

BLACK HOLES IN DENSE STAR CLUSTERS
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TITLE: Detecting Binary Black Holes with Electromagnetic Signals

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Supermassive binary black holes approaching merger are extremely interesting systems, but have proven very hard to detect because the light from accreting supermassive black holes in binaries should be, in many ways, very similar to the light from accreting solitary supermassive black holes, i.e., ordinary AGN. One way they can be distinguished is through a pair of continuum features unique to binary black holes: a "notch" in their optical/UV spectra resulting from a gap in the accretion flow, and a hard X-ray bump resulting from the shocks occurring when streams cross that gap and encounter the outer edges of the accretion disks around the individual black holes. Another way is through pulsar timing array (PTA) observations sensitive to the gravitational wave emission associated with the later stages of binary black hole evolution. The spectrum of gravitational waves can be significantly altered if the intrinsic orientation of the accreting matter's angular momentum is retrograde relative to the binary orbit. Detection or bounds on this alteration would then confirm or limit the contribution of retrograde systems.