Abstract Submitted
for the APR15 Meeting of
The American Physical Society

The Eikonal Quasinormal Modes of Kerr-Newman Black Holes ZACHARY MARK, Caltech, HUAN YANG, Perimeter Institute, AARON ZIMMERMAN, CITA, YANBEI CHEN, Caltech — Due to the complicated coupling between gravity and electromagnetism near a Kerr-Newman black hole, a master, separable equation governing gravitational or electromagnetic perturbations has yet to be discovered, impeding efforts to calculate the quasinormal modes of perturbed black holes with arbitrary spin and charge. Instead, gravitational and electromagnetic perturbations are found to obey a pair of coupled, partial differential equations. To study the quasinormal modes, we examine these equations in the eikonal limit (where the waves are rapidly changing in space and time) via a newly developed WKB technique capable of handling coupled wave equations. Surprisingly, it turns out that an approximate master equation introduced by Dudley and Finley provides an accurate description of perturbations in the eikonal regime. These techniques allow the "geometric correspondence" between quasinormal modes and photon geodesics that is known to be true for Kerr black holes to be extended to Kerr-Newman black holes.

Zachary Mark
Caltech

Date submitted: 09 Jan 2015 Electronic form version 1.4