

## 9. DEPARTMENT OF RADIATION DETECTORS



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### Overview

Work carried out in 1996 in the Department of Radiation Detectors concentrated on three subjects: (i) Semiconductor Detectors (ii) X-ray Tube Generators (iii) Material Modification Using Ion and Plasma Beams.

#### SEMICONDUCTOR DETECTORS

Semiconductor detectors of ionizing radiation are among the basic tools utilized in such fields of *research and industry as nuclear physics, high energy physics, medical radiotherapy (oncology), radiological protection, environmental monitoring, energy dispersive X-ray fluorescence non-destructive analysis of chemical composition, the nuclear power industry.*

The Departmental objectives are:

- a search for new types of detectors
- adapting modern technologies (especially of industrial microelectronics) to detector manufacturing
- producing unique detectors tailored for physics experiments
- manufacturing standard detectors for radiation measuring instruments.

These objectives were accomplished in 1996 by:

- research on unique detectors for nuclear physics (e.g. a spherical set of particle detectors "silicon ball", detectors for particle identification)
- development of technology of high-resistivity silicon detectors HRSi (grant proposal)
- development of thermoelectric cooling systems (grant proposal)
- research on p-i-n photodiode-based personal dosimeters
- study of applicability of industrial planar technology in producing detectors
- manufacturing detectors developed in previous years
- re-generating and servicing customer detectors of various origin.

In accomplishing the above, the Department cooperated with groups of physicists from SINS P-I and P-II Departments, Warsaw University, Warsaw Heavy Ion Laboratory and with some technology Institutes based in Warsaw (ITME, ITE). Some detectors and services have been delivered to customers on a commercial basis.

#### X-RAY TUBE GENERATORS

The Department conducts research on the design and technology involved in producing X-ray generators based on X-ray tubes of special construction. Various tube models and their power supplies were developed. Some work has also been devoted to the detection and dosimetry of X-rays.

X-ray tube generators are applied to non-destructive testing and are components of analytical systems such as:

- X-ray fluorescence chemical composition analysis
- gauges of layer thickness and composition
- stress measurements
- on-line control of processes
- others where an X-ray tube may replace a radio-isotope source.

In 1996, the Department:

- reviewed the domestic demand for X-ray generators
- developed an X-ray generator for diagnosis of osteoporosis of human limbs
- prepared a grant proposal for the development of a new instrument for radiotherapy, the so-called needle-like X-ray tube.

In accomplishing the above, the Department cooperated with the Institute of Physics of the Jagiellonian University in Cracow and with Polon IZOT and Dora Power Systems companies.

#### MATERIAL MODIFICATION USING ION AND PLASMA BEAMS

See Chapter PLASMA AND ION TECHNOLOGY IN SURFACE ENGINEERING of this Review.