

Mark R. J. Williams

Department of Physics
Lancaster University
Lancashire LA1 4YB
United Kingdom

Phone (USA): (773) 876-1790
Phone (UK): (01248) 681011
markw@fnal.gov

Professional Positions

- **Fermilab International Fellow** February 2009 – February 2012
Fermi National Accelerator Laboratory
- **Post-Doctoral Research Assistant** October 2008 – Present
Lancaster University HEP group

Education

- **Lancaster University** 2004–2008
Ph.D. in High Energy Physics.
Supervisors: Peter Ratoff, Guennadi Borissov.
“Observation and Measurements of $L = 1$ Orbitally Excited B Mesons at the D0 Experiment”.
- **University of Oxford** 1999–2003
Master of Physics (MPhys.).
Result: 1st Class Honours.
Advanced final year majors in Particle Physics, Theoretical Physics, and Cosmology.

Prizes and Fellowships

- **Fermilab International Fellowship** February 2009 – February 2012
- **Rutherglen Prize** 2007
Joint-winner of this prize, awarded annually to the best High Energy Physics PhD student from all universities collaborating with the Daresbury Accelerator and Research Complex (Cheshire, UK).
- **Meyricke Scholarship** 2000
Awarded by Jesus College, Oxford, following a Distinction in Preliminary Examinations.

HEP Research Experience

- **Convener of the B Physics Group** September 2010 – Present
D0 Experiment, Management
 - One of two group conveners, responsible for coordinating the direction and application of research efforts, both in terms of the general strategy, and specific coordination of analyses;
 - Delivered ten analyses into publication review so far, with several more in advanced stages;
 - Coordinating with other group conveners, collaboration management, and external experimentalists and theorists;
 - Mentoring several PhD students from various institutions;
 - Arranging meetings and conference speakers, writing abstracts and editing papers;

- **Technical Expert in B Group Analysis Framework** September 2007 – Present
D0 Experiment, Technical

 - Transformed group-wide data-access model to a centrally coordinated system (SAM-based), giving improved speed, reliability and flexibility for analysers;
 - Responsible for producing data files and skims, and uploading to SAM, for use by entire B group;
 - Took leading role in study and application of ‘Extended Tracking’ algorithm, boosting yields of long lived hadrons by re-optimising tracking reconstruction code;
 - Produced thorough documentation of analysis and data-access framework, with ongoing user assistance.

- **Leading Member of B Physics Group** October 2008 – Present
D0 Experiment, Analysis

 - Leading role in several important CP violation measurements, including dimuon asymmetry, ϕ_s in $B_s^0 \rightarrow J/\psi\phi$ decays, and flavor-specific semileptonic asymmetry analyses.
 - Primary author of high-profile D0 analysis, searching for anomalous production of dimuon events in which one or both muons is produced at large radial distances from the primary interaction point;
 - Made first observation of the doubly-excited states B_1 and B_2^* as separate objects, and the first observation of the B_{s2}^* meson. Measured masses, decay branching ratios, and production rates.

- **Trigger Meister of the D0 Experiment** February 2009 – December 2011
24 hour on-call expert

 - Creating, optimising, and testing new triggers, based on requests from physics groups;
 - Maintaining and updating existing trigger suites, as accelerator and detector conditions change;
 - Identifying, addressing and correcting anomalous trigger behaviour in conjunction with run coordinators and sub-detector experts.
 - Reporting to the trigger board and operations crew on a weekly basis.

- **Member of D0 Editorial Board** February 2010 – Present
“Vector Bosons + Jets Analyses”

 - Part of an efficient and productive review panel;
 - Published world-leading results in $Z + b$ -jet cross-sections, $\gamma + b$ -jet cross-sections, $W + \text{jet}$ cross-sections, and Z transverse momentum distribution;

- **Participation in Task-Forces** February 2010 – Present
Multiple active roles, taking advantage of my technical and analysis experience, including:

 - SMT efficiency task-force;
 - Hadron yield working-group;
 - Momentum scale task-force;

- **Service Work for D0 Experiment** January 2006 – December 2011
Ongoing control room shifts

 - Undertook full 42 data acquisition shift rotation in the control room, ensuring high efficiency acquisition of data through the detector and trigger framework;
 - Also took shifts as control room ‘captain’, responsible for all D0 operations, and coordination with the main Fermilab control room.

Conference and Seminar Presentations

A total of approximately 150 internal D0 talks, including management meetings, physics group meetings, detector and software meetings, and full collaboration meetings. Several public presentations, including the following highlights:

- American Physical Society Meeting; April 2006 (Dallas, USA):
“Study of B^{**} and B_s^{**} ”.
- DOE Review of Fermilab; May 2006 (Fermilab, USA):
Poster presentation on behalf of D0 B-group containing summaries of all current analyses.
- DPF Meeting; October 2006 (Honolulu, USA):
“Properties of Excited B Mesons B^{**} and B_s^{**} ; and First Measurement of the B_s^0 Semileptonic Branching Ratio to an Orbitally Excited D_s^{**} State.”
- American Physical Society Meeting; April 2007 (Jacksonville, USA):
“Study of B^{**} and B_s^{**} ”.
- ‘Lattice QCD Meets Experiment’ Workshop; December 2007 (Fermilab, USA):
“B Meson Spectroscopy at D0 and CDF.”
- New Perspectives Conference; June 2008 (Fermilab, USA):
“B Meson Spectroscopy at D0.”
- Institute of Physics Meeting; April 2008 (Lancaster, UK):
“First Observation of the Excited B_{s2}^* Meson at D0.”
- Rencontres de Moriond 2009 – QCD and High Energy Interactions; March 2009 (La Thuile, Italy):
“A Search for Excess Dimuon Production in the Radial Region ($1.6 < r \lesssim 10$) cm at the D0 Experiment.”
- Europhysics Conference on High Energy Physics; July 2009 (Krakow, Poland):
“A Search for Excess Dimuon Production in the Radial Region ($1.6 < r \lesssim 10$) cm at the D0 Experiment.”
- Rencontres de Moriond 2010 – Electroweak Interactions and Unified Theories; March 2010 (La Thuile, Italy):
“CP Violation Measurements at the Tevatron.”
- HEP Seminar at the University of Chicago; June 2010:
“Evidence for an Anomalous Like-Sign Dimuon Asymmetry at the D0 Experiment.”
- BEACH 2010, IX International Conference on Hyperons, Charm and Beauty Hadrons; June 2010 (Perugia, Italy):
“Evidence for an Anomalous Like-Sign Dimuon Asymmetry at the D0 Experiment.”
- FPCP 2011, Flavor Physics & CP Violation; May 2011 (Kibbutz Maale Hachamisha, Israel):
“Dimuon asymmetry measurements at the Tevatron”.
- LISHEP 2011, Workshop on High Energy Physics; July 2011 (Rio de Janeiro, Brazil):
“Summary of CP Violation and Rare Decays at the Tevatron” (by Personal Invitation).
- SUSY 2011, 19th International Conference on Supersymmetry and Unification of Fundamental Interactions; August 2011 (Fermilab, USA):
“Anomalous Like-sign Dimuon Asymmetry at the D0 Experiment”.
- Tevatron Shutdown Event, Special morning session during the final day of Tevatron operations, September 2011 (Fermilab, USA):
“New Phenomena and B Physics at D0: Probing the SM from all Angles”.
- Fermilab Joint Experimental-Theoretical ‘Wine and Cheese’ Seminar, October 2011 (Fermilab, USA):
“CP Violation Studies in the B_s^0 System at D0”.
- HEP Seminar at the University of Chicago; October 2011:
“CP Violation Studies in the B_s^0 System at D0”.

- BEACH 2012, X International Conference on Hyperons, Charm and Beauty Hadrons; July 2012 (Wichita, USA):
“Measurements of semileptonic mixing asymmetries in B_d^0 and B_s^0 mesons”

HEP Schools / Retreats

- Rutherford-Appleton Laboratory High Energy Physics Summer School; September 2005 (Abingdon, UK);
- European School of High Energy Physics; June 2006 (Aronsborg, Sweden)
- Erice International School of Subnuclear Physics; September 2009 (Sicily, Italy)
- CERN-FNAL Hadron Collider Physics Summer School; August 2010 (Fermilab, USA)

Publications

Approximately 150 publications as a member of the D0 Collaboration (V.M. Abazov *et. al*), including the following notable contributions:

- “Properties of $L = 1$ B_1 and B_2^* mesons” (Primary Author)
Phys. Rev. Lett. **99**, 172001 (2007).
- “Observation and properties of the orbitally excited B_{s2}^* meson” (Primary Author)
Phys. Rev. Lett. **100**, 082002 (2008).
- “Study of direct CP violation in $B^+ \rightarrow J/\psi K^\pm(\pi^\pm)$ decays” (Significant Contributor)
Phys. Rev. Lett. **100**, 211802 (2008).
- “Search for excess dimuon production in the radial region ($1.6 \leq r \leq 10$) cm at the D0 Experiment” (Primary Author)
PoS E **PS-HEP2009**, 248 (2009).
- “Evidence for an anomalous like-sign dimuon Charge asymmetry” (Significant Contributor)
Phys. Rev. Lett. **105**, 081801 (2010), Phys. Rev. D **82**, 032001 (2010).
- “Measurement of the production fraction times branching fraction $f(b \rightarrow \Lambda_b) \cdot \mathcal{B}(\Lambda_b \rightarrow J/\psi\Lambda)$ ” (Significant Contributor)
Phys. Rev. D **84**, 031102 (2011).
- “Measurement of the anomalous like-sign dimuon charge asymmetry with 9 fb^{-1} of $p\bar{p}$ collisions” (Significant Contributor)
Phys. Rev. D **84**, 052007 (2011).
- “Measurement of the CP-violating phase $\phi_s^{J/\psi\phi}$ using the flavor-tagged decay $B_s^0 \rightarrow J/\psi\phi$ in 8 fb^{-1} of $p\bar{p}$ collisions” (Significant Contributor)
Phys. Rev. D **85**, 032006 (2012).
- “Measurement of the relative branching ratio $B_s^0 \rightarrow J/\psi f_0(980)$ to $B_s^0 \rightarrow J/\psi\phi$ ” (Significant Contributor)
Phys. Rev. D **85**, 011103 (2012).
- “Observation of a narrow state decaying into $\Upsilon(1S) + \gamma$ in $p\bar{p}$ collisions at $\sqrt{s} = 1.96 \text{ TeV}$.” (Significant Contributor)
Accepted by Phys. Rev. D (9 July 2012).
- “Measurement of the Λ_b lifetime in the exclusive decay $\Lambda_b \rightarrow J/\psi\Lambda$ in $p\bar{p}$ collisions at $\sqrt{s} = 1.96 \text{ TeV}$.” (Significant Contributor)
Phys. Rev. D **85**, 112003 (2012).
- “Study of the decay $B_s^0 \rightarrow J/\psi f_2'(1525)$ in $\mu^+\mu^-K^+K^-$ final states” (Significant Contributor)
Submitted to Phys. Rev. D. (26 April 2012)
- “Measurement of the semileptonic charge asymmetry using $B_s^0 \rightarrow D_s\mu X$ decays” (Primary Author)
Submitted to Phys. Rev. Lett. (8 July 2012)

Professional Skills and Experience

- I am familiar with the following software environments and programming languages: Windows OS, Mac OS, Linux OS, C++, shell scripting, python, perl, ROOT, MINUIT, PYTHIA, EVTGEN, LATEX, HTML. I have performed the local administrator duties for all Lancaster-managed computer nodes at Fermilab from 2008 to the present. I am also an experienced user of the SAM data-access application.
- I am experienced at public speaking to a range of ages and backgrounds. I have also had teaching experience via volunteering for the 'Researchers in Residence' scheme for two university terms. This entailed spending one day per week in a school, being heavily involved in the science club, spreading awareness about the nature of science and research, and taking physics lessons (with a supervising teacher). This culminated in the Y10 science club preparing a junior conference talk on the history and development of sub-atomic theory. After coming first at the regional finals they were invited to compete in the British finals in London.
In addition, I have twice participated as a judge in the district finals of the Chicago schools science fair program.
- I have experience in organising large-scale meetings, having been a member of local organising committees for two D0 summer workshops, in 2009 (Fermilab) and 2012 (Lancaster);
- I am an approved reviewer for the Slovak Research and Development Agency (APVV), and have participated in peer review of HEP projects to assess their feasibility, scientific importance, and value-for-money.

Other Details

- I am a highly driven individual, within and beyond my HEP duties. I am a competitive triathlete, racing 4-6 times per year up to half-ironman distance. I also participate in individual running, cycling and swimming events, including marathons in 2010 and 2011. In the past I have captained my country at the Foosball World Championships, and travelled extensively to compete in prestigious competitions.