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Analysis and Design of a Series-Parallel Resonant Converter without Inductor Filter for use in High Voltage Capacitor Charger Applications

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A huge inductor filter becomes essential when capacitor charger which has capacitive characteristics is implemented based on the series-parallel resonant converter. This paper described anaysis, design and test results of the series-parallel resonant converter which operates as a constant current source on above resonance without inductor filter for use in high voltage capacitor charger applications. Voltage gain and current gain of the series-parallel resonant converter in terms of the load variation, series-to-parallel capacitance ratio and normalized switching frequency are derived and the voltage and current stresses of each resonant component are calculated using the Fundamental Harmonic Approximation (FHA) analysis. The resonant current and *kVA/kW* rating are considered for the optimal design of the resonant parameters and a 3 *kJ/s* constant current source type series-parallel resonant converter prototype is assembled with 6 *kΩ* resistor of 100 *kJ*, 10 *kV* energy storage capacitor. Design results based on the FHA analysis are verified by resistive load and high voltage capacitor charging experiments.

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