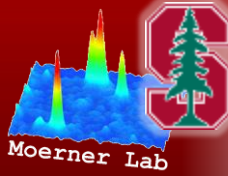
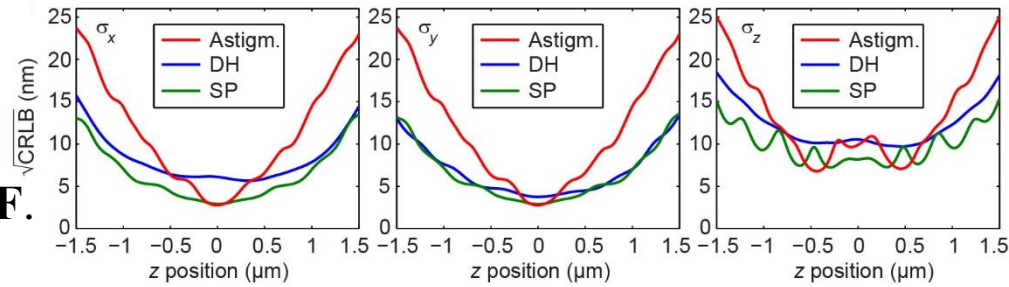


Optimal Point Spread Function Design for 3D Imaging



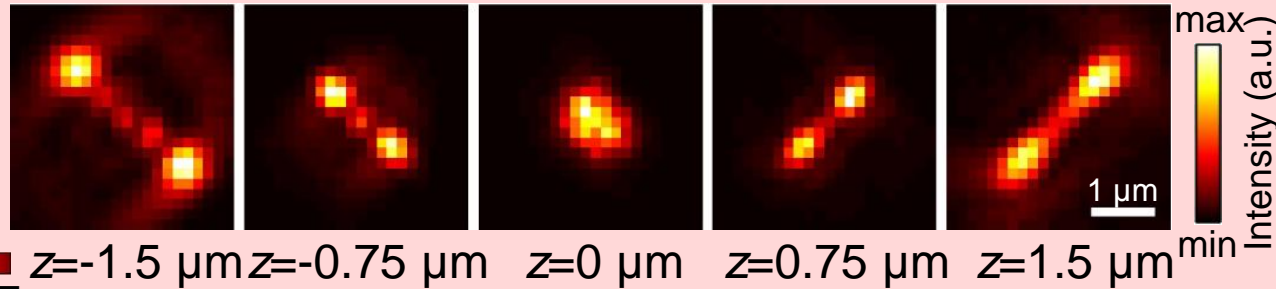
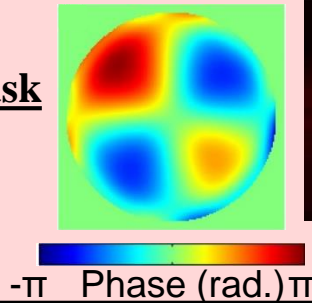
The precision to which the 3D position of an emitter can be determined, quantified by the Cramer-Rao Lower Bound (**CRLB**), is a function of **the shape of the microscope's PSF**.



We develop a framework for pupil-plane engineering, based on **maximizing the information content of the system**, by finding the pupil-plane phase pattern that would yield a PSF with **minimal CRLB**. We generate and experimentally demonstrate two example PSFs:

Saddle-point mask

Optimized for a **3 μm** z-range



Cat mask

Optimized for a **6 μm** z-range

