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Detection of superparamagnetic nanoparticles using magnetoencephalography TERESA CHEUNG, KAREN KAVANAGH, SARMITA MAJUMDER, URS RIBARY, Simon Fraser University, ALEXANDER MOISEEV, Down Syndrome Research Foundation — When bound to a biomarker, iron oxide nanoparticles have found applications in medicine because they are non-toxic and detectable using SQUID magnetometers in opaque tissue. In a liquid carrier, these particles are superparamagnetic with moments that randomly rotate due to thermal fluctuations. We have utilized a 151-channel magnetoencephalography (MEG) device to measure the net magnetic fluctuations from a 0.5 ml sample of Fe3O4 in a colloidal suspension spatially, temporally and as a function of temperature. TEM measurements suggest the sample particles are 10 to 50 nm in size. The sample was placed in an MEG and magnetic noise data was collected. The presence of these particles caused an increase in noise that was detectable in the frequency domain but was difficult to detect in the time domain. Temperature dependence exhibited a 1/T relationship with measured power. Spatial contour maps of the frequency data showed a distinct peak near the location of the sample. We hope to utilize our results towards creation of a model to localize these nanoparticles in vivo.

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