

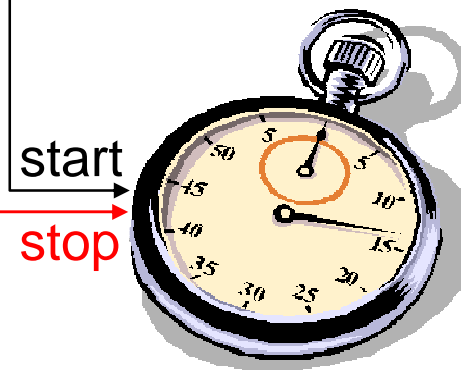
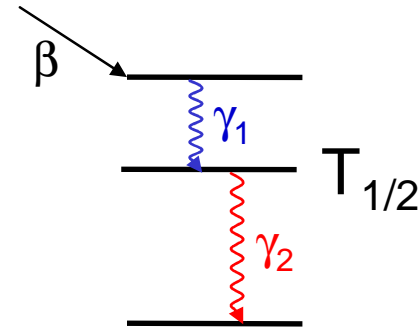
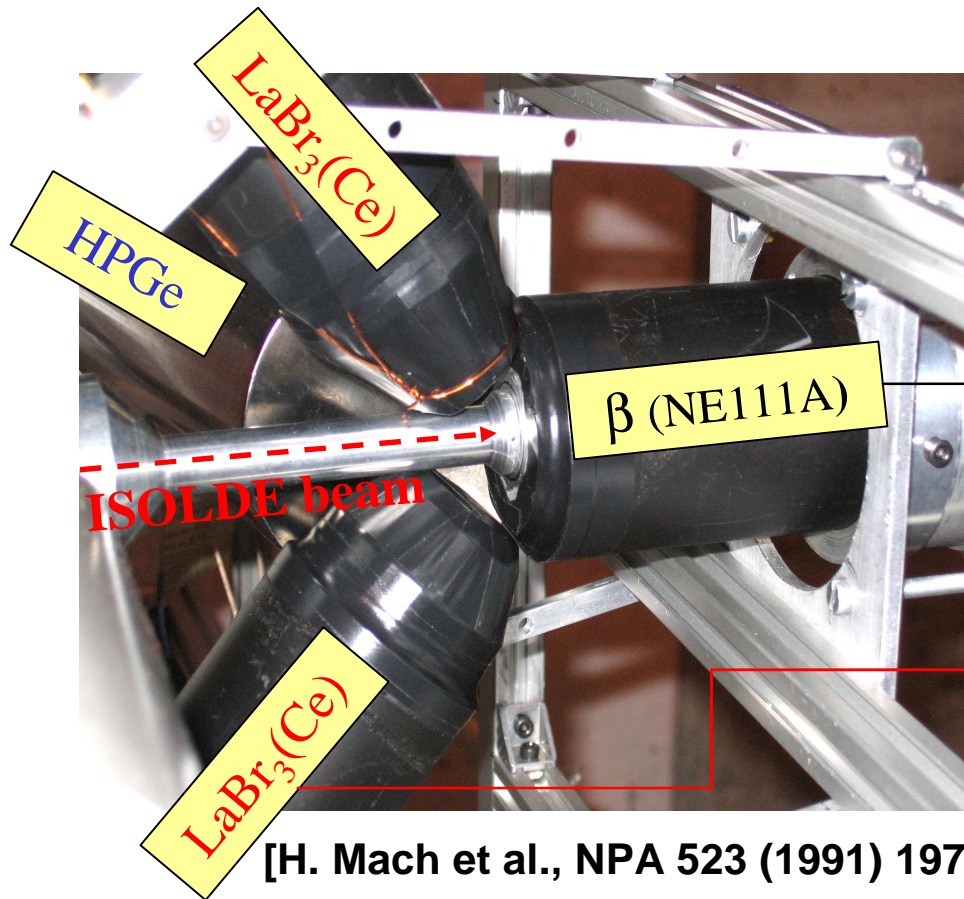
**A fast-timing setup for excited-state half
life measurements at DESIR**

**A conversion-electron setup for transition
multipolarity determination at DESIR**

**Gary Simpson LPSC Grenoble
On behalf of the fast-timing collaboration**



The Advanced Time Delayed $\beta\gamma(t)$ method



TAC

HPGe: BRANCH SELECTION

High energy resolution
Poor time response

Plastic β scintillator: TIMING

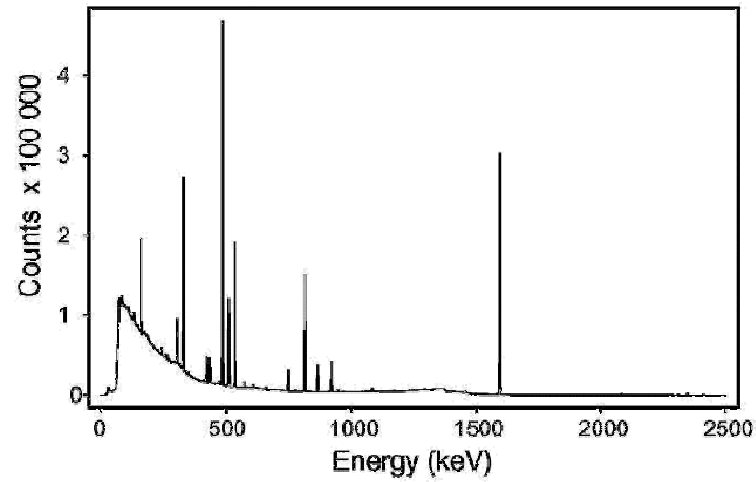
Fast response
Efficient start detector

LaBr₃(Ce): TIMING

Fast response γ -detectors
Poor energy resolution
Stop detectors

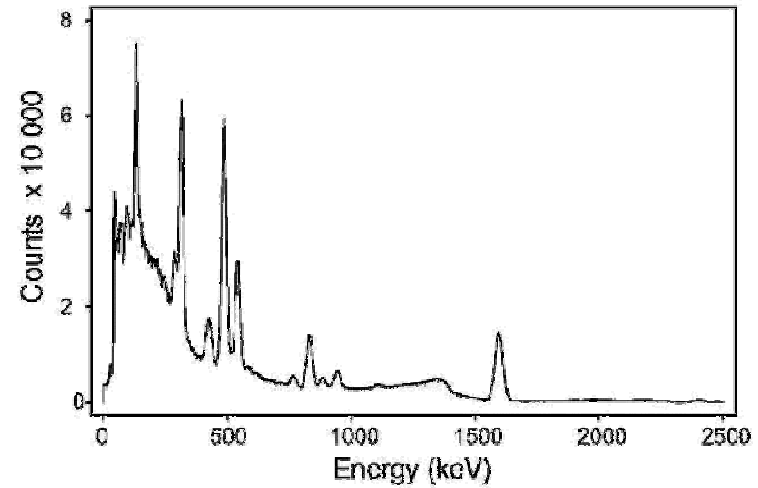
^{140}Ba and ^{140}La decay

Ge spectrum



Good E resolution (~2 keV)
Moderate T resolution (few ns)

LaBr₃(Ce) spectrum



Moderate E resolution (3 %)
Good T resolution (~140 ps)

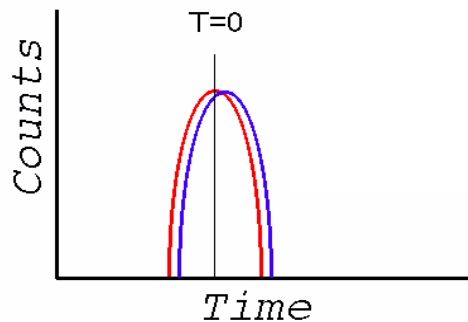
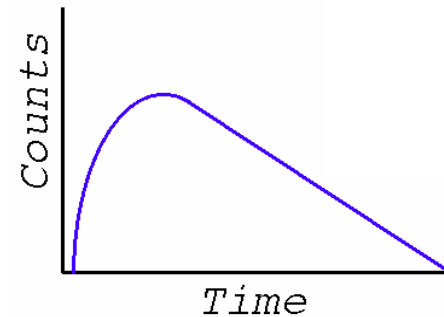
The Advanced Time Delayed $\beta\gamma\gamma(t)$ method

β -LaBr₃-HPGe: lifetime measurements

TAC

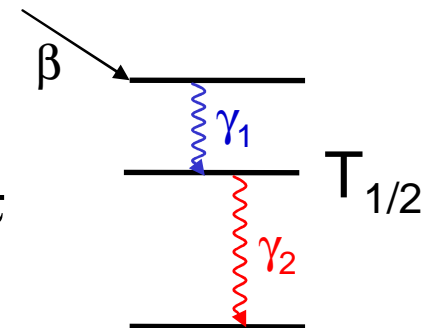
✓ De-convolution of slope

- Slope = $T_{1/2}$
- Range: 30 ps to 30 ns (or longer)
- **3-5% precision**



✓ Centroid shift

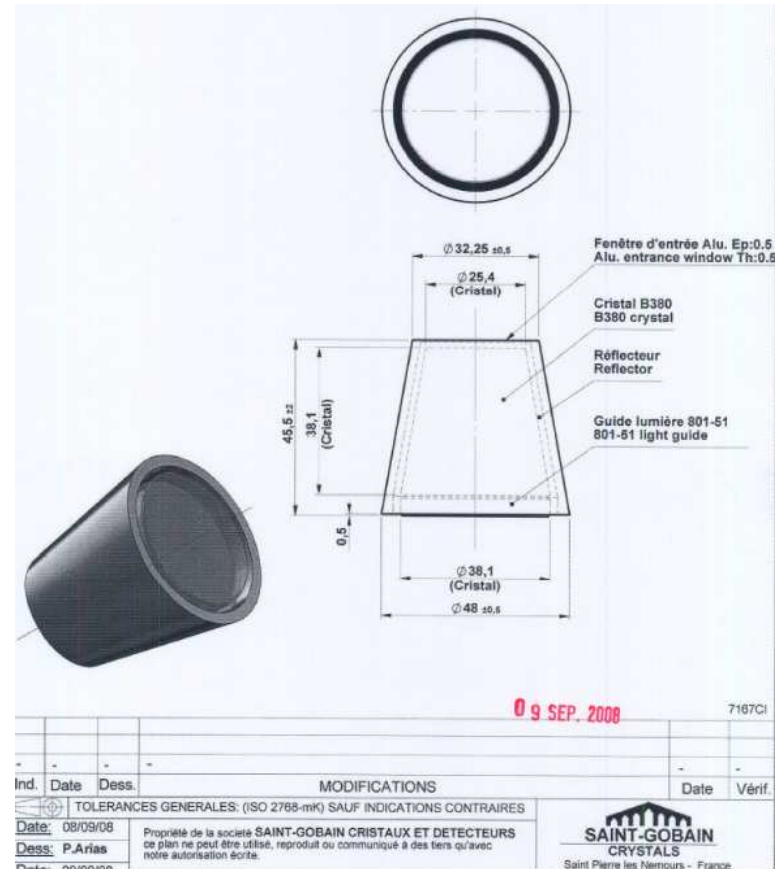
- Shift in centroid position = τ
- Range: down to ~5-10 ps



Also get β -HPGe-HPGe: coincidences, level scheme

Cylindrical LaBr₃ Crystals in French community

Type	Total Number
1.5"x1.5"	10
1"x1"	2
2"x2"	2



Conical crystals expected to give ~30% improvement, but only ~10-20 ps so far. Doping is important.

Physics accessible

Transition rates

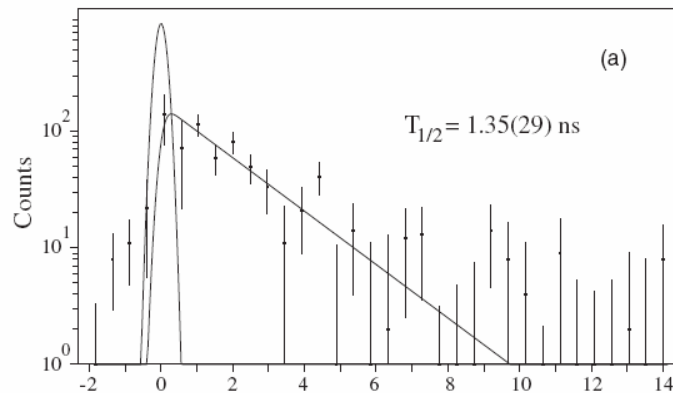
- Collectivity – Quadrupole or Octupole modes
 - sensitive tests of model predictions
- Multipolarity

Complementary to Coulex experiments

- access to magnetic transitions
- conversion electrons influence lifetime
- access to non-yrast states

Technique useful for exotic nuclei

- lifetimes determined with low statistics



PHYSICAL REVIEW C 77, 014309 (2008)

Lifetime measurements of the negative-parity 7^- and 8^- states in ^{122}Cd

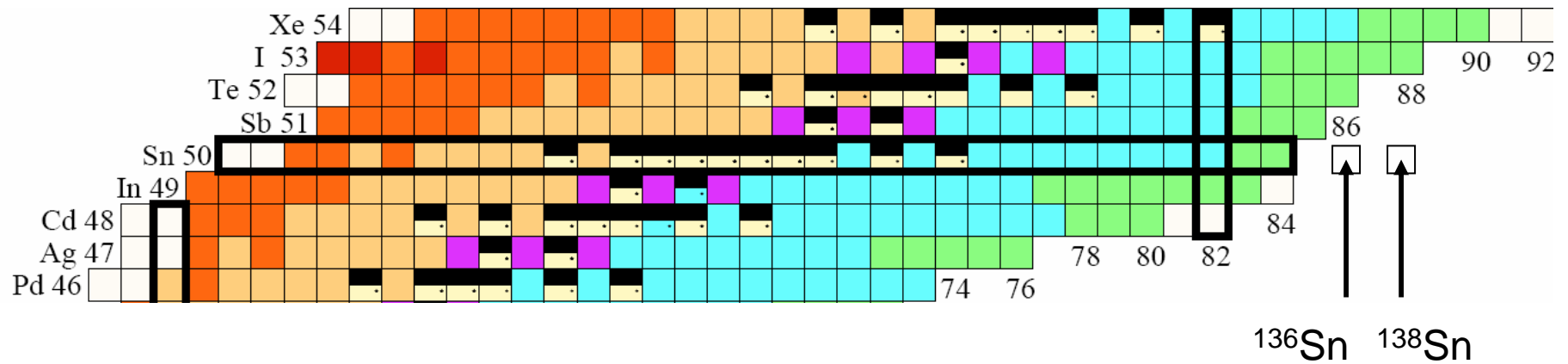
D. L. Smith,^{1,*} H. Mach,^{2,3,†} H. Penttilä,⁴ H. Bradley,^{3,5} J. Äystö,⁴ V.-V. Elomaa,⁴ T. Eronen,⁴ D. G. Ghiță,⁶ J. Hakala,⁴ M. Hauth,⁷ A. Jokinen,⁴ P. Karvonen,⁴ T. Kessler,⁴ W. Kurcewicz,⁸ H. Lehmann,⁷ I. D. Moore,⁴ J. Nyberg,³ S. Rahaman,⁴ J. Rissanen,⁴ J. Ronkainen,⁴ P. Ronkanen,⁴ A. Saastamoinen,⁴ T. Sonoda,^{4,9} O. Steczkiewicz,^{8,10} and C. Weber⁴

Possible Measurements at DESIR



^{132}Sn region

Neutron-rich Sn nuclei –to test N-N interactions



^{78}Ni region

Onset of collectivity in n-rich Ga, Ge nuclei

Beams from S^3

^{100}Sn region

V. heavy nuclei

Structure of even-even $A = 138$ isobars and the yrast spectra of semi-magic Sn isotopes above the ^{132}Sn core

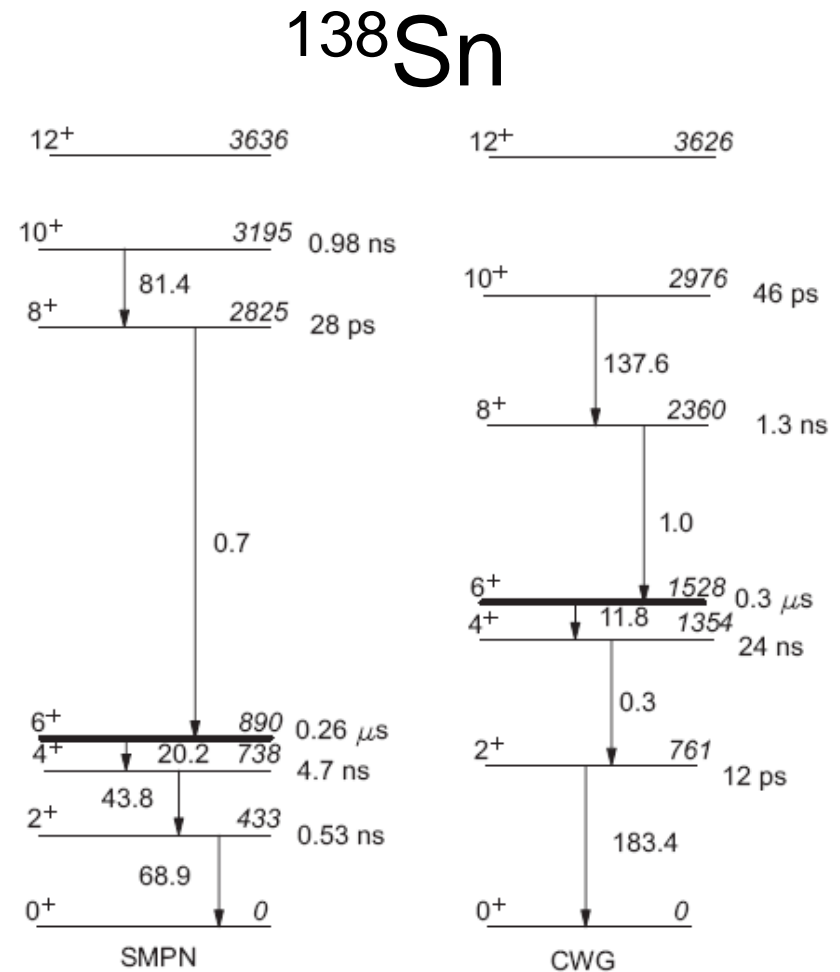
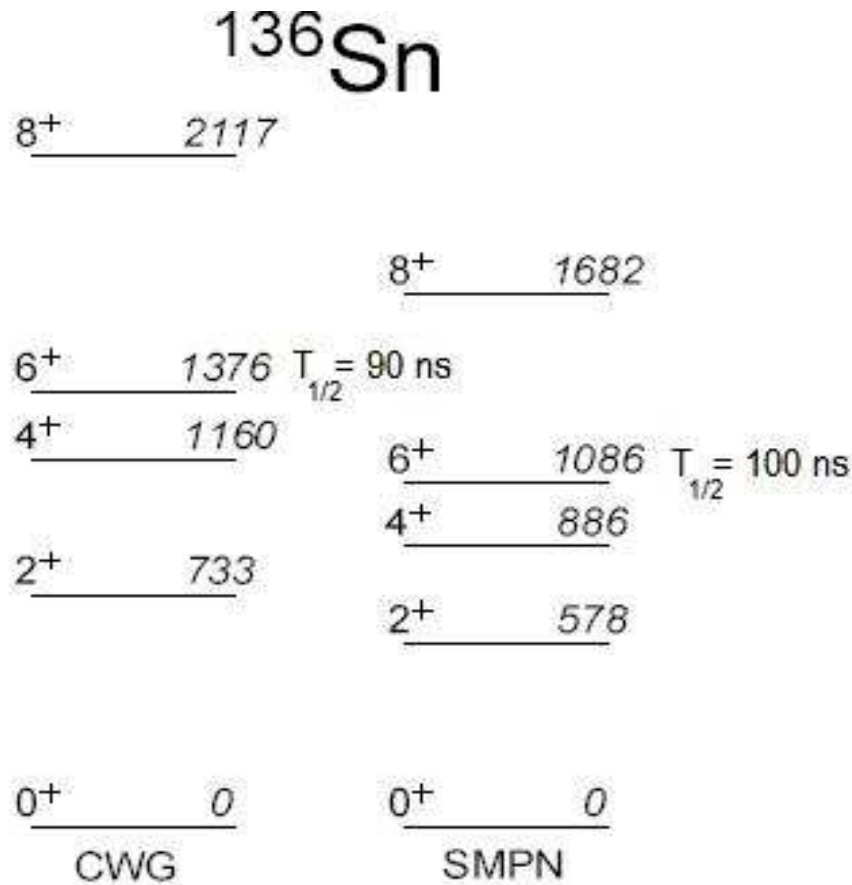
S. Sarkar

Department of Physics, Bengal Engineering and Science University, Shibpur, Howrah 711103, India

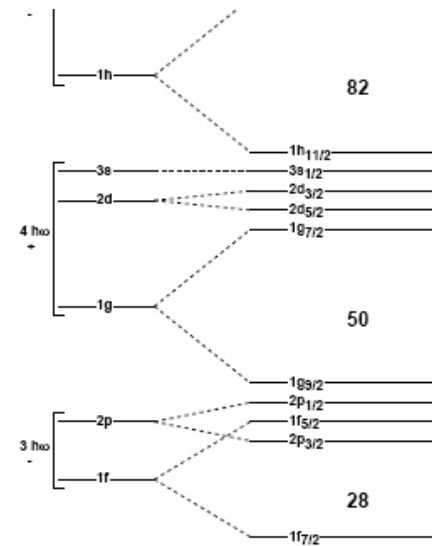
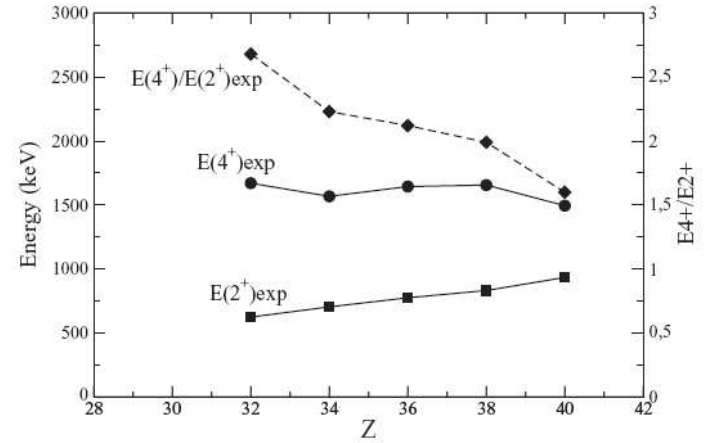
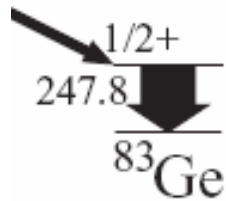
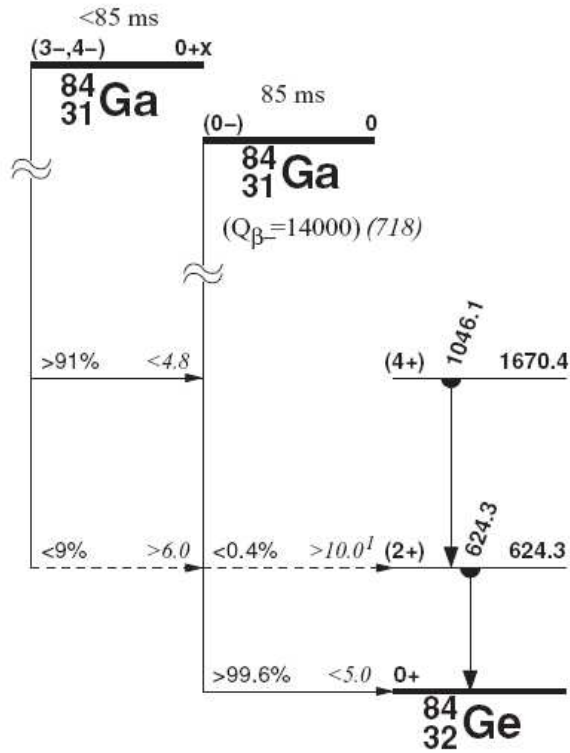
M. Saha Sarkar*

Nuclear and Atomic Physics Division, Saha Institute of Nuclear Physics, Kolkata 700064, India

(Received 5 December 2007; revised manuscript received 8 July 2008; published 14 August 2008)

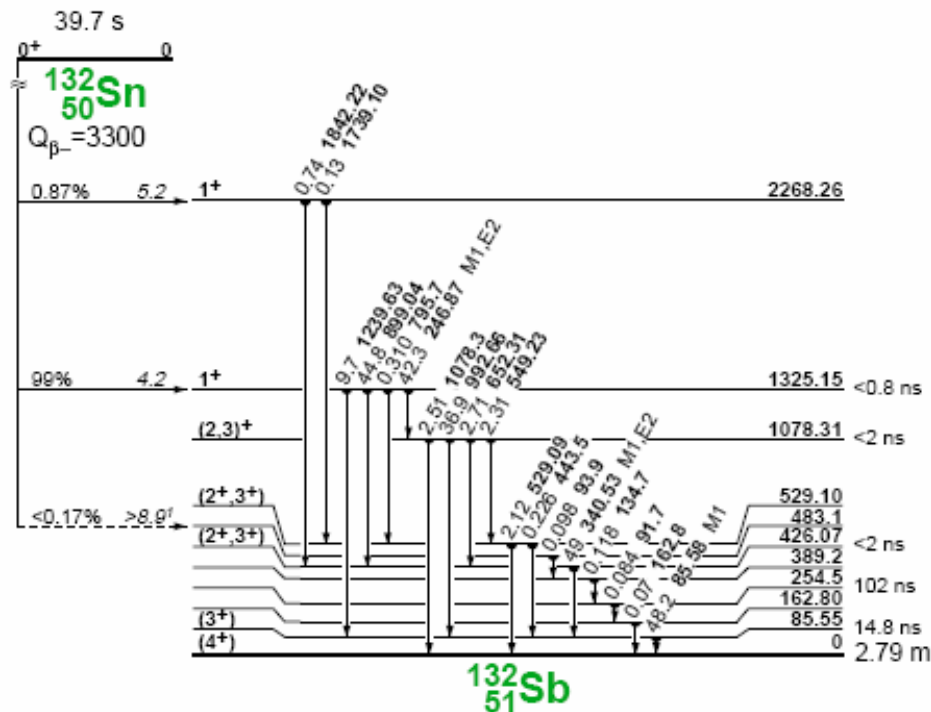


Onset of collectivity in neutron-rich Ga nuclei



Conversion-Electron setup -to determine Multipolarities

How do we determine multipolarities of transitions following β decay



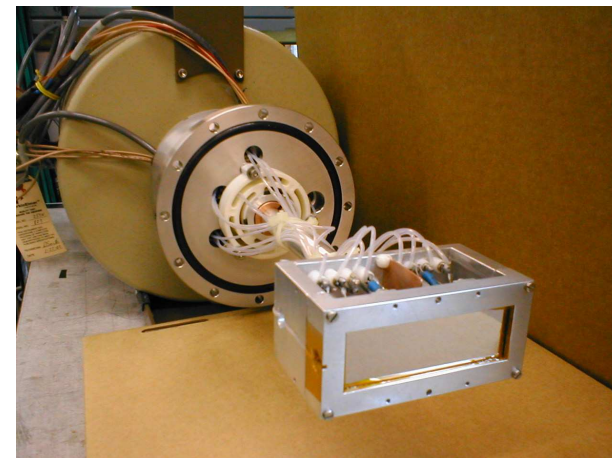
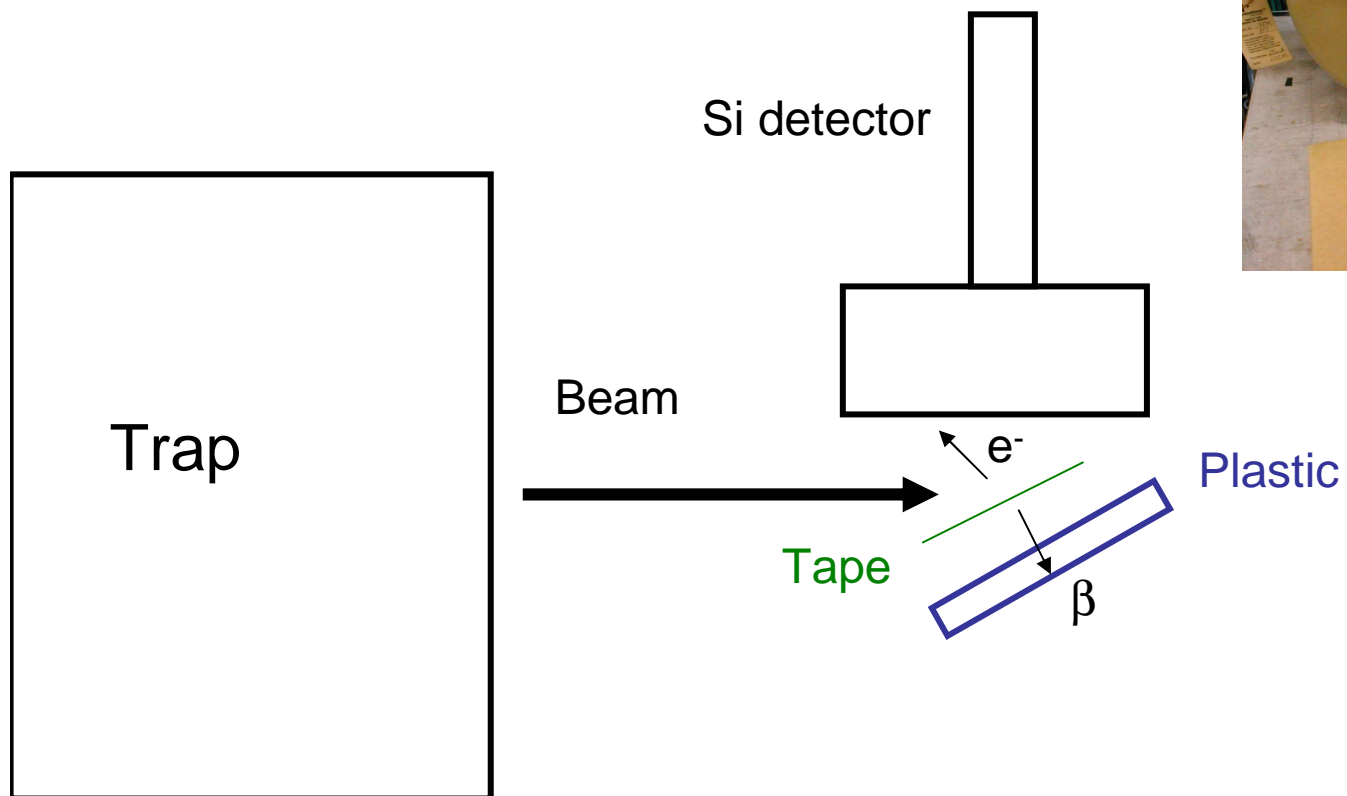
Low Statistics

- strong direct population
- decay pattern

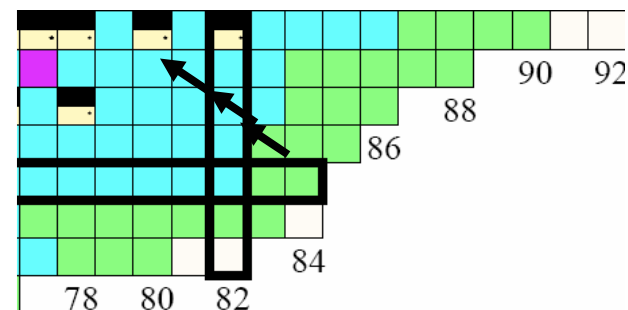
High Statistics

- gate on feeding transition and look at X- γ coincidences
- lifetimes
- angular correlations

Side-on view

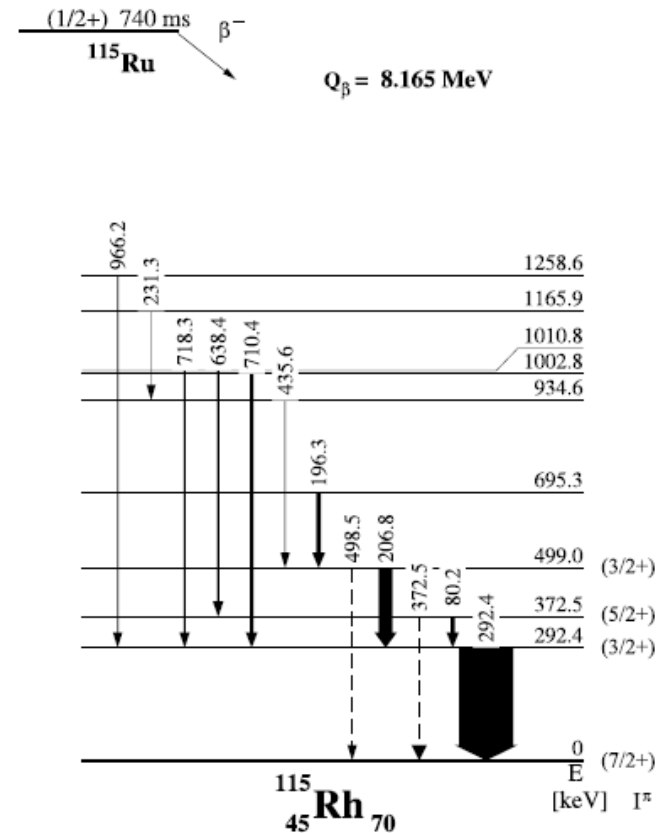
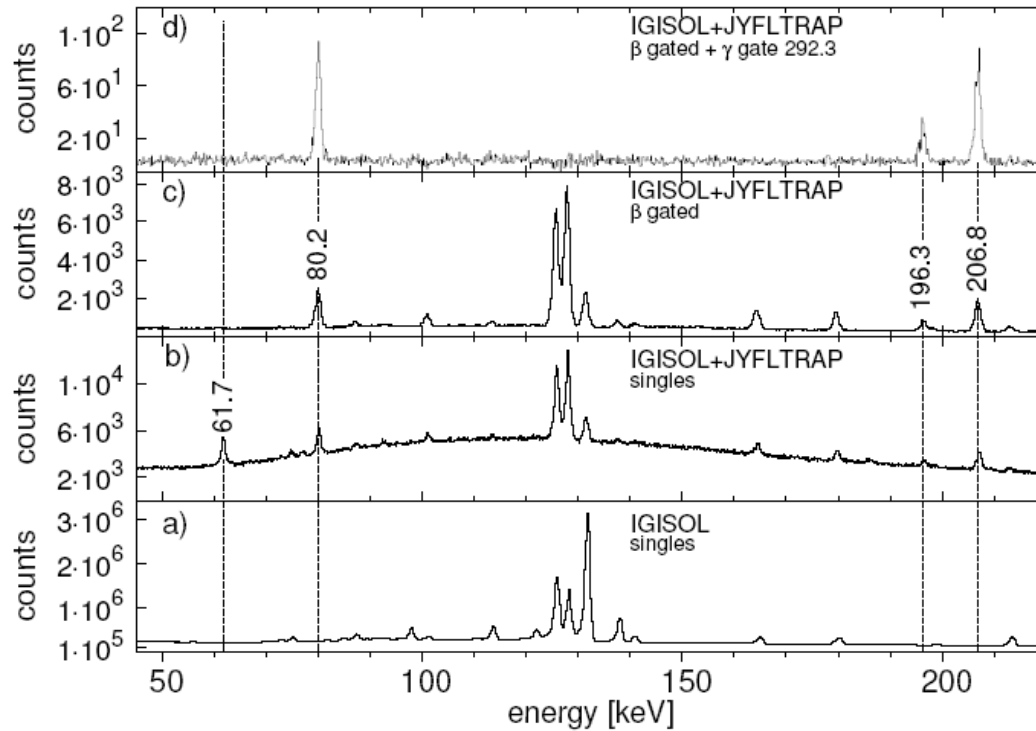


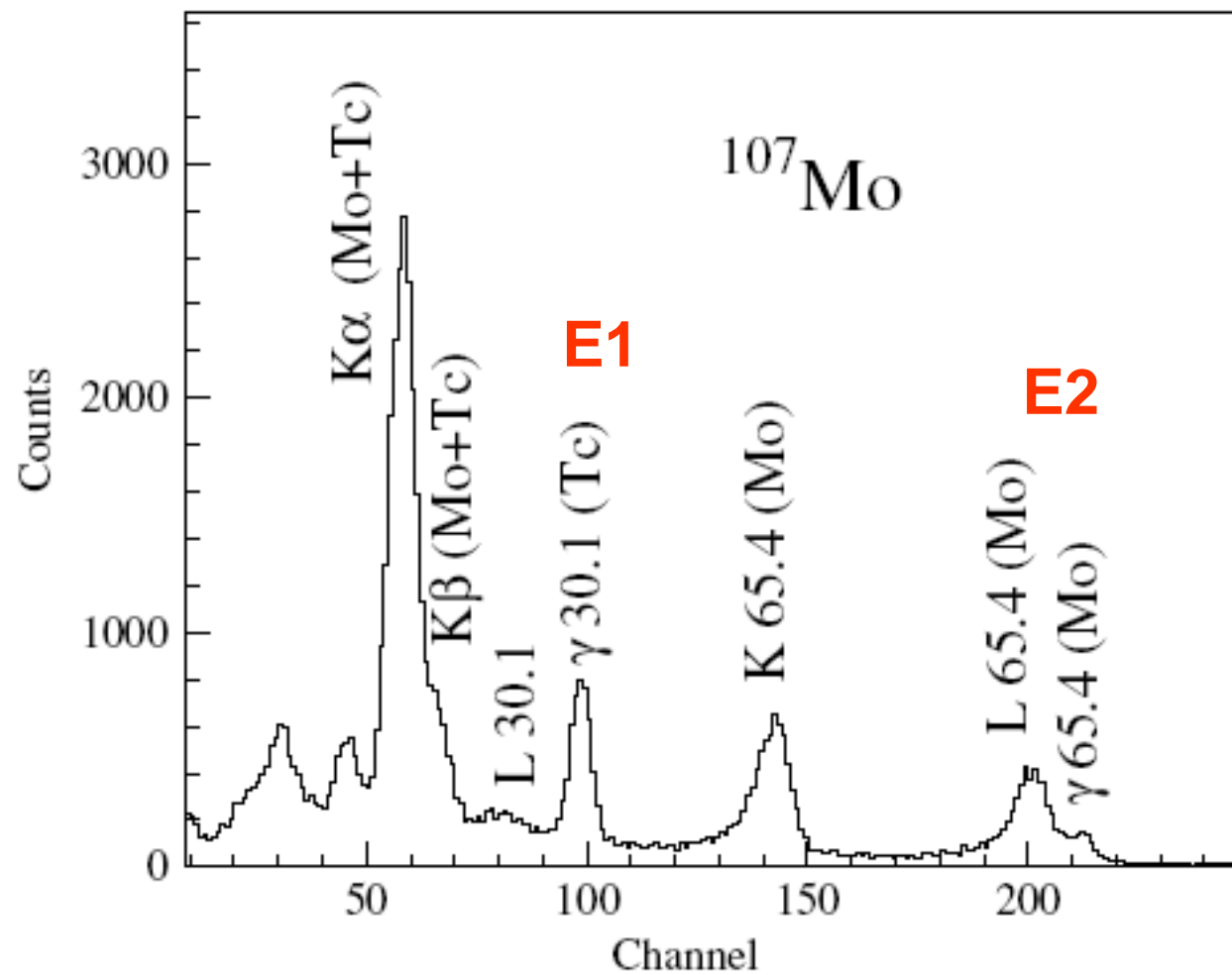
Resolution ~ 2.5 keV
Area = 4 cm x 2 cm
Can work near high B
Typically 20 -30 % eff



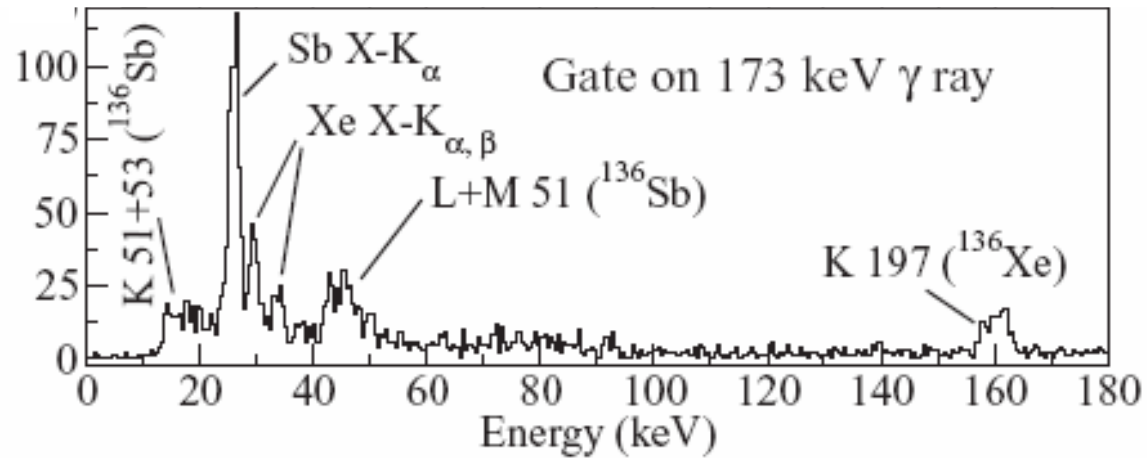
PROGRESS IN TRAP ASSISTED β DECAY SPECTROSCOPY OF $^{115}\text{Ru}^*$

J. KURPETA^a, J. RISSANEN^b, V.-V. ELOMAA^b, T. ERONEN^b
 J. HAKALA^b, A. JOKINEN^b, P. KARVONEN^b, I.D. MOORE^b
 H. PENTTILÄ^b, A. PŁOCHOCKI^a, S. RAHAMAN^b, S. RINTA-ANTILA^b
 J. RONKAINEN^b, A. SAASTAMOINEN^b, T. SONODA^b, J. SZERYPOC^c
 W. URBAN^a, CH. WEBER^b, J. ÄYSTÖ^b



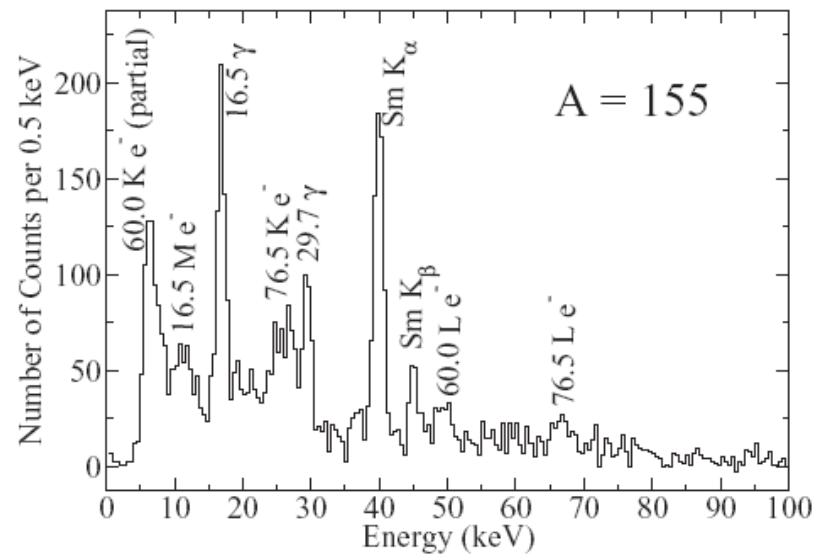


Can work with low statistics and get good results



And at very low energy

A
n
d
s
a
s



Conclusions

- Fast-timing and conversion-electron measurements can help us determine transition multipoles at DESIR for weakly produced nuclei allowing a better understanding of nuclear structure
- We look forward to using these techniques soon