

Maximum Permissible Exposure (MPE) Evaluation Report

Report No. : TS08100102-EME

Model No. : H3C DNMA-83

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**Applicant: 3Com Corporation
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**Test Method/
Standard: FCC 1.1310 and IC Safety Code 6**

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Table of Contents

Summary of Tests	3
1. Introduction	4
2. RF Exposure Limit	4
3. RF Exposure calculations	5
4. Test results	6



Summary of Tests

MPE Evaluation meet FCC OET No. 65: 1997/ IEEE C95.1-1999

**Wireless mini PCI Card-H3C DNMA-83
FCC ID: O9C-DNMA83**

Test	Reference	Results
MPE Evaluation	FCC Guidelines for Human Exposure IEEE C95.1	Pass



1. Introduction

The EUT operates in the 2.4GHz ISM band. Due to the EUT (include antenna) at its normal operation distance is at least 20 cm from the human body, the EUT was defined as a Mobile Device.

The EUT operates in the 2.4GHz ISM band. The EUT (antenna included) is compliant with modular approval and the normal operation distance (after installing in other device, such as router or access point), 20cm from the human body; therefore, the EUT is defined as a Mobile Device.

The reason to do the MPE Evaluation is to avoid the RF hazard to human body. The maximum output power and gain of the antenna were used to calculate the limited Power density (S) at 20cm distance away from the product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed.

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				
30-300	61.4	0.163	1.0	6
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6
(B) Limits for General Population / Uncontrolled Exposure				
30-300	27.5	0.073	0.2	30
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30

F= Frequency in MHz

3. RF Exposure calculations

From §FCC 1.1310 table 1, the maximum permissible RF exposure for an uncontrolled environment is 1mW/(cm²)

Power density (S) is calculated by the following formula:

$$S = (P * G)/4\pi R^2$$

where, S = Power density (mW/cm²)

P = Output power to antenna (mW)

R = Distance between radiating structure and observation point (cm)

G = Gain of antenna in numeric

$\pi = 3.1416$

Example:

Assume a mobile device operates at 2412MHz and its maximum output power is 50mW, and the maximum gain of antenna is 1 (numeric) /0dBi.

then the power density (S) = $(50 * 1)/4*\pi*20^2 = 0.00995$ (mW/cm²)

4. Test results

Test Mode: 802.11b mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	1.58	302.22	0.095220431	1.0
6	2437	1.58	312.12	0.098339987	1.0
11	2462	1.58	316.39	0.099708032	1.0

Test Mode: 802.11g mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	1.58	702.63	0.221681854	1.0
6	2437	1.58	693.23	0.218640265	1.0
11	2462	1.58	604.61	0.190427710	1.0

Test Mode: 802.11n HT20 mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	1.58	713.27	0.224765756	1.0
6	2437	1.58	702.38	0.221681854	1.0
11	2462	1.58	608.80	0.191747692	1.0

Test Mode: 802.11n HT40 mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
3	2422	1.58	591.97	0.186522035	1.0
6	2437	1.58	592.74	0.186952013	1.0
9	2452	1.58	570.12	0.179775351	1.0

Test Mode: 802.11a mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
149	5745	1.58	595.29	0.187814944	1.0
157	5785	1.58	629.50	0.198486121	1.0
165	5825	1.58	488.85	0.154074279	1.0

Test Mode: 802.11n HT20 mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
149	5745	1.58	587.19	0.185238026	1.0
157	5785	1.58	620.27	0.195762789	1.0
165	5825	1.58	656.96	0.239734283	1.0

Test Mode: 802.11n HT40 mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
151	5755	1.58	618.01	0.194863341	1.0
159	5795	1.58	660.31	0.208319606	1.0

Test Mode: 802.11a mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
36	5180	1.58	45.56	0.014379048	1.0
40	5200	1.58	45.80	0.014445419	1.0
48	5240	1.58	46.02	0.014512096	1.0

Test Mode: 802.11n HT20 mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
36	5180	1.58	45.03	0.014181760	1.0
40	5200	1.58	46.67	0.014713979	1.0
48	5240	1.58	45.34	0.014280064	1.0

Test Mode: 802.11n HT40 mode with Mode 1

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
38	5190	1.58	43.31	0.013668792	1.0
46	5230	1.58	44.45	0.014019423	1.0

Test Mode: 802.11b mode with Mode 2

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	3.98	270.46	0.214155950	1.0
6	2437	3.98	273.38	0.216635759	1.0
11	2462	3.98	278.62	0.220663318	1.0

Test Mode: 802.11g mode with Mode 2

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	3.98	444.64	0.352151988	1.0
6	2437	3.98	555.79	0.440281203	1.0
11	2462	3.98	549.72	0.435241346	1.0

Test Mode: 802.11n HT20 mode with Mode 2

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	3.98	412.10	0.326384965	1.0
6	2437	3.98	500.21	0.396031877	1.0
11	2462	3.98	505.42	0.400617710	1.0

Test Mode: 802.11n HT40 mode with Mode 2

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
3	2422	3.98	312.27	0.247588315	1.0
6	2437	3.98	492.16	0.389699766	1.0
9	2452	3.98	438.57	0.347320282	1.0

Test Mode: 802.11a mode with Mode 2

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
149	5745	6.31	595.29	0.747704759	1.0
157	5785	6.31	629.50	0.790187481	1.0
165	5825	6.31	488.85	0.613380753	1.0

Test Mode: 802.11n HT20 mode with Mode 2

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
149	5745	6.31	587.19	0.737445865	1.0
157	5785	6.31	620.27	0.779345702	1.0
165	5825	6.31	656.96	0.954399371	1.0

Test Mode: 802.11n HT40 mode with Mode 2

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
151	5190	6.31	618.01	0.775764934	1.0
159	5230	6.31	660.31	0.829335288	1.0

Test Mode: 802.11b mode with Mode 5

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	39.81	104.37	0.827427869	1.0
6	2437	39.81	107.78	0.854535569	1.0
11	2462	39.81	121.64	0.96323032	1.0

Test Mode: 802.11g mode with Mode 5

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	39.81	117.12	0.928389339	1.0
6	2437	39.81	116.20	0.919877814	1.0
11	2462	39.81	124.34	0.985666837	1.0

Test Mode: 802.11n HT20 mode with Mode 5

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	39.81	116.71	0.924123777	1.0
6	2437	39.81	117.52	0.930529497	1.0
11	2462	39.81	124.62	0.987939033	1.0

Test Mode: 802.11n HT40 mode with Mode 5

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
3	2422	39.81	88.34	0.699407274	1.0
6	2437	39.81	118.03	0.934824626	1.0
9	2452	39.81	112.88	0.89480859	1.0

Test Mode: 802.11a mode with Mode 5

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
149	5745	39.81	447.71	0.886482473	1.0
157	5785	39.81	459.20	0.909222456	1.0
165	5825	39.81	476.43	0.943344134	1.0

Test Mode: 802.11n HT20 mode with Mode 5

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
149	5745	39.81	434.51	0.860340076	1.0
157	5785	39.81	457.09	0.905044958	1.0
165	5825	39.81	474.24	0.939009862	1.0

Test Mode: 802.11n HT40 mode with Mode 5

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
151	5755	39.81	444.63	0.88037997	1.0
159	5795	39.81	470.98	0.932545763	1.0

Test Mode: 802.11b mode with Mode 8

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	6.31	188.83	0.236990067	1.0
6	2437	6.31	197.95	0.248731131	1.0
11	2462	6.31	192.14	0.241396042	1.0

Test Mode: 802.11g mode with Mode 8

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	6.31	461.38	0.579068772	1.0
6	2437	6.31	465.12	0.584426829	1.0
11	2462	6.31	404.61	0.507843788	1.0

Test Mode: 802.11n HT20 mode with Mode 8

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	6.31	465.09	0.584426829	1.0
6	2437	6.31	469.96	0.589834464	1.0
11	2462	6.31	410.29	0.514908599	1.0

Test Mode: 802.11n HT40 mode with Mode 8

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
3	2422	6.31	367.25	0.461031017	1.0
6	2437	6.31	369.08	0.463159040	1.0
9	2452	6.31	380.71	0.478332781	1.0

Test Mode: 802.11a mode with Mode 8

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
149	5745	10	448.07	0.890697318	1.0
157	5785	10	458.88	0.913545420	1.0
165	5825	10	476.00	0.947829332	1.0

Test Mode: 802.11n HT20 mode with Mode 8

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
149	5745	10	434.95	0.864430625	1.0
157	5785	10	457.36	0.909348060	1.0
165	5825	10	474.52	0.943474452	1.0

Test Mode: 802.11n HT40 mode with Mode 8

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
151	5755	10	444.70	0.884565801	1.0
159	5795	10	471.23	0.936979620	1.0

The Notice in Installation Manual has been stated as below:

While installing and operating this transmitter, the radio frequency exposure limit of 1mW/(cm*cm) may be exceeded at distances close to the transmitter. therefore, the user must maintain a minimum distance of 20 cm from the device at all time.