

Mitigating Eddy Current Distortions

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In this presentation, we will cover three main topic areas:

The first is where eddy currents come from and why they are problematic for MRI. They are induced electrical currents in the conductive materials surrounding the field gradient coils that oppose the changing magnetic field. The resulting field is the sum of these two fields of opposite polarity. Thus these currents distort the changing magnetic field experienced by the subject, and when not corrected, these field distortions appear as image distortions.

Eddy currents can be mitigated in several ways. First, the field gradient coils and magnet surround can be designed to cancel or block the induced currents. The applied field gradients can be compensated or pre-emphasized so that the magnetic field resulting from the applied currents and the induced currents more closely approached the intended field gradient form. The pulse sequence can be designed so that the induced fields decaying with a characteristic time constant cancel. And finally, with knowledge of the characteristics of the distorted field, the distorted image can be corrected in image processing. Each of these approaches will be described and explained.

The final topic area will be to explore specific research related to each of the mitigation approaches.