WP10 – CSIC report

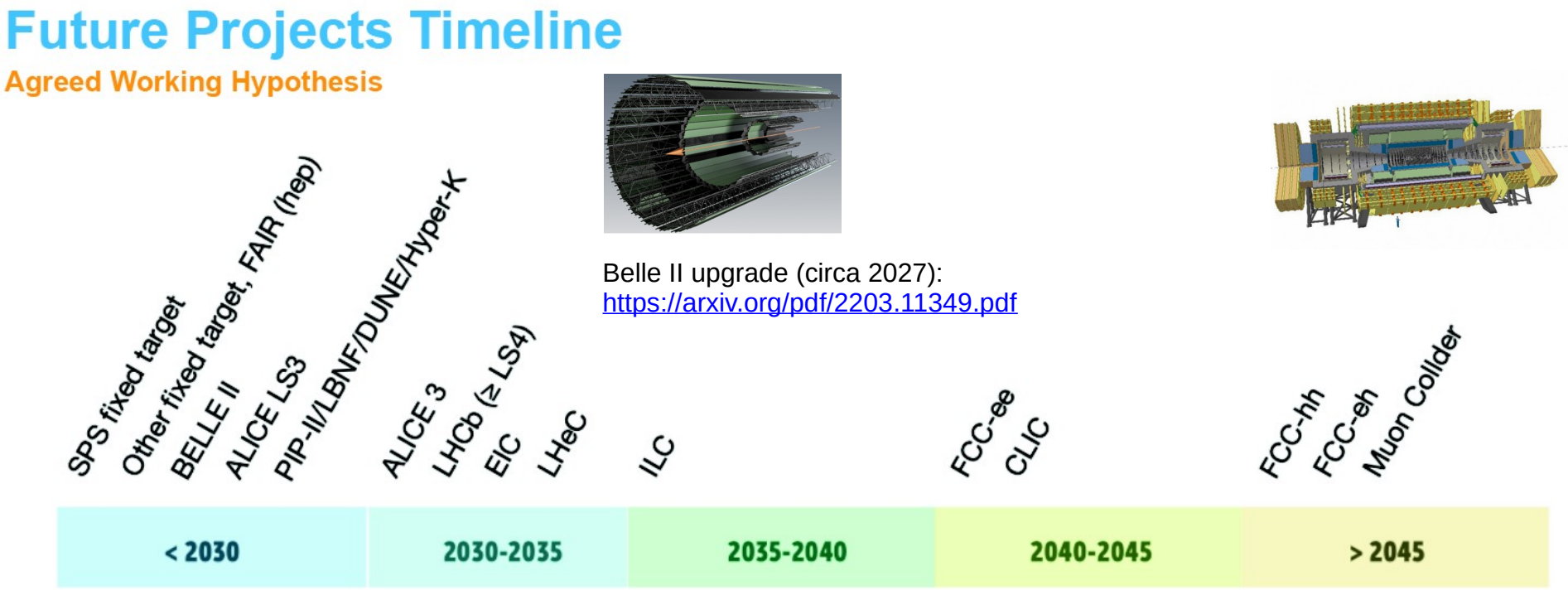

Carlos Marinas, Marcel Vos (IFIC – UVEG/CSIC – Valencia),

2nd[t] AIDAinnova annual meeting, Valencia, April 2023

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004761.

Global R&D landscape

- detector R&D embedded in the global R&D landscape



Belle II upgrade (circa 2027):
https://arxiv.org/pdf/2203.11349.pdf

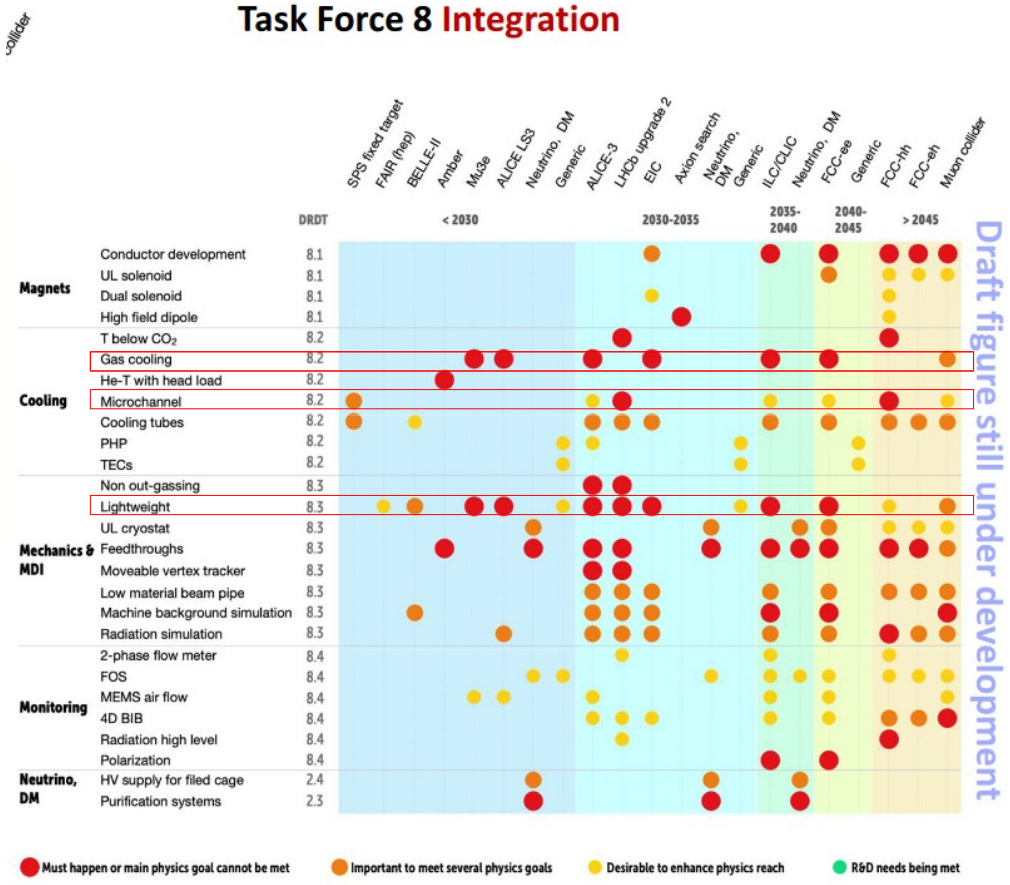
- Funding for “future” projects and “blue sky” R&D is scarce
- Try to use intermediate-timescale projects as stepping stones

ECFA R&D strategy

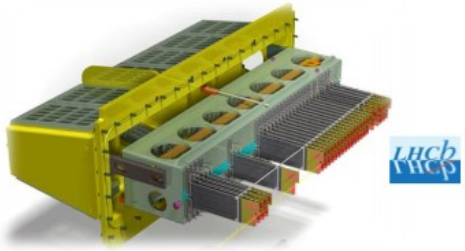
Important effort in Europe to inventorize detector R&D needs of upcoming experiments in particle physics

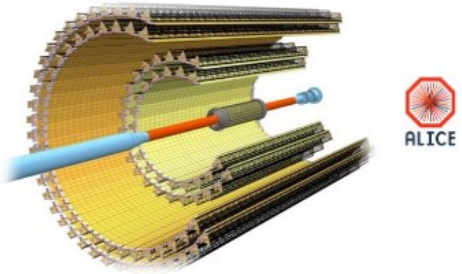
See also:
Snowmass detector R&D

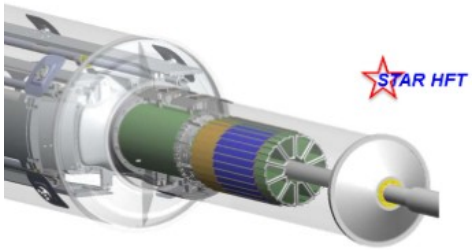
See talks in ECFA R&D symposium:
https://indico.cern.ch/event/999825/



Ultra-light cooling







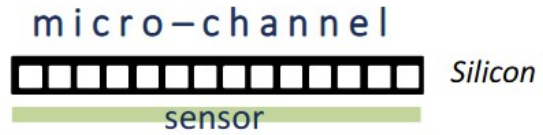
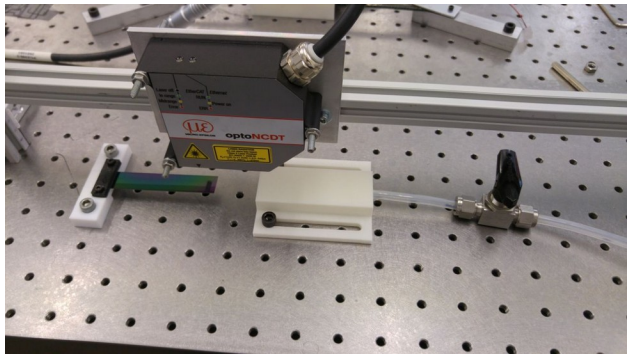


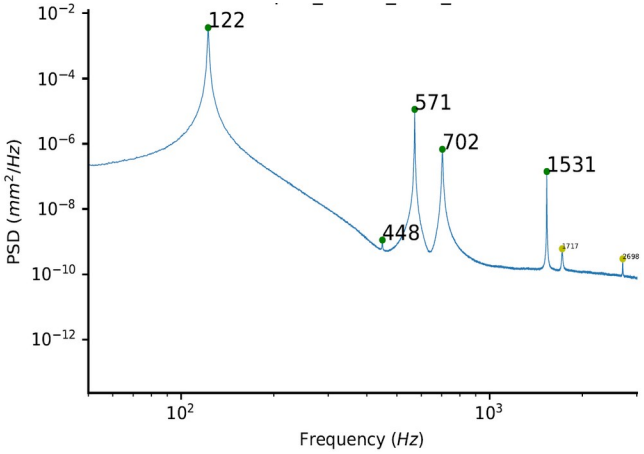
Image from Corrado Gargiulo

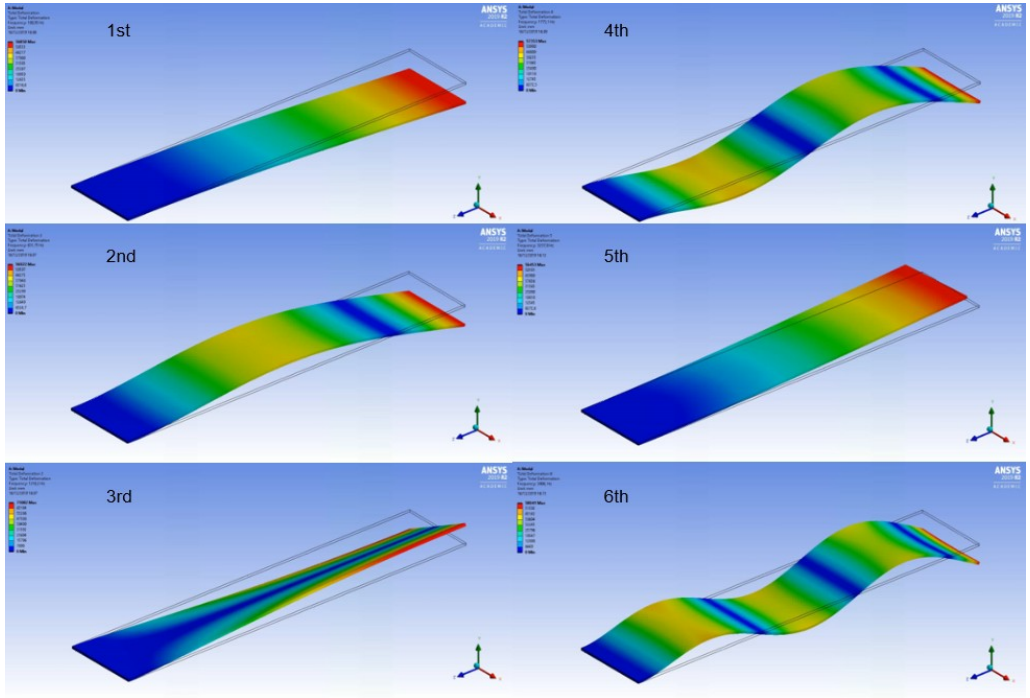
AIDA innova Measurements

Multiple silicon structures measured in Oxford and Valencia

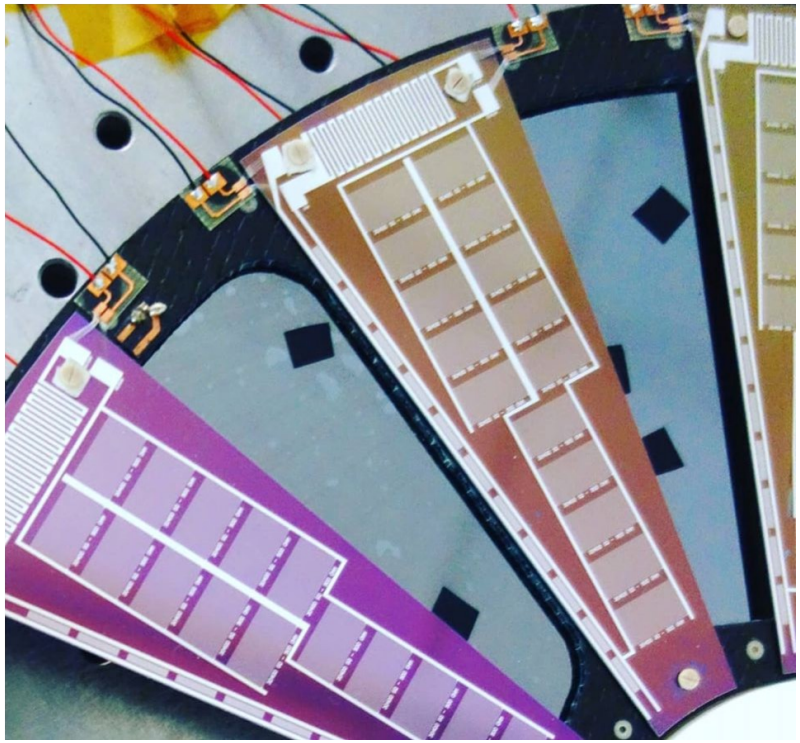


Vibration Setup – IFIC Valencia





Vibration analysis



Master's thesis Yamal Naser Requena

Analytical expressions

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ANSYS FEA

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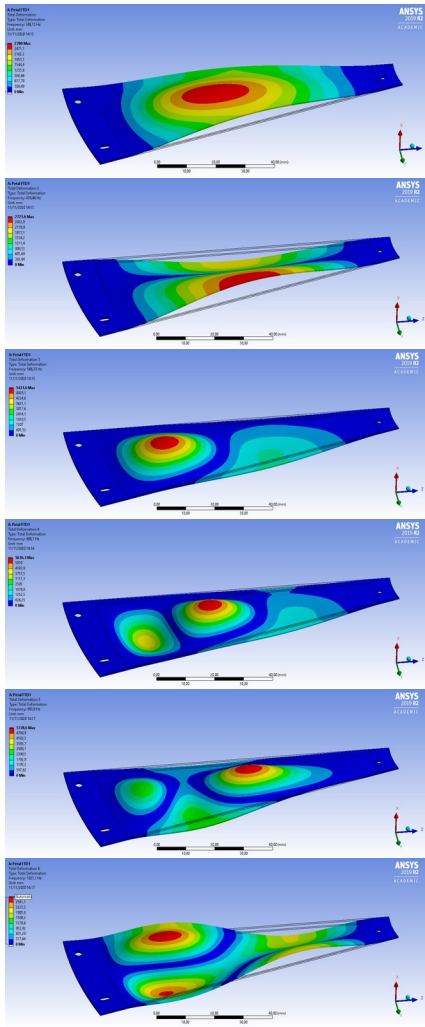
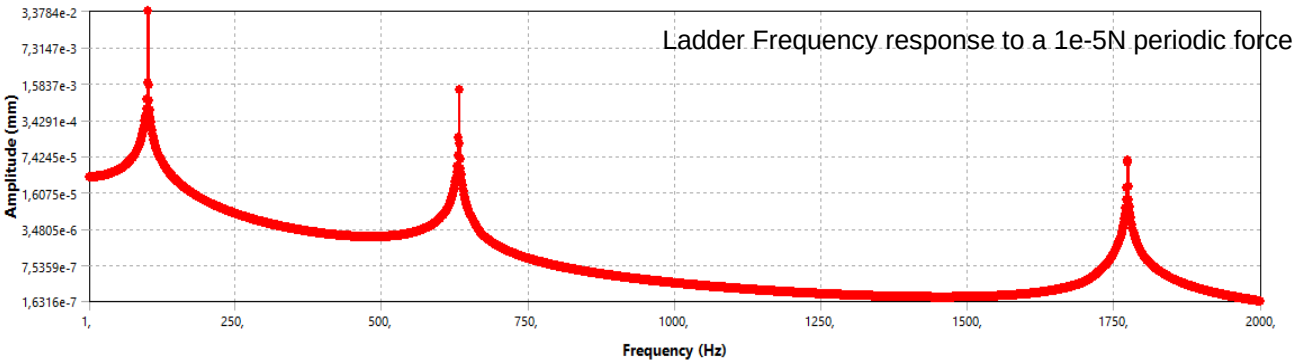
Measurements

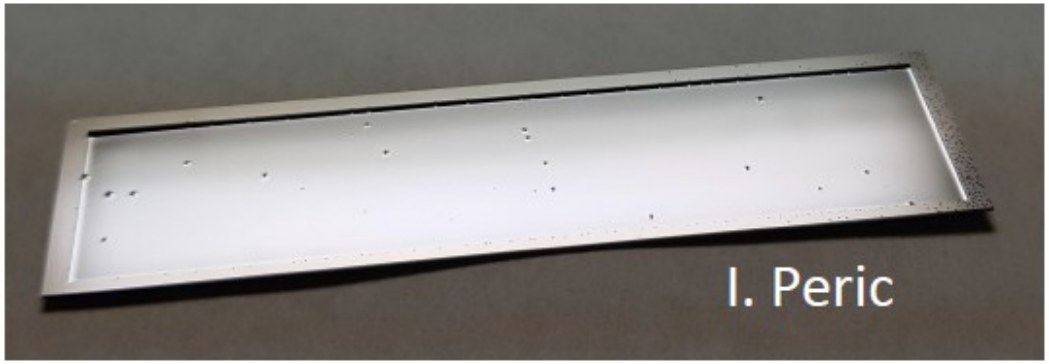
Extend to more realistic vibration loads (air flow, cavern floor, earthquake)

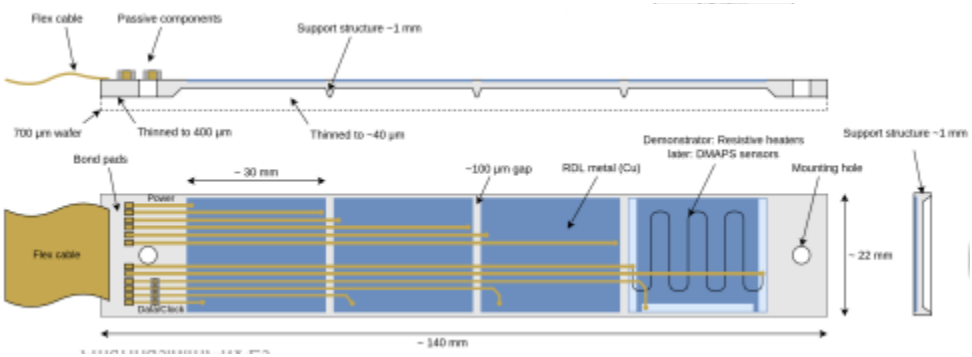


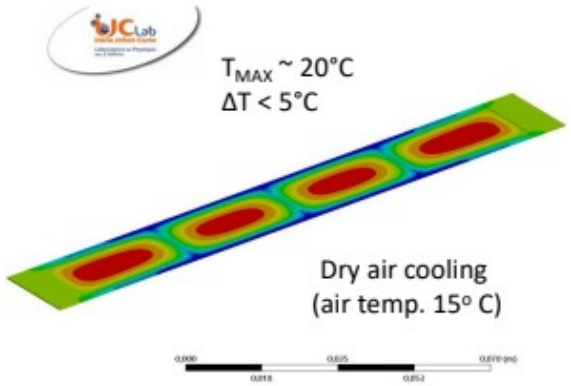


Thin integrated CMOS sensors

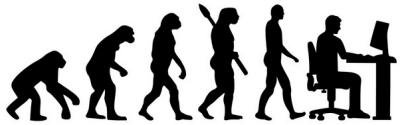
Thin multi-CMOS-chip Silicon structures for Belle 2 upgrade
Thermo-mechanical iVTX demonstrator submitted to IZM by Bonn/Valencia, thermal simulations in IJCLab Paris
part of Belle 2 upgrade CDR

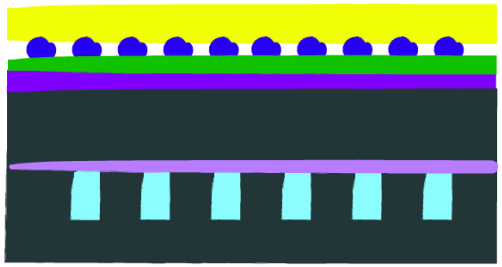






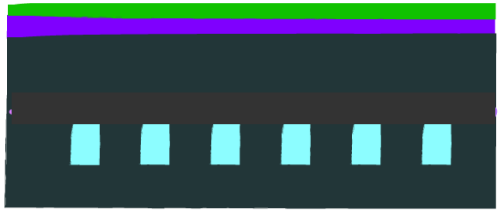
MCC evolution: integrated cooling





Hybrid pixel detector &
micro-channel cooling plate

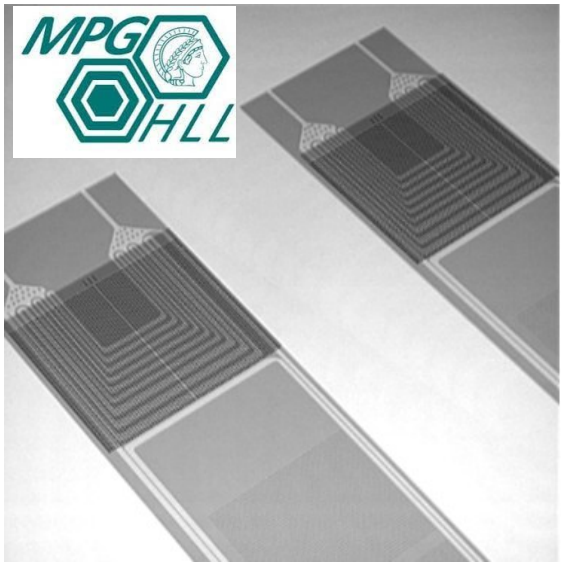
Monolithic CMOS detector

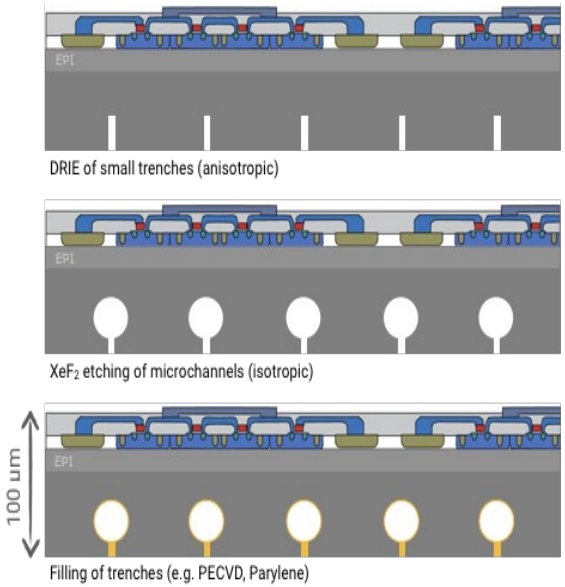


Monolithic CMOS detector
with integrated micro-channels

Integrated micro-channels

- 2016: Developed process to integrate micro-channels in DEPFET Silicon sensor (with MPG-HLL, JINST11(2016) 06)





M. Boscardin et al., NIM A, 2013
C. Lipp, MSc Thesis, EPFL, 2017
I. Berdalovic et al., JINST 13 C01023, 2018

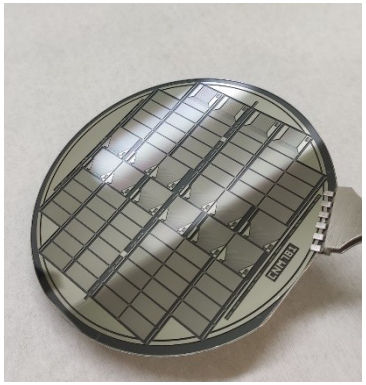
2019: Buried micro-channels in working MALTA CMOS sensor (CERN, EPFL)

WP10 – CSIC - NEWS

Milestone MS41 with minor delay

Executive summary:

- CNM anodic/eutectic bonding (see M. Ullan)
- HLL direct bonding (see L. Andricek)
- INFN effort on CoolFPGA (see L. Bosi)
- buried channels currently uncovered



Grant Agreement No: 101004761

AIDAinnova

Advancement and Innovation for Detectors at Accelerators

Horizon 2020 Research Infrastructures project AIDAINNOVA

MILESTONE REPORT

COMBINED WORKPLAN WITH OBJECTIVES AND TEST DEFINITION FOR ALL TECHNOLOGIES

MILESTONE: MS41

Document identifier:	AIDAinnova_MS41.docx
Due date of milestone:	End of Month 11 (February 2022)
Justification for delay:	[if delays occurred]
Report release date:	07/03/2022
Work package:	WP10: Advanced mechanics for tracking and vertex detectors
Lead beneficiary:	CERN
Document status:	Draft

CSIC summary

Aim: integrate support structures and micro-channel cooling in “large” CMOS ladders for Belle 2 upgrade and Higgs factories

Development of low-temperature bonding compatible with CMOS post-processing ongoing at CNM and HLL (see talks by L. Andricek and M. Ullan)

IFIC to focus on simulation studies and design and characterization of prototypes (hiring a new student or engineer towards the end of AIDAinnova)

Small steps: mechanical prototypes & dummy CMOS wafers within AIDAinnova, full demonstrator beyond the timeline of the project.