Bose-Einstein Condensation of Dipolar Molecules

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Atomic Bose-Einstein condensates (BECs) opened the fields of quantum simulation, quantum computation, and precision measurement with neutral atoms. Similarly, the recent realization of the first BEC of dipolar molecules [1] promises a far-reaching impact on the field of molecular quantum science. Here, we report on our experimental approach to creating molecular BECs, including recent improvements that led to a high evaporation efficiency > 2.5 and BECs with more than 1000 condensed molecules. Furthermore, we report on thermodynamic properties of the BEC, such as critical temperature, expansion energy, and BEC fraction, which are significantly impacted by the strong hard-core collisional potential between the molecules.

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References

[1] N. Bigagli, W. Yuan, S. Zhang, B. Bulatovic, T. Karman, I. Stevenson and S. Will, *Nature* **631**, 289–293 (2024).