

Spectral Properties of Accretion Disk-Jet Configuration around Super-Massive Black Hole using Monte Carlo Simulations

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We present the first two-dimensional general relativistic study of superconducting regions in magnetars with toroidal magnetic fields. Using the XNS code, we map the distribution of type-II and type-I superconductivity for different field strengths and stellar masses. While low-mass stars preserve larger superconducting outer cores, higher-mass stars show reduced regions. Consistent with 1D models, the inner cores remain nonsuperconducting; however, our 2D results uncover novel torus-shaped normal regions absent in previous work. We further speculate on the indirect role of superconductivity on continuous gravitational wave emission from millisecond pulsars, highlighting PSR J1843–1113 as a key target for future detectors.