

SBN Joint Working Groups

SBN Oversight Board Meeting

FNAL

November 30th 2018

Ornella Palamara

SBN – Joint Efforts across the SBN program

- ❑ **Joint Efforts** across the SBN program are **key to the success of the program**.
 - ❑ Exploiting synergies
 - ❑ Sharing of expertise from different groups
 - ❑ Reduce the effort of the single Collaborations
 - ❑ Minimize systematics that impact the final analysis

- ❑ **Existing Working Groups:**
 - ❑ SBN Analysis Group
 - ❑ SBN DAQ and Data Pre-Processing
 - ❑ SBN Slow Controls
 - ❑ SBN Cosmic Ray Tagger

- ❑ **To be formed:** SBN Cryogenics WG, SBN Data Management WG

SBN – Joint Efforts across the SBN program

- ❑ Quick overview
- ❑ Detailed presentations from the WG conveners at the September SBN general meeting

September 2018 SBN Collaboration Meeting; Fermilab

Friday, 21 September 2018 from 08:30 to 21:00 (US/Central)
at IARC Lecture Hall (<http://saturdaymorningphysics.fnal.gov/location-of-iarc/>)

14:55 - 17:00	SBN Working Groups Reports
15:15	SBN CRTs 20' Speaker: Dr. Umut Kose (CERN and BERN University)
15:35	SBN DAQ and Data Pre-Processing 20' Speaker: Dr. Wesley Ketchum (Fermi National Accelerator Laboratory)
15:55	SBN Slow Controls 20' Speaker: Prof. Sowjanya Gollapinni (University of Tennessee, Knoxville)
16:15	SBN Analysis Group 20' Speaker: Prof. Daniele Gibin (Università di Padova and INFN Sezione di Padova)

SBN DAQ and Data Pre-Processing WG *(conveners: B. Badgett, A. Fava, W. Ketchum, S. Ventura)*

- ❑ Scope: Identify areas of common effort on data acquisition and data pre-processing, and coordinate activities in those areas.
- ❑ Successful in spreading information on efforts in the common areas, and in coordinating with the experiment specific groups to establish milestones and discuss plans for upcoming work
 - ❑ *Match the needs of each experiment*
 - ❑ *Need to make more efforts to setup common software platforms to better allow direct and efficient integration of common efforts.*
 - ❑ *This will be a priority of the group in the coming month(s), to ensure we are well positioned for ICARUS and SBND to move from test-stand work to full integrated systems and benefit most from each other's work.*
- ❑ The group is well-structured, no modifications to the group are considered.
- ❑ Meet once every three weeks since July 2016 , alternating with ICARUS- and SBND-specific DAQ working group meetings
 - ❑ *Good attendance from both experiments and technical experts at Fermilab*

SBN Slow Controls WG *(conveners: A. Fava, S. Gollapinni)*

- Scope: Develop a system based on hardware and software interfaces as much as possible identical for the two experiments, leading to efficient sharing of resources and effort between both experiments
 - *Both experiments converged on using EPICS as the primary controls system, resulting in a lot of common software and tools development*
- The current model established for this common effort has been very successful and productive!
- Meet bi-weekly since Oct. 2017

Milestones for common activities

Milestone	Date
Cryogenics status into EPICS	Nov. 2018
DAQ server/status monitoring into EPICS	Feb. 2019
Beam Status into EPICS	Feb. 2019
Cameras for monitoring access to the buildings operational	March 2019
Slow Controls Archiver, Alarm Server ready	March 2019
CSS GUI interface & navigation ready	April 2019
Expert/commissioning-level documentation ready	June 2019
Shifter-level documentation ready	Sept. 2019

SBN CRT WG *(conveners: U. Kose, I. Kreslo, B. Wilson)*

- ❑ Review the requirements and expected performances of the CRT system for the different detectors.
- ❑ Review the CRT production status and the installation plans.
- ❑ Develop a common data model for the CRT detector systems.
- ❑ Review the DAQ scheme (adjust if needed). Define a common data output format for the CRTs together with the SBN DAQ working group.
- ❑ Develop common CRT monitoring for all CRT systems.
- ❑ Together with SBN Analysis groups
 - ❑ *Identify similarities and differences in the near and far detectors CRT systems that may impact oscillation analysis.*
 - ❑ *Identify physics scenarios where CRT detector system will be valuable, such as calibration; rejection of cosmic muon; rejection of electromagnetic activity; beam-based background, "dirt events"; understanding systematics.*
- ❑ Meet bi-weekly since September 2018.

SBN Analysis WG *(conveners: D. Gibin, O. Palamara)*

- ❑ Explore how combined SBN physics analysis for sterile neutrino oscillation searches can be most effectively performed.
- ❑ Work focuses on implementing a multi-detector simulation, building reconstruction and analysis tools within a common framework, and developing an end-to-end common analysis scheme in preparation for real data exploitation.
- ❑ Meet bi-weekly since September 2016, with typically 30+ participants.
- ❑ Two SBN analysis workshops
 - ❑ *Fermilab, Oct. 2017*
 - ❑ *Padua, March 2018*
- ❑ Status of the SBN analysis efforts presented at the Fermilab Physics Advisory Committee (PAC) meeting in July (by OP).

SBN Analysis WG (conveners: D. Gibin, O. Palamara)



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September 18, 2018

Dr. Ornella Palamara
MS 220

Dear Ornella,

Thank you for your presentation "SBN Analysis Working Groups Report" at the meeting on July 16th for the Fermilab Physics Advisory Committee (PAC). The committee explicitly mentioned the appreciation of the excellent reports at the meeting.

The status of the SBN analysis was an important topic at the meeting. Relevant excerpts from the PAC report are attached. "The Committee was pleased to see the continued development of the joint SBN analysis effort" and looks "forward to seeing an updated sensitivity study based on the latest software framework, an update on the strategy for the cross section measurements". The PAC also encourages SBN to work with the "laboratory to develop a detailed computing strategy".

I take note of the PAC comments, and look forward to an update on the SBN analysis and computing model.

Sincerely,

Nigel S. Lockyer
Director of Fermilab

cc: G. Bock, S. Brice, A. Canepa, S. Geer, J. Lykken, M. Spiropulu, H. Tanaka

Letter
from Nigel
(after
July 2018
PAC
meeting)

SBN Analysis WG *(conveners: D. Gibin, O. Palamara)*

From
July 2018
PAC report

Excerpts from the July 2018 PAC Report:

From the executive Summary:

At the next PAC meeting, the Committee is looking forward to seeing an updated sensitivity study based on the latest software framework. The PAC encourages the collaborations to develop a strategy for the cross section measurements with an eye towards maximizing input towards DUNE, and to work with the Laboratory to develop a detailed computing strategy

From the SBN Section:

The Committee was pleased to see the continued development of the joint SBN analysis effort, with regular meetings and workshops that have led to an agreement to implement a common simulation and reconstruction framework based on LArSoft and a unified analysis scheme for sterile neutrino oscillation searches. The effort has successfully generated simulated neutrino events for both SBND and ICARUS, and is jointly developing aspects of the simulation such as the cosmic ray and photon detection systems, as well as reconstruction and selection algorithms. The joint effort is augmented by a new collaborative effort that includes the Fermilab Theory group.

The Committee encourages the SBN analysis effort to maintain its momentum, especially in preparation for early data coming out of the commissioning of the ICARUS detector. At the next PAC meeting, we look forward to seeing an updated sensitivity study based on the latest software framework. We also encourage the collaborations to develop a strategy for the cross section measurements with an eye towards maximizing input towards DUNE, and to work with the Laboratory to develop a detailed computing strategy.

1) Updated sensitivity study

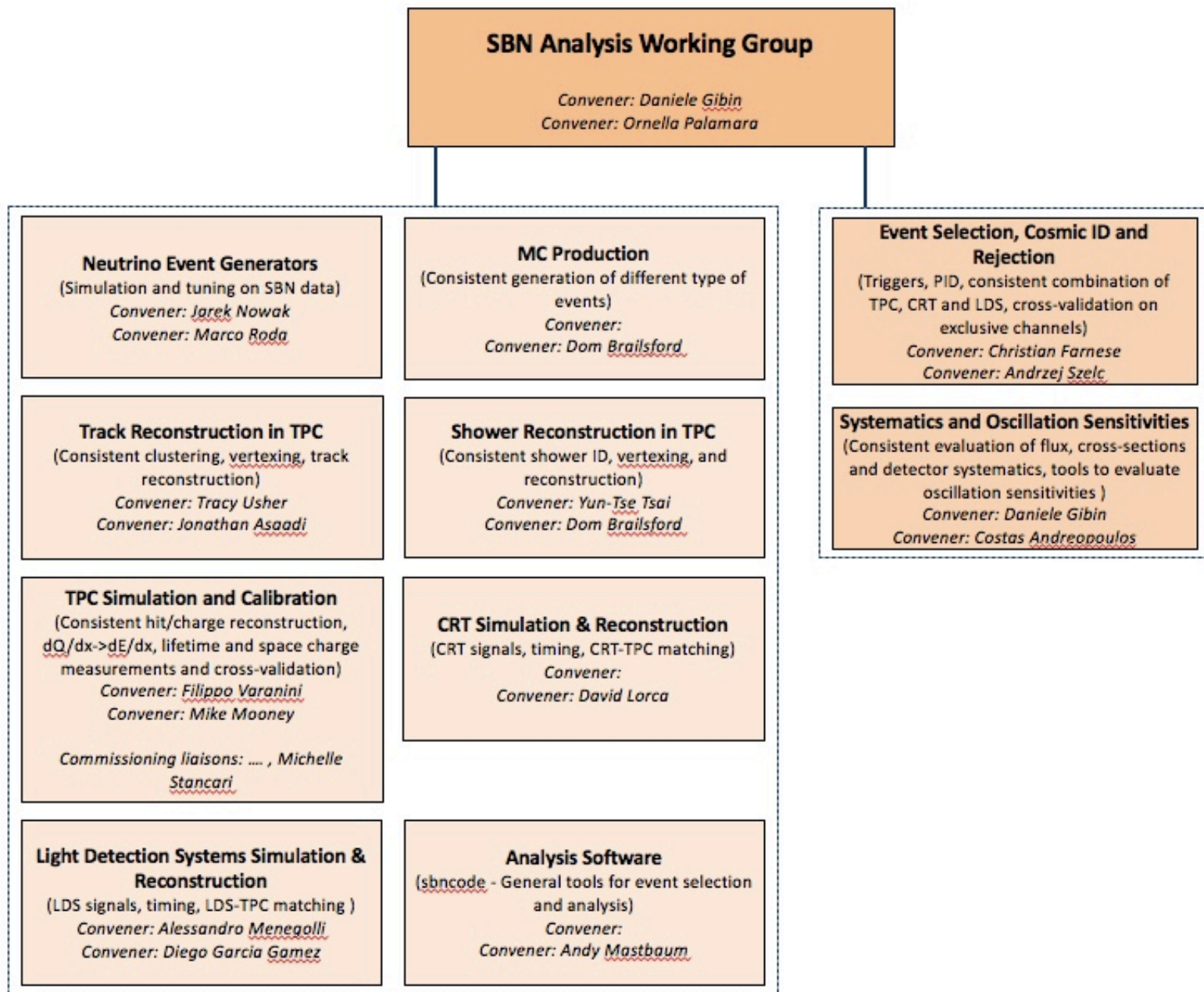
2) Cross section measurements (input toward DUNE)

3) Computing Strategy

SBN Analysis WG: Next Steps

- ❑ The PAC requested us to present “an updated sensitivity study based on the latest software framework” at the next PAC meeting on 16-18 January
 - ❑ At the present stage achieving such a result by next PAC meeting appears too ambitious.
 - ❑ By January we will present to the PAC
 - ❑ a well established organization, with clear tasks and responsible persons, setting clear milestones and timeline
 - ❑ Milestones and timeline to fulfill the required update of the sensitivity including full detector simulation and full event reconstruction.
- ❑ An internal organizational structure with sub-groups working on specific reconstruction and analysis topics has been recently defined.
 - ❑ The approach was to start from the informal structure of subgroups already successfully adopted during past workshop and formalize it by clearly identifying tasks and people to report on progresses
 - ❑ Each sub-group has two co-conveners (an ICARUS and a SBND expert).

SBN Oscillation Analysis Group Organizational Chart



SBN Analysis WG: Sub-groups

- ❑ The mission of each subgroup, within its proper domain, includes:
 - ❑ Ensuring the closest possible commonality in simulation, reconstruction and analysis between the two detectors
 - ❑ Developing suitable procedures to cross-calibrate and cross-check the efficiencies and backgrounds in the near and far detectors
 - ❑ Checking that the difference between the detectors and their running condition are properly understood and handled (systematics)
- ❑ Sub-groups are already active and started to have regular meetings.
- ❑ Defining intermediate milestones and timescales relative to their specific domains

SBN Analysis WG: Sub-groups activities

- ❑ Activities progress in parallel within the sub-groups, but there is continuous sharing of information within the Analysis Group
 - ❑ Regular presentation on progresses each second/third SBN Analysis Group meeting
- ❑ Dec. 4-5: SBN Analysis Software Workshop/Hackathon at Fermilab
- ❑ SBN Analysis wiki page:
<https://cdcv.s.fnal.gov/redmine/projects/sbn-analysis-group/wiki>

New SBN Working Groups

❑ SBN Cryogenics WG

- ❑ Continue exchange of information between different teams in charge of build and support/operate the cryogenics systems
 - ❑ *SBN cryogenics are a collaborative effort between Fermilab, CERN and INFN.*
- ❑ The formation of this group has been discussed/approved at the 1st meeting of the SBN Oversight Board in May
- ❑ It has been difficult getting the group started because of the intense activity at CERN associated with filling and starting protoDUNE.
- ❑ Hope to make progress when protoDUNE is in steady-state operations.

❑ Data Management WG

- ❑ The Data management topic is currently included in the DAQ and Data Pre-Processing WG, but there seems to be a need for a specific group.

Overflow

From SBN Organization Document

❑ *SBN Joint Working Groups*

- ❑ Purpose: A set of SBN Joint Working Groups are needed to co-develop many key aspects of SBN operations and physics analysis. A list of existing Working Groups will be maintained by the SBN Oversight Board. New SBN Working Groups shall be set up as needed by the SBN-OB.
- ❑ Membership: The Working Groups are open to all participants in the SBN Program. For each Working Group the SBN-OB will identify a set of conveners to lead the activities of the group and report progress to the SBN-OB and the collaborations.