Introductory presentation

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I E A P

ERLANGEN CENTRE FOR ASTROPARTICLE PHYSICS

Institute of Experimental and Applied Physics
Czech Technical University in Prague

General information

Benedikt Bergmann
Germany, Pressig
12th February 1987


X-mas Concert (2011)

- Interest and Hobbies
  - Soccer, Beach Soccer, Running, Hiking, ….
  - Music: Trumpet, Keyboard

Bavarian Beach Soccer Champion (2010)



ECAP vs. Theory 4:1 (2012)

Scientific Career

- 2006 German ABITUR

- 2007 – 2010: Studying Bachelor's courses at Friedrich-Alexander University Erlangen
  - "Studies on ambient deep-sea background noise at the ANTARES-site", Erlangen Centre for Astroparticle Physics (ECAP)

- 2010 – 2012: Master's courses at FAU
  - "Application of a time-resolving X-ray pixel detector in the detection of coincident fluorescence emissions after double K-shell vacancy production in the electron capture decay of Fe-55" , ECAP

- Since 2012: PhD student within the ARDENT-framework
  - PhD thesis at ECAP FAU
  - Institute for Experimental and Applied Physics, Czech Technical University in Prague (IEAP CTU)

Double vacancy production in EC of Fe-55

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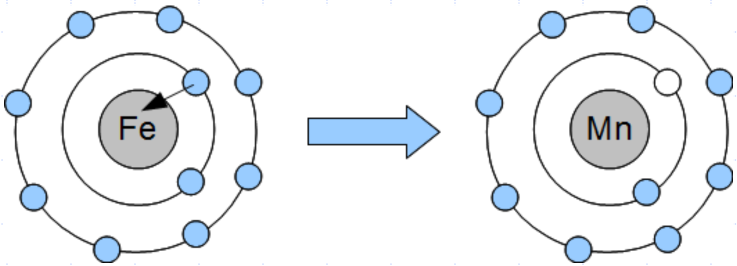
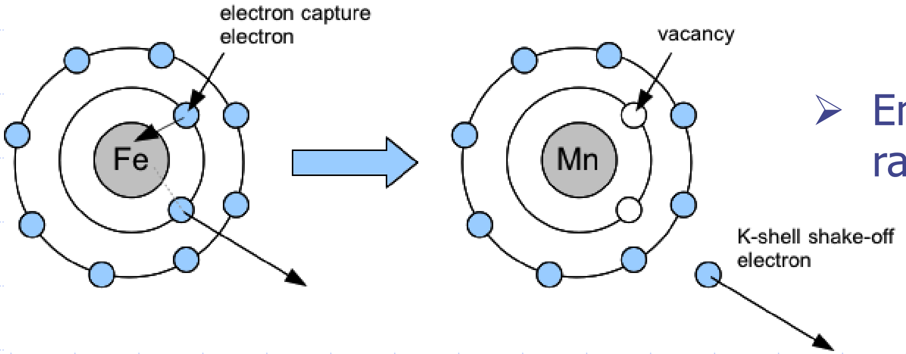
- Usually



  - Emission of 1 K-X-ray

- but, each ~ 10^{-4} th disintegration

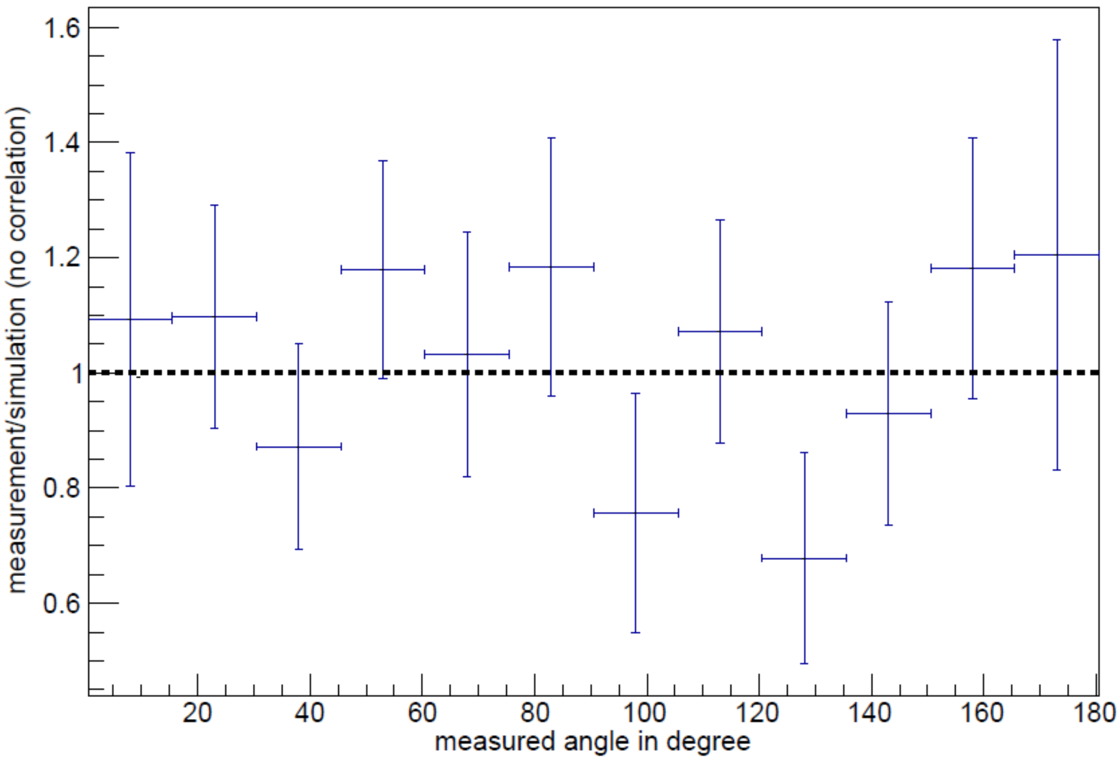


  - Emission of 2 coincident K-X-rays

- Questions:
  - What is the value of P_{KK} (= ratio single to double vacancy production)?
  - Is there an angular dependence between the two X-rays?

Results

- $P_{KK} = (1.40 \pm 0.17_{stat.} \pm 0.05_{syst.}) \cdot 10^{-4}$
- Angular distribution



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ARDENT: Optimization of mixed field data evaluation

- "As an ESR, you will work in the field of complex radiation detection. The aim of the work is development and optimization of data evaluation techniques for one or more Medipix/Timepix pixel detectors (individually and in coincidence mode) in order to distinguish reliably different species of the mixed radiation fields. You will work on Monte Carlo simulations of the detector setup to improve the precision of the data evaluation."
- Evaluate data taken by the MPX-devices already installed in ATLAS detector concerning dosimetric issues, especially neutron dosimetry
- Contribute to the ATLAS upgrate from MPX to TPX during next shut down

ATLAS – MPX positions

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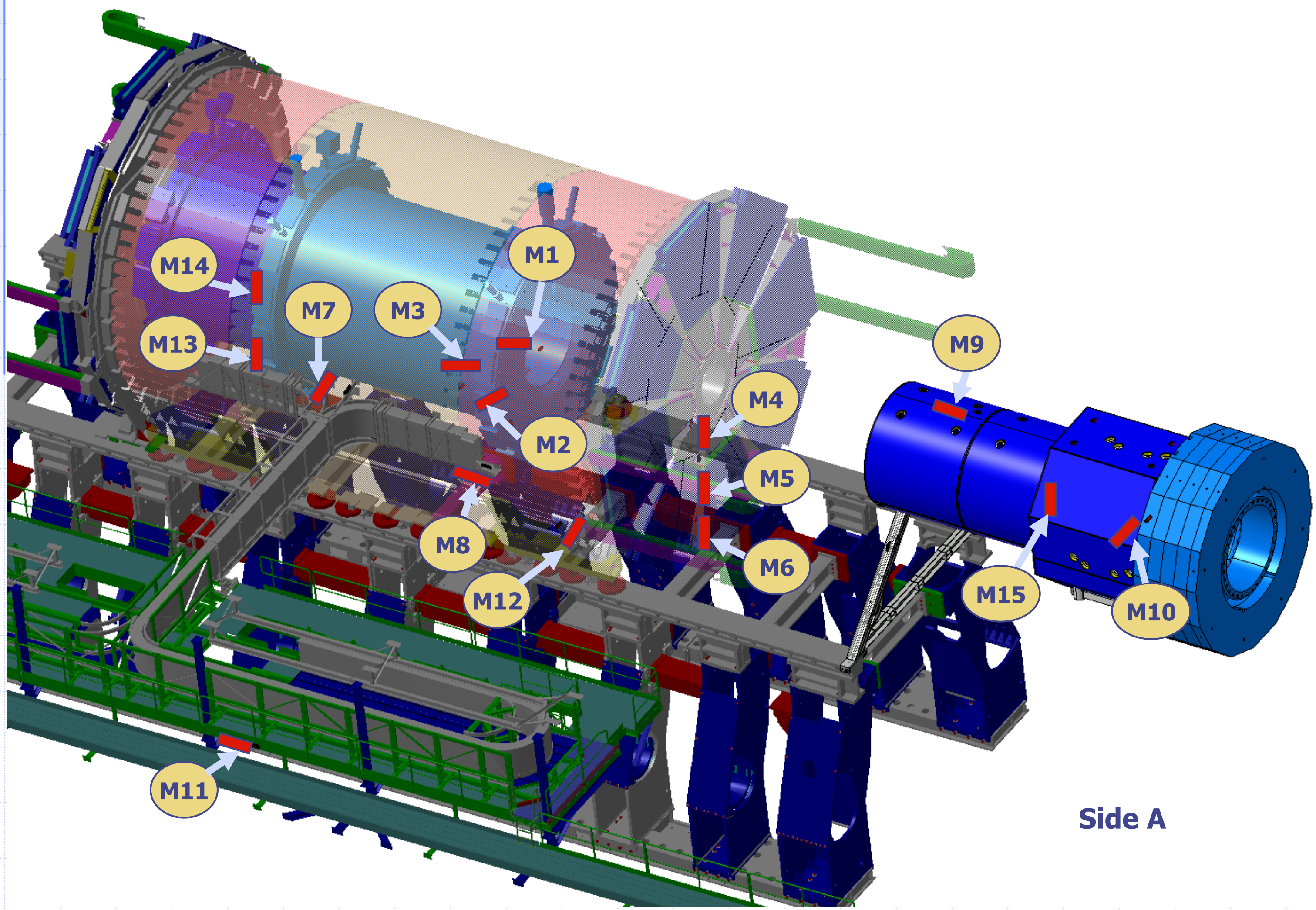

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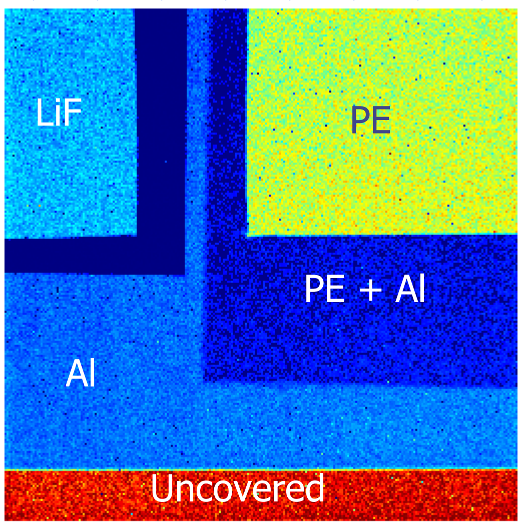
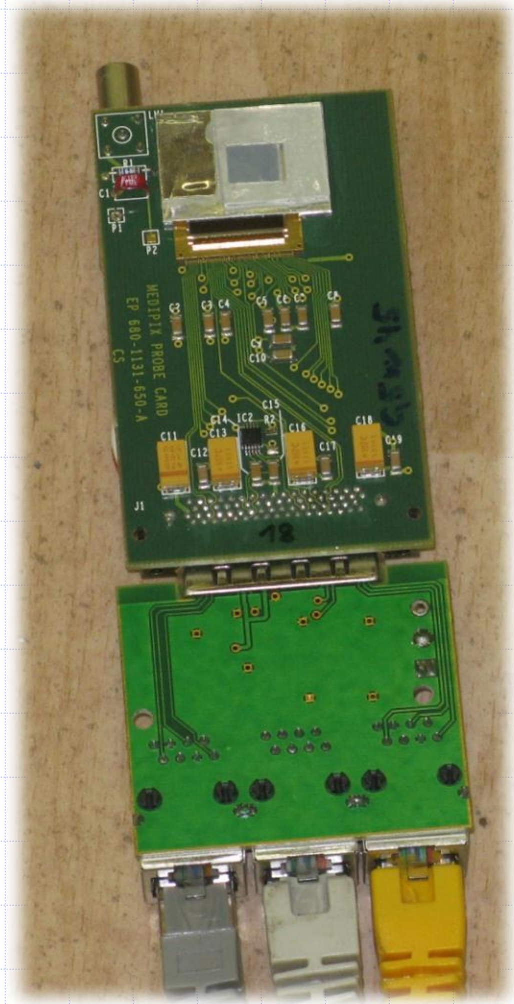
Neutron detection

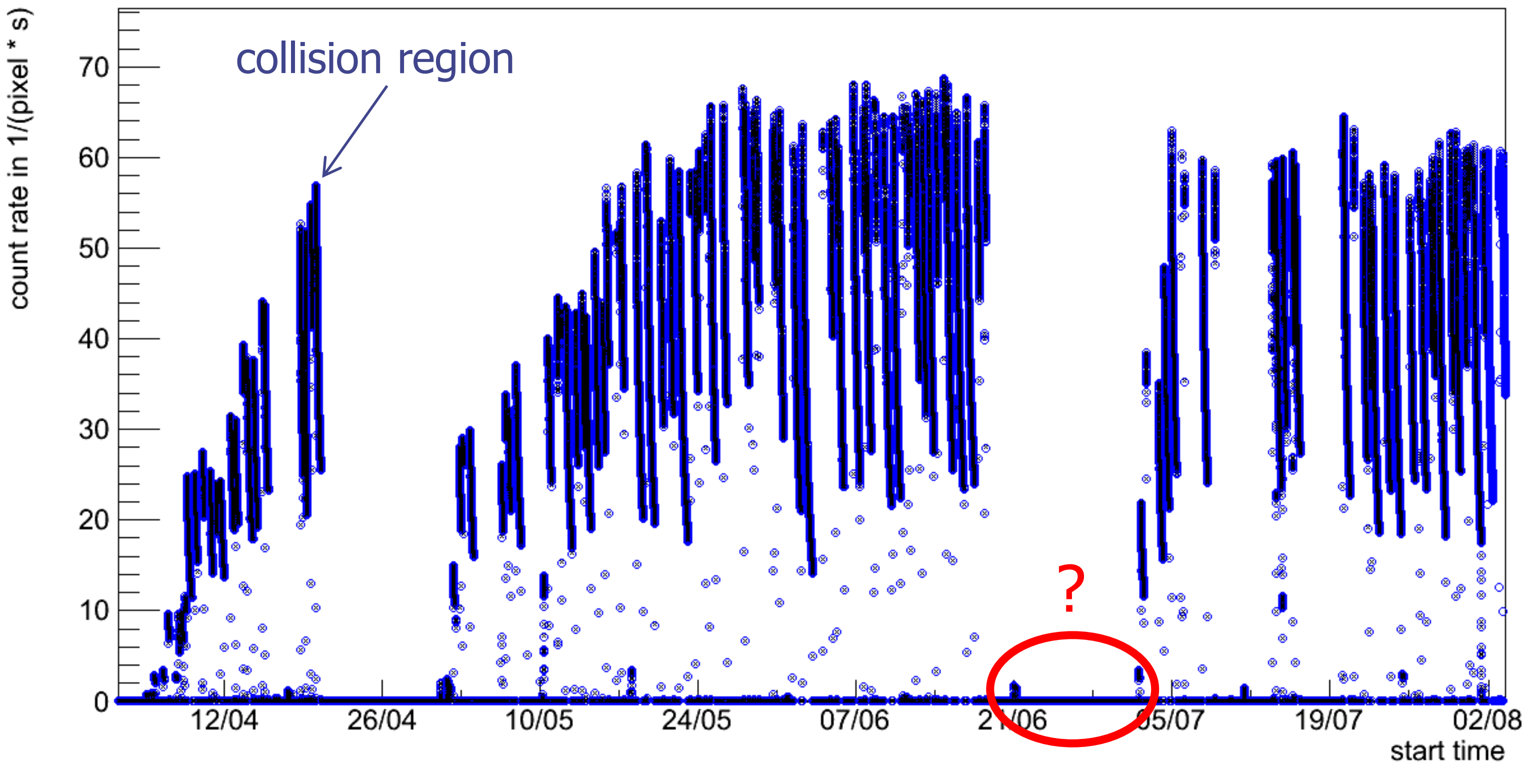
- Medipix 2 ASIC with 300µm Silicon layer
  - 256 x 256 pixel
- Converter foils:
  - $^{6}Li(n,\alpha)^{3}H$ -> thermal neutrons
  - PE: recoiled protons -> fast neutrons





Studies on activation in the ATLAS cavern

- Activation of surrounding material during collisions in the ATLAS detector
  - Luminosity monitoring with MPX devices: Background contribution
  - Dosimetric aspect: What is the time dependency of the equivalent dose rate after the collisions?



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Modelling the decay of activation products (mpx01)

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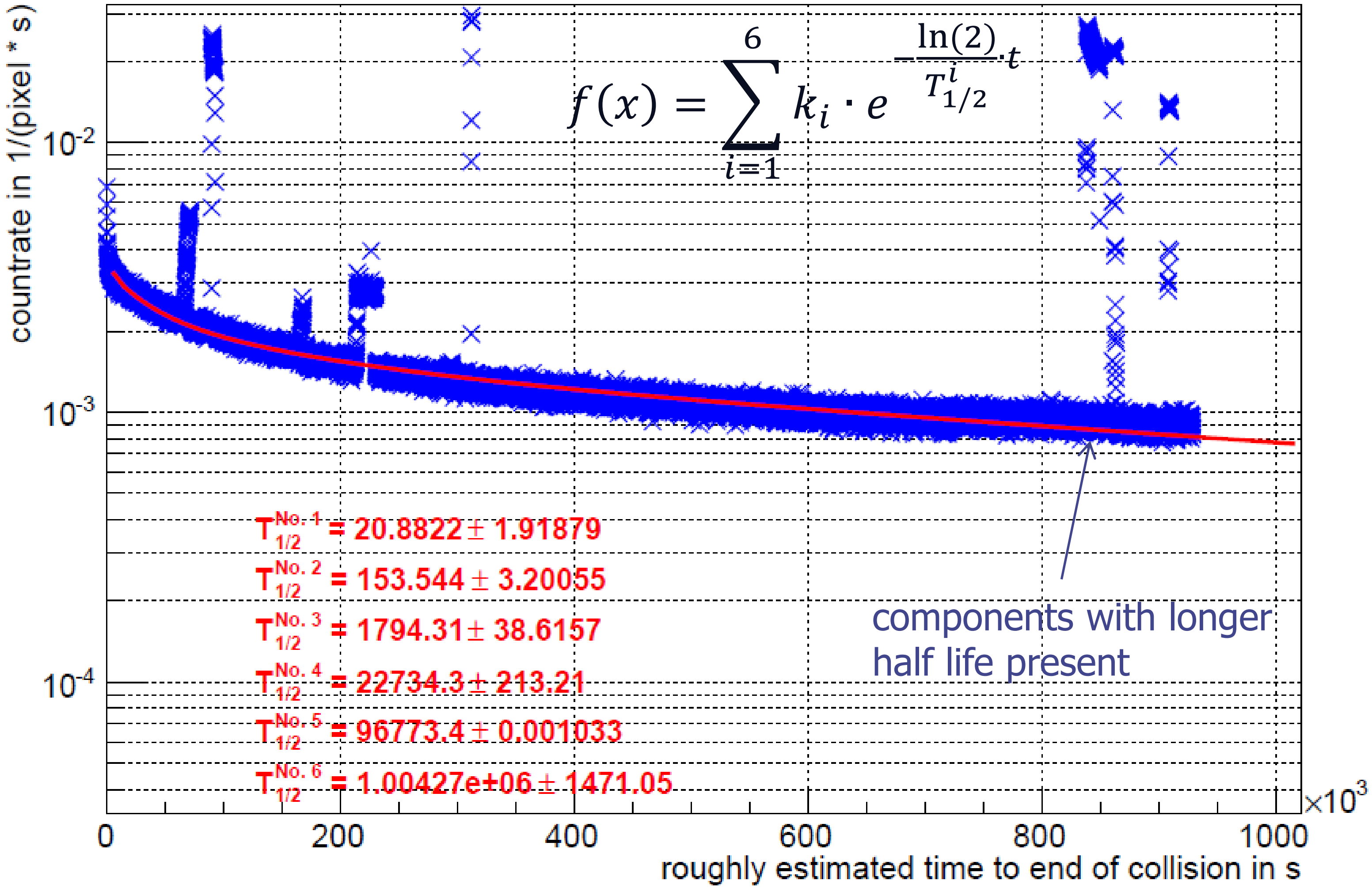

Next steps

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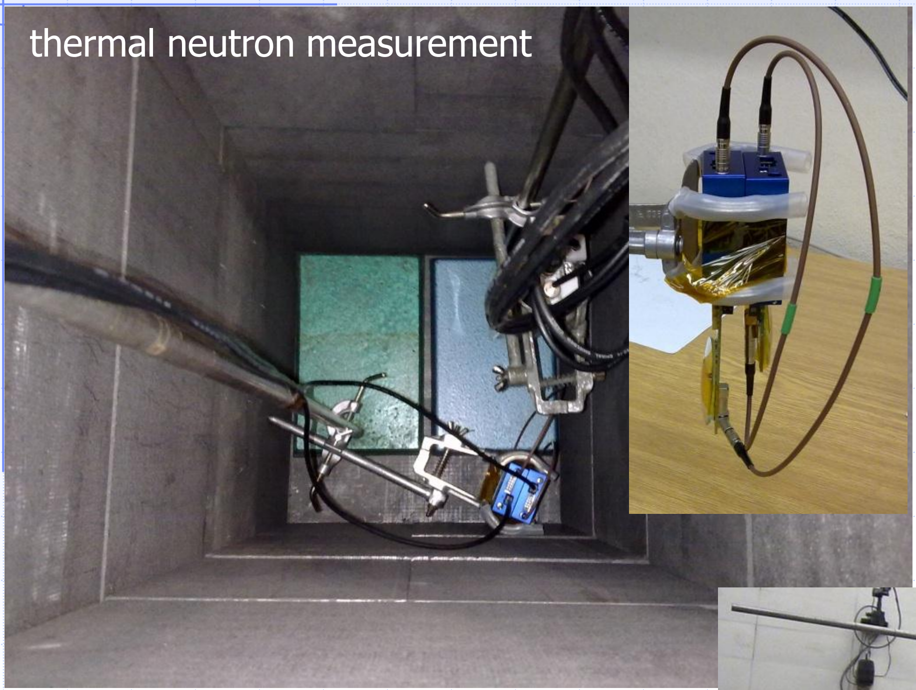
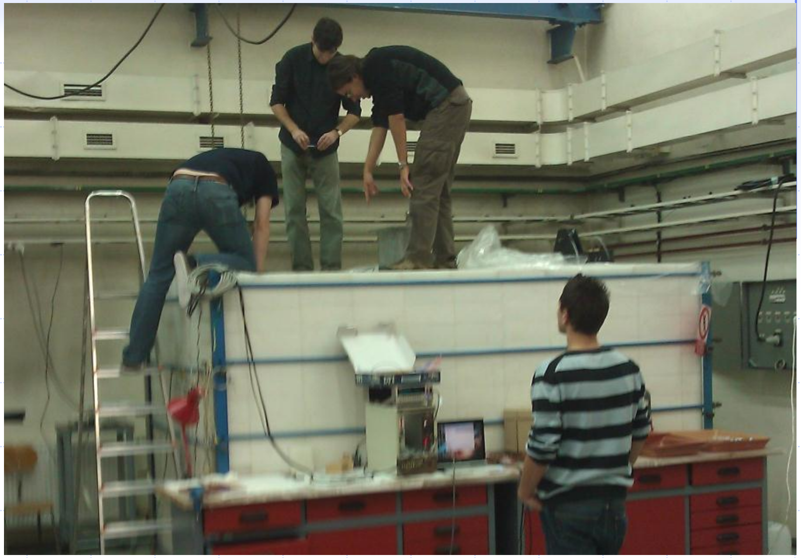
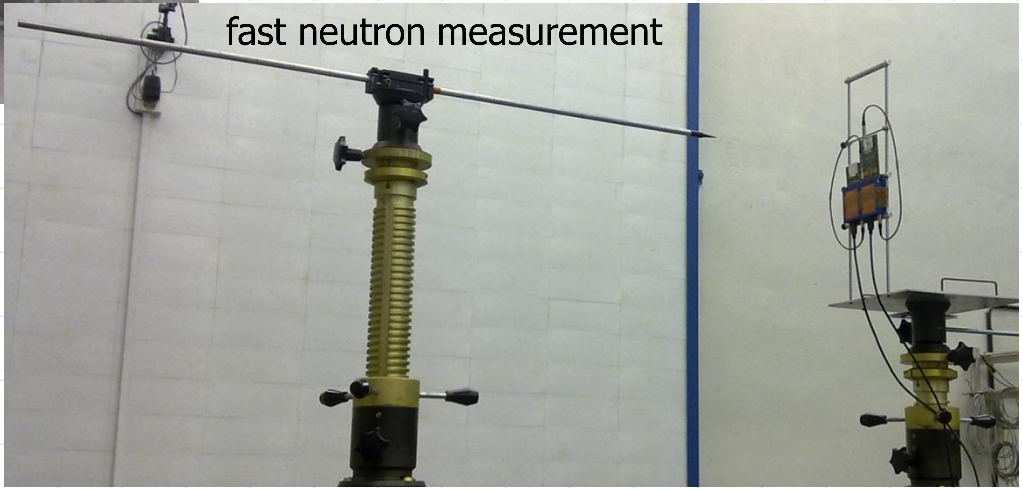
- Are these half lifes reproduceable for mpx01?
  - Take other no beam regions and see if the results will be identical
- What does the activation look like at the sites of the mpx02-mpx15?
  - Spatial distribution of activation in the ATLAS cavern
- Translate the measured count rates to dose rates
  - Evaluate the regions below each converter seperately (determine the composition of the radiation)
- (Luminosity monitoring
  - Estimate the background contribution due to this activation during collision periods)

ATLAS upgrate: Measurement at Czech Metrological Institute

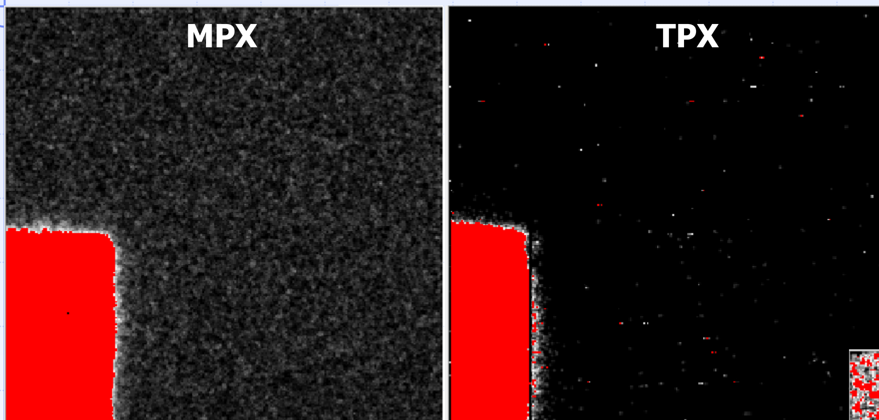






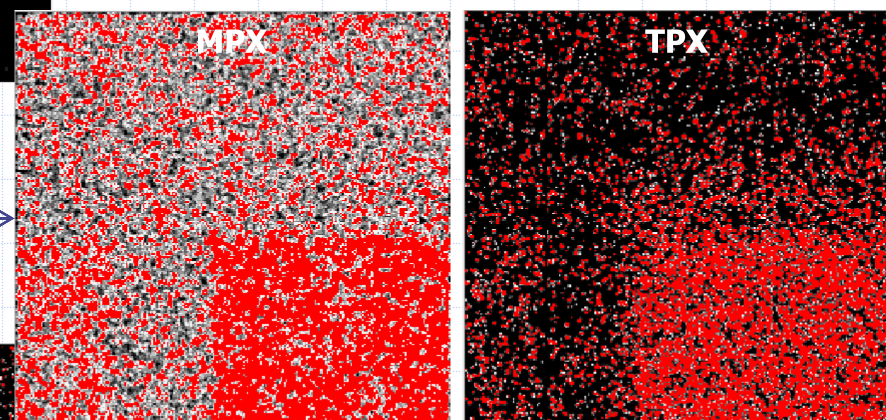
- Upgrate from MPX to TPX
- Measurement to compare the response of MPX and TPX to thermal neutron and fast neutron impact (Cf, AmBe)

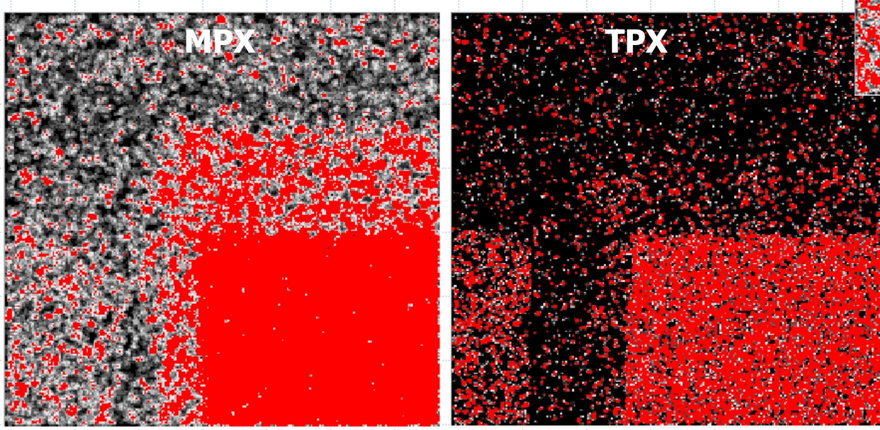
Comparison: MPX vs. TPX



← thermal neutrons (E < 0.5eV)

^{252}Cf (E_{mean} = 2 MeV) →





← AmBe (E_{mean} = 4 MeV)

Thank you for your attention!