



RF EXPOSURE REPORT

REPORT NO.: SA960926L01

MODEL NO.: WGA-600N

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: Cisco-Linksys LLC

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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	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/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

The antenna of the 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

The maximum Gain measured in Fully Anechoic Chamber is 2.37dBi or 1.725837892 (numeric)(2.4GHz) & 1.00dBi or 1.258925412 (numeric)(5.0GHz).

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)	POWER DENSITY (mW/cm ²)	LIMIT OF POWER DENSITY (mW/cm ²)
1	2412	64.121	18.07	0.022	1.0
6	2437	64.714	18.11	0.022	1.0
11	2462	64.417	18.09	0.022	1.0

802.11g OFDM MODULATION

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/cm ²)	LIMIT OF POWER DENSITY (mW/cm ²)
1	2412	40.087	16.03	0.014	1.0
6	2437	40.551	16.08	0.014	1.0
11	2462	40.272	16.05	0.014	1.0

DRAFT 802.11n (20MHz) OFDM MODULATION

CHAN.	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	25.468	25.527	14.06	14.07	50.995	17.075	0.018	1.0
6	2437	25.468	25.410	14.06	14.05	50.878	17.065	0.017	1.0
11	2462	20.324	19.999	13.08	13.01	40.323	16.056	0.014	1.0



DRAFT 802.11n (40MHz) OFDM MODULATION

CHAN.	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	2422	16.144	16.106	12.08	12.07	32.250	15.085	0.011	1.0
4	2437	25.177	25.177	14.01	14.01	50.354	17.020	0.017	1.0
7	2452	16.181	16.069	12.09	12.06	32.205	15.079	0.011	1.0

For 5.150 ~ 5.350, 5.470 ~ 5.725GHz band:

802.11a OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/cm ²)	LIMIT OF POWER DENSITY (mW/cm ²)
For 5.150 ~ 5.350GHz band:					
1	5180	25.293	14.03	0.006	1.0
4	5240	25.704	14.10	0.006	1.0
5	5260	25.351	14.04	0.006	1.0
8	5320	25.586	14.08	0.006	1.0
For 5.470 ~ 5.725GHz band:					
1	5500	25.293	14.03	0.006	1.0
6	5600	25.351	14.04	0.006	1.0
11	5700	25.410	14.05	0.006	1.0



DRAFT 802.11n (20MHz) OFDM MODULATION

CHAN.	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				
For 5.150 ~ 5.350GHz band:									
1	5180	20.230	25.235	13.06	14.02	45.465	16.577	0.011	1.0
4	5240	20.184	25.410	13.05	14.05	45.594	16.589	0.011	1.0
5	5260	17.458	26.303	12.42	14.20	43.761	16.411	0.011	1.0
8	5320	20.512	26.546	13.12	14.24	47.058	16.726	0.012	1.0
For 5.470 ~ 5.725GHz band:									
1	5500	20.464	22.646	13.11	13.55	43.110	16.346	0.011	1.0
6	5600	22.029	24.378	13.43	13.87	46.407	16.666	0.012	1.0
11	5700	21.330	23.496	13.29	13.71	44.826	16.515	0.011	1.0

DRAFT 802.11n (40MHz) OFDM MODULATION

CHAN.	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				
For 5.150 ~ 5.350GHz band:									
1	5190	20.137	25.645	13.04	14.09	45.782	16.607	0.011	1.0
2	5230	20.277	25.351	13.07	14.04	45.628	16.592	0.011	1.0
3	5270	16.634	27.227	12.21	14.35	43.861	16.421	0.011	1.0
4	5310	17.539	27.164	12.44	14.34	44.703	16.503	0.011	1.0
For 5.470 ~ 5.725GHz band:									
1	5510	22.490	25.645	13.52	14.09	48.135	16.825	0.012	1.0
3	5590	22.751	23.988	13.57	13.80	46.739	16.697	0.012	1.0
5	5670	22.029	24.155	13.43	13.83	46.184	16.645	0.012	1.0



For 5725 ~ 5850MHz band:

802.11a OFDM MODULATION

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/cm ²)	LIMIT OF POWER DENSITY (mW/cm ²)
1	5745	25.527	14.07	0.006	1.0
3	5785	25.645	14.09	0.006	1.0
5	5825	25.351	14.04	0.006	1.0

CHAN.	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	5745	25.351	28.708	14.04	14.58	54.059	17.329	0.014	1.0
3	5785	25.468	28.510	14.06	14.55	53.978	17.322	0.014	1.0
5	5825	25.293	25.468	14.03	14.06	50.761	17.055	0.013	1.0

DRAFT 802.11n (40MHz) OFDM MODULATION

CHAN.	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	5755	25.235	28.249	14.02	14.51	53.484	17.282	0.013	1.0
2	5795	25.586	28.249	14.08	14.51	53.835	17.311	0.013	1.0