VELA: a fast DEPFET readout circuit for the IXO mission

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Application: Fast X-ray Imaging for Astronomy developed for the IXO mission.

The VELA (VLSI Electronic for Astronomy) ASIC is specifically design to fulfill the requirement of the WFI (wide field imager) instrument. The detector of the WFI will be a Active pixel matrix based on the DEPFET device.

WFI (Wide Field Imager) performances

- Detector type: Active Pixel DEPFET
- Number of pixels: 1024 x 1024
- Dynamic Range: 100 eV – 30 keV
- Energy resolution: 125 eV @ 6 keV
- Noise: 3-5 e ENC
- Time resolution: 200 Hz in Full Frame Mode
  
  Processing Time: 4 μs

Fast Trapezoidal time-variant filter is needed
Operating principle of drain current read-out.

The novel drain current readout scheme overcomes the limitations of the conventional voltage readout.

- Since the information is sensed on the DEPFET drain, the input of the analog front-end can be a virtual ground. Thus, the stray capacitance have a negligible effect on the shape of the weighting function and it is possible to operate the device at higher speed.

- The gain increases as the square root of the current; thus, it is possible to bias the DEPFET at a higher current to improve the performances.

Layout of 64-channels VELA.
Chip size is 5.2 mm x 4.6 mm.

Hit Map
Processing time = 2 μs/line
Frame Rate = 7800 fps
Noise = 7.2 electrons ENC

Recorded spectrum of $^{55}$Fe source

Constant: 14686.89
Mean: 5892.37
Sigma: 58.30
FWHM: 137.28
P2B: 525.47