



RF EXPOSURE REPORT

REPORT NO.: SA980609H02A

MODEL NO.: WIS10ABGN

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: Samsung Electronics CO. LTD

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ISSUED BY: Bureau Veritas Consumer Products Services (H.K.)
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RF Exposure Measurement

1. Introduction

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this product is measured in a Fully Anechoic Chamber (FAC) calibrated for antenna measurement in our lab, and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

2. RF Exposure Limit

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental 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 (minutes)
(A)Limits For Occupational / Control Exposures				
300-1500	F/300	6
1500-100,000	5	6
(B)Limits For General Population / Uncontrolled Exposure				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

3. Friis Formula

Friis transmission formula : $P_d = (P_{out} * G) / (4 * \pi * r^2)$

where

P_d = power density in mW/cm^2

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 is the limit of MPE, $1 mW/cm^2$. If we know the maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the MPE value at distance 20cm.

Ref. : David K. Cheng, *Field and Wave Electromagnetics*, Second Edition,
Page 640, Eq. (11-133).

4. EUT Operating condition

The software provided by Manufacturer enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

5. Classification

This Wireless LAN adapter will be sold and used with SAMSUN TV series. So the antenna of this product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20cm or more separation distance with the antenna should be included in users manual. So, this device is classified as **Mobile Device**.

6. TEST RESULTS

6.1 Antenna Gain

There are two antennas provided to this EUT, please refer to the following table:

No.	Antenna Type	For 2.4GHz Gain (dBi)	For 5GHz Gain (dBi)				Antenna Connector
			5.125 ~ 5.25 MHz	5.25 ~ 5.35 MHz	5.47 ~ 5.725 MHz	5.725 ~ 5.850 MHz	
CHAIN(0)	Printed	0.46	0.9	1.53	1.58	1.72	NA
CHAIN(1)	Printed	-0.04	-0.91	1.71	0.79	0.09	NA

6.2 Output Power Into Antenna & RF Exposure value at distance 20cm:

For 15.247(2.4GHz):

802.11b:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	131.8	0.029	1.0
6	2437	239.9	0.053	1.0
11	2462	120.2	0.027	1.0

802.11g:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	128.8	0.028	1.0
6	2437	269.2	0.060	1.0
11	2462	269.2	0.060	1.0

802.11n (20MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	532.2	0.118	1.0
6	2437	545.4	0.121	1.0
11	2462	491.1	0.109	1.0

802.11n (40MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2422	360.0	0.080	1.0
4	2437	571.1	0.126	1.0
7	2452	351.8	0.078	1.0

For 15.247(5GHz):

802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
149	5745	144.5	0.043	1.0
157	5785	147.9	0.044	1.0
165	5825	134.9	0.040	1.0

802.11n (20MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
149	5745	303.0	0.090	1.0
157	5785	292.6	0.086	1.0
165	5825	260.8	0.077	1.0

802.11n (40MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
151	5755	273.8	0.081	1.0
159	5795	261.1	0.077	1.0

For 15.407(5GHz):

802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
36	5180	25.1	0.007	1.0
40	5200	28.8	0.008	1.0
48	5240	25.7	0.007	1.0
52	5260	33.9	0.010	1.0
60	5300	31.6	0.009	1.0
64	5320	30.2	0.009	1.0
100	5500	18.2	0.005	1.0
120	5600	33.1	0.009	1.0
140	5700	32.4	0.009	1.0

802.11n (20MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
36	5180	23.8	0.007	1.0
40	5200	26.1	0.008	1.0
48	5240	25.5	0.008	1.0
52	5260	88.3	0.026	1.0
60	5300	94.6	0.028	1.0
64	5320	87.4	0.026	1.0
100	5500	68.9	0.020	1.0
120	5600	61.1	0.018	1.0
140	5700	65.0	0.019	1.0

802.11n (40MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
38	5190	44.8	0.013	1.0
46	5230	48.1	0.014	1.0
54	5270	82.3	0.024	1.0
62	5310	82.5	0.024	1.0
102	5510	56.9	0.017	1.0
118	5590	46.4	0.014	1.0
134	5670	51.9	0.015	1.0