

Abstract Submitted
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Tendex and Vortex Lines of Black Hole Spacetimes AARON ZIMMERMAN, DAVID NICHOLS, Caltech, ROB OWEN, Cornell, FAN ZHANG, Caltech, JEANDREW BRINK, National Institute for Theoretical Physics, Stellenbosch, South Africa, YANBEI CHEN, JEFFREY KAPLAN, Caltech, GEOFFREY LOVELACE, Cornell, KEITH MATTHEWS, MARK SCHEEL, KIP THORNE, Caltech — In a 3+1 split of spacetime, the Riemann curvature tensor is completely characterized by two symmetric, trace-free tensors: the tidal field and the frame-drag field. The eigenvalues and eigenvectors of these tensors characterize them completely, and the streamlines of the eigenvector fields provide a set of six field lines, called the tendex and vortex lines of the spacetime. These lines are directly analogous to the more familiar electric and magnetic field lines, and they provide a visual representation of the preferred directions of stress and frame dragging in a spacetime. I will review the theory of vortex and tendex lines, and discuss their application to the study of black hole spacetimes. In particular, I compare the tendex and vortex lines of a Kerr black hole in several gauges.

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