

Non-Contact Optical Detection of Explosive Particles via PDLIF

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PDLIF (photodissociation followed by laser-induced fluorescence) has the potential to detect trace levels of various explosives at standoff distances.

PDLIF utilizes an ultraviolet laser at a very particular wavelength (236.2 nm) to detect NO-bearing explosives (most military-grade explosives fall into this class). It has demonstrated very high sensitivity, relatively high immunity to clutter, and the potential for standoff distances exceeding 10 m. It has been field tested under the DARPA POSSE program (results available upon request).

Under the ATO program, PDLIF was used as a candidate standoff detection technique to understand the effects of morphology on detection. We observed that PDLIF sensitivity is directly related to the percent area occupied by the explosives of interest and only indirectly related to the mass loading of the surface (i.e. $\mu\text{g}/\text{cm}^2$). Most likely these results will generalize to other optical based techniques and should form the basis for more carefully evaluating techniques.

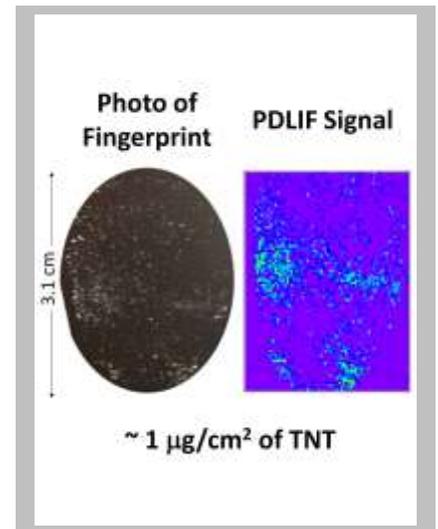
The strengths of PDLIF (low clutter signal, relatively high signal strength) make it a good complement to Raman (which can perform identification not possible with PDLIF). Both systems could potentially operate with the same 236.2 nm laser. Note that the background Raman clutter is generally much lower for wavelengths shorter than 250 nm.

During the course of this program, the PDLIF technique was tested by the government (TSL/TSWIG) under double-blind conditions along with many other potential standoff techniques. The results are available from Barry Smith (Barry.T.Smith@HQ.DHS.GOV; 609.813.2844).

For more information, contact Charles M. Wynn, cwynn@ll.mit.edu; 781-981-3132

References

- C. M. Wynn *et al.*, *Noncontact optical detection of explosive particles via PDLIF*, *Opt. Expr.* **19**, 18671, (2011)
C.M. Wynn *et al.* *Noncontact detection of homemade explosive constituents via PDLIF*, *Opt. Expr.* **18**, 5399 (2009).



PDLIF images fingerprint levels of explosives