

## Quiz 08: Pulse propagation

Two transform-limited Gaussian pulses are launched into a dispersive medium where no diffraction appears. The frequency-dependent wavenumber is

$$k(\omega) = \frac{\omega_0}{c} + \frac{2}{c}(\omega - \omega_0) + \frac{D}{2}(\omega - \omega_0)^2,$$

where  $c$  is the speed of light in vacuum and  $D = -0.1 \text{ (ps)}^2/\text{m}$ . The first pulse has the central frequency  $\omega_0$ , the second has the central frequency of  $\omega_1 = \omega_0 - \delta\omega$ , with  $\delta\omega = 0.1 \text{ THz}$ .

- 1) Find the group indices of the first and the second pulse ( $n_{g1}$  and  $n_{g2}$ ). [5 points]
- 2) How is the Group Velocity Dispersion (GVD) defined? You do not have to calculate the specific number, just give the formula. [2 points]
- 3) Please write down the wave equation, which describes the propagation of the slowly varying pulse envelope in the co-moving reference frame. [3 points]

You have 10 minutes!

Make sure that you indicate your name and seminar group on your answer sheet.