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Prompt Electromagnetic Transients from Binary Black Hole Mergers BERNARD KELLY, University of Maryland Baltimore County, NASA Goddard Space Flight Center, JOHN BAKER, NASA Goddard Space Flight Center, ZACHARIAH ETIENNE, West Virginia University, BRUNO GIACOMAZZO, University of Trento, JEREMY SCHNITTMAN, NASA Goddard Space Flight Center — Binary black hole (BBH) mergers provide a prime source for current and future interferometric GW observatories. Massive BBH mergers may often take place in plasma-rich environments, leading to the possibility of a concurrent EM signal observable by traditional astronomical facilities. However, many critical questions about the generation of such counterparts remain unanswered. We explore mechanisms that may drive EM counterparts with magnetohydrodynamical simulations treating a range of scenarios involving equal-mass BH binaries immersed in an initially homogeneous fluid with uniform, orbitally aligned magnetic fields. We find that the time development of Poynting luminosity, which may drive jet-like emissions, is relatively insensitive to aspects of the initial configuration. In particular, over a significant range of initial values, the central magnetic field strength is effectively regulated by the gas flow to yield a Poynting luminosity of $10^{45} - 10^{46}(\rho/10^{-13}\mathrm{g\,cm^{-3}})M_8^2\mathrm{erg\,s^{-1}}$. We also calculate the direct plasma synchrotron emissions processed through geodesic ray-tracing. Despite lensing effects and dynamics, we find the observed synchrotron flux varies little leading up to merger.

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