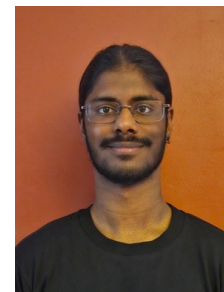




# Electron-Ion Collider UK Gathering

Birmingham, 18-19 November 2024

## Welcome on behalf of the Group



# Locations For Meeting

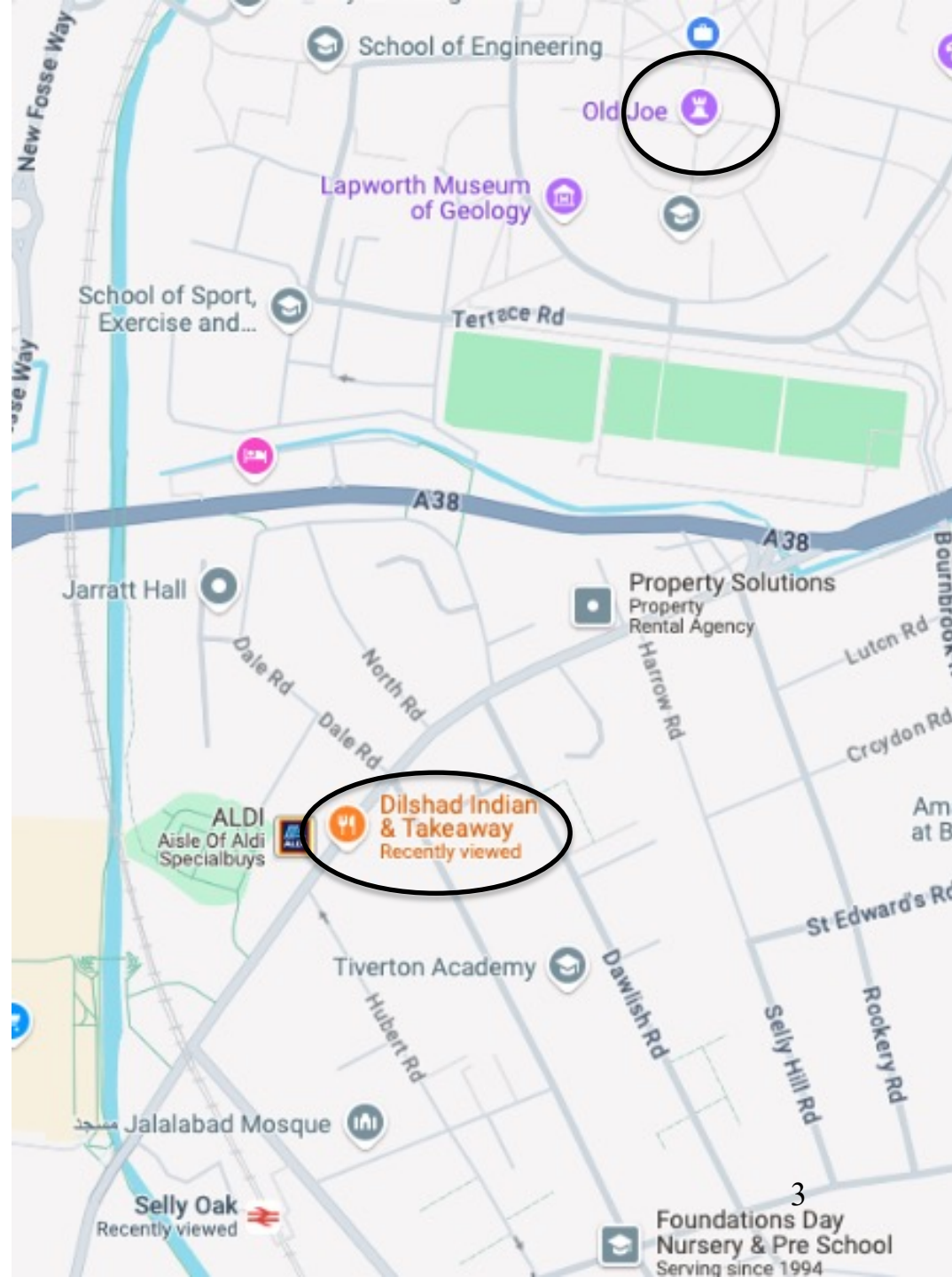


# Evening Meal

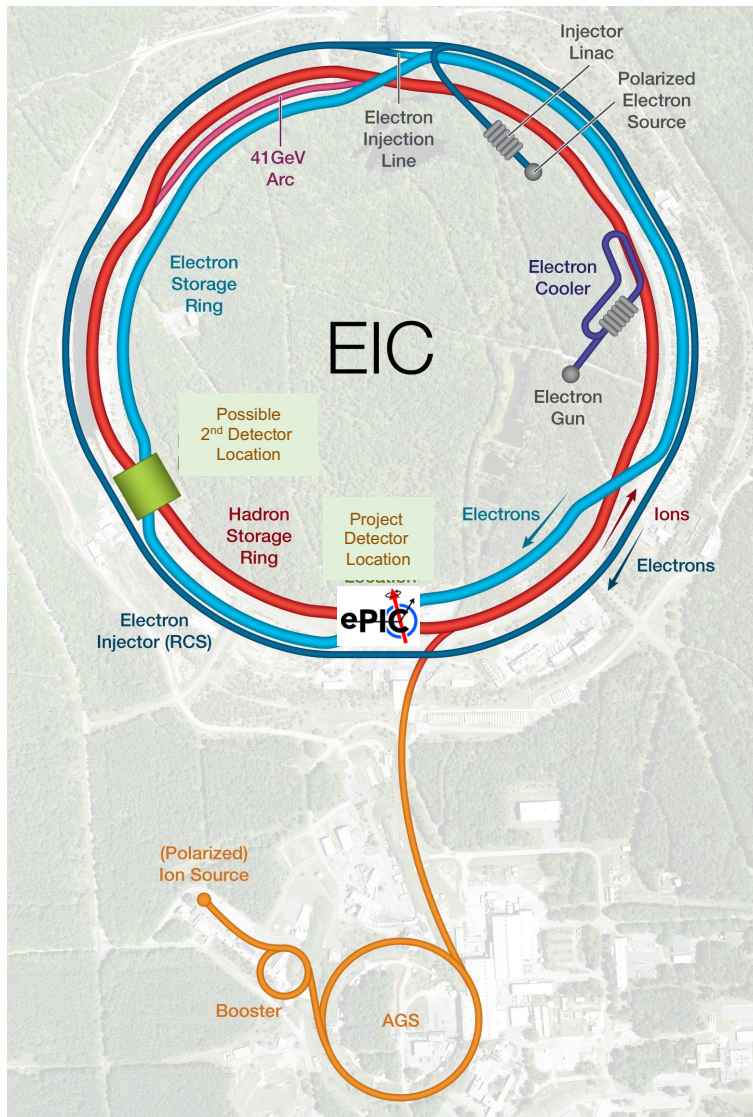
Thanks to Stephen for organising a group meal ...

- 7pm, Dilshad Indian Restaurant, Selly Oak
- About 10 minutes walk from centre of campus
- Bring your own alcohol (Tesco express directly opposite)
- Return to city centre from Selly Oak station, or Bus / Taxi / Uber

Further restaurant suggestions (also in city centre) on web page



# The Electron-Ion Collider



## New electron ring, to collide with RHIC p, A

- Energy range  $28 < \sqrt{s} < 140$  GeV

## World's next high energy collider

Science operations from early 2030s

## World's first ...

- High lumi ep Collider  
( $\sim 10^{34} \text{ cm}^{-2} \text{ s}^{-1} \rightarrow \sim 100 \text{ fb}^{-1}$  per year)
- Double-polarised DIS collider  
( $\sim 70\%$  for leptons & light hadrons)
- eA collider  
(Ions H to U)

## Scientific Remit

- Exploration of structure & dynamics of strongly interacting matter using Deep Inelastic Scattering

# Physics questions to be addressed at EIC

- How is proton mass generated from quark and gluon interactions?

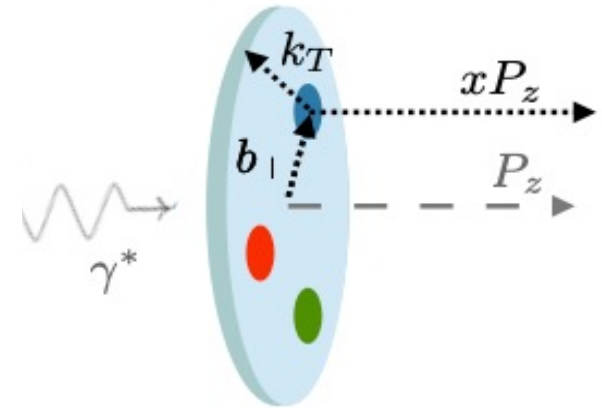
Atom: Binding/Mass = 0.00000001

Nucleus: Binding/Mass = 0.01

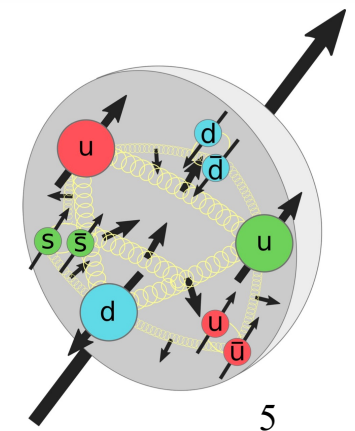
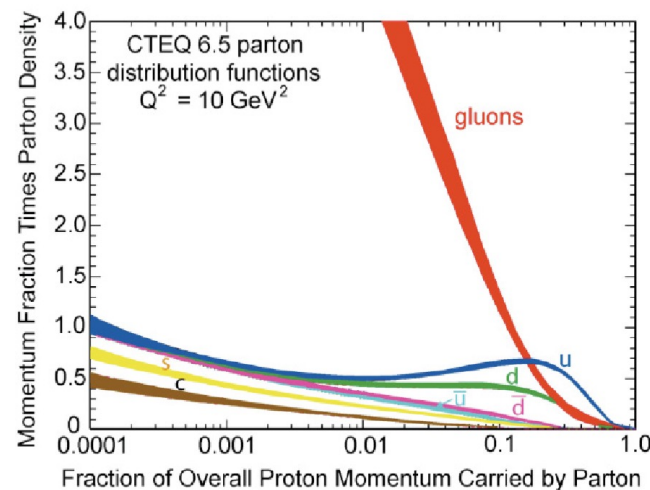
Proton: Binding/Mass = 100

- What does the proton look like in 3D?

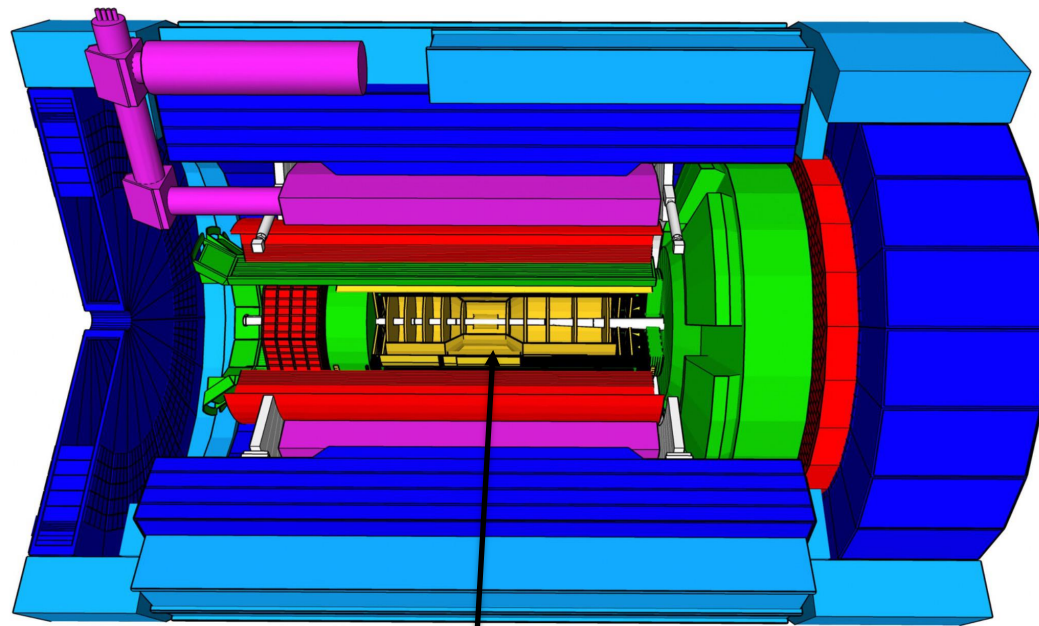
- How is proton spin generated?



- What are the dynamics of high density systems of gluons?... taming the low  $x$  growth ...

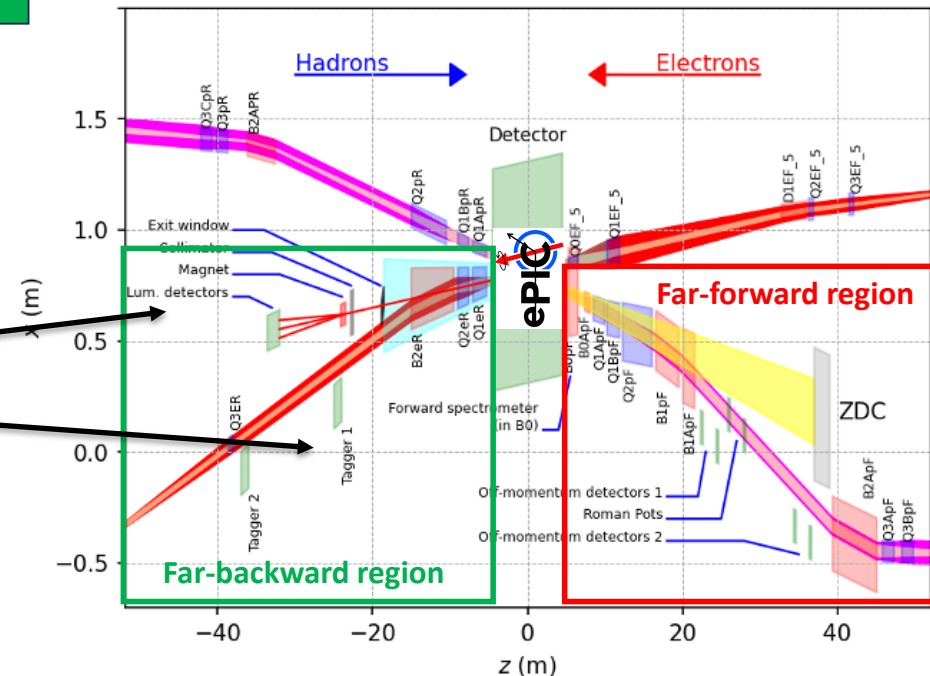


# A Detector for the EIC



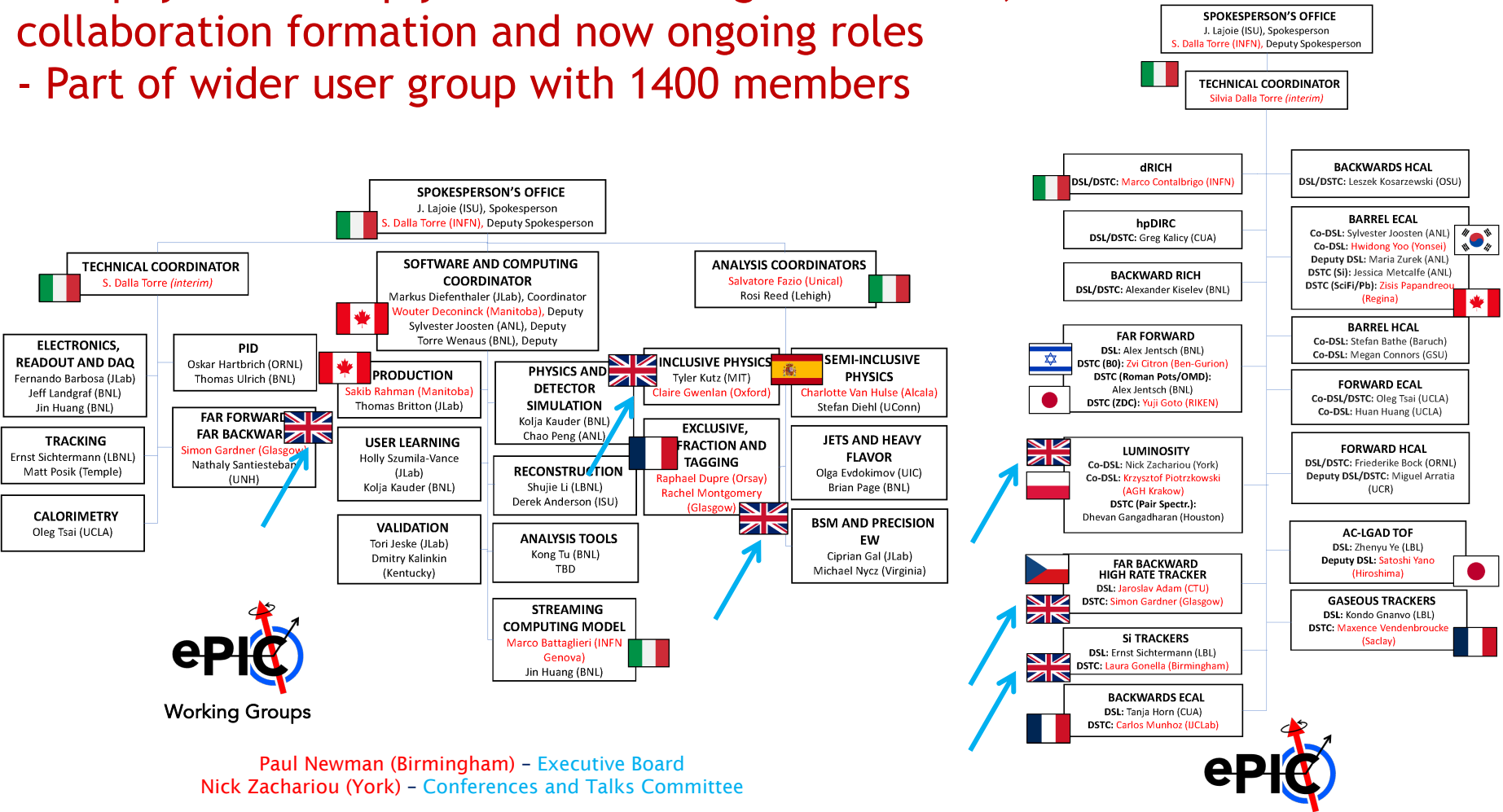
Proton/Ion beam

Electron beam



# ePIC Demographics and UK Leadership

- Currently >850 ePIC collaborators (UK is 4<sup>th</sup> largest)
- UK physicists deeply involved through motivation, collaboration formation and now ongoing roles
- Part of wider user group with 1400 members



Paul Newman (Birmingham) - Executive Board  
Nick Zachariou (York) - Conferences and Talks Committee

Detector Subsystem Collaborations

[Organigram slightly out of date by now]

# UKRI-Infrastructure-Funded UK Involvement

- WP1: MAPS → 65nm CMOS (wafer scale) stitched sensors, developed from ALICE-ITS3, to be deployed in central tracker  
→ Construction of 2 barrel layers, corresponding to around 1/3 of silicon tracker
- WP2: Timepix → Application of pixel sensors for beamline electron tagger for luminosity and physics at  $Q^2 \rightarrow 0$
- WP3: Lumi Monitoring → Novel pair-spectrometer, beamline  $\gamma \rightarrow ee$  counting
- WP4: Accelerator → SRF systems for Energy Recovery cooler.  
→ Crab-cavity RF synchronisation, beam position monitoring, Energy Recovery modelling and design



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of Glasgow

Lancaster  
University



Science & Technology Facilities Council

Daresbury Laboratory  
Rutherford Appleton Laboratory  
ASTeC



UNIVERSITY OF  
LIVERPOOL



UNIVERSITY  
of York



The Cockcroft Institute  
of Accelerator Science and Technology



# Agenda Monday

|       |                                                                           |                                       |
|-------|---------------------------------------------------------------------------|---------------------------------------|
| 12:00 | <b>Sandwich lunch</b>                                                     |                                       |
|       | <i>Education G39, University of Birmingham</i>                            | <i>12:00 - 13:00</i>                  |
| 13:00 | <b>Session 1: Introduction, Infrastructure Project Detector Programme</b> |                                       |
|       | <i>Dr Stephen Kay</i>                                                     |                                       |
| 14:00 |                                                                           |                                       |
| 15:00 | <i>Education G39, University of Birmingham</i>                            |                                       |
|       | <b>Tea and Coffee</b>                                                     |                                       |
|       | <i>Education G39, University of Birmingham</i>                            | <i>15:15 - 15:45</i>                  |
| 16:00 | <b>Session 2: ePIC Physics Studies</b>                                    | <b>Session 2: SVT Working Meeting</b> |
|       | <i>Claire Gwenlan</i>                                                     | <i>Georg Viehhauser</i>               |
| 17:00 |                                                                           |                                       |
|       | <i>Education G39, University of Birmingham</i>                            | <i>Education 312</i>                  |
|       | <i>15:45 - 18:00</i>                                                      | <i>15:45 - 18:00</i>                  |
| 18:00 |                                                                           |                                       |

# Agenda Tuesday

|       |                                                    |                          |                                       |                         |
|-------|----------------------------------------------------|--------------------------|---------------------------------------|-------------------------|
| 09:00 | <b>Session 3: Theory, Phenomenology</b>            | <i>Rachel Montgomery</i> | <b>Session 3: SVT Working Meeting</b> | <i>Georg Viehhauser</i> |
| 10:00 |                                                    |                          |                                       |                         |
| 11:00 | <b>Tea and Coffee</b>                              |                          |                                       |                         |
|       | <i>Gisbert Kapp NG16, University of Birmingham</i> |                          | <i>Education 312</i>                  |                         |
| 12:00 | <b>Session 4: UK Activities and Discussion</b>     |                          |                                       |                         |
|       | <i>Paul Newman</i>                                 |                          |                                       |                         |
| 13:00 |                                                    |                          |                                       |                         |
|       | <i>Gisbert Kapp NG16, University of Birmingham</i> |                          | <i>11:30 - 13:30</i>                  |                         |

# This Session

|       |                                                                                                                                         |                                                                                                                              |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| 13:00 | <b>Introduction</b><br><i>Education G39, University of Birmingham</i>                                                                   | <i>Paul Newman</i><br>13:00 - 13:15                                                                                          |
|       | <b>ePIC Timepix-based Electron Tagger</b><br><i>Education G39, University of Birmingham</i>                                             | <i>Simon Gardner</i><br>13:15 - 13:45                                                                                        |
| 14:00 | <b>ePIC Pair Production Spectrometer</b><br><i>Education G39, University of Birmingham</i>                                              | <i>Alex Smith</i><br>13:45 - 14:15                                                                                           |
|       | <b>ePIC Silicon Vertex Tracker - Overview, layout, production and integration</b><br><i>Education G39, University of Birmingham</i>     | <i>Georg Viehhauser</i> <br>14:15 - 14:35 |
|       | <b>ePIC Silicon Vertex Tracker - Sensors, powering, readout and associated topics</b><br><i>Education G39, University of Birmingham</i> | <i>James Julian Glover</i><br>14:35 - 14:55                                                                                  |
| 15:00 | <b>ePIC Silicon Vertex Tracker - Mechanics and Cooling</b><br><i>Education G39, University of Birmingham</i>                            | <i>Adam Huddart</i><br>14:55 - 15:15                                                                                         |

... enjoy the meeting!...