Abstract

In this paper, design and implementation of a new MIMO linear control technique based on theoretically established and experimentally validated small signal model for the three-phase three-level boost-type AC/DC Vienna converter is presented. The resulted transfer functions are discretized for sake of digital controllers design. Multipleloop control strategy is adopted and consists of inner current feedback loops, based on the straightforward looping technique that neglects interactions between the dq components of respectively control inputs and currents, and of an outer voltage loop, designed to ensure DC voltage regulation by adjusting the magnitude of the references for the inner current loops. The proposed control approach is first simulated, using SIMULINK of Matlab, and then validated on a 1.5 kW laboratory prototype supported by the DS 1104 digital real-time controller board of dSPACE. The obtained results prove that a judicious choice of controller parameters, as well as an adequate rating of boost inductors allow meeting the IEEE standards requirements in terms of AC line current Total Harmonic Distortion (THD) and Power Factor (PF). The efficiency of the proposed control technique is maintained in case of disturbances occurring on both source and load sides.