Observations of Black Holes show the possibility of a widely separated accretion disk

Rudy Schild

Harvard-Smithsonian Center for Astrophysics, 60 Garden Street - 19, Cambridge, MA USA

Observations of the UV-Optical continuum radiation from quasars using techniques of micro-lensing and reverberation have produced a picture that differs from standard black hole theory [1]. For the first discovered Q0957 lens, emission does not originate from the inner edge of an accretion disc at 6 R_g, but rather from an edge at 70 R_g, indicating action of a magnetic propeller. More than half the emission originates from a luminous ring at the light cylinder. On the other hand, in radio quiet lensed quasar Q2237 (Einstein Cross) the 6 R_g inner ring and also outer ring are seen [2]. Thus the radio loud and radio quiet quasars are in different spectral states, as would be expected for a source dominated by a rotating centrally anchored dipole magnetic field, as also modeled for Magnetars.

Of course black holes have no hair, but other solutions of the Einstein-Maxwell field equations pioneered by Abhas Mitra (ECO) and the magnetic variant by D.Leiter and S.Robertson (MECO) [3] allow extremely strong magnetic fields, whose co-rotation on the accretion disc creates the different quasar spectral states (radio loud/quiet) observed. Instead of an event horizon, these solutions have a physical surface whose redshift is so high that time dilation prohibits crossing the surface in a time exceeding the life of the universe. The ECO/MECO solutions have been found in analytical form, but not yet simulated.

[1] R. Schild, D. Leiter, and S. Robertson, AJ, 132 (2006) 420

[2] R. Schild, D. Leiter, and S. Robertson, AJ, 135 (2008) 947

[3] S. Robertson and D. Leiter, astro-ph/0307438