

(Above) A conventional mammogram scan. (Right) These images were taken using the DEI method developed by the scientists from Brookhaven National Laboratory.

Breast Cancer

Introduction

The American Cancer Society estimates that in the United States in 2001, over 233,000 women will be diagnosed with breast cancer and approximately 40,000 will die from this disease. In the United States, breast cancer accounts for 29% of all cancers in women. One woman out of eight will develop breast cancer sometime during her life. Although earlier detection results in higher cure rates, breast cancer remains the leading cause of cancer death of adult women under 54 years of age and the second most common cause after age 54.

How is breast cancer diagnosed?

The key to cure is early detection and prompt treatment. Physical examination, mammography, and breast self-examination comprise an early detection approach. The ultimate diagnosis of breast cancer can only be made by pathological examination of breast tissue.

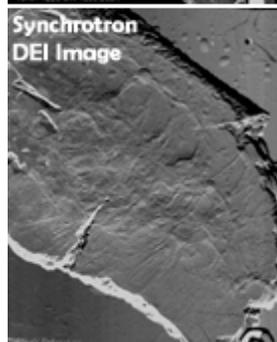
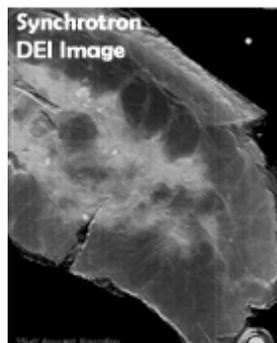
What is BNL doing for breast cancer diagnosed?

In conventional mammograms, differences in tissue densities and composition show up as contrasting areas due to X-ray absorption, allowing doctors to see tumors or changes in tissue. The problem is that differences between healthy and cancerous tissues are very small and scattering of X-rays can lead to blurring and even lower contrast, making it difficult to detect small tumors. Researchers at BNL have developed a new mammography technique called diffraction-enhanced imaging (DEI) which uses ultra-brilliant x-rays and provides a dramatic contrast between normal tissues and tumors. Recent DEI results showed up to 25 times

better contrast than a normal x-ray image.

How is synchrotron light used?

The DEI method uses a single-energy (monochromatic) fan beam of X-rays instead of the broad-energy beam used in conventional imaging. The object is scanned through the beam. The key to the new imaging method is an analyzer crystal placed between the object and the X-ray detector. The analyzer can differentiate between X-rays that are traveling much less than one ten thousandth of a degree apart. This method of line scan imaging reduces scatter and helps us visualize low-contrast areas that otherwise would be lost.



How will this help the future of breast cancer diagnoses?

This technology offers great hope for early detection of breast cancer and therefore allows for higher survival

percentages for women with breast cancer. The researchers say their DEI method could be used in experimental clinical trials within five years and possibly in routine mammography in 10 years. In addition to mammography, potential applications of DEI include other low contrast tissues and organs such as kidneys, and in non-destructive testing of materials.

For more information, you can contact:

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Fast Facts

- Breast cancer is the most commonly diagnosed cancer among women in the United States and worldwide (excluding skin cancer).
- In 2001, it is estimated that 233,000 new cases of breast cancer will be diagnosed among women in the United States.
- Breast cancer is the second leading cause of cancer death for women in the U.S.; approximately 40,000 women in the U.S. die from the disease each year.
- Breast cancer is the leading cause of cancer death for U.S. women between the ages of 20 and 59.
- 92% of breast cancers can be cured with early detection and prompt treatment
- The current methods of treatment in use in the United States are: surgery, radiation, chemotherapy, hormone therapy, and monoclonal antibody therapy.