

TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: A3LWIDT20R

Equipment Under Test : Wi-Fi Module
Model Name : WIDT20R
Applicant : Samsung Electronics Co., Ltd.
Manufacturer : Samsung Electronics Co., Ltd.
Date of Test(s) : 2016.05.13 ~ 2016.05.18
Date of Issue : 2016.05.26

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

Tested By:



Youngmin Park

Date:

2016.05.26

Approved By:



Alvin Kim

Date:

2016.05.26

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

-Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

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1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea

Contact Person : Cho, Min-Hyeong

Phone No. : +82 31 277 2688

1.3. Description of EUT

Kind of Product		Wi-Fi Module
Model Name		WIDT20R
Power Supply		DC 5.0 V
Frequency Range		5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20), 5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40)
Modulation Technique		OFDM
Number of Channels		5 channels (Band 3: 11a/n_HT20), 2 channels (Band 3: 11n_HT40)
Antenna Type		Fixed type (MIMO - 2 Tx / 2 Rx)
Antenna Gain	Port#1	5 745 MHz ~ 5 825 MHz (MIMO): 2.48 dB i
	Port#2	5 745 MHz ~ 5 825 MHz (MIMO): 1.21 dB i

1.4. Declaration by the manufacturer

- The device supports 2.4 GHz WLAN and 5 GHz WLAN(Band 1, Band 2A, Band 2C and Band 3).
- There is no increase in authorized power for UNII bands(Band 1, 2A, 2C, and 3) compared to original output power.

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1.5. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL009827	2016.05.18	Initial
1	F690501/RF-RTL009827-1	2016.05.24	Updated the report to include other 5 GHz sub bands and 2.4 GHz
2	F690501/RF-RTL009827-2	2016.05.26	Modified target power for 2.4 GHz WLAN

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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

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/Controlled Exposure				
0.3 – 3.0	614	1.63	*100	6
3.0 – 30	1842/f	4.89/f	*900/f ²	6
30 - 300	61.4	0.163	1.0	6
300 – 1 500	-	-	f/300	6
1 500 – 100 000	-	-	5	6
(B) Limits for General Population/Uncontrolled Exposure				
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 – 1 500	-	-	f/1500	30
<u>1 500 – 100 000</u>	-	-	<u>1.0</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**WLAN (2.4 GHz)****- Maximum tune up tolerance**

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
1	2 412	17	5.57	0.035 953	1

WLAN (5 GHz)**- Maximum tune up tolerance****U-NII band 1**

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
36	5 180	12	4.39	0.008 664	1

U-NII band 2A

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
52	5 260	11	4.94	0.007 811	1

U-NII band 2C

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
100	5 500	16	4.88	0.024 363	1

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U-NII band 3

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
149	5 745	14.50	4.88	0.017 248	1

Note :

- The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm².
- Unequal antenna gains, with equal transmit powers. For antenna gains given by G₁, G₂, ..., G_N dB i
 - If transmit signals are correlated, then
 Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dB i [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

Antenna gain

Antenna \ Frequency	2.4 GHz	5 GHz (band 1)	5 GHz (band 2A)	5 GHz (band 2C)	5 GHz (band 3)
ANT 1 (dB i)	2.19	0.56	1.47	2.48	2.48
ANT 2 (dB i)	2.92	2.13	2.37	1.21	1.21
ANT 1+ ANT 2 (dB i) (Calculated)	5.57	4.39	4.94	4.88	4.88

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