

MPE Estimates

System Description

CN3 hand held computer with the addition of IP30, RFID hand grip scanner

CN3

The CN3 is a hand held computer. The unit contains WLAN and Bluetooth radios.

FCC ID: EHA-01CN3 **all transmitters for this model are filed under a single FCC ID**

The WLAN or Bluetooth radios operates at anytime when the CN3 is connected to the IP30, operation against the head or body is not considered normal when the IP30 is used to read RFID tags as the IP30 should be aimed toward those tags.

The WLAN and Bluetooth radios share a PCB but transmit on separate antennas, they cannot transmit simultaneously, the WLAN portion contributes the most RF energy for this calculation.

IP30

The IP30 is a RFID hand grip option. It contains the IM4 RFID PC Card and Bluetooth Radios

FCC ID: EHAIM4 915 MHz

FCC ID: EHA-BTM4 Bluetooth

The radios all transmit on separate antennas.

The IP30 RFID scanner is operated by the user only when in the hand.

The user manual instruct to provide for a separation distance of 23-cm or greater distance between the CN3/IP30 system antennas and the head or torso of the user or near by persons.

Radio Disc / Rule	MHz -	MHz	Watts (Conducted)	Watts(ERP)	Watts (EIRP)
CN3	FCC ID: EHA-01CN3	IC :1223A-01CN3			
802.11bg radio (DHIB)					
15C	2412	2462	0.175		
Bluetooth radio (DHIB) {Cannot operate simultaneous with 802.11bg transmitter}					
15C	2402	2480	0.0016		
IP30					
RFID radio	FCC ID: EHAIM4	IC: 1223A-IM4			
15C	902.75	927.25	0.861		
Bluetooth Radio	FCC ID: EHA-BTM4	IC: 1223A-BTM4			
15C	2402	2480	0.00964		

Table 1 in 47 CFR 1.1310 defines the maximum permissible exposure (MPE) for the general population. The exposure level at the distance listed from the EUT's transmitting antenna is calculated using the general equation:

Calculations	cm	inches
	23.0	9.06

(See OET 65, Page 19, Eq. 4):

$$S = (PG)/4\pi R^2$$

Where: S = power density (mW/cm²)

P = power input to the antenna (mW)

G = numeric power gain relative to an isotropic radiator

R = distance to the center of the radiation of the antenna (23 cm = limit for this MPE estimate)

PG = EIRP

Solving for S, the maximum power densities 23 cm from the transmitting antennas are summarized in the following tables:

FCC ID: EHA-01CN3
 IC: 1223A-01CN3

802.11bg Radio (DHIB) **CN3 802.11bg antenna with highest power frequency band worst case EIRP**
 Calculation for exposure at 23cm distance

Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
CN3 DHIB	linear	NA	2450	175.000	2.2	0.0437	1.0	0.043689

Bluetooth **CN3 802.11bg-BT Bluetooth chip antenna worst case EIRP**
{Cannot operate simultaneous with 802.11bg transmitter}

Calculation for exposure at 23cm distance

Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
CN3 BT chip	linear	NA	2450	1.600	-3.3	0.0001	1.0	0.000113

RFID Radio **IP30 yagi antenna worst case EIRP**

FCC ID: EHAIM4
 IC: 1223A-IM4

Calculation for exposure at 23cm distance

Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
Intermec IP30	yagi	NA	902	861.000	5.2	0.4289	0.601	0.713614

Bluetooth **IP30 Bluetooth PC trace antenna worst case EIRP.**

FCC ID: EHA-BTM4
 IC: 1223A-BTM4

Calculation for exposure at 23cm distance

Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
PC trace	microstrip	NA	2450	9.640	0	0.0015	1.0	0.001450

Co-Located Transmitter Calculation of RF Exposure

Per FCC TCB Training April 3, 2002

"Devices operating in multiple frequency bands

When RF exposure evaluation is required for TCB approval

Separate antennas – estimated minimum separation distances may be considered for the frequency bands that do not require evaluation or TCB approval, however, the estimated distance should take into account the effect of co-located transmitters. (Note 24)

Note 24 According to multiple frequency exposure criteria, the ratio of field strength or power density to the applicable exposure limit at the exposure location should be determined for each transmitter and the

sum of these ratios must not exceed 1.0 for the location to be compliant.”

Worst Case Exposure for CK61 / IP30 when using co-located transmitters.

Calculation for exposure at 23cm distance

Transmitter FCC ID: Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
FCC ID: EHA-01CN3 802.11bg	chip	NA	2450	175.0	2.2	0.0437	1.0	0.0437
FCC ID: EHAIM4 IP30 yagi	yagi	NA	902	861.0	5.2	0.4289	0.601	0.7136
FCC ID: EHA-BTM4 PC trace	microstrip	NA	2450	9.6	0	0.0015	1.0	0.0015
							ratio limit	
Total							1.0	0.7588

The worst case configuration for all combinations of co-located transmitters and antennas are shown. In all cases the ratio of exposure compared the limit when totaled does not exceed 1.0.