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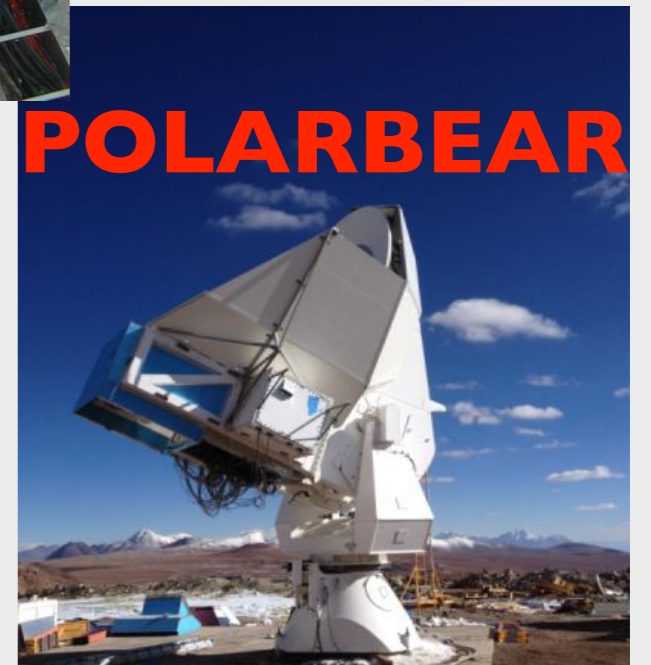
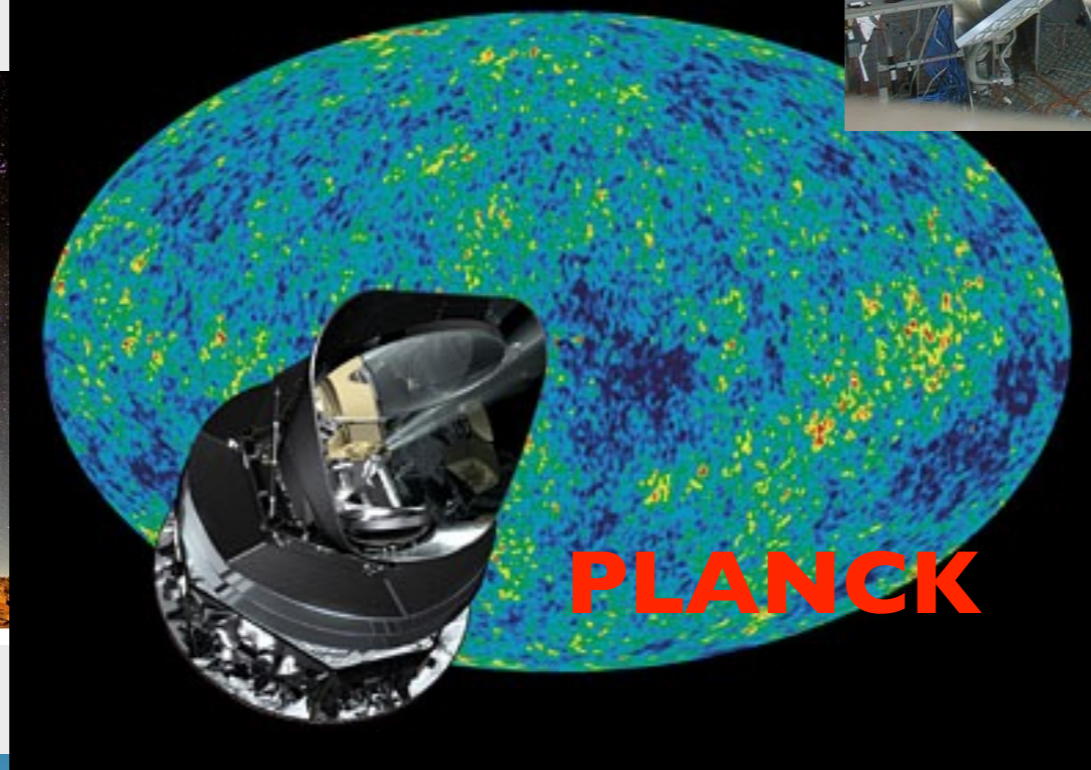


CMB research in the UK post-Planck

Michael Brown (Manchester)
on behalf of UK CMB community



UK has rich heritage in CMB experiments



Motivation for creating a UK roadmap now

- Since CLOVER cancellation in 2009, UK mostly focussed on Planck.
- UK has rich heritage in field and has important expertise to offer.
- Future ESA CMB satellite mission at least a decade away.
- Need to identify UK role in global activities for next 10-15 years.



- STFC is main astronomy / particle astrophysics funding agency in UK.
- Currently undergoing a “Balance of Programs” exercise:

Terms of Reference

Balance of Programme Science Board Sub Group

The purpose of the balance of programme exercise is to ensure the balance of STFC's PPAN Research programme is the most appropriate.

The Science Board Sub Group will:

Identify the most appropriate balance between STFC's key research areas

- Astronomy
- Nuclear Physics
- Particle Physics
- Particle Astrophysics
- Accelerators for the above
- Computing for the above

Ensure there is appropriate breadth within each research area including development for future opportunities and scale of projects.

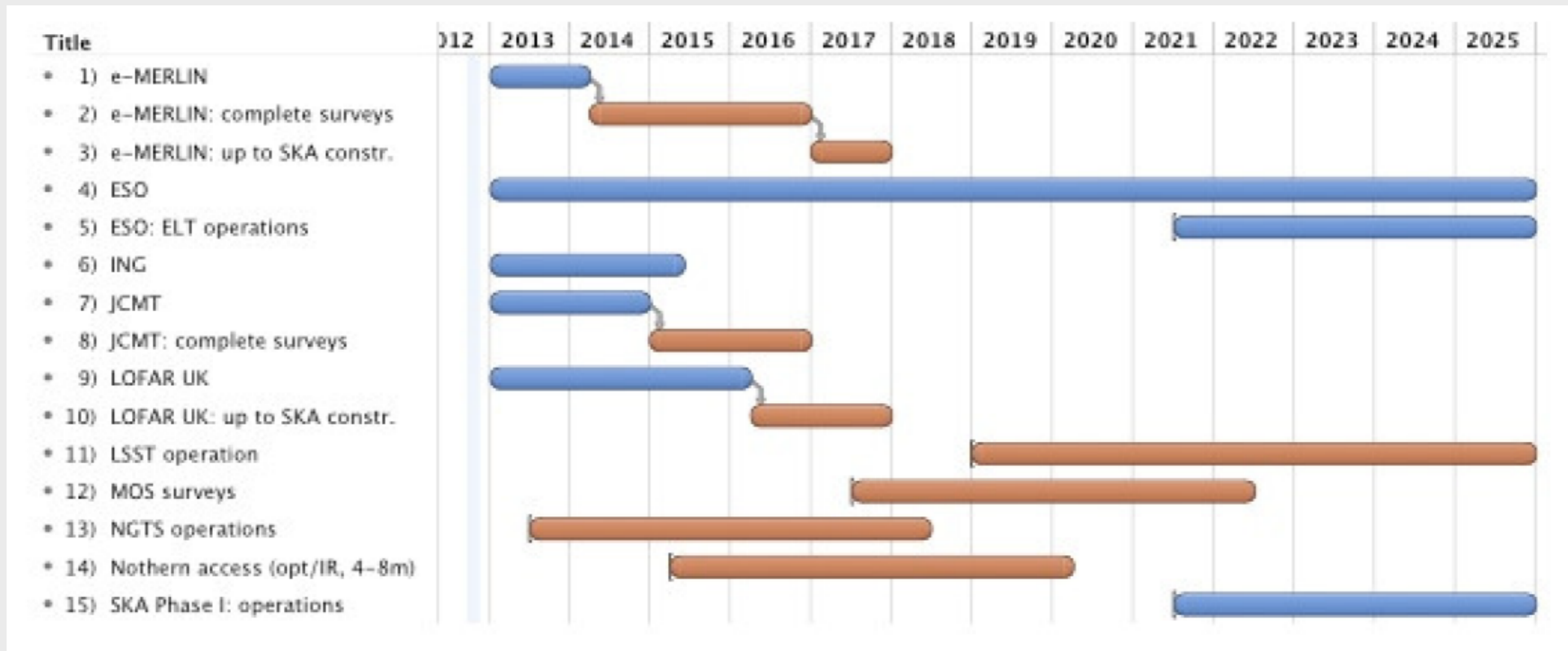
Identify the most appropriate balance between R&D, construction and scientific exploitation both across the programme and in each subject area.

Recommend financial planning that will ensure provision for STFC's highest strategic priorities.

Recommend the appropriate balance of programme for the following financial scenarios.

- Flat cash
- Flat cash + / - 5%

Most recent STFC Astronomy Roadmap (2012):



No CMB experiments!

Most recent STFC Particle Astrophysics Roadmap (2016 Draft):

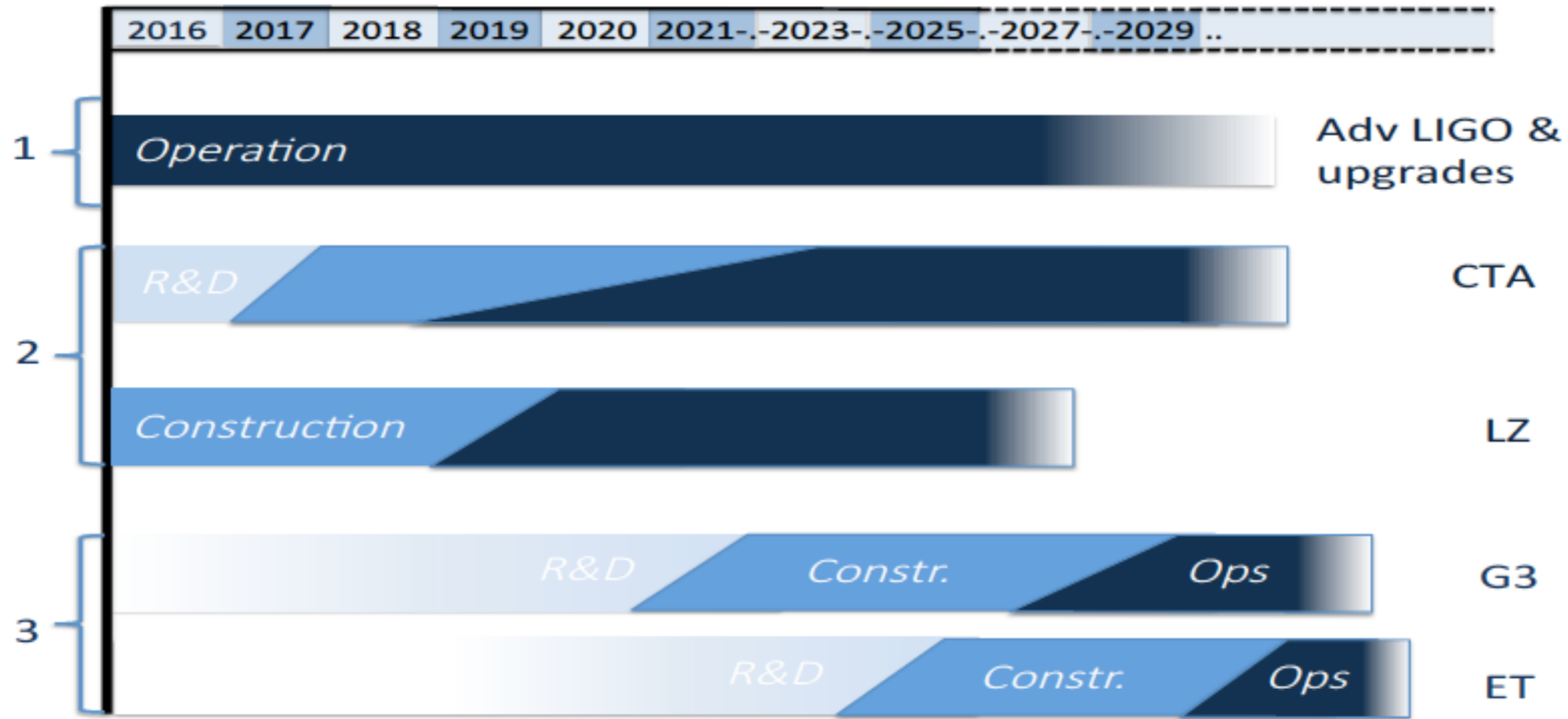


Figure 1: Anticipated roadmap for UK particle astrophysics, showing the global R&D, construction/installation, and operations phases of each project. Numbers on the left indicate the prioritisation bands.

No CMB experiments!

UK CMB Community White Paper

Cosmic Microwave Background research in the UK post-*Planck*

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- Intended audience: STFC.
- ~25 pages.
- Summarises future CMB science goals.
- Identifies key UK strengths & expertise
- Proposes a roadmap for substantial UK engagement in future of field.

Headline recommendation I

- Building on our involvement in ongoing Stage-3 experiments, the UK CMB community should make a major contribution to the Simons Observatory. Engaging in the Simons Observatory now is the UK's surest route to securing leadership roles in CMB-S4 and is critical for maintaining the health of the UK CMB community. This recommendation therefore forms the cornerstone of our future CMB roadmap.
- Builds on existing UK participation in Stage 3 experiments e.g. ACT, Polarbear/Simons Array, SPIDER etc.
- A group of UK institutes is currently in discussion with Simons Observatory to explore what a significant UK contribution might look like.
- Instrumental contribution is TBD but viable options include detector fabrication (KIDs and/or TES options), optics & cryogenics contributions and/or fielding a constituent SO telescope including a partially filled focal plane.

Headline recommendation 2

- The UK should work towards full engagement in the CMB-S4 effort. By the middle of the next decade CMB-S4 will be the *only* state-of-the-art ground-based CMB activity. If the UK is to maintain an interest in ground-based CMB, it must position itself to play a major role in CMB-S4.
- One strand could build on UK optics and detector expertise, again potentially including self-contained UK-built instruments.
- A second strand could be a dedicated low frequency telescope(s) – “NextBASS” – in the 8-30 GHz building on C-BASS (and QUIJOTE) heritage and drawing on expertise and technology from SKA.
- Work as part of larger European effort to progress a CMB-S4 northern site option?

Headline recommendation 3

- The UK should capitalise on its major contributions to *Planck* by fully engaging in the development and execution of future satellite missions. We should pursue leadership roles in the CORE mission, currently being prepared for submission to ESA's M5 call. Depending on the outcome of the CORE proposal, the UK should pursue significant roles in the Japanese LiteBIRD mission and/or in the US-led PIXIE mission.
- UK already fully embedded in CORE collaboration and making major contributions to many areas of CORE proposal (e.g. scan strategy, component separation, lensing science etc.)

THE END