PERFORMANCE OF 1ST 90 T INSERT MAGNET FOR DOE-NSF 100 TESLA MULTI-SHOT MAGNET SYSTEM

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Introduction

The National High Magnetic Field Laboratories 100 T Multi-shot Magnet has completed phase one commissioning to deliver science at 85 Tesla. The US Department of Energy and the National Science Foundation supported the magnet system's development and construction. The magnet system is the culmination of 10 years of efforts by DOE and NSF design teams. The program goals for the first phase of operations are a non-destructive millisecond-scale 90 T pulse magnet system to support scientific research in high magnetic fields. Two magnet subsystems comprise the magnet: a nested array of seven generator-driven coils designed to produce ~ 40T in a 225 mm bore; and a capacitor-driven 15 mm bore "insert" magnet that developed to produce ~ 50 T inside the outer coil set. The US-DOE 100 T Multi-shot (MS) Pulsed Magnet Program is collaboration between US-DOE and US-NSF engineering teams at Los Alamos National Laboratory.

Technology for the 90 T insert evolved from a series of prototype magnets build to access engineering concepts and materials, and gain experience operating insert-like coils at the intensities encountered at 100 T. The insert magnet performance exceeded design specification by almost 15% delivering 53.6 T on a record system pulse of 88.9 T. The field measurement was made using a de Haas van Alphen measurement on pure Copper. The magnet system enters the science user program providing the highest magnetic fields ever produced non-destructively.

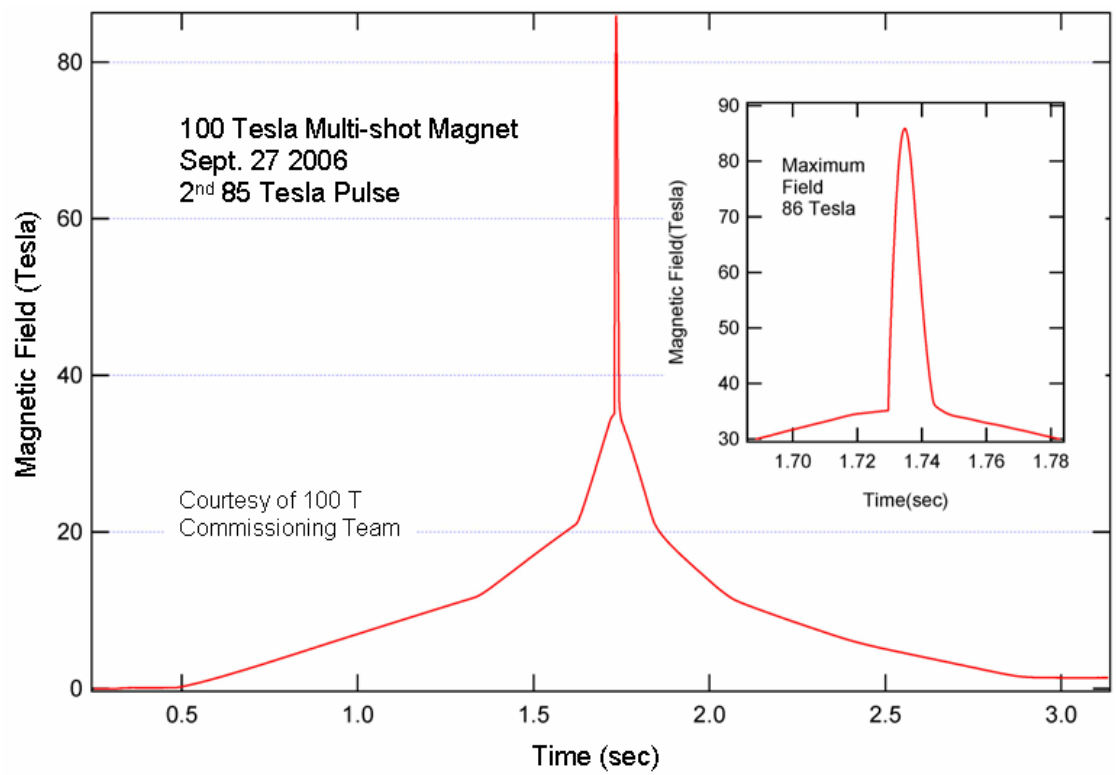

Figure 1 Second 85 T pulse using insert and outsert magnet systems

References

[1] C.A. Swenson, *et al*., Submitted to the proceedings of the Santa Fe Megagauss (2006).