Shape transition in the neutron-rich W isotopes
on behalf of the E673 Experiment collaboration
AGATA+FATIMA
Shape transitions in the neutron-rich W, Os and Pt isotopes

Pt  Transition region starts with $A=192$ and persists till $A \approx 200$ with $\gamma$-soft ground states

Os  Decrease in deformation, $^{196}$Os $\gamma$-soft with a slight oblate deformation

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

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What we know of $^{190}\text{W}$

- Yrast band interpreted as prolate deformed

- Oblate shaped $10^-\text{ isomer in }^{190}\text{W}$
  G.J. Lane et al, Phys. Rev. C 82, 051304(R) (2010)

- Candidate for the $2^+_2$ state observed

- Triaxial degree of freedom important for the description
Goals

▶ First in-beam $\gamma$-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$^\circ$ for fast timing, shielded with 1 mm $\mu$ material
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Typical use of AGATA
Ancillary device, such as Vamos, MuGasT, selects good events
Trigger Experiment E673

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

How to do it?

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

identification
Time difference for $\gamma - \gamma$ Trigger

Identified!

$E_{\gamma}$ (keV)

$t_{\gamma}$ (ns)
Sorting higher Cubes and Hypercubes

Determination of correct time differences
Lifetime measurement with FATIMA (near line results)

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

![Graph showing energy levels and counts per keV for $^{190}$Os using AGATA and FATIMA.]

$^{190}$Os AGATA on $6^{+} \rightarrow 4^{+}$ (502.5 keV) and Fatima on $4^{+} \rightarrow 2^{+}$ (361.1 keV) and $2^{+} \rightarrow 0^{+}$ (186.7 keV)

$2^+ T_{1/2} = 386(33) \text{ ps}$

$T_{1/2 \text{ lit.}} = 375(10) \text{ ps}$
Identification Beam-like recoils
Identification target-like recoils
Identification target-like recoils Isomeric states
Conclusions

- The Data at TU Darmstadt is only 1.5 days of the experiment
- The Grid transfer is not yet available at TU Darmstadt, IT of TU Darmstadt is working on it
- Cube and Hypercube sorting developed for the available 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 $\gamma$-ray transitions
- Obviulsly, no Replay yet, touch the tracking parameters