AIDAINNOVA

AIDAINNOVA (ADVANCEMENT AND INNOVATION FOR DETECTORS AT ACCELERATORS)

CONTEXT

The AIDA-2020 proposal had been prepared in 2014

- following the European Strategy Update 2013
- clear emphasis on R&D for HL-LHC upgrades

AIDAinnova had to navigate in less well charted sea

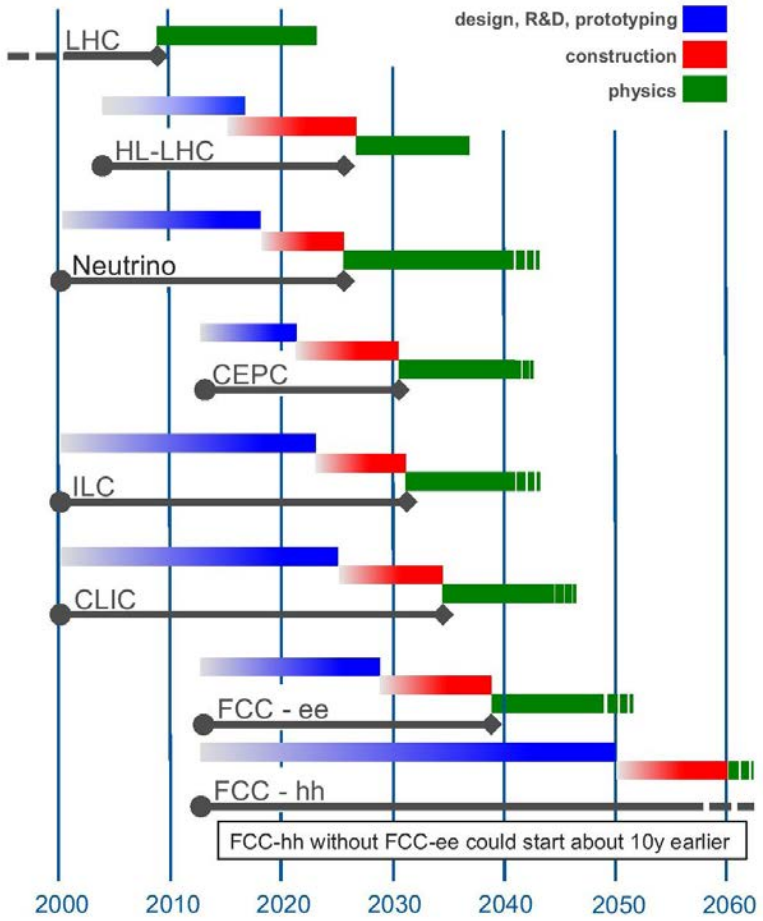
- more diverse range of target applications

Regardless of ongoing strategy process and funding uncertainties, projects have natural timelines

- e.g.: LHC < Higgs Factory < Future hadron collider

Emphasise common aspects and needs

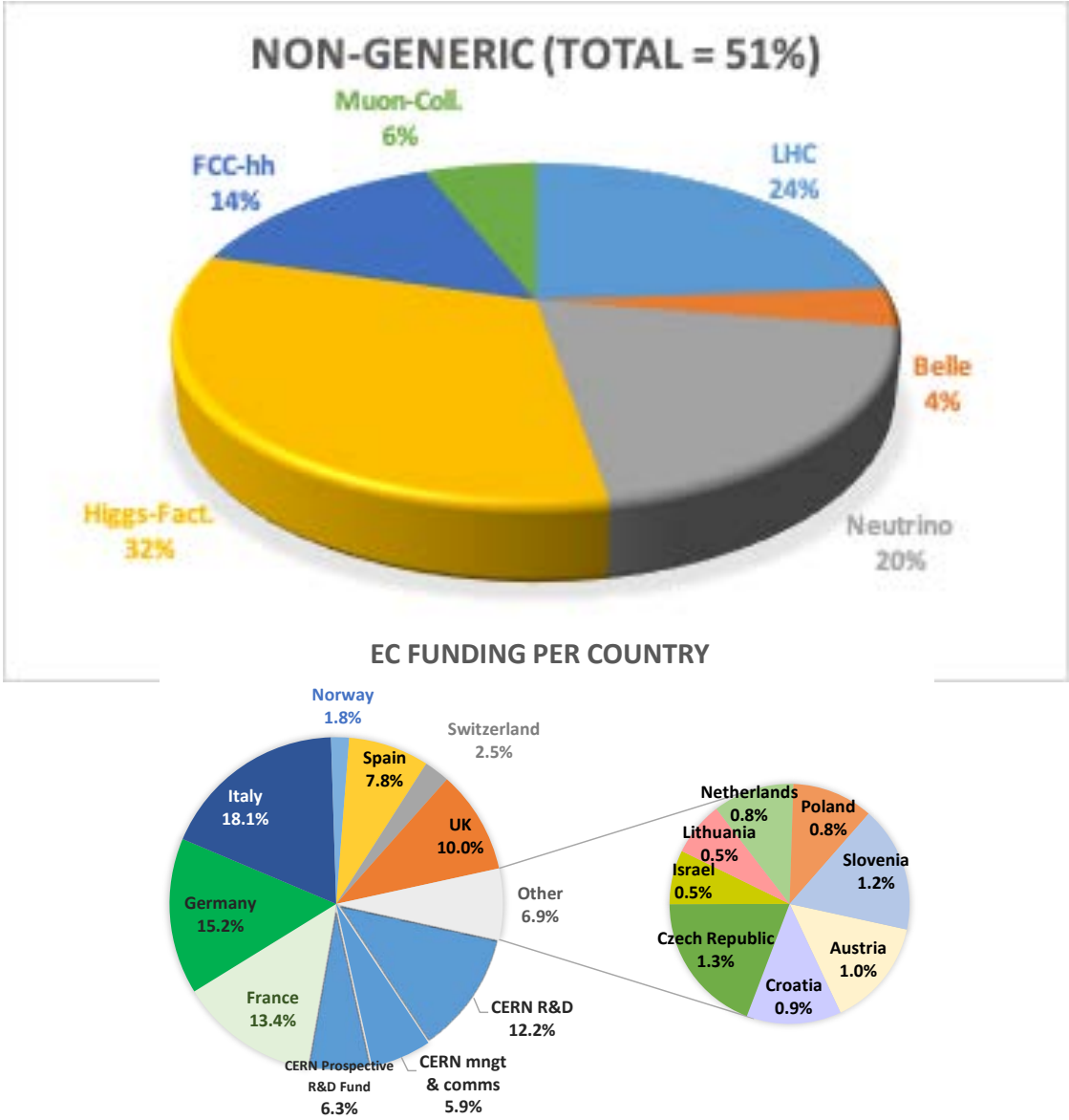
- not exclusively, see later



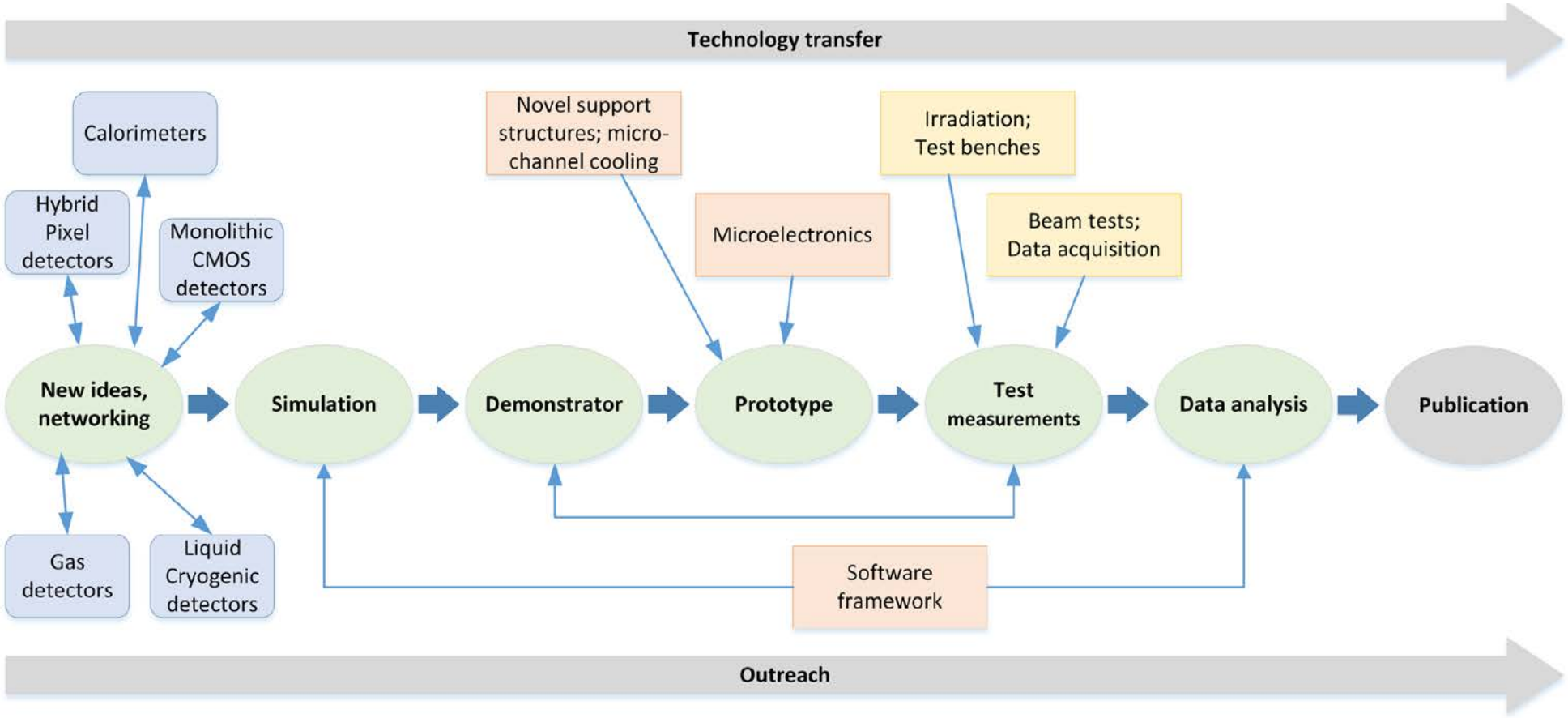
BUDGET

- 49% is “generic”, beneficial for all future projects
- 51% can be associated with 1 to 3 projects
- Total budget 22.5 M€
  - academic partners match overhead-subtracted EC funds 2:1, commercial partners 1:1
- 10% of EC funds to non-academic partners

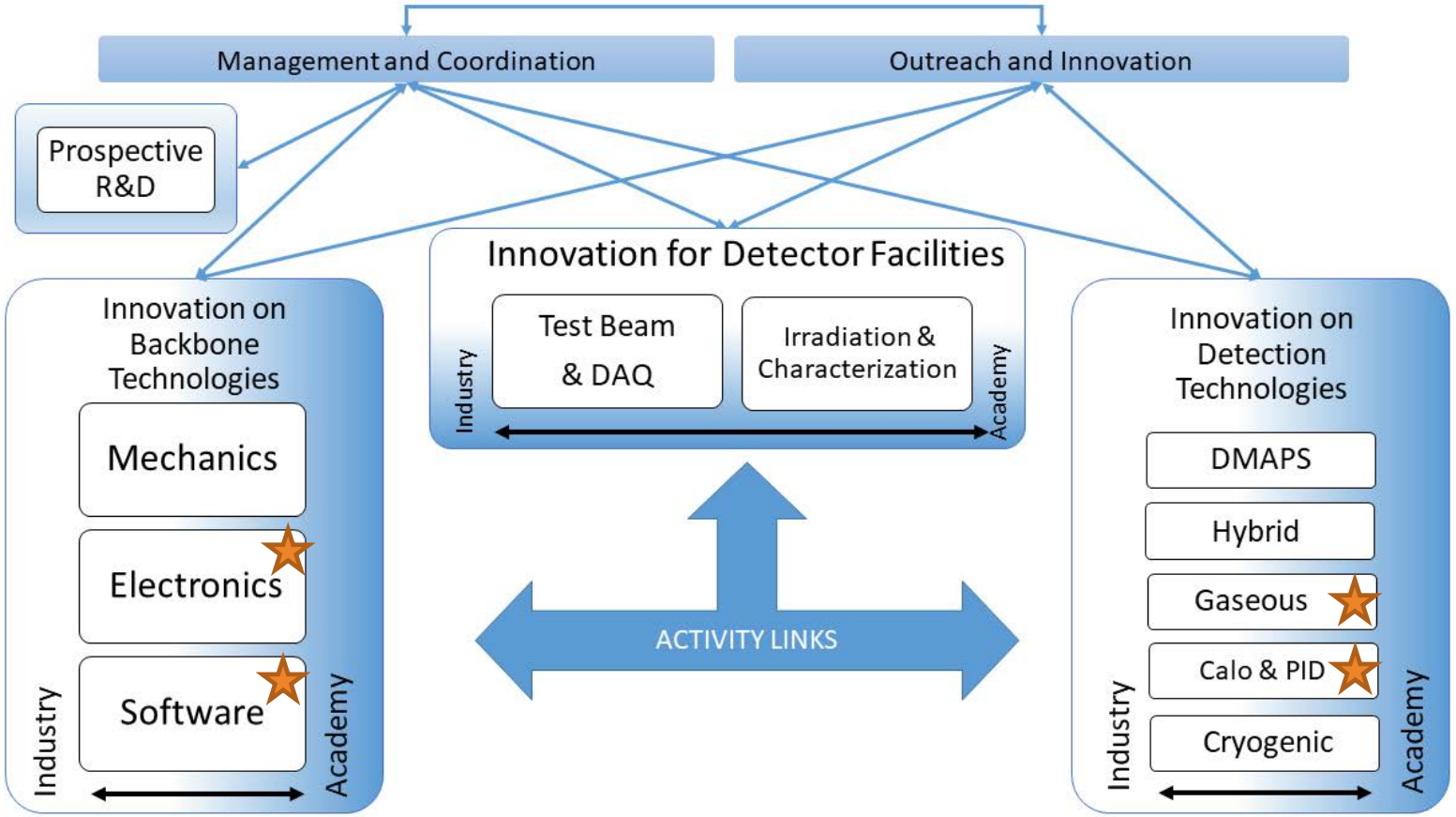
- Started on April 1st, 2021
  - 4-years project



ACTIVITIES


Technology transfer
Calorimeters
Hybrid Pixel detectors
Monolithic CMOS detectors
Novel support structures; micro-channel cooling
Microelectronics
Irradiation; Test benches
Beam tests; Data acquisition
New ideas, networking
Simulation
Demonstrator
Prototype
Test measurements
Data analysis
Publication
Gas detectors
Liquid Cryogenic detectors
Software framework
Outreach

WORK PACKAGES



CRYSTALS FOR FORWARD CALORIMETRY

Development of highly-compact, small-angle electromagnetic calorimeters for intensity-frontier experiments at fixed target

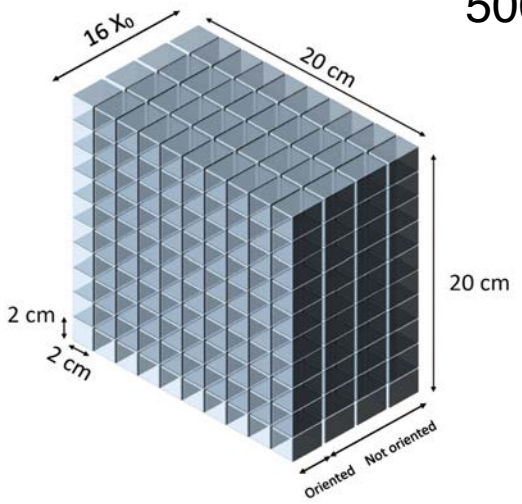
- Resistance to > 100 MHz sustained rates
- Time resolution σ_t < 100 ps, 2-pulse separation at ~ 1 ns
- Good radiation resistance (10^{14} n/cm^2)

AIDA innova

WP8 Calorimeters / PID
3.1 crystal detectors
Task coord. M. Moulson - LNF

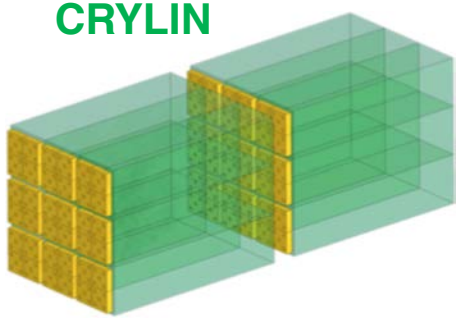
KLEVER **An experiment to measure $K_L \to \pi^0 \nu\nu$ at the CERN SPS (in the NA62 area)**

- Good efficiency for detection of photons with $E_\gamma > 5$ GeV while operated in 500 MHz neutral hadron beam



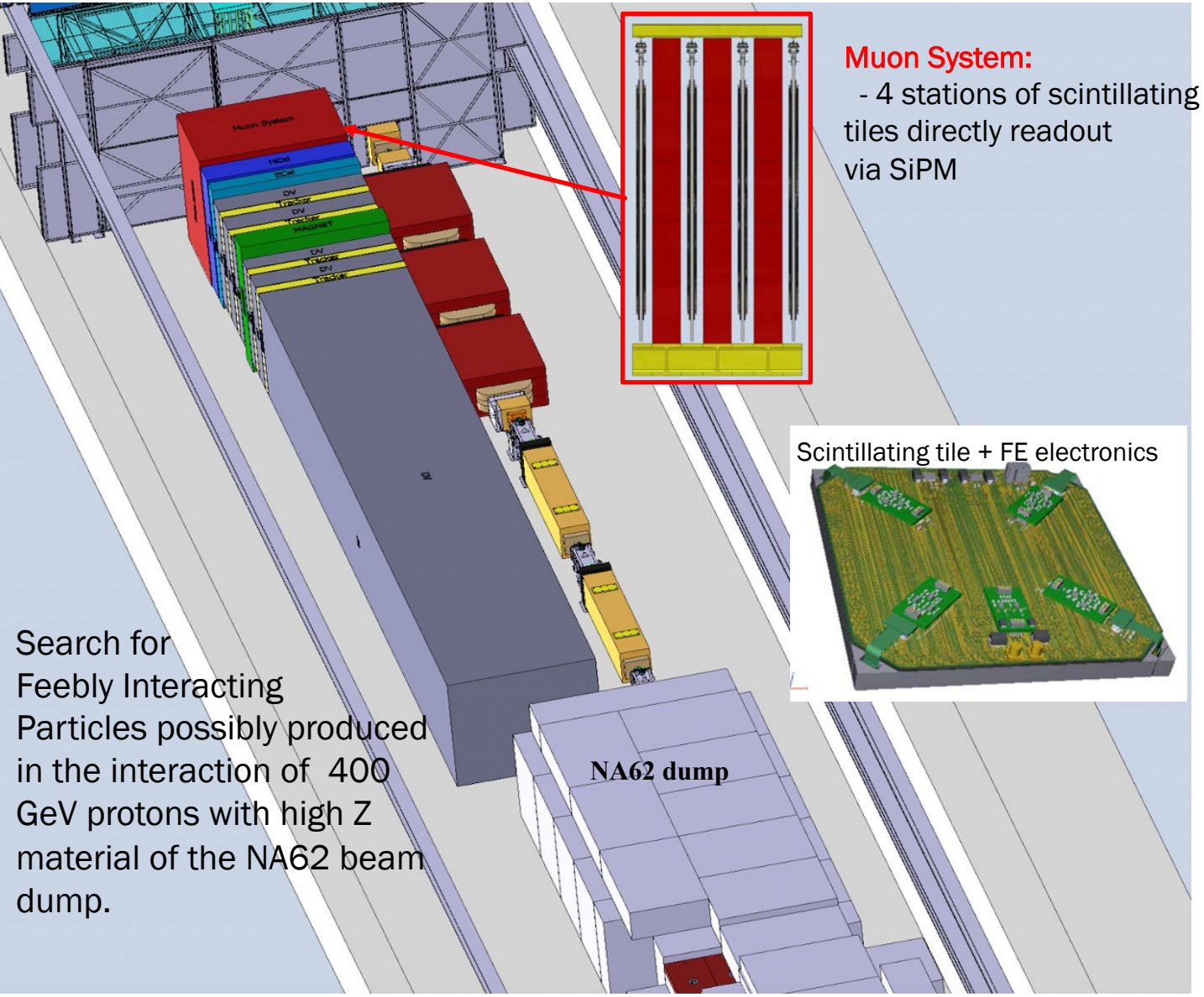
- **Select Cerenkov radiator or ultrafast scintillator for use at high rates and radiation doses**
- Optimize design (e.g. choice of photodetector)
- **Evaluate performance gains from alignment of crystal axis to exploit effect of coherent interactions**

CRYLIN



- Collaborate with MuCol group to test **CRYLIN** prototype
- 1 week of test beam at CERN SPS in August 2021 in collaboration with the **CSN5 STORM** team

SHADOWS: SEARCH FOR HIDDEN AND DARK OBJECTS WITH THE SPS



- SHADOWS verra' discusso in CSN1 a Luglio in un talk dedicato (G. Lanfranchi)
- In attesa di aprire la sigla in CSN1 l'attivita' sara' sotto AIDAinnova: WP8.3.2:
  - Consumi: 36 kE (su 2-3 anni) per costruzione di un prototipo → 16 tiles con elettronica di FE
  - Missioni su Dotazioni 1: tasca speciale "shadows"
- Sezioni coinvolte:
  - LNF: G.Lanfranchi
  - BO A. Montanari
  - FE: W. Baldini (10%)
- Richieste Ferrara:
  - Servizio meccanico: **4-5 giorni persona** per la lavorazione delle tiles di scintillatore e di componenti meccaniche per l'assemblaggio
  - Missioni: **1.0. kE** per riunioni organizzative + **0.5kE** partecipazione a workshop annuale AIDAinnova
- R&D di potenziale interesse anche per il Muon Detector di LHCb Upgrade II.

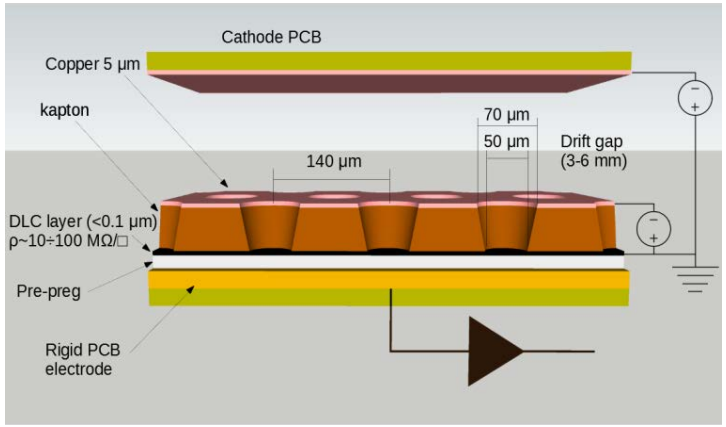
CO-DEVELOPMENT OF THE INDUSTRIAL MANUFACTURING PROCESS OF μ-RWELL (TASK 7.3.2)

- The **goal of the project is the development of μ-RWELL detectors** in strict collaboration **with CERN and ELTOS SpA.**

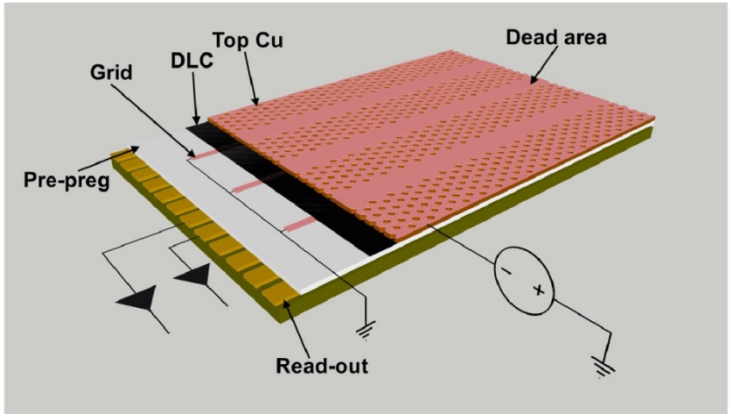
- **The responsibilities in the manufacturing process of the detector are as follows:**
  - Detector layouts design: **INFN**
  - Mechanical drawings: **INFN**
  - PCB with strip/pad readout: **ELTOS SpA**
  - Coupling DLC-kapton with PCB: **ELTOS SpA**
  - Amplification-stage etching: **CERN EP-DT-MPT Workshop**

- Crucial for the development of the technology is the tuning of the DLC coating on polyimide substrate:
  - The **DLC sputtering** technology currently at **Be-Sputter** – Kobe (Japan) and **USTC – Hefei (PRC)**
  - A joint **CERN – INFN DLC (C.I.D)** magnetron sputtering facility will be **operative at CERN EP-DT-MPT Workshop from the 2022**

Low-rate layout → FCC_{ee}



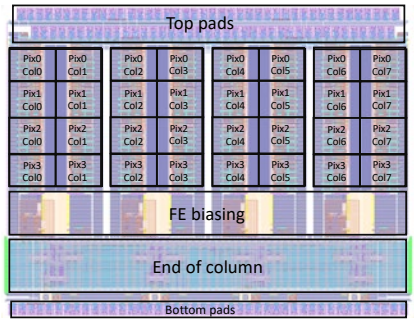
High layout → LHCb



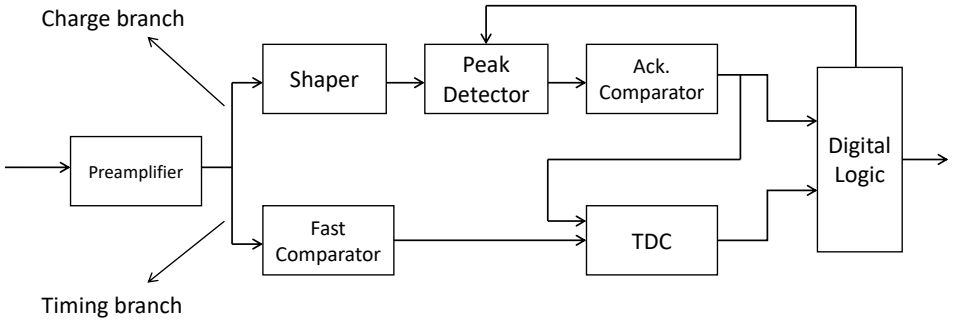
Attività sinergica a RD_FCC

ASICS FOR MPGD (TASK 11.3.2)

- Two complementary designs:
  - larger channel counts, less critical for timing (u-Rwell)
  - smaller channel count, 100 ps.



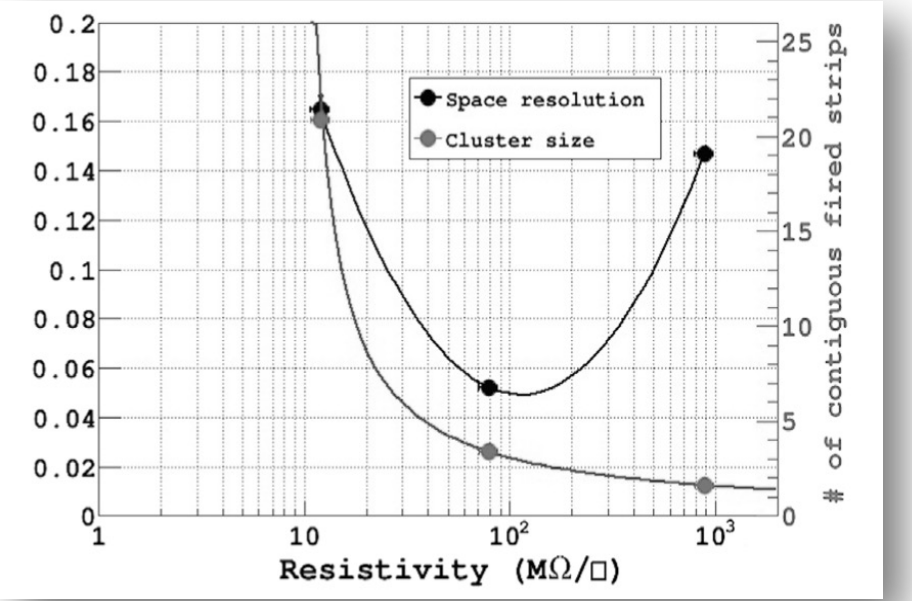
- Profit of the experience with the existing TIGER chip to upgrade features and functionalities



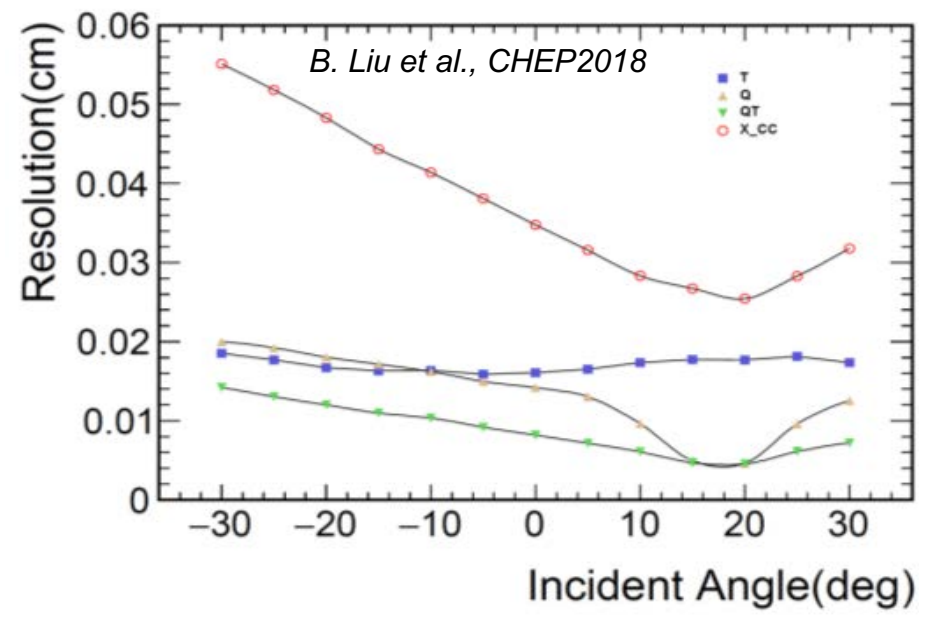
Attività sinergica a RD_FCC

DEVELOPMENT OF MACHINE LEARNING ALGORITHMS FOR MICRO PATTERN GASEOUS DETECTORS (TASK 12.4)

Goal I: extend the simulation to uRWELL (in progress)



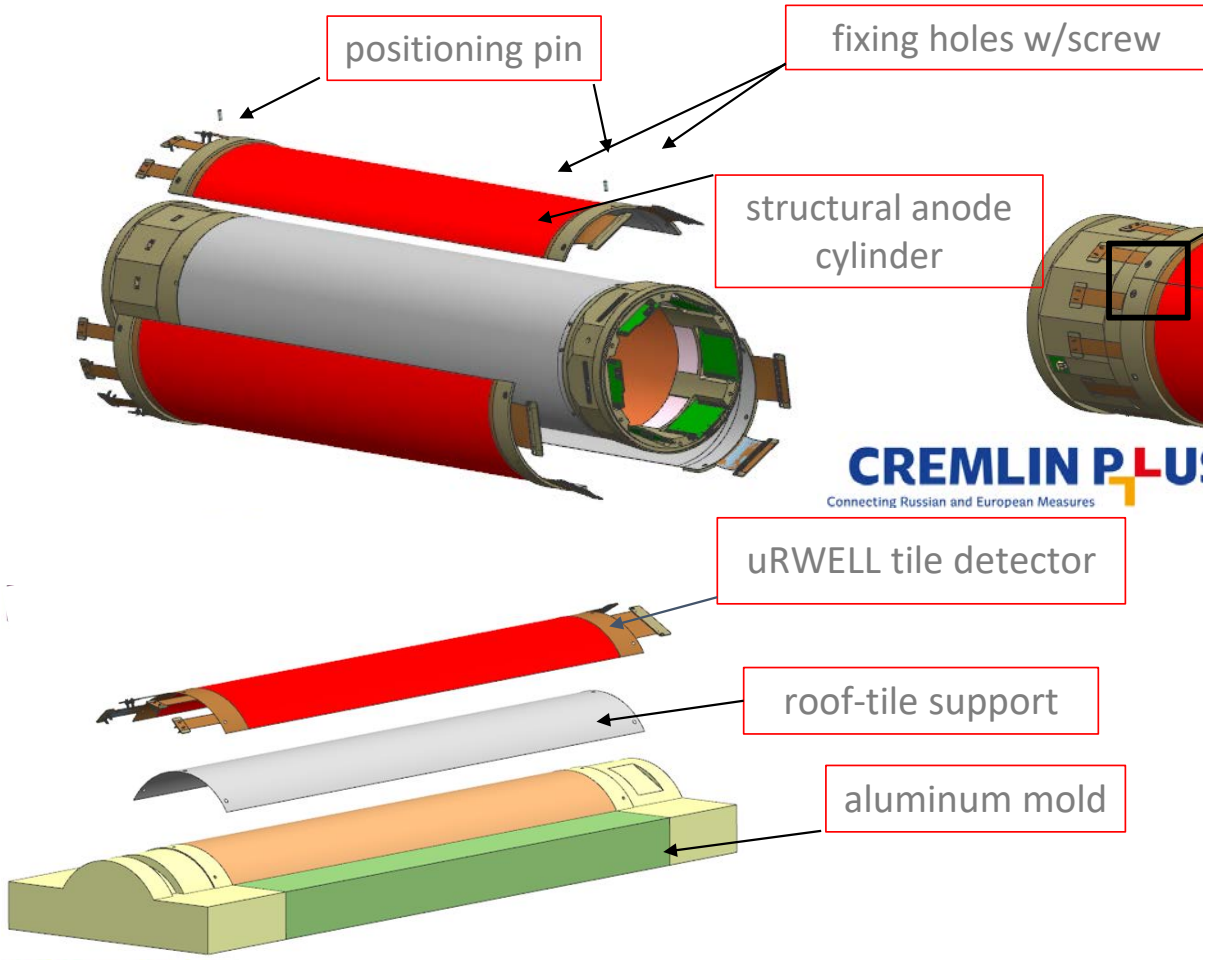
Goal II: develop general purpose Machine Learning tracking algorithms for MPGDs

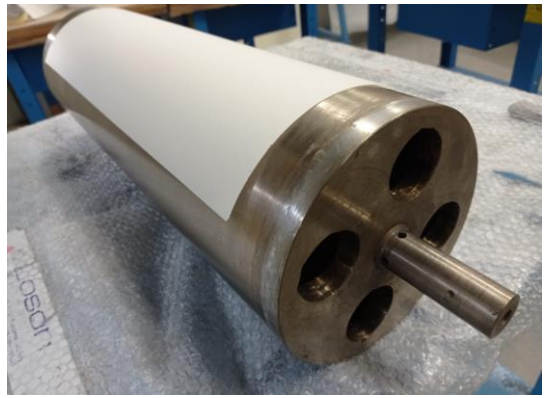


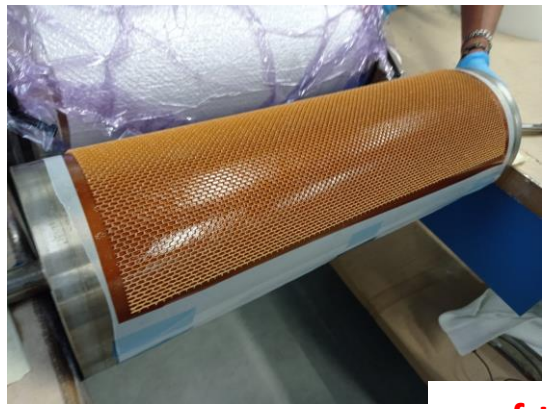
Simulation and ML algorithms will be developed in the general FCC_ee IDEA framework

Attività sinergica a RD_FCC

CREMLINPLUS (WP5): THE C+RWELL FOR THE SCT DETECTOR







roof-tile tests