

Handheld RF Exposure

The CK3 is a hand-held computer that contains a combination WLAN and Bluetooth radio module, FCC ID: EHA-CK3DHIB. The IP30 is a RFID Tag reader that is an optional accessory to the CK3. It contains two separate radios: FCC IDs: EHAIM4 (915 MHz RFID) and EHA-BTM4 (Bluetooth). The CK3 can be used while attached to the top of the IP30 (see attached photos).

KDB 447498 (4)(c)(iii)(1)-(3) was reviewed for RF Safety test requirements for the combined CK3 / IP30 configuration:

"c) Extremity and body SAR evaluation considerations

i) PDA, UMPC (Ultra-Mobile PC), and devices with similar form factor and configurations that allow next to the ear transmissions are tested according to the handset procedures in IEEE Std 1528-2003, OET Bulletin 65 Supplement C 01-01 and the specific FCC test procedures.

ii) Devices that allow transmissions while worn next to the body using an accessory are tested with the device and associated accessories in all applicable orientations, at the minimum separation distance, using a flat phantom.

iii) Contact the FCC Laboratory to determine whether:

(1) Hand SAR is required for hand-held and hand-operated devices with output power $> 1000 [f(\text{GHz})]^{-0.5} \text{ mW}$ that are designed with the hand operating closer than 5 cm from the antenna during normal use.²⁴

(2) Extremity SAR is required for wrist, feet or ankle worn devices.

(3) Body SAR is required for hand-held and hand-operated or wrist, feet and ankle worn devices that operate closer than 5 cm to the body and the output power is $> 300 [f(\text{GHz})]^{-0.5} \text{ mW}$."

The following is a discussion of KDB 447498 (4)(c), Items i) – iii), and how it relates to the combination of CK3 and IP30:

Item i), the CK3 in a stand-alone configuration can be used as a “walkie-talkie” in a Push-To-Talk (PTT) mode. This configuration is addressed in Section 12 in the SAR Evaluation report that is on file with the original grant for FCC ID: EHA-CK3DHIB. Ear position is not possible. The user is not likely to attempt PTT operation while using the combined CK3 / IP30 unit.

Item ii), the RFID tag reader cannot operate while worn next to the body. It can only operate when held in the hand, aimed at a remote tag, and the trigger pulled.

Item iii), the attached pictures show that the closest spacing between the user’s hand and the radios contained in the CK3 is 7 cm. The closest spacing between the RFID radio and the user’s hand is 10 cm.

Since the spacing is greater than 5cm between the antennas and the user’s hand, SAR testing is not required. The following MPE estimates are used to demonstrate compliance of the CK3 while operating with the IP30.

CK3

IP30









MPE Estimates

System Description

CK3 hand held computer with the addition of IP30, RFID hand grip scanner

CK3

The CK3 is a hand held computer. The unit contains a combination WLAN and Bluetooth radio module.
FCC ID: EHA-CK3DHIB

The WLAN or Bluetooth radios operates at anytime when the CK3 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 separate radios: the IM4 RFID PC Card and Bluetooth Radios
FCC ID: EHAIM4 (915 MHz RFID)
FCC ID: EHA-BTM4 (Bluetooth)

The radios all transmitt 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 seperation distance of 23-cm or greater distance between the CK3/IP30 system antennas and the head or torso of the user or near by persons.

CK3

FCC ID: EHA-CK3DHIB IC :1223A-CK3DHIB
802.11bg radio (DHIB)

Rule Part	Frequency Range		Conducted
	(MHz)		Power Watts
15.247	2412	2462	0.0419

Bluetooth radio (DHIB) {Cannot operate simultaneous with 802.11bg transmitter}
15.247 2402 2480 0.0043

IP30

RFID radio FCC ID: EHAIM4 IC: 1223A-IM4

Rule Part	Frequency Range		Conducted
	(MHz)		Power Watts
15.247	902.75	927.25	0.861

Bluetooth Radio FCC ID: EHA-BTM4 IC: 1223A-BTM4
15.247 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

The exposure level at a 23 cm distance from the EUT's transmitting antenna is calculated using the general equation (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-CK3DHIB
IC: 1223A-CK3DHIB

802.11bg Radio (DHIB) **CK3 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	Pwr Density Limit mW/cm ²	Power Density Ratio
CK3 DHIB	linear	NA	2450	41.900	0.7	0.0074	1.0	0.007405

Bluetooth **CK3 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	Pwr Density Limit mW/cm ²	Power Density Ratio
CK3 BT chip	linear	NA	2450	4.300	-0.9	0.0005	1.0	0.000526

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

IP30 Bluetooth PC trace antenna 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	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 CK3 / 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	Pwr Density Limit mW/cm ²	Power Density Ratio
FCC ID: EHA-CK3DHIB 802.11bg	chip	NA	2450	41.9	0.7	0.0074	1.0	0.0074
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	0.7225

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.