

Abstract Submitted  
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**LES of transitional duct flows by the non-uniform Lorentz force**  
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OKUNO, Tokyo Institute of Technology — Large-eddy simulation (LES) of turbu-  
lent duct flows is carried out in the liquid metal MHD power generator, and the  
influence of the non-uniform Lorentz force caused by the non-uniform magnetic flux  
density on the turbulent flows is examined. As increasing the high magnetic flux  
density, the structures of Reynolds stress align along the orientation of the magnetic  
flux density, and those structures periodically flowed toward the downstream region  
like Karman vortex sheets are observed. The stronger magnetic flux density makes  
the laminarized flow turbulent again. That is confirmed by using spectrum analy-  
sis. It is found that a pair of eddy as the secondary flow for the non-MHD duct  
flow diminishes in the MHD flow. The non-uniform magnetic flux density in the  
streamwise direction produces the eddy currents that lead to the M-shaped velocity  
profiles in the plane parallel to the external magnetic field. The velocity profiles are  
modulated more strongly with the magnetic flux density.

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