

# Kim Doyeong 김도영

**Field:** High Energy Physics | **Title:** Postdoctoral Research Associate | **Institution:** Argonne National Laboratory  
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## PROFESSIONAL APPOINTMENT

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**Argonne National Laboratory**, Lemont, IL **Oct 2022 - present**  
*Postdoctoral Research Associate in High Energy Experimental Physics Division(ATLAS)*

Research topics: Precision measurement of the Standard Model, Silicon-based Pixel Modules for ATLAS HL-LHC upgrade  
Supervisors: Dr. Jessica Metcalfe and Dr. Christine McLean

## EDUCATION

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**Kansas State University**, Manhattan, KS **Aug 2016 - Aug 2022**  
*Ph.D. in Physics, Department of Physics*

Thesis: [Measurement of the Higgs boson properties using its decay to a pair of  \$\tau\$  leptons in proton-proton collisions at  \$\sqrt{s} = 13\$  TeV at the Large Hadron Collider](#)  
Supervisor: Professor Ketino Kaadze

**Jeonbuk National University**, Republic of Korea **Mar 2012 - Feb 2016**  
*B.S. in Physics, Department of Physics*

## RESEARCH EXPERIENCE

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**Argonne National Laboratory ATLAS group** **Oct 2022 - present**  
*Physics*

*Study of Vector Boson Scattering(VBS) and diboson electroweak production in the final states with jets (Run2)*

- Leading the analysis developing analysis strategy, software framework, and event selection criteria

*Contributions to physics objects study: jet and missing-energy*

- The combination of the scale factor measurements for boosted objects (W/Z/top) for Run 2 analyses
- The boosted-boson (W/Z) tagger optimization for Run 3 analyses

### *Detector upgrades*

*ITk pixel module assembly and testing*

- Leading ITk Pixel module testing and local database at ANL
- Coordinating readiness and preparation of the clean room for ITk pixel module pre-production and production

**Kansas State University CMS group** **Dec 2016 - Aug 2022**  
*Physics*

*Differential cross sections measurement of the Higgs boson with  $H \rightarrow \tau\tau$  process (Run2)*

- Fully responsible for fully hadronic channel ( $\tau_h\tau_h$ ) of the  $H \rightarrow \tau\tau$  signal in this measurement, including analysis framework development, trigger studies, event selection criteria, etc.
- Combined results for all four  $H \rightarrow \tau\tau$  final states, including unfolding, regularization, and statistical interpretation

*Search for anomalous ggH and HVV coupling with  $H \rightarrow \tau\tau$  process (Run2)*

- Fully responsible for fully hadronic channel ( $\tau_h\tau_h$ ) of the  $H \rightarrow \tau\tau$  signal in this search, including analysis framework development, trigger studies, event selection criteria, developing multi-class neural network, etc.

*The  $H \rightarrow \tau\tau$  simplified template cross section (STXS) (Run2)*

- Fully responsible for fully hadronic channel ( $\tau_h\tau_h$ ) of the  $H \rightarrow \tau\tau$  signal in this measurement, including analysis framework development, trigger studies, event selection criteria, statistical interpretation etc.

*Search for associated HV production via  $H \rightarrow \tau\tau$  decay (partial Run2 - 2016)*

- Performed optimization of selection criteria for search for associate WH production

### **Detector upgrades**

*Precision timing ASIC testing and developing for MIP timing detector (ETROC project) 2021 - 2022*

- Served as a leader of the team among five students
- Developed analysis framework, 24/7 remote monitoring and logging framework for test setup
- Planned test beam data taking analyzing data promptly daily basis
- Analyzed data to understand the ETROC1 ASIC prototype and checked its performance

*HCAL Online-to-offline (O2O) database software 2020 - 2022*

- Developed entire framework for HCAL O2O machinery
- Tested HCAL O2O with real detector configuration

*HCAL HB frontend commissioning and  $^{60}\text{Co}$  sourcing activity 2019*

- Took commissioning runs and provided troubleshooting for the newly installed HB units
- Took  $^{60}\text{Co}$  sourcing runs and monitored source driver

*HCAL HB calibration unit assembly and burn-in testing 2019*

- Assembled 50 HB calibration unit for HCAL phase1 upgrade
- Developed analysis framework for electronics and optical parts of the calibration unit tests

*HCAL operation detector-on-call shifter 2018*

- Monitored the status of the HCAL during the operation to provide prompt feedback and support to HCAL operation team
- Took daily HCAL detector health check runs and analyse

*HCAL HE/HB QIE cards testing and test beam activity 2017*

- Developed analysis framework for HE/HB QIE readout cards at FNAL test-stand
- Took test runs using various types of beams (muon, pion, and electron) for HCAL HE upgrade

## **HONORS AND AWARDS**

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**LPC Graduate Scholars Program**

**Feb 2021 - Jan 2022**

*Fermi National Accelerator Laboratory*

**Foundation Scholarship**

**Feb 2014 - Feb 2016**

*Kwanjeon Educational Foundation*

## **CONFERENCES**

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**The ETROC project: Precision timing ASIC development for CMS MTD endcap timing layer (ETL) upgrade**

*Parallel talk at APS April 2022 conference - New York, NY*

**Apr 09, 2022**

- Measurements of Higgs cross sections and different distributions in the  $H \rightarrow \tau\tau$  final state from CMS  
*Parallel talk at Higgs 2021 conference - Stony Brook, NY (Virtual world)* **Oct 21, 2021**
- Higgs-vector boson CP studies, incl.  $H \rightarrow 4l$  anomalous couplings and VBF  $H \rightarrow \tau\tau$  CP  
*Parallel talk at Higgs 2020 conference - Virtual world* **Oct 28, 2020**
- Measurement of Higgs boson couplings in the di-tau final state at CMS  
*Plenary talk in the Young Scientist Forum at La Thuile conference - La Thuile, Italy* **Mar 13, 2020**  
 (Conference canceled 3 days before due to COVID-19)
- Measurement of Higgs boson couplings in the di-tau final state at CMS  
*Poster session at LHCC - Geneva, Switzerland* **Feb 19, 2020**

## TEACHING AND MENTORSHIPS

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- Graduate Teaching Assistant** **Aug 2016 - May 2017**  
*Kansas State University*
- Teaching assistant in engineering physics labs

## OUTREACH & ACTIVITIES

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- APS CUWiP(Conferences for Undergraduate Women in Physics) at Argonne National Laboratory** **2023**  
*American Physical Society*
- Served as a moderator in Science Careers at National Labs session
- LPC Tau Hands-on Advanced Tutorials at Fermi National Accelerator Laboratory** **2022**  
*Facilitators*
- Planned and design hands-on tutorial program for tau lepton
  - Provided prompt help during the event week
- CERN Open Days at The European Organization for Nuclear Research** **2019**  
*CMS detector tour guide*
- Guide public visitors to the underground detector providing stories and explanations

## PUBLICATIONS

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This section contains publications in which I was a primary analyzer or made significant contributions.

- [1] CMS Collaboration, “Constraints on anomalous Higgs boson couplings to vector bosons and fermions in its production with associated particles using the  $H \rightarrow \tau\tau$  final state”, CMS-HIG-20-007, CMS-PAS-HIG-20-007, CERN-EP-2022-021, [arXiv:2205.05120](https://arxiv.org/abs/2205.05120)
- [2] CMS Collaboration, “Measurement of Higgs boson production in the decay channel with a pair of  $\tau$  leptons”, CMS-HIG-19-010, CERN-EP-2022-027, [arXiv:2204.12957](https://arxiv.org/abs/2204.12957)
- [3] CMS Collaboration, “Measurement of the inclusive and differential Higgs Boson production cross section in the decay mode to a pair of  $\tau$  leptons in  $pp$  collisions at  $\sqrt{s} = 13$  TeV”, 2022. *Phys. Rev. Lett.* **128** (2022) 081805, CMS-HIG-20-015, CERN-EP-2021-134, [arXiv:2107.11486](https://arxiv.org/abs/2107.11486)
- [4] CMS Collaboration, “Search for the associated production of the Higgs boson and a vector boson in proton-proton collisions at  $\sqrt{s} = 13$  TeV via Higgs boson decays to  $\tau$  leptons”, *JHEP* **06** (2019) 093, CMS-HIG-18-007, CERN-EP-2018-221, [arXiv:1809.03590](https://arxiv.org/abs/1809.03590)

- [5] Minji Lee, Ahmed Y Mohamed, Doyeong Kim, Dae Hyun Kim, Tae Joo Park, Deok-Yong Cho, “*Identification of ZnTiO<sub>3</sub> nanostructures in oxidized TiN/ZnS thin films using X-ray absorption spectroscopy*”, *Applied Surface Science* 2019, 494 , 63-71. <https://doi.org/10.1016/j.apsusc.2019.07.188>
- [6] Doyeong Kim, Minji Lee, Seung-Yub Song, Dae Hyun Kim, Tae Joo Park, Deok-Yong Cho, “*Observation of Titania and Titanate Phase Changes in Oxidation-Controlled ZnO/TiN and HfO<sub>2</sub>/TiN Thin Films: An X-ray Absorption Spectroscopy Study*”, *The Journal of Physical Chemistry C* 2016 120 (33), 18674-18681, DOI: [10.1021/acs.jpcc.6b06565](https://doi.org/10.1021/acs.jpcc.6b06565)