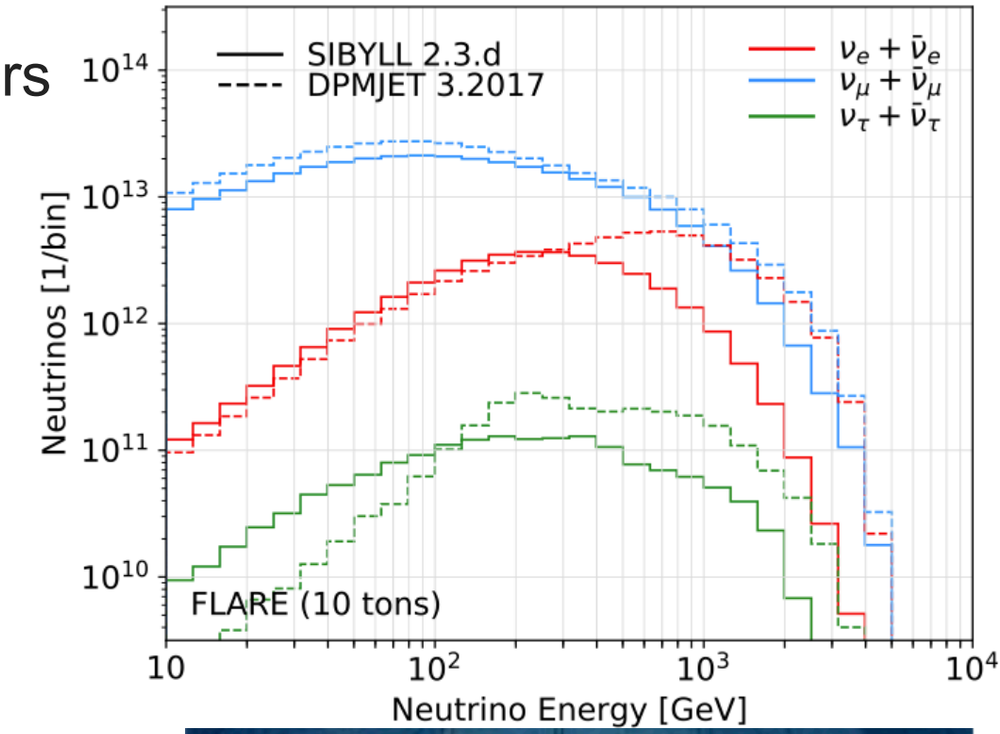
Event Generators for Neutrino Interactions Session

Vishvas Pandey (U Florida) and Mary Hall Reno (U Iowa)

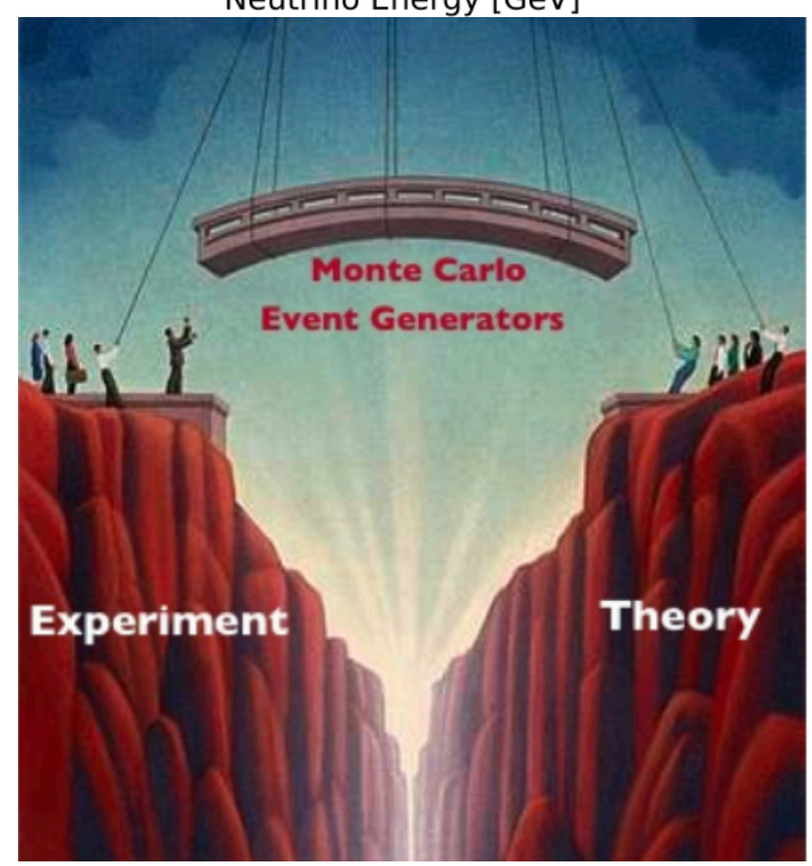
3rd FPF Meeting, Oct 25-26, 2021

- FPF experiments need Neutrino Monte-Carlo generators to predict:
  - interaction cross section, all final-state particles and their energies
  - for all the current and proposed target material in the detector (tungsten, argon,…)
  - for all three SM neutrino flavors
  - for a broad spectrum of FPF neutrino energies



- Uncertainties associated with the neutrino interactions need to be well controlled for precision neutrino and BSM measurements.

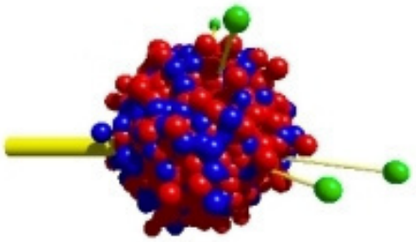
- Neutrino interaction uncertainties will be an important contribution to the overall uncertainties for all the neutrino associated measurements (fluxes, interaction cross sections, oscillations, other new physics applications, ...)



Plan for the Session:

The goal is to review the status of widely used neutrino MC generators in the context of FPF, identify differences, gaps and challenges. Identify opportunities at the FPF, and layout a path forward to better constraining neutrino interactions physics at the FPF.

- Short presentations by the Monte Carlo generator representatives (5 mins each):
  - **FLUKA**: Paola Sala
  - **GENIE**: Alfonso Garcia Soto
  - **GiBUU**: Ulrich Mosel
  - **NEUT**: Luke Pickering
  - **NuWro**: Jan Sobczyk



GiBUU

NEUT

- Panel Discussion (30 mins):
  - Comparison between predictions from different MC generators
  - Discussion between generator representatives and audience

Plan for the Session:

The goal is to review the status of widely used neutrino MC generators in the context of FPF, identify differences, gaps and challenges. Identify opportunities at the FPF, and layout a path forward to better constraining neutrino interactions physics at the FPF.

Panel Discussion:

- ✦ What are the known knowledge gaps (or generator implementation gaps) and the biggest challenges in simulating precise neutrino interaction at FPF kinematics in generators? What is needed to overcome them?
- ✦ How should one quantify uncertainties associated with the simulations of neutrino interactions at FPF kinematics?
- ✦ What neutrino interaction measurements you would like to see at FPF that can in return help constrain the interaction physics in generators?