
Dark Matter Working Group

**Dan Akerib, Paul Brink, Dan McKinsey,
Andrew Hime, Jeff Filippini, Dave Berley, Jeff Martoff**

**Dusel S1 Science Meeting
Berkeley, CA Aug 2004**

Answering the Charge

- 3 paragraphs...
 - ◆ Science - cosmology; LHC-reach/complementarity at a fraction of the \$\$\$
 - Various reports: HEPAP's "The Quantum Universe," OSTP's "The Physics of the Universe"
 - ◆ Describe the open questions that define the study (see next slide)
 - ◆ Infrastructure needs for the first round
 - ◆ Long range science (and lab needs)
 - ◆ +infrastructure matrix -- acquire Snolab tables from DM Lol responders (in the near term mainly to inform S2, but not needed for 15 Sept?)
 - CDMS
 - Drift
 - Clean
 - Zeplin
 - Xenon
 - Picasso
 - Also... XMASS, U of Chicago bubble chamber... others?
 - Allowance for new technologies
-

Open questions for the study 1

- **Particle accelerators:** How might SUSY searches at the Tevatron and LHC collapse our parameter space and inform the >20 year plan
 - **What can WIMP detection and WIMP astronomy do for particle physics, astrophysics & cosmology?** (beyond confirming that DM exists in a new elementary particle!!)
 - **Exotica**
 - ◆ Try to involve the theorists
 - ◆ Possible connections with low-energy neutrinos
 - ◆ Low-seismic noise environment -- what sort of fundamental physics experiment could benefit? (we need to learn more) -- Axion telescopes, gravity wave bars, gravity at small distance scales
 - What has limited their sensitivity and how might DUSEL help?
 - ◆ Dark energy in the lab - force plates/torsions; Josephson junctions (mode cutoff on noise)
 - ◆ These topics cut across disciplines -- exotics working group?
 - **Education & Public outreach**
 - ◆ Take advantage of mass public appeal of cosmology
 - ◆ Explore specifics - HS teacher/student internships, teaching modules, science exhibit development
-

Open questions for the study 2

- **Depth & shielding of neutron background - first round & beyond**
 - ◆ **Cost issues**
 - ◆ **Systematics (try to quantify potential compromise for shallow + active)**
 - ◆ **Ultimate reach**
 - ◆ **Cavern-wide vetos**
 - Array of boring holes of interest to Geo/Bio sciences?
 - Vice versa - existing arrays of interest to particle/astro for studies?
 - ◆ **Refs/sub-working-group**
 - Baudis & Schnee - Lead working group paper
 - Gaitskell "Have we got what it takes..." paper
 - Martoff - estimates w/PFSmith
 - Akerib et al - Fluka literature/running
 - **Space - minimum # of experiments? (a delicate question)**
 - ◆ **The science demands multiple approaches with different techniques**
 - International context
 - ◆ **Mostly modest space-wise, so could side step this**
 - ◆ **Wimp astronomy TPC at 10^{-46} as strawman, (ie, directionality)**
 - **LBCF needs**
 - ◆ **Mundane, eg, #HPGe counting days**
 - ◆ **R&D aspects - new tools**
 - Alpha/beta 'cage' and/or cloud chamber
 - ATTA - atomic trap trace analysis - sensitive to single Kr-81 atoms - Xe, Ne contaminant, ground water dating
 - Further development/cross checks of surface chemistry probes
 - Snolab water purification & D2O storage tanks available?
 - **Detector R&D: define the program to get to ton-scale**
 - ◆ **Present a robust that a vigorous R&D program can provide the reach for the first round of experiments**
 - **Connections with double beta decay experiments**
-

Brainstorming on table entries (a random list to be compared with existing ones)

- **Shielding option [call out differences among experiments]**
 - **Cooling requirements**
 - **Power**
 - **UPS power**
 - **Physical Scale**
 - ◆ **Experiment proper (LxWxH)**
 - ◆ **Operating space (sq ft)**
 - ◆ **Setup space**
 - **Access requirements -- impact of limited access**
 - **Hazmat, eg, cryogenes, flammables**
 - **Seismic noise tolerance (amplitude & duty cycle)**
 - **Amenities, eg, ping pong**
-