Research program
Study of proton source in heavy-ion collisions at the LHC

The research program is aimed at studying the space-time extent and evolution of the source of particles, protons in particular, created in high-energy hadronic and nuclear collisions at the Large Hadron Collider. The research has applications to the physics of the Quark—Gluon Plasma produced in ultra-relativistic heavy-ion collisions and to model the process of formation of light nuclei in high-energy interactions.
The measurement of the correlation between proton-proton pairs with femtoscopic techniques will be carried out in Pb–Pb collisions using large data samples collected during the LHC Run 3 with the ALICE detector. The femtoscopic technique has been applied successfully by ALICE to measure the correlation function of baryon-baryon pairs in pp, p–Pb, and Pb-Pb collisions. The measured correlation function will be empirically fitted with model-dependent functions to extract the relevant parameters that provide information on the (anti)proton source, including one- and three-dimensional radii; the 3D radii will be measured for the first time for protons.

The fellow will be involved in data analysis using the ALICE O2Physics framework and distributed computing resources. Given the key role of particle identification based on Time-of-Flight (TOF) detector information for the relevant observables, involvement in offline activities for ALICE-TOF (data quality control, calibration, performance studies) and data preparation is foreseen.
For this project, the research fellow will join the ALICE-TOF group at DIFA-INFN, and the team involved in the CosmicAntiNuclei project.

In summary, the activities include:
- detector calibration and quality control activities, evaluation of detector performance for the TOF
- data analysis
- software development (C++/Python, ALICE O2Physics framework)
- application of the results obtained within the context of the CosmicAntiNuclei project.