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Verifying the Performance of the Argon-41 Monitoring System from Fluorine-18 Production for Medical Applications

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Abstract : The aim of this work is to characterize, from radiation protection point of view, the emission into the environment of air contaminated by argon-41. In this research work, 41Ar is produced by a TR19PET cyclotron, operated at 19 MeV, installed at 'A. Gemelli' University Hospital, Rome, Italy, for fluorine-18 production. The production rate of 41Ar has been calculated on the basis of the scheduled operation cycles of the cyclotron and by utilising proper production algorithms. Then extensive Monte Carlo calculations, carried out by MCNP code, have allowed to determine the absolute detection efficiency to 41Ar gamma rays of a Geiger Muller detector placed in the terminal part of the chimney. Results showed unsatisfactory detection efficiency values and the need for integrating the detection system with more efficient detectors.

Keywords : Cyclotron, Geiger Muller detector, MCNPX, argon-41, emission of radioactive gas, detection efficiency determination
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