Abstract Submitted
for the APR21 Meeting of
The American Physical Society

3D-GRMHD Simulations of Binary Supermassive Black Holes: Light curves and behavior during inspiral MARK AVARA, IoA, Univ of Cambridge, DENNIS BOWEN, LANL, MANUELA CAMPANELLI, RIT, SCOTT NOBLE, NASA Goddard, JULIAN KROLIK, Johns Hopkins University, VASSILIOS MEWES, ORNL — While many promising candidate accreting binary supermassive black hole systems have been identified, more comprehensive and realistic physical models of these systems will be necessary to confirm their identity. Unfortunately, the large range of temporal and physical scales have made their simulation in full 3D-MHD prohibitive. Here we present new 3D-GRMHD simulations that extend to 10s of binary orbits in duration, made possible via the enhanced numerical efficiencies of the multi-mesh/multi-physics code PatchworkMHD. These simulations demonstrate a number of key advances capturing realistic physical behavior including evolution of the entire central cavity and resolving the black hole horizons where acceleration of jets and winds can occur due to black hole spin. We report unexpected 3D hydrodynamical behavior, the evolution and importance of magnetic fields, and early results from radiative post-processing which provides spectra and light curves. Finally, we describe our next steps towards a future database of synthetic light curves, images, and spectra that can be used with new observational resources, especially in the time-domain, to confirm the identity of supermassive black hole binaries and fix those systems as a cornerstone in the multi-messenger era.

Mark Avara
Univ of Cambridge

Date submitted: 10 Jan 2021 Electronic form version 1.4