RF EXPOSURE REPORT

REPORT NO.: SA980922L13

MODEL NO.: ZF7731

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

Applicant's Company	Senao Networks, Inc.
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FCC ID	U2M-ZF7731
Manufacturer's Company	Senao Networks, Inc.
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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 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

The maximum Gain measured in Fully Anechoic Chamber are 14dBi or 25.119(numeric) (for internal antenna); 23dBi or 199.526(numeric) (for external antenna).

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

For 5.180 ~ 5.250GHz band:

DRAFT 802.11n (40MHz) OFDM MODULATION (Internal antenna with 14dBi gain):

CHAN.	CHAN. FREQ. (MHz)	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				
46	5230	5.97	5.84	7.791	8.92	0.044	1.000

DRAFT 802.11n (40MHz) OFDM MODULATION (External antenna with 23dBi gain):

CHAN.	CHAN. FREQ. (MHz)	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				
38	5190	-3.31	-3.07	0.960	-0.18	0.078	1.000

For 5.745 ~ 5.825GHz band:

DRAFT 802.11n (20MHz) OFDM MODULATION (Internal antenna with 14dBi gain):

CHAN.	CHAN. FREQ. (MHz)	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				
157	5785	16.17	16.13	82.420	19.16	0.417	1.000

DRAFT 802.11n (40MHz) OFDM MODULATION (External antenna with 23dBi gain):

CHAN.	CHAN. FREQ. (MHz)	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				
157	5785	9.90	9.81	19.344	12.87	0.808	1.000