

Sensor Market Survey

ongoing

Mimosa26

- Type
 - AMS 350 nm CMOS technology
 - Epitaxial Layer: different families 10, 15, 20 um, high resistivity (about 400 cm)
- Dimensions:
 - Pixel pitch: 18.4 m x 18.4 m
 - Active area: 21.2x10.6 mm 1152 columns and 576 lines/rows
 - Thinned to 50um
- Read-out
 - Binary
 - integration time equals 115.2 s
 - Continuous Rolling shutter: line by line
 - Dead time free
- Features:
 - Zero-Suppression
 - Buffer: states, sections, ...
 - Deactivate (hot) columns
- Characterisation:
 - "average intrinsic resolution of the MIMOSA 26 sensors at 6 GeV and threshold $n=6$ results to $M26=(3.24 \pm 0.09)m$ "
 - "For $dz=dz_{DUT}=20$ mm at 5 GeV beam energy the track resolution at the DUT is $t(zDUT) = (1.83 \pm 0.03)m$ "

Alpide

task owner: Yi, Jan

- Type:
 - TowerJazz 180nm CMOS Imaging sensor
 - 25um epitaxial layer
 - Full CMOS within pixel matrix
- Key concepts:
 - In-pixel amplification
 - In-pixel discrimination
 - In-pixel 3-level event memory
 - In-matrix zero-suppression
- Dimensions:
 - Pixel pitch: 29um x 27um
 - Active area: 30mm x 13.8mm (plus 1.2mm periphery) = 1024 x 512 pixels
 - Thinned to 50um (= 0.05% x/X0)
- Read-Out:
 - Binary
 - Event-time resolution 2-4us (charge collection time only 1-30ns, but not exploited)
 - Global Shutter (strobe = shutter behind discriminator)
 - triggered acquisition (up to ~6MHz/cm² particle hit rate)
 - continuous (integration time from 1us to infinity)
 - 1.2 Gbit/s serial link, up to 5m cable
- Features:
 - optionally working with reverse bias voltage
 - low power consumption 40mW/cm² no cooling needed
- Characterisation (threshold 160e-)
 - Detection Efficiency: > 99%
 - Fake-Hit-Rate: 10⁻¹¹ /pixel/event
 - Averaged Cluster Size
 - ALPIDE telescope = 7 planes, middle plane as DUT, distance 2cm:
Simulated track resolution at DUT 2-3um with 6GeV/c pions

CLIC developments

task owner: Hendrik

- CLICpix + 50 um sensor, 65 nm, 25 um pitch, ~8 um spatial res for 50 um thin sensor, caveat: hybrid
- C3PD + CLICpix2 (glued), 65 nm, 25 um pitch, ~9 um spatial res, improvement expected for HR sample, 10 ns time res from CLICpix2, caveat: hybrid
- ATLASpix HV-CMOS, 130 x 40 pitch ...
- HRCMOS Investigator, 180 nm, 28 um pitch, down to 5 us spatial res, noise !, time res FRONT-END ONLY ~5 ns,
- Cracow SOI, 200 nm, down to 30 x 30 pitch, below 2 um spatial res!caveat: rolling shutter
- CLIPS SOI technology?, 20 pitch, target < 3 um spatial res, below 10 ns time res, thinning to 75-100 was already planned, r/o ??

Details will be added after CLIC Collaboration Meeting end of August

DEPFETs

task owner: nn

availability poor, slow production and slow r/o, costly Survey not really needed ?!

- e.g. Belle II version

Moench

task owner: nn

... is a hybrid Check feasibility to make thin version (= "50 um sensor + 50 um ASIC)

FPCCD (Vertex detector for ILC)

task owner: nn

Monolythic SOI

task owner: nn

(CLIC SOI covered by Hendrik)

Malta

LF2

LGAD/iLGAD

hybrid

3D

hybrid

Gigatracker

task owner: nn

https://indico.cern.ch/event/781403/contributions/3314640/attachments/1821558/2979606/perrin-terrin_2019-04-01.pdf