

Neutrino Lines from Dark Matter

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NuCo 2021: Neutrinos en Colombia

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Prospects for discovering a neutrino line induced by dark matter annihilation

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Motivation

Part II

Neutrino lines from annihilating dark matter

Part III

Neutrino lines from the decay of Majoron dark matter

Majoron mass and production mechanism

Mass

- It could arise due to Quantum Gravity effects

Rothstein, Babu, Seckel (1993), Akhmedov, Berezhiani, Mohapatra (1993).

- Heavy chiral fields that render $B - L$ anomalous

Mohapatra, Senjanovic (1983), Langacker, Peccei, Yanagida (1986), Ballesteros, Redondo, Ringwald (2017).

- Explicit breaking Frigerio, Hambye, Masso (2011), Gu, Ma, Sarkar (2010).
(This could lead to severe fine-tuning issues).

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Production

Sub-GeV Majorons can be produced via Freeze-in

Frigerio, Hambye, Masso (2011) , Heeck, Teresi (2017).

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Production

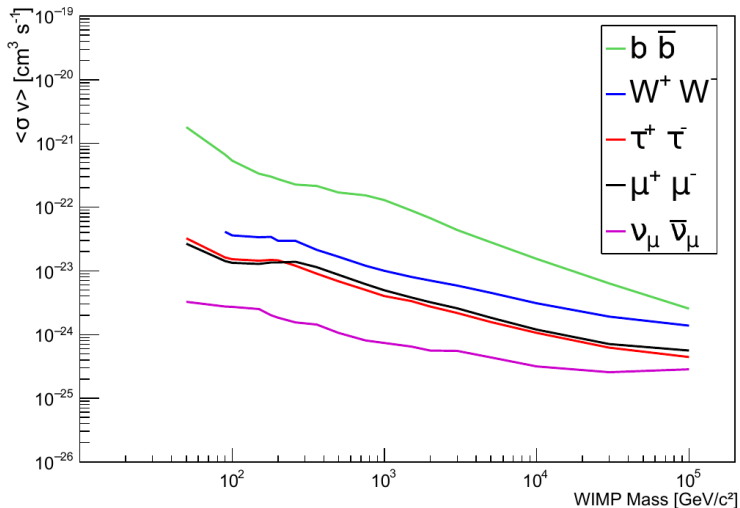
Sub-GeV Majorons can be produced via Freeze-in

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Here we adopt a phenomenological approach and take the mass as given.

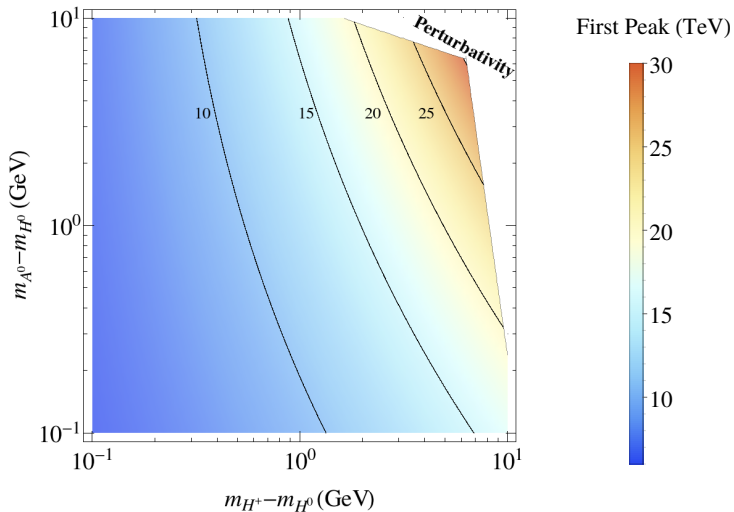
Best limit as of today

Antares 2017



It doesn't use the line feature!!!! Improvement in the near future.

Position of the peak



- Multi-TeV DM models predict significant annihilation rates due to the Sommerfeld effect. These typically correspond to cross sections well above the canonical thermal value.
- I discussed models whose main signature is the annihilation into neutrino lines. They can be probed in the near future.
- In certain cases, the flavor structure of the lines can not be mimicked by astrophysical neutrinos.

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Thanks for your attention