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Relativistic Jets from black hole accretion disc

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Astrophysical jets from AGNs and microquasars are often relativistic and collimated. We study magnetic and radiative driving of jets to address these issues. The plasma is described by relativistic equation of state which depends on the composition. We show that the matter content may not affect the streamline of magnetically driven jets, but the poloidal velocity and temperature distribution strongly depend on composition of the jet. We also discuss the salient features of radiatively driven jets. Although consensus in the community precludes radiation driving to be effective acceleration mechanism, we show that is certainly not the case. For black holes surrounded by luminous discs, jets may be accelerated up to few Lorentz factors for baryon dominated jets. Interestingly, the terminal Lorentz factor may reach to a value of few tens for lepton dominated jets. We also show internal shock driven by radiation is also possible for jets. Moreover, consideration of temperature dependent scattering cross-section can produce relativistic jets which stats with very low speed and quite moderate temperatures which are expected in the inner region of the accretion discs. Although we have studied magnetic driving and radiative driving separately, but it is apparent that both the processes should be incorporated in order to solve collimation and acceleration enigma of astrophysical jets.

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