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The cell proton irradiation facility at Oslo University

Department of Physics at University of Oslo operates a MC-35 cyclotron (Scanditronix AB in Uppsala, Sweden), which includes a cell irradiation set-up with an adjacent cell laboratory.
The cyclotron accelerates 1H+(8 – 35 MeV), 2H+ (4 – 18 MeV), 3He2+ (6 – 47 MeV), and 4He2+ (8 – 35 MeV). For cell irradiation, only protons of 15 MeV have so far been used. A 50 µm W foil scatters the beam to give 90% dose homogeneity over a 3.5 cm cell dish in the distance of about 1 m. The proton fluence is measured by a transmission ion chamber and calibrated for each position in the Bragg peak to dose measurements by a Marcus chamber. The proton fluence readings are used to determine the dose for each irradiation. GRID irradiation is done with steel GRID collimators using Gafchromic EBT3 films to map the relative dose distribution. Dose rates can be obtained from about 0.1 to at least 100 Gy/s.
The cell irradiation set-up includes a cell dish holder kept at 37℃, which can be slowly rotated to avoid liquid build up in the bottom of the dish. Custom made GRID collimators with different GRID patterns can be inserted into the holder in front of the cell dish. Similar GRID collimators in tungsten have been made for X-ray reference irradiation with our Precision 225 kV X-ray system.
The cell lab is equipped with an Attune flow cytometer, equipment for EPR spectroscopy, and Ruskinn glovebox hypoxia workstations including microsensors for on-line pericellular oxygen detection.
A new proton therapy center (Varian) will open at Oslo University Hospital at the end of 2024. A dedicated research beam line with options for both horizontal and vertical irradiation and adjacent cell and animal laboratories will be in operation from 2025. The animal facility will include stalling, animal MRI, CT and an X-ray system for reference irradiation.

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