Temperature evolution of the GDR width and Jacobi shape transitions in hot rotating ^{88}Mo nuclei

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Plan of speach

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   - GDR width
2. Experimental setup
   - Detectors
   - Reactions
3. Data analysis
4. Results
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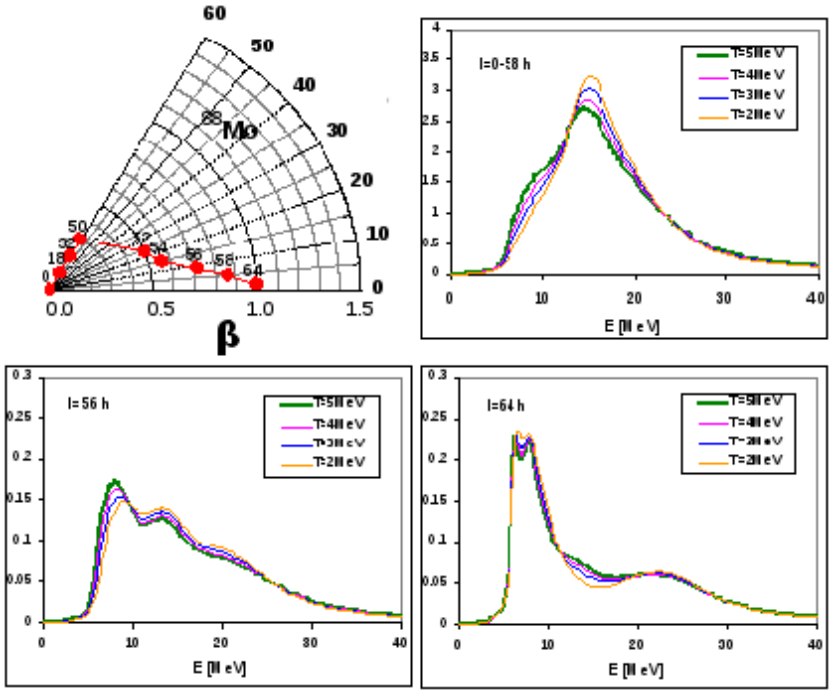
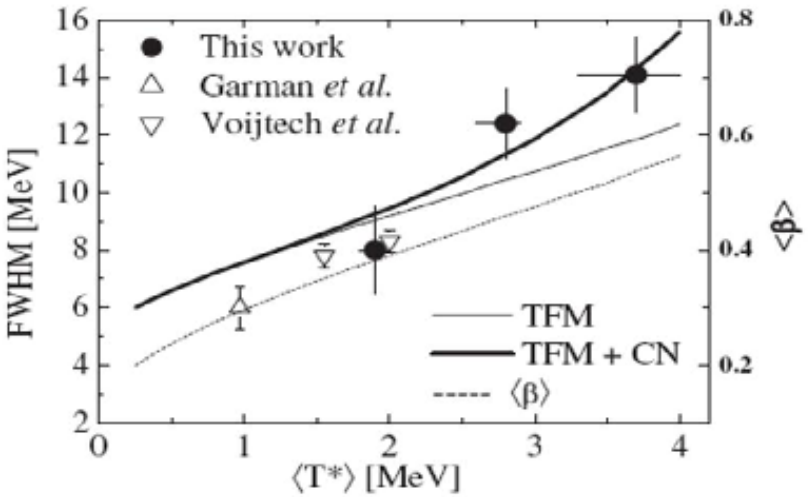
   - GDR spectra
5. Conclusions and future

Jacobi shape transition is predicted as an abrupt change of an oblate shape at the so called critical value of spin.



LSD model calculations

Angular momentum evolution of the equilibrium shape of ^{88}Mo. Calculated GDR strength functions at different temperatures: b) integrated over whole spin distribution of the compound nucleus; c) for I=56, at the Jacobi regime; d) for I=64 - slightly above the fission limit.

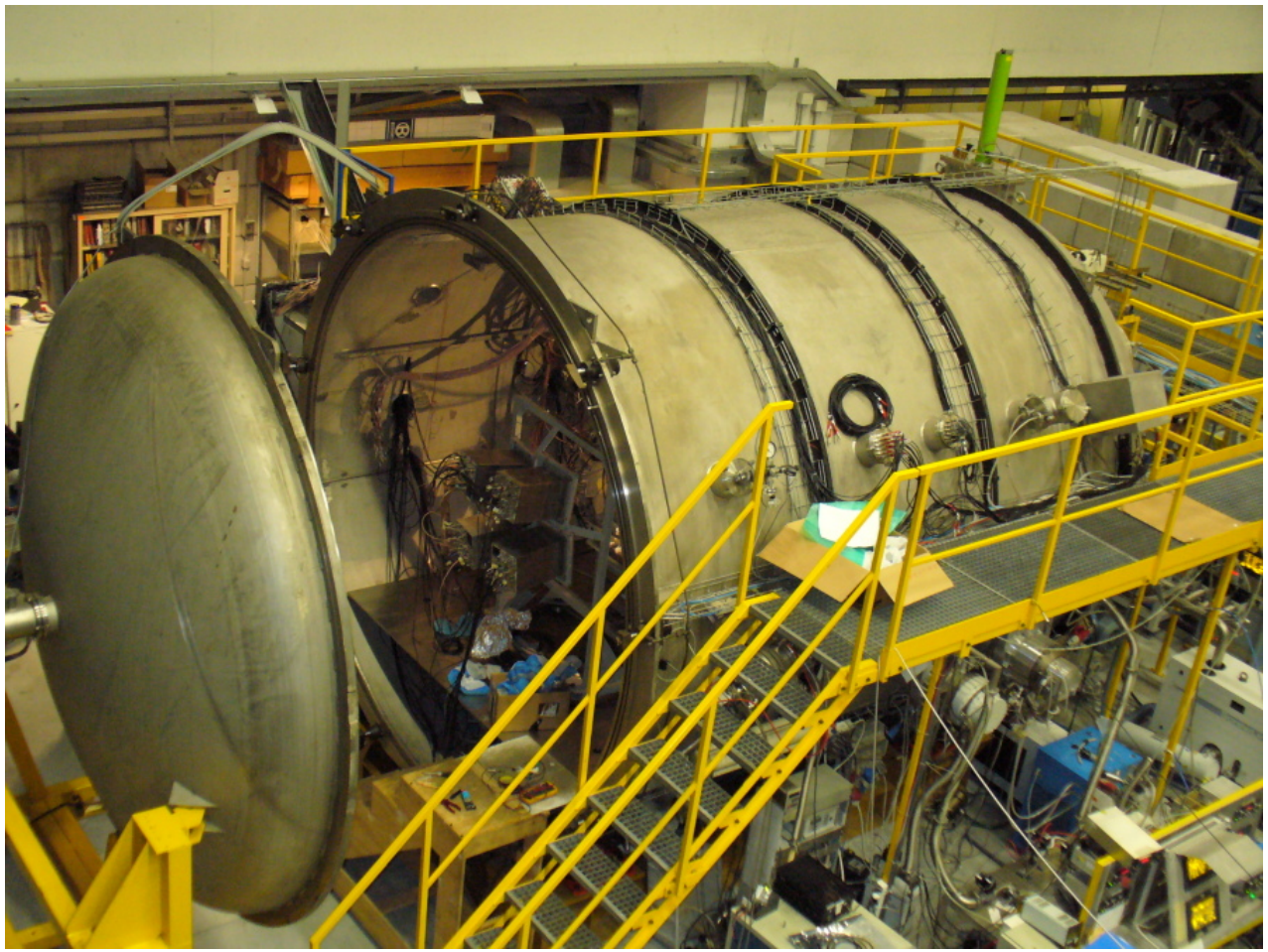


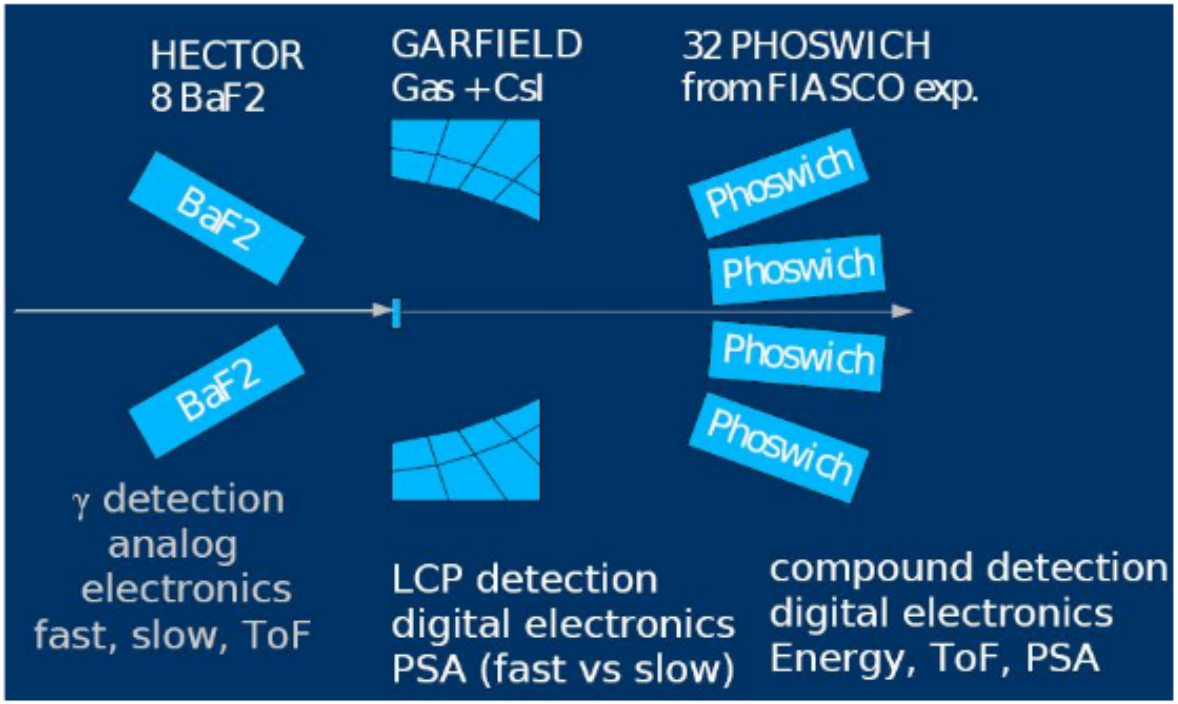
O. Wieland et al.

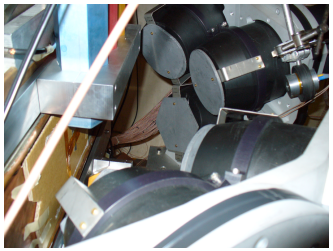
Recent results from the GARFIELD + HECTOR experiment in Legnaro, for the A=130 mass region in temperature interval T=2-4 MeV.

The change of the GDR width with angular momentum and temperature reflects the role played by quantal and thermal fluctuations in the damping of the giant vibrations.

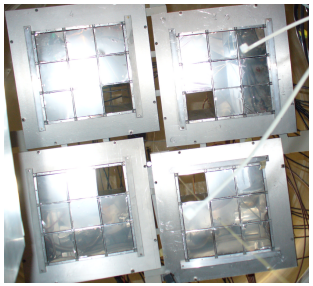
All of the measurements were performed at Legnaro National Laboratory, Italy.
Detectors were mounted in large vaccum chamber:







HECTOR array



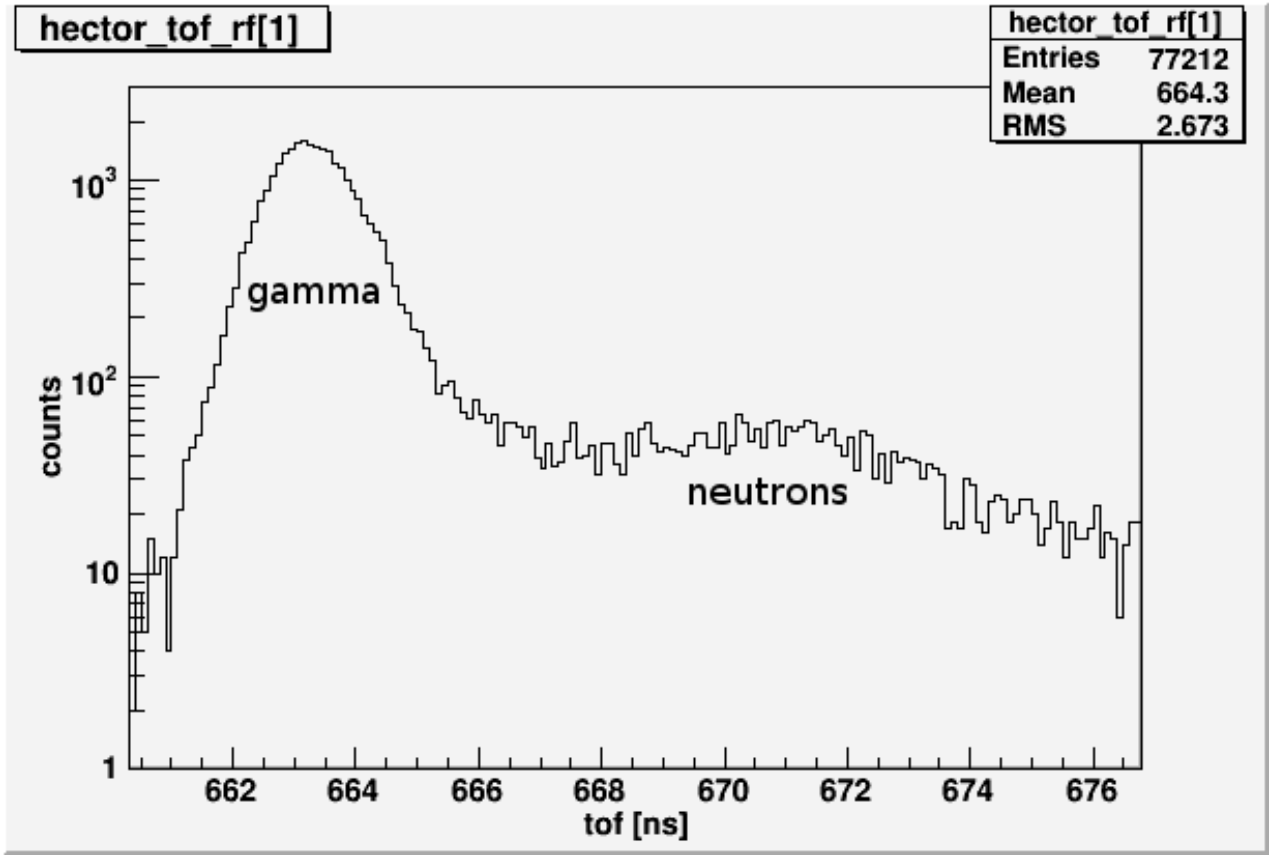
PHOSWICH detectors

Used reactions

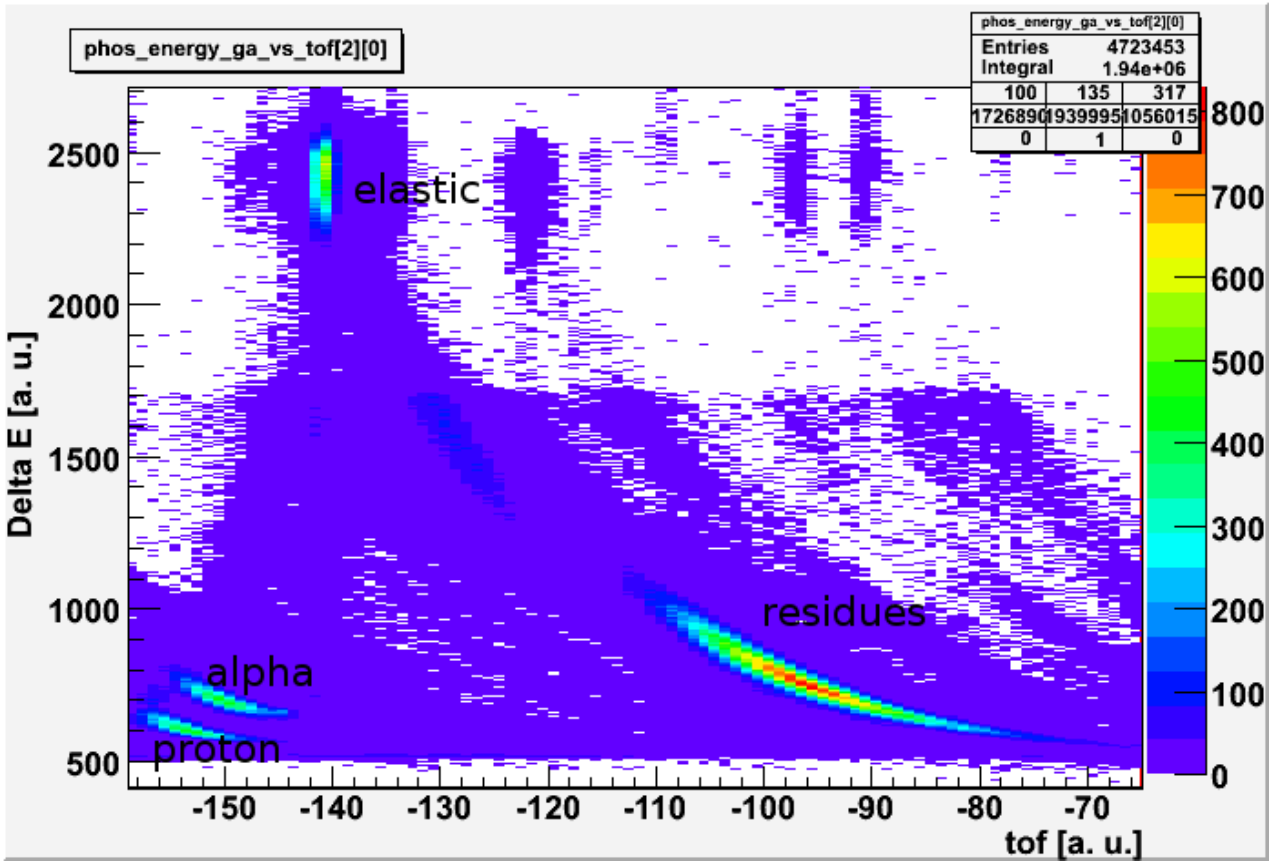
- ^{48}Ti beam + ^{40}Ca target $\longrightarrow$ ^{88}Mo at beam energy 300 MeV (temperature 3 MeV),
- ^{48}Ti beam + ^{40}Ca target $\longrightarrow$ ^{88}Mo at beam energy 450 MeV (temperature 3.8 MeV),
- ^{48}Ti beam + ^{40}Ca target $\longrightarrow$ ^{88}Mo at beam energy 600 MeV (temperature 4.5 MeV).

For all energies thin – 0.5 mg cm^{-2} – ^{40}Ca target was used.

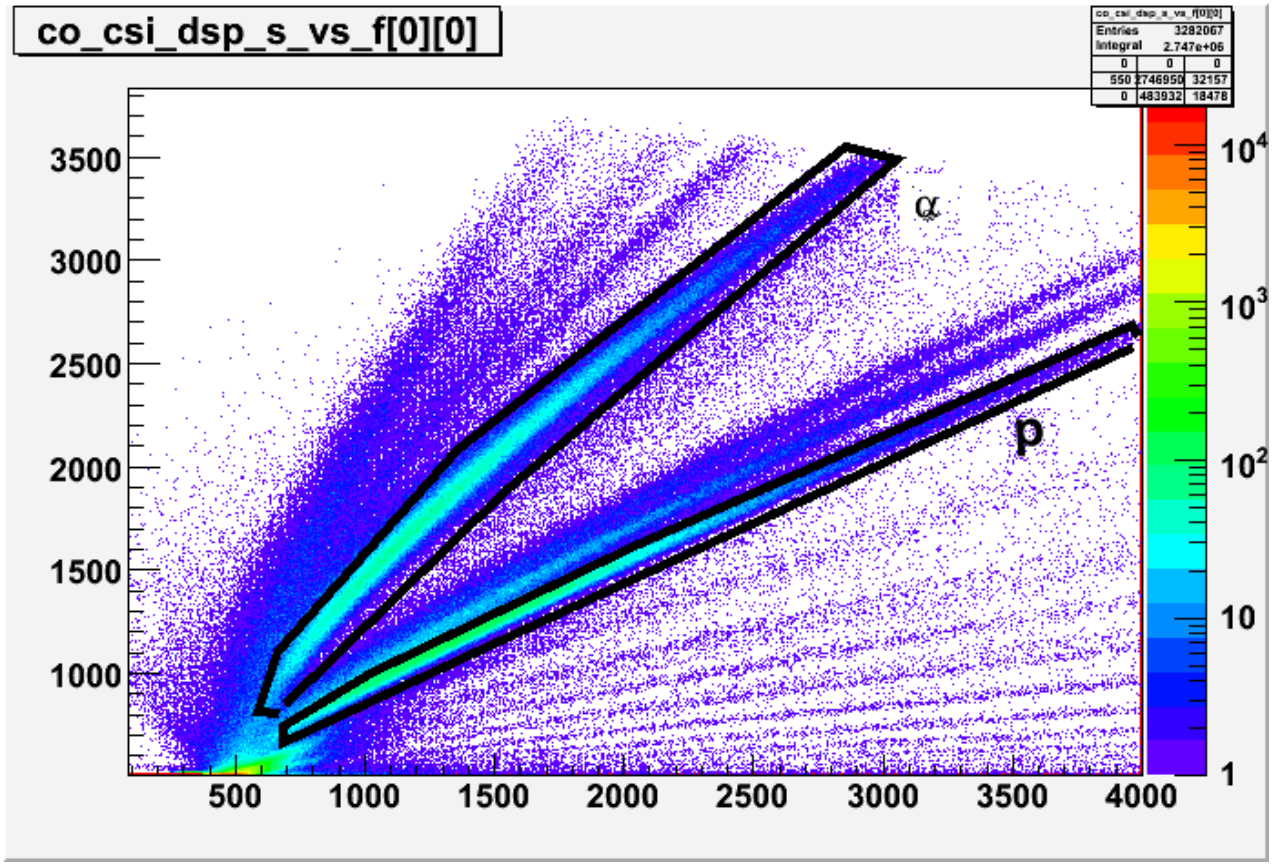
Removal of neutron energy deposits in BaF_2 crystals by ToF method.



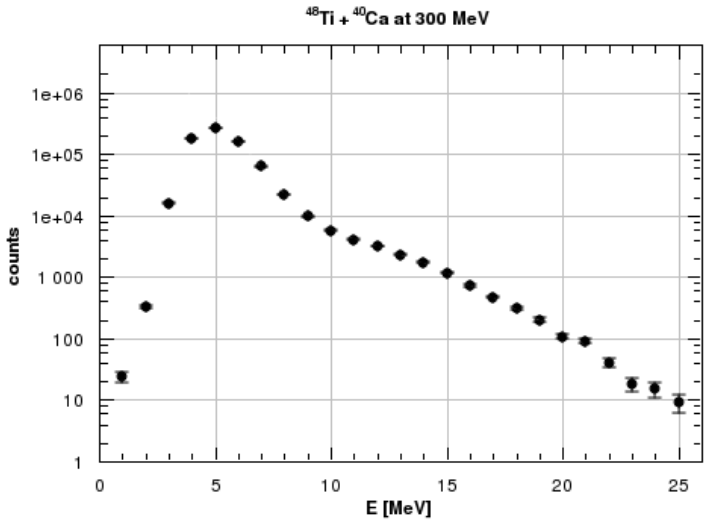
Selection of residues and light charged particles in PHOSWICH detector.



Selection of light chagred particle in GARFIELD array.



CASCADE
GDR spectra



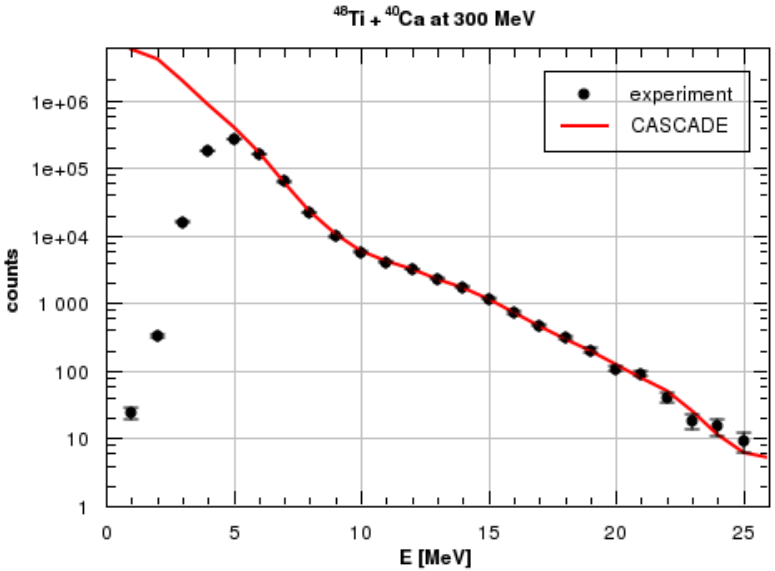
Spectrum of γ-rays measured by HECTOR array, gated by ToF and residues.

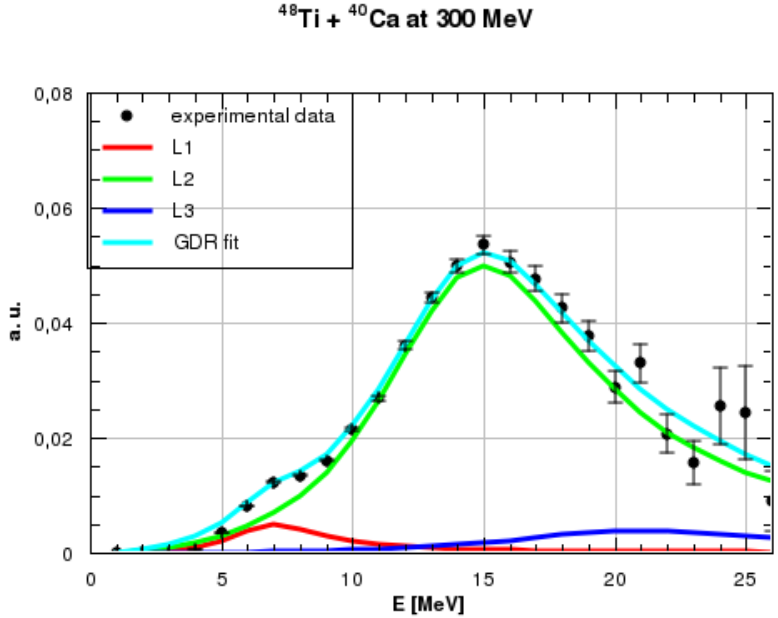
Procedure of analysing γ-rays data:

1. Run CASCADE with defined GDR parameters,
2. Divide experimental spectrum by simulated one,
3. Multiply result by GDR spetrum which was used as input to CASCADE,
4. Compare input GDR with GDR spectra,
5. Modify input GDR parameters and return to point 1.

Monte Carlo CASCADE with Reissdorf density level parametrisation.

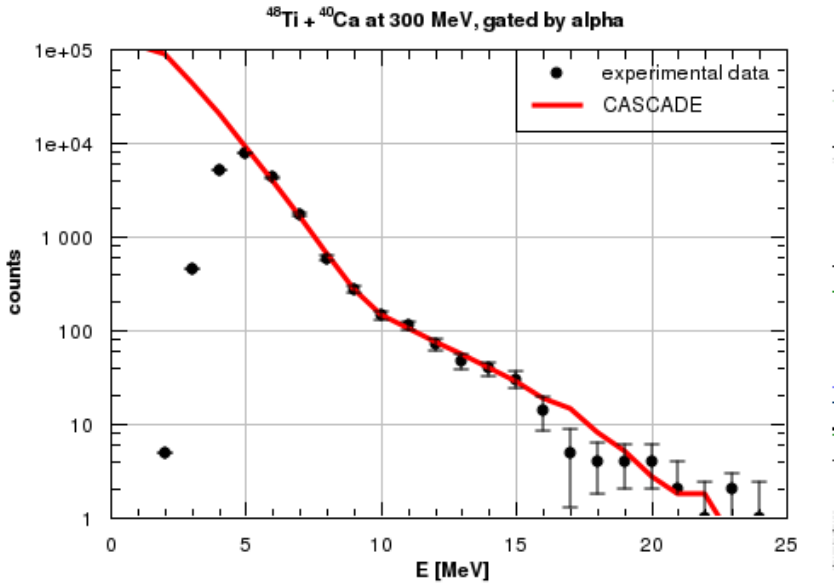
GDR spectra of ^{88}Mo created in 300 MeV reaction (E*= 126 MeV)

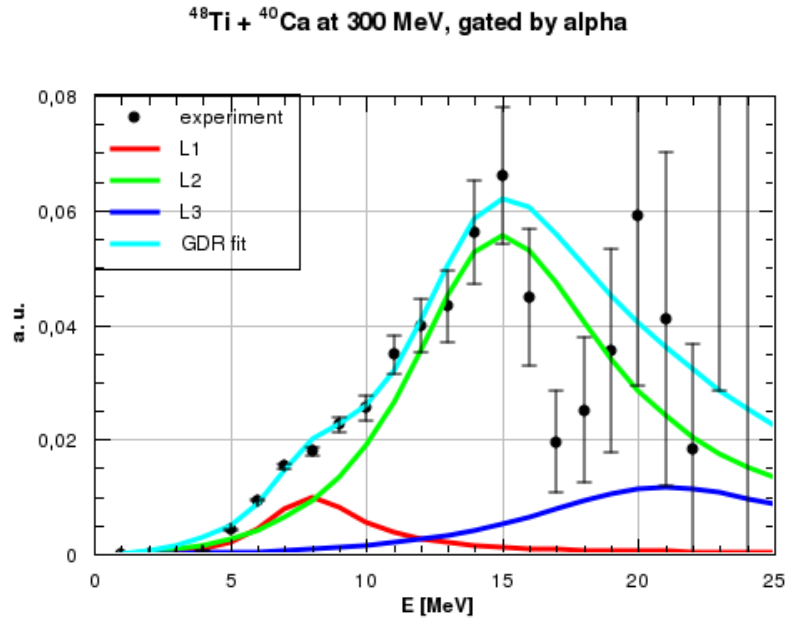




$< \Gamma > = 11.5$ MeV

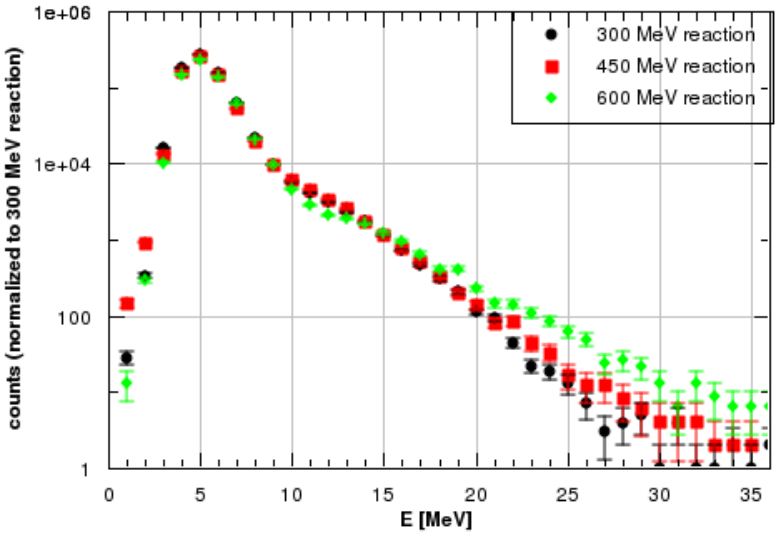
GDR spectra for 300 MeV reaction, gated on alpha particles to choose higher spin of compound nucleus

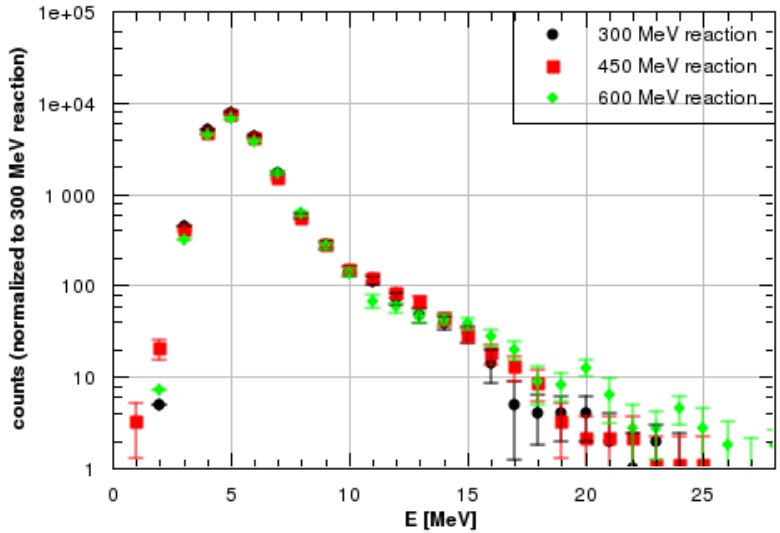




$< \Gamma > = 12.5$ MeV

Comparison of obtained GDR spectra for three different reaction energies





Conclusions

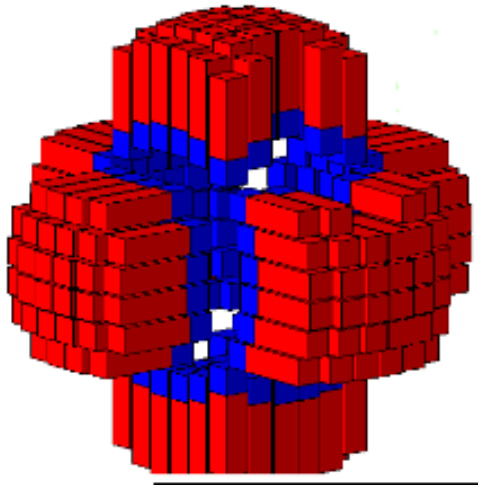
- Obtained low energy (9MeV) GDR component can indicate existance of Jacobi shape transition in ^{88}Mo,
- We see increasing GDR width with increase of angular momentum, by gating γ-rays spectrum with alpha particles
- Also we observed change of GDR shape with changing the temperature of compound nucleus,

Possible continuation of investigation GDR width and Jacobi shapes in Mo nuclei (e.g. ^{98}Mo)

Reaction

$^{68}\mathrm{Ni} + {}^{30}\mathrm{Si} \rightarrow {}^{98}\mathrm{Mo}$

Measure at SPIRAL2 by PARIS detector array.



HECTOR and GARFIELD Collaboration:

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