



## STFC Update

### **Grahame Blair**

Executive Director Programmes

**9 April 2019**

The image shows the interior of a large, cylindrical metal chamber, likely a particle accelerator or a laboratory facility. The walls are made of a dark, textured metal. There are several viewing ports: three circular ports in the middle row, each showing a different view (one shows a person, another shows a blue structure, and the third shows a blue structure with the number '22' on it); and three square ports in the top row, each showing a different view (one shows a white structure, another shows a blue structure, and the third shows a white structure). A large circular opening is visible at the bottom center, showing a grid-like structure. The lighting is dramatic, with strong shadows and highlights.

# Programme Highlights



# Square Kilometre Array

On 12 March, the UK and six other countries signed the Square Kilometre Array convention in Rome



- The UK ambassador to Italy (far left) signed on behalf of the UK government
- UK, South Africa, Australia, Italy, China, Portugal, and the Netherlands took part in the signing ceremony

# Scientific Machine Learning



£3 million funding from UKRI to Scientific Computing's Scientific Machine Learning (SciML) Group, through the Strategic Priorities Fund and the Alan Turing Institute, for the 'AI for Science' theme

Exploring the use of Machine Learning technologies on an array of 'big scientific data' generated by facilities at RAL

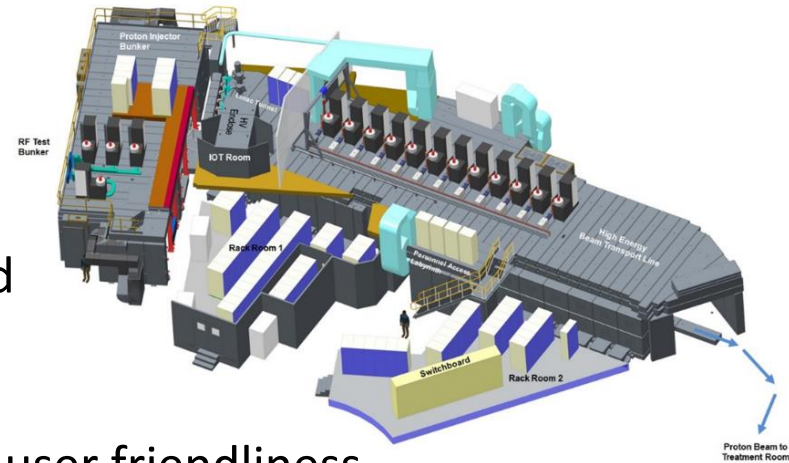
- Diamond, ISIS, CLF, Electron Microscopy Facility, and the Centre for Environmental Data Analysis (CEDA) / JASMIN

SCD will host and manage the *PEARL* AI Computing Service for The Alan Turing Institute

# AVO infrastructure project

The design and installation of bespoke infrastructure and services to house the Advanced Oncotherapy (AVO) LIGHT proton therapy verification and validation system is underway at Daresbury

- A new generation of proton therapy system, LIGHT (Linac for Image Guided Hadron Therapy) aims to:
  - Overcome the costly infrastructure and extensive shielding requirements of first-generation cyclotrons
  - Offer increased precision and improve user friendliness
- STFC are delivering a staged build to allow AVO to start installing and commissioning in parallel with the infrastructure construction
- The proton injector bunker and RF test bunker are already delivered and the first half of linac tunnel is built



# New Europractice Project

## Call for Next Europractice eXtended Technologies and Services (NEXTS)

- Microelectronics Support Centre awarded €2M from H2020
- Extends EC funding to December 2021
- STFC responsible for the provision, support and training in the use of the microelectronic and electronic system design tools
- Currently used by 610 academic institutions in 44 countries !
- NEXTS will lower the barrier for early stage start-up companies/spin-offs from the academic sector
- Providing access to design tools to produce a low cost industrial demonstrator



# The Wonder initiative



We are changing the balance of audiences we reach with our public engagement work



We make a bigger difference by working with new people:

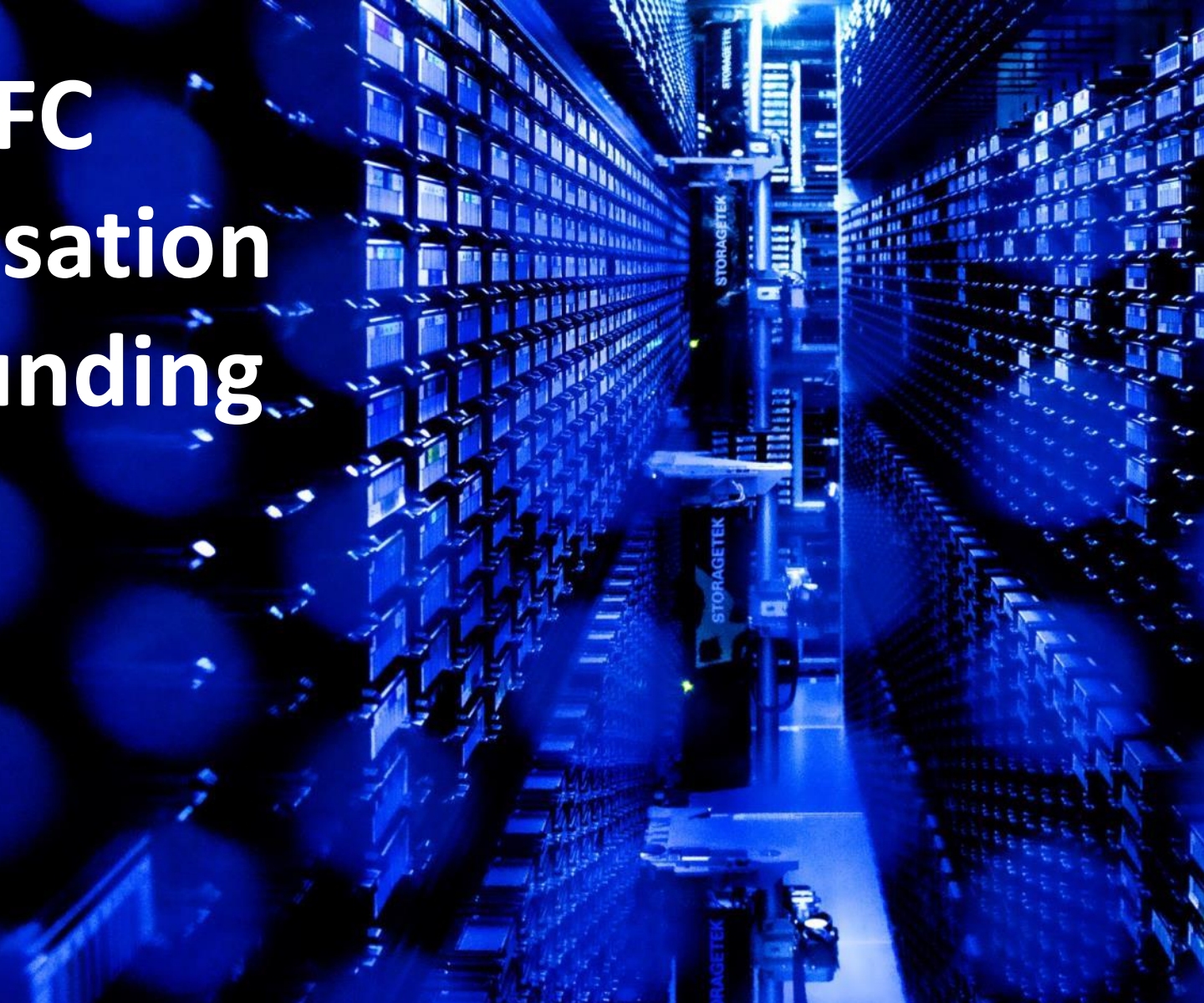
- Target our work at people who don't commonly engage with STEM
- Focus on the 40% most socio-economically deprived communities in the UK



Strengthening new approaches across the programme: speak to local PE teams to find out more, and participate



# STFC Organisation and Funding





# Transformation

UKRI Transformation Programme focussed on:

- The work of the councils, cross-cutting programmes and projects, central teams

Executive Committee agreed a set of principles:

- Clear lines of accountability
- Divide activities into programme management, domain expertise & administration
- Strengthen post-grant management and 'outputs, outcomes and impact'
- Challenge the number of organisational levels and 1.1 reporting

STFC areas in-scope: Strategy Planning & Communications, Programmes & Executive Office

# Strategic Delivery Plan

STFC's first "Strategic Delivery Plan" as part of UKRI

- Planning based on publication by June 2019
- Draft approved by the UKRI Board in April
- New format: priority areas / strategy for the next ~10 years
- Includes delivery plan for FY'19/20

STFC has a "bold and ambitious" forward-looking plan

- A lot of change around us, including additional resources associated with formation of UKRI and the Industrial Strategy



# Strategic Delivery Plan

Some key priorities in SDP:

- Fully engage with new frontier science opportunities and drive development of novel technologies
- Use our inspiring high-tech facilities (in UK and overseas) as a training ground for skills in engineering, technology and computing for the UK
- Create a strategic pipeline for developing our world-leading National facilities and to keep them world class
- Grow our stewardship of the R&I ecosystem at the Harwell and DL Campuses
- Strengthen strategic partnerships with other councils, e.g. EPSRC



# New funds

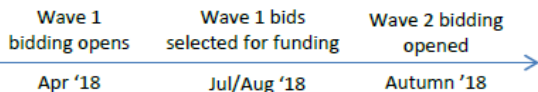
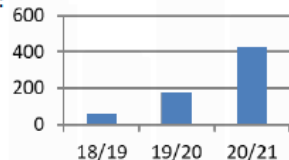
## UKRI funding streams

### Strategic Priorities Fund

UKRI partner-led proposals that are:

- Multi/Inter-Disciplinary cutting edge research or;
- National strategic research or innovation priorities or;
- Strategic cross-cutting R&D aligned with Government priorities

Total: £560m

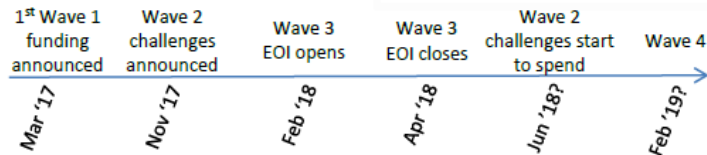
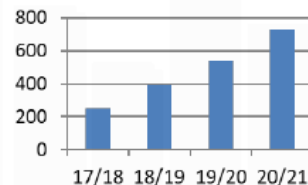


## Industrial Strategy Challenge Fund

£1,024m was awarded for Wave 1 challenges from '17/18. Supports industrially-led proposals where:

- UK has world-leading research base and businesses ready to innovate
- There is a large or fast-growing global market

Total: £1,907m

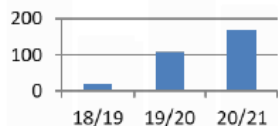


## Talent

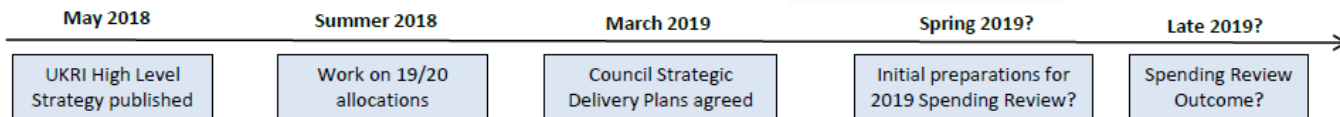
Budget '17 announced £300m, building on initial spend in '17/18:

- PhD Studentships
- Innovation Scholarships
- Future Leaders Fellowships
- Rutherford International Leaders (Schemes run beyond 2020/21)

Total: £300m



### Overall timeline

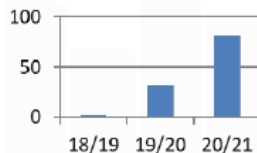


## Strength in Places Fund

Research and Innovation-led proposals for regional economic growth:

- Areas with genuine potential and emerging capacity
- Collaboration with local partners
- Encourage bids from Science and Innovation Audit areas

Total: £115m

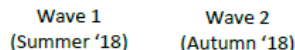
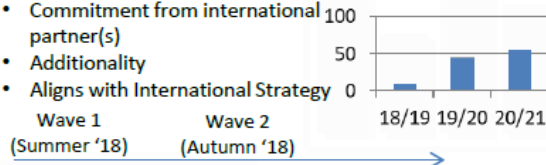


## Fund for International Collaboration

Criteria:

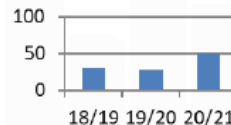
- Quality of research/innovation
- Commitment from international partner(s)
- Additionality
- Aligns with International Strategy

Total: £110m



Total: £108m

## Commercialisation



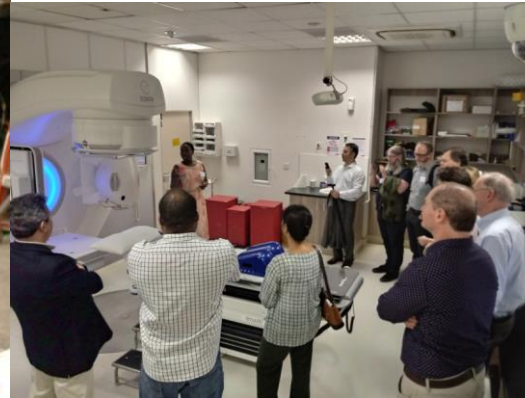
- HEIF
- ICURE
- Review of commercialisation activity ongoing

# Radiotherapy in Africa



STFC and CERN trying to address the global shortage of radiotherapy facilities in low-middle income countries.

- Develop rational and affordable radiotherapy cancer treatment technology for deployment in challenging environments, such as in Africa.
- Workshop in Gaborone, Botswana in March with over 60 participants.



Radiotherapy at Life Botswana Hospital, Gaborone

Attended by oncologists, medical physicists and accelerator experts from 7 African countries, Nepal, ICEC, CERN and UK institutes.

# Research Infrastructures Roadmap

Progress report now available from

<https://www.ukri.org/research/infrastructure/>

- Summarises key policy issues and identifies emerging themes and areas of potential capability that could be addressed by infrastructures identified through consultation with research and innovation communities so far.
- The report does not seek to make specific proposals or judgements on how to deliver these or the funding of particular infrastructures.



A summary report is also available



# Spending Review 2019



# Spending Review 2019

The last full spending review in 2015 set departmental resource budgets for 16/17, 17/18, 18/19 and 19/20. Health and Defence set for 20/21.

Capital budgets set to 20/21.

Large increase to science budget in Autumn Statement 2016 - £4.7Bn over 2017/18 - 20/21, adding £2 billion pa by 2020/21.

Autumn Budget 2017 added a further £2.3 billion for 2021/22, effectively 'baselining' this uplift.



# Additional allocations since the CSR 15

**Industrial Strategy Challenge Fund** - National Satellite Test Facility, Bridging for innovators.

**Fund for International Collaboration** - ALIGO+ and AIT/Watchman

**Strategic Priorities Fund** – AI funding, major new project in Wave 1

**Talent funding** – CDTs in data intensive science. Future Leadership Fellows.

**New capital projects** – DUNE; Dirac, e-infrastructure.

**Additional funding** - £5m pa for core in 18/19 & 19/20, £2.2m for Impact Acceleration Accounts.

**Reversal of cuts** to allocations for UK National Facilities following the Independent Review.

**Reversal of 40% cuts** to core capital allocations in 18/19 & 19/20



# Spending Review 2019 parameters

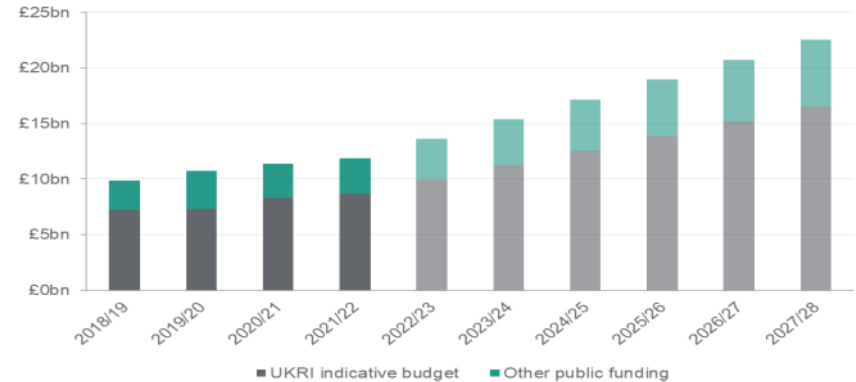
Expected to be challenging as public finances remain tight, plus potential implications of leaving the EU.

But... commitment to raise R&D spending to 2.4% of GDP by 2027.

OBR reported that January 2019 had a record budget surplus of £14.9bn (greater than forecast).

Borrowing to date in 18/19 down almost 50% relative to same period in 17/18.

Public R&D funding required to meet the 2.4% Target (£bn nominal)



# Spending Review 2019

## What we know

- Must be in 2019 to set allocations beyond March '20
- Latest indications are September - October
- Three year period 2020/21 to 2022/23
- Preparations well underway in UKRI – requested input in October 2018. UKRI making the case for the 2.4%.
- UKRI planning to have their case ready by July – we are expecting a new commission in April.



## What we don't know

- The detailed process - likely to be 2 stage. First stage to make the case for science and the UKRI budget, then 2nd phase to allocate funding within UKRI

# UKRI Spending Review preparations

STFC submitted evidence to UKRI on the impact of three scenarios to 2024/25; -20%, flat real (GDP inflators), and an increased budget scenario

- These are NOT plans or proposals

The increased budget scenario included a 'pipeline' of strategic infrastructure projects, three capital projects that are ready to go and our overall 5 Top priorities for additional funding from the SDP.

- Sustaining UK Research and Innovation Leadership
- Investing in the Talent of the Future
- Attracting Inward Investment with state of the art laboratories and infrastructure
- Inspiring Innovation
- Technology and Innovation for UKRI



# Common messages across UKRI

Core under severe pressure

- -20% is pulling out of science areas
- Flat real is still a reduction in volume

World class labs are under threat

Talent important – not just PhDs, if we are to reach the 2.4% target

New funding streams have not replaced need for core funding – in some cases increased the pressure

# Particle Physics/Astrophysics Update



# Particle Physics

LHCb reported CP violation in the  $D^0$  meson

ATLAS and CMS jointly reported the observation of the Higgs boson decaying into a pair of b-quarks (significance  $>5\sigma$ ).

Boulby Underground Laboratory hosted the second MINAR (Mine ANalogue Research) gathering, bringing various projects underground, furthering astrobiology and planetary exploration research



# DUNE prototype detectors delivered

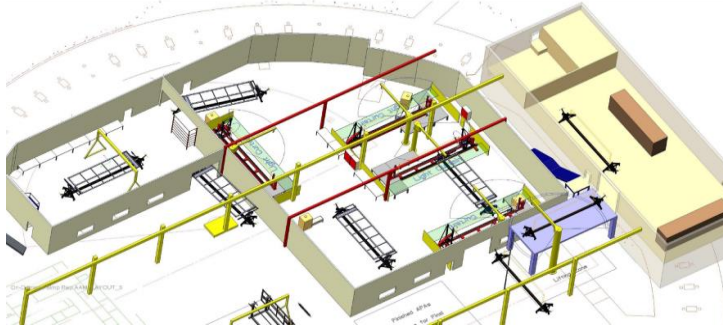
The final Anode Plane Assembly (APA) under construction at DL prior to despatching to CERN

- APA production site is under construction at DL as part of UK's £65 million contribution to the DUNE project
- UK to construct approximately 150 APA's over five years from April 2020



Paul Dabbar – DOE Under Secretary, complimentary about APA progress

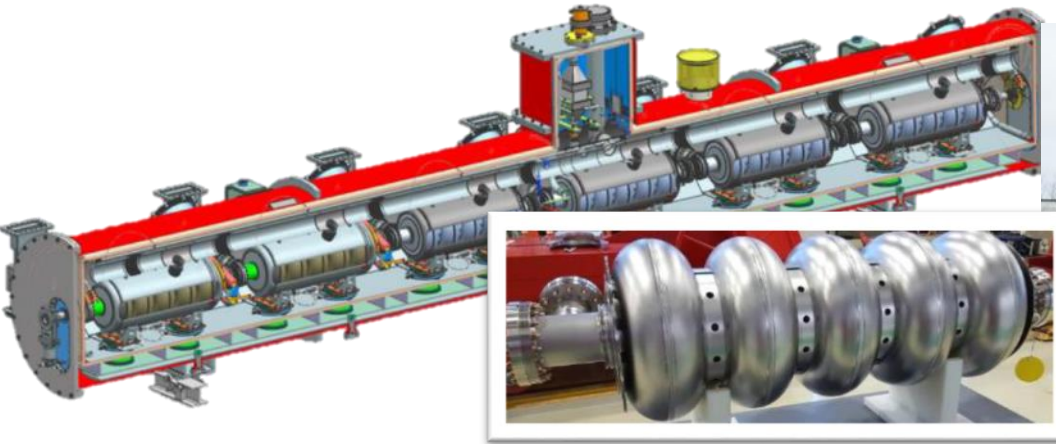
Daresbury Laboratory DUNE Factory Layout.



- Factory building moving forward with a capacity for four winding machines and associated assembly and testing equipment



# UK and PIP-II



ASTeC and Technology have secured responsibility to provide three integrated Superconducting RF (SRF) cryomodules for the PIP-II accelerator at Fermilab for LBNF/DUNE

- Opportunity to develop UK SRF industry fabrication capability and qualify new global vendor – first ever achievement!

Specialist SRF expertise and infrastructure to be developed across STFC Daresbury Laboratory and industry – driving UK growth in SRF!

- The official PIP-II ground-breaking ceremony took place at Fermilab on 15 March

# Particle Physics Programme Evaluation

PP Evaluation to be completed by May 2019

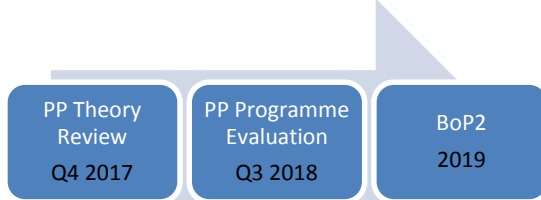
- Will feed into next Balance of Programme exercise

Consider current and future balance of the programme.

Inter-dependencies between areas to be managed (e.g. PA and PP).

Each review will explore the consequence of +/- 10% funding over the next 5 years.

2017 Review of Theory will be an input to the evaluation



# Review of Consolidated Grants

CG Review is underway.

- Chaired by Alison Davenport (former chair of Science Board)

Will consider options for grants delivery mechanisms for PP Experiment and Theory, Astronomy and Nuclear Physics.

Will need to meet the needs of STFC and its communities and offer flexibility to meet the different needs of the programme.

But should also be administratively straightforward and efficient in line with UKRI processes and TRAC methodology.

# Particle Physics Update

2018 PPE CG grants round ~£60M for 2019-2022

- Huge funding pressures due to continued flat cash, magnified by changes in TRAC methodology, and LHC commitments
- Resulting programme smaller but relatively balanced between groups and experiments. Carries significant risks to UK deliverables and physics

2019 Particle Physics Theory CG grants round underway

New major project investments:

- ATLAS and CMS Phase 2 upgrades
- DUNE report considered by Science Board 8/9 April



# Grid/Computing Update

GridPP6 (2020-24) review is underway

- Resource and hardware to support LHC experiments during Run 3

DiRAC Computing – Efforts continue to find funding for DiRAC-3 needed to help underpin STFC's frontier science programme

- Core component, together with GridPP, of National e-Infrastructure provision
- DiRAC-3 Operations proposal submitted and reviewed by PPRP in December 2018 and March 2019. Report will be submitted to June Science Board

# Particle Physics Strategy

European Strategy for Particle Physics Update underway

- Open Symposium 13-16 May, Granada, Spain
- UK Community Meeting 1 July, London, registration opens soon
- Group PIs have been invited to provide input to the Community Meeting

The impact evaluation of CERN to the UK

- Intended to highlight the myriad, and often overlooked, benefits of CERN to the UK and provide a baseline for future monitoring
- Evaluation by Technopolis, report to STFC expected summer 2019
- Thank you to everyone who participated in interviews (~50) and completed the CERN supplier and researcher survey (200+)

# Astro particle physics update

Programme Evaluation for PA concluded – no major surprises but difficult decisions ahead in a tight funding environment

- **Gravitational waves**
  - £11M for ALIGO+ from Fund for International Collaboration
- **CTA**
  - ESO named as founding members of the ERIC, so will give UK access to some observing time in future
  - Decision needed on the UK's participation in construction; based on the programme evaluation, and expected contribution.
- **Dark Matter**
  - exciting area and a review of the subject will be carried out after the Programme Evaluation.

# Watchman and Boulby Underground Lab

£9.7 million for the Advanced Instrumentation Testbed (AIT) project to harness existing particle physics research techniques to remotely monitor nuclear reactors – step change for Boulby

Expression of interest for academic participation in the UK closes 10 April 2019  
<https://stfc.ukri.org/funding/research-grants/funding-opportunities/closing-calls/expressions-of-interest-invited-for-watchman-project/>).

Will continue development of BUL as a facility for the UK



# Other updates

- New Opportunities Call 2019/20
- Joint workshop with EPSRC on quantum:  
<https://stfc.ukri.org/innovation/ways-to-work-with-us/events-and-innovations-club/innovations-club-events/quantum-opportunities-in-fundamental-physics-workshop/>
- PRD Review
- Benefits realization – new emphasis.
- Advisory panels and boards – please apply.