

SBN Joint Working Groups

SBN Oversight Board Meeting

FNAL

March 8th 2019

Ornella Palamara

SBN Joint Working Groups

❑ Existing Working Groups

- ❑ **SBN DAQ and Data Pre-Processing** (*conveners: B. Badgett, A. Fava, W. Ketchum, S. Ventura*)
 - ❑ Scope: Identify areas of common effort on **trigger, data acquisition and data pre-processing**, and coordinate activities in those areas.
- ❑ **SBN Slow Controls** (*conveners: A. Fava, S. Gollapinni*)
 - ❑ Scope: Develop a **control system** based on hardware and software interfaces as much as possible identical for the two detectors.
- ❑ **SBN Cosmic Ray Tagger** (*conveners: U. Kose, I. Kreslo, B. Wilson*)
 - ❑ Scope: Review the **CRT production status and the installation plans for the two detectors**, develop common **CRT DAQ and data output format** (together with the SBN DAQ WG), develop **common CRT monitoring**.
- ❑ **SBN Data Management** (recently formed, *convener: W. Ketchum*)
 - ❑ Scope: Review computing resources and needs for SBND and ICARUS, and define a **model for SBN computing**. Collaborate with the Fermilab Scientific Computing Division to develop an **implementation of the SBN computing strategy**.
- ❑ **SBN Analysis** (*conveners: D. Gibin, O. Palamara*)

SBN DAQ and Data Pre-processing WG Status

- ❑ Common sbndaq repository/framework established
 - ❑ Supports common, ICARUS-, and SBND-specific readout.
 - ❑ Supports scripts and configurations for site-specific locations.

- ❑ Readout progress
 - ❑ Photon Detector System readout progress at both DAB and CERN test stands
 - ❑ Improved monitoring and configuration options
 - ❑ High rate, throughput, and longevity tests informing improvements
 - ❑ Common Cosmic Ray Tagger readout effort progressing
 - ❑ MicroBooNE code ported, integrated and running → preparing tasks for building events

- ❑ DAQ software progress
 - ❑ Common Data Quality Monitor (DQM) tools developing based on SBND Vertical Slice Test (VST) and ICARUS experience
 - ❑ Run Control GUI interfacing with `artdaq` system is underway
 - ❑ Run configuration Data Base design improvements are underway

SBN Slow Controls WG Status

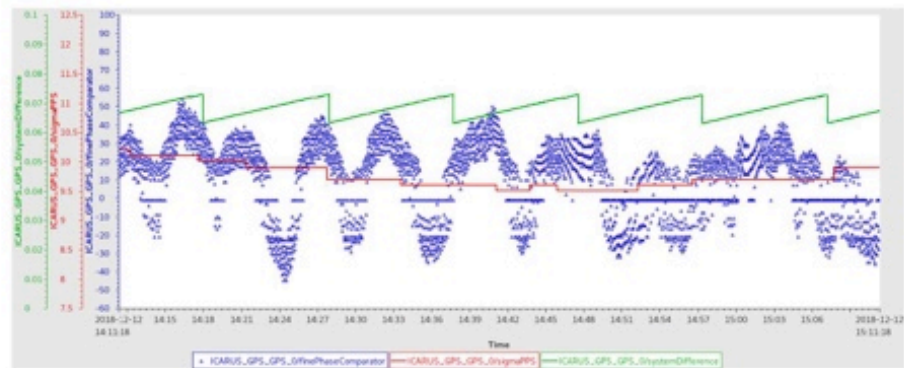
- ❑ Meeting Frequency: once every 4 weeks.
Meeting page: <https://sbn-docdb.fnal.gov/cgi-bin/private/ListEventsBy?authorid=723>
- ❑ Lot of scope for common activities in Detector Control System, both hardware & software.
- ❑ Active WG with several members from both experiments and updates presented at corresponding experiment DAQ/SBN online meetings.
- ❑ Plan is to use Experimental Physics and Industrial Control System (EPICS) as the base software control system and EPICS Control System Studio (CSS), successfully used at MicroBooNE.
- ❑ Prioritization of common tasks driven by the ICARUS commissioning timeline.

Detector Slow Control Activities

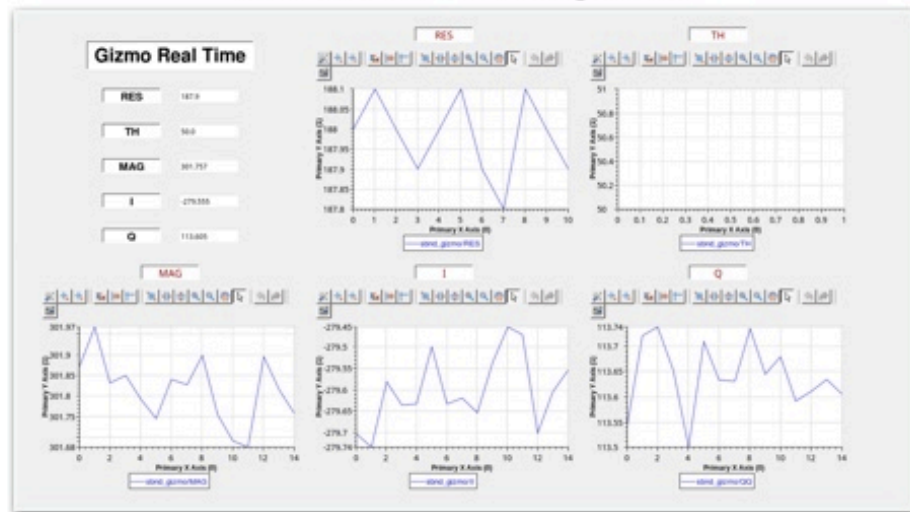
Green=done; Orange=ongoing; Gray=not started

Hardware
Rack Power Distribution Units (PDUs)
Ground Monitoring
GPS & Timing
Photon Detector System power supply
Cameras
Cryogenics Status
DAQ Monitoring
Beam Status
Network
Rack Protection System
Environment/Building
Interlock Bit Monitoring
Software
UPS Packaging
Graphical User Interface
Archiver database
Alarm Server
Documentation (Expert & Shifter)

GPS monitoring



Ground monitoring GUI



SBN CRT WG Status

- WG Tasks defined in [SBN Document 8619-v1](#)
- Cosmic Ray Tagger System for SBN detectors reviewed. Similarities and differences of the systems are identified and documented in [SBN Document 11589-v1](#)
- [Production and installation plan](#) for ICARUS and SBND CRT reviewed.
- [GPS and beam spill timing](#) references to be supplied to the CRT FEBs have been defined. Implementation of the White Rabbit system for the synchronization of the other subdetectors with the CRT systems has been agreed.
- First common meeting with Calibration Working Groups within SBN held on February 1st to review the need of [CRT data for calibration purposes](#).
- Planning to review [CRT DAQ-scheme](#) and define a [common data output format](#) in a common meeting with the DAQ Working Group.
- Discussing the status of the White Rabbit system on March 8, 2019.

SBN Data Management WG Status

- ❑ First presentation of goal and near-term tasks to the SBN Analysis group
 - ❑ Meet with computing experts on needs and technical models for common data management.
 - ❑ Meet with collaborators to discuss about computing and storage offsite.
 - ❑ Perform data volume diagnostics from Monte Carlo simulations output files as basis to plan for data reduction schemes.

- ❑ Presentations of ICARUS and SBND computing needs and computing strategy at Fermilab Scientific Computing Portfolio Management Team (SCPMT) review
 - ❑ Received generally positive response from the committee and the Fermilab Scientific Computing Division.

SBN Analysis WG Status

- ❑ With the ultimate *goal* of **updating the projections of expected physics capabilities of the SBN program**
 - ❑ Generating common MC samples with the current software packages.
 - ❑ Including updated reconstruction efficiencies, performances, systematic effect and background rejection from a full MC simulation of the detectors.
 - ❑ Combining appearance and disappearance channels.
 - ❑ Exploiting different models with multiple sterile states and exclusive topology measurements.
- ❑ A set of **Deliverables, Milestones and timeline** have been defined.
- ❑ The **internal organizational structure** with sub-groups working on specific reconstruction and analysis topics is set up and working well.

SBN Analysis Group - Sub-groups

- ❑ Sub-groups have defined milestones and timescales relative to their specific domains and have regular meetings.
- ❑ Activities progress in parallel within the sub-groups, and there is continuous **sharing of information** through regular presentations of the status of the activities/discussions within the different subgroups at the joint SBN Analysis Group meetings.
- ❑ SBN Analysis Group wiki page (*being developed*)
<https://cdcvs.fnal.gov/redmine/projects/sbn-analysis-group/wiki>
- ❑ Next SBN analysis workshop: Oxford (UK) March 30-April 3 2019.
- ❑ Sub-groups are working in preparation for the workshop.
- ❑ “Report on the SBN Analysis Group” presented by OP at the PAC meeting in January 2019.

Nigel Lockyer
Director

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February 26, 2019

Dr. Ornella Palamara
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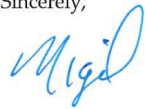
Dear Ornella,

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

The status and plans for of the SBN Analyses Groups were important topics at the meeting. Relevant excerpts from the PAC report are attached. The PAC "commends SBN for the organization of joint working groups" as " these will serve to clearly demonstrate the success in coordinating the analysis effort between ICARUS and SBND".

I take note of the PAC comments and look forward to updated studies of sensitivity.

Sincerely,



Nigel S. Lockyer
Director of Fermilab

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

Letter from
Nigel
(after January
2019 PAC
meeting)

Excerpts from the January 2019 PAC Report:

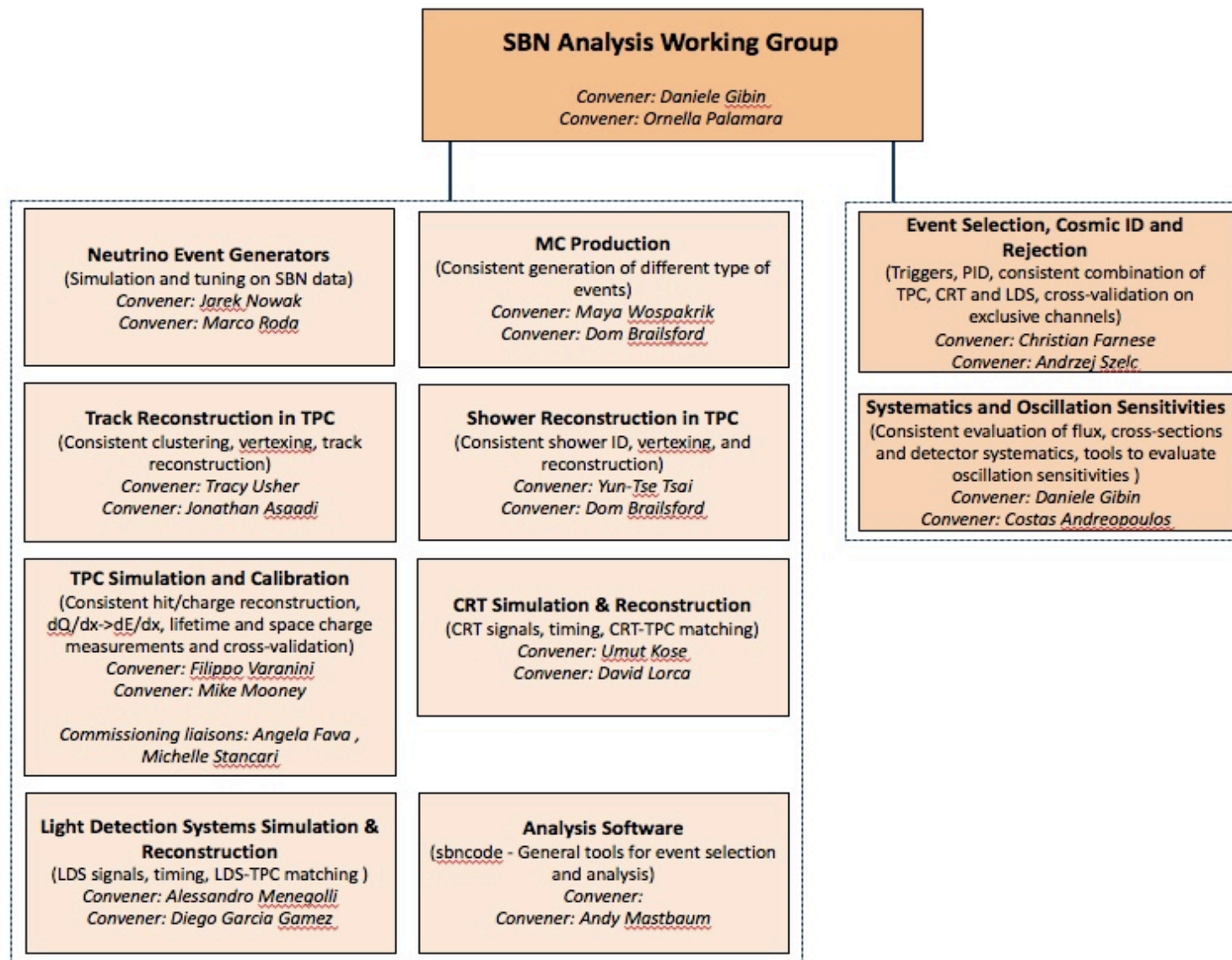
From the Executive Summary:

The Committee was presented with updates on the status of SBN (SBND and ICARUS), including the successful outcome of the Director's Review in December 2018, and the formation and activities of several SBN-wide physics analysis, trigger and technical groups. The Committee encourages the Laboratory to continue emphasizing the importance of further developing these joint activities towards a coherent SBN technical operations and physics analysis framework and keeping the program on schedule, **both of which are essential to the success of the SBN program.**

From the SBN Analysis Groups Section:

The PAC commends SBN for the organization of joint working groups in analysis, DAQ, slow control, cosmic taggers and offline computing to develop key aspects for SBN operation and physics analysis. We heard a detailed presentation from the SBN Analysis Groups. The Committee is pleased with the efforts to develop an analysis group with an internal organizational structure responsible for the multi-detector oscillation analysis at SBN, including common simulation, reconstruction and analysis methods and tools. We appreciate the concrete and detailed simulation and analysis milestones for the next two years. These will serve to clearly demonstrate the success in coordinating the analysis effort between ICARUS and SBND. **The PAC looks forward to the first deliverables, including, in March of 2019, the reproduction of the sensitivity of the appearance and disappearance oscillation channels reported in the SBN proposal, and, in the Summer of 2019, the first reassessment of the same sensitivities using more realistic estimates of backgrounds and systematics.**

SBN Oscillation Analysis Group Organizational Chart



SBN Analysis Group - Deliverables

- ❑ Implement a **multi-detector** simulation, implement reconstruction algorithms/tools and analysis tools.
- ❑ Oscillation Analysis: proceed in three (**parallel**) intermediate steps
 - I. **Consistency check** - reproduce the SBN proposal-era oscillation sensitivities with 3 new oscillation fitting frameworks, using truth-level information and the same inputs for beam, reconstruction efficiencies, backgrounds and systematic uncertainties.
 - II. **Update the oscillation sensitivities** - still using truth-level information, and exploiting **updated inputs** for efficiencies/backgrounds and systematic effects (accounting for the available/developed SBN event reconstruction and recent results from other LAr experiments).
 - III. **Oscillation physics sensitivity results based on full event simulation and full event reconstruction.**

Oscillation Sensitivities - Milestones and Timeline

- M.1: Reproduce the SBN proposal oscillation sensitivity for both ν_e appearance and ν_μ disappearance (**Mid March 2019**).
- M.2: Revise the proposal assumptions using more realistic estimate of efficiency and backgrounds, implementing a truth-level based sensitivity study for both appearance and disappearance channels (**Summer 2019**).
- M.3: Produce an end-to-end analysis of ν_μ disappearance with as complete as possible event selection and reconstruction (**End of 2019**).
- M.4: Produce an end-to-end analysis of ν_e appearance with as complete as possible event selection and reconstruction (**Spring 2020**).
- M.5: Final, complete, reconstruction & systematics included appearance and disappearance sensitivities (**by end of 2020**)