Contribution ID : **111** Type : **Oral**

Neutron Radiography at SARAF: from Reactor to Accelerator

Thursday, 6 September 2018 16:50 (20)

Soreq Applied Research Accelerator Facility (SARAF) will be a user facility for basic and applied nuclear physics, upon expected completion at the beginning of the next decade. SARAF is based on a 40 MeV, 5 mA CW proton/deuteron superconducting linear accelerator. A high intensity accelerator-based Thermal Neutron Source (TNS) will be a major application of SARAF within its higher goal to enhance and back-up Soreq IRR-1 5 MW nuclear research reactor, mainly for neutron imaging and neutron diffraction research. The current thermal neutron radiography system of IRR-1 was characterized at the imaging plane in order to determine the neutron flux, beam profile, cadmium ratio and gamma background. The image quality was examined based on American Society for Testing and Materials (ASTM) standards. The main characteristics found: neutron flux is 6-9×105 n/s/cm2 and cadmium ratio of 10-15, with collimation ratio (L/D) of 250. SARAF TNS is designated to provide an accelerator based neutron radiography system with equivalent or upgraded capabilities compared to IRR-1. The TNS will be based on a liquid lithium conversion target, generating a fast neutron yield of up to 2×1015 n/s when irradiated with a 40 MeV, 5 mA (0.2 MW) deuteron beam. The produced fast neutrons will be moderated to the thermal energy range by heavy water that surrounds the conversion target, along with a beryllium multiplier which enhances the number of neutrons, and a peripherals neutron reflector. Extraction tube toward the radiography systems will be positioned at backward angles with respect to the incident deuteron beam in order to diminish the contribution of fast neutrons. The dimensions of the moderator, multiplier and the tubes position are investigated by detailed Monte-Carlo simulations and a preliminary design of the radiography system has been established. The simulation results will be presented and they indicate that the neutron beam characteristics at the imaging plane will be improved compare to those of IRR-1 facility.

Primary author(s) : HALFON, Shlomi (Soreq NRC); Mr HERSHKO, Itzhak; Mr MISHNAYOT, Yonatan; Dr HIRSH, Tzviki; Dr AVIV, Ofer; Dr BERKOVITS, Dan; Mr BREITMAN, Dan; Dr DATZ, Hanan; Dr EISEN, Yosef; Mr ELDAD, Nissan; Dr FEINBERG , Gitai; Mr GOLDVARD, Ilan; Dr MOR, Ilan; Dr SILVERMAN, Ido; Mr YUNGRAIS, Zohar; Mr ZILKA , Eli

Presenter(s) : HALFON, Shlomi (Soreq NRC)

Session Classification : Speaker Sessions and Seminars

Track Classification : Instrumentation