



<b>ATF-LS-FT11</b> <b>Theory of Identification and Range of Conclusions</b>	Published Online: <b>March 2018</b>
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**I. Scope**

This policy and procedure guideline establishes a standard theory for the identification of toolmarks and the range of conclusions that are applicable to the examination of toolmarks. This protocol is applicable to all ATF firearms examiners, and relates to all types of toolmark examinations.

**II. References**

“AFTE Theory of Identification as it Relates to Toolmarks.” *AFTE Journal*. Volume 43, Number 4, p 287.

Association of Firearm and Tool Mark Examiners. *AFTE Glossary*. 6<sup>th</sup> Edition. 2013.

[SWGUN Elimination Factors Related to FA/TM Examinations](#), website, (Last assessed 3-8-17).

**III. Theory of Identification as it Relates to Toolmarks**

1. The theory of identification as it pertains to the comparison of toolmarks enables opinions of common origin to be made when the unique surface contours of two toolmarks are in “sufficient agreement.”

2. This “sufficient agreement” is related to the significant duplication of random toolmarks as evidenced by the correspondence of a pattern or combination of patterns of surface contours. Significance is determined by the comparative examination of two or more sets of surface contour patterns comprised of individual peaks, ridges and furrows. Specifically, the relative height or depth, width, curvature and spatial relationship of the individual peaks, ridges and furrows within one set of surface contours are defined and compared to the corresponding features in the second set of surface contours. Agreement is significant when the agreement in individual characteristics exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and is consistent with agreement demonstrated by toolmarks known to have been produced by the same tool. The statement that “sufficient agreement” exists between two toolmarks means that the agreement of individual characteristics is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility.

3. Currently the interpretation of individualization/identification is subjective in nature, founded on scientific principles and based on the examiner’s training and experience.

**IV. Range of Conclusions Possible When Comparing Toolmarks**

The examiner is encouraged to report the objective observations that support the findings of toolmark examinations. The examiner should be conservative when reporting the significance of these observations.

1. **Identification:** Agreement of a combination of individual characteristics and all discernable class characteristics where the extent of agreement exceeds that which can occur in the

comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool.

2. **Inconclusive:**

- A. Some agreement of individual characteristics and all discernable class characteristics, but insufficient for an identification.
- B. Agreement of all discernable class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility.
- C. Agreement of all discernable class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

3. **Elimination:** Significant disagreement of discernable class characteristics and/or individual characteristics.

4. **Unsuitable:** Unsuitable for microscopic examination.

V. **Glossary of Relevant Terms**

**Class Characteristics:** Measurable features of a specimen which indicate a restricted group source. They result from design factors and are determined prior to manufacture.

**Individual Characteristics:** Marks produced by the random imperfections or irregularities of tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage. They are unique to that tool to the practical exclusion of all other tools.

**Pattern Matching:** The act of visually comparing the surface contours of two or more striated or impressed tool marks for corresponding and/or differentiating features.

**Practical Impossibility:** A phrase, which currently cannot be expressed in mathematical terms, that describes an event that has an extremely small probability of occurring in theory, but which empirical testing and experience has shown will not occur. In the context of firearm and toolmark identification, "practical impossibility" means that based on 1) extensive empirical research and validation studies, and 2) the cumulative results of training and casework examinations that have either been performed, peer reviewed, or published in peer-reviewed forensic journals, no firearms or tools other than those identified in any particular case will be found that produce marks exhibiting sufficient agreement for identification.

**Subclass Characteristics:** Features that may be produced during manufacture that are consistent among items fabricated by the same tool in the same approximate state of wear. These features are not determined prior to manufacture and are more restrictive than class characteristics.

**Toolmark, Impressed:** Contour variations on the surface of an object caused by a combination of force and motion where the motion of the tool is approximately perpendicular to the plane being marked. The class characteristics (shape) can indicate the type of tool used to produce the mark. These marks may contain class, subclass, and/or individual characteristics of the tool producing the marks. Also known as compression marks.

**Toolmark, Striated:** Contour variations, generally microscopic, on the surface of an object caused by a combination of force and motion where the motion of the tool is approximately parallel to the plane being marked. Friction marks, abrasion marks, and scratch marks are terms commonly used when referring to striated marks. These marks may contain class, subclass, and/or individual characteristics of the tool producing the marks.