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High-resolution study of dipole excitations in ^{208}Pb with polarized proton scattering at 0° *

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RCNP Osaka / U. of Osaka / iThemba LABS / Wits U. / TU Darmstadt / IFIC Valencia / Kyoto U./ U. of Tokyo

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Content

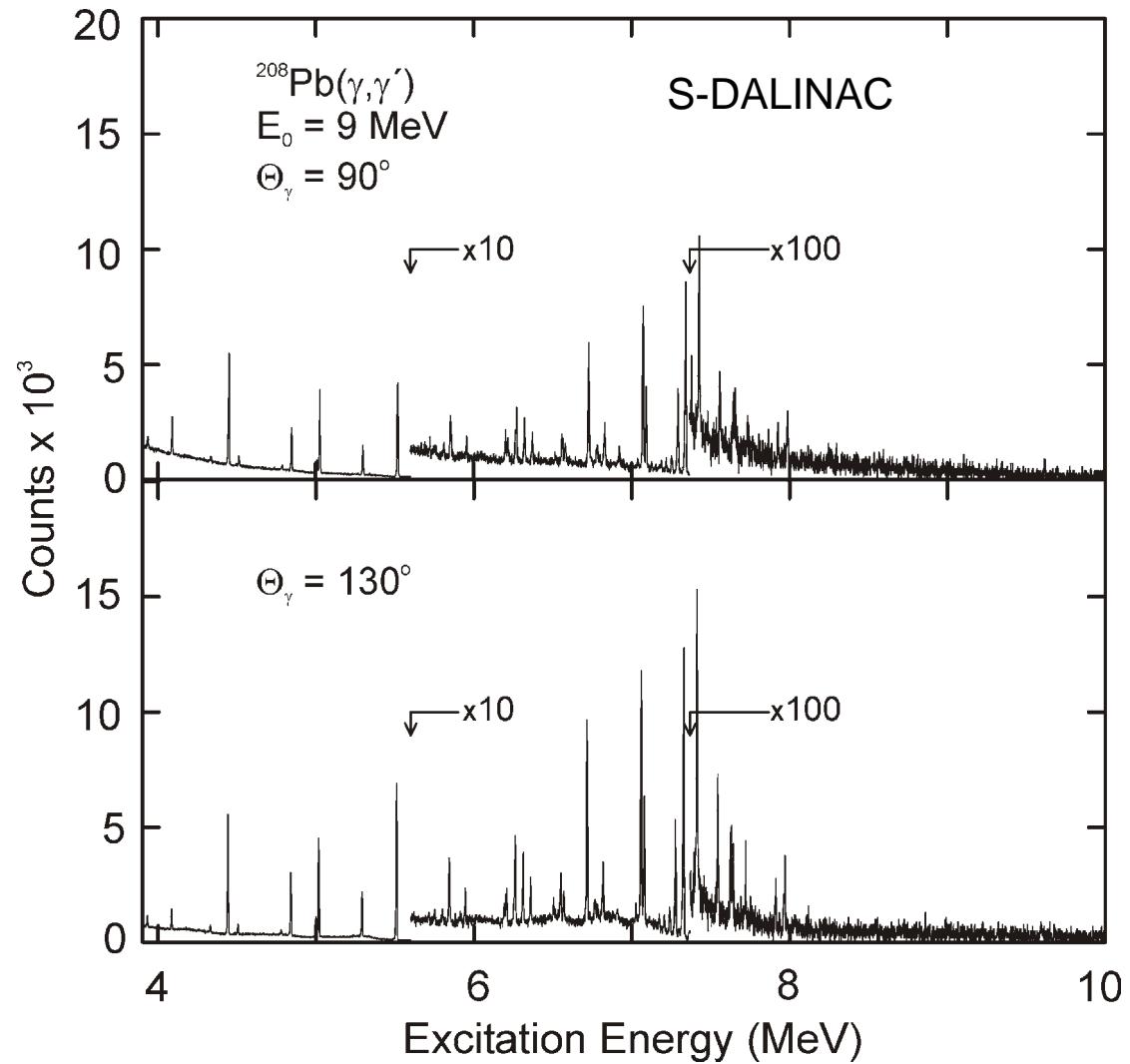


- Motivation
- Experimental setup
- First results
- Summary and outlook



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$^{208}\text{Pb}(\gamma, \gamma')$ Spectrum



N. Ryezayeva et al., PRL 89 (2002) 272502

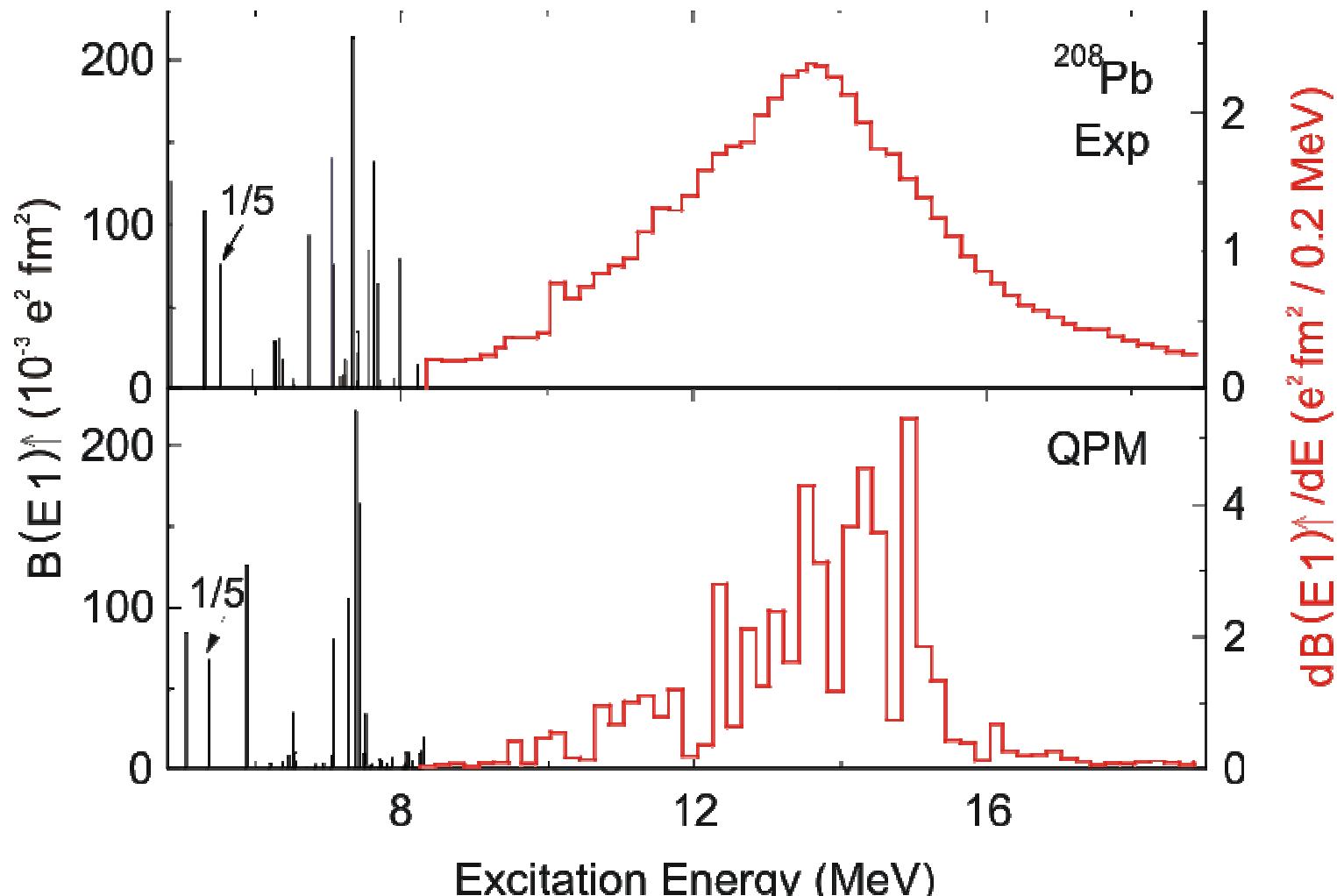


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$^{208}\text{Pb}(\gamma, \gamma')$ Spectrum



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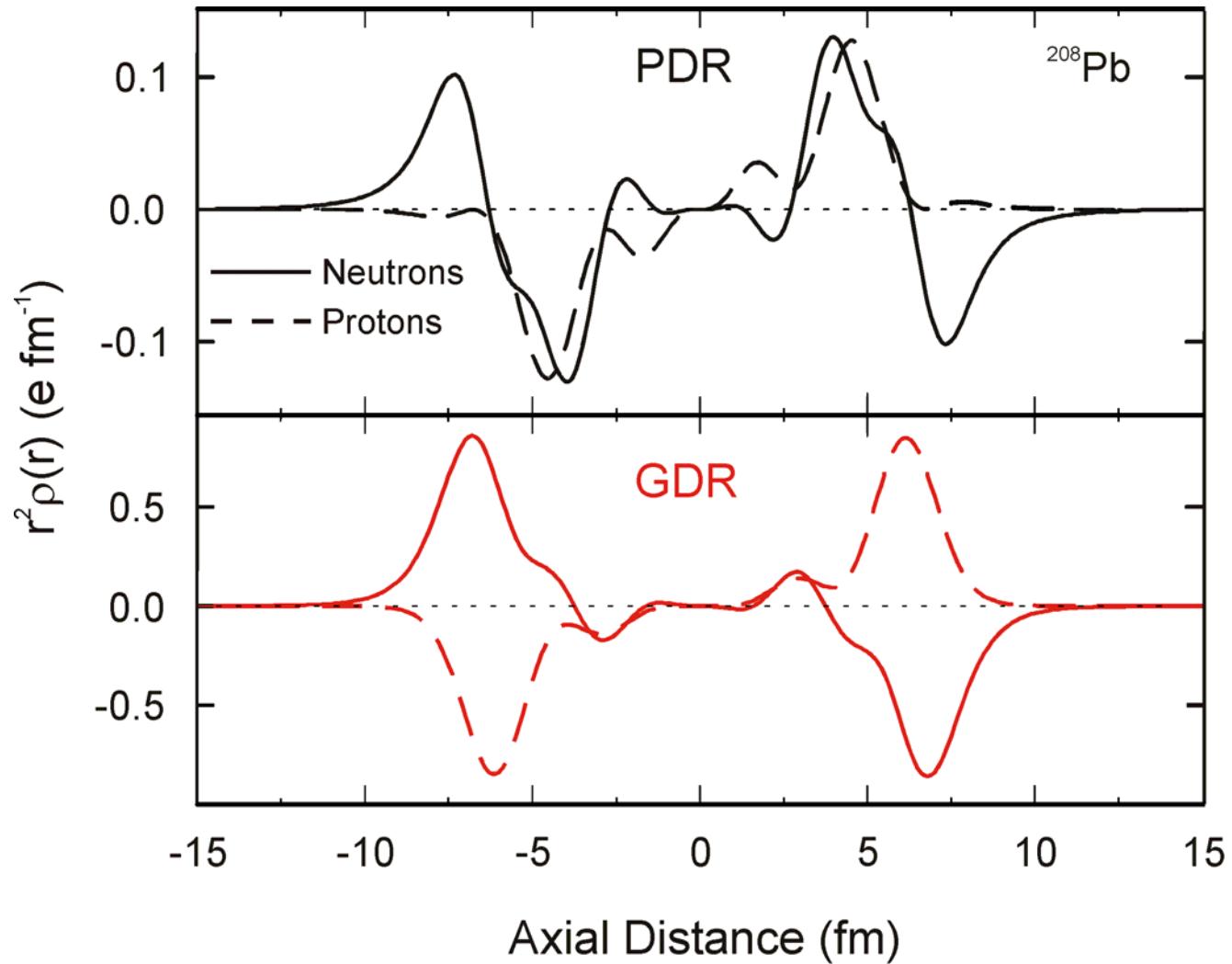


- Excellent agreement of QPM with experiment



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The Averaged Transition Densities



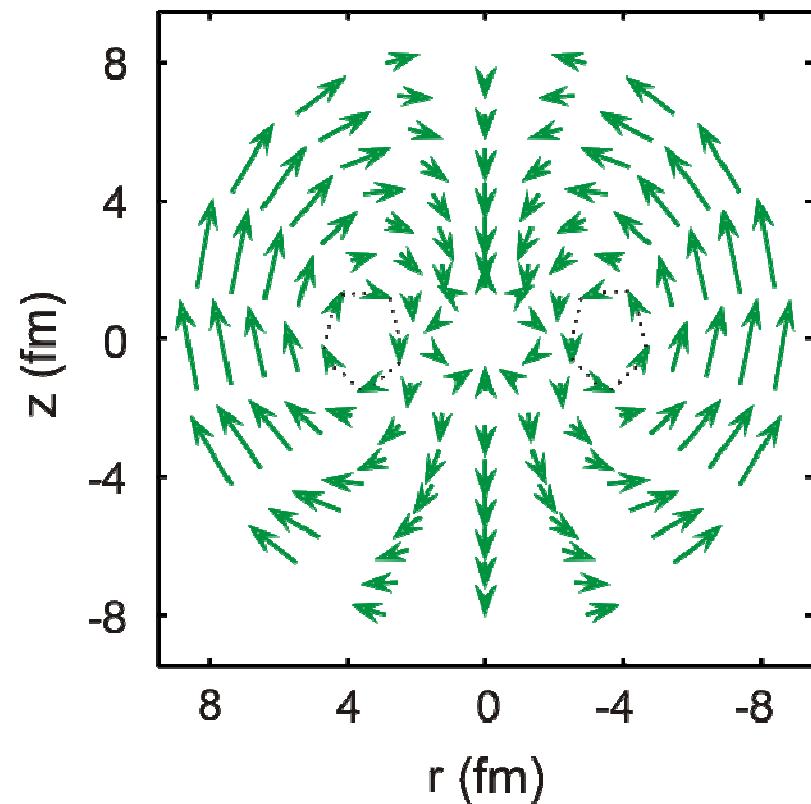


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Predicted Velocity Distribution for E1 Transitions

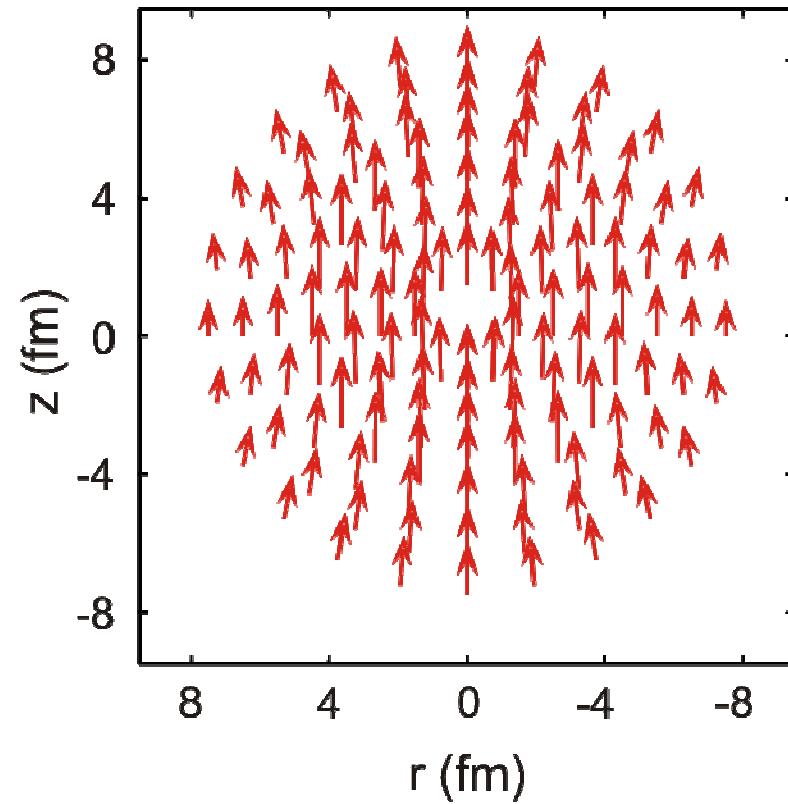


Toroidal



$$E_x = 6.5 - 10.5 \text{ MeV}$$

GDR



$$E_x > 10.5 \text{ MeV}$$

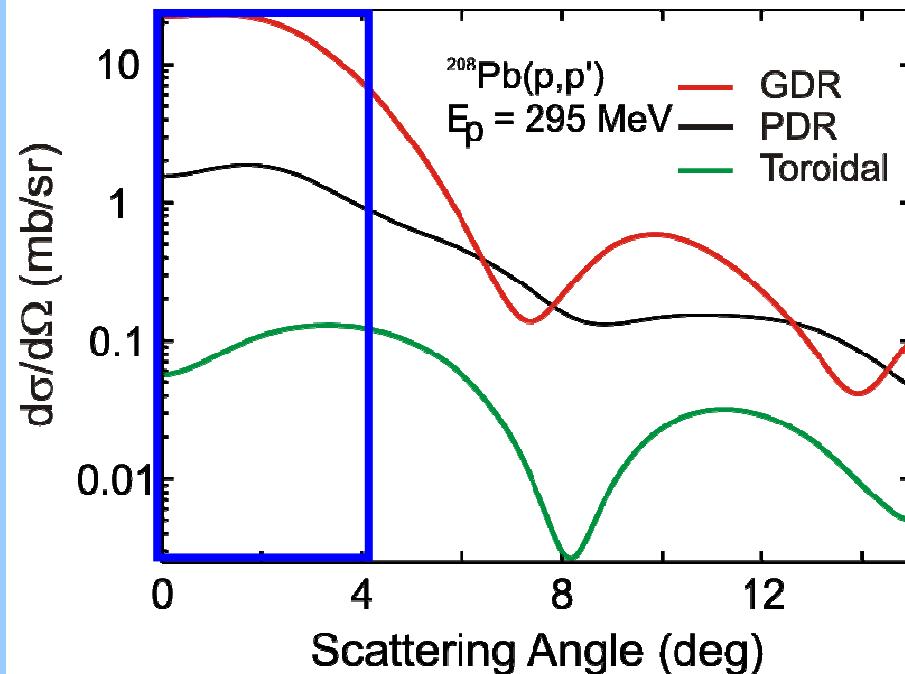


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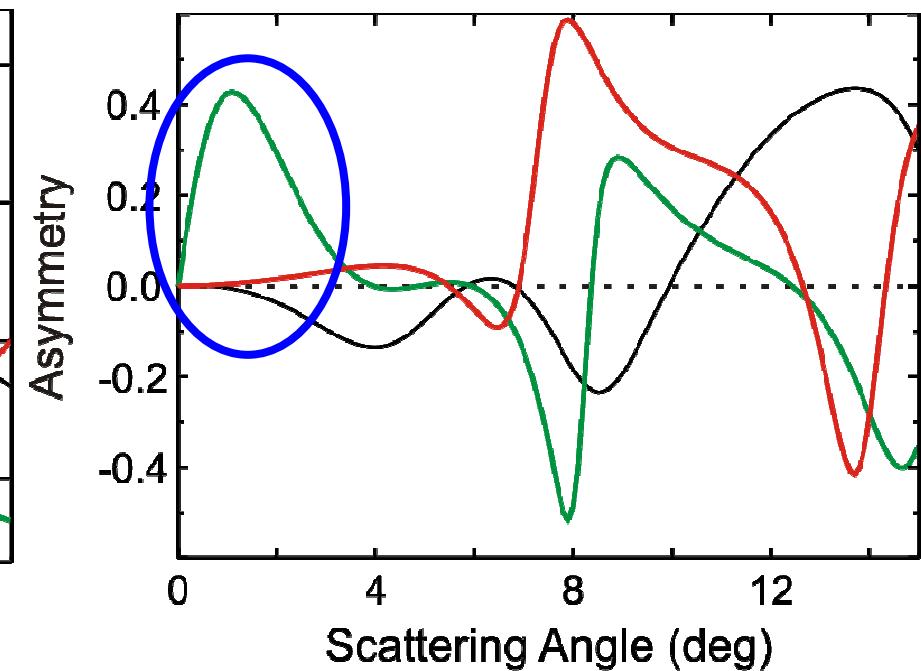
Coulomb-Nuclear Interference



Cross Section



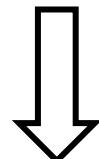
Asymmetry



Angular distribution

+

Polarisation transfer coefficients

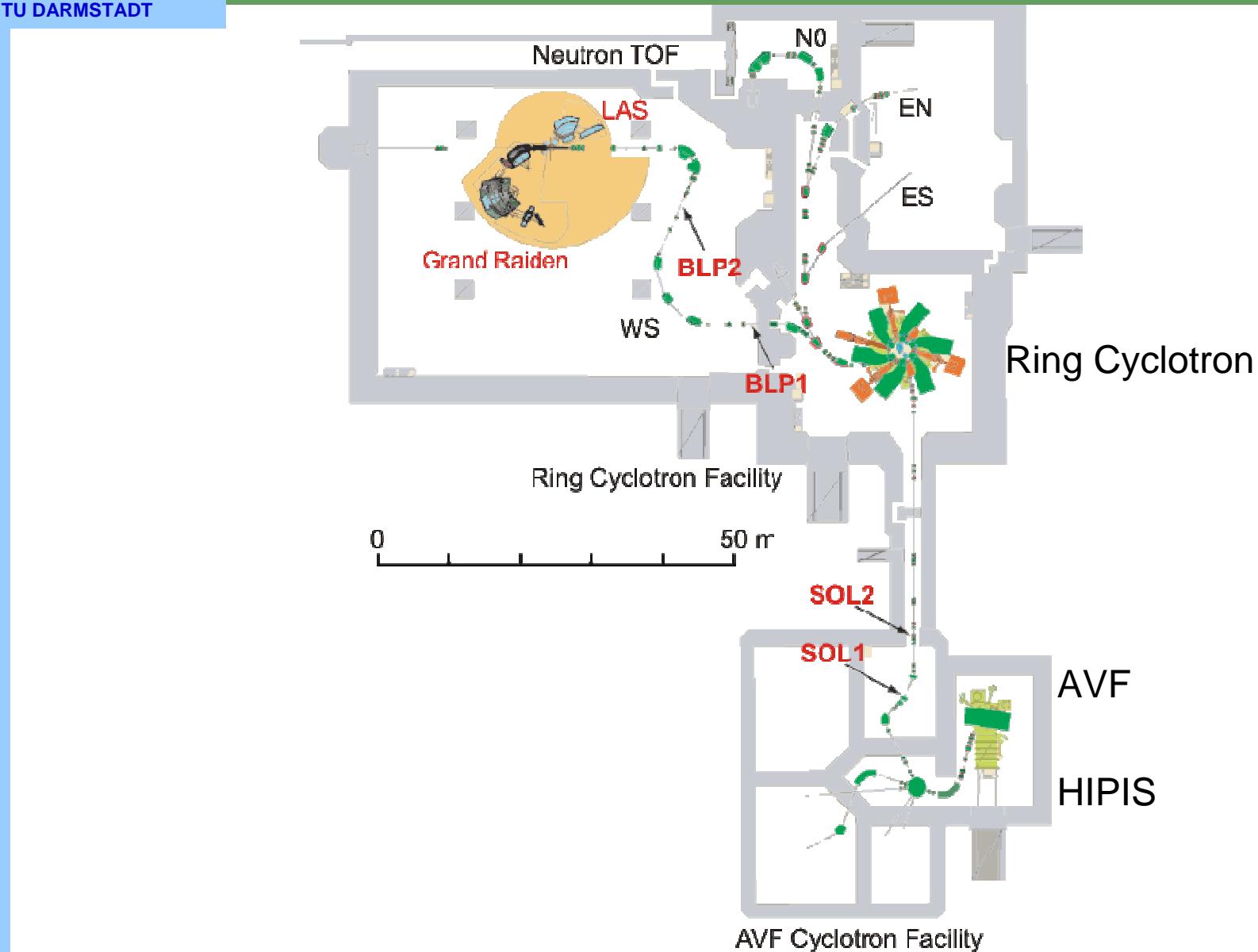


Evidence for the toroidal mode ???



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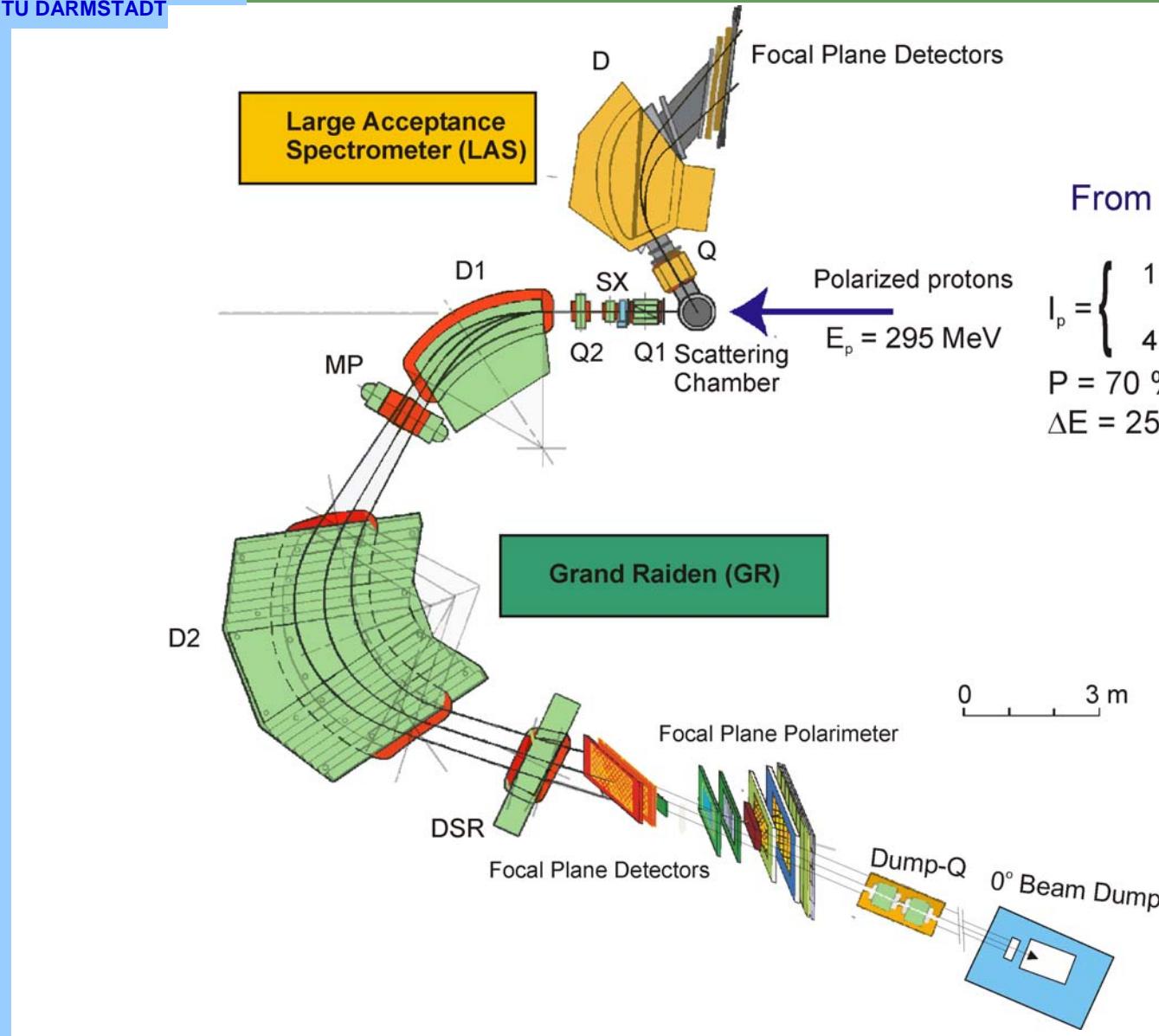
Cyclotron Facility at RCNP





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0° Setup at RCNP



From cyclotrons:

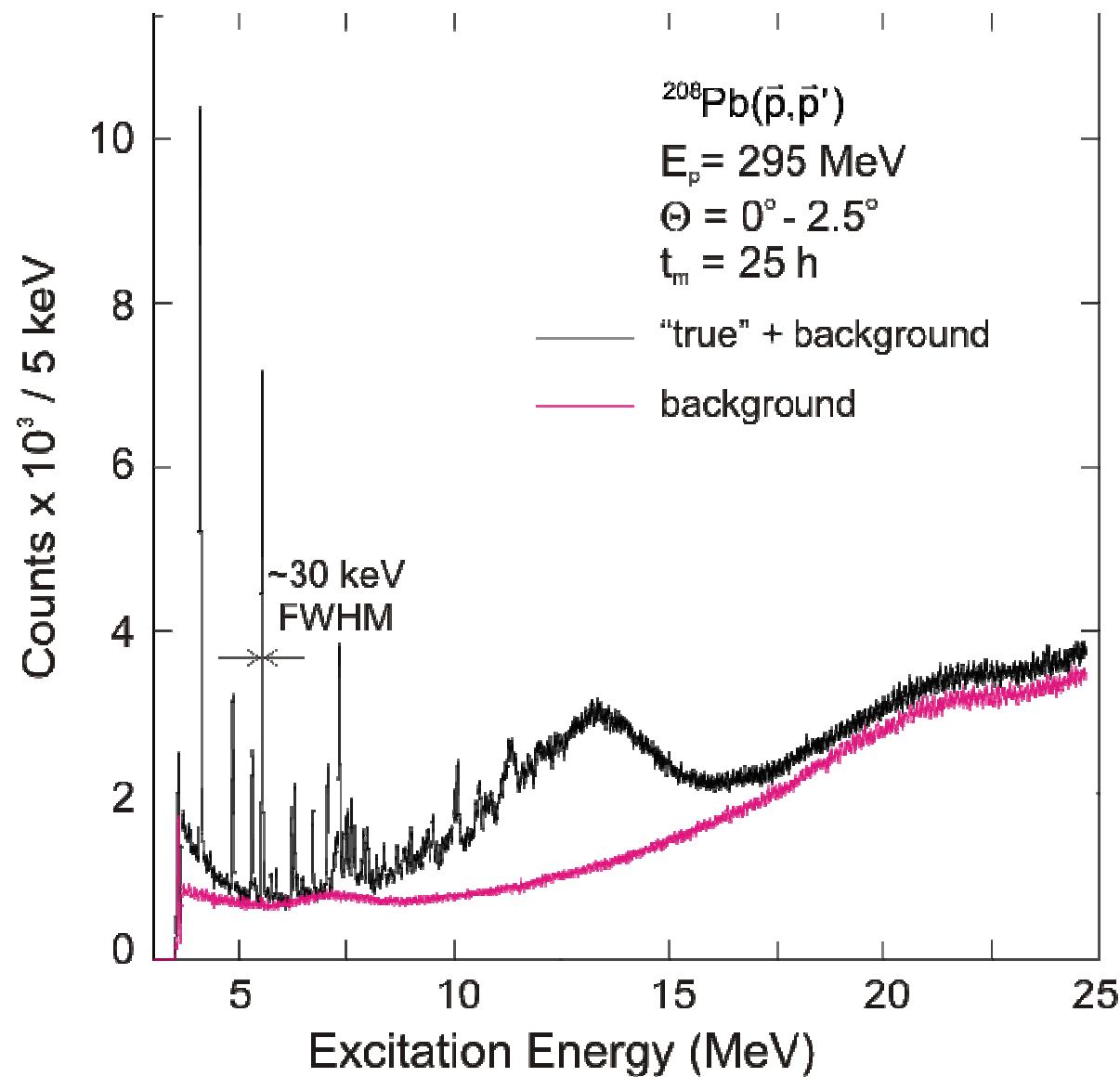
$$I_p = \begin{cases} 1 \text{ nA } (\Theta = 0^\circ) \\ 4 \text{ nA } (2.5^\circ < \Theta < 10^\circ) \end{cases}$$

$P = 70 \%$
 $\Delta E = 25 - 30 \text{ keV}$



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Measured Spectrum





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Spectrum



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$d^2\sigma / d\Omega dE$ (mb / sr / MeV)

150
100
50
0

5 10 15 20

Excitation Energy (MeV)

$^{208}\text{Pb}(\bar{p}, \bar{p}')$
 $E_p = 295$ MeV
 $\Theta = 0^\circ - 2.5^\circ$
 $t_m = 25$ h

Preliminary

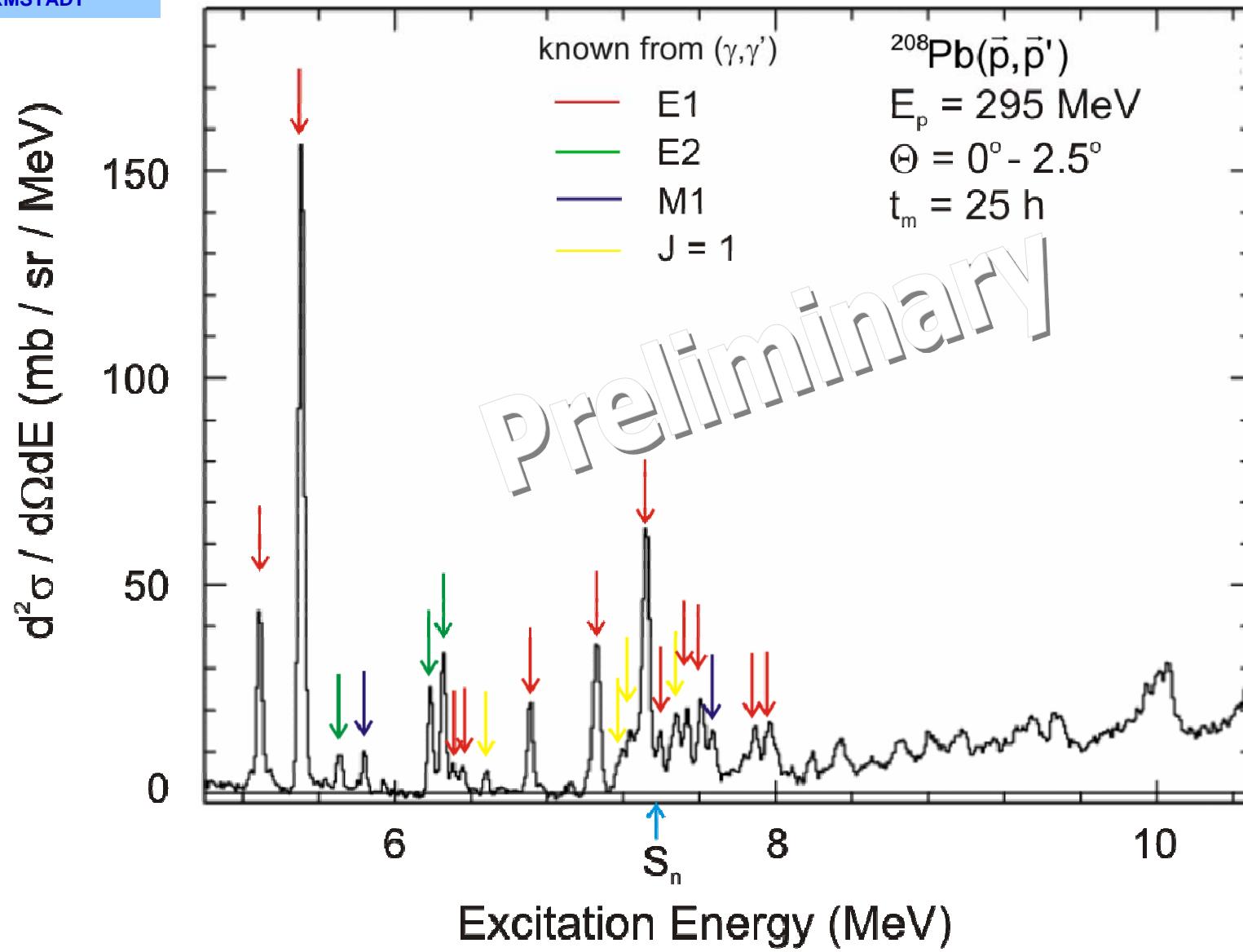


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Spectrum (expanded)



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Summary and Outlook



- First high-resolution zero degree polarized proton scattering experiment on ^{208}Pb was performed
- Energy resolution of about 25 - 30 keV at FWHM for ^{208}Pb was achieved
- $d\sigma/d\Omega$, D_{ss} measurements
- Polarization transfer measurements are to be completed
- Completion of the analysis
- Comparison with $^{208}\text{Pb}(e,e')$ at backward angles