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IONIZATION DOSIMETRY PRINCIPLES FOR CONVENTIONAL AND LASER-DRIVEN CLINICAL PARTICLE BEAMS

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In this paper after mentioning the clinical radiation fields of 20 keV–450 MeV/u, they are characterized by the number of particles and their energy. Particle energy is the quantity that determines radiation penetration at the depth at which the tumor is situated. The number of particles (or beam intensity) is the second major quantity that assures the administration of the absorbed dose in the tumor. The first application shows the radiation levels planned for various radiation fields. Prior to interacting with the medium, the intensity (or energy fluence rate) allows the determination of energy density, energy, power and relativistic force. In the interaction process, it determines the absorbed dose, kerma and exposure. Non-ionizing radiations in the EM spectrum are used as negative energy waves to accelerate particles loaded into special installations called particle accelerators. The particles extracted from the accelerator are the source of the corpuscular radiation for high-energy radiotherapy. Of these, light particle beams (electrons and photons) for radiotherapy are generated by betatron, linac and microtron, and heavy particle beams (protons and heavy ions) are generated by cyclotron, isochronous cyclotron, synchrocyclotron and synchrotron. The ionization dosimetry method used is the ionization chamber for both indirectly ionizing radiation (photons and neutrons) and for directly ionizing radiation (electrons, protons and carbon ions). Because the necessary energies for hadrons therapy are relatively high, 50–250 MeV for protons and 100–450 MeV/u for carbon ions, the alternative to replace non-ionizing radiation with relativistic laser radiation for generating clinical corpuscular radiation through radiation pressure acceleration mechanism (RPA) is presented.

Biography

Florea Scarlat has completed his graduation as a Physicist Engineer from the Faculty of Electronics and Telecommunications at the Polytechnic University of Bucharest, Romania. Later on he obtained his PhD in Nuclear Techniques at the Institute of Atomic Physics of the State Committee for Nuclear Energy with subjects “Contributions to the development of the magnetic induction electron circular accelerator for radiotherapy use”. He was the Scientific Director at the Institute of Physics and Nuclear Engineering Bucharest, Magurele and Director of the Romanian-English joint venture GEC Romanian Nuclear Limited, Leicester, England. Then he was a fulltime Professor of Physics at Valahia State University of Targoviste. He was elected Member of the New York Academy of Sciences and Corresponding Member of the Romanian-American Academy. Presently, he is a Consultant Manager at STARDOOR Laboratory at the National Institute for Lasers, Plasma and Radiation Physics, Magurele.

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