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Exploring neutrino masses and dark matter at particle colliders

Among the currently open questions in particle physics are the origin of the extremely small neutrino masses, and the nature of dark matter. One possibility to solve both problems is to consider neutrinos as Majorana particles, and extend the Standard Model with three additional particles, the heavy neutral leptons (HNLs). In this model, the masses of these particle species are related, such that heavier HNLs imply lighter neutrinos. Being neutral and considerably massive, HNLs are optimal dark matter candidates.
Heavy neutral lepton models are the subject of a vigorous analysis activity both at operating and future particle physics experiments. The ATLAS group has just concluded an analysis of LHC data and is starting a new round of analysis on the additional statistics collected in the last 4 years. A similar search is performed and presented, through simulations of the IDEA detector at the Future Circular Collider, by the RD_FCC group.

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