RF Exposure evaluation

1. RF Exposure evaluation for the applying LMA transmitter

As shown below, the transmission antenna (the main antenna) is built in the top side of LCD. The separation distances between the antennas and the human body is 20cm or more. Therefore the applying LMA transmitter and the antenna system is categorized as a mobile device by FCC CFR 47 Section 2.1091.

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

[MPE evaluation]

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

P: conducted peak output power	**G**: peak antenna gain of transmission antenna (main antenna)
17.2 dBm (52.5 mW)	+ 1.24 dBi

With this result, the maximum power density at 20cm distance is calculated as follows.

EIRP = P + G (dBm)	EIRP (mW)	Max. power density $S = EIRP/(4 \times 20^2 \times \pi)$
18.44	69.8	0.0139 mW/ cm^2

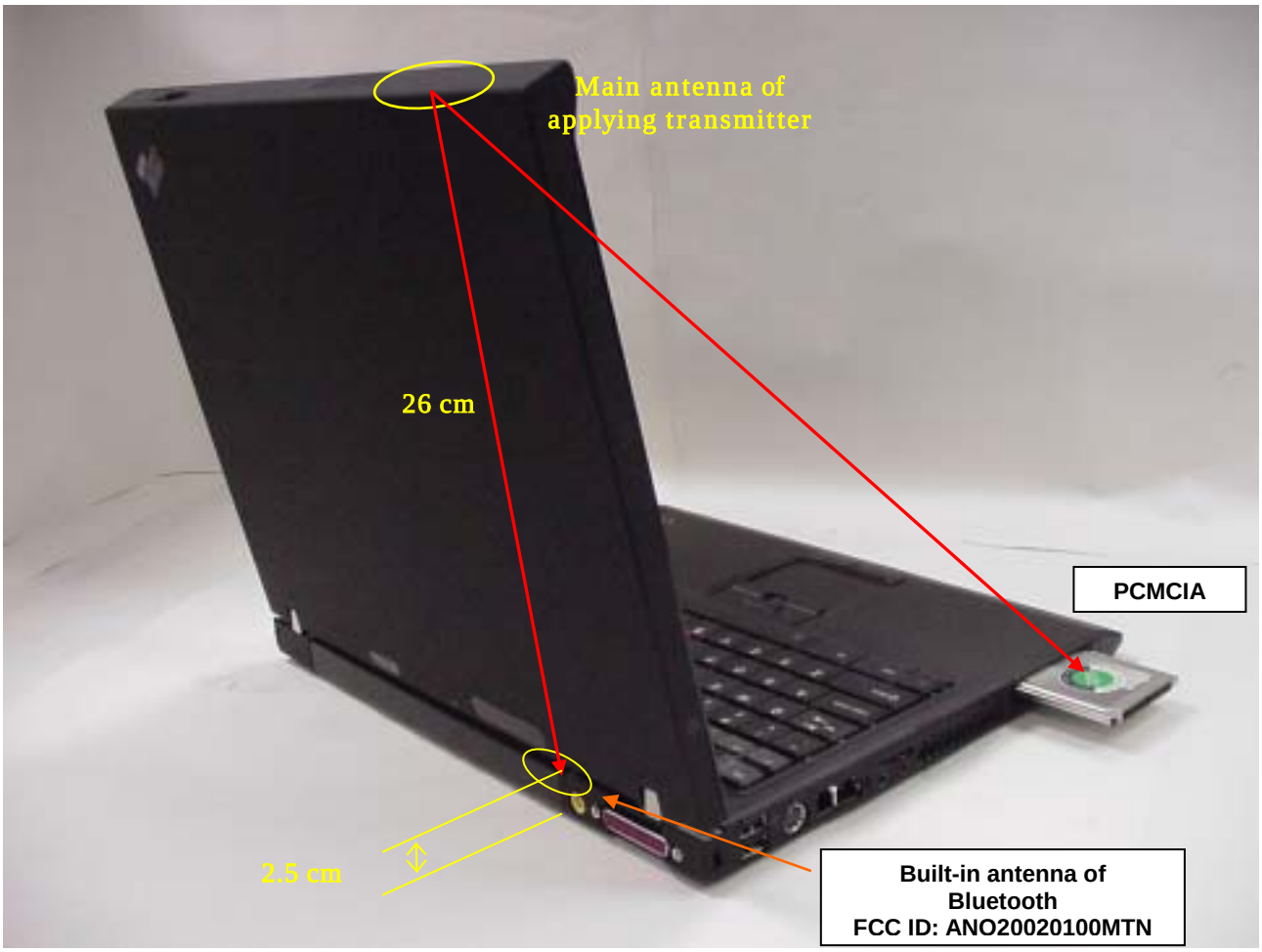
The result is far below the MPE limit (1.0 mW/ cm^2) that keeps the sufficient margin for use of continuous RF exposure environment in normal operation. Therefore the LMA transmitter meets the MPE requirements for general Population/Uncontrolled exposure.

2. RF Exposure evaluation for co-located Bluetooth transmitters

The applying host device supports two kinds of Bluetooth devices as follows.

	FCC ID	Grantee Name	Product Name	Granted Date	Output
User's option	**PI4BT-IBM-PCII**	**TDK Systems Europe Ltd.**	**Bluetooth PC Card II**	**August/21/2001**	**1.0mW**
Built-in type LMA transmitter	**ANO20020100MTN**	**IBM Japan, Ltd.**	**IBM integrated Bluetooth III with 56K Modem**	**Under inspection with this application**	**2.34mW**

Collocated Bluetooth options for ThinkPad T40 Series, LCD 15 inch Model



The main and auxiliary antennas placed at LCD section of the host device (ThinkPad T40 Series, LCD 15 inch model) are assembled apart from each Bluetooth antenna shown in the previous page with 20 cm or more.

Therefore the RF exposure evaluation for those Bluetooth transmitters is allowed to be examined independently of the applying WLAN antennas. In other word, the SAR testing for the applying transmitter in co-locating with those Bluetooth options is not required thanks to the following reasons.

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 :

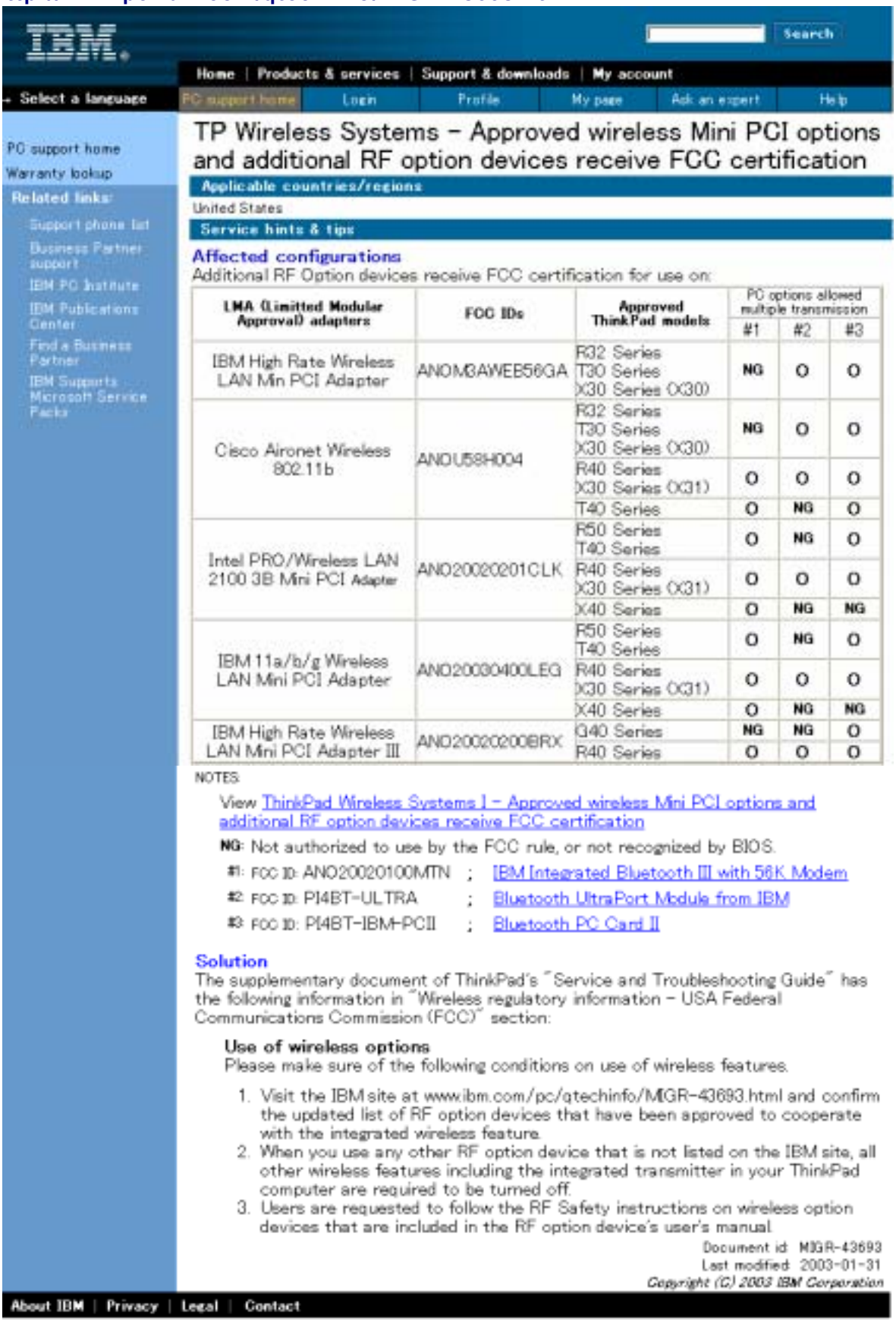
> "[14] ……. If a device, its antenna or other radiating structures are operating at closer than 2.5 cm from a person's body or in contact with the body, SAR evaluation may be necessary when the output is more than 50 – 100 mW, depending on the device operating configurations and exposure conditions."

The 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)(5) without a SAR compliance test report, and can operate with the applying transmitter simultaneously.

IBM Web site guides customers about the **grant condition** concerning those collaborating transmitter devices. See the next page.

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

Note) The info for the applying LMA transmitter is not available until the product announcement.
http://www.pc.ibm.com/qtechinfo/MIGR-43693.html



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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

Additional RF Option devices receive FCC certification for use on:

LMA (Limitted Modular Approval) adapters	FCC IDs	Approved ThinkPad models	PC options allowed multiple transmission		
			#1	#2	#3
IBM High Rate Wireless LAN Min PCI Adapter	ANOM3AWEB56GA	R32 Series T30 Series X30 Series (X30)	NG	O	O
Cisco Aironet Wireless 802.11b	ANOU58H004	R32 Series T30 Series X30 Series (X30)	NG	O	O
		R40 Series X30 Series (X31)	O	O	O
		T40 Series	O	NG	O
Intel PRO/Wireless LAN 2100 3B Mini PCI Adapter	ANO20020201CLK	R50 Series T40 Series	O	NG	O
		R40 Series X30 Series (X31)	O	O	O
		X40 Series	O	NG	NG
IBM 11a/b/g Wireless LAN Mini PCI Adapter	ANO20030400LEG	R50 Series T40 Series	O	NG	O
		R40 Series X30 Series (X31)	O	O	O
		X40 Series	O	NG	NG
IBM High Rate Wireless LAN Mini PCI Adapter III	ANO20020200BRX	G40 Series	NG	NG	O
		R40 Series	O	O	O

NOTES:

View ThinkPad Wireless Systems I – Approved wireless Mini PCI options and additional RF option devices receive FCC certification

NG: Not authorized to use by the FCC rule, or not recognized by BIOS.

#1: FCC ID: ANO20020100MTN ; IBM Integrated Bluetooth III with 56K Modem
#2: FCC ID: PI4BT-ULTRA ; Bluetooth UltraPort Module from IBM
#3: FCC ID: PI4BT-IBM-PCII ; 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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