Design, technology and production of superconducting accelerating cavities at INFN

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The Italian National Institute for Nuclear Physics (INFN) plays an important role in the development of superconducting radiofrequency (SRF) technologies for current and future large scale accelerator facilities. This contribution presents an overview of the activities carried out by the Legnaro National Laboratories (LNL) and the Laboratory for Accelerators and Applied Superconductivity (LASA) on this topic.

This work includes the design of high-performance superconducting half-wave resonators for the International Fusion Material Irradiation Facility – DEMO Oriented Neutron Source (IFMIF-DONES) project, aiming at building a state-of-the-art neutron source to test materials for fusion reactors, as well as the development, qualification and production of superconducting elliptical cavities for the Proton Improvement Plan II (PIP-II), an H^- linac designed to support neutrino physics programs at Fermilab. Finally, the development of Nb_3Sn thin-film coatings on Cu cavities for the Future Circular Collider (FCC-ee) will be presented, together with Plasma Electrolytic Polishing (PEP) of the Cu substrate as the enabling surface-preparation step.