# ASNT Research Symposium Abstract

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**Towards an in-process narrow-gap weld inspection method using ultrasonic phased arrays.**

Traditional weld inspection procedures dictate that Non-Destructive Evaluation (NDE) should be performed as a post-manufacturing test. Nevertheless, recent research has shown that defects can be detected as they form by combining the welding and NDE processes at the point of manufacture. This ‘in-process’ inspection method will provide clear benefits in terms of schedule certainty, reduced rework and improved process efficiency. However, research has thus far been limited to common weld prep geometries, such as V and double-V grooves. As such, the application of an in-process welding and inspection process for narrow-groove welds is an area yet to be considered. Narrow-groove welds are notoriously difficult to inspect using traditional Phased Array Ultrasonic Testing (PAUT) techniques due to large thicknesses and the vertical nature of Lack-of-Sidewall Fusion (LOSWF) defects. This is further complicated by the presence of partially-filled weld geometries during in-process inspection, which can cause geometric reflections which mask or falsely indicate the presence of a potential weld flaw. A solution to this is proposed in this work by adapting a dual-tandem phased array imaging system for the imaging of LOSWF defects in a partial weld geometry. This proposes a two array system utilising a phased array probe on each weld side, coupled with a dual-aperture Full Matrix Capture (FMC) acquisition technique. Advanced multi-mode image processing algorithms such as the Total Focusing Method (TFM) and Phase Coherence Imaging (PCI), with adaptive delay law calculation, have shown high sensitivity to LOSWF defects in a partial weld geometry. These results have demonstrated the potential of a tandem phased array approach to image LOSWF defects during the in-process inspection of narrow-gap welds.