

DRD-on-Calorimetry

Welcome to Collaboration Meeting

Roman Pöschl



On behalf of DRD Calo Proposal Team

DRD Calo – Collaboration Meeting April 2024

Coordinators: Roberto Ferrari, Gabriella Gaudio (INFN-Pavia), R.P. (IJCLab)

Representative from ECFA Detector R&D Roadmap Coordination Team: Felix Sefkow (DESY)

WP 1: Sandwich calorimeters with fully embedded Electronics – Main and forward calorimeters

Conveners: Adrian Irlles (IFIC, adrian.irlles@ific.uv.es), Frank Simon (KIT, frank.simon@kit.edu), Jim Brau (University of Oregon, jimbrau@uoregon.edu), Wataru Ootani (University of Tokyo, wataru@icepp.s.u-tokyo.ac.jp), Imad Laktineh (I2PI, imad.laktineh@in2p3.fr), Lucia Masetti (masetti@physik.uni-mainz.de)

WP 2: Liquified Noble Gas Calorimeters

Conveners: Martin Aleksa (CERN, martin.aleksa@cern.ch), Nicolas Morange (IJCLab, nicolas.morange@ijclab.in2p3.fr), Marc-Andre Pleier (mpleier@bnl.gov)

WP 3: Optical calorimeters: Scintillating based sampling and homogenous calorimeters

Conveners: Etienne Auffray (CERN, etiennette.auffray@cern.ch), Marco Lucchini (University and INFN Milano-Bicocca, marco.toliman.lucchini@cern.ch), Philipp Roloff (CERN, philipp.roloff@cern.ch), Sarah Eno (University of Maryland, eno@umd.edu), Hwidong Yoo (Yonsei University, hdyoo@cern.ch)

WP 4: Electronics and DAQ

Christophe de la Taille (OMEGA, taille@in2p3.fr)

Transversal Activities

Photodetectors: Alberto Gola (FBK, gola@fbk.eu)

- **ECFA R&D Roadmap**
 - CERN-ESU-017 <https://cds.cern.ch/record/2784893>
 - 248 pages full text and 8 page synopsis
- Endorsed by ECFA and presented to CERN Council in December 2021

The Roadmap has identified

- General Strategic Recommendations (GSR)
 - Detector R&D Themes (DRDT)
 - Concrete R&D Tasks
- Timescale of projects as approved by European Lab Director Group (LDG)

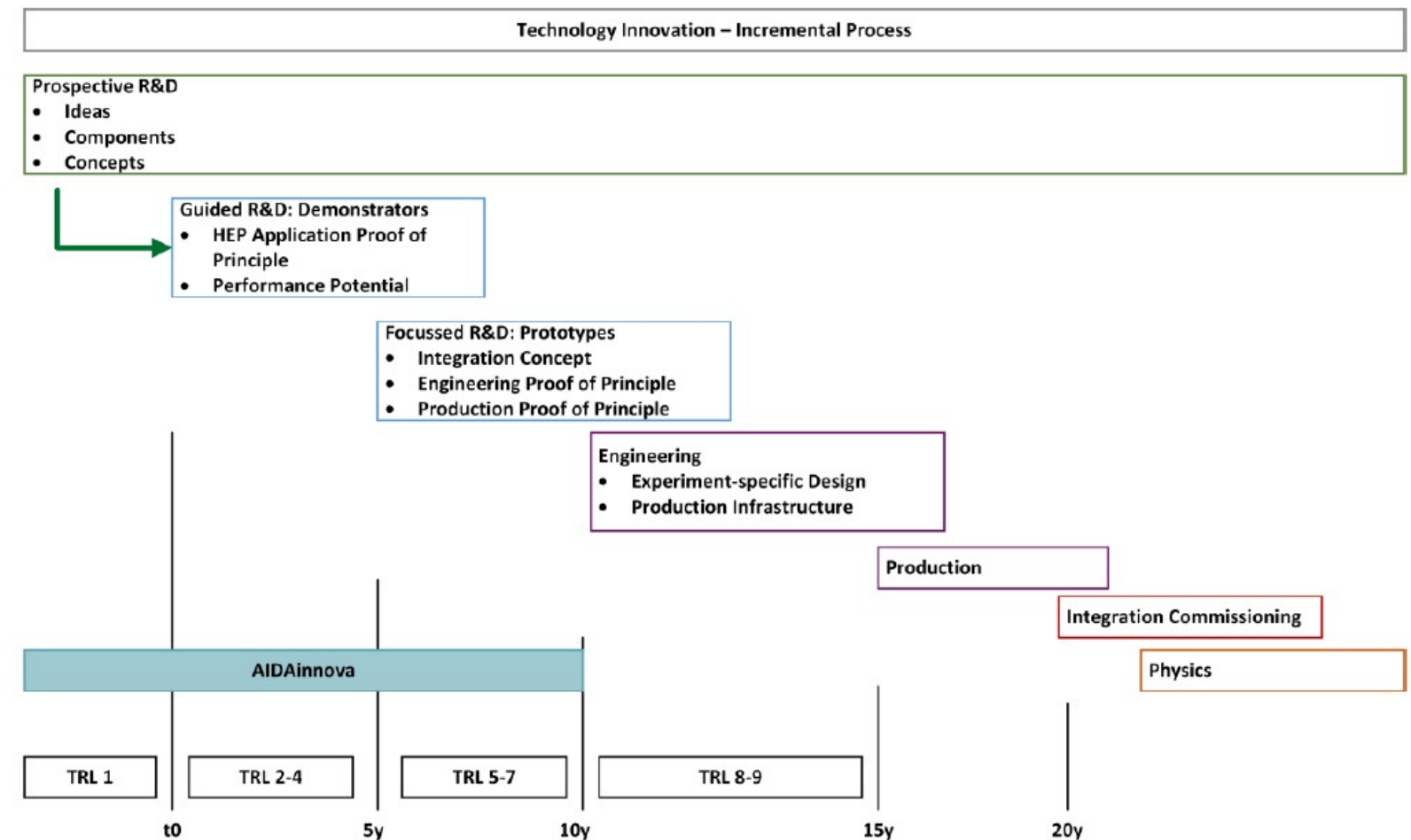


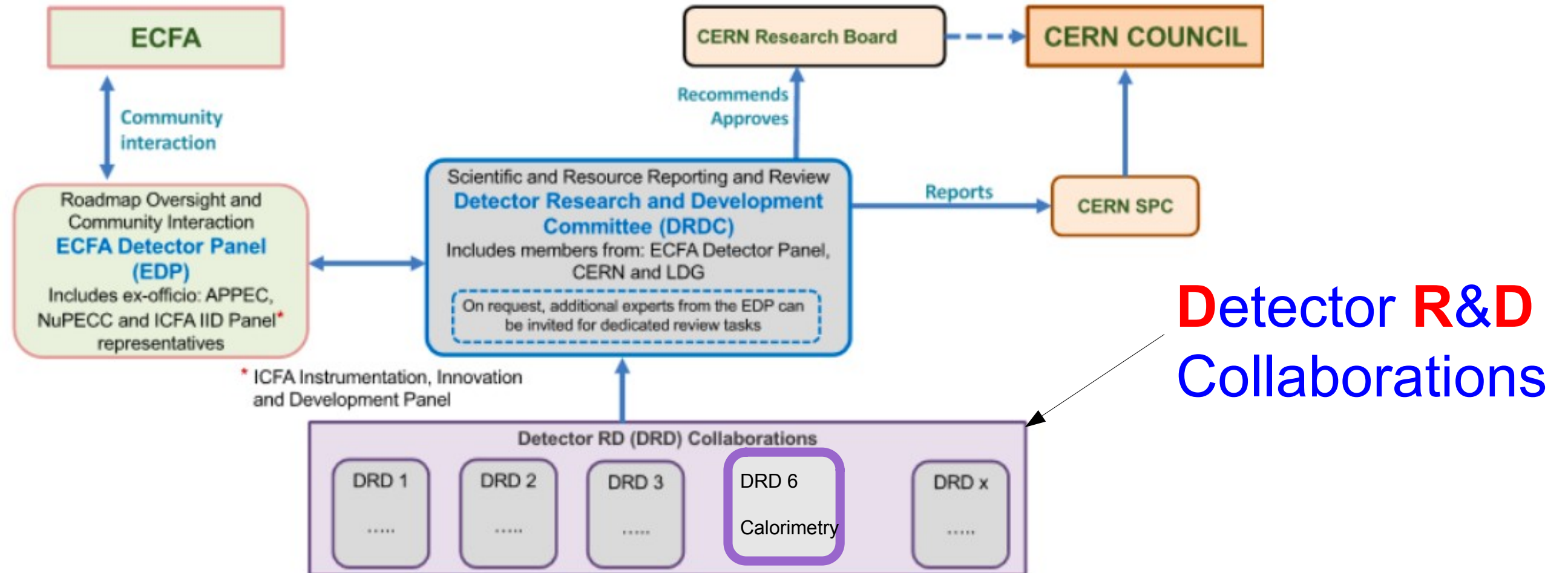
Guiding principle: Project realisation must not be delayed by detectors



1. Strategic R&D via DRD Collaborations vision
 (long-term strategic R&D lines)
 (address the high-priority items defined in the Roadmap via the DRDTs)
2. Experiment-specific R&D focus
 (with very well defined detector specifications)
 (funded outside of DRD programme, via experiments, usually not yet covered within the projected budgets for the final deliverables)
3. "Blue-sky" R&D agility
 (competitive, short-term responsive grants, nationally organised)

Transitions Blue-sky → Strategic → Specific expected
Cross-fertilisation desired



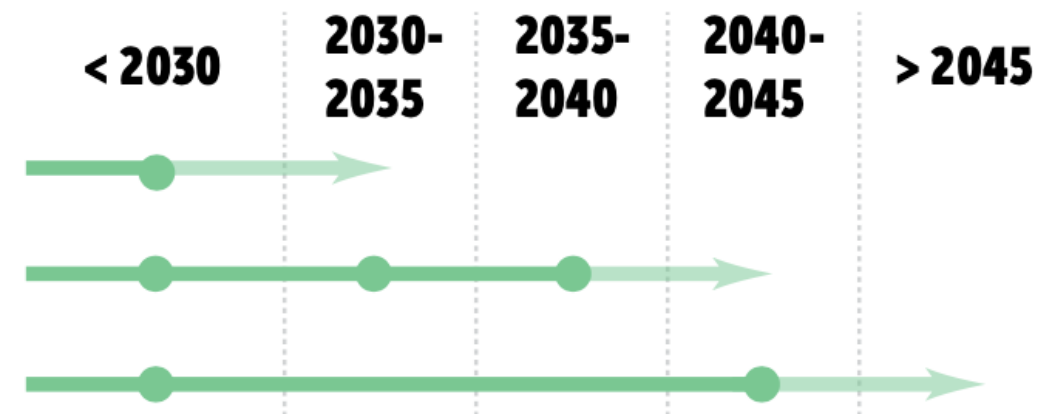


- **DRD will be hosted by CERN and therefore become legally CERN collaborations**
 - Significant participations by non-European groups is explicitly welcome and needed => World wide collaborations!
- **The progress and the R&D will be overseen by a DRDC that is assisted by ECFA**
 - Thomas Bergauer of ÖAW/Austria appointed as DRDC-Chair
- **The funding will come from national resources (plus eventually supranational projects)**



Calorimetry

- DRDT 6.1** Develop radiation-hard calorimeters with enhanced electromagnetic energy and timing resolution
- 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



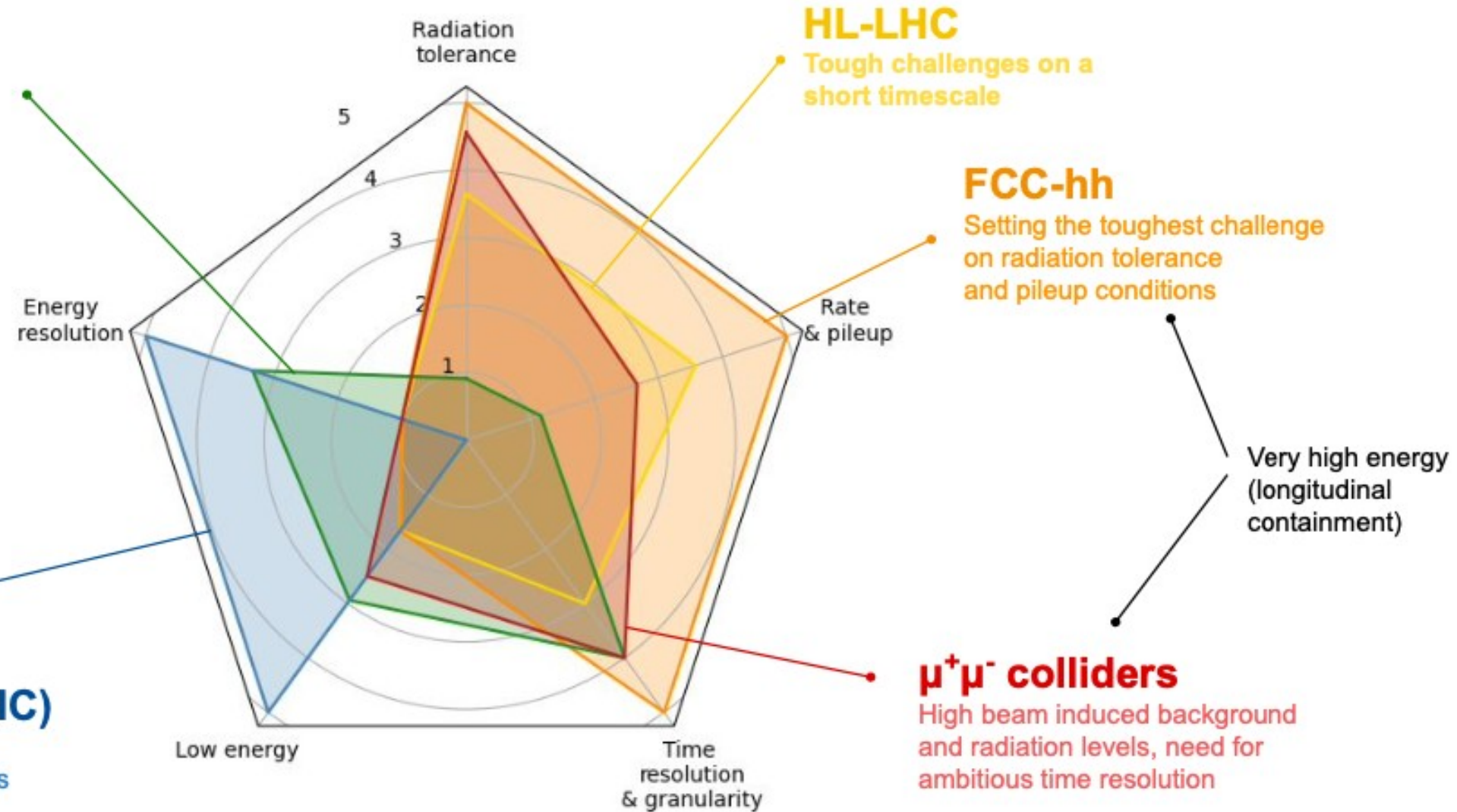
- The **Detector R&D Themes** and the provisional time scale of facilities set high-level boundary conditions
- See backup slides for detailed R&D tasks

e^+e^- colliders

Precision physics benefits from exploiting the best possible energy and time resolution

Strong interaction experiments (e.g. EIC)

Requiring the highest energy resolution for low energy photons



HL-LHC

Tough challenges on a short timescale

FCC-hh

Setting the toughest challenge on radiation tolerance and pileup conditions

Very high energy (longitudinal containment)

$\mu^+\mu^-$ colliders

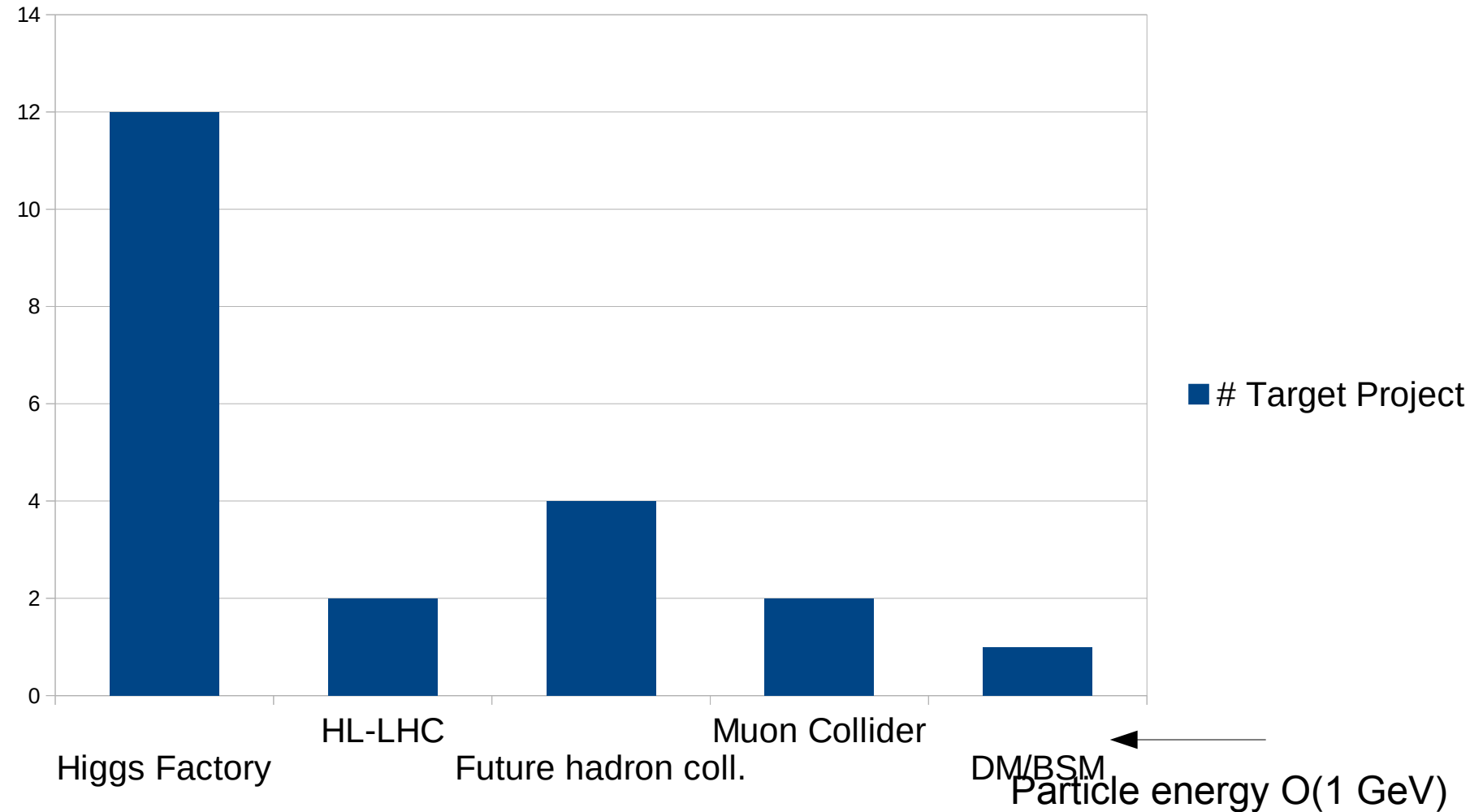
High beam induced background and radiation levels, need for ambitious time resolution

Inspired from <https://indico.cern.ch/event/994685/>

MUCOLL
CALICE
CERN FCC-ee
ALICE-FOCAL
Korea NRF GRANT
CrystalClear
CalVision LHC FCC-LH
AIDA InnoVA LUXE
MODE
GlassScint
EUROLABS
Radical

- Proposals comes from pre-existing collaborations or working framework
- Consolidated modus-operandi and experience
- Need to pick up all the best and put into the DRD6 collaboration

- **Entry point, “DRD Calo indico page”**: <https://indico.cern.ch/category/12772/>
 - 234 people from four regions registered
 - Indico page now retired
- **1st Community Meeting 12/1/23**
 - <https://indico.cern.ch/event/1212696/>
- **Proposal phase until 15th of November 2023**
 - **Input proposals collected until 1st of April 2023**
 - **2nd Community Meeting 20th April 2023**
 - <https://indico.cern.ch/event/1246381/>
 - **Input proposals have been condensed into a DRD-on-Calorimetry proposal**
 - Final version submitted to DRDC on November 15th
- **DRD-on-Calorimetry approved by CERN Research Board on December 6th 2023 to start on January 1st 2024**



- Higgs factories dominate
 - HF includes heavy flavour that target superb elm. energy resolutions
- (Already now) orientation towards future hadron collider and muon collider

DRD 6: Calorimetry

Proposal Team for DRD-on-Calorimetry

January 6, 2024

Martin Aleksa¹, Etienne Auffray¹, David Barney¹, James Brau², Sarah Eno³, Roberto Ferrari⁴, Gabriella Gaudio⁵, Alberto Gola⁶, Adrian Irlas⁶, Imad Laktineh⁷, Marco Lucchini⁸, Nicolas Morange⁹, Wataru Ootani¹⁰, Marc-André Pleier¹¹, Roman Pöschl¹², Philipp Roloff¹³, Felix Seifow¹², Frank Simon¹³, Tommaso Tabarelli de Fatis⁸, Christophe de la Taille¹⁴, Hwidong Yoo¹⁵ (Editors)

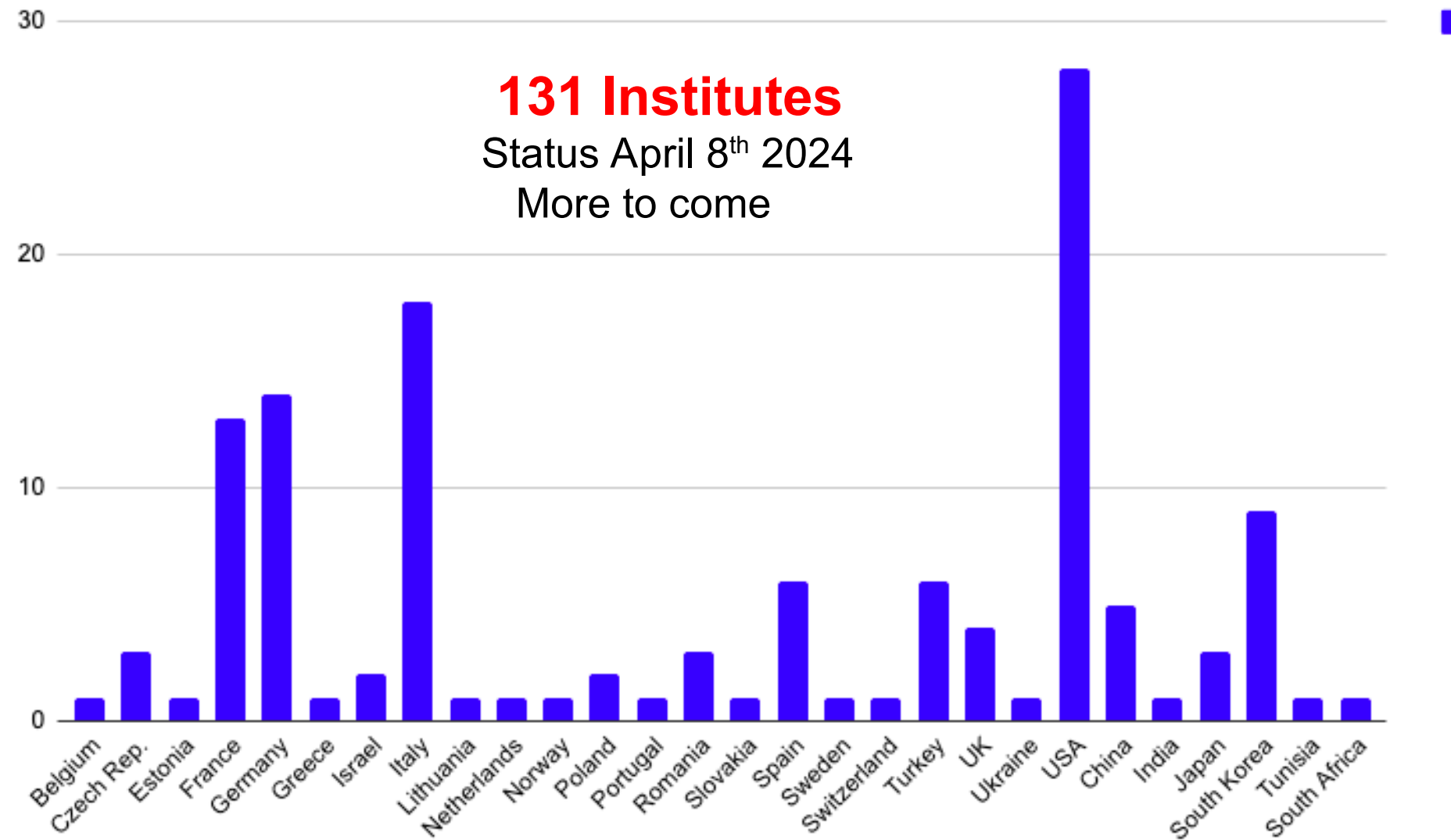
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Contents

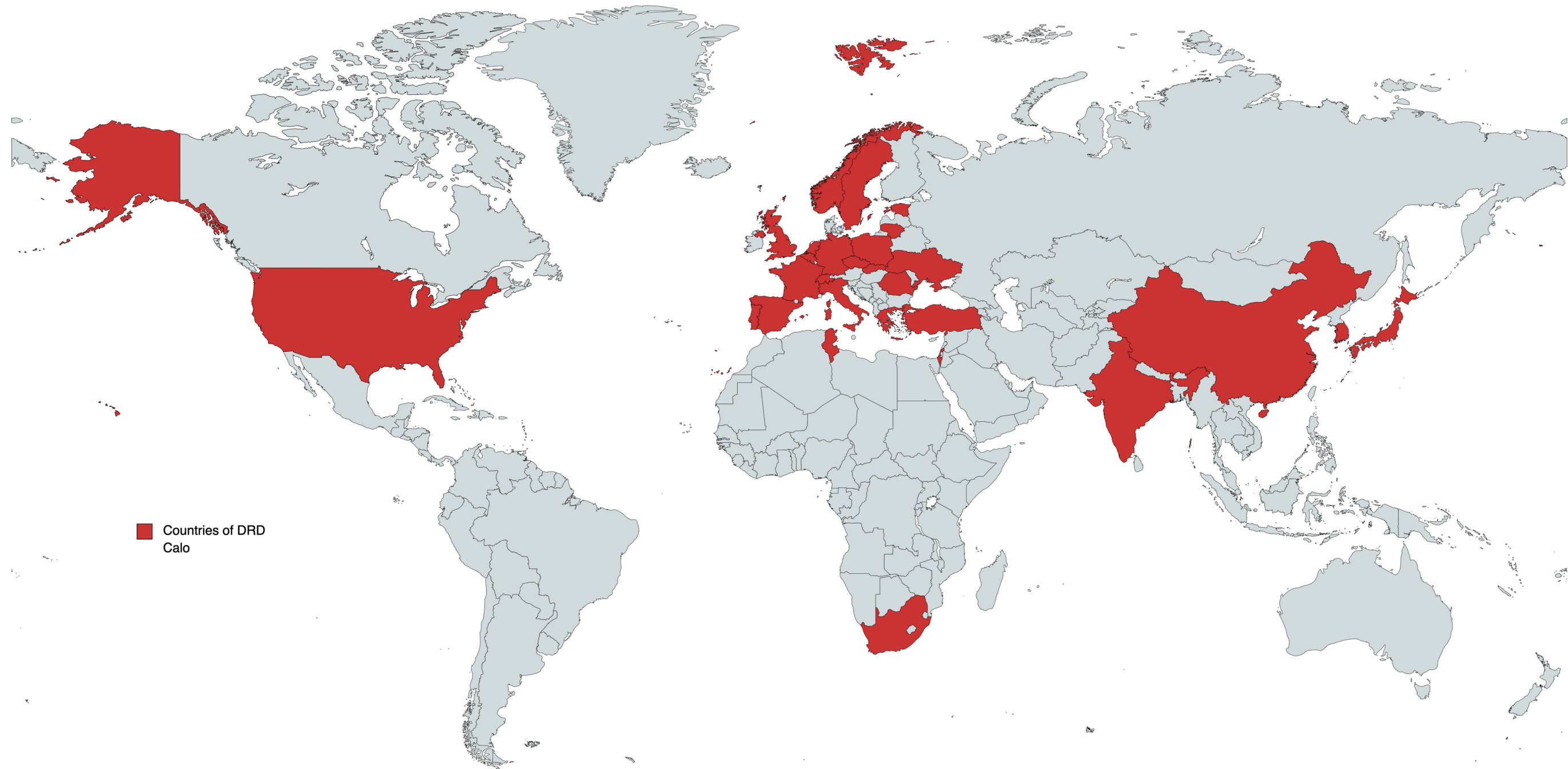
1 Introduction	3
2 Organisation of the DRD-on-Calorimetry	3
2.1 Scientific organisation	4
2.2 Governance	5
2.2.1 Executive bodies	6
3 Work Package 1: Sandwich calorimeters with fully embedded electronics	7
3.1 Description	7
3.2 Activities and objectives	8
3.2.1 Task 1.1: Highly pixelised electromagnetic section	8
3.2.2 Task 1.2: Hadronic section with optical tiles	9
3.2.3 Task 1.3: Hadronic section with gaseous readout	10
3.3 Short-term applications	11
4 Work Package 2: Liquefied Noble Gas Calorimeters	11
4.1 Description	11
4.2 Objectives	14
5 Work Package 3: Optical calorimeters	15
5.1 Description	15
5.2 Activities and objectives	15
5.2.1 Task 3.1: Homogeneous and quasi-homogeneous EM calorimeters	16
5.2.2 Task 3.2: Innovative sampling EM calorimeters	17
5.2.3 Task 3.3: Hadronic sampling calorimeters	17
5.2.4 Task 3.4: Materials	18
5.3 Milestones and deliverables	19
5.4 Short-term applications	19
6 Work Package 4: Electronics and readout	21
6.1 Description	21
6.2 Objectives	21
7 Resources	22
8 Working Groups	22
8.1 Photodetectors	22
8.2 Testbeam plans, facilities and infrastructure	25
8.2.1 Thoughts on facilities and infrastructures	25
8.3 Detector physics, simulations, algorithms and software tools	26
8.3.1 Data models and data management	26
8.3.2 DAQ software	27
8.3.3 Simulation	27
8.3.4 Particle flow algorithms	27
8.3.5 Machine learning approach	27
8.4 Industrial connection and technological transfer	27
8.5 Mechanics and Integration	28
9 Interconnections with other DRDs	28
10 Conclusion	28
A Institute list	29
B Contact persons to other DRDs	34

- 34 pages
- Based on worldwide community input
- Short description of goals, projects and organisation
 - Research program (and resources) focuses on 2024 – 2026
 - ... and outlooks beyond
 - Introduction of
 - Proposal of initial Governance structure (see below)
 - Work Packages and Working Groups (see below)
- CERN-DRDC-2024-004 ; DRDC-P-DRD6: <http://cds.cern.ch/record/2886494>

Institutes per Countries



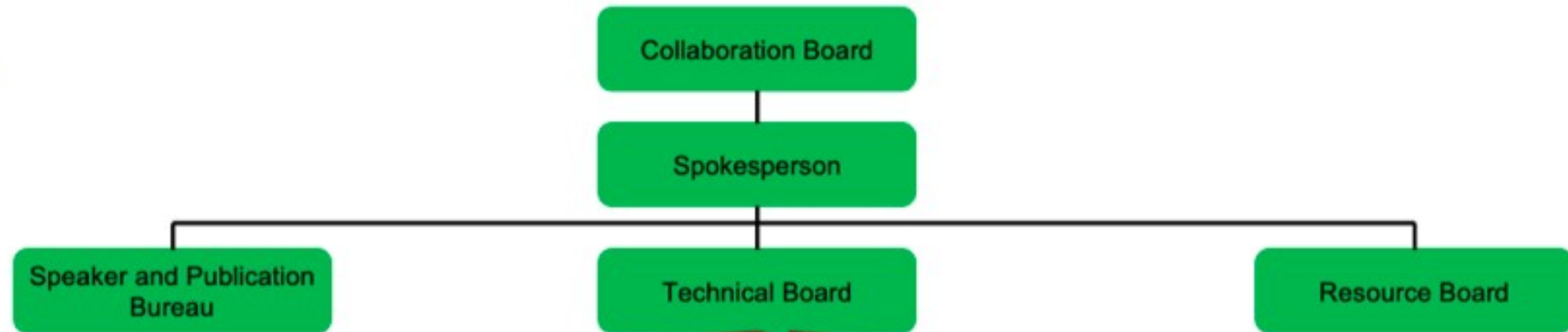
- Counted are groups that have expressed an interest to join the DRD Calo via the input proposals or in communication afterwards
- **Representatives of these groups form the proto-Collaboration Board (proto-CB)**



Created with mapchart.net

- DRD should deliver informed input to technological decisions of future facilities (of all sizes)
- All proposals should reach the same level of maturity
- Openness to new ideas
- Collaboration structure should reflect these goals
- **Research Programs of Work Packages and Working Groups will be at the heart of the collaboration**
 - Work Package 1: Sandwich calorimeters with fully embedded Electronics – Main and forward calorimeters
 - Work Package 2: Liquified Noble Gas Calorimeters
 - Work Package 3: Optical calorimeters: Scintillating based sampling and homogenous calorimeters
 - Work Package 4: Electronics and DAQ
 - The Work Packages are complemented by a set of Working Groups that help to ensure the overall coherence of the scientific program

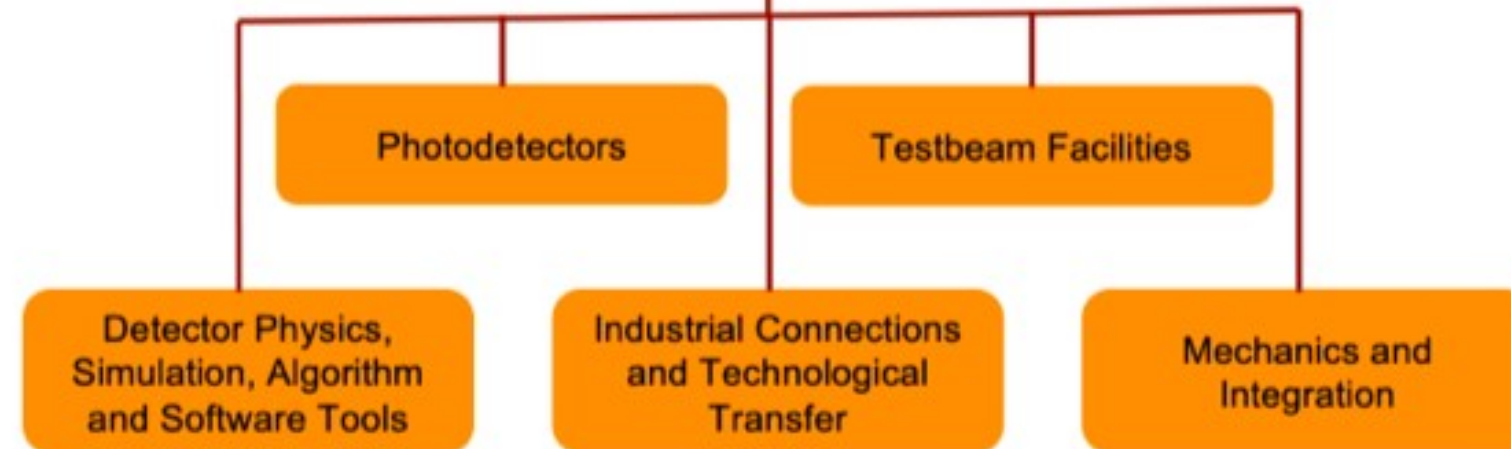
MANAGEMENT:



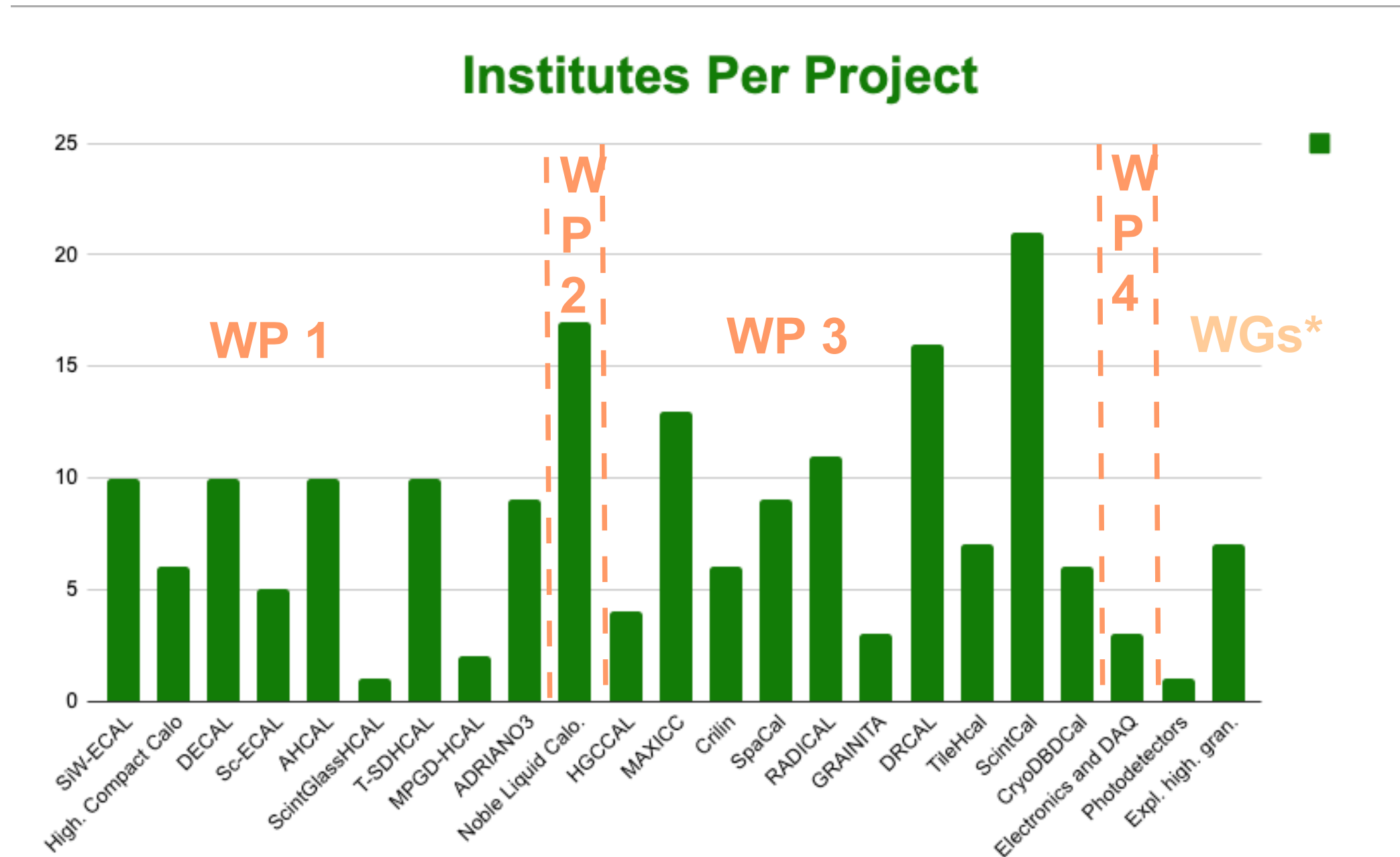
WORK PACKAGES:



WORKING GROUPS:



Complementation with TA on Mechanics under discussion



T. Bergauer, 113th Plenary ECFA Meeting, Nov
. 2023



Memorandum of Understanding



- All institutes of one DRD collaboration sign a “light-weight” MoU
 - Does not contain commitments on strategic funds
 - Defines Common Fund, if agreed by the respective DRD Collaboration
 - Covers IP topics, how to handle involvement of industr
(In that case very similar as the current existing MoUs of RD50/51)
 - MoU Template will be provided by CERN (currently being negotiated with legal office, KT, DRC,..)
 - Strategic funding will be agreed upon in annexes to this light-weight MoU
 - One Annex per Work Package, signed by the FAs of the institutes involved in the respective WP
-
- Active discussions on MOU with DRDC and CERN Management
 - More in talks by Thomas and Roberto

- 10th of January 2024
1st proto-Collaboration Board Meeting = First event of new DRD-on-Calorimetry Collaboration
 - 92 groups registered
 - Recap of way until approval of DRD
 - Outline and discussion of “way ahead”
 - First steps to implement the Collaboration and their endorsement
 - Bootstrap procedure
 - Initial Collaboration structure
 - Preparation of CB-Chair election
- Election of Collaboration Board Chair
 - Meeting on CB Election on February 22nd
 - Roberto Ferrari (INFN Pavia) elected on March 6th
- Preparation of Spokesperson Election
 - Call for proposals until April 4th
 - Candidate presentation today
 - Election after Collaboration Meeting

- In general we will use CERN e-groups as main communication channel
- Tree structure for general DRD Calo e-group
 - This means that **each institute** creates and maintains its own e-group
 - drdcalo-cern, drdcalo-pavia, drdcalo-ijclab, drdcalo-desy, ...
 - **Only these e-groups will be included into the general e-group drdcalo-general@cern.ch**
 - drdcalo-general exists since 22/2/24
 - Remark: It will take some time until all institutes have created their e-group
 - Until this happens the corresponding group leader will be explicitly part of drdcalo-general@cern.ch and will be responsible for propagating relevant information to his/her group
 - As soon as the e-group is created the group leader will be removed from the general e-group
 - As of today 30 institute e-groups exist, further reminders will be sent regularly to the Collaboration Board
- We need a web page ...
- We need a logo (and another name?)

- Indico page: <https://indico.cern.ch/event/1368231/>
 - 130 registered participants, 67 on-site partially from far away
- Support by Patricia Mage-Granados and Caroline Cazenoves, Thank you very much!!!!
- Sessions and Rooms
 - April 9th: CERN Council Chamber for plenaries
 - April 10th: CERN Council Chamber, Salle Dirac, Filtration Plan for parallels
 - Parallels on WP 1-3 in morning and early afternoon (see agenda)
 - Two parallel sessions for Software (Council) and Beamtest WG (Filtration Plant) including discussion/brainstorming on how to set them up
 - April 11th: CERN Council Chamber for plenaries
 - Room B as office space that might be also used for ad-hoc meetings
- Social events
 - Dinner on Wednesday 10th of April at CERN, area outside of Glassbox in R1
 - Coffee breaks
 - Delivery Pas Perdus on 9th and 11th
 - 5 CHF vouchers on April 10th

- DRD-on-Calorimetry will pursue strategic R&D for calorimeters for future colliders
 - Partially new efforts, partially capitalising on existing activities
- Scientific programme and first ideas of Collaboration structure have been worked out by Proposal Team in collaboration with community
- Approval by CERN Research Board to start Collaboration on January 1st 2024
- Now progressive move from Proposal Team to full collaboration structure
- This meeting kicks off the collaboration and the scientific programme

**Welcome to the meeting
(and be there for the Group Photo at 15.30h)**

Backup



- **Input proposals reveal little (extra) need at the beginning (2024-2026)**
 - Start with prototypes that are either existing or currently under construction
 - (Mainly) benefitting from existing funding at national or international level (i.e. AIDAInnova, EUROLABS in Europe or CalVision, RADICAL in the US [plus maybe others])
 - Specification studies, concept proof – would require fresh funding
- **Relatively high density of beam tests with new (large scale) prototypes after 2026**
 - Several large-scale prototypes demonstrate ambition of R&D programme
- **Execution of program requires availability and support of beam test facilities**

- Key technologies and requirements are identified in ECFA Roadmap

- Si based Calorimeters
- Noble Liquid Calorimeters
- Calorimeters based on gas detectors
- Scintillating tiles and strips
- Crystal based high-resolution Ecals
- Fibre based dual readout

- R&D should in particular enable

- Precision timing
- Radiation hardness

- R&D Tasks are grouped into

- Must happen
- Important
- Desirable
- Already met

