Dark Matter in a Nutshell

- PICASSO uses CFC$_2$ droplets superheated in the act as an independent bubble chamber. The energy deposited by the nuclei triggers an explosive phase transition which can be recorded by piezoelectric transducers.

The PICASSO Detector

- PICASSO uses CFC$_2$ droplets. Superheated droplets can be detected in the form of heat, charge or light, depending on the detector principle.

- The system has proven to be stable and reliable over long time periods.

- Downtime and running, ready to collect long exposure (700 kg-days) high quality data.

- The temperature response curves of a backgrounds and nuclear recoils are significantly different, and this allows for signal extraction analysis in PICASSO.

- The temperature of operation. As an example, a threshold lower than 10 keV can be achieved.

- The efficiency curve for nuclear recoils has been calculated from first principles and verified using mono-energetic neutron calibrations in the Tandem facility at the Université de Montréal.

- Temperature stable and uniform with the active material.

The PICASSO Improvements

- Higher loading ~95% of active mass.
- Anti-coincidence technique.
- Improved purification technique: re-purification of Th, Pd and Pb with HDO.
- New clean room at Université de Montréal and Queen’s University.

- New and improved detectors!!

- Design and construction of 8 TPCS.
- Temperature stable and uniform with precision of 1/10°C.

- Each of them can host 4 detectors.
- Pressure system re-designed: hydraulic recompression system.
- DACs re-designed: stable.
- New improved preamplifiers and DAC system boards.

- Design and construction of new piezoelectric transducers.
- 4-channel read out for every detector: localization by triangulation.
- Capability to define surface events and hot spots.

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32 detectors inside 8 TPCS surrounded by 30 cm water shielding

- New neutron calibrations agree with MC simulations.
- 32 detectors are ready to collect long exposure data.

- For one year (2007) data has been collected with this new setup.
- The system has proven to be stable and reliable over long time periods.

- This data is currently under the last stages of the analysis and new PICASSO results will be presented soon (Stay tuned!!)

- At the beginning of 2008 the rest of the equipment needed to instrument the 32 detectors started to be installed at the site.

- Already 8 of the 32 TPCS have been installed, 24 detectors are underground and of these 16 are already hooked-up and being read.

- An air cooling system has been installed. With it the setup can reach the low temperatures (~18°C) needed to characterize the temperature profile and effectively subtract the background.

- By the end of summer 2008 we expect to have the 32 detector system up and running, ready to collect long exposure (700 kg-days) high quality data.

Acknowledgements to N. T. and N. Vander Werf (Indiana University, USA)