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A final word on electroweak Dark Matter models at future lepton colliders LUDOVICO VITTORIO, SALVATORE BOTTARO, MARCO COSTA, Scuola Normale Superiore and INFN, Pisa, DARIO BUTTAZZO, INFN, Pisa, ROBERTO FRANCESCHINI, Dipartimento di Fisica, Università Roma Tre, and INFN, Roma Tre, PAOLO PANCI, Dipartimento di Fisica, Università di Pisa, and INFN, Pisa, DIEGO REDIGOLO, Dipartimento di Fisica, Università di Firenze, and INFN, Firenze and CERN, Theory Division — Weakly Interacting Massive Particles (WIMPs) are theoretically appealing Dark Matter (DM) candidates. Generalizing the Minimal Dark Matter paradigm, we consider stable DM candidates within a single $SU(2)_L$ n-plet, with odd n in order to avoid strong constraints from direct detection and $n \leq 7$ to ensure calculability. WIMPs are perfect candidates for a high-energy lepton collider, given the electroweak nature of the signal, and since their thermal masses lie in the range $1 - 45$ TeV [1].
We consider the reach of the mono-γ, the mono-W and the di-γ channels, for both scalar and fermion WIMPs. We compute the signal-to-noise ratio and the reaches for each n-plet and compare them with their respective thermal targets. Our key result is that a 30 TeV muon collider can probe the DM 5-plets at 95% CL, while to produce the 7-plets a higher energy machine is required.

[1]For previous work, see M. Cirelli et al, JHEP, 10 (2014) [Erratum: JHEP 01, 041 (2015)], M. Low et al, JHEP, 08 (2014), T. Han et al, arXiv:2009.11287

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