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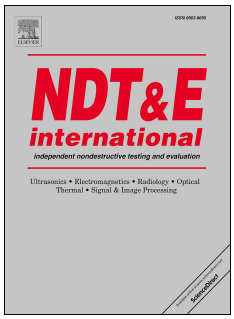

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PII: S0963-8695(18)30445-6

DOI: 10.1016/j.ndteint.2018.09.007

Reference: JNDT 2025

To appear in: *NDT and E International*

Received Date: 6 August 2018

Revised Date: 14 September 2018

Accepted Date: 17 September 2018

Please cite this article as: Huajun Liu, Menglong Liu, Lei Zhang, Yi Fan Chen, Chin Yaw Tan, Shifeng Guo, Fangsen Cui, Directed Acoustic Shearography for Crack Detection around Fastener Holes in Aluminum Plates, *NDT & E International* (2018), doi: 10.1016/j.ndteint.2018.09.007

Directed Acoustic Shearography for Crack Detection around Fastener Holes in Aluminum Plates

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Abstract

The detection of fatigue cracks around fastener holes in riveted structures is important to ensure the safety of the structures and to prevent major structural failure. However, due to the complex structure around the fastener holes, the existing non-destructive methods are not effective to address this challenge. Here, we demonstrate a directed acoustic shearography system using a ring-shaped phased array transducer for crack imaging around fastener holes in thick aluminum plates. Supported by numerical simulations, a 16-element ring-shaped phased array transducer was designed, fabricated and tested. The 16-element phased array transducer was excited by an in-house developed phased array drive circuit to control the directions of acoustic waves. Directed acoustic shearography testing with the ring-shaped phased array transducer showed that by controlling the direction of acoustic waves, the imaging contrast of the defects could be significantly improved. Directed acoustic shearography was able to detect subsurface crack which was not detectable by conventional

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