Eccentricity distributions of eccentric binary black holes in galactic nuclei

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Galactic nuclei are expected to be one of the main sites for formations of eccentric binary black holes (EBBHs), with an estimated detection rate of O(1-100/yr) with design aLIGO detectors. The two main formation channels of these binaries are gravitational capture and the secular Kozai-Lidov mechanism, with expectedly commensurable formation rates. In Takátsy et al. (2018) we used Monte Carlo simulations to construct the eccentricity distributions of EBBHs formed through these channels in galactic nuclei, at the time their gravitational-wave signals enter the aLIGO band at 10 Hz. We also showed that if future EBBH detection rates with aLIGO will be dominated by EBBHs formed in galactic nuclei, then the branching ratios of these two formation channels can be constrained to a 0.2 wide one-sigma confidence interval with a few tens of observations, even if parameter estimation errors on EBBH eccentricities are taken into account at realistic levels.

References

Takátsy, J., Bécsy, B., Raffai, P., *submitted to MNRAS*; eprint arXiv:1812.04012

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