

RF EXPOSURE REPORT

REPORT NO.: SA980302H02 MODEL NO.: AR5BDT92

ACCORDING: FCC Guidelines for Human Exposure IEEE C95.1

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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 ADT, 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)

Frequency	Electric Field	Magnetic Field	Power Density	Average Time		
Range	Strength (V/m)	Strength (A/m)	(mW/cm ²)	(minutes)		
(MHz)						
(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	6		
1500-100,000			1.0	30		

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

F = Frequency in MHz



3. Friis Formula

Friis transmission formula : $Pd = (Pout^{*}G) / (4^{*}pi^{*}r^{2})$

where $Pd = power density in mW/cm^2$ Pout = output power to antenna in mW G = gain of antenna in linear scale Pi = 3.1416R = distance between observation point and center of the radiator in cm

Pd is 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 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

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:

Transmitter Circuit	Brand	Model	Antenna Type	Antenna Gain (dBi) For 2.4GHz	Antenna Gain (dBi) For 5GHz	Antenna Connector
Chain(0)	Тусо	1513327-1	Dipole	3	4	RPSMA
Chain(1)	Тусо	1513327-1	Dipole	3	4	RPSMA

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

For 15.247(2.4GHz) :

For	Part	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	214.815	0.085	1.0
6	2437	193.670	0.077	1.0
11	2462	183.458	0.073	1.0

For Part 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	669.196	0.266	1.0
6	2437	785.481	0.312	1.0
11	2462	587.573	0.233	1.0

DRAFT 802.11n (20MHz) OFDM

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	738.015	0.293	1.0
6	2437	784.234	0.311	1.0
11	2462	616.770	0.245	1.0

DRAFT 802.11n (40MHz) OFDM

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2422	519.278	0.206	1.0
4	2437	882.267	0.350	1.0
7	2452	555.291	0.220	1.0



For 15.247(5GHz) : For Part 802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)	
1	5745	414.769	0.414	1.0	
3	5785	400.550	0.399	1.0	
5	5825	376.428	0.375	1.0	

For DRAFT 802.11n (20MHz) OFDM:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5745	417.146	0.208	1.0
3	5785	406.501	0.203	1.0
5	5825	377.129	0.188	1.0

DRAFT 802.11n (40MHz) OFDM

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5755	433.680	0.217	1.0
3	5795	409.566	0.205	1.0



For 15.407(5GHz) : For Part 802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5180	28.027	0.028	1.0
2	5200	27.019	0.027	1.0
4	5240	27.297	0.027	1.0
5	5260	101.983	0.102	1.0
7	5300	101.873	0.102	1.0
8	5320	83.773	0.084	1.0
9	5500	44.903	0.045	1.0
14	5600	101.400	0.101	1.0
19	5700	54.960	0.055	1.0

For DRAFT 802.11n (20MHz) OFDM:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5180	39.060	0.020	1.0
2	5200	33.731	0.017	1.0
4	5240	34.918	0.017	1.0
5	5260	106.429	0.053	1.0
7	5300	102.694	0.051	1.0
8	5320	112.601	0.056	1.0
9	5500	66.119	0.033	1.0
14	5600	104.252	0.052	1.0
19	5700	47.066	0.024	1.0

DRAFT 802.11n (40MHz) OFDM

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5190	47.161	0.024	1.0
2	5230	44.844	0.022	1.0
3	5270	106.702	0.053	1.0
4	5310	44.239	0.022	1.0
5	5510	30.174	0.015	1.0
7	5590	106.796	0.053	1.0
9	5670	78.550	0.039	1.0