

ABSTRACT

The multi-phase N-type interleaving three-level converter is a DC-DC converter topology that can provide high voltage conversion with improved inductor current ripple and output current ripple as well as noise filtering thus improved efficiency as compared to the conventional converters. These advantages make the converter a promising candidate for the solar PV power system application. PV modules produce low voltage DC electricity and hence this must be first converted to high voltage DC to be fed to the load. Multi-phase three-level converter specifically the N-type interleaving was demonstrated to solve the problem. The circuit topology was modeled in MATLAB environment using Simulink blocks. Fuzzy logic controller was developed using the fuzzy logic Toolbox in MATLAB and it monitored both current and voltage of the PV module. The output of the converter showed a positive gain of the fuzzy logic controller to work as a MPPT for the solar module together with the converter. The simulation of the N-type interleaving multi-phase three-level converter with inverse coupled inductor was provided to illustrate the performance of the converter. The converter had good performance in high voltage, high power applications. Finally, the simulation results were discussed and conclusions drawn.

Keywords: DC-DC converters, Multi-phase three-level converter, Fuzzy logic, solar photovoltaic systems, N-type interleaving, MATLAB/Simulink