

Diagnostics Features of Malignancy in Breast Tissue SAXS Patterns

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Small Angle X-ray Scattering (SAXS) patterns of breast tissue have been examined by the research community as a diagnostic of cancer for over a decade. In that time the relationship between the structure of collagen and the features present in the scattering pattern has been of considerable interest. These features include parameters such as the peak position, amorphous scatter content and the spectral characteristics of the scattering peaks. The spectral features of breast tissue SAXS patterns, in particular, hold great promise as a diagnostic tool. Features extracted using the wavelet transform allows the examination of the tissue structure over multiple length scales. Key features can then be identified that allow the discrimination of tissue type with all irrelevant information being filtered out. Analysis of a large data set of breast tissue SAXS patterns collected over 8 years of imaging at station 2.1 of the Daresbury Synchrotron Radiation Source demonstrates that accurate detection of malignancy can be achieved using breast tissue collagen SAXS patterns based upon the spectral features within the pattern. The classification models produced have provided understanding of important features in breast tissue SAXS patterns that are characteristic of malignancy and suggest new research directions in the field of coherent scatter imaging.

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