Physics Aspects

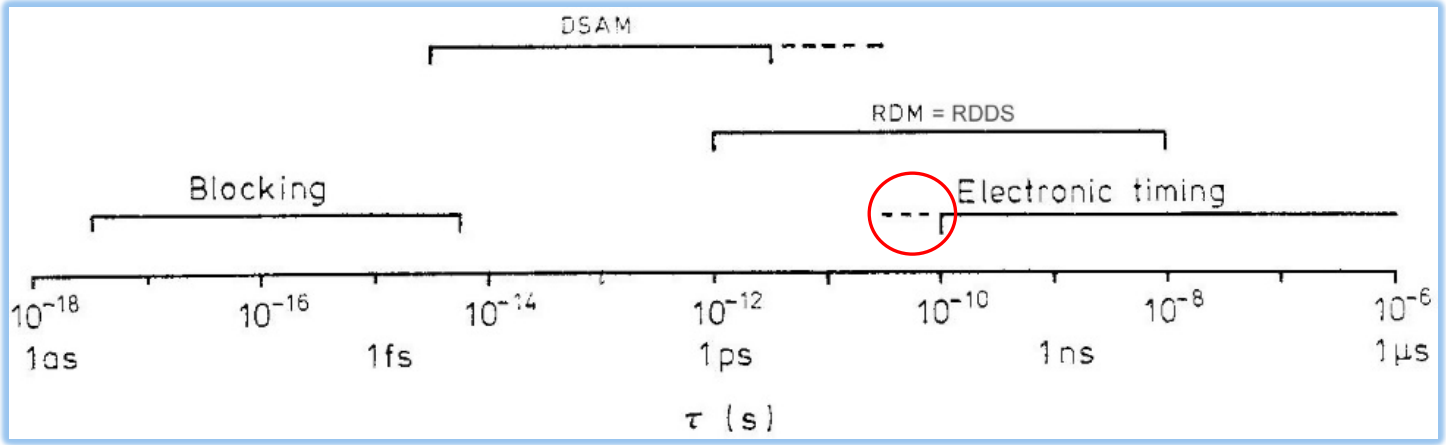


Figure:
Nolan & Sharpey-Schafer
Rep. Prog. Phys. 42, 1 (1979);
slightly modified

DSA = Doppler Shift Attenuation
RDDS = Recoil Distance Doppler Shift

Fast electronic timing ($\tau < 5$ ns) now possible down to $\tau = 50$ ps

Overlap between Electronic Timing and RDDS method!

RDDS has the disadvantages that it

— is restricted to inbeam ("in-flight") γ spectroscopy

— must be performed at 5 - 10 target-degrader distances (at least for a classical experiment); statistics is divided up into the same number of data sets

NB "fast timing" and RDDS are complementary, we need 'em both

Examples for regions of interest

- Z > 50, N >132
  A = odd: decay of intruder states
  A = even: decay of octupole states
- Z < 82, N ~ 100
  Onset of rotational behavior
- Z < 82, N ~ 126
  Similar features as N ~ 100 cases?
- Many more examples…

Detector Aspects

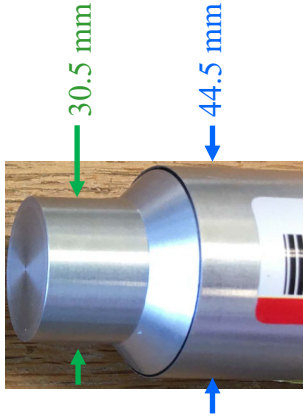
Premise: want dedicated timing array running in a "mixed" configuration with a premier HPGe array

Preference: 1" ϕ x 1" $LaBr_3$:Ce/$CeBr_3$ crystals; these provide

- better timing characteristics than larger crystals (for given set of PMT and readout electronics)
- sufficient stopping for the γ energies of interest (determined by range of fast-timing's applicability; e.g. 300 keV W-Os region)
- better packing than larger crystals (in a mixed array with HPGe's use of the free real estate, e.g., GS pentagons)

NB also important is that PMT has low transit-time-spread and high gain (e.g. R4998)

Preferred!



PMT R9420

Optional

Comparable size crystals

E.g. 1.5" ϕ x 1.5"

Infrastructure aspects and community involvement

Presently two setups are considered

I. "inbeam setup": GS pentagons and available hexagons each filled w/ a triple cluster of 1" x 1" units

II. "decay" setup": X-Array-Saturn system with initially one ring of 15 1" x 1" units

Mounts for I. are available; detector-target distance adjustable, "passive suppressors"

Electronics readout: 250-MHz, 14-bit, 10-G-Ethernet digitizers

Future considerations

FDSi, perhaps GRETA may benefit

Specific: Compatibility with GS and X-Array trigger

"Standard": CFD algorithm on board

"Bromide share" follows the example of "Clover share" and should

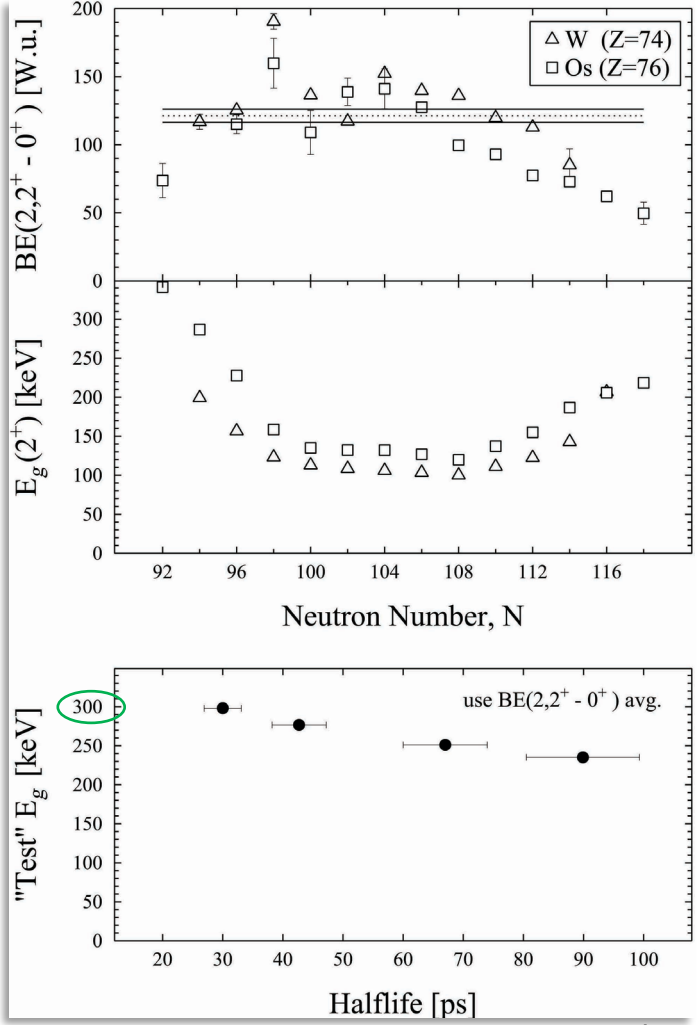
- ease the access to similar detector equipment
- improve the exchange of knowledge and ideas about purchasing new equipment
- discuss new physics projects in the context of lifetime measurements
- form collaborations and aim at experimental campaigns

Backup slide

Dataset: known B(E2)'s and corresponding E_γ's in W-Os region

Applicability of fast-timing method: $T_{1/2} \geq 30$ ps

=> Typical γ energy from average B(E2)'s



Backup slide

X-Array-Saturn conceptual design (15 $LaBr_3$'s) ⟶

Gammasphere adjustable mount

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