

**Tuesday, November 1st, 2022, 2:30pm in PSE 317**

**Speaker:** Prof. Junwu Huang

**Institution:** Perimeter Institute

**Title:** A new pulsar

**Abstract:**

Many extensions of the standard model predict the presence of ultra-light bosons in the low energy theory. If any of these bosons are in the mass range of  $10^{-20}$  to  $10^{-10}$  eV they will affect the evolution of astrophysical black holes through the superradiance process. When a boson's Compton wavelength is comparable to the size of a black hole, the boson binds to the black hole forming a gravitational atom in the sky. The occupation number of atomic states can grow exponentially to as large as  $10^{76}$ , extracting energy and angular momentum from the black hole.

In this talk, I will present the first study of the electromagnetic signals coming from a blackhole superradiance cloud of light dark photon. I will show how this dark photon superradiance cloud produces and hosts a rotating plasma of Standard Model charged particles. Crudely, this rotating plasma behaves like an electric dipole rotating around the blackhole spin direction. Just like a pulsar, which is qualitatively a rotating magnetic dipole, our system of a rotating electric dipole also produces periodic electromagnetic radiation. I will discuss the similarities and differences between our system and a pulsar, and several search strategies based on detailed numerical simulations.