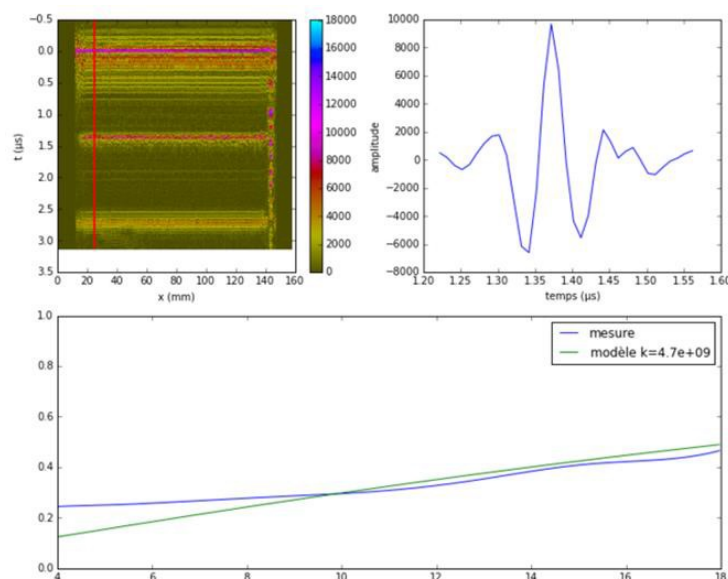


(198)

## Reflexion Measurements for Inverse Characterization of Steel Diffusion Bonds Mechanical Properties

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The present work describes a non-destructive testing method aimed at securing very high manufacturing quality of the innovative compact heat exchanger developed under the framework of the CEA R&D program dedicated to the Advanced Sodium Technological Reactor for Industrial Demonstration (ASTRID). The heat exchanger assembly procedure currently proposed involves high temperature and high pressure diffusion welding of stainless steel plates. The aim of the non-destructive method presented herein is to characterize the quality of the welds obtained through this assembly process. Based on a low-frequency model developed by Baik and Thompson [1], pulse-echo normal incidence measurements are calibrated according to a specific procedure and allow the determination of the welding interface stiffness using a nonlinear fitting procedure in the frequency domain. Performing the characterization of plates after diffusion welding using this method allows a useful assessment of the material state as a function of the diffusion bonding process.



**Figure 1.** Experimental data (top left), gated echo used to perform inversion (top right), comparison of fitted non-linear model and experimental spectrum of calibrated signal (bottom).

### References:

1. J.-M. Baik and R. B. Thompson, "Ultrasonic scattering from imperfect interfaces: A quasi-static model," *J. Nondestruct. Eval.*, vol. **4**, no. 3–4, pp. 177–196, Dec. 1984.