Conformal-thin-sandwich initial data for a
Pablo Laguna Center for Gravitational Physics and Geometry,
abstract Sequences of initial-data sets representing binary black holes in quasi-circular orbits have been used to calculate what may be interpreted as the innermost stable circular orbit. These sequences have been computed with two approaches. One method is based on the traditional conformal-transverse-traceless decomposition and locates quasi-circular orbits from the turning points in an effective potential. The second method uses a conformal-thin-sandwich decomposition and determines quasi-circular orbits by requiring the existence of an approximate helical Killing vector. Although the parameters defining the innermost stable circular orbit obtained from these two methods differ significantly, both approaches yield approximately the same initial data, as the separation of the binary system increases. To help understanding this agreement between data sets, we consider the case of initial data representing a single boosted or spinning black hole puncture of the Bowen-York type and show that the conformal-transverse-traceless and conformal-thin-sandwich methods yield identical data, both satisfying the conditions for the existence of an approximate Killing vector.