8GHz Band 802.11n-HT40	MCS7	Low	5755	18.49	100	4.07	0.0359	1
		High	5795	18.07	100	4.07	0.0326	

Note :

The power density at a distance of 20 cm calculated from the friis transmission formula is far below each limits.

4.1.2. Result of Section 15.407

Operation Mode	Data Rate (Mbps)	Channel	Channel Frequency (MHz)	Output Peak Power (dBm)	Duty Cycle (%)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
802.11a (Non-DFS)	54	Low	5180	14.36	100	4.07	0.0139	1
		Middle	5220	13.93	100	4.07	0.0126	
		High	5240	13.85	100	4.07	0.0123	
802.11n-HT20 (Non-DFS)	MCS7	Low	5180	14.87	100	4.07	0.0156	1
		Middle	5220	13.89	100	4.07	0.0124	
		High	5240	13.85	100	4.07	0.0123	
802.11-HT40 (Non-DFS)	MCS7	Low	5190	15.02	100	4.07	0.0161	1
		High	5230	15.11	100	4.07	0.0165	
802.11a (DFS)	54	Low	5260	14.44	100	4.07	0.0141	1
		Middle	5300	14.99	100	4.07	0.0160	
		High	5320	14.97	100	4.07	0.0160	
		Low	5500	14.78	100	4.07	0.0153	
		Middle	5580	14.93	100	4.07	0.0158	
		High	5700	15.02	100	4.07	0.0161	
802.11n-HT20 (DFS)	MCS7	Low	5260	14.13	100	4.07	0.0132	1
		Middle	5300	14.72	100	4.07	0.0151	
		High	5320	14.90	100	4.07	0.0157	
		Low	5500	14.74	100	4.07	0.0151	
		Middle	5580	14.98	100	4.07	0.0160	
		High	5700	15.11	100	4.07	0.0165	
802.11n-HT20 (DFS)	MCS7	Low	5270	15.05	100	4.07	0.0163	1
		High	5310	15.58	100	4.07	0.0184	
		Low	5510	14.98	100	4.07	0.0160	
		Middle	5550	15.03	100	4.07	0.0162	
		High	5670	15.10	100	4.07	0.0164	

Note :

The power density at a distance of 20 cm calculated from the friis transmission formula is far below each limits.

APPENDIX A. Accreditations and Authorizations

ESTECH CO., LTD. has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Mark
Accreditation	Korea	KOLAS	KT141	ISO/IEC 17025
Site Filing	USA	FCC	659627	Test Facility list & NSA Data
Certification	Korea	KC	KR0019	Test Facility list & NSA Data

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competent of calibration and testing laboratory”.