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From water radiolysis to hadrontherapy: Nanox a multi-scale model for biological effects

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Biological effects induced by ionization radiations is a complex function of many parameters. Some are related to the type of irradiated cells and their environment. Some others are related to the irradiation characteristics. While considering the specific case of swift ions, not only the dose of irradiation but also the ion charge, the ion energy, the irradiation temporal and spatial substructures need to be considered.

In 2008, at the shim conference [1], we presented the two track-structure models dedicated to the prediction of cell killing induced by ions and pointed out some of the conclusions we drew from a detailed analysis of these models. Based on these conclusions, we developed an alternative model: nanoxTM (NAdosimetry and Oxidative stress). The nanoxTM model takes as input dosimetry quantities at multi-scale, starting from nanoscale, but also the production of radicals induced by water radiolysis. The model will be presented along with first results.

[1] M. Beuve, A. Colliaux, D. Dabli, D. Dauvergne, B. Gervais, G. Montarou, E. Testa, Statistical effects of dose deposition in track-structure modelling of radiobiology efficiency, Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, Volume 267, Issue 6, March 2009, Pages 983-988

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