R&D on Detector Mechanics and Cooling at CERN

Burkhard Schmidt, August 26, 2019

with Antti Onnela and Corrado Gargiulo

R&D on Detector Mechanics

- We discussed this topic at the Forum in Cornell in the context of an R&D collaboration
- Positive aspects of an R&D collaboration:
  - It acts as facilitator to carry out common research plans and activities;
  - It simplifies the exchange of students between participating institutes;
  - It will help to get prepared and organized for 'what comes next';
  - The regular reviewing process is generally appreciated by the Funding Agencies and *might* help the participating institutes to get resources;
  - Better dissemination of knowledge and results.
- Still, we should not overlook that an R&D collaboration comes not for free:
  - It requires work to prepare the proposal for approval by the CERN Research Board
  - Some colleagues (who must be identified) need to take time to lead the effort
  - It will take resources to coordinate the work of the different research lines
- **We should be sure that at he end the community benefits from it!**
- We came to the conclusion that a bottom-up approach is best, and that in a first step the research lines and foreseen activities in the institutes interested should be defined
- **Today's meeting aims at discussing foreseen activities at CERN**

R&D on Detector Mechanics at CERN

- The coordinator of the Strategic R&D on Experimental Technologies (Ch. Joram) asked us to clarify the priorities and come up with a preliminary allocation of resources by the end of August.
- The available resources at CERN for the coming years are as follows:

	2020	2021	2022	2023	2024	Total
Material (kCHF)	250	300	350	400	250	**1550 (kCHF)**
Student (PY)	2	2	3	3	3	**14**
Fellow (PY)	2	3	3	3	3	**14**
Total (kCHF)	550	750	800	850	700	**3650 (kCHF)**

- The activities mentioned in the Proposal are:
  1. Low mass mechanical structures for future HEP experiments
     i. Low mass mechanics for future Tracking Detectors
     ii. Low mass composite cryostat for Calorimeters and Detector Magnets
  2. New Detector-Infrastructure interfaces and service architectures for automated installation and maintenance
  3. High-performance cooling for future detectors

R&D on Detector Mechanics and AIDA next (AIDA++)

- Expressions of interest (EoI) for ‘AIDA next’ have been submitted in July.
- Out of 162 EoIs 8 are Mechanics and Cooling related
- An open meeting will take place next Wednesday: https://indico.cern.ch/event/838460/

- The funds requested by the EoI are much beyond the resources, and a selection will need to be carried out in the fall of this year (roughly only 1 out of 4 can be accepted).
- Note that for any proposal included in AIDA++, ⅔ of the resources have to come from the institutes, only ⅓ are fresh resources from the EU. The total amount for AIDA++ is 30M€, with 10M€ fresh money, shared between many proposals.
- ‘AIDA next’ can complement the CERN initiative on strategic R&D.
- ‘AIDA next’ fosters collaboration between institutes, which we want to encourage as well.

Mechanics: Structures and Cooling

Low tech - not at all.

Presentation of Felix Sefkov

New materials - lowest mass structures

trackers, of course, but also thin cryostats

expand large structures

Advanced cooling

Airflow

integrated design and FSI diagnostics

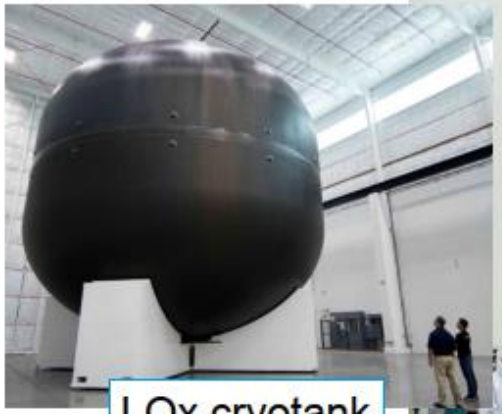
Micro-channel cooling

for micro-structures CMOS post-processing

High performance - low temperature

CO2 for hadronic environments

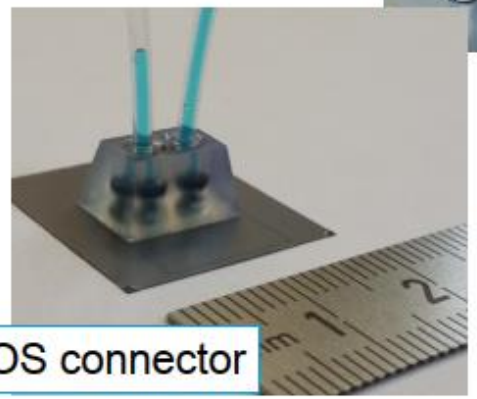
New topic: automated handling for highly irradiated environments



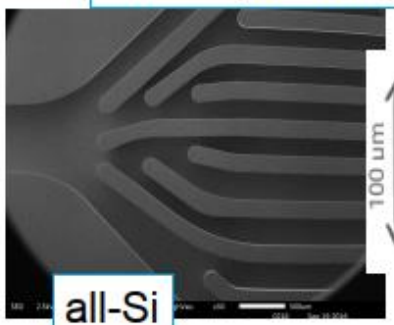
LOx cryotank

telescope backplane

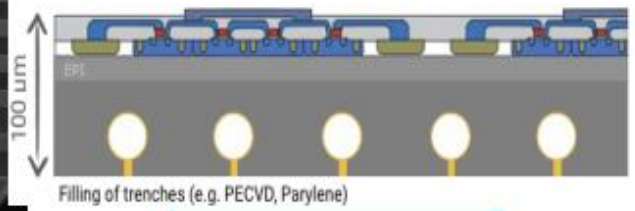
CF-honeycomb disk



CMOS connector



all-Si



CMOS structure

Final comments

- We discuss presently the activities and priorities for the coming years on R&D on Mechanics and Cooling planned at CERN (in the context of the Strategic R&D on Experimental Technologies).
- We should also identify areas where we can collaborate with other institutes.

- All this is an important step in view of a possible R&D collaboration
- A follow up meeting on this is planned after further discussion with potential stakeholders.

BACKUP

EC-funded Projects

AIDA-2020 and Follow-up

Presentation of Felix Sefkov

Integrating Activities since 2006
increasing level of integration

All have strong leverage on matching fund

AIDA-2020: 2015-2020

39 beneficiaries from 19 countries

EC funds **10 M€**, total budget **29.8 M€**

Unique in establishing coherence at European level

Subsidiary approach to coordination

build on existing structures where possible

New Call in Horizon 2020

Innovation Pilot for Detectors

Expected budget 10 M€

Deadline for submission **March 17, 2020**

Call for Expressions of Interest this week

Open community meeting CERN September 4

Complementary to ATTRACT

no double-funding