



FCC Maximum Permissible Exposure (MPE) Estimation Report

**Product Name: WLAN Mini-PCI Adapter
Model Number: MPCl-B4322L-AGN**

**Report No: SYBH (R) 004122009EB-4
FCC ID: QISHSMPClAGN01**

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REPORT ON FCC Maximum Permissible Exposure (MPE) Estimation of WLAN Mini-PCI Adapter

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1 EUT Information

1.1 Product Description

This model is compliant with mini PCI standard Adapter. The Broadcom 802.11b/g/n technique delivers up to 54Mbps (802.11b/g) or 300Mbps 11n data rate, the bandwidth support 20MHz and 40MHz for legacy WLAN standard and also fulfilled high throughput data rate requirement on 11n defined draft 2.0 specification, it is used 2sets of 2.4 Tx / Rx antenna's combinations, since the IEEE802.11g is CCK & OFDM modulation scheme and used CCK modulation to follow backward compatible with IEEE802.11b, up to 54Mbps on single 2.4GHz frequency band and also complies with IEEE802.11g standard on this dual band single chip client solution.

1.2 Technical Description of EUT

Table 1. Service and Test Mode List

Operating frequency band:	2.4G Band: Uplink (RX): 2400 MHz to 2483.5 MHz Downlink (TX): 2400 MHz to 2483.5 MHz
Maximum power:	2.4G Band: Measured Peak Power: 26.02 dBm (for all modes) (Note: refer to FCC/RF test report for the measured output power. For consideration of worst-case, the peak power limit value of 30 dBm required by FCC rules can be used.)
Antenna Information:	2.4G Band: Antenna type: Omni directional Antenna gain (typical): < 2 dBi Feed line loss (length variable): <1 dB (Note: here a typical antenna is used to perform estimation. If antennas with higher gain and/or with different type are used, the MPE radiation exposure should be reappraised.)



2 FCC RF Exposure Requirements

2.1 FCC Routine Environmental Evaluation

Base Transceiver Station / Fixed Station (BTS/FS) emit RF radiation (Radiation Hazard). Although there is no scientific evidence of possible health risks to persons living near to BTS/FSs some recommendations are giving below for the installation and operation of BTS/FSs. Operators of BTS/FSs are required to obey the local regulation for erecting base station transceivers.

The Federal Communications Commission (FCC) 47CFR §1.1307 requires operator to perform an Environmental Assessment. The objective of the Environmental Evaluation is to ensure that human exposure to RF energy does not go beyond the maximum permissible levels stated in the standard.

As specified in 47CFR §1.1307 and OET Bulletin 65, the Environmental Evaluations are required if the BTS/FS fall into the categories listed in Table 1 of 47CFR §1.1307 and Table 2 of OET Bulletin 65, also summarized and listed in Table 2 below. Other BTS/FSs are categorically excluded from making such studies or preparing an EA, except as indicated in paragraphs (c) and (d) of §1.1307.

Table 2. BTS/FSs Subject To Routine Environmental Evaluation

Service (title 47 CFR rule part)	Evaluation required if:
Cellular Radiotelephone Service (subpart H of part 22)	Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 1000 W ERP (1640 W EIRP). Building-mounted antennas: total power of all channels > 1000 W ERP (1640 W EIRP).
Personal Communications Services (part 24)	(1) Narrowband PCS (subpart D): Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 1000 W ERP (1640 W EIRP). Building-mounted antennas: total power of all channels > 1000 W ERP (1640 W EIRP). (2) Broadband PCS (subpart E): Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 2000 W ERP (3280 W EIRP). Building-mounted antennas: total power of all channels > 2000 W ERP (3280 W EIRP).
Miscellaneous Wireless Communications Services (part 27 except subpart M).	(1) For the 1390–1392 MHz, 1392–1395 MHz, 1432–1435 MHz, 1670–1675 MHz, and 2385–2390 MHz bands: Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 2000 W ERP (3280 W EIRP). Building-mounted antennas: total power of all channels > 2000 W ERP (3280 W EIRP). (2) For the 698–746 MHz, 746–764 MHz, 776–794 MHz, 2305–2320 MHz, and 2345–2360 MHz bands: Total power of all channels > 1000 W ERP (1640 W EIRP).
Broadband Radio Service and Educational Broadband Service (subpart M of part 27).	Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1640 W EIRP. Building-mounted antennas: power > 1640 W EIRP. BRS and EBS licensees are required to attach a label to subscriber transceiver or transverter antennas that: (1) provides adequate notice regarding potential radiofrequency safety hazards, e.g., information regarding the safe minimum separation distance required between users and transceiver antennas; and (2) references the applicable FCC-adopted limits for radiofrequency exposure specified in §1.1310.



- Note 1: "Building-mounted antennas" means antennas mounted in or on a building structure that is occupied as a workplace or residence.
- Note 2: The term "power" refers to total operating power of the transmitting operation in question in terms of ERP, EIRP or PEP.
- Note 3: For the case of the Cellular Radiotelephone Service (47CFR Part 22 subpart H), the Personal Communications Service (47CFR Part 24) and the Specialized Mobile Radio Service (47CFR Part 90), the phrase "total power of all channels" means the sum of the ERP or EIRP of all co-located simultaneously operating transmitters owned and operated by a single licensee.
- Note 4: When applying the criteria of this table, radiation in all directions should be considered. For the case of transmitting facilities using sectorized transmitting antennas, applicants and licensees should apply the criteria to all transmitting channels in a given sector, noting that for a highly directional antenna there is relatively little contribution to ERP or EIRP summation for other directions.



3 RF Exposure Evaluation

As mentioned in OET Bulletin 65, a theoretical approach to calculate possible exposure to electromagnetic radiation around BTS/FS antenna. Precise statements are basically only possible either with measurements or complex calculations considering the complexity of the environment (e.g. soil conditions, near buildings and other obstacles) which causes reflections, scattering of electromagnetic fields.

The maximum output power (given in EIRP) of a BTS/FS is usually limited by license conditions of the network operator.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

- S = power density
- P = power input to the antenna
- G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator
- R = distance to the centre of radiation of the antenna

For the EUT (refer to section 1), the power density at the distance R = 20 cm can be calculated as Table 4:

Table 4. Safe distance calculation

2.4G Band:	f(TX) = 2400 MHz to 2483.5 MHz P = 30 dBm = 1 W G = 2 dBi = 1.585 (numeric) Population/uncontrolled exposure: R = 20 cm = 0.2 m S = 3.15 W/m ² = 0.315 mW/cm ² (< 1.0 mW/cm ² Limit)
Note 1:	The minimum antenna feed line loss (=0 dB) is taken into account. For consideration of worst-case, the peak power limit value required by FCC rules (=30 dBm) is used.
Note 2:	It is assumed that the RF exposure evaluation is base on the far-field and the MPE is over-estimated.
Note 3:	MPE limits that are provided to the customer and only serve as a guideline. The site license holder is ultimately responsible for MPE compliance at a given site.

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