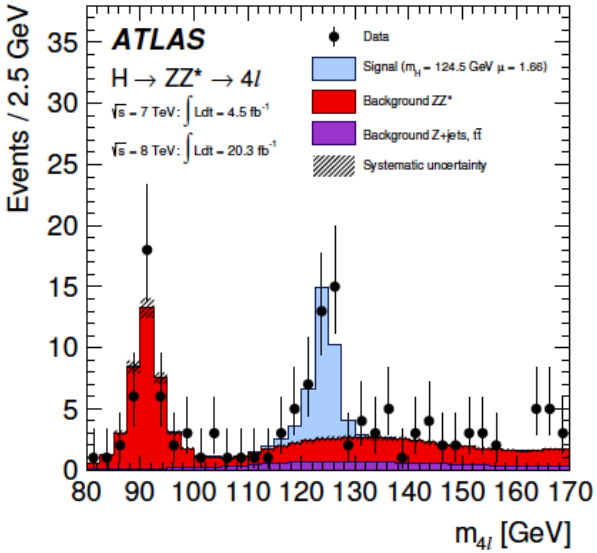
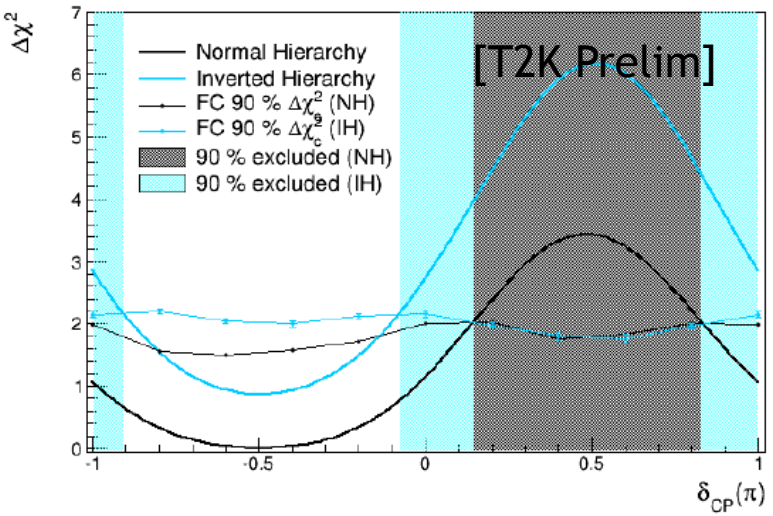
# PPAP Community Meeting 2014
# Introduction and Welcome





Paul
Newman
(Birmingham)


Mon 21 July
2014




- PPAP Terms of Reference and Membership
- PPAP Activities
- Reminder of Last Roadmap Document
- Significant Developments since last Roadmap
- Plans for this meeting

# Panel Terms of Reference

`The purpose of the Panel is to provide a link between Science Board and the community and to represent the needs of the Community to STFC.
The Advisory Panel is tasked to

- Maintain an overview of activities within the area
- Develop and maintain a science vision and long term strategy / roadmap by assessing the merit of current and future science opportunities
- Develop and maintain a technology roadmap
- Consult and interact with the community to ensure its views are canvassed and there is an appropriate and effective route for communication with STFC on strategic programmatic issues
- Provide advice to Science Board on specific questions as requested
- Liaise with other Advisory Panels when appropriate

The remit of the panel includes Technology Development, Theory, High performance Computing and Data Curation issues.

We welcome contact on matters of interest / concern and news of new initiatives at any time (to the panel as a whole or any of us as individuals).

# Panel Membership

- Phil Burrows (Oxford) stood down as chair Autumn 2013
- Cinzia Da Via (Manchester), Nigel Glover (Durham) terms ended
- New members Rob Appleby, Christine Davies, Victoria Martin

Current Panel Composition

Rob Appleby (Manchester)
Christine Davies (Glasgow)
Victoria Martin (Edinburgh)
Paul Newman (Birmingham, chair)
Jonas Rademacker (Bristol)
Claire Shepherd-Themistocleous (RAL, deputy-chair)
Bill Spence (QMUL)
Mark Thomson (Cambridge)
Matthew Wing (UCL) + Sarah Verth (STFC)

Further membership rotation expected this summer.

# Activity in the Past Year

Typical schedule:

- Phone meet every ~2 months to exchange and review news
- In-person meeting once per year (has not always been done)
- Organise and host Annual Community Meeting → Roadmap
- Ad hoc PI's fora when relevant matters arise

In past 12 months (all by phone)

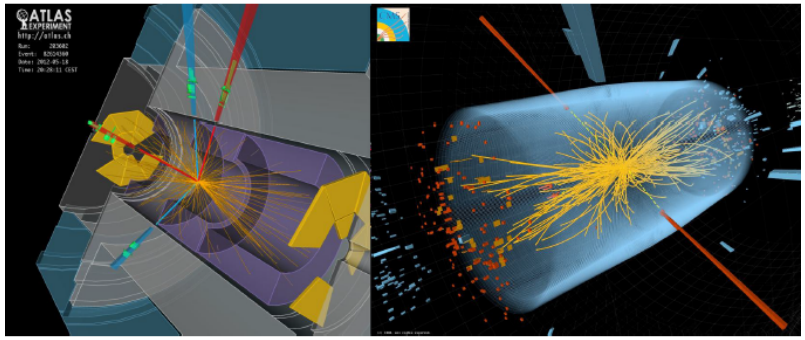
16/7/13: News round-up
30/10/13: News round-up, panel member rotation
14/2/14: News round-up, digest Spending Review Allocation
31/3/14: Digest Programmatic Review Announcement
15/4/14: PI's Forum on Prog Review (with John W, Tony M)
15/5/14: Plan community meet, BIS capital consultation input
Several: Further planning of community meeting.
10/6/14: Annual report to Science Board

All PPAP documents and slides from community meetings are available from our web-page:
http://www.stfc.ac.uk/2415.aspx

# Most Recent Documents

7/11/12: Roadmap Report (as input to Programmatic Review)

27/6/14: Input to BIS Capital Consultation




**The UK Particle Physics Roadmap**

Particle Physics Advisory Panel:

*P. N. Burrows, C. Da Via, E. W. N. Glover, P.R. Newman, J. Rademacker, C. Shepherd-Themistocleous, W.J. Spence, M. A. Thomson and M. Wing*

*7/11/12*

**PPAP Input to BIS Capital Consultation**

**27 June 2014**

**Question 4**

**KEY QUESTION: What balance should we strike between meeting capital requirements at the individual research project and institution level, relative to the need for large-scale investments at national and international levels?**

Whilst both are important (see below), experimental particle physics relies fundamentally on large-scale investments at the international level. Projects such as the Large Hadron Collider (LHC) can only be realised by the coherent actions of multiple nations with reliable funding streams over very long periods, sometimes measured in decades. This international collaboration is facilitated to a large extent by the CERN subscription, which is absolutely vital.

As explained further in answer to question 8, progress in particle physics relies on a range of facilities, not all of which can be provided by CERN. This is particularly true of neutrino physics at present. It is therefore essential to the fulfillment of our programme that we continue to engage with and invest in facilities outside Europe.

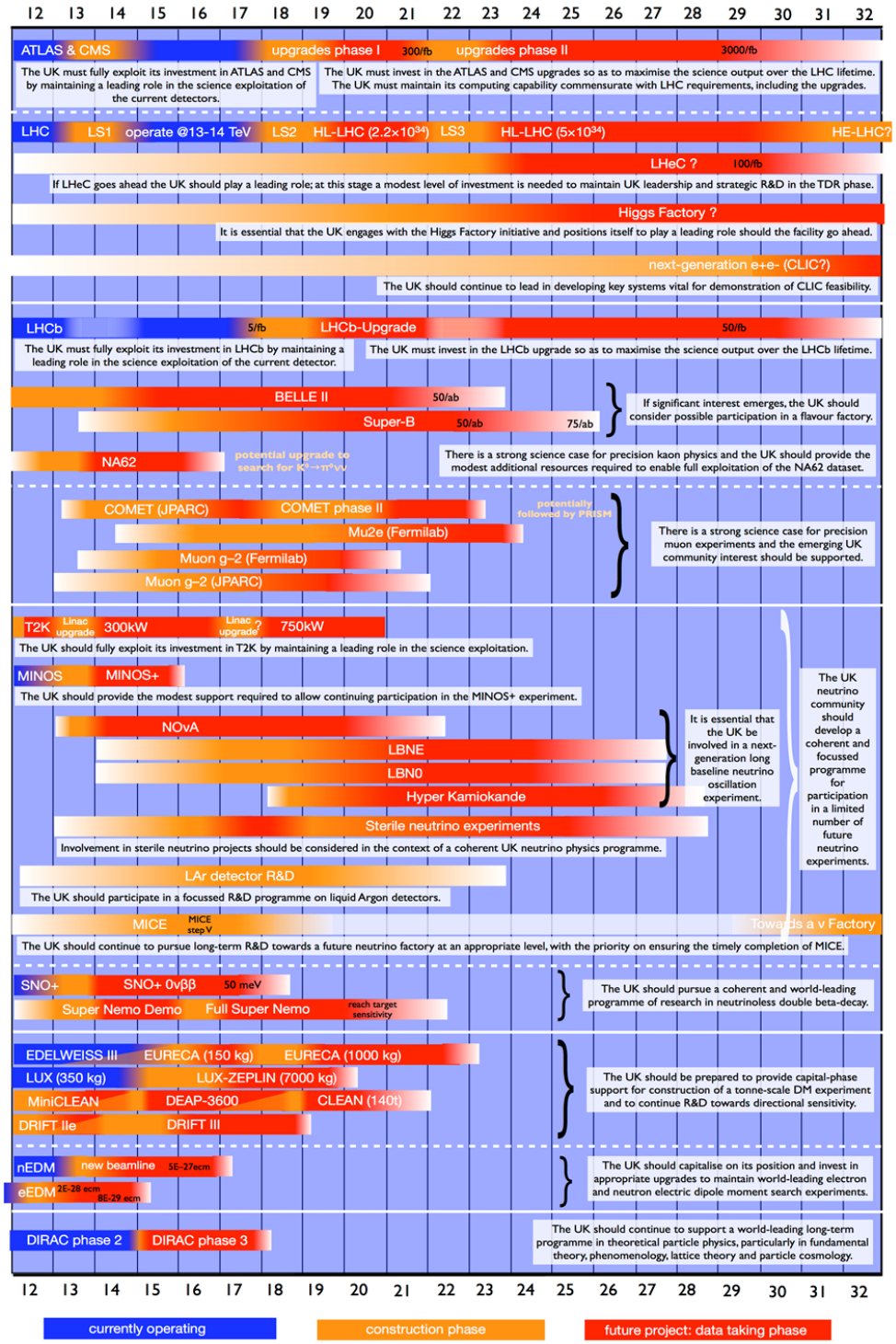
Very often, there is a high fraction of UK leadership in the large-scale international projects to which we contribute. This is in part a consequence of the excellence of our scientists, as measured with a variety of metrics. A recent example survey found that the UK had the highest scientific impact in physics among prolific publishing nations in 2009, as measured by citations per publication (www.iop.org/publications/iop/2014/file_63082.pdf). However, UK leadership in international projects also depends on our development of a reputation as a reliable partner, derived from long-term funding planning and funding stability (see also answer to question 9)

# Nov 2012 Roadmap

**Fundamental Questions addressed in PPAP science, according to 2012 roadmap document …**

- **What are the basic building blocks of the Universe?**
- **Can the forces between particles be understood in a unified framework?**
- **How does gravity fit in?**
- **What unknown properties of these particles and forces drove the evolution of the Universe from the Big Bang to its present state?**
- **What is the origin of the matter/antimatter asymmetry?**

**Update planned Autumn 2014**



# Recommended `Balanced Programme' from 2012 Roadmap

| | Exploitation phase | Upgrade phase | Medium-term construction (operation within c. 10 years) | Design-stage projects; construction decision/start within c. 5 years | R&D for longer-term future projects |
|---|---|---|---|---|---|
| Energy frontier | **ATLAS+CMS** | ***ATLAS+CMS phase 1 upgrades*** | ***ATLAS+CMS phase 2 upgrades (HL-LHC)*** | *Higgs Factory*<br>*LHeC* | *HE-LHC*<br>*CLIC* |
| Flavour frontier | **LHCb**<br>NA62 | ***LHCb upgrade*** | *Precision lepton flavour experiment* | | |
| Neutrino frontier | **T2K**<br>MINOS+<br>SNO+ | | ***Neutrinoless double beta decay experiment*** | ***Next-generation long baseline experiment***<br>*LAr detector* | Neutrino factory |
| Non-accelerator frontier | **EDM searches** | | ***Dark matter search experiment*** | | |

- `Flagship elements' in bold font
- Smaller scale / other projects where UK leads in normal font
- Projects not yet approved/funded by STFC in italics
- All to be supported by vibrant theory programme.

# Developments since the Last Roadmap

- International: European Strategy Document / US P5 Report

- National: Spending review / STFC Programmatic Review

    - Prioritisations in PPAN sub-group report (Annex G) broadly in-line with PPAP roadmap.

    - Tensioning similarly ranked projects happened since.

    - Strong statements on protecting grants line

    - Statements on PhD studentships and PD Fellowships

- Significant new scientific opportunities …

# Scientific Developments

- LHC physics and high-lumi upgrade programme developing fast (and will do so further with 13 TeV running from 2015)

- Convergence on UK plans for long baseline neutrinos
  - LBNE + T2HK + CHiPS.

- Interest throughout community in possible Japanese ILC

- Many new or renewed initiatives with strong UK involvement
  - Future $0\nu\beta\beta$ experiments → SuperNEMO, SNO+
  - Neutron EDMs at PSI and ILL
  - Atmospheric and reactor neutrino detectors (e.g. Pingu)
  - Dark Matter future → Lux-Zeplin
  - Plasma Wakefield Acceleration (AWAKE …)
  - Long-term Future Circular Colliders (CERN FCC)
  - …

**More (and clearer) picture after this meeting …**

# Programme for Next 2 Days

Aim to cover all projects in which members of the community are engaging.

Plenty of time for discussion - eager to gather opinions of as many groups / projects / individuals as possible.

- Update ourselves on global project/facility status and developments
- Understand better the UK's areas of expertise
- Discuss future strategy given possibly tight funding scenarios
- Distill outcomes to updated roadmap

Looking forward to some interesting and constructive discussion of the whole programme

# Agenda

## Monday, 21 July 2014

10:30 - 11:00 Coffee

11:00 - 11:40 Introduction and Context

- 11:00 **Introduction and Welcome** *15'*
  Speaker: Paul Newman (The University of Birmingham)
- 11:20 **Science Board and STFC news** *15'*
  Speaker: Dr. Dan Tovey (Sheffield PPPA)

11:40 - 12:30 Theory

- 11:40 **Overview** *20'*
  Speaker: Prof. Simon Hands (Swansea University)
- 12:00 **Formal theory and cosmology** *20'*
  Speaker: Daniel Litim

12:30 - 13:30 Lunch

13:30 - 14:35 Theory

- 13:30 **Phenomenology** *20'*
  Speakers: Prof. Robert Thorne (University College London), Pro London)
- 13:55 **Lattice QCD** *20'*
  Speaker: Christine Davies
- 14:20 **Discussion** *15'*

14:35 - 15:45 High Energy Frontier

- 14:35 **ATLAS - upgrades + future physics programme** *30'*
  Speaker: Phil Allport
- 15:10 **CMS - updgrades and future physics programme** *30'*
  Speaker: Geoff Hall

15:45 - 16:10 Tea

16:10 - 18:15 High Energy Frontier

- 16:10 **Grid Computing** *15'*
  Speaker: Steve Lloyd
- 16:30 **ILC and the CLIC connection** *30'*
  Speaker: Phil Burrows
- 17:05 **FCC + other Future ee/pp Circular Colliders** *20'*
  Speaker: Rob Appleby
- 17:30 **LHeC / lepton-hadron colliders** *15'*
  Speaker: Eram Rizvi
- 17:50 **New Technologies (plasmas, dielectrics, muons)** *20'*
  Speaker: Guoxing Xia

18:15 - 18:55 Discussion *40'*

## Tuesday, 22 July 2014

09:30 - 10:45 Neutrinos & non-accelerator programme

- 09:30 **Long-baseline neutrino oscillation experiments** *20'*
  Speaker: Lee Thompson
- 09:55 **Reactor, SBL and PINGU** *20'*
  Speaker: Dr. Justin Evans (University of Manchester)
- 10:20 **UK Dark Matter** *20'*
  Speaker: Prof. Hans Kraus (University of Oxford)

10:45 - 11:10 Coffee

11:10 - 12:40 Neutrinos & non-accelerator programme

- 11:10 **Neutrinoless double-beta decay** *20'*
  Speaker: Prof. David Waters (UCL)
- 11:35 **e and n EDMs** *20'*
  Speaker: Prof. Philip Harris (University of Sussex)
- 12:00 **LSST** *15'*
  Speaker: Ian Shipsey
- 12:15 **Discussion** *15'*

12:40 - 13:40 Lunch

13:40 - 16:00 Flavour Physics

- 13:40 **Introduction and other news** *20'*
  Speaker: Sebastian Jaeger
- 14:00 **LHCb** *30'*
  Speaker: Matt Needham
- 14:35 **NA62 and kaon experiments** *15'*
  Speaker: Dr. Evgueni Goudzovski (University of Birmingham)
- 14:55 **SHIP** *15'*
  Speaker: Andrey Golutvin
- 15:15 **COMET / PRISM / cLFV** *20'*
  Speaker: Ajit Kurup
- 15:40 **Muon g-2** *20'*
  Speaker: Dr. Stephen Maxfield (University of Liverpool)

16:00 - 16:20 Tea

16:20 - 17:10 Discussion

# Agenda

## Monday, 21 July 2014

10:30 - 11:00 Coffee

11:00 - 11:40 Introduction and Context

- 11:00 **Introduction and Welcome** *15'*
  Speaker: Paul Newman (The University of Birmingham)
- 11:20 **Science Board and STFC news** *15'*
  Speaker: Dr. Dan Tovey (Sheffield PPPA)

11:40 - 12:30 Theory

- 11:40 **Overview** *20'*
  Speaker: Prof. Simon Hands (Swansea University)
- 12:00 **Formal theory and cosmology** *20'*
  Speaker: Daniel Litim

12:30 - 13:30 Lunch

13:30 - 14:35 Theory

- 13:30 **Phenomenology** *20'*
  Speakers: Prof. Robert Thorne (University College London), Pro London)
- 13:55 **Lattice QCD** *20'*
  Speaker: Christine Davies
- 14:20 **Discussion** *15'*

14:35 - 15:45 High Energy Frontier

- 14:35 **ATLAS - upgrades + future physics programme** *30'*
  Speaker: Phil Allport
- 15:10 **CMS - updgrades and future physics programme** *30'*
  Speaker: Geoff Hall

15:45 - 16:10 Tea

16:10 - 18:15 High Energy Frontier

- 16:10 **Grid Computing** *15'*
  Speaker: Steve Lloyd
- 16:30 **ILC and the CLIC connection** *30'*
  Speaker: Phil Burrows
- 17:05 **FCC + other Future ee/pp Circular Colliders** *20'*
  Speaker: Rob Appleby
- 17:30 **LHeC / lepton-hadron colliders** *15'*
  Speaker: Eram Rizvi
- 17:50 **New Technologies (plasmas, dielectrics, muons)** *20'*
  Speaker: Guoxing Xia

18:15 - 18:55 Discussion *40'*

## Tuesday, 22 July 2014

09:30 - 10:45 Neutrinos & non-accelerator programme

- 09:30 **Long-baseline neutrino oscillation experiments** *20'*
  Speaker: Lee Thompson
- 09:55 **Reactor, SBL and PINGU** *20'*
  Speaker: Dr. Justin Evans (University of Manchester)
- 10:20 **UK Dark Matter** *20'*
  Speaker: Prof. Hans Kraus (University of Oxford)

10:45 - 11:10 Coffee

11:10 - 12:40 Neutrinos & non-accelerator programme

- 11:10 **Neutrinoless double-beta decay** *20'*
  Speaker: Prof. David Waters (UCL)
- 11:35 **e and n EDMs** *20'*
  Speaker: Prof. Philip Harris (University of Sussex)
- 12:00 **LSST** *15'*
  Speaker: Ian Shipsey
- 12:15 **Discussion** *15'*

12:40 - 13:40 Lunch

13:40 - 16:00 Flavour Physics

- 13:40 **Introduction and other news** *20'*
  Speaker: Sebastian Jaeger
- 14:00 **LHCb** *30'*
  Speaker: Matt Needham
- 14:35 **NA62 and kaon experiments** *15'*
  Speaker: Dr. Evgueni Goudzovski (University of Birmingham)
- 14:55 **SHIP** *15'*
  Speaker: Andrey Golutvin
- 15:15 **COMET / PRISM / cLFV** *20'*
  Speaker: Ajit Kurup
- 15:40 **Muon g-2** *20'*
  Speaker: Dr. Stephen Maxfield (University of Liverpool)

16:00 - 16:20 Tea

16:20 - 17:10 Discussion



Thanks to attendees, speakers, RAL …