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Measuring the Innermost Stable Circular Orbits of Supermassive Black Holes

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We present a promising new technique (g-distribution method) for measuring the innermost stable circular orbit (ISCO), the inclination angle (i), and the spin of a supermassive black hole. The g-distribution method involves measurements of the distribution of the energy shifts of the relativistic iron line emitted from the accretion disk of a supermassive black hole that is microlensed by stars in a foreground galaxy and a comparison of the measured g-distribution with microlensing caustic simulations. The method has been applied to the gravitationally lensed quasar RX J1131–1231 and initial results indicate that $r_{\text{ISCO}} < 9$ gravitational radii and $i < 60$ degrees. Further monitoring of RX J1131–1231 and other lensed quasars will provide tighter constraints on the inclination angles, ISCO radii and spins of the black holes of distant quasars.

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