We study the propagation of an ultrawideband electromagnetic pulse through a semiconductor with complex dielectric permittivity given by a Debye model with static conductivity $\sigma$, as

$$\epsilon_c(\omega) = \epsilon_\infty + \frac{\Delta \epsilon}{1 - i\omega \tau} + i\frac{\sigma}{\omega}. $$

Our method of analysis is an asymptotic approximation to the integral representation of the electric field component of the propagated field

$$E(z,t) = \frac{1}{2\pi} \int_{ia-\infty}^{ia+\infty} \tilde{E}(0,\omega) \exp\left[\frac{z}{c} \phi(\omega,\theta)\right] d\omega, $$

where $z > 0$ is the propagation distance into the material. Here, $a > 0$ is a constant, $\tilde{E}(0,\omega)$ is the temporal spectrum of the pulse in the plane $z = 0$, $\phi(\omega,\theta) = i\omega \left[\epsilon^{1/2}_c(\omega) - \theta\right]$ is the complex phase function, $\theta = ct/z$ is a space-time parameter and $c$ denotes the speed of light in vacuum.

We have found non-uniform asymptotic expansions that provide a valid approximation to the propagated field for low and high levels of static conductivity. In this talk, we will address the issues faced in finding a uniform description that is valid for all levels of static conductivity. (Received September 12, 2008)