

$$d) \frac{P_{\text{rad}}}{2} = \int_0^{2\pi} \int_0^{\theta^*} \underbrace{V(\theta, \phi)}_{= B_0 \cos^3 \theta} \sin \theta \, d\theta \, d\phi = 2\pi \frac{2P_{\text{rad}}}{\pi} \left(-\frac{\cos^4(\theta)}{4} \Big|_0^{\theta^*} \right)$$

$$\Rightarrow \frac{P_{\text{rad}}}{2} = \left[-\frac{\cos^4(\theta^*)}{4} + \frac{\cos^4(0)}{4} \right] 2\pi \frac{2P_{\text{rad}}}{\pi}$$

$$\Rightarrow \frac{1}{2} = -\cos^4(\theta^*) + 1 \Rightarrow \cos^4(\theta^*) = 1/2 \Rightarrow \theta^* = 32,7^\circ$$

$$\cos(\theta^*) = 0,84$$

$$\Rightarrow \cos^4(\theta^*) = 0,84^4 = 0,5$$

$$\Rightarrow \frac{1}{2} = \frac{2P_{\text{rad}}}{\pi} \left(\frac{1}{4} - \frac{\cos^4(\theta^*)}{4} \right)$$

$$57,4$$