NANOPHOTONIC PEROVSKITE SCINTILLATOR FOR TIME-OF-FLIGHT GAMMA-RAY DETECTION

Positron emission tomography (PET) scanners map the metabolic or biochemical function of tissues by detecting the gamma radiation released by the decay of radioactive tracers ingested by a patient. This technology is particularly useful for mapping tumors because one can devise tracers which tumor cells uptake preferentially. Current gamma radiation detectors are expensive and inefficient, requiring large integration times and radionuclide doses for meaningful image quality. Additionally, the spatial resolution of the resulting map is limited by detector latency, which for traditional technology is 200-500 picoseconds.

To address these problems, researchers at UC Berkeley have developed a novel gamma radiation detector with much greater time resolution (potentially down to 10 picoseconds), and higher efficiency (nearly all gamma rays successfully detected). Additionally, these detectors use well-established nanotechnology manufacturing methods and can be produced an order of magnitude more cheaply than existing detectors. The high efficiency of these detectors allows amounts of radioactive tracer used to be decreased by an order of magnitude and spatial resolution to be increased by an order of magnitude when compared to traditional methods.

SUGGESTED USES

Production of PET scanner detectors.

ADVANTAGES

These devices are an order of magnitude cheaper to produce compared to current PET detectors. Additionally, their high efficiency allows for a multifold reduction of expensive tracer radionuclides, substantially reducing the patient’s exposure to potentially harmful radiation. This in turn opens up PET scanning to elderly or otherwise vulnerable patients who otherwise would be endangered by a high radiation dose.