

Development of Series Neutron Sources at FDS

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Abstract

Neutron sources are important for the R&D of advanced nuclear energy systems and extended nuclear technology applications. FDS Consortium has developed series neutron sources for different applications, including the Mini Neutron Generator MINEG, Compact Neutron Source CONEG, High Intensity Neutron Source HINEG and Volumetric Neutron Source VNEG.

MINEG, with minimal diameter of 26mm, has characteristics of high neutron yield, long service life, high temperature resistance, and good anti-vibration performance, and the pulse timing can be flexibly set. It has been applied in neutron logging, elements analysis of industrial materials, security inspection, etc.

Small Neutron Generator SNEG is DD/DT neutron source with characteristics of high neutron yield, long-life time, high safety and reliability, compact design, and movable. SNEG has extensive applications in neutron radiography, NAA for elements analysis, detector calibration, irradiation experiments, nuclear physics experiments, etc.

High Intensity Neutron Source (HINEG) comprises of three phases, HINEG-I, HINEG-II, and HINEG-III. HINEG-I, currently operational, is a D-T fusion neutron source with a remarkable yield of 6.4×10^{12} n/s. It has been integrated with the Lead-based Zero Power Reactor (CLEAR-0). Key experiments conducted at HINEG-I include performance assessments of shielding modules, measurements of neutron leakage spectra from lead and lead-bismuth, and irradiation damage evaluations on laser crystals. HINEG-II is a high-voltage electrostatic accelerator-based D-T neutron source with neutron yield over 10^{13} n/s, which is built in Chongqing, China. With development of target technology, ion injecting technology, accelerator technologies, etc., the assembly and commission of HINEG-II has been finished, the facility is open for experiments now.

Besides, a Gas-dynamic Trap (GDT) based Volumetric Fusion Neutron Source VNEG is designed. It can also be used as driver of fusion-fission hybrid system.

FDS offers an open platform for collaboration, inviting global partnerships and joint research initiatives in neutron source and applications.

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