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From Quarks to Cosmos

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Effects of a non-universal IMF and binary parameter correlations on compact binary merger populations

Binary population synthesis (BPS) provides a direct way of studying the effects of different choices of binary evolution models and initial parameter distributions on present-day binary compact merger (BCM) populations, which can then be compared to empirical properties such as observed merger rates. Samples of zero-age main sequence (ZAMS) binaries to be evolved by BPS codes are typically generated from a universal IMF and simple, uniform, distributions for orbital period P, mass ratio q and eccentricity e. More recently, however, mounting observational evidence has suggested the non-universality of the IMF and the existence of correlations between binary parameters. In this study, we implement a metallicity- and redshift-dependent IMF alongside correlated distributions for P, q and e in order to generate representative populations of binaries at varying redshifts, which are then evolved with the COMPAS rapid BPS code in order to study the variations in merger rates and overall population properties.

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