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Quench dynamics and Townes soliton formation in two-dimensional Bose gases[1] CHENG-AN CHEN, CHEN-LUNG HUNG, Purdue University — Predicting the evolution of many-body systems under attractive interactions is a challenging task, owing to the instability to collapse. Bright solitons are remarkable stationary states, established when the self-focusing effect responsible for collapse is exactly compensated by the wave dispersion. In two-dimensional (2D) Bose gases, however, such intricate balance cannot be fulfilled except at a critical norm known as the Townes threshold only at which matter-wave bright solitons can form. By quenching the atomic interaction from repulsive to attractive via a Feshbach resonance [2], we report the observation of Townes solitons formation through the manifestation of modulational instability that results in the amplification of density wave disturbances and fragmentation of a 2D sample. Our high-resolution density measurements in space and time domain reveal detailed information about the formation process, and demonstrate multiple universal behaviors in association with the formation of a stationary state in an attractive many-body system.

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[2]Cheng-An Chen and Chen-Lung Hung, **arXiv**:1907.12550 (2019).

Cheng-An Chen
Purdue University

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