

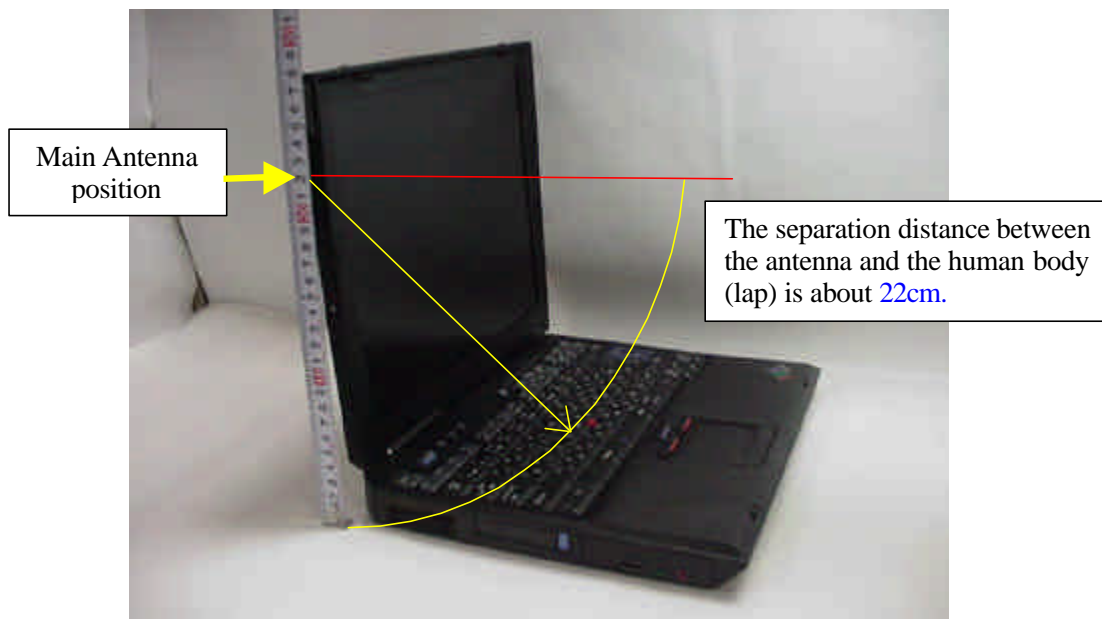
RF Exposure

1. RF Exposure evaluation for the applying transmitter

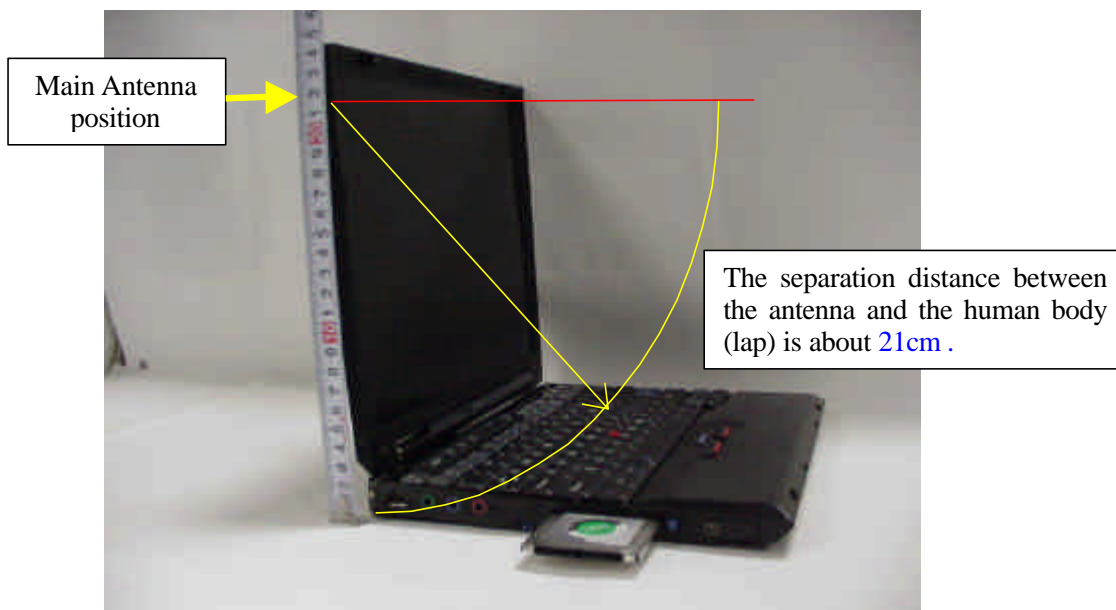
As shown below, the transmitter antennas (the main antennas) of all supported host PC devices are located at the top portion of each display (LCD) section, and the separation distances between the antennas and the human body are 20cm or more. Therefore the applying LMA transmitter and each antenna system is categorized as a mobile device by FCC CFR 47 Section 2.1091.

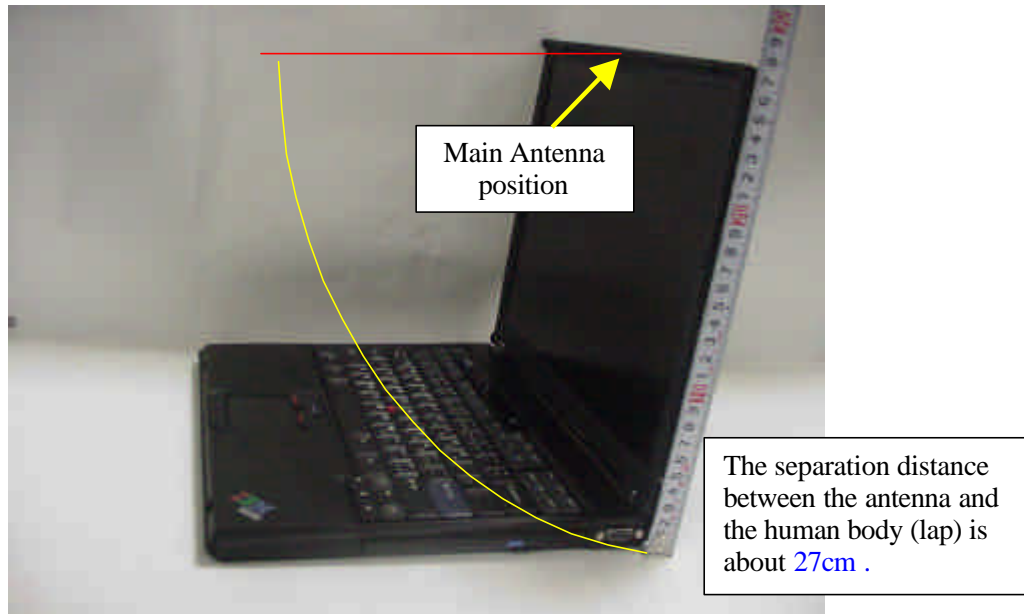
Note) The auxiliary antennas are not used for transmission, so they are not subjected to the RF exposure evaluation.

Antenna separation of ThinkPad R40 Series



Antenna separation of ThinkPad X30 Series



Antenna separation of ThinkPad T40 Series**[MPE evaluation]**

The following table shows the highest conducted peak output power values measured on each host PC device, and the maximum peak antenna gains.

Host device model name	P : conducted peak output power	G : peak antenna gain
ThinkPad R40 Series (13/14 inch)	17.1dBm (51.3mW)	- 0.37 dBi
ThinkPad R40 Series (15 inch)	16.9dBm (49.0mW)	+ 0.46 dBi
ThinkPad T40 Series	17.4dBm (55.0mW)	+ 0.99 dBi
ThinkPad X30 Series	17.3dBm (53.7mW)	+ 0.62 dBi

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

Host device model name	EIRP = P + G (dBm)	EIRP (mW)	Max. power density $S = \text{EIRP} / (4 \times 20^2 \times \pi)$
ThinkPad R40 Series (13/14 inch)	16.73	47.1	0.0094 mW/ cm ²
ThinkPad R40 Series (15 inch)	17.36	54.5	0.0108 mW/ cm ²
ThinkPad T40 Series	18.39	69.1	0.0137 mW/ cm ²
ThinkPad X30 Series	17.92	62.0	0.0123 mW/ cm ²

The results are far below the MPE limit (1.0 mW/ cm²) that keep the sufficient margin for use of continuous RF exposure environment in normal operation. Therefore the LMA transmitter meets the MPE requirements for general Population/Uncontrolled exposure.

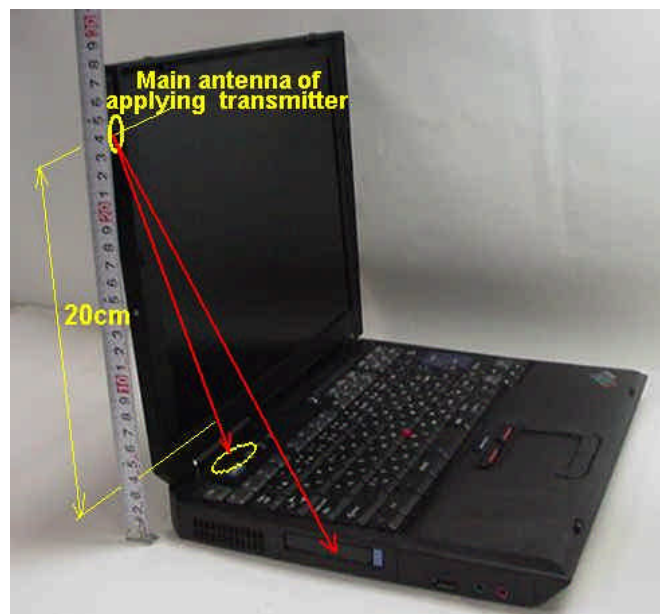
2. RF Exposure evaluation for Bluetooth transmitters

The applying laptop PCs (ThinkPad R40, T40, and X30 Series) support three kinds of Bluetooth devices as follows.

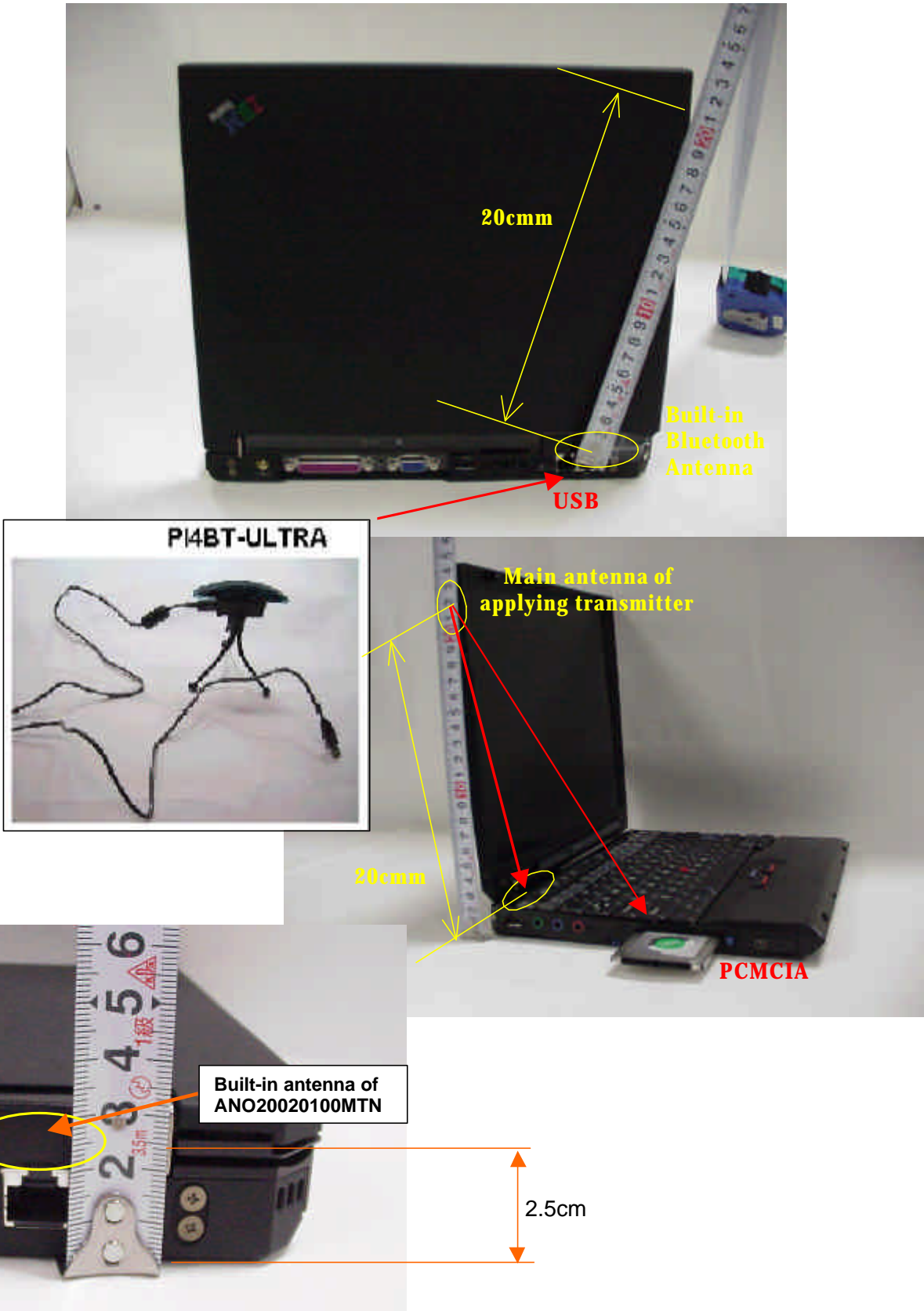
	FCC ID	Grantee Name	Product Name	Granted Date	ERP in FCC Test Report
User's option	PI4BT-ULTRA	TDK Systems Europe Ltd.	Bluetooth Ultraport Module	May/22/2001	1.4 mW
	PI4BT-IBM-PCII		Bluetooth PC Card II	August/21/2001	1.0mW
Built-intype LMA Transmitter	ANO20020100MTN	IBM Japan, Ltd.	IBM integrated Bluetooth with 56K Modem	Under inspection with this application	2.58mW ^{*1}

*1: Refer to the separate application document for FCC ID:ANO20020100MTN which is submitted with this application simultaneously.

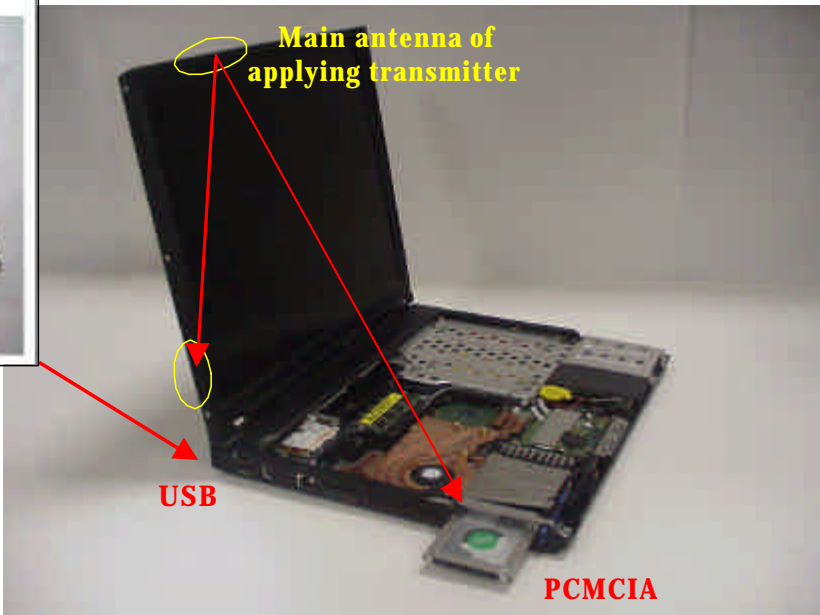
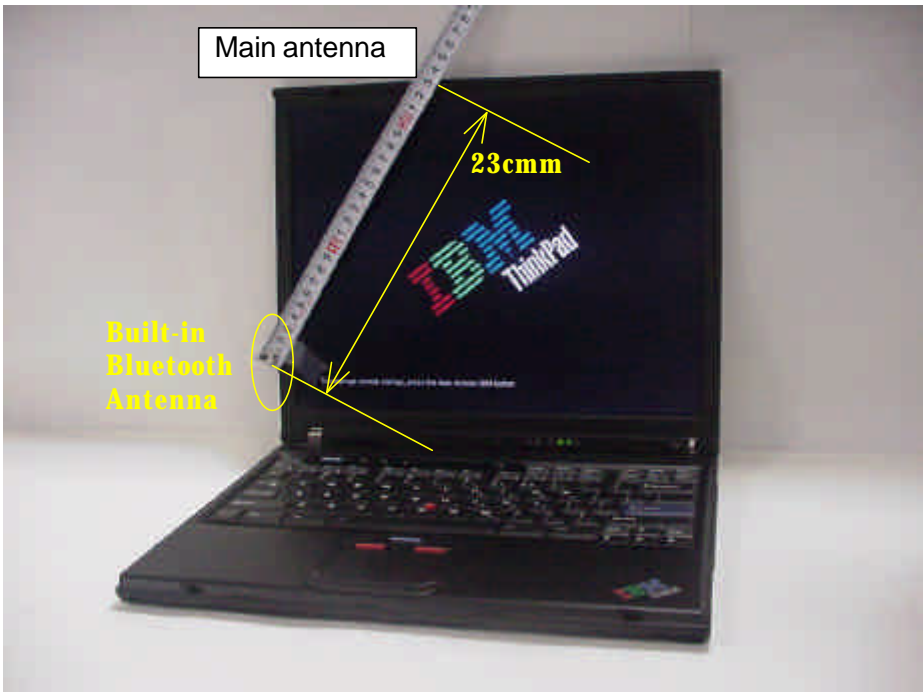
Collocated Bluetooth options for ThinkPad R40 Series



Collocated Bluetooth options for ThinkPad X30 Series



Collocated Bluetooth options for ThinkPad T40 Series



The main antennas placed at the LCD section of each host devices are assembled apart from each Bluetooth antenna with 20 cm or more.

Therefore the RF exposure evaluation for those Bluetooth transmitters is allowed to be examined independently of the applying main antennas. In other word, the SAR testing for the applying transmitter in collocating with those Bluetooth options is not required.

When users operate the applying host PCs on ones' lap, the sufficient separation distance (minimum 20cm) between the above Bluetooth antennas and the person's body (lap) can not be maintained. That is, for the Bluetooth PC Card II (FCC ID:PI4BT-IBM-PCII) the minimum separation distance is approximately 1.5cm, and for the built-in Bluetooth (FCC ID: ANO20020100 MTN) the minimum distance is approximately 2.5cmm in case of ThinkPad X30 Series. (Refer to page 4/7 of this exhibit.)

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 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 to customers about the **grant condition** related to those collaborating transmitter devices. Refer to page 7/7 of this exhibit.

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

Note) The contents will be available after the product announcement.
<http://www.pc.ibm.com/qtechinfo/MIGR-43693.html>

The screenshot shows the IBM PC support website. The main heading is "TP Wireless Systems – Approved wireless Mini PCI Options and Additional RF option devices receive FCC certification". Below this, there are sections for "Applicable countries/regions" (United States), "Service hints & tips", and "Affected configurations". The "Affected configurations" section is divided into two groups: "BIOS group 1" and "BIOS group 2". Each group contains a table listing LMA (Limited Modular Approval) adapters, their FCC IDs, and the approved ThinkPad models. The table for BIOS group 1 shows that the IBM High Rate Wireless LAN Mini PCI Adapter (FCC ID: ANOM3AWEB56GA) and the Cisco Aironet Wireless 802.11b (FCC ID: ANOU58H004) are approved for R32, T30, and X30 Series models. The table for BIOS group 2 shows that the Cisco Aironet Wireless 802.11b (FCC ID: ANOU58H004), the Intel PRO/Wireless LAN 2100 3B Mini PCI Adapter (FCC ID: ANO20020201CLK), and the IBM High Rate Wireless LAN Mini PCI Adapter III (FCC ID: ANO20020200BRX) are approved for R40, T40, and X30 Series models. The table also indicates whether multiple transmission is allowed (NG for Not Authorized, O for OK). Below the tables, there is a section for "Solution" which provides a link to the "Service and Troubleshooting Guide" and a section for "Use of wireless options" which lists three steps for using wireless features. The footer of the page includes the document ID (MIGR-43693), the last modified date (2002-06-03), and the copyright notice (Copyright (C) 2002 IBM Corporation).

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

Applicable countries/regions
United States

Service hints & tips

Affected configurations

BIOS group 1

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	R32 Series T30 Series X30 Series(X30)	NG	O	O
Cisco Aironet Wireless 802.11b	ANOU58H004				

BIOS group 2

LMA (Limited Modular Approval) adapters	FCC IDs	Approved ThinkPad models	PC options allowed multiple transmission		
			#1	#2	#3
Cisco Aironet Wireless 802.11b	ANOU58H004	R40 Series T40 Series X30 Series(X31)	O	O	O
Intel PRO/Wireless LAN 2100 3B Mini PCI Adapter	ANO20020201CLK				
IBM High Rate Wireless LAN Mini PCI Adapter III	ANO20020200BRX	R40 Series			

NG: Not authorized to use by the FCC rule, nor recognized by BIOS.
 #1: FCC ID: ANO20020100MTN [IBM Integrated Bluetooth with 56K Modem](#)
 #2: FCC ID: P14BT-ULTRA [Bluetooth UltraPort Module from IBM](#)
 #3: FCC ID: P14BT-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.ibm.com/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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