

On-board power converter for battery charging application of e-mobility vehicles

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Abstract

The topologies for high power supply modules are emerging and transforming in advent of dynamically changing application requirements, and continuous growth in the semiconductor device technology. This paper proposes a simple design procedure for single phase 7.2kW two stage power supply module to cater need of battery charging and other energy storage application. The three phase interleaved Totem pole AC to DC power factor controlling bridgeless converter is used at front end to regulate input power at high power factor. The Dual Active bridge(DAB) topology is used in second stage for high power DC-DC conversion. The ultra wide gap Silicon Carbide (SiC) power mosfets are used in both the stages to increase power density, reduce losses and increase overall system efficiency. The average current control algorithm is used for Pulse width modulated(PWM) control of power switches separately for both the stages which can be easily be implemented using digital microcontrollers. The magnetics design for inductor of Totem pole PFC and high frequency transformer is DAB is presented. The power supply can be powered from single phase 100-230VAC,50Hz. The DAB generate output of 7.2kW at 150-200V to charge an 30kWh Li-Ion battery bank. The hardware design of the power supply module is presented. The simulation results of the power supply module is presented and the results are compared with the existing low power classical single phase power supply module.

Key Words: Totem Pole PFC, Dual Active Bridge, Pulse width Modulation

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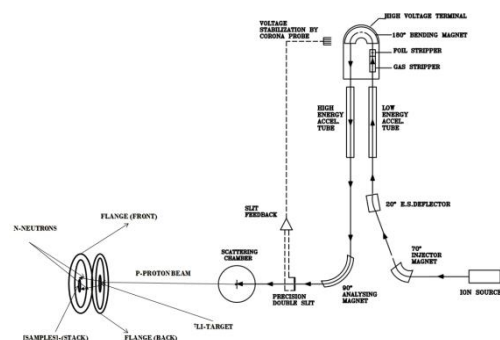


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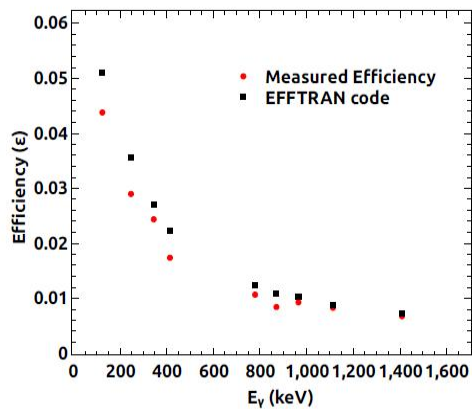


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Amitava Roy received the B.Sc. degree (Hons.) in physics from North Bengal University, Siliguri, India, in 1995, the M.Sc. degree in physics from Jawaharlal Nehru University, New Delhi, India, in 1997, and the Ph.D. degree from the Training School, Homi Bhabha National Institute (HBNI), Bhabha Atomic Research Centre (BARC), Mumbai, India, in 1998, focusing on intense relativistic electron beam generation and applications.

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