Matthew Kirk

Nationality: British
Email: matthew.j.kirk@durham.ac.uk
Website: https://mjkirk.github.io
IPPP profile: https://www.ippp.dur.ac.uk/profile/mkirk
INSPIRE: https://inspirehep.net/authors/1452491
ORCID: https://orcid.org/0000-0003-0845-7227

Current Position

Postdoctoral Research Associate – IPPP, Durham University, United Kingdom

Research Interests

- Precision calculations of flavour physics observables
- Simplified model building and EFT approaches to studying BSM signatures
- Development and promotion of open source software for reproducible physics results

Previous Employment and Education

- 2022-2023: María Zambrano postdoctoral research fellow – ICCUB, Universitat de Barcelona, Spain
- 2021-2022: Postdoctoral researcher – ICCUB, Universitat de Barcelona, Spain
- 2018-2021: Postdoctoral researcher – Università di Roma “La Sapienza”, Italy
- 2014-2018: PhD – IPPP, Durham University, UK, supervised by Alexander Lenz.
- 2010-2014: MSci, BA in Natural Sciences (Physics) – King's College, University of Cambridge, UK

Grants and Awards

- 2022: María Zambrano Fellowship (2 year Spanish government grant with €96000 total funding)
- 2019: Springer Thesis Prize

Publications & Talks

Articles

A Global Determination of $|V_{us}|$
Matthew Kirk, Danny van Dyk
Phys. Rev. D 113 (2026) 054022 (arXiv:2511.08682)

Collider-flavour complementarity from the bottom to the top
Oliver Atkinson, Christoph Englert, Matthew Kirk, Gilberto Tetlalmatzi-Xolocotzi
Eur. Phys. J. C 85 (2025) 8, 258 (arXiv:2411.00940)

A Simple Parametrisation of the Pion Form Factor
Matthew Kirk, Bastian Kubis, Méril Reboud, Danny van Dyk
Phys. Lett. B 861 (2025) 139266 (arXiv:2410.13764)

Diquark explanation of $b \to s\ell^+\ell^-$
Andreas Crivellin, Matthew Kirk
Phys. Rev. D 108 (2023) L111701 (arXiv:2309.07205)

Cabibbo angle anomalies and a global fit to vector-like quarks
Matthew Kirk
PoS(FPCP2023)059 (arXiv:2308.09669)

A ν window onto leptoquarks?
Matthew Kirk, Shohei Okawa, Keyun Wu
JHEP 12 (2023) 093 (arXiv:2307.11152)

Y=0 Scalar Triplet Beyond the W Mass: (g-2)μ, h$\to\mu\mu$, and CKM Unitarity
Andreas Crivellin, Matthew Kirk, Anil Thapa
Phys. Rev. D 108 (2023) L031702 (arXiv:2305:03081)

Global fit of modified quark couplings to EW gauge bosons and vector-like quarks in light of the Cabibbo angle anomaly
Andreas Crivellin, Matthew Kirk, Teppei Kitahara, Federico Mescia
***JHEP* 03 (2023) 234** (arXiv:2212.06862)

Large t$\to$cZ as a sign of vectorlike quarks in light of the W Mass
Andreas Crivellin, Matthew Kirk, Teppei Kitahara, Federico Mescia
Phys. Rev. D 106 (2022) L031704 (arXiv:2204.05962)

Unveiling Hidden Physics at the LHC
Oliver Fisher et al.
Eur. Phys. J. C 82 (2022) 8, 665 (arXiv:2109.06065)

First-generation new physics in simplified models: from low-energy parity violation to the LHC
Andreas Crivellin, Martin Hoferichter, Matthew Kirk, Claudio Andrea Manzari, Luc Schnell
JHEP 10 (2021) 221 (arXiv:2107.13569)

Cabibbo anomaly versus electroweak precision tests: An exploration of extensions of the Standard Model
Matthew Kirk
Phys. Rev. D 103 (2021) 3, 035004 (arXiv:2008.03261)

Anomalies and accidental symmetries: charging the scalar leptoquark under Lμ-Lτ
Joe Davighi, Matthew Kirk, Marco Nardecchia
JHEP 12 (2020) 111 (arXiv:2007.15016)

Vcb and gamma from B-mixing
Daniel King, Matthew Kirk, Alexander Lenz, Thomas Rauh
JHEP 3 (2020) 112 (arXiv:1911.07856)

Charming New B-Physics
Sebastian Jäger, Kirsten Leslie, Matthew Kirk, Alexander Lenz
JHEP 3 (2020) 122 (arXiv:1910.12924)

ΔMs theory precision confronts flavour anomalies
Luca Di Luzio, Matthew Kirk, Alexander Lenz, Thomas Rauh
JHEP 12 (2019) 009 (arXiv:1909.11087)

Updated Bs-mixing constraints on new physics models for b$\to$s$\ell+\ell$- anomalies
Luca Di Luzio, Matthew Kirk, Alexander Lenz
Phys. Rev. D 97 (2018) 9, 095035 (arXiv:1712.06572)

Dimension-six matrix elements for meson mixing and lifetimes from sum rules
Matthew Kirk, Alexander Lenz, Thomas Rauh
JHEP 12 (2017) 068 (arXiv:1711.02100)

Charming Dark Matter
Thomas Jubb, Matthew Kirk, Alexander Lenz
JHEP 12 (2017) 010 (arXiv:1709.01930)

Charming new physics in rare B-decays and mixing?
Sebastian Jäger, Kirsten Leslie, Matthew Kirk, Alexander Lenz
Phys. Rev. D 97 (2018) 1, 015021 (arXiv:1701.09183)

On the ultimate precision of meson mixing observables
Thomas Jubb, Matthew Kirk, Alexander Lenz, Gilberto Tetlalmatzi-Xolocotzi
Nucl. Phys. B 915 (2017) 431-453 (arXiv:1603.07770)

Talks

Hadronic tau decays and the determination of V_{us} – Invited talk at “Beyond the Flavour Anomalies VII” workshop, Santiago (Apr 2026)
Top BSM phenomenology of B→DK & Bs→Dpi – Invited talk at “Nonleptonic Decays of Heavy Mesons” workshop, IPPP Durham (Mar 2026)
A new look for the pion form factor – Invited talk at “New Physics at Present and Future Colliders” workshop, MITP Mainz (Jun 2025)
A new look for the pion form factor – Seminar at Sussex (May 2025)
Phenomenology of $B \to D \{K,\pi\}$ decays – Invited talk at “Beyond the Flavour Anomalies VI” workshop, Rome (Apr 2025)
A new look for the pion form factor – Seminar at Cambridge (Mar 2025)
Interfacing EOS WET likelihoods to a SMEFT analysis – Invited talk at “SMEFT-Tools 2025” workshop, MITP Mainz (Jan 2025)
Non-leptonic anomalies – a view from the top – Talk at “Quirks in Quark Flavour Physics 2024” workshop (Jun 2024)
The Cabibbo Angle Anomaly – the bigger picture – Invited talk at “Beyond the Flavour Anomalies V” workshop, Siegen (Apr 2024)
Leptoquarks without leptons – a new scalar for the universal b→sll anomalies – Seminar at Siegen (Dec 2023)
A global fit at 1-loop the easy way - VLQs for BSM – Invited talk at “EFT Foundations and Tools” workshop, MITP Mainz (Sep 2023)
The Cabibbo Angle Anomaly and a global fit to vector-like quarks – Talk at “FPCP 2023” conference, Lyon (May 2023)
The Cabibbo Angle Anomaly and potential BSM explanations – Invited talk at “Beyond the Flavour Anomalies IV” workshop, Barcelona (Apr 2023)
Vector-like Leptons – Invited talk at "Electroweak Precision Physics from Beta Decays to the Z Pole" workshop, MITP (Oct 2022)
Vector-like quarks for t→cZ, B physics, and MW with automated 1-loop matching – Seminar at La Sapienza (Jun 2022)
Review of New Physics in non-leptonic tree level B meson decays – Invited talk at "Status and Prospects of Non-leptonic B meson decays" conference, Siegen (Jun 2022)
CP violation in flavour anomaly models – Invited talk at "Heavy Quarks and Leptons" conference, Warwick (Sep 2021)
Cabibbo Angle Anomaly – Invited talk at "Anomalies and Precision in the Belle II Era" workshop, Vienna (Sep 2021)
Charging a leptoquark under $L\mu$-$L\tau$ - Seminar at Siegen (June 2020)

Anomalies vs Mixing and CPV - Invited talk at "Beyond the Flavour Anomalies" workshop, IPPP (Apr 2020)
BSM in Charming operators? - Seminar at Nikhef (Feb 2020)
Interplay between ΔM_s and flavour anomalies - Talk at "bsll 2019" conference, Lyon (Sep 2019)
Hints of new physics in flavour anomalies - Invited talk at "7th Rome Joint Workshop", Frascati (Dec 2018)
What Mixing and Lifetimes can tell us about NP - Invited talk at "LHCb Implications", CERN (Oct 2018)
Constraints on new physics from the latest results in meson mixing – Invited talk at "From Flavour to New Physics" conference, Lyon (April 2018)
Future of CP violation in a_{sl} – Invited talk at "Towards the Ultimate Precision in Flavour Physics" workshop, Warwick (April 2018)
Meson mixing and lifetimes – Talk at LHCb-UK annual meeting, Glasgow (January 2018)
What is the ultimate precision of meson mixing variables? – Invited talk at "Heavy Flavour 2016 – Quo Vadis?" workshop, Islay, Scotland (July 2016)
Charming Dark Matter – Talk at YTF 8, IPPP (January 2016)
Combining dark matter and charm bounds – Talk at LHCb-UK annual meeting, Liverpool (January 2016)

Poster Presentations

Charming Dark Matter – UK HEP Forum, Abingdon (November 2015)
Looking forward to new lattice inputs for flavour phenomenology – "Lattice 2016" conference, Southampton (July 2016)

Scientific Community Activities

- Theory convener for the "Mixing and CP violation" stream at the "Implications of LHCb measurements and future prospects" workshop in 2019, 2022 and 2024
- Journal peer referee for JHEP, EPJC and PRD (2022 – present)
- Grant referee for the Polish National Science Center (2024)
- Member of UKRI Talent Peer Review College (2024 – present)
- Seminar organiser at IPPP (2023 – present) and ICCUB (2021-2023)
- Local organiser for PASCOS 2025
- Co-organiser of Durham Pint of Science 2024
- IPPP representative on Durham University Department of Physics "Developing Talent Award" grant panel (2023)
- Organiser of EFT journal club at IPPP (2024 - present)

Supervisory and Teaching Activities

- 2025: MSc in Scientific Computing and Data Analysis (MISCADA) – coding workshop demonstrator, problem sheet marking
- 2023-2025: Foundations of Physics 1 (1st year undergraduate course) – group tutorial supervisor, weekly homework marking
- 2022: Co-supervisor (with Professor Federico Mescia) of undergraduate thesis on perturbative unitarity bounds on new physics
- 2017–2018: Introduction to Programming in Python (1st year undergraduate course) – examples class demonstrating, project marking
- 2016–2017: Computational Physics (2nd year undergraduate course) – examples class demonstrating
- 2015–2016: Mathematics Workshop (3rd year undergraduate course) – problem class demonstrating

- 2014–2015: Mathematical Methods in Physics (2nd year undergraduate course) – problem class demonstrating, exam marking

Outreach

- August 2025: Nuffield Trust Research Placement co-supervisor
  Co-supervisor of a one week Nuffield Trust summer research placement for a local school student, who worked on a project studying simulated FCC-ee data using Monte Carlo techniques.
- August 2024: Nuffield Trust Research Placement co-supervisor
  Co-supervisor of a one week Nuffield Trust summer research placement for a local school student, who worked on a project studying simulated LHC data using Monte Carlo techniques.
- May 2024: Pint of Science 2024 “Atoms to Galaxies” theme co-organiser
  Scheduling and organisation of broad range of talks aimed at the general public as part of annual science festival.
- March 2024: International Particle Physics Masterclass volunteer
  Supervising of local school students as they perform analysis of MINERvA data.
- August 2018: Chi ha ordinato quel?
  Talk to postgraduate students at Grey College, Durham University as condition of “Grey College Trust Student Experience” funding award.
- February 2018: Phenomenology: Not Just a Long Word
  Talk to postgraduate students at Grey College, Durham University as part of postgraduate academic programme.
- July 2017: Modelling the Invisible (Royal Society Summer Science Exhibition)
  The Summer Science Exhibition is a week long event at the Royal Society in London each year, with approximately 14000 visitors total, and 20 exhibitors. I was involved with the preparation of the exhibition pieces, publicising our stand through a blog post by the Raspberry Pi Foundation, and engaging with the public over four days at the exhibit.
- April 2017: Durham University Supported Progression tutorial supervisor
  Program to support school students from the local area into university, including small group tutorials with university style problems, with reduced entry requirements for participants.
- October 2016: Dark Matter – A Particle Physicist's Perspective
  Talk to postgraduate students at Grey College, Durham University as part of postgraduate academic programme.
- August 2016: Sutton Trust Summer School tutorial supervisor
  The Sutton Trust organises summer schools for school students from disadvantaged backgrounds, which include small group tutorials.
- June 2016: What don't we know?
  Talk to postgraduate students at Grey College, Durham University as part of postgraduate academic programme.
- August 2015: Sutton Trust Summer School tutorial and poster project supervisor
  The Sutton Trust organises summer schools for school students from disadvantaged backgrounds, which include small group tutorials and poster creation and presentation sessions.
- Summer 2012: Raspberry Pi (Undergraduate Research Program, Computer Science Department, University of Cambridge)
  10 week project to produce materials for students and the general public, following the launch of the Raspberry Pi earlier that year, and working with several of the founders of the Raspberry Pi Foundation.