Joint Tasks for Groups A and B, aim to complete by the end of next week (February 9th)

1. Become familiar with Matlab code, generate single exponential fluorescence decays for 20-minute acquisition times with lifetimes from 200 picoseconds (0.2 ns) to 2 ns in steps of 200ps, analyse using nonlinear least square fitting in Origin, plot the single exponential lifetimes and their uncertainties.

2. Fourier transform the decays to obtain the corresponding phasors and their positions on the unit circle (Use the Matlab code written by Clemens Kaminski's group as discussed in our meeting yesterday).

3. Proceed to the generation and analysis of bi-exponential fluorescence decays, first by nonlinear least square fitting, then by phasor analysis, do the phasor plots indicate the presence of two different emitting populations?

$$I(t) = a_1 e^{\left[\frac{-t}{\tau_1}\right]} + a_2 e^{\left[\frac{-t}{\tau_2}\right]}$$

(a) NADH like fluorescence decays $\alpha_1 = 0.75, \tau_1 = 0.4\ ns; \alpha_2 = 0.25, \tau_2 = 4.0\ ns$

(b) EGFP like fluorescence decays $\alpha_1 = 0.503, \tau_1 = 3.07\ ns; \alpha_2 = 0.497, \tau_2 = 2.43\ ns$

(c) mCherry like fluorescence decays $\alpha_1 = 0.83, \tau_1 = 1.43\ ns; \alpha_2 = 0.17, \tau_2 = 2.38\ ns$

AJB and TSB 2nd February 2024