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Atomic decompositions of Lorentz martingale spaces and applications

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Abstract. In the paper we present three atomic decomposition theorems of Lorentz martingale spaces. With the help of atomic decomposition we obtain a sufficient condition for sublinear operator defined on Lorentz martingale spaces to be bounded. Using this sufficient condition, we investigate some inequalities on Lorentz martingale spaces. Finally we discuss the restricted weak-type interpolation, and prove the classical Marcinkiewicz interpolation theorem in the martingale setting.

1. Introduction and Preliminaries

The idea of atomic decomposition in martingale theory is derived from harmonic analysis. Just as it does in harmonic analysis, the method is key ingredient in dealing with many problems including martingale inequalities, duality, interpolation and so on, especially for small-index martingale and multi-parameter martingale. As well known, Weisz [8]