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NEUMANN–NEUMANN METHODS FOR VECTOR FIELD PROBLEMS*

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Abstract. In this paper, we study some Schwarz methods of Neumann–Neumann type for some vector field problems, discretized with the lowest order Raviart–Thomas and Nédélec finite elements. We consider a hybrid Schwarz preconditioner consisting of a coarse component, which involves the solution of the original problem on a coarse mesh, and local ones, which involve the solution of Neumann problems on the elements of the coarse triangulation, also called substructures. We show that the condition number of the corresponding method is independent of the number of substructures and grows logarithmically with the number of unknowns associated with an individual substructure. It is also independent of the jumps of both the coefficients of the original problem. The numerical results presented validate our theoretical bound.

Key words. edge elements, Raviart–Thomas elements, domain decomposition, iterative substructuring, preconditioners, heterogeneous coefficients

AMS subject classifications. 65F10, 65N22, 65N30, 65N55.

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