Evaluating a new segmented germanium detector contact technology

E.G. JACKSON, C.J. LISTER, P. CHOWDHURY, University of Massachusetts Lowell, E. HULL, R. PEHL, PHDs Co — New technologies for making gamma ray detectors position sensitive have many applications in space science, medical imaging, homeland security, and in nuclear structure research. One promising approach uses high-purity germanium wafers with the planar surfaces segmented into orthogonal strip patterns forming a Double-Sided Strip Detector (DSSD). The combination of data from adjoining strips, or pixels, is physics-rich for Compton image formation and polarization studies. However, sensitivity to charge loss and various kinds of cross-talk [1] have limited the usefulness of first generation devices. We are investigating new contact technologies, developed by PhDs Co [2], based on amorphous-germanium and yttrium contacts RF sputter deposited to a thickness of \( \sim 1000 \, \text{Å} \). New techniques allow both physical and photolithographic segmentation of the contacts with inter-strip gap widths of 0.25 mm. These modifications should improve all aspects of charge collection. The new detector technology employs the same material and fabrication technique for both the n- and p- contacts, thus removing artificial asymmetry in the data. Results from tests of cross-talk, charge collection, and scattering asymmetry will be presented and compared with older technologies. This mechanically cooled counter, NP-7, seems to represent a breakthrough.