

NEPTUNE

Nuclear process driven Enhancement of Proton Therapy Unraveled

Third Annual Meeting

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NEPTUNE Main Goal





SCIENTIFIC REPORTS

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First experimental proof of Proton Boron Capture Therapy (PBCT) to enhance protontherapy effectiveness

G. A. P. Cirrone [™], L. Manti, D. Margarone, G. Petringa, L. Giuffrida, A. Minopoli, A. Picciotto, G. Russo, F. Cammarata, P. Pisciotta, F. M. Perozziello, F. Romano, V. Marchese, G. Milluzzo, V. Scuderi, G. Cuttone & G. Korn

Scientific Reports 8, Article number: 1141 (2018) | Download Citation 🛓



NEPTUNE Structure

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Call-Project

Project duration: 3 years (2019-2021)

INFN Participant units: LNS,Roma3, Milano,LNL, Roma1,Pavia,Napoli,TIFPA,



Some Important Results

- **Molecula:** BPA was identified as best molecula in terms of toxicity and 11B concentration; F-BPA was recently syntetized and shown a low toxicity level inside the cells.
- Radiobiological experiments: different radiobiological endpoints (survival, ROS, chromosome aberrations, pathway repairs) with different incident proton energies (60 MeV and 150 MeV) and different LET (1 keV/um up to 20keV/um) was studied;
- Microdosimetric measurements: experimental campaigns were performed adopted 3 different detectors along the same SOBP adopted for the radiobiological experiments; New boron target was realized and adopted to estimates the alpha particles contribution
- **Neutron contamination:** the flux of neutron was experimentally evaluated;
- **Simulation:** the adopted experimental set-up was both simulated and LET, RBE estimation performed

Scientific production

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pВ

MAECI - Grande rivelanza project (2019-2021) melanoma cells PRIN - PBCT (2020-2023) in-vivo experiments

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Project Status - Third year

Deadline	Description	%
31/12	WP1 - Comparison between the simulations and experimental data taken by the WP4 (ROS, Foci, DSB, cell survival).	
31/12	WP1 - Comparison between the simulations and experimental data taken by the WP3	
31/12	WP2 - Optimization of sensitivity of 19-F MRI by means of hardware and software improvements	
31/12	WP3 - Microdosimetric spectra and scatter-plots with F loaded converts	?
31/12	WP4 - Confirmation of nuclear reaction-driven enhancement of proton biological effectiveness and identification of associated specific CL biomarkers. Elucidation of the underlying biophysical processes and role of bystander effect	
31/12	WP5 - Summary report of all experimental activities carried out by WP2, WP3, WP4	

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Next year

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- A project extension will be asked to the CSNV.
- All of the involved WPs have to finalize the experimental runs and data analysis.
- The pandemic situation has dramatically affected the entire project
- We have to perform all exp tests with F-BPA
- We have to extimate the toxicity of FDG
- We have to conclude all the microdosimetric measurements

=> A reallocation of travel funds will be asked.

=> The FTE from LNS will be reconfirmed