Detector-related Sessions:

Introduction

FCC Week 2023

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Opening Remarks

Detectors in the feasibility study:

- **support the implementation of the Roadmap for Detector R&D**
- to stay informed, register at https://indico.cern.ch/event/957057/page/27294-implementation-of-the-ecfa-detector-rd-roadmap
- see also workshops in the framework of the ECFA study https://indico.cern.ch/event/1044297/page/28993-wg3-group-activities

- **develop detector concepts to guide the R&D and establish the link between technologies and physics performance**

- **the “D" in MDI**

Detector Sessions

This session:

10:35 **Calorimetry R&D for FCC-ee and FCC-hh**
Speaker: Gabriella Gaudio (INFN-Pavia)

10:57 **Si tracking and vertexing R&D for FCC**
Speaker: Prof. Daniela Bortoletto (University of Oxford (GB))

11:19 **Particle ID and Photodetector R&D for FCC**
Speaker: Roger Forty (CERN)

11:41 **Gaseous detector R&D for FCC**
Speaker: Dr Maksym Titov (IRFU, CEA Saclay, Université Paris-Sacl

This afternoon:

15:30 → 17:00 **PE&D: Detectors (II)**
Convener: Paolo Giacomelli (INFN Sezione di Bologna)

15:30 **Tracking system requirements ALICE-3 versus FCC-ee**
Speaker: Didier Claude Contardo (Centre National de la Recherche Scientifique (FR))

16:00 **Si detector development for ALICE ITDS3 and ALICE-3**
Speaker: Magnus Mager (CERN)

16:30 **Detector activities and plans in the US**
Speaker: Srini Rajagopalan (Brookhaven National Laboratory (US))

Joint Sessions

This afternoon:

13:30 → 15:00 **PE&D: Software and Computing / Detectors**

Convener: Marc-Andre Pleier (BNL)

- 13:30 **Status of software for detector studies**
  Speaker: Brieuc Francois (CERN)
- 13:50 **IDEA vertex and drift chamber in Key4hep**
  Speaker: Armin Ilg (University of Zurich)
- 14:10 **RICH full sim implementation in Key4hep**
  Speaker: Alvaro Tolosa Delgado (CERN)
- 14:30 **IDEA Dual readout calorimeter in Key4hep** ¶
  Speaker: Sang Hyun Ko (Seoul National University (KR))
- 14:45 **FCC-ee TileCal simulation and reconstruction**
  Speaker: Michaela Mlynarikova (CERN)

Tuesday: IR design and background studies

MDI (I) Convener: John Seeman (SLAC)	
M. Boscolo (INFN)	MDI overview
F. Palla (INFN)	Mechanical integration of the IDEA detector in the IR
A. Ing (Un. Zurich)	IDEA VXD implementation in full simulation
F.Fransesini(INFN)	Mechanical model of the MDI
L. Brunetti (CNRS)	Towards mechanics and optics evaluation of the vibration effects for the MDI

MDI (II) Convener: Manuela Boscolo (INFN-LNF)	
H. Nakayama (KEK)	SuperKEKB MDI lessons
G. Broggi (CERN&Sap.&INFN)	Beam Losses in the MDI
K. Andre (CERN)	Synchrotron radiation background studies
A. Ciarma (INFN)	Detector background simulations
G. Lerner (CERN)	Beamstrahlung dump and radiation levels in the experiment IRs

Back-up

ECFA Detector Roadmap Summary

Relating Technology R&D to Major Drivers from Facilities

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

~ 200 pages
~ 1 year young

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

stepping stones, ILC, FCC, CLIC

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

		< 2030	2030-2035	2035-2040	2040-2045	> 2045
Gaseous	DRDT 1.1 Improve time and spatial resolution for gaseous detectors with long-term stability					
	DRDT 1.2 Achieve tracking in gaseous detectors with dE/dx and dN/dx capability in large volumes with very low material budget and different read-out schemes					
	DRDT 1.3 Develop environmentally friendly gaseous detectors for very large areas with high-rate capability					
	DRDT 1.4 Achieve high sensitivity in both low and high-pressure TPCs					
Liquid	DRDT 2.1 Develop readout technology to increase spatial and energy resolution for liquid detectors					
	DRDT 2.2 Advance noise reduction in liquid detectors to lower signal energy thresholds					
	DRDT 2.3 Improve the material properties of target and detector components in liquid detectors					
	DRDT 2.4 Realise liquid detector technologies scalable for integration in large systems					
Solid state	DRDT 3.1 Achieve full integration of sensing and microelectronics in monolithic CMOS pixel sensors					
	DRDT 3.2 Develop solid state sensors with 4D-capabilities for tracking and calorimetry					
	DRDT 3.3 Extend capabilities of solid state sensors to operate at extreme fluences					
	DRDT 3.4 Develop full 3D-interconnection technologies for solid state devices in particle physics					
PID and Photon	DRDT 4.1 Enhance the timing resolution and spectral range of photon detectors					
	DRDT 4.2 Develop photosensors for extreme environments					
	DRDT 4.3 Develop RICH and imaging detectors with low mass and high resolution timing					
	DRDT 4.4 Develop compact high performance time-of-flight detectors					
Quantum	DRDT 5.1 Promote the development of advanced quantum sensing technologies					
	DRDT 5.2 Investigate and adapt state-of-the-art developments in quantum technologies to particle physics					
	DRDT 5.3 Establish the necessary frameworks and mechanisms to allow exploration of emerging technologies					
	DRDT 5.4 Develop and provide advanced enabling capabilities and infrastructure					
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					
Electronics	DRDT 7.1 Advance technologies to deal with greatly increased data density					
	DRDT 7.2 Develop technologies for increased intelligence on the detector					
	DRDT 7.3 Develop technologies in support of 4D- and 5D-techniques					
	DRDT 7.4 Develop novel technologies to cope with extreme environments and required longevity					
	DRDT 7.5 Evaluate and adapt to emerging electronics and data processing technologies					
Integration	DRDT 8.1 Develop novel magnet systems					
	DRDT 8.2 Develop improved technologies and systems for cooling					
	DRDT 8.3 Adapt novel materials to achieve ultralight, stable and high precision mechanical structures. Develop Machine Detector Interfaces.					
	DRDT 8.4 Adapt and advance state-of-the-art systems in monitoring including environmental, radiation and beam aspects					
Training	DCT 1 Establish and maintain a European coordinated programme for training in instrumentation					
	DCT 2 Develop a master's degree programme in instrumentation					

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).