RF EXPOSURE REPORT

REPORT NO.: SA980701H01
MODEL NO.: WU260-AM

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: AmTRAN Technology Co., Ltd.

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ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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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 our lab, 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

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

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

There are two antennas provided to this EUT, please refer to the following table:

Chain	Antenna Gain		Antenna Type	Connector	Cable Length (External only, if any)
	For 2.4GHz Gain (dBi)	For 5GHz Gain (dBi)			
Chain(0)	2	4	Printed Board Type	Hirose U.FL	680cm(black)
Chain(1)	2	4	Printed Board Type	Hirose U.FL	950cm(black)

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

For 15.247(2.4GHz):

For Part 802.11b:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	123.595	0.039	1.0
6	2437	121.899	0.038	1.0
11	2462	126.765	0.040	1.0

For Part 802.11g:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	256.448	0.081	1.0
6	2437	257.632	0.081	1.0
11	2462	246.037	0.078	1.0

DRAFT 802.11n (20MHz) OFDM

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	515.957	0.163	1.0
6	2437	549.174	0.173	1.0
11	2462	496.923	0.157	1.0

DRAFT 802.11n (40MHz) OFDM

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2422	359.878	0.113	1.0
4	2437	480.574	0.152	1.0
7	2452	482.958	0.152	1.0

For 15.247(5GHz):

For Part 802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
149	5745	175.388	0.088	1.0
157	5785	181.552	0.091	1.0
165	5825	185.780	0.093	1.0

For DRAFT 802.11n (20MHz) OFDM:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
149	5745	229.874	0.115	1.0
157	5785	216.800	0.108	1.0
165	5825	204.658	0.102	1.0

DRAFT 802.11n (40MHz) OFDM

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
151	5755	211.977	0.106	1.0
159	5795	205.147	0.103	1.0

For 15.407(5GHz):

For Part 802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
36	5180	24.266	0.012	1.0
40	5200	23.823	0.012	1.0
48	5240	23.227	0.012	1.0
52	5260	23.442	0.012	1.0
60	5300	24.378	0.012	1.0
64	5320	22.961	0.011	1.0
100	5500	22.131	0.011	1.0
120	5600	24.660	0.012	1.0
140	5700	27.164	0.014	1.0

For DRAFT 802.11n (20MHz) OFDM:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
36	5180	33.537	0.017	1.0
40	5200	34.265	0.017	1.0
48	5240	33.421	0.017	1.0
52	5260	46.511	0.023	1.0
60	5300	41.931	0.021	1.0
64	5320	42.270	0.021	1.0
100	5500	33.832	0.017	1.0
120	5600	50.436	0.025	1.0
140	5700	38.898	0.019	1.0

For DRAFT 802.11n (40MHz) OFDM:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
38	5190	24.034	0.012	1.0
46	5230	43.233	0.022	1.0
54	5270	39.199	0.020	1.0
62	5310	34.019	0.017	1.0
102	5510	23.578	0.012	1.0
118	5590	53.113	0.027	1.0
134	5670	39.643	0.020	1.0