Isobel Ojalvo

Field: High Energy Particle Physics
Title: Associate Research Scholar
Institution: Princeton University
Alma Mater: University of Wisconsin-Madison
Doctoral Advisor: Prof. Wesley H. Smith

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Objective

My current research focuses on probing the nature of Higgs couplings to fermions with the Compact Muon Solenoid (CMS) detector on the Large Hadron Collider Ring. My most recent major publication, "Observation of the Higgs boson decay to a pair of tau leptons" is the product of many years of my work to improve the detection and acquisition, reconstruction, identification and measurement of tau leptons. Thinking about the long-term developments at CMS, I am actively designing algorithms and implementing firmware for the Phase 2 Level 1 Trigger and I have also been an active supporter and collaborator on a new detector at CMS which uses fast timing to map MIPs to their proper primary vertex in a high pile up environment. Much of my experience over the last few years has been working with high speed FPGAs and commissioning hardware and, as a faculty member, I would continue work on the Phase II hardware upgrades.

Professional Appointments

Dicke Fellow Princeton University - Princeton, NJ **Sept 2016 – Present**

- Tau Physics Object Group Convener (since 2015) – Convener of Tau Physics Object group which relies on 30 students and post-doctoral researchers to provide recommendations on tau reconstruction to the CMS collaboration
- Publication: "Observation of the Higgs boson decay to a pair of tau leptons"
- MIP Timing Detector for the HL-LHC – performed projection of improvement for the VBF Higgs decay to Tau Leptons at the HL-LHC with and without the proposed detector, my analysis shows that a factor of 2 reduction in background can be achieved in the fully hadronic tau channel.
- Phase 2 Level 1 Trigger Upgrade – provided projections of firmware resource utilization of the Tau Identification Algorithm with a custom designed algorithm which is designed to run on a state of the art FPGA

Post Doctoral Research Scientist University of Wisconsin - Madison **Feb 2014 - Aug 2016**

- Search for MSSM heavy higgs resonance via its decay to two 125 GeV higgses with a final state of two tau leptons and two b-quarks and pseudo-scalar resonances (A) via its decay to Zh and then to 4 leptons with taus in the final state
- Stage 1 Calorimeter Trigger Upgrade – testing of upgrade hardware, design and implementation of a number of software tools in C++ used for testing and installation of upgrade hardware in the Regional Calorimeter Trigger at CMS
- Tau Trigger Subgroup Convener, responsible for Level 1 and High Level Trigger preparations for the 2015 run

Boeing: Space and Intelligence Systems El Segundo, CA **June 2007 - Aug 2009**

- Systems Engineer in the Survivability Department that is responsible for ensuring satellites survived lifetime requirements by evaluating vulnerabilities due to electrostatic discharge, single event effects and high doses of radiation
- Enhanced Low Dose Radiation Project Lead- Lead a team to review spacecraft hardware components that may be damaged by Low Dose Rate Radiation

National Astronomy and Ionosphere Center Arecibo, Puerto Rico **May 2006 - Aug 2006**

- Research Assistant in Dr. Robert Minchin and Dr. Steven Gibson's Galactic Survey group
- Objective: Development of application for analysis and visualization of astronomical forces through data cubes

Education

University of Wisconsin – Madison Madison, WI **Aug 2009 - Feb 2014**

Ph.D. in Physics with a concentration in High Energy Particle Physics and Minor in Experimental Particle Physics
Thesis Advisor: Professor Wesley Smith, **Dissertation:** Measurement of W+bb and a search for MSSM Higgs Bosons with the CMS Detector at the LHC

Rensselaer Polytechnic Institute Troy, NY **Aug 2003 - May 2007**

Dual Degree in Physics and Mathematics, Bachelor's of Science, School of Science

Scientific Leadership and Coordination

Tau Physics Object Group Convener - CMS Experiment **May 2015 - Present**

Leading a group of more than thirty Tau physics enthusiasts at CMS in developing, commissioning and measuring Tau triggering and reconstruction at CMS

Tau Trigger Sub-group Convener – CMS Experiment **May 2014 - May 2015**

Successfully commissioned the trigger upgrade in 2015

Level 1 Trigger Online Software – CMS Experiment **Fall 2013 - Fall 2015**

Responsible for maintaining and integrating Online SW for the Layer 1 trigger and Regional Calorimeter Trigger

Teaching and Mentorship

Sam Higgonbotham (Princeton Graduate Student) **Current**

Sajana Sekhar (Tata Institute for Fundamental Research - Mumbai) **Current**

Laura Dodd Spring 2014 (UW-Madison Graduate Student) **Fall 2016**

Tyler Ruggles Spring 2014 (UW-Madison Graduate Student) **Fall 2016**

Aaron Levine (UW-Madison Graduate Student) **Spring 2014-Spring 2015**

Aaron Markowitz (Harvard) **Summer 2015**

Nick Cinko (Purdue) **Summer 2016**

Conferences for Undergraduate Women in Physics Organizer (Princeton) **Fall 2016**

UW Madison Teaching Assistant (UW-Madison) **Fall 2009 - Spring 2011**

Awards

Elizabeth S. Hirschfelder Award - University of Wisconsin – Madison **May 2010 and 2011**

Piore Prize - University of Wisconsin – Madison **February 2011**

Award for obtaining the highest score on the physics graduate school Qualifying Examination

Dicke Fellowship– Princeton University **December 2, 2015**

Post Doctoral Researcher selected from the field of High Energy Collider Physics to receive a 3 year fellowship for independent research at Princeton University

LPC GUESTS AND VISITORS (G&V) PROGRAM – Fermilab **January-February, 2017**

Awarded travel grant and research funding for a short term stay at the Fermilab LHC Physics Center (LPC)

APS-IUSSTF Physics Ph.D. Student & Postdoc Visitation Program – TIFR **December 2017**

Awarded grant for a short term stay at the Tata Institute of Fundamental Research in Mumbai

LPC Distinguished Researchers Program – Fermilab **Fall 2017**

Awarded funding for partial appointment at the LHC Physics Center at Fermilab for 2018

Recent Conference and Invited Seminars

Status and Future of Tau Physics at CMS – University of Wisconsin - Madison **December 18, 2015**

Higgs Couplings to Fermions – La Thuile Conference – La Thuile, Italy **March 6, 2015**

Tau Identification at CMS in Run II – ICHEP – Chicago, Illinois **Aug 6, 2016**

Tau Physics for Run II – Fermilab – Batavia, Illinois **January 19, 2017**

MIP Timing Detector Upgrade CMS – Fermilab – Varna, Bulgaris **August 2017**

Observation of the higgs decaying to Tau Leptons– Colloquium – TIFR, Mumbai, India **November 13, 2017**

Standard Model Higgs Plenary – SUSY 2017 – TIFR, Mumbai, India **December 2017**

Miscellaneous Skills/Hobbies

Computing: Vivado HLS, C++, Python, Online Software Design and Development, Word, Excel, HTML, LaTex
Languages: Mandarin Chinese and French

Hobbies/Other: I have run seven marathons in 4 countries, am a certified PADI Professional SCUBA Diver Guide and Deep Water Rescue, and an avid outdoor rock climber and mountaineer.

Selected Publications as a Primary Author
(Chronological order by date of publication)

CMS Collaboration, **Evidence for the 125 GeV Higgs boson decaying to a pair of τ leptons**, *JHEP 1405 (2014), 104.*

CMS Collaboration, **Measurement of the muon charge asymmetry in inclusive $pp \to W+X$ production at $\sqrt s =$ 7 TeV and an improved determination of light parton distribution functions**, 2014. *Phys. Rev. D90, DOI: 10.1016/j.physletb.2014.06.04, arXiv: 1312.6283*

CMS Collaboration, **Measurement of the production cross section for a W boson and two b jets in pp collisions at $\sqrt{s}$=7 TeV**, 2014. *Phys.Lett. B735, DOI:10.1016/j.physletb.2014.06.041, arXiv: 1312.6608*

CMS Collaboration, **Evidence for the 125 GeV Higgs boson decaying to a pair of τ leptons**, 2014. *JHEP 1410, DOI: 10.1007/JHEP10(2014)160, arXiv: 1408.3316*

CMS Collaboration, **Search for neutral MSSM Higgs bosons decaying to a pair of tau leptons in pp collisions,** 2014. *JHEP 1410, DOI: 10.1007/JHEP10(2014)160, arXiv: 1408.3316*

CMS Collaboration, **Searches for a heavy scalar boson H decaying to a pair of 125 GeV Higgs bosons hh or for a heavy pseudoscalar boson A decaying to Zh, in the final states with h to tautau**, 2015. *CMS-HIG-14-034, CERN-PH-EP-2015-211, arXiv: 1510.01181*

CMS Collaboration, **Measurements of the Higgs boson production and decay rates and constraints on its couplings from a combined ATLAS and CMS analysis of the LHC pp collision data at sqrt s = 7 and 8 TeV**, 2015. *CMS-PAS-HIG-15-002*

CMS Collaboration, **Search for additional neutral Higgs bosons decaying to a pair of tau leptons in pp collisions at $\sqrt{s}$ = 7 and 8 TeV**, 2015. *CMS-PAS-HIG-14-029*

CMS Collaboration, **Measurements of differential cross sections for associated production of a W boson and jets in proton-proton collisions at sqrt(s)=8 TeV,** 2016. *CMS-SMP-14-023, CERN-PH-EP-2016-231, arXiv: 1610.04222*

CMS Collaboration, **Performance of reconstruction and identification of tau leptons in their decays to hadrons and tau neutrino in LHC Run-2**, 2016. *CMS-PAS-TAU-16-002*

CMS Collaboration, **Observation of the Higgs boson decay to a pair of tau leptons**, 2016. *CMS-HIG-16-043, CERN-EP-2017-181, arXiv:1708.00373*

For complete list of publications, please see INSPIRE publication database.