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First Operation on Inertial Electrostatic Confinement Fusion Device with Deuterium and Tritium Gas
トリチウムを用いた放電型プラズマ中性子源の基礎実験

Takuma Yoshida[1], Taiki Kajiwara[2], Kazuma Takaoka[1], Keita Kamakura[1], Hodaka Osawa[1], Kai Masuda[2] and Masami Ohnishi[1]
吉田拓真[1], 梶原泰樹[2], 高岡和摩[1], 鎌倉慶太[1], 大澤穂高[1], 増田開[2], 大西正視[1]

[1]*Kansai Univ. 3-3-35, Yamate-cho, Suita-shi, Osaka 564-8680, Japan*
[2] *Institute of Advanced Energy, Kyoto Univ.,Gokasho, Uji-sii, Kyoto611-0011, Japan*
[1]関西大学 〒564-8680 大阪府吹田市山手町3-3-35
[2]京都大学エネルギー理工学研究所 〒611-0011 京都府宇治市五ヶ庄

The Inertial Electrostatic Confinement Fusion (IECF) device is a portable neutron source in which the only deuterium gas is usually used. This study is aim to raise the neutron production rate using mixer gas tritium and deuterium. The tritium has about 200 times larger cross section of neutron production fusion than deuterium. The several pre-experiments and tests are performed with IECF250 device at Kyoto Univ. There are many law, rules and limitations of handling the tritium. The experimental parameter is determined within obeying these rules. The experiment using the tritium is now ready to operate, the first result will be shown at the poster session.

1. Introduction

Figure 1 shows the IECF device (IEC250) of Kyoto Univ. designed for mine detection researches [1]. The volume of main chamber and pipes should be measured. The South 3 building (IEC250 is equipped) is restraining area on the neutron production rate (<10^7/sec) and the amount of tritium (<1GBq). The experiment using tritium is planned as seal condition with 0.1GBq of tritium.

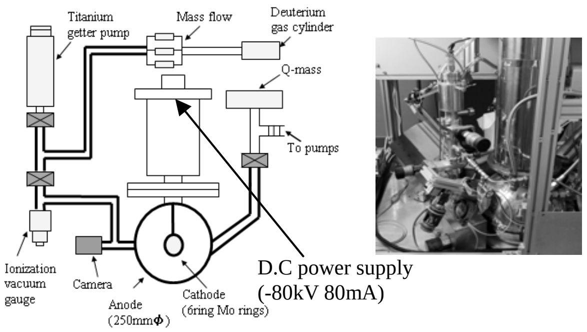

Fig. 1. IECF device of Kyoto Univ. (IEC250)

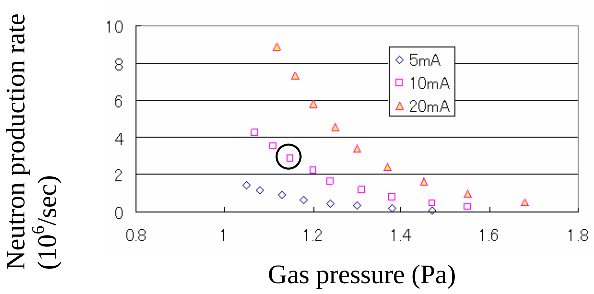

Fig. 2. Discharge characteristics of IEC250
The circle point means best parameters for tritium experiment (1.07Pa, 10mA, 60kV)

2. Experimental results and Conclusions

The volume of the main chamber and the connecting pipes are almost 8.5L, the partial pressure of the tritium gas (0.1GBq) is 0.0137Pa. The discharge characteristic of IEC250 and. the Neutron v.s. pressure characteristics (Fig.2.)are indicated the parameter of tritium experiment. At the 1.07Pa of mixture gas, the ratio of tritium is almost 1.28%. In this condition, the neutron production rate using the mix gas is about 3.55 times of deuterium gas. The neutron production rate is estimated almost 10^7(1/sec).

The tritium gas has tendency to cling on the inner surface of pipe and to immerse into the material. It is not easy to flow the tritium gas into the main chamber. The amount of gas feeding loss should be estimated by other pre-experiments before the tritium operation.

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