

## Minutes of the 19<sup>th</sup> Meeting of the SBN Oversight Board (Fermilab, December 9, 2022)

### Committee Attendees:

- S. Brice (Chair, Fermilab)
- A. Ereditato (Switzerland)
- A. Fava (ICARUS Deputy Spokesperson)
- A. Guglielmi (ICARUS Deputy Spokesperson)
- O. Palamara (SBND Co-spokesperson)
- C. Rubbia (ICARUS Spokesperson)
- M. Shaevitz (US NSF)
- R. Wilson (US DOE)

### Committee Absentees:

- S. Bertolucci (INFN, Italy)
- J. Evans (UK)
- M. Nessi (CERN)
- D. Schmitz (SBND Co-spokesperson)

### Non-Committee Attendees:

P. Wilson (SBN Program Head), E. Worcester (Deputy IB Chair), J. Saviano (Secretariat), D. Salmieri (ICARUS Scientific Secretary), D. Gibin (INFN, Italy), C. Montanari (CERN/Fermilab)

### New Action Items

Steve will talk to reconstruction experts to understand if there is value to additional coordination across detectors.

### Introduction and Review of Last Meeting

No action items from last meeting. Dates sent for next 3 OB meetings. As discussed in previous meeting, the OB will hold quarterly meetings until SBND is running. No comments on minutes from previous meeting. No questions or comments from the group.

### Spokesperson Update

C. Rubbia, ICARUS Spokesperson, presented an update

The Spokes for ICARUS and SBN have been meeting regularly. ICARUS is preparing its first publication based on the FNAL detector. Six SBND collaborators are being included in the author list. Discussions were held regarding minor changes to text

### SBN Institutional Board Update

E. Worcester, SBN IB Deputy Chairperson

Slides presented

- SBN IB Current Goals
  - Ratification of SBN Committee Rules document
  - Charge standing committees to carry out key SBN processes as specified in organization documents.
  - Regular business of the IB, as specified in its by-laws
- SBN activities since last OB meeting
  - Last meeting held 15 November. Discussion of final suggested amendments from members of the SBN IB. Non-substantive/clarification changes (made prior to meeting), two proposed minor modifications (adopted/clarified) and one major modification (no consensus/not adopted)
  - The SBN Committee Rules documents were referred to the collaboration for approval.
- Upcoming Activities:
  - Hope to ratify documents at next meeting scheduled for 10 January. If approvals are not received, fallback goal is to have a final agreed-upon draft that will be approved by the collaborations without modification for approval by the SBN IB. (list of requested changes on slide 5)
  - Engage with Fermilab-wide Code of Conduct initiatives

#### Questions/Comments:

(Referring to slide 6) **Guglielmi** reminded everyone the UK has stricter guidelines for protecting the data of people which needs to be considered. **Worcester** said we need to understand those laws/guidelines before we proceed. In the short term, we can come to a compromise on language.

### ICARUS Commissioning

C. Montanari – ICARUS Technical Coordinator

Slides presented

- Detector Status: Planned activities for summer shutdown delayed due to fire on 14 September. Detector brought back to normal operation mid-October. Restarted liquid recirculation pump in the West module at beginning of November.
- LAr purity as of 2 December: West module: 6.6ms, East module: 3.4ms, purity has been improving steadily. Periodic venting of both modules required to improve LAr purity.
- Slides of electron lifetime trend in the East and West modules

- Neutrino data taking: Technical meeting held on 23 November to verify status of various sub-systems in relation to start of continuous data taking with the beams. Start of Run 2 confirmed on 30 November. Some optimization activities planned.
- Trigger developments during summer shutdown: standard trigger logic used in Run 1 presented some inefficiencies in recording cosmic rays. New “overlapping window” logic has been adopted to mitigate this.
- PMTs timing calibration
- CRT matching with PMTs and TPC: CRT time offset has been corrected
- Other activities during summer shutdown: DAQ improvements, Bottom CRT acquisition, Top CRT telescope, Monitoring tools have been improved
- TPC Wire signal calibration: full calibration chain developed
- TPC energy response non-uniformity: procedure being developed to correct non-uniformities.
- TPC events reconstruction: Quality of automatic pattern recognition of both vertices and tracks in TPC being validated.
- Neutrino-4 analysis; First ICARUS-only analysis will check the Neutrino-4 claim

### Questions/Comments

**Ereditato:** asked if the difference of the purity between East and West related to fire? The fact for the East is not exponential at all and am wondering if it could be a hardware problem inside. **Montanari:** We were planning to repeat the regeneration in the East module, but due to fire, did not. We decided to delay because the risk was too large. The reason why is because the West regeneration level was not at the same level of the East one. In both modules, it’s reasonable to assume the level of saturation is roughly the same. It’s not the same because at the filling time (2 years ago) each was filled at slightly different times.

Originally, the two modules have seen a little bit of difference between the purities that were injected. **Ereditato:** Can you understand why this is not exponential? **Montanari:** This has to do with the fact that the filter is not fully operational. As the filter gets saturated, this time becomes more and more like the transit times of the impurity inside the filter. When you get there, you’re no longer filtering out exponentially You must run a little bit of calculation.

**Brice:** The filter becomes saturated from front to back, not uniformly.

### SBN Project Update

P. Wilson, SBN Program Deputy Coordinator

Slides presented

- Near Detector – SBND
- Light Systems and Detector Assembly: Installation of all PDS boxes completed.
- SBND Cryostat: Completed
- Cryogenics: Internal cryo completed 8 Nov. Detector top cap rigged onto cryostat, started detector feedthrough pressure tests at PAB. Cryogenic installation work ramping up

- Assembly and Installation: all QA/QC completed, ATF reconfiguration into transport mode completed. Attached chains/straps for securing to trailer, wrapped ATF in opaque plastic
- Final Detector Move Preparations: 3 trial runs, mitigation of obstacles on route. Had to reschedule to 1 Dec due to weather.
- Slides of detector moving
- Milestone updates – S2 Detector ready to fill with LAr:
  - QC checks start next week, will be complete in January.
  - Plug welded to cryostat 18-May
  - Cryogenic operation approved 18-May
  - S2:SBND Detector is ready to fill with liquid Argon 20-Jun
- Timeline to completion review
- Closer look at the near future CY23 (Jan through July)
- Final Director's Review Feb 28-March 2. Primary focus shifts from Installation to Commissioning & Transition to Operations. In preparation, will add detail to the Cryogenics & Detector Commissioning plans and timeline estimates for getting from S2 to S4

#### Questions/Comments

**Shaevitz:** Before the welding takes place, will there be many measurements of the wire tensions? **Wilson:** No. There's no real way to measure. The wires were strung (half) in the UK and (half) at Yale. They were re-measured at delivery. There were only small changes. From the shock data we had, there were fewer accelerations in the transport than were had during moving the components to the lab. Also, we don't really have a mechanism for re-measuring.

**Fava:** Congratulations were given to the Collaboration and the team working on the move.

**Brice:** This bodes well for Fermilab's future, especially having such a young team pull off this complex assembly and maneuvering.

#### SBN Joint Working Groups Update

D. Gibin, INFN Italy

Slides presented

- SBN Working Groups: Review of groups and goals
- SBN DAQ and Data Pre-processing WG: Coordination and developments
- SBND Slow Control WG: SBND - Goal is to establish controlling/monitoring system for important devices.
- CRT WG: ICARUS – Optical Flash time difference is under study without TPC reconstruction.
- SBN Analysis Infrastructure WG: Updates include new co-conveners, preparation of production release SBN2022B, final patches being prepared coincide with ICARUS Run 2 beginning.
  - Computing planning: Fermilab Computing Resource Scrutiny group (FCRSG) annual review planned for early February. Group has been asked to prepare a 5-year computing plan. Discussions have begun, docdb URL links provided. Will share overall plan early 2023.

- Tools for Cosmics and  $\nu$ : URL links provided for details of cosmic modeling discussion and proposal from ICARUS to use ‘DUNE’ interaction model. SBN encourages move to use updated GENIE v3.2 as default for  $\nu$  event generator.
- SBN Analysis Group: Updates: Joint activities slowing down. Progress on joint efforts/interactions between SBND and ICARUS has stalled, leading to divergent efforts. Joint WG efforts need to be revitalized. Slide of present organization and proposed organizational structure.
- Additional Considerations for SBN Analysis strategy going forward: Should allow and enable people to apply their creativity and interests, while supporting and guiding them to do this in an organized way. Need to keep computing needs manageable/viable, optimize physics analysis performance, and use available people power and other resources efficiently.

### Comments/Questions

**Brice:** The slowdown in work of the SBN Analysis group as described is very worrying at this time, when one detector is starting to take data and the other is not too far behind. The described reorganization of the structure will help, but will more steps be needed to get this group as productive as they need to be? **Gibin:** Yes, the plan is to organize some workshop activities and convey as much info from one group to the other as possible. A workshop on Calibration will give opportunities to work together and if possible, in person. **Brice:** This is an area where the Oversight Board is going to want to watch very closely for the next year. As the IB starts to wind-up most of its work on the rules/procedures, this could become more of a focus for the IB. **Worcester:** IB could be used to help find people to fill roles or to recruit for different tasks. She will mention it to McFarland (IB Chair).

**Guglielmi:** There has been a lack of activity in the last period partly because ICARUS has been focused on getting ready for Run II and SBN was concentrating on the preparation for the detector move. Groups definitely need to start working together.

**Shaevitz:** There are several TPC reconstruction events. Are SBND and ICARUS planning to have a common reconstruction event level reconstruction? How is that working now? **Gibin:** We are trying to develop low level stuff that is linked to the actual properties of the detector. At a higher level, we’re trying to have as much shared among the SBN court. We capitalize on the previous experience, which is one of the key elements. We must be as close as possible to control systematics in this measurement. **Shaevitz:** So, there’s movement towards having a common lab level TPC reconstruction that will help with the systematics. Is that correct, between the 2 detectors? **Gibin:** Yes, that was the decision from the very beginning. For the success of the experiments, we have to have as close as possible common tools. There are some differences in the hardware we have to account for, but the reconstruction should be done as common as possible. **Ereditato:** This board should push Fermilab to organize a forum at Fermilab. We should avoid duplication. There is a cultural issue. Maybe we should discuss with Lia. **Brice:** Is this where you imagine talking to the relevant collaborations to get reconstruction experts together in a room to share best practices? **Ereditato:** Yes, to some extent. We need to define this body, which should oversee any effort and try to be economical. The collaborations should talk to each other under an umbrella or over-arching structure. **Brice:** Not just some workshop, but something longer-lived structure? **Ereditato:** No, something specific of Fermilab. **Brice:** It’s

an idea that's been kicked around, but we made the decision to leave it to the collaborations, but maybe there needs to be some help in that communication. **Palamara:** This is the exact way we were structured in the beginning - that the reconstruction part is in common, and it is. Lists are being passed back and forth between collaborations and in fact, a MicroBooNE person made the effort to import extra tools into the SBN framework. **Ereditato:** Acknowledges what has been done and it is clear. He is suggesting capitalizing on the experience/expertise that is floating around Fermilab to anticipate problems, not to try to solve any problems. **Palamara:** What you are describing is LArSoft. I'm not sure we need to have another structure. Code is centralized for all experiments. **Brice:** we're not sure that what we're doing right now is everything we should be doing. Should we bring together the relevant reconstruction experts, leaders from DUNE (FD/ND), MicroBooNE, ICARUS, SBND, LArIAT and ArgoNeUT and pose the question, "Are we doing everything we should, to have coordination in reconstruction between these efforts?" We might emerge from the meeting saying, "We're doing ok, but maybe we could do these few things better." Is that the right step forward? **Ereditato:** Yes, this is developing the rough idea. Said Palamara pointed out the physiological issues with LArSoft, which was to some extent "bottom-up." He is thinking of something more "top-down." Something which is directly in the hands of Fermilab. The first point before answering questions that are not there, we should proceed with a fake zero and understand if there are questions. More formal, not only for the basic reconstruction but for everything that is related to event reconstruction. **Montanari:** Are we sure there is a problem? If we keep trying to modify the way people work, it may be detrimental. **Brice:** It's an optimization problem and a complex one. **Fava:** The repository of the tools is LArSoft and there is a LArSoft steering group, which is supposed to be doing what we're discussing now - bringing together the management of all the collaborations. They are making sure that the tools being developed within LArSoft are what the collaborations need. Maybe we should have the analysis coordinator or reconstruction coordinator meet with the steering group. **Guglielmi:** Agrees with Claudio and Ornella. **Brice:** Will talk to reconstruction experts (ex. Tingjun or people working on the 2x2) to understand whether there is value to pulling the experts and collab leaders together to discuss this topic, or if we're reasonably optimized right now.

**Worcester:** this is an add-on to Gibin's comment to Shaevitz's question regarding common analysis code. She agrees with everything that Gibin said and that we make every effort to keep the analysis code symmetric between ICARUS and SBND. Another flavor to the question is, are there multiple reconstruction pathways and the answer is yes. We have 2 that are pretty well developed and are actively studied (Pandora based one and a machine-learning based one). We're trying within the analysis leadership to treat those things on equal footing and work together, but it's a different line of code, almost by necessity for some parts of it. Machine learning code has to run on GPUs, so it can't be integrated into LArSoft trivially. That's something that the analysis leadership of both collaborations are going to have to keep an eye on, making sure it does stay symmetric between the collaborations when we do have these multiple threads and try to get the threads connected in all the places they can be connected and only diverge where it's necessary. We're doing pretty well so far, but we should keep an eye on.

**Gibin:** From the very beginning, the idea was to have rules as common as possible in LArSoft. A significant effort was led by the SBN Analysis Infrastructure group to reach restructuring of the base code. So now we're building on top of LArSoft from a specific detector code, taking into

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account the differences between the detectors. There are conversations about how to bring inside possible alternatives such as machine learning in a common way.

**Other Business**

None

*The SBN-OB meeting was adjourned.*

Next meeting 3 months from now 10 March 2023