to determine the α-decay energy and half-life of isomer $^{216}Fr^{m}$ ($9^-$) for the first time. The isomer ratios of 0.28(1) and 0.31(2) were determined for the ($9^-$) isomers of $^{212}At$ and $^{216}Fr$, respectively [1].

It would have been a difficult task to obtain these results without using mass-separation and α-α time correlation (i.e. on the basis of measuring a mere α single spectrum). If the ($9^-$) state energies of parent and daughter nuclei are very similar, the α line originating from the transition between these levels could be obscured by the much stronger ground-state to ground-state α transition.

Identification of the α-decaying ($9^-$) isomer in $^{216}Fr$ provides a basis for assignment of level energies of alternating parity band. Recently, high-spin octupole yrast levels in $^{216}Rn$ were studied [2]. All experimental characteristics indicate that $^{216}Rn$ is a transitional nucleus. From this result, the lightest nucleus showing evidence of octupole collectivity at low spins is still $^{216}Fr$, thereby defining the lowest mass "cornerstone" for this phenomenon in the $N \geq 129$, $Z \geq 87$ region of the nuclear chart [2].

The results obtained in this work suggest the existence of an isomeric state in $^{220}Ac$. The search for an α-decaying ($9^-$) isomer in $^{220}Ac$ will be the aim of our next study.

Some technical improvements were performed on the IGISOL system. The most important one was the installation of a movable diaphragm in the focal plane of the mass separator, which allows to cut off the neighbouring masses in the mass spectrum and, consequently, to purify the α-spectra.

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**References:**

[1] J. Kurcewicz, W. Czarnacki, M. Karny, M. Kasztelan, M. Kisieliński, A. Korgul, W. Kurcewicz, J. Kurpeta, S. Lewandowski, P. Majorkiewicz, H. Penttilä, A. Płochocki, B. Roussière, O. Steczkiewicz , A. Wojtasiewicz, Phys. Rev. **C76**, 054320 (2007)

[2] M.E. Debray *et al.*, Phys. Rev. **C73**, 024314 (2006)

## 15. Double sided strip monolithic silicon E-ΔE telescope produced by Quasi-Selective Epitaxy

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The main problem discovered during tests of the monolithic silicon E-ΔE telescopes produced by the Quasi-Selective Epitaxy was a cross-talk of signals between the two active layers of the telescope. It was shown by solving the telegraphic equation [1] that the time evolution of induced signals in the E-ΔE detector RC line depends strongly on the detector shape. The calculations were performed for rectangular detectors of various length to width ratio, at a constant area. For long and narrow detectors (high length to width ratio) the fall time of induced signals was significantly shortened (see Fig. 1) resulting in a cross-talk pulse length below the minimum required by the related electronics. These results are experimentally supported by measurements of α particles with a circular monolithic E-ΔE telescope [2,3]. When α particles were measured at the telescope edge, the induced signal (cross-talk) was decreased. For α particles measured at the centre of the telescope the amplitude of cross-talk was higher, see Fig. 2.

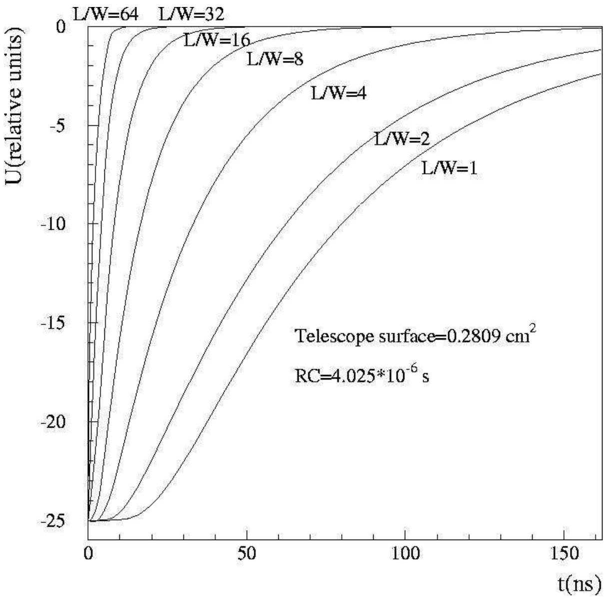


**Figure 1.** Average potential versus time for rectangular monolithic E - ΔE telescopes calculated using (A.8) from Ref. [3] for various rectangular telescope shapes L (length) and W (width) with constant telescope area=L*W=0.2809 $cm^2$ and RC=4.025*$10^{-6}$ s, where C = 917.4 pF/$cm^2$ and sheet resistance R = 4387.4 Ω. The initial position of the source cross-talk potential was localized at the centre of the detector. The curves were calculated for the following values of the ratio L/W: 1, 2, 4, 8, 16, 32, and 64.

Applying these results we have designed a new type of the device based on the $n^+$- n – $p^+$- n – $n^+$ structures: double-sided strip monolithic silicon E-ΔE telescope, see Fig. 3. The device is similar to the traditional double sided strip detector [4], however, an introduced $p^+$- type buried grounded separating layer isolates the (upper) ΔE strip detector from the (bottom) E strip detector of the telescope. We plan to build such a device in the following months in collaboration with the Institute of Electronic Materials Technology and Institute of Electron Technology in Warsaw.

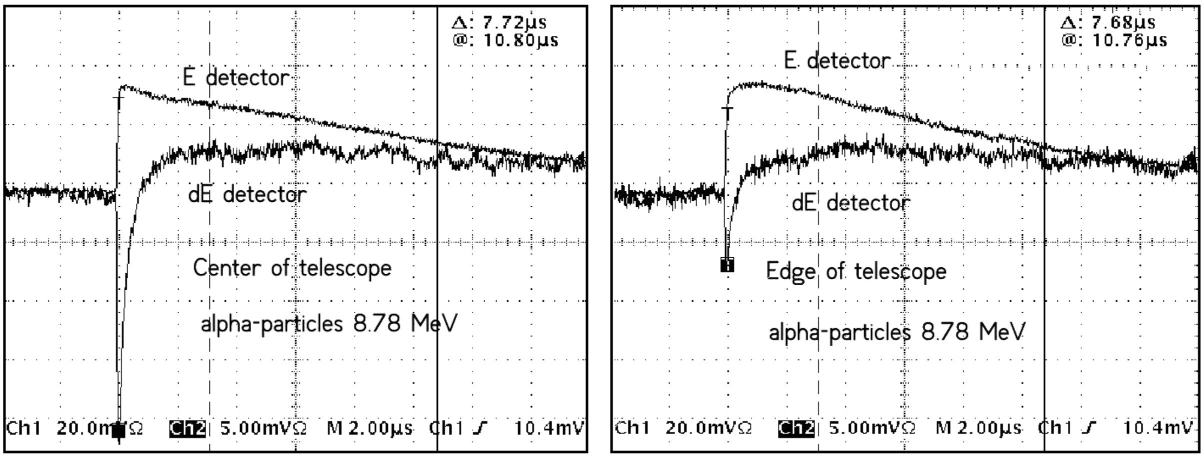


**Figure 2.** Oscilloscope pictures of the charge preamplifier outputs for a monolithic E - ΔE telescope with a 20 µm thick E-ΔE detector irradiated by α particles of 8.78 MeV energy. For ΔE detectors a negative cross-talk signal is observed. Left: α particles hit the centre of the telescope. Right: α particles hit the edge of the ΔE detector.

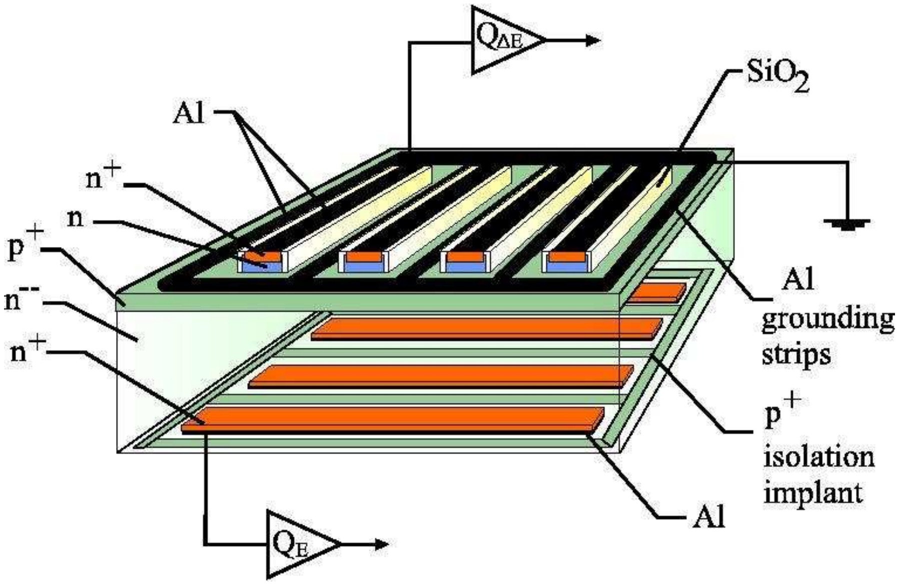


**Figure 3.** Design of the double-sided strip monolithic silicon E - ΔE telescope produced by Quasi-Selective Epitaxy.

## References:


[1] A.J. Kordyasz *et al.,* Nucl. Instr. and Meth. **A 568** (2006) 778
[2] A.J. Kordyasz *et al.,* Nucl. Instr. and Meth. **A 530** (2004) 87
[3] A.J. Kordyasz *et al.,* Nucl. Instr. and Meth. **A 528** (2004) 721
[4] G. Lutz MPI-PAE/EXP. EL 175 (1987)