FIMS meeting

9 Dec 2024
Peter Lewis

**Assorted items
([minutes])**

Personnel update

Welcome, Prakhar, Tom, Evgeny!

James has decided to stay and do his PhD on FIMS 🎉

Postdoc Tanner is arriving in a month (liaison with Peter S on amplification structure, detector)

 Possible analog circuit role…

Postdoc Yubo is arriving in February (liaison with Carl on readout system)

 Possible digital circuit role…

CPAD recap

Enthusiastic reception for the project after my talk. Some interesting bits:

Re: **US-based production**:

- Lots of interest here; many people are looking at GridPix, but production is over (?)
- Growing awareness that gas detectors are still relevant and will be for a long time

Re: **IBF < primary ionization objective**

- This seems to be highly desired for future collider experiments, including, for example, EIC and FCC-ee
- I think this is a unique approach–the feedback reaffirmed that our focus here is valuable

Re: **FE ML/AI hit discrimination**

- The general attitude seems to be "obviously we need this"

CPAD recap

An interesting coffee break conversation with Yuan and Peter S:

Current G3pix chip prototypes only have pixels + CSAs: there's an opportunity here to **develop a FIMS ASIC**
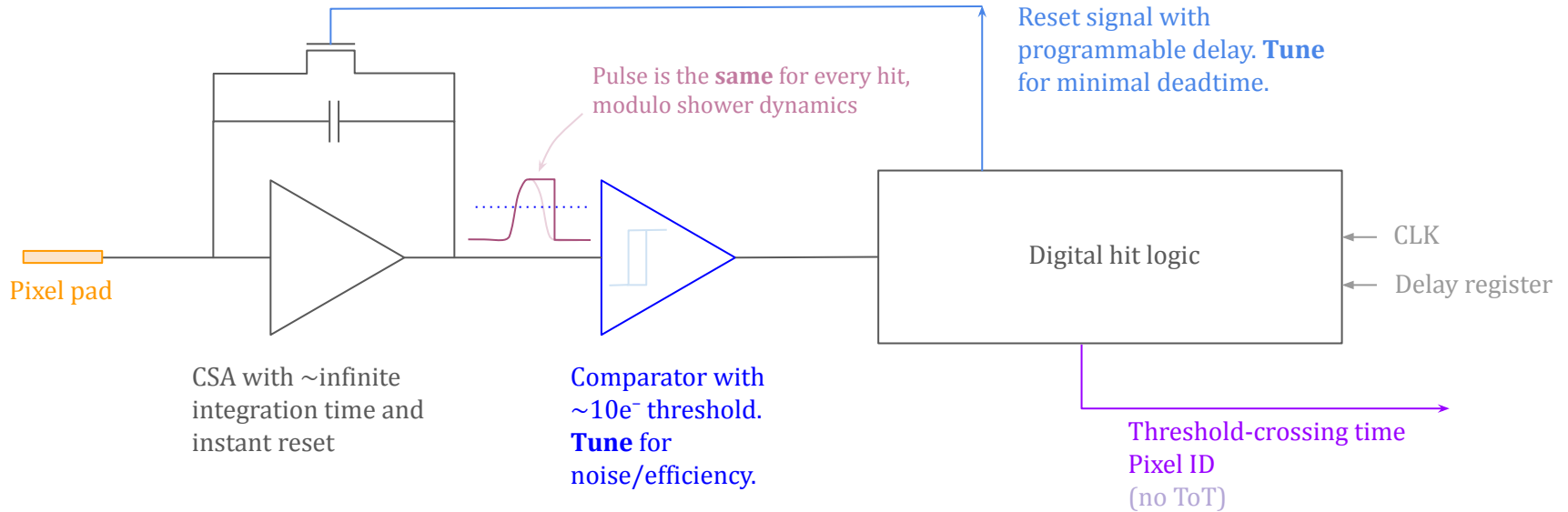
- Some challenges:
    - The EPSCoR grant doesn't fund this specifically (I thought it was too ambitious)
    - FIMS needs are significantly distinct from G3pix
- However:
    - I have some (limited) startup I could throw at this
    - The design/capabilities I have in mind are theoretically quite simple (next slide)
    - We have engineering support at UH with ASIC design experience
    - We can offset extra work with testing/integration at UH

Whether this is part of the FIMS scope currently basically depends on whether Yuan and Peter agree to support a fork of the G3pix development for FIMS

First concept for a FIMS ASIC

One primary charge ↔ one hit.

In my view, we should lean completely into the "**single-charge counting** regime":

Reset signal with programmable delay. **Tune** for minimal deadtime.

Pulse is the **same** for every hit, modulo shower dynamics

Pixel pad

Digital hit logic

CLK

Delay register

CSA with ~infinite integration time and instant reset

Comparator with ~10e⁻ threshold. **Tune** for noise/efficiency.

Threshold-crossing time
Pixel ID
(no ToT)

This is a far simpler device than most modern pixel chips. Feedback?

Some questions for everybody

EIC Detector 2 folks:

Can somebody prepare a short presentation outlining your hopes and desires for a gas TPC readout?

Peter S and Yuan:

Can we get a G3pix prototype at UH soon? Can you send me a list of required equipment?

Carl and Peter S:

What do we need to do to talk to G3pix on a platform we can use as a ML/AI sandbox?

Everybody:

New meeting time for new year: please fill out this poll

Me: send around links to access all the documents and slides