# High-Intensity / Relativistic Optics

**Question set 1**

1. **Exercise:** Calculate the light intensity for a given vector potential $\vec{A}(x,t) = \vec{e_y} A_0 \sin(k_\mathrm{L} x - \omega_\mathrm{L} t)$.

2. **Exercise:** Assuming that all light power from the sun that is reaching the surface of the earth could be focussed to a small focal spot, how small would the focal spot area need to be in order to generate an intensity where an electron interacting with the associated electric field would—at least in the classical limit—reach the speed of light?
   Assume that the total power emitted from the sun into the total solid angle $(4\pi)$ is $3.86 \cdot 10^{26}\,\mathrm{W}$.
   Which "practical" problems would have to be solved first to realize such a setup?
   Would it—at least in principle—be possible to use a sufficiently large lens?

3. **Exercise:** How can the intensity be measured in an experiment?
   Concieve of at least two methods to determine the intensity. Have in mind the dimension of the intensity or special physical effects that are directly related to the intensity.