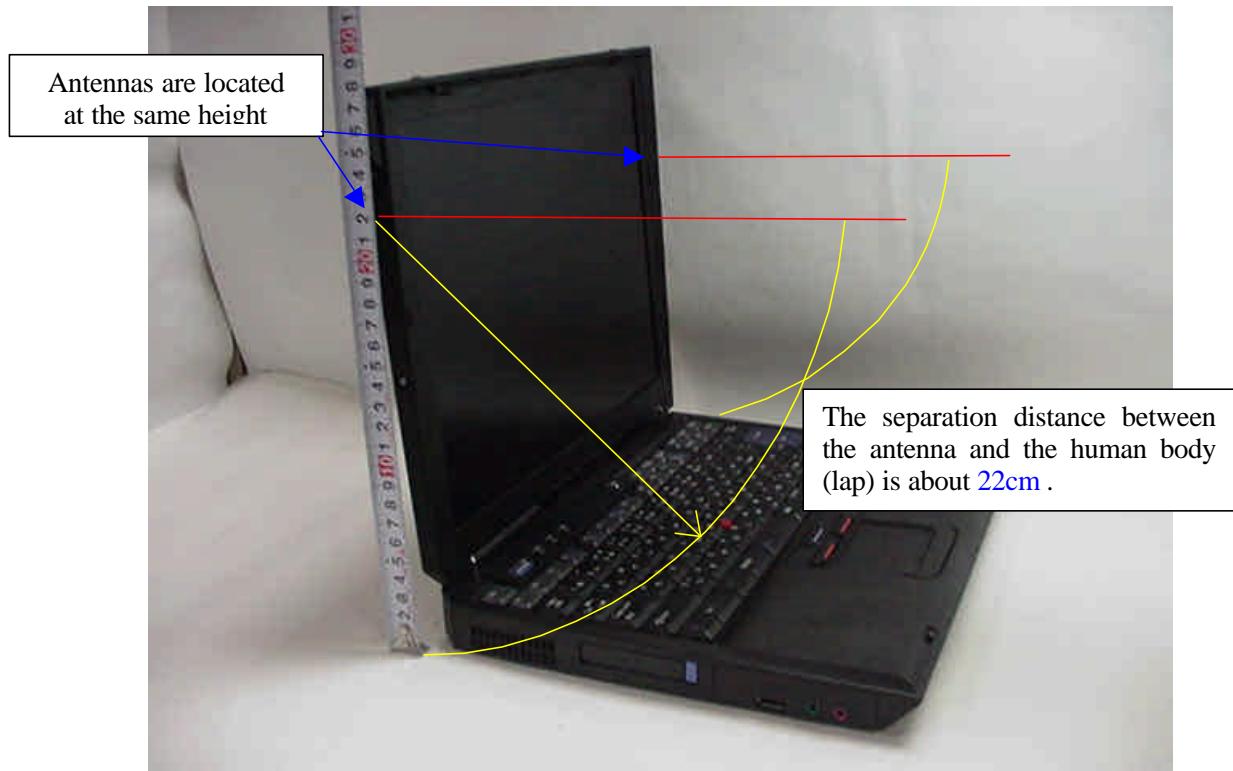


# RF Exposure

## 1. RF Exposure Evaluation of ThinkPad R40 Series

As shown in the following photo, both **main** and **auxiliary** WLAN antennas of the applying laptop PC, IBM ThinkPad R40 Series, are located at the top of display (LCD) bezel. The separation distances between the antennas and the human body are 20cm or more. Therefore the laptop PC can be categorized as a mobile device by FCC CFR 47 Section 2.1091.



The highest conducted peak output power of the Test Report is 97.7mW (19.9 dBm) and the maximum antenna gain is 0.83 dBi.

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

$$\text{EIRP} = P + G = 19.9 \text{ dBm} + 0.83 \text{ dBi} = 20.73 \text{ dBm (118.30 mW)}$$

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

$$S = \text{EIRP}/(4 \times R^2 \times \pi) = 0.0235 \text{ mW/cm}^2$$

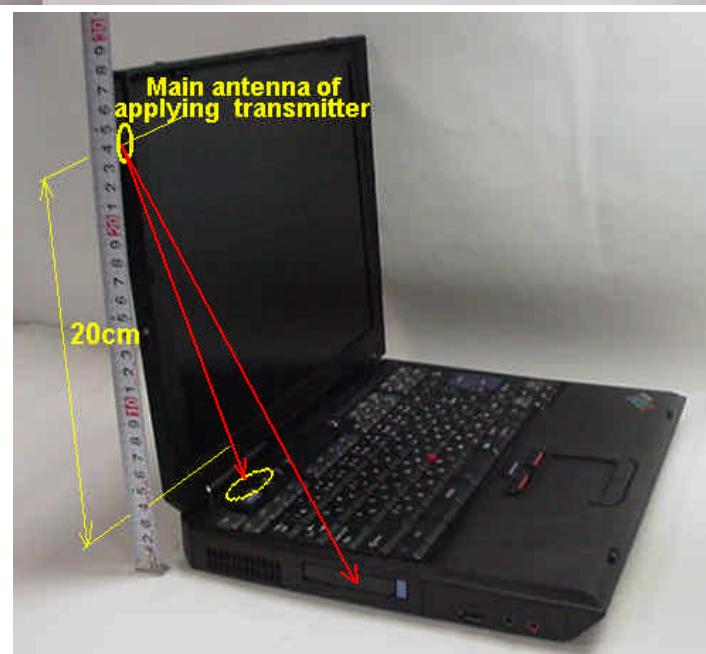
Since the applying laptop PC's WLAN transmitter does not function to emit the radio frequency from both diversity antennas simultaneously, the above value is the maximum RF exposure to the persons and is below the MPE limit (1.0 mW/ cm<sup>2</sup> ). Therefore the laptop PC meets the MPE requirements for general Population/Uncontrolled exposure.

## 2. RF Exposure evaluation for Bluetooth transmitters

The applying laptop PC (ThinkPad R40 Series) supports three kinds of Bluetooth devices as follows.

	FCC ID	Grantee Name	Product Name	Granted Date	ERP in FCC test report
User's option	PI4BT-ULTRA	TDK Systems Europe Ltd.	Bluetooth Ultraport Module	May/22/2001	1.4 mW
	PI4BT-IBM-PCII		Bluetooth PC Card II	August/21/2001	1.0mW
Built-intype LMA transmitter	ANO20020100MTN	IBM Japan, Ltd.	IBM integrated Bluetooth with 56K Modem	Under being inspected with this application	2.5mW

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The main and auxiliary antennas of the applying transmitter in the LCD section are assembled apart from each Bluetooth antenna shown in the previous page with 20 cm or more distance.

Therefore the RF exposure evaluation for those Bluetooth transmitters is able to be done independently of the applying antennas. In other word, a collocated SAR testing is not required.

When a customer operates the applying PC on one's lap, the sufficient separation distance (minimum 20cm) between the above Bluetooth antennas and the person's body (lap) can not be maintained.

But the footnote of the Section 3 in Supplement C to OET Bulletin 65 states “<sup>14</sup> ..... If a device, its antenna or other radiating structures are operating at closer than 2.5 cm from a person's body or in contact with the body, SAR evaluation may be necessary when the output is more than 50 – 100 mW, depending on the device operating configurations and exposure conditions.”

The total output power of the three Bluetooth transmitters in the previous table does not exceed 5mW. Therefore these transmitters also satisfy the RF exposure evaluation regarding CFR 47 Part 15.247(b)(4) without a SAR compliance test report, and can operate with the applying transmitter simultaneously.

IBM Web site guides these approved collaborating transmitter devices to customers. (See next page.)

### 3. IBM Web site for user's guidance concerning the co-located transmitters

Note) **Draft version.** The contents will be available after the product announcement.

<http://www.pc.ibm.com/qtechinfo/MIGR-43693.html>

TP Wireless Systems – Approved wireless Mini PCI Options and Additional RF option devices receive FCC certification

LMA (Limited Modular Approval) adapters	FCC IDs	Approved ThinkPad models	PC options allowed multiple transmission		
			#1	#2	#3
IBM High Rate Wireless LAN Mini-PCI Adapter	ANOM3AWEB56GA	ThinkPad R32, T30, X30	NG	O	O
Cisco Aironet Wireless 802.11b	ANOU58H004	ThinkPad R40	O	O	O
IBM High Rate Wireless LAN Mini-PCI Adapter III	ANO20020200BRX				

**NG:** Neither be authorized to use nor recognized by BIOS.

FCC ID: Option card name

#1: ANO20020100MTN [IBM Integrated Bluetooth with 56K Modem](#)

#2: PI4BT-ULTRA [Bluetooth UltraPort Module from IBM](#)

#3: PI4BT-IBM-PCI [Bluetooth PC Card II](#)

**Solution**  
 The supplementary document of ThinkPad's "Service and Troubleshooting Guide" has the following information in "Wireless regulatory information – USA Federal Communications Commission (FCC)" section:

**Use of wireless options**  
 Please make sure of the following conditions on use of wireless features.

1. Visit the IBM site at [www.pc/qtechinfo/MIGR-43693.html](http://www.pc/qtechinfo/MIGR-43693.html) and confirm the updated list of RF option devices that have been approved to cooperate with the integrated wireless feature.
2. When you use any other RF option device that is not listed on the IBM site, all other wireless features including the integrated transmitter in your ThinkPad computer are required to be turned off.
3. Users are requested to follow the RF Safety instructions on wireless option devices that are included in the RF option device's user's manual.

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