CHAPTER 2

Solution Manual

Exact	Approximate

2.1. (a) $d\Omega = \sin\theta\, d\theta\, d\phi$

$$\Omega_A = \int_{45^\circ}^{60^\circ}\int_{30^\circ}^{60^\circ} d\Omega = \int_{\pi/4}^{\pi/3}\int_{\pi/6}^{\pi/3} \sin\theta\, d\theta\, d\phi$$

$$= (\phi)\Big|_{\pi/4}^{\pi/3}(-\cos\theta)\Big|_{\pi/6}^{\pi/3}$$

$$= \left(\frac{\pi}{3}-\frac{\pi}{4}\right)(-0.5+0.866)$$

$$\Omega_A = \left(\frac{\pi}{12}\right)(0.366) = 0.09582 \text{ sterads}$$

$$\Omega_A = \begin{cases} 0.09582 \text{ sterads} \\ 0.09582\left(\frac{180}{\pi}\right)\left(\frac{180}{\pi}\right) = 314.5585 \text{ (degrees)}^2 \end{cases}$$

$$\Omega_A \simeq \left(\frac{\pi}{3}-\frac{\pi}{4}\right)\left(\frac{\pi}{3}-\frac{\pi}{6}\right)$$

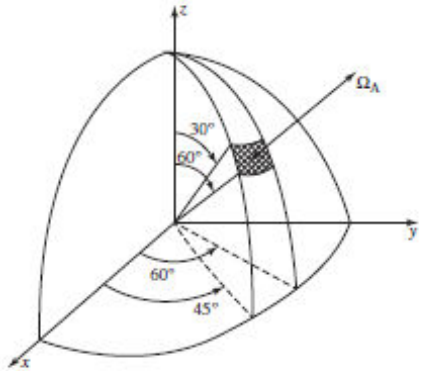
$$\simeq \left(\frac{\pi}{12}\right)\left(\frac{\pi}{6}\right) = \frac{\pi^2}{72}$$

$$\Omega_A \simeq 0.13708 \text{ sterads}$$

$$\Omega_A \simeq (60-45)(60-30)$$

$$\simeq 450 \text{ (degrees)}^2 \text{ or error of}$$

$$\left(\frac{450-314.5585}{314.5585}\right)\times 100 = 43.06\%$$



Antenna Theory: Analysis and Design, Fourth Edition. Constantine A. Balanis.

Companion Website: www.wiley.com/go/antennatheory4e