

Report from S202 (RUN 97, July 2001) and outlook on S235

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for the

S202 collaboration

**(Bordeaux - Edinburgh - GANIL - GSI - Liverpool -
Oak Ridge - Tennessee - Warsaw)**

Spokesperson: M. Pfützner, B. Blank

and

S235 collaboration

**(Argonne - Edinburgh - GSI - Lund -
Milano - Oak Ridge - Warsaw)**

Spokesperson: P.J. Woods, K. Schmidt

Decay of neutron-deficient isotopes

S202

Search for 2-proton decay of ^{45}Fe

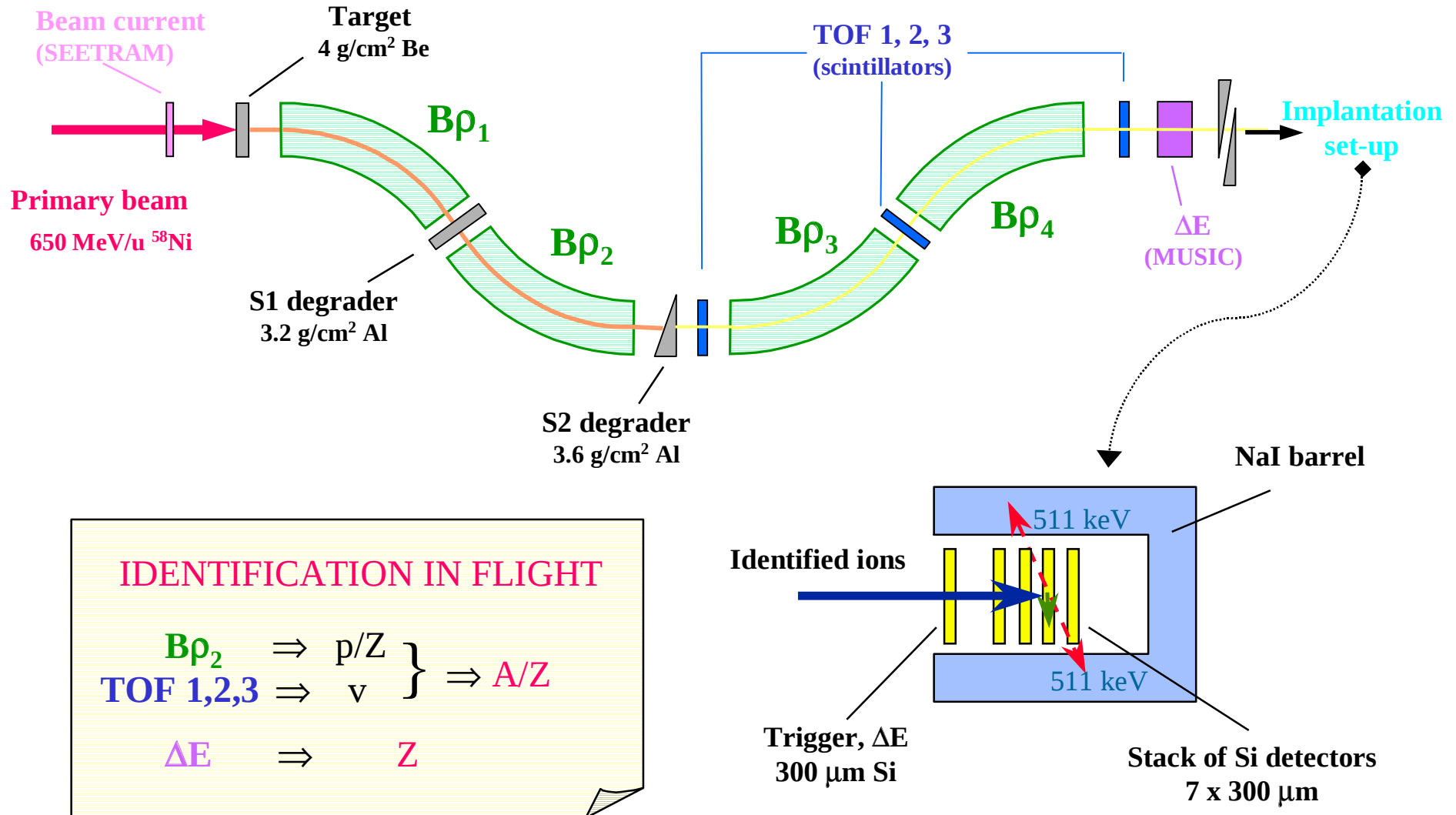
- * ^{58}Ni fragmentation
- * Detection: direct protons (line spectrum),
positrons and β -delayed protons
(continuous spectra)
- * Signature of 2p decay: energy ~ 1 MeV,
very short half-life (μs)

S235

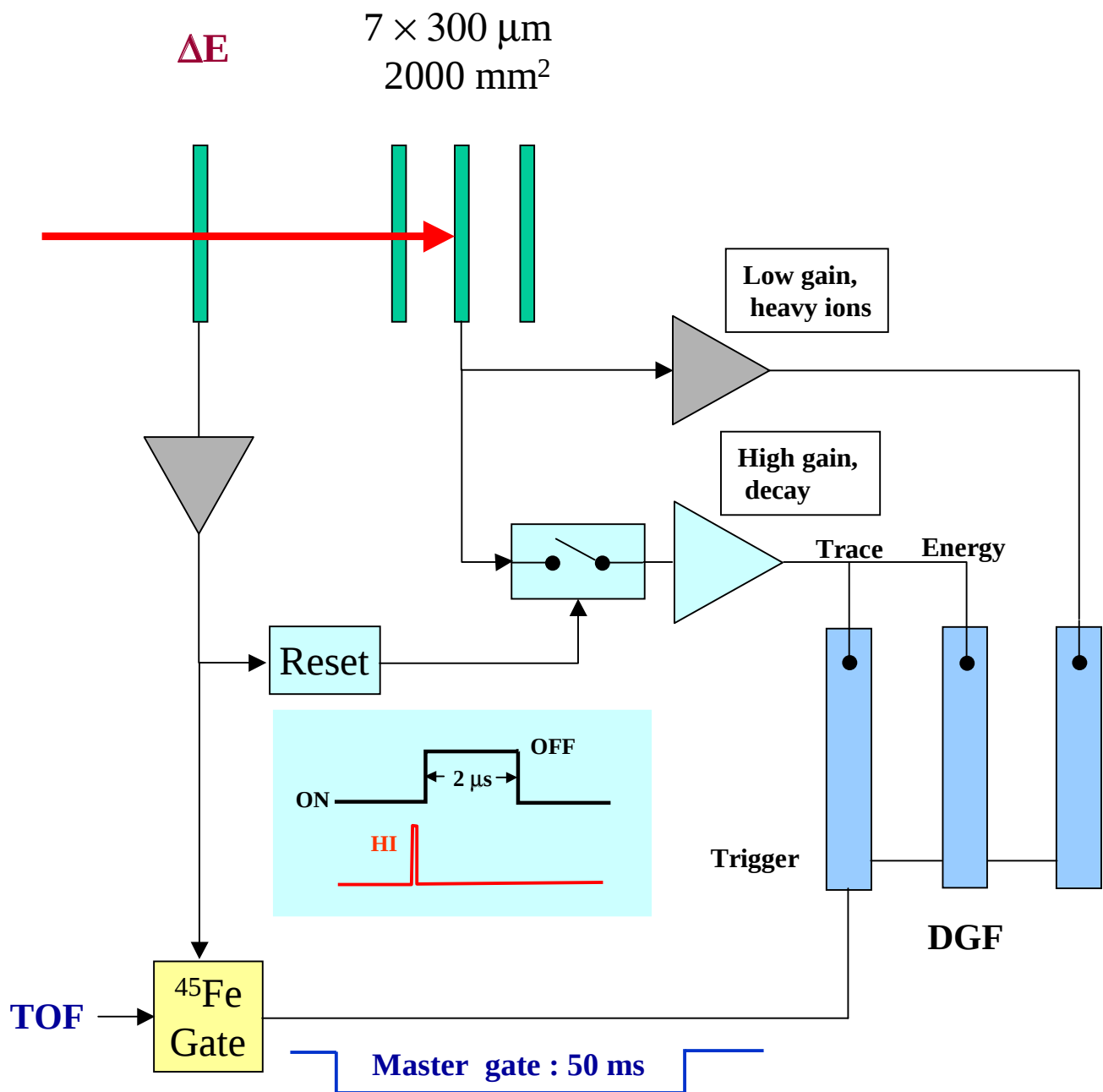
Search for proton and α emitters beyond lead

- * ^{238}U fragmentation $\rightarrow$ light polonium ($Z=84$)
to protoactinium ($Z=91$)
isotopes
- * Half-lives down to μs expected

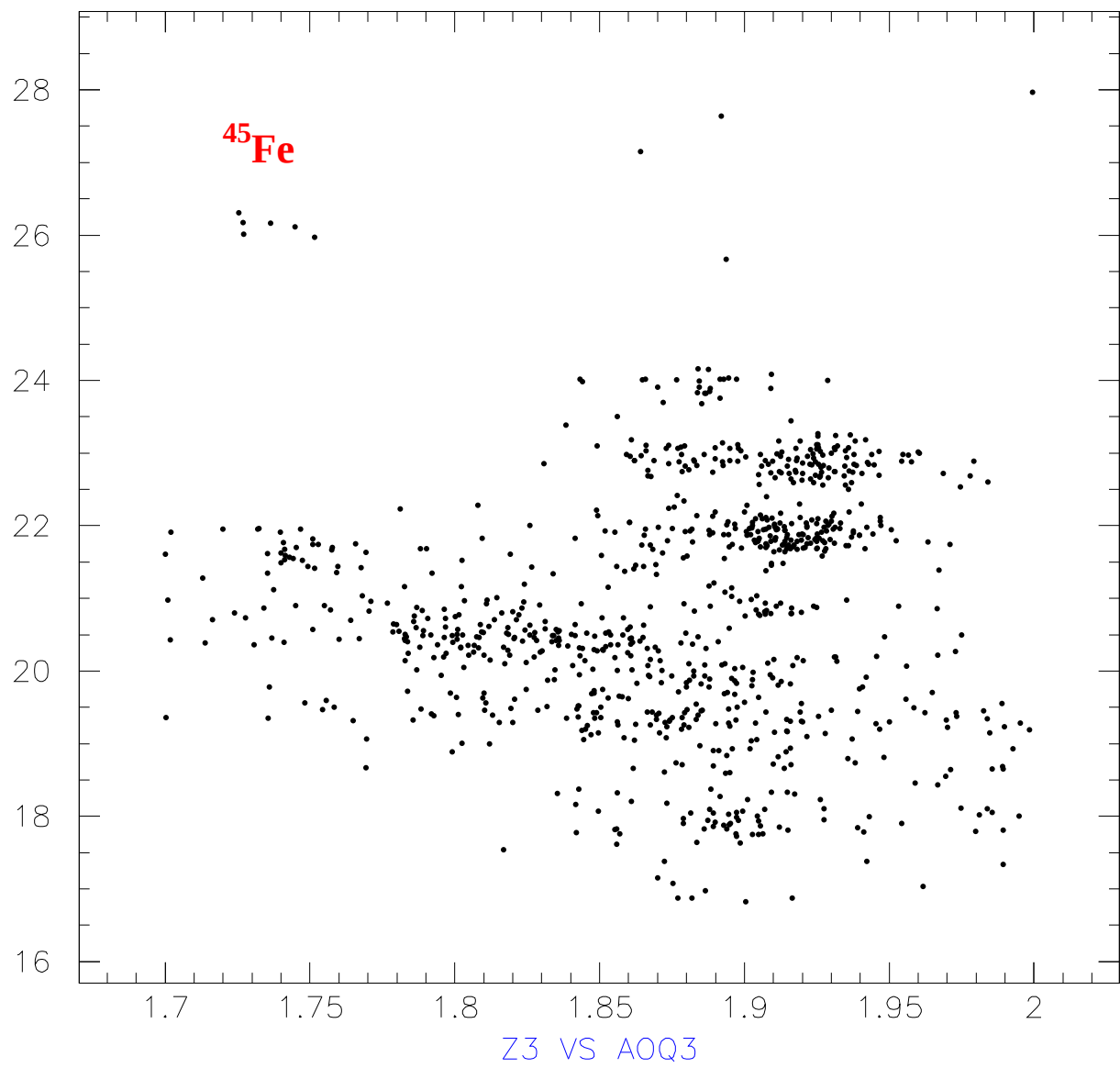
FRS Set-up



Scheme of electronics for Si detectors

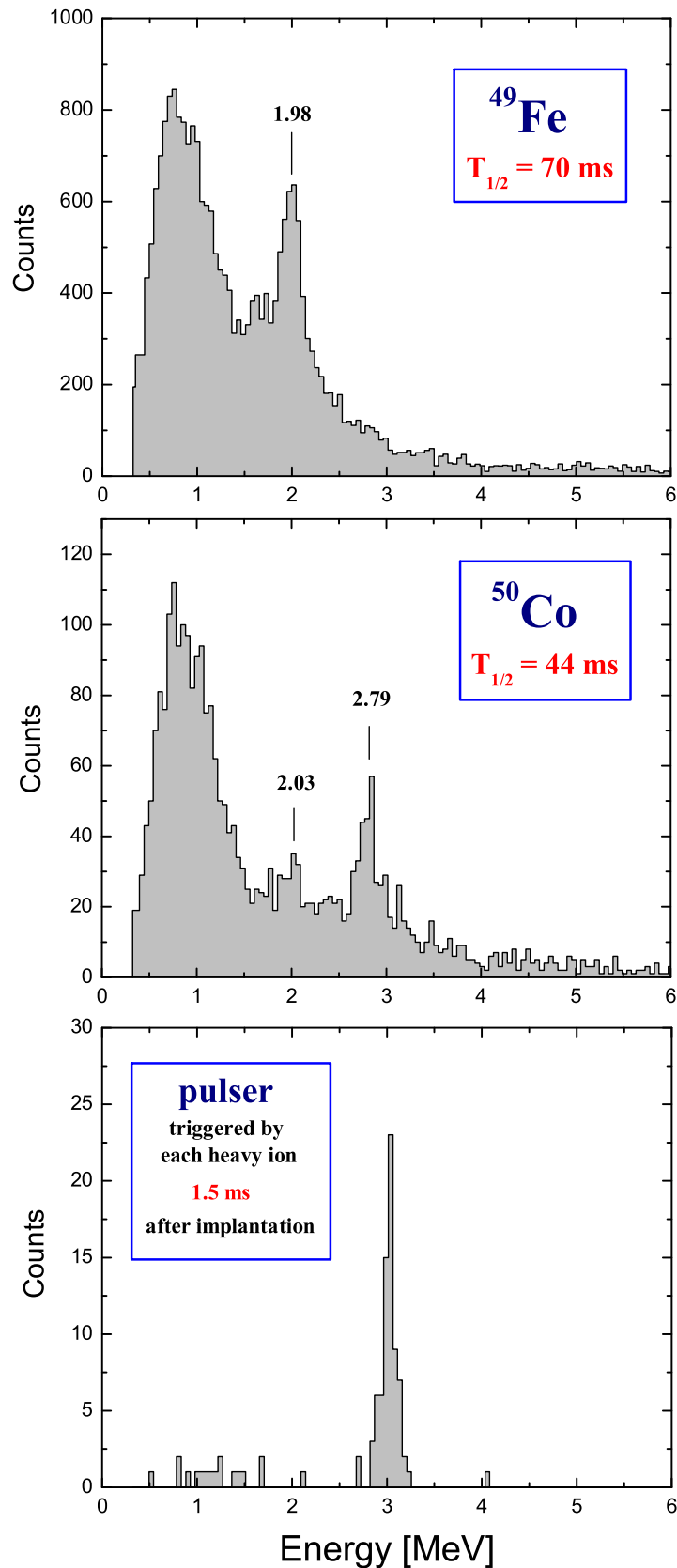


650 MeV/u $^{58}\text{Ni} + ^9\text{Be} \rightarrow ^{45}\text{Fe}$



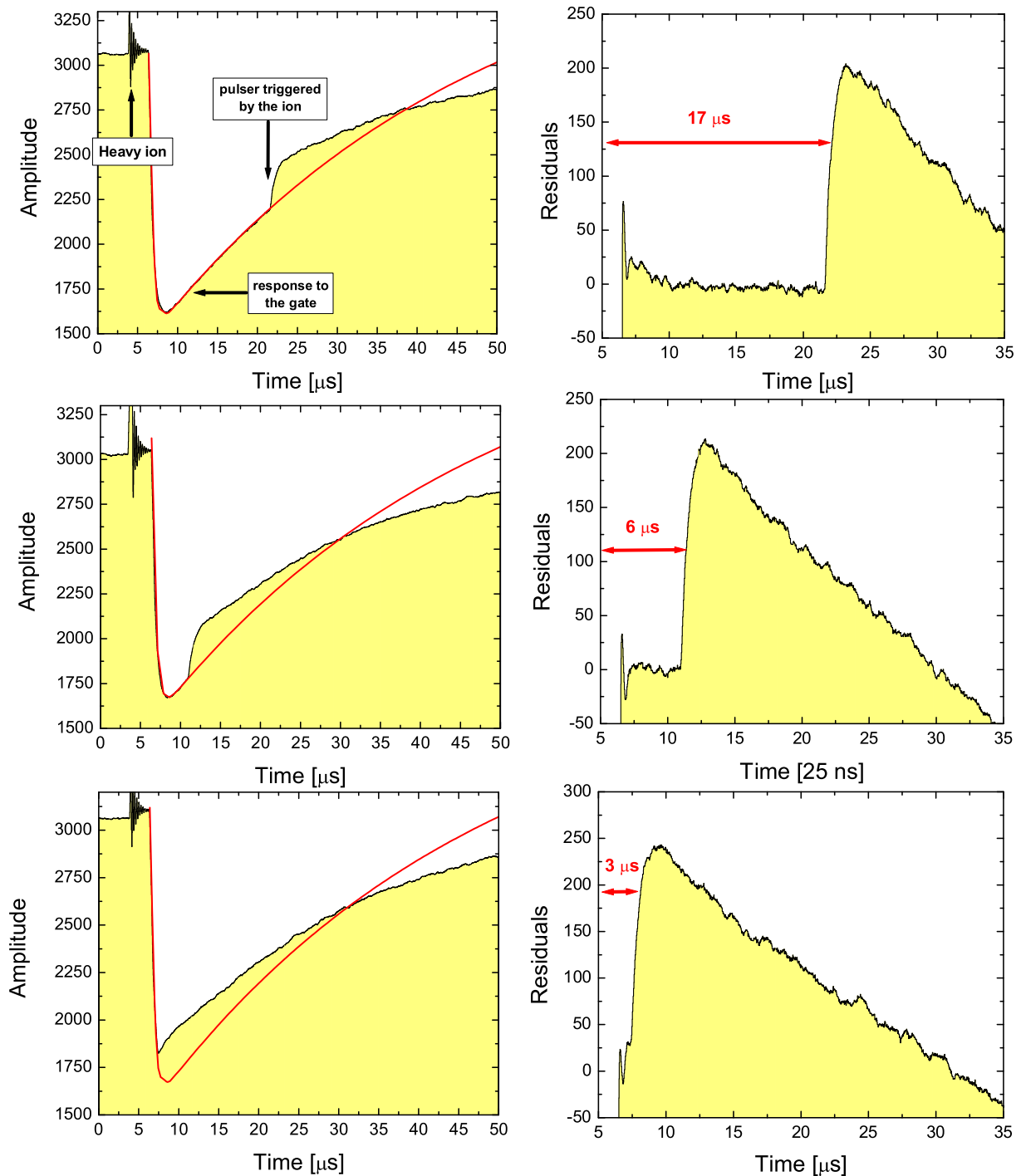
Decay spectroscopy in milisecond range

Amplitude analysis online : energy and time values are stored

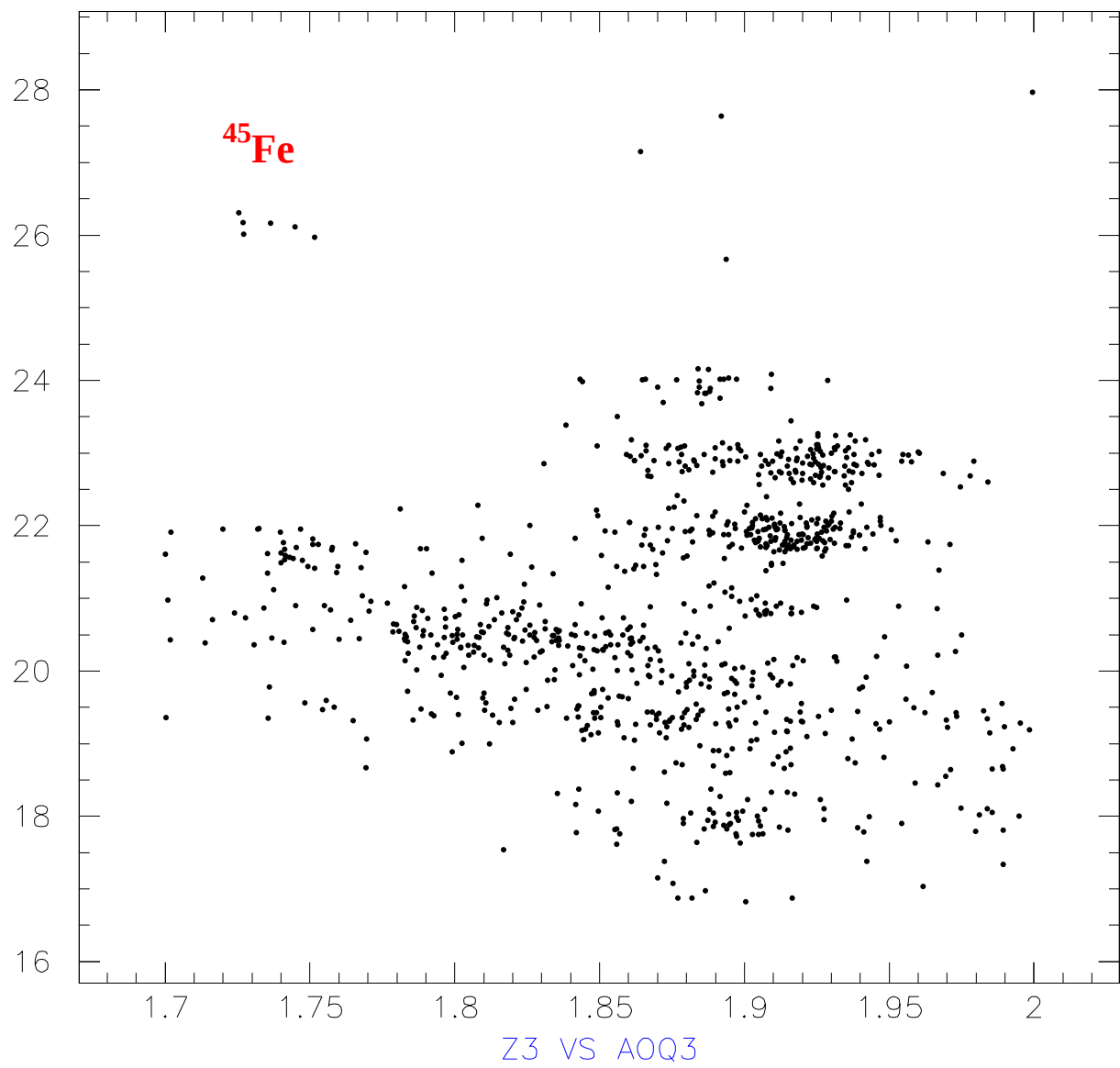


Decay spectroscopy in microsecond range

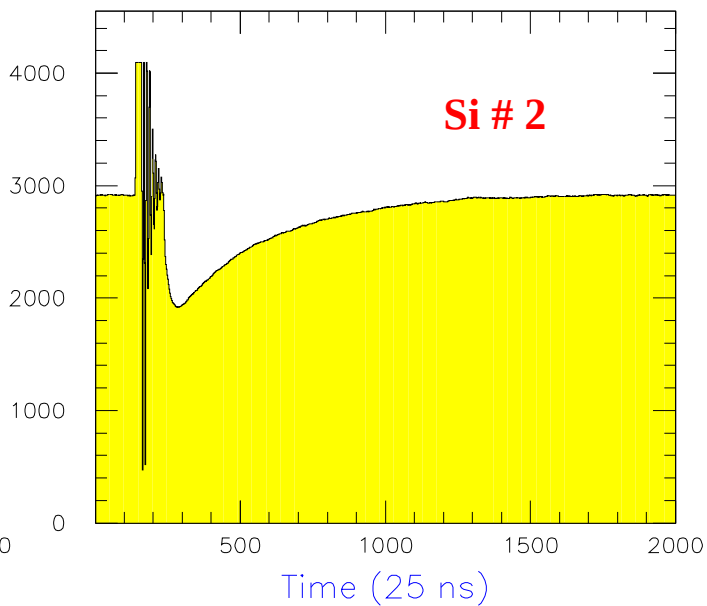
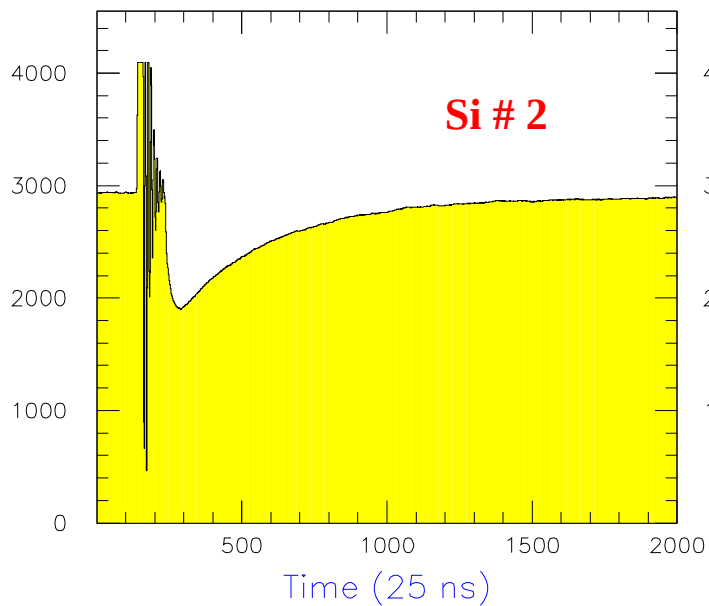
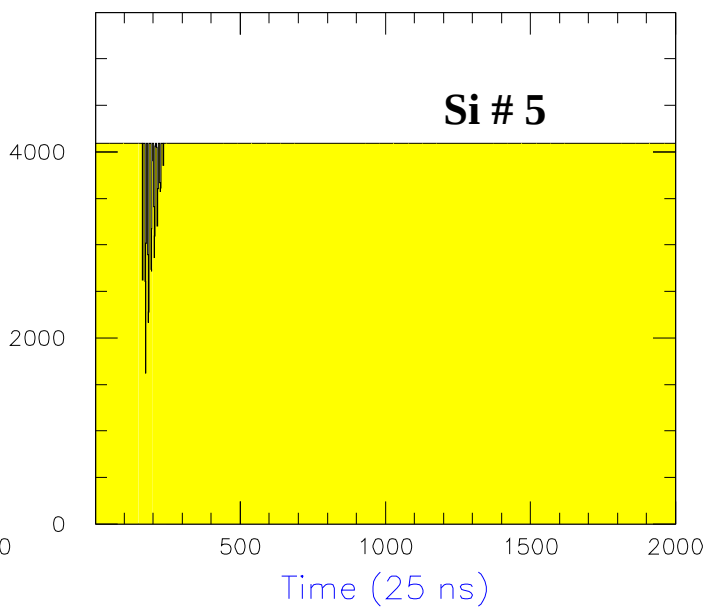
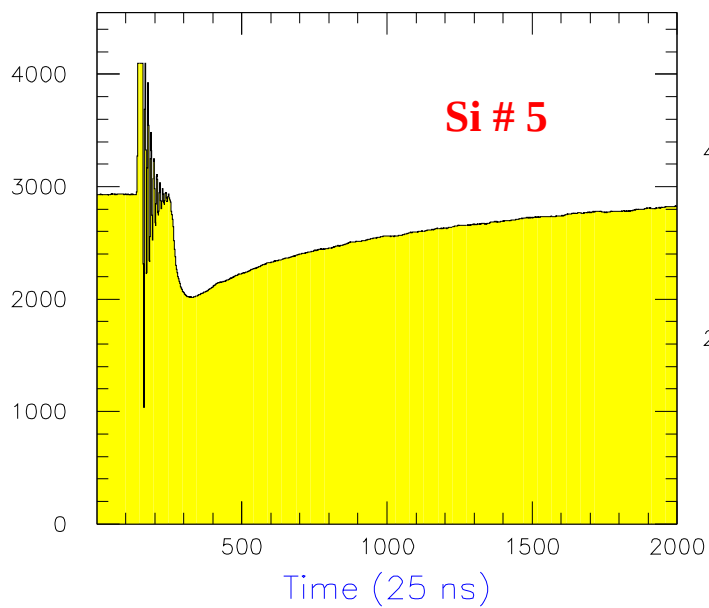
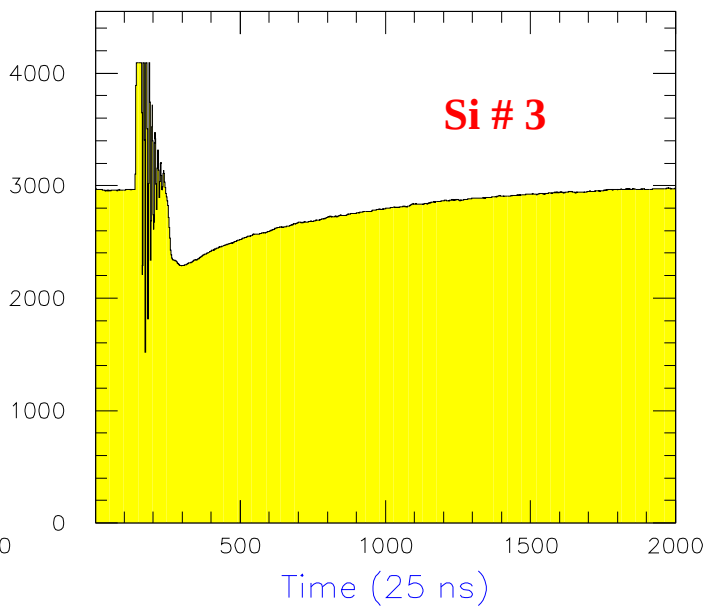
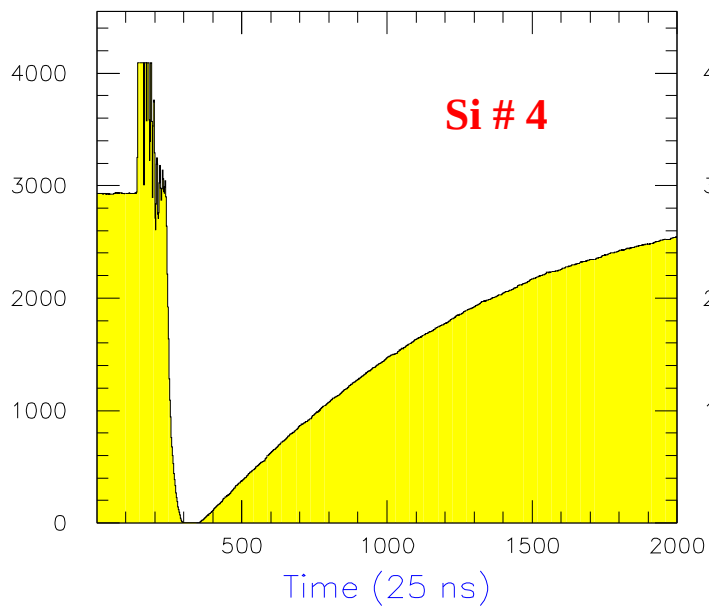
Pulse traces are stored and analysed offline



650 MeV/u $^{58}\text{Ni} + ^9\text{Be} \rightarrow ^{45}\text{Fe}$



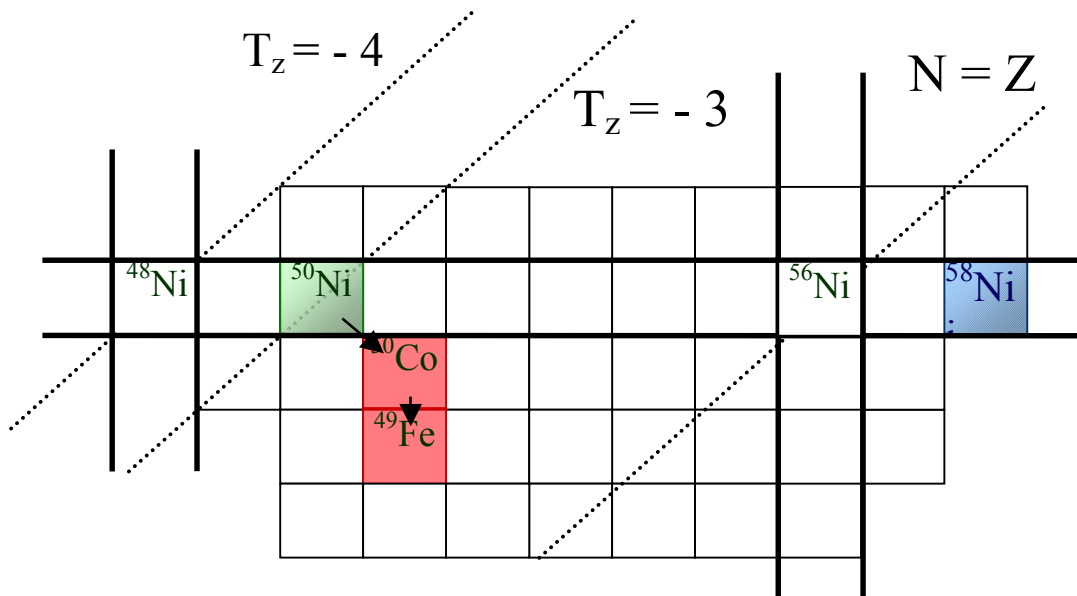
Traces of 6 events of ^{45}Fe



Spectroscopy of ^{50}Ni

!!!!!!! PRELIMINARY !!!!!!!

- Observed at FRS: no spectroscopic information
(B. Blank et al., PRC 50 (1994))



RUN97 (analog electronics):

- 77 ^{50}Ni ions identified at S4, 41 implanted in the
silicon telescope (36 hours)
- βp emission observed
- $b_{\beta p} = (85 \pm 10) \%$
- $T_{1/2} = (9 \pm 2) \text{ ms}$

Summary and Outlook

S202 (RUN 97, July 2001)

- * Successful test of DAQ based entirely on digital modules and of new preamplifiers
- * Too low primary-beam intensity (5×10^9 ^{58}Ni /spill) for good statistics on ^{45}Fe (6 events in 7 days)
- * No evidence for fast (μs) decay of ^{45}Fe (consistent with J. Giovinazzo *et al.*, EPJA 10 (2001))
- * Analysis still in progress...
- * First spectroscopic information on ^{50}Ni (publishable)

S235 (search for proton radioactivity beyond lead)

- * Technique for identifying μs activity works
- * ^{238}U beams being successfully developed ($>10^9$ / spill required)
- * Experiment S235 accepted in December 1999

→ ready to run!

⇒ **BEAMTIME (^{238}U , 26 shifts) REQUIRED**
during 4th block 2002