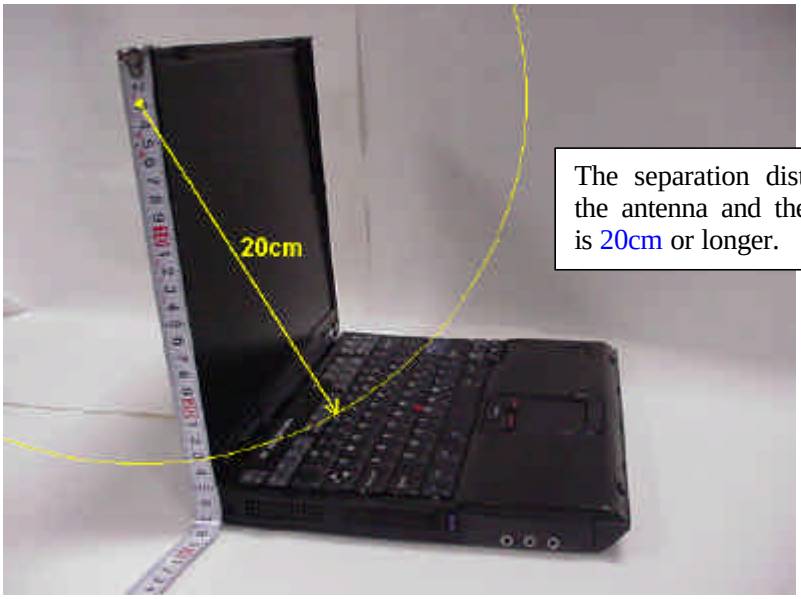
RF Exposure

The applying equipment is a standard fullsize laptop computer which is categorized as a mobile device by FCC CFR 47 Section 2.1091. Therefore the separation distance between the antenna and the human body is 20cm or more. As shown in the following photos, the applying equipment satisfies the requirement of antenna separation.

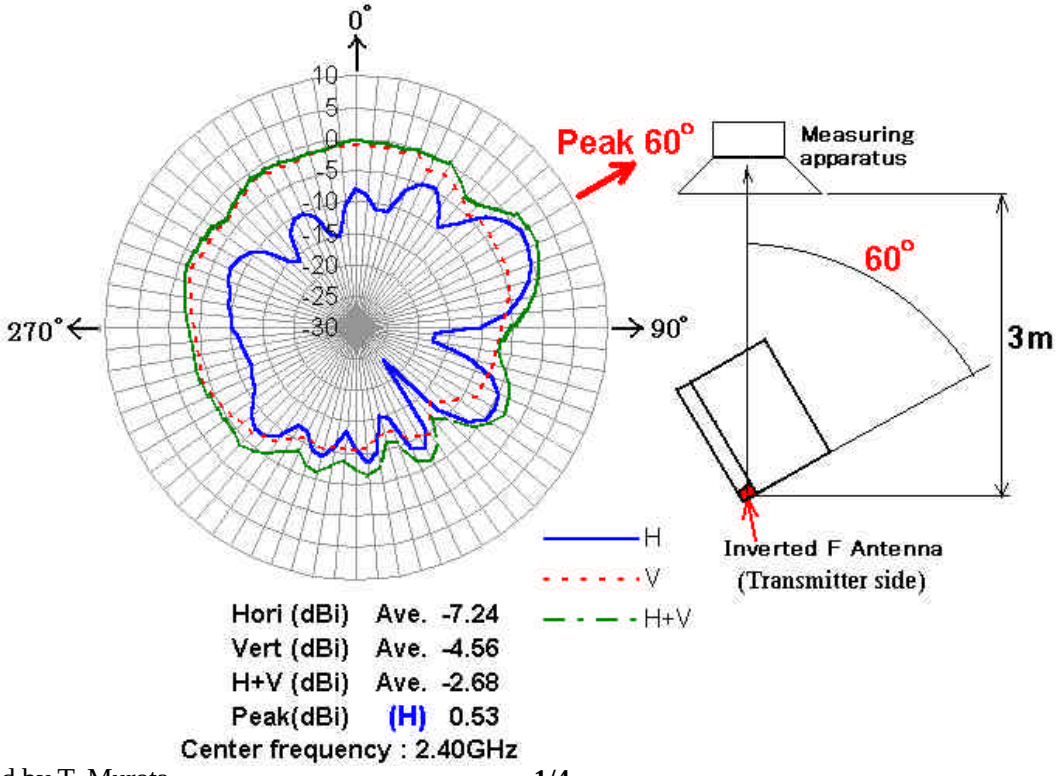
1. IBM High Rate Wireless LAN Mini-PCI Adapter with Modem II



The separation distance between the antenna and the human body is 20cm or longer.

The conducted peak output power of the IEEE802.11b Wireless LAN Adapter is 17.0dBm and the maximum antenna gain is 0.53dBi as shown below.

Figure A: Antenna Gain of IEEE802.11b Wireless LAN Adapter



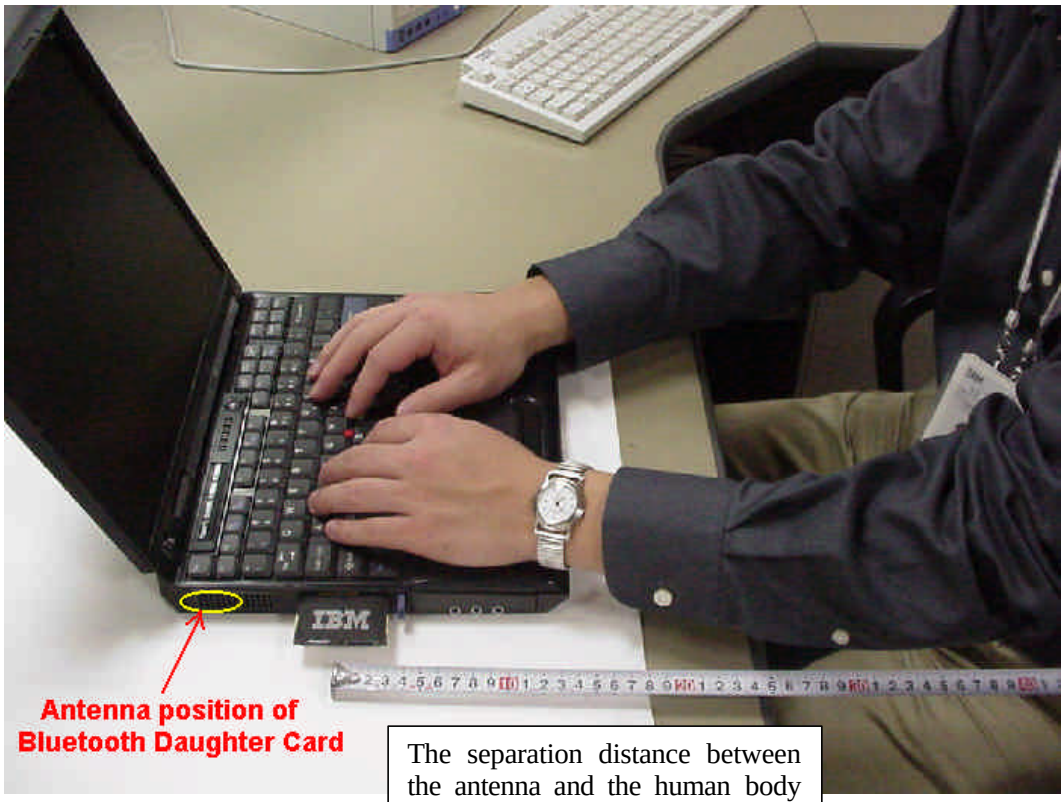
Therefore the peak radiated output power(EIRP) is calculated as follows.

EIRP = P + G = 17.0 dBm + 0.53 dBi = 17.53 dBm (56.6 mW)

Then, the maximum power density at 20cm distance is calculated as :

$S_1 = EIRP/(4 \times R^2 \times \pi) = 0.0113$ mW/cm^2

2. IBM Bluetooth Daughter Card



The separation distance between the antenna and the human body is 20cm or longer.

The peak conducted output power of the Bluetooth Daughter Card is 3.9 dBm and the maximum antenna gain is 1.87dBi as shown in the Figure B.

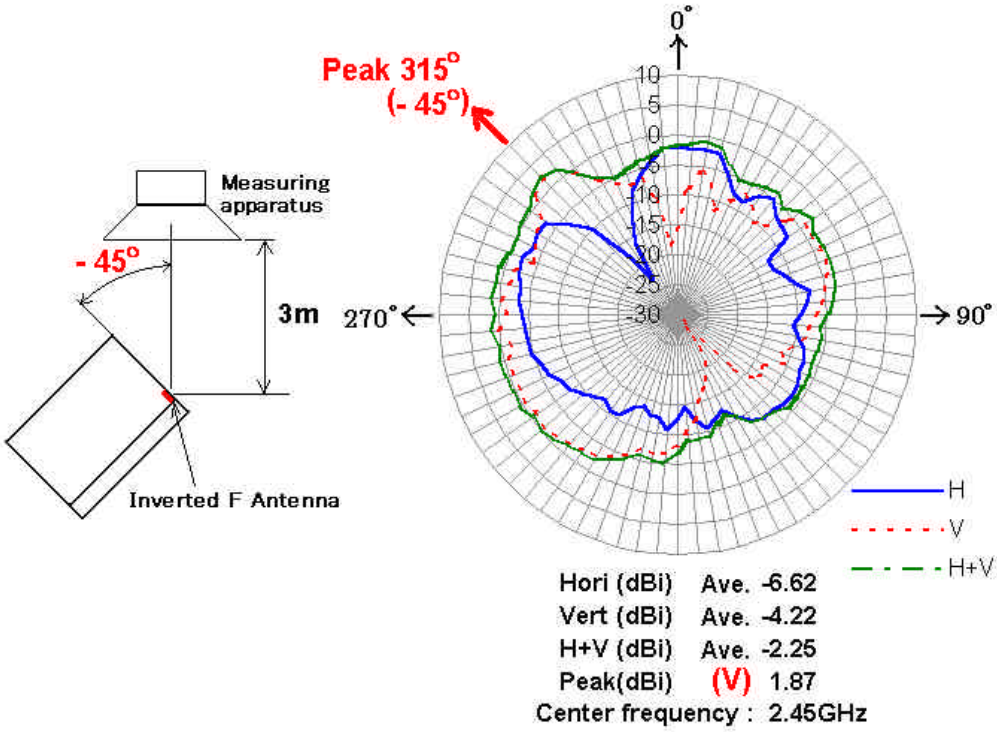
Therefore the peak radiated output power(EIRP) is calculated as follows.

EIRP = P + G = 3.9 dBm + 1.87 dBi = 5.77 dBm (3.78 mW)

Then, the maximum power density at 20cm distance is calculated as :

$S_2 = EIRP/(4 \times R^2 \times \pi) = 0.00075$ mW/cm^2

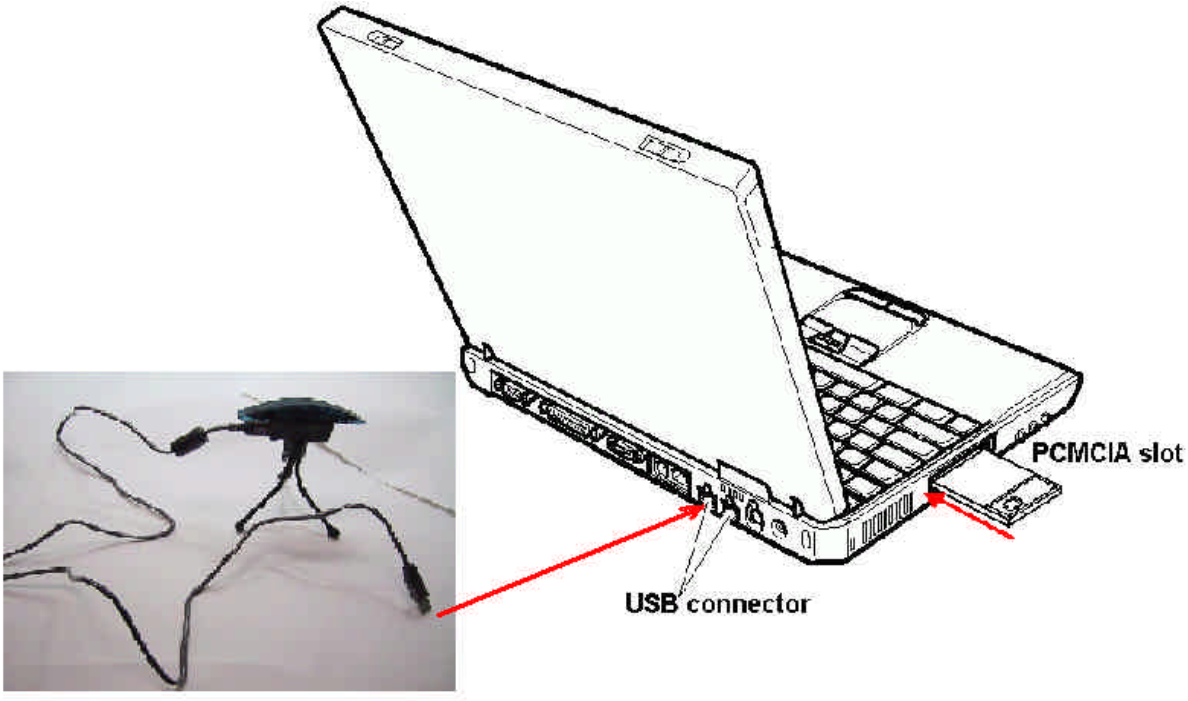
Figure B: Antenna Gain of Bluetooth Daughter Card



3. User option Wireless cards

The applying equipment has two interfaces for user's optional wireless features. Figure C shows the locations of each interface. The photo in the previous page also demonstrates that the separation distance between the antenna of wireless option card and the human body is 20cm or more in normal operation with normal posture.

Figure C. Interfaces to connect Wireless options



The table below lists the wireless options which are plugged in the PC slot or USB port of the applying equipment.

Interface	FCC ID	Grantee Name	Product Name	Granted Date	EIRP in FCC test report
USB port	**PI4BT-ULTRA**	**TDK Systems Europe Ltd.**	**Bluetooth Ultraport Module**	**May/22/2001**	**1.4 mW**
PCMCIA slot	**O2OBTPCM101**	**Degianswer A/S**	**Motorola Bluetooth 0dBm PC-Card (type no.: BTPCM100)**	**October/18/2000**	**2.7mW**
	PI4BT-IBM-PCII	**TDK Systems Europe Ltd.**	**Blutooth PC Card II**	**August/21/2001**	**1.0mW**

The minimum antenna separation to meet the MPE limits (1mW/cm^2) and the maximum power density at 20cm distance of each card are calculated as follows.

Interface	FCC ID	EIRP	Min. separation to satisfy the MPE limits *1	Max. power density at 20cm *2
USB port	**PI4BT-ULTRA**	1.4mW	0.34cm	S_3 = 0.00028 mW/cm^2
PCMCIA slot	**O2OBTPCM101**	2.7mW	0.47cm	S_4 = 0.00054 mW/cm^2
	PI4BT-IBM-PCII	1.0mW	0.28cm	S_5= 0.00020 mW/cm^2

*1 = $\sqrt{\text{EIRP} / (1\text{mW/cm}^2 \times 4 \times \pi)}$
*2 = $\text{EIRP}/(4 \times 20\text{cm}^2 \times \pi)$

When an operator will use the four transmitters simultaneously during 30 minutes continuously in normal operation, the time-averaging exposure is : $(S_1 + S_2 + S_3 + S_4) \times 30 = 0.386$
So the source-based time-averaging duty factor is considered as 100% duty.

Therefore the applying equipment meets the MPE requirements for general Population/ Uncontrolled exposure.