γ – ray spectroscopy of ^{36}Cl nucleus

Sezgin AYDIN

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Aksaray University, Aksaray, TURKEY

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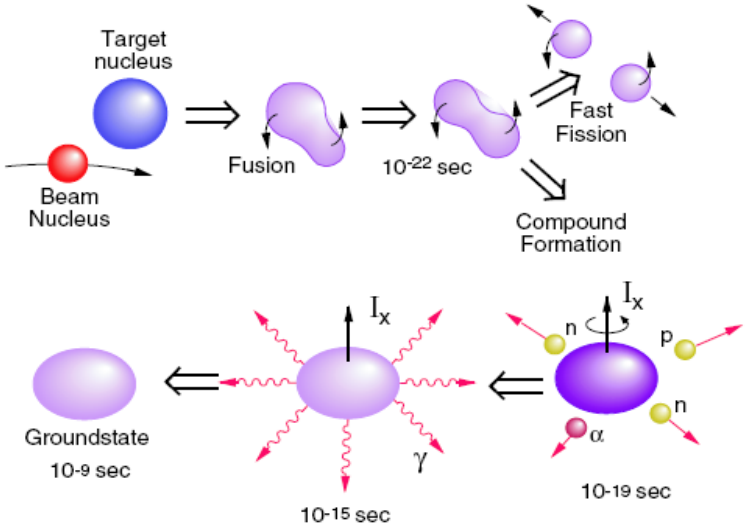
Introduction

doubly-odd ^{36}Cl
"1n & 3p valence holes with respect to doubly magic ^{40}Ca"

^{24}Mg(^{14}N,2p)^{36}Cl: fusion-evaporation



Previous studies: (Stripping/pickup)

Endt et al., $\Rightarrow J \leq 5$
Warburton et al., $\Rightarrow J \leq 6^{(-)}$& $7^{(+)}$
confirmed by Nolan et al.,

Endt et al. NP 34, 325 (1962)
Warburton et al. PRC 14,996 (1976)
Nolan et al. JPG 3, 1371 (1977)

Experiment & data reduction procesdure

4π- GASP Array at LNL

Configuration II

- 40 HPGe (Compton suppressed)
- $d_{target\text{-}det.}$ = 22 cm
- ε_{ph}~ 5.8% @ 1332.5 keV
- Pb collimator (6 cm thick)
- inner space R_{int} = 15 cm

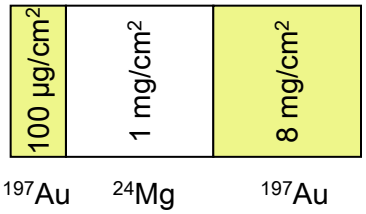
7 rings @

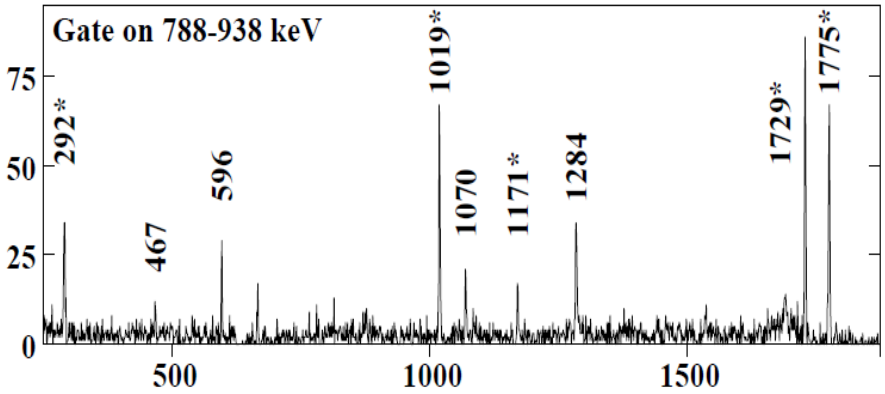
35^O,	60^O,	72^O,	90^O,	108^O,	120^O,	145^O
6	6	4	8	4	6	6

Angular distributions:
Data sorted in 7 matrices

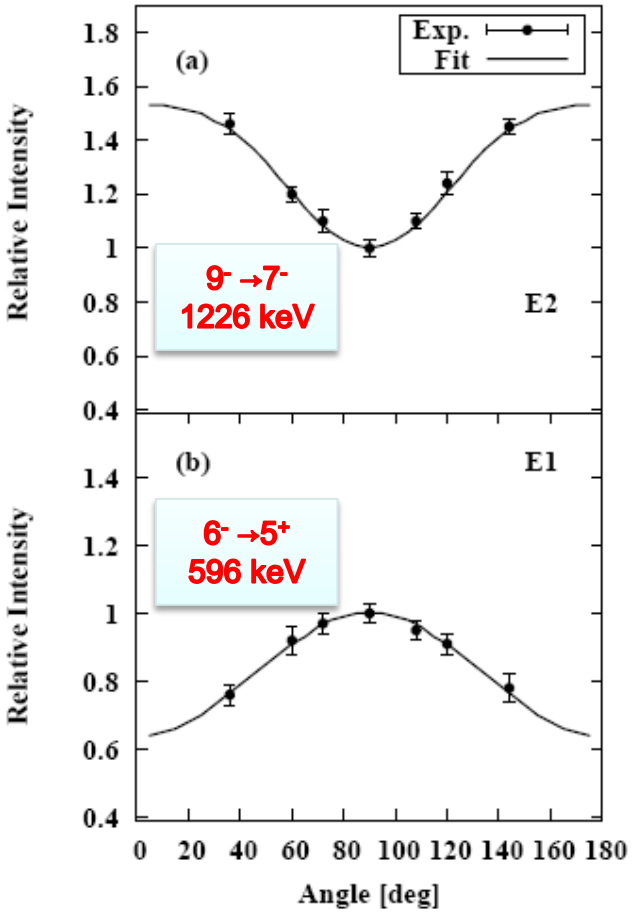
(i) γ-γ , (ii) γ-γ-γ cubes

$^{24}Mg(^{14}N, 2p)^{36}Cl$: fusion-evaporation
Target = ^{24}Mg (78.99 %)
t_m = 1 mg/cm^2 / sandwiched
Beam = ^{14}N (≈ 31 MeV), 5pnA / TANDEM

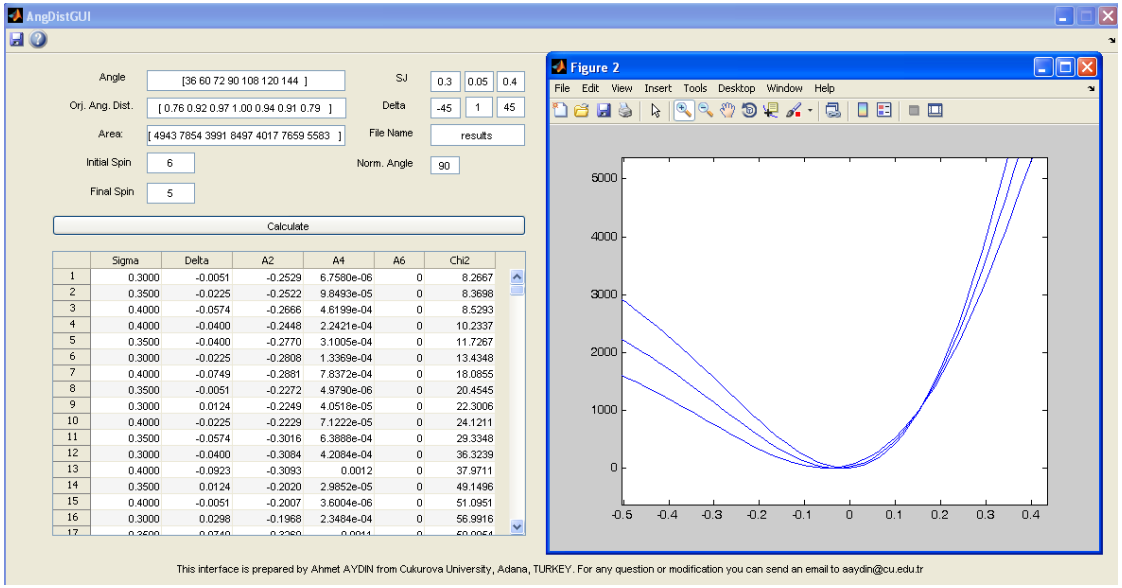




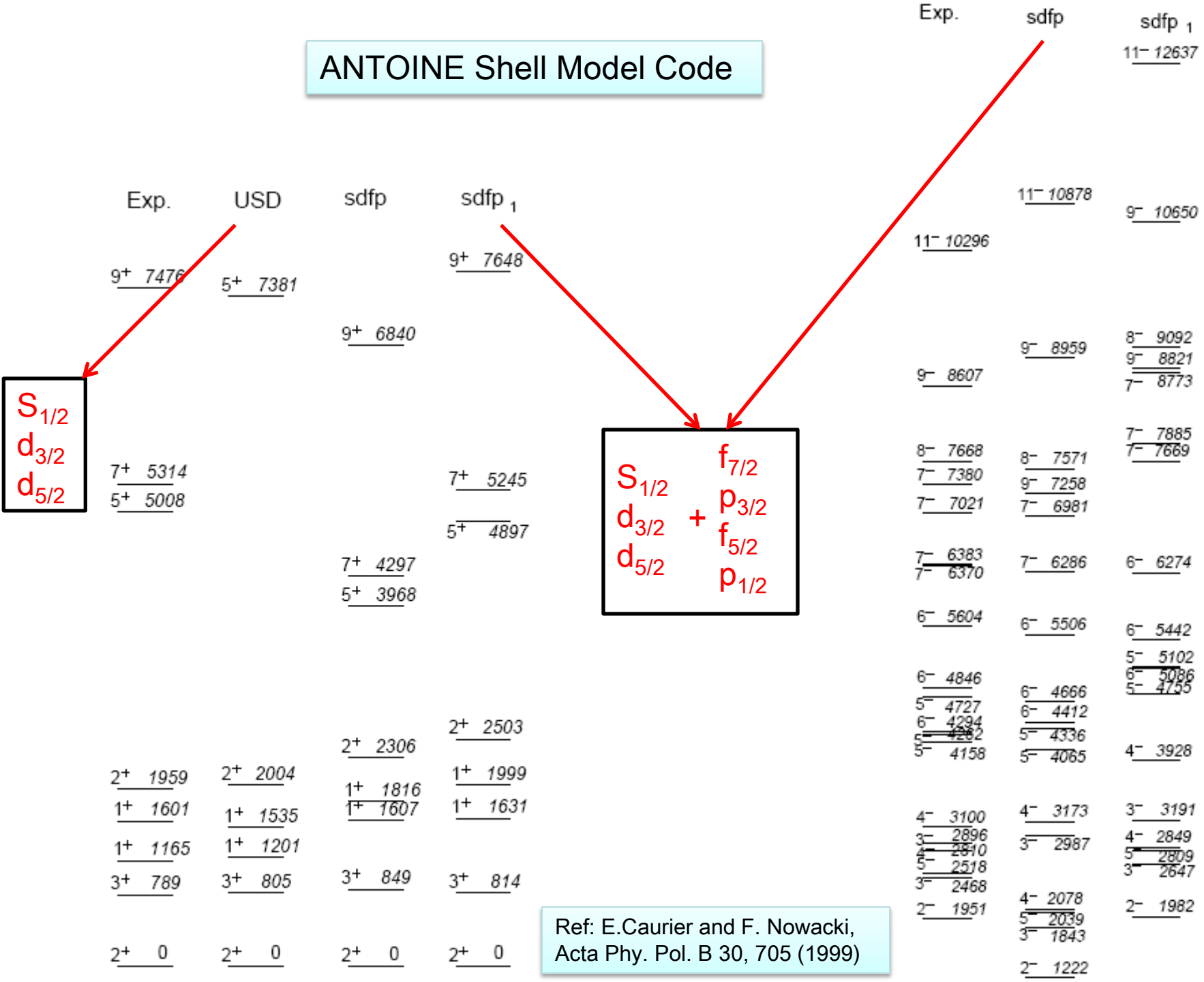
Angular distribution analysis



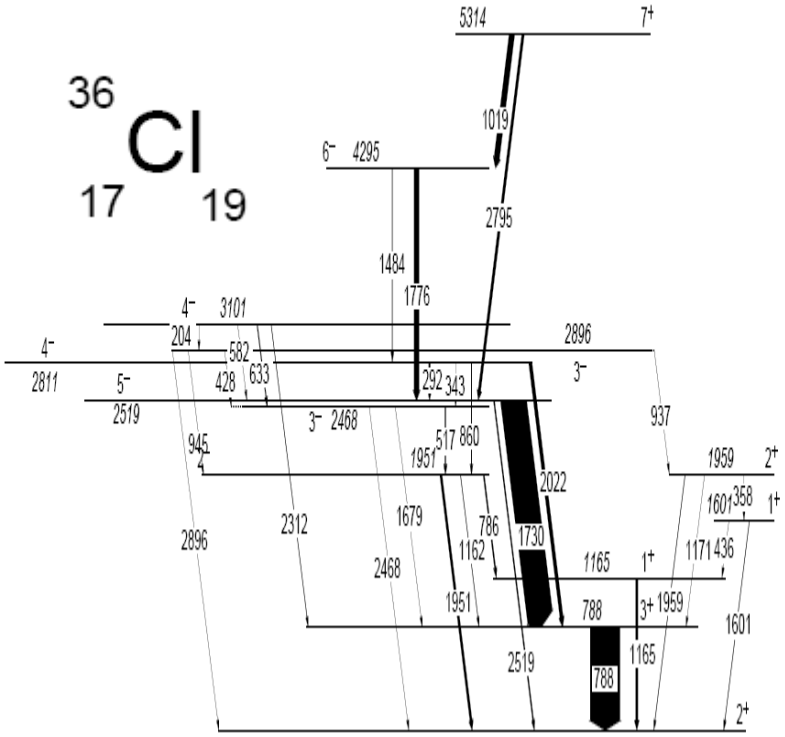
$$R_{ADO} = \frac{I_\gamma(34°) + I_\gamma(146°)}{2I_\gamma(90°)}$$



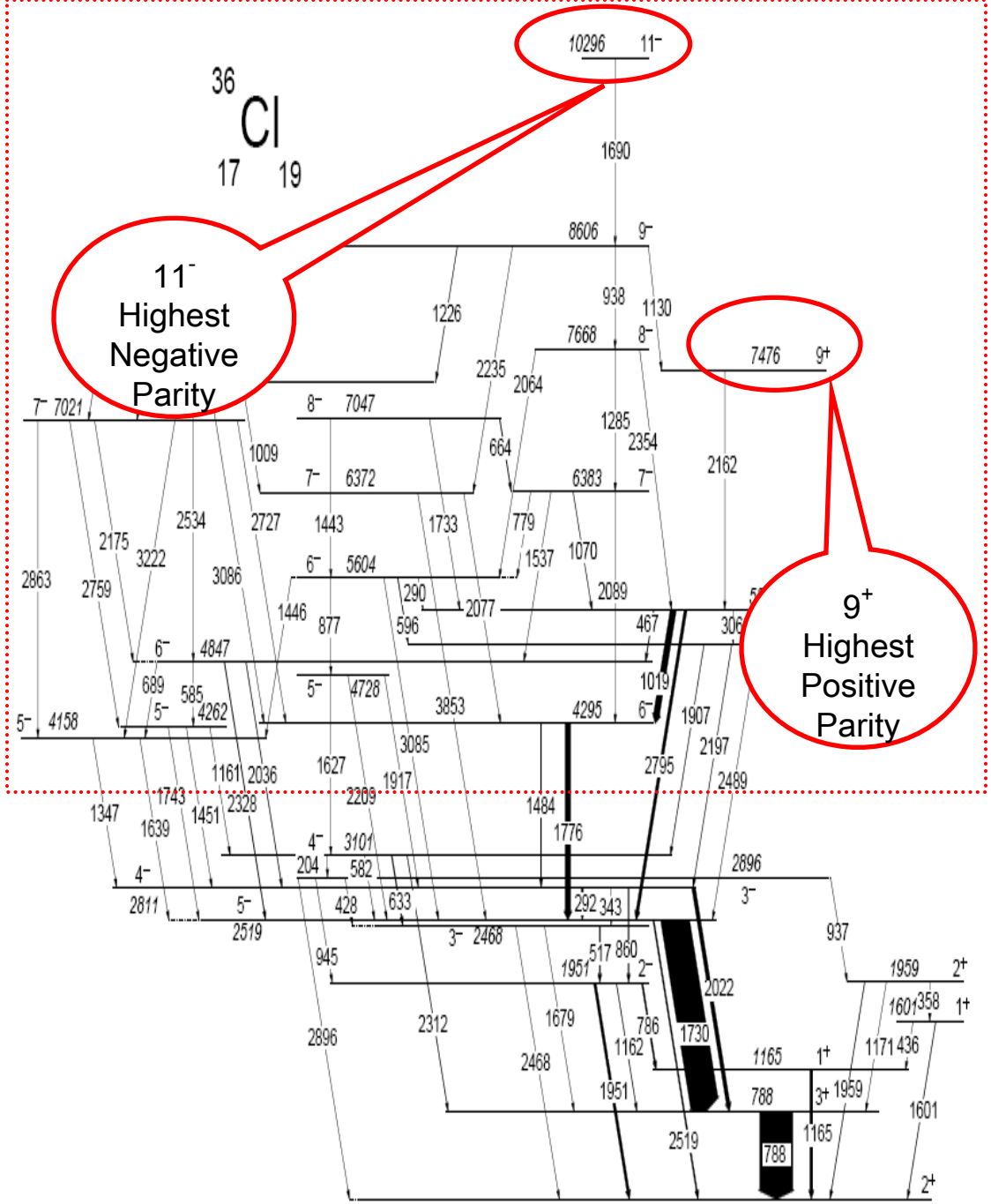
ANTOINE Shell Model Code



Ref: E.Caurier and F. Nowacki, Acta Phy. Pol. B 30, 705 (1999)



Nolan et.al, JPG 3,1371 (1977)



Aydin et.al, to be submitted PRC

11⁻ Highest Negative Parity

9⁺ Highest Positive Parity

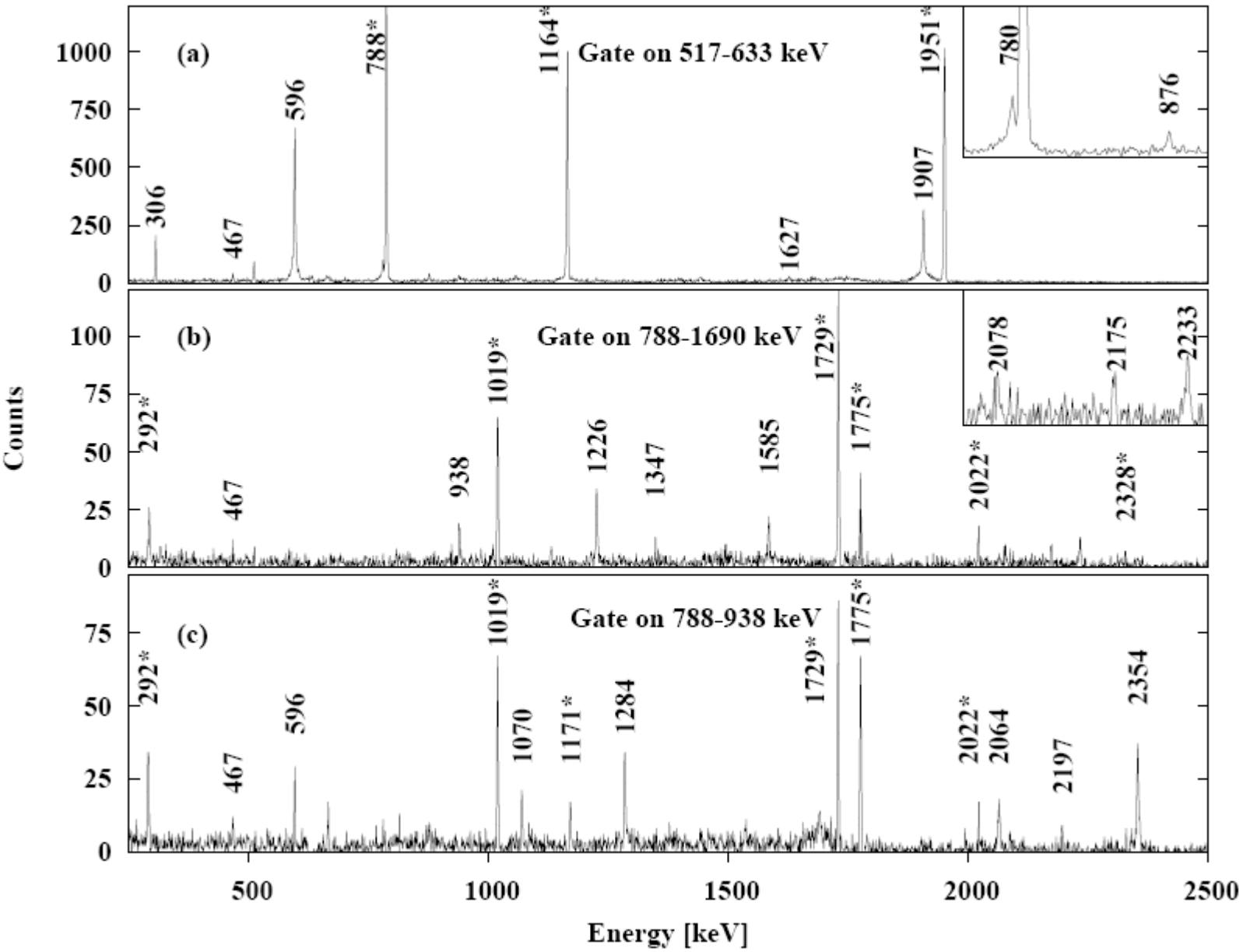
Summary

- $^{24}Mg(^{14}N,2p)^{36}Cl$: fusion-evaporation
- 4π-GASP Array at LNL
- ANTOINE code with *USD* and *sdfp* eff. int.
- 50 γ newly observed
  - o 11^- is the highest negative spin at 10.3 MeV
  - o 9^+ is the highest positive spin at 7.5 MeV
- We hope the knowledge acquired in this study will contribute to improve SM in the frontier region between the *sd* and *fp* shells.

Collaborators

S. Aydin[1,2],* F. Recchia[3], A. Gadea[3,4], S. Lenzi[2], Pushpendra P. Singh[3], C. Ur[2], E. Sahin[3], E. Farnea[2], D. Tonev[5], G. de Angelis[3], D. Bazzacco[2], P.G. Bizzeti[6], A.M. Bizzeti-Sona[6], I. Deloncle[7], A. Gottardo[2,3], T. Huyuk[4], H. Laftchiev[5], S. Lunardi[2], D. Mengoni[2,8], C. Michelagnoli[2], D. R. Napoli[3], and J. J. Valiente-Dobón[3]

[1] *Department of Physics, University of Aksaray, Aksaray, Turkey*
[2] *INFN-Sezione di Padova and Dipartimento di Fisica, Università di Padova, Padova, Italy*
[3] *INFN-Laboratori Nazionali di Legnaro, I-35020 Legnaro, Italy*
[4] *Instituto de Física Corpuscular, CSIC-Universidad de Valencia, Valencia, Spain*
[5] *Institute for Nuclear Research and Nuclear Energy, BAS, Sofia, Bulgaria*
[6] *Dipartimento di Fisica dell' Universitá and INFN Sezione di Firenze, Firenze, Italy*
[7] *IPNO, IN2P3/CNRS et Université Paris-Sud, Orsay, France and*
[8] *University of the West of Scotland, Paisley, United Kingdom*


(a)
Gate on 517-633 keV
306
467
596
788*
1164*
1627
1907
1951*
780
876
(b)
Gate on 788-1690 keV
292*
467
938
1019*
1226
1347
1585
1729*
1775*
2022*
2328*
2078
2175
2233
(c)
Gate on 788-938 keV
292*
467
596
1019*
1070
1171*
1284
1729*
1775*
2022*
2064
2197
2354
Counts
Energy [keV]