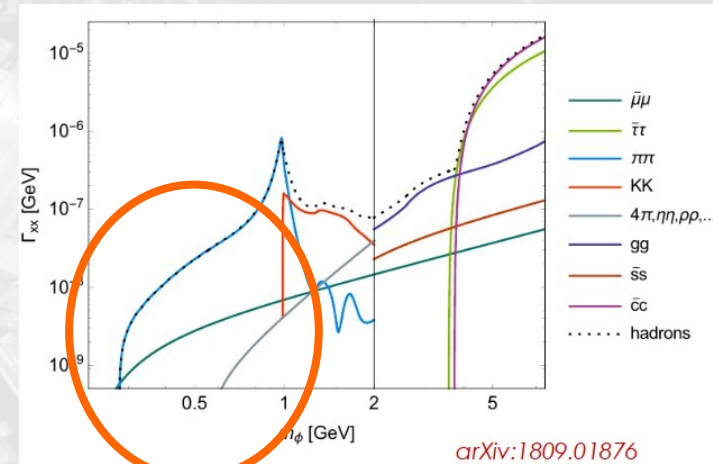


New physics in CMS data analysis

- search for new physics in ZH, $H \rightarrow ss$
 - uncovered for $m(s) < 2\text{GeV}$ and low displacement
 - search in the decay of s to 2 kaons or pions with $Z \rightarrow$ muons
 - study signal and background, devise selection, and assess uncertainties and sensitivity

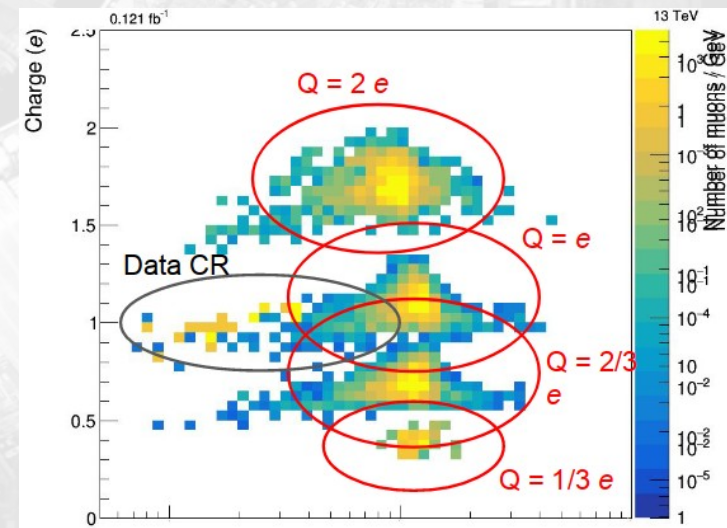
master thesis



- extension or
 - dark photon jet reconstruction with neural networks

bachelor thesis

- search for new particles with charge $\neq 1e$
 - challenge at very low charge:
 - how to collect the data
 - how to see the feeble interactions



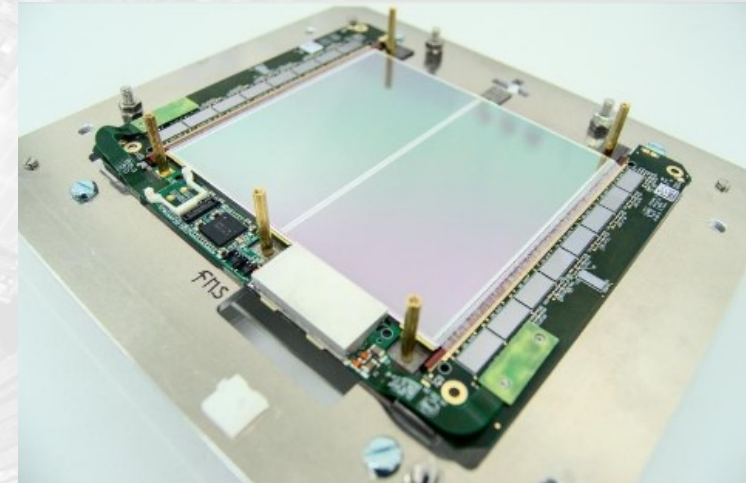
master thesis

bachelor thesis

- option 1 [MA]: study alternative trigger
- option 2 [MA] (technical): straight track reconstruction with missing hits
- [BA] study of charge and mass estimators from ionization loss and particle speed measurement

Detector development

- **the CMS tracker upgrade:** understand and develop the detector of tomorrow's discoveries
 - module characterization during production
 - **bachelor thesis** study the performance of modules for quality assurance link results to fundamental properties of silicon detectors
 - beam test studies
 - **master thesis** study the behaviour of modules in a muon beam
 - **bachelor thesis** reproduce [BA] or produce novel results [MA] using state-of-the-art experimental data
- **the milliQan detector:** characterize a real-life detector
 - 2023 LHC data are being understood
 - second detector in construction phase
- advanced project, scope to be defined
- one possibility: study feasibility of observing low-charge particles from cosmic-ray – atmosphere interactions



master thesis