

Abstract Submitted  
for the APR18 Meeting of  
The American Physical Society

**Post-Newtonian Dynamics in Dense Star Clusters** CARL RODRIGUEZ, Massachusetts Inst of Tech-MIT, PAU AMARO-SEOANE, Universitat Autònoma de Barcelona, Chinese Academy of Sciences, Zentrum für Astronomie und Astrophysik, SOURAV CHATTERJEE, FREDERIC RASIO, Northwestern University — We present models of realistic globular clusters with post-Newtonian dynamics for black holes. By modeling the relativistic accelerations and gravitational-wave emission in isolated binaries and during three- and four-body encounters, we find that nearly half of all binary black hole mergers occur inside the cluster, with about 10% of those mergers entering the LIGO/Virgo band with eccentricities greater than 0.1. In-cluster mergers lead to the birth of a second generation of black holes with larger masses and high spins, which, depending on the black hole natal spins, can sometimes be retained in the cluster and merge again. As a result, globular clusters can produce merging binaries with detectable spins regardless of the birth spins of black holes formed from massive stars. These second-generation black holes would also populate any upper mass gap created by pair-instability supernovae.

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Date submitted: 16 Jan 2018

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