Abstract Submitted
for the APR21 Meeting of
The American Physical Society

BlackHoles@Home: Numerical Relativity on Consumer-Grade Computers, for the Benefit of Gravitational Wave Astronomy[1]
ZACHARIAH ETIENNE, West Virginia University — Much of gravitational wave (GW) science depends on GW observations being compared with millions of theoretical predictions generated by GW approximants. Our most reliable approximants are built upon GW catalogs extracted from numerical relativity (NR) simulations, which solve Einstein's equations in full. To date each of these NR simulations has required a small computing cluster, which has limited throughput to only about 3,000 GWs in 15 years. Given the vast parameter space of even the simplest observed GW source—binary black holes (BBHs)—such a small GW collection threatens potential science gains from future GW observations. BlackHoles@Home is a proposed BOINC-based citizen-science project leveraging new techniques to fit NR BBH simulations on a consumer-grade desktop computer, enabling GW follow-ups and catalogs with unprecedented throughput using volunteer computers. We recently demonstrated that our techniques enable the final orbits of a BBH and post-merger to be calculated on a cellphone in full NR, with accurate GWs. We report on our latest improvements, which indicate we are on track to launch BlackHoles@Home within months.

[1]NSF PHY-1806596

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Date submitted: 08 Jan 2021 Electronic form version 1.4