

May 23, 2025: NIST FORENSIC PROGRAMS SLATED FOR TERMINATION

PROGRAM	USE	JUSTIFICATION FOR NEED
Firearms/ Toolmarks Lab	<p>Research and Development for 3D measurements used in firearm and toolmark analysis.</p> <p>Developing standards, reference samples, and procedures for measurement quality assurance and interoperability</p> <p>Developing objective metrics and algorithms for evaluating the similarity of toolmarks</p> <p>Building research and reference databases of toolmarks for method development and statistical evaluation of the strength of the evidence</p> <p>Developing statistical models and procedures to quantify the strength of the evidence</p>	<p>Firearm and toolmark examinations are among the most frequently challenged forensic disciplines in American courts. Emerging technologies in three-dimensional toolmark topography offer significant advancements, enabling virtual comparison microscopy, algorithmic analysis, and statistical methods to support and strengthen examiners' conclusions. A major advantage of 3D imaging is its ability to capture high-resolution surface topography, which is essential for ensuring the repeatability and reproducibility of comparison results.</p> <p>The advancement and adoption of 3D firearm and toolmark analysis necessitate the parallel development of standards, reference materials, and robust quality assurance protocols. Ensuring interoperability among manufacturers is crucial to enable universal access to reference databases and facilitate effective data sharing across forensic laboratories.</p> <p>Firearm and toolmark analysis is traditionally a subjective discipline. The integration of algorithms allows examiners to quantify the degree of similarity between toolmarks, providing objective support for their conclusions.</p> <p>Research databases containing ground truth samples support both academic and commercial development of novel algorithms. However, a similarity score alone does not provide sufficient context regarding the strength of the evidence. Population databases comprising tens of thousands of firearm and ammunition comparisons offer this context by establishing statistical baselines. National reference databases are essential for ensuring consistent and scientifically grounded reporting of the statistical weight of evidence in forensic firearm and toolmark comparisons.</p> <p>Statistical models can be developed using reference databases to estimate the strength of evidence through methods such as the likelihood ratio. These models must undergo thorough validation before they are applied to casework.</p>