

**Marie Skłodowska Curie Action – Postdoctoral Fellowship 2023**  
**Expression of interest – Hosting offer**  
**(MSCA-PF-2023)**

<b>Contact Person/Scientist in charge</b> <i>(data of the principal investigator of the research group/lab or scientific supervisor)</i>	<b>Name</b>	Enrico
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<b>Laboratory /Department /Institute /Centre /</b> <i>(data of the centre/department where the fellow would be located)</i>	<b>Name</b>	Theoretical Physics Group, Scuola Normale Superiore
	<b>Address</b>	Piazza dei Cavalieri 7, 56126 Pisa
<b>Research Area</b> <i>(Please select one the following research areas: corresponding to the eight MSCA evaluation panels. You can select between one and up to three scientific areas per EOI)</i>		Physics (PHY)
<b>Brief description of the Centre/Research Group</b> <i>(max. 1,600 characters including spaces: information about the research centre or research group, scientific staff. Please include URL if possible)</i>		<p>The research interests of the Theoretical Physics Group at SNS span a wide range of fields. We pursue fundamental questions related to cosmology, gravity, string theory, particle physics, and effective field theory.</p> <p>The group consists of faculty, post-docs, graduate students and affiliates. Current members are:</p> <p>Faculty: Guilherme Leite Pimentel, Augusto Sagnotti, Enrico Trincherini</p> <p>Postdocs: Adrien Kuntz</p> <p>PhD students: Bruno Bucciotti, Craig Clark, Marco Costa, Andrea Luzio, Salvatore Raucci, Francesco Serra, Tom Westerdijk, Chen Yang</p> <p>More information can be found at: <a href="https://www.heptheory.sns.it">https://www.heptheory.sns.it</a></p>
<b>Project description</b> <i>(max. 1,800 characters including spaces: short description of the research project / research line where the fellow would be hosted and develop his /her project)</i>		<p>In recent years we have witnessed an increasing interest in imposing consistency conditions on various physical systems.</p> <p>The broad objective of the project is to explore the consequences of first principles, such as unitarity, causality, and symmetries, on a general Quantum Field Theory (QFT).</p> <p>Recently, the methods for extracting constraints on low-energy Effective Field Theories (EFTs) from these basic requirements have been given a more systematic foundation. This has led to a number of important outcomes. These methods have been used to bound the Standard Model EFT, and systems of scalars and spinning particles including photons and gravitons. Complementary to the above works, the S-matrix bootstrap has developed systematic methods to construct the most general scattering amplitude consistent with the basic axioms of quantum field theory.</p> <p>By using general properties of QFTs, the project will develop a framework to constrain the space of consistent theories and obtain bounds on observables of theoretical and experimental interest.</p>

In pursuing such aims the group will expand existing QFT tools, as well as develop new ones. It will also bridge techniques across different fields and export results from one area to another. Methods that will be used are based on fundamental properties of scattering amplitudes, the absence of causality violations in signal propagation, and a blend of kinematical and dynamical constraints of correlation functions describing the early universe. The hosted fellow is expected to contribute to one or more of the lines of research outlined above.

**Applications: documents to be submitted and deadlines**

*(Please indicate the documents that the candidate fellow should submit to establish contact: CV, letter of motivation, letter of references, etc., please indicate deadline. Recommended deadline: April 2023)*

CV, letters of reference  
Deadline: May 2023