DESIGN STUDY OF AN INNOVATIVE STRIPPING EXTRACTION SYSTEM FOR HIGH INTENSITY CYCLOTRONS

Medical isotopes can be used for both diagnostics and treatment of cancer. IBA is the world-leader in the manufacturing of cyclotrons for medical radioisotope production. The cyclotron accelerates particle beams to high energy and intensity. After extraction from the cyclotron, these beams are directed towards an isotope production target. The beam extraction element is one of the key sub-systems of a cyclotron. One smart way of extraction is the so-called stripping extraction where negative hydrogen (H^-: a proton with two electrons) ions are accelerated. When the required beam energy is obtained, the two electrons are removed from the H^- by passing the beam through a thin carbon stripping foil. Then the curvature of the accelerated beam suddenly changes sign and protons naturally exit from the cyclotron (beam extraction). The stripping foil is a fragile element with limited life-time due to extreme foil heating and sublimation. An improved and innovative extraction method has been conceived where the foil heating may be substantially reduced by placing it inside of a magnetic element which serves to remove the source of heating (the two stripped electrons) away from the foil. The student is challenged to do a design study of this magnetic element and validating the new method. For this purpose, a commercial suite of a 3D finite element electro-magnetic design package is available in our group, as well as in-house software for tracking particle beams in 3D electro-magnetic fields.