Abstract Submitted
for the APR13 Meeting of
The American Physical Society

Novel Surface Preparation and Contacts for CdZnTe Nuclear Radiation Detectors Using Patterned Films of Semiconductors and Insulators ARNOLD BURGER, MICHAEL GROZA, Fisk University, ADAM CONWAY, STEVE PAYNE, Lawrence Livermore National Laboratory — The semiconductor Cadmium Zinc Telluride (CZT) has emerged as the material of choice for room temperature detection of X-rays and gamma-rays. The detectors will cover the energy range from 30 keV to several MeV, and will achieve excellent 662 keV energy resolution. The development of high resolution gamma ray detectors based on CZT is dependent on low electronic noise levels. One common source of noise is the surface leakage current, which limits the performance of advanced readout schemes such as the coplanar grid and pixelated architectures with steering grids. Excessive bulk leakage current can result from one of several surface effects: leaky native oxides, unsatisfied bonds, and surface damage. We propose to fabricate and test oriented [111] CZT crystals with thicknesses up to 1.5 cm with an innovative detection technique based on co-planar or other electron only transport designs using plasma processing, thin film sputtering, chemical passivation and wet etching techniques. Compared to conventional pixel detectors, the proposed contact configuration needs lower power consumption and a lower cost. The detector design can be used for building very low-cost handheld radiation detection devices.

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Date submitted: 10 Jan 2013 Electronic form version 1.4