The Gamma Cube

Published date: Aug. 24, 2012

Technology description

Summary

This invention is a sensor for the detection of gamma rays doses over a wide range in real time. The small and compact design, plus a user-friendly handling and connectivity to a PC via a USB interface are the special features of the gamma cube. The gamma radiation sensor of the cube is based on commercial radio chromium films whose responsivity is immune against disruptive subsurface neutron radiation and which do not depend on the incidence angle of gamma radiation.

Problem

In many areas of basic research and applied technology, exposure to radiation is a threat to both humans and electronic components and measuring equipments. On the other hand, an accurate and reliable gamma radiation dosimeter is necessary in the field of radiation therapy for the detection of the gamma dose at the site of a malignant tumor. It is known that a high-energy electron accelerator driven free-electron laser (FEL) such as FLASH (Free Electron Laser in Hamburg) and XFEL (X-Ray Free Electron Laser) and the synchrotron light sources such as HASYLAB at DESY and PETRA III as well as the medical linear accelerator (linac Medical) located in hospitals are operated in pulse mode. Gamma detectors (dosimeters) with conventional detection electronics are not suited for pulsed radiation fields. This enables a highly versatile use of the gamma cube in accelerator radiation protection.

Innovation

Semiconductor gamma detectors such as RADFET (Radiation Field Effect Transistor) are nowadays being used worldwide in high-energy accelerators. Instead of using RADFET, the gamma cube uses commercial radio chromium films and works with the innovative “differential methods of measurement”, which results in the following advantages: (a) independence from temperature, (b) automatic compensation of radiation damage in the measuring circuit, (c) measurement in real time, (d) capability of networking several Gamma Cubes (e) low-voltage operation (at 9V), (f) very low costs.

Advantages

Fields of application for the Gamma Cube are : (a) dosimetry and measurement of the gamma radiation in a high-energy accelerator (b) gamma dosimetry at the medical linear accelerator (radiotherapy).

Institution

DESY Deutsches Elektronen-Synchrotron