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Non-thermal Plasmas Around Massive Black Holes: Collective Modes, Ring Configurations and Magnetic Field Generation* B. COPPI, MIT — The discovered gamma-ray bubbles emanating from the center of Our Galaxy are a new motivation to develop theories for large scale structures in the Universe in terms of plasmas for which electromagnetic interactions are no less important than the relevant (e.g. density wave theory of spirals) gravitational interactions. Moreover, considering the observed emission spectra, the particle distributions in phase space cannot be represented by isotropic Maxwellian in significant cases. The consequent theory of plasmas surrounding rotating massive black holes has led to identify new stationary plasma and field configurations (in particular Solitary Rings) and modes, emerging from conventional (currentless) disks, that depend on the existence of temperature anisotropies. These modes, which produce outward transport of angular momentum at a significant rate, involve large amplifications of a seed magnetic field. In the related (by the envisioned non-linear mode evolution) stationary configurations, without a seed magnetic field, the field energy densities are of the order of the particle thermal energy densities. Thus a clear sequence of processes for the generation of magnetic fields in the Universe is identified. *US DOE partly sponsored.

[1] B. Coppi, A&A, 548, A84 (2012).

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