RF EXPOSURE REPORT

REPORT NO.: SA931214H02
MODEL NO.: DWL-3200AP

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: D-LINK Corporation

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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)

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 : 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 = 3.1416
R = distance between observation point and center of the radiator in cm

Pd 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 is a stand alone radio device. So under normal use condition, it is easy to be re-located in the place where at least 20 cm far 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

Antenna No.	The maximum Gain	Cable lose (dB)
3	7.61 dBi	0
5	5.89 dBi	0
9	12.0 dBi	3.2
10	5.0 dBi	0

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

For Part 802.11b:

Antenna 3

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	90.1571138	0.103449675	1.0
6	2437	162.181010	0.186092611	1.0
11	2462	86.8960429	0.099707799	1.0

Antenna 5

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	90.1571138	0.069619216	1.0
6	2437	162.181010	0.125235983	1.0
11	2462	86.8960429	0.067101021	1.0

Antenna 9

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	90.1571138	0.136059581	1.0
6	2437	162.181010	0.244753623	1.0
11	2462	86.8960429	0.131138173	1.0

Antenna 10

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	90.1571138	0.056719074	1.0
6	2437	162.181010	0.102030292	1.0
11	2462	86.8960429	0.054667489	1.0

For Part 802.11g:

Antenna 3

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	63.095734	0.0723984	1.0
6	2437	199.52623	0.2289439	1.0
11	2462	63.095734	0.0723984	1.0
Turbo 6	2437	60.255959	0.06914	1.0

Antenna 5

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	63.095734	0.0487225	1.0
6	2437	199.52623	0.1540739	1.0
11	2462	63.095734	0.0487225	1.0
Turbo 6	2437	60.255959	0.0465296	1.0

Antenna 9

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	63.095734	0.0952202	1.0
6	2437	199.52623	0.3011127	1.0
11	2462	63.095734	0.0952202	1.0
Turbo 6	2437	60.255959	0.0909346	1.0

Antenna 10

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	63.095734	0.0396944	1.0
6	2437	199.52623	0.1255247	1.0
11	2462	63.095734	0.0396944	1.0
Turbo 6	2437	60.255959	0.0379078	1.0