LASER COOLED MOLECULES FOR TESTS OF FUNDAMENTAL PHYSICS

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Ultracold polar molecules are a powerful platform for precision measurements and tests of physics beyond the Standard Model. There has been huge effort and progress over recent years to produce, trap and control ultracold molecules. I will present an overview of the current status of the field and discuss recent developments at Imperial College London. In our experiments, pulses of CaF molecules from a cryogenic source\(^1\) are slowed to low speed by frequency-chirped laser slowing\(^2\), captured in a magneto-optical trap\(^3\), then cooled to low temperature in two steps, first to 55 µK using a blue-detuned optical molasses\(^4\), then to 5 µK using velocity-selective dark states\(^5\). We prepare the molecules in a single quantum state and trap them in a magnetic quadrupole trap\(^6\).

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5 L. Caldwell et al., arXiv:1812.07926.