

Handheld RF Exposure

The IP30 RFID tag reader is a pistol grip accessory that can attach to several Intermec ultra-mobile computers. See the attached photos. IP30 uses two separate transmitters:

FCC ID: EHAIM4 (915 MHz RFID) IC: 1223A-IM4
FCC ID: EHA-BTM4 (Bluetooth). IC: 1223A-BTM4

The 70 series family of computers contains WWAN, WLAN and Bluetooth (BT) transmitters. This document addresses the collocation for the flexible carrier WWAN versions (Gobi) 70 series computers filed under the following:

FCC ID: EHA-1000CP01SX1 IC: 1223A-1000CP01SX1

1000CP01S (CN70), 1000CP02S (CN70e), 1001CP01S (CK70), 1001CP03S (CN70)

Utilizing recent FCC guidance, the highest output transmitter IP30, FCC ID: EHAIM4 (RFID) will contain the collocation grant information for the IP30 – 70 series configurations.

KDB 447498 D01 Mobile Portable RF Exposure v04 (4)(c)(iii)(1)-(3) was reviewed for RF Safety test requirement for the combined IP30 – 70 series 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 $> 1000 \cdot [f(\text{GHz})]^{-0.5}$ mW that are designed with the hand operating closer than 5 cm from the antenna during normal use.²⁵
 - (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 $> 300 \cdot [f(\text{GHz})]^{-0.5}$ mW. “

Discussion for items (iii)(1)-(3) related to IP30 - 70 series computer configuration.

Item i), the 70 series computers in a stand-alone configuration can be used as a cellular phone hand-set against the head or body, these conditions are currently addressed with SAR evaluations under the above FCC ID. The use against the head is not likely while the IP30 is attached to the handheld computers.

Item ii), the IP30 RFID reader cannot operate while worn next to the body. The user is instructed to operate the reader from the hand, aimed toward the remote tags, and pull the trigger to engage the transmitter.

Item iii), the attached pictures show the closest spacing between the users hands and the radio antennas contained in the 70 series computers to be 6-cm. The closes spacing from the IP30 RFID antenna to the hand is 7-cm.

Since the spacing is greater than 5-cm between the antennas and the user's hands, SAR testing is not required. The following MPE estimates are used to demonstrate compliance of the IP30 – 70 series computer system.

²⁵ Hand-held and hand-operated devices are inherently designed to only transmit while operated in the user's hands.

EIRP Calculation of RF Exposure

cm inches
23.0 9.06

CFR 47 Part 15.247 (b)(5)

(b)(5) 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 Sec. 1.1307(b)(1) of this chapter.

47 CFR 2.1091 (b). The system is classified as a mobile transmitter.

47 CFR 2.1091(c). The EUT is categorically excluded from routine environmental evaluation.

System Description

IP30, RFID hand grip scanner with CN70 mobile computer

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 IP30 / CN70 system antennas and the head or torso of the user or near by persons.

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 IP30 operates on batteries, to improve battery life the transmitter is limited to 50% on/off time via software, power output is de-rated for RF exposure from 0.861 Watts to 0.4305 Watts.
The radios all transmit on separate antennas.

CN70 (70 series) Computers

The CN70, CN70e, and CK70 are hand held computers. These unit contains WWAN, WLAN and Bluetooth radios.
FCC ID: EHA-1000CP01SX1 **all transmitters for this model are filed under a single FCC ID**
The FCC file describes the identical placement of radios and antennas in all models listed.

The WWAN radio operates at anytime when the 70 series computer 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 and antenna, they cannot transmit simultaneously, the WLAN portion contributes the most RF energy for this calculation.

Radio Disc / Rule	MHz -	MHz	Watts (Conducted)	Watts (ERP)	Watts (EIRP)	Antenna Gain (dBi)
IP30						
RFID radio FCC ID: EHAIM4 IC: 1223A-IM4						
15C	902.75	927.25	0.4305			5.2
Bluetooth Radio FCC ID: EHA-BTM4 IC: 1223A-BTM4						
15C	2402	2480	0.0096			0
FCC ID: EHA-1000CP01SX1 (WWAN-WLAN-BT) IC: 1223A-1000CP01SX1 MCB355 (Gobi)						
22H	824.2	848.8	1.7100	1.12		0.3
24E	1850.2	1909.8	0.8400		1.56	2.7
27	1712.4	1752.6	0.2500		0.44	2.4
802.11abgn radio (RC12)						
15C	2412	2462	0.0532			0.5
15E	5180	5240	0.0251			4.2
15E	5260	5320	0.0245			4.2
15E	5500	5700	0.0195			4.5
15C	5745	5825	0.0170			4.4
Bluetooth radio (RC12) (Cannot operate simultaneous with 802.11abgn transmitter)						
15C	2402	2480	0.0072			0.5

EIRP Calculation of RF Exposure

cm inches
23.0 9.06

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):

$S = (PG)/4(P)R^2$

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:

RFID Radio 915 MHz IP30 yagi antenna worst case EIRP

FCC ID: EHAIM4

IC: 1223A-IM4

Calculation for exposure at 23 cm distance

Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23 cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
Intermec IP30	yagi	NA	915	430.5	5.2	0.2144	0.610	0.351542

Bluetooth IP30 Bluetooth PC trace antenna worst case EIRP

FCC ID: EHA-BTM4

IC: 1223A-BTM4

Calculation for exposure at 23 cm distance

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

FCC ID: EHA-1000CP01SX1 CN70 WWAN antenna with highest power frequency band worst case EIRP

IC: 1223A-1000CP01SX1

WWAN Radio MC8355 Calculation for exposure at 23 cm distance

Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23 cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
CN70 internal	PIFA	805-668-001	850	1710.0	0.30	0.2756	0.558	0.49397
CN70 internal	PIFA	805-668-001	1900	840.0	2.70	0.2353	1.0	0.23530
CN70 internal	PIFA	805-668-001	1700	250.0	2.40	0.0654	2.0	0.03268

802.11abgn Radio RC12 CN70 802.11abgn antenna with highest power frequency band worst case EIRP

Calculation for exposure at 23 cm distance

Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23 cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
CN70 RC12	PIFA	805-668-001	2450	53.2	0.5	0.0090	1.0	0.00898
CN70 RC12	PIFA	805-668-001	5200	25.1	4.2	0.0099	1.0	0.00993
CN70 RC12	PIFA	805-668-001	5300	24.5	4.2	0.0097	1.0	0.00969
CN70 RC12	PIFA	805-668-001	5600	19.5	4.5	0.0083	1.0	0.00827
CN70 RC12	PIFA	805-668-001	5805	17.0	4.4	0.0070	1.0	0.00704

Bluetooth CN70 BT Bluetooth antenna worst case EIRP

{Cannot operate simultaneous with 802.11abgn transmitter}

Calculation for exposure at 23 cm distance

Antenna Description	Antenna Type	Antenna Part No.	Transmit Freq. (MHz)	Peak Conducted Power (mW)	Gain (dBi)	Pwr Density @ 23 cm mW/cm ²	Pwr Density Limit mW/cm ²	Power Density Ratio
CN70 BT	PIFA	805-668-001	2450	7.200	0.5	0.0012	1.0	0.001215

