

# Generation and Sizing of Sub-Micron Mists

## Math Thesis Proposal for 2001–2002

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### 1 Objective

The droplet source project is geared toward modeling and creating a device for generating sub-micron water droplets of a precise size input by the user. Once created, this device will be used to create deuterized target droplets for laser fusion experiments.

### 2 Project Outline

The project is already underway, and a reliable particle-sizing method and apparatus have been created and tested. Based on the Mie scattering equations, this method produces accurate size measurements for monodisperse latex spheres in water. During the summer of 2001, this technique will be extended to measure droplet mists containing a distribution of sizes.

The creation of droplets by ultrasonic atomization will also be investigated during the summer. Modeling, experiment, and literature research will be combined to determine the factors influencing droplet size in ultrasonic atomization, with the ultimate goal of manipulating size through these parameters.

During the 2001–2002 school year, theoretical and experimental work on the droplet source will be completed. With this device in hand, theoretical work on the fusion experiments will begin, including design and modeling of the experiment.

### 3 Thesis Topic

The exact topic of the thesis will depend on the pace at which summer research can be completed. If the device is finished by the end of the summer, the thesis will most likely focus on the theory behind fusion experiments to be conducted with the device. If the device is still incomplete, the thesis will probably focus on the modeling behind the device itself.

### 4 Advisors

Thomas D. Donnelly and Andrew J. Bernoff will advise this project.

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Thomas D. Donnelly, Ph.D.

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Andrew J. Bernoff, Ph.D.