Singular Integrals on Product Spaces Related to the Carleson Operator

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Abstract. We prove $L^p(T^2)$ boundedness, $1 < p \leq 2$, of variable coefficients singular integrals that generalize the double Hilbert transform and present two phases that may be of very rough nature. These operators are involved in problems of a.e. convergence of double Fourier series, likely in the role played by the Hilbert transform in the proofs of a.e. convergence of one dimensional Fourier series. The proof due to C. Fefferman provides a basis for our method.