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Relativistic Bondi Accretion and the BEC Dark Matter Spike

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We consider the spike mass density profile in a dark halo by self-consistently solving the relativistic Bondi accretion of dark matter onto a non-spinning black hole. We assume that the dark matter in the halo forming a Bose-Einstein condensate (BEC) is described by a self-interacting scalar field. In the hydrodynamic limit, we find that the accretion rate has a lower bound. The spike density profile can be solved piecewise, and the power-law index of the profile is less cuspy compared to the density profiles of dark matter models with Coulomb-like self-interaction.

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