Magnetic quadrupole modes in self-conjugate sd-shell nuclei from electron scattering at 180° *

Maksym Chernykh
Institut für Kernphysik, TU Darmstadt

M. Chernykh[1], N.G. Goncharova[2], P. von Neumann-Cosel[1], N.D. Pronkina[2], S. Rathi[1] and A. Richter[1]

[1] Institut für Kernphysik, TU Darmstadt, Germany
[2] Institute of Nuclear Physics, Moscow State University, Russia

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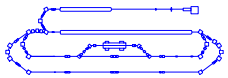

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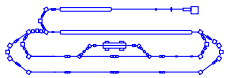
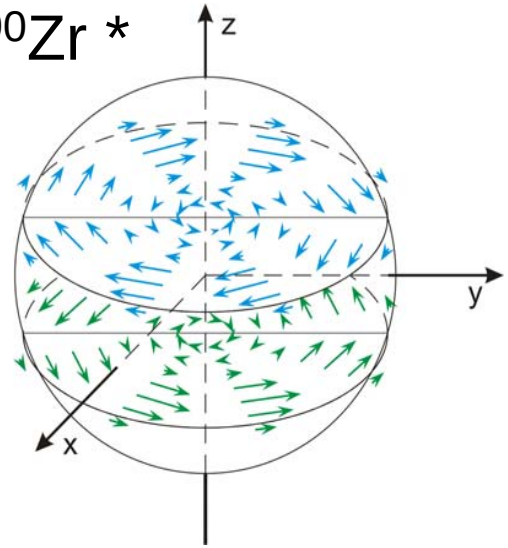


Motivation

- Study of magnetic quadrupole (M2) excitations in sd-shell nuclei
- Magnetic quadrupole excitations have been studied in medium-mass nuclei ^{48}Ca, ^{58}Ni and ^{90}Zr *
  - quenching similar to M1
  - orbital twist mode
- Relevant in light nuclei?
- Nuclei under study: ^{24}Mg, ^{28}Si and ^{32}S



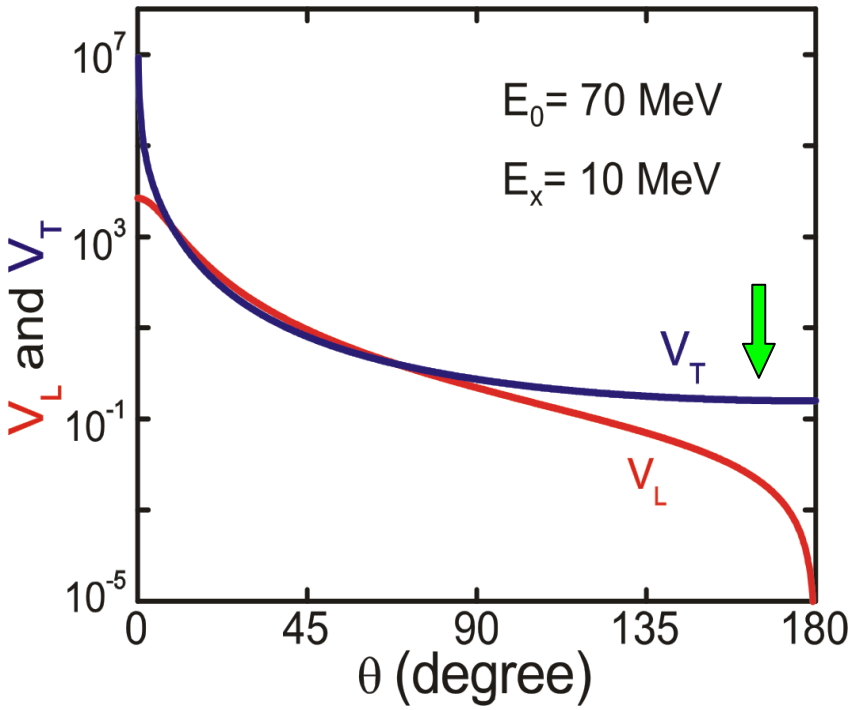
* P. von Neumann-Cosel *et al.*, Phys. Rev. Lett. **82** (1999) 1105
B. Reitz *et al.*, Phys. Lett. **B532** (2002) 179

Experimental method

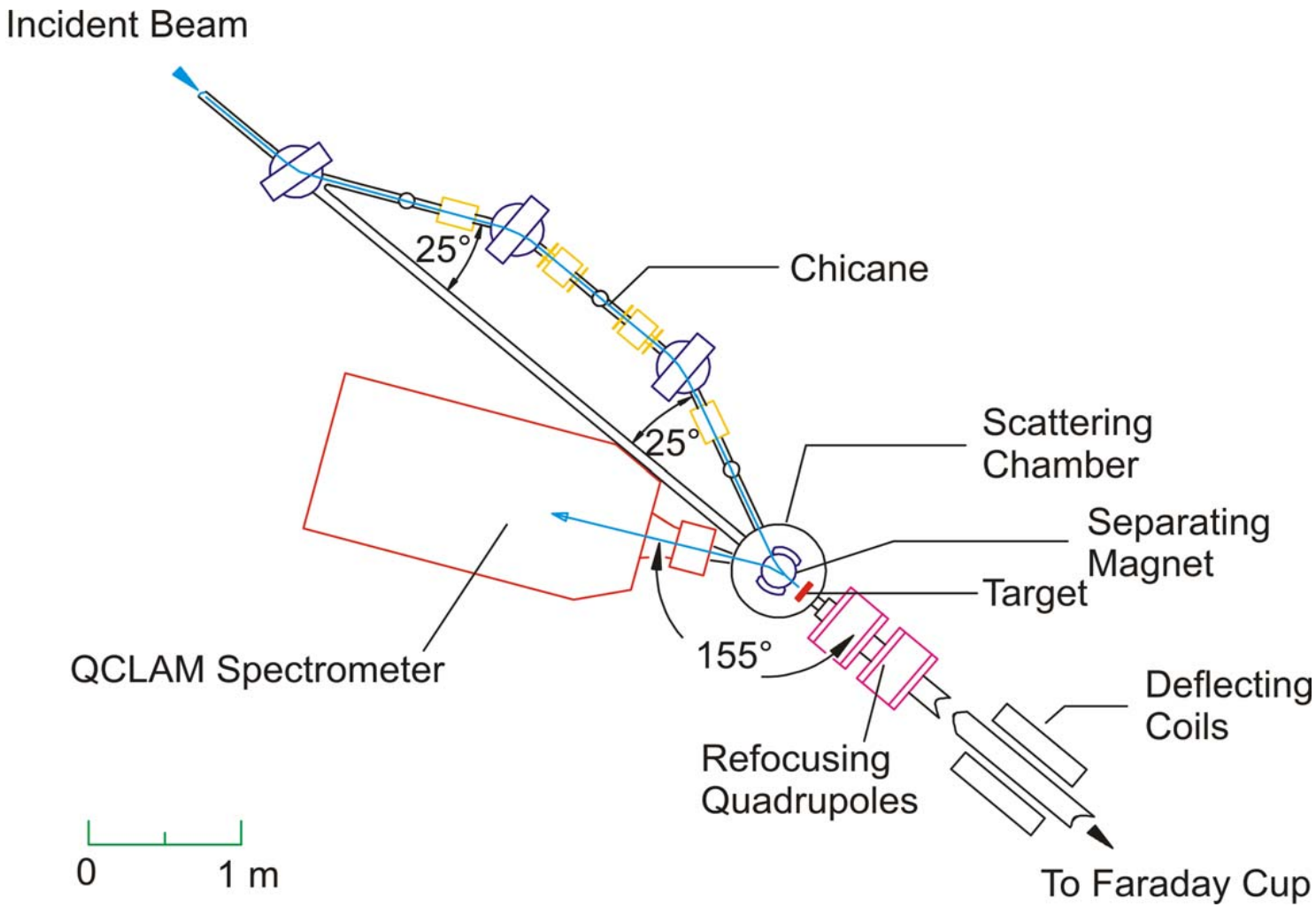
- Real photons not suitable

  ➡ electron scattering at 180°

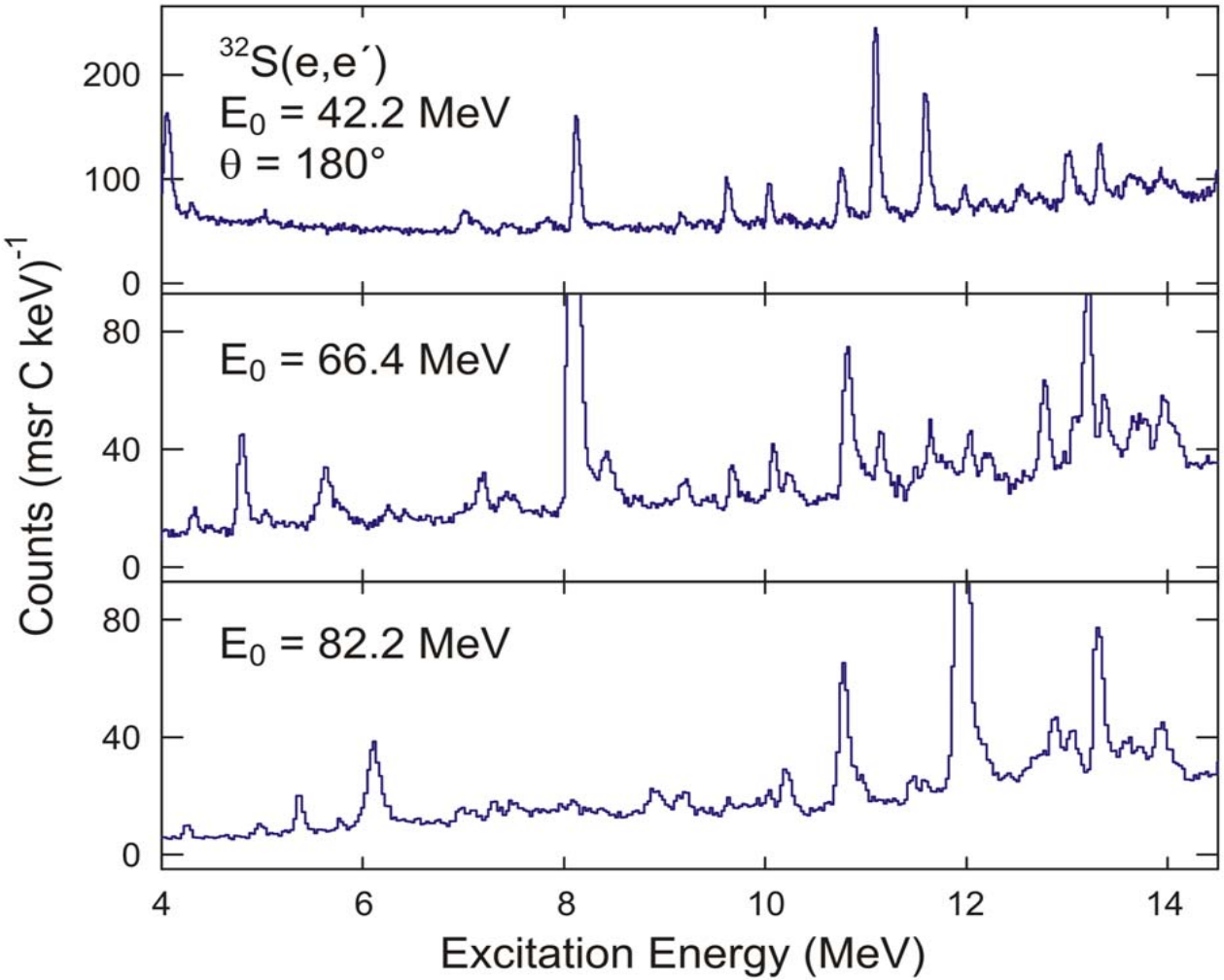
$$\frac{d\sigma}{d\Omega} \propto V_L \times |F_L(q)|^2 + V_T \times |F_T(q)|^2$$



180° system at the S-DALINAC



Measured spectra



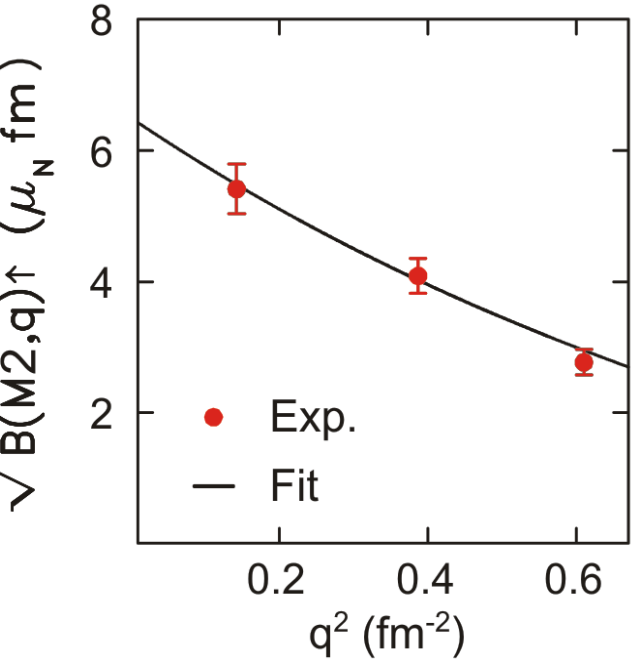
- ^{28}Si (180°), ^{24}Mg (117°, 141°, 165°)

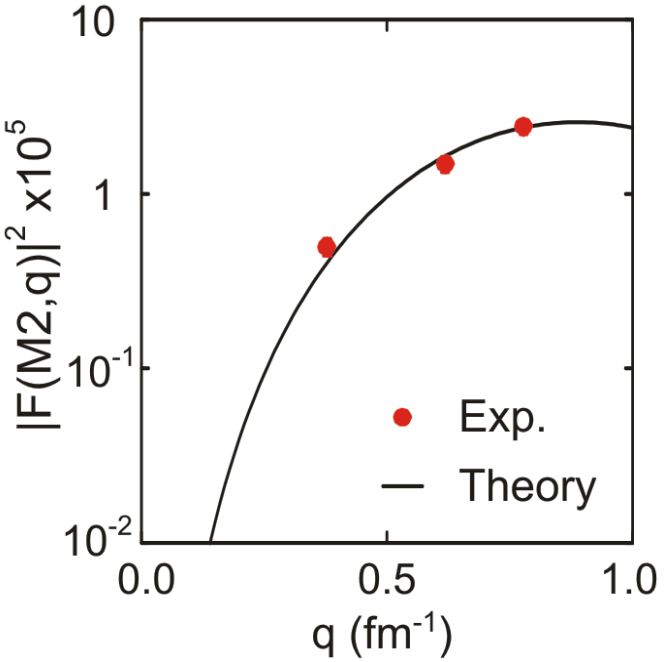
Extraction of B(M2) values

- PWBA analysis
- Almost model-independent

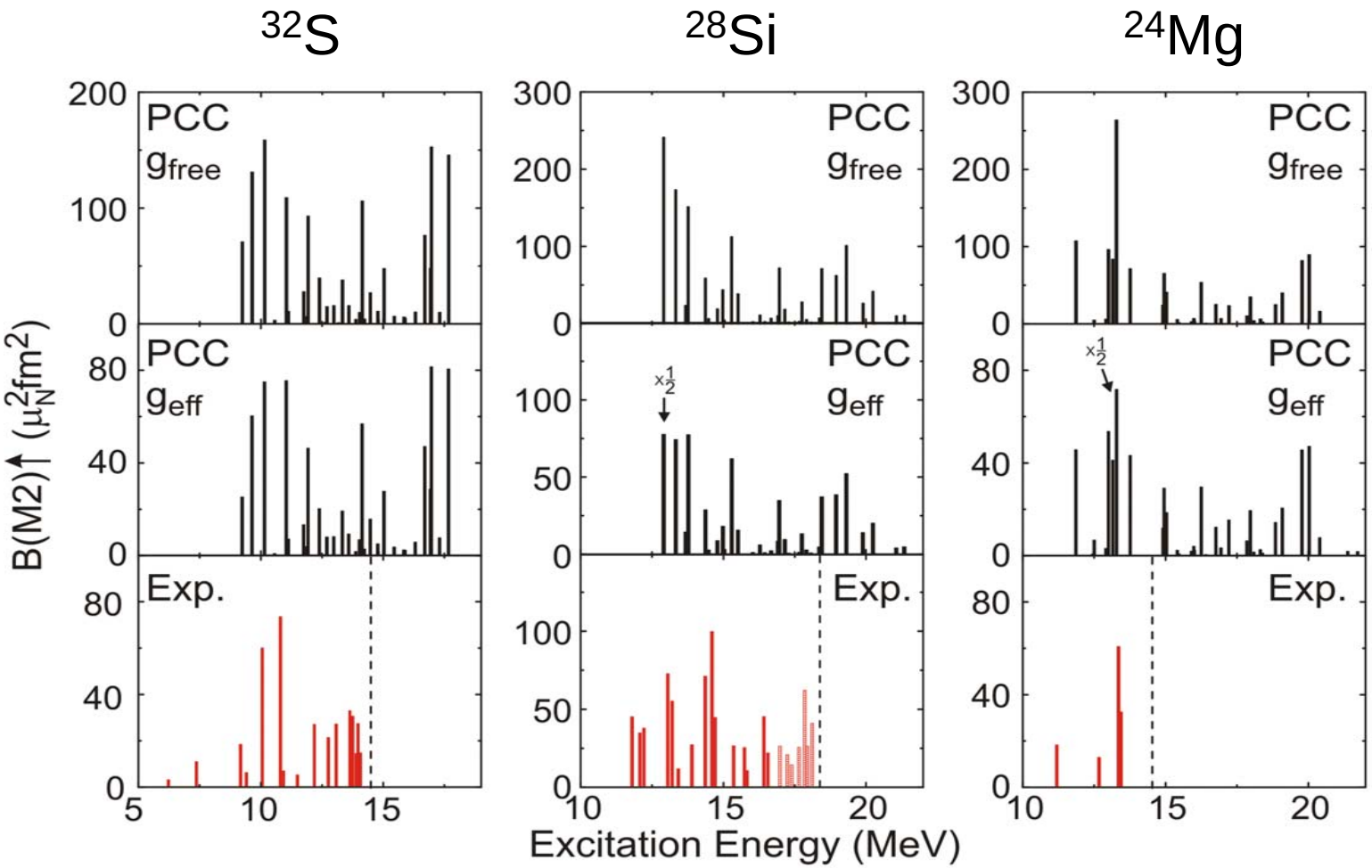
$$\sqrt{\frac{B(M\lambda,q)\uparrow}{B(M\lambda,0)\uparrow}} = \sum_{i=0}^{\infty} (-1)^i C_i^{\lambda} q^{2i} R_{tr}^{2i}$$

- DWBA analysis
- Model-dependent



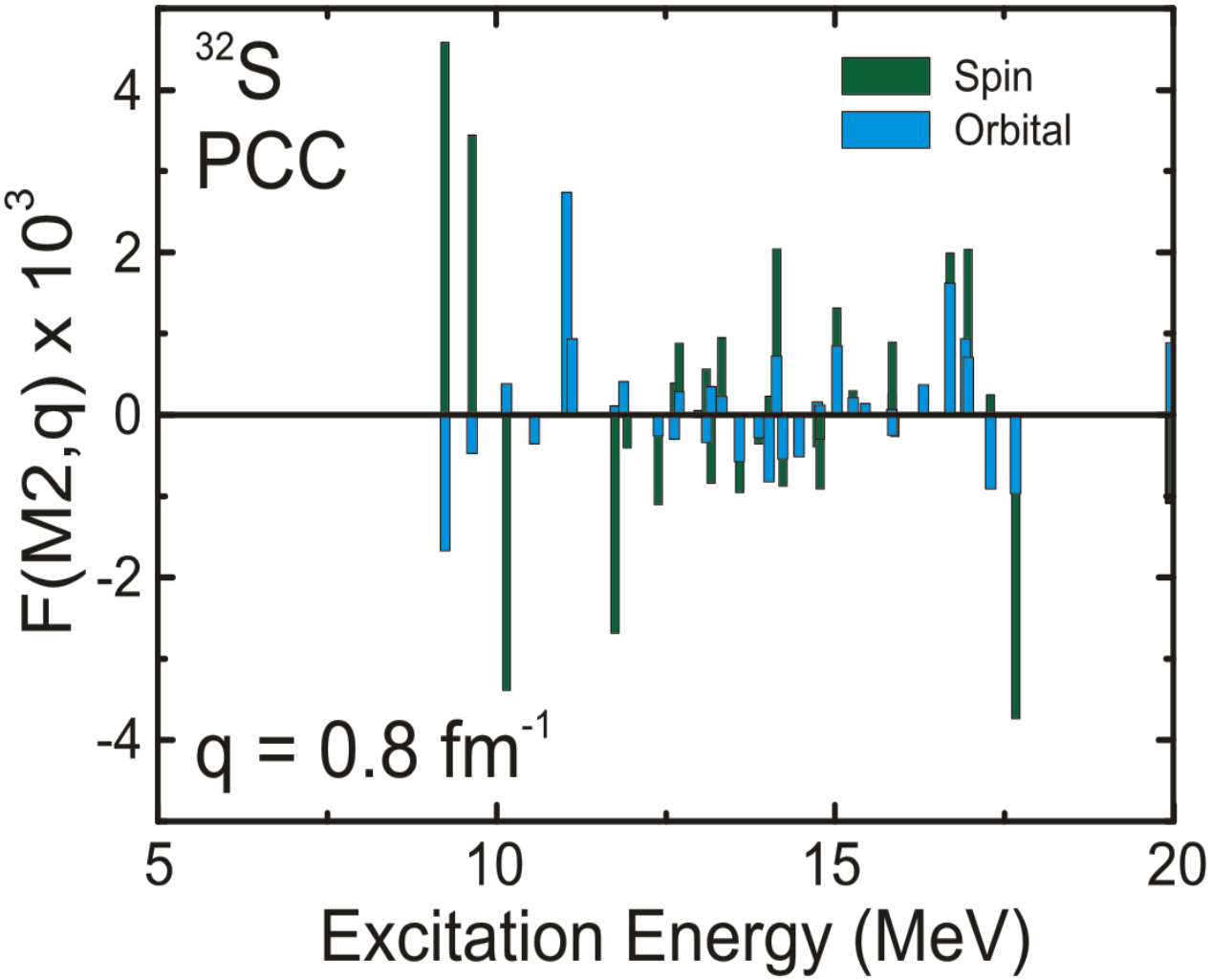


Comparison with theory

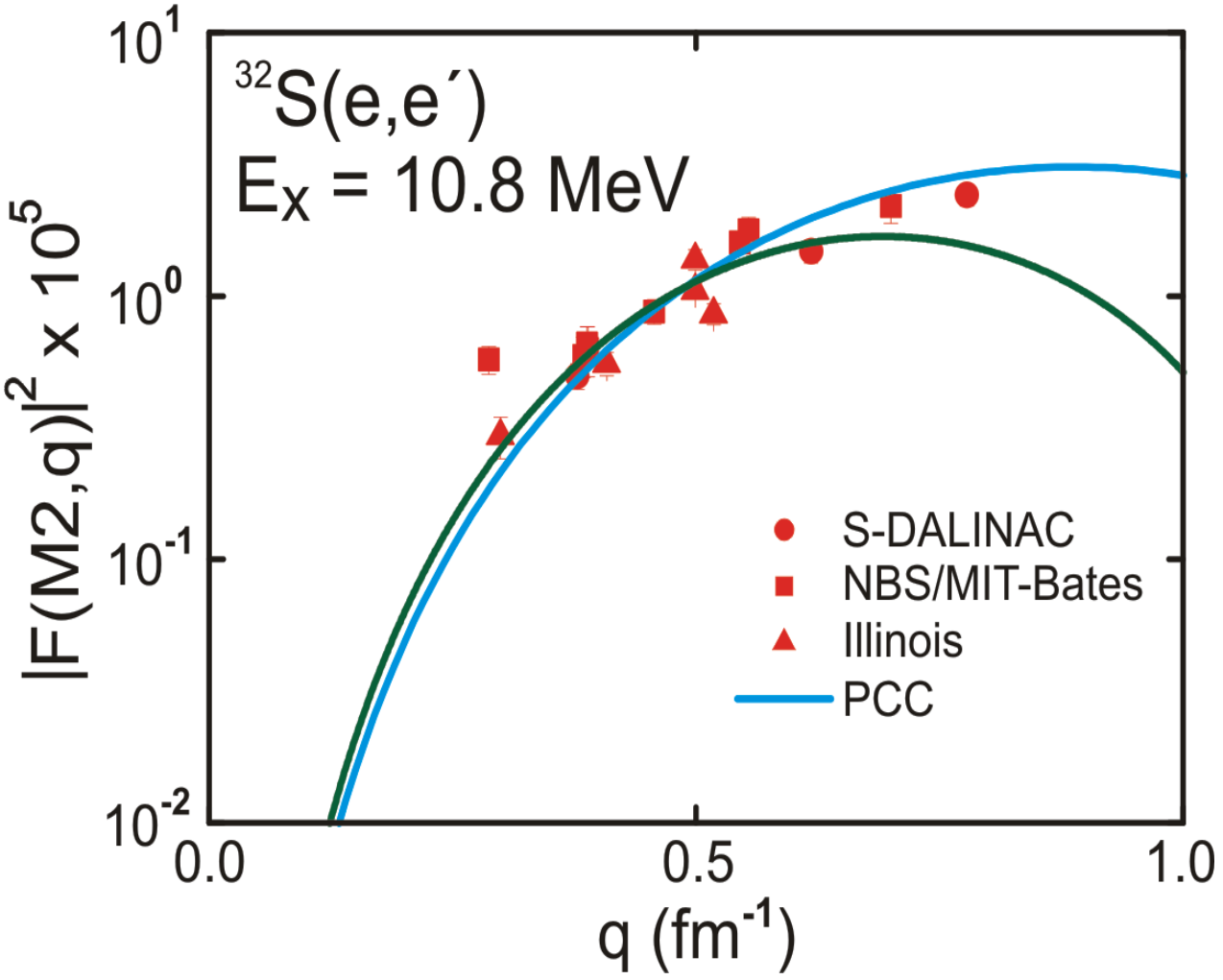


- Quenching factor $g_{eff} = 0.7 g_{free}$

Spin-orbital decomposition



Candidate for twist mode



Summary

- Electron scattering at 180° is an excellent tool for investigation of transverse transitions
- Structure of highly fragmented strength distribution well described by PCC
- Quenching factor $g_{eff} = 0.7 g_{free}$ in light nuclei confirmed
- Large orbital contribution to the form factor

  ➡ indication for the twist mode