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Performance and resolution upgrade on DINGO at OPAL

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The neutron radiography / tomography / imaging instrument DINGO is operational since October 2014 to support research at ANSTO [1]. DINGO had a high subscription rate from a broad national and international scientific user community and for routine quality control for defense, industrial, cultural heritage and archaeology applications. DINGO provides a useful tool to give a different insight into objects because of different contrast compared to X-rays and high sensitivity to light elements. In the field of industrial application it has shown promising results for studying cracking and defects in concrete or other structural material. A major part of applications from both sides of the community, research and industrial user, was demanding the high resolution setup on DINGO. In the original design DINGO could provide a minimum pixel size of 27 μm . The neutron beam size can be adjusted to the sample size from 50 x 50 mm² to 200 x 200 mm² with a resulting pixel size from 27 μm to ~100 μm . The measured flux (using gold foil) at this high resolution setup for an L/D of approximately 1000 at HB-2 is $1.1 \cdot 10^7$ [n/cm²s], which is in a similar range to other facilities. Depending on the sample composition a full tomography has been taken in 24 – 36 hours with a 50 μm thin ZnS/6LiF-screen and the CCD (Andor IKON-L) camera. In a two stage upgrade the background radiation has been reduced by an additional slit system adjusting the beam size more flexible and further down to 0.5 x 0.5 mm². The new system allows minimizing the beam according to the sample size. In combination with the Andor IKON SCMOS and Kenko distance rings, to increase the focal length of the existing 100mm lens the pixel size was reduced to 7 μm . The scintillator was a 10 μm thick Gadox screen and for each projection we have taken 3 – 6 images for better white spot correction. We would like to present first radiography and tomography results using the new setup [2,3]. A full tomography under these conditions can be taken in 2 -4 days depending on the nature of the sample.

[1] Garbe, U; Randall, T; Hughes, C; Davidson, G; Pangelis, S and Kennedy, SJ (2015), A New Neutron Radiography / Tomography / Imaging Station DINGO at OPAL, Physics Procedia 69, 27-32.

[2] Peng, E; Wei, X; Garbe, U; Yu, D; Edouard, B; Liu, A and Ding, J, Robocasting of Dense Yttria-stabilized Zirconia Structures, J. Mater. Sci. 53(1), 247-273 (2018).

[3] Peng, E; Wei, X; Herng, TS; Garbe, U; Yu, D and Ding, J, Ferrite-based soft and hard magnetic structures by extrusion free-forming, RSC Adv. 7(43), 27128-27138 (2017)

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