NICOLA MONTINARO

RESEARCH & INNOVATION PROFILE | Mechanical Engineering Researcher

CNR - Institute of Advanced Energy Technologies “Nicola Giordano” (ITAE) | Palermo, Italy

ORCID: 0000-0001-9607-3324

PROFESSIONAL PROFILE

Mechanical Engineering Researcher with 15+ years of experience in experimental mechanics, multimodal diagnostics, non-destructive testing (NDT), structural health monitoring (SHM) and numerical modelling. My work combines FEM-based design and structural assessment with experimental validation and technology development for components and structures in aerospace, transport and energy-related applications. At CNR-ITAE, my current research also addresses hydrogen technologies, fuel-cell components, energy storage, additive manufacturing and sustainability-oriented approaches.

CORE EXPERTISE

Structural design & numerical modelling Mechanical design; FEM; static and fatigue assessment; structural integrity, lightweighting and analysis of multilayer and anisotropic structures.	**Multimodal NDT & SHM** Laser thermography and microthermography; non-contact laser ultrasound; vibration-based diagnostics and damage monitoring.
Experimental mechanics Mechanical, thermal, vibration and shock testing; experimental-numerical correlation; validation of components, joints and structures.	**Composite & sustainable materials** Fibre Metal Laminates, fibre-reinforced composites, CNT-based nanocomposites, CNT nanofibres, thin films and membranes; interest in repairability and remanufacturing.
Energy technologies Hydrogen technologies, fuel-cell components, electrochemical and thermal energy storage; sustainable-by-design and life-cycle-oriented assessment.	**Prototyping & technology development** Additive manufacturing, development of experimental setups and sensorised prototypes; translation of engineering concepts into demonstrators.

EXPERIMENTAL METHODS & FACILITIES

Infrared thermal imaging; laser-induced thermography and microthermography; conventional and laser based ultrasonics inspection; laser vibrometry; mechanical and fatigue testing; additive manufacturing of continuous-fibre-reinforced polymer composite prototypes. *These capabilities are available through CNR-ITAE and research collaborations, as applicable to each project.*

RESEARCH DIRECTIONS & APPLICATION AREAS

Composite structures and green materials; multimodal inspection and in-service monitoring; fatigue and damage assessment; quantitative validation of repair and remanufacturing; NDT-based performance indicators for energy-storage devices; fuel-cell components and hydrogen technologies; sustainable energy-storage systems.

PROJECT EXPERIENCE & COLLABORATION

Selected activities and potential contribution to European R&I consortia

SELECTED PROJECTS AND RESPONSIBILITIES

2022 | Horizon 2020 AHEAD2020 - Trans-National Access, GA 871158
Principal Investigator for a specific experimental test campaign at Centre Spatial de Liège (Belgium, 16-20 May 2022): preparation of the competitive access proposal, definition of the vibration-test plan, coordination with the host facility, supervision of tests on nanostructured membranes and meshes, and scientific reporting.

2021 | Horizon 2020 AHEAD2020 - Elettra beamtime activity, GA 871158
Co-author and scientific contributor to a beamtime proposal; participation in the XPS/XAS measurement campaign at Elettra Sincrotrone Trieste, including measurement strategy, data interpretation and reporting.

STORIES - Storage Research Infrastructure Ecosystem, grant 101036910
Contribution, in collaboration with Karlsruhe Institute of Technology (KIT), to a sustainability assessment framework for hybrid energy-storage systems.

2022-2027 | Research on Hydrogen Technologies and Energy Storage - Italian National Electricity System (RdS)
Research collaboration on hydrogen technologies and end uses, fuel-cell components, and electrochemical and thermal energy-storage technologies.

2017 | SEBike - Regional innovation project
Co-proposer of a funded project (€49,680) for the development of a sensorised e-bike for environmental mapping and low-emission route suggestions.

SELECTED INDUSTRIAL AND CROSS-SECTOR EXPERIENCE

- **Rail and transport:** FEM-based static and fatigue assessment and weight optimisation of structural components for the Zefiro V300 / ETR1000 high-speed train; collaboration on laser-ultrasound SHM for railway structures.
- **Circularity and prototyping:** design and pre-industrial prototyping of reverse-vending machines for glass and plastic container recovery; experience relevant to circular-economy and remanufacturing challenges.
- **Aerospace instrumentation:** thermo-mechanical design and experimental testing of thin films, membranes, filters and multilayer structures for space-instrumentation applications, including the Athena / NewAthena context.

INTERNATIONAL COLLABORATION NETWORK

University of Cambridge (UK); Université de Genève (Switzerland); Karlsruhe Institute of Technology - KIT (Germany); University of Palermo; CNR-ICAR; INFN - Frascati National Laboratories; University of Messina and Trenitalia; INAF - Palermo Astronomical Observatory.

POTENTIAL CONTRIBUTION TO HORIZON EUROPE PROJECTS

Interested in contributing to collaborative R&I projects through:

- **Scientific work-package/task leadership:** experimental validation, multimodal NDT/SHM, structural integrity and fatigue assessment.
- **Technology and demonstrator development:** thermographic and ultrasonic monitoring strategies, composite structures, repair/remanufacturing validation and prototyping.
- **Interdisciplinary integration:** bridging mechanical design, experimental engineering, materials and energy-technology teams, with industry-facing validation activities.

Open to Horizon Europe partnerships, consortium building and scientific responsibility for clearly defined work packages. *My previous Horizon 2020 responsibility concerned a specific Trans-National Access campaign, rather than overall project coordination.*

EDUCATION & ACADEMIC ACTIVITY

PhD in Mechanical Design, University of Palermo, 2015 | MSc in Mechanical Engineering, University of Palermo, 2009 (110/110 cum laude).

University teaching and thesis supervision in mechanical design and engineering; member of the International PhD Board at the University of Palermo from academic year 2026/2027; member of the Local Organising Committee of ICEM22 (Palermo, July 2027).

SELECTED AWARDS & RECOGNITIONS

2023 – AIAS Award, Experimental Mechanics, Italian Scientific Society for Mechanical Design and Machine Construction.

2019 – First Prize, Start Cup Palermo (€8,000 award); First Prize, Start Cup Sicilia, with admission to the National Innovation Award (PNI 2019).

2019 – Healthcare Innovation Award, Italian Association of Clinical Engineers (AIIC), awarded within the National Innovation Award with the Tripie team.

2017 – Best Paper Award, Department of Industrial and Digital Innovation, University of Palermo, for the best departmental publication of the year (first author).

SELECTED PUBBLICATIONS

- **Montinaro, N.,** Epasto, G., Cerniglia, D., Pantano, A. (2026). Non-contact detection of interlaminar defects in titanium-graphite FMLs using laser ultrasonics and thermography. Composite Structures, 389, 120401. https://doi.org/10.1016/j.compstruct.2026.120401.

Montinaro, N., Marchesa, G., Cerniglia, D., Pantano, A. (2025). Nanoparticles Dispersion Assessment by a Novel Pulsed Laser-Induced Micro Thermography Technique. Polymer Composites, 46(17), 15811–15823. https://doi.org/10.1002/pc.70008.

- Vangi, D., Gulino, M.S., **Montinaro, N.,** Mineo, C., Cerniglia, D., Epasto, G. (2023). On the use of two emerging laser-based flaw-detection techniques – Considerations and practicalities. Optics and Lasers in Engineering, 165, 107551. https://doi.org/10.1016/j.optlaseng.2023.107551.

- **Montinaro, N.,** Epasto, G., Cerniglia, D., Guglielmino, E. (2020). Laser ultrasonics for defect evaluation on coated railway axles. NDT & E International, 116, 102321. https://doi.org/10.1016/j.ndteint.2020.102321.

- **Montinaro, N.,** Cerniglia, D., Pitarresi, G. (2019). Evaluation of Vertical Fatigue Cracks by Means of Flying Laser Thermography. Journal of Nondestructive Evaluation, 38(2). https://doi.org/10.1007/s10921-019-0586-5.

- **Montinaro, N.,** Epasto, G., Cerniglia, D., Guglielmino, E. (2019). Laser Ultrasonics Inspection for Defect Evaluation on Train Wheel. NDT & E International, 107, 102145. https://doi.org/10.1016/j.ndteint.2019.102145.

- Cerniglia, D., **Montinaro, N.** (2018). Defect Detection in Additively Manufactured Components: Laser Ultrasound and Laser Thermography Comparison. Procedia Structural Integrity, 8, 154–162. https://doi.org/10.1016/j.prostr.2017.12.016.

- **Montinaro, N.,** Cerniglia, D., Pitarresi, G. (2017). Detection and characterisation of disbonds on Fibre Metal Laminate hybrid composites by flying laser spot thermography. Composites Part B: Engineering, 108, 164–173. https://doi.org/10.1016/j.compositesb.2016.09.084.

- Mineo, C., Infantino, I., Barbera, O., Giacoppo, G., **Montinaro, N.** (2024). Sustainable by Design: Advancing Hydrogen Fuel Cell Production through Automation. MATEC Web of Conferences, 401, 12001. https://doi.org/10.1051/matecconf/202440112001.