

PTB DOS-2005 – An electronic personal dosimeter for high-energy neutrons

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At high-energy accelerators and inside the ISS space station the neutron spectra contributing to dose equivalent are peaked at two energies (around 1 MeV and around 100 MeV) with different relative contributions to dose equivalent dependent on the amount of shielding.

The neutron dose equivalent response for neutron energies up to 60 MeV has been determined for the electronic personal dosimeter prototype PTB DOS-2002 and also for the commercially available dosimeters Thermo Electron EPD-N2 and Aloka PDM-313. All dosimeters show a too high dose equivalent response (about a factor of 10) at 60 MeV, whereas the response at 1 MeV is about a factor 5 too low. These significant over-readings and under-readings, just in the peak regions of the neutron spectrum contributing to dose equivalent, are not satisfactory, even if the readings can in principle be corrected using workplace dependent pre-information of the spectrum derived from calculations and measurements.

A new dosimeter with much flatter energy dependence of the dose equivalent response for neutrons – now called PTB DOS-2005 – has been set up by changing the detector, the converters and the thresholds of the PTB DOS-2002. The flatter response is mainly achieved by using a detector with thinner effective thickness and by setting the low energy threshold for the detected pulse height signals at 200 keV. First results of the dose equivalent response are shown.