

FIG. 10: The $\ell = 5$ multipole projections, for initial data of a pure monopole field as functions of time. Shown are the fields with three different grid densities, $64K \times 64$ (dash-dotted curve), $80K \times 80$ (dashed curve), and $100K \times 100$ (solid curve). The inserts show the same for segments of the full data, in addition to a reference curve $\sim t^{-9}$.

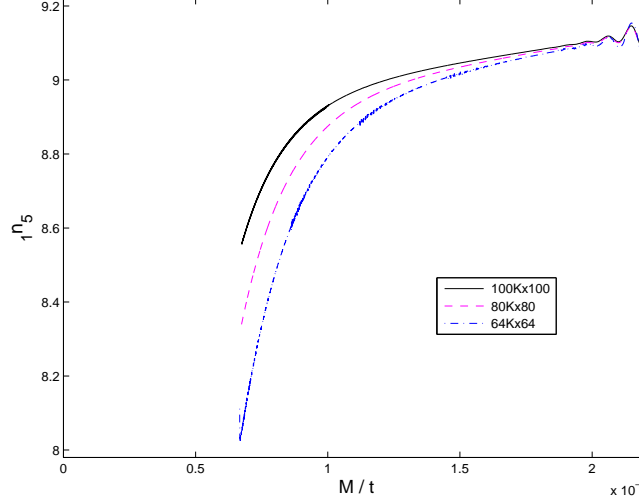


FIG. 11: The local power index ${}_1n_5$ as a function of the time t for three grid resolutions, $64K \times 64$ (dash-dotted curve), $80K \times 80$ (dashed curve), and $100K \times 100$ (solid curve).

In Fig. 12 we show the fields for $m = 1$ and $m = 2$ modes that are created by an initial octupole and excites all odd ℓ modes. Specifically, we show the $\ell = 3, 5$ projections for both m values. We also show the full fields for both m values. Notably, for the case $m = 1$ the dipole mode is also excited, and eventually dominates the full field at late times. In the $m = 2$ case the smallest ℓ -mode that is excited is the octupole, such that the full field in the $m = 2$ case decays more rapidly than in the $m = 1$ case. We also show the local power indices in Fig. 13. The late time values of the local power indices for each projected ℓ mode approach the same values independently of the value of m , in accordance with Eq. (3).

In Table IV we re-organize the data appearing in Tables I, II, and III, so that the m -independence of the power-law indices is brought out in a sharper way. Specifically, the late-time decay rates for any allowed excited ℓ' mode from an initial ℓ mode is independent of the value of m in all the cases we have examined.