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Relativistic MHD Turbulence with Synchrotron and Inverse-Compton Radiation Cooling[1] DMITRI UZDENSKY, University of Colorado Boulder and IAS — This work investigates the energetic aspects and observational appearance of driven relativistic MHD turbulence in an optically thin, relativistically hot plasma subject to strong synchrotron and synchrotron-self-Compton (SSC) radiative cooling. Steady-state balance between turbulent heating and radiative cooling is shown to lead, essentially independent of turbulent driving's strength, to a characteristic electron temperature of $T_e/m_ec^2 \sim \tau_T^{-1/2}$, where $\tau_T \ll 1$ is the systems Thomson optical depth. Furthermore, the SSC cooling power becomes automatically comparable to the synchrotron power. Under certain conditions, a few higher-order inverse-Compton components also become comparable to the synchrotron and SSC losses, and so the broad-band radiation spectrum of the system consists of several distinct peaks with gradually decreasing luminosity, separated by a factor of $\tau_T^{-1} \gg 1$ from each other. The number of these spectral components is governed by synchrotron self-absorption and Klein-Nishina effects. These findings have important implications for several classes of high-energy astrophysical systems including pulsar wind nebulae and black-hole-driven accretion flows, jets, and radio-lobes.

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