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# Nonthermal Dark Matter from Early Matter Domination

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# Nonthermal Dark Matter from Early Matter Domination

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Dark matter (DM) production in the early universe traditionally assumes a standard thermal history where the universe is in a radiation-dominated phase after the end of inflation until matter-radiation equality. However, the presence of additional scalar fields (which is a generic prediction of explicit string constructions) can lead to an epoch of early matter domination (EMD) that ends before the onset of big bang nucleosynthesis. Such an EMD phase has important cosmological consequences and renders thermal production of DM irrelevant. We present three scenarios for DM production involving an era of EMD: evaporation of primordial black holes into DM, DM freeze-out/in in the presence of two scalar fields, and production of PeV scale magnetic monopoles during EMD. These scenarios can reproduce the observed abundance of DM, and illustrate the diverse range of possible non-thermal mechanisms involving non-standard thermal histories.