

The Parallel Resonant Converter

Constant-frequency Parallel-resonant Converter A Series-parallel Resonant Converter in Capacitor Charging Applications Dynamic Analysis of the Parallel Resonant Converter Steady-state Analysis and Design of the Parallel Resonant Converter Current-source Parallel-resonant Converter Study and Control of a Phase-controlled Series-parallel Resonant Converter and a Phase-controlled Series-parallel Resonant Inverter Series-parallel and Parallel-series Resonant Converters Operating on the Utility Line - Analysis, Design, Simulation and Experimental Results Resonant Power Converters The Parallel Resonant Converter as a Rectifier Resonant DC/DC Converters Design and Control of a Parallel Resonant Converter Utilizing Feedforward of the Supercapacitor Input Voltage Design and Analysis of a Parallel Resonant Converter for Standby Power System Applications The Parallel Resonant Converter as a Rectifier Analysis of a Series Parallel Resonant Converter Steady-state and Dynamic Analysis of the LCC-Type Parallel Resonant Converter Modelling and Control of the Series-parallel Resonant Converter Investigation of a Quasi-square Parallel-resonant Converter Analysis and Design of Inductive Coupled Parallel Resonant Converter Analysis and Design of a Three-phase Series-parallel Resonant Converter Investigation of a Quasi-square Parallel-resonant Converter Yuan Chin Barry Christopher Pollard Adan F. Hernandez Steven D. Johnson Abdulkarim Ajil Abdulkarim Carlos Viñolo Monzoncillo Vijayakumar Belaguli Marian K. Kazimierczuk Christian Wolf Yung-Lin Lin Brian Patton Roberts Orlando L. Peña C. Wolf Norjulia Mohamad Nordin Vivek Agarwal Colin Franklin Price Rui Liu (Raymond) Lu Zheng Colin Franklin Price

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angle resonant converters have been widely used for some few decades because of their inherit soft switching characteristic their fast transient response their low losses compared to the pwm based hard switching converters and thus their capability to work at higher frequencies modeling resonant converters and designing its control is however a challenge due to the high order systems that could be obtained in this kind of circuits this thesis is aimed to analyze and design the closed loop control of a phase controlled series parallel resonant converter pc sprc that was designed and built some years ago in the dissertation of a phd student in the polytechnic school of brooklyn that nowadays belongs to nyu also a phase controlled series parallel resonant inverter pc spri is designed in parallel in a joint work so its stability and control are studied and designed as well both the pc sprc and pc spri closed loops are simulated and their controls are implemented in the same dsp having a stable output of 300v dc for the first one and 200vp ac for the second one these outputs are connected to a 1 100 and 1 50 transformers respectively so a 30kv dc with a 10kvp ac coupled signal is obtained if both transformer secondaries are serially connected the building process of the pc spri resonant tank and control board that includes the switching drivers and other devices is detailed the high voltage obtained output is applicable to electrostatic precipitators its operation is based on the electrostatic attraction of the dust particles in polluted air using a high dc signal with a coupled high voltage sinusoid so the operation point of the system is designed based on this application the results of the controlled pc sprc and pc spri are presented here avoiding the transformer connection as a security measure but using an equivalent load

high performance ac to dc converters are required to meet the regulation standards to suit wide variety of applications this thesis presents the steady state analysis design and operation of high frequency hf transformer isolated resonant converters on the single phase utility line as a low harmonic controlled rectifier two resonant converter configurations of third order have been studied namely the lcc type parallel resonant converter also popularly known as series parallel resonant converter sprc and the hybrid parallel series resonant converter bridge hpsrcb these converters are operated at hf using variable frequency as well as fixed frequency control and they operate in different modes depending on the choice of switching frequency and load the variable frequency sprc is operated in discontinuous current mode dcm to obtain low line current total harmonic distortion t h d and high power factor pf without using active control state space analysis has been presented for one of the predominant circuit modes encountered during its operation in dcm the various design constraints for operating the resonant converter on the utility line for high pf operation have been stated for different control schemes in addition steady state analysis design optimization carried out for dc dc converter have been presented the effect of resonant capacitor ratio on the converter performance characteristics have been studied spice3 simulations and experimental results obtained from a 150 w converter are presented to verify the theory continuous current mode ccm operation of the sprc and its effect on the line current t h d and pf are studied both fixed and variable frequency control schemes have been used to control the sprc complex ac circuit analysis method has been considered as the design tool to get the design curves and design of the sprc operating on the utility line spice3 simulation results for open loop operation and experimental results for both open as well as closed loop operations active control for two capacitance ratio s have been presented to verify the converter performance it is shown that nearly sinusoidal line current operation at unity pf can be obtained with closed loop operation a hpsrcb has been proposed and operated at very high pf on the utility line as a controlled rectifier some of the predominant operating modes of the fixed and variable frequency hpsrcb have been identified the steady state analysis using state space modeling presented for a dc to dc converter has been extended to analyze the ac to dc converter using the large signal discrete time domain model the time variation of line current and line pf have been predicted using promatlab for both fixed and variable frequency operations of hpsrcb on the utility line spice3 simulation results without active control and experimental results obtained from the bread board model for both open as well as closed loop fixed and variable frequency operations have been presented to verify the theory and design performance

this book is devoted to resonant energy conversion in power electronics it is a practical systematic guide to the analysis and

design of various dc dc resonant inverters high frequency rectifiers and dc dc resonant converters that are building blocks of many of today s high frequency energy processors designed to function as both a superior senior to graduate level textbook for electrical engineering courses and a valuable professional reference for practicing engineers it provides students and engineers with a solid grasp of existing high frequency technology while acquainting them with a number of easy to use tools for the analysis and design of resonant power circuits resonant power conversion technology is now a very hot area and in the center of the renewable energy and energy harvesting technologies

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