Supporting information:

The lateral diffusion constant \( (D_L) \) of the fluorescent probe molecule have been calculated by the following procedure:

By using eq (i) we have calculated \( \tau_m \) value; 
\[
\tau_m = \frac{2 \pi \eta r_h^2}{K T} \quad \text{(I)}
\]
where 
\( \eta \) = viscosity of the medium (water), \( r_h \) = hydrodynamic radius of the SUV, \( K \) = Boltzmann constant, \( T \) = absolute temperature, \( \tau_1 \) and \( \tau_2 \) are fast and slow component of anisotropy decay.

Again, by using the value of \( \tau_m \), we have obtained the \( \tau_D \) value with the help of eq. (ii);
\[
\frac{1}{\tau_D} = \frac{1}{\tau_2} + \frac{1}{\tau_m} \quad \text{(ii)}
\]
where \( \tau_m \) = time constant for overall rotation of the vesicles and \( \tau_D \) = lateral diffusion of the probe.

Lastly we have obtained the \( D_L \) value by using the \( \tau_D \) and \( r_h \) values with the help of eq. (iii);
\[
D_L = \frac{r_h^2}{6 \tau_D} \quad \text{(iii)}
\]