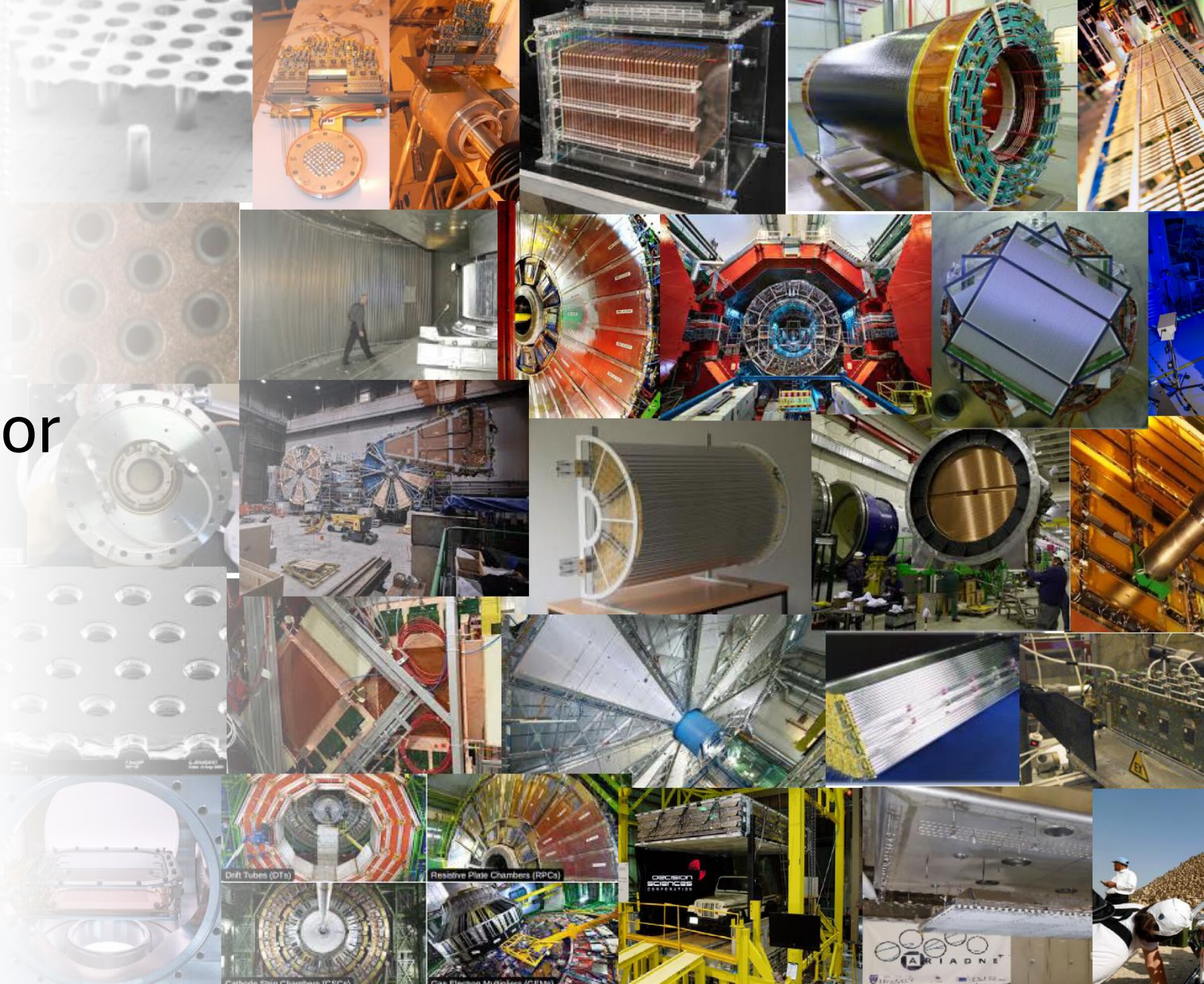
DRD1

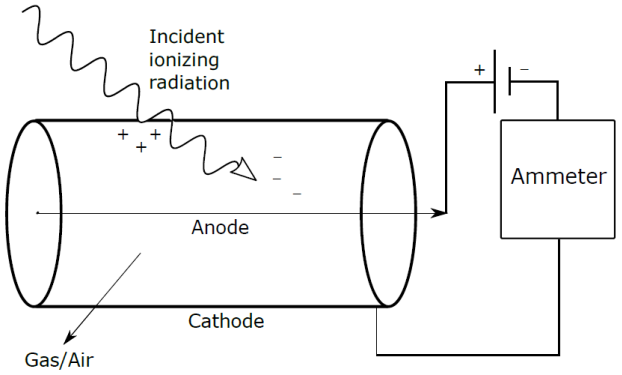
Development of Gaseous Detector Technologies

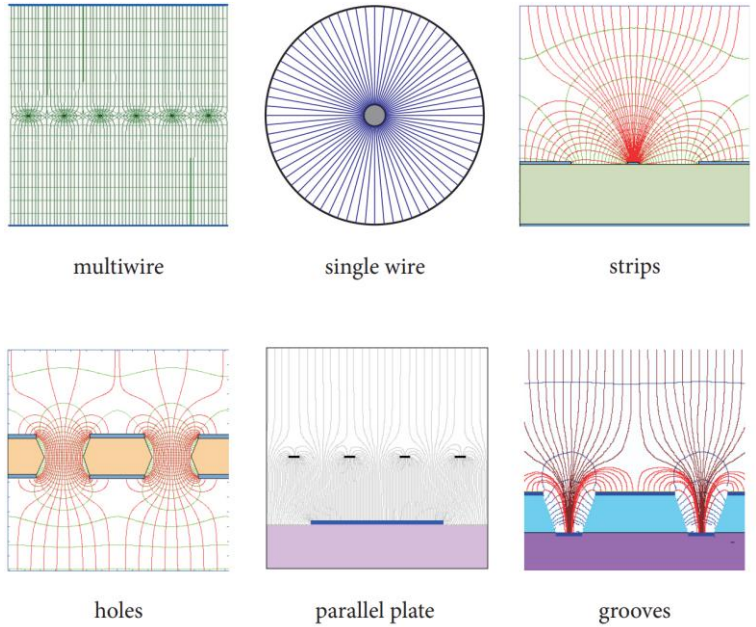


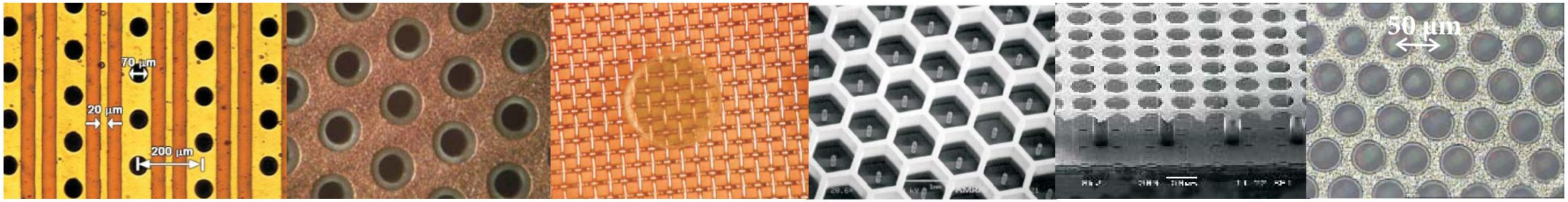
Kirill Salamatin

What are Gaseous Detectors?

- Particle detection via ionisation in gas
- Large-area, flexible detector technology
- Used for tracking, timing, calorimetry, PID





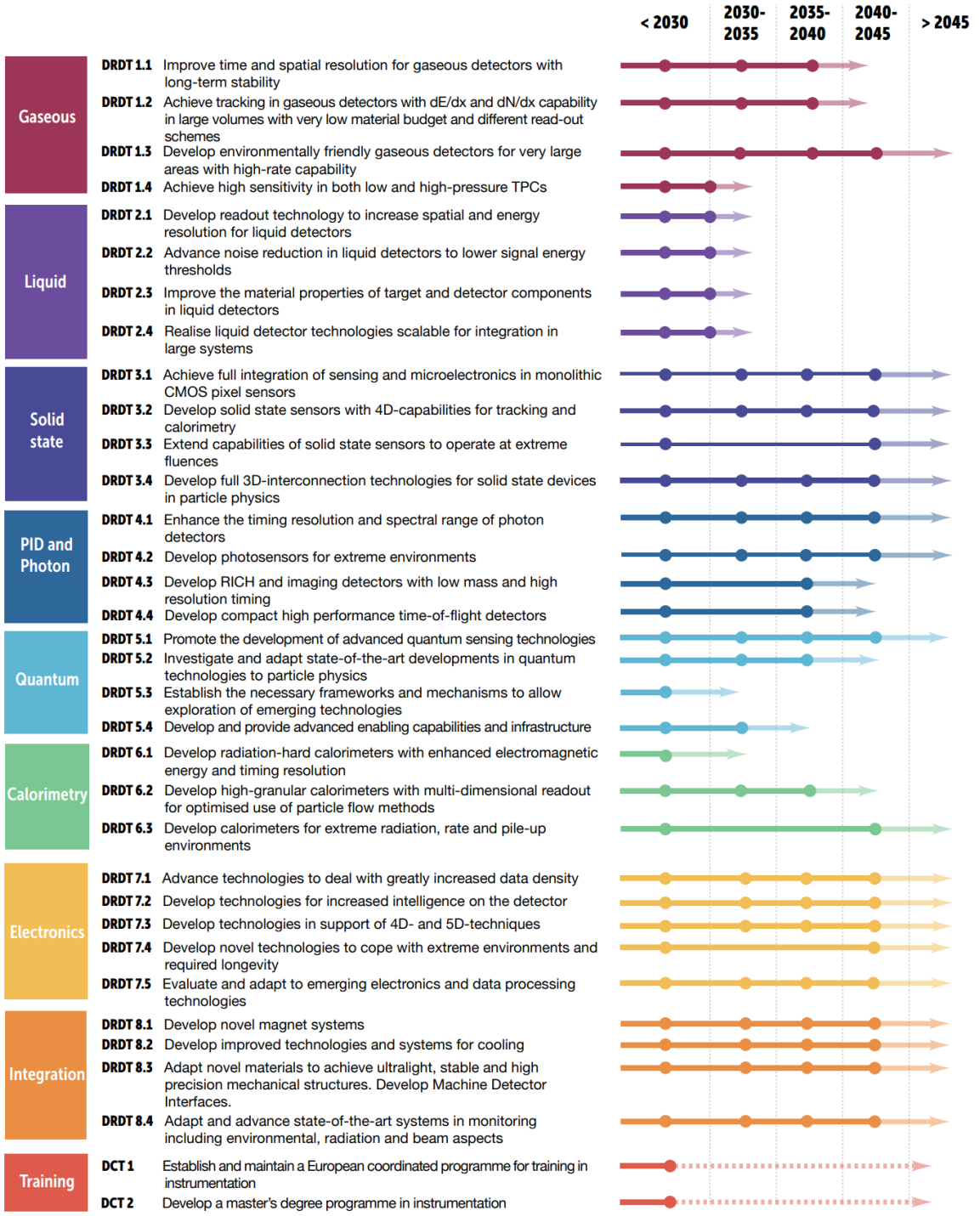


Why DRD Collaborations?

- Detector R&D is increasingly complex and costly
- Long timescales for future experiments
- Need for coordination and shared infrastructure
- Driven by the ECFA Detector R&D Roadmap

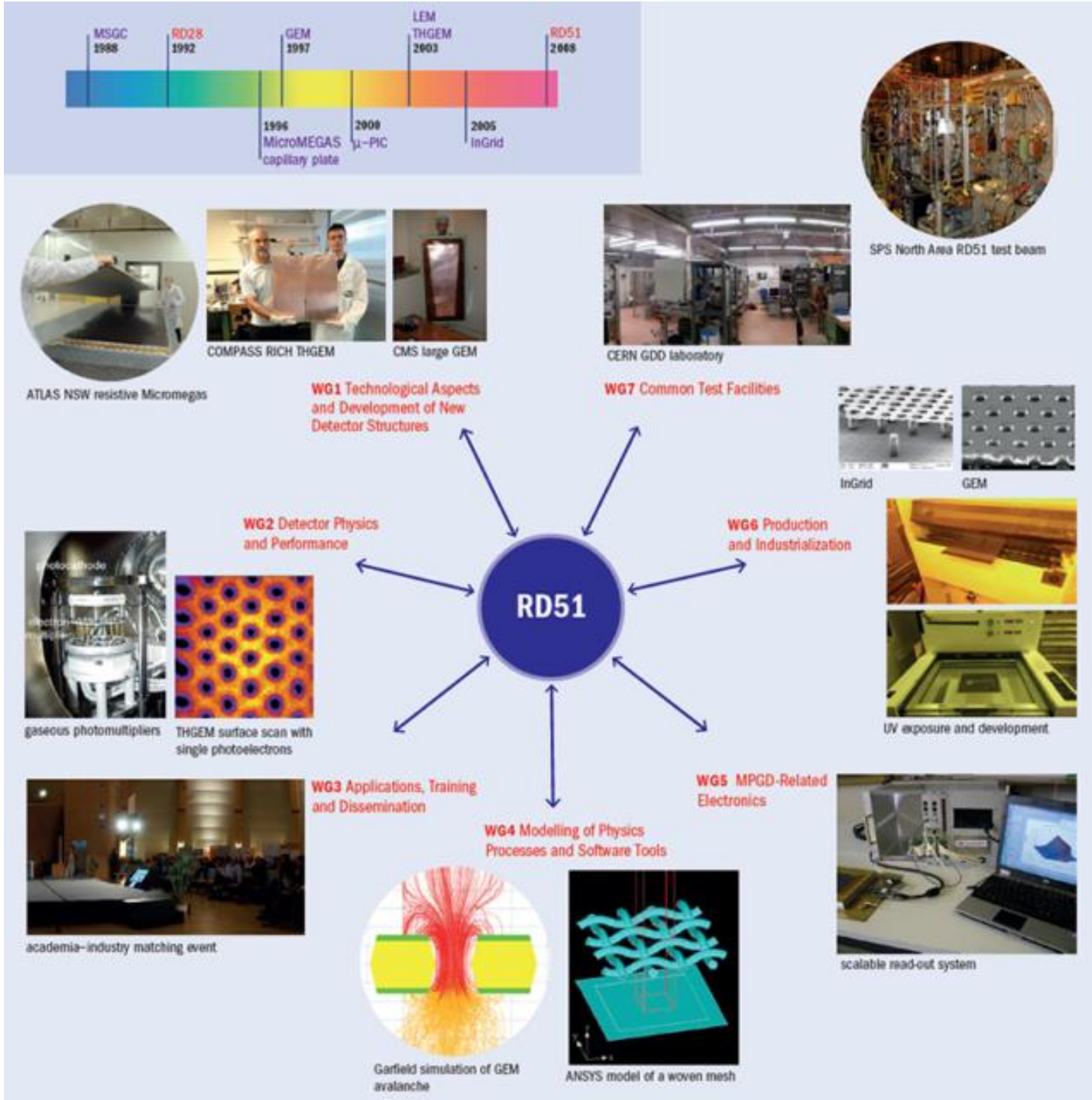
European Strategy Update

ECFA
European Committee for Future Accelerators



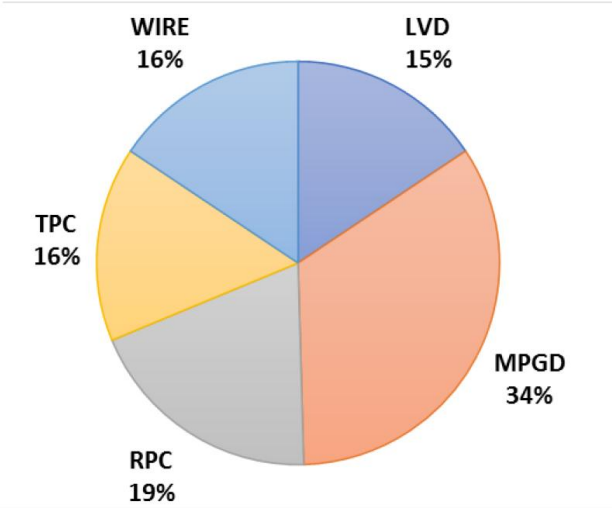
From RD51 to DRD1

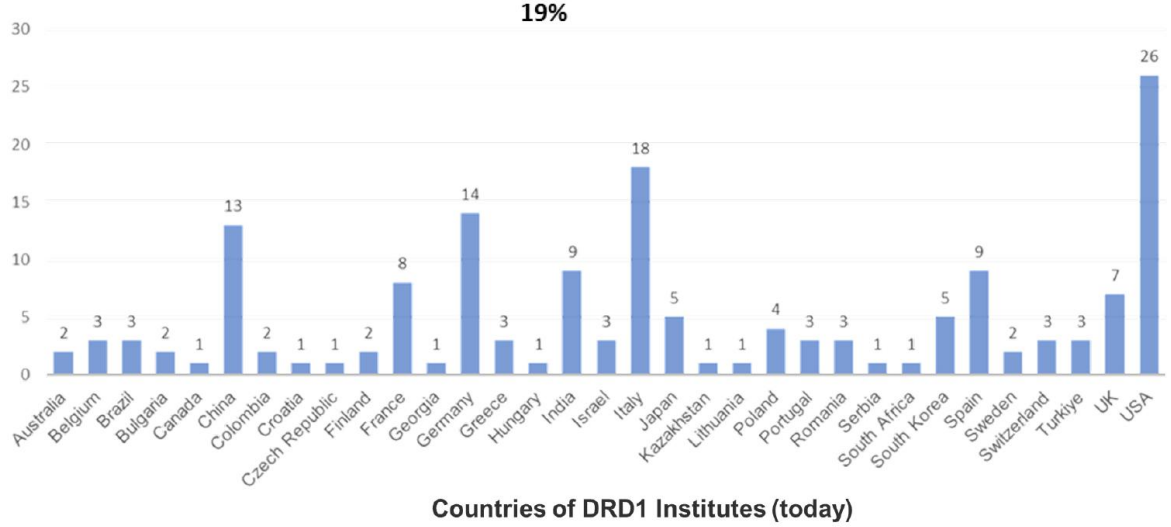
- Founded at CERN in 2008 to coordinate gaseous detector R&D
- Focused on Micro-Pattern Gaseous Detectors (MPGDs)
- International community of ~70+ institutes and 25+ countries
- Shared infrastructure: tools, test beams, simulation & workshops
- Paved the way for DRD1 evolution



DRD1 Community

- ***161 Institutes***
- ***5 Industrial, Semi-Industrial and Research Foundations***
- ***33 Countries***
- ***More than 700 members***





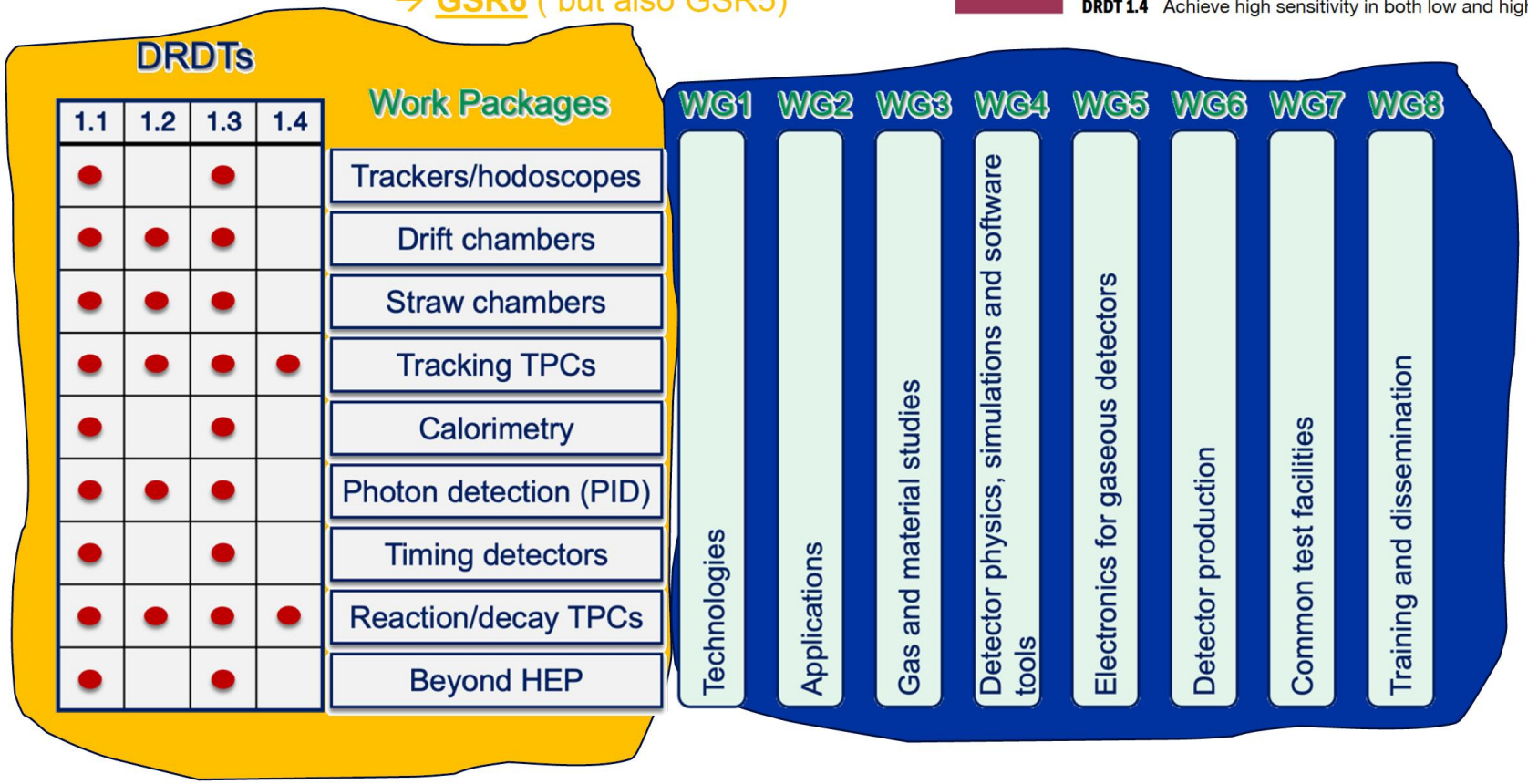
Countries of DRD1 Institutes (today)

How DRD1 is Organized

Strategic R&D and Long-Term Funding based on Work Packages
→ **GSR6** (but also GSR5)

Gaseous

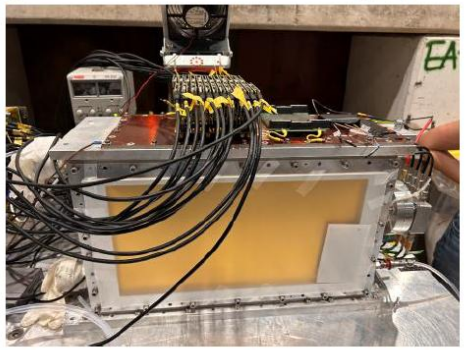
DRDT 1.1 Improve time and spatial resolution for gaseous detectors with long-term stability
DRDT 1.2 Achieve tracking in gaseous detectors with dE/dx and dN/dx capability in large volumes with very low material budget and different read-out schemes
DRDT 1.3 Develop environmentally friendly gaseous detectors for very large areas with high-rate capability
DRDT 1.4 Achieve high sensitivity in both low and high-pressure TPCs



R&D Framework based on Working Groups
→**GSR5**
(but also GSR6**)**

Scientific Scope of DRD1

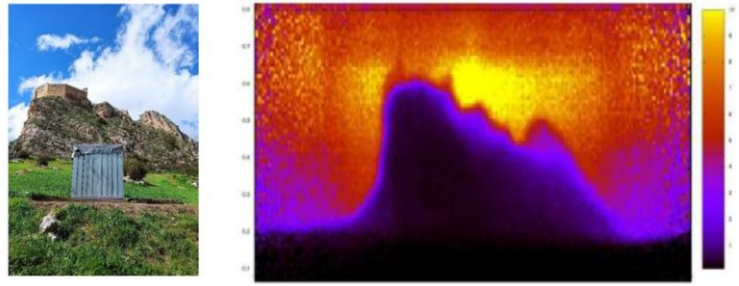
High-Rate Tracking (HYDRA)



HYDRA pion tracker, GEM+MM
TPC with VMM3a readout

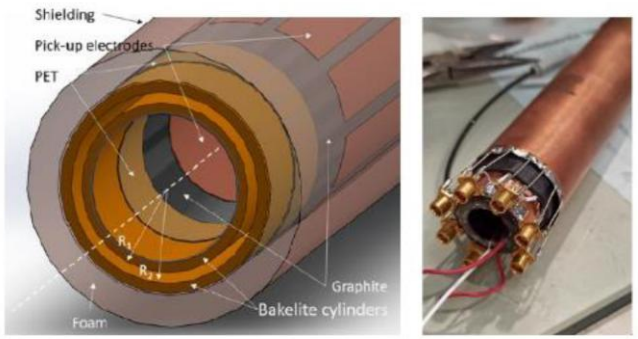
Self-supporting Straw module (PANDA-STT)

Muon imaging and extreme environment conditions



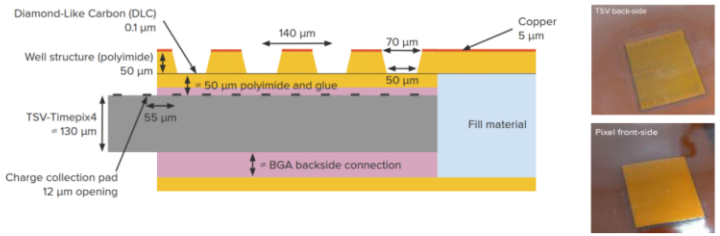
Sealed mode operation demonstrated for over 6 months for RPCs and MWPCs.

New Detector Structures

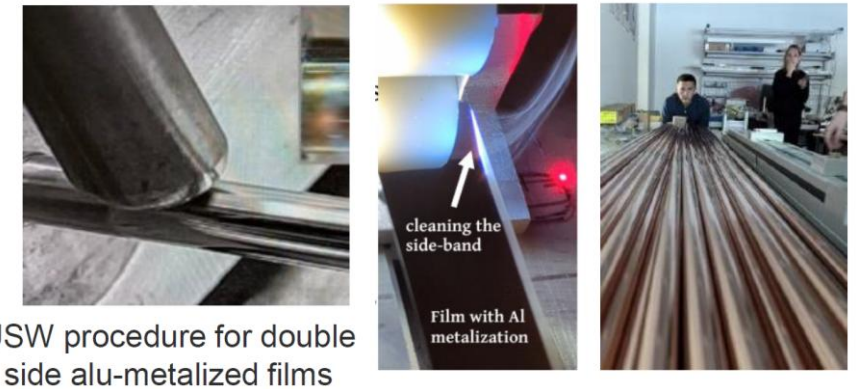


Resistive Cylindrical Chamber: RCC
https://doi.org/10.1016/j.nima.2023.168822

Timepix4 Embedding in uRWELL/MM



Ultrasonic Welding Technique



USW procedure for double side alu-metalized films

Examples of DRD1 Activities

- New detector concepts
- Eco-friendly gas mixtures
- Advanced electronics and DAQ
- Test beams and irradiation
- Detector schools

DRD1 Gaseous Detector Schools

Lab exercises

FTD at Bonn University hosting the school was a unique opportunity to include lab exercises on the **manufacturing and assembly** of GEMs in the in-house cleanroom facilities as well as the readout of a small TPC with **GridPix** detectors.

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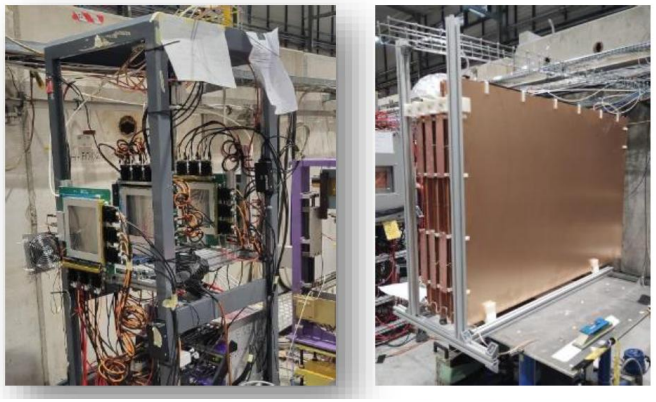
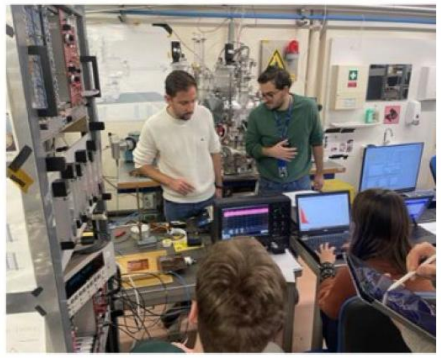
FE & DAQ for Test Beam

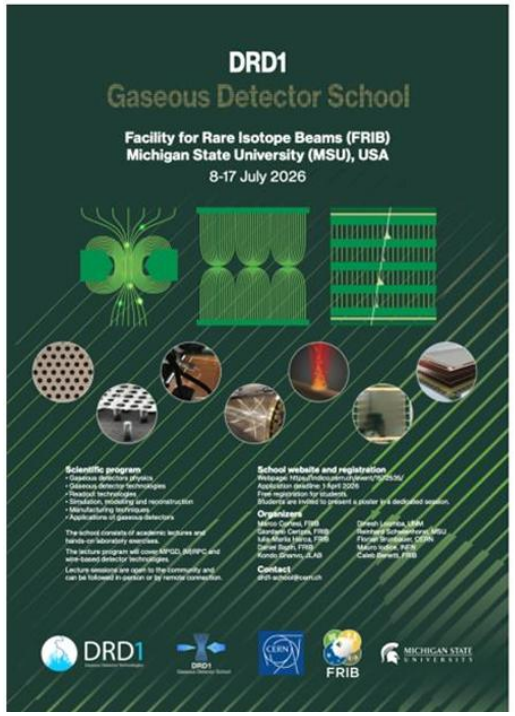


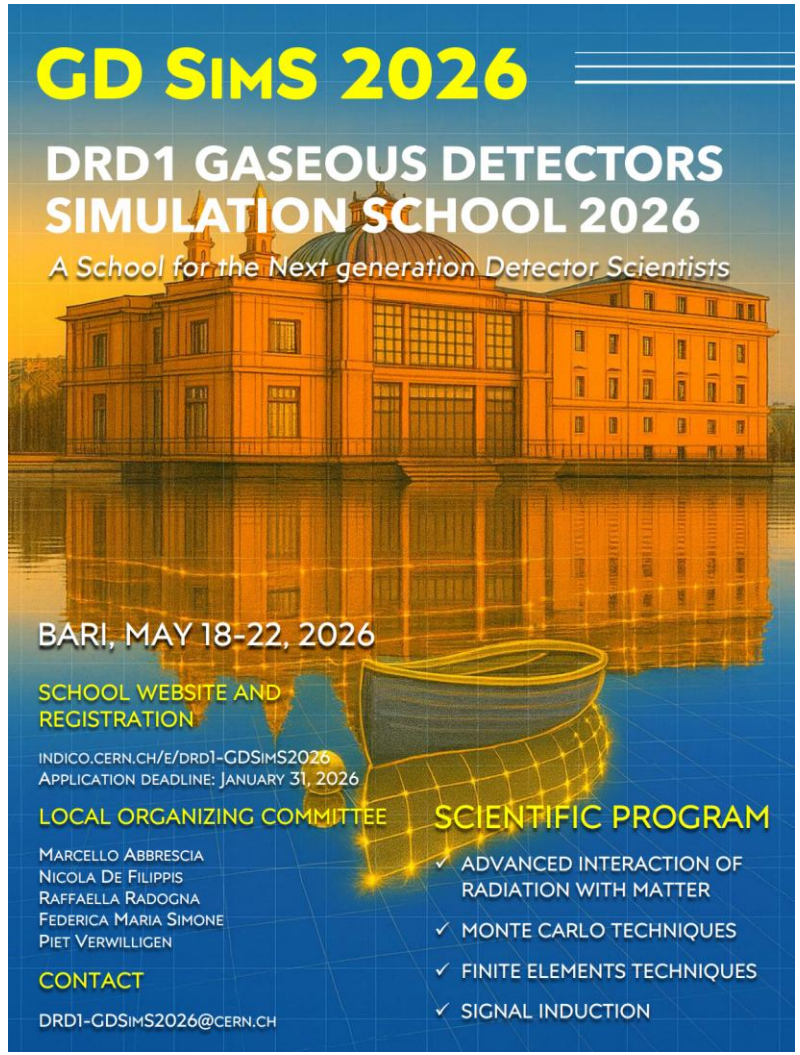
DRD1 Beam telescopes

Training & Opportunities for Students

- DRD1 detector schools
- Hands-on lab and test-beam work
- MSc & PhD thesis projects
- International networking







DRD1 Interests @ IFIC

Related to the **NA64** project:

- Integration of readout pipeline and FE into NA64 DAQ
- Joint testbeam campaigns for detectors, electronics and gas studies

Related to the **NEXT** project:

- Electroluminescent Xe TPCs for $0\nu\beta\beta$
- Low-diffusion gases for high-pressure Xe TPCs
- Dense SiPM tracking for topology & energy reconstruction