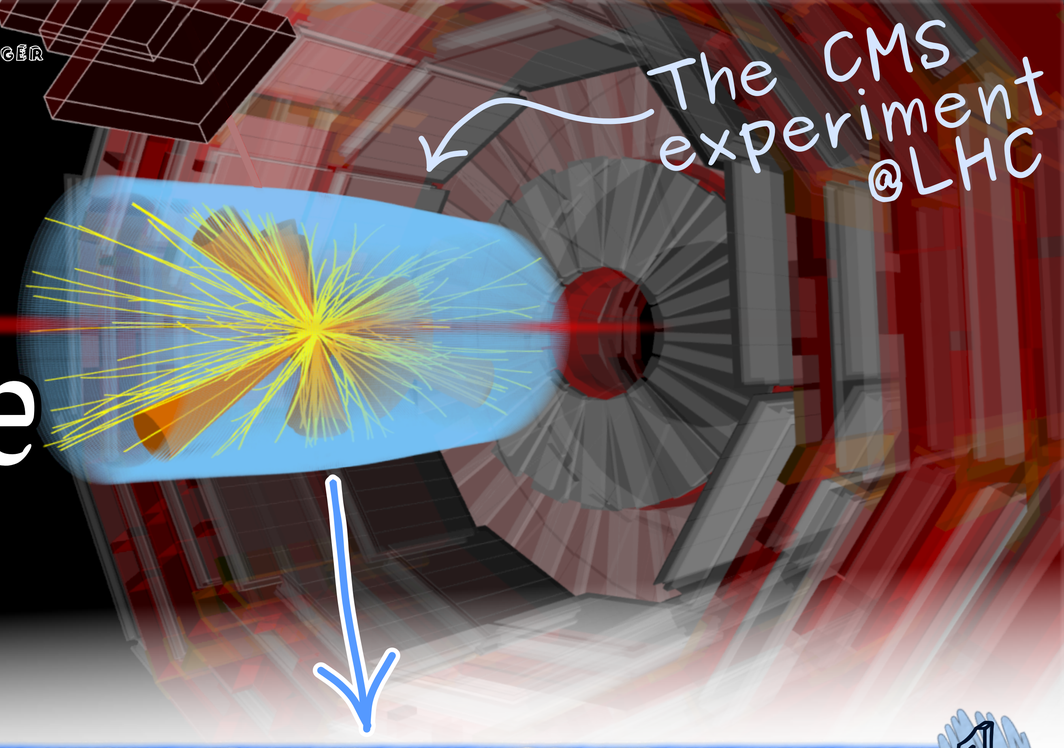
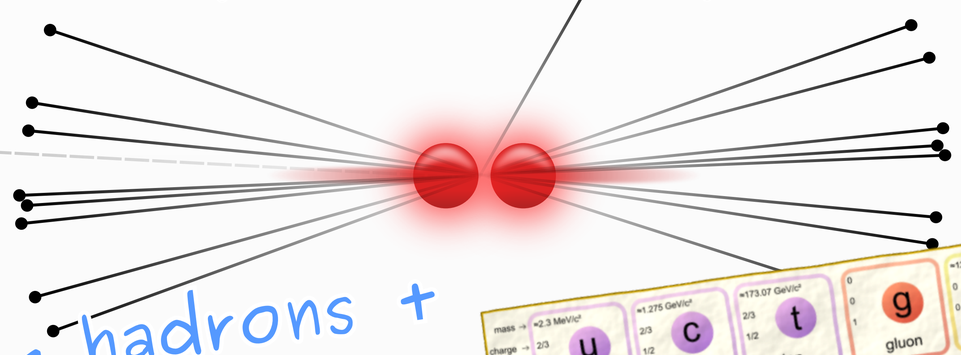
University of Zurich, November 2021,
B. Kilminster, A. Reimers, M. Senger

Pixels for the subatomic universe

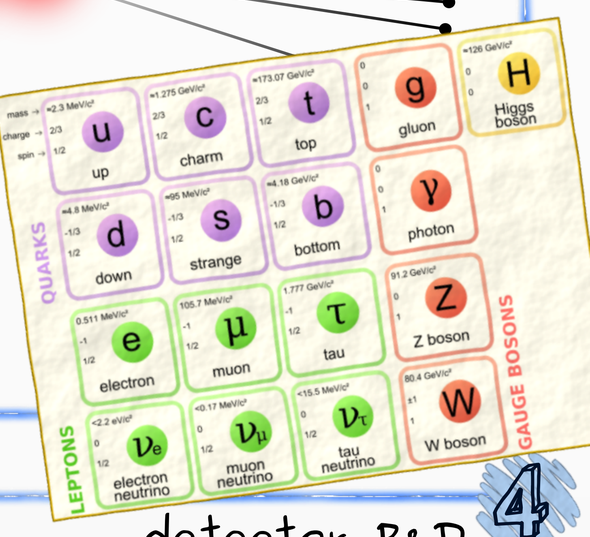
PROF. BEN KILMINSTER'S GROUP



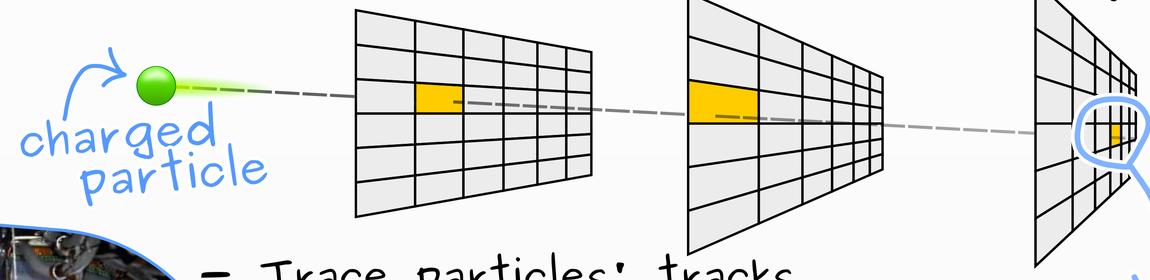
1 protons collide

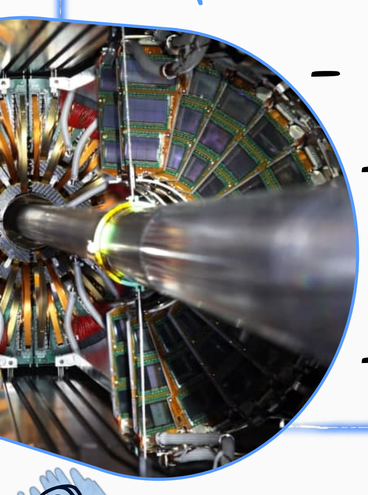


hadrons + leptons + photons + etc...

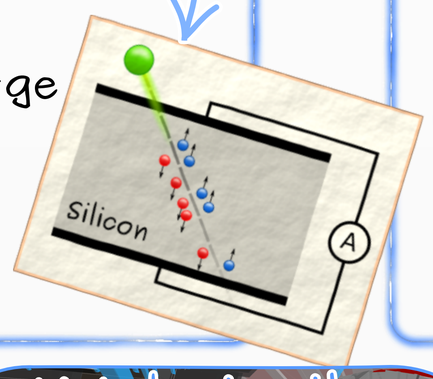


2 Pixel detector (the tracker)

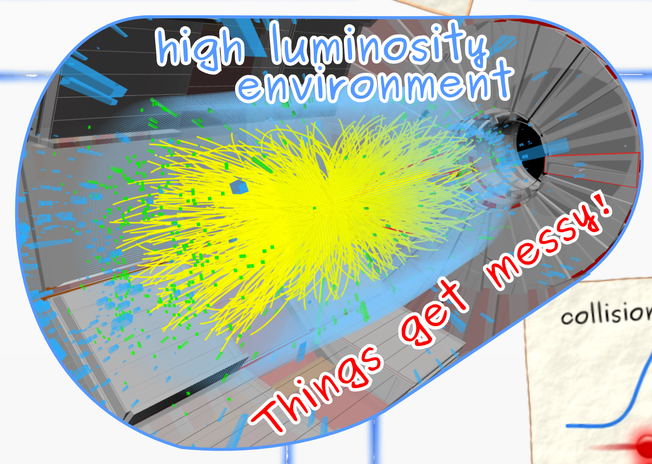




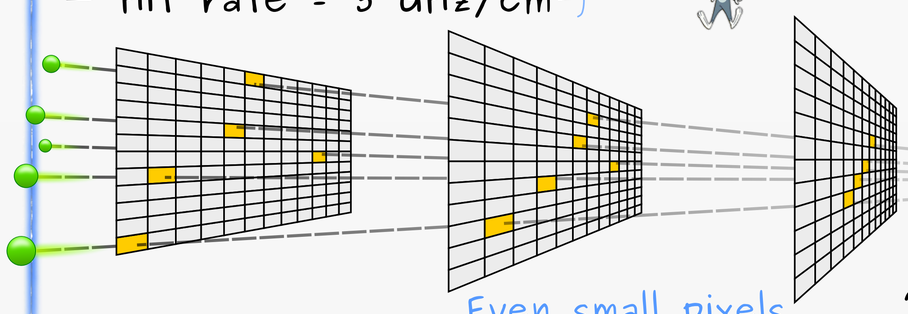
- Trace particles' tracks
- Measure momentum and charge
- Identify point of collision
- Find decays of b-quarks

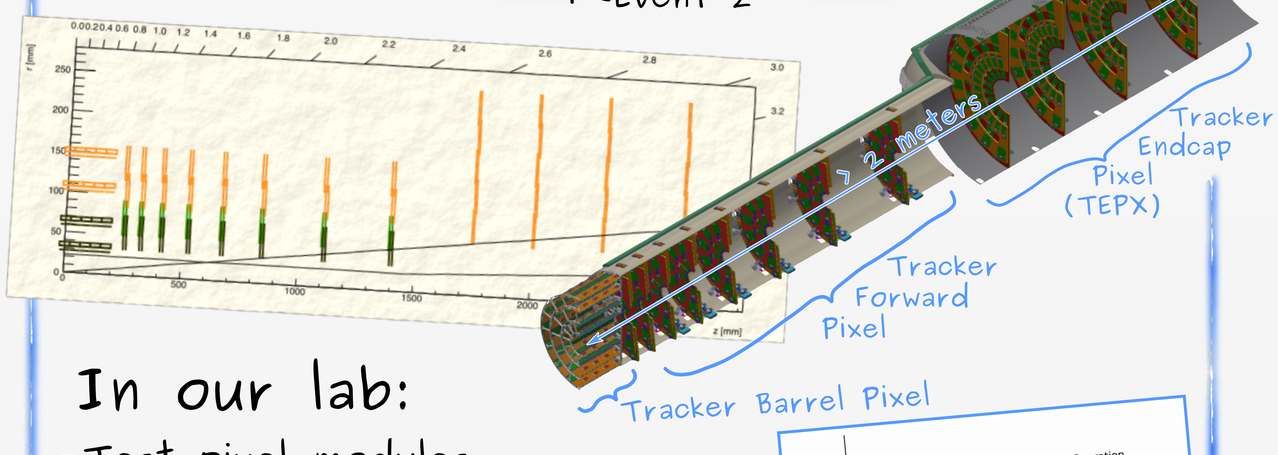


3 3D-TRACKING



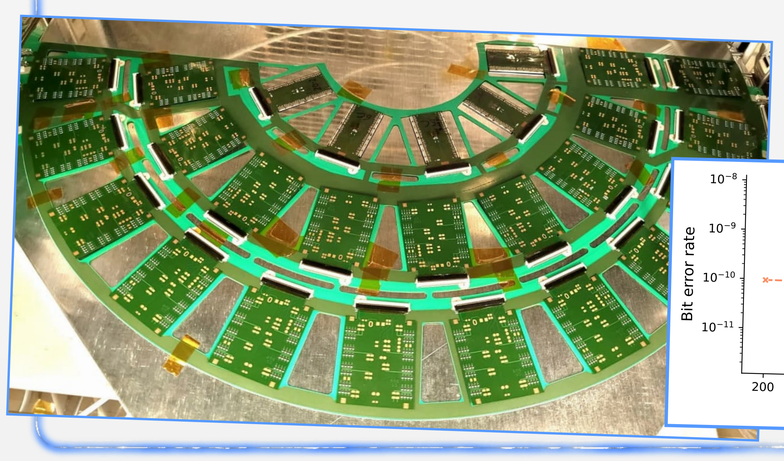
- Major upgrade of CMS detector
- Starting operations in 2027
- Pixel size = 50x50 μm^2
- $\approx$ 2 Gigapixels
- Hit rate = 3 GHz/cm^2 } compare to your smartphone

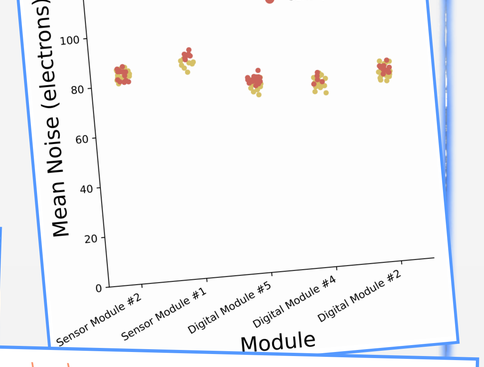


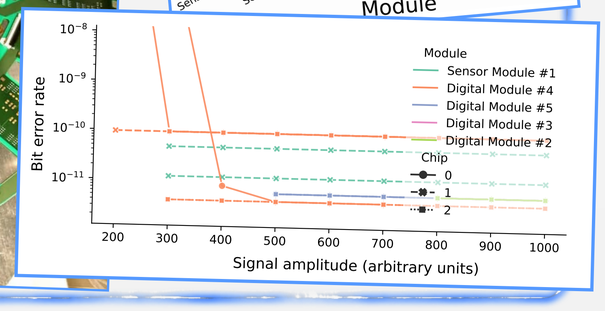


In our lab:

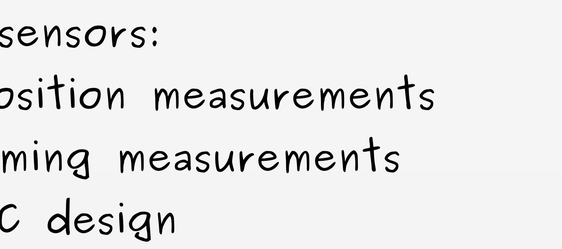
- Test pixel modules
- Study TEPX prototype @ UZH
- Work on CMS code
- Help build our super-camera







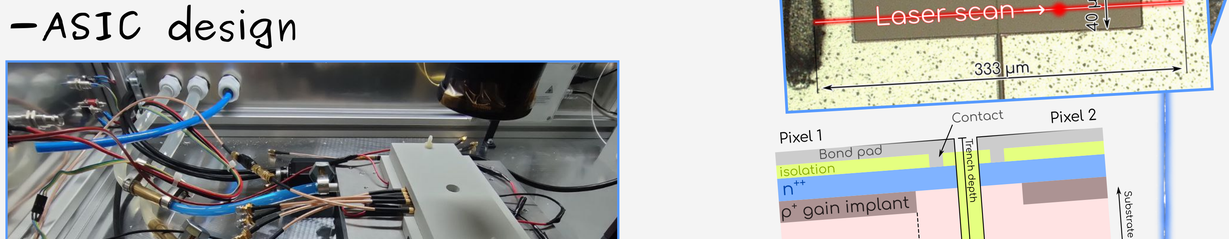
4 detector R&D 4D-TRACKING

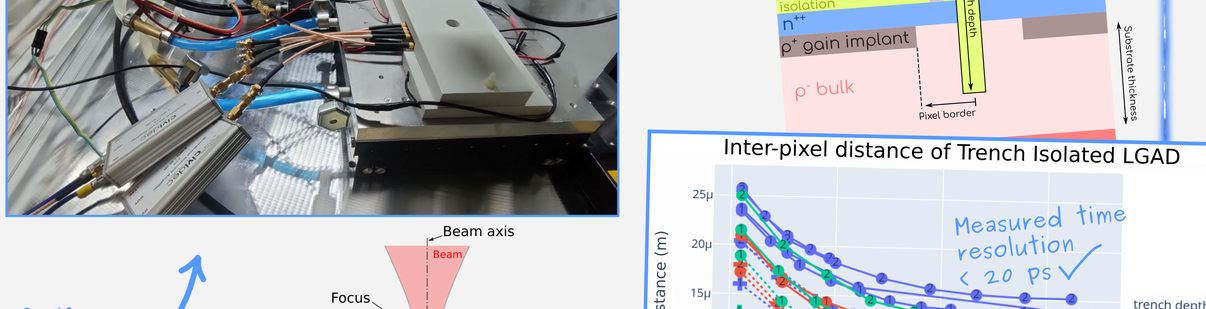


Can we exploit the temporal spread of the collisions?

Answer: yes!

planned installation @CMS by 2032



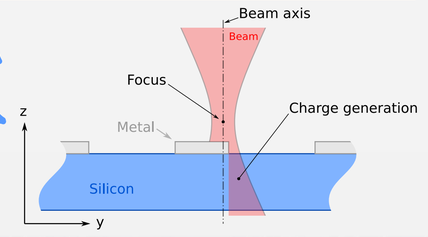


In our lab:

Your hands get dirty!

- Novel LGAD technology
- 4D sensors:
  - position measurements
  - timing measurements
- ASIC design

Our TCT setup!



Our most recent study: