- LA SOCIETE TAL INSTRUMENTS PANTIN
- REPRESENTE LA SOCIETE AUSTIN INSTRUMENTS
- SAVOIR FAIRE POUR DU ONLINE MINERAI ET TRI ALLIAGE AUTOMATIQUE
- CONE PENETROMETER XRF CP-1000

AUSTIN AI
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Automation & Instrumentation

Tal Instruments
Smart Solutions Strong Relationships

Austin AI

Background

Power through Partnering and Licensing

Austin AI has an extensive network of colleagues and corporate partners

This virtual talent pool gives Austin AI unmatched capabilities to solve the toughest problems…or engineer new and creative solutions for the identification and/or processing material

Available Sensors Technology
Innovation through Sensor Technology

[m]

Gamma-radiation	10^{-12}
	10^{-11}
X-ray	10^{-10}
	10^{-9}
Ultraviolet (UV)	10^{-8}
	10^{-7}
Visible light (VIS)	10^{-6}
Near Infrared (NIR)	10^{-5}
	10^{-4}
Infrared (IR)	10^{-3}
Microwaves	10^{-2}
	10^{-1}
Radio waves	10^{1}
	10^{2}
	10^{3}
Alter. current (AC)	10^{4}

Sensor/ Technology	Material Property	Segment
RM (Radiometric)	Natural Gamma Radiation	Fuel, Precious Metals
X-ray (Transmission and Fluorescence)	Atomic Density and Material Chemistry. Visible Fluorescence under X-rays	Base and Precious Metals, Scrap Metals Industrial Minerals Fuel, Diamonds
LIBS (Laser Induced Breakdown Spect.)	Material Chemistry	Scrap Metals, Light Elements, PMI
COLOR (CCD Color Camera)	Reflection, Absorption, Transmission	Base and Precious Metals, Scrap Metals, Industrial Minerals, Diamonds
PM (Photometric)	Monochromatic Reflection/Absorption	Industrial Minerals Diamonds
NIR (Near Infrared Spectrometry)	Reflection, Absorption	Base metals Industrial Minerals
IR (Infrared cam)	Heat conductivity, heat dissipation	Base Metals Industrial Minerals
EM (Electro-Magnetic sensor)	Conductivity, permeability	Base Metals

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Part 1. Examples of Process/Systems Invented by AAI
Innovation

Norilsk, Botswana - Ni Ore Probe

Rio Tinto, Australia - Blast Hole Analyzer

Proprietary - Mobile Core Scanner

Nautilus Minerals - Subsea Mineral Probe (in process)

Proprietary - Run of Mine Systems

Fugro Int'l, Germany - CPT/XRF

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## A Partial List of Clients Served

Austin AI

Success Stories

TECHNOLOGY LICENSED!

The Cone Penetrometer (CP)

The Austin AI CP-1000 is a one-of-a-kind energy dispersive X-ray fluorescence (EDXRF) analyzer in a push probe format that can perform in-field analysis of soil, sediment, sludge, tailings, and related material

All testing is done in a real-time, automated fashion. It is designed to seamlessly integrate with current hydraulic push probe systems and totally augment the existing devices now used for physical and organic measurements

The probe can be mounted in the specially designed lab stand for standards measurement or random grab sample data confirmation

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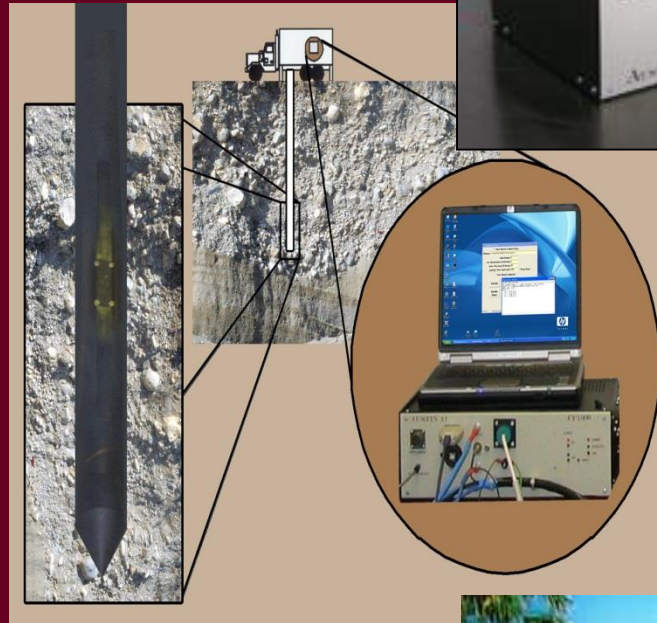
Austin AI

Success Stories

The Down-Hole Probe (DHP)

is a high performance device based on EDXRF spectrometry for the determination of minor and major concentrations of elements in bore holes, blast holes, ore seams, tailing piles, pipes, and other applications.

The Down Hole Probe revolutionizes in-situ characterization, providing real-time concentration data on the actual hole walls. No waiting on lab results. No errors from sample mixing.

It is possible to lower the DHP system down a pre-drilled hole up to 100's of meters. An optional specially engineered stand allows the operator to perform bench top-type XRF analysis while in the field.

Simulated to demonstrate in hole positioning device

Tension Springs

XRF Aperture

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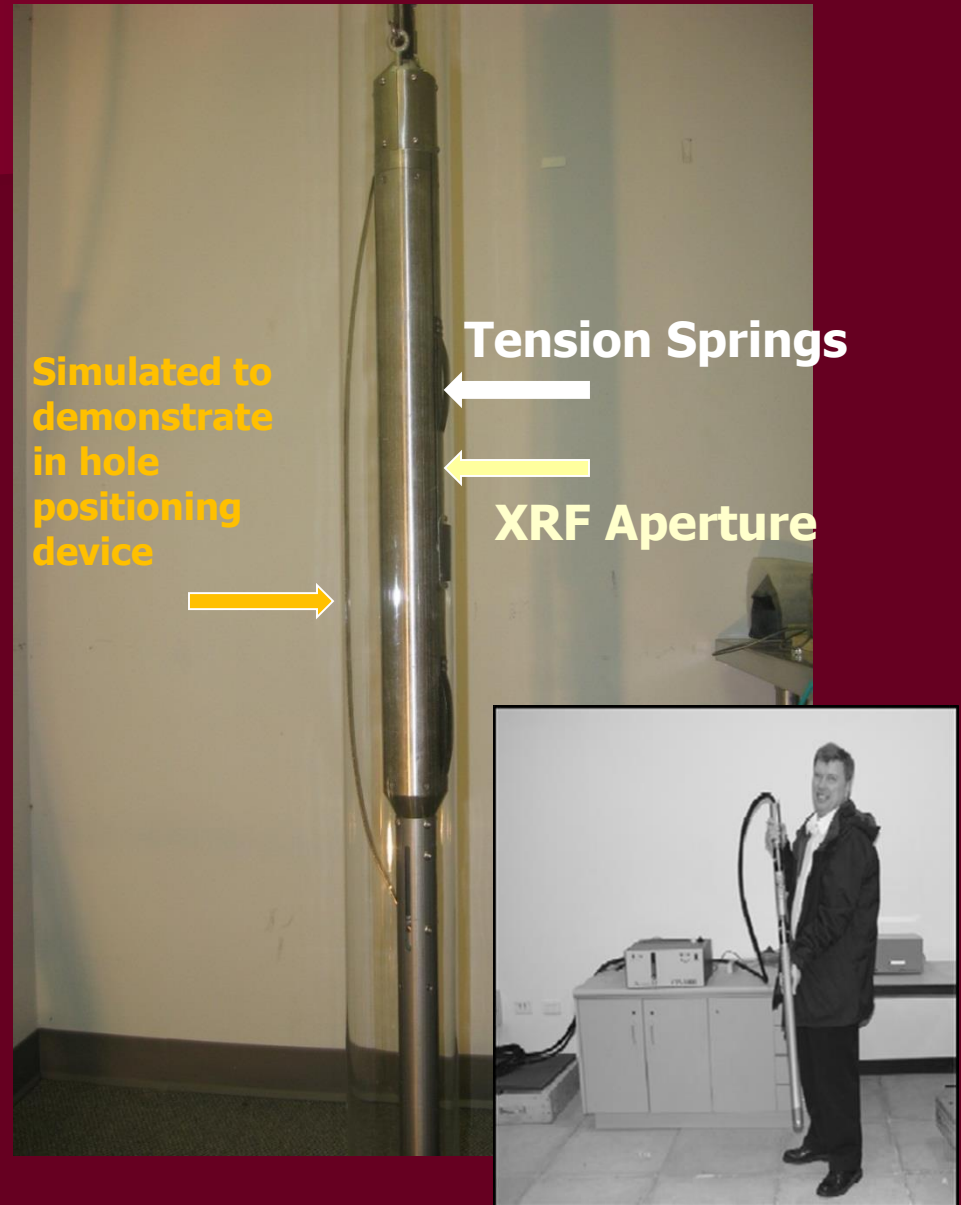
Austin AI
EDXRF Mining Probe - DHP
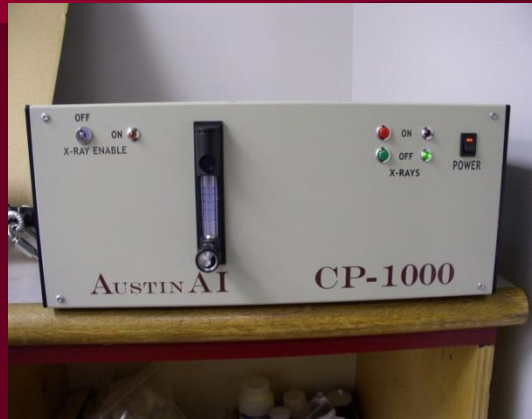
DHP Front Panel, w/ He option
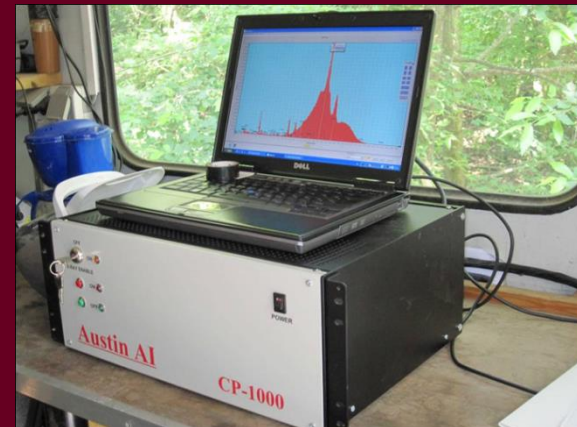
DHP Back Panel, w/ He option

Austin AI
EDXRF Mining Probe - DHP
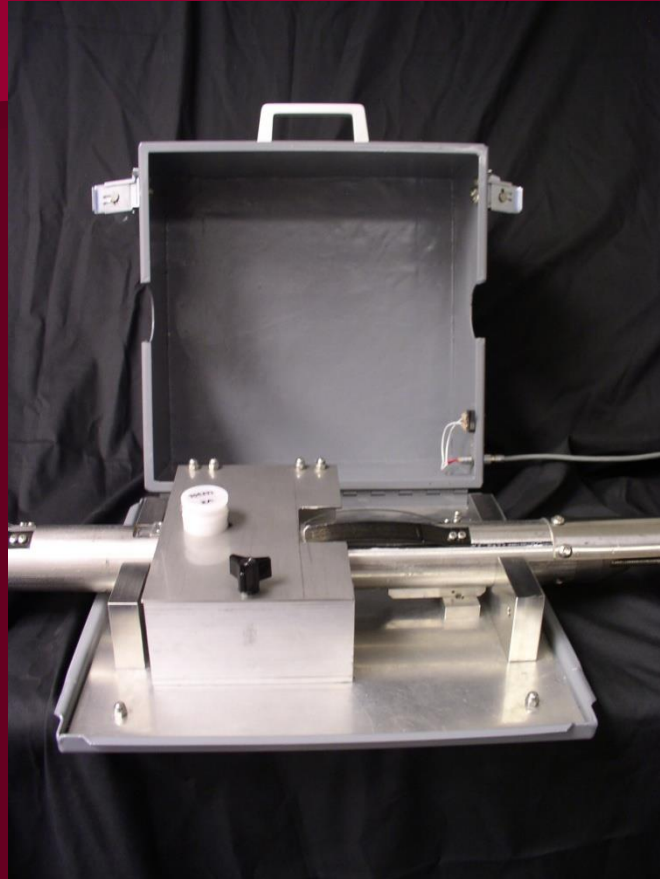
DHP Lab Test Stand

Austin AI
EDXRF Mining Probe - DHP

DHP:

Window

w/Seal Pad

← **Required for all LE analyses**

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EDXRF Mining Probe - DHP

Software: Analytical Parameters

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EDXRF Mining Probe - DHP

Software: Probe Options

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EDXRF Mining Probe - DHP

Software: Supervisor Set Up

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EDXRF Mining Probe - DHP

DHP:
10 keV
excitation

Confidential
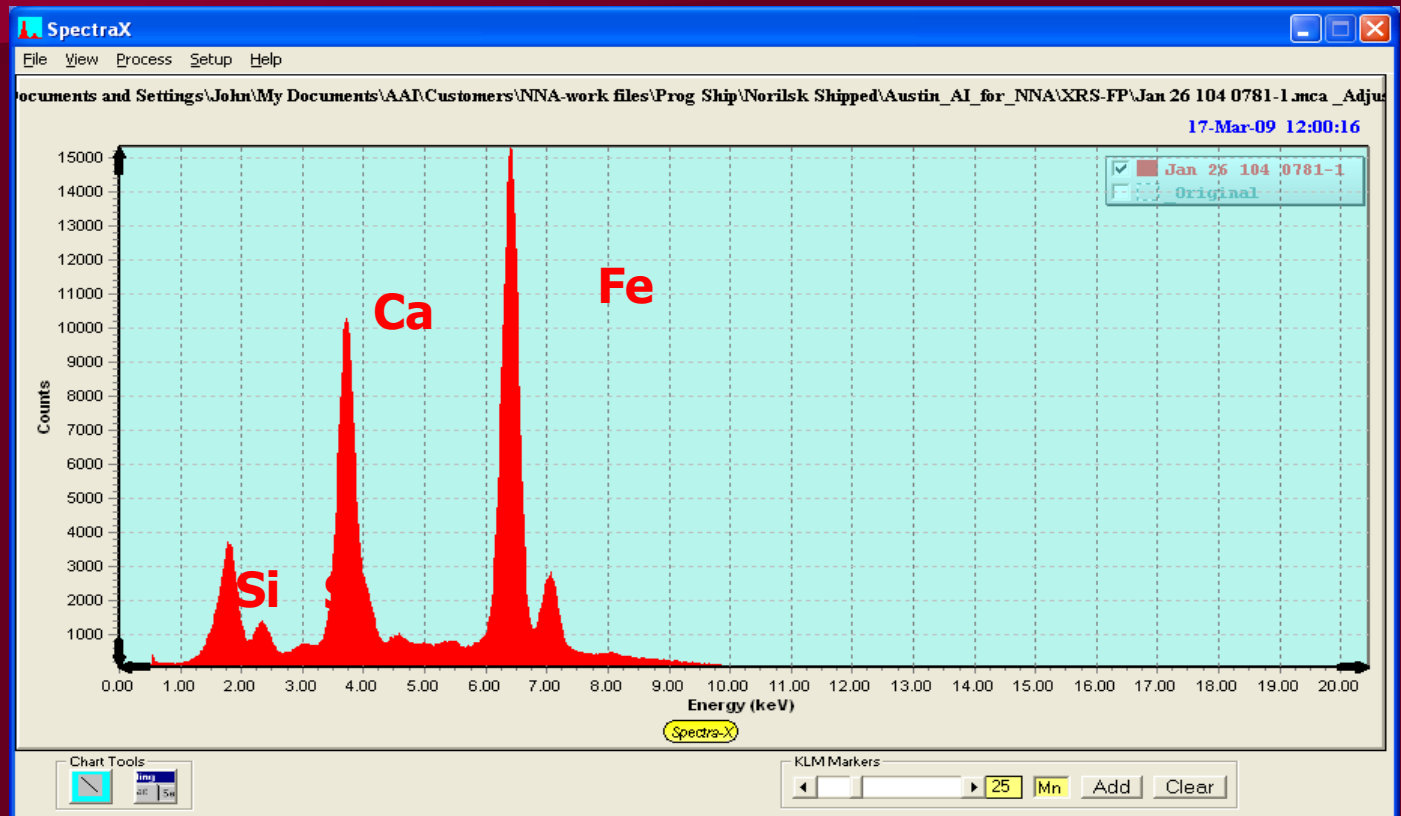
Austin AI
EDXRF Mining Probe - DHP

DHP:
40 keV
excitation

Austin AI
EDXRF Mining Probe - DHP

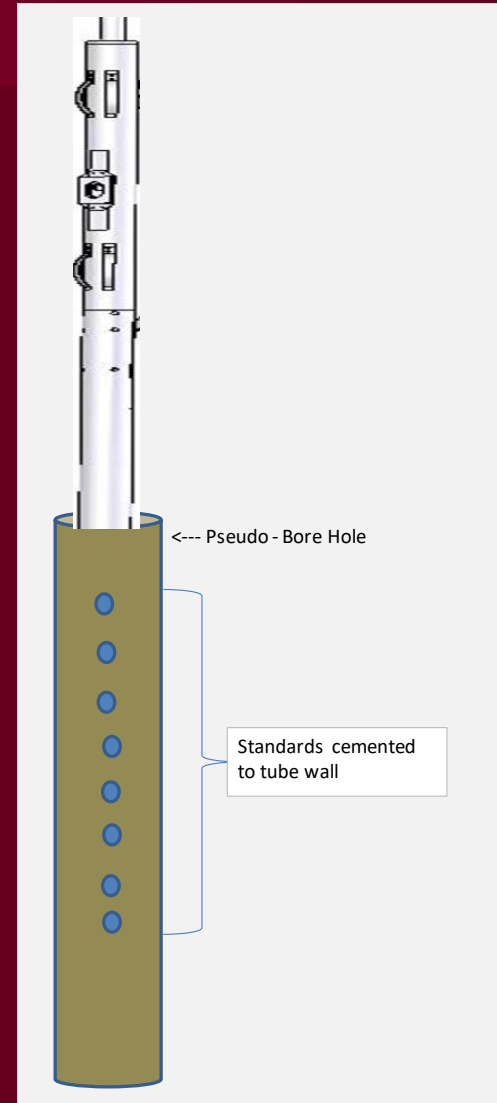## Test Conditions for DHP Performance in Various Ore Samples

Simulation provides excellent proof of performance in real world scenarios such as bore holes or blast holes

<--- Pseudo - Bore Hole

Standards cemented to tube wall

Confidential

Austin AI
EDXRF Mining Probe - DHP

DHP
Fe ore:
SiO$_2$

SiO2 Calibration
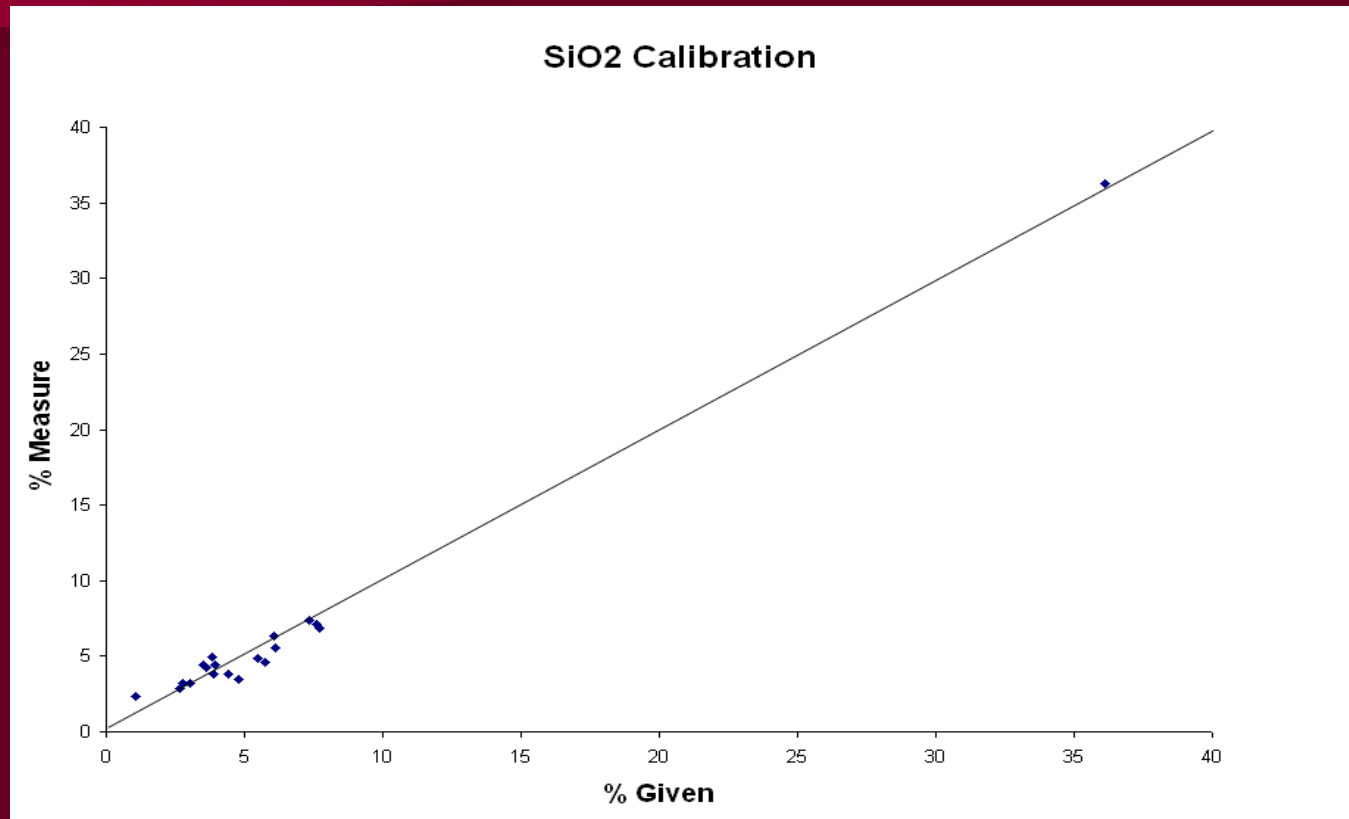
Austin AI
EDXRF Mining Probe - DHP
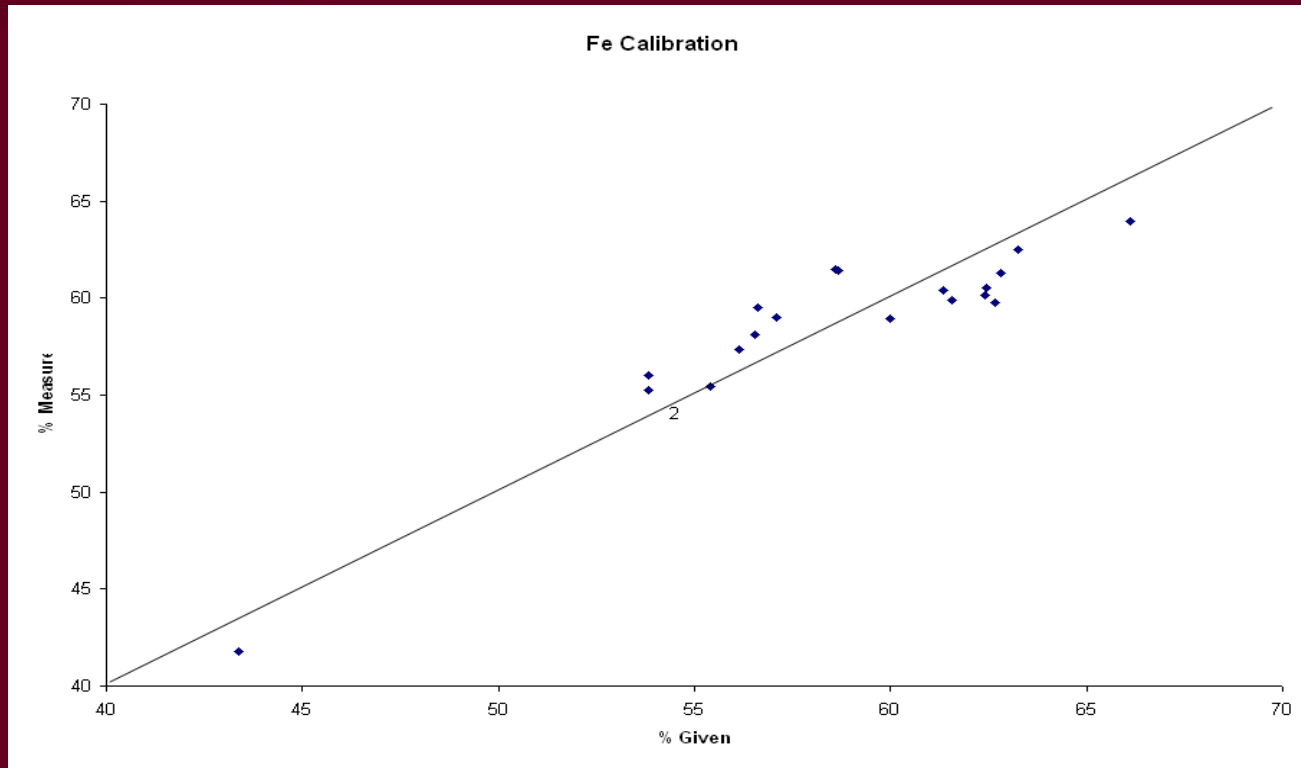
DHP
Fe ore:
Fe_2O_3

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EDXRF Mining Probe - DHP

DHP
Ni ore:
Ni

Nickel Ore: Ni on DHP

$y = 0.0064x - 0.1618$
$R^2 = 0.9676$

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EDXRF Mining Probe - DHP

DHP
Ni ore:
Cr

Nickel ore: Cr on DHP

$y = 127.03x - 1563.7$
$R^2 = 0.9996$

x-axis: cps Cr
y-axis: ppm Cr

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EDXRF Mining Probe - DHP

DHP
Ni ore:
Fe_2O_3

Nickel ore: Fe on DHP

$y = 0.0078x - 2.255$
$R^2 = 0.998$

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EDXRF Mining Probe - DHP

DHP Phosphate ore: P_2O_5

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EDXRF Mining Probe - DHP

DHP Phosphate ore: SiO_2

DHP
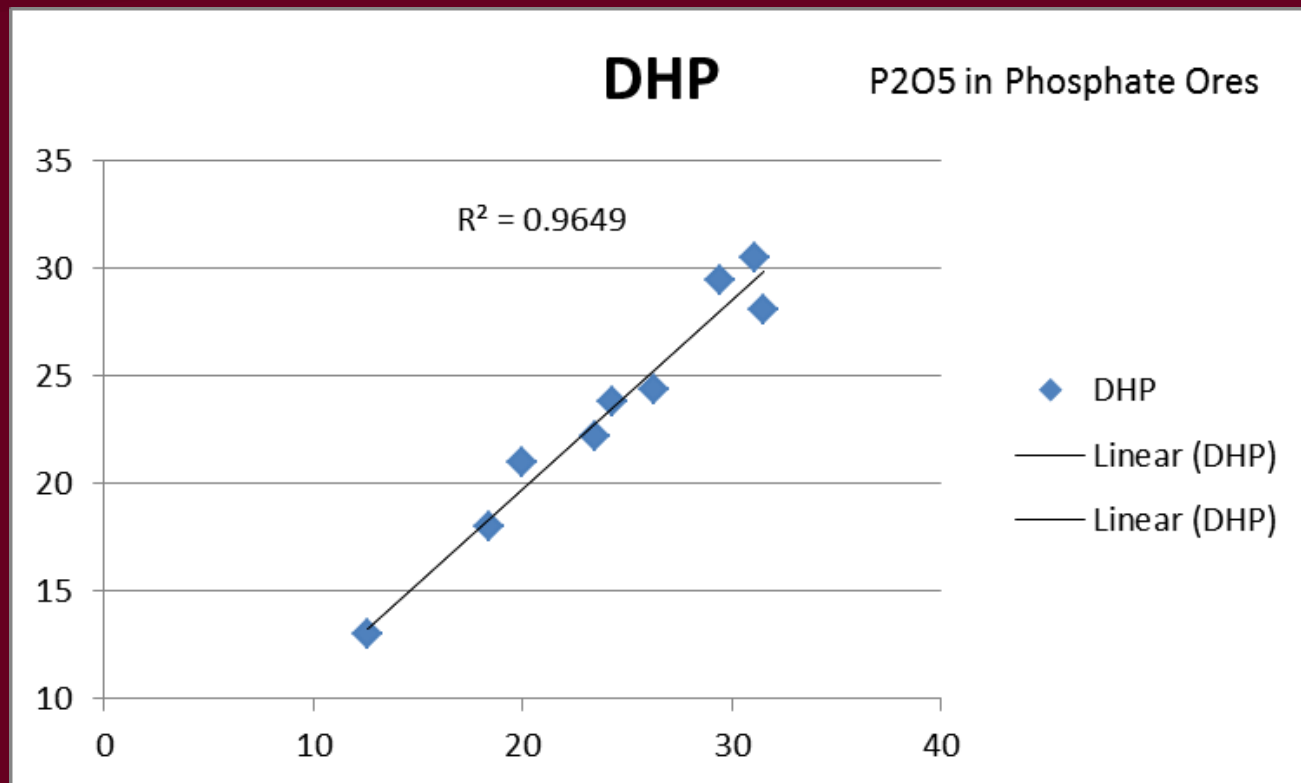
$R^2 = 0.9829$

- ◆ DHP
- —— Linear (DHP)
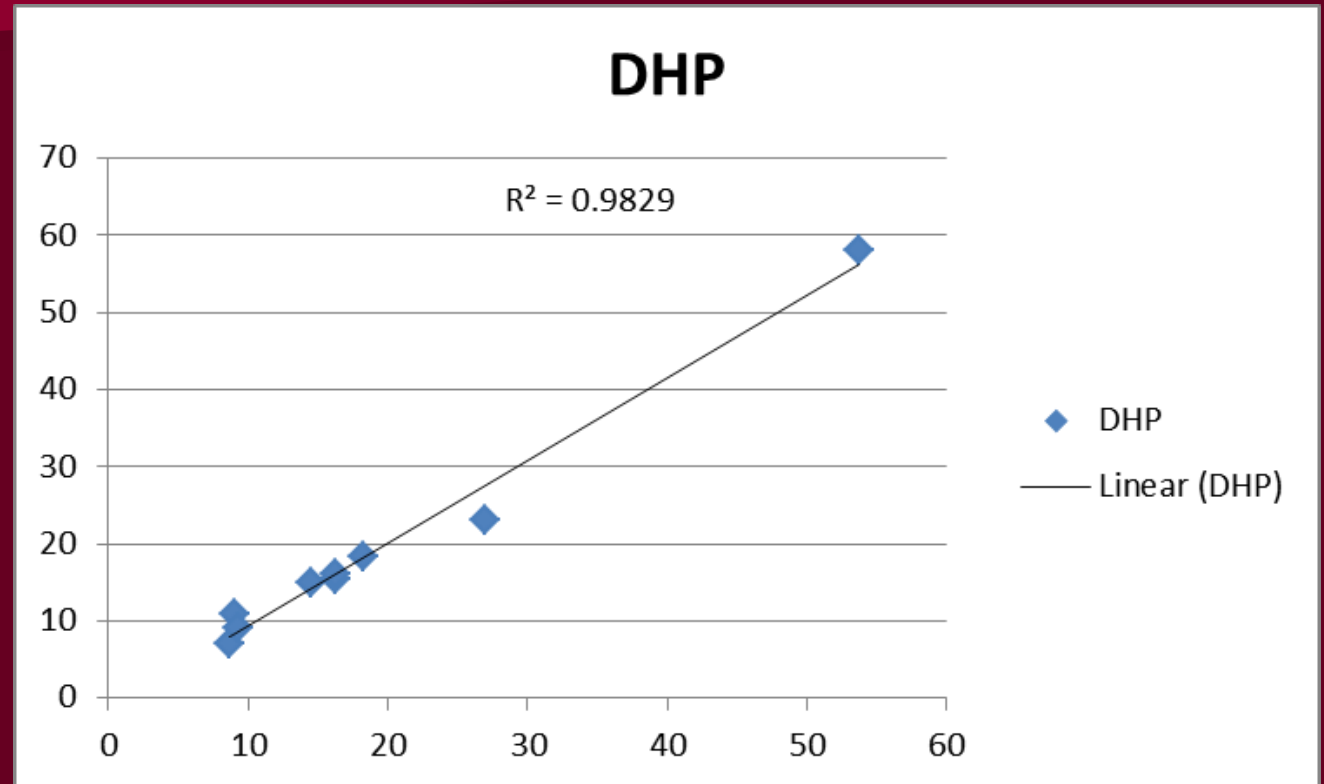
Austin AI
EDXRF Mining Probe - DHP

DHP Phosphate ore: Fe_2O_3

DHP

$R^2 = 0.9416$

◆ DHP
— Linear (DHP)
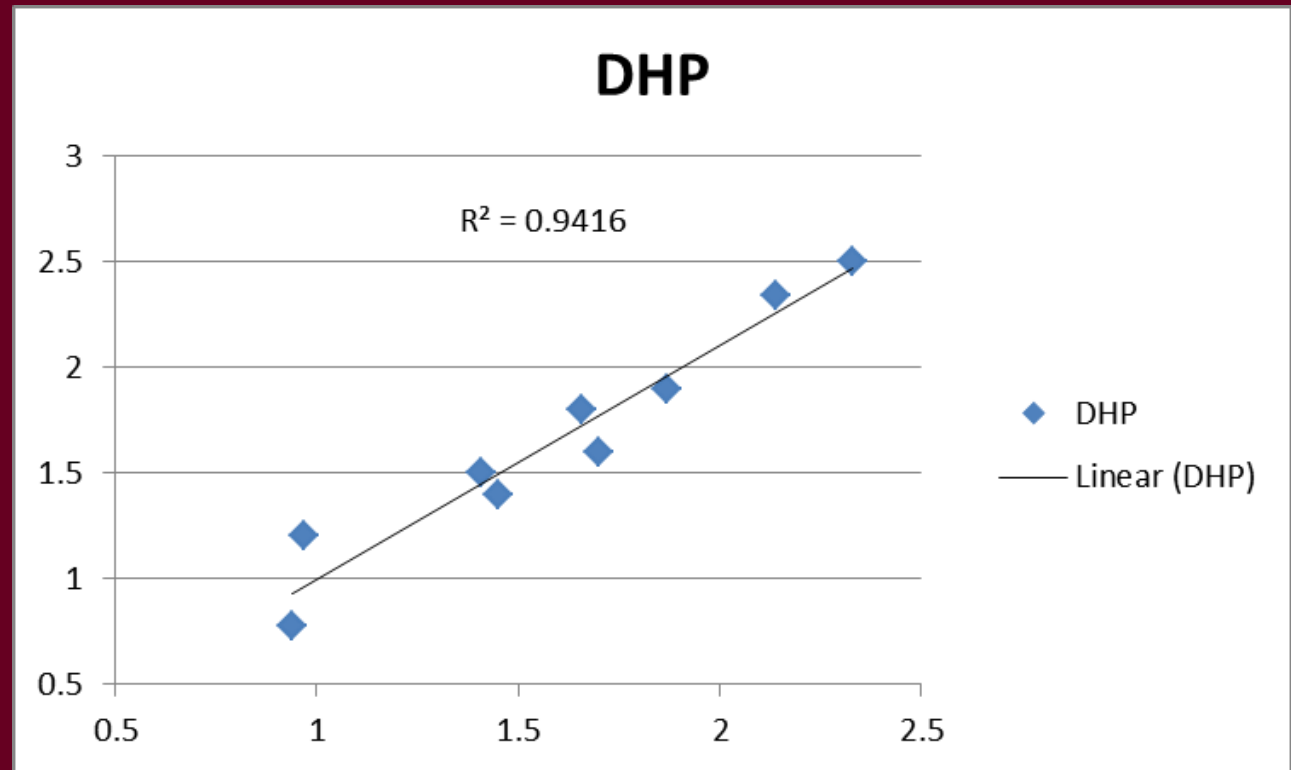
DHP Detection Limits, ppm
100 sec, SiO2 matrix

Some examples of actual Lab data

The DHP can "see" all elements between Al and U

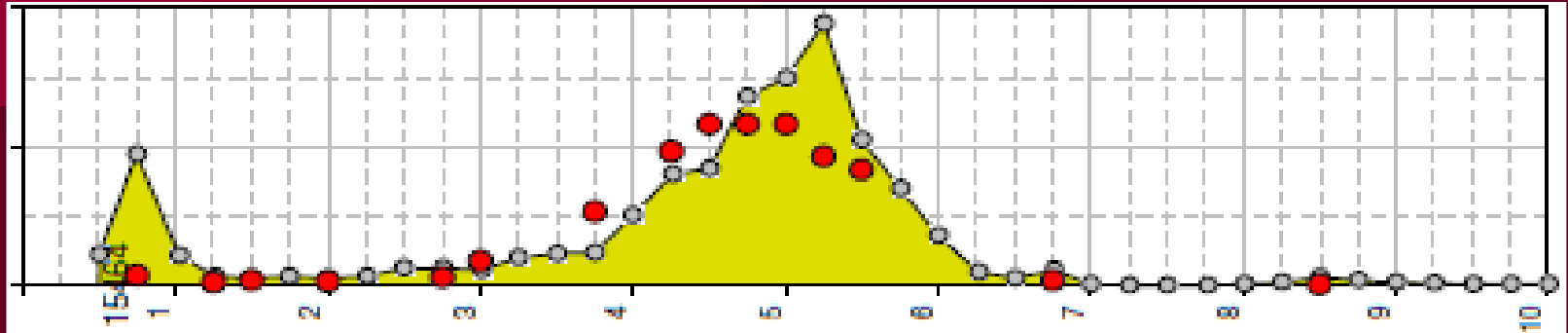|	
Fe, Ni, Cu, Zn, Hg, Pb	~10 ppm
Cr, Mn, Co	~20 ppm
As, Se	~10 ppm
Ag, PMG	~50 ppm
Cd, Ba	~25 ppm
S, P	~0.01%
Al	~0.2%

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DHP Field Data Reports

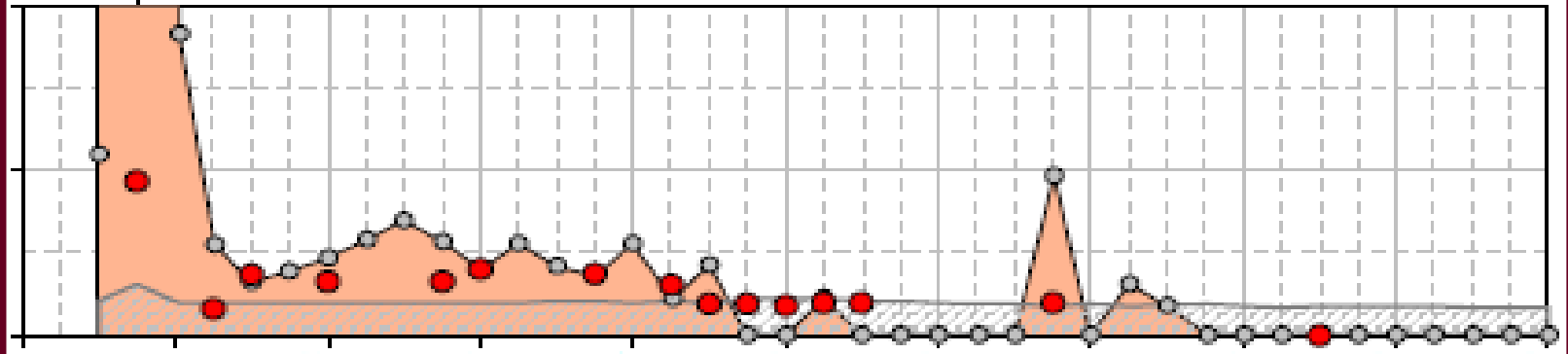**Chart of Conc v. Depth for a pre-set array of EOI's**
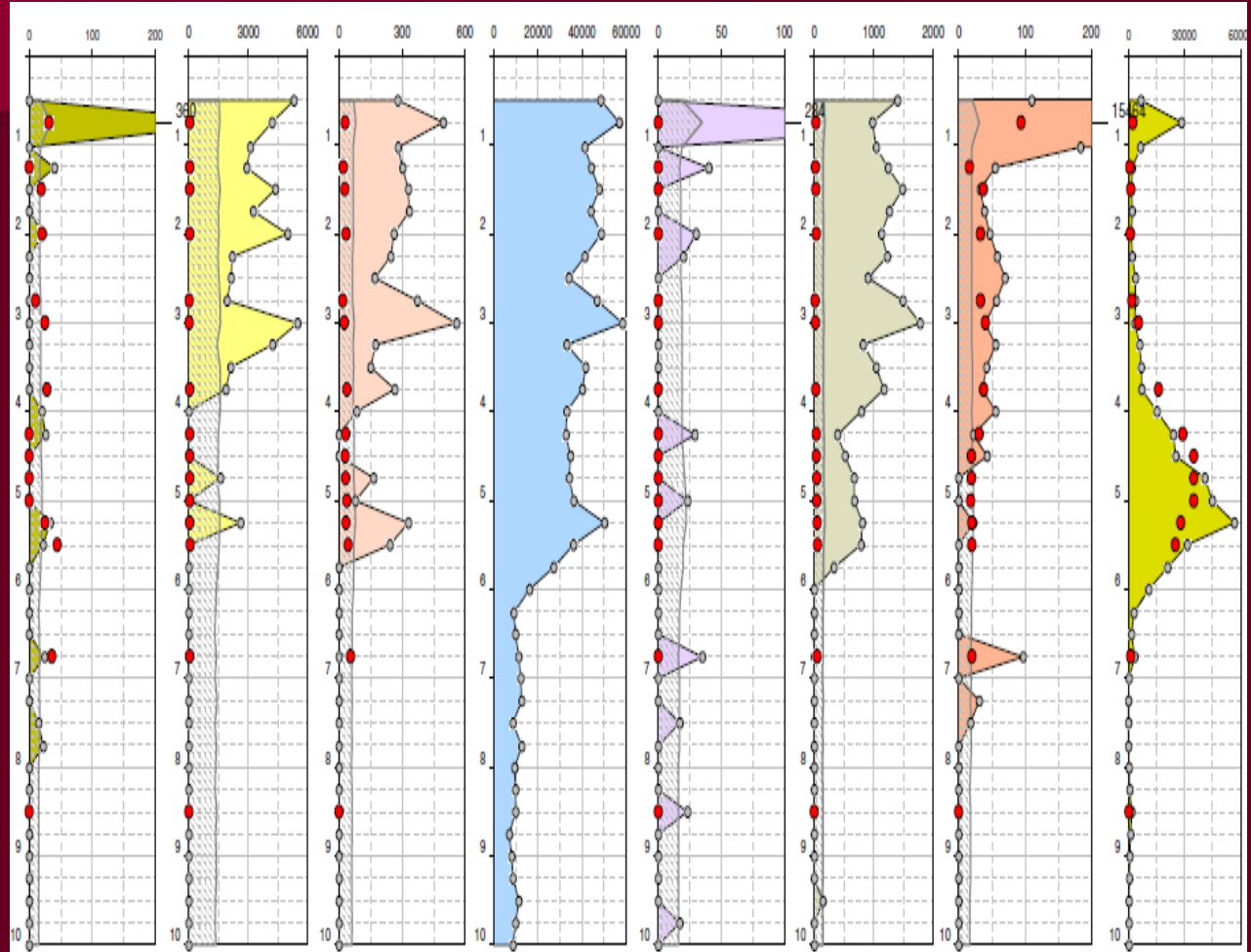
DHP Field Data Reports

P$_2$O$_5$

SiO$_2$

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Consultants in Sensor - Based Sorting/Process Solutions

Summary -- Austin AI are highly qualified to provide the most cost-effective consultation services for mining and milling because:

1) <u>Experience</u>
   a) We have been advancing the state of the art in sensor sorting systems and processes for many years
   b) We have worked for clients, contractors, and vendors—therefore we have seen all perspectives
   c) We guarantee our products and services

2) <u>Expertise</u>
   a) We have developed many new processing technologies
   b) We are creative. We use or develop the best solutions—not previously used ones
   c) We have a large network of colleagues and subcontractors

3) <u>Motive</u>
   a) We are not focused on selling equipment—we are focused on our client's needs
   b) We listen to the client's needs and desires

4) <u>Scope</u>
   a) We understand the economics AND the technology of processing
   b) We cover all process streams, automated processing lines, and systems

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