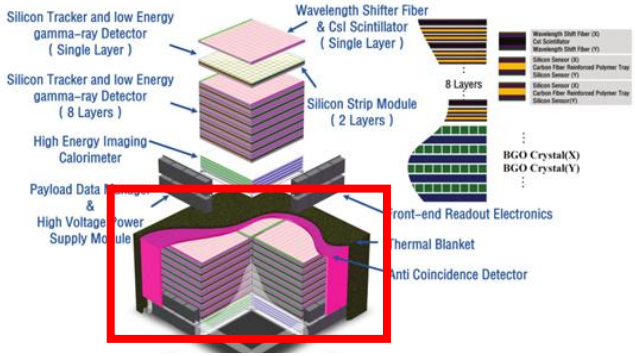
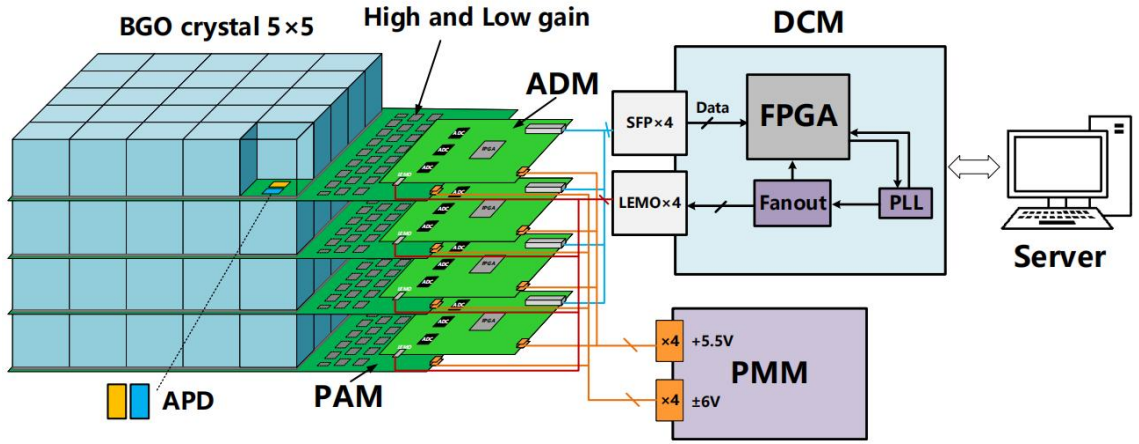
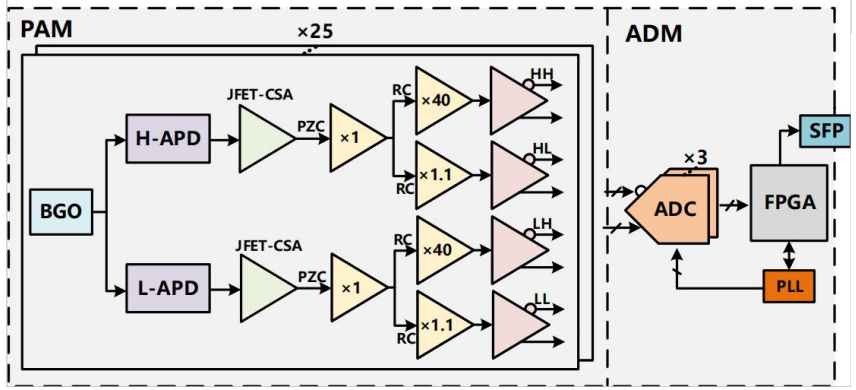
Design of Large Dynamic Range Readout Electronics for the Prototype Calorimeter of VLAST

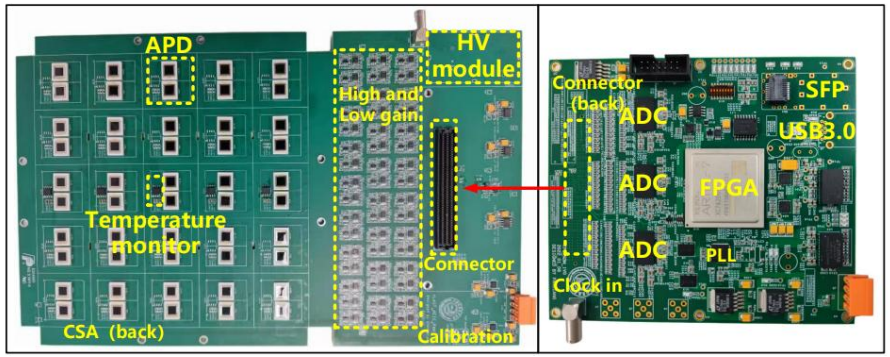
#117

- Very Large Area gamma-ray Space Telescope (**VLAST**)
  - High-energy resolution spatial observations of gamma rays
- High-Energy Imaging Calorimeter **(HEIC)**
  - Measuring the energy and identify particles
  - Dynamic range: **0.1 GeV - 20 TeV (~ 2 × 10^5)**
  - Noise: < **0.5 MIPs**
- Prototype
  - 3×3×3cm^3 BGO crystals as absorption materials
  - APDs as light-to-charge materials
  - 4-layers, 396 channels
- Challenges & Solutions
  - **High dynamic range**
    - High and Low gain
    - Light filter
  - **Low noise**
    - Charge Sensitive Amplifier









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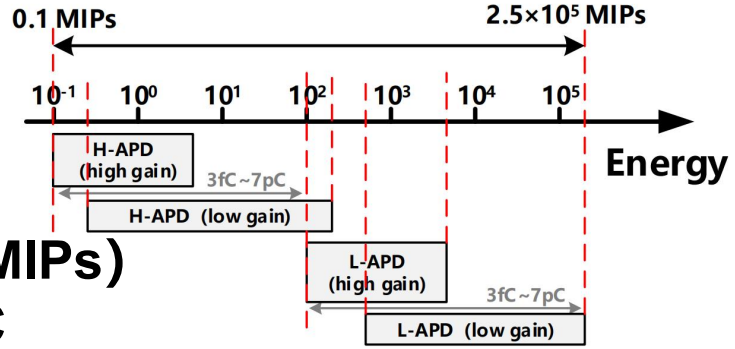
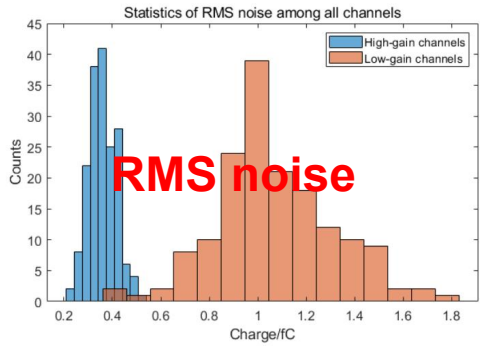
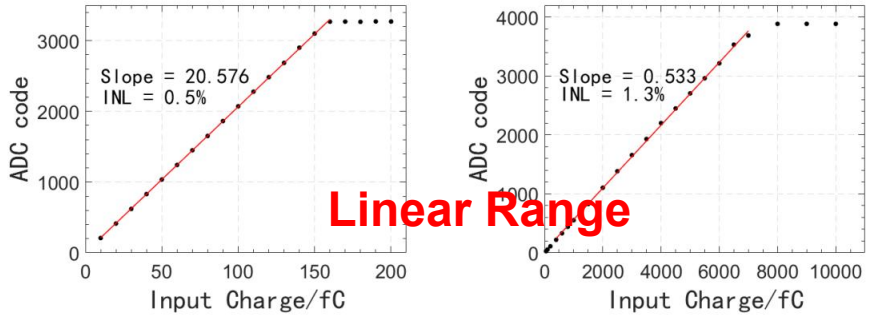
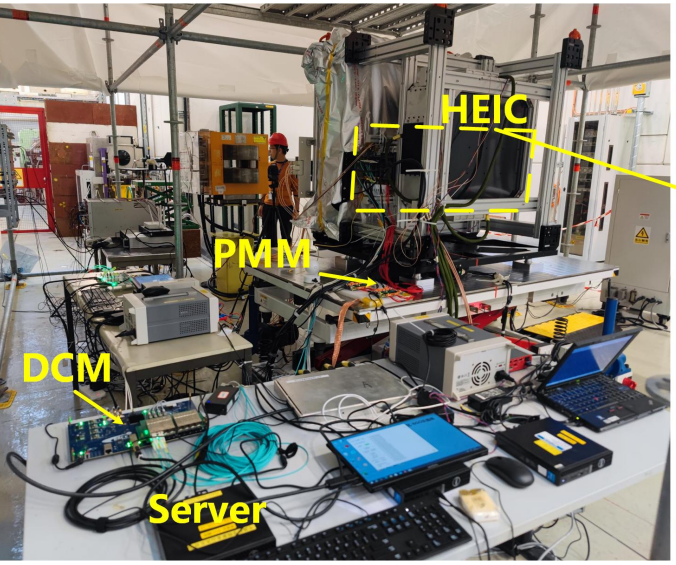
➢ Test result

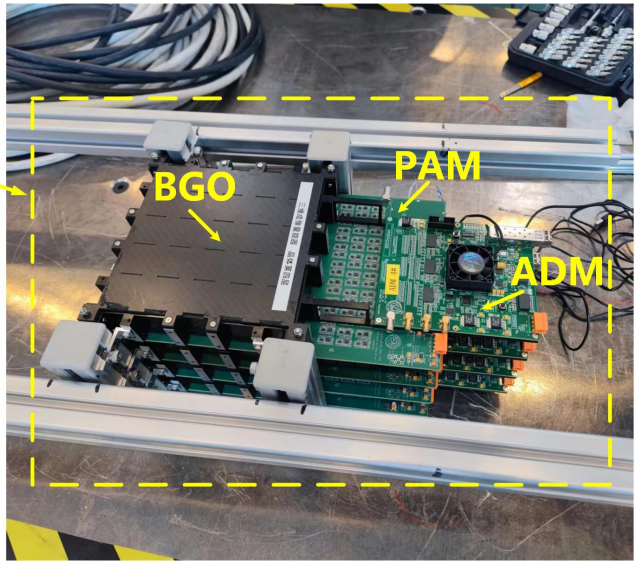
- RMS Noise：less than **0.6 fC （~ 0.023 MIPs）**
- Electronics Dynamic Range：**3 fC - 7 pC**
- Prototype Dynamic Range：**0.1 MIPs - 2.5×10⁵ MIPs**
- Dead Time：**40μs**
- Good **linear relationship** among different gain channels

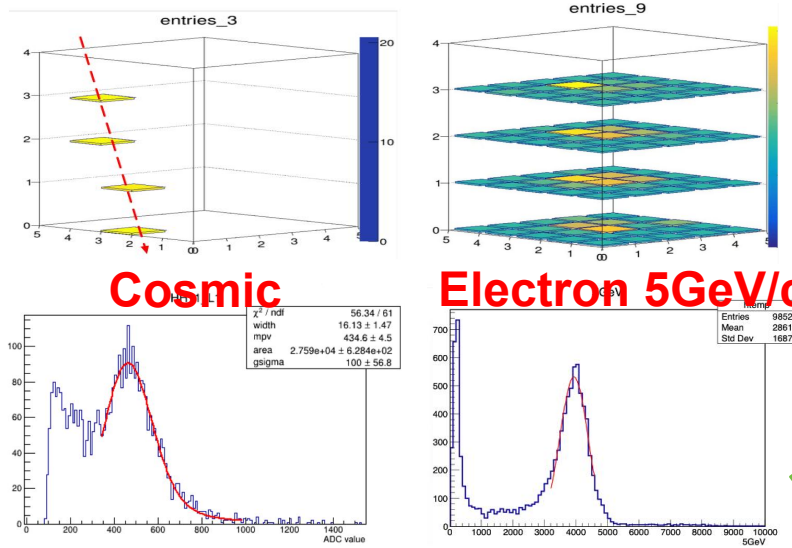












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