FROM RESEARCH TO INDUSTRY


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# CEA-Saclay : preliminary thoughts on the EoI

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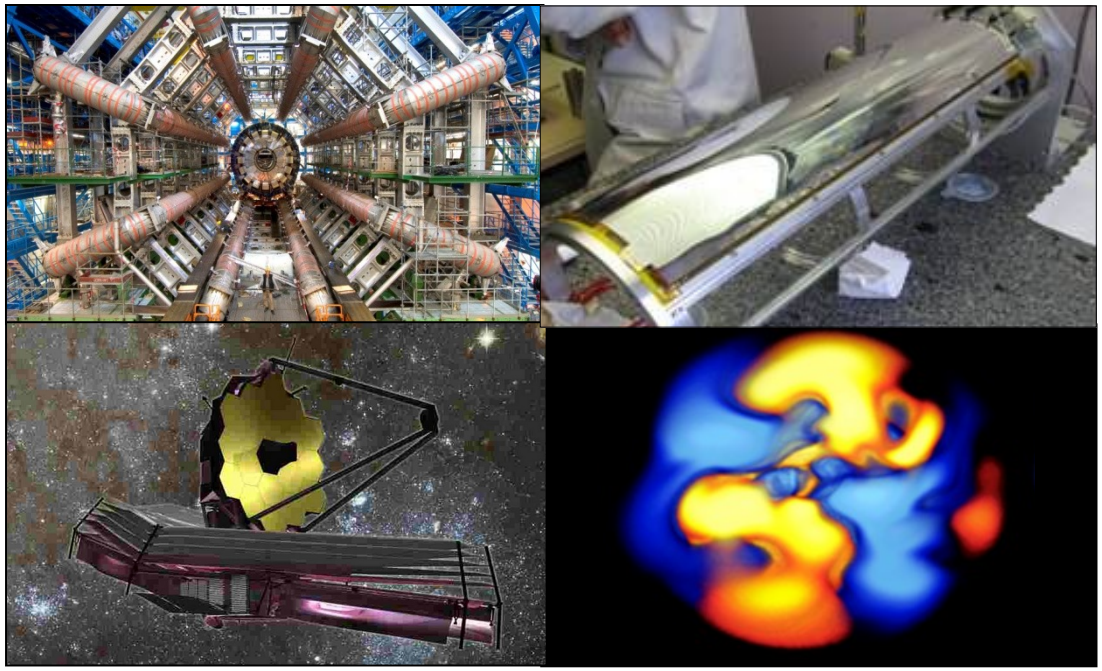
# INVENTING AND CONSTRUCTING NEW DEVICES

## Accelerator and superconducting magnets

- *Intense ion sources, RFQ, Cryomodules:*
- *Superconducting magnets for accelerators and detectors*
- *Beam dynamics*

## Detecting

- *Gaseous detectors (Micromegas)*
- *Solid detectors (bolometers)*
- *Electronics (ASICS)*



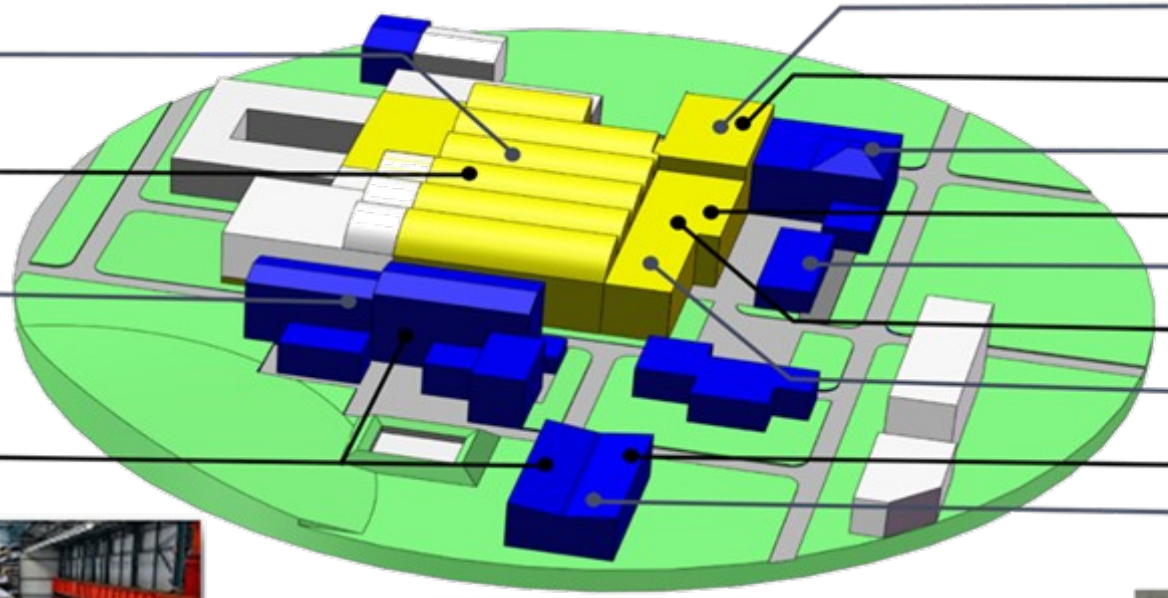
## Observing : space devices

- *Camera, spectroimaging,..*
  *From X-ray to sub-mm*
- *cryomecanisms*

## Simulating

- *HPC*
- *Grid*

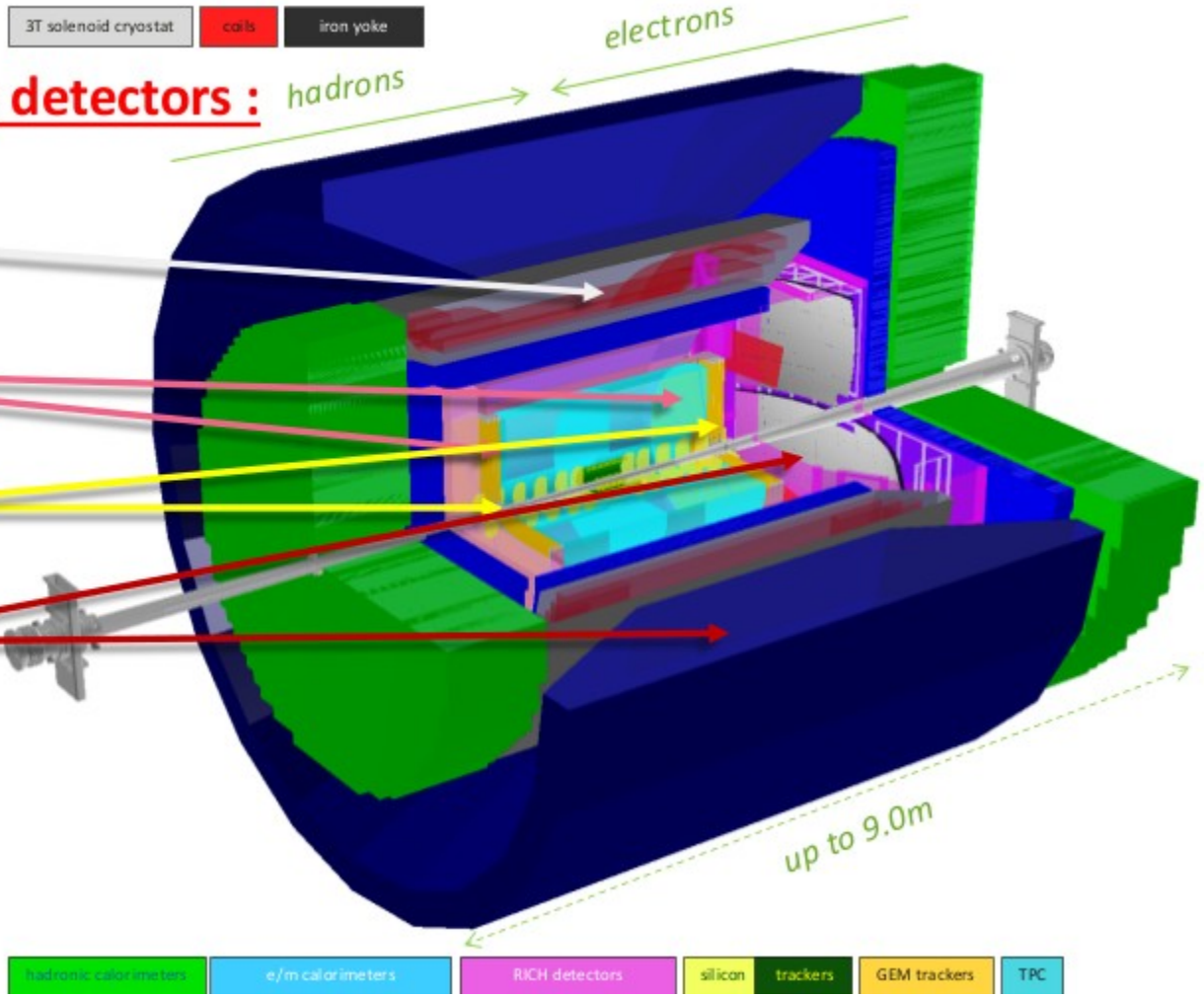
# ACCELERATOR AND MAGNETS TECHNOLOGICAL INFRASTRUCTURES (25 000 M²)




# WHERE CEA-SACLAY CAN CONTRIBUTE

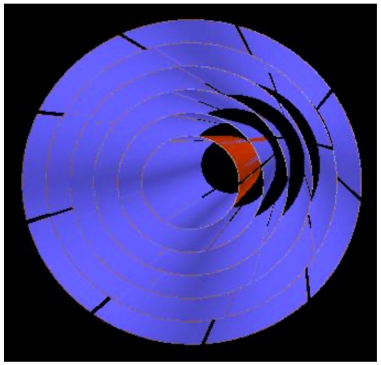
## IRFU's expertise in tracking detectors :

- Barrel detectors
- TPC Readout
- Forward Detectors
- Timing Detectors

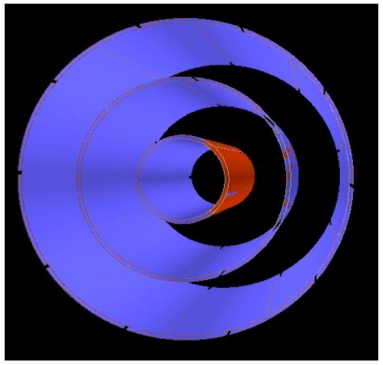


# CENTRAL REGION

## Micromegas based tracker

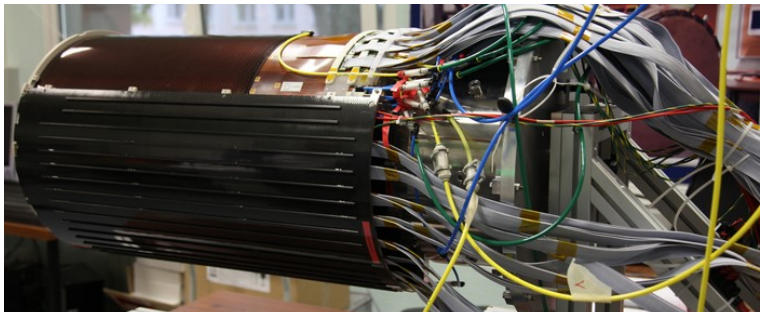


6 equidistant layers

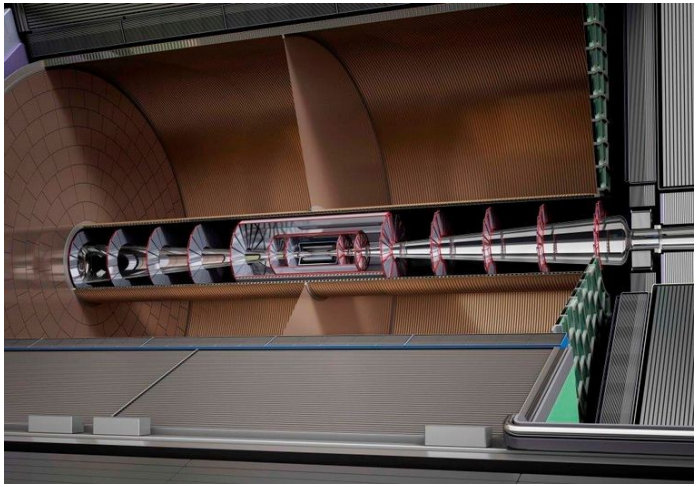


6 layers arranged as 3×2

- Compact design and low material budget: about 0.3%X0 per layer
- Good resolutions: spatial ~100µm, time ~40 ns
- Curved MM technology already used in CLAS12 and ASACUSA
- Ongoing R&D on readout patterns (M.Revolle)
- Preliminary geometries discussed within YR tracking meetings (Q. Huang)



## MM based TPC readout

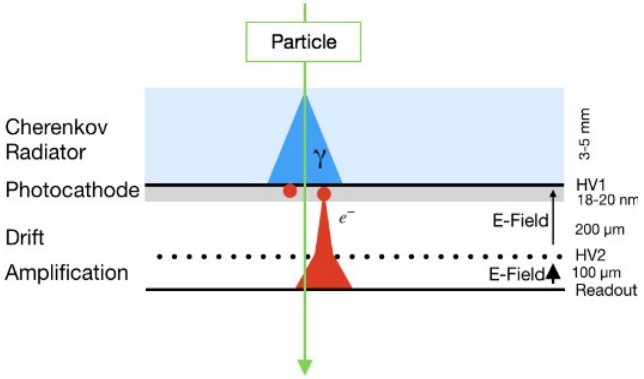


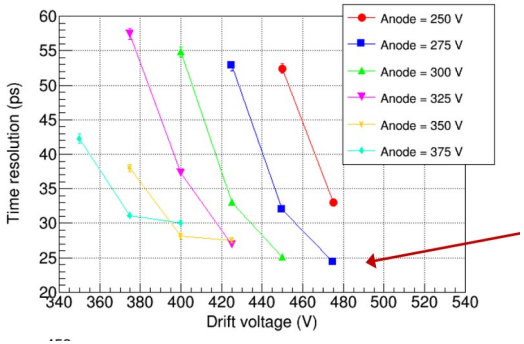
- EIC TPC will require good dE/dX resolution and minimum material budget in the endcaps
- MM provide similar performances as GEM, with less material
- IRFU's experience in TPCs for ILC, T2K, Minos, FCC
- Ongoing R&D for a very low IBF and with a good energy resolution (A. Glaenzer)

# TIMING DETECTORS AND FORWARD REGIONS

## Picosec: Micromegas for timing detectors

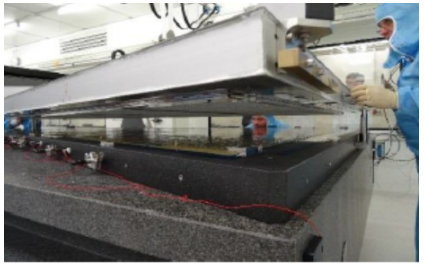
- Use light (Cerenkov radiation) instead of ionization: fast detectors
- Cheap and modular design
- Time resolution ~25 ps for MIPs



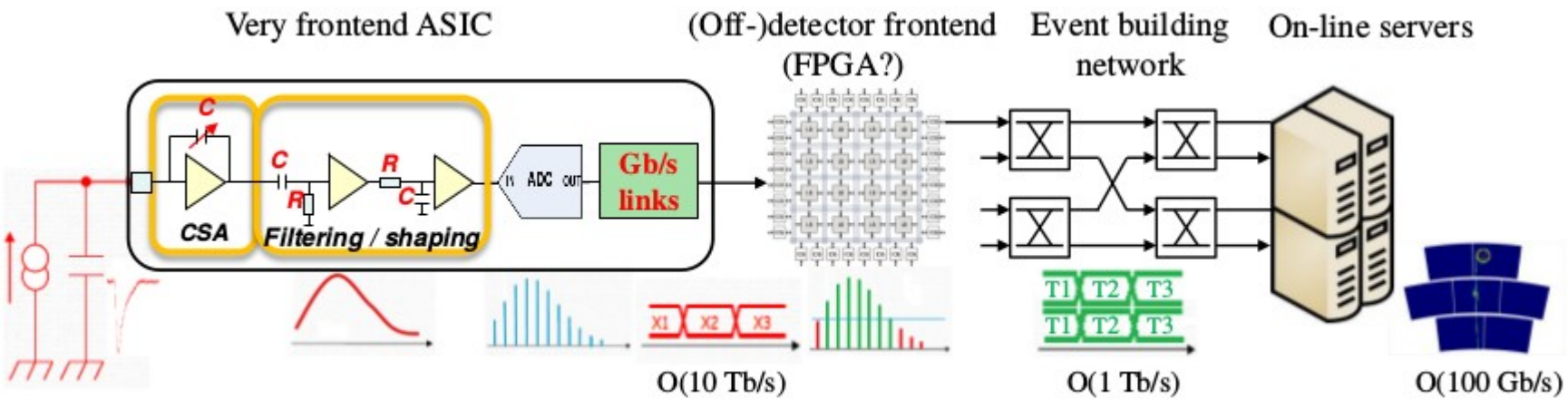

## Forward tracking detectors

- Experience in high rate detectors (COMPASS, CLAS12, ATLAS)
- Very large detectors ATLAS NSW
- 1200m2 of resistive Micromegas
- 100μm mechanical precision
- Maximum rate of 15kHz/cm2
- 2M channels read by MMFE-8



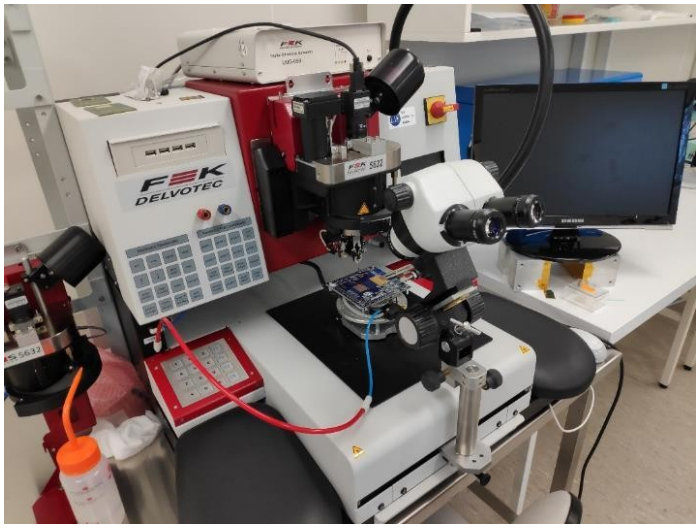
# ELECTRONICS

- Substantial experience in the design of readout systems
  - → Among major contributors to HEP experiments world-wide
  - Gaseous TPC / trackers, active sensors, calorimeters, muon spectrometers
- Concentration of know-how
  - → Analog / digital ASIC and electronics board design
  - → Turnkey system developments with O(100k) channels
- Close access to advanced machinery for prototyping, production, validation
  - → In-situ and within the scientific-industrial pole of the Plateau de Saclay
- Successful history of co-developments
  - → ASICs, boards and trigger/DAQ systems

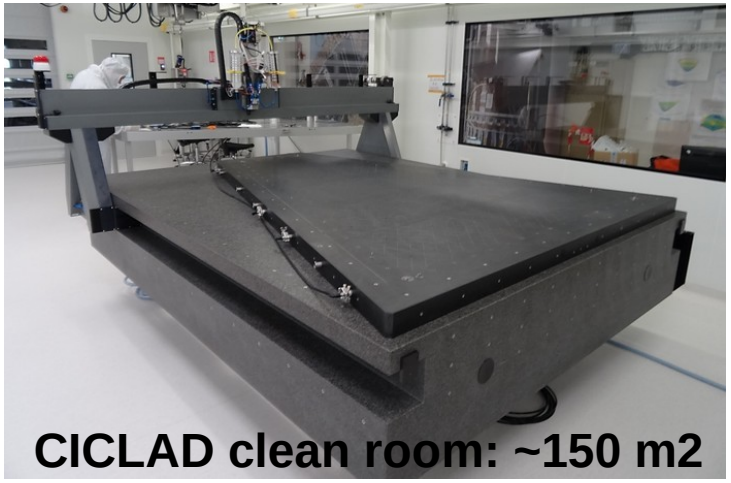


# (SOME OF THE) ELECTRONICS AND DETECTOR FACILITIES

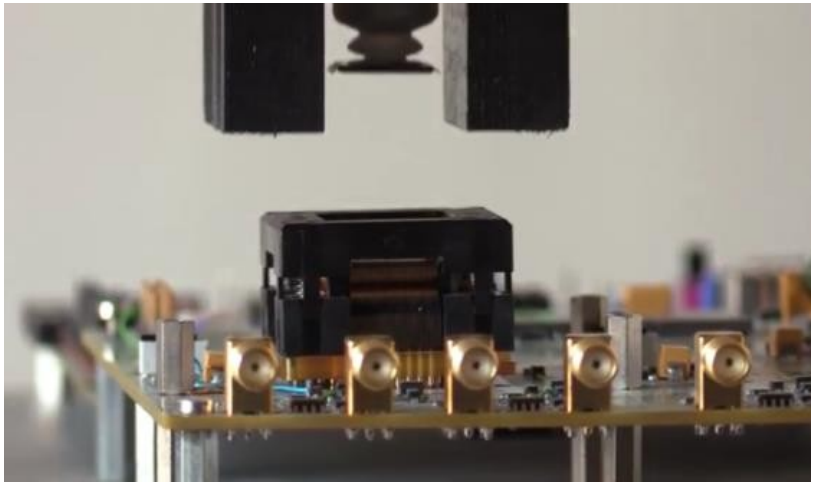
## Wire-bonding machines




## Large area clean rooms




## Robotized test bench for ASIC



## MPGD workshop

# SUMMARY

- The EIC project is in the CEA/Irfu roadmap
- Involvement in YR report activities (physics, tracking and electronics), in LDRD programs and eRD6 recently joined
- Broad interest in many areas:
  - Magnets and accelerator elements
  - Tracking and timing detectors
  - ASICs and readout electronics
- Large facilities at Saclay for magnets and detectors production
- Interest in participation to whole systems development: detectors together with the readout electronics
- Open to collaborate in international consortia