PhD in LHCb experiment with The University of Manchester

MANCHESTER 1824
The University of Manchester

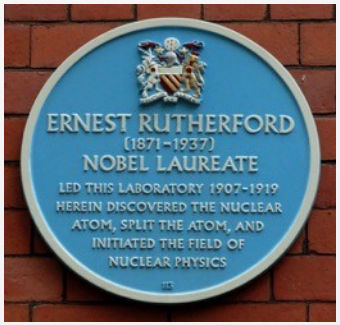
LHCb

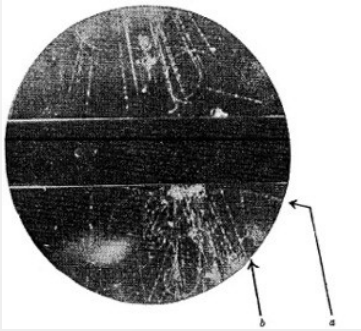
Ivan Polyakov
ivan.polyakov@cern.ch

The University of Manchester

- 26 Nobel Prizes (physics, chemistry, medicine, economics)
- Over 150 years Department of Physics has been among the birthplaces of fields including:

  Nuclear Physics (nucleus, proton, ...),
  Quantum Physics (Bohr),
  Particle Physics (strangeness – kaon, cascade),
  Radio Astronomy (Lovell telescope),
  2D materials (Graphene)





University and Department today

- Largest single-site university in UK: ~12k staff, ~40k students
- Department: ~120 academic staff and fellows, ~250 research staff, ~250 PhD students, ~1200 undergraduates

2024 Global Ranking Physics

Academic Ranking of World Universities

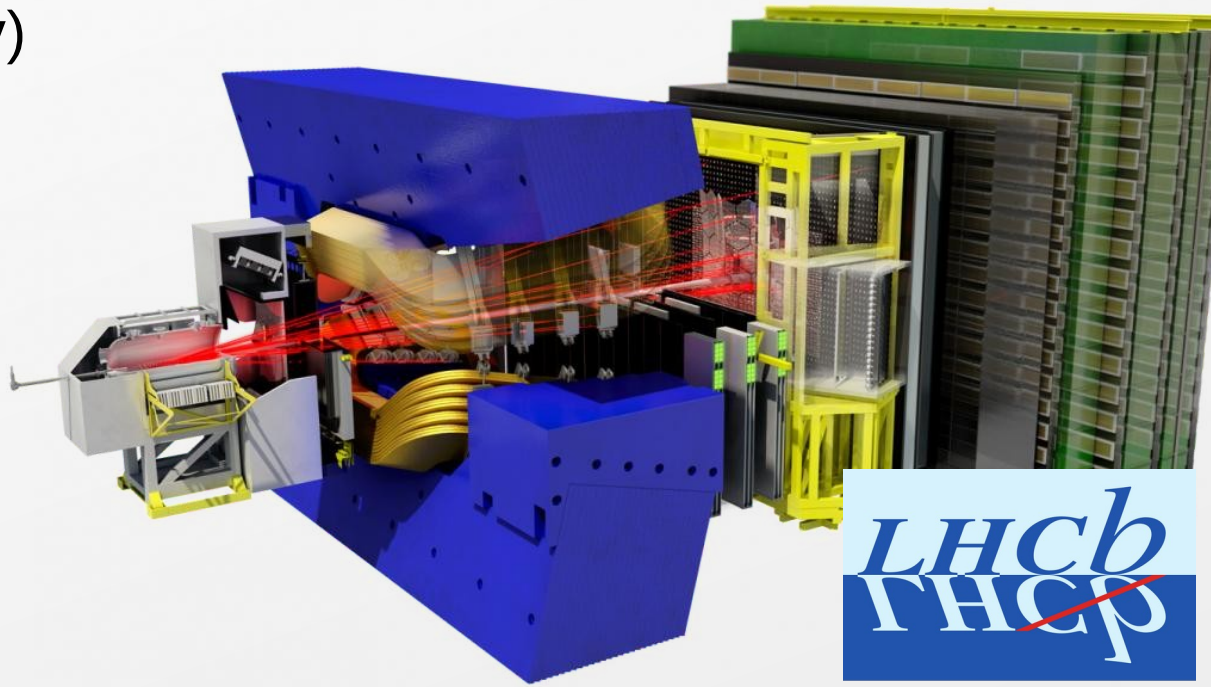
10 The University of Manchester

The LHCb group

- 4 faculty, 2 research + 7 engineering/technical staff,
  7 post-docs, 11 PhDs

- Responsible for detector R&D, construction and commissioning + software
  (VErtex LOcator, Real-Time Analysis, **MightyTracker Pixel**)

- Leading positions in physics analysis
  (CKM γ, CPV in D-mesons, semi-leptonic and rare decays,
  exotic hadron spectroscopy)



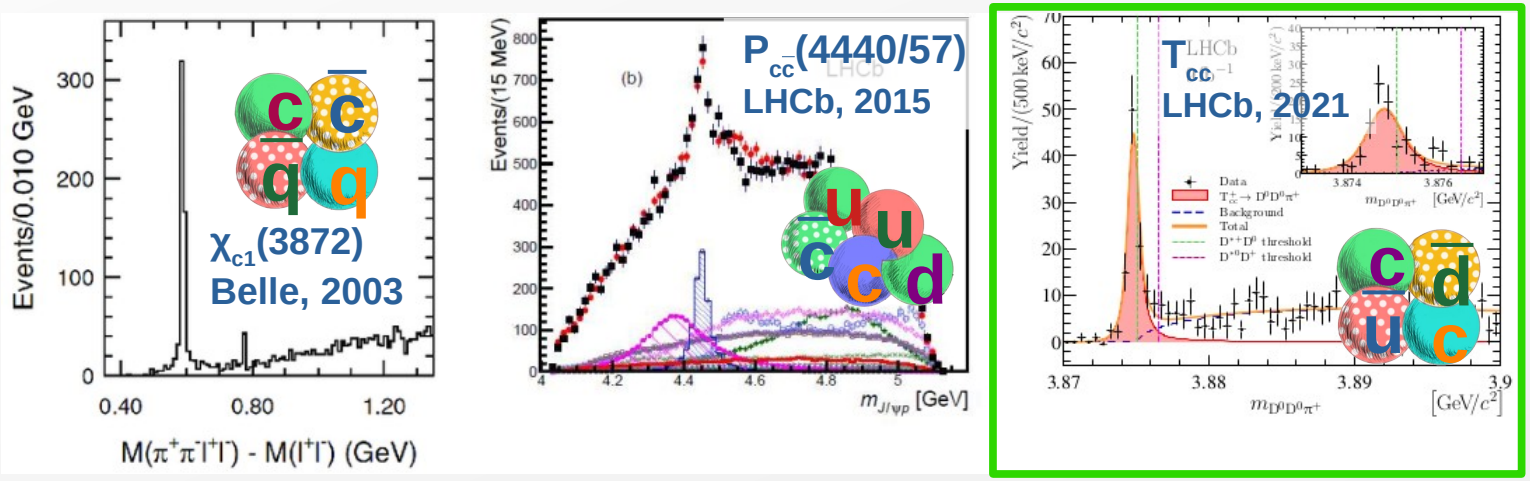
Details on position

- PhD scholarship programs
  - starting September 2025
  - 3.5 years (research only) / 4.5-5.5 years (research+teaching)
  - deadlines: **15 January 2025** (1st round), **12 March 2025** (2nd round)
- Additional options may appear in early spring 2025
- + Post-Doc call (see here)
- Located in Manchester (3rd largest city in UK)
  ~1 year in CERN (optional)
- Opportunity to work on
  - Physics analysis
  - Detector R&D
  - Software for high-speed/high-power data processing
- *ivan.polyakov@cern.ch* for contact

Why exotic hadrons

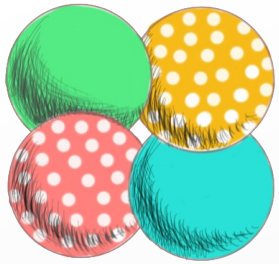
- Mechanisms by which quarks bind into hadron and nuclei **are not well understood**
  - *the base for understanding (nuclear) matter*
  - *limiting many New Physics searches*

- Study of **exotic hadrons** with *b&c* quarks – most promising avenue to its understanding



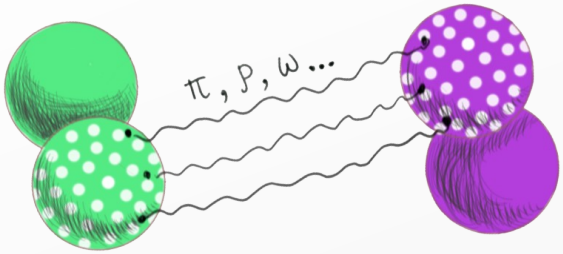
The Pressing question

- What is the internal structure of exotic hadrons?



compact configuration

vs.



molecule configuration

vs. **?**

… still not clear even though over 50 of such candidates are reported
→ **new approach is needed**

- Concentrate on **specific and simpler systems** to obtain unambiguous conclusions
- Understand **relative role of each configuration**

PhD Project options

- Physics analysis:
  focus on exploration of the $\mathbf{T_{cc}}$ and $\boldsymbol{\chi_{c1}}$**(3872)**
  or search for next class of exotic hadron states

- Hadrware:
  R&D for the next generation silicon tracker detector
  (**MightyTracker Pix** for the LHCb Upgrade II)