Development of Duplex Pulsed Magnet Technology for High Magnetic Fields

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Introduction

The NHMFL Pulsed Field Facility will complete a 4 MJ capacitor bank in 2009. The new capacitor bank will have double the available electrical energy. The key feature of this new pulsed energy source is that there is provision for multiple circuits firing in a specified temporal sequence. The firing capability of the bank will allow pulsing of up to four circuits in a given magnet assembly. The NHMFL will first implement two-circuit duplex pulsed magnets for operation with this bank. Duplex magnet technology enables better control of the conductor heating and the mechanical stress distributions in the magnet. Two circuit operations also allow a more flexible range of pulsed operation as the energy in a given circuit can be adjusted.

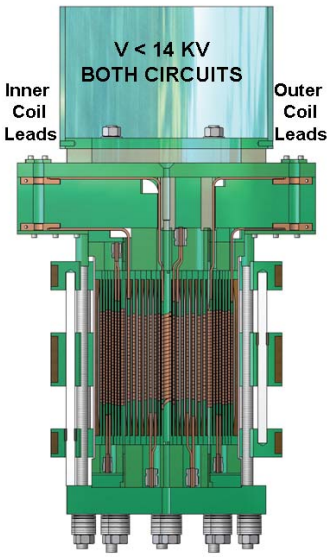

Figure 2 Cross section of HF01 duplex magnet showing coaxial lead connections.

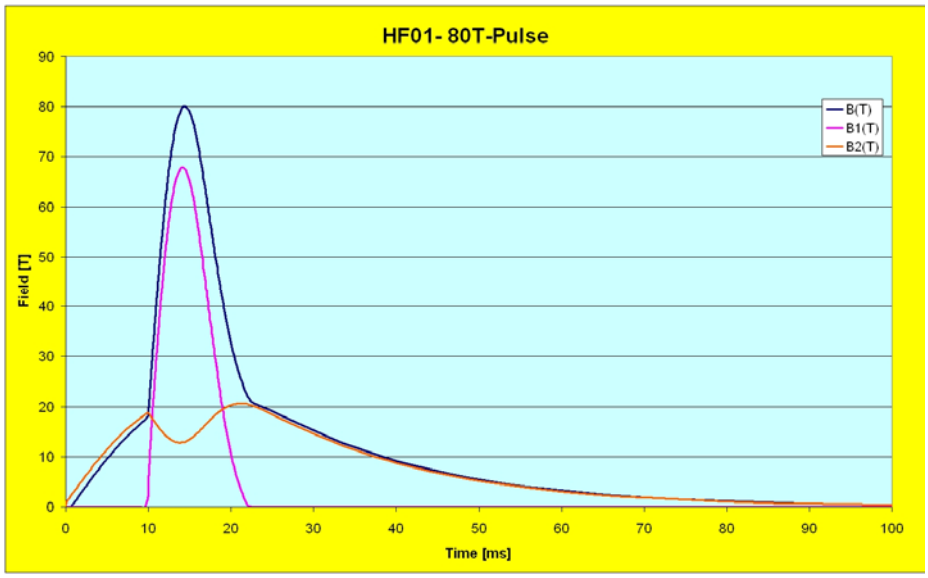

Figure 1 Pulsed waveform calculation of HF01 two-circuit duplex magnet. The HF01 duplex magnet will have a 15 mm bore matching existing NHMFL user magnets. Waveform shapes can be adjusted by varying the circuit inductance.

Status of the Work

The NHMFL has designed a 1st generation of duplex magnets for operation with the new capacitor bank. Both duplex coils will employ poly-layer poly-metal assembly process developed at the NHMFL. Design calculations have been completed for a 15 mm bore 80T pulsed magnet for the user science program, and a 10 mm bore 83T magnet that will serve as a prototype magnet for the next 100T insert upgrade. CAD models have been completed and component detailing is in progress. We anticipate starting construction in summer 2009.

Acknowledgements

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References

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[2] Swenson, C.A., *et al*., IEEE Trans. Appl. Supercond., **16 (2**), 1650-1655 (2006)