FORMATION OF SUPERMASSIVE BLACK HOLES: SIMPLE TO HOYLE-LYTTLETON-BONDI ACCRETION

Anamika Goswami [1,*]

1 Gauhati University

* Presenting author (anagoswami616@gmail.com)

All large galaxies are now found to contain supermassive black holes (SMBHs) with mass 10^6-10^9 MÃŠËœ at their core. The premature appearance of SMBHs at cosmological redshift , (z ~ 6) with masses ~ 10^9 MÃŠËœ , challenges the theories and our understanding of the formation and growth of these black holes. For appearance of such huge masses at the very infancy of the universe, massive seeds are necessary, but their origin remains unknown. We discuss the possibility of formation of these large black hole seeds which can later grow to supermassive size by accretion.

We consider the self-interacting or collisional nature of dark matter (SIDM) and discuss the possibility of quasi-spherical accretion of dark matter in the context of Hoyle-Lyttleton-Bondi model of accretion. We find definite relations of the core mass and the core radius of the SMBHs in terms of the self-interaction cross-section ÃÆ'/m_dm & sound speed CA. We investigate the values of seed black hole masses produced in the primordial dark matter halo with temperature T Ã¢â€°Â³ 10^4 K. We then calculate the ÃÆ'/m_dm values for a range of sound speed which are required to produce core masses in the range 10^2-10^6 MÃŠËœ . Lastly, we refer to earlier papers on bounds on ÃÆ'/m_dm and then compare our results to get an idea how this bounds are decided.