

Short EP-Retreat Report

Yearly meeting of TC/TL
Normally in the Abbay de Talloires
This time nicely from home



Welcome to Joachim Mnich

- New CERN director of research and computing as of 1/1/2021, taking over from E. Elsen



Introduction

EP Department

- Mission and tasks of the Experimental Physics (EP) Department
 - Is an important reference centre for the European particle physics community
 - Covers Host Laboratory responsibilities and provides technical support to the Experiments
 - Participates in the research as a collaboration institution (for some of the experiments)
 - Facilitates the USERS community to do their work
 - Provides a stimulating scientific atmosphere
 - Contributes to the education and training of young scientists and engineers
- EP is the largest department at CERN, with more than **700 members** of personnel employed (MPE) and more than **12,000 members** of personnel associated (MPA).
- Total EP budget in 2020 (before Covid): **182,7 MCHF**

Introduction

CERN Research Programme – EP Participation



APPROVED Experiments

- **LHC:** ALICE, ATLAS, CMS, LHCb, FASER, MoEDAL, TOTEM, LHCf
- **SPS:** COMPASS, NA61, NA62, NA63, NA64, NA65
- **PS:** CLOUD
- **AD:** AEGIS, ALPHA, ALPHA-g, ASACUSA, BASE, GBAR
- **Neutrino Platform:** ProtoDUNE, T2K/ND280, ENUBET
- **R&D:** RD42, RD50, RD51, RD53, Crystal Clear, UA9
- **Non-accelerator experiments:** CAST, OSQAR
- **ISOLDE** and **nTOF** facilities

Experiments and Projects under Study

- **FCC**
- **BDF facility / SHiP**
- **LHC:** SND
- **SPS:** NA64 μ , MUonE, AMBER, MadMax
- **AD:** PUMA

CERN-EP involvement

Substantial
Significant
Limited
None

Recognized experiments (Astrophysics etc.)

Use of CERN resources should be marginal

- RE1 AMS
- RE2b Pamela
- RE3 Auger
- RE6 Antares
- RE7 Fermi
- RE8 LISA-PF
- RE10 IceCube
- RE11 MICE
- RE12 MEG
- RE13 T2K
- RE14 Katrin
- RE17 Magic
- RE18 ArDM
- RE19 CREAM
- RE20 Belle II
- RE21 CBM
- RE22 Panda
- RE23 CTA-PP
- RE25 CALET
- RE26 Borexino
- RE27 NEXT
- RE28 Virgo
- RE29 DAMPE
- RE30 KM3NeT
- RE31 Euclid
- RE33 LIGO
- RE34 JUNO
- RE35 SNO+
- RE36 Mu3e
- RE37 DarkSide-20k
- RE38 DAMIC-M
- RE39 sPHENIX
- RE40 POLAR-2

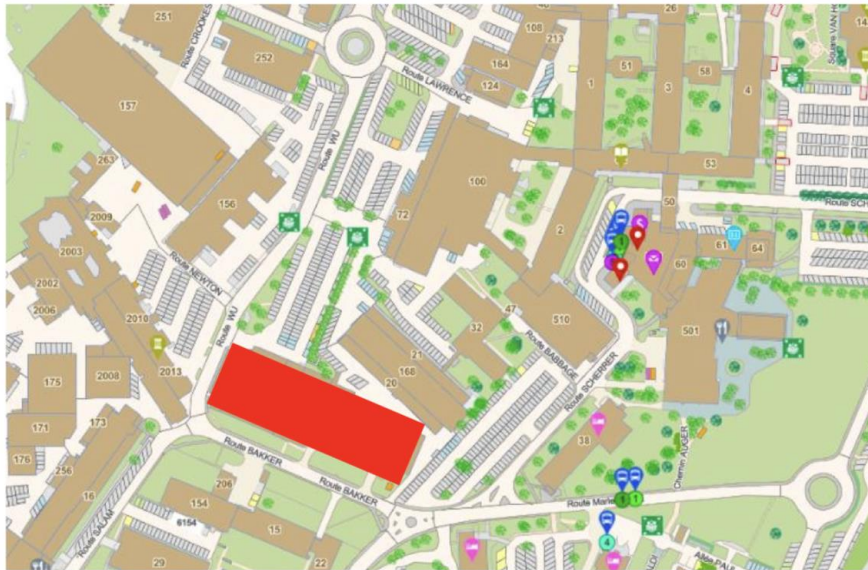
New Building for EP...

Building 140 – The EP Building



Large new building to be constructed in the centre of CERN Meyrin

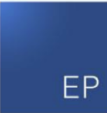
Building to host EP personnel, infrastructure, users



Artistic view from a previous study. Building will likely look different.

New Building for EP

Building 140 – The EP Building



- Re-structuring of BNP Paribas Fortis loan through new credit facility with UBS
~30 Mio/year liberated in **2021-2025**
- Refinancing approved by Council under the condition that a large fraction of these 30 Mio to improve/consolidate infrastructure at CERN
- Seen as a chance for EP. Together with SMB we proposed Building 140
Digging out a proposal from the past, proposed Buildings 140 + 146 (not realized)
- MTP 2020 contains **50 Mio CHF for Building 140**
- MTP approved in September Council

Unique chance for EP: New building for ~700 people

Opportunity to optimise EP space usage, restructure some historically grown, but no longer efficiently used space, demolish old buildings and barracks (some aged 30-65 years)

First consideration for Bat 140, hosting of

EP management + EP services (e.g. EP secretariat)

DT cluster, DT offices, possibly “light” laboratories

Healthy mixture of EP Staff/Fellows and Users

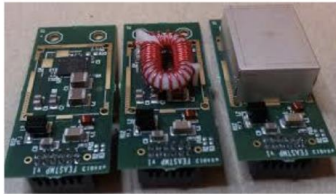
Building ready in/after 2025.. ?

Detector R&D @CERN

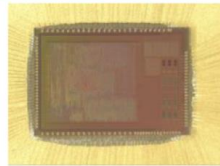
CERN has a tradition to define R&D programs for developing technologies and facilities, in time for next experimental challenge (e.g. LHC upgrade => White Paper R&D)



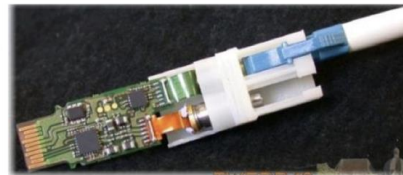
Rad hard DC-DC converters



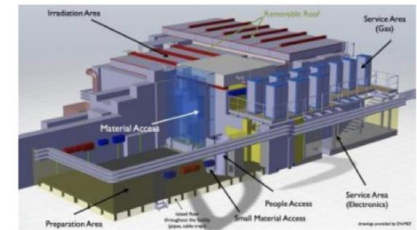
ASICs in 130 nm technology



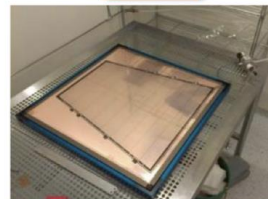
Versatile links



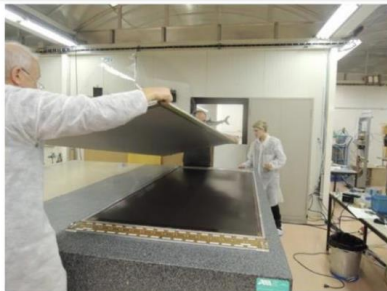
GIF++



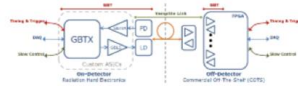
RD51



MPGD fabrication techniques



GBT



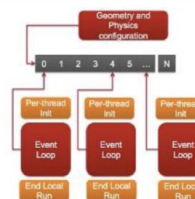
PS Irrad upgrade



Virtualisation



Multi core architectures



“White Paper” R&D program (2008-2011), initiative of CERN DG Robert Aymar, PH budget ~20 MCHF.

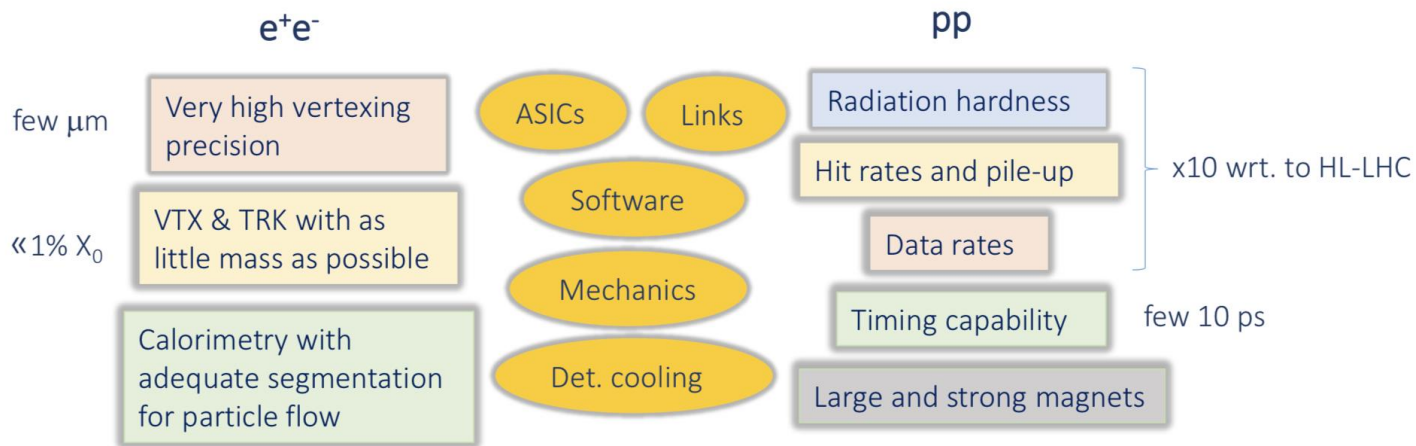
Detector R&D

New EP R&D programme (2020 – 2024 ...)



- A strategic technological R&D programme, rather than experiment specific developments.
- Its results shall enable future projects to develop and build optimal detectors
- We use the requirements of HL-LHC and studies like FCC (ee/hh), CLIC, ... as guidelines.

Instrumentation challenges in future detectors (beyond HL-LHC)



Concentrate on key detector technologies, but equally important are mechanics, infrastructure, electronics, software and experimental magnets

Detector R&D

EP R&D program

- has been defined in a transparent bottom-up process
- with wide participation of HEP community
- 1 kick-off (2017), 2 workshops (2018), R&D Day in 2019
- 100 pages R&D proposal. 10 pages Input to ESPP update.

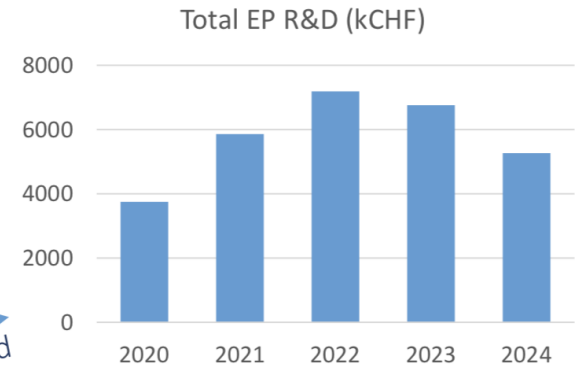


R&D

Resources

- Budget in MTP2019: 24.6 MCHF (spread over 5 years). Material, fellows, students, no staff.
- ~20 FTE staff, distributed over about 70 persons, 'volunteer' as supervisors.
- Approved budget is 55% of request → reduction of scope / delayed start of some activities.
- LHC experiments and EP SG contribute additional ~15% (fell.+stud.)

included

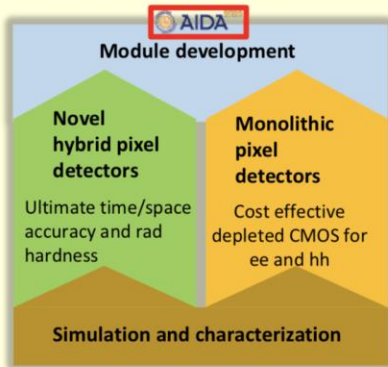


Cooperation

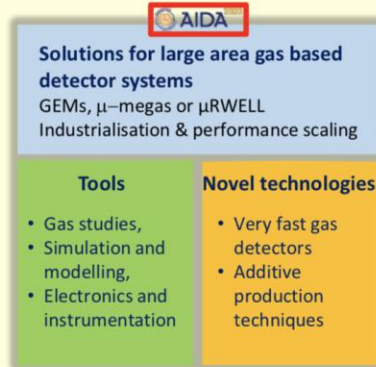
- We cooperate with many external groups, also via R&D collaborations like RD50 and RD51.
- We profit from European projects like AIDAinnova (~1 MCHF).

Detector R&D

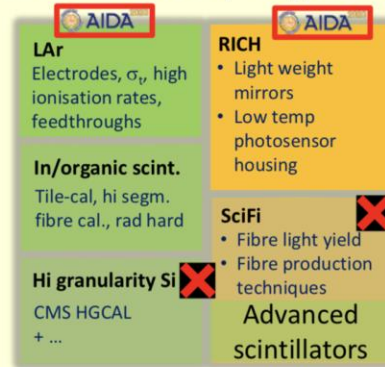
WP1: Silicon Sensors



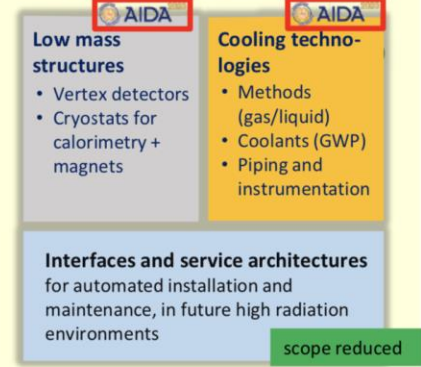
WP2: Gas Detectors



WP3: Calorimetry + Light based



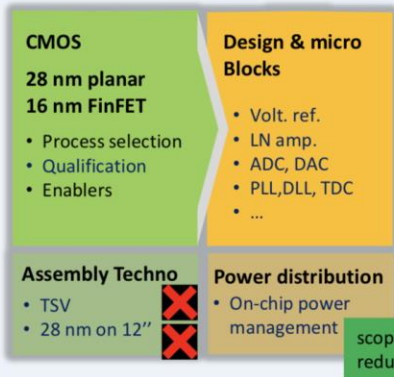
WP4: Mechanics⁺⁺



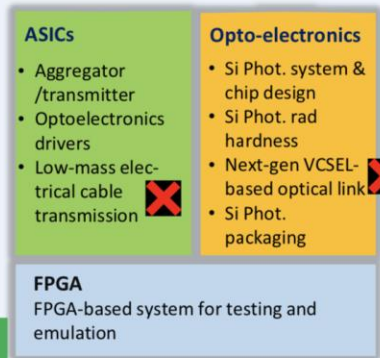
✗ on hold

synergy with AIDAInnova

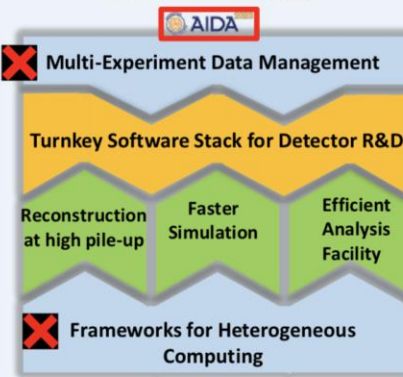
WP5: IC Technologies



WP6: High Speed Links



WP7: Software



WP8: Exp. Magnets



Detector R&D



AIDAinnova Approved & Next Steps

Proposal approved by EU on 3rd November 2020

Ongoing → March 2021: Project preparation (legal & financial)

- Grant Agreement, which is the contract with the EC. Early next year first CERN will sign the Grant Agreement, then institutes sign Accession Forms.
- The Consortium Agreement, which is the contract between the beneficiaries (only)
- **Feb 2021** (date tbc), **CERN internal meeting**, with CERN Task Leaders and CERN Finance to organize mechanics of budget codes
 - **Budget 918.5 k euro for CERN R&D**

April 1st 2021 Project start date

- First reporting 18month later

April 12-16 for the Kick-off meeting at CERN (in person/virtual tbc)

- outline the work program in more detail than what is written on the few pages of the proposal
- **Incl. first meeting of the Governance Board**

March 31st 2025 Project END date

Thanks to Anne Dabrowski and Lucie Linssen, not only for preparing the slides!

AIDAinnova
CERN
contact
person

Detector R&D



CERN Participation

Participation as beneficiary

- WP1: Project management and coordination
- WP2: Communication & Knowledge Transfer
- WP3: Test beam and DAQ infrastructure
- WP4 : Irradiation and characterisation upgrades
- WP5: DMAPS (Monolithic Pixel Detectors)
- WP6: Hybrid Semiconductor Detectors
- WP7: Gaseous detectors
- WP8: Highly granular calorimeters and PiD detectors
- WP10: Mechanics
- WP12: Software
- WP13: Prospective R&D

No CERN Participation as beneficiary in

- WP9: Cryogenic Neutrino Detectors
- WP11: Electronics

Program

11:10	→ 11:35	EP R&D	🕒 25m
Speaker: Christian Joram (CERN)			
11:35	→ 12:00	CHIPS initiative	🕒 25m
Speaker: Francois Vasey (CERN)			
12:00	→ 13:15	Lunch	🕒 1h 15m
13:15	→ 14:15	HL-LHC Computing Challenge	🕒 1h
Speaker: Marco Cattaneo (CERN)			
14:15	→ 14:55	Neutrino Platform	🕒 40m
Speaker: Marzio Nessi (CERN)			
14:55	→ 15:05	Coffee break	🕒 10m
15:05	→ 15:45	FCCEe	🕒 40m
Speaker: Patrick Janot (CERN)			

ASICs @ CERN

Hard problem!

Nice overview

A new EP group?