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LeHaMoC: A novel radiation code for high-energy astrophysics

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Recent associations of high-energy neutrinos with active galactic nuclei (AGN) have revived the interest in leptohadronic models of radiation from astrophysical sources. The rapid increase in multi-messenger observations requires fast numerical models that may be applied to large source samples. In this contribution, we introduce LeHaMoC, a newly developed code for solving (using an implicit difference scheme) the Fokker-Planck equations of photons and relativistic particles (e.g., electrons, positrons, protons, neutrinos) produced in a homogeneous magnetized source that may also be expanding. Our code offers several notable benefits compared to other existing codes, such as flexibility, speed, and precision. We demonstrate the capabilities of LeHaMoC by presenting astrophysical applications. All applications showcase the versatility of our code and its ability to accurately predict the observed high-energy photon and neutrino emission from high-energy astrophysical sources. Additionally, it can be easily customized to model a variety of high-energy astrophysical sources and has the potential to become a widely utilized tool in multi-messenger astrophysics.

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