

New X-Ray Imaging System for Breast Tomosynthesis

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Breast cancer is the leading cause of new cancer cases for women in the United States in 2009, and the current lifetime incidence rate of breast cancer is 1 in 8. Since 1991, however, there has been a 23% decrease in breast cancer mortality rates due to better treatments, increased awareness and early detection. Early detection of disease has been made possible by improved breast cancer imaging, and this in turn, positively influences patient survival. At this time, mammography remains the gold standard for breast cancer imaging although the false-negative rate is nearly 15%.

Dr. Zhou's team has employed tomosynthesis to perform *in vivo* imaging of breast cancer; this technique is characterized with less radiation exposure of the patient and involves significantly shorter procedure time. The main innovative feature of this technique is a multi-beam field emission X-ray (MBFEX) source which can generate X-ray beams from multiple projection angles without mechanical motion or electromagnetic steering. The X-ray radiation produced in the device can have programmable waveform with high temporal and spatial resolution. The system is composed of a 25-pixel X-ray source array, a flat panel detector for full-field mammography, a control unit for X-ray sources, and a computer work station. It could acquire of 25 projection images in 11 seconds at 0.2-mm resolution. By contrast, the Siemens system at the same dose requires 20 seconds to take 25 images with 0.3-mm focal spot size. The imaging system with the MBFEX source and an area digital detector can increase the imaging speed, reduce the size and cost of the equipment and enable experimentations on new imaging configurations which can give better imaging quality but are not feasible with the convention step-and-shoot method. Digital tomosynthesis is an innovative technique merging digital image capture with conventional radiographic tomography.

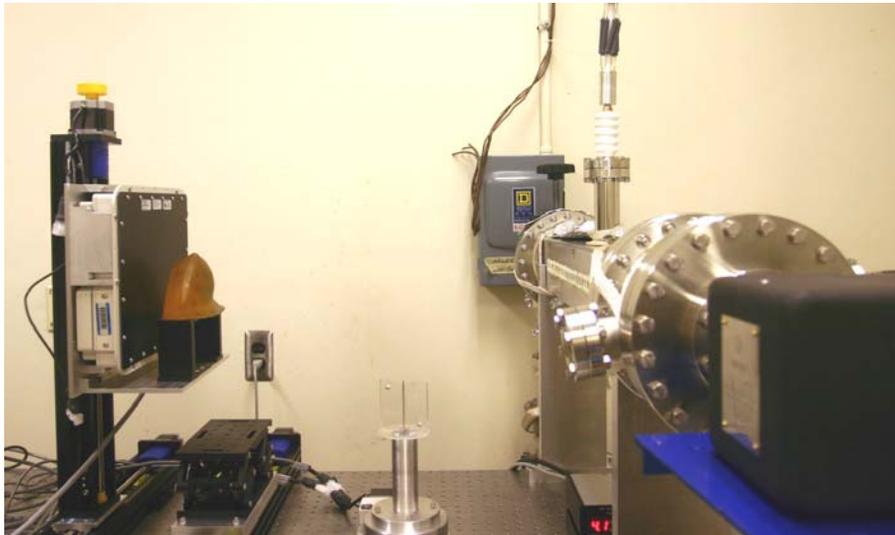


Figure. The x-ray source array, breast phantom, and detector – parts of new tomosynthesis system.