Astrophysics > High Energy Astrophysical Phenomena

Extremal energy shifts of radiation from a ring near a rotating black hole

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Radiation from a narrow circular ring shows a characteristic double-horn profile dominated by photons having energy around the maximum or minimum of the allowed range, i.e. near the extremal values of the energy shift. The energy span of a spectral line is a function of the ring radius, black hole spin, and observer's view angle. We describe a useful approach to calculate the extremal energy shifts in the regime of strong gravity. Then we consider an accretion disk consisting of a number of separate nested annuli in the equatorial plane of Kerr black hole, above the innermost stable circular orbit (ISCO). We suggest that the radial structure of the disk emission could be reconstructed using the extremal energy shifts of the individual rings deduced from the broad wings of a relativistic spectral line.

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