

Non-destructive, local and quantitative assessment of residual mechanical properties in composites structures

Ph.D. Candidate: Carlo Boursier Niutta
Tutor: Prof. Giovanni Belingardi

XXXIII Cycle
A.Y.: 2018/2019

Department of Mechanical and
Aerospace Engineering (DIMEAS)
Mail: carlo.boursier@polito.it

Motivation

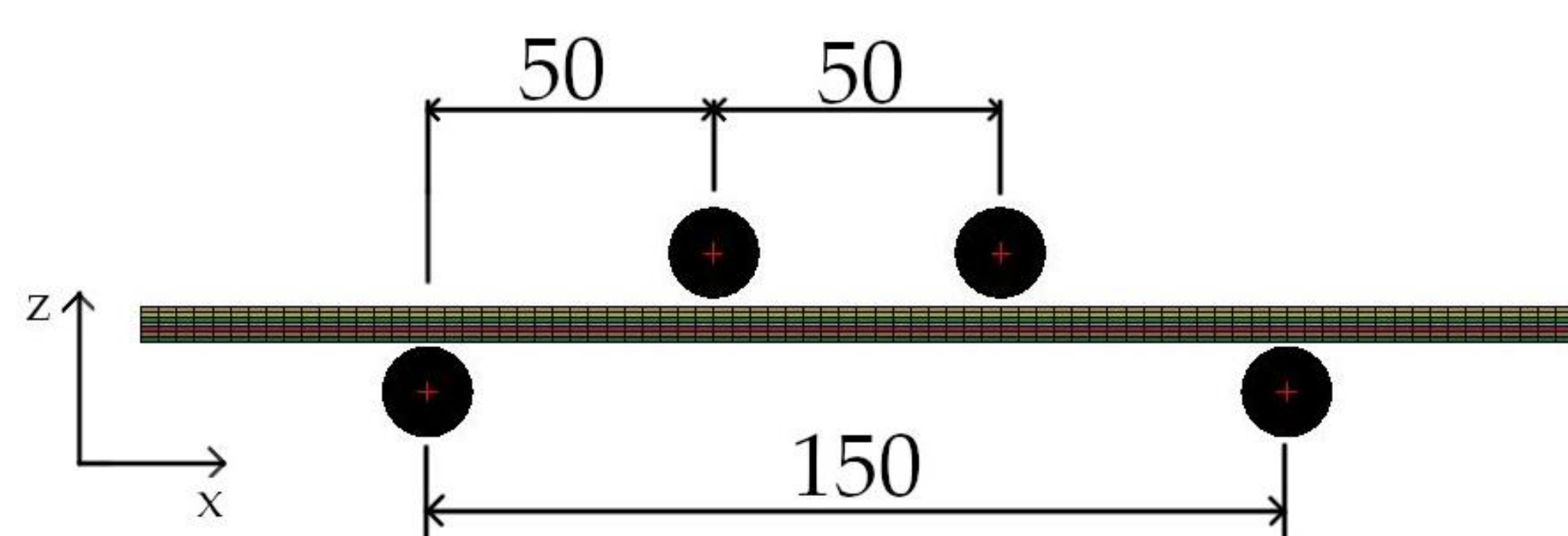
- Reduction of CO2 emissions and fuel consumption in transport vehicles by reducing weight of structures
- Use of composite materials as replacement of standard metals
- Characterization of damage level and of damage evolution in composite materials for their widespread diffusion

Research activity

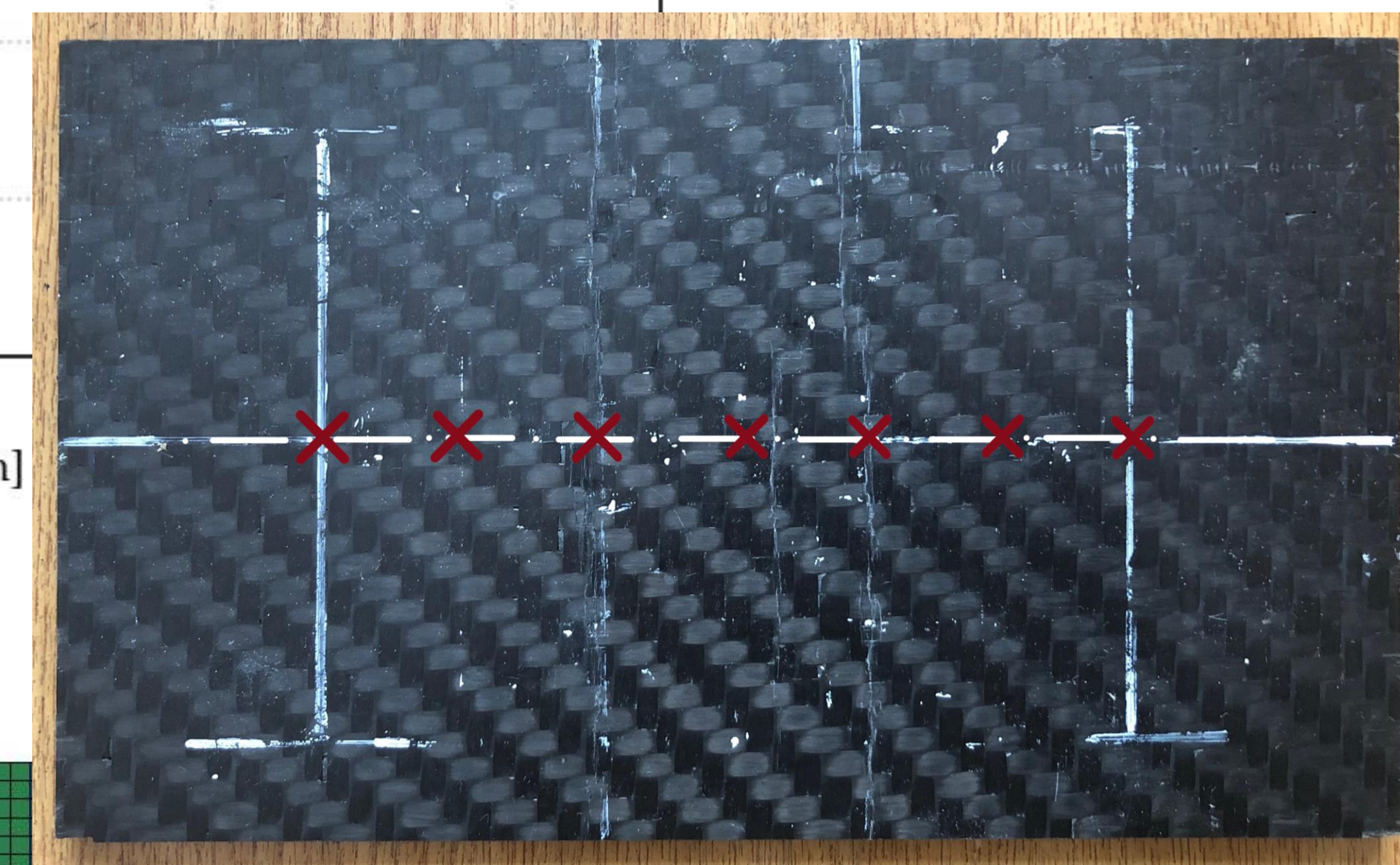
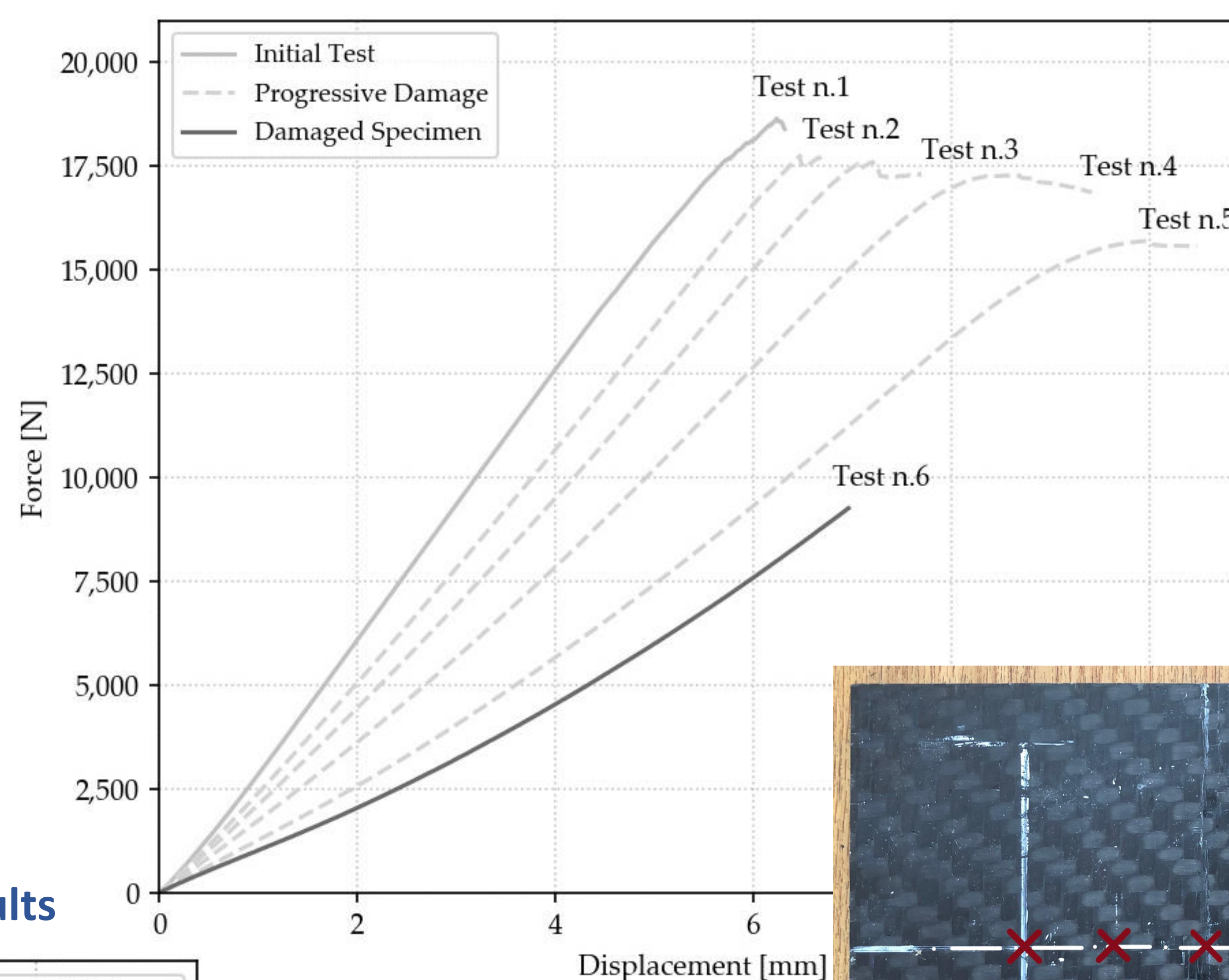
Damage Index Methodology (DI_d)

Local assessment of residual elastic properties

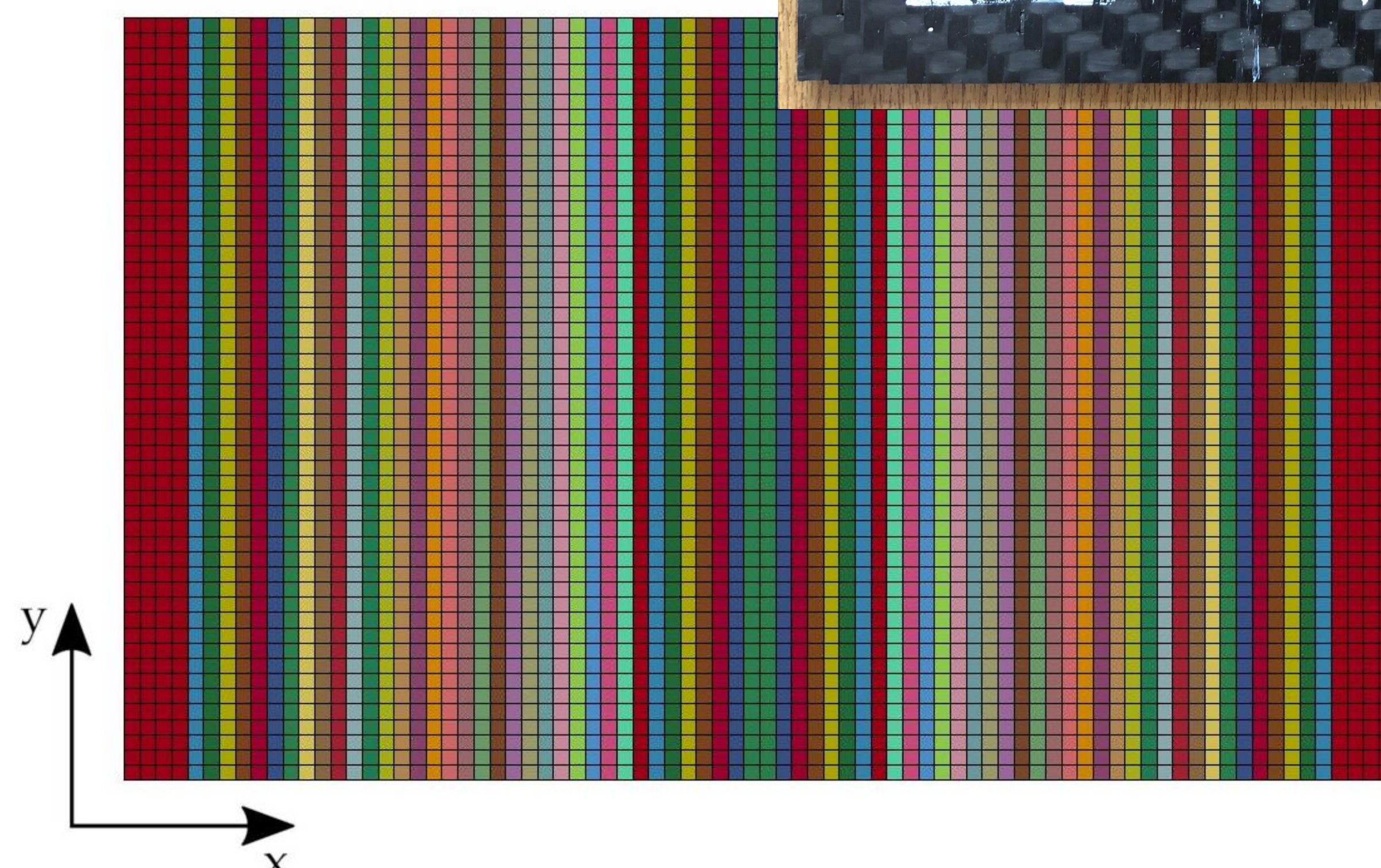
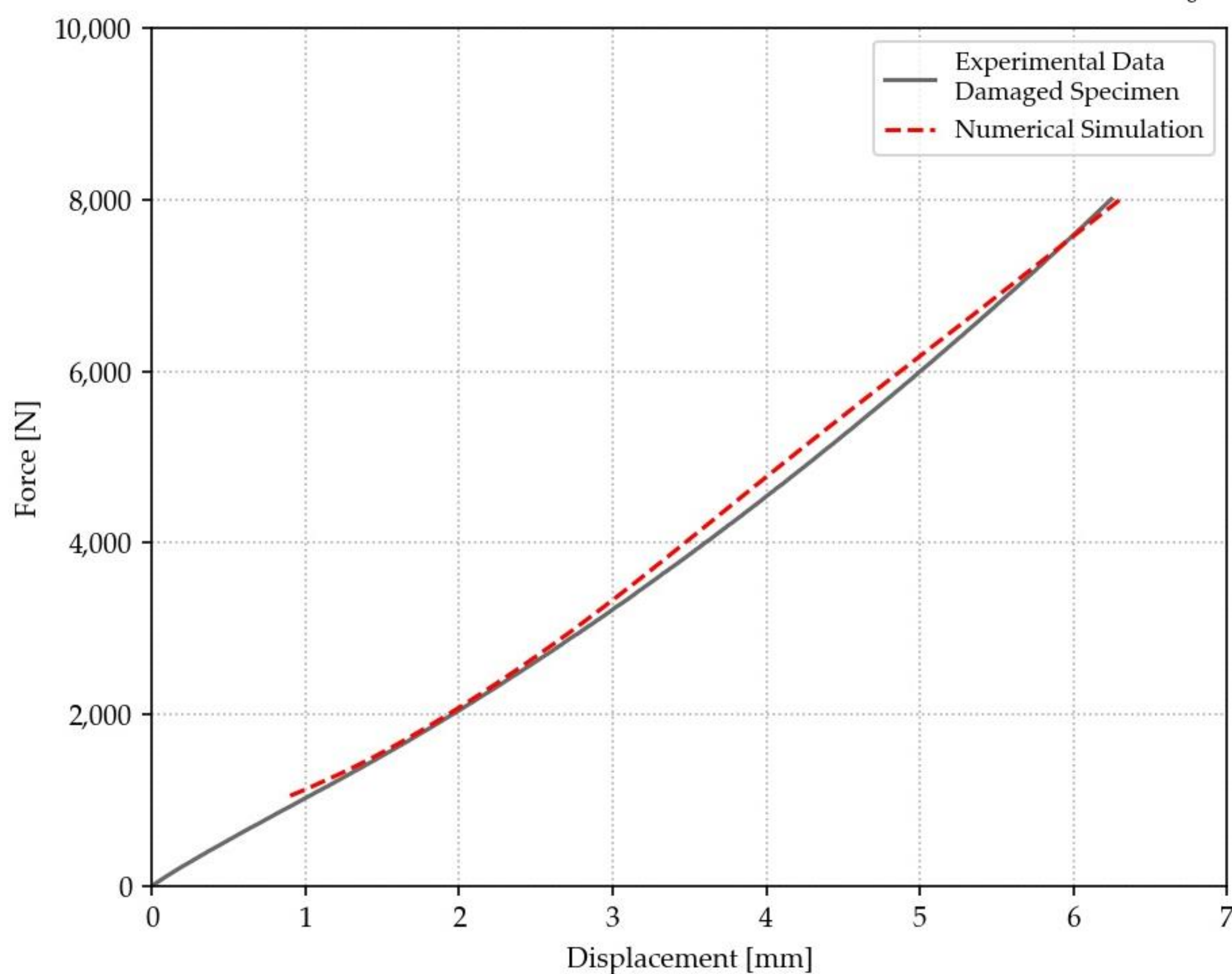
1) Tuning of a finite element model of a 8-layers laminate



2) Damaging of composite plate and mapping local residual properties with DI_d



3) Comparison of experimental and numerical results

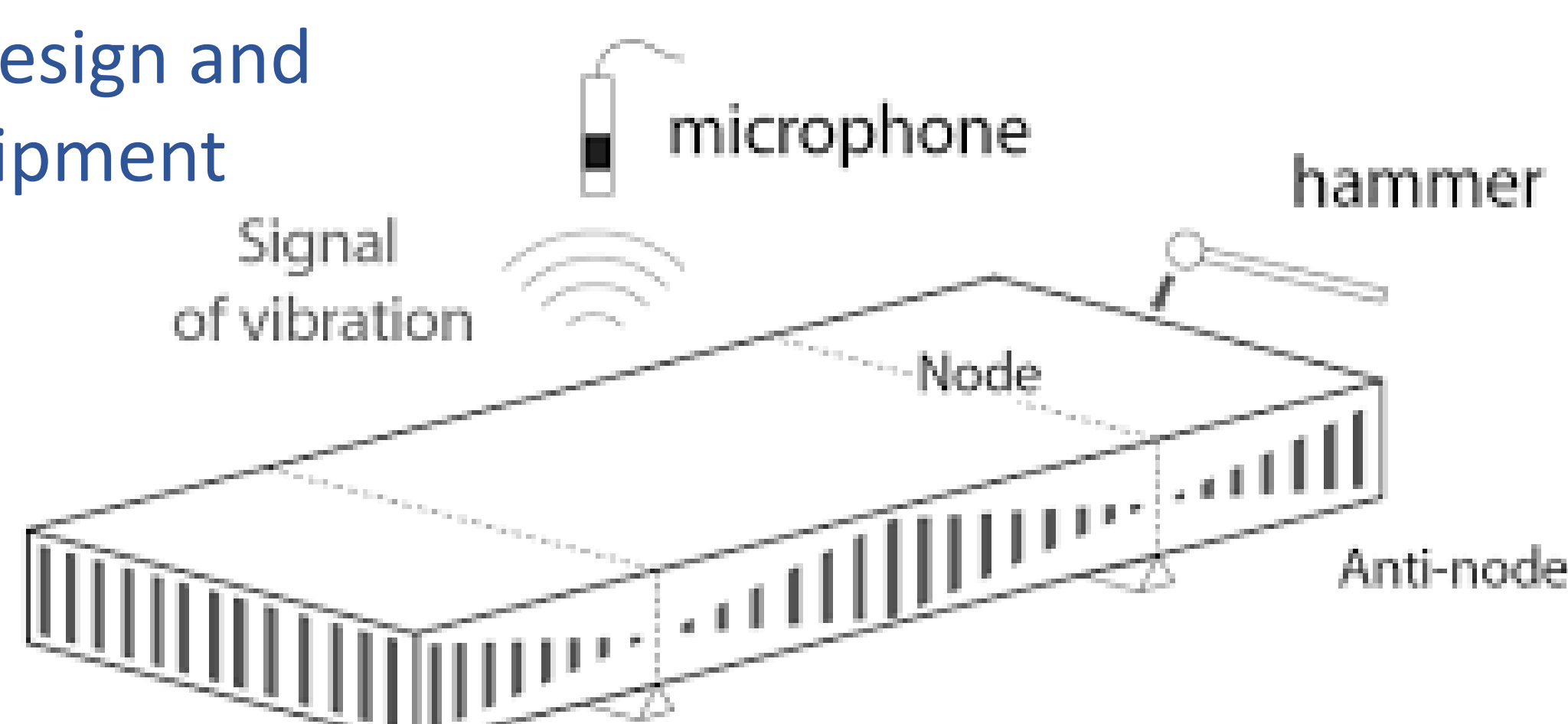


Boursier Niutta C., Tridello A., Ciardiello R., Belingardi G. and Paolino D.S. "Assessment of residual elastic properties of a damaged composite plate with combined Damage Index and Finite Element methods", Applied Sciences, 9(12):2579-2593, 2019.

Impulse Excitation Technique (IET)

From specimen to component: design and development of a laboratory equipment (patent pending)

$$f_{RIS} \sim (E_1, E_2, G_{12}, \nu_{12})$$



Research Plan

1. Experimental validation of the designed laboratory equipment
2. Characterization of various damaging modalities in composites