

IPPP/NuSTEC topical meeting on neutrino-nucleus scattering Summary

Durham, 18th to 20th April 2017

Summary

An international group of forty two nuclear and particle physicists drawn from the theory, phenomenology and experimental communities met in Durham to discuss:

- The status of $\bar{\nu} A$ and $e^\pm A$ scattering and the theory through which these processes are understood; and
- The programme of measurement, theory and phenomenology required to drive the field forward and enhance the sensitivity and precision of future neutrino-oscillation experiments.

The material presented at the meeting is collected at <https://conference.ippp.dur.ac.uk/event/583/>.

The agenda for the meeting was split into sessions that covered:

- Quasi-elastic, shallow- and deep-inelastic neutrino-nucleus scattering and the impact of uncertainties on studies of neutrino oscillation;
- Ab-initio and lattice QCD calculations of nuclear structure and neutrino-nucleus interactions;
- Models of neutrino-nucleus and electron-nucleus scattering and their application in the analysis of long-baseline neutrino-oscillation experiments; and
- Measurements of the axial form factor and the future programme of $e^\pm N$ scattering measurements at JLAB.

The energetic discussion in the final session was seeded by two “provocateurs” who had been asked to identify critical issues emerging from the workshop. The discussion converged to an agreement on the way forward which was presented in slides prepared during the discussion session.

Opportunities and next steps

The conclusions drawn by those present and agreed during the final discussion were that:

- A collaborative approach involving theorists, phenomenologists and experimenters from the nuclear- and particle-physics communities has the potential to make substantial contributions to the understanding of neutrino- and electron-nucleus scattering;
- A systematic approach to the development of generators and fitting codes is required—which will benefit from detailed comparison with the (unfitted) predictions of nuclear transport models; and
- Over the longer-term a systematic programme of measurement is required that encompasses the use of a variety of nuclear targets, the development of novel detector systems (e.g. a high-pressure argon time-projection chamber) and exploits novel neutrino-beams such as those provided by nuSTORM and/or tagged kaon decays.

Further, there was consensus that:

- Towards the end of summer 2017, a statement of intent for a programme to study neutrino- and electron-nucleus scattering should be prepared and submitted to STFC; and
- A follow up to the present workshop should be organised in roughly one year’s time.