Contribution ID: **62**   Type: **not specified**

Precise relic abundance and photon spectra for general Neutralinos

Thursday 19 June 2025 14:45 (15 minutes)

I will present a Mathematica code, to be made public in the near future, which computes Sommerfeld enhanced annihilation cross-sections to obtain relic densities for neutralino dark matter as well as semi-inclusive photon endpoint spectra up to $\mathcal{O}(1\%)$ corrections.

The main purpose of this tool is to provide reliable, state-of-the-art theory predictions in general, mixed MSSM models to be compared to experimental bounds on the dark matter energy density and indirect detection spectra.

The program can use the wide-spread SLHA file format as input and automatically computes necessary running couplings (2-loop), mass corrections (1-loop), Sommerfeld enhanced annihilation cross-sections (P-wave and $\mathcal{O}(v^2)$ S-wave) and the dark matter thermal relic abundance in an efficient manner. The annihilation cross-sections into exclusive final states are easily accessible and, for photon-spectra near the endpoint, also semi-inclusive results (including NLL electroweak Sudakov resummation) are available.

Code-related publications arXiv numbers:

2211.14341 (Sudakov resummation for photon spectra),

1611.00804 (wino-Higgsino mixed DM study),

1601.04718 (inclusion of one-loop mass splittings),

1411.6930 (pMSSM study),

1411.6924 (Sommerfeld treatment),

1303.0200 ($\mathcal{O}(v^2)$-SE annihilation),

1210.7928 (mixed neutralino and chargino annihilation)

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Session Classification: Research talks