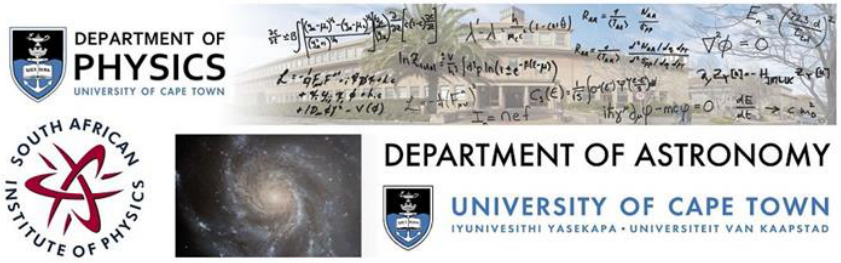

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Crystal orientation of the iThemba LABS segmented clover detector

Tuesday, 5 July 2016 16:10 (1h 50m)

Abstract content
   (Max 300 words)
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In order to characterize a segmented germanium detector for the purpose of pulse shape analysis one has to have a correct understanding and be able to model the movement of electron and hole charges inside the detector volume. The movement of the charges is defined by their drift velocity along the direction of the applied electric field. One of the parameters that can influence the drift velocity of the holes and electrons is the crystal lattice orientation. The pulse shape, particularly its rise time is a useful tool to understand the interaction position and the velocity of the moving charges. This is because the rise times are proportional to the distances the charge carriers travel from the point of interaction to their respective electrodes. The iThemba LABS segmented clover detector was irradiated by a collimated Am-241 source at different positions. Measurements were taken at a depth of 1 mm from the detector front surface and in steps of 5 mm around the four sides of the detector. Traces were then averaged for each position offline using a sorting code and then the rise times were measured at 10%, 30%, 60% and 90% fractions of the total trace amplitude. Fractional rise times at T30, T60 and T90 were calculated from the measured rise times values and then plotted for every position with respect to the angle. If the crystal axis is orientated along the diagonal of the crystal the rise times will have equal values for surface interactions at equal distances from the core. Therefore T30, T60 and T90 will be symmetric with respect to the diagonal of the crystal. If the rise times do not show symmetry with respect to the diagonal the crystallographic axis is not aligned with the crystal diagonal. The measured rise times will be presented and discussed.

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