The decay pattern of the PDR in ^{128}Te using the γ^3-setup

Johann Isaak

ExtreMe Matter Institute EMMI and Research Division, GSI

The 5th international conference on

„Collective Motion in Nuclei under Extreme Conditions“

Krakow, September 14 - 18, 2015

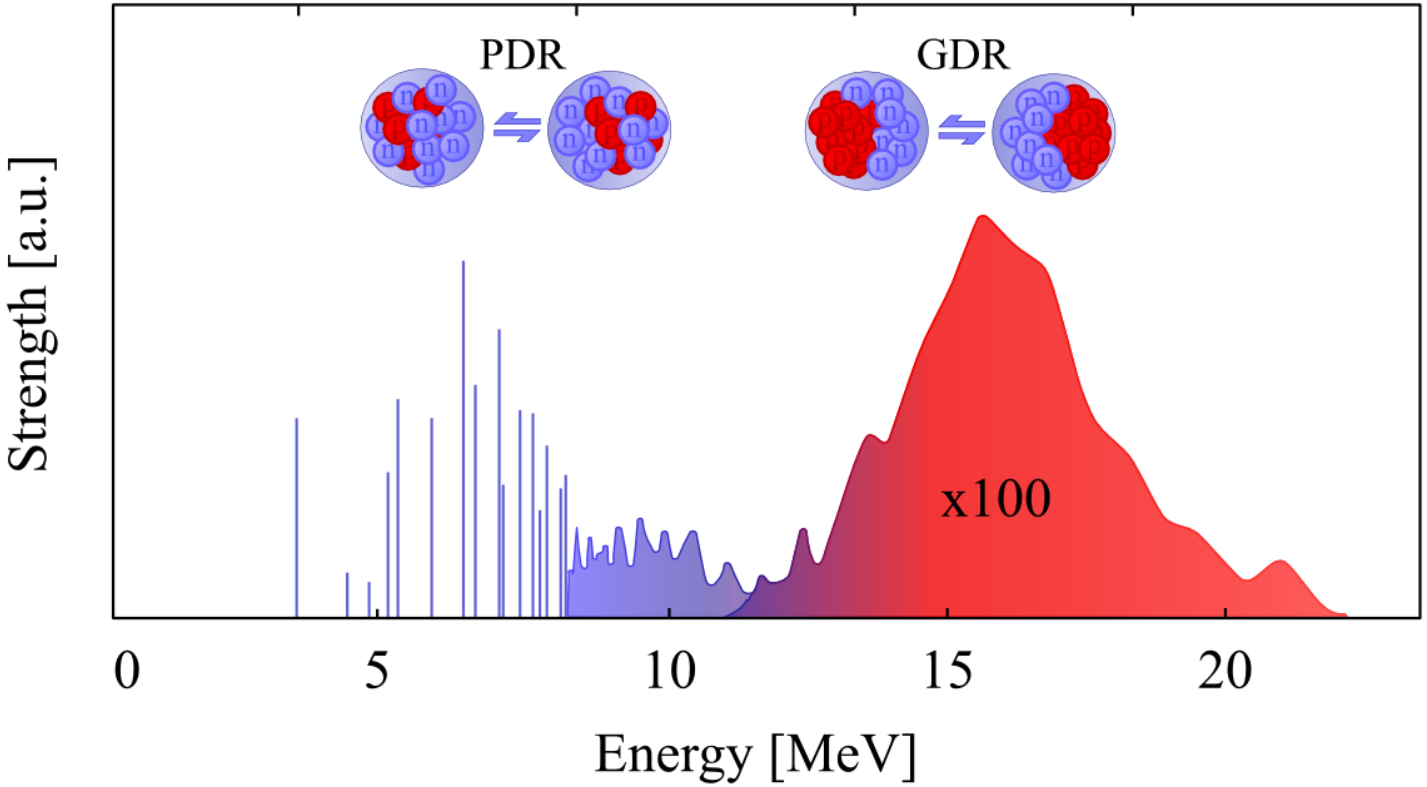
FIAS Frankfurt Institute for Advanced Studies

EMMI

γ^3

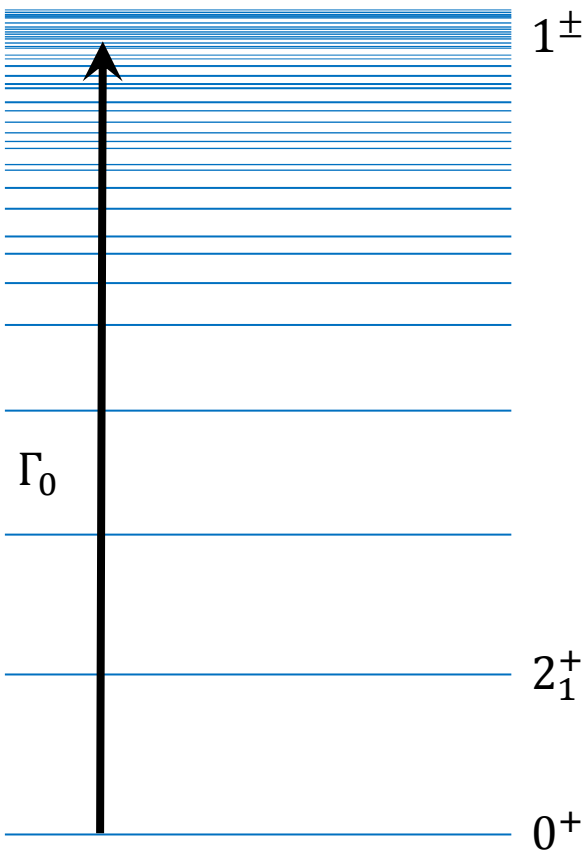
GSI

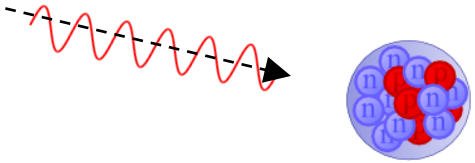
What is the Pygmy Dipole Resonance ?



How to investigate the Pygmy Dipole Resonance ?

Nuclear Resonance Fluorescence (NRF)





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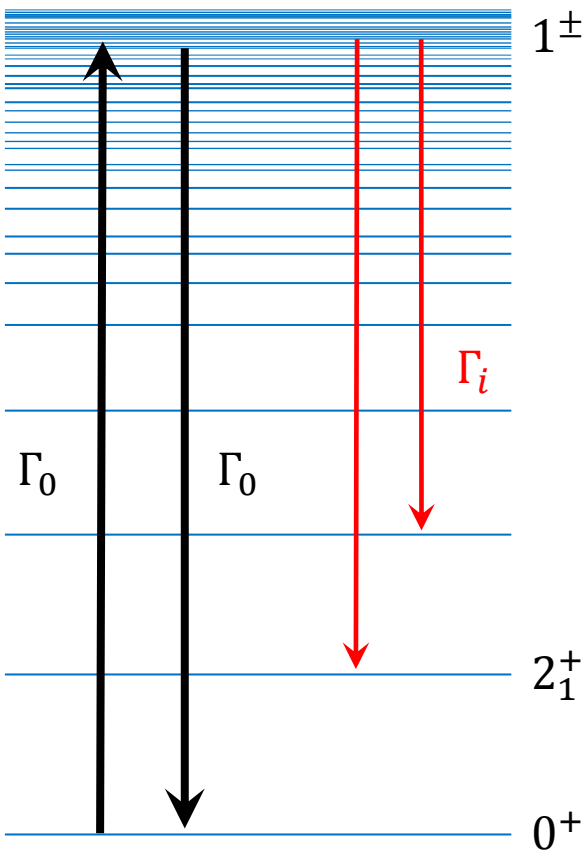

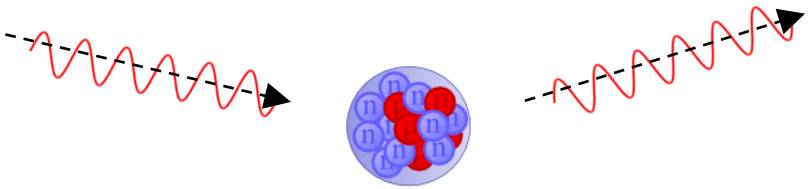

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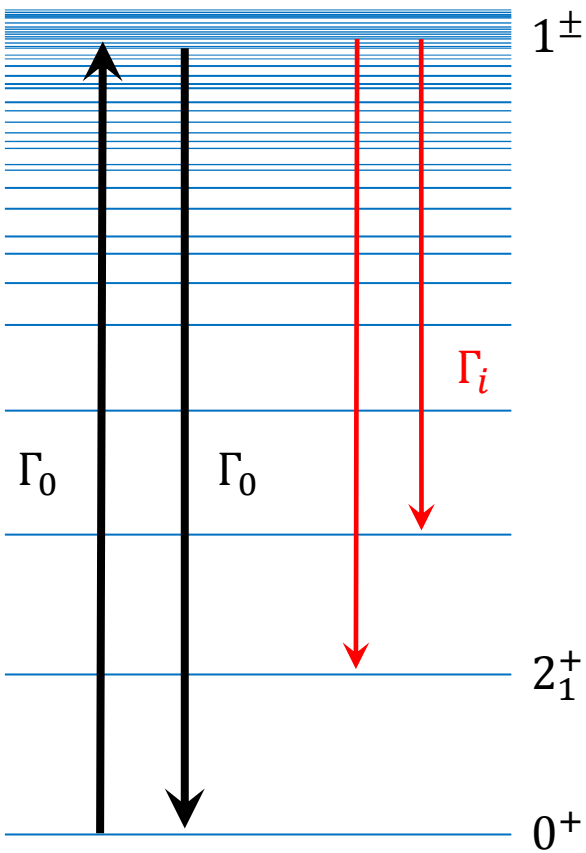
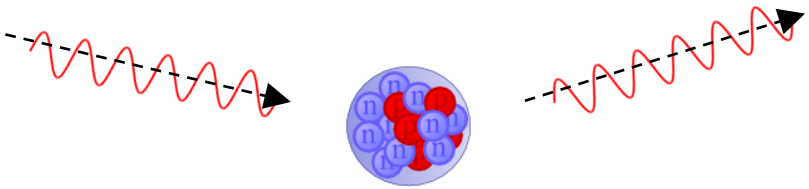
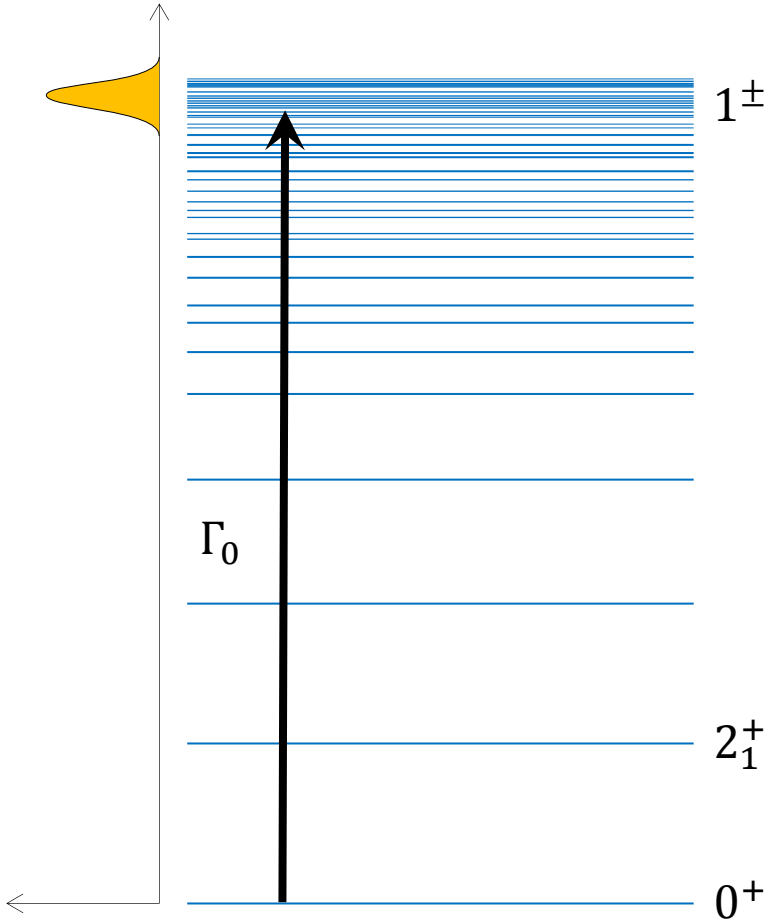




- selective to J=1 states
- model independent
  - spin
  - parity
  - transition strength
- **low sensitivity for small Γ_i**

γ-γ coincidence at HIγS → γ^3- setup

Nuclear Resonance Fluorescence (NRF)



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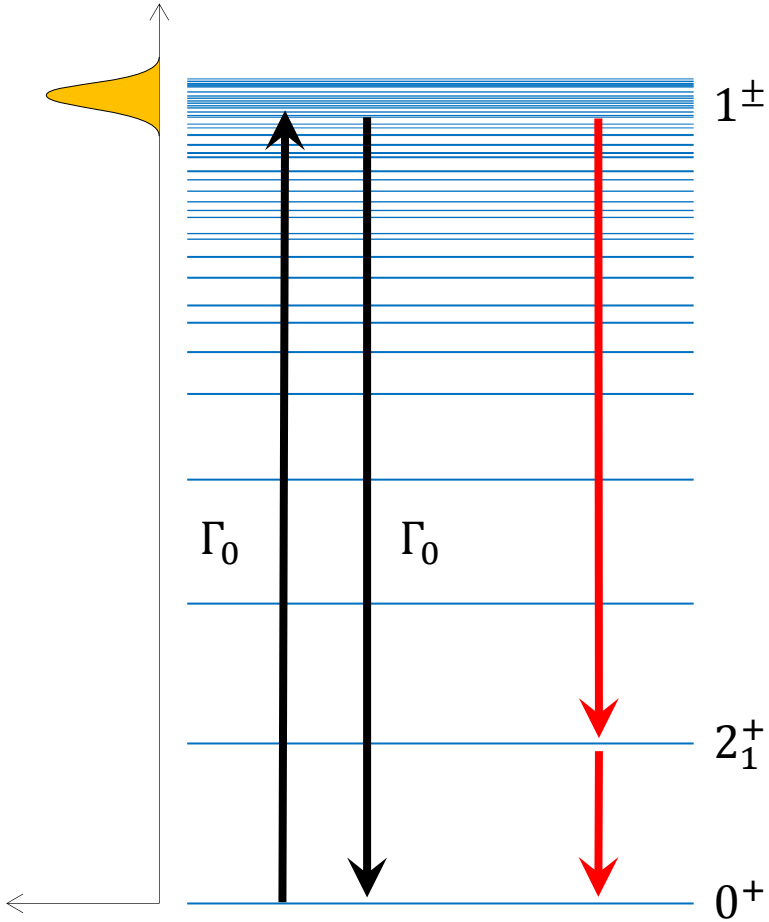

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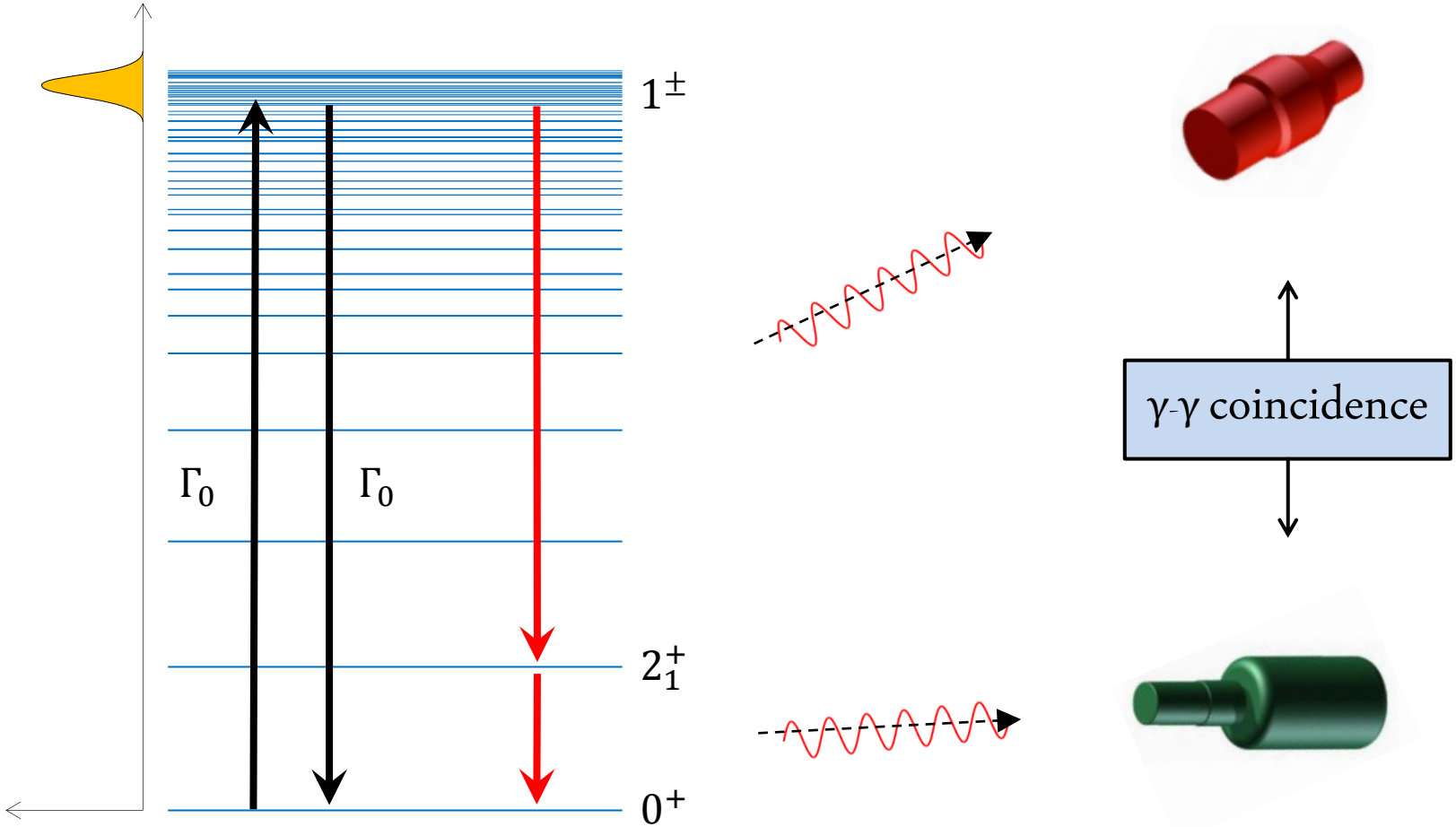

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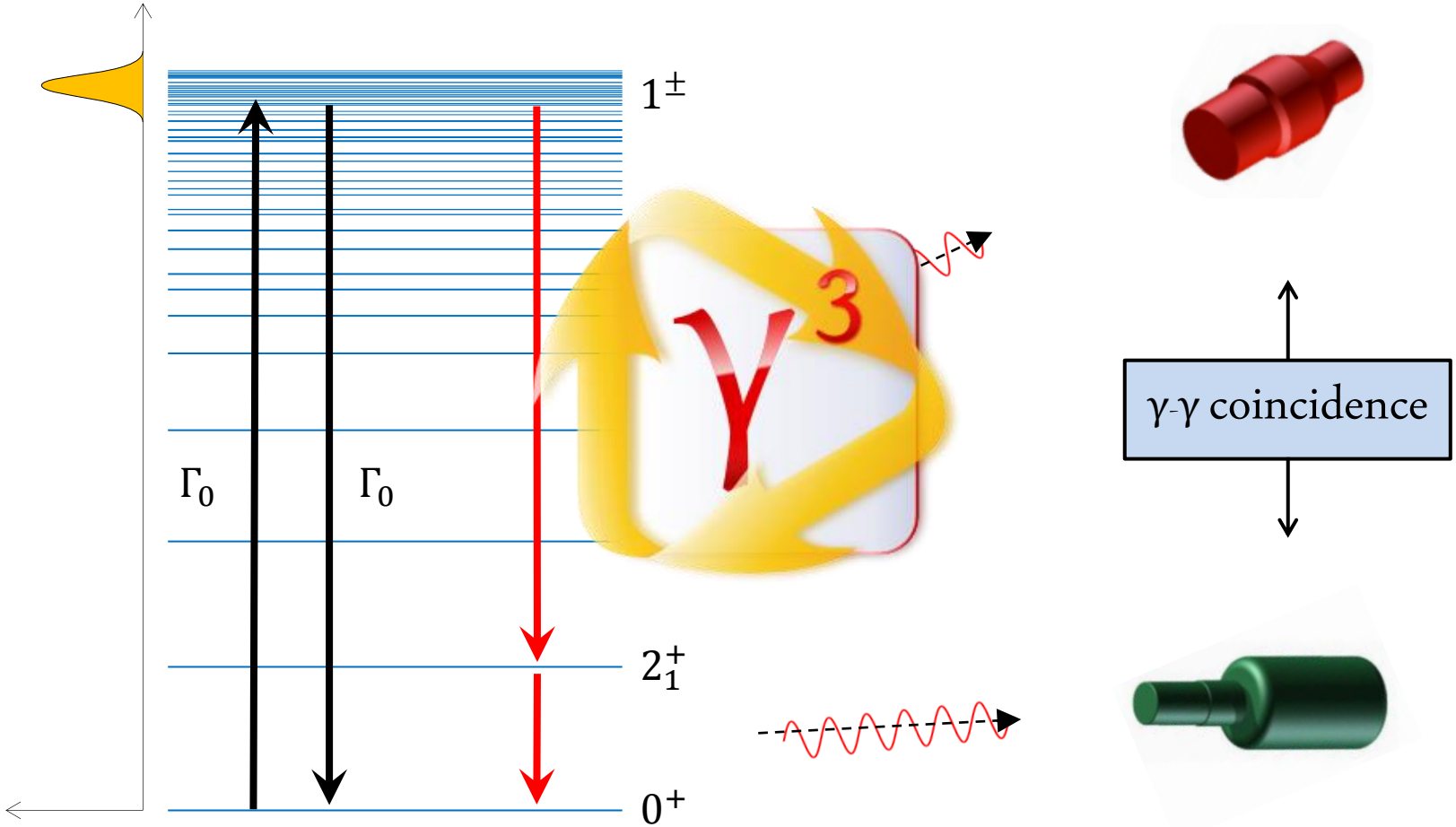
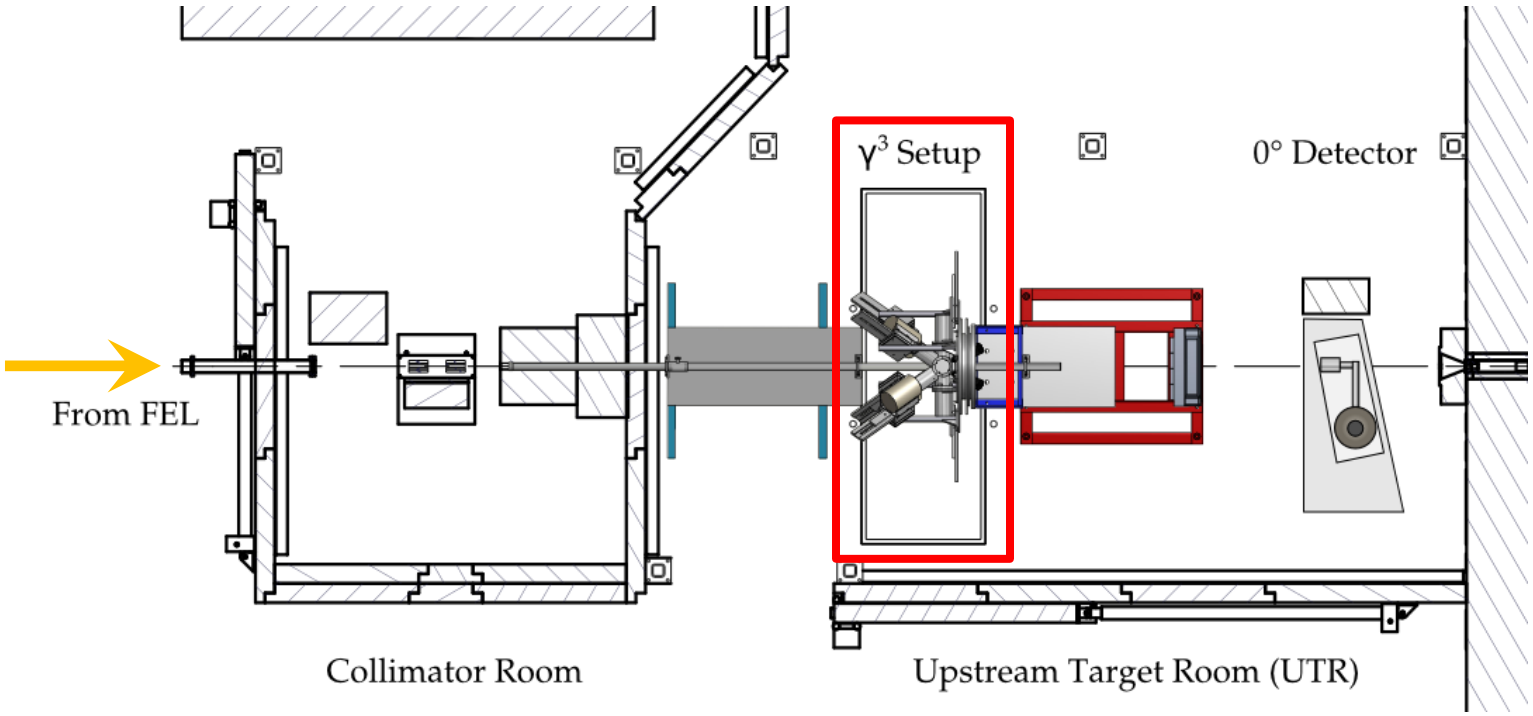


γ^3- setup

B. Löher *et al.*, NIMA **723** (2013) 136



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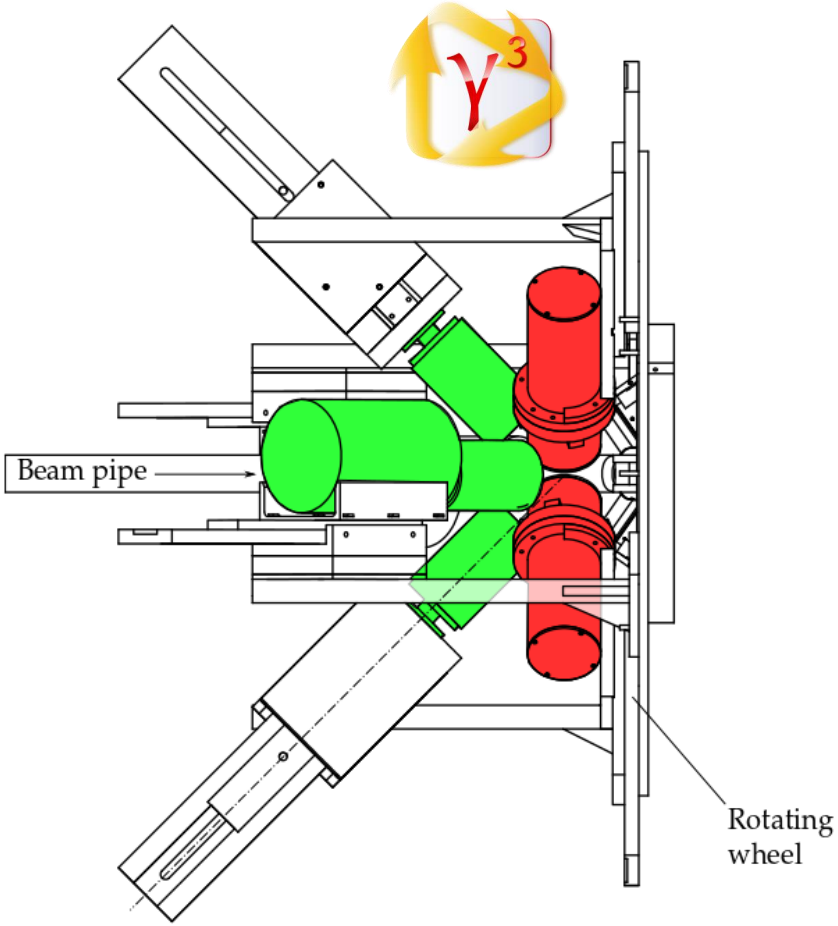

γ^3- setup

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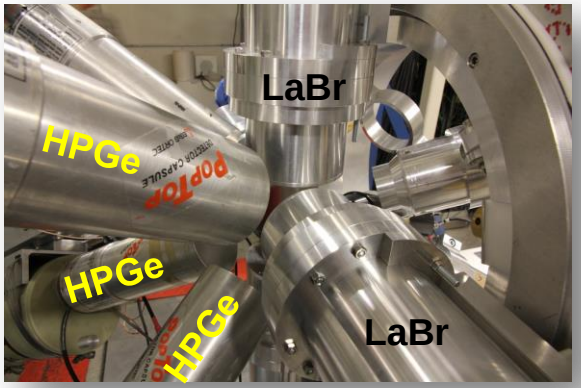
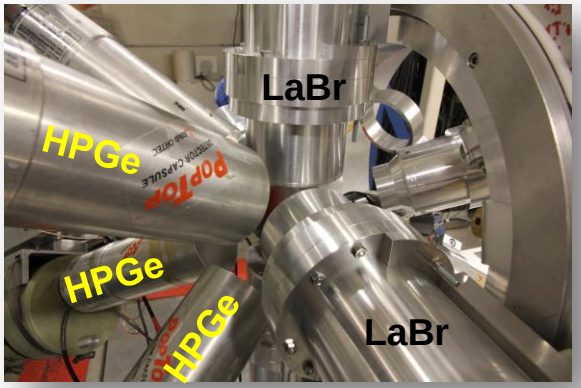


- combination of:
  - high energy resolution HPGe
  - high efficiency LaBr

γ^3- setup

B. Löher *et al.*, NIMA **723** (2013) 136



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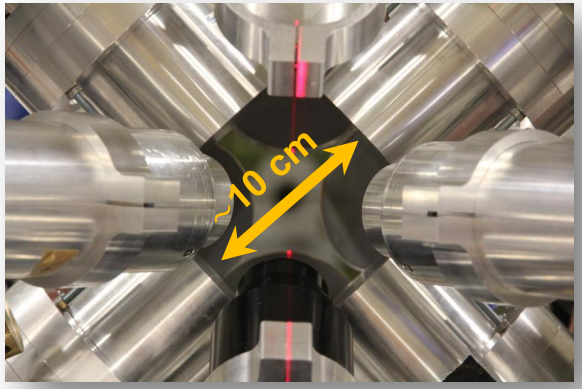
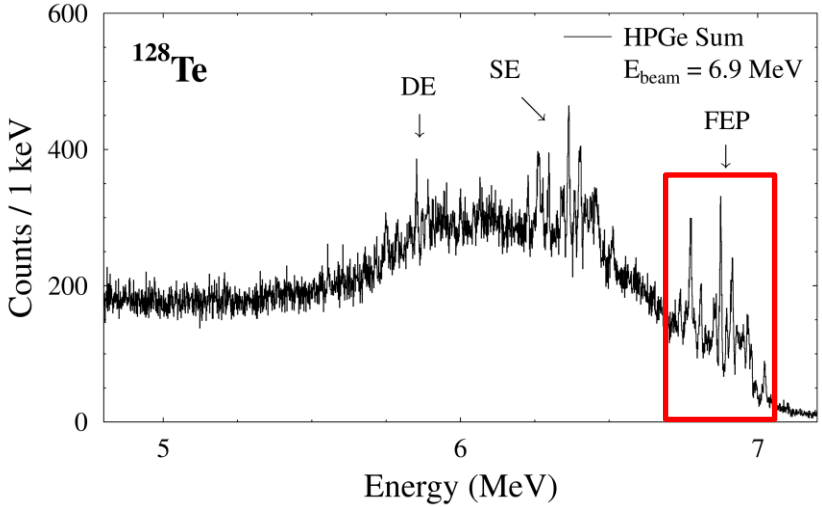


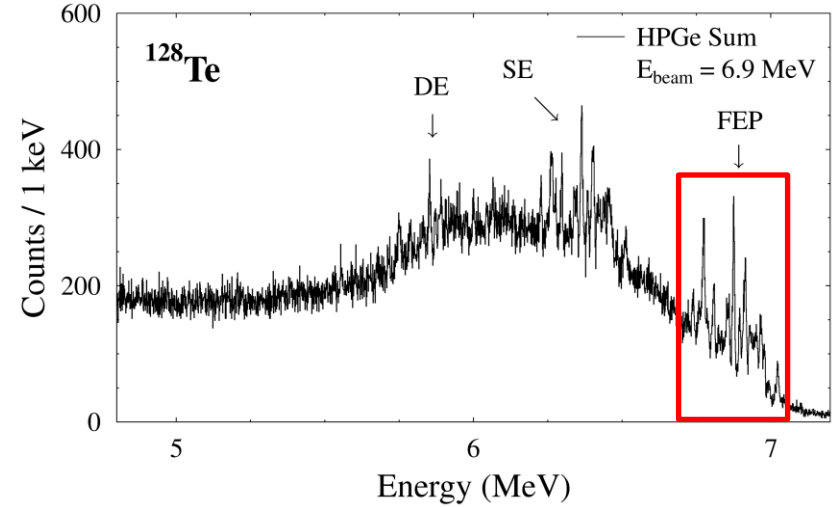
- close setup geometry
- total photopeak efficiency
  - LaBr ~ 6 %
  - HPGe ~ 1.5 %

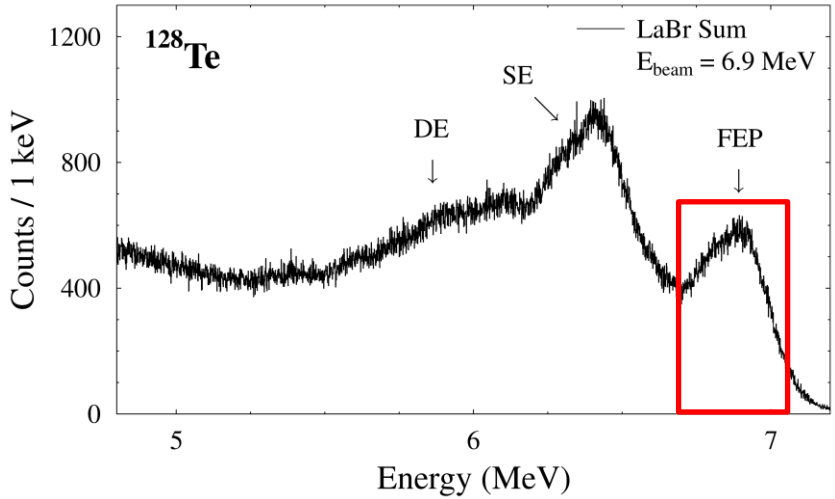
Single γ-ray spectroscopy on ^{128}Te



- high energy resolution
- state-to-state analysis

Single γ-ray spectroscopy on ^{128}Te



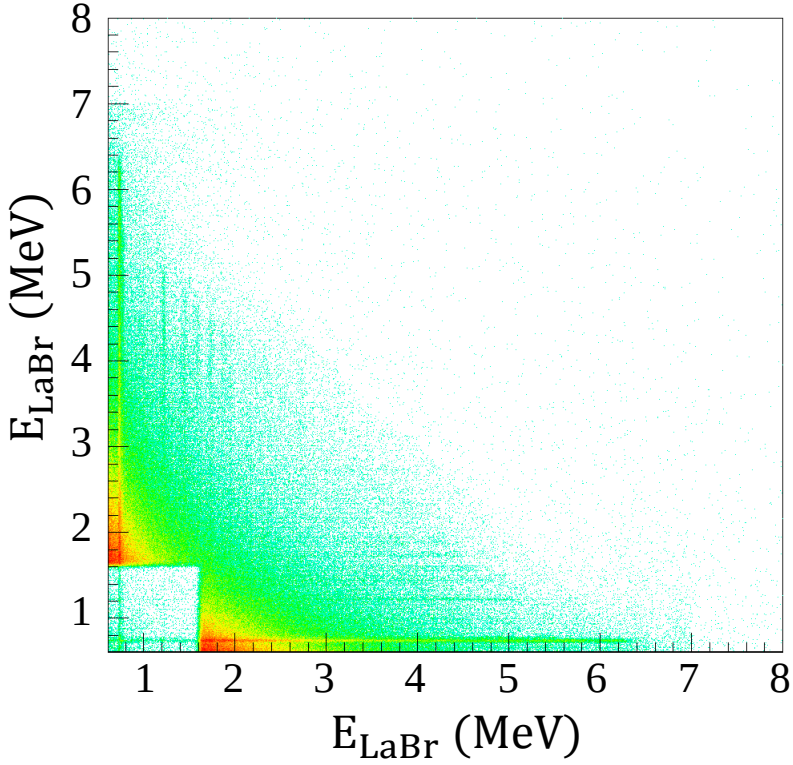


- high energy resolution
- state-to-state analysis

- high photopeak efficiency
- average quantities

γ-γ coincidence on ^{128}Te

^{128}Te → E=6.9 MeV



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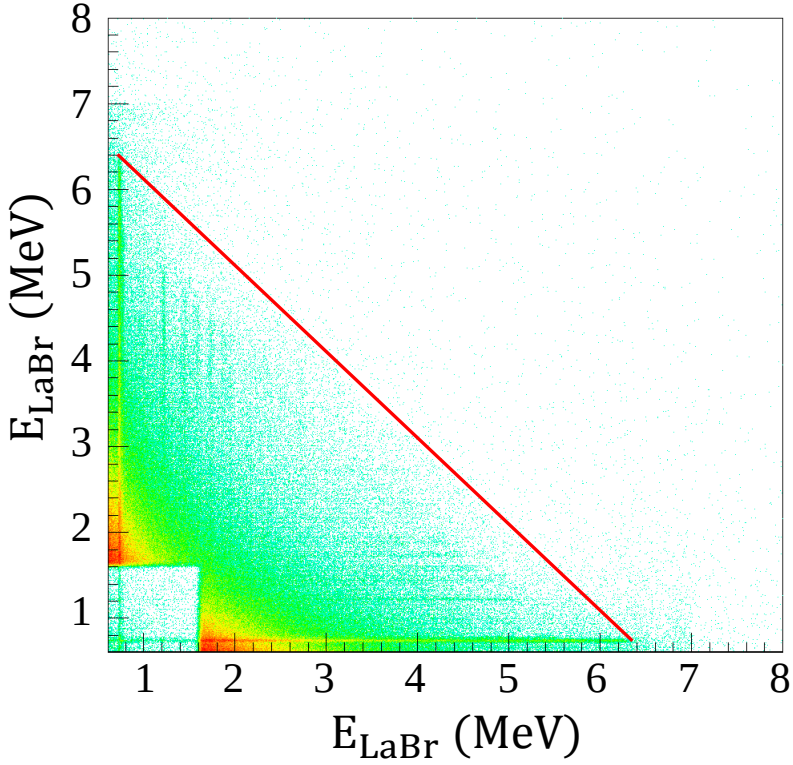

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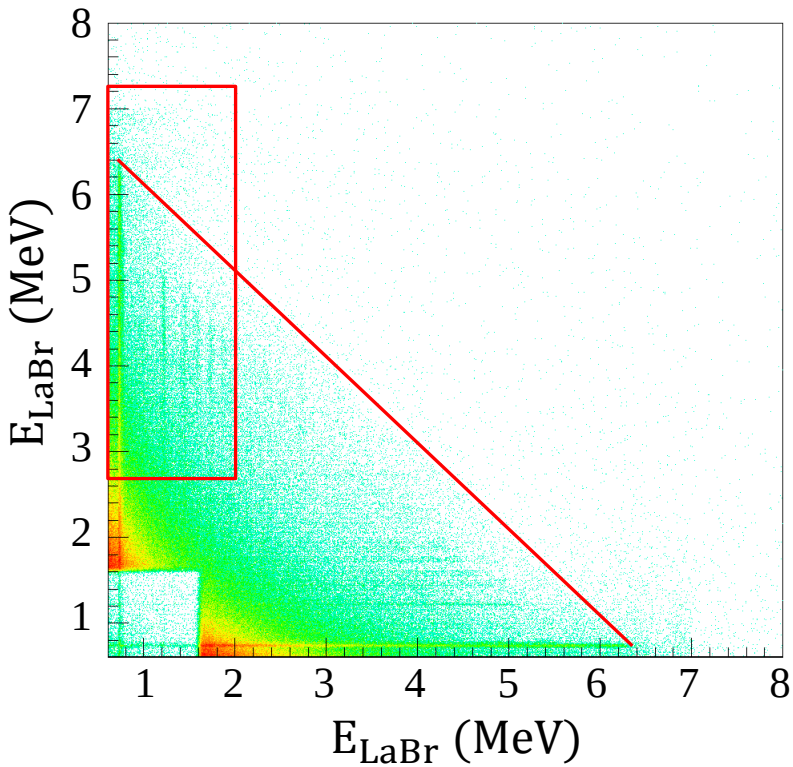

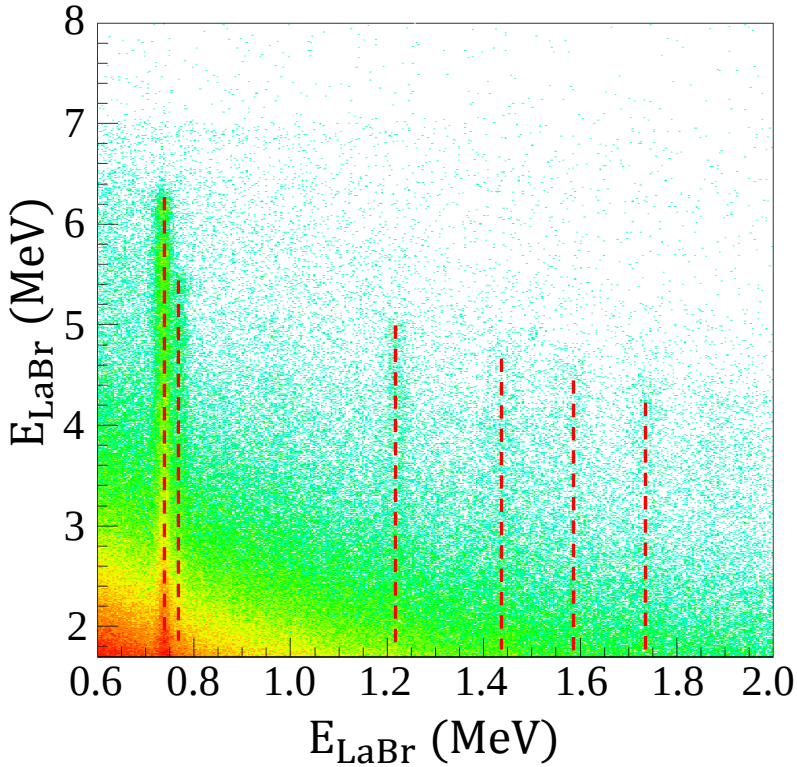

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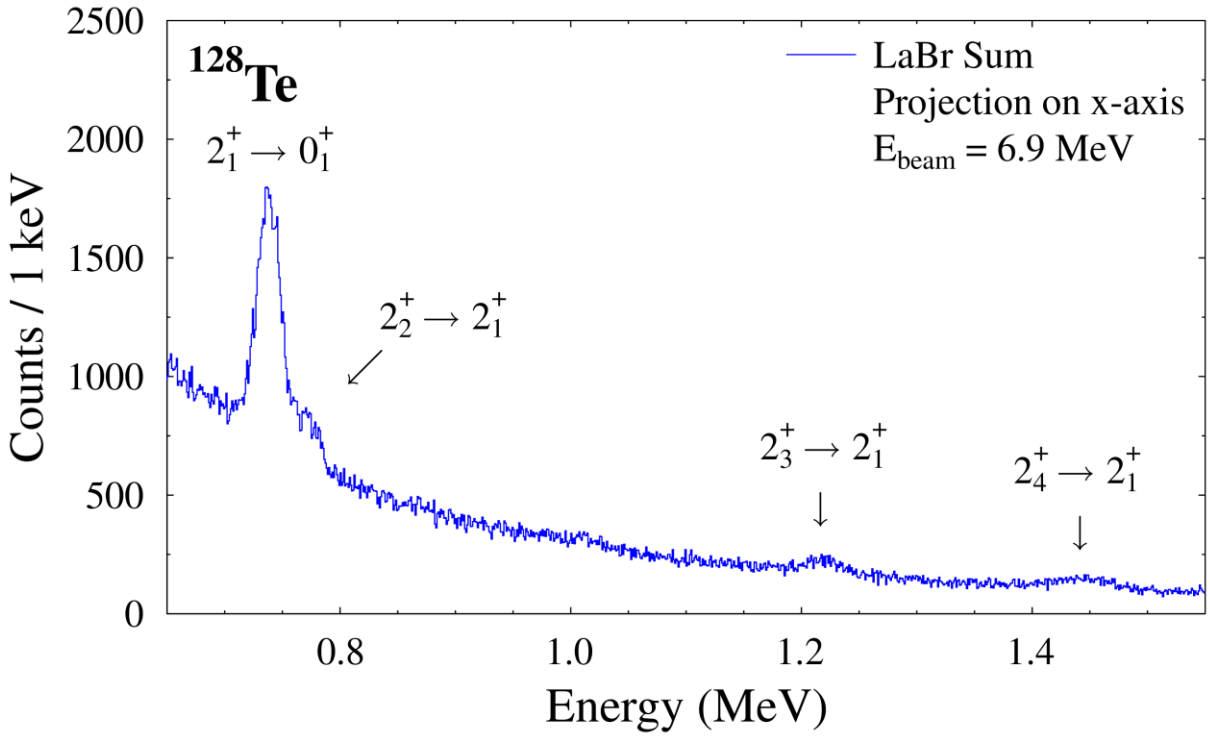

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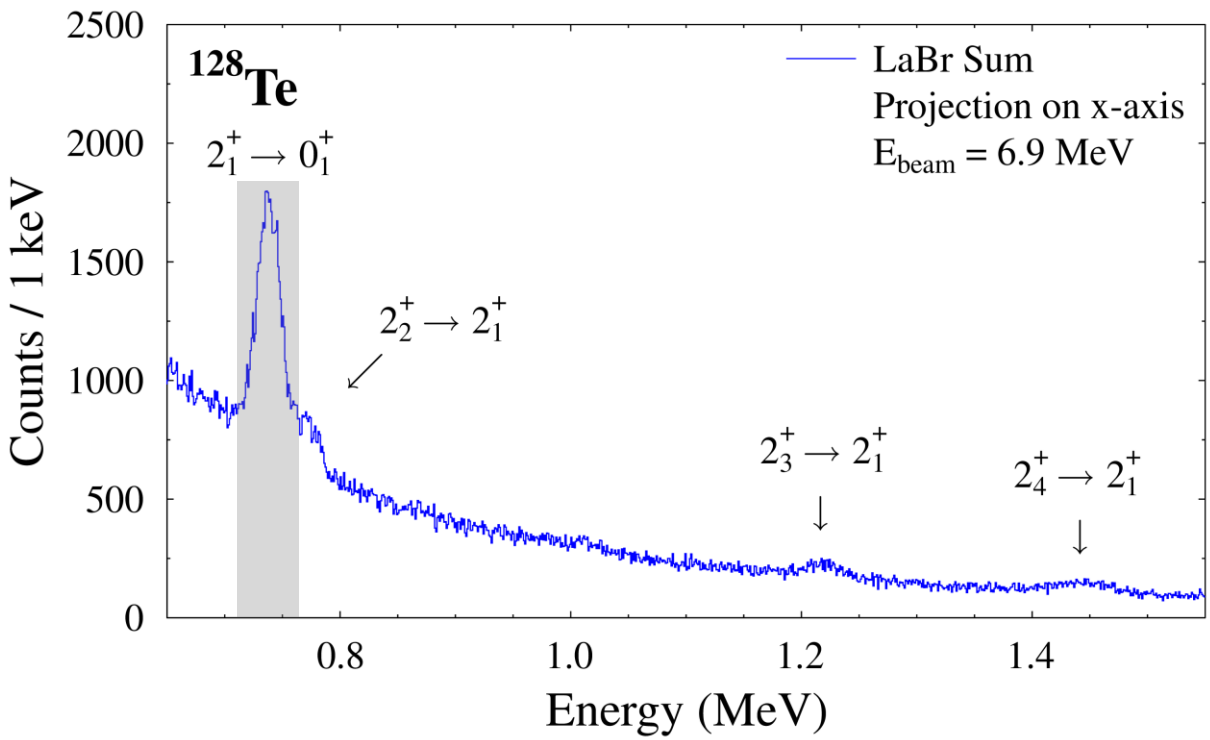

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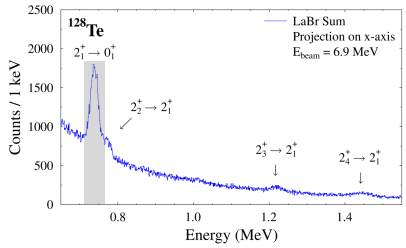

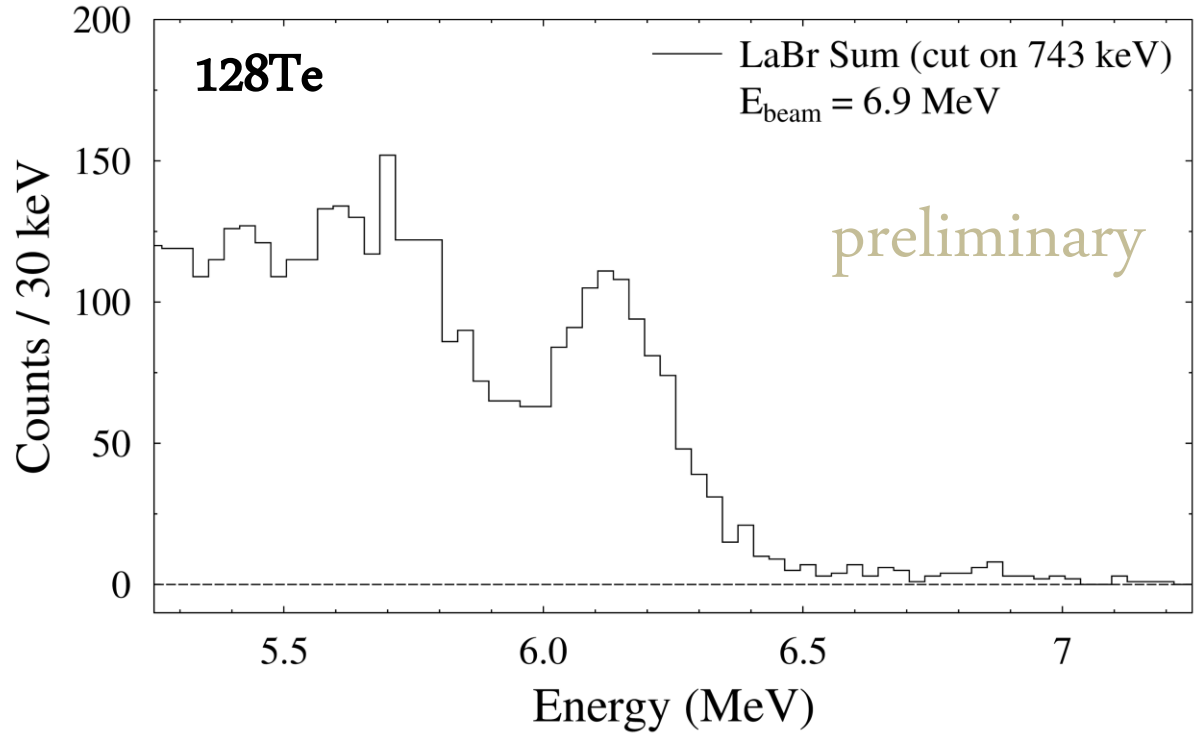

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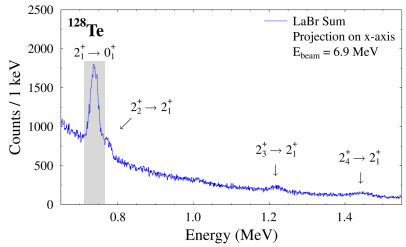

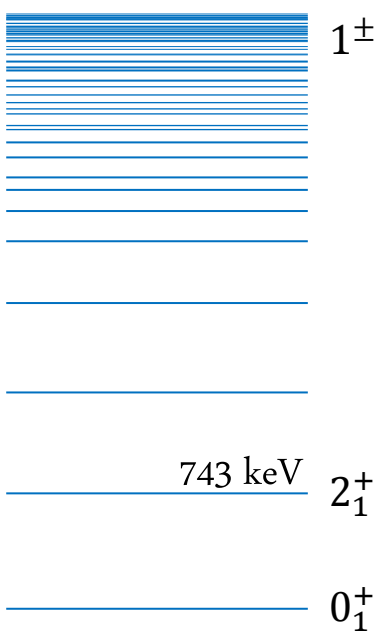

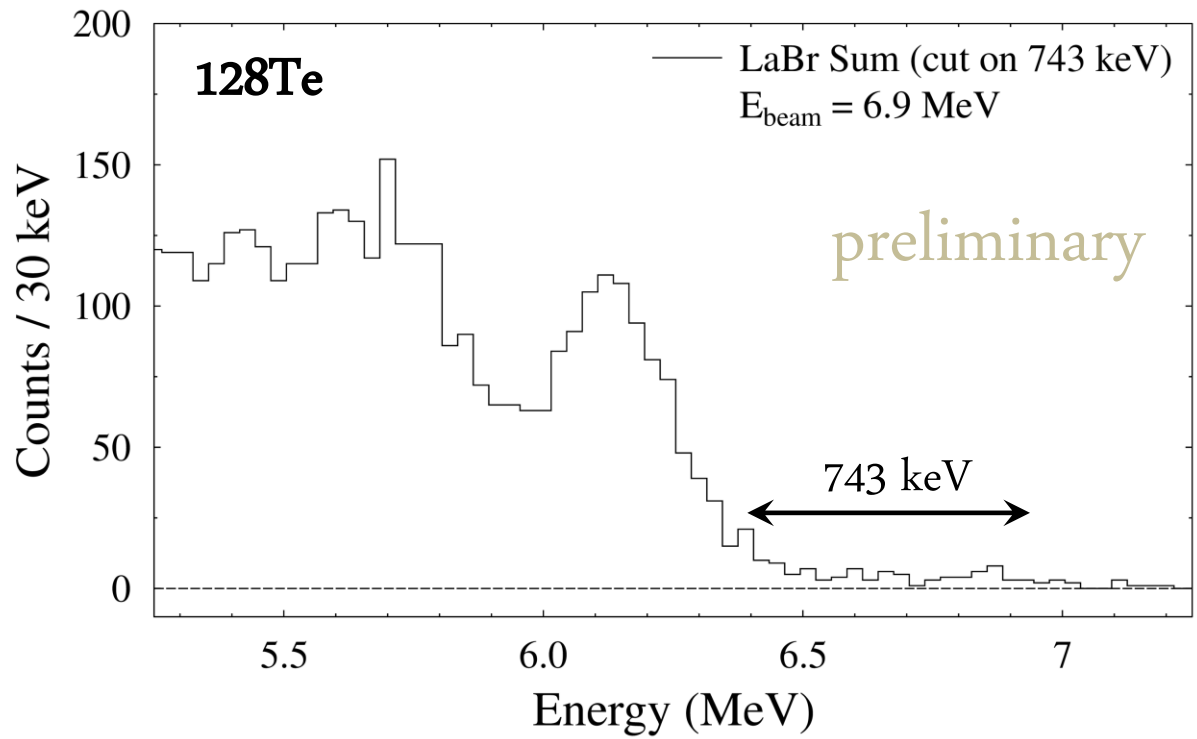

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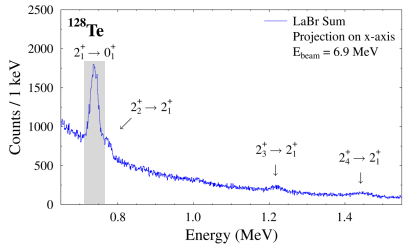

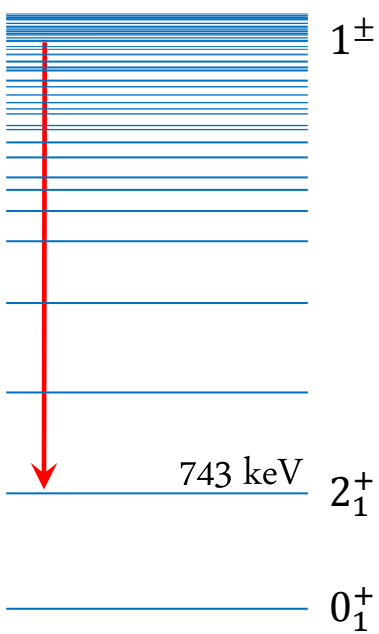

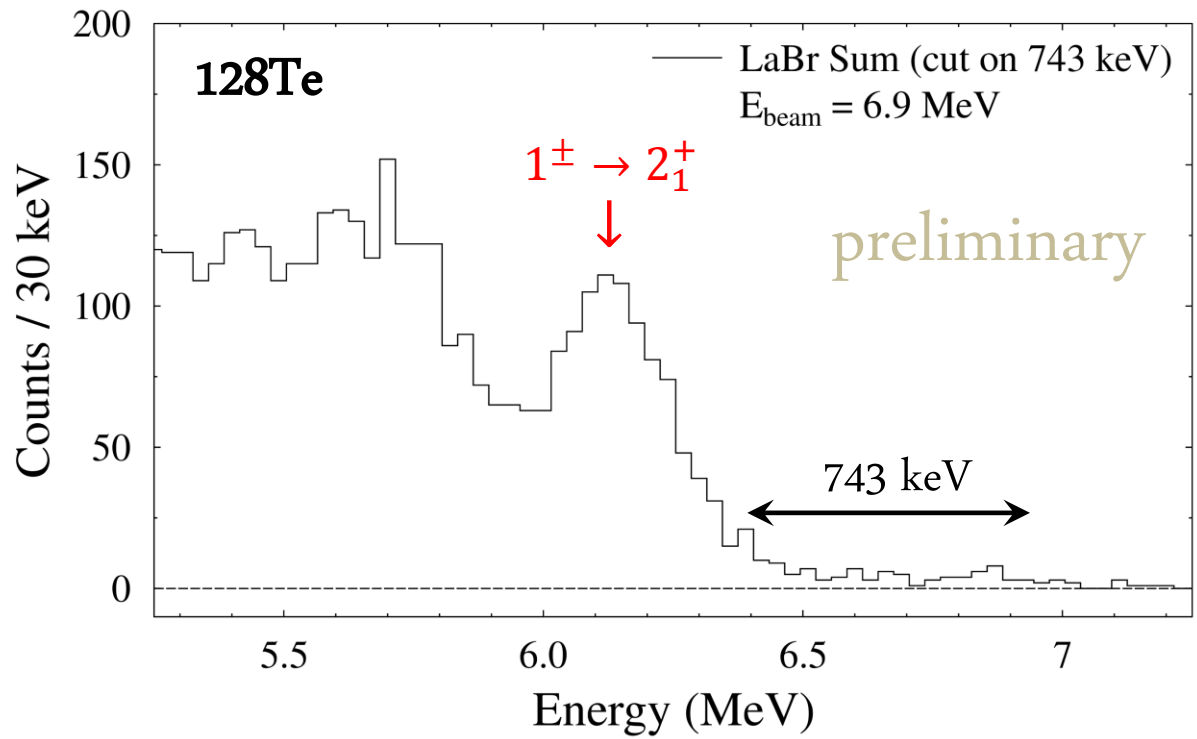

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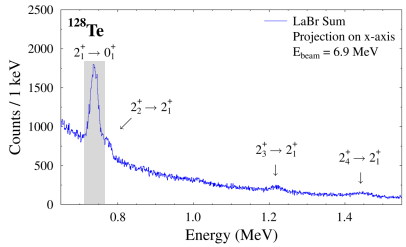

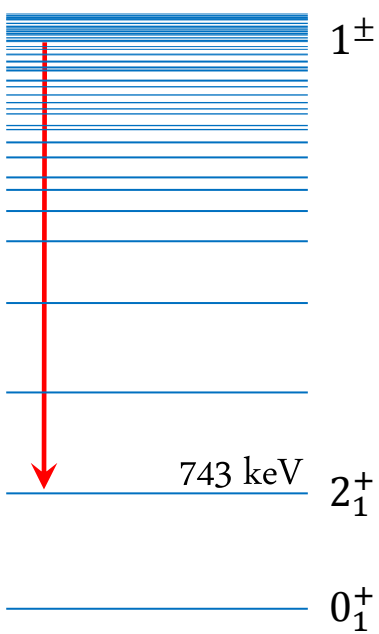

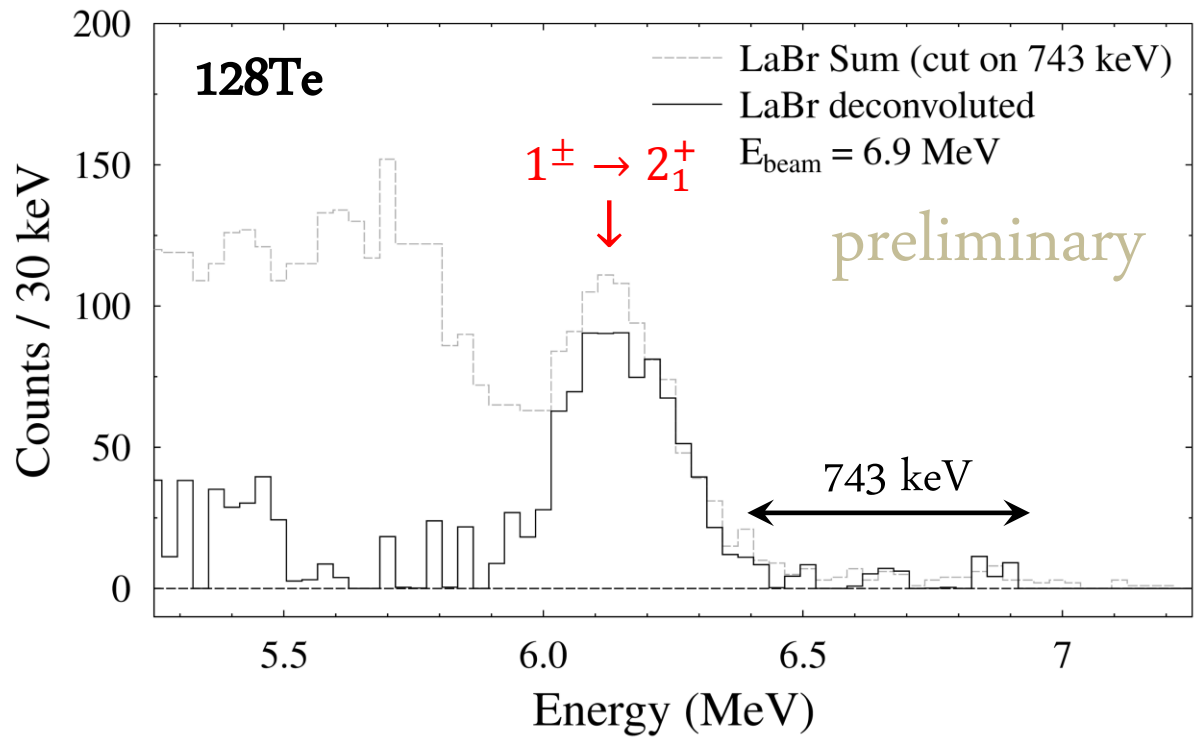

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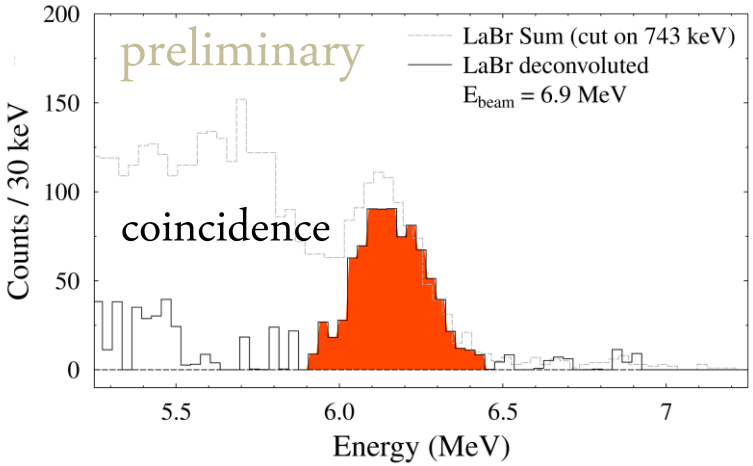

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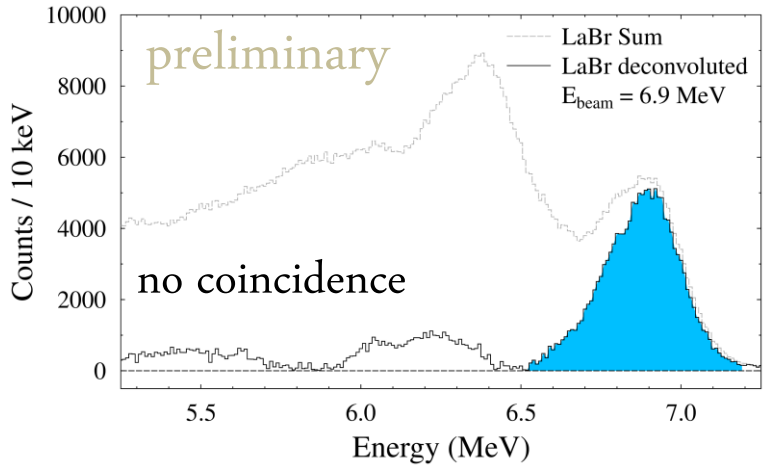

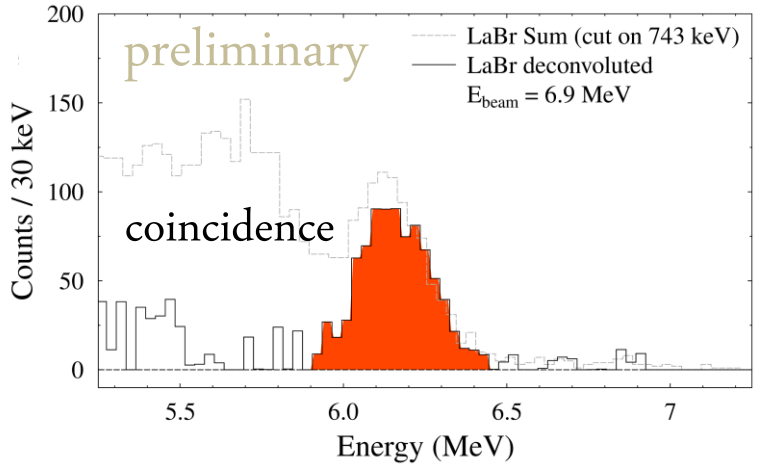

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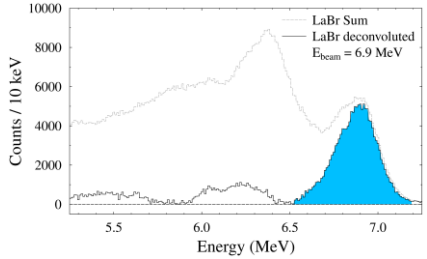
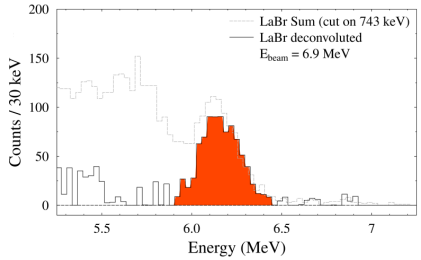
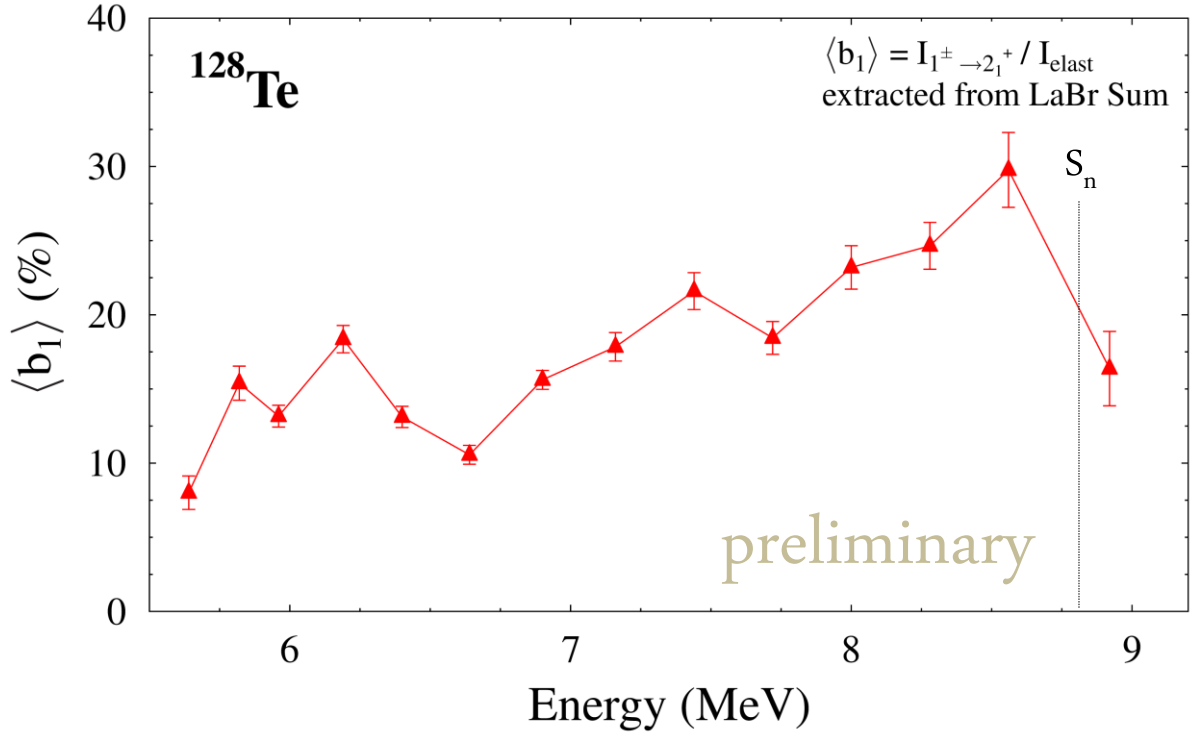


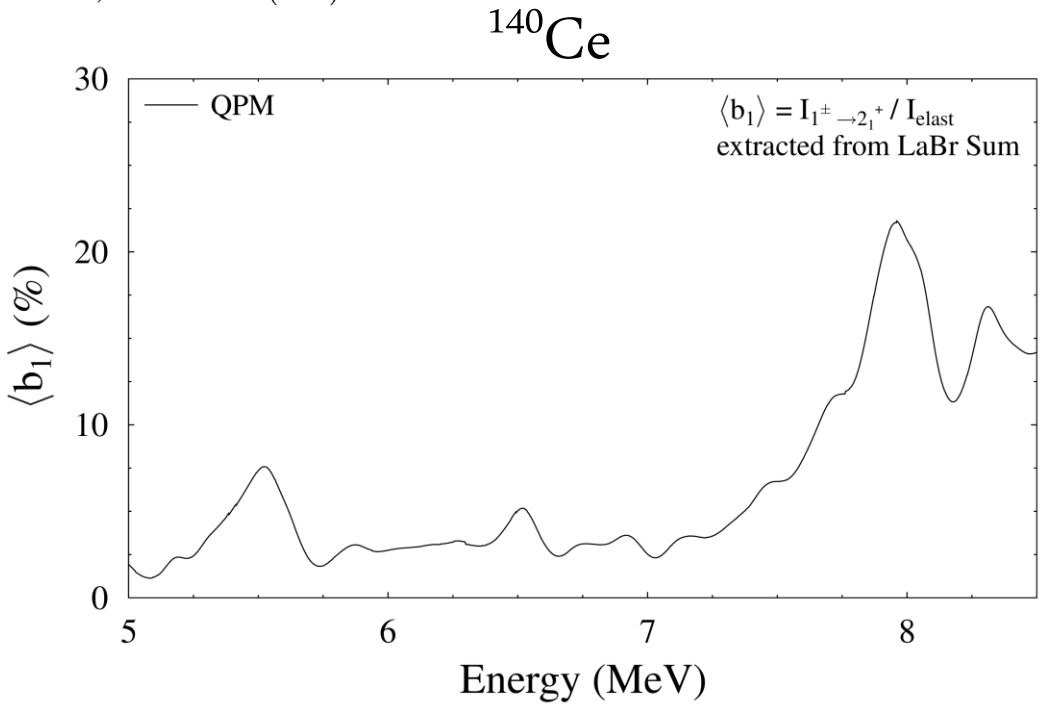


$$\langle b_1 \rangle = \frac{I_{1^{\pm}\to 2_1^{+}}}{I_{elast}}$$



γ-γ coincidence on ^{140}Ce

V. Yu. Ponomarev, private communication
B. Löher, doctoral thesis (2014)



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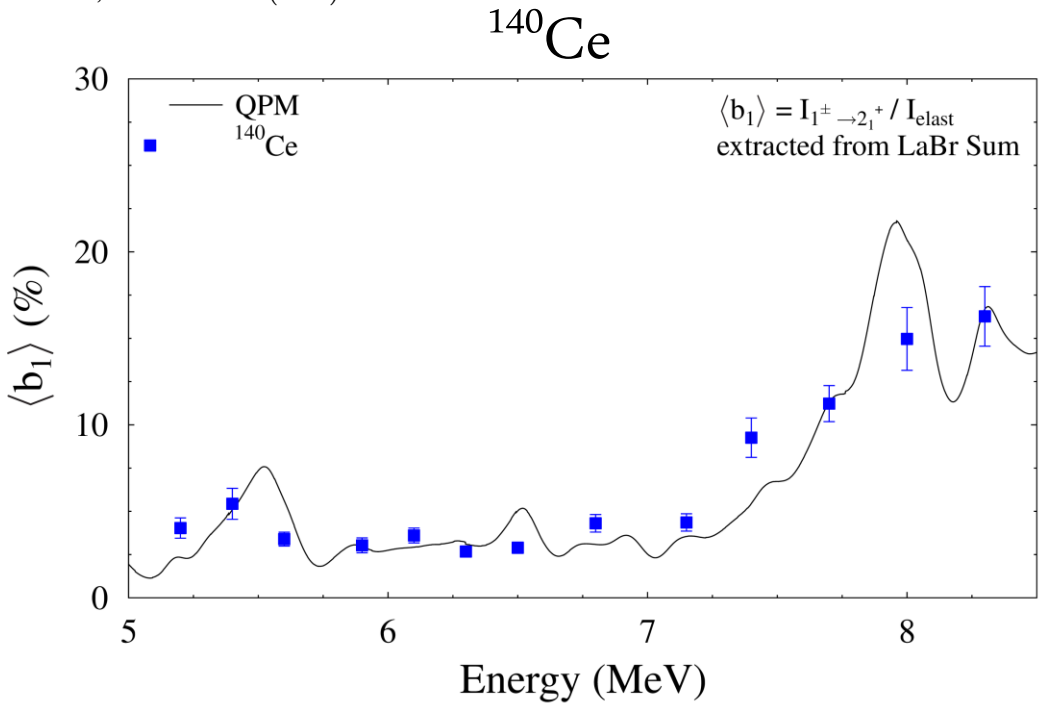

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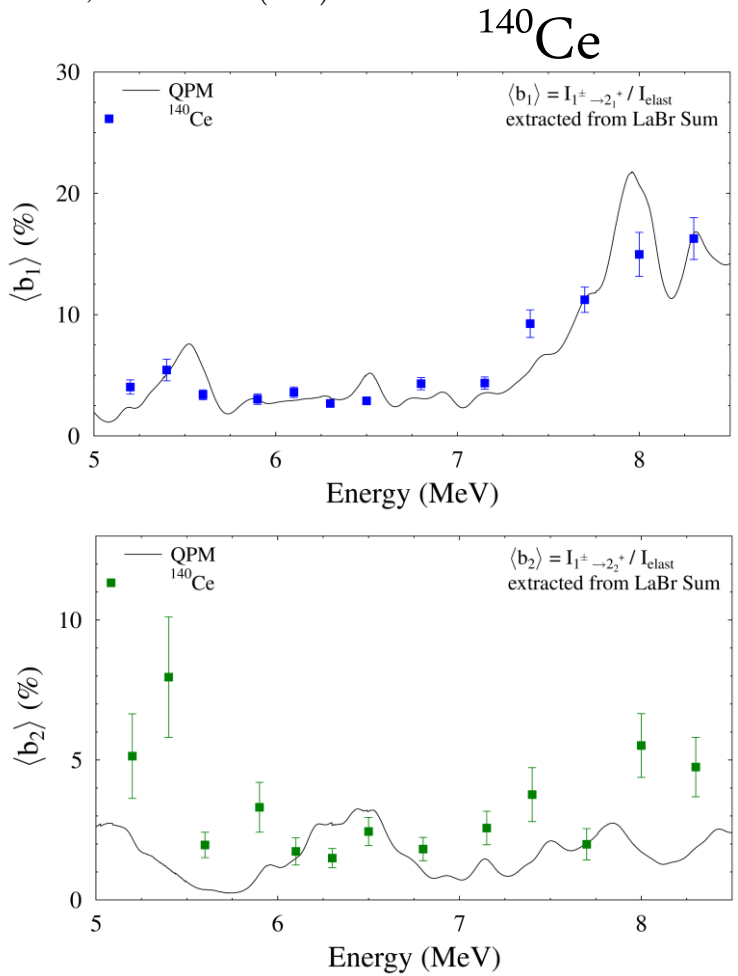

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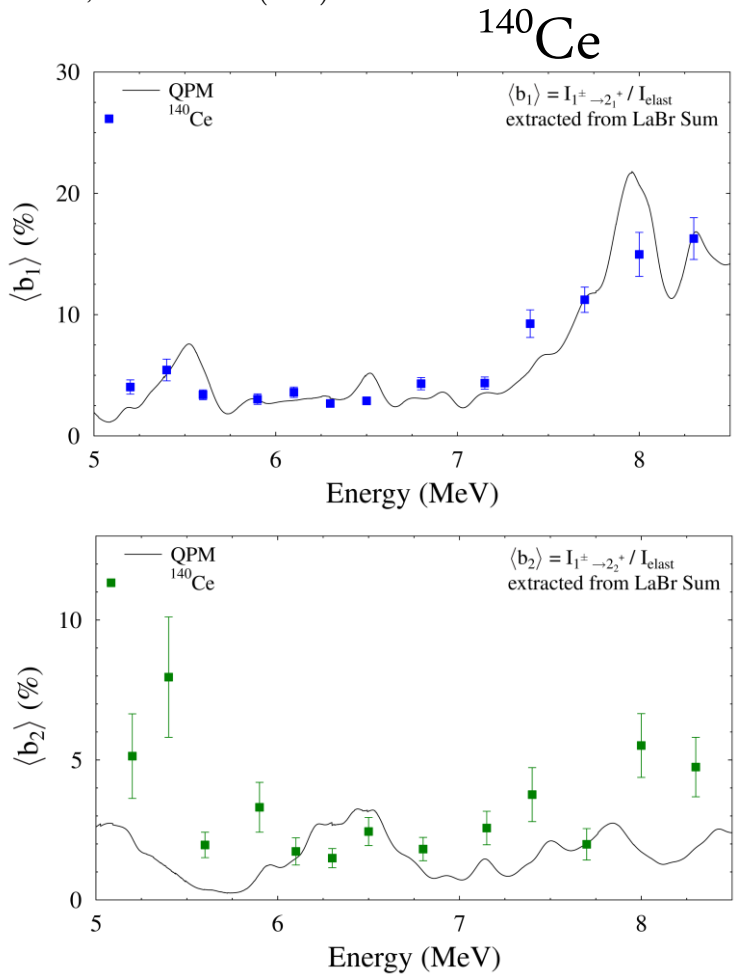

coupling between PDR and low-lying states well described

Thank you for your attention !

B. Löher, D. Savran and J. Silva

ExtreMe Matter Institute EMMI and Research Division, *GSI*

T. Aumann, T. Beck, J. Beller, U. Gayer, N. Pietralla, C. Romig, H. Scheit, V. Werner and M. Zweidinger

Institut für Kernphysik, TU Darmstadt

M. Scheck

School of Engineering, UWS, Paisley, UK & SUPA, Glasgow, UK

V. Derya and A. Zilges

Institut für Kernphysik, Universität zu Köln

N. Cooper

Yale University, New Haven, USA

W. Tornow and H.R. Weller

Department of Physics , Duke University, Durham, USA

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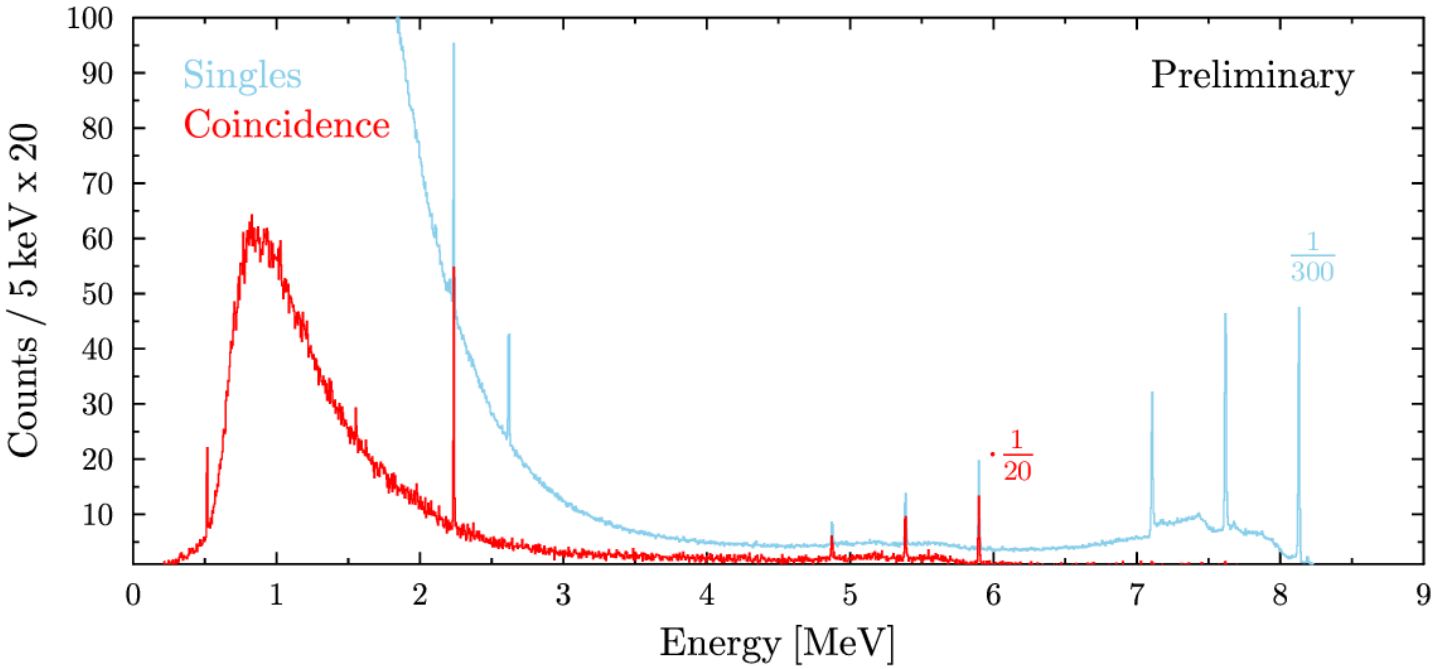
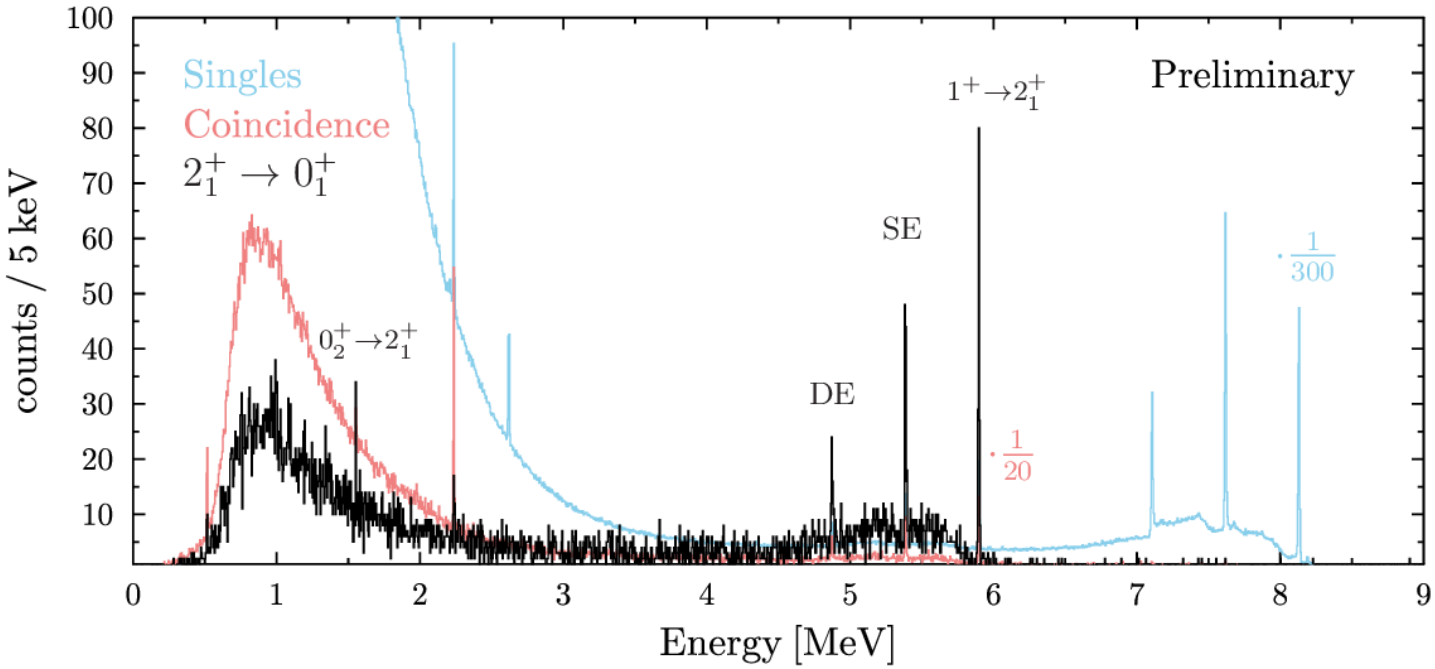
Commissioning with ^{32}S



peak to background

2230 keV	Singles:	0.197(3)
5894 keV	Singles:	1.03(2)

Commissioning with ^{32}S



peak to background

2230 keV	Singles:	0.197(3)
	Energy Cut:	**9.6(15)**
5894 keV	Singles:	1.03(2)
	Energy Cut:	**11.7(13)**

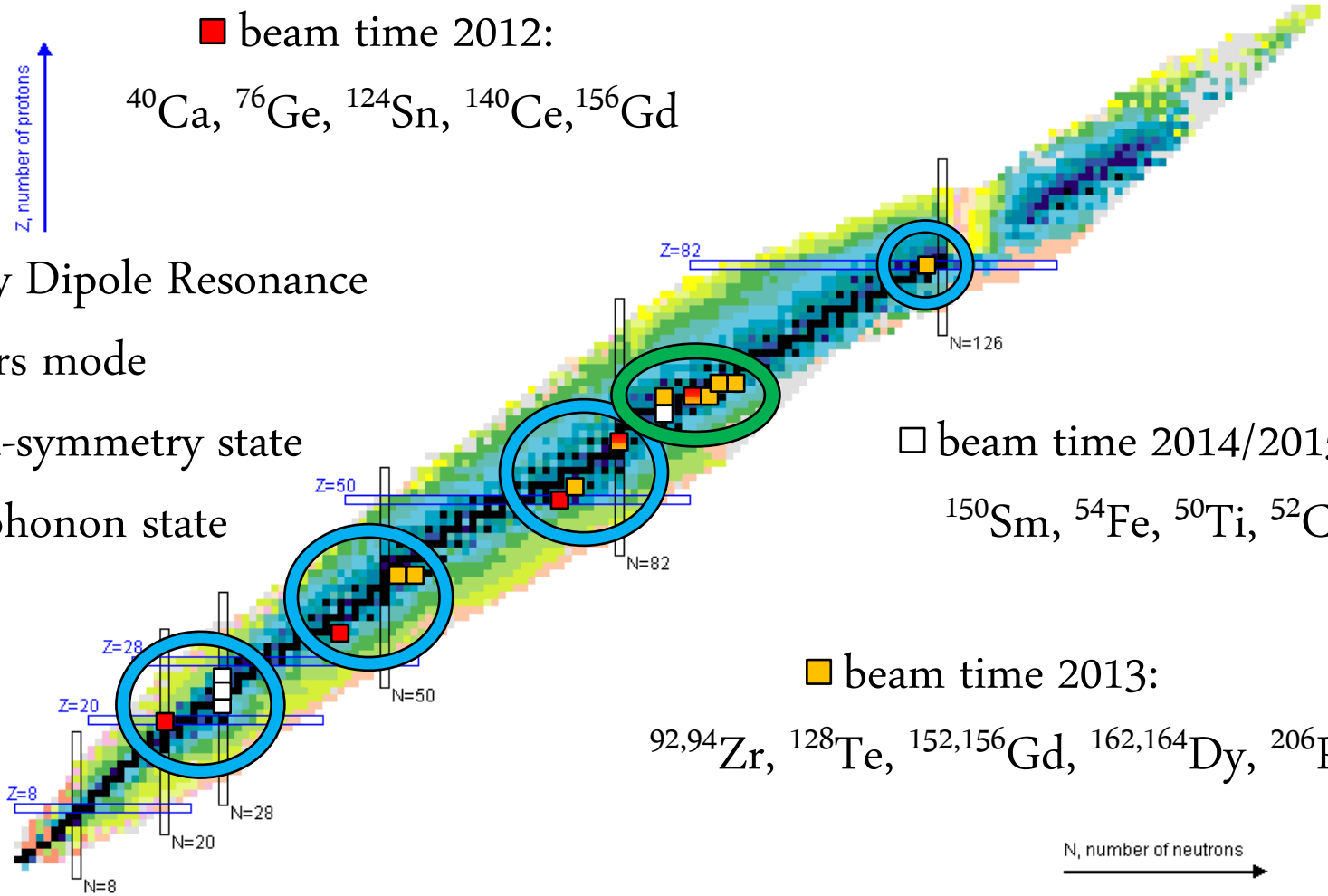
Experimental campaigns using the γ^3- setup

http://www.nndc.bnl.gov

■ beam time 2012:

^{40}Ca, ^{76}Ge, ^{124}Sn, ^{140}Ce, ^{156}Gd

- Pygmy Dipole Resonance
- Scissors mode
- Mixed-symmetry state
- Two-phonon state



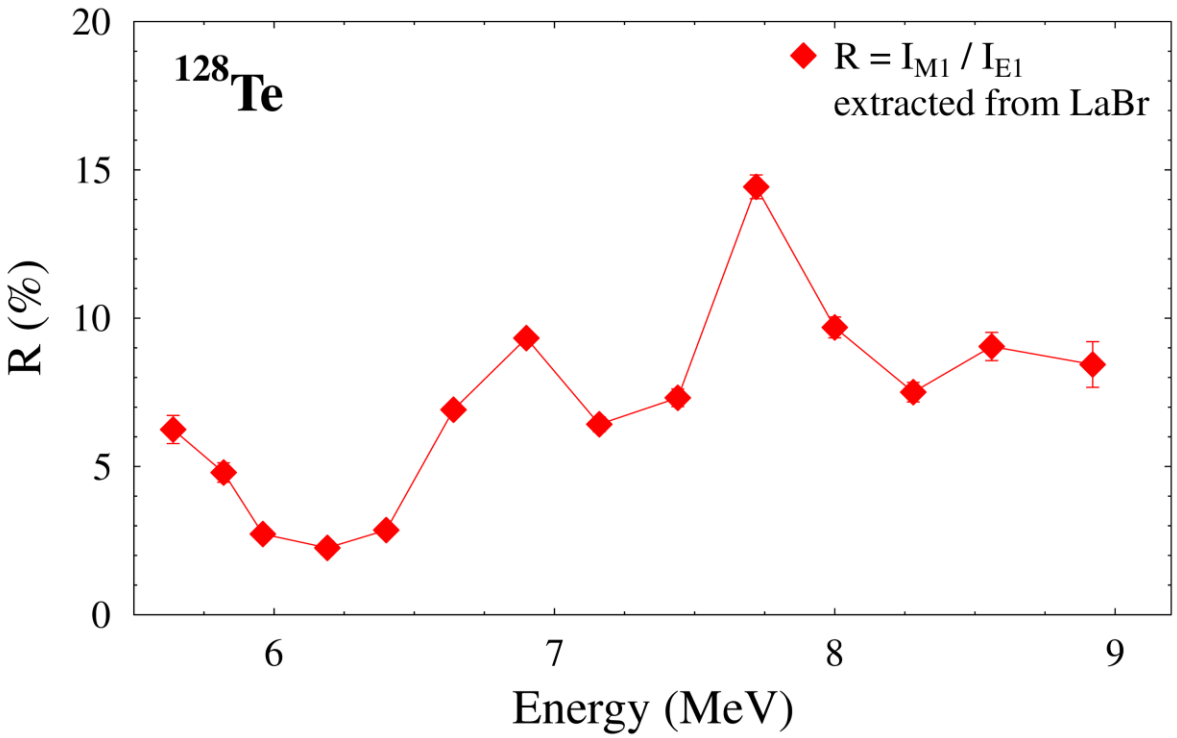
□ beam time 2014/2015:

^{150}Sm, ^{54}Fe, ^{50}Ti, ^{52}Cr

■ beam time 2013:

^{92,94}Zr, ^{128}Te, ^{152,156}Gd, ^{162,164}Dy, ^{206}Pb

Single γ-ray spectroscopy on ^{128}Te



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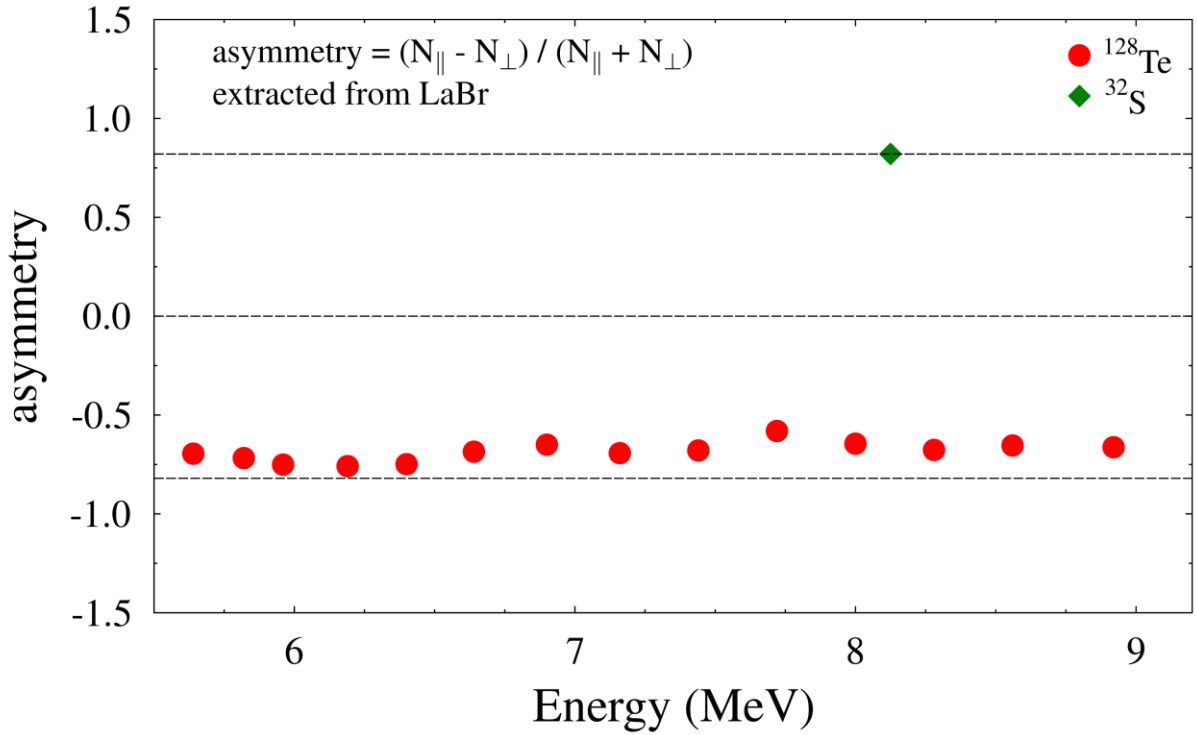

Single γ-ray spectroscopy on ^{128}Te

... with linearly polarized photons

- distinguish between E1 & M1 transition

N. Pietralla *et al.*, PRL (2001) 012502