Problem 7.20 The skin depth of a certain nonmagnetic conducting material is 3 μm at 2 GHz. Determine the phase velocity in the material.

Solution: For a good conductor, $\alpha = \beta$, and for any material $\delta_s = 1/\alpha$. Hence,

$$u_p = \frac{\omega}{\beta} = \frac{2\pi f}{\beta} = 2\pi f \delta_s = 2\pi \times 5 \times 10^9 \times 3 \times 10^{-6} = 9.42 \times 10^4 \quad \text{(m/s)}.$$