Ted R. Kolberg

CONTACT INFORMATION

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EMPLOYMENT

Florida State University, Tallahassee, FL, USA

Asst. Professor, 2016-current

University of Maryland, College Park, MD, USA

Research Assistant, 2011-2016

EDUCATION

University of Notre Dame, Notre Dame, IN, USA

Ph.D., Physics, 2011

- Advisor: Colin Jessop.
- Thesis topic: Measurement of the isolated prompt photon cross section at $\sqrt{s} = 7$ TeV with conversions.

M.S., Physics, 2009

Stanford University, Stanford, CA, USA

B.S., Physics, 2005

RESEARCH INTERESTS

Experimental high-energy physics: searches for physics beyond the Standard Model with long-lived particles, searches for "natural" supersymmetry, photon production measurements, calorimetery, event reconstruction software development, data acquisition (DAQ) systems and software. Currently working on the Compact Muon Solenoid (CMS) experiment at the Large Hadron Collider (LHC) at CERN.

RESEARCH EXPERIENCE

- 2017: Member of Task Force on Mixed Cassettes: worked on mechanical, thermal, and electrical design of mixed scintillator/silicon cassettes for the CMS Phase II upgrade.
- 2016 – present: USCMS Phase II upgrade project, Endcap Calorimeter (EC) L3 manager for electronics and services.
- 2015 – present: Long-lived exotica physics subgroup convenor. Leading a group with about twelve active analyses and approximately thirty physicists, focusing on searches for new physics in final states with long-lived particles. Analyses search for particles which decay in flight (displaced leptons, displaced jets), decay in the detector material asynchronously with the LHC bunch structure (stopped particles), or are stable but leave unique signatures in the detector (very heavy particles with large energy loss).
- 2015 – present: Physics analysis with displaced jets. Primary analyst on two 13 TeV analyses searching for final states with jets displaced from the primary vertex on the millimeter to meter scale.

- 2013 – 2015: CMS hadronic calorimeter (HCAL) Operations coordinator. Led a team of approximately forty physicists, engineers, and technicians. Responsible for overseeing the commissioning and operation of the detector during the crucial transition from LHC Long Shutdown 1 to the 2015 physics run. During this period the HCAL made major changes to the detector, including new photodetectors in the HO outer calorimeter (SiPMs), HF forward calorimeter (multi-anode PMTs), a new µTCA backend for HF and major changes to the CMS clock and trigger system which cumulatively required an overhaul of the HCAL operations effort. In addition to all the above changes, the move to 25 ns running (from 50 ns) required new strategies and procedures for timing, calibrating, and monitoring the detector. Additional duties included organizing shift coverage, analyzing and correcting the causes of HCAL problems during running, and supervising the collection and analysis of detector monitoring data.

- 2013 – 2014: HCAL back-end electronics upgrade. Participated in testing and qualification of electronics for the HCAL upgrade electronics to be installed during LHC Long Shutdown 1. Also responsible for testing and qualification of optical data transmission components for the upgrade. Participated in the integration and commissioning of these components in CMS as part of operations duties.

- 2012 – 2015: Principal member of stop to dileptons analysis on 8 TeV data. Organized and performed an analysis looking for pair production of the scalar partner of the top quark decaying to final states containing two leptons. Also supervised a graduate student working on the analysis (Brian Calvert, now in industry) to PhD thesis completion.

- 2012 – 2016: Part of HCAL operations expert team. On-call as main HCAL expert for large fractions of this period.

- 2012: Responsible for leading the HCAL detector monitoring group. Mentored a group of six to eight graduate students analyzing weekly monitoring data from HCAL calibration runs and CMS collision data. Led analysis of special topics affecting HCAL data quality and made regular reports on the detector status.

- 2012: MET performance studies with photons. Worked on quantifying the MET scale and resolution using the hadronic recoil in single photon events. Supervised a graduate student on the study, published in JINST.

- 2010 – 2016: CMS Run Field Manager (RFM). Coordinated CMS online operations and data-taking for multiple two-week shifts during physics runs. Responsibilities include leading the daily CMS run meeting, identifying solutions to any problems which prevent smooth data-taking, and coordinating the shift crew.

- 2010: Primary editor, CMS PAS EGM-10-005. Produced public document on the first CMS physics results with photons on the first 75 nb^{-1} of 7 TeV *pp* collision data for ICHEP 2010.

- 2009 – 2011: Member of QCD photons group, one of the principal members working on measuring the isolated photon cross section at the LHC. Developed techniques to measure the photon cross section using photon conversions. The conversion techniques developed in this context were later applied to primary vertex identification and other studies in the Higgs to two photons discovery. Also performed studies on a variety of more general topics related to photon physics including: differences between theory-level and reconstructed isolation, effects of pileup on photon identification efficiency, photon trigger configuration. Additional contributions to the group included development of common analysis tools and data and Monte Carlo processing.

- 2009 – 2010: ECAL Run Field Manager (RFM). Part of a small team responsible for coordinating ECAL activities at CMS: reports on ECAL status and operations to CMS run coordination and ECAL detector performance group (DPG); acting as shift leader to answer shifter questions and refer questions to the appropriate experts; quick problem-solving to keep ECAL running with good quality data.
- 2008 – 2009: Development of off-detector electronics monitoring system for electromagnetic calorimeter (ECAL). Developed and maintained a web-based suite of monitoring applications which reports and logs electronics status and errors for expert debugging and shifter notification purposes. This monitoring software is still in daily use for ECAL operations as of 2015.
- 2007: CMS ECAL endcap testbeam campaign. Adapted DAQ software from 2006 ECAL barrel testbeam for endcap, enabling performance studies on a near-final ECAL endcap configuration.
- 2007 – 2016: Based full time at CERN.
- 2006 – 2011: Developer for CMS software (CMSSW). Contributions to photon conversion reconstruction and identification. Also helped to set up a prompt workflow to evaluate the quality of photon data in real time as data is taken.
- 2006: CMS ECAL summer testbeams at CERN. H4 (standalone) and H2 (combined test with hadronic calorimeter). Contributed to DAQ system for testbeams. Analysis of ECAL performance in testbeams.

Technical Experience

- Proficient with C++ (including the ROOT analysis environment and the XDAQ data acquisition software package), C, Java, HTML/CSS, XML, version control with git, SVN, and CVS, software project support with Atlassian JIRA software, and the GNU/Linux ensemble of software tools.
- Project management with Primavera P6 software.
- Experience administering a small cluster of research computers with shared storage for the Notre Dame group at CERN.

Teaching

- Spring 2017: Phys 2053 – College Physics A – Mechanics, thermodynamics for non-majors; recitations.
- Fall 2016: Phys 2054 – College Physics B – E&M, modern physics for non-majors; recitations and labs.
- 2015 – present: Supervising Young Ho Shin (UMD graduate student) on his analysis work with displaced jets.
- 2012 – 2015: Supervised Brian Calvert (UMD graduate student) on his analysis work with the stop to dileptons analysis, and on MET performance studies with photons.
- January 2014: RooStats exercise facilitator, CMS Data Analysis School at CERN. Helped to develop material and lead workshops for junior members of the collaboration.
- Spring 2007: Teaching Asst., Physics 11310 (Mechanics Lab). Taught undergraduate students basic principles of mechanics as well as lab and computer skills.
- Fall 2007: Teaching Asst., Physics 20330 (Modern Physics) and Physics 31210 (Mechanics Lab).

Awards, Honors, and Service

- 2017: CMS ARC (Analysis Review Committee) for full 2016 dataset stop search (SUS-16-051)
- 2016 – 2017: Proficiency exam committee, Physics Dept.
- 2016: CMS ARC (Analysis Review Committee) for 13 TeV stop search, all channels combination (SUS-16-008).
- 2016: Co-organizer, 2016 LHC Workshop on Long-Lived Particle Searches – organized a workshop at CERN bringing together CMS, ATLAS, and LHCb physicists and phenomenologists to discuss prospects for long-lived results at the 13 TeV LHC.
- 2016: CMS ARC (Analysis Review Committee) for 13 TeV stop search in the single lepton channel (SUS-16-002).
- 2016: 2015 CMS Achievement Award winner "for his leadership and contributions as the HCAL Operations manager during the commissioning phase of Run 2."
- 2009: USLHC blogs outreach project (http://blogs.uslhc.us): Contributing blogger. Blog posts are authored for a general audience to describe the work going on at the LHC. Responsibility for authoring original content and interacting with blog commenters from the public.
- Spring 2007: Graduate Student Recruitment Committee, Student Chair, Notre Dame Physics Dept. Organized the academic and social schedule for the department's annual graduate student visitation weekend.
- 2005 – 06: Notre Dame Physics Department Fellowship.
- 2004 – 05: Student assistant, Stanford Physics Department. Work-study job. Set up labs and demonstrations for physics courses.

Selected Publications

A full list of peer-reviewed publications is available here.

1. V. Khachatryan *et al.* [CMS Collaboration], "Search for direct pair production of scalar top quarks in the single- and dilepton channels in proton-proton collisions at sqrt(s) = 8 TeV", JHEP 07 (2016) 027
2. V. Khachatryan, et al. [CMS Collaboration], "Performance of the CMS missing transverse momentum reconstruction in pp data at $\sqrt{s} = 8$ TeV", JINST 10 (02) (2015) P02006. dx.doi.org/10.1088/1748-0221/10/02/P02006
3. V. Khachatryan *et al.* [CMS Collaboration], "Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC," Physics Letters B Volume 716, Issue 1, 17 September 2012.
4. V. Khachatryan *et al.* [CMS Collaboration], "Measurement of the differential cross section for isolated prompt photon production in *pp* collisions at 7 TeV," Phys. Rev. D 84, 052011 (2011). arXiv:1108.2044 [hep-ex].
5. V. Khachatryan *et al.* [CMS Collaboration], "Measurement of the Isolated Prompt Photon Production Cross Section in pp Collisions at sqrt(s) = 7 TeV," Phys.Rev.Lett. 106 (2011) 082001. [arXiv:1012.0799 [hep-ex]].
6. S. Chatrchyan *et al.* [CMS Collaboration], "Commissioning of the CMS Experiment and the Cosmic Run at Four Tesla," JINST **5**, T03001 (2010). [arXiv:0911.4845 [physics.ins-det]].

7. S. Chatrchyan *et al.* [CMS Collaboration], "Performance and Operation of the CMS Electromagnetic Calorimeter," JINST **5**, T03010 (2010). [arXiv:0910.3423 [physics.ins-det]].

8. S. Abdullin *et al.* [USCMS and ECAL/HCAL Collaborations], "The CMS barrel calorimeter response to particle beams from 2-GeV/c to 350-GeV/c," Eur. Phys. J. **C60**, 359-373 (2009). Contributed to ECAL DAQ effort for the test beam campaign.

9. R. Adolphi *et al.* [CMS Collaboration], "The CMS experiment at the CERN LHC," JINST **0803**, S08004 (2008).

Selected talks and presentations

1. "Decays to dark sector particles at the CMS experiment," Dark Interactions 2016, Brookhaven National Laboratory, October 5 2016.

2. "Long-lived particles, displaced vertices, and lepton jets," CIPANP2015, Vail, CO, 19 May 2015.

3. "Photon production (direct photon and di-photon) at ATLAS and CMS," 24th Rencontres de Blois, Blois, France, 30 May 2012.

4. "Prompt-Photon production in p-p collisions," Winter Workshop on Recent QCD Advances at the LHC, 13-18 Feb 2011, Les Houches, Rhne-Alpes (France)

Grants and External Funding

1. 2017 – "Florida State University for Activities Related to the High Luminosity (HL) LHC CMS Detector Upgrade Project – Endcap Calorimeter" (DOE), Principal Investigator, $16,000.00

2. 2017 – "Florida State University for Activities Related to the US CMS HCAL Subsystem" (DOE), Principal Investigator, $121,286.00