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Direct Collapse Black Holes from Dark Matter Annihilation

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Pre-stellar galactic halos are highly sensitive to soft radiation: the presence of sources of O(10 eV) Lyman-Werner radiation changes the gas chemistry and prevent the standard fragmentation of the gas. Rather than producing Population III stars, this may instead lead to direct collapse black holes. Observations of supermassive black holes at high redshift have long been suspected to be evidence for direct collapse black holes. Recent studies have explored the possibility that direct collapse may be influenced by new particle physics.

We present a simple dark matter model where resonant annihilation can dissociate molecular hydrogen and discuss the assumptions that are necessary to induce direct collapse black holes. In these models, O(10 MeV) dark matter annihilates into electron-positron pairs which produce Lyman-Werner radiation by inverse Compton scattering CMB light. We present a self-consistent modeling of H2 self-shielding that highlights the challenges when building models for direct collapse.

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