WORKSHOP SCIENTIFIC REPORT

TITLE

NSTAR2017 "11th International Workshop on the Physics of Excited Nucleons"

DATE / LOCATION

August 20 - 23, 2017 / University of South Carolina, Columbia, SC

ORGANIZERS

Ralf W. Gothe, Chair (University of South Carolina, USA)
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NUMBER OF PARTICIPANTS / INSTITUTIONS

116 / 62

SYNOPSIS AND MAIN TOPICS

Nucleon excitations are providing a unique opportunity to explore many facets of the non-perturbative strong interaction and how various baryons, including those with strange and heavy flavor content, emerge from QCD. The rapid growth of high-quality experimental results on exclusive meson photoproduction off nucleons from CLAS, ELSA, GRAAL, LEPS, and MAMI allow us to pin down reaction amplitudes with unprecedented precision and to establish the baryon spectrum with minimal model dependence. Experiments with hadronic beams (GSI, JPARC) and hadron production in e^+e^- collisions (BES) extend and complement the scope of baryon spectroscopy, where the importance of baryon states in the evolution of the Universe has also just recently been elucidated.

Space-like resonance electrocouplings can be extracted, based mainly on the CLAS data on exclusive meson electroproduction off nucleons, over a wide range of photon virtualities and provide valuable information on the excited nucleon structure by offering access to non-perturbative strong interaction mechanisms behind the N* generation. The insight into the baryon structure is complemented by the studies of time-like form factors (BABAR, BES, GSI, PANDA).

From the theory side, the Dyson-Schwinger-Equation and Lattice-QCD approaches are remarkably progressing in describing the baryon spectrum and structure from the first principles of QCD. New opportunities to explore the full spectrum of excited nucleons as well

as strange and heavy baryons have been offered by advances in the QCD-inspired quark models.

Synergistic efforts between experimentalists and theorists have already demonstrated our capability to address some open key problems of hadron physics on the nature of hadron mass, quark-gluon confinement, and their emergence from QCD via the exploration of the baryon structure and spectrum including the search for the new states of hadron matter such as hybrid and 'multi-quark' baryons. The purpose of this workshop was to share the latest results on various aspects of low-energy QCD dynamics in terms of N* resonances, and to discuss the future developments.

Topics covered in the workshop are:

- Baryon spectrum through meson photoproduction
- Baryon resonances in experiments with hadron beams and in the e+e- collisions
- Baryon resonances in ion collisions and their role in cosmology
- Baryon structure through meson electroproduction, transition form factors, and time-like form factors
- Amplitude analyses and baryon parameter extraction
- Baryon spectrum and structure from first principles of QCD
- Advances in the modeling of baryon spectrum and structure
- Facilities and future projects

SPEAKERS

1 Public Lecture

26 Plenary Talks

78 Parallel Session Talks

All presentations are accessible online via http://nstar2017.physics.sc.edu/.

JSA/JLAB FUNDS

As proposed we used the $2000/$2000 to partially support participants' local expenses and transportation. We could accommodate the requests of six senior, three post-doc, and five PhD participants who would not have been able to come to the NSTAR2017 otherwise.

RESULTS AND HIGHLIGHTS

We have met and exceeded all proposed objectives laid out in our submitted evaluation plan. The workshop gave us a unique opportunity to merge expertise and knowledge of experimentalists and theorists from 62 European, US, and other international institutions on the nucleon resonance spectrum and structure as well as to discuss and refine the best suited approaches for the reliable extraction of resonance parameters and their sound theoretical interpretation in a comprehensive QCD-based hadron structure theory. The NSTAR2017 was an overall very successful workshop and the 116 participants praised the organization and the scientific as well as the social program.

Proceedings of the NSTAR2017 workshop will be peer reviewed and published in Few-Body Systems by Springer and are funded by the INFN. Preparation and organization by Elena Santopinto are ongoing.