

FAST MOVING FRONTS - 2010

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Tao Han & Bin Zhang talk with *ScienceWatch.com* and answer a few questions about this month's Fast Moving Fronts paper in the field of Physics.



Article: Signatures for Majorana neutrinos at hadron colliders

Authors: **Han, T;Zhang, B**

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Addresses: Univ Wisconsin, Dept Phys, Madison, WI 53706 USA.

Univ Wisconsin, Dept Phys, Madison, WI 53706 USA.

Tsing Hua Univ, Ctr High Energy Phys, Beijing 100084, Peoples R China.

Acad Sinica, Inst Theoret Phys, Beijing 100080, Peoples R China.

SW: Why do you think your paper is highly cited?

The recent discovery of neutrino masses was one of the most significant developments in physics. The mission of the CERN Large Hadron Collider (LHC) will be to open up a new era in basic science. Our paper has relevance in connection to these two quite important developments, and it has naturally received considerable interest from the physics community.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

Based on the recent studies of neutrino properties, our work outlines some potential new discoveries in experiments scheduled to be conducted at the LHC in the near future.

SW: Would you summarize the significance of your paper in layman's terms?

The paper proposed a unique and clean signal to test a long-standing theoretical conjecture for generating tiny neutrino masses. The so-called "type 1 seesaw mechanism" predicts the existence of a new particle, called the "Majorana neutrino."

We demonstrated the feasibility of searching for Majorana neutrinos at the Fermilab Tevatron Collider near Chicago and also at the LHC. If discovered, it would revolutionize our understanding of mass

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generation for elementary particles.

SW: How did you become involved in this research and were any particular problems encountered along the way?

It is a natural question to ask how the LHC could help in our understanding of the recent observation of neutrino masses. We have been contemplating these issues for some time.

It took quite awhile to develop an optimal search strategy, and it will remain challenging to observe the signal in the realistic experiments conducted at the LHC. This paper is our pioneering piece of work, and there have been several follow-up publications of ours.



Coauthor: Bin Zhang

See related works: A. Atre, *et al.*, "The Search for Heavy Majorana Neutrinos," e-Print:arXiv:0901.3589 [hep-ph], *High Energy Physics – Phenomenology*, 2009; P. F. Perez, *et al.*, "Neutrino Masses and the LHC: Testing Type II Seesaw," e-Print: arXiv:0805.3536 [hep-ph], *High Energy Physics – Phenomenology*, 2008; T. Han, *et al.*, "Pair Production of Doubly-Charged Scalars: Neutrino Mass Constraints and Signals at the LHC," arXiv:0706.0441 [hep-ph], *High Energy Physics – Phenomenology*, 2007.

SW: Where do you see your research leading in the future?

This paper has generated a lot of theoretical and experimental interests in the field.

The ultimately important outcome is to put forth the test experimentally at the LHC.

If confirmed, it would not only provide an exciting explanation for a mass generation mechanism, but also have significant impact on nuclear physics, astroparticle physics, and cosmology as well.

SW: Do you foresee any social or political implications for your research?

We think that the implications would be mainly scientific. It is the experimental confirmation or falsification which will finally determine the impact of this research in the field of high-energy physics and for science over all.

Tao Han, Ph.D.

Professor

Department of Physics

University of Wisconsin

Madison, WI, USA

Web

Bin Zhang, Ph.D.

Professor

Physics Department

Tsinghua University

Beijing, PRC

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Additional information:

Read a Fast Moving Front (March 2009) comment from **Tao Han**.



2010 : **March 2010 - Fast Moving Fronts** : Tao Han & Bin Zhang Discuss the Recent Discovery of Neutrino Masses

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