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Latest Results on the Radiation Tolerance of Diamond Detectors

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As nuclear and high energy facilities around the world are upgraded and move to higher and higher intensities, the detectors in use at these facilities must become more radiation tolerant. Diamond is a material in use at many facilities due to its inherent radiation tolerance and ease of use. In this talk, we will present the results of recent radiation tolerance measurements of the highest quality poly-crystalline Chemical Vapor Deposition (pCVD) diamond material for a range of proton energies, pions and neutrons up to a fluence of 2 x 10ˆ16 particles/cmˆ2. From this data we are able to derive the damage constants as a function of energy and particle species and compare with theoretical models. We will also present the recent measurements of the rate dependence of pulse height for non-irradiated and irradiated pCVD diamond pad and pixel detectors. The results we will present include detectors tested over a range of particle fluxes up to 20 MHz/cm^2 with both pad and pixel readout electronics. Our results indicate the pulse height of unirradiated poly-crystalline CVD diamond detectors and the neutron irradiated poly-crystalline CVD diamond detectors measured with the pad readout show no dependence on the particle flux.

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