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**Matthias Eller\***, Department of Mathematics, Georgetown University, 37th & O Street NW, Washington, DC 20016. *Boundary regularity for Maxwell's equation with applications to shape optimization.*

We consider weak solutions to a boundary value problem for Maxwell's equations with a dissipative boundary condition. Energy estimates show that the tangential components of the electric and the magnetic field are in  $L_2$ . However, since the boundary is characteristic, no statement can be made about the normal components of the vector fields. We manage to obtain  $L_2$  regularity for these normal components by including a divergence condition on the initial data. This result does not follow from the trace theorem in Sobolev Spaces, hence it can be classified as a "hidden regularity" result. Boundary regularity of weak solutions is of importance when it come to shape optimization. The shape derivative for this boundary value problem is established. This is a joint work with John Cagnol from the Pôle Universitaire Léonard da Vinci in Paris. (Received September 15, 2009)