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Precision spectroscopy of ultracold fermions in a triangular optical lattice CHRISTOF WEITENBERG, NICK FLAESCHNER, DOMINIK VOGEL, FRIEDER FROEBEL, JASPER KRAUSER, JANNES HEINZE, KLAUS SENGSTOCK, CHRISTOPH BECKER, Institute of Laser Physics, University of Hamburg — Ultracold fermions in optical lattices provide an ideal testing ground for solid-state theories due to the high experimental control and wide range of tunable parameters. It is of substantial interest to probe the elementary excitation spectrum and to measure both the band structure and the filling of the lowest bands. In this talk, we present measurements of the full two-dimensional band structure of ultracold fermions in a triangular lattice using a versatile, fully momentum-resolved spectroscopy method based on lattice amplitude modulation. Our newly implemented lattice setup allows us to tune the tunneling matrix elements in each lattice direction independently. In combination with the high precision of the spectroscopy technique, this is promising for engineering and investigating novel lattice systems with interacting fermionic spin-mixtures and non-equilibrium phenomena in exotic lattice geometries including strong artificial gauge fields.

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