Purpose
Detectibility of brain activation with functional MRI (fMRI) strongly depends on signal stability and noise of the echo-planar imaging (EPI), the most commonly applied pulse sequence. This study aimed to test the EPI stability using Weisskoff's method for clinical and 32-channel head coils, with and without parallel imaging, at two 3T MRI scanners.
Materials and Methods
Experiments were performed on two 3T MR systems, the MAGNATOM Trio (Siemens) and the Signa MR750 (GE). The same head phantom filled with silicone oils (GE Model No. 2359877) was scanned using a clinical (12-channel) and a 32-channel head coils on the Siemens, and a clinical (8-channel) and a 32-channel head coils on the GE system. Single-shot gradient-echo EPI sequences were applied in all experiments with TR/TE/FA = 2 s/30 ms/90-degrees, FOV = 256 mm, matrix size = 64 x 64, number of dynamics = 300. Thirty contiguous axial slices with thickness = 3 mm and gap = 1 mm were acquired. For scans with parallel imaging, an acceleration factor of 2 was applied. Signal-to-noise ratio (SNR0) and the relative fluctuation (as a function of ROI size) were determined following Weisskoff's method.
Results
The results from the Siemens system showed lower relative fluctuations with the 32-channel coil as compared to the 12-channel coil. For both coils, parallel imaging improved the stability for larger ROIs. The results from the GE system showed greater instability with the 32-channel coil when parallel imaging was applied. The other three conditions demonstrated similar instability.
Conclusion
EPI stability was found varied between imaging methods, coils and systems. It might as well differ between two installations of scanners with the same manufacture/model. Further study will be conducted to compare images from different sites with the same imaging hardware and method.