



DRD on Calorimetry (DRD6)

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Detector Research and Development

European Committee for Future Accelerators (ECFA) released [2021 Detector R&D Roadmap](#): nine (technology) focus domains

=> Task forces developing into Detector R&D (DRD) collaborations:

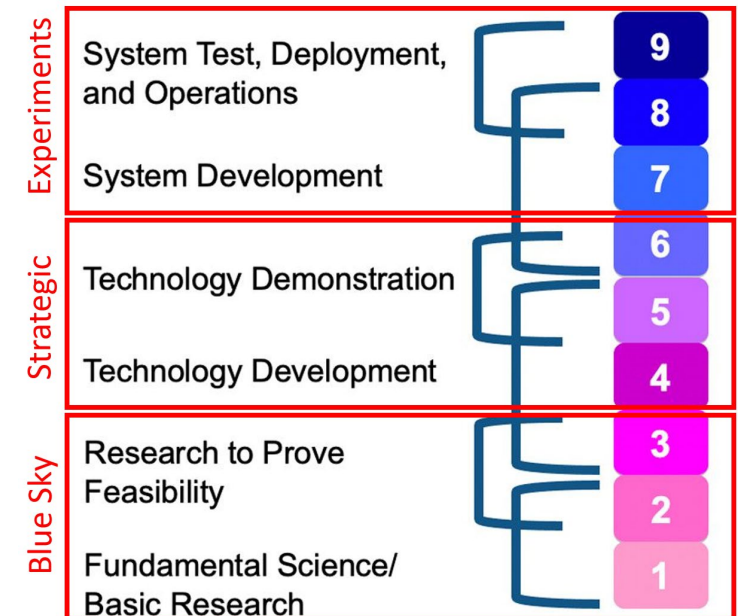
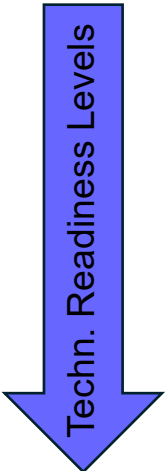
approval status

- Gaseous Detectors (DRD1) [ex RD51]
- Liquid Detectors (DRD2)
- Photodetectors & Particle ID (DRD4)
- Calorimetry (DRD6)
- Semiconductor Detectors (DRD3) [ex RD50, RD42,..]
- Quantum Sensors (DRD5)
- Electronics (DRD7)
- Integration (DRD8)

DRDs are **international (global)** collaborations, hosted by CERN

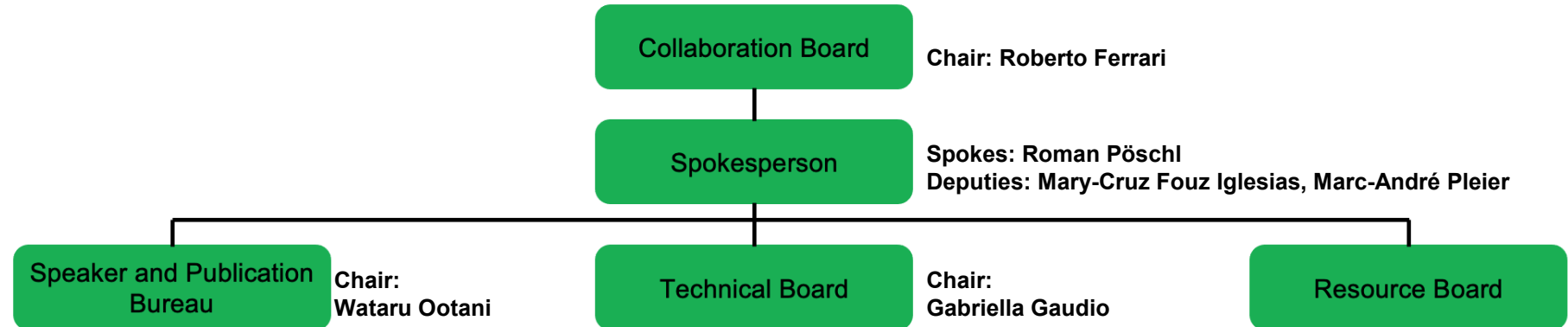
Proposals describing the scope are on [CDS](#) – new ideas welcome!

Focus on strategic RnD to bridge the gap between “blue sky” research and deployment in a HEP experiment – includes targeted FCC RnD

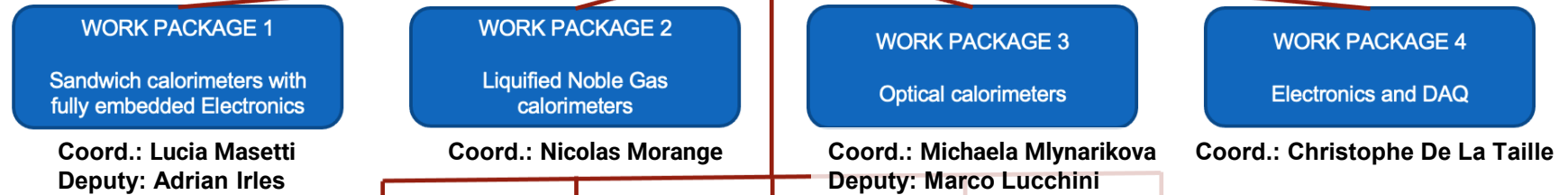


DRD on Calorimetry Organization

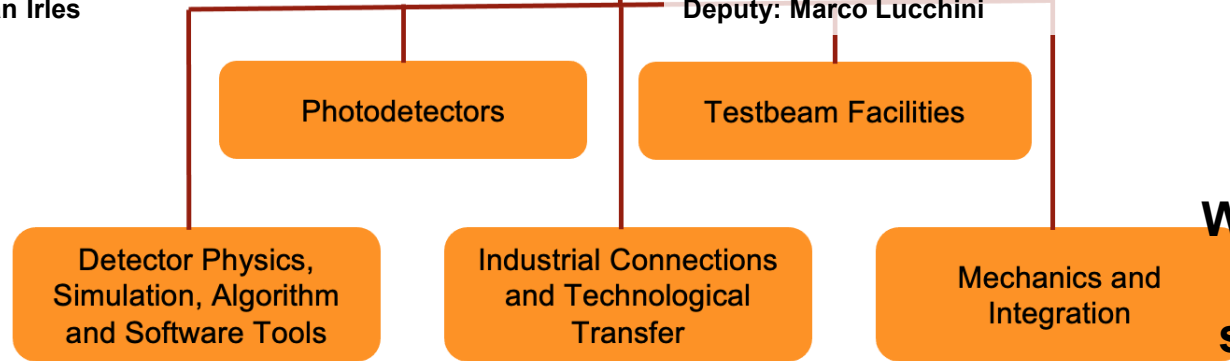
MANAGEMENT:



WORK PACKAGES:

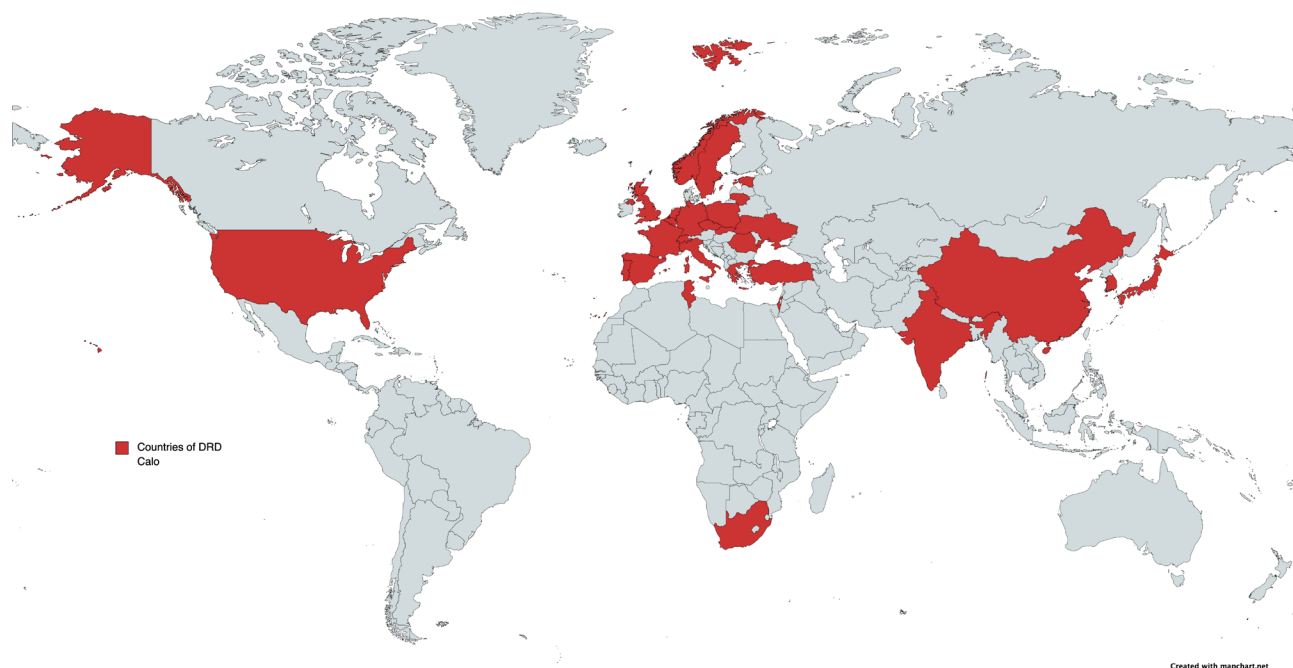


WORKING GROUPS:



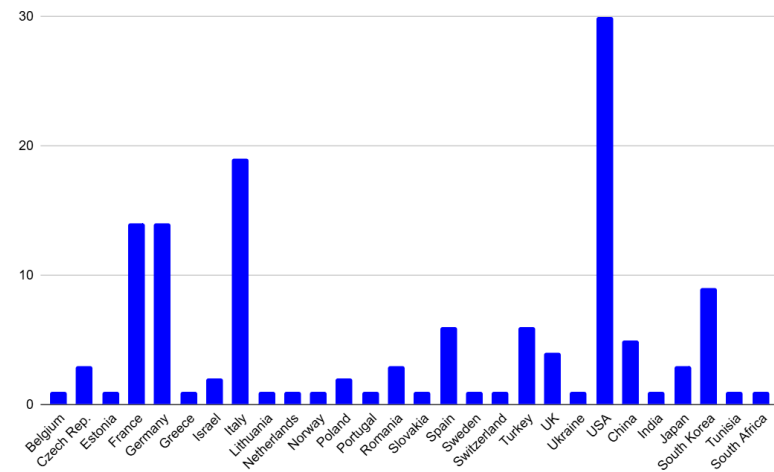
Working groups are being set up, starting with software and test beams

DRD on Calorimetry Participation so far

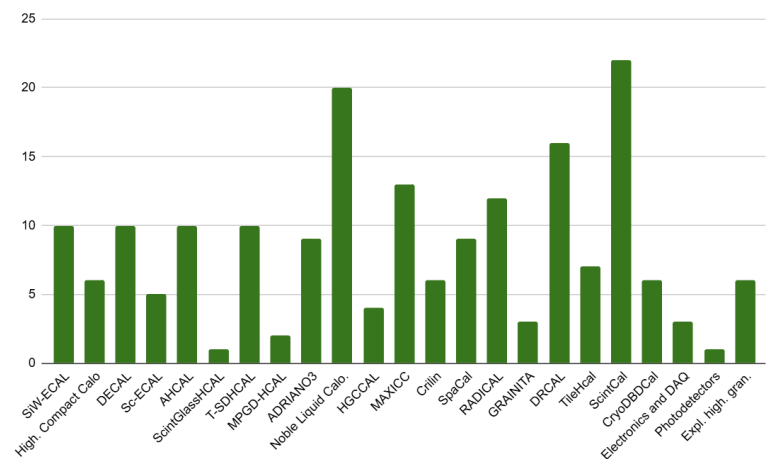


125 confirmed member institutes, plus more to join!

Institutes per Countries

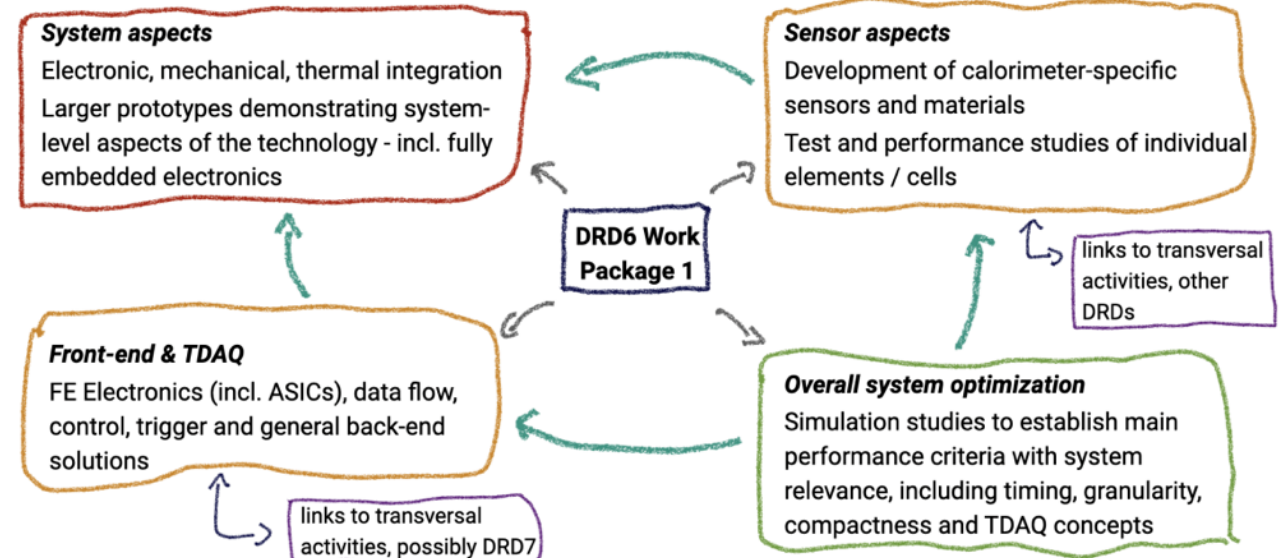
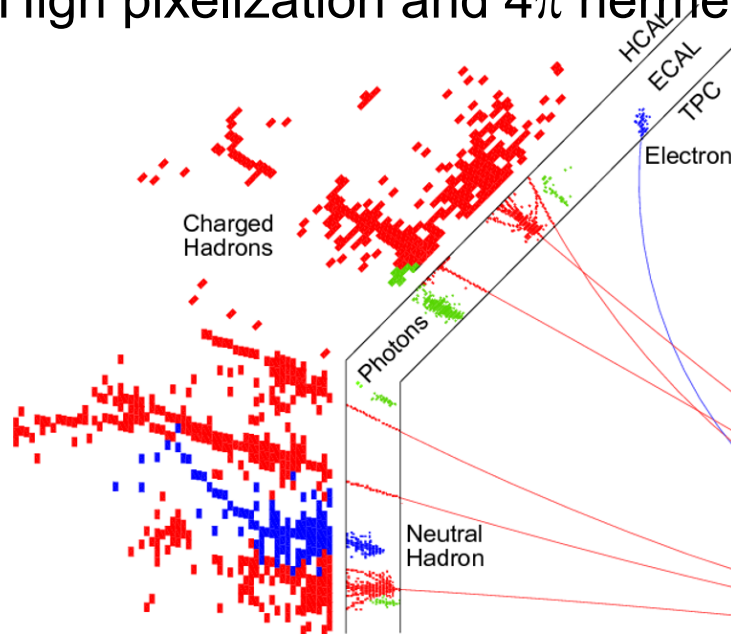


Institutes Per Project



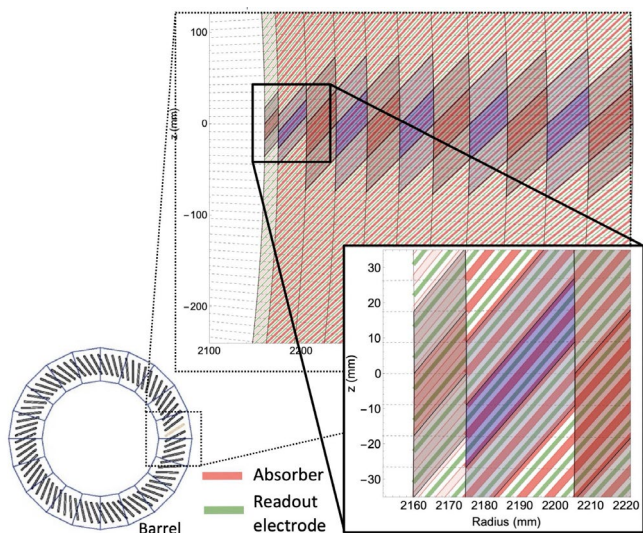
WP 1: Sandwich calorimeters with fully embedded Electronics

- Imaging calorimeters optimized for particle flow: high-resolution in 3D plus time and energy
- Three groups of tasks: highly pixelized electromagnetic section, hadronic section with optical tiles, hadronic section with gaseous readout
- High pixelization and 4π hermeticity challenge room needed for services

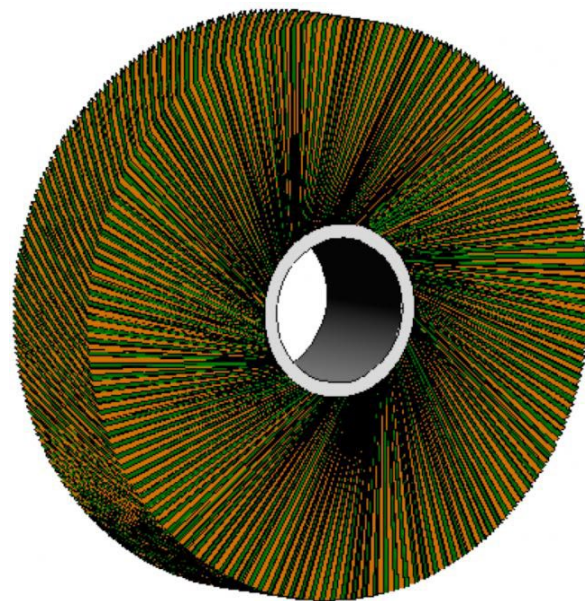


WP 2: Liquified Noble Gas Calorimeters

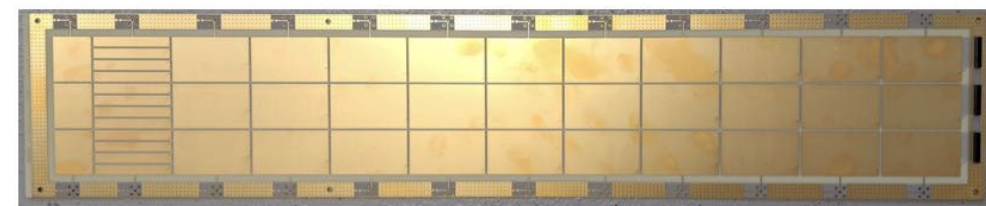
- Current focus: sampling EM calorimeter for e+e- factories - one key feature of "[ALLEGRO](#)" detector concept
- Highly granular calo with absorbers planes inclined in r-phi (barrel) / arranged in turbine-like structure (endcap)
- Readout by segmented PCB planes alternated to Pb (or W) absorbers, gaps in between filled with LAr (or LKr)



Barrel



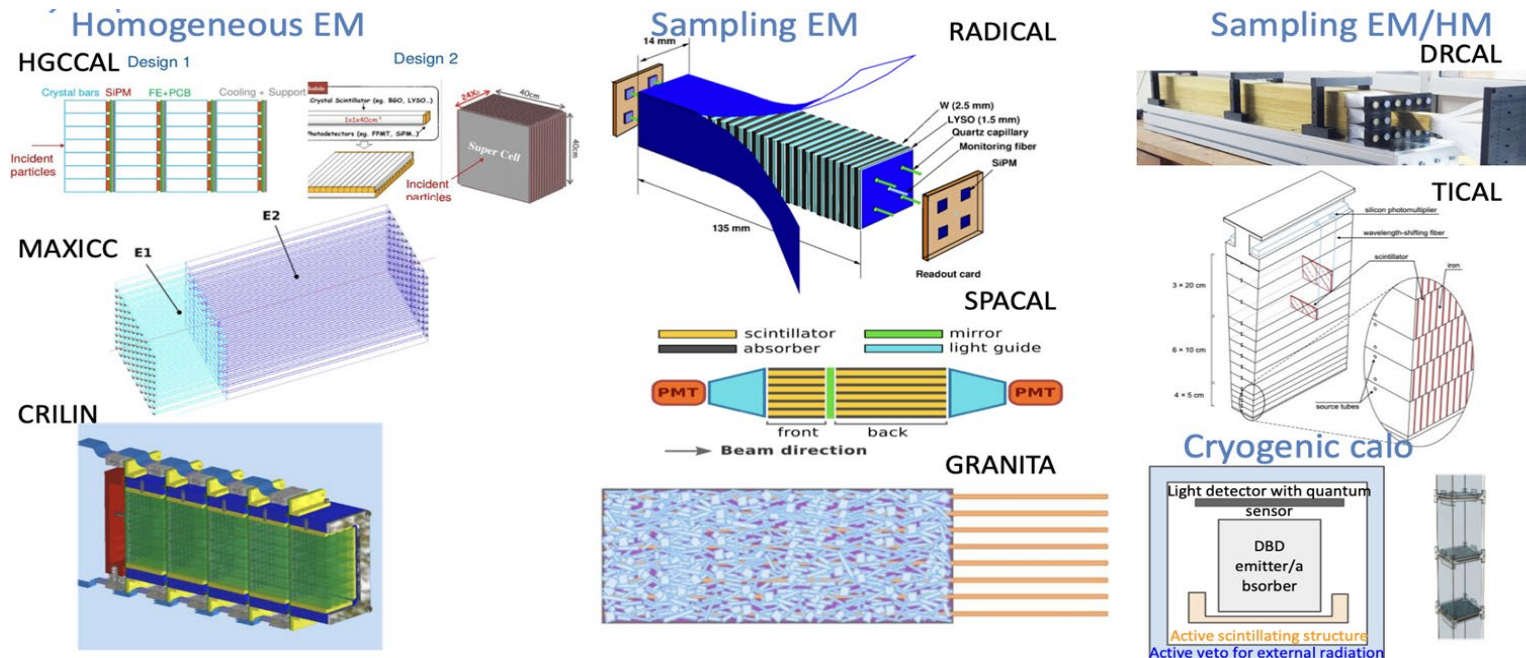
Endcap



PCB readout electrode

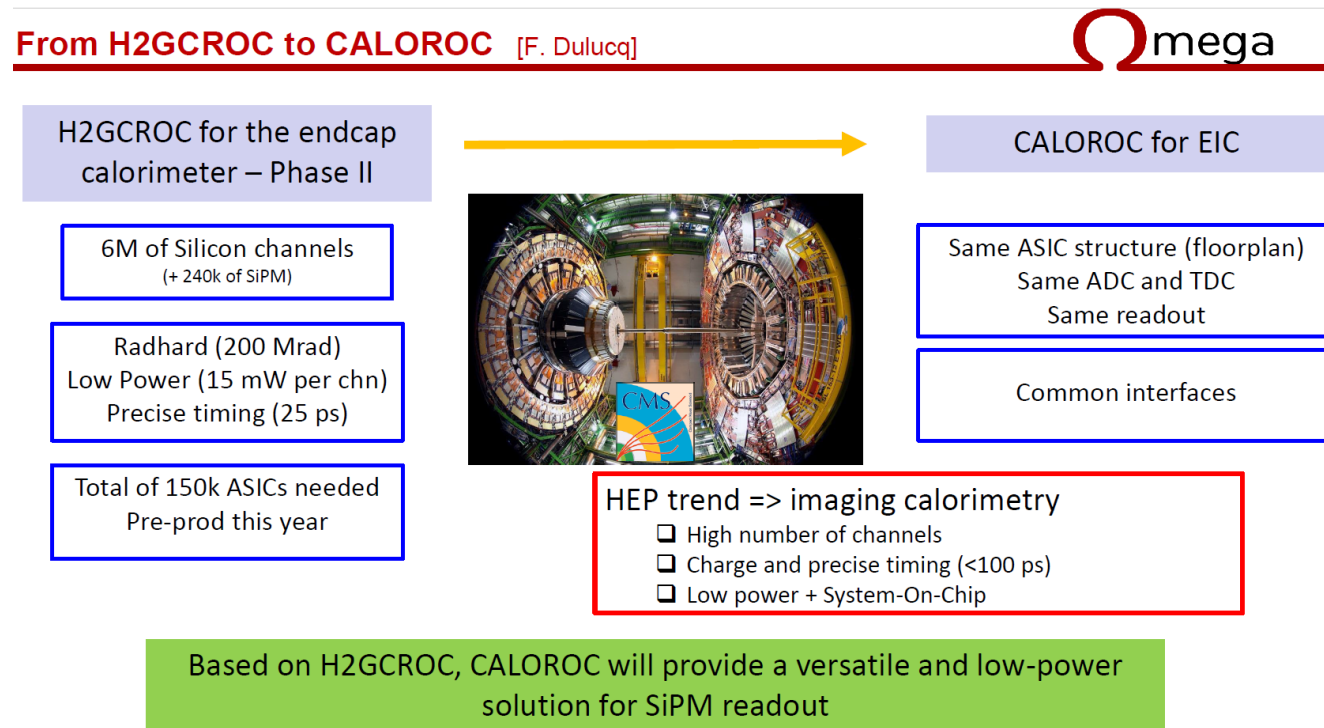
WP 3: Optical calorimeters - Scintillating based sampling & homogenous calorimeters

- Involvement from ~70 institutes working on 11 different projects
- **The goal:** explore, optimise and demonstrate with full shower-containment prototypes, new concepts of sampling and homogeneous calorimeters based on scintillating materials



WP 4: Electronics and DAQ

- Calorimeter electronics commonalities: large dynamic range (10-16 bits), very low noise, high accuracy (< 1%), usually large capacitance (100's of pF)
- Highly granular (5D) calorimetry needs low-power highly integrated embedded electronics, integrated inside ASICs
- Develop a family of ASICs, optimized for different subdetectors, sharing as much as possible common back-end and readout systems



2024 Collaboration Meetings



- April 9th - 11th 2024 at CERN
- <https://indico.cern.ch/event/1368231/>
- 133 participants, 67 on-site



- October 30th - November 1st 2024 at CERN
- <https://indico.cern.ch/event/1449522/>
- 184 participants, 54 on-site

Presentations are a great resource to see technical status/progress!

Upcoming Events

- Test Beams 2025 – 7 requests @ CERN from DRD6:

WP/task	Task	Beam	Location	Duration (d)
1.3.2	MPGDAL	pion	PS	14
3.1.1	HGCCAL	e, pion, muon	PS - SPS (H2/H4)	14 + 7
3.1.2	MAXICC	high purity e	SPS (H6)	14
3.1.3	CRILIN	high purity e	SPS (H2/H4)	7 + 7
3.1.4	OREO	high purity e, mixed particles	SPS (H2/H4)	14
3.2.3	RADICAL	high purity e	SPS (H6)	7
3.3.1	DRCAL	e, pion, muon	SPS (H8)	7+7+14

- Dedicated test beam area at CERN under discussion to optimize resources, streamline hardware and software setup, exploit synergies across DRD6

- Collaboration Meetings:
 - DRD6: April 1-4 2025 at Orsay, IJCLab
<https://indico.cern.ch/event/1487128/>
 - ALLEGRO Ecal workshop in Prague, June 30 – July 2 2025
 - DRD6: Week of Sept 15 2025, Ancona

Conclusions

- DRD on Calorimetry pursues strategic R&D for calorimeters for future colliders, in particular Higgs Factories
 - Partially new efforts, partially capitalizing on pre-existing activities
 - Large diversity of calorimeter technologies
- Collaboration structure is being put in place
 - Chairs of Boards in place (except Resource Board where discussions are ongoing)
 - Work has started (e.g. Technical Board Meetings, draft on Publication Policy, ...)
 - First set of Governance Rules approved by Collaboration Board in October
- Scientific Program has started
 - All four work packages fully active, first deliverables either completed or in sight
 - Working Groups are being formed
- Main goal of the next months: show the added value of being member of the DRD on Calorimetry
- US plays a crucial role across work packages and working groups – **additional institutes are welcome!!!**

Backup