



TEXAS A&M UNIVERSITY

J. Mike Walker '66 Department of
Mechanical Engineering

Thursday, August 15, 2024 | 2:00-3:30 PM *(Refreshments to Follow)*

Room: MEOB 301 | Co-hosts: Drs. Pablo Tarazaga and TJ Ulrich

Zoom Link: <https://tamu.zoom.us/j/99930232139>

Frontiers of Ultrasonic Phased Array for Accurate Crack Imaging

Abstract

Cracks are one of the severe defects that can drastically decrease the material strength of structures and mechanical components. Ultrasonic testing is the most widely used technique for nondestructive detection and sizing of cracks. However, ultrasonic testing faces challenges with crack closure and 3D visualization. Crack closure can lead to the underestimation of crack depth, as ultrasound waves can transmit through the crack. To address this issue, we have developed closed-crack imaging methods using a nonlinear ultrasonic phased array. This technique has successfully measured closed-crack depth in various metallic specimens.

Currently, the nonlinear ultrasonic phased array is limited to 2D imaging due to the use of a 1D array transducer, while real-world defects often have complex 3D geometries. The primary limitation has been the insufficient number of elements for an array transducer. To overcome this challenge, we are developing two types of ultrasonic 3D imaging systems. The first is a Piezoelectric and Laser Ultrasonic System (PLUS) for flexible 3D imaging. The second is a real-time 3D phased array system using a piezoelectric 1024-element 2D matrix array transducer developed for nondestructive evaluation (NDE) applications. This seminar will introduce the nonlinear ultrasonic phased array and two types of 3D imaging methods for accurate crack imaging.



Dr. Yoshikazu Ohara, Ph.D.

Professor, Tohoku University, Japan

Dr. Yoshikazu Ohara received his Ph.D. from Tohoku University, Japan in 2007. Following a one-year post-doctoral fellowship, he was promoted to Assistant Professor in the Department of Materials Processing in 2008, Associate Professor in 2017, and Full Professor in 2023. He is an honorary full member of Academia NDT International and was recently appointed as a co-opted council member, the first Japanese to hold this position. Dr. Ohara specializes in ultrasonic nondestructive evaluation, such as nonlinear ultrasonics, ultrasonic phased array, laser measurement, etc. He has been actively engaged in various international collaborations, particularly with the Los Alamos National Laboratory.