FccID: H9PLA2400 WLAN PC Card, 1 Mbps, CR-1

Conf Num: EA99056 Class II Permissive Change

Corespondence # 17366 Date Emailed: 12/12/00

Question 1(a)	**Answer:**
The antenna list dated Tuesday, October 17, 2000 has included two IBM antennas (antenna #5 & #6) that are not on the antenna list dated Tuesday, November 14, 2000.	There were four broken links in my data base. These two and two others under different FCC IDs were affected. I have uploaded a corrected list.
Question 1(b)	**Answer:**
The Previous Class II grant indicates there are 6 hand-held and 1 belt-worn configurations. But the latest antenna list dated November 14, 2000 has included 9 antenna configurations.	Two of the antennas #6 and #8 were withdrawn. I have uploaded a corrected list.
Question 2	**Answer:**
Please provide supporting info for the duty factor indicated on the antenna list.	I have attached the duty cycle calculations.

Duty Cycle Calculations

The maximum duty cycle of a 802.11 compliant transmitter is dependent on the data rate and the processing speed of the device the transmitter is installed in. The duty cycle is the ratio of the maximum transmitter on time divided by the total cycle time which is composed of the maximum on time and the minimum off time. The maximum on time is dependent on the data rate. The 802.11 spec mandates what the maximum data payload for a packet may be. The data pay load along with packet addressing and other network overhead information determine the maximum size of a packet. The maximum transmitter on time is the longest time that it will take the radio to transmit the packet. In the case of Symbol's Spectrum 24 products the 1 Mbps data rate is the slowest.

For the cycle time the minimum off time consists of an acknowledgement from the receiver, the shortest carrier sense time and the shortest packet construction time. The acknowledgment and carrier sense times are driven by the 802.11 protocol while the packet construction time is driven by the processing power of the radio host. For access points , laptops, and workstations with fast processors the construction time is fairly short. While for hand held battery powered terminals with slower processors the construction time can be really significant.

Directly related to the duty cycle is data throughput of a link. The lower the duty cycle the lower the data throughput.

Longest On Time

N = Maximum # of data bytes / packet
OP = Overhead bytes/packet
Ton = ((N + OP) * 8 bits/byte) / 10^6 bits/sec = 4.872 mS

Maximum Duty Cycle Factor
DCF = Ton / (Ton + Toff)

Shortest Off Time

CST = Carrier Sense Time
APA = AP Ack time
PCT = Packet Construction Time
Toff = CST + APA + PCT

Radios

LA2400	CR-1	1Mbps	FH
LA3020	Duo	2Mbps	FH
LA3021	Proj C	2Mbps	FH
LA4111	T1	11Mbps	DS
LA4121	T2	11Mbps	DS
XX3010	FH Phone	1Mbps	FH
DM4026	DS Phone	11Mbps	DS

Duty Cycle Variables

Radio	N		OP		CST (uS)		APA (uS)		PCT (uS)	
	AP	Rmt	AP	Rmt	AP	Rmt	AP	Rmt	AP	Rmt
LA2400	548	548	61	61	100	100	220	220	3000	10000
LA3020	548	548	61	61	100	100	220	220	2000	2000
LA3021	548	548	61	61	100	100	220	220	2280	2370
LA4111	548	548	61	61	100	100	220	220	1640	1660
LA4121	548	548	61	61	100	100	220	220	1600	1690
NP3010	N/A	32	N/A	80	N/A	100	N/A	220	N/A	7119
DP3010	N/A	32	N/A	80	N/A	100	N/A	220	N/A	7119
DM4026	N/A	32	N/A	80	N/A	100	N/A	220	N/A	7119

Duty Cycle Calculations

Duty Cycle Factors			
Radio	**Data Rate**	**AP**	**Remote**
LA2400	1 Mbps	60% / -4.4 dB	32 % / -9.9 dB
LA3020	1 Mbps	68% / -3.4 dB	68% / -3.4 dB
LA3021	1 Mbps	65% / -3.7 dB	64% / -3.9 dB
LA4111	1 Mbps	71.3% / -2.9 dB	71.1% / -3.0dB
LA4121	1 Mbps	71.8% / -2.9 dB	70.8% / -3.0dB
NP3010	1 Mbps	N/A	10.75% / -19.4 dB
DP3010	1 Mbps	N/A	10.75% / -19.4 dB
DM4026	1 Mbps	N/A	10.75% / -19.4 dB