# New CERN R&D framework and UK strategic R&D plans including discussion

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#### Towards the new 'Detector R&D' collaborations...

#### 2021 ECFA Detector R&D Roadmap

- Developed by the community to balance the detector R&D efforts in Europe
- Highlighted the need for a new R&D phase in the form of DRD collaborations
- To enhance the performance of the particle physics programme in the near and long term

ECFA R&D Roadmap (link here)



# DETECTOR RESEARCH AND DEVELOPMENT THEMES (DRDTs) & DETECTOR COMMUNITY THEMES (DCTs)

From 01.01.2024

Gaseous	DRDT 1.1	Improve time and spatial resolution for gaseous detectors with long-term stability
	DRDT 1.2	Achieve tracking in gaseous detectors with dE/dx and dN/dx capability in large volumes with very low material budget and different read-out
	DRDT1.3	schemes Develop environmentally friendly gaseous detectors for very large areas with high-rate capability
	DRDT1.4	Achieve high sensitivity in both low and high-pressure TPCs
Liquid	DRDT2.1	Develop readout technology to increase spatial and energy resolution for liquid detectors
	DRDT 2.2	Advance noise reduction in liquid detectors to lower signal energy thresholds
	DRDT 2.3	Improve the material properties of target and detector components in liquid detectors
	DRDT 2.4	Realise liquid detector technologies scalable for integration in large systems
Solid state	DRDT 3.1	Achieve full integration of sensing and microelectronics in monolithic CMOS pixel sensors
	DRDT 3.2	Develop solid state sensors with 4D-capabilities for tracking and calorimetry
	DRDT 3.3	Extend capabilities of solid state sensors to operate at extreme fluences
	DRDT 3.4	Develop full 3D-interconnection technologies for solid state devices in particle physics
PID and Photon	DRDT 4.1	Enhance the timing resolution and spectral range of photon detectors
	DRDT 4.2	Develop photosensors for extreme environments
	DRDT 4.3	Develop RICH and imaging detectors with low mass and high resolution timing
	DRDT 4.4	Develop compact high performance time-of-flight detectors
Quantum	DRDT 5.1	Promote the development of advanced quantum sensing technologies
		Investigate and adapt state-of-the-art developments in quantum technologies to particle physics
		Establish the necessary frameworks and mechanisms to allow exploration of emerging technologies
	DRDT 5.4	Develop and provide advanced enabling capabilities and infrastructure

- The roadmap identified several R&D themes
  - Critical to achieve the scientific programme in the ESPP (European Strategy for Particle Physics)
- Derived from the technological challenges that need to be overcome for the scientific potential of the future facilities

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	DRDT 6.1	Develop radiation-hard calorimeters with enhanced electromagnetic energy and timing resolution
Calorimetry	DRDT 6.2	Develop high-granular calorimeters with multi-dimensional readout for optimised use of particle flow methods
	DRDT 6.3	Develop calorimeters for extreme radiation, rate and pile-up environments
Electronics	DRDT7.1	Advance technologies to deal with greatly increased data density
	DRDT7.2	Develop technologies for increased intelligence on the detector
	DRDT7.3	Develop technologies in support of 4D- and 5D-techniques
	DRDT7.4	Develop novel technologies to cope with extreme environments and required longevity
	DRDT7.5	Evaluate and adapt to emerging electronics and data processing technologies
Integration	DRDT 8.1	Develop novel magnet systems
	DRDT 8.2	Develop improved technologies and systems for cooling
	DRDT 8.3	Adapt novel materials to achieve ultralight, stable and high precision mechanical structures. Develop Machine Detector Interfaces.
	DRDT 8.4	Adapt and advance state-of-the-art systems in monitoring including environmental, radiation and beam aspects
Training	DCT1	Establish and maintain a European coordinated programme for training in instrumentation
	DCT 2	Develop a master's degree programme in instrumentation

#### Areas of 'Detector R&D'

#### Strategic R&D via DRD Collaborations

- Long-term strategic R&D lines
- To address the high-priority items defined in the Roadmap via the DRDTs

#### "Blue-sky" R&D

- Competitive
- Short-term responsive grants
- Nationally organised

#### Experiment-specific R&D

- With very well defined detector specifications
- Funded outside of the DRD programme, via experiments

## Timeline for establishing the new DRD Collaborations

Q4 2022

 DRD proposal teams formed to lead the preparation of the DRD proposals in each area

Q1 2023

- Each DRD proposal team calls for expressions of interest from institutes and community workshops take place
- DRDC membership appointments begin

Q2 2023

- The new DRD proposals are developed based on the detector roadmap and community interest
- Mechanisms agreed with funding agencies for structuring country-specific
   DRD collaboration funding requests

# Timeline for establishing the new DRD Collaborations

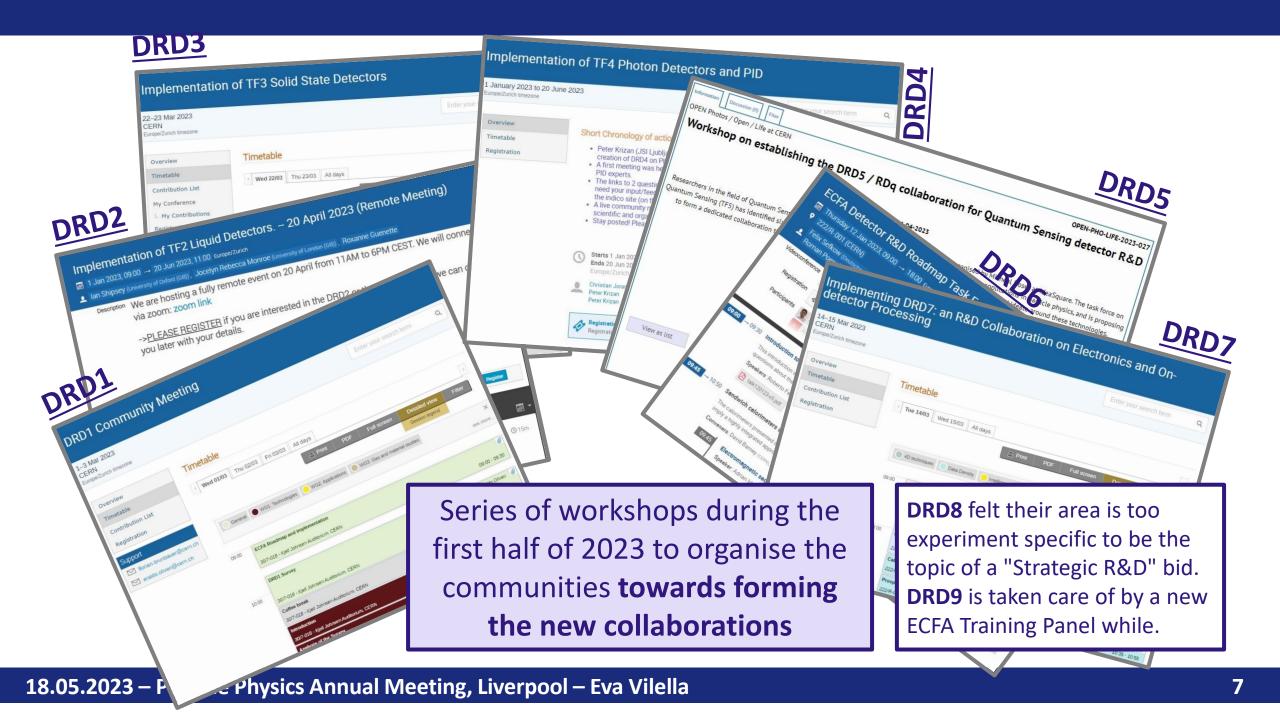
Q3 2023 The DRD proposal teams submit full DRD Proposals, including estimates of the resources needed

**Q4 2023** Following the review and revision (if required) of proposals, the DRDC recommends the formal establishment of the DRD collaborations

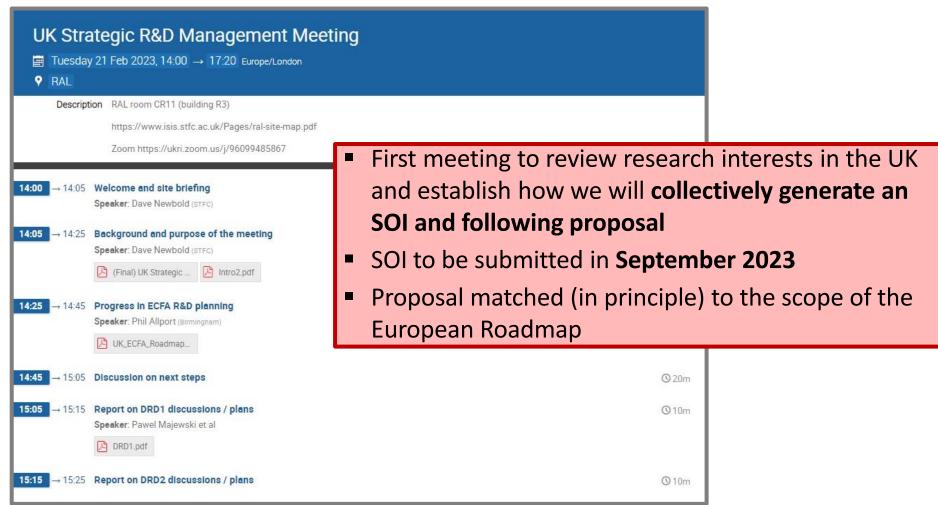
- Formal approval is given by the CERN Research Board
- Collection of MoU signatures

# Formal start of the DRD Collaborations (01.01.2024)

(End of current RD Collaborations)



# Strategic Detector R&D Proposal in the UK



**Meeting link** 

#### UK Tracker Strategic R&D

- Daniel Hynds (University of Oxford), Eva Vilella (University of Liverpool), Jens Dopke (STFC), Laura Gonella

- Workshop to shape the strategic UK R&D programme on solid state detectors within the international DRD3 and DRD7 collaborations, and the proposal that will later be submitted to STFC
- 26-27 June in Liverpool