

## **Holographic optical element for compact fingerprint imaging system**

Michael H. Metz, Zane A. Coleman<sup>†</sup>, Nicholas J. Phillips<sup>\*</sup>, Carl Flatow

ImEdge Technology, Inc.  
2123 Fountain Court, Yorktown Heights, NY 10598

<sup>\*</sup>Centre for Modern Optics,  
De Montfort University, Hawthorn Building, The Gateway, Leicester. LE1 9BH, UK

<sup>†</sup>Loughborough University of Technology  
Dept. of Physics, Loughborough, LE11 3TU, UK

### **ABSTRACT**

An edge-lit holographic optical element has been developed which produces a high contrast and high resolution fingerprint image. Continuing work on the development of a holographic optical element for use in a compact fingerprint imaging system is described. The hologram is combined with an electronic imaging array into a package only several millimeters thick, using no image transfer lens system.

Previously reported results with green holograms are reviewed. New results are presented for red holograms illuminated by a laser diode. Design issues and experimental results are discussed, relating to selection of hologram operating wavelength, angular and wavelength sensitivity of the hologram, and image quality versus packaging volume tradeoffs.

**Keywords:** hologram, edge-lit, fingerprint

### **1. INTRODUCTION**

Fraud costs our society billions of dollars worldwide each year. A growing industry has sprung up to develop new technologies and methods of preventing fraud. One important aspect of this is the need to positively identify an individual as the proper owner of a credit card, passport, or bank account, for example, or that the person is allowed access to a door, a computer, or other physically secured systems.

Numerous biometric devices are being developed to recognize human characteristics which can uniquely identify an individual. One of the oldest and best understood of the various biometric identifiers is fingerprints. Automated fingerprint capture systems connected to computer databases are replacing the long used inked fingerprints on paper. In addition to law enforcement applications, these automated fingerprint identification systems, known as 'live scan' devices, are being used in welfare, health care and motor vehicle offices, for employee time and attendance monitoring, and for secure keyless entry systems allowing access to computer networks, sensitive areas, offices, cars, homes, and hotel rooms. As the number of such systems put into use increases, more pressure is put on the industry to reduce the cost of these systems. Additionally, reduction in the physical size of the fingerprint capture system will open it to many new markets not available to larger systems. Examples where live scan systems are being considered, and physical size constraints are very important, include computer PCMCIA cards, computer mice and cellular telephones.



















