NON OVERLAPPING DOMAIN DECOMPOSITION METHODS WITH NON LOCAL TRANSMISSION CONDITIONS FOR ELECTROMAGNETIC WAVE PROPAGATION

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Abstract. Since the pioneering work of B. Desprs [1], domain decomposition methods have become an important tool for the numerical solution of large scale time harmonic wave propagation problems. Recently, a new class of iterative non overlapping methods, allowing for parallel computation at each step, has been introduced for the scalar Helmholtz equation [5, 6]. The main novelty of the approach is that, contrary to [3, 4] for instance, non-local impedance operators (integral operators) are used in the transmission conditions between two adjacent subdomains. This ensures an exponential rate of convergence (at least in appropriate geometrical conditions on the subdomains), in the spirit of [2], a property which is unattainable with local operators. In this work, we propose the extension of such methods to 3D time harmonic Maxwell's equations. The main issue is first to design well adapted integral operators taking into account the specificity of corresponding trace spaces and second to propose a finite element approximation preserving exponential convergence with a rate independent of the space step of the computational mesh, as in [7]. The main theoretical aspects of the method will be detailed and preliminary numerical results will be presented.

Keywords: Domain Decomposition, Time harmonic Maxwell's equations, Impedance transmission conditions, Non-local operators.

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