

**INNOV-X SYSTEMS**  
[www.innovx.com](http://www.innovx.com)

**INSTANT GEOCHEMISTRY**



**Innov-X Systems**  
**AIG – SMEDG Workshop**

*Friday 6<sup>th</sup> November 2009*

**Presenter**  
**Andrew Somers**  
**Managing Director : Innov-X Australia**



# WHO WE ARE & WHAT WE DO...

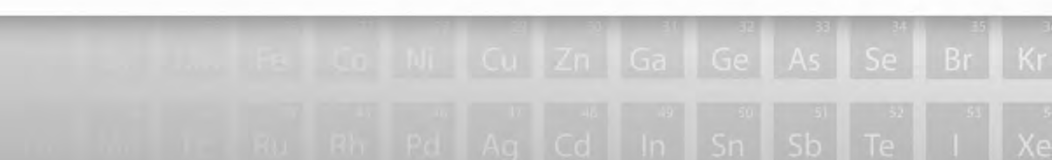
Innov-X Systems are the Global experts at delivering, supporting and servicing  
**“In-Situation” (In-Situ)**  
elemental analysis with XRF technology

Handheld – Portable – Bench Top – Online – Conveyor

***“Customized”***

Innovative XRF Technologies

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# INNOV-X TODAY

- ~150 Employees Globally
- Headquarters Woburn, MA
- International Operations:
  - Europe (Holland)
  - Hong Kong
  - Australia
  - Canada
  - Dubai UAE
  - South Africa
  - Latin America
- Service centers and field service worldwide:
  - Proven technology with a world of support
- 6000+ systems shipped



*"We put XRF where you need it, to solve your problems and suit your needs."*

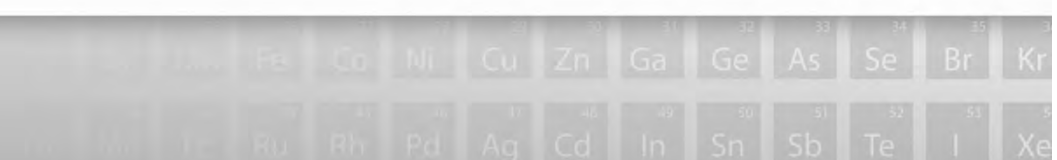


# OUR MISSION...

**Take XRF out of the lab and into the real world, to help our customers make real-time decisions.**

Innovative XRF Technologies

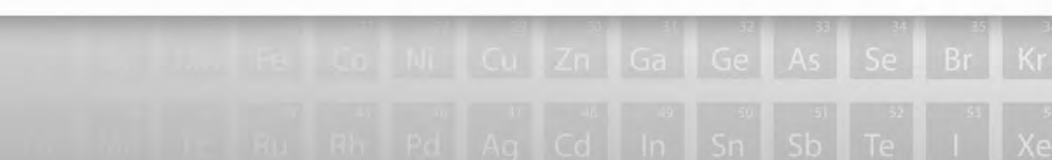
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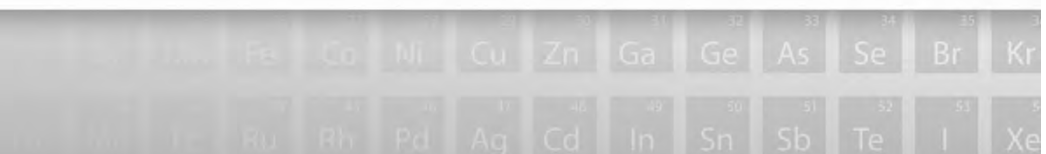


# INNOV-X IN AUSTRALIA

- **The ONLY manufacturer of FPXRF with a direct presence in Australia**
- **Home to IMG-International Mining Group**
- **Leading innovation in FPXRF for mining**
- **Fully capable service centre**



# INNOV-X USERS





# INNOV-X SOLUTIONS...



ALPHA



OMEGA



OMEGA + SDD + VAC



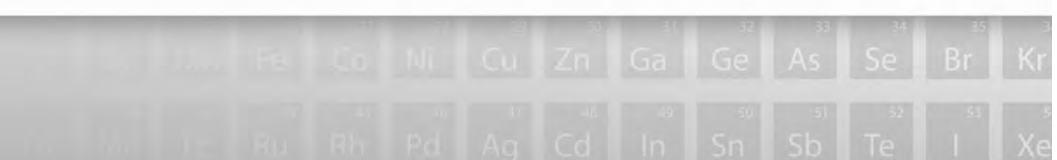
X-50



TERRA XRD



OMEGA + SDD + VAC + GPS-GIS





# OMEGA HANDHELD



## Ruggedized Handheld XRF for MINING

- Features fully integrated, sealed controller & industrial-grade touch screen
- Tube-based system eliminates radioactive isotope source
- 40 kV, 100 $\mu$ A => **4 Watt System**
- Choice of High Res Si-PIN or **SDD Detectors**
- Multi-element Analysis – all in one measurement
- Ergonomic, lightweight design
- Easily measures uneven surfaces
- High-Visibility Yellow Shell

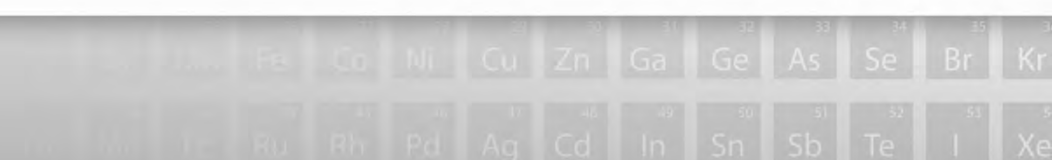
# MOST POWERFUL HH XRF

At 40 kV / 4 Watts, the Omega is still the **most powerful** handheld XRF available on the market today.

Optimizable “TRI-FECTA”

Voltage  
Current  
Filtering

Manufacturer	Voltage (kV)	Current (uA)	Power (W)
Innov-X	40	100	4
Innov-X	20 max	200	4
Competitor	50	40	2



# XRF-ELEMENTS VISIBLE



BY INNOV-X SYSTEMS HANDHELD XRF ANALYZERS

<b>INNOV-X SYSTEMS</b>																																																																																																																	
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0.05 Li 3	0.11 Be 4																	0.18 B 5	0.28 C 6	0.39 N 7	0.52 O 8	0.68 F 9	0.85 Ne 10																																																																																										
1.04 Na 11	1.25 Mg 12	<i>Superior In-Air LOD's with NEW High Performance SDD</i>																1.49 Al 13	1.74 Si 14	2.01 P 15	2.31 S 16	2.62 Cl 17	2.96 Ar 18																																																																																										
		IIIB		IVB		VB		VIB		VIIB		Group VIII		IB		IIB																																																																																																	
3.31 K 19	3.59 Ca 20	3.69 Sc 21	4.01 Ti 22	4.09 V 23	4.46 Cr 24	4.51 Mn 25	4.93 Fe 26	4.95 Co 27	5.43 Ni 28	5.41 Cu 29	5.95 Zn 30	5.9 Ga 31	6.49 Ge 32	6.4 As 33	6.93 Se 34	7.65 Br 35	7.48 Kr 36	8.26 Rb 37	8.05 Sr 38	8.91 Y 39	8.64 Zr 40	9.25 Nb 41	10.26 Mo 42	9.89 Tc 43	10.98 Ru 44	10.54 Rh 45	11.73 Pd 46	11.22 Ag 47	12.5 Cd 48	11.92 In 49	13.29 Sn 50	12.65 Sb 51	14.11 Te 52	12.85 I 53	14.11 Xe 54																																																																														
13.4 Rb 37	14.96 Sr 38	14.17 Y 39	15.84 Zr 40	14.96 Nb 41	16.74 Mo 42	15.78 Tc 43	17.67 Ru 44	16.62 Rh 45	18.62 Pd 46	17.48 Ag 47	19.61 Cd 48	18.37 In 49	20.82 Sn 50	19.28 Sb 51	21.66 Te 52	20.22 I 53	22.72 Xe 54	21.18 Cs 55	23.82 Ba 56	22.16 La 57	24.94 Ce 58	23.17 Pr 59	26.1 Nd 60	24.21 Pm 61	27.28 Sm 62	25.27 Eu 63	28.49 Gd 64	26.36 Tb 65	29.73 Dy 66	27.47 Ho 67	31 Er 68	28.61 Tm 69	32.29 Yb 70	29.78 Lu 71	33.62 Hf 72	29.78 Ta 73	33.62 W 74	29.78 Re 75	33.62 Os 76	29.78 Ir 77	33.62 Pt 78	29.78 Au 79	33.62 Hg 80	29.78 Tl 81	33.62 Pb 82	29.78 Bi 83	33.62 Po 84	29.78 At 85	33.62 Rn 86																																																																
1.69 Fr 87	1.75 Ra 88	1.81 Ac 89	1.87 Th 90	1.92 Pa 91	2 U 92	2.04 Np 93	2.12 Pu 94	2.17 Am 95	2.26 Cm 96	2.29 Bk 97	2.39 Cf 98	2.42 Es 99	2.54 Fm 100	2.56 Md 101	2.68 No 102	2.56 Lr 103	2.68 Rf 104	2.68 Db 105	2.68 Sg 106	2.68 Bh 107	2.68 Hs 108	2.68 Mt 109	2.68 Ds 110	2.68 Rg 111	2.68 Og 112	2.68 Ts 113	2.68 Lr 114	2.68 Uu 115	2.68 Uub 116	2.68 Uut 117	2.68 Uuq 118	2.68 Uur 119	2.68 Uus 120	2.68 Uuq 121	2.68 Uur 122	2.68 Uus 123	2.68 Uuq 124	2.68 Uur 125	2.68 Uus 126	2.68 Uuq 127	2.68 Uur 128	2.68 Uus 129	2.68 Uuq 130	2.68 Uur 131	2.68 Uus 132	2.68 Uuq 133	2.68 Uur 134	2.68 Uus 135	2.68 Uuq 136	2.68 Uur 137	2.68 Uus 138	2.68 Uuq 139	2.68 Uur 140	2.68 Uus 141	2.68 Uuq 142	2.68 Uur 143	2.68 Uus 144	2.68 Uuq 145	2.68 Uur 146	2.68 Uus 147	2.68 Uuq 148	2.68 Uur 149	2.68 Uus 150	2.68 Uuq 151	2.68 Uur 152	2.68 Uus 153	2.68 Uuq 154	2.68 Uur 155	2.68 Uus 156	2.68 Uuq 157	2.68 Uur 158	2.68 Uus 159	2.68 Uuq 160	2.68 Uur 161	2.68 Uus 162	2.68 Uuq 163	2.68 Uur 164	2.68 Uus 165	2.68 Uuq 166	2.68 Uur 167	2.68 Uus 168	2.68 Uuq 169	2.68 Uur 170	2.68 Uus 171	2.68 Uuq 172	2.68 Uur 173	2.68 Uus 174	2.68 Uuq 175	2.68 Uur 176	2.68 Uus 177	2.68 Uuq 178	2.68 Uur 179	2.68 Uus 180	2.68 Uuq 181	2.68 Uur 182	2.68 Uus 183	2.68 Uuq 184	2.68 Uur 185	2.68 Uus 186	2.68 Uuq 187	2.68 Uur 188	2.68 Uus 189	2.68 Uuq 190	2.68 Uur 191	2.68 Uus 192	2.68 Uuq 193	2.68 Uur 194	2.68 Uus 195	2.68 Uuq 196	2.68 Uur 197	2.68 Uus 198	2.68 Uuq 199	2.68 Uur 200

Lanthanides  
57-71

33.44 La 57	37.8 Ce 58	34.72 Pr 59	39.26 Nd 60	36.03 Pm 61	40.75 Sm 62	37.36 Eu 63	42.27 Gd 64	38.72 Tb 65	43.83 Dy 66	40.12 Ho 67	45.41 Er 68	41.54 Tm 69	47.04 Yb 70	43 Lu 71
4.65 5.04	4.84 5.26	5.03 5.49	5.23 5.72	5.43 5.96	5.64 6.21	5.85 6.46	6.06 6.71	6.27 6.98	6.5 7.25	6.72 7.53	6.95 7.81	7.18 8.1	7.42 8.4	7.66 8.71

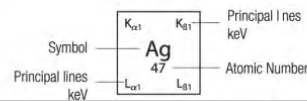
Actinides  
89-103

90.88 Ac 89	102.85 Th 90	93.35 Pa 91	105.61 U 92	95.87 Np 93	108.43 Pu 94	98.44 Am 95	111.3 Cm 96	101.00 Bk 97	114.18 Cf 98	103.65 Es 99	117.15 Fm 100	106.35 Md 101	120.16 No 102	109.10 Lr 103
12.65 15.71	12.97 16.2	13.29 16.7	13.61 17.22	13.95 17.74	14.28 18.28	14.62 18.83	14.96 19.39	15.31 19.97	15.66 20.56	16.02 21.17	16.38 21.79			

**Alloy Elements and Detection Limit Guidelines:**

Elements Detected Magnesium (Mg, Z=12) through Silicon (Si, Z=14) and Titanium (Ti, Z=22) through Plutonium (Pu, Z=94) typically 0.1% - some elements as low as 0.01%

**Low-Density Sample Types (Soils, powders, liquids)**



Requires vacuum, LOD 0.2 - 3%  
LOD 1% - 5%

250 - 2,500 ppm  
10 - 100 ppm

50 - 150 ppm  
Not Measured

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Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe

# MINING ELEMENT SUITES

## **SOIL MODE (ppm) – ~30 Elements Standard**

Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Zr, Mo, Ag, Cd, Sn, Sb, W, Hg, Pb, Bi, Th, U  
+ LEAP II (Light Element Analysis Protocol) Overlap for Ti, V, Cr, Mn, Fe + P, S, Cl, K & Ca

## **MINING MODE (%) – ~20 Elements Standard**

Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Zr, Nb, Mo, Ag, Cd, Sn, Sb, W, Pb, Bi  
+ **2<sup>nd</sup> Beam** Mg-Al-Si-P-S-Ti-V (for Light Elements with X-PRESS)

*NOTE: Other elements can be added with a Customized Calibration **BUT** inter-elemental effects must be addressed.*

**REMEMBER: IN GENERAL, MORE ELEMENTS ≠ A BETTER XRF INSTRUMENT!**

# DETECTION LIMITS (LOD's)

## The 1 Million Dollar Question!...

### *Depends on Many Aspects:*

- Energy of excitation source (**instrument**) - **Not** all about Max kV => *Fine-Tuning Voltage & Current => To Maximize Count Rate*
  - Atomic number of element being analyzed (**sample**)
  - Concentration (**sample**)
  - Density & Matrix (**sample**)
  - Sample size (**sample & user**)
  - Length of test (**user**)
  - + Quality of the Instrument Calibration & QC Samples used to “Tweak” the instrument (**user & instrument**)
- => THE **SAMPLE** IS THE MOST INFLUENTIAL FACTOR WITH USING FPXRF

# WHAT IS THE OMEGA *Xplorer*?

1. **OMEGA Portable XRF Analyzer with Soil Mode**
2. **TRIMBLE Nomad Field Computer with GPS**
3. **Mobile GIS - “ArcPAD” or “Discover Mobile”**
4. **ioGAS - Geochemical Analysis Software**
5. **Soil Extension Pole and Soil Foot**



# OMEGA Xplorer Overview



Bluetooth®



DGPS



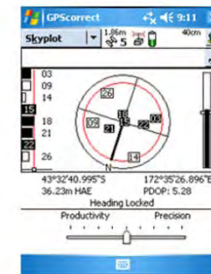
*Streaming XRF Meta-Data into ArcPAD Mobile GIS*



OR



encom discover mobile  
Pitney Bowes MapInfo



*Real-Time DGPS via GPScorrect Extension*

THIRD PARTY SOFTWARE  
(ioGAS / ioHUB / ArcGIS / ENCOM Discover / MAPINFO)







# ACCESSORIES – TEST STAND

**New Portable Test Stand for the Omega + Alpha**



# ACCESSORIES – TEST STAND

**New Portable Test Stand for the Omega + Alpha**



**Lid Open**



**Lid Closed**

# SI-DRIIFT DETECTORS – NEW DETECTOR TECHNOLOGY



## *Main Advantages for Mining Applications*

- **Much FASTER!**

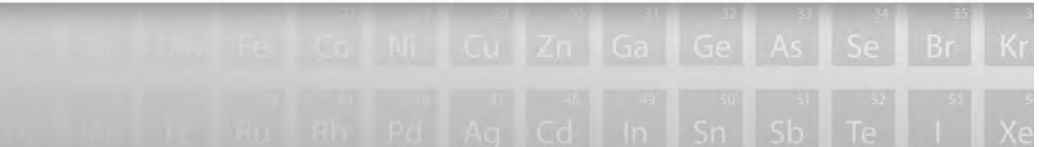
The order of magnitude increase in count-rates means much lower test times for similar LODs with the Si-PiN. 60 Min test times – now in 15-20secs.

- **Light Element Ability with 2-Beam Mining In-Air**

Exceptional Performance on Al, Si, P, Ca & S – Usually require very long test times – up to 180secs. Now obtainable in 30-60sec's or LESS.

- **Lower LOD's & Higher Precision**

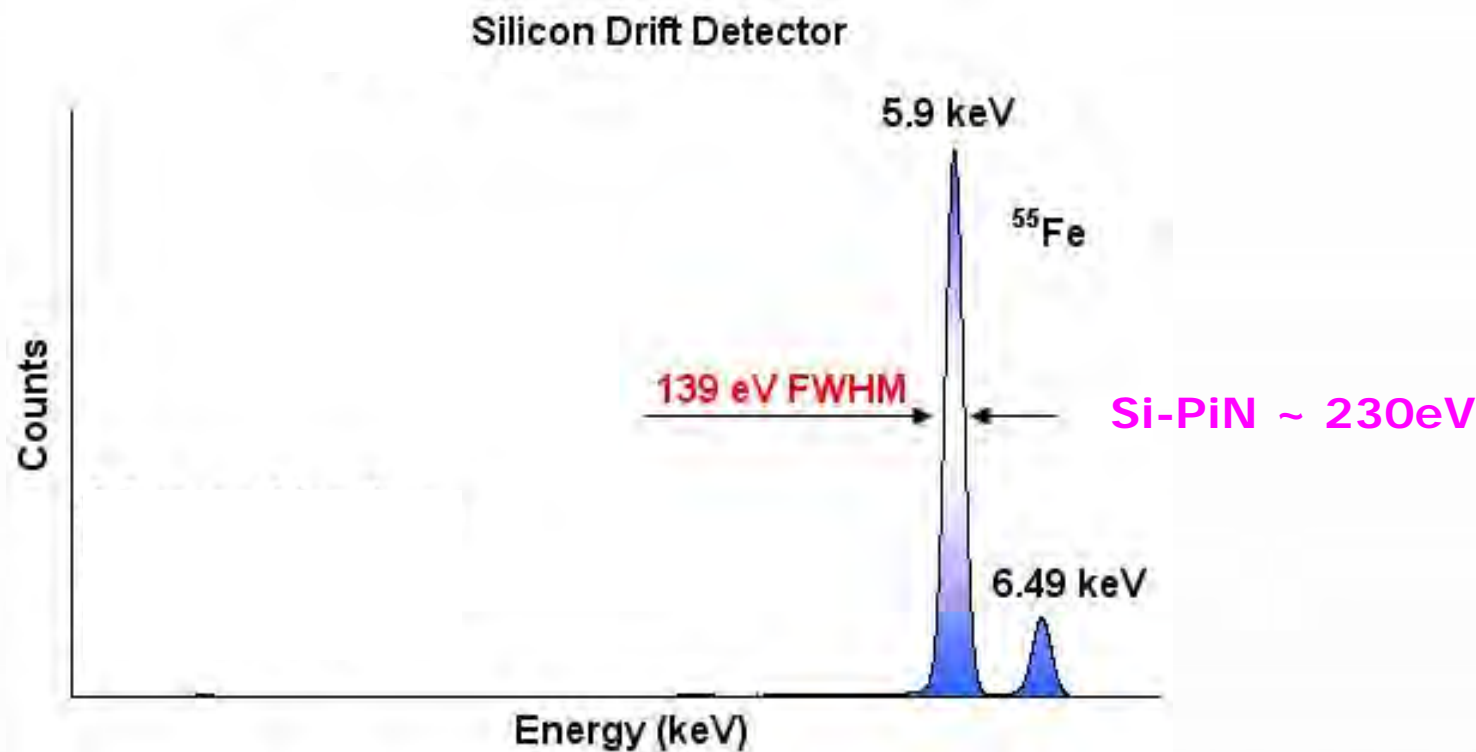
The X-press SDD achieves much better LOD's across the entire Periodic Table and a significant increase in analytical precision => tighter results and better confidence.



# SI-DRIFT DETECTORS – NEW DETECTOR TECHNOLOGY



## Much Higher Resolution (Standardization)



# ADD VACUUM FOR SUPERIOR Mg PERFORMANCE



## Superior Light Element (LE) Capability with Vacuum Upgrade:

- Patent-pending Vacuum technology allows fast, accurate, safe, Mg Analysis
- No compressed Helium to buy or store
- No Backpack to carry
- Upgrade to VAC package at any time



**“OMEGA X-PRESS  
VAC”**

Innovative XRF Technologies

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A faint background image of a periodic table of elements, showing various chemical symbols and atomic numbers.

# LODS – SDD Vs Si-PiN

## Typical Limits Of Detection (LOD's)\*

Element	Omega Xpress	Omega
	SDD	Si-PiN

### Mining Mode (%)

Mg	1.00%	N/A
Al	0.50%	N/A

### Soil Mode (ppm)

P	698	7995
S	237	1443
Cl	98	591
K	70	234
Ca	40	150
Ti	15	24
V	12	19
Cr	10	15
Mn	14	36
Fe	10	30
Co	9	27
Ni	8	24
Cu	6	15
Zn	3	10
As	3	8
Se	1	3

Element	Omega Xpress	Omega
	SDD	Si-PiN

### Mining Mode (%)

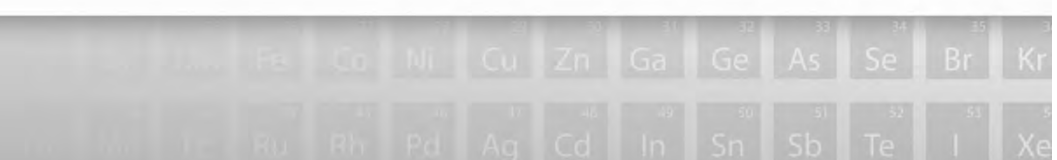
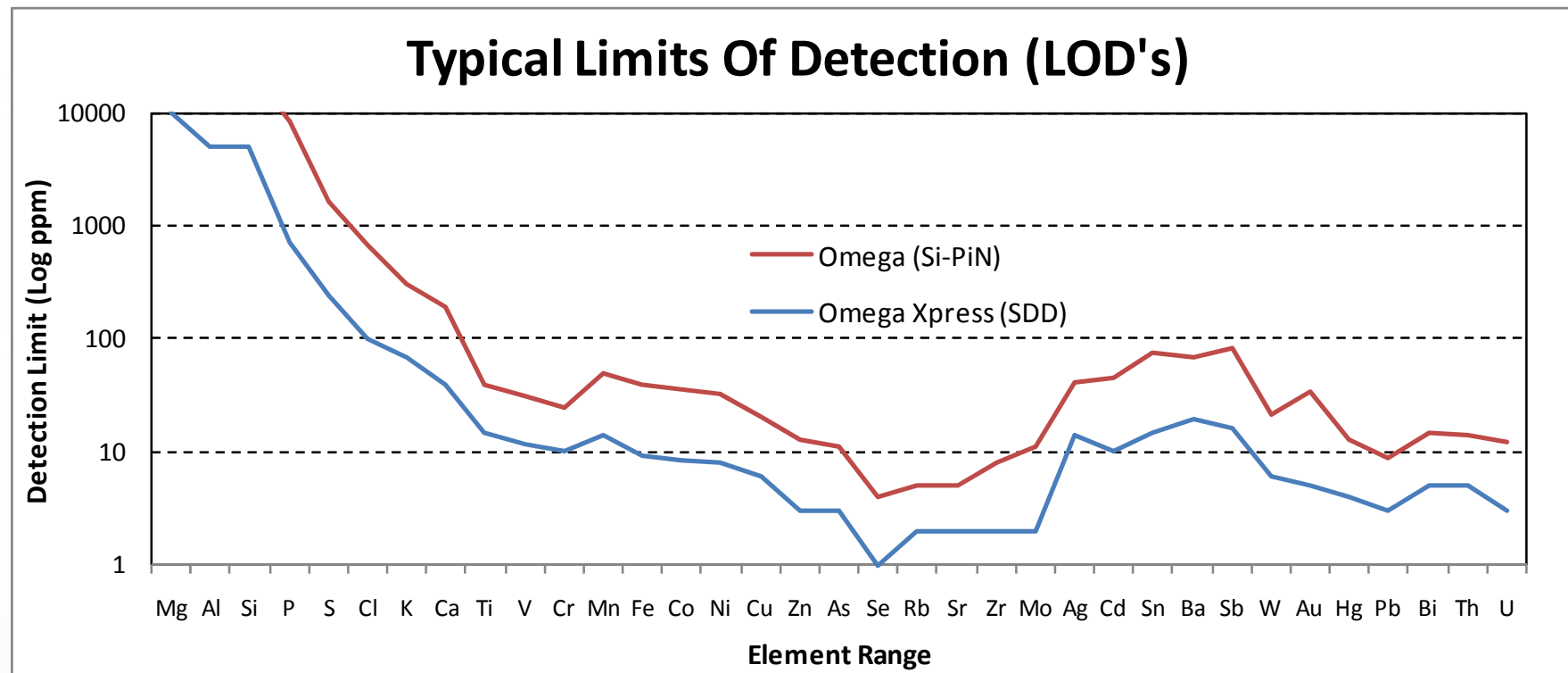
Si	0.50%	N/A
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### Soil Mode (ppm)

Rb	2	3
Sr	2	3
Zr	2	6
Mo	2	9
Ag	14	27
Cd	10	36
Sn	15	60
Sb	16	66
Ba	20	50
W	6	15
Au	5	30
Hg	4	9
Pb	3	6
Bi	5	10
Th	5	9
U	3	9

\*90sec Test per Beam per Mode

# LODS – SDD Vs Si-PiN





# MINING APPLICATIONS



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26	27	28	29	30	31	32	33	34	35	36
Li	Be	B	C	N	O	F	Ne	Na	Mg	Al
Si	P	S	Cl	Ar	K	Ca	Sc	Ti	V	Cr
Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br
Kr	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd
Ag	Cd	In	Sn	Sb	Te	I	Xe	Ba	La	Ce

# COMODITIES WHERE XRF USED:

- **Cu-Pb-Zn-Ag (Base Metals) Deposits**
  - **Uranium-Thorium +/- REE Deposits**
  - **Fe-Ore & Bauxite (Al) Deposits**
  - **Epithermal Au-Mo-Sn-W-Bi-Sb Deposits**
  - **Ni-Cu-Sulphide Deposits**
  - **Fe-Ni-Co Laterite Deposits**
  - **Ti Mineral Sands**
  - **Phosphate & Potash Mining**
  - **Magmatic Ni-Cr-V Deposits**
  - **Au – Exploration (Pathfinders)**
- + Many More...**

# Fe-Ore with New SDD Samples From Pilbara, Australia



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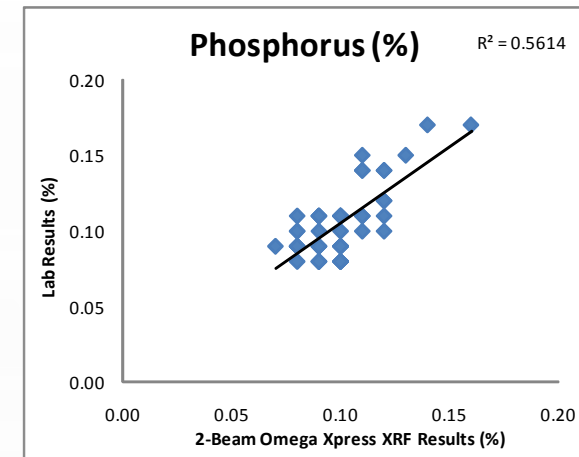
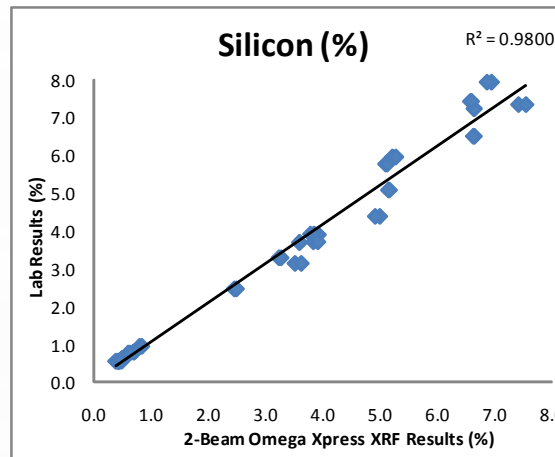
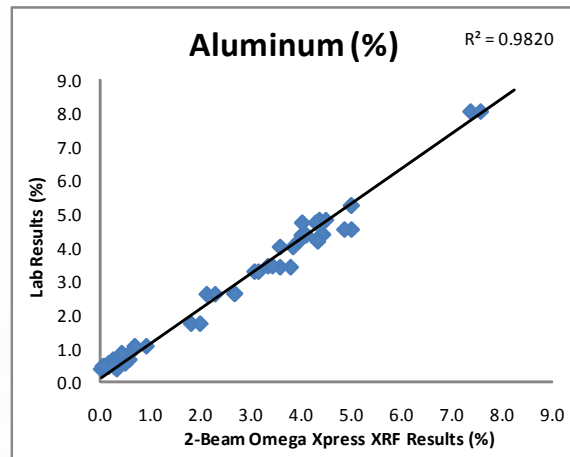
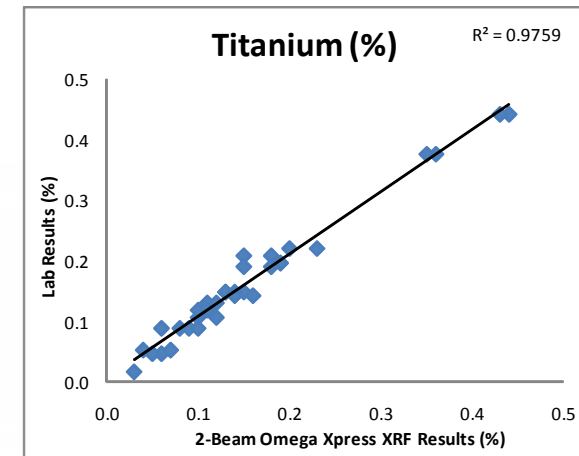
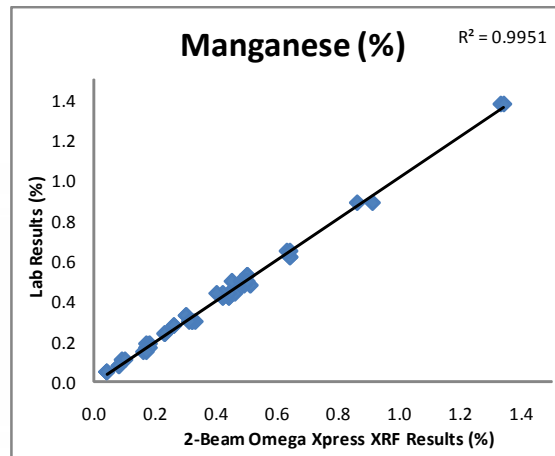
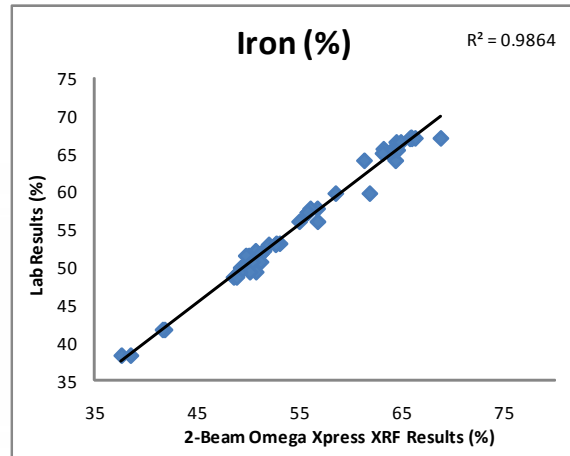
**Client Samples – Hematite Ore – Pilbara Region W.A**

Fe Co Ni Cu Zn Ga Ge As Se Br Kr  
Ru Rh Pd Ag Cd In Sn Sb Te I Xe

# Fe-Ore Performance Omega Xpress (SDD)



[ 90sec Test on Pulps in Mining Mode in AIR ]



# Fe-Ore Mineralisation & FPXRF

Utilization of Innov-X Systems New Omega Xpress XRF Analyser with Advanced Silicon Drift Detector (SDD) Technology for Heavy & Light Element Analysis in Fe-Ores.

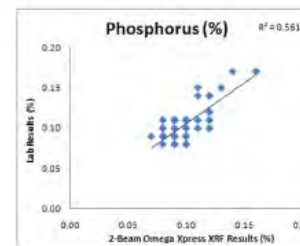
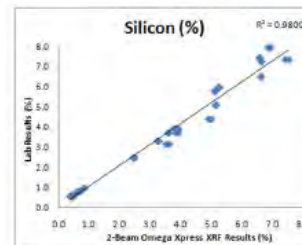
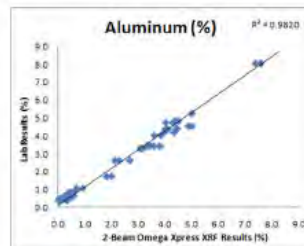
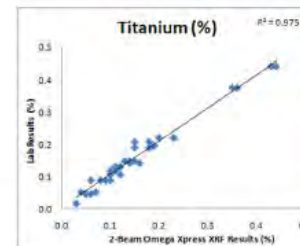
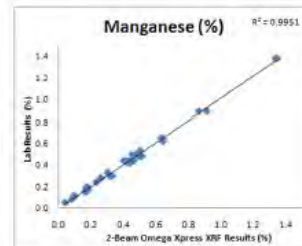
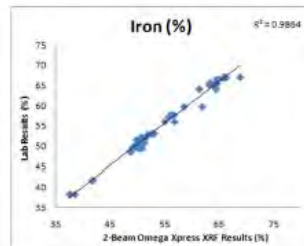


## Introducing the Innov-X Omega Xpress XRF Analyzer

Innov-X's new Omega Xpress couples an ultra high resolution Silicon Drift Detector (SDD) with a powerful 4W X-ray tube, delivering the fastest, most precise analysis available today in a handheld X-ray Fluorescence (XRF) analyzer. SDDs provide three major improvements over traditional Si PIN Diode X-ray detectors: 1) The ability to detect and process 10X more X-rays in a given amount of time, 2) better energy resolution, and 3) improved peak-to-background ratio. The result is far better precision and lower limits of detection for Mining and Exploration applications. The addition of Innov-X Systems patented Vacuum technology can also assist in enhancing light element performance significantly.

## Unprecedented Performance in Iron Ores & Associated Trace Elements:

The inclusion of even small amounts of some trace elements can have profound effects on the behavioral characteristics of a batch of iron or the operation of a smelter / blast furnace. These effects can be both good and bad. Consequently, the optimal feed grade for Iron Ore concentrates is usually in excess of 60% Fe by weight with less than 0.2% phosphorus, 3-7% silica, less than 5% aluminum and low sulphur and titanium. The introduction of the Omega Xpress SDD XRF with Light Element capabilities now enables the determination of ALL important phases of interest in Fe-Ores. Together with the enhanced ability to accurately and precisely determine elemental Fe content over a broad analytical range (typically 30 => 80% Fe), it is now possible to analyze Mn, Ti as well as Al, Si, P & S simultaneously (as well as up to 25 other elements if required).



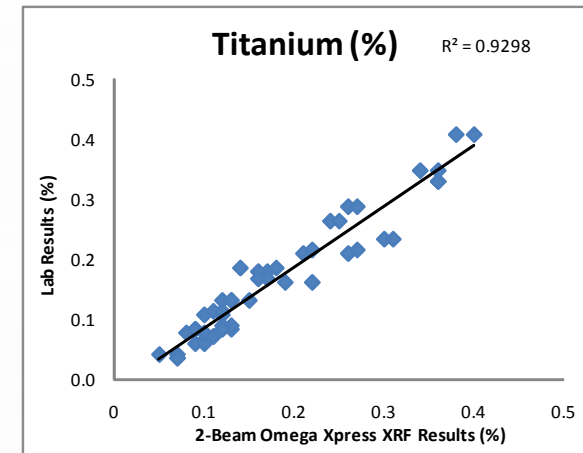
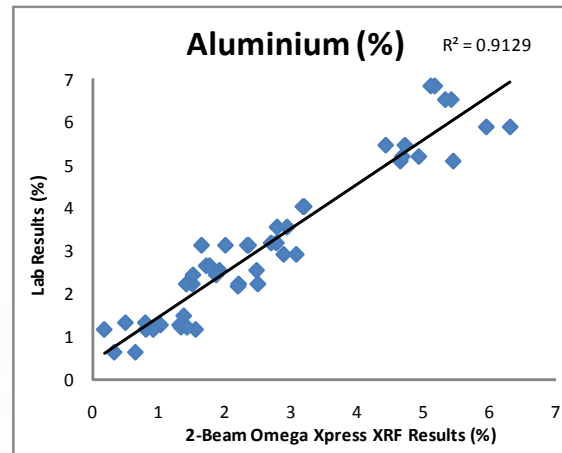
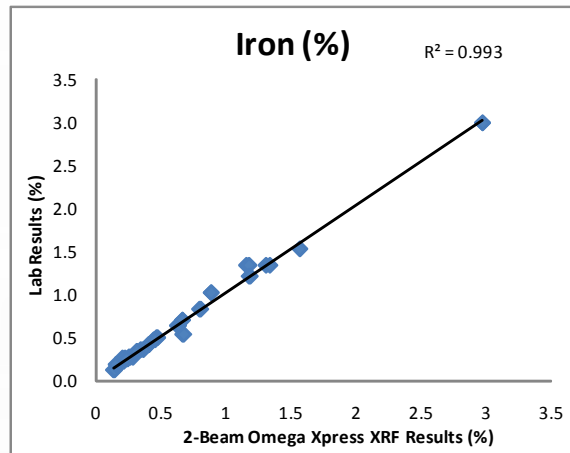
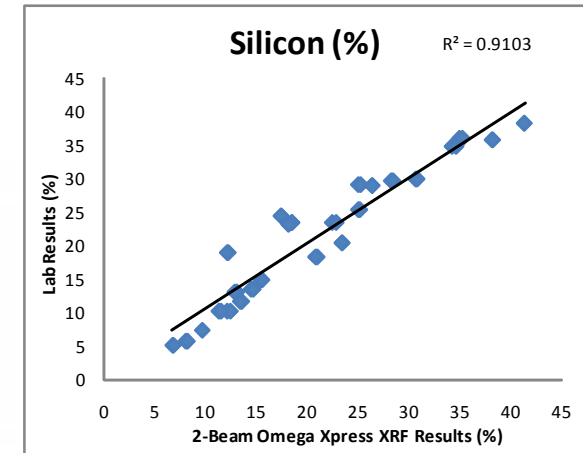
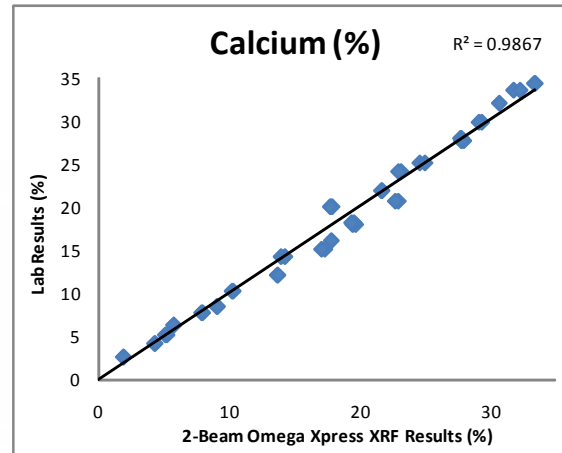
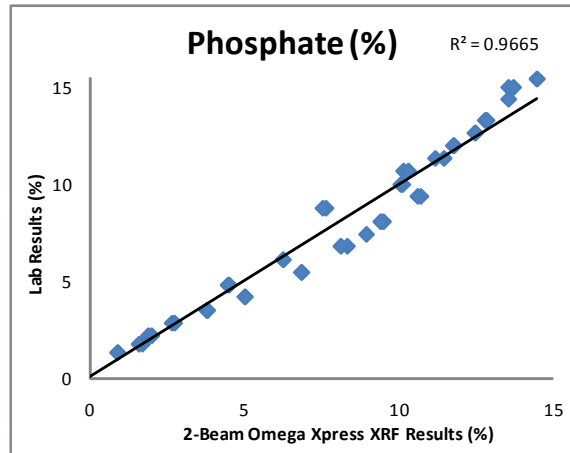
Iron, Manganese, Titanium, Aluminum, Silicon & Phosphorous Performance on Typical Hematite Rich, Banded Iron Ore. (90sec test time in AIR using Mining Mode on an Omega Xpress SDD Analyzer)

APPLICATION BRIEF

# Phosphate Performance Omega Xpress (SDD)



[ 90sec Test on Pulps in Mining Mode in AIR ]



Innovative XRF Technologies

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Client Samples – Phosphate Hill Region - QLD

# Phosphate Mineralisation & FPXRF

Utilization of Innov-X Systems Field Portable XRF Analyzers for the determination of Phosphate Mineralization & Associated Pathfinder Elements.



## Introduction & Background:

The use of Field Portable X-Ray Fluorescence (FPXRF) & X-Ray Diffraction (FPXRD) within the Mining & Mineral Exploration Industry is fast becoming an established method for conducting real-time geochemical investigations in the field, with the significant benefit of receiving a determination at the actual sample location. Customized analyzer configuration and flexibility across the element calibration suite from Mg (z=12) to U (z=92), provides versatility to the Explorer or Miner looking for Phosphate as well as accompanying geochemical pathfinder signature elements.

## Phosphate Mineralization & Pathfinders

The average natural crustal abundance of phosphorus is around 1000 parts per million (ppm) in most rock types. Phosphate rock (or Phosphorite) is a general term referring to rock with high concentrations of phosphate minerals, most commonly those of the Apatite family (an impure tri-calcium phosphate mineral) with the general formula  $\text{Ca}_5(\text{PO}_4\text{CO}_3)_3(\text{F,OH,Cl})$ . With over 90% of global phosphate mined used for fertilizer production, phosphate rock or its concentrates preferably have levels exceeding 15-20% phosphorus pentoxide ( $\text{P}_2\text{O}_5$ ), with reasonable amounts of calcium carbonate (up to 35%) and <5% combined iron and aluminum oxides. The general pathfinder element suite that is usually associated with phosphorites is Ag, F, Mo, Ni, Pb, REE, V, U & Th.

## Phosphate & FPXRF

Due to the high concentration of phosphate (>15-20%  $\text{P}_2\text{O}_5$ ) required to constitute an economic deposit, Field Portable XRF (FPXRF) represents an effective tool for use in both exploration and mine grade control. The Lower Limits of Detection (LODs) for Phosphorus with the new generation Silicon Drift Detector (SDD) XRF Analyzers is in the order of 0.05% (500ppm), dependant on sample matrix. Obviously, this LOD is significantly higher than for most of the transition metals because Phosphorus is a much weaker responder to X-Ray radiation. This is due to the low energy emission lines required to excite the fluorescence of phosphorous at only 2.01KeV for the K-Alpha line and 2.14 for the K-Beta line. As such the determination of Phosphorous relies upon using lower voltage and filtering settings (Beam Settings), over longer test times (60-120secs versus 10-20secs) to obtain good levels of precision. The use of new Silicon Drift Detector (SDD) technology, which combines dramatically increased count rates, lower background, and higher resolution, can significantly reduce analysis time and enhance results. The addition of Innov-X Systems patented Vacuum technology can also assist in enhancing light element performance significantly. This is achieved by purging the area adjacent to the detector of air which can otherwise attenuate the signal recieved from the light materials being analyzed.

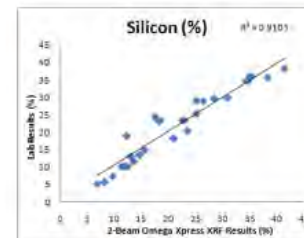
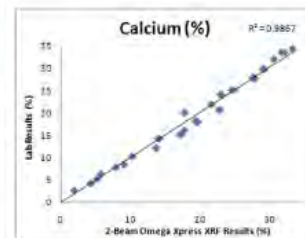
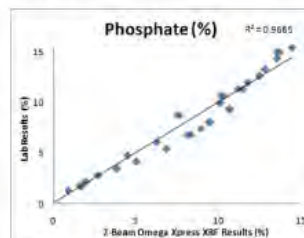


Element	LOD*
Al	~1.0%
Si	~0.5%
P	500ppm
Ca	35ppm
Fe	10ppm
Li	2ppm
Th	5ppm

\*Omega Xpress (SDD) 90Sec Test in S104 Matrix  
 ~In Air (Non Vac) & Matrix Dependant



Phosphate Fertilizer



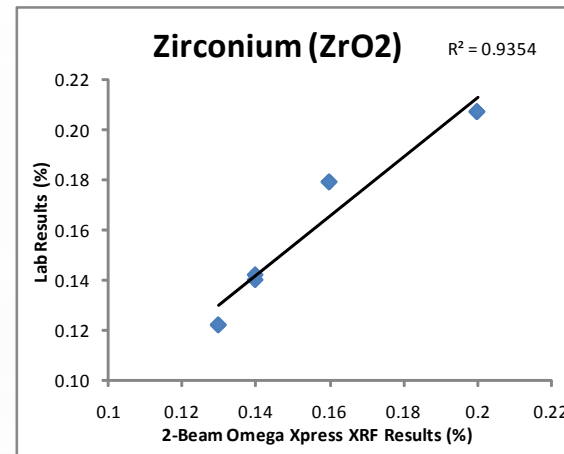
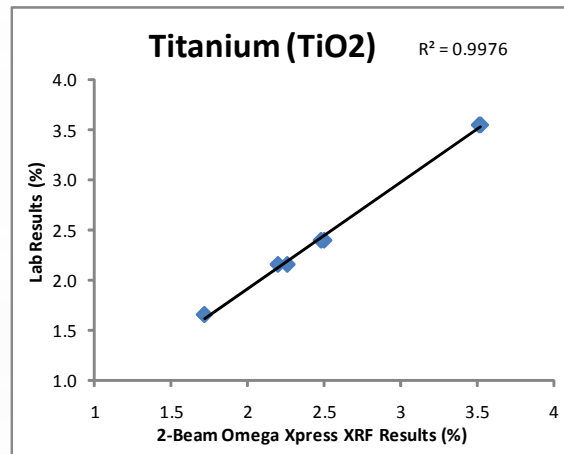
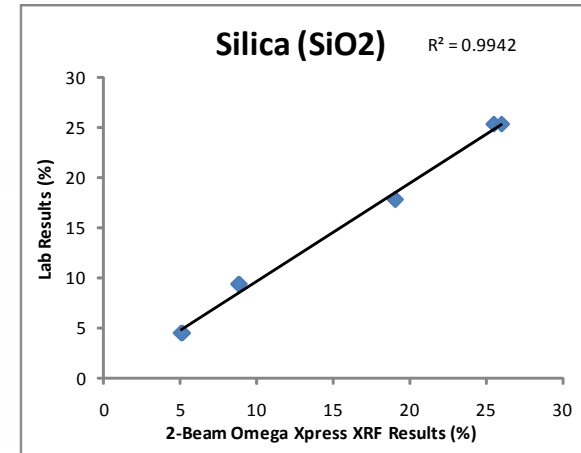
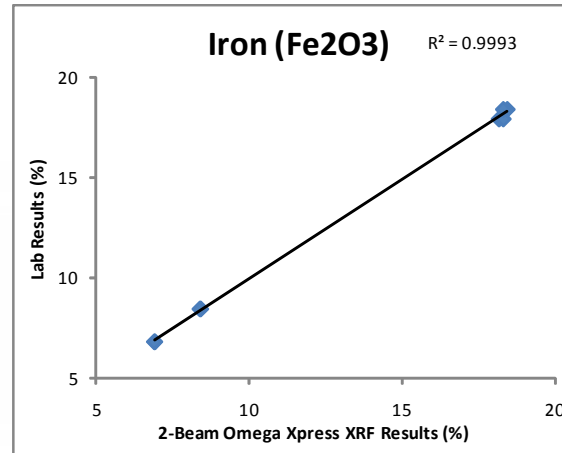
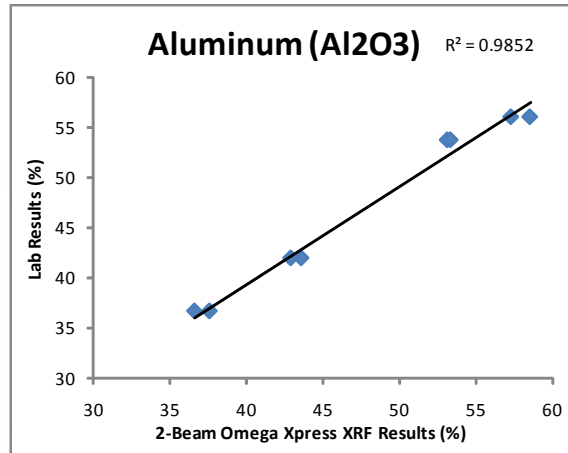
Phosphorous, Calcium & Silicon Performance on Typical Phosphate Rock (90sec test time in AIR using Mining Mode on an Omega Xpress SDD Analyzer)

APPLICATION BRIEF

# Bauxite Performance Omega Xpress (SDD)



[ 90sec Test on Pulps in Mining Mode in AIR ]



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GEOSTATS CRM's



# OMEGA Xpress For Bauxite

Utilization of Innov-X Systems New Omega Xpress XRF Analyser with Advanced Silicon Drift Detector (SDD) Technology for Bauxite Applications



## Bauxite Ore Analysis Aluminum & Associated Impurities

**Innov-X's New Omega Xpress** couples an ultra high resolution SDD detector with a powerful 4W X-ray tube, delivering the fastest, most precise analysis available today in a handheld X-ray Fluorescence (XRF) analyzer. The introduction of new SDD technology has significantly advanced the application of Field Portable XRF for the Mining & Mineral Exploration Industry. The key benefits include:

- Significantly Increased Speed - higher count-rates mean shorter testing times
- In-Air Light Element Ability with Xpress Mining Mode for Al, Si, P, Ca, & S
- Lower Detection Limits (LOD's) and higher precision across the entire periodic table

### Unprecedented Performance in Bauxite Ores:

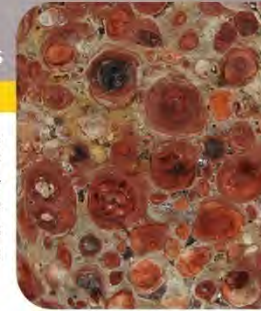
In its mineral form Bauxite, Aluminum is the most abundant metal in the earth's crust. Bauxite contains one of a variety of hydrated aluminum oxides (gibbsite, boehmite or diaspore), which are often expressed as  $Al_2O_3 \cdot xH_2O$  but are more commonly regarded as impure  $Al_2O_3$ . Bauxite is claylike and earthy and ranges in color from white to deep brown or red according to the nature and quantity of its components. The major impurities in Bauxite are iron oxides (goethite & hematite), silicon dioxide, the clay mineral kaolinite as well as small amounts of anatase ( $TiO_2$ ). Consequently, its composition varies considerably with alumina constituting from about 50% to about 70%. The Omega Xpress analyzer, with SDD technology, now enables the determination of ALL important phases of Bauxite ores. Al content can be accurately and precisely determined over a broad analytical range simultaneously along with Si, Fe, Mn, Ti, Zr and up to 20+ other elements.

### The Power of 3 - SDD Advantages

Silicon Drift Detectors provide three major improvements over existing silicon PIN diode X-ray detectors. 1) Detect and process 10x or more X-rays in a given amount of time, 2) Better energy resolution, and 3) Improved peak-to-back-ground ratios. The result is better precision...



**Focus**  
Handheld XRF  
Silicon Drift Detector  
Light Element Analysis  
Lower Detection Limits  
Significantly Increased Speed

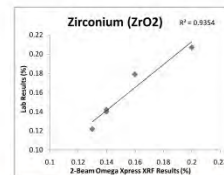
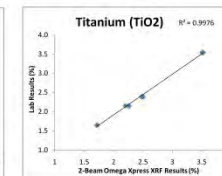
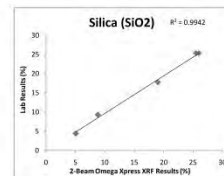
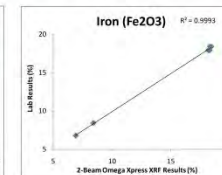
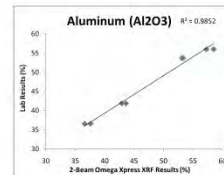


*Pisolitic Iron-Rich Bauxite Ore*

**Xpress Mining Mode**  
Superior Light Element Performance

12 Mg Magnesium	13 Al Aluminum	14 Si Silicon	15 P Phosphorus
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In Air or under Vacuum (optional)



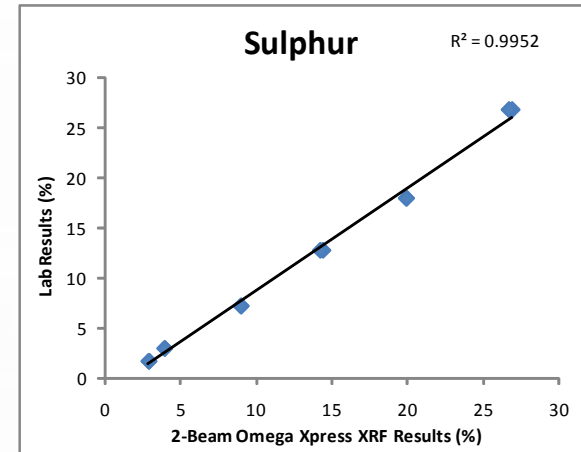
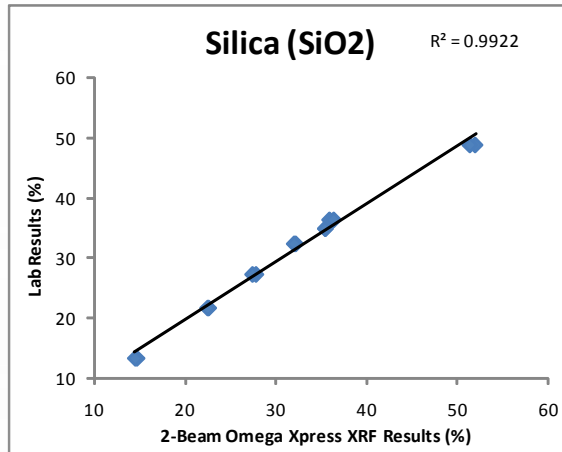
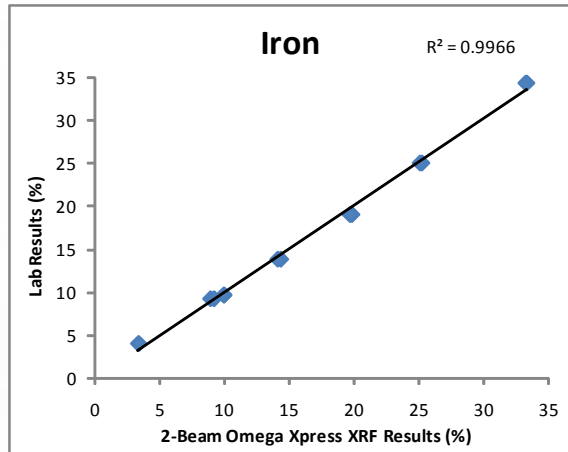
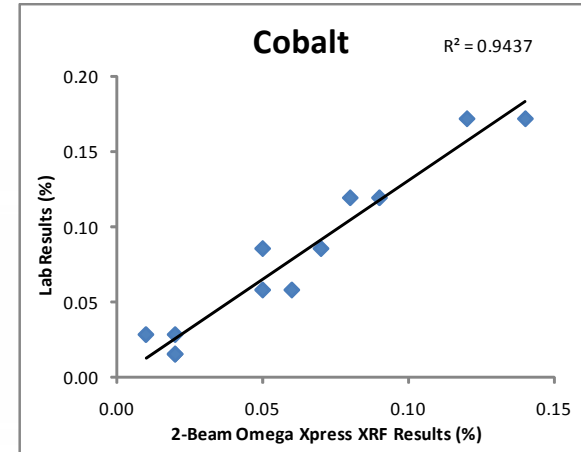
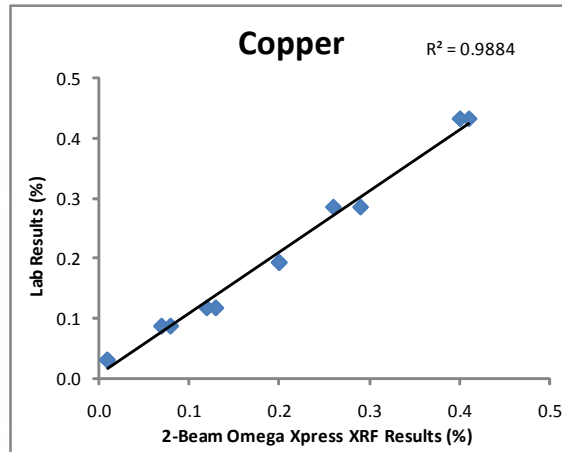
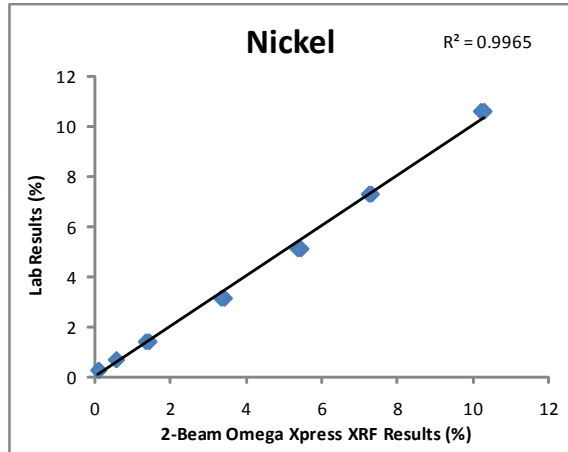
*Typical Al, Fe, Si, Ti & Zr Performance on GeoStat's Bauxite Certified Reference Materials (90 second test time IN AIR on prepared, powdered ores in Mining Mode using an Innov-X Omega Xpress SDD XRF Analyzer).*

APPLICATION BRIEF

# Ni-Sulphide Performance Omega Xpress (SDD)



[ 90sec Test on Pulps in Mining Mode in AIR ]



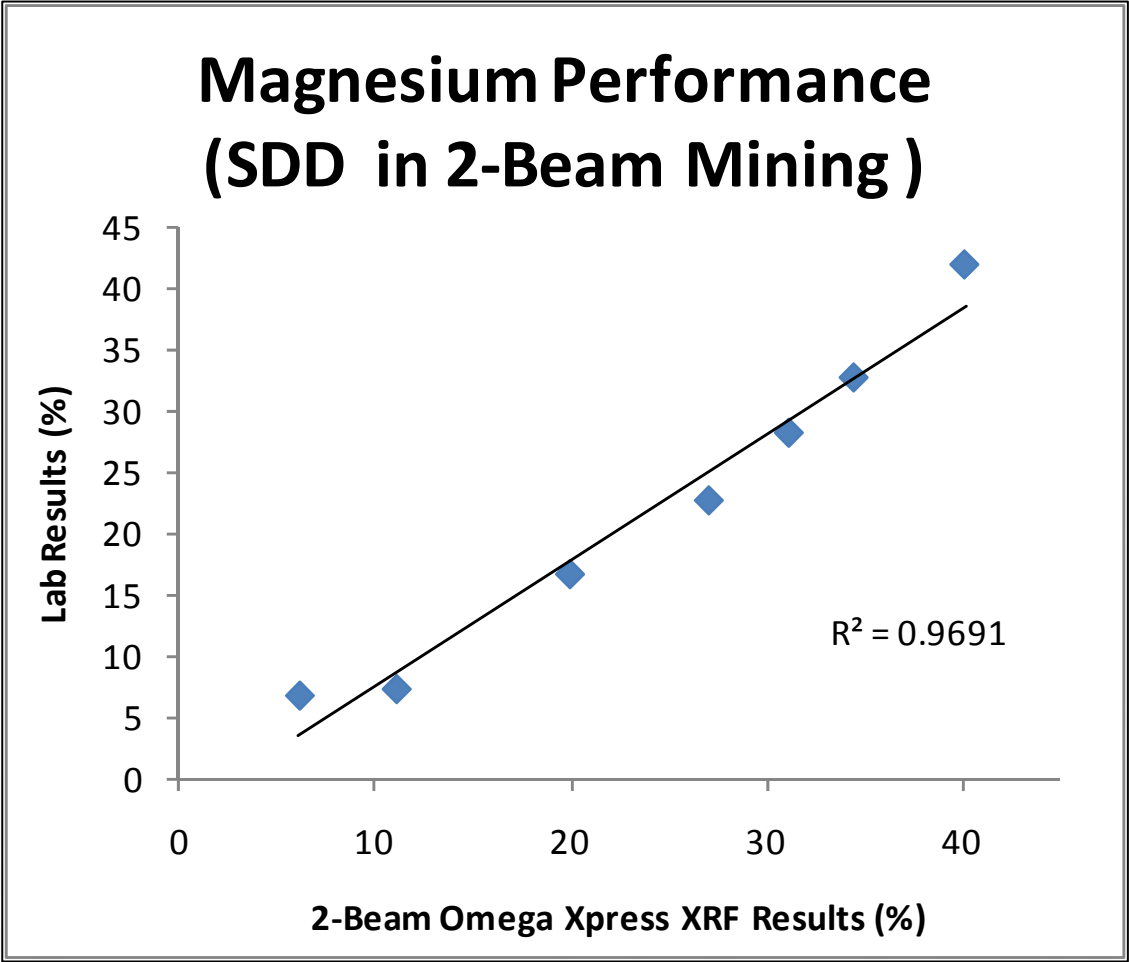
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ORE RESEARCH CRM's

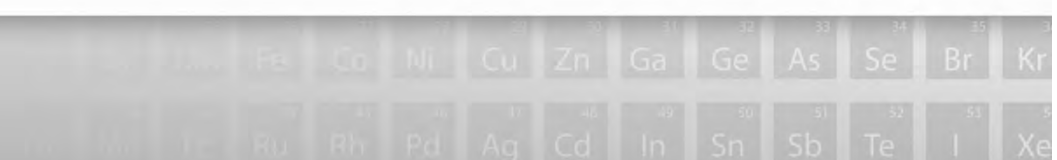
# Ni-S Performance – Mg SDD Omega

[ 90sec Test on Pulps in Mining Mode in Air]



# CONCLUSION

- **To continue providing the most innovative solutions with FPXRF for the mining industry**
- **To continue building the Innov-X brand as a high quality, best value solution for the mining industry**

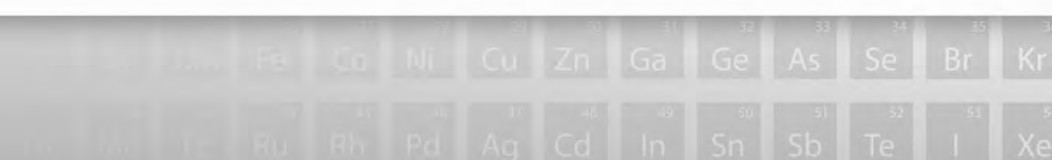




**THANK YOU!**

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