# Characterization of a new Photon counting Detector with XRF (X-ray fluorecense)

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Outline

➢ Dosepix: General overview of Detector

➢ Dosepix: Comparison of Calibration Methods

➢ Dosepix: Measuring Xray Spectra
   (preliminary results)

Dosepix: General Overview

- ➢ Hybrid Pixel Detector
- ➢ Single Photon Counting Detector : Time-over-Threshold Method
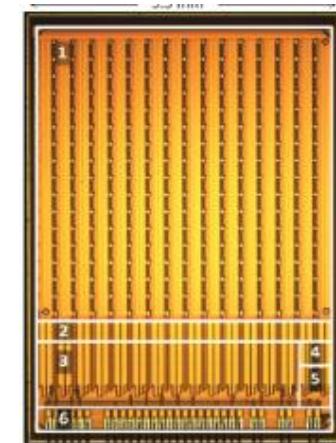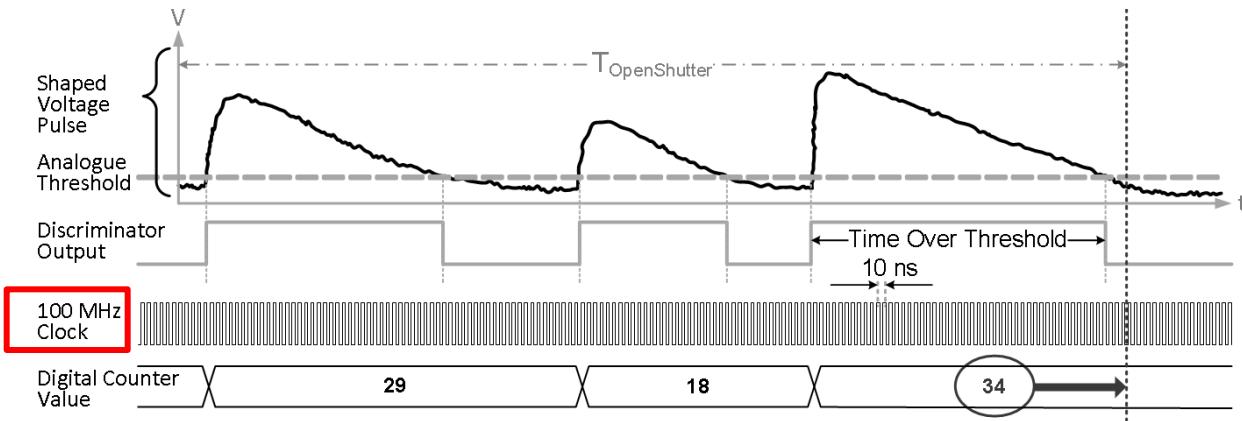
Dosepix: General Overview

➢ kVp Mode (counting)

➢ Dosi Mode
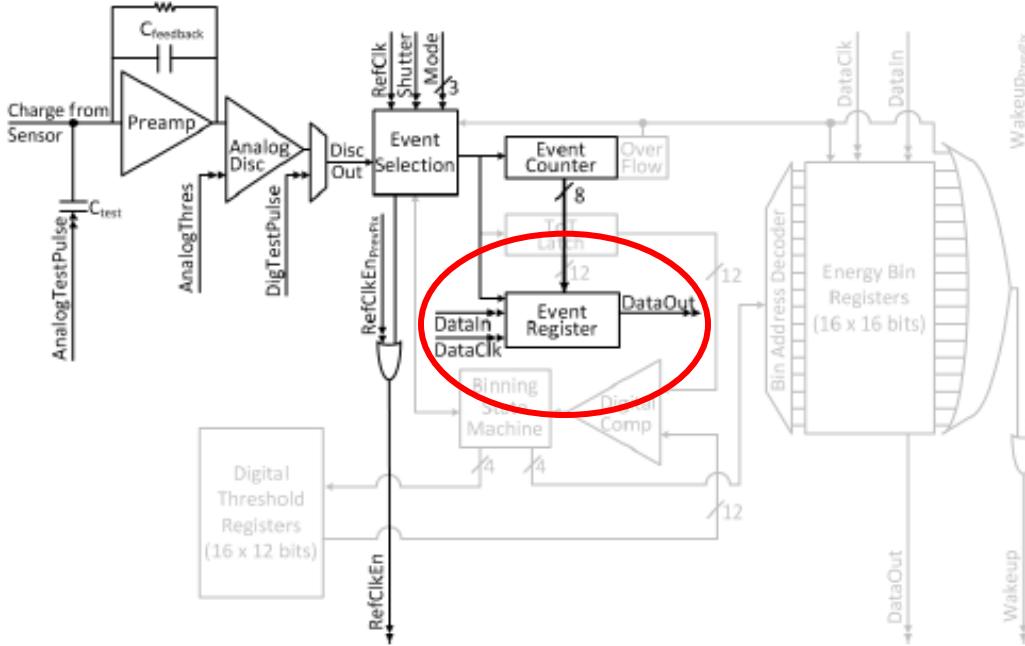
Dosepix: General Overview

- ➤ kVp Mode
- ➤ Dosi Mode

(assessing energy)
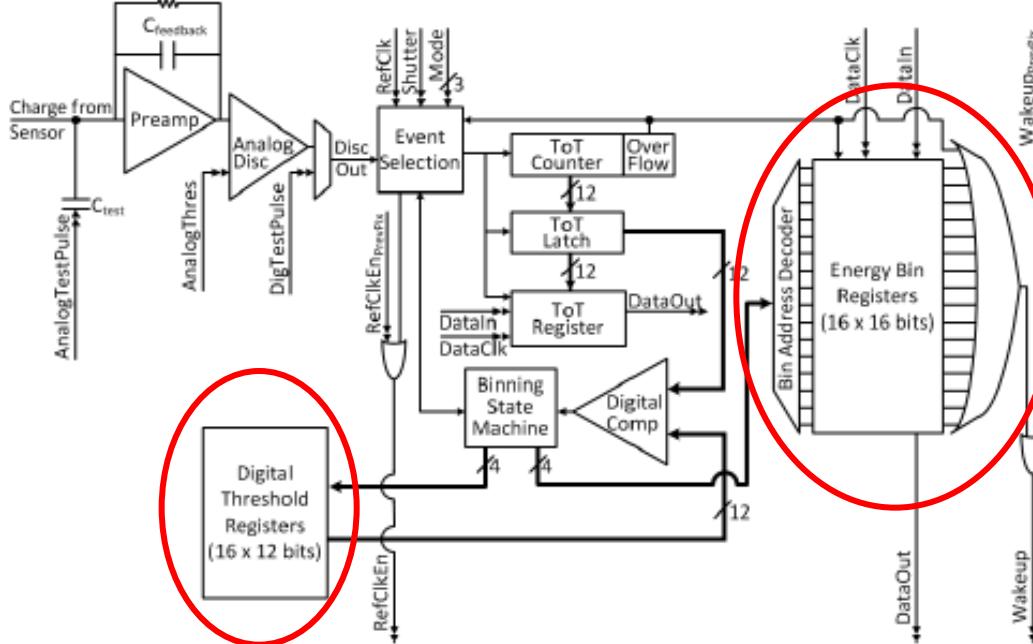
Calibration Methods I: Analog Test Pulse method

➢ This is a Pixel Wise Calibration

➢ Analog Test-Pulse

The ToT value for each Test Pulse is recorded

Calibration Methods I: Analog Test Pulse method

> ➢ Pixel Wise Calibration
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The ToT value for each Test Pulse is recorded

Calibration Methods I: Analog Test Pulse method

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 - ➢ Pixel Wise Calibration
  - ➢ Analog Test-Pulse

An. Test Pulse Scan
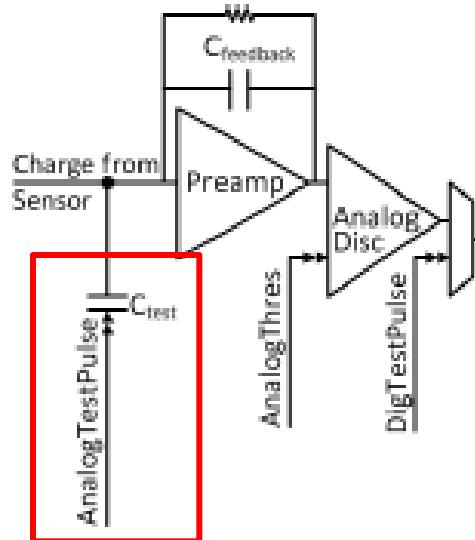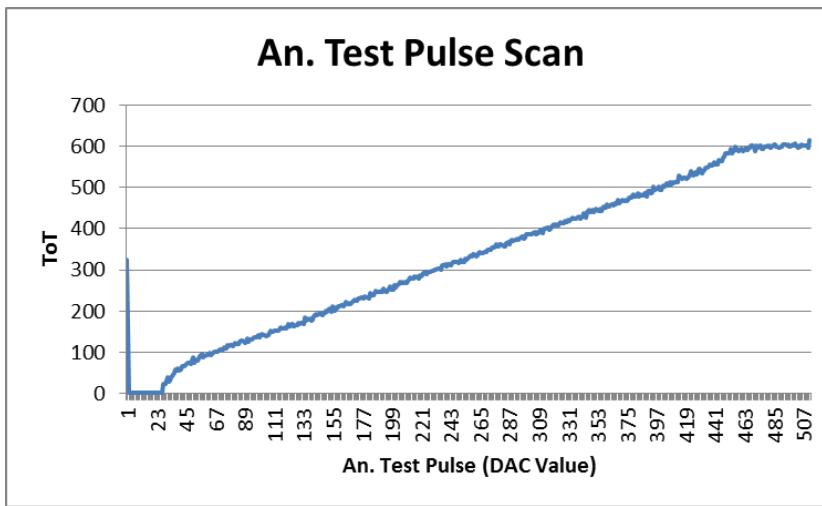
Prague Formula:

$$f(x) = a + b * x + \frac{c}{(x-t)}$$

Outcome:

Internal Calibration

Range of work of the detector

➤ XRF Calibrations

> ➤ XRF Lines

*Response of **one pixel** at different fluorescence lines*
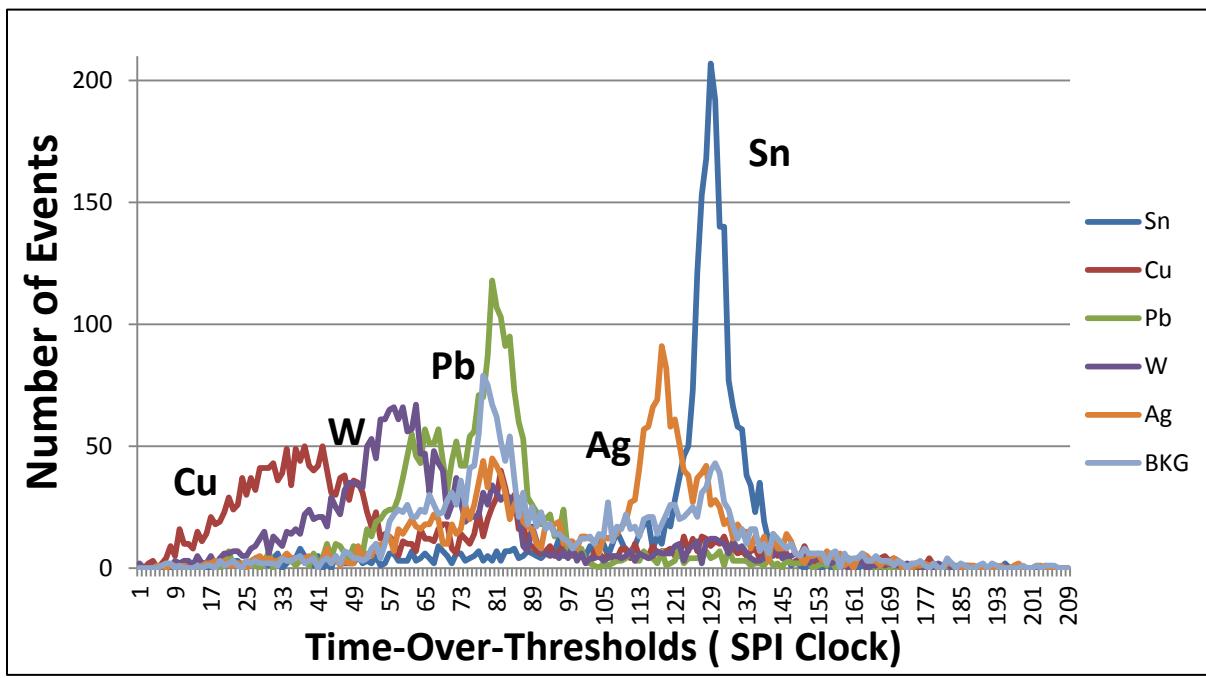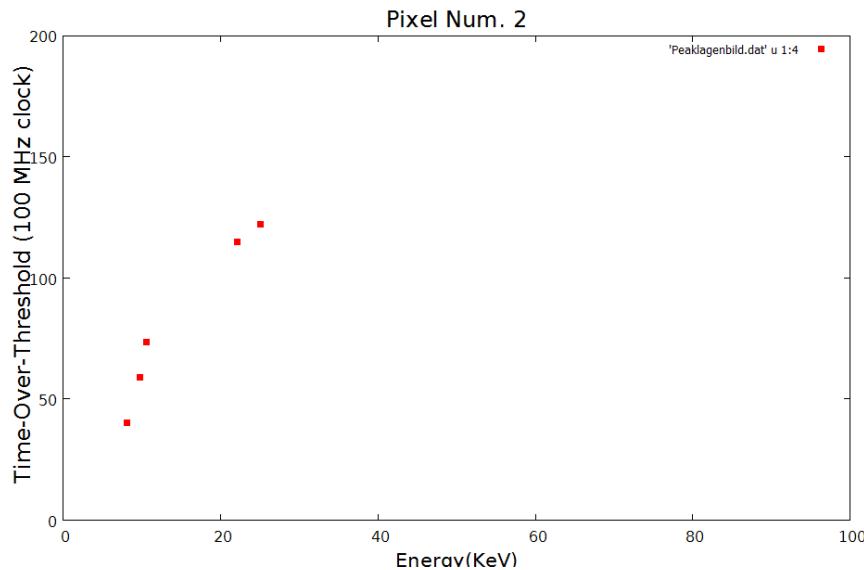
➢ Interpolation and Fitting of the response of **one pixel**

Material	Energy (KeV)
Pb	11.41
Ag	22.10
Sn	25.07
Cu	8.06
W	9.67

➢ Interpolation and Fitting of the response of **one chip** (256 pixels)
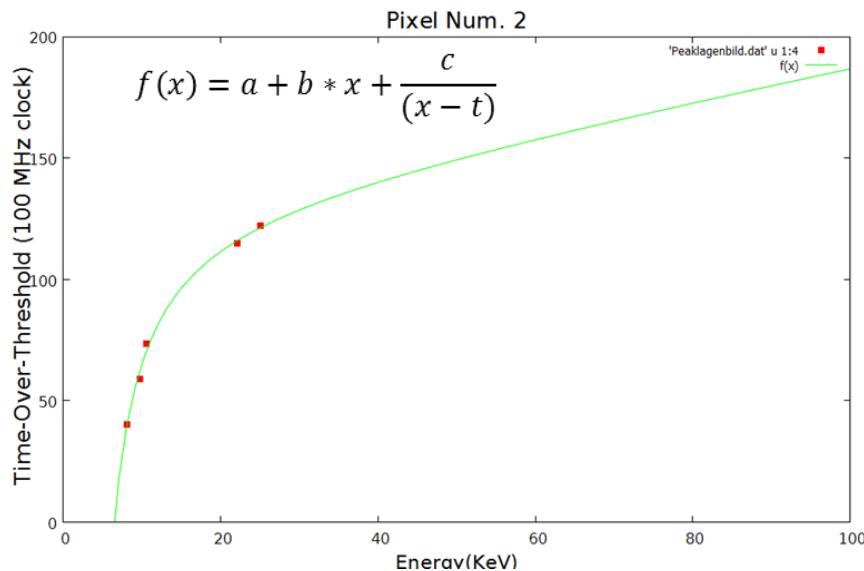
Pixel Num. 2

$$f(x) = a + b * x + \frac{c}{(x - t)}$$

Material	Energy (KeV)
Pb	11.41
Ag	22.10
Sn	25.07
Cu	8.06
W	9.67
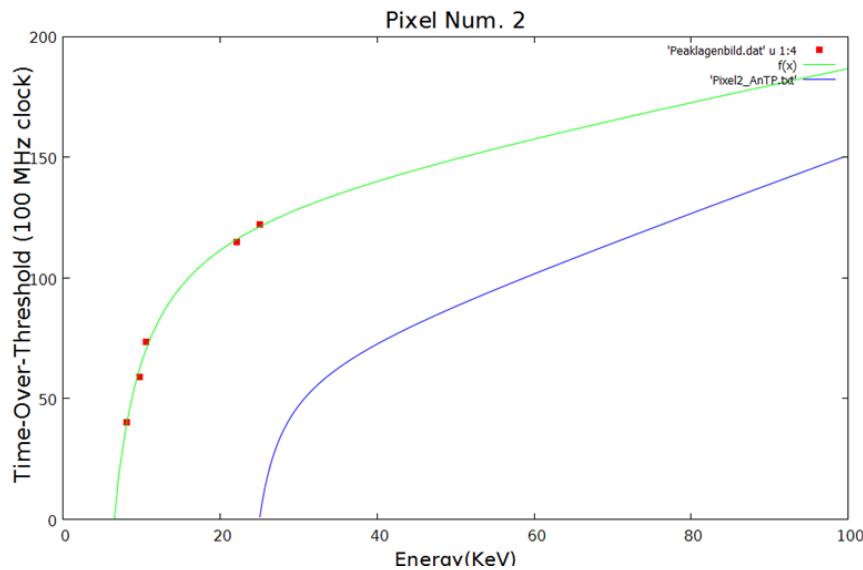
Energy Calibration

Analog Test Pulse Calibration

Pixel Num. 2

$y = 2.8568x + 6.7484$
$R^2 = 0.9963$
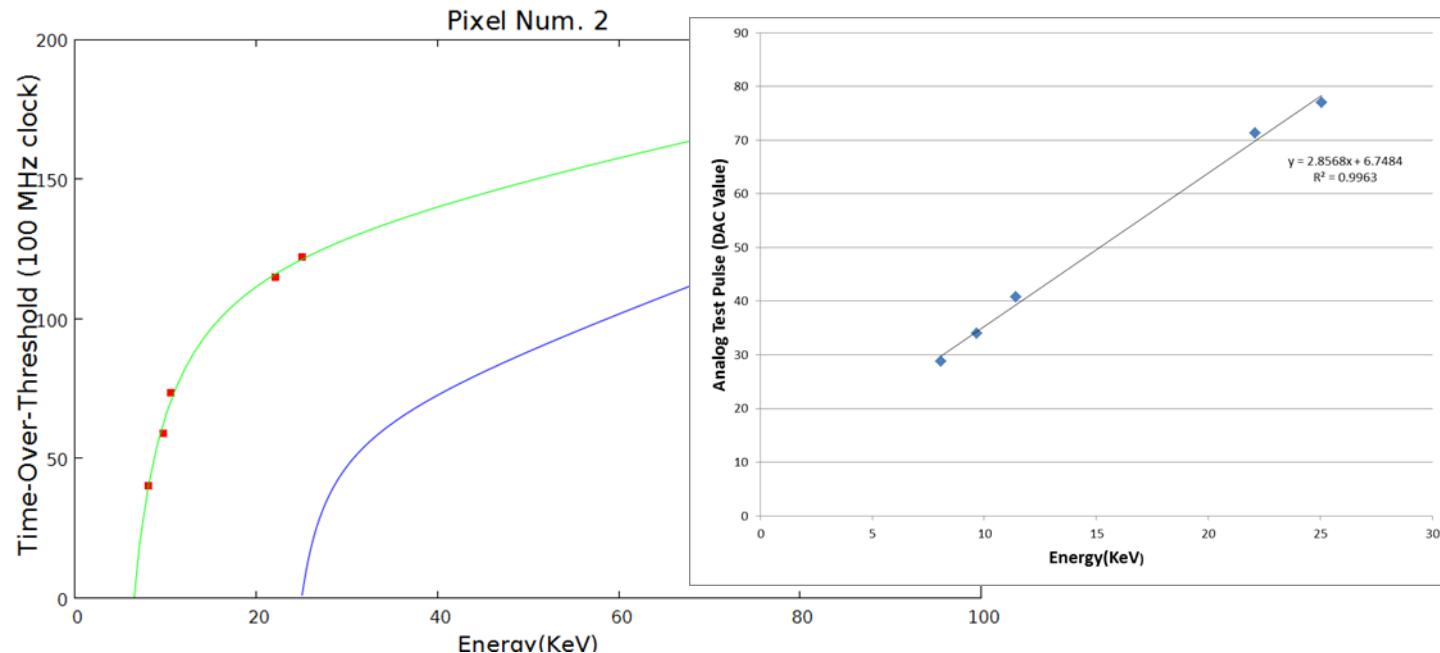
Xray Spectra: Preliminary results

Energy Calibrated
Spectra at Xray device

➢ Overlapping Method for
Energy Binning

Pixel 1
Pixel 2

Histo Big Pixels
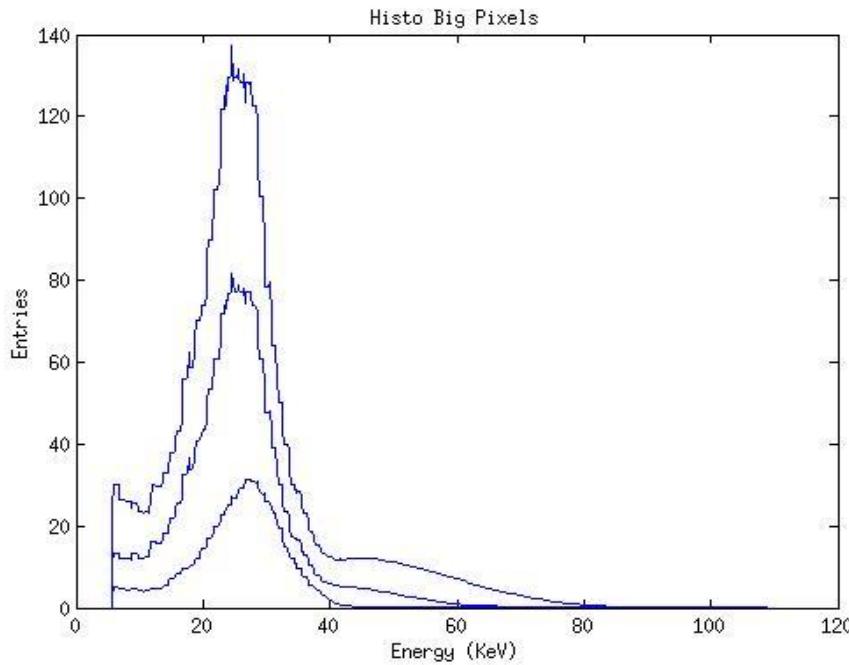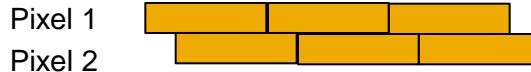
Conclusion

Detector Characterization:

➢ Thr: 20-30 An TP → 5-7 KeV

➢ Second order proportionality between An. Test Pulse and Energy

➢ Energy Resolution: expected to be better than 1 kV, however preliminary results not conclusive

Future Work

➢ Clinical Application

Collaborators and partners

I.Ritter[2], F. Tennert[2], T. Gabor[2,5], M. Campbell[3], W.S. Wong[3], S. Wölfel[1], G.Anton[2], N.Michel[4] and T. Michel[2]

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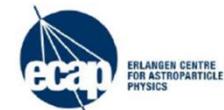
Thank you fo your attention