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 $b \to s\ell^+\ell^-$ 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 in the Emmy Noether group headed by Johannes Albrecht.

Education

Oct 2013 **PhD, High Energy Physics**, *Imperial College London*, UK.
Thesis: *Exploring $b \to s$ 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

2015 to 2017 **Working group convener** As a convener of LHCb 's electroweak penguin working group, I coordinate research projects internationally and am responsible for thirty researchers ranging from students to faculty members.

2013 to 2014 **Lead analyst on testing lepton universality** The measurement of R_K, the ratio of $B^+ \to K^+\mu^+\mu^-$ to $B^+ \to K^+e^+e^-$ decays, was not expected to be possible at LHCb. In October 2013, I took over 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.

2010 to 2012 **Experimental analyst** The decay $B^0 \to K^{*0}\mu^+\mu^-$ is one to the priority measurements for LHCb. Working on the first data from the LHC, found several discrepancies with the standard model. These measurements are an area of significant discussion in both the experimental and theoretical community.

2011 & 2014 **Theoretical analyses** The existence of a $K\pi$ S-wave is a critical aspect to precision measurements of $B^0 \to K^{*0}\mu^+\mu^-$ and I I wrote one of the first papers on how this affects experimental measurements. At Dortmund, I initiated a collaboration with theorists to predict the size of the $K\pi$ S-wave.

Ostenhellweg 56 – 44135 Dortmund – Germany
+49 (173) 690 9175 • +44 (7799) 823 210 • a.shires@gmail.com
AlexanderShires • alexshires

2010 & 2014 **Trigger development** The prospects of new physics in R_K and $B^0 \to K^{*0}\mu^+\mu^-$ 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.

Summer 2008 **Undergraduate research placement**, *Imperial College London*, UK.
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 2006 & 2007 **Junior engineer**, *Westinghouse Rail Systems*, Wiltshire, UK.
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, 3^{rd} year undergraduate particle physics, Technische Universität Dortmund.

Autumn 2014 Particle identification lecture, part of the 4^{th} year particle detectors lecture course, Technische Universität Dortmund.

Summer 2014 Project supervision, 3^{rd} and 4^{th} year undergraduate course, Technische Universität Dortmund.

Winter 2014 Particle identification lecture, part of the 4^{th} year particle detectors lecture course, Technische Universität Dortmund.

2012 Computational lab demonstrator, 3^{rd} year undergraduate course, Imperial College London.

2011 Experimental lab demonstrator, 3^{rd} year undergraduate couse, Imperial College London.

Skills

Key skills: Problem solving, Data Analysis, Programming

Computing: C++, Python, Fortran

Frameworks: ROOT, boost, gsl, numpy/scipy

OS: Linux, Windows

Tools: SVN, Git, MS Office, LaTeX, Vim

Languages: English (native), German (working competency)

Additional: Full, clean UK driving licence

References

Available on request

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Publications

LHCb

LHCb collaboration, R. Aaij *et al.*, *Test of lepton universality using $B^+ \to K^+\ell^+\ell^-$ 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 $B^0 \to K^{*0}\mu^+\mu^-$*, JHEP **08** (2013) 131, arXiv:1304.6325

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

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

Theoretical

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

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

Invited Talks

International conferences

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

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

Seminars

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

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

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

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

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

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

Internal notes

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