
The NuSTEC Concept

Neutrino Scattering Theory Experiment Collaboration

Jorge G. Morfín

Fermilab

INT 2013 - Seattle

Goals of NuSTEC

- ◆ **Generators:** Coordinate theorist-experimentalist collaborative efforts to improve generator(s):
 - ▼ Develop transfer protocols – how to get theoretical concepts in form that can be used by generator.
 - ▼ Checking/verifying these implementations (...avoid double counting... etc)
 - ▼ Retire outdated/incorrect procedures...
 - ▼ Implications: need at least one member from each generator and one member from every experiment and many/all theorists as members.
- ◆ **Workshops:** Organize Community-wide Workshops when needed.
 - ▼ Main Conference is the NuInt Workshop with next one scheduled just outside London (Selsdon Park Hotel) May 19-24 2014.
 - ▼ Leave frequency of NuInt at 18 months and organize smaller topic-specific workshops such as this INT workshop and the Pittsburgh generator workshop in between
 - ▼ Implication: members of NuSTEC must be ready to devote time to, with community help, organizing and running workshops.

Goals continued

- ◆ **School:** Organize and Run a neutrino-nucleus scattering physics school aimed at experimentalists/theorists \pm few years from Dr.
 - ▼ First school late-summer/early-fall (early August or early September) of next year - most likely at Fermilab.
 - ▼ There after coordinated with location and 18 month cycle of NuInt. Makoto Sakuda already making plans for second school at NuInt15.
- ◆ **Funding:** Collaborative funding request to support the NuSTEC school (+ NuSTEC postDocs or show support of postDocs at member institutions).
- ◆ **Global Fits:** Down the line Combine results from multiple experiments – not only neutrino - to compare with a theory / model framework.
 - ▼ Experiment representatives insure results are in form to be included in the fits
 - ▼ Since many measurements are in form of convoluted $\phi(E) \times \sigma(E) \times \text{Nuc}(E)$ need generator in the fit and flux from each experiment.

Collaboration Structure and Meetings

- ◆ Collection of individual / group efforts that feed into the generator upgrades and global fits.
- ◆ Coherent NuSTEC collaborative effort for
 - ▼ The organization of workshops and the school.
 - ▼ The global fits themselves.
- ◆ Meetings:
 - ▼ Frequent smaller project meetings – phone/video... as required.
 - ▼ Larger collaborative meetings held in conjunction with workshops and – perhaps – school.
 - ▼ One (?) several day directed NuSTEC collaboration meeting a year to review status of individual projects and global fits. To begin planning the next NuSTEC workshops and school.

NuSTEC School

If we want a school next year we need to start planning now

- ◆ First School next year Sept. (avoid 9-12) / Oct. (at Fermilab?)
- ◆ CTEQ Style - 4 days lecture, 1 day off and 4 more days of lecture.
 - ▼ Day consists of
 - » (09:00) 1 hour AM lecture 1 – break
 - » (10:30) 1 hour AM lecture 2
 - » (11:30) 1.5 hour break: lunch (students and lecturers together)
 - » (13:00) 1 hour PM lecture 3 – break
 - » (14:30) 1 hour PM lecture 4
 - » (15:30) 4 hour break: dinner (students and lecturers together)
 - » (19:30) 1.5 hour recitation (day's lecturers field questions from assembled students)
 - » (21:00) nightcap
 - ▼ 32 hours of courses divided into
 - » 16 hours of fundamental theory plus illustrative applications (before free day)
 - » 16 hours of special applications reflective of location of school, special community requirements.....

Example: of a CTEQ School Agenda

◆ FOCUSED INTRO

- ▼ Intro to Parton Model and QCD (4 hours)
- ▼ MC Intro
- ▼ DIS
- ▼ Higgs (theory)
- ▼ Vector Boson/Dir Photon
- ▼ Jets I (Intro)
- ▼ Jets (Substructure)
- ▼ Heavy Quarks I and II

◆ IN-DEPTH

- ▼ MC Tutorial
- ▼ NLO Comp. & Matching/Merging
 - » Higgs
 - » LHCb/Heavy Quark
 - » SM
 - » SUSY+
- ▼ PDFs
- ▼ Transverse PDFs
- ▼ Neutrinos
- ▼ Intensity Frontier
- ▼ Low E spectroscopy
- ▼ SM & Beyond :

School Funding

- ◆ Try to keep student registration fee to \leq \$700 to cover student's housing, all meals, coffee breaks (first drink at nightcap).
- ◆ Provide 5 – 10 half or full “NuSTEC Fellowships”
- ◆ Do NOT cover any student (and preferably lecturer) travel.
- ◆ Cover all lecturer costs at school.
- ◆ Need DOE and/or NSF and/or FNAL and/or LANL \$

NuSTEC – How do we start?

- ◆ **Do we want to make such a school happen?**
- ◆ Need to form a school organizing committee – nucleus of NuSTEC Collaboration.
- ◆ Would like to collect ideas of classes and school structure from this workshop's attendees.
- ◆ Need to decide on school dates and where school to be held.
- ◆ Need to prepare proposals for DOE and NSF – submit in parallel with GENIE support proposal.
- ◆ General NuSTEC collaboration – need theorists and generator gurus. Ask for volunteers with awareness of obligations to organize workshops.....
- ◆ Door is open with an example goal of 20 – 30 collaborators being optimal for CTEQ activities.