1046-65-2025 **Gunay Dogan*** (gunay.dogan@nist.gov), 100 Bureau Drive, Stop 8910, Gaithersburg, MD 20899-8910, and **George Biros**. *A fast inversion algorithm for linearized diffuse optical tomography with large data sets.* Preliminary report.

Diffuse optical tomography is an emerging imaging technology with great potential for breast and brain imaging. Sources of visible light are used to illuminate the body and images are inferred from outside measurements of the light that has diffused in the body. The reconstruction of images requires the solution of an ill-posed nonlinear inverse problem, which is usually computationally-intensive. In our work, we propose a fast method to compute 2d image reconstructions in the case of a large amount of measurements, when the inversion becomes even more demanding in terms of computation. We consider a square geometry where the light sources and measurements are located regularly on opposite sides of the domain, and solve a linearized version of the problem based on the Born approximation. By revealing the special structure of the problem, we design fast methods to assemble the coefficient matrix for the linearized problem. We also propose fast matrix-vector product routines that can be used to solve the linear system with iterative methods or sparse SVD. Finally we introduce a fast inversion algorithm that produces the solution of the inverse problem by solving a sequence of small systems. We demonstrate the effectiveness of our method with several examples. (Received September 16, 2008)