Proposal for the DRD1 organization

A team including representatives of different technologies will guide the transition phase:

- ECFA TF1 Conveners : Anna Colaleo, Leszek Ropelewski; Other TF1 Members: Klaus Dehmelt, João Veloso
- ECFA Coordinators Group Member: Silvia Dalla Torre
- MPGDs: Eraldo Oliveri, Fulvio Tessarotto, Maxim Titov
- RPCs: Ingo Deppner, Giuseppe Iaselli, Barbara Liberti
- TPCs: Esther Ferrer Ribas, Jochen Kaminski
- Large volume detectors: Marco Panareo, Francesco Renga
- Straw tubes, TGC, CSC, drift chambers, and other wire detectors: Peter Wintz
- Infrastructure, detector R&D programmes (CERN EP R&D, AIDAinnova): Roberto Guida, Beatrice Mandelli
- Administrative support: Hans Taureg, Florian Brunbauer

Proposal for the DRD1 organization

Conclusions from the Community Meeting

DRD1 Community Meeting 1-3 March 2023

- **Collaboration type: Community-driven** with the **R&D environment** (common infrastructures and R&D tools).
- **Scientific organization: Working Groups** structure with mixed technologies, flexibility, and possible parallel configurations.
- **DRD1 funding model: light-weight** RD51-like **MoU** (focused on collaboration aspects including common fund and fund sharing, organization, and signed by all DRD1 Institutes) and annexes with **Work Packages** (describing deliverables, work plan, and resources, and signed by participating funding agencies).

Working Group ≠ Work Package !!!

Working Groups (proposal)

DRD1 Scientific Platform

Working Groups are defining the platform for:

- **Sharing experience** (Work Packages (WPs), Common Projects(CPs), Experiments, generic R&D, and detector physics studies)
- **Identifying directions for the future detector R&D** supported by assisting in the establishment of WPs and CPs
- **Maintaining an R&D environment** for developing gaseous detector technologies:

  - Gas and material studies, and link to the novel technologies
  - Software tools and detector physics
  - Electronics for gaseous detectors
  - Detector production
  - Infrastructure for detector R&D
  - Training and dissemination

DRD1 Scientific Organization (proposal)

Working Groups

WG1: Technologies, limitations, and challenges ➔ WG2, WG4
Includes detector physics aspects

- MPGDs
- RPCs, MRPCs
- Large Volume Detectors (drift chambers, TPCs)
- Wires: straw tubes, TGCs, CSCs
- New amplifying structures

WG2: Applications ➔ WG1
full alignment with the ECFA detector R&D roadmap and Work Packages funding model

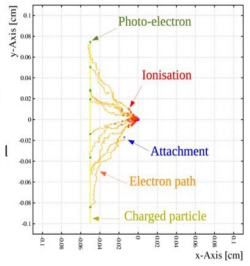
- Muon systems
- Inner and central tracking with particle identification capability
- Calorimetry ➔ DRD6
- Photon detection ➔ DRD4
- Time of Flight systems
- TPCs for rare event searches ➔DRD2
- Fundamental research applications beyond HEP
- Medical and industrial applications

WG3: Gas and material studies ➔ WG7
Interdisciplinary working group

Gas	- Gas Properties (e.g. cross-section, chemical characterization, measurements) - Eco-gases studies - Light emission in gas
Systems	- Gas recuperation and recirculation systems - Gas systems - Sealed detectors and systems
Materials	- Resistive electrodes - Solid converters - Photocathodes (novel, aging, protection) - Novel materials (e.g. nanomaterials) - Material properties for detector and infrastructures - Light (low material budget) materials - Precise mechanics
Long-term operation	- Ageing - Outgassing - Radiation hardness

WG4: Detector physics, simulations, and software tools

- Detector Physics
  simulation & modeling of physics processes that happen inside detectors:
  - basics: primary ionization; electron & ion drift; avalanches; signal induction
  - advanced: avalanche to streamer; discharges; rate-capability; clustering of ions …
- Detector Performance
  modeling and simulation of detection efficiency, spatial resolution, time resolution, track reconstruction, two-track separation, …
  - stand-alone (e.g. Garfield++)
  - integrated in big experiment (e.g. GEANT4 & custom C++ digitizers)
- Software development and maintenance
  people working on SW integrated in their experiments – private code
  Stand-alone or re-usable code available to everyone (e.g. Garfield++)
- Gas Properties Databases (e.g. cross-sections)
  Measurements - Extraction of cross-sections from data
  Upload in DB – Implementation in SW Tools (e.g. Magboltz)
- Detector design
  Specific software used for detector design …
  of course we need this but … commercial … no R&D in our community



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DRD1 Scientific Organization (proposal)

Working Groups

WG5: Electronics for gaseous detectors ➔ DRD7

- Analog/Digital Electronics
- Discrete Readout Front End Electronics and ASICs (strips/pixels)
- Charge/Photon readout
- FE input protection & spark quenching
- Waveforms and Digitizer
- Cluster Counting
- Signal Processing
- Specific needs: Timing, High rate, Low noise, Wide Dynamic Range,…)
- Grounding and shielding
- Calibration
- SoC based sensor readout
- General purpose DAQ, FPGA based readout/trigger and Trigger-less systems
- High Voltage Systems and High Voltage distribution schemes
- LV Powering
- Cooling
- Laboratory instrumentation (High resolution floating ammeters, Monitoring and control systems)

WG6: Detector production

- Common production facilities
- Process industrialization
- Collaboration with industrial partners
- Material database

WG7: Common test facilities ➔ Euro-labs, WG3

Includes development of common detector characterization standards

- Detector development laboratories
- Test beam
- Irradiation facility
- Laser
- Cosmic ray test bench

} Detector common test facilities

- Ageing Study Facility
- Outgassing Study Facility
- Gas studies facility
- Chemistry and material laboratory

} Specialized characterization facilities

- Clean Room(s)
- Detector Mechanical workshop(s)
- Gas system workshop(s)
- Metrology facility

} Support Facilities (not testing but assembly,..)

WG8: Training and dissemination ➔ ECFA TF9

- Topical workshops
- Schools
- Technical trainings
- Knowledge and technology transfer
- Education and outreach
- Supporting and promoting careers

Synergies with General Strategic Recommendations

GSR 1 - Supporting R&D facilities – WG7

GSR 2 - Engineering support for detector R&D – WG5

GSR 3 - Specific software for instrumentation - WG4

GSR 4 - International coordination and organization of R&D activities – DRD1

GSR 5 - Distributed R&D activities with centralized facilities – WG3, WG4, WG7

GSR 6 - Establish long-term strategic funding programs – Work Packages

GSR 7 - Blue-sky R&D - Common Projects

GSR 8 - Attract, nurture, recognize, and sustain the careers of R&D experts – WG8

GSR 9 - Industrial partnerships – WG6

GSR 10 - Open Science – DRD1

DRD1 Funding (proposal)

With the intention to keep lightweight RD51 like MoU and flexibility

Common Fund - very **limited** fixed **contribution** by each institute (covered by MoU signed by all member Institutes)

- *common projects* (blue sky and other projects requiring special support and vital for the community) approved and reviewed by DRD1 management (matching funds requirement)
- limited support for the *electronics and software tools* development
- limited support of the *common facilities*
- Collaboration events support (*meetings, conferences, schools*)

Work Packages - funds won, fully controlled, and operated by participating Institutes - **major funding lines** for strategic R&D projects as **identified** (scientific promotion) **by DRD1** (covered by MoU addenda)

- a formal agreement between *participating inst*itutes and DRD1 management and/or host lab
- approved and co-signed by funding agencies
- scope, deliverables, work plan, resources
- coordinated internally by participating institutes, reported to DRD1 and reviewed by DRDC
- WG (software, electronics, ..) activities should be included when possible

Work Packages group activities of the Institutes with shared research interests around **Applications** (TPC, Muon Systems, Calorimetry,..), **Challenges** (Precise timing, High rate, Longevity,..), **Technologies** (Resistive electrodes, Photocathodes,..), **Detector Technologies** (MPGDs, RPCs, Wires,..), **or Working Group tasks** (Electronics, Software tools,..).

Major Common Investments (material, infrastructure) - a similar mechanism to WPs

art. 9.3 of the MoU for the RD-51 Collaboration:

independently from the RD-51 Common Fund, Parties to the RD-51 Collaboration may agree amongst themselves to share costs for common projects, such as the submission of wafer production or other procurements.

Common Projects (proposal)

Short-term, community supported

Common Projects support **blue sky** and other **projects vital for the community** and requiring special backing.

They are approved and reviewed by DRD1 management.

They are **supported by DRD1 Common Fund** with matching resources from participating Institutes.

There is a requirement for a minimum number of participating Institutes (5) to encourage collaborative effort.

They are limited in time (3 years).

Support is limited (20-30k/y).

Successful Common Projects may advance to **Work Packages.**

Work Packages (proposal)

Long-term, Strategic R&D, FA supported

Work Packages group activities of the Institutes with **shared research interests** around **Applications** (TPCs, Muon Systems, Calorimetry,..), **Challenges** (Precise Timing, High-Rate Performance, Longevity,..), **Technologies** (Resistive Electrodes, Photocathodes,..), **Detector Technologies** (MPGDs, RPCs, Wires,..), **or Working Group tasks** (Electronics, Software Tools, Gas Properties...).

Like CPs, they may start at any time.
There is no obligation to participate in the WP to be a member of DRD1.

WPs are organized and coordinated internally by participating Institutes.
They define their scope, deliverables, and work plan and describe involved resources.
They are reporting to DRD1 and are reviewed by DRDC.

Involved **funds come from participating Institute's Funding Agencies** through **major funding lines** for strategic detector R&D as identified by the ECFA detector R&D roadmap in compliance with DRD1 scientific program.

Funds are **fully controlled and operated by participating Institutes.**

A formal agreement (DRD1 MoU Addendum) between participating Institutes, DRD1 management, and the host lab (CERN) is requisite **when required by FAs.** In this case, it should be approved and co-signed by Funding Agencies.

Work Packages **take full advantage and may contribute** to the DRD1 scientific program, R&D environment, infrastructure, and R&D tools (electronics, software).

DRD1 Implementation Timeline

- **From January 2023**: Through the team members, collect the contact person(s) for each institution interested in joining the collaboration, set up a proposal-writing group with the goal of preparing the DRD1 proposal
- **23 January:** Survey sent to contact persons identified by the team to get the first feedback from the community.
- **1-3 March:** Community Meeting at CERN
  - *Review of inputs received from the community until 15 February*
  - *Begin preparing a short proposal outlining the path to fulfilling and developing the technological goals outlined in the ECFA R&D roadmap for the gaseous detector.*
- **By Easter** (April 7th): 3-4 pages draft chapter ready for community consultation
- **1st of May:** the end of the Survey and end of community consultation
- **May-Middle June**: Proposal Team works on proposal document within Working Groups
- **Middle June** (week 19-23 of June) : Community (Collaboration)-wide discussions/workshop for finalizing the proposal