General Relativity and Quantum Cosmology

Evolution of near-extremal-spin black holes using the moving puncture technique

Yuk Tung Liu, Zachariah B. Etienne, Stuart L. Shapiro

(Submitted on 22 Jan 2010)

We propose a new radial coordinate to write the Kerr metric in puncture form. Unlike the quasi-radial coordinate introduced previously, the horizon radius remains finite in our radial coordinate in the extreme Kerr limit a/M -> 1. This significantly improves the accuracy of the evolution of black holes with spins close to the extreme Kerr limit. We are able to evolve accurately both stationary and boosted black holes with spins as high as a/M=0.99 using initial data constructed in these new puncture coordinates. Initial data of compact binaries with rapidly spinning black holes can be constructed using our proposed new puncture metric for the background conformal metric. Our simulations for single black holes suggest that such initial data can be evolved successfully by the moving puncture technique.

Comments:	6 pages, 5 figs
Subjects:	**General Relativity and Quantum Cosmology (gr-qc)**; High Energy Astrophysical Phenomena (astro-ph.HE)
Journal reference:	Phys.Rev.D80:121503,2009
DOI:	10.1103/PhysRevD.80.121503
Cite as:	**arXiv:1001.4077v1 [gr-qc]**

Submission history

From: Yuk Tung Liu [view email]
[v1] Fri, 22 Jan 2010 21:00:08 GMT (24kb)

Which authors of this paper are endorsers?