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Regularization of fields for self-force problems in curved spacetime: foundations and a time-domain application IAN VEGA, STEVEN DETWEILER, University of Florida — We report on recent tests of a new approach towards the calculation of self-forces and waveforms arising from moving point charges in curved spacetimes. As opposed to mode-sum schemes that regularize the self-force derived from the singular retarded field, this approach regularizes the retarded field itself. The singular part of the retarded field is first analytically identified and removed, yielding a finite, differentiable remainder from which the self-force is easily calculated. This regular remainder satisfies an effective wave equation which enjoys the benefit of having a non-singular source. Our method of field regularization then involves directly solving this effective wave equation for the remainder, which avoids the difficulties associated with numerical models for singular sources, while providing easy access to the self-force on the charge without the need for further regularization or slowly-convergent mode sums. In this talk, we shall discuss our preliminary implementation of this method using a 4th-order (1+1) code applied to the simple case of a scalar charge moving in a circular orbit around a Schwarzschild black hole. Comparisons with highly-accurate, frequency-domain results indicate agreement to $\sim 0.1\%$.

Ian Vega
University of Florida

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