

The logo features a stylized grey lightbulb with three vertical lines above it representing light rays.

WHISTLE QA

We focus on quality



PT – AN ESSENTIAL QUALITY TOOL

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BACKGROUND AND FORWARD

My credentials

- *40 years lab experience*
- *Implementation of ISO systems*
- *Customer satisfaction through quality*

Presentation plan

- *What is proficiency testing?*
- *What types are available?*
- *Why do labs need it?*
- *Where do they get it?*

WHAT IS PROFICIENCY TESTING?

- *Proficiency testing is the process of validating analytical data by applying statistical tests to the results of analysis conducted on “control” samples by participating laboratories.*
- *These statistical tests are chosen in such a way that the probability of a set of results being “correct” can be calculated.*
- *Proficiency test results demonstrate the accuracy and precision of a set of analytical data.*
- *Statistical analysis is carried out independently of the organisation in question.*

WHAT TYPES ARE AVAILABLE?

- *Simultaneous Participation Schemes*
- *External Quality Assessment Schemes*
- *Split Level Designs*
- *Split Sample Testing Schemes (c.f. Split Level Design)*
- *Partial Process Schemes*

PT - AGAINST ESTABLISHED CRITERIA

- *Quantitative Schemes*
- *Qualitative schemes*
- *Single item testing*
- *Bulk Material Testing*
- *Single Occasion testing*
- *Continuous Schemes*
- *Sampling/Sub sampling Proficiency*
- *Data Interpretation/transformation*

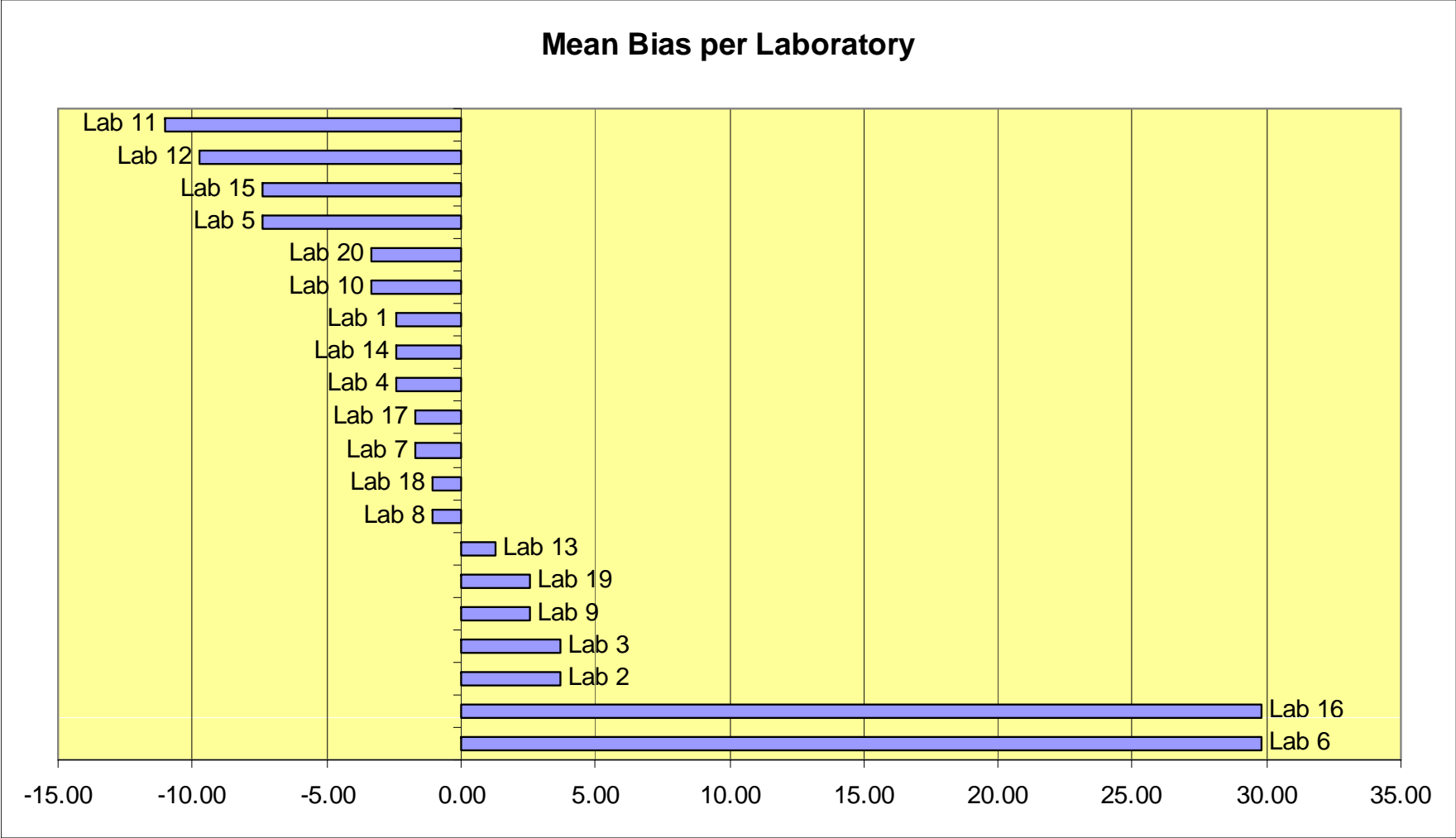
DEFINITIONS

- *Accuracy*
The proximity of the test result to the "True Value".
- *True Value*
A consensus value for a particular sample based on rigorous statistical analysis.
- *Precision*
*The degree of reproducibility of results using a given method.
(see "t" test)*
- *Outlier*
A result which lies so far from the "True Value" that it should be discarded from statistical analysis
- *Confidence Interval*
That range of results in a normal distribution within which a given proportion of the results should lie (often 95%)
- *Students "t" test*
A statistical method of determining whether a number of results form part of the same dataset

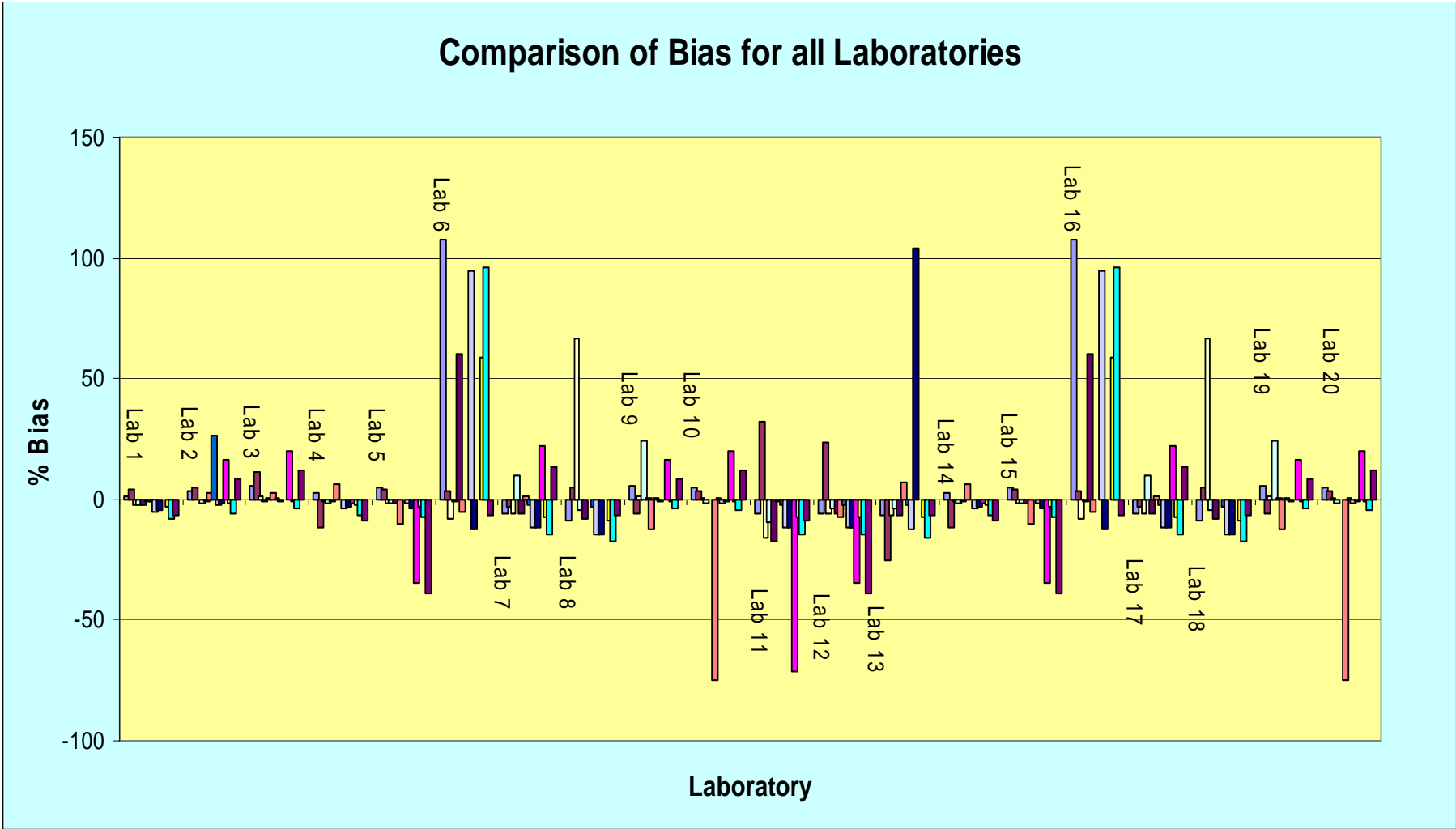
DEFINITIONS

- *Certified Reference Material*
A sample whose values for certain elements are well established using internationally accepted statistical practice.
- *“z” score*
A statistical test used to determine whether a series of CRM results are acceptable in relation to the standard deviation.
- *Paired “t” test*
A method of determining whether 2 sets of results on a series of samples comprise a single dataset
- *Control Chart*
A graphical representation of a series of CRM results about the “true value” represented by the horizontal axis

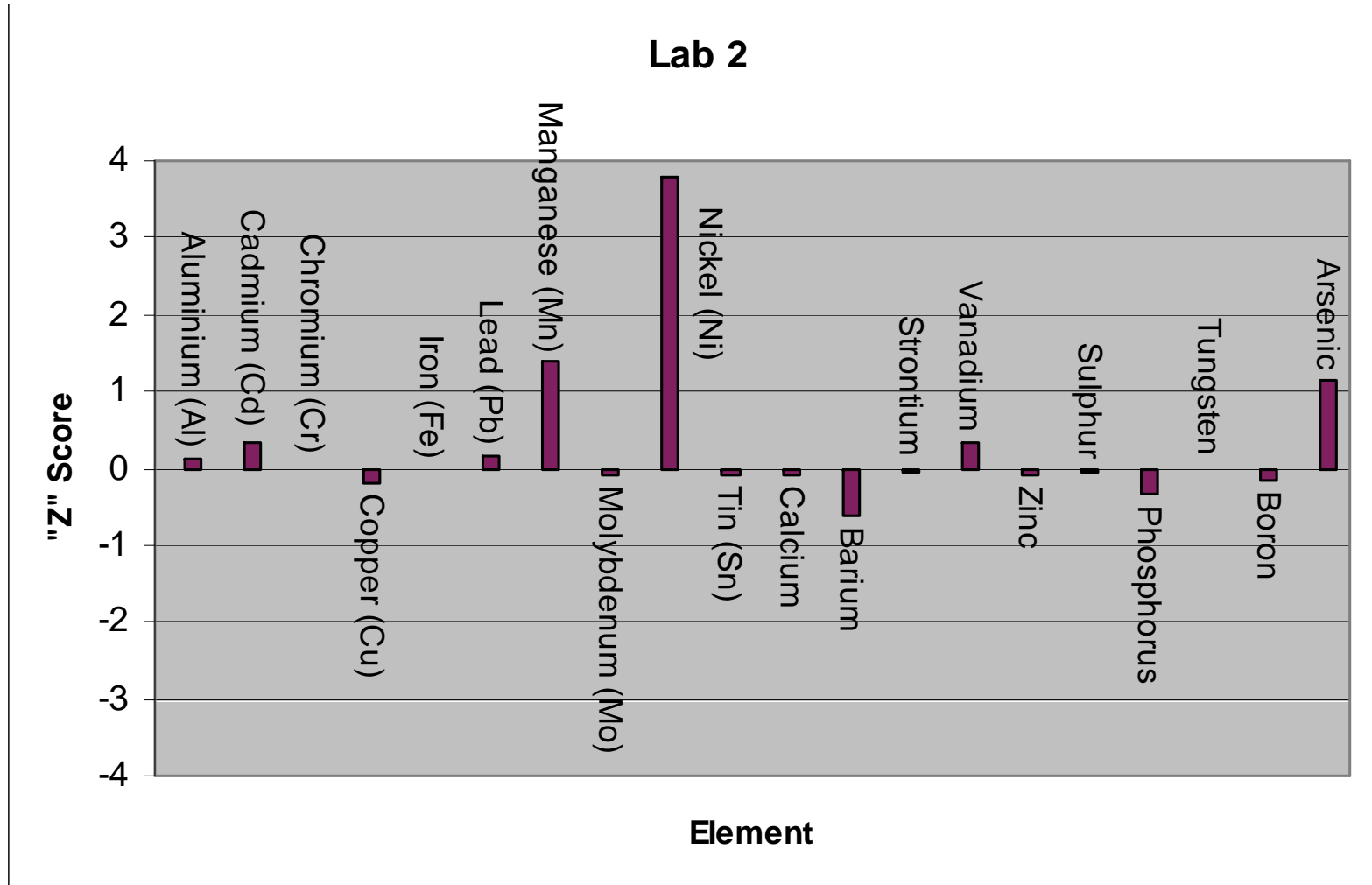
LABORATORY COMPARISONS



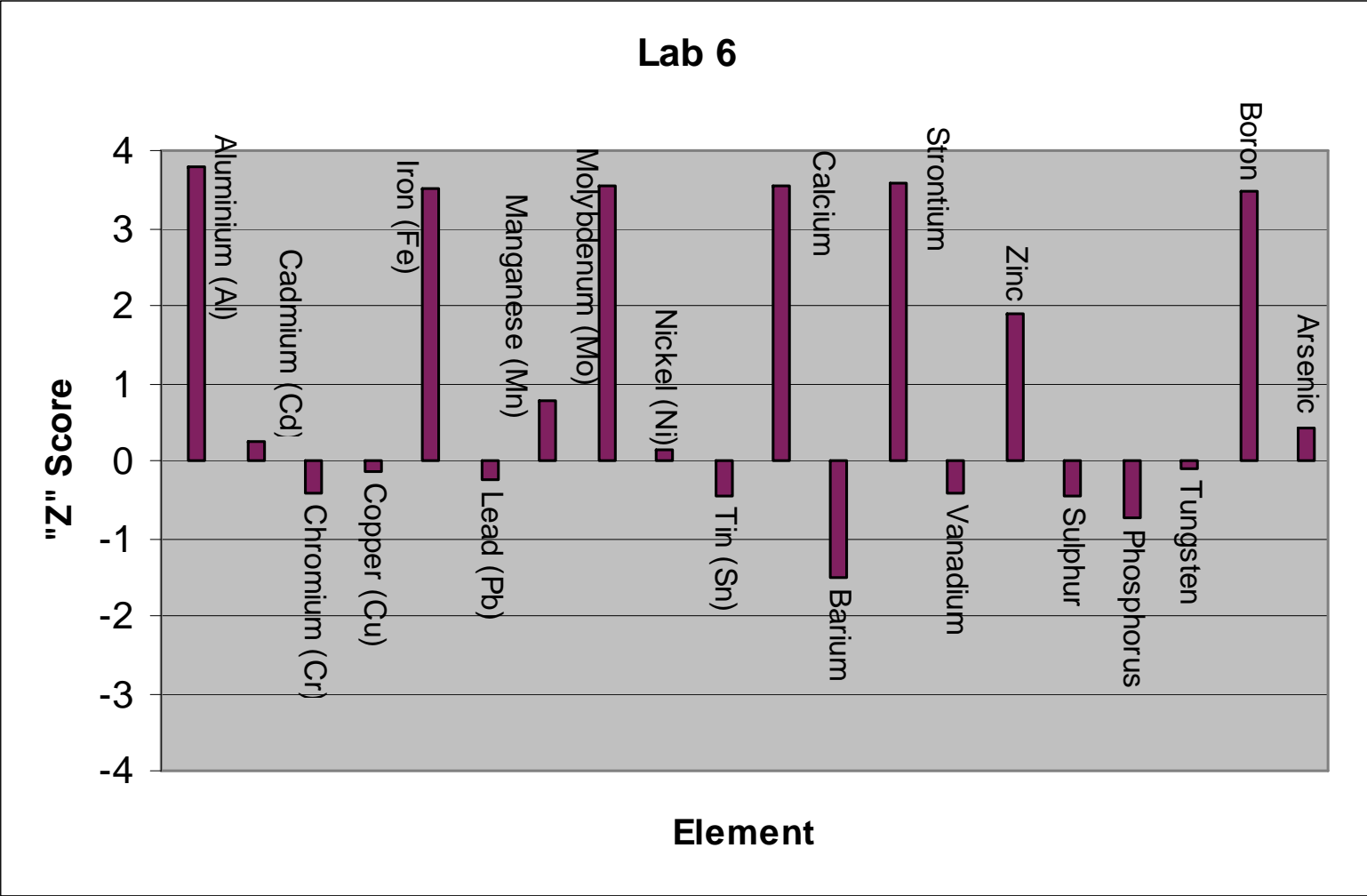
LABORATORY COMPARISONS



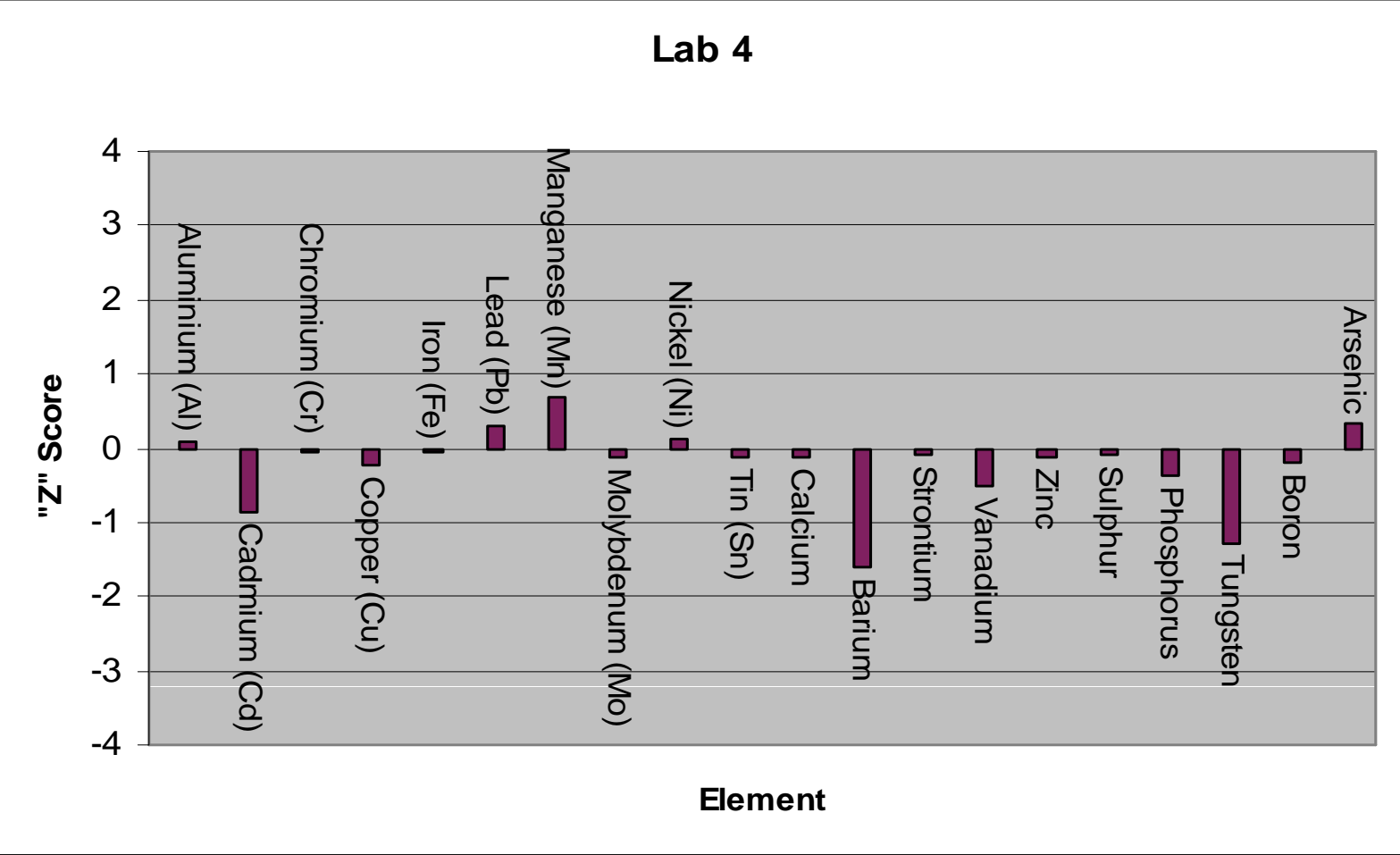
Typical "z" Score Report



Indicative of Positive Bias



Generally Well Controlled



METHODOLOGY

Empirical

Results obtained are dependent on the precise conditions used during the procedure. An example would be the determination of acid soluble (oxide) copper where the result depends on the acid concentration used, the degree of saturation with sulphur dioxide and the decomposition period. Because these parameters are difficult to reproduce exactly results obtained are hard to validate and such methods should be avoided if possible.

Relative

These methods typically include all common instrumental methods (AAS, ICP, XRF) where the result is dependent on a calibration and is subject to possible inter-atomic interferences and mineralogical effects. Such methods are successfully applied to plant control and geochemical samples where the sample matrices are relatively consistent. Even so it is advisable to confirm the calibration values by using certified reference materials or have the values confirmed by an absolute method.

METHODOLOGY

Absolute

Such methods rely on “Primary Standards” which are chemically stable and whose concentration can be established accurately or yield a stable product which can be weighed accurately. Results obtained therefore do not depend on comparison with other parameters. Such methods tend to be expensive and time consuming but are the methods of choice for determination of contained metals in say, shipment samples. Determination of nickel by dimethyl glyoxime would be an example.

ACCEPTANCE CRITERIA

Certified Reference Material

- *Laboratory results are unlikely to match quoted limits since in generating the CRM value all outliers will have been excluded.*
- *Initially results within 5% to 10% depending on actual value should be considered acceptable until sufficient data are available to calculate a standard deviation (s).*
- *After accumulation of sufficient data a standard deviation may be calculated taking account of the sample type, specific component and method employed.*

ACCEPTANCE CRITERIA

Certified Reference Material

- *Thereafter 95% of CRM results would be expected to lie within 2s of the mean.*
- *Should this not be the case all samples between the previous and the following acceptable CRM results should be scheduled for re-analysis*
- *Results further from the mean than 3s should be considered outliers and discarded from the subsequent analysis.*
- *More than 5% of results categorised as outliers along with unusual trends or bias should be made the subject of an investigation.*
- *Handling of outlying CRM results needs to be documented.*

ACCEPTANCE CRITERIA

Replicates

- *Replicate results within the same batch of analyses should lie within 2 standard deviations of each other*
- *Replicates which agree within 3 standard deviations may be acceptable under certain circumstances (e.g. results close to the detection limit)*
- *Should this not be the case all samples between the previous and the following acceptable replicate pairs should be scheduled for re-analysis*
- *How replicate results which do not agree within these parameters are handled needs to be documented.*

ACCEPTANCE CRITERIA

Blanks

- *Blanks should return values lower than the lower limit of detection for the method.*
- *Should this not be the case all samples between the previous and the following acceptable blank results should be scheduled for re-analysis*
- *Blank results higher than the lower limit of detection for the method may not simply be subtracted from the data set.*

ACCEPTANCE CRITERIA

"Z" Score

- *A test to determine whether or not a set of control sample results is acceptable in terms of general error (scatter) or bias at the chosen confidence interval having removed gross outliers.*
- *"z" score is calculated by subtracting the reference result from the laboratory mean and dividing the difference by the standard deviation. i.e. (lab result – reference value)/std dev*
- *By ignoring the sign (\pm) of the result (i.e. the absolute value) an indication of scatter is obtained*
- *At the 95% confidence interval the result for bias should lie between +2 and -2 and that for general error between 0 & 2*
- *"z" scores lying outside these parameters need to be investigated.*

ACCEPTANCE CRITERIA

% RSD

- *%RSD is calculated by expressing the standard deviation for a data set as a percentage of the mean.*
- *Generally %RSD should be less than 5% on high grade material and less than 10% on traces and low grade materials.*
- *%RSD values lying outside these ranges need to be investigated.*

ACCEPTANCE CRITERIA

Inter-Laboratory Data

- *Inter-laboratory results on the same batch of samples should lie within 2 standard deviations of each other*
- *Inter-laboratory results within 3 standard deviations may be acceptable under certain circumstances (e.g. results close to the detection limit)*
- *Should this not be the case a review should be made of the applicability of the methodology at both laboratories*
- *How results which do not agree within these parameters are handled needs to be documented.*

WHY HAVE PROFICIENCY TESTING?

- *Identify systematic errors before your clients do.*
- *Performance of a particular laboratory can be assessed against a group of laboratories undertaking similar work.*
- *Benchmark your laboratory against the competition.*
- *Validate appropriate methodology.*
- *Confirm competency of analysts*
- *It is a requirement of ISO/IEC 17025/2005.*

BENEFITS OF PTs

- *Monitoring the performance of laboratories for specific tests and their continuing level of performance.*
- *Identification of incipient problems and proposing actions to be taken.*
- *Establish the effectiveness and comparability of test methods.*
- *Providing additional confidence to laboratory customers.*
- *Identification of differences between laboratories*
- *Education of participants based on the outcome of such studies.*
- *Evaluation of the performance characteristics of a method.*
- *Assignment of values to test materials and assessment of their suitability for use.*
- *Provide support for statements regarding the equivalence of measurements of National Metrological Institutes through "Key Comparisons".*

WHERE DO YOU FIND ACCREDITED PTs?

- *PT service providers must satisfy ISO guide 43 and ILAC G:13 – soon to become ISO17043*
- *Overseas programmes – expensive generally*
- *In house PTs - should also conform to ISO guide 43*
- *Design local PTs through an accredited local company already operating in over 60 countries*



CERTIFICATE OF ACCREDITATION

This is to certify that:

THISTLE QA

Facility Accreditation Number: **PTS0001**

is a South African National Accreditation System accredited Organisation
provided that all SANAS conditions and requirements are complied with

This certificate is valid as per the scope on the accompanying schedule of accreditation
bearing the above accreditation number for

**PROFICIENCY TESTING BY INTERLABORATORY
COMPARISONS – DEVELOPMENT AND OPERATION OF PROFICIENCY
TESTING SCHEMES**

The facility complies with the general requirements of
ISO/IEC GUIDE 43-1:1997 AND ILAC G13:2000

PT Programme Highlights

- *Make recommendations with regard to setting up a quality assurance programme.*
- *Provide an independent assessment of the quality performance of participating laboratories highlighting areas for improvement.*
- *Assess the performance of your laboratory using inter-laboratory data*
- *Assess the effectiveness of new laboratory methods*
- *Assist in sourcing certified reference materials for use in laboratory quality assurance programmes.*
- *Issue a comprehensive report setting out conclusions drawn from the clients' QA data independently from those of the client in compliance with ISO Guide 43, ILAC G13*



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