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Excitation of Single Mode Lamb Waves at High Frequency Thickness Products

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Guided wave inspection is used extensively in petrochemical plants to check for defects such as corrosion. Long range, low frequency inspection can be used to detect relatively large defects, while higher frequency inspection provides improved sensitivity to small defects, but the presence of multiple dispersive modes makes it difficult to implement. This paper investigates the possibility of exciting a single mode Lamb wave with low dispersion at a frequency-thickness of around 20MHz-mm. It is shown by finite element analysis backed up by experiments that a signal dominated by the A1 mode can be generated, even in a region where many modes have similar phase velocities. The A1 mode has relatively little motion at the plate surface which means that only a small reflection is generated at features such as T-joints; this is verified numerically. It is also expected that it will be relatively unaffected by surface roughness or attenuative coatings. These features are very similar to those of the higher order mode cluster (HOMC) reported by other authors, and it is shown that the A1 mode shape is very similar to the deflected shape reported in HOMC.