

**DESIGN, CONSTRUCTION, AND INSULATION TEST OF A 15
MILLIHENRY INDUCTOR FOR A SOLID-STATE BUCK
CONVERTER OF A GYROTRON CATHODE POWER SUPPLY**

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Abstract

Solid-state buck converters are popular for regulating output voltages of switch-mode dc power supplies for various applications. An output filter inductor in a buck converter is one of the crucial components to provide a continuous load current when the switching devices in the buck converter, such as BJTs, FETs, MOSFETs, or IGBTs, turn off. This inductor can be purchased as a commercial-off-the-shelf (COTS) component for a converter with a low voltage and power application. In a low voltage and high power application, it is still available through a number of vendors in the magnetic component industry. However, for a gyrotron cathode power supply in electron cyclotron heating (ECH) for fusion energy research [1] with an input voltage of 120 kV and output voltage of 80 kV at a load current of 100 Amperes, it is very difficult to obtain such an inductor from a qualified vendor. Two 15 mH inductors at a load current of 100 Amperes were designed and built in-house to meet the required input and output voltages. The design strategy, method of construction, and insulation test results of these inductors will be discussed in this paper.

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