

Dear Sir or Madam,

I am currently completing my masters degree at the Max-Planck-Institute for Physics (MPP) in Munich, which I intend to finish in January 2018. In the following, I would like to start a PhD in the field of high energy physics and with this letter I would like to apply for the open position in your institute.

I received my bachelor of physics in 2015 from the Technical University of Munich, after I had finished an apprenticeship as electronics technician at Deckel MAHO, which is one of the worlds leading companies in terms of mechanical engineering. During my masters courses, I have gotten excited by the field of elementary particle physics very quickly and chose courses and seminars, e.g. Testing the Standard Model of Particle Physics, Computational Physics, Gas Detectors: Theory and Application, Particle Physics with Cosmic and Terrestrial Particle Colliders and Satellite-Based Particle Physics, to get a well-rounded education in Quantum Field Theory, Detector Physics and Data Analysis.

In parallel to my studies at the university, I also worked as a trainee in several fields of physics, e.g. in neutron scattering at the research reactor FRM2 in Garching or at the ATLAS-MDT group of the MPP. At the MPP I contributed to the hardware development, where I could apply my technical experience. In addition I gained experience in the application of data analysis tools, which I have been using for my masters project, the top-quark mass measurement in the lepton + jets channel at 13 TeV with ATLAS. This work is based on the previous analysis for 7 and 8 TeV [1, 2]

Furthermore, I also took part in this years (2017) summer student program at CERN, where I could improve my knowledge about theoretical particle physics and computational physics by attending lectures about effective field theories, phenomenological particle physics and statistical methods. My summer student project was the extraction of the strong coupling constant α_s from photon-structure functions F_2^γ (see [3]). The main goal of this summer student project has been the implementation of the F_2^γ fit and the extraction of α_s in the existing proton PDF fit framework xFitter [4]. In terms of this project I have learned a lot about QCD, e.g. about the evolution of the PDFs via the DGLAP equations. I am still involved in this project to date.

For my prospective work, my interests are based on the contribution for future analysis, as well as in the development of new experimental equipment to approach the challenges which will arise at increasing luminosity.

Particularly high precision measurements and the investigation of CP-violation seem very interesting to me, since they could be the cornerstone for the discovery of new physics beyond the Standard Model. Therefore, the latest results of the LHCb collaboration are very fascinating. A very good example is the deviation from the Standard Model predictions, observed in the angular distribution of the $B^0 \rightarrow K^{*0} \mu \mu$ channel [5].

In addition to this, I am also really enthusiastic about the the first observations of top-quarks in the forward direction [7]. These fantastic and promising measurements, have deeply influenced my scientific interests, thus I would like to contribute in the future LHCb analysis tasks.

Furthermore, I am also very interested in the technical details. The LHCb experiment has, due to its special conditions and needs, a very unique detector system. The chance to contribute in the future development, e.g. of the hardware and trigger system, are very motivating, especially if I consider the challenges, which arise with the upcoming high luminosity LHC (HL-LHC). In order to handle the fast amount of data, which will occur with the LHC upgrade, new technical and exciting solutions have to be found.

I would be honored to contribute in that work, especially at a renowned university like yours, which offers in my opinion great possibilities, due the fact that you are strongly involved in the development of the LHCb detector system and in the data analysis.

Since the EPFL Lausanne is a partner university of Technical University of Munich and also a member of the EuroTech University alliance, I have gotten a good impression about the excellent capabilities you can offer. Therefore, I would be grateful to do my PhD at your university.

If you have further questions, please do not hesitate to contact me.

Yours sincerely,

Sebastian Schulte

References

- [1] G. Aad *et al.* [ATLAS Collaboration], Eur. Phys. J. C **75**, no. 7, 330 (2015) doi:10.1140/epjc/s10052-015-3544-0 [arXiv:1503.05427 [hep-ex]].
- [2] The ATLAS collaboration [ATLAS Collaboration], ATLAS-CONF-2017-071.
- [3] S. Albino, M. Klasen and S. Soldner-Rembold, Phys. Rev. Lett. **89**, 122004 (2002) doi:10.1103/PhysRevLett.89.122004 [hep-ph/0205069].
- [4] S. Alekhin *et al.*, Eur. Phys. J. C **75**, no. 7, 304 (2015) doi:10.1140/epjc/s10052-015-3480-z [arXiv:1410.4412 [hep-ph]].
- [5] R. Aaij *et al.* [LHCb Collaboration], JHEP **1602**, 104 (2016) doi:10.1007/JHEP02(2016)104 [arXiv:1512.04442 [hep-ex]].
- [6] R. Aaij *et al.* [LHCb Collaboration], JHEP **1502**, 121 (2015) doi:10.1007/JHEP02(2015)121 [arXiv:1409.8548 [hep-ex]].
- [7] R. Aaij *et al.* [LHCb Collaboration], Phys. Rev. Lett. **115**, no. 11, 112001 (2015) doi:10.1103/PhysRevLett.115.112001 [arXiv:1506.00903 [hep-ex]].