

EIC@IP6 Tracking Discussion Summary

EIC @IP6 Monthly Meeting 05/06/2021

Tracking Session, EIC@IP6 Meeting, 05/06/2021

EIC@IP6 Tracking Working Group

The screenshot shows a Zoom meeting invitation for the "EIC@IP6 Tracking Working Group meeting". The meeting is scheduled for Wednesday, May 12, 2021, from 11:00 AM to 1:00 PM US/Eastern. The hosts are Domenico Elia (INFN Bari), Francesco Bossu (CEA-Saclay), Laura Gonella, and Matt Posik (Temple University). The description includes a Zoom link and the meeting ID: 685 0497 1149 with passcode 667837. The agenda shows a session from 11:00 AM to 11:10 AM titled "Introduction" with the same speakers. A 10-minute timer and a share icon are visible in the bottom right of the agenda section.

EIC@IP6 Tracking Working Group meeting

Wednesday May 12, 2021, 11:00 AM → 1:00 PM US/Eastern

Domenico Elia (INFN Bari) , Francesco Bossu (CEA-Saclay) , Laura Gonella , Matt Posik (Temple University)

Description Zoom link - click here

Meeting ID: 685 0497 1149 - Passcode: 667837

11:00 AM → 11:10 AM **Introduction**

Speakers: Domenico Elia (INFN Bari) , Francesco Bossu (CEA-Saclay) , Laura Gonella, Matt Posik (Temple University)

- Meeting Page: <https://indico.bnl.gov/event/11629/>
- Tracking Working Group Email: <https://lists.bnl.gov/mailman/listinfo/eic-ip6-det-trk-l>

Subscribe to the tracking group email if you would like to follow the tracking working group!

Last Week's Tracking Session Outline

- Presentations from the groups

- ▶ EIC Silicon consortium / Leo /
- ▶ UK silicon groups / **Laura** /
- ▶ Berkeley / Ernst /
- ▶ INFN / **Domenico** /

- ▶ Si+MPGD concept (SIMPLE @ IP6) / **Matt** for FIT, Temple, UVa/
- ▶ Saclay contribution / **Francesco** /
- ▶ LANL contribution / Xuan /

- ▶ Czech institutions / Lukas /
- ▶ GEM-TRD / Yulia /

**For all topics discussed during bi-weekly meeting please see
Presentation slides**

<https://indico.bnl.gov/event/11405/contributions/48355/attachments/34117/55315/2021-04-29-eic-at-ip6-tracking-session.v03.pdf>

- Discussion

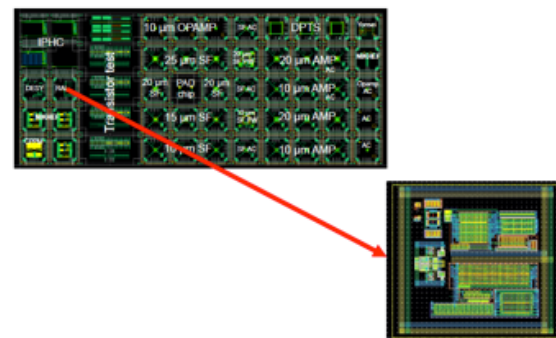
What contributions can you bring to the tracking activities towards the proposal in the next months?

EIC Silicon Consortium

- All institutions will or are actively engaged in developing and detailing the tracking detector parameters. This includes
 - Participation at a high level in the simulation of detector concepts based on silicon
 - Parameters for the readout and estimates of hardware footprints
 - R&D into reducing services
 - Cost and schedule generation for R&D, construction, and deployment of detector concepts

UK Silicon Group

- Continuation of YR activities on detector and physics performance simulations
- Sensor design
 - 65 nm sensor development with ITS3, IP block contribution for the MLR1
- Sensor prototype characterization
 - Wire bonding of prototypes on test cards, lab and beam tests, irradiations, data analysis, DAQ simulations.
- Carbon fiber mechanics – design and manufacture



What contributions can you bring to the tracking activities towards the proposal in the next months?

Berkeley (LBNL)

- Continue contributions at a similar level of effort as the YR with a continued focus on the realization of MAPS-based tracking and vertexing
 - Simulation and R&D work

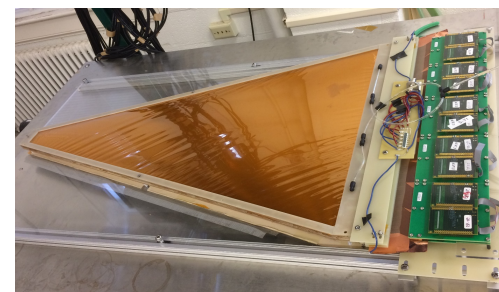
INFN

- Study of the vertex detector performance
- Development of techniques and tools for bending and interconnecting wafer-scale chips
 - Scale techniques developed for ALICE ITS3 to size/modularity needed for EIC
- Characterization of 65 nm test structure and study the effect of curvature on the performance

What contributions can you bring to the tracking activities towards the proposal in the next months?

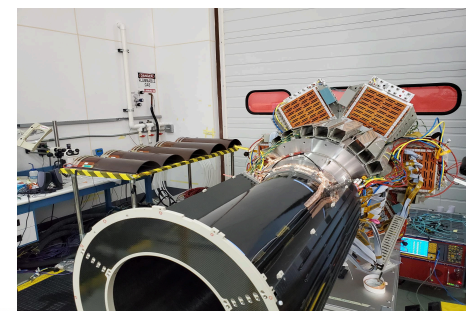
FIT, Temple, Uva

- Continue R&D and prototyping of
 - low mass and large-area MPGDs endcap trackers – GEM and μ RWELL
 - Large cylindrical μ RWELL barrel tracker
 - Development of high performance and low channel count anode readout
- Simulation of Si-MPGD hybrid detector endcap MPGD trackers



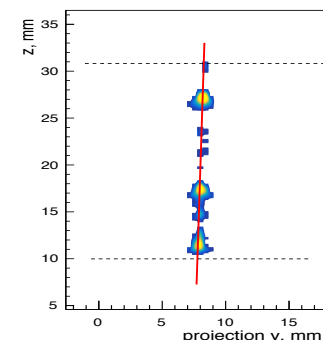
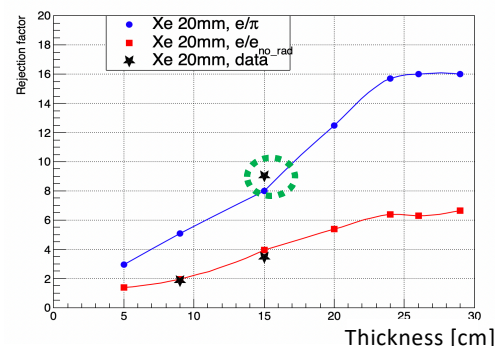
Saclay

- Continue simulation work done for YR – Micromegas barrel tracker
- Implementation of light support structure
- Continue R&D of ultra-light Micromegas (aiming at 0.05% X_0 per detector)
- Strong interest in developing new ASIC for MPGD readout



GEM-TRD

- Provides tracking and e/π discrimination



What contributions can you bring to the tracking activities towards the proposal in the next months?

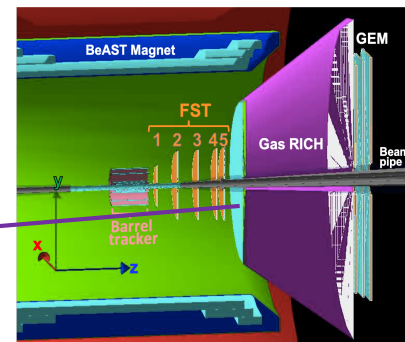
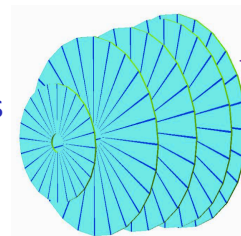
LANL

- Focus on forward silicon tracking detector (FST) simulation and development
- Heavy flavor and jet physics studies associated with proposed FST

Czech institutions

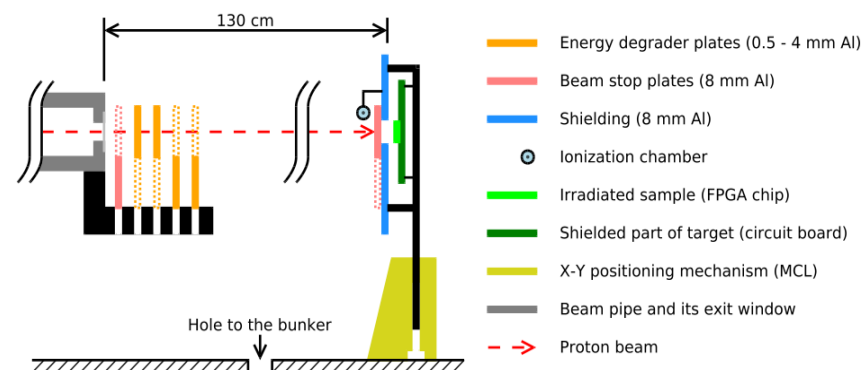
- Development and testing of detector simulations
- Participation in silicon detector R&D and hardware preparation
- Radiation hardness tests
 - At the NPI cyclotron

Finer segments
for the FST



Different geometries explored
[arXiv:2009.02888](https://arxiv.org/abs/2009.02888)

Radiation hardness
test setup



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What are the most relevant and urgent questions in the tracking sector?

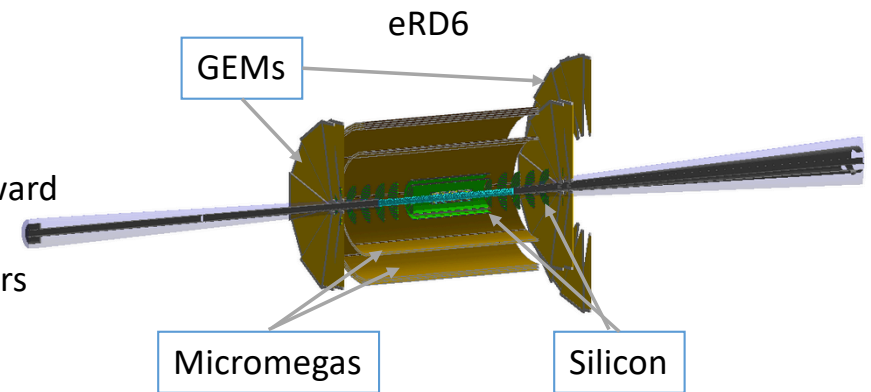
- Clarification of MC simulation strategy
 - Continue/extend developments and implementation in Fun4All
 - is there a easy way to preserve compatibility with other frameworks?
 - Implement geometry directly in Fun4All bypassing present link with EicRoot (vertex, GEMs)
 - EicToyModel can bring existing EicRoot geometries into Fun4All framework
- Define reference detector: All-Silicon and Hybrid tracker (Si+MPGDs)
 - Assess tradeoffs between physics performance, cost, and development timeline
 - Risk assessment: Identify baseline technology with fallback options
 - If no TPC option is pursued, then we need to account for the missing PID that the TPC provided via dE/dx
 - Close discussion with PID group to define available space and tracking performance requirements
 - Define tracking timing requirements
 - Readout electronics

What are the most relevant and urgent questions in the tracking sector?

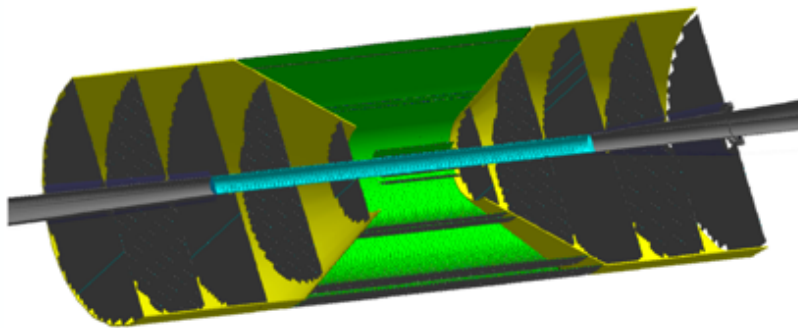
- Implementation of YR concepts or (variants thereof) into **full simulation** of **integrated detector** with realistic services, mechanical supports, magnetic fields, 25 mrad crossing angle, beam pipe models, etc. to assess physics performance.
 - Leads to optimizations
 - Allows the Identification of areas where new concepts may need to be developed and point out where new technology or techniques will need to be examined.
 - “Problem” areas will need to be addressed to the point where viable solutions can be presented as part of an overall detector proposal
- Continue studies of tracking stations at large z (forward / backward) to improve momentum resolution
- Vertex determination for long-lived particles
- Overall material budget, in particular the the electron endcap and barrel, where particle energies are low
- Close communication with Software Working group
- Track finding algorithm (extrapolated vs. interpolated)

How do you see global tracking for detector 1?

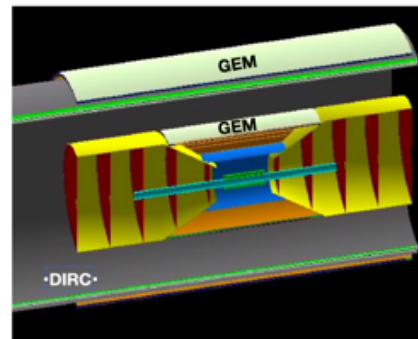
- Very high granularity, low mass silicon MAPS vertex tracker
- Either **compact all-silicon** or **Si-MPGD hybrid** configurations
 - Si-MPGD Hybrid: MAPS-based inner barrels and forward/backward disks complimented with large MPGD barrel and endcap trackers
- Silicon and MPGD detectors outside barrel region ($|\eta| > 1$)



All Silicon



LBNL



LANL

