

# Alpha Series™

portable XRF technology for airborne metals analysis of filter media.



*Harmful airborne contaminants can result from welding.*

## Overview.

Thousands of companies involved in metalworking use XRF multielemental analysis technology to safeguard the quality of their products. That same technology can be used to help safeguard the health of employees who are exposed to airborne metals.

Such exposure can lead to cancer, liver or kidney damage, central nervous system or respiratory disorders, and other adverse health problems. OSHA regulations require employers to verify that workers in the metal industries such as mining, welding, construction, fabrication, maintenance and repair, and paint removal/rehabilitation not be exposed to excessive concentrations of airborne metals.

A host of protective measures are in place to minimize exposure. Monitoring is required to verify exposure levels and to determine appropriate adjustments in worker protection. Typically workers wear air sampling pumps and filter cassettes, or work near them, to monitor their exposure. Off-site laboratories, using wet chemical analysis, then analyze the filter media.

## Approved for In-field Analysis of Lead in Dust Wipes and Air Filters.

The Innov-X Alpha Series™ tube-based portable XRF analyzer meets the requirements for OSHA Methods OSA1, OSS1 and NIOSH Method 7702, and does not use any radioactive materials. Because it is a tube-based system, it is an ideal tool for non-destructive, on-the-spot analysis of airborne metal filter media or wipes. There are minimal regulatory requirements, no travel restrictions and the owner is free from the liability and headaches inherent with isotope-based systems. Alpha Series™ portable handheld XRF analyzer is the breakthrough system that utilizes an X-ray tube for analysis in the field.



*Alpha Series™ enables fast testing of filters using optional benchtop test stand (open).*

## Alpha Series™ for Multielemental Analysis of Filter Media: Ni, Cr, Mn, Cu, Pb, Fe, As, Zn.

The wet chemical regulatory technology in the "Method for Multielemental Analysis on Filter Media" has been ICP-ES, NIOSH Method 7300. This technology offers excellent analytical results.

However, it is not a portable technology and cannot be taken into the field. It is an expensive, complex laboratory technique that typically takes a substantial amount of time – days to weeks or even longer – to obtain the necessary information. Obviously, the closer industry and regulators can get to obtaining inexpensive, simple, real-time quality information to screen or verify exposure levels, the better.

Both the success of field portable X-ray fluorescence technology for surface lead contamination analysis at Superfund Sites and its usefulness for measuring metals collected from the air on sample filters resulted in the release of NIOSH Method 7702 for analysis of lead on air sample filters – and OSHA Method OSA1.

The recent emergence of tube-based portable XRF technology, which lends itself more readily to multielemental analysis than its source-based predecessors, led NIOSH to revisit their "Methods for Multielemental Analysis on Filter Media" and to incorporate tube-based portable XRF spectrometry.

NIOSH presented a government study, entitled "Emerging Portable X-Ray Fluorescence Technology for Measuring Multiple Airborne Metals: An Evaluation of the Battery Powered X-Ray Tube Instrument," at the American Industrial Hygiene Conference in May of 2003.

The study featured the Innov-X handheld, X-ray tube-based XRF system. This presentation showed that for measurements that took only 3 minutes, Limits of Quantification (LOQs) for the Alpha Series™ were between 0.5–3.5 µg/cm<sup>2</sup> for the elements of interest. Accuracy data showed that for the majority of elements studied, the 90% Confidence Interval (CI) fell within the NIOSH 25% accuracy criterion.

It was mentioned that, although the test was highly idealized, the results were "remarkable." Unlike the sealed source models they had tested in the past, the accuracy for all elements of interest in this airborne dust study had single point values below 10% and the 90% CI did not exceed 16% for any element measured with the Innov-X tube-based portable XRF unit.

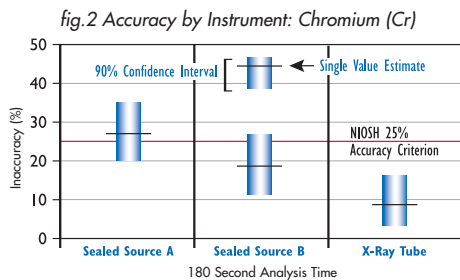
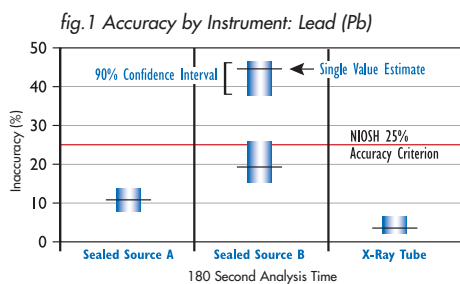


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## Innov-X Performance Data for Lead and Chromium.

The Innov-X Alpha Series™ SmartBeam tube technology automatically tunes the X-ray tube source to provide optimal sensitivity to the widest range of elements. Our unique filtering technology allows low detection limits for elements from P (Z=15) to U (Z=92).



Handheld Alpha Series™ set up as benchtop unit with optional test stand (closed).

## Portable Tube-based XRF vs. Isotope-based XRF: Ni, Cr, Mn, Cu, Pb, Fe, As, Zn.

The NIOSH study compared portable tube-based and source-based technologies and found that the Limits of Detection (LODs) were well below the Occupational Exposure Level (OEL) for all elements on the X-ray tube instrument.

For LOQs, the tube-based systems showed an improvement over the source-based systems for all elements except Manganese. (Innov-X believes recent improvements also make Mn LOQs better than isotope-based systems.) It was pointed out that with the Innov-X Alpha Series™ tube-based system all LOQs were below the OEL for the studied elements. That was not the case for the source-based systems previously studied.

Due to its simplicity, speed, precision, accuracy, lack of radioactive isotopes, and overall cost effectiveness, portable tube-based XRF technology is the most suitable multi-elemental analysis tool available for field work. Innov-X Systems pioneered this technology to overcome the significant limitations of early portable source-based systems.

The handheld, point-and-shoot Alpha Series™ XRF system eliminates burdensome radioactive sources and provides on-the-spot quality data for elements critical to the analysis of airborne metals on filter media. A single tube replaces multiple isotopes used in source-based systems to offer simultaneous analysis of 20–25 metals. These significant advancements by Innov-X Systems have taken portable XRF technology to the next level.

## Summary.

Innov-X Alpha Series™ XRF units are affordable, easy to use, reliable, and overall cost effective. These portable tube-based units incorporate state-of-the-art components including the battery operated miniature X-ray tube, high-resolution silicon pin detector, high-speed data acquisition circuitry, and a HP iPAQ Pocket PC® for calculations, results and operator interface.

Innov-X also offers a specific method for thin-film applications such as the analysis of 37mm air filters. Systems can be configured with a docking station/test stand for docked, bench top testing of filter samples, or for other sample types including soils, wipes, paint, alloys, liquids and powders.

NIOSH does not approve of, or endorse, the Innov-X Alpha Series™ XRF analyzer or any commercially available XRF analyzer.



Operators should use protective gear to minimize exposure to airborne contaminants.



23 Vanadium 50.9415	24 Cr Chromium 51.9415	25 Mn Manganese 54.938049	26 Fe Iron 55.8457	27 Co Cobalt 58.9332	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61
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