RF Exposure Antenna Summary

Network Systems Organization

FCC ID: **H9PLA3021-100 new** WLAN PC Card, 2 Mbps, Proj. C, Lo Pwr

Output Power: 112 mW Class II Permissive Change

Source Based
AP DC Factor: 0.650
Remote DC Factor: 0.640

Mobile Antennas (R>2m)

Ant No	Model	Symbol P/N	Type	Gain (dBi)	Cable Loss (dB)	Net Gain	Pout (dBm)	MPE (cm)	TR Status	Device Use
01.	Rockwell Blade	MAA-2000	Blade	4.7	0.75	4.0	19.74	3.8	Tested	Fixed
02.	Rockwell Patch	PMAA-2000	Patch	8.0	4.50	3.5	15.99	3.6	Tested	Fixed

Antenna Gain listed without cable
TR Status refers to wither the antenna was tested. If not refer to the directed antenna test data

Duty Cycle Factors are applied to MPE and EIRP

2.3 MAA-2000 ANTENNA DESCRIPTION

The Terminal LAN WLU-2001 operates with the MAA-2000 antenna. The MAA-2000 antenna is a streamlined blade utilizing a ground return feed system. It provides omnidirectional coverage in the horizontal plane with no nulls. All exposed surfaces and the base plate of the antenna are all-metal construction with a height of approximately 33 mm (not including connector). This design provides mechanical rigidity and grounding for lightning protection. The MAA antenna weighs approximately 0.1 kilograms (not including cable).

Figure 2.6 MAA-2000 Microwave Airborne Antenna

2.3.1 MAA-2000 Antenna Mounting Requirements

The optimal MAA antenna location is on the top of the aircraft, on or near the centerline, and from the middle to the rear of the fuselage. Exact location will be dependent on the aircraft type. For the diversity option, the second antenna should also be placed at or near the aircraft centerline on the top of the aircraft a short distance from the first antenna.

Table 2.2 MAA-2000 Characteristics

CHARACTERISTIC	SPECIFICATION
Frequency	2.200 GHz - 2.400 GHz
Polarization	Linear - Vertical
Beamwidth	Omni (Cardiod pattern)
Gain (less cables)	4.7 dBi
Connector Type	TNC Female
Weight (PMAA-2000 Antenna)	0.1 Kg. (3.0 Oz.)
Overall dimensions (PMAA-2000 Antenna) (connector and cable not included)	33.0 mm (1.30 in) max height 44.5 mm (1.75 in) max width 133 mm (5.25 in) max length

2.4 PMAA-2000 ANTENNA DESCRIPTION

The Cabin LAN WLU-2001 operates with the PMAA-2000 antenna. The PMAA-2000 antenna is a low profile patch antenna allowing installation within the cabin area. It provides 8 dBi of gain directed perpendicularly out from the radome surface. This design provides increased nose-to-tail coverage throughout the aircraft. The implementation of a circularly polarized antenna reduces the affects of polarizition fading upon the link quality brought on by the orientation of the user's antenna. The PMAA antenna is 154.78 mm by 154.78 mm with a thickness of 22.22 (not including cable). The PMAA antenna weighs less than 0.3 kilograms.

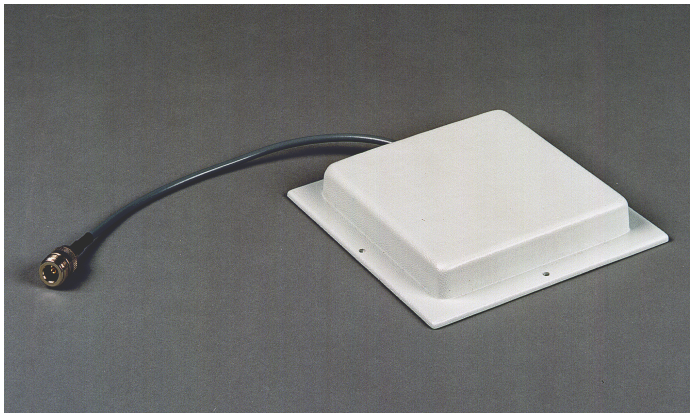


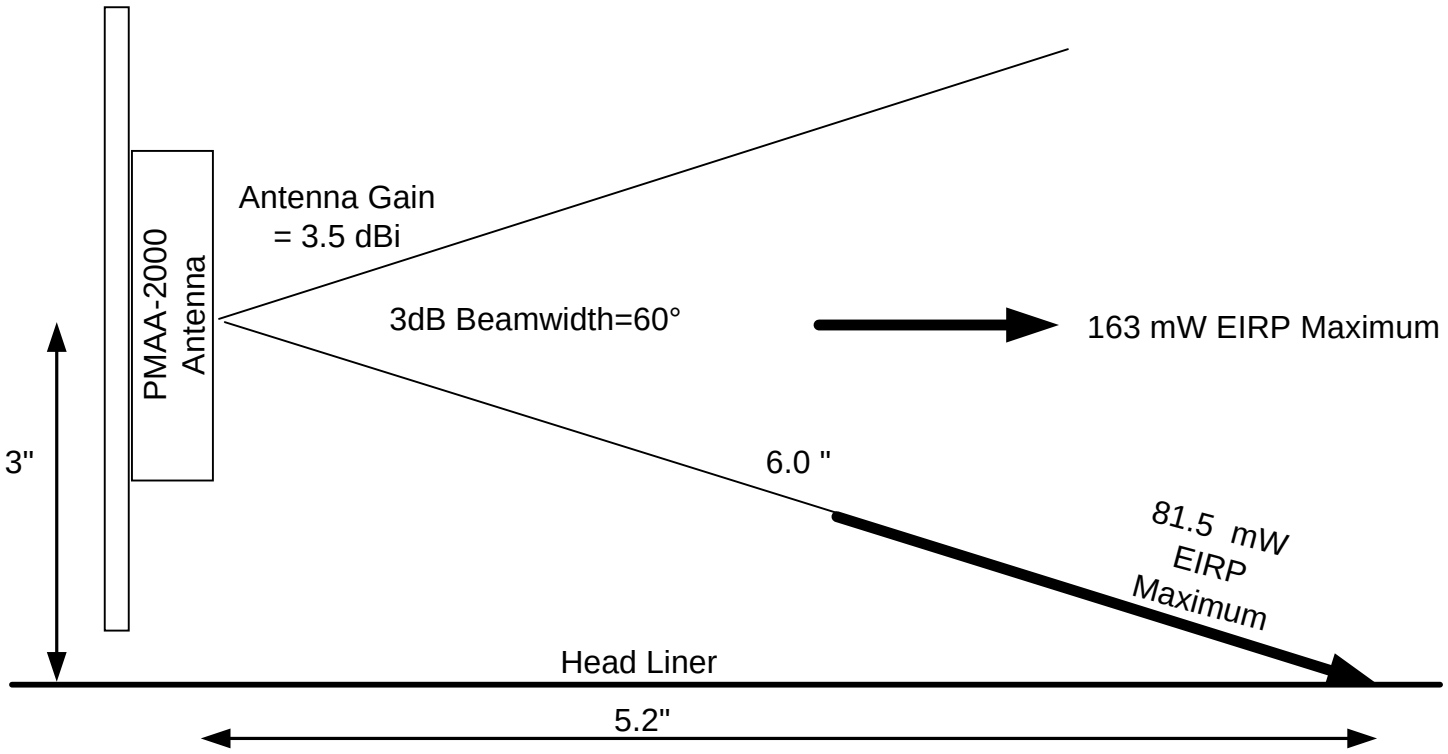
Figure 2.7 PMAA-2000 Portable Microwave Airborne Antenna

2.4.1 PMAA-2000 Antenna Mounting Requirements

The optimal PMAA antenna location is dependent of the internal configuration and size of the aircraft cabin. For a single Cabin LAN WLU-2001 installation, the PMAA antenna might be located on a vertical surface in the first class service with the radome directed towards the back of the plane. Reflections and the backlobe of the antenna provide cockpit coverage. For a diversity installation, the second antenna should be placed a short distance from the first antenna, mounted similarly.

Table 2.3 PMAA-2000 Characteristics

CHARACTERISTIC	SPECIFICATION
Frequency	2400 MHz - 2500 MHz
Polarization	Circular
Beamwidth	65 deg E Plane 75 deg H Plane
Gain (less cables)	8.0 dBic
Connector Type	Type N Female
Weight (PMAA-2000 Antenna)	0.3 Kg. (8.0 Oz.)
Overall dimensions (PMAA-2000 Antenna) (connector and cable not included)	22.22 mm (0.875 in) max height 154.78 mm (6.094 in) max width 154.78 mm (6.094 in) max length



Antenna installation configuration

The PMAA-2000 antenna is mounted on a vertical surface above the headliner in the interior of the aircraft just above the passenger compartment. It is impossible for passengers and other personnel to enter the main beam of the antenna within 20 cm of the antenna. However it is possible for passengers to come as close as three inches (7.6 cm) of the antenna if the person stands with their head touching the headliner directly below the antenna.

Exposure Category

Since this is installed in commercial passenger aircraft this is a **GENERAL POPULATION / UNCONTROLLED EXPOSURE** category.

MPE Calculations

Formula

$S=PG/4\pi R^2$ Where S is power density in mW/cm
P is the transmit power in mW at the antenna
G is the gain of the antenna in dBi
R is the distance in cm to the antenna.

For mobile devices in **GENERAL POPULATION / UNCONTROLLED EXPOSURE** the power density limit is 1 mW/cm^2

Therefore the MPE limit is $MPE=sqrt(PG/4\pi S)$

Main beam MPE calculation.

P= 112 mW * 0.65 source based averaging. = 72.8 mW
G= 3.5 dBi = 2.24
S= 1 mW/cm^2
EIRP = 163 mW

MPE=sqrt(72.8 *2.24 / 4π) = 3.6 cm

30° off main beam MPE calculation.

P= 112 mW * 0.65 source based averaging. = 72.8 mW
G= 0.5 dBi = 1.12
S= 1 mW/cm^2
EIRP = 81.5 mW

MPE=sqrt(72.8 *1.12 / 4π) = 2.54 cm

90° off main beam MPE calculation.

P= 112 mW * 0.65 source based averaging. = 72.8 mW
G= -17 dBi = 0.02
S= 1 mW/cm^2
EIRP = 1.46 mW

MPE=sqrt(72.8 *0.02 / 4π) = 0.34 cm

Conclusion

These calculations show that the RF Exposure limits are met under all conditions.