

Tutorial for “Amsterdam DDA”

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“Amsterdam DDA” (ADDA) is a computer code to simulate light scattering by arbitrary shaped particles using the discrete dipole approximation (DDA). ADDA has been developed over a period of more than 10 years at the University of Amsterdam [1-3]. Its main feature (distinctive from other DDA codes) has always been the capability of running on a cluster of computers, parallelizing a *single* DDA computation. This allows using a practically unlimited number of dipoles, since ADDA is not limited by the memory of a single computer. Recently the overall performance of the code has been improved significantly, together with some optimizations specifically for single-processor mode [4]. Most of ADDA is written in ANSI C, which ensures wide portability on the source-code level. The code is fully operational under Linux and, in sequential mode, on Windows based systems. The parallelization over multiple processors is based on a geometric decomposition of the particle and the single-program-multiple-data paradigm of parallel computing. The code is written for distributed memory systems using the Message Passing Interface (MPI). ADDA's source code and documentation is freely available [5].

At the workshop I will present a tutorial, which will give some insights in the following aspects of light scattering simulations using ADDA:

- Running a sample simulation and understanding output.
- Specifying size and refractive index of the scatterer and size of dipoles.
- Understanding dependence of the performance on the refractive index.
- Using the internal help system.
- Specifying one of the predefined shape for the scatterer.
- Calculating scattering cross section by integration over the whole solid angle.
- Changing the convergence criterion of the iterative solver.
- Performing orientation averaging.
- Using built-in granule generator.

There will be a number of computers available at the workshop. Anyone, who is willing to participate with his own laptop, is encouraged to download and compile the latest version of ADDA source code or download ready-to-use executable files for Windows system [5].

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 2. A. G. Hoekstra and P. M. A. Sloot, "Coupled dipole simulations of elastic light scattering on parallel systems," *Int. J. Mod. Phys. C* **6**, 663-679 (1995).
 3. A. G. Hoekstra, M. D. Grimminck, and P. M. A. Sloot, "Large scale simulations of elastic light scattering by a fast discrete dipole approximation," *Int. J. Mod. Phys. C* **9**, 87-102 (1998).
 4. M. A. Yurkin, V. P. Maltsev, and A. G. Hoekstra, "The discrete dipole approximation for simulation of light scattering by particles much larger than the wavelength," *J. Quant. Spectrosc. Radiat. Transf.* (2007) , doi:10.1016/j.jqsrt.2007.01.33.
 5. "Amsterdam DDA," <http://www.science.uva.nl/research/scs/Software/adda> (2007).