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Can the Lorentz force accelerate magnetic field
expansion?

A. BRANDENBURG (NORDITA, Kopenhagen, Denmark),
F. KRAUSE (Astrophysikalisches Observatorium
Potsdam, Germany), D. MOSS (Mathematics Department,
The University, Manchester, UK), I. TUOMINEN
(Observatory and Astrophysics Laboratory, University
Helsinki, Finland)

As a initial value problem the development of a magne-
tic field generated by an electric ring current in the
centre of an electrically conducting sphere embedded
in vacuum is studied. If the prescribed electric field
strength is weak, or the viscosity of the medium large
the Lorentz force is negligible and the expansion of
the magnetic field into the outer regions of the
sphere occurs on the magnetic diffusion time scale.
If, however, the prescribed electric field is strong
and the viscosity small, the Lorentz force becomes
important and causes a quenching of magnetic field in
the vicinity of the generating region together with an
enhanced amplification of the magnetic field further
out. For magnetic Prandtl numbers of 0.01 we found a
growth rate four times large than the diffusion time
scale. Implications for the magnetic field evolution
in cosmical objects (stars, galaxies) are discussed.

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