Takeshita, S., Buttapeng, C.

**Acceleration effect of swirl flow for disk MHD accelerator**

DOI: 10.1541/ieejpes.130.517

a Nagaoka University of Technology, 1603-1, Kamitomioka, Nagaoka 940-2188, Japan
b University of the Thai Chamber of Commerce, 126/1, Vibhavadee-Rangsit road, Dindaeng, Bangkok 10400, Thailand

**Abstract**

The purpose of this study is to verify how the swirl vane influences the acceleration performance, namely, the radial gas velocity and the static gas pressure, for the Disk MHD accelerator. A quasi-1-dimensional (Q1D) numerical program is used for the calculations. Results of the current calculations show that the static gas pressure decreases approximately 40% when using the inlet swirl vane. It is found that the MHD compression phenomena, which generates at the closest to the MHD channel inlet due to the Joule heating, could suppress effectively. The maximum radial gas velocity of 3,380 m/s is successfully achieved at the channel exit when swirl ratio was -1.0, and swirl ratio was set to be 0.0 and mass flow rate was kept the same as that for the case of swirl ratio of 1.0 and -1.0. The acceleration efficiency of 40.5% and 36.7% are calculated when the swirl ratio is -1.0, and the case of swirl ratio was set to be 0.0 and mass flow rate was kept the same as that for the case of swirl ratio of 1.0 and -1.0 respectively. The difference of efficiency is due to increase the Hall parameter in the upstream and midstream of MHD channel. This current study can show and confirm the function of inlet swirl for Disk MHD accelerator. © 2010 The Institute of Electrical Engineers of Japan.

**Author Keywords**

Air-plasma; Disk-shaped; Inlet swirl; Magnetohydrodynamics; Numerical simulation

**References**

- Sakamoto, N., Anwari, M., Kondo, J., Harada, N.

- Litchford, R., Lineberry, J.

- Takeshita, S., Furuya, S., Harada, N.

- Takeshita, S., Furuya, S., Harada, N.

- Harada, N., Kizuka, N., Okamura, T., Yamasaki, H., Shioda, S.

- Harada, N.

- Sakamoto, N., Kondo, J., Harada, N.
  *MHD power generation using by scramjet engine* (2007) 47<sup>th</sup> AIAA Airplane Engine and Space Propulsion Conference, AAI,
Lineberry, J., Begg, L., Castro, J., Litchford, R.
HVEPS scramjet-driven MHD power demonstration test results
(2007) 38th AIAA Plasmadynamics and Lasers Conference in Conjunction with the 16th
International Conference on MHD Energy Conversion, AIAA-2007-3880,

Document Type: Article
Source: Scopus