

# MEASURING DISPLACEMENT FIELD AND DETECTION OF UNBONDED REGIONS IN A SINGLE LAP JOINT WITH MOIRÉ INTERFEROMETRY

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## Conference Topic:

## Abstract

The goal of this work is the development of an experimental technique to measure the displacement field and to perform detection of unbonded regions [1] in a single lap joint [2, 3]. The proposed experimental technique is based on the use of Moiré Interferometry. It is a field technique that allows in-plane displacement measurements without contact and with high resolution [4, 5]. Grating replication techniques were developed to record high quality diffraction gratings onto the specimen's surfaces [6]. It was also, developed an optical assembly of laser interferometry used to generate the master grating (virtual) [7]. A tension load was applied to a lap joint and its deformation was accessed by the interference between the reference grating, recorded on the object surface, and virtual master grating generated by laser interferometry. A phase shifting technique [8] was developed to allow the phase map calculation. Image processing techniques [9] will be used to assess the in-plane displacement field.

A finite elements code (ANSYS®) will be used to calculate the displacement field [10, 11]. An unbonded region in a single lap joint was numerically simulated and the obtained results will be compared with those obtained in the experimental work. In the figure 1 it's possible to observe the displacement field, measured in a horizontal direction, of a single lap sound joint: and the results obtained by numerical simulation.

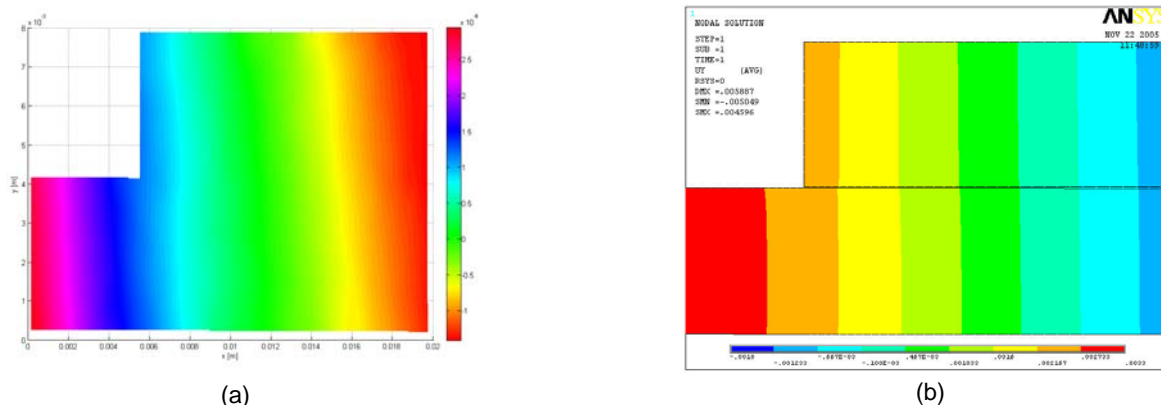


Figure 1 – Displacement field: (a) experimental results; (b) numerical simulation.

In the figure 2 it is possible to observe the simulation of a single lap joint with an unbonded region. As can be seen in this figure, the debonded region is clearly seen in the strain field. A defected lap joint will be produced and used to record its displacement field. Differentiation algorithms will be used to access the displacement field gradients.

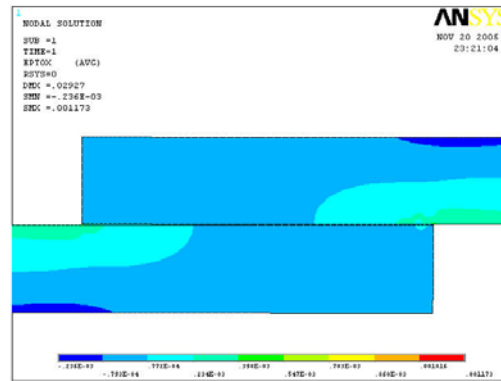


Figure 2 – Numerical simulation of a single lap joint with a non-glue region, it's possible to verify this region using the strain field.

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