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Design and characterization of an aerodynamic shoe sampling system for screening trace explosive materials MATTHEW STAYMATES, National Institute of Standards and Technology, GREG GILLEN, JESSICA GRANDNER, STEFAN LUKOW — As part of an ongoing effort with the Transportation Security Laboratory, the National Institute of Standards and Technology has been developing a prototype shoe sampling system that relies on aerodynamic sampling as the primary mechanism for liberating, transporting, and collecting explosive contamination. This presentation will focus on the fluid dynamics associated with the current prototype design. This design includes several air jets and air blades that are used to dislodge particles from target areas of a shoe. A large blower then draws air and liberated particles into a collection device at several hundred liters per second. Experiments that utilize optical particle counting techniques have shown that the applied shear forces from these jets are capable of liberating particles efficiently from shoe surfaces. Results from real-world contamination testing also support the effectiveness of air jet impingement in this prototype. Many examples of flow visualization will be shown. The issues associated with air spillage, particle release efficiency, and particle transport will also be discussed.

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