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Photo-hadronic pair creation in magnetospheric current sheets of accreting black holes

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A ubiquitous feature of accreting black hole systems is their hard X-ray emission which is thought to be produced through Comptonization of soft photons by electrons and positrons (pairs) in the vicinity of the black hole. The origin and composition of this hot plasma source, known as the corona, is a matter open for debate.
In this contribution we investigate the role of relativistic protons accelerated in black-hole magnetospheric current sheets in the pair enrichment of AGN coronae.
We find cases where photohadronic interactions between protons and photons in the magnetospheric region can produce enough secondary pairs to create coronae with Thomson optical depths, $\tau \sim 0.10 - 10$. More importantly we find a significant dependence of the secondary pair density on the Eddington ratio, defined here as the ratio of the intrinsic X-ray luminosity to the Eddington luminosity of the source: systems with the same Eddington ratio are found to behave in similar ways. We also present the predicted high-energy neutrino spectrum and discuss our results in light of the recent IceCube observations of TeV neutrinos from NGC 1068. We finally discuss the implications of our model for coronae of stellar-mass black hole systems.

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