

A sonic black hole in a density-inverted Bose-Einstein condensate

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Abstract:

We have created the analogue of a black hole in a Bose-Einstein condensate. In this sonic black hole, sound waves, rather than light waves, cannot escape the horizon. The black hole is realized via a counterintuitive density inversion, in which an attractive potential creates a region of low density. This allows for measured flow speeds which cross and exceed the speed of sound by an order of magnitude. The Landau critical velocity is therefore surpassed. The point where the flow speed equals the speed of sound is the sonic horizon. The effective gravity is determined from the profiles of the velocity and speed of sound.