

RF Exposure

1. Antenna Gains of applying transmitters

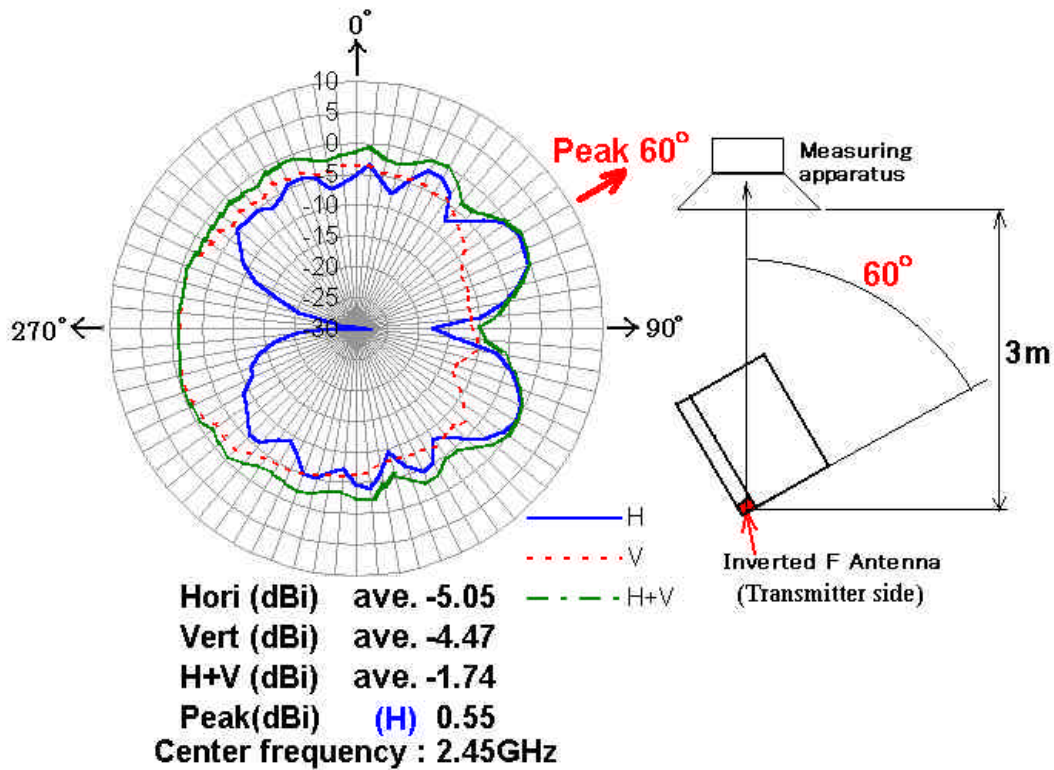


Figure A: Main Antenna Gain

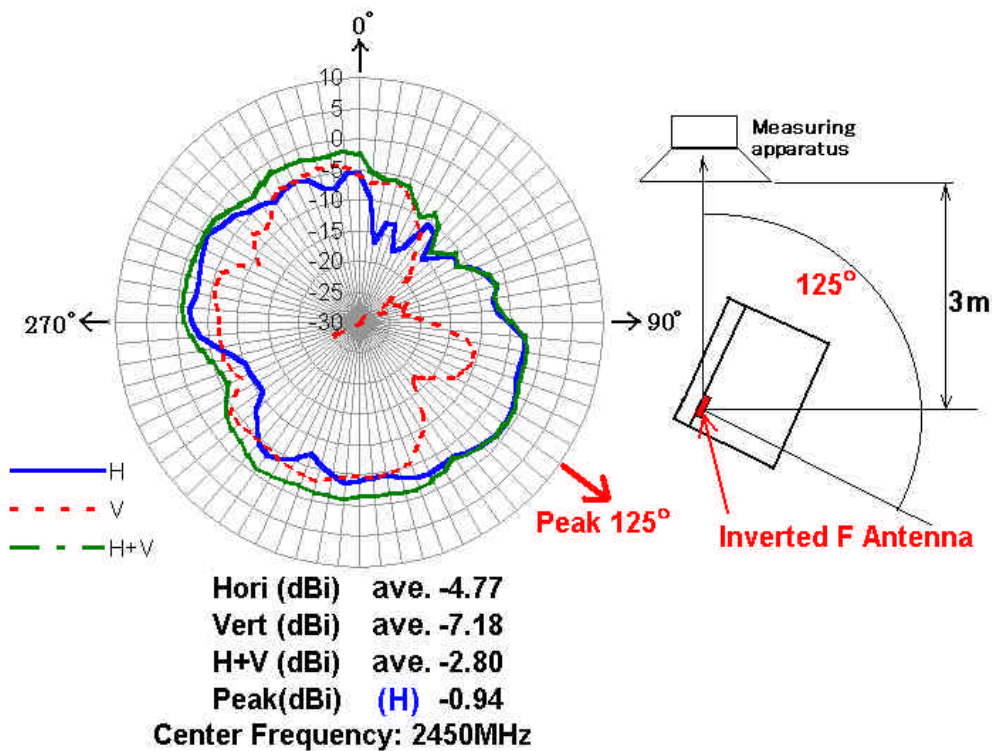


Figure B: Auxiliary Antenna Gain

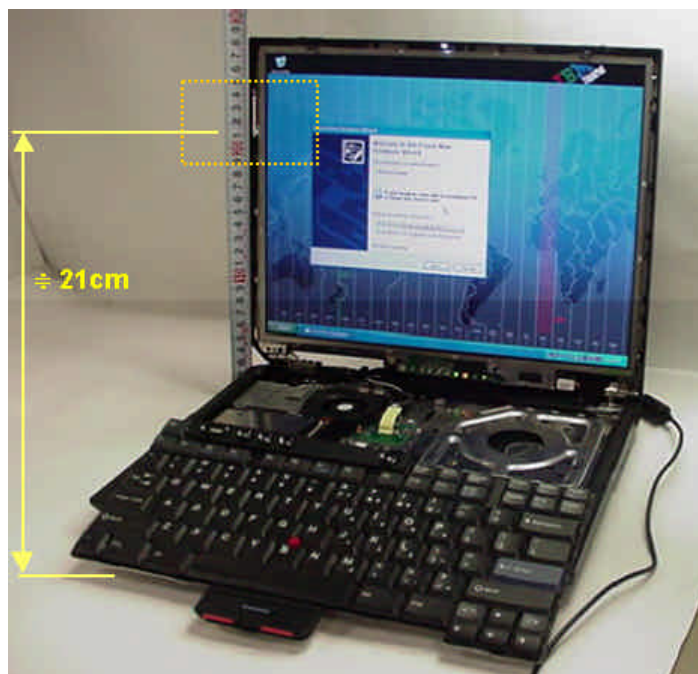
2. RF Exposure evaluation of Cisco Aironet Wireless 802.11b

The applying equipment is a standard size laptop computer. The separation distance between the main antenna built in the LCD section and the person's body is 21cm or more. So the applying transmitter with the main antenna is able to be evaluated with the FCC CFR 47 section 2.1091

Figure C. Separation distance of the main antenna from human body



The separation distance between the antenna and the human body is 21cm or more.



The conducted peak output power of the IEEE802.11b Wireless LAN Adapter is 19.9 dBm and the maximum antenna gain is 0.55dBi as shown in the Figure A.

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

$$EIRP = P + G = 19.9 \text{ dBm} + 0.55 \text{ dBi} = 20.45 \text{ dBm} (110.92 \text{ mW})$$

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

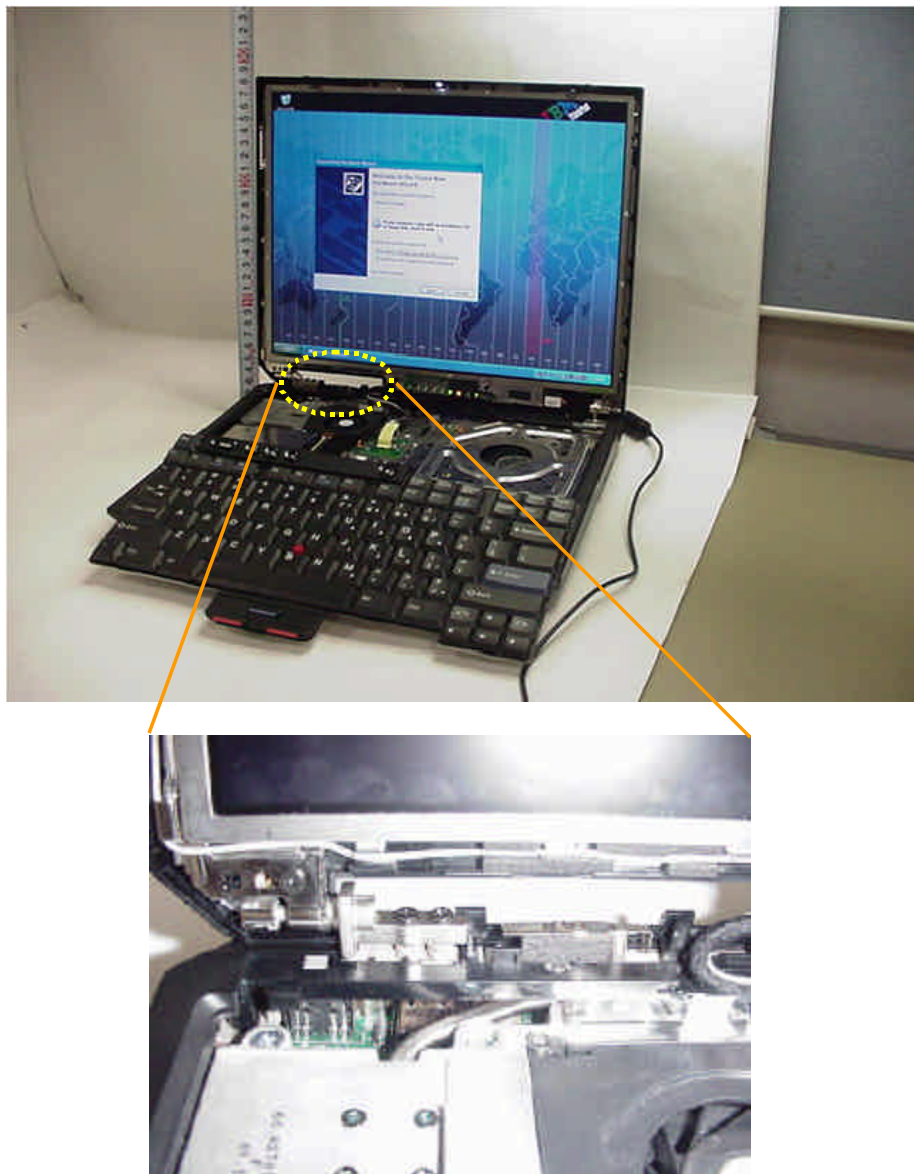
$$S_1 = EIRP / (4 \times R^2 \times \pi) = 0.022 \text{ mW/cm}^2$$

When an operator will use the transmitter during 30 minutes continuously in normal operation, the time-averaging of exposure is : $S_1 \times 30 = 0.66 < (1\text{mW/cm}^2) \times 30$
 So the source-based time-averaging duty factor is considered as 100% duty.

The RF exposure energy from the auxiliary antenna in the hinge location meets the limit of SAR compliance according FCC CFR 47 section 2.1093. Please refer the measurement result of the separated SAR test report.

Therefore the applying transmitter and both built_in antennas conform to the RF Exposure requirement.

[Figure D. The auxiliary antenna location](#)

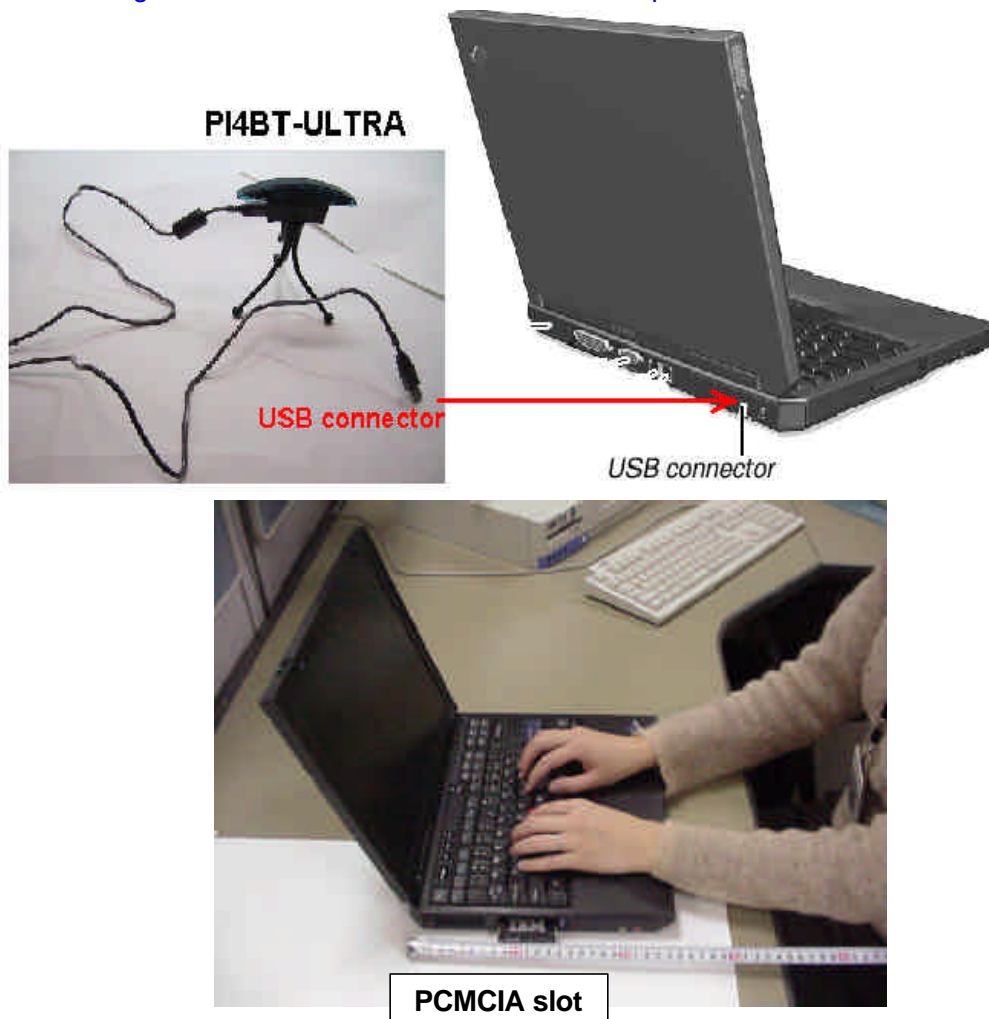


3. RF Exposure evaluation of option Bluetooth transmitters

The applying laptop PC (ThinkPad R32 Series) supports the following two Bluetooth PC options which function with the applying transmitter simultaneously.

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
PC card slot	PI4BT-IBM-PCII		Bluetooth PC Card II	August/21/2001	1.0mW

Figure E. Interfaces to connect Wireless options



When a customer operates the applying PC on his lap, the sufficient separation distance (min. 20cm) between the antennas of above transmitters and the person’s body (lap) can not be maintained (approximately 1.5 cm for the supported PCs).

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 two Bluetooth transmitters in the above table is 2.4mW. Therefore these transmitters also satisfy the RF exposure evaluation regarding CFR 47 Part 15.247(b)(4) without a SAR compliance test report.