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Irradiation of cell cultures with laser-generated protons and X-rays

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Laser-based particle sources allow for investigating biological effects of radiation at high instantaneous dose rates. We have run two experiments including the irradiation of monolayer cell cultures at total dose values of 3-12 Gy.
At the Laser Laboratory for Acceleration and Applications (L2A2) an X-ray source driven by a 35 fs pulsed laser with 1 mJ pulse energy at 1 kHz shot rate, focalized on a rotating copper plate, generates bremsstrahlung up to some tens of keV. It has been applied to 36 cell samples with a dose rate of about 100 mGy/s. An ionization chamber has been implemented for real-time dose control.
At the VEGA-3 laser of CLPU (1 PW, 27 J at 1 Hz pulse rate), a proton source developed by IGFAE has been combined with a magnetic energy selector from i3M to obtain a quasi-monoenergetic, 5 MeV beam which was guided through a thin vacuum window. Here, 27 cell samples have been exposed to proton pulses. For both campaigns, biological samples were prepared and analysed by local collaborators (IDIS, IBFG).

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