Contribution ID: **141** Type: **Talk**

A new instability to black-hole spin precession

Thursday 17 December 2015 14:20 (20 minutes)

We unveil a new dynamical instability in binary black holes with aligned spins. If the spin of the more massive black hole is aligned with the orbital angular momentum while the spin of the less massive black hole is anti-aligned, spins suddenly start to precess when the binary separation falls below the threshold of our newly discovered instability. This instability provides a natural channel to circumvent astrophysical spin alignment at large binary separations allowing significant spin precession prior to merger. The onset of the instability lies in the sensitivity windows of future detectors LIGO/Virgo and eLISA, thus predicting binaries that start precessing while being observed.

The instability criterion is derived with novel effective-potential methods to study the black-hole binary dynamics. We double average over both the orbital and the precessional timescale. This allows us to solve the post-Newtonian spin-precession equations analytically for arbitrary mass ratios and spins. These solutions improve our understanding of spin precession in much the same way that the conical sections for Keplerian orbits provide additional insights beyond Newton's 1/rˆ2 law.

More on arXiv:1506.09116 (PRL).

Author: GEROSA, Davide (University of Cambridge)

Presenter: GEROSA, Davide (University of Cambridge)

Session Classification: 11 - Gravitational waves