

# ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

## INRiM - Additive Manufacturing for energy-efficient applications in electrical engineering

<b>Funded By</b>	I.N.R.I.M. - ISTITUTO NAZIONALE DI RICERCA METROLOGICA [Piva/CF:09261710017]
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<b>Context of the research activity</b>	Worldwide there is a tremendous demand for more efficient and cleaner devices to reduce energy and natural resource consumption and gas emissions. Over 20% of the final energy consumption in Europe is in the form of electricity. Electrical energy undergoes multiple stages of conversion and transformation, all of which involve soft-magnetic materials (SMM) in the form of cores of electrical machines and magnetic components in power electronics. The quest for energy-efficient motors will be here based on recyclable amorphous metals, thereby increasing the availability of alloys with unique magnetic and mechanical properties.
<b>Objectives</b>	The research focuses on developing new metallic materials for additive manufacturing (3D printing) using selective laser melting (SLM) technology. In particular, Fe-based soft magnetic amorphous metals for electrical devices will be designed. The main objective is to evaluate the magnetic behaviour of magnetic materials of different nature, structures and dimensions in search of the lowest intrinsic coercivity, highest magnetic permeability, and highest magnetic saturation, which will maximize the energy efficiency (nano- and mesoscale design level). This objective will be achieved by alloy development, casting technologies and microstructure characterization at several length scales. The electrical and magnetic properties of powders, ribbons, bulk metallic glasses samples, and additive manufactured complex elements will be investigated. In particular, the candidate will develop testing methods to measure magnetic materials' DC and AC electromagnetic properties. In addition, the candidate will be closely in contact with the project partners through short-term stays in consortium research to follow all the processing steps.
<b>Skills and competencies for the</b>	A general background in electrical engineering or materials science is appreciated. Experience and willingness in experimental activities will be preferred.

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the activity**

The candidates should be highly motivated to join a dynamic consortium to contribute to the EU Green Deal. Capabilities in team working in a multidisciplinary environment are then recommended.