

Medical Ultrasound Transducers: Piezoelectrics at Work

L. S. Smith

Imaging & Bioelectronics Labs, GE Global Research
One Research Circle, Niskayuna, NY 12309

smithls@ge.com

Ultrasound is the most widely used medical imaging modality worldwide because it is safe, fast, portable, and inexpensive. The global market is currently over \$5 billion annually and continues to grow faster than GDP. Imagers can be divided into three main parts, the transducer probe, an electronic processing unit, and the display. Piezoelectrics are the key component of the probe where they generate and detect ultrasonic waves. The rest of the imager is electronics controlled by software. With the dramatic miniaturization of electronics over the last half century the rest of the imager has become largely a computer and software. Hence, advances in piezoelectric materials and designs that fully exploit piezoelectric properties have been, and in the future are expected to be, essential for progress.

This overview presentation will describe the main requirements for various medical diagnoses: penetration, resolution, contrast, frame rate, and field of view, and will show how these change for different medical exams. For example, transducers for a cardiac stress test, a 2nd trimester fetal exam, and a peripheral vascular exam will all have different shapes and sizes. An exploration of the physics behind these requirements will enable a better understanding of the various structures. Transducer design tools, materials, and fabrication will be briefly described. Throughout the focus will be on the role of piezoelectric properties and how they impact clinical practice. After approximately half a century of dominance by PZT piezoceramic materials, single crystal materials, both the binaries and ternaries, are starting to find their way into medical products. are beginning to show membrane based transducers operating either piezoelectrically or electrostatically. A wide range of ultrasound images and videos will illustrate the rich variety of the technology, some extensions to non-imaging applications like drug delivery and therapy, and suggest some of the opportunities for further progress.

This sample abstract illustrates the format for preparing abstracts for the 2017 ISAF/IWATMD/PFM. The abstract should succinctly describe the results reported, as this is the only written record prepared for this meeting. You may, however, distribute any preprints or reprints you wish to other participants at the time of the meeting; in the past, many participants found this to be a valuable way to disseminate their research results.

Authors must prepare their abstract for direct reproduction in the abstract book; the abstract text will appear precisely as the author prepared it. Abstracts (one page limit) should be single-spaced with type no smaller than 10 point. The title-authors-text material should fit into a 6.0-inch-wide by 7.5-inch-high rectangle, and be formatted as follows. The title of the abstract should be in a type size 2 points larger than the authors-text material, bold type, upper and lower case, and centered on a line by itself. Leave one blank line under the title and on the next line, type the authors' names, centered, underlining the presenting author. Centered on the next line(s), type the affiliation(s) and address(s); superscripts may be used to designate different addresses and affiliations of authors. The email address of the corresponding author should be included as the last line in this list. Leave one blank line and then begin the body of the abstract on the next line. Any references or support acknowledgments must be included within the text of the abstract. Line drawings may be included within the text, but gray scale images do not reproduce well.

Exhibitors do not need to submit an abstract.

Please select an Exhibit when you register for the conference.