**Visualizing 2PN Binary Black Hole Spin Precession**

Alicia Lima

*Mentor: Davide Gerosa*

In the post-Newtonian regime, the time it takes the two black-holes to orbit each other $t\_{orb}$ is much shorter than the time it takes the spins and the orbital angular momentum to precess about the direction of the total angular momentum $t\_{pre} $which, in turn, is much shorter than the time it takes the binary's orbit to shrink due to gravitational-wave emission$ t\_{RR}$. In short, the dynamics of precessing binary black holes has the following timescale hierarchy: $t\_{orb}\ll $ $t\_{pre}\ll t\_{RR}$ . This inequality has been exploited in [1], where it was shown that relative orientations of the three angular momenta are fully specified by the magnitude of the total spin, which oscillates on the precession time [1]. Given the variables identified in [1] that respect the timescale separation of the dynamics of precessing binary black holes ($ξ$, J, S), we build a 3D visualization routine in Python to explore the phenomenology of spin precession.

References

[1] D. Gerosa, M. Kesden, U. Sperhake, E. Berti, and R. OShaughnessy, PRD 92, 064016 (2015), arXiv:1506.03492 [gr-qc].