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**Title Page**

# Use of an Ion Mobility Spectrometer for Detecting Uranium Compounds

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## Abstract

The safeguards community currently lacks a method to rapidly determine the chemical form of radioactive and non-radioactive compounds in real time during inspection activities. Chemical speciation identification can provide important information on both the types of materials that are collected during environmental sampling and can inform inspectors as to where to focus efforts during inspections or complementary access visits. Ion Mobility Spectrometry (IMS) is an established field technique for the detection of explosives, narcotics, and other organic compounds. More recently, electrospray ionization (ESI) has been used to introduce inorganic compounds to IMS instruments for analysis. These techniques have shown the ability to supply chemical information on the compounds analyzed. Although these laboratory based instruments use a liquid-based injection system, there is evidence in the literature of unaltered and intact pharmaceutical tablets being volatilized and ionized in open atmosphere using heat and a Ni-63 source. This work determined that a commercial-off-the-shelf (COTS) IMS could be used for the identification of solid uranium compounds directly after sampling using a COTS sample swipe.

### Highlights

- The technique enables the rapid detection of uranium compounds
- Detection limits are lower than conventional radiological measurements
- No sample pre-treatment is required for analysis
- Application of IMS to safeguards inspection activities

## Keywords

Ion Mobility Spectrometry; Uranium; Safeguards; Rapid Analysis

## 1. Introduction

The lack of a method to determine the chemical form of radioactive and non-radioactive compounds rapidly is a significant gap in the currently available safeguards inspector toolkit. Chemical speciation

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