



better analysis counts

# Rapid Heavy Metal Analysis

Quantify cadmium and other heavy metals in soil and food.



## Cadence

Heavy Metal Analyzer for Soil & Powders

EPA 6200

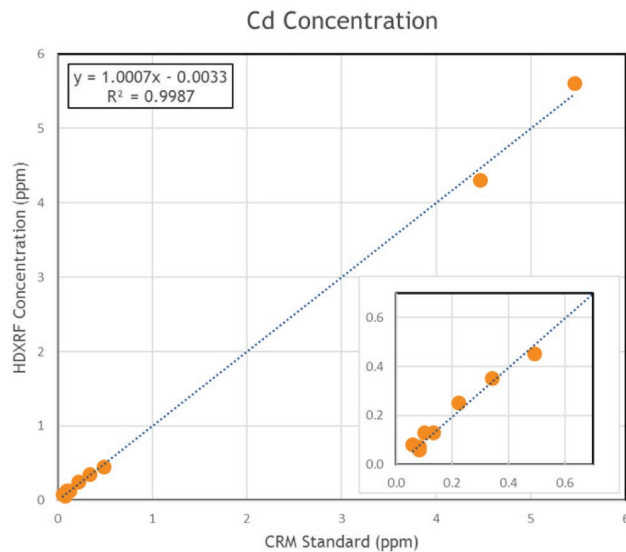
# Quantify Cd Below Regulation

Powered by HDXRF® technology, Cadence delivers best-in-class limit of detection for Cd in soil below the China Agricultural regulatory limit of 0.3 ppm. In addition, Cadence offers simultaneous measurement of other heavy metals like As, Pb, Cu, Ni, and Se in soil and agricultural products such as rice and wheat. Whether you're an agricultural inspector or environmental assessor, Cadence enables you to run more samples in less time, allowing you to conduct a more thorough analysis for improved site remediation and land use decisions.

## Accuracy

With complex matrices such as soil, it is essential to demonstrate accurate results that compare well with accepted standards. **Figure 1** shows that HDXRF can deliver accurate results across a wide range of Cd concentrations, including soils that have contamination below the regulatory limit of 0.3 ppm.

**Figure 1:**  
**Cd Concentration vs Certified Reference Standard**



## Repeatability

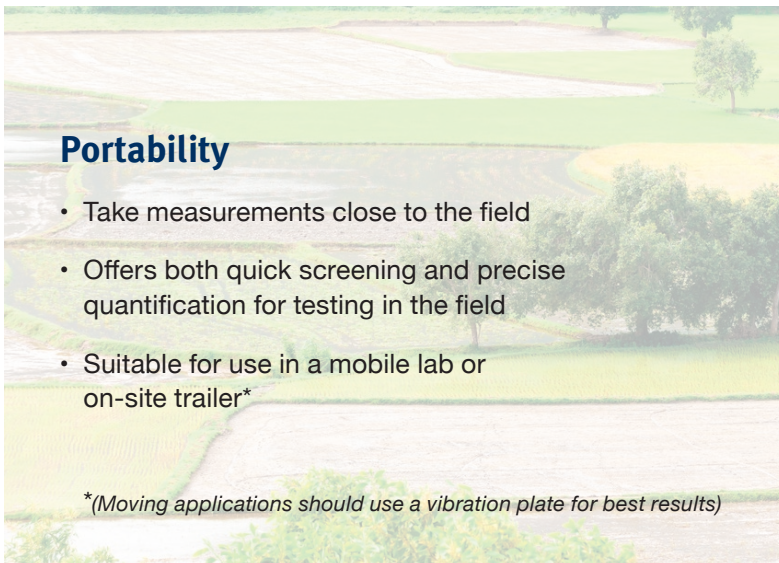
Reliable data is repeatable when following the same measurement process with well-prepared samples. **Table 1** depicts repeatable results for each of the GSS-14 standards with below-limit concentration of Cd in soil.

Table 1: Repeats of GSS-14 Standard Concentration: 0.2 +/- 0.02 ppm Cd		
Repeat	Single Measurement (ppm)	Avg of 2 Measurements (ppm)
1	0.25	0.23
2	0.21	0.19
3	0.16	0.17
4	0.18	0.2
5	0.22	0.21
6	0.19	0.17
7	0.15	0.17
8	0.19	0.2
9	0.2	0.17
10	0.14	0.18
11	0.21	0.18
12	0.15	0.16
13	0.17	0.2
14	0.22	0.2
15	0.17	0.18
16	0.19	0.16
17	0.13	0.15
18	0.17	0.19
19	0.21	0.23
20	0.24	--
<b>Avg</b>	0.188	
<b>SD</b>	0.033	0.021
<b>RSD</b>	17%	11%

## Portability

- Take measurements close to the field
- Offers both quick screening and precise quantification for testing in the field
- Suitable for use in a mobile lab or on-site trailer\*

*\*(Moving applications should use a vibration plate for best results)*



# Multi-elemental Analysis

In addition to industry-leading accuracy and repeatability for Cd, Cadence delivers multi-elemental analysis for other contaminants as shown in **Table 2**. With the ability to directly measure 15 inorganic pollutants, Cadence is a comprehensive soil-screening tool that is essential for site characterization.

**Table 2: Repeatability Results**

Element / Standard	Cd GSS-4	As GSS-13	Pb GSS-13	Ni GSS-14	Cr GSS-6
Standard Concentration (ppm)	0.35 +/- 0.06	10.6 +/- 0.8	21.60 +/- 1.2	33 +/- 2	75.0 +/- 3.0
HDXRF Concentration (ppm)	0.25 +/- 0.09	11.3 +/- 0.3	21.1 +/- 0.3	25.1 +/- 0.9	76.0 +/- 2.7
# Observations	40	20	20	20	50
SD	0.09	0.3	0.33	0.9	2.7
RSD	15%	2.3%	1.6%	3.8%	3.6%

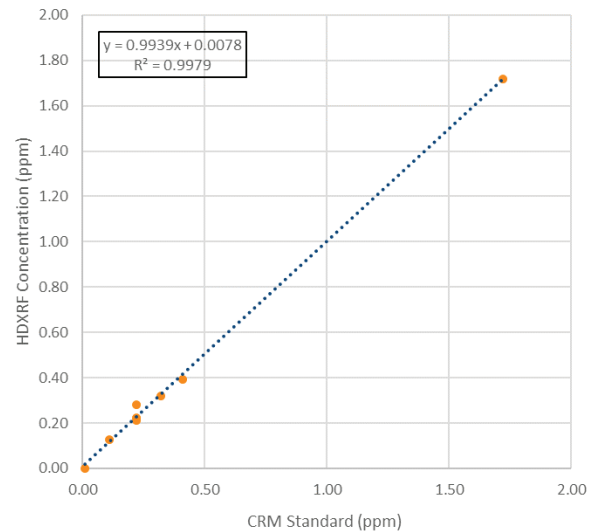
## Rice Applications

While Cadence is excellent for quantifying contamination in complex matrices such as soil, it also delivers exceptional accuracy when measuring other powders such as rice as shown in **Figure 2**. As with soil, repeated measurements with Cadence summarized in **Table 3** show the limit of quantification for rice is below the regulatory limit of 0.2 ppm, providing a level of consistency only rivaled by wet chemistry.

**Table 3: GBW100360**

	Single Measurement (ppm)	Avg of 2 Measurements (ppm)
Std Val	0.22	
Avg	0.23	
SD	0.021	0.016
RSD	10%	7%
LOD	0.066	0.049
LOQ	0.20	0.15

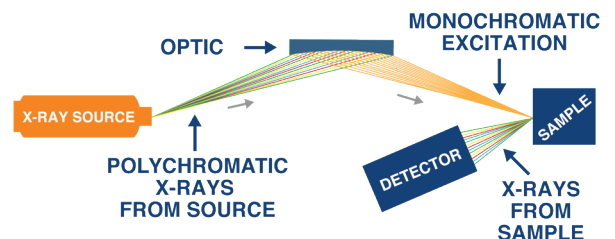
**Figure 2: Rice LOQ**



## Quantifiable Cd Analysis with HDXRF


Cadence is powered by High Definition X-ray Fluorescence (HDXRF<sup>®</sup>) technology: an elemental analysis technique offering significantly enhanced detection performance over traditional Energy Dispersive X-ray Fluorescence (EDXRF) technology. This technique applies state-of-the-art monochromating and focusing optics, enabling dramatically higher signal-to-background ratio compared to traditional polychromatic X-ray Fluorescence. **Figure 3** shows the basic configuration of HDXRF and its use of focused monochromatic excitation. In this system, the diffraction-based doubly curved crystal optics capture a wide angle of X-rays from the source and focus a narrow energy band (monochromatic) of X-rays to a small spot on a measurement cell. The monochromatic beam excites the sample and secondary characteristic fluorescence X-rays are emitted. A detector processes those secondary X-rays and the instrument reports elemental composition of the sample.

**Figure 3: HDXRF Technology**



# Technical Specifications

Cadence - Limit of Detection (ppm) Application: Cd & Trace Heavy Metals in Soil															
Element	Cd	As	Hg	Pb	Cr	Cu	Ni	Zn	Mn	Co	Se	V	Sb	Ti	Mo
Screening	0.22	2	2	2	40	2	10	4	40	40	2	100	0.6	2	3
Quantification	0.09	0.8	0.8	0.8	16	0.8	4	1.6	16	16	0.8	40	0.24	0.8	1.2

Cadence Specifications	
Method Compliance	EPA 6200
Measurement Time	30-1800 seconds
Element Range	Up to 40 Elements from Mg - U
Data Storage & Output	Printout, Ethernet, USB, Internal Storage, USB Flash Drive
I/O Ports	Ethernet 10/100, USB
Power Supply	110-240 VAC ± 10%, 50-60 Hz (hertz) 12V DC - 8A Battery Power
Operating Temperature	+41°F to 104°F (5°C to 40°C)
Operating Humidity	30 – 85 %
Weight	28 lbs (12.7 kg)
Dimensions	<p>14.5 in W x 16.5 in L x 6 in H (36.8 cm W x 41.9 cm L x 15.3 cm H)</p> 

## About XOS

XOS is a leading manufacturer of application-specific X-ray analyzers, offering elemental analysis solutions that improve public safety and customer efficiency in industries like petroleum, consumer products, and environmental compliance. For environmental applications, XOS offers High Definition XRF (HDXRF) analyzers for the detection of toxic elements in food, soil, and water.

XOS is a Danaher company: a global science and technology innovator committed to helping customers solve complex challenges and improve quality of life around the world. Through strategic acquisitions, Danaher Corporation has formed a diverse portfolio of water quality optimization companies. Amongst this group are XOS and Hach Water Analysis Instrument (Shanghai) Co., Ltd. Founded in 1947, Hach (HACH) is a global leader in water quality analysis solutions.