

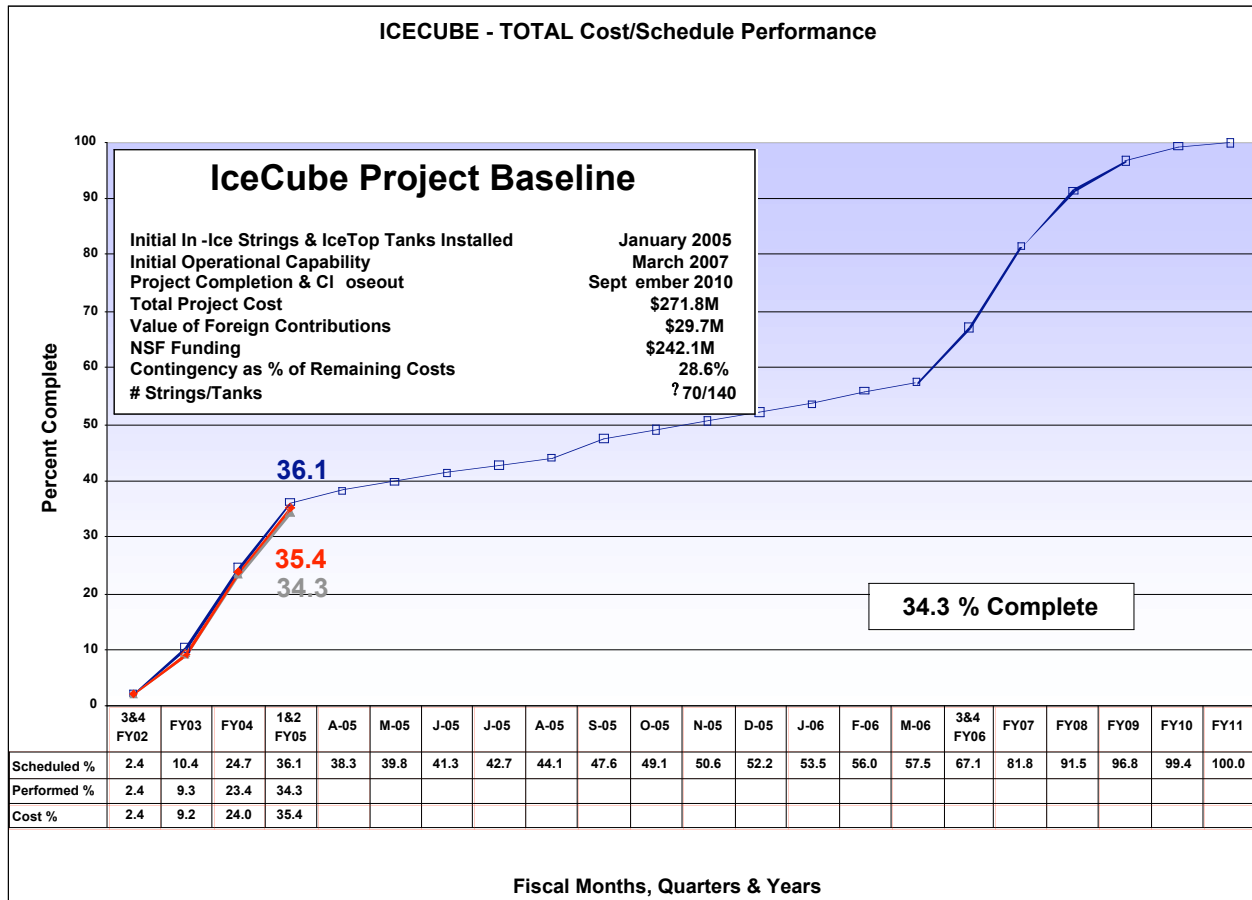
## IceCube Project Monthly Report April 2005

### Accomplishments

All Digital Optical Modules (DOMs) installed at the South Pole continue to produce physics quality data. There are 60 DOMs installed in the operating string and 16 DOMs installed in the IceTop surface tanks.

Production of digital optical modules (DOMs) is now underway at the three worldwide production sites (W-Madison, Stockholm University, and DESY-Zeuthen). The project will produce 930 DOMs this calendar year.

NSF completed a site visit on April 8, 2005, that addressed general project status and plans for the annual review scheduled for May 23-25, 2005.



**Cost and Schedule Performance** – The total cumulative schedule and cost variances at the end of March were a few percent. A report of cumulative variances at a lower level of the work breakdown is provided as an attachment to this report.

***Drill Construction and Operation*** – Improvements to the reliability and general performance of the hot water drill are in progress at the University of Wisconsin's Physical Sciences Laboratory. The major categories of improvements activities include: design and procurement of components; heater safety and reliability, motors and drive reliability, software and networking improvement; thermal modeling, and documentation and standard operations procedures. These improvements are necessary to support the current planning goals for next season:

- Set up the drill camp and prepare for the start of drilling by December 10<sup>th</sup>.
- Drill and install strings over seven weeks (December 11<sup>th</sup> – January 28<sup>th</sup>).
- Achieve drilling time per hole of less than 48 hrs, including firm drilling.
- Achieve deployment times of less than 24 hrs (last season was ~18 hours).
- Assemble and use a 2<sup>nd</sup> drill tower to leapfrog between drilling and deployment.
- Install 2 strings per week with a total of 12 strings possible at this rate.

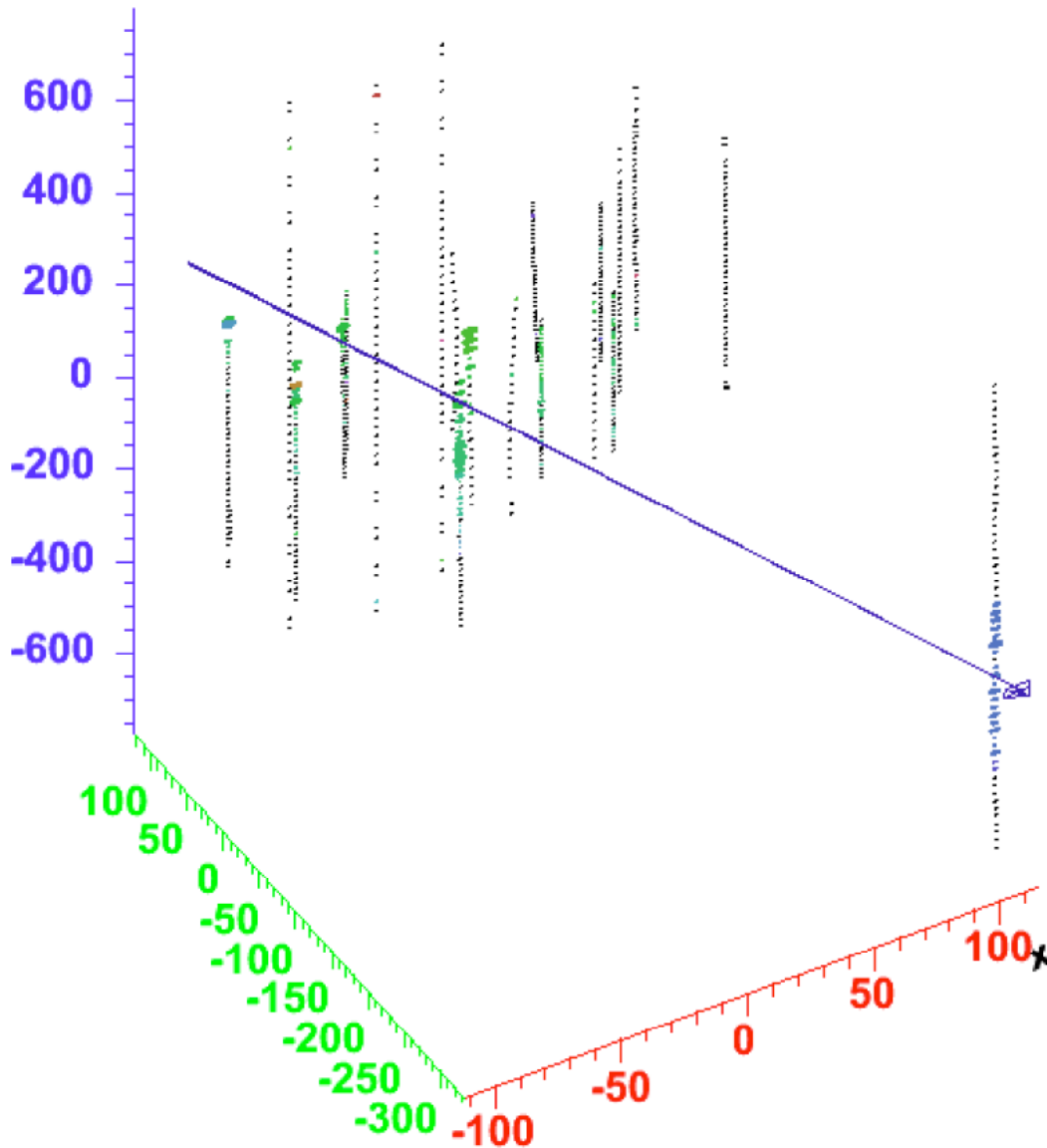
The nominal shift schedule for drilling operations is two shifts of ten people providing for 24 hours of operations during deep ice drilling. The two shifts will be staggered to ensure there is good information transfer between shifts as well as appropriate breaks for lunch, etc. Each shift will have two teams of five people with a total of nine hours where all ten on a shift are at work together. There will also be a break of 24 hours before each hole is drilled. The drill manager and shift leads will ensure that members of the drilling crews do not work excessive hours, a problem experienced last season.

***Instrumentation Production, Testing, and Shipping*** – The production goal for this calendar year is to produce 930 DOMs and to ship 800 to McMurdo Station. The initial production of 70 DOMs at PSL resulted in the use of gel that is not currently viewed as acceptable. A tighter procedure for gel acceptance has been implemented for future production and the affected DOMs may be reworked. Additional quality control issues identified during production/testing start-up were identified and are being addressed. The IceCube DOM production plan and current status is shown in the graph included at the end of this report.

***String and IceTop Commissioning*** – All 76 DOMs are operating and reading data (60 DOMs on the string and 16 DOMs in 8 surface tanks). Communication tests show that all DOMs can communicate simultaneously at a bandwidth of about 1/2 Mbit/DOM/sec. The four DOMs on the top quad show an elevated bit error rate in the startup mode but they continue to produce acceptable data. The cause for the bit error rate is still being investigated. One DOM is operating at relatively low voltage, a gain of  $3 \times 10^6$ , due to excessively high noise rates at higher voltages.

Overall, the data from the first string and IceTop tanks looks very promising and adequate for moving ahead with production plans for 2005. Single photoelectron noise rates (1/4 PE threshold, no dead time) have settled at about 750 Hz. This noise rate is excellent and slightly exceeded expectations. Calibration data and reconstructed events were shown.

Muon reconstruction with a real event with AMANDA strings plus the 1<sup>st</sup> IceCube string is shown in the following picture.



**Instrumentation System Test Status** – The South Pole Test System located at the Physical Sciences Laboratory continues to operate as a test environment. The engineering and instrumentation team use the setup for off-line trouble shooting including tests of new software.

**Data Systems** – The data handling systems are installed in the temporary counting house (future optical module laboratory) and the software is operational. Due to cargo shipment limitations NSF and Raytheon decided to postpone build out of the interior of the permanent counting house until next year. It is now anticipated that conditional occupancy of the IceCube Counting House will be December 1, 2006.

**Quality Assurance** – A new document control process will be implemented in May 2005. This process was designed by the IceCube Quality Assurance Manager and the Engineering Manager and improves on the previous system. A high level Nonconforming Material Analysis Process

was defined for PSL, DESY, and for Sweden. Due to a significant increase in DOM production numbers for this season, the turnaround time for the failed DOM analyses must decrease in order to keep up with production. The plan will focus on a timely return of failures into the Production stream, while being careful to extract the necessary analytical data for process improvement. A review of the DOM Inspection plan was conducted and a plan generated for enhancing the key component surveillance effort. The Detector Wide Monitoring Plan for year one was completed and approved. The IceCube Sensor System Calibration Plan was completed and approval is pending.

**Safety** – The newly hired IceCube Safety Manager reviewed the existing IceCube Safety Manual and determined that it was complete and comprehensive. Appendix E, Drilling & Deployment Training Agenda, is in the process of being updated for this coming year. Safety design reviews are being planned to address changes to drill design and processes. A Hazard Analysis for the IceCube Lab (formerly the Counting House) is planned for later on this summer.

**Future Meetings and Events**

UW/RPSC Detailed Planning Meeting in Support of SIP @ UW	April 5-6, 2005
NSF Site Visit @ UW	April 8, 2005
NSF Baseline Update Status Review (Hartill IV) @ UW	May 23-25, 2005
International Oversight and Finance Group Meeting @ NSF	TBD

The monthly reports are posted at [IceCube Monthly Reports](#).

IceCube Neutrino Observatory Cost Schedule Status Report Reporting Period Ending: 3/31/2005 <sup>1</sup>											
WBS Element	Cumulative To Date (AY K\$)					At Completion (AY K\$)			Complete (%)		
	Budgeted Cost <sup>2</sup>		Actual Cost of Work Performed	Variance		Budgeted AY \$s	Latest Revised Estimate	Variance	Scheduled	Performed	Actual
	Work Scheduled	Work Performed		Schedule	Cost						
1.1 Project Support <sup>3</sup>	12,249.8	12,027.6	12,493.8	-222.2	-466.2	28,694.2	29,160.4	-466.2	42.7%	41.9%	43.5%
1.2 Implementation	13,425.7	13,110.5	14,245.8	-315.2	-1,135.3	27,757.2	28,892.4	-1,135.3	48.4%	47.2%	51.3%
1.3 Instrumentation	32,023.6	33,028.5	34,931.7	1,004.9	-1,903.2	92,289.3	94,192.5	-1,903.2	34.7%	35.8%	37.9%
1.4 Data Systems	7,704.7	6,811.3	6,145.5	-893.5	665.8	26,568.9	25,903.1	665.8	29.0%	25.6%	23.1%
1.5 Detector Commissioning & Verification	5,509.7	3,665.7	3,578.0	-1,844.0	87.8	19,596.8	19,509.0	87.8	28.1%	18.7%	18.3%
1.6 Polar Support Services	10,885.3	9,239.2	8,852.6	-1,646.1	386.7	32,634.4	32,247.7	386.7	33.4%	28.3%	27.1%
NSF <sup>3</sup>	426.5	426.5	426.5	0.0	0.0	1,263.0	1,263.0	0.0	33.8%	33.8%	33.8%
Sub Total	82,225.3	78,309.3	80,673.8	-3,916.0	-2,364.5	228,803.6	231,168.1	-2,364.5	35.9%	34.2%	35.3%
Management Reserve											
Total Contingency						42,967.4	40,602.9	42,963.8			
Items Outside of Approved Baseline											
IceCube Neutrion Observatory	82,225.3	78,309.3	80,673.8	-3,916.0	-2,364.5	271,771.0	271,771.0	0.0	35.9%	34.2%	35.3%

Notes: 1 Incorporates approved and currently pending baseline changes.  
2 Budgeted contingency includes \$536K of currently undesignated Non-US Contributions.  
3 Budgeted contingency is 28.6% of the Budgeted cost of work remaining.

