## SUPPLEMENTARY INFORMATION

**Figure S1.** **(a)** Schematic of the experimental setup for Fluorescence Interference Contrast Microscopy (FLIC) experiments, including the supported membrane system and illustrative interference paths. As discussed in the main text, the presence of a reflective silicon substrate leads to optical interference of the excitation or emission light of a fluorophore with its reflection from the substrate, illustrated here for one pair of emission paths. **(b)** Fluorescence image of a supported monolayer consisting of 99 mol% TDM with 1 mol% Texas Red-DHPE. Each square represents a different $SiO_2$ thickness and the intensity of an individual square is determined by the interference of direct and reflected light. **(c)** Average intensity of each square versus the corresponding oxide thickness (squares) and the best-fit theoretical model curve (dashed line). The mean height of the probes above the oxide is extracted as a fit parameter.