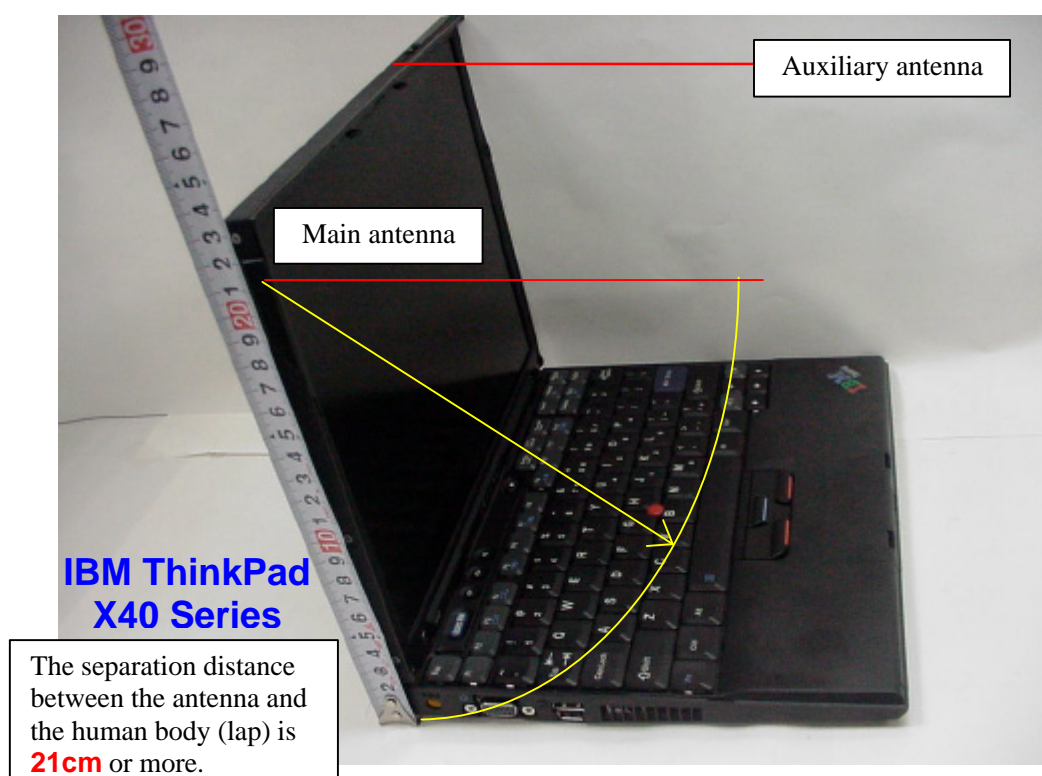
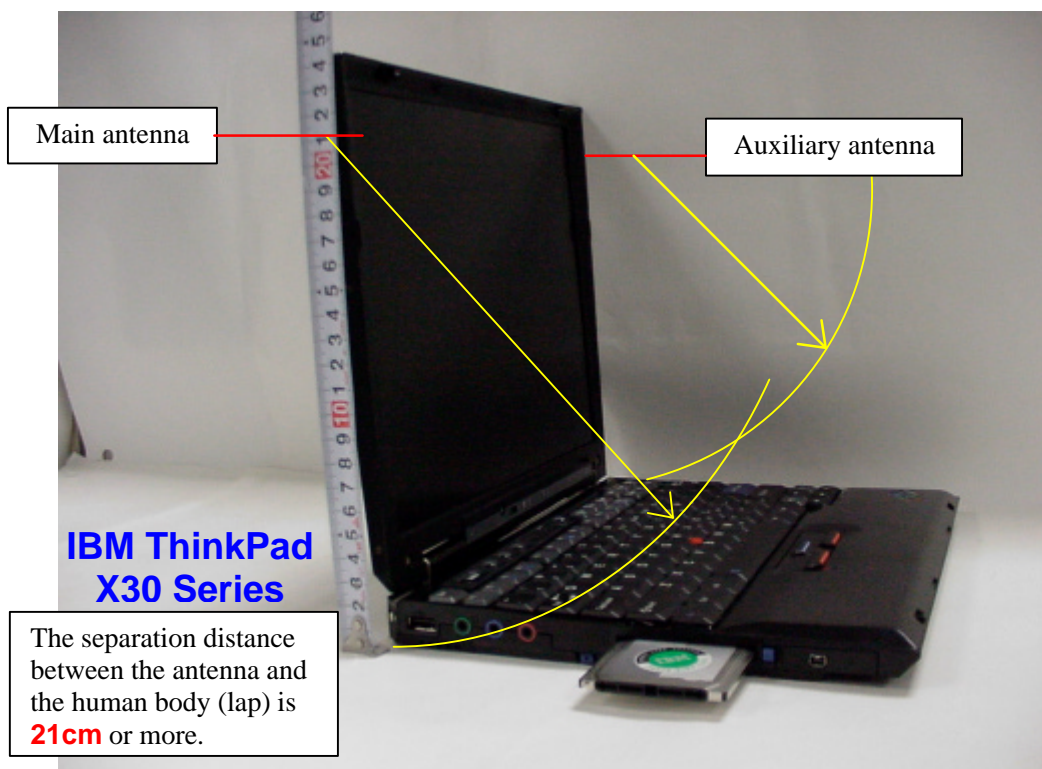


RF Exposure evaluation

1. RF Exposure evaluation for the applying LMA transmitter

As shown below, the all transmission antennas of the new host PC devices (IBM ThinkPad X30 and X40 Series) are located at the upper portions of each display (LCD) section, and the separation distance between each antenna and the human body is 20cm or more. Therefore the applying LMA transmitter and each antenna system is categorized as a mobile device by FCC CFR 47 Section 2.1091.



[MPE evaluation]

The following table shows the highest conducted peak output power values of the applying modular device, and the maximum peak antenna gains of each host device.

Transmission mode	P : conducted peak output power
5180 – 5240 MHz band OFDM	11.78 dBm (15.1 mW)
5260 – 5320 MHz band OFDM	15.77 dBm (37.8 mW)

Host PC model	G : peak antenna gain
ThinkPad X30 Series	1.42 dBi (Main antenna)
ThinkPad X40 Series	2.15 dBi (Auxiliary antenna)

With those results, the maximum power density at 20cm distance is calculated as follows.

IBM ThinkPad X30 Series

Transmission mode	EIRP = P + G (dBm)	EIRP (mW)	Max. power density $S = \text{EIRP} / (4 \times 20^2 \times \pi)$
5180 – 5240 MHz band OFDM	13.20	20.9	0.0042 mW/ cm ²
5260 – 5320 MHz band OFDM	17.19	52.3	0.0104 mW/ cm ²

IBM ThinkPad R50 Series

Transmission mode	EIRP = P + G (dBm)	EIRP (mW)	Max. power density $S = \text{EIRP} / (4 \times 20^2 \times \pi)$
5180 – 5240 MHz band OFDM	13.93	24.7	0.0049 mW/ cm ²
5260 – 5320 MHz band OFDM	17.92	61.9	0.0123 mW/ cm ²

Since the applying modular transmitter device does not function to emit the radio frequency from both diversity antennas simultaneously, the above results are the maximum values of RF exposure to the persons, and are far below the MPE limit (1.0 mW/cm²). Therefore the LMA transmitter meets the MPE requirements for general Population/Uncontrolled exposure.

2. RF Exposure evaluation with co-located WLAN transmitters

The applying transmitter co-locates with one of the following two Bluetooth modules.

Option type	FCC ID	Grantee Name	Product Name	Granted Date	Conducted Tx power
Built-in LMA Transmitter	ANO20040700HER	IBM Japan, Ltd.	IBM integrated Bluetooth IV with 56K Modem	Under certification process separately with this application	2.0mW
Built-in LMA Transmitter	ANO20020100MTN	IBM Japan, Ltd.	IBM integrated Bluetooth III with 56K Modem	Feb/26/2003 (T40 14", X30)	2.5mW
				Sep/29/2003 (R50)	
				Dec/17/2003 (X40)	
				May/04/2004 (T40 15")	

The main and auxiliary antennas located at LCD section of each host device (ThinkPad R50, T40, X30 or X40 Series) are assembled apart from each Bluetooth antenna shown in the next pages with 20 cm or more.

Therefore, those co-located Bluetooth transmitters are allowed to evaluate the RF exposure compliance independently of the applying modular transmitter. In other word, the SAR testing for the applying transmitter in co-locating with those Bluetooth transmitters is not required, when the Bluetooth transmitters could satisfy the RF exposure requirement with those own transmission powers.

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 :

“¹⁴ 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 output power of the Bluetooth transmitters does not exceed 5mW (far below 50mW). Therefore these transmitters also satisfy the RF exposure requirement regarding CFR 47 Part 15.247(b)(4) without a SAR compliance test report, and can operate with the applying transmitter simultaneously.

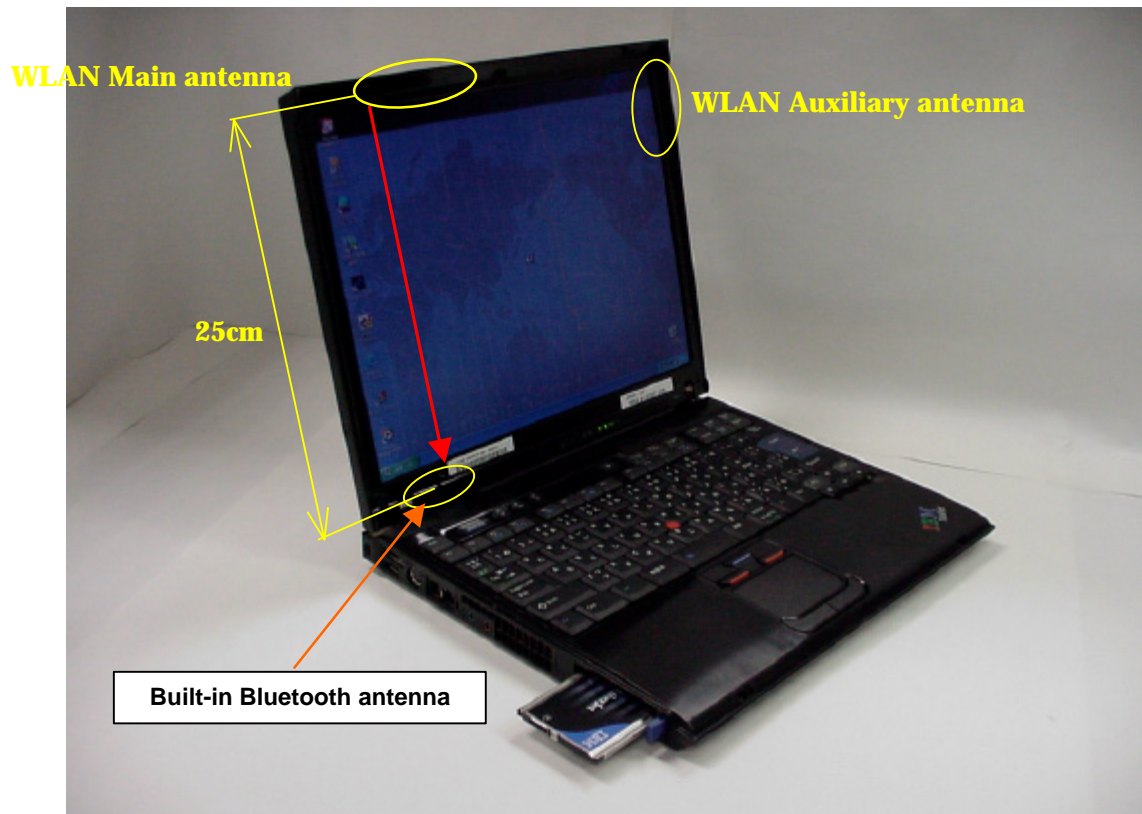
The user's manual provides the instruction to customers in use of multiple transmission with the applying transmitter and co-locating Bluetooth devices as follows.

Use of wireless options

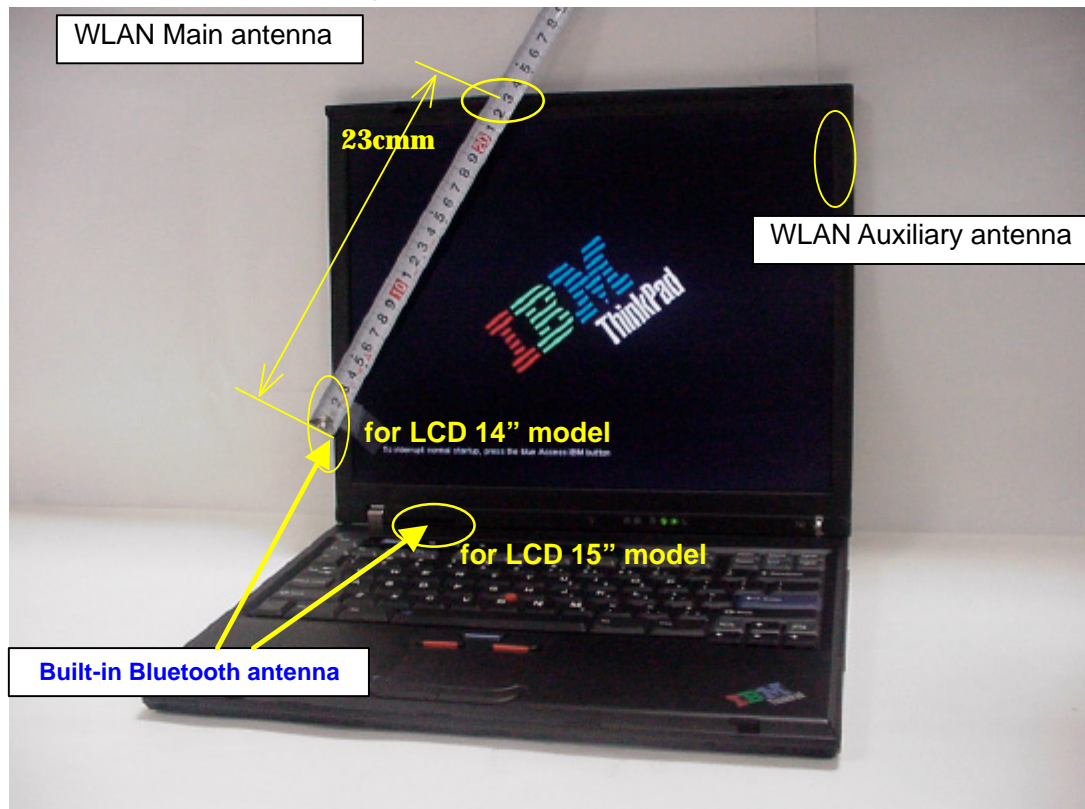
Your ThinkPad computer is approved for use of one of the granted Wireless LAN Mini-PCI Cards together with one of the granted *Bluetooth* modules (FCC ID: ANO20040700HER or ANO20020100MTN) in the CDC slot simultaneously. Make sure of the following conditions on use of these wireless features.

1. When you use any other RF option device, all other wireless features including the integrated Wireless LAN Mini-PCI Card and *Bluetooth* transmitters in your ThinkPad computer are required to be turned off.
2. Users must follow the RF Safety instructions on wireless option devices that are included in the RF option device's user's manual.

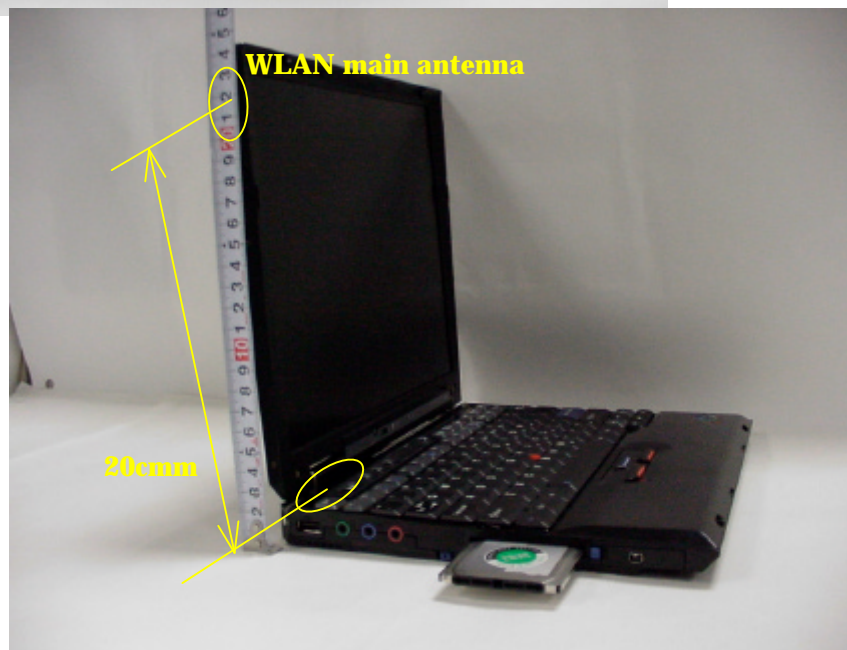
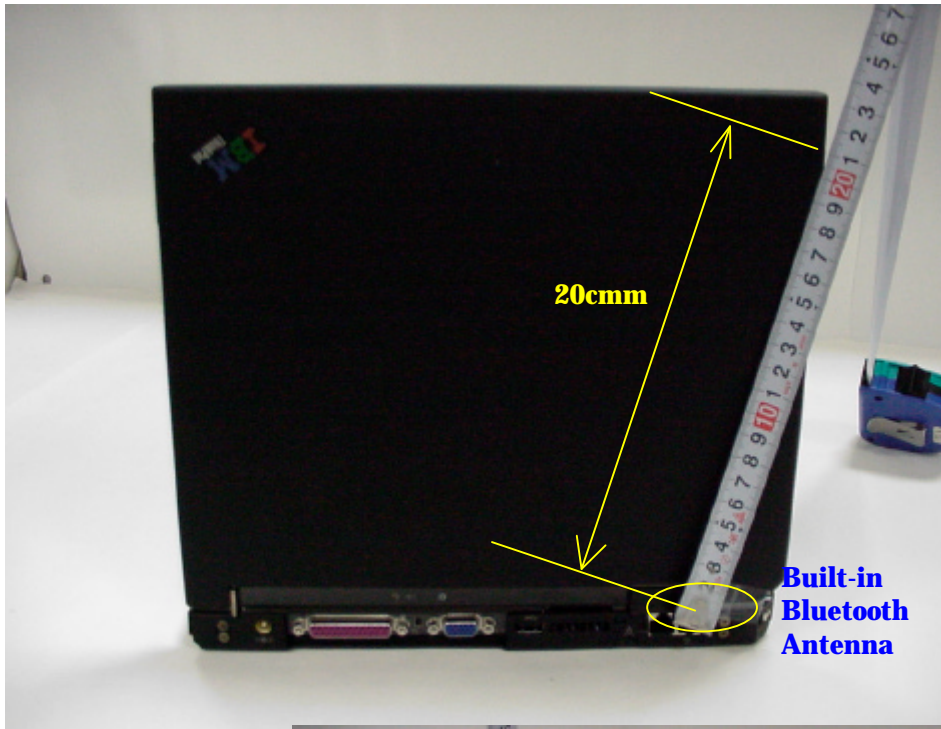
Antenna separation of ThinkPad R50 Series



Antenna separation of ThinkPad T40 Series



Antenna separation of ThinkPad X30 Series



Antenna separation of ThinkPad X40 Series

