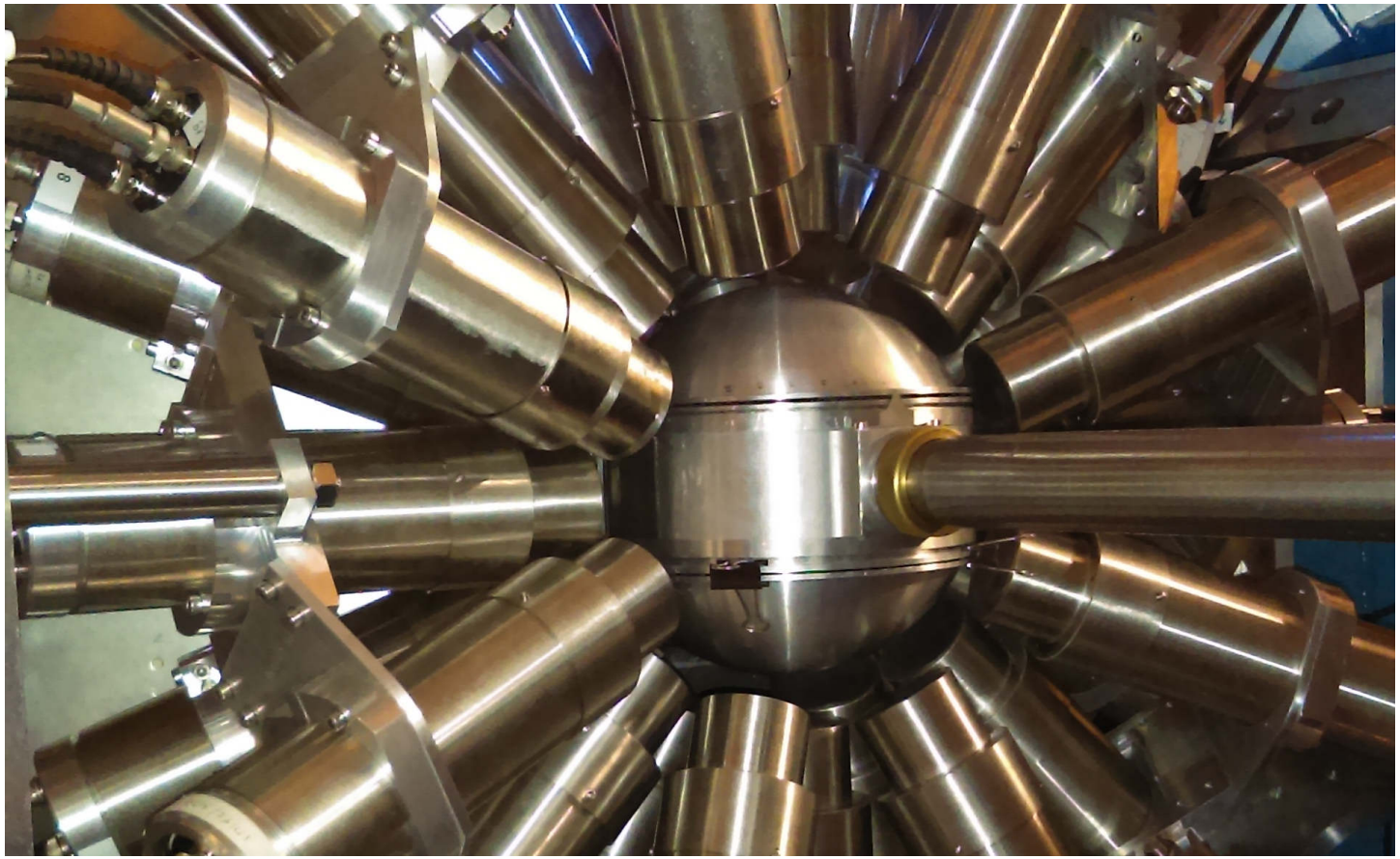
Shape transition in the neutron-rich W isotopes

on behalf of the E673 Experiment collaboration AGATA+FATIMA

TECHNISCHE UNIVERSITÄT DARMSTADT



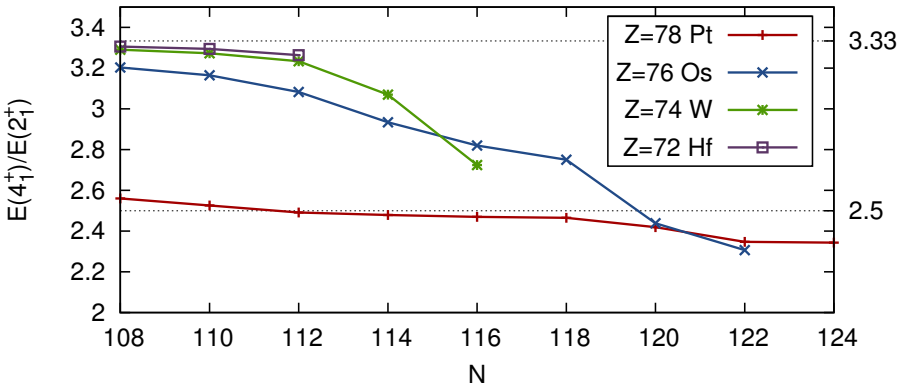
Shape transitions in the neutron-rich W, Os and Pt isotopes

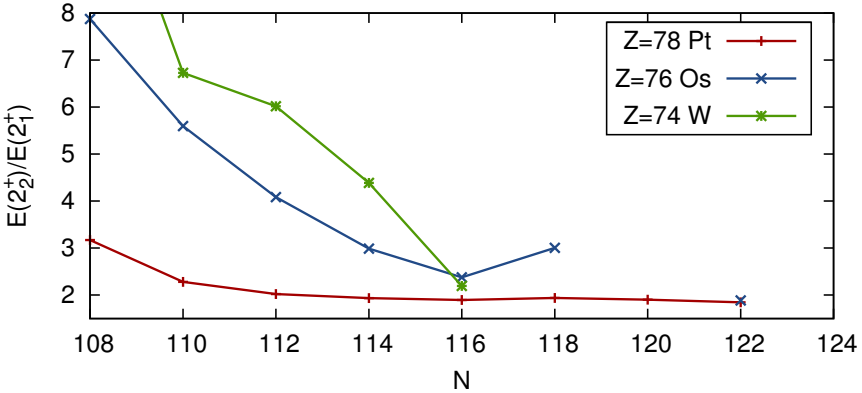
TECHNISCHE UNIVERSITÄT DARMSTADT

Pt Transition region starts with A=192 and persists till A≈200 with γ-soft ground states
F. Todd Baker et al., Nucl. Phys. A266 (1976) 337.

Os Decrease in deformation, ^{196}Os γ-soft with a slight oblate deformation
P.R. John et al.,Phys. Rev. C 90 (2), 021301.

W Prolate to oblate shape transition predicted for A=190 till A=194





Data taken from: Nuclear Data Database NUDAT 2, http://www.nndc.bnl.gov/nudat2.

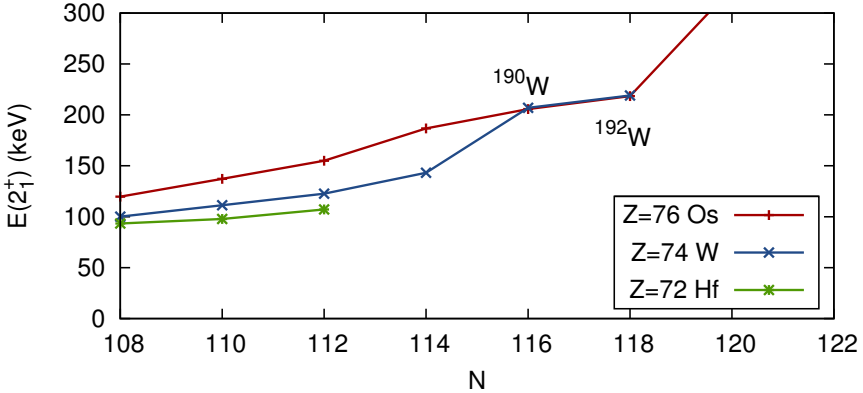
Shape transitions in the neutron-rich W, Os and Pt isotopes

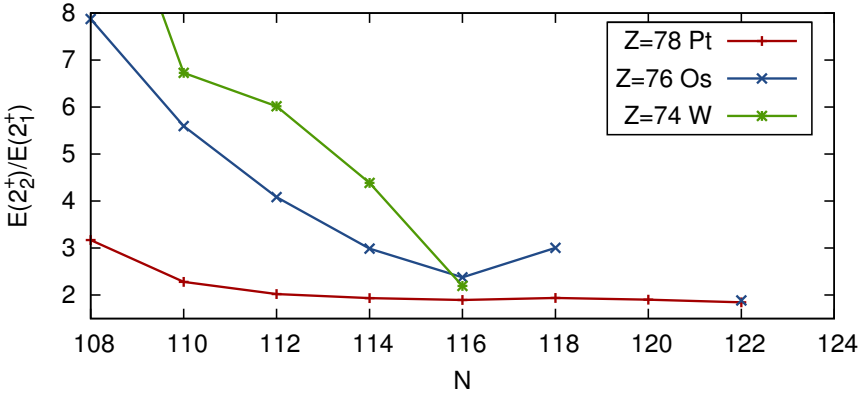
TECHNISCHE UNIVERSITÄT DARMSTADT

Pt Transition region starts with A=192 and persists till A≈200 with γ-soft ground states
F. Todd Baker et al., Nucl. Phys. A266 (1976) 337.

Os Decrease in deformation, ^{196}Os γ-soft with a slight oblate deformation
P.R. John et al.,Phys. Rev. C 90 (2), 021301.

W Prolate to oblate shape transition predicted for A=190 till A=194



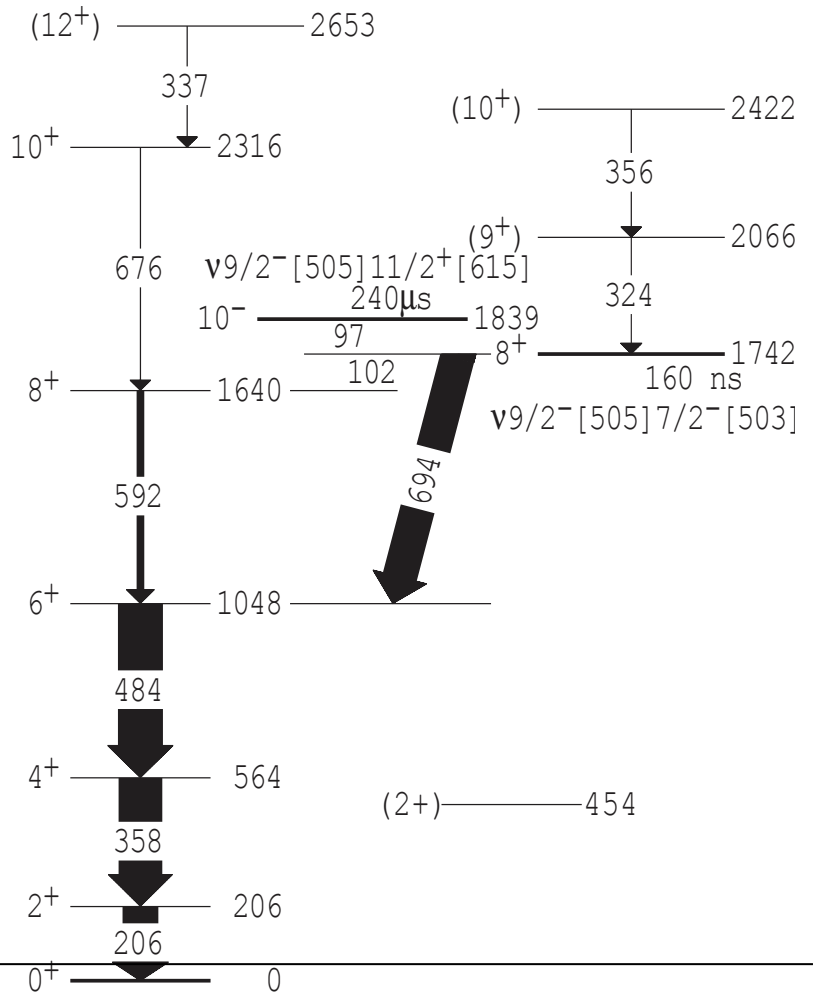


Data taken from: Nuclear Data Database NUDAT 2, http://www.nndc.bnl.gov/nudat2.

What we know of ^{190}W

TECHNISCHE UNIVERSITÄT DARMSTADT

- Yrast band interpreted as prolate deformed
  Yang Sun et al., Phys. Lett. B 659 (2008) 165â169
- Oblate shaped 10^- isomer in ^{190}W
  P.M. Walker, F.R. Xu / Phys. Lett. B 635 (2006) 286â289
  G.J. Lane et al, Phys. Rev. C 82, 051304(R) (2010)
  Yang Sun et al., Phys. Lett. B 659 (2008) 165â169
- Candidate for the 2_2^+ state observed
  N. Alkhomashi et al., Phys. Rev. C 80, 064308 (2009)
- Triaxial degree of freedom important for the description
  P. Sarriguren et al., Phys. Rev. C 77, 064322 (2008
  L.M. Robledo et al., J. Phys. G 36, 115104 (2009).



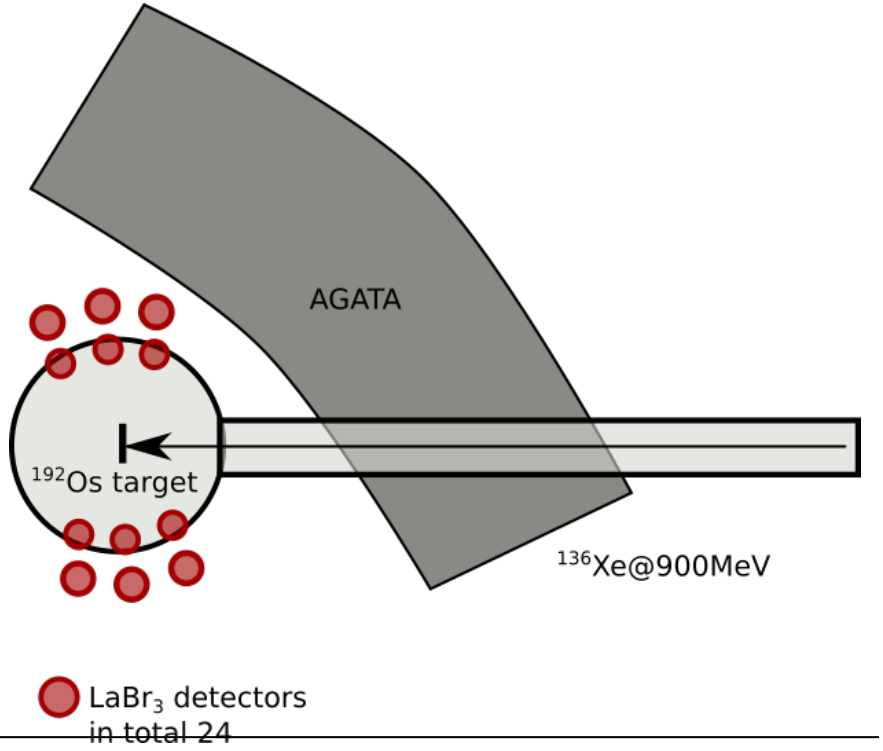
Experiment E673

TECHNISCHE UNIVERSITÄT DARMSTADT

Goals

- First in-beam γ-ray spectroscopy of ^{190}W and ^{192}W
- Measurement the of $B(E2; 2_1^+ \rightarrow 0_{gs}^+)$ of ^{190}W and ^{192}W

- Reaction ^{192}Os + ^{136}Xe at 900 MeV
- 0.2pnA
- 45 mg/cm^2 ^{192}Os target
- AGATA nominal position
- FATIMA (Array of 24 $LaBr_3$(Ce)) at 90° for fast timing, shielded with 1 mm μ material



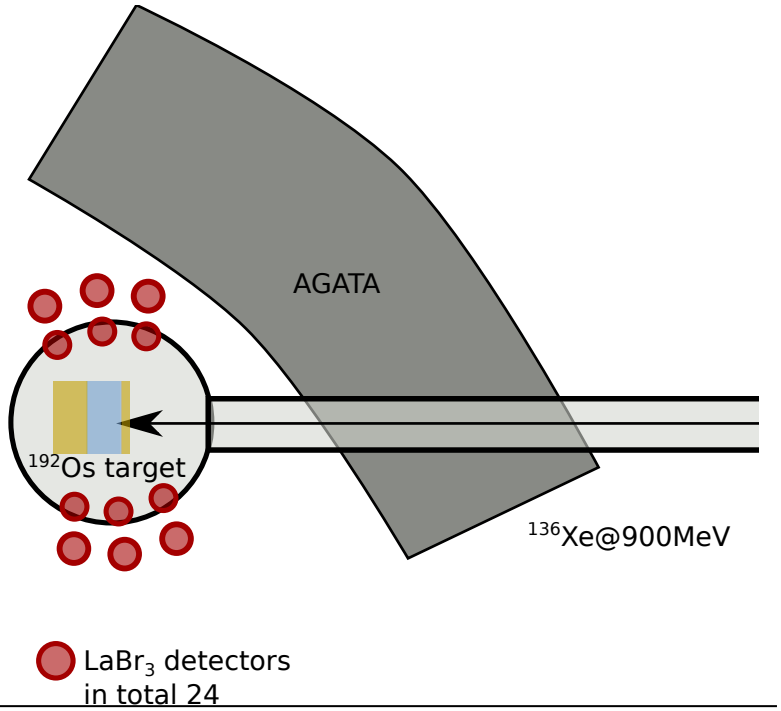
Experiment E673

TECHNISCHE UNIVERSITÄT DARMSTADT

Goals

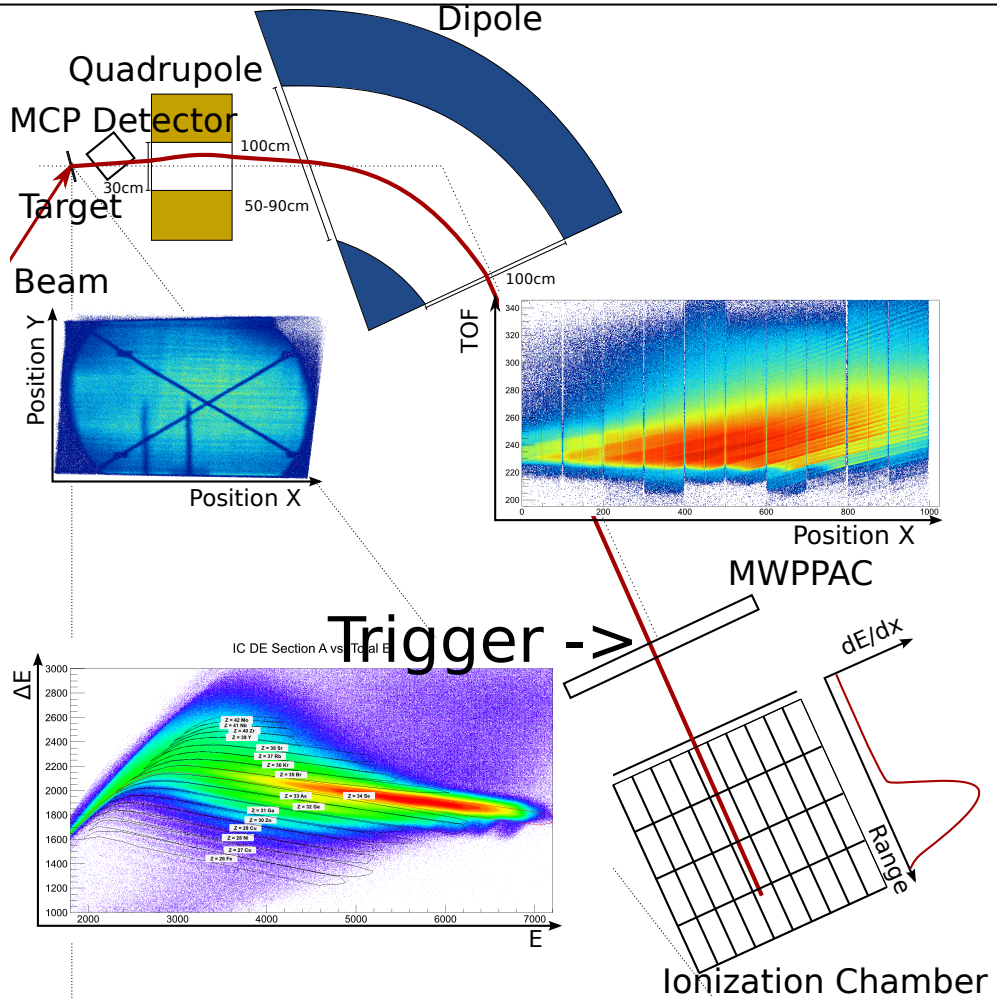
- First in-beam γ-ray spectroscopy of ^{190}W and ^{192}W
- Measurement the of $B(E2; 2_1^+ \rightarrow 0_{gs}^+)$ of ^{190}W and ^{192}W

- Reaction ^{192}Os + ^{136}Xe at 900 MeV
- 0.2pnA
- 45 mg/cm^2 ^{192}Os target
- AGATA nominal position
- FATIMA (Array of 24 $LaBr_3$(Ce)) at 90° for fast timing, shielded with 1 mm μ material



Typical use of AGATA

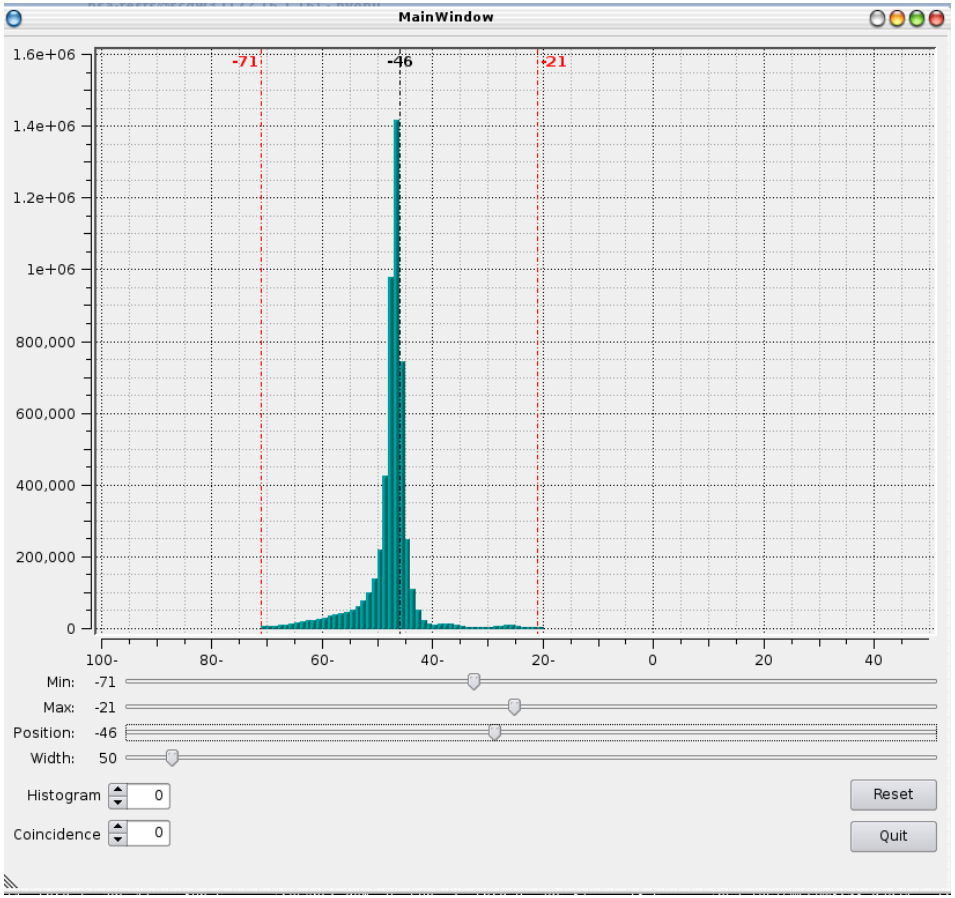
Ancillary device, such as Vamos, MuGasT, selects good events



Trigger Experiment E673

TECHNISCHE UNIVERSITÄT DARMSTADT

- AGATA $\gamma - \gamma$ + FATIMA $\gamma - \gamma$, i.e. quadruple coincidences for lifetime measurement
- Also higher fold γ data



Obtaining prompt events

How to do it?

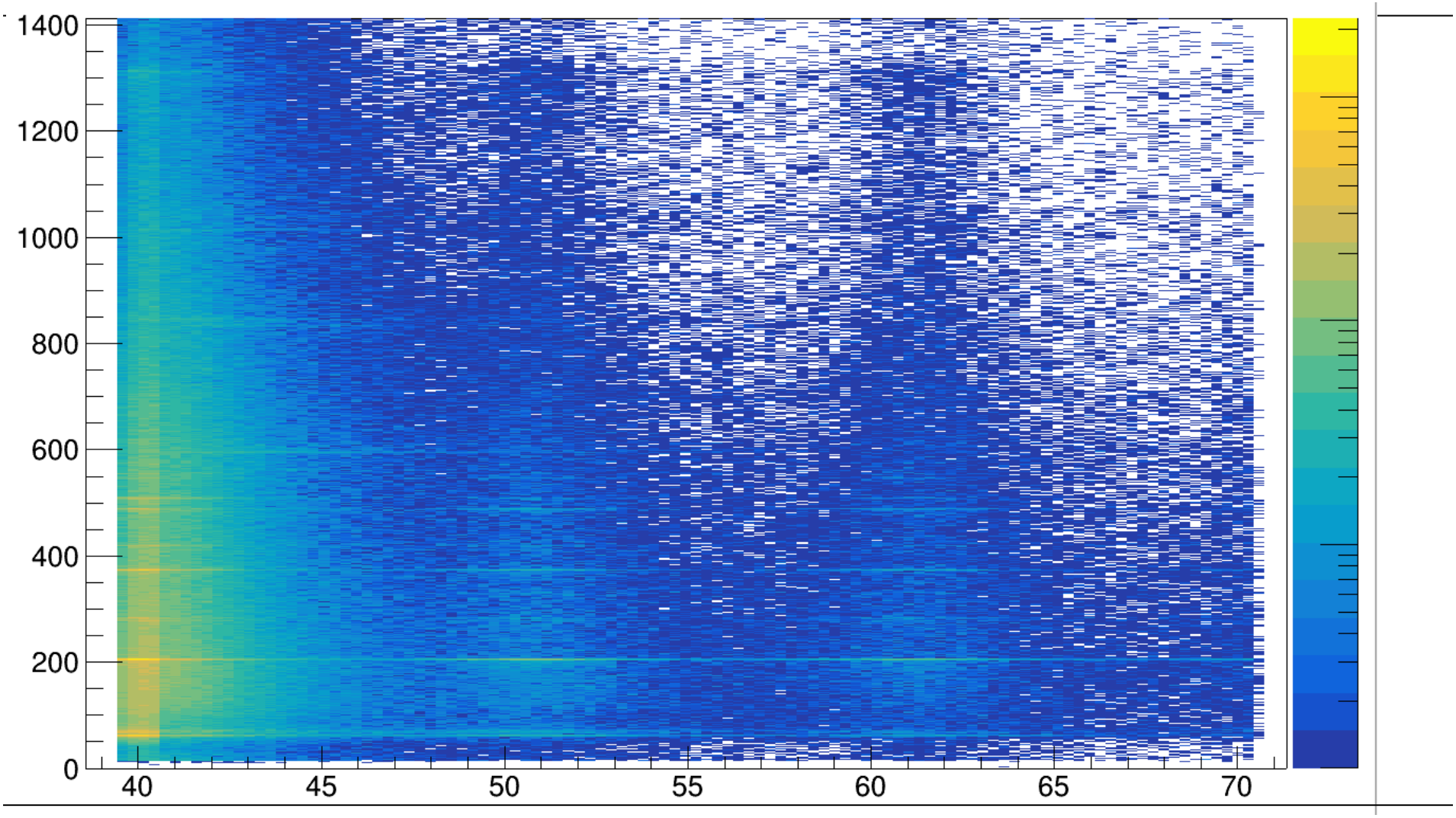
TECHNISCHE UNIVERSITÄT DARMSTADT

- TAC between AGATA and RF
- TAC between FATIMA and RF
- only in the datastream with FATIMA data
- Timestamped data
- Frequency of the cyclotron: 9.4565 MHz
- Every 105 ns a new bunch

Prompt events with FATIMA

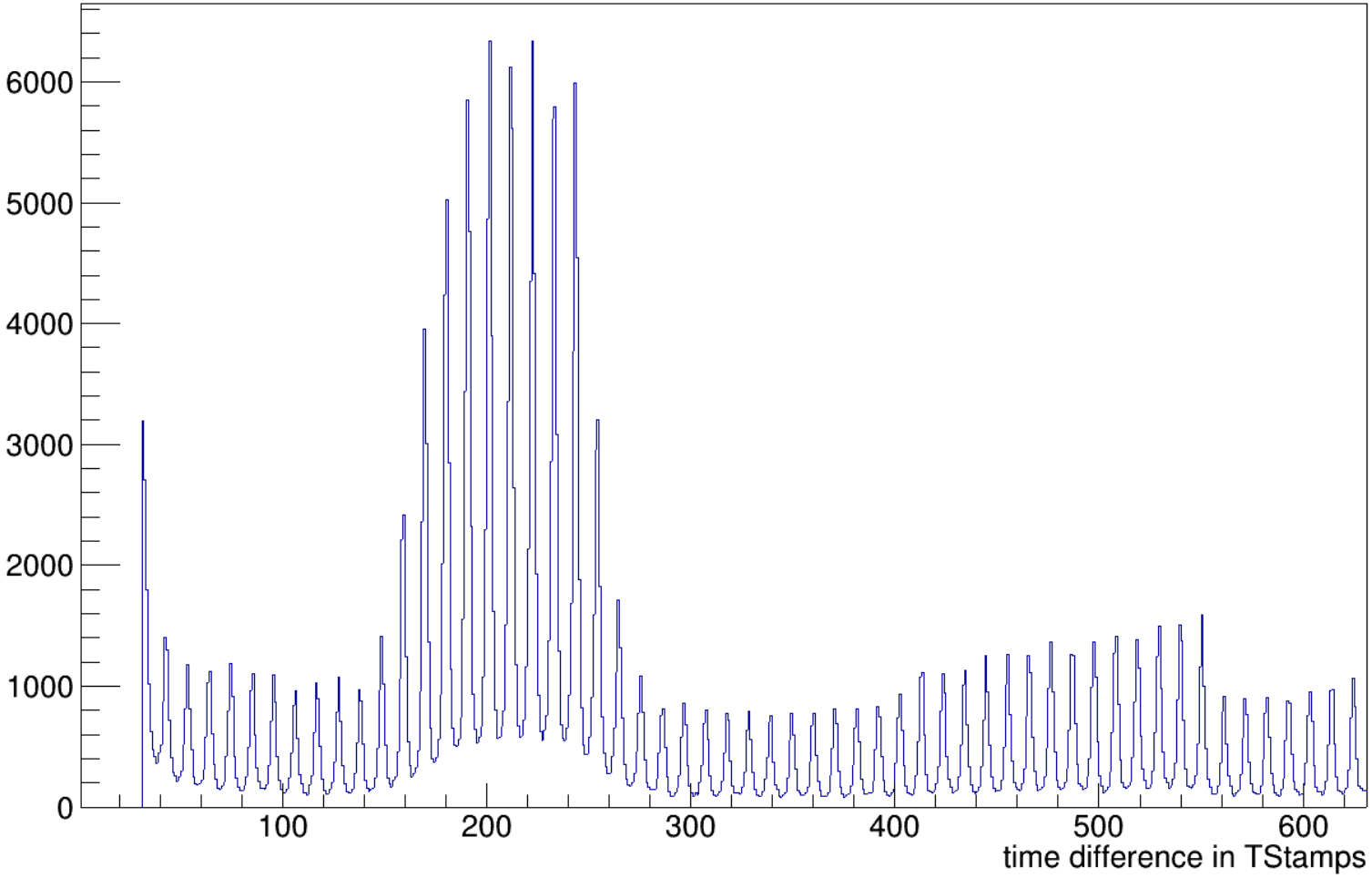
What does it mean?

TECHNISCHE UNIVERSITÄT DARMSTADT



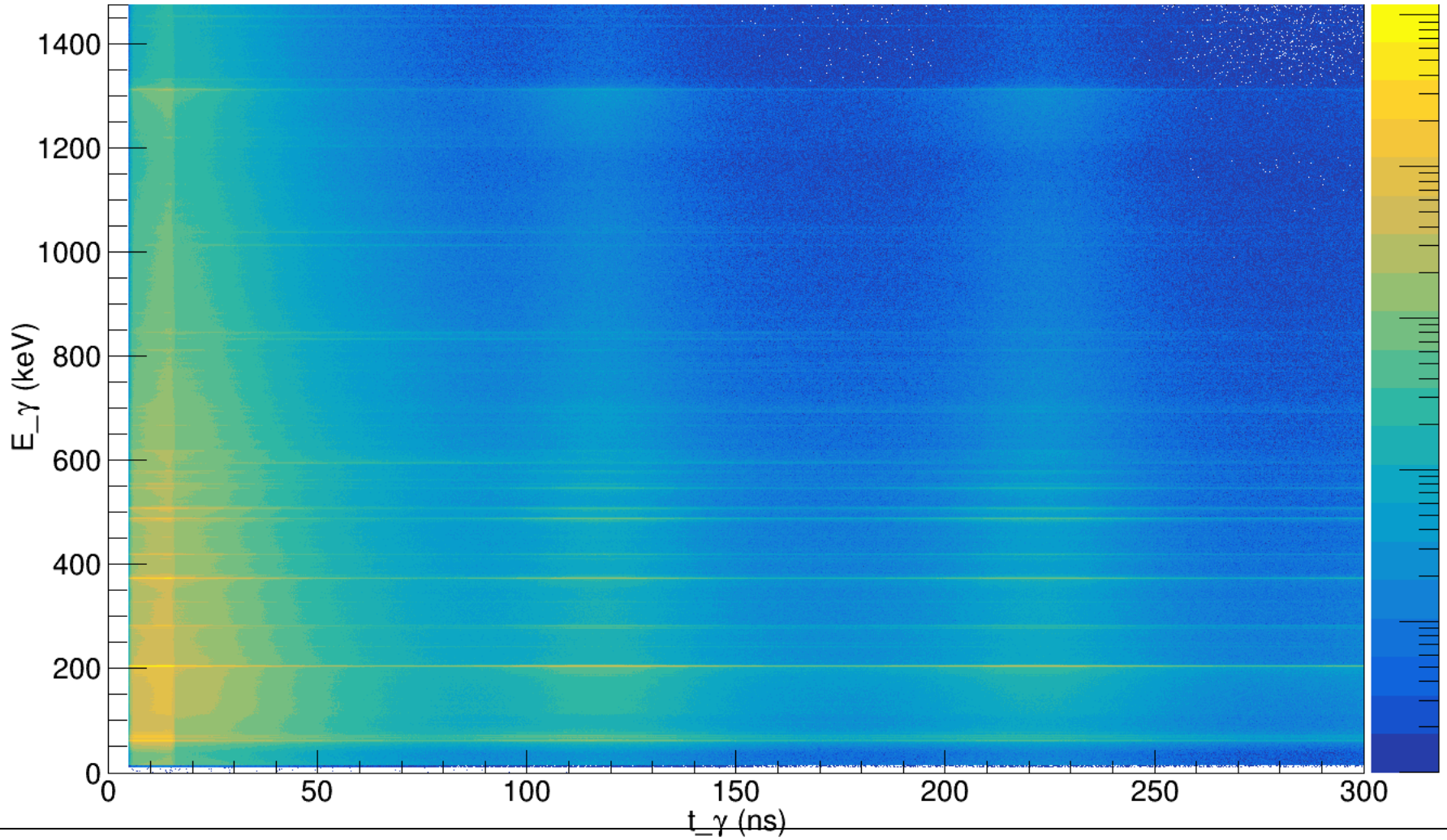
Time difference between FATIMA events and $\gamma - \gamma$ events

identification



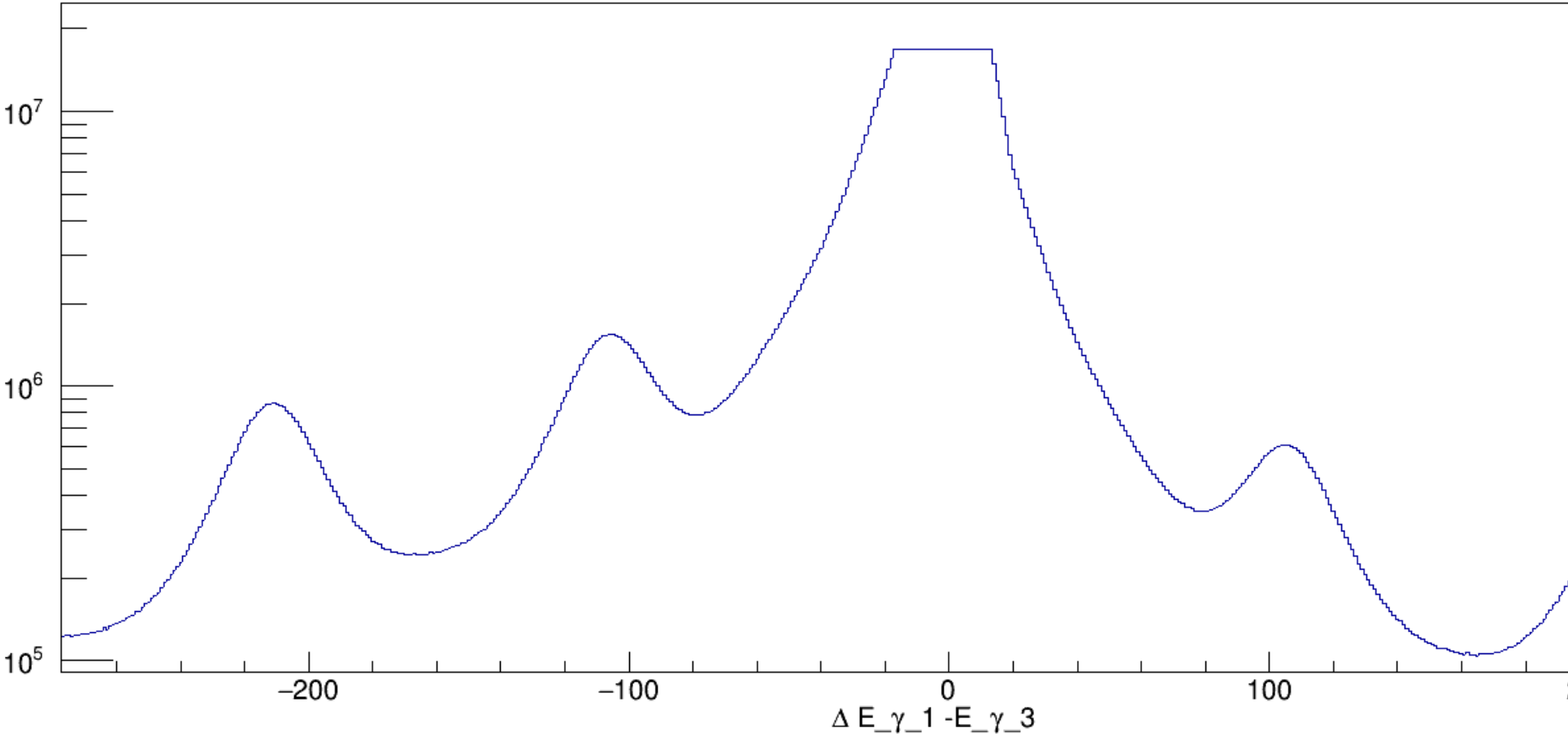
Time difference for $\gamma - \gamma$ Trigger

Identified!



Sorting higher Cubes and Hypercubes

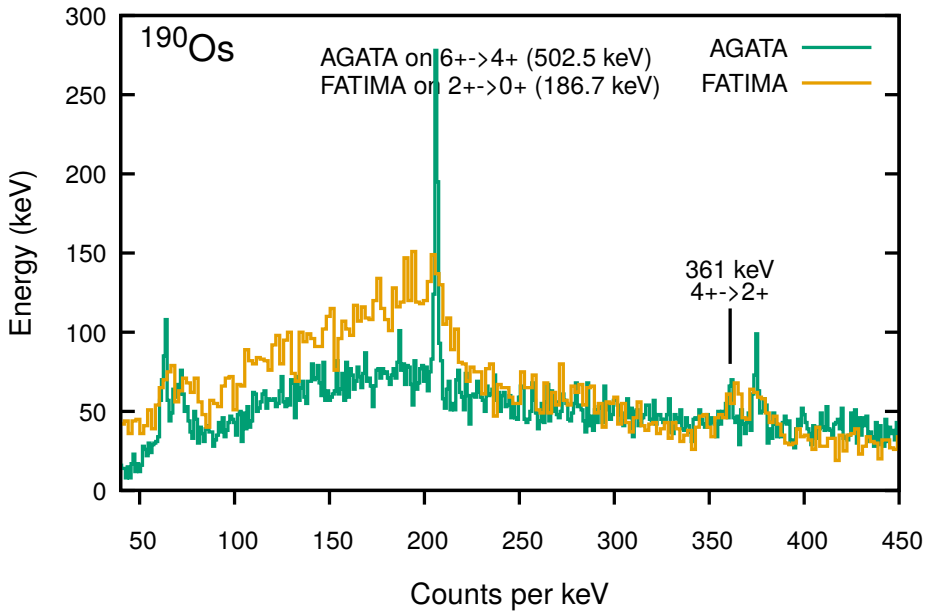
Determation of correct time differences

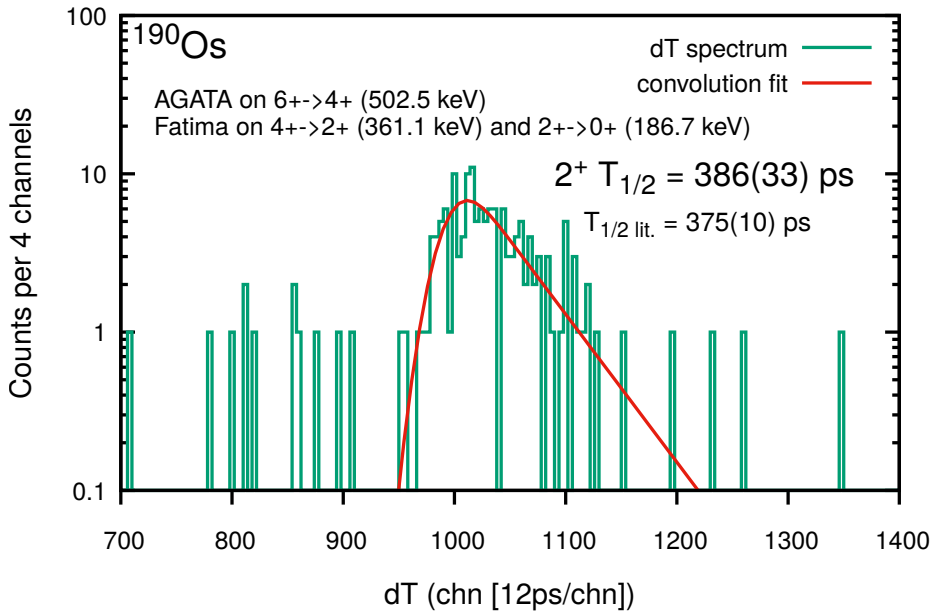


Lifetime measurement with FATIMA (near line results)

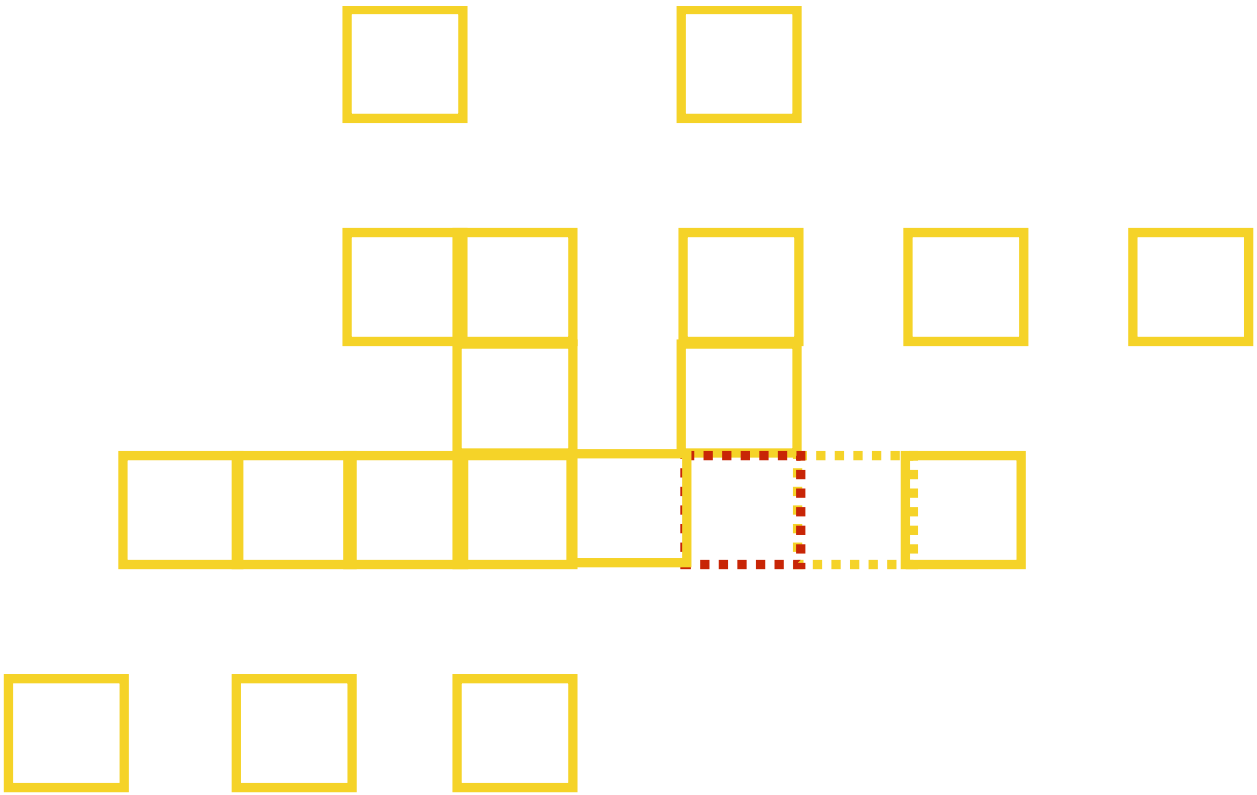
TECHNISCHE UNIVERSITÄT DARMSTADT

- highest cross section for transfer ^{190}Os
- demonstartion that we can measure lifetimes with this setup

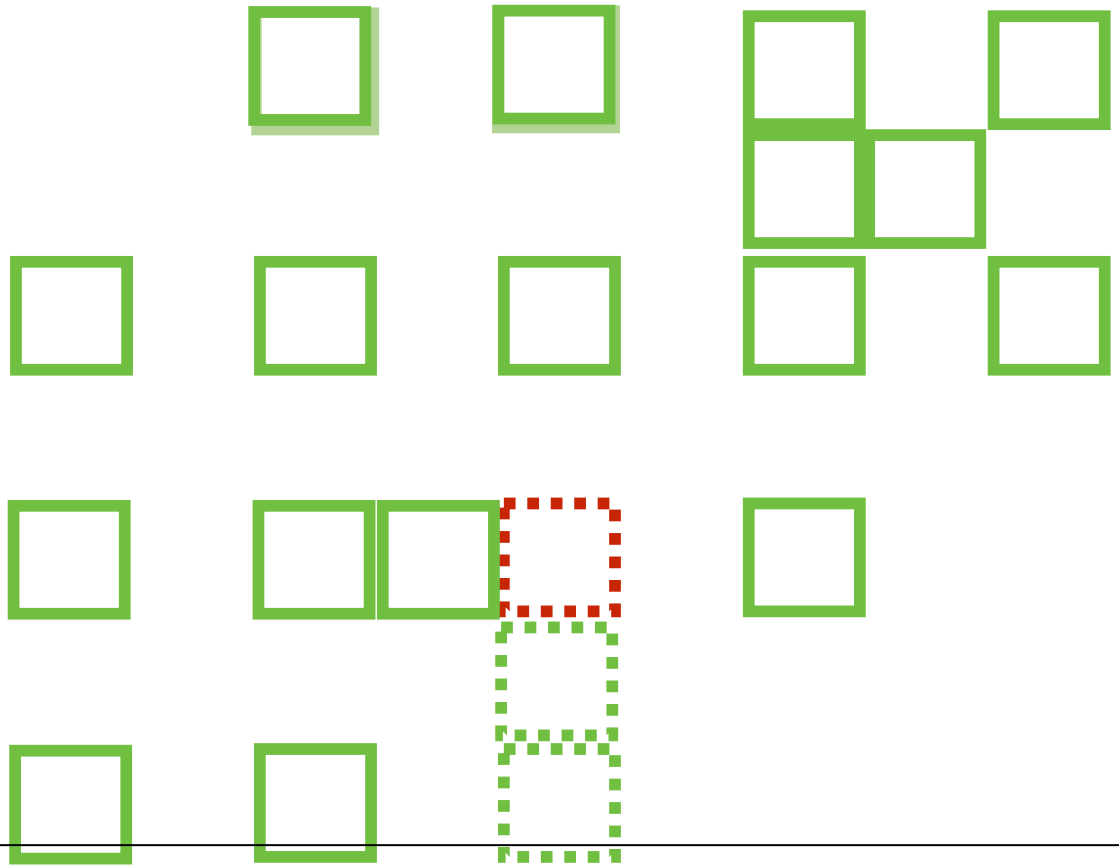




Identification Beam-like recoils



Identification target-like recoils



Identification target-like recoils Isomeric states

TECHNISCHE UNIVERSITÄT DARMSTADT

Conclusions

TECHNISCHE UNIVERSITÄT DARMSTADT

- **The Data at TU Darmstadt is only 1.5 days of the experiment**
- **The Grid transfer is not yet avaible at TU Darmstadt, IT of TU Darmstadt is working on it**
- Cube and Hypercube sorting developed for the avaible data, However, we need to apply to the full experiment
- Experiment worked fine, huge effort
- No obvious lines for ^{190}W yet!
- Identification of isomeric decays $\Rightarrow$ cleaner gating
- Identification of many new γ-ray transitions
- *Obviulsly, no Replay yet, touch the tracking parameters*