Phil and ECFA

- The ECFA Detector R&D Roadmap Enterprise -

The pre-ECFA days …

We worked together already since ~30 years, since the early days of ATLAS in the 1990s

- ATLAS Semiconductor Tracker
- ATLAS Upgrade Coordinator
- Chair of the ITk Institute Board
- Chair of the ECFA Detector Panel (EDP)
- **Chair of the ECFA Roadmap Panel**

Deep expertise in silicon detectors

Brilliant Scientist

Amazing overview of detector Technologies and related fields

Commitment and endurance

Excellent leadership skills
- Listening to all arguments
- Consensus oriented
- Confidence building

From the 2020 Update of the European Strategy for Particle Physics

*The **success of particle physics experiments relies on innovative instrumentation** and state-of-the-art infrastructures. To prepare and realise future experimental research programmes, the **community must maintain a strong focus on instrumentation**. Detector R&D programmes and associated infrastructures should be supported at CERN, national institutes, laboratories and universities.*

Synergies between the needs of different scientific fields and industry should be identified and exploited to boost efficiency in the development process and increase opportunities for more technology transfer benefiting society at large.

*Collaborative platforms and consortia must be adequately supported to provide coherence in these R&D activities. **The community should define a global detector R&D roadmap that should be used to support proposals at the European and national levels.***

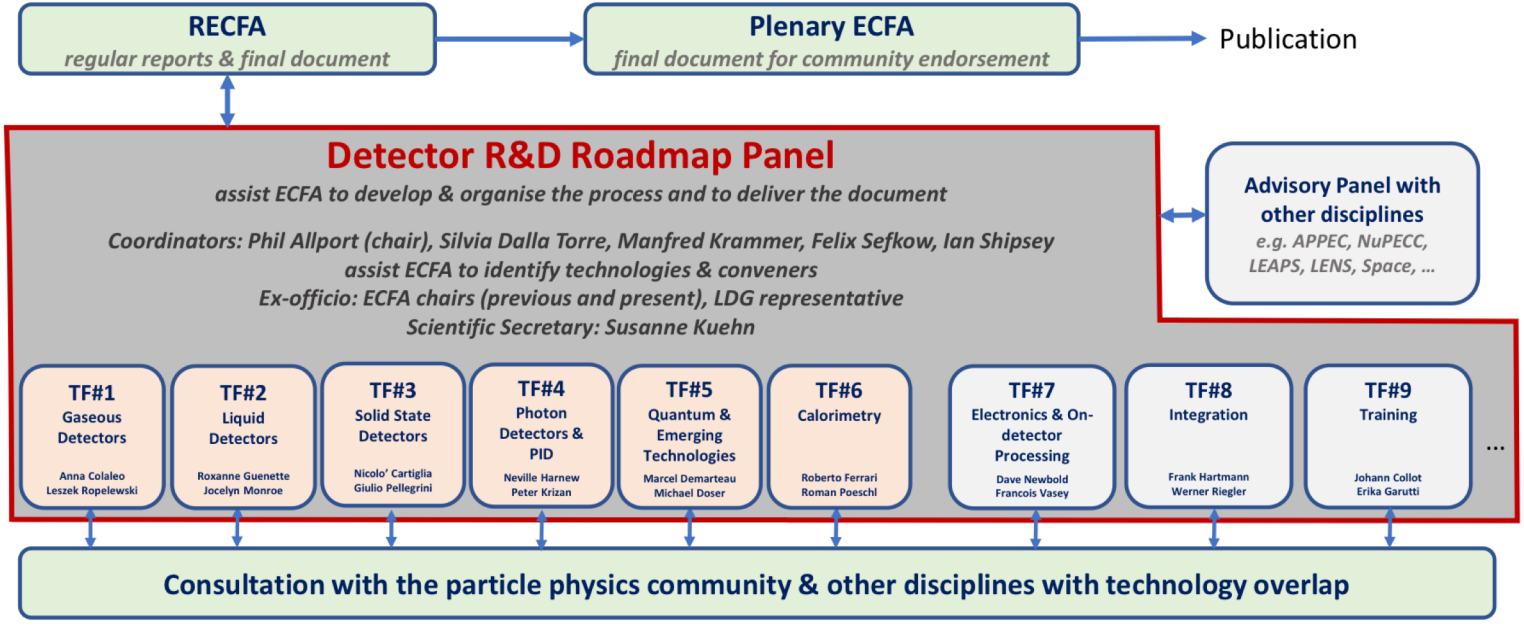
Organised by ECFA, a roadmap should be developed by the community to balance the detector R&D efforts in Europe, taking into account progress with emerging technologies in adjacent fields. The roadmap should identify and describe a diversified detector R&D portfolio that has the largest potential to enhance the performance of the particle physics programme in the near and long term. …

Who else than Phil Allport could lead this?

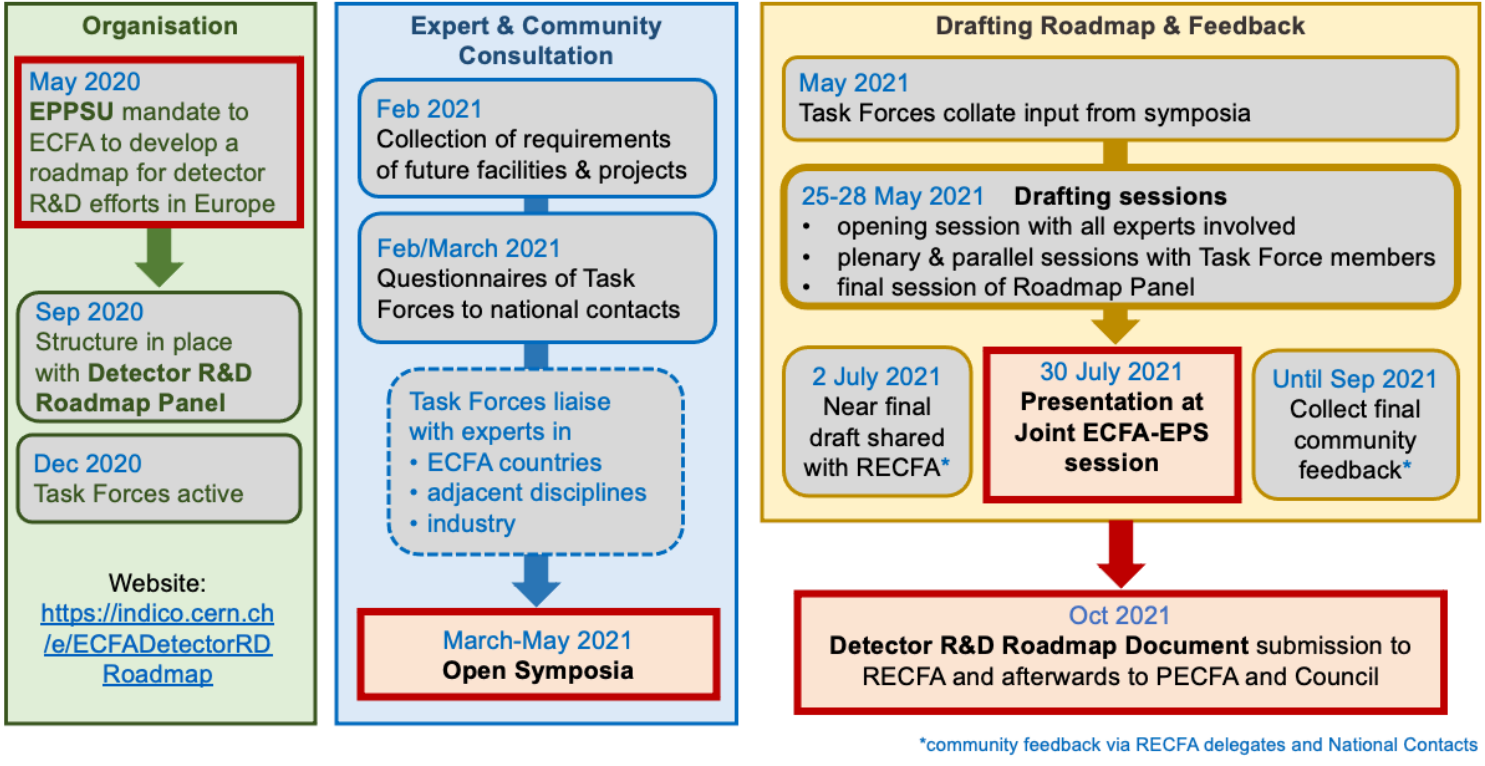
Jorgen D'Hondt (ECFA Chair 2018 – 2020) appointed Phil as Chair of a Roadmap Panel and together they designed the structure

"Today, I have no hesitation to state that I cannot think of anyone else other than you who could have led this mission impossible effort successfully and deliver such a wonderful document."
(Jorgen D'Hondt)

The Detector R&D Roadmap Panel



The Timeline of the Roadmap Process



You and the team of excellent Coordinators and Task Force Leaders made it happen. You steered this process in an excellent way.

"I saw you up close doing a superb job day in day out, leading from the front throughout the lengthy and intricate process." (Ian Shipsey)

Numerous meetings:

- *Nearly daily in the intense phase of the drafting period*
- *Meetings early morning, over lunch, late evening, often during the day, but then they were scheduled and well prepared by Phil and Susanne….*

"Numerous meetings, sometime long in time but also often short under huge time pressure to achieve the necessary conclusions. In order to accommodate these discussions within the busy work schedule of Phil and other participants these meetings took place regularly early in morning or late in the evening." (Manfred Krammer)

What impressed me most was your way of working: your incredibly strong commitment and endurance, always listening to all arguments, your patience, and in particular your ability to focus your efforts to come to the right conclusions in time.

I appreciated as well that despite all your kindness, you are also able to put up "demarcation" lines, when necessary.

You were always "online", with emails at any time, early mornings, late evenings, weekends included… and zoom meetings could be set up promptly, when needed.

The Final Product

https://cds.cern.ch/record/2784893

Plenary ECFA, 18-19 November 2021

"ALLPORT (University of Birmingham), Chair of the Detector R&D Roadmap Panel, presented a brief overview of the now completed process and summarised the conclusions and recommendations set out in the final Detector R&D Roadmap document, which was accompanied by a shorter synopsis publication for less specialist audiences, both of which would be presented to the CERN Council in December."

The Committee took note of the presentation by Allport and of the additional information provided during the discussion and unanimously approved the Detector R&D Roadmap."

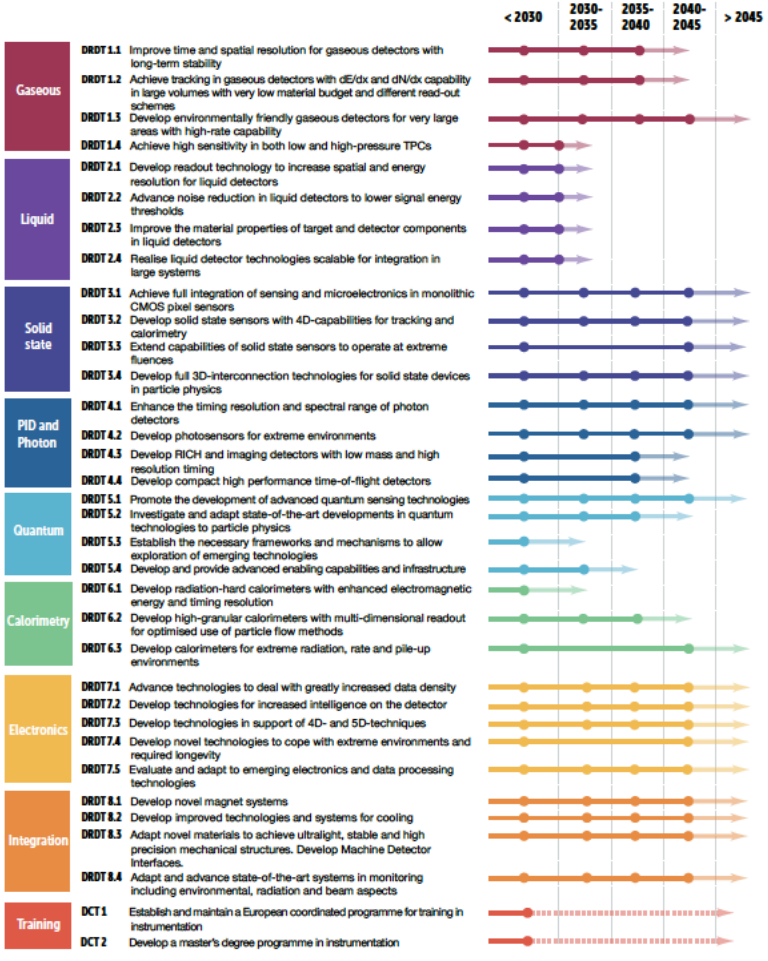
CERN Council, 9-10 December 2021

"The Council agreed to invite ECFA and the LDG to elaborate, in close collaboration with the SPC, the funding agencies and the relevant research organisations in Europe and beyond, detailed implementation plans setting out milestones, priorities and funding sources, for consideration by the Council at its Session in March 2022."

CERN Council, 29-30 September 2022

"The Council further thanked ECFA for organising the development of the roadmap, warmly welcomed the implementation plan and encouraged ECFA to move forward with the implementation phase."

Detector Research and Development Themes (DRDTs) & Detector Community Themes (DCTs)



General Strategic Recommendations (GSRs)

GSR 1 - Supporting R&D facilities

GSR 2 - Engineering support for detector R&D

GSR 3 - Specific software for instrumentation

GSR 4 - International coordination and organisation of R&D activities

GSR 5 - Distributed R&D activities with centralised facilities

GSR 6 - Establish long-term strategic funding programmes

GSR 7 - Blue-sky R&D

GSR 8 - Attract, nurture, recognise and sustain the careers of R&D experts

GSR 9 - Industrial partnerships

GSR 10 - Open Science

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"Thanks to you, we have raised what used to be a low-priority background activity to a proper field with its own organizational structure (ECFA Training Panel) and all the recognition it deserves." (Erika Garutti and Johann Collot)

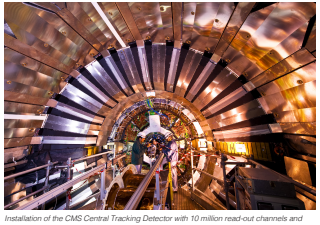
Synopsis Document:

_Building the Foundations

"Strong planning and appropriate investments in Research and Development (R&D) in relevant technologies are essential for the full potential, in terms of novel capabilities and discoveries, to be realised."

The field of particle physics builds on the major scientific revolutions of the 20th century, particularly on the experimental discoveries and theoretical developments which culminated in the Nobel Prize-winning discovery of the Higgs boson at CERN in 2012. The ambitions for the field going forward are set out from a European perspective in a global context in the European Strategy for Particle Physics (ESPP) which was updated in 2020. This strategy lays down a vision for the coming half-century, with a science programme which, in exploring matter and forces at the smallest scales and the Universe at earliest times, will continue to provide answers to questions once thought only to be amenable to philosophical speculation, and has the potential to reveal fundamentally new phenomena or forms of matter never observed before.

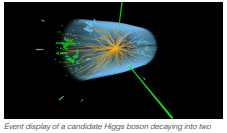
The ESPP recognises the huge advances in accelerator and detector technologies since the world's first hadron collider, the Intersecting Storage Rings, started operation at CERN 50 years ago. These advances have not only supported, and in turn benefited from, numerous other scientific disciplines but have spawned huge societal benefits through developments such as the World Wide Web, Magnetic Resonance Imaging, Positron Emission Tomography and 3D X-ray imaging.



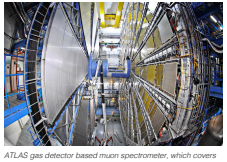
Installation of the CMS Central Tracking Detector with 10 million read-out channels and using silicon detectors covering an area of over 200 m². (© CERN)

The far-reaching plans of the ESPP require similar progress over the coming decades in accelerator and detector capabilities to deliver its rich science programme. Strong planning and appropriate investments in Research and Development (R&D) on relevant technologies are essential for the full potential, in terms of novel capabilities and discoveries, to be realised.

The 2020 update of the ESPP called on the European Committee for Future Accelerators (ECFA) to develop a global Detector R&D Roadmap defining the backbone of detector R&D required to deploy the community's vision. This Roadmap aims to cover the needs of both the near-term and longer-term programme, working in synergy with neighbouring fields and with a view to potential industrial applications.



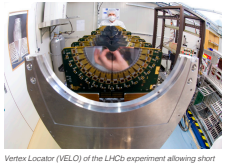
Event display of a candidate Higgs boson decaying into two photons as recorded by the CMS experiment. (© CERN)



ATLAS gas detector based muon spectrometer, which covers a total area the size of a football field and measures the paths of the muons that pass through it to an accuracy of better than a tenth of a millimetre. (© CERN)

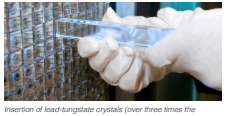
_Setting the Priorities

"To fully explore the properties of the Higgs boson and study many of the other deepest questions in physics necessitates the development of a roadmap for the required detector technologies."



Vertex Locator (VELO) of the LHCb experiment allowing short lived particle lifetimes to be measured with precision of a twentieth of a picosecond. (© CERN)

The highest priority laid down by the updated ESPP is for a future Higgs factory to thoroughly explore the properties of this completely new type of particle, which is seen as a key to a much deeper understanding of how the Universe works. Until the discovery of the Higgs boson, every known particle was either a "matter" or a "force" particle, describing the world in terms of fundamental entities and their interactions without being able to accommodate the fact that particles also have mass. In the ESPP, the vision for the future facilities to fully explore the properties of the Higgs boson and study many of the other deepest questions in physics necessitates the development of a roadmap for the required detector technologies (in much the same way as the LHC and its upgrades significantly guided R&D planning for previous decades). The ECFA Detector R&D Roadmap addresses this need whilst highlighting synergies with other projects on nearer timescales and showing how they are also embedded in the longer-term context.



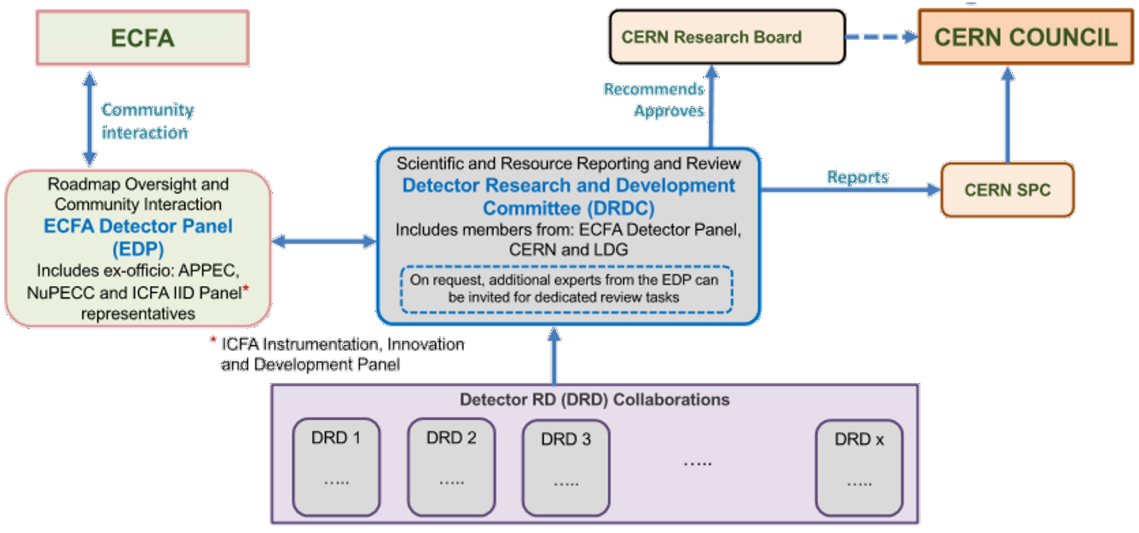
Insertion of lead-tungstate crystals (over three times the density of conventional glasses) into the high granularity electromagnetic calorimeter of the ALICE detector giving percent scale energy measurements. (© CERN)

In the area of detector development, it is vital to build on Europe's world-leading capabilities in sensor technologies for particle detection, using gas and liquid-based or solid-state detectors, as well as energy measurement and particle identification. Also required are cutting-edge developments in bespoke microelectronics solutions, real-time data processing and advanced engineering. Adequate resourcing for such technology developments represents a vital component for future progress in experimental particle physics. Talented and committed people are another absolutely core requirement. They need to be enthused, engaged, educated, empowered and employed. The ECFA Detector R&D Roadmap brings forward concrete proposals for nurturing the scientists, engineers and technicians who will build the future facilities and for incentivising them by offering appropriate and rewarding career opportunities.

ProtoDUNE: three hundred cubic metre volume prototype Liquid Argon Neutrino Detector being constructed at CERN. (© CERN)

https://cds.cern.ch/record/2784893

The Implementation



Dear Phil, it is too early to retire!
We are very grateful that you will still continue the work for ECFA!

We still need you and all your skills to successfully complete the implementation and to set up the DRDs and the review panels.

You have an important role to play as Co-Chair of the EDP and in the DRDC reviews

The Final Words

"The centrality of experimentation to the scientific method which has led to the discoveries that underpin our current understanding of the Universe, and the technological wonders which have flowed from this understanding, cannot be overstated. To appropriately test our current level of understanding requires very high accuracy instrumentation. The degree of confirmation that can be assigned to any hypothesis is determined both by the agreement between theoretical prediction and measurements and the level of precision achievable in each. Enabling future particle physics experiments to achieve the most accurate measurements possible is the fundamental target of all the proposed detector developments outlined in this report."

- ECFA Detector R&D Roadmap

You brought us together to make an instrumentation roadmap - revolutionary technologies advancing discovery science. While the end goal was clear the best path to get there was not. So you led from the front, fashioning a path and the methods to traverse it. Each step along the path was discussed, every voice was heard, diverging views were reconciled and each step was the surer for it. Although all were so busy, we enjoyed our meetings together and looked forward to the next one. We found easy agreement on the topic of each taskforce and choice of conveners, and we felt blessed by the talents of the team you assembled. Trepidation before the symposia passed quickly with their success. The symposia bestowed momentum and definition upon the taskforces. Greater trepidation preceded the four-day intense workshop where the roadmap would be written as plans for a highly-interactive in-person meeting were thwarted by COVID. We entered unknown territory where many tens of geographically scattered physicists worked remotely, but together within and across taskforces. During the workshop our daily high-pressure steering meetings called for clear, quick and responsive thinking and you provided these in abundance. As the report came together, you became the voice of the roadmap, persuasively explaining, illuminating, and clarifying it to a wider community. You won approval from ECFA, the SPC and CERN Council. The result - the roadmap - is now being followed across Europe, and the wider world takes note.

Yes, to this thought I hold with firm persistence; The last result of wisdom stamps it true:
He only earns his freedom and existence Who daily conquers them anew.

- Goethe -

With our admiration, gratitude, and respect,
Felix, Ian, Jorgen, Karl, Lenny, Manfred, Silvia, Susanne

2022 James Chadwick Medal and Prize

Professor Philip Allport is an international leader in the development of particle physics instrumentation and its implementation in experiments. He has made seminal contributions to radiation-hard semiconductor detector development and to the transfer of particle physics detector technologies for use in medical applications, as well as being central to the recent establishment of a coherent European detector R&D strategy.

Allport's work at the Large Hadron Collider (LHC) began in 1994, when he led prototyping of the silicon sensors for ATLAS. He was pivotal in the experiment's silicon technology choices, detailed specifications and sensor testing programmes. He oversaw the construction of the ATLAS Semiconductor Tracker End-Caps, one of which was fully assembled in the Liverpool Semiconductor Detector Centre under his leadership.

Allport has been a long-term leader in the ATLAS High Luminosity LHC upgrade programme, including the role of Upgrade Coordinator in the period spanning project approval (2011–15). He chaired the Institute Board for the Inner Tracker from 2017–21.

Prior to ATLAS, Allport was a pivotal figure in early high-energy physics silicon detectors, making major contributions to the microvertex detector at DELPHI and novel double-sided sensor designs for OPAL. Through the RD20 collaboration, he made the first investigations of whether silicon microvertex technologies could survive LHC doses. He was a founder member of RD50, where he initiated the study of p-type sensors: a cost-effective radiation-hard sensor technology that is now employed for both the ATLAS and CMS tracker upgrades.

Allport has taken a key role in setting the international agenda for future detector developments. He chairs the Detector R&D Panel of the European Committee for Future Accelerators (ECFA), through which he led the development of the 2021 roadmap to implement the instrumentation aspects of the 2020 European Particle Physics Strategy Update.

Allport is currently director of the Birmingham Instrumentation Laboratory for Particle physics and Applications (BILPA) , a project that he conceived and led from the outset. As well as playing a major role in the ATLAS tracker upgrade, his laboratory delivers R&D into novel monolithic active pixel sensors, low-gain avalanche detectors and medical physics applications.

Allport's work on technology transfer from particle physics to medicine is headlined through the PRaVDA and OPTima consortia, applying radiation-hard sensor technologies to imaging and dosimetry in proton therapy. As part of the COVID-19 response, he chaired the review of the CERN HEV rapidly manufacturable ventilator proposal, which was carried forward through the UK 'High Performance Low Cost' Ventilator project, where he co-led the Engineering and Prototyping work package.

Phil Allport Fest, Birmingham 27th January 2023

Thank you, Phil!

For all your contributions
to our research field

… to ATLAS, ECFA and way beyond,

and enjoy the new phase of your life!

- Not only in ECFA or ATLAS, but also giving more time to your private life -