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Early clustering of dark matter particles around primordial black holes: density profiles and signatures

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Primordial black holes may have been produced in the early stages of the universe, after cosmic inflation. If so, dark matter in the form of elementary particles can be subsequently accreted around these objects, in particular when it gets non-relativistic and further streams freely in the primordial plasma. A dark matter mini-spike builds up gradually around each black hole, with density orders of magnitude larger than the cosmological one. The radial profile of this mini-spike depends sensitively on black hole mass, dark matter particle mass and temperature of kinetic decoupling. It exhibits a rich variety of behaviors which I will discuss. Dark matter spikes subsequently annihilate and leave potentially detectable signatures, such as anomalous anisotropies in the cosmic microwave background (CMB). I will discuss how CMB observations constrain the early dressing of primordial black holes by particle dark matter.

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