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Detailed analysis of the implementation of frequency-adaptive resonant and repetitive current controllers for grid-connected converters

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Abstract— Current control is a common feature in power electronics voltage source converters connected to the grid. In this scenario frequency drifts can entail a big loss in performance of these controllers, significantly worsening the quality of the power delivered to the grid. This article focuses on the study and implementation of current control algorithms for DC–AC voltage source converters (VSCs) that are able of both reducing the harmonic contents of the grid current and maintaining the selectivity of the current control against frequency drifts, so that the stability of the system is preserved. Two types of current control techniques are investigated here, namely, resonant and repetitive controllers. A thorough study of alternative implementation structures is carried out whilst spelling out the frequency-adaptive algorithm in each case. Besides, basic guidelines for their software implementation are given and the computational load for each alternative is analyzed.

Index Terms— Current control; Frequency-adaptation; Repetitive control; Resonant control; Digital implementation; Converter

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