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**Dynamics and Interaction of Quantized Vortex Lines in Trapped Bose-Einstein Condensates** FRANCO DALFOVO, SIMONE SERAFINI, ELENA ISENI, TOM BIENAIMÉ, RUSSELL N. BISSET, GIACOMO LAMPORESI, GABRIELE FERRARI, INO-CNR BEC Center and Dipartimento di Fisica, Università di Trento, 38123 Trento, Italy, LUCA GALANTUCCI, CARLO F. BARENGHI, JQC Durham–Newcastle, and School of Mathematics and Statistics, Newcastle Univ., Newcastle upon Tyne, NE1 7RU, UK — We report experimental and numerical observations of the dynamics and the interaction of 3D quantum vortex filaments in a cigar-shaped atomic Bose–Einstein condensate. Vortices are spontaneously created by the Kibble-Zurek mechanism by quenching the system across the BEC transition. We then use an innovative imaging technique which exploits self-interference effects of out-coupled atoms in order to extract both the position and orientation of vortex lines from a temporal sequence of absorption images. We combine experiments and numerical Gross-Pitaevskii simulations to study the interaction between two vortices approaching at various relative speeds and angles. We show that the interaction between vortex lines in a finite system is rather different from the one in infinite uniform superfluids. In particular, the presence of boundaries induce new effects, such as rebounds, double reconnections, and ejections. These processes may play an important role in the dynamics of trapped condensates in multi-vortex and turbulent-like configurations, and, on a wider perspective, they can represent novel keys for better understanding the behavior of superfluids near boundaries.

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