

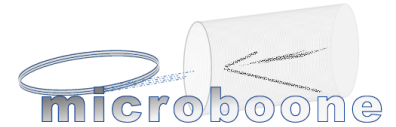
Construction Phase Organization

Gina Rameika

February 16, 2014

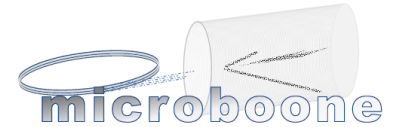


Detector Development + Physics



- MicroBooNE detector is not a pure prototype for LBNE; however, it incorporates several major advances over the (larger, 1st generation) ICARUS detector, which are important “proofs of principle” for next generation large detectors:
 - *non-evacuated cryostat*
 - *passive insulation of the cryostat and cryogenics*
 - *cold (in liquid) electronics*
 - *2.5 meter drift (~100kV HV)*
- additionally, MicroBooNE will collect a large data set of ν events which will be used to develop fully automated event reconstruction
- being near the surface, MicroBooNE will also measure non-beam backgrounds which are relevant to determining the reach of add'l physics which can or cannot be done with a surface detector

Project CD Milestones



- ❑ Proposal submitted to FNAL PAC : October 2007
 - ❑ Proposal addendum : March 2008
 - ❑ Stage 1 approval : June 2008
 - ❑ CD-0 Mission Need : September 2009
 - ❑ Fermilab Stage 1 approval :
 - ❑ CD-1 Alternative Selection and Cost Range : June 2010
 - ❑ CD-2/3a Performance Baseline : September 2011
 - DOE Project baseline = \$15.6 M
 - DOE TPC = \$19.9M
 - NSF funding ~\$1.8M
 - ❑ CD-3b Begin Full Construction : March 2012
 - ❑ CD-4 Begin Operations :
 - Working date : mid-2014 (< 6 months from now)
 - DOE CD-4 milestone – September 2015 (from PEP)
- 7 years from proposal
to start of operations**

Project Work Breakdown Structure

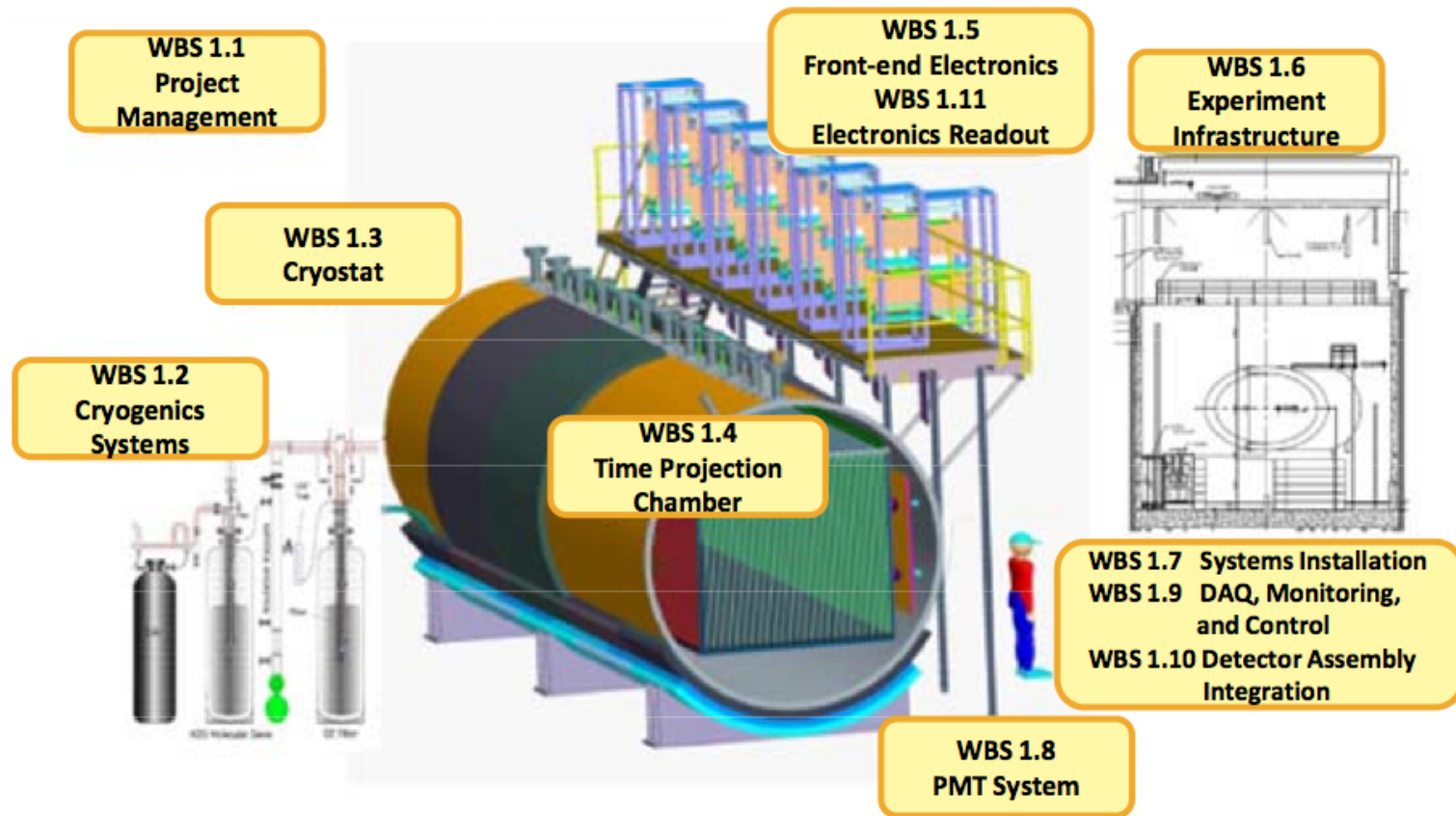
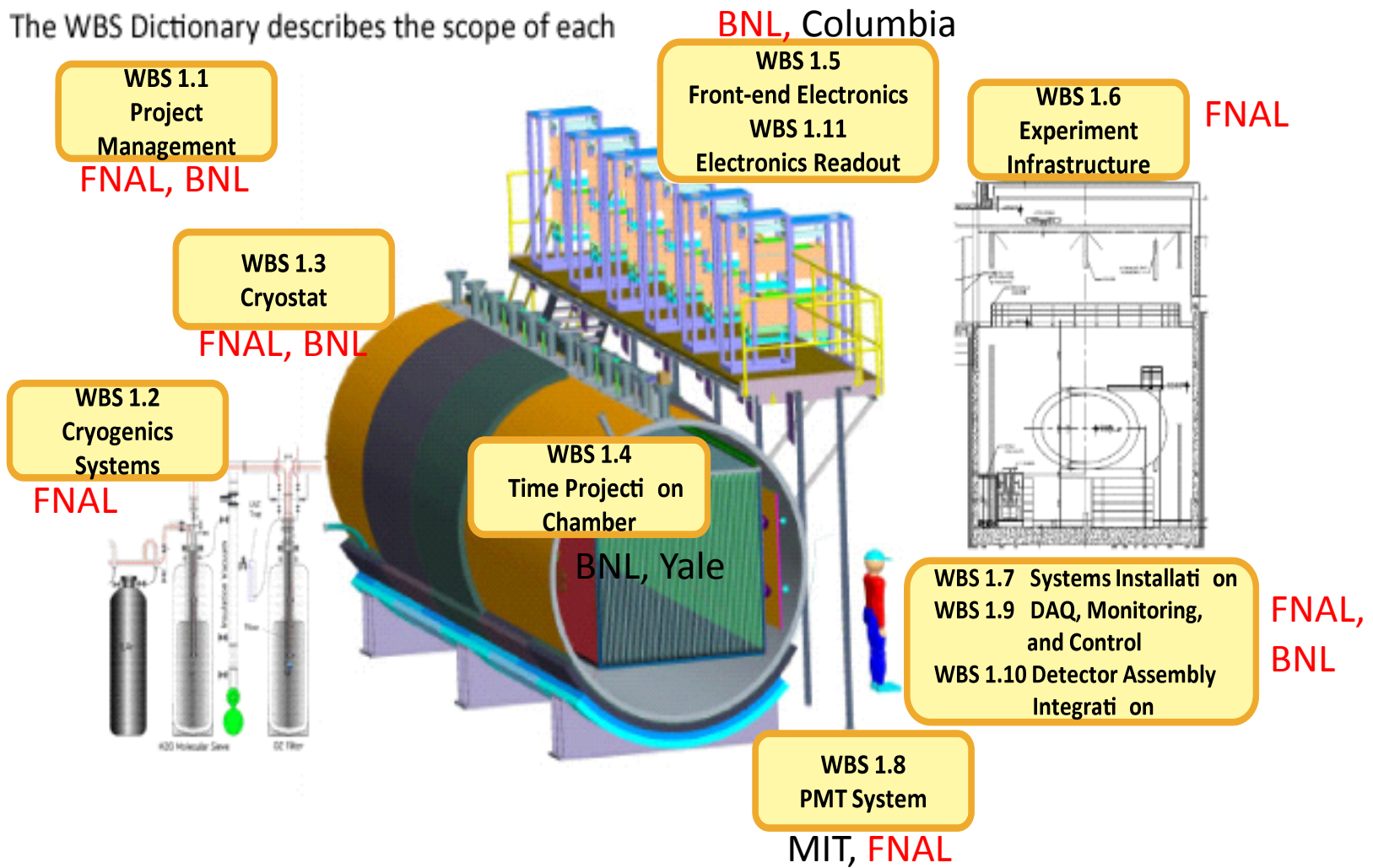


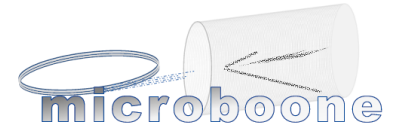
Figure 2.1 MicroBooNE Detector Diagram

Management Responsibilities

The WBS Dictionary describes the scope of each

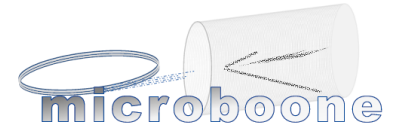


Collaboration and Project Team



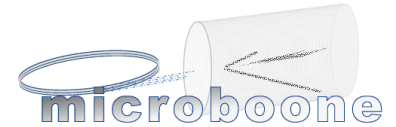
- ❑ 23 institutions including
 - 4 national labs (FNAL, BNL, LANL, SLAC)
 - 4 international institutions (INFN, Bern, Oxford, Cambridge)
 - 2 undergraduate institutions (St. Mary's, Minn. , Otterbein)
- ❑ Scientific Collaboration
 - ~90 persons, including
 - ~25 research associates
 - ~10 graduate students
- ❑ Fermilab Group
 - 11 Senior scientists (8 PPD, 2 CD, 1 AD)
 - 1 Associate Scientist
 - 5 research associates
 - 2 scientists retired (paid on contract with project)

Breakdown of project funding



- ❑ DOE Project funds spent at FNAL and BNL
- ❑ Mostly Labor : ~\$14M
 - FNAL : \$11M, FY10 – 14
 - BNL : \$ 3M, FY10 – 14
- ❑ M&S : just under \$6M
 - FNAL : ~\$4.5 M
 - BNL : ~\$1.3M
- ❑ A lot of additional labor was “contributed” by university and lab research associates, graduate students and undergraduates
 - Have not yet properly assessed the value of this
 - Important to do, for correctly estimating cost of new detector projects

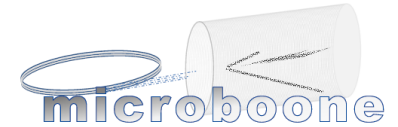
Getting a building



- In August 2011 DOE agreed to the construction of a new building on the BNB using GPP funding
- The MicroBooNE Experiment will be the 1st tenants in the building
- The building design accommodates reconfiguration for future use
 - Ground-breaking in January 2012
 - Beneficial occupancy in May 2013

2 years from funding approval
To B.O.

Largest single procurement



FNAL Purchase Order Inquiry

Fermilab Business Services



FERMI RESEARCH ALLIANCE, LLC
 FERMI NATIONAL ACCELERATOR LABORATORY
 P.O. BOX 500 BATAVIA, ILLINOIS 60510
 AREA CODE 630 840-3000

STANDARD PURCHASE ORDER NO.
606341
 Status: APPROVED Reprints 4

VAL FAB INC
 218 JACKSON ST
 NEENAH, WI 54957

SHIP TO FERMILAB
 RECEIVING WAREHOUSE 2
 KIRK RD & WILSON STREET
 BATAVIA, IL 60510 US

BILL TO FERMILAB
 ACCOUNTS PAYABLE
 PO BOX 500
 BATAVIA, IL 60510 US

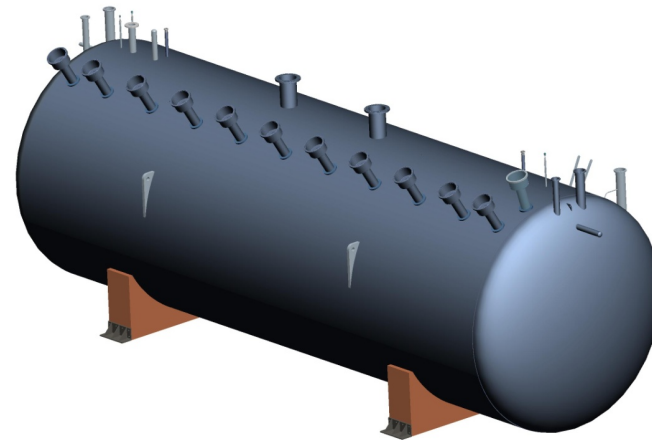
ORDER DATE 25-May-2012
 BUYER [REVANS](#)

TERMS: FROM RECEIPT
 OF GOODS OR INVOICE,
 WHICHEVER IS LATER

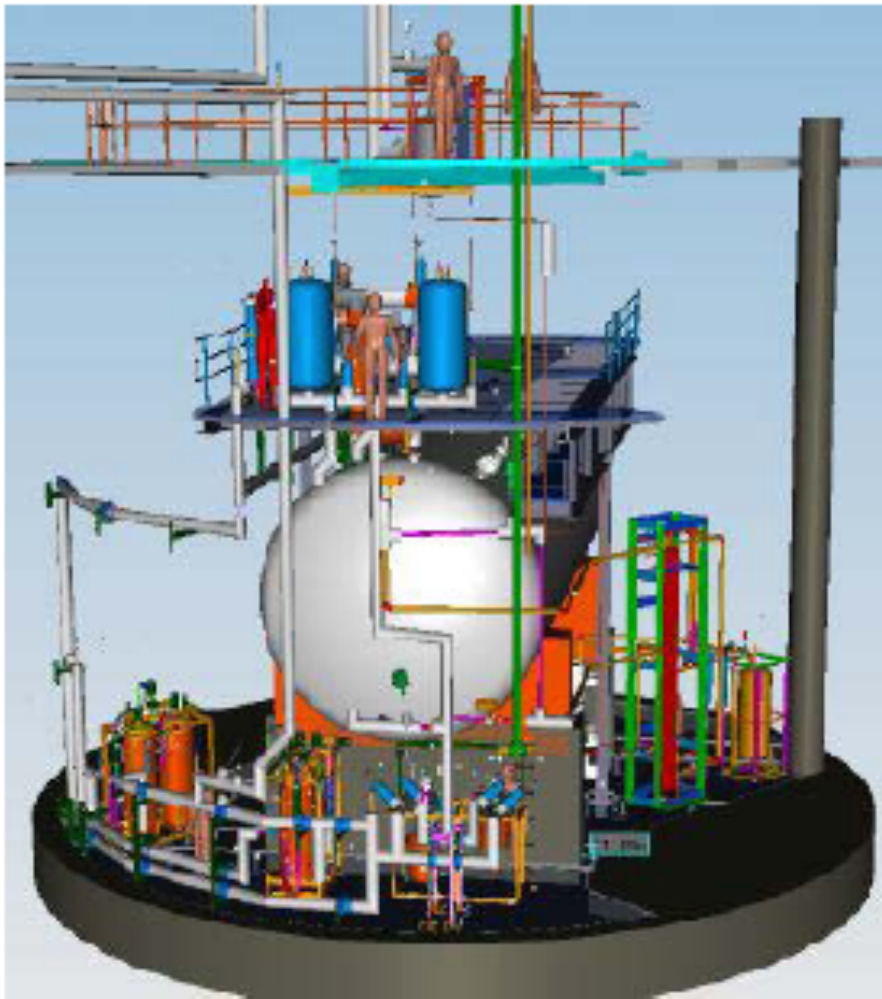
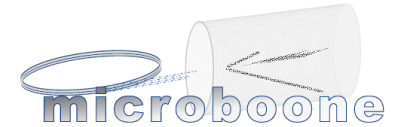
F.O.B. Destination

SHIP VIA:
 VENDORS
 CHOICE

Line	Item Description	Qty	U/M	Unit Price	Ext. Price	Work Pkg-CE	Req Number(s)
1	Design and fabricate a MicroBooNE Vessel per drawings UBOONE_LAR_VESSEL_RFP, Rev B and the Technical Specification for the MicroBooNE LAr Vessel dated February 21, 2012. Promised Date: 07-Dec-2012 Deliver To: KILMER, JAMES R Project: MicroBooNE Task: Argon Cstat Constrtn Task Number 3.03.03 Exp. Org PPD - MECHANICAL ENGINEERING DPT Exp. Type MATERIAL PURCHASES Task Org PPD - NEUTRINO DEPARTMENT Service Type EQ-PROJECT R&D-MICROBOONE	1.00	EACH	290,069.00	290,069.00	00000-41	233954
				PO Total:	290,069.00		



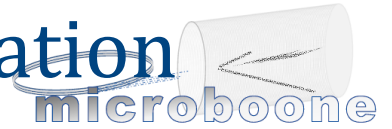
LAr Cryogenics



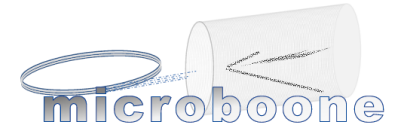
- ❑ M&S ~\$2,000,000
 - Included pumps and filters on pre-fab skids
- ❑ FNAL Labor
 - Design >30,000 hours to date
 - Fabrication ~3X original estimate
 - Installation

We believe we need to find a more efficient way to do the job

Lot's of opportunity for student participation



Wire winding at universities



~5,000 fixed and variable length (U, V) wires wound at Yale

3,456 fixed length vertical wires wound at Syracuse

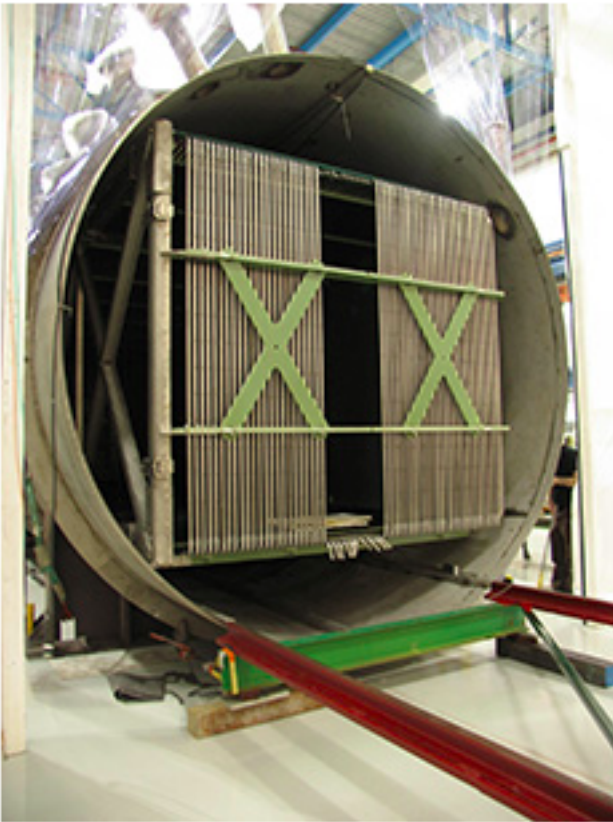


Construction Highlights



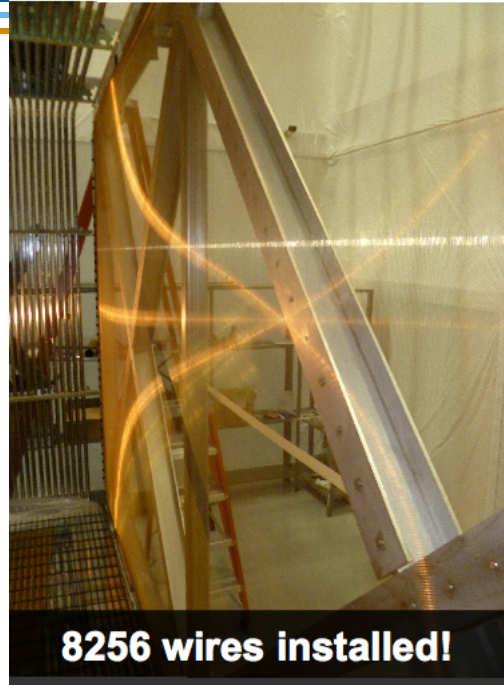
Feature

Liquid-argon time projection chamber gets a test fit

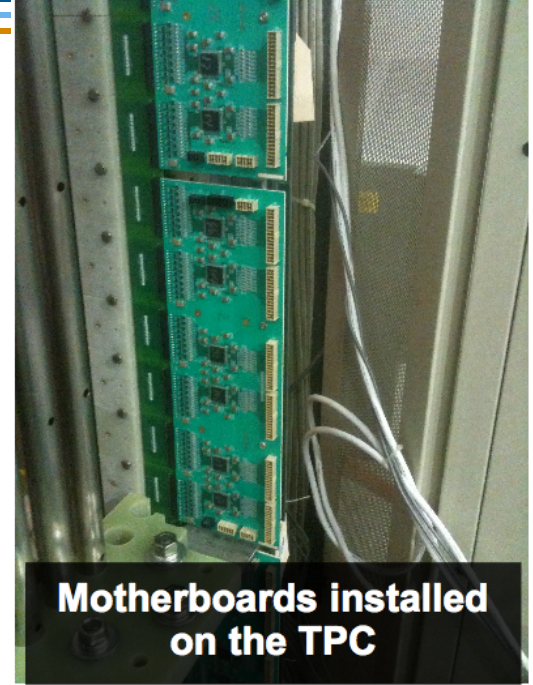


A 6-ton time projection chamber now sits inside the MicroBooNE cryostat. *Photo: Sarah Khan*

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8256 wires installed!

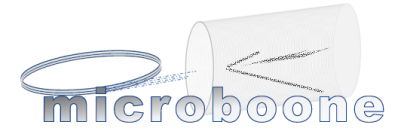


Motherboards installed on the TPC

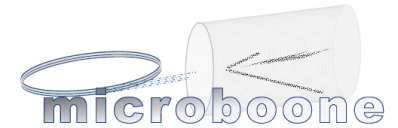


All 32 PMTs installed inside the cryostat (covered with dark bags for protection)

TPC Installation in cryostat



Liquid Argon Test Facility (LArTF)



Feature

Innovation at Fermilab: Liquid Argon Test Facility



From left: Fermilab Deputy Director Young-Kee Kim; Gina Rameika, PPD; Kevin Bomstad and Jason Whittaker, Whittaker Construction and Excavation; Dixon Bogert, Fermilab; Mike Weis, DOE; Fermilab Director Pier Oddone; Erik Gottschalk, PPD. *Photo: Reidar Hahn*

January 24, 2012:
LArTF Ground breaking

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Construction Update

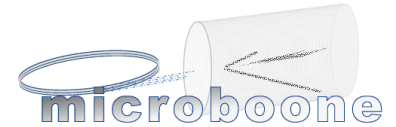
Fermilab takes beneficial occupancy of the LArTF



Two dewar vessels were moved from the Central Helium Liquefier to the Liquid Argon Test Facility. *Photo: Cindy Arnold*

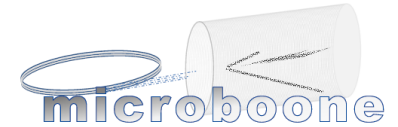


Conclusions : Short term plans



- ❑ MicroBooNE is in the last year of construction
 - Plan to begin commissioning in mid 2014
- ❑ The project and collaboration have been working together very closely to build the experiment
- ❑ We are extremely fortunate to have a lot of students and post-docs who are fully participating in (and leading) detector construction and preparing for our first data with this new device
- ❑ We have made excellent progress and we are eager to start commissioning the detector
 - We believe we have a lot to contribute to the design and planning for construction of larger LAr detectors and are eager to share what we have learned
- ❑ We will be ready for Booster neutrino beam in mid-2014; given the current status of the PIP, we are very concerned about beam delivery to the experiment

Conclusions : Long term vision



- ❑ Construction and operation of the MicroBooNE detector is an important step in the design and development of large liquid argon detectors for use in future neutrino experiments.
- ❑ Potential BNB program using LAr Detectors
 - Near detector in the existing SciBooNE Hall (LAr1-ND)
 - Kiloton scale detector ~800 m from the target (LAr1)
- ❑ Other options :
 - consider placement in MINOS Near Hall
 - Placement further downstream (better L/E) requires going deeper (\$\$)

