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Applications of Near-field Acoustic Holography on Small Apertures

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Small, finite measurement apertures are a major impediment for accurate and fast application of near-field acoustic holography (NAH). In theory, FFT-based NAH methods are very powerful and acquire extremely fast inverse calculations of the sound field. However, in practice the usually small amount of sensors in a measurement array limit the possibilities of classical implementations of NAH, especially near the edges of the array or measurement grid. An alternative method to, for example, spatial windowing, patch NAH, SONAH, etc. is the recently introduced border-padding technique. This method makes it possible to apply FFT-based NAH with a large increase of accuracy compared to the original methods, specifically at the measurement grid edges, while maintaining the high speed of the inverse process PNAH is known for. This work focuses on the application of border-padding and the practical implementation in a newly developed PNAH system. It illustrates a large variety of extended possibilities for PNAH that border-padding enables. Apart from the earlier introduced standard border-padding, experimental results are shown for a highly improved border-padding method. Measurements and calculations on industrial products illustrate the wide applicability of the presented method.