1075-35-31 **Niklas Wellander*** (niklas.wellander@eit.lth.se), P.O. Box 1165, SE-58111 Linköping, Sweden. *Homogenization of a Nonlocal Electrostatic Equation.* Preliminary report.

We find the effective conductivity of a composite when the current density is given as a spatial convolution of the electric field with a conductivity kernel. It turns out that the homogenized equation is supplied with a nonlocal constitutive relation if the non-local dependence does not scale. The domain, Ω, is assumed to be a bounded subset of $\mathbb{R}^n$, $n \in \mathbb{N}$ with a Lipshitz boundary $\partial\Omega$. The current density is given by a spatial convolution of the electric field with a nonlocal kernel which gives the current density contribution at a point due to the electric field in a neighborhood of x. The weak electrostatic equation reads: find $\phi^\varepsilon \in H_0^1(\Omega)$ such that

$$\int_\Omega \int_\Omega K^\varepsilon(x-\xi)\nabla\phi(\xi)\,\mathrm{d}\xi \cdot \nabla\psi(x)\,\mathrm{d}x = \int_\Omega f^\varepsilon(x)\psi(x)\,\mathrm{d}x$$

$\forall \psi \in H_0^1(\Omega)$. The fine scale structure in the composite is modeled by the parameter $\varepsilon > 0$. The source f^ε is bounded in $L^2(\Omega)$ and converges strongly to f in $H^{-1}(\Omega)$ when $\varepsilon \to 0$. (Received August 26, 2011)