

ICARUS @ Colorado State University*

Robert J. Wilson
 ICARUS Collaboration Meeting
 13-14 May 2018

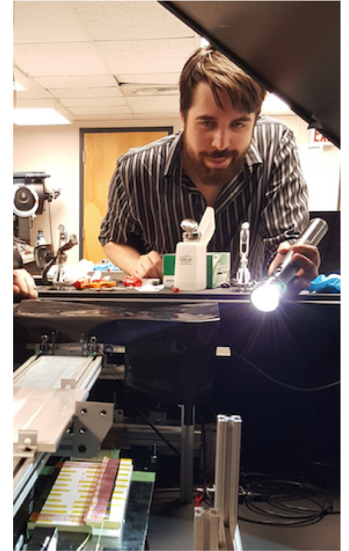
* Mike Mooney as a potential new member will present separately

Group Introduction

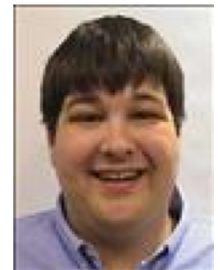
- Joined the ICARUS collaboration summer 2015
- Physics interests
 - Oscillation physics, (NuMI) ν_e on argon at DUNE energies
- Technology contributions
 - Cosmic Ray Tagger design/construction/installation/commissioning
 - Support for technical developments from Fermilab
 - CRT + Light detection system: Trigger + reconstruction
- Relevant experience
 - T2K Pi0 Detector design/fab/op, oscillation physics sensitivity task force, ν cross section analyses
 - LBNE spokesperson, physics coordinator, simulation, DUNE photon detection
- Support: 3-year DOE award April 2017-March 2020
 - Transition from T2K+DUNE to SBN+DUNE
 - 1 postdoc: ~60% ICARUS starting mid-late summer
 - 2 100% students: 1 at FNAL, 1 at CSU unless additional funding found to move to FNAL

Graduate Students

- **Christopher Hilgenberg:** 100% on SBN, started in 2015
 - Based at Fermilab
 - DOE base grant
 - URA Visiting Scholar partial support 2018 and 2019!
 - Working on ICARUS Cosmic Ray Tagger system
 - Measurements/analysis of the CRT prototypes
 - Presentation on CRT simulation tomorrow



- **Tyler Boone:** 100% on SBN, started on SBN Summer 2016
 - Based at CSU; would move to Fermilab if funding available
 - DOE base support summer + 1 semester
 - Working on ICARUS Cosmic Ray Tagger system
 - Assembly/measurements of the CRT prototypes and fixtures
 - Check out of new frontend electronics
 - CRT DAQ (joint with SBND)
 - “Side (MINOS)” CRT readout production



Post doc: Biswaranjan Behera

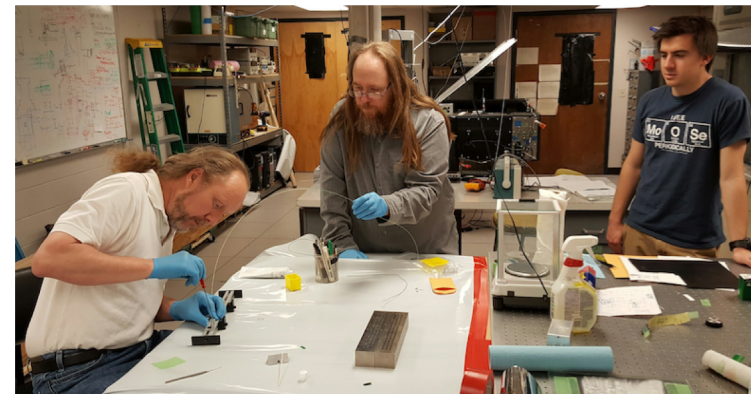
- Completing his thesis on NO ν A – defense early summer
 - Supervisors: Prof. Anjan Giri (IIT-Hyderabad) + Dr. Jonathan Paley (FNAL)
 - At Fermilab since 2015
 - Inclusive ν_{μ} charged-current cross section in the NO ν A near detector
 - Particle ID; calibration; reconstruction; simulations
 - DAQ; data quality
 - Near detector electronics maintenance

- ~60% on SBN, ***start mid-late to summer 2018***
 - Based at Fermilab
 - DOE base grant
 - Will work on CRT; ICARUS installation/commissioning; neutrino analysis; ...



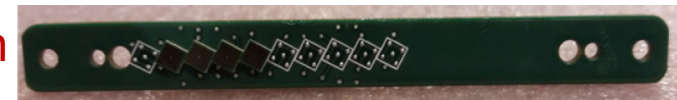
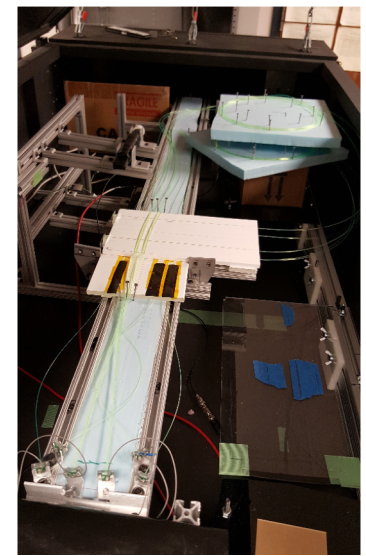
Technical Support

- Undergraduate Students:
 - William Palmer (physics), Blake Troska (eng.), Sarah Earl (eng.)
 - Dark noise studies of photosensor candidate
 - Setup digital oscilloscope readout of photosensors
 - QA on long FNAL extruded scintillator (hole diameter)
- Engineer/Technicians:
 - Dave Warner (eng.), Jay Jablonski (tech), elec. eng. students;
 - Precision machinist (Bob Adame)
 - PCB for SiPMs
 - Dark box design/fab
 - Design/fabrication of side CRT photosensor readout units.



ICARUS Activities To Date

- Design of a full-coverage CRT including many prototypes for cost/performance optimization
 - Not funded by DOE
- Co-chair SBN Cosmics Task Force
- Studies of CRT tagging/auto-veto
- Testing of MINOS scintillator
- Help installation of “Bottom CRT” (Double Chooz counters)
- Photosensor studies - improved SenSL and new Hamamatsu (improved over SBND option)
- **Design/fabrication of the replacement for the MINOS PMTs**
 - Passed Fermilab technical review last month
 - A proposal is pending for CSU to fund production of the readout module
- CRT DAQ – recently started
- Organization with US groups



ICARUS Survey

Science interest [Check all that apply.]

- Nue Appearance
- Numu Disappearance
- Cross section using NuMI beam
- Oscillation Fits
- Background Studies

Which Activities is your institution interested to contribute? [apply.]

- Development and tests
- Installation
- Pre-commissioning
- Commissioning
- Detector operation
- Data taking
- Event reconstruction
- Data Analysis
- Publications, presentation to conferences, outreach

Which sub-systems is your institution interested to contribute? [that apply.]

- Wire chambers
- High-voltage
- Scintillation light readout
- PMT laser calibration
- CRT (split in bottom part, sides and top)
- DAQ
- Trigger
- Slow control
- Online monitoring
- LAr quality control
- Control of cryogenics (cryogenics itself is a Fermilab responsibility)
- Data storage and data transfer
- Event simulation: BNB; NuMI OA
- Event reconstruction: BNB; NuMI OA
- Cosmic rays data taking and analysis

More details about the contribution - it would be helpful to refer the "Activities" file (<https://indico.cern.ch/event/727055/>) for specific activities e.g. slide 5 items 8-10 and slide 6 - item 4

Initially most effort on the CRT sides - production of the SiPM readout boards, installation, commissioning, DAQ, trigger, CRT-PMT timing/interface.

Slide 4 items 1+7; Slide 6 item 4+7; Slide 8 items 12+13; slide 11 items 6f+h; slide 15 item 4; slide 17 items 1,2,3

How many graduate students, post-docs and summer students are you expecting to have working in ICARUS? [Include FTE estimate and if they will be resident at Fermilab.]

Initially 2 (almost) full-time graduate students: 1 currently resident at Fermilab, could be 2 if funding available. 0.5 FTE post doc resident at Fermilab from ~July 2018.