Exotic hadron spectroscopy workshop - discussion session

Edinburgh, 26-27th September 2016

https://higgs.ph.ed.ac.uk/workshops/exotic-hadron-spectroscopy

IOP Institute of Physics
High Energy Particle Physics Group

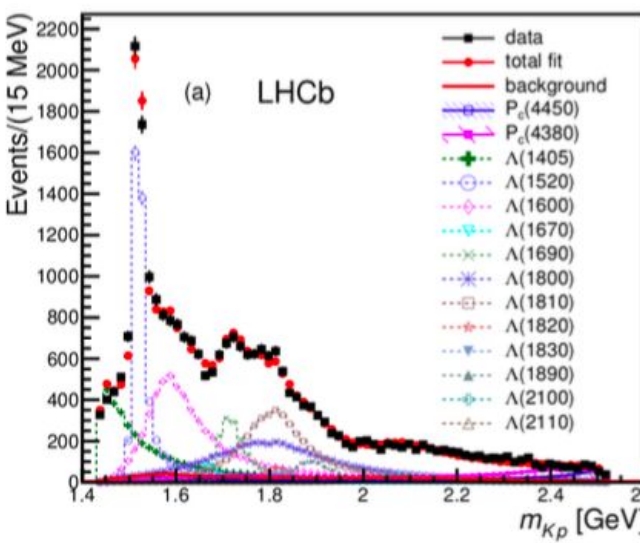
Science & Technology Facilities Council

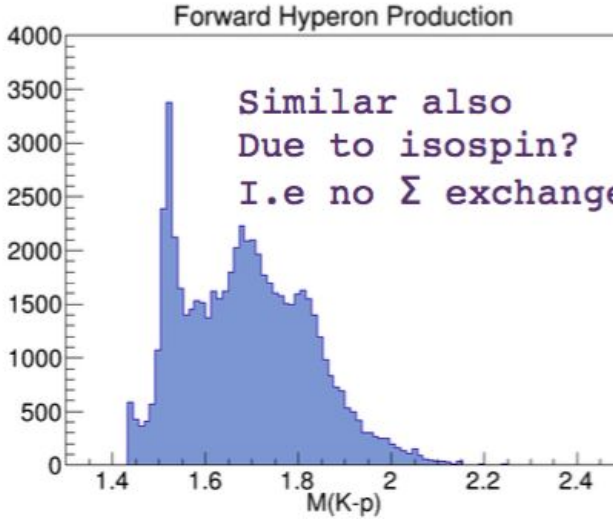
SUPA

Higgs Centre for Theoretical Physics

A few items 1

- LHCb has re-invigorated (exotic) hadron spectroscopy
  - Marco showed many results from Run-1, many more to come
  - New results expected in the short term from CLAS12
- Clear links between nuclear and particle physics!
- Isobar, isobar, isobar - what else can we do?
  - New ideas for model (in)dependent amplitude building emerging.
    - Important to keep close contact with theorists (**embedding**)
    - JPAC and Amplitude analysis schools (could LHCb students attend these?)





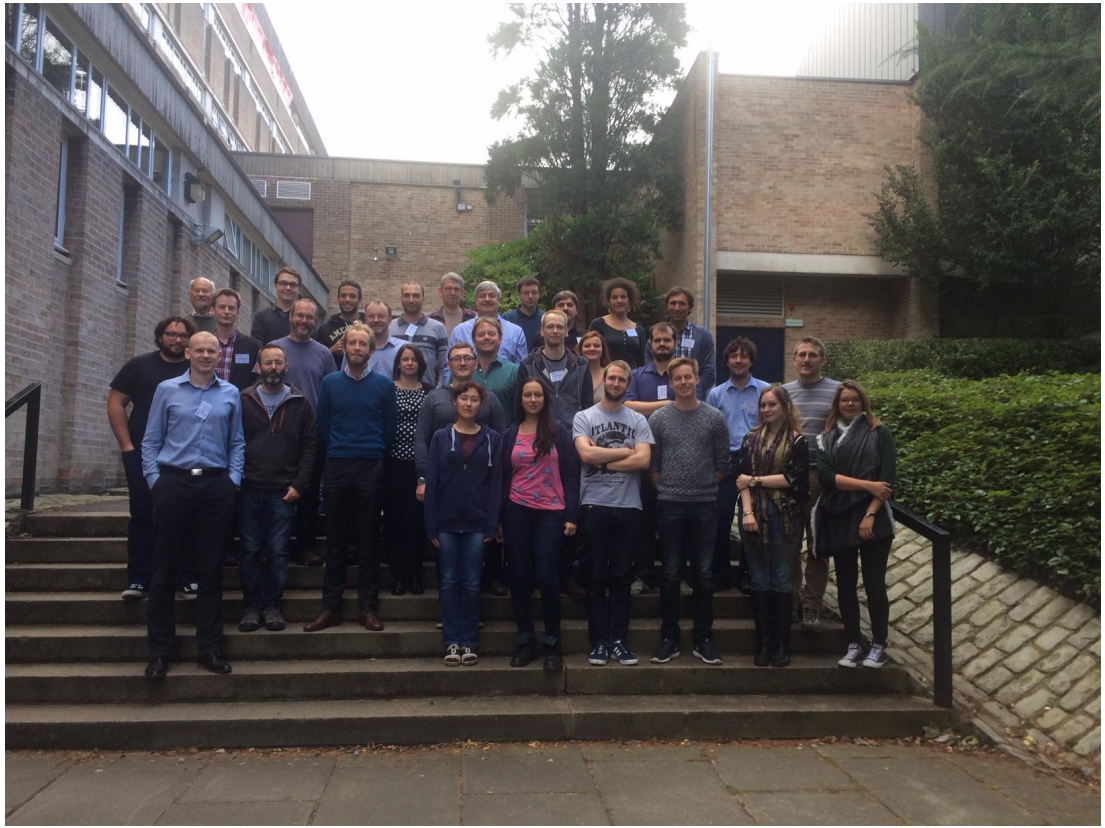
A few items 2

- What can LHCb do to search for the d*(2380)? Lb -> d p pi pi K ??
- What can CLAS12 tell us about pentaquarks in charmonium photoproduction?
- Molecule interpretation of tetra/pentaquarks is strong (it's the width that matters!)
- CEP @ LHCb will provide a (huge) unique dataset, perfect for clean studies of exotic states.
- Lattice providing new insights into hadron spectrum
    - Can we use this information to provide parameterisations for experiment amplitude analyses?
- Software tools
    - IUAmpTools look promising - I'd like to have a closer look at this tool
    - sWeights now being used both in nuclear and particle physics to subtract background
- **What shall we go away and measure tomorrow?**

Meeting next year?

There appears to be enthusiasm to have a repeat meeting, possibly next year (autumn?).

Would be interested to get your feedback.



Points for discussion

- Can we identify measurements that particle physics could make that could help nuclear physics and vice versa? Where are the **backgrounds**?
- What can nuclear physics tell us about properties of the **pentaquarks** found at LHCb?
- Elucidating the nature of exotics states using **large datasets**.
- **Model building** in amplitude/partial wave analyses.
    - Line-shapes, thresholds/rescattering
    - Connection between quark and hadron degrees of freedom
    - Model-independent approaches?
- How else can we **analyse** our data? Technology (e.g. GPUs) and formalism (Bayes)?, Mixture models, statistics ....
- Can theory point to **new production** + **decay modes** that experiments could search for?
- Light quark spectroscopy - pinning down standard meson and baryons (e.g. N*) that are important input to amplitude analyses. Searching for light quark exotics.

Aims of workshop

- Bring together the nuclear and particle physics communities to:
  - Discuss experimental searches for exotic hadronic resonances.
  - The latest data analysis methods
  - Theoretical interpretation of exotic states
  - Potential for future searches at current facilities (CERN, JLab, Mainz...)
    - Hit list of studies to be done

Foster new ideas/collaborations