Marie-Skłodowska-Curie Actions – Postdoctoral Fellowships 2025

INL Expression of Interest

Research Group Leader /Research Group name:	
Jana Nieder/Nieder group on Ultrafast Bio- and Nanophotonics	
Scientist in charge:	
Name & surname	Jana Nieder
Contact email	Jana.Nieder@inl.int

Short description of the research group, including URL if applicable *(Strengths and scientific achievements (publications, patents, etc.), important infrastructure (up to 2000 characters with spaces)):*

Nieder's group explores light-matter interactions and control within three primary domains. Firstly, ***advanced bioimaging and sensing*** involves the use of nanofunctionalised surfaces and particles with ultrafast laser technology to achieve innovative imaging and sensing capabilities in terms of resolution and multi-parameter functional imaging. The group collaborates with researchers and innovators to apply novel techniques for therapeutic advancements or enhanced diagnostic tools. Secondly, in ***quantum photonics***, the focus is on comprehending and using the emission of single quantum emitters in 2D materials or 3D crystals. These emitters could play a pivotal role if seamlessly integrated into controllable photonic platforms. Finally, the emphasis in ***photonic integrated devices*** is on developing photonic integrated chips and advanced characterisation tools to provide new paradigms in neuromorphic and quantum computation, while also enabling nanotechnologies for biosensing and quantum information technologies.

Project title:

Nanoscopy on single point defects in diamond

Project description *(up to 2000 characters with spaces):*

IN frame of the new project APECS a pilot line for heterogenous integration we will develop Reactive Ion etching (RIE) processes for diamond material. In synergy with this activity we hope to host a Marie curie postdoctoral fellows that aims to develop an exciting research project that analyses the nanoscale positioning of NV center defects in processed diamond relative to the diamond surface using advanced optical nanoscopy techniques.

Once the placement of the quantum sensors are optimized those may be used for various applications via in house developed ODMR setups.

Our group is expert in exploring near field effects of thin metal layers of 2D materials such as Graphene for accurate axial position determination. Processing of diamond using RIE and testing of positioning of NV centers in diamond using advanced optical nanoscopy techniques via the near field quenching methods (see references below, for nearfield sensing work developed in our group for sensing in cellular and molecular environments).

Collaboration with external groups is encouraged e. g., with experts in integrated photonics to develop diamond platforms integrated in read out units or with the quantum sensing to quantum computation community in house and external.

Based on the background and interest of the candidate we are eager to co-develop a winning MSCA application, that meets the candidate's strength as well as opportunity in career growth.

Related references by the research group and in collaboration with INL internal and external researchers:

Nearfield quenching based nanoscopy on gold substrates:

Edite Figueiras, Oscar F. Silvestre, Teemu O. Ihalainen, Jana B. Nieder, Phasor-assisted nanoscopy reveals differences in the spatial organization of major nuclear lamina proteins, Biochimica et Biophysica Acta (BBA) - Molecular Cell Research, Volume 1866, Issue 12, 2019,

Ghaeli, R. M. R. Adão, J. B. Nieder, CLeANFIT – Contact-Less Axial Nearfield-Based Fluorescence Imaging Topography: A Method for 3D Micro- and Nanotopography Characterization. *Adv. Mater. Interfaces* 2020, 7, 2000581. https://doi.org/10.1002/admi.202000581

Nearfield quenching based nanoscopy on graphene:

Ricardo M R Adão, Rui Campos, Edite Figueiras, Pedro Alpuim and Jana B Nieder l Graphene setting the stage: tracking DNA hybridization with nanoscale resolution, *2D Mater.* **6** 045056, 2019

Maria M. Soares, João Freitas, Tiago Queirós, Agnes Purwidyantri, Pedro Alpuim, Jana B. Nieder. DNA Hybridization Kinetics Observed at the Single-Molecule Level Using Graphene Near-Field Effects, J. Phys. Chem. A 2024, 128, 49, 10689–10696

J. D. G. Azevedo, T. Queirós, F. Camarneiro, M. J. Lopes, J. Freitas, A. Purwidyantri, P. S. Prakash, S. Chandrasekhar, T.-L. Schmidt, P. Alpuim, J. B. Nieder, Hybrid DNA Origami – Graphene Platform for Electrically-Gated Nanoscale Motion. *Adv. Mater. Interfaces* 2024, 2400617. https://doi.org/10.1002/admi.202400617

Research fields *(You may choose more than one)*			
Chemistry (CHE)	x	Life Sciences (LIF)	x
Economic Sciences (ECO)		Mathematics (MAT)	
Environment and Geosciences (ENV)		Physics (PHY)	x
Information Science and Engineering (ENG)	x	Social Sciences and Humanities (SOC)	

Expiration date for Expressions of Interest from postdoctoral fellows:	4 weeks before the MSCA application deadline

Necessary documents to be submitted (in addition to the required CV and motivation letter):

A research statement that connects the candidate's expertise with a "**Nanoscopy on single point defects in diamond**" related project.