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# Backscattering spectroscopy as an approach to medical ultrasonic diagnosis.

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Historically, the early development of pulse echo diagnosis entailed an application to tissue systems of the analagous technique that had been successfully used in non-destructive testing. One of the early differences to be found between the two uses of the technique was that, whereas a flaw in a casting acted as a non-specular reflector, returning echoes to the transducer irrespective of its orientation, tissue interfaces acted as specular reflectors, only returning echoes to the transducer if they lay within a few degrees of being normal to the pulse propagation direction.

As a result of this situation the main aims of subsequent development have been to improve the efficiency of collection and display of echoes specularly reflected from interfaces; for example by using compound sector scanning. However the most that can be expected from this approach is an accurate map of the interfaces within the tissues being investigated.

It is an accepted fact that present diagnostic scans display some diffuse background echoes between tissue interfaces, presumably coming from the body of the tissue, and some effort has been devoted to minimizing this part of the returned signal. That this diffuse background is specular reflexion from a series of interfaces is inconceivable because there are no such major interfaces in the body of a liver for example, where the phenomenon is frequently seen.

It is possible to produce non-specular reflexion when the size of the object under interrogation is comparable with or smaller than the interrogating wavelength, when omnidirectional scattering takes place. Thus it is suggested that the mechanism of production of these diffuse echoes is in fact a scattering process.

The present paper comprises a progress report on a project aimed at:

1) measuring the volume scattering of tissue samples, employing a spectroscopic approach

2) ascertaining the contribution of scattering to the total attenuation coefficient for ultrasound in tissue.

3) comparing the results of 1) to similar results from known tissue models, with a view to defining the macroscopic acoustical structure of the tissue for possible relation to pathological condition, and use in diagnosis.