

# TECHNICAL REPORT

## DOE

### DE-FG03 97 ER 62346

Department of Energy, DE-FG03-97ER62346

Title: CENTER OF EXCELLENCE FOR MEDICAL LASER APPLICATIONS

PI: Steven L. Jacques

Feb 1, 1998 - Jan 31, 1999

TOTAL Award: \$75,000

Institution:      Providence Health Systems  
                    Oregon Medical Laser Center  
                    Providence St. Vincent Medical Center  
                    9205 SW Barnes Rd., Portland, OR 97224

The project supported work by three graduate students:

**1. John Viator (advisor: Scott A. Prahl)**

PhD candidate in Electrical and Computer Engineering, Oregon Graduate Institute  
Oregon Medical Laser Center, Providence St. Vincent Hospital

#### **“Pulsed laser optoacoustic imaging of layered tissue structures”**

**Abstract:** Optoacoustic imaging mapped the depth profile of penetration by an absorbing dye into a biomaterial. A Q-switched 2<sup>nd</sup> harmonic Nd:YAG laser and a piezoelectric transducer were used to create an optoacoustic imaging system for mapping the distribution of indocyanine green that had penetrated into the superficial 100 um region of an elastin sample prepared by hydrolysis of porcine aorta. The pulsed laser induced transient heating and stress generation in the tissue proportional to the dye concentration. The sound wave generated was detected by a lithium niobate detector on the back side of the sample. The time-resolved trace of the detected sound wave was acquired by a digitizing oscilloscope. Analysis of the trace by a simple Beer's Law model allowed reconstruction of the distribution of dye concentration within the sample. Such depth profiling is important for the preparation of dye-stained biomaterials which will be used as patches that are laser welded using a diode laser.

**Publication:** J.A. Viator, S.L. Jacques, S.A. Prahl: Depth profiling of absorbing soft materials using photoacoustic methods. IEEE J. Selected Topics in Quantum Electronics 5:989-996, 1999.

## **DISCLAIMER**

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## **DISCLAIMER**

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document.**

**2. Chung-Chieh Cheng (advisor: Michael Raymer)**

PhD candidate in Physics, University of Oregon

**“Long-range saturation of spatial decoherence in wave-field transport in multiple-scattering media”**

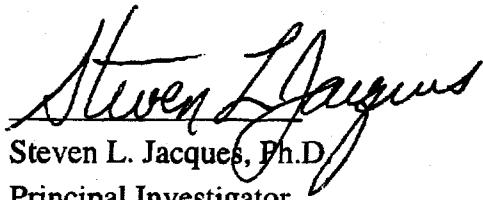
**Abstract:** We report the first experiments showing the saturation of the decoherence rate of a wave field subject to random perturbations, specifically a light field traveling in a dense scattering medium. Quantum matter waves are predicted to display similar behavior.

**3. Erik Veach (advisor: Michael Raymer)**

PhD candidate in Physics, University of Oregon

**“Addition of angular information to optical coherence tomography (OCT) by volume holography”**

**Abstract:** Optical Coherence Tomography (OCT) is a method for creating 2-D images of the scattering of light by tissues in the lateral (x) and depth (z) to yield an x-z image that looks similar to a tissue biopsy but is non-invasive. This project modified the basic OCT system to allow resolution of the angle of backscattered light so as to distinguish the apparent particle size of the tissue structures that backscattered light. The goal is to create an OCT system which can be color-coded by the apparent size of particles creating the image, for example distinguishing membranes from mitochondria from nuclei from collagenous structures.



Steven L. Jacques, Ph.D.

Principal Investigator

May 18, 2000

# MEMORANDUM

**Date:** May 19, 2000 / Friday

**Reply:** DOE Oakland Operations Office (CAPD)

**To:** Property Administrator, Property Management Group,  
Management Services Division.

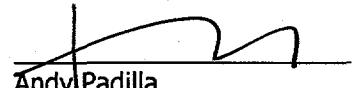
**Subject:** Request for Property Clearance:

Grant Number: **DE-FG03 97 ER 62346**

## **Providence Portland Medical Center**

### **Part I**

This award has **EXPIRED** and is in the **CLOSE-OUT PROCESS**. The Awardee has submitted a Close-Out Inventory Schedule and Certificate to the Contract Specialist. The original document is attached for your review and processing. To complete the close-out of this award, please complete **Part II** of this memorandum and return it to the Close-Out Contract Specialist who signed below.



Andy Padilla  
Close-Out Contract Specialist  
Contracts Acquisition and  
Property Division.

### **Part II**

The Awardee has satisfied all Government property management and disposition requirements for the subject award and final payment is recommended.

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Property Administrator  
Property Management Group  
Management Services Division.

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Date

Attachment: As Stated.

PMS: \_\_\_\_\_ FIS: \_\_\_\_\_

**PROPERTY REPORT  
DOE  
DE-FG03 97 ER 62346**

Department of Energy, DE-FG03-97ER62346

Title: CENTER OF EXCELLENCE FOR MEDICAL LASER APPLICATIONS

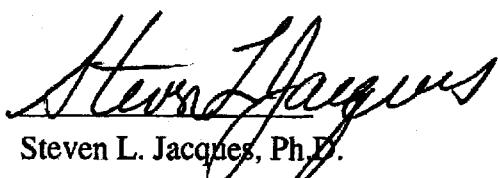
PI: Steven L. Jacques

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**TOTAL** Award: \$75,000

Institution: Providence Health Systems  
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There was no equipment purchased under this grant.



Steven L. Jacques, Ph.D.

Principal Investigator

May 18, 2000