

**An Ultrasonic C-Scan Imaging System:
Development of Test Targets and a Protocol for System Characterization**

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Abstract

The Ultrasound Imaging Lab at the Chester F. Carlson Center for Imaging Science has been involved in the characterization of three different generations of ultrasound-based C-scanning systems. A set of quantitative standards for calibration is currently being developed.

Although appropriate test targets have been developed for B-scan ultrasound imagers, very little attention has been paid to C-scanners. In order to successfully characterize these systems a quantitative measure must be performed. The Modulation Transfer Function (MTF) is one of the most commonly used quality metrics of any Linear Shift Invariant imaging system, though a test target must first be developed.

A direct measurement of the MTF normally requires sinusoidal test patterns of various spatial frequencies. In the case of ultrasound this implies that patterns should have an acoustic impedance mismatch that varies in a sinusoidal fashion. This is very difficult, if not impossible, to achieve. An alternative method is to use a straightedge pattern. This project describes the theory to calculate the MTF from the system response to an edge input. Polyethylene terephthalate (PET) film phantoms were created in collaboration with the Microelectronics Department. A suitable pattern was laser etched into the film and images were acquired using the scanners.

A computer routine was written in IDL to extract MTF information from the imaged resolution targets. This same program was also used to compare MTFs calculated from different test targets presented at different angles and using the different generation scanners. This resolution information was then compared to MTF data calculated from a stand-alone transducer, identical to those used within the systems, imaging the edge of a glass plate immersed in oil.

About the Presenter

David Fetzer is an undergraduate in Imaging Science from San Antonio, Texas. He is a recipient of several honors and awards including the Imaging Science and Technology Outstanding Undergraduate Scholarship award and the Doolittle-Merrill Premedical Studies scholarship.

David is a member of the College of Science Student Advisory Board, Golden Key International Honour Society and the student chapter of the Society for Imaging Science and Technology. He is a singer in the RIT Choir and RIT Brick City Singers. He has held several positions on campus though is currently an ultrasound imaging researcher at the Chester F. Carlson Center for Imaging Science. David will be attending medical school at the University of Texas at Houston this fall in hopes of studying radiology to extend his knowledge in medical imaging.