Abstract Submitted
for the APR14 Meeting of
The American Physical Society

Wavefront twisting by rotating back holes: orbital angular momentum generation and phase coherent detection HUAN YANG, Perimeter Institute for Theoretical Physics — In this work we study the wave propagation and scattering near a rotating black hole. In particular, we assume a coherent emission source near the black hole, and investigate the wavefront distortion as seen by a distant observer. Near the observer, the propagating wave can be decomposed using the Laguerre-Gaussian mode basis, and its wavefront distortion can be characterized by the decomposition coefficient. We find that this decomposition spectrum is symmetric for wave sources located near a Schwarzschild black hole, but is generically asymmetric if the host black hole is rotating. The spectrum asymmetry, or the net orbital angular momentum carried by the wave, is intimately related with the black hole spin, mass, the wave frequency, the source location as well as the observer's location. We present semi-analytical expressions and numerical results of these parameter-dependences, which suggest that the black-hole-induced spectrum asymmetry is generally too weak to be observed in radio astronomy.

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Date submitted: 08 Jan 2014 Electronic form version 1.4