

# **Adaptive Total Focusing Method for Samples with Complex Surface**

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In This paper, we proposed an adaptive Total Focusing Method, which can improve the accuracy of automated ultrasonic array testing for complex structures with large curvature. First, reconstruct the geometrical contour of the interface between the coupling medium and the sample automatically according to the direct TFM image. Second, using the Fermat's principle, calculate the propagation path of the sound line from the transducer through the reconstructed surface to the focus point. Finally, calculate the TFM imaging of the sample with complex structure in the case of two layers. For the problems in the current research, such as surface reconstruction results are not accurate, and the amount of data that needs to be calculated is too large, we proposed a surface reconstruction method based on the connected region weighting and recognition, which can reduce the influence of imaging artifacts in the TFM image, and identify complex surfaces effectively; we optimized the array aperture for imaging and interpolated the intermediate data to improve detection efficiency and guarantee imaging accuracy at the same time. Research shows that with the adaptive Total Focusing Method, we can complete the TFM imaging inside the complex structural samples in a short time, and identify the minor embedded defects. As well as the results have a high detection accuracy.