

Dr Alexander Shires

I am a highly motivated physicist with five years' experience of contributing to the LHCb collaboration at CERN. My research is focussed on searching for physics beyond the standard model in $b \rightarrow s \ell^+ \ell^-$ decays.

Employment history

2013 to present **Post doctoral researcher**, *Technische Universität Dortmund*, Germany.
Post-doctoral position in experimental particle physics as part of the LHCb collaboration experiment in the Emmy Nöther group headed by Johannes Albrecht.

Education

Oct 2013 **PhD, High Energy Physics**, *Imperial College London*, UK.
Thesis: *Exploring $b \rightarrow s$ electroweak penguins at LHCb*, Supervisor: Prof. Ulrik Egede
Research PhD searching for physics beyond the Standard Model on the LHCb experiment at CERN.

Jun 2009 **MSci (Hons), Physics With Theoretical Physics**, *Imperial College London*, UK.
First Class degree concentrating on the theoretical aspects of physics, specifically to understand current research into particle physics and cosmology. This four year course involved specific modules in applied mathematics, statistics and computing dedicated to implementing algorithms for modelling and data analysis.

Aug 2005 **A-levels, GCSEs**, *Hardenhuish School*, Wiltshire, UK.
A-levels: Physics (A), Mathematics (A), Chemistry (A), Further Mathematics (A).
GCSEs: 3 A*, 3 A, 3 B.

Research Experience

Most recently, I have tested lepton universality using $B^+ \rightarrow K^+ \ell^+ \ell^-$ decays. The measurement of R_K , the ratio of $B^+ \rightarrow K^+ \mu^+ \mu^-$ to $B^+ \rightarrow K^+ e^+ e^-$ decays, was not expected to be possible at LHCb. In October 2013, I took over this analysis as the project lead and developed new models to describe the data, implemented the calculations in a coherent framework and brought the result to publication. This measurement was published as an *Editor's highlight* in PRL in October 2014.

The related channel $B^0 \rightarrow K^{*0} \mu^+ \mu^-$ is one to the top 3 measurements for LHCb and I worked on the first three publications of this decay as part of my PhD. We found several discrepancies with the standard model and these measurements are an area of significant discussion in both the experimental and theoretical community. One factors which needs to be addressed for future measurements is the presence of a $K\pi$ S-wave in the K^* system. During my PhD, I wrote one of the first papers to study this measurement and at Dortmund, I then initiated a collaboration with theorists to predict the size of the $K\pi$ S-wave.

The prospects of new physics in R_K and $B^0 \rightarrow K^{*0} \mu^+ \mu^-$ led me to develop the electron triggers for Run II of the LHC. Based on my experience developing the muon triggers for Run I, I have ensured that there will be sufficient rate of electron decays for precision studies to test lepton non-universality. This required a good understand of the LHCb software framework, both in C++ and Python, and the ability to work in a rapidly changing environment.

Ostenhellweg 56 – 44135 Dortmund – Germany

☎ +49 (173) 690 9175 • ☎ +44 (7799) 823 210 • ✉ a.shires@gmail.com

🐦 AlexanderShires • 🌐 alexshires

- Summer **Undergraduate research placement**, *Imperial College London*, UK.
- 2008 The Ganga project has developed front-end software that allows hundreds of researchers to use many distributed computing systems across the world in a coherent format and is the main user software for LHCb and ATLAS. Developed and integrated autonomous remote testing for the Ganga project and added reporting options to show test failure differences between different versions. Worked with established Python framework as part of a small team of 10 developers to implement the remote testing.
- Summer **Junior engineer**, *Westinghouse Rail Systems*, Wiltshire, UK.
- 2006 & 2007 As a scholarship given to the best 3 students from local schools, worked as the sole data analyst for the first live railway trial of a multi-million pound project. Invited back for a second year to develop software to test the integration of a new railway track-side communications protocol.

Teaching Experience

- 2014 English speaking tutorial group, 4th year undergraduate particle physics, Technische Universität Dortmund.
- 2014 Project supervision, 3rd and 4th year undergraduate course, Technische Universität Dortmund.
- 2014 Particle identification seminar, part of the 4th year particle detectors lecture course, Technische Universität Dortmund.
- 2012 Computational lab demonstrator, 3rd year undergraduate course, Imperial College London.
- 2011 Experimental lab demonstrator, 3rd year undergraduate course, Imperial College London.

Skills

Key skills	Physics, Data Analysis, Programming		
Computing	C++, PYTHON, FORTRAN	Frameworks	ROOT, boost, gsl, numpy/scipy
OS	Linux, Windows	Tools	SVN, Git, MS Office, L ^A T _E X, Vim
Languages	English, German	Additional	Full, clean UK driving licence

References

Available on request

Publications

D. Das, G. Hiller, M. Jung, and A. Shires, *The $\overline{B} \rightarrow \overline{K}\pi\ell\ell$ and $\overline{B}_s \rightarrow \overline{K}K\ell\ell$ distributions at low hadronic recoil*, JHEP **09** (2014) 109, arXiv:1406.6681

LHCb collaboration, R. Aaij *et al.*, *Test of lepton universality using $B^+ \rightarrow K^+\ell^+\ell^-$ decays*, Phys. Rev. Lett. **113** (2014) 151601, arXiv:1406.6482

LHCb collaboration, R. Aaij *et al.*, *Differential branching fraction and angular analysis of the decay $B^0 \rightarrow K^{*0}\mu^+\mu^-$* , JHEP **08** (2013) 131, arXiv:1304.6325

T. Blake, U. Egede, and A. Shires, *The effect of S-wave interference on the $B^0 \rightarrow K^{*0}\ell^+\ell^-$ angular observables*, JHEP **03** (2013) 027, arXiv:1210.5279

LHCb collaboration, R. Aaij *et al.*, *Differential branching fraction and angular analysis of the decay $B^0 \rightarrow K^{*0}\mu^+\mu^-$* , Phys. Rev. Lett. **108** (2012) 181806, arXiv:1112.3515

Additional author on more than 200 papers as a member of the LHCb collaboration.

Invited Talks

Testing lepton universality in b decays, GDR-Terascale annual meeting, Heidelberg, Dec, 2014

Searching for new physics in $b \rightarrow (s,d)\ell^+\ell^-$ transitions, Seminar, TU Dortmund, Oct, 2014

Test of lepton universality using $b \rightarrow s\ell^+\ell^-$ decays at LHCb, Collider cross talk, CERN, Sept, 2014

Rare heavy flavour decays at the LHC, Frontiers in Particle Physics, Aspen, Jan, 2014

Electroweak penguins at LHCb, Seminar, University of Bonn, Oct, 2013

*Exploring $B^0 \rightarrow K^{*0}\mu^+\mu^-$ at LHCb*, Seminar, TU Dortmund, Apr, 2013

Testing the helicity structure of new physics with rare decays at LHCb, Spin-PRAHA, Prague, Jul, 2012

*Angular analysis of $B^0 \rightarrow K^{*0}\mu^+\mu^-$ at LHCb*, IOP HEPP Annual Meeting, Queen Mary, University of London, Apr, 2012