

EXECUTIVE SUMMARY:

Mammography is a well-known x-ray technique for early detection of breast cancer. It is a highly effective screening tool, but it is not perfect, and other medical imaging modalities are useful either as a supplement to mammography or for tasks such as characterizing known cancers, for which mammography is less effective. Radiotracer imaging, or nuclear medicine imaging, is used in the clinic for breast cancer diagnosis and characterization. Special-purpose equipment is being to image breast cancer using minute amounts of radioactively labeled chemicals. These chemicals bind to cancer cells, and the radiation they emit shows up on the resulting image.

The radiation dose to the patient is small, but still, the radiation emerging from the patient should be used efficiently, to get the best possible clinical image for the radiation used. Efficiency can be increased by using several gamma-ray cameras, to detect photons that would have gone to waste. Surrounding the breast with cameras presents a practical limit, unless there is a way to place a camera behind the other cameras and image between them. For one type of camera, called a pinhole camera, this can be done, given the camera's pyramid shape.

This project will develop the computer software to analyze such two-layer camera arrays for breast cancer imaging, and will build a prototype camera to begin testing these results. California, the nation, and the world would share in the benefits of a more effective tool against breast cancer. Manufacturing devices like this in California is quite plausible, and would contribute to local and state economies.