Statement on the ICRU proposed operational quantities

The proposed set of redefined operational quantities has been introduced to achieve an optimised estimate of the corresponding protection quantities. These redefined quantities are closer to the protection quantities than the current operational quantities due to their mathematical definition. However, the current protection quantities are based on a physical model of measurement and therefore include a concept for the design of suitable dosemeters. Derived from this concept a huge number (some millions) of accepted and approved dosemeters are in use for radiation monitoring all over the world. Although the current concept has been defined about 30 years ago, during this time these operational quantities have been well established in legislation and standardisation. The application of this concept is now well working in radiation monitoring for the controlling of limits and optimisation of radiation safety. Yet, this process is not even finished for some applications – e.g. authorised experts for X-ray installations still claim $H^*(10)$ doserate-meters for their official approval measurements. Therefore, performing major amendments to the system of operational quantities before the previous changes have been completely implemented on the operational, technical level does not serve as an improvement for the radiation protection community.

The proposed quantities bear the risk of losing a well performing system in radiation protection by demanding a revision or even substitution of current dosemeters without improving radiation safety. Especially the change of conversion coefficients below 70 keV could result in the need of new dosemeter designs. Most of the medical personnel working within this X-ray energy range are equipped with simple passive dosemeters that guarantee a wide range monitoring and therefore high standard of radiation safety. These users comprise a substantial amount of all monitored personnel. Additional costs will arise due to more sophisticated dosemeter designs or investments in new dosemeter systems. Customers obliged to radiation monitoring would have to bear these costs without receiving improvements in radiation protection. Furthermore, this could result in a loss of monitored persons and therefore a declining quality in radiation protection.

The benefit of the proposed quantities for radiation protection would be a better conformity between operational and protection quantities in the lower X-ray region (overestimation for $H_p(10)$ and $H^*(10)$) and for higher photon energies (underestimation for $H^*(10)$).However, this benefit is rather small with regard to the purpose of radiation protection and the cost-performance ratio of this proposal has not been assessed so far.

The overestimation of $H_p(10)$ in the field of low energy photon applications such as X-ray diagnostics and therapy is not a real problem in routine radiation monitoring. Quite the contrary, a conservative estimation of radiation exposures is mandatory for the concept of radiation protection.
X-ray applications play the largest part in routine dose monitoring, and most of the monthly measured doses are close to zero. In this dose region, monitoring is primarily about optimisation in radiation protection; hence it is important that the operational quantities are sensitive to small relative changes of dose vales. An overestimation in the operational quantities is actually helpful to establish this sensitivity. If in rare cases the dose exceeds limits, calculations are mandatory in any case to take into account all circumstances of the exposure situation.

The underestimation of $H_p(10)$ and $H^*(10)$ for photon energies above 4 MeV affects only very few workers, monitored in this kind of radiation fields. The application of correction factors could be a reasonable solution to this problem.

Up to now it remains an open question if new dosemeter designs can be realised with this redefined set of quantities. Even if there are possible new designs, it is unclear which efforts have to be made to realise them. Therefore, it is extremely important to address the upcoming costs and the relation to the benefits for radiation protection *before* redefined quantities would be introduced. We expect the benefit for radiation safety to be rather small, compared to a cost estimate of world-wide more than 100 Mio. Euro. We therefore strongly recommend to stay with the current operational quantities.

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