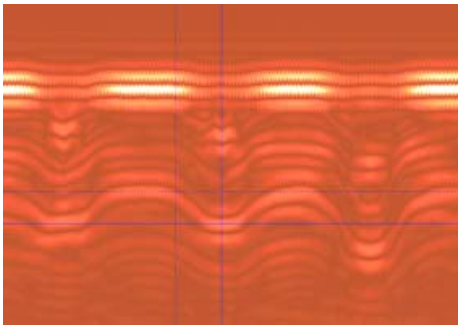
B-scan inspection
Rotor Blade GFR wrinkles
and undulations

Inspection for GFR wrinkles and undulations

FORCE Technology may provide ultrasonic inspection methods for proper indication of fibre wrinkles and undulations, often occurring in load-bearing girder structures, mainly containing UD fibre lay-up.



This is accomplished from basic A-scan data, captured with novel manual scanners. Data are transformed through P-scan System 4 data processing into proprietary B-scan presentations.

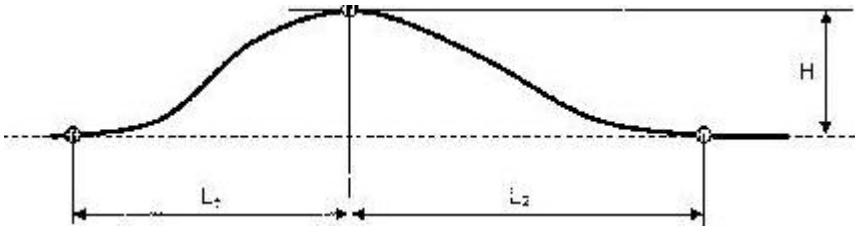
Critical defect size for GFR wrinkles

Ultrasonic line scanning, compiled into B-scan presentation, may be applied for contour imaging. Even more interesting is the imaging capability for internal interface contours in FRP composite structure.

Intra-laminar defects, such as undulations and wrinkles in highly loaded UD layers, may be indicated and assessed by NDT methods, once the appropriate UT method has been developed and critically qualified for the purpose.

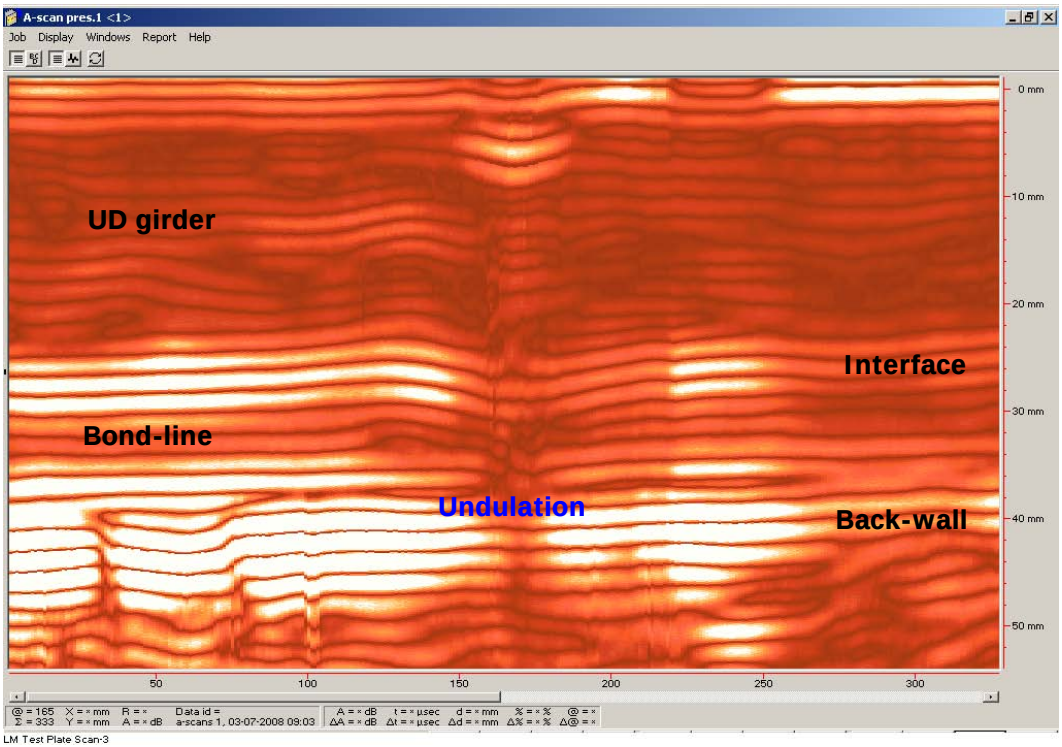
Assessments for wrinkles and undulations in UD composite layers should be judged against common theoretical aspects on composite material. FORCE Technology would propose a provisional specification for judgement of wrinkles:

- Critical peak height H = 3 mm. Any value **> 3 mm** in local amplitude is reported.
- For both left hand and right hand slope of a wrinkle, the width on both sides L_1 and L_2 are estimated.
- Critical half wave length L_1 = 50 mm, L_2 = 50 mm. Any value **< 50 mm** in width is reported. Anything less sharp in size is not reported.

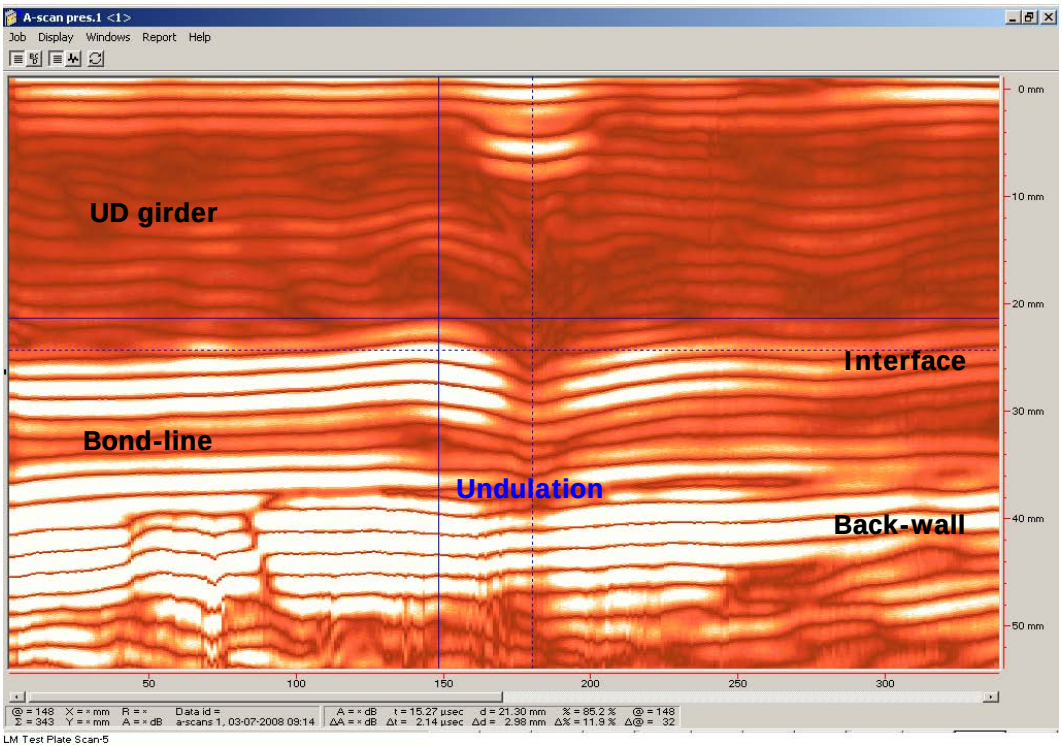


Reference sample

Rotor Blade sample cut along Main Laminate, with adhesive bond-line below.



Indication for a GFR wrinkle through the laminate, starting close to Top Surface Skin.
Estimated amplitude 1.50 mm, half wave width 19 mm (~ 4°fibre deviation).



In the middle of Main Laminate structure, the indicated fibre wrinkle is quite high.
Estimated amplitude 3.0 mm, half wave width 32 mm (~ 5°fibre deviation).

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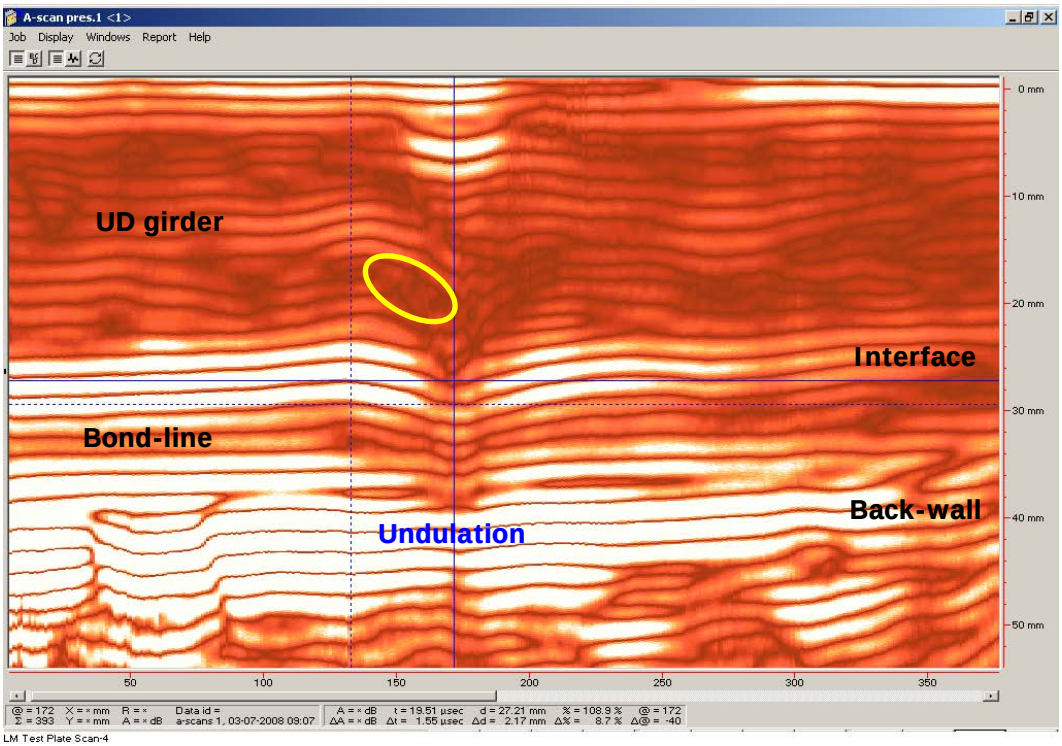

Lower down, the amplitude is 2.17 mm, half wave width 40 mm (~ 3°fibre deviation). A foreign object is visible in the composite structure – left hand of the wrinkle.

Summary

This method may easily be applied either for regular production control, or for on-site assessment of wrinkles and undulations in vital UD girder structures.