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Upgrading the neutron radiography set-up at IFE in Kjeller, Norway

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S. Deledda(1), C. Prabhu (1), G. Helgesen (1), H.K. Jenssen (2)

1) Physics Department, Institute for Energy Technology, PO Box 40, NO-2027 Kjeller, Norway

2) Department of Nuclear Materials Technology, Institute for Energy Technology, PO Box 40, NO-2027 Kjeller, Norway

Email: stefano.deledda@ife.no

The JEEP II research reactor (2 MW thermal power) at the Institute for Energy Technology (IFE) in Kjeller (Norway) is presently the only neutron source in the Nordic Countries. A national infrastructure project, funded by Research Council of Norway, to upgrade the neutron scattering facilities, NeNeutron, is currently running (2016-2020). NeNeutron aims at establishing a neutron research and technology exchange center and being a Norwegian and regional home-laboratory in neutron-based science.

The upgrade of the facilities includes the reconstruction and modernization of the neutron radiography instrumentation which was built in the mid-1970s. The current setup is based on a traditional Dy-foil technique with a relatively high spatial resolution (40-50 μm), but with a low maximum number of recorded images per day and with a man-hour intensive image processing. The facility is presently dedicated to the analysis of post-irradiation examination data from safety and integrity tests of nuclear fuels performed within reactor safety research projects.

The neutron radiography upgrade, currently in the design phase, consists of three main tasks: (i) beam optimization (new sapphire filter, new aperture, and new in-pile collimator); (ii) modification of the current radiography cell, implementing different configurations for the analysis of radioactive and non-radioactive samples; (iii) installation of new sample stage and new digital neutron imaging detector.

The new neutron imaging instrument (NIMRA) is being designed to have an ratio of up to 300 and a FOV of $15 \times 15 \text{ cm}^2$. It will be intended for studying energy materials (e.g. hydrogen storage systems, Li-ion batteries, heat storage units) as well as flow in porous media (e.g. clays, concrete). However, applications within other material classes and systems will be actively pursued.

Author: Dr DELEDDA, Stefano (Institute for Energy Technology)

Presenter: Dr DELEDDA, Stefano (Institute for Energy Technology)

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