



### **B94 Micro-Marked Firing Pins: Character Durability and Impression Legibility**

*David Howitt, PhD\*, Frederick Tulleners, MA, and Michael Beddow, MA, University of California, 1 Shields Avenue, Forensic Science, Davis, CA 95616*

After attending this presentation, attendees will be briefed on information about the concept of firearm labeling.

This presentation will impact the forensic community and/or humanity by improving the understanding of the laser identification methods.

The placing of micro-marks on specific firearm components, that would in turn be transferred directly to the ammunition upon discharge, has been proposed to assist in the identification of expended ammunition components found at crime scenes. Versions of this technology involving the laser engraving of firing pins have been developed by companies such as Pivotal Development and Laser Automation Gekatronic. The technology initially involved masking but has subsequently developed into a direct laser writing method where a pattern of characters is cut into the firing pin by locally ablating the metal surface. The scale of these characters is small enough that a unique identification of the firearm can be embedded on the firing pin that is invisible to the naked eye but decipherable at a magnification of about 25 times. The obvious concerns with this type of labeling are the visibility and persistence of the impression evidence that is produced and the ease with which micro-characters can be removed by the user. When a firearm is discharged the firing pin moves forward to strike the primer that is composed of a thin metal cup, typically made of brass, which contains a contact sensitive chemical mixture. The impression of the characters into the primer is the result of both the velocity of the firing pin and the pressure created by the deflagration of the gunpowder. As long as the markings extend beyond the length of the firing pin that can potentially impact the primer, deliberate attempts to completely remove the characters should also defeat the operation of the firearm.

In response to the development of this technology the State of California proposed an amendment to Sections 12126 and 12130 of the California Penal Code in the form of Assembly Bill 352 (AB 352) in February 2005. This bill required that "Commencing January 1, 2009, all semiautomatic pistols that are not already listed on the "not unsafe handgun" roster shall be designed and equipped with a microscopic array of characters that identify the make, model, and serial number of the pistol, etched into the interior surface or internal working parts of the pistol, and which are transferred by imprinting on each cartridge case when the firearm is fired."

In light of this legislation a research project was initiated to investigate the viability of this technology by engraving micro-serial numbers and radial bar coding on the faces of firing pins and testing the durability and longevity of the impressions that they produce. The testing of this technology was carried out with multiple brands of ammunition on a variety of different caliber semi-automatic handguns, two semi-automatic rifles and a pump shotgun. This testing was conducted, in part, with the assistance of the California Highway Patrol (CHP) Academy. Six engraved firing pins were placed on the Smith and Wesson Model 4006 firearms used by academy recruits. All of the firing pins and cartridge cases have been evaluated microscopically to determine the consequences to the impressed characters. The results of these findings will be presented.

**Firearms, Code, Identification**