

Final Technical Report for the BOOST2013 Workshop
Hosted by the University of Arizona

Project title: BOOST 2013 Workshop Hosted by the University of Arizona

Institution: University of Arizona

Address: 888 N. Euclid Ave., Tucson, AZ 85722

Principal Investigator (PI): Kenneth Johns

PI Postal Address: 1118 E. 4th Street, Tucson, AZ 85721

PI Telephone Number: 520-621-6791

PI Email: johns@physics.arizona.edu

DOE/Office of Science Program Manager Contact: Dr. David Boehnlein

DOE Grant Number: SC0010420

The Fifth International Workshop on Boosted Object, Phenomenology, Reconstruction and Searches (BOOST2013) was held 11-16 August, 2013 in Flagstaff, Arizona. This workshop continued a series of workshops on the same topics at SLAC (2009), Oxford (2010), Princeton (2011), and Valencia (2012). On the theoretical side, the primary goal of the workshop was to provide a forum to present and discuss the latest findings from theory and phenomenology on the understanding of the reconstruction of boosted objects in high energy hadron collisions and their use in searches for new physics. Examples of boosted objects include high transverse momentum W-bosons and top quarks. On the experimental side, the most recent results from experimental applications and new particle searches employing boosted analysis methods were presented. A final focus was to analyze and refine existing techniques for application in future higher intensity and higher energy hadron collisions such as expected in Run 2 of the LHC and beyond.

The specific topics covered were:

- (1) Experimental results for the performance of jet substructure and boosted object reconstruction techniques, including pile-up suppression strategies
- (2) Experimental results from physics analyses using these techniques, including Standard Model analyses and searches for new physics
- (3) Theory results from new calculational approaches for substructure related observables using new paradigms to overcome previous theoretical problems
- (4) New phenomenological approaches to improve substructure and boosted object reconstruction
- (5) Work plan for the BOOST2013 report and proposals for follow-up topics for BOOST2014
- (6) Tutorials for software commonly used by theorists and experimentalists

A total of 81 physicists participated in the workshop. There was a good balance between professors and Ph.D. students (15 each). Thirteen senior scientists and 36 postdocs also participated. Approximately one half of the participants were from the U.S. and the other half from Europe (primarily Germany, the United Kingdom and Switzerland). There were approximately 50 presentations given and these may be found here:
<https://indico.cern.ch/event/215704/contributions>

The main scientific outcome is the BOOST2013 report entitled “Towards an Understanding of the Correlations in Jet Substructure”. The report presents particle-level studies of various observables used to characterize boosted jets and their scaling dependence on jet characteristics such as transverse momentum and radius. A final draft of this report exists and will be submitted to the European Physical Journal C. in the near future. Approximately ten public notes or publications from ATLAS and CMS were generated based on the use of some of the new techniques discussed at BOOST2013. The workshop spawned a joint theory-experiment workshop on jet substructure held in Boston in 2014. Perhaps most importantly, BOOST2013 provided the first strategies and technical foundation for optimal jet substructure analyses under the new energy and luminosity conditions of Run 2 of the CERN LHC beginning in March, 2015.