

Estimation of deposition positions of alpha-emitters in the body by L X-ray analysis/LX 線解析によるアルファ線放出核種の体内沈着位置の推定

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In the case of accidents involving inhalation of radioactive materials, there is a need for rapid evaluation of the amount of transuranium (TRU) nuclides such as Pu ingested in the body by measurement from outside of the body. In the measurement, L X-rays, which have energies of 10 to 30 keV and are emitted by internal conversion electrons due to α -decay, are used. In order to measure the L X-ray energy spectrum of TRU, the use of a transition edge sensor (TES)-type microcalorimeter with an energy resolution of less than 100 eV is being considered. It is because each daughter nuclide emits a couple of L X-rays between 10 to 30 keV. In this case, the attenuation of L X-rays in body tissues must be taken into account, and information on the position of deposition in the lungs is important. The deposition positions of α -emitters are estimated by the radiation transport code PHITS with a tetrahedral mesh phantom model published by ICRP and a TES-type microcalorimeter using a Sn absorber. The energy spectra deposited to the absorber are calculated. As a result, it was found that the deposition position in the lung was estimated from the intensity ratio of each L X-ray peak in the energy spectrum.

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