Towards lifetime and g-factor measurements of short-lived states in the vicinity of ^{208}Pb

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Objectives of the AGATA@GANIL experiment

- Measurement important for the experimental information across the $N = 126$ and $Z = 82$ closed shell.
- ^{208}Pb is a key nucleus for the Shell-Model.
- Even-even nuclei around ^{208}Pb: few transition strength measured.
- For example $B(E2; 2^+ \rightarrow 0^+)$ of ^{206}Hg unknown.
- Lack of g-factor measurement in this region.

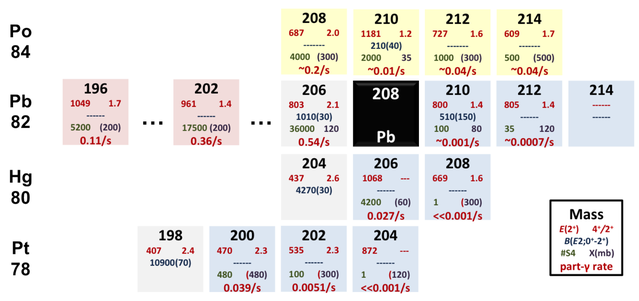

Fig. 1: Known spectroscopic information around ^{208}Pb

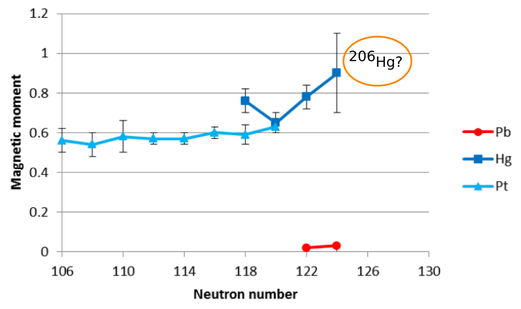

Fig. 2: Systematics of the g-factor measurement in the ^{208}Pb region

Experimental setup

- ^{208}Pb beam at 6.25 MeV: multi-nucleons transfer reaction.
- ^{100}Mo target (1 mg/cm^2) with a ^{58}Ni plunger degrader ($\sim$2 mg/cm^2).
- Heavy recoil detected by the VAMOS spectrometer [1] positioned at 26°.
- Key: for $Z > 50$ VAMOS cannot identified the proton number of the fragment thus the utilization of an newly developed ionization chamber in the reaction chamber.
- AGATA [2] provides large angle coverage needed for g-factor measurement.

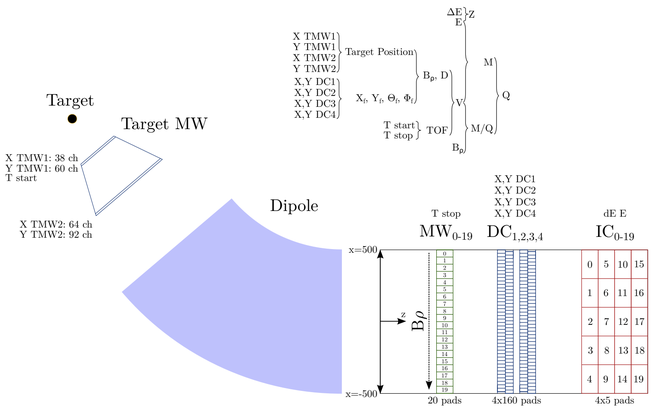

Fig. 3: Schematic view of the VAMOS reconstruction

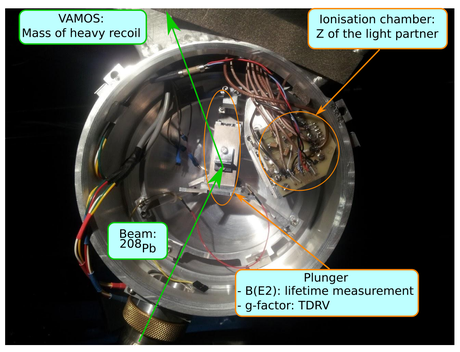

Fig. 4: Picture of the reaction chamber

Analysis of the data

Mass identification in VAMOS for A≈200 is not straightforward

- A good time resolution is needed.
- A really fine calibration is needed to obtained a good mass resolution in the full focal plane.

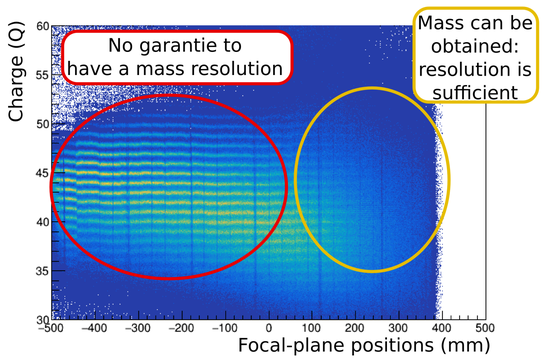

Fig. 5: $\sim$ 30% of the recorded statistic with a mass resolution

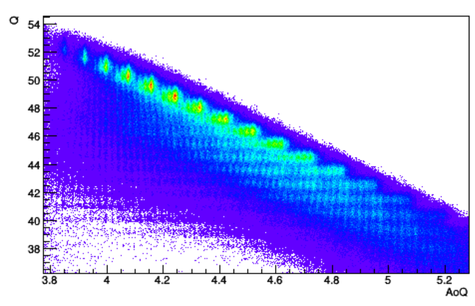

Fig. 6: Identification of the mass and charge state for three Multi-Wires (labels 5,6,7) detectors of the final focal plane of VAMOS

Analysis challenges

Identification of the proton number transfered in the reaction is not possible:

- Identification of the fragments rely on mass, X-rays, and known γ-ray transitions
- AGATA [2]: calibration and treatment for a good energy resolution after Doppler-correction
- Large amount of data recorder: 28TB of data on disks

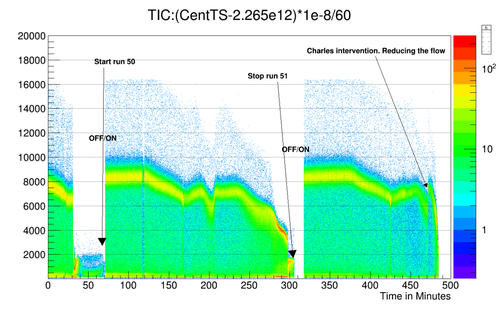

Fig. 7: Issue with the small ionization chamber

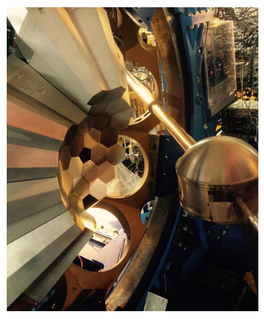

Fig. 8: Picture of the AGATA detectors

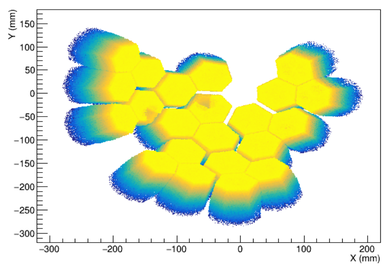

Fig. 9: Hit distribution in AGATA

Physics output

- Known case of 3^- state of ^{208}Pb present in the data: good verification point.
- Lifetime $19/2^-$ state of ^{207}Pb can be measured.

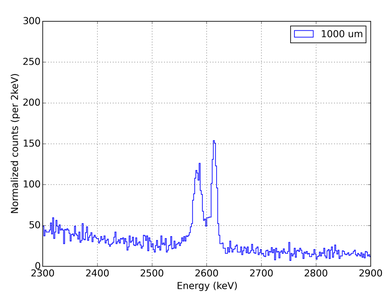

Fig. 10: Clear plunger experiement with the well known 3^- state of ^{208}Pb
$T_{1/2} = 16.7(3)$ ps

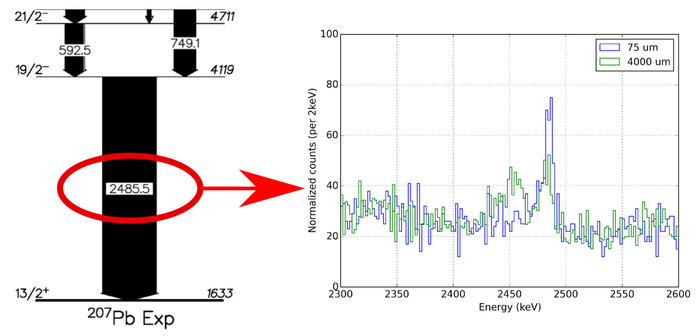

Fig. 11: ^{207}Pb: lifetime of $19/2^-$, excited state above the $13/2^+$ isomer

Conclusions

- Data analysis is on-going, and required a fine treatment of the data.
- Pushing the limits of VAMOS detection systems: mass $A \approx$200 have never been done before.
- VAMOS detectors need to have an improved calibration with correction of second order aberrations: e.g. the angular dependence of the trajectories in the spectrometers
- It is still not clear if the full focal plane of VAMOS detector can be used.
- The status of the analysis assure physics outputs.

References

[1] M. Rejmund *et al.* (2005) Performance of the improved larger acceptance spectrometer VAMOS++ *NIM A*, **646**: 184-191.
[2] S. Akkoyun *et al.* (2012) AGATA - Advanced GAmma Tracking Array *NIM A*, **668**: 26-58.

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