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Saturation study of a CVD diamond detection system[1] LUCILE S. DAUFFY, EDWARD C. MORSE, JEFFREY A. KOCH, AARON M. TREMAINE, DAVID J. GIBSON, JEREMY S. JACOB, Lawrence Livermore National Laboratory — Chemical Vapor Deposition (CVD) diamond detection systems are being tested to evaluate the feasibility of measuring areal density during the ignition campaign at the National Ignition Facility (NIF). The areal density of the compressed core, ρR, is determined by the ratio of downscattered (scattered inside the target, 4-10 MeV) to primary neutrons (14 MeV). The 14 MeV peak intensity is several orders of magnitude larger than the downscattered neutron intensity. This large contrast presents a challenge, and detector saturation by the 14 MeV neutrons can lead to a nonlinear response to the downscattered neutrons. In order to quantify this non-linearity after a large pulse, the saturation of a CVD diamond detector and surrounding electronics is being studied. We are separately exploring saturation and recovery of the diamond wafer, the biasing electronics, and the data acquisition system, with the goal of demonstrating a capability to reliably measure a weak signal, hundreds of nanoseconds after saturation by a strong signal, with a contrast ratio of 1000 or more. Results from experiments and calculations will be presented.

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