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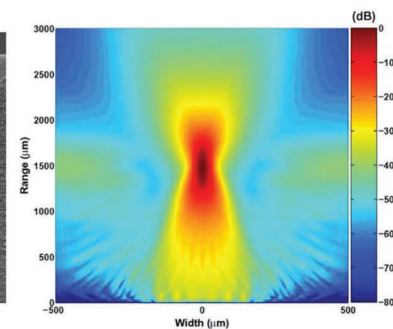
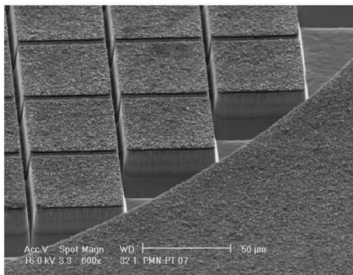
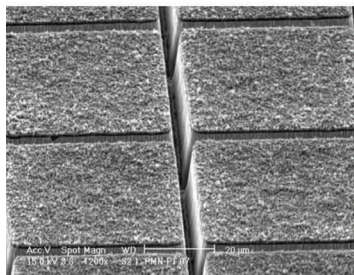
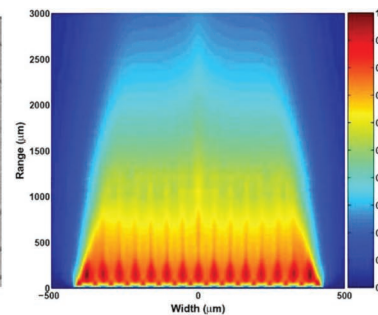
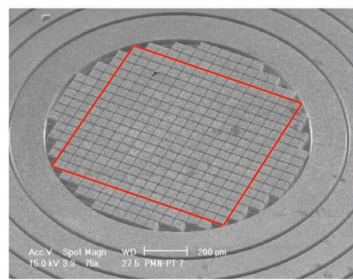
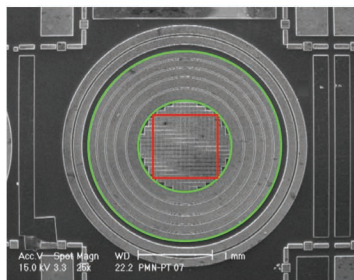
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The front cover illustrates the development of a high-frequency (~90 MHz), broadband ultrasound microsystem designed to image cellular structure/tissue along the gastrointestinal (GI) tract. PMN-PT single crystal is used as the piezoelectric material for the transducer. The system is bistatic and includes of parabolic transmitter divided into 5 annular rings and a 16 x 16 element ultrasound receiver array. Data are acquired with a read-out integrated circuit. The nominal sampled volume extends below the GI tract surface to depths in the range of 2 to 4 mm, depending on the proximity of the sensor to the GI wall.

MEMS processing is used to pattern the transducer. At left are four views of the PMN-PT transducer obtained with a scanning electron microscope. This material was dry-etched using an inductively coupled plasma/reactive ion etching system with a Cl<sub>2</sub>/Ar based chemistry. The upper-left frame shows the complete transducer consisting of two outer rings for built-in tests, five inner rings which are used for the transmitter, and square array elements that reside within the innermost ring. Green circles surround the transmitter, and a red square designates the region of active array elements. Inert elements are used to fill out the circular area to ensure that each active element has a similar electrical and acoustic environment. Close up views of the system are shown in the other three frames. The outer diameter of the transmitter rings is 2.6 mm, and the active inner array is 880 μm x 880 μm in size. Each array element is 50 μm x 50 μm in size, and the kerf width between the elements is 5 μm. The PMN-PT thickness is 19 μm for both the transmitter and receiver. In the upper-right panel is a simulation of the near field receiver array (linear scale), and in the bottom-right panel is a simulation of the effective beam at 1.5 mm vertical range above the center of the array (logarithmic scale).

Images courtesy of Frank T. Djuth, Medical Division, Geospace Research, Inc., El Segundo, CA. The contributors are F. T. Diuth and C. G. Liu of Geospace Research Inc., and Q. F. Zhou, D. Wu, and K. K. Shung with the NIH Transducer Resource Center and Department of Biomedical Engineering, University of Southern California.