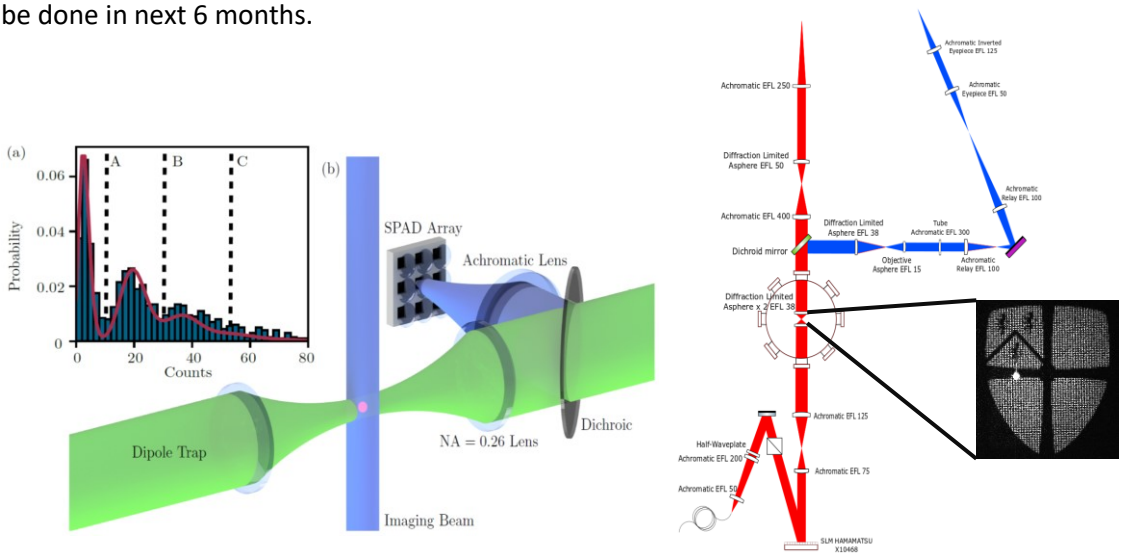
Number-resolved imaging of ^{88}Sr atoms in a long working distance optical tweezer

We demonstrate single atom imaging in a low numerical aperture (NA=0.26) 532 nm tweezer, with corresponding waist and Rayleigh length of 1.28(1) µm and 9.68(15) µm respectively. The tweezer uses a long working distance of 37mm to reduce the effects of unwanted DC Stark shifts in later work. Imaging the tweezer with a SPAD array we can image single atoms with fidelity >0.99, as well as demonstrating number resolved detection of zero, one and two atoms. This completes Task 1.1 of trapping single atoms.

For now, the system only has one (532nm) tweezer, though we are currently implementing our 813 nm (magic wavelength) 2-D array tweezer array using a SLM. This will later be combined with our existing apparatus to trap arrays of single atoms. This is work of task1.2. This task could be done in next 6 months.



The left is the setup of our system, and the result of the Number-resolved imaging. The right is the plan for creating and imaging the tweezer array, and an image of 2-D array for the Durham University logo created with our SLM.