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Characteristics of cylindrical inertial electrostatic confinement fusion device with magnetron discharge ion source

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High input power operation is effective to enhance neutrons production rate (NPR). However, when IEC operates at high input power, the cathode is usually heated excessively. To avoid overheating of the cathode, the technology of thermal load reduction is required. There are two ideas to reduce heat load of the cathode. The first one is to adopt a cylindrical cathode which was proposed by Gu et al. at Illinois University [1]. Since transparency of cylindrical cathode is 100%, it does not intercept ion beam and extremely reduces heat load to the cathode. Second idea is to introduce ion sources. Our device uses ion sources to create ions in special areas where are close from the anode and the central axis. The ions created in the area are well-confined by electrostatic well. Hence NPR per input power of IEC is expected to increase.

We are developing a new cylindrical IEC (C-IEC) device. Figure 1 shows the structure of the C-IEC device. The device consists of two plate anodes at both ends and a cylindrical cathode. The thickness of the anode plate is 1 mm and permanent magnets are mounted behind the anodes. We are planning to measure NPR and the temperature of the cathode to confirm the reduction of heat load.

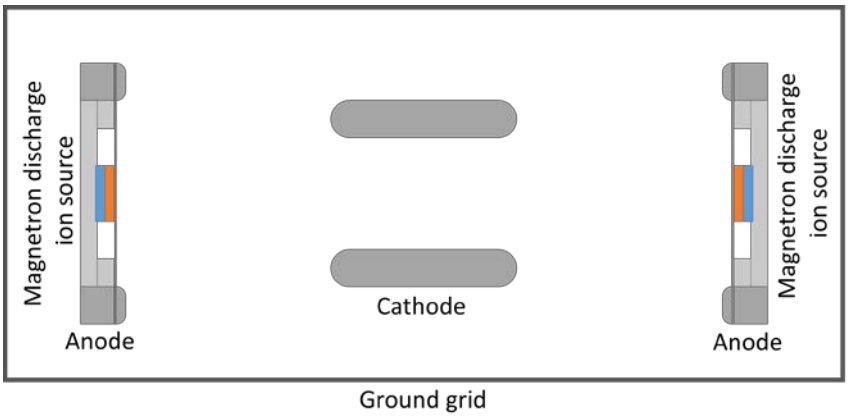

Figure 1. The schematic of C-IEC device

References

[1] Yibin B. Gu, Jalal B. Javedani, George H. Miley, "A portable cylindrical electrostatic fusion device for neutronic tomography," *Fusion Technology* ***26***, 929(1994).