Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Suppressing local hot spots due to eddy currents in magnetic coil systems[1] ZHEN YAO, AARON SHOJINAGA, YONG WU, Case Western Reserve University, SHMARYU SHVARTSMAN, TIMOTHY EAGAN, THOMAS CHMIELEWSKI, ViewRay Inc., ROBERT BROWN, Case Western Reserve University — A particular goal in magnetic field applications is to avoid eddy current heating in coils and shields. It is important, in MRI, for example, to avoid hot spots near the patient to be imaged as well as in the vicinity of soldering joints. We develop effective analytical formulas for the eddy current behavior of sources close to surrounding conductors, we verify these via numerical simulations, and we make successful comparisons to corresponding experimental temperature distributions. Optimized patterns of incisions made in the conductors are discovered for addressing particularly troublesome heating locations. The criteria include the need to minimize the number and length of the cuts. Theory and experiment are in agreement on the efficacy of this method for reducing steady-state temperatures. An example of results in the practical design of commercial coils and shields is that a single cut parallel to the long edge of rectangular conductors reduces the temperatures much more than making multiple cuts parallel to the short edge.

[1]Supported by Ohio Third Frontier Program

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Date submitted: 19 Nov 2010 Electronic form version 1.4