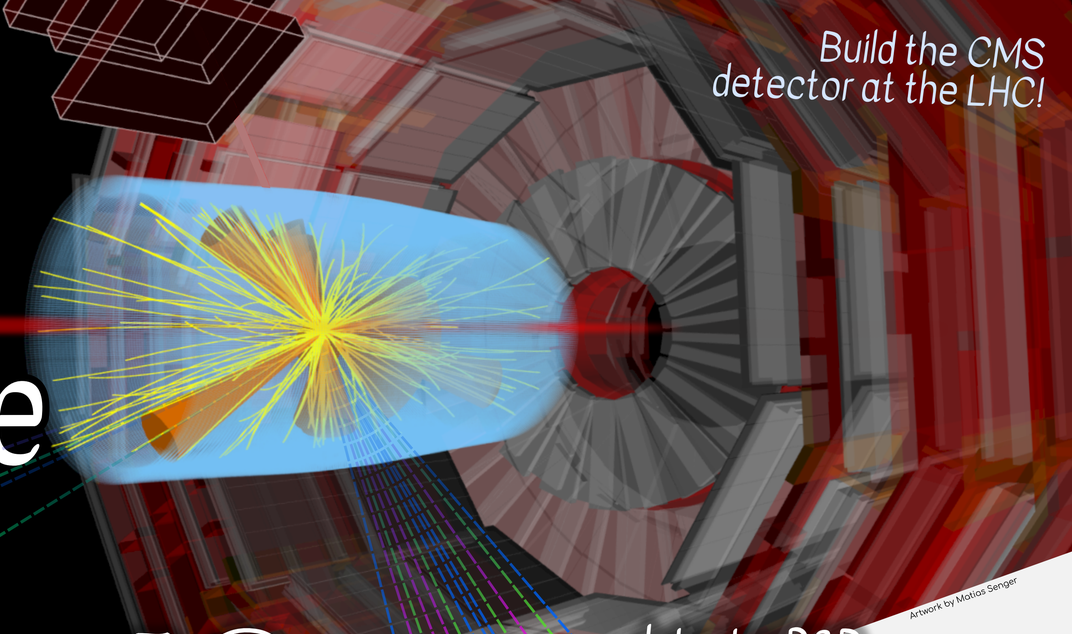
University of Zurich, November 2022

Pixels for the subatomic universe

PROF. BEN KILMINSTER'S GROUP

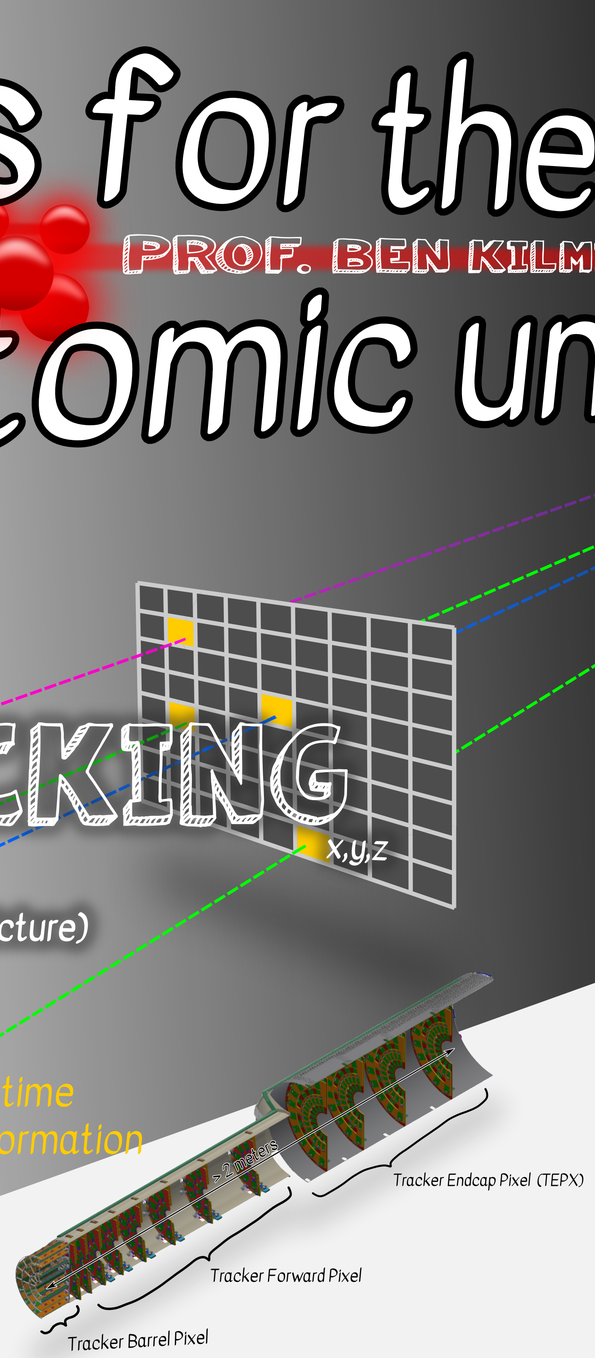


3D-TRACKING

x,y,z

Track only position (i.e. take a picture)

no time information



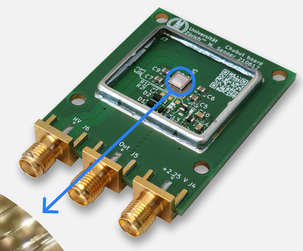
4D-TRACKING

detector R&D

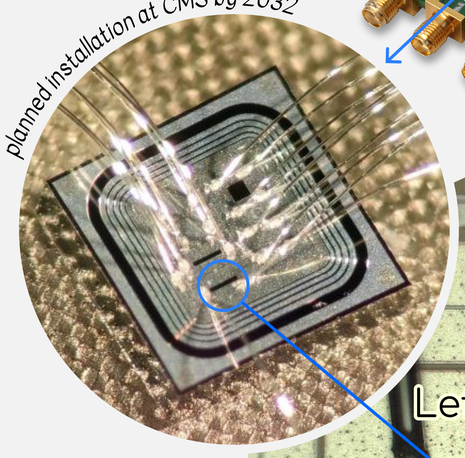
x,y,z,t

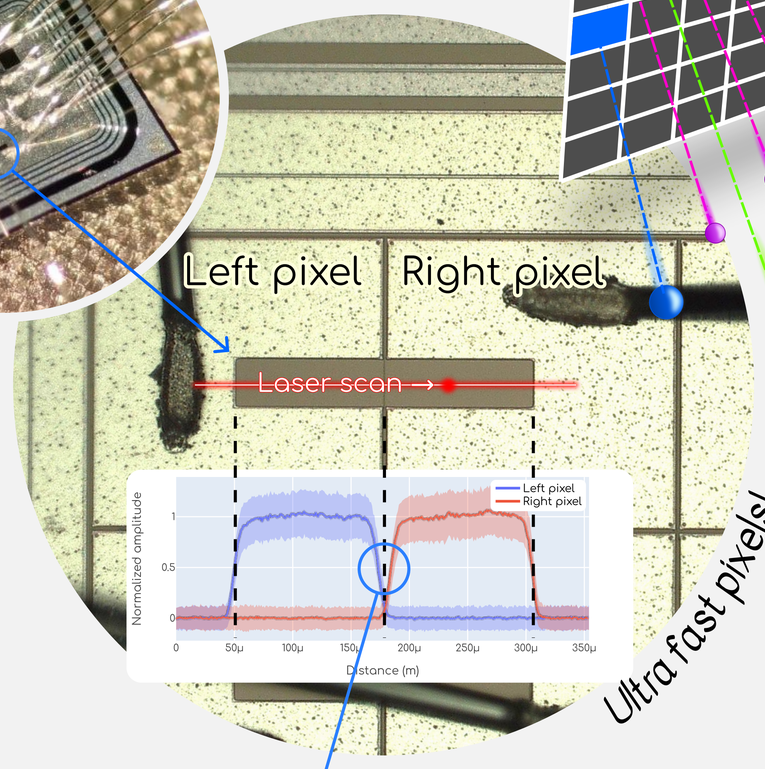
Track position+time (i.e. make a video)

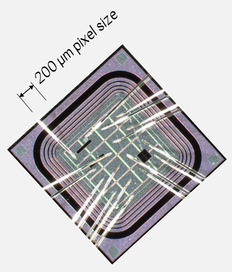
time1 time2 time3



planned installation at CMS by 2032

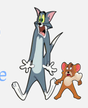






- Major upgrade of CMS detector (2027)
- Pixel size = 50×50 µm²
- 2 Gigapixels
- Hit rate = 3 GHz/cm²

compare to your smartphone



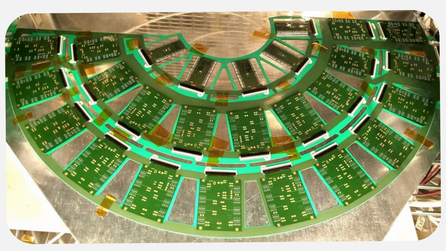
Our activities

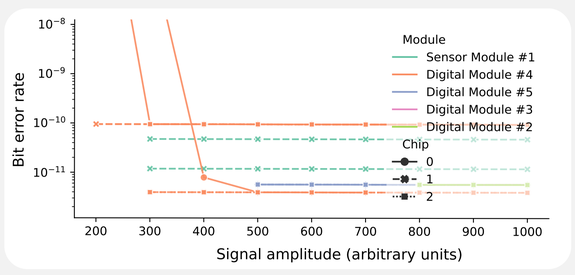
-Test pixel modules

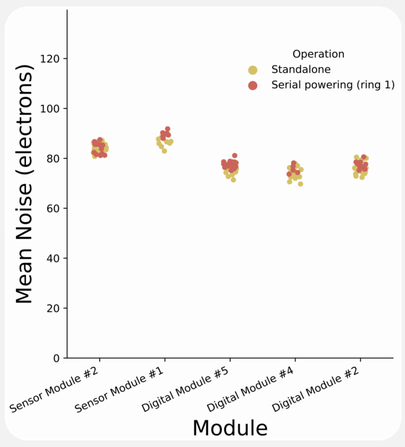
-Study TEPX prototype @ UZH

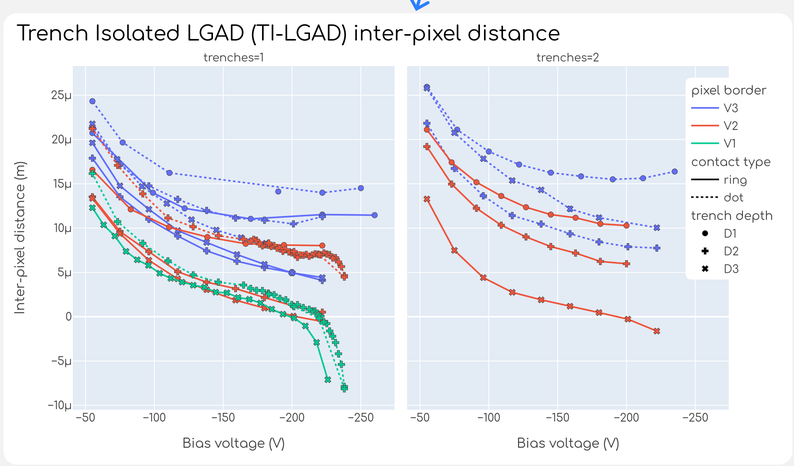
-Work on CMS code

-Help build our super-camera









Our R&D

-Novel LGAD technology

-4D sensors:

-position measurements

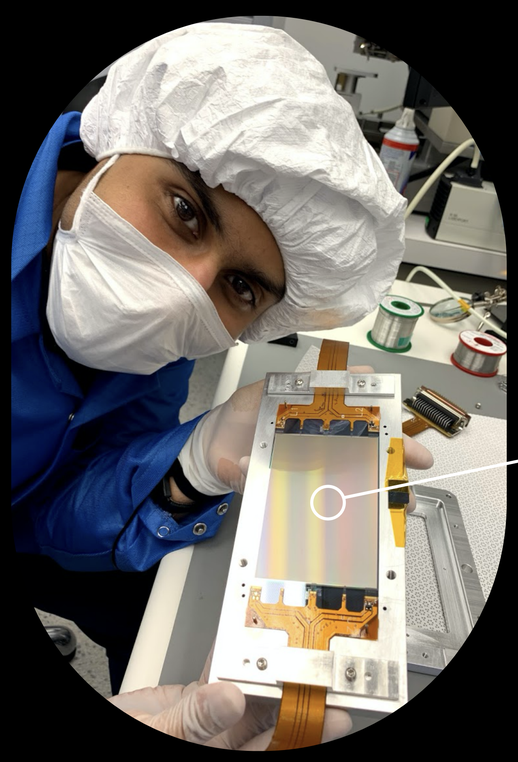
-timing measurements

-radiation hardness

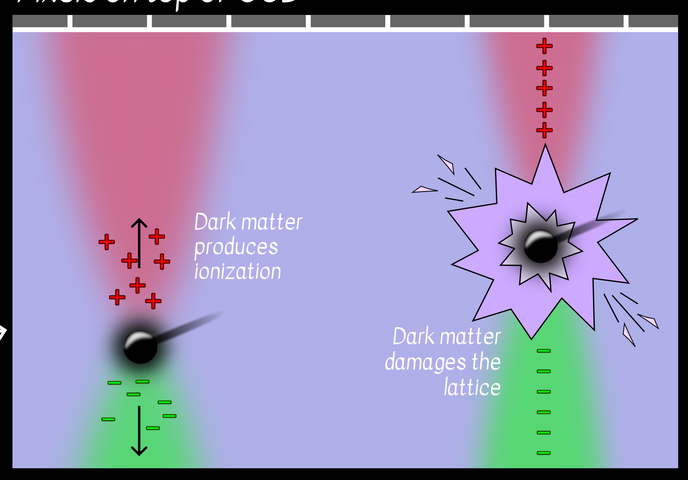
-ASIC design

Pixels for the dark universe

DAMIC CCD detector



Pixels on top of CCD



Effects of dark matter in CCD
- Ionization
- Radiation dammage

So far, CCD detectors have only used ionization to search for dark matter.

UZH is pioneering a new technique to use radiation damage to find evidence of dark matter in CCD detectors.

See UZH PhD student Steven Lee's paper: https://arxiv.org/abs/2210.00469