LArSoft External Review:

Potential Reviewers(~10? There are 9 below)

* Paolo Calafiura – LBNL ([PCalafiura@lbl.gov](mailto:PCalafiura@lbl.gov))
* Patrick Huber – Virginia Tech (LBNC) ([pahuber@*vt*.edu)](mailto:pahuber@vt.edu))
* Dan Katz – NSF - [dkatz@nsf.gov](mailto:dkatz@nsf.gov)
* Joshua Klein – U Penn ([jrk@hep.upenn.edu](mailto:jrk@hep.upenn.edu))
* Chang Kee Jung - SUNY (chang.jung@stonybrook.edu)
* Robert Lucas – ISI – [rflucas@isi.edu](mailto:rflucas@isi.edu)
* Frank Würthwein – UCSD ([fkw@ucsd.edu](mailto:fkw@ucsd.edu) )
* Pere Mato – CERN (Pere.Mato@cern.ch)
* Frank Gaede – DESY([**frank.gaede@desy.de)**](mailto:frank.gaede@desy.de))
* If want someone from Fermilab ? Doug Glenzinski? Ruth Van der Water?

The LArSoft Collaboration provides a common toolkit for the development and use of software for data simulation, reconstruction and analysis of Liquid Argon Time Projection Chambers (LArTPCs). The LArSoft core platform is managed and released by Fermilab Scientific Computing Division (SCD) scientists and engineers. The experiments contributing to and using the software are at different stages of development and data taking: LArIAT, MicroBooNE and the DUNE 35Ton prototype and currently in data taking mode; The DUNE CERN ProtoDUNE and WA105 prototypes will take data in 2018, as will the Fermilab Short Baseline Program Detector (SBND). The current date for full DUNE data taking is 2022. There are thus many asynchronous simulation, reconstruction and analysis timelines and goals.  The LArSoft software depends on several external software providers such as Geant4, Genie, art. It also integrates with external algorithms through collaboration with the development projects, currently PANDORA, NEST and WireCell, with expectations of more to come in the future.

The LArSoft Collaboration is led by the experiment spokespeople and Fermilab management. They would like the committee to review and evaluate the current status and future plans for the LArSoft software to include the architecture and design, efficiency and usability, platform and toolkits, and organization for sharing of code.

In particular, the review should comment on:

1. The current software architecture, infrastructure, environment and tools, including build and release tools, frameworks, capabilities, interfaces, data model, user interactions, development methodologies, flexibility for evolution and integration.
2. Are the tools, infrastructure, and established processes sufficient to be used by non-expert resources from the collaborations? Are they sufficient to enable effective contributions of physics algorithms and codes? Are best practices employed in these processes?
3. The manpower needs and availability - within the experiments, contributing software projects, and Fermilab.

The committee is charged with producing a written report addressing these questions and making recommendations for correcting any problems and issues identified.

1. The requirements and implementation plans. Are the requirements applicable and complete? Is the implementation plan reasonable and achievable? Have adequate personnel resources, from the experiments, contributing external software providers and Fermilab, been identified? If not, where are the personnel shortfalls? Will the plan result in tools, infrastructure, and processes that are capable of producing "analysis ready" data in a timely manner and allow for significant engagement of non-expert resources from the collaboration? Do the plans sufficiently address efficiency, usability and sharing?
2. Software. Is the scope and architecture of the software appropriate? Are the current infrastructure and tools capable of meeting the requirements and implementation in a timely manner? Are best practices employed and is there an appropriate software development, release and support methodology? Are the mechanisms and tools to support and encourage sharing of software adequate and mature? Are an appropriate set of metrics – validations and tests - being developed to measure progress meeting the requirements and timelines established? Is the software efficient and usable?
3. Are the current organization structures and processes well-matched to the needs of the collaborations, including users? Are there adequate structures for decision making and prioritization in the face of multiple, incompatible timelines and needs? Are there adequate controls for identifying issues, delays and shortfalls and pathways for having these listened to and addressed? Are the processes for support, communications and operations well specified and accepted? Have the required resources been correctly assessed. Are the assumptions of resource requirements well justified? Have the resources been identified? Is the proposed schedule for implementation reasonable?