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Measuring Dopant Concentration in Graded NIF Targets through Quantitative Contact X-Radiography[1] H. HUANG, R.B. STEPHENS, General Atomics, J. GUNTHER, Lawrence Livermore National Laboratory — Doping level must be known to 0.05 atomic percent and its radial distribution to one micron for graded targets used in NIF experiments. We have developed a quantitative contact x-radiography system (x-radiograph, film digitizer, and analysis software) that can meet those conditions. Traditional x-radiograph systems (either film- or scintillator-based) contain 1) spatial distortion errors and 2) opacity uncertainties that are unacceptable for this case. For the first, we designed a high precision digitization system with 0.5 μm optical resolution and added a customized algorithm to remove the lens pincushion distortion and the CCD pixel size effect. For the second, we have developed a detailed film model to convert gray scale information into x-ray absorption strength under polychromatic radiation conditions. The model is calibrated on polypropylene flats and can measure the x-ray absorption (and thereby dopant level) to $\sim$10% in each sublayers. Our measurement results on Cu-doped Be shells and Ge-doped GDP shells agrees with those from destructive techniques.

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