



# APPENDIX I RADIO FREQUENCY EXPOSURE

## LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

## EUT Specification

<b>EUT</b>	Wirless N Day / Night Camera Color Night Vision
<b>Model Number</b>	DCS-2136L
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz 802.11n HT40: 2.422GHz ~ 2.452GHz 802.11a: 5150 ~ 5250MHz / 5250 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850MHz 802.11 HT20: 5150 ~ 5250MHz / 5250 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850MHz 802.11 HT40: 5150 ~ 5250MHz / 5250 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850MHz 802.11 ac: 5150 ~ 5250MHz / 5250 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850MHz <input type="checkbox"/> Others
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )
<b>Antenna Specification</b>	PCB Antenna Gain 2.4GHz   0.1 dBi (Numeric ga 1.02) PCB Antenna Gain 5GHz     4.7 dBi (Numeric ga 2.95)
<b>Max. output power</b>	IEEE 802.11b Mode:           19.00 dBm (0.079 W) IEEE 802.11g Mode:           19.00 dBm (0.079 W) IEEE 802.11n HT 20 Mode:   19.00 dBm (0.079 W) IEEE 802.11n HT 40 Mode:   19.00 dBm (0.079 W) IEEE 802.11a Mode:           14.00 dBm (0.025 W) IEEE 802.11n HT20 Mode:    14.00 dBm (0.025 W) IEEE 802.11n HT40 Mode:    14.00 dBm (0.025 W) IEEE 802.11ac HT80 Mode:   12.00 dBm (0.016 W)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A



## **TEST RESULTS**

**No non-compliance noted.**

### **Calculation**

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{377}$

Where  $E$  = Field strength in Volts / meter

$P$  = Power in Watts

$G$  = Numeric antenna gain

$d$  = Distance in meters

$S$  = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>



**Maximum Permissible Exposure**

Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm<sup>2</sup>

**IEEE 802.11b mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
1	2412	0.079	1.02	20	0.0000	1

**IEEE 802.11g mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
1	2412	0.079	1.02	20	0.0000	1

**IEEE 802.11n HT20 mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
1	2412	0.079	1.02	20	0.0000	1

**IEEE 802.11n HT40 mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
1	2422	0.079	1.02	20	0.0000	1

**IEEE 802.11a mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
157	5785	0.025	2.95	20	0.0000	1

**IEEE 802.11a HT20 mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
157	5785	0.025	2.95	20	0.0000	1

**IEEE 802.11a HT40 mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
159	5795	0.025	2.95	20	0.0000	1

**IEEE 802.11ac mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
155	5775	0.025	2.95	20	0.0000	1