

TITLE OF THE FELLOWSHIP

Design of advanced elastic metamaterials leveraging nonlinearity, space-time modulation, and disorder

DESCRIPTION OF THE RESEARCH ACTIVITIES

Elastic metamaterials are composite materials characterized by an internal microstructure able to confer to the media unusual/superior mechanical properties, such as enhanced stiffness, auxeticity and negative effective density, to name a few. In the dynamic regime, the same microstructure enables unique responses including wave redirection, wave focusing and wave filtering.

In the last years, our research group has primarily focused on the dynamics of linear elastic, time-invariant, metamaterials characterized by a periodic microstructure. The proposed research fellowship is aimed at extending this investigation by accounting for non-linear mechanical response (material and or geometrical), space-time modulation, and disorder in the microstructure arrangement. These additional features can enhance the dynamic response of the media allowing for mechanical tunability, unidirectional energy transport, and enhanced wave filtering properties.

To address these aims, the research activity will be organized in three distinct phases:

1. development of analytical tools, based on multiple scattering theory, to explore the dynamics of non-linear and time-modulated elastic metamaterials;
2. development of numerical models (in a FE based environment) to validate the analytical methods;
3. design of table-top experiments to validate the numerical/analytical findings.

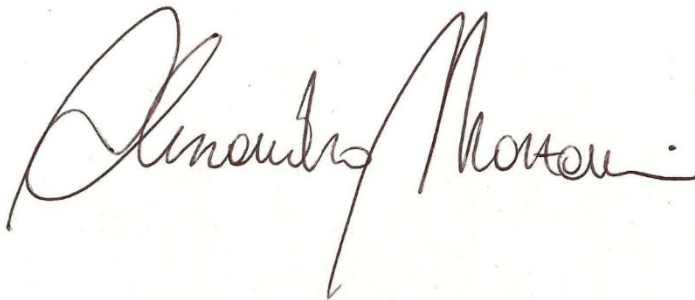
RESEARCH TEAM

- Alessandro Marzani – DICAM
- Antonio Palermo - DICAM

MODALITIES

The fellow will perform the activities planned in close collaboration with the other members of the main research team.

Prof. Alessandro Marzani

A handwritten signature in black ink, appearing to read 'Alessandro Marzani', written in a cursive style.