4. Transparent film (6 pts)

The short-wavelength oscillations on the graph are due to the diffraction on the film, therefore the local maximum condition is $2dn = \lambda N = cN/\nu$. So, $2dn\nu = cN$ and $2dn(\nu + \delta)\nu = c(N + 1)$, hence $2dn\delta\nu = c$ and $d = c/2n\delta\nu$. In order to measure the distance between two maxima more precisely, we take a longer frequency interval, e.g. $\Delta\nu = 80\,\mathrm{THz}$ and count the number of maxima between them, $m \approx 34$. Consequently, $\delta\nu = \Delta\nu/m \approx 2.35\,\mathrm{THz}$, and $d \approx 50\,\mu\mathrm{m}$.