# Bo Liu

*Curriculum vitae*

## Personal Information

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| Name | Bo Liu |
| Data of Birth | 1988 Augest 14 |
| Place of Birth | Inner Mongolia, China |
| Nationality | China |
| Mobile | +41 76 23 41 888(CH)/+86 134 0699 3990(CN) |
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## Education

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| 2011–2016 | **Doctor of Philosophy in Particle Physics, School of Physics, Shandong University, Jinan, China** |
| Thesis Title | *Search for heavy Higgs Boson in $H \to ZZ \to \ell\ell\nu\nu$ channel with ATLAS detector at $\sqrt{s} = 13\,\mathrm{TeV}$* |
| Supervisors | Prof. Cunfeng Feng (Shandong University) and Dr. Rachid Mazini (Academia Sinica) |
| 2007–2011 | **Bachelor of Science in Physics, School of Physics, Shandong University, Jinan, China** |
| Thesis Title | *Study on the performance of extended air shower detector grid unit module using Geant4* |
| Supervisor | Prof. Cunfeng Feng |

## Research Experience

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| 2012.10–now | **Research Assistant in Academia Sinica and Shandong University** <br> I involved several topics during the stay at CERN. |

*1. The missing transverse momentum reconstruction developments and the performance studies*:

I improved the track-based missing transverse momentum ($p_T^{miss}$) reconstruction by optimizing the track selections using $\sqrt{s} = 8\,\text{TeV}$ data collected by the ATLAS detector. At same time, I also worked on the performance studies of $p_T^{miss}$ with minimum bias, Z+jets and W+jets events using 8 TeV dataset. My results on the $p_T^{miss}$ were also used to develope track-based softterm (TST) $E_T^{miss}$ using 8 TeV data.

For ATLAS run-II studies, I tested and implemented the tracking group recommended track selections for TST $E_T^{miss}$ and $p_T^{miss}$ reconstructions. Beside that, I also developed the method to derive the systematic uncertainties for $p_T^{miss}$ and derived the systematic uncertainties using data and MC. Along with the systematic uncertainties studies, I was also involved in the performance studies for $p_T^{miss}$ using 2015 $\sqrt{s} = 13\,\text{TeV}$ data.

*2. Search for single production of vector-like quark b\* and B in Wt final state with ATLAS detector at $\sqrt{s} = 8\,\text{TeV}$:*

This analysis was motivated by the composite Higgs model, which predict the vector-like quark to solve the naturalness problem of the Standard Model. The $b^*$ quark was also considered as excited quark which has a chromomagnetic coupling to a gluon and a b-quark.

I was involved the studies on the selections optimization, backgrounds estimations, systematic uncertainties evaluations and providing the templates for statistical analysis.

*3. Search for high-mass resonances decaying into a Z boson pair in the $\ell\ell\nu\nu$ final state with the ATLAS detector at $\sqrt{s} = 13\,\text{TeV}$:*

This analysis was mainly motivated by some extensions of the Standard Model like two-higgs-doublet-model (2HDM) and Electroweak singlet model, which predict the additional Higgs partners along with the Standard Model Higgs boson. The non-Higgs beyond the Standard Model particles like Randall-Sundrum graviton, which have some decay final state, was also used as signal candidate in this analysis.

I was involved the tasks of minitree production, selections optimization, backgrounds estimations, systematic uncertainties estimations and the statistical analysis.

*4. Search for invisible decay of Higgs boson in association production with Z boson with the ATLAS detector at $\sqrt{s} = 13\,\text{TeV}$:*

I also worked on the invisible decay of Higgs search using 13 TeV dataset. This analysis was mainly motivated by the Higgs portal model, where the Standard Model Higgs boson can be the bridge between Standard Model particles and the Dark Matter sectors. I was the support note editor for this analysis. Beside that I also worked on the signal sample production and statistical analysis.

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*5. Measurement of ZZ production cross section in $\ell\ell\nu\nu$ final state with the ATLAS detector at $\sqrt{s} = 13$ TeV:*
Recently, I join the effort on the measurement of $ZZ$ production cross section in $\ell\ell\nu\nu$. I am the support note editor and mainly contribute to the statistical analysis.

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| 2012.07–<br>2013.07 | **Research Assistant in Academia Sinica and Shandong University**<br>I mainly worked on my qualification task which was related to the Integral Simulation Framework (ISF). The efforts included the installation of the Run Time Tester (RTT) jobs for the ISF, monitoring the test results and the development of the tool used to convert AltfastII simulation results to standard hits information use in ATLAS simulation. |
| 2011.09–<br>2012.06 | **Graduate student in Shandong University**<br>As the first year of the PhD student, I worked on validating the generators for single-top production using Rivat package and debugging the ISF software. |
| 2010.10–<br>2011.04 | **Undergraduate student in Shandong University**<br>As undergraduate student, I studied the performance of unit scintillator detector for extended air shower detector grid using Geant4 program. |

## Languages

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| English | Fluent |
| Chinese | Mother Tongue |

## Computer skills

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| Operation System | Windows, Linux |
| Programming Languages | C++, Python, Bash script, LaTeX |
| Analysis tools | ROOT, Geant4, Athena (ATLAS software framework), RootCore, Rivet |
| Statisical tools | RooFit, RooStats, Histfactory, Histfitter |

## Publications

[1] Search for new phenomena in the $Z(\to \ell\ell) + E_T^{\text{miss}}$ final state at $\sqrt{s} = 13$ TeV with the ATLAS detector. Technical Report ATLAS-CONF-2016-056, CERN, Geneva, Aug 2016.

[2] ATLAS Collaboration. Expected performance of missing transverse momentum reconstruction for the ATLAS detector at $\sqrt{s} = 13$ TeV. ATL-PHYS-PUB-2015-023, 2015.

[3] ATLAS Collaboration. Performance of missing transverse momentum reconstruction for the ATLAS detector in the first proton-proton collisions at at $\sqrt{s}=$ 13 TeV. Technical Report ATL-PHYS-PUB-2015-027, CERN, Geneva, Jul 2015.

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[4] ATLAS Collaboration. Reconstruction and Performance of Missing Transverse Momentum in the ATLAS Detector in Proton-Proton Collisions at $\sqrt{s} = 8\,\text{TeV}$. *Eur. Phys. J. C*, 2016. Submitted to EPJC.

[5] ATLAS Collaboration. Search for high-mass resonances decaying into a Z boson pair in the $\ell\ell\nu\nu$ final state in $pp$ collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector. Technical Report ATLAS-CONF-2016-012, CERN, Geneva, Mar 2016.

[6] ATLAS Collaboration. Search for the production of single vector-like and excited quarks in the $Wt$ final state in $pp$ collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector. *JHEP*, 02:110, 2016.

## Conferences and Workshops

**1** ATLAS $H \to ZZ$ Workshop 2016, Munich, Germany, 26 – 29 April, 2016
Presentation: The $\ell\ell\nu\nu$ analysis framework status and plan.
Presentation: The $ZH \to \ell\ell + inv.$ search: status and plan.
https://wwwatlas.mpp.mpg.de/HZZWorkshop2016/

**2** ATLAS Hadronic Calibration Workshop 2015, Bratislava, Slovakia, 15 – 19 September, 2015
MET session co-organizer
https://indico.cern.ch/event/368856/other-view?view=standard

**3** QCD@LHC Workshop, London, UK, 1 – 5 September, 2015
Presentation: Higgs Measurements from ATLAS
https://indico.cern.ch/event/381832/other-view?view=standard

**4** 121st LHCC Meeting, CERN, 4 – 5 March, 2015
Poster: Missing Transverse Momentum Measurement using the ATLAS Detector
http://indico.cern.ch/event/369822/

**5** ATLAS Hadronic Calibration Workshop 2014, Munich, Germany, 9 – 14 September, 2014
Contribution: The $p_{\mathrm{T}}^{\mathrm{miss}}$ performance for high luminosity
Contribution: The $p_{\mathrm{T}}^{\mathrm{miss}}$ reconstruction using FTK and its usage in MET trigger.
https://indico.cern.ch/event/299407/other-view?view=standard

**6** 37th International Conference of High Energy Physics (ICHEP), Valencia, Spain, 1 – 10 July, 2014
Poster: Measurement of missing transverse momentum with the ATLAS detector at the LHC Run-I and beyond
http://ichep2014.es/

**7** The 4th Workshop of France China Particle Physics Laboratory, Jinan, China, April, 2011
Workshop volunteer

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