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# Dosimetry of laser-accelerated carbon ions for cell irradiation at ultra-high dose rate

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Charged particle radiotherapy is nowadays used in an increasing number of centres worldwide.
In particular, carbon ions have shown many advantages for the treatment of radioresistant tumours, thanks to their higher Linear Energy Transfer (LET) and Relative Biological Effectiveness (RBE).
The complexity of the conventional carbon therapy facilities has stimulated the investigation of alternative acceleration approaches such as the processes based on high-power laser interaction with solid targets.
Particularly, recent results demonstrating Radiation Pressure Acceleration (RPA) of carbon ions allowed us to investigate for the first time the biological effects of carbon ions at ultra-high dose-rate (109-1010 Gy/s) using the GEMINI laser system at Rutherford Appleton Laboratory (RAL).
Carbon ions up to 20 MeV/u were accelerated from ultrathin (10-20 nm) carbon foils and energy selected by a magnet allowing to irradiate the cells with an average carbon energy of 10 MeV/u +- 10%.
A new dosimetry approach was required based on the use of unlaminated EBT3 Radiochromic films, specifically designed for these low-energy ions and calibrated using an innovative procedure. The details of the dosimetry procedure and the outcomes of the experiment will be presented in this contribution.

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