

## **A. Franchini: Electromagnetic signals from EMRIs and Massive Black Hole Binaries**

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Gravitational wave sources typically evolve in gaseous environments and it is crucial to understand what are the possible emission signatures that derive from this interaction.

We produce synthetic X-ray light curves compatible with X-ray data from the four confirmed Quasi Periodic Eruption (QPEs) sources (GSN 069, eRO-QPE1, eRO-QPE2 and RX J1301.9+2747), using a semi-analytical model based on an extreme mass-ratio inspiral (EMRI) system where the secondary intersects a rigidly precessing accretion disc surrounding the primary massive black hole. Our model reproduces the diversity of QPE properties between the considered objects well, and is also able to account naturally for the varying QPE amplitudes and recurrence times in individual sources.

We further present possible electromagnetic (EM) counterparts of merging Massive Black Hole Binaries (MBHBs) that evolve through the interaction with a gaseous circumbinary disc towards the merger, using 3D hyper-Lagrangian hydrodynamical simulations with Post-Newtonian corrections to the binary dynamics.