

Technical Procedure for the Coherent TracER Laser

1.0 Purpose - This procedure describes how to examine evidence with the Coherent TracER laser.

2.0 Scope - This procedure applies to all evidence that is examined with the TracER laser. The TracER can assist in discovering latent impressions that contain substances that fluoresce naturally when exposed to a laser beam. In addition, the TracER may be used with fluorescent dyes to develop and enhance latent impressions. The TracER can also detect serological and trace evidence which may not be visible to the naked eye.

3.0 Definitions

- **LASER** - Light Amplification by the Stimulated Emission of Radiation.

4.0 Equipment, Materials and Reagents

4.1 Equipment and Materials

- Coherent TracER laser
- Camera equipment
- Protective/filter goggles

4.2 Reagents – N/A

5.0 Procedure – Items of evidence shall be subjected to the TracER prior to using processing techniques if using it for inherent luminescence examination. This will serve to detect any inherent latent impressions and to reveal the color and the intensity of any background fluorescence. This will allow the Forensic Scientist to determine which fluorescent dye will be appropriate to use in processing evidence. The TracER shall also be used in conjunction with fluorescent dyes and chemicals to develop and photograph latent impressions.

5.1 Start Up Procedures

- 5.1.1 Plug the unit into a standard electrical outlet.
- 5.1.2 Verify the LASER ON/OFF key switch is in the OFF position.
- 5.1.3 Turn the POWER ON/OFF switch on the front panel of the power supply to the ON position.
- 5.1.4 Ensure the hand piece LASER CONTROL is selected to "F.P." for front panel control and turn power adjust knob fully counter-clockwise. If the hand piece trigger is enabled, the system will emit laser energy within 5 seconds after the LASER ON/OFF key switch is turned to the ON position.
- 5.1.5 Ensure the hand piece is pointed at an intended target and turn the LASER ON/OFF key switch to the ON position. After 5 seconds the shutter will open.
- 5.1.6 Using the hand piece trigger, press the trigger to emit the laser beam.
- 5.1.7 The front panel displays zero until there is actual laser energy. Set the front panel display to the desired output power by turning the POWER ADJUST knob clockwise.

5.2 Turn On Hand Piece Control

- 5.2.1 Verify the LASER ON/OFF key switch is in the OFF position.
- 5.2.2 Turn the POWER ON/OFF switch on the front panel of the power supply to the ON position.
- 5.2.3 Ensure the hand piece LASER CONTROL is selected to "H.P." for hand piece control.
- 5.2.4 On the hand piece, select the preset HI or LOW power option.
- 5.2.5 Ensure the hand piece is pointed at an intended target and turn the LASER ON/OFF key switch to the ON position. After 5 seconds the shutter will open. If the hand piece trigger is enabled, the system will emit laser energy within 5 seconds after the LASER ON/OFF key switch is turned to the ON position.
- 5.2.6 Using the hand piece trigger, press the trigger to emit the laser beam.

5.3 Shut Down Procedures

- 5.3.1 Ensure that the trigger is set to the OFF position so that no laser light is emitting from the hand piece.
- 5.3.2 Set the LASER ON/OFF key switch to the OFF position.
- 5.3.3 Set the POWER ON/OFF switch to the OFF position.

OPERATIONAL STATE	DESCRIPTION	VISUAL INDICATORS
OFF	POWER ON/OFF switch is in the off position. No power is applied to the system regardless of AC power cable, battery module or key switch position.	No visual indicators.
POWER ON	POWER ON/OFF switch is in the on position. An internal fan will be operational, but the system will power up 30 seconds after the POWER ON/OFF is initially set to the on position. No display or LED indicators are operational for the first 30 seconds. Following a click, the shutter will open. After 30 seconds, power is applied to the rest of the system. This will only happen with each battery module installation or every power cycle with AC only.	INLK OK (Orange) if no active interlock or exists. SYSTEM FAULT (Red) If active interlock or system fault exists. LASER ON and INLK OK if key switch is in the on position and no active interlock or system fault exists.
LASER ON	POWER ON/OFF switch and LASER ON/OFF key switch are in the on position. Laser emission is possible after 5 seconds if no interlock or system fault is active.	INLK OK and LASER ON if no active interlock or system fault exists. SYSTEM FAULT is active interlock or system fault exists. Cycle key switch.

5.4 Examination of Evidence

- 5.4.1 While wearing goggles, scan the item of evidence with the light source. A strong hand held magnifier may be used to enhance visualization of the latent impressions.

- 5.4.2 If a latent impression is detected, immediately note the location and direct the light source away from the area.
- 5.4.3 Position the area of interest under the camera and place the appropriate filter over the lens of the camera. (See technical procedure for the camera used.)
- 5.4.4 Direct the laser beam over the area to be photographed and begin photography.
- 5.4.5 After each photograph is taken, redirect the source away from the impression to avoid destruction of the area or surface. Prolonged exposure to the beam may cause the latent impression to photo-degenerate over a short period of time until eventually the impression disappears.
- 5.4.6 After the impression is photographed, further techniques shall be applied to enhance or develop additional impressions, if applicable (see Image Processing Procedure).

5.5 **Standards and Controls** – N/A

5.6 **Calibration** – N/A

5.7 **Sampling** – N/A

5.8 **Calculations** – N/A

5.9 **Uncertainty of Measurement** – N/A

6.0 Limitations – The TracER enclosure relies on internal cooling fans to control the temperature of its internal components. In order for these fans to function efficiently, a 10 cm (4 in.) clearance shall be observed on both the fan inlet and exhaust ports. A 2.2 cm (1 in.) clearance shall also be observed on the top panel to facilitate cooling of the system electronics.

7.0 Safety – Eye protection shall be worn when using a laser and/or alternate light source. This also applies to any other individual who may be in the same room or area. This is particularly important when examining reflective surfaces as the light source may be reflected and result in eye damage.

7.1 Never look directly into any light source as this will cause eye damage.

7.2 Do not expose the light source to the skin; although it will not immediately cause harm, the light source may have long term effects with prolonged exposure.

8.0 References

Almog, J, A. Hirshfeld and J.T. Klug. "Reagents for the Chemical Development of Latent fingerprints: Synthesis and Properties of Some Ninhydrin Analogues." *Journal of Forensic Sciences*. Vol. 27, 4: 912-917 (1982).

Ayala, Garcia J.A. "Lasers in Crime Investigation: Detecting Latent Fingerprints at the Scene of a Crime." *International Criminal Police Review*. (April 1984): 90-93.

Burt, J.A. and E.R. Menzel. "Laser Detection of Latent Fingerprints: Difficult Surfaces." *Journal of Forensic Sciences*. Vol. 13, 2: 364-370 (1985).

Dalrymple, B.E., J.M. Duff and E.R. Menzel. "Inherent Fingerprint Luminescence – Detection by Laser." *Journal of Forensic Sciences*. Vol. 22, 1: 106-111 (1977).

Everse, K.E. and E.R. Menzel. "Blood Print Detection by Fluorescence." Center for Forensic Studies, Texas Tech University, Lubbock. TXSPIE Vol. 743, *Fluorescence Detection* (1987): 184-202.

Fisher, J.F. "The Enhancement of Blood Prints by Chemical Methods and Laser-Induced Fluorescence." *Identification News*. (1984): 2; 14-15.

Forensic Laser Technology. Omnichrome. New Jersey.

German, E.R. "You Are Missing Ninhydrin Developed Prints." *Identification News*. (1981): 3-5.

Goss, E., L. Sin-David, and J. Almog. "Transmitted Infrared Luminescence in Document Examination." *Journal of Forensic Sciences*. Vol. 25, 2: 382-385 (1980).

Hammond, J. *Cyanoacrylate Ester Fuming For the Development of Latent Prints*. Loctite Corporation.

Hazen, R.J. "Significant Advances in the Science of Fingerprints." *Forensic Science*. 2nd Ed. Geoffrey Davies, Editor ACS, Washington, DC, 1986, pp 299-312.

Herod, D.W. and E. R. Menzel. "Laser Detection of Latent Fingerprints: Ninhydrin. Followed by Zinc Chloride." *Journal of Forensic Science*. Vol. 27, 3: 513-518 (1982).

Inlow, V.K. "The Use of Flashlight and Filters for Fluorescent Examinations." Administrative Advanced Latent Fingerprint Training, FBI, Quantico, VA (November 1993): 1-5.

"III: Visualization of Latent Fingerprints by Fluorescent Reagents in Vapor Phase." *Journal of Forensic Sciences*. Vol. 25., 2: 408-410 (1980).

Kobus, H. J., M. Stoilovic and R.N. Warrenner. "Laser Detection of Latent Fingerprints: Treatment with Glue Containing Cyanoacrylate Ester." *Journal of Forensic Sciences*. Vol. 28, 2: 307-317 (1983).

"Laser Enhancement of Latent Fingerprints." Fingermatrix, Inc., Pender Drive, Suite 310 Fairfax, Virginia, 22030 (March 17, 1988): 1-16.

"Luminescent Enhancement Procedures for the Detection of Latent Fingerprints." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 1987): 45-49.

Menzel, E.R. "Detection of Latent Fingerprints by LASER-Excited Luminescence." *Analytical Chemistry*. Vol. 61, 8: 557 – 561 (1989).

Menzel, E.R. "Laser Fingerprint Detection and Development." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 7-10, 1987): 25-38.

Menzel, E.R. "Pretreatment of Latent Prints for Laser Development." *Forensic Science Review*. Vol. 1, 1: 43-66 (June 1989).

Menzel, E.R. "A Guide to LASER Latent Fingerprint Development Procedures." *Identification News*. (September 1983): 9 – 13.

Menzel, E.R. "LASER Detection of Latent Fingerprints – Treatment with Phosphorescers." *Journal of Forensic Sciences*. Vol. 24, 3: 582–585 (1979).

Menzel, E.R. *Chemical Reagents for the Development of Latent Fingerprints*.

Menzel, E.R. and J.M. Duff. "Laser Detection of Latent Fingerprints – Treatment with Fluorescers." *Journal of Forensic Sciences*. Vol. 24, 1: 96-100 (1979).

Menzel, E.R. "Ion-Laser Detection of Fingerprints Grows More Powerful." *Laser Focus World*. (November 1989): 89-94.

Menzel, E.R. "Laser Detection of Latent Fingerprints on Skin." *Journal of Forensic Sciences*. Vol. 27, 4: 918-922 (1982).

Menzel, E.R., et al. "Room Light and Laser Development of Latent Fingerprints with Enzymes." *Journal of Forensic Sciences*. Vol. 29, 1: 99-109 (January 1984).

Menzel, E.R. and J.A. Burt. "LASER Detection of Latent Fingerprints: Difficult Surfaces." *Journal of Forensic Sciences*. Vol. 13, 2: 364–370 (1985).

Misner, A. H. "Ultraviolet Light Sources and Their Uses." *Journal of Forensic Identification*. Vol. 41, 3: 171-175 (June 1991).

Salares, V. R., C.R. Eves and P.R. Carey. "On the Detection of Fingerprints by Laser Excited Luminescence." *Forensic Science International*. Vol. 14: 229-237 (1979).

Sasson, Y. and J. Almog. "Chemical Reagents for the Development of Latent Fingerprints, I: Scope and Limitations of the Reagent 4-Dimethylamino-Cinnamaldehyde." *Journal of Forensic Sciences*. (1978): 852-855.

Thompson, J. *Laser Technology as Utilized in the Development of Latent Prints*. Ocean County Sheriff's Department, Criminalistics Investigation Unit.

Walton, A.N. "A Technique for the Detection and Enhancement of Latent Prints on Curved Surfaces by the Use of Fluorescent Dyes and Painting with Laser Light (Beam)." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 7-10, 1987): 121-123.

Watkin, J.E. "Alternate Lighting Methods of Detecting Latent Prints." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 7-10, 1987): 39-44.

9.0 Records – N/A

10.0 Attachments – N/A

Revision History		
Effective Date	Version Number	Reason
09/17/2012	1	Original Document