Design Progress of Gas Dynamic Trap Based Fusion Neutron Source in China

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The Gas Dynamic Trap (GDT) is a kind of axisymmetric standard simple mirror that its length of plasma is larger than mean free path of electrons. Oblique injection neutral beams are used to fuel and sustain energetic sloshing ion populations at the vicinity of turning points to make fusion reaction as a king of fusion neutron source. The plasma experiments on GDT at Budker Institute of Nuclear Physics at Novosibirsk, Russian federation have achieved the beta of 0.6, temperature of electron temperature of 250eV, which would make fusion power of MW magnitude. Comparing with other plasma-based fusion neutron sources, the GDT fusion neutron source is easier to reach steady state of plasma operation, the linear structure is relatively simple and compact, and its cost is relatively low because of the compact structure and modest tritium consumption without tritium breeding blankets. This concept as a candidate first plasma-based fusion nuclear facility (Fig.1.) are being developed by Institute of Nuclear Energy Safety Technology, Chinese Academy of Sciences/FDS Team in China, with aim of assisting future development of fusion nuclear science and technology, especially for testing and R&D of fusion material and plasma facing components.

In this contribution, the design progress of GDT based fusion neutron source was presented, including design parameter space optimization, confinement concept innovation, neutron shielding design, as well as the potential application strategy and feasibility, involving fusion material testing and fusion-fission hybrid system driver.

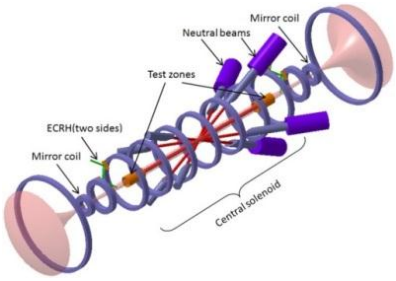

Fig. 1: a schematic of the concept of GDT fusion neutron source.

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