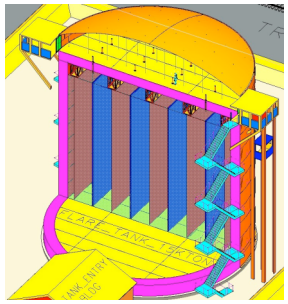
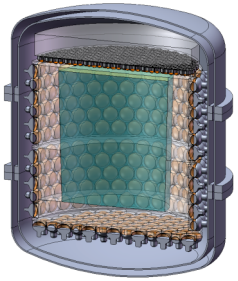
Liquid Argon R & D work at Fermilab



neutrinos



WIMPS

Some Recent LAr History at Fermilab

Initiative at Fermilab for Neutrinos - due to A.Para.
FLARE proposal P-942- June 2004 - connection with Yale & Michigan State
Accreted some scientists & eng. support - home in the PAB
Submission to NUSAG for 15 kton Detector Sep. 2005 FN-0776-E
Argon with 10 ms electron drift lifetime March 2006: TM-2385-E, Oct 2006
ArgoNeuT T962 (B. Fleming) proposed June 2006
Purge Tests, TPC design, Nitrogen Detection, Readout Electronics
MicroBooNE (B. Fleming) proposal P974 Sep. 2007
Discussions with Princeton re Dark Matter Oct 2007
Materials Test System commissioned Jan 2008
MicroBooNE stage 1 approval July 2008
Electronics Test System/Tracks in LAr Aug 2008 F.T. 8/13/2008
ArgoNeuT 1st tracks Aug 2008 F.T. 8/19/2008
Electronics and Reconstruction Software Development
S4 proposal to NSF for Dark Matter, MAX, submitted Jan 2009
ArgoNeuT moved into MINOS hall

Nice words for Neutrinos from P5 - 2008

From the report

–The panel recommends a world-class neutrino program as a core component of the US program, with the long-term vision of a large detector in the proposed DUSEL laboratory and a high-intensity neutrino source at Fermilab.

From C. Baltay presentation:

– Should our Long Range Vision include having a world-leading Neutrino program in the US

If so, it is clear that we can not get there in one step but have to follow a program with a series of steps

- It might be important to realize that each step in isolation by itself may not be spectacular but is justified as a step necessary to get to our goal
- Care should be taken that these steps not be detours or sidetracks but are the most direct and rapid steps that lead to our goal

Massive detectors for Neutrino Oscillation and Proton Decay

Develop a plan leading to the construction of a 50 to 100 kiloton Liquid Argon TPC experiment *.

–Develop confidence in the construction technology
–Develop confidence in the cost estimate
–Develop a reasonable cost device
–*Do interesting and relevant physics on the way*

These issues need to be treated over a multi-year time frame.

Experience in Liquid Argon TPC technology exists in Europe through the ICARUS program - there is much less in the U.S.

* with charge and light readout

Massive detectors for Neutrino Oscillation and Proton Decay

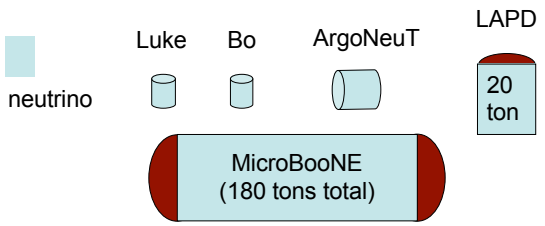
Use small test stands for specific issues;

–Measure contaminant effects of TPC materials
–Measure efficacy of contaminant removal filters
–Provide real signals for electronics development

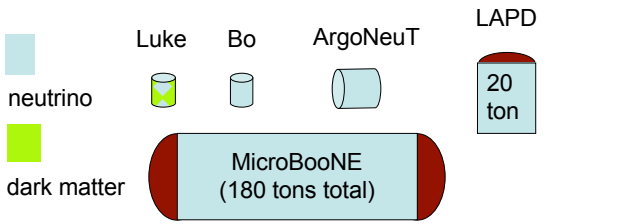
Build intermediate size detectors (1/3 ton (ArgoNeut), 200 tons (MicroBoonE) and few kilotons (LAr5))

–Stimulates and sets schedules for technology
–Forces integration of all aspects of experiment design
–Stimulates development of `physics' software
–Builds collaborations

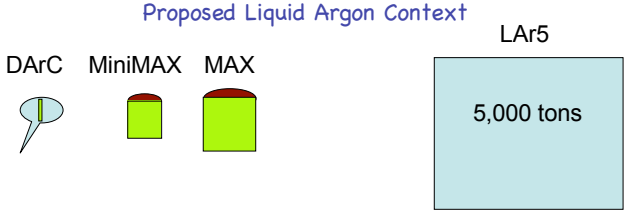
MicroBooNE: BNL,Columbia, Fermilab, LANL, MSU, UTA & Yale.



Present Liquid Argon Context



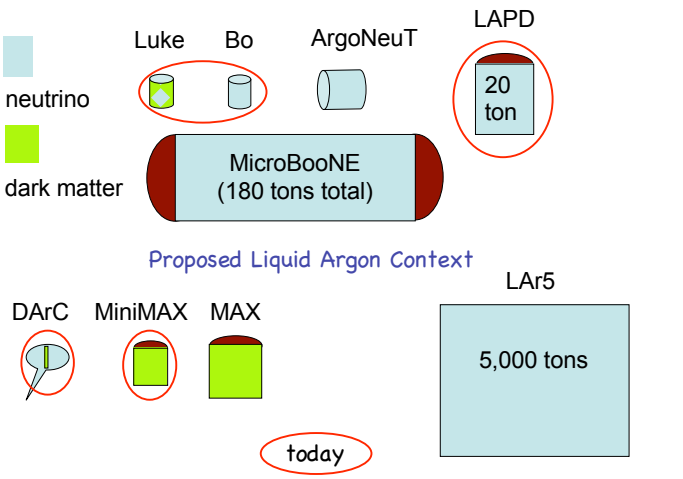
Proposed Liquid Argon Context

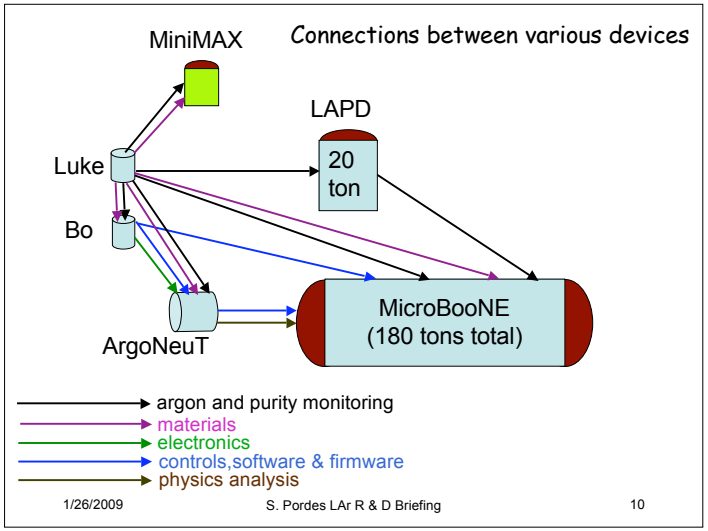


GLOSSARY

Luke	280 kg - Materials Test System	(operating)
Bo	280 kg - Electronics Test System	(operating)
LAPD	20 tons - Purity without Evacuation	(parts ordered)
ArgoNeuT	0.75 tons - Neutrino Interactions	(installing)
MicroBooNE	180 tons - Physics/R & D	(phase 1 app.)
LAr5	5,000 tons - Physics/Prototype	(EOI/S4 prop)

DArC	1 kg - measure Ar39 Depletion
miniMAX	1 ton - WIMP search/R & D for MAX (today)
MAX	10 tons - Argon (and Xenon) WIMP search (S4 prop)





What not circled

ArgoNeuT (Fermilab, MSU, Yale) is installing in the MINOS tunnel

- it has Fermilab Scientific involvement and is aimed at collecting a large number (~20,000) of neutrino interactions;

-tests purification and electronics, development of pattern recognition, track reconstruction, event identification, physics analysis

MicroBooNE has stage 1 approval and a growing collaboration (BNL, Columbia, LANL, Fermilab, MIT, MSU, St. M.C, UTA, Yale). Resources to be negotiated.

LAr5 is now (imho) *the* crucial project for the long-term neutrino future - in particular for issues not treated by MicroBooNE such as the TPC and Cryostat