

Ch.16 Prob.77

$$P_1 = 100 \text{ mW} = 0.100 \text{ W}$$
$$r_1 = 30 \text{ m}$$

Find power output to reduce the range to $r_2 = 12 \text{ m}$

Assume the wifi signal spreads out in all directions equally, then the intensity is

$$I = \frac{P}{4\pi r^2}$$

Since we are at the threshold of the signal being picked up, the intensities in each case are the same

$$\frac{P_1}{4\pi r_1^2} = I_1 = I_2 = \frac{P_2}{4\pi r_2^2}$$

so the new power level is

$$\frac{P_1}{4\pi r_1^2} = \frac{P_2}{4\pi r_2^2} \rightarrow P_2 = \frac{P_1 (4\pi r_2^2)}{4\pi r_1^2}$$
$$= P_1 \frac{r_2^2}{r_1^2} = P_1 \left(\frac{r_2}{r_1}\right)^2$$

$$P_2 = 100 \text{ mW} \left(\frac{12 \text{ m}}{30 \text{ m}}\right)^2$$

$$P_2 = 16 \text{ mW}$$