Direct detection

DarkSUSY 4.2
(pre-release, trunk @ rev 231)

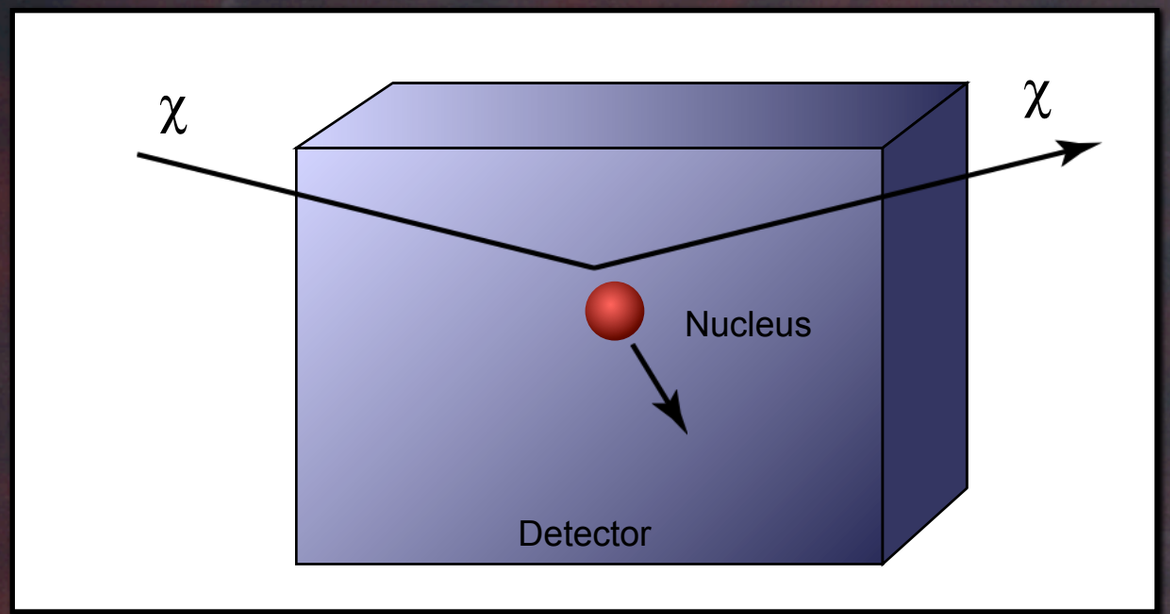
DarkSUSY day, Stockholm, June 16, 2008

Direct detection

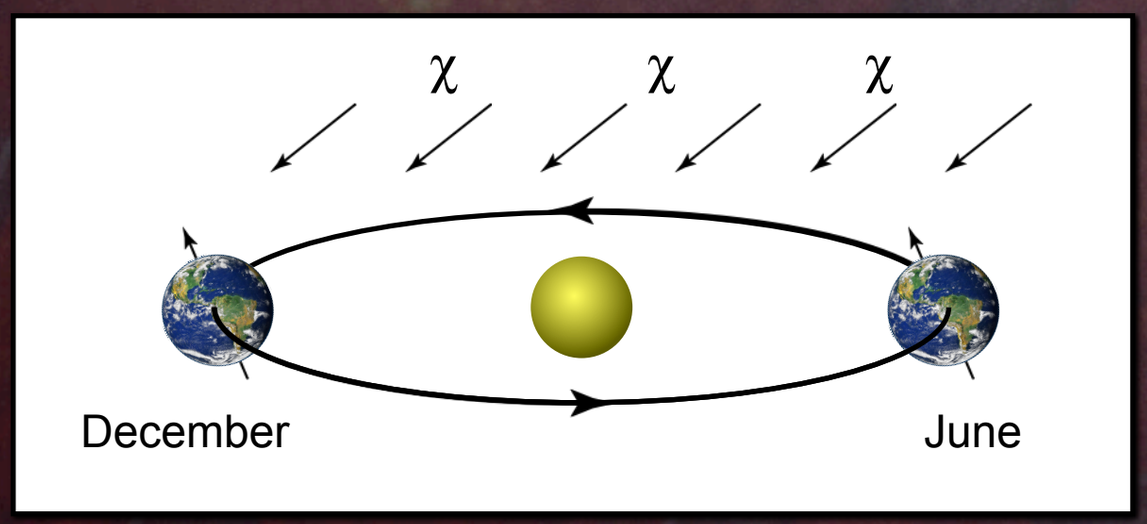
- Cross sections on protons and neutrons
- Scattering off specific nuclei, including recoil spectra
- Possibility to change spin-dependent and spin-independent form factors
- Optionally, Drees-Nojiri scattering treatment
- Annual modulation signals
- Choice of halo velocity distributions

Direct detection

general principles

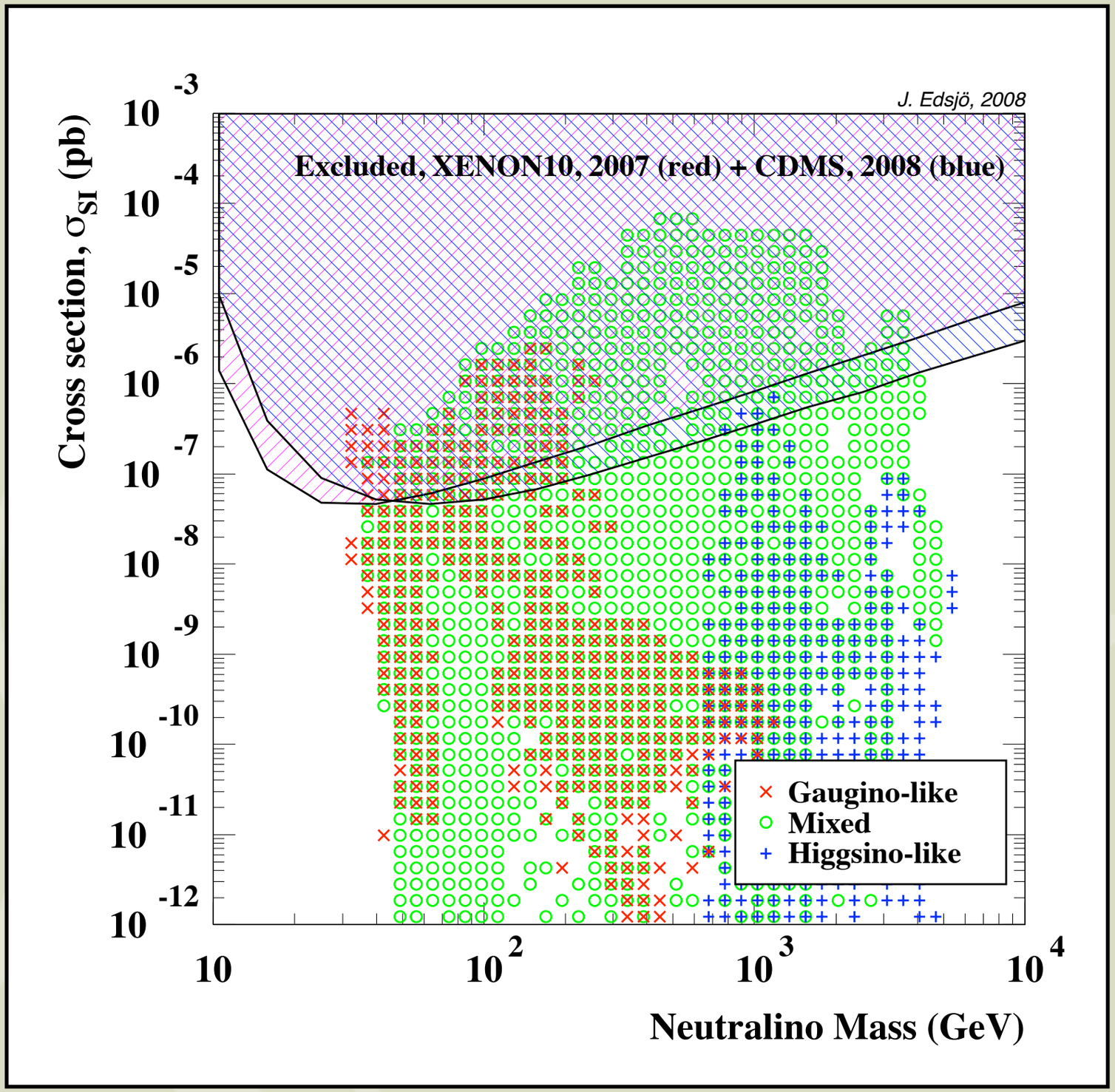


- WIMP + nucleus → WIMP + nucleus
- Measure recoil energy
- Suppress background enough to be sensitive to a signal, or...



- Search for an annual modulation due to the Earth's motion in the halo

Direct detection – XENON10 + CDMS limits



- XENON10, arXiv: 0706.0039
- CDMS, arXiv: 0802.3530
- Direct detection experiments have really started to explore the MSSM parameter space!
- Use this to constrain our models (for 'standard' halo)

Direct detection in DarkSUSY

- Routines to calculate the spin-independent and spin-dependent scattering cross sections on protons and neutrons. These are most easily used to compare with experimental results.
- Also routines to calculate the differential rate on various targets including both spin-independent and spin-dependent form factors.

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Main uncertainties – direct detection

- Quark content of the nucleons, especially the strange content
- Form factors

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Routines

- **dsddneunuc:** calculates the spin-independent and spin-dependent scattering cross sections on neutrons and protons.
- **dsdddrde:** calculates the differential scattering rate on various targets as a function of time (can be used to predict annual modulation signals e.g.)

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