RF EXPOSURE REPORT

REPORT NO.: SA960911L05

MODEL NO.: DIR-655

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: D-Link Corporation

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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 : 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

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 2dBi or 1.5849(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)	POWER DENSITY (mW/cm^2)	LIMIT OF POWER DENSITY (mW/cm^2)
1	2412	72.277	18.59	0.023	1.000
6	2437	70.958	18.51	0.022	1.000
11	2462	56.885	17.55	0.018	1.000

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	72.277	18.59	0.023	1.000
6	2437	80.724	19.07	0.025	1.000
11	2462	50.119	17.00	0.016	1.000

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)
		CHAIN0	CHAIN1	CHAIN2	CHAIN0	CHAIN1	CHAIN2				
1	2412	44.668	40.644	40.458	16.50	16.09	16.07	125.770	21.00	0.040	1.0
6	2437	41.020	40.272	40.272	16.13	16.05	16.05	121.564	20.85	0.038	1.0
11	2462	40.926	40.832	39.994	16.12	16.11	16.02	121.752	20.85	0.038	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)
		CHAIN0	CHAIN1	CHAIN2	CHAIN0	CHAIN1	CHAIN2				
1	2422	25.527	25.586	25.882	14.07	14.08	14.13	76.995	18.86	0.024	1.0
4	2437	25.882	25.704	25.823	14.13	14.10	14.12	77.409	18.89	0.024	1.0
7	2452	25.119	25.823	25.586	14.00	14.12	14.08	76.528	18.84	0.024	1.0