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Testing the Hyperbolic-Algebraic Initial Data for Static and Boosted Black Holes[1] MARIA BABIUC HAMILTON, Marshall University, JEFFREY WINICOUR, University of Pittsburgh — The LIGO/Virgo collaboration, now in the third observation run, reports gravitational waves (GW) at a rate of one detection every few days. Binary black holes are primary sources of GW, and their dynamics is described by the Einstein Equations of general relativity. This problem is unsolved analytically and is numerically challenging. Although when given correct initial data the equations yield the expected solution, they are sensitive to numerical errors and could lead to wrong spacetimes. Standard techniques for constructing initial data use elliptic equations that require inner boundary conditions and are prone to nonphysical radiation. Based on a method proposed by I. Racz, we developed recently A-HyperSolID, a code that calculates Algebraic-Hyperbolic Solutions for Initial Data describing black hole spacetimes in stereographic coordinates on a logarithmic grid. With this code, we reported 4th order convergence for the Hamiltonian and momentum constraints corresponding to the Schwarzschild black hole metric. Here we present new results obtained by testing the code with the boosted Schwarzschild black hole metric for velocities near the speed of light. We then use the generated initial data to evolve a static and a boosted black hole, and analyze the initial radiation content.

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