2023.09.25
EC4301
hw#4 (Due by Oct. 11)
Let $E_j(t,f) = E_0 e^{if_jt}$ be a monochromatic wave, where $E_0 = 1$ and $f_0 = 10^{14}$ Hz.
Let the frequency range be $-\Delta < \delta f < \Delta$, where $\Delta = 0.1 f_0$. Thus, $f_j = f_0 + \delta f$.

(a) Plot $\mathrm{E}_j(\mathrm{t}, \mathrm{f})$ for t and δf, where $-100\mathrm{T} < \mathrm{t} < 100\mathrm{T}$ and $\mathrm{T} = f_0^{-1}$.

(b) Plot mean intensity $\langle \mathrm{I(t)} \rangle = \mathrm{E(t)} E(t)^*$,where $\mathrm{E(t)} = \frac{1}{(2N+1)} \sum_{f=-\Delta}^{\Delta} E_j\,(\mathrm{t}, \mathrm{f})$. Here, 2N+1 represents total frequency divisions. Here E(t) represents the frequency sum of E_j for all f_j at each t.

(c) (Bonus) Apply weighted factors of Gaussian distribution to $E_j(t,f)$. Use the following Gaussian function g1:

$\mathrm{g1}(x) = e^{-\left(\frac{x-b}{c\sqrt{2}}\right)^2}$, where b=0 and c=5. Here, b (x) represents f_0 (frequency detuning δf). The c represents the standard deviation of the bandwidth. Hint: $\mathrm{E}_j(\mathrm{t}, \mathrm{f}) \rightarrow \mathrm{E}_j(\mathrm{t}, \mathrm{f}_j) * \mathrm{g1}(\mathrm{f}_j)$.