23. (a) The first minimum in the diffraction pattern is at an angular position θ, measured from the center of the pattern, such that $\sin\theta = 1.22\lambda/d$, where λ is the wavelength and d is the diameter of the antenna. If f is the frequency, then the wavelength is

$$\lambda = \frac{c}{f} = \frac{3.00 \times 10^8\,\mathrm{m/s}}{220 \times 10^9\,\mathrm{Hz}} = 1.36 \times 10^{-3}\ \mathrm{m}\ .$$

Thus

$$\theta = \sin^{-1}\left(\frac{1.22\lambda}{d}\right) = \sin^{-1}\left(\frac{1.22(1.36 \times 10^{-3}\,\mathrm{m})}{55.0 \times 10^{-2}\,\mathrm{m}}\right) = 3.02 \times 10^{-3}\ \mathrm{rad}\ .$$

The angular width of the central maximum is twice this, or $6.04 \times 10^{-3}\,\mathrm{rad}$ ($0.346°$).

(b) Now $\lambda = 1.6\,\mathrm{cm}$ and $d = 2.3\,\mathrm{m}$, so

$$\theta = \sin^{-1}\left(\frac{1.22(1.6 \times 10^{-2}\,\mathrm{m})}{2.3\,\mathrm{m}}\right) = 8.5 \times 10^{-3}\ \mathrm{rad}\ .$$

The angular width of the central maximum is $1.7 \times 10^{-2}\,\mathrm{rad}$ ($0.97°$).