New H*(10)- Environmental Dosimeter

The Gamma-Sphere from Solid-State-Dosimetry-Laboratory of Research Center Karlsruhe, Institute of Radiology

Introduction

The environmental equivalent dose is intended to serve as a good approximation for an effective dose for a person who is positioned facing any direction within measuring range of the radiation field. In contrast to the old open-air-area-dose-measured-quantity H_x there is now the environmental-equivalent-dose *H*(10)*, defined on a phantom at 10 mm depth in the ICRU-sphere (International Commission on Radiation Units and Measurement).

Therefore, the previous H_x-photon-area-dosimeters are not or are only partly usable for measurement the new measured-quantity *H*(10)*. *H*(10)*-area-dosimeters should indicate the equivalent dose of penetrating radiation above 15 keV.

Materials and methods

Solid-State-Dosimetry-Laboratory use for measurement of photon radiation LiF: Mg, Ti (MTS-700) thermoluminescent detectors. TLD-700 without dosimeter-case shows *H*(10)* incorrectly.
Figure 1 shows the results of irradiation of various materials. Al- and Cu-covers show too low responsivity of $R_{H^*(10)}$ in the lower energy range, PE with PVC shows a good $R_{H^*(10)}$.

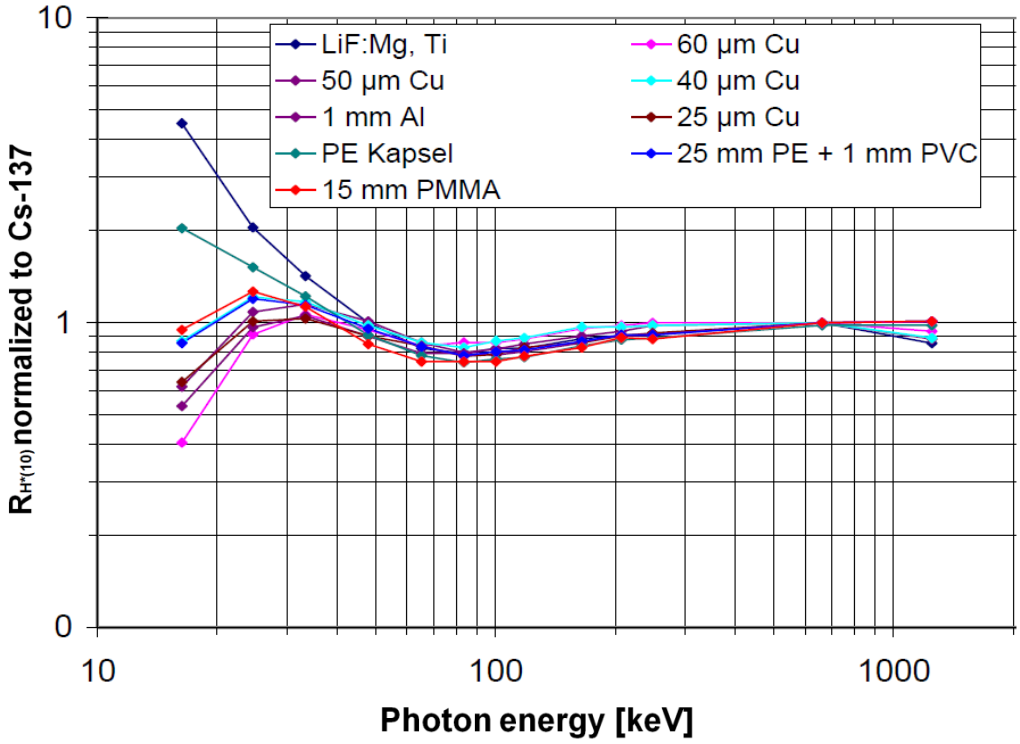


Figure 1: *H*(10)* responsivity of TLD-700 in different materials with variable thickness.

PMMA with a thickness of 15 mm is quite suitable as a stand-alone material. The over-response compared to TLD without a filter (blue curve LiF: Mg, Ti in Figure 1) is significantly reduced. The resulting *H*(10)*-response of TLD in a PMMA-sphere with 16 mm wall thickness is shown in Figure 2.

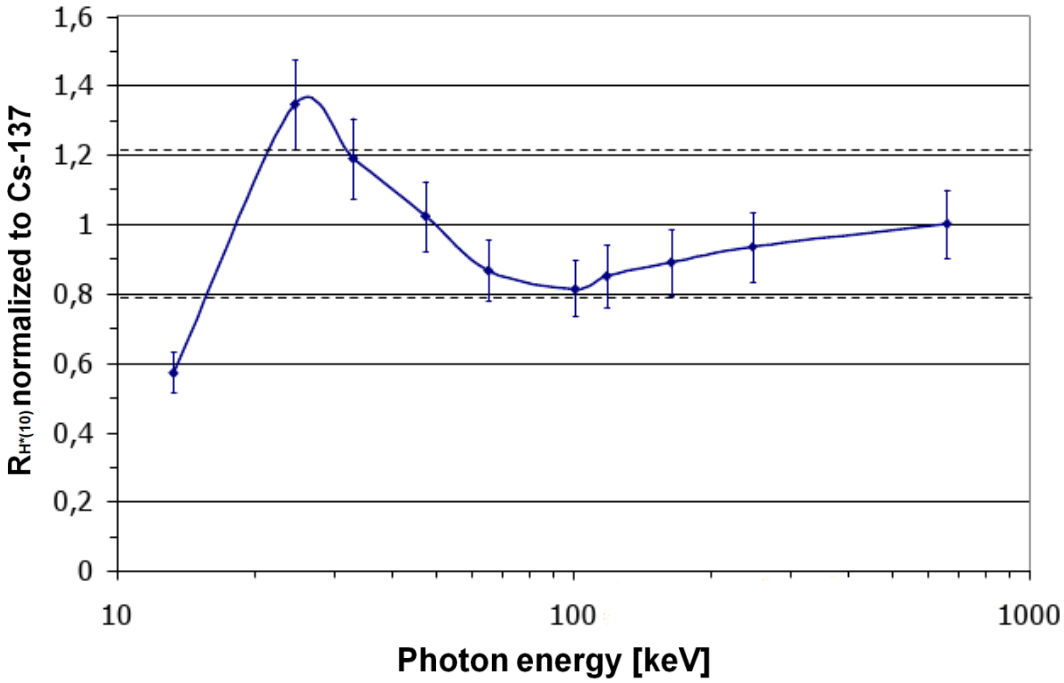
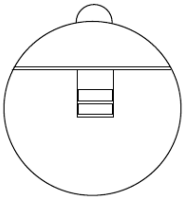


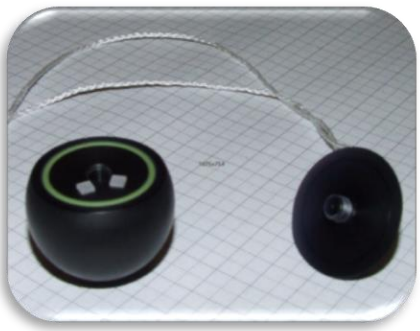
Figure 2: Energy responsivity of the *H*(10)* gamma-sphere

The subdivision into a smaller spherical cap and larger spherical segment, with seal and thread, allows it to insert two MTS-700 chips in a 5 mm hole.

Product Specification

Type of radiation:	Gamma- and X-rays
Measured-quantity:	Environmental-equivalent-dose *H*(10)*
Material:	PMMA (polymethyl methacrylate)
Dimensions:	Ø35mm
Weight:	27g
Detector:	^{7}LiF:Mg;Ti (MTS-700)
Measurement range:	0,05 mSv to 10 Sv
Nominal ranges:	Photon energy: 15 keV to 7 MeV Temperature: -10°C to 40°C Humidity: 10% to 90%
Variation coefficient of the dose results:	< 3%
Linearity deviation:	< 5%
Other types of radiation:	Neutron- and β-rays insensitive
Exposure duration:	up to 1 year





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