^{76}Seの高スピン状態

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Two experiments for $A \sim 80$ nuclei with Hyperball2

Search for chiral doublet structures in ^{79}Kr

Beam: ^{13}C@65 MeV from 930 Cyclotron
Target: 500 μg/cm^2 and 70 % enriched ^{70}Zn
(self-supporting, stacked)

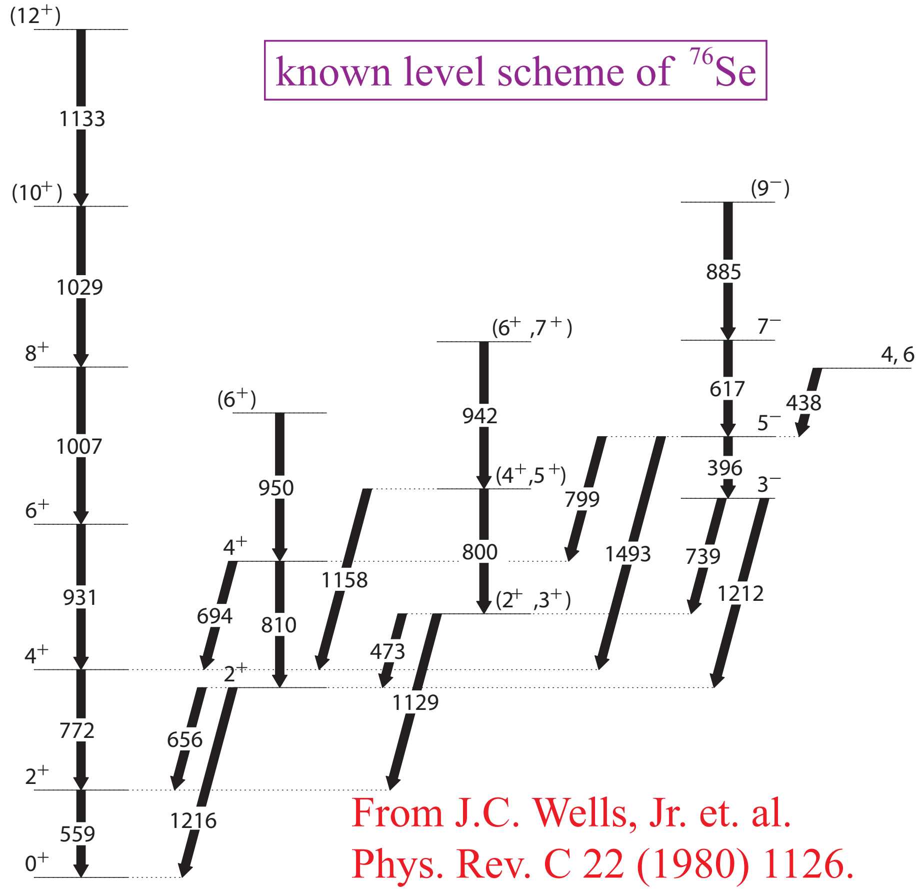
370 million γ-γ-γ cube events were obtained!

Search for chiral doublet structures in ^{80}Br

Beam: ^{13}C@53 MeV from 930 Cyclotron
Target: 1 mg/cm^2 and 70 % enriched ^{70}Zn
(Pb backing, 10mg/cm^2)

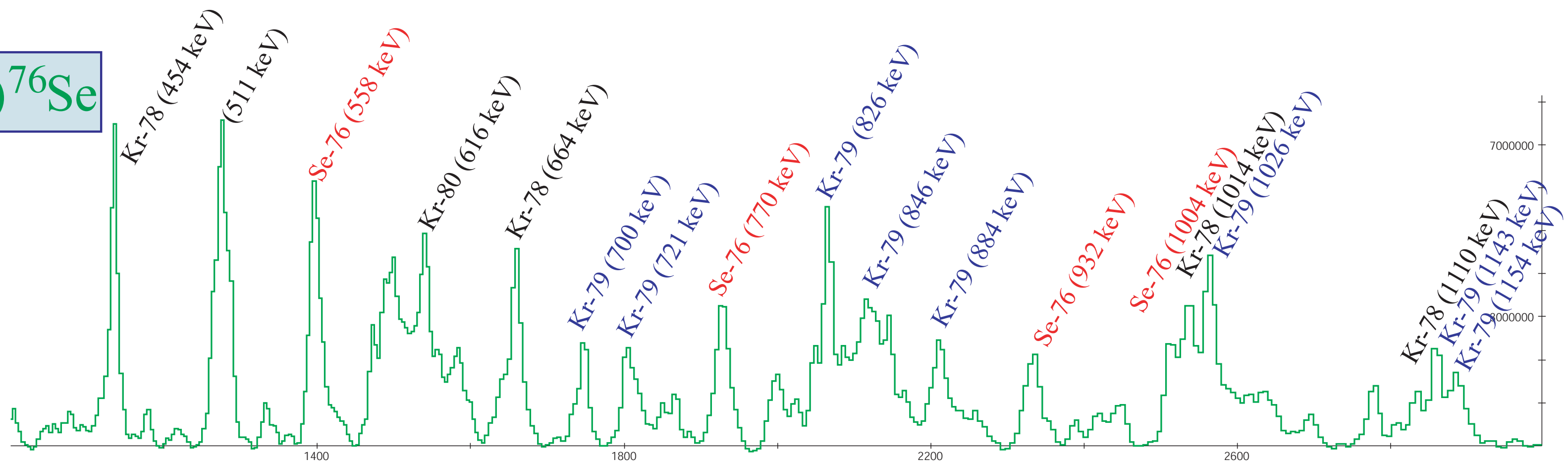
170 million γ-γ-γ cube events were obtained!

known level scheme of ^{76}Se

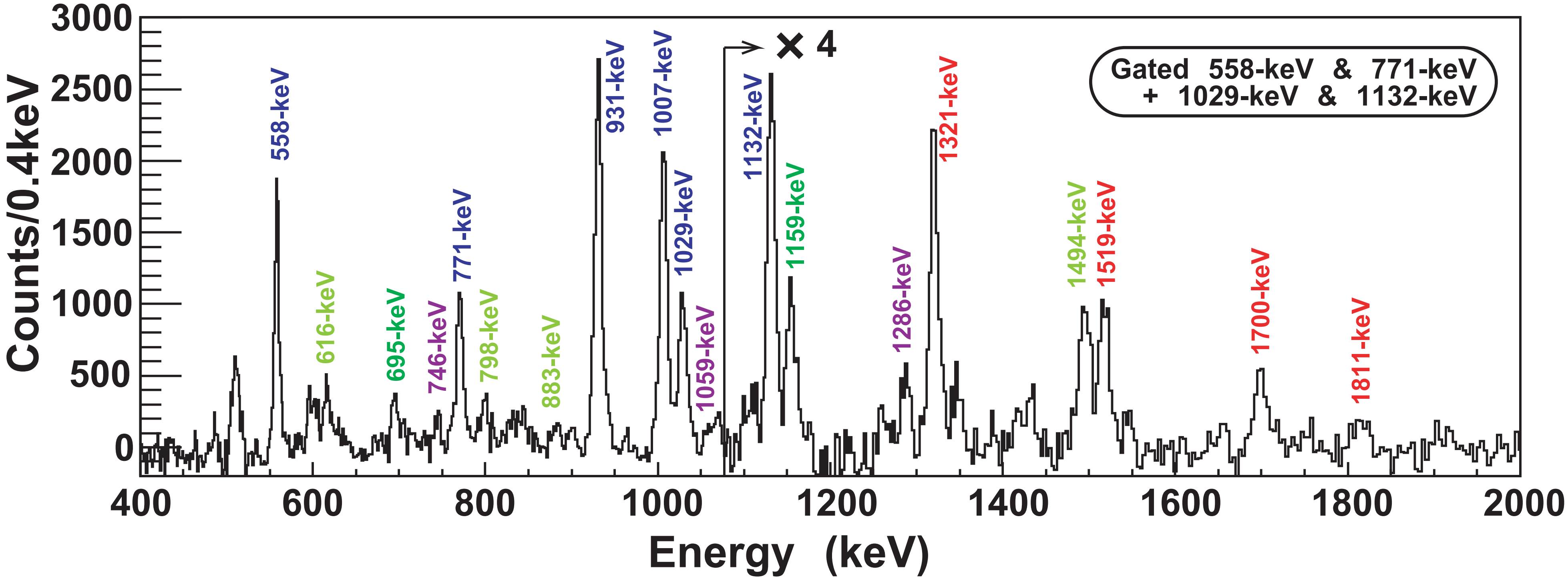


From J.C. Wells, Jr. et. al.
Phys. Rev. C 22 (1980) 1126.

^{70}Zn(^{13}C,α3n)^{76}Se



γ-γ-γ spectrum



Search for chiral doublet structures in ^{79}Kr

Beam: ^{13}C@65 MeV from 930 Cyclotron
Target: 500 μg/cm^2 and 70 % enriched ^{70}Zn
(self-supporting, stacked)

Level scheme,
Spin parity assignment
(Linear polarization, DCO ratio)

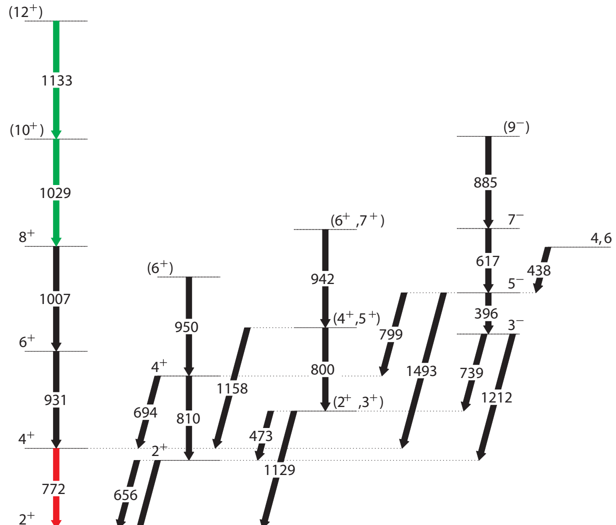
for ^{76}Se

Search for chiral doublet structures in ^{80}Br

Beam: ^{13}C@53 MeV from 930 Cyclotron
Target: 1 mg/cm^2 and 70 % enriched ^{70}Zn
(Pb backing, 10mg/cm^2)

Lifetime measurement
(Doppler-Shift Attenuation Method)

for ^{76}Se



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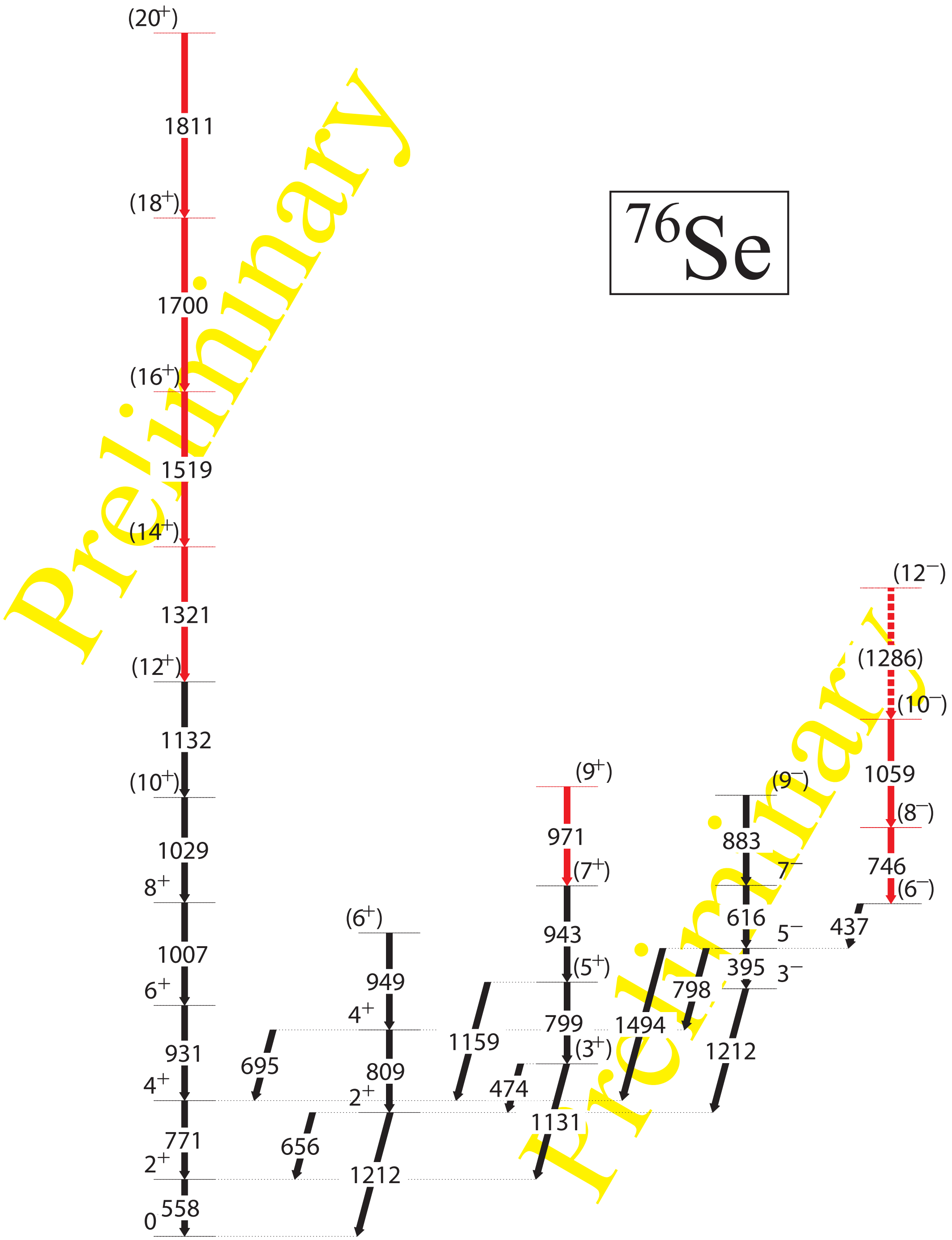
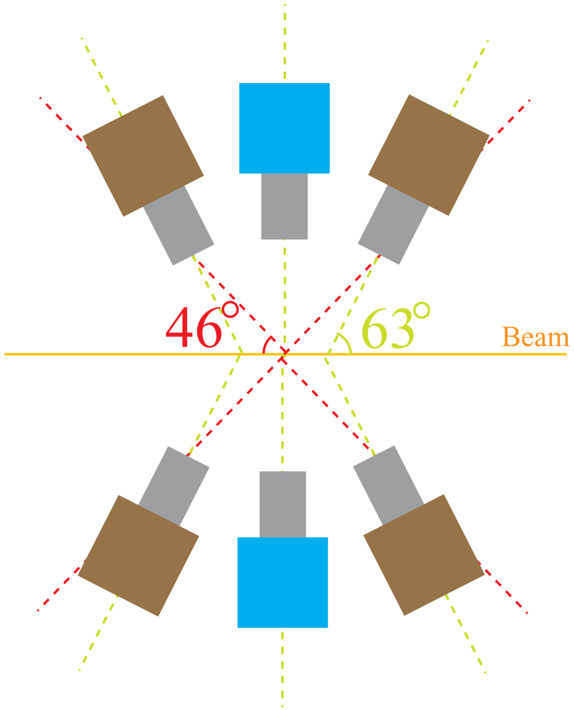
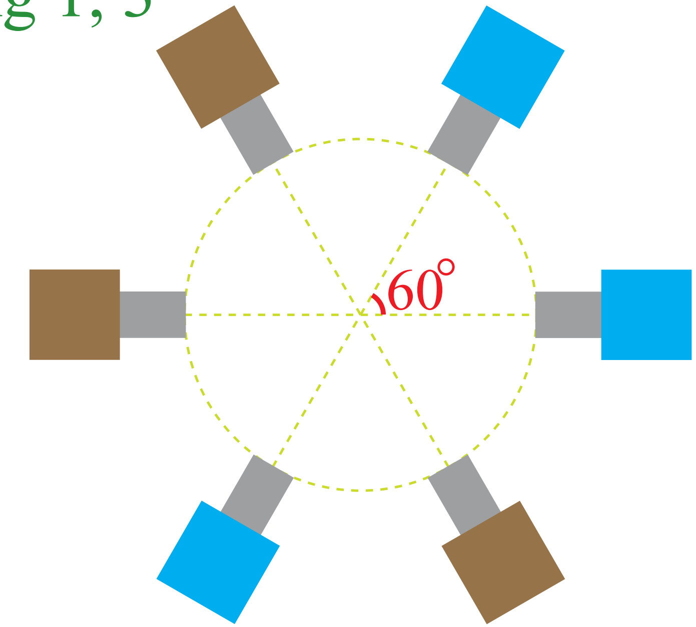
Deduced Level Scheme



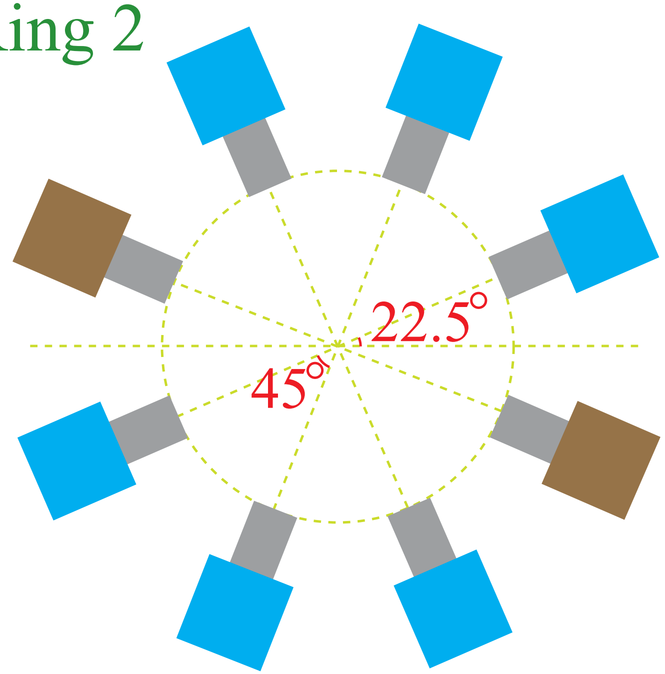
Detectors geometry of Hyperball-2



Ring 1, 3



Ring 2



- Polar angles

  46, 90, 134 deg

- Azimuthal angles

  Ring 1, 3:

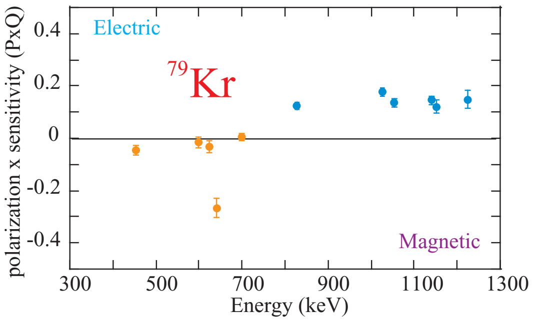
  0, 60, 120, 180, 240, 300 deg

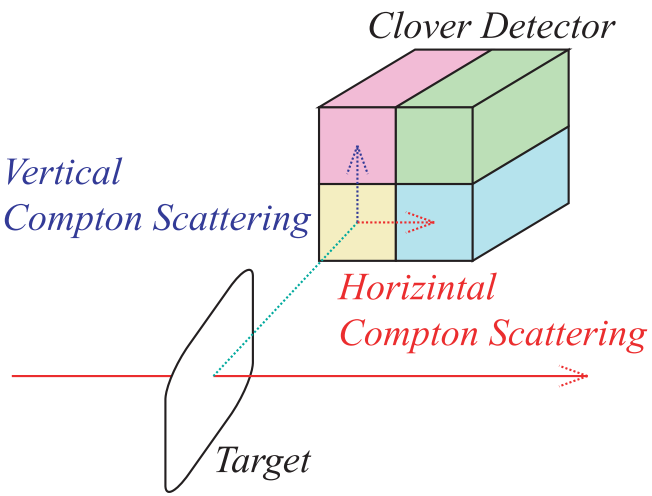
  Ring 2:

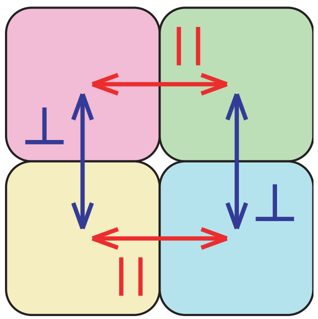
  22.5, 67.5, 112.5, 157.5,
  202.5, 247.5, 292.5, 337.5 deg

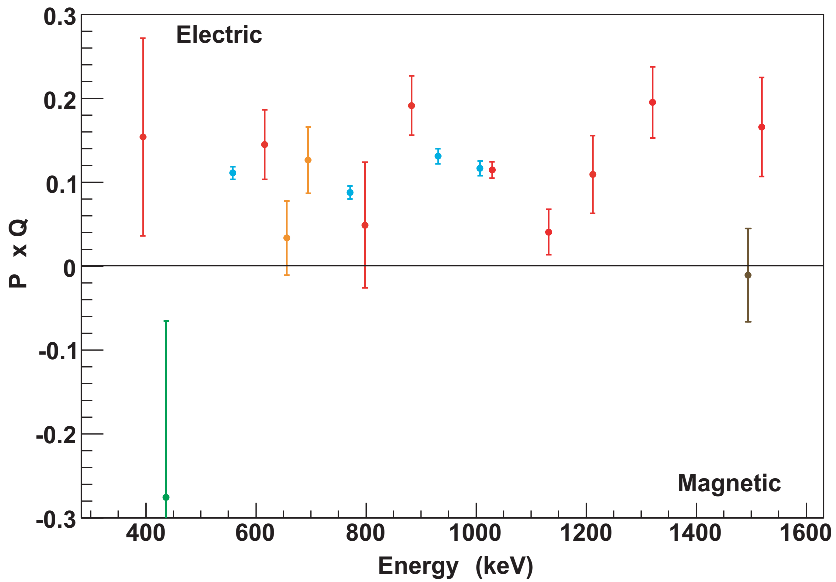
Linear Polarization

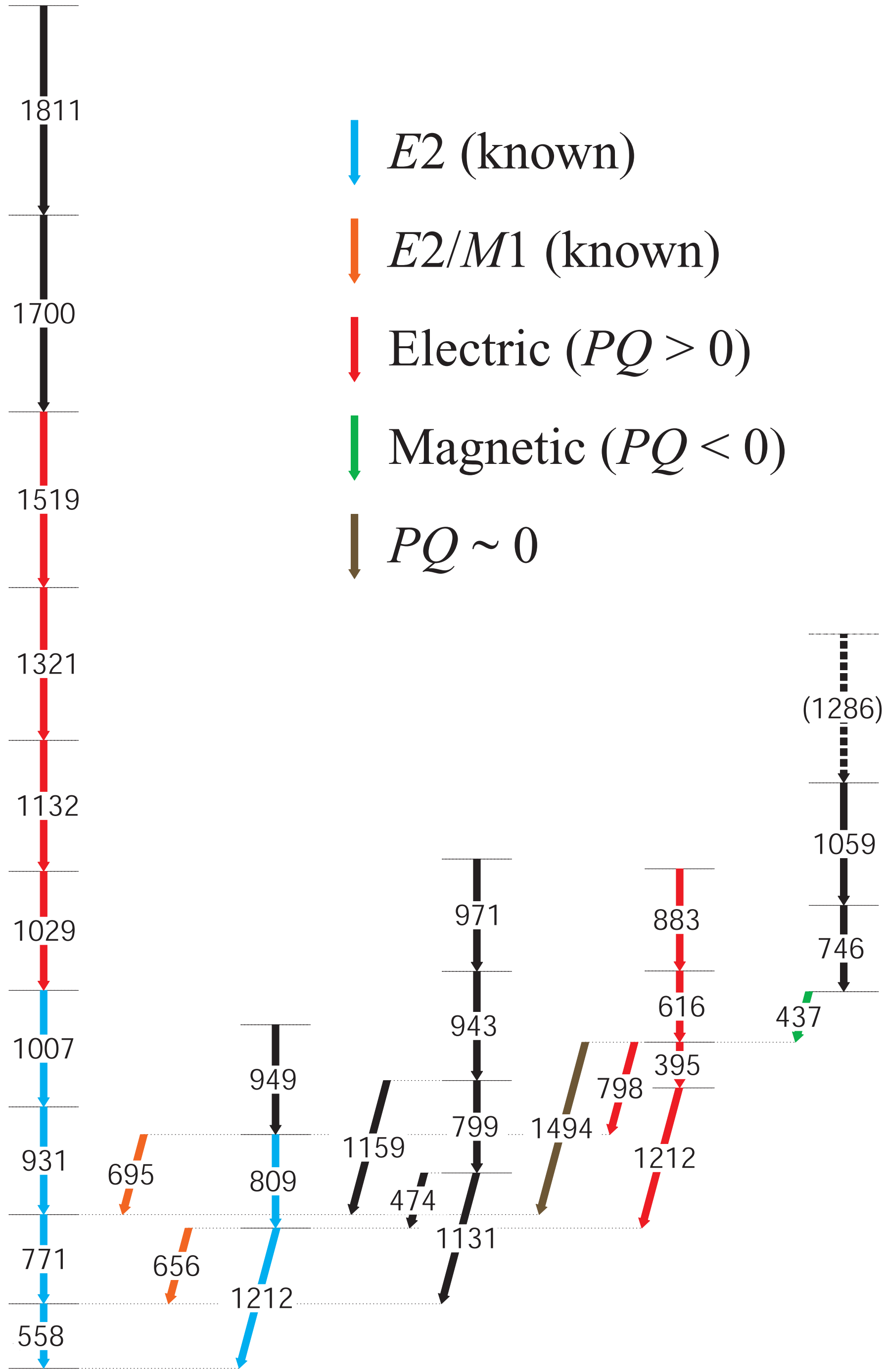
$$P = \frac{1}{Q}\frac{N_\perp - N_\parallel}{N_\perp + N_\parallel}$$







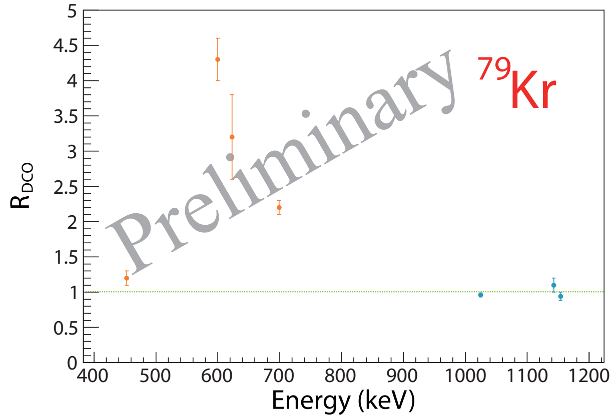




DCO ratios with Hyperball-2

$$R_{\mathrm{DCO}} = \frac{I_\gamma \text{ (at Ring 2: 90}^\circ\text{) gated by } \gamma_{\mathrm{G}} \text{ (at Ring 1: 134}^\circ\text{)}}{I_\gamma \text{ (at Ring 1: 134}^\circ\text{) gated by } \gamma_{\mathrm{G}} \text{ (at Ring 2: 90}^\circ\text{)}}$$

A. Krämer-Flecken et. al.
Nucl. Instr. and Methods in Phys. Res. A 275 (1989) 333.

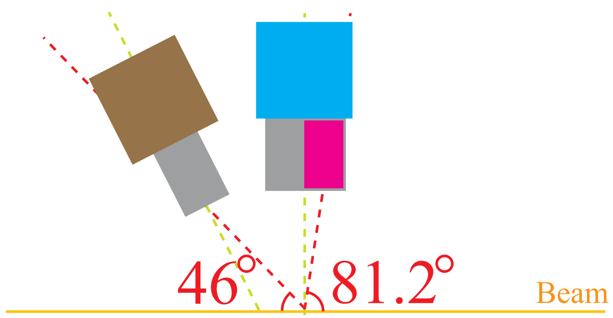


- Q transitions ··· dominant $\sim 0^\circ$
- D transitions ··· dominant $\sim 90^\circ$

$\Longrightarrow$ If the gate is set on $E2$ transition,

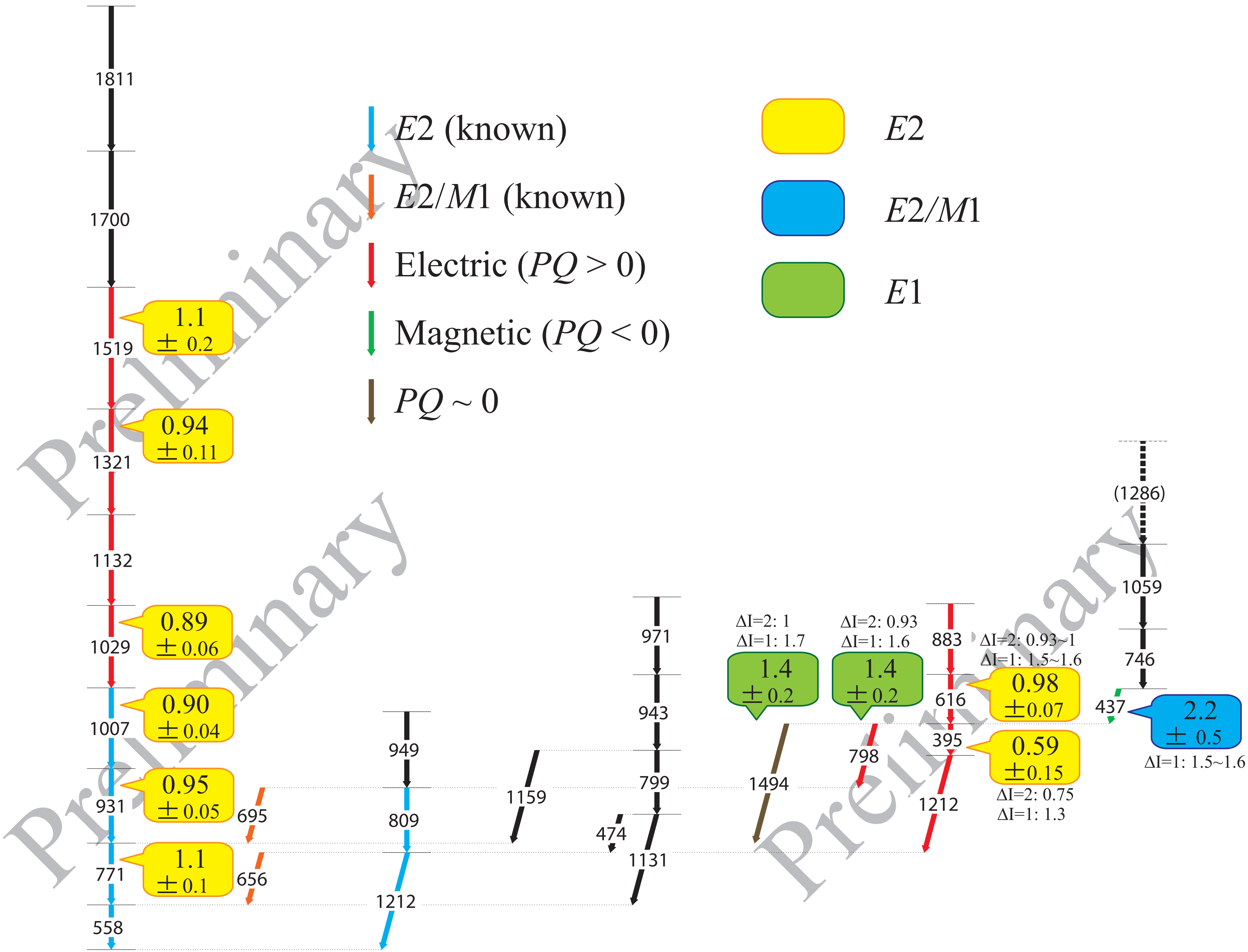
- $R_{\mathrm{DCO}} = 1$: observed γ ··· Q transitions
- $R_{\mathrm{DCO}} \neq 1$: observed γ ··· D transitions (with mixing)

when detectors are placed at $\phi = 0^\circ$.
(ϕ: azimuthal angle)

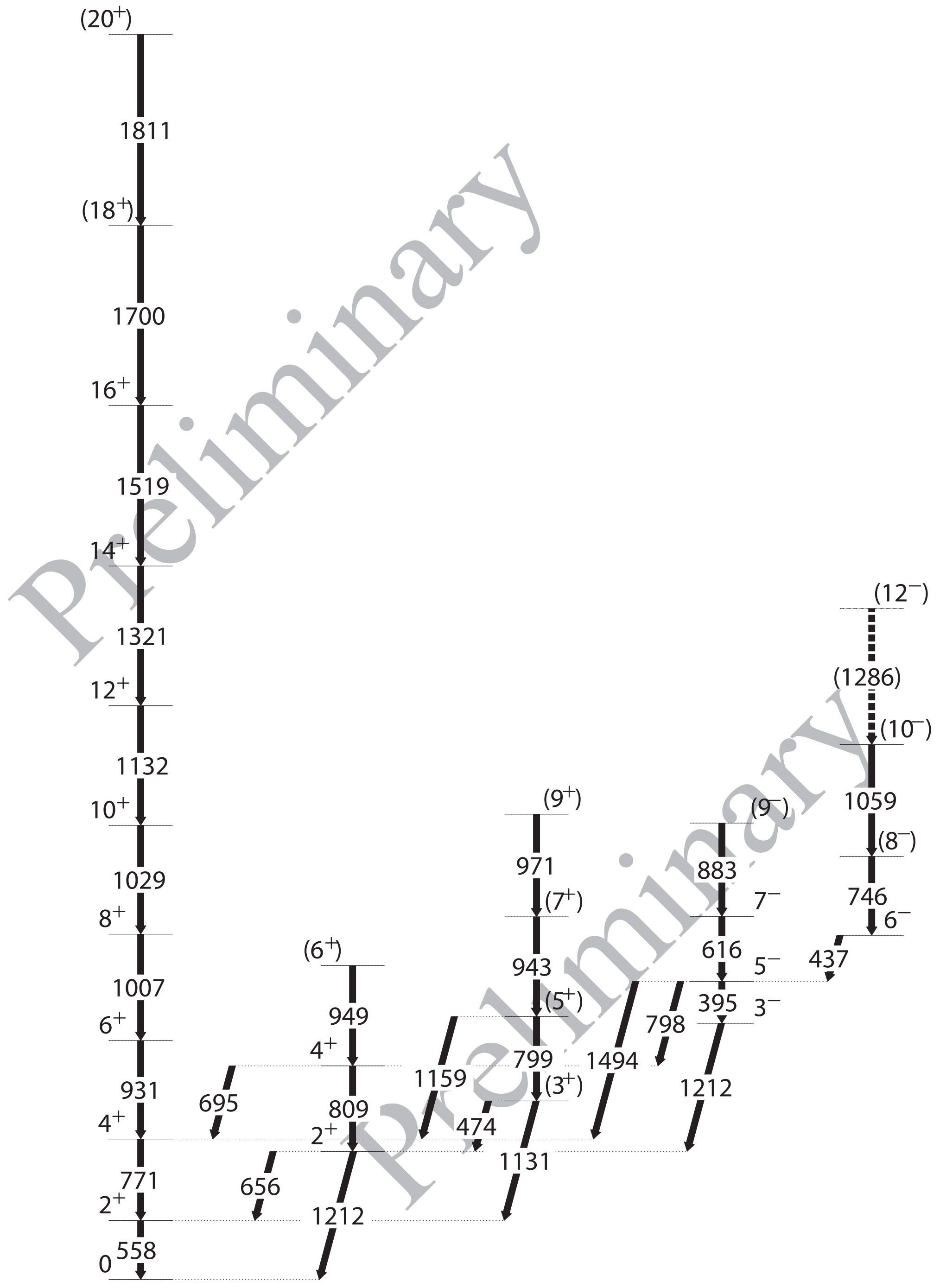


- Issues using DCO method for Hyperball-2
  - Large opening angles
    - ∗ Low angular sensitivity for DCO method
    - ∗ Large peak width due to Doppler-broadning

Results of DCO analysis

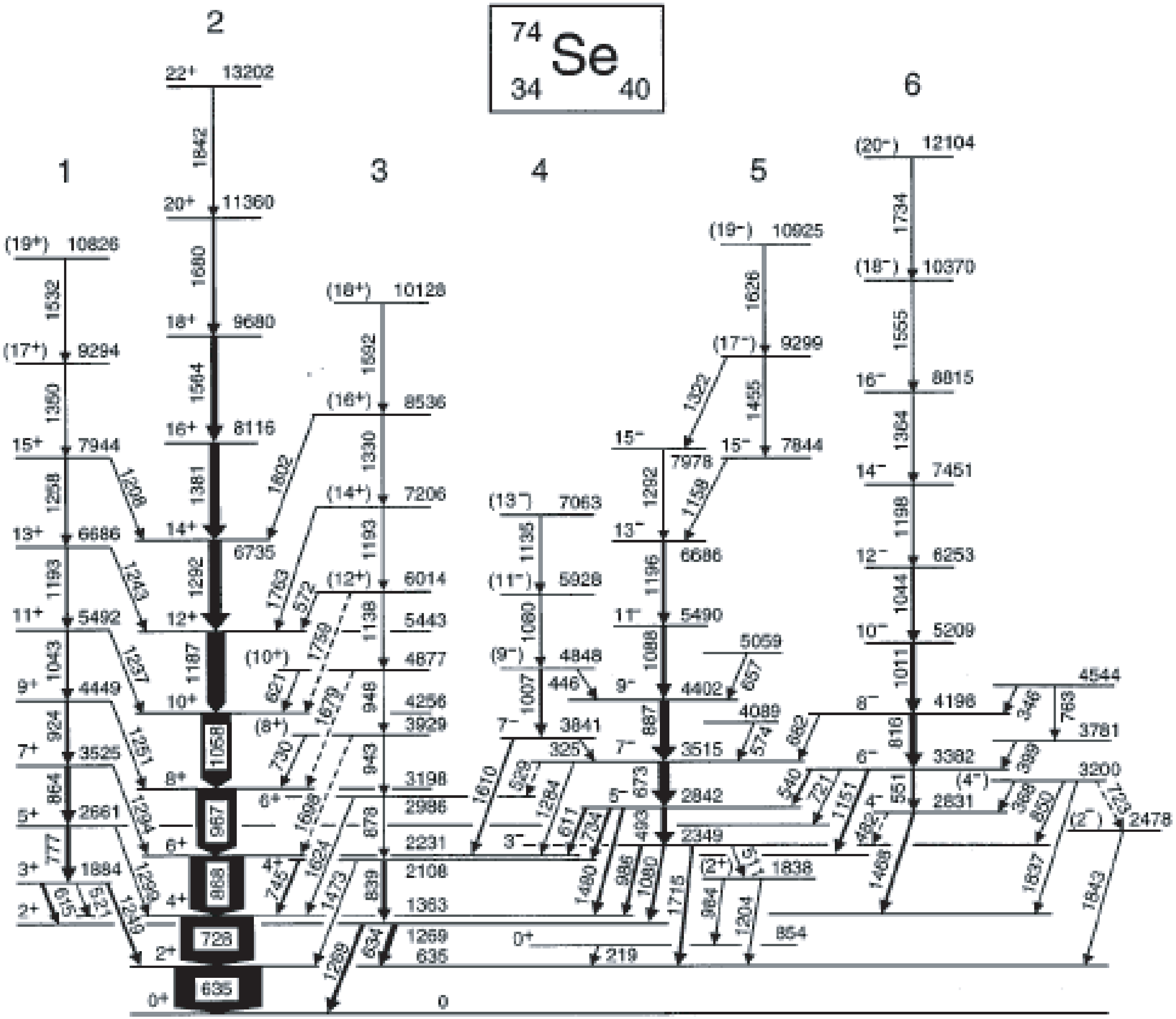


Preliminary Results



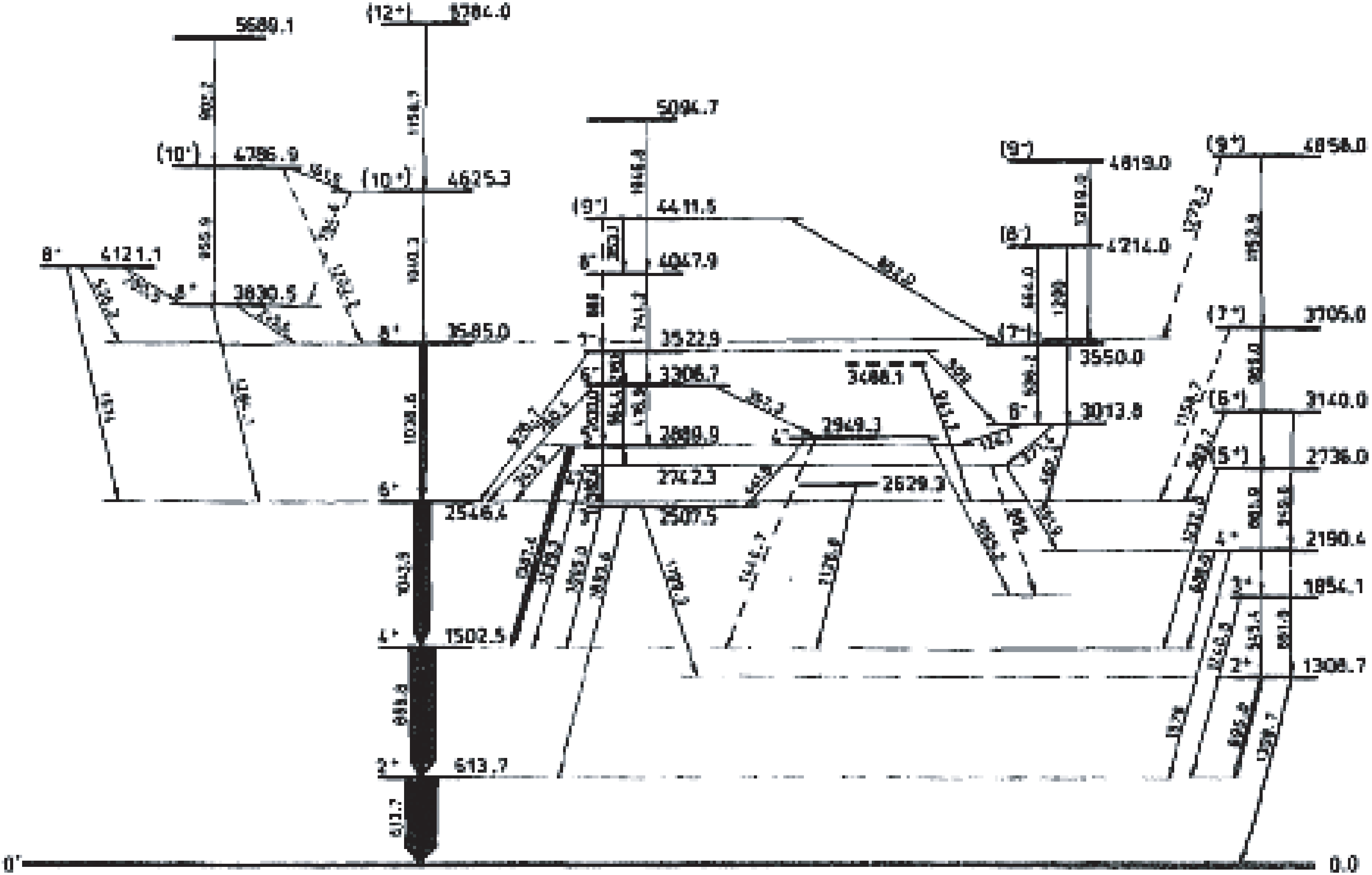
backup Slides

Level scheme of ^{74}Se



From J. Doring et. al. Phys. Rev. C 57 (1998) 2912

Level scheme of ^{78}Se



From R. Schwengner et. al. Z. Phys. A 326 (1987) 287.

Results of DCO analysis

558	771	E	$4^+ \to 2^+ \to 0^+$	1.1(1)	1
558	931	E	$6^+ \to 4^+ \to 2^+ \to 0^+$	0.95(5)	1
558	1007	E	$8^+ \to 6^+ \to 4^+ \to 2^+ \to 0^+$	0.90(4)	1
931	1029	E	$10^+ \to \cdots \to 4^+ \to 2^+ \to 0^+$	0.89(6)	1
558	1321	E	$14^+ \to \cdots \to 4^+ \to 2^+ \to 0^+$	0.94(11)	1
771	1519	E	$16^+ \to \cdots \to 4^+ \to 2^+ \to 0^+$	1.1(2)	1
771	798	E	$5^- \to 4^+ \to 4^+ \to 2^+$ $6^+ \to 4^+ \to 4^+ \to 2^+$	1.4(2)	1.6 0.93
771	1494	E	$5^- \to 4^+ \to 2^+$ $6^+ \to 4^+ \to 2^+$	1.4(2)	1.7 1
558	395	E	$5^- \to 3^- \to 4^+ \to 2^+ \to 0^+$ $5^- \to 4^- \to 4^+ \to 2^+$	0.59(15)	0.75 1.3
558	437	M	$6^+ \to 5^+ \to 4^+ \to 2^+ \to 0^+$ $6^+ \to 5^+ \to 4^+ \to 4^+ \to 2^+ \to 0^+$	2.2(5)	1.6 1.5
	616	E	$7^+ \to 5^+ \to 4^+ \to 2^+ \to 0^+$ $7^+ \to 5^+ \to 4^+ \to 4^+ \to 2^+ \to 0^+$	0.98(7)	1 0.93