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Very low noise, high speed Charge Sensitive PreAmplifier for Single Crystals Diamond Detectors

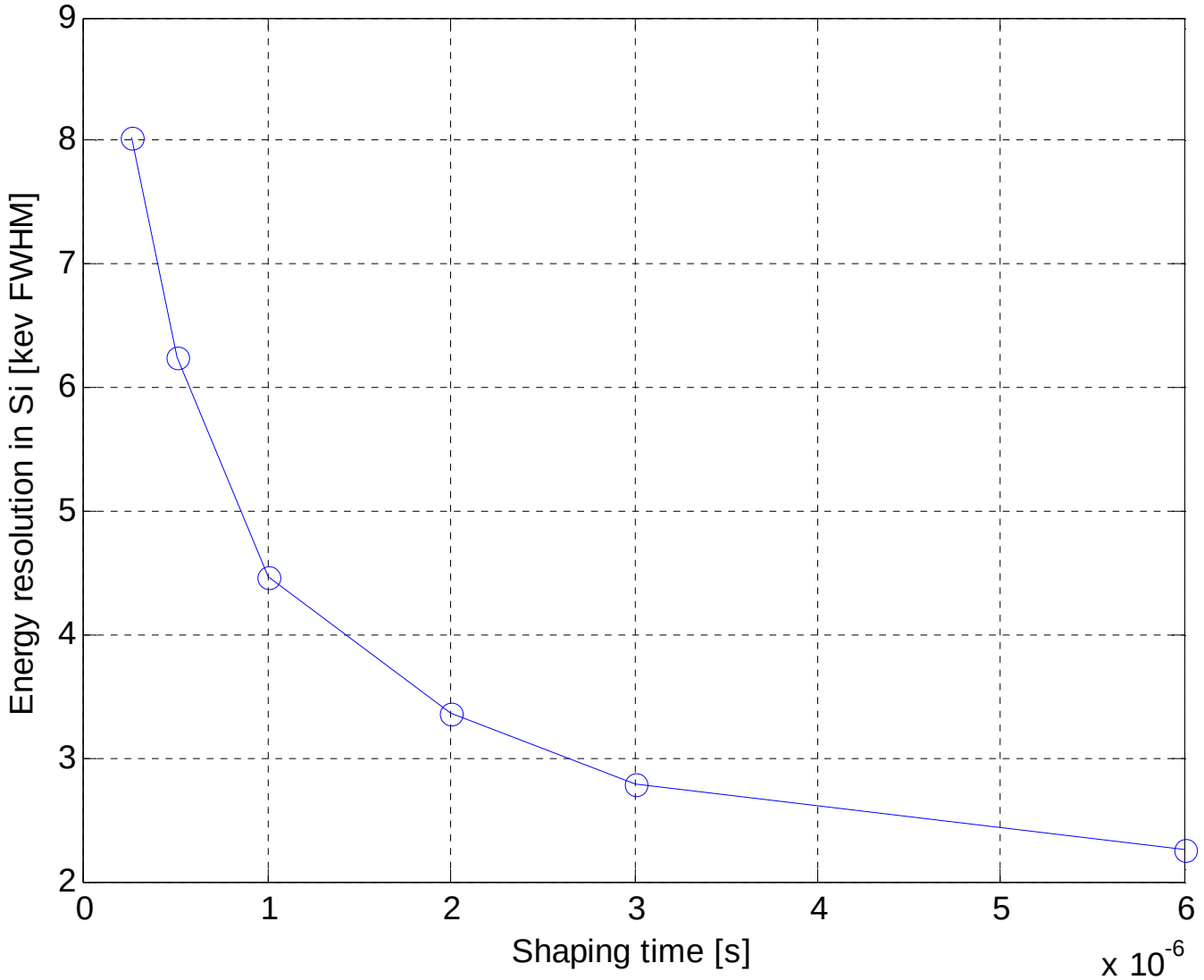
Fano factor estimation in Single Crystals Diamond Detectors

Target goal of Charge Sensitive PreAmplifier

- Rise time < 1 ns (BW > 300 Mhz)
- Noise < 150 e^- rms @ 5 pF det. cap (+ stray cap)
  (eq. to 1.4 kev FWHM in Si, @ 8 us semi-gaussian shaping time)
- Linearity better than one over one thousand
- Large dynamic range (800 Mev in Si @ 4.7 pF f.b. cap)
- Power consumption < 500 mW
- Reliable, small sized and low cost

Fano factor estimation in S.C.D.D.

- Set up of very low noise CSA for energy measurements
  (noise less than 20 e^- rms @ 6 us semi-gaussian shaping time)
- Detector / alpha particles hole collimator set-up
  (in order to minimize energy loss and energy loss spread among different paths)
- High voltage filtering to minimize disturbance
  (large enough to provide almost full charge collection inside SCDD)
- Energy measurements with standard alpha particles
  (in vacuum, with controlled temperature and low count rate)
- Estimation of all residual contribution to energy measurement degradation
  (electronic noise from CSPA, energy spread within alpha particles paths, incomplete charge collection, etc.)
- Fano factor estimation (still technology dependent!!)


Energy resolution in Si [kev FWHM]
9
8
7
6
5
4
3
2
0
1
2
3
4
5
6
Shaping time [s]
x 10^-6