



# Practical Considerations for Optimal Collection of Trace Explosive Residue

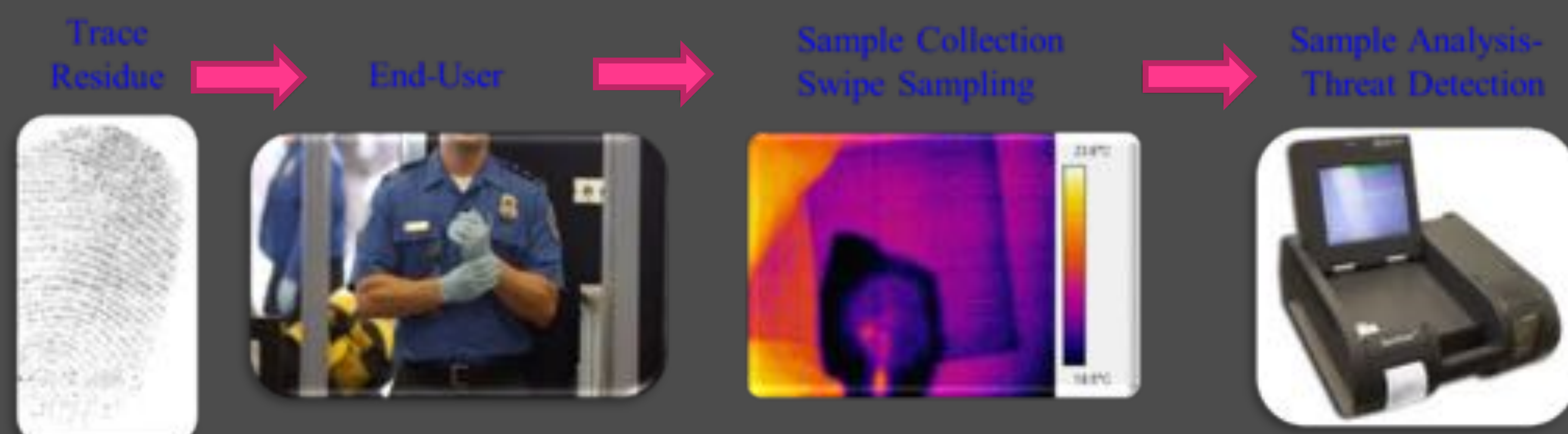
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## Introduction

- Sampling is the most critical step in the trace detection analysis chain.
- If sufficient explosive residue is not effectively transferred from a surface to the collection media, ETD analysis will result in NO ALARM.
- The most impactful way to disseminate laboratory findings to the field is education and training.



## Objectives

- To develop a training module that complements any existing ETD training with sampling best practices supported by scientifically validated data.
- Provide the end-user with "Why do you do things the way you do?"
- Factors considered: clear and concise training material, COTS consumables, and interactive hands-on training.
- Complete prototype training module where the feasibility of standardizing and/or optimizing sampling is quantitatively demonstrated.

## Smart Sampling: PAD

- **Pressure:** Laboratory data suggests that a higher applied force improves collection of the explosive residue
- **Area of the wipe:** Wipes have a "sweet spot" defined by the ETD desorber size; Explosive particles collected outside of that target area will not be analyzed.
- **Area of the sample:** Virtual threat collection simulations suggests that the more area of the sample covered during swiping, the more probable interaction with the threat becomes.
- **Direction:** One direction swiping pattern prevents the loss of collected explosives particles.



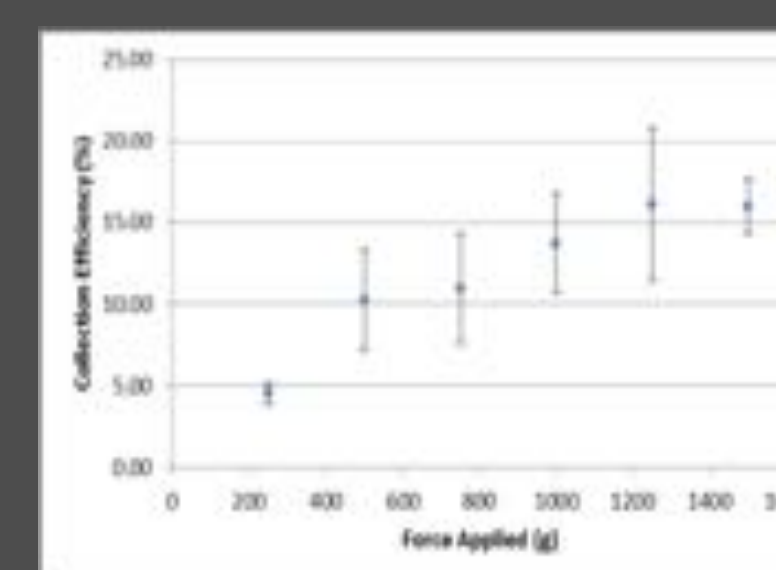
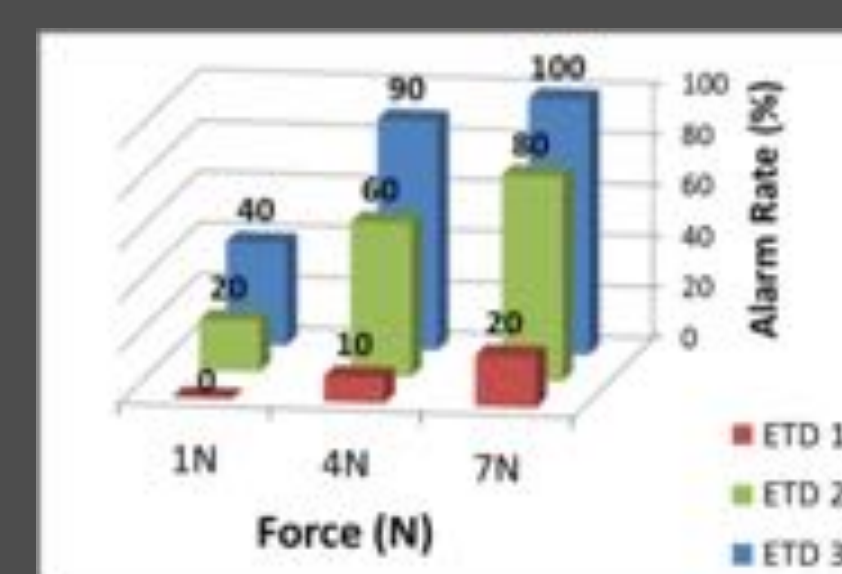
## Potential Forensic Applications

- Explosives Detection Field Kits
- Trace Evidence Field Collection
- Methamphetamine Remediation
- Nuclear Forensics
- National Institute of Occupational Safety and Health – Anthrax

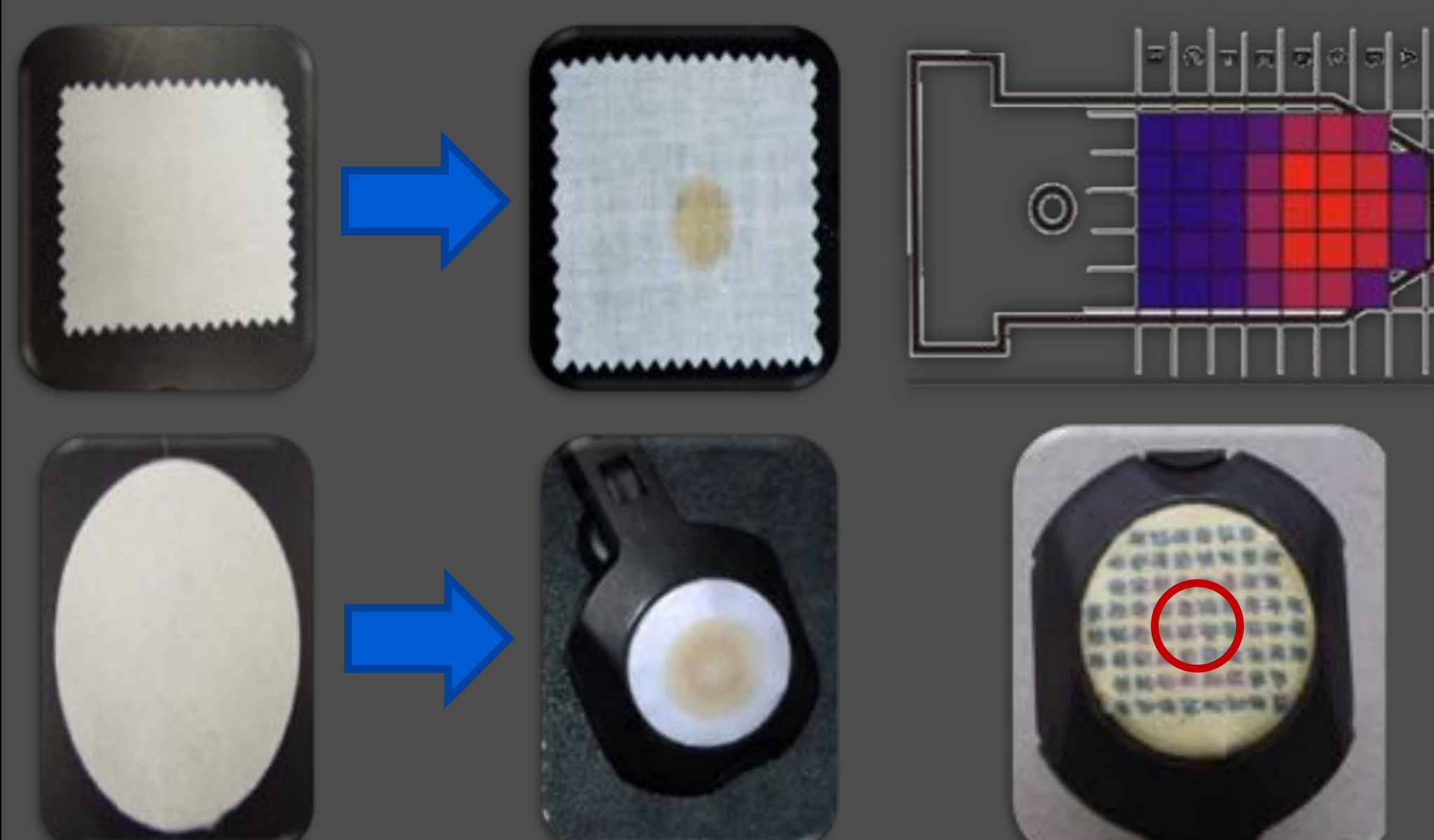


## Science Behind Pressure

- Studies using RDX particles show that the alarm rate of three different ETDs significantly increased as a function of pressure applied while swipe sampling.
- Sample collection studies show that collection efficiency improves as a function of increasing pressure.

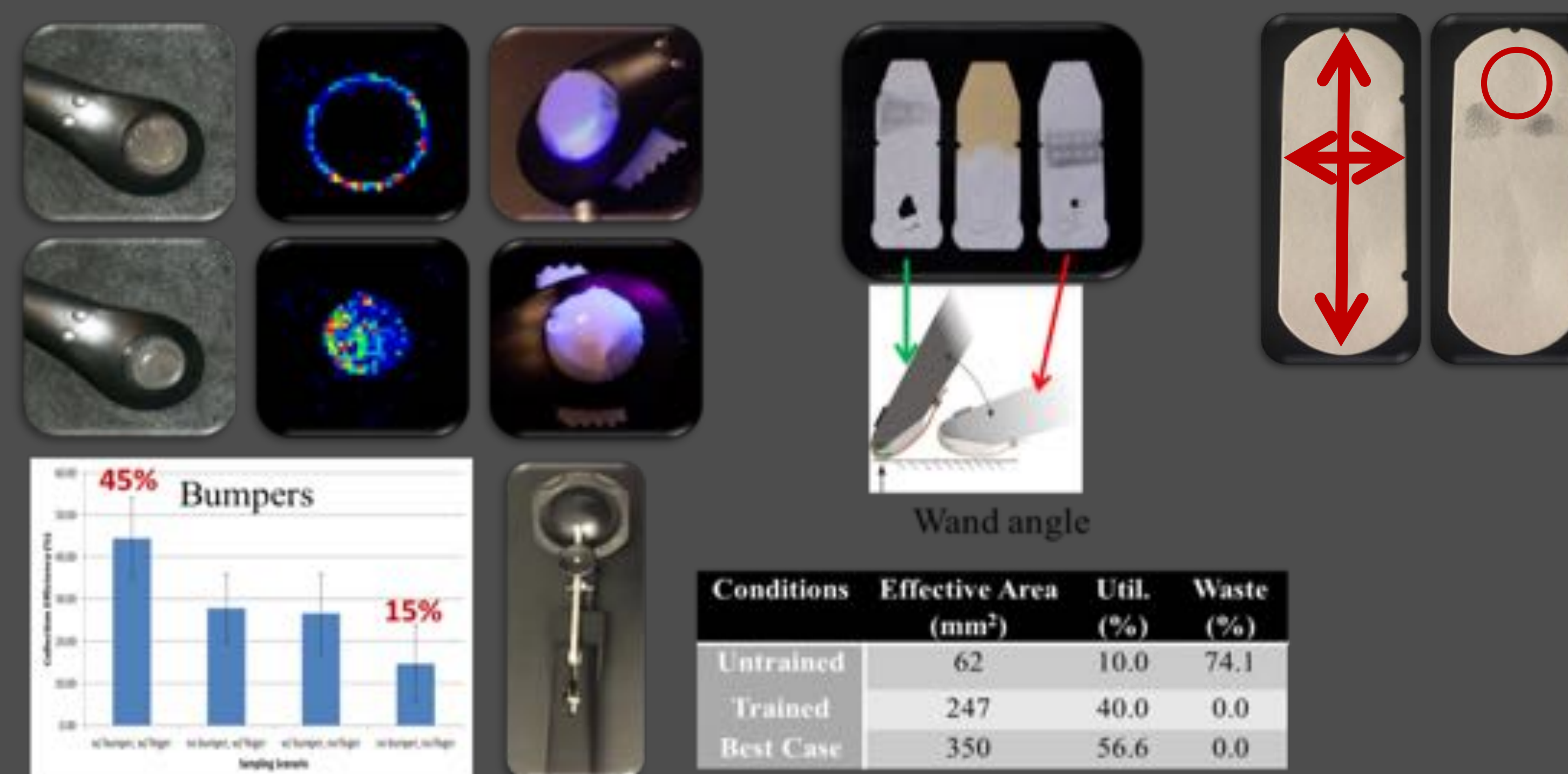


## Science Behind Target Area

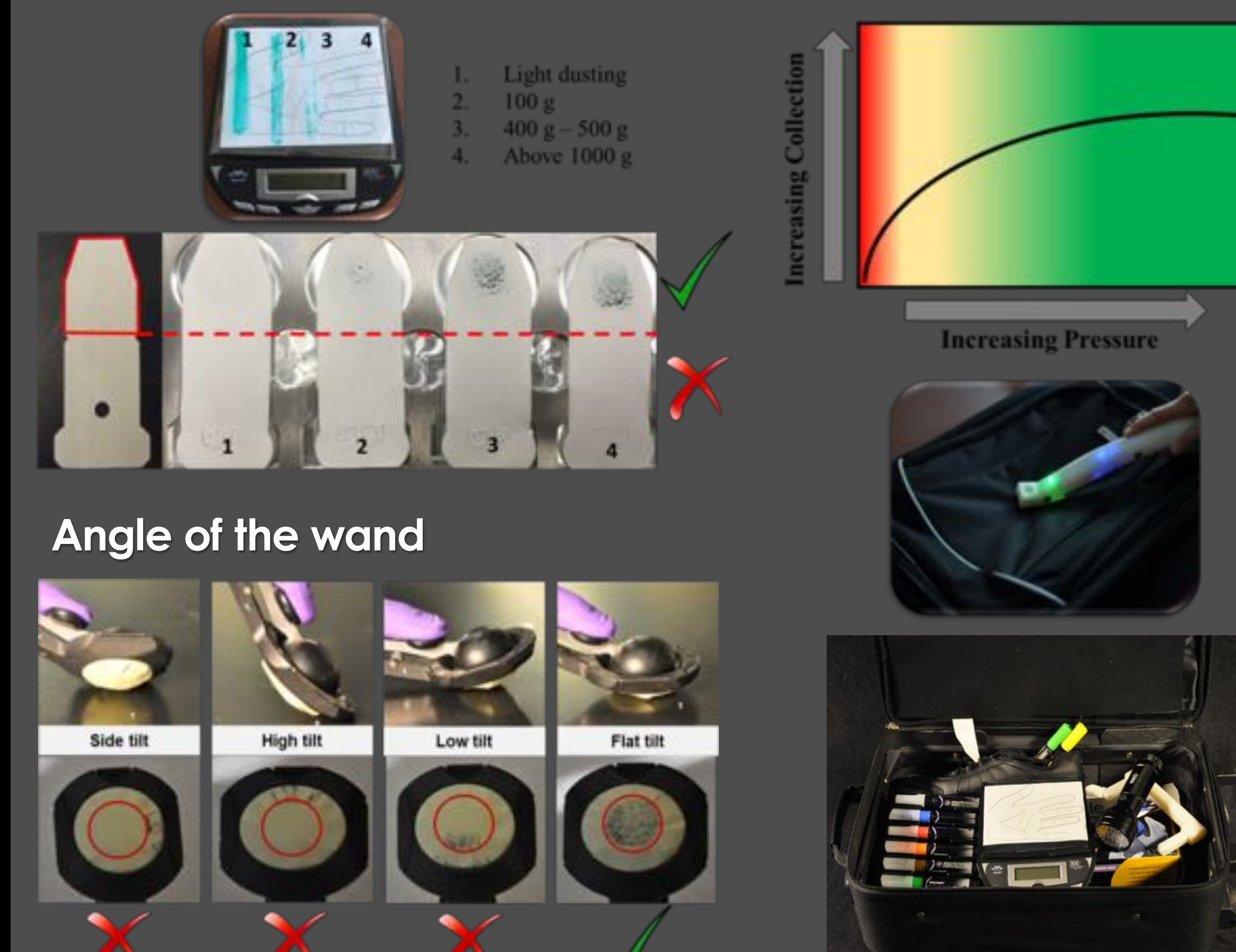


- Deployed ETDs use a thermal desorber to heat a particular area on the wipe.
- It is critical to know the location of the sweet spot for the type of wipe and detector used.

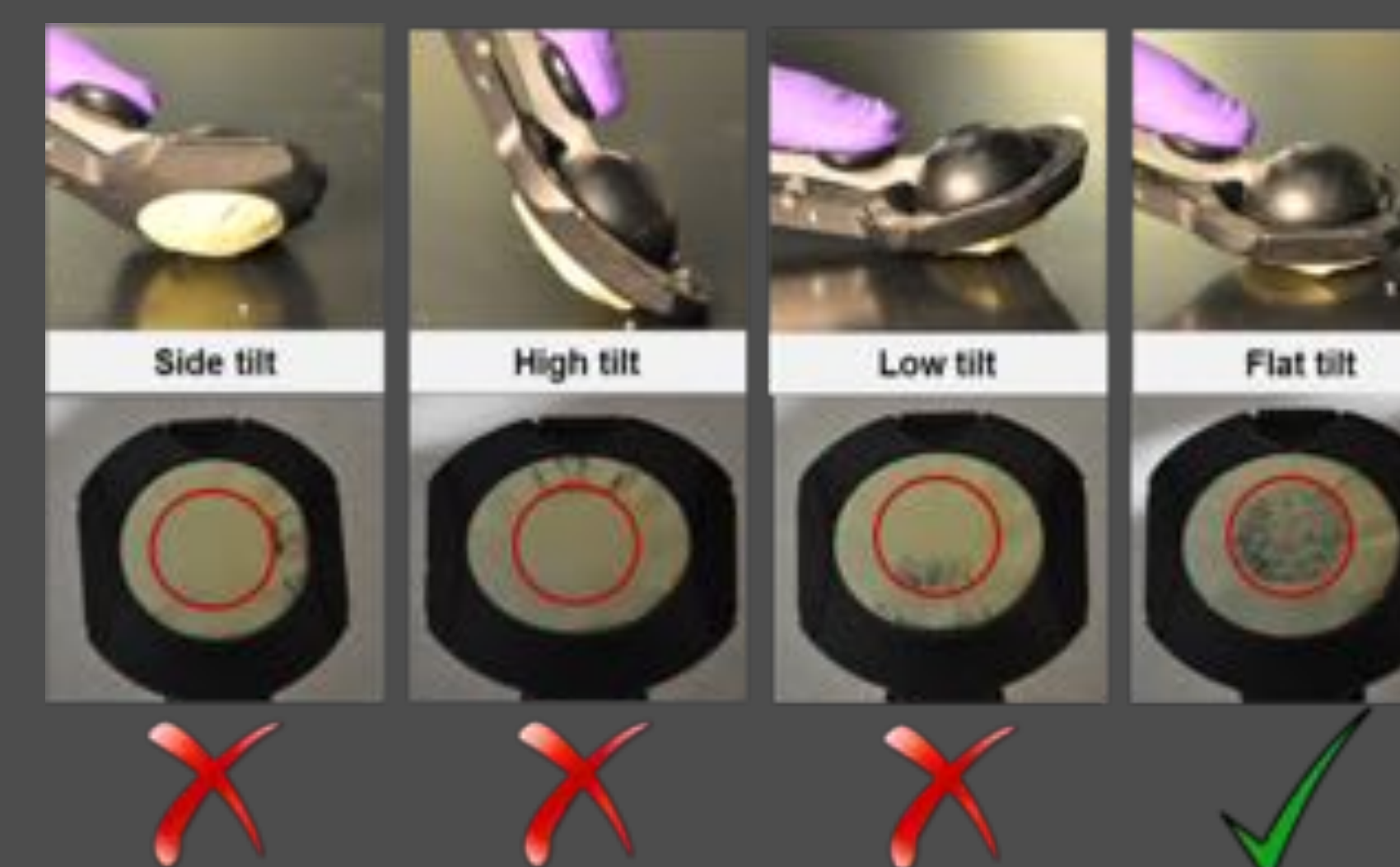
## Sampling Pitfalls



## Hands-On Training: PAD



## Angle of the wand



## Training Validation



- Tekscan is a pressure mapping system capable of measuring applied pressure and coverage area over a test surface.
- Integrated software provides real-time performance feedback.

- Quantify effectiveness of training (benchmark vs. post training)
- Quantify end-user performance (recurrent training)

## Conclusions

- Pilot study (131 participants) completed where the feasibility of standardization and/or optimization of sampling practices was quantitatively demonstrated.
- Demonstrable increases in both applied pressure and sampled area were noted after training.
- Plans to transition training module to institutional training for end-users in a variety of environments.

## Commercialization of NIST R&D

