RF EXPOSURE REPORT

REPORT NO.: SA980105L18

MODEL NO.: A5200, A5250

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: AirMagent, Inc.

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

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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 2.8dBi or 1.905(numeric) & 2.0dBi or 1.585(numeric) (for 2.4GHz); 2.0dBi or 1.585(numeric) & 5.1dBi or 3.236(numeric) (for 5.0GHz).

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

For 2.412 ~ 2.462GHz band:

802.11b DSSS MODULATION:

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	CHAIN 2				
1	2412	16.52	16.54	17.04	140.539	21.48	0.053	1.000
6	2437	16.51	16.55	16.52	134.831	21.30	0.051	1.000
11	2462	16.54	16.56	16.53	135.349	21.31	0.051	1.000

802.11g OFDM MODULATION:

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	CHAIN 2				
1	2412	20.53	21.53	20.52	367.932	25.66	0.139	1.000
6	2437	20.54	21.55	20.53	369.109	25.67	0.140	1.000
11	2462	20.55	21.56	20.54	369.960	25.68	0.140	1.000

DRAFT 802.11n (20MHz) OFDM MODULATION:

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	CHAIN 2				
1	2412	17.56	17.52	17.55	170.395	22.31	0.065	1.000
6	2437	17.53	17.54	17.51	169.742	22.30	0.064	1.000
11	2462	17.54	17.56	17.53	170.395	22.31	0.065	1.000

DRAFT 802.11n (40MHz) OFDM MODULATION:

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	CHAIN 2				
1	2422	19.02	18.55	19.04	231.582	23.65	0.088	1.000
4	2437	19.04	18.54	19.03	231.601	23.65	0.088	1.000
7	2452	19.05	18.52	19.06	232.012	23.66	0.088	1.000

For 5.180 ~ 5.320GHz band:

802.11a OFDM MODULATION:

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	CHAIN 2				
36	5180	11.02	12.06	11.03	41.393	16.17	0.027	1.000
40	5200	11.05	12.03	11.04	41.400	16.17	0.027	1.000
48	5240	11.06	12.09	11.08	41.768	16.21	0.027	1.000
52	5260	11.08	12.11	11.02	41.726	16.20	0.027	1.000
60	5300	11.09	12.07	11.04	41.665	16.20	0.027	1.000
64	5320	12.08	13.02	12.07	52.295	17.18	0.034	1.000

DRAFT 802.11n (20MHz) OFDM MODULATION:

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	CHAIN 2				
36	5180	8.02	8.03	8.09	19.134	12.82	0.012	1.000
40	5200	10.51	8.53	10.55	29.725	14.73	0.019	1.000
48	5240	11.03	11.06	13.58	48.244	16.83	0.031	1.000
52	5260	14.50	15.04	17.03	110.565	20.44	0.071	1.000
60	5300	15.53	15.53	16.51	116.226	20.65	0.075	1.000
64	5320	11.08	9.08	10.04	31.007	14.91	0.020	1.000

DRAFT 802.11n (40MHz) OFDM MODULATION:

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	CHAIN 2				
38	5190	9.02	9.53	9.02	24.934	13.97	0.016	1.000
46	5230	12.03	12.02	12.01	47.766	16.79	0.031	1.000
54	5270	13.51	13.51	14.02	70.112	18.46	0.045	1.000
62	5310	11.06	9.56	10.03	31.870	15.03	0.021	1.000

For 5.745 ~ 5.825GHz band:

802.11a OFDM MODULATION:

CHAN.	CHAN. FREQ. (MHz)	PEAK POWER OUTPUT (dBm)			TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DEN SITY (mW/CM^2)	LIMIT OF POWER DEN SITY (mW/CM^2)
		CHAIN 0	CHAIN 1	CHAIN 2				
149	5745	21.03	21.55	21.54	412.215	26.15	0.265	1.000
157	5785	23.05	24.56	24.56	773.355	28.88	0.497	1.000
165	5825	24.56	22.53	23.53	690.244	28.39	0.444	1.000

DRAFT 802.11n (20MHz) OFDM MODULATION:

CHAN.	CHAN. FREQ. (MHz)	PEAK POWER OUTPUT (dBm)			TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DEN SITY (mW/CM^2)	LIMIT OF POWER DEN SITY (mW/CM^2)
		CHAIN 0	CHAIN 1	CHAIN 2				
149	5745	19.52	18.06	18.03	217.043	23.37	0.140	1.000
157	5785	18.53	19.54	19.02	241.035	23.82	0.155	1.000
165	5825	20.04	18.02	18.55	235.927	23.73	0.152	1.000

DRAFT 802.11n (40MHz) OFDM MODULATION:

CHAN.	CHAN. FREQ. (MHz)	PEAK POWER OUTPUT (dBm)			TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DEN SITY (mW/CM^2)	LIMIT OF POWER DEN SITY (mW/CM^2)
		CHAIN 0	CHAIN 1	CHAIN 2				
151	5755	24.52	24.04	23.54	762.596	28.82	0.491	1.000
159	5795	24.53	24.05	23.56	764.876	28.84	0.493	1.000