TAREQ ABUZAYYAD

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Education

Ph.D. In High Energy Astrophysics — August 2000
University of Utah
Salt Lake City, Utah

BS In Physics — May 1993
Brigham Young University
Provo, Utah

Skills & Awards

Citizenship: United States.

Languages: Fluent in Arabic

Awards: Outstanding Graduate Student Award.

Programming: 14+ years experience with C/C++/Fortran/CUDA programming languages.

Simulation: Extensive experience with Monte Carlo simulation and detector modeling.

Data Reduction: Broad experience in quantitative modeling and statistical analysis of large data sets.

Work Experience

Research Associate Professor: 07/2014 – present (University of Utah)

- Produced a first measurement of the energy spectrum of cosmic rays recorded by the TALE detector. Starting energy of 4 PeV, lowest for any detector of this type. A publication is in preparation.
- Continue to support (developing and maintaining MC& reconstruction code) other analyses performed by members of the TA collaboration in Utah.

Research Assistant Professor: 08/2010 – 07/2014 (University of Utah)

- Developed a new observation technique for the study of cosmic rays using Air Fluorescence detectors in the energy region above the knee and below that accessible by using established methods. This method significantly enhances the capability of TALE (TA – Low Energy extension) detector.
- Full time work on Telescope Array (TA) experiment (http://www.telescopearray.org): Leader for the development and maintenance of the simulation and event reconstruction code for TALE.
- Analysis of Atmospheric Attenuation using the TA central laser data.

- Continuing research into General Programing on Graphics Processor Units (GPGPU) by porting the detector simulation chain to the CUDA programing language.
- Assist and guide graduate students and post docs working on TA analysis projects.

Visiting Assistant Professor: 09/2008 – 08/2010 (University of Wisconsin, River Falls)

- Full time Teaching during Fall semesters and doing Research on IceCube neutrino observatory (http://www.icecube.wisc.edu) during Spring/Summer. Taught following classes: Math Methods/Basic physics/Introductory laboratory.
- For IceCube, I ported part of the detector simulation to run on a Graphics Processor Unit, enabling a 100-fold increase in overall speed of program execution. The simulation run on the GPU is a valuable tool for detector characterization and is now being pursued by other members of the collaboration for that purpose. In addition, it provides a proof-of-concept demonstration of the general technique of using GPUs for computation.
- Taught introductory physics course and General Physics Lab during Fall of 08.
- Supervised undergraduate students research on IceCube. One student finished her summer research and presented results at a conference.

Research Assistant Professor: 07/2006 – 08/2010 (University of Utah)

- Worked on the spectrum measurement from the TA Middle Drum Fluorescence Detector (FD). The result was presented at the 31st International Cosmic Ray Conference.
- Wrote event reconstruction code for TA, and performed first analysis of this data.
- Incorporated new Fluorescence measurements/Energy deposit calculations and other updates into detector MC and analysis code.
- Coordinated the comparisons of three separate stereo analysis efforts by different members of the HiRes (http://www.cosmic-ray.org) Collaboration, including my own analysis.
- Reanalyzed the HiRes-1 data for an updated spectrum measurement, guiding a Ph.D. Student with his research.
- Participated in the field deployment of an array of 507 surface detectors for the TA experiment (spread over 300 square miles).

Research Associate: 03/2004 – 07/2006 (University of Utah)

- Developed a “tandem stereo analysis”, in support of the monocular results. This tandem concept is used in the hybrid analysis of on TA in 2012.
- Performed simulation studies for the optimization of the TA/TALE detector which were included in the proposal for the Telescope Array experiment.
- Taught an introductory Physics course “Preparation for College Physics”

Post Doctoral Research Associate: 08/2000 – 03/2004 (resident at George Mason University)

- Worked with Prof. Gene Loh on the OWL (a proposed satellite borne cosmic rays detector) experiment. Developed a complete set of simulation and event reconstruction programs (written in C++/ROOT) and did detector performance studies.
- Studied the possible effects of cloud presence on the accuracy of measurements by space borne extensive air shower telescopes operated in monocular or stereo modes.

- Published a paper on the results.

Graduate Research Assistant: 1997 – 2000 (University of Utah)

- Participated in data taking with the Prototype HiRes detector.
- Surveyed, performed final calibration and decommissioning of the Prototype HiRes Detector
- Participated in the construction and deployment of the HiRes-1/HiRes-2 detectors.
- Co-developed the detector Monte Carlo program and was the primary developer of the data analysis and event reconstruction programs for data collected in monocular mode (main detector operation mode from 97-99.)
- Performed detector electronics calibration and atmospheric calibration data analysis.
- The results of my analysis were the basis of the HiRes monocular spectrum paper (evidence for the GZK cut-off), and were used for a number of other publications on anisotropy studies based on HiRes-1 monocular data.

Graduate Teaching Assistant: 1994 -- 1997 (University of Utah)

- Conducted lectures, supervised laboratory courses and graded homework and exams.

Selected Publications

R. U. Abbasi *et al.* "The Hybrid Energy Spectrum of Telescope Array's Middle Drum Detector and Surface Array" [arXiv:1410.3151]

T. Abu-Zayyad *et al.* "The Telescope Array Fluorescence Detector Simulation on GPUs", Proceedings of the CHEP2013 meeting, Amsterdam.(Submitted to IOP, JPCS, to appear in Q2 2014)

T. Abu-Zayyad *et al.* "Cerenkov Events Seen by The TALE Air Fluorescence Detector", in Proceedings of the DPF2013 meeting, Santa Cruz, 2013. [arXiv:1310.0069]

T. Abu-Zayyad *et al.* "The Energy Spectrum of Telescope Array's Middle Drum Detector and the Direct Comparison to the High Resolution Fly's Eye Experiment", Astroparticle Physics, 2012

R. U. Abbasi *et al.* "Measurement of the Flux of Ultra High Energy Cosmic Rays by the Stereo Technique", Astroparticle Physics, 2009

T. Nonaka *et al*. "The present status of the Telescope Array experiment.", Nucl. Phys. Proc. Suppl., 2009

R. U. Abbasi *et al.* "Observation of the GZK Cutoff by the HiRes Experiment", Physical Review Letters, 2008

R. U. Abbasi *et al.* "Air fluorescence measurements in the spectral range 300-420 nm using a 28.5-GeV electron beam", Astroparticle Physics, 2008.

R. U. Abbasi *et al.* "The FLASH thick-target experiment", Nuclear Instruments and Methods A, 2008

R. U. Abbasi *et al.* "Search for point-like sources of cosmic rays with energies above 10** 18.5 eV in the HiRes. 1. Monocular data-set", Astroparticle Physics, 2007

R. U. Abbasi *et al.* "Search for cross-correlations of ultrahigh-energy cosmic rays with BL Lacertae objects", Astrophysical Journal, 2006

R. U. Abbasi *et al.* "Observation of the Ankle and Evidence for a High-Energy Break in the Cosmic Ray Spectrum", Phys. Letters B, 2005

T. Abu-Zayyad and D. R. Bergman "Cross-checks of the HiRes Monocular Flux Measurements", 29th International Cosmic Ray Conference, 2005

T. Abu-Zayyad, C. C. H. Jui, E. C. Loh "The Effect of Clouds on Air Shower Observation from Space", Astroparticle Physics, 2004

R. U. Abbasi *et al.* "A Search for Arrival Direction Clustering in the HiRes-I Monocular Data above 10^{19.5} eV." Astroparticle Physics, 2004

R. U. Abbasi *et al.* "Search for Global Dipole Enhancements in the HiRes-1 Monocular Data above 10^{18.5} eV.", Astroparticle Physics, 2004

R. U. Abbasi *et al.* "Measurement of the Flux of Ultrahigh Energy Cosmic Rays from Monocular Observations by the High Resolution Fly's Eye Experiment", Physical Review Letters, 2004

T. Abu-Zayyad *et al.* "The Prototype High-Resolution Fly's Eye Cosmic Ray Detector", NIMA, 2000

T. Abu-Zayyad *et al.* "Evidence for Changing of Cosmic Ray Composition Between 10^{17} and 10^{18} eV From Multicomponent Measurements", Physical Review Letters, 2000

Selected Talks

"Cerenkov Events Seen by The TALE Air Fluorescence Detector",
UHCER2014, Springdale, Utah, October 2014
"The Telescope Array Fluorescence Detector Simulation on GPUs",
CHEP2013, Amsterdam, The Netherlands, October 2013
"Cerenkov Events Seen by The TALE Air Fluorescence Detector",
HEAP Seminar, University of Utah, September 2013
"TALE As a Cerenkov Detector",
NICHE Workshop, University of Utah, August 2013
"Cerenkov Events Seen by The TALE Air Fluorescence Detector",
APS Division of Particles and Filelds, UC Santa Cruz August 2013
"The Telescope Array Fluorescence Detector Simulation on GPUs",
Nvidia GPU Technology Conference, San Jose CA, March 2013
"Monte Carlo Simulation of Photon Propagation and Detection by the IceCube Neutrino Detector",
Nvidia GPU Technology Conference, San Jose CA, September 2009 (Poster)
"Summary of Recent Results from HiRes",
Aspen Workshop on Cosmic Ray Physics, April 2007
"Tandem Stereo Measurement of the Flux of Ultra High Energy Cosmic Rays Spectrum",
TeV Particle Astrophysics, Fermi Lab, July 2005
"Summary of Recent HiRes Results", Frontiers in contemporary physics-III,
Vanderbilt University, May 2005