Report on AGATA@LNL experiment 23.08: Coulomb excitation of ^{60}Ni

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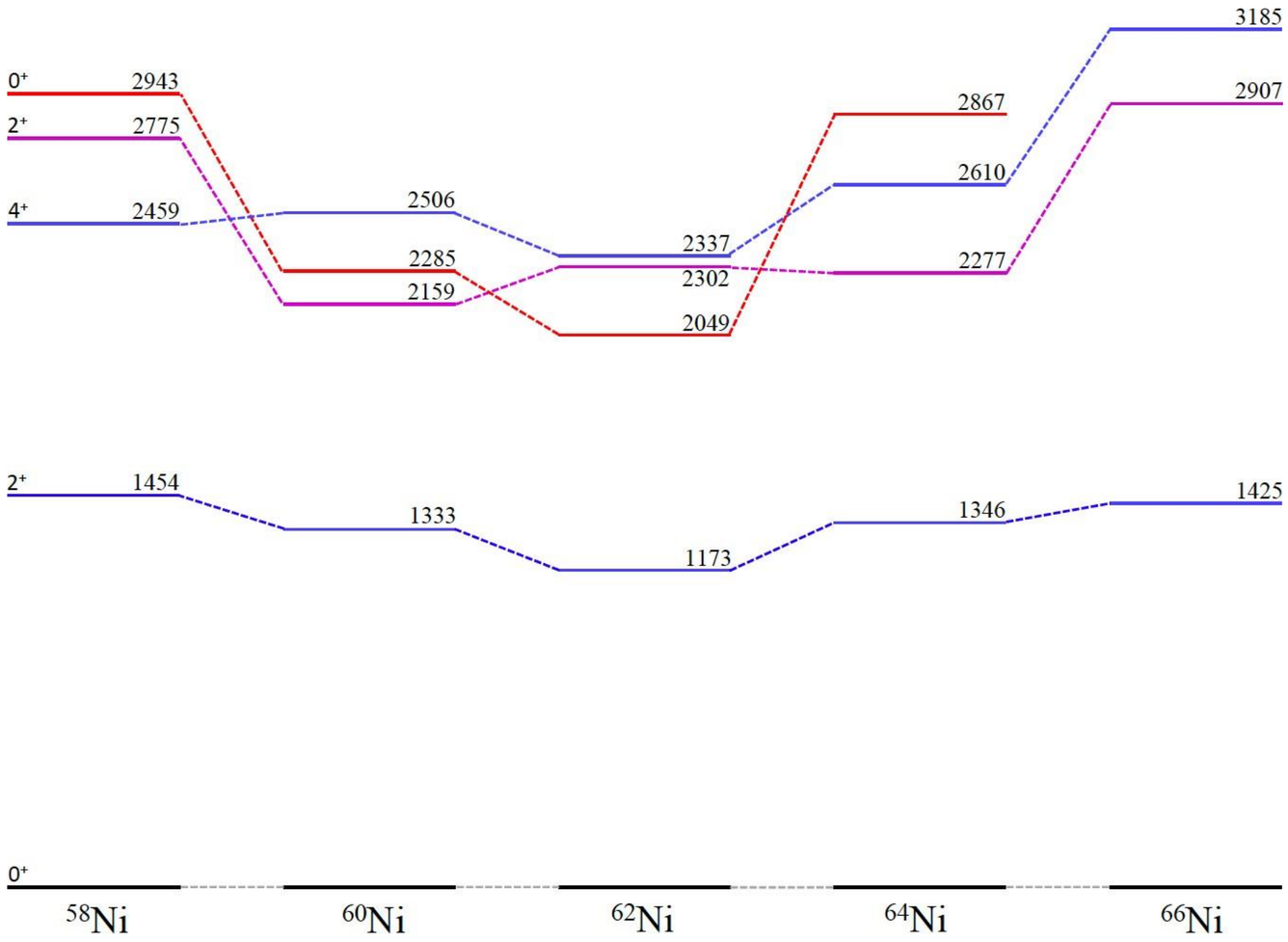
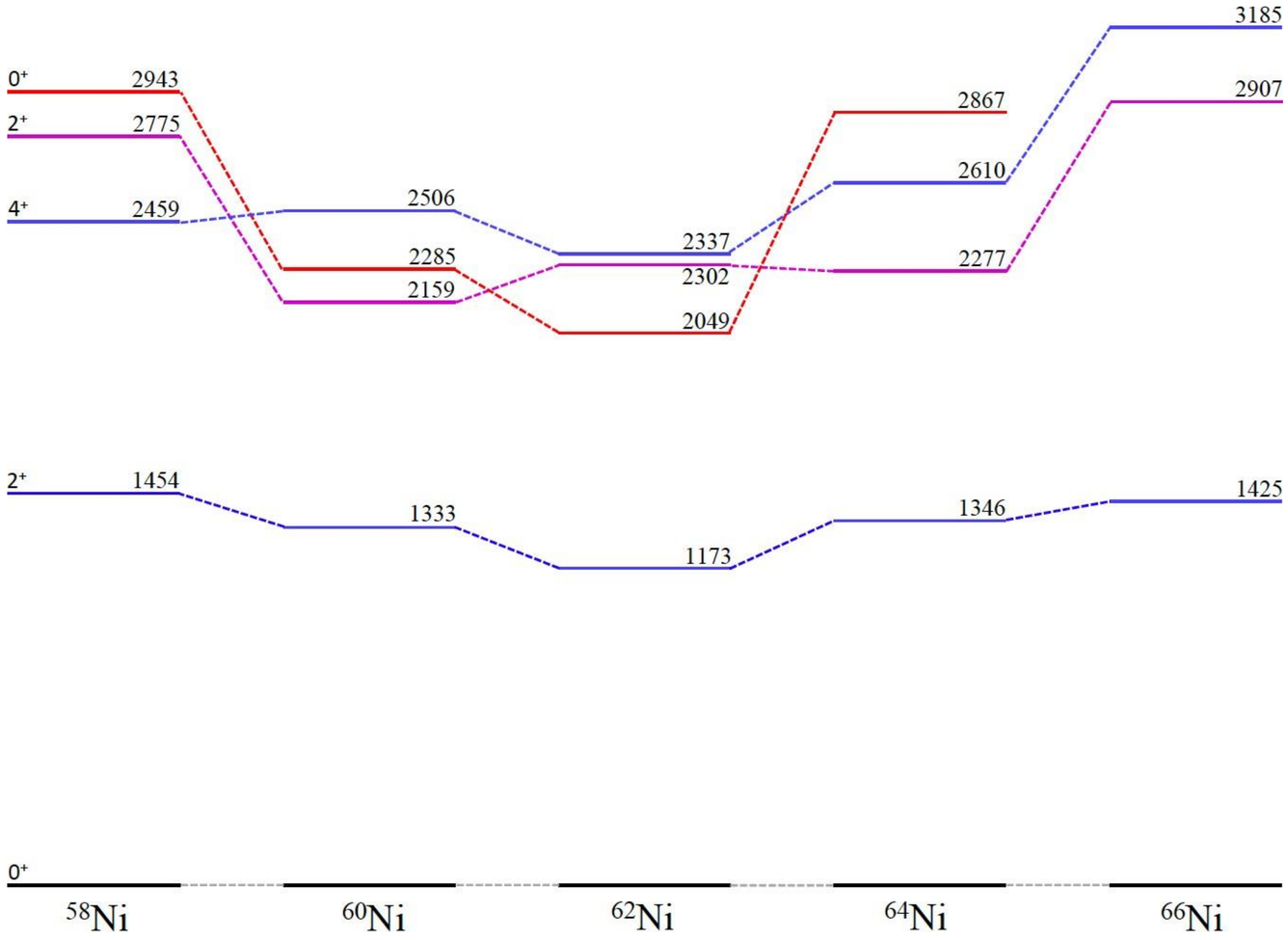
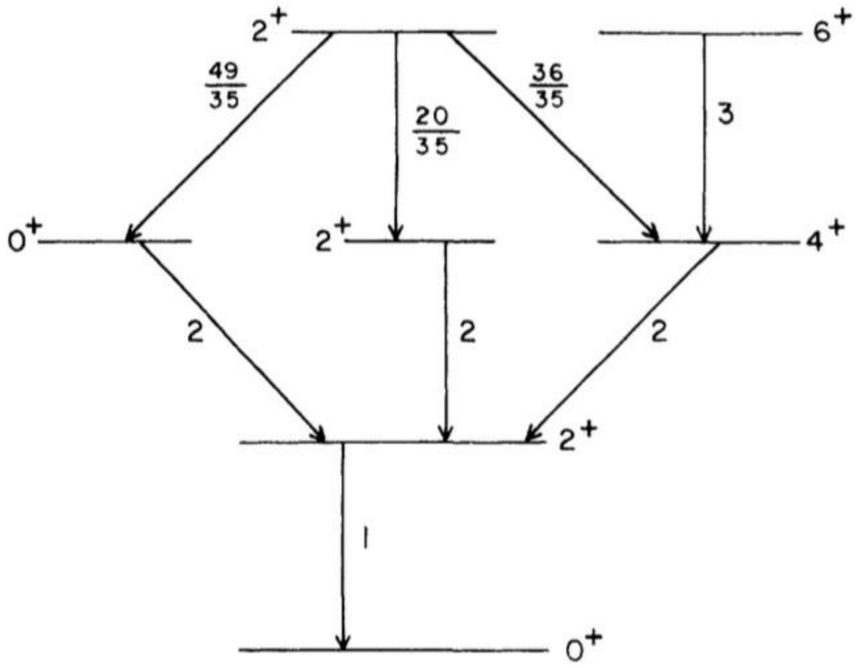
Stable Nickel isotopes: Vibrations?



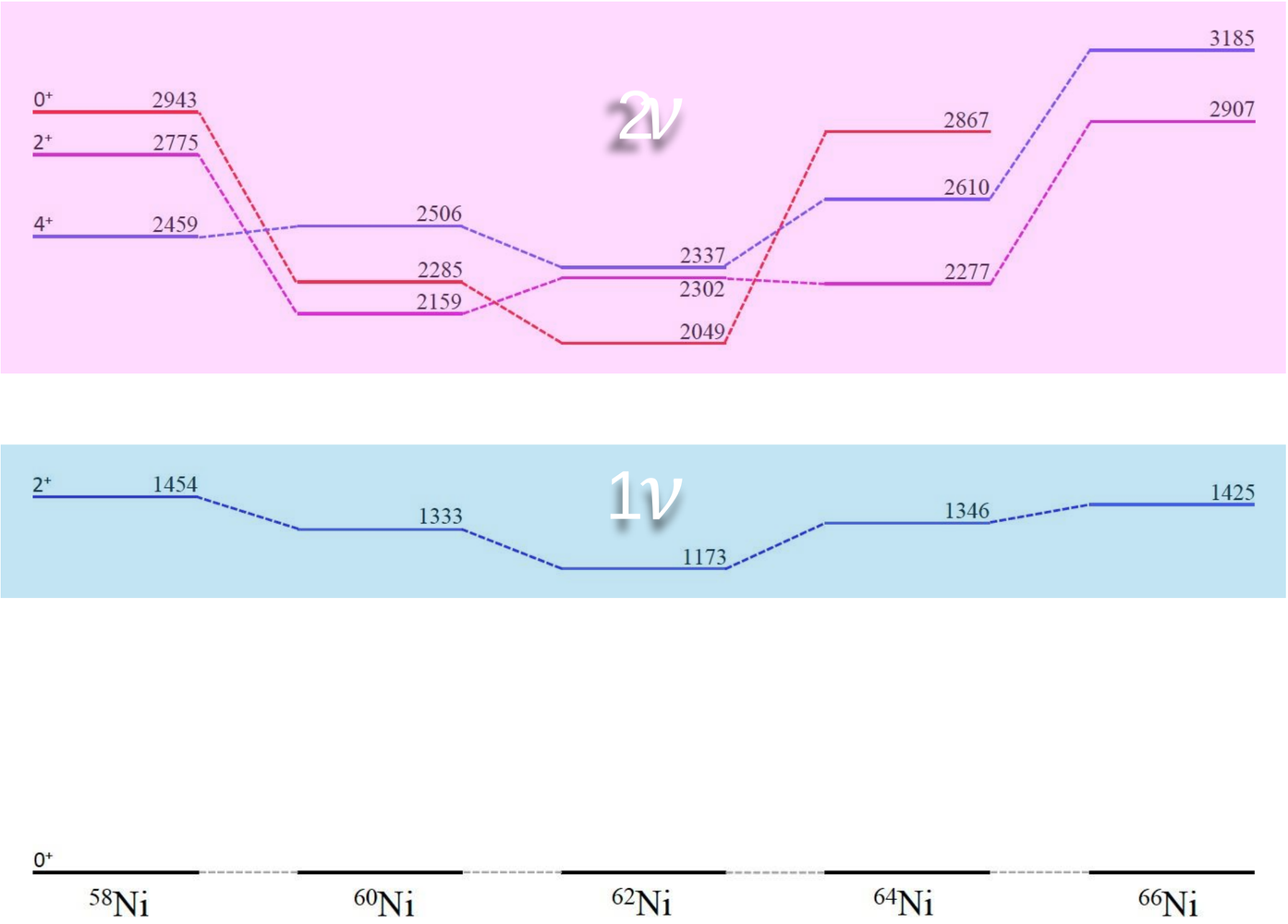
Nickel isotopes: Vibrations?

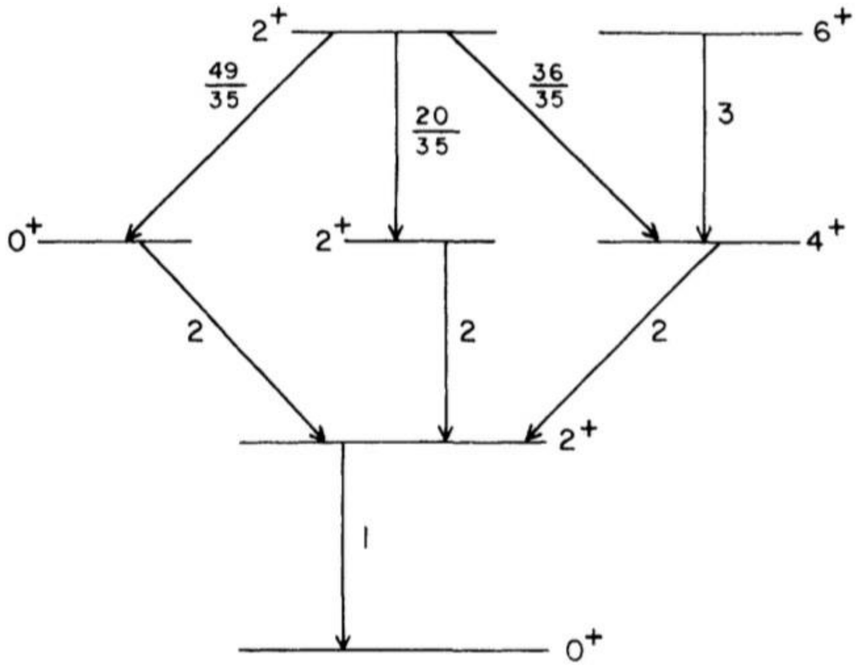




B(E2) VALUES FOR DECAY OF MULTI-PHONON STATES

Nickel isotopes: Vibrations?





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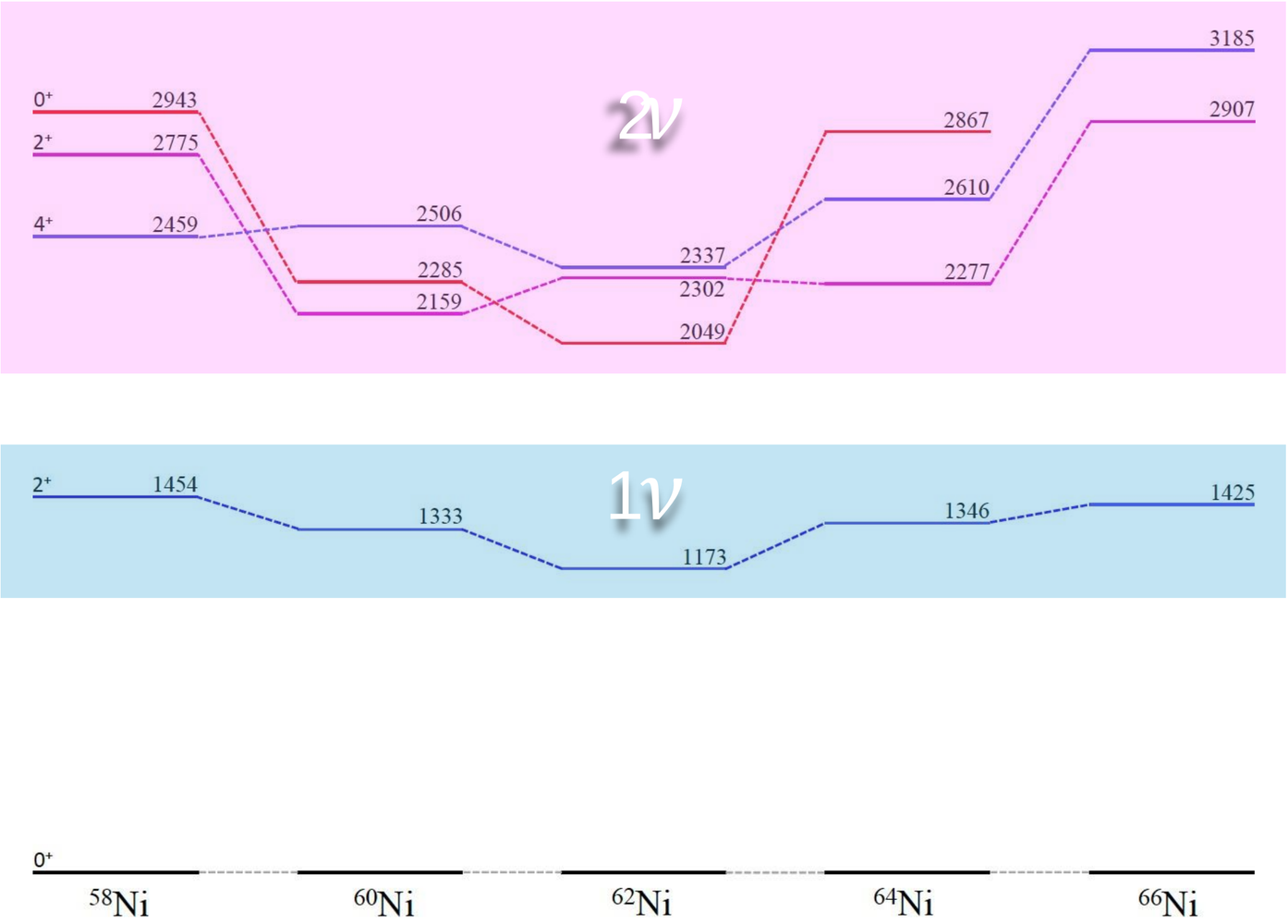
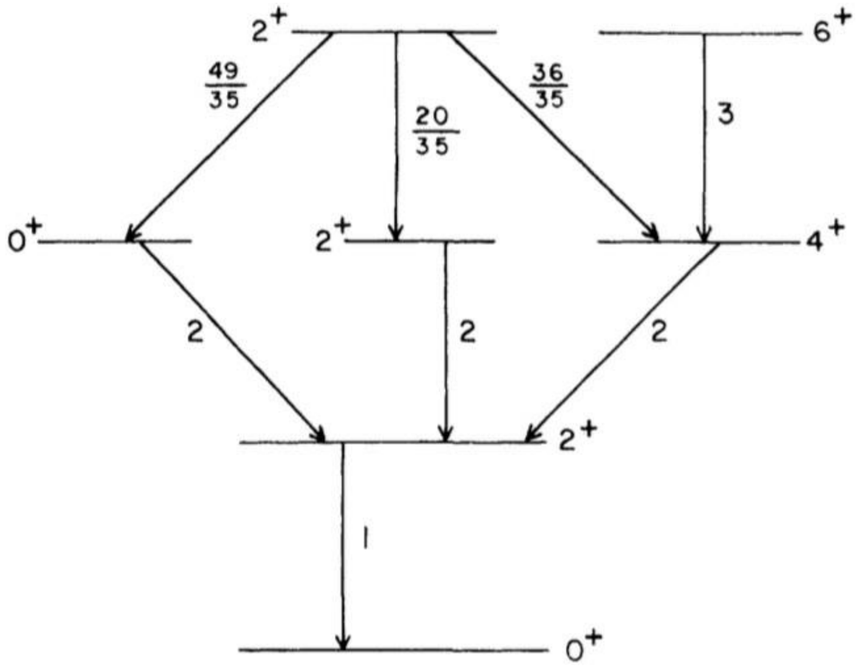


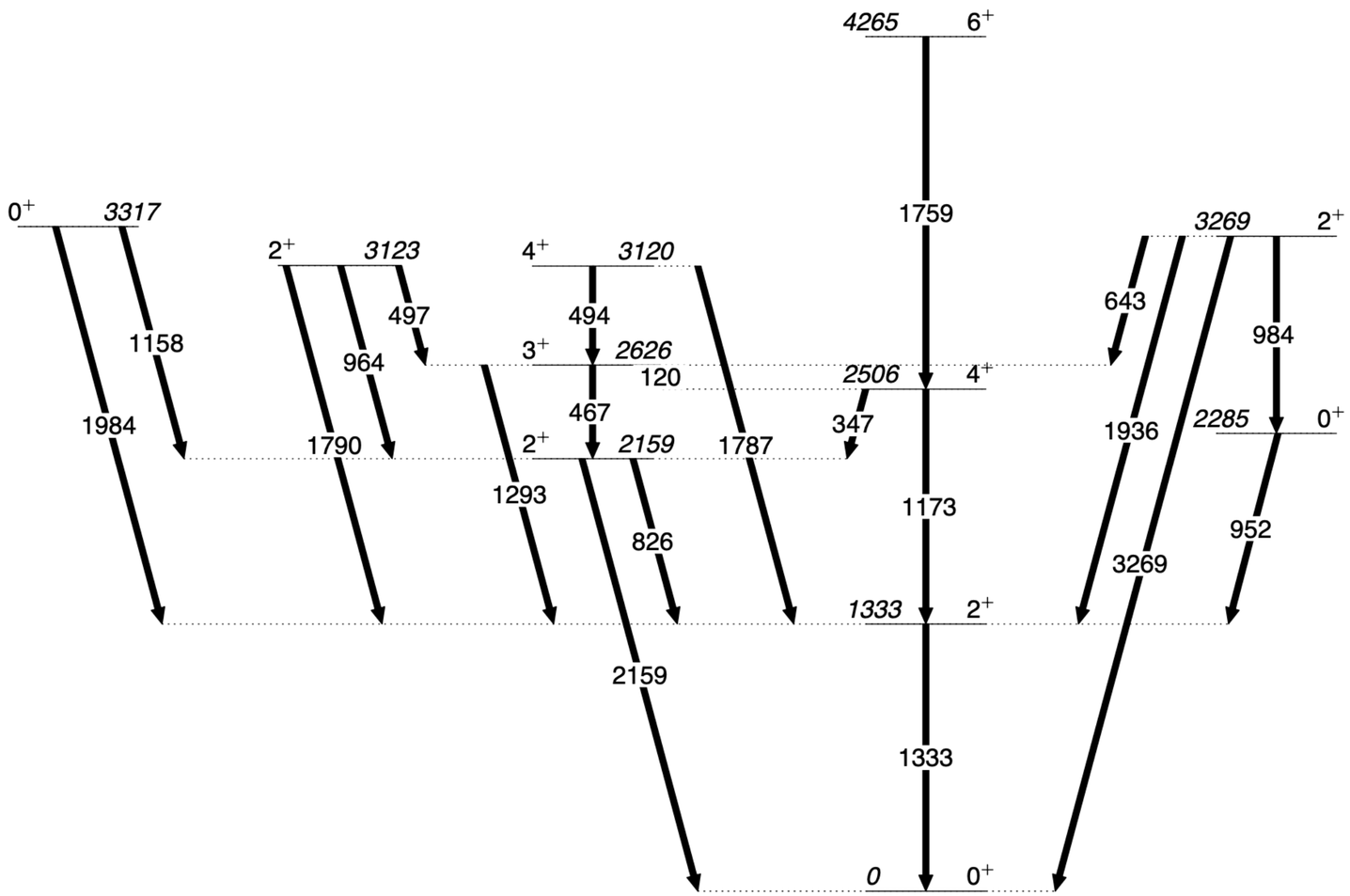


B(E2) VALUES FOR DECAY OF MULTI-PHONON STATES

B(E2) and Qs values needed

Not only the level scheme but the structure

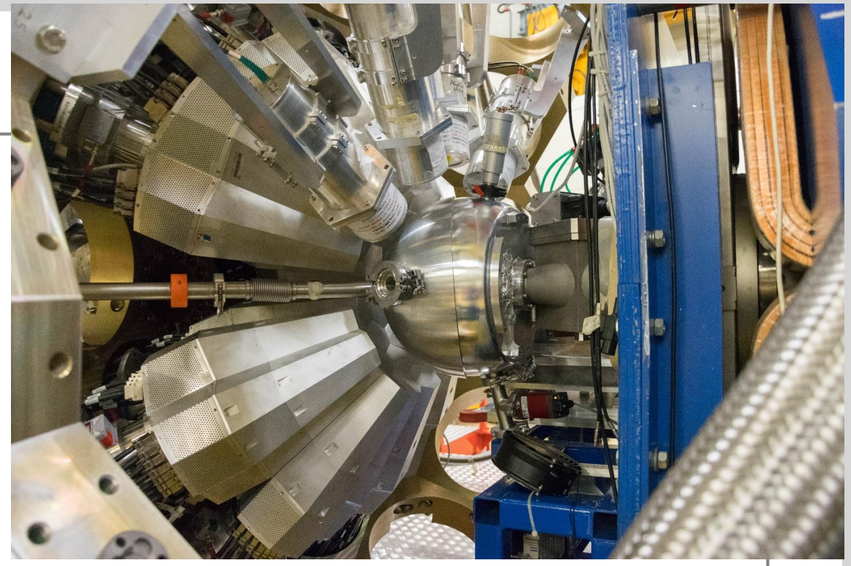
Coulomb excitation of ^{60}Ni - main goals

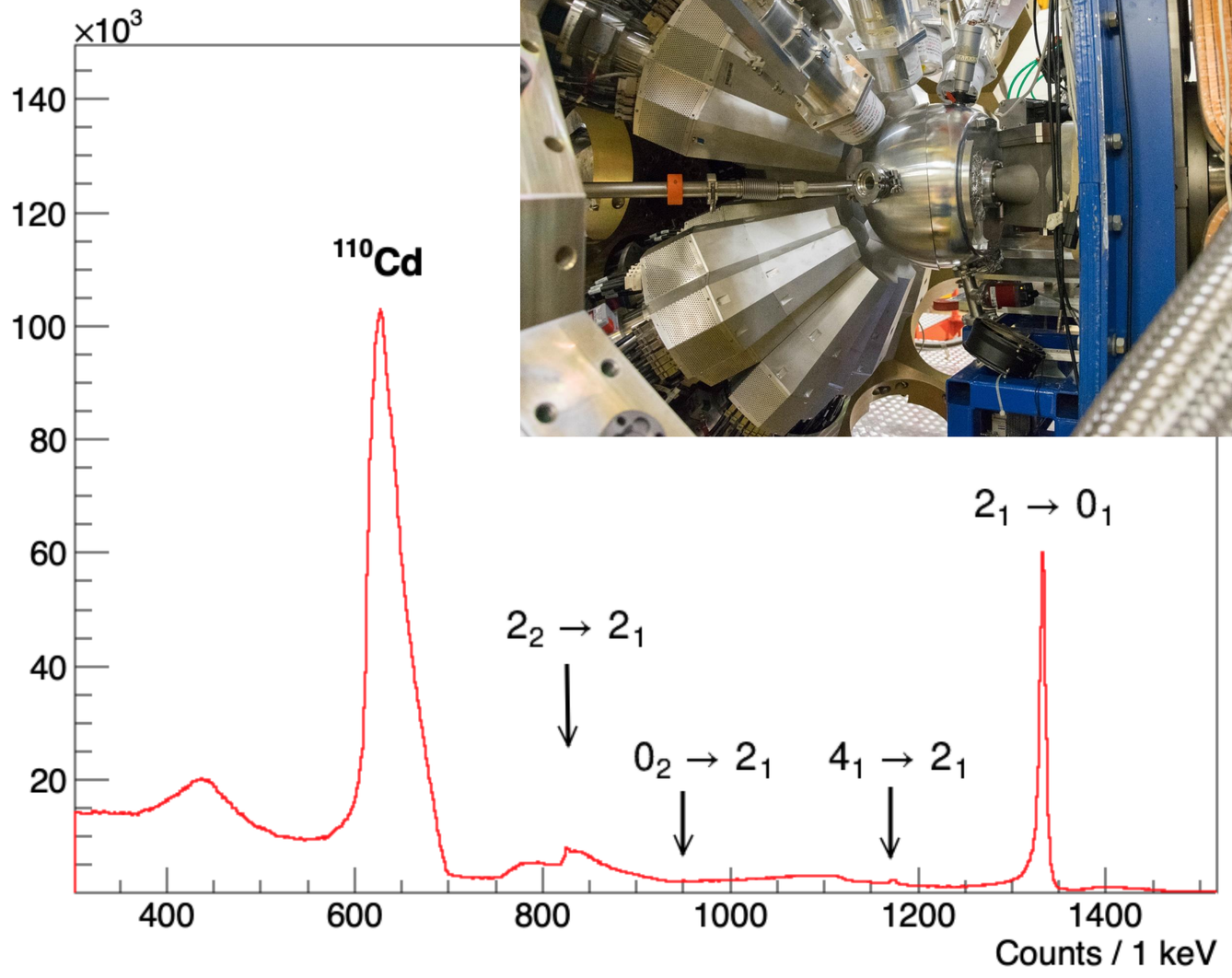


- Population of 0^+ and 2^+ states needed to understand the low-lying structure of ^{60}Ni
- Q(2_1^+) - weakly known (measured in the reorientation experiment, indicating spherical/slightly oblate GS, but electron scattering is giving completely different value)
- 0_2^+ (2284 keV) - lifetime unknown, BE2(0_2^+ -> 2_1^+) never measured
- Deformation of the ground and excited 0^+ states
- Triaxiality - quadrupole moments of the 2^+ states needed

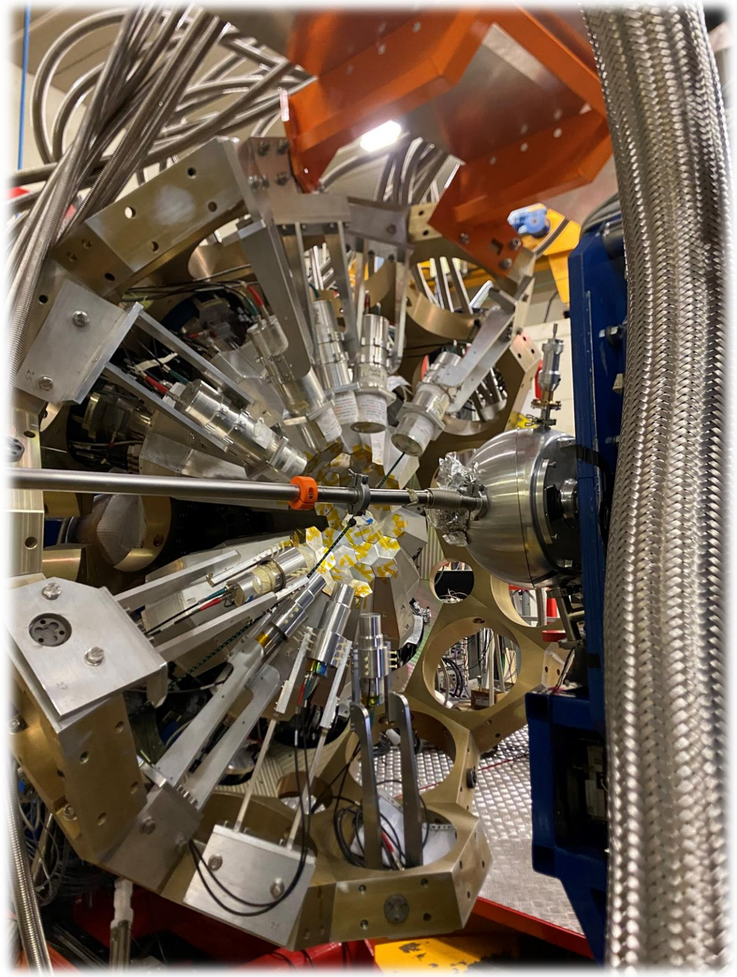
^{60}Ni @ ^{110}Cd exp. 22.41 (2022) -> see the talk by Iwona Piętka

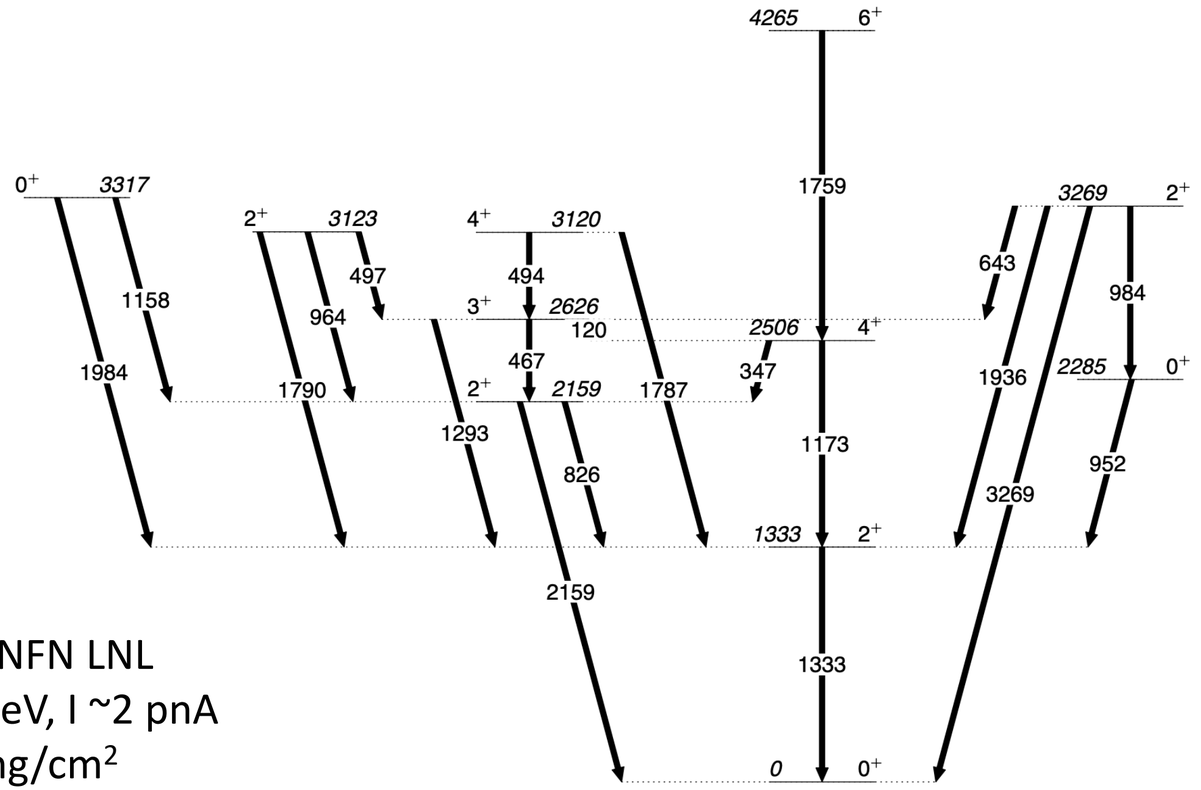
- Coulex data from the AGATA+SPIDER experiment focused on the structure of ^{110}Cd – June and October 2022
- **^{60}Ni (187 MeV) used as a beam, ~2 pnA**
- observed: 2_1(1333 keV), 2_2 (2159 keV), 4_1 (2506 keV) and 4_2 (3120 keV)
- 952 keV - decay from 0^+ - observed!
- some of the crucial ^{60}Ni lines are covered by the background from the Doppler-broadened ^{110}Cd transitions





^{60}Ni - INFN LNL - experiment 23.08 (2023)





- October 2023
- TANDEM XTU @ INFN LNL
- ^{60}Ni beam, 240 MeV, I ~2 pnA
- ^{208}Pb, 1 and 2.5 mg/cm^2

- AGATA, 12* triple clusters
- SPIDER, 7 sectors, 8 rings : 128-160^o

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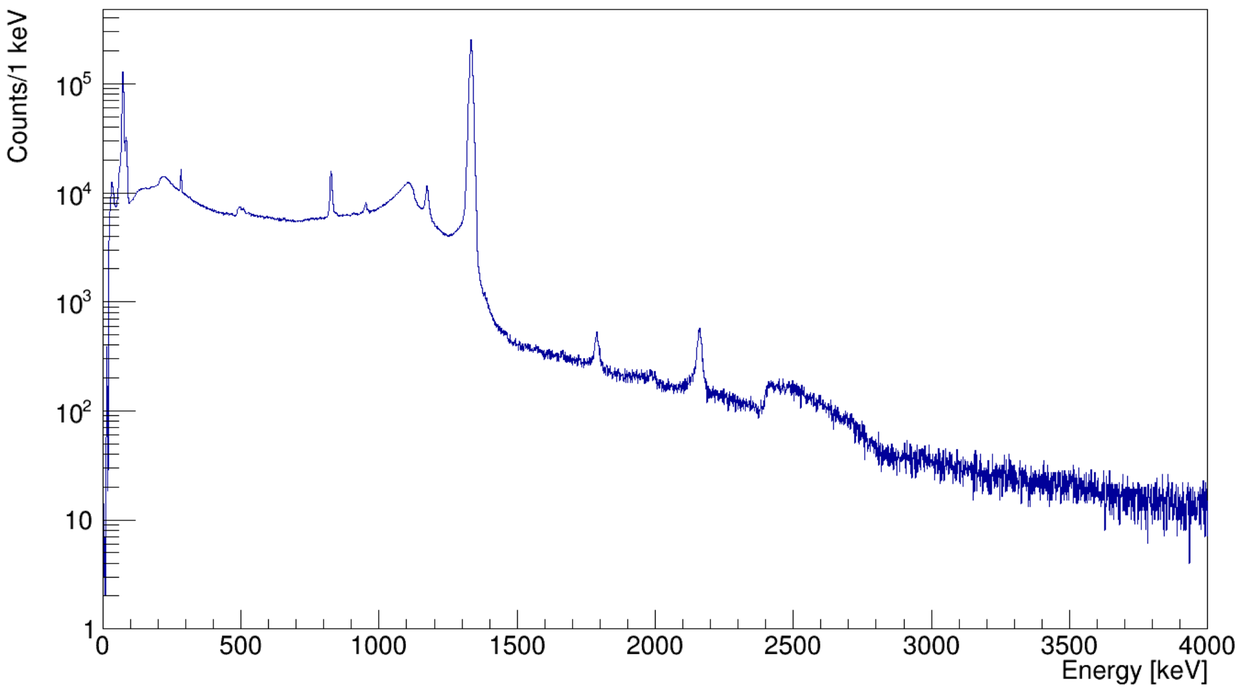

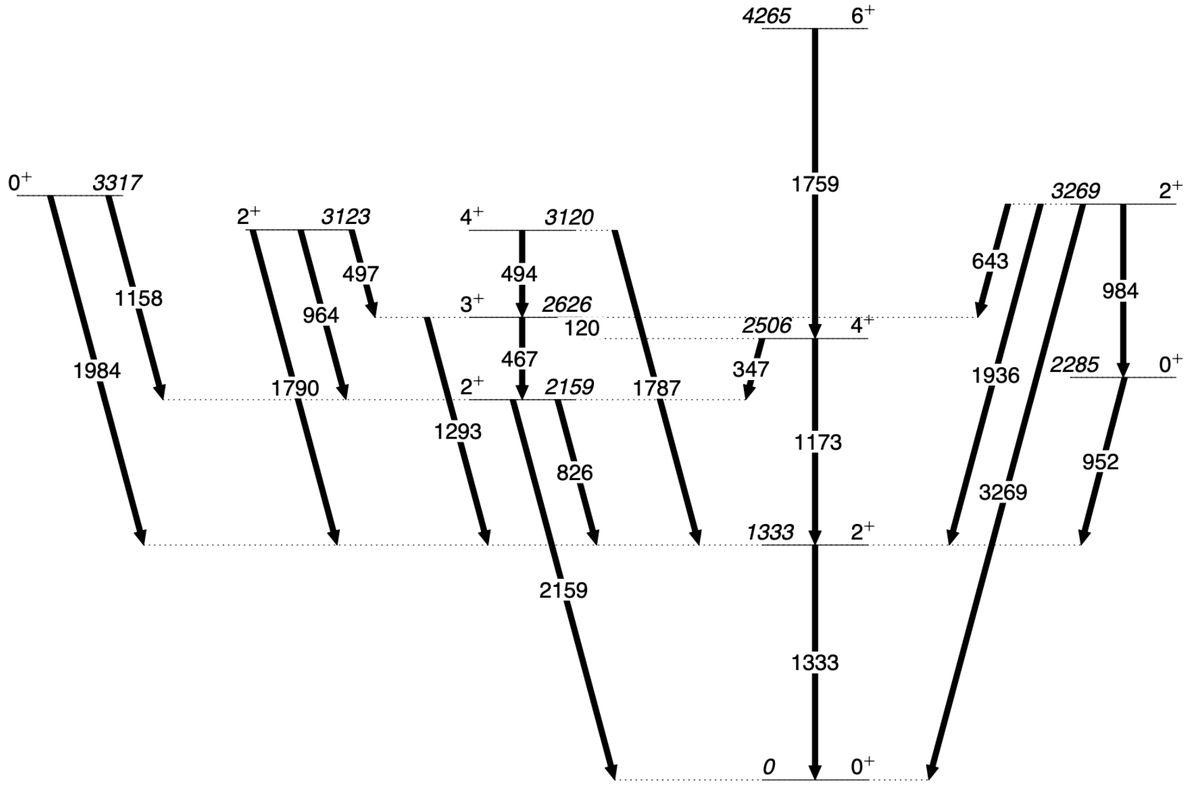

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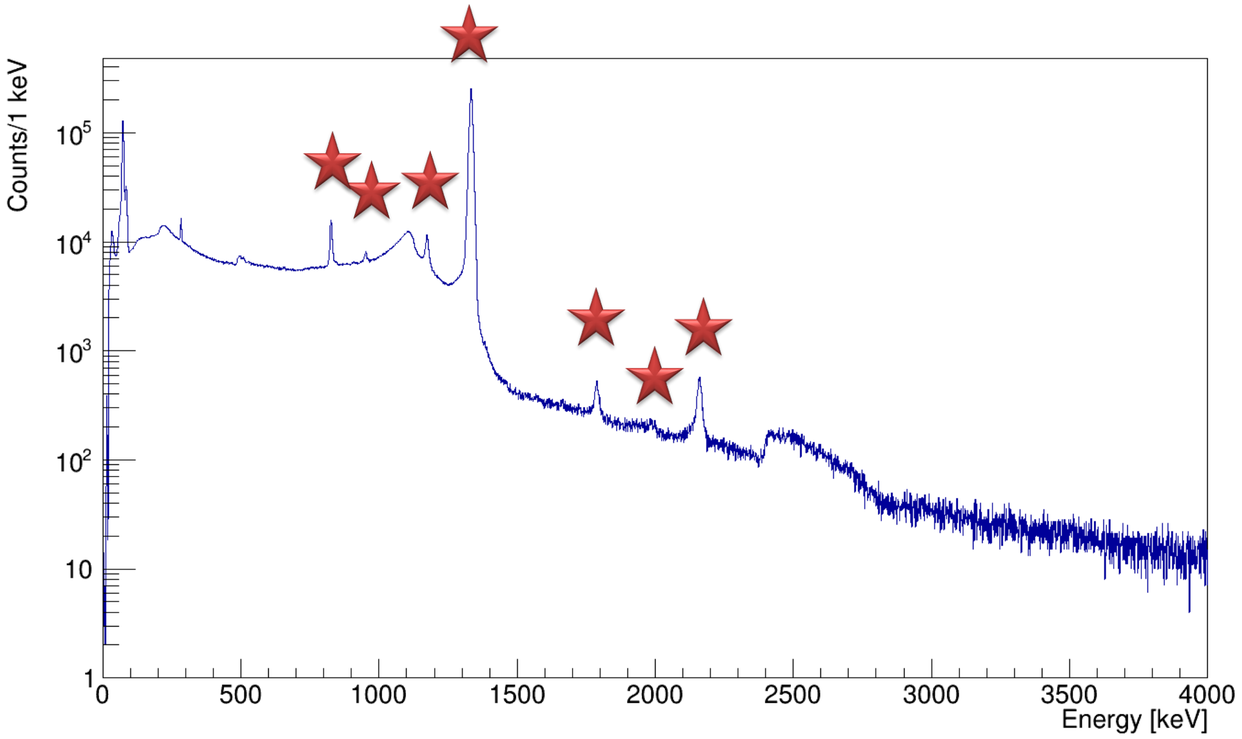

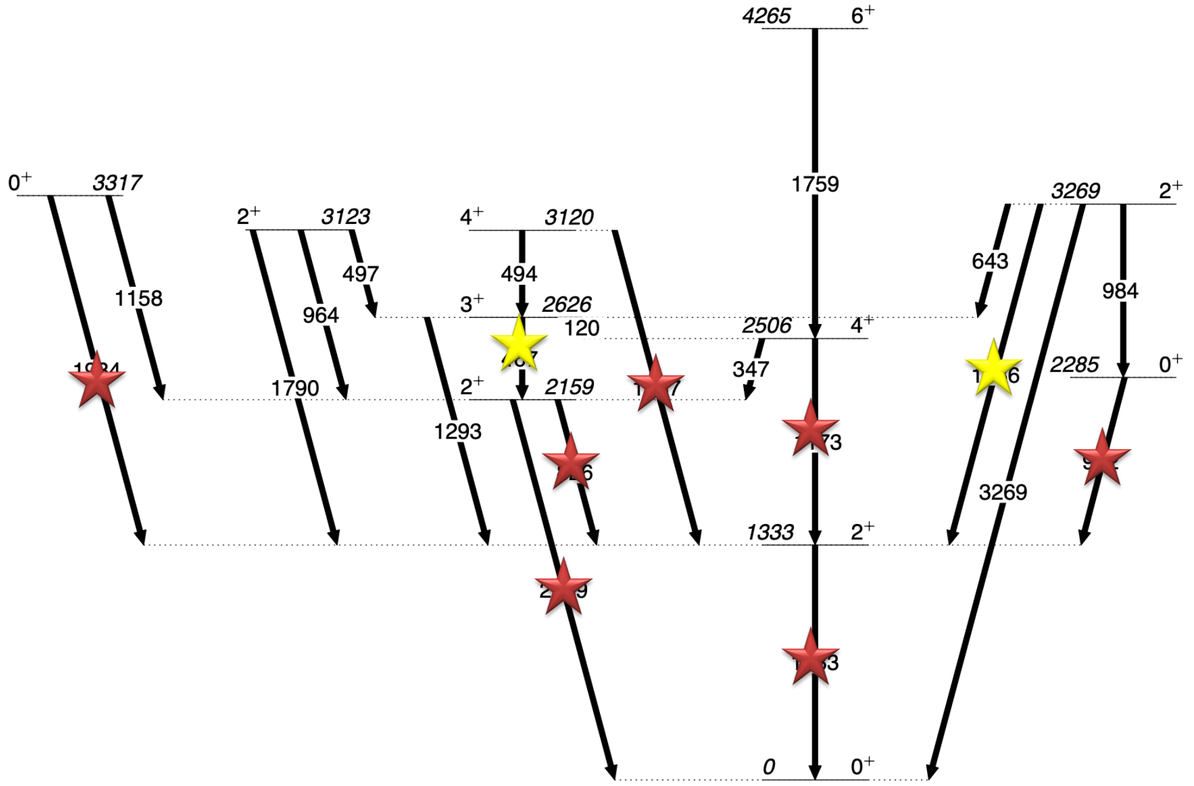

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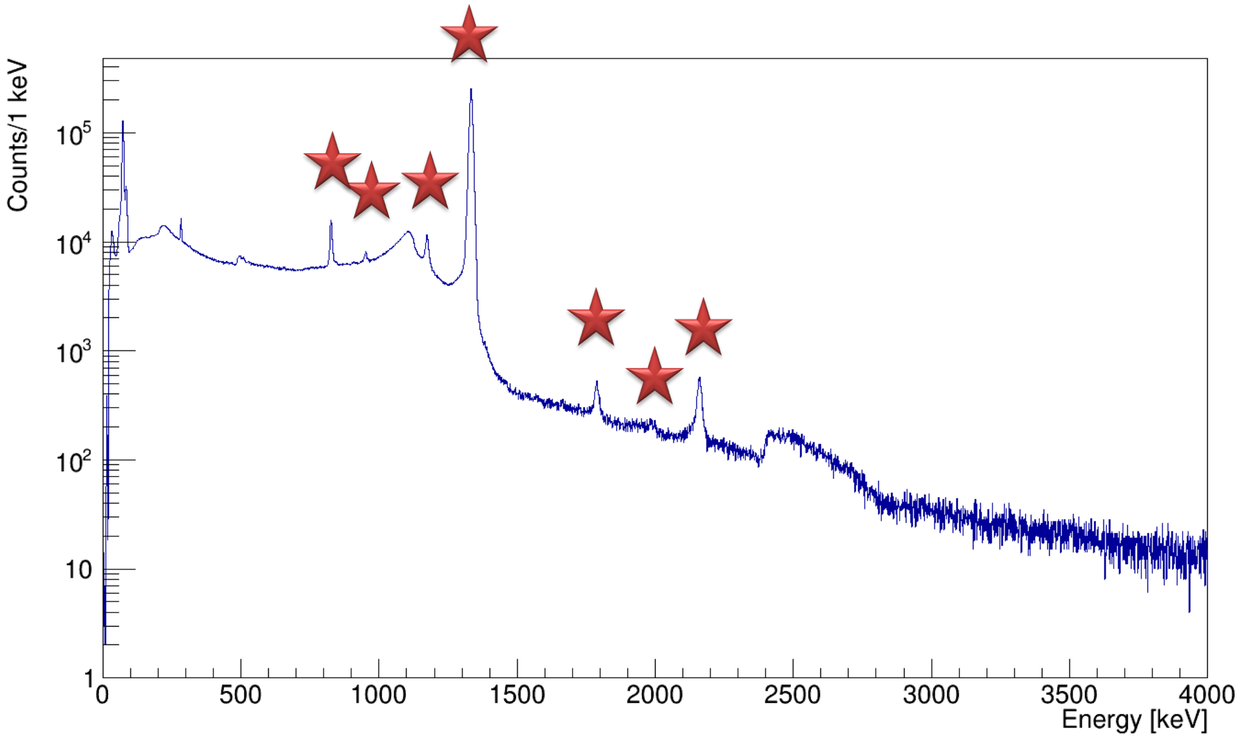
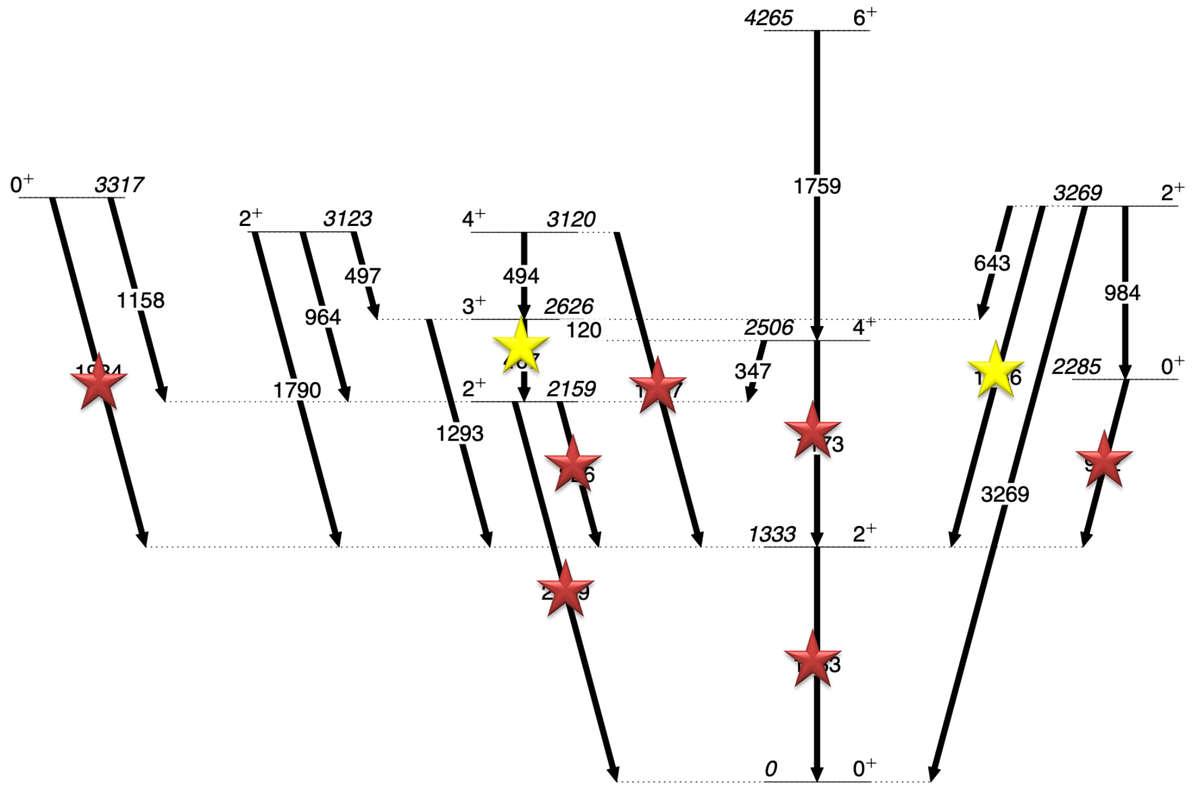


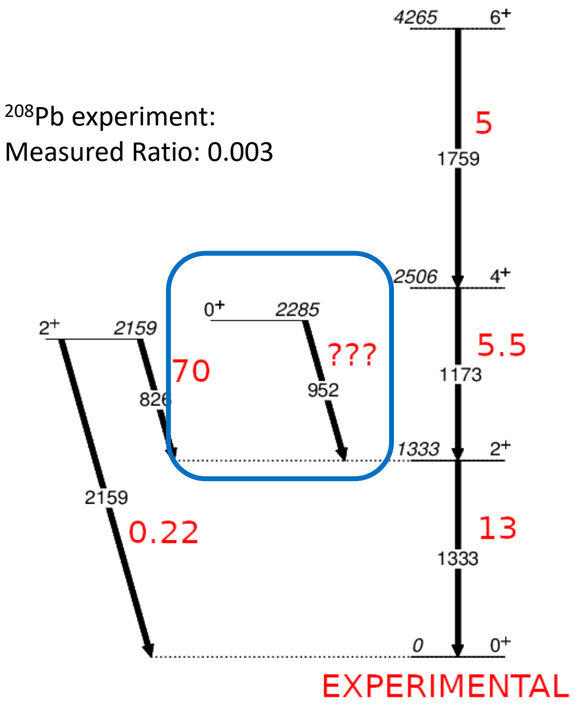


Analysis is ongoing

Starting from Oct 2024 – Agata Krzysiek (Faculty of Physics, Uni of Warsaw, Poland)

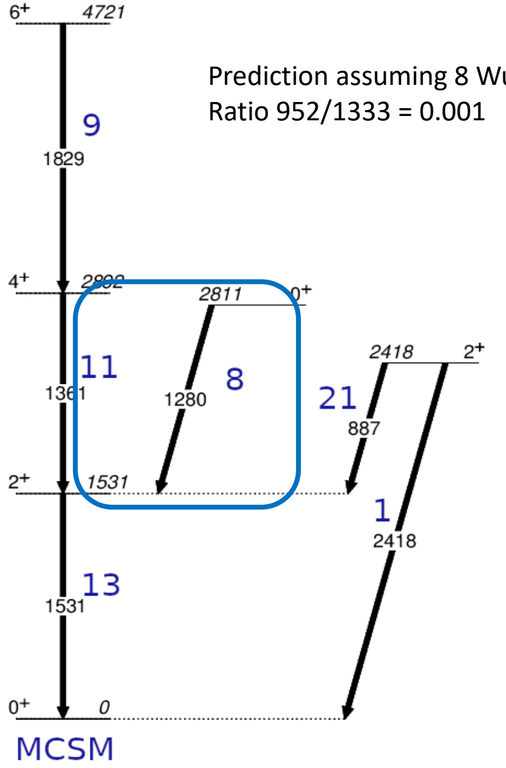
COULEX of ^{60}Ni – GOSIA calculations vs. experiment

^{208}Pb experiment:
Measured Ratio: 0.003



EXPERIMENTAL

Prediction assuming 8 Wu:
Ratio 952/1333 = 0.001



MCSM

Monte Carlo Shell Model
T. Otsuka, Y. Tsunoda
priv. comm.

To-do list (first stage of the analysis)

- Basically everything, starting from the AGATA calibrations (the analysis was put on hold due to the technical problems)
- Neutron damage correction
- Doppler correction has to be improved – the nearline DC was not optimal

  (several parameters in the nearline selector.conf have to be optimised, such as target thickness – RBS @ INFN Firenze, M. Chiari)

- ^{208}Pb, 1 mg/cm^2 (nominal)
  - Irradiated region: 0.781 +/- 0.007 mg/cm^2 (carbon on the surface: 9.7 +/- 1.1 ug/cm^2.)
  - Not irradiated region: 0.76 +/- 0.03 mg/cm^2 (carbon on the surface: 0.88 +/- 0.16 ug/cm^2.)
- ^{208}Pb, 2.5 mg/cm^2 (nominal)
  - Irradiated region: 3.93 +/- 0.12 mg/cm^2
  - Not irradiated region: 3.87 +/- 0.04 mg/cm^2

- SPIDER position (angles) has to be corrected
- p-g timing – a good background reduction

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Thank you