

# Non-smooth decomposition of homogeneous Triebel-Lizorkin spaces with applications to the Marcinkiewicz integral

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The aim of this paper is to develop a theory of non-smooth decomposition in homogeneous Triebel-Lizorkin spaces. As a byproduct, we obtain the decomposition results for Hardy spaces. The result extends what Frazier and Jawerth obtained in 1990. The result by Frazier and Jawerth covers only the limited range of the parameters but the result in this paper is valid for all admissible parameters for Triebel-Lizorkin spaces. As an application of the main results, we prove that the Marcinkiewicz operator is bounded.