

A medical and multi-disciplinary in-air transport beam life for the 70 MeV protons from the INFN-LNL cyclotron

Thanks to the expertise coming from over twenty years of dosimetric and clinical experience gained from operating the CATANA and zero-degree proton therapy beamlines at INFN-LNS, we propose the establishment of a multidisciplinary in-air irradiation facility at the newly operating INFN-LNL cyclotron, which can deliver protons with energies up to 70 MeV and currents ranging between 20 nA and 50 μ A. We propose the development of a dedicated in-air transport beamline. The beamline will incorporate systems for energy and fluence modulation, spatial distribution shaping, and extensive real-time, on-line monitoring systems for both relative and absolute dosimetry. A Geant4 simulation of the complete beamline will be also developed to be incorporated in the Geant4 official release and serving as an estimator of dose, fluence, LET and RBE in any experimental condition. Thanks to this beamline, the LNL facility will work as a sophisticated platform for conducting radiobiological experiments, medical physics research, and exploratory investigations into innovative FLASH radiation protocols. Through the establishment of this advanced infrastructure, INFN-LNL will enable pioneering multidisciplinary research, connecting fundamental science with clinical applications and fostering innovation in proton treatment techniques.

Primary author: PETRINGA, Giada (Istituto Nazionale di Fisica Nucleare)

Co-authors: SCIUTO, Alberto (Istituto Nazionale di Fisica Nucleare); CAMMARATA, Francesco (Istituto Nazionale di Fisica Nucleare); CUTTONE, Giacomo (Istituto Nazionale di Fisica Nucleare); CIRRONE, Giuseppe (Istituto Nazionale di Fisica Nucleare); RAFFAELE, Luigi (LNS); CATALANO, ROBERTO (Istituto Nazionale di Fisica Nucleare)

Session Classification: First session: Flash Therapy and Particle Therapy