Abstracts

Microwave Thermoelastic Tissue Imaging--System Design

J.C. Lin and K.H. Chan. "Microwave Thermoelastic Tissue Imaging--System Design." 1984 Transactions on Microwave Theory and Techniques 32.8 (Aug. 1984 [T-MTT] (Special Issue on Electromagnetic-Wave Interactions with Biological Systems)): 854-860.

A microwave-induced thermoplastic tissue imaging system is proposed as a new and promising imaging modality. It possesses unique features that permit noninvasive imaging of tissue characteristics which are not identifiable by other techniques. It uses nonionizing radiation and relies on a beam of impinging microwave energy to launch an acoustic wavefront into tissue. This thermoplastic wave of pressure propagates through the tissue and is detected by a two-dimensional array of piezoelectric transducers positioned on the body surface to give an image of the intervening tissue structure. Signals from the output of this transducer array are amplified and band-limited. A computer-controlled data acquisition system samples and converts them to digital form for further processing. A hybrid parallel/serial design for dividing the array into segments and collecting data from each segment sequentially is used. The area image sensor offers inherent geometric stability essential for reliable measurement. Error in scan position is not a concern, since mechanical scanning is not involved. The gray level resolution is 256 after digitization, and the spatial resolution is 5 X 5 mm. These resolutions, along with a calculated signal-to-noise ratio greater than 2500, are sufficient to provide structural information needed to render microwave-induced thermoelastic imaging a useful, noninvasive method for imaging biological tissues.

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