

2.19 The maximum gain of a horn antenna is +20 dB, while the gain of its first sidelobe is -15 dB. What is the difference in gain between the maximum and first sidelobe:

(a) in dB (b) as a ratio of the field intensities.

- Modify problem so that the maximum gain is 18 dB and that of the first sidelobe is -14 dB.

$$\begin{aligned} a) \quad \Delta G &= G_{\max} - G_{1^{\text{st}} \text{ sidelobe}} \\ &= 18 \text{ dB} - (-14 \text{ dB}) \end{aligned}$$

$$\underline{\underline{\Delta G = 32 \text{ dB}}}$$

b) Per (2-12a), note that power $\propto |\bar{E}|^2$
 $\hookrightarrow G \propto |\bar{E}|^2$

$$\Delta G (\text{dB}) = 10 \log_{10} \left(\frac{G_{\max}}{G_{1^{\text{st}} \text{ sidelobe}}} \right) \quad \leftarrow \begin{array}{l} \text{ratio of} \\ \text{dimensionless} \\ \text{gains} \end{array}$$

$$32 \text{ dB} = 10 \log_{10} \left(\frac{|\bar{E}|_{\max}^2}{|\bar{E}|_{1^{\text{st}} \text{ sidelobe}}^2} \right)$$

$$32 \text{ dB} = 20 \log_{10} \left(\frac{|\bar{E}|_{\max}}{|\bar{E}|_{1^{\text{st}} \text{ sidelobe}}} \right)$$

$$\underline{\underline{\frac{|\bar{E}|_{\max}}{|\bar{E}|_{1^{\text{st}} \text{ sidelobe}}} = 10^{32/20} = 39.8107}}$$