New technology of thin Si ion implanted epitaxial detectors

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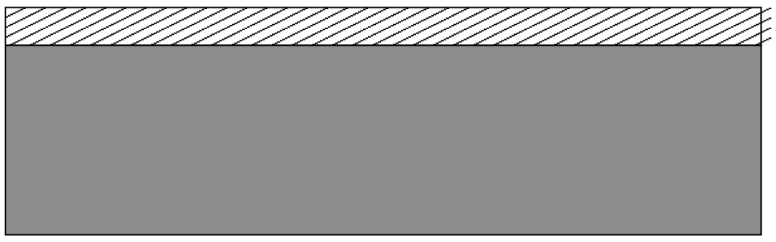
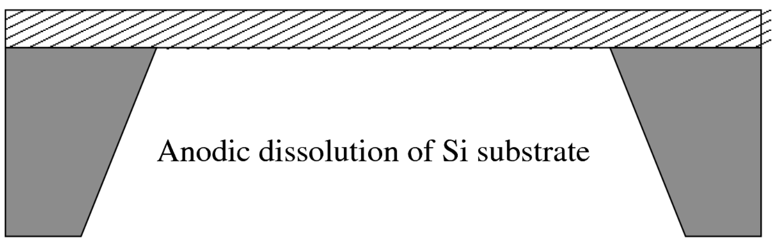
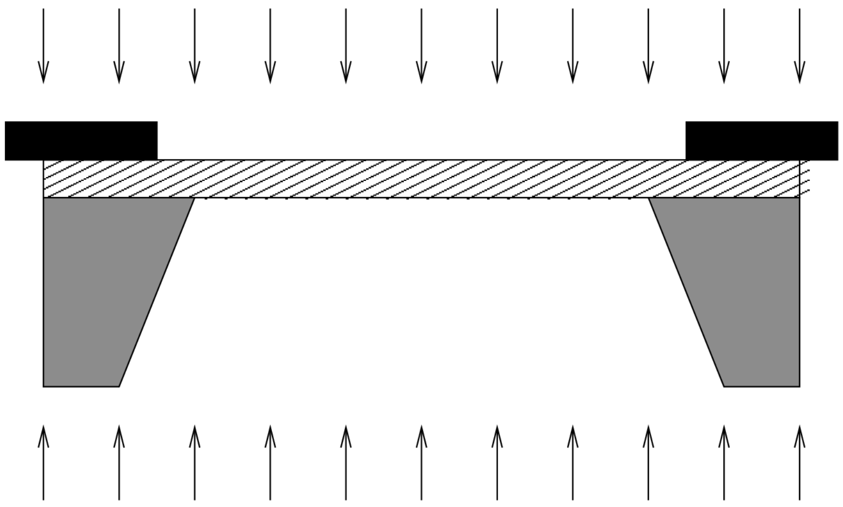
High resistivity, thin, n–type Si epitaxial layer



Low resistivity, n–type thick Si substrate



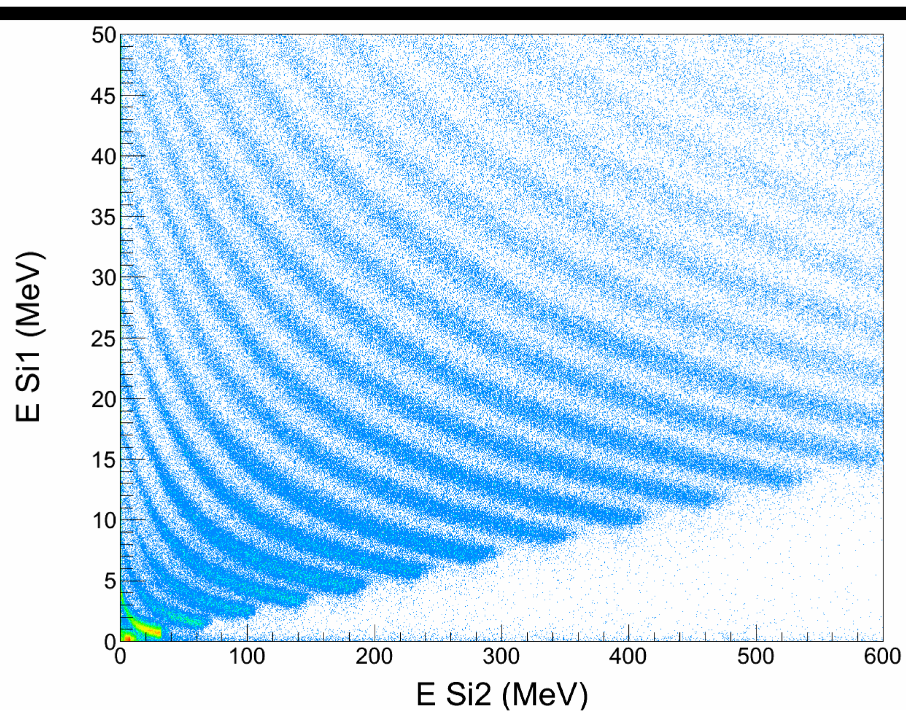
50 KeV Boron ions implantation folowed by Al evaporation



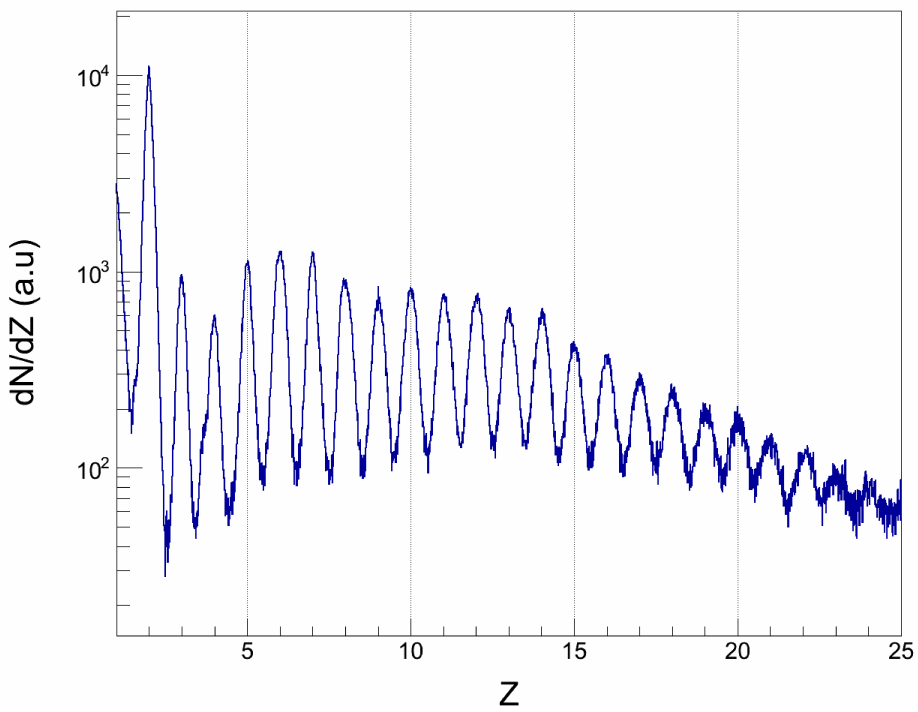
Al evaporation followed by long time baking of the Si detector

Technology. We used n^+ - n silicom structure of resistivity about 900 Ω*cm and thickness 21 µm, respectively, grown on the thick (400 µm), low resistivity (0.01 Ω*cm) substrate (upper part of figure). The low-resistivity n^+ substrate was removed by anodic dissolution (central part of figure). Not removed extenal part of the substrate close to the wafer edge, supports mechanically the thin silicon epitaxial membrane.The top of the etched silicon epitaxial structure n^+ - n was collimated by the Al mask (see to the lower part of the figure) in order to select the region of epitaxial layer for implantation 50 keV B^+ ions with dose $5*10^{14}$ ions/cm^2. After implantation was finished the Al metalisation through the Al mask was performed. The 50 keV B^+ ions implanted to silicon epitaxial layer produces p^+ - n junction and evaporated Al creates electric contact to the face p^+ implanted layer of the detector. The back detector contact was made by Al evaporation to the back side of the wafer. To activate detector p+ - n junction the wafer was baked during long time. On this way produced detector has active area about 20 *20 mm^2. **The essence of new technology** is the application of the low temperature baking process for post-implantation thermal treatment instead of the high temperature annealing process used elsewhere. The new technology gives possibility application of baking process after evaporation of metal contacts on both sides of the detector. Additional achievement of the technology is possibility to use the common mask for ion implantation and Al evaporation on the face detector side.

FAZIA COLLABORATION



Preliminary tests of the thin 20*20 mm^2 detector were performed at LNS cyclotron in Catania (Italy) using products of heavy ion reactions ^{84}Kr (E=35 MeV/A) + ^{112}Sn. The E-ΔE scatter plot of measured results is presented at upper figure. Evaluated charge distribution were shown on the lower figure.



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