Technology for Contactless Dosimetry / Fluxmetry of Ionising Radiations

Vilnius University

SUMMARY

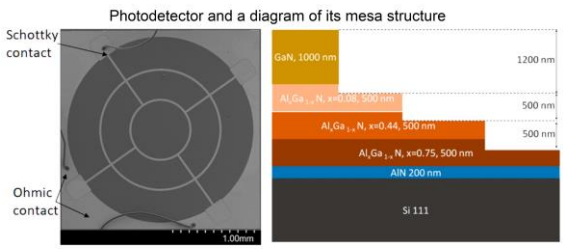
Vilnius University offers a contactless and *in situ* continuous dosimetry / fluxmetry system for ionizing radiation detection. A single device measures a very wide range or radiation and is suitable for large area radiation control in radiation research centres, nuclear energy related facilities and specific medical purposes.

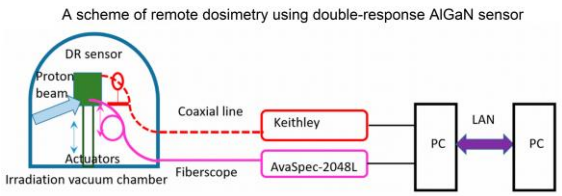
BACKGROUND

Nowadays radiation technologies are more often used in R&D, e.g. in optimisation of specific parameters of electronic devices, modification of electrical characteristics of layered structures, medical diagnostics and therapy, etc. Exploitation of nuclear power plants, particle accelerators and spallators needs precise and *in situ* dosimetry monitoring. Application of radiation technologies requires strict monitoring and control of irradiance. Most radiation sources emit different types of particles and rays. Thus, a large collection of expensive dosimeters is necessary for comprehensive monitoring of radiation facilities.

TECHNOLOGY

The proposed technology involves dosimetry system for comprehensive and simultaneous evaluation of several components of irradiation spectrum and doses, and is based on combined radiation sensors and fluence readers [1]. The combined sensors are selectively sensitive to definite types of radiations. The combined readers for these tandem/triplex sensors are based on simultaneous measurements of the ESR, luminescence and microwave probed photoconductivity parameters being directly dependent on irradiation dose. The prototype dosimetry system is devoted to reading of big amount of combined sensors by contactless techniques, based on ESR and luminescence spectroscopy together with microwave probed photoconductivity transients. The dosimetry system enables monitoring of large areas at particle accelerators, nuclear waste storages and so on. On the other hand, the proposed dosimetry system has rather high spatial precision (of 5-500 mkm) for dose cross-sectional distribution within sensors, thereby being suitable for medical diagnostics and therapy and beam profiling in particle accelerator systems. This system is also suitable for remote and *in situ* monitoring of harsh areas of irradiation facilities, as it enables measurements of exceptionally high fluences.





TECHNOLOGY READINESS LEVEL

TRL 3 – experimental proof of concept. TRL 4-5 (validation in lab and relevant environment) is under development.

INTELLECTUAL PROPERTY

Invented in Vilnius University by: E. Gaubas, T. Čeponis, J. Pavlov, V. Rumbauskas, L. Deveikis, K. Pūkas.

PUBLICATIONS

[1] T. Čeponis *et al*. Evolution of Scintillation and Electrical Characteristics of AlGaN Double-Response Sensors During Proton Irradiation. Sensors 2019, 19(15), 3388. https://doi.org/10.3390/s19153388

BENEFITS

- A single device measures very wide range of radiation;
- High contactless detection speed;
- Possibility to measure *in situ* and remotely;
- Suitable for control of large radiation areas;
- High local resolution (5-500 mkm);
- High radiation hardness;
- Relatively cheaper than alternatives.

APPLICATION

Technology could be used in different areas, where fast detection of wide dose ranges of ionising radiation is needed:

- Particle accelerators;
- Irradiation facilities;
- Nuclear fuel and nuclear waste storage facilities;
- Medical centres of radiation diagnostics and therapy.

CONTACTS

Pavel Ragozin
Innovation Manager
E-mail: pavel.ragozin@cr.vu.lt
Phone No.: +370 5 236 6273

Vilnius University
Innovation Office
Saulėtekio av. 9, III building
Vilnius, LT-10222, Lithuania
E-mail: innovations@vu.lt
Phone No.: +370 5 236 6273
Web: www.vu.lt/en/business