Contribution ID: **289** Type: **Invited**

Search for Light Dark Matter with POKER

Tuesday, 6 June 2023 15:35 (25 minutes)

Dark Matter (DM) is one of the biggest unanswered questions in modern physics. Despite the astrophysical and cosmological observations suggesting its existence, to date no particle physics experiment detected an unequivocal DM signal, shedding light on its fundamental properties. Among the different hypothetical DM models, vector-mediated Light Dark Matter (LDM) is a compelling paradigm, being theoretically well motivated and largely unexplored. In this scenario, DM is identified with new sub-GeV "Hidden Sector"states, neutral under known interactions and interfacing with the Standard Model via a new force, mediated by the Dark Photon (Heavy Photon, A'), a new massive vector boson. Accelerator-based searches at the intensity frontier are uniquely suited to explore this model; the "missing energy" technique, in particular, has proven especially efficient, as demonstrated by the results of NA64-e at CERN. NA64-e exploits an electron beam impinging on a thick active target (electromagnetic calorimeter) to produce LDM particles via A'-mediated radiative processes; the so produced LDM particles escape the detector carrying away a significant fraction of the primary particle energy. The experimental signal signature is a significant "missing energy", defined as the difference between the energy of the beam and the energy deposited in the active target. The goal of POKER (POsitron resonant annihilation into darK mattER) is to perform a missing energy measurement with a positron beam, using a high resolution active target (lead tungstate calorimeter). A positron beam allows to fully exploit the unique features of the positron resonant annihilation into hidden sector states (e+e- -> A' -> XX), resulting in an outstanding LDM discovery potential. In this talk, after a brief introduction on the LDM scenario, I will thoroughly describe the POKER project, reporting on its current status and future prospects.

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Session Classification: Hadrons and physics beyond the standard model

Track Classification: Hadrons and physics beyond the standard model