



RF EXPOSURE REPORT

REPORT NO.: SA971031L01

MODEL NO.: 74-4876-04

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: HON HAI Precision IND., CO., LTD.

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ISSUED BY: Bureau Veritas Consumer Products Services
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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 : $P_d = (P_{out} * G) / (4 * \pi * r^2)$

where

P_d = power density in mW/cm^2

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 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 2dBi or 1.58489 (2.4GHz) & 5dBi or 3.16228(numeric) (5.0GHz).

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

802.11b DSSS MODULATION: 1TX

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	101.625	20.07	0.032	1.0
6	2437	102.802	20.12	0.032	1.0
11	2462	101.158	20.05	0.032	1.0

802.11g OFDM MODULATION: 1TX

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	226.986	23.56	0.072	1.0
6	2437	228.560	23.59	0.072	1.0
11	2462	225.424	23.53	0.071	1.0

DRAFT 802.11n (20MHz) OFDM MODULATION: 1TX

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	160.694	22.06	0.051	1.0
6	2437	161.436	22.08	0.051	1.0
11	2462	159.956	22.04	0.050	1.0

DRAFT 802.11n (20MHz) OFDM MODULATION: 2TX

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				
1	2412	22.05	22.07	321.389	25.07	0.101	1.0
6	2437	22.08	22.11	323.991	25.11	0.102	1.0
11	2462	22.02	22.05	319.545	25.05	0.101	1.0

**DRAFT 802.11n (40MHz) OFDM MODULATION: 1TX**

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	2422	159.956	22.04	0.050	1.0
4	2437	161.808	22.09	0.051	1.0
7	2452	159.588	22.03	0.050	1.0

DRAFT 802.11n (40MHz) OFDM MODULATION: 2TX

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				
1	2422	22.03	22.06	320.282	25.06	0.101	1.0
4	2437	22.07	22.09	322.873	25.09	0.102	1.0
7	2452	22.04	22.05	320.280	25.06	0.101	1.0

802.11a OFDM MODULATION: 1TX

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/cm ²)	LIMIT OF POWER DENSITY (mW/cm ²)
36	5180	31.769	15.02	0.020	1.0
40	5200	32.063	15.06	0.020	1.0
48	5240	31.915	15.04	0.020	1.0
52	5260	32.211	15.08	0.020	1.0
60	5300	32.434	15.11	0.020	1.0
64	5320	31.842	15.03	0.020	1.0
100	5500	32.137	15.07	0.020	1.0
116	5580	32.211	15.08	0.020	1.0
140	5700	31.989	15.05	0.020	1.0
149	5745	255.270	24.07	0.161	1.0
157	5785	257.632	24.11	0.162	1.0
165	5825	254.097	24.05	0.160	1.0

**DRAFT 802.11n (20MHz) OFDM MODULATION: 1TX**

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/cm ²)	LIMIT OF POWER DENSITY (mW/cm ²)
36	5180	12.677	11.03	0.008	1.0
40	5200	20.184	13.05	0.013	1.0
48	5240	20.230	13.06	0.013	1.0
52	5260	20.324	13.08	0.013	1.0
60	5300	20.464	13.11	0.013	1.0
64	5320	12.823	11.08	0.008	1.0
100	5500	20.230	13.06	0.013	1.0
116	5580	20.137	13.04	0.013	1.0
140	5700	20.045	13.02	0.013	1.0
149	5745	159.956	22.04	0.101	1.0
157	5785	162.555	22.11	0.102	1.0
165	5825	161.436	22.08	0.102	1.0

DRAFT 802.11n (20MHz) OFDM MODULATION: 2TX

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				
36	5180	11.05	11.08	25.558	14.08	0.016	1.0
40	5200	13.04	13.06	40.367	16.06	0.025	1.0
48	5240	13.08	13.04	40.461	16.07	0.025	1.0
52	5260	13.02	13.07	40.322	16.06	0.025	1.0
60	5300	13.09	13.09	40.741	16.10	0.026	1.0
64	5320	11.01	11.02	25.266	14.03	0.016	1.0
100	5500	13.02	13.07	40.322	16.06	0.025	1.0
116	5580	13.07	13.03	40.368	16.06	0.025	1.0
140	5700	12.54	12.57	36.019	15.57	0.023	1.0
149	5745	22.06	22.02	319.915	25.05	0.201	1.0
157	5785	22.13	22.08	324.741	25.12	0.204	1.0
165	5825	22.03	22.05	319.912	25.05	0.201	1.0

**DRAFT 802.11n (40MHz) OFDM MODULATION: 1TX**

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/cm ²)	LIMIT OF POWER DENSITY (mW/cm ²)
38	5190	12.647	11.02	0.008	1.0
46	5230	20.230	13.06	0.013	1.0
54	5270	20.324	13.08	0.013	1.0
62	5310	12.735	11.05	0.008	1.0
102	5510	20.091	13.03	0.013	1.0
110	5550	20.277	13.07	0.013	1.0
134	5670	20.137	13.04	0.013	1.0
151	5755	159.588	22.03	0.100	1.0
159	5795	161.436	22.08	0.102	1.0

DRAFT 802.11N (40MHz) OFDM MODULATION: 2TX

CHAN.	CHAN. FREQ. (MHz)	PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/cm ²)	POWER DENSITY (mW/cm ²)
		CHAIN 0	CHAIN 1				
38	5190	11.08	11.04	25.529	14.07	0.016	1.0
46	5230	13.05	13.08	40.507	16.08	0.025	1.0
54	5270	13.07	13.02	40.322	16.06	0.025	1.0
62	5310	11.04	11.07	25.500	14.07	0.016	1.0
102	5510	13.07	13.05	40.460	16.07	0.025	1.0
110	5550	13.04	13.08	40.461	16.07	0.025	1.0
134	5670	13.08	13.04	40.461	16.07	0.025	1.0
151	5755	22.04	22.07	321.020	25.07	0.202	1.0
159	5795	22.08	22.05	321.760	25.08	0.202	1.0