



B101 Comparison of VisionX and Leica® UFM4 Comparison Microscopes and Validation of the VisionX Comparison Microscope for Intra- and Inter-Laboratory Examination

Mark S. Dreyfuss, PhD, Maryland State Police, Forensic Sciences Division, Pikesville, MD 21208; Daniel E. Katz, MFS, Maryland State Police, Forensic Sciences Division, Pikesville, MD 21208; Torin Z. Suber, Maryland State Police, Forensic Sciences Division, Pikesville, MD 21208; Susan L. Kim, MFS, Maryland State Police, Forensic Sciences Division, Pikesville, MD 21208*

Learning Overview: After attending this presentation, attendees will understand the technical advances in the forensic examination of firearms and tool marks and how newly available technology can be used to expand peer to peer communications and improve the decision-making process during the microscopic comparisons of bullets, cartridge cases and tool marks. Results of an independent validation study of two comparison microscopes will question whether current requirements to perform same location/same scope verifications are necessary. Results evaluating the VisionX for intra- and inter-laboratory examinations will also be presented.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by addressing whether the principles of the firearms and tool marks community require updating considering new comparison microscopes enhancements and communication technology.

The VisionX comparison microscope integrates advanced computer technology for the microscopic comparison of bullets, cartridge cases, and tool marks. Additional capabilities of the VisionX software allows for enhanced peer-to-peer communication and statistical analysis during the examiner's decision-making process. Validation of new equipment in a forensic laboratory requires not only that the equipment perform as expected, but also that it can produce results that are useful for law enforcement and acceptable in court settings. To accomplish a validation of the VisionX comparison microscope, a series of projects were designed and implemented.

Project 1 compared the VisionX comparison microscope with the Leica UFM4 comparison microscope by evaluating each microscope's ability to provide measurements of land and groove impressions and highlight characteristics of fired bullets that are required for entry into the Federal Bureau of Investigation (FBI) General Rifling Characteristics (GRC) database. Samples were gathered from handguns submitted to the Maryland Handgun Roster Board (HRB) as part of the approval process to sell a new handgun in Maryland.

Project 2 functioned as an in-place verification that the new VisionX technology and currently used Leica UFM4 are, at a minimum, equivalent in function for firearms casework. Four firearms examiners were given standardized proficiency examinations that required the identification of matched and unmatched .40 S&W cartridge cases fired from consecutively manufactured slides for a Smith and Wesson model SW40VE. Each examiner was tested for accuracy and time of determination and surveyed for their impressions of the two comparison microscopes.

Project 3 was designed to evaluate the need for on-site examiners who visually inspect all cartridge casings to be present in the same location. By linking two VisionX Comparison Microscope Stations or by linking a VisionX Comparison Microscope Station to an examiner's office computer, examiners within a single lab can see live camera images at the same time but not in the same location or at the same microscope. The ability of pairs of examiners to share the same live camera image and discuss or text each other in real time so that independent determinations can be made based on the same agreed-upon image will be discussed.

Project 4 expands the peer to peer connectivity tests by having Maryland State Police firearms examiners share images with other firearms examiners located in other counties, states, and countries.

Last, Project 5 applies the capabilities of the VisionX software to create data that can be used to calculate a statistical relevance value for the comparison conclusions rendered during the validation study.

**Supported by a grant from the National Institute of Justice (2016-DN-BX-K006)*

Firearms and Tool Marks, Comparison Microscopes, Inter-Laboratory Communication