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Binary Black Holes produced in Globular Clusters CARL RODRIGUEZ, MEAGAN MORSCHER, BHARATH PATTABIRAMAN, SOURAV CHATTERJEE, FRED RASIO, Northwestern University — The mergers of binary black holes will be one of the most promising sources for gravitational-wave astronomy; however, the number of sources expected to form dynamically within the dense environments of globular clusters is highly uncertain. We use a Monte Carlo technique to explore the stellar dynamics of globular clusters. This approach can model systems with $\sim 10^6$ stars and realistic stellar physics, enabling the study of even the most massive of galactic globular clusters. We have produced a collection of globular cluster models with structural properties similar to those observed in the Milky Way. We explore the population of binary black holes produced in these models, including the distribution of masses, semi-major axes, and eccentricities. We find that a typical Milky Way globular cluster can produce hundreds of black hole binaries, several tens of which will coalesce within one Hubble time. We use these models to simulate the globular cluster population of a single Milky Way-equivalent galaxy, providing us with the first realistic merger rate of dynamically formed binary black holes in the local universe.

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