



UK CMB Roadmap update

Michael Brown (Manchester)
on behalf of UK CMB community



UK funding agencies



- Funds all astronomy, particle astrophysics and particle physics projects in the UK.
- Also funds science exploitation of space missions.



- Responsible for strategic decisions on the UK civil space programme and provides a clear, single voice for UK space ambitions (c.f. interactions with ESA).
- Takes advice on scientific merits of proposed science missions from STFC.

This time last year....

UK CMB White Paper for input to 2016 STFC review

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

P. Ade¹, M. Ashdown², R. Battye³, A. Bonaldi³, T. Bradshaw⁴, M. L. Brown³, E. Calabrese⁵,
A. Challinor², J. Chluba³, D. L. Clements⁶, P. Coles⁷, C. Contaldi⁶, R. Crittenden⁸,
C. Dickinson³, S. Doyle¹, J. Dunkley⁵, G. Efstathiou², S. Feeney⁶, P. G. Ferreira⁵, W. Gear¹,
D. Goldie², K. Grainge³, S. Gratton², M. Griffin¹, P. Hargrave¹, A. Heavens⁶, A. H. Jaffe⁶,
M. Jones⁵, T. Kitching⁹, A. Lasenby², P. Leahy³, A. Lewis⁷, P. Mauskopf¹, J. D. McEwen⁹,
E. Pascale¹, H. Peiris⁹, L. Piccirillo³, G. Pisano¹, M. Remazeilles³, G. Savini⁹, R. Sudiwala¹,
A. C. Taylor⁵, A. N. Taylor¹⁰, C. Tucker¹, S. Withington², G. Yassin⁵

¹ *University of Cardiff*

² *University of Cambridge*

³ *University of Manchester*

⁴ *Rutherford Appleton Laboratory*

⁵ *University of Oxford*

⁶ *Imperial College London*

⁷ *University of Sussex*

⁸ *University of Portsmouth*

⁹ *University College London*

¹⁰ *University of Edinburgh*

- Intended audience: STFC.
- ~25 pages.
- Summarised future CMB science goals.
- Identified key UK strengths & expertise
- Proposed 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.

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- Builds on existing UK participation in Stage 3 experiments e.g. ACT, Polarbear/Simons Array, SPIDER etc.
- We now have significant levels of UK membership in SO collaboration including members from Cardiff, Cambridge, Imperial, Manchester, Oxford & Sussex. UK groups actively contributing to TWG and SWG work. **UK co-leads three SO science working groups.**
- We also have ambitions to make a significant instrumental contribution to SO...

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- We submitted a “Statement of Interest” to STFC proposing to build 5 complete “optics tubes” for SO large aperture telescope + major contributions to pipeline and analysis.
- Science case well received, but STFC unable to fund it at this time due to financial restrictions.
- Recommendation to invite a revised proposal after forthcoming STFC Astronomy & PA reviews if a new STFC project this size appears financially feasible at that time. At best, this means ~2 year delay.
- Exploring other options (ERC synergy grant) with European partners .

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.
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- Nothing major to report here - tied in with wider European effort.

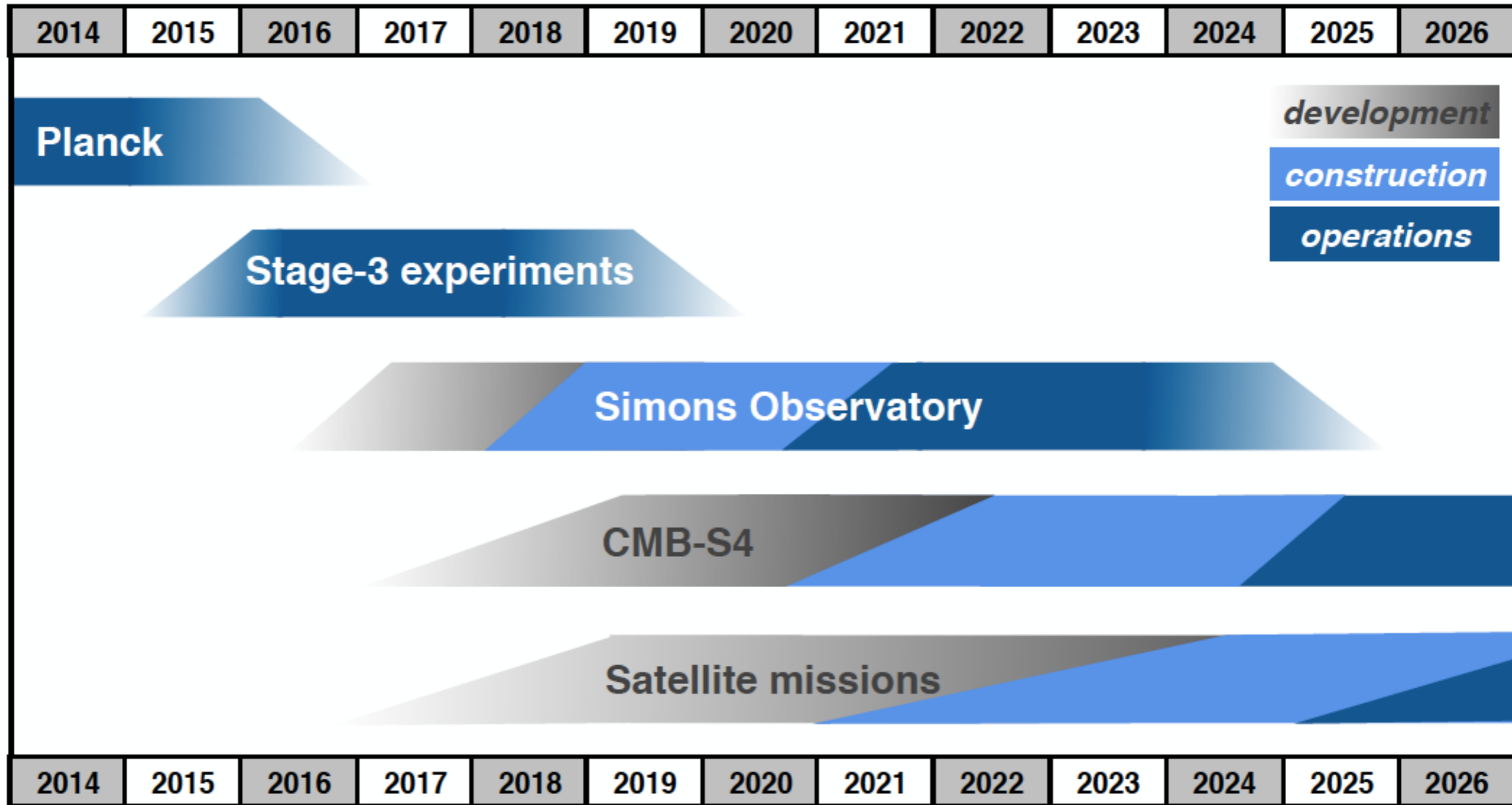
Headline recommendation 3

- 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.
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- 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.)
- UK played a major role in CORE proposal but unfortunately not selected by ESA.
- Now engaging with LiteBIRD as part of wider European effort (see Erminia's talk).

Proposed UK CMB Roadmap





- STFC recently completed “Balance of Programs” review. Little mention of CMB area in the panel’s report...

breakthrough in the astronomical distance scale) and the launch of the NASA/ESA JWST in 2018. Likewise, Euclid - ESA’s upcoming dark universe mission - will fly in 2020 and there are on-going discussions about the future of Cosmic Microwave Background (CMB) research. This new science will flow through as continued pressure on AGP, as indeed is already the case for spending on gravitational wave science: some active groups in this particular area already choose to seek, and receive, support

operation support were cancelled, the UK community would lose access to a robotic telescope dedicated (uniquely) to time domain astronomy – a science area highlighted as a priority in the AAP report. A decision will also be needed about NGTS operations and other modest support functions (e.g. Gaia data centre, future CMB experiments) in early 2018.

5. In 2018 and beyond, there are several key decisions that will shape UK astronomy into

STFC next steps

- The CMB science case is consistently well received and the UK profile in this area is acknowledged to be very strong.
- Our challenge is to open up a new line of funding in the STFC astronomy program in a very harsh funding environment.
- STFC will conduct reviews of Astronomy and Particle Astrophysics programs in Q3 2018 (feeding into next BoP review in 2019).
- CMB projects (e.g. CMB-S4, LiteBIRD) must feature prominently in these reviews if they are to receive future STFC (or UKSA) funding.

THE END