

# DRBEM Solution of the Cauchy MHD Duct Flow with a Slipping Perturbed Boundary

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## Abstract

In this study, the MHD flow problem is solved as a direct and a Cauchy problem in a rectangular duct with a perturbed, curved, and slip upper boundary. The aim is to recompute the slip length and the slipping velocity by employing the asymptotic analysis with respect to the perturbation parameter  $\epsilon$  and solving MHD flow equations for the first order and the corrector solutions in the problem region. Hence, we are able to obtain the solution of MHD flow in the duct with curved perturbed boundary without discretizing the curved part of the boundary. The dual reciprocity boundary element method (DRBEM) is utilized for solving the coupled MHD equations in one stroke. The discretization of Cauchy problems results in ill-conditioned systems of linear algebraic equations, hence a regularization technique is needed. In this study, the Tikhonov regularization is used to obtain the solution of the Cauchy MHD problems. The main advantage of the DRBEM is discretizing only the boundary and providing both the velocity and its normal derivative values on the boundary. This enables us to recover the slip length on the perturbed boundary through the slip boundary condition.

## References

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