Hardy space infinite elements for exterior Maxwell problems

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In this talk we present an infinite element method for solving electromagnetic scattering and resonance problems posed on unbounded domains. As our motivation is to solve Maxwell's equations we take care that these infinite elements fit into the discrete de Rham diagram, i.e. they span discrete spaces, which together with the exterior derivative form an exact sequence.

The theoretical framework of the method is the so called *pole condition*, which characterizes radiating solutions via the poles or singularities of the Laplace transformed solutions: The Laplace transform in radial direction of an outgoing wave belongs to a certain Hardy space of holomorphic functions, while the Laplace transform of an incoming wave does not. Hence, the Hardy space infinite elements are constructed using tensor products of Hardy space basis functions with standard finite element surface basis functions.

Numerical tests indicate super-algebraic convergence in the number of additional unknowns per degree of freedom on the coupling boundary.

References:

[1] L. Nannen, T. Hohage, A. Schädle, and J. Schöberl. High order curl-conforming hardy space infinite elements for exterior Maxwell problems. arXiv:1103.2288, 2011.

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