GAGG:Ce scintillator screens for high-speed radiography

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High-speed X-ray radiography of detonation events requires scintillators with both high light yield and rapid decay for adequate temporal resolution. Gadolinium aluminum gallium garnet (GAGG) doped with cerium ($Gd_3Al_2Ga_3O_{12}$:Ce) is an ideal candidate offering a high light yield of 50-55,000 photons/MeV and ~50 ns decay time. To leverage these properties, we developed and fabricated relatively thin GAGG scintillator screens from powder material, optimized for high light output. These screens, deposited onto reflective substrates, were integrated into an imaging system comprising a high-speed camera and a high-flux X-ray source. This system has successfully achieved imaging speeds of up to 2 million frames per second (fps) with integration times as brief as 200 ns, significantly enhancing the contrast in the radiography of detonation events beyond prior capabilities.

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