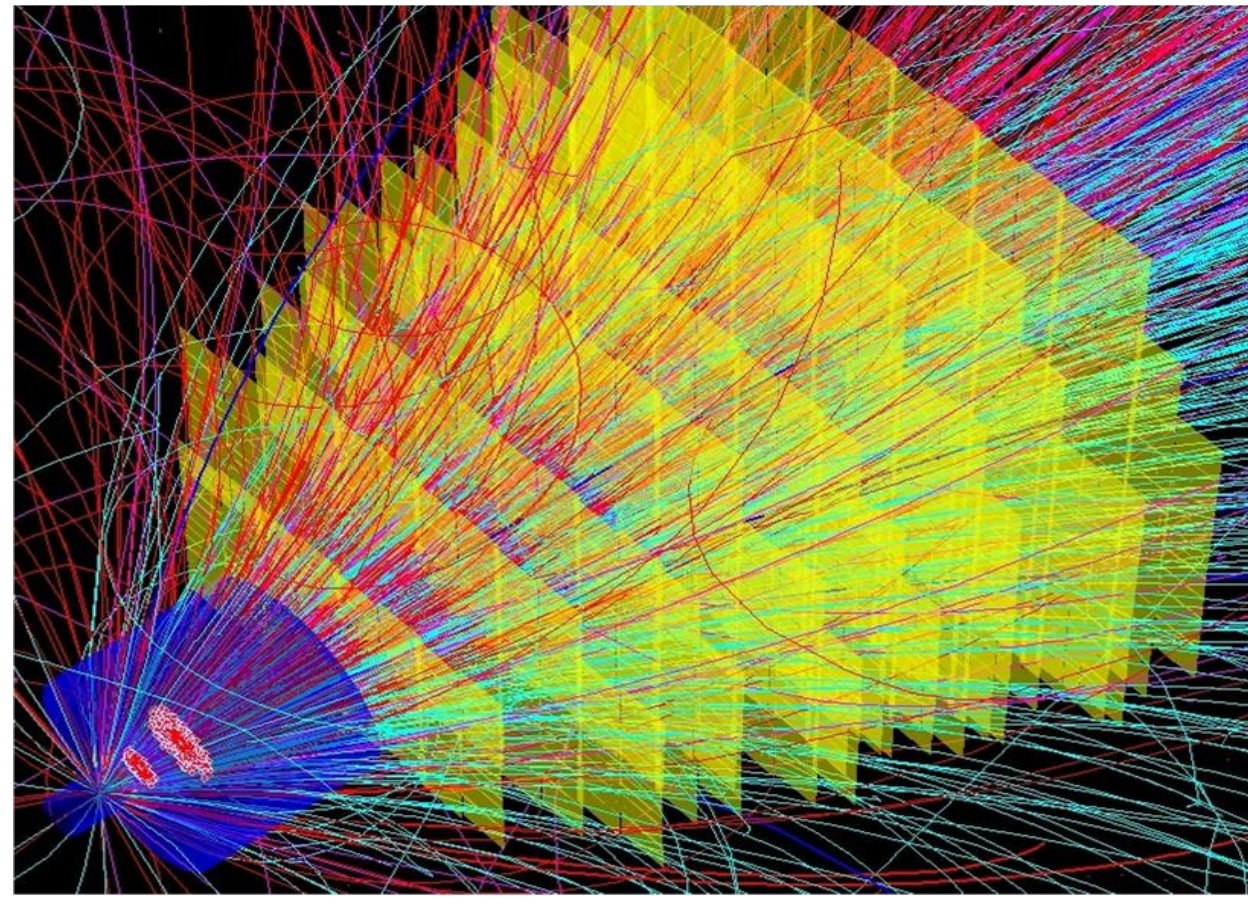


The CBM Silicon Tracking System

Pavel Larionov for the CBM Collaboration

Silicon Tracking System



GEANT model of the STS with tracks from one Au+Au interaction at 25 GeV/nucleon (URQMD)

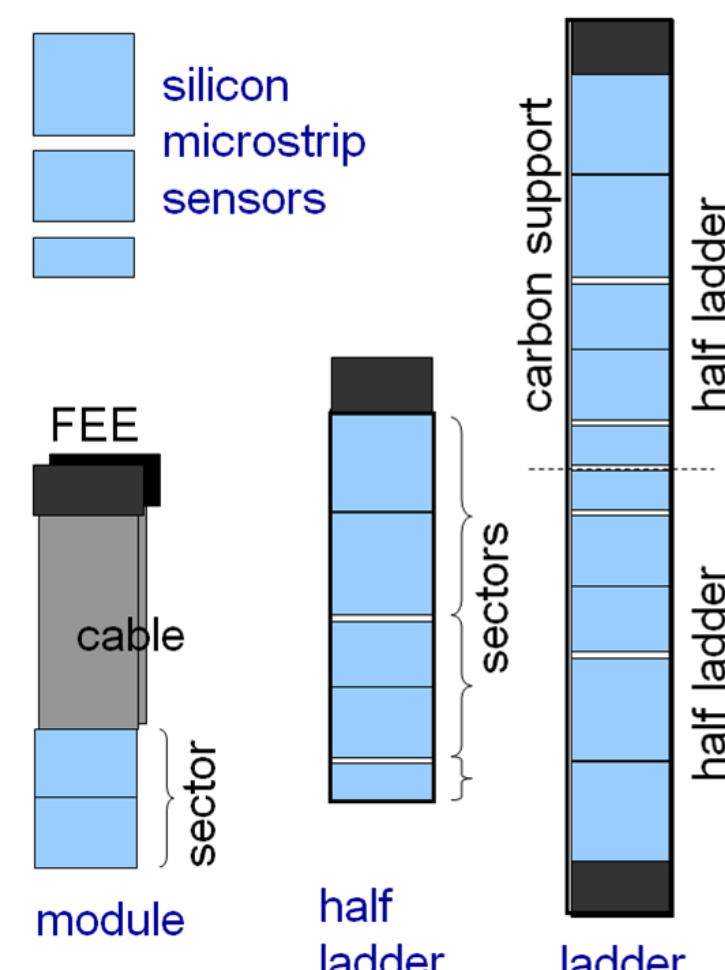
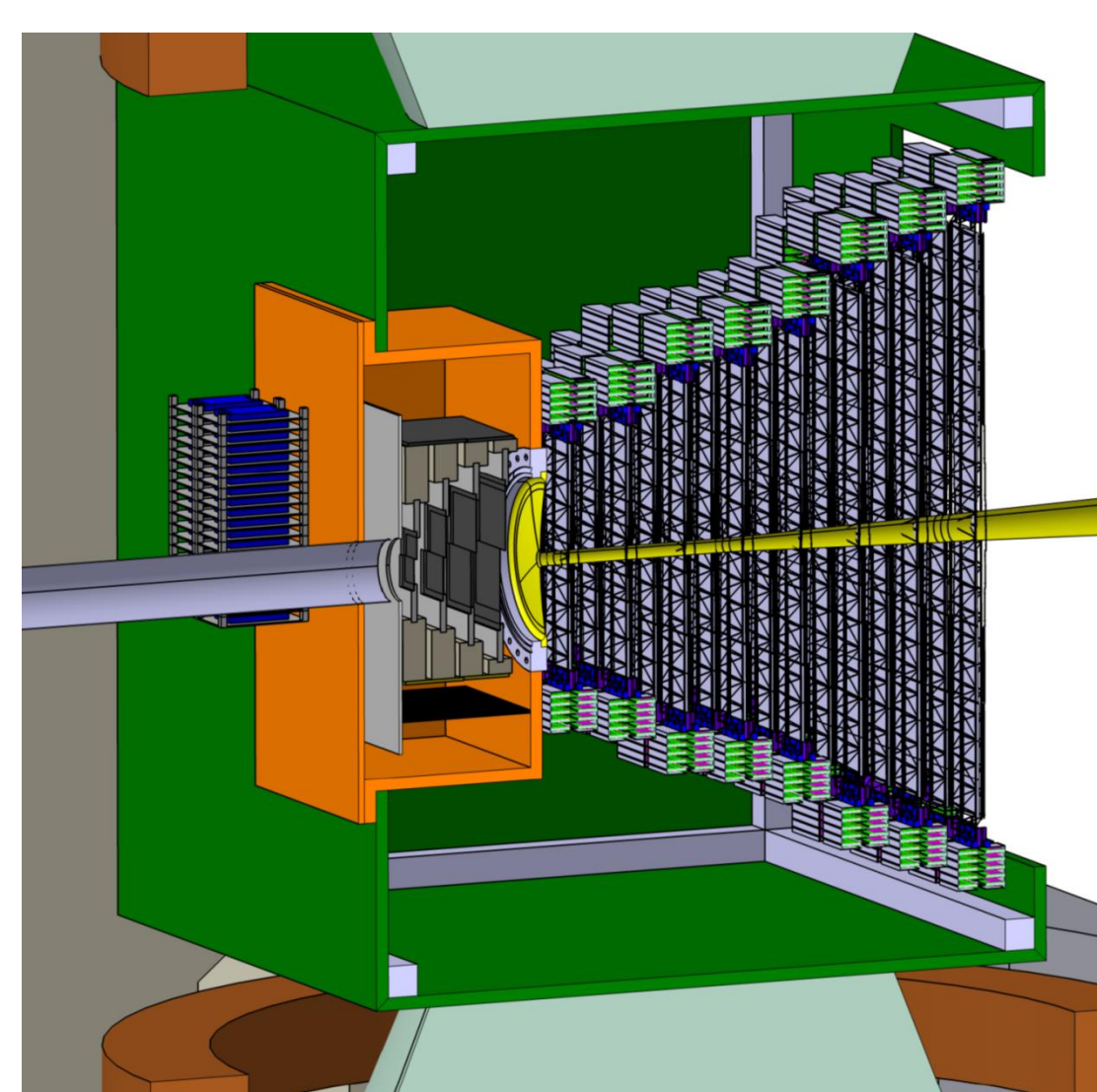
STS is the central tracking detector in CBM

- efficient: hit points ~100%, tracks: ~ 95%
- fast: hit rates 3-20 MHz/cm²
- radiation hard: up to 10^{14} n_{eq}/cm²
- low material budget: ~1% X₀ per station
- momentum resolution: $\delta p/p \sim 1\%$ ($p > 1$ GeV/c)

System overview

- 8 tracking stations downstream of the target, in a 1 T dipole magnet
- ~4 m² active area
- ~2 million read-out channels

Station design



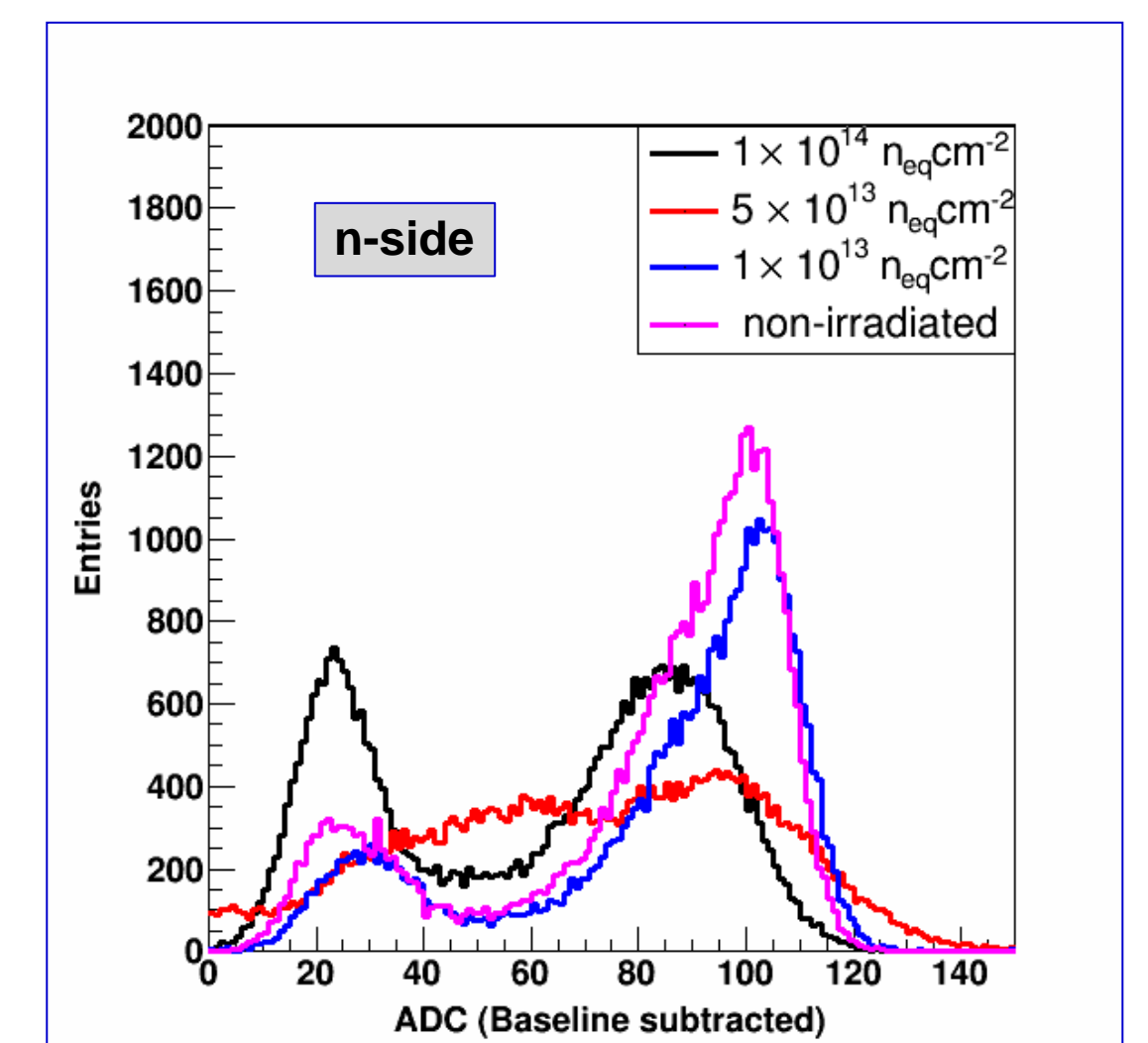
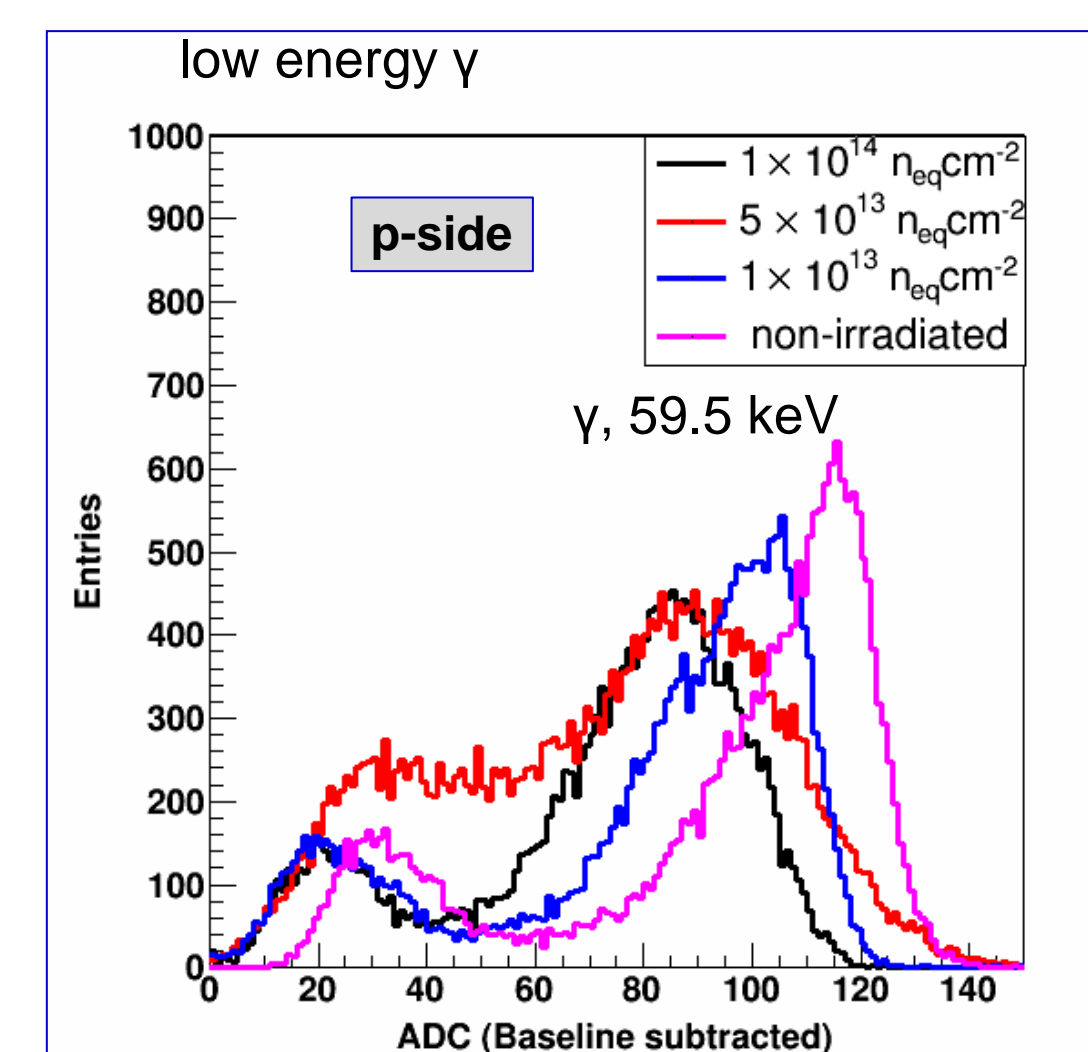
Number of components	
Ladders	106
Modules	896
Sensors	1220
r/o chips	14336
channels	1835k

Study of radiation hardness

Exposure of test sensors up to the maximum integrated neutron equivalent fluence expected in the STS: 1×10^{14} n_{eq} cm⁻²

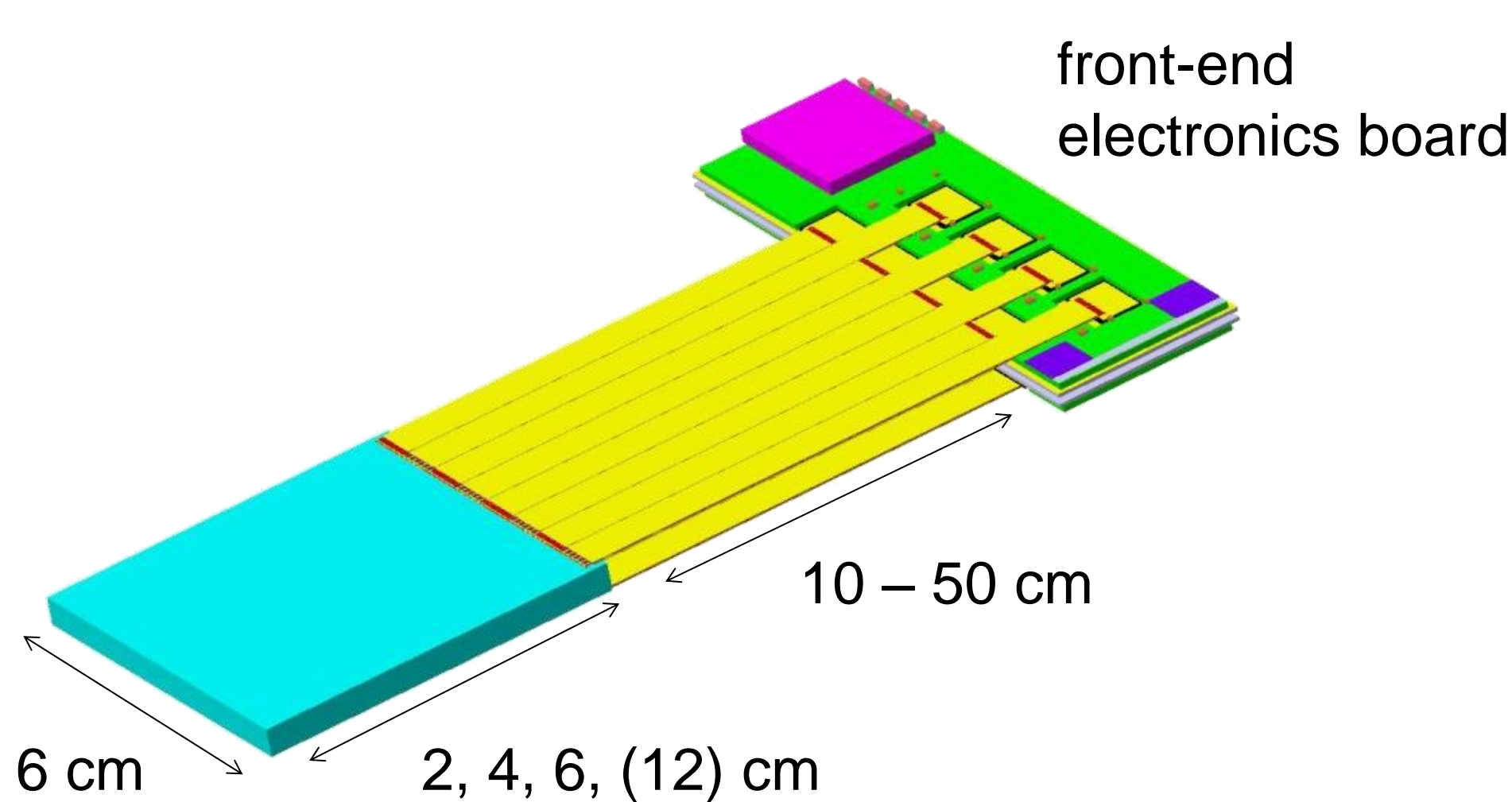
- operation at T = -5°C
- electrical properties
- charge collection efficiency

Amplitude spectra with ²⁴¹Am



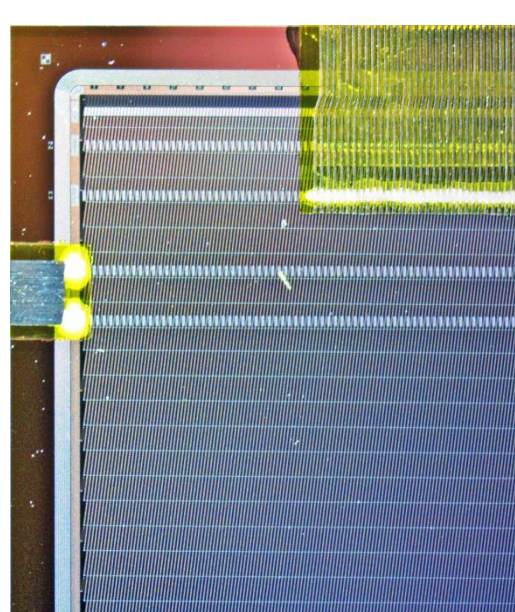
fluence (n _{eq} cm ⁻²)	V _{fd} (V)	V _{bias} (V)	peak ADC p ± 3	eff. (%) p ± 4	n
0	80±2	160±1	117	102	90
1×10 ¹³	35±5	130±1	105	100	88
5×10 ¹³	45±5	180±1	95	81	84
1×10 ¹⁴	110±2	300±1	95	81	71

Module components



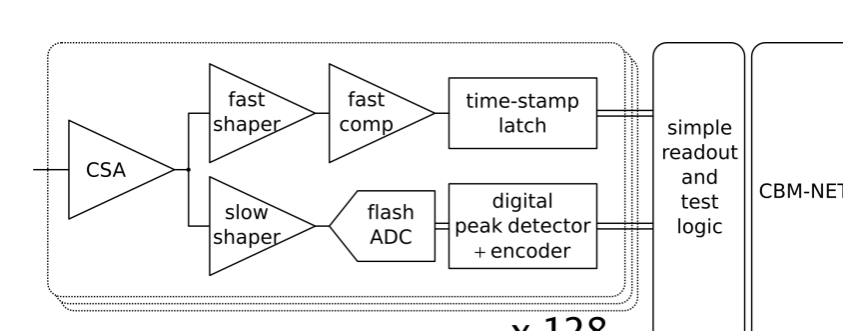
CBM05 sensors

- double-sided
- p-n-n structure
- 285 μm thickness
- 4 sensor sizes
- 58 μm strip pitch
- 7.5° stereo angle
- integrated AC-coupled readout pads

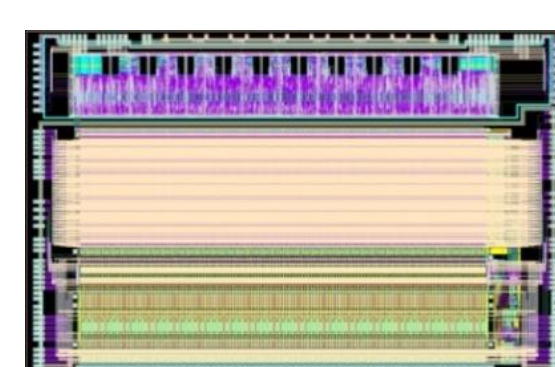


Readout electronics

FEB prototype with n-XYTER chip

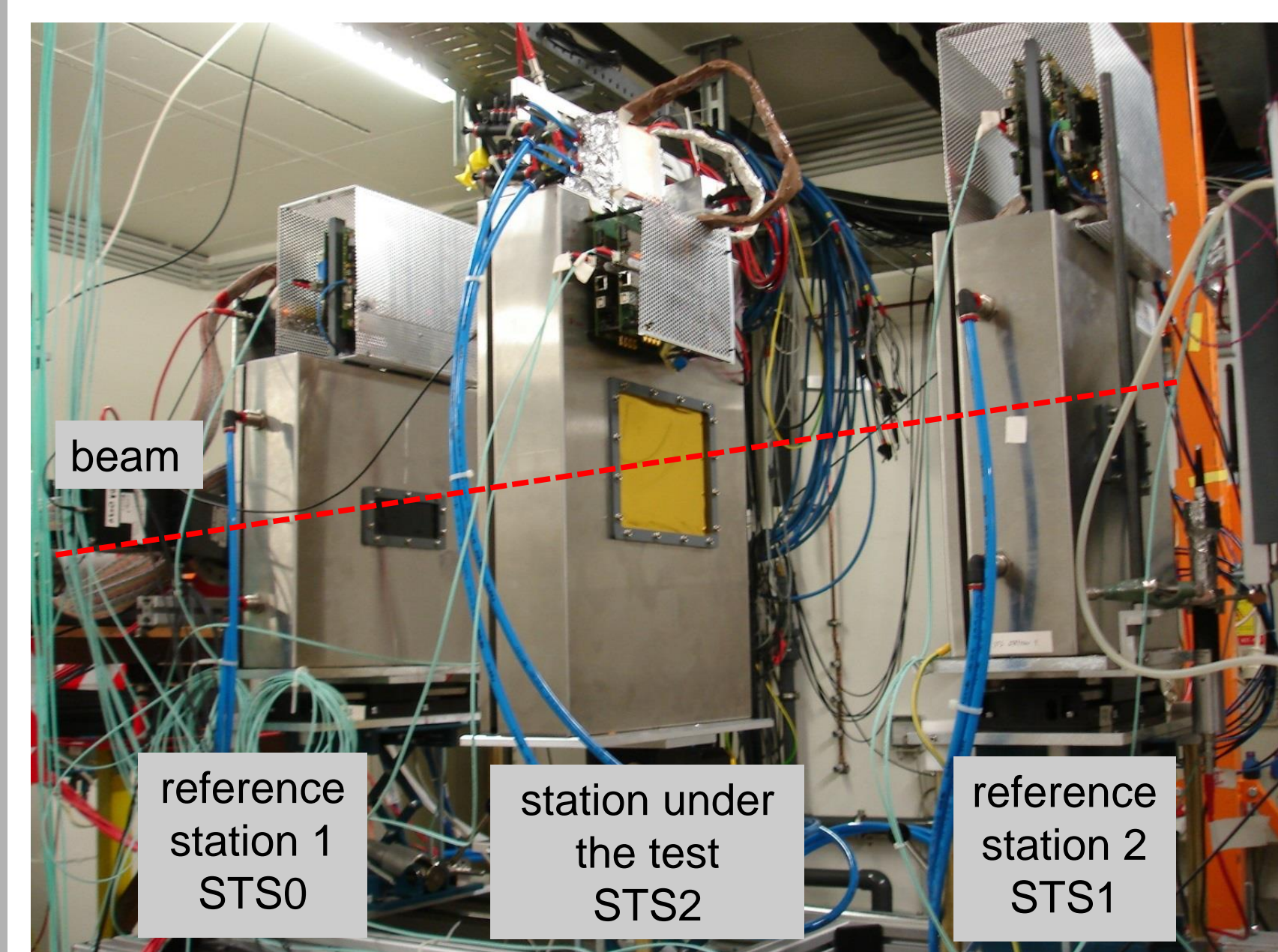


STS-XYTER chip

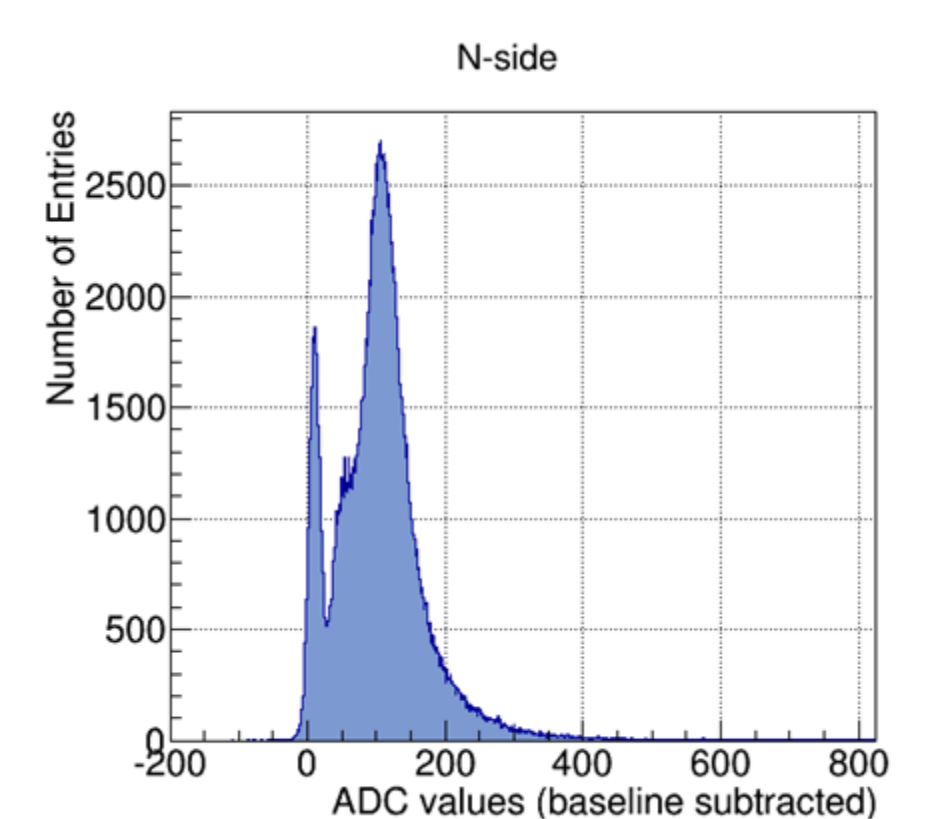
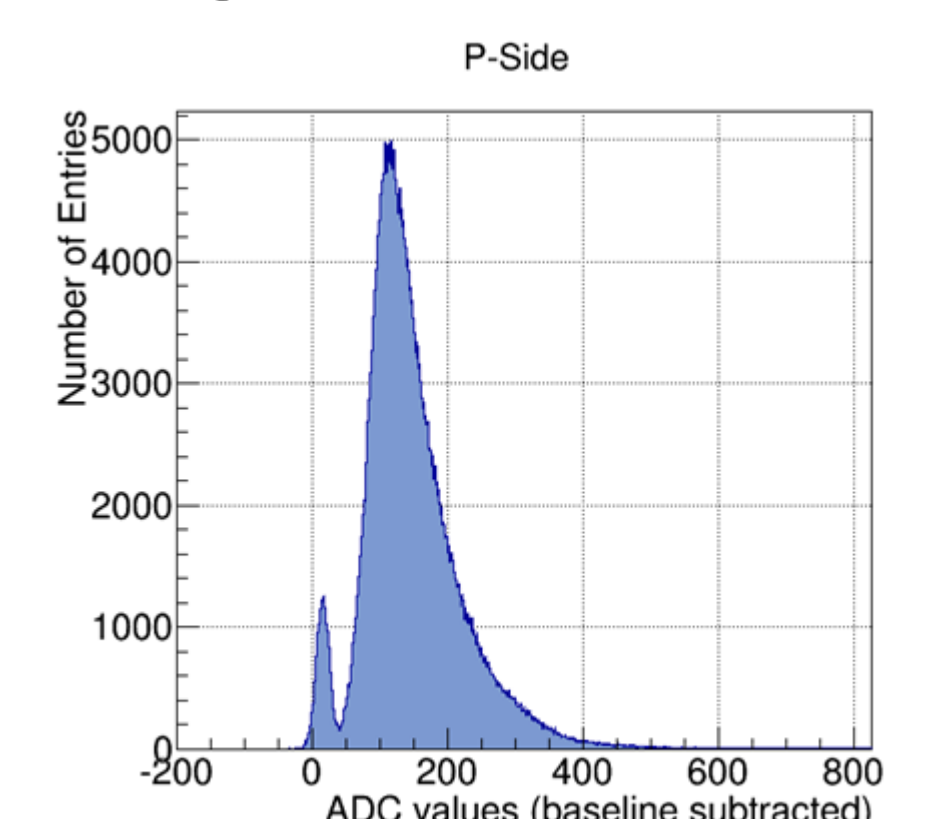


In-beam test @ COSY

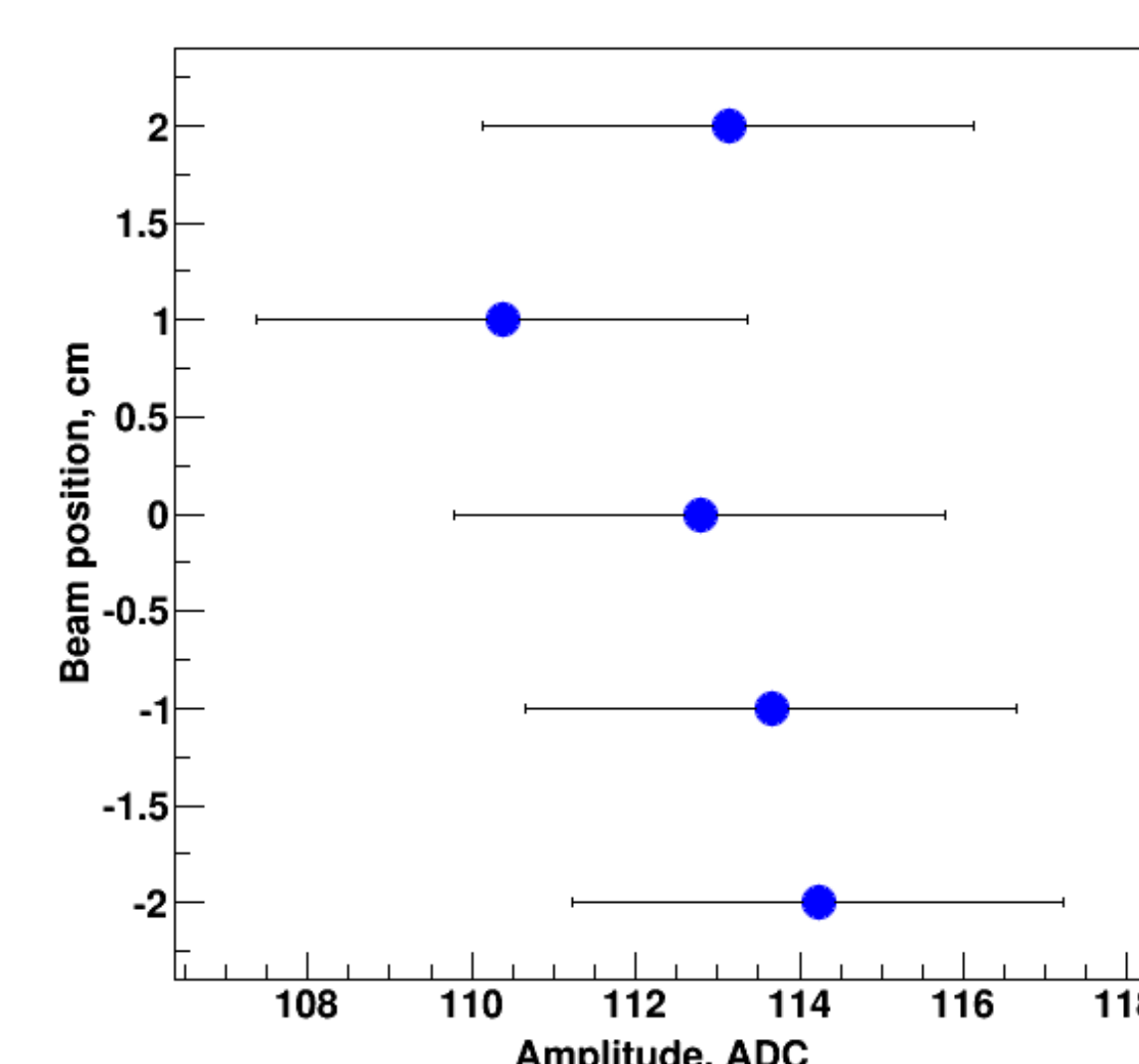
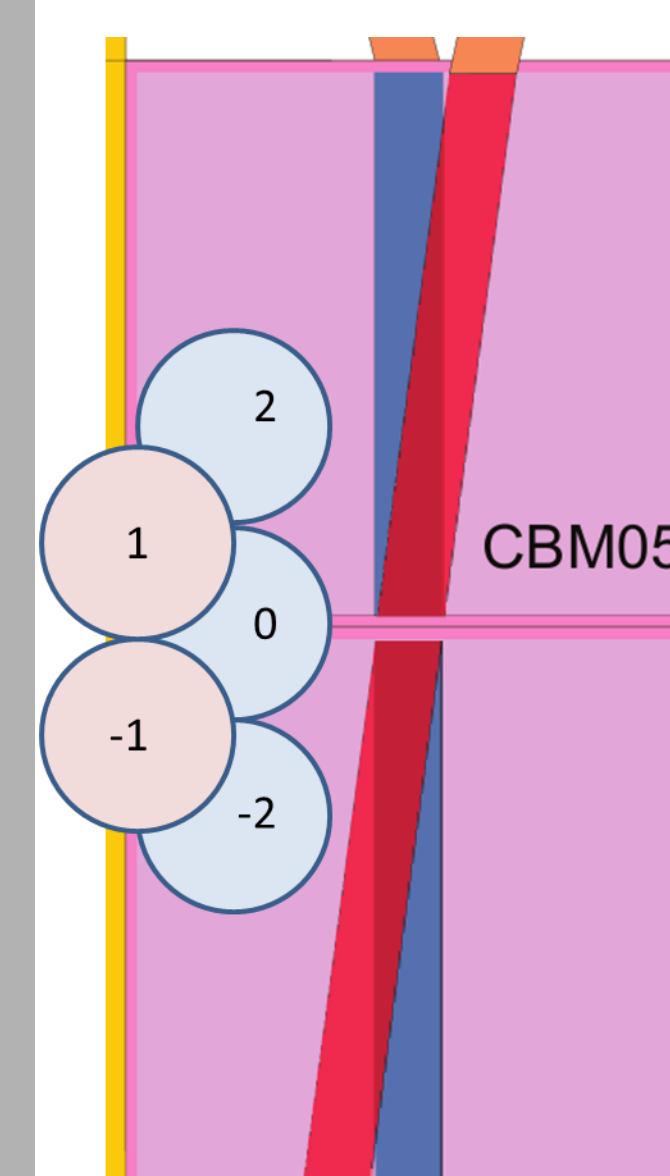
- proton beam, 2.8 GeV
- self-triggered and externally triggered r/o
- prototype modules under test



Signal amplitudes



Study of daisy-chained sensors



Cluster size

