**ID: 515-24 E**

**Innovations in Power Electronics & Renewable Energy**

**Universal Electric Vehicle Charger**

**מטען אוניברסלי לרכב חשמלי**

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Power factor correction (PFC) is compulsory for any electronic circuitry connected to the electrical grid. While most electronic load devices consume low DC voltage, the majority utilized FPC is based on a step-up converter that supplies high DC voltage at its output terminal. Electric vehicle battery voltage varies from a few hundred to almost a thousand volts. Thus, an additional conversion step is obligatory. This paper presents a new type of front-end universal step up / down three voltage level PFC. First, the rectifier’s principle of operation is described, and then an innovative rectifier is analyzed for continuous conduction modes. Finally, the proposed theory is validated in a cascade dual closed loop mode simulation. An internal inductor current and external voltage loop. The rectifier is examined at different battery pack voltage levels while presenting a near-unity power factor with low harmonic distortion.



Dr. Ilan Aharon is the director of the hybrid energy sources laboratory and the head of the power electronics track. Well-experienced engineer with hands-on skills as an engineer, team manager, R&D manager, hi-tech entrepreneur (establishing a start-up), and playing the role of CTO and CEO. When working in the industry, Dr. Aharon acquired experience in the following fields: Microgrid, Hybrid systems, Storage Devices, Analog circuits, DC-DC, AC-DC, DC-AC converters, Digital signal controllers, Robust Control, Solar Power, Fuel Cells, LED, HID bulbs; and interdisciplinary systems—served in paratroops Elite unit of the IDF, Major (reserve).

The Hybrid Energy Sources R&D Laboratory (HESL) specializes in energy conversion and management of hybrid energy sources. The HESL group is formed by principal investigator Dr. Ilan Aharon, PhD students, MSc students, BSc students, and Lab manager (engineer). Apart from publication record papers (in peer-reviewed journals and professional conferences), the group has a proven record of accomplishing industry-initiated R&D projects. Hybrid Energy Sources R&D Laboratory benefits professionally equipped research facilities in the field of energy up to 20kW ratings, including programmable electronic loads and power supplies, controlled hydrogen and diesel fuel supplies, high-performance measurement devices, advanced data-acquisition devices, CAD, and several simulation software tools.