

Using IGM as a Probe of PBH Dark Matter

Primordial black holes (PBHs) in the asteroid-mass regime ($M \sim 10^{16} - 10^{21}$ grams, $T_{\text{Hawking}} \sim 1 \text{ MeV} - 10 \text{ eV}$) continue to persevere as a candidate for all the dark matter content of the universe. If PBHs have existed for an extended period of cosmic history, their Hawking radiation could have sizeable imprints in the cosmic history of the intergalactic medium (IGM), namely the ionization history, the kinetic gas temperature, and especially the 21 cm spin temperature. Previously, our group has analytically[1] and numerically[2] computed the Hawking radiation photon spectrum from dissipative processes for the primary and secondary radiation from PBHs, and found non-negligible spectra that extend into the eV range. This radiation from PBHs is able to influence the intergalactic medium (IGM) in a highly nontrivial way and affect a number of observational diagnostics. This talk will show the specific effects of the Hawking radiation from low asteroid-mass PBHs on IGM history, as well as discuss future detection possibilities.

[1] Silva, et. al. Phys. Rev. D 107, 045004

[2] Koivu, et. al. arXiv:2408.17423

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