



# Second Generation Dark Matter Experiment Program

HEPAP Meeting

Washington, DC

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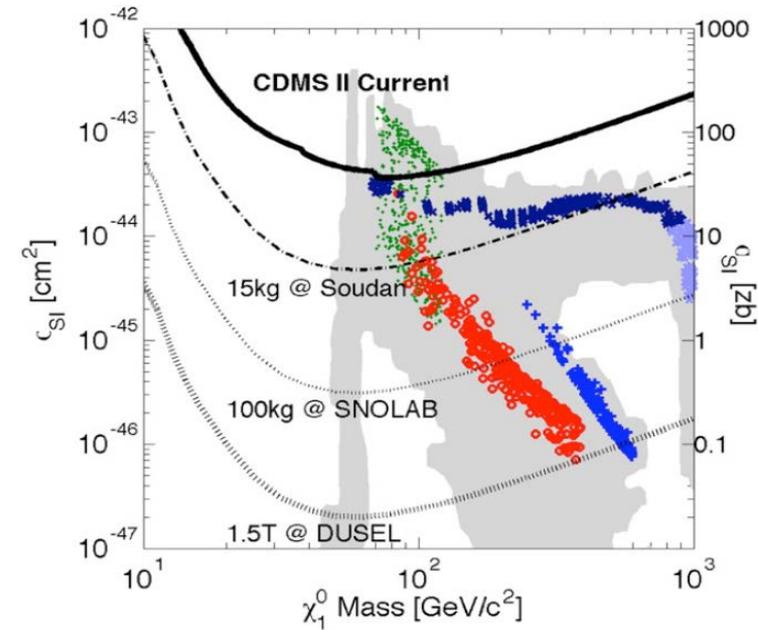
Michael Salamon/DOE Office of High Energy Physics



# Long-Term Strategy for Direct DM Detection

## • “First Generation” DM Experiments (on-going):

- Support R&D for several different WIMP detection media: liquid argon, liquid xenon, crystalline germanium, bubble chamber fluid ( $\text{CF}_3\text{I}$ ),  $\text{CF}_4$  and others; search for axions in magnetized resonant cavities.
- Support several small-scale experiments capable of reaching WIMP-nucleon interaction cross sections of  $\sim 10^{-45} \text{ cm}^2$ ; support one axion experiment.
- In absence of detection, obtain crucial information about backgrounds and other limitations for each method and detector medium.



## • “Second Generation” DM Experiments (R&D begins in FY13):

- Solicitation for one year of R&D in FY13 has come out. Several methods will be selected for study. At end of FY13, a down-selection to two or three of the most promising methods will be made.
  - individual projects estimated to cost  $\sim \$5\text{-}15\text{M}$  and will be conducted under DOE Orders 413.3b over the period FY14-FY16.
  - WIMP-nucleon cross section reach improves by an order of magnitude compared to first-generation.
- The most popular supersymmetry models predict a high probability of detection at this sensitivity.*

## • “Third Generation” DM Experiments (FY17 and beyond):

- One large ( $\sim \$50\text{-}100\text{M}$ ) experiment to bring cross section reach down by another order of magnitude, reaching close if not to the level of cosmogenic backgrounds



# G2 DM FOA

- Issued March 7, 2012
- DOE Funding Opportunity Announcement for Second Generation Dark Matter Experiments can be obtained at [http://science.doe.gov/grants/pdf/SC\\_FOA\\_0000597.pdf](http://science.doe.gov/grants/pdf/SC_FOA_0000597.pdf)
- Letter of Intent requested: May 4, 2012
  - Helps DOE identify unconflicted reviewers for panel
- Proposal due date: July 6, 2012
- Review to be held in late August
- Selections to be made and announced in September
- Funding start near the beginning of FY13
- FAQ page for questions
- Expect to have G2 DM Experiment Program CD-0 in place by Summer 2012



# Description of FOA

- This FOA solicits experiments for the direct detection of DM.
  - Must satisfy the criterion that it is a “second generation” experiment, i.e., must show that experiment will improve knowledge of a DM physical parameter by at least one order of magnitude.
  - Any DM candidate species—WIMP, axion searches, others.
- Solicitation is for one year of R&D funding only. (MIE funds for G2 DM experiments planned for FY14-16.) \$6M estimated available for this year.
  - Plan to select more experiments than be carried through fabrication and operations.
  - No equipment purchases, fabrication.
  - Pre-conceptual experiment design activities.
  - Activities for the reduction of scientific, technical, cost risk.
  - Experiments with DOE TPC < \$5M are exempt from restriction on fabrication (they are below the project threshold).



# Selection of Projects

- Near the end of FY13 a “down selection” is planned.
  - From the several experiments selected for one year of R&D support, only a few will be selected to carry forward into project phase.
  - “Proposals” for continuation into project phase will be submitted as DOE laboratory Field Work Proposals. (Each project will be managed by a DOE lab.)
  - Evaluation based on updated experiment concept, risk reduction.
  - External scientific review; internal technical and cost risk review planned.
  - **Selections made in coordination with NSF (Jon Kotcher’s presentation)**
  - Eliminate several months delay that new FOA would entail.
- Project phase starts with MIE funding in FY14.
  - Each experiment becomes a project within the G2 DM Program, with independent project life cycles (e.g. CD-1, CD-2/3a, etc. gates).
  - Project phase starts near the beginning of FY14
  - CD-4 is to be reached by end of FY16.
  - Approximately \$29M total available for FY14-16.



# Selection of Small Experiments

- “Small” experiments fall below the project thresholds:
  - DOE Total Project Cost (TPC) < \$5M
  - DOE Equipment cost < \$2M
- MIE restrictions do not apply; equipment purchase, fabrication may occur using FY13 funds.
- DOE laboratory management not required.
- “Down-selection” occurs via submission of proposal to DOE SC “Continuation Solicitation” (DE-FOA-0000411).



# Final Points

- As G2 R&D activities occur in FY13, current G1 experiments continue fabrication and operations (as funds permit).
- Non-G2 DM experiments may always apply to the DOE SC Continuing Solicitation for support. (But G2 funding levels will likely not be available for such experiments.) This is a pathway for achieving competitiveness for the G3 selection process (FY17 or later).
- Coordination with NSF in this process is essential. Q&A with Jon Kotcher after his presentation.



# Upcoming DOE DM Workshop

- DOE OHEP will conduct an open workshop in late August/early September 2012 (location TBD) to assess the complementary roles played by direct and indirect detection experiments and by accelerator searches.
- The information obtained will be used by OHEP to craft a strategic plan and rationale for a comprehensive DM national program. This plan will be used to explain and advocate DM research to governmental bodies (Congress, OSTP, OMB,...) and the community.
  - Extensive technical document
  - Short “elevator” summary
- No advice or recommendations; non-consensual findings only (non-FACA).
- Dear Colleague letter to be issued for Organizing Committee membership along with workshop charge/goals.