Priv.-Doz. Dr. A. Naber
Exercises to the lecture Nano-Optics, WS 2023/24

Exercises (II)
(Discussion is on Friday, 15.12.2023)

Problem 1:

We saw in a previous problem that for light propagating in a material 1 with $\epsilon_1 = 1$ and $\mu_1 = 1$ and then entering a material 2 with properties $\epsilon_2 = -1$ and $\mu_2 = -1$ perpendicular to the plane of the interface, the reflection disappears and the propagation direction $\vec{k}$ changes its sign, $\vec{k}_2 = -\vec{k}_1$.

We now consider the case that the light impinges on the interface under an oblique angle α in material 1. Calculate the refraction angle β in material 2.

Problem 2:

In Maxwell's equations the optical properties of a material are represented by the complex permittivity as a function of frequency, $\epsilon(\omega) = \epsilon' + i\epsilon''$. Values for ϵ of real materials are tabulated in many textbooks. However, in many applications the complex index of refraction $n(\omega) = n' + in''$ is required instead. Determine the real and imaginary part of n as a function of ϵ' and ϵ'' by using the fundamental relation $n(\omega) = \sqrt{\epsilon(\omega)}$.