

# **Standard for Verification of Source Conclusions in Toolmark Examinations**

*Firearms & Toolmarks Subcommittee  
Physics/Pattern Interpretation Scientific Area Committee  
Organization of Scientific Area Committees (OSAC) for Forensic Science*



# OSAC Proposed Standard

# Standard for Verification of Source Conclusions in Toolmark Examinations

Prepared by  
Firearms & Toolmarks Subcommittee  
Version: 1.0  
August 2020

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## **Disclaimer:**

This document has been developed by the Firearms & Toolmarks Subcommittee of the Organization of Scientific Area Committees (OSAC) for Forensic Science through a consensus process and is *proposed* for further development through a Standard Developing Organization (SDO). This document is being made available so that the forensic science community and interested parties can consider the recommendations of the OSAC pertaining to applicable forensic science practices. The document was developed with input from experts in a broad array of forensic science disciplines as well as scientific research, measurement science, statistics, law, and policy.

This document has not been published by an SDO. Its contents are subject to change during the standards development process. All interested groups or individuals are strongly encouraged to submit comments on this proposed document during the open comment period administered by the Academy Standards Board (ASB) <https://www.asbstandardsboard.org/>.

Keywords: *bias, comparison, primary examiner, verification*

This document was developed to provide a standard for the verification of toolmark source conclusions by a second qualified examiner.

## **Foreword**

This standard was proposed by the Firearms and Toolmarks Subcommittee of the Organization of Scientific Area Committees (OSAC) by submitting a request to the American Academy of Forensic Sciences (AAFS) Academy Standards Board (ASB). This document is intended to provide a standard for the verification of toolmark source conclusions by a second qualified examiner. This document takes into consideration the current state of professional practices and scientific research on contextual bias and confirmation bias<sup>1</sup>.

Documents that contain information related to this standard include:

- *Standard Scale of Source Conclusions and Criteria for Toolmark Examinations*
- *Minimum Education Requirements for Firearm and Toolmark Examiner Trainees*
- *Requirements and Recommendations for a Firearm and Toolmark Examiner Training Program*

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<sup>1</sup> Numerous scientific studies, both inside and outside of forensic science, have provided convincing evidence for the existence of contextual influences that may have a deleterious effect on the judgement of examiners performing Peer Reviews. Some of these studies that relate directly to forensic science issues are listed in the Bibliography.

## **Acknowledgements**

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## **Table of Contents**

<b>1</b>	<b>Scope</b>	<b>6</b>
<b>2</b>	<b>6</b>	
<b>3</b>	<b>6</b>	
<b>4</b>	<b>7</b>	
4.1	7	
4.2	7	

## **1 Scope**

This standard provides a standard for conducting verifications of source conclusions arising from forensic toolmark comparisons. This document is limited to the process of verifying the source conclusions reached by the primary firearm and toolmark examiner in a case and does not address or consider other types of technical casework review.

## **2 Normative References**

## **3 Terms and Definitions**

For the purposes of this document, the following definitions and abbreviations apply:

### **3.1**

#### **Forensic Science Services Provider (FSSP)**

A forensic science agency or forensic science practitioner providing forensic science services

### **3.2**

#### **Light Comparison Microscopy (LCM)**

A method of toolmark analysis involving the use of a brightfield microscope to allow side-by-side comparison.

### **3.3**

#### **Primary Examiner**

The qualified firearm and toolmark examiner responsible for conducting a toolmark examination, making source conclusions, and authoring a report.

### **3.4**

#### **Comparison**

The side-by-side microscopic examination of two items or two toolmarks.

### **3.5**

#### **Verification**

The independent comparison of previously compared toolmarks to provide a quality check of a source conclusion.

### **3.6**

#### **Verifier**

The qualified firearm and toolmark examiner tasked with reaching an independent source conclusion regarding evidence examined by the primary examiner.

### **3.7**

#### **Virtual Comparison Microscopy (VCM)**

A method of toolmark analysis involving the use of hardware and software to allow side-by-side comparison of 3D topography data.

## **4 Requirements**

### **4.1 Extent of Verification**

All (100%) of the primary examiner's source conclusions shall be subjected to the verification process.

### **4.2 Method**

The FSSP shall implement written procedures for verification. All verifications should be conducted by examining the original evidence using LCM or VCM whenever practicable.

However, it is recognized that there are circumstances in which verification by an independent examiner viewing the original evidence may not be possible or practically feasible. In these circumstances, and when sufficient agreement or disagreement of class or individual characteristics can be clearly demonstrated to support an opinion of Exclusion or Identification, photographic and/or digital images may be used by the verifier to form an opinion. The representation or information provided to the verifier, including additional documentation from the primary examiner, must be sufficient, in the verifier's opinion, to support an independent source opinion. Due to the numerous variables that can lead to inconclusive comparison opinions, it is not feasible to verify these types of comparisons through the use of photographs only. Therefore, all inconclusive comparison results made by the primary examiner shall be verified by examining the original evidence using LCM or VCM.

The verifier shall not be informed of the primary examiner's source opinion(s) nor be exposed to task-irrelevant information prior to reaching their own opinion(s). It is recognized that this may not be feasible if verification is performed using photographs of comparisons taken by the primary examiner.

### **4.3 Assignment of Verifier**

The FSSP should implement policies for the assignment of verifiers. Whenever practicable, the primary examiner shall not assign their own verifier. Assignment may be accomplished through a written procedure or less formally, depending on factors such as staff size and availability, potential for confirmation bias by particular staff members due to known exposure to task-irrelevant case information, or other needs and requirements of the FSSP. When assigning a verifier, the FSSP will make every effort to select an examiner who has no prior knowledge of the primary examiner's source opinions.

### **4.4 Item Identity Check**

As with all casework, it is the responsibility of the primary examiner to ensure that the compared items are correctly controlled. It is the primary examiner's responsibility to present the correct items to the verifier for the verification process. However, it is also incumbent on the verifier to ensure the proper items have been compared during their verification. Therefore, the FSSP shall

have a written procedure for ensuring compared items are correctly controlled, to include securely marking the evidence items (whenever practicable) prior to comparison and having the verifier deliberately check the identity of each item immediately before or after they are microscopically verified.

#### **4.5 Resolution of Conflicting Conclusion(s) between Primary Examiner and Verifier**

The FSSP shall have a policy for the arbitration of differences in source conclusion(s) between the primary examiner and verifier. Differences in conclusions may be resolved through a consultation between the conflicting examiners, or, in the case of an impasse, it may require a review by a third qualified examiner. The third examiner can decide in favor of either opinion or send the evidence to another FSSP for arbitration, if needed. The third examiner shall not be informed of the conclusions reached by the primary examiner and verifier before making their assessment. The person acting as the third examiner should not be chosen by either the primary examiner or verifier. The FSSP's policy shall address how the third examiner is selected. If necessary, the third examiner can be a qualified examiner from another FSSP.

#### **4.6 Documentation of Verifications**

The following information shall be documented:

- The identity of the verifier
- The date(s) of verification
- The basis for the verifier's opinion (e.g. what marks were compared)
- The verifier's conclusion(s)
- Affirmation of the verifier's item identity check
- The method of review (e.g., LCM, VCM, or photographs)
- Any disagreement of source opinions and their resolutions, including any change(s) to original conclusion(s)

### **Bibliography**

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