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Low Mass Black Holes from Dark Core Collapse

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Unusual masses of black holes being discovered by gravitational wave experiments pose fundamental questions about the origin of these black holes. Black holes with masses smaller than the Chandrasekhar limit $\approx 1.4 M_{\odot}$ are essentially impossible to produce through stellar evolution. We propose a new channel for production of low mass black holes: stellar objects catastrophically accrete nonannihilating dark matter, and the small dark core subsequently collapses, eating up the host star and transmuting it into a black hole. The wide range of allowed dark matter masses allows a smaller effective Chandrasekhar limit and thus smaller mass black holes. We point out several avenues to test our proposal, focusing on the redshift dependence of the merger rate. We show that redshift dependence of the merger rate can be used as a probe of the transmuted origin of low mass black holes.

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