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## Superradiant pion clouds around primordial black holes

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We show that highly spinning primordial black holes of mass  $M \sim 10^{12}$  kg, potentially born in a matter-dominated era after inflation, can produce clouds of pions in their vicinity via the superradiant instability, with densities up to that of nuclear matter. We discuss the electromagnetic signatures of this process, via neutral pion decay and charged pion annihilation into photons, computing in particular their contribution to the isotropic gamma-ray background. This allows us to place upper bounds on the abundance of such primordial black holes that are comparable to the ones obtained from Hawking evaporation. We also discuss the possibility of directly observing such clouds in high-redshift superclusters.

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