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 ㎒ ~ 5 825 ㎒ (Band 3: 11a/n_HT20), 5 755 ㎒ ~ 5 795 ㎒ (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 ㎒ ~ 5 825 ㎒ (MIMO): 2.48 ㏈i
	Port#2	5 745 ㎒ ~ 5 825 ㎒ (MIMO): 1.21 ㏈i

1.4. Declaration by the manufacturer

- The device supports 2.4 ㎓ WLAN and 5 ㎓ 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.

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 ㎓ sub bands and 2.4 ㎓
2	F690501/RF-RTL009827-2	2016.05.26	Modified target power for 2.4 ㎓ WLAN

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 (㎒)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (㎽/㎠)	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
1 500 – 100 000	-	-	**1.0**	**30**

2.1.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*R^2)

Where Pd = power density in ㎽/㎠

Pout = output power to antenna in ㎽

G = gain of antenna in linear scale

Pi = 3.1416

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

Pd the limit of MPE, 1 ㎽/㎠. 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.

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 ㎓)

- Maximum tune up tolerance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
1	2 412	17	5.57	0.035 953	1

WLAN (5 ㎓)

- Maximum tune up tolerance

U-NII band 1

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
36	5 180	12	4.39	0.008 664	1

U-NII band 2A

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
52	5 260	11	4.94	0.007 811	1

U-NII band 2C

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
100	5 500	16	4.88	0.024 363	1

U-NII band 3

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
149	5 745	14.50	4.88	0.017 248	1

Note :

1. The power density Pd (5th column) at a distance of 20 ㎝ calculated from the friis transmission formula is far below the limit of 1 ㎽/㎠.
2. Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N dB i
   (i) If transmit signals are correlated, then
   Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/N_{ANT}$] 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

Frequency / Antenna	2.4 ㎓	5 ㎓ (band 1)	5 ㎓ (band 2A)	5 ㎓ (band 2C)	5 ㎓ (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