

GGTACACATGA  
TACTTCAGGACC  
GGTACCCATGAA  
CAGTCC

\*

*CATCH-U-*

*DNA*

*Tours - 13/5/2018*

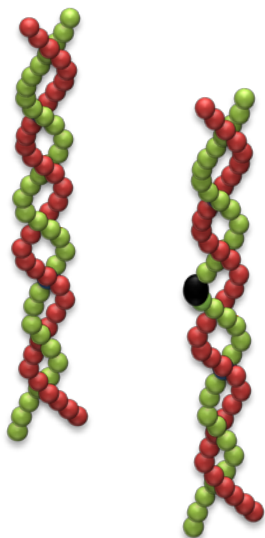
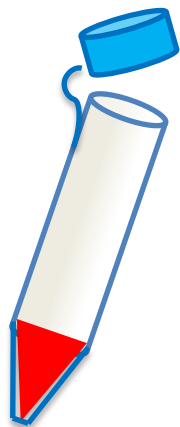
***Objective:***

... to discover which DNA and/or system manipulation produces a higher Acoustic signal in order to lower the

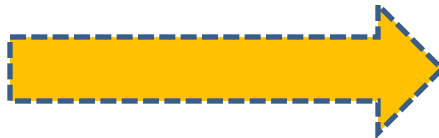
Limit-of-Detection

for

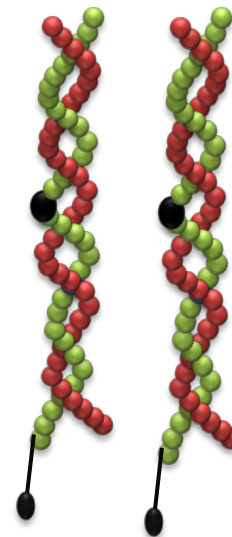
blood circulating tumor *DNA* ...



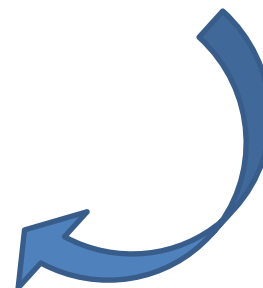
*LCR*

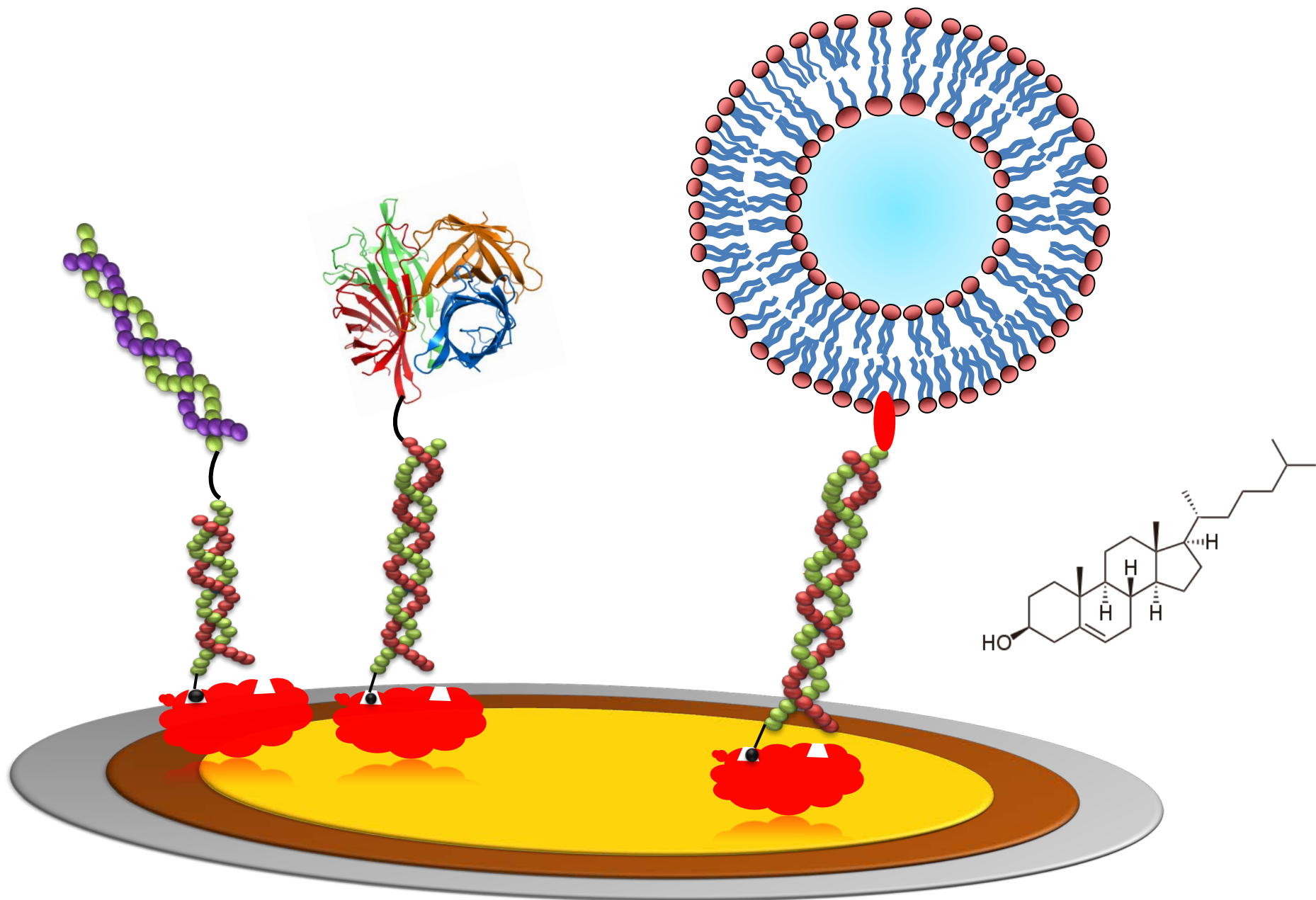


+



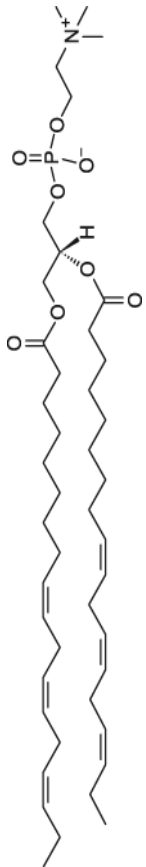
???





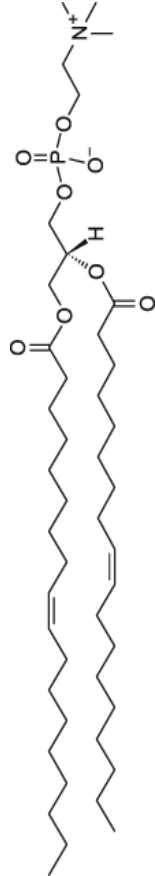
# Lipids

18:3



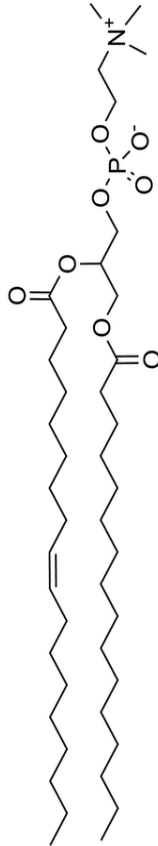
DLPC  
( $T_m$ ) - 60 °C

18:1



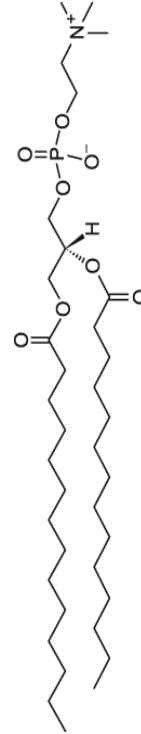
DOPC  
- 17

16:0 / 18:1



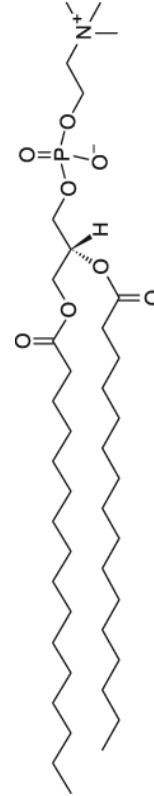
POPC  
- 2

14:0



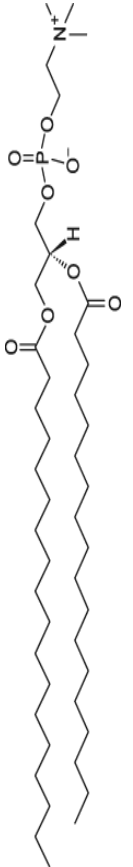
DMPC  
+ 24

16:0



DPPC  
+ 41

18:0

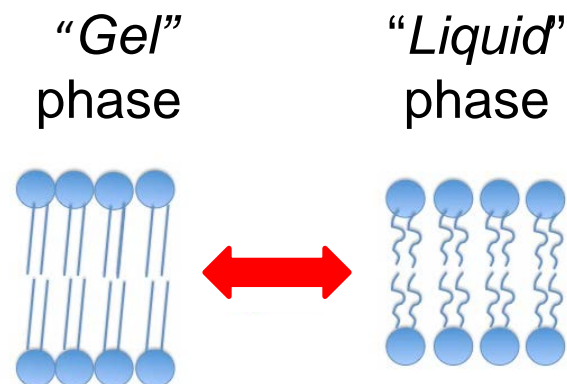
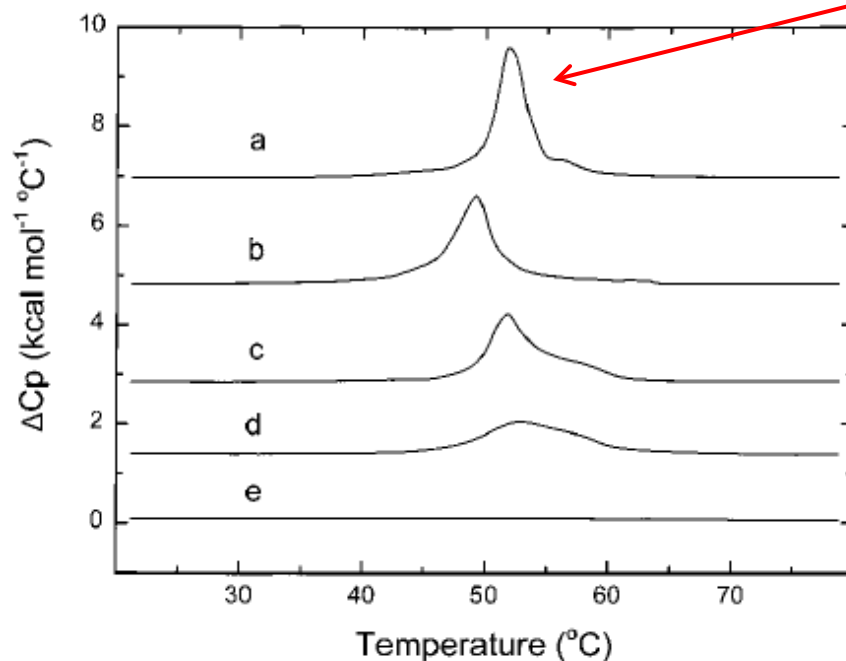


DSPC  
+ 55

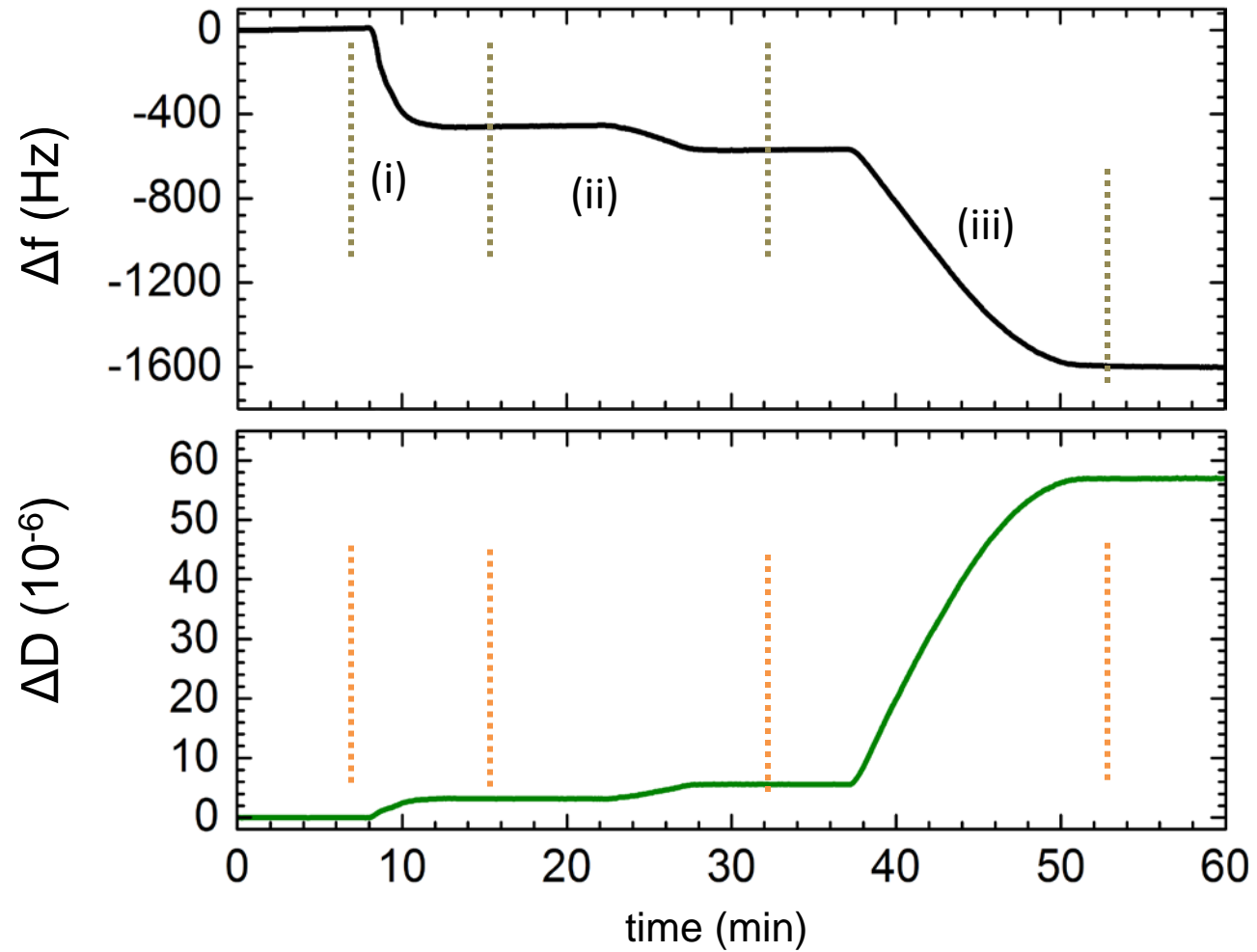
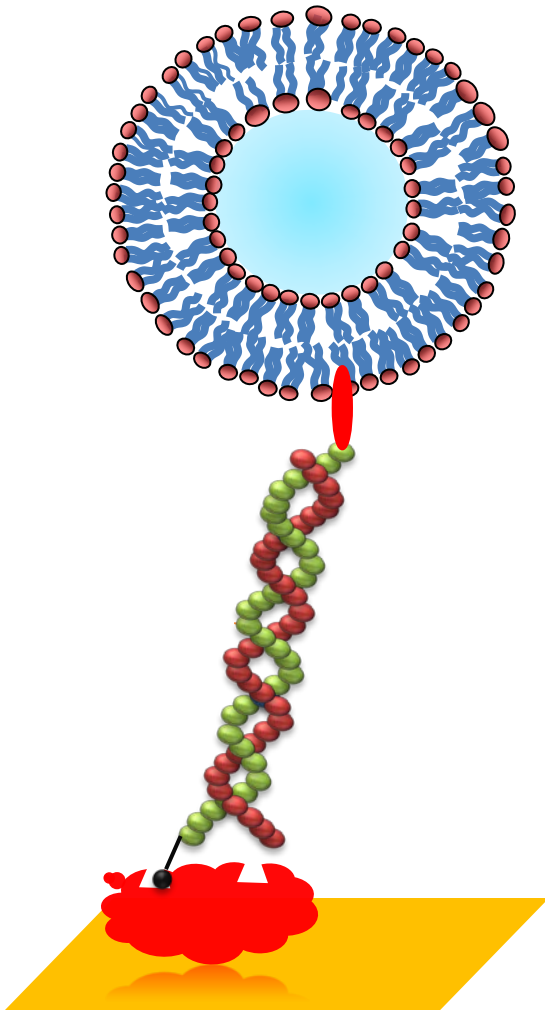
**Table 2: Transition Temperatures ( $T_m$ ) and Enthalpy Changes ( $\Delta H$ ) for the Main-Phase Transition of the Various Liposomal Dispersions**

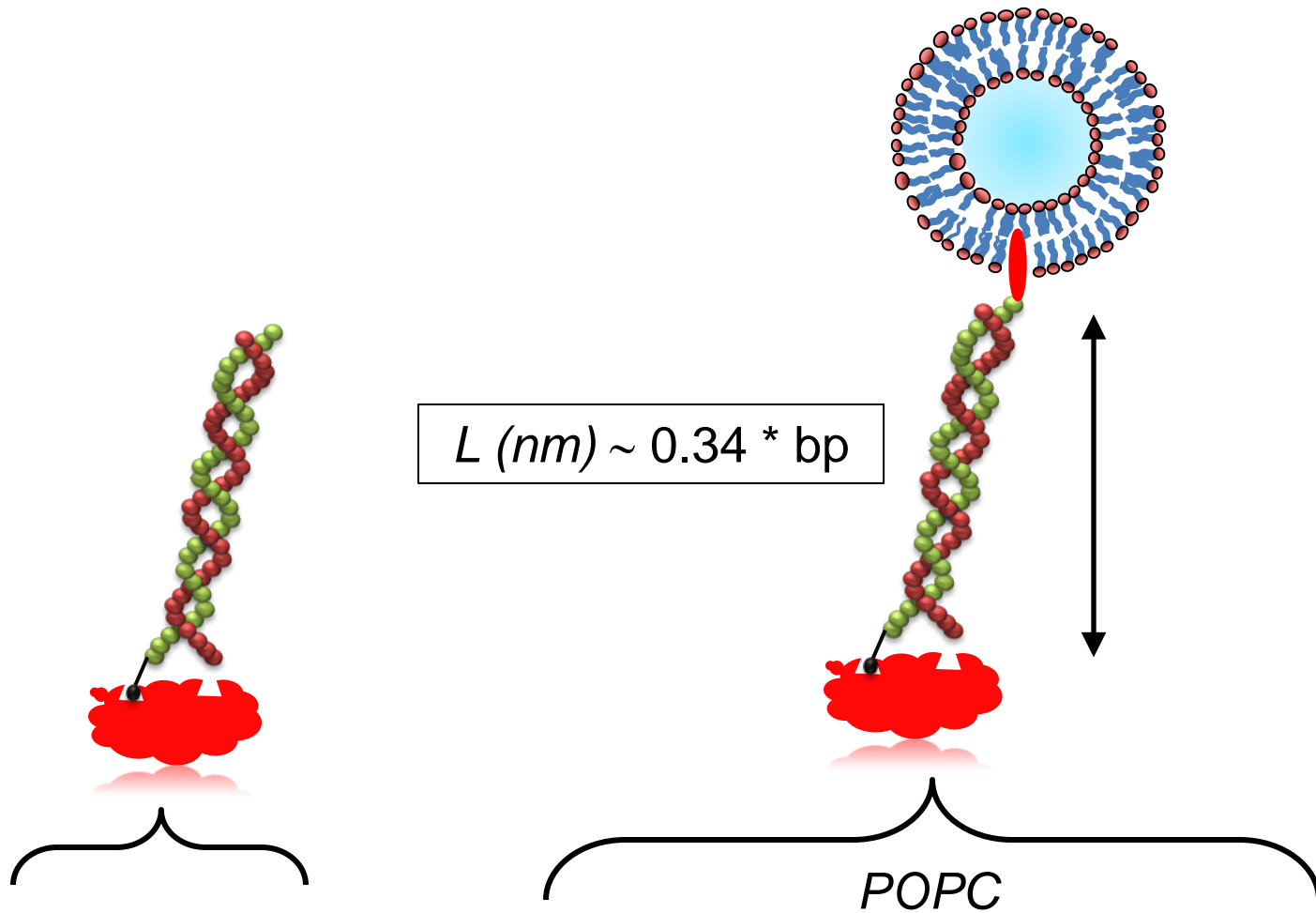
	$T_m$ ( $^{\circ}\text{C}$ )	$\Delta H$ (kcal mol $^{-1}$ )
PC	51.88	11.9
PC/DHP (19:1)	49.24	10.2
PC/DBG (19:1)	52.11	12.1
PC/cholesterol (10:1)	50.16	7.4
PC/cholesterol/DHP (19:1.9:1)	51.84	8.9
PC/cholesterol/DBG (19:1.9:1)	52.01	9.1
PC/cholesterol/DHP (19:3.8:1)	52.90	6.6
PC/cholesterol/DBG (19:3.8:1)	52.95	6.8
PC/cholesterol/DHP (19:9.5:1)	<i>a</i>	
PC/cholesterol/DBG (19:9.5:1)	<i>a</i>	

*a* No transition has been detected.



# Acoustic detection of DNA

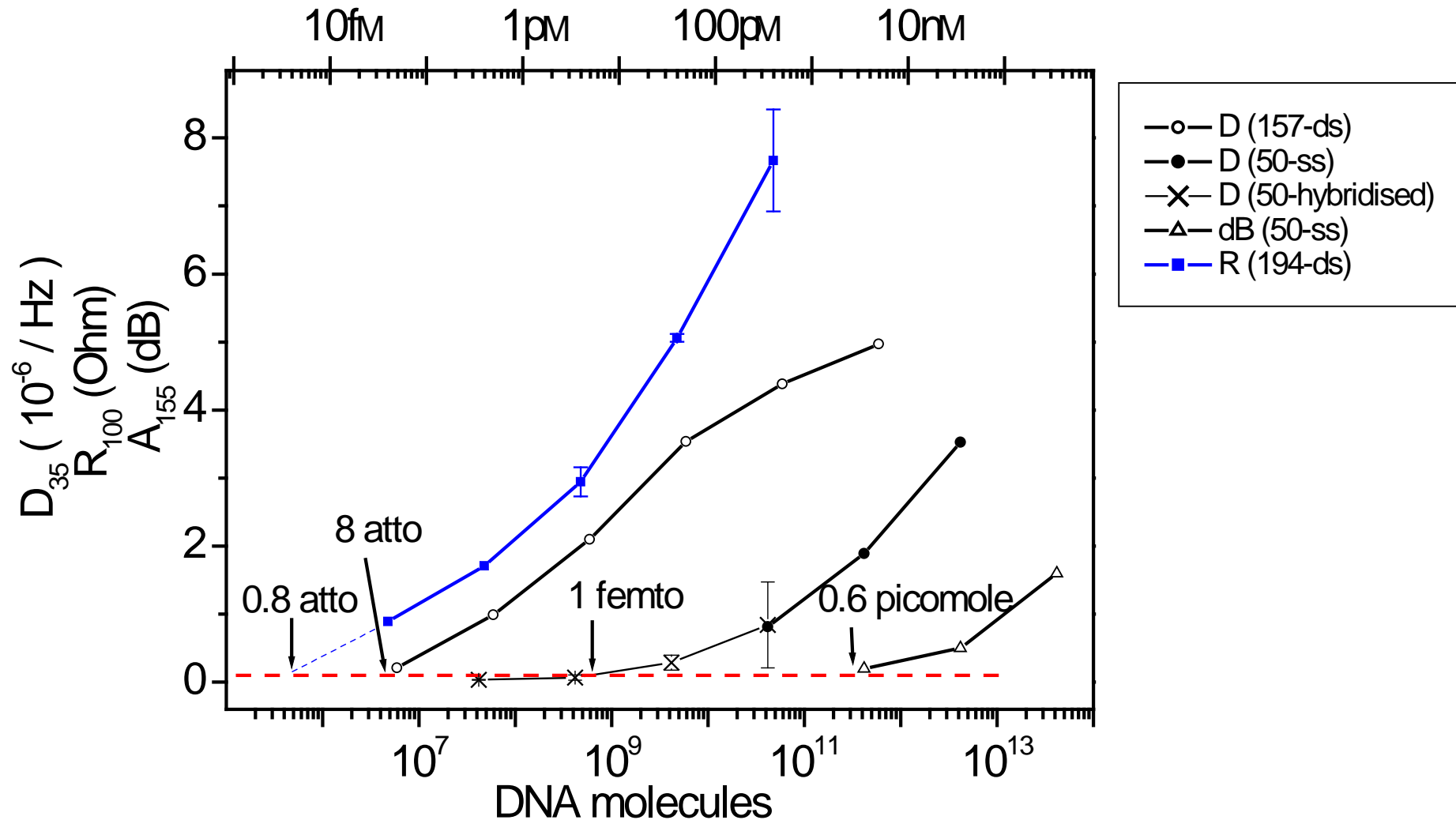




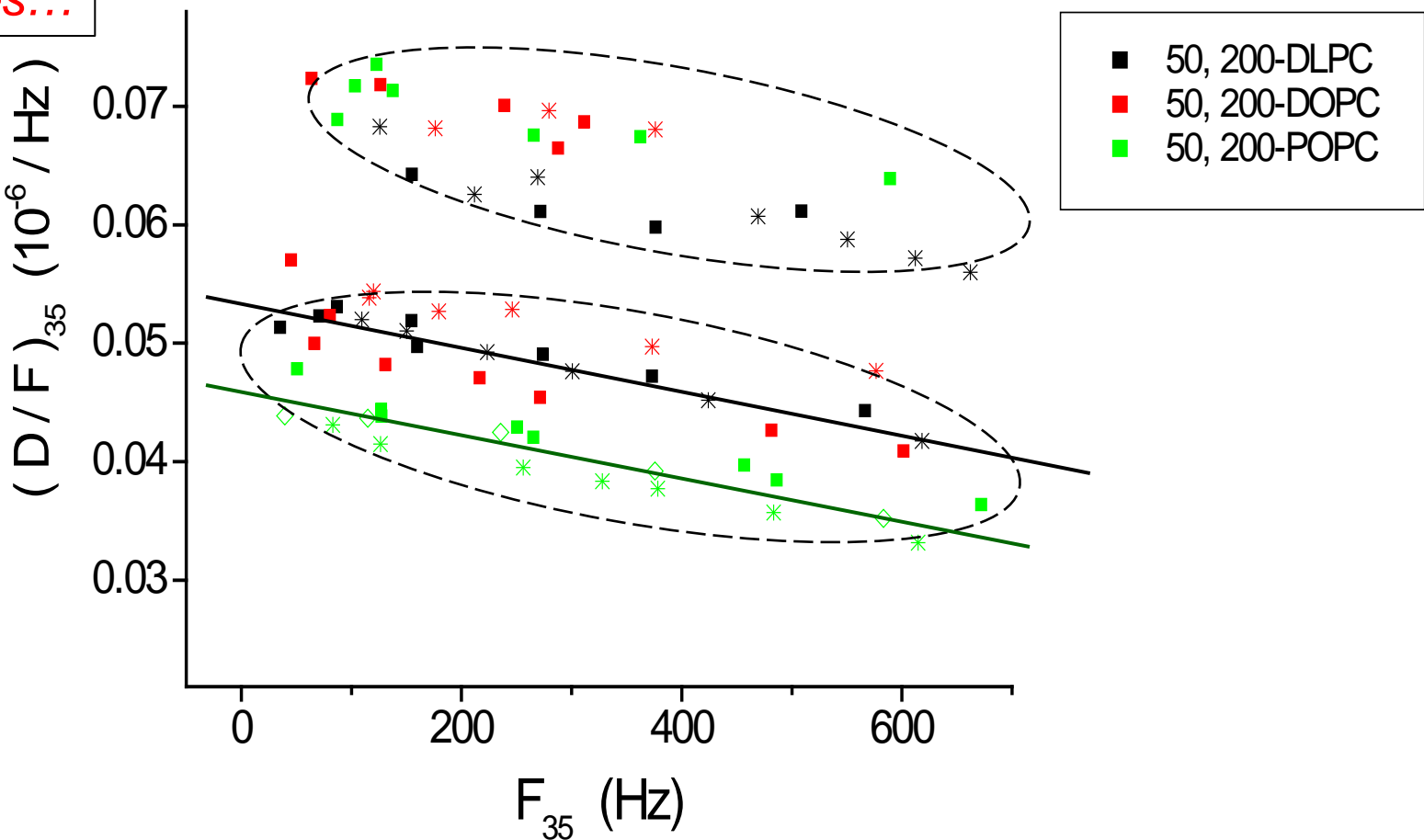
# bp	$L_{\text{DNA}}$ (nm)	D / F ( $10^{-6} / \text{Hz}$ )	30 (nm)	50 D / F	100	200
21	7.1	0.014	0.025	0.038	0.051	0.102
50	17.0	0.018	0.036	0.044	0.063	0.110
157	53.4	0.032	0.061	0.071	0.088	0.134



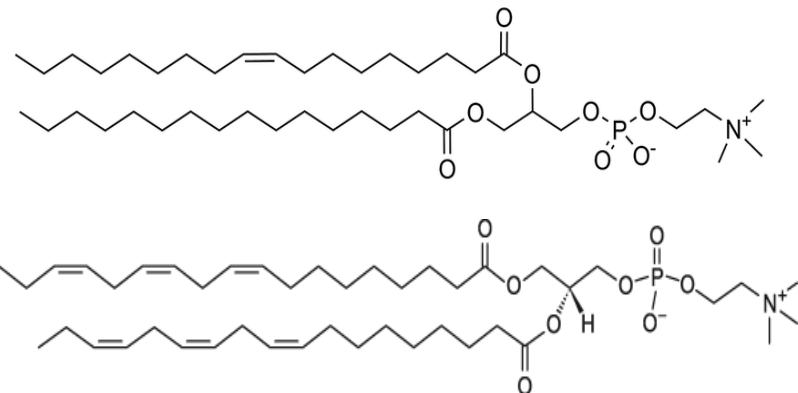
# Limit-of-detection



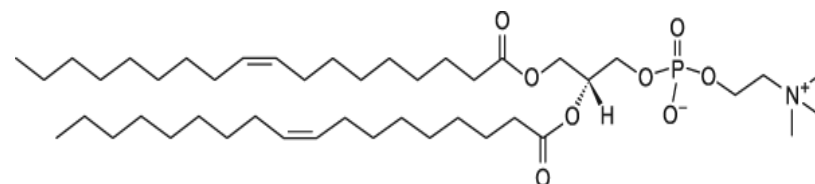
*“Soft” particles...*



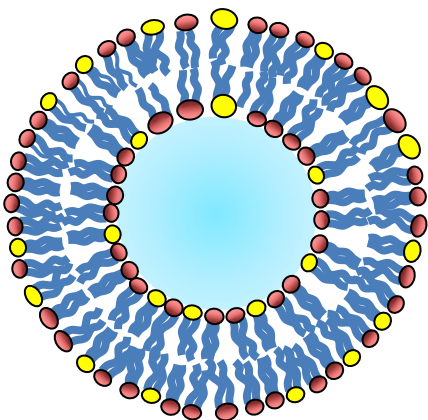
$POPC = -2$



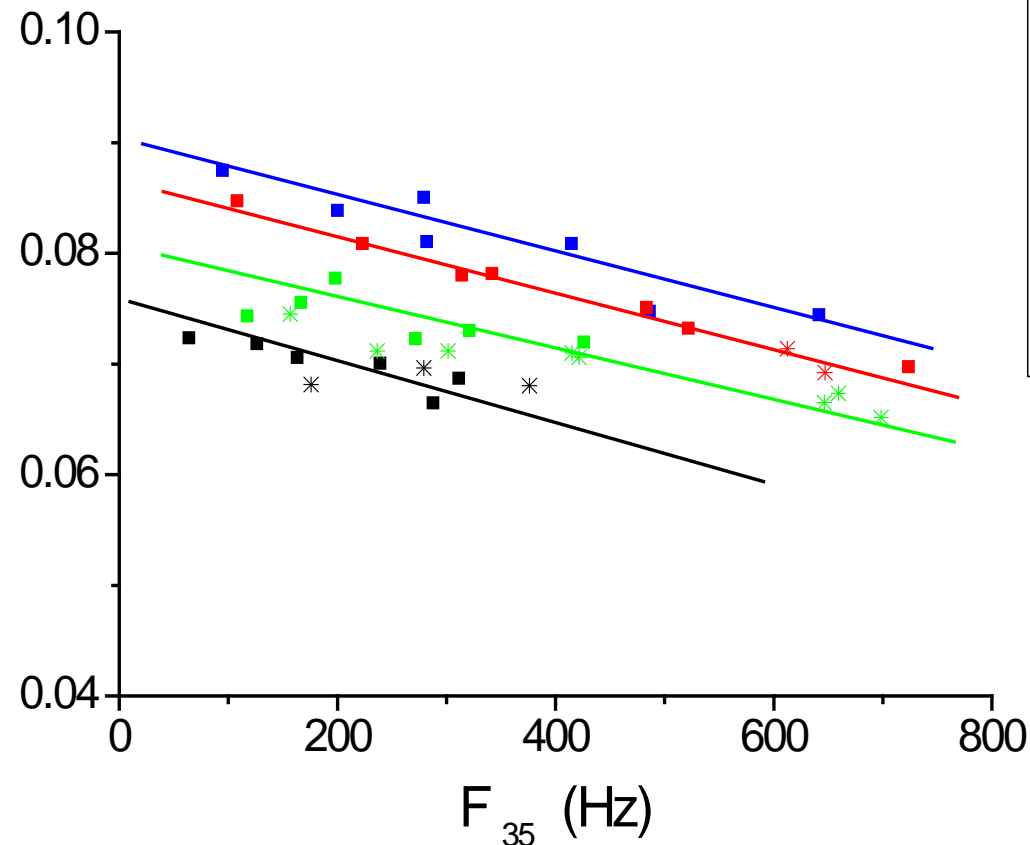
*DOPC* = -17 °C


$$DLPC = -60$$

... "Mixed" particles

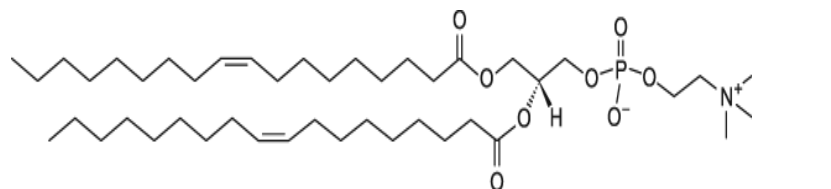


$(D/F)_{35} \text{ (} 10^{-6} / \text{Hz)}$



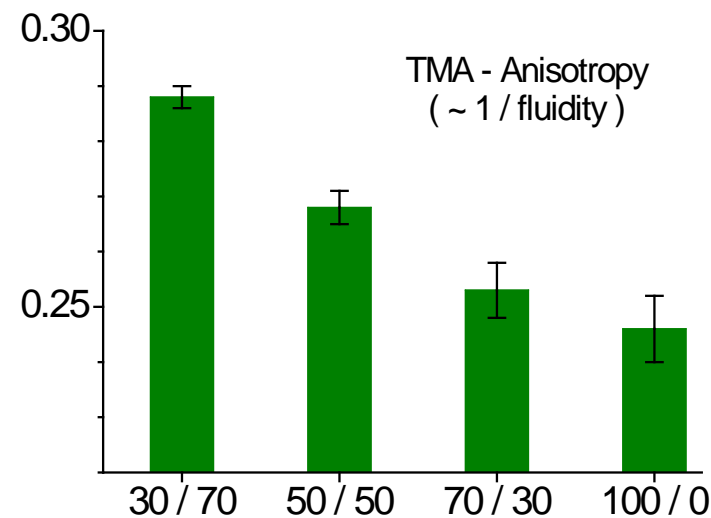
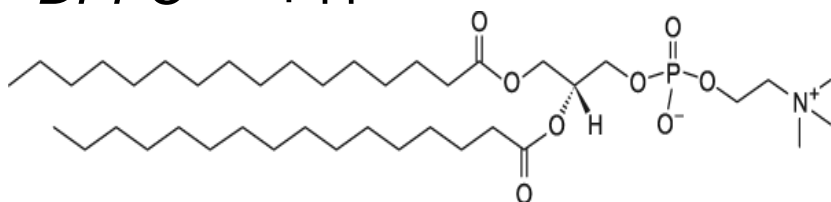
DOPC / DPPC  
(200 nm)

- 30:70
- 50:50
- 70:30
- 100:0

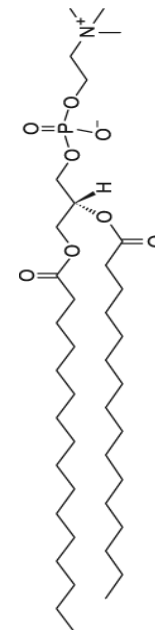
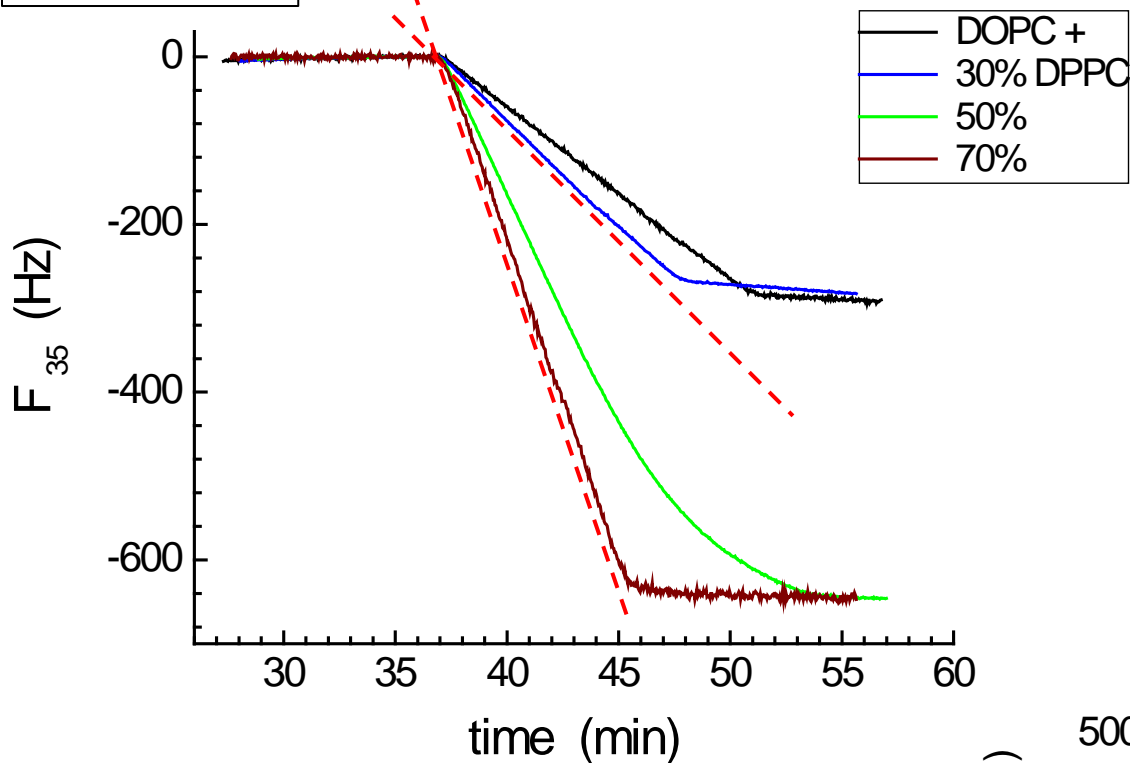


DOPC = -17 °C

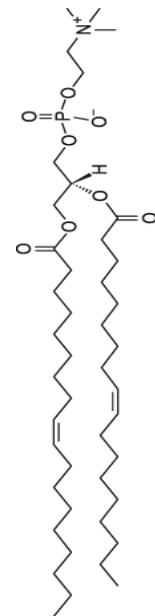
DPPC = +41



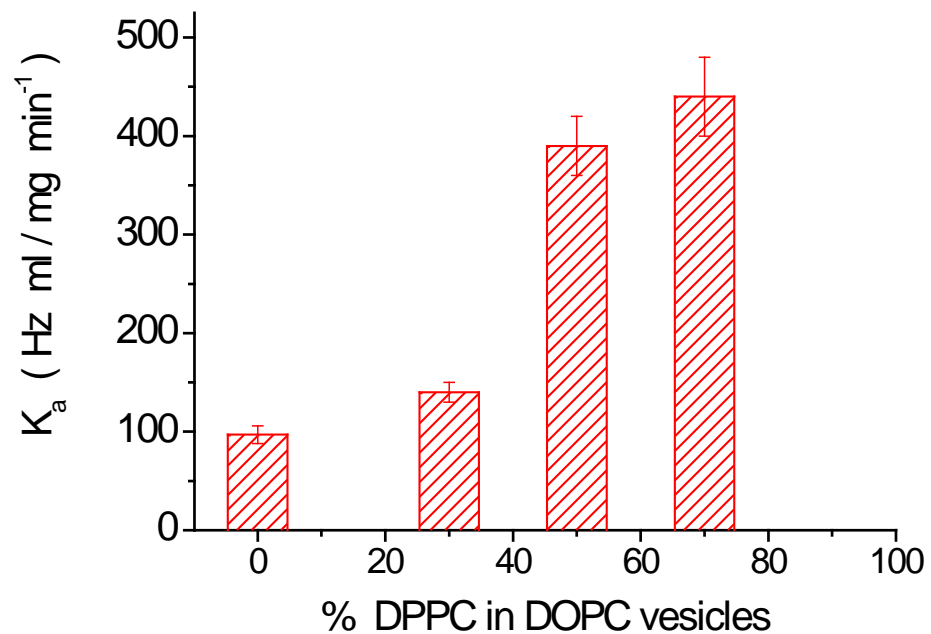
... *Kinetics*



*DPPC* = +41

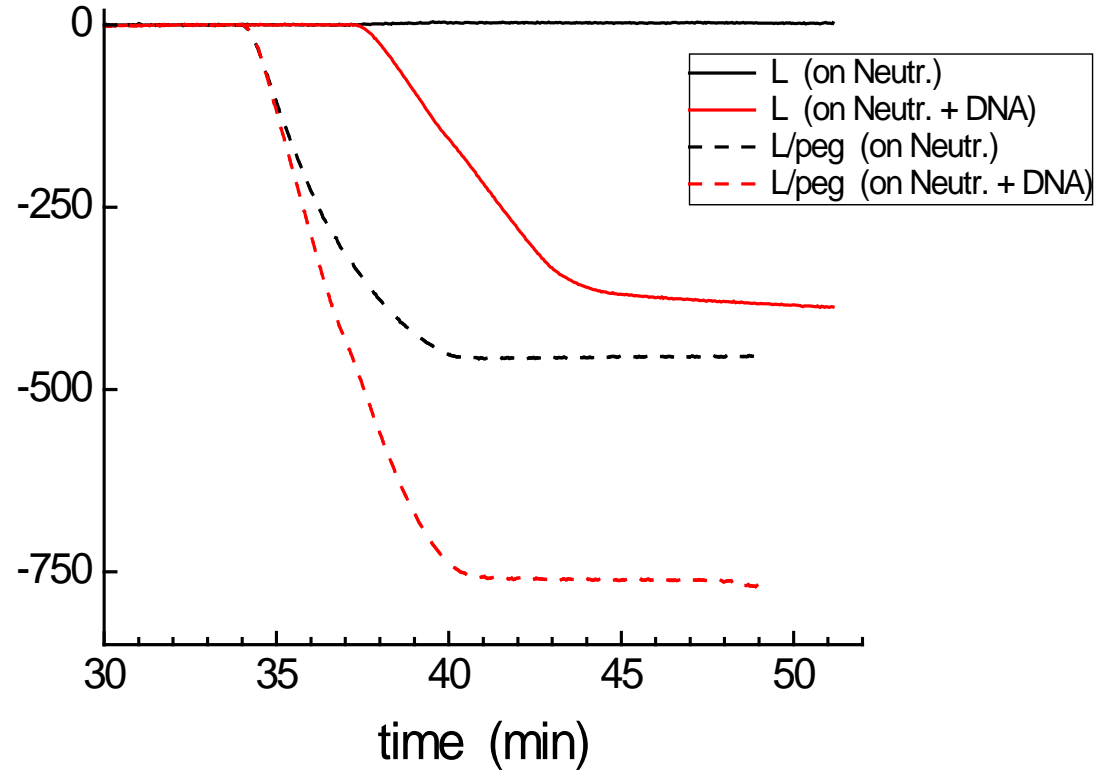
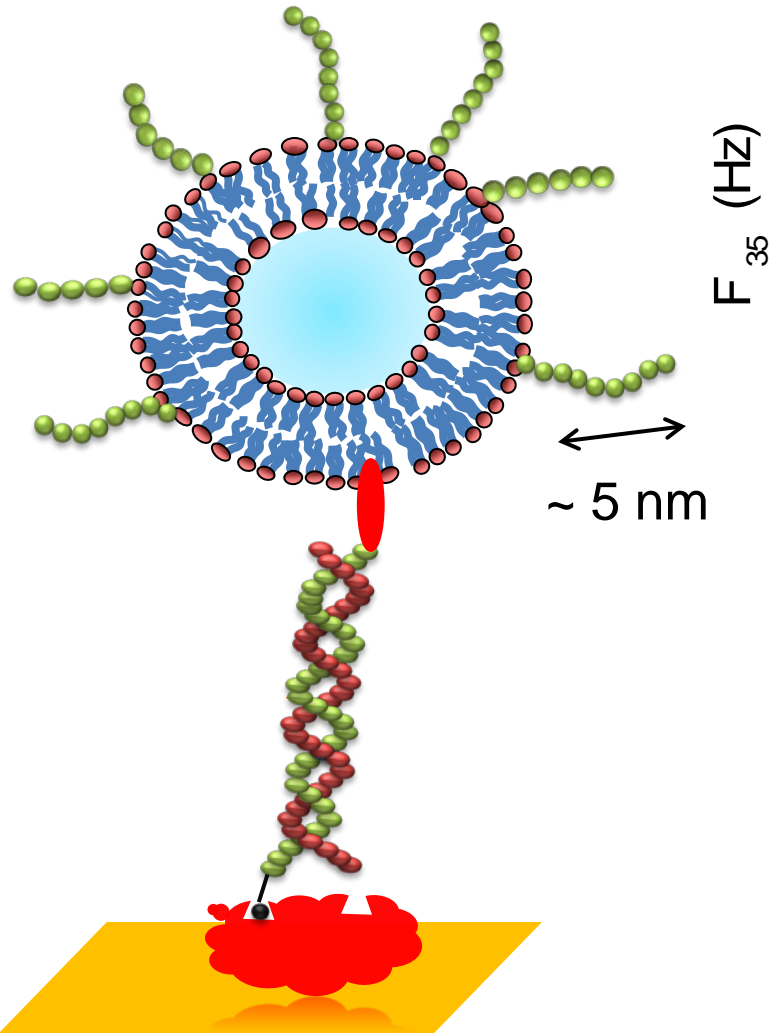


*DOPC* = -17



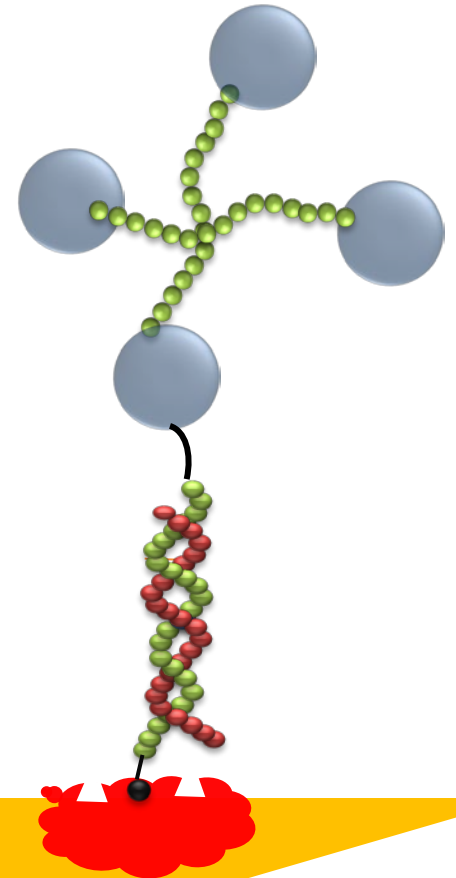
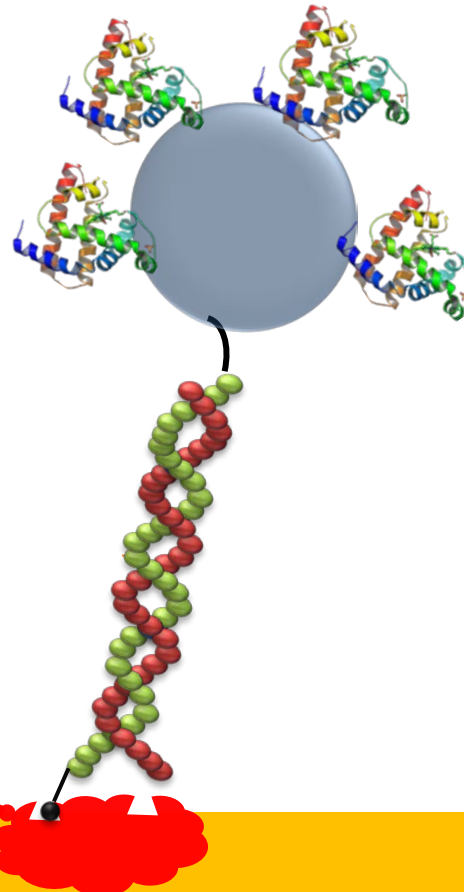
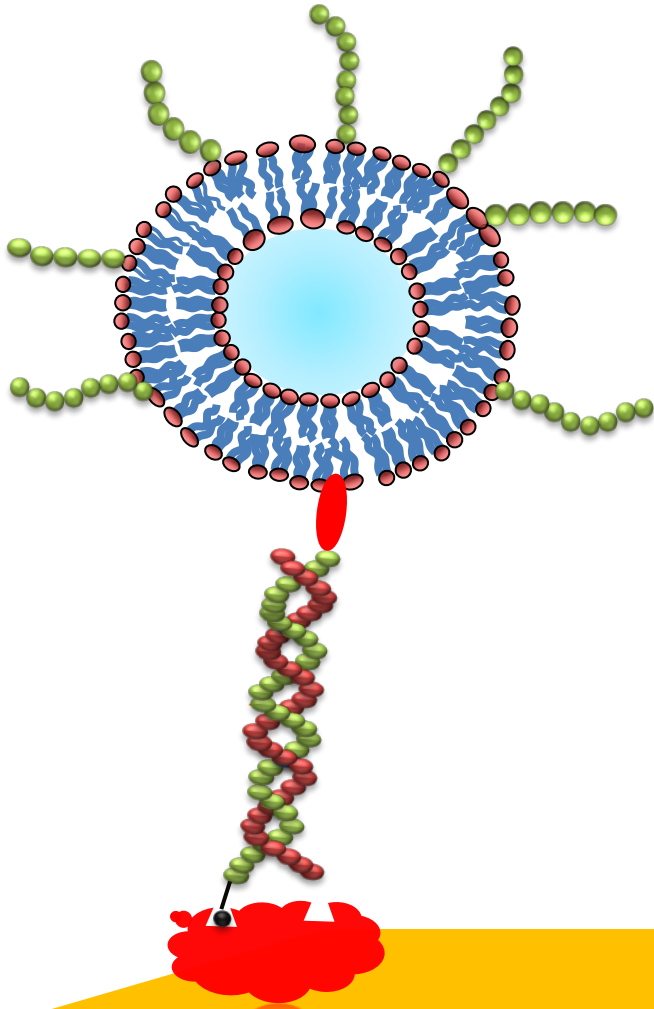
200 nm Liposomes @ 0.2 mg/mL  
on 50 bp *DNA* @ 10 pmol

...*PEG* “decoration”

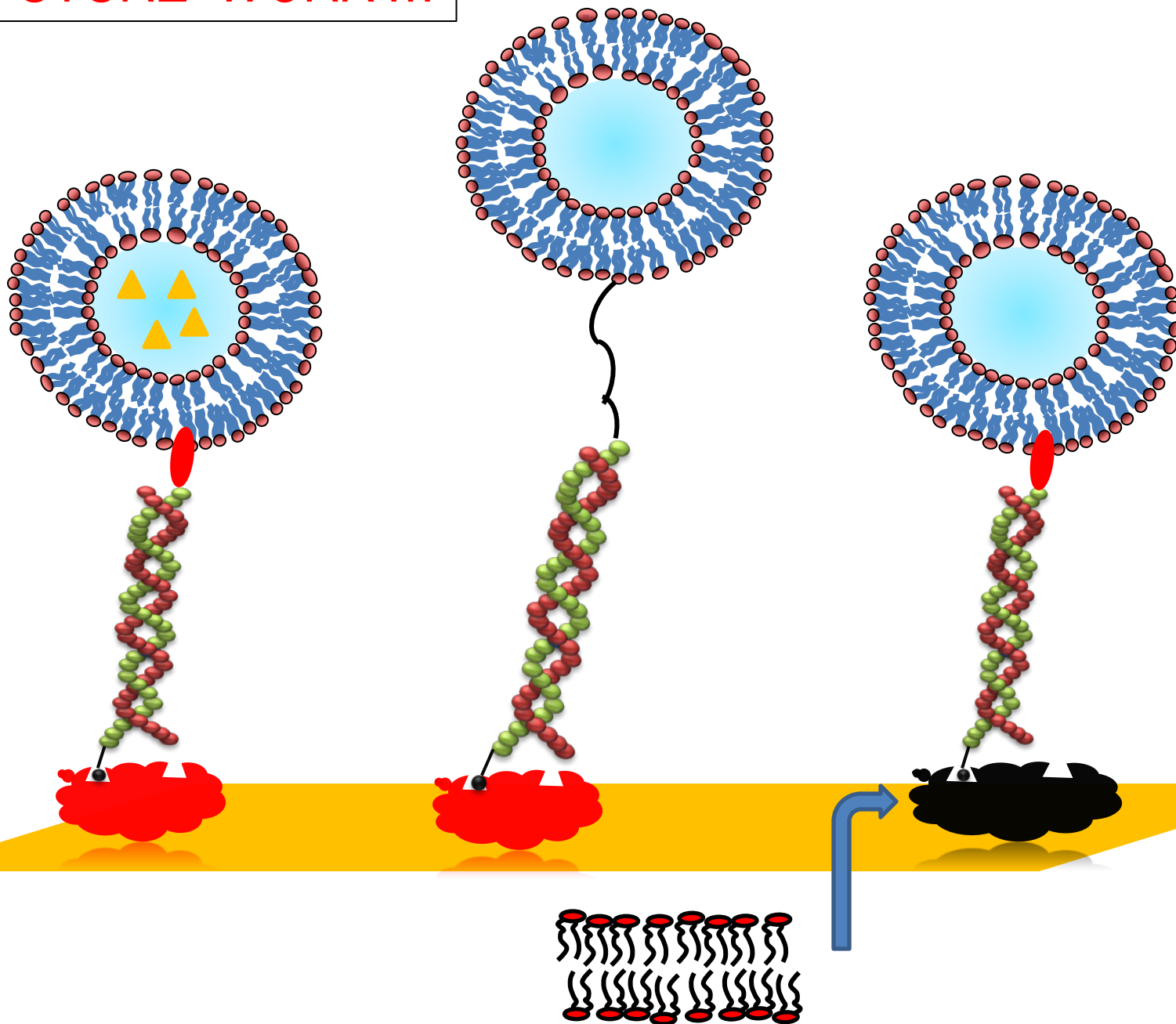


DNA = 50 bp, L = 50 nm *DOPC* (+ 0.1% *DOPE-PEG*<sub>5,000</sub>)

*... FUTURE WORK ...*



... FUTURE WORK ...



--- *Deviations* --- *Delays* --- *Problems* ---

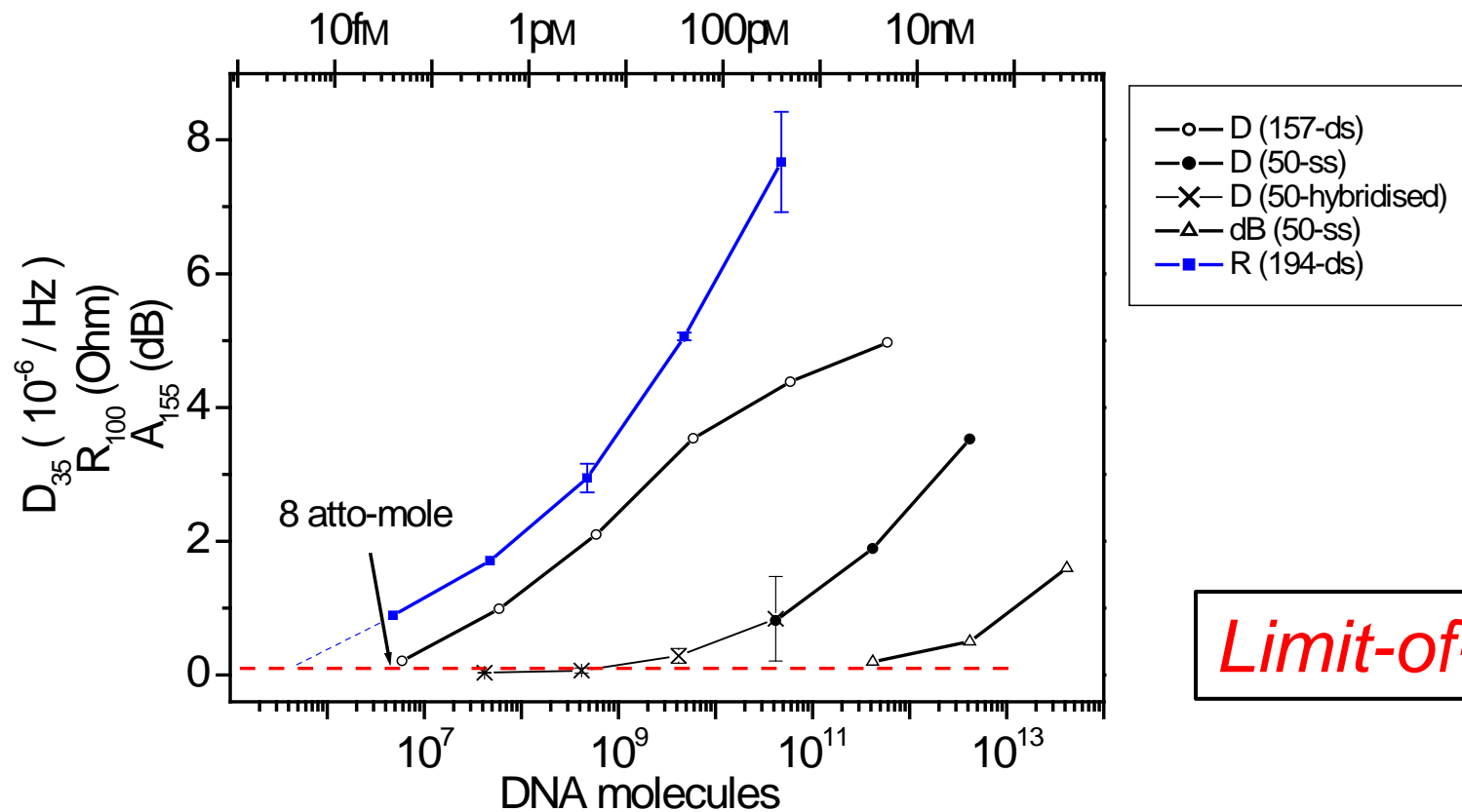
... “Avanti” → “Sigma”

*PEG* decoration → ... non-specific ?

... liposome manipulation at  $\uparrow\uparrow T$  ??







“Biophysics”



$\left\{ \begin{array}{l} \sim 6 \times 10^6 \text{ molecules} \\ \sim \times 10^5 \text{ times amplification} \end{array} \right\}$

“LCR”



$$N \sim N_o A^{99}$$



George



Dimitra



Nikoletta



Pablo

*THANK YOU*