

INFN – FRASCATI NATIONAL LABORATORIES

The Frascati National Laboratories (LNF) created in Italy to study nuclear and subnuclear physics using particle accelerators. It is the biggest laboratory of the INFN (Istituto Nazionale di Fisica Nucleare), the national agency which promotes, manages and finances public research activities in the field of nuclear and subnuclear physics.

The LNF was built in 1955, a period of major breakthroughs in particle physics. During the previous decades, physicists had studied the structure and the transformations of the nuclei and they were just starting to discover the nature of their components. Moreover, cosmic ray experiments had shown the existence of new particles, absent in ordinary matter. INFN gave LNF the task to build particle accelerators able to probe the nucleus constituents and to produce these new forms of matter in laboratory experiments.

Since then, LNF has always been a major actor in all INFN research fields: accelerator physics, nuclear and subnuclear physics, cosmic ray physics and synchrotron light applications in physics. Today the laboratory manpower counts about 350 people in total: researchers, engineers, technicians and administrative staff. In addition, about 450 visitors from Italy and abroad contribute to the on-site activities.

The main asset of LNF is its capability to build state-of-the-art particle accelerators. This activity started in 1957 with the 1100 MeV synchrotron, the most powerful machine at that time; then it proceeded with AdA and ADONE, to lead today to the successful DAΦNE machine which holds the world record of instantaneous luminosity at low energy. Nowadays, the LNF is hosting as well SPARC, a free-electron laser built in collaboration with ENEA and CNR, and FLAME, an ultra-high power laser which is used to study innovating techniques to accelerate particles.

The technical and scientific skills of the LNF Accelerator Department are unique in Italy and rare in Europe; they are resources INFN provides to the society. Indeed, in addition to its fundamental research activities, the Accelerator Department took part in the building of an accelerator of protons and carbon ions, used for medical therapies at CNAO (Centro Nazionale per la Adroterapia Oncologica) in Pavia.

Alongside the Accelerator Division and supported by the Technical and Administrative Departments, stands the Research Division: researchers, engineers and technicians involved in research activities at Frascati and in international collaborations. Two experiments are currently running on the LNF site: KLOE, a particle physics detector which is studying the differences between matter and antimatter and the gravitational wave detector NAUTILUS. The LNF is also taking part in ongoing experiments at CERN near Geneva, at Fermilab near Chicago, at Stanford's SLAC (California), at JLAB (Virginia), at DESY in Germany and at the INFN Laboratories of Legnaro, Gran Sasso and Catania. The close collaboration with all these research institutes allows LNF researchers and technicians to continuously seek a direct confrontation with their foreign counterparts; that confrontation is mandatory for initiating and maintaining high quality research in Italy.

On-site accelerators, such as the international collaborations named above, have given a great contribution to the laboratory while motivating the best physicists, engineers and technicians to come and work at Frascati. Thanks to this cultural richness, complementary activities to the research in particle physics could be created. Examples of this include the use of the synchrotron light emitted by the DAΦNE electrons; the use of electron, positron and photon beams extracted from the DAΦNE injector; research in material science; medical and spatial applications; the development of new detectors; imaging techniques; the development of X-ray optics; radioprotection and environment control; the management of computing networks; finally the construction of advanced computing centers.

Moreover, the LNF has been active for years in science outreach thanks to educational programs targeting schools and the general audience: guided tours of experiments; training sessions for students; physics meetings ("Incontri di Fisica") for high school teachers in addition to regular courses; seminars; conferences with the authors of books dealing with science outreach. These activities are organized both at LNF and in many schools and science institutes nationwide.