RACE: RAdiation resistance of Cancer CElls using GEANT4 DNA

**J-M. Chezal (1), E. Debiton (1) , F. Degoul (1), L. Maigne (2), E. Noirault (1), H. Payno (2), Y. Perrot (2), C. Peyrode (1)**

(1)UMR 990 - 58, rue Montalembert, BP 184, 63005 Clermont-Ferrand

(2)CNRS/IN2P3, UMR6533, LPC, 63177 Aubière, France, Clermont Université, Université Blaise Pascal, LPC, BP 10448, 63000 Clermont-Ferrand, France

In the RACE project, we want to develop an accurate comparison between in silico and in vitro analysis to better quantify the effect of radiations on cancer human cells. This study is specifically focused on in vitro evaluation of radiation damages on 3D melanoma and chondrosarcoma human cells coupled with gadolinium nanoparticles to improve cancer treatment by radiation therapy. 3D cultured cells will be irradiated using a self-contained X-ray system X-RAD 320 delivering a precise radiation dosage (from 1 to 10 Gy). In order to achieve cell population modeling, the CPOP++ program, an open-source and C++ cross-platform, is being developed for the geometrical representation of 2D and 3D cell populations including a specific cell mesh coupled with a multi-agent system. Physical and radiochemical processes from Geant4-DNA are used to simulate the interactions of particles with cell cultures using or not gadolinium nanoparticles. Cluster ionizations will be then quantified and compared to foci produced by fluorescence microscopy.