Introduction of the Imago LEAP4000X: Second-Generation Commercial Laser-Pulsed Atom Probe Tomography

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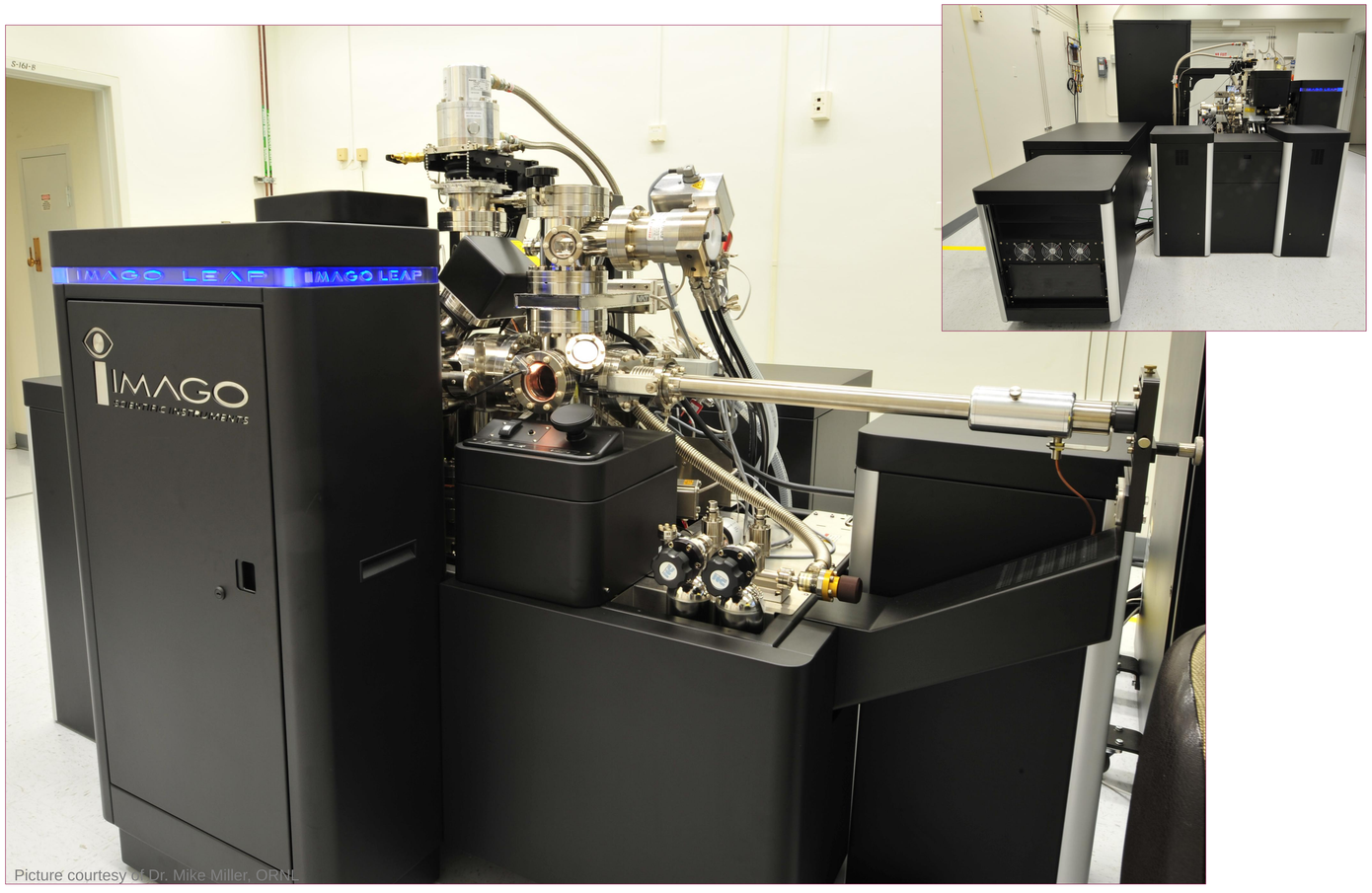
Focused Laser Delivers Performance

The LEAP4000X builds on the success of the LEAP3000X, the first commercially available laser-pulsed atom probe (20 units sold since release in mid 2006) to offer major advances in laser mode performance.

- **Key Features:**
  - ✓ *Ultra-small, diffraction-limited spot for optimized thermal pulsing*
  - ✓ *Significantly increased mass resolution*
  - ✓ *New Active Laser Control™ with fully integrated optics chain to drive evaporation process and enhance laser power stability*
  - ✓ *Advanced auto alignment protocols*
  - ✓ *Increased dynamic range on laser power*
  - ✓ *Increased repetition rate (up to 1 MHz)*
- **Benefits:**
  - ✓ *Change-on-the-fly operation for enhanced ease of use and improved throughput*
  - ✓ *Improved compositional accuracy and precision*
  - ✓ *Enhanced detection sensitivity limits*
  - ✓ *Elimination of thermal tails in low-thermal-diffusivity materials*
  - ✓ *Enhanced specimen yield for dielectric/ceramic materials*
  - ⇨ *Improved quantification*

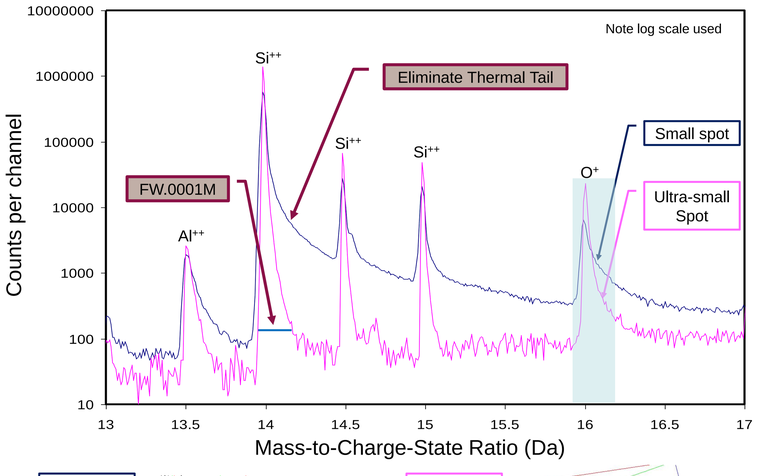


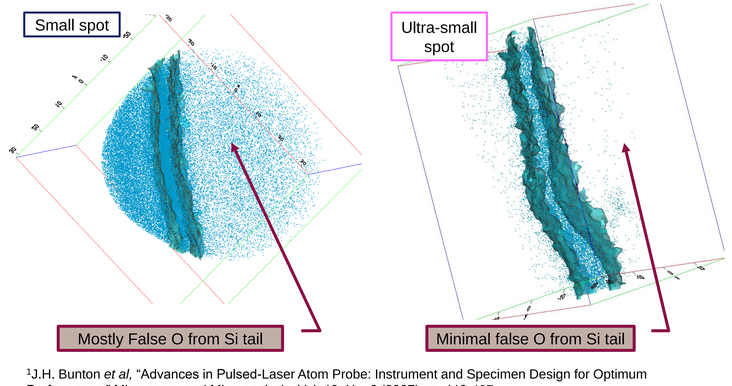
Picture courtesy of Dr. Mike Miller, ORNL

Smaller Spot = Higher Quality Data

Published experimental results show that laser-induced field evaporation is overwhelmingly dominated by a thermal mechanism[1,2].

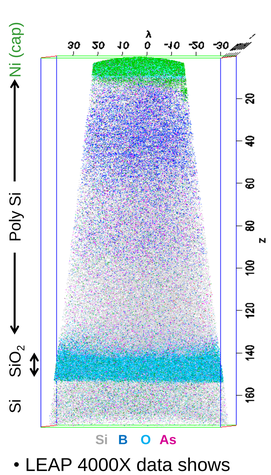
An ultra-small spot design maximizes performance.





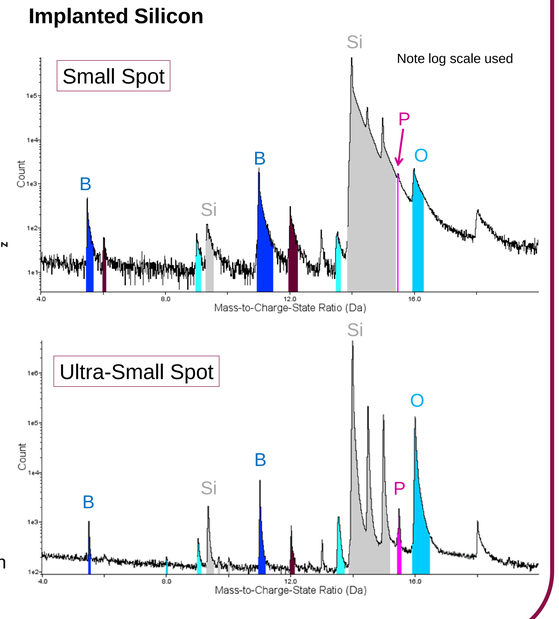
[1]J.H. Bunton *et al*, "Advances in Pulsed-Laser Atom Probe: Instrument and Specimen Design for Optimum Performance," Microscopy and Microanalysis, Vol. 13, No. 6 (2007) pp. 418-427.
[2]F Vurpillot *et al*,"Thermal response of a field emitter subjected to ultra-fast laser illumination" J. Phys. D: Appl. Phys. **42** (2009) 125502 (7pp).

Ultra-small Spot Improves Quantification



- LEAP 4000X data shows improved mass resolution.
- In this example, the Phosphorous peak (located in silicon tail) is detected with much greater sensitivity.

Implanted Silicon



Application Example: High-κ Dielectric

- Shows the benefit of superior mass resolution of the LEAP4000X for separating closely spaced peaks in a complex material
- It is also an example of quality data from a low-thermal-diffusivity material