Macroscopic Dark Matter Detection Using Fluorescence Detectors

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arXiv:1808.06978

Case Western Reserve University, Cleveland, Ohio

IPA 2018

8th October 2018

Statement of Acknowledgement: This presentation was made possible, in part, through financial support from the School of Graduate Studies at Case Western Reserve University.

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- A wide variety of dark matter candidates have been explored in recent times.
- We consider a broad class of macroscopic dark matter candidates, with characteristic size(cross section) in cm^2 and mass in g.

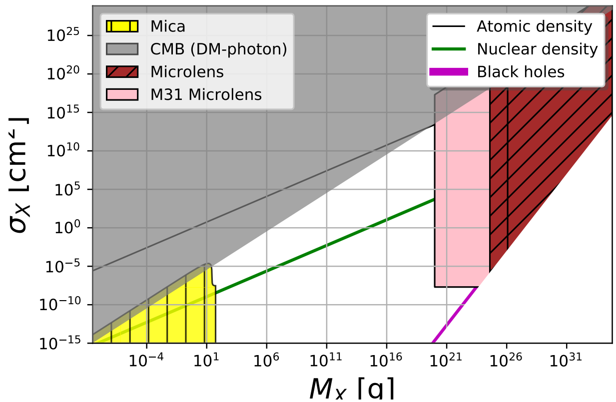

Figure 1: Macro parameter space

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- For the optically thick analysis, we analogously integrated the Planck spectrum

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- The number of photons received at a pixel is dependent on the height of the macro(trajectory) above our detector and the size of the macro.
- Utilizing a bigger array gives a larger detector volume so we can probe larger masses to lower cross sections.

Luminosity

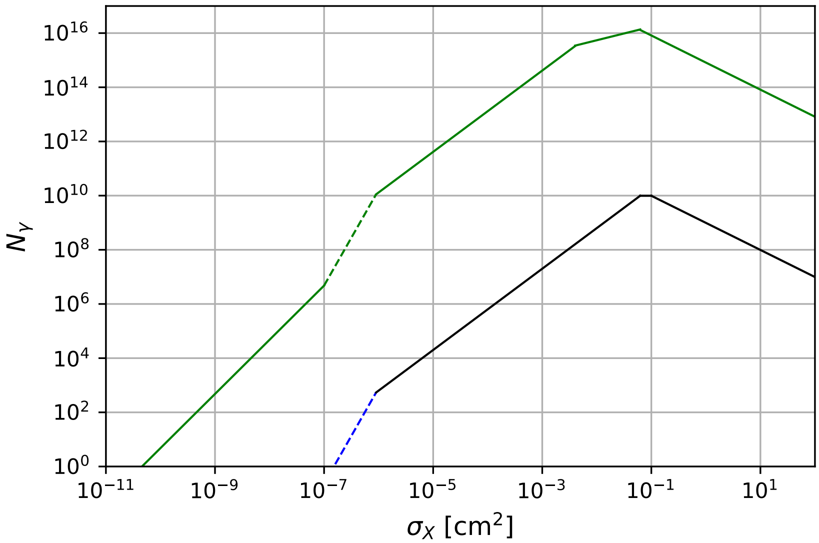

Figure 2: Number of photons received at the detector per bin time, N_γ as a function of the macro cross section for Auger in green and JEM-EUSO in black.

Results

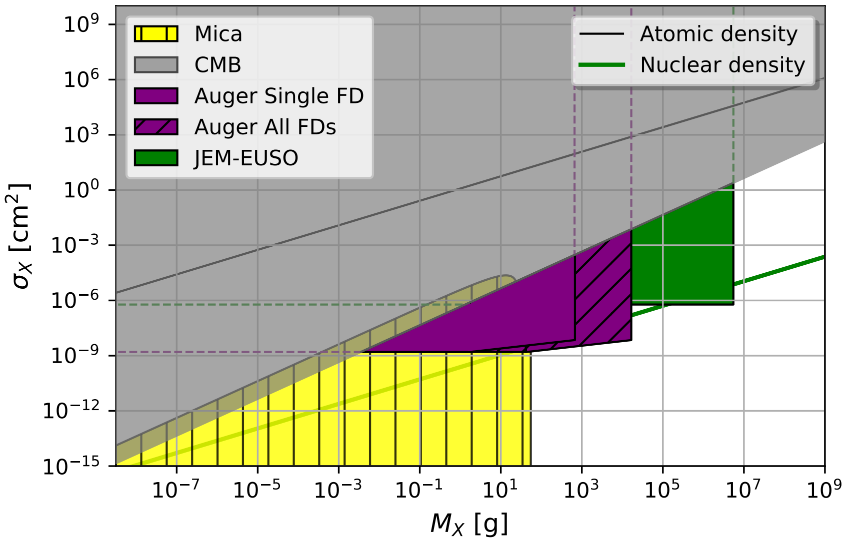

Figure 3: The parameter space that could be probed by both Auger(for one FD telescope in purple and the full array in purple with diagonal lines) and JEM-EUSO(in green).

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- A general detection scheme has been developed for measuring the fluorescence caused by a passing macro in the atmosphere.
- It is of particular significance that both detectors are sensitive to macros of nuclear or lower density, since the expected Standard Model macro candidates, as well as most others that have been explored are expected to be of approximately nuclear density.