Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Relativistic Three-body Effects in Hierarchical Triples[1] HALSTON LIM, Massachusetts Institute of Technology MIT, CARL RODRIGUEZ, Harvard — The hierarchical three-body problem has many applications in relativistic astrophysics, and is very likely to play an important role in forming binary black hole mergers detected by LIGO/Virgo. However, the majority of studies have only included relativistic corrections to the two-body equations of motion, and have ignored the relativistic effects that arise in the presence of a third body. We revisit this problem and develop a fully consistent derivation of the secular three-body problem to first post-Newtonian order. We perform a post-Keplerian, two-parameter expansion of the single orbit-averaged Lagrange planetary equations in $\delta = v^2/c^2$ and $\epsilon = a_1/a_2$, where a_1 and a_2 are the semi-major axes of the inner and outer orbit, respectively. It is well established that eccentricity growth through the Lidov-Kozai mechanism can be suppressed or amplified by two-body 1pN precession. In this study, we derive and investigate three-body 1pN effects and find that these effects lead to heightened eccentricity growth in triples in certain regions of parameter space. In such cases, inclusion of these effects can substantially alter the evolution of three-body systems as compared to an analysis in which they are neglected.

[1]NSF Grant PH-1707549

Halston Lim
Massachusetts Institute of Technology MIT

Date submitted: 07 Jan 2020 Electronic form version 1.4