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**A Road Map to Ultracold Polyatomic Molecules** SOTIR CHERVENKOV, XING WU, JOSEF BAYERL, ANDREAS ROHLFES, BARBARA ENGLERT, ROSA GLÖCKNER, ALEXANDER PREHN, MARTIN IBRÜGGER, MARTIN ZEPPENFELD, GERHARD REMPE, Max Planck Institute of Quantum Optics, 85748 Garching, Germany — Producing ensembles of polyatomic molecules at ultracold temperatures is a challenge. In pursuit of this goal, we propose a very general scheme combining sequentially three promising techniques. First, high-flux continuous supersonic beams of internally cold polar molecules are produced from a buffer-gas cell [1,2] operated in hydrodynamic regime. Then those beams are guided in an electrostatic guide [3] and decelerated by the centrifugal potential in a rotating frame. The decelerated beams are delivered to an electrostatic trap, where the molecules are further cooled down via a Sisyphus process [4] employing laser, microwave, and radiofrequency radiation. Here we demonstrate experimental results from the three techniques and give evidence for the viability of their joint operation en route to achieving sub-milliKelvin ensembles of polyatomic polar molecules.

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[4] M. Zeppenfeld et al., Nature **491**, 570 (2012)

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