Attachment A - Research topics for scholarships based on Ministerial Decree n.118/2023, founded by PNRR Program – Next Generation EU

Ph.D. Course	**COMPUTATIONAL ASTROPHYSICS AND COSMOLOGY [COMPAC]**
Scholarship type	**MISSIONE 4 – ISTRUZIONE E RICERCA** **Investimento 4.1 - Dottorati di ricerca PNRR (art. 8, DM 118/2023)**
N.	1
CUP	**E53C23000920001**
Title	**Radiation-hydrodynamic of galactic outflows**
Brief description of the research project	The selected candidate is expected to perform High Performance Computing numerical simulations aimed at understanding the dynamics of radiation-driven galactic outflows. Outflows are increasingly invoked to explain the properties of the earliest galaxies observed by James Webb Space Telescope and ALMA. However, the energetics, dynamics and impact on the host galaxy and the intergalactic medium is far from being understood. The numerical simulations will explore the various possibilities from supernovae to radiation pressure mediated by dust grains, following at the same time the radiative transfer of light trough the outflow on-the-fly. To catch these details, it will be necessary to improve existing zoom-in grid codes to include several effects (particularly radiation pressure by Lyman Alpha photons and UV light). The candidate will be able to use the SNS supercomputing center featuring about 1000 nodes fully dedicated to the Cosmology Group. Along with the various courses on computational astrophysics and cosmology, there will be ample possibility for the candidate to participate to all the activities of the Cosmology Group at SNS, which at the moment features an ERC Advanced Grant dedicated to themes very interconnected with the Thesis work.
SSD	FIS/05
Period of study and research to be carried out abroad	It is mandatory to carry out periods of study and research in companies or research centers from a minimum of six (6) months to a maximum of twelve (12) months, even if not continuous, and periods of study and research abroad, The destinations for each student will be decided by supervisors and the Ph.D course board.