Abstract Submitted
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Disentangling the potential dark matter origin of LIGO's black holes[1] RYAN MAGEE, CHAD HANNA, Penn State University — The nature of the dark matter remains an unsolved mystery of physics. LIGO's recent detections of gravitational waves from binary black hole coalescences have restored interest in the possibility that dark matter could be comprised solely of primordial black holes. Astrophysical constraints suggest that primordial black holes of mass comparable to those already detected by LIGO (above $\sim 10M_{\odot}$) cannot account for all of the dark matter. At lower masses, constraints found by microlensing surveys dominate, though these surveys have claimed conflicting results. We consider a primordial black hole mass distribution that accounts for all of the dark matter while remaining consistent with LIGO's observations arising from primordial black hole binaries and with microlensing constraints. We find that this distribution also makes an interesting prediction: that $\sim 1\%$ of the black holes LIGO observes will have masses less than the mass of our Sun and $\sim 10\%$ will exist within the mass gap. Advanced LIGO's enhanced sensitivity will allow a $\sim 50\%$ chance of detecting 100 binary black hole mergers, and a search for black holes below one solar mass-which otherwise have no known astrophysical formation mechanism-could allow LIGO to pin down the nature of dark matter.

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