FINAL REPORT

MODELING SINGLE MOLECULE FLUORESCENCE AND LASING

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Prepared for:

Michael D. Barnes
Chemical and Analytical Sciences Division
Oak Ridge National Laboratory
Oak Ridge, TN

Prepared by:

Steven C. Hill
Physicist
Army Research Laboratory
AMSRL-BE-S
2800 Powder Mill Road, Adelphi, MD 20783-1197
(301)394-1813, 4797 (Fax)

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Modeling single molecule fluorescence and lasing

Steven C. Hill
Army Research Laboratory, 2800 Powder Mill Road, Adelphi, MD 20783-1197

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In FY 1998 our efforts were in three main areas, all related to detecting single fluorescent molecules[1] and understanding their emission.

1) We completed the calculations and analysis for a paper on spatial photoselection of single molecules on the surface of a dielectric microsphere.[2] Molecules that are oriented parallel to the surface of a spherical microcavity have position-dependent excitation probabilities and a collection efficiencies. The results are different for different polarizations.

2) We completed the modeling and analysis for a paper analyzing single molecule photocount statistics in microdroplets.[3] In this paper we employed a Monte Carlo technique to simulate effects of molecular occupancy, photobleaching, and fluorophor spatial diffusion within the droplet. We discussed the optimization of detection of single molecules in microdroplets.

3) We modeled the images of single molecules in microdroplets and submitted a preliminary report of these images in a paper which also showed experimental results.[4] The computed images depend upon the molecule's position within the microsphere, its orientation and emission frequency, and on the size and refractive index of the microsphere.

For this work we used and modified models and computer codes developed previously,[5, ?] as well as developed new models and codes.

References

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