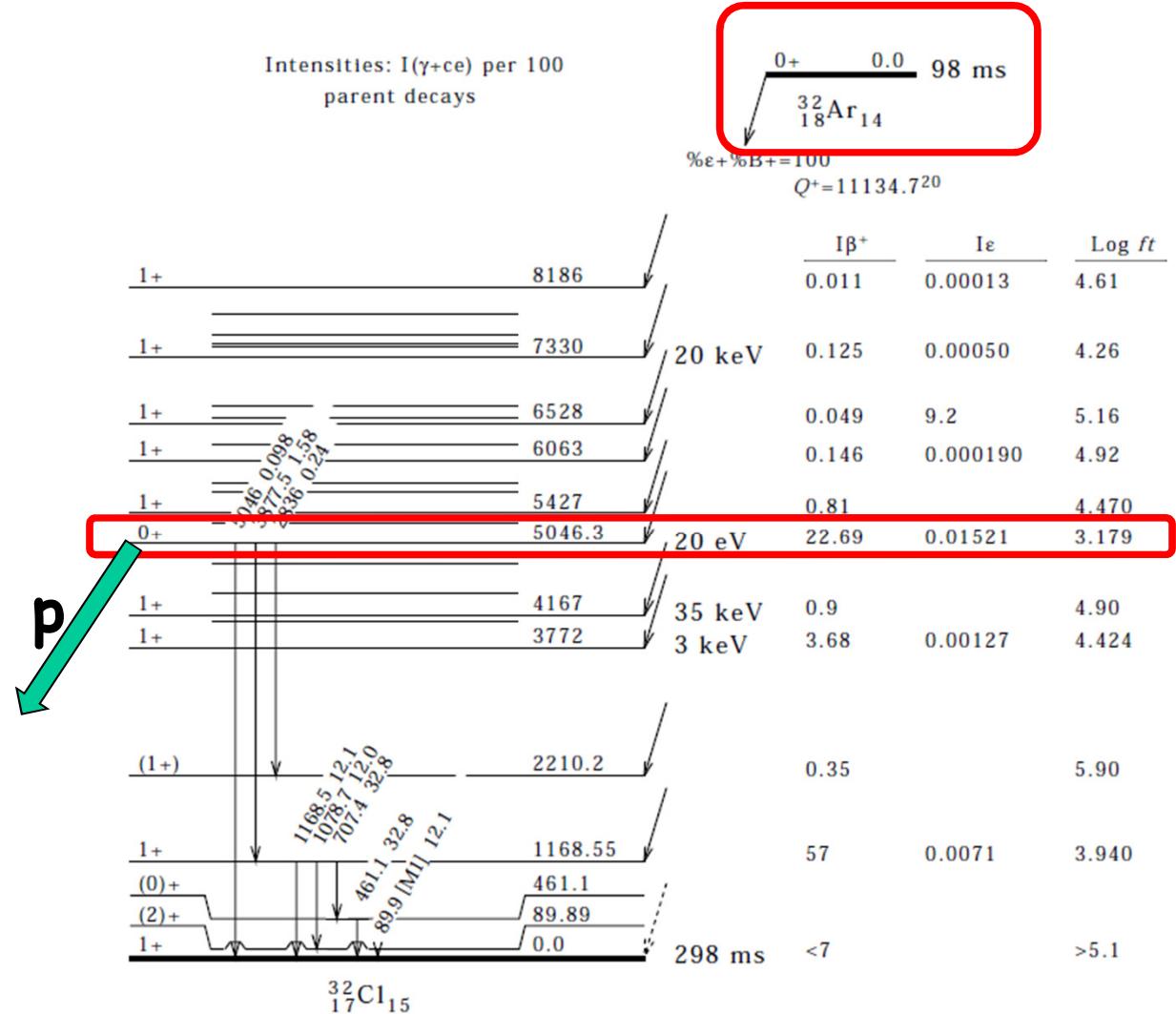


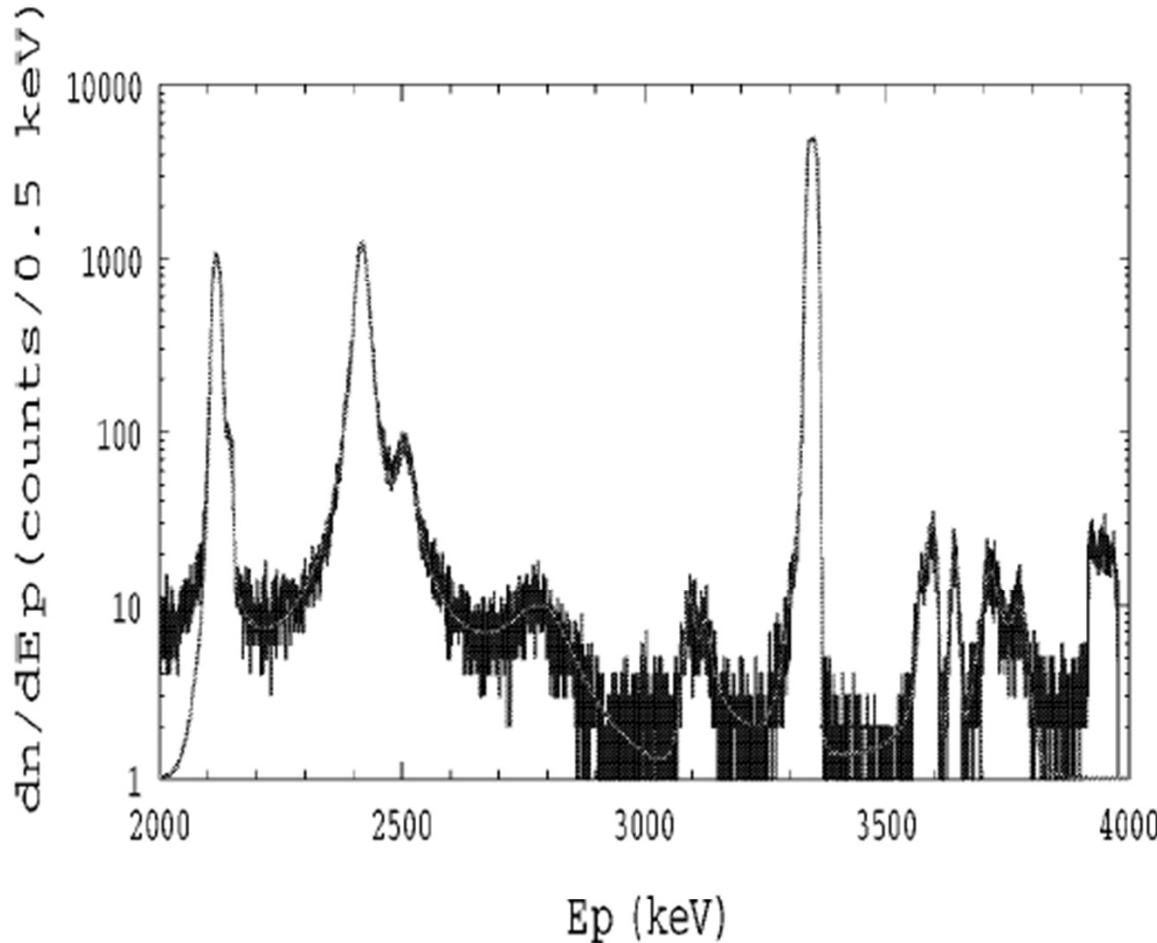
^{32}Ar

measurement of β -delayed p energy shift

(β -p coincidences measurement)

- Pure F transition, 23 %
- $T_{1/2} = 98 \text{ ms}$
- $E_p = 3.35 \text{ MeV}, \Gamma = 20 \text{ eV}$
- $E_{\beta,\text{max}} = 5.1 \text{ MeV}, E_{\text{rec,max}} = 0.52 \text{ keV}$
- Production: $\sim 5 \times 10^3 \text{ ions/s}$





R-matrix fit to the ^{32}Ar -delayed proton spectrum. This spectrum contains 1/10 of our data.

$$\begin{aligned} \tilde{a} &= / (1 + 0.1913b) \\ &= 0.9989 \pm 0.0052(\text{stat}) \pm 0.0039 \end{aligned}$$

E.G. Adelberger et al., Phys. Rev. Lett. 83 (1999) 1299
 A. Garcia et al., Hyperfine Interactions 129 (2000) 237

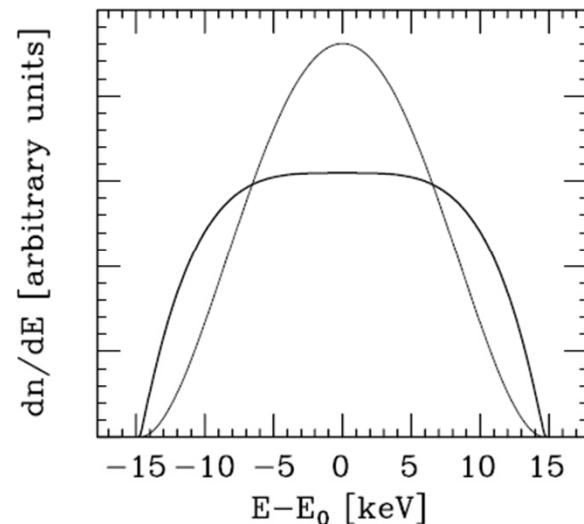


FIG. 1. Intrinsic shapes of the $0^+ \rightarrow 0^+$ delayed proton group for $a = +1, b = 0$ (heavy curve) and $a = -1, b = 0$ (light curve). The daughter's 20 eV natural width is not visible on this scale.

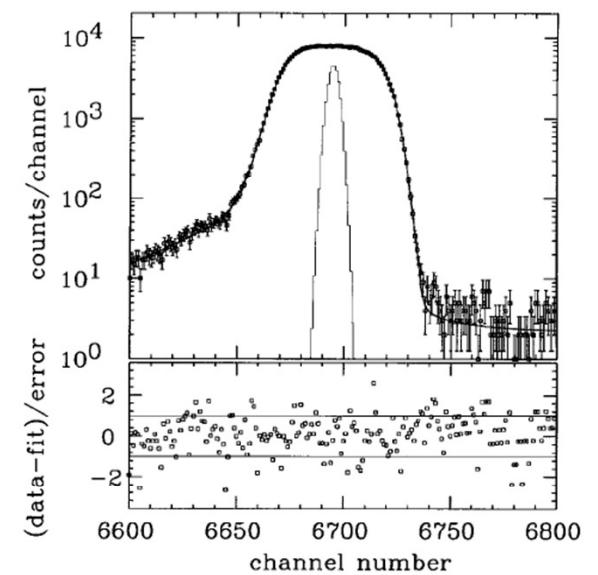
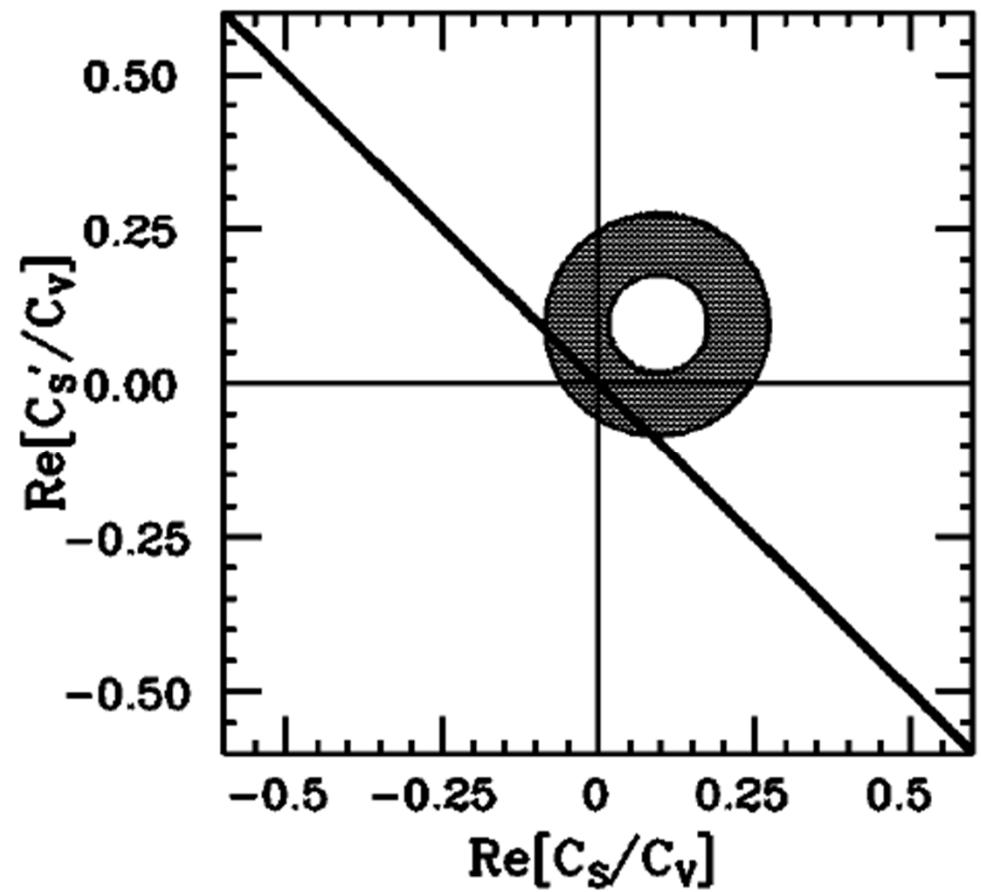
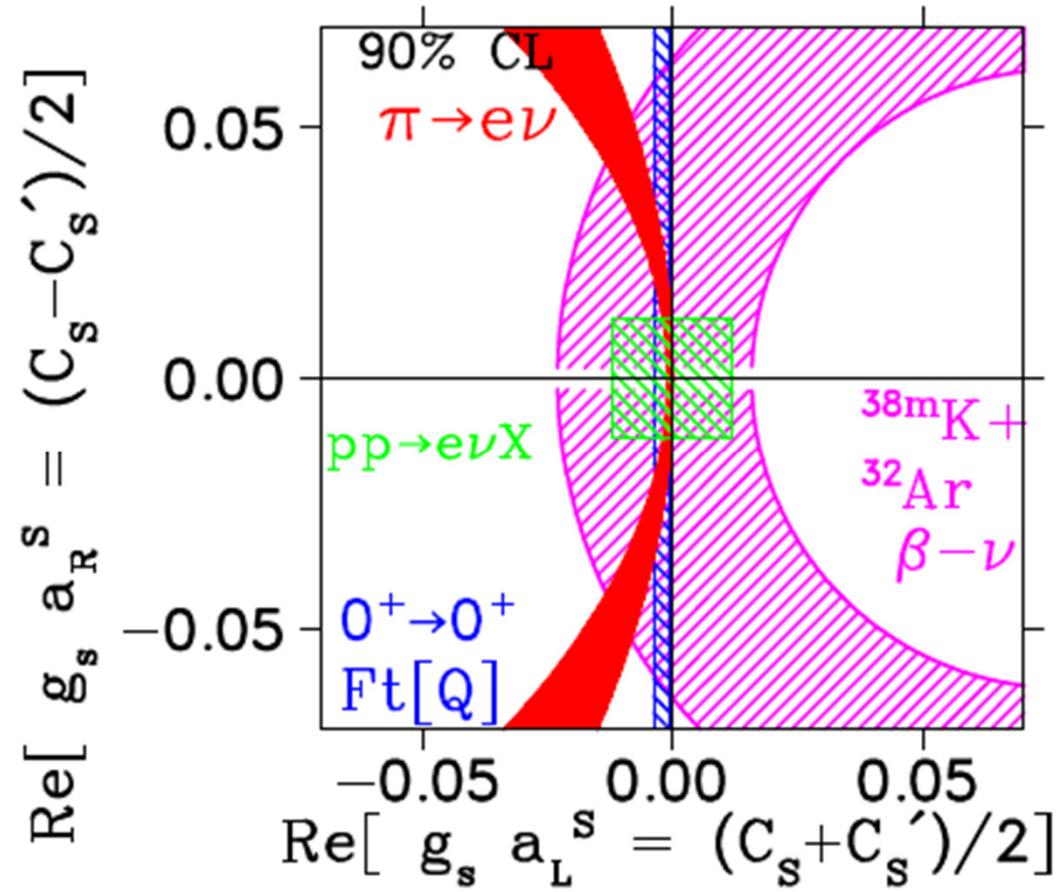


FIG. 2. Fit (upper panel) and residuals (lower panel) of the $0^+ \rightarrow 0^+$ delayed proton peak. This spectrum (the sum of detector 2 data in reflection geometry) contains roughly 1/4 of our data. The energy scale is 0.500 keV/channel. The pulser peak shows the electronic resolution. The Breit-Wigner tail from the 20 eV daughter width is visible on the high-energy side of the peak.



E.G. Adelberger et al., Phys.Rev. Lett. 83 (1999) 1299
 A. Garcia et al., Hyperfine Interactions 129 (2000) 237

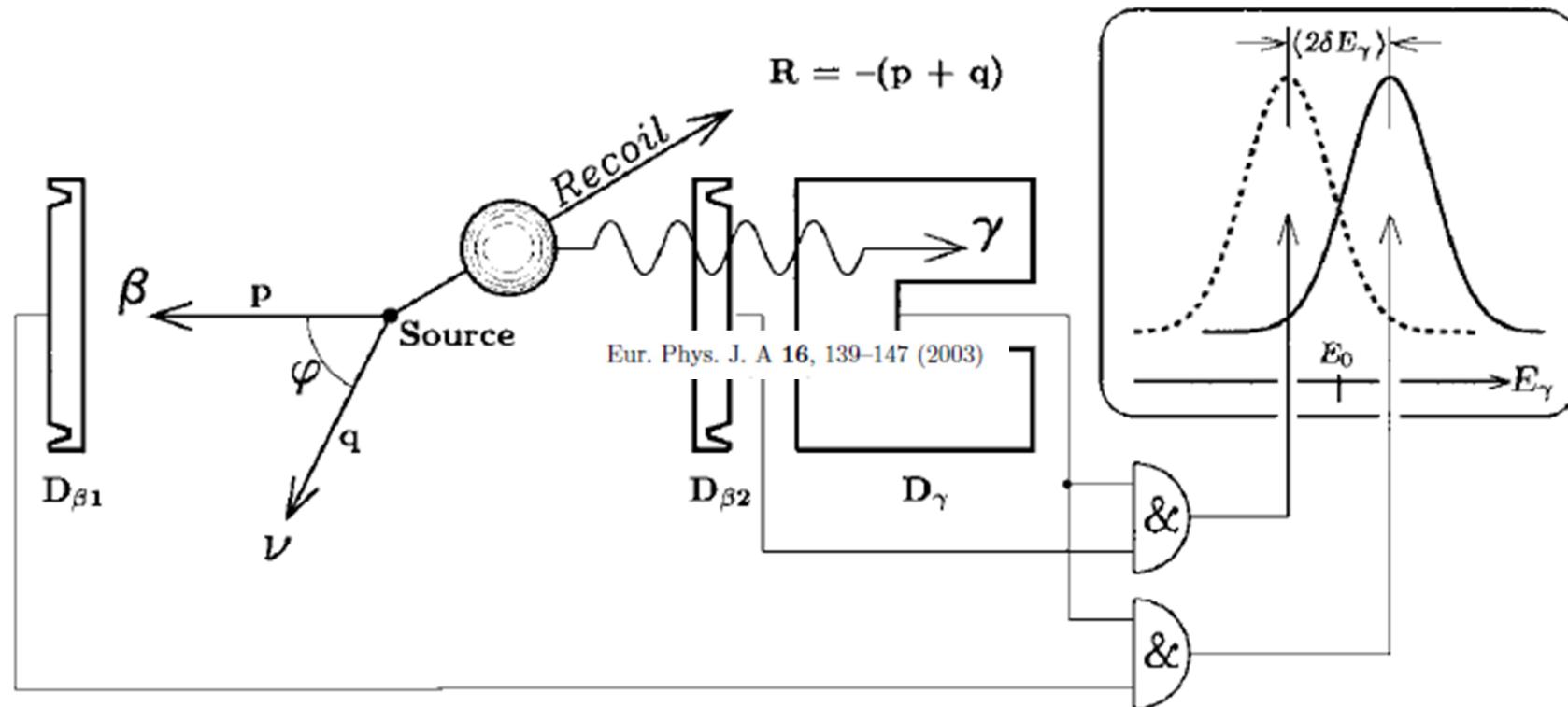


J.A. Behr and A. Gorelov, J. Phys. G 41 (2014) 114005

measurement of β -delayed p or γ energy shift i.s.o. broadening

- less sensitive to mass of nucleus (\sim factor 5)
- β -p or β - γ coincidences measurement

Dubna - CSNSM - LAL -
Louvain-la-Neuve - Leuven



V. Vorobel et al., Eur. Phys. J. A 16 (2003) 139

V. Egorov et al./Nuclear Physics A 621 (1997) 745–753

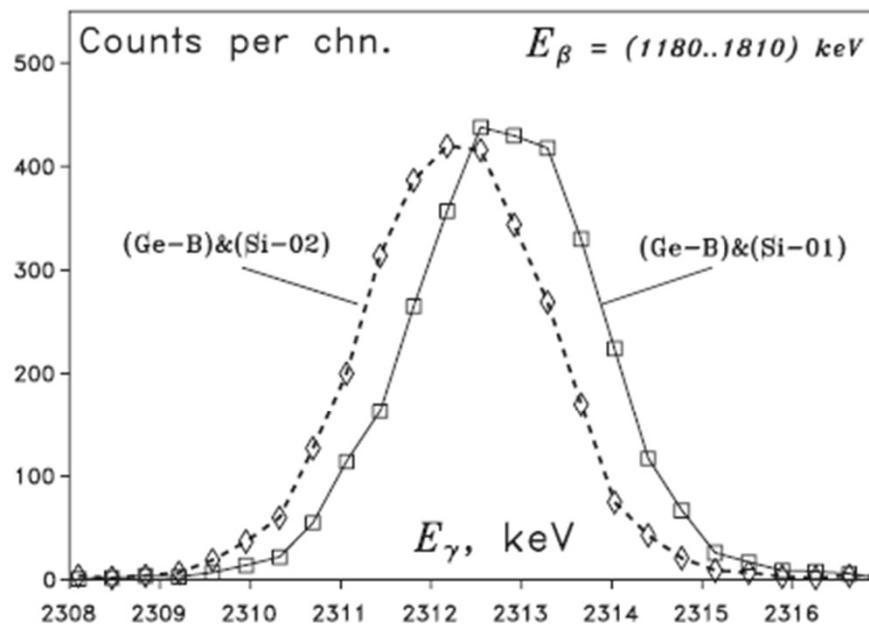
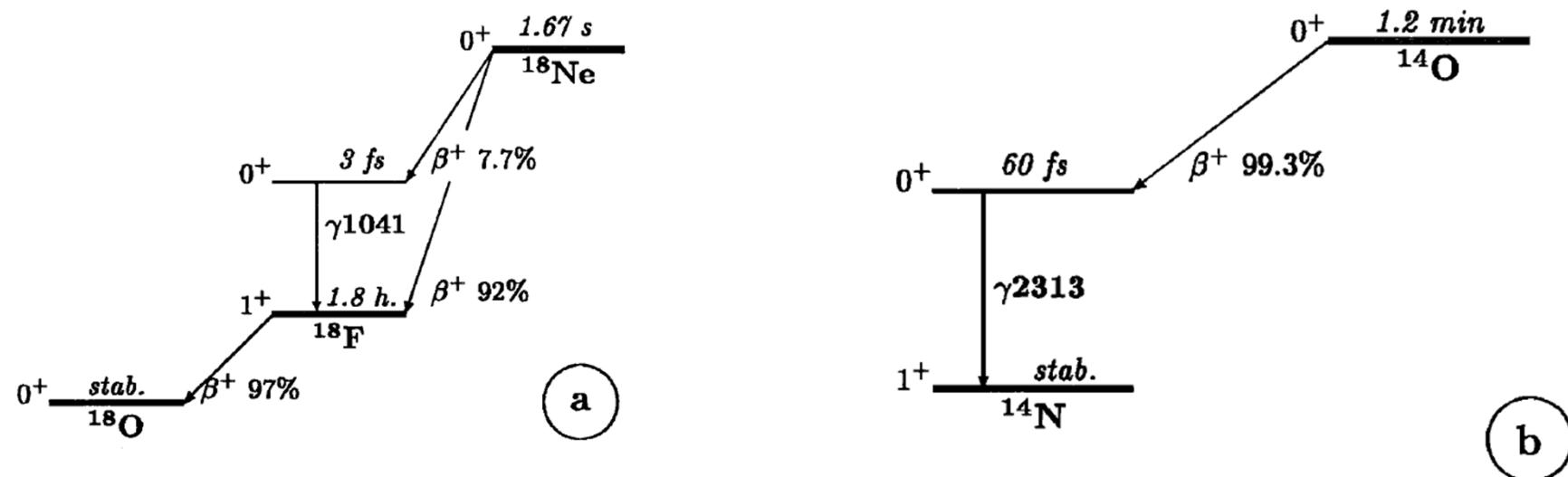
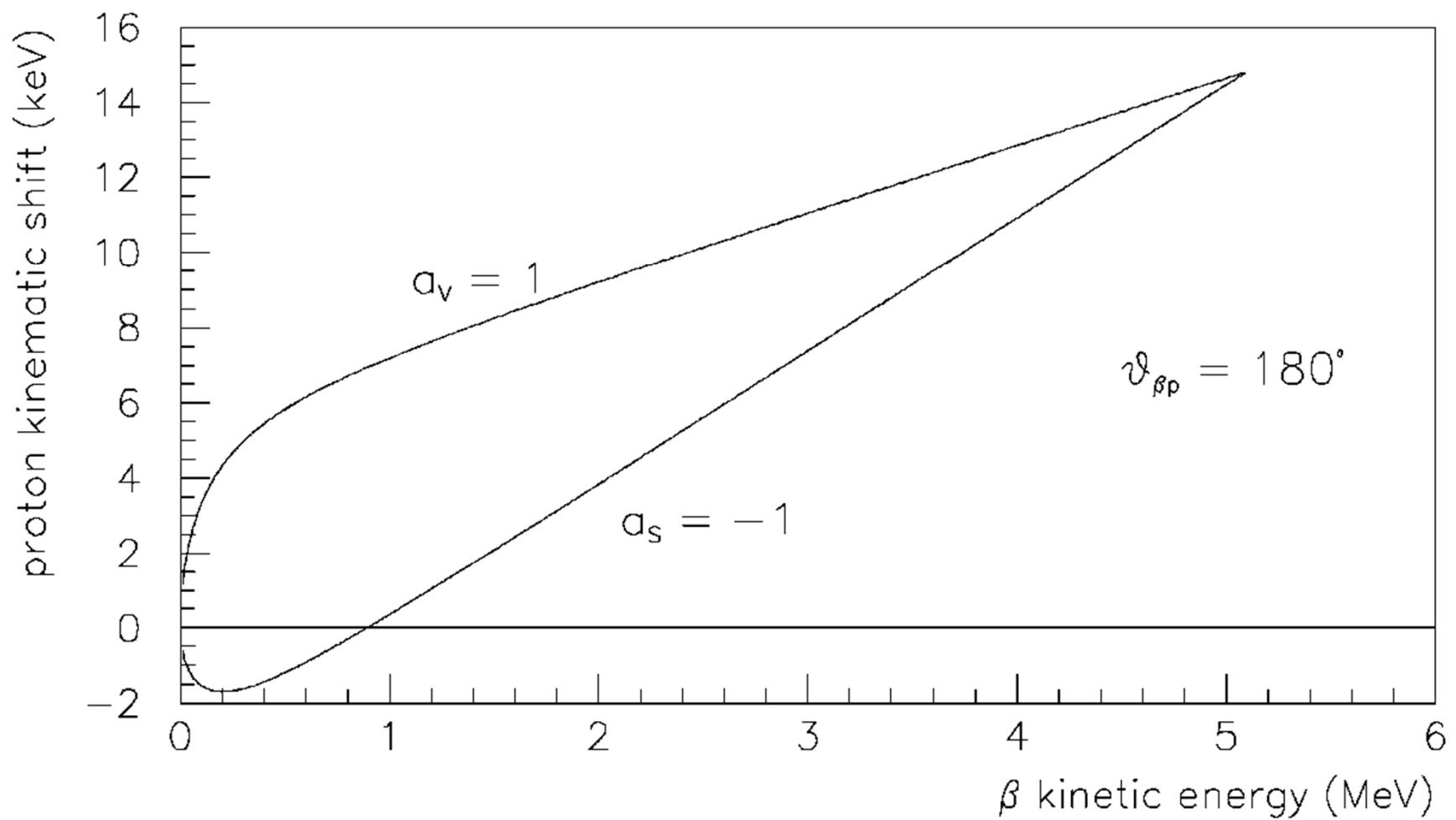


Fig. 7. Typical Doppler shifts of γ -lines measured by each γ detector (Ge-A, Ge-B) in coincidence with high-energy positrons ($> 1180 \text{ keV}$) stopped in the axially placed (Si-1, Si-2) β detectors.



β -delayed p doppler shift



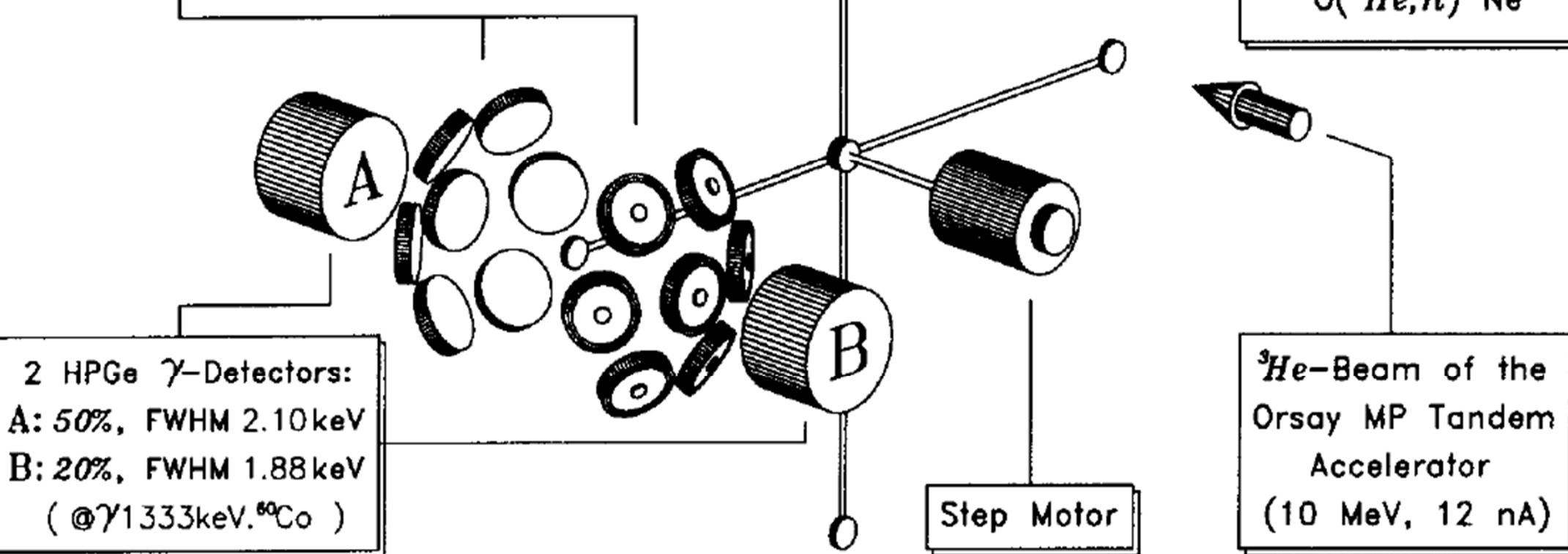
14 Si(Li) β -Detectors:
 $\phi 26\text{ mm} \times 4\text{ mm}$
FWHM 3.50–5.25 keV
(@ $eK1063\text{keV. }^{207}\text{Bi}$)

4 Targets:
 $6.55\text{mg/cm}^2 \text{ B}_2\text{O}_3$

Optical Sensor
of the Target
Position

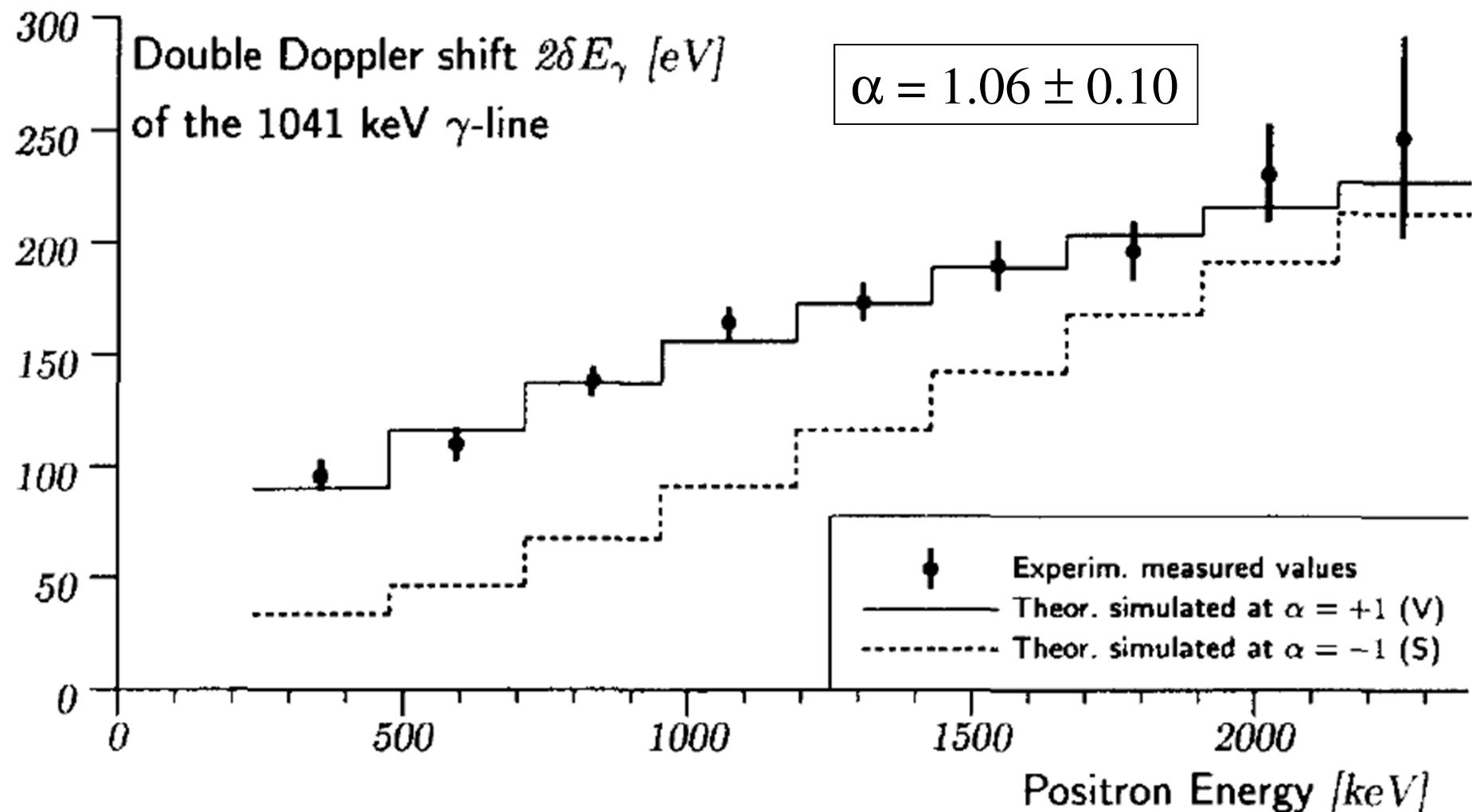
Control & Data
Acquisition:
CAMAC + PC/AT486

Reaction Used:
 $^{18}\text{O}(\text{He},n)^{18}\text{Ne}$



2 HPGe γ -Detectors:
A: 50%, FWHM 2.10 keV
B: 20%, FWHM 1.88 keV
(@ $\gamma 1333\text{keV. }^{60}\text{Co}$)

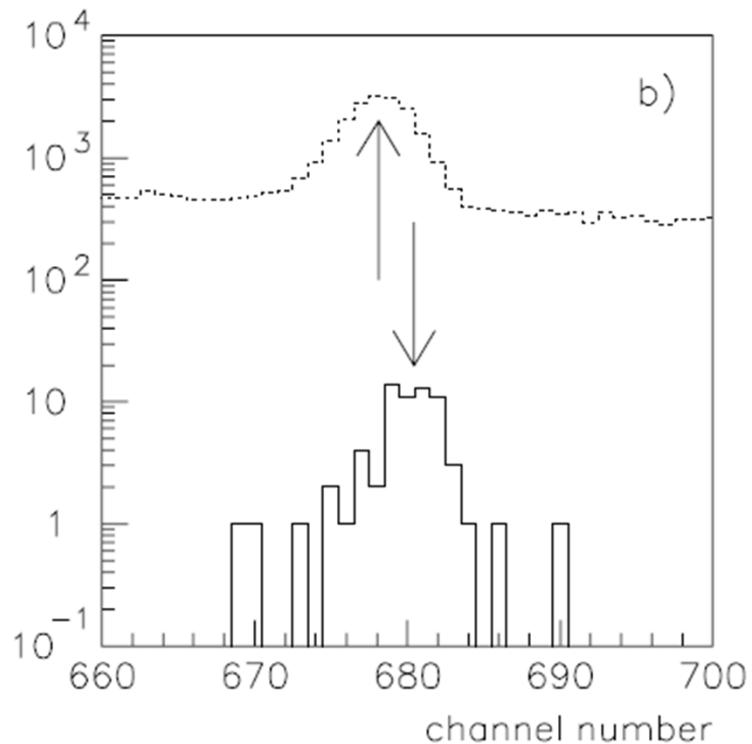
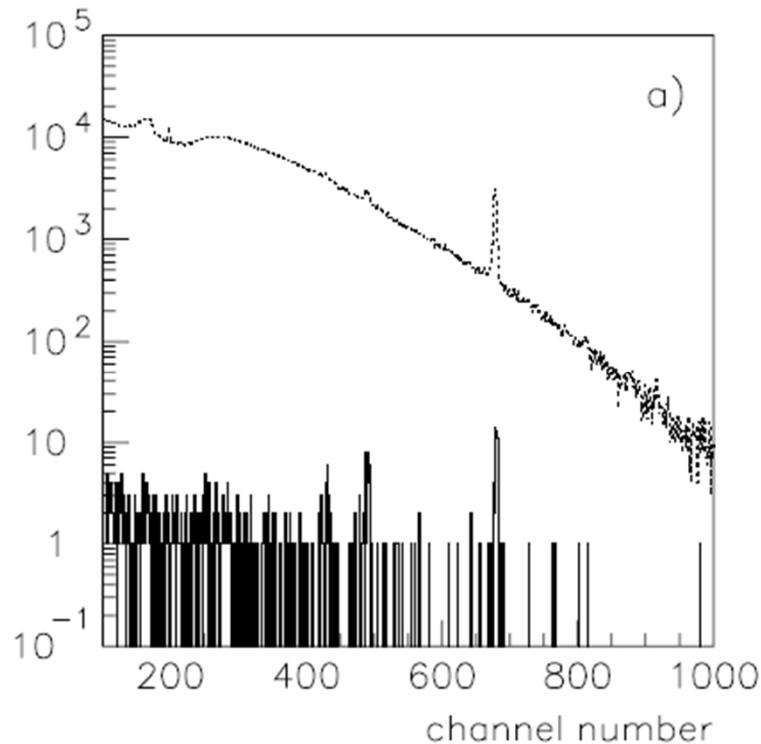
^3He -Beam of the
Orsay MP Tandem
Accelerator
(10 MeV, 12 nA)



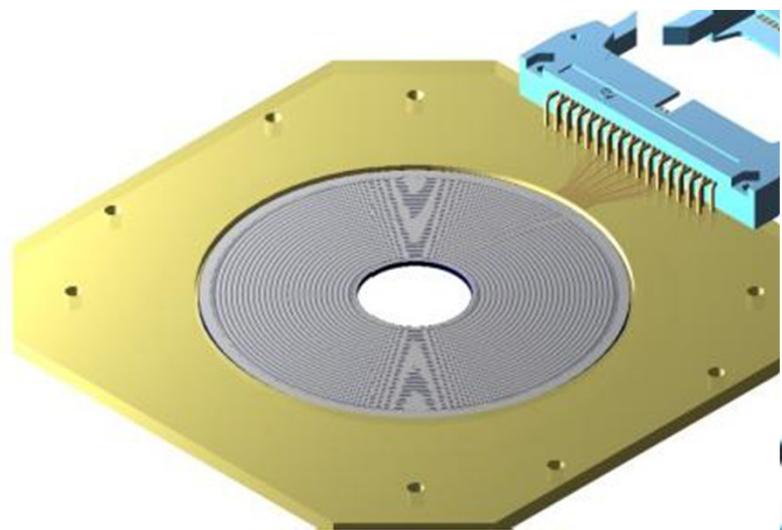
LPC Caen - Dubna - Louvain-la-Neuve
Argonne - Leuven - @ LIRAT, 2002

feasability tests performed in 2002 @ SIRa

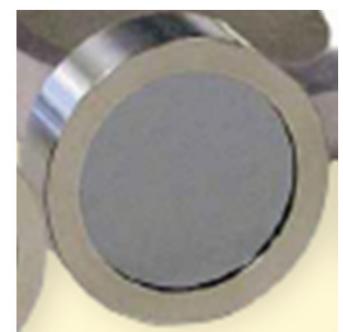
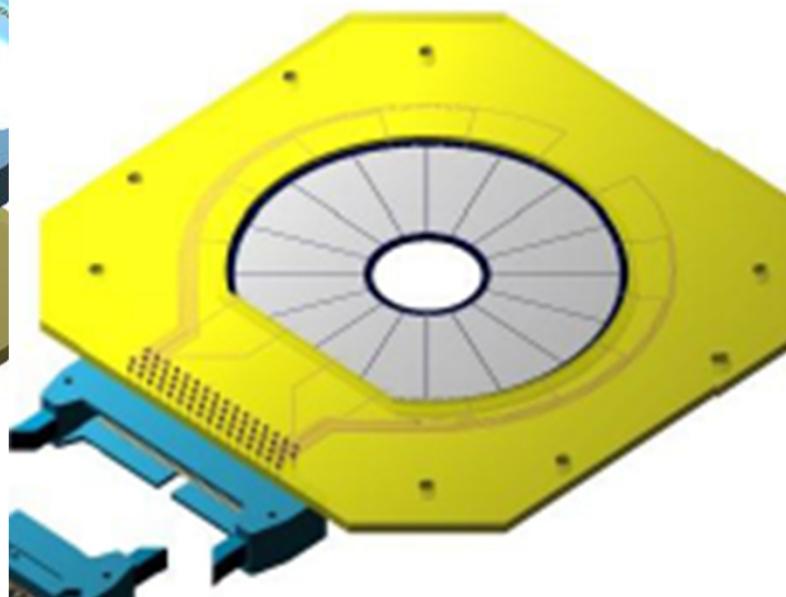
- $300 \text{ } ^{32}\text{Ar}/\text{s}$, clean beam
- ions implanted in carbon foil
- p & β detected by Si telescopes



➤ a few 10^5 events in p peak needed to get $\Delta a = 0.006$ (1σ)



proton detector



ACTIVE OUTER DIAMETER	70 mm	70 mm
ACTIVE INNER DIAMETER	22 mm	22 mm
CHIP OUTER DIAMETER	76 mm	76 mm
CHIP INNER HOLE DIAMETER	20 mm	20 mm
Nº of JUNCTION ELEMENTS	48 Incomplete Rings	24 Complete Rings

$$r(\text{proton}) = \sim 4.5 \text{ cm in } 6 \text{ T}$$

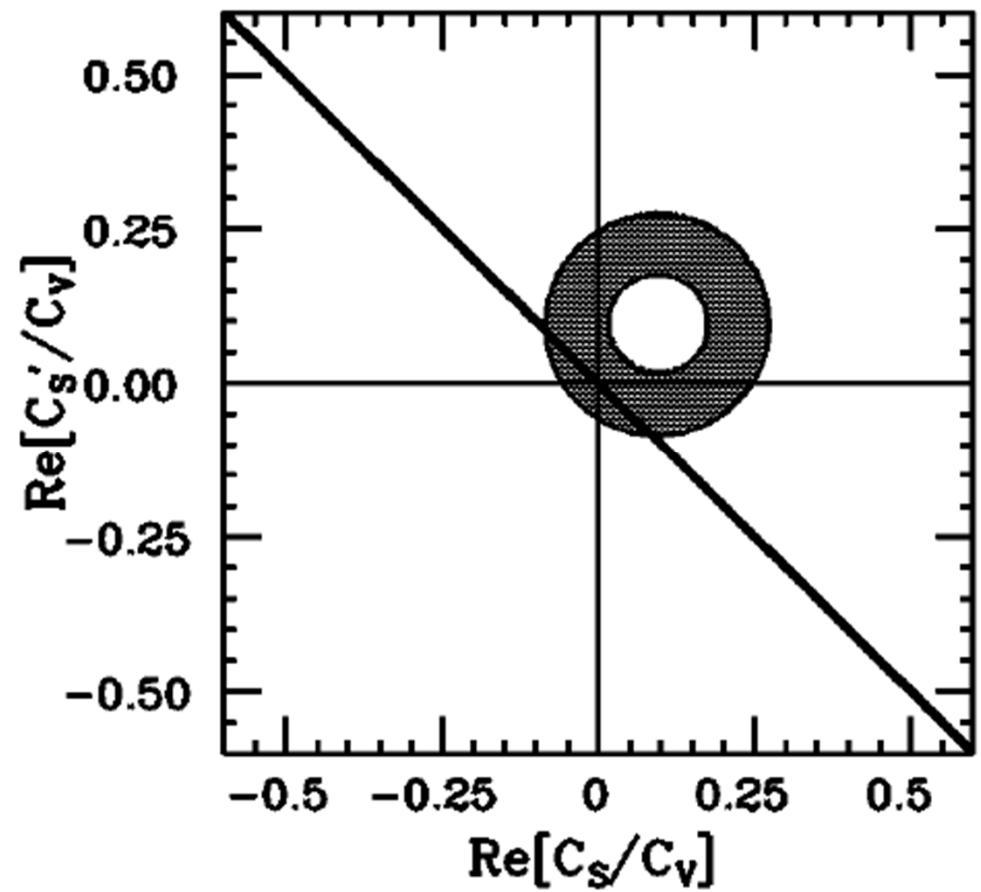
$$\begin{aligned} r(\text{beta}) &= \sim 3 \text{ mm in } 6 \text{ T} \\ &= \sim 12 \text{ mm in } 1.5 \text{ T} \end{aligned}$$

beta detector

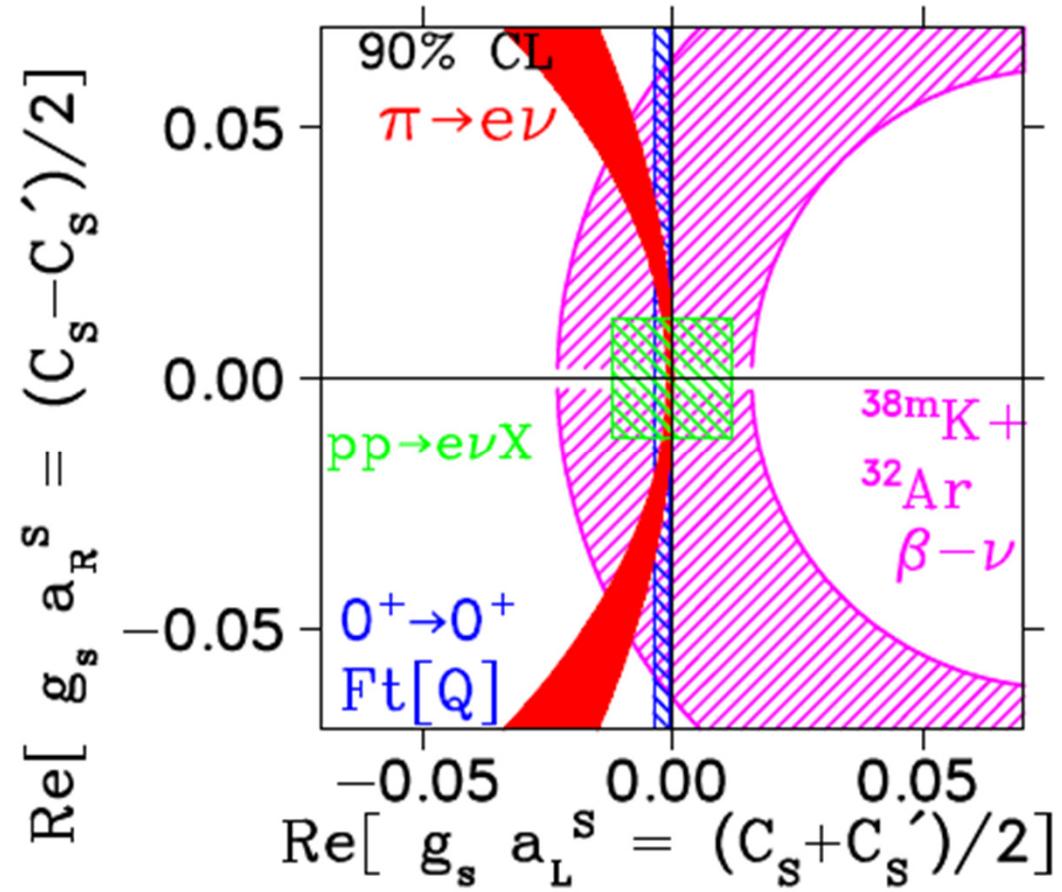
ANNULAR PIPS DETECTORS

These detectors have a 4 mm diameter through hole, and are available in RM mounts only. They are available in Partially Depleted (PD) and Fully Depleted (FD) versions which are 300 microns thick.

Active Diameter (mm)		Resolution keV (FWHM)		Mount Size mm ²	Model Number
Inside	Outside	Alpha	Beta		
5.5	19.5	20	15	300	ANFD300-20-300RM
5.5	19.5	18	14	300	ANPD300-18-300RM



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Intensities: $I(\gamma+ce)$ per 100
parent decays

0^+ 0.0 98 ms
 $^{32}_{18}\text{Ar}_{14}$
 $\%e + \%B+ = 100$
 $Q^+ = 11134.7^{20}$

