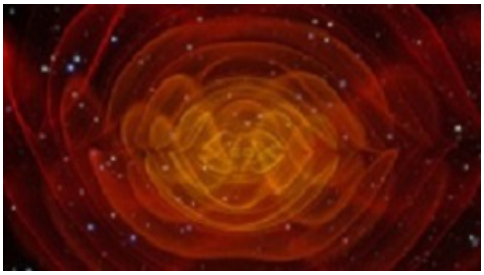

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General-Relativistic Dynamics of an Extreme Mass-Ratio Binary with an External Body

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We study the dynamics of a hierarchical three-body system in the general-relativistic regime:an extreme mass-ratio inner binary under the tidal influence of an external body.
The inner binary consists of a central Schwarzschild black hole and a test body moving around it. We discover three types of tidal effects on the orbit of the test body.
First, the angular moment of the inner binary precesses around the angular momentum of the outer binary. Second, the tidal field drives a “transient resonance” when the radial and azimuthal frequencies are commensurable.In contrast with resonances driven by the gravitational self-force, this tidal-driven resonance may boost the orbital angular momentum. Finally, as an orbit-dynamical effect during the non-resonant phase, we calculate the correction to the Innermost Stable Circular (mean) Orbit due to the tidal interaction. Hierarchical three-body systems are potential sources for future space-based gravitational wave missions and the tidal effects that we find could contribute significantly to their waveform.

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