



TENNESSEE BUREAU OF INVESTIGATION

Forensic Services Division

Microanalysis Standard Operating Procedures Manual

Physical Comparisons

Physical Comparisons

1. Scope

The purpose of a physical comparison is to associate/ disassociate two or more items using individual characteristics (fracture matches) or class characteristics (e.g. size, construction, physical properties).

2. Terms and Definitions

Fracture or Physical Match - The examination of two or more objects that have been cut, torn or broken, using physical, optical and photographic means, which allows one to conclude that these objects were at one time one entity.

Hackle marks – fine ridges on a fracture surface.

3. References

Bradley, Keagy, Preston etc. “A Validation Study for Duct Tape End Matches”
Journal of Forensic Science May 2006, Vol. 51, No.3

Miller, Jerry and H. Kong, “Metal Fractures: Matching and Non-matching Patterns,
ATFE Journal, vol. 38(2), Spring 2006, pp. 133-165.

Richard Saferstein Criminalistics 6th Edition Prentice Hall 1998.

4. Examination Procedures

4.1. Evidence Types

This includes, but is not limited to: automobile parts, paper, matches, glass, fabric and cordage, buttons, items of clothing, tapes, fabric impressions and any other non-footwear or tire impressions.

4.2. Instruments and Equipment

Stereomicroscope
Caliper
Magnifying glass
Photographic equipment and accessories.
Fingerprint powder and brush



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Adhesive acetate paper
Non-adhesive acetate paper
Ruler
Biofoam
Computer system with printer

4.3. *Procedural and Chemical Precautions*

4.4. *Limitations*

A fracture match may not be possible, among like items, if all the pieces are not submitted.

4.5. *Procedure*

Document submitted samples according to *Microanalysis Quality Assurance Policy*.

Evidence submitted may be photographed for case file documentation.

Examine the items to see if the edges of the questioned and standard pieces fit together like a jigsaw puzzle. Hard substances often break leaving unique features. Some physical end matches have a three dimensional fit which is helpful in making a conclusive determination. Matching hackle marks and defects should also be examined to reinforce the physical fit. The topography of the two pieces is often mirror images of each other.

If a fracture match is possible, all matches must be photographed. All matches should be labeled; however, if this is not possible due to size, photographs should be representative of before and after the match and the unlabeled items shall be described in the case notes. All fracture matches will be verified by a qualified examiner. This will be recorded by initialing next to the results in the case folder.

If a test impression is necessary, follow the procedure for acquiring test impressions in Microanalysis Standard Operating Procedure *Footwear Impression Analysis and Comparison*. This same technique can be used for other items such as keys and fabrics.

If a fracture match is not possible or applicable, the items may be compared using physical characteristics (size, color, construction, dimensions, etc.). All the

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physical characteristics that were used for this comparison must be well documented as part of the case file.

If further analysis is required, refer to the following Microanalysis Standard Operating Procedures for proper analysis:

Paint and Polymer Analysis and Comparison
Glass Analysis and Comparison
Fiber Identification and Comparison
Unknown Substance Analysis and Comparison

5. Measurement Traceability

Any measurement that is made is used only in comparison and is not critical to the results.

6. Reference Materials

7. Reports

The following are possible results concluded from the examination:

Comparison of the evidence submitted revealed matching characteristics along the fracture line(s) to conclude that the evidence had been joined at one time.

Comparison of the evidence submitted did not reveal matching characteristics along the fracture lines.

Comparison of the evidence submitted revealed them to be consistent with respect to (morphology, texture, color, or other physical characteristics).

Comparison of the evidence submitted revealed them to be inconsistent with respect to (morphology, texture, color, or other physical characteristics).

Analysis and/or comparison of the evidence submitted was inconclusive.