Contribution ID : **156** Type : **Oral**

Performance and resolution upgrade on DINGO at OPAL

Tuesday, 4 September 2018 16:50 (20)

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 27µm to ~100µm. The measured flux (using gold foil) at this high resolution setup for an L/D of approximately 1000 at HB-2 is 1.1*107 [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-screnn and the CCD (Andor IKON-L) camera. In a two stage upgrade the background radiation has been reduce 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 reduce to 7µm. 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 on 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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Session Classification : Speaker Sessions and Seminars

Track Classification : Instrumentation