

ECFA WG3: Topical workshop on calorimetry, PID and photodetectors

Introduction

CERN

May 3-4, 2023

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DESY



Opening Remarks

ECFA Detector Roadmap

ECFA Higgs Factory WG3 Detectors

Status of Roadmap Implementation

ECFA Detector Roadmap Summary

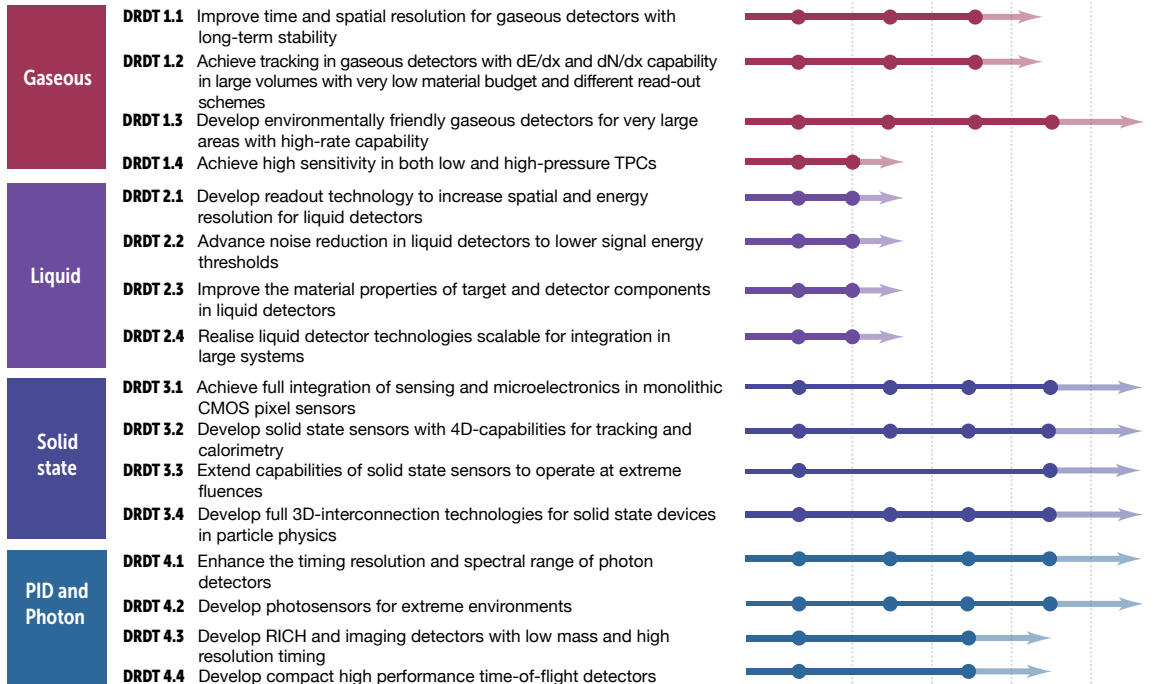
Relating Technology R&D to Major Drivers from Facilities

<https://cds.cern.ch/record/2784893>

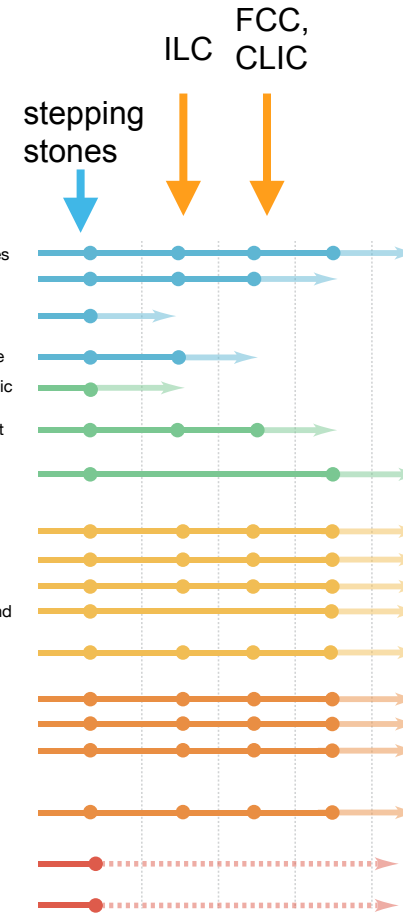


~ 200 pages
~ 1 year young

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



Dates when R&D finished and real engineering & construction can start



Detector R&D Themes (DRDTs) and Detector Community Themes (DCTs). Here, except in the DCT case, the final dot position represents the target date for completion of the R&D required by the latest known future facility/experiment for which an R&D programme would still be needed in that area. The time from that dot to the end of the arrow represents the further time to be anticipated for experiment-specific prototyping, procurement, construction, installation and commissioning. Earlier dots represent the time-frame of intermediate "stepping stone"

projects where dates for the corresponding facilities/experiments are known. (Note that R&D for Liquid Detectors will be needed far into the future, however the DRDT lines for these end in the period 2030-35 because developments in that field are rapid and it is not possible today to reasonably estimate the dates for projects requiring longer-term R&D. Similarly, dotted lines for the DCT case indicate that beyond the initial programmes, the activities will need to be sustained going forward in support of the instrumentation R&D activities).

DRD: Detector R&D Collaborations

Anchored at CERN

Follow the successful model of R&D collaborations for the LHC

- funding in place since ~1986, R&D collaborations established in 1990

Take full account of existing, successful and well managed R&D coll.

- Integrate with CERN EP R&D, AIDAinnova, RDxy, CALICE,...

Community-driven approach, supported by ECFA Roadmap Task Forces

- invite proposals, moderate process, timeline 1-2 years

Reasonably dimensioned review process (ECFA and CERN)

- **addressing needs of future experiments is important criterion**
- worldwide perspective

Process approved by CERN Council

- following extensive consultations with funding agencies
- Document: https://indico.cern.ch/event/1197445/contributions/5034860/attachments/2517863/4329123/spc-e-1190-c-e-3679-Implementation_Detector_Roadmap.pdf

Review and Approval Process

Lightweight and commensurate with effort

Scientific and Resource Reporting and Review by a Detector Research and Development Committee (DRDC)

- yearly follow-up

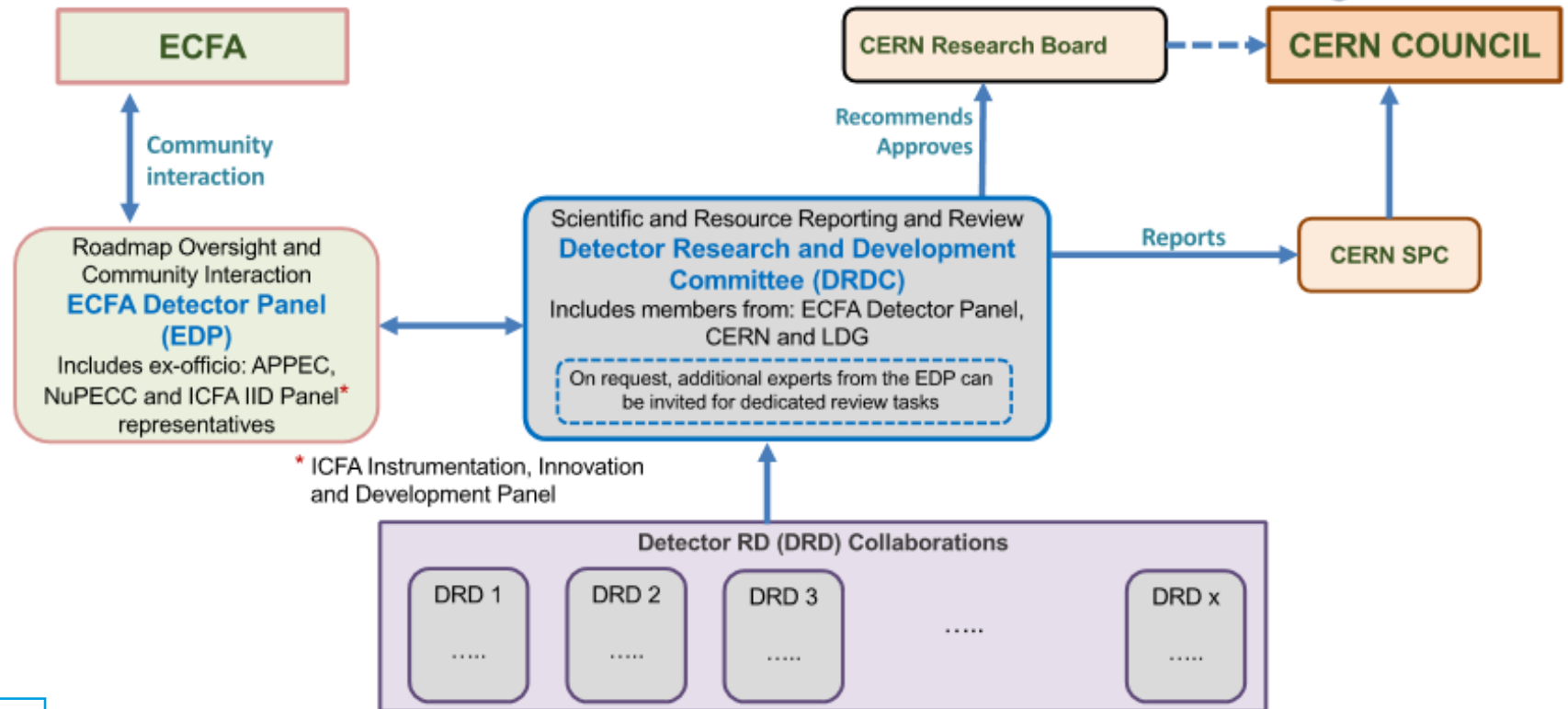
Assisted by the ECFA Detector Panel (EDP):

- the scope, R&D goals, and milestones should be vetted against the vision encapsulated in the Roadmap.

Co-chairs: P. Allport. D. Contardo

Funding Agency involvement via a dedicated Resources Review Board

- once every two years



* ICFA Instrumentation, Innovation and Development Panel

resources awarded to and held by institutes

Implementation Timeline

Ambitious Schedule

Goal: Transition to new scheme during 2023

- approval of LHC-oriented RD50 (silicon), RD51 (gas detector) collaborations expires Dec 2023

Major Steps:

- **community input** (via existing R&D bodies where possible) by **Q1 2023**
 - To get involved, register at <https://indico.cern.ch/event/957057/page/27294-implementation-of-the-ecfa-detector-rd-roadmap>
- Written **proposals**, based on ECFA Detector Roadmap, by **mid 2023**
 - do not repeat roadmap; concrete plans, deliverables, resource-loaded (not a wish list) for **period 2024-2030**
 - aim at 20 pages per each of 9 the DRDs
- **Review** (by DRDC, assisted by EDP) in **fall 23**, approval by **end 2023**
- R&D collaborations **operational**, “Grant Agreements” (**MoU** signatures) through **2024**

How to get involved:

- register at <https://indico.cern.ch/event/957057/page/27294-implementation-of-the-ecfa-detector-rd-roadmap>

Implementation Process in Full Swing

Meetings

DRD6 Calorimeters made a start

- Jan 12 at CERN: <https://indico.cern.ch/event/1212696/>
- 120 participants, 60 in person, lively and constructive discussions
- 2nd community meeting **April 20**: WP structure - reports today

More meetings held

- **DRD1 Gas detectors** March 1-3 at CERN <https://indico.cern.ch/event/1245751/>
- **DRD7 Electronics** March 14-15 at CERN <https://indico.cern.ch/event/1214423/>
- **DRD3 Solid State detectors** March 22-23 at CERN <https://indico.cern.ch/e/1214410>

DRD4 Photodetectors and PID has also started

- following a change in leadership: C. Joram (CERN) for N. Harness, P. Krizan (JSI)
- and preparatory discussions (no existing collaborations yet)
- 1st community meeting 16-17 at CERN <https://indico.cern.ch/event/1263731/>
 - trends today, and review of requirements

Others:

- **DRD2 Liquid Detectors** and **DRD5 Quantum Technologies** also in progress
- **DRD8 Integration**: discussions on on one-to-one basis, coordinators F.Hartmann (KIT), W.Riegler (CERN)

From 2nd DRD6 Community Meeting

International Participation, strong Higgs Factory focus

The Proposal Team

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

Track conveners:

Adrian Irlles (IFIC), **Frank Simon** (KIT), **Jim Brau** (U. of Oregon), **Wataru Ootani** (U. of Tokyo)

Track 2: Liquified Noble Gas Calorimeters

Track Conveners:

Martin Aleksa (CERN), **Nicolas Morange** (IJCLab), **Marc-André Pleier** (BNL)

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

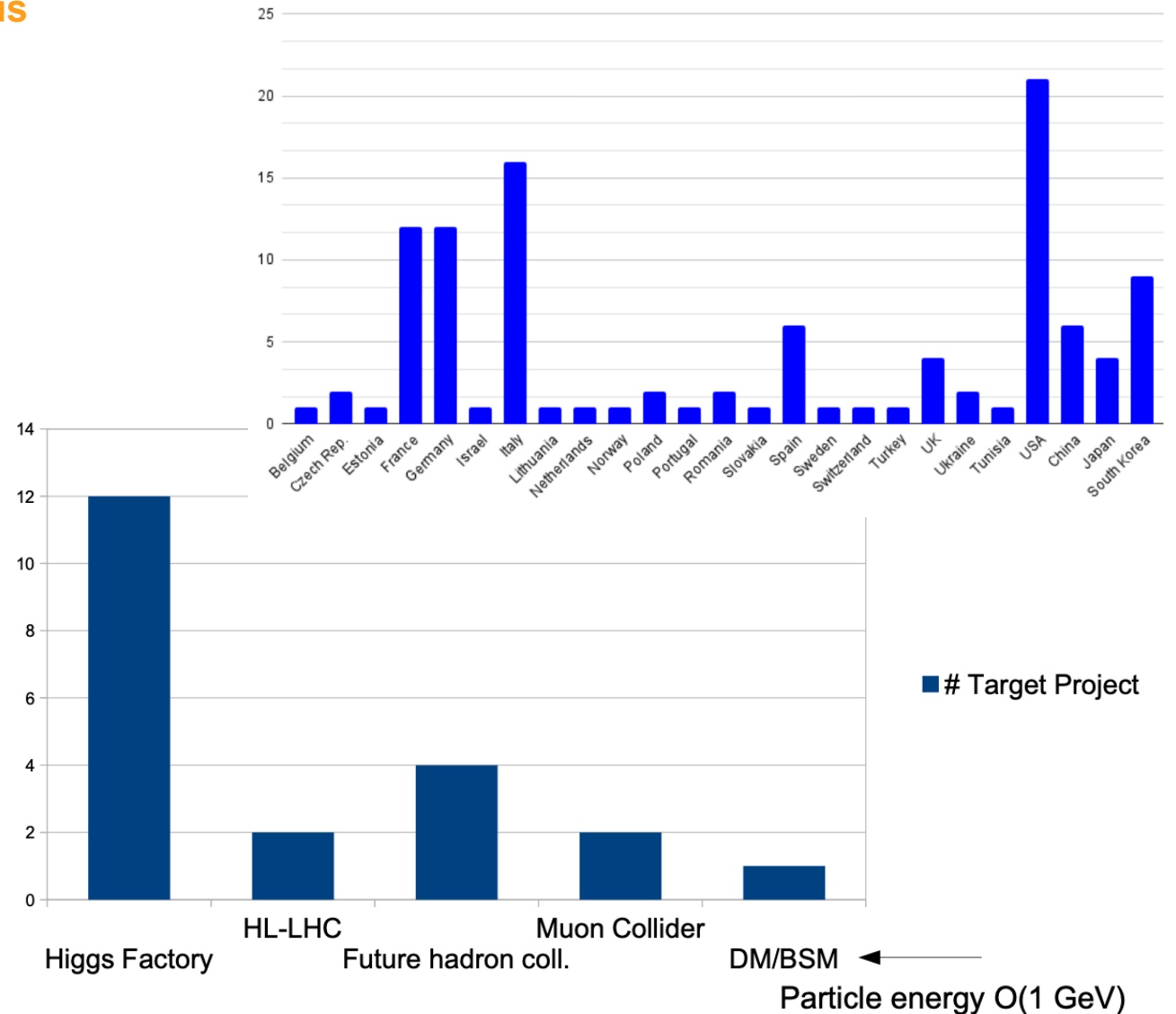
Track Conveners:

Etiennette Auffray (CERN), **Gabriella Gaudio** (INFN-Pavia), **Macro Lucchini** (U. and INFN Milano-Bicocca), **Philipp Roloff** (CERN), **Sarah Eno** (U. of Maryland), **Hwidong Yoo** (Yonsei Univ.)

Track 4: Transversal Activities

Christophe de La Taille (Lab. Omega)

Institutes per Countries



Workshop Programme

Main Idea

Review physics drivers

- main physics motivations, performance goals

Concepts and challenges

- design considerations, optimisation, need for R&D

DRD plans

- emerging proposals, common topics

Neighbouring DRDs

- silicon, gas, electronics, mechanics

Discussion

- motivation for R&D, feedback to Higgs factory studies
- common development and optimisation

Logistics

Dinner tonight 1930

still possible to join: contact Giovanni



Back-up

How Much Time Do We Need?

“Random” Examples - and NOT from the start of the R&D

Nuclear Instruments and Methods in Physics Research A309 (1991) 438–449
North-Holland

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**NUCLEAR
INSTRUMENTS
& METHODS
IN PHYSICS
RESEARCH**
Section A

Performance of a liquid argon electromagnetic calorimeter with an “accordion” geometry

RD3 Collaboration

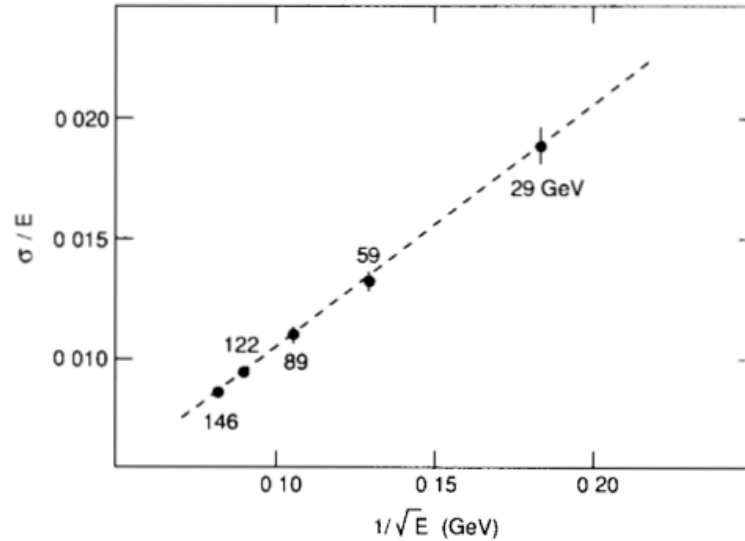
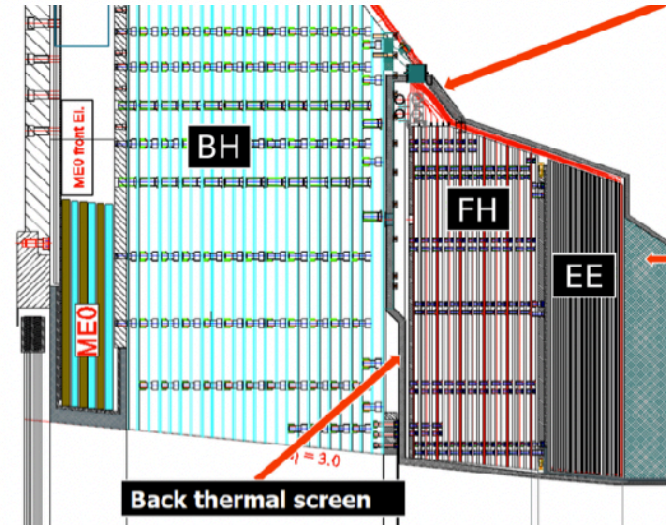


Fig. 6. Energy resolution of the prototype at different electron energies. The dashed line is a linear fit to the experimental points.



CERN-LHCC-2015-10
LHCC-P-008
CMS-TDR-15-02
ISBN 978-92-9083-417-5
1 June 2015



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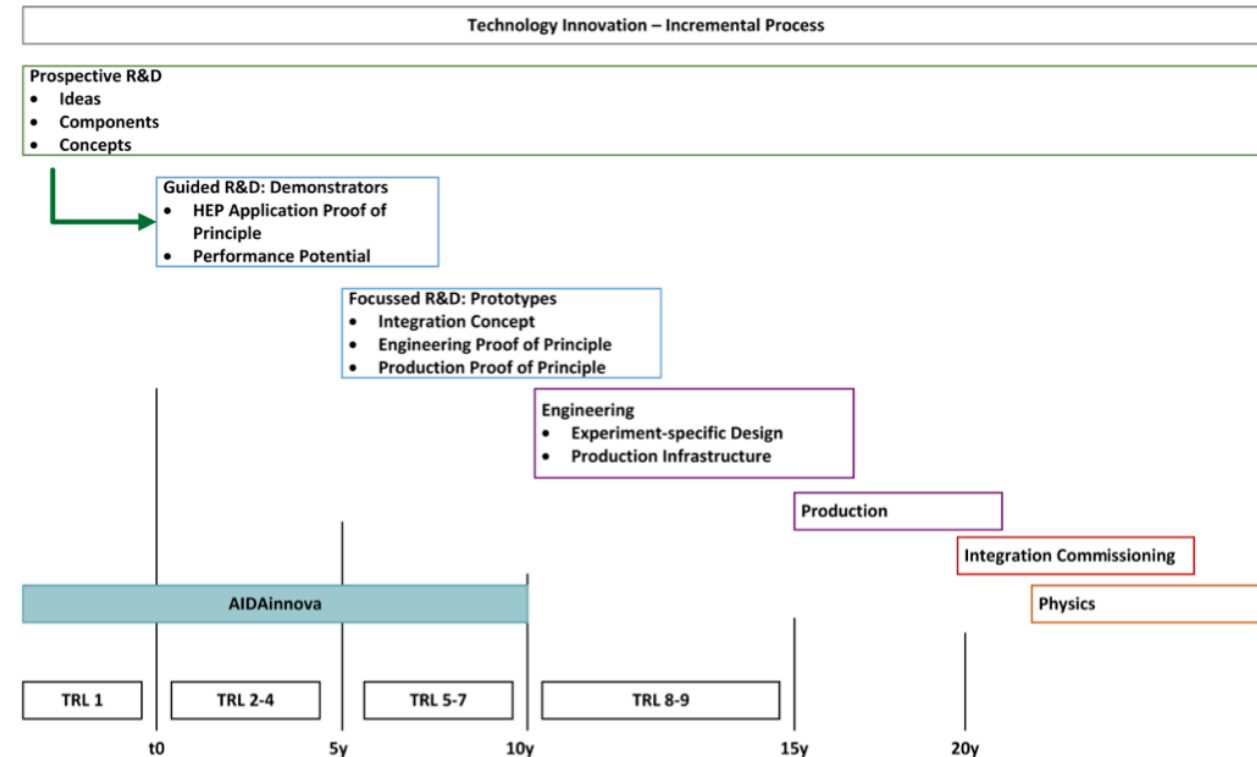
CALICE
2006-2018

Categories of R&D

And Sources of Funding

1. Strategic R&D via DRD Collaborations
(long-term strategic R&D lines)
(address the high-priority items defined in the Roadmap via the DRDTs) **vision**
2. Experiment-specific R&D
(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) **focus**
3. "Blue-sky" R&D
(competitive, short-term responsive grants, nationally organised) **agility**

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



From the AIDAInnova proposal

ECFA Higgs Factory Study WG3 Detectors: Plans

For this year

The Roadmap implementation process with its ambitious timescale challenges the detector R&D community

- Meetings, proposals, coordination - heavy load
- Resources for actual work are still at a very low level, and progress moderate (apart from exceptions)

Main priority of ECFA WG3 is to support this process

- provide input on detector requirements and needed R&D
- provide a forum for feedback on R&D plans
- help R&D groups to convincingly make their case for a strategic R&D program
- make sure that Higgs factories well represented among other targets of DRDs

Plan a series of workshops: bring together DRDs and studies / concepts

- Tracking and Vertexing for Higgs factories (TF1, TF3) **May 30 - June 1 at CERN**
- Calorimetry (and PD/PID?) for Higgs factories ((TF4,) TF6): **May 3-5 at CERN**
- Electronics and integration (TF7, TF8)
- Systematics, Alignment and Calibration

Will also be discussed in individual projects (ILC, FCC), but keep global view and ensure coherence here