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Towards Scalable Generation and Control of Ultracold Singly-Trapped NaK Molecules XIU QUAN QUEK, KRISHNA CHAITANYA YELLAPRAGADA, MOHAMMAD MUJAHEED ALIYU, WEI HONG YEO, HUANQIAN LOH, Centre for Quantum Technologies, National University of Singapore — Ultracold polar molecules have been shown to possess long-lived coherent states and long-range electric dipole interactions, making them ideal candidates for applications in large-scale quantum information processing and quantum memory. The generation of these molecules involves starting from arrays of two atomic species cooled to the ground motional state of tightly focused optical dipole traps, before merging the atoms using Feshbach interactions and performing stimulated Raman adiabatic transfer into the molecular ground state. When combined with reconfigurable dipole trap arrays, a high degree of control over system Hamiltonians can be achieved, which is ideal for quantum simulation. We present the experimental progress made towards achieving this goal, primarily the efforts in cooling and trapping of single Na and K atoms for eventual generation of NaK molecules.

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