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Self-Force in Scalar-Tensor Theories of Gravity: Perturbative Approach Beyond Linear Order (Remote)

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For precise measurements of EMRIs with LISA data, first-post-adiabatic accuracy EMRI models will be required. Great effort is being expelled in pursuing first-post-adiabatic models in General Relativity. However, to test our fundamental theory of gravity, we also need models in alternative theories. Scalar fields are ubiquitous in alternative theories of gravity. In this talk, we provide a framework for modelling EMRIs to first-post adiabatic accuracy in general scalar-tensor theories of gravity. In our perturbative approach, the background spacetime can be treated as Kerr, as discussed in the preceding talks and Ref. [PRL. 125, 141101]. Additionally, we produce an ansatz for the action of a point particle experiencing a scalar self-force. From these assumptions, we derive field equations for the metric and scalar field perturbations to second order. Moreover, we derive the equations of motion of the compact object to second order. Crucially, our formalism builds on inputs from the General Relativity calculation, and the additional contributions are no more challenging to calculate than the General Relativity self-force contributions.

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