Abstract Submitted
for the APR15 Meeting of
The American Physical Society

Nearly extremal apparent horizons in simulations of merging black holes GEOFFREY LOVELACE, California State University Fullerton, MARK SCHEEL, California Institute of Technology, ROBERT OWEN, Oberlin College, MATTHEW GIESLER, California Institute of Technology, REZA KATEBI, California State University Fullerton, BELA SZILAGYI, California Institute of Technology, TONY CHU, University of Toronto, NICHOLAS DEMOS, California State University Fullerton, DANIEL HEMBERGER, California Institute of Technology, LAWRENCE KIDDER, Cornell University, HARALD PFEIFFER, University of Toronto, NOUSHA AFSHARI, California State University Fullerton, SXS COLLABORATION — The spin S of a Kerr black hole is bounded by the surface area A of its apparent horizon: $8\pi S \leq A$. We present recent results (arXiv:1411.7297) for the extremality of apparent horizons for merging, rapidly rotating black holes with equal masses and equal spins aligned with the orbital angular momentum. Measuring the area and (using approximate Killing vectors) the spin on the individual and common apparent horizons, we find that the inequality $8\pi S < A$ is satisfied but is very close to equality on the common apparent horizon at the instant it first appears—even for initial spins as large as $S/M^2 = 0.994$. We compute the smallest value e_0 that Booth and Fairhurst's extremality parameter can take for any scaling of the horizon's null normal vectors, concluding that the common horizons are at least moderately close to extremal just after they appear. We construct binary-black-hole initial data with marginally trapped surfaces with $8\pi S > A$ and $e_0 > 1$, but these surfaces are always surrounded by apparent horizons with $8\pi S < A$ and $e_0 < 1$.

Geoffrey Lovelace
California State University Fullerton

Date submitted: 09 Jan 2015 Electronic form version 1.4