After the removal of wild points, individual determinations have a deviation of less than 15 ms from their median value. Identification of the causes of wild points allow further improvements in examination technique.

The system is used predominantly on the liver and results to date have yielded a normal range of 1568-1588 ms^{-1} (average 1580 ms^{-1}), alcoholic cirrhotics 1520-1530 (average 1524), alcoholic fatty change 1540-1555, and fatty infiltration 1530-1535. Hepatitis and metastic liver give values in the range of 1575-1600. Clinical trials are proceeding.

[1] Robinson, D.E., Chen, C.F. and Wilson, L., Ultrasound Med. Biol. 8, 413-420 (1982).

SUPERRESOLUTION ULTRASONIC IMAGING USING OBJECT-DEPENDENT ADAPTIVE FOCUSING, Takayoshi Yokota and Takuso Sato, The Graduate School at Nagatsuta, Tokyo Institute of Technology, Yokohama-shi, 227 Japan.

A new superresolution ultrasonic imaging method is proposed. In this method, a set of reflected wave field data from an object is first acquired by repeating transmission and reception for all possible combinations of pairs of transducers on the array. From these data, the object-dependent adaptive focusing is performed so that only the desired point on the object is illuminated at a constant level. The fields on the remaining regions on the object are suppressed by adaptively distributing the nulls of the illuminating beam over them.

Image reconstruction is performed by scanning these adaptive focusing beams over the object region and collecting the reflected wave field. The beam-scanning operations are carried out automatically in a computer by manipulating only the acquired data set. The resolution of this method is much better than that of 2-D MEM which uses an active incoherent technique [1] for objects with fairly localized dominant reflecting regions.

The effectiveness of this method is demonstrated by several numerical examples and experimental results.

[1] Yokota, Takayoshi and Sato, Takuso, in Acoustical Imaging, Vol. 12, E.A. Ash, pp. 621-634 (Plenum Press, New York, 1982).

REFLECTION-TYPE IMAGING OF TWO NEW PARAMETERS OF NONLINEAR INTERACTION, Nobuyuki Ichida[1], Takuso Sato[1], Hirohide Miwa[2] and Yutaka Igarashi[2], [1]The Graduate School at Nagatsuta, Tokyo Institute of Technology, Yokohama-shi, 227, and [2]Medical Engineering Lab, Fujitsu Laboratories, Kawasaki-shi, 211 Japan.

In this paper, a new reflection-type system for imaging the nonlinear parameters r_1, r_2 is described. These parameters are defined as 2nd and 3rd reflection coefficients with respect to the sound pressure P as follows: $r = r_0 + r_1 \cdot P + r_2 \cdot P$. Hence they give information about the dependence of the characteristic impedance on the sound pressure or the change of the scattering cross section with sound pressure.

To obtain images of these parameters, an impulsive relatively high power (10mW/cm^2) pumping wave is applied from the same direction as a low intensity probing wave of high frequency so that the amplitude of echo signal of the probing wave is modulated by the product of r_1 and P pump, or r_2 and P^2 pump at the reflecting point. The spatially-modulated echo signals are detected and demodulated to derive the distribution of r_1, r_2. Images of these parameters for several typical objects are obtained. These experimental results show the usefulness of this method as a new means of ultrasonic tissue characterization.