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REPETITIVE CURRENT CONTROL TOPOLOGY FOR GRID-CONNECTED BOOST-HALF-BRIDGE PHOTOVOLTAIC MICRO INVERTER

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ABSTRACT

This paper presents a novel Repetitive Current control topology for grid-connected boost half- bridge photovoltaic (PV) micro inverter system. To reduce the cost, easy control, improving efficiency, and high reliability, boost-half-bridge dc–dc converter using minimal devices is introduced to interface the low-voltage PV module. A full-bridge inverter with pulse width-modulator is cascaded and injects synchronized sinusoidal current to the grid. In addition, a plug-in repetitive current controller based on a fourth-order linear phase IIR filter is proposed to regulate the grid current. Through this approach we obtained high power factor and very low total harmonic distortions under both heavy load and light load conditions. Dynamic stiffness is obtained when load or solar irradiance is changing rapidly. In addition, the dynamic behavior of the boost-half-bridge dc–dc converter is analyzed; a customized maximum power point tracking (MPPT) method, which generates a ramp-changed PV voltage reference, is developed accordingly. Variable step size is embrace such that fast tracking speed and high MPPT efficiency are both obtained. Simulation results are provided to verify the validity and performance of the circuit operations, current control, and MPPT algorithm.

KEYWORDS: Repetitive Current Control Topology, MPPT Algorithm, Fourth-Order Linear Phase