UNIVERSITY OF CENTRAL FLORIDA

PV Energy Conversion and System Integration

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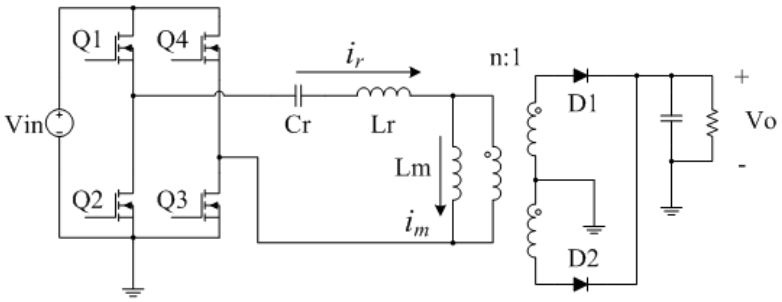
Description: The objective of this project is to develop a system-driven Plug'N'Gen solar power system demonstrating architecture of decentralized, low-cost, mass-produced, PV panel-mounted micro-inverters. This system will be able to compete with today's centralized multi-kW PV inverters that require cost prohibitive professional installation. The project tasks are: 1) novel inverter topology and control concepts; 2) advanced digital control algorithms; 3) SmartTie interface with the utility grid; and 4) low cost and ultra-compact PV inverter in package.

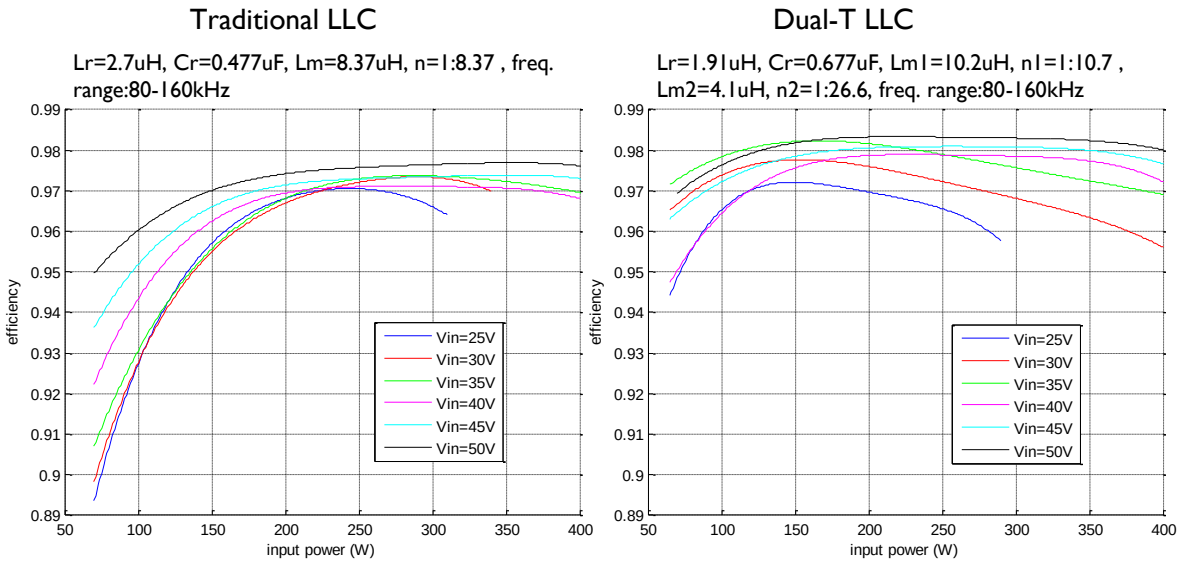
Budget: $1,267,000
Universities: UCF

Progress Summary

The focus of this period was on developing very high efficiency LLC resonant DC/DC converter stage for the PV inverters



LLC is a 3-resonant-component converter topology with high efficiency and high power density. It has advantages of achieving ZVS for wide input voltage and load range, which makes it ideal candidate for PV applications. LLC's operation is complicated. A systematic analysis and modeling based on its operating modes are proposed and verified by experiments. The model provides high accuracy in DC gain prediction comparing to traditional approaches (FHA method). And the model is used to optimize LLC design. A modified LLC topology with dual transformers is proposed. The modified topology has better efficiency than traditional one. A prototype board was built to perform comparative tests.



LLC optimal design is to find the circuit parameters that minimize the power loss while maintaining a desired DC gain level to adapt the wide input range. An optimal design procedure is developed based on the mode model. The experiments validate our LLC model study and show promising results of the dual-T LLC topology. A power loss model will be built to further improve the converter efficiency. We will finalize the circuit for its implementation in the mico-inverter prototype

Grants Awarded					
Title	**Agency**	**Ref. #**	**PI, Co-PI, Collaborators**	**Period of performance**	**Funding Awarded**
Photovoltaic Power Electronics Initiative (PERI)	DOE	DE-EE0003176	I. Batarseh, J. Shen, T. Wu	24 months	$1,400,000