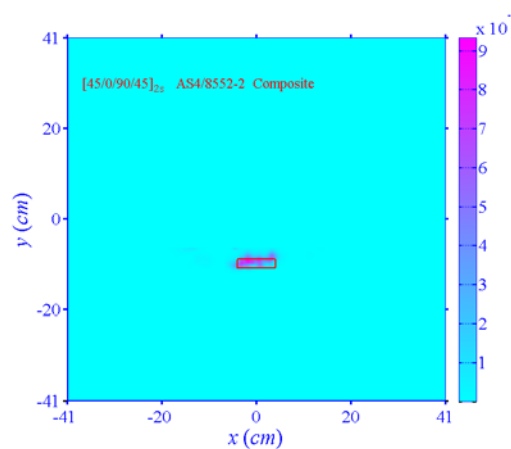


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### Damage Detection in Composite Structures Using Time-Reversal Migration Technique

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The use of composites in aircraft manufacturing is growing dramatically. Ultrasonic guided waves (UGW) can propagate a long distance, and thus have been used in structural health monitoring (SHM) for large area composite structures like wings and fuselages. UGW can detect not only the damages on the surface of the structures, but also the flaws inside the structures. In this paper, a time-reversal migration (TRM) technique, which originates from the geophysical migration technique, is used to reconstruct the image of damage in composites. The TRM technique uses a linear-array transducer. Each time, one element is used as actuator and the rest of elements in the linear-array transducer are used as receiver. With the TRM scheme, a damage (or the secondary sources) in the composite specimen can be reconstructed. By sequentially switching the element in the linear-array transducer as the actuator, a set of images of the same damage in the composite are reconstructed. Through stacking all images together, a final image of the damage with higher accuracy and lower noise than each individual image is obtained. Figure 1 shows the stacked image from the time-reversal migration images of nine actuators. Experiment results confirm the promising of the TRM technique for damage detection in composite structures.



**Figure 1.** Stacked image of the simulated rectangular damage

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