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(G*) (POS-3) Quantum catastrophes in a rotating Bose-Einstein condensate

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We consider a dilute gas of bosons in a slowly rotating toroidal trap, focusing on the two-mode regime consisting of a non-rotating mode and a rotating mode corresponding to a single vortex. With the help of the single-particle density matrix we track the presence of Bose-condensates in this system which can occur in one mode, both modes or superpositions of the two. We also compare an enhanced mean-field theory which uses the truncated Wigner approximation comprising multiple classical trajectories with a fully quantum many-body description. Following a sudden quench, we find quasi-periodic dynamics where the condensates oscillate between the modes and identify cusp-shaped structures in the wavefunction as quantum versions of elementary catastrophes.

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