

Comparison of FASTMAP and B0 Field Map Shimming for 4T MRI

Authors : Mohan L. Jayatiake, Judd Storrs, Jing-Huei Lee

Abstract : The optimal MRI resolution relies on a homogeneous magnetic field. However, local susceptibility variations can lead to field inhomogeneities that cause artifacts such as image distortion and signal loss. The effects of local susceptibility variation notoriously increase with magnetic field strength. Active shimming improves homogeneity by applying corrective fields generated from shim coils, but requires calculation of optimal current for each shim coil. FASTMAP (fast automatic shimming technique by mapping along projections) is an effective technique for finding optimal currents works well at high-field, but is restricted to shimming spherical regions of interest. The 3D gradient-echo pulse sequence was modified to reduce sensitivity to eddy currents and used to obtain susceptibility field maps at 4T. Measured fields were projected onto first-and second-order spherical harmonic functions corresponding to shim hardware. A spherical phantom was used to calibrate the shim currents. Susceptibility maps of a volunteer's brain with and without FASTMAP shimming were obtained. Simulations indicate that optimal shim currents derived from the field map may provide better overall shimming of the human brain.

Keywords : shimming, high-field, active, passive

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