Interleaved Resonant Boost Inverter 
Featuring SiC Module for High-Performance Induction Heating

Introduction:
Induction heating (IH) has become a key technology in recent years due to its benefits in terms of performance and efficiency when compared with classical heating methods. Advances in enabling technologies, including power electronics, digital control, and magnetic components, has enabled a significant breakthrough in IH technology, which has led to a number of relevant industrial, domestic, and medical applications.

Although alternative implementations using permanent magnets are being studied, usually IH systems rely on a power converter to generate an alternating magnetic field to heat the IH target. The most common approaches when designing IH power supplies. The first approach is the simplest one, requiring a rectifier, dc–dc conditioning, and medium-frequency inverter blocks.

Existing system:
The first approach is the simplest one, requiring a rectifier, dc–dc conditioning, and medium-frequency inverter blocks. This is the most extended approach, with multiple variations, due to its simplicity and easy control. In some cases, the second approach is followed where the rectifier and dc–dc blocks are combined, leading to an integrated approach.

Several direct ac–ac converters have been proposed, enabling the design of higher power density and performance solutions at the...
cost of a more complex design and control. In all the discussed approaches, the inverter is the core of the power converter and is commonly implemented using single-switch or half-bridge topologies for low-medium power applications, and the full-bridge topology for high-power applications.

**Dis-advantages:**
- More complex design.
- Not suitable for High power applications.

**Proposed system:**
An interleaved boost resonant inverter topology in order to provide an efficient and high-performance IH power supply. The proposed topology achieves high efficiency by reducing the current through the power devices and inductor, while the use of an interleaved configuration enables reduced input current ripple. Besides, the boost full bridge inverter provides additional control degrees, enabling fine output power control.

The proposed converter takes advantage of a three-phase sic module to achieve a high power density and performance implementation. The main power supply vac is rectified by means of the half-bridge branch. It is important to remark that a synchronous rectification has been implemented to improve efficiency, being possible to use a two-diode standard half-wave rectifier branch. Consequently, activated during the positive mains voltage half-cycle and during the negative one. Two additional inverter branches simultaneously perform a voltage boost function and generate the high-frequency current required for the induction heating (IH) application.
Advantages:
- Efficiency and versatile control.
- Reduced switching losses.

Applications:
- Industrial IH applications.

Block Diagram:

Diagram showing the flow of power from DC input, through Interleaved Boost resonant Inverter, to Load, with branches that show connections to Gate driver circuit, Buffer circuit, and Microcontroller circuit. Connections are indicated with arrows.