Development of High Intensity D-T fusion NEutron Generator (HINEG)

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Fusion energy becomes essential to solve the energy problem with the increase of energy demands. Although the recent studies of fusion energy have demonstrated the feasibility of fusion power, it commonly realizes that more hard work is needed on neutronics and safety before real application of fusion energy. A high intensity D-T fusion neutron generator is keenly needed for the research and development (R&D) of fusion technology. However the intensity of D-T neutron generators currently on operation around the world is lower than 10^{13}n/s, which is severely restricting the research capability.

The Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences (CAS) has launched the High Intensity fusion NEutron Generator (HINEG) project to develop an accelerator-based D-T fusion neutron generator with the neutron yield higher than 10^{14}~10^{15} n/s. The R&D of HINEG includes two phases: HINEG-I and HINEG-II. HINEG-I, which is designed to generate both the steady beam and pulsed beam, has been completed and commissioning since the end of 2015 with the D-T fusion neutron yield of up to 10^{12} n/s. HINEG-II aims at a high neutron yield of 10^{14}~10^{15} n/s neutrons via high speed rotating tritium target system and high intensity ion source. HINEG can be used for research of fusion nuclear technology and safety including the validation of neutronics method and software, radiation shielding and protection, mechanism of materials activation and radiation damage as well as neutronics performance of components. Its application can also be extended to nuclear medicine, radiotherapy, neutron imaging and other

nuclear technology applications. This contribution will summarize all the latest progress and future plans for the R&D of HINEG.