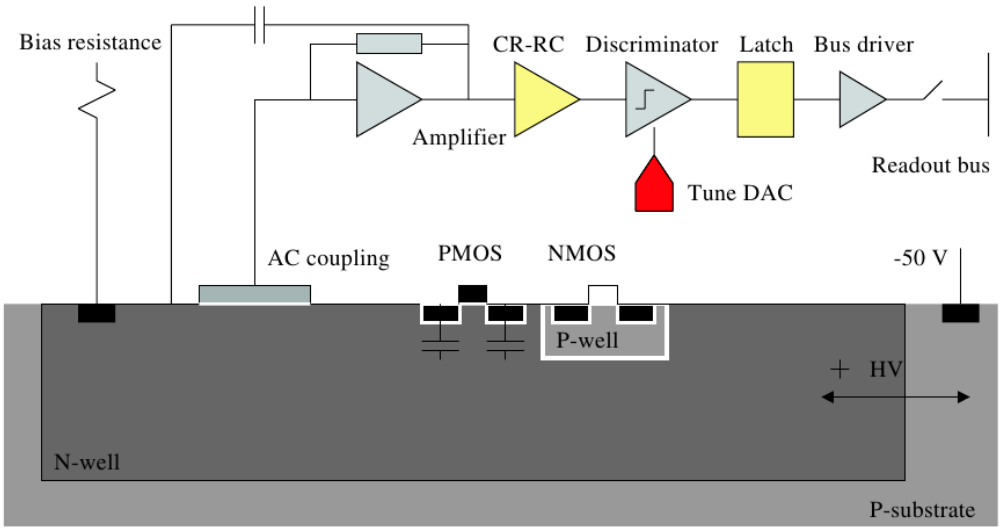
First Measurements with HV-MAP Sensor

Tobias Weber

Helmholtz Institut Mainz

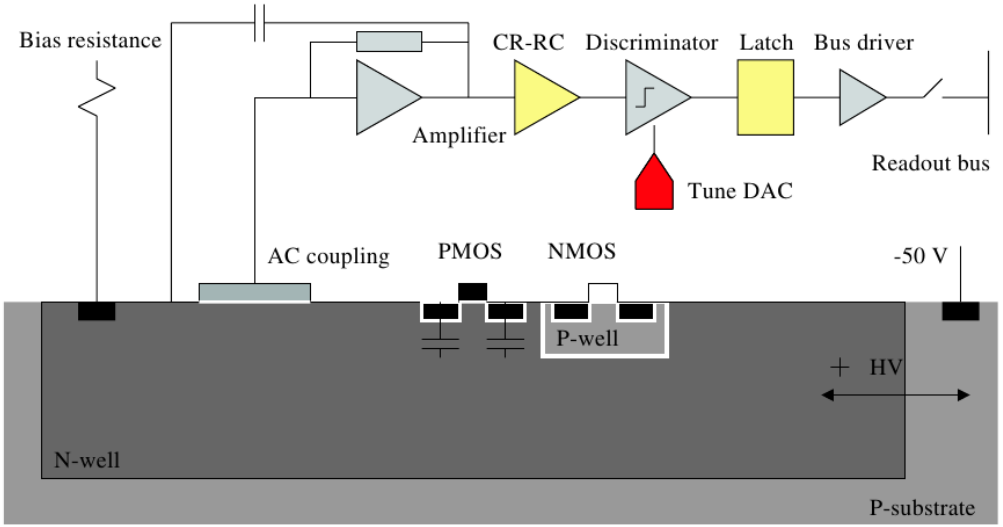
PANDA Collaboration Meeting
10.12.12

HV-MAPS



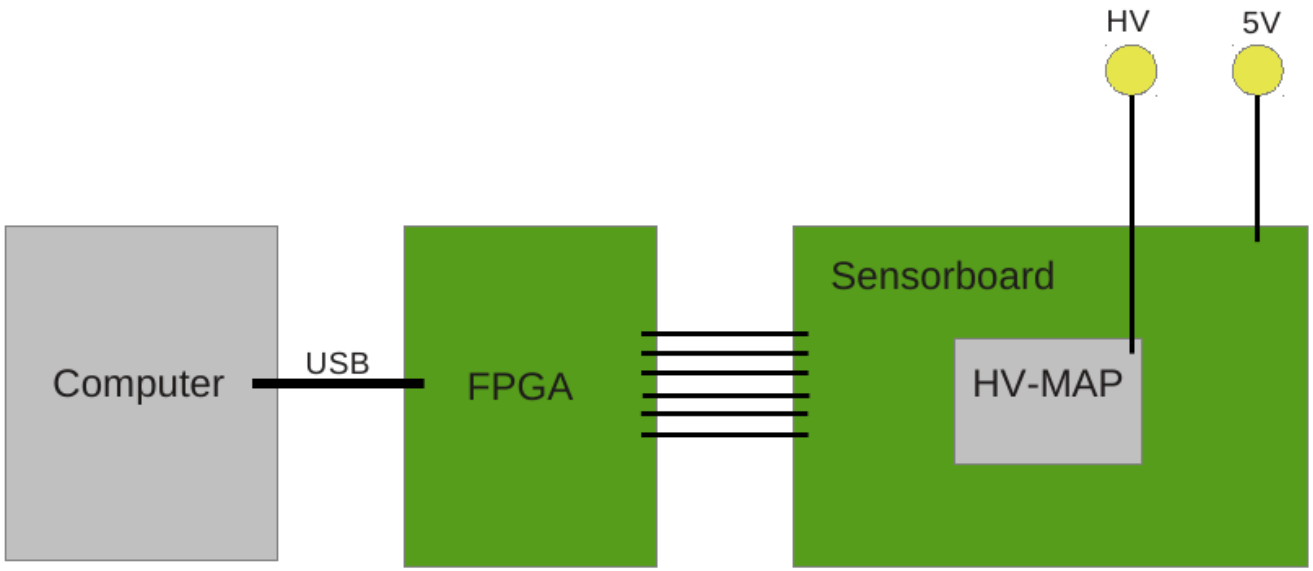
- fast charge collection
- high radiation tolerance
- thickness of 50 µm
- low power consumption ($\approx$ 20 µW/pixel)

HV-MAPS



- Time-over-Threshold
- self-triggering
- 10-20 MHz readout

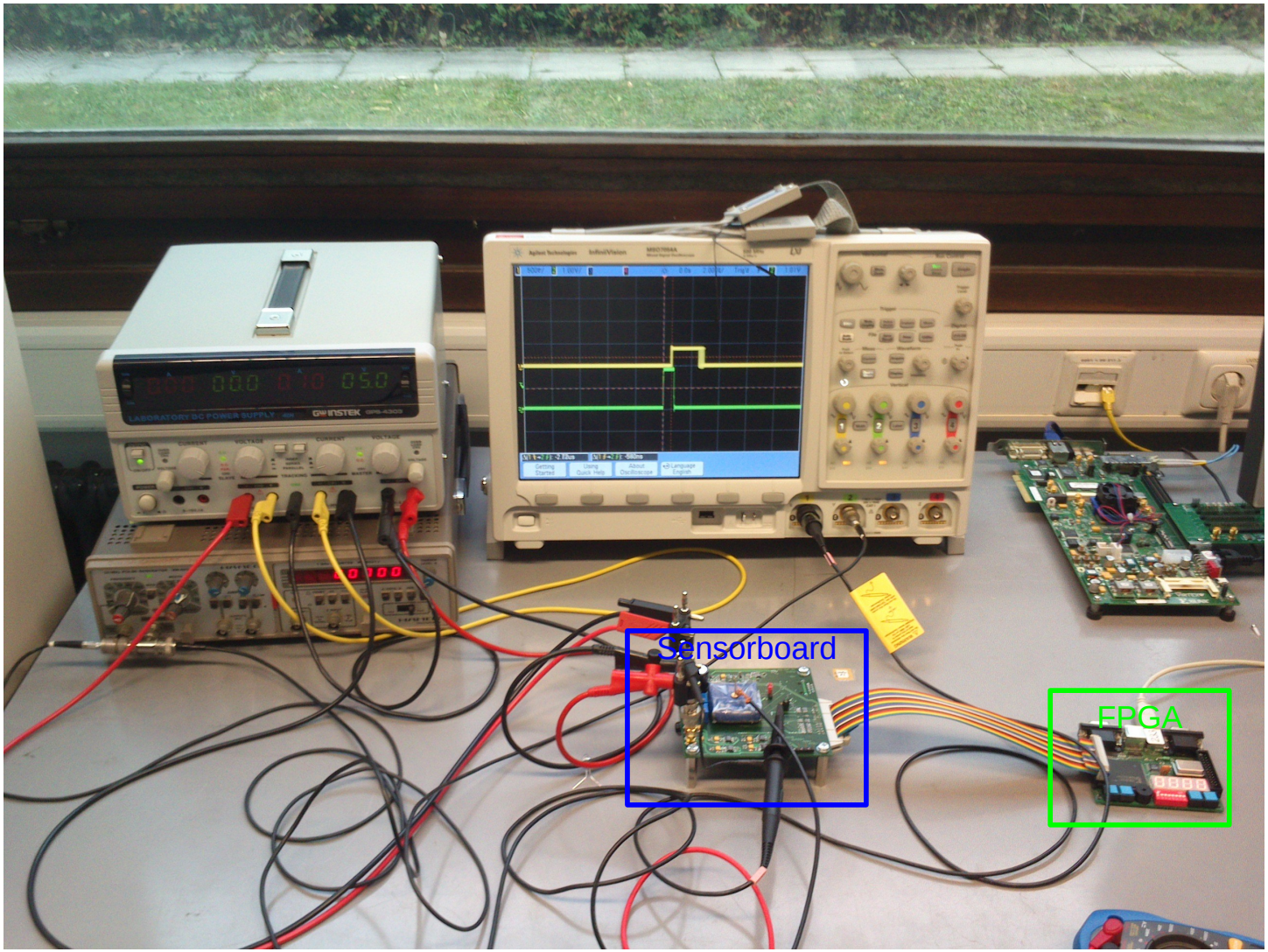
Tests in Mainz



MuPix2 Test Chip

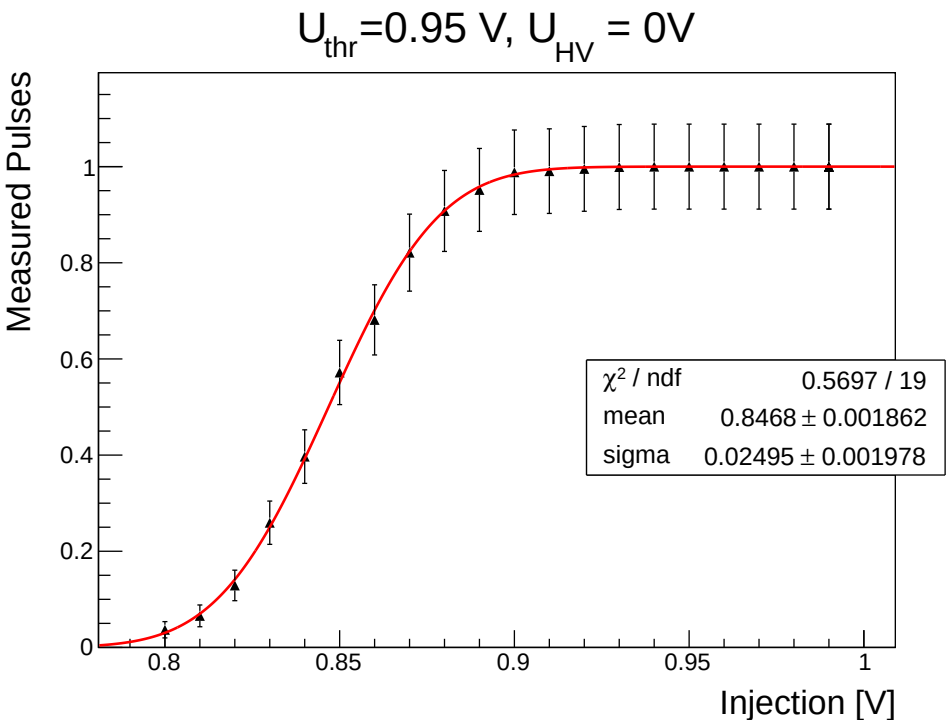
- 180 nm technology
- 42 x 36 pixels with 27 x 40 μm^2
- pixel logic on FPGA (Spartan 2)

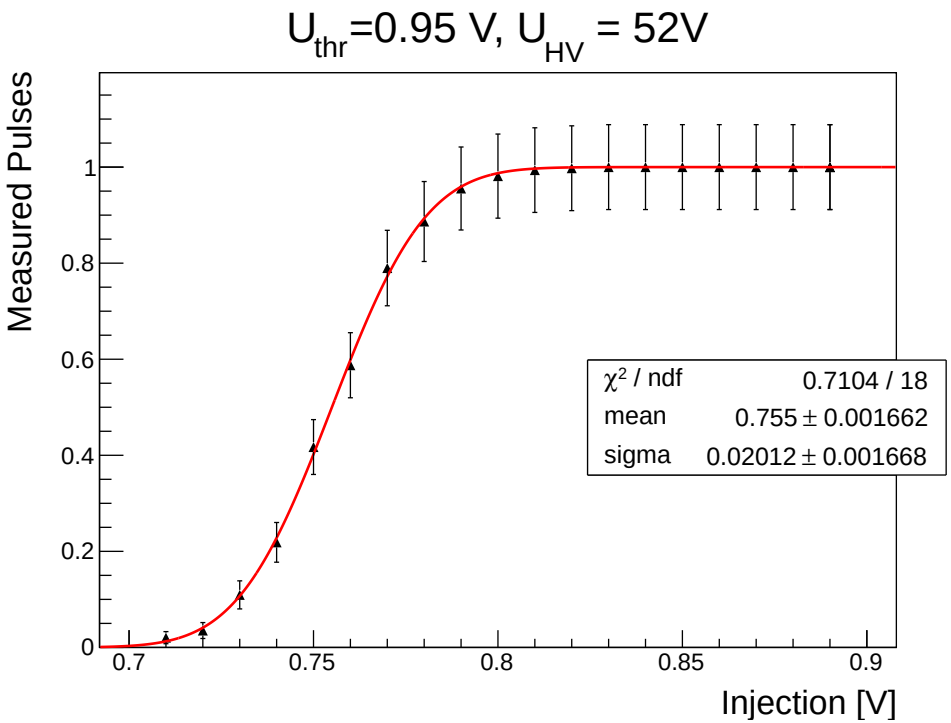
Tests in Mainz



Pixel Noise

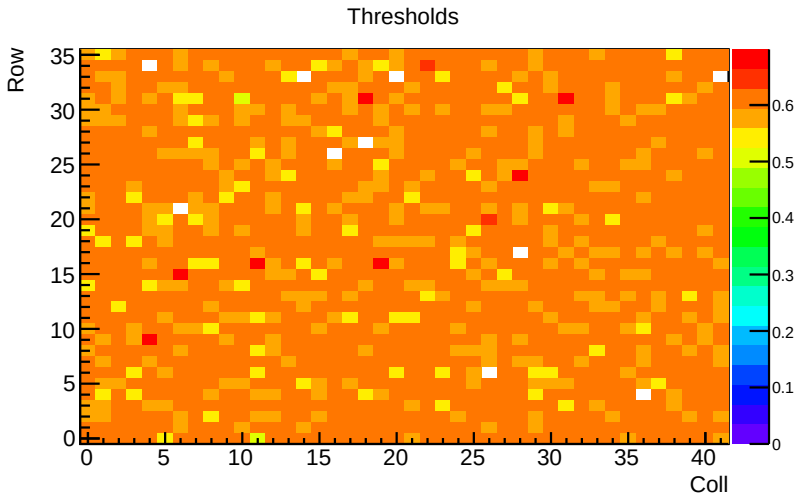
- inject sequence of test pulses
- count detected pulses

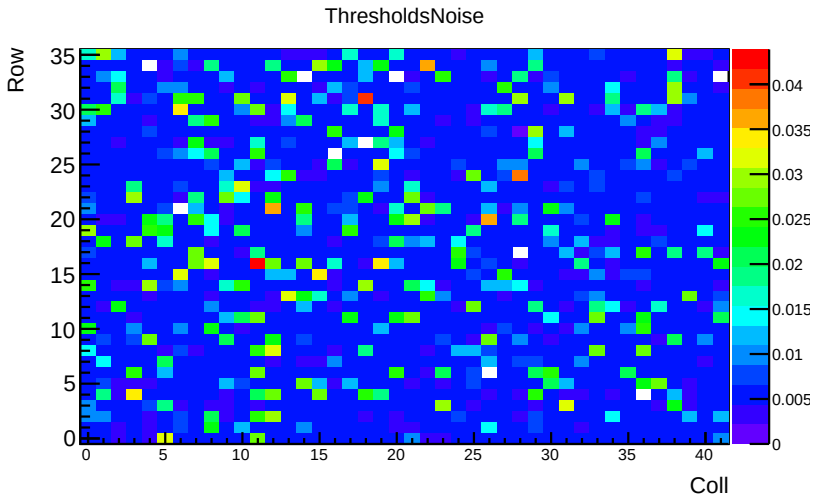


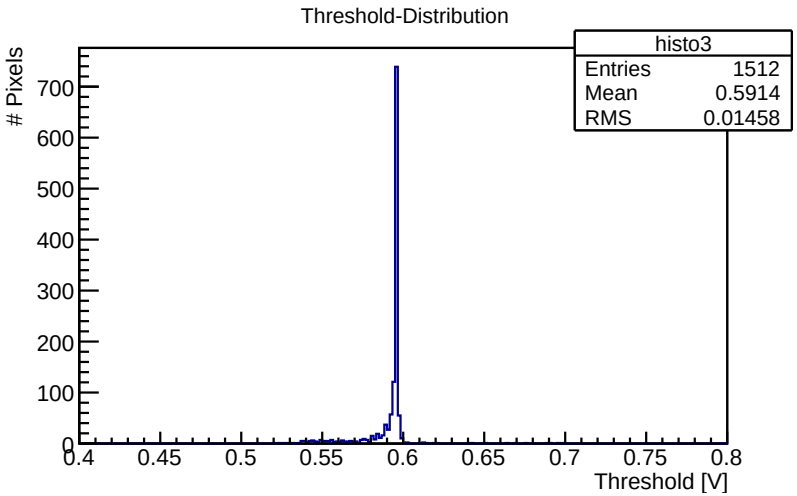


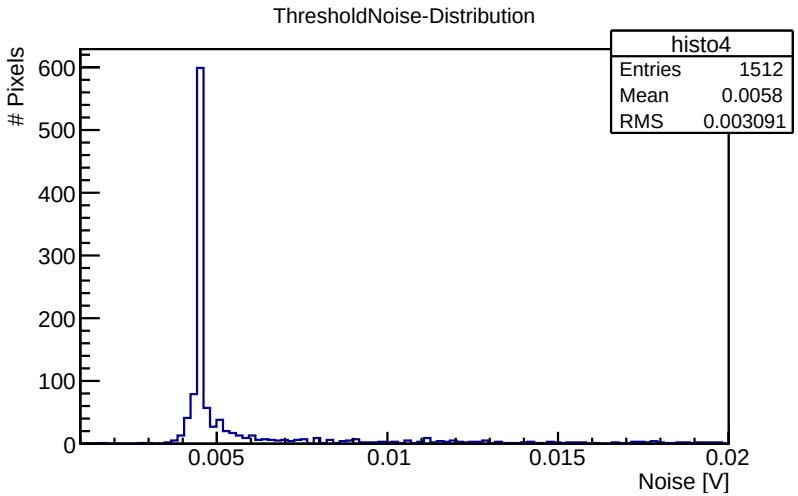
- reduction of pixel noise and threshold with high voltage
- $(S/N)_{HV} \approx 38$

Pixel Noise

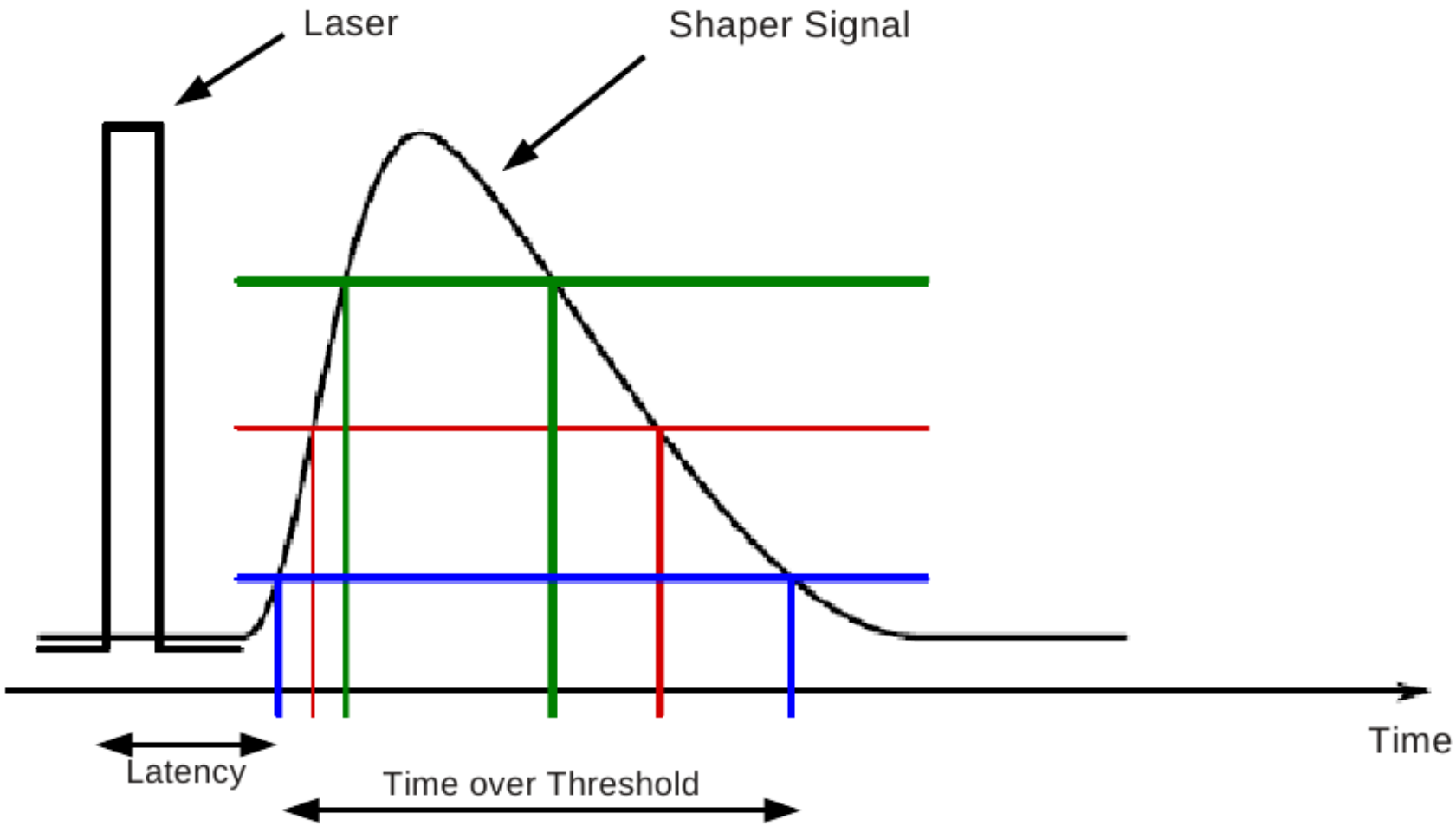

Thresholds
Row
Coll


ThresholdsNoise
Row
Coll

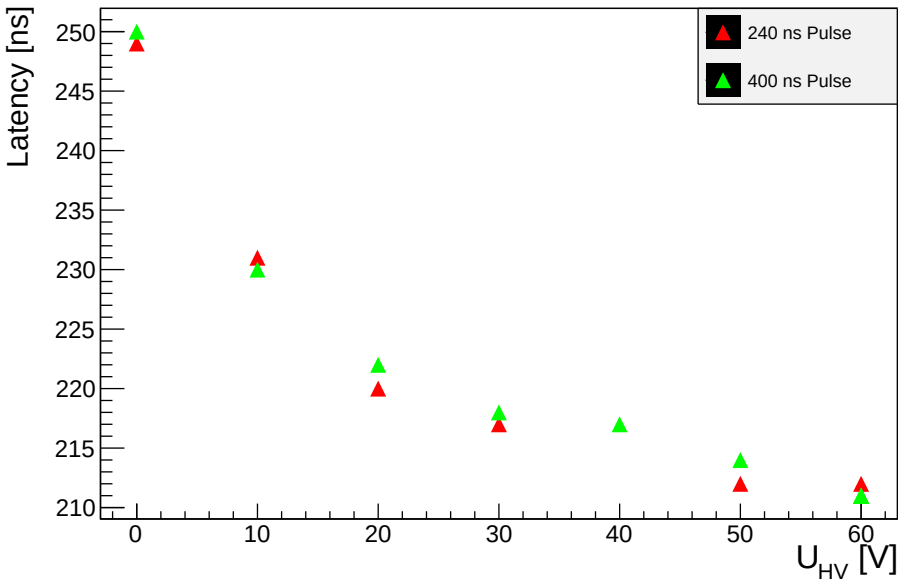

Threshold-Distribution
histo3
Entries 1512
Mean 0.5914
RMS 0.01458
Pixels
Threshold [V]

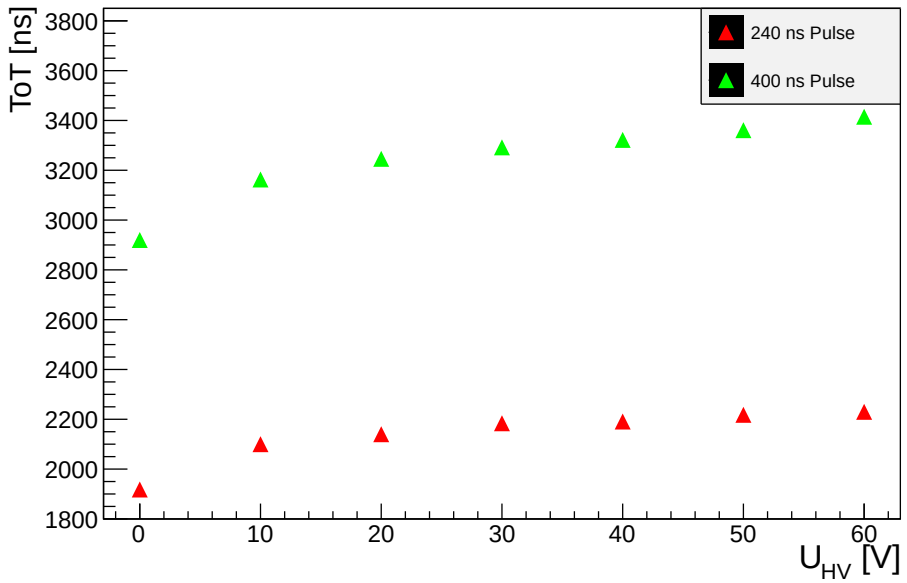

ThresholdNoise-Distribution
histo4
Entries 1512
Mean 0.0058
RMS 0.003091
Pixels
Noise [V]

Latency and ToT Measurement



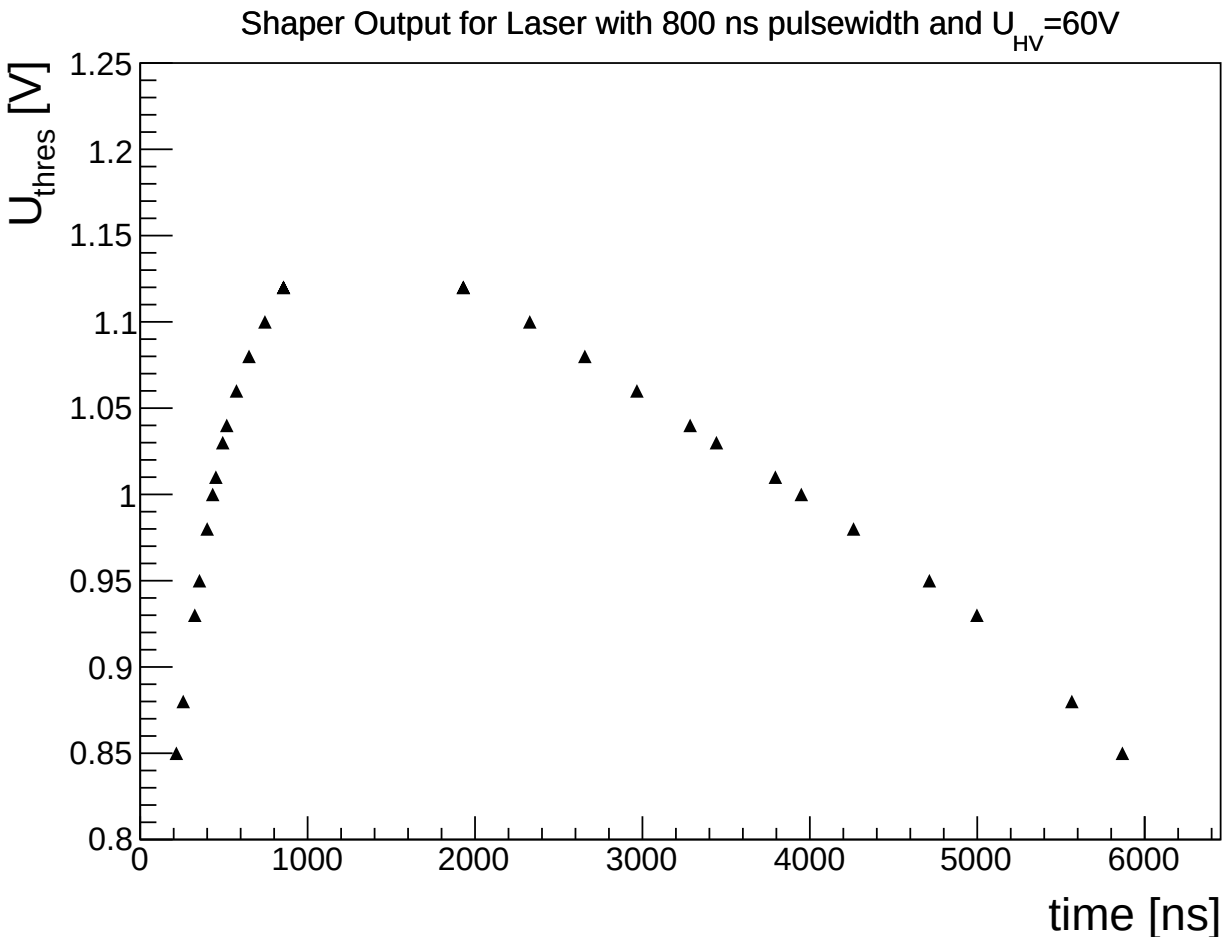
Latency and ToT Measurement





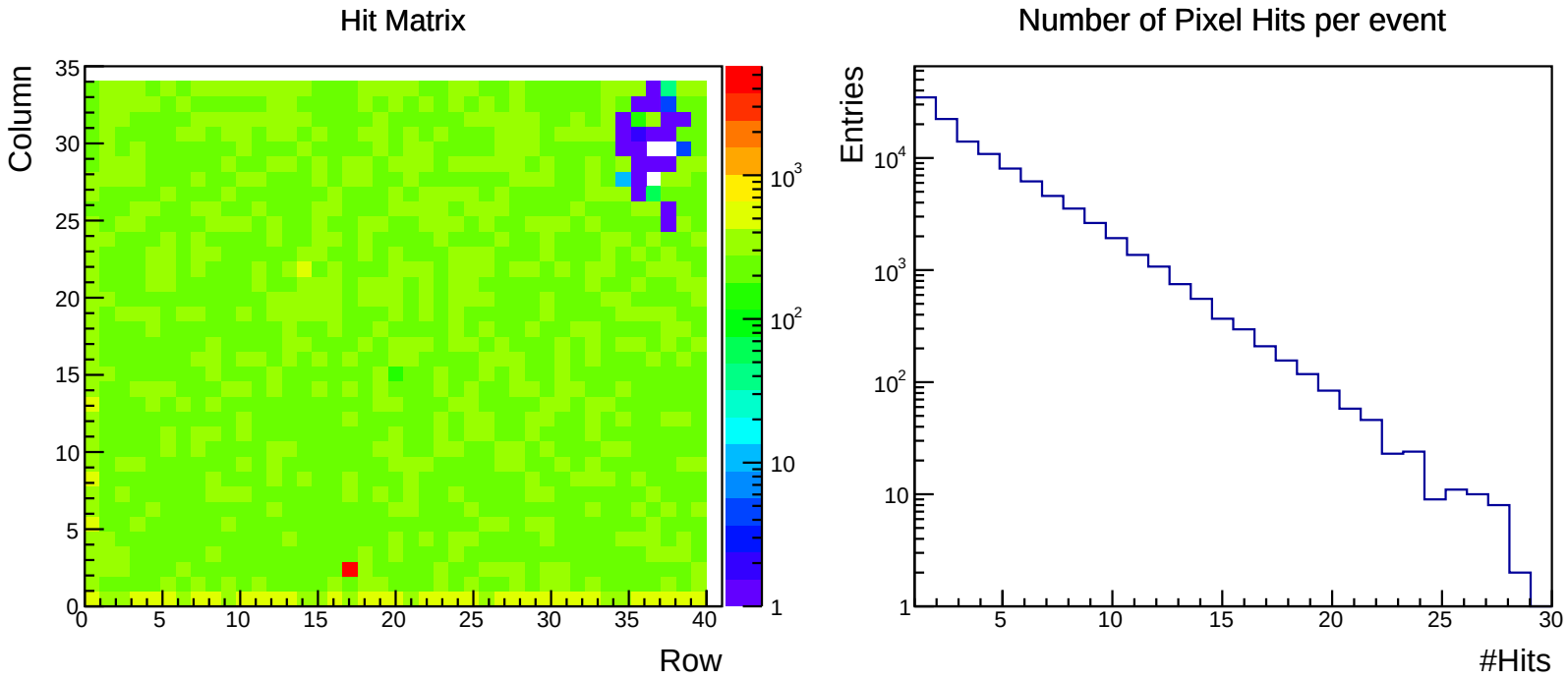
- latency decreases with growing high voltage
- Time-over-threshold increases with high voltage
- both effects most prominent between 0 and 20 V

Shaper Signal with Laser Diode



- shaper signal typical for CR-RC
- shaping time of 6 µs

Measurements with ^{90}Sr (different Sensor)



- pixel close to readout logic more active
- up to 30 pixel hits per readout frame

Outlook

- further measurements with MuPix2
  - pixel noise
  - double pulse resolution
  - temperature behavior
- new version of HV-MAP (MuPix3) end of November
  - 80 x 80 μm^2 pixel size
  - faster shaping time ($\approx$ 1 µs)
  - pixel and column logic
    $\Rightarrow$ new readout board (January 2013)
- readout of MuPix3 with optical link