

QCIF Technology Diffusion Project
Progress Report

Magnetica Extension Project

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Riyu Wei
ACMC, University of Queensland
Magnetica Ltd

Major Achievements

In the past three months, much of work has been focused on development of the passive shimming optimization software, test of the prototype magnet and design of a new whole body magnet. Achievements during the period are outlined below:

(1) Further improvement of the shimming optimization program to minimize magnetic field errors caused in the manufacturing processes has been completed, during which a new shimming algorithm has been developed. By means of the shimming program, a field error of up to thousands ppm that is likely caused in practice can be reduced to less than 5 ppm, while iron piece thicknesses can be minimized to less than 1 mm with a limited number of iron pieces. This is a major technology breakthrough in Magnetica and may lead to a patent application. Figure 1 shows an example of the iron piece distribution in a further optimized shim structure expanded from 3D to 2D, in which the maximum error has been reduced from original 870 ppm to 0.8 ppm after shimming.

(2) The prototype magnet of 1.5 Tesla is now in the process of a bucket test. By the time of this report, the field strength has reached to 1.2 Tesla. One of purposes is to test a stress level at which a magnet can work reliably without quench. The test results will provide important guides for future stress analysis and product design.

(3) Preliminary stress analysis of a new whole body magnet with high electromagnetic forces has been completed.

Progress against the Milestones

- Development of the shimming optimization program has been completed, which may lead to a patent application.
- Development and modification of current software for modelling the product magnet which is a redesign of the prototype magnet based on testing and shimming results, has been undertaken and completed.

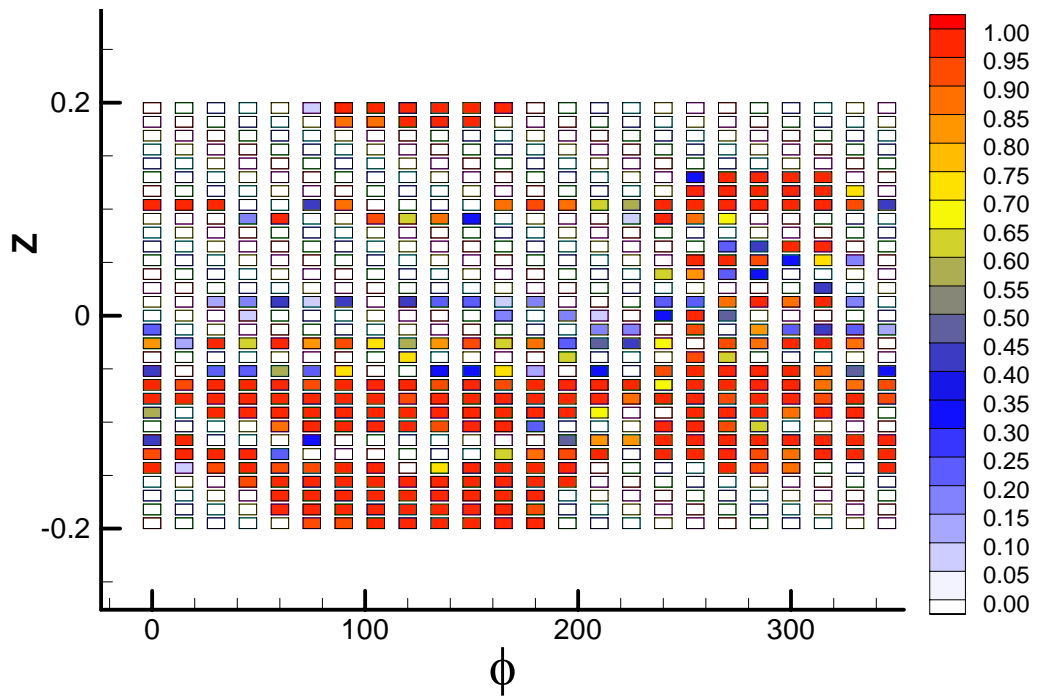


Figure 1. A Further Optimized Shimming Structure