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Radiation imagers for quantitative, single-particle digital autoradiography of alpha-and beta-particle emitters for targeted radionuclide therapy

Over the last several years new quantitative digital autoradiography imaging tools have been developed that are sensitive to both alpha- and beta-particle emitters. These include scintillation-, gaseous-, and semiconductor-based radiation-detection technologies that localize the emission location of charged particles on an event-by-event basis at resolutions up to 20 μm FWHM. These imaging systems allow radionuclide activity concentrations to be quantified to unprecedented levels (mBq/μg) and provide simultaneous, real-time imaging capabilities of both high- and low-activity samples without dynamic range limitations that plague traditional autoradiography. Additionally, large-area imagers are available (>20 × 20 cm2) to accommodate high-throughput imaging studies. This presentation reviews the various detector technologies and their associated performance trade-offs to provide targeted alpha therapy researchers with an overview of the current technologies available for selecting an optimal detector configuration to meet imaging requirement needs.

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