



RF EXPOSURE REPORT

REPORT NO.: SA950509L08

MODEL NO.: WAP4400N

ACCORDING: FCC Guidelines for Human Exposure

IEEE C95.1

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RF EXPOSURE MEASUREMENT (MOBILE DEVICE)

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)

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	6
1500-100,000	1.0	30

F = Frequency in MHz



3. FRIIS FORMULA

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

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 r .

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 device is fixed inside the host equipment. 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

The maximum Gain measured in Fully Anechoic Chamber is 3.14dBi or 2.06 (numeric).

6.2 OUTPUT POWER INTO ANTENNA & RF EXPOSURE VALUE AT DISTANCE 20cm:

802.11b DSSS MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)		PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/CM ²))	LIMIT OF POWER DENSITY (mW/CM ²)
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2412	40.179	39.902	16.04	16.01	80.081	19.035	0.033	1.0
6	2437	113.240	112.720	20.54	20.52	225.960	23.540	0.093	1.0
11	2462	80.168	79.433	19.04	19.00	159.601	22.030	0.065	1.0

802.11g OFDM modulation:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)		PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/CM ²))	LIMIT OF POWER DENSITY (mW/CM ²)
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2412	51.168	50.933	17.09	17.07	102.101	20.090	0.042	1.0
6	2437	101.625	100.693	20.07	20.03	202.318	23.060	0.083	1.0
11	2462	45.082	44.771	16.54	16.51	89.853	19.535	0.037	1.0


DRAFT 802.11n (20MHz) OFDM modulation - DUAL TX

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)		PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/CM2))	LIMIT OF POWER DENSITY (mW/CM2)
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2412	51.286	50.816	17.10	17.06	102.102	20.090	0.042	1.0
6	2437	101.158	100.925	20.05	20.04	202.083	23.055	0.083	1.0
11	2462	45.082	44.875	16.54	16.52	89.957	19.540	0.037	1.0

DRAFT 802.11n (40MHz) OFDM modulation - DUAL TX

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)		PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/CM2))	LIMIT OF POWER DENSITY (mW/CM2)
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2422	32.137	31.915	15.07	15.04	64.052	18.065	0.026	1.0
4	2437	50.933	50.582	17.07	17.04	101.515	20.065	0.042	1.0
7	2452	28.840	28.510	14.60	14.55	57.350	17.585	0.024	1.0

802.11b (CB mode) OFDM MODULATION: DUAL TX:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)		PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/CM2))	LIMIT OF POWER DENSITY (mW/CM2)
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2422	64.269	63.387	18.08	18.02	127.636	21.060	0.052	1.0
4	2437	127.350	126.183	21.05	21.01	253.533	24.040	0.104	1.0
7	2452	63.533	63.241	18.03	18.01	126.774	21.030	0.052	1.0