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Towards two-dimensional quantum gases of ultracold NaCs molecules[1] NICCOLO BIGAGLI, CLAIRE WARNER, ADEN LAM, IAN STEVENSON, SEBASTIAN WILL, Columbia University — Ultracold gases of dipolar ground state molecules open up the opportunity to study many-body quantum systems with strong long-range interactions and promise to become a novel platform for quantum simulation. We are constructing a new experimental apparatus that is geared towards creating novel quantum phases in two-dimensional gases of ultracold dipolar sodium-cesium molecules. We will use static electric and microwave fields to control the dipolar interactions and engineer optical potentials with a digital micromirror device. In addition, we will implement a high-resolution imaging system to identify 2D quantum phases. In a regime where repulsive dipolar interactions dominate, the emergence of a self-organized crystalline phase is predicted. Upon reducing the interaction strength, a quantum phase transition into a dipolar superfluid is expected, as well as the possible appearance of a supersolid.

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