NOVEL REFERENCE FIELD FOR PULSED PHOTON RADIATION FOR RESEARCH AND TYPE TESTING

J. Klammer, O. Hupe and J. Roth
Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany

Introduction

The application of pulsed radiation fields for medical investigations has increased remarkably in the last years. But until today, radiation protection dosemeters have only been tested in continuous fields, as shown by Ankerhold et al.. The characteristics of dosemeters determined in continuous fields cannot be transferred to those in pulsed radiation fields. Therefore, a reference field for pulsed radiation is needed. Such novel X-ray equipment has been installed at PTB for research and type testing of personal and area dosemeters (Klammer et al.).

References:


Properties of the new X-ray equipment for pulsed photon radiation

All relevant field parameters, like pulse duration, tube voltage, and current can be varied independently with small uncertainty.

- **Tube voltage** $U_{\text{tube}}$: 40 kV to 125 kV
- **Tube current** $I_{\text{tube}}$: 0.5 mA to 800 mA
- **Radiation pulse duration** $t_{\text{pulse}}$: 0.2 ms to cw
- **Max. el. power**: 80 kW for 300 ms, 3 kW for cw
- **Pulse repetition frequency** $f_{\text{pulse}}$: 0.1 Hz to 100 Hz
- **Radiation qualities**: N-series, RQR-series
- **Dose per radiation pulse**: 100 nSv to 300 mSv ($H_{\text{(10)}}$
- **Radiation pulse dose rate**: 4 mSv/h to 3700 Sv/h ($H_{\text{(10)}}$
- **Field size**: 5.5 cm to 52.5 cm

**Measurement equipment for characterization**

- Additional external high voltage divider and voltmeter for measurement
- Traceable to primary standards
- Monitoring ion chamber for measurement of dose per pulse
- Monitoring diode for measurement of pulse shape

**Dose rate distribution due to the Heel effect**

Field distribution measured for a RQR2 radiation quality using an image plate (type: BAS-MS2040 by Fujifilm).

**Personal dosemeters in pulsed radiation fields**

The response of two different personal dosemeters has been tested at the novel equipment for pulsed photon radiation for single pulses with constant dose per pulse but increasing dose rate.

**Status**

- The novel equipment for pulsed photon radiation has been installed at the PTB, characterized and is now ready to use.
- The capability to measure under pulsed conditions has been tested with active dosemeters of different measuring principles.
- IEC Technical specification IEC 62743 TS Ed.1 - see poster by Hayo Zutz

**Contact**

Physikalisch-Technische Bundesanstalt (PTB)
Dr. Jana Klammer
Department 6.3 “Radiation Protection Dosimetry”
Bundesallee 100, 38116 Braunschweig, Germany
phone: +49 531 592 6319
e-mail: jana.klammer@ptb.de