

## COMPLEX HARMONIC CAPACITORS

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SEMINAR IN HELSINKI, THURSDAY, MARCH 16, 12:15 –14:00

ABSTRACT. The concept of complex harmonic potential in a doubly connected planar capacitor is considered. The differential of a complex potential plays the role of the gradient of a scalar potential of an electrostatic vector field. The main objective is to rule out having the differential vanish at some points. Nevertheless, there can be critical points where the Jacobian determinant of the differential turns into zero. The latter is in marked contrast to the case of real-valued potentials. The complex electric capacitor also admits an interpretation of the stored energy of a hyperelastic deformation. Actually, we explore numerous results developed in this latter context, largely by us.

Engineers interested in electrical systems, such as energy storage devices, might also wish to envision a complex capacitor (in some rough sense described here) as an *electromagnetic capacitor* that allows to store more energy.

Mathematicians as well, will find exciting new ideas about geometry of harmonic mappings, PDEs, and some topology.