Abstract Submitted
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Dynamic Granularity for X-Ray Imaging Systems[1] MATTHIAS GEISSEL, VERLE H. BIGMAN, AARON D. EDENS, MARIUS SCHOLLMEIER, IAN C. SMITH, JONATHON E. SHORES, JOHN L. PORTER, Sandia National Laboratories — Dynamic range and spatial resolution are correlated, because imaging units such as pixels or film grains can cover a wider dynamic range if they are larger, so that they can contain more electrons in a well or fluorescence centers in a grain. However, for systems that are subject to low photon flux, statistical noise influences the spatial resolution. Statistical noise is important for many experiments that rely on single shot X-ray imaging diagnostics. Detectors face a limited photon flux and often also a limited detection probability, where photons of higher energy may just penetrate the detector. The effective spatial resolution depends on detector efficiency, incident photon flux, detector cell size (grain/pixel), and the detector's inherent noise. We describe the combined influences with a "dynamic granularity" function, based on measurements of the grain size dependent distinguishability of grey levels. The dynamic granularity is unique to each imaging system, but allows us to quantify the performance of different detectors in a system. We have characterized a fast microchannel plate imaging detector and imaging plate with respect to dynamic granularity on the 6.151 keV crystal imaging system at the Z-Beamlet laser.

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