Physics 102
Quiz # 2
Chapter 18

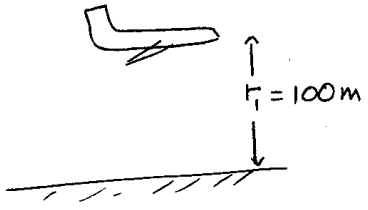
Name : Solution Id : Sec. # :

A jet plane flies at an altitude of 100 m. The sound intensity on the ground as the jet passes over head is 150 dB. At what altitude should the plane fly so that the ground noise is 120 dB.

$$\beta_1 - \beta_2 = 10 \log \frac{I_1}{I_2}$$

But

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



$$\Rightarrow \frac{I_1}{I_2} = \frac{P_s\, 4\pi r_2^2}{4\pi r_1^2 \cdot P_s} = \frac{r_2^2}{r_1^2}$$

$$\Rightarrow \beta_1 - \beta_2 = 10 \log \frac{r_2^2}{r_1^2}$$

$$150 - 120 = 10 \log \frac{r_2^2}{(100)^2}$$

$$\Rightarrow 10^3 = \frac{r_2^2}{100^2}$$

$$\Rightarrow r_2^2 = 10^7$$

Thus

$$r_2 = \sqrt{10^7} = 3162\ m$$