



中国科学院近代物理研究所

Institute of Modern Physics, Chinese Academy of Sciences



Silicon Lab at IMP

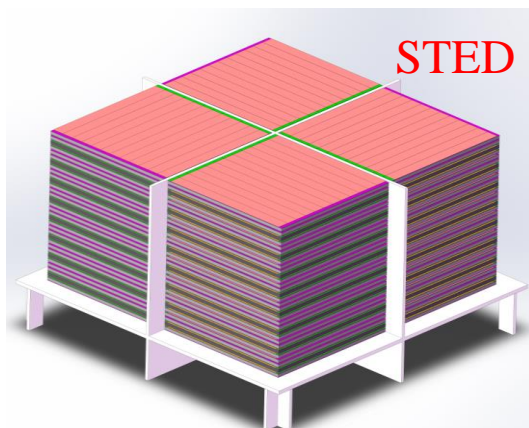
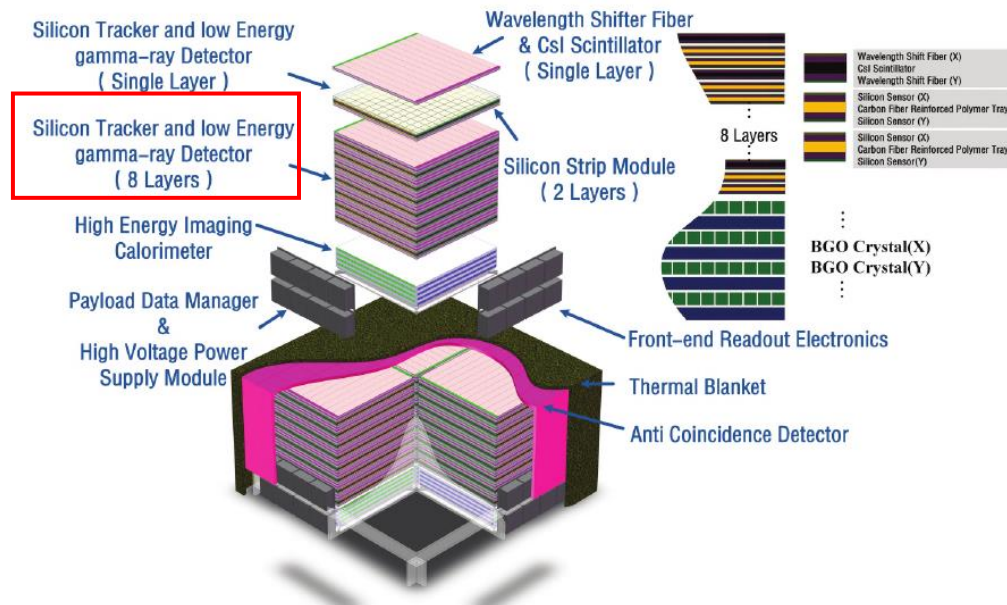
— 近物所像素探测器研究室 —

Low-power large-dynamic range readout ASIC for VLAST silicon strip detector(ID #83)

Reporter: Weijia Han, Gang Chen

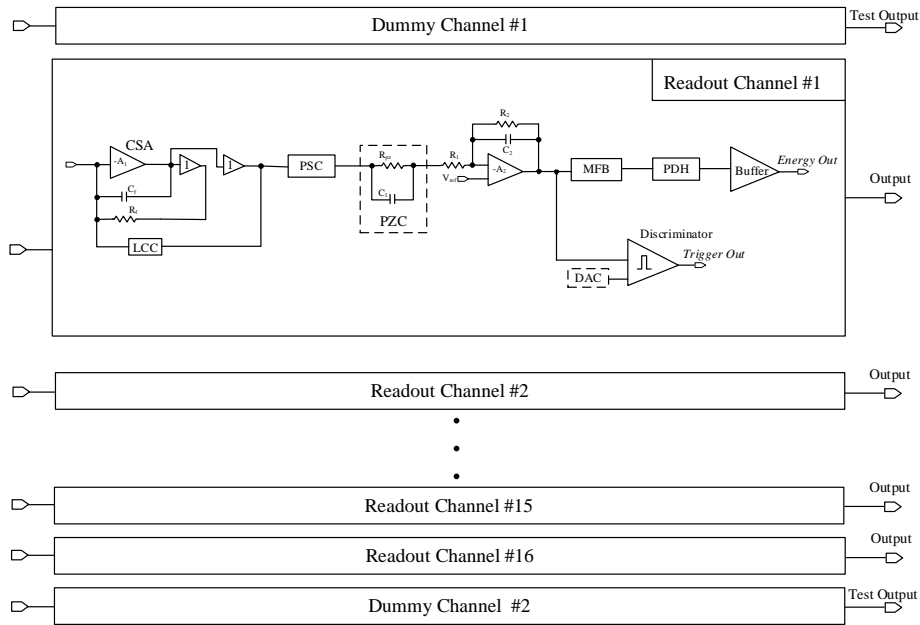
Report Time: 22/04/2024



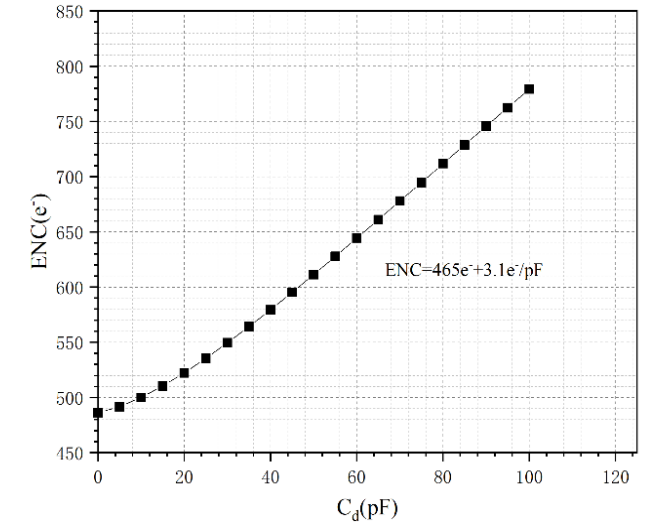


Composed of 2×2 detection arrays

- **VLAST main scientific goals:** dark matter detection, high-energy time-domain astronomy, gamma-ray horizon, and the origin of cosmic rays.
- **STED's main scientific goals:**
 - Used to measure high-energy photon (electron pair) tracks and low-energy Compton effect photons
- **STED components plan:**
 - It consists of four identical detection arrays that are closely combined in 2×2. The effective detection area of each layer is: not less than 2.8 m × 2.8 m
 - The detection array has a total of 1376256 silicon strip readout channels
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 - The total equivalent capacitance of each channel is ~ 100pF
- **Requirements for the chip:** large dynamic range; low noise; low power consumption



	VA140/IDE114 0	SiReadout
Dynamic Range	$\pm 200fC$	$\pm 200fC$
Noise	$784e^- @ 100pF$	$< 800e^- @ 100pF$
power consumption	$290\mu W/channel$	$< 270\mu W/channel$
Number of channels	64	16
Trigger function	None	✓
Digital output	None	None



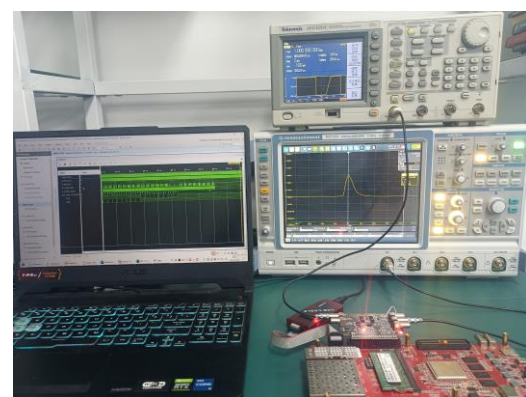
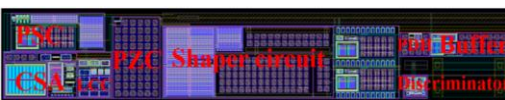
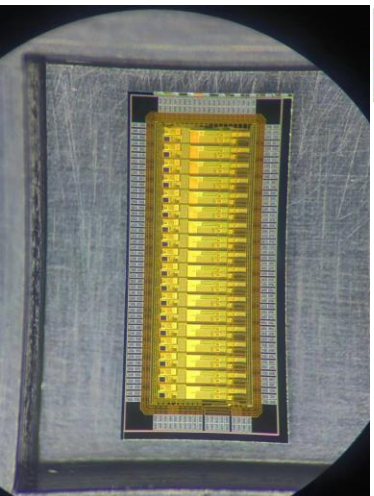
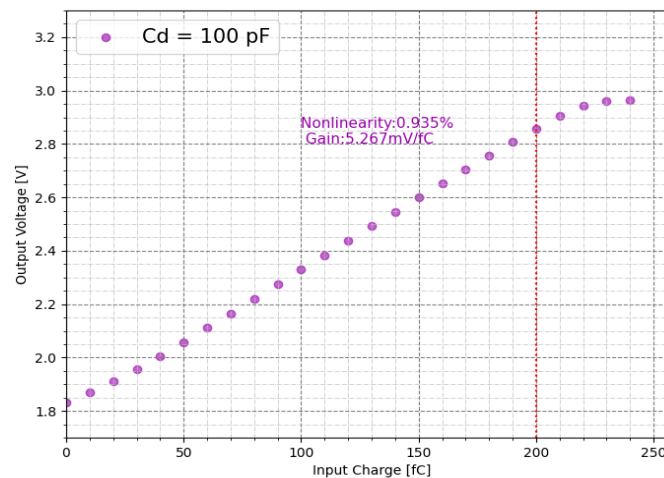
● **Advantage:**

- The preamplifier using dual power supplies reduces power
- The large-size input device operating in the weak inversion region reduces noise
- The shaper circuit improves the signal-to-noise ratio

● **Typical positive charge input:**

ENC = 465e⁻ + 3.1e⁻/pF

INL_{max} < 1% @ 0-200fC





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THANK YOU

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