Contribution ID: **1252** Type: **not specified**

P3.205 Physical design of GDT-based fusion neutron source with 2-3 folds increase of Q

Wednesday, 19 September 2018 11:00 (2 hours)

Gas Dynamic Trap (GDT) is very attractive as a kind of fusion neutron source for testing fusion materials and components as well as driving fusion-fission hybrid reactor due to its linear and compact structure, low physics and technology requirement, relatively low cost and tritium consumption. These years, the conceptual designs of GDT-based neuron source for above two purposes, named FDS-GDT, have been proposed as a candidate of fusion neutron source by Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences • FDS Team in China. However, the fusion energy gains (Q) in current designs are still lower than 0.05.

In order to improve the Q and reduce the technology requirements of magnet and neutral beam injection (NBI) for GDT based fusion neutron source, a new method was proposed that using high field neutral beam injection (HFNBI) to replace the neutral beams obliquely injected at middle plane of GDT where the field is minimal. This method will benefit for confining higher density of fast ions at the turning point in the zone with a higher magnetic field, as well as getting higher mirror ratio by reducing mid-plane field rather than increasing the mirror field. The preliminary analysis with system code SYSCODE indicates that the fusion energy gain can be improved 2-3 folds.

With HFNBI method, two designs of GDT-based fusion neutron source (FDS-GDT) were updated, one is for testing fusion materials and components with 2.57MW of fusion power, 2MW/m2 of neutron flux density and 0.13 of Q, and the other is for driving fusion-fission hybrid reactor with 14.72 MW of fusion power and 0.16 of Q. Further detailed simulation will be carried out to optimize and verify the designs by 3D Monte-Carlo simulation code MCFIT and bounce-averaged simulation code DOL developed by Budker Institute of Nuclear Physics (BINP), Russia.

Presenter: CHEN, Dehong (Key Laboratory of Neutronics and Radiation Safety Institute of Nuclear Energy Safety Technology Chinese Academy of Sciences)

Session Classification: P3