11th World Conference on Neutron Radiography
WCNR-11
2-7 September **2018** | Sydney, **Australia**

Contribution ID : **40**　　Type : **Oral**

HIGH RESOLUTION HIGH ENERGY NEUTRON COMPUTED TOMOGRAPHY AT LANSCE-WNR

Monday, 3 September 2018 14:10 (20)

It has long been recognized that neutrons can compliment x-rays for imaging. This is due to their very different attenuation characteristics based on nuclear cross-section, which allows imaging of low Z materials through higher Z materials. Additionally one can use energy dependent Time of Flight (ToF) imaging to exploit phenomenon like nuclear resonances for isotope and element specific imaging. The Los Alamos Neutron Science Center (LANSCE) accelerator is an 800 MeV proton linear accelerator which supplies protons to a range of missions including two spallation neutron targets, one moderated (water and liquid hydrogen) and one unmoderated. This combination of targets provides flight paths which have cold, thermal to epi-thermal and fast neutron energy ranges. In addition the proton pulse structure of the LANSCE accelerator provides neutron pulse lengths of < 270ns for the thermal/cold flight paths and < 1ns for the fast flight paths. These pulse lengths allow for energy discrimination from eV to ~100 MeV.
Over the last 6 years there has been significant renewed interest in utilizing this source for neutron imaging as a complement to existing x-ray and proton imaging capabilities at LANL. To this end thermal to epi-thermal integrated and ToF imaging (2D radiography and Computed Tomography or CT) have been established and cold neutron propogation based phase contrast imaging has been demonstrated. Finally, significant work has been put into developing a fast neutron imaging capability with the goal of reaching sub mm resolution on objects with an integrated density > 200 g/cm2 and a CT scan time of less than 12 hrs. Fast neutron imaging at high resolution is an area with relatively sparse development due to a lack of available high intensity sources. This talk focuses on advances made in fast neutron imaging at LANSCE-WNR over the last 4 years including flight path modifications, scintillator development and detector testing. Results are shown for a range of scintillators, flat panel detectors and lens coupled camera systems. In addition energy discriminating Time of Flight images from 2 to 60 MeV are shown. Imaging results are shown on imaging quality indicators, a range of industrial parts (cracking, casting voids, etc) and on fossils of various sizes. Where available x-ray CT results are shown on the same parts to demonstrate the pros and cons of fast neutron imaging. Finally, ongoing work and outlook for continued improvement in fast neutron imaging will be discussed.

Primary author(s) : HUNTER, James (Los Alamos National Lab); NELSON, Ronald (Los Alamos National Lab); ESPY, Michelle (Los Alamos National Lab); GAUTIER, Doald C. (Los Alamos National Lab); MADDEN, Amanda (Los Alamos National Lab); WINCH, Nicola (Los Alamos National Lab); SWIFT, Alicia (Y12 National Security Complex); EDWARD, Ray (AWE Aldermaston); AEDY, Chris (AWE Aldermaston); BAZIN, Nicholas James (AWE Aldermaston); ALDRICH-SMITH, Giles (AWE Aldermaston)

Presenter(s) : HUNTER, James (Los Alamos National Lab)

Session Classification : Speaker Sessions and Seminars

Track Classification : Methods