# AbstractID: 8891 Title: Quantifying Magnetic Moments of Small Spherical Objects in MRI images

**Purpose:** The goal of this research is to develop a novel method for quantifying relative magnetic moment of **any** small object appearing in MRI images. This method may be useful in evaluating the magnetic characteristics of localized microbleeds in the brain or nanoparticles of contrast agents. We have successfully developed a 2D version applied only to long narrow cylindrical objects [1-2]. A key feature of this method is in the extraction of the desired information from MRI data **without any *a priori*** information. **Method and Materials:** The complex signal from a spherical object in a concentric spherical region is given in [3]. The signal contains three unknowns: effective proton density, volume of the object, and magnetic moment. The center of the object can be determined by minimizing the aggregate signal from the spherical region. The magnetic moment can be derived from the composite complex signals of three concentric spheres. Whether the object is paramagnetic or diamagnetic (relative to water) can be determined from the imaginary part of the complex signal. Both the thermal noise and the discrete voxels were included in simulations and were studied by the error propagation method. **Results:** The center of the spherical object was determined within 0.3 voxel from its true center. With a proper choice of the echo time, the magnetic moment of the object can be determined within 5% of the actual magnetic moment. This result has been confirmed by both simulations and error propagation analysis. **Conclusion:** Our preliminary study demonstrates the feasibility of the new method that can be used to accurately quantify the magnetic moment of a voxel wide object such as microbleeds or implanted nanoparticles without any *a priori* information.

[1]Cheng et. al, *MRI*, 2007, pp.1171-1180. [2]Hsieh et. al, ISMRM, 2007 p.2596. [3]Cheng et. al, *MRI*, 2001, pp.1017-1023.