

(216)

## Non-destructive Testing of 3D-Hybrid Components Using Air-coupled Ultrasound

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The increasing use of hybrid lightweight structures in the automotive industry brings new challenges in the area of multi-material boundaries. Insufficient bonding quality between two kinds of materials, especially in highly loaded structures, affects the component's performance. Hence, it is very important to monitor the bonding quality in multi-material structures. Flat specimen, consisting of sheet steel and organic sheet layers were examined using air-coupled ultrasound transducers in reflection setup. By slanted incidence of the ultrasound on the profile's surface, guided waves were excited in the specimen and delaminated areas could be visualized due to changed phase values in the received signal.

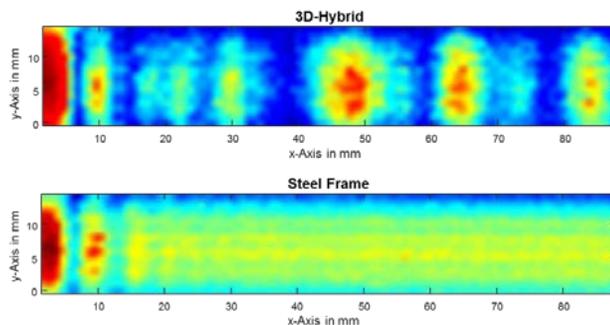
Furthermore, a 3D-Hybrid cap profile consisting of sheet steel, organic sheet layers and injection molded reinforcing ribs was examined using a special transducer setup. Results show that distinctions in the received signal could be made between bonded and delaminated organic sheets as well as intact and broken ribs behind the organic sheet layer. Several frequencies from 200 kHz up to 500 kHz were then used and compared with this new setup. Simulations of the guided waves propagation support the findings.

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**Figure 1.** Image of Hybrid Structure



**Figure 2.** C-Scan Image of cap profile with (top) and without ribs (bottom).

### References:

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