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A New Efficient Topology of Single-Phase Five-level Inverter for PV System

Ayoub Nouaiti*, Abdallah Saad, Abdelouahed Mesbahi, Mohamed Khafallah

Laboratory of Energy and Electrical Systems, Superior National School of Electricity and Mechanical, Hassan II University of Casablanca, B.P 8118, Oasis, Casablanca, Morocco

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Abstract

This paper presents the design, simulation, and implementation of a new single-phase five-level inverter, for photovoltaic systems, with a reduced number of power switches and fewer gate-drivers power supply. This multilevel inverter consists of a high step-up DC-DC converter, a switched-capacitor converter, and a full bridge converter. The proposed topology is used to deliver optimal AC voltage and current with fewer harmonics to the loads by controlling the high step-up DC-DC converter with a small duty cycle. A prototype of a 200W rated power feeding an inductive load from solar panels is tested by simulation and experiment. A maximum power point tracking method and a pulse width modulation technique are presented and evaluated under normalized criteria for voltage, frequency, and total harmonics distortion (THD). The experimental results show that the proposed multi-level inverter is an efficient converter to supply power energy from solar panels to industrial machines such as single phase induction motors.

Keywords: photovoltaic system, switched capacitor converter, multilevel inverter, boost converter

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* Corresponding author. E-mail address: nouayoub@gmail.com

Tel.: +212522230789; Fax: +212522231299

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