

Discrete-time resonant controllers design for power conditioning applications

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Abstract— Power quality has become a key issue in modern electric power systems due to the increasing number of sensitive loads and disturbing sources. In this scenario, electronic power converters are commonly used to compensate voltage and current disturbances, above all in relation with harmonics. These devices require sophisticated control systems like Proportional Resonant Controllers (PRCs) that must be implemented in Digital Signal Processors (DSPs). However, PRCs are sometimes difficult to design and implement in discrete-time applications. This paper presents a systematic method to design high-performance PRCs. Discrete-time implementation aspects such as frequency adaptability with low computational burden are addressed in detail. The proposed control system improvements are analysed and tested on a 5 kVA prototype of a Series Active Conditioner (SAC) that protects a linear load against voltage sags and harmonics.

Index Terms— Resonant controller; Harmonics Power quality; AC-DC power conversion; Series active power filter; Dynamic voltage restorer

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