

Exotic hadron spectroscopy workshop

Edinburgh, 11-13th December 2017

<https://higgs.ph.ed.ac.uk/workshops/exotic-hadron-spectroscopy-2017>



Higgs Centre
for Theoretical Physics

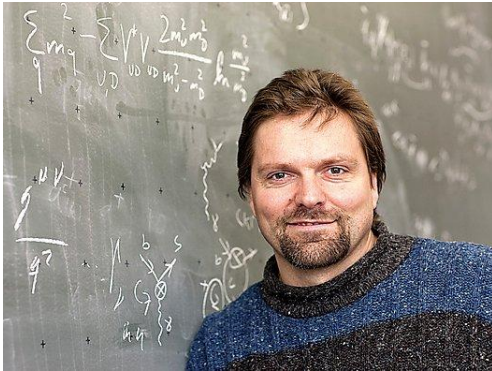
Introductions



Greig Cowan



Matt Needham



Alex Lenz (IPPP)

PARTICLE PHYSICS



Dan Watts



Mikhail Bashkanov

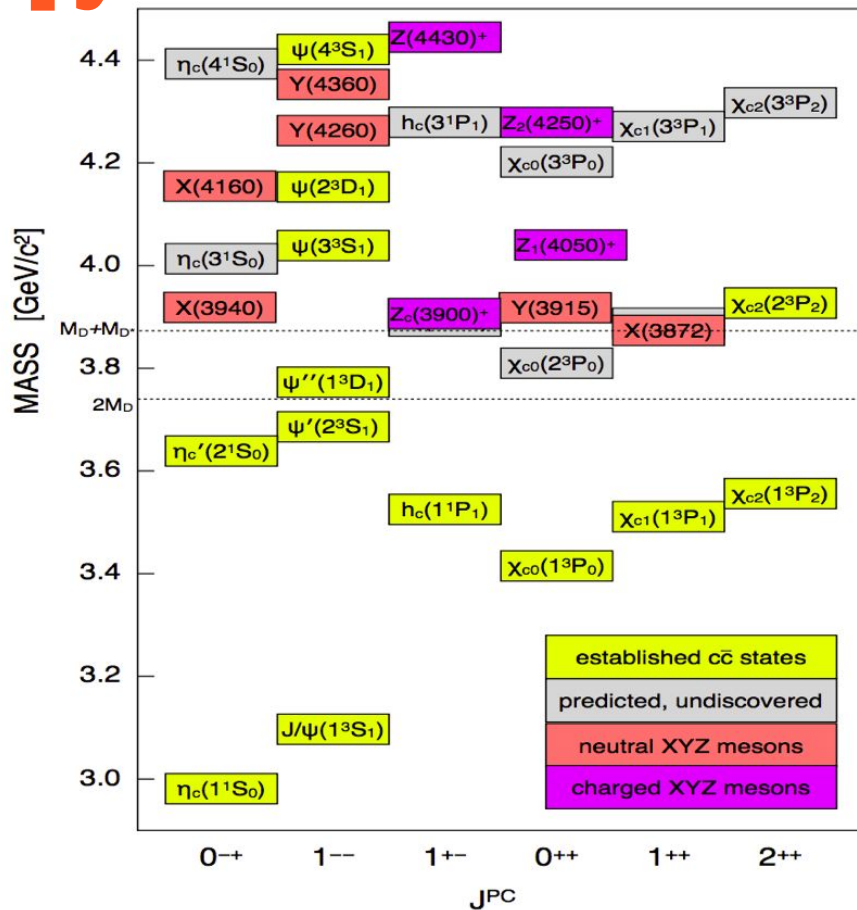
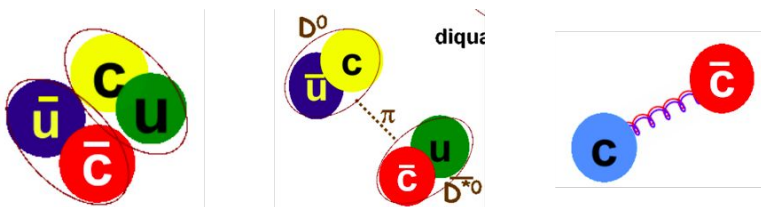
NUCLEAR PHYSICS

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, 11 December 2017

- | | | |
|---------------|---|---|
| 12:00 - 12:55 | Arrival | |
| 13:00 - 13:10 | Introduction and welcome 10' | ▼ |
| | Speaker: Dr. Greig Cowan (Edinburgh) | |
| 13:10 - 13:35 | Diquark models for exotics 25' | ▼ |
| | Speaker: Prof. Luciano Maiani (CERN) | |
| 13:40 - 14:05 | X Y Z with nonrelativistic Effective Field Theories 25' | ▼ |
| | Speaker: Prof. Nora Brambilla (TUM) | |
| 14:10 - 14:35 | Exotics on the lattice 25' | ▼ |
| | Speaker: Mr. Gavin Cheung (Cambridge) | |
| 14:40 - 15:05 | Tea and coffee | |
| 15:10 - 15:35 | LHCb exotics overview 25' | ▼ |
| | Speaker: Dr. Sebastian Neubert (Heidelberg) | |
| 15:40 - 16:05 | d* photo-induced reactions 25' | ▼ |
| | Speaker: Dr. Mikhail Bashkanov | |
| 16:10 - 16:35 | Exotics and their links to astrophysics 25' | ▼ |
| | Speaker: Dr. Isaac Vidana Haro (INFN, Catania) | |
| 16:40 - 17:05 | X3872 production and future prospects from the ATLAS experiment 25' | ▼ |
| | Speaker: Prof. Vakhtang Kartvelishvili (Lancaster) | |
| 17:10 - 18:10 | Drinks reception | |

<https://indico.ph.ed.ac.uk/event/31/>

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

Tuesday, 12 December 2017

- | | | |
|---------------|---|---|
| 09:00 - 09:25 | The social life of heavy quarks 25'
Speaker: Prof. Marek Karliner (Tel Aviv) |  |
| 09:30 - 09:55 | J/psi photo-production using CLAS12 25'
Speaker: Dr. Bryan McKinnon (Glasgow) |  |
| 10:00 - 10:25 | Tea and coffee | |
| 10:30 - 10:55 | Light-meson spectroscopy and search for exotic heavy-quark states at COMPASS 25'
Speaker: Dr. Boris Grube (TUM) |  |
| 11:00 - 11:25 | Baryon physics at LHCb 25'
Speaker: Dr. Marco Pappagallo (Edinburgh) |  |
| 11:30 - 11:55 | Baryon spectroscopy and heavy states 25'
Speaker: Dr. Christian Fisher (Giessen) |  |
| 12:00 - 13:25 | Lunch | |
| 13:30 - 13:55 | Unquenching the quark model 25'
Speaker: Dr. Timothy Burns (Swansea) |  |
| 14:00 - 14:25 | Belle status and prospects 25'
Speaker: Dr. Alexey Garmash (Budker) |  |
| 14:30 - 14:55 | Tea and coffee | |
| 15:00 - 15:25 | Searching for beauty-fully bound tetraquarks from lattice NRQCD 25'
Speaker: Dr. Ciaran Hughes (Fermilab) |  |
| 15:30 - 15:55 | Exotic hadrons at PANDA 25' CANCELLED
Speaker: Dr. Marc Pelizaeus (Bochum) |  |
| 16:00 - 17:00 | Discussion |  |
| 19:30 - 21:30 | Workshop dinner | |

Wednesday, 13 December 2017

- 09:00 - 09:30 **Strangeness physics at the JLab KL-Facility 30'**
Speaker: Prof. Daniel Watts (Edinburgh)
- 09:30 - 10:00 **Using TensorFlow for amplitude analyses 30'**
Speaker: Dr. Anton Poluektov (Warwick)
- 10:00 - 10:30 **Dibaryons on lattice 30'**
Speaker: Dr. Kenji Sasaki (YITP, Kyoto University)
- 10:30 - 11:00 **Outlook 30'**
Speaker: Prof. Mike Pennington (Glasgow, JLab)
- 11:00 - 11:15 **Closing remarks 15'**
Speaker: Dr. Greig Cowan (Edinburgh)



Points for discussion

Google document for sharing discussion ideas:

<https://docs.google.com/document/d/17k1Mvuc0wPGNHqSwBMeEvfRMiTXtnLTozd2mpclgfO4/edit?usp=sharing>

Possible write-up following this meeting??

- 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?
- 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**
- **Today:** Drinks reception ~5pm. Break into small groups for dinner in Edinburgh. List of restaurants on the webpage.
- **Tomorrow:** Dinner booked in Sylvester's restaurant (EH8 9DB) at 7.30pm. You should have already chosen your meal.

<http://www.sylvestersedinburgh.co.uk>

