

Radiofrequency superconducting cavities and high power proton Linacs



PIP-II PROTON IMPROVEMENT PLAN II

Producing the world's most intense neutrino beam for the Deep Underground Neutrino Experiment (DUNE)

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- **Scientific leader:** David Longuevergne (IJCLab) *
- **Laboratories involved:** IJCLab (Orsay)
- **Nature:** research infrastructure
- **Status:** International project under construction, mainly supported by the United States (DOE), India (DAE), Italy (INFN), France (CNRS and CEA), England (UKRI-STFC) and Poland (WUST, WUT and TUL)
- **Website:** <https://pip2.fnal.gov/>

SCIENTIFIC OBJECTIVES

The PIP-II project is part of an ambitious programme to study neutrinos. Its objective is to upgrade the Fermilab accelerator complex in the United States to provide a neutrino beam of unprecedented intensity for the DUNE (Deep Underground Neutrino Experiment) project (see DUNE fact sheet). The core of the project is the construction of a new superconducting linear proton accelerator capable of delivering a beam power of 1.2 MW on target from the existing rings.

RESOURCES DEPLOYED

The new superconducting linear accelerator will provide a continuous 2 mA H⁺ ion beam up to an energy of 800 MeV. It will consist of a short hot section equipped with a radio frequency quadrupole (pre-acceleration to 2.1 MeV and beam bundling). The final beam is converted into H⁺ protons, accelerated to 8 GeV in the first ring (booster) for the production of low-energy neutrinos, then raised to an energy of between 60 and 120 GeV in two rings (Recycler ring/ Main injector) for the production of high-energy protons, high-energy neutrinos and muons.

215 metres: total length of the linear accelerator

15 international institutes

1.2 MW of protons on target

800 MeV: proton energy

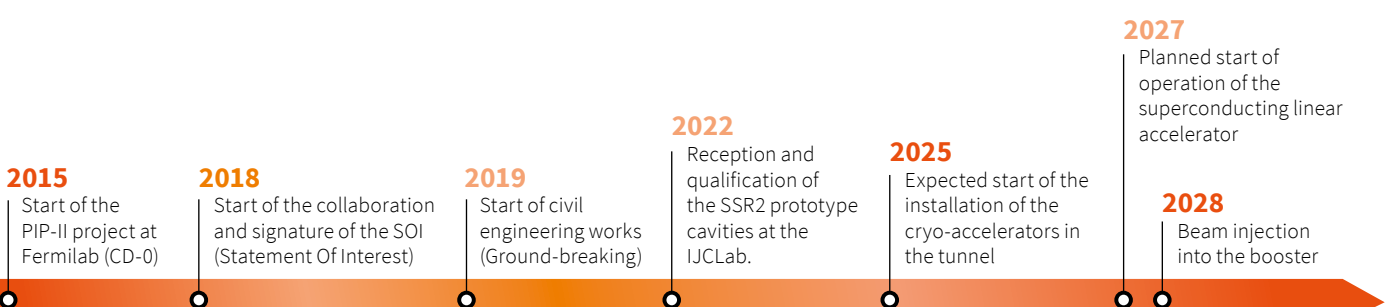
2027 first beam in the accelerator

IN2P3 CONTRIBUTIONS

- Participation in the development, construction and validation of 33 Spoke type superconducting accelerator cavities (SSR2).
- Construction of prototype components (power coupler and tuning system) in view of their qualification for series production.

OTHER FRENCH LABORATORIES INVOLVED

Irfu (CEA Saclay)



* Since 2018