

**GUIDED WAVE BEAM STEERING FOR IMAGING APPLICATIONS USING PARTIAL  
CIRCUMFERENTIAL ARRAY IN PIPES**

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**ABSTRACT**

*Guided wave testing (GWT) is one of the more recent non-destructive testing methods for inspecting tubular structures. It is usually applied through an attached fully circumferential ring of transducers, allowing long range inspection from a single device position using elastic waves guided by the object's boundaries. EDF Energy, the industrial partner of this project, have an interest in deploying GWT technology for relatively short range inspections to detect and characterise specific candidate defects (i.e. cracks) in pipes and other tubular structures where access for placing the ring of transducers is incomplete, such as there is an access to only part of the circumference. The project aims to investigate the capability of defect detection, location and sizing in steel tubular structures using GWT for transduction across a wide range of different circumferential access values, as well as to assess the relationship between the number of transducer rings in the axial direction and damage detection capabilities. A range of imaging techniques will be deployed to improve accurate defect location, characterisation and sizing in limited access problems.*

*Recent work has investigated the potential for using shear horizontal SH0 plane waves sent at different angles for guided wave phased array imaging. Sending plane waves at different angles allows inspection of almost the entire area of the pipe from a single partial array placement. These plane waves travel through different helical paths and hence arrive at potential defect sites at a range of different angles which is advantageous for imaging applications. Wider range of illumination angles allows more accurate reconstruction of the inspected area and reduces the occurrence of imaging artefacts.*

Keywords: guided waves, imaging, SH0 waves

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