PHYSICS

INRiM - Advanced metrology in physics (2)

Funded By	I.N.RI.M. - ISTITUTO NAZIONALE DI RICERCA METROLOGICA [P.iva/CF:09261710017]

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Context of the research activity	This Thematic Grant includes 4 research Topics (listed below), with a specific title and proponent Supervisor/s. The applicants have the possibility to identify the specific topic they are interested in. Topic 1: Development of a Yb Optical Clock for International Comparisons. Topic 2: Development of certified reference materials of CO2 gas mixtures characterized for the isotopic composition by developing on purpose physical measurements. Topic 3: Developing a Scalable Quantum Network of Trapped Ions. Topic 4: Operando small-angle x-ray scattering analysis of nanostructured materials for energy storage. For more details about the Topics, visit: https://www.inrim.it/en/services/training/early-career-metrology/phd

Objectives	Topic 1: Developing a high-precision optical atomic clock at INRIM for advanced metrology, with applications in SI second redefinition, space tech, and international clock comparisons. Topic 2: CO2 gas mixture preparation and uncertainty evaluation. Stability studies by CRDS and FTIR spectroscopies. Measurement comparison. Protocol and measurement system setup for field measurements. Topic 3: The objective is to build a quantum network of trapped ions for distributed quantum computing architectures. This will be realized by entangling two distant Ba+ ions by using a photonic network. Topic 4: This PhD thesis is focused of the characterization by small-angel xray scattering of nanostructured materials (e.g. porous silicon and selfassembled) applied to Energy Storage.

Skills and competencies for the development of the activity	Topic 1: Background in atomic/laser/quantum physics or optics can be useful, but the candidate will have the chance to fill initial gaps during the activity. Topic 2: Master degree in Physics, Chemistry, Industrial Chemistry, Chemical and Sustainable Processes Engineering. Background in spectroscopic techniques, analytical analysis, and basic knowledge in metrology. Topic 3: Learning drive is paramount. Competencies will be developed in: laser operation, data analysis, basic electronics, UHV technology, and finite element software for simulation. Topic 4:Basic knowledge of solid-state physics and x-ray analysis