

12) RF Exposure information

The following is an excerpt from the Operating Manual:

“QUOTE

On page ii-

Maximum Permissible Exposure

Any Wireless Equipment can pose health hazards if precaution is not exercised in its use/operation, especially its proximity to the human body. Excessive absorption of RF energy in the body is known to cause Cancer and/or other diseases. The FCC has issued guidelines to determine the safe distance of a transmitting antenna from the human body, to limit absorption to safe levels.

Please follow the instructions given in this manual.

WARNING: Refer to Table 4 in Section 3 (*Operating the transmitter*) to determine the MINIMUM DISTANCE the Transmitter with Antenna mounted, or the Antenna itself (if connected via coax to the transmitter), must be placed away from the body to minimize the health hazard. Also, note the Warning for TX630 after Table 4. User's failure to comply with the instructions in this manual voids the site license granted.

In Section 3 of the manual -

For proper operation of the wireless link, the transmitter antenna should be kept clear of metal objects, trees, buildings, etc. If the transmitter is mobile such as on a video camera, ensure the antenna is sufficiently clear of the operator's body, especially the head. A 2.4 GHz link is a line-of-sight communications, which means the receive antennas should 'see' the transmit antenna.

Another very important aspect relates to health hazards from RF energy absorption in the body. To minimize the risk, we ask that the user ENSURE the minimum distance of the transmitting antenna from the human body per Table 4. These values have been calculated per FCC Bulletin OET65, Supplement C & related documents.

Minimum Distance from Body (in Inches)						
Model ↓	Antenna Gain →	0 dBi	3 dBi	10 dBi	16dBi	27 dBi
TX600/TX618	Distance	2"	3"	4"	8"	-
TX623		3"	4"	8"	16"	48"
TX630		6"	9"	16"	32"	84"

Table 4 – Minimum Safe Distance

WARNING:

An Antenna extender cable is shipped with the TX6XX Transmitter, it is meant to hold the antenna at the minimum safe distance from the human body. This extender cable *MUST* be used whenever the Transmitter is operated in a mobile environment (such as on a camera) and the user should mount the transmitter in a way that does not defeat the purpose of this cable. If the transmitter is mounted in a manner other than intended with the extender cable, it *SHALL* be the user's responsibility to ensure the above minimum distance from 'any' human being. Avalon RF will help/advise you if necessary. Failure to comply with these instructions will void the grant of the site license under part 74 or part 90 (as the case may be).

From Section 4 of the manual-

4.3 Recommended accessories.

4.3.1 Antennas

The following is a list of antennas available from Avalon RF. Only certain antennas can be used with high power models like TX623 & TX630 to comply with FCC's EIRP restrictions. Overseas customers must check local regulations for compliance before ordering. The choice of a particular antenna is dictated by transmitter power consumption, the application environment, physical size constraints, governing local regulations, etc. As a rule, the higher the antenna gain, the larger it's size and narrower the beam width (the more directional the antenna).

Omni-directional antennas for mobile application:

Gain	2.4GHz	Comments
0dbi	AX600	1/4 wave whip (needs ground plane)
3dbi	AX603CP	Circular polarized whip
3dbi	AX603	Linear polarized
4dbi	AX604	Linear polarized
6dbi	AX606	Linear polarized
8dbi	AX608	Linear polarized
10dbi	AX610	Linear polarized

Directional antennas for fixed point-to-point applications:

Gain	2.4GHz	Comments
10dbi	AX610CP	Circular polarized panel
13dbi	AX613CP	Circular polarized panel
16dbi	AX616CP	Circular polarized panel
24dbi	AX624PD	Parabolic Dish
27dbi	AX627PD	Parabolic Dish

The following table shows permissible Antennas that can be used with the different transmitters:

Antenna	Permissible for use with Model			
	FCC Part 15 (License Free)	RSS210 (Canada)	FCC Part 90 (Licensed)	FCC Part 74 (Licensed)
AX600	TX600	Any TX6XX	Any TX6XX	Any TX6XX
AX603 AX603CP	-	TX600 TX618 TX623	Any TX6XX	Any TX6XX
AX604	-	TX600 TX618 TX623	Any TX6XX	Any TX6XX
AX606	-	TX600 TX618 TX623	Any TX6XX	Any TX6XX
AX608	-	TX600 TX618	TX600 TX618 TX623	Any TX6XX
AX610 AX610CP	-	TX600 TX618	TX600 TX618 TX623	Any TX6XX
AX613CP	-	TX600	TX600 TX618 TX623	TX600 TX618 TX623
AX616CP*	-	TX600	TX600 TX618	TX600 TX618 TX623
AX624PD* AX627PD*	-	TX600	TX600	TX600
* These antennas must be mounted on a roof or mast.				

Table 5 - Permissible Antenna/Transmitter Model Combinations

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The distances (in the Table 4 above) have been arrived at as per the following calculations:

Using formula 18 from FCC OET Bulletin 65 -

$$S_{ff} = P \times G \div (4\pi R^2)$$

where: S_{ff} = power density (on axis) in mW/cm^2

P = power fed to the antenna in mW

G = numerical power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the point of interest in cm

And re-arranging it for R (the distance) yields-

$$R = \sqrt{P \times G \div (4\pi S)}$$

As specified in Table 1.B of FCC OET Bulletin 65, **S = 1 mW/cm² as the Limits for General Population/Uncontrolled Exposure for operation at frequencies > 1500 MHz.**

As an example, for the TX630 (0.9W) with a 10 dBi antenna –

$R = \sqrt{900 \times 10 \div (4\pi \times 1)} = 26.8 \text{ cm} = 10.55 \text{ inches}$. This is specified in table in the manual at 16” with a safety margin of 40% (users will tend to be careless/unmindful and reduce our specified distance, hence the safety factor) except for 6” margin for the 27 dBi Parabolic Dish Antenna which will be mounted on a roof top/ tall mast (the only way to mount it).

The table below shows ‘ACTUAL VALUES’ calculated per above equation-

Model	Minimum Distance from Body (per calculation)				
	0 dBi	3 dBi	10 dBi	16 dBi	2
TX600/TX618	1”	1.4”	2.9”	5.8”	
TX623	1.8”	2.5”	5.5”	11”	
TX630	3.5”	5”	11”	22”	