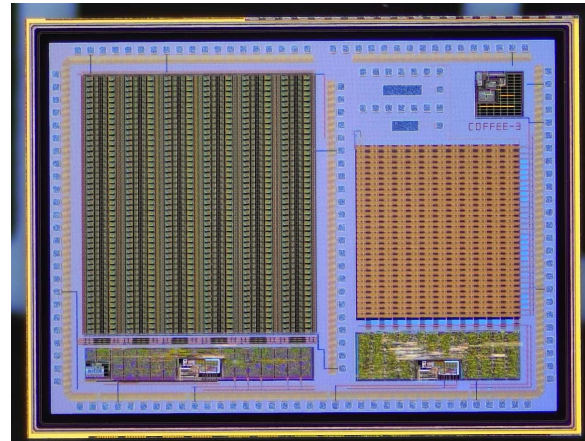
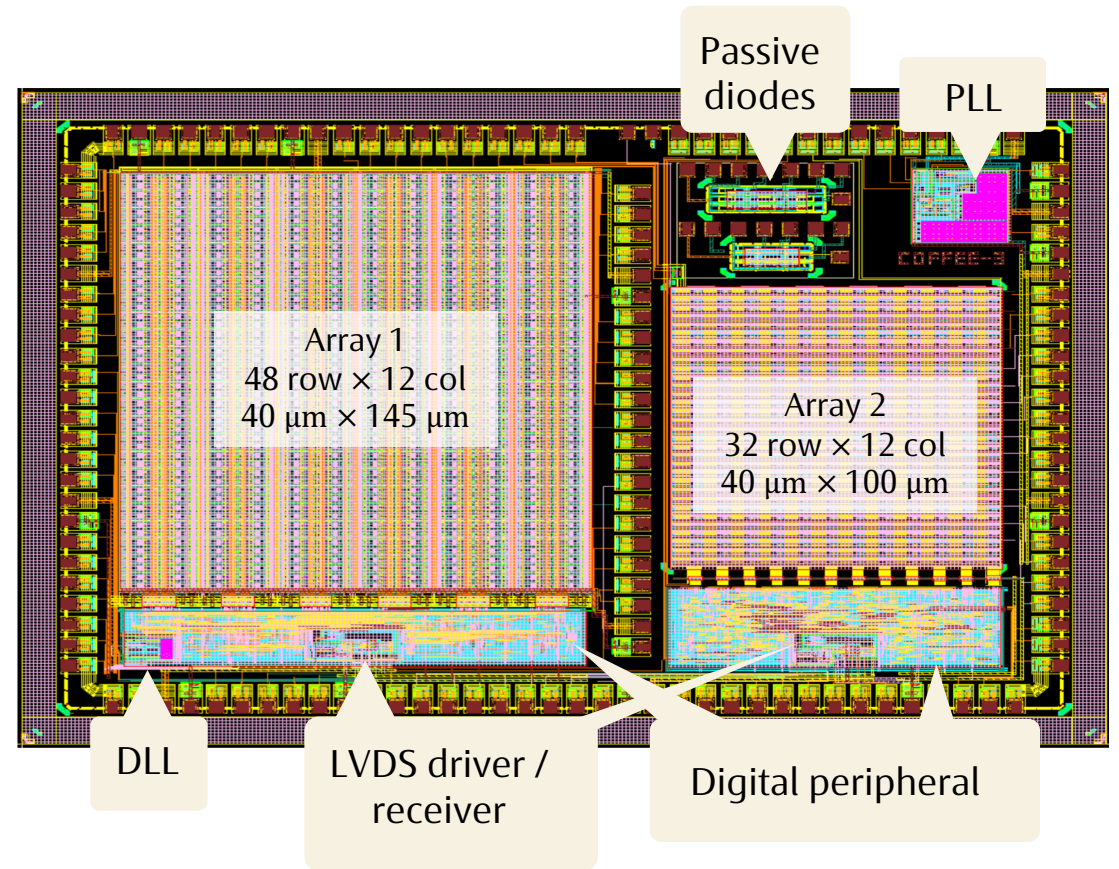


# COFFEE3 chip

- Submission in January 2025
  - 4 mm × 3 mm
- Two readout pixel arrays + a few function modules
  - Array 1: CMOS-based in-pixel circuit, fully exploiting 55nm potential for optimal timing performance (eg: with in-pixel TDC and coarse-fine delay line)
  - Array 2: optimized for triple-well process, only NMOS for in-pixel circuit to avoid cross-talk
  - Digital peripheral circuits: End of Column, function configuration, data scrambler, serializer
  - Passive diode array
  - PLL, LVDS modules, extendable for larger array
- Received in end May

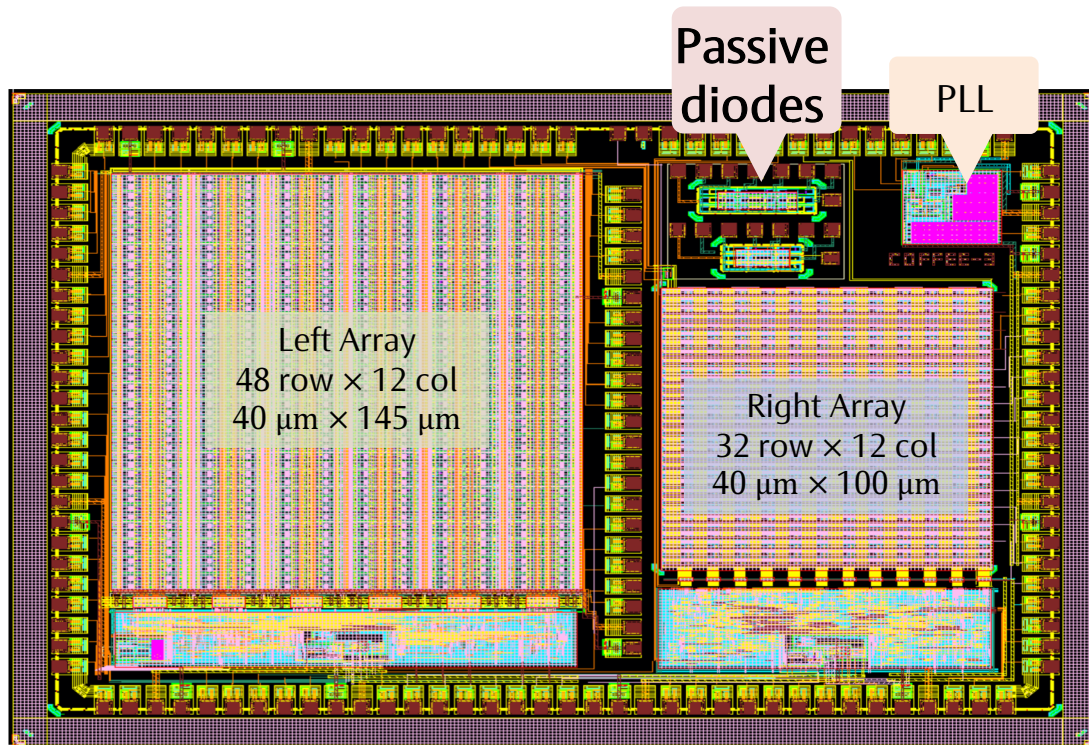


COFFEE3 photo

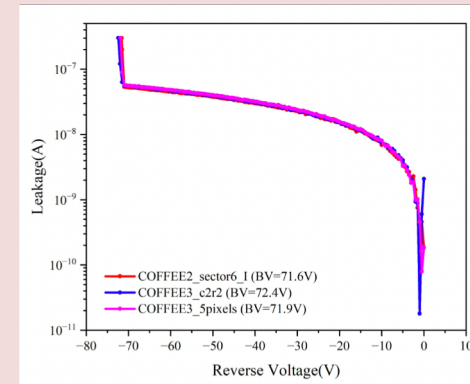
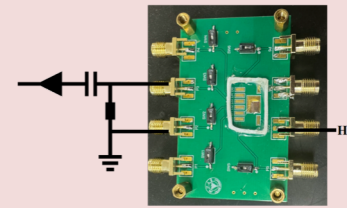


COFFEE3 layout

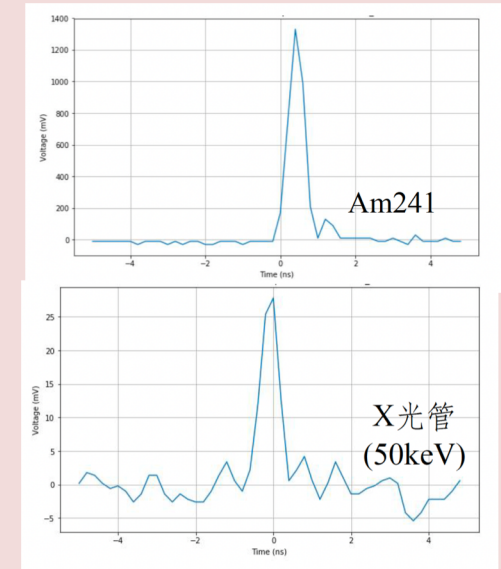
## COFFEE3 tests



**Passive diode array:** validation of sensor performance; test result consistent with COFFEE2:



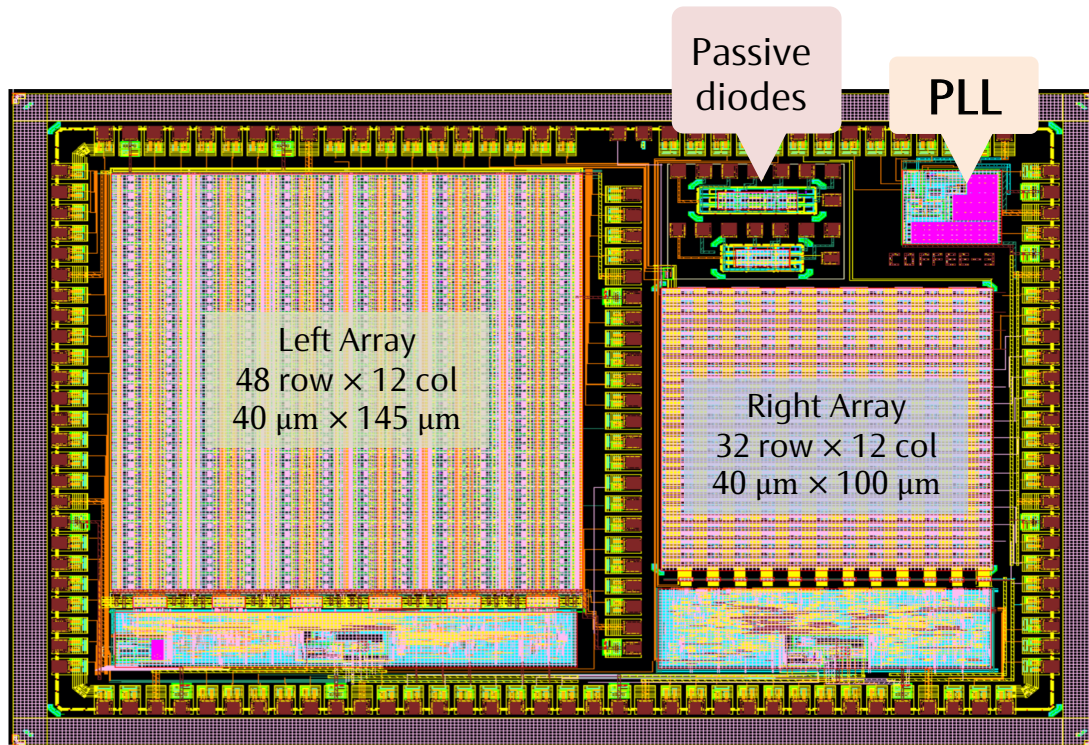
Breakdown voltage: -71V



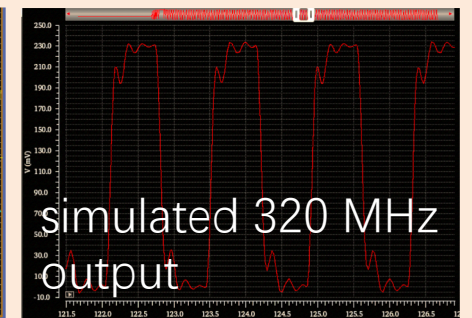
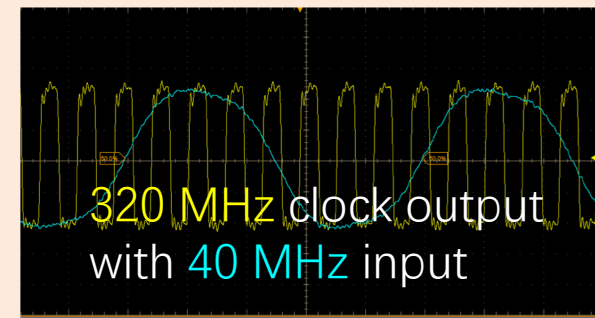
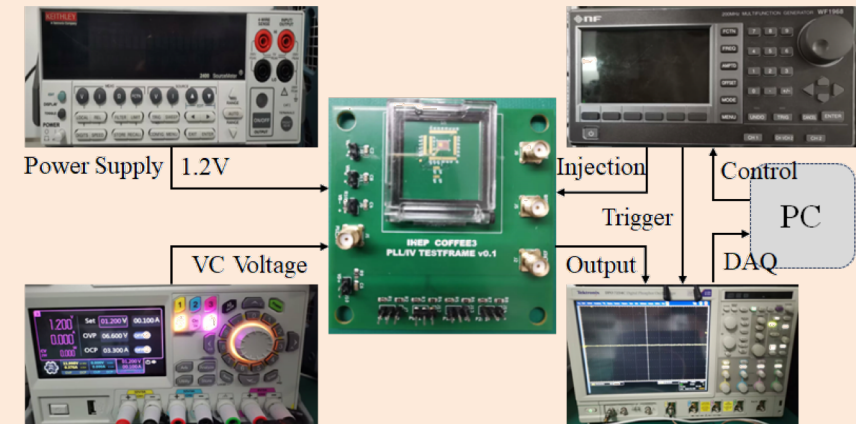
Responsive to  $\alpha$ - and X-rays



## ■ COFFEE3 tests

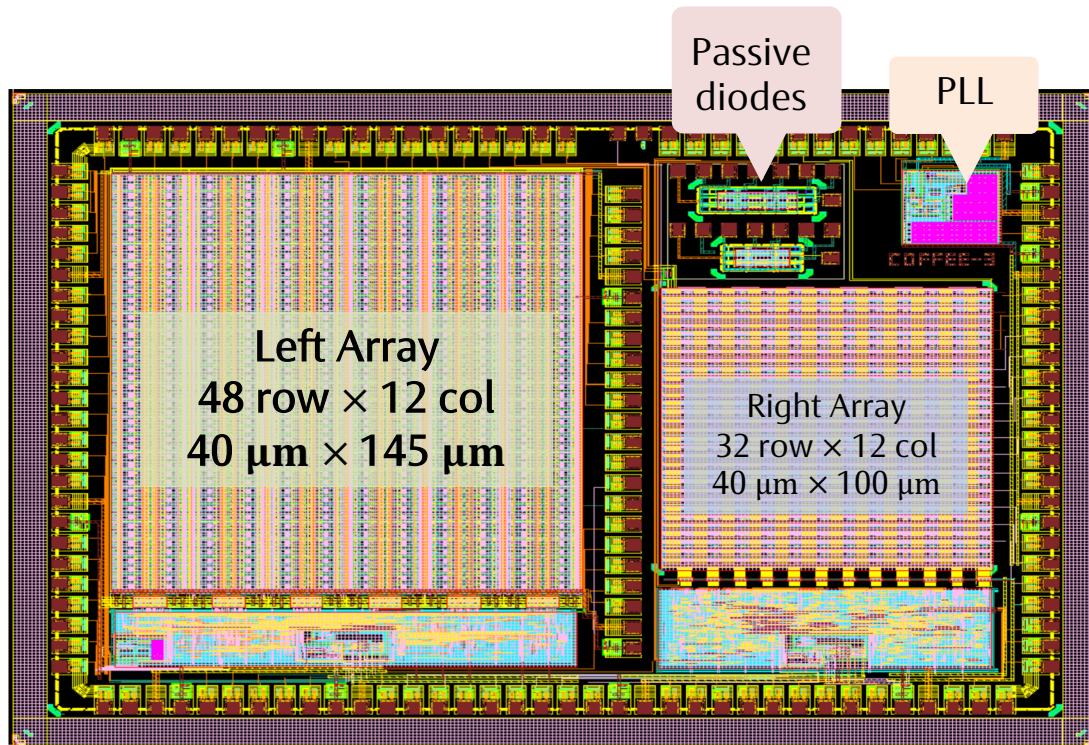


**PLL:** new module for clock synchronization.  
Test result consistent with simulation up to 320MHz output with 40MHz input → Module validated!





## ■ COFFEE3 tests

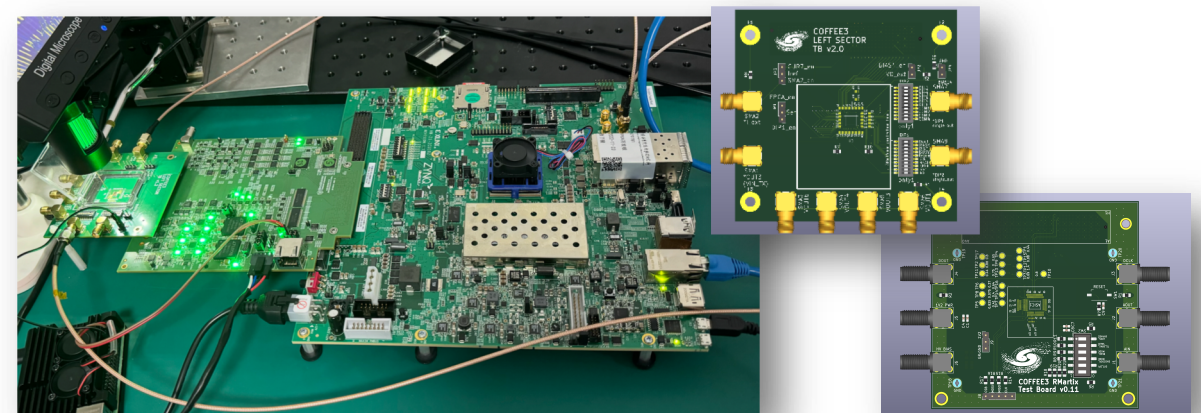
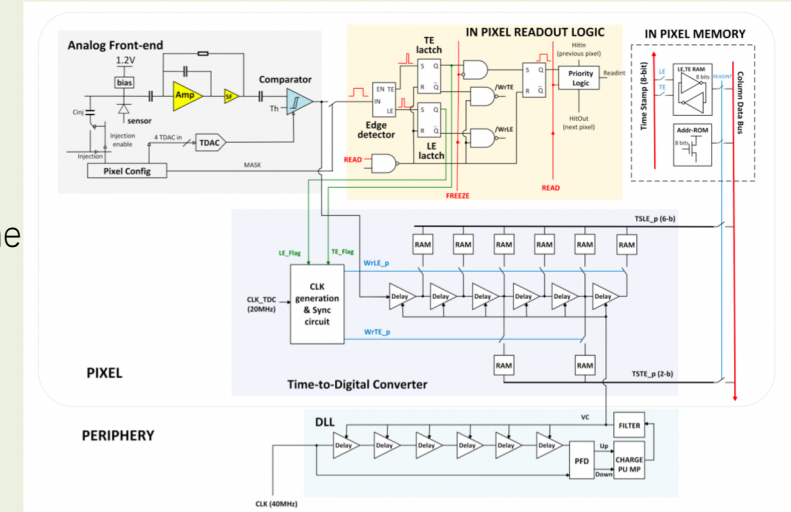


Testing team actively contributing to Car(ibou) community, with the latest software and firmware versions

## pixel array: full readout architecture validation

Testing goals :

- In-pixel analog: CSA, comparator
- In-pixel digital: TDC, me
- Data-driven readout
- DLL
- LVDS transceiver



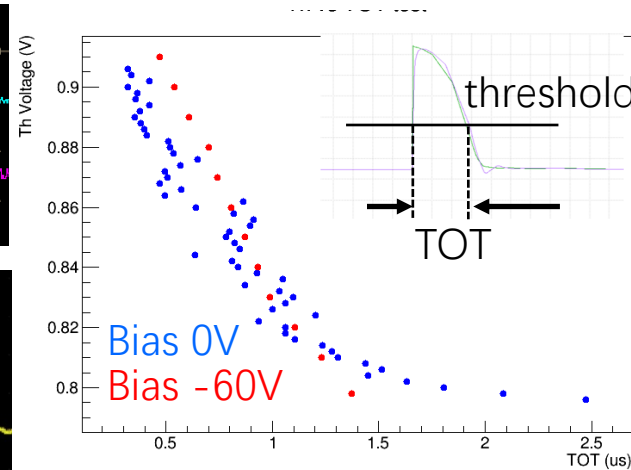
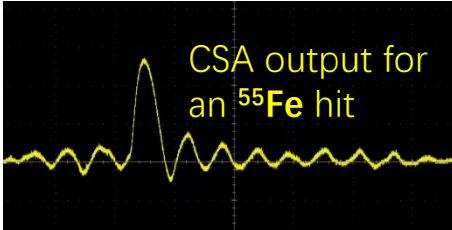
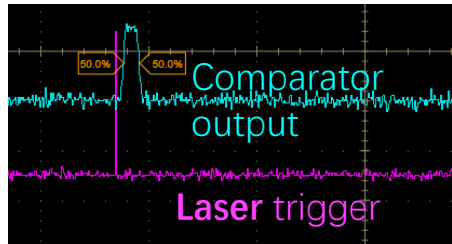
Dedicated test PCBs + CariBou readout board in place



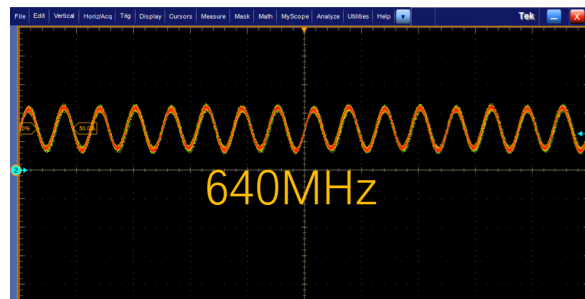
# COFFEE3 pixel array test

Pixel response to laser &  $^{55}\text{Fe}$ ;

In-pixel CSA and comparator working as design



Typical TOT of laser signal 1-2us, consistent with simulation



LVDS transceiver works up to 640 MHz supporting 1.28 Gbps data transmission



DLL delivers clock phase decay as expected

Testing goals :

- In-pixel analog: CSA, comparator ☒
- In-pixel digital: TDC, memory ☐
- Data-driven readout ☐
- DLL ☒
- LVDS transceiver ☒
- Function configuration; serializer ☒
- End of Column; data scrambler ☐

