First Operation on Inertial Electrostatic Confinement Fusion Device with Deuterium and Tritium Gas

Takuma Yoshida\textsuperscript{1}, Taiki Kajiwara\textsuperscript{2}, Kazuma Takaoka\textsuperscript{1}, Keita Kamakura\textsuperscript{1}, Hodaka Osawa\textsuperscript{1}, Kai Masuda\textsuperscript{2} and Masami Ohnishi\textsuperscript{1}

1Kansai Univ. 3-3-35, Yamate-cho, Suita-shi, Osaka 564-8680, Japan
2 Institute of Advanced Energy, Kyoto Univ., Gokasho, Uji-si, Kyoto611-0011, Japan

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\textsuperscript{7}/sec) and the amount of tritium (<1GBq). The experiment using tritium is planned as seal condition with 0.1GBq of tritium.

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\textsuperscript{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.

Acknowledgments

The authors are very thanks to Dr. Hatano (Toyama Univ.), Dr. Nishikawa (Kyushu Univ, retired) and Dr. Yamamoto (Kansai Univ.) about the giving the information of tritium handling techniques.

References

[3] H.Osawa, Y. Nakajima, Y. Nakagawa, M. Ohnishi; 24P144P