Analysseminariet

Andreas Axelsson, Australian National University, Canberra: Transmission problems for Dirac's and Maxwell's equations with Lipschitz type interfaces.

Abstract: he aim of this thesis is to give a mathematical framework for scattering of electromagnetic waves by rough surfaces. We prove that the Maxwell transmission problem with a weakly Lipschitz interface, in finite energy norms, is well posed in Fredholm sense for real frequencies. Furthermore, we give precise conditions on the material constants ϵ, μ and σ and the frequency ω when this transmission problem is well posed.

To solve the Maxwell transmission problem, we embed Maxwell's equations in an elliptic Dirac equation. We develop a new boundary integral method to solve the Dirac transmission problem. This method uses a boundary integral operator, the *rotation operator*, which factorises the double layer potential operator. We prove spectral estimates for this rotation operator in finite energy norms using Hodge decompositions on weakly Lipschitz domains.

To ensure that solutions to the Dirac transmission problem indeed solve Maxwell's equations, we introduce an *exterior/interior derivative operator* acting in the trace space. By showing that this operator commutes with the two basic reflection operators, we are able to prove that the Maxwell transmission problem is well posed.

Tisdagen den 14/1, kl. 16.00 OBS TIDEN S1