
Technical Procedure for Physical Match Examinations

1.0 Purpose – This procedure shall be followed for the examination of items of evidence that may have broken, cut and/or torn edges that can be joined together, demonstrating a physical match.

2.0 Scope – This procedure applies to all physical match cases in the Trace Unit.

3.0 Definitions – N/A

4.0 Equipment, Materials, and Reagents

- Camera
- Stereomicroscope
- Casting media
- Comparison Microscope
- Scanning Electron Microscope (SEM)

5.0 Procedure

5.1 Analytical Approach

5.1.1 General Guidelines

5.1.1.1 Items submitted for physical match analysis include a wide variety of materials. The Physical Match Technical Leader or designee shall assign a Forensic Scientist to each physical match case based on the type of examination requested and the instrumentation and expertise required to perform the analysis.

5.1.1.2 When pieces can be physically matched, the Forensic Scientist can say with certainty that the pieces were joined to form a single unit.

5.1.1.3 For items in which a physical match is not found, other examinations or comparisons may be performed.

5.1.1.4 If DNA analysis is requested, ensure that the items have been swabbed for DNA prior to proceeding with a physical match analysis.

5.1.2 Visually examine each item of evidence to determine its class characteristics (e.g., size, color, pattern, dimension, composition) and compare the items for similarities.

5.1.3 Orient the pieces and determine if they have broken, cut and/or torn edges that physically fit together.

5.1.3.1 Fabric matching involves examining the general size and shape, weave/knit type, fiber type and twist, colors and patterns, long versus short threads, unusual stretching or contours, stains, damaged areas and stitched edges or selvages.

- ## 5.2 Guidelines for Physical Match Analysis Result Statements

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5.2.4 Negative

5.2.4.1 Class characteristics do not match.

5.2.4.1.1 Example: Items A and B were found to have different __ (e.g., manufacturing characteristics); therefore no physical match is possible.

5.2.4.2 Class characteristics match, but the pieces do not fit together.

5.2.4.2.1 Example: No physical match was found between Items A and B.

5.2.4.2.2 Evidence will go on for additional testing if possible (e.g., paint analysis).

5.3 Standards and Controls – N/A

5.4 Calibrations – N/A

5.5 Maintenance – N/A

5.6 Sampling and Sample Selection

5.6.1 No sampling is performed. When sample selection occurs, it shall be based on the Forensic Scientist's training and experience.

5.6.2 Once a physical match has been made conclusively linking two objects, scenes, etc., no additional pieces originating from those same areas need to be further evaluated for additional physical matches.

5.7 Calculations – N/A

5.8 Uncertainty of Measurement – N/A

6.0 Limitations – N/A

7.0 Safety – Broken edges can be sharp. Care shall be exercised during this technical procedure.

8.0 References

8.1 ASTM / SWG Guidelines

ASTM Standard E2288, 2003, "Standard Guide for Physical Match of Paper Cuts, Tears, and Perforations in Forensic Document Examinations." ASTM International, West Conshohocken, PA, 2003.

8.2 Books

Saferstein, R., ed. *The Forensic Science Handbook, Volume I, 2nd Edition*. New Jersey: Pearson Education, Inc., 2002. Chapter 4: Forensic Glass Comparisons.

Deforest, P.R., R.E. Gaensslen and H.C. Lee. *Forensic Science – An Introduction to Criminalistics*. New York: McGraw-Hill, 1983. Chapter 11 – Physical Patterns.

Kirk, Paul L. *Crime Investigation*. New York: Interscience Publishers, Inc, 1953. Chapters 20 and 22: “Casts and Replicas” and “Metals.”

8.3 Journals

Argon, N., Schecter, B. “Physical Comparisons and some Characteristics of Electrical Tape.” *AFTE Journal* 18.3 (1986): 53-59.

Bradley, M.J., et al. “A Validation Study for Duct Tape End Matches.” *Journal of Forensic Sciences* 51.3 (2006): 504-508.

Dixon, K. “Positive Identification of Torn Burned Matches with Emphasis on Cross Cut and Torn Fiber Comparisons.” *American Academy of Questioned Document Forensic Scientists* (August 1982).

Funk, H.J. “Comparison of Paper Matches.” *Journal of Forensic Sciences* 13.1 (1968): 137-143.

Katterwe, H. “Fracture Matching and Repetitive Experiments: A Contribution of Validation.” *ATFE Journal* 37.3 (2005): 229-241.

Klein, A., L. Nedivi and H. Silverwater. “Physical Match of Fragmented Bullets.” *Journal of Forensic Sciences* 45.3 (2000): 722-727.

Laux, D. “Identification of a Rope by Means of a Physical Match Between the Cut Ends.” *Journal of Forensic Sciences* 29.4 (1984): 1246-1248.

Miller, J. “Metal Fractures: Matching and Non Matching Patterns”. *AFTE Journal* 38.2 (2006): 133-165.

Shor, Y., et al. “Physical Match: Insole and Shoe.” *Journal of Forensic Sciences* 48.4 (2003).

Tsach, T., Wiesner, S., Shor, Y. “Empirical proof of physical match: Systematic research with tensile machine.” *Forensic Science International*. 166 (2007): 77-83.

VonBremen, U.G. and B. Lorne. “Physical Comparison of Plastic Garbage Bags and Sandwich Bags.” *Journal of Forensic Sciences* 28.3 (1983).

Weimar, B. “Physical Match Examinations of Adhesive PVC – Tapes: Improvement of the Conclusiveness by Heat Treatment.” *AFTE Journal* 40.3 (2008): 300-302.

Weimar, B. “Physical Match Examination of the Joint Faces of Adhesive PVC-Tapes”. *AFTE Journal*. 42.3 (2010): 271-277.

9.0 Records – N/A

10.0 Attachments – N/A

Revision History		
Effective Date	Version Number	Reason
09/17/2012	1	Original ISO Document
10/18/2013	2	Added issuing authority to header
08/29/2014	3	Updated header to Physical Evidence Section – Trace Unit, issuing authority to Physical Evidence Section Forensic Scientist Manager. Updated all references in procedure from Trace Evidence Section to Trace Unit.
03/20/2015	4	Changed title to Physical Match Examinations; added cut and/or torn to 1.0; added Comparison Microscope and SEM to 4.0; changed Forensic Scientist Manager to Physical Match Technical Leader or designee in 5.1.1.1; changed wording in 5.1.1.2; added cut and/or torn to 5.1.3; added additional documentation statement to 5.1.5; changed fracture to physical in 5.1.6; removed 5.6.2 and added five additional references to 8.3
12/11/2015	5	Added 5.1.1.4