

Exotic hadron spectroscopy workshop

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



Higgs Centre
for Theoretical Physics

Introductions



Greig Cowan



Matt Needham



Dan Watts



Mikhail Bashkanov

PARTICLE PHYSICS

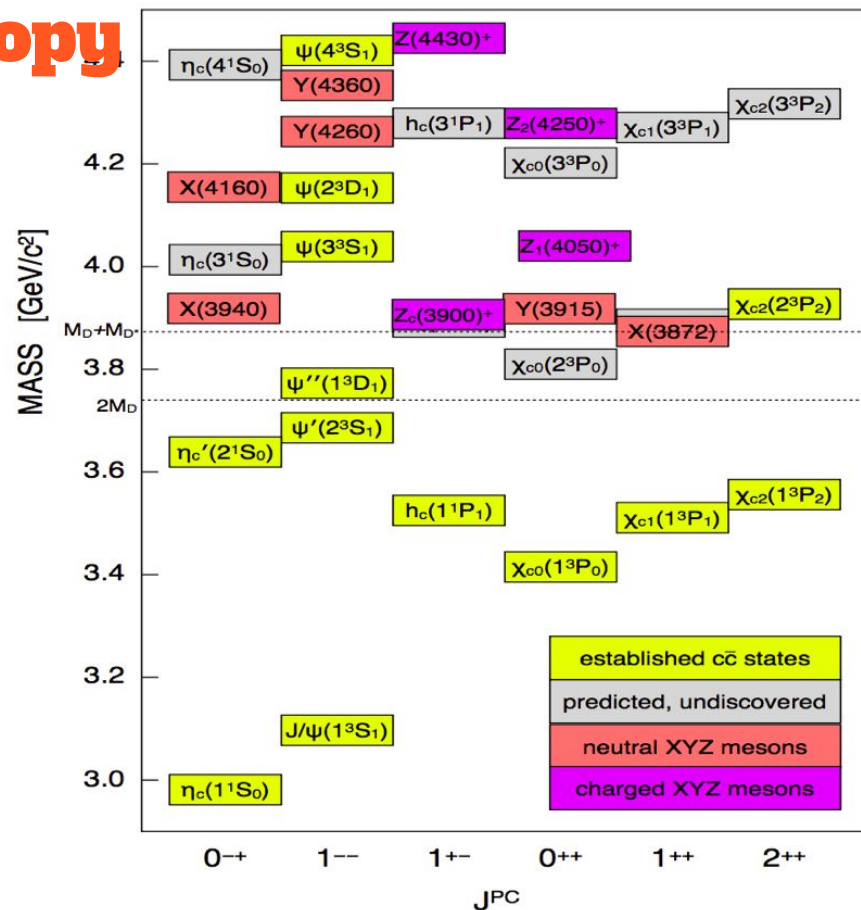
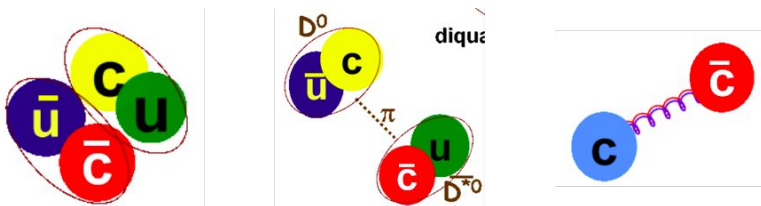
NUCLEAR PHYSICS

Exotic hadron spectroscopy

Many different exotic (XYZ) states have been seen since ~ 2003 .

Are these $[QQ][\bar{q}\bar{q}]$ (tetraquarks), mesonic molecules, hybrids, threshold effects...?

No clear pattern: need experimental, theoretical study to understand strong interaction dynamics that can cause their production and structure.









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



Monday, 26 September 2016

- 12:00 - 13:00 **Light lunch and registration**
- 13:00 - 13:10 **Introduction 10'** 
Speaker: Dr. Greig Cowan (Edinburgh)
- 13:10 - 13:40 **Summary of LHCb results on exotic spectroscopy 30'** 
Speaker: Dr. Marco Pappagallo (Bari)
- 13:55 - 14:25 **Hexaquarks in hadro and photo-induced reactions 30'** 
Speaker: Dr. Mikhail Bashkanov (Edinburgh)
- 14:40 - 15:10 **Coffee**
- 15:10 - 15:40 **Hidden charm pentaquarks as hadronic molecules 30'** 
Speaker: Dr. Timothy Burns (Swansea)
- 15:55 - 16:25 **Preparations for CLAS12 analysis and connections between nuclear and particle physics data 30'** 
Speaker: Dr. Derek Glazier (Glasgow)
- 16:40 - 17:10 **Analysis methods 30'** 
Speaker: Prof. Mike Pennington (JLab)
- 17:10 - 17:40 **Discussion session**

<https://indico.ph.ed.ac.uk/indico/conferenceDisplay.py?confId=21>

Please register for an account to upload your slides or email them to greig.cowan@cern.ch

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|---------------|--|---|
| 09:00 - 09:30 | Amplitude analysis methods (LHCb) 30'
Speaker: Dr. Anton Poluektov (Warwick) | ▼ |
| 09:45 - 10:00 | Bayesian analysis methods for hadronic spectroscopy 15'
Speaker: Prof. David Ireland (Glasgow) | ▼ |
| 10:15 - 10:45 | Coffee | |
| 10:45 - 11:15 | Central exclusive production of exotic states at LHCb 30'
Speaker: Dr. Paolo Gandini (Oxford) | ▼ |
| 11:30 - 12:00 | Exotic baryons and mesons with heavy quarks 30'
Speaker: Prof. Marek Karliner (Tel Aviv) | ▼ |
| 12:15 - 13:15 | Lunch | |
| 13:15 - 13:45 | Distinguishing kinematic effects and pole structures from threshold enhancements (CANCELLED) 30'
Speaker: Dr. Qian Wang (Bonn) | ▼ |
| 14:00 - 14:30 | CLAS12 options for LHCb pentaquark and hybrid searches/studies 30'
Speaker: Dr. Bryan McKinnon (Glasgow) | ▼ |
| 14:45 - 15:15 | Exotic hadrons, resonances and Lattice QCD 30'
Speaker: Dr. Christopher Thomas (Cambridge) | ▼ |
| 15:30 - 16:00 | Investigation of open and hidden strangeness baryons at ELSA 30'
Speaker: Dr. Tom Jude (Bonn) | ▼ |
| 16:15 - 16:30 | Wrap-up and ideas for future measurements 15'
Speakers: Dr. Greig Cowan (Edinburgh), Everyone | ▼ |
| 16:30 - 17:30 | Discussion session and closing remarks | |

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)?
- 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.

Logistics

- All meetings in this room (Higgs centre)
- Lunch/coffee at the back of the room
- Toilets can be found in this corridor
- Wifi: **eduroam**
- Dinner booked in Pataka restaurant (Indian food) at 7pm
 - (alcoholic drinks not paid for!)
- Suggest pre-dinner drinks at the Old Bell Inn

www.patakarestaurant.co.uk

