Answer on Question #45657-Physics-Electromagnetism

What are the maximum values of the electric and magnetic fields in the light coming from the sun?

Solution

Assume that the intensity of solar radiation incident on the cloudtops of the Earth is $I = 1370 \frac{W}{m^2}$.

The intensity of light is related to the peak electric field by equation

$$I = \frac{1}{2\mu_0 c} E_{max}^2.$$

So

$$E_{max} = \sqrt{2\mu_0 cI} = \sqrt{2 \cdot 4\pi \cdot 10^{-7} \cdot 3 \cdot 10^8 \cdot 1370} = 1016 \frac{V}{m} = 1.016 \frac{kV}{m}.$$

In a light wave, $E_{max} = cB_{max}$ so

$$B_{max} = \frac{E_{max}}{c} = \frac{1016}{3 \cdot 10^8} = 3.4 \cdot 10^{-6} \, T = 3.4 \, \mu T.$$