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# Reduced Afterglow CsI:Tl,Sm for High Energy Imaging

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CsI activated with thallium is one of the most important scintillators in the radiation detection field. Long a standard for medical diagnostics, it has also become particularly attractive for radiographic scanning and active interrogation of cargo in transit via trucks or rail. CsI:Tl has one of the highest conversion efficiencies (60,000 photons/MeV) of all scintillators in current use, which along with its high density and effective atomic number, excellent light transport properties, broad commercial availability, and low cost, make it the detector of choice for a wide variety of applications. It does have one drawback, however, in its relatively long-lived afterglow, which restricts its use in high count-rate applications, causing reconstruction artifacts in CT, and reduced contrast and image blurring in high speed radiographic scanning and imaging.
Addressing this issue, we report here on our development of an approach to reduce this limiting afterglow by a factor of ˜50 without significantly degrading its other scintillation properties. This approach, which involves codoping of the material with small amounts of Sm2+ or Eu2+, has been demonstrated to be effective even at energies as high as the 7 MeV level relevant for use in typical cargo inspection systems. The improved CsI:Tl scintillator is a straightforward replacement to the standard material, increasing contrast and steel penetration while allowing dual-energy performance, thus enabling reduced scan times and increased speeds for the same performance level. This in turn leads to greater throughput efficiency at ports and borders, where imaging systems often create choke points in the workflow, as well as more efficient detection of contraband such as explosives, drugs, weapons, and special nuclear materials.
We have also produced CsI:Tl,Sm in the form of microcolumnar films, where it exhibits the same reduction in afterglow as it does in the single crystal form. We currently have the capability to produce such films up to 800 microns thick and up to 45 x 45 cm2 in area, and expect yet further development in the future. This provides a combination of high-resolution, high-frame-rate, and large-area capabilities not hitherto available for imaging applications.

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## Has accepted

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