Contribution ID: **84** Type: **Oral Presentation**

#10-84 Intelligent Dosimeter Plug for Endoscopic Sleeve in Critical Equipment Applications for Nuclear Industry

Friday, June 13, 2025 9:20 AM (20 minutes)

This paper presents a research project carried out as part of the BPI France udd@ORANO project to instrument the plug of a diagnostic sleeve with a fiber-optic dosimeter. These endoscope sleeves are used to insert tools for monitoring the ageing of the bowl of a decanter centrifuge used in ORANO's La Hague plant. The objectives of this study are the following: 1) to monitor the concerned industrial process via continuous dose rate monitoring (X-rays) within the facility. This will help optimize the cyclic cleaning phases; 2) to protect operators via knowledge of the residual dose rate before removing the plug from the sleeve. Both objectives can be achieved by measuring the dose rate in real time, which ranges between a maximum of 100 Gy/h during operation phases and a minimum of 1 Gy/h during shutdown. This was made possible by the use of two active fiber optic dosimeters based on the radioluminescence of silica-based probes, integrated into a functionalized or "intelligent"plug and then connected to an optimized acquisition chain. For the selected radioluminescent fibers, X-ray testing demonstrated that the measured radioluminescence is directly proportional to the dose rate to which the two radiation-sensitive silica-based optical fibers are exposed. We will first present the architecture chosen for the intelligent plug, as well as the acquisition chain developed by the consortium, from the fiber optic cable to the radiation detector. The sensor was first evaluated using the X-ray machines of Laboratoire Hubert Curien, then calibrated at a X-rays (Cs-137) facility at ORANO La Hague, and finally deployed on-site under operational conditions. The results of this calibration campaign will be analyzed, based on complementary Geant4 Monte Carlo simulations of the complete plug geometry and of the specific radiation environment. The on-site results from the intelligent plug will then be presented to demonstrate the strong capability of the developed sensor to monitor the dose rates associated to the various stages of the industrial process and to help the plant control. Finally, prospects for use of this type of instrumentation within nuclear facilities will be discussed.

Primary authors: GIRARD, Sylvain (Université Jean Monnet, Saint-Etienne, France); WENINGER, Luca (Université Jean Monnet); LEMIÈRE, Stéphane (ORANO); FRANCO, Sébastien (ORANO); HELEINE, Yannick (ORANO); TONDUT, Lionel (ORANO); ROUET, Pascal (ObdO); HAAS, Olivier (ObdO); SOSTERO, Lorenzo (Università degli Studi di Brescia); FRICANO, Fiammetta (Université Jean Monnet); MORANA, Adriana (Université Jean Monnet); FERRARI, Matteo (Université Jean Monnet); BERGONT, Mathieu (Exail); MACÉ, Jean-Reynald (ORANO)

Presenter: GIRARD, Sylvain (Université Jean Monnet, Saint-Etienne, France)

Session Classification: #10 - Current Trends in Development of Radiation Detectors

Track Classification: 10 Current Trends in Development of Radiation Detectors